Piper™

AIRPLANE MAINTENANCE MANUAL

CARD 1 OF 5

PA-32-301FT	PA-32-301XTC
Piper™ 6X	Piper™ 6XT
(S/N's 3232001 & UP)	(S/N's 3255001 & UP)

THE NEW PIPER AIRCRAFT, INC.

PART NUMBER 766-854 February 19, 2004

Published by
Technical Publications

2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member
General Aviation
Manufacturers Association

AEROFICHE REVISION STATUS

Revisions to this Maintenance Manual 766-854 issued June 1, 2003 are as follows:

Revision	Publication Date	Aerofiche Card Effectivity
ORG030601	June 1, 2003	All
PR040219 *	February 19, 2004	All

*** PARTIAL REVISION OF MAINTENANCE MANUAL 766-854**

This revision contains changes in all five aerofiche cards. Accordingly, replace the entire existing Aerofiche Card Set with this one dated 2/19/04.

NOTE: For those few customers who received Temporary Revision No. 22-1, dated January 6, 2004, when taking delivery of a new airplane at the factory or in conjunction with Piper Service Bulletin No. 1145, this February 19, 2004 revision supercedes Temporary Revision No. 22-1 in its entirety - those yellow pages should be removed and destroyed.

Consult the Customer Service Information Aerofiche (P/N 1753-755) for current revision dates for this manual.

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
Intro-List of	1	Feb 19/04			
Effective Pages	2	Jun 1/03			
Intro-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
Introduction	1	Jun 1/03			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Jun 1/03			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Feb 19/04			
	14	Jun 1/03			
Index	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

1. Instructions for Continued Airworthiness

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

The PIPER PA-32-301FT 6X and PA-32-301XTC 6XT Maintenance Manual constitutes the Instructions for Continued Airworthiness as required by Federal Aviation Regulations (FAR) Part 23, Appendix G. Chapter 4 contains the Airworthiness Limitations section (4-00-00) and the Inspection Program is in Chapter 5 (5-20-00).

2. General

This publication is prepared in accordance with the General Aviation Manufacturers Association (GAMA) Specification No. 2, with respect to the arrangement and content of the System/Chapters within the designated Chapter/Section-numbering system.

WARNING: USE ONLY GENUINE PIPER AIRCRAFT PARTS OR PIPER AIRCRAFT APPROVED PARTS OBTAINED FROM PIPER APPROVED SOURCES, IN CONNECTION WITH THE MAINTENANCE AND REPAIR OF PIPER AIRPLANES.

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

THE NEW PIPER AIRCRAFT, INC. expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-PIPER approved parts.

NOTE: THE NEW PIPER AIRCRAFT, INC. expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

In any question concerning the care of your airplane, be sure to include the airplane serial number in any correspondence.

3. Effectivity

This maintenance manual is effective for PA-32-301FT Piper 6X airplane serial numbers 3232001 and up and for PA-32-301XTC Piper 6XT airplane serial numbers 3255001 and up.

This encompasses the following model years:

NOTE: The following is provided as a general reference only.

A. PA-32-301FT 6X

Model Year	Serial Numbers
2003	3232001 thru 3232013
2004	3232014 and up

B. PA-32-301XTC 6XT

Model Year	Serial Numbers
2003	3255001 thru 3255014
2004	3255015 and up

4. Serial Number Explanation

Example: 32 32 001

TYPE CERTIFICATE DESIGNATION → 32

MODEL CODE → 32
32 = PA-32-301FT 6X
55 = PA-32-301XTC 6XT

SEQUENCE NUMBER → 001

5. Assignment of Subject Material

This publication is divided into industry standard, three element, numeric subject groupings as follows:

A. System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. They are assigned a number, which becomes the first element of the standardized numbering system. Thus, the element “28” of the number 28-40-01 refers to the chapter “Fuel”. Everything concerning the fuel system will be covered in this chapter.

B. Sub-System/Section - The major systems/chapters of an airplane are broken down into subsystems. These sub-systems are identified by the second element of the standard numbering system. The element “40” of the number 28-40-01 concerns itself with the indicating section of the fuel system.

C. Unit/Subject - The individual units within a sub-system/section may be identified by the third element of the standard numbering system. The element “01” of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and is normally zeroed out by PIPER.

Refer to paragraph 14, Chapter/Section Index Guide, for a complete breakdown and list. The material is arranged in ascending numerical sequence.

6. Pagination

The Chapter - Section (i.e. - 28-40-00) numbering system (explained above) forms the primary page numbering system for this manual. Within each Section, pages are numbered consecutively beginning with Page 1 (i.e. - 28-40-00, Page 1). Additionally, the aerofiche grid numbering system (explained below) is also used to indicate location within the manual.

7. Aerofiche Effectivity

A. The General Aviation Manufacturers Association (GAMA) have developed specifications for microfiche reproduction of aircraft publications. The information compiled in this Aerofiche Maintenance Manual will be kept current by revisions distributed periodically. These revisions will supersede all previous revisions and will be complete Aerofiche card replacements and shall supersede Aerofiche cards of the same number in the set. The "Aerofiche Effectivity" page at the front of this manual lists the current revision for each card in this set.

B. Conversion of Aerofiche alpha/numeric grid code numbers:

First number is the Aerofiche card number.
Letter is the horizontal row reference per card
Second number is the vertical column reference per card.

Example: 2J16 = Aerofiche card number two, row J, column 16.

C. To aid in locating information, the following is provided at the beginning of each aerofiche card:

(1) A complete Introduction containing the Chapter/Section Index Guide for all fiche in this set.
(2) A complete subject Index for all fiche in this set.

8. Identifying Revised Material

A revision to a page is defined as any change to the printed matter that existed previously. Revisions, additions and deletions are identified by a vertical line (i.e. - change bar) along the left-hand margin of the page opposite only that portion of the printed matter that was changed.

A change bar in the left-hand margin opposite the footer (i.e. - chapter/section/subject, page number and date), indicates that the text was unchanged but the material was relocated to a different page.

Example.

NOTE: Change bars are not used in the title pages, list of effective pages, or index.

9. Indexing

An alphabetically arranged subject Index follows this introduction to assist the user in locating desired information. In addition, each System/Chapter begins with an individual Table of Contents.

10. List of Effective Pages

Each System/Chapter has a List of Effective Pages preceding the Table of Contents to identify the effective revision date for each page in that chapter.

11. Warnings, Cautions and Notes

These adjuncts to the text are used to highlight or emphasize important points when necessary. Warnings call attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons. Cautions call attention to methods and procedures which must be followed to avoid damage to equipment. Notes call attention to methods which make the job easier. Warnings and Cautions shall be located directly above and Notes directly beneath the text and be in line with the paragraphs to which they apply.

12. Accident/Incident Reporting

To improve our Service and Reliability system and aid in our compliance with FAR 21.3, knowledge of all incidents and/or accidents must be reported to Piper immediately. To expedite and assist in reporting all incidents and accidents, Piper Form 420-01 has been created. See Service Letter 1041 for latest revision. This procedure is to be used by all Dealers, Service Centers and Repair Facilities.

13. Supplementary Publications

The following publications/sources provide servicing, overhaul and parts information for the PA-32-301FT/301XTC airplanes and their various components. Use them to supplement this manual.

A. Piper Publications:

	PA-32-301FT	PA-32-301XTC
(1) Parts Catalogs:	P/N 766-856	P/N 766-855
(2) Periodic Inspection Reports:	P/N 766-857	P/N 766-858
(3) Progressive Inspection Manuals (pending)	P/N 767-027	P/N 767-028

B. Vendor Publications:

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY.

(1) AIR CONDITIONING COMPRESSOR:

Vendor Address: Sanden International (USA), Inc.
601 South Sanden Blvd.
Wylie, Texas 75098
http://www.sanden.com/
PH: - (972) 442-8400
FAX: - (972) 442-8700

(2) AIR CONDITIONING EVAPORATORS AND BLOWERS:

Vendor Address: Enviro Systems, Inc.
P.O. Box 1404
Seminole, Oklahoma 74868
PH: - (405) 382-0731

(3) ALTERNATOR:

Vendor Address: Electro Systems, Inc.
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/
PH: - (888) 461-6077

(4) AUTOPILOT:

Vendor Address: S-TEC Corporation
One S-TEC Way
Mineral Wells, Texas 76067-9236
http://www.s-tec.com
PH: - (940) 325-9406

(5) BATTERY:

Vendor Address: GILL Batteries
A Division of Teledyne Continental Motors
http://www.gillbatteries.com
PH: - (800) 456-0070

(6) BRAKES AND WHEELS:

Vendor Address:	Parker Hannifin Corp Aircraft Wheel and Brake Division 1160 Center Road Avon, Ohio 44011 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 272-5464

(7) ELECTRONIC FLIGHT DISPLAY SYSTEM (EFDS)

Vendor Address:	Avidyne Corporation 55 Old Bedford Road Lincoln, MA 01773 http://www.avidyne.com/index.htm	PH - (800) 284-3963

Instructions for Continued Airworthiness

Primary Flight Display and Magnetometer/OAT:	Document No. AVPFD-174
Multifuntion Display:	Document No. AVMFD-167
Data Acquisition Unit:	Document No. AVSIU-011

(8) EMERGENCY LOCATOR TRANSMITTER:

Vendor Address:	Artex Airccraft Supplies 14405 Keil Road NE Aurora, Oregon 97002 http://www.artex.net/	PH: - (800) 547-8901

(9) ENGINE:

Vendor Address:	Textron Lycoming 652 Oliver Street Williamsport, PA 17701 http://www.lycoming.textron.com/main.html	PH - (717) 323-6181 FAX - (717) 327-7101
Overhaul Manual:	DIRECT DRIVE MODELS - P/N 60294-7	
Parts Catalog:	IO-540- ..... - K1G5, ... ENGINES - P/N PC-615 TIO-540-AH1A ENGINES - P/N PC-615-12	
Operators Handbook:	O-540, IO-540 SERIES - P/N 60297-10 TIO-540 Series - P/N 60297-23	

NOTE: The above Lycoming publications can be ordered as a set on CD-ROM from Avantext. See www.avantext.com or PH - (800) 998-8857.

(10) FIRE EXTINGUISHER (PORTABLE):

Vendor Address:	H3R Inc. 43 Magnolia Ave # 4 San Francisco, California 94123-2911 http://www.h3r.com/index.htm	PH: - (800) 249-4289

(11) FUEL PUMP:

Vendor Address:	Weldon Pumps P.O. Box 46579 640 Golden Oak Parkway Oakwood Village, Ohio 44146 http://www.weldonpumps.com/index.html	PH: - (440) 232-2282 FAX - (440) 232-0606

(12) FUEL CELLS:

Vendor Address:	Engineered Fabrics Corporation 669 Goodyear Street Rockmart, Georgia 30153-0548 http://www.kfefc.com/index.htm	PH - (770) 684-7855 FAX - (770) 684-7438

(13) HI-LOK FASTENERS AND TOOLS:

Vendor Address:	Hi-Shear Corporation 2600 Skypark Drive Torrance, California 90509	PH: - (213) 326-8110

(14) LIGHTS - NAVIGATION, STROBE, AND STANDBY/MAP LIGHTS:

Vendor Address:	Whelen Engineering Co. Inc. Route 145, Winthrop Rd. Chester, Conneticut 06412 http://www.whelen.com/	PH: - (860) 526-9504 FAX - (860) 526-2009

(15) MAGNETOS:

Vendor Address:	Slick Aircraft Products Unison Industries Attn: Subscription Dept. 530 Blackhawk Park Ave. Rockford, IL 61104 http://www.unisonindustries.com/index4.html	PH - (815) 965-4700 FAX - (815) 965-2457
Installation, Operation and Maintenance Instructions:	F1100 MASTER SERVICE MANUAL, 4300/6300 SERIES MAGNETO MAINTENANCE AND OVERHAUL MANUAL - L-1363	

(16) NAVIGATION, COMMUNICATIONS, AND GPS (NAV/COM/GPS):

Vendor Address:	Garmin International 1200 East 151ST Street Olathe, KS 66062 http://www.garmin.com	PH: - (913) 397-8200

(17) OXYGEN SYSTEM (6XT only):

Vendor Address:	Scott Aviation 2225 Erie Street Lancaster, New York 14086 http://www.scottaviation.com/	PH - (716) 683-5100

(18) PROPELLER:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Standard Practices:	Manual No. 202A	
Overhaul and Maintenance:	Manual No. 113B	
Aluminum Blade Overhaul:	Manual No. 133C	
Propeller Owner's Manual and Logbook:	Manual No. 115N	

(19) PROPELLER GOVERNOR:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Governor Maintenance:	Manual No. 130B	

(20) STANDBY ATTITUDE INDICATOR:

Vendor Address:	Mid-Continent Instruments Co., Inc. 9400 E. 34 TH Street N. Wichita, KS 67226 http://www.mcico.com/index.html	PH - (316) 630-0101 FAX - (316) 630-0723
Installation Manual and Operating Instructions:	Manual No. 9015762	

(21) STARTER:

Vendor Address:	Sky-Tec 350 Howard Clemmons Rd. Granbury, Texas 76048 http://www.skytecair.com	PH - (800) 476-7896 FAX - (817) 573-2252

(22) VACUUM PUMPS:

Vendor Address:	Aero Accessories, Inc. 1240 Springwood Avenue Gibsonville, NC 27249 http://www.aeroaccessories.com/index.html	PH - (800) 822-3200

(23) VACUUM REGULATORS:

Vendor Address: Parker Hannifin Corp. PH: - (800) 382-8422
Airborne Division
711 Taylor Street
Elyria, Ohio 44035
http://www.parker.com/cleveland/Universe/book.pdf

(24) VOLTAGE REGULATOR:

Vendor Address: Electro Systems, Inc. PH: - (888) 461-6077
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/

14. Chapter/Section Index Guide

NOTE: The following GAMA Specification No. 2 standard chapters are not included in this Maintenance Manual: 26, 29, 36, 38, 49, 53, 54, 60, 72, 75, 76, and 83. These chapters are omitted because the subject system is either: not installed in these airplanes; adequately covered in vendor or other manuals; or, for ease of use, has been combined with another chapter.

GRIDS 1A22 THRU 1A24
INTENTIONALLY BLANK

A

B

C

D

E

F

M

O

P

R

S

GRIDS 1B6 THRU 1B24
INTENTIONALLY BLANK

CHAPTER

4

AIRWORTHINESS LIMITATIONS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 4

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 4 - AIRWORTHINESS LIMITATIONS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

AIRWORTHINESS LIMITATIONS.

NOTE: The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

1. Limitations

No limitations, related to fatigue life of the airplane and its components, have been established for the PA-32-301FT nor the PA-32-301XTC.

NOTE: Refer to the LIMITATIONS section in the Pilot's Operating Handbook for a detailed delineation of the flight limitations of the airplane.

2. Inspections

Refer to 5-20-00 for Piper's recommended Inspection Program.

3. Life Limited Parts Marking and Disposition

14 CFR Part 43.10, Disposition of Life-Limited Aircraft Parts requires that proper procedures are followed when removing life limited parts with time and/or cycles remaining on them as well as the disposition of life limited parts with no time and/or cycles left. Life limited parts defined by Type Certificate (TC) are listed in paragraph 1, above. Other parts which are replaced or rebuilt at specified intervals are listed in Chapter 5.

A. Parts that are removed prior to accumulating their life limit, are to be marked with indelible ink or marker with the part number, serial number and accumulated life status as defined in 14 CFR Part 43.10 in a manner that does not affect part structural integrity, i.e. - no surface deformation such as vibration/etching allowed.

B. Parts that have accumulated the life limit shall be disposed of in accordance with the applicable FARs. Piper recommends life limited parts with no time and/or cycles remaining be completely destroyed.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

5

TIME LIMITS / MAINTENANCE CHECKS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 5

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE
5-List of Effective Pages	1	Feb 19/04
	2	Jun 1/03
5-Table of Contents	1	Feb 19/04
	2	Feb 19/04
5-00-00	1	Jun 1/03
	2	Jun 1/03
5-10-00	1	Jun 1/03
	2	Jun 1/03
5-20-00	1	Jun 1/03
	2	Feb 19/04
	3	Feb 19/04
	4	Feb 19/04
	5	Jun 1/03
	6	Jun 1/03
	7	Feb 19/04
	8	Feb 19/04
	9	Feb 19/04
	10	Feb 19/04
	11	Feb 19/04
	12	Feb 19/04
	13	Feb 19/04
	14	Feb 19/04
	15	Feb 19/04
	16	Jun 1/03
	17	Feb 19/04
	18	Feb 19/04
	19	Feb 19/04
	20	Feb 19/04
	21	Feb 19/04
	22	Feb 19/04
	23	Feb 19/04
	24	Feb 19/04
	25	Feb 19/04
	26	Feb 19/04
	27	Jun 1/03
	28	Jun 1/03
5-30-00	1	Feb 19/04
	2	Feb 19/04
	3	Feb 19/04
	4	Feb 19/04
	5	Feb 19/04
	6	Feb 19/04
	7	Jun 1/03
	8	Jun 1/03
5-50-00	1	Feb 19/04
	2	Feb 19/04
	3	Jun 1/03
	4	Jun 1/03
	5	Jun 1/03
	6	Jun 1/03
	7	Jun 1/03
	8	Jun 1/03
	9	Jun 1/03
	10	Jun 1/03

THIS PAGE INTENTIONALLY BLANK

CHAPTER 5 - TIME LIMITS / MAINTENANCE CHECKS

TABLE OF CONTENTS

CHAPTER 5 - TIME LIMITS / MAINTENANCE CHECKS

TABLE OF CONTENTS (cont.)

GENERAL

The New Piper Aircraft, Inc. (Piper) takes a continuing interest in having the owner get the most efficient use from his airplane, and keeping the airplane in the best mechanical condition. To that end, Piper publishes a recurring maintenance schedule which is supplemented with Service Bulletins, Service Letters and Service Spares Letters as required.

A. The recurring maintenance schedules for the PA-32-301FT 6X and PA-32-301XTC 6XT are provided in 5-20-00.

B. Piper Service Bulletins are of special importance and Piper considers compliance mandatory. These are sent to the latest U.S. registered owners and Piper Service Centers.

C. Service Letters deal with product improvements and service hints pertaining to the aircraft. They are sent to Piper Service Centers and sometimes directly to owners, so they can properly service the aircraft and keep it up to date with the latest changes. Owners should give careful attention to the service letter information.

D. Service Spares Letters, which are sent only to Piper Service Centers, offer improved parts, kits and optional equipment which were not available originally and which may be of interest to the owner.

NOTE: Piper mails Service Bulletins, Service Letters, and P.O.H. Revisions to the registered owner's name and address as shown on the Aircraft Registration Certificate. If the aircraft is based and/or operated at a different location (or locations) and/or by a person (or persons) other than those recorded on the aircraft registration, then the registered owner(s) is responsible for forwarding these Bulletins and Letters to the operating location(s) or person(s).

Changes in aircraft registration may take a substantial amount of time to be recorded by the Federal Aviation Administration and received by Piper to change the mailing address. Owners and operators should make arrangements to keep abreast of service releases during this interim period through their Piper Service Center.

The Federal Aviation Administration (FAA) publishes Airworthiness Directives (AD's) that apply to specific aircraft. They are mandatory changes and are to be complied within a time limit set by the FAA. When an AD is issued, it is sent to the latest registered owner of the affected aircraft and also to subscribers of the service. The owner is solely responsible for being aware of and complying with airworthiness directives.

NOTE: A searchable database of AD's is available on the FAA website. See the "Airworthiness DIrectives" link at "www1.faa.gov". Additionally, Avantext offers a free email notification service for new AD's as well as the last six weeks worth of AD's at "www.avantext.com".

An owner should periodically check with a Piper Service Center to find out the latest information to keep his aircraft up to date.

The New Piper Aircraft, Inc. has a subscription service for the Service Bulletins, Service Letters, and Service Spares Letters. This service is offered to interested persons such as owners, pilots, and mechanics at a nominal fee and may be obtained through Piper Service Centers. Owners residing outside of the United States are urged to subscribe to this service since Piper cannot otherwise obtain the addresses of foreign owners. Maintenance Manuals and Illustrated Parts Catalogs are also available through Piper Service Centers and Dealers world wide.

THIS PAGE INTENTIONALLY BLANK

TIME LIMITS

1. Refer to 4-00-00 for the FAA-approved airworthiness limitations section. It sets forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure required for type certification.
2. Refer to 5-20-00 for Piper's recommended Inspection Programs. They include the frequency and extent of the inspections required for the continued airworthiness of these airplanes.
3. Inspections required by Flight Hour or Calendar Year, if due, are included as part of the Annual / 100 Hour Inspection and/or the Progressive Inspection Event cycles, and are listed individually in 5-30-00.

THIS PAGE INTENTIONALLY BLANK

SCHEDULED MAINTENANCE

This section provides instructions for conducting inspections. Repair or replacement instructions for those components found to be unserviceable during inspections will be found in the applicable airplane system chapter. (See Chapter/Section Index Guide, Introduction.)

WARNING: GROUND THE MAGNETO PRIMARY CIRCUIT (P LEAD), BEFORE PERFORMING ANY MAINTENANCE OPERATION ON THE ENGINE.

1. Description

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

The recurring maintenance schedules for the PA-32-301FT 6X and PA-32-301XTC 6XT are provided herein as Annual / 100 Hour Inspections. Progressive Inspection Programs will be available from Piper Dealers in a separate manual form.

Piper inspection programs comply with the F.A.A. Federal Aviation Regulations Parts 43, 91 and 135. The owner/operator is primarily responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives and conformity with the requirements in FAR 91.409, 91.411 and 91.413.

The first overhaul or replacement of components should be performed at the given periods. The condition of various components can then be used as criteria for determining subsequent periods applicable to the individual airplane, depending on usage, providing the owner/operator has an established Part 91 Progressive Inspection Program (see 91.409(d)) or Part 135 Approved Aircraft Inspection Program (see 135.419).

The time periods given for inspections of various components are based on average usage and environmental conditions.

NOTE: The listed inspection, overhaul and replacement schedules do not guarantee that a particular item or component will reach the listed time without malfunction. Unique operating conditions encountered by individual airplanes cannot be controlled by the manufacturer.

2. Definitions

A. Inspections - Must be performed only by Certified Mechanics who are qualified on these aircraft, using acceptable methods, techniques and practices to determine physical condition and detect defects.

(1) Routine Inspection - Consists of a visual examination or check of the aircraft and its components and systems without disassembly.

(2) Detailed Inspection - Consists of a thorough examination of the aircraft, appliance, component, or system; with disassembly as necessary to determine condition.

(3) Special Inspection - Involves those components, systems or structure which by their application or intended use require an inspection peculiar to, more extensive in scope or at a time period other than that which is normally accomplished during an event or annual inspection.

B. Checks - Can be performed by pilots and/or mechanics who are qualified on this aircraft and consists of examinations in the form of comparisons with stated standards for the purpose of verifying condition, accuracy and tolerances.

C. Approved Inspection - Means a continuing airworthiness inspection of an airplane and its various component and systems at scheduled interval in accordance with procedures approved by the FAA under FAR Part 91.409(d) or Part 135.419.

D. Tests - Operation of aircraft components, appliances or systems to evaluate functional performance.

(1) Operational Test - A task to determine that an item, is fulfilling its intended purpose.The task does not require quantitative tolerances. This is a fault finding task.

(2) Functional Test - A quantitative check to determine, if one or more functions of an item performs within specified limits. This test may require the use of supplemental bench test equipment.

(3) In addition, each of the above tests must be performed by an FAA Certified Repair Station with appropriate ratings or by a Certified Mechanic who is qualified on this aircraft. The recording of the above function must be made in the permanent aircraft records by the authorized individual performing the test.

E. Bench Test - Means removal of component from the aircraft to inspect for cleanliness, impending failure, need for lubrication, repair or replacement of parts and calibration to at least the manufacturers specifications using the manufacturers recommended test equipment or standards or the equivalent.

Each bench test will be performed by a Piper Service Center, FAA Certified Repair Station with appropriate rating or by a certified mechanic. This test will be performed at the scheduled interval regardless of any bench test performed on a particular component while being repaired/overhauled before scheduled interval bench test. After the component is installed into the aircraft, an operational test of the component and its related system should be performed to ensure proper function. Serviceable parts that were issued to the component will be filed in the aircraft permanent records. The person performing the check must make appropriate entries in the aircraft's permanent maintenance record.

F. Maintenance - The word maintenance as defined by FAR Part 1, means "inspection, overhaul, repair, preservation and the replacement of parts, but excludes preventive maintenance."

G. On Condition Maintenance - A primary maintenance process having repetitive inspections or tests to determine the condition of units, systems, or portions of structure with regard to continued serviceability (corrective action is taken when required by item condition.)

H. Time - as used in this manual.

(1) Time-in-service for aircraft components, unless otherwise specified, is a cumulative total of flight hours or calendar time calculated from the time a new or overhauled component was first installed in any aircraft, and including:

(a) the aircraft time that elapses from the initial installation to the first removal, if any; and,

(b) the aircraft time that elapses from each subsequent installation to each subsequent removal, if any; or,

(c) the calendar time elapsed since the installation.

NOTE: Dates stamped on individual components at the time of manufacture are typically applied to determine shelf life - i.e. the maximum time allowed from manufacture/assembly/cure until actually installed in an aircraft and are not relevant.

Do not, however; ignore markings applied to life-limited parts when removed with time and/or cycles remaining on them.

(2) Aircraft time, flight hours, or aircraft hours are the "Hobbs Time" shown on, or calculated from, the installed "Hour Meter."

3. Inspection Requirements

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

A. Annual / 100 Hour Inspection. (See paragraph 4.)

Owners/operators may maintain the airplane solely under FAR 91.409 (a) and (b) inspection requirements. The 100 hour inspection cycle is a complete inspection of the airplane and is identical in scope to an annual inspection. The 500 and 1000 hour inspection cycles are extensions of the 100 hour inspection which require a more detailed examination of the airplane, and overhaul or replacement of some major components. Inspections must be accomplished by persons authorized by the FAA.

B. Progressive Inspection.

The Progressive Inspection program is designed to permit the best utilization of the aircraft through the use of a planned inspection schedule. This schedule is prepared in a manual form, which will be available from Piper Dealers:

P/N 767-027 (pending) for the 6X (S/N's 3232001 & up), and

P/N 767-028 (pending) for the 6XT (S/N's 3255001 & up).

Refer to Piper's Customer Service Information Aerofiche P/N 1753-755 for a checklist to ensure obtaining latest issue.

NOTE: The 50 Hour Progressive Inspection Manuals (P/N's 767-027 and 767-028) referenced above will not be stand-alone documents. They will consitute snapshots of the Airworthiness Limitations and Inspection sections of the Instructions for Continued Airworthiness (ICA) and will be current only at the time of printing. Use them as follows:

(1) Owners/operators desiring to establish a Part 91 Progressive Inspection Program (PIP) (see 91.409(d)) or a Part 135 Approved Aircraft Inspection Program (AAIP) (see 135.419) should use the appropriate Progressive Inspection Manual as a template for submission to their regional FAA office.

(2) Service centers conducting Event Cycle inspections under a FAA-approved PIP or AAIP can use the appropriate Progressive Inspection Manual as a working check-off list/form, provided they verify its currency against the FAA-approved PIP or AAIP.

C. Overlimits Inspection.

If the airplane has been operated so that any of its components have exceeded their maximum operational limits, special inspections may be required by Piper and/or the component manufacturer. See 5-50-00 and applicable vendor publications.

4. Annual / 100 Hour Inspection Procedure

A. Scheduled Maintenance (i.e. - paragraphs 5 and 6.)

(1) The required periodic inspection procedures are listed in paragraphs 5 (PA-32-301FT) and 6 (PA-32-301XTC). These inspection procedures are broken down into major groups which include Propeller, Engine, Cabin and Cockpit, Fuselage and Empennage,Wing, Landing Gear, Operational Inspection and General. The first column in each group lists the inspection or procedure to be performed. The second column is divided into two sub-columns indicating the required inspection interval of 50 hours or 100 hours. Each inspection or operation is required at each of the inspection intervals indicated by a circle (O). When vendor publications specify times other than those designated in the the various columns, it will be indicated as:

As required by "applicable vendor publication"	or	See Note "X"

in the inspection interval columns, or listed as a special inspection in 5-30-00, or both.

(2) Refer to the applicable chapter of this manual for instructions on how to gain access to remove any item that must be removed and is not completely accessible.

(3) Inspection Report Forms.

To help in the performance of periodic inspections, Inspection Report forms are available through Piper Dealers:

P/N 766-858 for the 6XT (S/N's 3255001 & up).

NOTE: Service centers conducting Part 91 Annual / 100 Hour Inspections can use the Inspection Report Form (P/N 766-858), as a working check-off list, provided they verify its currency against an up-to-date copy of the ICA (i.e. - this Maintenance Manual, see 4-00-00 and 5-20-00).

(4) In addition to inspection intervals required in scheduled maintenance (i.e. - paragraphs 5 and 6), preflight inspection must also be performed.

(5) References to maintenance manual applicable areas are per the "chapter - system/sub-system" assignment of subject material numbering system.

B. Special Inspections (see 5-30-00.)

C. Unscheduled Maintenance (see 5-50-00.)

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up)

Refer to Notes 1, 2, 3, and 4 before performing the following inspections.

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
A. PROPELLER GROUP		
WARNING: USE EXTREME CAUTION WHEN ROTATING PROPELLER BY HAND; PROPELLER MAY KICK BACK. PRIOR TO ROTATING PROPELLER ENSURE BOTH MAGNETO SWITCH(S) ARE OFF (GROUNDED). IF MAGNETO(S) ARE NOT GROUNDED, TURNING PROPELLER MAY START ENGINE.		
1. Inspect spinner and back plate for cracks, dents, missing screws, and security	O	O
2. Inspect blades for nicks and cracks	O	O
3. Check for grease and oil leaks	O	O
4. Lubricate propeller per Lubrication Chart, 12-20-00		O
5. Inspect spinner mounting brackets for cracks and security		O
6. Inspect propeller mounting bolts for security and safety. Recheck torque values if safety is broken		O
7. Inspect hub parts for cracks and corrosion		O
8. Rotate blades and check for tightness in hub pilot tube		O
9. Inspect complete propeller and spinner assembly for security, chafing, cracks, deterioration, wear, and correct installation		O
10. Overhaul or replace propeller governor	As required by Hartzell Service Letter No. 61	
11. Overhaul propeller	As required by Hartzell Service Letter No. 61	
B. ENGINE GROUP		
WARNING: IF MAGNETO(S) ARE NOT GROUNDED, TURNING PROPELLER MAY START ENGINE. USE EXTREME CAUTION WHEN ROTATING PROPELLER BY HAND; PROPELLER MAY KICK BACK. PRIOR TO ROTATING PROPELLER ENSURE BOTH MAGNETO SWITCH(S) ARE OFF (GROUNDED).		
NOTE: Read Note 5 prior to completing this group.		
1. Remove engine cowl and inspect for internal and external damage	O	O
2. Clean and inspect cowling for cracks, distortion, and loose or missing fasteners		O
3. Drain oil sump	O	O
4. Clean suction oil strainer at oil change; inspect strainer for foreign particles	O	O
5. Change full flow, cartridge type, oil filter element; inspect element for foreign particles. (See Note 7.)	O	O
6. Inspect oil temperature sender unit for leaks and security		O
7. Inspect oil lines and fittings for leaks, security, chafing, dents, & cracks	O	O
8. Clean and inspect oil radiator cooling fins		O
9. Fill engine with oil per information on cowl or in Lubrication Chart, 12-20-00	O	O
CAUTION: USE CAUTION NOT TO CONTAMINATE VACUUM PUMP WITH CLEANING FLUID. (REFER TO LATEST REVISION TEXTRON LYCOMING SERVICE INSTRUCTION NO. 1221.)		
10. Clean engine with approved solvents		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
B. ENGINE GROUP (CONT.)		
11. Inspect condition of spark plugs. Clean and adjust gap as required; adjust per latest revision Textron Lycoming Service Instruction No. 1042		O
NOTE: If fouling of spark plugs is apparent, rotate bottom plugs to upper plugs.		
12. Inspect spark plug cable leads	O	O
13. Check cylinder compression. (Refer to AC 43.13-1, latest revision.)		O
14. Inspect cylinders for cracked or broken fins. (See Note 8.)		O
15. Inspect rocker box covers for evidence of oil leaks. If found, replace gasket; torque cover screws 50 inch-pounds	O	O
16. Inspect ignition harness and insulators for high tension leakage and continuity		O
17. Check magneto points for proper clearance		O
18. Inspect magneto for oil seal leakage		O
19. Inspect magnetos to engine timing		O
20. Remove air filter and clean per 12-10-00. Replace as required	O	O
21. Clean fuel injector inlet line screen	O	O
22. Inspect condition of alternate air valve and housing	O	O
23. Inspect intake seals for leaks and clamps for tightness. (Torque clamps 40-50 in.-lbs.)	O	O
24. Inspect all air inlet duct hoses. Replace as required.	O	O
25. Inspect condition of flexible fuel lines.		O
26. Inspect fuel system for leaks		O
27. Inspect engine-driven and electric fuel pumps for operation		O
28. Overhaul or replace engine-driven and electric fuel pumps	Engine Overhaul or Five (5) Years	
29. Inspect and operationally test engine driven vacuum pumps and lines.		O
30. Inspect throttle, alternate air, mixture, and propeller governor controls for security, travel, and operation condition.		O
31. Inspect exhaust stacks, connections and gaskets. Replace gaskets as required. (Refer to 78-00-00.)	O	O
32. Inspect muffler, heat exchange, and baffles. (Refer to 78-00-00.)	O	O
33. Inspect breather tube for obstructions and security		O
34. Inspect crankcase for cracks, leaks, and security of seam bolts		O
35. Inspect engine mounts for cracks and loose mounting		O
36. Inspect all engine baffles		O
37. Inspect rubber engine mount bushings for deterioration. (Replace as required.)		O
38. Inspect firewall seals		O
39. Lubricate alternator idler pulley; remove front grease seal and add grease. (Refer to Lubrication Chart, 12-20-00.) (Disregard if sealed bearing is installed.)		O
40. Inspect condition of alternator and starter		O
41. Inspect security of alternator or mounting		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
B. ENGINE GROUP (CONT.)		
42. Inspect condition and tension of alternator drive belt. (See Adjusting Alternator Belt Tension, 24-30-00.)	O	O
43. If installed, inspect condition of A/C compressor belt and tension. (See Adjusting Drive Belt Tension, 21-50-00.)	O	O
44. If installed, check A/C compressor oil level. (See Note 9.)		O
45. If installed, inspect A/C compressor clutch security and wiring. (See Note 10.)		O
46. If installed, inspect A/C compressor mounting for cracks, corrosion, and security		O
47. Check fluid in brake reservoir. Fill as required.	O	O
48. Inspect and lubricate all controls. (Refer to Lubrication Chart, 12-20-00.)		O
49. Complete overhaul of engine or replace with factory rebuilt.	As req'd by Lycoming Svc Instr. No. 1009	
50. Install engine cowl	O	O
C. CABIN AND COCKPIT GROUP		
1. Inspect cockpit and cabin doors, latches, and hinges, and windows, and aft baggage compartment door, latch, and hinge for damage, operation, and security		O
2. Inspect windows for scratches, crazing, and condition.		O
3. Check window and door seals for deterioration, cracks, and voids		O
4. Inspect upholstery for tears		O
5. Inspect seats, seat belts, shoulder harnesses, security brackets, and bolts. (See Seat Belt and Shoulder Harness Inspection, 25-10-00.)		O
6. Inspect trim operation		O
7. Inspect rudder pedals		O
8. Inspect parking brake valve and brake handle for operation and cylinder leaks		O
9. Inspect control wheels, column, pulleys, cables, turnbuckles, and fittings. (See Note 11.)		O
10. Inspect flap lever to control cable attachment bolt for condition and security. (See Note 11.)		O
11. Check landing, navigation, strobe, cabin, and instrument lights	O	O
12. Inspect instruments, lines, and attachments.		O
13. Inspect gyro operated instruments and electric turn and bank. (Overhaul or replace as required.)		O
14. Replace central air filter.		O
15. Clean or replace vacuum regulator filter		O
16. Inspect altimeter and transponder for installation/certification per latest revision of AC43.13-1 and tested/inspected per FAR's 91.411 and 91.413, respectively		O
17. Inspect and test ELT per FAR 91.207. (See Testing ELT, 25-60-00.)		O
18. Inspect operation of fuel selector valve.		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
C. CABIN AND COCKPIT GROUP (CONT.)		
19. Inspect fuel valve drain lever cover for security. Verify door opens and closes freely and prevents operation of lever when closed	O	O
20. Inspect condition of heater controls and ducts		O
21. Inspect condition and operation of air vents		O
22. Inspect condition of air conditioning ducts		O
23. If installed, remove and clean air conditioning evaporator filter		O
D. FUSELAGE AND EMPENNAGE GROUP		
1. Remove inspection plates and panels		O
2. Check forward and rear wing attach bolts and fittings for corrosion. (Refer to 57-40-00, Figure 1.)		O
3. Inspect fwd baggage door, latch, and hinge for damage, operation and security	O	O
4. Inspect battery, shelf, and cables. Flush area as required and fill battery per Battery, 24-30-00		O
5. Inspect electronic installations		O
6. Inspect skins, bulkheads and stringers for damage		O
7. Inspect antenna mounts and electric wiring		O
8. Inspect air conditioning system for refrigerant leaks. (See Note 9.)		O
9. Inspect refrigerant level in sight gauge of receiver-dehydrator	O	O
10. Inspect air conditioner condenser air scoop for condition and rigging. (See Note 17.)	O	O
11. Inspect fuel lines, valves, and gauges for damage and operation		O
12. Remove, drain, and clean fuel strainer bowl and screen located in bottom of selector valve		O
13. Inspect fuel pump overboard drain outlet for evidence of fuel discharge. (See Electric Fuel Pump, 28-20-00.)	O	O
14. Inspect security of all lines		O
15. Inspect vertical fin and rudder for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
16. Inspect rudder hinges, sector and attachments for damage, security, and operation		O
17. Inspect vertical fin attachments for security		O
18. Inspect rudder control stops to ensure stops have not loosened and locknuts are tight		O
19. Inspect rudder hinge bolts for excess wear. Replace as required		O
20. Inspect stabilator and tab for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
D. FUSELAGE AND EMPENNAGE GROUP (CONT.)		
21. Inspect stabilator tab hinges, horn, and attachments for damage, security, and operation		O
22. Inspect stabilator attachments and attach brackets for corrosion, rust, and security. Repair as required. (See Stabilator Attach Brackets Corrosion Inspection, 55-20-00.)		O
23. Inspect stabilator and tab hinge bolts and bearings for excess wear. Replace as required		O
24. Inspect stabilator control stops to ensure stops are not loose. Ensure bolts and locknuts are tight		O
25. Inspect rudder and stabilator cables, fittings, turnbuckles. Check all cable tensions using a tensiometer (See Notes 11 & 12.)		O
26. Inspect stabilator trim mechanism, stabilator trim cables, fittings, turnbuckles, guides, and pulleys for safety, damage, and operation. (See Note 11.)		O
27. Lubricate per Lubrication Chart, 12-20-00	O	O
28. Inspect anti-collision light for security and operation	O	O
29. Inspect security of Autopilot bridle cable clamps. (See Note 11.)		O
30. Inspect all control cables, air ducts, electrical leads, lines, radio antenna leads, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation. (See Note 11.)		O
31. Inspect ELT battery for condition/date per FAR 91.207		O
32. Inspect ELT installation and antenna for condition and security. Replace antenna if bent or damaged		O
33. Install inspection plates and panels		O
E. WING GROUP		
1. Remove inspection plates and fairings		O
2. Inspect wing surfaces and tips for damage, loose rivets, and condition of walkway		O
3. Inspect airlerons for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
4. Inspect aileron hinges and attachments		O
5. Inspect aileron control stops to ensure stops have not loosened and locknuts are tight		O
6. Inspect aileron cables, fittings, turnbuckles, pulleys, and bellcranks for damage and operation, and cable tensions. (See Note 11.)		O
7. Inspect pitot tube for damage and condition.		O
CAUTION: SEVERE BURNS CAN RESULT FROM COMING IN CONTACT WITH A HEATED PITOT TUBE.		
8. Check pitot heat		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
E. WING GROUP (CONT.)		
9. Inspect flaps for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
10. Inspect condition of flap hinge bolts. Replace as required.		O
11. Lubricate per Lubrication Chart, 12-20-00.	O	O
12. Inspect wing attachment bolts and brackets. (See Note 13.)		O
13. Inspect fuel tanks and lines for leaks and water. (See Note 14.)		O
14. Inspect fuel tanks for minimum octane markings		O
15. Inspect fuel cell vents		O
16. Inspect all control cables, air ducts, electrical leads, lines, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation. (See Note 11.)		O
17. Install inspection plates and fairings		O
F. LANDING GEAR GROUP		
1. Check oleo struts for proper extension and evidence of fluid leakage. See Landing Gear, 12-10-00	O	O
2. Inspect nose gear steering control and travel		O
3. Remove wheel fairings		O
4. Inspect wheel alignment		O
5. Put airplane on jacks. (Refer to 7-10-00.)		O
6. Inspect tires for cuts, uneven or excessive wear, and slippage		O
7. Remove wheels, clean, inspect, and repack bearings		O
8. Inspect wheels for cracks, corrosion, and broken bolts		O
9. Check tire pressure	O	O
10. Inspect brake lining and disc for wear		O
11. Inspect brake backing plates for cracks		O
12. Inspect condition of brake and hydraulic lines		O
13. Inspect shimmy dampener operation		O
14. Inspect gear forks for damage		O
15. Inspect oleo struts for fluid leaks and scoring		O
16. Inspect gear struts, attachments, torque links, and bolts for condition and security		O
17. Inspect torque link bolts and bushings. Rebush as required		O
18. Inspect wheel fairings and attachments		O
19. Inspect all hydraulic lines, electrical leads, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation		O
20. Lubricate per Lubrication Chart, 12-20-00	O	O
21. Install wheel fairings		O
22. Remove airplane from jacks		O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
G. SPECIAL INSPECTIONS		
See 5-30-00	O	O
H. OPERATIONAL INSPECTION		
Note: Refer to Note 15 prior to starting engine or taxiing airplane.		
1. Check fuel pump and fuel tank selector	O	O
2. Check fuel quantity, pressure, and flow readings	O	O
3. Check oil pressure and temperature	O	O
4. Check alternator output	O	O
5. Check manifold pressure	O	O
6. Check alternate air	O	O
7. Check parking brake	O	O
8. Check vacuum gauge	O	O
9. Check gyros for noise and roughness	O	O
10. Check cabin heater operation	O	O
11. Check magneto switch operation	O	O
12. Check magneto rpm variation	O	O
13. Check throttle and mixture operation	O	O
14. Check propeller smoothness	O	O
15. Check propeller governor action	O	O
16. Check engine idle	O	O
17. Check annunciator light panel	O	O
18. Check electronic equipment operation	O	O
19. If installed, check operation of autopilot, including automatic pitch trim, and manual electric trim. (See Note 16.)	O	O
20. If installed, check air conditioner compressor clutch operation	O	O
21. If installed, check air conditioner condenser scoop operation	O	O
I. GENERAL		
1. Aircraft conforms to FAA Specification	O	O
2. Latest revisions of all Airworthiness Directives complied with	O	O
3. Latest revisions of all Manufacturers' Service Bulletins and Letters complied with	O	O
4. Check for proper Pilot's Operating Handbook	O	O
5. Aircraft papers in proper order	O	O

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

J. NOTES

1. Refer to Piper's Customer Service Information Aerofiche P/N 1753-755 for latest revision dates to Piper Inspection Reports/Manuals and this maintenance manual. References to Chapter/Section are to the appropriate Chapter/Section in this manual.

   WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

2. Inspections or operations are to be performed as indicated by a “O” at the 50 or 100 hour inspection interval. Inspections or operations (i.e. - component overhauls/replacements, etc.) required outside the 100 hour cycle are listed as special inspections in section 5-30-00. Inspections must be accomplished by persons authorized by the FAA.
   (a) The 50 hour inspection accomplishes preventive maintenance, lubrication and servicing as well as inspecting critical components.
   (b) The 100 hour inspection is a complete inspection of the airplane, identical to an annual inspection.

   NOTE: A log book entry should be made upon completion of any inspections.

3. Piper Service Bulletins are of special importance and Piper considers compliance mandatory. In all cases, see Service Bulletin/Service Letter Index P/N 762-332 or Service Bulletin/Service Letter Aerofiche Set P/N 1762-331 to verify latest revision.
4. Piper Service Letters are product improvements and service hints pertaining to servicing the airplane and should be given careful attention.
5. Inspections given for the power plant are based on the engine manufacturer’s operator’s manual (Textron Lycoming Part No. 60297-10) for this airplane. Any changes issued to the engine manufacturer’s operator’s manual shall supersede or supplement the inspections outlined in this report.
6. Overhaul as required and at engine overhaul. In no case may Slick 6300 series magneto's time-in-service exceed engine TBO.
7. Refer to latest revision of Textron Lycoming Service Bulletin No. 480.
8. Check cylinders for evidence of excessive heat indicated by burned paint on the cylinders. This condition is indicative of internal damage to the cylinder and, if found, its cause must be determined and corrected before the airplane is returned to service. Heavy discoloration and appearance of seepage at the cylinder head and barrel attachment area is usually due to emission of thread lubricant used during assembly of the barrel at the factory, or by slight gas leakage which stops after the cylinder has been in service for a while. This condition is neither harmful nor detrimental to engine performance and operation. If it can be proven that leakage exceeds these conditions, the cylinder must be replaced.

5. Scheduled Maintenance - PA-32-301FT Piper 6X (S/N's 3232001 & up) (continued)

J. NOTES (CONT.)

CAUTION: ENVIRONMENTAL REGULATIONS MAY REQUIRE SPECIAL EQUIPMENT AND PROCEDURES BE USED WHEN CHARGING AIR CONDITIONING SYSTEMS.

9. The compressor oil level should not be checked unless a refrigerant leak has occurred or system pressure has been released, requiring an addition of refrigerant to the system.
10. Clean any traces of oil from the clutch surface.
11. Examine cables for broken strands by wiping them with a cloth for their entire length. Visually inspect the cable thoroughly for damage not detected by the cloth. Replace any damaged or frayed cables.
    (a) See 27-00-00, Control Cable Inspection, or the latest edition of FAA AC 43.13-1.
    (b) At fifteen (15) years time-in-service, begin Cable Fittings 100 Hour Special Inspection (see 27-00-00).
12. Maintain cable tensions specified in Chapter 27.
13. Check torque at forward and aft spar attach per 57-40-00, Figure 1.
14. Sloshing of fuel tanks not approved.
15. Refer to Section 4 of the Pilot's Operating Handbook for preflight and flight check list.
16. Refer to Pilot's Operating Handbook Supplement for preflight and flight check and for intended function in all modes.
17. Refer to 21-50-00, Condenser Assembly Rigging, and verify/check microswitch adjustment.

THIS PAGE INTENTIONALLY BLANK

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up)

Refer to Notes 1, 2, 3, and 4 before performing the following inspections.

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
A. PROPELLER GROUP		
WARNING: USE EXTREME CAUTION WHEN ROTATING PROPELLER BY HAND; PROPELLER MAY KICK BACK. PRIOR TO ROTATING PROPELLER ENSURE BOTH MAGNETO SWITCH(S) ARE OFF (GROUNDED). IF MAGNETO(S) ARE NOT GROUNDED, TURNING PROPELLER MAY START ENGINE.		
1. Inspect spinner and back plate for cracks, dents, missing screws, and security	O	O
2. Inspect blades for nicks and cracks	O	O
3. Check for grease and oil leaks	O	O
4. Lubricate propeller per Lubrication Chart, 12-20-00		O
5. Inspect spinner mounting brackets for cracks and security		O
6. Inspect propeller mounting bolts for security and safety. Recheck torque values if safety is broken		O
7. Inspect hub parts for cracks and corrosion		O
8. Rotate blades and check for tightness in hub pilot tube		O
9. Inspect complete propeller and spinner assembly for security, chafing, cracks, deterioration, wear, and correct installation		O
10. Overhaul or replace propeller governor	As req'd by Hartzell Service Letter No. 61	
11. Overhaul propeller		
B. ENGINE GROUP		
WARNING: IF MAGNETO(S) ARE NOT GROUNDED, TURNING PROPELLER MAY START ENGINE. USE EXTREME CAUTION WHEN ROTATING PROPELLER BY HAND; PROPELLER MAY KICK BACK. PRIOR TO ROTATING PROPELLER ENSURE BOTH MAGNETO SWITCH(S) ARE OFF (GROUNDED).		
NOTE: Read Note 5 prior to completing this group.		
1. Remove engine cowl and inspect for internal and external damage	O	O
2. Clean and inspect cowling for cracks, distortion, and loose or missing fasteners		O
3. Drain oil sump	O	O
4. Clean suction oil strainer at oil change; inspect strainer for foreign particles	O	O
5. Change full flow, cartridge type, oil filter element; inspect element for foreign particles. (See Note 7.)	O	O
6. Inspect oil temperature sender unit for leaks and security		O
7. Inspect oil lines and fittings for leaks, security, chafing, dents, & cracks	O	O
8. Clean and inspect oil radiator cooling fins		O
9. Fill engine with oil per information on cowl or in Lubrication Chart, 12-20-00	O	O
CAUTION: USE CAUTION NOT TO CONTAMINATE VACUUM PUMP WITH CLEANING FLUID. (REFER TO LATEST REVISION TEXTRON LYCOMING SERVICE INSTRUCTION NO. 1221.)		
10. Clean engine with approved solvents		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
B. ENGINE GROUP (CONT.)		
11. Inspect condition of spark plugs. Clean and adjust gap as required; adjust per latest revision Textron Lycoming Service Instruction No. 1042		O
NOTE: If fouling of spark plugs is apparent, rotate bottom plugs to upper plugs.		
12. Inspect spark plug cable leads	O	O
13. Check cylinder compression. (Refer to AC 43.13-1, latest revision.)		O
14. Inspect cylinders for cracked or broken fins. (See Note 8.)		O
15. Inspect rocker box covers for evidence of oil leaks. If found, replace gasket; torque cover screws 50 inch-pounds	O	O
16. Inspect ignition harness and insulators for high tension leakage and continuity		O
17. Check magneto points for proper clearance		O
18. Inspect magneto for oil seal leakage		O
19. Inspect magnetos to engine timing		O
20. Remove air filter and clean per 12-10-00. Replace as required	O	O
21. Clean fuel injector inlet line screen	O	O
22. Inspect condition of alternate air valve and housing	O	O
23. Inspect intake seals for leaks and clamps for tightness. (Torque clamps 40-50 in.-lbs.)	O	O
24. Inspect all air inlet duct hoses. Replace as required.	O	O
25. Inspect condition of flexible fuel lines.		O
26. Inspect fuel system for leaks		O
27. Inspect engine-driven and electric fuel pumps for operation		O
28. Overhaul or replace engine-driven and electric fuel pumps	Engine Overhaul or Five (5) Years	
29. Inspect and operationally test engine driven vacuum pumps and lines		O
30. Inspect throttle, alternate air, mixture, and propeller governor controls for security, travel, and operation condition		O
31. Inspect exhaust stacks, connections and gaskets. Replace gaskets as required. (Refer to 78-00-00.)	O	O
32. Inspect muffler, heat exchange, and baffles. (Refer to 78-00-00.)	O	O
33. Inspect breather tube for obstructions and security		O
34. Inspect crankcase for cracks, leaks, and security of seam bolts		O
35. Inspect engine mounts for cracks and loose mounting		O
36. Inspect all engine baffles		O
37. Inspect rubber engine mount bushings for deterioration. (Replace as required.)		O
38. Inspect firewall seals		O
39. Lubricate alternator idler pulley; remove front grease seal and add grease. (Refer to Lubrication Chart, 12-20-00.) (Disregard if sealed bearing is installed.)		O
40. Inspect condition of alternator and starter		O
41. Inspect security of alternator or mounting		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
B. ENGINE GROUP (CONT.)		
42. Inspect condition and tension of alternator drive belt. (See Adjusting Alternator Belt Tension, 24-30-00.)	O	O
43. If installed, inspect condition of A/C compressor belt and tension. (See Adjusting Drive Belt Tension, 21-50-00.)	O	O
44. If installed, check A/C compressor oil level. (See Note 9.)		O
45. If installed, inspect A/C compressor clutch security and wiring. (See Note 10.)		O
46. If installed, inspect A/C compressor mounting for cracks, corrosion, and security		O
47. Check fluid in brake reservoir. Fill as required	O	O
48. Inspect and lubricate all controls. (Refer to Lubrication Chart, 12-20-00.)		O
49. Complete overhaul of engine or replace with factory rebuilt	As req'd by Lycoming Svc. Instr. No. 1009	
50. Install engine cowl	O	O
C. TURBOCHARGER GROUP		
WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)		
NOTE: Read Note 5 prior to completing this group.		
1. Inspect all oil inlet ducting and compressor discharge ducting for worn spots, loose clamps, or leaks	O	O
2. Inspect engine air inlet assembly for cracks, loose clamps, and screws	O	O
3. Inspect exhaust ducting and exhaust stacks for tightness	O	O
4. Inspect exhaust heat exchanger		O
5. Carefully inspect all turbo support brackets, struts, etc., for damage, sagging, and wear	O	O
6. Inspect all oil hoses, lines, and fittings for wear, leakage, heat damage, and fatigue	O	O
7. Inspect bypass valve for security and safety	O	O
8. Run up engine, and check all instruments for smooth, steady response	O	O
D. CABIN AND COCKPIT GROUP		
1. Inspect cockpit and cabin doors, latches, and hinges, and windows, and aft baggage compartment door, latch, and hinge for damage, operation, and security		O
2. Inspect windows for scratches, crazing, and condition		O
3. Check window and door seals for deterioration, cracks, and voids		O
4. Inspect upholstery for tears		O
5. Inspect seats, seat belts, shoulder harnesses, security brackets, and bolts. (See Seat Belt and Shoulder Harness Inspection, 25-10-00.)		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
D. CABIN AND COCKPIT GROUP (CONT.)		
6. Inspect trim operation		O
7. Inspect rudder pedals		O
8. Inspect parking brake valve and brake handle for operation and cylinder leaks		O
9. Inspect control wheels, column, pulleys, cables, turnbuckles, and fittings. (See Note 11.)		O
10. Inspect flap lever to control cable attachment bolt for condition and security. (See Note 11.)		O
11. Check landing, navigation, strobe, cabin, and instrument lights	O	O
12. Inspect instruments, lines, and attachments.		O
13. Inspect gyro operated instruments and electric turn and bank. (Overhaul or replace as required.)		O
14. Replace central air filter		O
15. Clean or replace vacuum regulator filter		O
16. Inspect altimeter and ELT for installation/certification per latest revision of AC43.13-1 and tested/inspected per FAR's 91.411 and 91.413, respectively		O
17. Inspect and test ELT per FAR 91.207. (See Testing ELT, 25-60-00.)		O
18. Inspect operation of fuel selector valve.		O
19. Inspect fuel valve drain lever cover for security. Verify door opens and closes freely and prevents operation of lever when closed	O	O
20. Inspect condition of heater controls and ducts		O
21. Inspect condition and operation of air vents		O
22. Inspect condition of air conditioning ducts		O
23. If installed, remove and clean air conditioning evaporator filter		O
E. FUSELAGE AND EMPENNAGE GROUP		
1. Remove inspection plates and panels		O
2. Check forward and rear wing attach bolts and fittings for corrosion. (Refer to 57-40-00, Figure 1.)		O
3. Inspect fwd baggage door, latch, and hinge for damage, operation and security	O	O
4. Inspect battery, shelf, and cables. Flush area as required and fill battery per Battery, 24-30-00		O
5. Inspect electronic installations		O
6. Inspect bulkheads and stringers for damage		O
7. Inspect antenna mounts and electric wiring		O
8. Inspect air conditioning system for refrigerant leaks. (See Note 9.)		O
9. Inspect refrigerant level in sight gauge of receiver-dehydrator	O	O
10. Inspect air conditioner condenser air scoop for condition and rigging. (See Note 17.)	O	O
11. Inspect fuel lines, valves, and gauges for damage and operation		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
E. FUSELAGE AND EMPENNAGE GROUP (CONT.)		
12. Remove, drain, and clean fuel strainer bowl and screen located in bottom of selector valve		O
13. Inspect fuel pump overboard drain outlet for evidence of fuel discharge. (See Electric Fuel Pump, 28-20-00.)	O	O
14. Inspect security of all lines		O
15. Inspect vertical fin and rudder for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
16. Inspect rudder hinges, sector and attachments for damage, security, and operation		O
17. Inspect vertical fin attachments for security		O
18. Inspect rudder control stops to ensure stops have not loosened and locknuts are tight		O
19. Inspect rudder hinge bolts for excess wear. Replace as required		O
20. Inspect stabilator and tab for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
21. Inspect stabilator tab hinges, horn, and attachments for damage, security, and operation		O
22. Inspect stabilator attachments and attach brackets for corrosion, rust, and security. Repair as required. (See Stabilator Attach Brackets Corrosion Inspection, 55-20-00.)		O
23. Inspect stabilator and tab hinge bolts and bearings for excess wear. Replace as required.		O
24. Inspect stabilator control stops to ensure stops are not loose. Ensure bolts and locknuts are tight		O
25. Inspect rudder and stabilator cables, fittings, turnbuckles. Check all cable tensions using a tensiometer (See Notes 11 & 12.)		O
26. Inspect stabilator trim mechanism, stabilator trim cables, fittings, turnbuckles, guides, and pulleys for safety, damage, and operation. (See Note 11.)		O
27. Lubricate per Lubrication Chart, 12-20-00	O	O
28. Inspect anti-collision light for security and operation	O	O
29. Inspect security of Autopilot bridle cable clamps. (See Note 11.)		O
30. Inspect all control cables, air ducts, electrical leads, lines, radio antenna leads, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation. (See Note 11.)		O
31. Inspect ELT battery for condition/date per FAR 91.207		O
32. Inspect ELT installation and antenna for condition/security. Replace antenna if bent or damaged		O
33. Install inspection plates and panels		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
F. WING GROUP		
1. Remove inspection plates and fairings		O
2. Inspect wing surfaces and tips for damage, loose rivets, and condition of walkway		O
3. Inspect airlerons for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
4. Inspect aileron hinges and attachments		O
5. Inspect aileron control stops to ensure stops have not loosened and locknuts are tight		O
6. Inspect aileron cables, fittings, turnbuckles, pulleys, and bellcranks for damage and operation, and cable tensions. (See Note 11.)		O
7. Inspect pitot tube for damage and condition		O
CAUTION: SEVERE BURNS CAN RESULT FROM COMING IN CONTACT WITH A HEATED PITOT TUBE.		
8. Check pitot heat		O
9. Inspect flaps for surface damage or irregularities (i.e. - skin cracks, distortion, dents, corrosion, and excessive paint build up); structural defects (i.e. - loose or missing rivets); misrigging or structural imbalance; hinge damage, excessive wear, freedom of movement and proper lubrication; and attachment points for missing or worn hardware		O
10. Inspect condition of bolts used with hinges. Replace as required.		O
11. Lubricate per Lubrication Chart, 12-20-00.)	O	O
12. Inspect wing attachment bolts and brackets. (See Note 13.)		O
13. Inspect fuel tanks and lines for leaks and water. (See Note 14.)		O
14. Inspect fuel tanks for minimum octane markings		O
15. Inspect fuel cell vents		O
16. Inspect all control cables, air ducts, electrical leads, lines, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation. (See Note 11.)		O
17. Install inspection plates and fairings		O
G LANDING GEAR GROUP		
1. Check oleo struts for proper extension and evidence of fluid leakage. See Landing Gear, 12-10-00	O	O
2. Inspect nose gear steering control and travel		O
3. Remove wheel fairings		O
4. Inspect wheel alignment		O
5. Put airplane on jacks. (Refer to 7-10-00.)		O
6. Inspect tires for cuts, uneven or excessive wear, and slippage		O
7. Remove wheels, clean, inspect, and repack bearings		O
8. Inspect wheels for cracks, corrosion, and broken bolts		O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
G. LANDING GEAR GROUP (CONT.)		
9. Check tire pressure	O	O
10. Inspect brake lining and disc for wear		O
11. Inspect brake backing plates for cracks		O
12. Inspect condition of brake and hydraulic lines		O
13. Inspect shimmy dampener operation		O
14. Inspect gear forks for damage		O
15. Inspect oleo struts for fluid leaks and scoring		O
16. Inspect gear struts, attachments, torque links, and bolts for condition and security		O
17. Inspect torque link bolts and bushings. Rebush as required		O
18. Inspect wheel fairings and attachments		O
19. Inspect all hydraulic lines, electrical leads, and attaching parts for security, routing, chafing, deterioration, wear, and correct installation		O
20. Lubricate per Lubrication Chart, 12-20-00	O	O
21. Install wheel fairings		O
22. Remove airplane from jacks		O
H. SPECIAL INSPECTIONS		
See 5-30-00	O	O
I. OPERATIONAL INSPECTION		
Note: Refer to Note 15 prior to starting engine or taxiing airplane.		
1. Check fuel pump and fuel tank selector	O	O
2. Check fuel quantity, pressure, and flow readings	O	O
3. Check oil pressure and temperature	O	O
4. Check alternator output	O	O
5. Check manifold pressure	O	O
6. Check alternate air	O	O
7. Check parking brake	O	O
8. Check vacuum gauge	O	O
9. Check gyros for noise and roughness	O	O
10. Check cabin heater operation	O	O
11. Check magneto switch operation	O	O
12. Check magneto rpm variation	O	O
13. Check throttle and mixture operation	O	O
14. Check propeller smoothness	O	O
15. Check propeller governor action	O	O
16. Check engine idle	O	O
17. Check annunciator light panel	O	O
18. Check electronic equipment operation	O	O
19. If installed, check operation of autopilot, including automatic pitch trim, and manual electric trim. (See Note 16.)	O	O
20. If installed, check air conditioner compressor clutch operation	O	O
21. If installed, check air conditioner condenser scoop operation	O	O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

NATURE OF INSPECTION	Inspection Interval (Hrs) 50	100
J. GENERAL		
1. Aircraft conforms to FAA Specification	O	O
2. Latest revisions of all Airworthiness Directives complied with	O	O
3. Latest revisions of all Manufacturers' Service Bulletins and Letters complied with	O	O
4. Check for proper Pilot's Operating Handbook	O	O
5. Aircraft papers in proper order	O	O

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

K. NOTES

1. Refer to Piper's Customer Service Information Aerofiche P/N 1753-755 for latest revision dates to Piper Inspection Reports/Manuals and this maintenance manual. References to Chapter/Section are to the appropriate Chapter/Section in this manual.

   WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

2. Inspections or operations are to be performed as indicated by a "O" at the 50 or 100 hour inspection interval. Inspections or operations (i.e. - component overhauls/replacements, etc.) required outside the 100 hour cycle are listed as special inspections in section 5-30-00. Inspections must be accomplished by persons authorized by the FAA.

   (a) The 50 hour inspection accomplishes preventive maintenance, lubrication and servicing as well as inspecting critical components.

   (b) The 100 hour inspection is a complete inspection of the airplane, identical to an annual inspection.

   NOTE: A log book entry should be made upon completion of any inspections.

3. Piper Service Bulletins are of special importance and Piper considers compliance mandatory. In all cases, see Service Bulletin/Service Letter Index P/N 762-332 or Service Bulletin/Service Letter Aerofiche Set P/N 1762-331 to verify latest revision.

4. Piper Service Letters are product improvements and service hints pertaining to servicing the airplane and should be given careful attention.

5. Inspections given for the power plant are based on the engine manufacturer's operator's manual (Textron Lycoming Part No. 60297-23) for this airplane. Any changes issued to the engine manufacturer's operator's manual shall supersede or supplement the inspections outlined in this report.

6. Overhaul as required and at engine overhaul. In no case may Slick 6300 series magneto's time-in-service exceed engine TBO.

7. Refer to latest revision of Textron Lycoming Service Bulletin No. 480.

6. Scheduled Maintenance - PA-32-301XTC Piper 6XT (S/N's 3255001 & up) (continued)

K. NOTES (CONT.)

8. Check cylinders for evidence of excessive heat indicated by burned paint on the cylinders. This condition is indicative of internal damage to the cylinder and, if found, its cause must be determined and corrected before the airplane is returned to service. Heavy discoloration and appearance of seepage at the cylinder head and barrel attachment area is usually due to emission of thread lubricant used during assembly of the barrel at the factory, or by slight gas leakage which stops after the cylinder has been in service for a while. This condition is neither harmful nor detrimental to engine performance and operation. If it can be proven that leakage exceeds these conditions, the cylinder must be replaced.

CAUTION: ENVIRONMENTAL REGULATIONS MAY REQUIRE SPECIAL EQUIPMENT AND PROCEDURES BE USED WHEN CHARGING AIR CONDITIONING SYSTEMS.

9. The compressor oil level should not be checked unless a refrigerant leak has occurred or system pressure has been released, requiring an addition of refrigerant to the system.
10. Clean any traces of oil from the clutch surface.
11. Examine cables for broken strands by wiping them with a cloth for their entire length. Visually inspect the cable thoroughly for damage not detected by the cloth. Replace any damaged or frayed cables.
    (a) See 27-00-00, Control Cable Inspection, or the latest edition of FAA AC 43.13-1.
    (b) At fifteen (15) years time-in-service, begin Cable Fittings 100 Hour Special Inspection (see 27-00-00).
12. Maintain cable tensions specified in Chapter 27.
13. Check torque at forward and aft spar attach per 57-40-00, Figure 1.
14. Sloshing of fuel tanks not approved.
15. Refer to Section 4 of the Pilot's Operating Handbook for preflight and flight check list.
16. Refer to Pilot's Operating Handbook Supplement for preflight and flight check and for intended function in all modes.
17. Refer to 21-50-00, Condenser Assembly Rigging, and verify/check microswitch adjustment.

THIS PAGE INTENTIONALLY BLANK

GRIDS 1D22 THRU 1D24
INTENTIONALLY BLANK

SPECIAL INSPECTIONS

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

The following inspections are required in addition to those listed in 5-20-00. These inspections are required at intervals of:

A. Flight hours;

B. Calendar Year; or

C. the specific operation being conducted or the environment being operated in.

Unless otherwise indicated, these inspections are to be repeated at each occurance of the specified interval. Note that the items listed herein are guidelines based on past operating experience. Each operator should closely monitor his own unique operating conditions/environment and react accordingly to keep his aircraft airworthy.

NOTE: A log book entry should be made upon completion of any inspections.

1. Per Flight Hour

Each 300 Hours

- ☐ For S/N's 3255001 & up only: If installed, each 300 hours time-in-service, inspect the oxygen system regulator, pressure gauge, high and low pressure lines, and outlets per Inspections, 35-10-00.

Each 400 Hours

- ☐ At every 400 hours of engine operation, remove the rocker box covers and check for freedom of valve rockers when valves are closed. Look for evidence of abnormal wear or broken parts in the area of the valve tips, valve keepers, springs, and spring seats. If any indications are found, the cylinder and all of its components must be removed (including the piston and connecting rod assembly) and inspected for further damage. Replace any parts that do not conform with limits shown in the latest revision for Textron Lycoming Service Table of Limits SSP1776.

Each 500 Hours

- ☐ Beginning at 500 hours time-in-service, and each 100 hours thereafter, inspect vacuum pump vane wear per Vacuum Pump(s), Inspection, 37-10-00.
- ☐ Remove propeller; remove sludge from propeller and crankshaft.
- ☐ Remove and flush oil radiator.
- ☐ Inspect magneto(s) distributor block for cracks, burned areas or corrosion.
- ☐ Clean and lubricate stabilator trim drum screw.

Each 1000 Hours

- ☐ Replace engine compartment flexible hoses (fuel, oil, etc.) as required; but not to exceed 1000 hours time-in-service, eight (8) years, or engine overhaul, whichever comes first.
- ☐ Overhaul or replace magnetos. (See Note 6, 5-20-00.)
- ☐ Clean and lubricate all exterior needle bearings.
- ☐ Remove all turbocharger components from the engine. Inspect and repair or replace as necessary. Inspect turbocharger rotor for excessive play, carbon and dirt deposits. Remove and inspect turbine and compressor housings. Inspect turbine wheel and impeller for physical damage and excessive build up of deposits. If excessive, replace turbocharger assembly.

Each 2000 Hours

- ☐ Each 2000 hours or seven (7) years, whichever occurs first, remove interior cabinets, panels, and headliner and conduct detailed inspection of aircraft structure (skin, bulkheads, stringers, etc.) for condition and security. Inspection of structure concealed by headliner may be accomplished by alternate means (i.e. - through the use of a borescope) without removing the headliner, providing access is obtained to all concealed areas and borescope provides sufficient detail to adequately accomplish the inspection.
- ☐ Each 2000 hours, or as specified in the latest revision of Lycoming Service Instruction No. 1009, overhaul or replace engine.
- ☐ At engine overhaul or each 2000 hours, whichever comes first, overhaul or replace alternators.
- ☐ Overhaul or replace Hartzell propeller governors each 2000 hours or at engine overhaul. (Verify TBO in latest revision of Hartzell Service Letter No. 61.)
- ☐ Overhaul or replace Hartzell propellers each five (5) or six (6) years or each 2000 or 2400 hours. (Refer to latest revision of Hartzell Service Letter No. 61 to determine specific requirements for individual airplanes.)

Each 2400 Hours

- ☐ Overhaul or replace Hartzell propellers each five (5) or six (6) years or each 2000 or 2400 hours. (Refer to latest revision of Hartzell Service Letter No. 61 to determine specific requirements for individual airplanes.)

2. Per Calendar Year

Each Thirty (30) Days

- ☐ Inspect battery, box or shelf, and cables. Flush box as required and fill battery per instructions on box or in Chapter 24.

Each Ninety (90) Days

- ☐ For airplanes equipped with the Avidyne Entegra Electronic Flight Display System: if the Standby Attitude Indicator has not been operated in the previous 90 days, charge the battery of the Standby Attitude Indicator. See Standby Attitude Indicator, 34-20-00.
- ☐ Remove, drain, and clean fuel strainer bowl and screen located in bottom of fuel selector valve.

Each Six (6) Months

- ☐ If annual usage is significantly less than 100 Hours, lubricate propeller each six (6) months. See Hartzell Standard Practices Manual No. 202A.

Each Twelve (12) Months

- ☐ Lubricate propeller every 100 Hours or annually, whichever comes first. If annual usage is significantly less than 100 Hours, lubricate propeller each six (6) months. See Hartzell Standard Practices Manual No. 202A.

  For airplanes equipped with the Avidyne Entegra Electronic Flight Display System: each twelve months, perform a full capacity test of the Standby Attitude Indicator battery. See Standby Attitude Indicator, 34-20-00.

Each Two (2) Years

- ☐ Test and inspect the static pressure system and altimeters. Ensure compliance with the requirements of FAR 43, Appendix E. (See FAR 91.411.)
- ☐ Test and inspect the transponder. Ensure compliance with the requirements of FAR 43, Appendix F. (See FAR 91.413.)

Each Three (3) Years

WARNING: DO NOT USE GREASE OR ANY TYPE OF GREASE FITTING ON ANY OXYGEN SYSTEM. WHEN WORKING WITH AN OXYGEN SYSTEM MAKE SURE HANDS, CLOTHING, TOOLS, AND IMMEDIATE AREA ARE FREE OF GREASE.

- ☐ For S/N's 3255001 & up only: If installed, remove and hydrostatically test oxygen cylinder every three (3) years (i.e. - light weight composite cylinders - DOT E8162). No lightweight composite oxygen cylinder may exceed fifteen (15) years total time-in-service.

Each Five (5) Years

WARNING: DO NOT USE GREASE OR ANY TYPE OF GREASE FITTING ON ANY OXYGEN SYSTEM. WHEN WORKING WITH AN OXYGEN SYSTEM MAKE SURE HANDS, CLOTHING, TOOLS, AND IMMEDIATE AREA ARE FREE OF GREASE.

- ☐ For S/N's 3255001 & up only: If installed, for each oxygen system outlet, replace rubber components or entire outlet assembly each five (5) years time-in-service.
- ☐ For S/N's 3255001 & up only: If installed, replace oxygen system external recharge valve each five (5) years time-in-service.
- ☐ Replace engine-driven or electric fuel pumps at engine overhaul or five (5) years, whichever comes first.
- ☐ Overhaul or replace Hartzell propellers each five (5) or six (6) years or each 2000 or 2400 hours. (Refer to latest revision of Hartzell Service Letter No. 61 to determine specific requirements for individual airplanes.)

Each Six (6) Years

- ☐ Overhaul or replace Hartzell propellers each five (5) or six (6) years or each 2000 or 2400 hours. (Refer to latest revision of Hartzell Service Letter No. 61 to determine specific requirements for individual airplanes.)

WARNING: DO NOT USE GREASE OR ANY TYPE OF GREASE FITTING ON ANY OXYGEN SYSTEM. WHEN WORKING WITH AN OXYGEN SYSTEM MAKE SURE HANDS, CLOTHING, TOOLS, AND IMMEDIATE AREA ARE FREE OF GREASE.

- ☐ For S/N's 3255001 & up only: If installed, replace oxygen system regulator each five (5) years time-in-service.

Each Seven (7) Years

- ☐ Each seven (7) years time-in-service, drain and remove the inboard metal fuel tank from each wing and inspect for corrosion as specified in Fuel Tank/Wing Spar Corrosion Inspection, 28-10-00.
- ☐ Replace fuel tank flexible hose interconnect couplings and fuel tank vent line flexible hose and hose couplings as required; but not to exceed seven (7) years or fuel tank removal, whichever comes first.
- ☐ Each 2000 hours or seven (7) years, whichever occurs first, remove interior cabinets, panels, and headliner and conduct detailed inspection of aircraft structure (skin, bulkheads, stringers, etc.) for condition and security. Inspection of structure concealed by headliner may be accomplished by alternate means (i.e. - through the use of a borescope) without removing the headliner, providing access is obtained to all concealed areas and borescope provides sufficient detail to adequately accomplish the inspection.

Each Eight (8) Years

- ☐ Replace engine compartment flexible hoses (fuel, oil, etc.) as required; but not to exceed 1000 hours time-in-service, eight (8) years, or engine overhaul, whichever comes first.

Each Ten (10) Years

- ☐ Each ten (10) years time-in-service, test fuselage and wing fluid hoses to system pressure. Visually inspect for leaks. Hoses that pass inspection may remain in service, but must be rechecked each five (5) years additional time-in-service. No fluid hose may exceed twenty (20) years total time-in-service.

Each Twelve (12) Years

- ☐ Hydrostatically test the portable fire extinguisher each twelve (12) years.

Each Fifteen (15) Years

WARNING: DO NOT USE GREASE OR ANY TYPE OF GREASE FITTING ON ANY OXYGEN SYSTEM. WHEN WORKING WITH AN OXYGEN SYSTEM MAKE SURE HANDS, CLOTHING, TOOLS, AND IMMEDIATE AREA ARE FREE OF GREASE.

- ☐ For S/N's 3255001 & up only: If installed, no lightweight composite oxygen cylinder (i.e. DOT E8162) may exceed fifteen (15) years total time-in-service.

Each Twenty (20) Years

- ☐ No fluid hose may exceed twenty (20) years total time-in-service.

3. Per Specific Operation / Operating Environment

A. **Operation in High Dust or Industrial Pollution Environment**

CAUTION: DISCONNECT LINES FROM PITOT/STATIC SYSTEM BEFORE CONDUCTING THIS INSPECTION.

	Item	Inspection	Inspection Interval
☐	Engine Air Filter.	Clean and inspect.	Daily.
☐	Cabin Environmental and Instrument Air Filters.	Inspect and replace if necessary.	100 Hours.
☐	Pitot/Static system.	Check for obstruction. Reverse flow to lines.	100 Hours or as required.
☐	Landing Gear Oleos	Clean.	Before each flight.
		Inspect.	100 Hours.
☐	Landing Gear Wheel Bearings.	Clean, inspect and repack.	50 Hours.
☐	Windows.	Inspect for cracks, erosion, crazing, visibility, and cleanliness.	Daily.
☐	Structure drain holes.	Clean with pipe cleaner.	Before each flight.

B. **Operation in High Salt or High Humidity Environment**

	Item	Inspection	Inspection Interval
☐	Fuselage, Empennage and Wings.	Remove floor panels and exterior access plates; inspect for corrosion.	200 Hours.
☐	Landing Gear.	Inspect for corrosion and lubrication.	200 Hours.

WARNING: ENSURE BOTH MAGNETO SWITCHES ARE OFF (GROUNDED), BEFORE TURNING PROPELLER. ENGINE MAY START IF BOTH SWITCHES ARE NOT OFF. USE EXTREME CAUTION WHEN ROTATING PROPELLER BY HAND; PROPELLER MAY KICK BACK.

	Item	Inspection	Inspection Interval
☐	Engines with more than 50 hours total time.	Each five days, pull prop through five complete revolutions. Each 30 days, fly aircraft for 30 minutes or, ground run until oil temperature is in the green arc. Avoid excessive ground run.	Each 5 days and each 30 days.
☐	Engines with less than 50 hours total time.	Each day, pull prop through five complete revolutions. Each 30 days, fly aircraft for 30 minutes or, ground run until oil temperature is in the green arc. Avoid excessive ground run.	Daily and each 30 days.
☐	Instruments and Wiring.	Inspect for proper seal of cases and corrosion.	100 Hours.
☐	Interior.	Inspect upholstery, seat belts, seats and rugs for corrosion and integrity.	100 Hours.

NOTE: Do not use metallic tie downs (i.e. - chains, cables, etc.) in high salt or high humidity environments.

C. **Operation in Extreme Cold**

	Item	Inspection	Inspection Interval
☐	Hydraulic, Pneumatic and Environmental.	Check all fittings and attachments for security and leaks.	First 100 Hour, then as required.

D. **Operation from Soft or Unusual Terrain**

	Item	Inspection	Inspection Interval
☐	Landing Gear.	Inspect for cracks, attachment, damage, cleanliness and lubrication.	100 Hours.
☐	Wheels.	Inspect for cracks, damage, chipped rims; bearings for damage, corrosion and lubrication.	100 Hours.
☐	Tires.	Inspect for cuts, wear, inflation and deterioration.	Daily.
☐	Wheel Wells.	Inspect for foreign material, damage and corrosion.	100 Hours.
☐	Brakes.	Inspect for damage, foreign material, cracks and overheating.	Daily.
☐	Flaps, Lower Fuselage and Wing.	Inspect for damage, cracks and corrosion.	100 Hours.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

UNSCHEDULED MAINTENANCE CHECKS

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

The following inspections are required in response to specific anomalies encountered during aircraft operation. Note that the items listed herein are guidelines based on past operating experience. Each operator should closely monitor his own unique operating conditions/environment and react accordingly to keep his aircraft airworthy.

NOTE: A log book entry should be made upon completion of any inspections.

1. Lightning Strike

	Item	Inspection	Inspection Interval
☐	Propeller.	Refer to latest Hartzell Service Letter. Overhaul prior to return to service.	Each occurrence, before further flight.
☐	Engine.	See latest revisions of appropriate Textron-Lycoming Service Bulletins and Overhaul Manual.	Each occurrence, before further flight.
☐	Electrical and Avionics Systems.	Inspect and check harness, connections, and equipment for high voltage damage, burns and insulation degradation. Replace or overhaul as required. Consult with appropriate avionics vendor(s) for inspections and operational checks. Bench test alternator and voltage regulator(s), see 24-30-00.	Each occurrence, before further flight.
☐	All exterior surfaces, skins, and structure.	Inspect for burns, evidence of arcing, and damage on surfaces and bearings. Check for correct material properties in the area of the strike path. Degauss engine mount. Replace or repair affected areas/parts.	Each occurrence, before further flight.
☐	System Components.	Inspect instrumentation, vacuum, pitot/static, and fuel systems, for damage and correct operation.	Each occurrence, before further flight.
☐	Static Wicks.	Replace.	Each occurrence, before further flight.
☐	Bearings.	Inspect all control surface hinges and bearings, and landing gear and wheel bearings for pitting and damage. Replace as required.	Each occurrence, before further flight.

2. Engine Overspeed, Overtemp, Loss of Oil, or Sudden Stoppage

	Item	Inspection	Inspection Interval
☐	Engine.	See latest revisions of appropriate Textron-Lycoming Service Bulletins and Overhaul Manual.	Each occurrence, before further flight.
☐	Propeller.	Propeller overspeed of more than 10%. Refer to latest Hartzell Service Letter. Remove and overhaul before return to service.	Each occurrence, before further flight.
☐	Engine Mount and Attachments.	Inspect for distortion and damage. Replace or repair as required.	Each occurrence, before further flight.

3. Severe Turbulence, Hard or Overweight Landing

CAUTION: MINOR OR APPARENTLY SUPERFICIAL DAMAGE MAY INDICATE A MORE SEVERE CONDITION SOMEWHERE ELSE IN THE STRUCTURE.

A. Place aircraft in a normal level attitude.

B. Make a preliminary inspection of checking alignment and out-of-track condition of engine, wings, tail, landing gear and doors.

C. Follow Piper and Textron-Lycoming Maintenance Manual procedures. If there are any questions regarding repairs or procedures, contact your Piper Dealer's Service Advisor (DSA).

D. Inspect the following items closely to determine the extent of damage:

	Item	Inspection	Inspection Interval
☐	Landing Gear Struts. (Not required for severe turbulence.)	Cracks, signs of overstress deformation, loose or damaged strut housings. Axles for cracks, bending or flat spots. Damaged oleos and seals, hydraulic leaks and landing gear alignment.	Each occurrence, before further flight.
☐	Wheels, Tires, Brakes. (Not required for severe turbulence.)	Cracks, chips, loose or cracked mounting bolts, alignment of slippage marks, sidewall distress, hydraulic or air leaks. Inspect the wheels (dye penetrant method) and wheel bolts (magnetic particle method).	Each occurrence, before further flight.
☐	Wheel Wells and Landing Gear attach points. (Not required for severe turbulence.)	Buckling, cracks, overstress, wing skin buckling, and side brace for damage and condition. Inspect landing gear attachment bolts (magnetic particle method).	Each occurrence, before further flight.

3. Severe Turbulence, Hard or Overweight Landing (continued)

	Item	Inspection	Inspection Interval
☐	Wings.	Wing attach bolts for slippage, damage and overstress. Upper and lower wing skins for wrinkles, cracks, popped or loose rivets. Remove access plates and inspect for internal damage to ribs, stringers and sparwebs; and fuel tanks for damage, attachment, and leaks.	Each occurrence, before further flight.
☐	Engine.	Engine mounts for distortion and damage to elastomeric parts. Propeller for evidence of ground strike (i.e. - hard or overweight landing).	Each occurrence, before further flight.
☐	Fuselage.	Loose or missing rivets, door alignment, windows and attachments for overstress, cracks or damage. Wing carry through member for overstress damage. Stringers, bulkheads, keel beams for buckling, cracks, or damage. Avionics, instruments and accessories installation for security and operation.	Each occurrence, before further flight.
☐	Empennage.	Skins for buckling wrinkles, loose or missing rivets. Stabilator, rudder, and vertical fin for security of attachment and overstress of bolts. Ribs, stringers for buckling, cracks and damage.	Each occurrence, before further flight.

4. Flaps Extended Above Maximum Flap Extension Speed (V_{FE})

	Item	Inspection	Inspection Interval
☐	Flap torque tube/pushrod.	Inspect for distortion. Replace as required. (See Flap Torque Tube/Pushrod Distortion Inspection, 27-50-00.)	Each occurrence, before further flight.
☐	Flaps.	Inspect for damage to the skin and attach points. Replace as required.	Each occurrence, before further flight.

5. Flood Damage, Immersion in Water

A. These guidelines are general in nature and should be applied or varied to fit the individual aircraft according to water level, length of time of exposure and other variables. Only those areas that might not be obvious to the mechanic are addressed.

CAUTION: MAKE ALL REPAIRS AND/OR ADJUSTMENTS IN ACCORDANCE WITH THE APPROPRIATE PIPER MAINTENANCE MANUAL, THE COMPONENT MANUFACTURER'S MAINTENANCE MANUAL, AND FAR PART 43. PAY PARTICULAR ATTENTION TO SILT, CORROSION AND CONTAMINANTS.

B. Follow Piper and Textron-Lycoming Maintenance Manual procedures. If there are any questions regarding repairs or procedures, contact your Piper Dealer's Service Advisor (DSA).

C. Determine the water level on the aircraft. Determine which operating and/or electrical components have been exposed to the water.

D. If the following items were immersed, inspect them closely to determine the extent of damage:

	Item	Inspection	Inspection Interval
☐	Airframe.	Clean silt and contaminants from airframe.	If immersed, each event, before further flight.
☐	Tubular Structures. (i.e. - Engine Mounts, etc.)	Check for internal corrosion. Clean and represerve as required. (See 71-20-00 - Engine Mount Corrosion Inspection, Immersion in Water.)	If immersed, each event, before further flight.
☐	Wings.	Inspect to ensure that contaminants are cleaned from fuel cell areas.	If immersed, each event, before further flight.
☐	Landing Gear and associated Bearings, Torque Links, Shimmey Dampeners, etc.	Jack airplane and cycle landing gear oleos and torque links to ensure proper operation.	If immersed, each event, before further flight.
☐	Control Surfaces.	Remove surface, clean and check all bearings - relube or replace as necessary. Rebalance before installation.	If immersed, each event, before further flight.
☐	Flight Control System.	Clean and inspect all cables, pulleys, and bearings for evidence of corrosion. Replace corroded cables. Re-preserve galvanized cable with MIL- C-11796 Class 2 (hot).	If immersed, each event, before further flight.
☐	Trim Control System.	Clean and inspect all trim system cables, pulleys, drums, bearings, jack screws, etc. Do not apply preservation to trim cables.	If immersed, each event, before further flight.
☐	Actuating Cables.	Inspect "push-pull" actuating cables for powerplant, heating and ventilating system, fuel system, etc. for proper operation.	If immersed, each event, before further flight.

5. Flood Damage, Immersion in Water (continued)

Item	Inspection	Inspection Interval
☐ Engine.	Remove, disassemble, and inspect. Examine all parts paying particular attention for evidence of corrosion, rust or contaminants imbedded on bearing surfaces, piston, mounting flanges or any aluminum, magnesium or bronze surface that may be porous. Remove evidence of rust, or corrosion. If pitting in stressed areas is found the part should not be reused. Silt imbedded in porous surfaces may be removed. Be certain oil passages, dowel holes and similar hidden openings and recesses are thoroughly free from contaminants. Test electrical components and fuel metering devices in accordance with manufacturer's instructions to determine fitness for future use. Reassemble engine using new seals, gaskets, stressed bolts nuts and crankshaft sludge tubes. All reused parts must conform with Lycoming Table of Limits No. SSP-2070 for fits and clearances. See latest revision of Lycoming Service Bulletin No. 357.	If immersed, each event, before further flight.
☐ Engine Accessories.	Inspect. Aircraft systems that supply either fuel or oil to the engine must be thoroughly cleaned, including oil cooler, lines, valves, etc. to prevent contamination of the engine after reinstallation.	If immersed, each event, before further flight.
☐ Propeller.	Inspect and repair as necessary in an authorized propeller shop.	If immersed, each event, before further flight.

5. Flood Damage, Immersion in Water (continued)

	Item	Inspection	Inspection Interval
☐	Electrical Systems.	Replace all circuit breakers and switches. Replace all solenoids, relays and master contactors. Replace battery. Disassemble all connectors; clean and inspect for corrosion. Replace all corroded or pitted connectors. Inspect for wire corrosion at connector. Check all harness assemblies for entrapped contaminants. Clean and check for short circuits. Remove electric motors and electric pumps. Remove all potted solid state electrical equipment such as alternator inop. switches, low fuel warning switches, etc. Clean, dry and bench check per appropriate maintenance manual. Clean and check voltage regulators and overvoltage relays. Replace as necessary Clean and check all strobe light power supplies. Refer to appropriate maintenance manual. Replace all fuel senders, etc. Clean, inspect and check heated pitot systems.	If immersed, each event, before further flight.
☐	Autopilot System. (If Installed.)	Bench check in accordance with appropriate maintenance manual. Pay particular attention to clutch settings.	If immersed, each event, before further flight.

5. Flood Damage, Immersion in Water (continued)

Item	Inspection	Inspection Interval
☐ Vacuum and Pitot-Static Systems.	Replace gyros. Replace filters. Clean and inspect all lines, and pitot and static vents. Clean and check all regulating valves. Remove and inspect engine driven and auxiliary vacuum pumps.	If immersed, each event, before further flight.
☐ Induction System.	Clean and inspect for silt and corrosion. Check all ducts and gaskets. Replace as necessary. Clean and inspect all heat shrouds and ducting.	If immersed, each event, before further flight.
☐ Fuel System.	Perform Fuel Tank/Wing Spar Corrosion Inspection, 28-10-00. Remove and clean fuel cells and fuel cells wing area. Clean all associated lines and pumps. Clean and inspect all fuel tank vents, cap vents and vent lines.	If immersed, each event, before further flight.
☐ Instruments.	Clean and inspect instruments. Bench check per appropriate maintenance manual.	If immersed, each event, before further flight.
☐ Heating and Ventilating Systems.	Replace blower. Clean and inspect all distribution boxes, ducting and valves. Inspect and check system control cables. Replace corroded or binding cables. If installed, clean and inspect air conditioning evaporator, condenser, and compressor.	If immersed, each event, before further flight.

5. Flood Damage, Immersion in Water (continued)

Item	Inspection	Inspection Interval
☐ Oxygen System. (S/N's 3255001 & up only, if installed.)	Disconnect all lines from source and outlets; clean all fittings and lines per MIL-I-5585A. Remove and clean regulator valve per appropriate Scott publication. Replace pressure gauge.	If immersed, each event, before further flight.
☐ Avionics Systems.	Replace avionics. Clean and inspect antennas and connectors.	If immersed, each event, before further flight.
☐ Insulation and Upholstery.	Remove all wet insulation and upholstery. Thoroughly clean and dry (or replace) to ensure corrosion is not promoted in adjacent structures.	If immersed, each event, before further flight.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

6

DIMENSIONS AND AREAS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 6

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

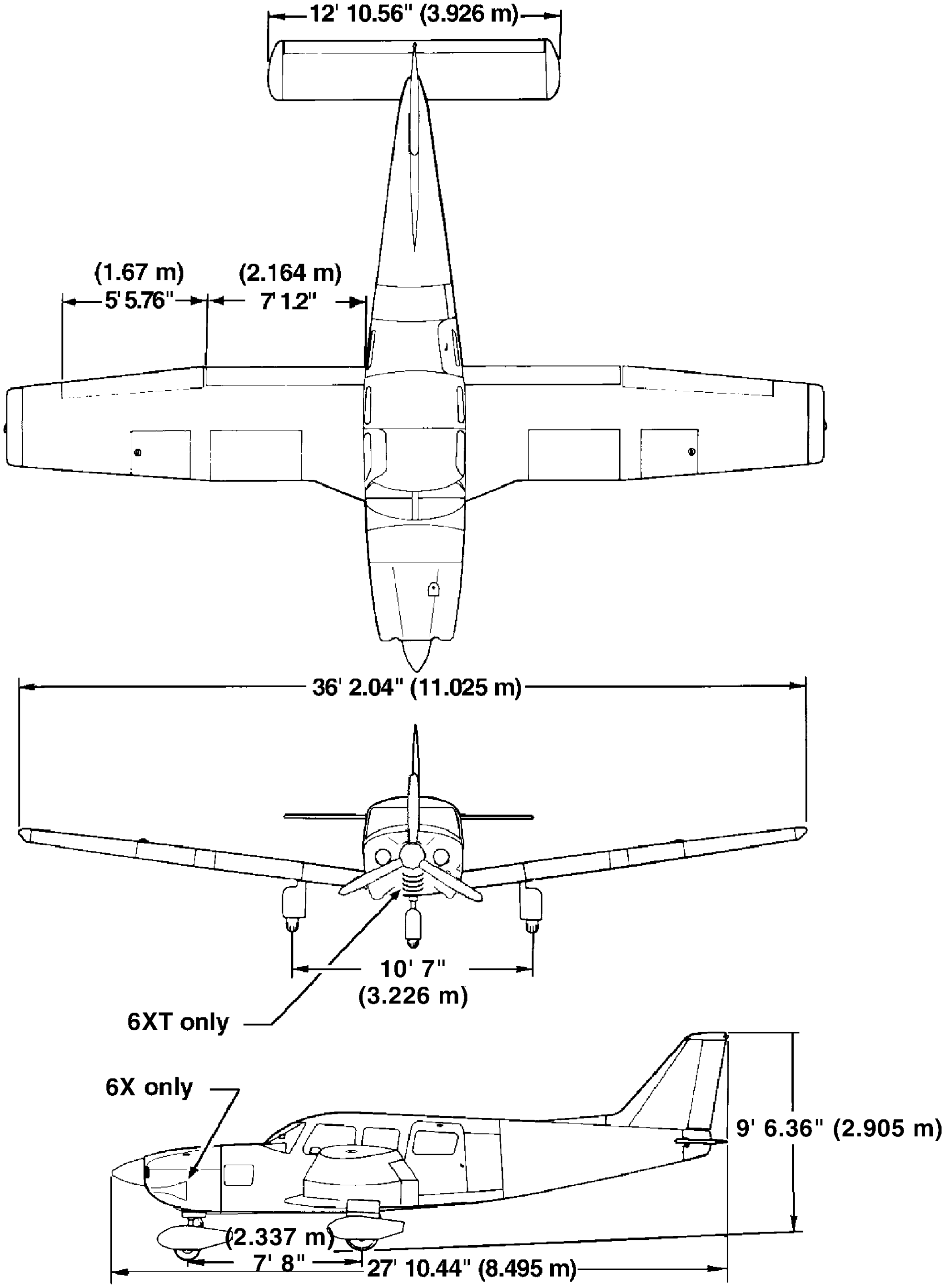
CHAPTER 6 - DIMENSIONS AND AREAS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

The principal airplane dimensions are shown in Figure 1, and the leading particulars/principal dimensions are listed in Chart 1. The airplane serial number is located on the Manufacturers Aircraft Association (MAA) plate located on the left side of the fuselage at approximately F.S. 278.6. The engine serial number plate is located on the right side of the engine oil sump just below cylinder number 5.



Three View
Figure 1

1. Leading Particulars and Principal Dimensions

CHART 1 (Sheet 1 of 3)
LEADING PARTICULARS AND PRINCIPAL DIMENSIONS

MODEL	PA-32-301FT (6X)	PA-32-301XTC (6XT)
ENGINE		
Manufacturer	Textron Lycoming	
Model	IO-540-K1G5	TIO-540-AH1A
FAA Type Certificate	1E4	
Rated Horsepower	300 HP at Sea Level	300 HP to 12,000 ft.
Rated Speed	2700 RPM	2500 RPM
Oil Pressure (PSI):		
Minimum Idling	25	
Normal	55	
Starting and Warmup	115	
Maximum	95	
Oil Type and Grade	See Lubrication Chart	
Oil Sump Capacity	12 U.S quarts (9.25 quarts usable)	
Fuel, Aviation Grade (Minimum and Specified Octane)	100/100LL	
Magnetos:		
(L/H)	Slick 6351	Slick 6361
(R/H)	6350	6360
Magneto Timing	20 degrees BTC	
Magneto Point Clearance	.010 ± .002	
Spark Plugs / Spark Plug Gap Setting	Refer to latest revision of Textron Lycoming Service Instruction No. 1042.	
Firing Order	1-4-5-2-3-6	
Starter:		
Skytech (28 volt)	149-24PM	
Alternator (90 amp):		
Electrosystems (28 volt)	P/N 680-501	
Voltage Regulator:		
Lamar (28 volt)	P/N 584-290	

CHART 1 (Sheet 2 of 3)
LEADING PARTICULARS AND PRINCIPAL DIMENSIONS

MODEL	PA-32-301FT (6X)	PA-32-301XTC (6XT)
PROPELLER	**THREE BLADE**	
Manufacturer	Hartzell	
Hub and Blade Model	HC-I3YR-1RF / F7663DR	
Diameter	78 in.	
Diameter, Minimum	77 in.	
Blade Angle:		
Low Pitch (High RPM)[1]	12.4° ± 0.2°	15.2° ± 0.2°
High Pitch (Low RPM)[1]	32°± 1°	34.0° ± 0.5°
Governor Control	Hartzell	
Governor Model	V-5-4	V-5-6
Note: (1) Measurement taken at 30 inch station.		
FUEL SYSTEM		
Fuel Tanks: (2 interconnected each wing / 4 total)		
Capacity:	53.5 U.S. Gallons / Wing	
Total Fuel Onboard	107 U.S. Gallons	
Total Usable Fuel	102 U.S. Gallons	
Electric Fuel Pump:		
Weldon (28 volt)	P/N 461-750	
LANDING GEAR		
Type	Fixed	
Shock Strut Type	Combination Air and Oil Oleo	
Fluid Required (Struts & Brakes)	MIL-H-5606	
Wheel Tread	10 ft. 7 in.	
Wheelbase	7 ft. 8 in.	
Nose Wheel Travel	30° ± 2° Left and Right	
Turning Distance (Min.)	59 ft., 10.8 in.	
Turning Radius (Minimum):		
Nose Wheel	22 ft., 11 in.	
Wing Tip		
Wheel, Nose	6.00 x 6 Cleveland 40-56B or 40-30665	
Wheel, Main	6.00 x 6 Cleveland 40-120C	
Brake Type	Cleveland 30-83A	
Tire, Nose	Type III, 6:00 x 6, 8 ply (Michelin Air)	
Tire, Main,	Type III, 6:00 x 6, 8 ply (Michelin Air)	

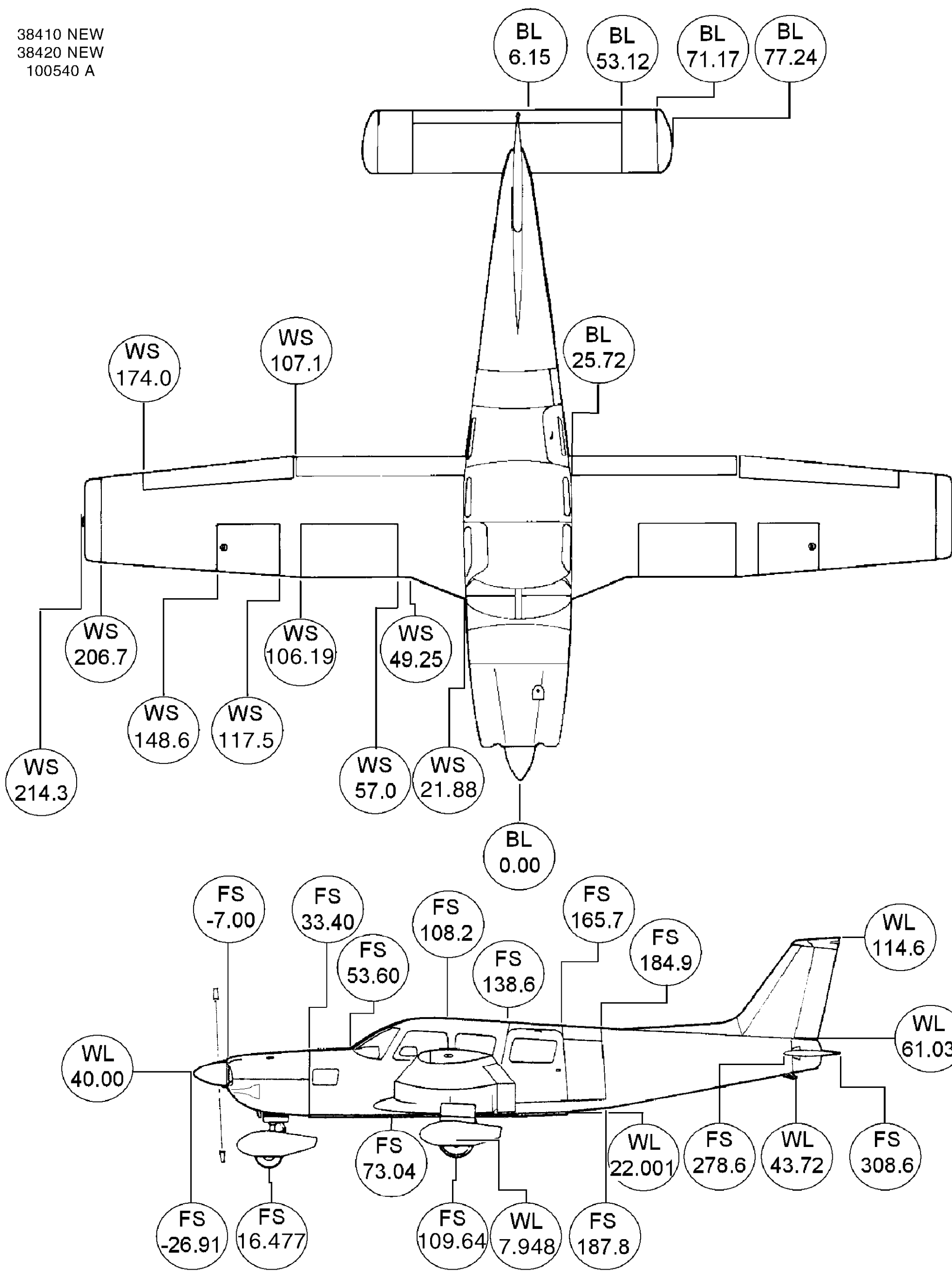
CHART 1 (Sheet 3 of 3)
LEADING PARTICULARS AND PRINCIPAL DIMENSIONS

MODEL	PA-32-301FT (6X)	PA-32-301XTC (6XT)
LANDING GEAR (cont.)		
Tire Pressure, Nose	35 psi	
Tire Pressure, Main	55 psi	
Nose Gear Strut Pressure	225 ± 22.5 psi	
Nose Gear Visible Piston Extension (Under Static Load)1	3.25 in. ± .25 in.	
Main Gear Strut Pressure	250 ± 25 psi	
Main Gear Visible Piston Extension (Under Static Load)[1]	4.5 in. ± .5 in.	

Note:
(1) Static Load is the empty weight of the airplane plus full fuel and oil.

2. Station Reference Lines

To locate various airplane components that require maintenance and servicing, a method utilizing fuselage station, wing station, buttock line and waterline designations is frequently employed in this manual. Fuselage stations (F.S.), wing stations, (W.S.) buttock lines (B.L.), and water lines (W.L.) are reference points measured by inches in the vertical or horizontal direction from a given reference line. The reference datum line (F.S. 0) is located 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section; B.L. 0 is the centerline of the airplane; and W.L. 0 is 20.5 inches below the cabin floor as measured at the rear wing spar with the airplane level.

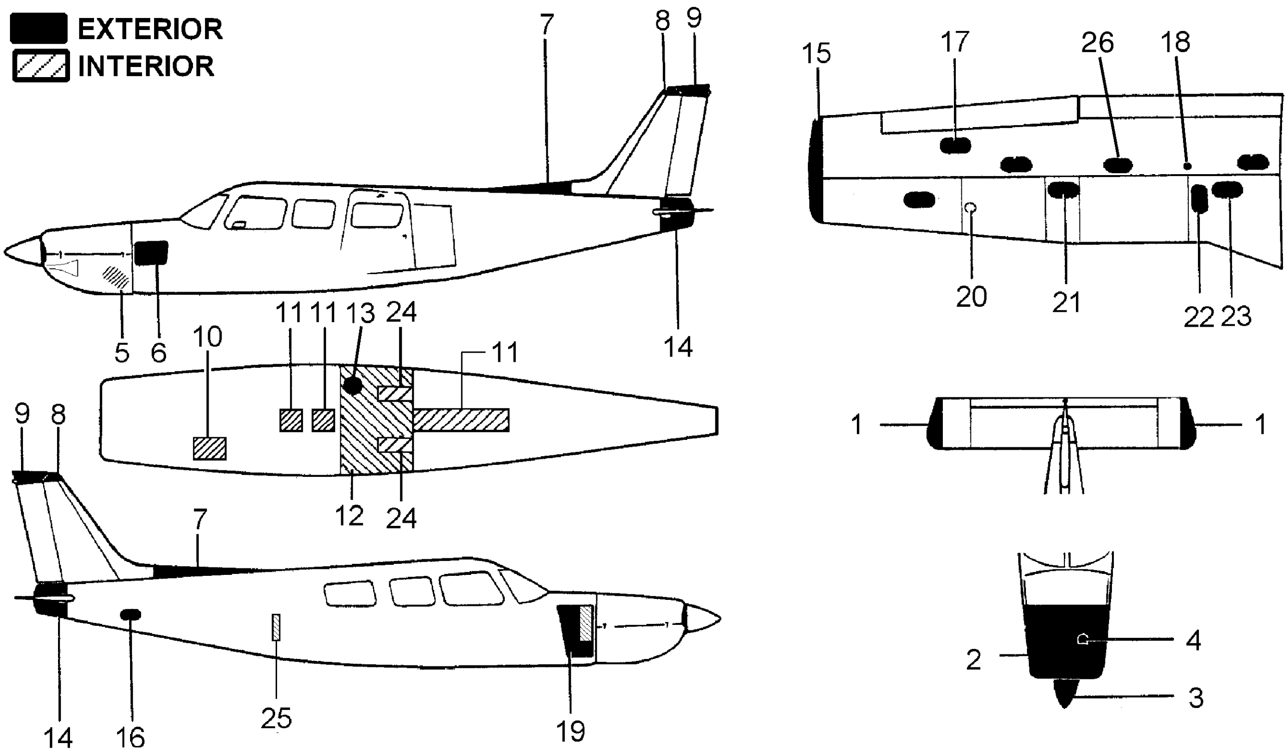


Station Reference Lines
Figure 2

3. Access And Inspection Provisions

CAUTION: BEFORE ENTERING THE AFT SECTION OF THE FUSELAGE, BE SURE THE AIRPLANE IS SUPPORTED AT THE TAIL SKID.

The access and inspection provisions for the airplane are shown in Figure 3. The component to be serviced or inspected through each opening is identified in the illustration. All access plates and panels are secured by either metal fasteners or screws. To enter the aft section of the fuselage, remove the rear trim panel.



1. TIP, STABILATOR
2. COWL, ENGINE ACCESS
3. SPINNER, PROPELLER
4. DOOR, OIL FILLER
5. AIR FILTER (6X ONLY)
6. VACUUM REGULATORS & SWITCHES, ALTERNATOR OUT SWITCH, DIODE
7. FAIRING, ACCESS
8. TIP, VERTICAL STABILIZER
9. TIP, RUDDER
10. SEE ITEM NO. 6, ABOVE
11. PLATES, TUNNEL ACCESS
12. PANEL, FLOOR
13. COVER, FUEL SELECTOR FILTER
14. TAIL CONE, CONTROL CABLES & TRIM SCREW
15. WING TIP
16. COVER, E.L.T. ACCESS
17. COVER, AILERON BELLCRANK ACCESS
18. COVER, MAIN GEAR OLEO AIR FILLER
19. DOOR, BAGGAGE (& COVER, MAGNETO ACCESS)
20. CAP, FUEL FILLING
21. COVER, FUEL FITTING
22. COVER, FUEL AND BRAKE FITTINGS
23. COVER, FUEL FITTINGS
24. REAR WING ATTACH FITTINGS & CONTROL CABLE INSPECTION PANEL
25. COVER, AFT FUSELAGE, OXYGEN[1] & BATTERY SERVICE
26. FUEL VENT

NOTE: (1) IF INSTALLED.

Access Plates and Panels
Figure 3

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

7

LIFTING AND SHORING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 7

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
7-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
7-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
7-10-00	1	Jun 1/03			
	2	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 7 - LIFTING AND SHORING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

JACKING

Jacking the airplane is necessary to service the landing gear and other operations. The jacking operation can be performed by using tripod jacks; in other situations (i.e. - emergency, post-accident lifting, etc.), slings or air bags should be used.

If wing or fuselage shoring is required, make sure the support is contoured to conform to the surface it is supporting.

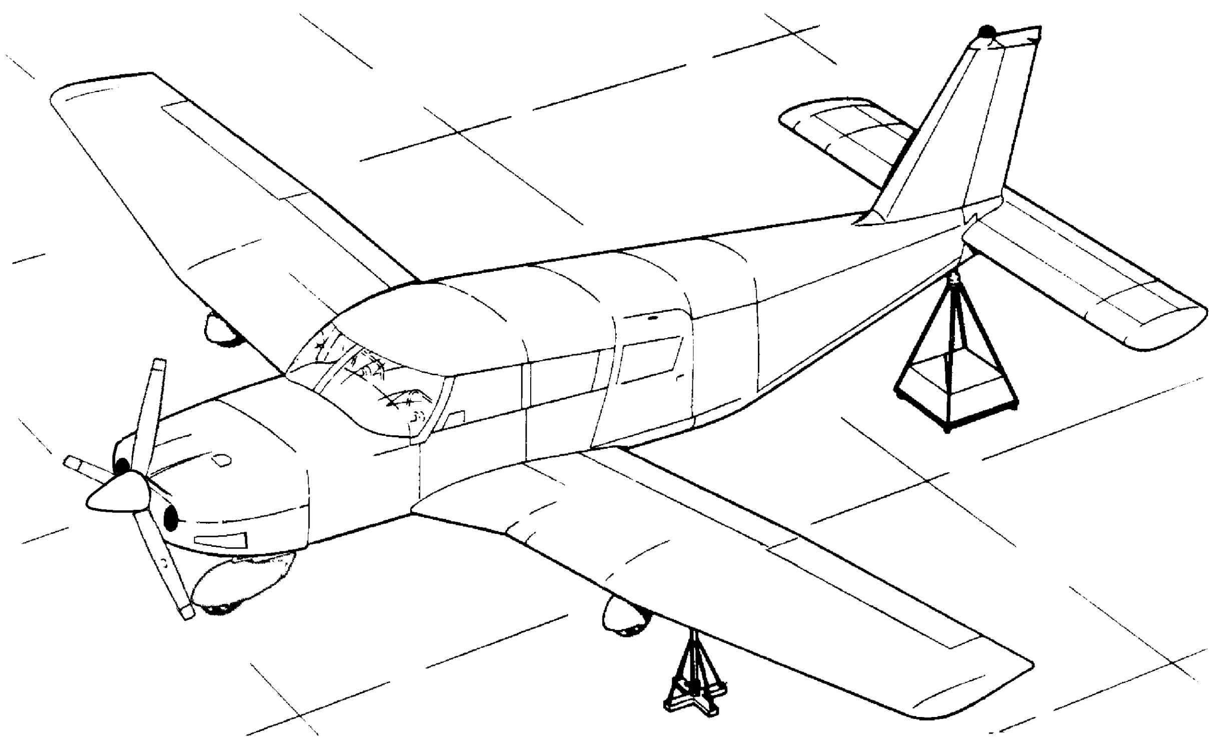
Jacking

A. Align jacks under the wing respective pads on the wing front spar.

CAUTION: BE SURE TO APPLY SUFFICIENT SUPPORT BALLAST. OTHERWISE, THE AIRPLANE WILL SLIP FORWARD AND FALL ON THE FUSELAGE NOSE SECTION.

B. Attach a tail stand with approximately 300 pounds ballast to tail skid.

C. Carefully raise jacks until all three wheels are clear of the surface.



Jacking
Figure 1

THIS PAGE INTENTIONALLY BLANK

CHAPTER

8

LEVELING AND WEIGHING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 8

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 8 - LEVELING AND WEIGHING

TABLE OF CONTENTS

GRIDS 1F22 THRU 1F24
INTENTIONALLY BLANK

WEIGHING

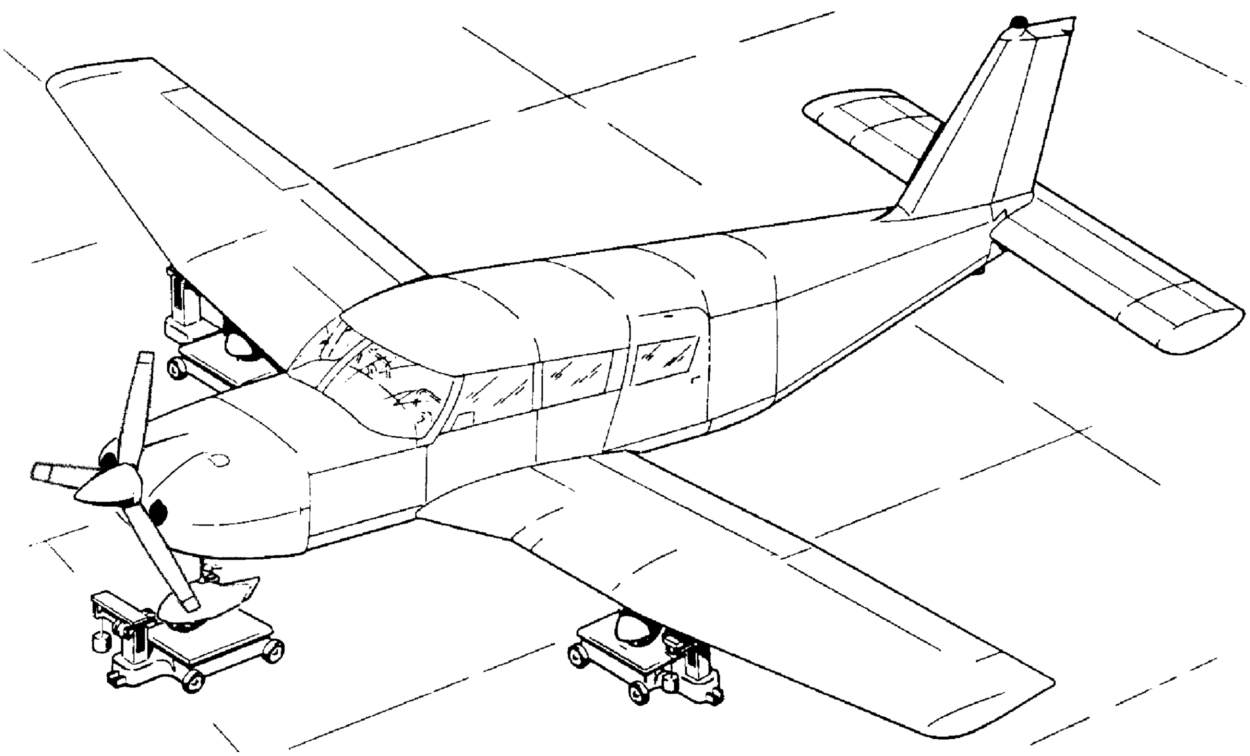
The airplane may be weighed by the following procedure (see Figure 1):

A. Position a scale and ramp in front of each of the three wheels.

B. Secure the scales from rolling forward and tow the airplane up onto the scales. (Refer to Towing, 9-10-00.)

C. Remove the ramp so as not to interfere with the scales.

D. If the airplane is to be weighed for weight and balance computations, level the airplane.



Weighing Airplane
Figure 1

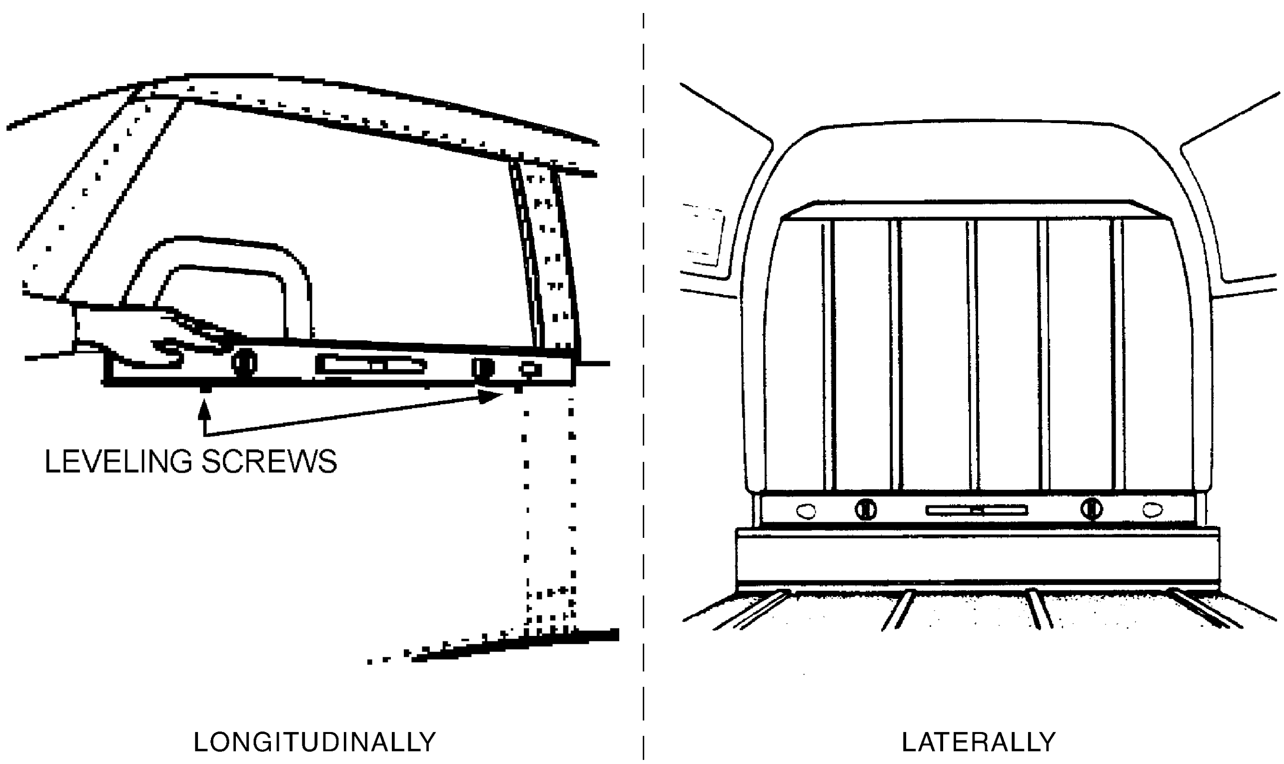
THIS PAGE INTENTIONALLY BLANK

LEVELING

All configurations of the airplane are provided with a means for longitudinal and lateral leveling. The airplane may be leveled while on jacks, during the weighing procedure while the wheels are on scales, or while the wheels are on the ground. To level the airplane for purposes of weighing or rigging, the following procedures may be used:

A. To longitudinally level the airplane, partially withdraw the two leveling screws located immediately below the left front side window. (Refer to Figure 1.) Place a spirit level on these screw heads and deflate the nose wheel tire or adjust the jacks until the bubble of the level is centered.

B. To laterally level the airplane, place a spirit level across the baggage compartment floor along the rear bulkhead (refer to Figure 1) and deflate the tire on the high side of the airplane or adjust either jack until the bubble of the level is centered.



Leveling Airplane
Figure 1

THIS PAGE INTENTIONALLY BLANK

CHAPTER

9

TOWING AND TAXIING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 9

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 9 - TOWING AND TAXIING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

TOWING

Before towing airplane, ground personnel must be informed by a qualified pilot or other qualified personnel about tow turning limits of nose gear and any other system functions required to properly and safely move the airplane.

CAUTION: WHEN TOWING WITH POWER EQUIPMENT, TURNING THE NOSE GEAR IN EITHER DIRECTION BEYOND THE STEERING RADIUS LIMITS WILL RESULT IN DAMAGE TO THE NOSE GEAR AND STEERING MECHANISM.

CAUTION: PUSHING ON THE TRAILING EDGE OF THE AILERONS, WHEN MOVING THE AIRCRAFT FORWARD BY HAND, WILL CAUSE THE AILERON CONTOUR TO CHANGE RESULTING IN AN OUT-OF-TRIM CONDITION.

The airplane may be moved by using the nose wheel steering bar that is stowed in the forward baggage compartment or by using power equipment that will not damage or cause excess strain to the nose gear steering assembly. Tow bar engages front axle inside fork.

In the event towing lines are necessary, lines (rope) should be attached to both main gear struts as high up on the tubes as possible. Lines should be long enough to clear the nose and/or tail by not less than 15 feet, and a qualified person to ride in the pilot's seat to maintain control by use of the brakes.

THIS PAGE INTENTIONALLY BLANK

TAXIING

Before attempting to taxi the airplane, ground personnel should be checked out by a qualified pilot or other responsible person. Engine starting and shutdown procedures should be covered as well. When it is ascertained that the propeller back blast and taxi areas are clear, apply power to start the taxi roll and perform the following checks:

CAUTION: DO NOT OPERATE THE ENGINE AT HIGH RPM WHEN RUNNING UP OR TAXIING OVER GROUND CONTAINING LOOSE STONES, GRAVEL OR ANY LOOSE MATERIAL THAT MAY CAUSE DAMAGE TO THE PROPELLER BLADES.

CAUTION: OBSERVE WING CLEARANCES WHEN TAXIING NEAR BUILDINGS OR OTHER STATIONARY OBJECTS. IF POSSIBLE, STATION A GUIDE OUTSIDE THE AIRPLANE TO OBSERVE.

CAUTION: WHEN TAXIING ON UNEVEN GROUND, AVOID HOLES AND RUTS.

A. Taxi forward a few feet and apply brakes to determine their effectiveness.

B. Taxi with propeller set in low pitch, high rpm setting.

C. While taxiing, make slight turns to ascertain the effectiveness of steering.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

10

PARKING AND MOORING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 10

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 10 - PARKING AND MOORING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

PARKING

1. Parking

When parking the airplane, ensure that it is sufficiently protected against adverse weather conditions and presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is recommended that it be moored.

A. To park the airplane, head it into the wind, if possible.

B. Set the parking brake by pulling back the brake lever and depressing the knob attached to the left side of the handle.

C. To release the parking brakes, pull back on the brake lever to disengage the catch mechanism. Then allow the handle to swing forward.

NOTE: Take care when setting brakes that are overheated or during cold weather when accumulated moisture may freeze the brakes.

D. The aileron and stabilator controls may be secured with the pilot's seat belt.

2. Locking Airplane

The right front cabin door, left aft cabin door and the nose baggage compartment door are provided with a key lock on the outside. All doors and the locking gas cap (optional) use the same key.

THIS PAGE INTENTIONALLY BLANK

MOORING

CAUTION: WHEN MOORING, USE SQUARE OR BOWLINE KNOTS. DO NOT USE SLIP KNOTS.

The airplane is moored to ensure its immovability, protection, and security under various weather conditions.

A. Head the airplane into the wind, if possible.

B. Block the wheels.

C. Lock the aileron and stabilator controls by looping the pilot's seat belt around wheel.

CAUTION: WHEN USING ROPE CONSTRUCTED OF NON-SYNTHETIC MATERIAL, LEAVE SUFFICIENT SLACK TO AVOID DAMAGE TO THE AIRPLANE WHEN THE ROPES CONTRACT DUE TO MOISTURE.

D. Secure tie-down ropes to the wing tie-down rings and the tail skid at approximately 45 degree angles to the ground.

NOTE: Additional preparations for high winds include using tie-down ropes from the landing gear forks, and securing the rudder.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

11

PLACARDS AND MARKINGS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 11

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 11 - PLACARDS AND MARKINGS

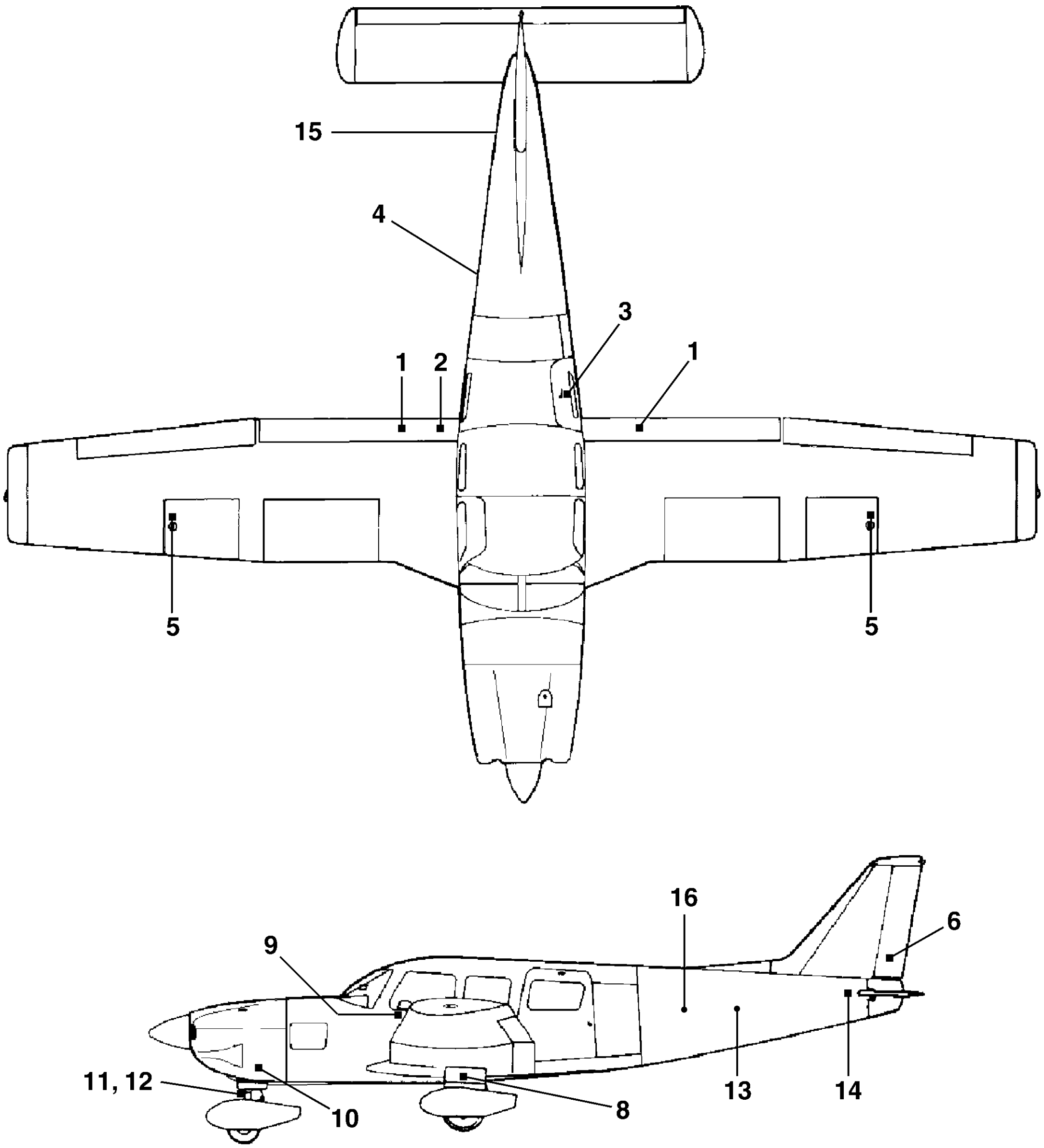
TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

EXTERIOR PLACARDS AND MARKINGS

The airplane nameplate placard (Figure 1, Item 14) is located on the left side of the fuselage near the stabilator leading edge at approximately F.S. 278.60. The placard identifies the airplane by its model number and serial number. Should a question arise concerning the care of the airplane, it is important to include the airplane serial number in any correspondence to your Piper Dealer's Service Advisor (DSA).

NOTE: Any time an airplane is repainted or touched up, inspect all placards to ensure that they are not covered with paint, are legible, and securely attached.



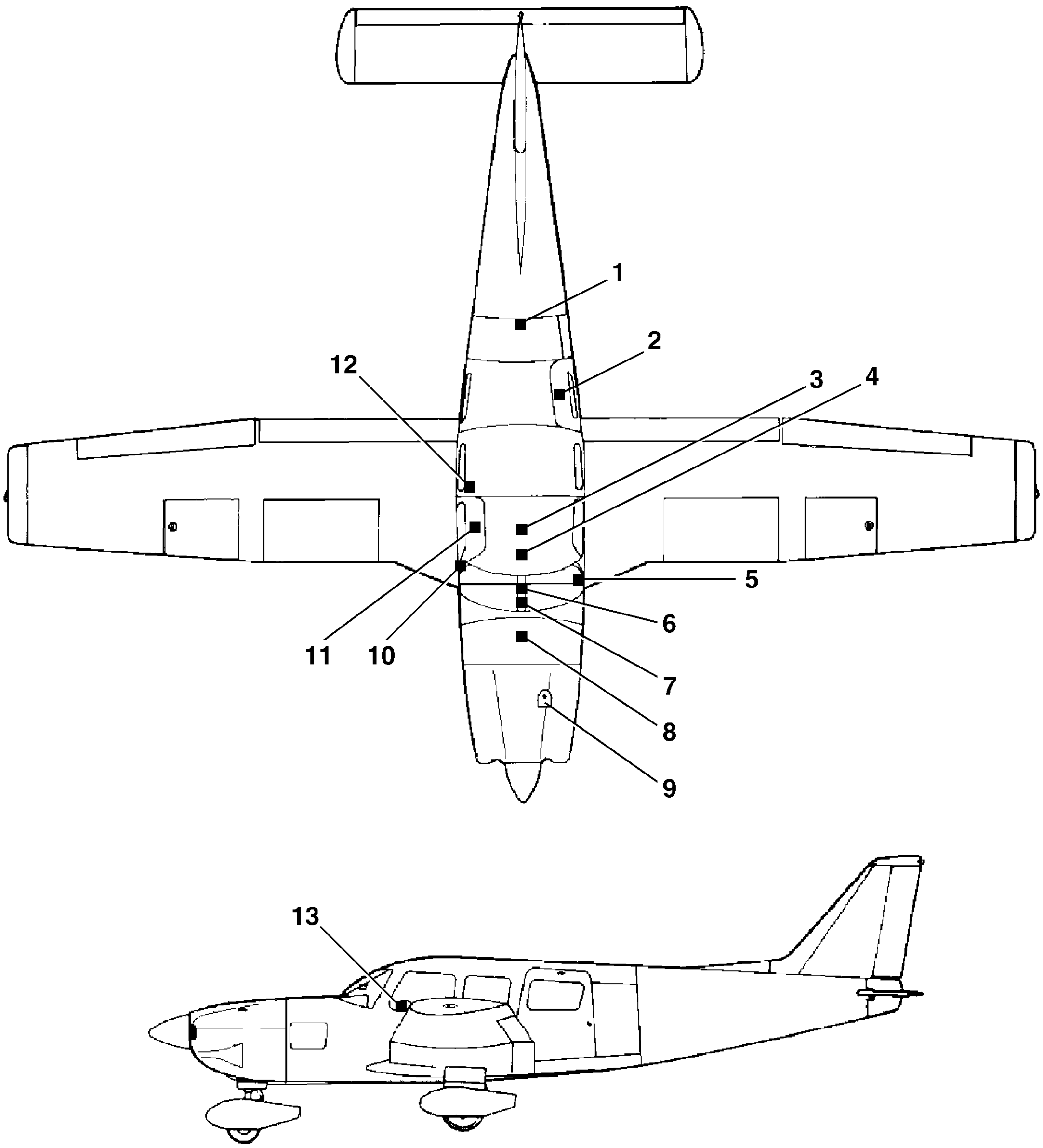
1. PLACARD - NO STEP
2. PLACARD - WARNING - FLAP STEP UNSAFE
3. PLACARD - DOOR RELEASE
4. PLACARD - EXTERNAL POWER
5. PLACARD - AVGAS ONLY
6. PLACARD - DO NOT PUSH
7. PLACARD - FUEL CHECK BOTTLE (NOT SHOWN)
8. PLACARD - OLEO SERVICE INSTRUCTIONS
9. PLACARD - LEVEL POINT
10. PLACARD - OLEO SERVICE INSTRUCTIONS (ON STRUT HOUSING)
11. PLACARD - TURN LIMIT
12. PLACARD - TURN LIMIT CENTER MARK
13. PLACARD - STATIC VENT - KEEP CLEAN (EACH SIDE)
14. PLACARD - AIRPLANE NAMEPLATE
15. PLACARD - ELT BEHIND PANEL (MAY NOT BE INSTALLED ON EXPORT AIRPLANES)
16. PLACARD - OXY H.P. RELIEF (6XT ONLY - OPTIONAL)

Exterior Placards and Markings
Figure 1

THIS PAGE INTENTIONALLY BLANK

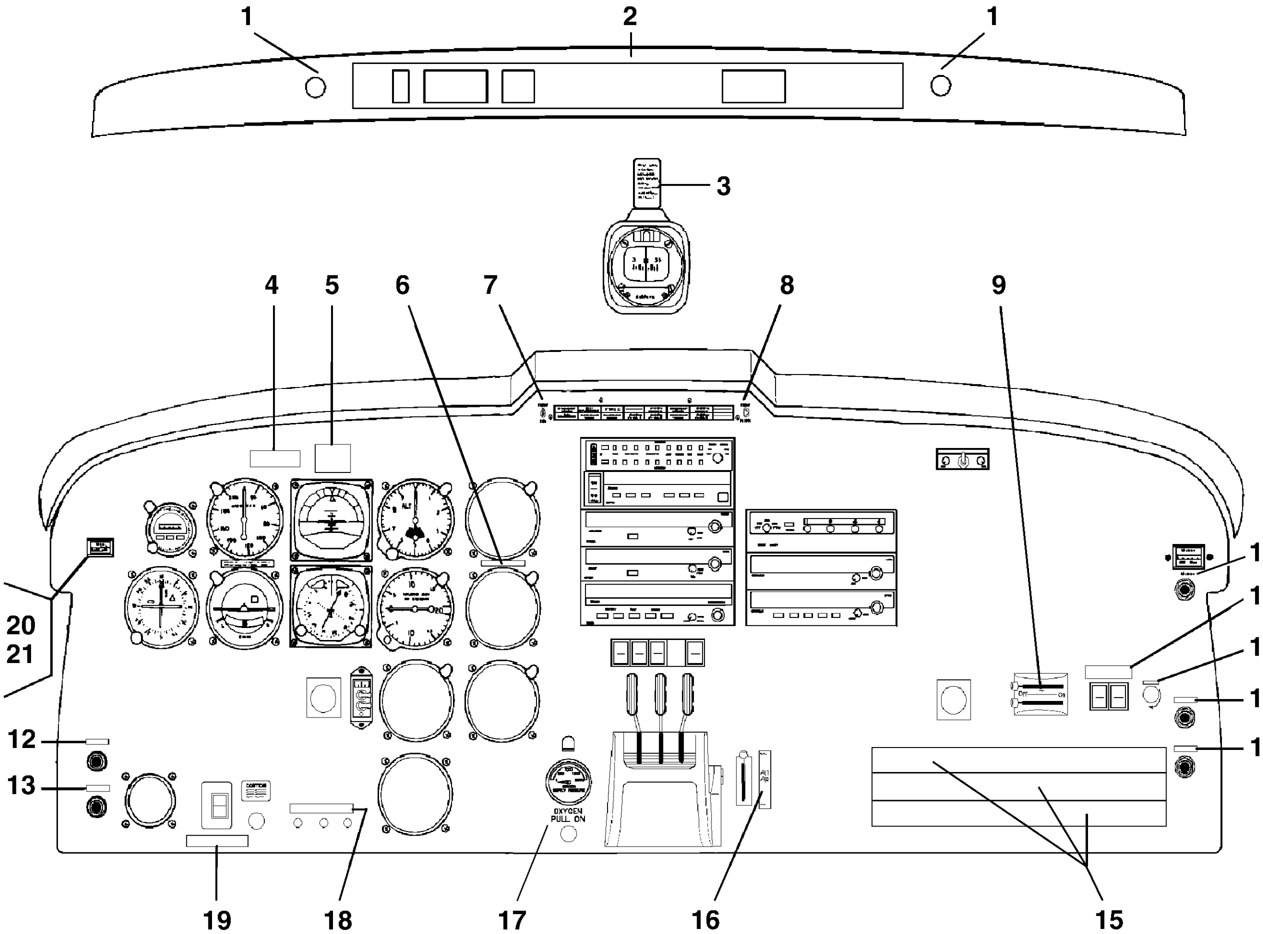
THIS PAGE INTENTIONALLY BLANK

INTERIOR PLACARDS



1. PLACARD - MAXIMUM BAGGAGE
2. PLACARD - LATCH - OPEN
3. PLACARD - FLAP LEVER
4. PLACARD - STABILATOR TRIM
5. PLACARD - AIRPLANE OPERATING CATEGORY
6. PLACARD - FUEL SELECTOR
7. PLACARD - NOSE L - R
8. PLACARD - MAXIMUM BAGGAGE
9. PLACARD - OIL GRADE
10. PLACARD - OPEN - LATCHED - CAUTION
11. PLACARD - OPEN - LATCH
12. PLACARD - FUEL SUMP DRAIN
13. PLACARD - DO NOT OPEN ABOVE ....

Interior Placards
Figure 1



1. PLACARD - DOME LIGHT
2. PLACARD - NO SMOKING
3. PLACARD - COMPASS DEVIATION
4. PLATE - N ....
5. PLACARD - DEMONSTRATED X-WIND
6. PLACARD - DO NOT EXCEED - MANIFOLD PRESSURE
7. PLACARD - DAY-NIGHT
8. PLACARD - PRESS TO TEST
9. PLACARD - HEAT-DEF - ON OFF
10. PLACARD - 28V ....
11. PLACARD - AIR CONDITIONER TAKEOFF WARNING (OPTIONAL)
12. PLACARD - COOLER (OPTIONAL)
13. PLACARD - PHONE
14. PLACARD - MIKE
15. PLACARD - CIRCUIT BREAKER PANEL
16. PLACARD - ALT AIR - OPEN CLOSE
17. PLACARD - OXYGEN - PULL ON (6XT ONLY - OPTIONAL)
18. PLACARD - DIMMING (SWITCH, PANEL, AVIONICS)
19. PLACARD - ALTERNATE STATIC SOURCE
20. PLACARD - CAUTION - BEFORE USING AUX PUMP
21. PLACARD - AUX VAC

Instrument Panel
Figure 2

Meyercord Decals

Decals installed on the instrument panel are Meyercord type manufacturered by Mark-It, 1055 Paramount Tarkway, Batavia. IL 60510. The following procedures should be followed in the event one or more of these decals must be replaced.

A. Removal

CAUTION: DO NOT USE LACQUER THINNER ON ANY PANEL THAT HAS BEEN PAINTED WITH ENAMEL OR LACQUER. INSTRUMENT PANELS ARE PAINTED AT THE FACTORY WITH POLYURETHANE PAINTS.

Remove placard to be replaced with of clean cloth ***dampened*** with lacquer thinner.

CAUTION: MARK-IT J-70 SOLVENT WILL REMOVE ENAMEL, LACQUER, AND POLYUTHERANE BASED PAINT PRODUCTS IF LIQUID IS DROPPED ONTO PAINTED SURFACE AND NOT REMOVED IMMEDIATELY.

If panel is painted with enamel or lacquer use a clean cloth ***dampened*** with Mark-It J-70 solvent to remove placard to be replaced.

B. Installation

(1) Mix a solution consisting of 2 parts water and 1 part J-70 solvent (P/N 179-497).
(2) Prepare surface to receive decal by wiping it with a clean cloth ***dampened*** with the diluted Mark-It J-70 solvent mixed above.
(3) Submerge decal in the mixed J-70 solution for approximately 3 to 5 seconds.
(4) Remove decal from mixed solution and lay in position.
(5) Using a rubber squeegee, squeegee out from center to edges to remove excess solution.
(6) Wait approximately 1 to 1 1/2 minutes, then remove backing paper.
(7) Using a damp sponge, remove excess solution from face of decal and surrounding area.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

12

SERVICING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 12

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 12 - SERVICING

TABLE OF CONTENTS

CHAPTER 12 - SERVICING

TABLE OF CONTENTS (continued)

GENERAL

This chapter covers all routine servicing of airplane, scheduled and non-scheduled, including replenishment of fuel, oil, brake fluid, oxygen (if installed), tire pressure, lubrication requirements, servicing of oleo struts with air and oil, etc. Pay special attention to all WARNINGS and CAUTIONS.

1. Aircraft Finish Care

WARNING: DO NOT USE GASOLINE, ALCOHOL, BENZENE, CARBON TETRACHLORIDE, THINNER, ACETONE OR WINDOW CLEANING SPRAYS TO CLEAN AIRPLANE.

The entire airplane is carefully finished inside and out to assure maximum service life. The external surfaces are coated with durable polyurethane enamel.

A. Dupont Imron 6000 Paint System

CAUTION: FAILURE TO OBSERVE THE PROPER "FINISH CARE" GUIDELINES MAY RESULT IN DAMAGE OR LOSS OF SHINE OF THE AIRCRAFT PAINT. IMPROPER CARE MAY ALSO VOID THE WARRANTY REGARDING THE AIRCRAFT FINISH.

New Piper aircraft delivered in 1999 and later use the new Dupont Imron 6000 paint system. The guidelines outlined below must be followed to prevent damage to the finish and ensure long paint life.

(1) For the first 30 days after painting:

(a) Hand wash the aircraft often. Use fresh water only.

(b) Avoid parking under trees or places where birds roost. If sap, bird droppings, or insect remains are discovered, rinse them off immediately. (Sap, bird droppings, or insect remains will damage the paint during this period.)

(2) For the first 120 days after painting:

(a) To remove heavy soil, use mild liquid soap. Never use detergent.

(b) DO NOT WAX THE AIRCRAFT WITHIN 120 DAYS OF PAINTING!

(3) For long term paint finish protection:

(a) Park in a sheltered area whenever possible.

(b) Never use a scraper to remove ice or snow from painted surfaces.

(c) Never let avgas, oil, or hydraulic fluid stand on painted surfaces. (This will permanently damage the finish.)

(d) Never wash the aircraft in the hot sun.

(e) Never wipe the finish with a dry cloth, always use fresh water.

(f) Avoid abrasive cleaners, chemicals, abrasive wax, or brushes.

(g) Have paint nicks or scratches touched up as soon as possible to maintain the aircraft's corrosion protection.

To summarize, New Piper aircraft using the new Dupont paint system need special attention in the early days of ownership.

B. Cleaning

CAUTION: IF PAINT IS LESS THAN SIX MONTHS, SEE "DUPONT IMRON 6000 PAINT SYSTEM," ABOVE.

CAUTION: DO NOT DIRECT ANY STREAM OF WATER OR CLEANING SOLUTION AT THE OPENINGS IN THE PITOT HEAD, STATIC PORTS, ALTERNATE STATIC PORTS OR FUSELAGE DRAINS.

The airplane should be washed with a mild soap and water. Harsh abrasives or detergents used on painted or plastic surfaces could make scratches or cause corrosion of metal surfaces. Cover areas where cleaning solution could cause damage. To wash the airplane, the following procedure may be used:

(1) Flush away loose dirt with water.

(2) Apply cleaning solution with a rag, sponge or soft bristle brush.

(3) To remove stubborn oil and grease, use cloth dampened with naphtha.

(4) Where exhaust stains exist, allow solution to remain on the surface longer.

(5) Any good automotive wax may be used to preserve the painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

2. Cleaning

A. Exterior Surfaces - see "Aircraft Finish Care," above, and "Windshield and Windows," below.

B. Engine Compartment

Before cleaning the engine compartment, place strips of tape on the magneto vents to prevent any solvent from entering these units.

(1) Place a pan under the engine to catch waste.

CAUTION: DO NOT SPRAY SOLVENT INTO THE ALTERNATOR, STARTER, VACUUM PUMP(S), AIR INTAKE AND ALTERNATE AIR INLETS.

(2) With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser, as desired. It may be necessary to brush areas that were sprayed where heavy grease and dirt deposits have collected in order to clean them.

(3) Allow the solvent to remain on the engine from five to ten minutes; then rinse the engine clean with additional solvent and allow to dry.

CAUTION: DO NOT OPERATE ENGINE UNTIL EXCESS SOLVENT HAS EVAPORATED OR OTHERWISE BEEN REMOVED.

(4) Remove the protective covers from the magnetos.

(5) Lubricate controls, bearing surfaces, etc., per Lubrication Charts,12-20-00.

C. Landing Gear

(1) Struts and Torque Links

Before cleaning the landing gear struts and torque links, remove wheel pants and place a plastic cover or similar material over the wheel and brake assembly.

(a) Place a pan under the gear to catch waste.

(b) Spray (low pressure only) or brush the gear area with solvent or a mixture of solvent and degreaser.

(c) Allow the solvent to remain on the gear for five to ten minutes. Rinse gear with additional solvent and allow to dry.

(d) Remove cover from wheel and remove the catch pan.

(e) Lubricate gear per Lubrication Chart, 12-20-00.

(f) Reinstall wheel pants, if not proceeding to wheels and brakes, below.

(2) Wheels and Brakes

CAUTION: DO NOT USE HIGH PRESSURE SPRAY WASH EQUIPMENT. ITS USE CAN INJECT SOAP SOLUTION AND WATER INTO THE WHEEL BEARINGS AND OTHER INTERNAL CAVITIES RESULTING IN CORROSION AND REDUCED SERVICE LIFE.

(a) Remove wheel pants, if not already removed, above.

(b) Hand wash wheels and brakes with a mild soap and water solution.

(c) Rinse with low-pressure spray.

(d) Lubricate gear per Lubrication Chart, 12-20-00, if not already done, above.

(e) Reinstall wheel pants.

D. Windshield and Windows

WARNING: DO NOT USE GASOLINE, ALCOHOL, BENZENE, CARBON TETRACHLORIDE, THINNER, ACETONE OR WINDOW CLEANING SPRAYS.

(1) Remove dirt, mud, etc., from exterior surfaces with clean water.

(2) Wash with mild soap and warm water, or an aircraft plastic cleaner using a soft cloth or sponge and a straight rubbing motion. Do not rub surfaces harshly.

(3) Remove oil and grease with a cloth moistened with kerosene.

(4) After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.

(5) A severe scratch or mar in plastic can be removed by using jeweler's rouge to rub out the scratch. Smooth both sides and apply wax.

(6) To improve visibility through windshield and windows during flight through rain, a rain repellent such as REPCON should be applied to windshield and windows. The surfaces of the windshield and windows treated becomes so smooth that water beads up and readily flows off the surface. Apply this product in accordance with the manufacturer's instructions. (See 91-10-00, Consumable Materials and Vendor Contact Information.)

E. Headliner, Side Panels and Seats

(1) Clean headliner, side panels, and seats with a stiff brush and vacuum where necessary.

WARNING: SOLVENT CLEANERS REQUIRE ADEQUATE VENTILATION.

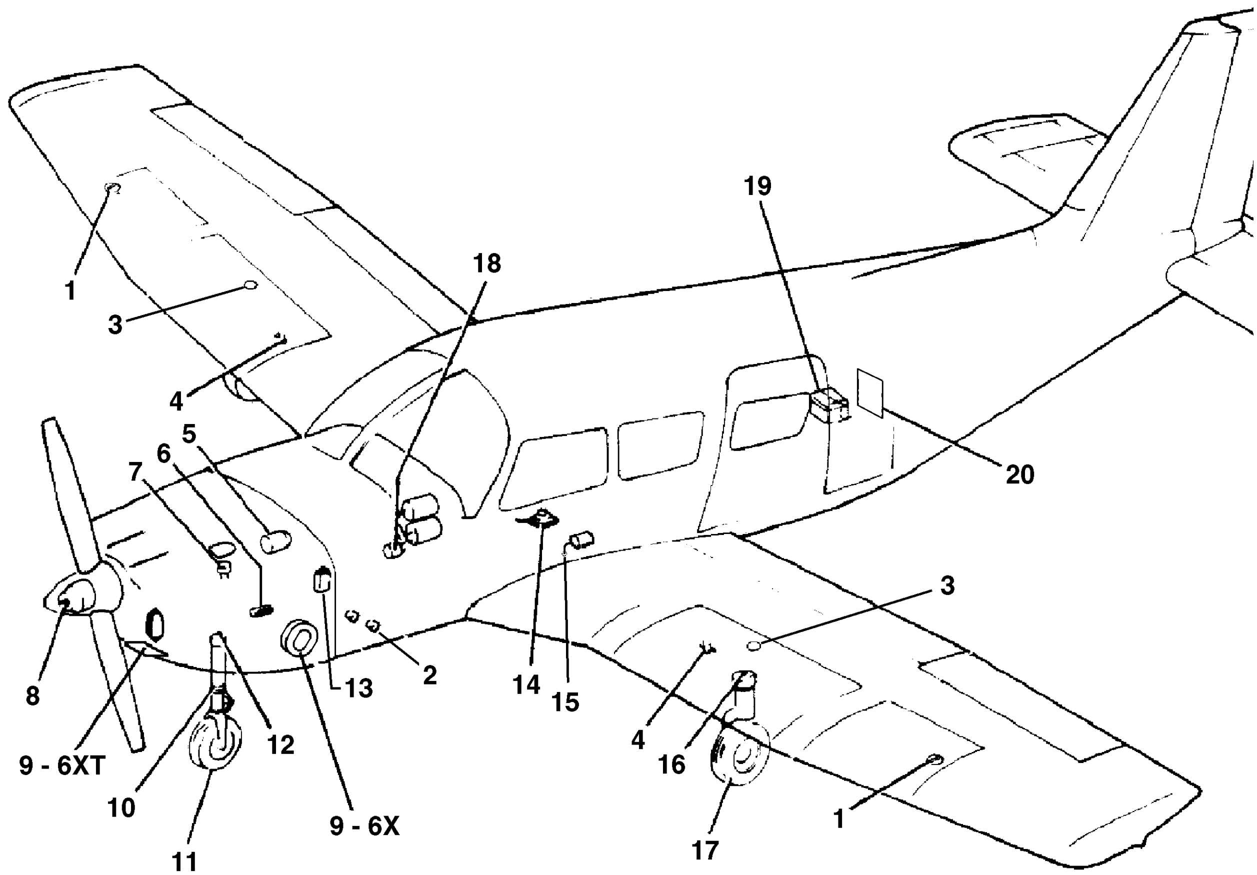
(2) Soiled upholstery, except leather, may be cleaned by using an approved air drying type cleaner or foam upholstery cleaner. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

(3) Leather material should be cleaned with saddle soap or mild soap and water.

F. Carpets

Use a small whisk broom or vacuum to remove dirt. For soiled spots, use a non-inflammable dry-cleaning fluid.

REPLENISHING



1. MAIN FUEL TANK FILLER
2. VACUUM REGULATORS
3. SIGHT GAUGE
4. MAIN FUEL TANK DRAIN
5. ENGINE OIL FILTER CARTRIDGE
6. ENGINE OIL SUCTION SCREEN
7. ENGINE OIL FILLER / INDICATOR
8. PROPELLER
9. INDUCTION AIR FILTER
10. NOSE GEAR LINK ASSEMBLY
11. NOSE GEAR TIRE
12. NOSE STRUT OLEO SHOCK FILLER
13. BRAKE SYSTEM RESERVOIR
14. FUEL SELECTOR VALVE FILTER AND DRAIN
15. ELECTRIC FUEL PUMP OVERBOARD DRAIN OUTLET
16. MAIN GEAR OLEO SHOCK STRUT FILLER (ACCESS THRU PLUG IN UPPER WING SKIN)
17. MAIN TIRE
18. CENTRAL AIR FILTER
19. BATTERY
20. A/C EVAPORATOR AIR FILTER (IF INSTALLED)

Service Points
Figure 1

1. Fuel System

A. Fuel Filter

At intervals of 50 hours or 90 days, whichever comes first, clean the fuel screen/filter (i.e. - strainer). The filter in the bowl of the fuel selector valve (refer to Figure 2) is located under the floorboard aft of the main spar and accessed from below the airplane through an access plate.

B. Fuel Tanks

(1) Filling

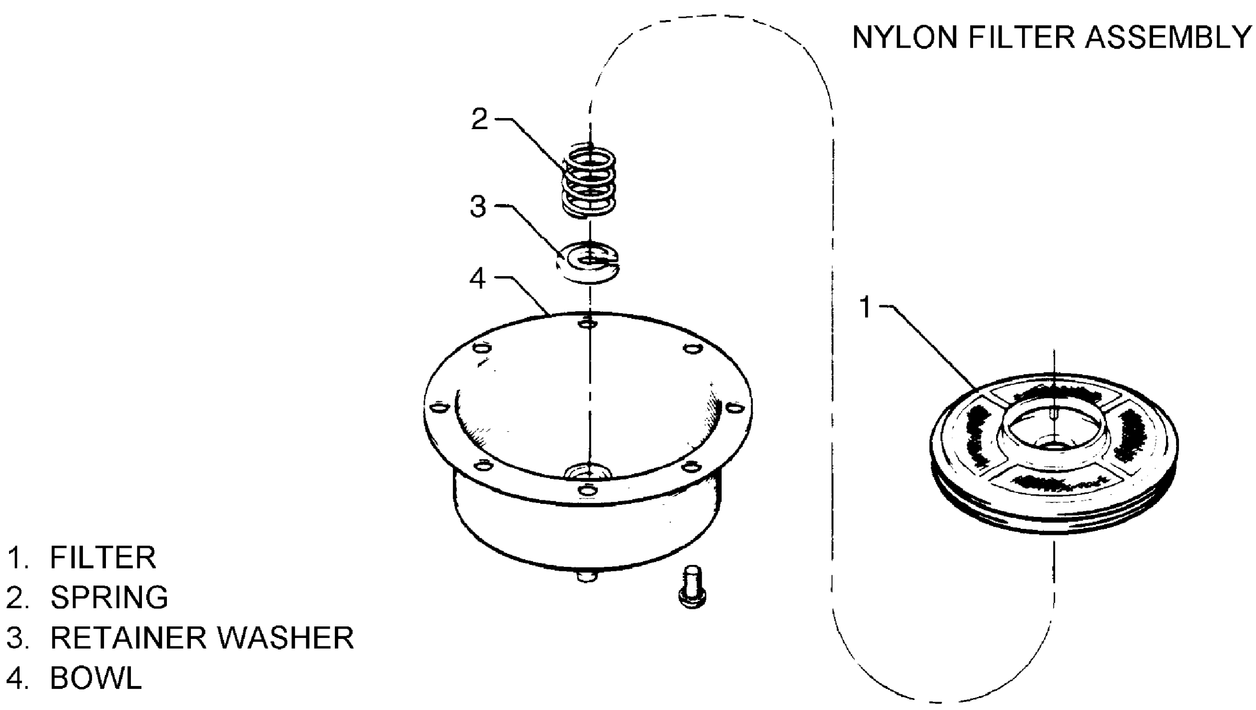
The fuel tanks of each wing are filled through filler necks located on the forward slope of the wings. Each wing tank holds a capacity of 55.5 U.S. gallons. Observe all required safety precautions for handling gasoline. Fill the tanks with fuel as specified on the placard adjacent to the filler neck.

(2) Draining Moisture

CAUTION: WHEN DRAINING ANY AMOUNT OF FUEL, INSURE THAT NO FIRE HAZARD EXISTS BEFORE STARTING ENGINE.

The fuel system should be drained daily prior to first flight and after refueling to avoid the accumulation of water sediment. Each aluminum fuel tank is equipped with an individual quick drain located at the lower inboard rear corner of the tank. This allows each wing to be drained individually. The fuel selector valve is provided with a quick drain valve located on the forward face of the spar box. Drain fuel tanks and selector valve per the following:

(a) Drain each wing through its individual quick drain located at the lower inboard rear corner of the aluminum fuel tank, making sure that enough fuel has been drained to insure that all water and sediment is removed.



Fuel Filter Bowl and Screen
Figure 2

CAUTION: AFTER EACH USE OF THE QUICK DRAIN VALVE, CHECK THE FUEL SELECTOR VALVE DRAIN TO ENSURE THAT THE QUICK DRAIN VALVE HAS PROPERLY SEATED AND THAT THERE IS NO LOSS OF FUEL FROM THE DRAIN.

(b) Place a container under the fuel selector valve drain. Depress the quick drain handle and allow a sufficient amount of fuel to drain from the strainer.

NOTE: The fuel selector should be positioned in the following sequence while draining the strainer: "OFF," "LEFT" and "RIGHT." This is done to insure that the fuel in the lines between each tank outlet and the fuel strainer is drained, as well as the fuel in the fuel strainer. When the fuel tanks are full, it will take approximately six seconds to drain all the fuel in one of the lines from a tank to the fuel strainer. If the fuel tanks are less than full, it will take a few seconds longer.

(c) Examine the contents of the container placed under the fuel selector valve drain for water and sediment and dispose of the contents.

(3) Draining Entirely

CAUTION: WHEN DRAINING ANY AMOUNT OF FUEL, INSURE THAT NO FIRE HAZARD EXISTS BEFORE STARTING ENGINE.

Fuel may be drained from the system by opening the valve at the inboard end of each aluminum fuel tank. The flush type drain valve requires the drain cup pin to hold the valve open. The remaining fuel in the system may be drained through the filter bowl. Either wing may be drained by closing the selector valve and then draining as desired.

C. Flushing Tanks and Selector Valve

(1) To flush the fuel tanks and selector valve, disconnect the fuel line at the injector.

(2) Select a fuel tank, turn on the electric fuel pump and flush fuel through the system until it is determined there is no dirt and foreign matter in the fuel valve or tank. During this operation, agitation of the fuel within the tank will help pick up and remove any dirt.

(3) Repeat this procedure for each tank.

(4) When all tanks are flushed, clean all filters.

2. Oil System

CAUTION: DO NOT INTRODUCE ANY TRADE ADDITIVE TO THE BASIC LUBRICANT UNLESS RECOMMENDED BY THE ENGINE MANUFACTURER.

Engine oil level should be checked before each flight. The engine oil and full flow cartridge filter should be changed every 50 hours or four months, whichever occurs first. Refer to the latest revision of Lycoming Service Bulletin 480. Should fuel other than the specified octane rating for the power plant be used, refer to the latest revision Lycoming Service Letter No. L185, for additional information and recommended service procedures. Use a quality brand Aviation Grade Oil of the proper season viscosity. For information on the use of detergent oil, refer to recommendations for Changing Oil and/or the latest revision of Lycoming Service Instruction No. 1014.

A. Oil Sump

(1) Draining

To drain the oil sump, provide a suitable container with a minimum capacity of that required to fill the sump. Remove the engine cowl and open the oil drain located on the underside of the engine by pushing the arms of the drain up and turning counterclockwise. This will hold the drain in the open position. It is recommended the engine be warmed to operating temperature to insure complete draining of the old oil.

(2) Filling

The oil sump should normally be filled with oil to the mark on the engine dipstick. The quantity of oil required for the engine may be found in 6-00-00, Chart 1. The specified grade of oil may be found in 12-20-00, Figure 5; on the inside surface of the engine oil filler access door; or in the appropriate vendor publication. To service the engine with oil, open the quick release oil filler access door on top of the cowl, and remove the oil filler cap with dipstick.

(3) Oil Screen (Suction)

The oil suction screen, located on the bottom aft end of the engine sump is installed horizontally. To remove, cut the safety wire and remove the hex head plug. The screen should be cleaned at each oil change to remove any accumulation of sludge and to examine for metal filings or chips. If metal particles are found in the screen , the engine should be examined for internal damage. To avoid possible damage to the screen,.after cleaning and inspection, place the screen inside the recess in the hex head plug, and insert the screen into the housing When certain that the screen is properly seated, tighten and safety the plug with MS-20995-C41 safety wire.

(4) Recommendations for Changing Oil

NOTE: Lycoming recommends changing the oil and filter each 50 hours of operation or every four months, whichever occurs first - for engines equipped with full flow cartridge filters. Refer to the latest revision of Lycoming Service Instruction No. 1014 and Lycoming Service Bulletins No. 446 and No. 480.

(a) A change to additive oil should be made with a degree of caution in engines that have been operating on straight mineral oil for several hundred hours, since the cleaning action of some additive oils will tend to loosen sludge deposits and cause plugged oil passages. On any engine that has been operating on straight mineral oil, and is known to be in excessive dirty condition, do not switch to an additive or compounded oil until the engine has been overhauled.

(b) When changing from straight mineral oil to compounded oil, the following precautionary steps should be taken:

1 Do not add additive oil to straight mineral oil. Drain the straight mineral oil from the engine and fill with additive oil.

2 Do not operate the engine longer than five hours before the first oil change.

3 Check all oil screens for evidence of sludge or plugging and change oil every ten hours if sludge conditions are evident. Resume normal oil drain periods after sludge conditions improve.

B. Oil Filter

(1) The oil filter should be replaced after each 50 hours of engine operation. This is accomplished by removing the lockwire from the bolt head at the end of the filter housing, loosening the bolt, and removing the filter assembly from the adapter.

(2) Before discarding the throwaway filter, remove the element for inspection by using a Champion cutter tool, CT-470, available from Champion Spark Plug Co., Toledo, Ohio 43601. It will cut open any spin on type oil filter for inspection. Examine the material trapped in the filter for evidence of internal engine damage, such as chips or particles from bearings. In new or newly overhauled engines, some small particles of metallic shavings might be found; these are generally of no consequence and should not be confused with particles produced by impacting, abrasion or pressure. Evidence of internal engine damage found in the oil filter justifies further examination to determine the cause.

(3) After the filter has been replaced, tighten the cartridge to 18 to 20 foot-pounds of torque. Lockwire the bolt through the loops on the side of the housing to the drilled head of the thermostatic valve. Be sure the lockwire is replaced at both the attaching bolt head and the thermostatic oil cooler bypass valve. Use MS-20995-C41 safety wire.

3. Landing Gear

The landing gear consists of tires, brakes and oleo strut assemblies. These should be inspected for scored piston tubes, possible hydraulic fluid leakage and security and condition of all connection points. Check the brake linings for wear and frayed edges, and brake discs for scoring. Replace if necessary. Minor servicing is described in the following paragraphs. For detailed services and overhaul instructions, refer to Chapter 32.

A. Servicing Oleo Struts

CAUTION: DO NOT EXCEED SPECIFIED TUBE EXPOSURES.

Air-oil struts are incorporated in each landing gear oleo to absorb the shock resulting from the impact of the wheels on the runway during landing. To obtain proper oleo action, the nose gear oleo strut must have approximately 3.25 ± .25 inches of piston tube exposed, while the main gear struts require approximately 4.50 ± .5 inches of tube exposure.

WARNING: DO NOT RELEASE AIR BY REMOVING THE STRUT VALVE CORE OR FILLER PLUG. DEPRESS THE VALVE CORE PIN UNTIL STRUT CHAMBER PRESSURE HAS DIMINISHED.

CAUTION: DIRT AND FOREIGN PARTICLES ACCUMULATE AROUND THE FILLER PLUGS OF THE LANDING GEAR STRUTS. THEREFORE, BEFORE ATTEMPTING TO REMOVE THESE PLUGS, THE TOPS OF THE STRUTS SHOULD BE CLEANED WITH COMPRESSED AIR AND/OR WITH A DRY SOLVENT.

These measurements are taken with the airplane setting on a level surface under normal static load (empty weight of airplane plus full fuel and oil). If the strut has less tube exposed than that prescribed, determine whether it needs air or oil by raising the airplane on jacks. With the strut extended, remove the cap from the air valve at the top of the housing and depress the valve core to allow air to escape from the strut piston until it is fully compressed. Allow the foam from the air-oil mixture to settle and then determine if oil is visible up to the bottom of the filler plug hole. If the oil is visible at the bottom of the hole, then all that is required is the valve be checked for unsatisfactory conditions and air added as described in Inflating Oleo Struts, below. Should fluid be at any level below the bottom of the filler plug hole, the oleo should be checked for leaks, etc, and oil added as described in Filling Nose Gear Oleo Strut, below; or, Filling Main Gear Oleo Strut, below, respectively. For repair procedures of the landing gear and/or oleo struts, refer to Chapter 32.

B. Filling Nose Gear Oleo Strut

To fill the nose gear oleo strut with hydraulic fluid (MIL-H-5606), whether it be only the addition of a small amount or if the unit has been completely emptied and will required a large amount, it should be filled as follows:

(1) Raise the airplane on jacks until the nose wheel is completely clear of the ground. (Refer to 7-10-00.)

(2) Place a pan under the gear to catch spillage.

(3) If not previously accomplished, remove the engine cowl and relieve air from the strut housing chamber by removing the cap from the air valve and depressing the valve core.

(4) There are two methods by which the strut chamber may be filled as follows:

(a) Method 1:

1 Remove valve core from filler plug at the top of strut housing. Do not remove plug.

2 Attach one end of a clear plastic hose to the valve stem of the filler plug and submerge the other end in a container of hydraulic fluid. Ascertain that the end of the hose on the valve stem is tight and the fluid container is approximately equal in height to the top of the strut housing.

3 Fully compress and extend strut to draw fluid from the fluid container and expel air from strut chamber. By watching the fluid pass through the plastic hose, determine when the strut is full and no air is present in the chamber.

4 When air bubbles cease to flow through hose, compress strut fully and remove hose from the valve stem.

5 With strut compressed, remove filler plug to determine that the fluid level is visible up to the bottom of filler plug hole.

6 Install core in filler plug. Apply an appropriate thread lubricant to threads of filler plug and install plug in top of strut housing. Torque plug to 45 foot-pounds.

(b) Method II:

1 Remove filler plug from top of strut housing.

2 Raise strut piston until fully compressed.

3 Pour fluid from a clean container through filler opening until it reaches bottom of filler plug hole.

4 Install filler plug finger tight. Extend and compress the strut two or three times to remove any air that may be trapped in housing.

5 Remove filler plug. Raise strut to full compression and fill with fluid if needed.

6 Apply an appropriate thread lubricant threads of filler plug and install filler plug in the top of strut housing. Torque plug to 45 foot-pounds.

(5) With airplane raised, compress and extend the gear strut several times. Ensure strut actuates freely. The weight of the gear fork and wheel should extend strut.

(6) Clean off overflow of fluid, and inflate strut as described in Inflating Oleo Struts, below.

(7) Check that fluid is not leaking from around strut piston at bottom of housing.

C. Filling Main Gear Oleo Strut

Fill partly full or completely emptied main gear oleo strut with MIL-H-5606 fluid as follows:

(1) Raise the airplane on jacks until the main wheel is off the ground.

(2) Place a pan under the gear to catch spillage.

(3) If not previously accomplished, remove a cap on top wing to gain access to top of strut housing. Release air from strut housing chamber by removing cap from air valve and depressing valve core.

(4) Fill the main gear housing by one or two methods which are as follows:

(a) Method I:

1 Remove valve core from filler plug at top of strut housing. Do not remove plug.

2 Attach one end of a clear plastic hose to valve stem of filler plug and submerge the other end in a container of hydraulic fluid.

3 Fully compress and extend strut to draw fluid into the strut. By watching fluid pass through plastic hose, determine when the strut is full and no air is present.

4 When air bubbles cease to flow through hose, compress strut fully and remove hose from valve stem.

5 With strut fully compressed, remove filler plug to determine that fluid level is visible up to bottom of filler plug hole.

6 Install core in filler plug. Apply an appropriate thread lubricant to threads of filler plug and install plug in the top of strut housing. Torque plug to 45 foot-pounds.

(b) Method II:

1 Remove the filler plug from the top of the strut housing.

2 Raise the strut to full compression.

3 Pour fluid from a clean container through the filler opening until it is visible at the top of the strut chamber.

4 Lower the gear until the wheel touches the ground and then fully compress and extend the strut three or four times to remove any air from the housing.

5 Raise the strut to full compression and if needed, fill with fluid to the bottom of the filler plug.

6 Apply thread lubricant (Parker 6PB) to the threads of the filler plug. Reinstall the filler plug and torque to 45 foot-pounds.

(5) With airplane raised, retract and extend gear strut several times to ascertain that the strut actuates freely. The weight of gear fork and wheel should extend strut.

(6) Clean off overflow of fluid and inflate strut as described in Inflating Oleo Struts.

(7) Check that fluid is not leaking around the strut piston at the bottom of the housing.

D. Inflating Oleo Struts

Make certain that oleo strut has sufficient fluid and that torque link is properly connected. Attach a strut pump to air valve and inflate oleo strut to proper visible piston extension, or a pressure of 250 ± 25 psi (for the main gear struts) and 225 ± 22.5 psi for the nose gear strut.

When using pressure method pistons must be fully extended by raising aircraft off ground. (Refer to 7-10-00.)

When using the extension method, the aircraft should be fully serviced with fuel and engine oil and resting on its landing gear. Inflate strut until correct inches of piston is exposed. Rock aircraft several times to ascertain that gear settles back to the correct strut position. If a strut pump is not available, raise aircraft and use line pressure from a high pressure air system. Lower aircraft and, while rocking it, bring strut down to proper extension by releasing air from valve.

Check for valve core leakage before capping valve.

4. Brake System

The brake system incorporates a hydraulic fluid reservoir through which the brake system is periodically serviced. Fluid is drawn from the reservoir by the brake cylinders to maintain the volume of fluid required for maximum braking efficiency. Spongy brake pedal action is often an indication that the brake fluid reservoir is running low on fluid. Instructions for filling the reservoir are given in Filling Brake Cylinder Reservoir. When found necessary to accomplish repairs to any of the brake system components, or to bleed the system, these instructions may be found in 32-40-00.

A. Filling Brake Cylinder Reservior

The brake cylinder reservoir is located on the left side of the firewall in the engine compartment. It should be checked at every 50 hour inspection and replenished as necessary. Fill with MIL-H-5606 fluid to level marked on reservoiR. No brake adjustment is necessary, though they should be checked periodically per instructions given in 32-40-00.

B. Draining Brake System

(1) Connect a hose to bleeder fitting on the bottom of the cylinder.
(2) Place other end of hose in a suitable container.
(3) Open bleeder fitting and slowly pump hand brake lever and appropriate brake pedal until fluid ceases to flow.
(4) Clean brake system by flushing with denatured alcohol.

5. Tires

The airplane may be equipped with either tubed or tubeless tires.

Tubeless tires are designed to permit any air or nitrogen that is trapped in the cords or that diffuses through the liner to escape through special sidewall vents. This venting prevents pressure build-up within the cord body which might cause tread, sidewall or ply separation. Discounting tire growth after initial inflation, once the tire has been inflated, the maximum permissible pressure drop due to diffusion is 5% in any 24 hour period.

Vent holes penetrate the sidewall rubber to, or into, the cord body and may vary in size, depth and angle. Therefore, the amount of diffusion through these holes will vary.

When water or a soap solution is brushed over the outside of an inflated tubeless tire, bubbles form. Some vents may emit a continuous stream of bubbles. Others may produce intermittent bubbles. And some may not bubble at all. This variety is normal and does not mean that there is anything wrong with the tire. In fact, as long as a tubeless tire is inflated, there will be some diffusion from the vents. When the loss rate exceeds 5% in 24 hours, recheck for possible injuries. Vents should remain open, so check periodically to make sure they have not been covered over or closed by tire paint or spilled solvent. And since vents may be covered during retreading, check for evidence that your retreads have been revented.

A. Several basic characteristics of tubeless aircraft tires may be mistaken for problems:

(1) Tire growth in the first 12 to 24 hours after inflation will result in a seemingly severe pressure drop. Simply inflate, wait for another 24 hours, then check pressure. It will probably be within specs.
(2) Make sure that initial inflation is to recommended operating pressure to ensure full tire growth.
(3) It is normal for tubeless tires to show a small amount of pressure leakage throughout the life of the tires.

B. Maintain tires at pressure specified in 6-00-00, Chart 1. When checking tire pressure, examine tires for wear, cuts, bruises and slippage on the wheel. Check that index mark on tire is aligned with index mark on wheel. Apply Age-Master #1 to tires to protect against ozone attack and weathering as follows:

(1) Clean oil and grease from all tire surfaces.

(2) Apply single heavy coat using brush at 0.4 - 0.5 fluid ounces per square foot. Cover surface completely and evenly; allow to dry for 5 - 10 minutes.

(3) Apply second coat per step 2; allow to dry for 20 - 30 minutes before handling.

(4) Remove agent on wheel assembly with cleaning solvent.

(5) Apply as conditions dictate.

6. Battery

The battery is located in the aft fuselage, aft of the rear baggage compartment. Check battery for proper fluid level. Do not fill battery above the baffle plates. Do not fill the battery with acid - use water only. A hydrometer check will determine the percent of charge in the battery.

Check for spilled electrolyte and corrosion at each 50 hour inspection or every 30 days, whichever comes first. Should corrosion be found on or around the battery, remove the battery and clean it and the surrounding area in accordance with the instructions in Chapter 24.

7. Oxygen System

See 35-10-00.

THIS PAGE INTENTIONALLY BLANK

SCHEDULED SERVICING

Routine cleaning and lubrication of the airplane and its component parts will significantly extend its service life and reduce the frequency of repairs.

1. Induction Air Filter

   Check induction air filter each 50 hour maintenance inspection. Clean or replace if found to be dirty. Replace the filter after one year, ten cleanings or 500 flight hours, whichever comes first.

   A. Removing

      (1) Remove lower engine cowling.

      (2) 6X only: Remove wing nuts securing air filter cover plate located on lower left aft engine section.

      6XT only: Remove screws securing air filter retainer located between the propeller and nose wheel.

      (3) Remove air filter.

   B. Cleaning

      (1) 6X only:

         (a) Tap gently to remove dirt particles. Do not blow out with compressed air.

         (b) Flush excessively dirty filter with running water (less than 40 psi) and soak it in a solution of Donaldson D-1400 compound and water. Do not use solvents or gasoline. Rinse until clear water comes through the filter.

         (c) Dry filter thoroughly before inspection. Mechanical dryers may be used provided the heated air is circulated and maintained below 180 °F. Do not use a light bulb.

         (d) Inspect filter medium for holes or tears and insure frame provides a good air seal. Replace defective filters.

      (2) 6XT only:

         (a) To clean filter, blow out with compressed air from gasket side; or,

         (b) Wash in warm water and mild detergent and dry.

         (c) Do not use oil.

   C. Installation

      After cleaning or replacing the filter, install the filter in the reverse order of removal.

      (1) Position air filter on engine.

      (2) Secure air filter using cover plate with wingnuts (6X) or retainer and screws (6XT).

      (3) Install lower engine cowling.

2. Alternate Air Door

   The alternate door is located in the air induction box to provide a source of air to the engine should there be an air stoppage through the filter system. The following should be checked during inspection:

   A. Check that air door seals are tight and that the hinge is secure.

   B. Check that when the cockpit control is in the closed position the door is properly seated in the closed position.

   C. Actuate the door by operating the control lever in the cockpit to determine that it is not sticking or binding.

   D. Check the cockpit control cable for free travel.

3. Propeller

Inspect spinner, back plate and propeller surfaces for nicks, scratches, corrosion and cracks. Remove minor nicks and scratches per instructions in 61-10-00. Paint face of each blade with a flat paint to retard glare. Wipe surfaces with a light oil or wax to prevent corrosion.

Inspect propellers for grease or oil leakage and freedom of rotation on the hub pilot tube. To check freedom of rotation, rock the blade back and forth through the slight freedom allowed by the pitch change mechanism. Lubricate the propeller at 100 hour intervals in accordance with the Lubrication Chart.

Additional service information for the propeller may be found in Chapter 61.

4. Electrical System

Servicing the electrical system involves adding distilled water to the battery to maintain correct electrolyte level, and checking for any spilled electrolyte that would lead to corrosion. The security of all electrical connections should be checked as well as the operation of all lights, general condition of the generator or alternator and starter. All electrical wires should be inspected for chafing and bare wires. For detailed information on this system, refer to Chapter 24 of this manual.

5. Tire Balance

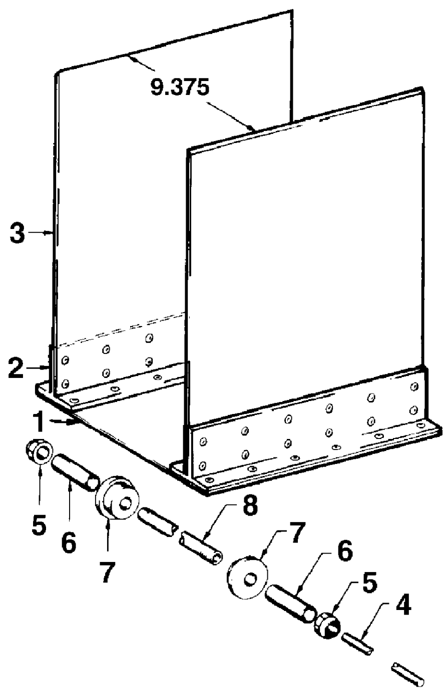
Proper balancing is critical for the life of aircraft tires. If a new tire is balanced upon installation it will usually remain balanced for the life of the tire without having any shimmy or flat spots. An inexpensive balancer can be made that will balance almost any tire for light aircraft. See Figure 1 for balancer details. Balance the tire as follows:

(1) Mount tire and tube (if one is used) on wheel, but do not install the securing bolts. Install wheel bearings in wheel; then, using the -7 bushings, -6 spacers, and -5 nuts, (refer to Figure 1) install the wheel-tire assembly on the pipe. Secure the nuts finger-tight so that the wheel halves touch each other. Be sure the bolt holes are aligned. Insert the axle through the pipe and place the wheel in the center of the balancer. Make sure the axle is only on the chamfered edges of the balancer and that it is at 90° to the sides of the balancer.

(2) Release the tire. If it is out of balance it will rotate, coming to rest with the heaviest point on the bottom. Tape a one-half (1/2) ounce patch across top center of the tire. Rotate the tire 45° and release it again. If the tire returns to the same position, add a one (1) ounce patch and again rotate the tire and release it. Continue this procedure until the tire is balanced.

(3) When balance is attained, put a chalk mark on the sidewall directly below the patch. Use one mark for each half ounce of weight needed. Mark the valve stem location on the tire and the opposite wheel half to assure reassembly in the same position. Remove the wheel from the balance stand, break it down and clean the inside of the tire with toluol. Apply a coat of patch cement to both the patch and the inside center of the tire in line with the chalk marks. When the cement has dried, install the patches making certain they are on the center line of the tire and aligned with the chalk marks on the sidewall. Burnish the patches to remove trapped air, etc.

(4) When reassembling the wheel, powder the inside of the tire. Mount the tire on the valve side of the wheel in the same position it was in when it was balanced. Install the other wheel half, aligning the chalk marks. Install the bolts and tighten to required torque, then air the tire and recheck the balance. The wheel should not be more than one-half (1/2) ounce out of balance.



USE THE FOLLOWING LIST OF MATERIALS TO MAKE THE BALANCER

- 1. 1 EA BASE	12 X 11	0.190 2024 T3 CLAD ALUMINUM ALLOY
- 2. 2 EA TEE	2.5 X 2 X 11	0.190 2024 T4 EXTRUDED ALUMINUM ALLOY
- 3. 2 EA SIDES	14 X 11	0128 2024 T3 CLAD ALUMINUM ALLOY
- 4. 2 EA AXLE	0.125 X 10.25	4130 STEEL, NOMALIZED
- 5. 2 EA NUTS	AN 365-624	
- 6. 2 EA SPACER	0.50 X 2.25	5052-0 ALUMINUM TUBING
2 EA SPACER	0.50 X 1.25	5052-0 ALUMINUM TUBING
- 7. 2 EA BUSHING	1.480 X 1.625 X 1.00	PHENOLIC OR ALUMINUM
2 EA BUSHING	2.240 X 1.37 X 1.00	PHENOLIC OR ALUMINUM
- 8. 1 EA PIPE	1/8 X 9.3	BLACK STEEL PIPE
* 2 EA BEARINGS	SAVE TWO OF EACH SIZE WORN WHEEL BEARINGS FROM PREVIOUS INSPECTIONS.	

Wheel Balancer
Figure 1

6. Lubrication

Proper lubrication procedures are valuable for prolonging the service life of the airplane and as a means of reducing the frequency of extensive and expensive repairs. The periodic application of recommended lubricants to their relevant bearing surfaces, combined with cleanliness, as detailed in the following paragraphs, ensures maximum efficiency and utmost service of all moving parts. Lubrication instruction regarding the locations, time intervals, and type of lubricants used are found in proper lubrication charts.

A. To ensure the best possible results from the application of lubricants, observe the following precautions:

NOTE: If the airplane is inactive for long periods of time, it should be lubricated in accordance with the Lubrication Charts every 90 days.

(1) Use only recommended lubricants. Where general purpose lubricating oil is specified, but unavailable, clean reciprocating engine oil may be used as a satisfactory substitute.

(2) Check components for evidence of excessive wear and replace as necessary.

(3) Remove all excess lubricants from components to prevent collecting dirt and sand in quantities capable of causing excessive wear or damage to bearing surfaces.

B. Application of Grease

When lubricating bearings and bearings surfaces with a grease gun, ensure gun is filled with new, clean grease of the grade specified for the particular application before applying lubricant to grease fittings.

(1) If a reservoir is not provided around a bearing, apply lubricant sparingly and wipe off excess.

(2) Remove wheel bearings from the wheel hub and clean thoroughly with a suitable solvent. When packing with grease, be sure the lubricant enters the space between the rollers in the retainer ring. Do not pack the grease into the wheel hub.

(3) Use extra care when greasing propeller hub to avoid blowing clamp gaskets. Remove one grease fitting and apply grease to the other fitting until fresh grease appears at the hole of the removed fitting. Uneven greasing effects propeller balance.

C. Application of Oil

If specific lubrication instructions for certain components are not available, observe the following precautions:

CAUTION: AFTER THOROUGHLY WASHING AIRPLANE, ENSURE LANDING GEAR, FLIGHT CONTROLS, FLAP TRACKS, ELEVATOR TRIM SCREW, AND ENGINE COMPARTMENT ARE STILL PROPERLY LUBRICATED.

(1) Apply oil sparingly. Never apply more than enough to coat the bearing surfaces.

(2) Do not oil control cables.

CHART 1
THREAD LUBRICANTS

Line	Lubricant
Brakes	MIL-H-5606
	WARNING: DO NOT PERMIT MIL-T-5544 ANTI-SIEZE COMPOUND TO ENTER SYSTEM. APPLY TO FITTING THREADS ONLY.
Air Conditioning Refrigerant	MIL -T-5544, Anti-Seize Compound
Fuel	MIL -T-5544, Anti-Seize, Graphite Patrolatum
Landing Gear Air Valve	6PB Parker
Oil	MIL-G-6032, Lubrication Grease (Gasoline and Oil Resistant)
Pitot and Static	TT-A-580 (JAN-A-669). Anti-Seize Compound (White Lead Base)

CAUTION: LUBRICATE ENGINE FITTINGS ONLY WITH THE FLUID CONTAINED IN THE PARTICULAR LINE.

THIS PAGE INTENTIONALLY BLANK

D. Lubrication Charts

The lubrication charts consist of individual illustrations for the various aircraft systems. Each component to be lubricated is indicated by a number, the type of lubricant and the frequency of application. Special instructions, Cautions, and Notes are listed at the beginning of the lubrication charts, with each applicable component illustration, and are consistent throughout.

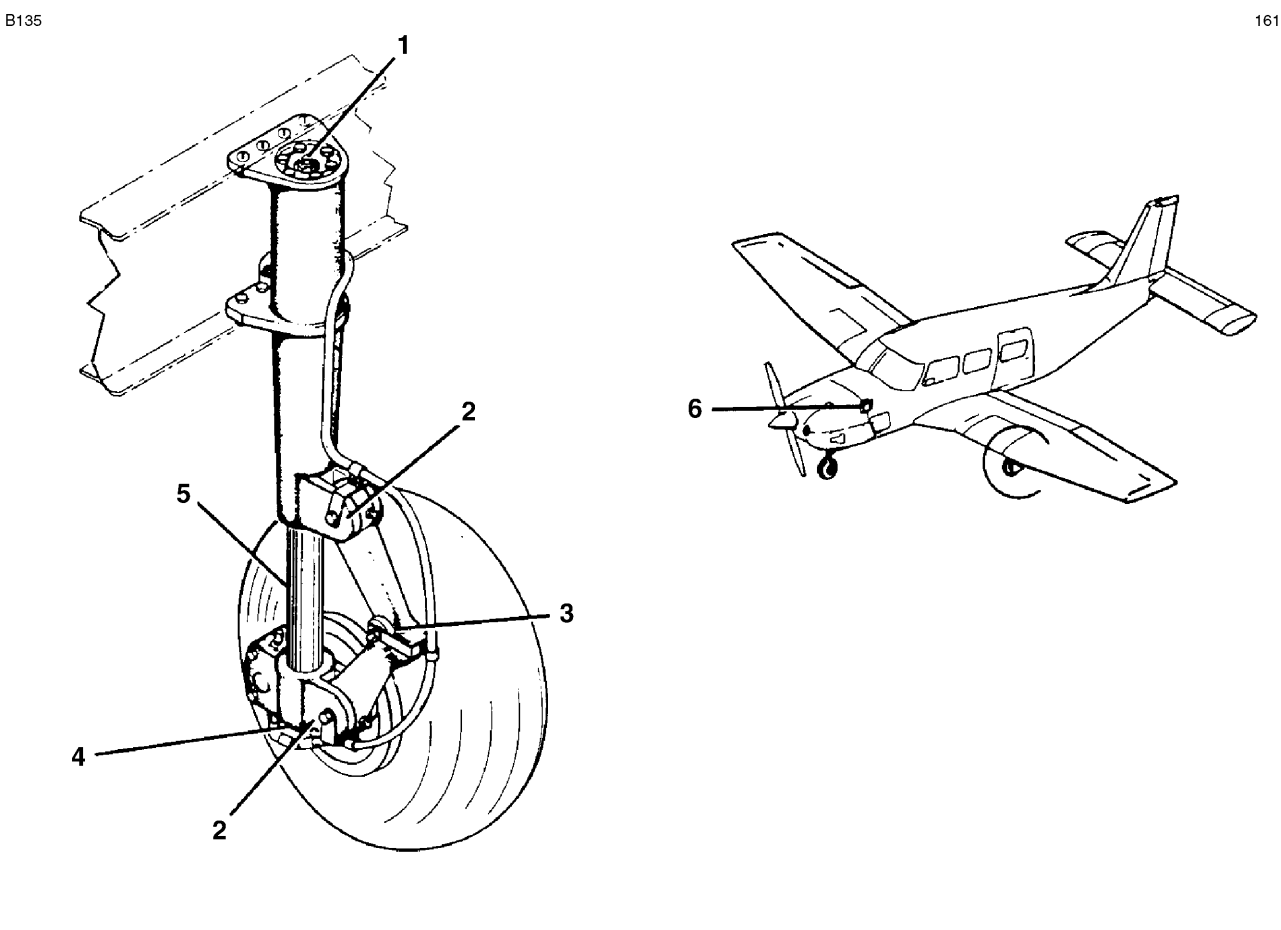
CAUTION: MIL-G-23827 AND MIL-G-81322, CONTAIN CHEMICALS WHICH MAY BE HARMFUL TO PAINTED SURFACES.

CAUTION: DRY LUBRICANT (I.E. - PTFE BASED MS-122DF) WILL ATTACK ANY ACRYLIC BASED PLASTIC (LUCITE), POLYCARBONATES (LEXAN), POLYSTYRENE AND ITS COPOLYMERS (ABS), AND CELLULOSE ACETATE.

Chart 2
SPECIAL INSTRUCTIONS

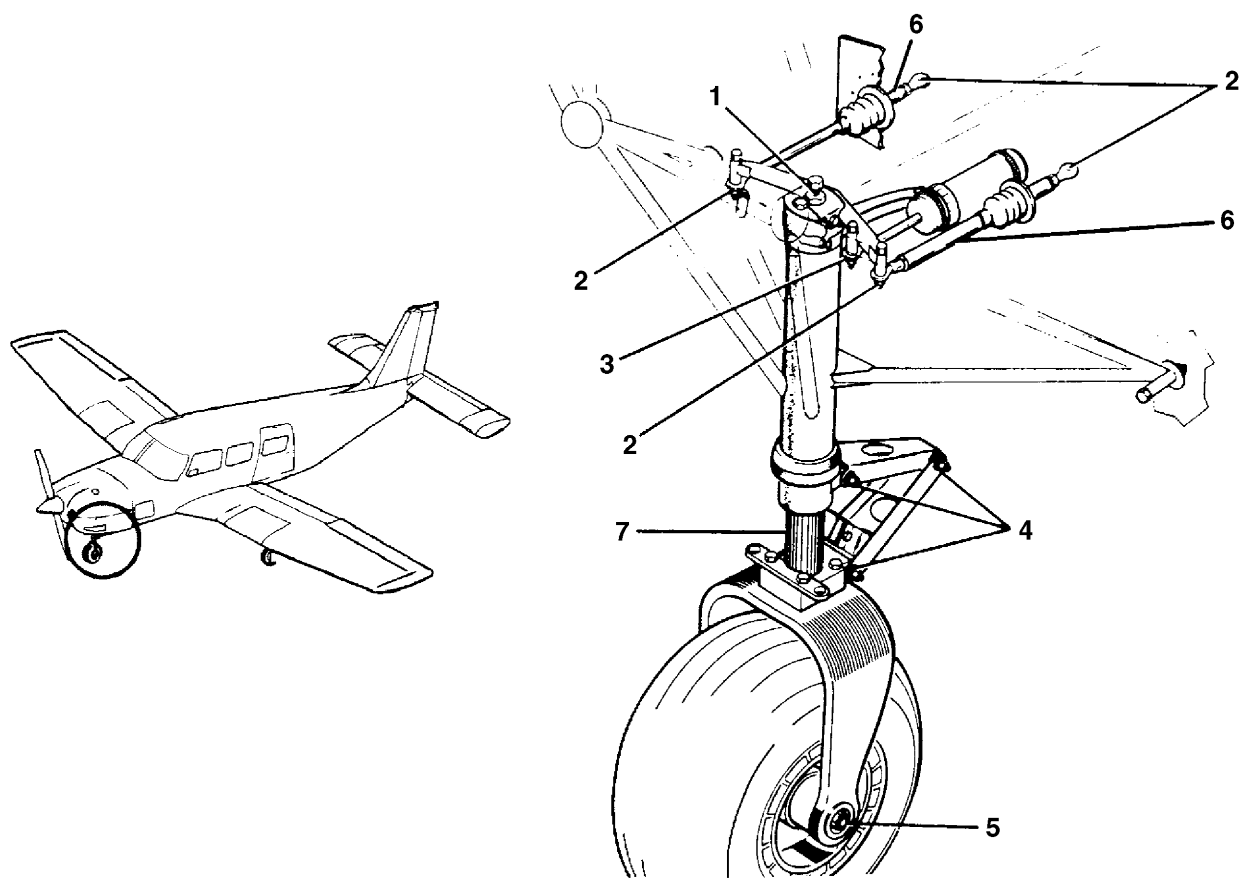
1.	BEARINGS AND BUSHINGS - CLEAN EXTERIOR WITH A DRY TYPE SOLVENT BEFORE LUBRICATING.
2.	LUBRICATING POINTS - WIPE ALL LUBRICATION POINTS CLEAN OF OLD GREASE, OIL, DIRT, ETC., BEFORE LUBRICATING.
3.	REMOVE ALL EXCESS GREASE FROM GREASE FITTINGS.
4.	AIR FILTER (6X ONLY) - TO CLEAN FILTER, TAP GENTLY TO REMOVE DIRT PARTICLES OR WASH IN WARM WATER AND MILD DETERGENT AND DRY. DO NOT BLOW OUT WITH COMPRESSED AIR. DO NOT USE OIL. REPLACE FILTER IF DAMAGED.
4.	AIR FILTER (6XT ONLY) - TO CLEAN FILTER, BLOW OUT WITH COMPRESSED AIR FROM GASKET SIDE OR WASH IN WARM WATER AND MILD DETERGENT AND DRY. DO NOT USE OIL.
5.	WHEEL BEARINGS - DISASSEMBLE AND CLEAN WITH A DRY TYPE SOLVENT. ASCERTAIN THAT GREASE IS PACKED BETWEEN THE ROLLER AND CONE. DO NOT PACK GREASE IN WHEEL HOUSING. WHEEL BEARINGS REQUIRE CLEANING AND REPACKING AFTER EXPOSURE TO AN ABNORMAL QUANTITY OF WATER.
6.	OLEO STRUTS AND BRAKE RESERVOIR - FILL PER INSTRUCTIONS ON UNIT OR CONTAINER, OR REFER TO APPLICABLE CHAPTER IN THIS MANUAL.
7.	DOOR SEALS - APPLY RELEASE AGENT/DRY LUBRICANT TO DOOR SEALS AT LEAST EVERY 30 DAYS TO IMPROVE SEALING AND TO PREVENT THE SEAL FROM STICKING.
8.	OIL AND FILTER - LYCOMING RECOMMENDS CHANGING THE OIL AND FILTER EVERY 50 HOURS OR FOUR MONTHS, WHICHEVER COMES FIRST.
9.	PROPELLER - FOR EACH BLADE: REMOVE A GREASE FITTING; APPLY GREASE THROUGH THE REMAINING FITTING UNTIL FRESH GREASE APPEARS AT HOLE OF REMOVED FITTING. IF ANNUAL USAGE IS SIGNIFCANTLY LESS THAN 100 HOURS, INCREASE LUBRICATION FREQUENCY TO EVERY SIX MONTHS.
10.	FUEL SELECTOR VALVE - LUBRICATE AREA WHERE DETENT BALL MOVES ACROSS COVER PLATE (ON EXTERNAL VALVE ONLY).
11.	DO NOT USE HYDRAULIC FLUID WITH A CASTOR OIL OR ESTER BASE.
12.	DO NOT OVER LUBRICATE COCKPIT CONTROLS.
13.	DO NOT OIL CONTROL CABLES. GREASE CONTROL CABLES WHERE THEY PASS OVER A PULLEY OR THROUGH A FAIRLEAD.
14.	SEE THE LATEST REVISION OF LYCOMING SERVICE INSTRUCTIONS NO. 1014 FOR USE OF DETERGENT OIL.

	COMPONENT	LUBRICANT	FREQUENCY
1.	OLEO STRUT FILLER POINT (See Spec. Instr. 6 & 11)	MIL-L-5606	AS REQUIRED
2.	TORQUE LINK BUSHINGS, UPPER & LOWER (See Spec. Instr. 1)	MIL-G-23827	100 HRS
3.	TORQUE LINK CONNECTOR BUSHING (See Spec. Instr. 1)	MIL-G-23827	100 HRS
4.	MAIN GEAR WHEEL BEARINGS (See Spec. Instr. 5)	TEXACO MARFAX ALL PURPOSE GREASE OR MOBIL GREASE 77 (OR MOBIL EP2 GREASE) MIL-G-3545C	100 HRS
5.	EXPOSED MAIN OLEO STRUT (See Spec. Instr. 2)	RELEASE AGENT/ DRY LUBRICANT MIL-L-60326	100 HRS
6.	BRAKE RESERVOIR (See Spec. Instr. 6 & 11)	MIL-H-5606	AS REQUIRED



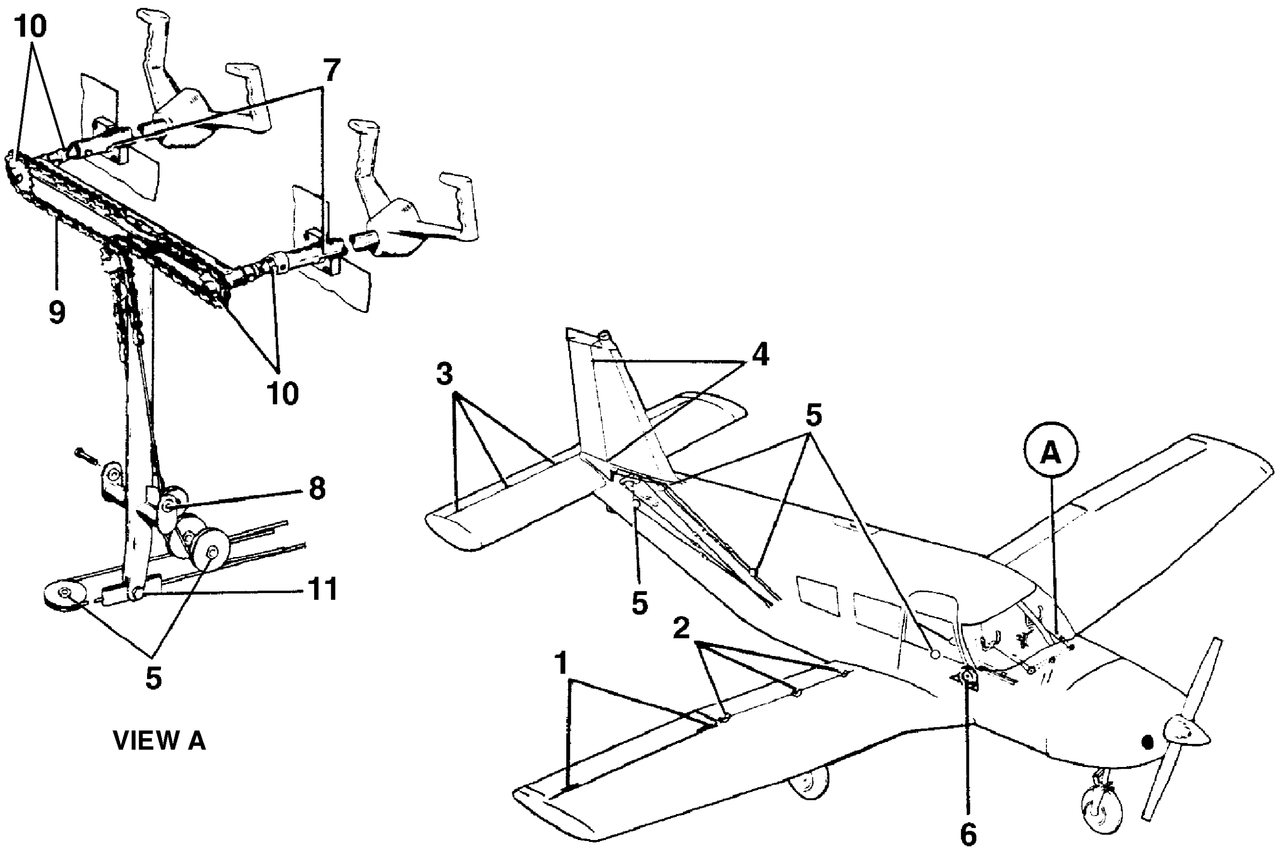
Lubrication Chart - Landing Gear, Main
Figure 2

	COMPONENT	LUBRICANT	FREQUENCY
1.	NOSE GEAR OLEO STRUT FILLER POINT (See Spec. Instr. 6 & 11)	MIL-H-5606	AS REQUIRED
2.	STEERING BELLCRANK PIVOT POINTS AND STEERING ROD ENDS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
3.	SHIMMY DAMPENER PIVOT POINT (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
4.	TORQUE LINK ASSEMBLY (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
5.	NOSE WHEEL BEARINGS (See Spec. Instr. 5)	TEXACO MARFAX ALL PURPOSE GREASE OR MOBIL GREASE 77 (OR MOBIL EP2 GREASE) MIL-G-3545C	100 HRS
6.	STEERING ROD (See Spec. Instr. 2)	PARKER O-RING LUBRICANT	100 HRS
7.	EXPOSED OLEO STRUT (See Spec. Instr. 2)	RELEASE AGENT/ DRY LUBRICANT MIL-L-60326	100 HRS



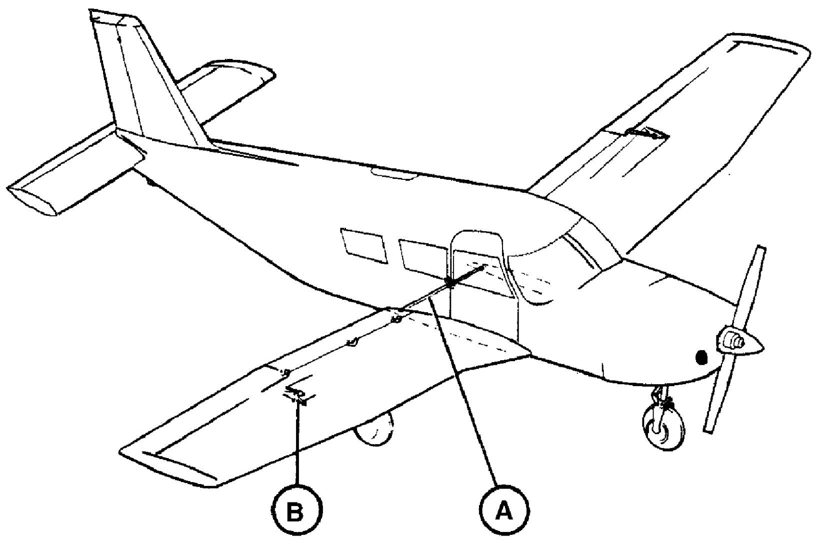
Lubrication Chart - Landing Gear, Nose
Figure 3

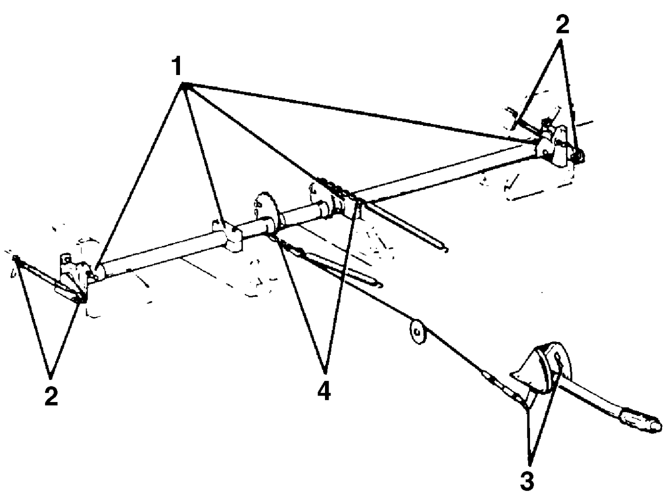
	COMPONENT	LUBRICANT	FREQUENCY
1.	AILERON HINGE bearings (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
2.	FLAP HINGE BEARINGS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
3.	STABILATOR HINGE PINs (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
4.	RUDDER HINGE BEARINGs (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
5.	CONTROL CABLE PULLEYS (See Spec. Instr. 12 & 13)	MIL-PRF-7870C	100 HRS
6.	STABILATOR TRIM CONTROL WHEEL (See Spec. Instr. 1 &12)	MIL-PRF-7870C	100 HRS
7.	O-RING, CONTROL SHAFT BUSHING (See Spec. Instr. 2 & 12)	PARKER O-RING LUBRICANT	AS REQUIRED
8.	TEE BAR PIVOT POINT (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
9.	CONTROL COLUMN CHAIN (See Spec. Instr. 2 & 12)	MIL-PRF-7870C	500 HRS
10.	CONTROL COLUMN FLEX JOINTS AND SPROCKET (See Spec. Instr. 2 & 12)	MIL-PRF-7870C	100 HRS
11.	STABILATOR CONTROL (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
12.	AILERON, STABILATOR, AND RUDDER CONTROL CABLES, AND STABILATOR TRIM CABLES (See Spec. Instr. 2, 12, & 13) (Not Shown)	MIL-G-23827	100 HRS



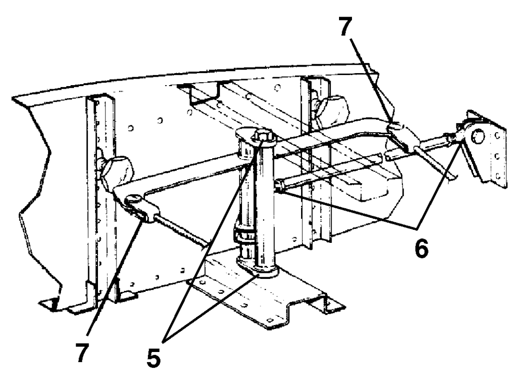
Lubrication Chart - Control System, Part 1
Figure 4

	COMPONENT	LUBRICANT	FREQUENCY
1.	FLAP TORQUE TUBE BEARING BLOCKS (See Spec. Instr. 2)	MIL-PRF-7870C	100 HRS
2.	FLAP CONTROL ROD END BEARINGS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
3.	FLAP HANDLE PIVOT POINT, LOCK MECHANISM, AND TURNBUCKLE END (See Spec. Instr. 1 & 2)	MIL-PRF-7870C	100 HRS
4.	FLAP RETURN AND TENSION CHAINS (See Spec. Instr. 2)	MIL-PRF-7870C	100 HRS
5.	AILERON BELLCRANK PIVOT POINTS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
6.	AILERON CONTROL ROD END BEARINGS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
7.	AILERON BELLCRANK CABLE ENDS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
8.	FLAP CABLE (See Spec. Instr. 2, 12, & 13) (Not Shown)	MIL-G-23827	100 HRS





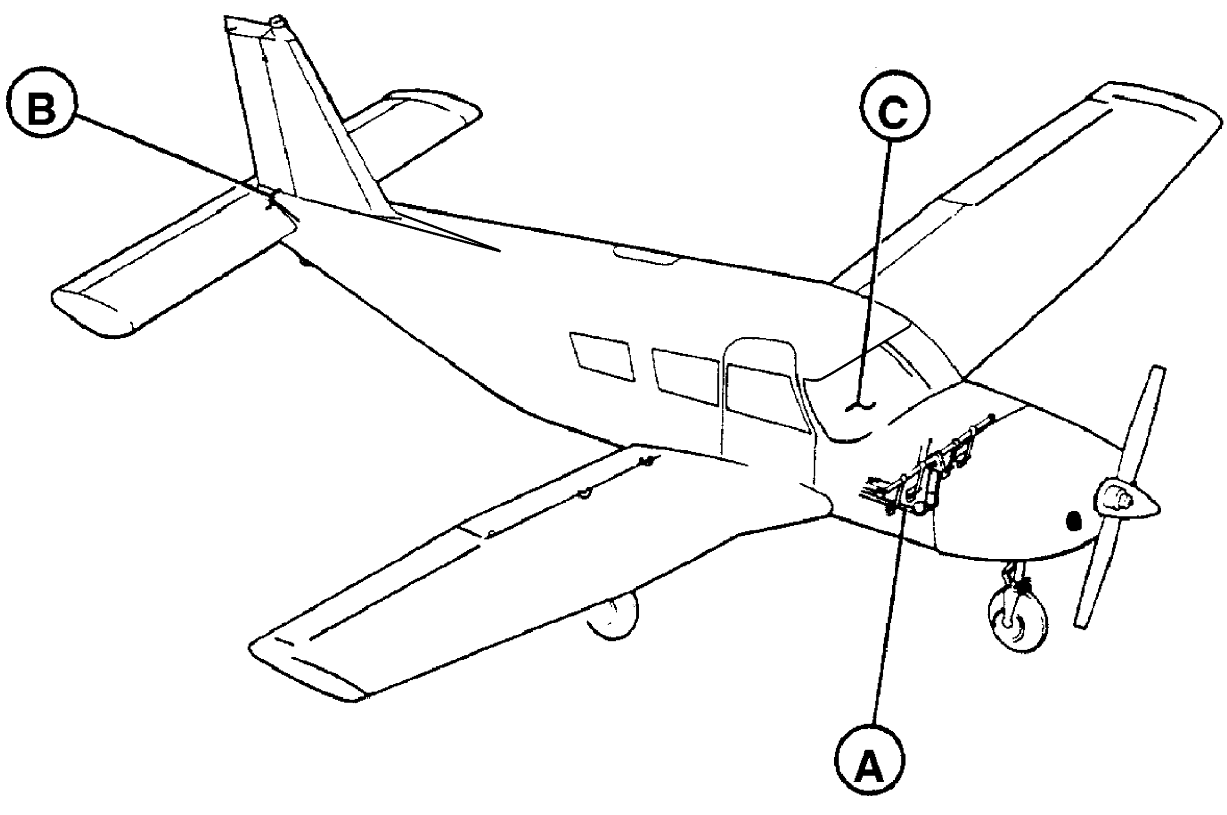
VIEW A



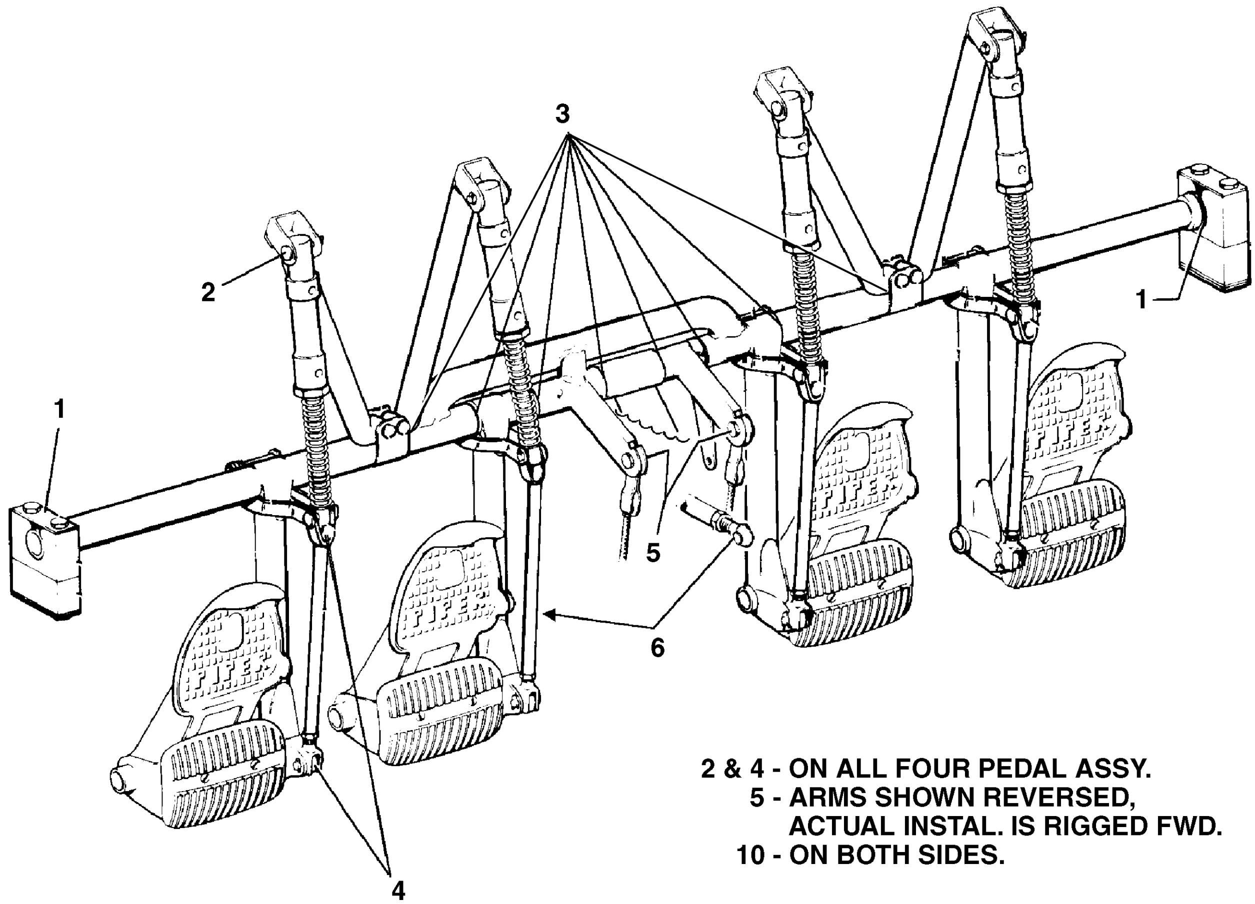
VIEW B

Lubrication Chart - Control System, Part 2
Figure 5

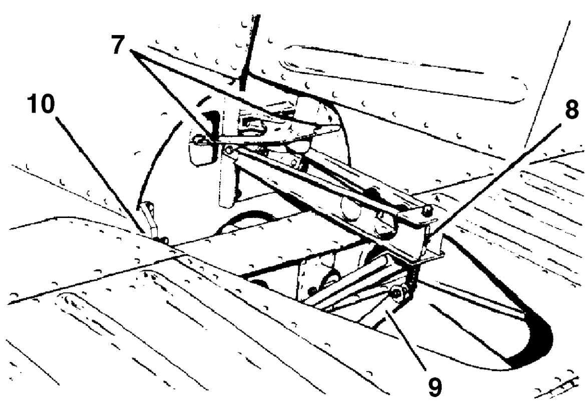
	COMPONENT	LUBRICANT	FREQUENCY
1.	RUDDER TUBE BEARING BLOCKS (See Spec. Instr. 2 & 12)	RELEASE AGENT/ DRY LUBRICANT MIL-L-60326	100 HRS
2.	TOE BRAKE CYLINDER ATTACHMENTS (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
3.	RUDDER TUBE CONNECTIONS (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
4.	BRAKE ROD ENDS (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
5.	RUDDER TUBE CABLE ENDS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
6.	NOSE GEAR STEARING ROD ENDS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
7.	RUDDER ARM CABLE ENDS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
8.	STABILATOR TRIM SCREW (See Spec. Instr. 2)	LUBRIPLATE #907, FISKE BROS. REFINING CO., OR, MIL-G-7711	100 HRS
9.	STABILATOR SCREW/TAB LINKS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
10.	STABILATOR HINGE POINTS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
11.	RUDDER TRIM ASSEMBLY (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS



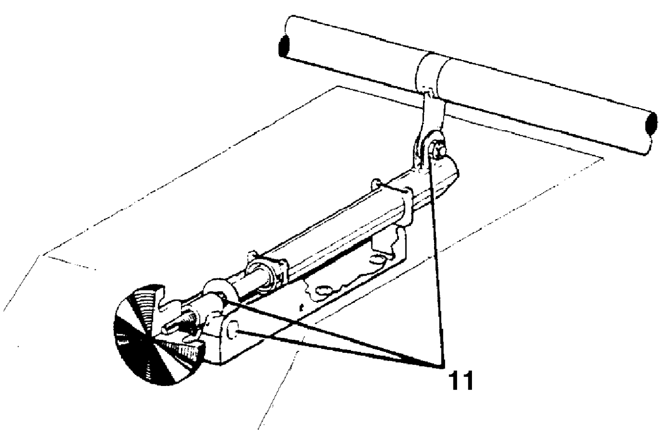
Lubrication Chart - Control System, Part 3
Figure 6 (Sheet 1 of 2)



VIEW A



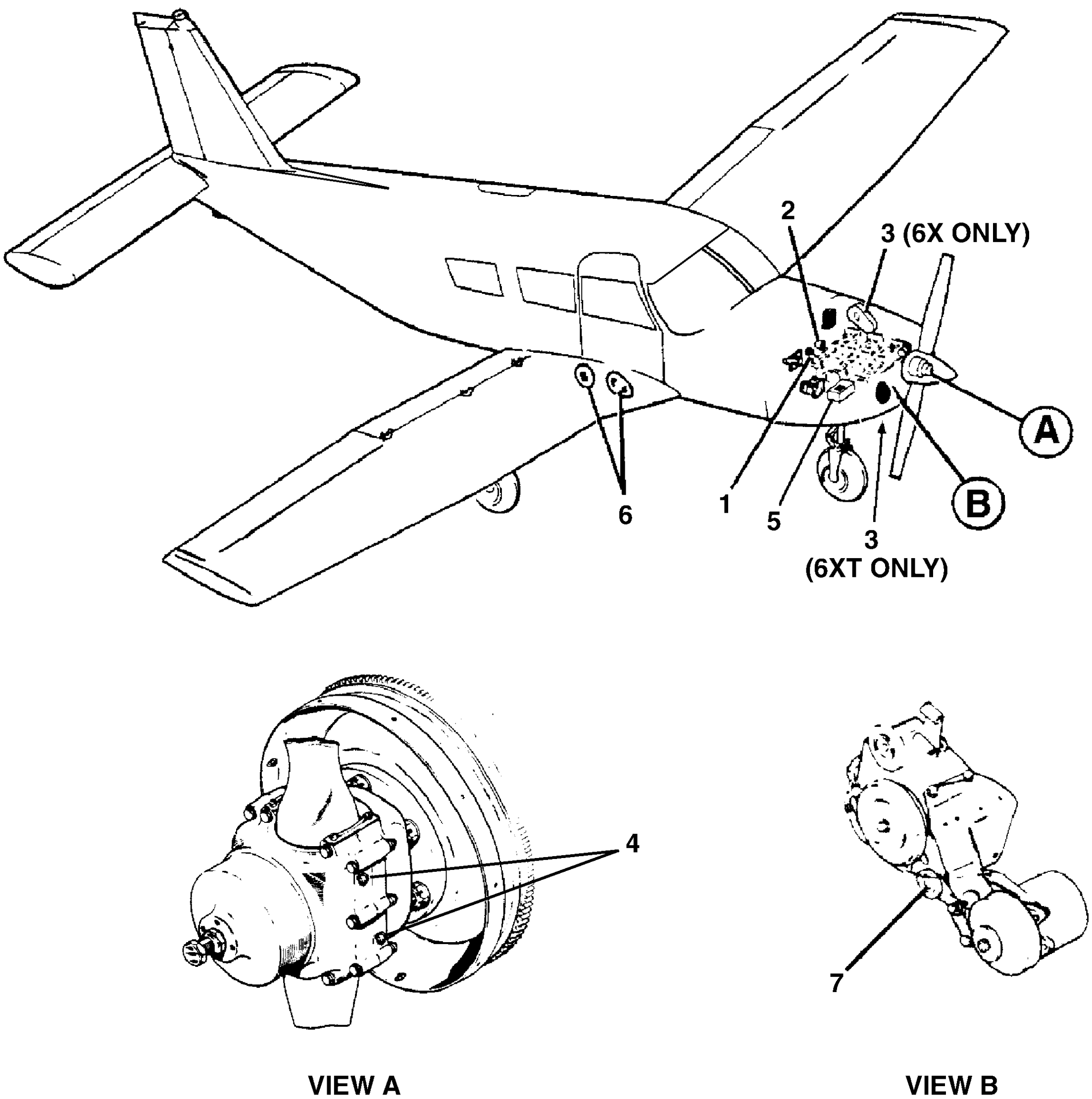
VIEW B



VIEW C

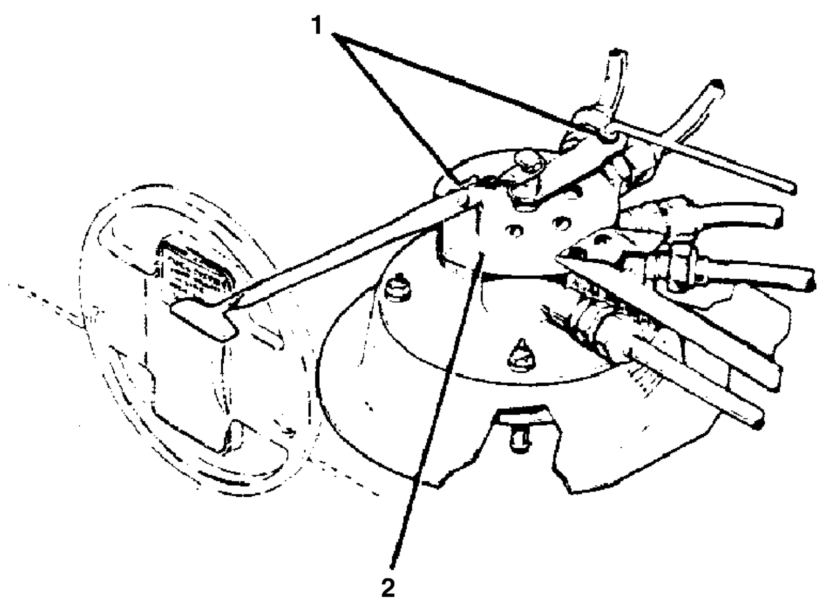
Lubrication Chart - Control System, Part 3
Figure 6 (Sheet 2 of 2)

	COMPONENT			LUBRICANT	FREQUENCY
1.	ENGINE SUMP	AIR TEMPERATURE	MIL-L-6082	MIL-L-22851	50 HRS
	LUBRICATING OIL,			(ASHLESS DISPERSANT)	
	AIRCRAFT RECIPROCATING	ALL		SAE 15W50 OR 20W50	
	ENGINE (PISTON)	ABOVE 80°F (26.67°C)	SAE 60	SAE 60	
		ABOVE 60°F (15.55°C)	SAE 50	SAE 40 OR SAE 50	
		30° TO 90°F (-1.11° TO 32.22°C)	SAE 40	SAE 40	
	(See Spec. Instr. 8 & 14)	0° TO 70°F (-17.77° TO 21.11°C)	SAE 30	SAE 40, 30, 20W40	
		BELOW 10°F (-12.22°C)	SAE 20	SAE 30, 20W30	
2.	CARTRIDGE TYPE OIL FILTERS (See Spec. Instr. 8 & 14)				50 HRS
3.	AIR FILTER (See Spec. Instr. 4)				50 HRS
4.	PROPELLER ASSEMBLY (See Spec. Instr. 3 & 9)			MIL-G-23827	100 HRS
5.	ENGINE CONTROL AND ENVIRONMENTAL CONTROL PIVOT POINTS (See Spec. Instr. 1 & 12)			MIL-PRF-7870C	100 HRS
6.	FRESH AIR VENT SHAFTS (See Spec. Instr. 2)			MIL-G-7711	500 HRS
7.	ALTERNATOR IDLER PULLEY BEARING (See Spec. Instr. 2 & 3)			MIL-G-81322	100 HRS



Lubrication Chart - Power Plant and Propeller
Figure 7

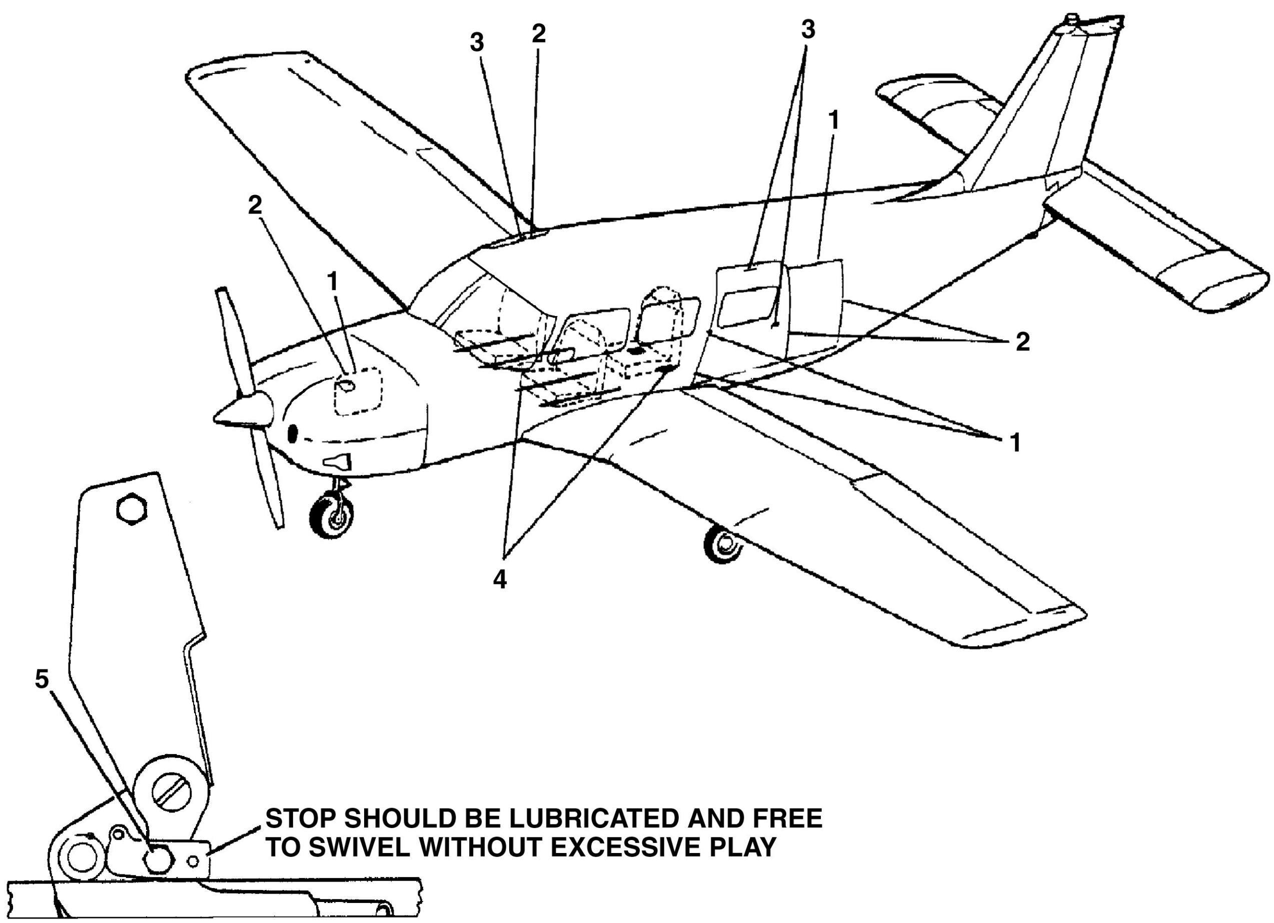
	COMPONENT	LUBRICANT	FREQUENCY
1.	FUEL SELECTOR LINKAGE (See Spec. Instr. 1 & 12)	MIL-PRF-7870C	100 HRS
2.	FUEL SELECTOR VALVE COVER PLATE (See Spec. Instr. 10)	RELEASE AGENT/ DRY LUBRICANT MIL-L-60326	100 HRS



TYPICAL INSTALLATION SHOWN

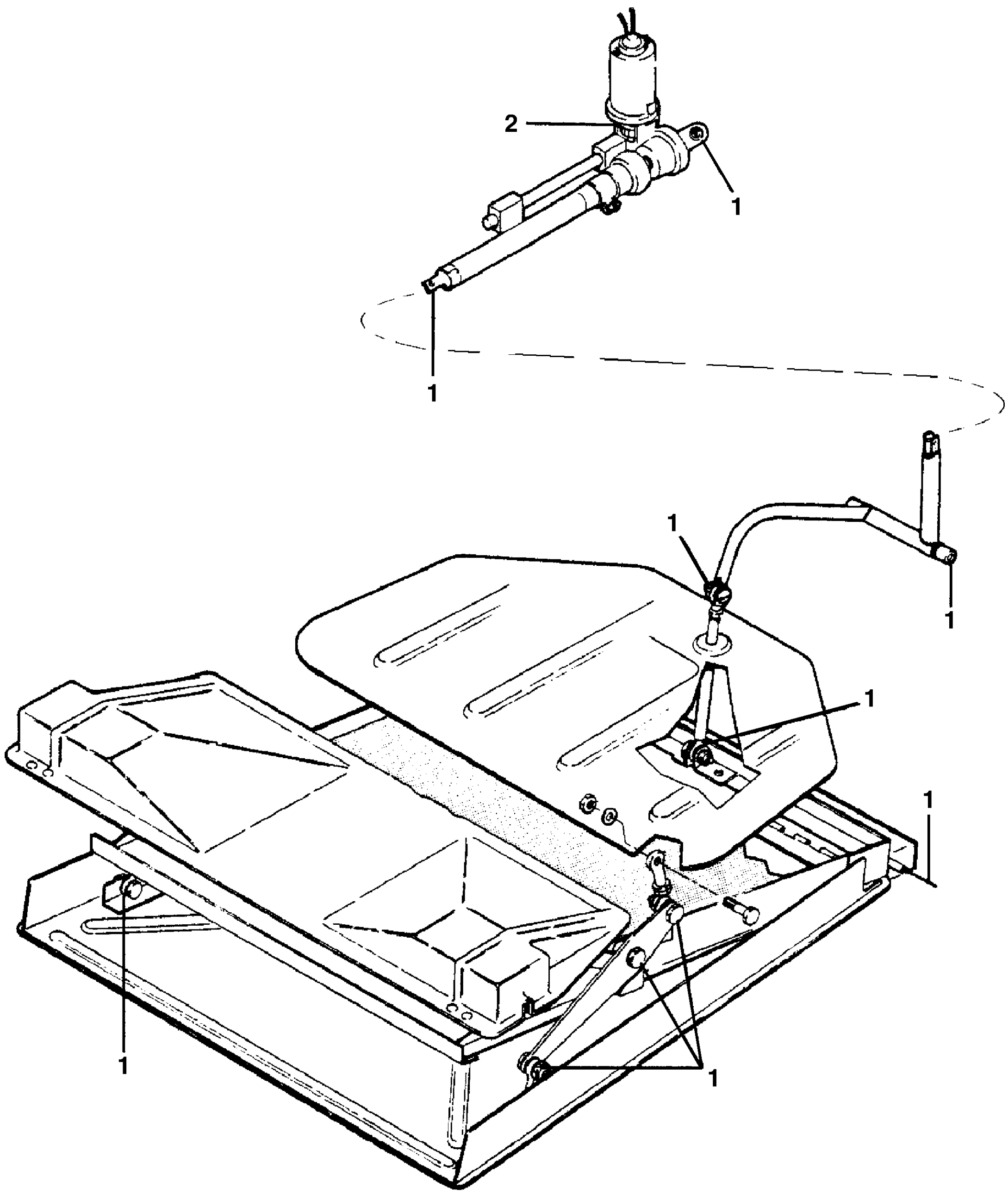
Lubrication Chart - Fuel Selector
Figure 8

	COMPONENT	LUBRICANT	FREQUENCY
1.	DOOR HINGES (See Spec. Instr. 2)	MIL-PRF-7870C	100 HRS
2.	DOOR SEALS (See Spec. Instr. 7)	RELEASE AGENT/ DRY LUBRICANT MIL-L-60326	50 HRS
3.	DOOR LATCH MECHANISMS (See Spec. Instr. 2)	MIL-PRF-7870C	500 HRS
4.	SEAT TRACK ROLLERS, STOP PINS AND REAR SEAT LEG RETAINER (CLIP AND CAM) (See Spec. Instr. 2)	LUBRIPLATE #907 FISKE BROS. REFINING CO., OR, MIL-G-7711	100 HRS
5.	SEAT LATCH STOP PIVOT POINT (COPILOT) (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS



Lubrication Chart - Doors and Seats
Figure 9

	COMPONENT	LUBRICANT	FREQUENCY
1.	CONDENSER HINGE AND ACTUATORS (See Spec. Instr. 1)	MIL-PRF-7870C	100 HRS
2.	CONDENSER DOOR ACTUATING TRANSMISSION (See Spec. Instr. 2)	MIL-G-23827	500 HRS



Lubrication Chart - Air Conditioning Condenser (if installed)
Figure 10

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

20

STANDARD PRACTICES - AIRFRAME

THIS PAGE INTENTIONALLY BLANK

CHAPTER 20

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
20-List of	1	Feb 19/04			
Effective Pages	2	Jun 1/03			
20-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
20-00-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Feb 19/04			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 20 - STANDARD PRACTICES - AIRFRAME

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

1. Description

This chapter contains general information pertaining to standard aircraft hardware installation and removal practices.

The information included will be very helpful if it is referred to on a regular basis.

If non-destructive testing is needed after repair of 4130 steel, use the magnaflux method.

Testing and inspecting of aluminum castings and machined aluminum parts may be done by the dye penetrant method.

Usually, a good visual inspection with a 10X magnifying glass will show any damage or defect in a repair that is of a significant nature.

2. Torque Wrenches

Torque wrenches should be checked daily and calibrated by means of weights and a measured lever arm to make sure that inaccuracies are not present. Checking one torque wrench against another is not sufficient and is not recommended. Some wrenches are quite sensitive as to the way they are supported during a tightening operation. Any instructions furnished by the manufacturer must be followed explicitly.

When it is necessary to use a special extension or adapter wrench together with a torque wrench, a simple mathematical equation must be worked out to arrive at the correct torque reading. Following is the formula to be used: (Refer to Figure 1.)

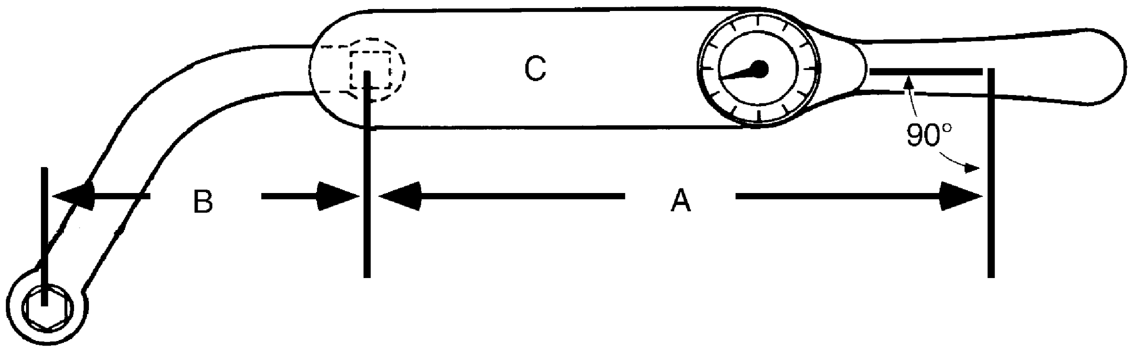
T = Torque desired at the part.
A = Basic lever length from center of wrench shank to center of handle or stamped on wrench or listed for that model wrench.
B = Length of adapter extension, center of bolt to center of shank.
C = Scale reading needed to obtain desired torque (T).

The formula: $$C = \frac{A \times T}{A + B}$$

EXAMPLE: A bolt requires 30 foot pounds and a 3 inch adapter (one-quarter of a foot or 0.25’) is needed to get at it. You want to know what scale reading it will take on a one-foot lever arm wrench to obtain the 30 foot pounds at the bolt.

$$C = \frac{1 \times 30}{1 + 0.25} \quad \text{or} \quad C = \frac{30}{1.25}$$

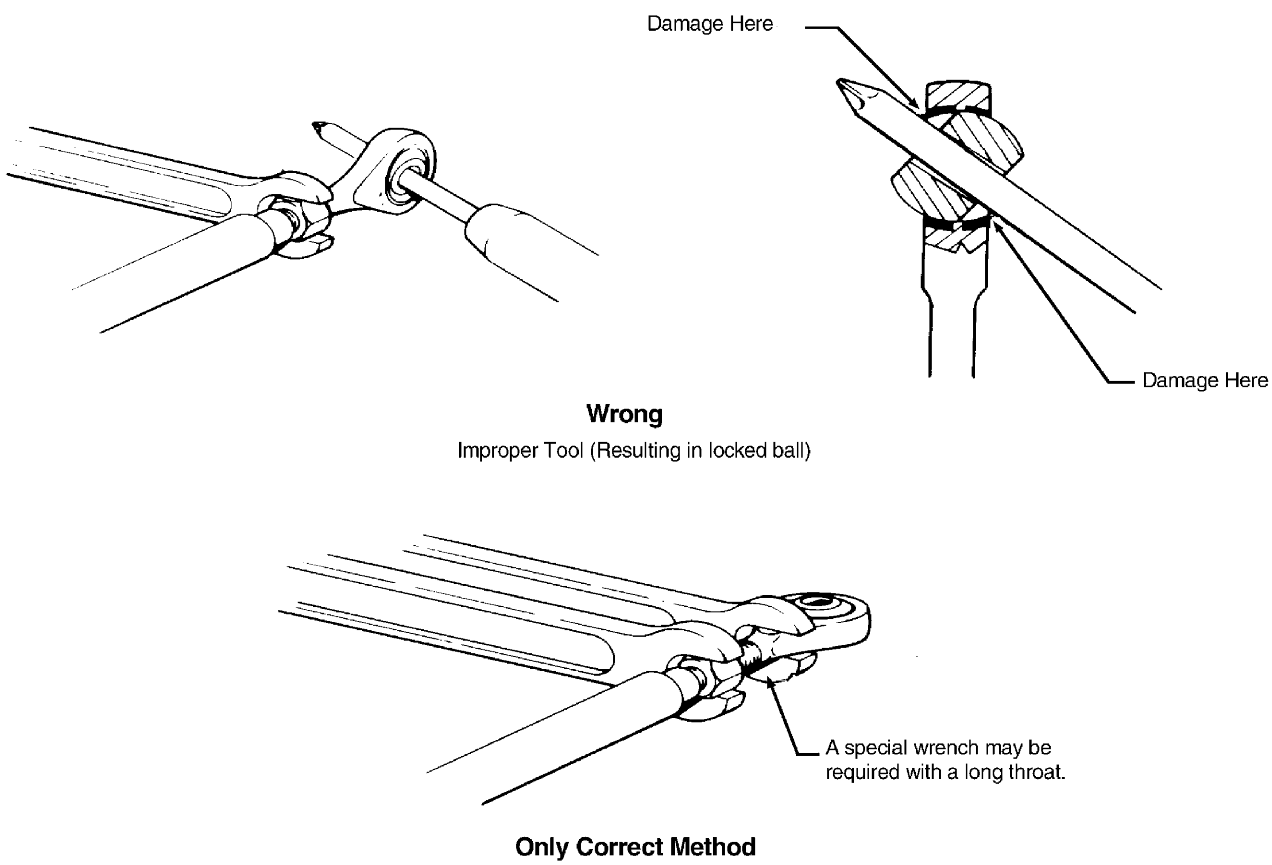
Remember, the 3 inch adapter must be projecting 3 inches straight along the wrench axis. In general, avoid all complex assemblages or adapters and extensions of flex joints.



Torque Wrench Formula
Figure 1

3. Installing Rod End Bearings

Install rod end bearings as shown in Figure 2.



Installing Rod End Bearings
Figure 2

4. Removing Cherrylock Rivets

Use following procedure to remove cherrylock rivets:

A. To remove from thick material, use a tapered steel drift pin to drive out rivet stem. (See Figure 3, View 1.)

CAUTION: DRIVING OUT THE LOCKED STEM OF RIVETS INSTALLED IN THIN MATERIAL MAY DAMAGE THE MATERIAL.

NOTE: Drilling completely through the rivet sleeve, when removing rivets, tends to enlarge hole.

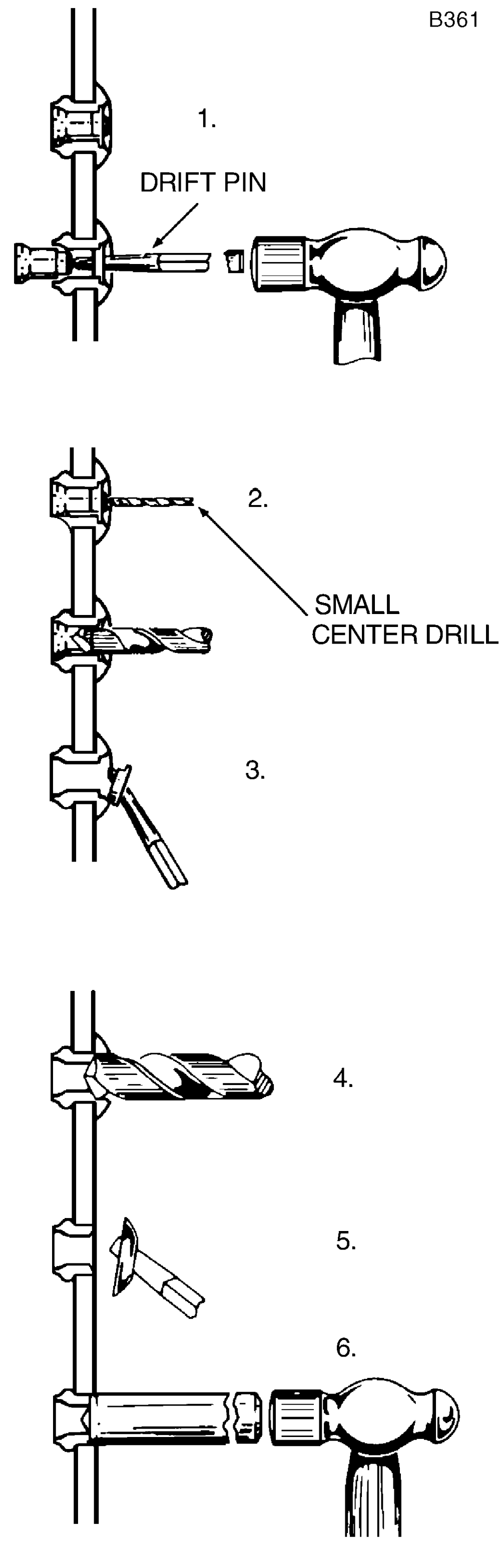
B. To remove from thin material, drill away tapered portion of stem to destroy the lock. Use a small center drill bit on top of the rivet stem to provide a guide for a larger bit. (See Figure 3, Views 2 and 3.)

C. Pry remainder of locking collar out of rivet head with a drift pin. (See Figure 3, View 3.)

D. Drill almost, but not completely, through head of rivet. Use a drill bit the same size as the rivet shank. (See Figure 3, View 4.)

E. Use a drift pin as a lever to break off rivet head. (See Figure 3, View 5.)

F. Drive out remaining rivet shank with a pin having same diameter as rivet shank. (See Figure 3, View 6.)



Removing Cherrylock Rivets
Figure 3

5. Identification of Fluid Lines (Refer to Figure 4.)

Aircraft fluid lines are identified by color code markers, words and geometric symbols. The markers identify each line`s function, content, primary hazard, and the direction of fluid flow.

Most fluid lines are marked with 1 inch tape or decals. Paint is used on lines in the engine induction system.

Certain lines may also be identified as to the specific function within a system. For example: DRAIN, VENT, PRESSURE or RETURN.

Lines conveying fuel may be marked FLAM. Lines containing toxic materials are marked TOXIC. Line containing physically dangerous materials, such as oxygen, nitrogen, or freon, are marked PHDAN.

The aircraft and engine manufacturer is responsible for the original installation of identification markers, Aircraft maintenance personnel are responsible for their replacement when it becomes necessary.

Tapes, paint, tags and decals are placed on both ends of a line and at least once in each compartment through which the line runs. Identification markers are also placed immediately adjacent to each valve, regulator, filter or other accessory within a line.

6. Flareless Tube Assemblies

The use of flareless tube fittings eliminates all tube flaring. An operation, referred to as presetting, is necessary prior to installing a new flareless tube assembly. Presetting is performed as follows:

A. Cut tube to correct length. Ensure ends are perfectly square. Deburr inside and outside of tube. Slip nut, then sleeve, over the tube. (Refer to Figure 5, Step 1.)

B. Lubricate fitting and nut threads as specified in table contained in Figure 5.

C. Place fitting in a vise (refer to Figure 5, Step 2). Hold tubing firmly and squarely on seat in fitting. (Tube must bottom firmly in the fitting.) Tighten nut until cutting edge of sleeve grips tube. This point is determined by slowly turning tube back and forth while tightening nut. When tube no longer turns, nut is ready for final tightening.

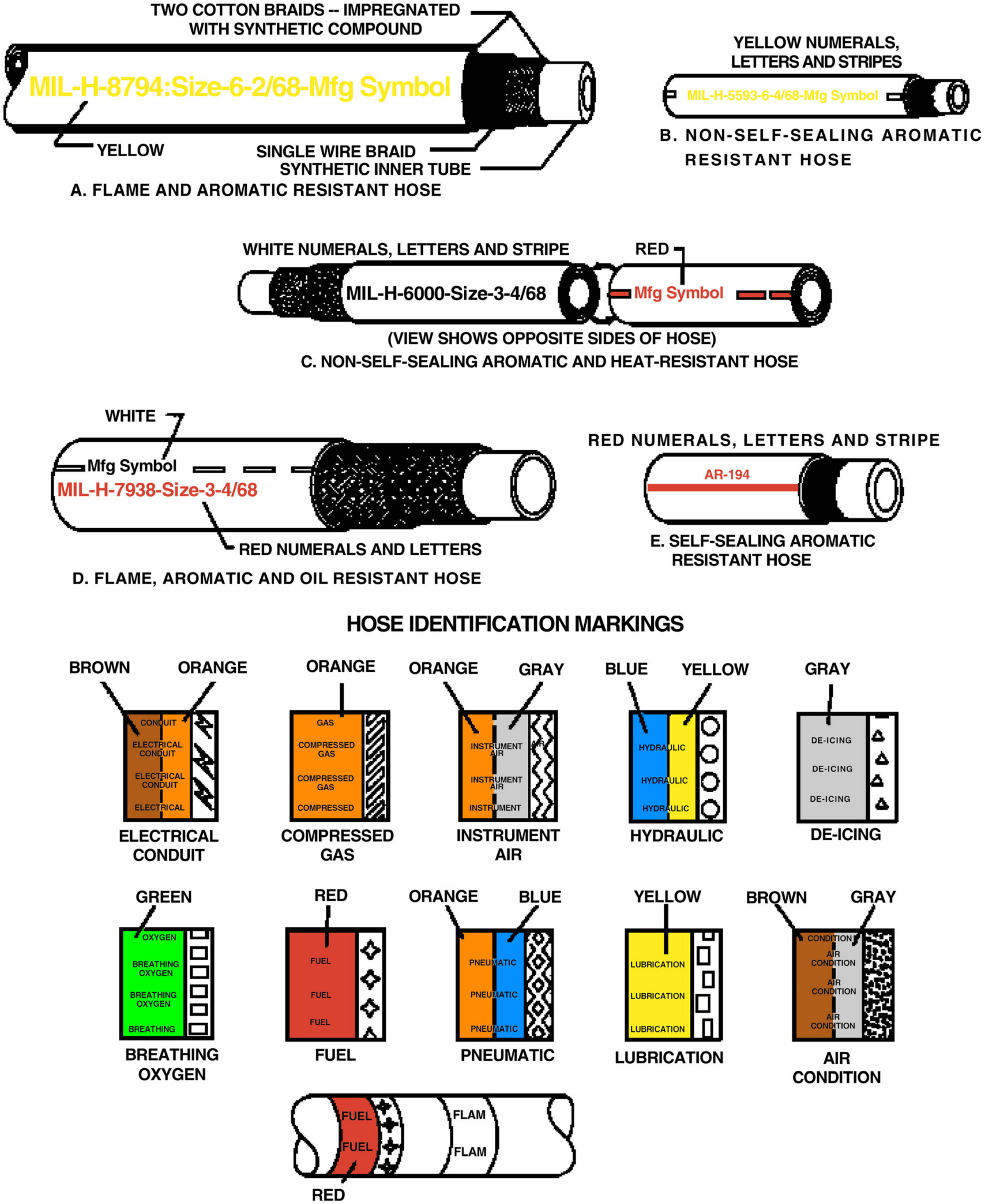
D. Final tightening depends upon type and size of tubing. On aluminum alloy tubing up to and including half inch outside diameter, tighten nut from 1 to 1-1/6 turns. On aluminum alloy tubing over half inch outside diameter, or steel tubing, tighten nut from 1-1/6 to 1-1/2 turns.

E. After presetting the sleeve, disconnect tubing from fitting and check the following points (refer to Figure 5, Step 3):

(1) Tube extends 3/32 to 1/8 inch beyond sleeve pilot to prevent blow off.

(2) Sleeve pilot contacts tube. A maximum clearance of 0.005 inch for aluminum alloy tubing, or 0.015 inch for steel tubing, is acceptable.

(3) A slight collapse of tube at sleeve cut is permissible. No movement of sleeve pilot, except rotation, is permissible.



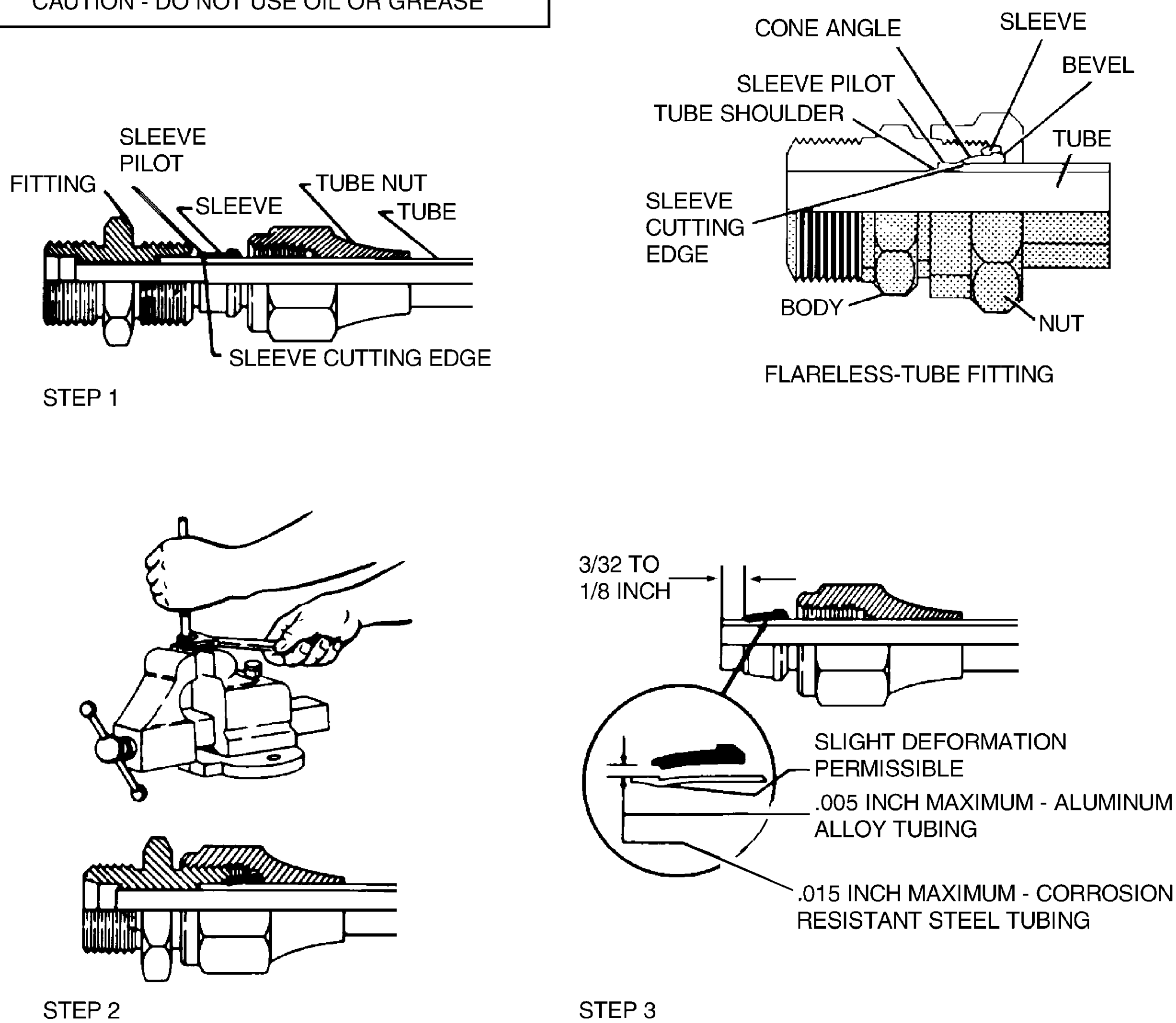
Hose, Tube, and Line Markings
Figure 4

B363

TUBING AND HOSE LUBRICANTS

TUBING SYSTEM	LUBRICANT
HYDRAULIC	MIL-H-5606
FUEL	MIL-H-5656
OIL	SYSTEM LIL
PNEUMATIC	MIL-L-4343
OXYGEN *	MIL-L-5542

* CAUTION - DO NOT USE OIL OR GREASE



Presetting Flareless Tube Fittings
Figure 5

7. Electrical Bonding

Aircraft electrical bonding should be accomplished or verified to establish a maximum allowable resistance value. See Chart 1 for values.

All electrical, electronic equipment and components shall be installed in such a manner as to provide a continuous low resistance path from the equipment enclosure to the airplane structure.

Parts shall be bonded directly to the primary structure rather than to other bonded parts.

All parts shall be bonded with as short a lead as possible.

All bonding surfaces shall be cleaned prior to the installation of the bonded joint.

All nuts used in bonding shall be of the self-locking type. (Do Not use fiber-locking type).

All electrical bonding shall be accomplished without affecting the structural integrity of the airframe.

Bond connections shall be secure and free from corrosion.

Self Tapping Screws will not be used for bonding purposes.

CHART 1. MAXIMUM ALLOWABLE RESISTANCE VALUES

Item to be Electrically Bonded	Maximum Allowable Resistance Value in Ohms
Static Wicks	0.0005
Starter/Alternator to Engine	0.0025
All Electrical/Electronic Equipment	
Ground Return to Primary Structure	0.0025
Instruments	0.0100
Battery to Primary Structure	0.0025
Radio Racks to Primary Structure	0.0025
R.F.I. Noise Filters	0.0025

8. Support Clamps

Support clamps are used to secure the various lines to the airframe or power plant assemblies. Several type of support clamps are used for this purpose. The rubber cushioned and plain are the most commonly used clamps. The rubber cushioned clamp is used to secure lines subject to vibration; the cushioning prevents chafing of the tubing. The plain clamp is used to secure lines in areas not subject to vibration.

A teflon cushioned clamp is used in areas where the deteriorating effects of hydraulic fluid or fuel is expected, however, because it is less resilient, it does not provide as good a vibration damping effect as other cushion materials.

Use bonded clamps to secure metal hydraulic, fuel and oil lines in place. Unbonded clamps should be used only for securing wiring. Remove any paint or anodizing from the portion of the tube at the bonding clap location. Make certain that clamps are of the correct size. Clamps or supporting clips smaller than the outside diameter of the hose may restrict the flow of fluid through the hose.

All plumbing lines must be secured at specified intervals. The maximum distance between supports for rigid fluid tubing is shown in Chart 2.

CHART 2. MAXIMUM DISTANCE BETWEEN SUPPORTS FOR FLUID TUBING

	Distance Between Supports (IN.)	
Tube O.D. (IN.)	**Aluminum Alloy**	**Steel**
1/8	9-1/2	11-1/2
3/16	12	14
1/4	13-1/2	16
5/16	15	18
3/8	16-1/2	20
1/2	19	23
5/8	22	25-1/2
3/4	24	27-1/2
1	26-1/2	30

9. Metal / Wire Stitching Repair (See Figure 6.) (Ref. PPS-20024, Rev. A.)

CAUTION: METAL/WIRE STITCHING (AND THE ALTERNATE METHOD OF JOINING DESCRIBED BELOW) SHALL ONLY BE USED FOR NON-STRUCTURAL, NON-LOAD CARRYING APPLICATIONS.

A metal/wire stitching process is used to staple fabric and rubber seal materials to engine baffles and some composite materials. The following alternate method of joining is approved for field use when replacing these fabric and rubber seal materials.

Alternate (Rivet) Method of Joining.

(1) Substitute two rivets in lieu of each staple where stitching was previoiusly used or is specified. Maintain a minimum of .75 inch spacing between rivets.

(2) When materials being joined include Stainless Steel, Galvanized Steel or Steel, use:

(a) MS20615M4 Rivet (Monel) and NAS1149CN432R Washer (See Figure 6.)

(b) Install with manufactured (factory) head against hardest material. Install washer against opposite side of joint and upset rivet (bucktail) against washer.

(3) When materials being joined include only aluminum and nonmetallic materials use:

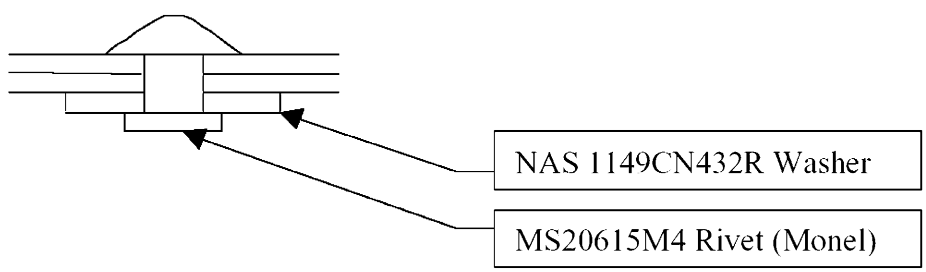
(a) MS20470A4 Rivet and NAS1149DN432H Washer (See Figure 6.)

(b) Install with manufactured (factory) head against hardest material. Install washer against opposite side of joint and upset rivet (bucktail) against washer.

When materials being joined include Stainless Steel, Galvanized Steel or Steel, use:

MS20615M4 Rivet (Monel)
NAS1149CN432R Washer

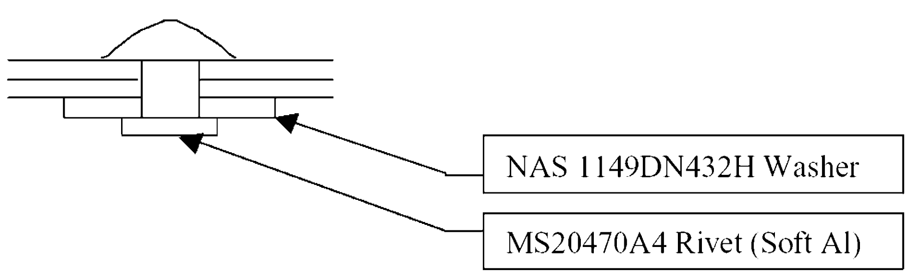
Install with manufactured (factory) head against hardest material. Install washer against opposite side of joint and upset rivet (bucktail) against washer.



When materials being joined include only aluminum and nonmetallic materials use:

MS20470A4 Rivet
NAS1149DN432H Washer

Install with manufactured (factory) head against hardest material. Install washer against opposite side of joint and upset rivet (bucktail) against washer.



Metal / Wire Stitching Repair
Figure 6

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

APPENDIX

1

AUTOFLIGHT

THIS PAGE INTENTIONALLY BLANK

APPENDIX 1

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
APP1-List of	1	Feb 19/04			
Effective Pages	2	Feb 19/04			
APP1-Table of Contents	1	Feb 19/04			
	2	Feb 19/04			
Appendix 1	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Feb 19/04			
	10	Feb 19/04			
	11	Feb 19/04			
	12	Feb 19/04			
	13	Feb 19/04			
	14	Feb 19/04			
	15	Feb 19/04			
	16	Feb 19/04			
	17	Feb 19/04			
	18	Feb 19/04			
	19	Feb 19/04			
	20	Feb 19/04			

THIS PAGE INTENTIONALLY BLANK

APPENDIX 1 - AUTOFLIGHT

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

S-TEC SYSTEM 55/55X

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.

1. S-TEC System 55X

The S-TEC System 55X may have been installed as an option in:

A. Piper 6X S/N's 3232003 and up.

B. Piper 6XT S/N's 3255001 and up.

2. Description (See Figure 1.)

The S-TEC System 55X is a rate based autopilot that controls the roll and pitch axis of the aircraft. The autopilot's main function is to convert pilot commands to logic signals for the roll and pitch computers. As the pilot enters the desired mode by pressing the appropriate mode selector switch, the computer acknowledges the mode, causing the appropriate annunciator to illuminate.

The Roll Computer receives select input signals from the Directional Gyro (DG) or Horizontal Situation Indicator (HSI), VHF Omnidirectional Radio (VOR), Localizer (LOC) or Global Positioning System (GPS), Deviation Indicators, and the Turn Coordinator. It then computes roll servo commands for stabilization, turns, navigation intercepts, and tracking.

The Pitch Computer receives select input signals from the Altitude Pressure Transducer, Accelerometer, Glideslope Deviation Indicator and Altitude Selector/Alerter (if installed). It then computes pitch servo commands for vertical speed, altitude hold and glideslope intercept and tracking. Sensing for trim annunciation or automatic stabilator trim is provided by the pitch servo. Drive for the stabilator trim servo is provided by the pitch computer.

A typical S-TEC System 55X Autopilot installation includes the following:

A. Panel Mounted:

Programmer/Computer, Turn Coordinator, Annunciator, and D.G. or HSI.

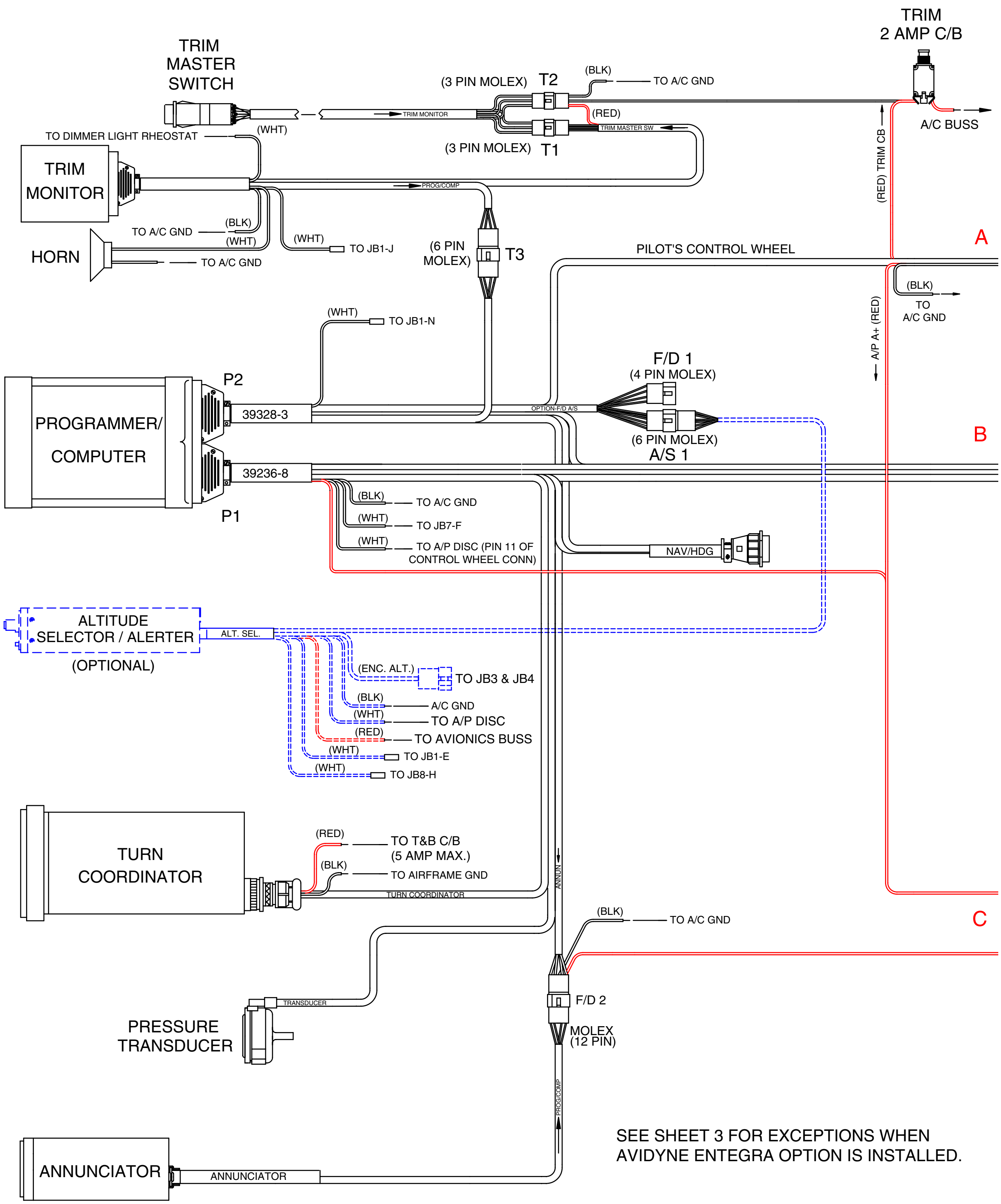
B. Remote Mounted:

Roll Servo, Pitch Servo, Trim Servo, Trim Monitor, A/P Disconnect switch, and Altitude (Pressure) Transducer.

Servo installations use aluminum brackets to secure the servos to the airframe. Attachment to the airplane's primary flight control and trim systems is accomplished with bridle cables and extension attachments.

3. Troubleshooting

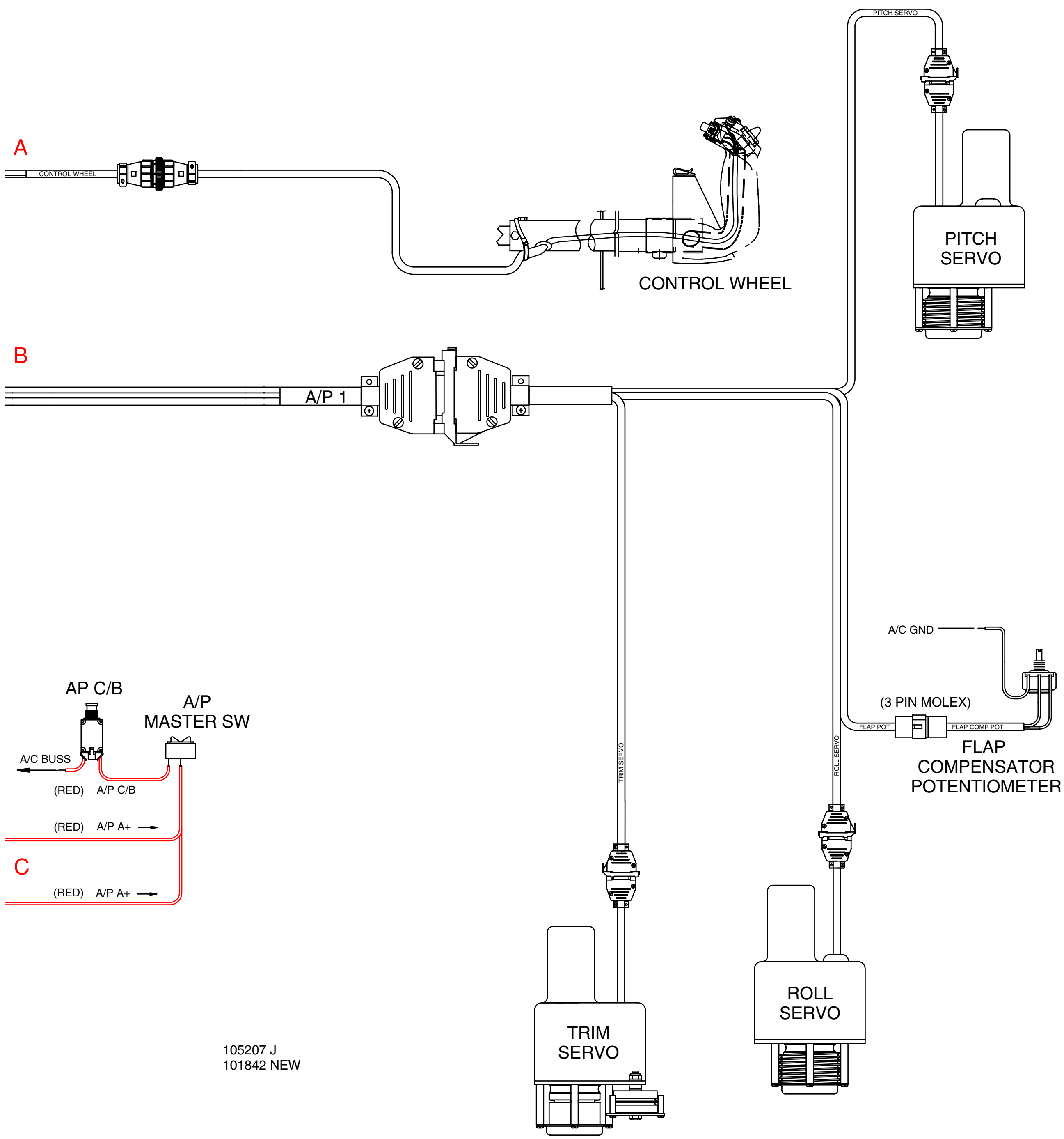
System functionality can be determined using functional checks descibed in the AFM Supplement and autopilot Pilot's Operating Handbook. More detailed troubleshooting should be accomplished by authorized S-TEC Dealers, holding the appropriate FAA certification, with required test equipment and service data.



SEE SHEET 3 FOR EXCEPTIONS WHEN
AVIDYNE ENTEGRA OPTION IS INSTALLED.

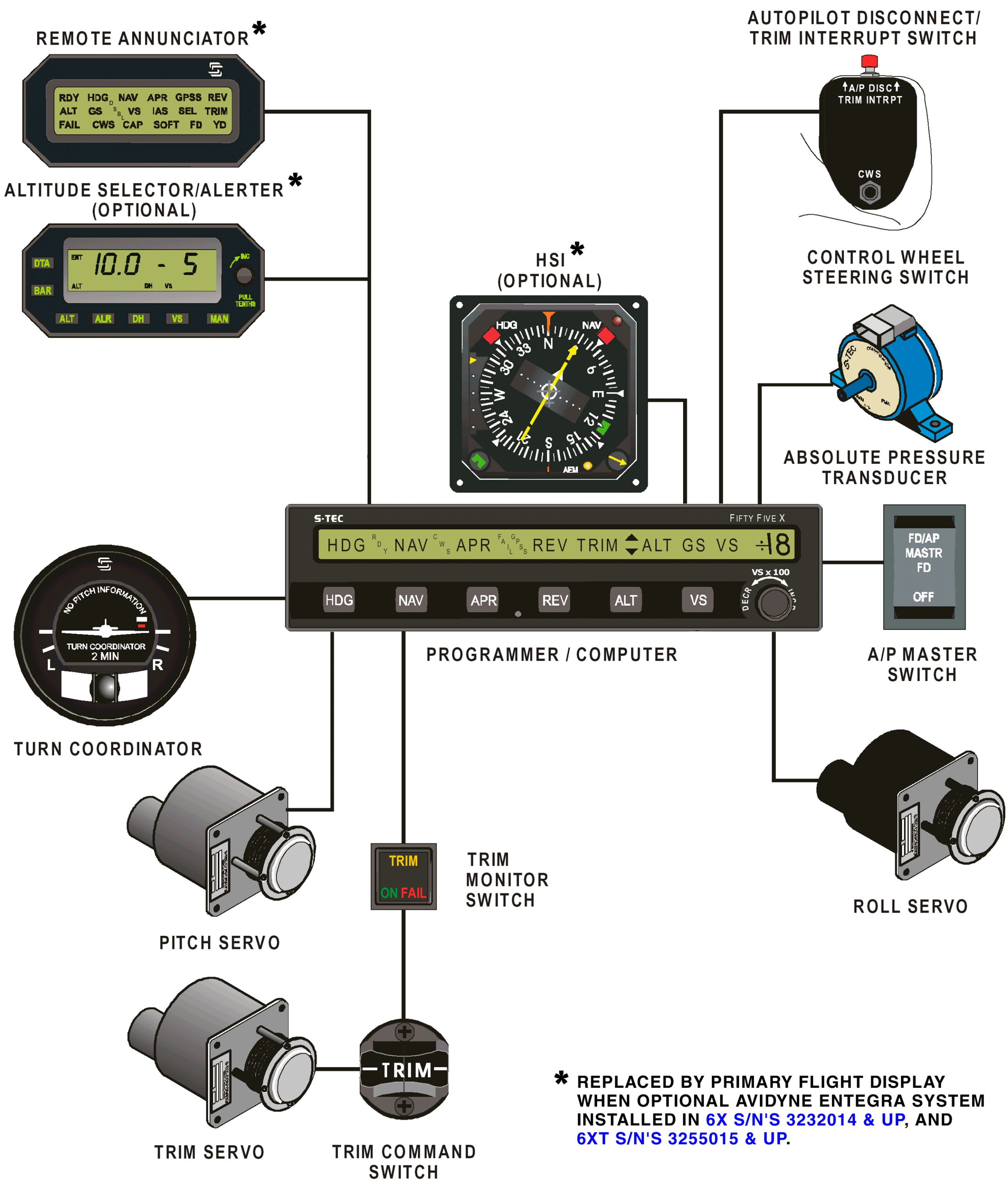
Effectivity
3232003 & up
3255001 & up

System 55X Autopilot Installation
Figure 1 (Sheet 1 of 3)



System 55X Autopilot Installation
Figure 1 (Sheet 2 of 3)

Effectivity
3232003 & up
3255001 & up



* REPLACED BY PRIMARY FLIGHT DISPLAY WHEN OPTIONAL AVIDYNE ENTEGRA SYSTEM INSTALLED IN 6X S/N'S 3232014 & UP, AND 6XT S/N'S 3255015 & UP.

Effectivity
3232003 & up
3255001 & up

System 55X Autopilot Installation
Figure 1 (Sheet 3 of 3)

4. GPSS

In the Global Positioning System Steering (GPSS) mode, the converter receives ground speed and bank angle digital signals that are calculated and converted to a commanded turn rate. The turn rate is then scaled and converted to a DC heading error signal that is compatible with S-TEC autopilots. The end result is an autopilot that can be directly coupled to the roll steering commands produced by the GPS Navigator, eliminating the need for the pilot to make any further adjustments to the HSI course arrow or the DG's heading bug.

5. System Operation

Operation of the autopilot and other systems is described in the FAA-approved Airplane Flight Manual Supplement (AFMS) - see airplane Pilot's Operating Handbook (POH), Section 9. Specialized controls, annunciation, operation and interpretation are covered in this supplement and in the S-TEC Autopilot POH that supplements the approved AFMS.

6. Maintenance

Except as provided in 5-20-00, servicing and/or maintenance of the autopilot system is On-Condition.

NOTE: Servicing of S-TEC System 55X Autopilot installations is best accomplished by approved S-TEC dealers holding the appropriate FAA-certification. Locations of and access to the components installed are described and depicted individually below. Removal and replacement of components is generally indicated by functional checks provided in the AFM Supplement, S-TEC Autopilot POH and/or below.

7. Post-Maintenance Operational Checkout (Ref. S-TEC Report No. 81191, Rev. 1.)

Complete the following checkout procedure after any maintenance to the system is performed.

NOTE: The System 55X incorporates a SELF-TEST that requires a 100% pass rate before the autopilot can be engaged.

NOTE: For airplanes equipped with the optional Avidyne Entegra Electronic Flight Display System, (see 34-20-00) references below to the remote annunciator, flight director, and HSI are to those functions in the Primary Flight Display (PFD).

A. Apply aircraft power.

B. Avionics Master Switch — ON

C. Autopilot Master Switch — Set to FD / AP

NOTE: Observe that all segments of the Programmer / Computer display and annunciators illuminate for five (5) seconds during test. Satisfactory completion of the SELF-TEST is indicated when the Ready (RDY) annunciator remains on at the end of the five (5) second self-test. Should a fault be detected, the FAIL annunciator will remain on at the conclusion of the self-test and the autopilot will not operate.

D. Trim Master (ON / OFF) Switch — ON

E. HDG and VS switches — PRESS / RELEASE

Ensure that HDG and VS illuminate on the Fifty Five X annunciator.

F. VS Knob — ROTATE CW

Pitch control (i.e. - the control yoke) should move slowly out (pilot may have to assist a heavy yoke).

G. VS Knob — ROTATE CCW

Pitch control should move slowly in.

H. A/P DISC Trim Interrupt Switch (on control yoke) PRESS

Verify the autopilot disconnects.

I. HDG Mode ENGAGE

J. DG or HSI HDG bug MOVE LT / RT

Roll control should follow the HDG bug.

NOTE: If HSI equipped, center the course arrow under the lubber line and push the NAV button. Move the course arrow on the HSI left then right. Roll control should follow the course arrow. Channel a valid VOR signal and move course arrow just enough to deflect the left / right needle one (1) or two (2) dots. Roll control should follow the Course Deviation Indicator (CDI) left / right needle during the test. (This test is only valid if the left / right needle is centered with the course arrow under the lubber line.)

NOTE: If DG equipped, center the HDG bug under the lubber line. Channel a valid VOR signal. Move the OBS to cause left / right CDI needle deflection. The roll control should follow the left / right needle movement.

K. REV Mode button PUSH

Roll control should respond opposite to the course arrow and CDI left / right needle inputs.

L. Altitude Hold (ALT) button PUSH

Slowly pull out (nose up) on the pitch control (i.e. - control yoke). Autotrim should run nose down with TRIM flashing on the remote annunciator and the autopilot computer / programmer after approximately 3 seconds. Slowly move control yoke forward (nose down). After 3 seconds, autotrim should move nose up with TRIM flashing on the remote annunciator and the autopilot computer / programmer after approximately 3 seconds.

M. Trim Master (ON / OFF) Switch OFF

N. Manual Electric Trim Test:

(1) Trim Master (ON / OFF) switch ON

(a) Move each segment of the Manual Electric Trim Command Switch FWD and AFT.
Trim should not run.

(b) Move both segments of the Trim Command switch FWD.
Trim should run nose down.

(c) Move both segments of the Trim Command switch AFT.
Trim should run nose up.

(2) Re-trim aircraft for takeoff and check controls for freedom of movement. Be sure the autopilot and trim servos are dis-engaged.

O. Flight Director Test (only if the optional Avidyne Entegra Electronic Flight Display System is installed):

(1) Autopilot Master Switch SELECT FD

Note the roll, pitch and trim servos are disengaged. The steering bar should be in view on the attitude indicator.

(2) HDG Mode ENGAGE

MOVE HDG bug 45 degrees left. The roll steering bar should slowly indicate a left steering command. Repeat the same test for the right side.

(3) VS Mode — ENGAGE

SELECT 1500 FPM rate of climb. Note the pitch steering bar moves slowly up. Repeat the same test for the down direction.

(4) Autopilot Master Switch — SELECT FD / AP

The servos should re-engage.

(5) Trim Master ON / OFF Switch — ON

(6) Manual Electric Trim Command Switch — MOVE FWD or AFT

The autopilot should disconnect.

NOTE: The Manual Electric Trim Command Switch will disconnect the autopilot only if there is a Pitch Mode engaged.

8. Panel-Mounted Components

The HSI (if installed), autopilot programmer/computer, altitude selector/alerter (if installed), remote annunciator, and turn coordinator are either face-mounted or rack-mounted in the instrument panel. See 39-10-00 for removal and installation instructions.

9. Component Locator

See Figure 2.

10. Trim Monitor (See Figure 2.)

The trim monitor is mounted on the left side of the fuselage under the instrument panel.

A. Removal

(1) Disconnect autopilot harness.

(2) Remove screws (4) holding trim monitor to mounting bracket and remove trim monitor.

B. Installation

(1) Place trim monitor in position on mounting bracket and secure with screws (4).

(2) Connect autopilot harness.

(3) Perform Post-Maintenance Operational Checkout, above.

11. Pressure Transducer (See Figure 2.)

The pressure transducer is located on the forward side of the pilot's instrument panel below the control wheel shaft.

A. Removal

(1) Remove the Ty-Rap and disconnect the transducer from the static-system by removing the flexible hose.

(2) Disconnect the autopilot harness.

(3) Remove screws and washers (2 ea.) and remove transducer.

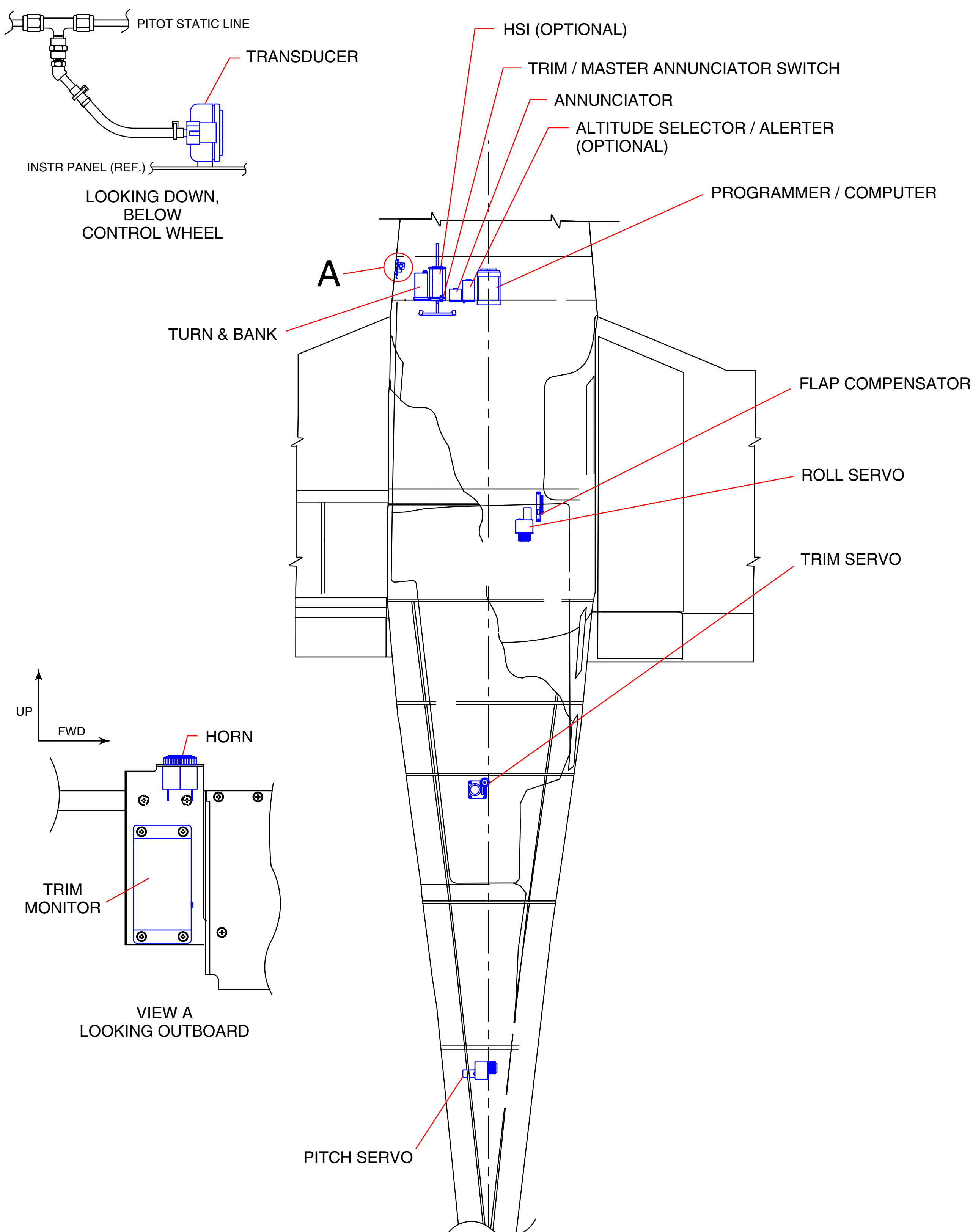
B. Installation

(1) Place transducer in position. Secure transducer to instrument panel with screws and washers (2 ea.)

(2) Connect the transducer to the static system by sliding the flexible hose over the hose barb. Then position and install Ty-Rap.

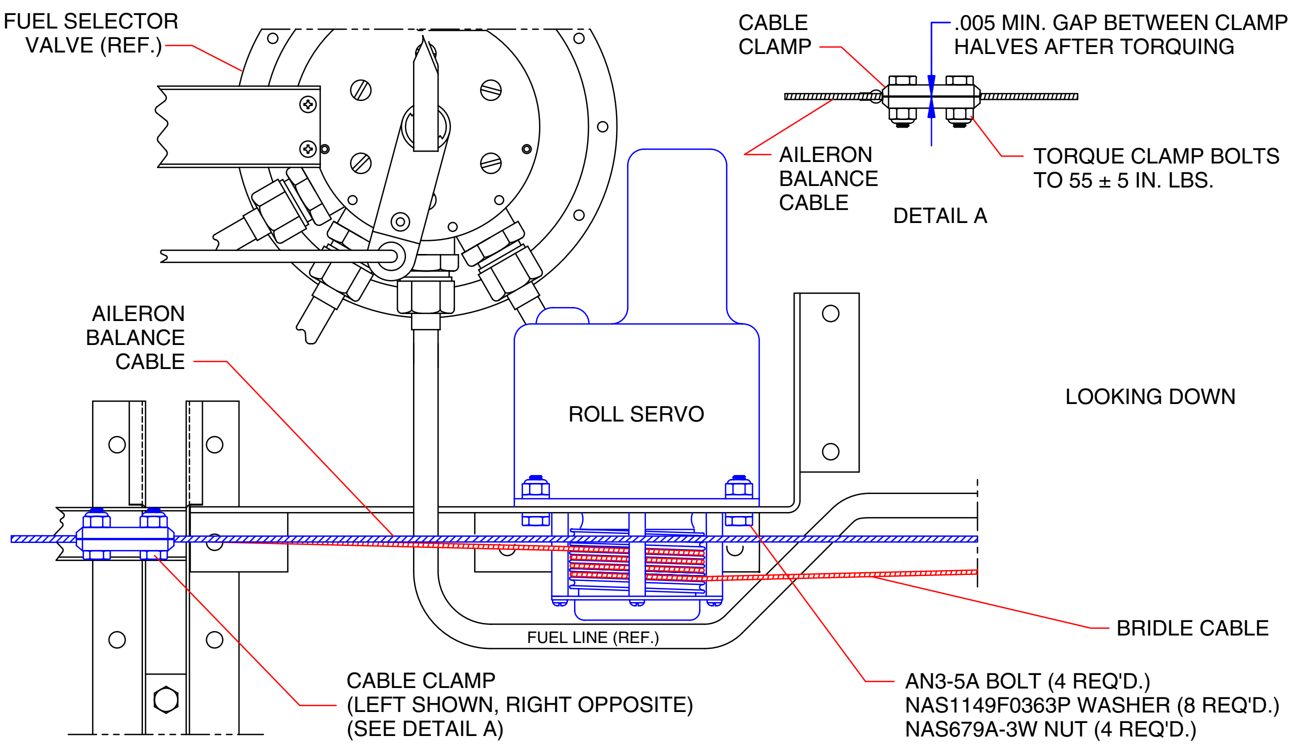
(3) Connect the autopilot harness.

(4) Perform Post-Maintenance Operational Checkout, above.



Effectivity
3232003 & up
3255001 & up

Component Locator
Figure 2



Roll Servo Installation
Figure 3

Effectivity
3232003 & up
3255001 & up

12. Roll Servo (See Figures 2 and 3.)

The roll servo is mounted underneath the right aft facing passenger seat. A bridle cable and clamps attach the servo capstan to the aileron balance cable.

A. Removal

(1) Remove the aft facing passenger seat.

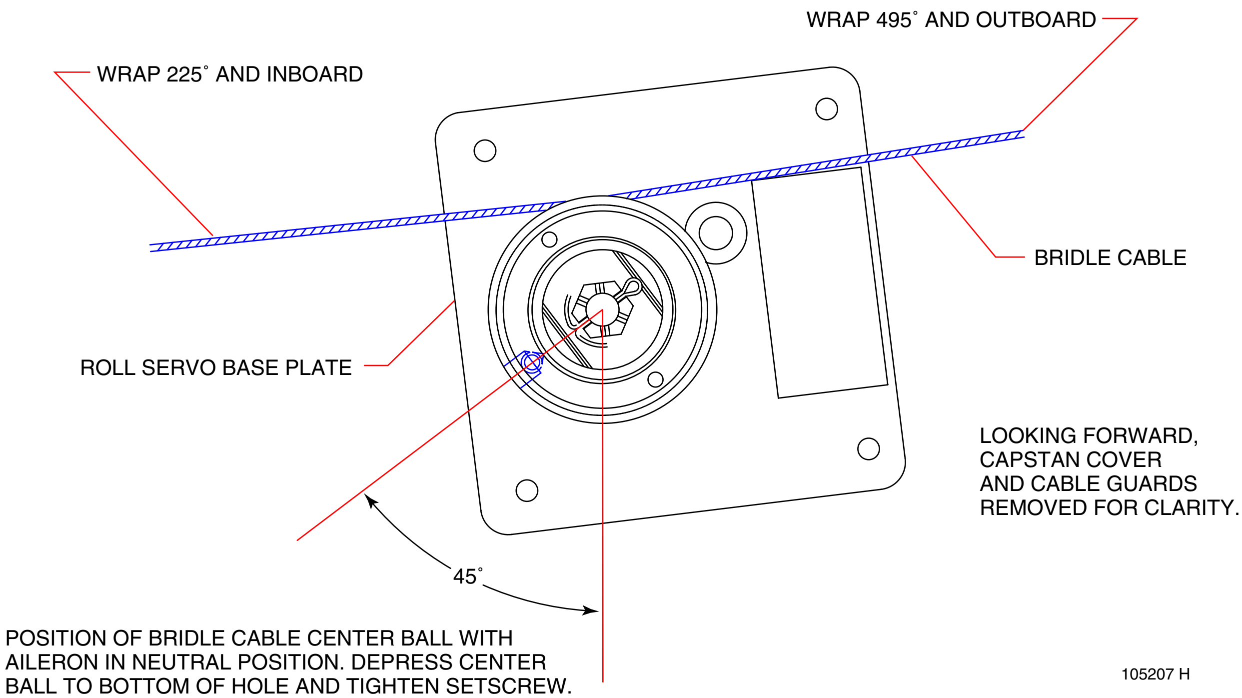
(2) Remove adjacent carpet.

(3) Remove screws securing floor panel and remove panel.

(4) Disconnect autopilot harness.

(5) Remove nuts and bolts (2 ea.) securing each cable clamp (2) and remove cable clamps from aileron balance cable and autopilot bridle cable.

(6) Remove nuts and bolts (4 ea.) and washers (8 ea.) securing roll servo to mounting bracket and remove roll servo with attached bridle cable.



Effectivity
3232003 & up
3255001 & up

Roll Servo Capstan Wrapping
Figure 4

B. Installation

(1) Rig ailerons per Aileron Control Rigging and Adjustment, 27-10-00.

(2) Place the control column tee bar in full forward position and secure by use of a suitable tool or by placing weights on the aft side of the stabilator, if stabilator cables have been previously tensioned.

(3) Lock the ailerons in neutral (i.e. - aligned with flaps) position using a suitable contour fixture at the inboard ends of the ailerons and the outboard ends of the flaps. Verify control wheels are centered and secure in that position.

(4) Remove screws (4) and remove capstan cover and cable guards from servo.

(5) Adjust roll servo clutch torque per Servo Clutch Torque Adjustment, below.

(6) Wrap autopilot bridle cable, align capstan, and and tighten center-ball setscrew as shown in Figure 4.

(7) Replace cable guards and capstan cover, secure with screws (4).

(8) Position servo as shown in Figure 3 and install and secure nuts (4 ea.) , washers (8 ea.) , and bolts (4 ea.) holding servo to mounting bracket.

(9) Position cable clamps (2) as shown in Figure 3 and tighten nuts and bolts (2 ea.). Adjust cable clamps in or out along the airleron cable to obtain a bridle cable tension of 15 + 10, -2 lbs. Torque cable clamp bolts to 55 ± 5 in. lbs.

(10) Remove the locking fixtures at the inboard ends of the airlerons. Aileron neutral (i.e. - aligned with flaps) position should be maintained with the control wheels in neutral. A droop of 1/8 inch is allowable.

(11) Remove the control wheel/tee bar locks. Check to insure that the left aileron up and right aileron down stops are contacted simultaneously and vice versa. Adjust stops as required.

(12) Rotate the left (pilot's) control wheel in each direction until the bellcranks contact the stops. The sprocket stops on the tee bar shall not be contacted until additional “override" movement (cushion) of the wheel occurs. A "cushion" on 0.030 to 0.040 inches is to be maintained as measured between the sprocket pin and adjustable control wheel stop bolts.

(13) Place the ailerons in the neutral (aligned with the flaps) position. For each aileron, from the neutral position, check that the "up" travel and the "down" travel are within the limits shown in 27-10-00, Figure 5, as follows:

(a) Center bubble of a protractor over surface of aileron at neutral position. Note reading.

(b) Move aileron full up and down. Check degree of travel in each direction. Degree of travel on protractor is determined by taking the difference between protractor reading at neutral and up, and neutral and down. Bubble must be centered at each reading.

When measuring "down" travel from the neutral position, a light "up" pressure shall be maintained at the center of the aft edge of the aileron. When measuring "up" travel from the neutral position, a light "down" pressure shall be maintained at the center of the aft edge of the aileron (at the "up" position only), just sufficient to remove the slack between the bellcrank and the aileron. Total free play measured at the aileron trailing edges shall not exceed 0.120 inches.

(14) If steps (10) thru (13), above, reveal the aileron controls out of rig, repeat steps (1) thru (9).

(15) Connect autopilot harness.

(16) Check aileron controls for free and correct movement.

(17) Perform Post-Maintenance Operational Checkout, above.

(18) Replace floor panel and secure with screws.

(19) Replace carpeting.

(20) Replace the aft facing passenger seat.

13. Trim Servo (See Figures 2 and 5.)

The trim servo is located on the centerline just aft of the cabin rear closeout panel. The left stabilator trim cable wraps around the servo idler pulley and servo capstan.

A. Removal

(1) Remove rear seats. Remove cabin rear closeout panel. Remove baggage compartment carpet and floor.

(2) Tie a pull rope to the left trim cable exposed beneath the baggage compartment floor and tie-off the pull rope to structure aft.

(3) Tie a pull rope to the left trim cable aft of the turnbuckle in the rear fuselage aft of the trim servo and tie-off the pull rope to structure forward.

NOTE: The pull ropes apply tension to the trim cables to prevent the cables from unwrapping from the trim wheel drum or the trim barrel, and to prevent the cables from fouling at any of the pulleys.

(4) Slack-off the turnbuckle in the left trim cable segment aft of the trim servo sufficient to relieve tension on the left trim cable as it wraps around the trim servo idler pulley and capstan.

(5) Disconnect the autopilot harness.

(6) Remove the capstan cover and cable guards (4) by removing the retaining screws (4).

(7) Remove the bolt, nut, and washer securing the idler pulley to the trim servo baseplate and mounting bracket and remove the idler pulley components.

NOTE: The idler pulley breaks down into the following components upon removal of the bolt, above: mounting plate/cable guard assembly, idler pulley, and two washers.

(8) Remove the remaining bolts, nuts, and washers (3 ea.) securing the trim servo to its mounting bracket and remove the trim servo.

B. Installation

(1) Adjust trim servo clutch torque per Servo Clutch Torque Adjustment, below.

(2) With the capstan cover and cable guards removed, position the trim servo as shown in Figure 5. Secure with bolts, nuts, and washers (3 ea. - i.e. - aft two and forward left).

(3) Assemble the idler pulley cable guards (3) to the mounting plate with screws (1 ea.) and star washers (2 ea.). Place the center bolt through the mounting plate/cable guard assembly and slide a washer over the threaded end and up against the mounting plate. Set the mounting plate/cable guard/bolt assembly aside.

(4) Drape the slack left trim cable over the servo capstan.

CAUTION: IN STEPS (5) THRU (9), BELOW, USAGE OF LEFT AND RIGHT IS RELATIVE TO THE VIEW OF THE TECHNICIAN IN THE CABIN BAGGAGE AREA LOOKING AFT, EXCEPT WHERE AIRPLANE COMPONENT PARTS ARE SPECIFICALLY NAMED.

(5) Place thumb and forefinger on top of the capstan over the trim cable in its groove. Pressing the trim cable into its groove, slide thumb and forefinger down around opposite sides of the servo capstan and pull the trim cable slack towards you and to your left.

(6) Holding the trim cable in that position, install the capstan cover and cable guards as shown in Figure 5.

(7) Hold the idler pulley aft of the trim servo and to the right of the aiplane's left trim cable. Move the idler pulley left to the left trim cable and capture the trim cable in the bottom cable groove on the left of the idler pulley.

(8) Keeping the trim cable in the bottom groove, slide the idler pulley forward along the trim cable, left of the servo capstan, and bring it approximately to its installed position (See Figure 5). At this point, the aft portion of the trim cable should be routed left, around the front, and to the right of the idler pulley and to the left, around the rear, and to the right of the capstan.

(9) Holding the idler pulley in this position, reach down and pull the forward portion of the trim cable over the idler pulley and seat it in the top cable groove on the idler pulley. The left trim cable should now be routed as shown in Figure 5.

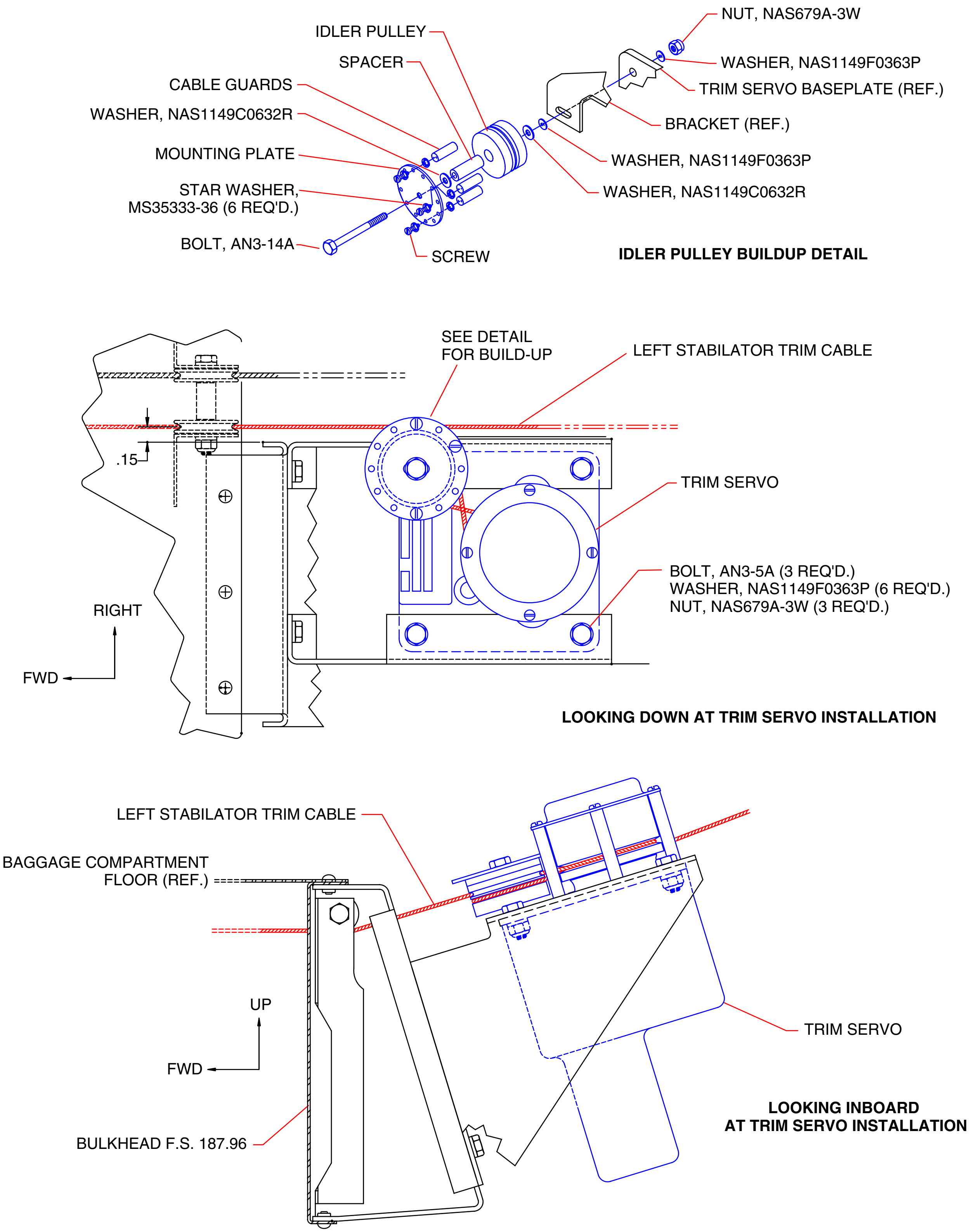
(10) Place the spacer inside the idler pulley.

(11) Position the mounting plate/cable guard/bolt assembly as shown in Figure 5 and slide the bolt through the spacer inside the idler pulley.

(12) Place a washer over the bolt end and put the bolt through the trim servo mounting bracket and baseplate. Secure with a nut and washer, taking care to ensure that the cable guards are positioned, and the left trim cable is routed, as shown in Figure 5.

(13) Take up the slack in the left trim cable with the turnbuckle and remove the pull ropes.

(14) Rig stabilator trim per Stabilator Trim Rigging and Adjustment, 27-30-00.



Trim Servo Installation
Figure 5

Effectivity
3232003 & up
3255001 & up

(15) Connect the autopilot harness.
(16) Perform Post-Maintenance Operational Checkout, above.
(17) Check elevator trim controls for free and correct movement.
(18) Reinstall baggage compartment floor and carpet, and cabin rear closeout panel.
(19) Reinstall rear seats.

14. Pitch Servo (See Figures 2 and 6.)

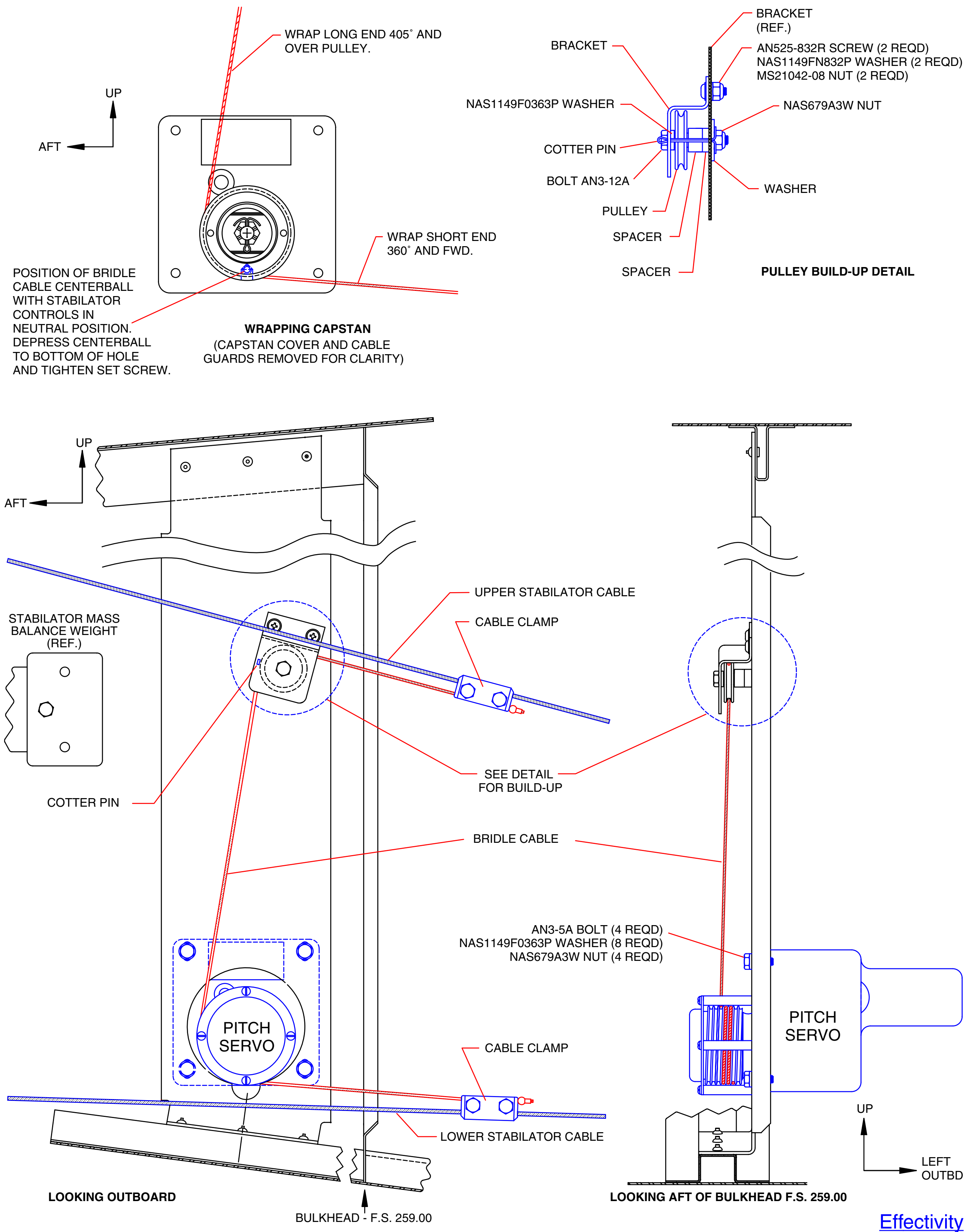
The pitch servo is located in the aft fuselage just aft of F.S. 259.00. A bridle cable and clamps attach the servo capstan to the upper and lower stabilator cables.

A. Removal

(1) Attach a tail stand under the tail skid.
(2) Remove the cabin rear closeout panel.
(3) Crawl into the tailcone until the pitch servo is accessible.
(4) Disconnect autopilot harness.
(5) Remove nuts and bolts (2 ea.) securing each cable clamp (2) and remove cable clamps from upper and lower stabilator cables and autopilot bridle cable.
(6) Remove cotter pin from bridle cable pulley and pull upper portion of bridle cable free of the pulley.
(7) Remove nuts and bolts (4 ea.) and washers (8 ea.), securing pitch servo to mounting bracket and remove pitch servo with attached bridle cable.

B. Installation

(1) Rig stabilator controls per Stabilator Controls Rigging and Adjustment, 27-30-00.
(2) Remove screws (4) and remove capstan cover and cable guards from servo.
(3) Adjust pitch servo clutch torque per Servo Clutch Torque Adjustment, below.
(4) Wrap autopilot bridle cable, align capstan, and tighten center-ball setscrew as shown in Figure 6.
(5) Replace cable guards and capstan cover, secure with screws (4).
(6) Position pitch servo as shown in Figure 6 and secure with bolts, nuts, and washers (4 ea.).
(7) Lead upper portion of bridle cable through pulley as shown in Figure 6. Reinstall cotter pin.
(8) Position cable clamps (2) as shown in Figure 6 and tighten nuts and bolts (2 ea.). Adjust cable clamps in or out along the stabilator cables to obtain a bridle cable tension of 15 + 10, -2 lbs. Torque cable clamp bolts to 55 ± 5 in. lbs.
(9) Connect autopilot harness.
(10) Perform Post-Maintenance Operational Checkout, above.
(11) Check stabilator controls for free and correct movement.
(12) Reinstall and secure the cabin rear closeout panel.
(13) Remove tail stand.



Pitch Servo Installation
Figure 6

Effectivity
3232003 & up
3255001 & up

15. Servo Clutch Torque Adjustment (See Figure 7 and Chart 1.)

A. Remove servo per instructions under specific servo, above.

B. Place servo in a holding fixture (i.e. - vice) with capstan up.

C. Remove capstan cover, cable guards, and cable.

D. Check capstan torque by attaching the capstan adjusting tool (special tool - see parts catalog) to the capstan and using a currently calibrated torque wrench as shown in Figure 7.

(1) Acceptable torque is specified in Chart 1.

(2) If adjustment is required, proceed as follows.

E. Remove cotter pin from end of servo shaft and remove castle nut, shim washers, and tension washers.

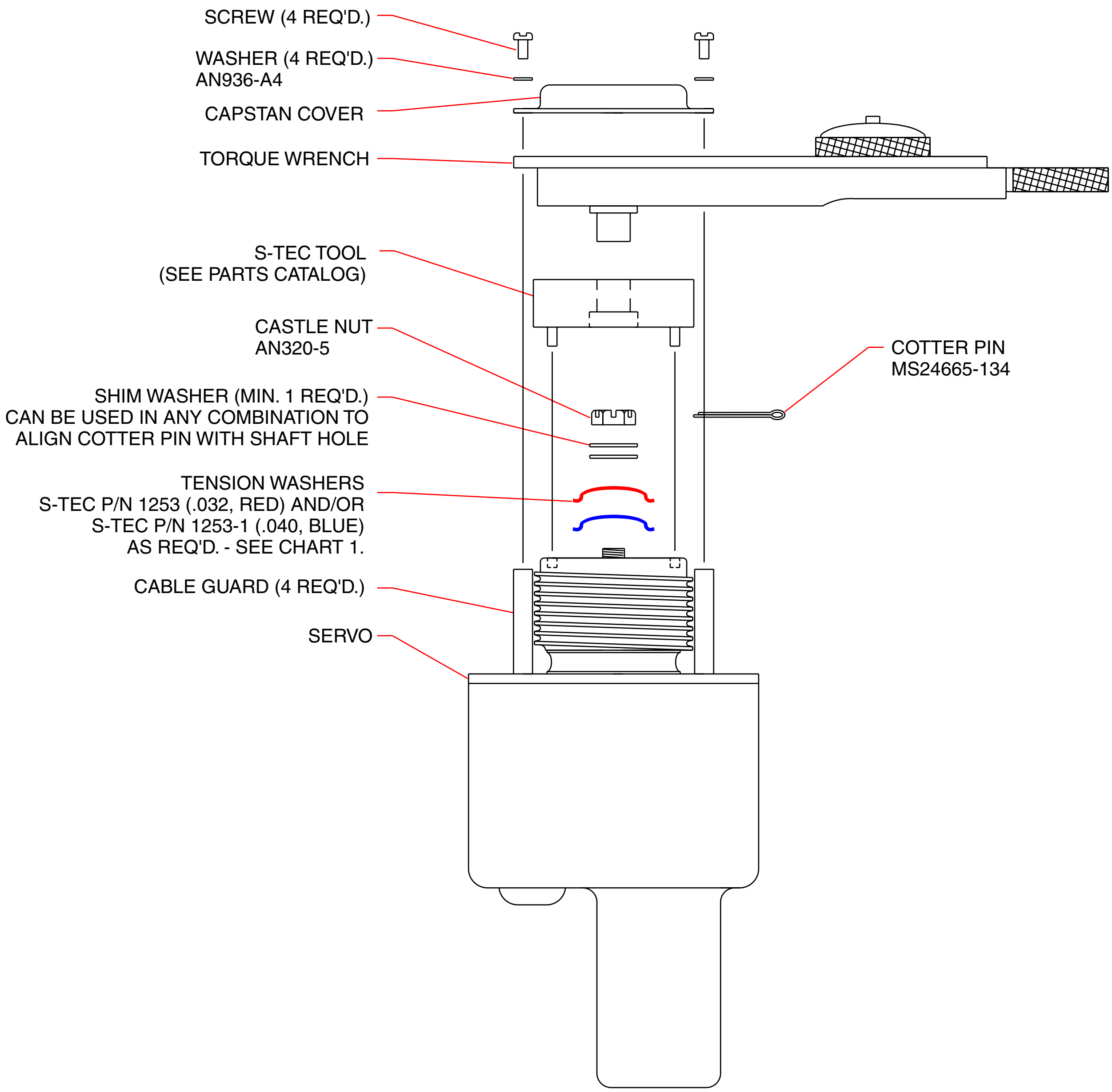
F. Replace tension washers as required (see Chart 1).

G. Replace shim washers and castle nut.

H. Tension castle nut so that capstan torque is as specified in Chart 1.

CHART 1
SERVO CLUTCH TORQUE

SERVO	TORQUE (In. Lbs.)	WASHERS REQUIRED
Roll	40 ± 3	One .032; Two .040
Pitch	44 ± 3	One .032; Two .040
Trim	27 ± 3	Three .032



Servo Clutch Torque Adjustment
Figure 7

Effectivity
3232003 & up
3255001 & up

16. Flap Compensator (See Figure 8.)

A flap compensator potentiometer is mounted underneath the right aft facing passenger seat or the entertainment cabinet, whichever is installed. The pot is mounted on a bracket just aft of the wing spar box and outboard of the fuel selector valve. The arm of the pot is linked to the flap troque tube by a cable assembly.

Adjustment

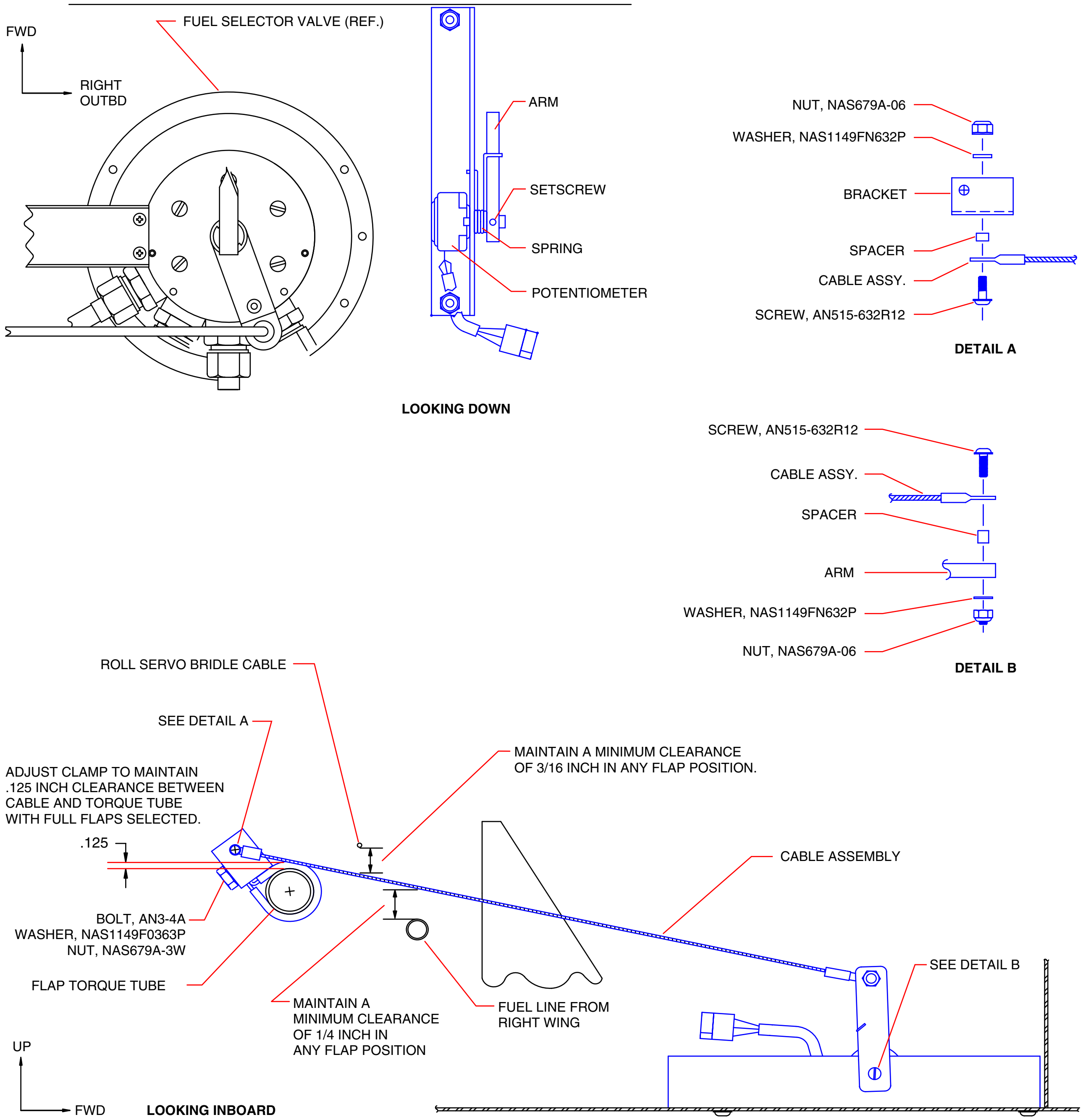
(1) With flaps in the full up position and set screw loose, turn A/P master switch ON.

(2) Connect a digital voltmeter (3 1/2 digit) between airframe ground and center terminal (wiper) of potentiometer (pot).

(3) Turn pot shaft clockwise to stop. Voltmeter should read 5.00 vdc.

(4) Turn pot shaft slowly counter-clockwise until voltage just starts to decrease from 5.00 volts.

(5) Tighten set screw and recheck wiper voltage for 4.95 to 5.00 vdc.



Flap Compensator Installation
Figure 8

Effectivity
3232003 & up
3255001 & up

GRIDS 1L2 THRU 1L24
INTENTIONALLY BLANK

AIRPLANE MAINTENANCE MANUAL

CARD 2 OF 5

PA-32-301FT (S/N's 3232001 & UP)

PA-32-301XTC (S/N's 3255001 & UP)

THE NEW PIPER AIRCRAFT, INC.

PART NUMBER 766-854

February 19, 2004

Published by
Technical Publications

2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

GAMA

Member
General Aviation
Manufacturers Association

AEROFICHE REVISION STATUS

Revisions to this Maintenance Manual 766-854 issued June 1, 2003 are as follows:

Revision	Publication Date	Aerofiche Card Effectivity
ORG030601	June 1, 2003	All
PR040219 *	February 19, 2004	All

*** PARTIAL REVISION OF MAINTENANCE MANUAL 766-854**

This revision contains changes in all five aerofiche cards. Accordingly, replace the entire existing Aerofiche Card Set with this one dated 2/19/04.

NOTE: For those few customers who received Temporary Revision No. 22-1, dated January 6, 2004, when taking delivery of a new airplane at the factory or in conjunction with Piper Service Bulletin No. 1145, this February 19, 2004 revision supercedes Temporary Revision No. 22-1 in its entirety - those yellow pages should be removed and destroyed.

Consult the Customer Service Information Aerofiche (P/N 1753-755) for current revision dates for this manual.

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

1. Instructions for Continued Airworthiness

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

The PIPER PA-32-301FT 6X and PA-32-301XTC 6XT Maintenance Manual constitutes the Instructions for Continued Airworthiness as required by Federal Aviation Regulations (FAR) Part 23, Appendix G. Chapter 4 contains the Airworthiness Limitations section (4-00-00) and the Inspection Program is in Chapter 5 (5-20-00).

2. General

This publication is prepared in accordance with the General Aviation Manufacturers Association (GAMA) Specification No. 2, with respect to the arrangement and content of the System/Chapters within the designated Chapter/Section-numbering system.

WARNING: USE ONLY GENUINE PIPER AIRCRAFT PARTS OR PIPER AIRCRAFT APPROVED PARTS OBTAINED FROM PIPER APPROVED SOURCES, IN CONNECTION WITH THE MAINTENANCE AND REPAIR OF PIPER AIRPLANES.

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

THE NEW PIPER AIRCRAFT, INC. expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-PIPER approved parts.

NOTE: THE NEW PIPER AIRCRAFT, INC. expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

In any question concerning the care of your airplane, be sure to include the airplane serial number in any correspondence.

3. Effectivity

This maintenance manual is effective for PA-32-301FT Piper 6X airplane serial numbers 3232001 and up and for PA-32-301XTC Piper 6XT airplane serial numbers 3255001 and up.

This encompasses the following model years:

NOTE: The following is provided as a general reference only.

A. PA-32-301FT 6X

Model Year	Serial Numbers
2003	3232001 thru 3232013
2004	3232014 and up

B. PA-32-301XTC 6XT

Model Year	Serial Numbers
2003	3255001 thru 3255014
2004	3255015 and up

4. Serial Number Explanation

Example: 32 32 001

TYPE CERTIFICATE DESIGNATION

SEQUENCE NUMBER

MODEL CODE
32 = PA-32-301FT 6X
55 = PA-32-301XTC 6XT

5. Assignment of Subject Material

This publication is divided into industry standard, three element, numeric subject groupings as follows:

A. System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. They are assigned a number, which becomes the first element of the standardized numbering system. Thus, the element “28” of the number 28-40-01 refers to the chapter “Fuel”. Everything concerning the fuel system will be covered in this chapter.

B. Sub-System/Section - The major systems/chapters of an airplane are broken down into subsystems. These sub-systems are identified by the second element of the standard numbering system. The element “40” of the number 28-40-01 concerns itself with the indicating section of the fuel system.

C. Unit/Subject - The individual units within a sub-system/section may be identified by the third element of the standard numbering system. The element “01” of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and is normally zeroed out by PIPER.

Refer to paragraph 14, Chapter/Section Index Guide, for a complete breakdown and list. The material is arranged in ascending numerical sequence.

6. Pagination

The Chapter - Section (i.e. - 28-40-00) numbering system (explained above) forms the primary page numbering system for this manual. Within each Section, pages are numbered consecutively beginning with Page 1 (i.e. - 28-40-00, Page 1). Additionally, the aerofiche grid numbering system (explained below) is also used to indicate location within the manual.

7. Aerofiche Effectivity

A. The General Aviation Manufacturers Association (GAMA) have developed specifications for microfiche reproduction of aircraft publications. The information compiled in this Aerofiche Maintenance Manual will be kept current by revisions distributed periodically. These revisions will supersede all previous revisions and will be complete Aerofiche card replacements and shall supersede Aerofiche cards of the same number in the set. The "Aerofiche Effectivity" page at the front of this manual lists the current revision for each card in this set.

B. Conversion of Aerofiche alpha/numeric grid code numbers:

First number is the Aerofiche card number.
Letter is the horizontal row reference per card
Second number is the vertical column reference per card.

Example: 2J16 = Aerofiche card number two, row J, column 16.

C. To aid in locating information, the following is provided at the beginning of each aerofiche card:

(1) A complete Introduction containing the Chapter/Section Index Guide for all fiche in this set.
(2) A complete subject Index for all fiche in this set.

8. Identifying Revised Material

A revision to a page is defined as any change to the printed matter that existed previously. Revisions, additions and deletions are identified by a vertical line (i.e. - change bar) along the left-hand margin of the page opposite only that portion of the printed matter that was changed.

A change bar in the left-hand margin opposite the footer (i.e. - chapter/section/subject, page number and date), indicates that the text was unchanged but the material was relocated to a different page.

Example.

NOTE: Change bars are not used in the title pages, list of effective pages, or index.

9. Indexing

An alphabetically arranged subject Index follows this introduction to assist the user in locating desired information. In addition, each System/Chapter begins with an individual Table of Contents.

10. List of Effective Pages

Each System/Chapter has a List of Effective Pages preceding the Table of Contents to identify the effective revision date for each page in that chapter.

11. Warnings, Cautions and Notes

These adjuncts to the text are used to highlight or emphasize important points when necessary. Warnings call attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons. Cautions call attention to methods and procedures which must be followed to avoid damage to equipment. Notes call attention to methods which make the job easier. Warnings and Cautions shall be located directly above and Notes directly beneath the text and be in line with the paragraphs to which they apply.

12. Accident/Incident Reporting

To improve our Service and Reliability system and aid in our compliance with FAR 21.3, knowledge of all incidents and/or accidents must be reported to Piper immediately. To expedite and assist in reporting all incidents and accidents, Piper Form 420-01 has been created. See Service Letter 1041 for latest revision. This procedure is to be used by all Dealers, Service Centers and Repair Facilities.

13. Supplementary Publications

The following publications/sources provide servicing, overhaul and parts information for the PA-32-301FT/301XTC airplanes and their various components. Use them to supplement this manual.

A. Piper Publications:

	PA-32-301FT	PA-32-301XTC
(1) Parts Catalogs:	P/N 766-856	P/N 766-855
(2) Periodic Inspection Reports:	P/N 766-857	P/N 766-858
(3) Progressive Inspection Manuals (pending)	P/N 767-027	P/N 767-028

B. Vendor Publications:

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY.

(1) AIR CONDITIONING COMPRESSOR:

Vendor Address: Sanden International (USA), Inc.
601 South Sanden Blvd.
Wylie, Texas 75098
http://www.sanden.com/
PH: - (972) 442-8400
FAX: - (972) 442-8700

(2) AIR CONDITIONING EVAPORATORS AND BLOWERS:

Vendor Address: Enviro Systems, Inc.
P.O. Box 1404
Seminole, Oklahoma 74868
PH: - (405) 382-0731

(3) ALTERNATOR:

Vendor Address: Electro Systems, Inc.
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/
PH: - (888) 461-6077

(4) AUTOPILOT:

Vendor Address: S-TEC Corporation
One S-TEC Way
Mineral Wells, Texas 76067-9236
http://www.s-tec.com
PH: - (940) 325-9406

(5) BATTERY:

Vendor Address: GILL Batteries
A Division of Teledyne Continental Motors
http://www.gillbatteries.com
PH: - (800) 456-0070

(6) BRAKES AND WHEELS:

Vendor Address:	Parker Hannifin Corp Aircraft Wheel and Brake Division 1160 Center Road Avon, Ohio 44011 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 272-5464

(7) ELECTRONIC FLIGHT DISPLAY SYSTEM (EFDS)

Vendor Address:	Avidyne Corporation 55 Old Bedford Road Lincoln, MA 01773 http://www.avidyne.com/index.htm	PH - (800) 284-3963

Instructions for Continued Airworthiness

Primary Flight Display and Magnetometer/OAT:	Document No. AVPFD-174
Multifuntion Display:	Document No. AVMFD-167
Data Acquisition Unit:	Document No. AVSIU-011

(8) EMERGENCY LOCATOR TRANSMITTER:

Vendor Address:	Artex Airccraft Supplies 14405 Keil Road NE Aurora, Oregon 97002 http://www.artex.net/	PH: - (800) 547-8901

(9) ENGINE:

Vendor Address:	Textron Lycoming 652 Oliver Street Williamsport, PA 17701 http://www.lycoming.textron.com/main.html	PH - (717) 323-6181 FAX - (717) 327-7101
Overhaul Manual:	DIRECT DRIVE MODELS - P/N 60294-7	
Parts Catalog:	IO-540- ..... - K1G5, ... ENGINES - P/N PC-615 TIO-540-AH1A ENGINES - P/N PC-615-12	
Operators Handbook:	O-540, IO-540 SERIES - P/N 60297-10 TIO-540 Series - P/N 60297-23	

NOTE: The above Lycoming publications can be ordered as a set on CD-ROM from Avantext. See www.avantext.com or PH - (800) 998-8857.

(10) FIRE EXTINGUISHER (PORTABLE):

Vendor Address:	H3R Inc. 43 Magnolia Ave # 4 San Francisco, California 94123-2911 http://www.h3r.com/index.htm	PH: - (800) 249-4289

(11) FUEL PUMP:

Vendor Address:	Weldon Pumps P.O. Box 46579 640 Golden Oak Parkway Oakwood Village, Ohio 44146 http://www.weldonpumps.com/index.html	PH: - (440) 232-2282 FAX - (440) 232-0606

(12) FUEL CELLS:

Vendor Address:	Engineered Fabrics Corporation 669 Goodyear Street Rockmart, Georgia 30153-0548 http://www.kfefc.com/index.htm	PH - (770) 684-7855 FAX - (770) 684-7438

(13) HI-LOK FASTENERS AND TOOLS:

Vendor Address:	Hi-Shear Corporation 2600 Skypark Drive Torrance, California 90509	PH: - (213) 326-8110

(14) LIGHTS - NAVIGATION, STROBE, AND STANDBY/MAP LIGHTS:

Vendor Address:	Whelen Engineering Co. Inc. Route 145, Winthrop Rd. Chester, Conneticut 06412 http://www.whelen.com/	PH: - (860) 526-9504 FAX - (860) 526-2009

(15) MAGNETOS:

Vendor Address:	Slick Aircraft Products Unison Industries Attn: Subscription Dept. 530 Blackhawk Park Ave. Rockford, IL 61104 http://www.unisonindustries.com/index4.html	PH - (815) 965-4700 FAX - (815) 965-2457
Installation, Operation and Maintenance Instructions:	F1100 MASTER SERVICE MANUAL, 4300/6300 SERIES MAGNETO MAINTENANCE AND OVERHAUL MANUAL - L-1363	

(16) NAVIGATION, COMMUNICATIONS, AND GPS (NAV/COM/GPS):

Vendor Address:	Garmin International 1200 East 151ST Street Olathe, KS 66062 http://www.garmin.com	PH: - (913) 397-8200

(17) OXYGEN SYSTEM (6XT only):

Vendor Address:	Scott Aviation 2225 Erie Street Lancaster, New York 14086 http://www.scottaviation.com/	PH - (716) 683-5100

(18) PROPELLER:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Standard Practices:	Manual No. 202A	
Overhaul and Maintenance:	Manual No. 113B	
Aluminum Blade Overhaul:	Manual No. 133C	
Propeller Owner's Manual and Logbook:	Manual No. 115N	

(19) PROPELLER GOVERNOR:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Governor Maintenance:	Manual No. 130B	

(20) STANDBY ATTITUDE INDICATOR:

Vendor Address:	Mid-Continent Instruments Co., Inc. 9400 E. 34 TH Street N. Wichita, KS 67226 http://www.mcico.com/index.html	PH - (316) 630-0101 FAX - (316) 630-0723
Installation Manual and Operating Instructions:	Manual No. 9015762	

(21) STARTER:

Vendor Address:	Sky-Tec 350 Howard Clemmons Rd. Granbury, Texas 76048 http://www.skytecair.com	PH - (800) 476-7896 FAX - (817) 573-2252

(22) VACUUM PUMPS:

Vendor Address:	Aero Accessories, Inc. 1240 Springwood Avenue Gibsonville, NC 27249 http://www.aeroaccessories.com/index.html	PH - (800) 822-3200

(23) VACUUM REGULATORS:

Vendor Address:	Parker Hannifin Corp. Airborne Division 711 Taylor Street Elyria, Ohio 44035 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 382-8422

(24) VOLTAGE REGULATOR:

Vendor Address:	Electro Systems, Inc. Airport Complex P. O. Box 273 Fort Deposit, Alabama 36032 http://www.kellyaerospace.com/index.htm/	PH: - (888) 461-6077

14. Chapter/Section Index Guide

NOTE: The following GAMA Specification No. 2 standard chapters are not included in this Maintenance Manual: 26, 29, 36, 38, 49, 53, 54, 60, 72, 75, 76, and 83. These chapters are omitted because the subject system is either: not installed in these airplanes; adequately covered in vendor or other manuals; or, for ease of use, has been combined with another chapter.

GRIDS 2A22 THRU 2A24
INTENTIONALLY BLANK

A

B

C

D

E

F

G

H

I

J

L

T

V

W

GRIDS 2B6 THRU 2B20
INTENTIONALLY BLANK

CHAPTER

21

ENVIRONMENTAL SYSTEMS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 21

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE
21-List of Effective Pages	1	Jun 1/03
	2	Jun 1/03
21-Table of Contents	1	Jun 1/03
	2	Jun 1/03
21-00-00	1	Jun 1/03
	2	Jun 1/03
21-20-00	1	Jun 1/03
	2	Jun 1/03
	3	Jun 1/03
	4	Jun 1/03
21-40-00	1	Jun 1/03
	2	Jun 1/03
	3	Jun 1/03
	4	Jun 1/03
21-50-00	1	Jun 1/03
	2	Jun 1/03
	3	Jun 1/03
	4	Jun 1/03
	5	Jun 1/03
	6	Jun 1/03
	7	Jun 1/03
	8	Jun 1/03
	9	Jun 1/03
	10	Jun 1/03
	11	Jun 1/03
	12	Jun 1/03
	13	Jun 1/03
	14	Jun 1/03
	15	Jun 1/03
	16	Jun 1/03
	17	Jun 1/03
	18	Jun 1/03
	19	Jun 1/03
	20	Jun 1/03
21-50-00 (cont.)	21	Jun 1/03
	22	Jun 1/03
	23	Jun 1/03
	24	Jun 1/03
	25	Jun 1/03
	26	Jun 1/03
	27	Jun 1/03
	28	Jun 1/03
	29	Jun 1/03
	30	Jun 1/03
	31	Jun 1/03
	32	Jun 1/03
	33	Jun 1/03
	34	Jun 1/03
	35	Jun 1/03
	36	Jun 1/03
	37	Jun 1/03
	38	Jun 1/03
	39	Jun 1/03
	40	Jun 1/03
	41	Jun 1/03
	42	Jun 1/03
	43	Jun 1/03
	44	Jun 1/03
	45	Jun 1/03
	46	Jun 1/03

THIS PAGE INTENTIONALLY BLANK

CHAPTER 21 - ENVIRONMENTAL SYSTEMS

TABLE OF CONTENTS

CHAPTER 21 - ENVIRONMENTAL SYSTEMS

TABLE OF CONTENTS (continued)

GENERAL

Environmental control is available in a standard ram air configuration or one of two optional configurations.

1. Standard

   A. Ram Air Cabin Ventilation (See 21-20-00.)

   Fresh air from an inlet on the left rear fuselage is ducted into overhead cabin vents.

   B. Ram Air Heat and Defrost (See 21-40-00.)

   Fresh air from a heater inlet duct on the lower cowling passes through a shroud around a(the) muffler(s) and is ducted to the windshield and through the cabin.

2. Optional

   A. Fresh Air Blower (See 21-20-00.)

   Fresh air from an inlet on the left rear fuselage is ducted into overhead cabin vents by a two-speed blower mounted aft of the rear closeout panel.

   B. Air Conditioning (See 21-50-00.)

   If installed, the optional air conditioning system uses a two-speed blower to recirculate cabin air through an evaporator and filter located in the aft fuselage. The cooled air is then ducted back into the cabin through the overhead vents.

   A compressor mounted on the front of the engine takes heat-laden, vaporized, refrigerant from the evaporator and pumps it to a condenser mounted in the aft fuselage where it is cooled to a liquid state and pumped back into the evaporator.

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

Overhead Vent System

When the optional air conditioning system is not installed cabin ventilation and cooling is provided solely by fresh air through the overhead vent system (see 21-40-00, Figure 1).

A. Ram Air Installation (Standard)

Air enters an inlet located on the rear left side of the fuselage and is ducted through the overhead vents to the cabin. Fresh air flow is controlled by a flapper valve positioned in the duct just forward of F.S. 220. A CABIN AIR knob, located in the cockpit overhead, controls the flapper valve.

B. Overhead Vent Blower (Optional)

An optional two-speed blower will force air through the overhead vent system whenever desired. It is mounted aft of the close-out panel underneath the top of the fuselage and is connected to the overhead vent system. The vent blower draws air in from the left rear side of the fuselage and forces it through the ducting. A three position blower switch on the instrument panel controls the two speed blower.

(1) Removal

(a) Remove the access door from the aft wall of the baggage area.

(b) With the master switch off, disconnect the plug assemblies at the blower assembly.

(c) Remove the inlet and outlet hoses from the blower assembly by removing the clamps.

(d) Remove the screws, washers and nuts that secure the blower assembly to the hanger braces.

(e) Remove the screws and washers which secure the blower assembly to the retainer and hangers.

(f) Remove the blower assembly from the aircraft.

(2) Disassembly

(a) Remove the hose duct from the forward edge of the blower assembly by removing the nuts, washers and screws.

(b) Remove the cover from the blower assembly by removing the nuts, washers and screws.

(c) Remove the blower fan from the motor shaft by removing the set screw.

(d) For removal of the motor, proceed as follows:

1 Separate the plate from the motor cover by carefully drilling out the connecting rivets.

2 Cut the motor wires at the edge of the receptacle and plug and remove the wire ends from the blocks.

3 Remove the motor from the mounting plate by removing the nuts, washers and bolts.

(3) Assembly

(a) Mount motor on plate and secure with bolts, washers, and nuts. Check that motor nuts are snug and shaft spins freely.

(b) Position cover over motor plate with motor wires protruding through cover grommet.

(c) With holes in cover matching holes in motor plate, secure the two parts together with rivets.

(d) Fill any opening left where wires are pass through cover grommet with Sealant, Airframe and Window (see 91-10-00, Chart 8).

(e) Install wires in plug and receptacle.

(f) Position blower fan on motor shaft and secure with set screw.

(g) Position hose duct on blower assembly and secure with screws, washers, and nuts. Install screws with heads inside duct.

(h) Clean old sealant from all surfaces where duct attaches to blower assembly.

(i) Seal all surfaces where duct attaches to blower assembly with Sealant, Airframe and Window (see 91-10-00, Chart 8).

(4) Installation

(a) Position blower assembly in hangers and retainer. Install washers and screws.

(b) Secure blower assembly to hanger braces nuts, washers, and screws.

(c) Seal all hose joints with Arno No. C-520 wrap tape.

(d) Install inlet and outlet hoses. Secure with clamps.

(e) Ensure master switch is OFF. Connect plug and receptacles to blower.

(f) Check blower for proper operation.

(g) Install access door to aft wall of baggage area. Secure with attaching hardware.

NOTE: Pin number 1 is at pointed side of plug and receptacle.

CHART 1. BLOWER SYSTEM WIRE COLOR CODES

24 VOLT	1482-22-1 Dukes MOTOR WIRES		AIRCRAFT WIRES	
	Pin Nos.		Aircraft Harness	Pin Nos.
Ground	1	Green	AC26A	1
Low Speed	2	Red	AC8A	2
High Speed	2	Orange	AC10A	2

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

HEATING

1. Description and Operation (See Figure 1.)

CAUTION: WHEN CABIN HEAT IS OPERATED, HEAT DUCT SURFACE BECOMES HOT. THIS COULD RESULT IN BURNS IF ARMS OR LEGS ARE PLACED TOO CLOSE TO HEAT DUCT OUTLETS OR SURFACE.

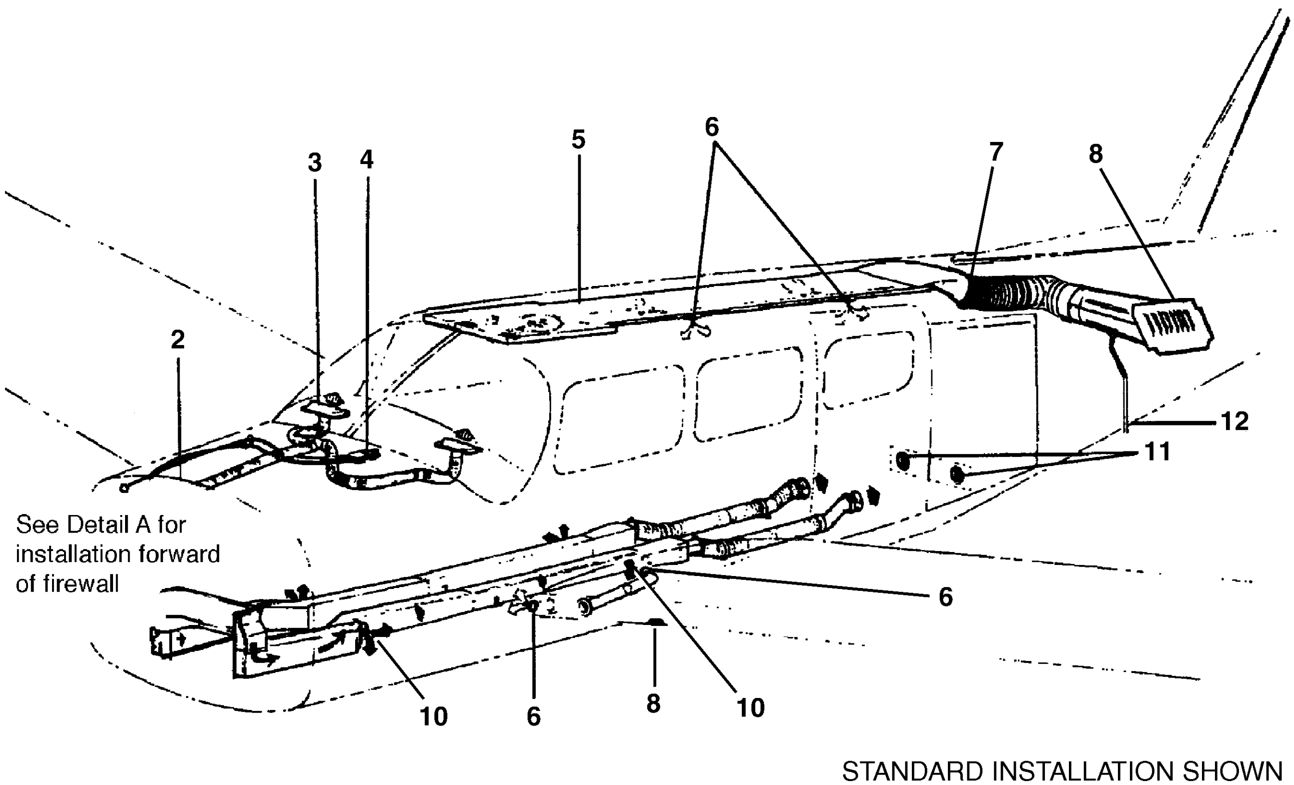
Fresh air is ducted from the heating intake vent located on the left front of the lower cowling to the heater shroud which is attached to the muffler. The heated air is then ducted to the valve box mounted on the firewall. When the valve is open, heated air enters the heat ducts located along each side of the center console. Outlets in the heat ducts are located at each seat location. Airflow to the rear seats can be regulated by controls in the heat ducts located between the front seats. The temperature of the cabin is regulated by the heater control located on the right side of the instrument panel.

Defrosting is accomplished by heat outlets located on the right and left side of the cowl cover. Heated air is ducted directly from the heater valve box to the defroster shut-off valves at the firewall and then to the defroster outlets. The airflow is regulated by a defroster control located below the heat control.

To aid air distribution, the cabin air is exhausted overboard by an outlet located on the bottom of the fuselage. Cabin exhaust outlets are located below and aft of the rear seats.

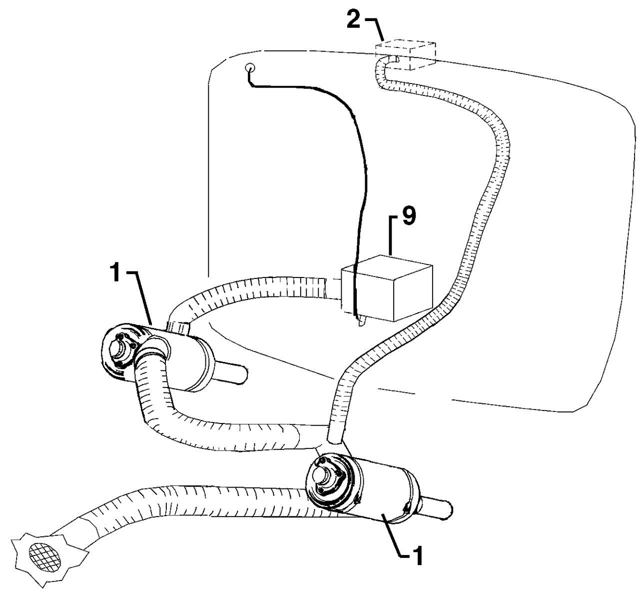
2. Heater Maintenance

If the exhaust manifold should become defective, carbon monoxide fumes may be discharged into the cabin area. Therefore it is imperative that the exhaust manifold be inspected regularly. Refer to 78-00-00 for the inspection procedure. The heater shroud must be removed in order to inspect the manifold assembly. Check the operation of the push-pull controls to insure the valve doors function properly. When the controls are pulled out, the door should be completely open to permit full airflow. When the controls are pushed in, the valves should close off all air passage and vent the air into the engine compartment.

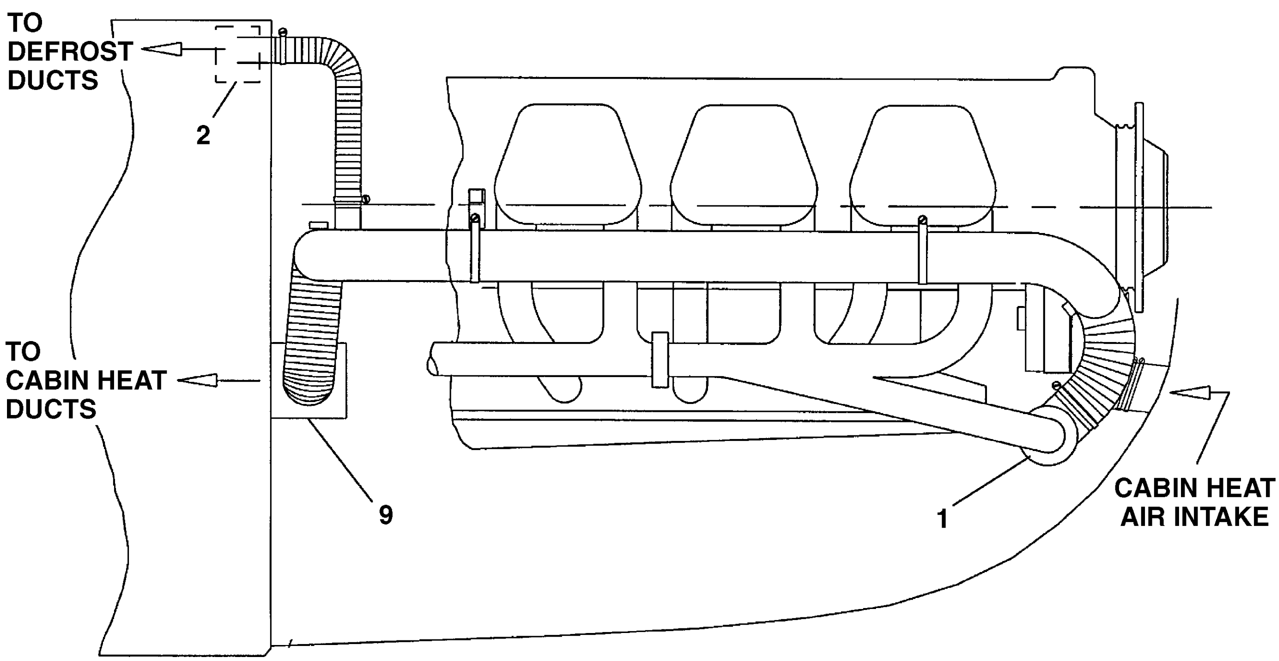


Cabin Heater, Defrosters, and Overhead Vent System
Figure 1 (Sheet 1 of 2)

1. HEATER SHROUD
2. DEFROSTER VALVE
3. DEFROSTER OUTLET
4. HEAT AND DEFROSTER AIR CONTROLS
5. OVERHEAD FRESH AIR CONTROLS
6. FRESH AIR OUTLET
7. CABIN AIR FLAPPER VALVE
8. FRESH AIR INLET
9. AIR BOX
10. CABIN HEAT OUTLET
11. CABIN AIR EXHAUST
12. DRAIN TUBE



DETAIL A (6X ONLY)



DETAIL A (6XT ONLY)

Cabin Heater, Defrosters, and Overhead Vent System
Figure 1 (Sheet 2 of 2)

THIS PAGE INTENTIONALLY BLANK

COOLING

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

1 Fresh Air (Standard) (See 21-20-00.)

When the optional air conditioning system is not installed cabin ventilation and cooling is provided solely by fresh air through the overhead vent system.

2. Air Conditioning (Optional)

A. Description and Operation (Refer to Figure 1.)

WARNING: WHEN SERVICING THE AIR CONDITIONING SYSTEM, BE SURE TO IDENTIFY THE SPECIFIC REFRIGERANT, LUBRICANT, AND COMPONENTS USED IN THE PARTICULAR INSTALLATION. THE AIR CONDITIONING SYSTEM INSTALLED IN THESE AIRPLANES USES HFC-134A REFRIGERANT.

NOTE: Operate air conditioning system at least once a month to keep system lubricated and prevent sticking valves.

This installation consists of a compressor with special mounting brackets, and an evaporator, condenser, receiver-dehydrator, circulating fan, high pressure switch, and related plumbing.

The compressor is a Sanden five cylinder piston type mounted opposite the alternator at engine front. A V-belt connected to engine ring gear drives the compressor through a magnetic clutch. The evaporator filters, dehumidifies, and cools air. The evaporator is mounted in a fabricated housing with the receiver/dehydrator, circulating fan, high pressure switch, and related plumbing which is in the rear fuselage, aft of baggage area closeout panel. The condenser is mounted on a door in the bottom of the fuselage section which is designed to allow extension into airstream during system operation. Electrically activated, the door extends when the system is ON and retracts when the system is OFF.

The system is designed not to increase aerodynamic drag during take-off and other maximum power operations. A micro-switch connected to the throttle de-clutches the compressor and retracts the condenser door automatically when full power is applied. To ensure maximum performance, however; the air conditioner is placarded to be switched off for takeoff.

The air conditioning system is a recirculating, independent unit. It filters, dehumidifies, and cools air as air cycles through evaporator. The unit operates from controls mounted on right side instrument panel. The air conditioning master switch has two positions, ON-OFF. If AIR COND position is selected, the compressor clutch engages, the condenser scoop opens, and the circulating fan is turned on. Temperature is controlled by temperature control selector thermostat. A two position fan switch (LOW-HIGH) operates the blower. The fan may be operated to circulate air without using air conditioning unit.

A pressure switch protects the system and automatically controls condenser maximum head pressure by temporarily declutching the compressor if pressure becomes excessively high. The air conditioning control switch, a fan control switch to govern cold air velocity, and a temperature control are on aircraft instrument panel adjacent to heater and defroster levers.

The air conditioning system in these airplanes uses HFC-134a. Refrigerant enters the compressor as a vapor. The compressor pressurizes the heat laden vapor until the vapor temperature becomes warmer than the outside air temperature. The compressor then pumps the vapor to the condenser where the refrigerant is cooled and changes to liquid. The liquid now passes to the receiver/dehydrator. The receiver/dehydrator filter removes moisture and ensures a steady flow of liquid refrigerant (which is visible in the receiver/dehydrator's sight glass) into the evaporator through the expansion valve. The expansion valve is a temperature controlled metering valve which regulates the flow of liquid refrigerant to evaporator. The evaporator enables the liquid refrigerant to absorbs heat from the outside air passing over coils, converting it back to a vapor. From the evaporator, heat laden refrigerant in a vapor state returns to compressor, and the cycle repeats.

B. Troubleshooting

Troubles peculiar to air conditioning system components are listed in Chart 1, with probable causes, and suggested remedies. Correct trouble and check entire system for security and components operation. The following definitions apply:

(1) High Side: Consists of all lines and components between the compressor outlet and the expansion valve. It includes the condenser and receiver sight gauge.

(2) Low Side: Consists of all lines and components between the expansion valve and the compressor inlet. It includes the evaporator.

(3) Service Ports: Located on evaporator unit, and are used for evacuating and charging the system. The port in the short line between the receiver and the expansion valve is the high side service port. The other port, located nearby, is the low side service port. The Schrader valves used in these ports are of the quick-disconnect type. The service hose couplers used in conjunction with this type of valve have a manually operated valve built in. After attachment, this coupler valve must be manually turned clockwise (in), to depress the Schrader valve spring and open it.

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS REQUIRE USE OF A COLLECTION SYSTEM WHEN EVACUATING REFRIGERANT FROM AIR CONDITIONER.

NOTE: Check all environmental regulations for your local area before servicing air conditioning system.

CHART 1 (Sheet 1 of 5)
TROUBLESHOOTING AIR CONDITIONING SYSTEM

Trouble	Cause	Remedy
High discharge pressure.	Refrigerant overcharge.	Purge excess refrigerant.
	Air in system.	Check for leaks. Bleed charge from system. Evacuate and recharge system.
	Overheated condenser due to blocked air passage.	Clean bugs and dirt from condenser fins. Straighten bent fins.
	Flooded evaporator indicated by heavy frosting on suction line and compressor suction service valve.	Check capillary bulb is securely clamped to suction line. If capillary bulb is OK, replace expansion valve.
	Restriction in liquid line from condenser.	Check for kinked hoses and clogged filter.
Low discharge pressure.	Refrigerant undercharge. Sight glass shows bubbles or foam.	Add refrigerant until bubbles disappear. Check system for leaks.
	Damaged compressor valves or dirt under valves.	Replace compressor.
	Damaged compressor. Worn or broken piston or piston rings.	Replace compressor.
Low suction pressure accompanied by icing of evaporator.	Low air supply through evaporator.	Repair blower or blower motor. Clean stoppage in air ducts.
	Very dirty evaporator fins and coils.	Clean and flush with water.
Low suction pressure. (Evaporator not cold enough.) Suction gauge reads vacuum indicating evaporator lacks refrigerant.	Refrigerant undercharge. Moisture freezing in expansion valve. Valve shows frost.	Add refrigerant. Install new dryer. Evacuate and recharge.
	Expansion valve inlet screen clogged. Inoperative expansion valve. Valve stuck closed or capillary bulb has lost charge.	Remove screen. Clean with solvent and replace. Warm capillary by holding in hand. If suction pressure does not change replace expansion valve.
	Restriction in liquid line. Restriction will show frost.	Locate restriction and repair.

CHART 1 (Sheet 2 of 5)
TROUBLESHOOTING AIR CONDITIONING SYSTEM

Trouble	Cause	Remedy
High suction pressure.	Capillary bulb clamp loose on suction line. Suction line shows frost.	Clean contact surfaces of suction line and cap bulb. Tighten clamp.
	Expansion valve not closing. Evaporator flooded. Suction line frosted to compressor.	Replace expansion valve.
	Compressor drive belt slipping.	Adjust belt tension.
	Magnetic clutch slipping.	Check electrical circuit for proper voltage to clutch coil. Clean oily clutch surfaces.
	Leaking or broken compressor.	Replace compressor valves.
Condenser door will not close when air conditioner switch is in OFF position.	Faulty K-2 relay.	Replace relay.
System does not cool.	**If electrical:**	
	Blown fuse in control head.	Replace fuse.
	Open circuit breaker.	Set circuit breaker.
	Broken or disconnected electrical wire.	Check all terminals for loose connections. Check wiring for hidden breaks.
	Broken or disconnected ground wire.	Check ground wire is not loose, broken, or disconnected.
	Clutch coil burned out or disconnected.	Verify voltage to clutch. Replace if inoperative.
	Thermostat sensing element defective.	Check thermostat and cabin comfort control panel.
	Blower motor disconnected or burned out motor.	Verify voltage to blower. Repair or replace if inoperative.

CHART 1 (Sheet 3 of 5)
TROUBLESHOOTING AIR CONDITIONING SYSTEM

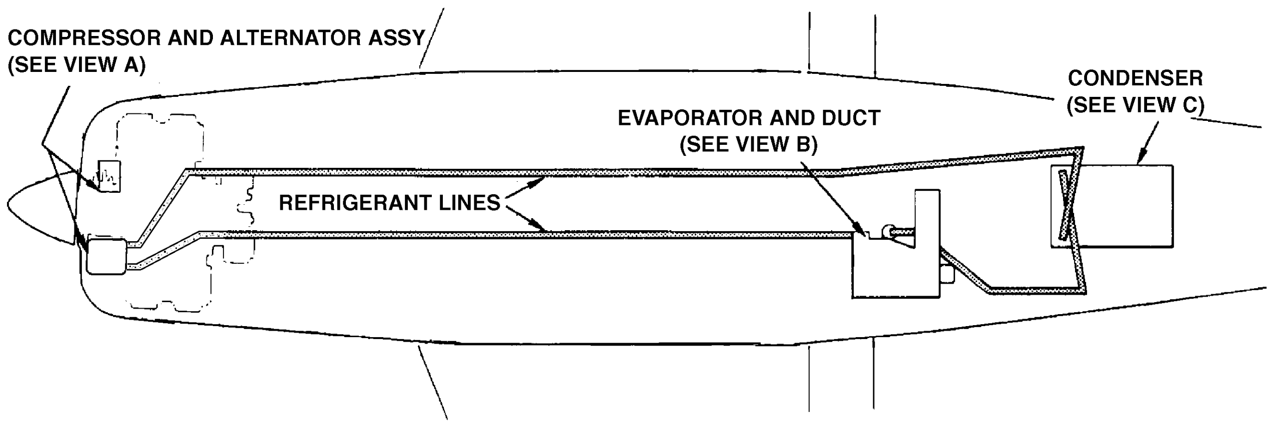
Trouble	Cause	Remedy
System does not cool. (cont.)	**If mechanical:**	
	Loose or broken drive belt.	Replace drive belts and tighten to specifications.
	Compressor partially or completely frozen.	Remove compressor. Service or replace.
	Expansion valve stuck in open position.	Replace expansion valve.
	If refrigeration:	
	Broken refrigerant line.	Examine all lines for evidence of breakage by external stress or rubbing wear.
	Leak in system.	Evacuate system, apply static charge, leak test system, and repair leak as necessary.
	Compressor shaft seal leaking.	Replace compressor.
	Clogged screen or screens in receiver dehydrator or expansion valve; plugged hose or coil.	Repair as necessary.
System cooling inadequate.	**If electrical:**	
	Blower motor operation sluggish.	Remove blower motor for service or replacement.
	If mechanical:	
	Compressor clutch slipping.	Remove clutch assembly for service or replacement. Check clutch airgap and coil.
	Obstructed blower passage.	Examine passage for obstruction. Correct as necessary.
	Insufficient air circulation over condenser coils; fins clogged with dirt or bugs.	Clean condenser coils.
	Clogged evaporator filter.	Clean with solvent.

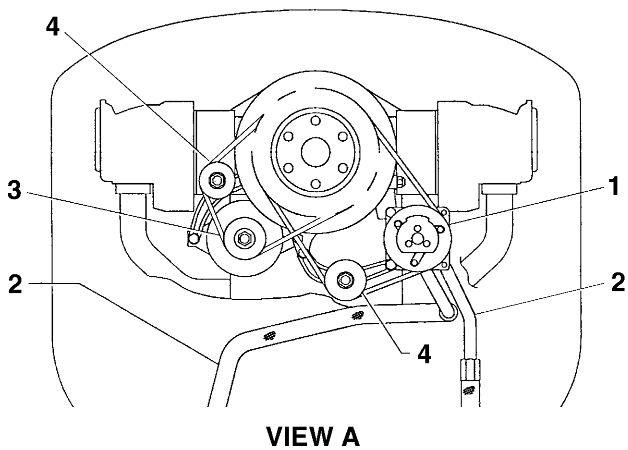
CHART 1 (Sheet 4 of 5)
TROUBLESHOOTING AIR CONDITIONING SYSTEM

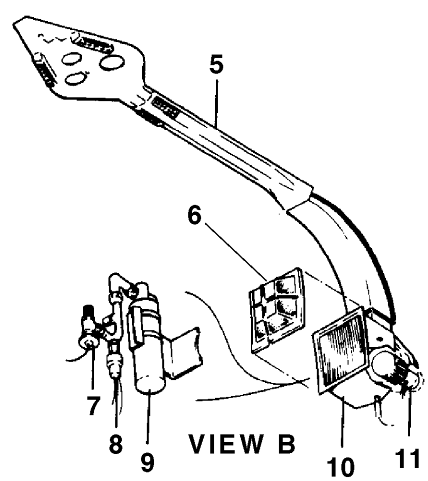
Trouble	Cause	Remedy
System cooling inadequate. (cont.)	**If refrigeration:**	
	System refrigerant low.	Recharge system until bubbles disappear in receiver dehydrator and gauge readings stabilize to specifications.
	Clogged screen in expansion valve.	Purge system, replace expansion valve.
	Expansion valve thermal bulb has no charge.	Purge system, replace expansion valve.
	Clogged receiver dehydrator screen.	Purge system, replace receiver dehydrator.
	Excessive moisture in system.	Purge system, replace receiver dehydrator.
	Air in system.	Purge, evacuate, and charge system. (Replace receiver dehydrator.)
Excessively noisy system.	**If electrical:**	
	Defective winding or connection in compressor clutch coil.	Replace or repair as necessary.
	If mechanical:	
	Loose or worn drive belts, crankshaft pulley, or idler pulley or bearing.	Tighten or replace as required.
	Engine components such as: alternator, water pump, valves, timing or mounts.	Check.
	Compressor mounting bolts or brackets - broken or loose.	Check, repair, replace.
	Compressor oil level low.	Fill with proper amount of specified oil.
	Compressor failure.	Check shaft turning smoothness. Remove compressor for service or replacement.
	Magnetic clutch failure.	Check airgap, clutch pulley, front plate, coil, and bearing. Adjust, repair, or replace, as required.

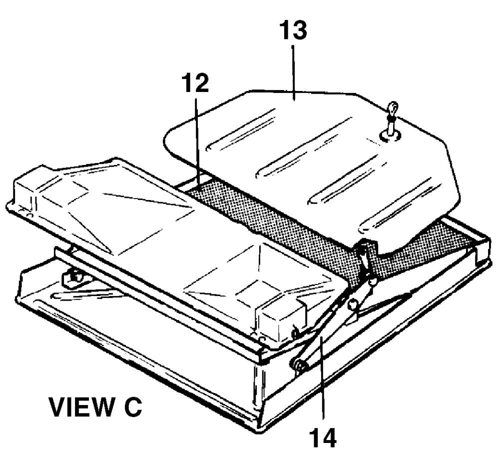
CHART 1 (Sheet 5 of 5)
TROUBLESHOOTING AIR CONDITIONING SYSTEM

Trouble	Cause	Remedy
Excessively noisy system. (cont.)	**If refrigeration:**	
	Excessive system charge.	Remove excess refrigerant until high pressure gauge drops within specifications.
	Low system charge.	Check system for leaks. Recharge system.
	Excessive moisture in system.	Replace dehydrator, purge, evacuate, and recharge system.









1. COMPRESSOR
2. REFRIGERANT LINES
3. ALTERNATOR
4. PULLEYS
5. DUCT ASSEMBLY
6. EVAPORATOR FILTER AND COVER
7. EXPANSION VALVE
8. PRESSURE SWITCH
9. RECEIVER DEHYDRATOR
10. EVAPORATOR
11. BLOWER MOTOR
12. CONDENSER
13. COVER ASSEMBLY
14. BELLCRANK ASSEMBLY

Air Conditioning Installation
Figure 1

3. Servicing Cooling System

A. Malfunction Detection

NOTE: If the cooling system has leaked refrigerant or is discharged, the compressor oil level must be checked.

Detection of system malfunction largely depends on the mechanic's ability to interpret gauge pressure readings into system problems. A system operating normally will have low side gauge pressure reading that will correspond with the temperature of the refrigerant evaporating, allowing for a few degrees temperature rise due to loss in tube walls and fins. The high side will have a gauge pressure that will corresponds with the temperature of the refrigerant condensing in the condenser, allowing for a few degrees temperature drop due to loss in tube walls and fins.

Any deviation from that which is normal indicates a malfunction within the system due to faulty control device, obstruction, defective part, or improper installation.

Detection of system malfunction is made easier with knowledge of the relationship between temperature and pressure of refrigerant HFC134a. Refer to Chart 2 for specific values.

NOTE: Gauge readings are about one inch mercury or 1/2 psi higher than chart reads for each 1000 feet elevation above sea level.

Actual air temperature of air passing over the evaporator coils will be several degrees warmer allowing for a temperature rise caused by the loss in the fins and tubing of the evaporator.

The importance of a seasonal check up of the air conditioning system should be brought to the attention of the customer whenever possible. A thorough check of the system performed in a methodical manner will reveal trouble the customer is often not aware of. Locating and repairing the trouble early will usually result in savings to the customer both in time and additional troubles that too often result from neglect.

A performance test of the system is the only positive way in which the complete system can be checked for efficient operation. The air conditioning system should be given this test before work is begun on the system whenever possible. However, if the system is completely inoperative, repairs must be performed before the system can be properly tested. The test can uncover further work that must be performed before the system is brought to its full operating efficiency. The performance test should always be performed after repair work has been done and before the airplane is released to the customer. The serviceman performing this test carefully will ensure that the repairs have been properly performed and that the system will operate satisfactorily.

The performance test, when properly performed includes a thorough examination of the outside of the system as well as the inside. Many related parts are overlooked because it is felt they are of no bearing on the operating efficiency of the unit. For this reason, a thorough visual inspection of the complete system should be performed, followed by an operating inspection of the system.

CHART 2
TEMPERATURE VS. PRESSURE

Refrigerant HFC134a Evaporator Pressure Gauge Reading psi	Refrigerant HFC134a Evaporator Temperature °F
-5	-27
0	-15
2	-9
4	-4
6	0
8	4
10	7
12	11
14	14
16	17
18	20
20	22
22	25
24	28
26	30
28	33
30	35
32	37
34	39
36	41
38	43
40	45
42	47
44	49
46	51
48	53
50	54
55	58
60	62
65	66
70	69

B. Special Servicing Procedures

The air conditioning system should be serviced by a qualified shop with trained personnel. The following procedures and precautions should be observed.

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS REQUIRE THAT AIR CONDITIONING SYSTEM REPAIRS BE ACCOMPLISHED BY A QUALIFIED SHOP WITH APPROPRIATELY TRAINED PERSONNEL.

The efficiency of this system depends upon the pressure-temperature relationship of pure refrigerant. As long as the system contains only pure refrigerant plus a specified amount of compressor oil (which is mixed with the refrigerant), it is considered to be chemically stable. Foreign materials within the system will affect the chemical stability, contaminate the system, and decrease its efficiency.

(1) Refrigerant Safety Precautions:

WARNING: REFRIGERANT HFC-134A IS ODORLESS AND COLORLESS IN EITHER THE LIQUID OR GASEOUS STATE. REFRIGERANT FOR CHARGING REFRIGERATION SYSTEMS IS SUPPLIED IN PRESSURIZED CONTAINERS (APPROX. 70 PSI AT 70°F) IN LIQUID FORM. SINCE THIS MATERIAL IS ESSENTIALLY INERT AT ROOM TEMPERATURES THE DANGERS ARE PRIMARILY ASSOCIATED WITH THE PRESSURE AND THE REFRIGERATION EFFECTS OF THE RELEASE AND SUBSEQUENT EVAPORATION OF THIS PRESSURIZED LIQUID.

WARNING: WEAR SUITABLE EYE PROTECTION WHEN HANDLING REFRIGERANT DUE TO THE POSSIBILITY OF FREEZING OF THE EYE IF CONTACTED BY ESCAPING LIQUID REFRIGERANT. IF LIQUID REFRIGERANT DOES STRIKE THE EYE, THE FOLLOWING ACTIONS SHOULD BE TAKEN:

1 DO NOT RUB THE EYE.
2 Splash large quantities of cool water into the eye to raise the temperature.
3 Tape on an eye patch to avoid the possibility of dirt entering the eye.
4 Rush to a physician or hospital for immediate professional aid.
5 DO NOT ATTEMPT TO TREAT IT YOURSELF.

WARNING: IF LIQUID REFRIGERANT STRIKES THE SKIN, FROSTBITE CAN OCCUR. TREAT WITH COOL WATER AND PROTECT WITH PETROLEUM JELLY.

WARNING: DO NOT DISCHARGE LARGE QUANTITIES OF REFRIGERANT INTO CLOSED ROOMS. IT MAY DISPLACE MOST OF THE AIR IN THE ROOM AND THIS COULD CAUSE OXYGEN STARVATION. GASEOUS REFRIGERANT IS HEAVIER THAN AIR AND FLOWS TO THE BOTTOM OF A CONTAINER.

WARNING: DO NOT APPLY DIRECT FLAME OR OTHER HIGH HEAT SOURCE TO A REFRIGERANT CONTAINER DUE TO THE HIGH PRESSURES WHICH WILL RESULT. IF ANY HEATING IS DONE TO REFRIGERANT CONTAINERS THE CONTAINER PRESSURE SHOULD BE MONITORED AND KEPT BELOW 150 PSI.

(2) System Servicing Precautions:

WARNING: DISCHARGE SYSTEMS SLOWLY TO PREVENT THE ESCAPE OF LIQUID REFRIGERANT AND THE LOSS OF THE LUBRICATING OIL.

NOTE: The term "Discharge," as used throughout this section, in no sense implies or suggests discharging refrigerant to atmosphere. In all cases when discharging, an enviormentally approved refrigerant recovery station is to be used.

WARNING: DO NOT LEAVE SYSTEMS OPEN TO THE ATMOSPHERE WHEN DISCHARGED. MOISTURE AND OTHER CONTAMINATION MAY ENTER AND DAMAGE OPEN SYSTEMS.

NOTE: When HFC-134a comes in contact with moisture it absorbs it into the system, which will lead to system failure.

WARNING: USE ONLY APPROVED REFRIGERATION OIL IN THE COMPRESSOR:

-- POLYALKYLENE GLYCOL (PAG) FOR HFC-134A SYSTEMS

IF ANY DOUBT EXISTS ABOUT THE CLEANLINESS OF THE COMPRESSOR OIL, REPLACE IT WITH NEW OIL.

WARNING: NEVER INTRODUCE ANYTHING BUT PURE REFRIGERANT AND THE APPROPRIATE REFRIGERANT OIL INTO A SYSTEM.

WARNING: KEEP REFRIGERANT OIL CONTAINERS TIGHTLY SEALED AND CLEAN TO PREVENT ABSORPTION OF MOISTURE OR OTHER CONTAMINATION.

WARNING: NEVER REUSE OIL REMOVED FROM THE SYSTEM -- DISCARD IT.

CAUTION: WHEN LOCTITE REFRIGERANT SEALANT HAS BEEN USED ON A JOINT IT MUST BE HEATED TO 400°F PRIOR TO DISASSEMBLY. LOCTITE MUST BE USED TO SEAL ANY PIPE THREADS IN THE SYSTEM LINES.

CAUTION: REPLACE THE RECEIVER-DEHYDRATOR ASSEMBLY ON ANY SYSTEM WHICH HAS BEEN OPERATING WITH A LEAK ALLOWING AIR TO ENTER THE SYSTEM. IF A RECEIVER-DEHYDRATOR IS LEFT OPEN TO THE ATMOSPHERE IT SHOULD BE REPLACED DUE TO THE LOSS OF EFFECTIVENESS OF THE DRYING COMPOUND IT CONTAINS.

CAUTION: A NEW RECEIVER-DEHYDRATOR SHOULD BE OPENED AND CONNECTED TO THE SYSTEM ONLY WHEN READY TO CHARGE THE SYSTEM WITH REFRIGERANT.

CAUTION: RECOMMENDED TORQUE VALUES MUST BE USED ON ALL FLARE FITTING AND O-RING JOINTS. SEE CHART 3.

CAUTION: IF AIR CONDITIONING REFRIGERANT LINES OR SYSTEM IS OPENED, LINES AND FITTINGS MUST BE CAPPED AND SEALED IMMEDIATELY TO PREVENT DIRT AND OTHER CONTAMINANTS FROM ENTERING THE SYSTEM. (DO NOT PUT A PLUG INTO THE HOSES OR FITTINGS.)

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS PROHIBIT THE RELEASE OF REFRIGERANT INTO THE ATMOSPHERE. SPECIAL EQUIPMENT IS REQUIRED WHEN TESTING, DISCHARGING, OR CHARGING THE SYSTEM.

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS REQUIRE THAT AIR CONDITIONING SYSTEM REPAIRS BE ACCOMPLISHED BY A QUALIFIED SHOP WITH APPROPRIATELY TRAINED PERSONNEL.

CHART 3
RECOMMENDED TORQUE SPECIFICATIONS

ALUMINUM TUBING		
Metal Tube O.D.	**Thread and Fitting Size**	**Ft./Lb.**
1/4	7/16	5-7
3/8	5/8	11-13
1/2	3/4	15-20
5/8	7/8	21-27
3/4	1-1/16	28-33

FLARE CONNECTIONS			O-RING CONNECTIONS		
Tube OD	**Thread size**	**Ft./Lb.**	**Tube OD**	**Thread size**	**Ft./Lb.**
3/8	5/8	18-20	3/8	5/8	11-13
1/2	3/4	36-39	1/2	3/4	15-20
5/8	7/8	52-57	5/8	7/8	21-27

C. Servicing the System with a Charging Stand (Ref. PPS 50003-3, Rev. C)

CAUTION: MINERAL OIL AND PAG ARE NOT COMPATIBLE. USE A SEPARATE MANIFOLD TEST SET AND / OR TEST/CHARGING STAND AND RECOVERY SYSTEM FOR EACH REFRIGERANT TYPE.

CAUTION: USE RECOVERY UNIT SPECIFICALLY DESIGNED FOR THE TYPE OF REFRIGERANT USED IN THE AIRCRAFT SYSTEM. UNINTENDED AFFECTS MAY OCCUR IF REFRIGERANTS ARE COMBINED.

(1) Discharging (Bleeding/Purging) the System (with a Robinair 34700 or similar charging stand/recovery station) (see Figures 2 and 5) (Required only if system contains refrigerant.)

CAUTION: APPLIES TO ROBINAIR 34700 OR SIMILAR CHARGING/RECOVERY STATION. SEE OPERATOR'S MANUAL OF STATION BEING USED FOR DETAILED INSTRUCTIONS FOR DISCHARGING SYSTEM.

NOTE: The term “Discharge,” as used throughout this section, in no sense implies or suggests discharging refrigerant to atmosphere. In all cases when discharging, an enviormentally approved refrigerant recovery station is to be used.

(a) Gain access to service valves by removing rear closeout panel in cabin.

(b) Remove protective caps from service valves.

(c) Connect high side (red) hose to air conditioner high side service valve. On systems equipped with quick disconnect connections, open coupler valve.

(d) Connect low side (blue) hose to air conditioner low side service valve. On systems equipped with quick disconnect connections, open coupler valve.

(e) Check the low side gauge (GAUGE 1) and high side gauge (GAUGE 2) to determine that there is pressure in the system. If there is no pressure, there is no refrigerant in the system to recover.

(f) Check that the oil drain valve is closed.

(g) Open both the low side and high side valves on control panel.

(h) Open the red GAS (vapor) valve and the blue LIQUID valve on the charging station's refrigerant tank.

(i) Slowly open the oil drain valve to see if system oil separator contains oil. If it does, let oil drain into the oil drain bottle (located at the bottom of the rear side of the charging station) until separator is empty.

(j) Close the oil drain valve. Dispose of collected oil in an environmentally accepted manner. Return collection bottle to its place on the charging stand.

(k) Plug unit into a proper voltage outlet. Turn MAIN POWER switch ON.

(l) Press the RECOVER key on charging station keypad.

(m) To assure complete recovery of refrigerant:

1 Wait 5 minutes. Observe pressure gauges for a rise above zero.

2 If a rise occurs, press the HOLD/CONT key.

3 Repeat as necessary until system maintains pressure for two minutes.

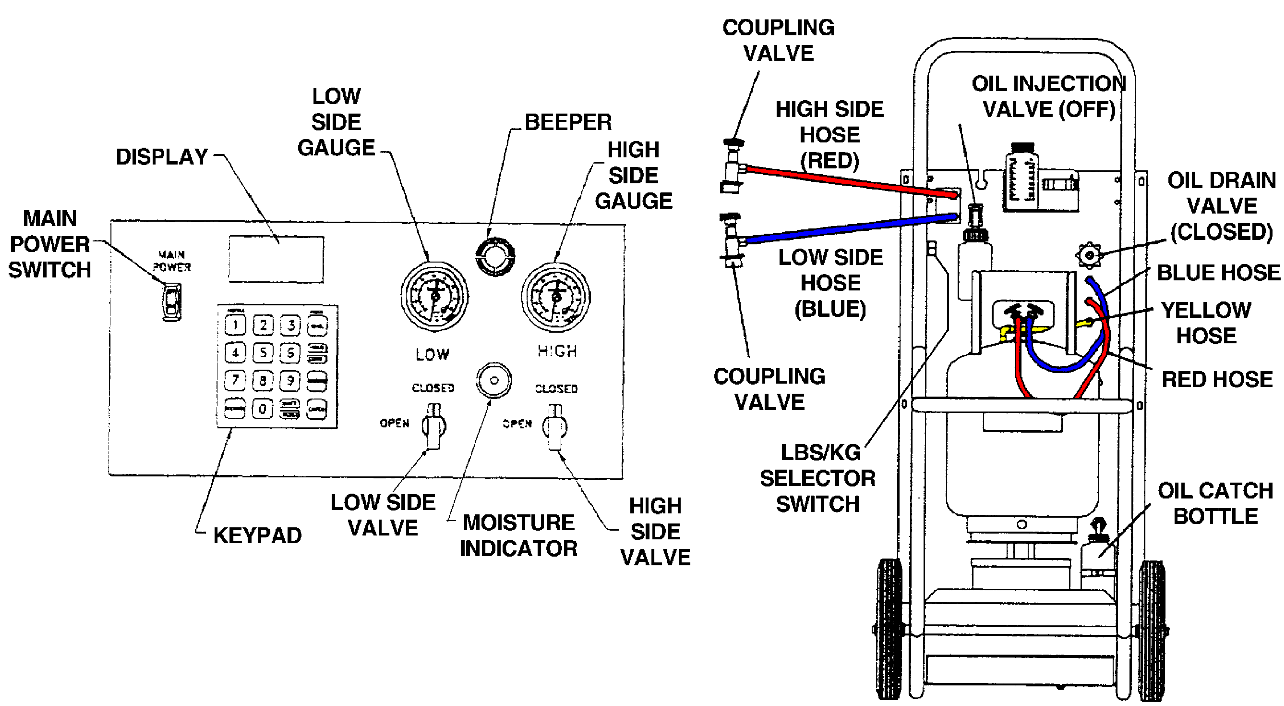
(n) Slowly open oil drain valve. Drain oil into the oil catch bottle. When all recovered oil has been completely drained, close oil drain valve.

NOTE: Drain oil separator after each job. Display will indicate OIL (OUNCES) or OIL (GRAMS) as a reminder.

(o) Measure the amount of oil in the catch bottle. The same amount of new oil must be added to the system before charging the system.

(p) To enter diagnostic mode, simultaneously press the SHIFT/RESET and ENTER keys. To display amount of refrigerant recovered by the unit, press the 3 key. The panel display will read the amount of recovered refrigerant in pounds or kilograms.

(q) Simultaneously press the SHIFT/RESET and ENTER keys to clear internal counter. Press SHIFT/RESET to return to the main menu.



Robinair 34700 Charging Stand
Figure 2

(2) Leak Detection (refer to Figures 2 and 3)

When using a charging stand, a leak may be located as follows:

(a) Ensure that aircraft and/or ground power is OFF.

(b) Close all valves on the charging stand.

(c) Remove the protective caps from the high and low side service ports on the evaporator.

(d) Connect the blue and red hoses to the service ports as shown in Figure 5.

(e) Proceed following the instructions in either paragraph (f) or (g), below.

(f) Using gaseous dry nitrogen:

1 Remove the pressure switch located on the evaporator assembly.

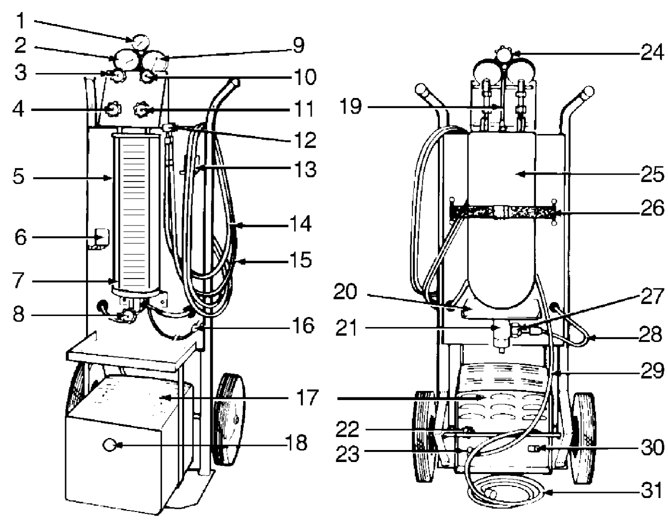
2 Connect a regulated (0-300 psig) gaseous dry nitrogen source to the pressure switch port on the evaporator assembly.

3 Slowly pressurize the system to 200 psig max. with nitrogen and turn off the nitrogen source.

4 Monitor pressure on the charging station gauge for 20 minutes. A leak free system will maintain the 200 psig pressure for 20 minutes.

5 If there is no pressure drop for 20 minutes, slowly release nitrogen pressure and disconnect the nitrogen source from the evaporator assembly. Re-install the pressure switch, lubricating the threads with Retro-fix CCI ESTER-25065 oil (P/N 197-511). Proceed to step (i).

1. CYLINDER PRESSURE GAUGE
2. COMPOUND GAUGE
3. VALVE, LOW PRESSURE CONTROL
4. VALVE, VACUUM CONTROL
5. CHARGING CYLINDER
6. BRACKET
7. SIGHT GLASS
8. CYLINDER BASE VALVE
9. HIGH PRESSURE GUAGE
10. VALVE, HIGH PRESSURE CONTROL
11. VALVE, REFRIG. CONTROL
12. CHARGING LINE HOSE HOLDER
13. BRACKET
14. LOW PRESURE CHARGING LINE
15. HIGH PRESSURE CHARGING LINE
16. HEATING ELEMENT PLUG
17. VACUUM PUMP
18. OIL FILL LOCATION
19. NECK ASSEMBLY
20. REFRIGERANT DRUM SUPPORT
21. REFRIGERANT DRUM VALVE
22. VACUUM PUMP VALVE
23. VACUUM PUMP EXHAUST PORT
24. TOP CYLINDER VALVE
25. REFRIGERANT DRUM
26. WEB STRAP
27. REFRIGERANT DRUM REDUCER
28. CHARGING CYLINDER HOSE
29. VACUUM PUMP INTAKE HOSE
30. VACUUM PUMP SWITCH
31. VACUUM PUMP POWER CORD



Kent Moore J23500 Charging Stand
Figure 3

6 If there is a pressure drop, find leak(s) by applying a soap solution to all connections.

7 Tighten/re-tighten fittings as necessary to stop leak(s). If leaks are due to damaged or worn components, proceed with refrigerant recovery/system discharge, perform repairs or component replacement and repeat leak detection procedure.

(g) Using HFC-134a refrigerant:

1 Ensure that there is at least one pound of refrigerant in the charging cylinder.

2 Open the high pressure control valve and the refrigerant control valve on the charging stand. Allow one pound of refrigerant to enter the system.

3 Close the high pressure control valve and the refrigerant control valve.

CAUTION: IT IS RECOMMENDED THAT A THICK SOLUTION OF SOAP AND WATER BE USED TO CHECK FOR LEAKS INSTEAD OF THE PROPANE LEAK DETECTOR THAT IS PROVIDED WITH SOME BRANDS OF CHARGING STANDS.

4 Locate leak(s) using an electronic leak detector designed to detect HFC134a refrigerant. Or, use soap and water in a thick solution.

5 If no leaks are found, proceed to step (h).

6 Tighten/re-tighten fittings as necessary to stop leak(s). If leaks are due to damaged or worn components, proceed with refrigerant recovery/system discharge, perform repairs or component replacement and repeat leak detection procedure.

(h) Recover remaining refrigerant from system using the Robinair 34700 (or other approved) charging station (see Discharging the System, above). Any quantity of oil recovered from aircraft must be measured and an equal amount of new oil (i.e. - PAG with HFC134a) must be added to system before recharging.

(i) Evacutate the system, see below.

(3) Evacuating the System

NOTE: Perform a Leak Detection check, above, before evacuting the system.

If the system has been operated in a discharged condition or anytime the system has been open to atmospheric pressure, the receiver-dehydrator must be replaced and the system evacuated to remove any trapped air and moisture which has entered it. A vacuum pump capable of pulling 29 inches of mercury or better should be used. As the pressure in the air conditioning system is lowered, the boiling temperature of the water (moisture) that may be present is also lowered. This then forces any moisture, in the form of water vapor, out of the system. Chart 4 demonstrates the effectiveness of moisture removal under a given vacuum.

CHART 4
SYSTEM VACUUM

	System Vacuum	Temperature °F
COMPOUND GAUGE READING IN INCHES OF MERCURY VACUUM	27.95	101
	28.74	84
	29.53	52
	29.76	29
	29.84	15
	29.88	1

NOTE: Compound gauge reading will be approximately one inch lower, numerically, for each 1000 feet elevation above sea level.

(a) Using a Kent Moore J23500 or similar charging stand: (See Figure 3)

1 Ensure that aircraft and/or ground power is OFF.

2 Close all valves on the charging stand.

3 Remove closeout panel at the rear of the cabin to gain access to the service valves.

4 Remove protective caps from the high and low side service ports on the evaporator.

5 Remove the protective cap from the vacuum pump outlet.

6 Connect the blue and red hoses to the service ports.

7 Start the vacuum pump.

8 Open the valve on the vacuum pump. Open the low pressure control valve and the vacuum control valve on the charging stand.

9 After five minutes of pump operation, the high pressure gauge should indicate slightly below zero.

a If it doesn't, stop the pump and eliminate the blockage in the system replacing the faulty component, then repeat steps (1)-(9).

b If it does, open the high pressure control valve on the charging stand and continue to evacuate the system.

10 Operate the vacuum pump for fifteen minutes, or until the compound gauge indicates 24 to 26 in. Hg. whichever occurs first.

11 Close the low pressure control valve and the high pressure control valve on the charging stand. Stop the vacuum pump and observe the compound gauge. If the gauge rises at a rate faster than 1 in. Hg. in 5 minutes, there is a leak in the system. Locate and fix the leak. Repeat the evacuation steps above.

12 Open the low pressure control valve and the high pressure control valve on the charging stand. Continue pumping and hold the system pressure below 26 in. Hg. for a minimum of 30 minutes. All the pumping time specified above may be included in the 30 minutes provided that no leaks or blockages are noted, and provided that the system is not opened by removal or disconnection of components.

13 Close the low pressure control valve, the high pressure control valve and the vacuum control valve. Stop the vacuum pump and perform the charging procedure immediately.

(b) Using a Robinair 34700 or similar charging/recovery stand: (See Figure 2)

1 Ensure that aircraft and/or ground power is OFF.

2 Close all valves on charging stand.

3 Remove closeout panel at rear of cabin to gain access to service valves.

4 Remove protective caps from the high and low side service ports on the evaporator.

5 Connect the blue and red hoses to the service ports (ref. Figure 5), on systems equipped with quick disconnect connections, open coupler valves.

6 Open blue (low side) valve (1) on unit's control panel.

7 Open both the red GAS (vapor) valve and the blue LIQUID valve on the tank (ref. Figure 5).

8 Program the length of evacuation time.

a Press the VACUUM key on control panel key pad.

b Display will show unit is in VACUUM mode.

c Refer to operator's manual for further detail.

9 Enter the required time in minutes and seconds (30:00 minutes minimum) by pressing appropriate keys and then ENTER on keypad. The display will show selected time in minutes and seconds. Example: one hour and fifteen minutes (1:15) would be entered as 7500. The display will show 75:00. Thirty minutes is entered as 3000. the display will show 30:00.

10 To start the vacuum pump press the VACUUM key on keypad again.

11 Vacuum sequence will continue for the programmed time. Digital display will then show CPL, indicating that the evacuation is completed.

12 If, after 5 minutes of pump operation, the RED gauge does not indicate a little below zero:

a Stop the pump by pressing the “1” key or the SHFT/RESET key.

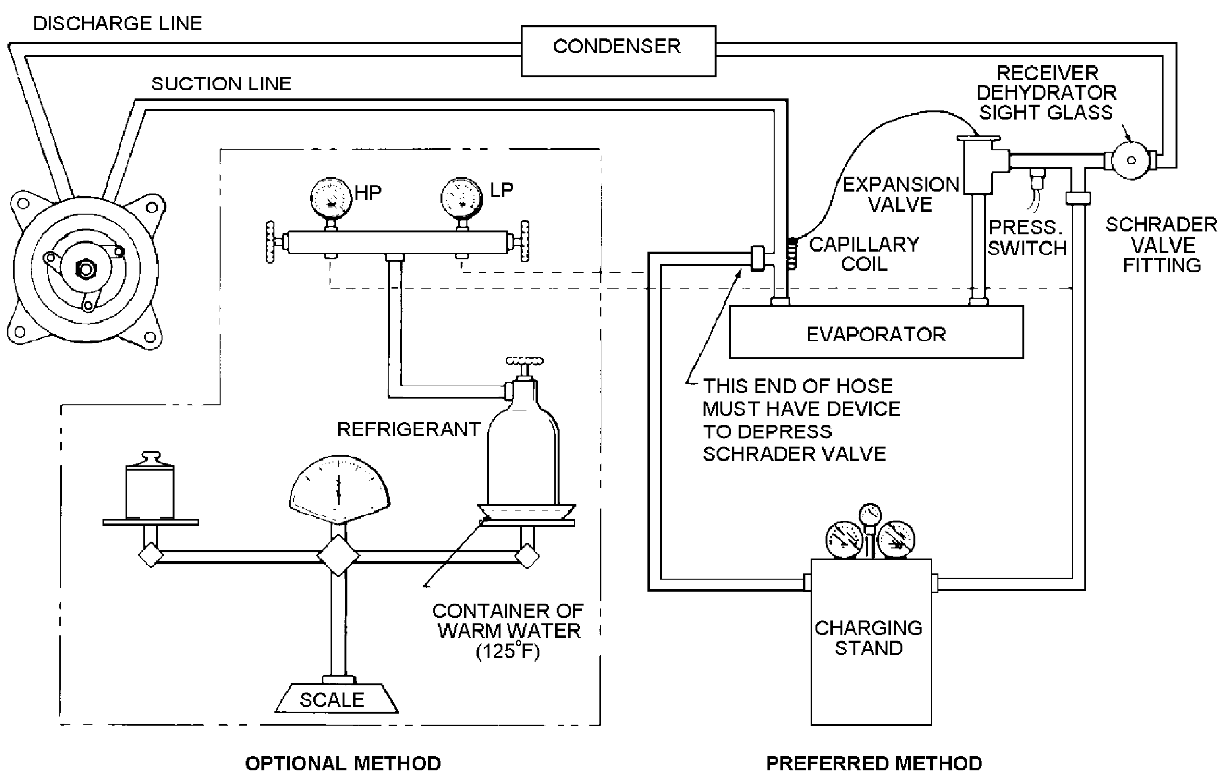
b Eliminate blockage in the system by replacing faulty parts.

c Repeat steps (1) through (12).

13 If, after 5 minutes of pump operation, the RED gauge indicates a little below zero, open red (high side) valve (2), and continue evacuation.

a System vacuum (i.e. - low side gauge (GAUGE 1)) should attain 24 to 26 inches of mercury (in. Hg.) in 10 to 15 minutes.

b Allow pump to hold a vacuum of 26 in. Hg. (or below) for a minimum of 15 minutes.



Charging Hookup
Figure 4

c Failure to acheive or hold a vacuum of 26 in. Hg. (or below) in either (a) or (b), above, indicates a leak in the system. Locate leak as described in Leak Detection, above.

d Repair leak. Repeat steps (1) through (13).

14 With the low side (1) and high side (2) valves OPEN, continue pumping, holding system below 26 in. Hg. for a minimum of 30 minutes.

Note: All specified pumping times may be included in the 0:30 minutes, provided no blockage or leaks are noted, and provided the system is not opened by disconnecting or removing components.

15 When panel display reads CPL (complete), close both the low side valve (1) and the high side (2) valves.

16 Perform charging procedure immediately, see Charging the System, below.

(4) Charging the System

Note: Always evacuate the system (see above), before charging.

(a) Using a Kent Moore J23500 or similar charging stand (refer to Figures 3 and 4)

1 Open the valve at the base of the charging cylinder and fill the charging cylinder with sufficient refrigerant to charge the system. If refrigerant stops filling the cylinder, open the bleed valve at the top of the charging cylinder to relieve head pressure and allow refrigerant to continue filling the charging cylinder.

2 Close the bleed valve and the valve at the base of the charging cylinder.

3 Turn the charging cylinder sight glass to match the pressure reading on the charging cylinder pressure gauge. Keep the sight glass in this position during the remainder of the charging operation.

4 Connect the heating element plug to a 110 volt power outlet.

5 With the low pressure control valve (3) closed, open the refrigerant control valve (11) and the high pressure control valve (10).

6 Allow the correct amount of refrigerant to enter the high side of the system.

7 Close the high pressure control valve (10) and the refrigerant control valve (11).

8 Disconnect the hoses from the airplane's system.

(b) Using a Robinair 34700 charging station or equivalent (Refer to Figures 2 and 5)

CAUTION: THE FOLLOWING PROCEDURE APPLIES TO ROBINAIR 34700 OR SIMILAR CHARGING STATION. SEE OPERATOR'S MANUAL OF CHARGING STATION BEING USED, FOR DETAILED INSTRUCTIONS FOR CHARGING SYSTEM.

1 Check that main power switch and/or ground power is OFF.

2 Check that the LBS/KG selector switch on back of unit is in desired measurement mode. Be sure to turn OFF the main power switch before changing the measurement mode.

NOTE: You may enter the amount of refrigerant to be charged when the unit is turned ON. The unit will store the amount in memory until it is turned off.

3 Remove protective caps from the high and low side service ports on the evaporator.

4 Connect the blue and red hoses to the service ports (ref. Figure 5), on systems equipped with quick disconnect connections, open coupler valves.

CAUTION: DO NOT PLACE ANY WEIGHT, INCLUDING HANDS AND/OR FEET, ON REFRIGERANT TANK OR SCALE DURING CHARGING PROCESS. ANY WEIGHT DISTURBANCE WILL CAUSE AN INDIRECT TRANSFER OF REFRIGERANT.

CAUTION: ADD REFRIGERANT THROUGH THE LOW PRESSURE SIDE ONLY.

5 Open the low side (blue) valve on the unit's control panel.

6 If the messages PROGRAM and CHARGE do not display, press the CHG key to enter the PROGRAM mode.

NOTE: The amount of refrigerant required must be determined for each airplane. It is the amount that will result in bubble-free operation at the system sight gauge. The PA-32-301FT and PA-32-301XTC require approximately 2.25 LBS.

7 Enter amount of refrigerant required to charge the system by pressing the appropriate number keys and ENTER on keypad.

NOTE: You may enter the amount of refrigerant to be charged when the unit is turned ON. The unit will store the amount in memory until it is turned off.

8 To begin charging process, press CHG key on keypad.

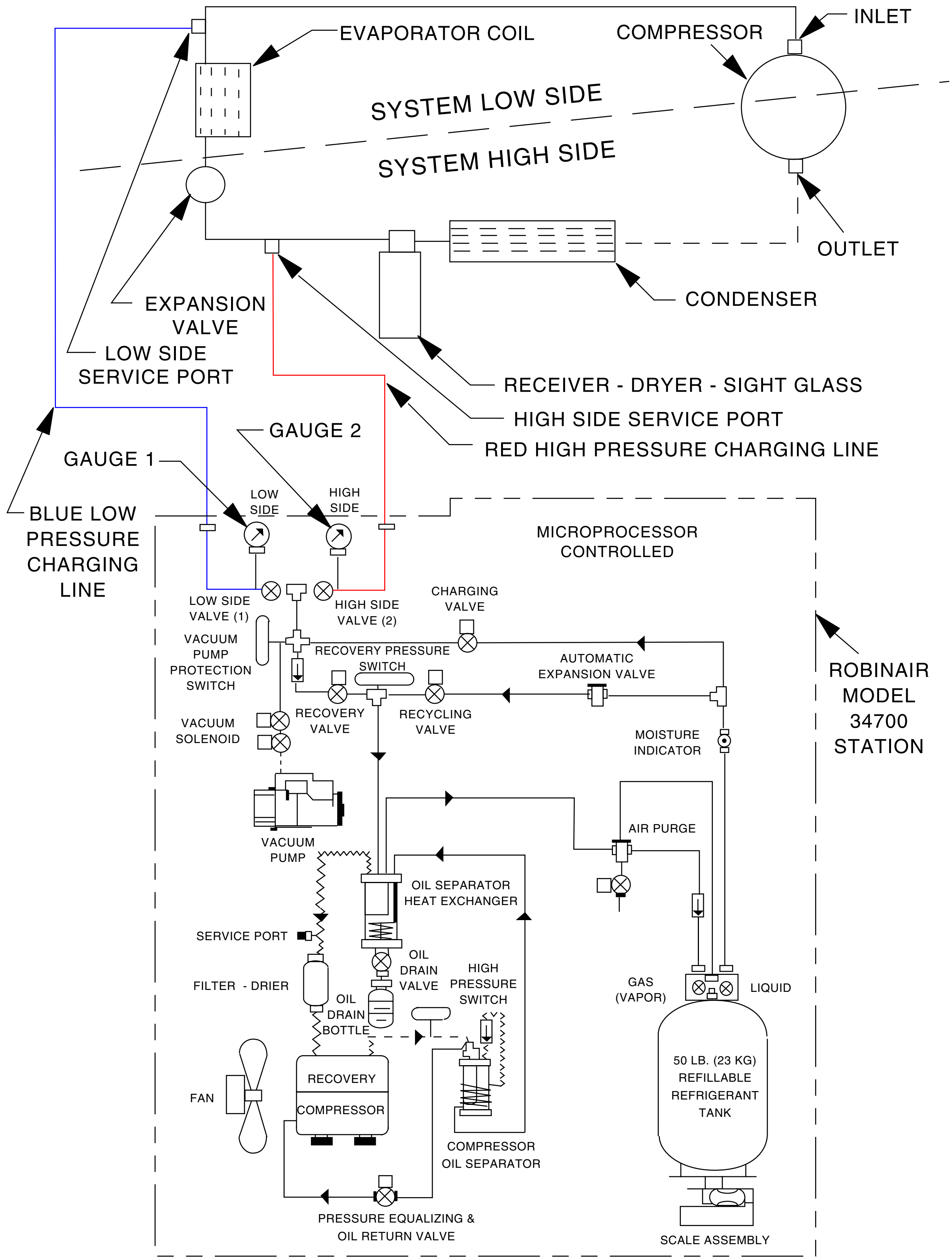
a The digital display will read AUTOMATIC and show the amount of refrigerant programmed for the charge.

b As the solenoid opens, it will make an audible sound.

c The display will count down to zero, and display message CPL, when charging is complete.

9 Close low side (blue) valve. Check that the high (red) valve is also closed. Also close coupler valves.

10 Perform Post Charging Operational Check, see below.



Robinair 34700 Charging Station Hose Hookup
Figure 5

(5) Post Charging Operational Check
(see Figures 2, 3, and 5 - numbers in parentheses refer to Figure 3, numbers in brackets refer to Figure 5)

(a) Ensure that the low pressure control valve (3) [1] and the high pressure control valve (10) [2] are closed. Hook up the charging stand to the system as shown in Figures 4 and 5.

(b) With Robinair 34700 style stands equipped with quick disconnect couplings only, ensure coupler valves are open.

CAUTION: ASCERTAIN THAT THE AREA AROUND THE AIRPLANE IS CLEAR AND THAT A QUALIFIED PERSON IS AT THE CONTROLS OF THE AIRPLANE.

CAUTION: ENSURE THE AIRPLANE IS HEADED INTO THE WIND.

(c) Activate the system and operate the engine at 1,000 rpm for 2 minutes. Then operate the engine at 2,000 rpm for 2 minutes.

(d) Check the sight gauge on the receiver-dehydrator during the engine operation at 1,000 and 2,000 rpm. Any indication of bubbles passing the sight gauge indicates that additional refrigerant is required.

(e) If additional refrigerant is required, add it slowly through the refrigerant control valve (11) (Kent Moore J23500 style stands only) and the low pressure control valve (3) [1] until the sight glass remains free of bubbles. Regulate the flow of refrigerant with the low pressure control valve. Do not allow the compound gauge (2) or the low side gauge [1] to exceed a reading of 40 psi.

(f) With the engine operating of 1,000-1,500 rpm, the low and high side gauges should indicate as shown in Chart 5.

(g) With the charge properly established, stop the engine and, with Robinair 34700 style stands equipped with quick disconnect couplings only, close the coupler valves.

(h) Close the low pressure control valve (3) [1] and, with Kent Moore J23500 style stands only, the refrigerant control valve (11).

(i) Remove the charging stand. Replace all protective caps and covers.

CHART 5
AMBIENT TEMPERATURE INDICATION

GAUGE	AMBIENT TEMPERATURE	GAUGE INDICATION
Low Pressure	All	10 to 35 psig
High Pressure	Up thru 75°F	125 psig min to 175 psig max
High Pressure	Over 75°F	150 psig min to 275 psig max

D. Servicing the System with a Manifold Set

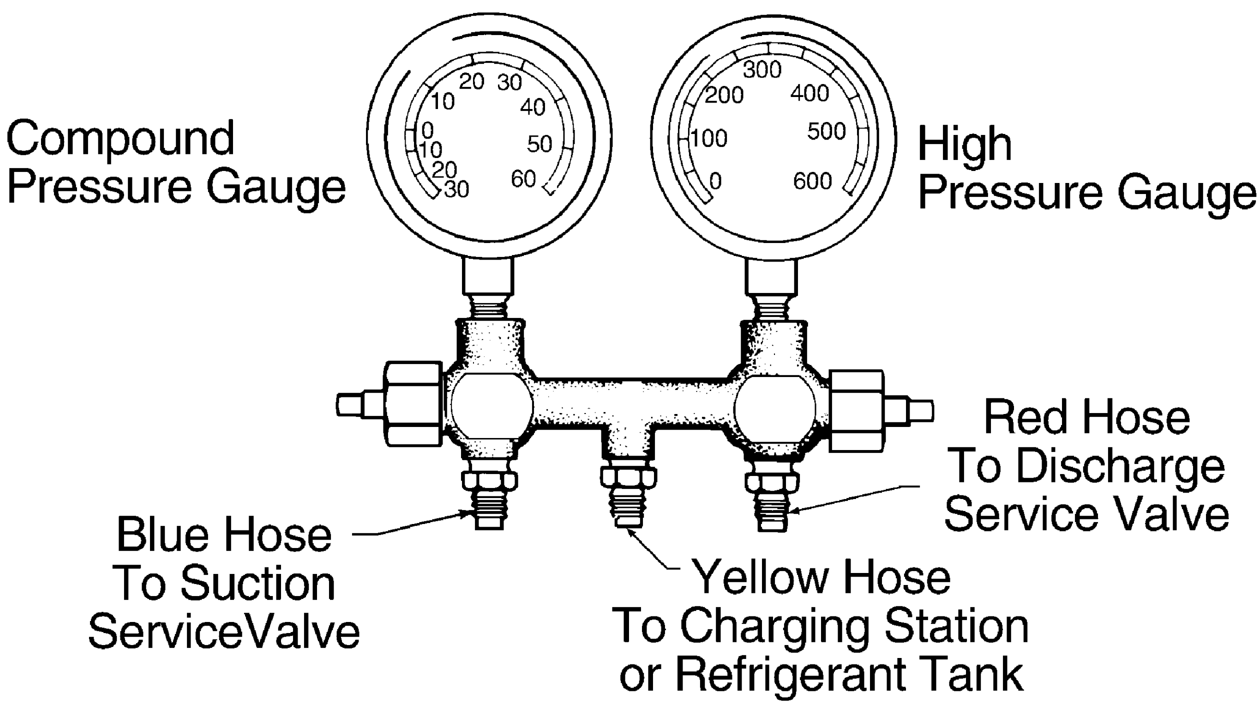
(1) Test Gauge and Manifold Set

The proper testing and diagnosis of the air conditioning system require that a manifold gauge set (or a charging stand) be attached to the system. This set consists of two gauges mounted to a manifold. One gauge is a high pressure gauge used in the discharge side of the system. The other is a low pressure gauge used in the suction side of the system. The manifold is a device having fittings for both gauges and connection hoses with provisions for controlling the flow of refrigerant through the manifold. (Refer to Figures 6 and 7.)

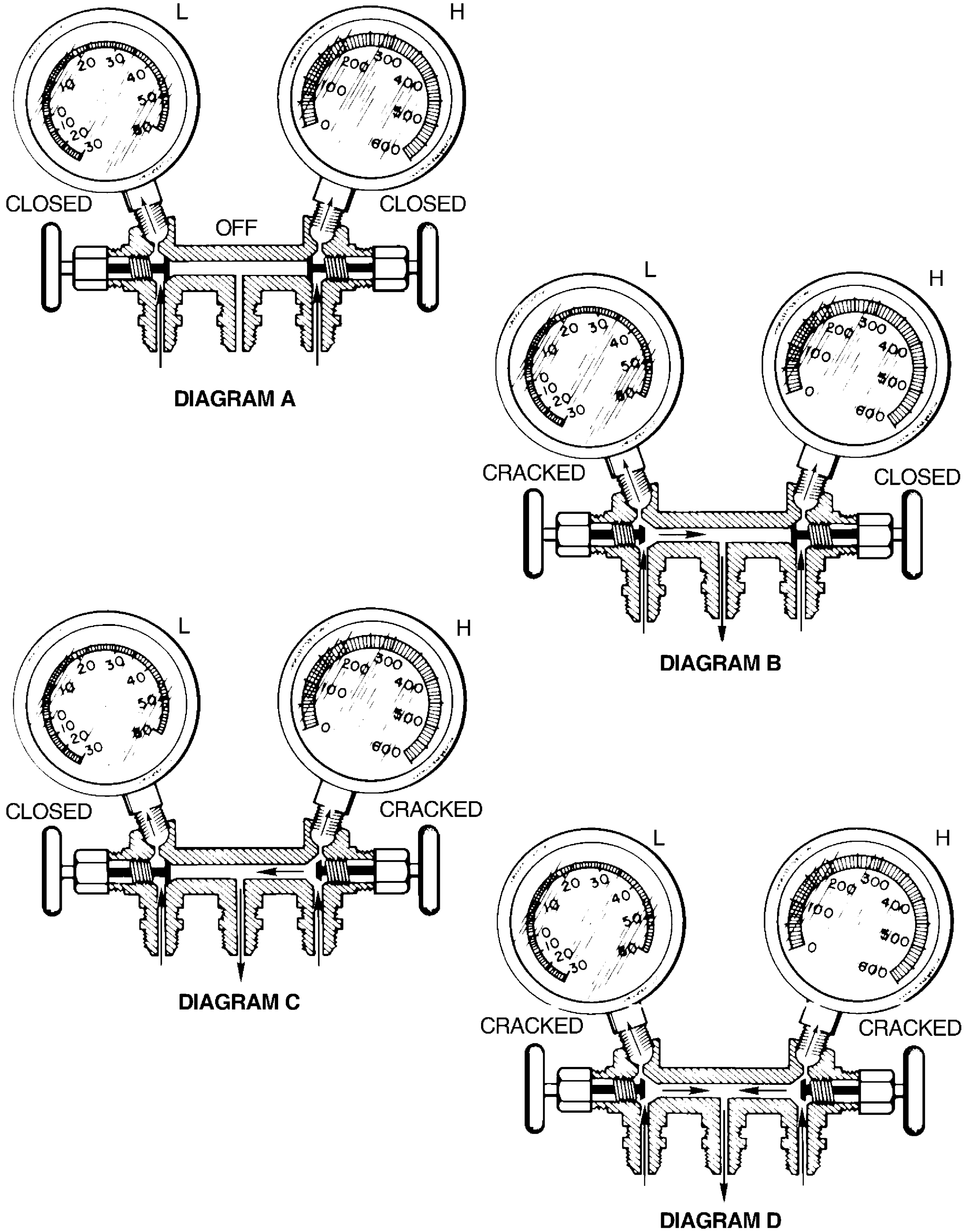
The center port of the manifold set is used for charging or evacuation procedures, or any other service that may be necessary.

Both the high or low side of the manifold have hand shut-off valves. When the hand valve is turned all the way in, in a clockwise direction, the manifold is closed. The pressures on that side of the system will, however, be recorded on the gauge above the hose.

Cracking the hand valve, in the counterclockwise direction, opens the systems to the middle service port of the manifold set. This is desirable only when it is necessary to let refrigerant out of or into the system. (Refer to Figures 6 and 7.)



Test Gauge and Manifold Set
Figure 6



Manifold Set Operation
Figure 7

(2) Leak Detection (refer to Figure 8.)

(a) Close both the low side and high side valves on manifold hand set.

(b) Connect manifold hand set middle port (yellow) hose to a regulated (0-300 psig) gaseous dry nitrogen source or a container of HFC-134a refrigerant.

(c) Open nitrogen source or refrigerant container service valve.

(d) Open the manifold hand set high side valve until a pressure of 50 psig is reached on low side gauge. Close high side valve.

(e) Locate leak(s) using soap and water in a thick solution; or, if using HFC-134a, an electronic leak detector designed to detect HFC134a refrigerant can also be used.

(f) Tighten/re-tighten fittings as necessary to stop leak(s). If leaks are due to damaged or worn components, proceed with refrigerant recovery/system discharge, perform repairs or component replacement and repeat leak detection procedure.

(g) Check that the both high side and low side valves on the manifold hand set are closed.

(h) Close service valve on nitrogen source or refrigerant container. Disconnect yellow manifold hand set center hose from nitrogen source or refrigerant container.

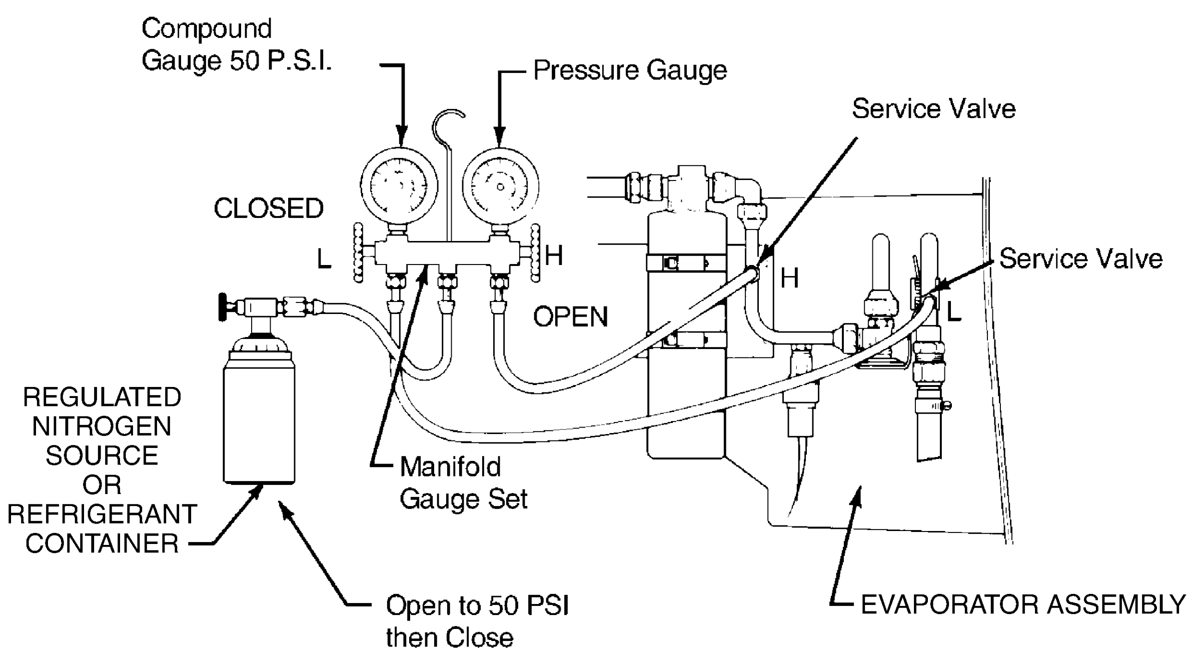
(i) On systems equipped with quick disconnect connections, close coupler valves. Disconnect manifold hand set red and blue hoses from airplane service ports. Remove manifold hand set.

(j) If HFC-134a refrigerant was used, recover remaining refrigerant from system using the Robinair 34700 (or other approved) charging station (see paragraph 3.C). Any quantity of oil recovered from aircraft must be measured and an equal amount of new oil (i.e. - PAG with HFC134a) must be added to system before recharging.

(k) When refrigerant recovery is complete, on systems equipped with quick disconnect connections, close coupler valves. Disconnect charging/test station from service ports.

(l) Evacuate the system, see below or paragraph 3.C.

(m) Immediately charge the system, see below or paragraph 3.C.



Leak Test Hookup
Figure 8

(3) Evacuating the System (refer to Figure 9)

NOTE: Perform a Leak Detection check, above, before evacuting the system.

If the system has been operated in a discharged condition or anytime the system has been open to atmospheric pressure, the receiver-dehydrator must be replaced and the system evacuated to remove any trapped air and moisture which has entered it. A vacuum pump capable of pulling 29 inches of mercury or better should be used. As the pressure in the air conditioning system is lowered, the boiling temperature of the water (moisture) that may be present is also lowered. This then forces any moisture, in the form of water vapor, out of the system. Chart 4 demonstrates the effectiveness of moisture removal under a given vacuum.

(a) Ascertain that all system pressure is released.

(b) Connect the manifold set hoses to the service ports and vacuum pump as shown in Figure 9.

(c) Close the high side (pressure) and low side (suction) hand valves on the manifold set.

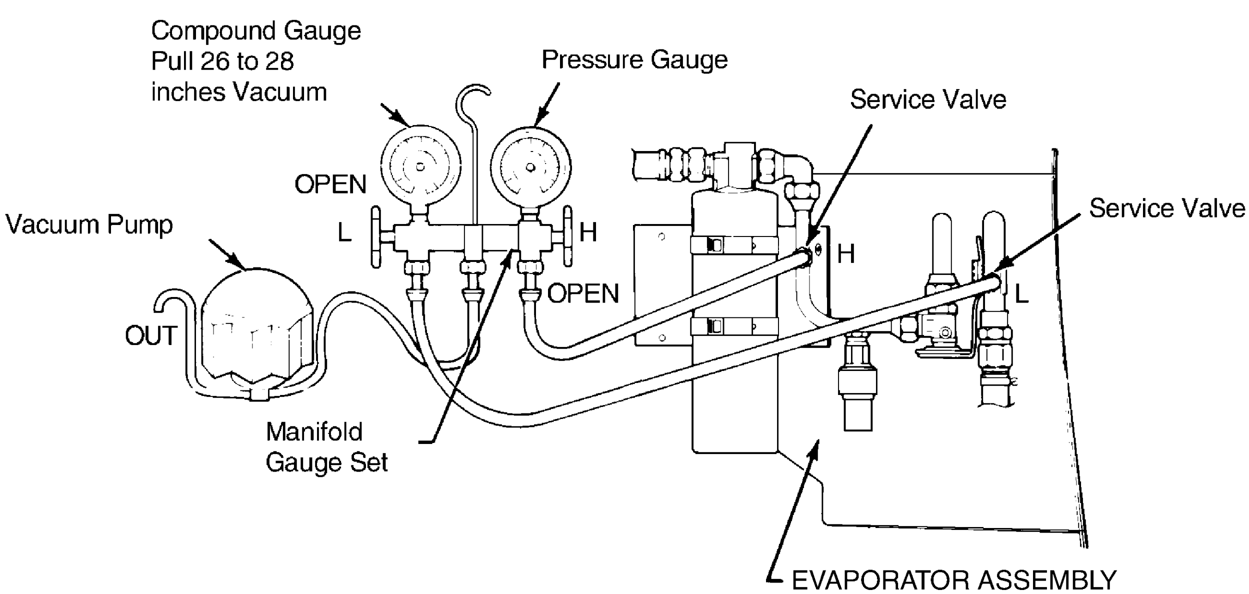
(d) Start the vacuum pump.

(e) Open the low side manifold set hand valve. The low side gauge should show a vacuum.

(f) After five minutes of pump operation the high side gauge should indicate slightly below zero. If it does not, stop the pump and eliminate the blockage in the system by replacing the faulty component, then repeat the previous evacuation steps.

(g) Operate the vacuum pump for fifteen minutes or until the low side gauge indicates 24 to 26 in. Hg. whichever occurs first.

(h) Close the low side hand valve, stop the vacuum pump and observe the low side gauge. If the gauge rises at a rate faster than 1 in. Hg. in 5 minutes, there is a leak in the system. Locate and repair the leak, then repeat the previous evacuation steps.



Evacuation Hookup
Figure 9

(i) With both the low and high side valves open, continue the pumping and hold the system below 26 in. Hg. for a minimum of 30 minutes. All the previous pumping time may be included in the 30 minutes provided that no leaks or blockages are noted, and provided that the system is not opened by removal or disconnection of components.

(j) Close the low and high side hand valves, stop the vacuum pump and perform the charging procedure immediately.

(4) Charging the System Using the Airplane Compressor

This method is the least desirable due to the requirement of operating the airplane's engine to run the compressor.

CAUTION: ASCERTAIN THAT THE AREA AROUND THE AIRPLANE IS CLEAR AND THAT A QUALIFIED PERSON IS AT THE CONTROLS OF THE AIRPLANE.

(a) Keep the system under the vacuum established during the evacuating procedure with both hand valves in the closed position.

(b) Attach a container of the refrigerant (HFC-134a) to the manifold set and open the container service valve.

(c) Loosen the center hose at the manifold set until a hiss can be heard. Allow the gas to escape for 2 to 3 seconds, then tighten the connection.

(d) Open the high side manifold set hand valve, observe the low side gauge, then close the high side hand valve. The low side gauge should immediately change from an indication of a vacuum to an indication of pressure. If it does not, the system is blocked, and the blockage must be corrected before proceeding.

(e) Start the engine and operate it at 1000 rpm.

(f) Adjust the airplane air conditioning controls for maximum cooling, high blower speed.

(g) Keep the refrigerant cylinder in an upright position. A slug of liquid refrigerant entering the system would damage the compressor.

(h) Open the low side manifold set hand valve and allow two pounds of refrigerant in the gas state to enter the system.

(i) Close the low side manifold set hand valve.

(j) Proceed with the Post Charging Operational Check, below.

(5) Post Charging Operational Check

CAUTION: ASCERTAIN THAT THE AREA AROUND THE AIRPLANE IS CLEAR AND THAT A QUALIFIED PERSON IS AT THE CONTROLS OF THE AIRPLANE.

NOTE: Head the airplane into the wind during these checks.

(a) With the manifold set installed, and both hand valves closed, actuate the system and operate the engine at 1,000 rpm for two minutes, then operate the system at 2,000 rpm for 2 minutes.

(b) Check the system sight gauge (on the receiver-dehydrator) during operation at 1,000 and 2,000 rpm. Any indication of bubbles passing the sight gauge indicates that additional refrigerant is required.

(c) Add additional refrigerant slowly through the low side manifold set hand valve until the sight glass remains free of bubbles.

(d) Close the low side hand valve and refrigerant container valve.

(e) With the engine operating at 1,000 to 1,500 rpm, the gauges should indicate as shown in Chart 6.

(f) Once the charge is properly established, stop the engine, close the refrigerant container service valve. Remove the manifold set and replace all protective caps and covers.

CHART 6
AMBIENT TEMPERATURE INDICATION

GAUGE	AMBIENT TEMPERATURE	GAUGE INDICATION
Low Pressure	All	10 to 35 psig
High Pressure	Up thru 75°F	125 psig min to 175 psig max
High Pressure	Over 75°F	150 psig min to 275 psig max

(6) Adding Partial Charge to System

The system can be topped off with refrigerant by the following method:

(a) Remove the closeout panel at the rear of the cabin.

(b) Connect a charging hose to a refrigerant cylinder and also to the low pressure Schrader valve fitting on the manifold assembly.

(c) Purge the charging hose by allowing a small amount of refrigerant gas to escape at the Schrader valve fitting.

CAUTION: ASCERTAIN THAT THE AREA AROUND THE AIRPLANE IS CLEAR AND THAT A QUALIFIED PERSON IS AT THE CONTROLS OF THE AIRPLANE.

NOTE: Head the airplane into the wind during this procedure.

(d) Start the engine, operate at 1000 rpm and turn the air conditioner on maximum cool.

(e) Remove the plastic plug (if installed) from the sight glass in top of the receiver-dehydrator.

(f) With a low refrigerant charge in the system, bubbles will be seen passing through the sight glass when the system is operating.

(g) Open the valve on the refrigerant cylinder.

(h) Allow refrigerant to flow into the system until the bubbles disappear from the sight glass.

(i) Close the refrigerant valve and check to see that the sight glass remains clear during system operation.

(j) When the sight glass stays clear of bubbles, add an additional pound of refrigerant to the system. (Engine should be operating at 1,000 rpm.)

NOTE: This is done with OAT at 70°F, or higher, with the air conditioner operating.

(k) Shut off the air conditioner and engine. Remove the charging hose from the Schrader valve with care due to refrigerant remaining in the line.

(l) Reinstall closeout panel.

E. Compressor (See Figure 13.)

The engine driven compressor is mounted on the left front of the engine. A V-belt connected to the ring gear pulley drives the compressor through a magnetic clutch.

(1) Compressor Service

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

It is not advisable to service the compressor in the field. It should be done by a qualified shop which has the special equipment and trained personnel required to properly service the unit.

Maintenance of the Sanden compressor is limited to Removal and Installation of Compressor, checking the compressor oil level and replacement of worn drive belt. Contact Sanden International, for special tools and instructions for detailed compressor maintenance. (Refer to Vendor Publications in the Introduction for the address and phone number.)

CAUTION: AN IMPORTANT FACTOR IN AIR CONDITIONING SERVICING IS CLEANLINESS. TAKE CARE TO PREVENT DIRT OR FOREIGN MATERIAL FROM ENTERING THE SYSTEM. ALL HOSE AND TUBING ENDS SHOULD BE CAPPED IMMEDIATELY. ANY LUBRICATION REQUIRED IN THE ASSEMBLY OF THE COMPONENTS SHOULD BE REFRIGERANT OIL OF THE TYPE USED IN THE COMPRESSOR.

(2) Removal

The system must be discharged before removing compressor. Refer to Discharging, paragraph 3.C, above. Remove the compressor as follows:

(a) Be sure the air conditioning circuit protector is in the off position.

(b) Remove engine cowling and right front baffles.

(c) Disconnect the electrical leads to the magnetic clutch on the compressor.

(d) Discharge the air conditioning system to an appropriate environmentally approved refrigerant recovery station. See Discharging, paragraph 3.C, above.

(e) Remove the suction and discharge lines from the connections on the compressor.

NOTE: All open lines should be capped immediately to prevent dirt and moisture from entering the system.

(f) Loosen bolt securing compressor idler pulley to release belt tension and remove belt from pulley. (Do not force belt over pulleys.)

(g) Support compressor and remove bolts securing compressor to engine mounting brackets.

(h) Remove compressor.

(3) Installation

Install the compressor as follows:

(a) Align compressor mounting lugs with mounting brackets. Install bolts and progressively tighten to a torque of 30 foot pounds. (Safety with cotter pins). If required, adjust compressor drive sheave forward and aft alignment by adding shims (LYC. P/N 76534 - 1.130 IN. OD x .410 IN. ID x .005 IN. THK) between the compressor mounting bracket and compressor mounting ears. See Drive Belt Service, below, for additional alignment details.

(b) Check oil level in compressor as described in Checking Compressor Oil, below.

CAUTION: DO NOT FORCE BELT INTO PULLEY SHEAVE. IF NECESSARY, REMOVE IDLER ASSEMBLY.

(c) Place drive belt over clutch pulley and adjust alignment of pulleys and belt as described in Drive Belt Service, below.

(d) Connect discharge and suction lines to service valves on evaporator unit.

(e) Evacuate the system per paragraph 3.C or 3.D.

(f) Charge the system per paragraph 3.C or 3.D.

(g) Install right front baffle.

(h) Install engine cowling.

(4) Checking Compressor Oil Level

Whenever a system component has been replaced or there is an obvious leak, use the following procedure to check the compressor oil level (after making necessary repairs):

(a) Run compressor for 10 minutes at engine idle rpm.

(b) Recover all refrigerant from the system. Be careful not to lose oil.

(c) Determine the compressor mounting angle by positioning the angle gauge (Sanden P/N 32448) across the flat surfaces of the two front mounting ears.

(d) Center the bubble and read the mounting angle to the closest degree.

NOTE: From the factory, the mounting angle is essentially zero (0), but this procedure may of use if the airplane is being serviced on a slope or uneven service.

(e) Remove the oil filler plug.

(f) Look through the oil filler plug hole and rotate the clutch front plate to position the internal parts as shown in Figure 10. Center the parts as they are moving to the rear of the compressor (discharge stroke). (Refer to Figure 12.)

NOTE: This step is necessary to clear the dipstick of internal parts and to allow its insertion to full depth.

(g) Insert the dipstick to its stop position (refer to Figure 11). The stop is the angle near the top of the dipstick.

1 The point of the angle must be to the left if the mounting angle is to the right.

2 The bottom surface of the angle must be flush with the surface of the oil filler hole.

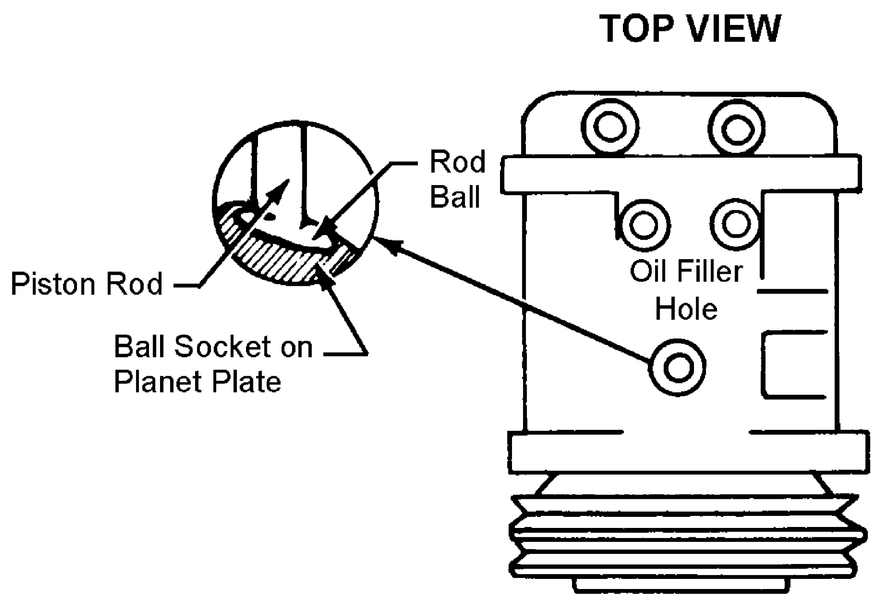
(h) Remove the dipstick and count the increments of oil.

(i) Use Chart 7 to determine the correct oil level for the mounting angle of the compressor.

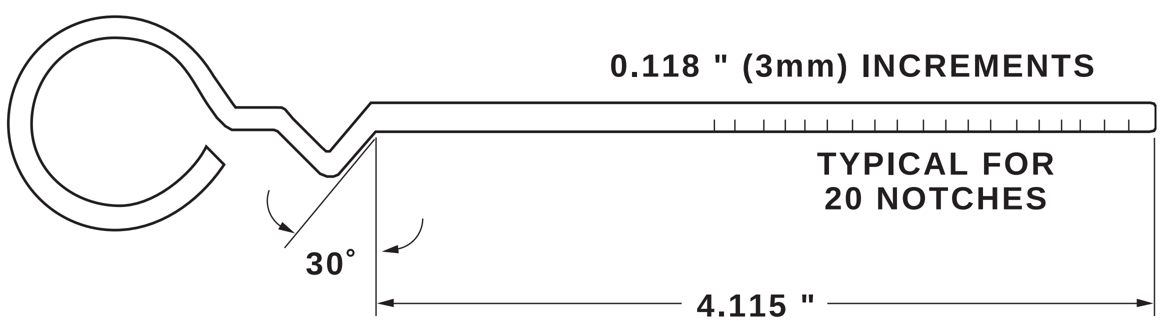
(j) If the increments read on the dipstick do not match the table, add or subtract oil (i.e. - Retro-fix, PAG-21941, P/N 923-384) to the mid-range value - i.e. - if the angle is 20°, the desired oil level is 7.

(k) Install the oil filler plug, first checking that the sealing O-ring is not twisted. Ensure that the seat and O-ring are clean.

(l) Torque the plug from 6 to 9 foot-pounds (0.8 to 1.2 kg-m). Do not over tighten the plug to stop a leak. If plug leaks, remove it, and install a new O-ring.



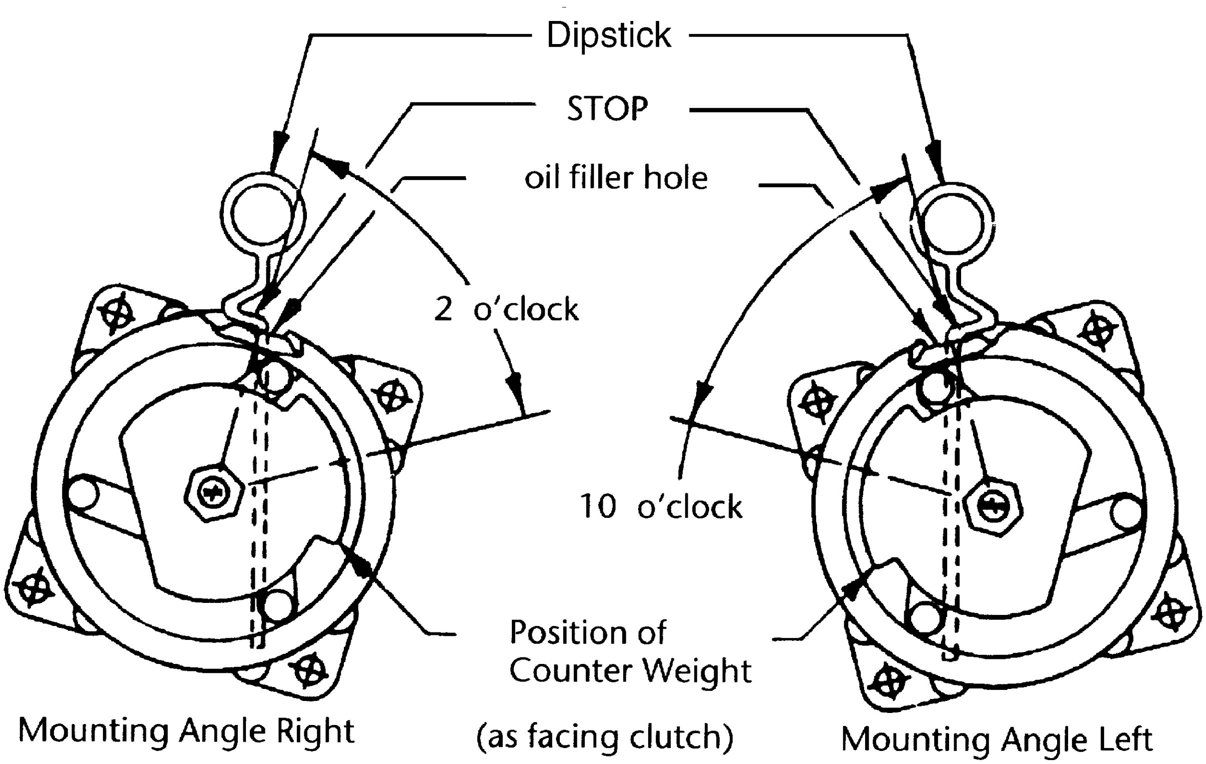
Positioning Sanden Compressor Internal Parts
Figure 10



Fabricated Dipstick
Figure 11

CHART 7
SANDEN COMPRESSOR OIL LEVEL VS. MOUNTING ANGLE

Mounting Angle	0°	10°	20°	30°	40°	50°	60°	90°
Oil Level (in notches)	3-5	5-7	6-8	7-9	8-10	8-10	9-11	9-11



Sanden Compressor Mounting Angle
Figure 12

(5) Drive Belt Service

(a) Replacement (See Figure 13.)

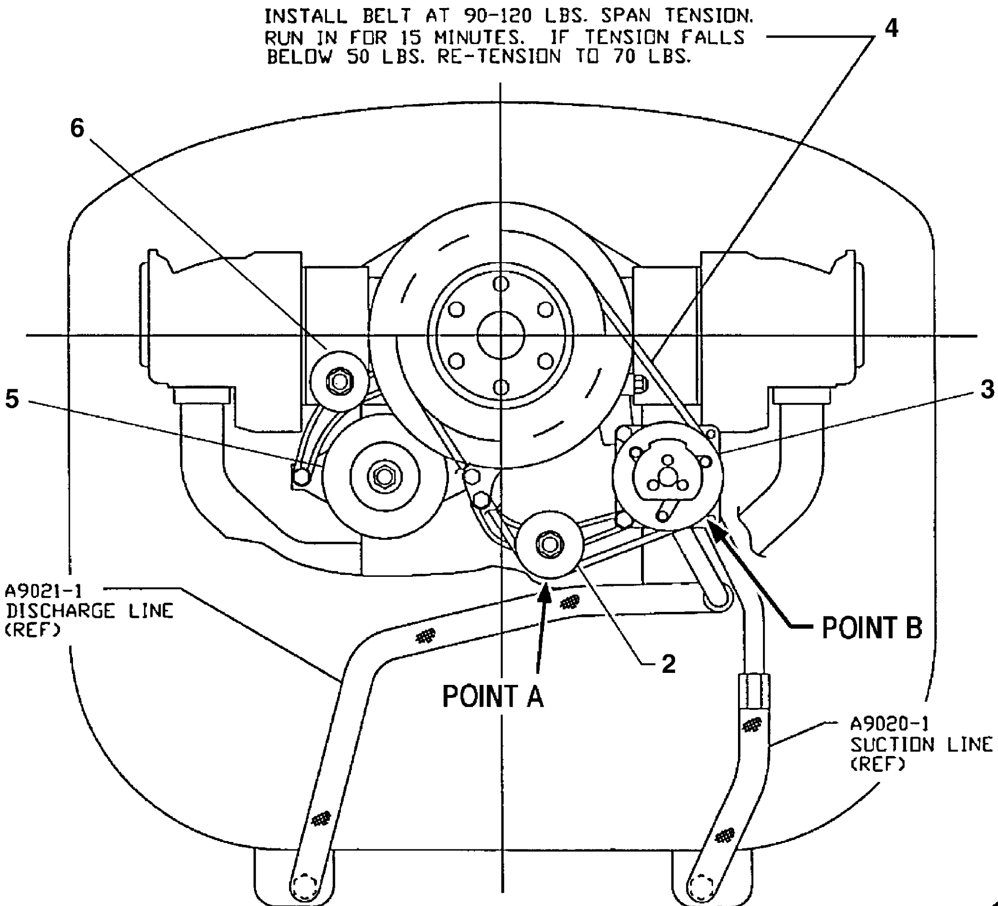
1 Remove old belt by removing spinner, propeller, cowling, engine baffles as required, starter ring gear assembly, and drive belt.

CAUTION: DO NOT FORCE BELT INTO PULLEY SHEAVE. REMOVE IDLER ASSEMBLIES, IF NECESSARY, AND ALTERNATOR LOWER MOUNTING BOLTS TO INSTALL BELT.

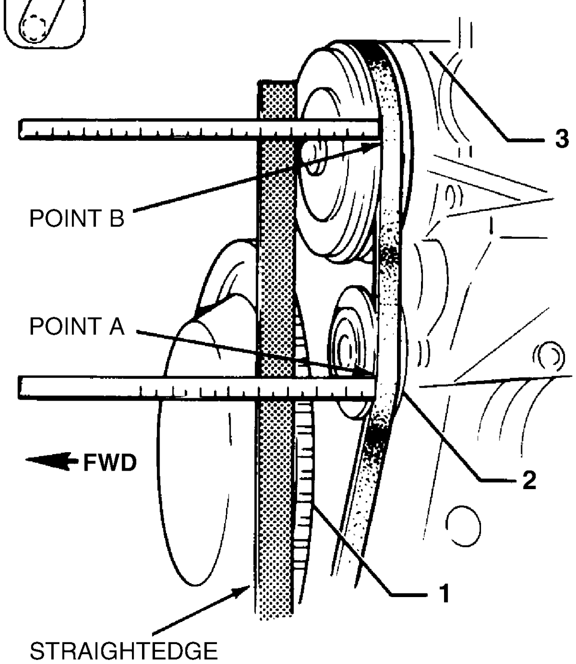
2 Position new belt on starter ring gear sheave.

3 Install starter ring gear assembly, propeller, and spinner.

4 Route belt to proper pulley sheaves.



1. RING GEAR
2. COMPRESSOR IDLER PULLEY
3. COMPRESSOR
4. COMPRESSOR DRIVE BELT
5. ALTERNATOR
6. ALTERNATOR IDLER PULLEY



CALCULATING IDLER PULLEY OFFSET
(LOOKING UP)

Compressor and Alternator Belt Installation
Figure 13

(b) Alignment (See Figure 13.)

Check and adjust compressor belt and pulley alignment as follows:

CAUTION: VERIFY THE STRAIGHTEDGE HAS SOLID CONTACT WITH THE SURFACE OF THE RING GEAR TO ENSURE TRUE READINGS.

1 Establish a datum line for checking belt and pulley alignment by clamping a straightedge to the forward machined edge of the ring gear.

2 Obtain the nominal compressor belt offset at the ring gear. Measure the dimension from the forward edge of the compressor belt (in its ring gear sheave) to the forward machined surface of the ring gear.

3 Measure actual compressor belt offset at the compressor sheave (Point-B). Measure the dimension from the forward edge of the compressor belt (in its compressor sheave) to the aft surface of the straightedge.

NOTE: If the compressor sheave offset is extreme, it may be adjusted by adding (or removing) shims between the compressor mounting ears and the compressor mounting bracket as described in Compressor, Installation, above. If zero offset is not obtainable, note the measured offset.

4 Measure actual compressor belt offset at the compressor idler pulley (Point-A). Measure the dimension from the forward edge of the compressor belt (in its idler sheave) to the aft surface of the straightedge. Belt offset at Point-A should be approximately half the offset (if any) measured at Point-B.

NOTE: Compressor Idler Pulley (Point A) offset is adjusted by adding (or removing) shims (LYC. P/N 76534 - 1.130 IN. OD x .410 IN. ID x .005 IN. THK) between the compressor mounting ears and the compressor belt adjusting bracket until the idler pulley is in (or as close as shims will allow to) the belt plane. The nominal idler pulley offset at Point A will be approximately one-half the measured compressor sheave offset at Point B.

(c) Adjusting Drive Belt Tension (Compressor and/or Alternator)

CAUTION: THE HIGHER TENSION SPECIFIED FOR A NEW BELT IS TO COMPENSATE FOR INITIAL STRETCH AT FIRST OPERATION. DO NOT APPLY HIGHER TENSION VALUES TO USED BELTS.

1 Compressor or Alternator Belts - use a calibrated belt tension gauge to adjust a new belt to 90-120 pounds of static tension. Run in for 15 minutes. If tension falls below 50 lbs., re-tension to 70 lbs.

2 Install engine baffles if removed. Install engine cowling.

CAUTION: IF AIR CONDITIONER IS OPERATED ON THE GROUND FOR SERVICING, CLEAR TEST AREA OF ANY LOOSE OBJECTS LYING ON RAMP. ENSURE THAT A QUALIFIED PERSON IS AT THE AIRPLANE CONTROLS.

3 Run engine 15 minutes at 1200 rpm.

4 Shut down engine, remove engine cowling, and check both belt tensions.

5 Check tension every 100 hours or annual inspection, whichever comes first.

6 Check all idler and bracket bolts for safety. Install engine cowling.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

F. Refrigerant Lines And Routing

CAUTION: DISCHARGE SYSTEM COMPLETELY BEFORE HOSE COUPLINGS ARE UNCOUPLED. (SEE DISCHARGING, PARAGRAPH 3.C OR 3.D, ABOVE.)

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS PROHIBIT THE RELEASE OF REFRIGERANT INTO THE ATMOSPHERE. SPECIAL EQUIPMENT IS REQUIRED WHEN DISCHARGING OR RECHARGING SYSTEM.

Handle refrigerant lines carefully. Refrigerant lines are flexible high pressure hoses. Hoses in power plant area are routed for maximum protection from heat and abrasion. They couple at firewall to hoses routed through the two inboard, external hat sections on bottom of fuselage, up through floor to condenser and evaporator in tail cone. Discharge is in the right hand hat section. The suction is in the left hand hat section.

G. Receiver-Dehydrator

(1) Removal

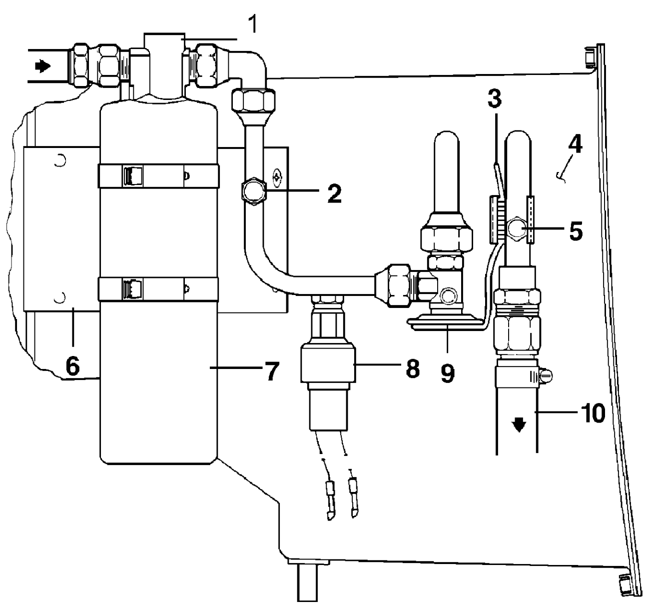
CAUTION: IF RECEIVER-DEHYDRATOR IS NOT SERVICEABLE, IT MUST BE REPLACED. RECEIVER-DEHYDRATOR MUST BE REPLACED WHEN SYSTEM HAS OPERATED WITHOUT A CHARGE OR HAS BEEN LEFT OPEN.

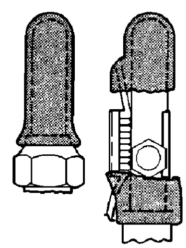
The unit is mounted on inboard side of evaporator assembly housing.

(a) Discharge system of all refrigerant. (See Discharging, paragraph 3.C or 3.D, above.)

(b) Uncouple refrigerant lines at receiver-dehydrator. (See paragraph 3.B, above.)

(c) Remove clamp attaching unit to evaporator housing.





WRAP TAPE AROUND THERMOSTAT CAPILLARY LEAVING SERVICE PORT ACCESSIBLE.

1. SIGHT GLASS
2. SERVICE VALVE (SCHRADER) (HI)
3. CAPILLARY COIL
4. HOUSING ASSY
5. SERVICE VALVE (SCHRADER) (LOW)
6. RECEIVER DEHYDRATOR CLAMP
7. RECEIVER DEHYDRATOR
8. PRESSURE RELIEF SWITCH
9. EXPANSION VALVE
10. OUTLET HOSE

NOTE: TORQUE FITTINGS PER CHART 3.

Components Installation
Figure 14

(2) Installation

On systems utilizing HFC 134a refrigerant, use only receiver-dehydrators marked with a GREEN arrow.

(a) Slip mounting bracket around receiver and put it in place on evaporator housing with tube fitting on top. Align fittings to proper line before securing mounting bracket.

(b) Replace O-rings on HFC-134a systems.

(c) Tighten fittings to torque listed in Chart 3.

(d) Evacuate and charge system per paragraph 3.C or 3.D, above.

H. Condenser

(1) Removal

Condenser is mounted in a frame assembly in fuselage bottom between stations 156.00 and 191.00.

(a) Discharge system per paragraph 3.C or 3.D, above. (See also paragraph 3.B, above.)

(b) Remove access panel from aft bulkhead of cabin.

(c) Remove condenser forward cover panel.

(d) Uncouple suction and discharge hoses at condenser fitting. (See paragraph 3.B, Special Servicing Procedures, above.) Remove hose clamps holding hoses to condenser frame.

(e) Remove AN-3 bolts from upper ends of side hinges and rod ends.

(f) Support condenser assembly and remove bolt attaching actuating rod to condenser assembly.

(g) Lower aft end of assembly on the piano hinge at assembly forward end.

(h) Remove eight screws attaching piano hinge to condenser frame assembly and remove.

(i) To remove condenser core from assembly, remove screws in the side mounting frame.

(2) Installation

(a) Install condenser core to frame assembly with hose fittings forward and RT fitting pointed inboard.

(b) Place condenser and frame assembly to fuselage frame mounting bracket and insert the eight screws into piano hinge.

(c) Attach side hinges, actuating rod, and rig per condenser assembly rigging instructions.

(d) Seal and couple hose fittings (seal with Loctite refrigerant sealant applied to flares only).

(e) Adjust condenser per condenser assembly rigging instructions, below.

WARNING: CONDENSER COVER PANEL(S) MUST BE REPLACED AND SEALED IN THE ORIGINAL MANNER. IF NOT SEALED PROPERLY, EXHAUST GASES CAN SEEP INTO CABIN DUE TO LOW PRESSURE AREA IN CABIN.

WARNING: TEST FOR CARBON MONOXIDE (CO) ON GROUND AND IN FLIGHT WITH AND WITHOUT AIR CONDITIONER OPERATING. PRESENCE OF CO MUST NOT EXCEED ONE (1) PART IN 20,000.

(f) Seal around condenser forward cover panel (and aft cover panel if removed) with Permagum Bead No. 576 purchased from Prestolite Engineering Company (see Figure 15).

(3) Condenser Door Actuator

The actuator is on a bracket mounted between two bulkheads in tail cone. It is coupled to the condenser assembly through a bellcrank mounted to a bracket on bulkhead aft of condenser. Actuator travel is controlled by two limit switches. Both up and down switches are on the actuator, see Figure 15 for switch locations.

(4) Condenser Assembly Rigging Instructions (See Figure 15.)

Condenser assembly is actuated by an electric motor through bellcranks, push rods, and limit switches. Condenser door must fit flush with fuselage skin, and with increased force along forward edge. Use the following steps:

(a) Adjust open limit switch to open condenser door 5.00 ± 0.50 inches measured from leading edge of door to fuselage skin.

(b) Adjust side push rods so a vertically measured gap of 0.16 inch exists along trailing edge of door the instant forward edge of door is flush with fuselage skin.

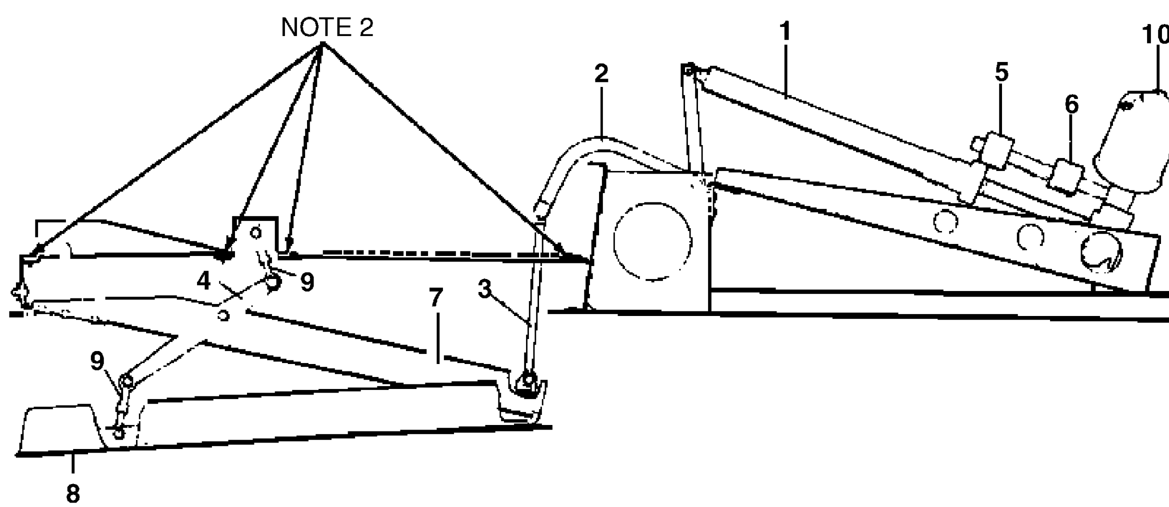
(c) Fully close door and adjust CLOSED limit switch so actuator travels an additional 0.12 inch with door fully closed - this is necessary to preload mechanism, see Figure 15.

(d) Cycle assembly several times. Verify proper operation without binding.

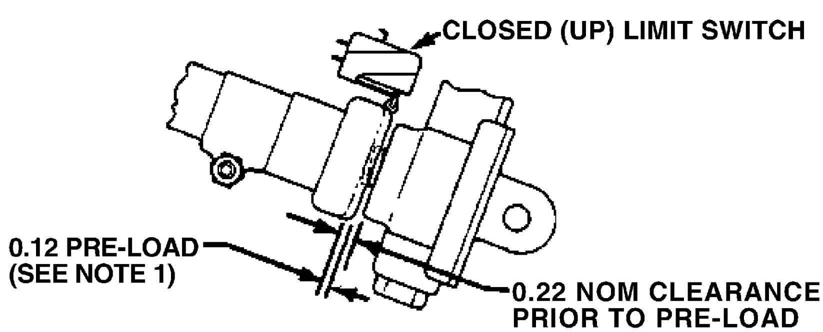
NOTES

99855 AB

1. WITH DOOR FULLY CLOSED ADJUST "CLOSED" (UP) LIMIT SWITCH SO THAT THE ACTUATOR TRAVELS AN ADDITIONAL 0.12 INCH (PRE-LOAD) AFTER DOOR IS FULLY CLOSED. ADJUST "OPEN" LIMIT SWITCH TO PROVIDE DOOR OPENING OF 5.00 INCHES.
2. SEAL ALL AROUND FORWARD AND AFT COVERS WITH PERMAGUM BEAD NO. 576 PURCHASED FROM PRESTOLITE ENGINEERING COMPANY.

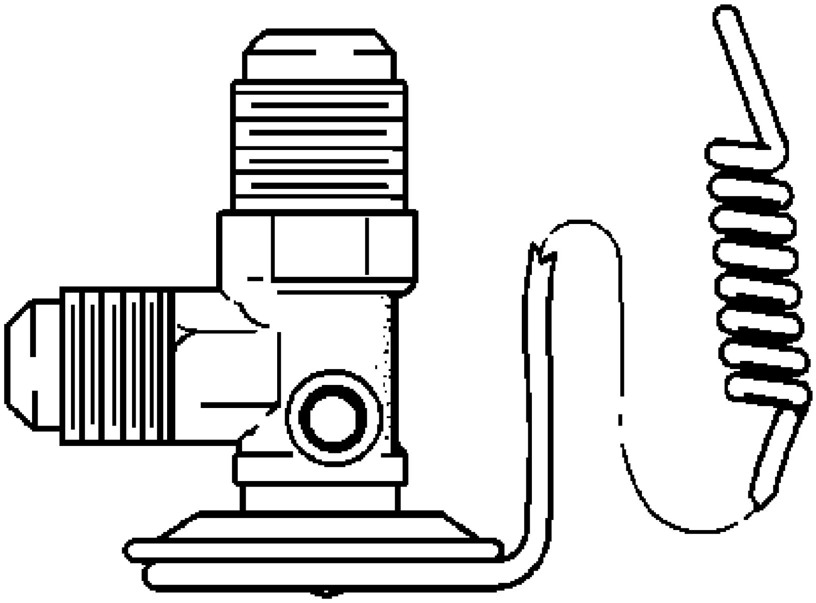


1. ACTUATING TRANSMISSION ASSY.
2. BELLCRANK ASSY. (CONDENSER)
3. PUSH ROD ASSY.
4. BELLCRANK ASSY, (MECHANISM)
5. OPEN LIMIT SWITCH
6. CLOSED LIMIT SWITCH
7. CONDENSER
8. CONDENSER DOOR
9. PUSH ROD
10. TRANSMISSION MOTOR ASSY.



CLOSED LIMIT SWITCH ADJUSTMENT

Condenser Air Scoop Installation
Figure 15



Expansion Valve
Figure 16

I. Expansion Valve

(1) Removal (see Figure 16.)

The expansion valve is in evaporator assembly between receiver dehydrator and evaporator inlet. The capillary coil is attached to evaporator outlet line.

NOTE: If expansion valve is not serviceable, it must be replaced with a new part.

(a) Remove access panels, and discharge system. Refer to paragraph 3.C or 3.D, above.

(b) Remove capillary coil from outlet line. (Do not kink capillary tube.)

(c) Uncouple all related tube fittings. (See Special Servicing Procedures, paragraph 3.B, above.)

(2) Installation

(a) Install expansion valve in inlet line of evaporator core. Apply P.A.G. lubricant on O-rings and replace O-rings on fittings, torque fittings per Chart 3.

(b) Secure capillary coil to evaporator outlet line.

(c) Evacuate and charge system per paragraph 3.C or 3.D.

(d) Check for leaks. (See leak detection, paragraph 3.C or 3.D.)

(e) Replace access panels.

J. Evaporator

(1) Removal

CAUTION: DISCHARGE THE SYSTEM BEFORE DISASSEMBLING ANY COMPONENTS FOR SERVICE.

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS PROHIBIT THE RELEASE OF REFRIGERANT INTO THE ATMOSPHERE. SPECIAL EQUIPMENT IS REQUIRED WHEN DISCHARGING OR RECHARGING SYSTEM.

Evaporator assembly consists of evaporator core, receiver-dehydrator, expansion valve, circulating fan, pressure switch, necessary housing, and plumbing. The housing is made of thermoplastic material and the condensed moisture is dumped overboard through a hose clamped to fitting on bottom of evaporator housing.

Evaporator assembly is behind cabin rear closeout panel, attached to mounting panel with 12 screws, washers, and a bracket securing the back to mounting panel.

(1) Remove air conditioning filter cover, filter, and rear access panels.
(2) Uncouple the liquid line from inlet side of receiver-dehydrator and suction line from evaporator core outlet (see Special Servicing Procedures, paragraph 3.B, above).
(3) Disconnect related electrical wires.
(4) Remove flexible air duct from housing outlet and remove drain hose from housing.
(5) Remove temperature probe from evaporator housing.
(6) Remove screws attaching support bracket and evaporator housing to mounting panel.
(7) Remove assembly through access hole in bulkhead.

(2) Installation

(1) Cement gasket in place on flanges of evaporator housing and attach large end of mounting gasket to back of housing.
(2) Install housing through access hole with air duct outlet on top and mate mounting flanges to surface of mounting panel and insert screws (Do not tighten at this time).
(3) Line mounting bracket with mating holes in mounting panel, insert screws and tighten. Tighten screws in flange and check that the gasket is in place, flange seal must be air tight.
(4) Couple suction and discharge lines to their proper fittings (apply Loctite refrigerant sealant to tube flares only).
(5) Evacuate and charge system per paragraph 3.C or 3.D, above.
(6) Check for leaks (see Leak Detection, paragraph 3.C or 3.D, above). If no leaks are detected, seal, and install access panel on evaporator housing.
(7) Couple flexible air duct and drain tube.
(8) Make and check electrical connections (see 91-21-50, Figure 1).
(9) Check blower operation and refrigerant systems.
(10) Install rear closeout panel.

K. Pressure Relief Switch

CAUTION: BEFORE RELIEF SWITCH REMOVAL, AIR CONDITIONING SYSTEM MUST BE DISCHARGED. (REFER TO DISCHARGING.)

CAUTION: UNITED STATES ENVIRONMENTAL REGULATIONS PROHIBIT THE RELEASE OF REFRIGERANT INTO THE ATMOSPHERE. SPECIAL EQUIPMENT IS REQUIRED WHEN DISCHARGING OR RECHARGING SYSTEM.

(1) Remove electrical connections from switch.

(2) Remove switch assembly from service port on steel line.

(3) Apply sealant sparingly to flare. When O-ring is present in HFC-134a systems, lube O-ring with PAG oil.

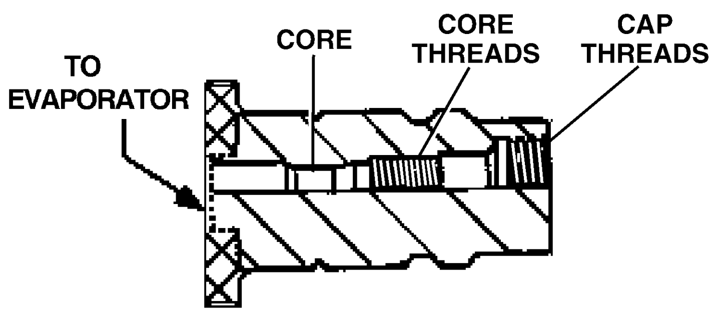
(4) Install new switch.

(5) Charge system per paragraph 3.C or 3.D, above.

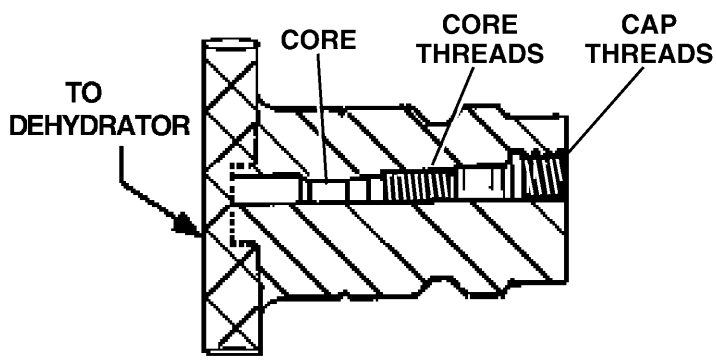
L. Service Valves

CAUTION: IF AIR CONDITIONING REFRIGERANT LINES OR SYSTEM IS OPENED, LINES AND FITTINGS MUST BE CAPPED AND SEALED IMMEDIATELY TO PREVENT DIRT AND OTHER CONTAMINANTS FROM ENTERING THE SYSTEM. (DO NOT PUT A PLUG INTO THE HOSES OR FITTINGS.)

Use inline service valves for all normal air conditioning service (i.e. - testing, bleeding, evacuating, and charging). The aircraft is equipped with inline service valves mounted in the suction and discharge lines of the evaporator assembly located behind the cabin rear closeout panel. These inline service valves are quick disconnect type Schrader valves.



LOW SIDE (PRESSURE) VALVE



HIGH SIDE (PRESSURE) VALVE

Service Valves
Figure 17

M. Electrical Installation

The wiring harness is connected to switches in the climate control center on the right side of the instrument panel. The harnesses cross the instrument panel to the left side where two wires are taken off for the compressor clutch. The harness then passes aft along the left side of fuselage connecting to the blower motor, the pressure relief switch, and the condenser actuating motor. Two fuses behind the air conditioning system control panel and a 10 amp circuit breaker mounted in circuit breaker panel protect the complete air conditioning electrical system.

(1) Adjustment of Throttle Switch

The throttle switch is mounted forward and below the throttle arm. The switch must be adjusted to actuate at the last quarter inch of full open throttle travel. Position the switch so that the throttle arm contacts the center of the switch actuator button.

(2) Fuse Replacement

Locate the fuse to be replaced behind the air conditioning system control panel.

(a) Open the fuse holder by applying a slight pushing, counterclockwise twisting, pressure.

(b) Remove blown fuse and insert a new 5 amp fuse.

(c) Close the fuse holder by applying a slight pushing and clockwise twisting pressure.

(3) Electrical Schematic

See 91-21-50, Figure 1.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

22

AUTOFLIGHT

THIS PAGE INTENTIONALLY BLANK

CHAPTER 22

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
22-List of Effective Pages	1	Feb 19/04			
	2	Jun 1/03			
22-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
22-10-00	1	Feb 19/04			
	2	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 22 - AUTOFLIGHT

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

AUTOPILOT

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. SEE INTRODUCTION, SUPPLEMENTARY PUBLICATIONS.

The S-TEC System 55X Autopilot may be installed as optional equipment. It is a conventional two-axis autopilot available with altitude pre-select and electric trim. It consists of a programmer/computer, altitude selector/alerter (optional), annunciator, turn coordinator, trim monitor, pressure transducer, pitch and roll servos, and pitch trim servo.

See Appendix 1 (grid 1K1).

THIS PAGE INTENTIONALLY BLANK

CHAPTER

23

COMMUNICATIONS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 23

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 23 - COMMUNICATIONS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

Radio Master Switch (See 91-23-00, Figure 1.)

A separate master switch for the radios is located in the switch panel in the center of the instrument panel.

NOTE: Communications tranceivers are installed in these aircraft as part of the Garmin GNS-430 or GNS-530 COM/NAV/GPS multi-function units.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

AUDIO INTEGRATING

WARNING: THE USER IS RESPONSIBLE FOR REFERING TO THE APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

GMA-340

The Garmin GMA-340 Audio Panel integrates the audio switching, amplifier, and intercom system with a marker beacon receiver. Maintenance of the GMA-340 is “on condition” only and, with the exception of swapping complete units, should be performed only by a qualified avionics shop in accordance with the GMA-340 Audio Panel Maintenance Manual (Garmin P/N 190-00149-02).

Information provided in this manual is intended to aid the removal and installation of the GMA-340 unit and its associated wiring and to permit basic system functional test and adjustment.

A. Removal and Installation (See Figure 2.)

See Rack-Mounted Avionics, Removal and Installation, 39-10-00.

B. System Functional Test (See Figure 1.)

(1) On Ground

The following known good equipment is required prior to performing this test: microphone, headset, speaker and avionics receivers.

(a) Lamp Test

1 Apply power to the unit by rotating the pilot intercom knob clockwise.

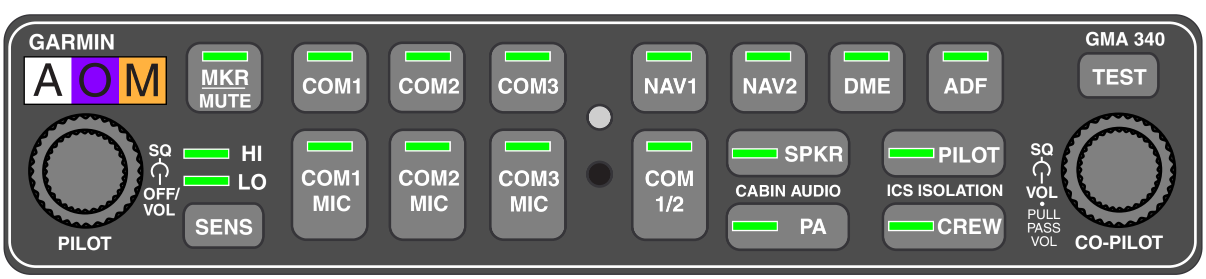
2 The test button checks the internal LED annunciator and marker beacon lamps. Press TEST to confirm operation of the LED’s. Cover the photocell with a finger and observe that the LED annunciators dim automatically. Check the front panel back-lighting and dimming function. Each annunciator contains a lamp for illumination.

(b) Fail-safe Operation Check

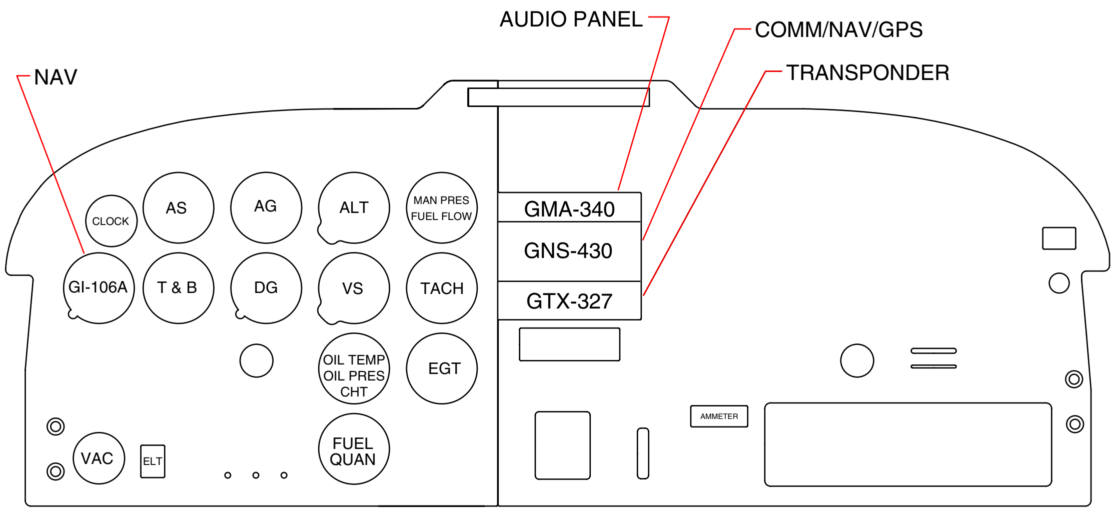
1 Turn the unit off by rotating the pilot intercom knob counterclockwise.

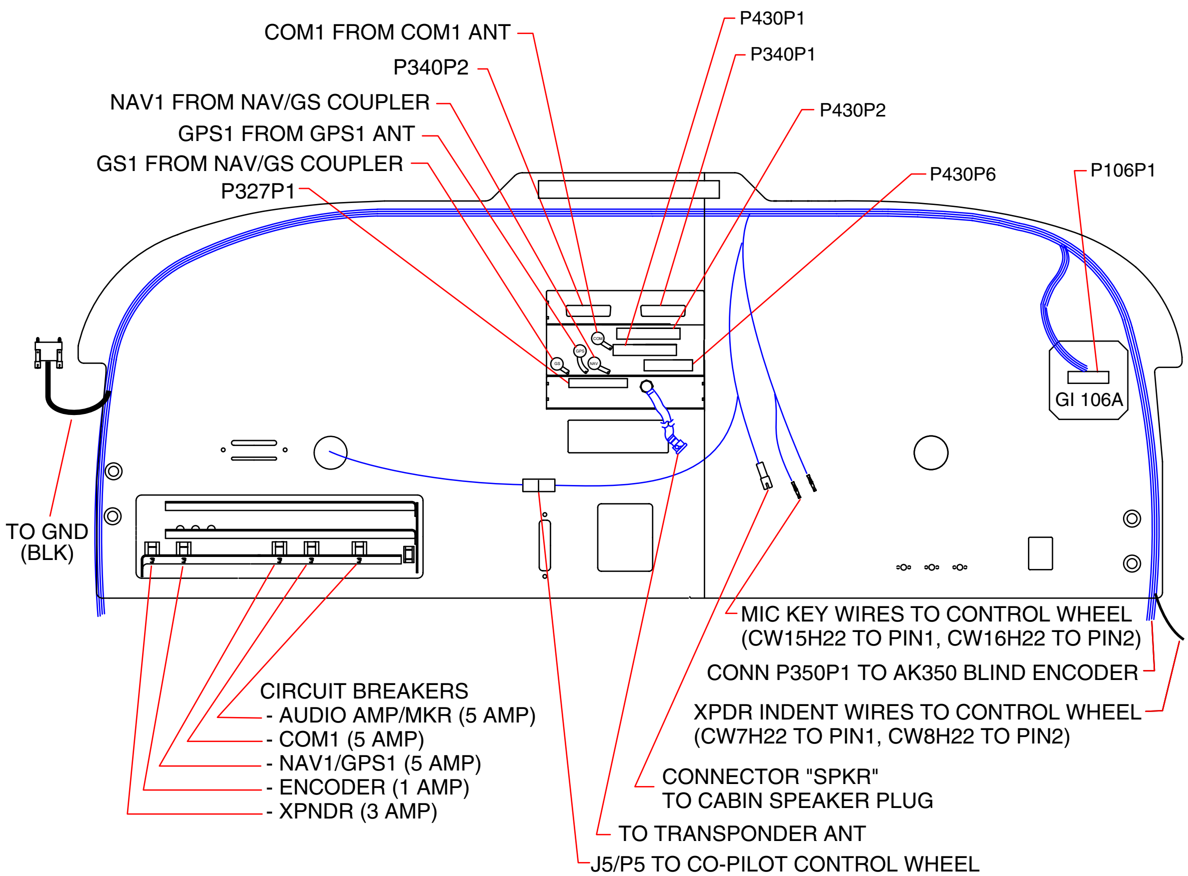
2 Check fail-safe operation by exercising the COM 1 microphone, microphone key and audio over the headphones.

3 Turn the unit back on to continue testing.



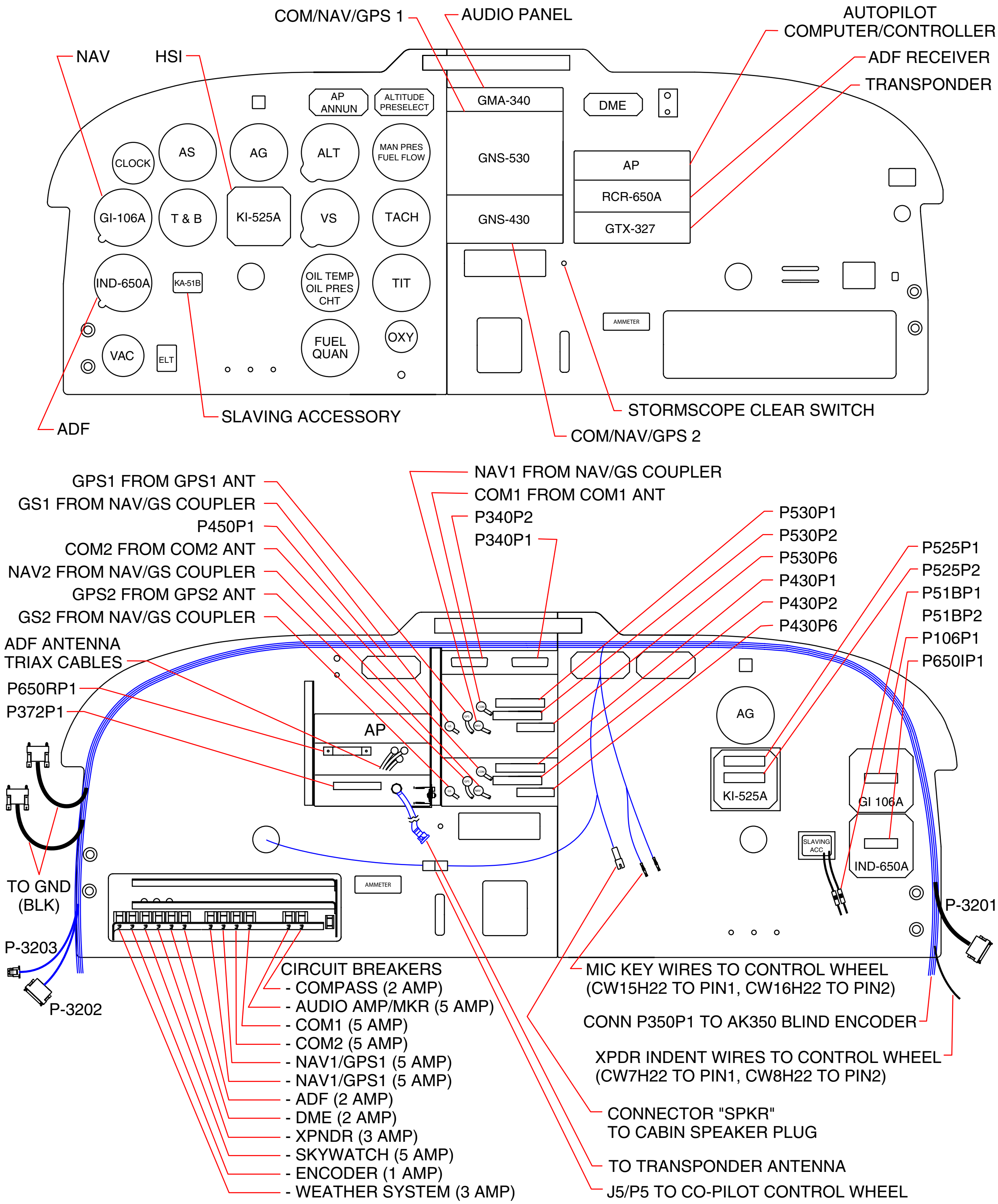
GMA-340 Audio Panel
Figure 1





STANDARD AVIONICS INSTALLATION
(6X SHOWN)

Avionics Installation
Figure 2 (Sheet 1 of 2)



OPTIONAL AVIONICS INSTALLATION
(6XT SHOWN)

Avionics Installation
Figure 2 (Sheet 2 of 2)

(c) Transceiver Operational Check

1 Perform a ramp test radio check by exercising the installed transceivers, microphone, microphone key and audio over the headphones and speaker.

2 Verify that communications are loud and clear and push-to-talk (PTT) operation is correct.

(d) Intercom System (ICS) Check

1 Set the intercom to the ALL mode (Crew and Pilot LED's off).

2 Plug in headsets at each ICS position.

3 Adjust squelch and volume for each position and verify that the ICS is working properly.

4 Check Pilot and Copilot ICS positions for isolation and proper operation of volume and squelch controls.

5 Press the PA button. Verify that microphone audio is heard over the speaker.

(e) Aircraft Receivers Check

1 Select the audio source corresponding to each installed avionics unit and check for audio over the headsets.

2 Check for Pilot/Copilot audio isolation when pressing the COM 1/2 button.

3 Press the SPKR button and verify that any selected audio is heard over the speaker.

(f) Music System Check

Connect a stereo music source to MUSIC 2. Press the CREW button to set the ICS to the crew mode. Verify that stereo audio is heard in the passenger headsets only.

(2) In Flight

Verify proper operation of the marker lamps and marker audio, including the marker audio mute function. Check proper operation of the marker sensitivity selection (using the SENS button) by flying towards the outer marker position initially using HI sensitivity. When the OM audio is just barely audible in the headset, switching to LO sensitivity should reduce or eliminate the audio.

C. Adjustment (See Figure 3.)

CAUTION: USE ONLY A 2 MM (MAX BLADE WIDTH) FLAT-BLADE NONCONDUCTIVE SCREW DRIVER AS AN ADJUSTMENT TOOL. BE CAREFUL WHEN INSERTING ADJUSTMENT TOOL THROUGH THE TOP COVER. THE UNIT MAY BE DAMAGED IF AN ADJUSTMENT TOOL IS ACCIDENTALLY FORCED AGAINST UNINTENDED COMPONENTS OR CIRCUIT BOARD PATHS.

The following adjustments can be made through access holes in the top cover of the GMA 340:

(1) Marker beacon audio level.

Counter-clockwise adjustment increases the marker audio level.

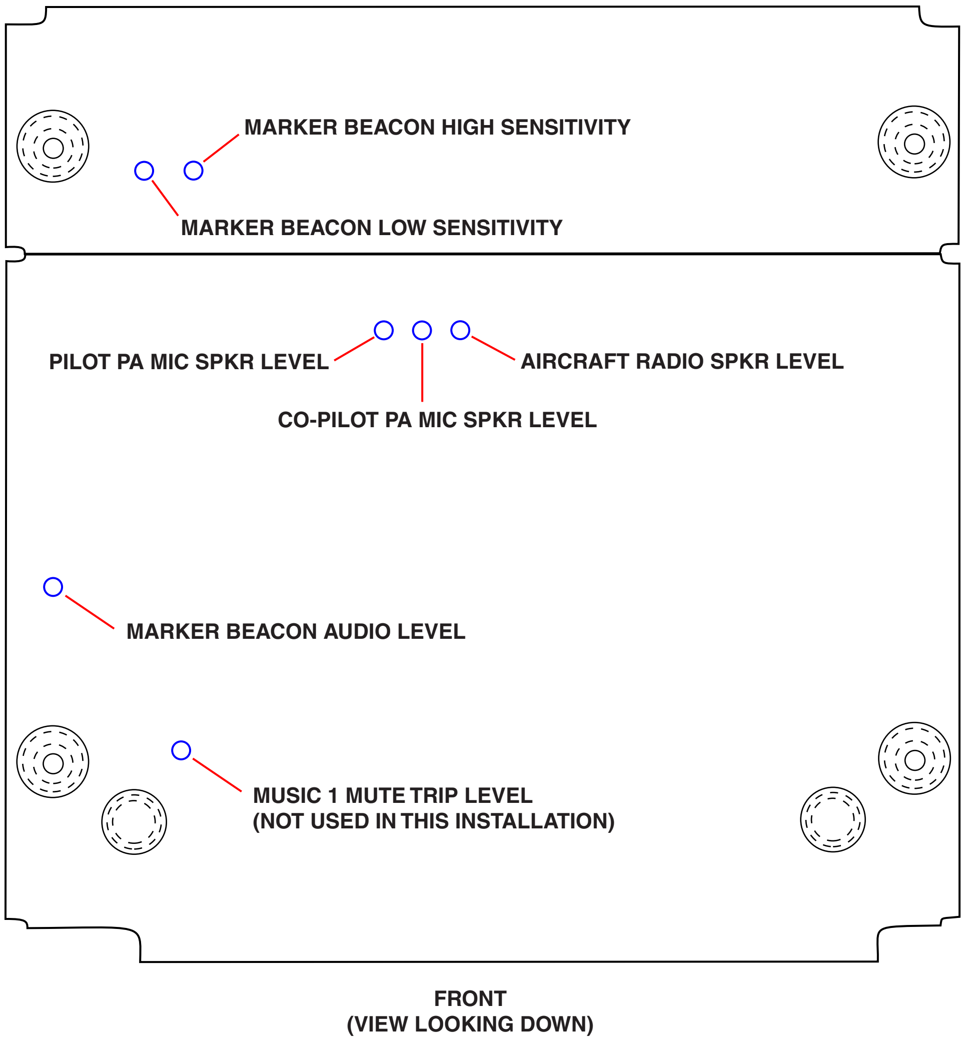
(2) Marker beacon sensitivity.

Clockwise (CW) adjustment increases the sensitivity. LOW sensitivity can be adjusted without affecting HIGH sensitivity setting. Adjusting HIGH sensitivity will, however, affect the LOW sensitivity. If the HIGH sensitivity setting is adjusted, then the LOW sensitivity setting should be checked and adjusted afterwards, as needed. If your GMA-340 top cover does not have the marker beacon sensitivity adjustment access holes as indicated in Figure 3, and you need to adjust the sensitivity, contact Garmin for instructions.

(3) Aircraft radio speaker output level.

(4) Pilot PA microphone speaker output level.

(5) Copilot PA microphone speaker output level.



GMA-340 Audio Panel Adjustments
Figure 3

THIS PAGE INTENTIONALLY BLANK

STATIC DISCHARGING

1. Static Wicks

A. Description

This airplane is equipped with seven (7) static wicks: one (1) on the inboard end of each aileron; one (1) on each outboard end of the stabilator; one (1) on the left-hand side of the rudder at the bottom; and one (1) in the center of each flap.

B. Inspection

Static discharging wicks must be inspected each 100 hours as follows:

(1) General appearance and physical condition.

(2) Security of attachment to airframe.

(3) Discharge points visible.

(4) Resistance (1.0 to 100 megohms, 500 to 1,000 volt megohmmeter).

(5) Base resistance to airframe (one (1) ohm maximum).

2. Bonding Straps

To aid in dissipating static electricity buildup the ailerons, stabilator, stabilator tab, and rudder are bonded to either the control's hinge or spar.

When replacing the jumper assemblies (bonding straps), secure the end of the jumper that mounts to the control's hinge or spar as follows:

A. Clean an area of 1 1/2 times the diameter of the jumper's washer down to bare metal.

B. Attach the jumper and washer to the control's hinge or spar.

C. Seal the cleaned area with waterborne, chromated, fluid resistant, epoxy primer (i.e. - PRC Desoto) and acrylic lacquer.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

24

ELECTRICAL POWER

THIS PAGE INTENTIONALLY BLANK

CHAPTER 24

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

GENERAL

1. Description and Operation

The electrical system is a 28-volt, direct current, single wire, negative ground system. All electrical equipment is grounded to the metal structure of the airplane; therefore, the structure takes the place of the second wire. A 24-Volt battery is incorporated in the system to furnish power for starting and as a reserve power source in case of alternator failure. With the exception of the starter, which receives its power directly from the load side of the battery, the battery and alternator (90 Amp Electrosystem, Inc.) are both connected to the bus bar, from which all electrical equipment is powered. The battery master switch controls the battery relay. A radio master (i.e. - ground clearance) switch is installed as standard equipment and provides a direct circuit to COMM1, speakers, and radio accessories when switched ON. Otherwise, the battery master switch must be on before any electrical equipment will operate. The airplane is equipped with standard navigation lights, anti collision lights, and a landing light mounted on the nose landing gear.

2. Troubleshooting

WARNING: ALL CHECKS AND ADJUSTMENTS OF THE ALTERNATOR AND/OR ITS COMPONENTS SHOULD BE MADE WITH THE ENGINE STOPPED. TO COMPLETE SOME CHECKS OR ADJUSTMENTS, IT WILL BE NECESSARY TO REMOVE THESE UNITS FROM THE AIRPLANE AND PLACE ON A TEST STAND.

Typical electrical system problems are listed in Chart 1 along with their probable causes and suggested remedies. The electrical schematics included in Chapter 91 depict the different electrical circuits used in the airplane.

After the trouble has been corrected, check the entire electrical system for security and operation of its components.

CHART 1 (Sheet 1 of 4)
TROUBLESHOOTING ELECTRICAL SYSTEM

Trouble	Cause	Remedy
Zero output indicated on ammeter regardless of rpm (refer to alternator system test procedure).	Open field circuit.	With the battery switch turned on, check for battery voltage from the main bus through the entire field circuit to the alternator field terminal.
		Measure the voltage from the ground (-) to the following points (+) in sequence: bus bar, field circuit breaker (5A), field terminals of master switch voltage regulator and alternator field terminal.
		Interruption of voltage through any of these points isolates the faulty component or wire which must be replaced. (See schematic, Chapter 91.)
	Open output circuit.	With the battery switch turned on, check for battery voltage from the airplane's main bus through the entire output circuit to the alternator battery post.
		Measure voltage from ground (-) to the following points (+) in sequence: bus bar, output current limiter, ammeter, and alternator battery post. Interruption of voltage through any of these points isolates the faulty component or wire which must be replaced. (See schematic, Chapter 91.)
		Open circuit in alternator output will usually burn out ALT annunciator and the 50 ohm resistor. Check 5 amp in-line fuse.

CHART 1 (Sheet 2 of 4)
TROUBLESHOOTING ELECTRICAL SYSTEM

Trouble	Cause	Remedy
Zero output indicated on ammeter regardless of rpm. (continued)	Open field winding in alternator.	Disconnect field terminal of alternator from field wiring and check for continuity from field terminal to ground with ohmmeter (20-100 ohms) depending on brush contact resistance.
CAUTION: TURN MAGNETO SWITCH TO OFF BEFORE TURNING PROP.		
		Pull propeller slowly by hand turning alternator rotor through 360° of travel.
		If resistance is high, check brushes for spring tension and excessive wear and replace if necessary. If brushes are okay and field reads open, replace alternator.
Output indicated on ammeter does not meet minimum values specified in alternator system test procedure.	Faulty voltage regulator.	Start engine, turn on load (ref. alternator test procedure), set throttle at 2300 rpm. Check voltage at buss bar (remove cigar lighter and check from center contact (+) to ground (-)). Voltage should be 27.5 volts minimum. If voltage is below this value, replace regulator.
.	High resistance connections in field or output circuit.	Check visually for loose binding posts at the various junction points in system, alternator battery post, lugs on ammeter, connections at voltage regulator, circuit breaker, etc. (See schematic, Chapter 91.)
		Examine crimped terminal ends for signs of deterioration at crimp or strands of broken wire at crimp. Tighten any loose binding posts or replace bad wire terminals.

CHART 1 (Sheet 3 of 4)
TROUBLESHOOTING ELECTRICAL SYSTEM

Trouble	Cause	Remedy
Output indicated on ammeter does not meet minimum values specified in alternator system test procedure. (continued)	Open rectifier.	If any of the six rectifiers pressed into the rear bell housing of the alternator open up internally, it will result in a definite limitation on the current that can be drawn from the alternator. After having checked the previous causes of low output it can be assumed that a faulty rectifier exists. See 24-30-00, Alternator Overhaul, Diode Testing.
Field circuit breaker trips.	Short circuit in field circuit.	Disconnect field wiring at terminal of alternator. Turn on master switch. If breaker continues to trip, disconnect each leg of field circuit, working from alternator towards the circuit breaker until breaker can be reset and will hold. Replace component or wire which was isolated as defective. (See schematic, Chapter 91.)
	Short circuit in field winding of alternator	Disconnect field wiring at terminal of alternator. Turn on master switch. Set breaker, and if breaker fails to trip, this isolates short circuit to field of alternator itself. Check brush holders for shorting against frame. If there are no obvious signs of a physical short circuit at field terminal or brush holder, replace alternator.

Note: Intermittent short circuit. Internal short circuit of the field can occur at various positions of the rotor, therefore, reconnect field, reset breaker.

CHART 1 (Sheet 4 of 4)
TROUBLESHOOTING ELECTRICAL SYSTEM

Trouble	Cause	Remedy
Field circuit breaker trips. (continued)	Short circuit in field winding of alternator. (continued)	
CAUTION: TURN MAGNETO SWITCH TO OFF BEFORE TURNING PROP.		
		Pull propeller slowly by hand turning alternator rotor through 360° degrees of travel. Observe circuit breaker for signs of tripping.
Ammeter indicates 60 amps at 1400 rpm and above, ALT annunciator light on.	Short to ground in alternator output wiring.	Check condition of teflon insulators on feet of diode heat sink. When the mounting screws are over torqued they can cut through insulators causing a short-to-ground.
		Check other wiring for chafing, etc.
Excessive ammeter fluctuation.	Excessive resistance in field circuit.	Check all connections and wire terminals in field circuit for deterioration such as loose binding posts, broken wire strands at terminals, etc. Tighten all connections and replace faulty terminals.
	High field circuit resistance.	If problem persists, jump across the terminals of the following components one at a time until the faulty unit is isolated. a. Field 5-amp (alternator circuit protector). b. Alternator switch. c. Overvoltage relay.
	Defective voltage regulator.	Replace voltage regulator.
	Faulty grounds.	Completely clean all corrosion from grounding points.

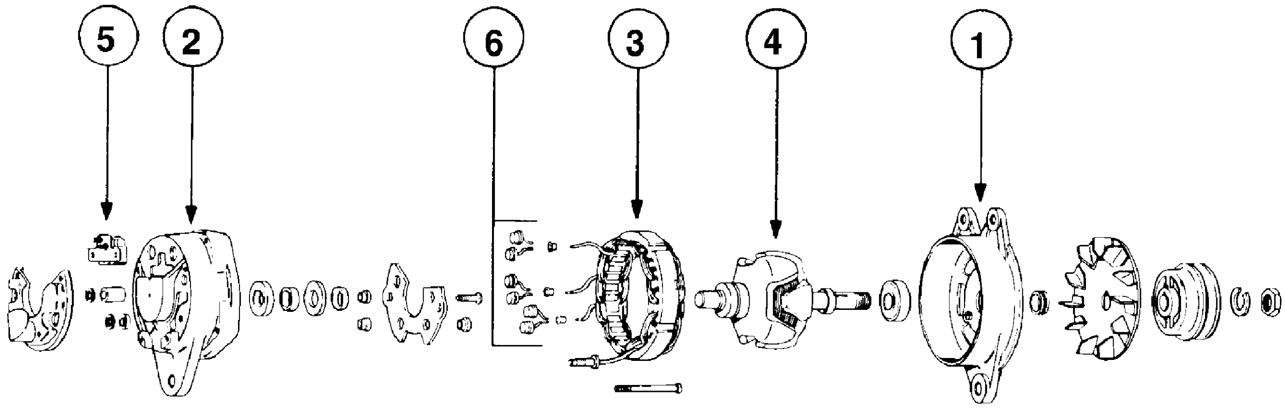
THIS PAGE INTENTIONALLY BLANK

D.C. GENERATION

1. Alternator System (90 Amp Electrosystems. Inc.) (See Figure 1.)

   A. Description

   The principal components of the alternator are the front housing, fan and pulley, rear housing and terminal identification, stator core and coil assembly, rotor core and coil, brushes and holder assembly and rectifier assembly.



Exploded View of Electrosystems Alternator
Figure 1

(1) The front housing (1) is a die-cast aluminum part which meets design requirements for a lightweight, non-magnetic material. This casting incorporates the bosses used to attach the assembly to its mounting bracket. It also provides the supporting surface for the rotor shaft front bearing and vendor identification data stamped into the front housing.

The fan and pulley are attached to the rotor shaft with a nut and lock-washer. The forward end of the shaft is threaded to accept the nut.

(2) The rear housing (2) is also a die-cast aluminum part which supports the rotor shaft rear bearing and provides mounting bosses for the rectifier assembly. The housing contains the various electrical connections and openings for cooling airflow. (Refer to Figure 2 for Terminal identification.)

(3) The stator core and coil assembly (3) consists of a number of steel stampings riveted together to form the stator core which contains 36 equally spaced vertical slots to accommodate the stator coil windings. (Refer to Figure 3.)

(4) The rotor core and coil assembly (4) consists of the rotor shaft, two slip rings, two rotor halves and the coil assembly. The shaft is supported at each end by bearings. The front bearing (ball-type) is a slip fit on the shaft and is retained in the front housing with a retainer. The rear bearing (needle-type) is pressed into the rear housing. The slip rings, core and coil assembly are press-fitted to the shaft with a rotor half enveloping each end of the coil.

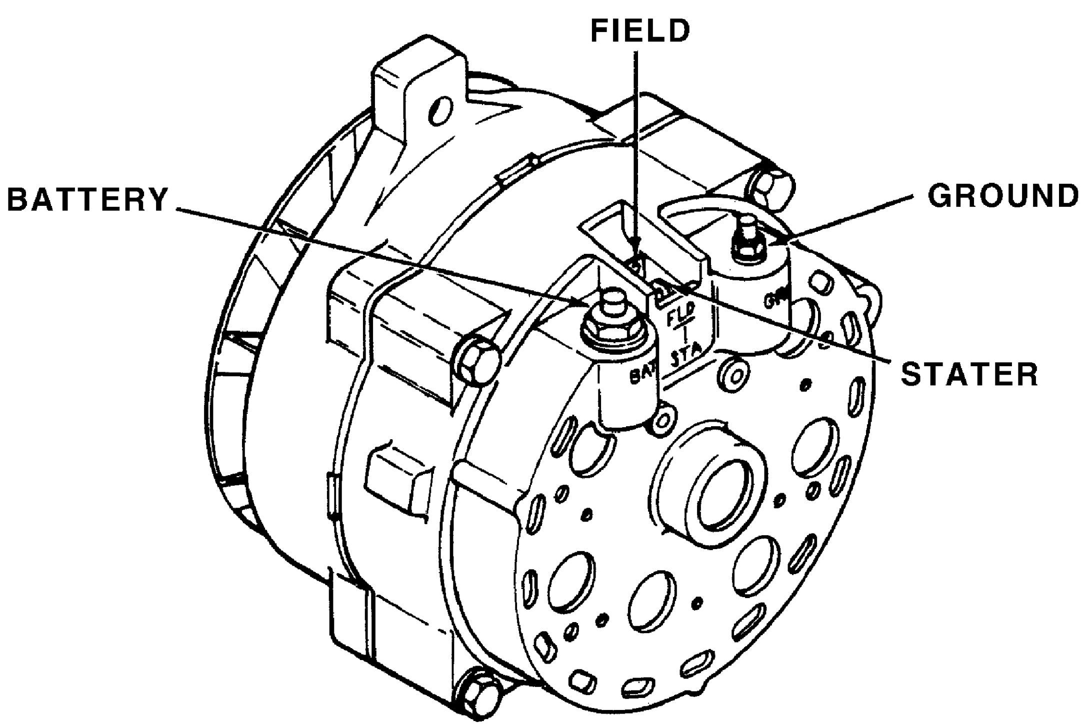
The rotor core and coil assembly turns inside the stator core and coil assembly with a very narrow air gap between the two assemblies, thus developing maximum magneto induction.

(5) The brush and holder assembly (5) is installed in a cavity inside the rear housing. The brushes ride the surfaces of the slip rings on the rotor shaft under spring pressure and transmit field current through their circuit to ground. One brush or field terminal is, therefore, insulated from the housing.

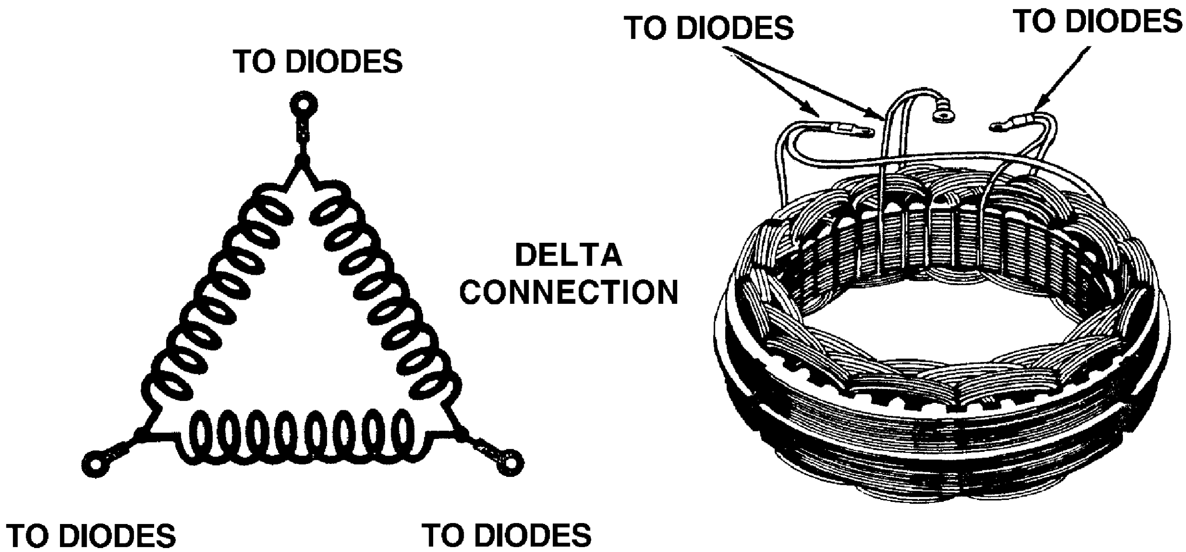
(6) The rectifier assembly is located between the stator and the inside surface of the rear housing. Attachment to the housing is made by means of mounting studs that protrude from the positive and negative diode plates (heat sinks). The positive plate is insulated from the housing, and the negative plate is grounded to the housing through the studs. The rectifier assembly has a printed circuit board spaced away from the heat sinks. (Refer to Figure 4.)

The stator winding leads (6) are soldered to integral terminals on the back of the circuit board. The stator phase top is attached to the insulated stator terminal. The heat sinks are attached to the circuit board with insulated spacers and roll pins maintaining the necessary separation between the two assemblies. The diodes themselves are exposed. The rectifier assembly has three diode plates connected to an AC potential. Each of the three plates is connected to one of the three stator leads. Two steel conductor plates or “bus bars”, one positive and the other negative, circle the diodes beginning at the BAT and GND terminal studs. The bus bars act as termination points for collecting the DC current from the terminal wire of each diode. One positive and one negative diode is soldered to each of three stamped aluminum plates to form the plate and diode assemblies. The aluminum plates serve as heat sinks to cool the diodes by providing increased surface area to the air flow through vent slots in the rear housing to the fan at the front of the alternator.

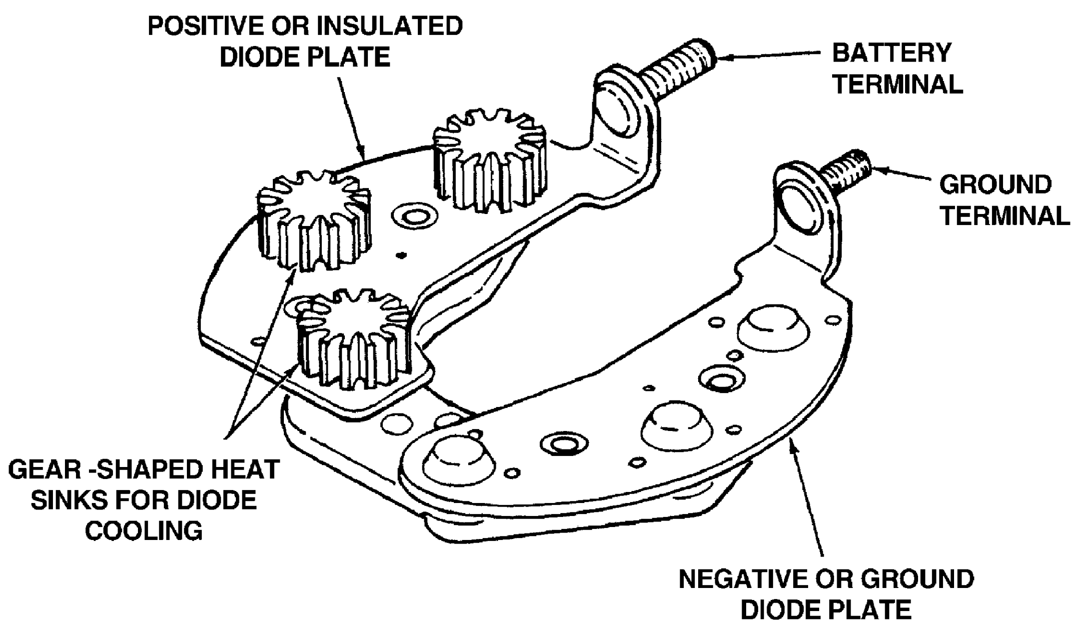
One plate and diode assembly is connected to each of the three leads to form the full wave bridge rectifier. Diode terminal wires are connected to the bus bars by means of a flexible connector wire. One diode is connected to the positive bus bar, and the other diode, on each plate, is connected to the grounded or negative bus bar. (Refer to Figure 5.)



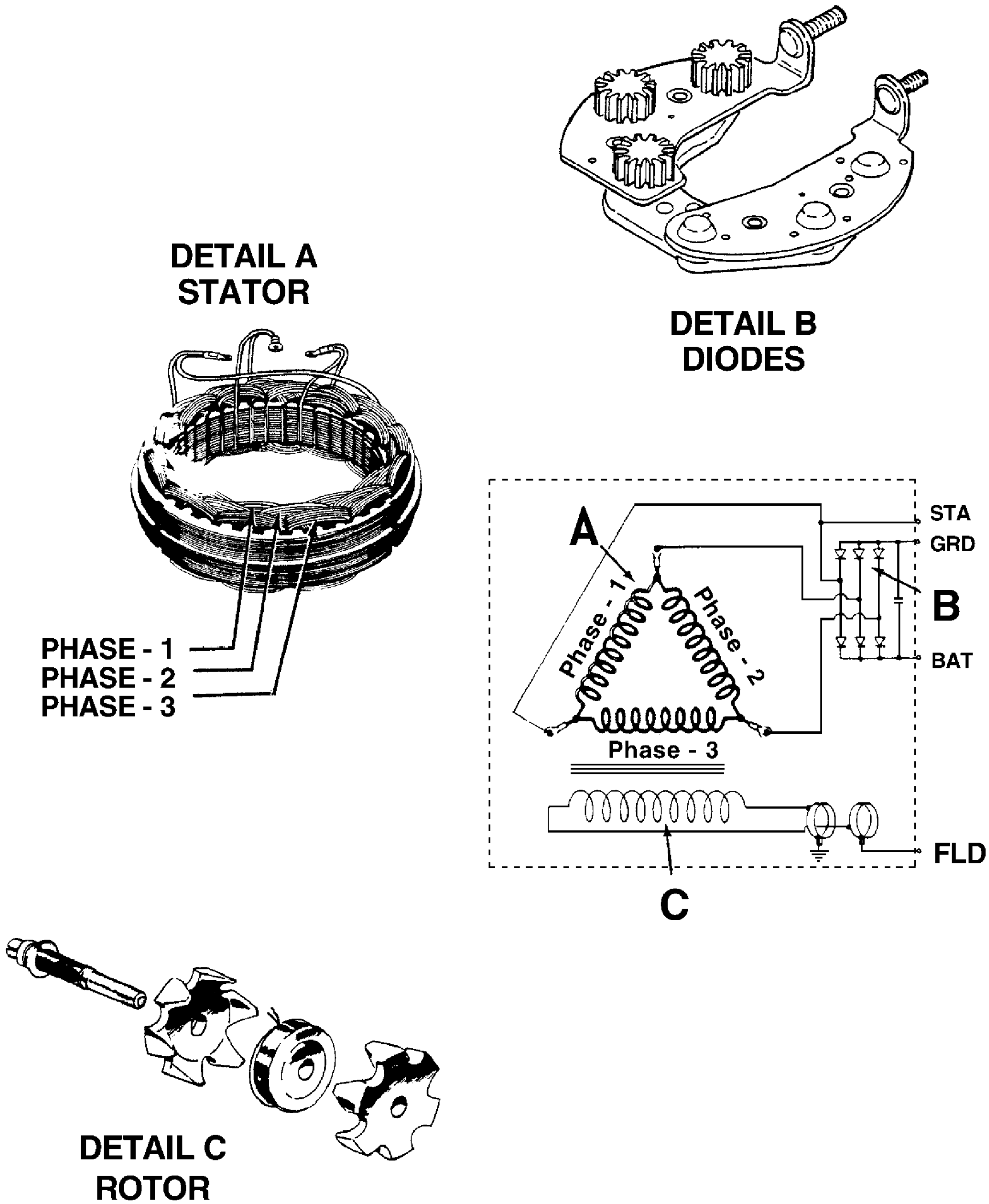
Rear View and Terminal Identification
Figure 2



Stator Core and Windings
Figure 3



Rectifier Assembly
Figure 4



Internal Relationships of Alternator Components
Figure 5

B. Precautions

Considerable time and expense can be saved observing the following precautions prior to testing the charging system.

(1) Always disconnect the battery ground cable before disconnecting wiring or components of system.

(2) Whenever the battery cables are connected and the BATT MASTR switch is ON, avoid contacting alternator output terminal (BAT), because it is directly connected to the battery bus voltage

(3) Never connect the battery ground cable until all system wiring connections and components are complete.

(4) When adjusting belt tension, always apply force near pulley of the alternator to avoid damage to stator and rectifier, or use a 1 1/8 inch open end wrench on the adjustment lug of the alternator case casting.

(5) Never attempt to polarize the alternator. Polarizing is not applicable to alternator and could damage the regulator.

(6) Observe polarity when installing a battery in aircraft. Reverse polarity will destroy the diodes in alternator.

(7) Always connect a booster battery in parallel, negative to negative, positive to positive.

(8) Before disconnecting a booster battery, reduce engine speed to idle. Turn landing light ON to prevent a voltage surge that could destroy small light bulbs. Disconnect booster battery; turn landing light OFF.

(9) Disconnect the battery ground cable before connecting a charger to the battery.

C. On Aircraft Checks

(1) Visual Inspection

Prior to testing, perform a visual inspection of charging system components. What appears to be a charging system problem can, in some instances, be traced to some of the relatively simple discrepancies outlined here that are easily corrected.

(a) Proper belt tension. If alternator pulley wheel can be slipped on belt by hand the belt is too loose or glazed. Replace or tighten belt per Alternator Belt Tension Adjustment, below.

(b) Specific gravity of battery reading. A fully charged battery should read 1.275.

(c) Clean and tighten battery posts and cable clamps.

(d) Clean and tighten wiring connection at alternator.

(e) Clean and tighten wiring connections at regulator.

(2) Ammeter Validity Test

With engine off, place BATT MASTR switch in the ON position. Switch landing light switch ON. Ammeter should show discharge. If ammeter needle does not move:

(a) Check wiring connections at ammeter are tight and clean, or;

(b) Ammeter is defective. Replace ammeter.

(3) Battery Supply Voltage Test

If airplane ammeter shows discharge with engine running, perform the following test before checking alternator voltage output. The test will verify that battery voltage is being supplied to regulator. Alternator cannot provide output unless field voltage is supplied.

(a) Disconnect connector at voltage regulator.

(b) Connect voltmeter positive lead to pin 1 of disconnected plug (B lead of regulator) and negative lead to aircraft structure.

(c) Turn BATT MASTR and ALTR switches ON. Voltmeter should read battery voltage. If voltage is not present:

1 Check continuity of wiring harness from regulator plug to alternator circuit breaker.

2 Ensure that alternator regulator circuit breaker is closed and not defective.

(4) Voltage Output No-Load Test

Perform this test, as well as the following voltage output load test, whenever an overcharging or undercharging condition is suspected. Make a visual check as previously outlined. Engine should be at normal operating temperature .

(a) Connect voltmeter positive lead to positive battery terminal and negative lead to negative battery terminal. Record voltage reading.

(b) Assure that all switches and lights are OFF, i. e., no load condition.

(c) Start engine and slowly increase speed to approximately 1500 rpm.

(d) Voltmeter reading should increase, but not more than 4 volts more than voltage recorded above.

(e) If the voltage does not increase, or if the increase is within the 4 volt limit, proceed to Voltage Output Load Test.

(f) If voltage increase exceeds 4 volts, stop engine, and isolate overvoltage problem as follows:

1 Disconnect regulator plug from regulator and repeat the test with plug disconnected.

2 Voltmeter should show no increase in voltage because excitation voltage to alternator is cut-off. Replace regulator.

3 If voltage increases, with the regulator plug disconnected, excitation voltage is being supplied to alternator field by a short circuit. Isolate and check continuity of wiring harness. Repair or replace.

(5) Voltage Output Load Test

This test will determine if there is an undercharge condition.

(a) Connect regulator plug.

(b) Connect voltmeter to negative and positive post of battery. Record voltage reading.

(c) Turn OFF all accessory switches. Open circuit breakers where switches do not control circuits.

(d) Start the engine. Apply a load by turning on the landing light.

(e) Slowly increase engine speed to 1500 rpm.

(f) Voltage reading should increase a minimum of 0.5 volt above previous reading.

(g) Turn OFF landing light and shut down engine.

(h) If voltage fails to increase a minimum of 0.5 volt, position alternator switch to OFF. An under voltage condition exists. Proceed as follows to isolate problem.

1 Disconnect regulator plug and install a jumper from positive terminal of battery to pin 2 (F pin of regulator plug).

CAUTION: DO NOT OPERATE ENGINE MORE THAN 2 MINUTES WITH JUMPER INSTALLED. DAMAGE TO COMPONENTS OF ELECTRICAL SYSTEM COULD OCCUR.

2 Start engine. Turn ALTR switch ON. Apply electrical load by turning landing light ON. Slowly increase engine speed to determine that voltage recorded in step (b), above, increases. Stop rpm increase when voltage measures 0 volts.

3 Voltage reading at battery should increase above previous reading a minimum of 0.5.

4 Turn landing light OFF. Turn ALTR switch OFF. Shut down engine. If the increase in voltage reading is still less than 0.5 volt, the problem is in the wiring harness or alternator.

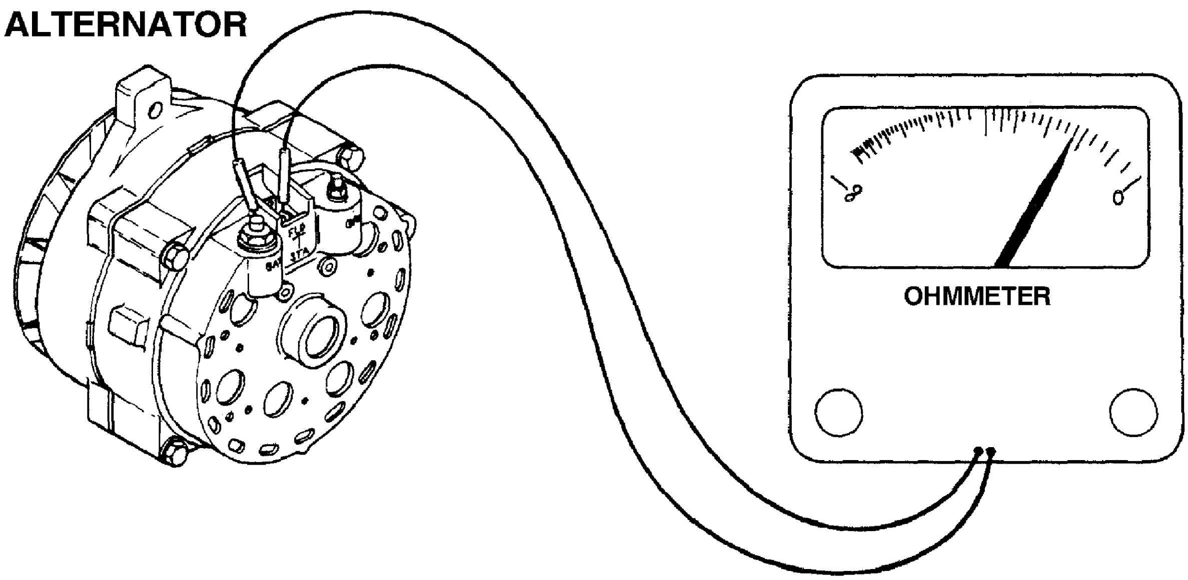
5 To isolate the wiring harness, remove jumper end from the voltage regulator plug and connect it to the FLD pin of the alternator (plug removed).

6 Leave alternator regulator plug disconnected.

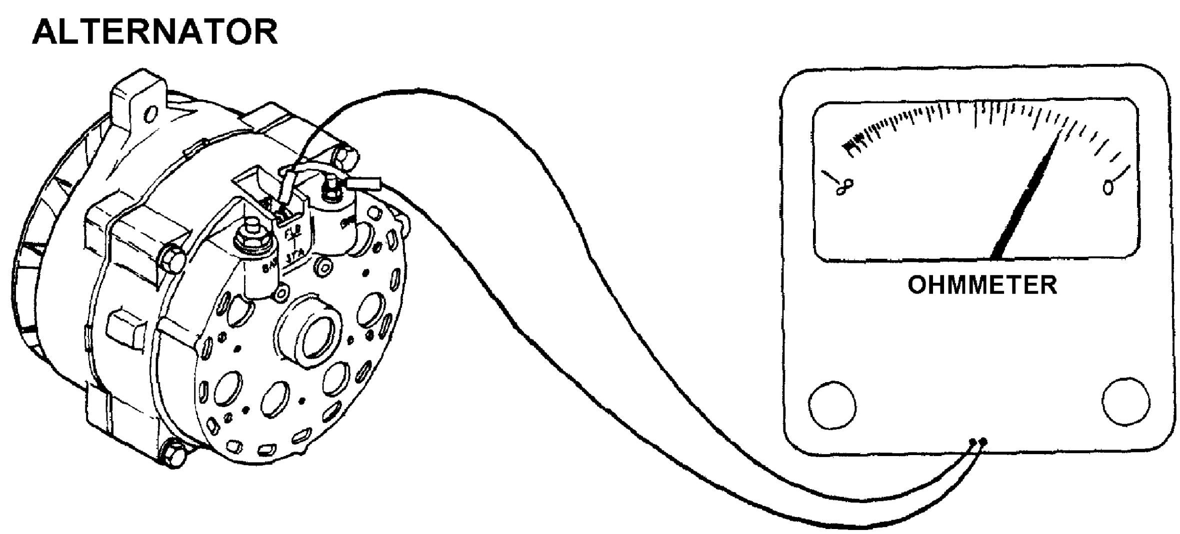
7 Start engine. Turn ALTR switch ON. Apply electrical load by turning landing light ON. Slowly increase engine speed to determine that voltage recorded in step (b), above, increases. Stop rpm increase when voltage measures 0.0 volts. Observe two (2) minute operation CAUTION, above.

a If the voltage increase is now a minimum 0.5 volt, fault is wiring harness. Repair or replace harness.

b If the voltage increase is still below 0.5 volt, fault is in alternator. Remove alternator from aircraft for bench test.



Rectifier Ground and Positive Diode Test
Figure 6



Stator Ground and Negative Diode Test
Figure 7

D. Alternator Removal

The alternator is factory-installed by the engine manufacturer (Lycoming) using Lycoming mounting brackets. Removal and installation instructions may be found in the appropriate vendor service publication or in the instructions / drawings for Lycoming Kit No. 05J22487.

E. Bench Tests

The only equipment required to bench check the alternator is an ohmmeter. Zero ohmmeter when each resistance setting is selected. Zeroing is accomplished by touching ohmmeter probes together and adjusting zero knob to align meter on full scale reading.

(1) Rectifier Ground and Positive Diode Test (Refer to Figure 6.)

CAUTION: DO NOT USE DIGITAL OHMMETER FOR THIS TEST; IT WILL GIVE FALSE INDICATIONS.

(a) Set the ohmmeter selector switch to resistance scale 10 and zero the meter.

(b) Attach one ohmmeter lead to BAT terminal and the other to the STA (Stator) terminal. A reading of 60 ohms should be obtained. Reverse leads. An infinite (no needle movement) should be obtained.

(c) A reading of 60 ohms or less in both directions indicates:

1 A defective positive diode.

2 A grounded positive diode plate.

3 A grounded alternator BAT terminal.

(d) Infinite reading (no needle movement) in both directions indicates an open STA terminal connection.

(2) Stator Ground and Negative Diode Test (Refer to Figure 7.)

CAUTION: DO NOT USE DIGITAL OHMMETER FOR THIS TEST; IT WILL GIVE FALSE INDICATIONS.

(a) Set the ohmmeter selector switch on resistance scale 10 and zero meter.

(b) Connect one lead to the “STA” terminal and the other lead to the GRD terminal. A reading of approximately 60 ohms should be obtained. Reverse leads and check in opposite direction. An infinite reading (no needle movement) should be obtained.

(c) A reading of 60 ohms or less in both directions indicates:

1 A defective negative diode.

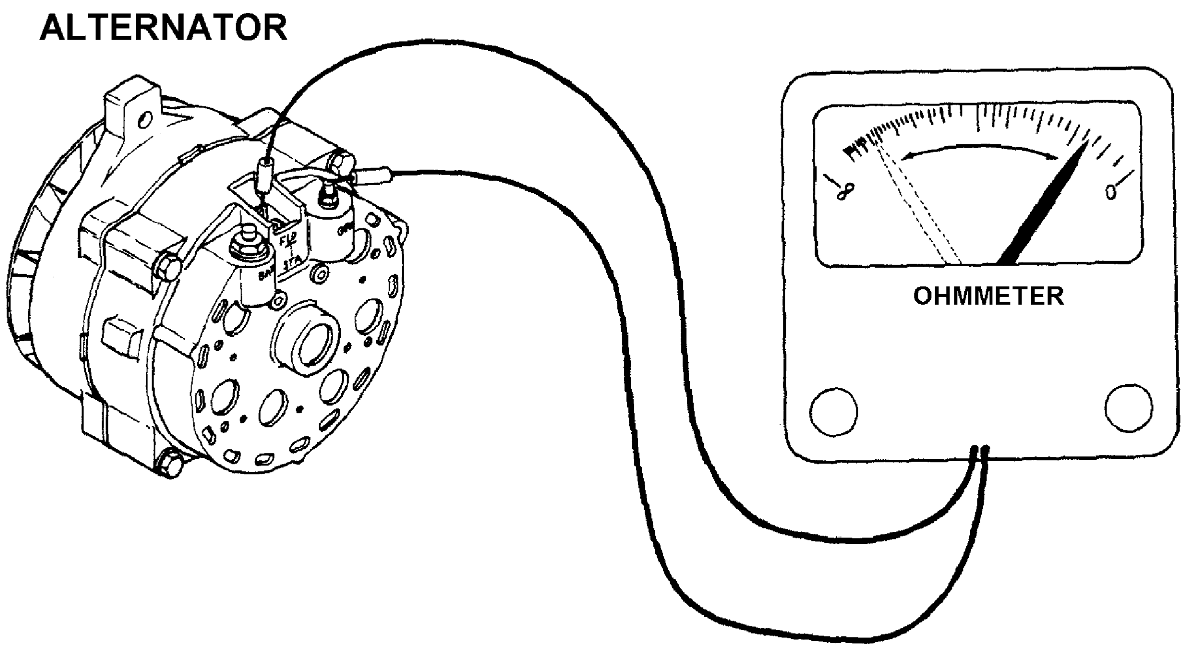
2 A grounded positive diode plate.

3 A grounded alternator BAT terminal.

4 A grounded STA terminal.

5 A grounded stator winding (laminations grounded or windings grounded to front or rear housing).

(d) Infinite readings (no needle movement) in both directions indicates an open STA terminal connection.



Field Circuit Open or Ground Test
Figure 8

(3) Field Circuit Open or Ground Test (Refer to Figure 8.)
- (a) Set ohmmeter selector switch to resistance scale one and zero meter.
- (b) Connect one lead to the FLD terminal and the other lead to the GRD terminal.
- (c) Spin alternator pulley and note ohmmeter reading. Meter should read between 4 and 200 ohms and fluctuate while rotor is turning.
- (d) A reading lower than four ohms indicates:
  - 1 A grounded positive brush.
  - 2 A grounded field terminal.
  - 3 A defective rotor.
- (e) A reading higher than 200 ohms indicates:
  - 1 Worn out or hung brushes.
  - 2 An open brush lead.
  - 3 A defective rotor.

F. Alternator Overhaul

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

(1) Disassembly

(a) Scribe a mark across stator and front and rear housings to facilitate alignment during assembly. (Refer to Figure 9.)

(b) Separate front housing and rotor from rear housing by removing four thru bolts between housings. Remove rear housing.

(c) Remove retainer nuts and insulators from the BAT and GRD terminals.

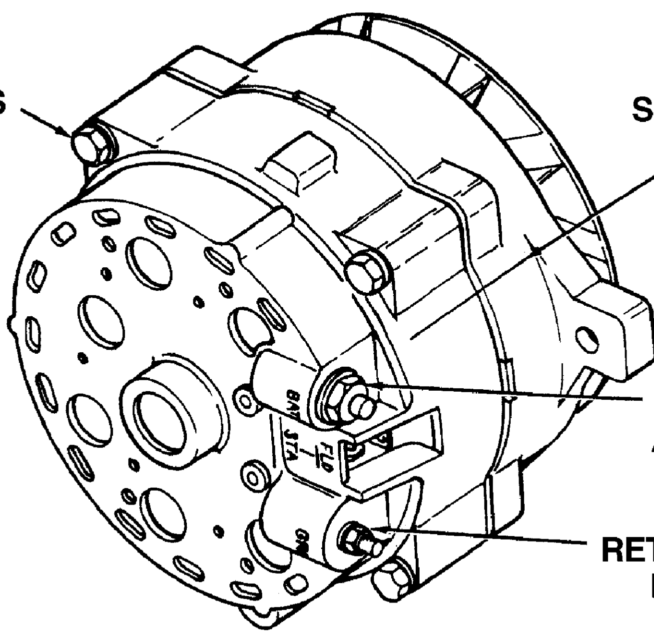
(d) It is not necessary to disassemble the complete rear housing to replace the brush assembly only. Unsolder the stator lead, remove two screws securing the brush holder assembly. (Refer to Figure 10.) (Refer to the Assembly Section for installation procedure.)

(e) Remove four retainer bolts from rectifier assembly, two retainer bolts from brush assembly,and one screw from radio suppression capacitor lead. Remove stator, rectifier assembly and brush assembly from rear housing.

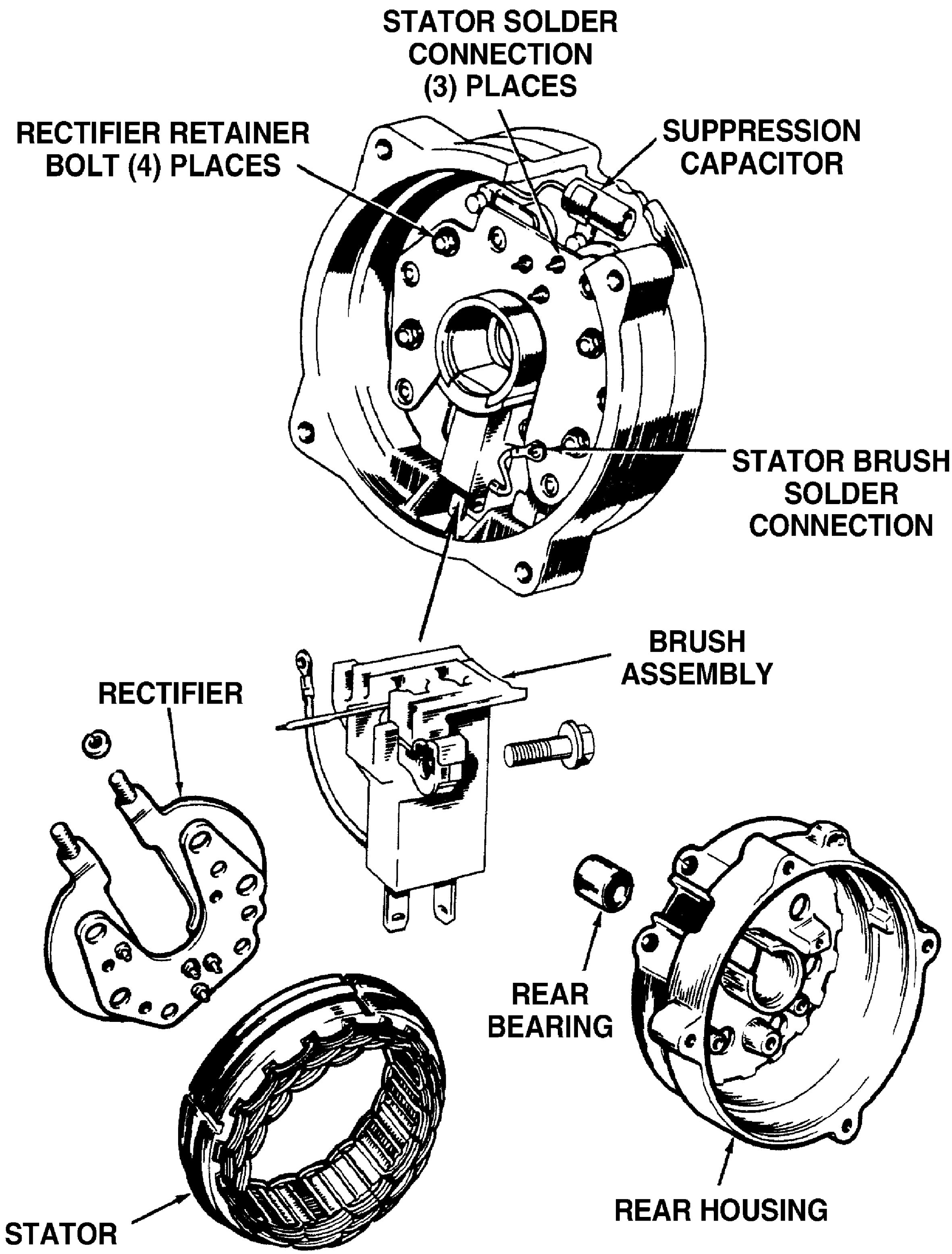
(f) If replacing the rear shaft bearing, support housing on the inner bearing boss and press bearing from housing.

(g) If the rectifier is to be replaced, or, if the stator and diodes are to be bench checked, separate rectifier from stator by unsoldering terminal connections of stator windings and rectifier assembly. (Use 100 Watt soldering iron to prevent excessive heat buildup.)

(h) Unsolder stator terminal from rectifier.

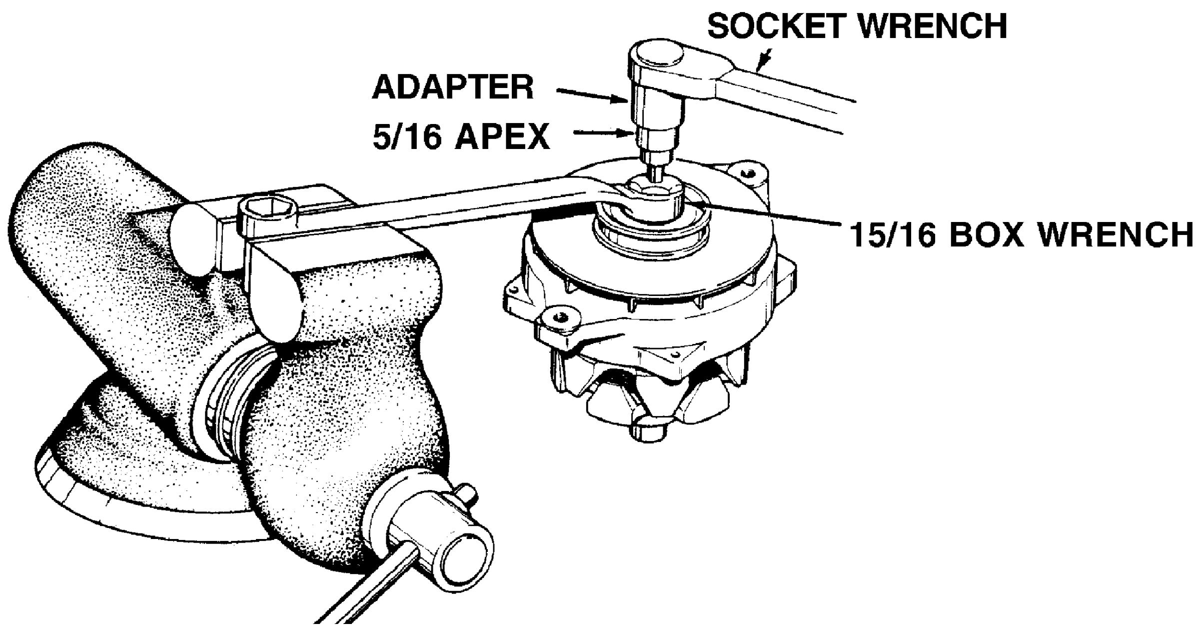


Alternator Housing Disassembly
Figure 9



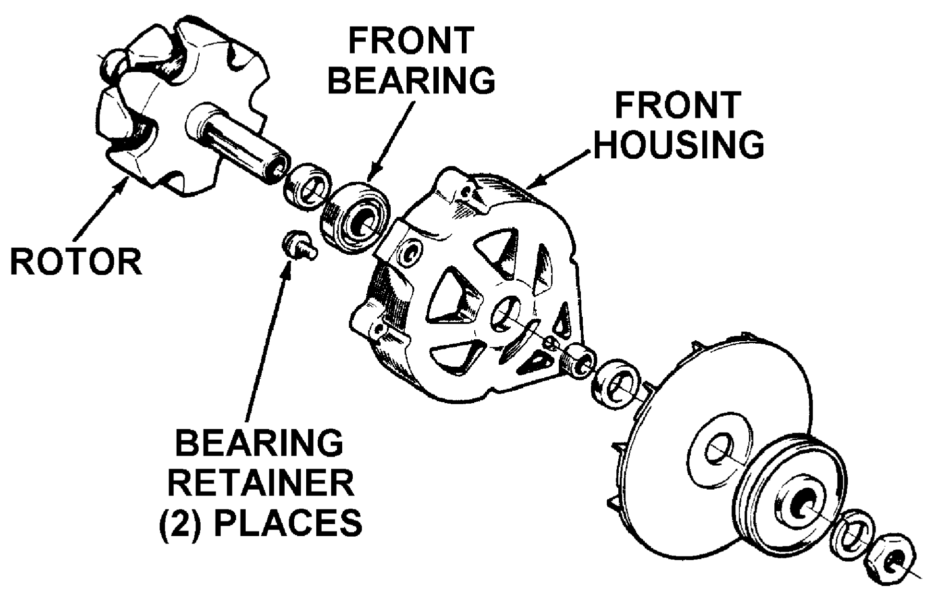
Rear Housing Components
Figure 10

(i) Separate rotor, fan and pulley from the front housing by removing hex nut. A special tool, similar to that depicted in Figure 11, is required to remove nut. Remove pulley, fan and rotor.



Front Housing Disassembly
Figure 11

(j) Remove front bearing from housing by removing bearing retainer screws. The bearing is normally a slip-fit. If stuck, support housing and press bearing from the housing. (Refer to Figure 12.)



Front Housing Components
Figure 12

(2) Cleaning and Inspection

(a) Clean the rotor, stator and bearings with a clean cloth. Do not clean these parts with solvent.

(b) Rotate the front bearing on the drive end of the rotor shaft. Check for any scraping noise, looseness, or roughness. Look for excessive lubricant leakage. If any of these conditions exist, replace bearing.

(c) Inspect the rotor shaft rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.

(d) Place the rear bearing on the slip-ring end of the rotor shaft and rotate the bearing. Make the same check for noise, looseness, or roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the bearing if these conditions exist, or if the lubricant is lost or contaminated.

(e) Check the pulley and fan for excessive looseness on the rotor shaft. Replace any pulley or fan that is loose or bent out of shape.

(f) Check both the front and rear housings for cracks, particularly in the webbed areas, and at the mounting ear. Replace damaged or cracked housings.

(g) Check all wire loads on both the stator and rotor assemblies for loose or broken soldered connections and for burned insulation. Resolder poor connections. Replace parts that show signs of burned insulation.

CAUTION: DO NOT TURN DOWN SLIP-RINGS BEYOND A MINIMUM DIAMETER OF 1.22 INCHES. IF THE RINGS ARE BADLY DAMAGED, REPLACE THE ROTOR ASSEMBLY.

(h) Check the slip-rings (brush contacts) for nicks and surface roughness. Nicks and scratches may be removed by turning down the slip rings.

(i) Replace brush assembly if brushes are worn beyond 5/16 inch minimum length.

(3) Rotor Continuity Test (Refer to Figure 13.)

(a) Separate front housing and rotor assembly from rear housing by removing four housing-thru bolts and separating rear and front housings. Springs and brushes are not retained by brush holder when housings are separated.

(b) Set the ohmmeter selector switch on resistance scale 1 and zero meter.

(c) Touch one lead of ohmmeter to each segment of the slip ring. The meter should read 3 to 5 ohms.

(d) Readings higher than 5 ohms indicate a damaged solder connection at the slip rings or a broken wire.

(e) Readings lower than 3 ohms indicate a shorted wire or slip ring.

(f) Replace the rotor if repairs cannot be made.

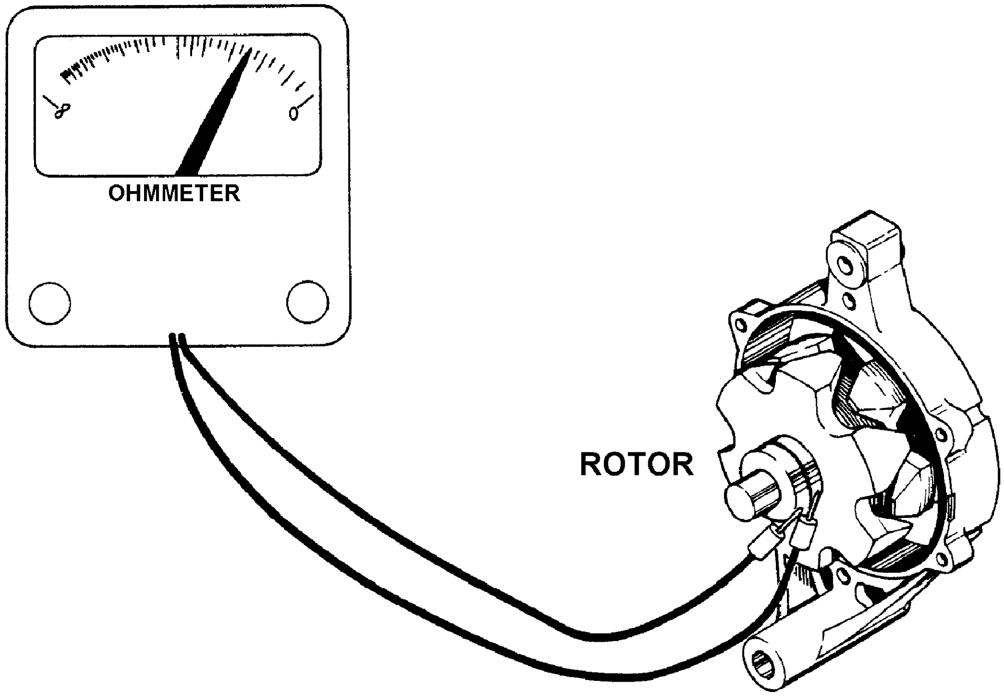
(4) Rotor Ground Test (Refer to Figure 14.)

(a) Set the ohmmeter selector switch on 1000 scale and zero the meter.

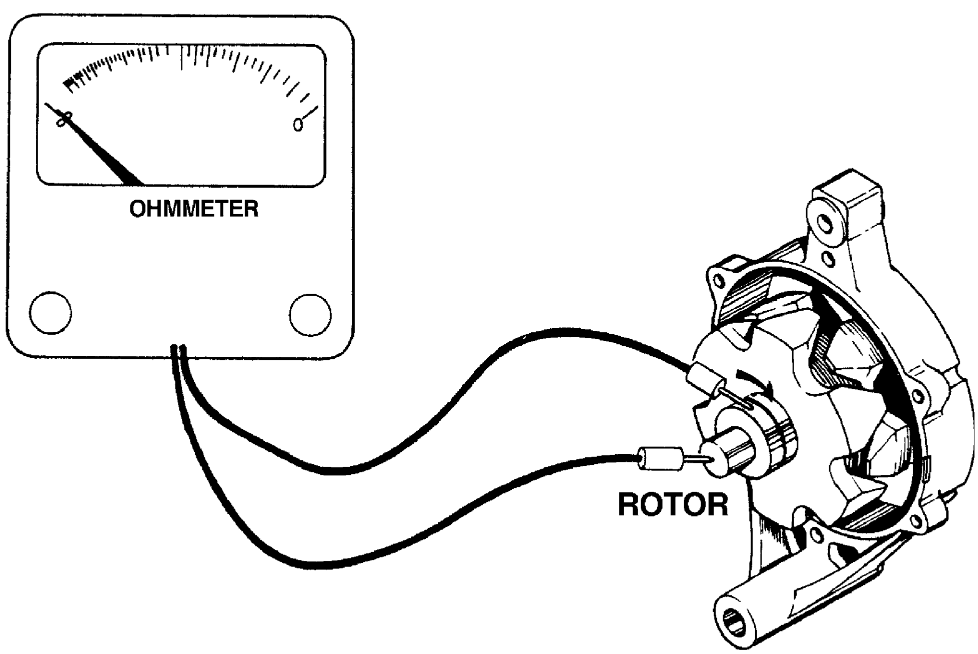
(b) Touch one lead to the rotor shaft and the other lead to first slip ring then to the other. The ohmmeter should read infinity (no needle movement) in both checks.

(c) If the meter shows a reading (needle moves) a short to ground exists. Check the soldered connections at the slip rings to make sure they are secure and grounding against the rotor shaft, or that excess solder is not grounding the rotor coil.

(d) Replace the rotor if repairs cannot be made.



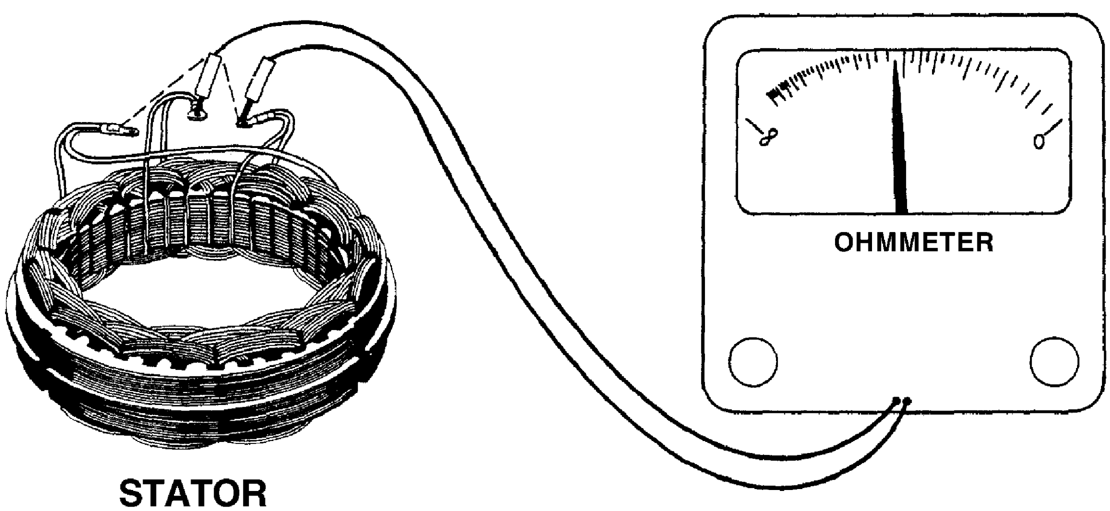
Rotor Continuity Test
Figure 13



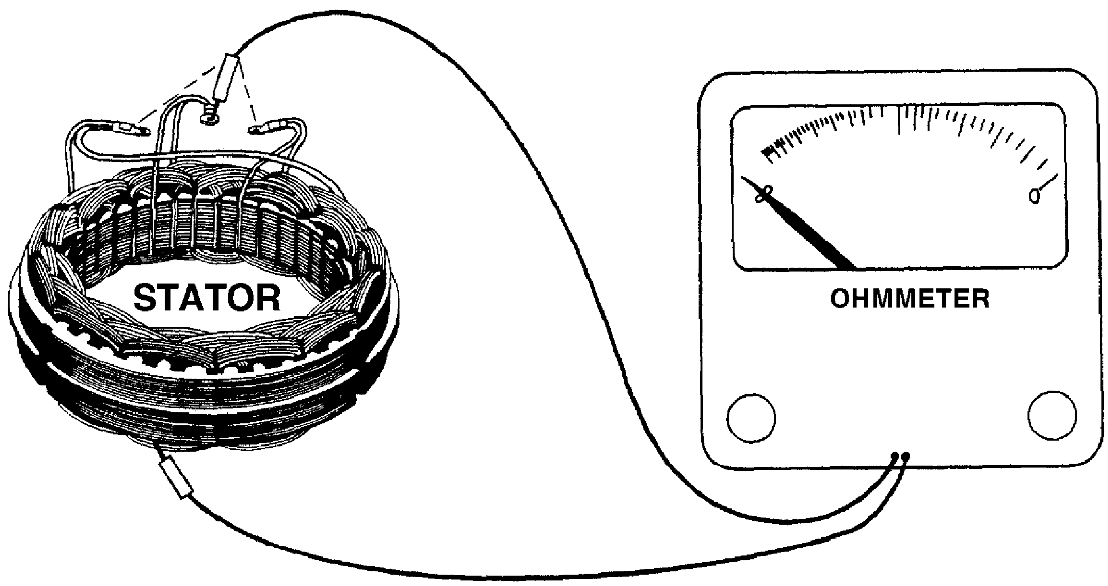
Rotor Ground Test
Figure 14

(5) Stator Continuity Test (Refer to Figure 15.)
   (a) Using a 100 watt soldering iron, disconnect the three stator wires from diode assembly, and remove stator from rear housing.
   (b) Set the ohmmeter selector switch on resistance scale 1 and zero the meter.
   (c) Connect ohmmeter leads alternately between all three sets of leads. Meter readings should be equal between any pair of stator leads.
   (d) If unequal readings are obtained, the stator winding is open. Check wiring junction. If breaks are found repair and recheck. If unequal readings still exist, replace the stator.
(6) Stator Ground Test (Refer to Figure 16.)
   (a) Set ohmmeter selector switch on resistance scale 1000 and zero the meter.
   (b) Connect one meter lead to bare metal portion of stator core and other lead alternately to each of the stator leads. The ohmmeter should read infinity (no needle movement). Be sure lead is making good contact with stator core surface.
   (c) If meter shows any reading (needle moves) the stator is grounded and must be replaced.
(7) Diode Testing (Refer to Figure 17.)

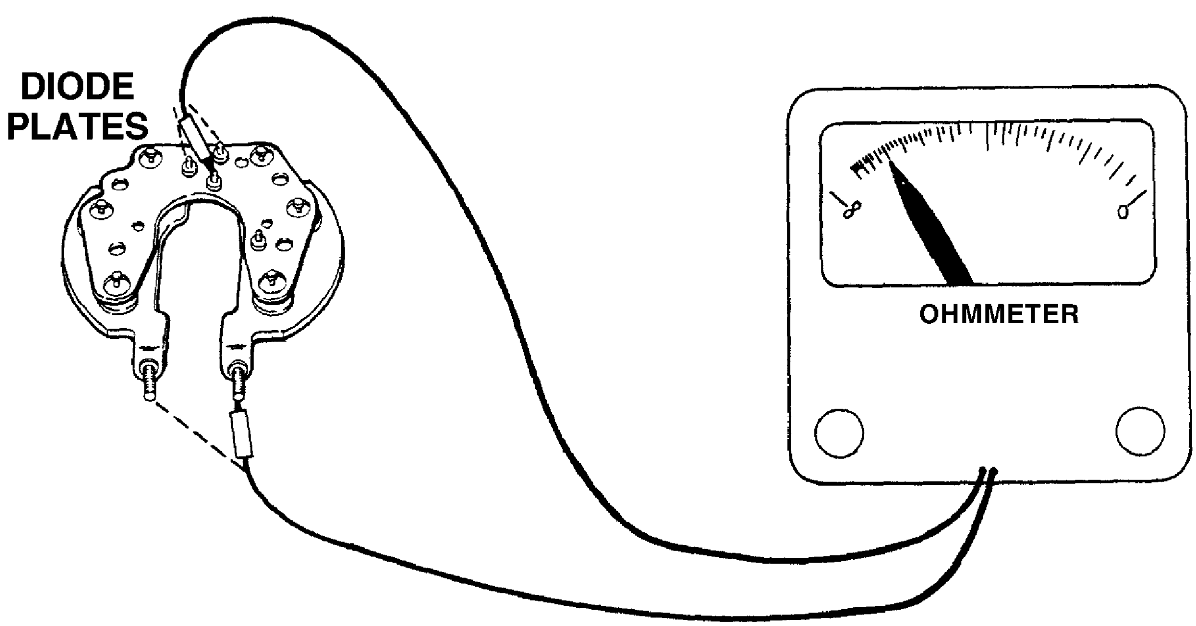
   Stator must be disconnected from rectifier assembly to perform this test. Rectifier shown removed for clarity.
   (a) Set the ohmmeter selector on resistance scale 10 and zero the meter.
   (b) Test the negative diodes by connecting one ohmmeter lead to GRD post terminal on rectifier and connect other lead to each stator lead connection of rectifier momentarily. Reverse ohmmeter leads and check in opposite direction. Meter must shown continuity in one direction and infinity (no needle movement) in other direction.



Stator Continuity Test
Figure 15



Stator Ground Test
Figure 16



Diode Testing
Figure 17

(c) Test the positive diodes by connecting one ohmmeter lead to the BAT terminal on rectifier and other lead to each stator lead connection of rectifier momentarily. Reverse ohmmeter leads and check in the opposite direction. Meter must show continuity in one direction and infinity (no needle movement) in other direction.

(d) If continuity is observed in both directions, the diode(s) is shorted.

(e) If no continuity is observed in both directions, the diode(s) is open.

(f) Replace the rectifier assembly if open or shorted diodes are found.

(8) Assembly (Refer to Figures 18, 19, 20, and 21.)

(a) Clean all parts with a lint free cloth.

(b) Position the front bearing in the front housing and install the bearing retainer screws.

(c) Install spacer on rotor shaft and slide rotor shaft through housing and bearing.

(d) Install spacer, fan, pulley, flat washer, lock washer and nut. Tighten the nut to 60-100 ft.-lbs. A special tool similar to that shown in Figure 18 is required to torque nut.

(e) If the rear bearing was removed, press a new bearing into place from inside the housing. Apply pressure to the outer race only. Install dust cover over bearing end of housing.

(f) Install radio suppressor capacitor in rear of housing and install retainer screw.

(g) Install springs and brushes into brush holder. Install short length of 0.040 wire through brush holder to retain brushes in place. Wire should be long enough to extend through hole in housing for removal after housings are assembled.

(h) Install two retainer screws in brush assembly and housing. Hold down on brush assembly while tightening screws, to prevent breaking brush assembly attachment brackets.

(i) Install insulator on BAT post of rectifier assembly and install insulators (2) in place in the rear housing for mounting bolts in positive BAT side of rectifier.

(j) Carefully install rectifier and stator into rear housing. Ensure insulators are in place. Install BAT post insulator and nut and GRD post retainer and nut, finger tight.

(11) Install the 4 rectifier retainer bolts (check insulators on positive side) finger tight. Install suppression capacitor lead to rectifier and tighten screw.

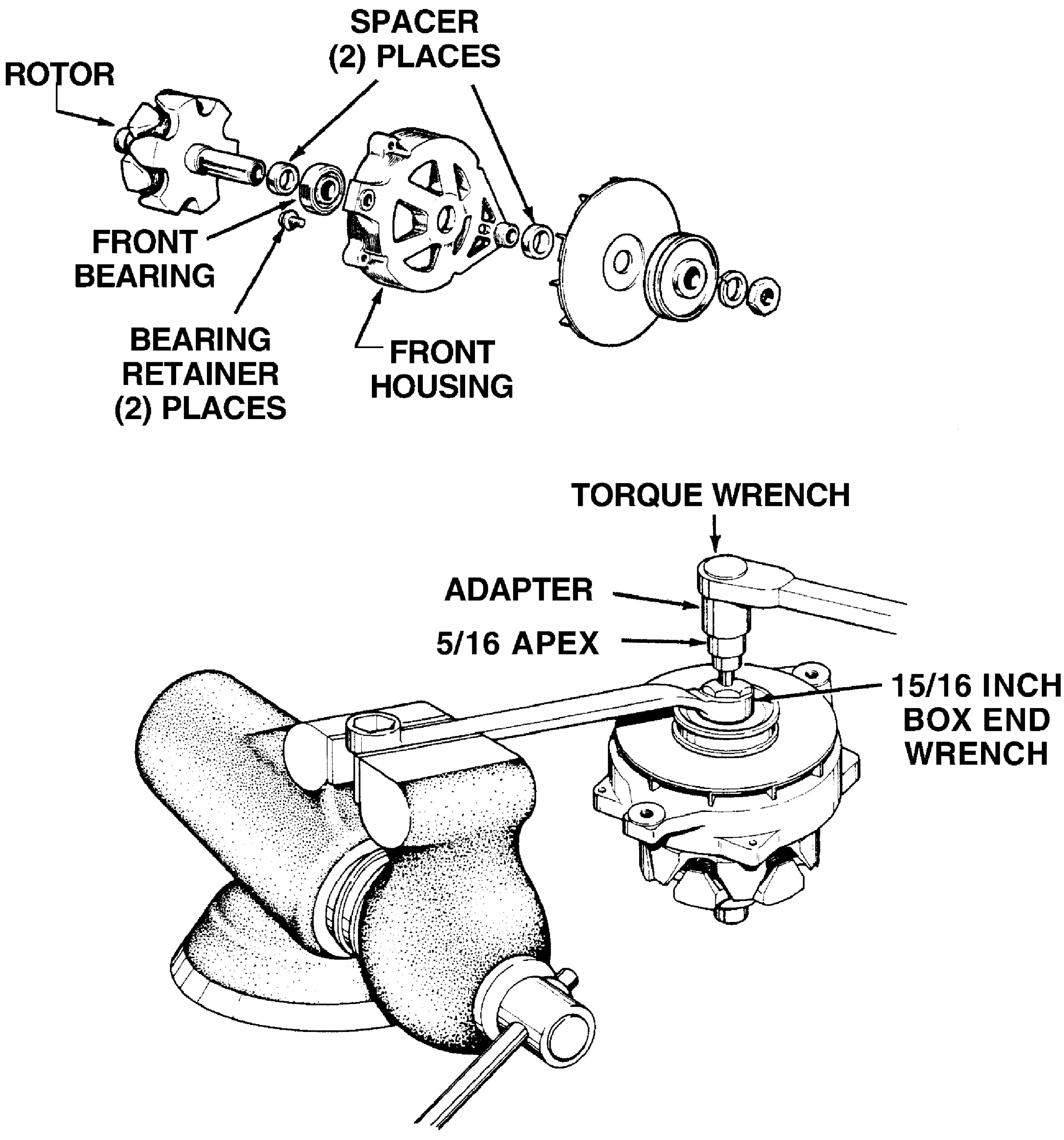
(12) Tighten BAT and GRD retainer nuts then 4 rectifier retainer bolts.

(13) Install the 3 stator winding leads to rectifier posts and solder with 100 watt iron (to prevent overheating of connection) and resin core solder. Solder stator terminal lead to diode assembly.

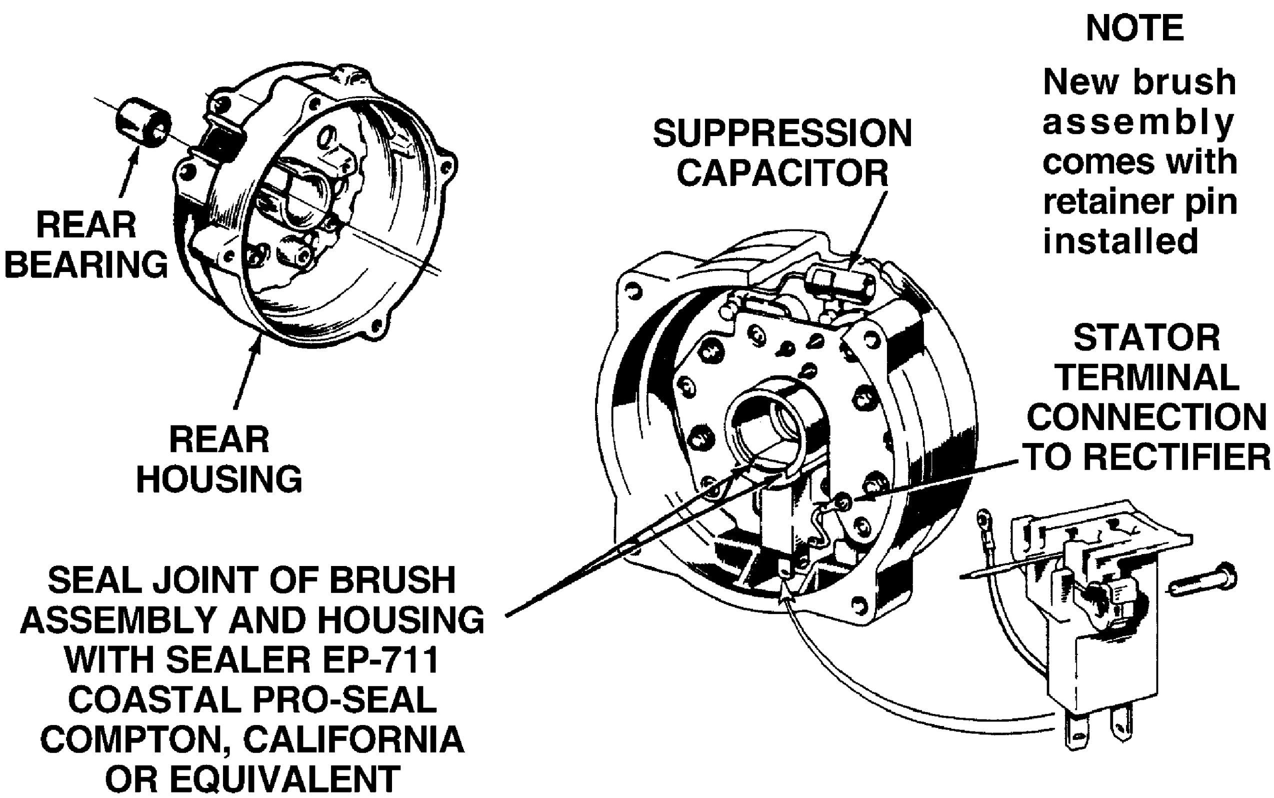
(14) Position the front and rear housings together, align scribe marks on housings and stator, and install four thru-bolts in housings. Alternately tighten each thru-bolt around alternator until a preliminary torque of 15 to 25 inch-pounds is reached for each bolt. Final torque each thru-bolt alternately around the alternator until each bolt is torqued 45 to 60 inch-pounds.

(15) Spin pulley to ensure that alternator is free of binding or noise.

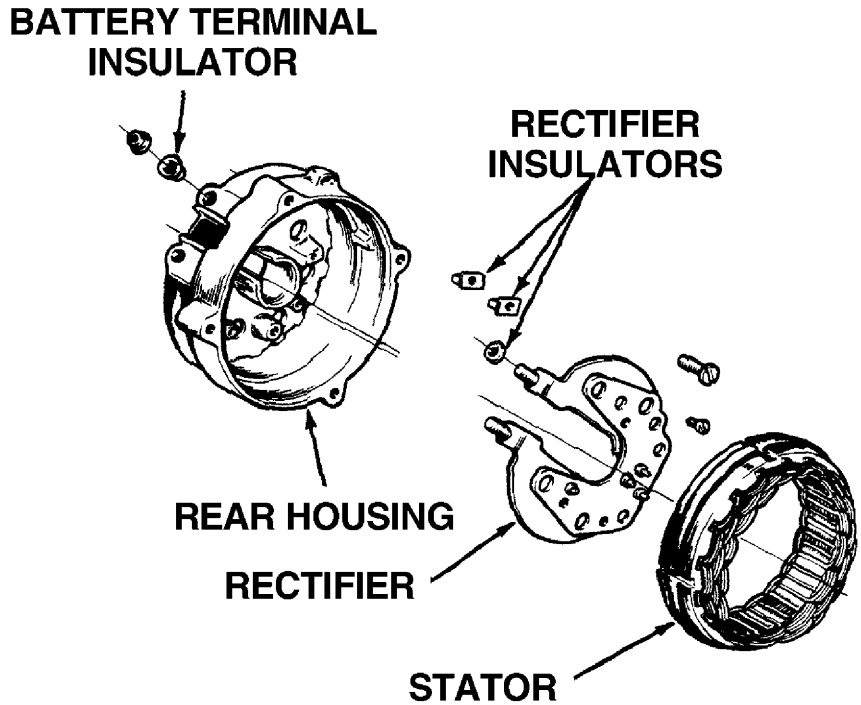
(16) Pull retainer wire from brush assembly and seal hole in housing with EP-711 sealant or equivalent. (Available from Coast Pro-Seal Compton, California or equivalent.)



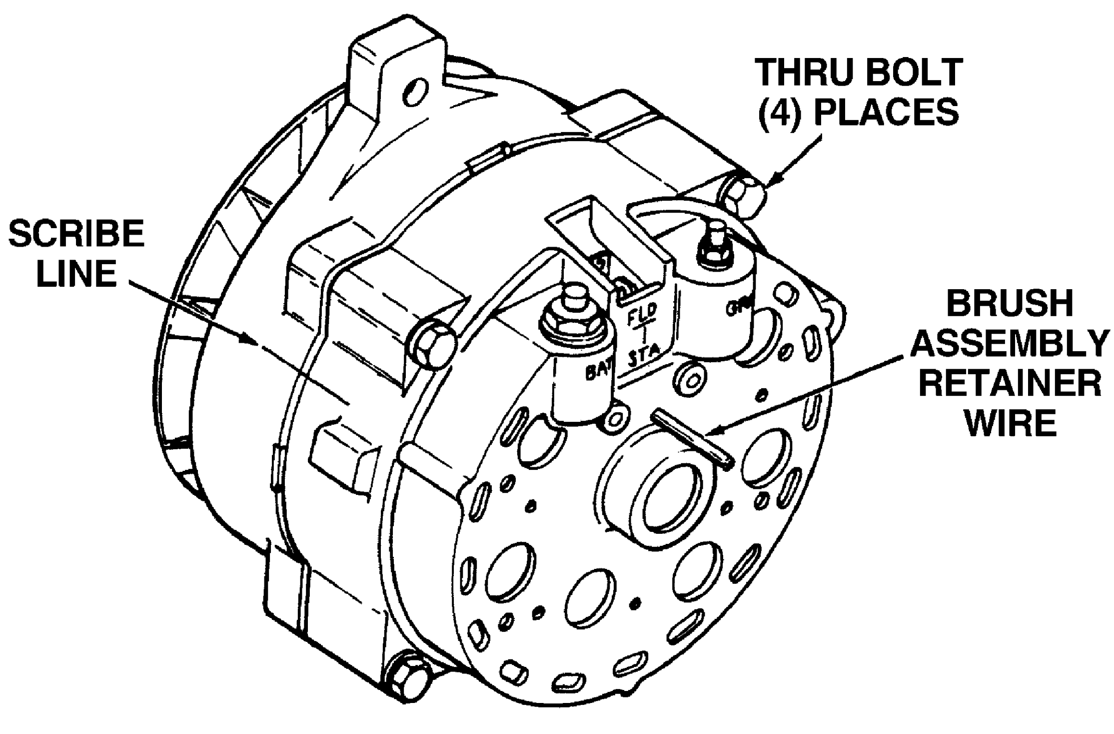
Front Housing Assembly
Figure 18



Rear Housing Bearing and Brush Assembly Installation
Figure 19



Rear Housing Components
Figure 20



Alternator Housing Assembly
Figure 21

G. Alternator Installation

The alternator is factory-installed by the engine manufacturer (Lycoming) using Lycoming mounting brackets. Removal and installation instructions may be found in the appropriate vendor service publication or in the instructions / drawings for Lycoming Kit No. 05J22487.

With a belt installed, align alternator idler pulley in the belt plane by adding or removing shims between the alternator mounting ears and the alternator mounting bracket. (See 21-50-00, Figure 13.)

H. Alternator Belt Tension Adjustment

(1) Loosen bottom mounting bolt and belt adjusting bolt. Adjust alternator belt tension by applying pressure to the adjusting lug of alternator with a one-inch open end wrench. Use a calibrated belt tension gauge to adjust a new belt to 90 - 120 pounds of static tension. Run in for 15 minutes. If tension falls below 50 lbs., re-tension to 70 lbs.

CAUTION: IF AIR CONDITIONER IS OPERATED ON THE GROUND FOR SERVICING, CLEAR TEST AREA OF ANY LOOSE OBJECTS LYING ON RAMP. ENSURE THAT A QUALIFIED PERSON IS AT THE AIRPLANE CONTROLS.

(2) Run engine 15 minutes at 1200 rpm.

(3) Shut down engine, remove engine cowling, and check both belt tensions.

(4) Check all idler and bracket bolts for safety. After tension is set and upper bolt safetied, tighten lower mounting bolt 450 to 500 lb.-in. There should be no end play in alternator mount. Add thin washers between alternator and mount to remove end play.

(5) Install engine cowling.

(6) Re-check tension every 100 hours or annual inspection, whichever comes first.

2. Battery (See Figure 22 and see also 12-10-00.)

The battery is located in the aft fuselage, aft of the rear baggage compartment. Access to the battery is through the aft fuselage access panel in the rear baggage compartment, below the hat shelf.

The manifold-type battery and its associated acid recovery sump jar are shelf mounted. Fumes accumulated from the natural charging process are vented to the outside of the aircraft, through the sump jar. This vent must be checked for corrosion. The battery manifold drains into the acid recovery sump jar through the manifold overflow/vent line. The sump jar vents through the fuselage vent line connected to a vent located on the bottom of the fuselage.

The battery should be checked for fluid level, but must not be filled above the baffle plates. A hydrometer check should be performed to determine the percent of charge in the battery. All connections must be clean and tight. If the battery is not up to normal charge, remove it from the airplane and recharge.

A. Removal

(1) Open the cabin rear closeout panel.

CAUTION: REMOVE GROUND CABLE FIRST AND INSTALL IT LAST TO PREVENT AN ACCIDENTAL SHORT CIRCUIT OR ARCING.

(2) Disconnect battery cables.

(3) Disconnect manifold overflow/vent line.

(4) Remove battery hold down bolts.

(5) Remove battery.

B. Installation

CAUTION: DO NOT INSTALL BATTERY WITH REVERSE POLARITY. CONNECT GROUND TO NEGATIVE TERMINAL OF BATTERY.

(1) Ensure that all vent lines are free of kinks, cracks, and loose connections. Replace only with special hoses specified in Parts Catalog. (DO NOT USE ORDINARY RUBBER HOSE.)

(2) Properly position battery on shelf.

(3) Connect manifold overflow/vent line.

(4) Connect battery cables. First, connect and secure the positive cable; then, connect and secure the ground (negative) cable.

(5) Install and secure battery hold down bolts

(6) Reinstall aft fuselage access panel or floor panel and external access panel, as appropriate.

C. Testing

Specific gravity values for checking battery charge using a hydrometer are listed in Chart 2. If the alternator output is known to be correct, battery capability can be more accurately determined with a load type tester.

CHART 2
HYDROMETER READING AND BATTERY CHARGE PERCENT

Hydrometer Reading	Percent of Charge
1280	100
1250	75
1220	50
1190	25
1160	Very little useful capacity
1130 or below	Discharged

D. Charging

CAUTION: NEVER ALLOW LEAD ACID BATTERIES OR TOOLS USED ON THEM TO BE NEAR NI-CAD BATTERIES AND NI-CAD BATTERY TOOLS.

CAUTION: WEAR EYE PROTECTION WHEN CHARGING BATTERY. ENSURE THE CHARGING AREA IS WELL VENTILATED. IF CENTRAL AIR CONDITIONING IS USED, VENT BATTERY CHARGING AREA TO OUTSIDE AIR TO PREVENT HYDROGEN GASSES FROM BEING CIRCULATED THROUGHOUT THE BUILDING.

NOTE: Refer to latest version of applicable battery manufacturer's service manual for any limitations or special charging procedures.

The National Electric Code forbids charging batteries that are installed in aircraft or are within 10 feet of fuel tank areas. Accordingly, remove battery from the airplane for charging. Further, an aircraft battery should not be allowed to deteriorate to the point where safety of flight is jeopardized. The batteries emergency capacity should be sufficient to power the essential bus for a minimum of thirty minutes.

(1) Remove battery from airplane.

(2) Remove cell plugs and ensure that vents in plugs are open and that vent valves operate freely.

(3) Check that the electrolyte level in each cell is at the bottom of the split ring.

(4) A hydrometer check of each cell should be accomplished. (Refer to Chart 2.)

(5) Place a wet cloth be over the vent caps within the manifold to prevent splashing of electrolyte.

(6) The battery may be charged at any rate (in amperes), but in no case to the point which would produce bubbling and gassing of the electrolyte or a cell temperature of 115° F.

(7) A constant current charge is recommended. Start charging at 3 amperes; finishing with 1.5 amps. A fast charge is not recommended.

(8) As charging occurs, if any cells sputter or flood, the electrolyte level is too high and the excess must be removed. Adjust electrolyte level at the end of the charge. The level will rise due to acid returning to the electrolyte mix, normal gassing, and expansion due to temperature rise.

(9) Thoroughly clean battery after charging to remove acid bridges which can form during charging.

E. Corrosion Prevention (See Figure 22.)

Check battery for spilled electrolyte or corrosion each 50 hour inspection or every 30 days, whichever comes first. Should spilled electrolyte or corrosion be found in, on, or near the battery, clean the battery, its mounting, and the general area as follows:

(1) Remove battery from airplane, see above.

(2) Disconnect fuselage vent line from acid recovery sump jar top.

(3) Keeping the sump jar upright in a vertical position, remove the sump jar by removing the two bracket screws that secure jar to bracket.

CAUTION: DO NOT ALLOW BAKING SODA SOLUTION TO ENTER BATTERY.

(4) Remove all accumulated contamination from the battery exterior with a stiff bristle brush. (Do not use a metal brush or abrasive materials.) Wipe exterior of battery and interior of manifold, including manifold top cover, with a cloth saturated with a solution of bicarbonate of soda mixed - one part soda to twenty parts of water. (Check that cell plugs are tight - do not allow soda solution to enter any cells.)

(5) Wash entire battery with clear water and dry thoroughly.

(6) Wash down the battery support and floor area, hold down supports, connectors and cable ends with a soda solution followed by clear water.

(7) Visually inspect all vent lines for kinks, cracks, flexibility, and loose connections. Replace only with special hoses from parts catalog. (DO NOT REPLACE WITH ORDINARY RUBBER HOSE.)

(8) Slowly pour the soda solution into the fuselage vent line, still attached to the bottom of the aft fuselage surface, using a small funnel. The solution will flow out the bottom vent.

(9) Follow with a final purge of clear water to flush the vent line and then blow dry with low pressure air. This ensures that the vent line is not kinked or restricted and that it is neutralized.

(10) Dry entire battery shelf area and component parts thoroughly. Apply fresh acid resistant paint if required.

(11) Wipe down the bottom aft fuselage area surrounding the vent with soda solution and clear water. Dry. Apply a fresh coat of high quality wax to entire area.

(12) Clean the acid recovery sump jar as follows:

(a) Unscrew the bottom of the recovery jar and separate from the top. Remove jar pad. Observing environmental regulations, empty jar contents into a suitable container for safe disposal.

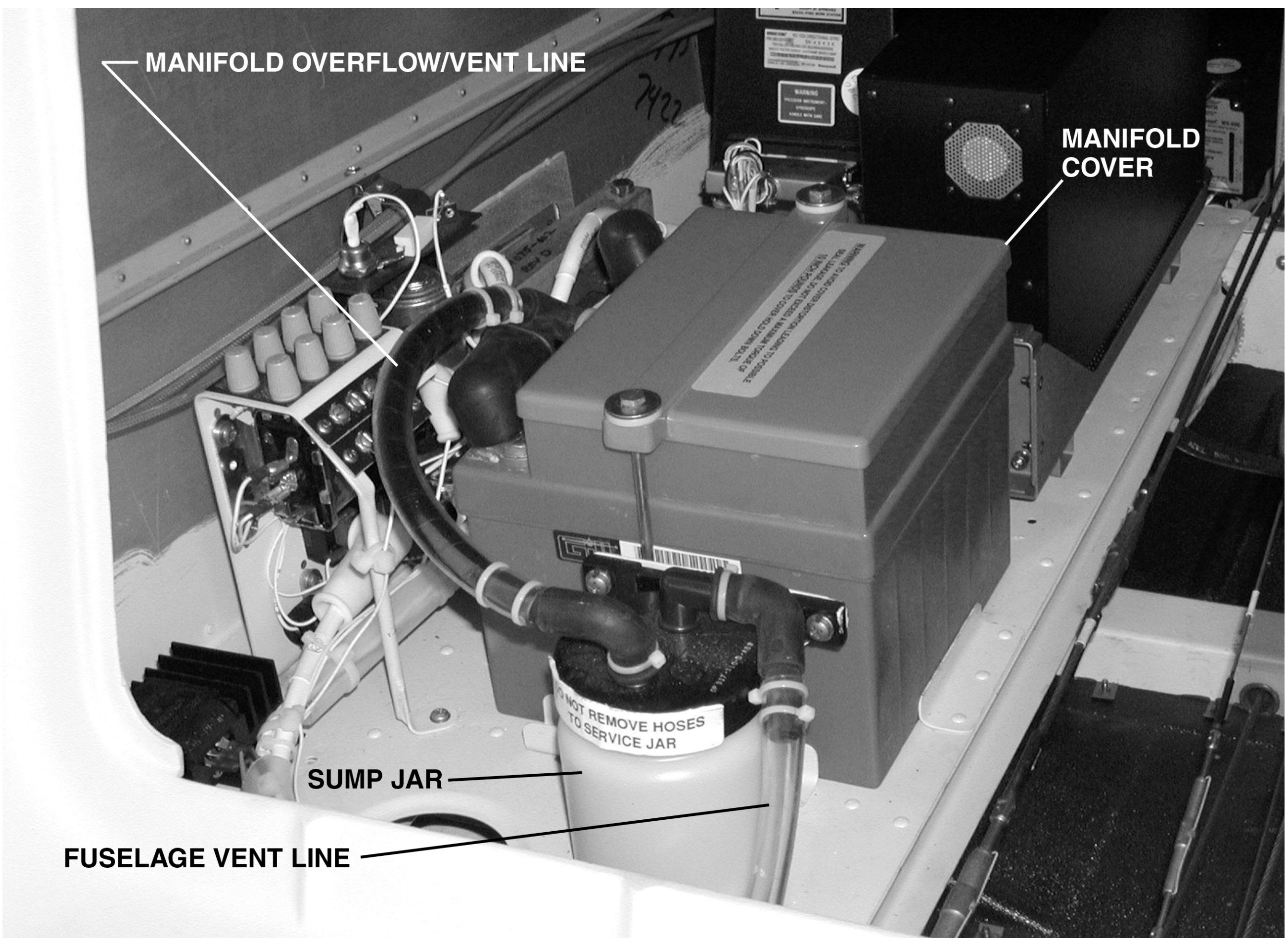
(b) Thoroughly wash and neutralize the jar, pad, top (including bracket), and the short length of manifold overflow/vent line still attached to the jar top with soda solution and clear water rinse.

(c) Thoroughly dry all components and recharge the jar with 0.75 bicarbonate of soda. Place dry jar pad in the jar on top of the soda charge.

(d) Screw jar back together and keep it in a vertical position.

(13) Install jar in aircraft, reattach fuselage vent line to sump jar top.

(14) Reinstall battery.



Battery Installation
Figure 22

3. Checking Voltage Regulator

A. Use only a good quality, adjustable DC power source.

CAUTION: ALL TESTS MUST BE ACCOMPLISHED WITH THE REGULATOR OUT OF THE CIRCUIT.

B. Use a quality, accurate voltmeter with at least a 35-volt scale.

CAUTION: AMBIENT TEMPERATURES SURROUNDING VOLTAGE REGULATOR MUST BE BETWEEN 50° F AND 100° F.

C. Voltmeter connections (refer to Figure 23.)

Connect positive voltmeter lead to red wire (supply) at regulator harness connector or wire.

D. Light Bulb Connections (refer to Figure 23.)

(1) Connect one bulb lead to blue wire (field) at regulator harness connector or wire.

(2) Connect other bulb lead to regulator ground wire (black).

E. In the regulation check procedure, increase voltage to regulator and monitor both the voltmeter and bulb.

F. As the regulation point of a properly functioning control unit is approached, the bulb will blink off and on. At regulation, the bulb will be ON continuously.

G. If regulator does not regulate to 28 Volts, it is out of calibration, and must be replaced.

H. If regulator checks good, check airplane for:

(1) Poor or loose connections.

(2) Poor ground on regulator housing.

(3) Shorted alternator windings.

(4) A grounded wire.

I. After completing test, connect regulator into circuit

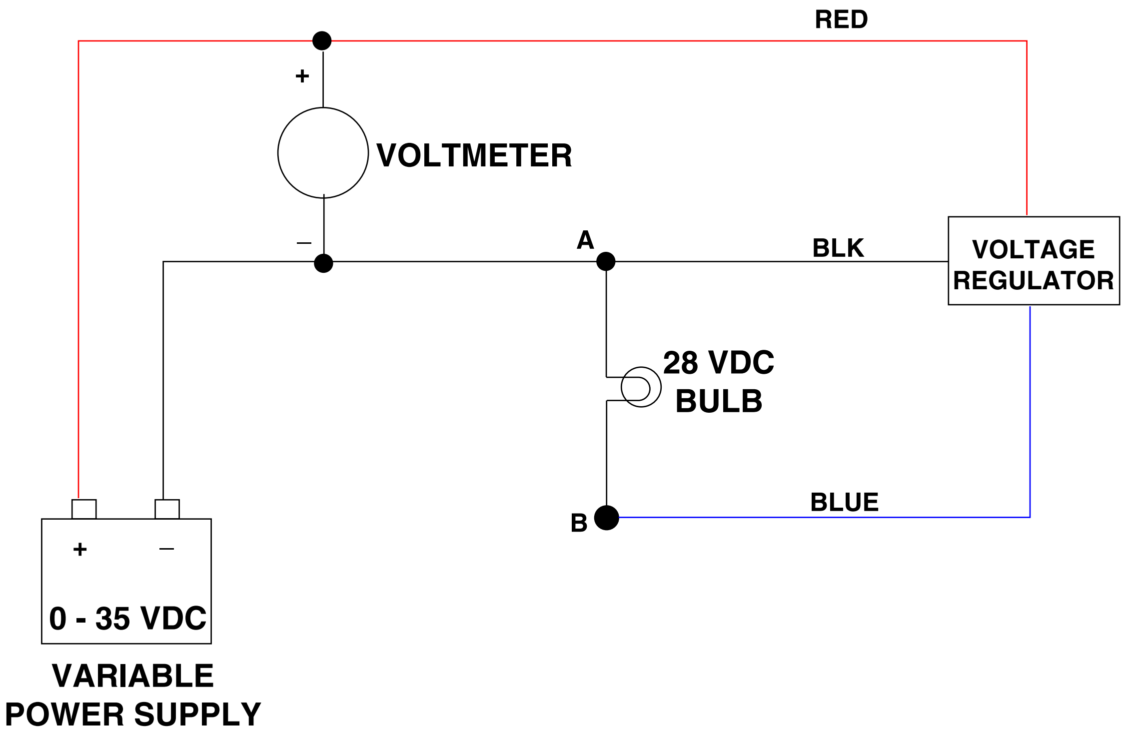
4. Checking Overvoltage Relay (See Figure 24.)

The Lamar regulator has an incorporated overvoltage relay. To check relay operation use the same test connections as testing the regulator, except connect the bulb across the RED and BLUE wires. Test as follows:

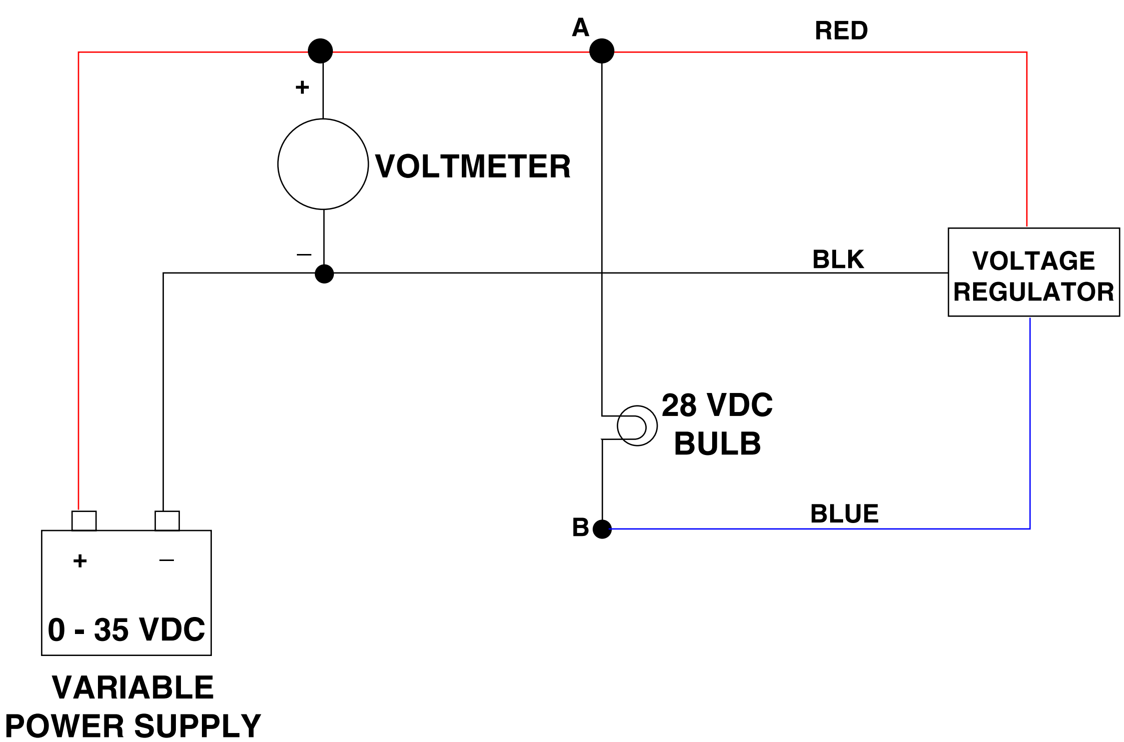
A. While monitoring both the voltmeter and the light bulb, increase voltage to circuit slowly to 32 volts.

B. After a slight delay, the bulb will light.

C. If overvoltage control fails to operate at 32 Vdc, it must be replaced.



Voltage Regulator Check
Figure 23



Overvoltage Relay Check
Figure 24

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

EXTERNAL POWER

1. Description

The external power receptacle is located near the battery on the right side aft fuselage, aft of the rear baggage compartment door.

2. Operation

Proceed as follows when using external power for engine start or operation of any of the airplane's equipment:

A. Turn the master switch OFF.

B. Turn all electrical equipment OFF.

C. Insert plug of a standard 28Vdc power source into the external power socket in the fuselage. Note that, after inserting plug, the electrical system is ON.

D. Proceed with the normal engine starting technique.

NOTE: Starter manufacturers recommend limiting cranking to thirty second periods with a two minute rest between periods. Lengthy cranking will shorten the starter's life.

E. After engine start:

(1) Reduce power to the lowest possible rpm to reduce sparking when disconnecting jumper cable.

(2) Disconnect the jumper cable from the aircraft.

(3) Turn the master switch ON and check the alternator ammeter. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT. If aircraft battery is weak, charging current will be high. DO NOT TAKE OFF until charging current falls below 20 amps.

NOTE: For all normal operations using jumper cables, the master switch should be OFF. The aircraft battery can be used in parallel with the external battery by turning the master switch ON. This will give longer cranking capabilities, but will not increase the amperage. Exercise care, because if the aircraft battery has been depleted, the external power supply can be drawn down to the level of the aircraft battery. This can be tested by turning the master switch ON momentarily while the starter is engaged. If cranking speed increases, the aircraft battery is at a higher level than the external power supply.

(4) When the engine is firing evenly, advance throttle to 800 RPM. If oil pressure is not indicated within thirty seconds, stop engine and determine trouble. It will take a few seconds longer in cold weather to get an oil pressure indication. If the engine fails to start, refer to the Lycoming Operating Handbook: Engine Troubles and Their Remedies.

THIS PAGE INTENTIONALLY BLANK

ELECTRICAL LOAD DISTRIBUTION

CHART 3
ELECTRICAL SYSTEM COMPONENT LOADS

Duty Cycle Cont.	Duty Cycle Inter.	Circuit / Equipment	Circuit Breaker	(Amps)	Optional
X		Alternator Field	5	1.5	
X		Nav Lights	10	3.6	
X		Anti-Collision Lights	10	3.0	
	X	Landing Light	15	9.0	
X		Panel Lights /	7.5	1.2	
X		Switch Lights		1.2	
	X	Courtesy/Reading Lights	5	1.2	
	X	Cockpit Flood Lights	3	0.6	
	X	Fuel Pump	10	1.5	
X		Engine Gauges	5	8.0	
X		Elec. Turn & Bank	5	0.28	
X		Pitot Heat	10	8.0	
	X	Starter Contactor	15	1.47	
X		Master Contactor	—	0.6	
	X	Air Conditioning	10	2.0	X
X		Fresh Air Blower	10	8.0	X

THIS PAGE INTENTIONALLY BLANK

CHAPTER

25

EQUIPMENT / FURNISHINGS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 25

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
25-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
25-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
25-10-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
25-60-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 25 - EQUIPMENT / FURNISHINGS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

FLIGHT COMPARTMENT

1. Pilot's Seat Lock and Release Rigging (Refer to Figure 1.)

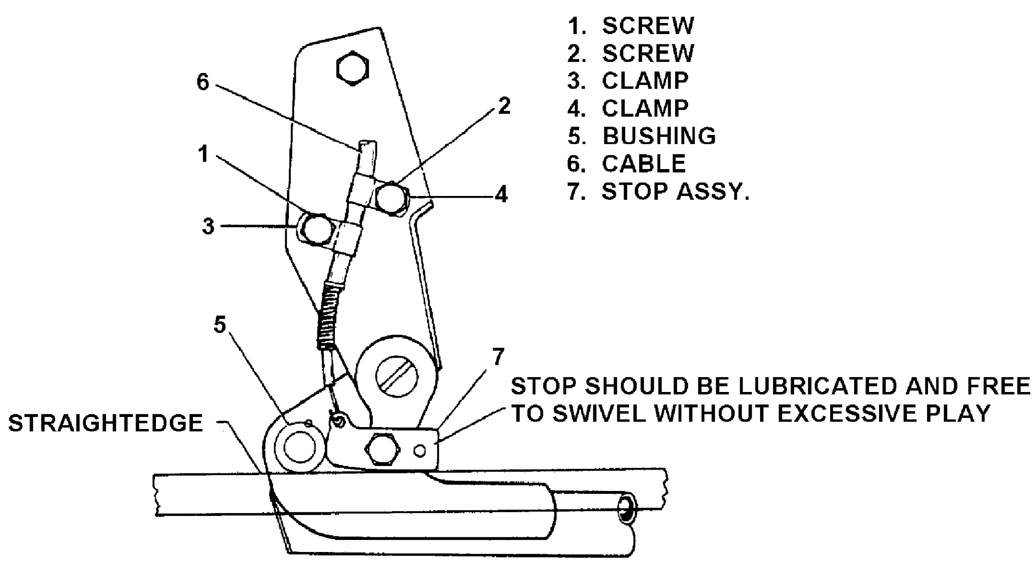
   A. Loosen screws and loosen clamps to allow push-pull cable to move within the clamps.

   B. Place a straightedge along lower surface of seat back release bushing.

   C. Adjust push-pull cable by raising or lowering until lower surface of the stop assembly is parallel to straightedge.

   D. Secure push-pull cable in position by tightening screws on clamps. The stop must be lubricated and free to swivel without excessive play.

   E. Push on seat back to check stop assembly engagement. Rotate seat back release handle and check for seat back disengagement.



Seat Back Lock
Figure 1

2. Lumbar Support (Refer to Figure 2.)

A. Description

In the optional interior, the pilot and co-pilot seats incorporate a Lumbar support feature. The installation consists of an inflatable bladder attached to the seat back filler and a inflation bulb located under and on the inboard side of each pilot and co-pilot seat.

B. Removal

(1) Remove seat from airplane.

(2) Loosen velcro securing seat back filler cover.

(3) Remove only enough of seat back filer cover to expose lumbar bladder.

NOTE: Inflation tube may be removed before or after bladder is removed from seat back filler. Tube is not glued to nipple attachment; it can be removed by carefully pulling on tube.

(4) Remove inflation tube from bladder.

CAUTION: DO NOT USE A CHEMICAL SOLVENT TO REMOVE BLADDER. SOLVENT MAY DAMAGE SEAT BACK FILLER

CAUTION: TO AVOID OR MINIMIZE DAMAGE TO SEAT BACK FILLER DURING REMOVAL, USE ONE HAND TO RETAIN SEAT BACK FILLER IN PLACE, WHILE GENTLY REMOVING BLADDER WITH OTHER HAND.

(5) Starting at either right or left edge of bladder, carefully and slowly pull bladder and pad assembly from seat back filler.

C. Assembly

(1) Apply a layer of 3M 847 cement to smooth side of bladder pad.

(2) Apply a layer of 3M 847 cement to back side of bladder (side away from inflation tube nipple).

(3) Attach bladder pad to bladder.

NOTE: While cement does not set immediately, there is no need to wait before attaching bladder and pad to seat back filler.

D. Installation

(1) Apply a layer of 3M 847 cement to rough side of bladder pad.

(2) Apply a layer of 3M 847 cement to seat back filler where bladder is to be located.

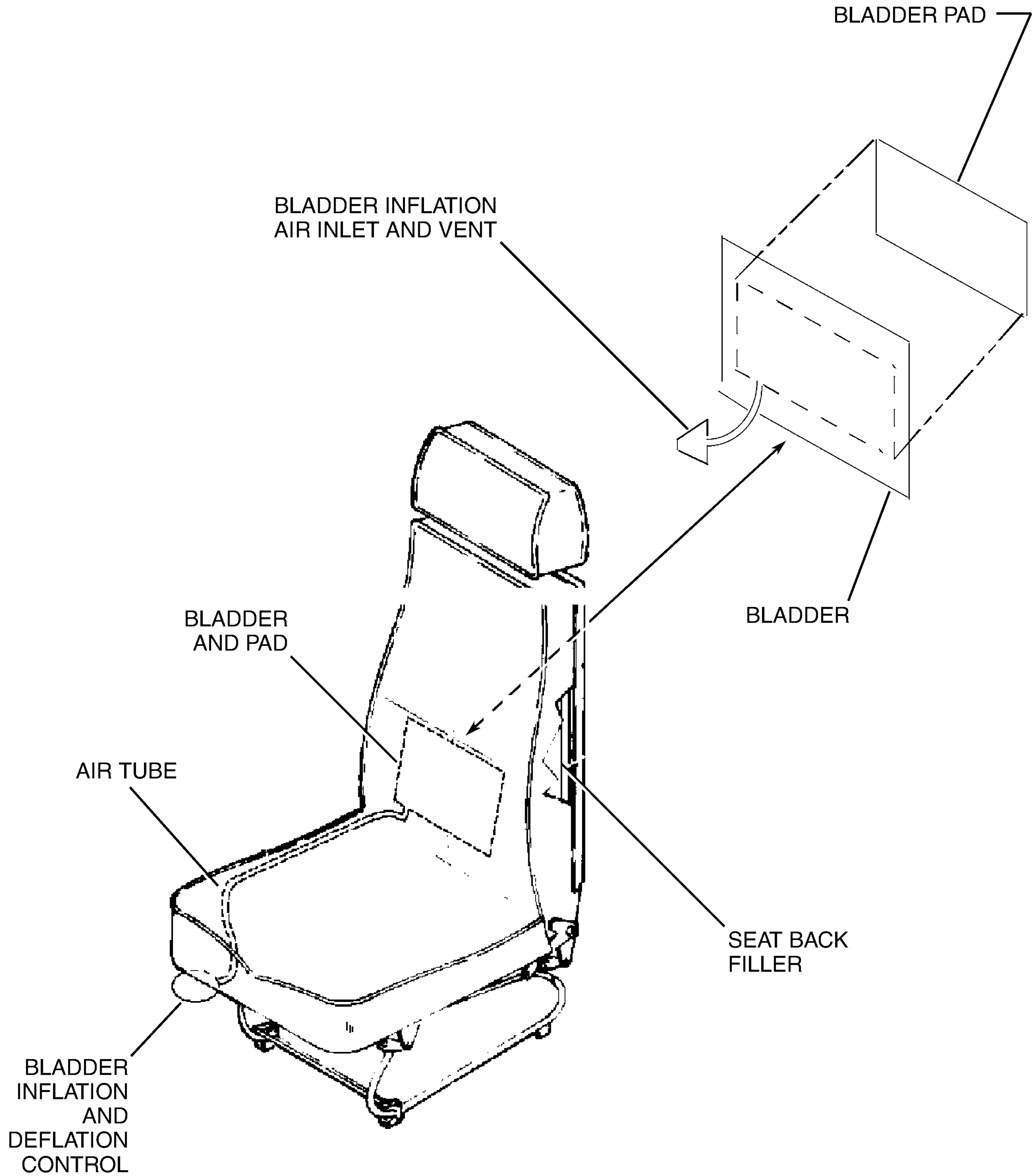
(3) Attach bladder and pad assembly to seat back filler. Depending on temperature and humidity, allow 0:30 minutes to 1:00 hour for cement to set.

(4) Install seat back filler cover and secure velcro fastenings.

(5) Install seat in airplane.

3. Carpets

The carpets are individually fastened to the floor with Velcro fasteners and adhesive (Hysol EA9309 NA).



Lumbar Seat Bladder Installation
Figure 2

4. Restraint System

An integrated shoulder harness / lap belt restraint system is installed.

A. Inspection

(1) Inspect ends and attachment points for condition and security.

(2) Inspect harness web material for condition and wear over its entire length. Particularly look for wear and fraying where harness web passes in and out of inertial reel and in and out of the adjusting buckle. If excessively worn, replace.

(3) Check inertia reel mechanism by pulling sharply on strap. Verify reel will lock in place under sudden stress.

B. Inertial Reel Adjustment

The inertial reel locking feature prevents the shoulder strap from extending and holds occupant in place. For normal movement strap will extend and retract as required. If required, adust inertial reel as follows:

(1) Allow harness to wind up on reel as much as possible.

(2) On end of reel, pry off plastic cover over spring. Make sure spring does not come out of plastic cover. Set aside plastic cover.

(3) Unwind the harness completely. Measure and mark the harness 24 inches from the reel center.

(4) Wind harness onto reel until the 24 inch mark is reached. Hold reel and place cap with spring over reel shaft end.

(5) Align slot in shaft with spring tang. Wind spring 6 1/2 turns and snap plastic cover into holes in reel end shaft.

(6) Release harness and allow harness to wind up. Extend harness several times to check reel for smooth operation.

(7) Hold inertia reel with reel completely wound and inertia mechanism end up. Pry off plastic cover over mechanism and set reel aside.

(8) Install nut in plastic cover so that stud in cover is flush with nut surface. Position cover over reel and snap cover into place. Extend harness several times to ensure reel operates smoothly.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

EMERGENCY

Artex ELT 110-4 Emergency Locator Transmitter (ELT)

A. Description

The Artex ELT 110-4 transmits on 121.5 mHz and 243.0 mHz, and is designed to meet or exceed the requirements of TSO C91a and FAR Part 91. Electrical power for the ELT transmissions is totally supplied by its own self-contained battery. The battery must be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour, or no later than the replacement date marked on the transmitter label, whichever comes first.

The Artex 110 cannot be accidentally activated by dropping the unit, handling it roughly, or during shipping. However, when properly mounted, and locked into its mounting tray, the ELT will activate in a crash, regardless of the cockpit remote switch and ELT. switch position. The normal position of the ELT switch is in the down or OFF position. The normal position of the remote cockpit switch is in down or ARM position

Whenever the ELT is activated, a red light located just above the remote cockpit switch will blink to alert the pilot or maintenance personnel. Should the ELT be activated accidentally, it must be reset. To reset:

(1) Position the remote cockpit switch to ON, then immediately reposition it to ARM, or;

(2) Position the switch on the ELT to ON, then immediately reposition it to OFF.

B. Battery (Refer to Figure 1.)

(1) Removal

(a) In cabin, remove rear closeout panel.

(b) Disconnect and remove positive cable from battery.

(c) At right side of empenage, remove four (4) screws and remove ELT access panel.

(d) Remove ELT from the airplane by:

1 Loosening the two screws on the front of the mounting tray and pull mounting tray cap off.

2 Disconnecting coax (antenna) cable.

3 Disconnecting the Molex cable from the ELT unit.

4 Remove unit from airplane.

(e) Remove the four screws on the bottom of the ELT securing the battery pack.

(f) Disconnect battery pack connector from main unit.

(g) Remove battery pack from unit.

(2) Installation

(a) Securely plug in new battery pack connector to main unit.

(b) Immediately reset unit by positioning unit switch to ON, then to OFF.

(c) Fit new battery pack into place. Ensure all gaskets are properly aligned.

(d) Replace the four screws. Dress wires away from standoffs to avoid pinching wires between standoffs and the battery pack.

(e) Install unit into mounting tray:

1 Connect molex and coax cables to ELT unit.

2 Install mounting tray cap and secure to front of mounting tray with the two screws.

(f) Replace ELT access panel and secure with four (4) screws.

(g) In cabin, install positive cable to battery.

(h) Replace cabin rear closeout panel.

(i) Test transmitter.

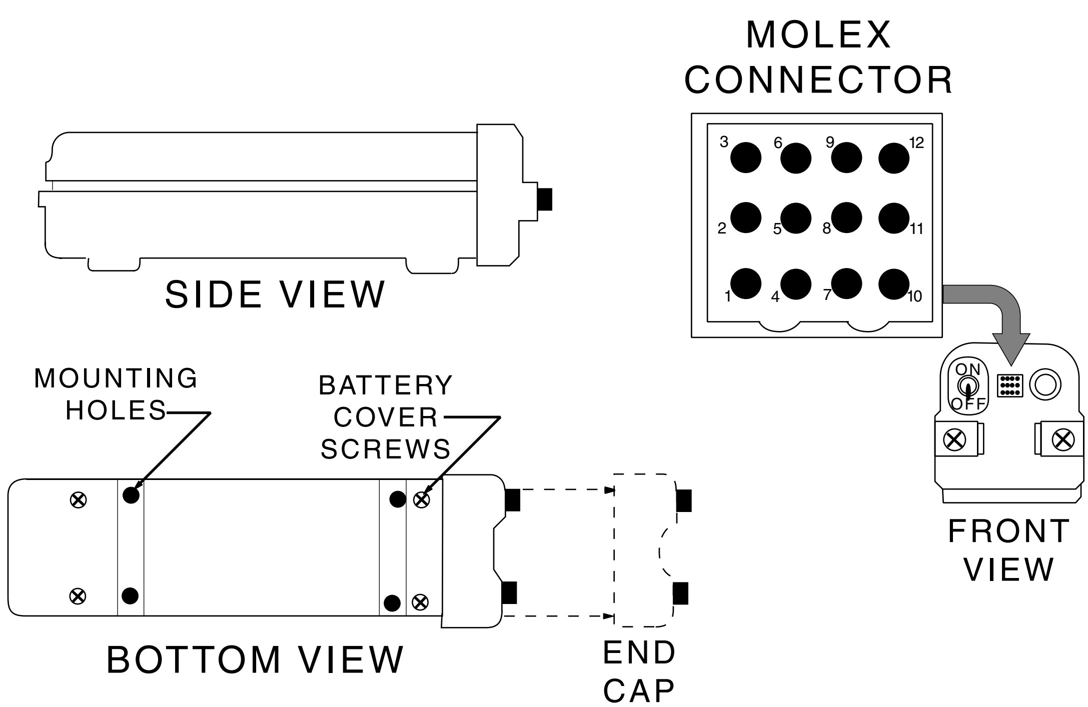
C. Testing

The transmitter operates on the emergency frequencies of 121.5 and 243.0 MHz; both of these frequencies are monitored by the various FAA installations. Before performing any operational test of the ELT, the following precautions should be observed:

CAUTION: TESTING OF AN ELT SHOULD BE CONDUCTED IN A SCREEN ROOM OR METAL ENCLOSURE TO ENSURE THAT ELECTROMAGNETIC ENERGY IS NOT RADIATED DURING TESTING. IF A SHIELDED ENCLOSURE IS NOT AVAILABLE, TESTING MAY BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:

(1) Test should be no longer than three audio sweeps.

(2) Test should be conducted only within the time period made up of the first five minutes after any hour.



Artex ELT 110-4
Figure 1

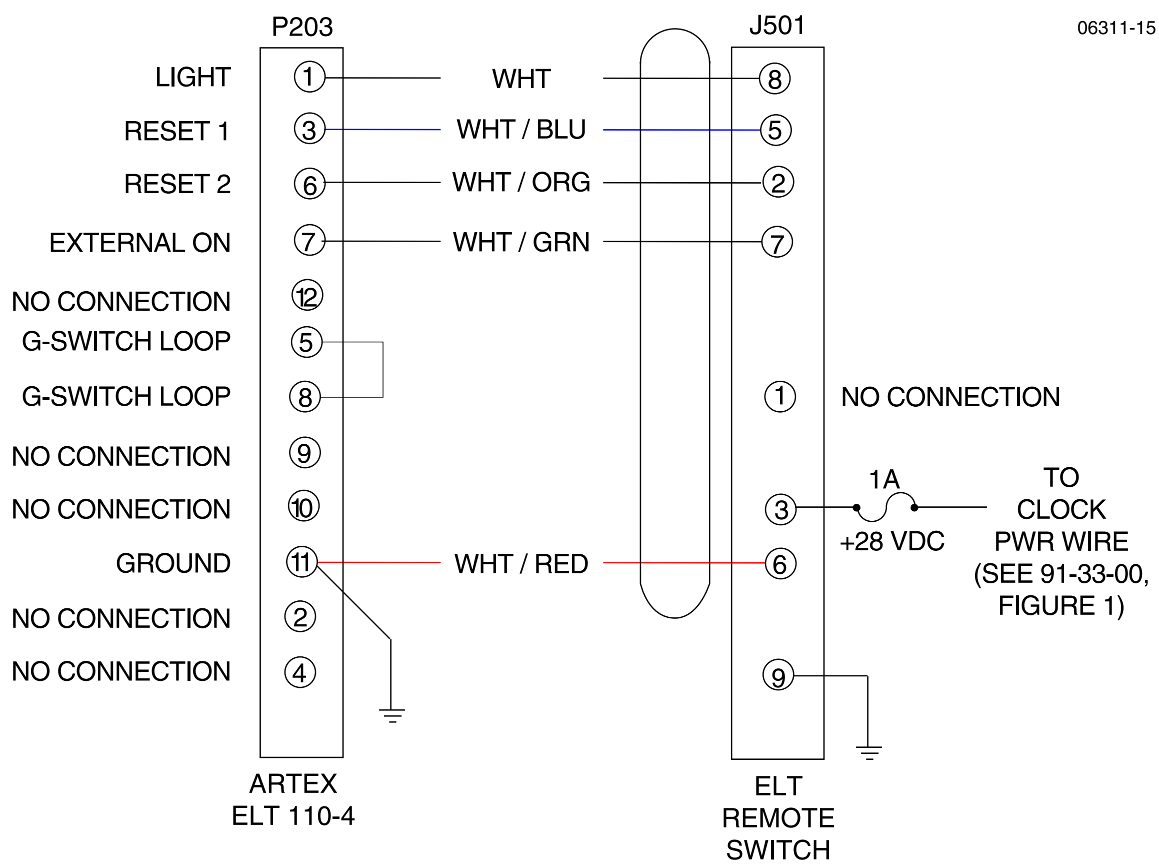
(3) If the operational tests must be made at a time not included within the first five minutes after the hour, the test should be coordinated with the closest FAA Tower or Flight Service Station.

CAUTION: CONSULT FAA ADVISORY CIRCULAR AC 20-81 FOR DETAILED INFORMATION CONCERNING UNSHIELDED TESTING.

(4) Turn both the airplane master switch and the radio master switch ON.

(5) Tune airplane communications receiver to 121.5 mHz and select SPKR on the audio panel.

(6) Position ELT cockpit switch to ON. The ELT should immediately begin signaling and the panel light should immediately come ON. Although the light may illuminate after a few seconds, failure of the light to immediately come ON indicates trouble with the G-Switch circuit, pins 5 and 8 on tray connector, and that the unit is not working properly. Repairs should be done only by a licensed aviation radio repair shop.



Artex ELT 110-4 Wiring Schematic
Figure 2

THIS PAGE INTENTIONALLY BLANK

CHAPTER

27

FLIGHT CONTROLS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 27

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS

GENERAL

1. Description and Operation

The airplane is controlled in flight by standard three-axis control surfaces, consisting of: ailerons (roll); stabilator (pitch); and rudder (yaw). These controls are operated by movement of the control column-tee bar assembly and rudder pedals.

On the forward end of each control wheel tube is a sprocket assembly. A chain is wrapped around the sprockets to connect the right and left control wheels and then back to idler sprockets on the column's tee bar, which connect to the aileron primary control cables. The cables operate the aileron bellcrank and push-pull rods. The stabilator is controlled by a cable connected to the bottom of the tee bar assembly and operates an aft fuselage bellcrank which controls a push rod connected to the balance arm of the stabilator. Cables also connect the rudder pedals with the rudder horn.

Pitch and yaw trim control is provided by separate adjustable trim mechanisms for both the stabilator and the rudder. Stabilator trim is controlled by a wheel and drum mounted on the floor tunnel between the front seats. Cables are routed aft from the drum to a screw assembly mounted above the stabilator attachment point. This screw assembly in turn moves the push rod which controls the stabilator trim tab. Rudder trim is controlled by a knob and screw assembly attached to the rudder pedal assembly.

An aileron-rudder interconnect system is provided which consists of a spring loaded cable located in the fuselage tunnel which connects the aileron cable to the rudder cable.

The flaps are manually operated.

2. Standard Practices and Procedures

The following tips may be helpful in the removal, installation, and rigging of individual control system assemblies.

A. It is recommended, though not always necessary, to level and place the airplane on jacks during rigging and adjustment.

B. Remove turnbuckle barrels from cable ends before withdrawing the cables through the structures.

C. Tie a cord to the cable end before withdrawing the cable through the structures to facilitate installation of cable.

D. Mark cable ends, etc., before disconnecting, use a felt tip marking pen.

E. Assemble and adjust the turnbuckles so that each terminal is screwed an approximately equal distance into the barrel. Do not turn the terminals in such a manner that will put a permanent "twist" into the cables.

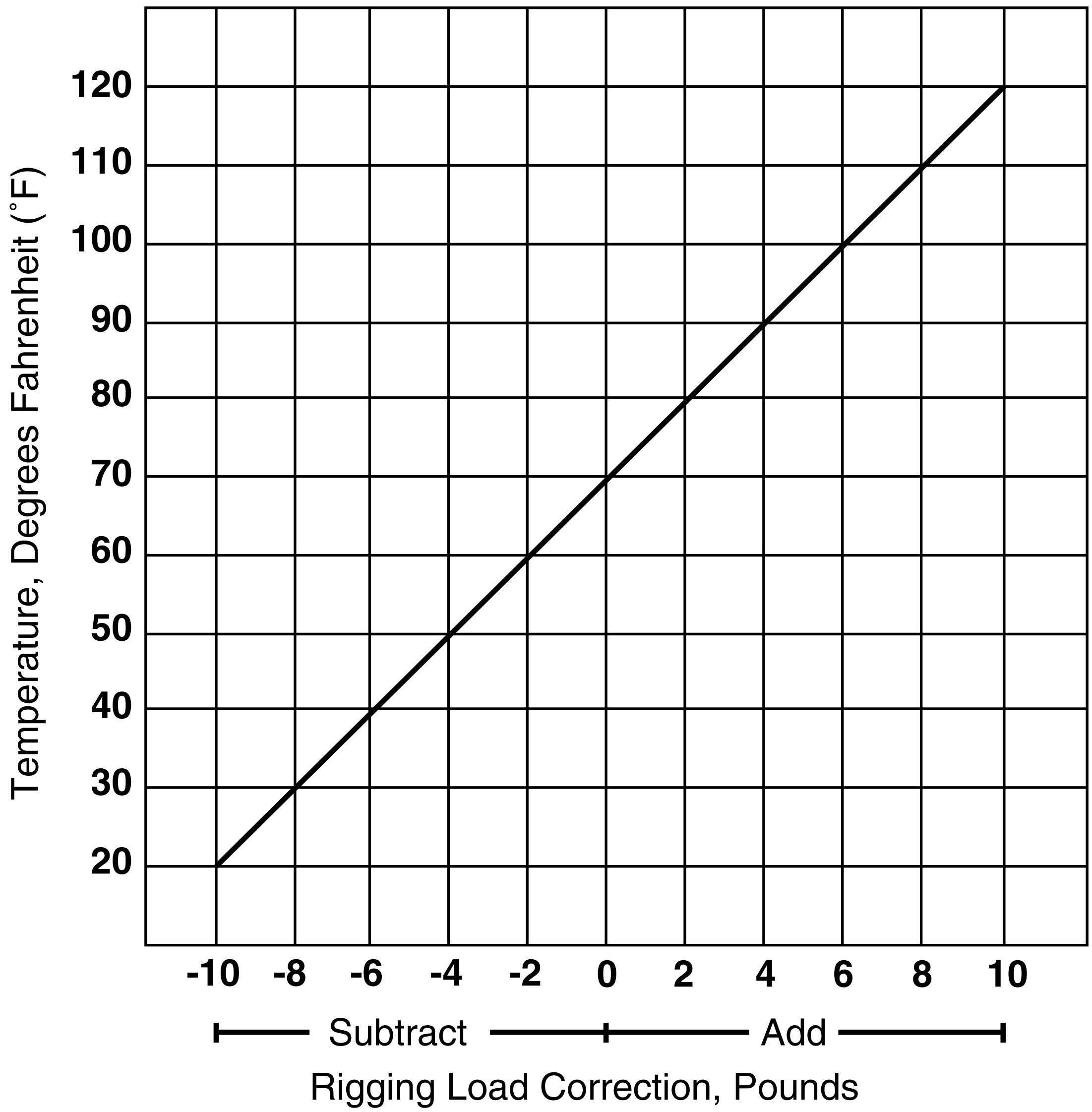
F. Cable tensions should be taken with the appropriate control surface in its neutral position.

NOTE: Cable rigging tensions specified must be corrected to ambient temperature in the area where the tension is being checked, using Chart 1. When installing new cables, initially tension them 20 to 30 % over nominal tension, then loosen them to the "High Side" of the tolerance. This "pre-stretching" will aid in maintaining specified tension after flight testing.

G. Check all cable ball ends for proper seating in retainers after setting cable tension.

H. After completion of each adjustment, check the turnbuckles to be sure not more than three terminal threads are visible outside the barrel. Install the locking clips, and check for proper installation by trying to remove the clips using fingers only. Both locking clips may be installed in opposite holes. Locking clips which have been installed and removed must be scrapped and not reused. Turnbuckles may be safetied in accordance with Advisory Circular 43.13-1, latest revision.

CHART 1
CABLE TENSION VS. AMBIENT TEMPERATURE



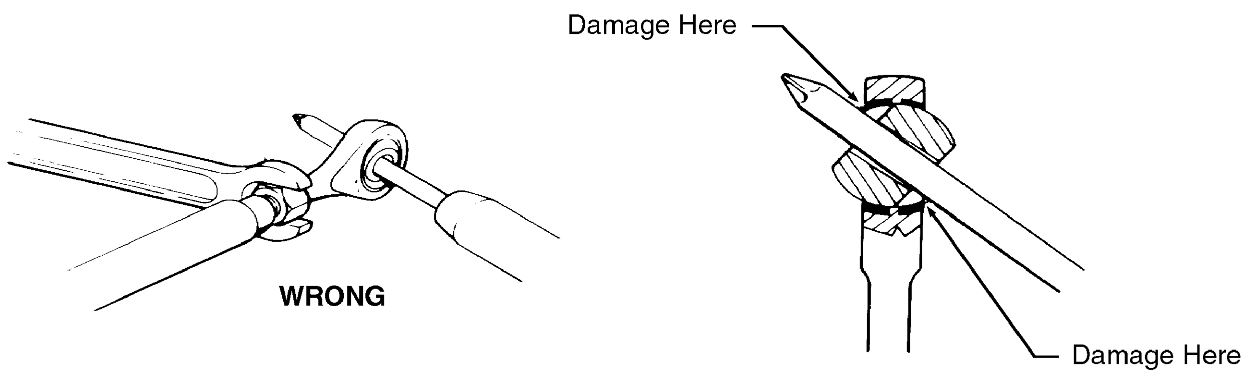
I. When pushrods or rod ends are provided with an inspection hole, the screw must be screwed in far enough to pass the inspection hole. This can be determined visually or by feel, inserting a piece of wire into the inspection hole. If no hole is provided, there must be a minimum of .375 (3/8) of an inch thread engagement.

J. When installing/adjusting rod end jamnuts, refer to Figure 1 for proper method.

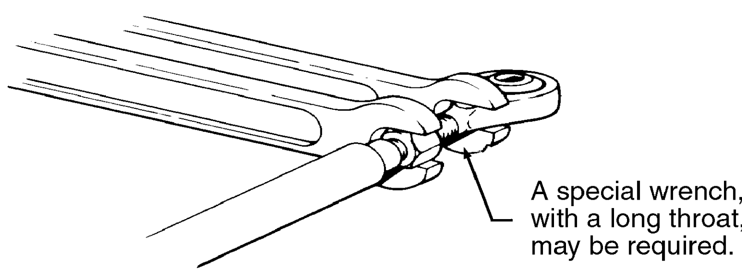
K. After completion of adjustments, each jam nut must be tightened securely.

NOTE: Torque all nuts in the flight control system (including nose wheel steering). Refer to 91-10-00, Chart 2.

L. Ensure all pulley guard pins are properly installed and secured.



Improper Tool (Resulting in locked ball)



ONLY CORRECT METHOD

Rod End Installation Method
Figure 1

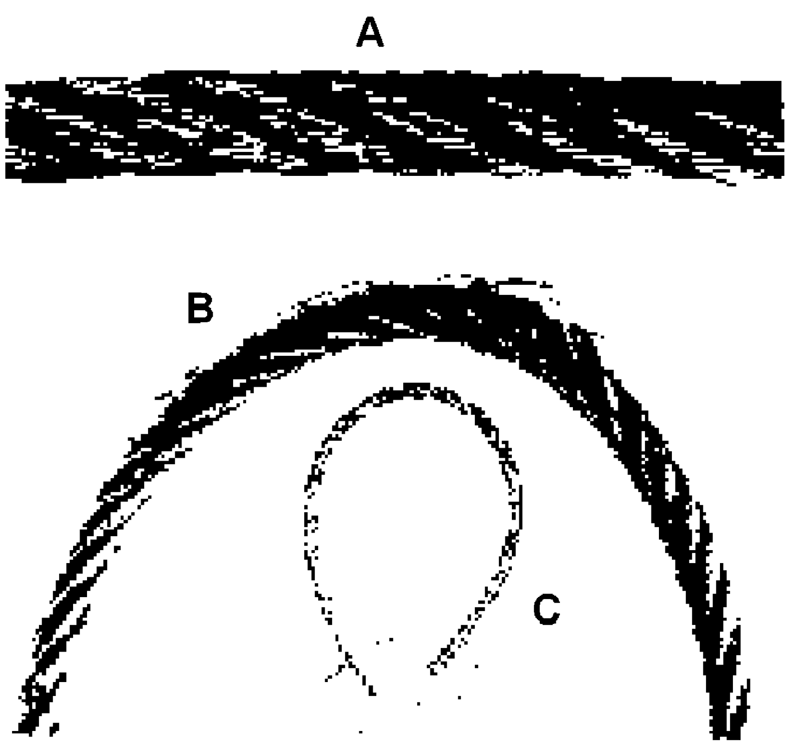
2. <u>Control Cable Inspection</u>

Aircraft control cable systems are subject to a variety of environmental conditions and forms of deterioration that, with time, may be easy to recognize as wire/strand breakage or the not-so-readily visible types of wear, corrosion, and/or distortion. The following data may help in detecting the presence of these conditions:

A. Cable Damage

Critical areas for wire breakage are sections of the cable which pass through fairleads and around pulleys. To inspect each section which passes over a pulley or through a fairlead, remove cable from aircraft to the extent necessary to expose that particular section. Examine cables for broken wires by passing a cloth along length of cable. This will clean the cable for a visual inspection, and detect broken wires, if the cloth snags on cable. When snags are found, closely examine cable to determine full extent of damage.

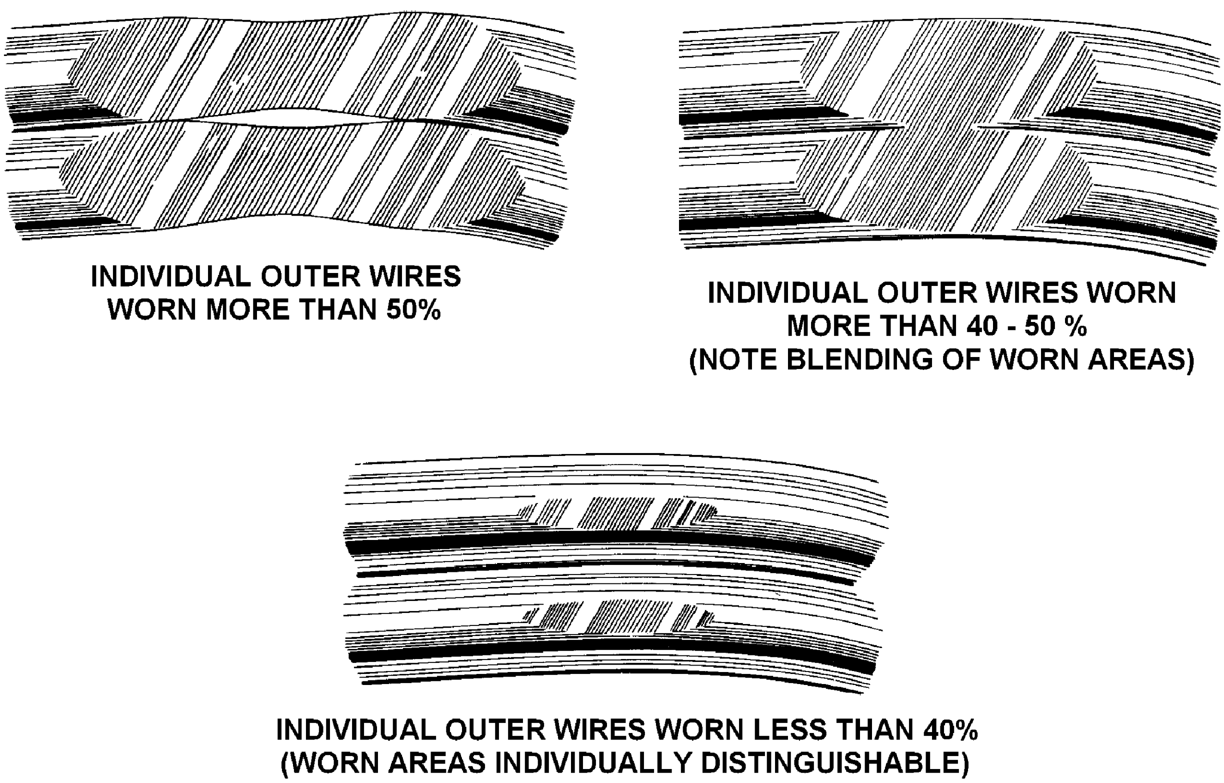
The absence of snags is not positive evidence that broken wires do not exist. Figure 2, View A, shows a cable with broken wires that were not detected by wiping, but were found during a visual inspection. The damage became readily apparent (View B) when the cable was removed and bent using the techniques depicted in View C.



Control Cable Inspection Technique
Figure 2

B. External Wear Patterns

Wear will normally extend along cable equal to the distance cable moves at that location. Wear may occur on one side of the cable only or on its entire circumference. Replace flexible and non-flexible cables when individual wires in each strand appear to blend together (outer wires worn 40-50 percent) as depicted in Figure 3.



External Cable Wear
Figure 3

C. Internal Cable Wear

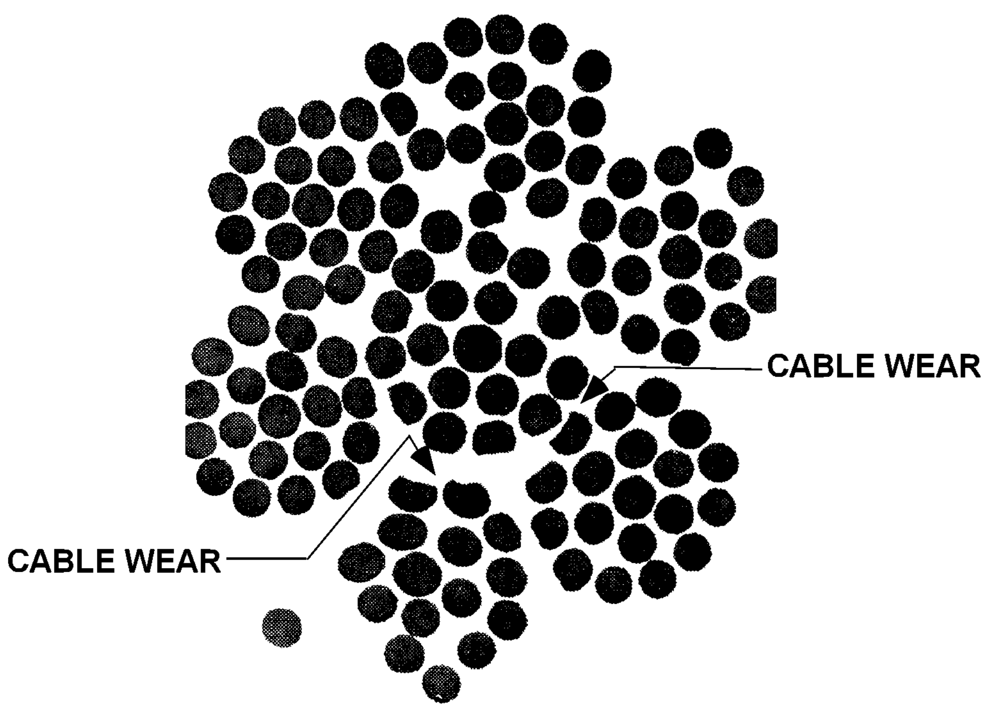
As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition, shown in Figure 4, is not easily detected unless the strands of the cable are separated. Wear of this type is a result of the relative motion between inner wire surfaces. Under certain conditions the rate of this type wear can be greater than that occurring on the surface.

D. Corrosion

Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear producing airframe components such as pulleys, fairleads, etc. It may be necessary to remove and bend the cable to properly inspect it for internal strand corrosion as this condition is usually not evident on the outer surface of the cable. Replace cable segments if internal strand rust or corrosion is found.

Areas especially conducive to cable corrosion are battery compartments, lavatories, wheel wells, etc., where concentrations of corrosive fumes, vapors, and liquids can accumulate.

NOTE: Check all exposed sections of cable for corrosion after a cleaning and/or metal-brightening operation has been accomplished in that area.



Internal Cable Wear
Figure 4

E. Cable Maintenance

CAUTION: TO AVOID REMOVAL OF CORROSION-PREVENTATIVE COMPOUNDS AND CABLE INTERNAL LUBRICANT, DO NOT USE VAPOR DEGREASING, STEAM CLEANING, METHYLETHYLKETONE (MEK) OR OTHER SOLVENTS.

CAUTION: DO NOT OIL CONTROL CABLES.

Frequent inspections and preservation measures such as rust prevention treatments for bare cable areas will help to extend cable service life. Where cables pass through fairleads, pressure seals, or over pulleys, remove accumulated heavy coatings of corrosion prevention compound. Provide corrosion protection for these cable sections by lubricating as specified in the Lubrication Chart, 12-20-00.

F. Cable Fittings

(1) 100 Hour Standard Inspection

Check swaged terminal reference marks for any indication of cable slippage within fitting. Inspect fitting assembly for distortion and/or broken strands at the terminal. Check that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

Pay particular attention to corrosion and “pitting” on cable terminals, turnbuckles and cable fittings. Any corrosion or pitting found requires replacement of the corroded fitting and/or cable.

(2) 100 Hour Special Inspection

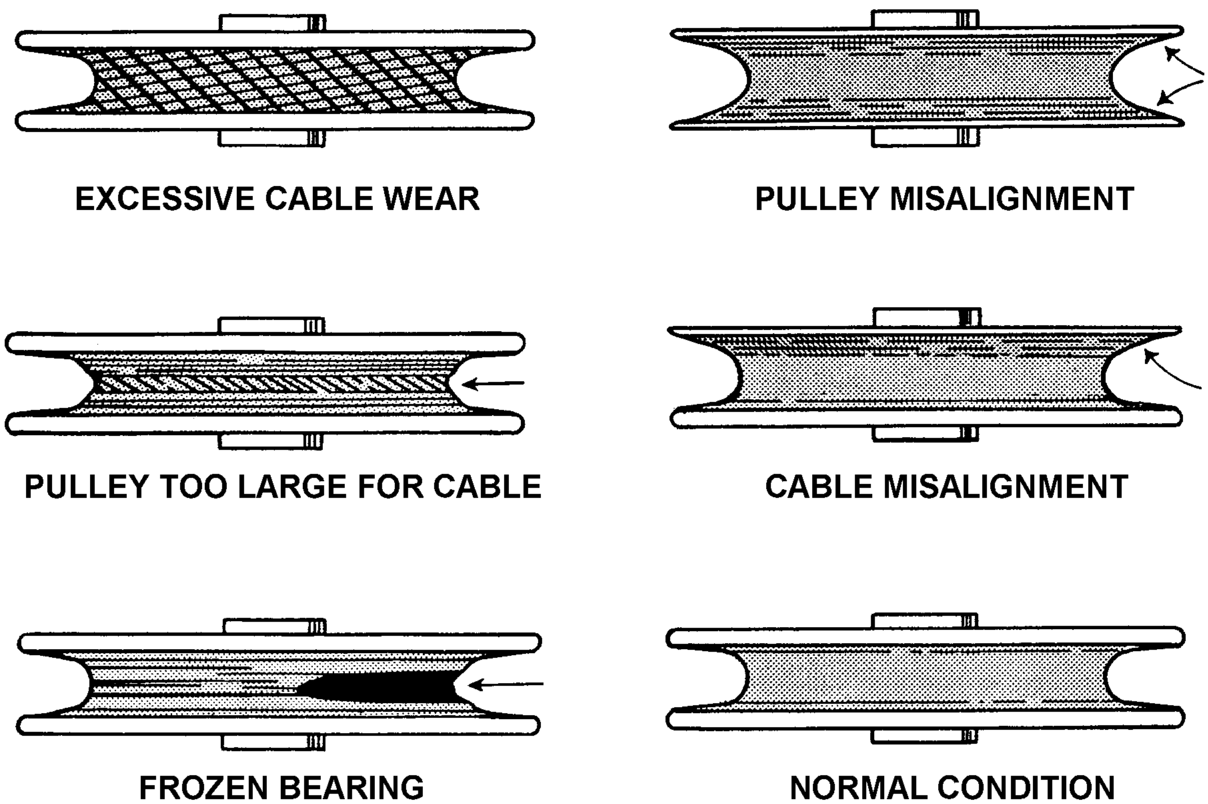
For airplanes 15 years old or older, using a 10X magnifier, visually inspect the entire surface of each cable terminal, turnbuckle, or other cable fitting for corrosion or cracking. Inspect under safety wire or clips wrapped around the cable or fitting. Any evidence of corrosion or cracking, however minute, is cause for replacement. A logbook entry documenting the replacement of a cable terminal, turnbuckle, or other cable fitting relieves the inspection requirement for that fitting only, until such time as that fitting has been in service for 15 years.

G. Pulleys

Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to assure proper lubrication, smooth rotation, freedom from flat spots, dirt, and paint spray. Periodically rotate pulleys, which turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on flanges and chafing against guards, covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

H. Pulley Wear Patterns

Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these conditions are shown in Figure 5.



Pulley Wear Patterns
Figure 5

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

AILERON AND TAB

1. Troubleshooting

   See Chart 1.

2. Control Column

   A. Removal (Refer to Figure 1.)

      (1) To remove either control wheel and tube:

         (a) Separate the control wheel tube from the flexible joint that is located on either side of the tee bar assembly by removing the nut, washer and bolt. Pull the tube from the flexible joint.

         (b) If removing the left control tube, slide the stop from the tube.

         (c) Should wires for the various Autopilot systems be installed in the control tube, disconnect them at the quick disconnect terminals behind the instrument panel. Draw the wires back into the tube and back out through the forward end of the tube.

         (d) Remove the control wheel assembly from the instrument panel.

      (2) To remove tee bar with assembled parts:

         (a) Remove access panel to aft section of the fuselage.

         (b) Relieve cable tension from stabilator control cables at one of the stabilator cable turnbuckles in the aft section of fuselage.

         (c) Relieve tension from aileron control cables and chains at turnbuckle that connects the chains at the top of the tee bar.

         (d) Disconnect control chains from control cables where chains and cables join by removing cotter pins, nuts, bolts and bushings.

         (e) If control wheel assemblies have not been previously disconnected from tee bar assembly, separate control wheel tubes at the flexible joints by removing nuts, washers and bolts.

         (f) Remove tunnel plate just aft of the tee bar by laying back enough tunnel carpet to remove plate attachment screws.

         (g) Remove the two aileron control cable pulleys attached to lower section of tee bar by removing pulley attachment bolt.

         (h) Disconnect stabilator control cables from lower end of tee bar assembly.

         (i) Disconnect necessary engine control cables, such as the propeller pitch control, mixture control, etc., to allow tee bar assembly to be removed.

         (j) Remove tee bar assembly by removing attachment bolts with washers and nuts that are through each side of the floor tunnel, and lifting it up and out through the right side of the cabin.

   B. Installation

      (1) To install tee bar assembly (Refer to Figure 1.)

         (a) Swing the tee bar assembly into place from the right side of the cabin and secure with attachment bolts, washers and nuts inserted through each side of the floor tunnel.

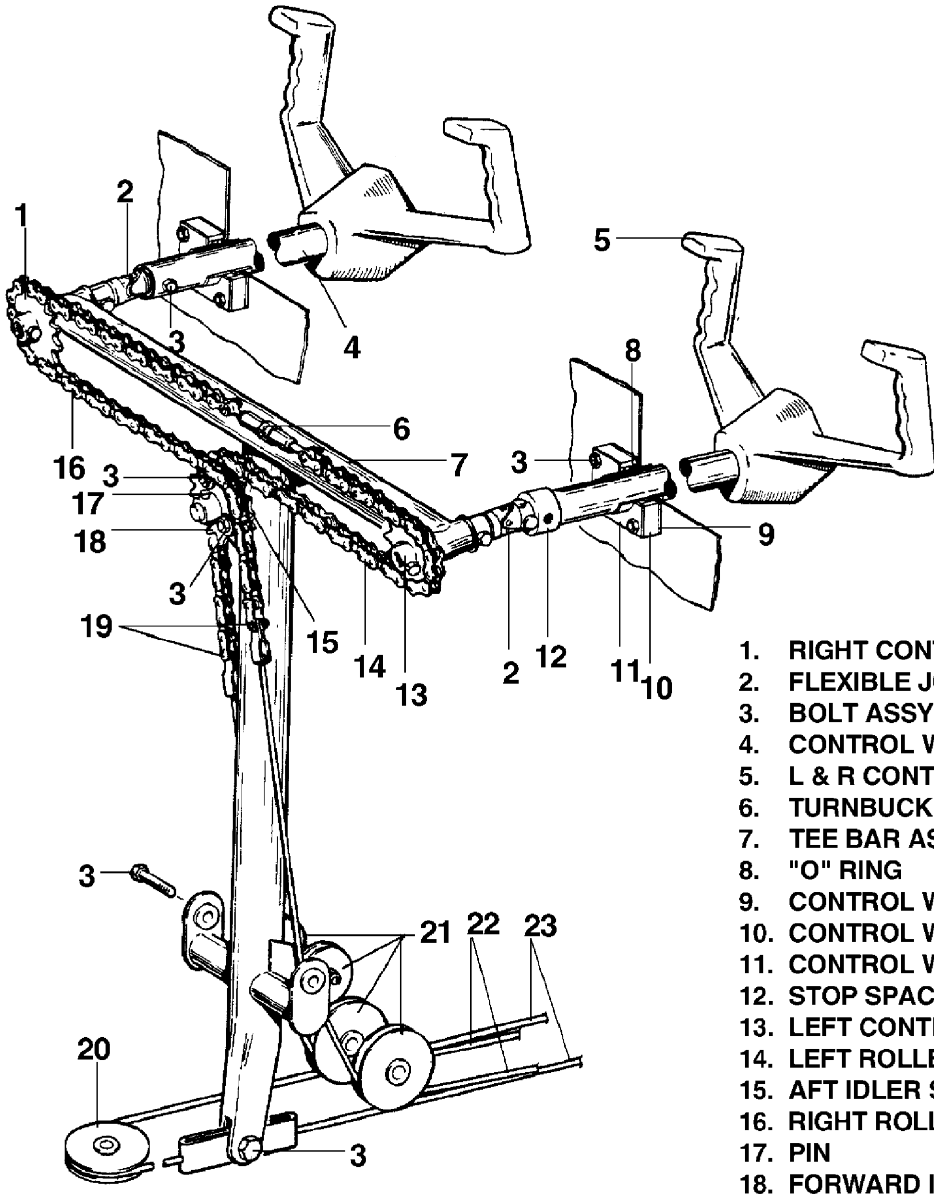
         (b) Connect the stabilator control cables to the lower end of the tee bar with bolt, washer, nut and cotter pin. Allow the cable ends free to rotate.

         (c) Place the aileron control cables around the pulleys that attach to the lower section of the tee bar; position pulleys and secure with bolt, washers and nut.

         (d) Install the control wheel per Step 2, below.

CHART 1
TROUBLESHOOTING AILERON CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between control wheel and aileron.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
Resistance to control wheel rotation.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Control column horizontal chain improperly adjusted.	Adjust chain tension.
	Pulleys binding or rubbing.	Replace binding pulleys and/or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
	Bent aileron and/ or hinge.	Repair or replace aileron and/or hinge.
	Cables crossed or routed incorrectly.	Check routing of control cables.
Control wheels not synchronized.	Incorrect control column rigging.	Check control column rigging.
Control wheels not horizontal when ailerons are neutral.	Incorrect rigging of aileron system.	Check aileron system.
Incorrect aileron travel.	Aileron control rods not adjusted properly.	Adjust control rods.
	Aileron bellcrank stops not adjusted properly.	Adjust bellcrank stops.
Correct aileron travel cannot be obtained by adjusting bellcrank stops.	Incorrect rigging of aileron cables, control wheel and control rod.	Check controls for proper rigging.
Control wheel stops before control surfaces reach full travel.	Incorrect rigging between control wheel and control cables.	Check controls.



1. RIGHT CONTROL WHEEL SPROCKET
2. FLEXIBLE JOINT
3. BOLT ASSY.
4. CONTROL WHEEL TUBE
5. L & R CONTROL WHEELS
6. TURNBUCKLE
7. TEE BAR ASSY
8. "O" RING
9. CONTROL WHEEL WASHER
10. CONTROL WHEEL PLATE
11. CONTROL WHEEL WASHER
12. STOP SPACER
13. LEFT CONTROL WHEEL SPROCKET
14. LEFT ROLLER CHAIN
15. AFT IDLER SPROCKET
16. RIGHT ROLLER CHAIN
17. PIN
18. FORWARD IDLER SPROCKET
19. BOLT, BUSHING, NUT & COTTER PIN
20. STABILATOR PULLEY
21. AILERON PULLEYS
22. AILERON CONTROL CABLES
23. STABILATOR CONTROL CABLES

Control Column Assembly
Figure 1

(e) Place the control wheels in neutral (centered) position and install the aileron control chains on the control wheel sprockets and idler cross-over sprockets. The turnbuckle must be centered between the two control wheel sprockets.

(f) Loosen the connecting bolts of the idler sprockets to allow the chain to fit snug around the control wheel sprockets and over the idler sprockets.

(g) Connect the aileron control cables to the ends of the chains with bolts, bushings, nuts and cotter pins.

(h) Adjust the chain turnbuckle between the two control wheel sprockets to allow the control wheels to be neutral and obtain proper cable tension as given in Figure 5. It may be necessary in order to have both control wheels neutral to set the chain turnbuckle to neutralize the wheels and then set cable tension with the turnbuckles located under the floor panel aft of the main spar. Before safety wiring the turnbuckle, check that when the ailerons are neutral, the control wheels will be neutral and the chain turnbuckle centered. Also the aileron bellcranks should contact their stops before the control wheel hits its stop. Maintain 0.030 to 0.040 inch clearance between sprocket pin and adjustable stop bolts on models having adjustable tee bar stops.

(i) Set stabilator cable tension with the turnbuckle in the aft section of the fuselage. Check safety of all turnbuckles upon completion of adjustments.

(j) Tighten the connecting bolts of the idler sprockets.

(k) Install the floor tunnel plate and secure with screws. Fasten the tunnel carpet in place.

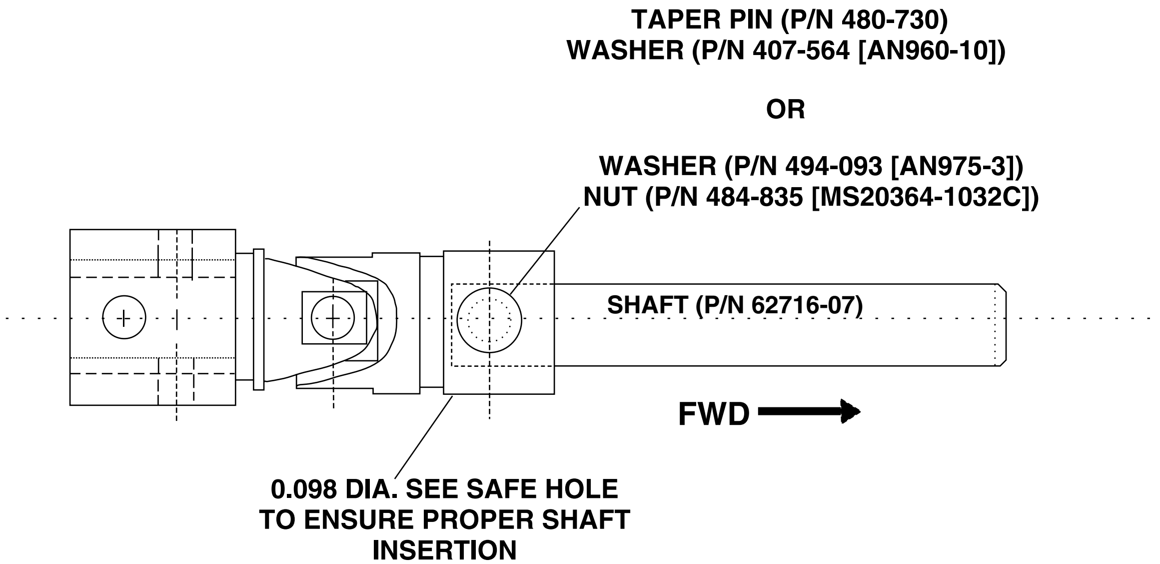
(2) To install either control wheel assembly (Refer to Figure 1.)

(a) Insert the control wheel tube through the instrument panel.

(b) Should wires for the various Autopilot systems need to be installed in the control tube, route them through the hole in the forward side of the tube and out of the small hole in the side. Position the rubber grommet in the hole in the side of the tube.

(c) On the left control tube, install the stop.

(d) Connect the control wheel tube to the flexible joint of the tee bar assembly. If the control cables and/or chains have not been removed or loosened, place the ailerons in neutral and install the control tube on the flexible joint to allow the control wheel to be neutral. Install bolt, washer and nut and tighten.



Flex (Universal) Joint Assembly
Figure 2

C. Flex Joint Replacement (Refer to Figures 1 and 2.)

Install a replacement control column flex joint as follows:

(1) Carefully lay out location for hole to be drilled in flex joint tube to match hole in control column shaft.

(2) Using a #5 (0.2055) drill bit, drill hole through flex joint tube at location determined in paragraph (a).

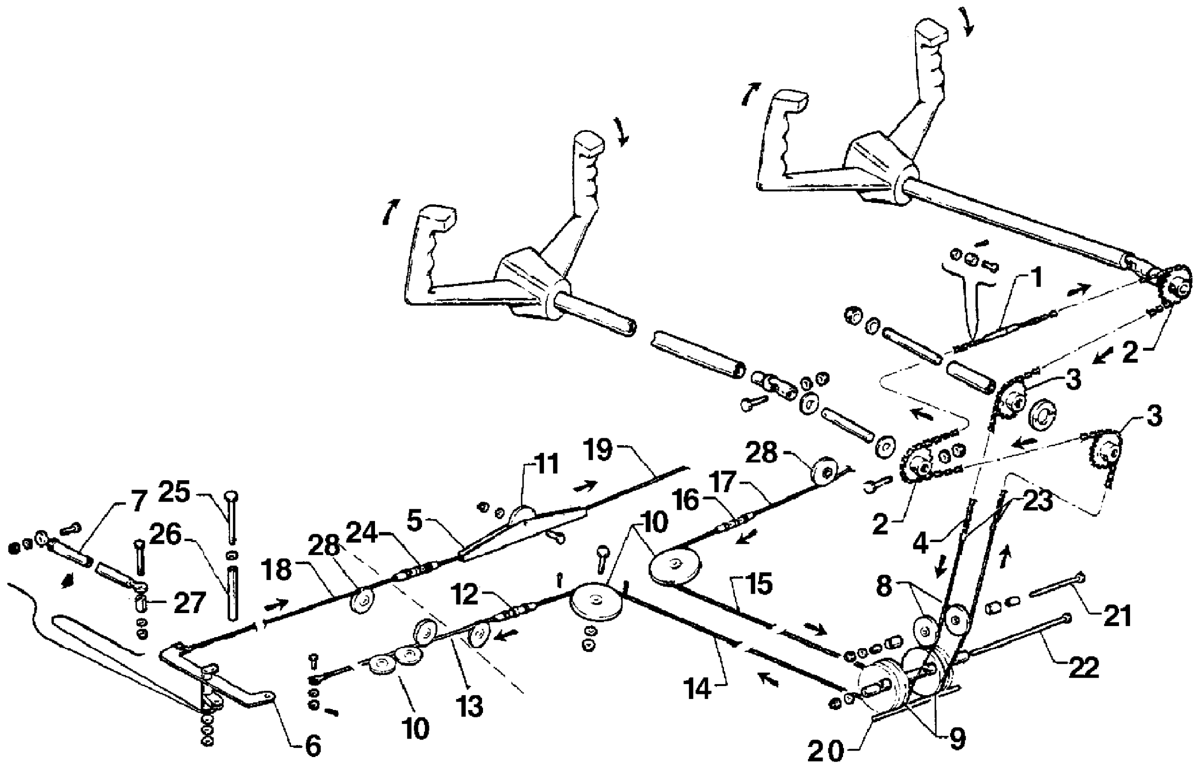
(3) Ream drilled hole, in steps, with a #1 reamer, checking to insure proper depth for taper pin and sufficient pin thread protrusion for proper installation.

NOTE: Reamer may be purchased from Enstice Tool Co., Palm Bay, Florida.

(4) Install pin through tube and shaft.

(a) If pin shoulder does not protruded past tube surface, install a AN960-10 washer.

(b) If pin shoulder does protruded past tube surface, install a MS20364-1032C washer.



1. CONTROL CHAIN TURNBUCKLE
2. CONTROL WHEEL SPROCKET
3. IDLER SPROCKET
4. AILERON CONTROL CHAIN
5. PULLEY BRACKET
6. AILERON BELLCRANK
7. AILERON CONTROL ROD
8. TEE BAR PULLEY
9. FORWARD CLUSTER PULLEY
10. PRIMARY CONTROL CABLE PULLEY
11. BALANCE CABLE PULLEY
12. RIGHT PRIMARY TURNBUCKLE
13. RIGHT WING PRIMARY CABLE
14. RIGHT FUSELAGE PRIMARY CABLE
15. LEFT FUSELAGE PRIMARY CABLE
16. LEFT PRIMARY TURNBUCKLE
17. LEFT WING PRIMARY CABLE
18. RIGHT BALANCE CABLE
19. LEFT BALANCE CABLE
20. CABLE GUARD ROD
21. BOLT, WASHER & NUT
22. BOLT, WASHER & NUT
23. BOLT, NUT, BUSHING & COTTER PIN
24. BALANCE CABLE TURNBUCKLE
25. BELLCRANK PIVOT BOLT
26. BELLCRANK BUSHING
27. TEFLON TUBE
28. PRIMARY CONTROL CABLE PULLEY

Aileron Controls
Figure 3

3. Aileron Control Cables

A. Removal (Refer to Figure 3.)

(1) To remove any of the aileron control cables in the fuselage or either wing:

(a) Remove center seats and seat belt attachments

(b) Remove screws securing floor panel located directly aft of the main spar. Lift panel and remove from airplane.

(c) Remove tunnel plate just aft of the tee bar by laying back enough tunnel carpet to remove plate attachment screws.

(d) Remove forward heat duct from side of floor tunnel from which the cable is to be removed by removing trim control wheel cover, heater baffles from side of duct, floor carpet and the duct attachment screws.

(e) Separate primary control cable at turnbuckle located in floor opening aft of main spar.

(f) Remove cable pulleys attached to lower section of control column tee bar assembly by removing pulley attachment bolt.

(g) Move cable guard located under pulley cluster below the fuel selector by removing cotter pin from exposed end of guard and sliding it to the left or right as required.

(h) Remove the cotter pins used as cable guards at the pulley in the forward area of the floor opening aft of the main spar.

(i) Disconnect the cable from the control chain at the control column tee bar assembly by removing the cotter pin, nut, bolt and bushing that connect the two together. Secure the chains in some manner to prevent them from unwrapping from around the sprockets.

(j) Draw the cable back through the floor tunnel.

(2) To remove primary control cable in either wing:

(a) Remove the access plate to the aileron bellcrank located on the underside of the wing forward of the inboard end of the aileron.

(b) If not previously disconnected, separate the cable at the turnbuckle located in the floor opening aft of the main spar.

(c) Disconnect the pulley guard pin from pulley.

(d) Disconnect the cable from the forward end of the aileron bellcrank by removing the cotter pin, nut, washer and bolt.

(e) Draw the cable from the wing.

(3) To remove either balance cable:

(a) Separate the balance cable at the turnbuckle in the right side of the floor opening aft of the main spar.

(b) If the left balance cable is to be removed, remove the cotter pin used as a cable guard at the pulley in the center of the floor opening.

(c) Remove the access plate to the aileron bellcrank located on the underside of the wing forward of the inboard end of the aileron.

(d) Disconnect the cable from the aft end of the aileron bellcrank by removing the cotter pin, nut, washer and bolt.

(e) Draw the cable from the wing.

B. Installation (Refer to Figure 3.)

(1) To install left or right primary control cable in fuselage:

(a) Draw cable through fuselage floor tunnel.

(b) Connect cable to the end of control chain and secure using bushing, bolt, nut and cotter pin.

(c) Place cable around pulley located in the tunnel below the fuel selector.

(d) Position cables and install cable pulleys that attach to lower section of tee bar assembly. Secure with bolt, washer and nut.

(e) Place the cable around pulley located in floor opening just aft of main spar.

(f) If primary control cable in the wing is already installed, connect control cable ends at turnbuckle located in floor opening aft of main spar.

(g) Check rigging and adjustment per Rigging and Adjustment of Aileron Controls.

(h) Position heat duct and secure with screws.

(i) Install tunnel plate aft of tee bar assembly and secure with screws.

(j) Put floor carpet in place and secure.

(k) Install lower and upper selector covers and secure with screws.

(l) Place fuel selector knobs in place and secure with set screws.

(2) To install primary control cable in left or right wing:

(a) Draw control cable into wing.

(b) Connect cable to the forward end of aileron bellcrank using a bolt, washer, nut and cotter pin. Allow cable end to rotate freely on bellcrank.

(c) If primary control cable is already installed in fuselage, connect ends at turnbuckle located under rear seat aft of main spar.

(d) Check rigging and adjustment per Rigging and Adjustment of Aileron Controls.

(e) Install access plate on underside of wing.

(3) To install left or right balance cable:

(a) Draw the cable into wing.

(b) Connect cable to the aft end of aileron bellcrank using a bolt, washer, nut and cotter pin. Allow the cable end to rotate freely on bellcrank.

(c) Connect balance cable ends at turnbuckle located under rear seat aft of main spar.

(d) If left cable was removed, install cotter pin cable guard at pulley located within fuselage aft of main spar.

(e) Check rigging and adjustment per Rigging and Adjustment of Aileron Controls.

(f) Install access plate on the underside of wing.

(4) Install floor panel, seat belt attachments, rear seat and two front seats.

4. Aileron Bellcrank Assembly (Refer to Figure 3.)

A. Removal

(1) Remove rear seat and floor panel.

(2) Remove access plate to aileron bellcrank located on underside of wing, forward of inboard end of aileron.

(3) Relieve aileron control cables tension by loosening balance cable turnbuckle located in opening aft of main spar.

(4) Disconnect primary and balance control cables from bellcrank assembly by removing cotter pins, nuts, washers and bolts.

(5) Disconnect aileron control rod at aft or forward end, as desired, by removing the cotter pin, nut, washer and bolt.

(6) Remove nut, pivot bolt and washers that secure bellcrank. The nut is visible from underside of wing.

(7) Remove bellcrank from within wing.

B. Installation

(1) Ensure that bellcrank pivot bushing is lubricated. Install pivot bushing in torque tube portion of bellcrank.

(2) Place bellcrank in position in wing with a washer located between each end of torque tube and mounting brackets.

(3) Install bellcrank pivot bolt with head up. Install a washer and nut on bolt. Torque nut 20 to 25 inch-pounds. Check that bellcrank rotates freely with little up-down play.

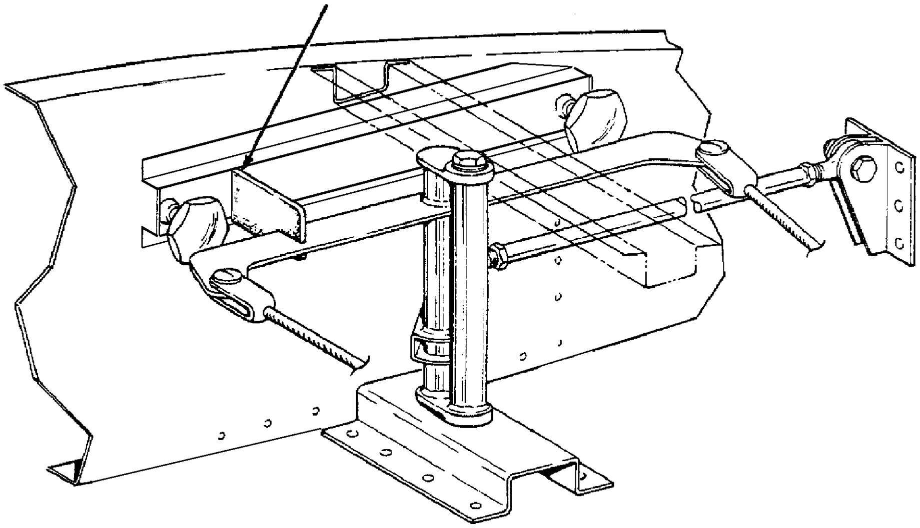
(4) Install and adjust control rod. Check aileron travel per Rigging and Adjustment of Aileron Controls.

(5) Connect ends of primary and balance control cables to bellcrank using bolts, washers, nuts and cotter pins. Allow cable ends to rotate freely on the bellcrank.

(6) Tighten control cables at balance cable turnbuckle in floor opening aft of main spar. Check cable tension per Rigging and Adjustment of Aileron Controls.

(7) Install access plate on underside of wing.

(8) Install floor panel, seat belt attachments and seats.



Aileron Bellcrank Rigging
Figure 4

5. Rigging and Adjustment (Refer to Figures 4 and 5.)

CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF AILERONS. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF AILERON RIGGING AND ADJUSTMENT, VERIFY THAT THE RIGHT AILERON MOVES UP AND THE LEFT AILERON MOVES DOWN WHEN THE CONTROL WHEEL IS TURNED RIGHT; AND THAT THE LEFT AILERON MOVES UP AND THE RIGHT AILERON MOVES DOWN WHEN THE CONTROL WHEEL IS TURNED LEFT.

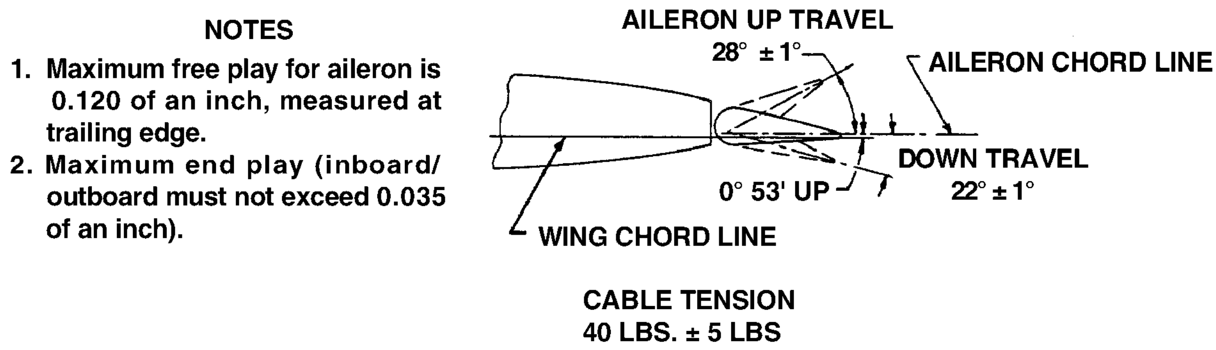
NOTE: Flap rigging and adjustment (see 27-50-00) must be completed before starting aileron rigging and adjustment.

A. Remove the two front seats if desired, the rear seat and floor panel to facilitate access to control system components.

B. Determine that control chains have been rigged per Control Column Installation, above.

C. Place tee bar in full forward position and secure by use of a suitable tool or by placing weights on the aft side of the stabilator if stabilator cables have been previously tensioned.

D. Remove access plate to each aileron bellcrank located on underside of wing, forward of inboard end of aileron, by removing plate attaching screws.



Aileron Rigging Limits
Figure 5

E. Set the right and left aileron bellcranks at neutral position by either:

NOTE: Neutral position of bellcrank is position at which forward and aft cable connection holes are an equal distance from adjacent outboard wing rib.

(1) Measuring the distance from each cable connection hole (i.e. - fwd and aft) to the adjacent outboard wing rib and adjusting until the distances are equal; or,

(2) Using locally fabricated aileron bellcrank rigging tools. (See 95-00-00, Figure 4.)

(a) Affix a bellcrank rigging tool between the forward arm of each bellcrank and the adjacent bellcrank stop hat section as shown in Figure 4.

(b) Slotted end of the tool fits on bellcrank arm adjacent to the control cable end.

(c) Position other end of the tool so that side of tool contacts aft side of bellcrank stop. Bellcrank must be moved to allow a snug fit of tool between bellcrank arm and rib. It may be necessary to loosen a primary control cable or balance cable.

F. With each bellcrank set at neutral, set the ailerons at neutral as follows:

(a) Ensure that bellcrank rigging tool fits snug between bellcrank and hat section.

(b) Adjust the aileron push rods so that the inboard end of the ailerons are aligned with the outboard ends of the flaps (i.e. - flaps in UP, zero degree position). The ailerons may be allowed to "droop" by approximately 1/8 inch at this point.

NOTE: Flap rigging and adjustment (see 27-50-00) must be completed before starting aileron rigging and adjustment.

G. With the control wheels locked in the centered position, adjust cable tension at the turnbuckles to obtain tension shown in Figure 5. Drive cable tensions will be slightly less than balance cable tension, but shall be within the tension specified. Adjust the cables in such a manner that when the specified tension is attained, the inboard ends of the ailerons are visually aligned with the outboard ends of the flaps. A light "up" pressure shall be maintained with the palm of the hand in the middle of the underside of the aileron when making this observation (sufficient to take the slack out of the hinge and linkage).

NOTE: Maintain neutral-center position of control wheels. To obtain neutral position of both control wheels, it may be necessary to adjust roller chain turnbuckle located between the control wheel sprockets.

H. Remove the aileron bellcrank rigging tool from each wing.

I. Remove the control wheel locks. Check to insure that the left aileron up and right aileron down stops are contacted simultaneously and vice versa. Adjust stops as required.

J. Rotate the left (pilot's) control wheel in each direction until the bellcranks contact the stops. The sprocket stops on the tee bar shall not be contacted until additional “override" movement (cushion) of the wheel occurs. A "cushion" on 0.030 to 0.040 inches is to be maintained as measured between the sprocket pin and adjustable control wheel stop bolts.

K. Place the ailerons in the neutral (aligned with the flaps) position. Check that the "up" travel of each aileron from the neutral position and the "down" travel is within the limits shown in Figure 5. When measuring "down" travel from the neutral position, a light "up" pressure shall be maintained at the center of the aft edge of the aileron. When measuring "up" travel from the neutral position, a light "down" pressure shall be maintained at the center of the aft edge of the aileron (at the "up" position only), just sufficient to remove the slack between the bellcrank and the aileron. Total free play measured at the aileron trailing edges shall not exceed 0.120 inches.

(1) Center bubble of a protractor over surface of either aileron at neutral position. Note reading.

(2) Move aileron full up and down. Check degree of travel in each direction. Degree of travel on protractor is determined by taking the difference between protractor reading at neutral and up, and neutral and down. Bubble must be centered at each reading.

(3) If travel is not correct, set by rotating bellcrank stops in or out. Stops are attached to wing rib adjacent to aileron bellcrank.

(4) Repeat procedure for other aileron.

L. Check complete system for operation and safety for turnbuckles, bolts, etc., install all pulley guard pins.

M. Install access plates and panels and any other components removed to facilitate access.

NOTE: When an out of trim condition exists after all rigging corrections have been made, the possibility exists that the trailing edge of the aileron has been used to move the aircraft forward. This will result in an out of rig condition, caused by a slight bulging of aileron contour at the trailing edge, which could require replacement of the aileron to correct.

6. Aileron-Rudder Interconnect

A. Description

The aileron rudder interconnect consists of a spring-loaded cable located in the fuselage tunnel which connects the aileron cable to the rudder cable. Application of full right rudder will result in a downward movement of the left aileron, thereby increasing aircraft stability in this particular maneuver.

B. Rigging and Adjustment

NOTE: Aileron and rudder rigging must be completed prior to rigging the interconnect.

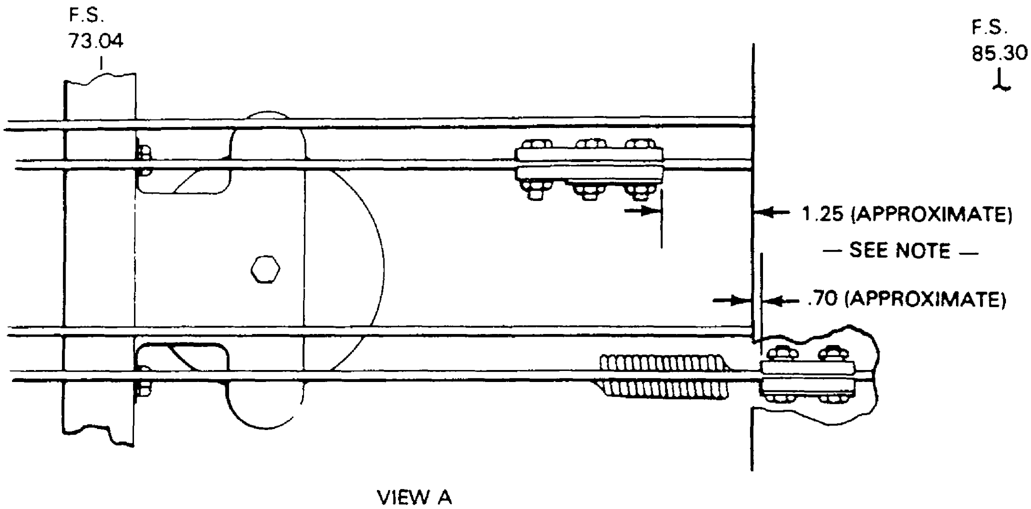
(1) Remove the tunnel access cover. Position interconnect cables as shown in Figure 6 and clamp. Position the left clamp so that the spring will not touch the fuselage under any control position.

(2) With the rudder pedals in neutral, rotate the control wheel from full right to full left.

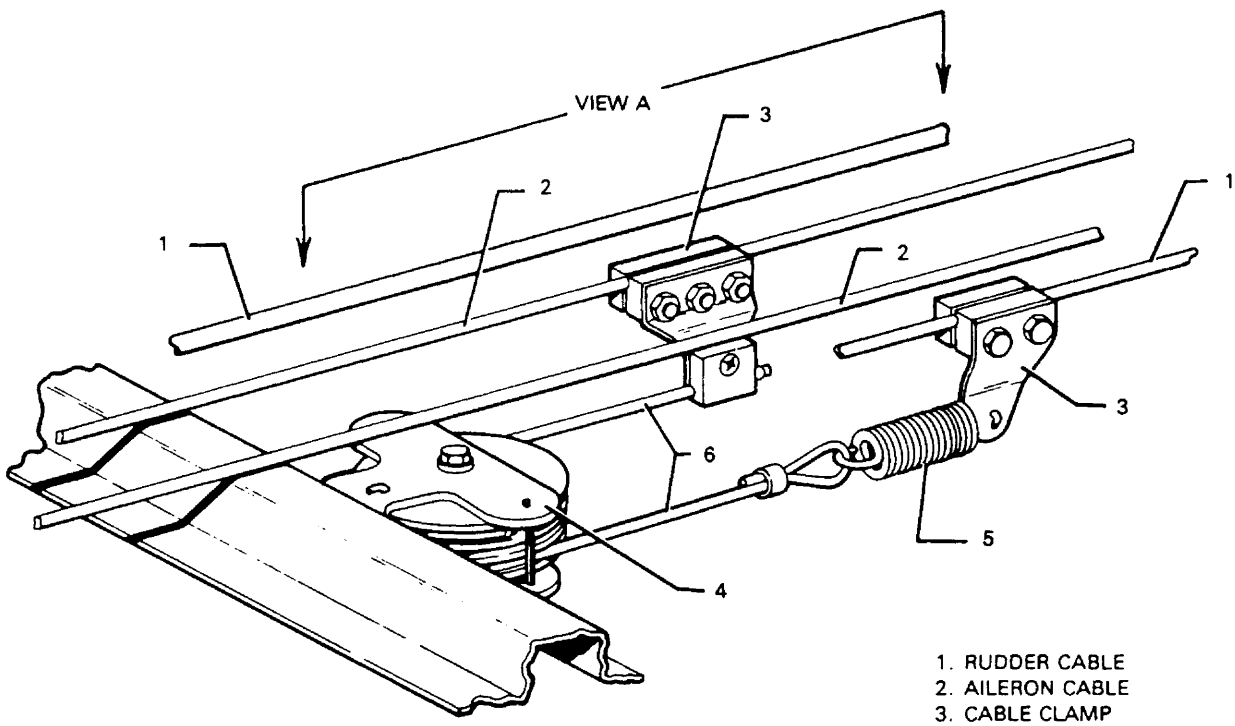
(3) Engagement of the interconnect cable shall occur with the control wheel passing between neutral and a point 10 degrees left of neutral.

(a) Engagement can be detected by movement of the interconnect spring and a loud click as the blocks on the interconnect pulleys engage.

(b) Should the interconnect cable not connect, reposition the right clamp forward or aft as required.



NOTE
THIS DIMENSION MAY VARY AS REQUIRED TO OBTAIN RIGGING SPECIFIED IN "RIGGING AND ADJUSTMENT" OF AILERON/RUDDER INTERCONNECT."



1. RUDDER CABLE
2. AILERON CABLE
3. CABLE CLAMP
4. PULLEY CLUSTER
5. SPRING
6. INTERCONNECT CABLES

38651 R

Aileron-Rudder Interconnect Rigging
Figure 6

THIS PAGE INTENTIONALLY BLANK

RUDDER AND TAB

1. Troubleshooting

   See Chart 1.

2. Rudder Control Cables (Refer to Figure 1.)

   A. Removal

      (1) To remove either forward rudder cable:

         (a) Remove access panel to aft section of fuselage.

         (b) Disconnect desired cable at turnbuckle in aft section of fuselage.

         (c) Remove tunnel cover in the aft area of cabin by removing carpet over the tunnel and cover attachment screws.

         (d) Remove cable guard plate from underside of pulley cluster located in aft area of floor tunnel, by removing guard attachment screws.

         (e) Remove floor panel located directly aft of main spar by removing center seats, seat belt attachments and screws securing floor panel. Lift panel and remove from airplane.

         (f) From within area of floor opening, remove cable rub blocks attached to spar housing by removing block attachment screws.

         (g) Remove cable guard pin at pulley cluster in aft area of opening by removing cotter pin from one end of the guard.

         (h) Remove fuel selector panel cover by removing rudder trim knob and cover attachment screws.

         (i) Remove lower fuel selector cover and fuel selector control lever by removing attachment pin at bottom of lever that holds lever on selector torque tube.

         (j) Remove tunnel plate just aft of tee bar by removing enough carpet from tunnel to allow plate attachment screws and plate to be removed.

         (k) Remove forward head duct from one side of the floor tunnel from which control cable is to be removed.

         (l) Move cable guard pin located under pulley cluster and below fuel selector by removing cotter pin from exposed end and sliding it to the left or right as required.

         (m) Disconnect the end of cable from arm on rudder pedal torque tube by removing cotter pin, nut, washer and bolt.

         (n) Draw the cable from floor tunnel.

      (2) To remove either aft rudder control cable:

         (a) Remove access panel to aft section of fuselage.

         (b) Remove tail cone by removing its attachment screws.

         (c) Disconnect desired cable at turnbuckle in aft section of fuselage.

         (d) Disconnect cable from rudder horn by removing cable clevis bolt, bushing, washer and nut.

         (e) Draw the cable through the fuselage.

   B. Installation

      (1) To install aft rudder control cable:

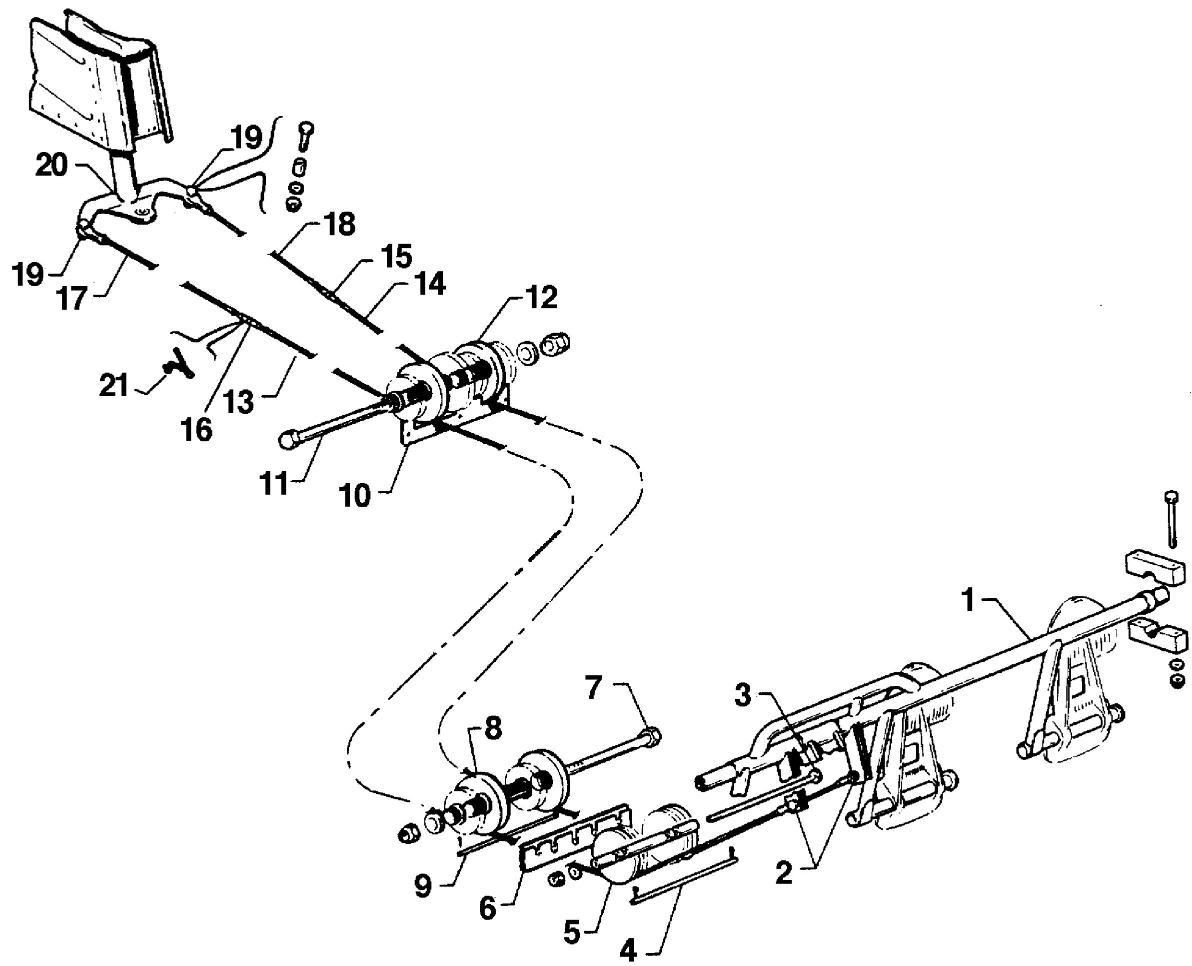
         (a) Position control cable(s).

         (b) Connect cable(s) at turnbuckle(s) in aft section of fuselage.

         (c) Connect cable to rudder horn with clevis bolt, bushing, washer and nut.

CHART 1
TROUBLESHOOTING RUDDER CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between rudder pedals and rudder.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Bolts attaching rudder to bellcrank are loose.	Tighten bellcrank bolts.
Excessive resistance to rudder pedal movement.	System not lubricated properly.	Lubricate system.
	Rudder pedal torque tube bearing in need of lubrication.	Lubricate torque tube bearings.
	Cable tension too high.	Adjust cable tension.
	Pulleys binding or rubbing.	Replace binding pulleys and or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
	Cables crossed or routed incorrectly.	Check routing of control cables.
Rudder pedals not neutral when rudder is streamlined.	Rudder cables incorrectly rigged.	Check rigging of rudder cables.
Incorrect rudder travel.	Rudder bellcrank stop incorrectly adjusted.	Check rigging of bellcrank stops.
	Nose wheel contacts stops.	Check rigging of nose wheel stops before rigging rudder.
Trim control knob moves with excessive resistance.	System not lubricated properly.	Lubricated system.



1. RUDDER & STEERING PEDAL ASSY.
2. BOLT, WASHER, NUT, & COTTER PIN
3. BOLT, BUSHING, WASHER, & NUT
4. CABLE GUARD PIN
5. PULLEY CLUSTER
6. RUB BLOCKS
7. BOLT, BUSHING, WASHER, & NUT
8. PULLEY CLUSTER
9. CABLE GUARD PIN
10. CABLE GUARD PLATE
11. BOLT, BUSHING, WASHER, & NUT
12. PULLEY CLUSTER
13. RIGHT FORWARD CABLE
14. LEFT FORWARD CABLE
15. LEFT TURNBUCKLE
16. RIGHT TURNBUCKLE
17. RIGHT AFT CABLE
18. LEFT AFT CABLE
19. BOLT, BUSHING, WASHER, & NUT
20. RUDDER HORN
21. TURNBUCKLE CLIP (2 PER TURNBUCKLE)

Rudder Controls
Figure 1

(d) Set cable tension and check rigging adjustment per Rigging and Adjustment, below.

(e) Install tail cone and secure with screws.

(f) Install the access panel to the aft section of the fuselage.

(2) To install forward rudder control cables:

NOTE: Aft cable(s) must be installed before installing forward cable(s), see above.

(a) Draw control cable through floor tunnel.

(b) Connect end of cable to arm on rudder pedal torque tube by installing bolt, washer, nut and cotter pin. Ensure cable end is free to rotate.

(c) Connect forward cable to aft control cable at turnbuckles in aft section of fuselage. Ensure each cable is in the groove of its pulley.

(d) Move cable guard, located in forward tunnel under pulley cluster and below the fuel selector, into position, and secure with cotter pin.

(e) Install cable guard blocks, located within floor opening aft of main spar, onto spar housing. Secure with screws.

(f) Install cable guard pin at pulley cluster in aft area of floor opening by sliding it into position and fastening with a cotter pin.

(g) Install cable guard plate under pulley cluster located in aft area of aft floor tunnel. Secure with screws.

(h) Set cable tension and check rigging adjustment per Rigging and Adjustment, below.

(i) Install heat duct. Secure with screws.

(j) Install forward tunnel plate aft of tee bar. Secure with screws.

(k) Put floor carpet in place and secure.

(l) Place fuel selector lever on selector torque tube. Secure with pin and cotter pin.

(m) Install lower and upper selector covers. Secure with screws.

(n) Install floor panel and seat belt attachment aft of main spar. Secure panel with screws.

(o) Install seats.

(p) Install cover and carpet of aft floor tunnel.

C. Rigging and Adjustment

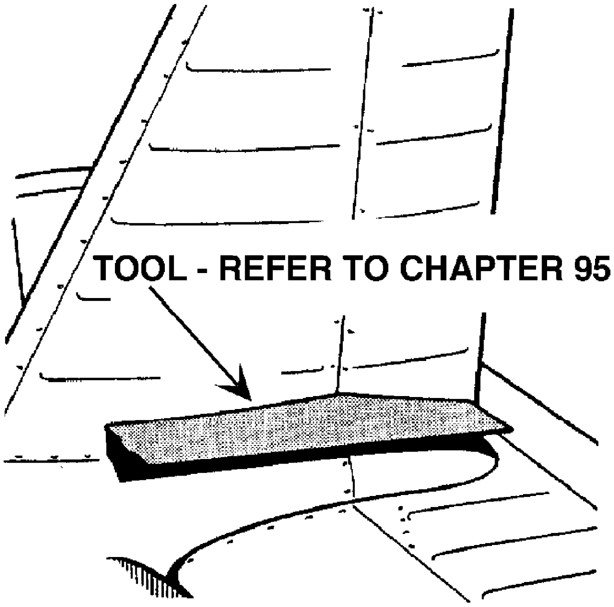
CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF RUDDER. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF RUDDER RIGGING AND ADJUSTMENT, VERIFY THAT THE RUDDER MOVES RIGHT WHEN THE RIGHT PEDAL IS DEPRESSED; AND, THAT THE RUDDER MOVES LEFT WHEN THE LEFT PEDAL IS DEPRESSED.

(1) Remove tail cone fairing and aft fuselage access panel.

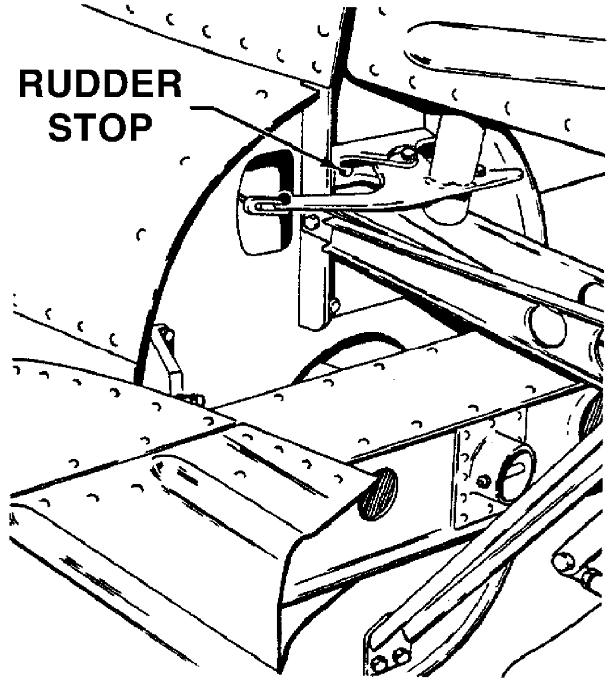
CAUTION: TO AVOID CABLE STRETCH, DO NOT PUSH RUDDER HARDER THAN NECESSARY.

(2) Using a suitable tool, as shown in Figure 2, set the rudder stops (see Figure 3) so that rudder travel is as specified in Figure 4, measured from neutral (i. e. - streamlined with the vertical stabilizer). (See 95-00-00, Figure 5, for tool fabrication instructions.)

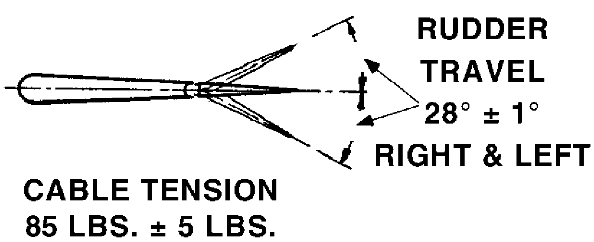
(3) Install a suitable tool which will streamline the rudder with the vertical stabilizer and lock it in that position.



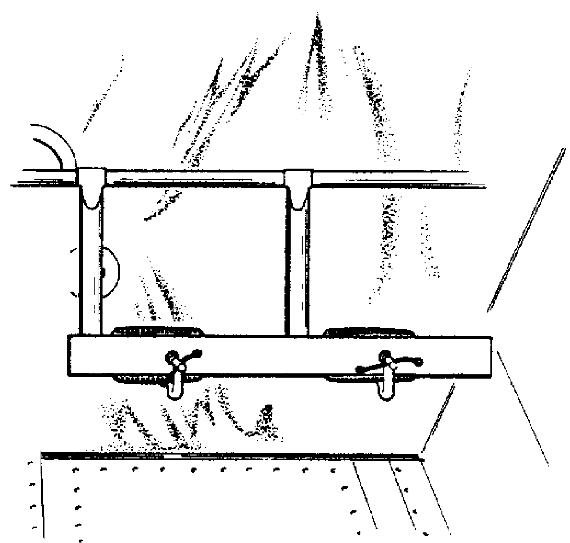
Rudder Rigging
Figure 2



Rudder Travel Adjustments
Figure 3



Rudder Rigging Limits
Figure 4



Clamping Rudder Pedals
Figure 5

(4) Install a suitable tool which will lock the rudder pedals together (see Figure 5) and in alignment with each other in the neutral position. In the neutral position, the rudder pedals are tilted 14 degrees aft as illustrated in 32-20-00, Figure 4.

(5) Install a suitable tool which will lock the nose wheel in alignment with the longitudinal axis of the aircraft.

NOTE: Verify that the rod ends on the pilot's rudder pedal push rods are adjusted so that the length of the rods is equal. If not, adjust the pedal push rods to equal lengths.

(6) Adjust the rudder cable turnbuckles to obtain the tension shown in Figure 4. Adjust the cables evenly to avoid uneven strain on aircraft components. Safety the turnbuckles.

(7) Remove the centering tools.

CAUTION: TO AVOID CABLE STRETCH, DO NOT PUSH TOW BAR HARDER THAN NECESSARY.

(8) With tow bar in place, turn the nose wheel to the left until the rudder stop makes contact. Adjust the nose wheel steering stop (see 32-20-00, Figure 2) to obtain 0.06 to 0.12 clearance, repeat this procedure with nose wheel turned to the right. Turn nose wheel to the left until the steering stop makes contact. Nose wheel travel shall be 29 degrees min. Repeat this procedure turning nose wheel to the right.

(9) Adjust rudder pedal stops by pushing on pilot’s left rudder pedal until rudder stop is contacted.

(a) Adjust pedal stop (on fire wall) to provide 0.060 to 0.120 of an inch clearance.

(b) Repeat procedure with the copilot’s right rudder pedal.

(10) Install tail cone and aft fuselage access panel.

3. Rudder Trim Control (Refer to Figure 6.)

A. Removal

(1) Remove fuel selector panel cover by removing rudder trim knob and cover attachment screws.

(2) Place trim knob on assembly and rotate to extreme left (counterclockwise) trim position.

(3) Disconnect housing lug from arm on rudder pedal torque tube by removing cotter pin, nut, washer and bolt.

(4) Remove threaded bushing from aft end of mounting channel by removing cotter pin and clevis pin.

(5) Remove mounting channel may by removing channel attachment screws inside of channel.

(a) Middle and aft screws need only be turned out.

(b) Forward screw is secured by a nut on underside of tunnel. To remove forward screw:

1 Lift floor carpet on right side of tunnel adjacent to channel and remove access plate on side of tunnel.

2 Secure nut and turn out screw.

B. Installation

(1) Install trim control mounting channel on upper side of floor tunnel. Install a spacer plate between the channel and tunnel.

(a) Install the middle and aft attachment screws. Secure screws and with anchor nuts.

(b) Install forward screw. Forward screw is secured with a nut that must be held from within the tunnel.

(2) Install the access plate on the side of the tunnel and secure carpet in place.

(3) Before attaching assembly to mounting channel, check that:
   (a) Clips are installed so safety wire will be on top.
   (b) Threaded bushing is installed on assembly shaft with welded attachment bushing forward or toward housing.

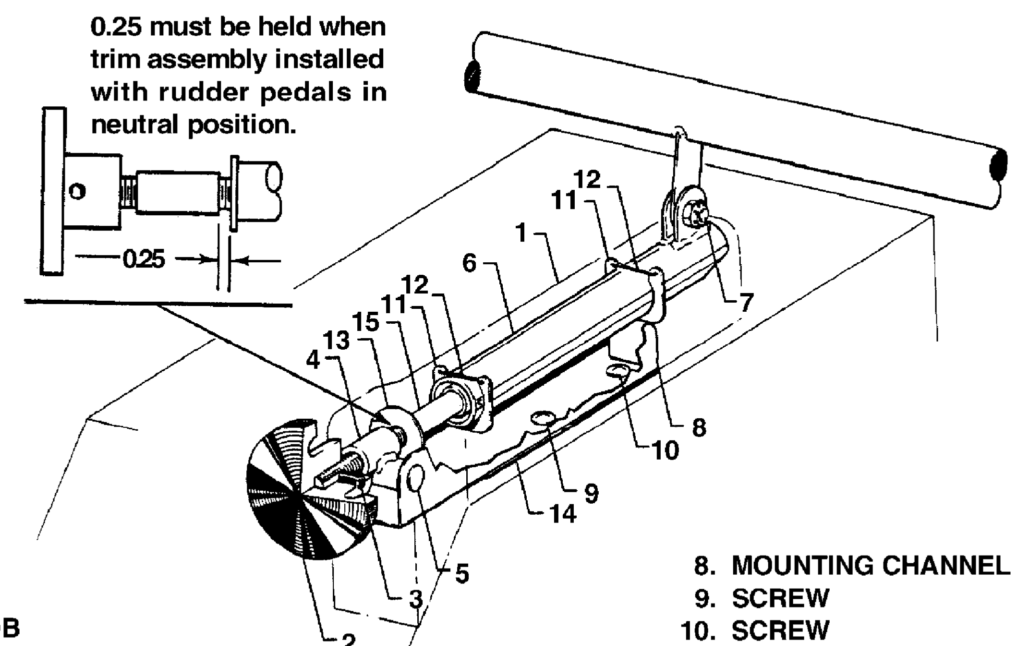
(4) Attach housing lug to arm provided on rudder pedal torque tube. Secure with bolt, washer and nut. Tighten nut only finger tight and safety with cotter pin.

(5) Clamp rudder pedals in neutral. Position threaded bushing and shaft extension in mounting channel.
   (a) Install the clevis pin and cotter pin.
   (b) Check that dimensions noted in Figure 6 are maintained.

(6) Install fuel selector panel cover and cover attachment screws.

(7) Install rudder trim knob

(8) Ensure that neutral indicator aligns with neutral position on cover placard.



1. COVER
2. RUDDER TRIM CONTROL KNOB
3. LOCK SCREW
4. BUSHING
5. CLEVIS PIN
6. CONTROL SHAFT HOUSING
7. BOLT ASSYMBLY
8. MOUNTING CHANNEL
9. SCREW
10. SCREW
11. CLIPS
12. SAFETY WIRE
13. INDICATOR WASHER
14. SPACER PLATE
15. CONTROL SHAFT

Rudder Trim Control
Figure 6

C. Rigging and Adjustment

CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF RUDDER. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF RUDDER TRIM RIGGING AND ADJUSTMENT, VERIFY THAT THE RUDDER MOVES LEFT WHEN THE RUDDER TRIM WHEEL IS TRIMMED LEFT; AND, THAT THE RUDDER MOVES RIGHT WHEN THE RUDDER TRIM WHEEL IS TRIMMED RIGHT.

Set rudder trim mechanism at the neutral (no load on spring) position. With the nose wheel centered, rudder centered and rudder pedals aligned, check the rudder trim indicator to verify that it indicates the neutral position on the placard. Remove cover and adjust if necessary. Left and right rudder trim control travel (on the ground) shall be five complete turns from neutral minimum.

4. Rudder and Steering Pedal Assembly (Refer to Figure 7.)

A. Removal

(1) Remove access panel to aft section of fuselage.
(2) Relieve rudder and stabilator cable tension by loosening one rudder and one stabilator cable turnbuckle in aft section of fuselage.
(3) Remove fuel selector panel cover by removing rudder trim knob and cover attachment screws.
(4) Remove lower selector cover. Disconnect fuel selector control lever from selector torque tube by removing attachment pin located at bottom of the lever.
(5) Remove tunnel plate just aft of tee bar by laying back enough tunnel carpet to remove plate attachment screws.
(6) Disconnect stabilator control cable from lower end of tee bar assembly.
(7) Remove tee bar attachment bolts with their washers and nuts which are through each side of the floor tunnel. Pull the lower end of the tee bar aft.
(8) Disconnect control cable ends from arms of torque tube by removing cotter pins, washers, nuts and bolts.
(9) Disconnect rudder trim from torque tube assembly by removing cotter pin, washers and bolt.
(10) Disconnect steering rods at the rudder pedals by removing nuts and bolts.
(11) Disconnect brake cylinders at lower end of each cylinder rod by removing cotter pins, washers, nuts and bolts.
(12) Disconnect vee braces from torque tube by removing nuts, washers and bolts that secure strap bracket to vee brace.
(13) If an AutoPilot amplifier is installed over the torque tube at the right side of the fuselage, disconnect electrical plug and release the two fasteners that secure it to its mounting bracket.
(14) Disconnect torque tube support bracket where it attaches to floor tunnel by removing its attachment bolts.
(15) Remove two bolts located at the center of the torque tube assembly over the floor tunnel that extend through torque tube. Compress the tubes.
(16) Disconnect torque tube support blocks from their support brackets on each side of fuselage by removing attachment nuts, washers and bolts.
(17) Remove trim side panels, if desired.
(18) Remove assembly from airplane. Note the spacer washer on each end between support blocks.

B. Installation

(1) Assemble torque tube assembly as shown in Figure 7. Do not install the two bolts through the center of the tube assembly at this time.

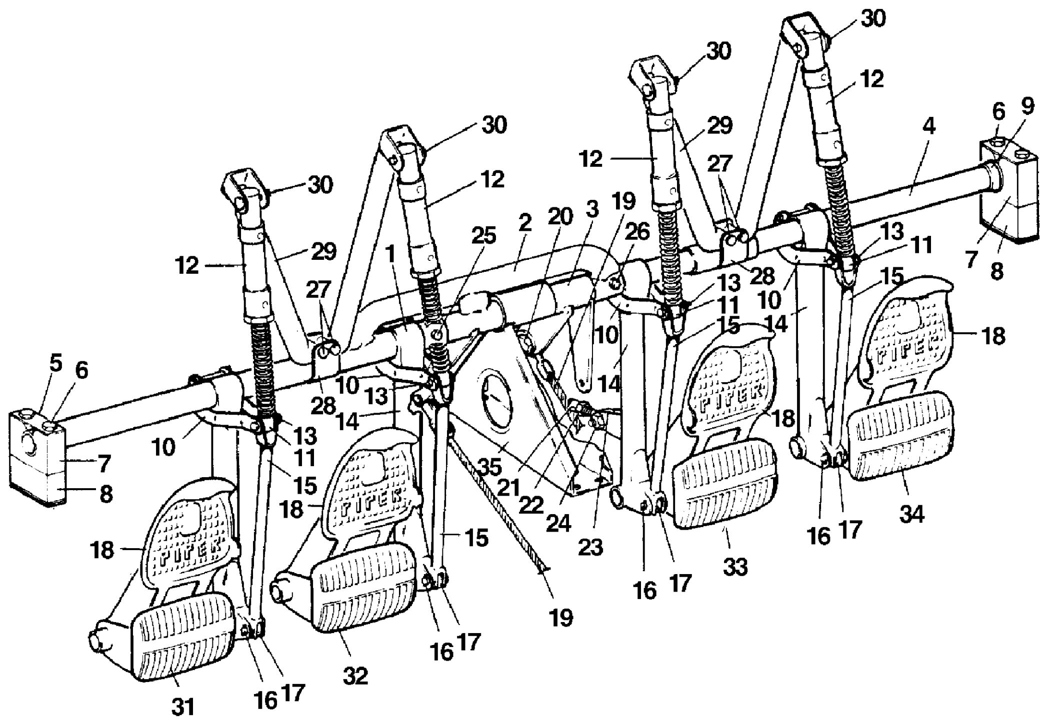
(2) Place upper support blocks on the ends of the torque tube assembly. Note that a washer is required on each end of tube.

(3) Position support blocks on their mounting brackets at each side of fuselage and secure with bolts, washers and nuts.

(a) A bushing is required in bolt holes of upper support block.

(b) A plate is required on top of upper block, between upper and lower blocks and under block mounting bracket.

(4) Align bolt holes in center area of torque tube assembly. Install bolts, washers and nuts and tighten.



1. L. OUTER TUBE
2. L. CENTER TUBE
3. R. CENTER TUBE
4. R. OUTER TUBE
5. PLATE
6. BOLT & NUT
7. UPPER SUPPORT BLOCK
8. LOWER SUPPORT BLOCK
9. SPACER WASHER
10. IDLER ARM
11. BRAKE CYLINDER ROD
12. BRAKE CYLINDER
13. CLEVIS PIN & COTTER PIN
14. RUDDER CONTROL TUBE
15. CLEVIS ROD
16. CLEVIS PIN & COTTER PIN
17. CLEVIS END
18. TOE BRAKE PEDAL
19. RUDDER CONTROL CABLE
20. BOLT, WASHER, NUT & COTTER PIN
21. NOSE WHEEL STEERING BUNGEE
22. JAM NUT
23. BUNGEE ROD END
24. BOLT & NUT
25. BOLT, WASHER & NUT
26. BOLT, WASHER & NUT
27. BOLT, WASHER & NUT
28. BRACKET
29. VEE BRACE
30. CLEVIS PIN & COTTER PIN
31. L. OUTER RUDDER PEDAL
32. L. INNER RUDDER PEDAL
33. R. INNER RUDDER PEDAL
34. R. OUTER RUDDER PEDAL
35. TUBE SUPPORT BRACKET

Rudder and Steering Pedal Assembly
Figure 7

(5) Position torque tube support bracket on floor tunnel and secure with bolts.

(6) Position vee braces on torque tube. Install strap bracket around torque tube and brace. Secure with bolts, washers and nuts.

(7) Connect ends of brake cylinder rods and clevis rods to idler arms. Secure with clevis and cotter pins.

(8) Connect steering rods to rudder pedals and secure with bolts and nuts. Check steering rod adjustment per Nose Landing Gear, Alignment, 32-20-00.

(9) Connect rudder trim to arm of torque tube and secure with bolt, washer, nut and cotter pin. Installed a thin washer under nut. Tighten nut only finger tight.

(10) Connect ends of rudder control cables to arms provided on torque tube. Secure with bolts, washers, nuts and cotter pins. Ends must be free to rotate.

(11) Swing tee bar into place. Insert attachment bolts through each side of the floor tunnel. Secure with washers and nuts.

(12) Connect stabilator control cables to lower end of tee bar with bolt, washer and nut. Secure with cotter pin. Cable ends must be free to rotate.

(13) Set rudder cable tension and check rigging and adjustment per Rudder Cables, Rigging and Adjustment, above.

(14) Set stabilator cable tension. Check rigging and adjustment per Stabilator Cables, Rigging and Adjustment, 27-30-00.

(15) Check aileron cable tension.

(16) Check safety of bolt and turnbuckles.

(17) Install floor tunnel plate and secure with screws. Fasten tunnel carpet in place.

(18) Install fuel selector lever on selector torque tube. Secure with clevis pin and safety with cotter pin.

(19) Install fuel selector covers and rudder trim control knob.

(20) Install access panel to aft section of the fuselage.

THIS PAGE INTENTIONALLY BLANK

GRIDS 2J22 THRU 2J24
INTENTIONALLY BLANK

STABILATOR AND TAB

1. Troubleshooting

   See Chart 1.

2. Stabilator Control Cables (Refer to Figure 1.)

   A. Removal

      (1) Forward Stabilator Control Cables:

         (a) Remove access panel to aft section of the fuselage.
         (b) Disconnect desired control cable at turnbuckle in aft section of fuselage.
         (c) Remove floor tunnel cover in aft area of cabin by:
            1 Removing trim plate.
            2 Removing carpet over tunnel.
            3 Removing cover attachment screws.
         (d) Remove cable guard plate from underside of pulley cluster in aft area of tunnel opening by removing guard attachment screws.
         (e) Remove floor panel located directly aft of main spar by removing center seats, seat belt attachments and screws securing the panel. Lift panel and remove from airplane.
         (f) Remove cable rub blocks attached to the spar housing, located in floor opening, by removing block attachment screws.
         (g) Remove cotter pin cable guard at pulley cluster in aft area of floor opening.
         (h) Remove fuel selector panel cover by removing rudder trim knob and cover attachment screws.
         (i) Remove lower fuel selector cover. Disconnect fuel selector control lever from selector torque tube by removing attachment pin located at bottom of lever.
         (j) Remove tunnel plate just aft of tee bar by removing enough carpet from tunnel to allow plate attachment screws and plate to be removed.
         (k) To remove right (upper) stabilator control cable:
            1 Remove cotter pin cable guards at pulley located in forward area of the tunnel.
            2 Disconnect cables from lower end of tee bar by removing cotter pin, nut, washer and bolt.
            3 Draw cable aft through the floor tunnel.

      (2) Aft Stabilator Control Cable - either side:

         (a) Remove access panel to aft section of the fuselage.
         (b) Disconnect desired control cable at turnbuckle in aft section of fuselage.
         (c) Disconnect cable end at stabilator balance arm by removing the cotter pin, nut, washer and bolt.
         (d) Remove cable guard pin at the pulley.
         (e) Remove cable from airplane.

CHART 1 (Sheet 1 of 2)
TROUBLESHOOTING STABILATOR CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between control wheel and stabilator.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Cables not in place on pulleys.	Install cables correctly.
Resistance to stabilator control movement.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Binding control column.	Adjust and lubricate.
	Pulleys binding or rubbing.	Replace binding pulleys and/or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly.
	Cables crossed or routed incorrectly.	Check routing of control cables.
	Bent stabilator hinge.	Repair or replace stabilator
Incorrect stabilator travel.	Stabilator stops incorrectly adjusted.	Adjust stop screws.
Correct stabilator travel cannot be obtained by adjusting stops.	Stabilator cables incorrectly rigged.	Check rigging of stabilator cables.
Lost motion between trim control wheel and trim tab.	Cable tension too low.	Adjust cable tension.
	Cables not in place on pulleys.	Install cables properly.
	Broken pulley.	Replace pulley.
	Linkage loose or worn.	Check linkage and tighten or replace.

CHART 1 (Sheet 2 of 2)
TROUBLESHOOTING STABILATOR CONTROL SYSTEM

Trouble	Cause	Remedy
Trim control wheel moves with excessive resistance.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Pulleys binding or rubbing.	Replace binding pulleys. Provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables properly.
	Trim tab hinge binding.	Lubricate hinge. If necessary, replace.
	Cables crossed or routed incorrectly.	Check routing of control cables.
Trim tab fails to reach full travel.	System incorrectly rigged.	Check and/ or adjust rigging.
	Trim drum incorrectly wrapped.	Check and/ or adjust rigging.
Trim indicator fails to indicate correct trim position.	Trim indicator unit not adjusted properly.	Adjust trim indicator.

B. Installation

(1) Aft Stabilator Control Cable - either side:

(a) Route left (lower) cable under pulley located beneath balance arm. Route right (upper) cable over pulley located above balance arm.

(b) Connect cable to the stabilator balance arm. Insert bolt and washer. Install nut and finger tighten as much as possible. Install cotter pin.

(c) Connect cable to forward cable at turnbuckle in aft section of fuselage. Upper aft cable connects to right forward cable and lower cable to left forward cable.

(d) Install cable guard pin at pulley.

(e) Set cable tension. Check rigging and adjustment per Rigging and Adjustment, below.

(f) Install access panels to aft section of the fuselage.

(2) Forward Stabilator Control Cables:

NOTE: Aft control cable(s) must be installed before installing forward cable(s). See above.

(a) Draw control cable through floor tunnel. Be sure right (upper) cable is routed around the pulley that is in the forward area of the forward floor tunnel.

(b) Connect cables to lower end of control column tee bar with bolt, washer, nut and cotter pin. Ensure that cable is free to rotate.

(c) Connect control cable to aft cable at turn buckle in aft section of fuselage.

(d) If installing right cable, install cotter pin cable guard at pulley in forward area of tunnel.

(e) Install the cable rub blocks to the spar housing located in forward area of floor opening aft of main spar. Secure with screws.

(f) Install cotter pin cable guard at pulley cluster located in aft area of floor opening.

(g) Install cable guard under pulley cluster located in aft area of aft floor tunnel. Secure with screws.

(h) Set cable tension. Check rigging and adjustment per Rigging and Adjustment, below.

(i) Install tunnel plate directly aft of tee bar assembly. Secure with screws.

(j) Put floor carpet in place and secure.

(k) Place fuel selector lever on selector torque tube. Secure with pin and safety with cotter pin.

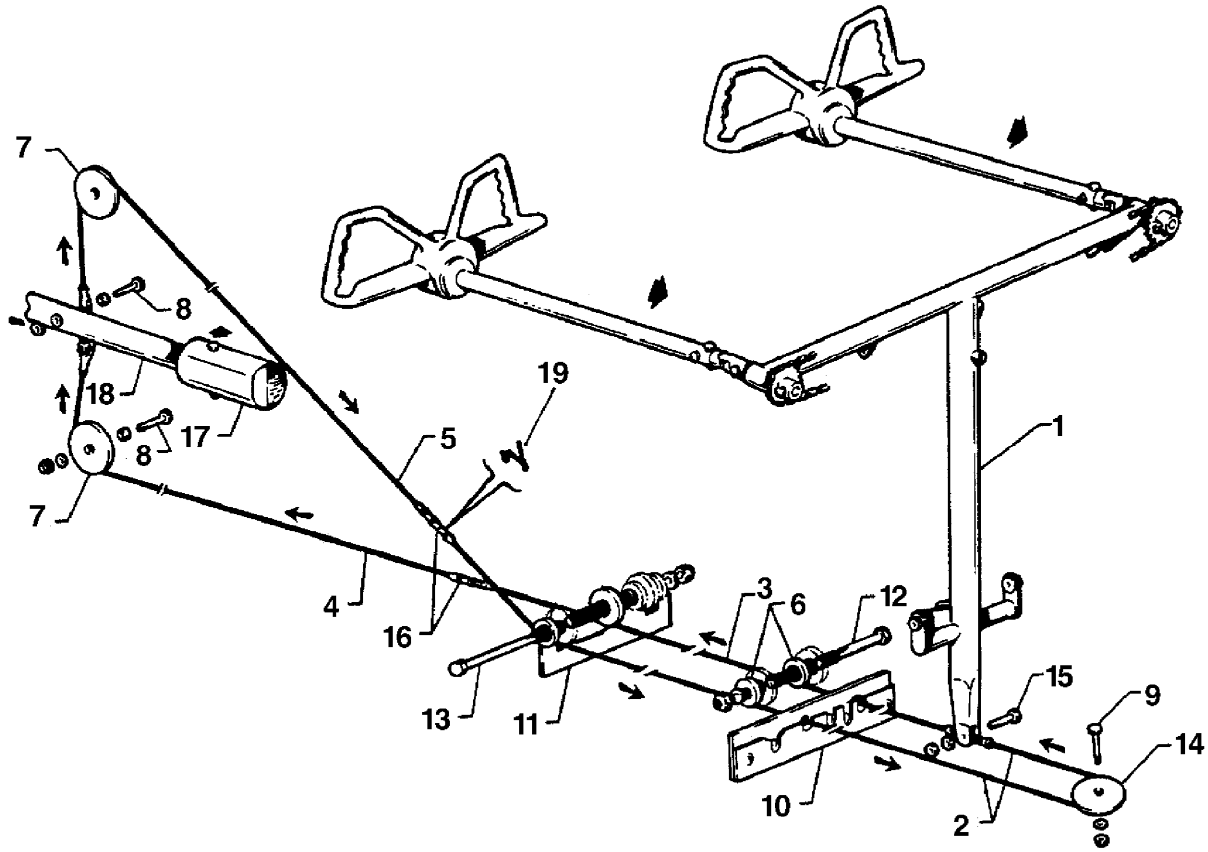
(l) Install lower and upper selector covers. Secure with screws.

(m) Install floor panel aft of main spar. Secure with screws.

(n) Install the seat belt attachments and seats.

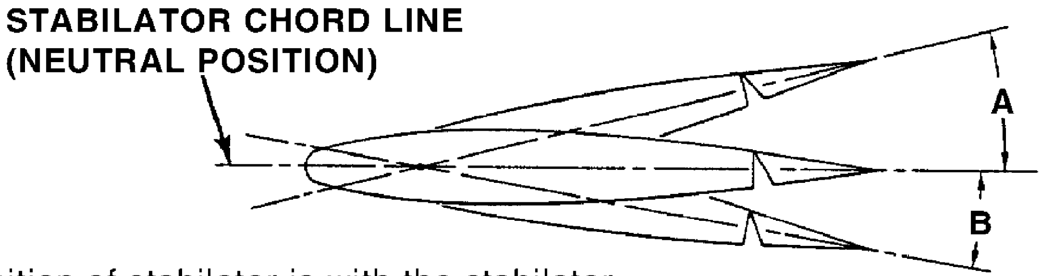
(o) Install cover and carpet of aft floor tunnel.

(p) Install access panels to aft section of the fuselage.



1. CONTROL COLUMN TEE BAR
2. RIGHT FORWARD CABLE
3. LEFT FORWARD CABLE
4. LEFT, LOWER AFT CABLE
5. RIGHT, UPPER AFT CABLE
6. FORWARD CLUSTER PULLEY
7. AFT PULLEY
8. BOLT, WASHER, NUT & COTTER PIN
9. BOLT, WASHER & NUT
10. CABLE RUB BLOCK
11. CABLE GUARD
12. BOLT, WASHER (7) & NUT
13. BOLT, WASHER (11) & NUT
14. FORWARD PULLEY
15. BOLT, WASHER, NUT & COTTER PIN
16. TURNBUCKLE
17. BALANCE ARM WEIGHT
18. STABILATOR BALANCE ARM
19. LOCKING CLIP

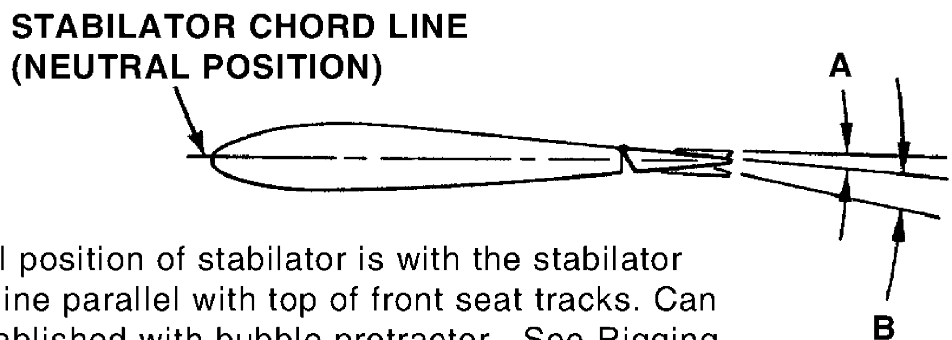
Stabilator Controls
Figure 1



Neutral position of stabilator is with the stabilator chord line parallel with top of front seat tracks. Can be established with bubble protractor. See Rigging and Adjustment of Stabilator Controls in text.

Stabilator

A - STABILATOR TRAILING EDGE UP TRAVEL FROM NEUTRAL = 14.5° ± 0.5°
B - STABILATOR TRAILING EDGE DOWN TRAVEL FROM NEUTRAL = 5.5° ± 0.5°
C - CABLE TENSION = 40 LBS. ± 5 LBS



1. Neutral position of stabilator is with the stabilator chord line parallel with top of front seat tracks. Can be established with bubble protractor. See Rigging and Adjustment of Stabilator Controls in text.
2. Maximum free play for control surface tab is 0.06 of an inch measured at tab trailing edge.

Stabilator Trim Tab

A - STABILATOR TAB TRAILING EDGE UP TRAVEL FROM NEUTRAL = 5° ± 1°
B - STABILATOR TAB TRAILING EDGE DOWN TRAVEL FROM NEUTRAL = 8° ± 1°
C - CABLE TENSION 14 LBS. ± 1 LB.

Stabilator and Tab Rigging Limits
Figure 2

C. Rigging and Adjustment

CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF STABILATOR. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF STABILATOR RIGGING AND ADJUSTMENT, VERIFY THAT THE REAR EDGE OF THE STABILATOR MOVES UP WHEN THE WHEEL IS PULLED BACK; AND, THAT THE REAR EDGE OF THE STABILATOR MOVES DOWN WHEN THE WHEEL IS PUSHED FORWARD.

(1) Stabilator Travel:

(a) Level airplane. (See 8-20-00.)

(b) Place stabilator in neutral position. Neutral position is obtained when a level, placed on stabilator rigging tool (Figure 3), indicates that stabilator is parallel (bubble centered) with leveling holes shown in 8-20-00, Figure 1. (See 95-00-00, Figure 7, for tool fabrication.)

(c) To check the stabilator travel:

NOTE: The stabilator should contact both of its stops before the control wheel contacts its stops.

1 Place rigging tool on the upper surface of stabilator.

2 Set number of degree up travel, specified in Figure 2, on a bubble protractor.

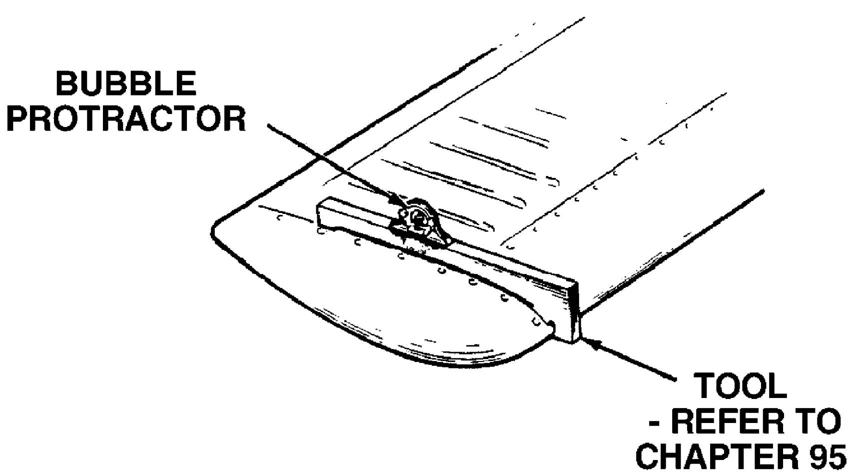
3 Place protractor on rigging tool.

4 Raise trailing edge of stabilator. Check that, when stabilator contacts its stops, protractor bubble is centered.

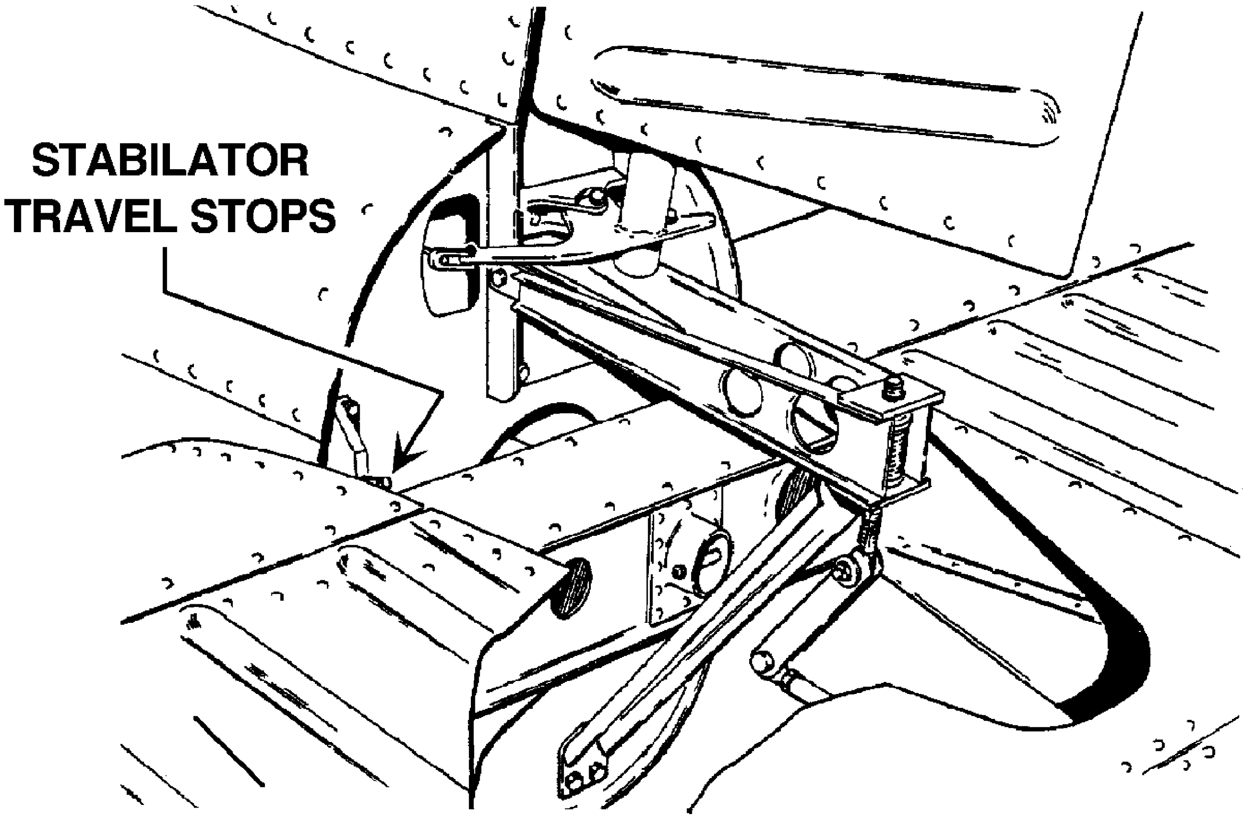
5 Set the number of degrees down travel specified in Figure 2 on a bubble protractor.

6 Place protractor on the rigging tool.

7 Lower trailing edge of stabilator. Check that, when stabilator contacts its stops, protractor bubble is centered.



Stabilator Rigging
Figure 3



Stabilator Travel Adjustments
Figure 4

(d) If stabilator travel is not correct in either the up or down position:

1 Remove tail cone by removing the attachment screws.

2 With use of rigging tool and bubble protractor, turn stops located at each stabilator hinge in or out to obtain correct degree of travel. (Refer to Figure 4.)

3 Check that locknuts of stop screws are secure.

4 Install the tail cone.

(2) Stabilator Control Cable Tension:

(a) Check that stabilator travel is correct.

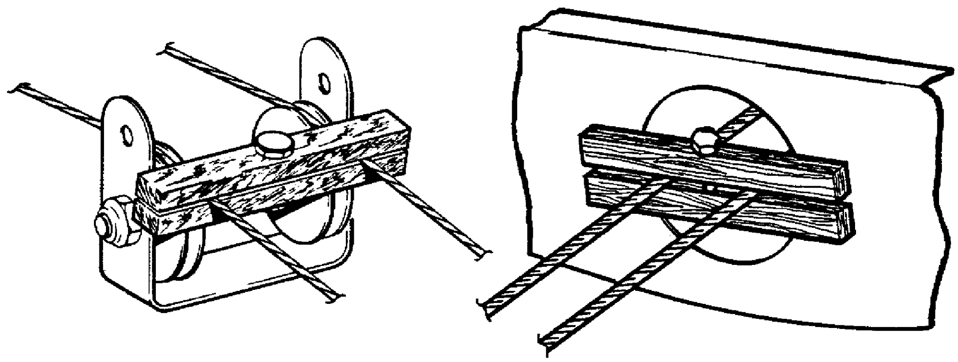
(b) Remove access panel to aft section of fuselage and tail cone.

(c) Position control wheel by adjusting the turnbuckles on the stabilator control cables to obtain 7/8 ± 1/8 inch of control shaft travel between contact with the primary up stop on the stabilator and secondary stop on the left hand control column shaft.

(d) Position and secure tee bar (control column) 1/2 inch ± 1/4 inch off forward tee bar stop.

(e) Check each stabilator control cable for correct tension as given in Figure 2.

(f) If tension is not correct, loosen turnbuckle of lower cable in aft section of fuselage and adjust turnbuckle of upper cable to obtain correct tension. Cable tension should be obtained with control wheel one-quarter inch from stop and stabilator contacting its stop.



Methods of Securing Trim Cables
Figure 5

(g) With the tension of upper cable correct and control wheel still forward, adjust the turnbuckle of lower cable to obtain correct tension.

(h) Recheck control wheel position for 7/8 ± 1/8 inch of control shaft travel between contact with the primary up stop on the stabilator and secondary stop on the left hand control column shaft. With the control wheel forward and stabilator on primary down stop, check for 1/4 inch minimum clearance between tee bar and secondary forward stop.

(i) Check safety of all turnbuckles and bolts.

(j) Install access panels and tail cone.

3. Stabilator Trim Controls (Refer to Figure 6.)

A. Forward Stabilator Trim Assembly

(1) Removal:

(a) Remove panel to the aft section of airplane.

(b) Remove trim control wheel assembly and/or trim control cables.

(c) If aft trim cable is not to be removed, block cables at pulleys in aft section of fuselage to prevent them from unwrapping from trim drum. (Refer to Figure 5.)

(d) To remove trim control wheel, loosen cables at trim cables turnbuckles in aft section of fuselage.

(e) To remove trim cables, disconnect cables at trim cables turnbuckles in aft section of fuselage.

(f) Control wheel with drum:

1 Remove control wheel cover by removing cover attaching screws.

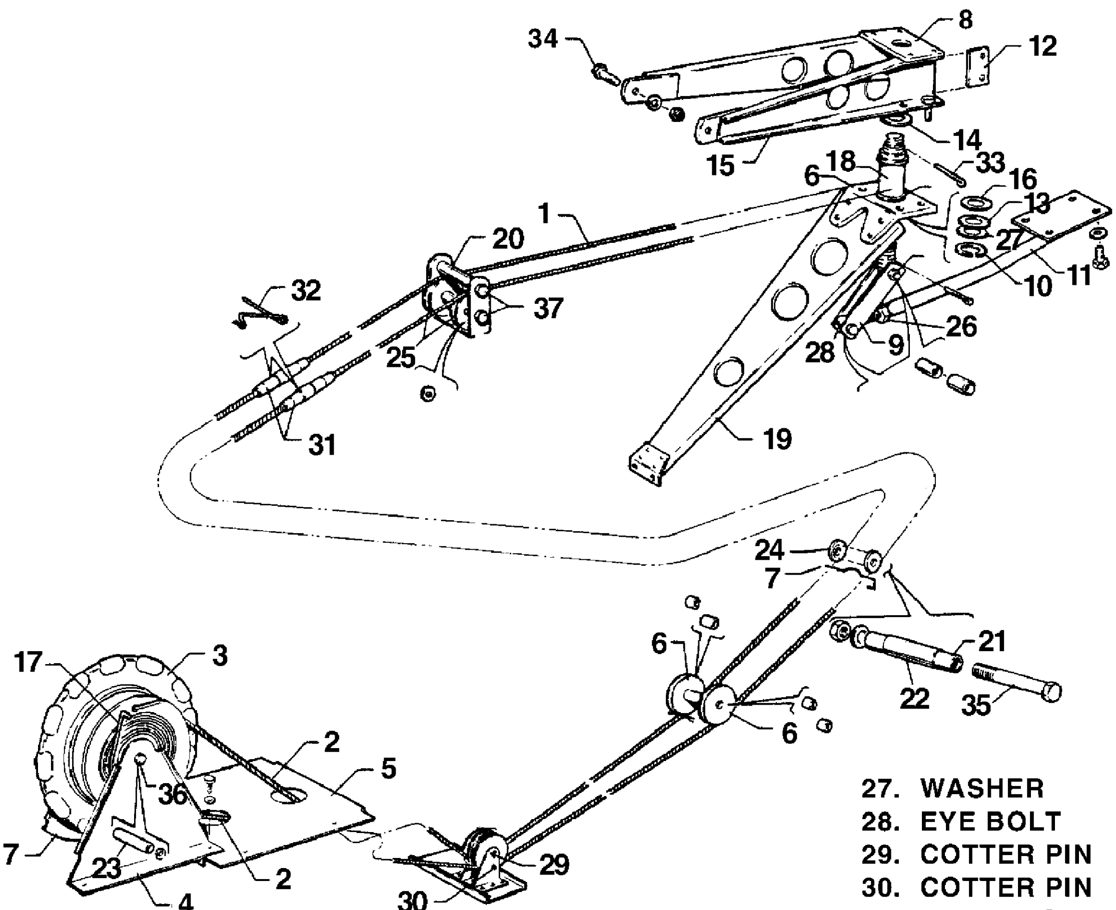
2 Remove wheel assembly from its mounting brackets by removing nut, washer and bolt that secures wheel between the brackets. Draw wheel from brackets. Use caution not to damage trim indicator wire.

3 Unwrap left cable from drum.

4 Wheel and drum are joined by a push fit. Separate these two items with their center bushing. Unwrap right cable.

5 Tie cables forward to prevent them from slipping back into floor tunnel.

1. AFT CABLE
2. FWD CABLE
3. TRIM TAB WHEEL ASSEMBLY
4. BRACKET ASSEMBLY
5. TRIM WHEEL PLATE ASSEMBLY
6. TRIM TAB PULLEY
7. CABLE GUARD
8. STABILATOR TRIM PLATE
9. STABILATOR TRIM LINK
10. SNAP RING
11. STABILATOR TRIM ARM ASSEMBLY
12. CABLE GUARD
13. THRUST BEARING
14. BEARING
15. STABILATOR TRIM RIB
16. STABILATOR TRIM SHIM
17. STABILATOR TRIM INDICATOR
18. STABILATOR TRIM BARREL
19. STABILATOR TRIM RIB
20. PULLEY BUSHING



21. INNER BUSHING
22. OUTER BUSHING
23. BUSHING
24. PULLEY
25. PULLEY
26. NUT
27. WASHER
28. EYE BOLT
29. COTTER PIN
30. COTTER PIN
31. TURNBUCKLE BARREL
32. TURNBUCKLE CLIP
33. COTTER PIN
34. BOLT, WASHER, NUT
35. BOLT, WASHER, NUT
36. BOLT, WASHER, NUT
37. BOLT, WASHER, NUT

Stabilator Trim Controls
Figure 6

(g) Trim control cables:

1 Remove pilot and rear seats.

2 Remove seat belts attached to forward floor tunnel by removing attachment nuts, washers and bolts.

3 Remove heater deflectors from each side of aft end of forward floor tunnel by sliding deflector sideways and releasing retainer spring.

4 Unfasten carpet from aft portion of forward floor tunnel and lay it forward.

5 Remove tunnel cover located between trim control wheel and spar cover by removing selector knobs and cover attachment screws.

6 Remove cable pulleys located in forward tunnel by removing cotter pin, washer and clevis pin.

7 Remove floor panel aft of main spar by removing panel attachment screws and seat belt attachments. Lift panel and remove from airplane.

8 Remove cable rub blocks located in floor opening on aft side of main spar by removing block attachment screws.

9 Remove trim plate located on top of forward end of aft floor tunnel.

10 Remove carpet from aft floor tunnel.

11 Remove cover plate from top of aft floor tunnel by removing attachment screws.

12 Remove cable guard from underside of trim cable pulleys located in forward area of aft floor tunnel by removing tinnerman nut and withdrawing the cable guard.

13 Remove cable guard plate from underside of pulley cluster located in aft area of floor tunnel by removing plate attachment screws.

14 Remove cable guard from cable pulleys in aft lower section of fuselage forward of cable turnbuckles.

15 With cables disconnected from trim control wheel, draw cable(s) through floor tunnel.

(2) Installation

(a) Trim Control Wheel with Drum:

1 Wrap right trim cable on trim drum by inserting swaged ball of cable in slot provided in right side of drum that mates with the control wheel. Looking at this side, wrap drum with three wraps of cable in a clockwise direction.

2 Attach trim control wheel to cable drum by aligning long lug of drum with long slot of wheel and pushing the two pieces together.

3 Wrap left trim cable on drum by inserting swaged ball of cable in slot provided in the flanged left side of drum. Looking at this side, wrap drum with three wraps of cable in a clockwise direction.

4 Lubricate and install bushing in control wheel and drum.

5 Align control cables and position trim control wheel assembly between its mounting brackets. Check that end of trim indicator wire is positioned in spiraled slot of drum with no bind on end. Install retainer bolt from left side. Install washer and nut.

6 Install cover over trim control wheel. Secure with screws, unless the control cables have to be installed.

(b) Trim Control Cables:

1 Draw cable(s) through floor tunnel.

2 If not already installed, wrap cable drum and install trim control wheel with drum as specified above.

3 Position cable pulleys on their mounting bracket and install clevis pin, washer and cotter pin.

4 Connect forward cable to aft cable at turnbuckle in aft section of fuselage. If aft cable has not been installed, refer to Aft Stabilator Trim Controls, Installation, below.

5 Install cable guard at cable pulleys in aft lower section of fuselage forward of cable turnbuckles.

6 Install cable guard plate at underside of pulley cluster located in aft area of aft floor tunnel. Secure with screws.

7 Install pin type cable guard at underside of pulleys located in forward area of aft floor tunnel. Secure with a tinnerman nut.

8 Install cable rub blocks located on aft side of main spar housing. Secure with screws.

9 Remove blocks that secure aft trim cable. Check that cables are seated on their pulleys.

10 Set cable tension. Check rigging and adjustment. Check safety of all turnbuckles.

11 Install tunnel cover on forward tunnel. Secure with screws.

12 Install carpet over floor tunnel.

13 Install heat deflectors on each side of floor tunnel.

14 Install cover over trim control wheel and secure with screws and special washers.

15 Install fuel selector knobs and secure with set screws.

16 Install seat belts removed from top of floor tunnel. Secure with bolt, washer and nut.

17 Install floor panel and seat belt attachments aft of main spar. Secure panel with screws.

18 Install aft floor tunnel and secure with screws.

19 Install carpet over aft floor tunnel.

20 Install trim plate on top of forward end of aft floor tunnel.

21 Install panel to aft section of airplane.

22 Install seats.

B. Aft Stabilator Trim Assembly

(1) Removal

(a) Remove access panel to aft section of the fuselage.

(b) Block trim cables at the first set of pulleys forward of cable turnbuckles in the aft section of the fuselage by method shown in Figure 5.

(c) Disconnect cable at the turnbuckles in aft section of fuselage.

(d) Remove cable guard from pulley cluster.

(e) Remove tail cone by removing attachment screws.

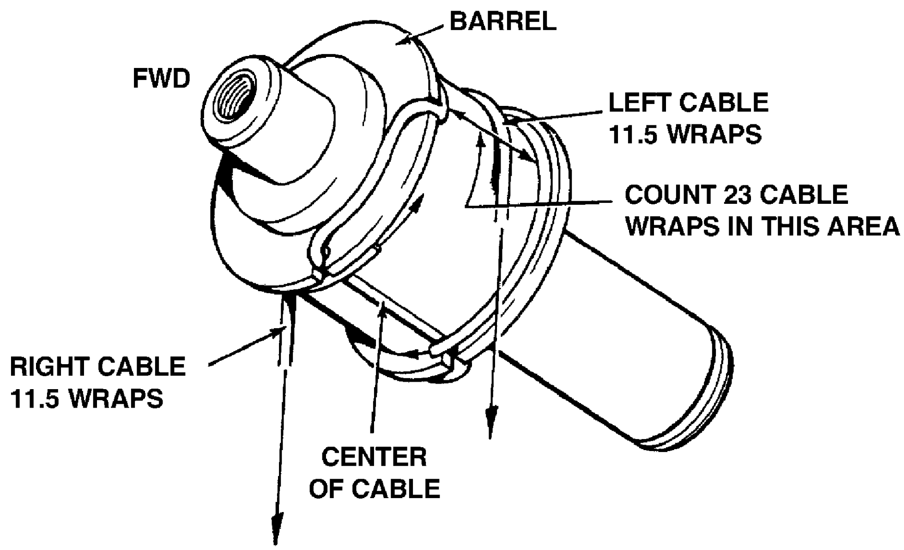
(f) Disconnect link between trim screw and trim control arm by removing nut, washer and bolt connecting link to screw.

(g) Remove cotter pin from top of trim screw. Turn screw down and out of barrel.

(h) Remove snap ring, washer and thrust washer from the bottom of barrel.

(i) Disconnect diagonal rib from the horizontal rib that supports trim assembly by removing four attachment nuts, washers and bolts.

(j) Draw trim cable from fuselage.



Wrapping Trim Barrels
Figure 7

(2) Installation

(a) Wrap the trim barrel by: (Refer to Figure 7.)

1 Laying center (as measured equally from each end to center of the cable) of trim cable in slot of the barrel.

2 Bring half of cable to be used on right side through the diagonal slot in flange at forward end of barrel and wrap aft in a clockwise direction 11.5 wraps to the center of barrel.

3 Bring half of cable to be used on left side through diagonal slot in aft end of barrel and wrap forward in a counterclockwise direction 11.5 wraps to the center of barrel.

4 Count a total of 23 cable wraps on top side of the barrel. (Refer to Figure 7.)

(b) Block cable by clamping between two pieces of wood laid next to wraps to prevent unwrapping. Fabricate block with a notch so hardware can be installed After installation of hardware safety wire the bolts.

(c) Ensure barrel bushings are installed in rib plate and clip.

(d) Lubricate bushings and install trim barrel in bushings between the two support ribs.

(e) Attach bottom diagonal rib to horizontal rib. Secure with bolt, washer and nut.

(f) Install thrust washer, washer and snap ring on lower end of barrel.

(g) Install trim screw in barrel. Secure both ends with a cotter pin through trim screw.

(h) Route cables into fuselage. Attach ends to forward trim cables.

(i) Remove blocks holding forward cables tight.

(j) Set cable tension. Check rigging and adjustment per Rigging and Adjustment, below. Check safety of all turnbuckles.

(k) Install tail cone and secure with screws.

(l) Install aft fuselage access panel.

C. Rigging and Adjustment

CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF STABILATOR TAB. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF STABILATOR TRIM RIGGING AND ADJUSTMENT, VERIFY THAT THE STABILATOR TAB MOVES UP WHEN THE TRIM WHEEL IS TRIMMED DOWN; AND, THAT THE STABILATOR TAB MOVES DOWN WHEN THE TRIM WHEEL IS TRIMMED UP.

(1) Level the airplane. (See 8-20-00.)

(2) Position control wheel by adjusting the turnbuckles on the stabilator control cables to obtain 7/8 ± 1/8 inch of control shaft travel between contact with the primary up stop on the stabilator and secondary stop on the left hand control column shaft.

(3) Position and secure tee bar (control column) 1/2 inch ± 1/4 inch off forward tee bar stop.

(4) Check for proper stabilator trim cable tension as given in Figure 2. If cables were disconnected, rotate trim control wheel several times to allow cables to seat and recheck tension.

(5) Recheck control wheel position for 7/8 ± 1/8 inch of control shaft travel between contact with the primary up stop on the stabilator and secondary stop on the left hand control column shaft. With the control wheel forward and stabilator on primary down stop, check for 1/4 inch minimum clearance between tee bar and secondary forward stop.

(6) Secure stabilator in neutral position. Refer to Figures 2 and 3.

(7) Turn trim control wheel until aft end of turn buckle of right trim cable is approximately two inches forward of double pulleys at top of rear bulkhead.

(8) Check that trim screw is turned down until cotter pin stop in top of screw is contacting plate on horizontal support rib of trim assembly.

   (a) If stop is not contacting plate, and links between the screw and trim control arm are not disconnected, disconnect the two by removing nut, washers and bolt.

   (b) With turnbuckle still two inches from pulley, turn screw down until pin contacts plate.

(9) Check rod end on tab actuating arm for approximately six threads forward of jam nut.

(10) Connect links to trim screw and secure with bolt, washers and nut.

(11) Turn the trim wheel until trim tab streamlines with neutral stabilator.

(12) Check bubble of protractor over neutral tab; then check tab travels specified in Figure 2. Degree of travel on protractor is determined by taking difference between protractor reading at neutral and up position, and neutral and down. With airplane level, bubble must be centered at each reading. To obtain correct travel:

   (a) Disconnect links at actuating arm rod end.

   (b) Turn rod end in or out, as required.

   (c) Connect links to actuating arm rod end.

   (d) Secure jam nut on actuating arm rod link

(13) Turn trim wheel full travel. Check for turnbuckle clearance and location of tab indicator.

(14) With the stabilator and trim in all extremes of travel, check to insure that there is no interference between turnbuckles and pulleys.

(15) Check to insure that stabilator up and down stops are contacted before the tee bar stops are contacted.

(16) With the stabilator held securely against either stop, determine the free play of the stabilator tab. Total free play, measured at the tab trailing edge, shall not exceed 0.06 inches.

4. Stall Warning System

A. Description and Operation

This system consists of two lift detectors located on the leading edge of the left wing, at wing station 174.00, that are electrically connected to the flap position switch and stall warning horn. As a stall condition is approached, the lift detector will activate the stall warning horn.

B. Functional Tests

(1) Ground

The following ground check will determine if the lift detectors are correctly connected and functioning properly. It also verifies the correct adjustment of the flap position switch. This ground check does not test the proper adjustment of the lift detectors.

(a) Apply electrical power to the airplane.

(b) Extend flaps to the 10° position. The 0° and 10° flap position activates the inboard lift detector only. Gently lifting the inboard lift detector vane should activate the stall warning horn. Gently lifting the outboard lift detector vane should not activate the stall warning horn.

(c) Position the flap to 25° or 40°. Gently lifting on the outboard lift detector vane should activate the stall warning horn. Lifting on the inboard lift detector vane should not activate the stall warning horn.

NOTE: In steps (b) and (c), above, if the stall warning horn sounds when it should not, or does not sound when it should, the fault may be the flap position switch being out of adjustment. See Wing Flap Controls, Rigging and Adjustment, 27-50-00.

(d) Remove electrical power from the airplane.

(2) Flight

WARNING: ALL FLIGHT TESTS SHALL BE CONDUCTED BY A QUALIFIED PILOT EXPERIENCED IN THIS PARTICULAR MAKE AND MODEL OF AIRPLANE.

The only way to test the accuracy of the lift detector setting/adjustment is in-flight. Several test flights and alternate adjustments (see Lift Detectors, Adjustment, below) may be required before the desired setting is obtained.

(a) Inboard lift detector:

1 Place the airplane in a flaps up, power off configuration.

NOTE: When 5 to 10 knots above the airspeed at which stall warning is anticipated, limit airspeed reduction rate to approximately one (1) knot per second, to ensure unaccelerated stall conditions.

2 Fly the airplane into a stall condition.

3 Note the speed at which the stall warning comes on.

4 The stall warning should come on not less than five knots, nor more than ten knots, before the actual stall occurs.

(b) Outboard lift detector:

1 Place the airplane in a configuration of flaps down 40°, power off.

NOTE: When 5 to 10 knots above the airspeed at which stall warning is anticipated, limit airspeed reduction rate to approximately one (1) knot per second, to ensure unaccelerated stall conditions.

2 Fly the airplane into a stall condition.

3 Note the speed at which the stall warning comes on.

4 The stall warning should come on not less than five knots, nor more than ten knots, before the actual stall occurs.

C. Lift Detectors

(1) Removal

NOTE: The master (battery) switch must be off prior to performing any work on the lift detector(s). Place reference marks on holding plate and wing skin for use when installing.

(a) Remove screws holding plate around tab. The lift detector is attached to plate. Remove unit from wing.

(b) Mark electrical wires and terminals to facilitate installation. Remove electrical wires from lift detector. Remove lift detector from airplane.

(2) Installation

(a) Attach electrical leads to appropriate terminals of lift detector.

(b) Using reference marks made during removal, position lift detector and holding plate assembly on wing. Determine that sensor blade of unit drops down freely.

(c) Ensuring unit is aligned with reference marks, secure in position with screws previously removed.

(3) Adjustment

The lift detector(s) is(are) adjusted at the factory, when the airplane is test flown, and should not require any further adjustment. If some type of service on the wing requires moving the lift detector, use the following procedure to set the lift detector at the proper position.

CAUTION: NEVER ADJUST THE LIFT DETECTOR BY BENDING THE VANE.

(a) Fly the airplane as described in Functional Tests, Flight, above.

(b) Loosen the two Philips head screws; one on either side of the vane.

1 If the stall warning comes on too late, move the lift detector up.

2 If the stall warning comes on to early, move the lift detector down.

(c) Tighten the screws after making any adjustments.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

FLAPS

1. Troubleshooting

   See Chart 1.

2. Wing Flap Controls (Refer to Figure 1.)

   A. Removal

      (1) Flap Torque Tube Assembly:

         (a) Remove the access plate located between the underside of the aft section of each wing and the fuselage by removing attaching screws.

         (b) Remove the floor panel located aft of the main spar by removing the center seats. seat belt attachments and the screws securing the panel. Lift the panel and remove from airplane.

         (c) Disconnect the left and right flap control tubes (rods) at the flaps by removing the nuts. washer, and bolts or at the torque tube cranks (arms) by removing the bolts and washers from the inner side of each crank. It will be necessary to remove bolt through a hole in the side skin of the fuselage located over the torque tube with the flap handle moved to its 40 degree position.

         (d) With the flap handle, fully extend the flaps and disconnect the flap tension spring at the spar or the aft end of the control cable as desired.

         (e) Grasp the flap handle, release the plunger and allow the flap to return to the retracted position. Use caution as forward pressure will be on the handle with the tension spring disconnected.

         (f) Disconnect the flap return spring at the spar or return chain as desired.

         (g) Disconnect the control cable from the chain by removing cotter pin, nut, and clevis bolt.

         (h) Remove the tube support blocks by removing the block attachment bolts.

         (i) Remove the nuts, washers and bolts securing the right and left cranks and stop fittings on the torque tube.

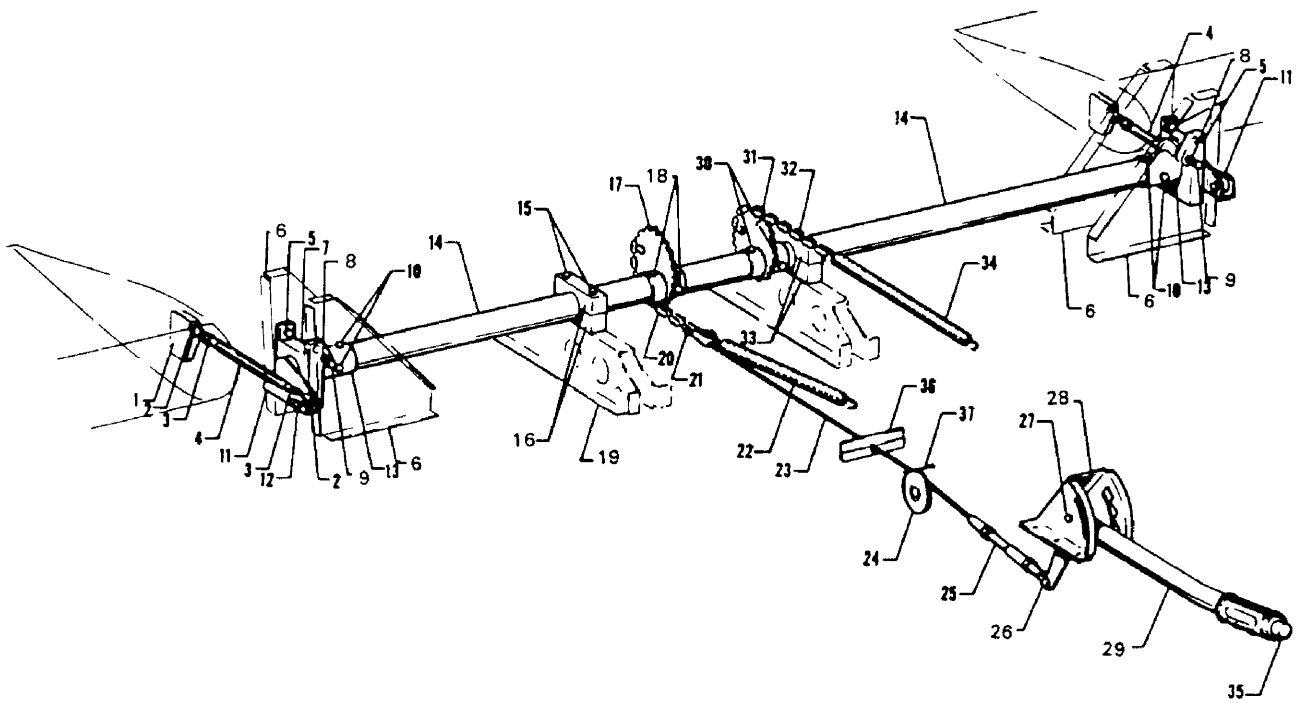
         (j) From between each wing and the fuselage, remove the cranks from the torque tube.

         (k) Disconnect one bearing block from its mounting brackets by removing nuts, washers and bolts.

         (l) Slide the tube from the bearing block still attached to its brackets, raise the end and lift it from the floor opening.

CHART 1
TROUBLESHOOTING FLAP CONTROL SYSTEM

Trouble	Cause	Remedy
Flaps fail to extend or retract.	Control cable broken or disconnected.	Replace or reconnect control cable.
Flaps not synchronized or fail to move evenly when retracted.	Incorrect rigging of system.	Adjust flaps.



1. ROD ATTACHMENT BRACKET
2. BOLT, WASHER & NUT
3. JAM NUT
4. FLAP CONTROL ROD
5. BEARING BLOCK ATTACHMENT BOLT
6. BEARING BLOCK BRACKET
7. BEARING BLOCK
8. LOCKNUT
9. FLAP STOP SCREW
10. BOLT, WASHER & NUT
11. TORQUE TUBE CRANK (ARM)
12. BOLT, WASHER & BUSHING
13. TORQUE TUBE STOP FITTING
14. TORQUE TUBE
15. BOLT, WASHER & NUT
16. BEARING BLOCK
17. TENSION SPRING SPROCKET
18. BOLT, WASHER & NUT
19. BEARING BLOCK BRACKET
20. TENSION SPRING CHAIN
21. CLEVIS BOLT, BUSHING, NUT & COTTER PIN
22. TENSION SPRING
23. FLAP CONTROL CABLE
24. PULLEY
25. TURNBUCKLE
26. CLEVIS BOLT, NUT & COTTER PIN
27. BOLT, BUSHING, WASHER & NUT
28. FLAP HANDLE BRACKET
29. FLAP HANDLE
30. BOLT, WASHER & NUT
31. RETURN SPRING SPOCKET
32. RETURN SPRING CHAIN
33. BEARING BLOCK
34. RETURN SPRING
35. FLAP RELEASE BUTTON
36. RUB BLOCK
37. SAFETY COTTER PIN

Flap Control System
Figure 1

(2) Flap Control Cable:

(a) If the center seats and floor panel have not been removed, remove the seats and the screws securing the floor panel.

(b) Disconnect the flap tension spring from the cable, if not previously disconnected, by extending the flaps to relieve spring tension.

(c) Retract the flap. Use caution as forward pressure will be on the handle with the spring disconnected.

(d) Disconnect the cable from the chain by removing cotter pin, nut, clevis pin and bushing.

(e) Remove the flap handle bracket and trim control wheel cover.

(f) Remove the aft heat deflectors on each forward floor tunnel by sliding far enough to release the spring fasteners.

(g) Lift the aft section of the tunnel carpet far enough to remove the screws securing the tunnel cover that is between the flap handle and the spar cover. Remove the cover.

(h) Remove the cotter pin cable guard from the flap cable pulley located inside the floor tunnel just ahead of the spar housing.

(i) Remove the cable rub blocks located in the floor opening on the aft side of the spar housing by removing the attachment screws.

(j) Disconnect the cable turnbuckle at the flap handle by removing cotter pin, nut and bolt.

(3) Flap Handle and Bracket:

Disconnect the cable turnbuckle from the handle and remove the bolts securing the bracket to the floor tunnel.

B. Installation

(1) Flap Torque Tube Assembly:

(a) Install the chain sprockets with chains on the torque tube and secure with bolts, washers and nuts.

(b) Slide the tube stop fittings on their respective ends of the torque tube.

(c) Ascertain that one bearing block fitting is installed between its attachment brackets.

(d) Slide the other bearing block over its respective end of the torque tube.

(e) Position the torque tube by placing the end with the bearing block on it between the mounting bracket and sliding the other end into the previously attached bearing block.

(f) Position the remaining bearing block and secure with bolts, washers and nuts.

(g) Push the torque tube cranks (arms) on each end of the torque tube and slide the stop fitting in place. Align the bolt hole of the crank and stop fitting with the holes in the torque tube, and install bolts. The holes in the stop fitting are elongated to allow the stop fitting to be pushed against the bearing block thus allowing no side play of the assembly. Tighten the bolt assemblies on the stop fittings.

(h) Install the tube support blocks on their support brackets and secure with bolts.

(i) Connect the flap return spring to the return chain and/or at the spar housing.

(j) Connect the control cable end to the tension chain and secure with bushing, clevis bolt, nut and cotter pin.

(k) Pull the flap handle full back and connect the tension spring. Release the flap handle to the forward position.

(l) Connect the flap control tube to the flap and/or torque tube crank and secure. The bolt and bushing that connects the control tube to the crank is installed through a hole in the side of the fuselage located over the torque tube.

(2) Flap Handle and Bracket:

Place the assembly on the floor tunnel and secure with bolts.

(3) Flap Control Cable:

(a) Attach the cable and turnbuckle to the flap handle arm and secure with a new clevis bolt, nut and cotter pin. Ascertain that the turnbuckle end is free to rotate on the arm.

(b) Route the cable through the tunnel and spar housing.

(c) Install the cable rub blocks on the aft side of the spar housing and secure with screws.

(d) Install cotter pin cable guard over pulley located just ahead of the spar housing in the forward floor tunnel.

(e) Attach the cable end to the tension chain and secure with bushing, clevis bolt, nut and cotter pin. If the chain is not installed because of the torque tube assembly being removed, install the assembly as given above.

(f) Pull the flap handle full back and connect the tension spring to the cable end.

(4) Install the tunnel cover and secure with screws. Also the tunnel carpet, heat deflectors, and bracket cover.

(5) Install the floor panel and seat belt attachments. Secure with screws and install seats.

C. Rigging and Adjustment

CAUTION: VERIFY FREE AND CORRECT MOVEMENT OF FLAPS. WHILE IT WOULD SEEM SELF-EVIDENT, FIELD EXPERIENCE HAS SHOWN THAT THIS CHECK IS FREQUENTLY MISINTERPRETED OR NOT PERFORMED AT ALL. ACCORDINGLY, UPON COMPLETION OF FLAP RIGGING AND ADJUSTMENT, VERIFY THAT THE FLAPS MOVE UP WHEN THE FLAP HANDLE IS DOWN; AND, THAT THE FLAPS MOVE DOWN WHEN THE FLAP HANDLE IS UP.

(1) Place the flap handle in the full forward, flap retracted position.

(2) If not previously accomplished, remove the floor panel just aft of the main spar.

(3) Adjust the flap stop screws located below the floor panel at the outer ends of the flap torque tube. (See Figures 2 and 4.)

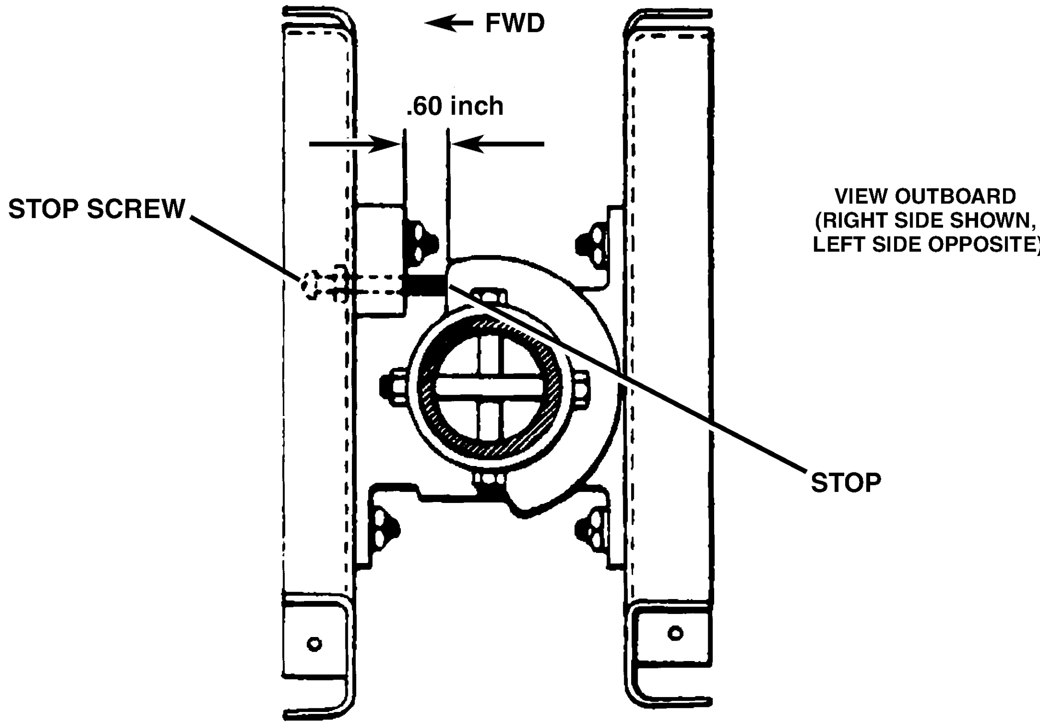
(a) Back off the left flap stop screw.

(b) Adjust the right flap stop screw to obtain approximately .60 inch between the stop fitting and the bearing block as measured along the top side of the screw. (Refer to Figure 2.)

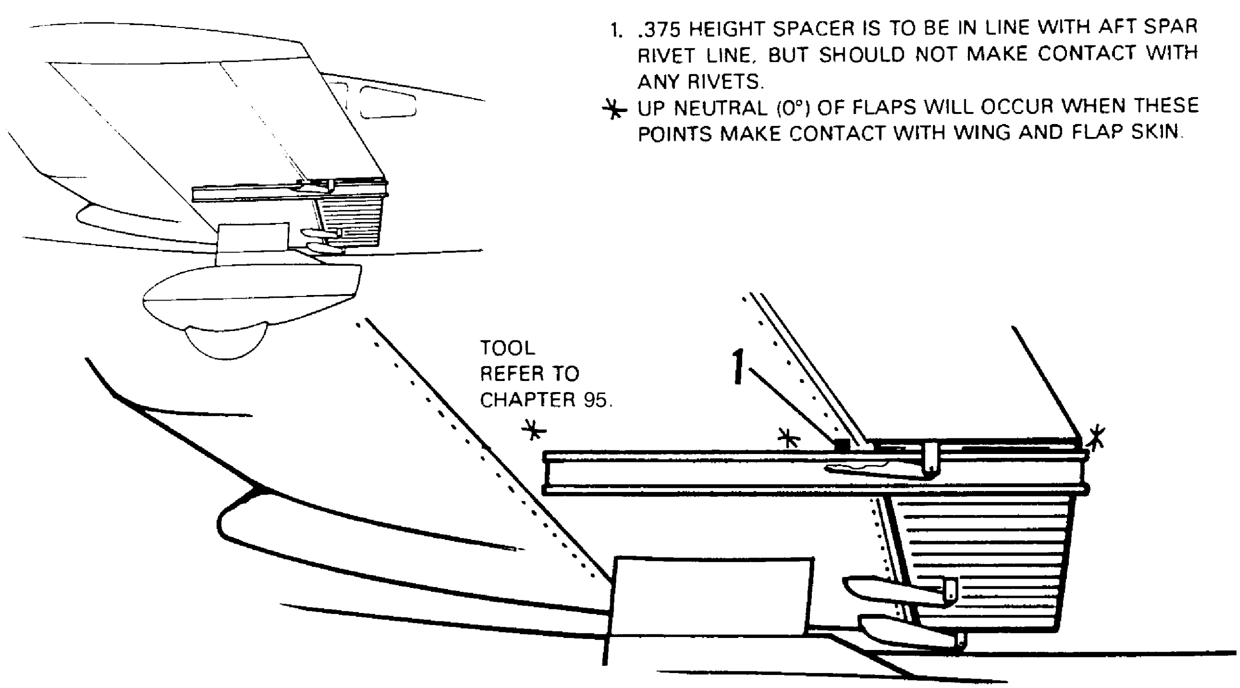
(c) With the right stop screw adjusted, locked, and against the stop, adjust the left stop screw to contact the stop and lock it.

(4) Adjust the flap control cable turnbuckle to remove all slack. Do not tighten cable to the point that the stop screw comes off the stop.

(5) Place a 0.125 inch thick spacer between the right hand stop screw and stop fitting. With flaps installed and control rods connected, determine that when down pressure is applied on top of the flap, it will not cause the flap to come down. If the flap extends (comes down under pressure), turn the stop screws out a few turns until the flap remains in the up-lock position under pressure. Adjust both left and right flap stop screws, tighten jam nuts and remove the spacer block.



Flap Stop Adjustment
Figure 2



Flap Rigging Tool
Figure 3

(6) Adjust flaps to neutral:

(a) Using the flap rigging tool shown in Figure 3. (See 95-00-00, Figure 6, for fabrication instructions.)

1 Place a flap rigging tool as shown in Figure 3 against the underside of the wing and flap as close as possible to the outboard end of the flap without contacting any rivets. The tool must be positioned parallel with the wing ribs, with the aft end of the tool even with the trailing edge of the flap.

2 With the flap control rods connected between the torque tube crank arm and flaps: check that the surface of the wing contacts the tool at its forward surface and at the spacer, and the aft end of the flap contacts the aft end of the tool. Maintain a light pressure on the underside of the flap to remove slack in the linkage while making this check.

(b) Alternatively, adjust each flap push rod so that the chord line of the flap forms a zero (0°) degree ± 1° angle with the wing chord at the outboard end of the flap. This check is made with a light pressure on the underside of the flap to remove slack in the linkage.

NOTE: In the event of wing heaviness during flight, the flap on the side of the heavy wing can be adjusted down from neutral to remedy this condition by lengthening the control rod. Check the inspection hole in each rod end to ascertain that there are sufficient threads remaining and a wire cannot be inserted through these holes. Do not raise the flap of the other wing above neutral.

(7) Measuring from the neutral position obtained from Step 6, and maintaining the light up pressure on the underside of the flap, check flap down travel, which should be 10 ± 2 degrees at first notch, 25 ± 2 degrees at second notch and 40 ± 2 degrees at third notch. Readjust the torque tube screw in or out as required. After any readjustment of the screw it will be necessary to review Steps 3 thru 6.

(8) Check complete operation of the flaps, and handle and ratchet mechanism.

(9) With flaps correctly adjusted, perform Stall Warning System, Functional Tests, Ground, 27-30-00, to verify correct adjustment of the flap position switch (see Figure 4). If flap position swtich requires adjustment:

(a) Loosen adjusting screw.

(b) Set switch to activate when flaps are set to the 25 degree position.

(c) Tighten adjusting screw.

(10) Install all access covers removed.

NOTE: The flap adjustment must be complete before starting aileron adjustment.

3. Flap Torque Tube/Pushrod Distortion Inspection

If flaps have been extended at or above V_{FE}, inspect the flap torque tube arms and pushrods for evidence of distortion.

A. If the paint is cracked or peeling anywhere along the torque tube arm or pushrod, torsional movement has occurred.

B. Remove the paint and inspect for cracks:

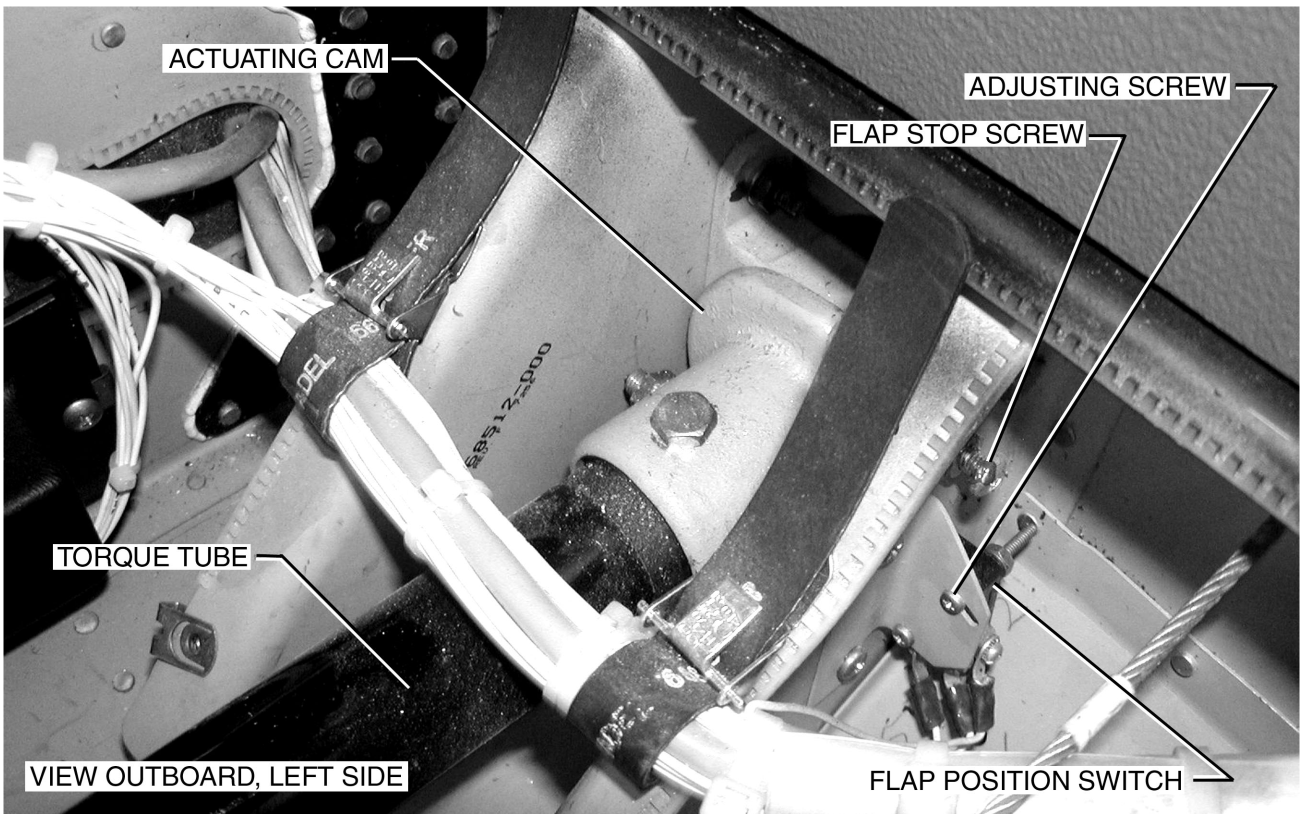
(1) In the welds at the arm on the torque tube end.

(2) In the rod ends and pushrod tube.

(3) Use a dye penetrant method of inspection.

C. If cracks are not found, repaint the part(s) and reinstall.

D. If cracked, replace the affected part(s).



Flap Position Switch
Figure 4

GRIDS 2L2 THRU 2L24
INTENTIONALLY BLANK

Courtesy of Bomar Flying Service
www.bomar.biz

AIRPLANE MAINTENANCE MANUAL

CARD 3 OF 5

PA-32-301FT

(S/N's 3232001 & UP)

PA-32-301XTC

(S/N's 3255001 & UP)

THE NEW PIPER AIRCRAFT, INC.

PART NUMBER 766-854

February 19, 2004

Published by
Technical Publications

2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

AEROFICHE REVISION STATUS

Revisions to this Maintenance Manual 766-854 issued June 1, 2003 are as follows:

Revision	Publication Date	Aerofiche Card Effectivity
ORG030601	June 1, 2003	All
PR040219 *	February 19, 2004	All

*** PARTIAL REVISION OF MAINTENANCE MANUAL 766-854**

This revision contains changes in all five aerofiche cards. Accordingly, replace the entire existing Aerofiche Card Set with this one dated 2/19/04.

NOTE: For those few customers who received Temporary Revision No. 22-1, dated January 6, 2004, when taking delivery of a new airplane at the factory or in conjunction with Piper Service Bulletin No. 1145, this February 19, 2004 revision supercedes Temporary Revision No. 22-1 in its entirety - those yellow pages should be removed and destroyed.

Consult the Customer Service Information Aerofiche (P/N 1753-755) for current revision dates for this manual.

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
Intro-List of	1	Feb 19/04			
Effective Pages	2	Jun 1/03			
Intro-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
Introduction	1	Jun 1/03			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Jun 1/03			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Feb 19/04			
	14	Jun 1/03			
Index	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

1. Instructions for Continued Airworthiness

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

The PIPER PA-32-301FT 6X and PA-32-301XTC 6XT Maintenance Manual constitutes the Instructions for Continued Airworthiness as required by Federal Aviation Regulations (FAR) Part 23, Appendix G. Chapter 4 contains the Airworthiness Limitations section (4-00-00) and the Inspection Program is in Chapter 5 (5-20-00).

2. General

This publication is prepared in accordance with the General Aviation Manufacturers Association (GAMA) Specification No. 2, with respect to the arrangement and content of the System/Chapters within the designated Chapter/Section-numbering system.

WARNING: USE ONLY GENUINE PIPER AIRCRAFT PARTS OR PIPER AIRCRAFT APPROVED PARTS OBTAINED FROM PIPER APPROVED SOURCES, IN CONNECTION WITH THE MAINTENANCE AND REPAIR OF PIPER AIRPLANES.

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

THE NEW PIPER AIRCRAFT, INC. expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-PIPER approved parts.

NOTE: THE NEW PIPER AIRCRAFT, INC. expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

In any question concerning the care of your airplane, be sure to include the airplane serial number in any correspondence.

3. Effectivity

This maintenance manual is effective for PA-32-301FT Piper 6X airplane serial numbers 3232001 and up and for PA-32-301XTC Piper 6XT airplane serial numbers 3255001 and up.

This encompasses the following model years:

NOTE: The following is provided as a general reference only.

		Model Year	Serial Numbers
A.	PA-32-301FT 6X	2003	3232001 thru 3232013
		2004	3232014 and up

		Model Year	Serial Numbers
B.	PA-32-301XTC 6XT	2003	3255001 thru 3255014
		2004	3255015 and up

4. Serial Number Explanation

Example: 32 32 001

TYPE CERTIFICATE DESIGNATION

SEQUENCE NUMBER

MODEL CODE
32 = PA-32-301FT 6X
55 = PA-32-301XTC 6XT

5. Assignment of Subject Material

This publication is divided into industry standard, three element, numeric subject groupings as follows:

A. System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. They are assigned a number, which becomes the first element of the standardized numbering system. Thus, the element “28” of the number 28-40-01 refers to the chapter “Fuel”. Everything concerning the fuel system will be covered in this chapter.

B. Sub-System/Section - The major systems/chapters of an airplane are broken down into subsystems. These sub-systems are identified by the second element of the standard numbering system. The element “40” of the number 28-40-01 concerns itself with the indicating section of the fuel system.

C. Unit/Subject - The individual units within a sub-system/section may be identified by the third element of the standard numbering system. The element “01” of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and is normally zeroed out by PIPER.

Refer to paragraph 14, Chapter/Section Index Guide, for a complete breakdown and list. The material is arranged in ascending numerical sequence.

6. Pagination

The Chapter - Section (i.e. - 28-40-00) numbering system (explained above) forms the primary page numbering system for this manual. Within each Section, pages are numbered consecutively beginning with Page 1 (i.e. - 28-40-00, Page 1). Additionally, the aerofiche grid numbering system (explained below) is also used to indicate location within the manual.

7. Aerofiche Effectivity

A. The General Aviation Manufacturers Association (GAMA) have developed specifications for microfiche reproduction of aircraft publications. The information compiled in this Aerofiche Maintenance Manual will be kept current by revisions distributed periodically. These revisions will supersede all previous revisions and will be complete Aerofiche card replacements and shall supersede Aerofiche cards of the same number in the set. The “Aerofiche Effectivity” page at the front of this manual lists the current revision for each card in this set.

B. Conversion of Aerofiche alpha/numeric grid code numbers:

First number is the Aerofiche card number.
Letter is the horizontal row reference per card
Second number is the vertical column reference per card.

Example: 2J16 = Aerofiche card number two, row J, column 16.

C. To aid in locating information, the following is provided at the beginning of each aerofiche card:

(1) A complete Introduction containing the Chapter/Section Index Guide for all fiche in this set.
(2) A complete subject Index for all fiche in this set.

8. Identifying Revised Material

A revision to a page is defined as any change to the printed matter that existed previously. Revisions, additions and deletions are identified by a vertical line (i.e. - change bar) along the left-hand margin of the page opposite only that portion of the printed matter that was changed.

A change bar in the left-hand margin opposite the footer (i.e. - chapter/section/subject, page number and date), indicates that the text was unchanged but the material was relocated to a different page.

Example.

NOTE: Change bars are not used in the title pages, list of effective pages, or index.

9. Indexing

An alphabetically arranged subject Index follows this introduction to assist the user in locating desired information. In addition, each System/Chapter begins with an individual Table of Contents.

10. List of Effective Pages

Each System/Chapter has a List of Effective Pages preceding the Table of Contents to identify the effective revision date for each page in that chapter.

11. Warnings, Cautions and Notes

These adjuncts to the text are used to highlight or emphasize important points when necessary. Warnings call attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons. Cautions call attention to methods and procedures which must be followed to avoid damage to equipment. Notes call attention to methods which make the job easier. Warnings and Cautions shall be located directly above and Notes directly beneath the text and be in line with the paragraphs to which they apply.

12. Accident/Incident Reporting

To improve our Service and Reliability system and aid in our compliance with FAR 21.3, knowledge of all incidents and/or accidents must be reported to Piper immediately. To expedite and assist in reporting all incidents and accidents, Piper Form 420-01 has been created. See Service Letter 1041 for latest revision. This procedure is to be used by all Dealers, Service Centers and Repair Facilities.

13. Supplementary Publications

The following publications/sources provide servicing, overhaul and parts information for the PA-32-301FT/301XTC airplanes and their various components. Use them to supplement this manual.

A. Piper Publications:	PA-32-301FT	PA-32-301XTC
(1) Parts Catalogs:	P/N 766-856	P/N 766-855
(2) Periodic Inspection Reports:	P/N 766-857	P/N 766-858
(3) Progressive Inspection Manuals (pending)	P/N 767-027	P/N 767-028

B. Vendor Publications:

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY.

(1) AIR CONDITIONING COMPRESSOR:

Vendor Address:
Sanden International (USA), Inc.
601 South Sanden Blvd.
Wylie, Texas 75098
http://www.sanden.com/
PH: - (972) 442-8400
FAX: - (972) 442-8700

(2) AIR CONDITIONING EVAPORATORS AND BLOWERS:

Vendor Address:
Enviro Systems, Inc.
P.O. Box 1404
Seminole, Oklahoma 74868
PH: - (405) 382-0731

(3) ALTERNATOR:

Vendor Address:
Electro Systems, Inc.
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/
PH: - (888) 461-6077

(4) AUTOPILOT:

Vendor Address:
S-TEC Corporation
One S-TEC Way
Mineral Wells, Texas 76067-9236
http://www.s-tec.com
PH: - (940) 325-9406

(5) BATTERY:

Vendor Address:
GILL Batteries
A Division of Teledyne Continental Motors
http://www.gillbatteries.com
PH: - (800) 456-0070

(6) BRAKES AND WHEELS:

Vendor Address: Parker Hannifin Corp PH: - (800) 272-5464
Aircraft Wheel and Brake Division
1160 Center Road
Avon, Ohio 44011
http://www.parker.com/cleveland/Universe/book.pdf

(7) ELECTRONIC FLIGHT DISPLAY SYSTEM (EFDS)

Vendor Address: Avidyne Corporation PH - (800) 284-3963
55 Old Bedford Road
Lincoln, MA 01773
http://www.avidyne.com/index.htm

Instructions for Continued Airworthiness

Primary Flight Display
and Magnetometer/OAT: Document No. AVPFD-174
Multifuntion Display: Document No. AVMFD-167
Data Acquisition Unit: Document No. AVSIU-011

(8) EMERGENCY LOCATOR TRANSMITTER:

Vendor Address: Artex Airccraft Supplies PH: - (800) 547-8901
14405 Keil Road NE
Aurora, Oregon 97002
http://www.artex.net/

(9) ENGINE:

Vendor Address: Textron Lycoming PH - (717) 323-6181
652 Oliver Street FAX - (717) 327-7101
Williamsport, PA 17701
http://www.lycoming.textron.com/main.html

Overhaul Manual: DIRECT DRIVE MODELS - P/N 60294-7
Parts Catalog: IO-540- ..... - K1G5, ... ENGINES - P/N PC-615
TIO-540-AH1A ENGINES - P/N PC-615-12

Operators Handbook: O-540, IO-540 SERIES - P/N 60297-10
TIO-540 Series - P/N 60297-23

NOTE: The above Lycoming publications can be ordered as a set on CD-ROM from Avantext. See www.avantext.com or PH - (800) 998-8857.

(10) FIRE EXTINGUISHER (PORTABLE):

Vendor Address: H3R Inc. PH: - (800) 249-4289
43 Magnolia Ave # 4
San Francisco, California 94123-2911
http://www.h3r.com/index.htm

(11) FUEL PUMP:

Vendor Address:	Weldon Pumps P.O. Box 46579 640 Golden Oak Parkway Oakwood Village, Ohio 44146 http://www.weldonpumps.com/index.html	PH: - (440) 232-2282 FAX - (440) 232-0606

(12) FUEL CELLS:

Vendor Address:	Engineered Fabrics Corporation 669 Goodyear Street Rockmart, Georgia 30153-0548 http://www.kfefc.com/index.htm	PH - (770) 684-7855 FAX - (770) 684-7438

(13) HI-LOK FASTENERS AND TOOLS:

Vendor Address:	Hi-Shear Corporation 2600 Skypark Drive Torrance, California 90509	PH: - (213) 326-8110

(14) LIGHTS - NAVIGATION, STROBE, AND STANDBY/MAP LIGHTS:

Vendor Address:	Whelen Engineering Co. Inc. Route 145, Winthrop Rd. Chester, Conneticut 06412 http://www.whelen.com/	PH: - (860) 526-9504 FAX - (860) 526-2009

(15) MAGNETOS:

Vendor Address:	Slick Aircraft Products Unison Industries Attn: Subscription Dept. 530 Blackhawk Park Ave. Rockford, IL 61104 http://www.unisonindustries.com/index4.html	PH - (815) 965-4700 FAX - (815) 965-2457
Installation, Operation and Maintenance Instructions:	F1100 MASTER SERVICE MANUAL, 4300/6300 SERIES MAGNETO MAINTENANCE AND OVERHAUL MANUAL - L-1363	

(16) NAVIGATION, COMMUNICATIONS, AND GPS (NAV/COM/GPS):

Vendor Address:	Garmin International 1200 East 151ST Street Olathe, KS 66062 http://www.garmin.com	PH: - (913) 397-8200

(17) OXYGEN SYSTEM (6XT only):

Vendor Address:	Scott Aviation 2225 Erie Street Lancaster, New York 14086 http://www.scottaviation.com/	PH - (716) 683-5100

(18) PROPELLER:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Standard Practices:	Manual No. 202A	
Overhaul and Maintenance:	Manual No. 113B	
Aluminum Blade Overhaul:	Manual No. 133C	
Propeller Owner's Manual and Logbook:	Manual No. 115N	

(19) PROPELLER GOVERNOR:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Governor Maintenance:	Manual No. 130B	

(20) STANDBY ATTITUDE INDICATOR:

Vendor Address:	Mid-Continent Instruments Co., Inc. 9400 E. 34 TH Street N. Wichita, KS 67226 http://www.mcico.com/index.html	PH - (316) 630-0101 FAX - (316) 630-0723
Installation Manual and Operating Instructions:	Manual No. 9015762	

(21) STARTER:

Vendor Address:	Sky-Tec 350 Howard Clemmons Rd. Granbury, Texas 76048 http://www.skytecair.com	PH - (800) 476-7896 FAX - (817) 573-2252

(22) VACUUM PUMPS:

Vendor Address:	Aero Accessories, Inc. 1240 Springwood Avenue Gibsonville, NC 27249 http://www.aeroaccessories.com/index.html	PH - (800) 822-3200

(23) VACUUM REGULATORS:

Vendor Address: Parker Hannifin Corp. PH: - (800) 382-8422
Airborne Division
711 Taylor Street
Elyria, Ohio 44035
http://www.parker.com/cleveland/Universe/book.pdf

(24) VOLTAGE REGULATOR:

Vendor Address: Electro Systems, Inc. PH: - (888) 461-6077
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/

14. Chapter/Section Index Guide

NOTE: The following GAMA Specification No. 2 standard chapters are not included in this Maintenance Manual: 26, 29, 36, 38, 49, 53, 54, 60, 72, 75, 76, and 83. These chapters are omitted because the subject system is either: not installed in these airplanes; adequately covered in vendor or other manuals; or, for ease of use, has been combined with another chapter.

GRIDS 3A22 THRU 3A24
INTENTIONALLY BLANK

A

B

C

D

E

F

GRIDS 3B6 THRU 3B24
INTENTIONALLY BLANK

CHAPTER

28

FUEL

THIS PAGE INTENTIONALLY BLANK

CHAPTER 28

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 28 - FUEL

TABLE OF CONTENTS

CHAPTER 28 - FUEL

TABLE OF CONTENTS (continued)

GENERAL

1. Description

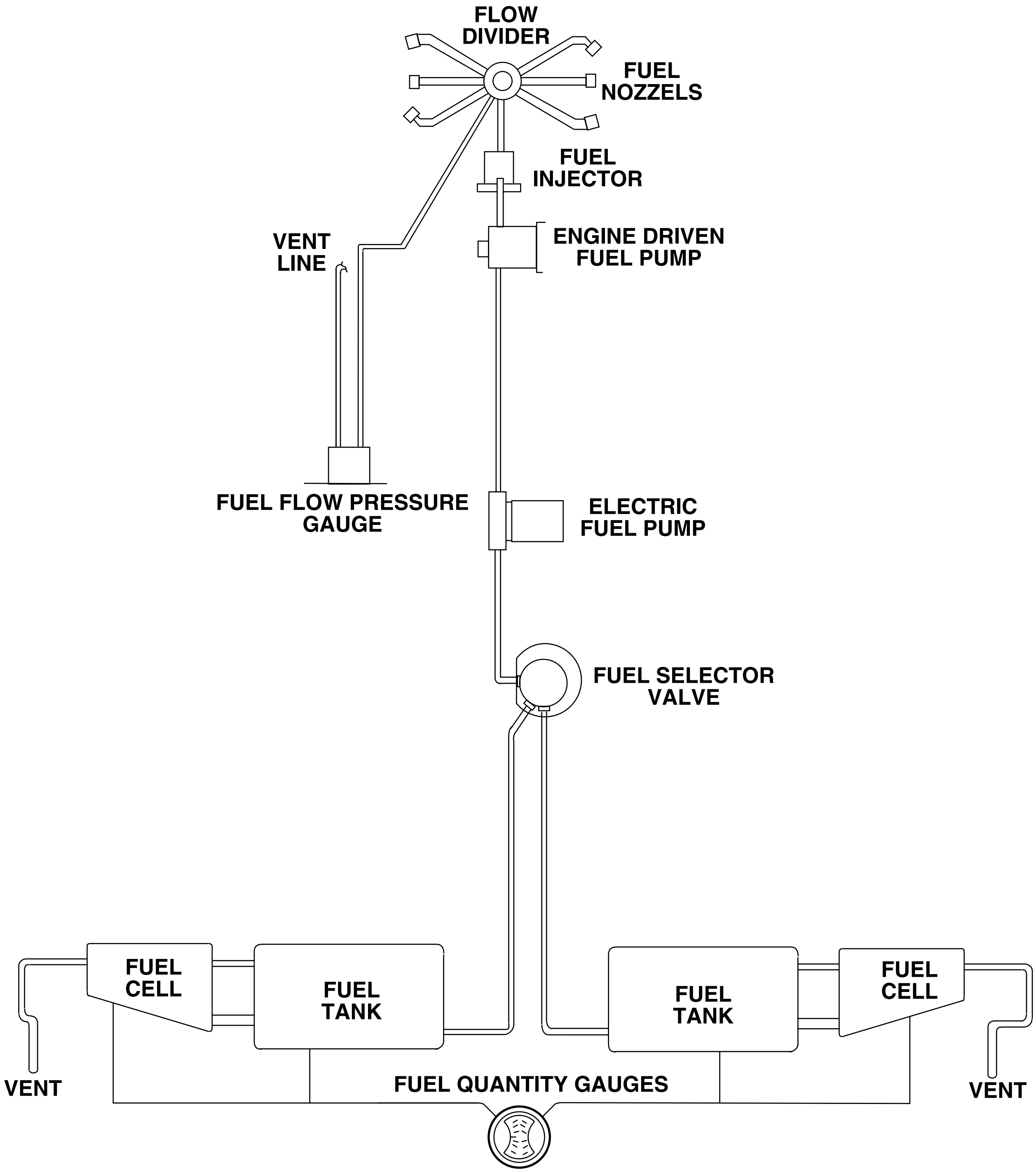
The fuel system consists of two interconnected tanks in each wing, having a combined capacity of 53.5 U.S. gallons per wing, for a total capacity of 107.0 U.S. gallons. The inboard tank is an integral part of the wing surface. Fuel flow is indicated on the gauge located in the instrument panel. A fuel quantity dual gauge is also located in the instrument panel, and indicates the amount of fuel remaining in each wing system as transmitted by the electric fuel quantity sending units located in the wing tanks. An exterior sight gauge is installed in the inboard tank of each wing so fuel quantities can be checked on the ground during the preflight of the airplane.

Fuel is drawn through a finger screen located in the inboard fuel tank and routed to a three position fuel selector valve and filter unit which is located aft of the main spar. The valve has OFF, LEFT and RIGHT positions which are remotely selected by means of a torque tube operated by a handle located in the pedestal. The handle has a spring loaded detent to prevent accidental selection to the OFF position. From the selector valve the fuel goes to the electric fuel pump which is also mounted aft of the main spar and then goes forward to the engine driven fuel pump which forces the fuel through the injector unit into the engine.

Refer to Figure1 for layout and relationship of the fuel system and components.

2. Troubleshooting

Electrical and mechanical troubles of the system are found in Chart 1. When troubleshooting, check from the power supply to the items affected. If no problem is found by this method, the trouble probably exists inside individual pieces of equipment, which may then be removed from the airplane and replaced with an identical unit or units, tested and known to be good.



Fuel System
Figure 1

CHART 1
TROUBLESHOOTING FUEL SYSTEM

Trouble	Cause	Remedy
Failure of fuel to flow.	Fuel line blocked.	Flush fuel system.
	Fuel vent cap blocked.	Check and clean vent hole in cap.
	Mechanical or electrical fuel pump failure.	Check and replace if necessary.
	Fuel selector valve in improper position.	Reposition as required.
		Check for obstructions in the fuel selector leverage mechaism.
	Damaged fuel selector valve.	Replace fuel selector valve.
Fuel quantity gauge fails to operate.	Broken wire.	Check and repair.
	Gauge inoperative.	Replace gauge.
	Fuel sender float partially or completely filled with fuel.	Replace sender.
	Circuit breaker open.	Check and reset.
	Float and arm assembly of fuel sender sticking.	Check.
	Bad ground.	Check for good contact at ground lip or rear of gauge.
No fuel pressure indication.	Fuel selector valve stuck.	Check fuel selector valve.
	Fuel tanks empty.	Check fuel tanks and fill.
	Defective gauge.	Replace gauge.
	Fuel selector valve in improper position.	Reposition fuel selector valve lever.
Lower pressure or pressure surges.	Obstruction in inlet side of pump.	Trace lines and locate obstruction.
	Air in line to pressure gauge.	Bleed line.

THIS PAGE INTENTIONALLY BLANK

STORAGE

1. Fuel System Inspection

Fill tanks with fuel. Inspect tanks and fuel line connections for leaks. Leaks will be indicated by telltale stains.

A. If inboard fuel tanks leak, see Fuel Tanks - Inboard (Aluminum), below.

B. If outboard fuel cells leak, see Fuel Cells - Outboard (Bladder-type) - Repair, below.

C. If fuel line connections leak, tighten clamps.

D. If fuel line connections continue to leak:

(1) Drain tanks (see Fuel Tanks - Draining, 12-10-00).

(2) Replace hose connections.

2. Fuel Tanks - Inboard (Aluminum) (See Figure 1.)

WARNING: IF DRAIN VALVES ARE REMOVED TO DRAIN TANKS, APPLY PARKER HANNIFIN THREAD LUBE, PIPER CODE NO. 913-224, TO MALE PIPE THREADS BEFORE INSTALLING. DO NOT ALLOW LUBRICANT TO ENTER FUEL SYSTEM.

WARNING: SLOSHING OF FUEL TANKS IS PROHIBITED.

NOTE: Before working on fuel tanks, completely drain them (see Fuel Tanks - Draining, 12-10-00).

Leaks will be indicated by telltale stains. If a fuel leak is detected, remove fuel tank and repair. Seal leaks with Products Research Corporation PR 1422A series or PR1433G series sealant. For example: PR1422A1.

A. Removal

(1) Completely drain fuel from tank (see Fuel Tanks - Draining, 12-10-00).

(2) Remove cover from access hole located on underside of wing between wing stations 88.75 and 115.95.

(3) Loosen clamps at hose connections on fuel line and fuel vent line. Slide hose connections away from fuel tank.

(4) Disconnect fuel line on inboard side of tank.

(5) Remove screws from around perimeter of the tank. Carefully pull tank away from wing far enough to gain access to/and remove sender wire.

(6) Remove tank.

B. Installation

(1) Position fuel tank in wing recess. Connect fuel sender wires. Slide tank completely into position. Secure with screws around its perimeter.

(2) Through access hole located on underside of wing:

(a) Slide hose on interconnecting fuel line.

(b) Slide fuel vent line into position.

(c) Tighten clamps on both lines.

(3) Connect fuel line on inboard side of tank.

(4) Fill fuel tanks and check for:

(a) Leaks

(b) Unrestricted fuel flow

(c) Accurate sender indications on fuel quantity gauge.

(d) Ground wire is securely attached to interconnecting fuel line, fuel vent line, and wing rib at wing station 88.75.

C. Fuel Tank / Wing Spar Corrosion Inspection (see Figure 1.)

NOTE: Paragraphs (1) and (2), below, are keyed to Figure 1.

(1) Each seven calendar years time-in-service, remove the fuel tanks and conduct inspections as specified below. Each inspection is for corrosion (intergranular, exfoliation, etc.), but while exposed all areas and parts should be checked for other anomalies such as damage, cracking, or wear. Any part or area determined to be defective must be repaired or replaced using standard FAA approved parts and methods.

A1. Inspect the fuel tank attach hardware and gang channels (nut plate strips).

A2. Inspect the exterior of the fuel tanks for leaks. Inspect the interior for corrosion or sloshing compound. If either condition exists, clean, repair, or replace the fuel tank as required.

A3. Remove fuel quantity senders. Inspect fot condition, operation, and security and freedom of movement of the float arm. Inspect condition of wires and terminals. Replace components as required. Replace gaskets.

A4. Inspect hard fuel vent lines for interior and exterior corrosion, wear, or deposits. Flush and clean with mineral spirits under pressure. If excessive debris, deposits, or corrosion observed, replace the line.

A5. Inspect flexible fuel hoses and couplings. Replace as required. Replacement is recommended regardless of servicability.

A6. Inspect the spar, spar angles (cap), and ribs behind and adjacent to the fuel tank. If corrosion is detected, conduct a thorough inspection of the entire wing.

A7. Remove the lacing at the wing root and inspect the spar and forward wing attach fittings.

(2) Treat the following areas with Dinotrol AV 8 before reassembly.

B1. Wing spar at root and forward wing attach fittings.

B2. Entire wing spar, spar angles (cap), and ribs behind and adjacent to the fuel tank..

3. Fuel Cells - Outboard (Bladder-type) (See Figure 2.)

A. Removal

NOTE: Prior to removal, a used cell should be drained, purged with fresh air and swabbed out to remove all traces of fuel.

(1) Drain fuel cell (see Fuel Tanks - Draining, 12-10-00).

(2) Remove the access covers located on bottom of wing at wing stations 111.8, 165.5, and 129.3.

(3) Remove the twelve screws securing fuel cap adapter assembly to upper wing surface (wing station 140.09). Remove adapter assembly.

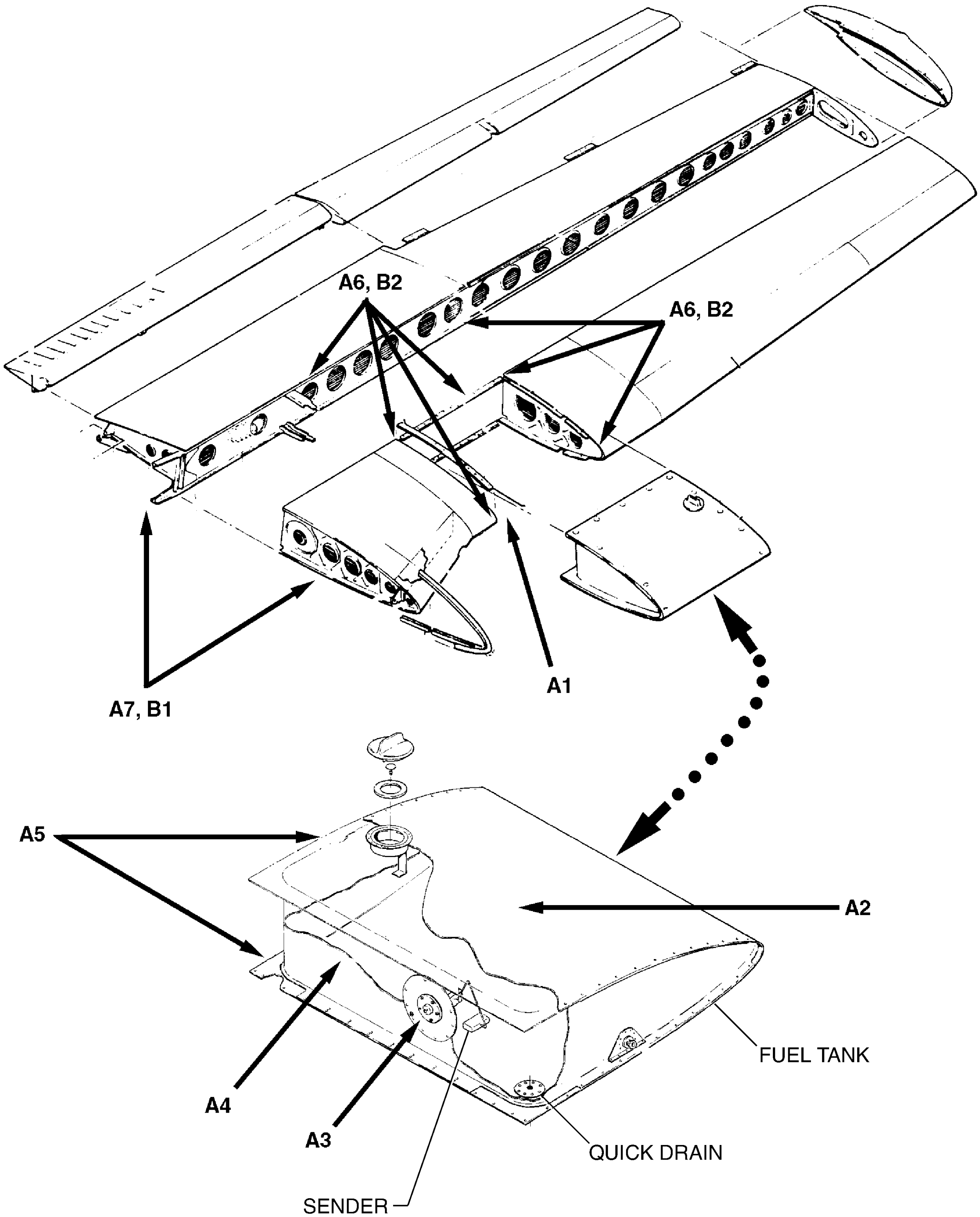
(4) Remove four screws securing fuel cell and nut ring and gasket to the top of wing. Remove nut ring and gasket.

(5) Utilizing access opening at wing station 165.5, loosen the two clamps which secure fuel vent line and fuel vent valve assembly in fuel cell nipple.

(6) Carefully separate \fuel vent line from fuel cell nipple.

(7) Reach in fuel cell and remove fuel vent valve assembly from fuel cell nipple.

(8) Utilizing access opening at wing station 111.8, loosen clamps securing fuel cell to upper and lower fuel interconnecting lines. Separate interconnecting lines from fuel cell.



Fuel Tank Components and Fuel Tank / Wing Spar Corrosion Inspection
Figure 1

(9) Working through access opening at wing station 129.3 (lower wing surface), disconnect electrical wire from fuel sender unit terminal. Remove the five bolts securing fuel sender unit and remove sender unit from fuel cell.

(10) Inserting arm between fuel cell and top of wing, separate velcro strips which hold fuel cell in place.

(11) Fold fuel cell into a manageable form and withdraw it through the access opening at top of wing.

B. Cleaning

(1) New fuel cells kept in their shipping containers should not require cleaning prior to installation. If a cell should become dirty, clean with soap and warm water.

(2) Prior to removal, a used cell should be drained, purged with fresh air and swabbed out to remove all traces of fuel. Upon removal the cell should be cleaned thoroughly with soap and warm water.

C. Inspection

(1) Inspect fuel cells during regularly scheduled airplane maintenance inspections.

(2) Inspect interior of each cell for cracking, porosity or other signs of deterioration.

(3) Inspect nipple as follows:

(a) Attempt to scrape the rubber off the nipple fitting with a fingernail. If rubber has not degraded, the fingernail will glide across rubber without damage to the rubber. If an unsatisfactory condition exists, the fingernail will dig into the rubber.

(b) Deteriorated rubber has consistency of either art gum or chewing gum. Usually it will have changed from a light tan color to a dark reddish-brown, bluish or greenish color, depending upon the color of fuel used.

(4) Replace any cell found seeping or with soft nipples.

D. Installation

(1) Inspect fuel cell compartment for cleanliness and condition. Ensure that:

(a) all sharp edges have been rounded off. Where this is not possible tape over all sharp edges or rough rivets;

(b) all filings, trimmings, loose washers, nuts, bolts, etc. have been removed from the compartment.

(2) Do not use sharp tools such as screwdrivers, files, etc. for installation purposes.

(3) Roll cell into a shape and size which can be inserted through access opening of the cell compartment.

(4) Place cell within cell compartment. Unroll and establish correct relationship of cell to compartment.

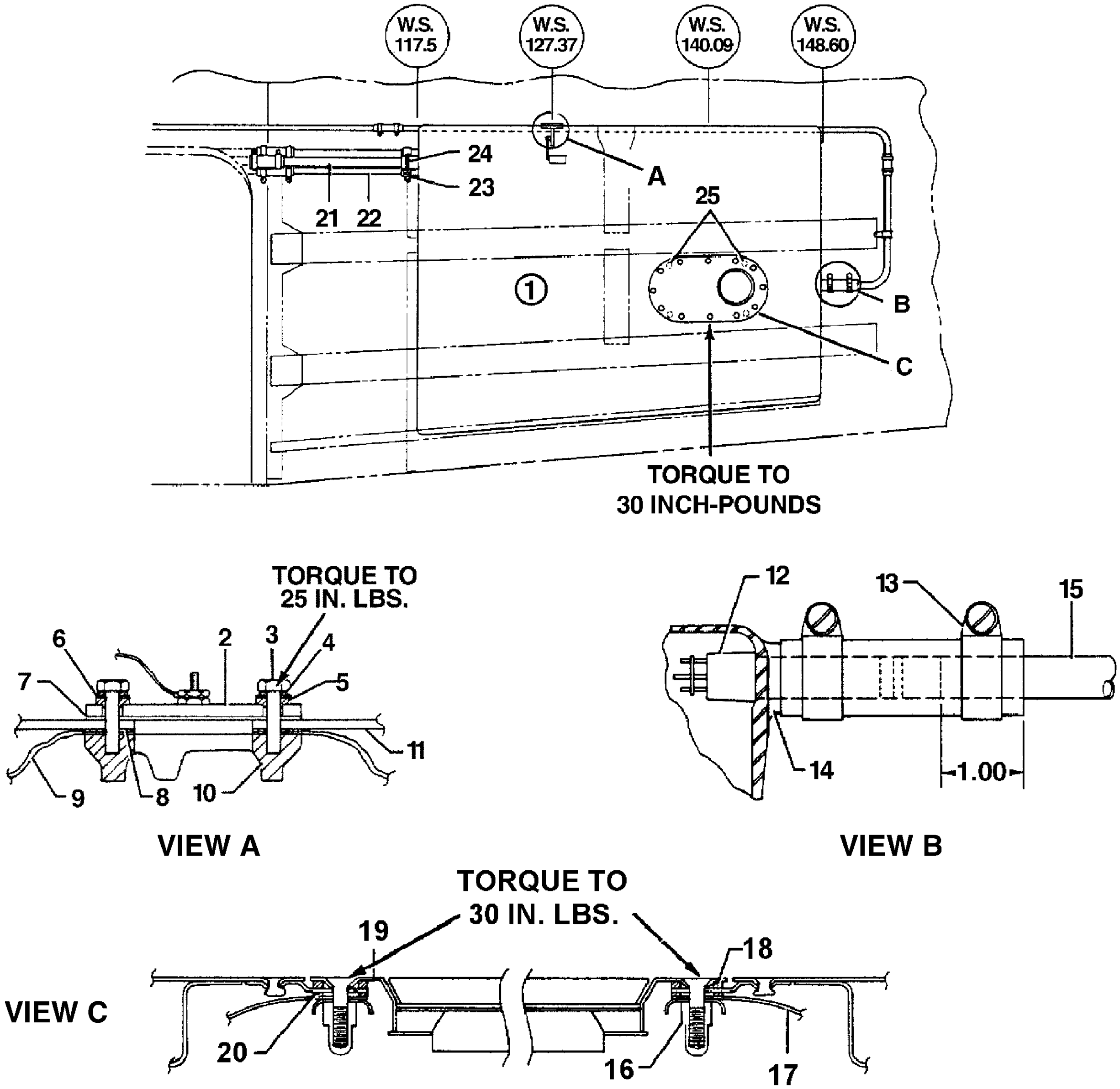
(5) Secure cell by pressing velcro strips of fuel cell against velcro strips of cell compartment.

(6) Using appropriate access opening in bottom of wing, install fuel sender unit as shown in Figure 28-2, View “A”.

(7) Reaching into fuel cell, place fuel vent valve assembly in place in fuel cell vent nipple. Secure with clamp installed through appropriate access opening in bottom of wing. Torque clamp 12-16 inch - pounds.

(8) Insert fuel vent line one inch into fuel cell vent nipple and secure with clamp. Torque clamp 12-16 inch - pounds.

(9) Insert fuel interconnect lines into appropriate fuel cell openings and secure with clamps. Torque 3/4 inch fuel vent interconnect clamp (12HL) 15-20 inch - pounds. Torque 2 inch fuel tank interconnect clamp (32HL) 30-35 inch - pounds.



1. FUEL CELL
2. FUEL SENDER UNIT
3. AN3-6A BOLT. TORQUE TO 25 IN.-LBS.
4. AN935-10 LOCK WASHER
5. INSULATING WASHER
6. AN960-10 7.WASHER
7. NEOPRENE GASKET
8. CORK GASKET
9. FUEL CELL
10. NUT RING
11. SPAR
12. FUEL VENT VALVE ASSEMBLY
13. #10HL CLAMP. TORQUE 12-16 IN.-LBS.
14. NIPPLE
15. FUEL VENT LINE
16. NUT RING
17. FUEL CELL
18. GASKET
19. FUEL CAP ADAPTER ASSEMBLY
20. GASKET
21. FUEL VENT INTERCONNECT LINE
22. FUEL TANK INTERCONNECT LINE
23. #32HL CLAMP. TORQUE 30-35 IN.-LBS.
24. #12HL CLAMP. TORQUE 15-20 IN.-LBS.
25. SCREWS (12)

Fuel Cell Components
Figure 2

(10) Align holes of cork gasket, fuel cell, and nut plate. Secure with four screws. Torque to 12-15 inch - pounds.

(11) Using a clean soft lint-free cloth, wipe inside of cell clean of all dirt and foreign material. Inspect for cleanliness.

(12) Install a new gasket and fuel cap adapter assembly. Coat each of the twelve screws' threads with PR 1422 CL2 sealant. Install screws and torque from 20 to 25 inch-pounds. After torquing, clean screws with MEK solvent.

(13) Fill fuel tanks and check for leaks, unrestricted fuel flow, and proper fuel level indication.

(14) Install access covers.

E. Handling and Storage

(1) Do not remove fuel cells from shipping container until time of installation.

(2) After removing fuel cell from its shipping container, inspect cell for damage due to crating or removal from crate.

(3) Do not use fuel cell nipple fittings as handholds. Do not drag fuel cells.

(4) Stack fuel cells only in original shipping containers.

(5) Prior to storing used fuel cells, clean with soap and warm water.

(6) Fold fuel cells smoothly and loosely with a minimum number of folds. Protective wadding should be placed between folds.

CAUTION: SHOULD THE TEMPERATURE BE BELOW 70° F MOVE THE CELLS TO A WARMER STORAGE LOCATION.

(7) Store fuel cells in a dry area protected from sunlight. Recommended storage temperature is 70° F.

F. Repair (Refer to Chart 1.)

The following procedure is recommended for field repair of fuel cells constructed of Goodyear Vithane material. These repairs may be accomplished by two methods. One method is by heat cure; the other is air cure. The end result of either method is a neat, permanent repair. The heat repair allows the cell to be cured and ready for reinstallation in two hours; while the air cure method requires that the cell not be moved for 72 hours during the air cure period.

NOTE: Air cure repairs are to be made at a room temperature of approximately 75°F. For each 10°F drop in temperature, add 20 hours cure time. For instance, if the room temperature reads 65°F, air cure for 92 hours instead of 72 hours.

NOTE: The repair of Goodyear Vithane fuel cells is restricted to authorized personnel. Authorized personnel are those who have been certified and trained by Goodyear representatives, or those who have received their training from persons who have been certified and trained by Goodyear representatives.

(1) Handling of Repair Materials

(a) Protect all materials from dirt contamination, sunlight, and excessive heat or cold while in storage. Keep containers tightly capped and stored at a temperature of 70°F.

NOTE: 80C27 repair cement requires thorough mixing to obtain full adhesive values.

(b) The 80C27 cement referred to in this text is prepared immediately prior to use by mixing repair cement 80C27 (pint can with 320 gms) with cross-linker 80C28 (4 oz. bottle with 81cc).

CHART 1
FUEL CELL REPAIR EQUIPMENT

Repair Kit, Goodyear Part No. 2F1-3-37813			
GROUP I MATERIALS:	**Item**	**Quantity**	**Packaging**
	80C27 Repair Cement	8	Pint cans (320 grams in each)
	80C28 Cross-Linker	8	1 four oz bottle (81 cc in each)
	Methylethylketone (MEK)	2	1 pint can
	FT-192 Repair Fabric	2	Sheet 12 x 12
	AP368 Manual	1	
GROUP II MATERIALS *:	**Item**		**Quantity**
	Foam Rubber Cloth Sheet, 1/4 x 12 x 12		2
	Paint Brush, 1 inch wide		2
	Aluminum Plates, 1/4 x 6 x 6		4
	Measuring Cup (250 ml)		1
	Cellophane (Sheet 12 x 24)		2

* This equipment is necessary to perform the repair. Group II equipment will be furnished at additional cost, if ordered.

NOTE: Accessories - order per individual cell requirements.

Phenol plates, phenol plate assemblies and phenol test equipment can be ordered as required from cell manufacturer.

Alodine 1200 to be ordered as required from cell manufacturer.

Cure Iron (Set 240°F) Optional.

CAUTION: ALL CONTAINERS FOR CEMENTS AND SOLVENTS SHOULD BE PROPERLY IDENTIFIED.

(c) Repair cement has a pot life of 20 minutes after mixing. The unmixed 80C27 and 80C28 have a shelf life of six months from the date of packaging.

(2) Limitations

NOTE: Fuel cells sustaining damage exceeding the limitations listed below should be returned for evaluation to: Engineered Fabrics Corporation, 669 Goodyear Street, Rockmart, Georgia 30153.

(a) FT-192 repair fabric is for repair of simple contours only. Patches referred to in this text are of this material.

(b) Inside patches are to lap defect edges a minimum of 1.0 inches in each direction.

(c) Outside patches are to lap defect edges 0.25 to 0.50 inches inside patches.

(d) Outside patches are to be applied and cured prior to applying an inside patch.

(e) Blisters between inner liner and fabric larger than 0.25 of an inch in diameter require an outside and an inside patch.

(f) Separations between layers or plies larger than 0.50 inch in diameter require an outside and inside patch. Holes and punctures require an outside and inside patch.

(g) Slits or tears up to 6.0 inches maximum length require an outside and inside patch.

(h) External abraded or scuffed areas without fabric damage require an outside patch only.

(i) A loose edge may be trimmed provided a 0.50 inch minimum lap or seam is maintained.

CAUTION: FOR EACH 10°F DROP IN TEMPERATURE FROM 75°F, ADD 20 HOURS CURE TIME. FOR EXAMPLE: AT 65°F, CURE FOR 92 HOURS.

(j) Air cure repair patches are to remain clamped and undisturbed for 72 hours at a room temperature of approximately 75°F.

(k) All heat cured patches are ready for use when cool.

(l) Fitting repairs are confined to loose flange edges, seal surface rework and coat stock.

(m) The maximum number of heat cure repairs in the same area is four.

(3) Heat Cure Repair Patch Method

The exterior patch is applied to the exterior cell wall and cured, first; then, the interior patch is applied to the interior cell wall.

(a) Preparation

1 Cut a repair patch from FT-192 material to size required to insure a proper lap over injury in all directions. (See Limitations, above.)

a Hold shears at an angle to produce a beveled edge (feather) on patch. (Dull side or gum contact face of repair patch should be largest surface after beveling.)

b Round corners of patch.

2 Wash one square foot of cell wall surrounding injury with a clean cloth soaked with Methylethylketone solvent.

3 Wash repair patch contact side with a clean cloth soaked with Methylethylketone solvent.

4 Abrade cell wall surface about the injury and on the contact side of patch with fine emery cloth to remove the shine.

5 Repeat Methylethylketone washings two more times, for a total of three washings for each surface.

6 Tape a 8" x 8" piece of cellophane inside the cell over the injury.

(b) Position cell for patch application on repair table.

(c) Mix the 80C27 cement (320 gms) with the cross-linker 80C28 (81cc), and stir mixture thoroughly, for five minutes.

NOTE: Cement must be at a minimum of 70°F before mixing. Keep away from water and excessive heat.

(d) Brush one even coat of mixed repair cement on the cell wall around the injury and on the contact side of the repair patch. Allow to dry for fifteen minutes.

CAUTION: DO NOT USE THE FIRST CAN OF MIXED CEMENT FOR SECOND COAT.

(e) Repeat a second mixing of repair cement and brush a second coat.

CAUTION: MAKE SURE CELLOPHANE INSIDE CELL OVER INJURY REMAINS IN PLACE BECAUSE CEMENT WILL STICK CELL WALLS TOGETHER WITHOUT IT AS A SEPARATOR.

(f) After cement has dried approximately five minutes, center patch over injury.

1 Lay patch by rolling it down on surface from center to edge without trapping air.

2 Hold unrolled portion of repair patch off cemented surface until roller contact insures an air-free union.

3 The patch may now be moved by hand on the wet surface to improve lap. Do not lift repair patch, slide it.

(g) Using two aluminum plates larger than patch:

1 Cover one smooth surface of each plate with fabric-backed air foam, fabric side out. Foam must cover edges of plate for protection.

2 Tape air foam in place.

(h) Using a cellophane separator to prevent cement from sticking in the wrong place:

1 Fold cell adjacent to patch and place one prepared plate over repair patch.

2 Place second prepared plate outside of bladder opposite patch.

CAUTION: MAKE SURE THAT CELL FOLD IS NOT CLAMPED BETWEEN PLATES. THIS WOULD CAUSE A HARD PERMANENT CREASE. ALSO MAKE SURE THAT THE PATCH DOES NOT MOVE WHEN CLAMP IS TIGHTENED.

(i) Center repair iron 2F1-3-25721-1 on plate over repair patch. Secure assembly with a C-clamp. Tighten by hand. Check cement flow to determine pressure.

(j) Connect repair iron into 110-volt current and cure repair for two hours.

(k) After curing, unplug repair iron and allow it to cool to touch. Remove C-clamp. Wet cellophane to remove it from repair.

CAUTION: APPLYING BOTH AN OUTSIDE AND INSIDE REPAIR PATCH SIMULTANEOUSLY NOT RECOMMENDED.

(l) After outside patch has been cured, apply inside patch using same procedure as above, except for side of repair patch (see Limitations, above.)

CAUTION: FOR EACH 10°F DROP IN TEMPERATURE FROM 75°F, ADD 20 HOURS CURE TIME. FOR EXAMPLE: AT 65°F, CURE FOR 92 HOURS.

(4) Air Cure Repair Patch Method

Follow procedure for heat cure method, above, except omit repair iron. Cure each patch for a minimum of 72 hours, undisturbed at 75°F.

(5) Fuel Cell Defect Repairs

(1) Blisters:

1 Remove loose material by trimming.

2 Apply an outside and inside repair patch.

(2) Holes, Punctures, Cuts, Tears and Deep Abraded Areas:

1 Trim away any ragged material

2 Apply an outside and inside repair patch.

(3) Loose Seams:

1 Buff loose edges and contact surfaces with emery cloth.

2 Wash three times with Methylethylketone.

3 Apply 80C27 mixed cement in two coats as with a repair patch.

4 Clamp and cure. Cure by either heat cure or air cure method.

5 Loose seams may be trimmed if a minimum lap remains.

(4) Loose Fitting Flange - Inside:

1 Buff the edge of the flange and the contact surface under the flange.

2 Apply 80C27 mixed repair cement, cellophane, padded plates and clamp.

3 Follow procedure as outlined for repair patch.

(5) Looseness Against Metal:

1 Prepare metal as per metal fitting - sealing surfaces.

2 Apply 80C27 mixed cement and cure.

G. Molded Nipple Fittings Installation

The lightweight molded nipple fitting was developed for ease of installation. To receive the best service from this type fitting, it is necessary to exercise certain precautions during installation.

(1) Unless otherwise specified, insert tubing into fitting until end is flush with inside edge of nipple.

(2) Hose clamp must clear end of fitting by 1/4 inch where possible.

(3) Locate hose clamp on fabric reinforced area of nipple.

(4) Do not use sealing paste or gasket compound.

(5) Use lightweight motor oil to facilitate insertion of tubing into nipple.

H. Accessory Replacement

(1) Obtain a cured repair accessory from cell manufacturer.

(2) Mark location of old accessory. Preserve markings for guide lines to locate new part.

(3) Remove old accessory by gradually loosening an edge with a blunt probe-like instrument.

(4) When a loose edge is created, grasp the accessory by loose edge with pliers and gently peel it off cell wall. Be careful not to pull cell lap open while peeling accessory off. Pull from blind side of a cell lap toward the exposed edge.

NOTE: Removal of the old accessory will probably leave an uneven cavity and surface.

(5) Buff cell surface under accessory with emery cloth to smooth roughness and prepare for cement.

(6) Prepare replacement accessory by buffing and washing contact surface. Also wash the cell surface (see Heat Cure Repair Patch Method, Preparation, above.)

(7) Apply mixed 80C27 repair cement to both surfaces being sure to level cavity left by removal of old accessory.

(8) Roll new accessory into place as with a repair patch. Place suitable padded plates in position to insure adequate pressure when clamped. Use a cellophane separator to prevent the cement from sticking in the wrong place (as described in Heat Cure Repair Patch Method, above.)

(9) Cure by either heat cure or air cure method.

I. Testing

Use either of the following procedures to detect leaks in bladder cells:

(1) Soap Suds Test:

(a) Attach test plates to all fittings.

(b) Inflate the cell with air to a pressure of 1/4 psi maximum.

(c) Apply a soap and water solution to all repaired areas suspected of leakage. Bubbles will appear at any point where leakage occurs.

(d) After testing, remove all plates and wipe soap residue from the exterior of the cell.

(2) Chemical Test:

NOTE: The chemical test is the more sensitive and preferred test.

(a) Attach a test plate to all fitting openings except one.

(b) Make up a Phenolphthalein solution as follows:

1 Add 40 grams Phenolphthalein crystals in 1/2 gallon of Ethyl Alcohol and mix, then;

2 Add 1/2 gallon of water.

(c) Pour ammonia on an absorbent cloth in the ratio of 3 ml per cubic foot of cell capacity. Place ammonia saturated cloth inside the cell.

(d) Install remaining test plate to opening used to insert ammonia saturated cloth.

(e) Inflate cell with air to a pressure of 1/4 psi maximum. Cap and maintain pressure for fifteen minutes.

(f) Soak a large white cloth in phenolphthalein solution. Wring it out thoroughly. Spread cloth smoothly on outer surface of cell. Press cloth down to insure detection of minute leaks.

(g) Check cloth for red spots, which indicate a leak. Mark any leaks found and move cloth to a new location. Repeat procedure until entire exterior surface of cell has been covered. Red spots appearing on cloth may be removed by resoaking cloth in phenolphthalein solution.

(h) Phenolphthalein solution and test cloth are satisfactory only as long as they remain clean. Any phenolphthalein solution that is not in immediate use should be stored in a closed rust proof container to prevent evaporation and deterioration.

(i) After test, remove all plates and test equipment. Allow cell to air out.

(3) In conducting either test outlined above, the cell need not be confined by a cage or jig, providing the 1/4 psi pressure is not exceeded.

4. Locking Fuel Cap (Refer to Figure 3.)

One key operates the locking fuel cap, the ignition and door locks.

A. Disassembly

(1) Remove the two screws from top of fuel cap.

(2) Remove screw and lock washer that secures pawl to bottom of key lock. Remove pawl.

(3) Remove nut that secures key lock to cover.

(4) Slide lock, gaskets, and spring over back of key lock.

(5) Remove key lock by pushing key lock through cover. Ensure that the O–ring is not lost.

B. Assembly

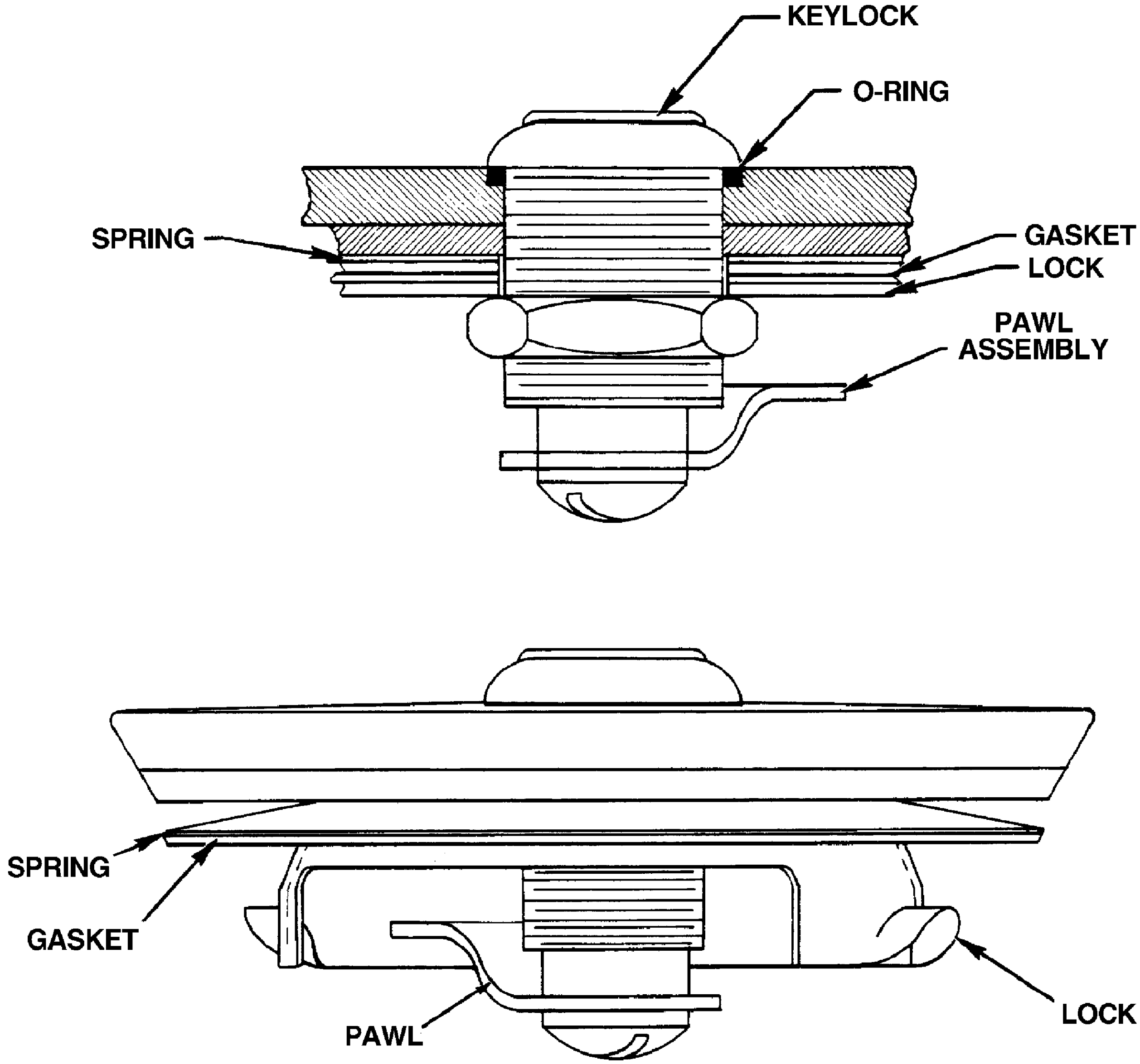
(1) Insert key lock through cover. Make sure that O–ring gasket is installed under head of key lock.

(2) Slide spring, gaskets, and lock over back of key lock.

(3) Install nut that secures key lock to cover.

(4) Apply LOCTITE #211 or #680 to screw threads primed with LOCQUIC “N” or “T”. Attach pawl to back of lock assembly with screw and lock washer.

(5) Apply a thin coating of PR-1422 sealant to shank and thread of the screws removed from top of cap. Install screws and lock washers on top of fuel cap.



Locking Fuel Cap
Figure 3

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

1. Cleaning Fuel System

A. Remove all fuel from tanks (see Fuel Tanks - Draining, 12-10-00). Drain fuel through a chamois or other straining equipment to inspect for presence of foreign matter.

B. Flush each tank by opening tank drain and adding two or three gallons of clean fuel. While fuel is draining, raise and lower airplane wing to allow the fuel to rinse out any contamination remaining in tank.

C. Cleaning Filter Assembly (Refer to Figure 1.)

NOTE: Cleaning the filter assembly can also be performed alone, with fuel in the system. Set the fuel selector to OFF and proceed as indicated below.

(1) Remove access panel to filter bowl on bottom of fuselage.

(2) Remove fuel strainer bowl.

(3) Remove filter disc assembly from center stem by compressing filter retainer spring and removing filter retainer washer.

(4) Inspect bowl gasket. Replace if necessary.

(5) Filter discs may be cleaned as follows:

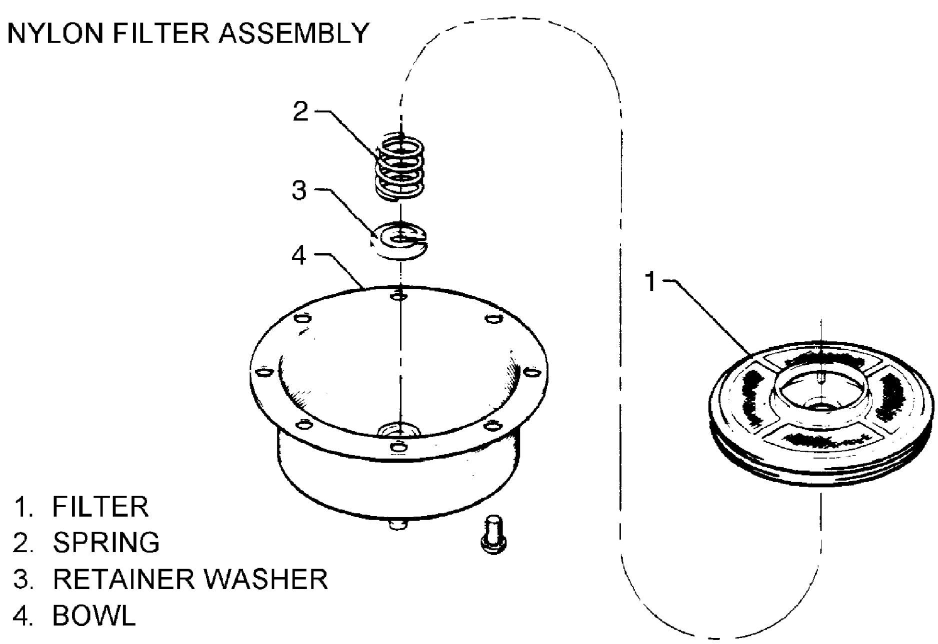
(a) Plug open ends of filter disc center with stoppers to prevent dirt from entering.

CAUTION: DO NOT USE ACETONE, METHYLETHYLKETONE, ETC., TO CLEAN NYLON FILTER DISCS.

(b) Wash metallic filter disc in acetone, gasoline, carbon tetrachloride, trichlorethylene (permachor) or Bendix cleaner. Wash nylon filter disc with soap and water.

(c) Remove stubborn deposits from filter disc with a soft bristle brush.

(d) Rinse all traces of soap solution. Drain or blow dry. Remove stoppers.



Fuel Filter Assembly
Figure 1

(6) Replace the filter disc if damage is evident.

(7) Reinstall filter disc assembly and strainer bowl.

D. After the aircraft is refueled:

(1) Disconnect fuel inlet line to injector.

(2) Turn electric fuel pump ON to flush lines.

(3) While flushing, move fuel selector back and forth from one tank to another.

2. Fuel Selector Valve and Filter Assembly (See Figure 2.)

CAUTION: NO FIELD DISASSEMBLY OR REPAIR OF FUEL SELECTOR VALVES IS AUTHORIZED. MAINTENANCE IS LIMITED TO REMOVAL AND REPLACEMENT OF THE WHOLE UNIT.

When the fuel selector handle is not in a positive selector detent position, more than one fuel port will be open at the same time. Ensure that the fuel selector is positioned in a detent, which can be easily felt, when moving the handle through its various positions.

A. Removal

(1) Drain fuel from tanks. (Refer to Draining Fuel System, Chapter 12.)

(2) Remove center seats, seat belt attachments and floor panel just aft of main spar by removing floor attachment screws. Lift panel and remove.

(3) Remove plate from bottom of fuselage that covers fuel selector valve.

(4) Disconnect fuel lines and selector control linkage from selector valve assembly.

(5) Remove the four mounting screws that hold the fuel selector valve in place. Remove selector valve assembly.

B. Installation

NOTE: When installing fuel selector valve, drain and flush complete fuel system and tanks to ensure no contamination is present. (See Cleaning Fuel System, above.)

(1) Position the selector valve inside the airplane just aft of the main spar.

(2) Secure the selector valve with machine screws, washers and self-locking nuts.

(3) Connect the fuel lines.

(4) Connect fuel selector control linkage to insure that selector handle engages the left indent position when it is against the safety stop on the console cover.

(5) Fill the fuel tanks and check all connections for leaks.

(6) Install the rear seat and fuel drain placard cover.

(7) Install the access plate to the bottom of the fuselage with attaching screws.

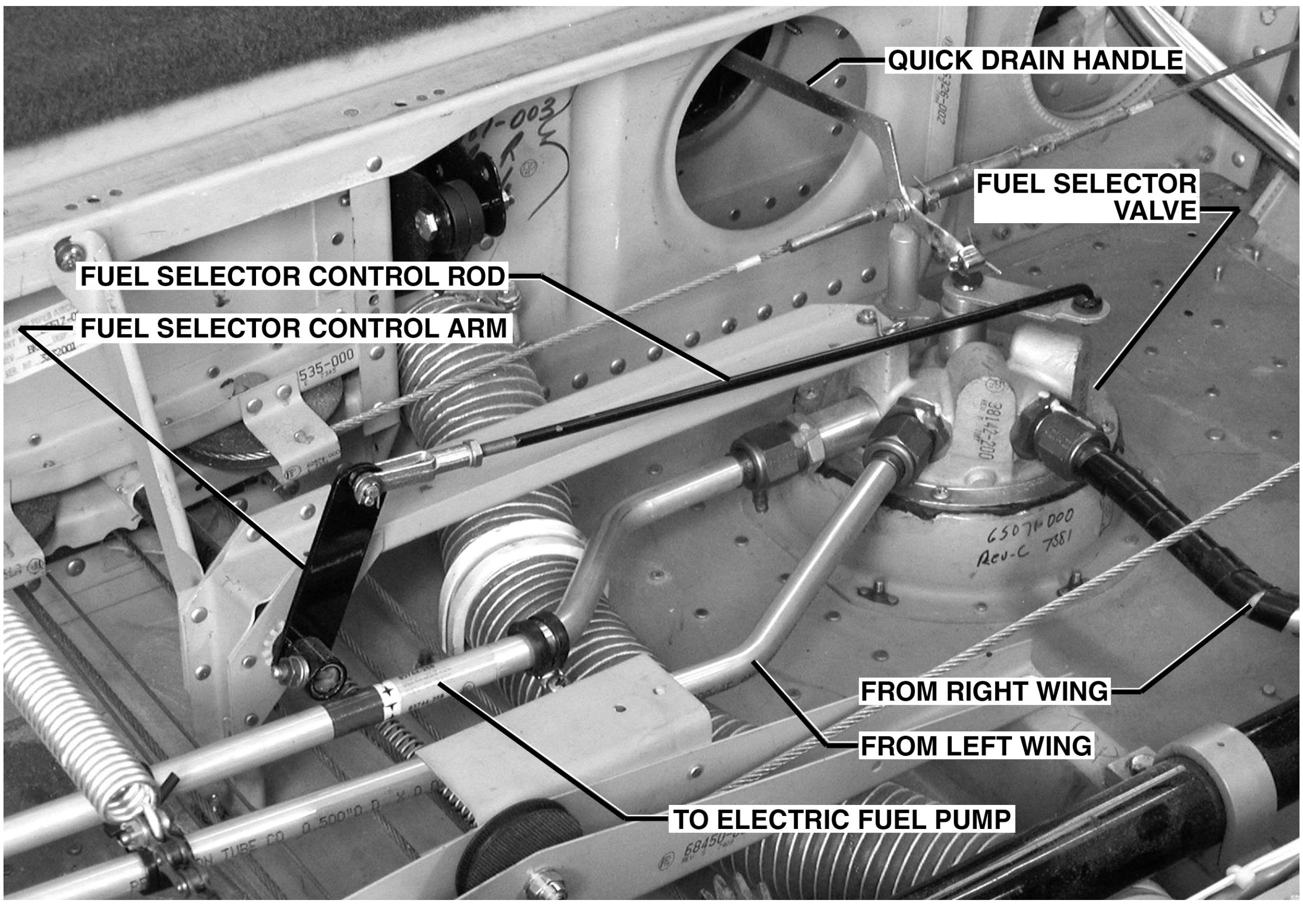
C. Flush Lines

After fuel selector valve is installed and the aircraft is refueled:

(1) Disconnect fuel inlet line to injector.

(2) Turn electric fuel pump ON to flush lines.

(3) While flushing, move fuel selector back and forth from one tank to another.



Fuel Selector Valve and Filter Assembly
Figure 2

3. Electric Fuel Pump (See Figure 3.)

A. Inspection

Each 50 hours, visually inspect the fuel pump overboard drain line outlet (i.e. - underside of aircraft, on the left side, opposite the fuel selector filter access plate) for evidence of fuel discharge. Fuel discharge through this drain line is indicative of internal seal failure and cause for fuel pump replacement.

B. Removal

(1) Turn fuel selector to off position.

(2) Remove center seats, seat belt attachments. Remove floor panel located directly aft of main spar by removing screws that secure panel. Lift panel and remove it from the airplane.

(3) Disconnect electrical lead from pump.

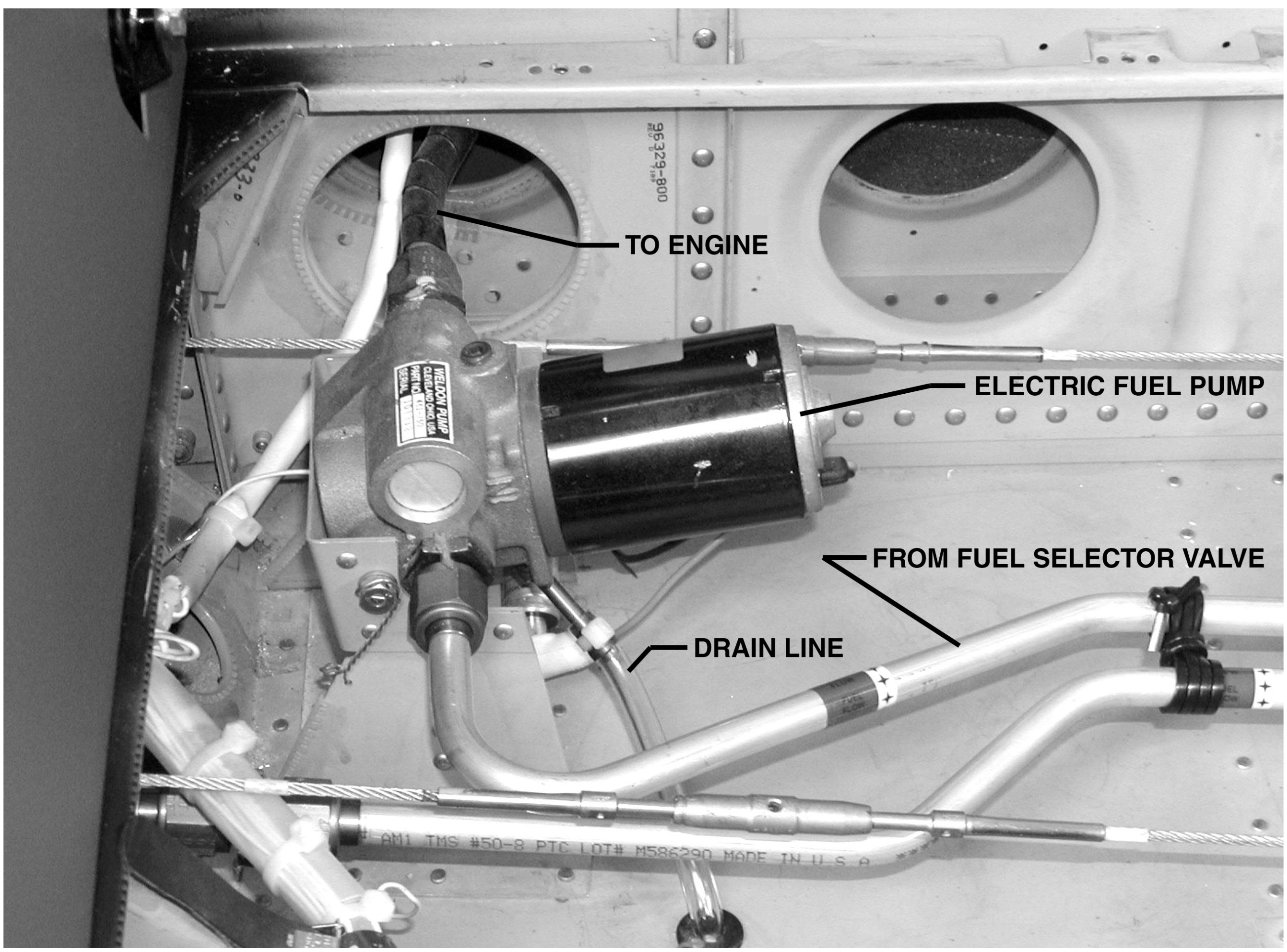
(4) Disconnect pump inlet, outlet, and drain lines.

(5) Remove pump by removing pump attachment hardware.

C. Installation

(1) Position pump in airplane. Secure with attachment hardware and safety.

(2) Connect pump inlet, outlet, and drain lines.



Electric Fuel Pump
Figure 3

(3) Attach electrical leads to pump.

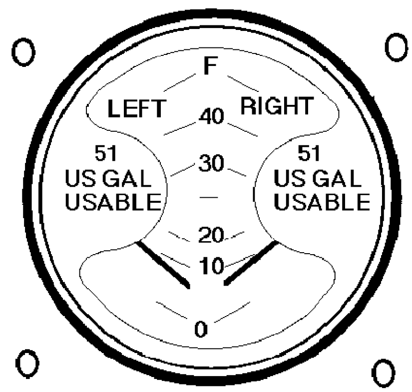
(4) Install floor panel in airplane and secure with screws. Install center seats and seat belt attachments.

(5) Set fuel selector to desired position.

THIS PAGE INTENTIONALLY BLANK

INDICATING

These airplanes are equipped with traditional analog dual gauges to indicate fuel quantity. Inboard and outboard fuel tanks in each wing are interconnected and have a total capacity of 53.5 gallons per wing. The cumulative quantity of fuel in each set of tanks is read on a single fuel quantity gauge with dual (left and right) indications (see Figure 1). The gauge is mounted at the bottom right of the pilot's flight instruments.



Fuel Quantity Dual Gauge
Figure 1

1. Fuel Quantity Sender and Gauge Check

   To check fuel quantity sender units and fuel quantity gauge while installed in airplane:

   A. Level airplane laterally and longitudinally ± 1° (refer to Leveling, 8-20-00).

   B. Place battery switch in OFF position.

   C. Connect external power supply to airplane. Adjust to provide 24 to 28 Vdc.

   D. Desired fuel quantity in side to be tested is obtained by either:

      (1) Completely draining fuel tanks on the side to be checked. Then adding fuel in increments specified in Chart 1; or,

      (2) with tanks completely full, defueling each tank 10 gallons at a time.

      (3) After measured amount has been added or drained, vibrate tank by bumping lower wing surface. Vibrate gauge by tapping gauge glass with fingers.

      WARNING: WHEN TESTING FUEL SENDER ELECTRICAL RESISTANCE, WITH SENDER INSTALLED IN THE AIRPLANE, ENSURE ONLY A HIGH IMPEDANCE OHM-METER IS USED.

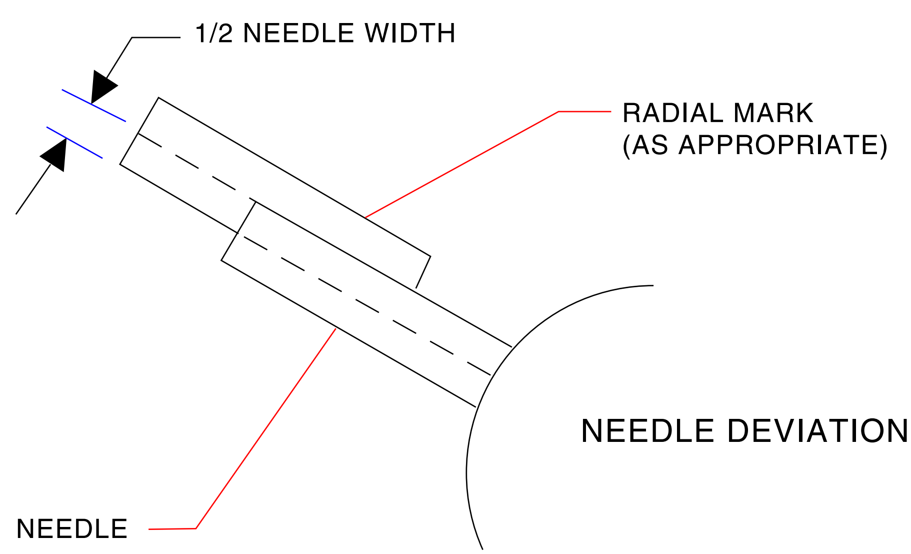
   E. If gauge does not read within tolerances specified in Chart 1, verify sender's resistance is as specified in Chart 1.

   F. If sender checks out OK, remove gauge and bench test/adjust as specified in paragraph 2, below.

   G. If gauge or sender fails to meet accuracy requirements in Chart 1, replace gauge or sender, as applicable.

CHART 1
FUEL QUANTITY ANALOG GAUGE / SENDER TOLERANCES

Total Fuel in Tanks [Side Being Tested] Gallons	Required Gauge Reading	Tolerance (Plus or Minus) Needle Widths*	Resistance (Ohms) Both Senders
2 1/2	0	+0, -1	5
12 1/2	10	± 3/4	21
22 1/2	20	± 1	32
32 1/2	30	± 1 1/2	46
42 1/2	40	± 1 1/2	63
53 1/2	F	± 1 1/2	90
		* See Figure 2	



Needle Deviation
Figure 2

2. Fuel Quantity Gauge Bench Test/Adjustment (Refer to Figure 3.)

   A. Install 5 ohm dummy resistor across sender terminal not to be tested as shown.

   B. Connect resistance decade across sender terminal to be tested as shown.

   C. Connect power supply as shown and adjust to provide 24 to 28 Vdc.

   D. Low End Adjustment

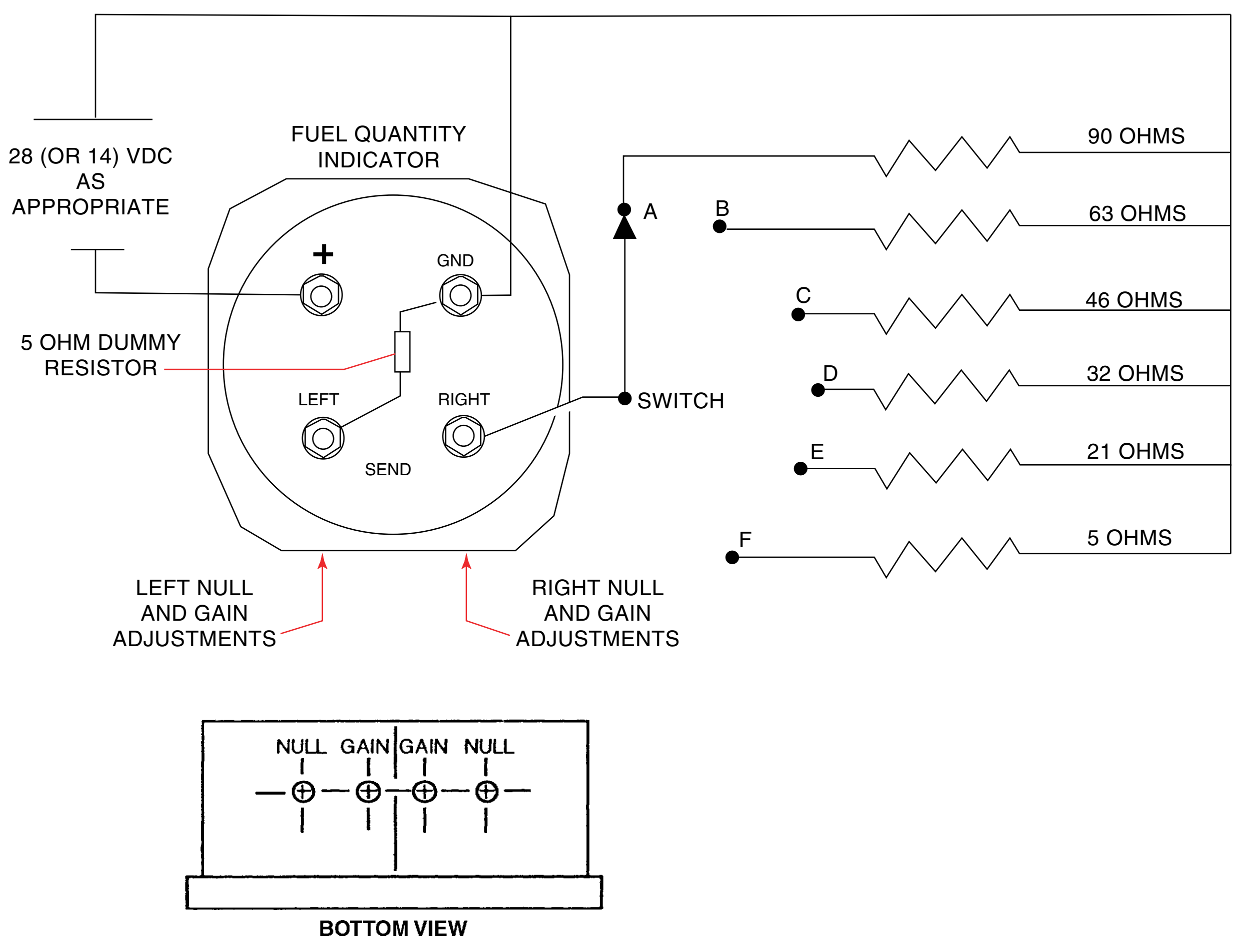
      Select posistion “F” on resistance decade. Verify that instrument needle points to “0”. If not, adjust respective “NULL” potentiometer to center needle on “0” radial.

   E. High End Adjustment

      Select position “A” on resistance decade. Verify that instrument needle points to “F”. If not, adjust respective “GAIN” potentiometer to center needle on “F” radial.

   F. Full Range Check

      After low and high end adjustments have been made, verify that for each resistance value, the gauge indication is as shown in Chart 2.



Fuel Quantity Gauge Bench Test/Adjust Set-Up
Figure 3

CHART 2
FUEL QUANTITY GAUGE BENCH TEST TOLERANCES

Switch Position**	Required Gauge Reading	Tolerance (Plus or Minus) Needle Widths*	Resistance (Ohms)
F	0	+0, -1/2	5
E	10	± 1/2	21
D	20	± 1/2	32
C	30	± 1/2	46
B	40	± 1/2	63
A	F	± 1/2	90
** See Figure 3		* See Figure 2	

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

30

ICE AND RAIN PROTECTION

THIS PAGE INTENTIONALLY BLANK

CHAPTER 30

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 30 - ICE AND RAIN PROTECTION

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

The 6X and 6XT are not approved for operation in icing conditions. Accordingly, the only ice and rain protection provided is a heated pitot-static mast.

The pitot-static heat system is activated by the PITOT HEAT switch located on the center instrument panel just above the engine power quadrant. In addition to the switch, the system incorporates a heated pitot-static head and the 10 amp PITOT HEAT circuit breaker.

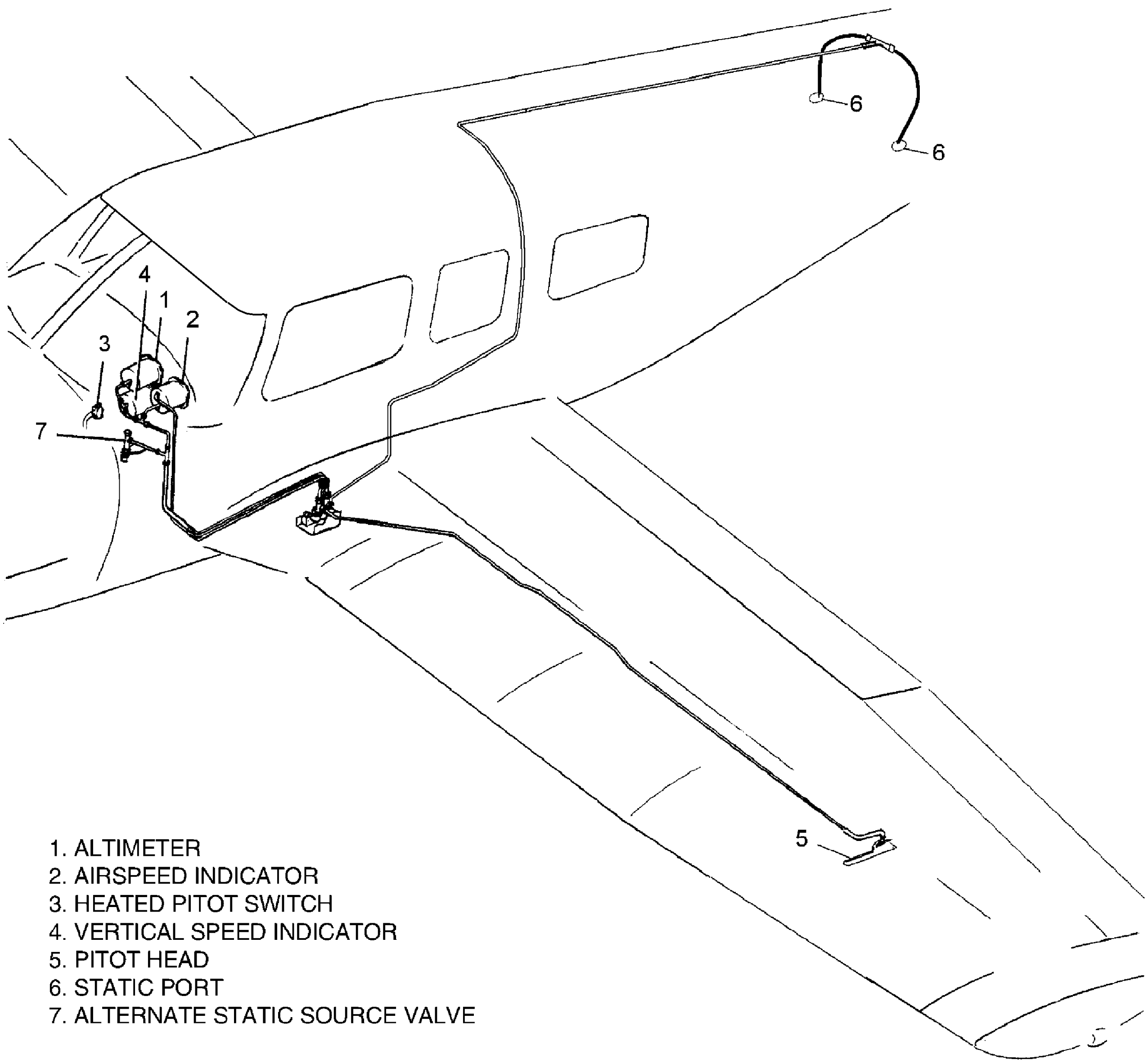
NOTE: Refer to Chapter 91 for pitot heat wiring schematic.

THIS PAGE INTENTIONALLY BLANK

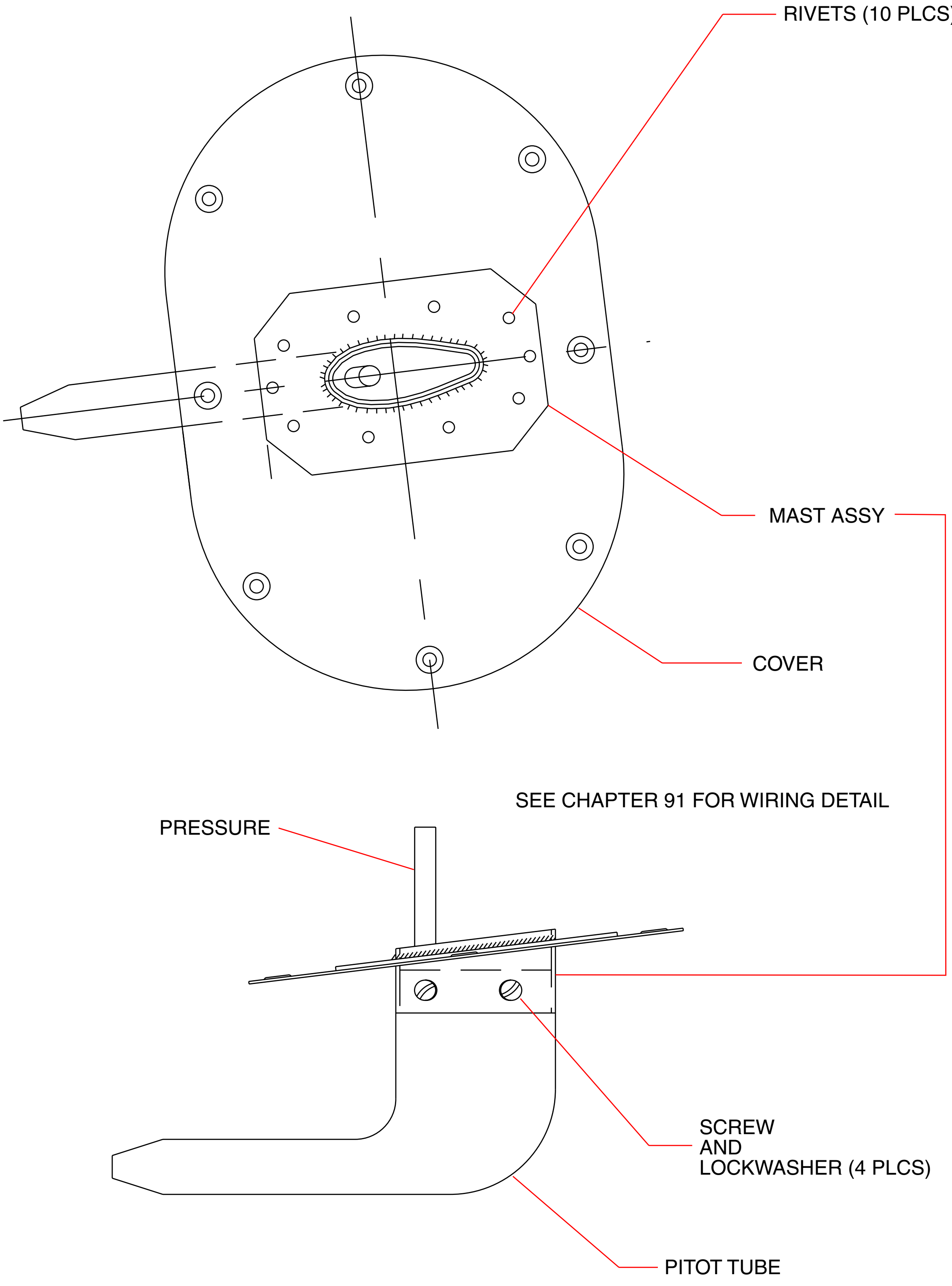
PITOT AND STATIC

The heated pitot-static mast installed in these airplanes is controlled by a single switch in the center of the instrument panel.

The system is quite simple in that it comprises only a heated pitot-static head, an ON-OFF switch, and a circuit breaker to protect the circuit. The pitot-static head is installed on the left wing.



Pitot Static System Installation
Figure 1



Heated Pitot Head
Figure 2

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

31

INDICATING / RECORDING SYSTEMS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 31

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 31 - INDICATING / RECORDING SYSTEMS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

CENTRAL WARNING SYSTEMS

1. Description and Operation

An annunciator panel mounted in the top center of the instrument panel provides centralized warning for the following systems: oil pressure, alternator, bus voltage, vacuum, starter, baggage door, pitot heat, and air conditioning (if installed). Annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly. The applicable system indicators (i.e. - gauges) should be checked and monitored to determine when, or if, any action is required.

Circuit breakers are located on lower right instrument panel.

2. Troubleshooting (See Chart 1.)

When checking the annunciator panel lighting system, the master switch must be on in order for lights to operate. Ensure that the appropriate circuit breaker is pushed ON.

NOTE: Press-to-Test switch tests only the operation of the annunciator light bulbs. It does not test functioning of the warning circuit.

See 33-10-00, for annunciator panel light bulb replacement procedure.

3. Annunciator Panel (See Figure 1.)

The annunciator panel consists of two rows of eight (8) colored lights which warn of malfunctions in various circuits or systems. A malfunction is identified by illumination of an individual warning light. There will typically be eight (8) or nine (9) warning lights (depending on installed options). Power is supplied from bus bar through a 5 amp ANNUN PANEL ciruit breaker.

VACUUM NO.1 INOP warning light is controlled by a vacuum sensor switch located below the forward baggage compartment floor and is attached to a vacuum regulator. The switch will activate when differential pressure from the upper engine-driven vacuum pump (i.e. - NO.1) is below 3.5 in. hg.

VACUUM NO.2 INOP warning light is controlled by a vacuum sensor switch located below the forward baggage compartment floor and is attached to a vacuum regulator. The switch will activate when differential pressure from the lower engine-driven vacuum pump (i.e. - NO.2) is below 3.5 in. hg.

OIL PRESSURE warning light is controlled by an oil pressure switch in oil line, located at bulkhead. Sensor switch will activate when oil pressure is below 35 psi.

ALTERNATOR INOP warning light comes from the alternator winding through a fuse to an alternator out switch which controls the annunciator light.

BAGGAGE DOOR annunciator lights when baggage door is not properly closed

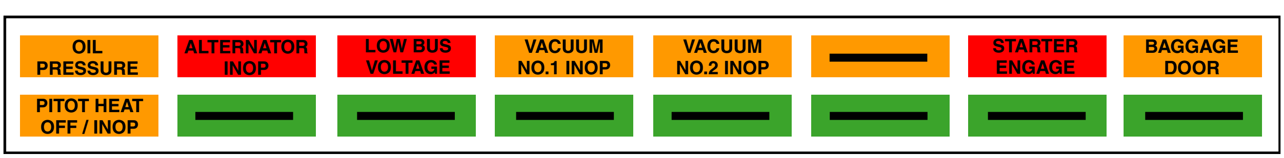
PITOT HEAT OFF/INOP annunciator lights when pitot heat fails or is selected off.

STARTER ENGAGE annunciator lights to indicate when the starter is engaged.

LOW BUS VOLTAGE annunciator lights to indicate low voltage supply to the bus.

AIR/COND DOOR OPEN (optional) annunciator lights when air conditioner door is not properly closed.

The press-to-test button is used to check operation of lights when engine is running. Lights will work when engine is not running with master switch turned on.



Annunciator Panel
Figure 1

CHART 1 (Sheet 1 of 3)
TROUBLESHOOTING ANNUNCIATOR

Trouble	Cause	Remedy
All warning lights fail to operate	Defective/tripped circuit breaker.	Reset/replace 5 amp CB.
	No current from bus.	Check all wire segments, connections, and the receptacle at the left side of the annunciator panel.
All the warning lights fail to extinguish after engine is running	Test switch grounded out.	Check terminals and replace switch if necessary.
OIL PRESSURE warning light fails to operate.	Bulb burned out.	Replace.
	No ground to sensor.	Check all wire segments and connections
	Sensor activates at too low a setting.	Replace.
	Defective sensor.	Replace.
OIL PRESSURE warning light fails to extinguish.	Sensor activates at too high a setting.	Replace sensor.
	Sensor terminals bridged.	Remove material between terminals.
	Defective sensor.	Replace sensor.
VACUUM INOP warning light(s) fails to operate.	Bulb(s) burned out.	Replace bulb(s).
	No ground to sensor.	Check all wire segments and connections.
	Sensor(s) activates at too low a setting.	Replace sensor(s).
	Defective sensor(s).	Replace sensor(s).
VACUUM INOP warning light(s) fails to extinguish.	Sensor(s) activates at too high a setting.	Replace sensor(s).
	Sensor(s) terminals bridged.	Remove material between terminals.
	Defective sensor(s).	Replace sensor(s).
ALTERNATOR INOP warning light fails to operate.	Bulb burned out.	Replace bulb.
	No current from bus to resistor.	Check all wire segments and connections.
	Defective Alt out switch.	Replace switch.

CHART 1 (Sheet 2 of 3)
TROUBLESHOOTING ANNUNCIATOR

Trouble	Cause	Remedy
ALTERNATOR INOP warning light fails to extinguish.	Blown fuse.	Replace 1/4 amp fuse near the alternator.
	No current from the fuse to the Alternator out switch.	Check all wire segments and connections.
Test switch fails to activate warning lights.	Bad switch or connections.	Check wires and replace switch if necessary
ALTERNATOR INOP warning light fails to extinguish, ammeter reads full output.	Diode heat sink shorted to airframe.	Replace teflon insulating washers. Do not tighten screws excessively.
BAGGAGE DOOR light fails to operate.	Bulb burned out.	Replace bulb.
	No ground to switch.	Check all wire segments and connections.
	Defective switch.	Replace switch.
BAGGAGE DOOR light fails to extinguish.	Switch terminals bridged.	Remove material between terminals.
	Defective switch.	Replace switch.
LOW BUS VOLTAGE light fails to operate.	Bulb burned out.	Replace bulb.
	No ground to monitor.	Check wiring to monitor.
	Sensor activates at too low a setting.	Replace sensor.
	Defective sensor.	Replace sensor.
LOW BUS VOLTAGE light fails to extinguish.	1A fuse open.	Replace fuse.
	Sensor activates at too high a setting.	Replace sensor.
	Defective sensor.	Replace sensor.
AIR/COND DOOR OPEN light fails to operate.	Bulb burned out.	Replace bulb.
	No current to sensor.	Check all wire segments and connections.
	Sensor activates at too low a setting.	Replace sensor.
	Defective sensor.	Replace sensor.

CHART 1 (Sheet 3 of 3)
TROUBLESHOOTING ANNUNCIATOR

Trouble	Cause	Remedy
AIR/COND DOOR OPEN light fails to extinguish.	Sensor terminals bridged.	Remove material between terminals.
	Sensor activates at too high a setting.	Replace sensor.
	Defective sensor.	Replace sensor.
STARTER ENGAGE light fails to operate.	Bulb burned out.	Replace bulb.
	5A fuse open.	Replace fuse.
	Sensor activates at too low a setting.	Replace sensor.
	Defective sensor.	Replace sensor.
STARTER ENGAGE light fails to extinguish.	Starter contactor terminal shorted.	Replace contactor.
	Defective annunciator.	Replace annunciator.
PITOT HEAT OFF/INOP light fails to operate.	Bulb burned out.	Replace bulb.
	No current to sensor.	Check all wire segments and connections.
	Defective sensor.	Replace sensor.
PITOT HEAT OFF/INOP light fails to extinguish.	Heat switch fails to open.	Replace switch.
	Sensor activates at too high a setting.	Replace sensor.
	Defective sensor.	Replace sensor.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

32

LANDING GEAR

THIS PAGE INTENTIONALLY BLANK

CHAPTER 32

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 32 - LANDING GEAR

TABLE OF CONTENTS

CHAPTER 32 - LANDING GEAR

TABLE OF CONTENTS

GENERAL.

1. Description

The landing gear is a fixed tricycle type, fitted with 6:00 x 6 main and nose gear wheels. The landing gear struts are of the air-oil type. The nose gear, steerable through a wide arc, enables a short turning radius in each direction. To aid in nose wheel and rudder centering and to provide rudder trim there is a spring device attached to the rudder pedal torque tube assembly. A shimmy dampener is also incorporated in the nose wheel steering mechanism.

The two main wheels are equipped with a single disc hydraulic brake assembly which is actuated by a hand lever connected to a cylinder located below and behind the center of the instrument panel, or by individual cylinders attached to each rudder pedal. The hand lever also doubles as a parking brake and may be operated by pulling back on the handle and depressing the knob attached to the top of the handle. To release the parking brake, pull back on the brake handle to disengage the catch mechanism: then allow the handle to swing, forward. A brake fluid reservoir is installed on the left forward face of the engine firewall.

2. Troubleshooting

Troubles peculiar to the landing gear are listed in Chart 1, along with their probable causes and suggested remedies. When troubleshooting the landing gear system, it may be necessary to place the airplane on jacks. If so, see .

CHART 1 (Sheet 1 of 2)
TROUBLESHOOTING LANDING GEAR

Trouble	Cause	Remedy
Nose landing gear shimmies during fast taxi, take-off, or landing.	Internal wear in shimmy dampener.	Replace shimmy dampener.
	Shimmy dampener or bracket loose at mounting.	Replace necessary parts and bolts.
	Tire out of balance.	Check balance and replace tire if necessary.
	Worn or loose wheel bearings.	Replace and/or adjust wheel bearings.
	Worn torque link bolts and/or bushings.	Replace bolts and/or bushings.
	Improper nose wheel fairing.	Replace with proper fairing.
Excessive or uneven wear on nose tire.	Incorrect operating pressure.	Inflate tire to correct pressure.
	Wear resulting from shimmy.	See “nose landing gear shimmies .....,” above.
Nose gear fails to steer properly.	Oleo cylinder binding in strut housing.	Lubricate strut housing. (See Lubrication Chart, 12-20-00.)
		Cylinder and/or strut housing bushings damaged.
	One brake dragging.	Determine cause and correct.
	Steering bellcrank loose on attachment plate.	Readjust and tighten.
	Steering bellcrank bearing and/or bolt worn.	Replace bearing and/or bolt.
	Shimmy dampener galling or bending.	Replace.
Main landing gear shimmies during fast taxi, take-off, or landing.	Tire out of balance.	Check balance and replace tire if necessary.
	Worn or loose wheel bearings.	Replace and/or adjust wheel bearings.
	Worn torque link bolts and/or bushings.	Replace bolts and/or bushings.

CHART 1 (Sheet 2 of 2)
TROUBLESHOOTING LANDING GEAR

Trouble	Cause	Remedy
Excessive or uneven wear on main tires.	Incorrect operating pressure.	Inflate tire to correct pressure.
	Wheel out of alignment (toe in or out).	Check wheel alignment.
Strut bottoms on normal landing or taxiing on rough ground.	Insufficient air and/or fluid in strut.	Service strut with air and/or fluid.
	Defective internal parts in strut.	Replace defective parts.

GRIDS 3E22 THRU 3E24
INTENTIONALLY BLANK

MAIN GEAR

1. Main Gear Oleo (See Figure 1.)

A. Disassembly

The main gear axle and piston tube assembly may be removed from the cylinder housing with the gear removed from or installed on the airplane. On some airplanes the metering components of the gear that are located in the top of the housing may be removed, but only with the gear removed from the airplane. (See Main Gear Assembly - Removal, below.)

(1) Place the airplane on jacks. (Refer to 7-10-00.)

(2) Place a drip pan under the main gear to catch spillage.

(3) The gear axle and piston tube assembly may be removed by the following procedure:

(a) Remove the air from the oleo chamber by depressing the air valve core pin found in the inspection hole on top of the wing. After the pressure in the oleo chamber has diminished, remove the valve core pin, attach a small hose to the air valve, and drain the fluid by slowly compressing the piston tube. If it is desirable to extract more fluid from the chamber, remove the filler plug, insert a siphon hose and drain fluid from the upper area of the housing.

(b) Disconnect the flexible brake line at the elbow on the brake assembly.

(c) Disconnect the torque link assembly by removing any one of the three cotter pins, nuts,washers and bolts. Note arrangement of the components for reinstallation. Carefully slide the piston tube from the cylinder housing.

(d) The scraper ring located inside the lower end of the cylinder housing may be removed by first removing the retainer ring, spacer ring and then the scraper ring.

(e) The O-ring seal located just before the scraper ring may be removed by using a curved wire or spoon shaped tool and inserting it under the ring.

(4) The cylinder head and the orifice assembly, may be removed by the following procedure:

(a) Cut safety wire and remove the bolts that secure the cylinder head in the top of the housing. Remove the assembly from the housing.

(b) Lubricate and install an O-ring on the cylinder head assembly.

(c) The orifice assembly may be removed from within the housing by rotating it counterclockwise out of the housing with the use of a .50x .125 stud type spanner wrench. (Refer to Chapter 95.) Do not remove orifice unless it necessitates replacement.

B. Cleaning, Inspection, and Repair

(1) Clean all parts with a suitable dry type cleaning solvent.

(2) Inspect the landing gear oleo components for the following:

(a) Bearing surfaces of housing for excess wear, corrosion, scratches and overall damage.

(b) Retaining ring for cracks, burrs, etc.

(c) Cylinder tube for corrosion, scratches, nicks, excessive wear and misalignment.

(d) Air valve for operation and general condition.

(e) Orifice plate for hole restriction.

(3) Repair of the oleo is limited to smoothing out minor scratches, nicks and dents, and replacement of parts.

C. Assembly

(1) Install the orifice assembly. if removed. by the following procedure:

(a) Lubricate with hydraulic fluid (MIL-H-5606) and install an O-ring in the annular slot in the metering orifice.

(b) Insert the orifice through the opening in the top of the gear housing and turn it into the threaded hole web. Tighten the orifice with the use of a stud type spanner wrench.

(c) Lubricate and install an O-ring or apply a thin layer of Permatex Forma-Gasket No. 6 Sealant, directly underneath the flange of the cylinder head.

(d) Insert the tube of the metering assembly through the opening in the top of the housing and into the orifice. Use caution not to cut or dislodge the O-ring slot in the orifice.

(e) Secure the metering tube assembly with bolts and safety with MS20995-C32 wire.

(2) Assemble the components of the piston tube on the tube by placing, in order, the retainer ring. spacer ring and scraper ring. Insert an O-ring into the annular slot in the bottom of the housing.

(3) Lubricate the wall of the piston and carefully insert it into the housing being careful not to damage or dislocate the O-ring in the housing.

(4) Ascertain that the bushings are installed in the upper and lower torque links and then install links. At cable end of each link. install with the use of brake line bracket. bearing washers. bolt. washer. nut and cotter pin. Do not over tighten causing binding or damage to the link. At the connection point of the upper and lower links. attach with the use of brake line brackets. spacer washers. grease bolt. washers, nut and cotter pins. Install washers (AN960-816L) under the head of the bolt to allow a firm sliding fit between the two links.

(5) Slide the scraper and spacer rings into place and secure with the retainer ring in the annular slot in the bottom of the housing.

(6) Install the hydraulic brake line.

(7) If removed, install the landing gear. (See Main Gear Assembly - Installation, below.)

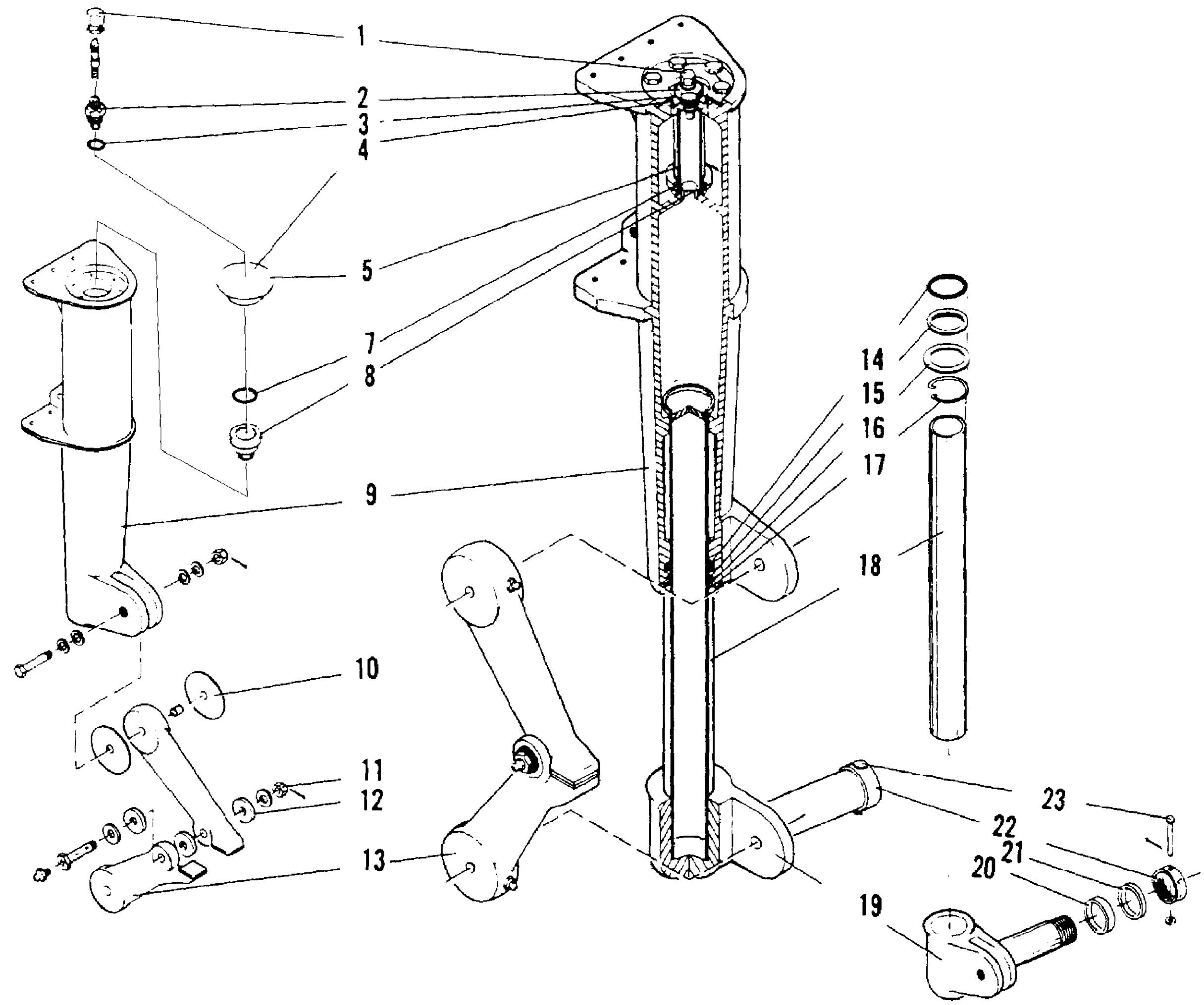
(8) Service-the oleo strut as given in Servicing Oleo Struts, 12-10-00.

(9) Actuate the gear several times by hand to be certain it operates freely.

NOTE: Links should be loose enough to allow free action of the gear, but also resist side play. For lubrication of links, refer to 12-20-00.

(10) Remove the drip pan and slowly lower the airplane from the jacks.

(11) If necessary, bleed brakes. (See Bleeding Brakes, 32-40-00.)



1. CAP, VALVE
2. PLUG, FILLER
3. O-RING
4. HEAD CYLINDER
5. O-RING
6. DELETED
7. O-RING
8. ORIFICE ASSEMBLY
9. STRUT HOUSING
10. WASHER
11. NUT
12. WASHER
13. TORQUE LINKS
14. O-RING OR QUAD RING
15. RING, SCRAPER
16. RING, SPACER
17. RING, RETAINER
18. TUBE, PISTON
19. AXLE STUB
20. SPACER
21. SPACER
22. NUT, WHEEL RETAINER
23. PIN, CLEVIS

Main Gear Oleo Strut
Figure 1

2. Main Landing Gear (See Figure 2.)

A. Removal

(1) Place the airplane on jacks. (Refer to 7-10-00.)

(2) Place a drip pan under the main gear to catch spillage.

(3) If desired, remove the air from the oleo chamber by depressing the air valve core pin found in the inspection hole on top of the wing. After the pressure in the oleo chamber has diminished, remove the valve core pin and attach a small hose to the air valve and drain the fluid by slowly compressing the piston tube. If it is desirable to extract more fluid from the chamber, remove the filler plug, insert the siphon hose and drain fluid from the upper area of the housing.

(4) Remove the fairing from around the cylinder housing.

(5) Unhook the hydraulic brake line inside the wing assembly. This is accessible through the access plate. Cap the line by use of a threaded cap or wrapping with plastic.

(6) Remove the top four bolts by holding them with a slotted screwdriver and turning the nut with the appropriate wrench. Remove the remaining six by use of a wrench. Carefully remove the gear assembly from the wing.

B. Cleaning, Inspection, and Repair

(1) Clean all parts with a suitable dry type cleaning solvent.

(2) Inspect the gear components for excessive wear, corrosion and damage. Check the cylinder housing and torque links for cracks, nicks and misalignment.

(3) Repair of the landing gear is limited to reconditioning of parts, replacement of parts. smoothing out minor nicks and scratches and repainting areas where paint has chipped or peeled.

C. Installation

(1) Install the main landing gear assembly on the wing as follows:

(a) Position the gear up in the wing through the access opening and secure with bolts, washers, and nuts.

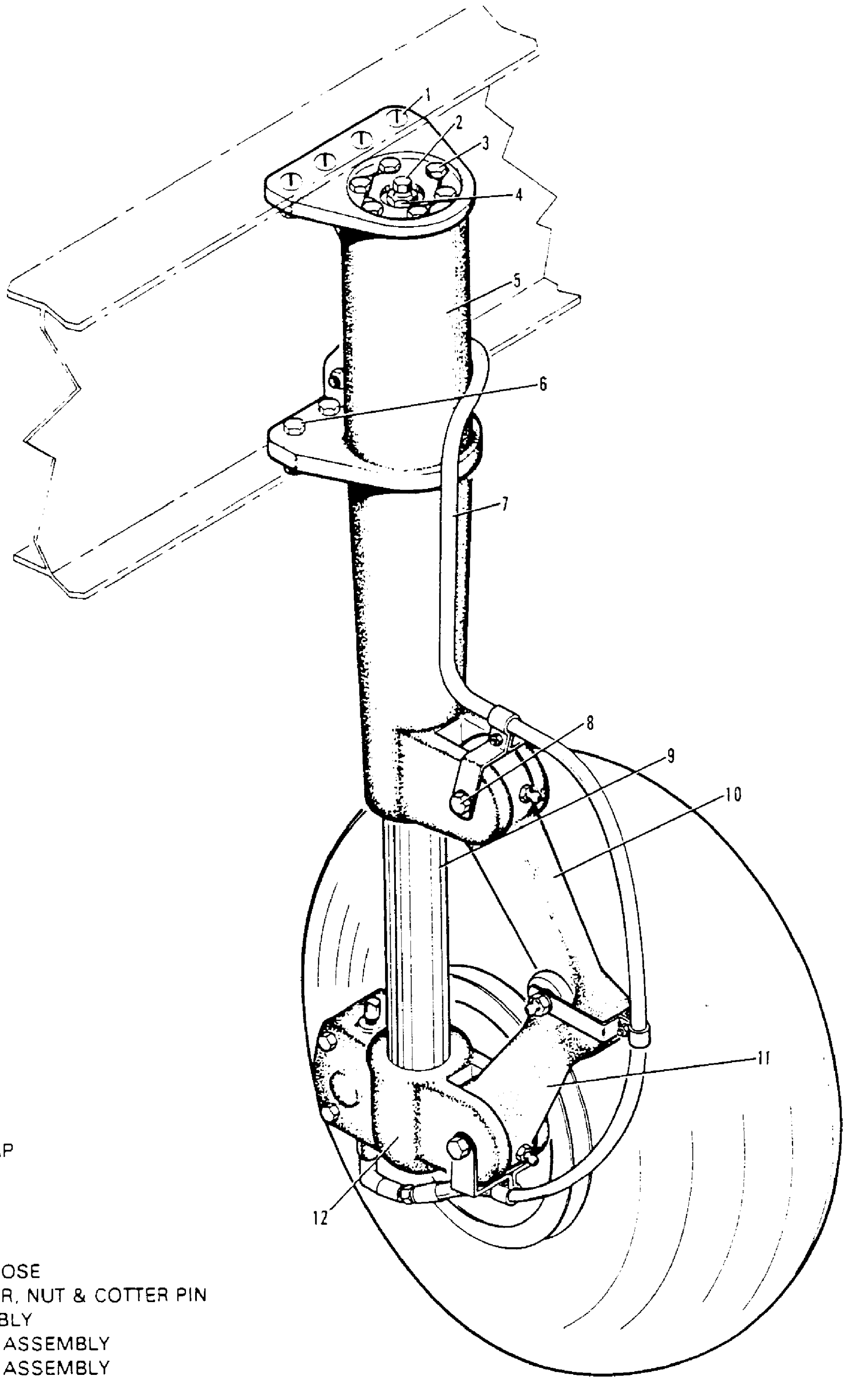
(b) Reconnect the brake line at the point of disconnection.

(2) Service the oleo strut. (Refer to 12-10-00.)

(3) Service the brake system. (Refer to 12-10-00.)

(4) Install the access plate to the bottom of the wing and the oleo housing fairing to the gear.

(5) Slide the drip pan from under the gear and remove the airplane from the jacks.



1. SCREW
2. AIR VALVE CAP
3. BOLT
4. AIR VALVE
5. CYLINDER
6. BOLT
7. BRAKE LINE HOSE
8. BOLT, WASHER, NUT & COTTER PIN
9. OLEO ASSEMBLY
10. TORQUE LINK ASSEMBLY
11. TORQUE LINK ASSEMBLY
12. STUB AXLE

Main Gear Installation
Figure 2

3. Main Gear Strut and Wheel Fairings (See Figure 3.)

A. Removal

(1) Wheel Fairing

(a) Remove the bolt and washer securing the wheel fairing to the wheel fairing support assembly.

(b) Remove the two screws on the top of the wheel fairing, outboard of the landing gear fairing.

(c) Loosen the eleven 1/4 turn fasteners securing the wheel fairing shell to the wheel fairing panel and remove the shell.

(d) If removal of the wheel fairing panel is desired, remove the wheel fairing panel attachment bolt. Remove the panel.

(2) Strut Fairing

(a) Remove wheel fairing as described above.

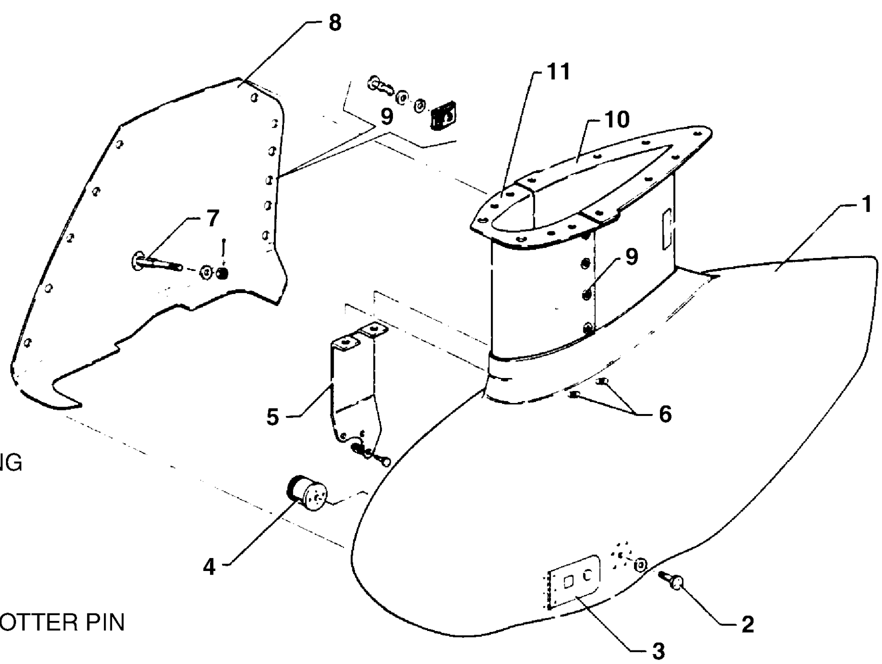
(b) Loosen the eight (four inboard, four outboard) 1/4 turn fasteners which secure the forward fairing half to the aft fairing half.

(c) Remove the six screws and washers securing the forward fairing half to the wing. Remove the forward fairing half.

(d) Remove the seven screws and washers securing the aft fairing half to the wing. Remove the aft fairing half.

B. Installation

Reverse the removal procedure.



1. SHELL, MAIN WHEEL FAIRING
2. BOLT AND WASHER
3. ACCESS DOOR
4. SUPPORT ASSEMBLY
5. BRACKET
6. SCREW AND WASHER
7. BOLT, WASHER, NUT AND COTTER PIN
8. ACCESS PANEL
9. 1/4 TURN FASTENERS
10. FAIRING, MAIN STRUT, AFT
11. FAIRING, MAIN STRUT, FORWARD

Main Gear Strut and Wheel Fairings
Figure 3

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

NOSE GEAR

1. Nose Gear Oleo (See Figure 1.)

   A. Disassembly

   The nose gear oleo strut assembly may be removed and disassembled from the strut housing with the gear removed from or installed on the airplane.

   (1) Remove the lower engine cowling. (Refer to 71-10-00.)

   (2) Place airplane on jacks. (Refer to 7-10-00.)

   (3) Place a drip pan under the nose gear to catch spillage.

   (4) To remove air from the strut, depress the air valve core pin found at the top of the strut assembly. After the pressure in the strut chamber has diminished, remove the valve core pin, and attach a small hose to the air valve, and drain the fluid by slowly compressing the piston tube. If it is desirable to extract more fluid from the strut chamber, remove the filler plug, insert the siphon hose and drain fluid from the upper area of the housing.

   (5) To remove the strut assembly from the strut housing, cut the safety wire at the top of the housing that secures the steering horn attaching bolt to the tube retainer nut. Then remove the steering horn attaching bolts thus relieving the steering horn from the top of the strut housing.

   (6) Loosen the strut assembly retainer nut that secures the strut assembly in the strut housing. At the same time, slide the strut assembly out through the bottom of the strut housing. Remove the nut and washer from the top of the strut housing after the assembly is removed.

   NOTE: The strut assembly may fit tight inside of the housing. It may be necessary to tap the top of the fork with a plastic mallet.

   (7) If desired, remove the top and bottom bearing from the strut housing. The bearings are compressed slightly into place, and light tapping may be needed to free them.

   (8) To remove the piston tube and fork assembly from the cylinder, proceed as follows:

   (a) Separate the upper and lower torque links by removing the connecting nut, washer and bolt.

   (b) Compress the piston tube and fork assembly slightly and remove the retainer ring from the annular slot in the bottom of the cylinder tube. Then remove piston tube and fork assembly by sliding out from the bottom of the cylinder tube.

   (9) To remove the bearing assembly from the piston tube, release the snap ring from the top of the piston tube and slide bearing assembly off the end. If desired, carefully remove the wiper strip, back-up washer and quad ring or O-ring from the inside of the bearing sleeve, and also the O-ring gasket from the outside of the bearing sleeve.

   (10) To remove the piston tube plug with O-ring located in the lower end of the tube, the following procedure may be used:

   (a) Remove the nose wheel from the fork. (Refer to Nose Wheel - Removal, 32-40-00.)

   (b) Loosen and remove the bolt, washer and nut that extends through the piston tube and block assembly.

   (c) Push the plug through the top of the piston tube by use of a rod inserted through the bottom of the tube.

B. Cleaning, Inspection, and Repair

(1) Clean all parts with a suitable dry type cleaning solvent.

(2) Inspect the landing gear oleo assembly for the following:

(a) Cylinder tube assembly for corrosion, scratches, nicks and excessive wear.

(b) Lock rings for cracks, burrs. wear.

(c) Fork assembly for corrosion. scratches, nicks. and misalignment.

(d) Link assembly for elongated holes, cracks, corrosion, scratches, nicks and straightness.

(e) General condition of air valve.

(3) Repair of the oleo is limited to smoothing out minor scratches, nicks and dents and replacement of parts.

C. Oil Orifice Retainer Ring Installation

(1) With the piston tube and fork removed from the cylinder, ascertain that all traces of the old retainer ring are removed from the metering tube.

(2) A tool can be fabricated to simplify the installation of the new retainer ring. (Refer to 95-00-00.)

(3) With the use of the fabricated tool, position the new retainer ring on the end of the tool with the locating stud.

(4) Insert the tool into the cylinder, with the centering stud positioned into the hole in the base of the metering tube.

(5) Hold the tool tightly against the metering tube and slide the sleeve of the tool towards the metering tube. This will move the new retainer ring over the end of the metering tube and position itself into the groove of the metering tube.

D. Assembly

(1) Ascertain that all parts are cleaned and inspected.

(2) To install the piston tube plug, proceed as follows:

(a) Lubricate the tube plug and O-ring with hydraulic fluid (MIL-H-5606) and install the O-ring on the plug.

(b) Lubricate the inside wall of the piston tube, and insert the plug into the top of the tube, pushing it to the fork end.

(c) Align the bolt holes of the fork, tube and plug: install the bolt, washer and nut.

(3) Carefully install in the bearing sleeve the quad ring, back-up washer and the wiper strip. Slide the O-ring in place on the outside of the sleeve.

(4) Lubricate the bearing assembly and carefully install it on the piston tube.

(5) Position the snap ring on the upper end of the piston tube.

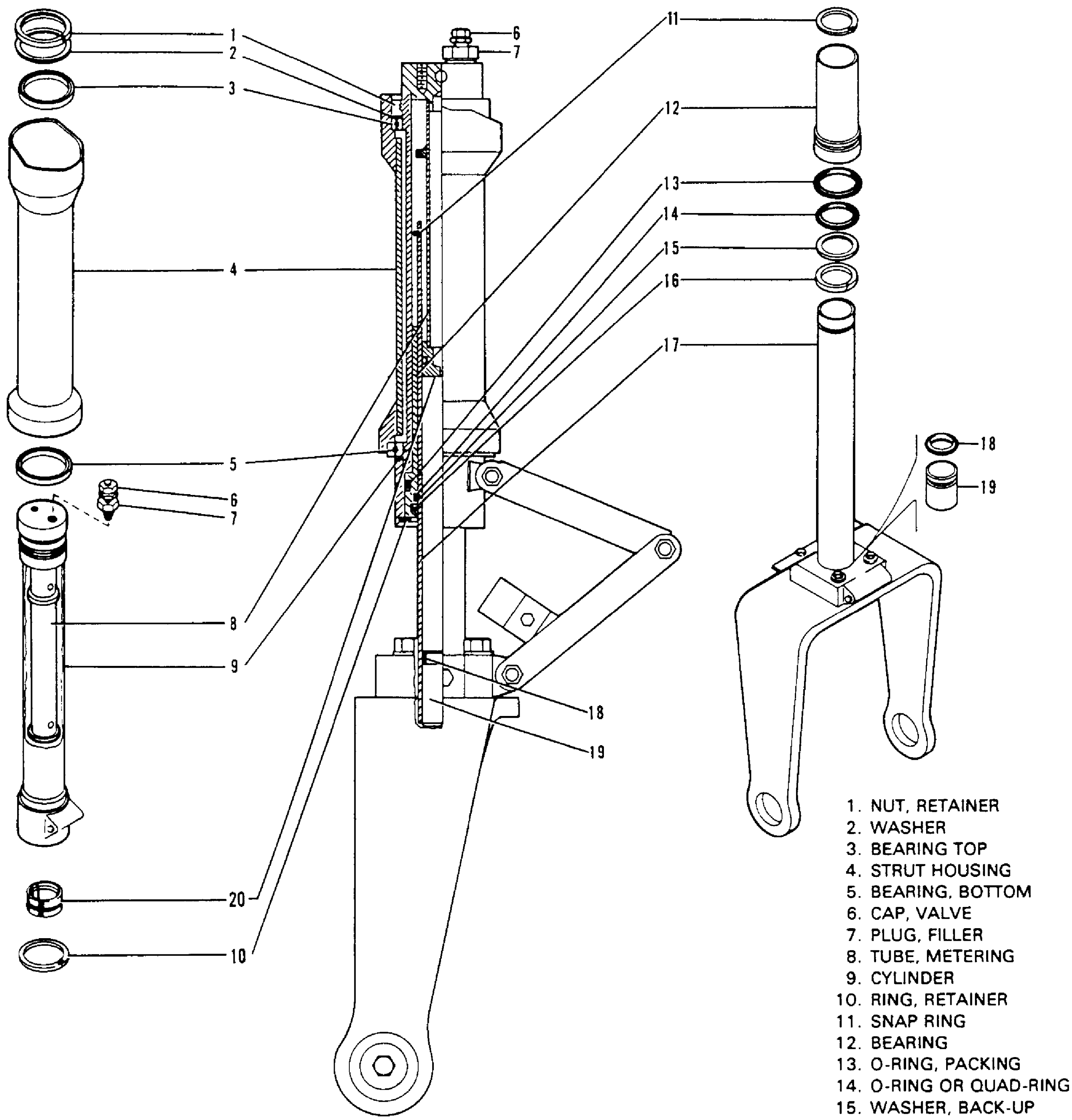
(6) Insert the piston tube with bearing assembly in the cylinder tube. Secure it with the retainer ring in the annular slot at the bottom of the tube.

(7) Connect the torque links on the tube and fork securing them with a bolt. washer and nut. Tighten the nuts only tight enough to retard side play, but still allowing the links to rotate freely.

(8) Ascertain that the upper and lower bearings are installed in the strut housing. Bearings are a press fit with the grooves in the inner and outer races in the up position.

(9) Position washer and strut assembly retainer nut on top of the strut housing. Insert the strut assembly up through the washer until it contacts the nut. Tighten the nut to a snug fit.

(10) To install the steering horn assembly, insert the hex bolt through the side of the horn and top of the strut assembly. When it protrudes through the other side of the steering horn, install the washer and nut.



1. NUT, RETAINER
2. WASHER
3. BEARING TOP
4. STRUT HOUSING
5. BEARING, BOTTOM
6. CAP, VALVE
7. PLUG, FILLER
8. TUBE, METERING
9. CYLINDER
10. RING, RETAINER
11. SNAP RING
12. BEARING
13. O-RING, PACKING
14. O-RING OR QUAD-RING
15. WASHER, BACK-UP
16. WIPER STRIP
17. TUBE, PISTON
18. O-RING
19. PLUG, PISTON TUBE
20. PLUG, ORIFICE

Nose Gear Oleo Strut
Figure 1

(11) Install the steering horn attaching bolt through the top of the horn into the strut assembly. Do not tighten bolt at this time. If a space appears between the steering horn plate and the top of the strut assembly, it will then be necessary to install spacer washer(s), (AN960-4l6L), between the horn and strut. Then tighten the bolt and safety the bolt to the strut assembly retainer nut with MS20995C40 wire.

(12) Compress and extend the strut several times to ascertain that the strut will operate freely. The weight of the gear wheel and fork should allow the strut to extend.

(13) Service the oleo strut with fluid and air. (Refer to Chapter 12.)

(14) Check the gear for alignment. (Refer to Alignment of Nose Landing Gear.)

2. Nose Landing Gear (See Figure 2.)

The nose gear strut housing is an integral part of the engine mount.

A. Removal

(1) Remove the engine cowling. (Refer to Chapter 71.)

(2) Remove the propeller. (Refer to Chapter 61.)

(3) Place the airplane on jacks. (Refer to Chapter 7.)

(4) Remove the engine. (Refer to Chapter 71.)

(5) Disconnect the two steering rods at the nose gear horn assembly by removing the cotter pins, nuts, washers and bolts.

(6) Disconnect the oil lines, vacuum lines, fuel lines, hoses and wires which are secured to the mount with clamps and Koroseal lacing. Mark all wires and lines for identification and reinstallation.

(7) Remove the nose gear and engine mount by removing the five bolts which attach the mount to the firewall.

B. Cleaning, Inspection, and Repair

(1) Clean all parts with a suitable dry type cleaning solvent.

(2) Inspect the nose gear assembly for the following:

(a) Bolts, bearings and bushings for excess wear, corrosion and damage.

(b) Strut housing and torque links for cracks, bends or misalignment.

(3) The shimmy dampener requires no service other than routine inspection. In case of damage or malfunction, the dampener should be replaced rather than repaired.

(4) Repair to the landing gear is limited to reconditioning of parts, such as replacing bearing and bushings, smoothing out minor nicks and scratches, repainting of areas where paint has chipped or peeled and replacement of parts.

C. Installation

(1) Install the nose gear and engine mount assembly to the firewall with bolts, washers and nuts. Torque nuts as specified in Torque Table, Chapter 91.

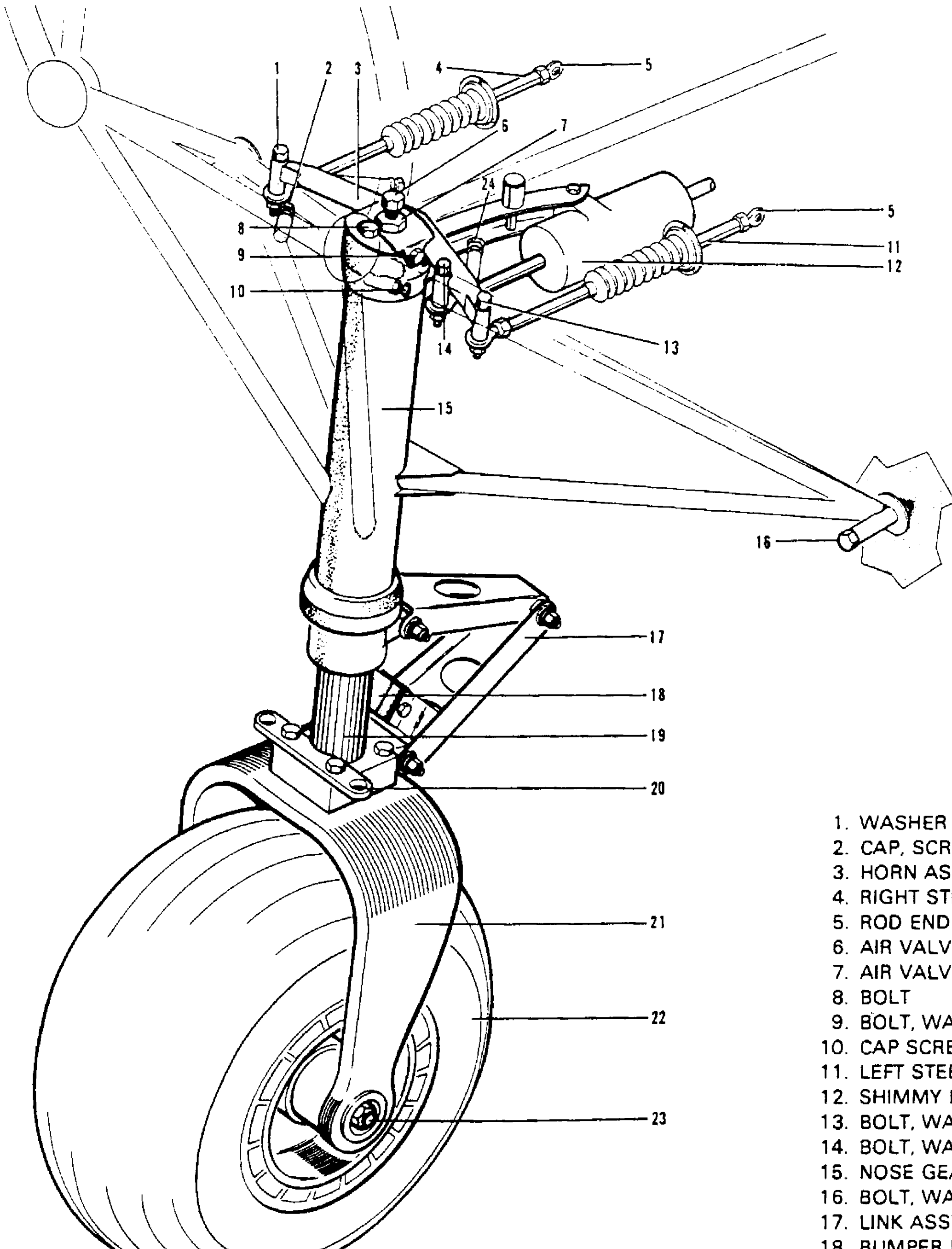
(2) Attach the two steering rods to the nose gear steering horn with bolts, washers and nuts.

(3) If removed, connect the shimmy dampener to the steering horn with bolts, washers and nuts. A spacer bushing and cotter pin are required at the body attachment point.

(4) Install the engine and connect controls. (Refer to Chapter 71.)

(5) Attach hoses, wires and cables to engine mount tubing, securing with clamps and Koroseal lacing where required.

(6) Check the alignment of the nose gear. (Refer to Alignment of Nose Gear.)



1. WASHER & NUT
2. CAP, SCREW
3. HORN ASSY.
4. RIGHT STEERING CONTROL ROD
5. ROD END BEARING
6. AIR VALVE CAP
7. AIR VALVE
8. BOLT
9. BOLT, WASHER & NUT
10. CAP SCREW
11. LEFT STEERING CONTROL ROD
12. SHIMMY DAMPENER
13. BOLT, WASHER & NUT
14. BOLT, WASHER & NUT
15. NOSE GEAR STRUT ASSY.
16. BOLT, WASHER & NUT
17. LINK ASSY.
18. BUMPER BLOCK
19. PISTON TUBE ASSY.
20. TOW BAR BRACKET
21. FORK ASSY.
22. TIRE
23. AXLE ROD ASSY.
24. STEERING STOP

Nose Gear Installation
Figure 2

(7) Remove the airplane from the jacks.

(8) Install the propeller (refer to Chapter 61) and engine cowling. (Refer to Chapter 71.)

D. Alignment

(1) Place the airplane on a smooth level floor that will accommodate the striking of a chalk line.

(2) Place the airplane on jacks. (Refer to 7-10-00.)

(3) Level the airplane laterally and longitudinally. (Refer to 8-20-00.)

(4) From the center of the tail skid, extend a plumb bob and mark the contact point on the floor.

(5) Extend a chalk line from the mark on the floor below the tail skid to a point approximately three feet forward of the nose wheel. Allow the line to pass under the wheel at the center line of the tire. Snap the chalk line.

(6) Ascertain that the rudder is properly rigged and the rudder cable tension is correct. (Refer to 27-20-00.)

(7) Clamp the rudder pedals to align in a lateral position. Ensure that rudder pedals are in a neutral position. (Refer to Figures 3 and 4.)

(8) Ascertain that the nose wheel is in alignment with the longitudinal axis of the airplane or chalk line.

(9) Install the steering assemblies between the steering horn and rudder pedals without any load on the rods. Adjust the rod ends to obtain this no load condition, and connect the rods to the steering horn.

NOTE: Check that the rod ends have sufficient thread engagement, by use of the check holes in the rods or a minimum of three-eighths of an inch thread engagement.

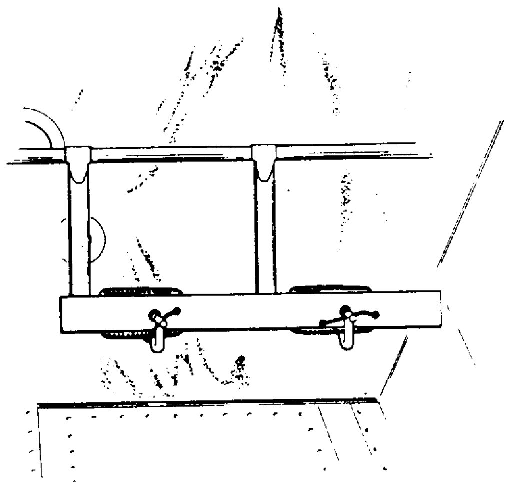
(10) Ascertain that the rudder pedal stops are adjusted in accordance with instructions given in 27-20-00.

(11) To check the nose gear steering for its maximum right and left travel, mark on each side of the nose wheel an angle line from the center line and wheel pivot point. (Refer to Chart 1 for nose wheel turning angle.) Turn the wheel to its maximum travel in both directions to check for allowable travel. Should travel be exceeded in one direction and not enough in the other direction, check for possible damage to the gear fork or torque links.

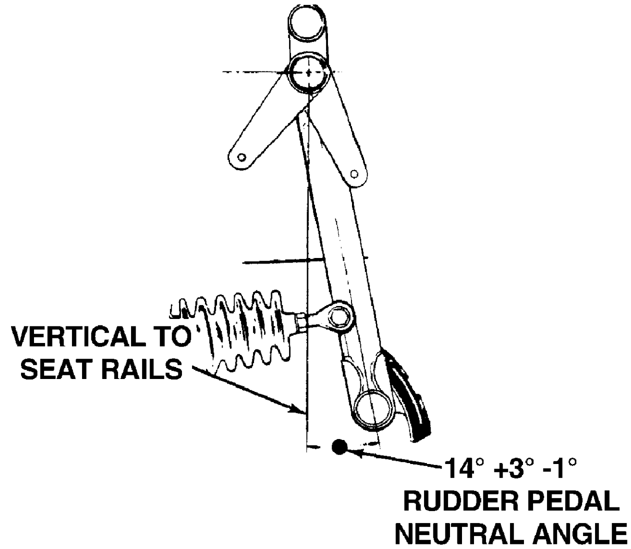
(12) When the wheel is turned to its extreme right or left travel, there should be .06 to .12 of an inch clearance between the nose wheel steering stops. This is due to the stops on the rudder making contact ahead of the nose gear stops. Prior to checking and/or making this adjustment, ascertain that the rudder travel is correct. (Refer to 27-20-00.)

(13) Adjust the shimmy dampener by turning the nose wheel against its stops and adjusting the rod end of the dampener for adequate travel to both directions.

(14) Remove the aircraft from jacks.



Clamping Rudder Pedals
Figure 3



Rudder Pedals at Neutral
Figure 4

CHART 1
NOSE GEAR ALIGNMENT TOLERANCES

Rudder Pedal Neutral Angle (Aft of Vertical)	14 degrees	+ 3° - 1°
Nose Wheel Travel	29 degrees left 29 degrees right	minimum minimum

3. Nose Gear Wheel Fairing See Figure 5.)

A. Removal

(1) Remove the four bolts (two on each side) securing the nose gear fairing to the strut assembly.

(2) Remove the screws securing the forward and aft fairing cover assemblies to the nose gear fairing.

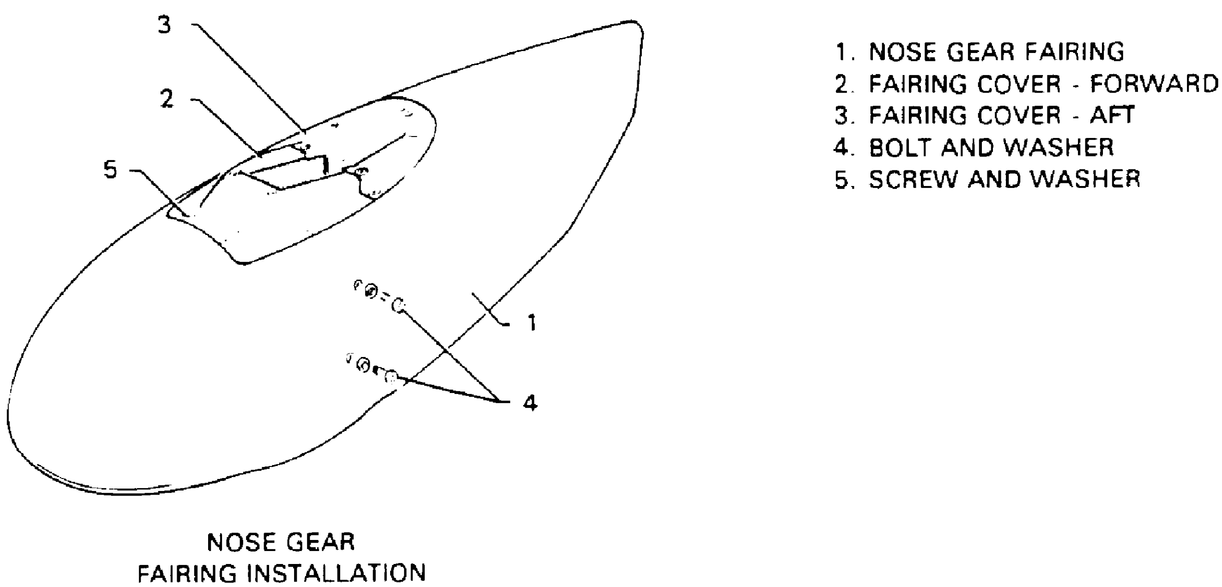
(3 Slide the fairing up on the strut assembly to allow access to the nose wheel assembly.

(4) Remove nose wheel as described in 32-40-00.

(5) Turn the fairing sideways and slide down and off of fork assembly.

B. Installation

Reverse the removal procedure.



Nose Gear Strut and Wheel Fairings
Figure 5

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

WHEELS AND BRAKES

1. Wheels

A. Main Wheel Assembly (See Figure 1.)

(1) Removal and Disassembly

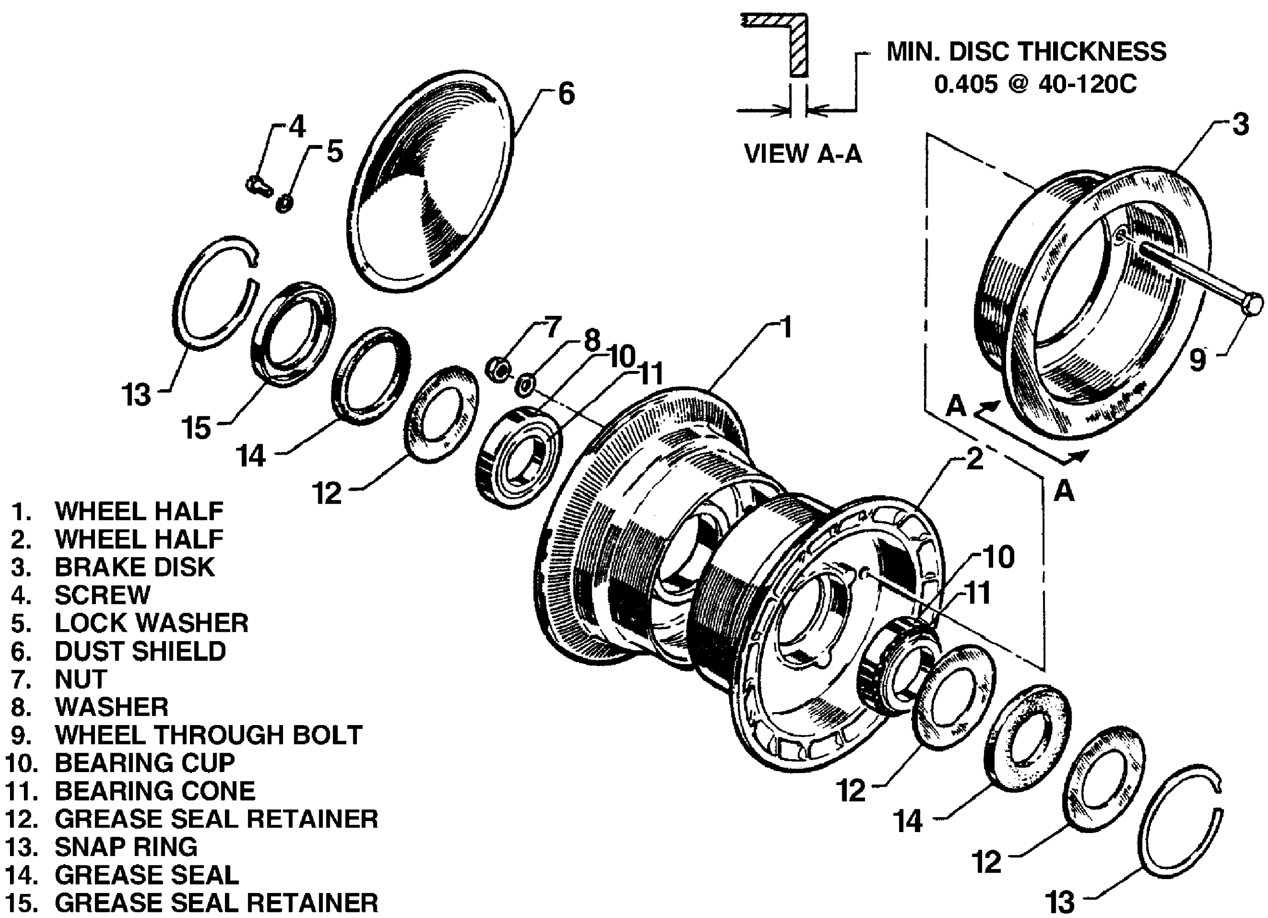
(a) Place airplane on jacks. (Refer to Jacking, 7-10-00.)

(b) To remove main wheel, remove cap bolts that join brake cylinder housing and lining back plate assemblies. Remove back plate from between brake disk and wheel.

(c) Remove dust cover, cotter pin and flat head pin that safeties wheel nut, and slide wheel from axle.

(d) Wheel halves may be separated by first deflating tire. With tire sufficiently deflated, remove wheel through bolts. Pull wheel halves from tire by removing inner half from tire first, and then outer half.

(e) Wheel bearing assemblies may be removed from each wheel half by first removing retainer snap rings that secure grease seal retainers, and then retainers, grease seals and bearing cone. Bearing cups should not be removed only for replacement. See Repair of Nose and Main Wheel Assemblies for bearing cup replacement instructions.



Main Wheel Assembly
Figure 1

(2) Inspection

Inspect brake disk for cracks, excessive wear or scoring, rust, corrosion and warpage. Remove rust and blend out nicks, using fine 400 grit sandpaper. Replace disk if cracked or when disk is worn below minimum thickness. (Refer to Cleaning, Inspection and Repair of Wheel Brake Assembly.) In addition also perform same inspection for nose wheel in Inspection of Nose Wheel Assembly.

(3) Assembly and Installation

(a) Check that bearing cup for each wheel is properly installed. Install tire with tube and wheel half with valve stem hole. Ascertain that index mark is aligned with index mark on tire to insure proper tire, tube and wheel balance. Join two wheel halves and position brake disk in inner wheel half. Install through bolts with nuts on valve stem side. Torque wheel nuts to 150 inch-pounds and inflate tire.

(b) Lubricate bearing cones and install cones, grease seals and seal retainer rings. Secure retainer with snap ring.

(c) Slide wheel on axle and secure with retainer nut. Tighten nut to allow no side play, yet allow wheel to rotate freely. Safety nut with a flat head pin, washer and cotter pin. Install dust cover.

(d) Position brake lining back plates between wheel and brake disk and brake cylinder on torque plate. Insert spacer blocks between back plates and cylinder, and install four bolts to secure assembly. If brake was disconnected, connect line and bleed brakes.

B. Nose Wheel Assembly (See Figure 2.)

(1) Removal and Disassembly

(a) Jack airplane enough to raise nose wheel clear of ground. (Refer to Jacking, 7-10-00.)

(b) To remove nose wheel, first remove cotter pin and washer that secures safety clevis pin of wheel nut. Next remove clevis pin, wheel nut and then slide wheel from axle.

(c) Wheel halves may be separated by first deflating tire. With tire sufficiently deflated, remove wheel through bolts. Pull wheel halves from tire by removing wheel half opposite valve stem first and then other half.

(d) Wheel bearing assemblies may be removed from each wheel half by first removing snap rings that secure grease seal retainers, and then retainers, grease seals and bearing cones. Bearing cups should be removed by tapping out evenly from inside.

(2) Inspection

(a) Visually check all parts for cracks, distortion, defects and excess wear.

(b) Check tie bolts for looseness or failure.

(c) Check internal diameter of felt grease seals. Replace felt grease seal if surface is hard or gritty.

(d) Check tire for cuts, internal bruises and deterioration.

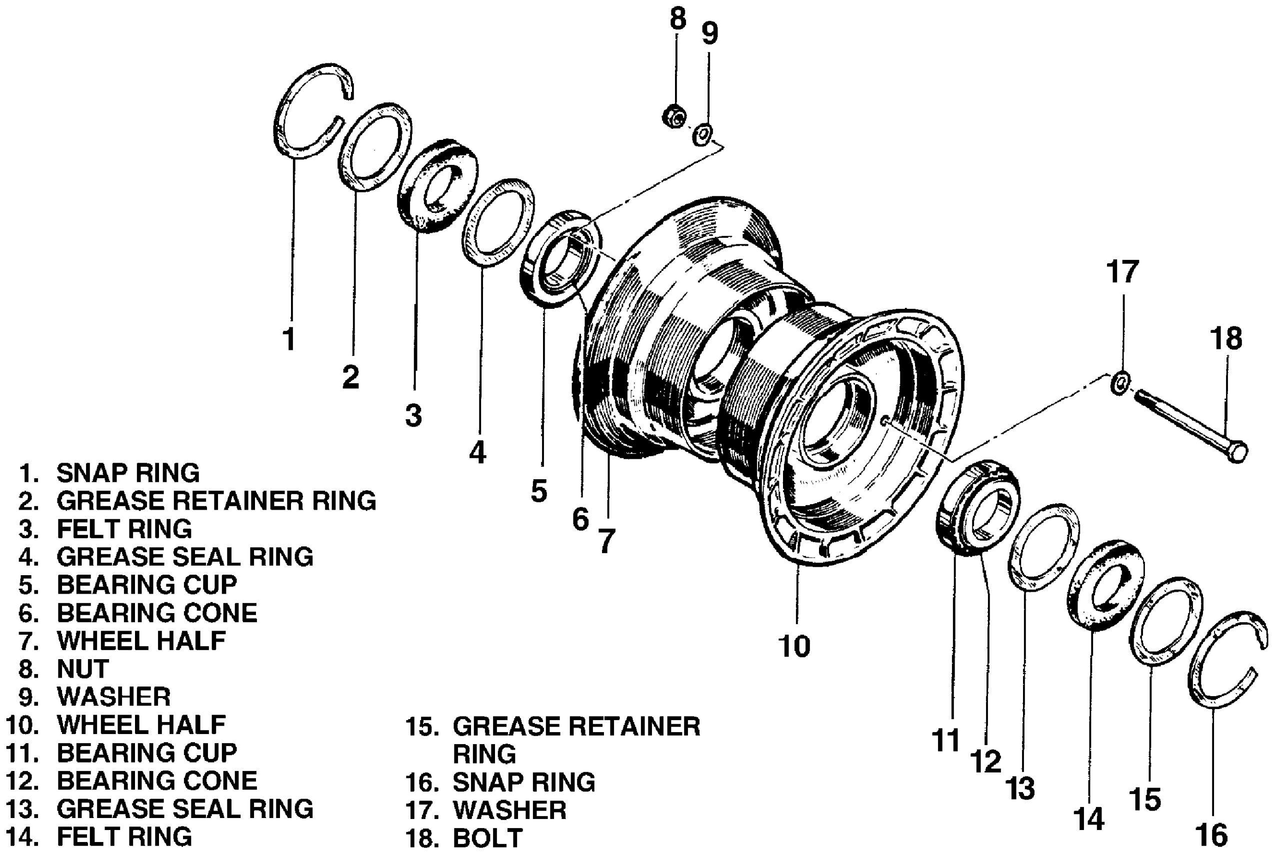
(e) Check bearing cones and cups for wear and pitting and relubricate.

(f) Replace any wheel casting having visible cracks.

(3) Assembly and Installation

(a) Check that bearing cup for each wheel is properly installed. Install tire with tube on wheel half with valve stem hole and then join two wheel halves. Install through bolts with washers and nuts to valve stem side. Torque nuts to 90 inch-pounds.

(b) Lubricate bearing cones and install cones, grease seals, felt rings and seal retainer rings. Secure with snap rings.



Nose Wheel Assembly
Figure 2

(c) Slide wheel on axle and secure with retainer nut. Tighten nut to allow no side play, yet allow wheel to rotate freely. Safety nut with clevis pin and secure pin with washer and cotter pin.

(d) Insure nose gear is down and locked. Remove jack.

C. Repair

NOTE: Remove rust and blend out small nicks, using fine 400 grit sandpaper.

Repairs are limited to blending out small nicks, scratches, gouges and areas of slight corrosion, plus replacement of parts which are cracked or badly corroded.

NOTE: Never paint working surfaces of bearing cups.

Wheels may also be repainted if parts have been repaired and thoroughly cleaned. Paint exposed areas with one coat zinc chromate primer and one coat of aluminum lacquer.

D. Bearing Cup Replacement

(1) Removal

(a) Insert wheel half into boiling water for 15 minutes or place in an oven not exceeding 250°F (121°C) for 15 minutes.

(b) Remove from source of heat and invert wheel half. If cup does not drop out, tap cup evenly from axle bore with a fiber drift pin or suitable arbor press.

(2) Installation

(a) To replace a new cup, apply one coat of zinc chromate primer to wheel half bearing bore.

(b) Insert wheel half into boiling water for 15 minutes or place in an oven not exceeding 250°F (121°C) for 15 minutes. Chill new bearing cup in dry ice for a minimum of 15 minutes.

(c) Remove wheel half from source of heat and bearing cup from dry ice. Install chilled bearing cup into bearing bore of heated wheel half. Tap gently to seat evenly in place,using a fiber drift pin or suitable arbor press.

2. Brakes (See Figure 5.)

A. Brake Adjustment and Lining Tolerance

Because they are self-adjusting, no adjustment of brake lining clearance is necessary. Inspection of lining is necessary, and may be inspected visually while installed on airplane.

B. Wheel Brake Assembly (See Figure 3.)

(1) Removal and Disassembly

(a) Disconnect brake line from brake cylinder at tube fitting.

(b) Remove cap bolts that join brake cylinder housing and lining back plate assembly. Remove back plate from between brake disk and wheel.

(c) Slide brake cylinder housing from torque plate.

(d) Remove pressure plate by sliding off anchor bolts of housing.

(e) Piston(s) may be removed by injecting low air pressure in cylinder fluid inlet and forcing piston from housing.

(f) Check anchor bolt for wear.

(g) Remove anchor bolt by the following procedure:

1 Position cylinder assembly on a holding fixture. (Refer to Figure 4.)

2 Use a suitable arbor press to remove anchor bolt from cylinder body.

(h) Install anchor bolt by the following procedure:

1 Support anchor bolt in a holding fixture. (Refer to Figure 4, step A.)

2 Align cylinder body over anchor bolt. (Refer to Figure 4, step B.)

3 Use a suitable arbor press and apply pressure on spot face directly over anchor bolt hole. (Refer to Figure 4, step C.)

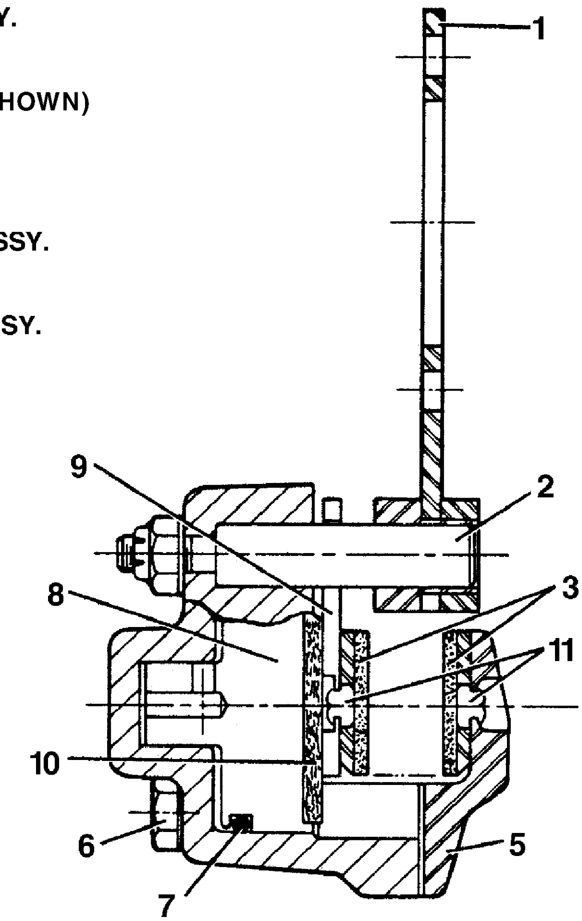
(2) Cleaning, Inspection and Repair

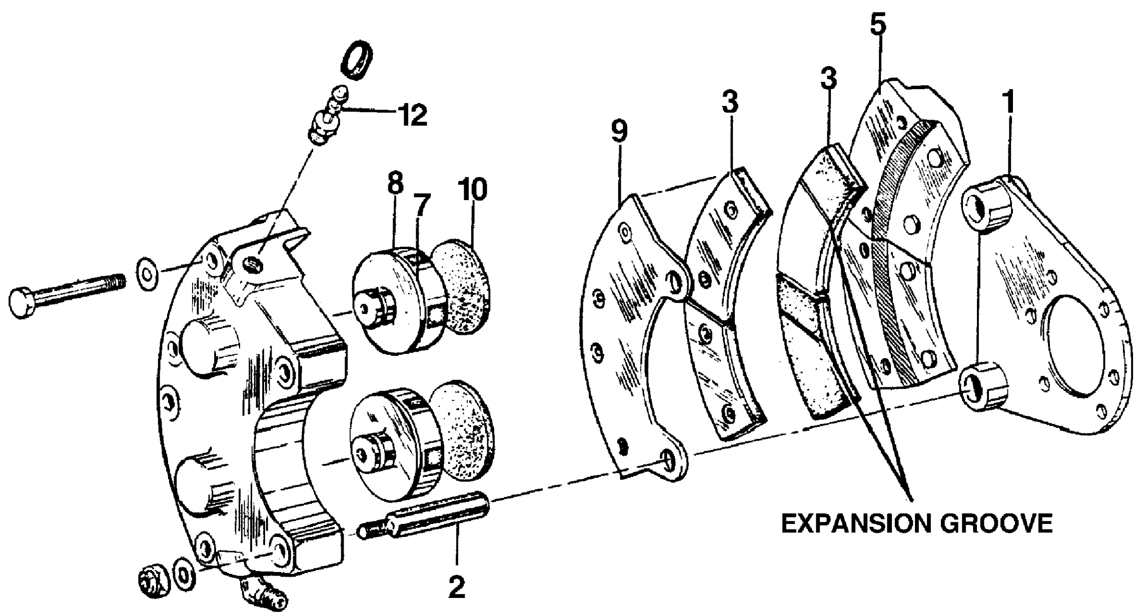
(a) Clean assembly with a suitable solvent and dry thoroughly.

(b) Check wall of cylinder housing and piston for scratches, burrs, corrosion, etc., that may damage O-rings.

(c) Check general condition of brake bleeder screw and lines.

1. TORQUE PLATE ASSY.
2. ANCHOR BOLT
3. BRAKE LINING
4. LINING PINS (NOT SHOWN)
5. BACK PLATE ASSY.
6. BOLT
7. O-RING
8. PISTON ASSY.
9. PRESSURE PLATE ASSY.
10. INSULATOR
11. SNAP
12. BLEEDER SCREW ASSY.

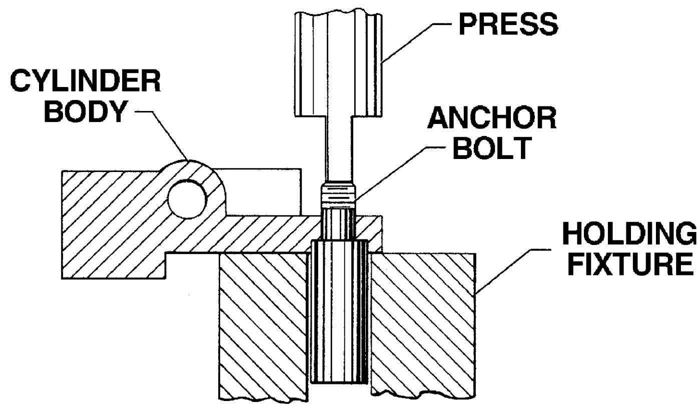




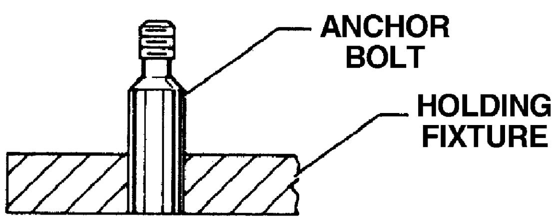
EXPLODED VIEW OF BRAKE ASSEMBLY

Wheel Brake Assembly (Typical)
Figure 3

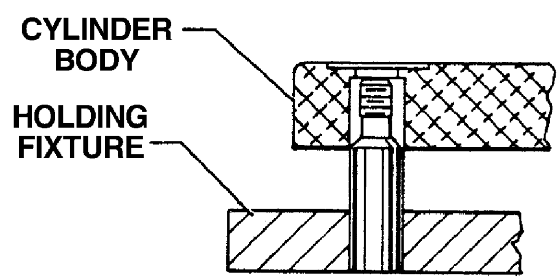
REMOVAL



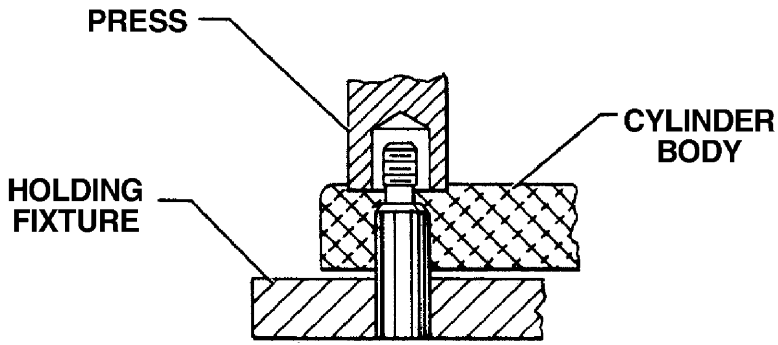
INSTALLATION



STEP A



STEP B



STEP C

Anchor Bolt
Figure 4

(d) Check brake disk for wear, grooves, scratches, or pits. Minimum disk thickness of disk used on Wheel Assembly 40-120C is 0.405 (see Figure 1). A single groove or isolated grooves up to .030 of an inch deep would not necessitate disk replacement. A grooving of entire disk surface would reduce lining life and should be replaced. If necessary to remove wheel disk, refer to Removal and Disassembly of Main Wheel.

(e) Check lining expansion groove. If groove is not showing replace linings. Remove linings by prying loose with a screwdriver or a thin flat wedge. To install linings:

1 Position linings onto pins

2 Apply pressure to snap into position.

NOTE: After installation, condition new linings by performing two (2) consecutive full stop braking applications from 30 to 35 kts. Do not allow brake discs to cool substantially between stops.

(3) Assembly and Installation

(a) Lubricate piston O-ring(s) with fluid MIL-H-5606A and install on piston(s). Slide piston(s) in cylinder housing until flush with surface of housing.

(b) Slide lining pressure plate onto anchor bolts of housing.

(c) Slide cylinder housing assembly on torque plate of gear.

(d) Position lining back plate between wheel and brake disc. Install bolts and torque to 40 inch -pounds to secure assembly.

(e) Connect brake line to brake cylinder housing.

(f) Bleed brake system as described in Bleeding Brakes.

C. Hand/Parking Brake Master Cylinder (See Figures 5 and 6.)

(1) Removal

(a) To remove brake master cylinder, first disconnect inlet supply line from fitting at top of cylinder and allow fluid to drain from reservoir and line into a suitable container.

(b) Disconnect pressure line from fitting on cylinder and allow fluid to drain from cylinder line.

(c) Disconnect end of cylinder rod from brake handle by removing cotter pin that safeties connecting clevis pin. Remove clevis pin and spacer washers.

(d) Disconnect base of cylinder from its mounting bracket by removing attaching bolt assembly.

(e) Handle assembly may be removed by removing attaching bolt assembly that secures handle to its mounting bracket.

(2) Disassembly

(a) Remove cylinder from its mounting bracket as per Removal of Brake Master Cylinder.

(b) To disassemble cylinder, first remove piston rod assembly by removing snap ring from annular slot at rod end of cylinder. Draw piston rod assembly from cylinder.

(c) Piston rod assembly may be disassembled by first removing small snap ring securing retainer bushing, spring, piston, seal, gland, and, if desired, large return spring.

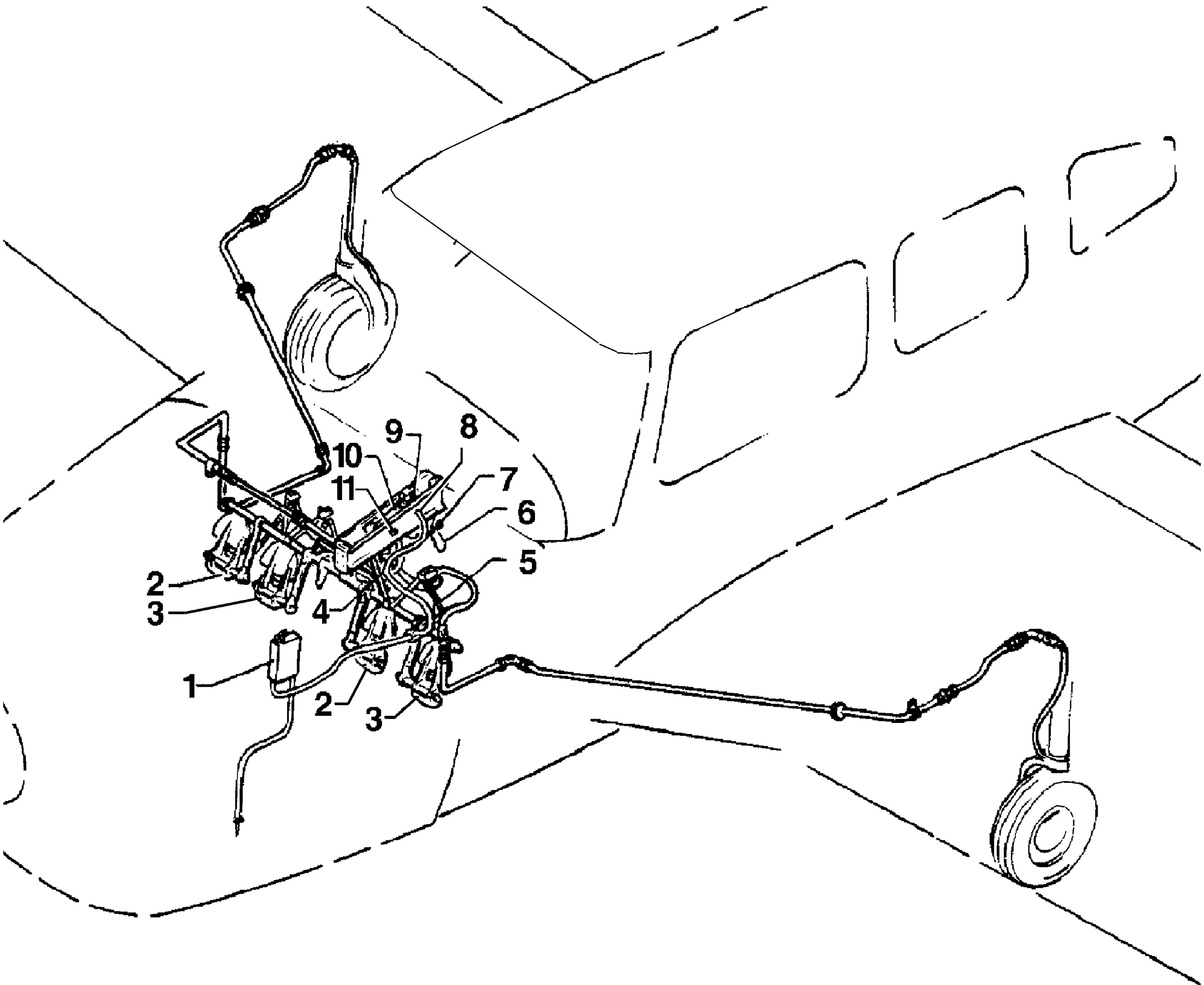
(d) Remove o-rings from piston and gland.

(3) Cleaning, Inspection and Repair

(a) Clean cylinder parts with a suitable solvent and dry thoroughly.

(b) Inspect interior walls of cylinder for scratches, burrs, corrosion, etc.

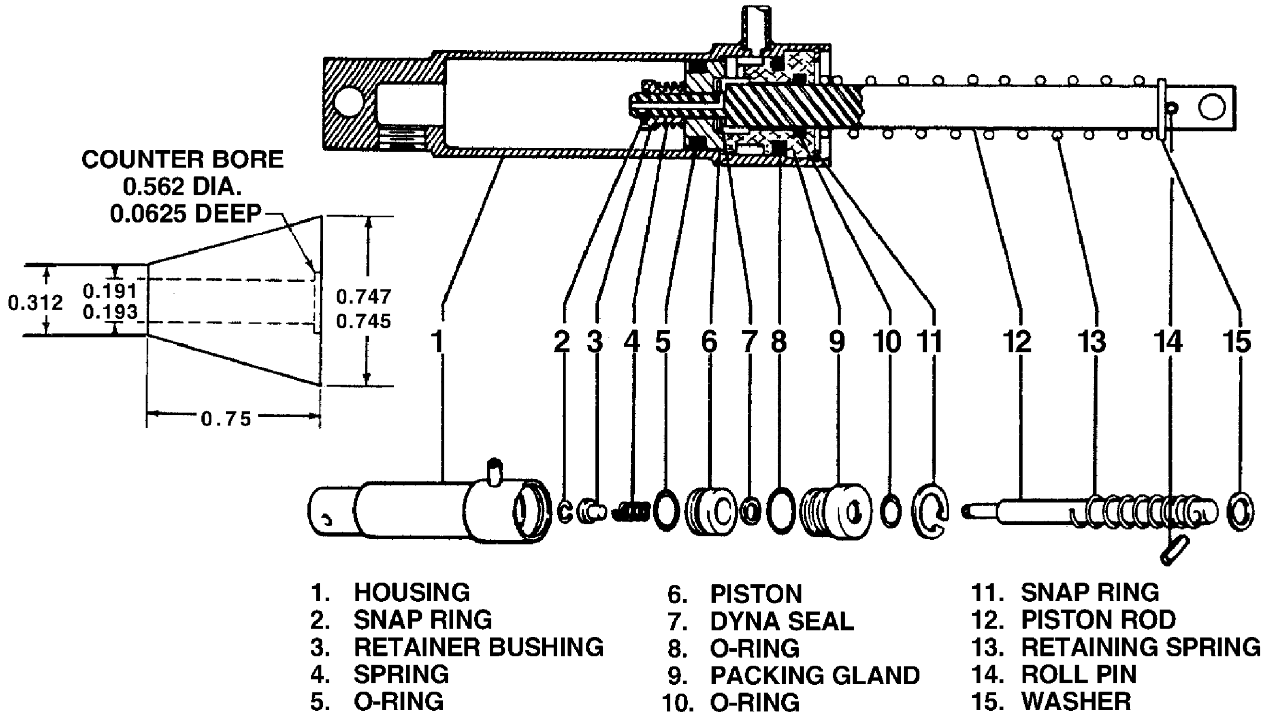
(c) Inspect general condition of fitting threads of cylinder.



1. BRAKE RESERVOIR
2. RIGHT BRAKE AND RUDDER PEDAL *
3. LEFT BRAKE AND RUDDER PEDAL *
4. RIGHT BRAKE CYLINDER *
5. LEFT BRAKE CYLINDER *
6. HAND BRAKE HANDLE
7. HAND BRAKE HANDLE RELEASE BUTTON
8. INLET LINE (FROM RESERVOIR)
9. CLEVIS PIN (HANDLE TO MASTER CYLINDER ROD)
10. MASTER CYLINDER ASSEMBLY
11. BOLT, WASHER, NUT

(* SEE TOE BRAKE INSTALLATION FOR DETAILS)

Brake System Installation
Figure 5



Hand / Parking Brake Master Cylinder
Figure 6

(d) Check piston for scratches, burrs, corrosion, etc.

(e) Repairs to cylinder are limited to polishing out small scratches, burrs, etc., and replace O-rings.

(4) Assembly

NOTE: Use a small amount of hydraulic fluid (MIL-H-5606A) on O-ring and component parts to prevent damage and ease of handling during assembly.

(a) Install new O-rings on outside of packing gland and on outside of piston. (Install teflon O-ring on piston, with use of a cone placed against piston. Cone may be constructed of plastic or metal with dimensions shown in Figure 6.)

(b) To assemble piston rod assembly, install on rod, in order:

1 Roll pins.

2 Return spring retainer washer.

3 Return spring, packing gland with O-rings.

4 Seal.

5 Piston with O-ring.

6 Spring and retainer bushing.

7 Secure with small snap ring on end of rod.

(c) Insert piston rod assembly in cylinder and secure packing gland with snap ring.

(d) Install cylinder per Installation, below.

(5) Installation

(a) Install brake handle assembly between its mounting bracket and secure with bolt, washers, nut and cotter pin. Place washers on each side of handle, between bracket and under nut.

(b) Place the cylinder between the mounting bracket and secure the base end with bolt, washers,nut and cotter pin. Place washers on each side of the cylinder and under the nut.

(c) Connect rod end of cylinder to brake handle with a clevis pin and thin washers Safety clevis with a cotter pin.

(d) Connect pressure line to fitting at bottom of cylinder.

(e) Connect inlet supply line to fitting at top of cylinder and secure with spring clamp.

(f) Bleed brake system per Bleeding Brakes, below.

D. Toe Brake Cylinder(s) (10-30) (See Figures 7 and 8.)

(1) Removal

(a) Disconnect upper and lower lines from cylinder to be removed and cap lines to prevent fluid leakage or drain fluid from brake reservoir and master cylinder.

(b) Remove cylinder from its attachment fittings by first removing cotter pins that safety cylinder attaching pins and then removing pins.

(2) Disassembly

(a) Remove cylinder from its mounting bracket per Removal, above.

(b) To disassemble cylinder, first remove piston rod assembly by removing retaining ring from annular slot in cylinder housing. Draw piston rod assembly from cylinder.

(c) Piston rod assembly may be disassembled by first removing retaining ring, sleeve, spring, and then piston assembly, O-ring, and gland, washer wiper, and if desired, return spring.

(d) Remove O-ring from piston and packing gland.

(3) Cleaning, Inspection and Repair

(a) Clean cylinder components with a suitable solvent and dry thoroughly.

(b) Inspect interior walls of cylinder for scratches, burrs, corrosion, etc.

(c) Inspect general condition of fitting threads.

(d) Inspect piston for scratches, burrs, corrosion, etc.

(e) Repairs to cylinder are limited to polishing out small scratches and burrs, and replacing seal and O-rings.

(4) Assembly

NOTE: Rub a small amount of hydraulic fluid (MIL-H-5606A) on all O-rings and component parts for ease of handling during reassembly and to prevent damage.

(a) Install new O-rings on inside and outside of packing gland and on outside of piston.

(b) To assemble piston rod assembly, install on rod, in order, roll pin, washer, spring, washer, packing gland with O-rings, seal, piston assembly with O-ring, sleeve and retaining ring.

(c) Insert piston rod assembly in cylinder and secure with retaining ring.

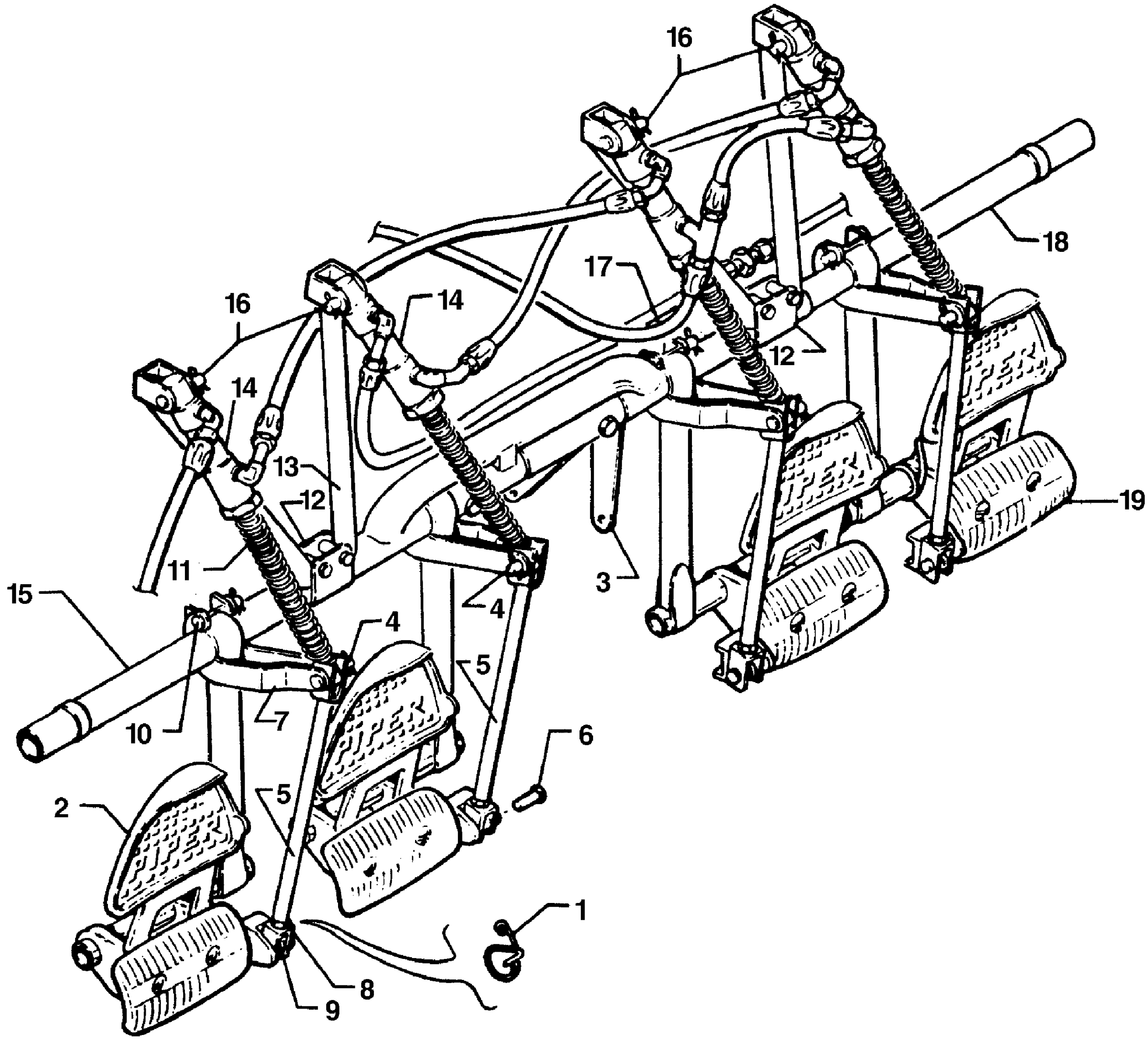
(d) Install cylinder per Installation, below.

(5) Installation

(a) Position cylinder at its mounting points and attach with clevis pins. Safety pins with cotter pins.

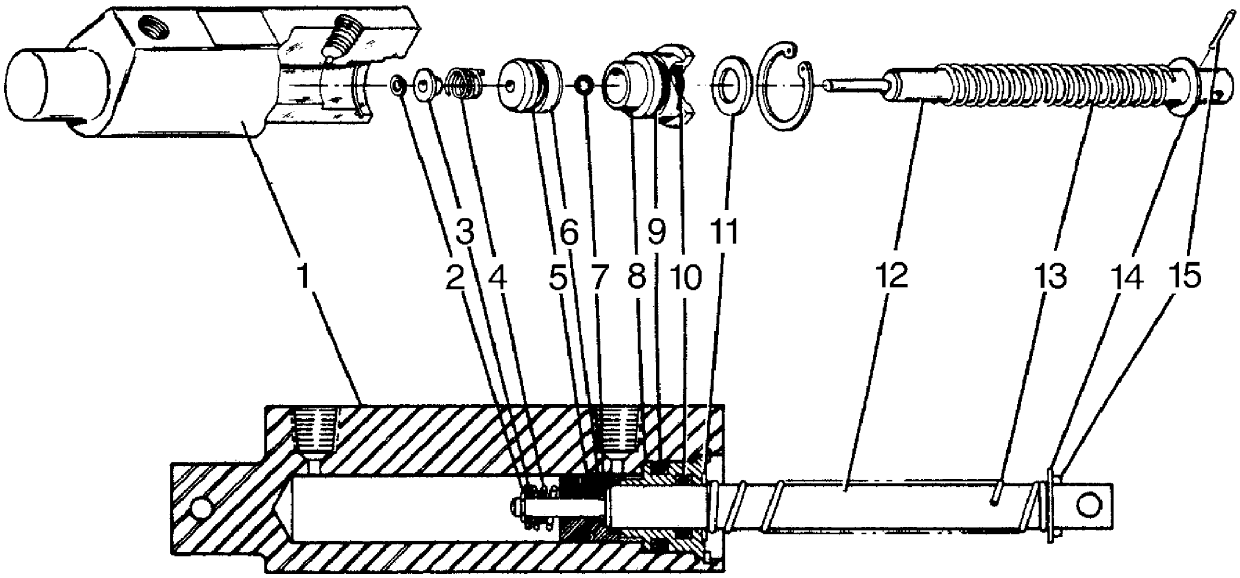
(b) Connect brake lines to cylinder fittings.

(c) Bleed brakes per Bleeding Brakes, below.



1. SPRING CLIP
2. TOE BRAKE PEDAL
3. TRIM CONTROL ATTACHMENT ARM
4. CLEVIS PIN, WASHER & COTTER PIN
5. CLEVIS ASSEMBLY
6. CLEVIS PIN
7. IDLER ARM
8. JAM NUT
9. CLEVIS PIN, WASHER & COTTER PIN
10. CLEVIS PIN, WASHER & COTTER PIN
11. RETURN SPRING
12. BRACKET
13. BRACE ASSEMBLY
14. HYDRAULIC CYLINDER ASSEMBLY
15. LEFT TUBE ASSEMBLY
16. CLEVIS PIN & COTTER PIN
17. FLEXIBLE HOSE ASSEMBLY
18. RIGHT TUBE ASSEMBLY
19. PEDAL PADS

Toe Brake Installation
Figure 7



1. HOUSING	5. O-RING	9. O-RING	13. SPRING
2. RETAINING RING	6. PISTON	10. O-RING	14. WASHER
3. SLEEVE	7. O-RING	11. WASHER WIPER	15. ROLL PIN
4. SPRING	8. GLAND	12. ROD	

Toe Brake Cylinder (10-30)
Figure 8

E. Brake System Leak Check

Pull for a good firm hand brake and lock parking brake mechanism. Allow system to stand for approximately 10 minutes; then by gripping parking brake handle, it should not be able to be pulled aft further than original set. Should handle be able to be pulled towards panel and feel spongy, a leak is present at some point in system. This leak may appear at any one of the connections throughout system or internally in master brake cylinder or wheel brake assemblies.

F. Bleeding Brakes

(1) Gravity Procedure

(a) On both main landing gear wheel brake assemblies, attach a clear plastic hose to brake bleeders and extend into container partially filled with hydraulic fluid, MIL-H-5606A. Ends of this hose should be submerged in the fluid. Open both bleeders approximately one and one-half to two turns.

(b) Fill brake reservoir on firewall with hydraulic fluid, MIL-H-5606A.

(c) Disconnect toe brake cylinders from pedal connection by removing clevis pin, washer and cotter pin.

(d) Invert toe brake cylinder to aid in releasing trapped air in top of cylinder.

(e) Check toe brake pedals in cockpit to insure pedals are pulled full aft.

(f) Pull hand brake handle, pumping master cylinder very slowly approximately 25 times until fluid is observed passing through clear plastic hoses at wheel cylinder.

NOTE: Maintained fluid level in reservoir to prevent air from entering line.

(g) Tighten both wheel bleeders.

(h) Pull hand brake until a firm handle is maintained.

(2) Pressure Procedure

(a) Place a small clear plastic hose on vent tube of brake reservoir and place a second small clear plastic hose on bleeder fitting on one main landing gear. Place open ends of these tubes in a suitable container to collect fluid overflow. Open bleeder fitting one or two turns.

(b) On other main gear, slide hose of pressure unit over bleeder fitting then open fitting one or two turns and pressure fill brake system with MIL-H-5606A fluid.

(c) With fluid continually flowing through brake system, SLOWLY and together actuate hand brake and toe brake pedal of side being bled, several times, to purge cylinders of air. On dual brake installations, both right and left pedals must be actuated.

NOTE: To determine if any air is left in system, watch fluid passing through the plastic hose at fluid reservoir and bleeder fitting on gear being bled . If air bubbles are evident, continue filling system until all air is out of system and a steady flow of fluid is observed. If brake handle remains spongy, disconnect bottom of toe brake cylinders (next to pedal) and rotate cylinder horizontally, or above horizontal, and, by use of hand brake alone, purge air from system.

(d) Close open bleeder fitting on gear being bled. Close open bleeder fitting to which pressure hose is attached; then close pressure unit and remove hoses from bleeder fittings. Check brakes for proper pedal pressure. Replace caps over bleeder fittings.

NOTE: It may be necessary to remove any trapped air in top of wheel brake unit by applying pressure to system with hand brake lever, slowly opening bleeder, and releasing hand lever.

(e) Repeat this procedure, if necessary, on other gear.

(f) Drain excess fluid from reservoir to fluid level line with a syringe.

(3) After a Unit Has Been Changed

CAUTION: TO PREVENT AIR FROM ENTERING SYSTEM, DO NOT ALLOW PRESSURE TO BLEED OFF BEFORE CLOSING BLEEDERS. REPEAT PUMPING AND BLEEDING APPROXIMATELY 10 OR MORE TIMES OR UNTIL ALL AIR IS RELEASED FROM SYSTEM. MAINTAINED RESERVOIR FLUID LEVEL DURING ALL BLEEDING.

(a) Actuate hand brake handle until some pressure builds up in system. At this time, crack attaching B nuts at any of hose connections of replaced unit. Most of handle sponge feeling should be displaced by this action. Retighten B nuts.

(b) Actuate master cylinder and toe brake cylinder of side on which unit was changed. Bleed fluid through brake assembly on wheel by pumping pressure and cracking bleeder until pressure drops.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

33

LIGHTS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 33

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 33 - LIGHTS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

1. Description and Operation

Exterior lighting switches are located in the overhead switch panel. Interior flood/map lights are located in the overhead switch panel and controlled by adjacent reostats. Instrument panel and avionics lighting is controlled by separate dimmer switches located below the pilot's control wheel.

Circuit breakers are located on lower right instrument panel.

2. Troubleshooting

When checking the lighting system, the master switch must be ON in order for lights to operate. Ensure also that the appropriate circuit breaker is pushed ON.

THIS PAGE INTENTIONALLY BLANK

FLIGHT COMPARTMENT

1. Instrument Post and Overhead Map / Flood Lights

Instruments are illuminated by use of instrument post lights. They are powered through the panel/SWITCH lights 7.5 amp circuit breaker and lights dimmer assembly. The dimmer controls are located below the pilot's control wheel. An additional dimmer controls light intensity for all avionic equipment.

Two lights, located in the overhead panel, provide instrument and cockpit lighting for night flying. They are controlled by rheostats located adjacent to overhead switches. A map light window in each lens is actuated by the slide switch.

2. Dimmer Control Assembly

A. Removal

(1) Access to Dimmer Control Assembly is from beneath instrument panel.

(2) Disconnect electrical connection from assembly.

(3) Remove two screws securing assembly to instrument panel.

(4) Remove assembly from airplane.

B. Installation

(1) Position assembly in instrument panel with control knobs inserted into appropriate slots.

(2) Secure assembly to instrument panel with two screws previously removed.

(3) Connect electrical connection to assembly.

(4) Check operation of Dimmer Control Assembly.

3. Annunciator Panel

The annunciator panel, located at the top center of the whole instrument panel, provides visual warning of critical aircraft systems status. A complete functional description is provided in 31-50-00.

Lamp Replacement

Push in the individual annunciator light until it "clicks", and release pressure. The cover assembly will be partially ejected from the annunciator base assembly. Pull the cover from the base and rotate to expose the lamp bulb. Replace defective bulb and reinstall by pushing the lamp cover assembly home.

Verify lamp function by pressing the "Press-to-Test" switch.

NOTE: Press-to-Test switch tests only the operation of the annunciator light bulbs. It does not test functioning of the warning circuit.

GRIDS 3G20 THRU 3G24
INTENTIONALLY BLANK

EXTERIOR

1. Landing Light (See Figure 1.)

The landing light is a single nose gear light secured to the nose gear strut housing with hose clamps. A single, two-position, rocker-type, switch in the overhead switch panel (wired through the 15 amp LANDING LIGHT circuit breaker) controls the light.

A. Removal

(1) Remove screws (4) securing retainer ring/bezel and shade and remove retainer ring/bezel and shade.

(2) Pull lamp out and remove electrical leads connected to it. (Make note of wire placement on lamp to facilitate installation.)

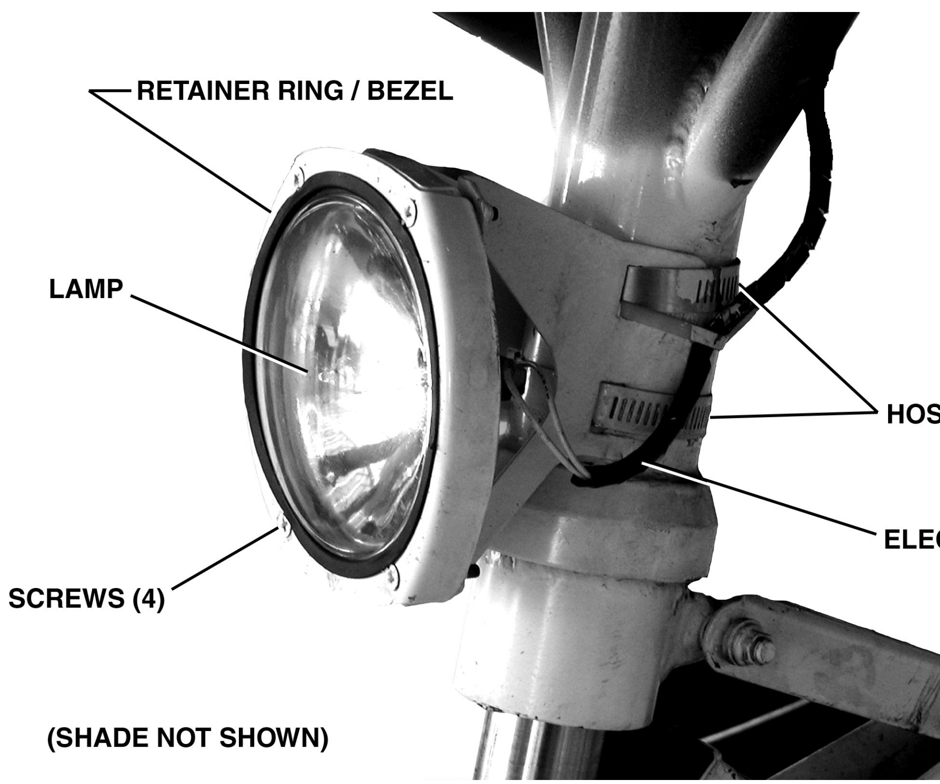
B. Installation

(1) Reconnect electrical leads and insert lamp into position.

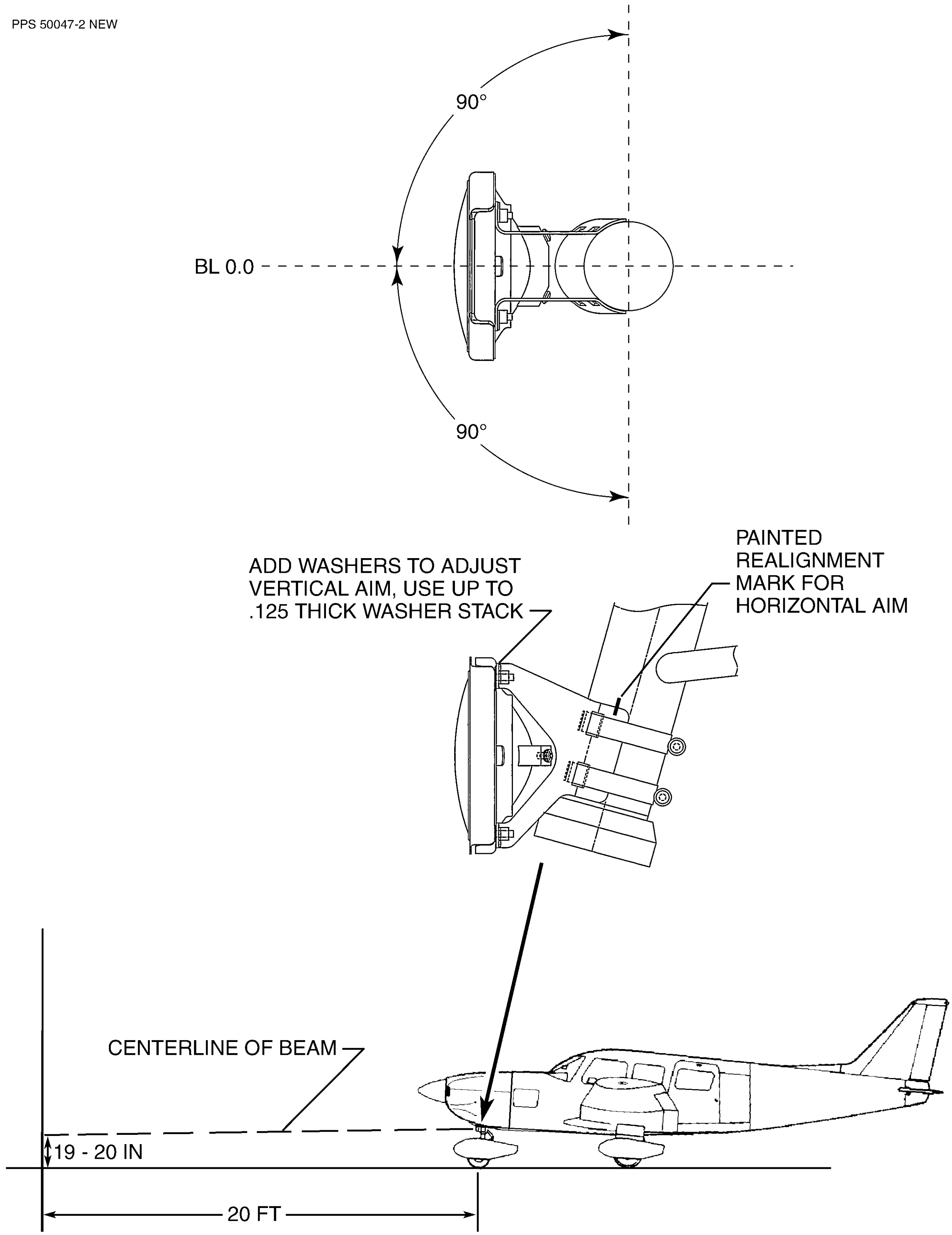
(2) Position shade over upper portion of lamp, capture shade with retainer ring/bezel and secure with screws (4).

C. Adjustment

With tires and oleo struts properly serviced, aim landing light as shown in Figure 2.



Landing Light Installation
Figure 1



Landing Light Adjustment
Figure 2

2. Navigation (Position) Lights

Two navigation lights are located in each wing tip in the same assembly as the wing tip strobe light. The navigation lights are controlled by a single switch and a 10 amp circuit breaker.

3. Anti-Collision Strobe Light

Anti-collision strobe lights are mounted on each wing tip in the same assembly as the navigation lights. These units are rated to flash at approximately 45 times per minute and are controlled by the STROBE LT switch through the 10 amp ANTI COLL circuit breaker.

A. Removal

a. Remove screw securing navigation light cover and remove cover.

b. Remove the three screws securing navigation light bracket assembly and pull out.

c. Remove strobe lamp by cutting wires on lamp beneath mounting bracket.

d. Remove defective lamp.

e. Remove and discard plug with cut wires from its electrical socket.

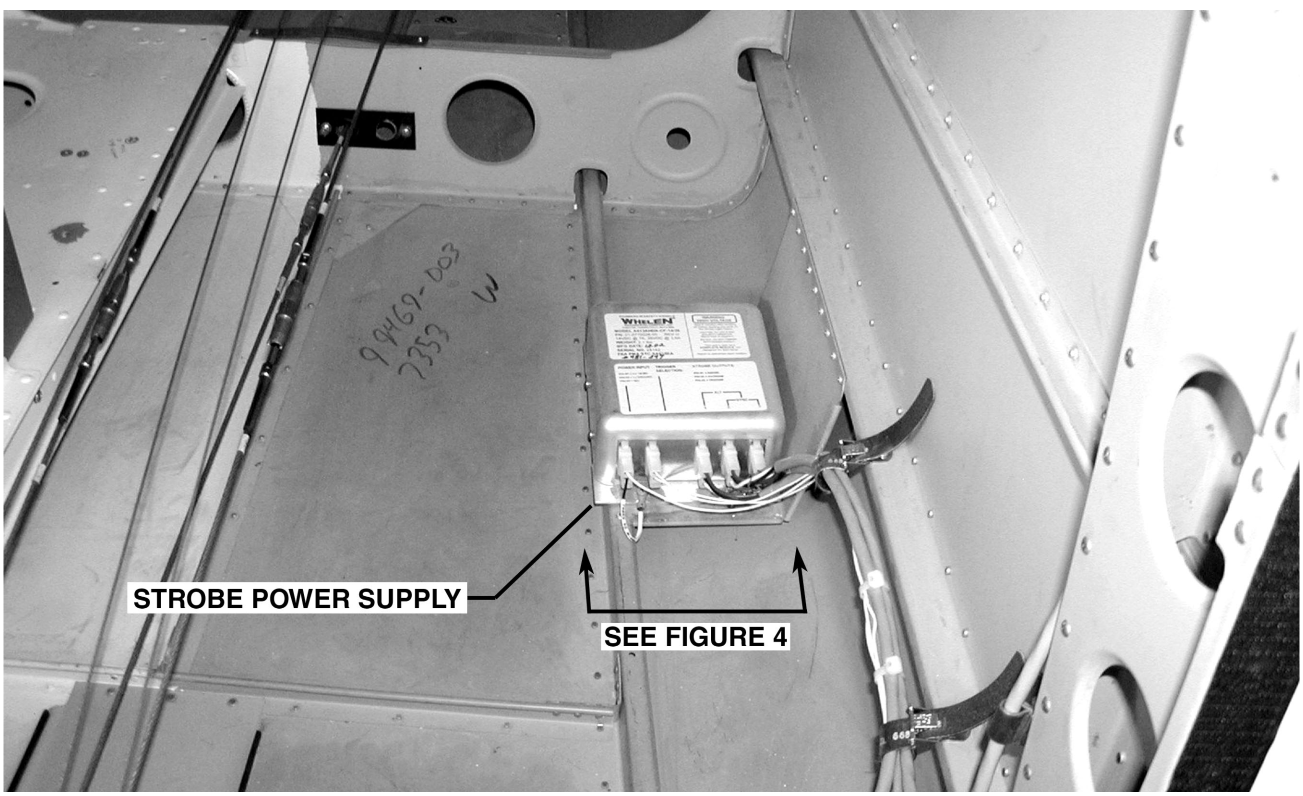
B. Installation

a. Route wires from new lamp down through hole in navigation light bracket.

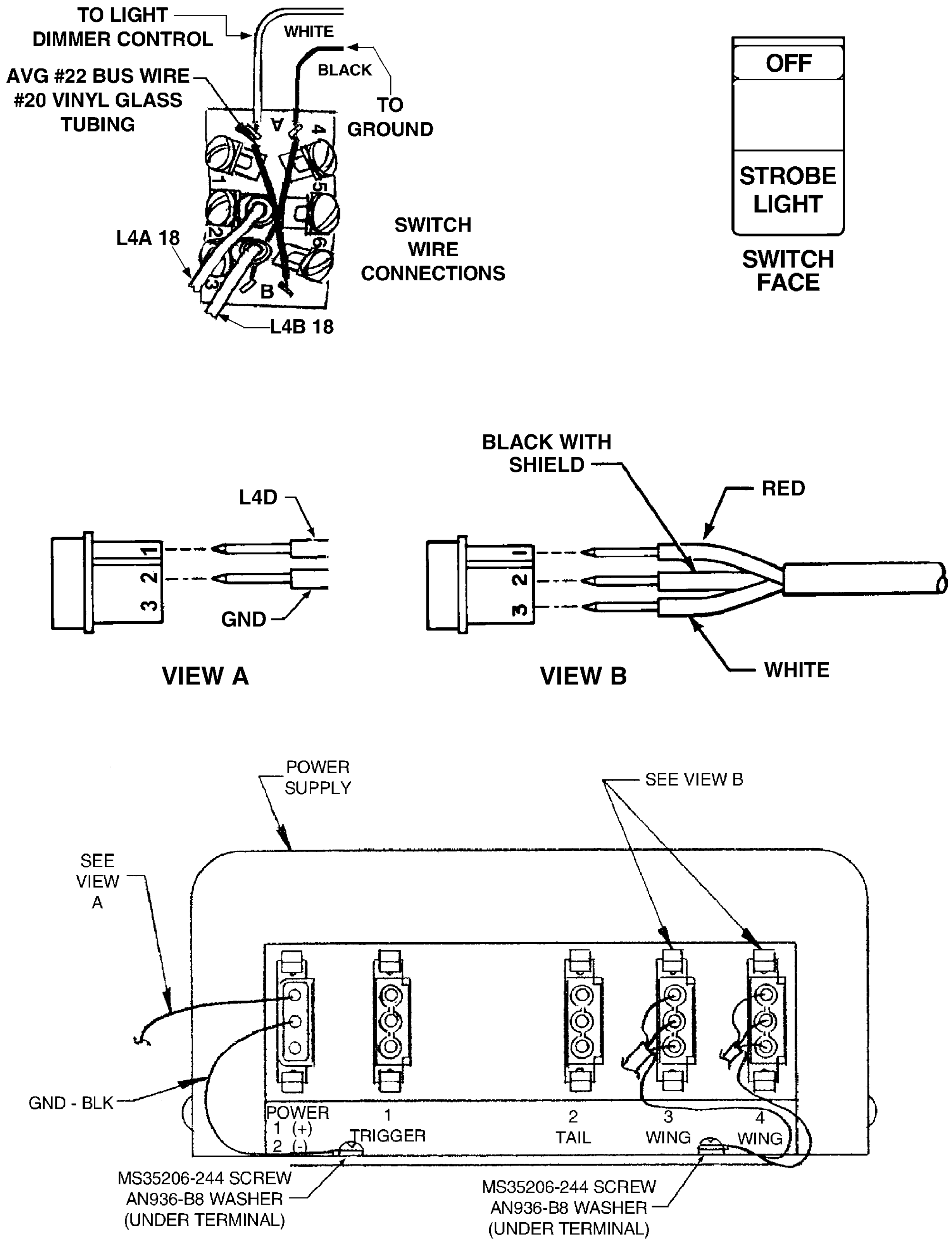
b. Insert wire terminals in plastic plug supplied with new lamp. Wire according to schematic diagram located in back of this section. Connect plug to receptacle.

c. Position strobe lamp on navigation light bracket.

d. Secure navigation light assembly and bracket with appropriate screw.



Strobe Power Supply Installation
Figure 3



Strobe Light Connections
Figure 4

C. Strobe Power Supply (See Figures 3 and 4.)

The strobe power supply is located in the aft section of the fuselage.

(1) Removal

(a) Remove access panel to aft section of fuselage in rear baggage compartment to gain access to power supply.

(b) Remove power supply disconnect electrical plugs and leads. (Make note of placement of plugs to facilitate installation.)

(c) Remove screws securing power supply to fuselage. Power supply can now be removed.

(2) Installation

(a) Position power supply in place and secure with four screws previously removed.

(b) Connect electrical leads in their proper place.

(c) Connect electrical plugs in their proper place.

(d) Replace access panel in rear baggage compartment.

D. Troubleshooting Procedure (See Figure 4.)

Strobe light functions as a condenser discharge system. A condenser in the power supply is charged to approximately 450 volts DC then discharged across Xenon flash tube at intervals of approximately 45 flashes per minute. Condenser is parallel across the Xenon flash tube which is designated to hold off the 450 volts DC applied until flash tube is triggered by an external pulse. This pulse is generated by a solid state timing circuit in power supply.

When troubleshooting the strobe light system, first determine if the trouble is in the flash tube or the power supply. Replacement of the flash tube will confirm if tube is defective. A nomally operating power supply will emit an audible tone of 1 to 1.5 KHZ. If there is no sound emitted, check system according to the following instructions. When troubleshooting system, use appropriate schematic in Chapter 91.

(1) Verify input voltage at power supply is 28 volts.

CAUTION: WHEN DISCONNECTING AND CONNECTING POWER SUPPLY INPUT CONNECTIONS, DO NOT GET CONNECTIONS REVERSED. REVERSED POLARITY OF INPUT VOLTAGE FOR JUST AN INSTANT WILL PERMANENTLY DAMAGE POWER SUPPLY. REVERSED POLARITY DESTROYS A PROTECTIVE DIODE IN POWER SUPPLY, CAUSING SELF-DESTRUCTION FROM OVERHEATING OF POWER SUPPLY. THIS DAMAGE IS SOMETIMES NOT IMMEDIATELY APPARENT, BUT WILL CAUSE FAILURE OF SYSTEM IN TIME.

(2) Check for malfunction in interconnecting cables.

NOTE: A short of the type described in steps a and b, below, will not cause permanent damage to the power supply, but the system will be inoperative if such a short exists. Avoid any connection between pins 1 and 3 of interconnecting cable as this will discharge the condenser into the power supply and destroy the trigger circuits.

(a) Ascertain pins 1 and 3 of interconnecting cables are not reversed.

(b) Using an ohmmeter, check continuity between pin 1 and 3 of interconnecting cable. If a reading is obtained on meter, cable is shorted and should be replaced.

CAUTION: WHEN DISCONNECTING POWER SUPPLY, ALLOW FIVE MINUTES OF BLEED DOWN TIME PRIOR TO HANDLING UNIT.

(3) Check interconnecting cables for shorts.

(a) Disconnect output cables from power supply outlets.

(b) The following continuity checks can be made with an ohmmeter.

(c) Check for continuity between connectors of each interconnecting cable by checking from pin 1 to pin 1, pin 2 to pin 2, and pin 3 to pin 3. When making these checks if no continuity exists, cable is broken and should be replaced.

(d) Check continuity between pins 1 and 2, 1 and 3, 2 and 3 of interconnecting cable. If continuity exists between any of these connections, cable is shorted and should be replaced.

(4) Check tube socket assembly for shorts.

(a) Disconnect tube socket assembly of anti-collision light from interconnecting cable.

(b) The following continuity checks can be made with an ohmmeter.

(c) Check for continuity between pin 1 of AMP connector to pin 1 of tube socket. Pin 2 of AMP connector to pins 6 and 7 of tube socket and pin 3 of AMP connector to pin 4 of tube socket. When making these tests, if no continuity exists, tube socket assembly is broken and should be replaced.

CHAPTER

34

NAVIGATION AND PITOT / STATIC

THIS PAGE INTENTIONALLY BLANK

CHAPTER 34

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
34-List of	1	Feb 19/04			
Effective Pages	2	Jun 1/03			
34-Table of Contents	1	Feb 19/04			
	2	Jun 1/03			
34-00-00	1	Feb 19/04			
	2	Jun 1/03			
34-10-00	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Feb 19/04			
	10	Feb 19/04			
34-20-00	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Jun 1/03			
	8	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 34 - NAVIGATION AND PITOT / STATIC

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

These airplanes are equipped with conventional air, vacuum, and mechanically driven flight instruments, unless the optional Avidyne Entegra Electronic Flight Display System is installed. When that system is installed, the vacuum system is completely removed and conventional air and electrically driven instruments are installed to provide redundancy.

In either case, removal and installation instructions are given in 39-10-00.

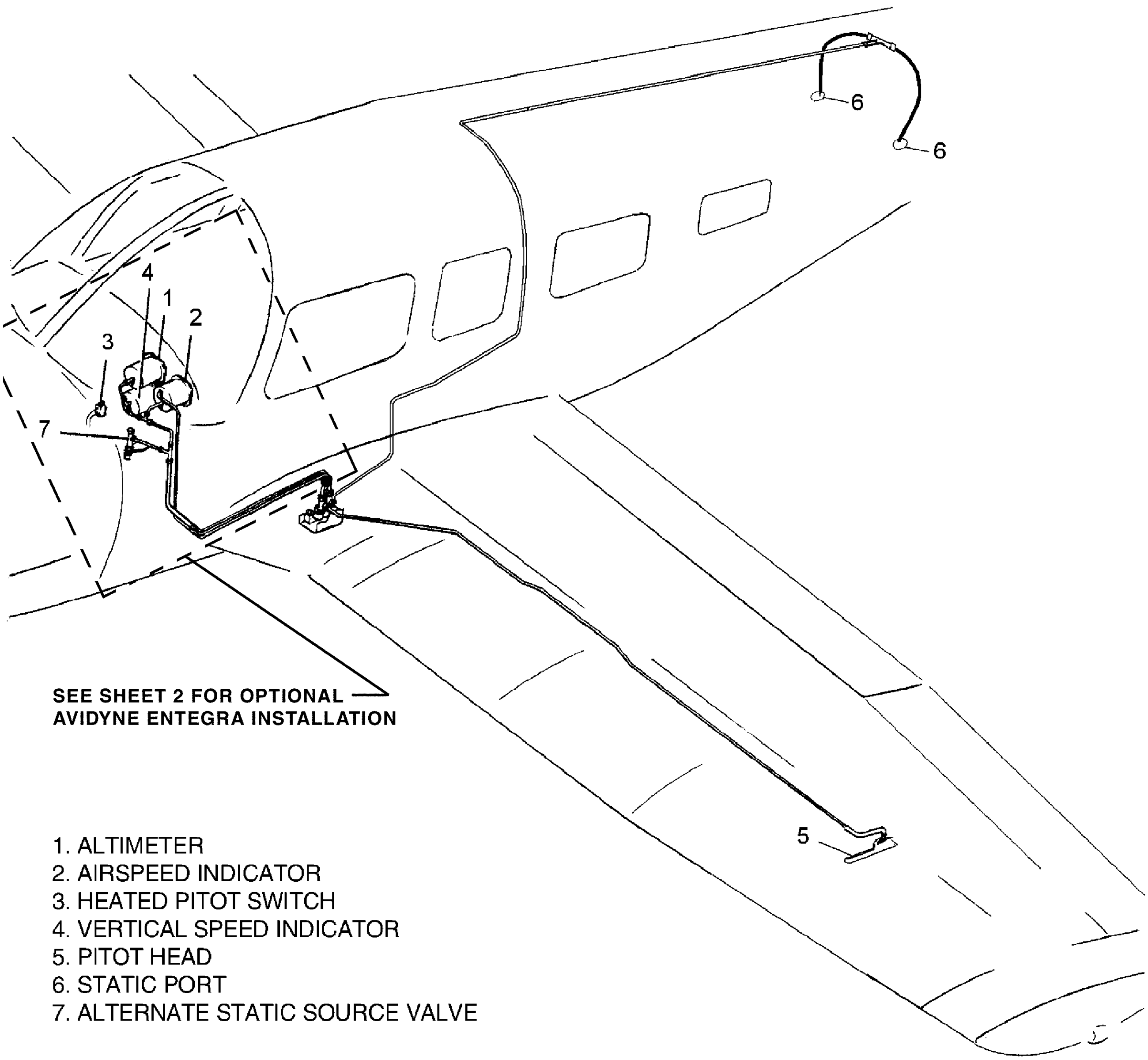
THIS PAGE INTENTIONALLY BLANK

FLIGHT ENVIRONMENT DATA

1. Pitot / Static System (See Figure 1.)

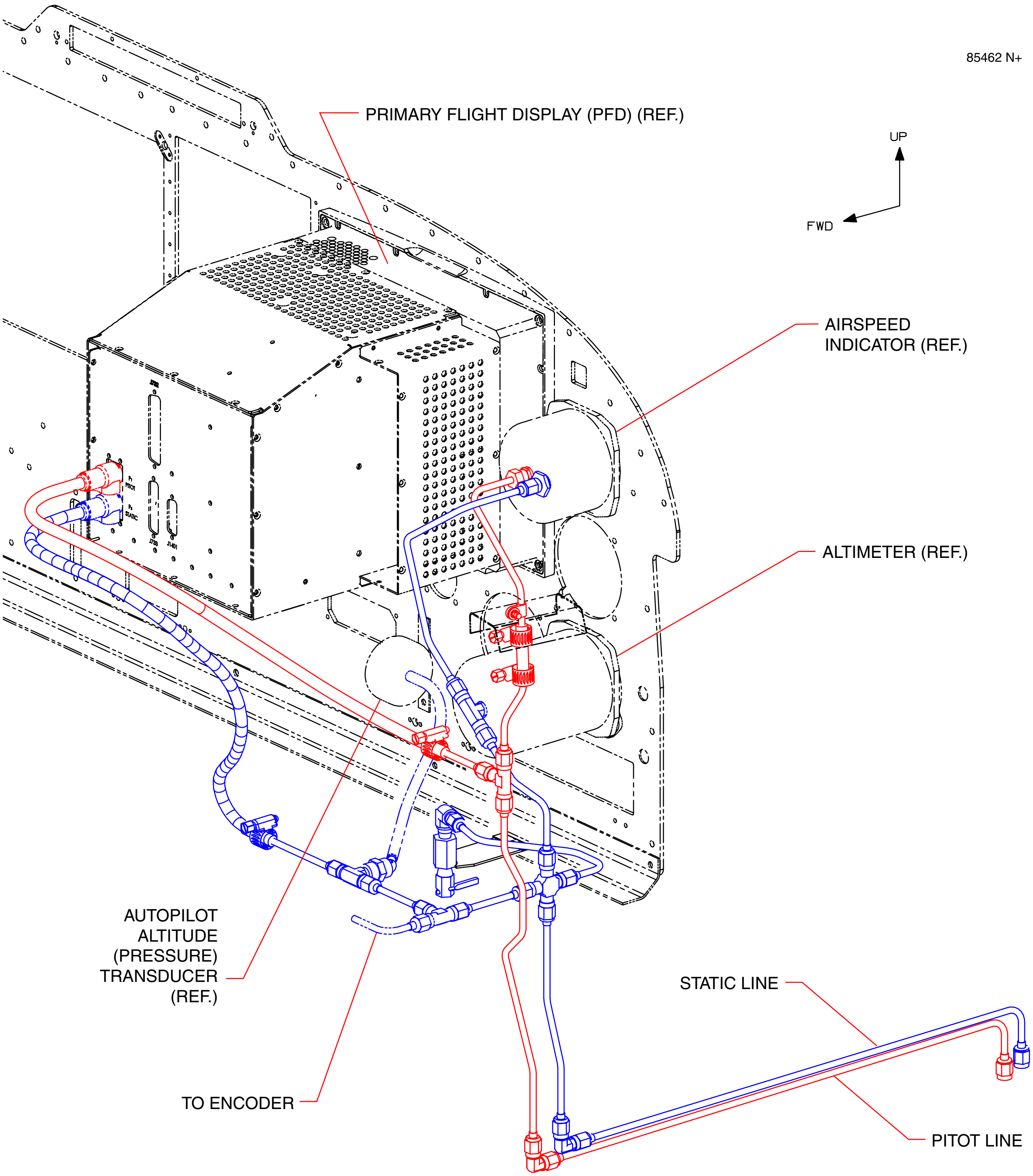
The pitot air system consists of a pitot mast located on underside of left wing, with its related plumbing. Ram air pressure entering the pitot is transmitted from the pitot inlet through hose and tubing (routed through the wing) to the airspeed indicator (and, if installed, to the Primary Flight Display (PFD) of the Avidyne Entegra system) on the instrument panel. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

The static air system consists of two static ports located on the left and right side of the aft fuselage. The static ports are directly connected to the airspeed, altimeter and rate of climb indicators in the instrument panel by means of hose and tubing. An alternate static air source is located below instrument panel in front of pilot. Alternate static source is part of standard system and has a shutoff valve which closes the port when it is not needed. A placard giving instructions for use is located on instrument panel. Pitot and static lines can be drained through separate drain valves located on left lower side of fuselage interior.



1. ALTIMETER
2. AIRSPEED INDICATOR
3. HEATED PITOT SWITCH
4. VERTICAL SPEED INDICATOR
5. PITOT HEAD
6. STATIC PORT
7. ALTERNATE STATIC SOURCE VALVE

Pitot / Static System Installation
Figure 1 (Sheet 1 of 2)



OPTIONAL AVIDYNE ENTEGRA INSTALLATION

Pitot / Static System Installation
Figure 1 (Sheet 2 of 2)

Effectivity
3232014 & up
3255015 & up

2. Vertical Speed Indicator

A. Description

Vertical speed indicator measures rate of change in static pressure when airplane is climbing or descending. By means of a pointer and dial this instrument will indicate a rate of ascent or descent of airplane in feet per minute. But due to lag of the instrument, aircraft will be climbing or descending before instrument starts to read and instrument will continue to read after aircraft has assumed level flight. In rough air this should not be considered a malfunction.

NOTE: When any connections in the static system are opened for checking, system must be rechecked per FAR 23.1325.

B. Troubleshooting

See Chart 1.

CHART 1
TROUBLESHOOTING VERTICAL SPEED INDICATOR

Trouble	Cause	Remedy
Pointer does not set on zero.	Aging of diaphragm.	Reset pointer to zero by means of setting screw. Tap instrument while resetting.
Pointer fails to respond.	Obstruction in static line.	Disconnect all instruments connected to the static line. Clear line.
	Pitot head frozen over.	
	Water in static line.	Check individual instrments for obstruction in lines.
	Obstruction in pitot head.	Clean lines and head.
Pointer oscillates.	Leak in static lines.	Disconnect all instruments connected to the static line. Check individual instruments for leaks. Reconnect instruments to static line and test installation for leaks.
	Defective mechanism.	Replace instrument.
Vertical speed indicates when aircraft is banked.	Water in static line.	Disconnect static lines and blow out lines from cockpit out to pitot head.
Pointer has to be set before every flight.	Temperature compensator inoperative.	Replace instrument.
Pointer cannot be reset to zero.	Diaphragm distorted.	Replace instrument.
Instrument reads very low during climb or descent.	Case of instrument broken or leaking.	Replace instrument.

3. Altimeter

A. Description

The altimeter indicates pressure altitude in feet above mean sea level. The indicator has three pointers and a dial scale; long pointer is read in hundreds of feet, middle pointer in thousands of feet and short pointer in ten thousands of feet. A barometric pressure window located on right side of indicator dial is set by knob located on lower left corner of instrument. Altimeter consists of a sealed diaphragm that is connected to pointers through a mechanical linkage. Instrument case is vented to static air system and as static air pressure decreases, diaphragm expands, causing pointers to move through mechanical linkage.

NOTE: When any connections in the static system are opened for checking, system must be rechecked per FAR 23.1325.

B. Troubleshooting

See Chart 2.

CHART 2
TROUBLESHOOTING ALTIMETER

Trouble	Cause	Remedy
Excessive scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation.	Defective mechanism.	Replace instrument.
High or low reading.	Improper venting.	Eliminate leak in static pressure system and check alignment of airspeed tube.
Setting knob is hard to turn.	Wrong lubrication or lack of lubrication.	Replace instrument.
Inner reference marker fails to move when setting knob is rotated.	Out of engagement.	Replace instrument.
Setting knob set screw loose or missing.	Not tight when altimeter was reset.	Tighten instrument screw, if loose. Replace instrument, if screw is missing.
Cracked or loose cover glass.	Case gasket hardened.	Replace instrument.
Dull or discolored markings.	Age.	Replace instrument.
Barometric scale and reference markers out of synchronism.	Slippage of mating parts.	Replace instrument.
Barometric scale and reference markers out of synchronism with pointers.	Drift in mechanism.	Refer to the latest revision of AC43.13-1.
Altimeter sticks at altitude or does not change with change of altitude.	Water or restriction in static line.	Remove static lines from all instruments, blow line clear from cockpit to pitot head.
Altimeter charges reading as aircraft is banked.	Water in static line.	Remove static lines from all instruments, and blow line clear from cockpit to pitot head.
Altimeter requires resetting frequently.	Temperature compensator inoperative.	Replace instrument.

4. Airspeed Indicator

A. Description

The airspeed indicator provides a means of indicating speed of airplane passing through air. Airspeed indication is differential pressure reading between ram air to pressure and static air pressure. This instrument has diaphragm vented to pitot air source and case is vented to static air system. As airplane increases speed, pitot air pressure increases, causing diaphragm to expand. A mechanical linkage picks up this motion and moves instrument pointer to indicated speed. Instrument dial is calibrated in knots, and also has necessary operating range markings for safe operation of airplane.

NOTE: When any connections in the static system are opened for checking, system must be rechecked per FAR 23.1325.

B. Troubleshooting

See Chart 3.

CHART 3
TROUBLESHOOTING AIRSPEED INDICATOR AND LINES

Trouble	Cause	Remedy
Pointers of stick instruments do not indicate properly.	Leak in instrument case or in pitot lines.	Check for leak and seal.
Pointer of instrument oscillates.	Defective mechanism.	Replace instrument.
Instrument reads high.	Pointer not on zero.	Replace instrument.
	Leaking static system.	Find leak and correct.
Instrument reads low.	Pointer not on zero.	Replace instrument.
	Leaking static system.	Find leak and correct.
	Pitot head not aligned correctly.	Realign pitot head.
Airpeed changes as aircraft is banked.	Water in pitot line.	Remove lines from static instruments and blow out lines from cockpit to pitot head.

5. Outside Air Temperature (OAT)

In the standard installation, OAT is provided by a direct reading thermometer mounted in the lower forward corner of the pilot's side window.

In 6X S/N's 3232014 & up and 6XT S/N's 3255015 & up with the optional Avidyne Entegra Electronic Flight Display System installed, OAT is provided by the Magnetometer / OAT Sensor Assembly (Mag/OAT) mounted in the underside of the outboard left wing, which feeds temperature data to the Primary Flight Display (PFD) and Multifunction Display (MFD).

See Electronic Flight Display System and Magnetometer in 34-20-00 for additional information.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

ATTITUDE AND DIRECTION

1. Attitude Indicator

   A. Description

   Attitude Indicator is essentially an air driven gyroscope rotating in a horizontal plane and is operated by same principal as directional gyro (see below). Due to gyroscopic inertia, spin axis continues to point in vertical direction, providing a constant visual reference to attitude of airplane relative to pitch and roll axis. A bar across face of indicator represents horizon and aligning miniature airplane to horizon bar simulates alighnent of airplane to actual horizon. Any deviation simulates deviation of airplane from true horizon. Attitude Indicator is marked for different degrees of bank.

   B. Troubleshooting

   See Chart 1.

CHART 1
TROUBLESHOOTING ATTITUDE INDICATOR

Trouble	Cause	Remedy
Bar fails to respond.	Insufficient vacuum.	Check pump and tubing.
	Filter dirty.	Clean or replace filter.
Bar does not settle.	Insufficient vacuum.	Check line and pump. Adjust valve.
	Incorrect instrument.	Check part number.
	Defective instrument.	Replace.
Bar oscillates or shimmies continuously.	Instrument loose in panel.	Tighten mounting screws.
	Vacuum too high.	Adjust valve.
	Defective mechanism.	Replace instrument.
Instrument does not indicate level flight.	Instrument not level in panel.	Loosen screws and level instrument.
	Aircraft out of trim.	Trim aircraft.
Bar high after 180° turn.	Normal, if it does not exceed 1/16 inch.	
Instrument tumbles in flight.	Low vacuum.	Reset regulator.
	Dirty filter.	Clean or replace filter.
	Line to filter restricted.	Replace line.
	Plug missing or loose in instrument.	Replace or tighten plug.

2. Standby Attitude Indicator

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

In 6X S/N's 3232014 & up and 6XT S/N's 3255015 & up with the optional Avidyne Entegra Electronic Flight Display System installed, an electric standby attitude indicator is installed to the left of the Primary Flight Display (PFD).

Other than removing and replacing the unit itself (see 39-10-00), the only line replaceable part is the emergency power battery which is located under the instrument panel mounted to a bracket on the left side of the fuselage. See Appendix 2 (grid 3L3) for an illustration.

Required periodic maintenance is listed in 5-20-00 and 5-30-00. Checkout and test procedures and Instructions for Continued Airworhiness are provided in Mid-Continent Instruments Manual No. 90157262.

3. Electronic Flight DIsplay System

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

6X S/N's 3232014 & up and 6XT S/N's 3255015 & up may be equipped with the Avidyne Entegra Electronic Flight Display System as an optional installation. If so, see Appendix 2 (grid 3L3).

4. Directional Gyro

A. Description

Directional gyro is a flight instrument incorporating an air driven gyro stabilized in vertical plane. Gyro is rotated at high speed by lowering pressure in air tight case and simultaneously allowing atmospheric air pressure to enter instrument against gyro buckets. Due to gyroscopic inertia, spin axis continues to point in same direction even though aircraft yaws to right or left. This relative motion between gyro and instrument case is shown on instrument dial which is similar to a compass card. Dial, when set to agree with airplane magnetic compass, provides a positive indication free from swing and turning error. However, directional gyro has no sense of direction and must be set to magnetic compass. Since magnetic compass is subject to errors due to magnetic fields, electric instruments, etc, directional gyro is only accurate for heading it has been set for. If gyro is set on 270°, for instance, and aircraft is turned to some other heading, there can be a large error between gyro and magnetic compass due to error in compass compensation. This will appear as gyro precession. Gyro should only be checked to heading on which it was first set. Due to internal friction, spin axis error, air turbulence and airflow, gyro should be set at least every 15 minutes for accurate operation, whether it has drifted or not.

B. Troubleshooting

See Chart 2.

CHART 2
TROUBLESHOOTING DIRECTIONAL GYRO

Trouble	Cause	Remedy
Excess drift in either direction.	Setting error.	Review paragraph titled "Description" for gyro operation.
	Defective instrument.	Replace instrument.
	High or low vacuum. If vacuum is not correct, check for the following:	
	1. Relief valve improperly	1. Adjust relief valve adjusted.
	2. Incorrect gauge reading.	2. Replace gauge.
	3. Pump failure.	3. Repair or replace.
	4. Vacuum line kinked or leaking.	4. Check and repair. Check for collapsed inner wall of hose.
Dial spins during turn.	Limits (55° bank) of gimbal exceeded.	Recage gyro in level flight.
Dial spins continuously.	Defective mechanism	Replace.

5. Magnetic Compass

A. Description

Magnetic compass is a self-contained instrument. This instrument has an individual light which is connected to instrument lighting circuit. Compass correction card is located in card holder mounted on instrument. Compass should be swung whenever instruments or radios are changed and at least once a year.

B. Troubleshooting

See Chart 3.

CHART 3
TROUBLESHOOTING MAGNETIC COMPASS

Trouble	Cause	Remedy
Excessive card error.	Compass not properly compensated.	Compensate instrument.
	External magnetic interference.	Locate magnetic interference and eliminate if possible.
Excessive card oscillation.	Insufficient liquid.	Replace instrument.
Card sluggish.	Weak card magnet.	Replace instrument.
	Excessive pivot friction or broken jewel.	Replace instrument.
Liquid leakage.	Loose bezel screws.	Replace instrument.
	Broken cover glass.	Replace instrument.
	Defective sealing gaskets.	Replace instrument.
Discolored markings.	Age	Replace instrument.
Defective light.	Burned out lamp or broken	Check lamp or continuity of circuit wiring.
Card sticks.	Altitude compensating diaphragm collapsed.	Replace instrument.
Card does not move when compensating screws are turned.	The gears that turn compensating magnets are stripped.	Replace instrument.
Compass swings erratically when radio transmitter is keyed.	Normal.	

C. Adjustment

Before attempting to compensate compass, every effort should be made to place aircraft in simulated flight conditions; check to see that doors are closed, flaps in retracted position, engine running, throttle set at cruise position and aircraft in level flight attitude. Aircraft master switch, alternator switch and all radio switches should be in ON position. All other cockpit controlled electrical switches should be in OFF position.

NOTE: Use a non-magnetic screwdriver to adjust magnetic compass

(1) Set adjustment screws of compensator on zero. Zero position of adjusting screws is when dot of screw is lined up with dot of frame.

(2) Head aircraft on a magnetic North heading. Adjust N-S adjustment screw until compass reads exactly North.

(3) Head aircraft on a magnetic East heading and do same as Step 2, adjusting E-W adjusting screw.

(4) Head aircraft on a magnetic South heading and note resulting South error. Adjust N-S adjusting screw until one-half of this error has been removed.

(5) Head aircraft on magnetic West and do same as Step 4, adjusting E-W adjustment screw.

(6) Head aircraft in successive magnetic 30° headings and record compass readings on appropriate deviation card. Deviations must not exceed ± 10° on any heading.

6. Magnetometer

In 6X S/N's 3232014 & up and 6XT S/N's 3255015 & up with the optional Avidyne Entegra Electronic Flight Display System installed, the Magnetometer / OAT Sensor Assembly (Mag/OAT) mounted in the underside of the outboard left wing, supplies magnetic heading information to the Primary Flight Display (PFD).

See Appendix 2 (grid 3L3) for additional information.

7. Turn and Bank Indicator

A. Description

These airplanes are equipped with electric Turn Coordinators, which indicate both rate of turn and rate of roll. This instrument consists of two components:

(1) An electrically driven, inclined, gyro rotor is slaved to the turn indicator (small airplane). The spinning gyro resists change in position as the airplane moves around it. This resistance is mechanically translated into indicator movement. If the aircraft is rolled right or left rapidly, the small airplane will move, indicating a turn. But, if aircraft is held in a bank and opposite rudder is applied, the small airplane will come back to zero (level) indicating no turn. When the aircraft is established in a coordinated turn, the small airplane will remain deflected, indicating the turn.

(2) A metal ball sealed in a curved glass tube filled with dampening fluid provides a sensitive indication of yaw (slip/skid) and is used to maintain coordinated flight. The ball rolls freely within the curved glass tube display on the lower instrument face. Any deflection from center indicates the presense of side forces on the aircraft.

B. Troubleshooting

See Chart 4.

CHART 4
TROUBLESHOOTING TURN AND BANK INDICATOR

Trouble	Cause	Remedy
Pointer fails to respond.	Foreign matter lodged in instrument.	Replace instrument.
Incorrect sensitivity.	Out of calibration.	Replace instrument.
Incorrect turn rate (electric).	Out of calibration.	Replace instrument.
	Aircraft not in coordinated turn.	Center ball in turn.
Ball sticky.	Flat spot on ball.	Replace instrument.
Ball not in center when aircraft is correctly trimmed.	Instrument not level in panel.	Level instrument.
Instrument will not run (electric).	No power to instrument.	Check circuit and repair.
	Instrument malfunction.	Replace instrument.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

35

OXYGEN

(6XT ONLY)

THIS PAGE INTENTIONALLY BLANK

CHAPTER 35

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 35 - OXYGEN

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

CREW / PASSENGER

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

CAUTION: WHEN REFILLING ANY OXYGEN CYLINDER MAKE SURE TO USE ONLY AVIATION BREATHING OXYGEN AS SPECIFIED IN MIL-O-27210C. THE MOISTURE CONTENT OF AVIATION OXYGEN CANNOT EXCEED 0.005 MILLIGRAMS OF WATER VAPOR PER LITER OF GAS AT 70°F (21°C) AND 29.92 INCHES OF MERCURY (760 MM HG.).

The following provides supplemental information for the servicing of the oxygen system. Major repairs to the oxygen system should be accomplished by an approved shop.

1. Description and Operation (See Figure 1.)

WARNING: DO NOT USE GREASE OR ANY TYPE OF GREASE FITTING ON ANY OXYGEN SYSTEM. WHEN WORKING WITH AN OXYGEN SYSTEM MAKE SURE HANDS, CLOTHING, TOOLS, AND IMMEDIATE AREA ARE FREE OF GREASE.

A fixed oxygen system is available in 6XT airplanes only, as an option. The major components for this system are manufactured by Scott Aviation. Accordingly, Scott Aviation, as well as Piper Dealer Service Administrators (DSA's), should be contacted for information / procedures not covered herein.

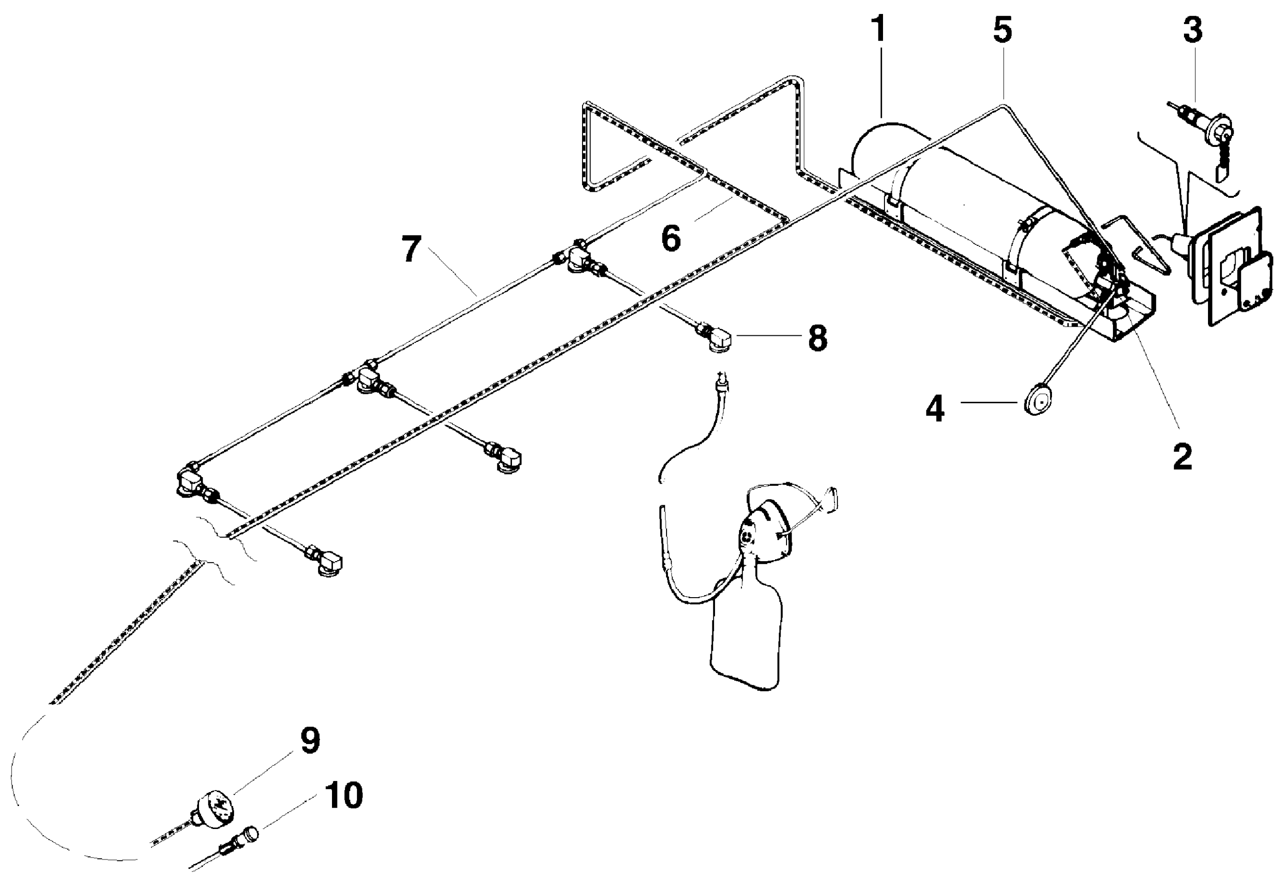
The oxygen system cylinder is installed in the tailcone, behind the baggage compartment, and is connected to an external recharge valve mounted to the left side of the fuselage, aft of FS 222.437. The low pressure (L.P.) feed line for the outlets is routed to the right side of the fuselage and then up into the cabin overhead. It joins the outlets' distribution manifold at a tee-fitting on the right rear passenger outlet.

The PULL-ON regulator valve control knob and pressure gauge are installed in the pilot's instrument panel below, and slightly to the right of, the control wheel. The control knob actuates a cable routed through the center cabin overhead and attached to the oxygen system cylinder regulator valve. The pressure gauge is fed by a high pressure line routed from the oxygen system cylinder along the right side of the fuselage and then up into the center cabin overhead where it joins the control cable and the two are then routed down the windshield centerpost and into the back of the instrument panel.

NOTE: Oxygen cylinders are identified by the ICC or DOT identification stamped on the cylinder. The lightweight cylinder of composite construction (DOT E8162) installed in these airplanes must be hydrostatically tested every 3 years, and the service life may not exceed 15 years. The month and year of the last test is stamped beneath the ICC/DOT identification.

2. Troubleshooting

See Chart 1.



1. OXYGEN CYLINDER
2. REGULATOR
3. H. P. RECHARGE VALVE
4. H. P. RELIEF VALVE EXHAUST PORT
5. REGULATOR CONTROL CABLE
6. H. P. LINE TO PRESSURE GAUGE
7. L. P. LINE TO OUTLETS
8. OUTLET
9. PRESSURE GAUGE
10. REGULATOR CONTROL KNOB (PULL ON)

Fixed Oxygen System Installation
Figure 1

CHART 1
TROUBLESHOOTING OXYGEN SYSTEM

Trouble	Cause	Remedy
No indication of pressure on pressure gauge.	Cylinder empty or leak in system has exhausted pressure.	Purge, charge, and check system for leaks.
	Pressure gauge or regulator defective.	Replace gauge.
Pressure indication normal but no oxygen flowing.	Oxygen cylinder regulator assembly defective.	Remove tank and have regulator removed.
Offensive odors in oxygen.	Cylinder pressure below 50 psi.	Purge the oxygen system.
	Foreign matter has entered the system during previous servicing.	Purge the oxygen system.

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

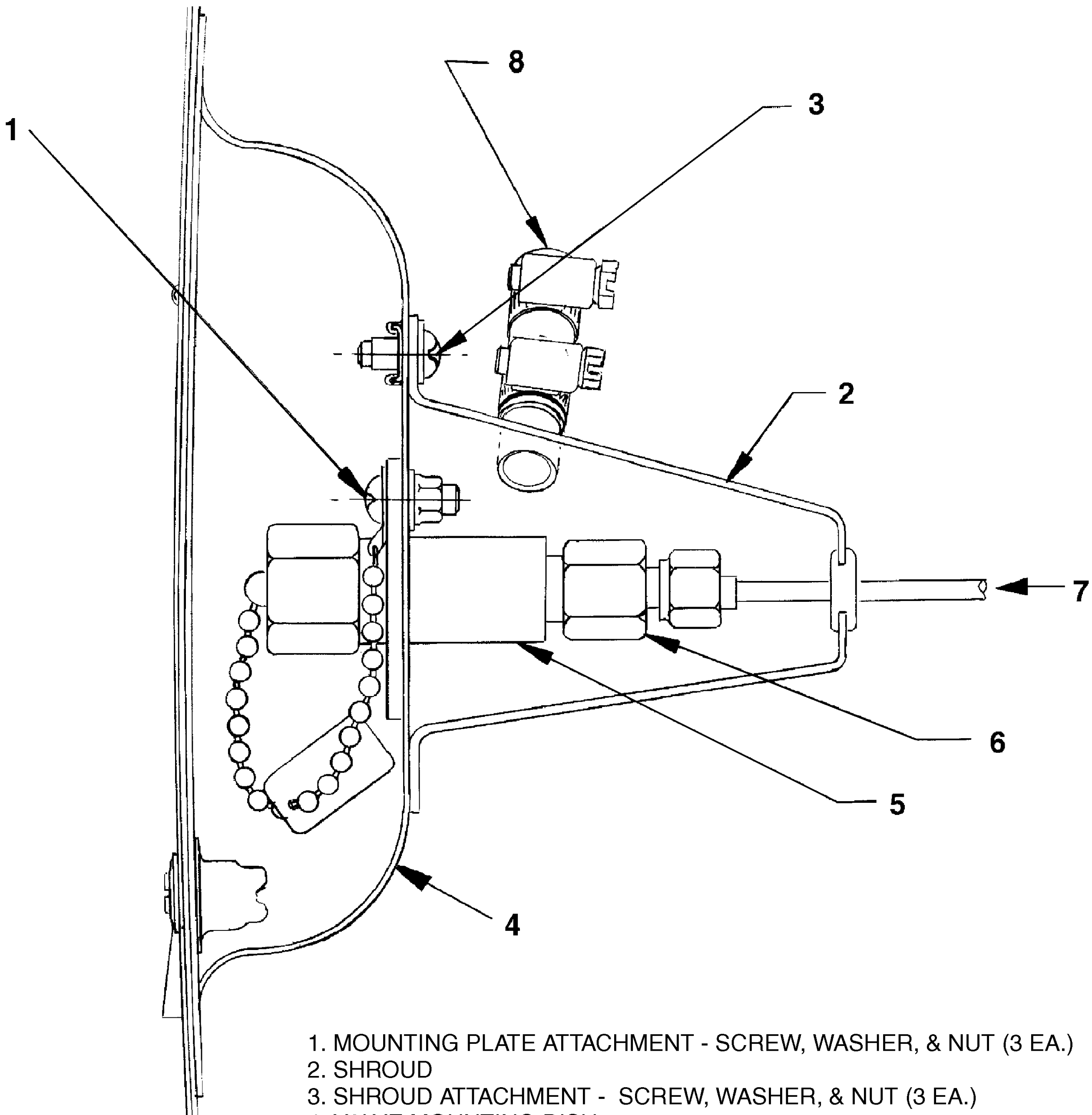
CAUTION: DO NOT ATTEMPT TO TIGHTEN ANY CONNECTIONS WHILE THE SYSTEM IS CHARGED.

CAUTION: BOTTLES WHICH HAVE BEEN EVACUATED TO 200 PSI FOR A SIGNIFICANT LENGTH OF TIME, OR THOSE THAT DO NOT PRODUCE AN AUDIBLE HISSING SOUND WHEN THE VALVE IS CRACKED, SHOULD BE REMOVED AND HYDROSTATICALLY TESTED. IF EITHER OF THESE CONDITIONS HAS EXISTED FOR A SIGNIFICANT LENGTH OF TIME, PURGE THE SYSTEM.

CAUTION: MAKE SURE THERE IS NO OIL, GREASE, HYDRAULIC FLUID, OR FUEL IN THE VICINITY OF ANY FITTINGS BEING SERVICED.

CAUTION: DO NOT USE THREAD LUBRICANTS OF ANY KIND. USE TEFLON TAPE (3M NO. 48) ON TAPERED PIPE THREADS, WITHOUT TAPE EXTENDING BEYOND THE FIRST THREAD. SEE APPLICATION OF TEFLON TAPE THREAD SEALANT, BELOW.

CAUTION: BEFORE WORKING WITH THE SYSTEM, MAKE SURE AIRCRAFT IS ELECTRICALLY GROUNDED AND YOUR HANDS TOOLS, AND CLOTHES ARE FREE OF OIL, GREASE AND DIRT.



1. MOUNTING PLATE ATTACHMENT - SCREW, WASHER, & NUT (3 EA.)
2. SHROUD
3. SHROUD ATTACHMENT - SCREW, WASHER, & NUT (3 EA.)
4. VALVE MOUNTING DISH
5. RECHARGING VALVE ASSEMBLY
6. FEMALE CONNECTOR (UNION) (TORQUE TO 30 - 150 IN. LBS.)
7. HIGH PRESSURE LINE TO REGULATOR
8. VENT TUBE PLUG ASSEMBLY

100946

Oxygen System Recharge Valve Installation
Figure 2

3. Servicing the Oxygen System

Due to the nature of the process used to test compressed gas tanks, servicing and hydrostatic tests must be conducted by a DOT or manufacturer (Scott Aviation) approved shop. The following material gives recommended inspection and maintenance information for the various parts of the oxygen system.

A. Refilling

CAUTION: BEFORE SERVICING THE OXYGEN SYSTEM, MAKE SURE THE AIRCRAFT IS SECURELY GROUNDED ELECTRICALLY.

CAUTION: DO NOT OPERATE ELECTRICAL EQUIPMENT WHILE SERVICING OXYGEN SYSTEM.

CAUTION: DO NOT ATTEMPT TO TIGHTEN ANY CONNECTIONS WHILE THE SYSTEM IS CHARGED.

Refilling of oxygen systems should be done by qualified personnel. For comparison of filling pressures to ambient temperatures refer to Chart 2. The following are parameters to be followed for filling.

(1) Only aviators breathing oxygen (MIL-0-27210) and appropriate filling equipment should be used to fill the system.

(2) If a cylinder has less than 5 psi pressure or has insufficient pressure to produce an audible hissing sound when the valve is cracked, it should be removed and/or purged, and if the condition has existed for a significant length of time, hydrostatically test cylinder.

(3) Make sure both the charge valve and recharge cart fittings are clean and free of contamination.

WARNING: BE CERTAIN THERE IS NO OIL OR OTHER PETROLEUM BASED MATERIAL ON THE FITTINGS OR IN THE IMMEDIATE VICINITY.

(4) Attach service cart hose to recharge port. Fill the system at a rate not exceeding 200 psig per minute proceeding as follows:

(a) To obtain the correct filling pressure for the oxygen system at various ambient temperatures, a table is included for your convenience. The pressures given are not exact, but sufficiently accurate for practical purposes of working pressures between 1800 and 2400 psig cylinders. The cylinder should be allowed to cool to a stabilized temperature after filling before checking against the values in Chart 2.

(b) When using a recharge unit consisting of one supply cylinder, slowly open the valve of the supply unit and allow the oxygen to transfer.

(c) When using a recharge unit consisting of two or more supply cylinders (cascade storage system), it is recommended that the following procedure be used:

1 Before opening any valves, check the pressure remaining in the airplane's oxygen cylinder. If it is still partly charged, note the pressure indicated on the cylinder gauge. Then open and close each valve on the cascade storage system and determine which cylinder has the lowest pressure. When found, if this cylinder has a pressure lower than the oxygen cylinder in the aircraft, do not attempt using it for filling; use the storage cylinder that has a pressure higher than the aircraft's cylinder but lower than the others.

2 Open the valve on only the one storage cylinder with the lowest pressure. When the pressure indicated on the aircraft's oxygen gauge and charging gauge has become equal, close the valve of the storage cylinder, then go to the storage cylinder with the next higher pressure and repeat the procedure.

CHART 2
FILLING PRESSURES* FOR CERTAIN AMBIENT TEMPERATURES

Ambient Temperature °F/°C	Filling Pressure	Ambient Temperature °F/°C	Filling Pressure
0 / -17.78	1650 (PSI)	70 / 21	1975 (PSI)
10 / -12.22	1700	80 / 27	2000
20 / - 6.67	1725	90 / 32	2050
30 / - 1.11	1775	100 / 38	2100
40 / 4.44	1825	110 / 43	2150
50 / 10	1875	120 / 49	2200
60 / 15.56	1925	130 / 54	2250

* Filling pressures are for 1850 PSI at 70°F (21.11°C). Table assumes 25°F (11.8°C) rise due to heat of compressor with max. fill rate.

3 If after using the last storage cylinder the aircraft's oxygen system is still not fully charged, a full storage cylinder should be put in place of a cylinder with the lowest pressure and used in the same manner.

4 A good amount of oxygen will remain in the large cylinders used in the cascade system after filling only one of the cylinders. This remaining oxygen will be at a pressure something less than the 1850 psi. This is not sufficient pressure to completely refill another aircraft cylinder, although it will refill several small cylinders.

5 It is not economical, even on a three or four cylinder cascade system, to begin recharging with oxygen at less than 300 psi pressure in the 300 cubic foot bank of cylinders. So use 300 cubic foot cylinders down to approximately 300 psi; then return for refilling. In two cylinder systems use to approximately 100 psi; then return for filling.

(d) When the pressure gauge on the recharge unit or in the aircraft reaches 1800 to 1850 psi, close the pressure regulator valve on the recharge unit. Disconnect the filler hose from the filler valve; replace the protective cap on the filler valve and close the access cover. Check the cylinder pressure according to Chart 2 after the cylinder temperature stabilizes.

(5) After detaching the service cart, cap hose and fittings to prevent contamination.

(6) Perform a leak check of the high pressure lines and clean off solution afterwards. If solution is not properly cleaned off, corrosion may result.

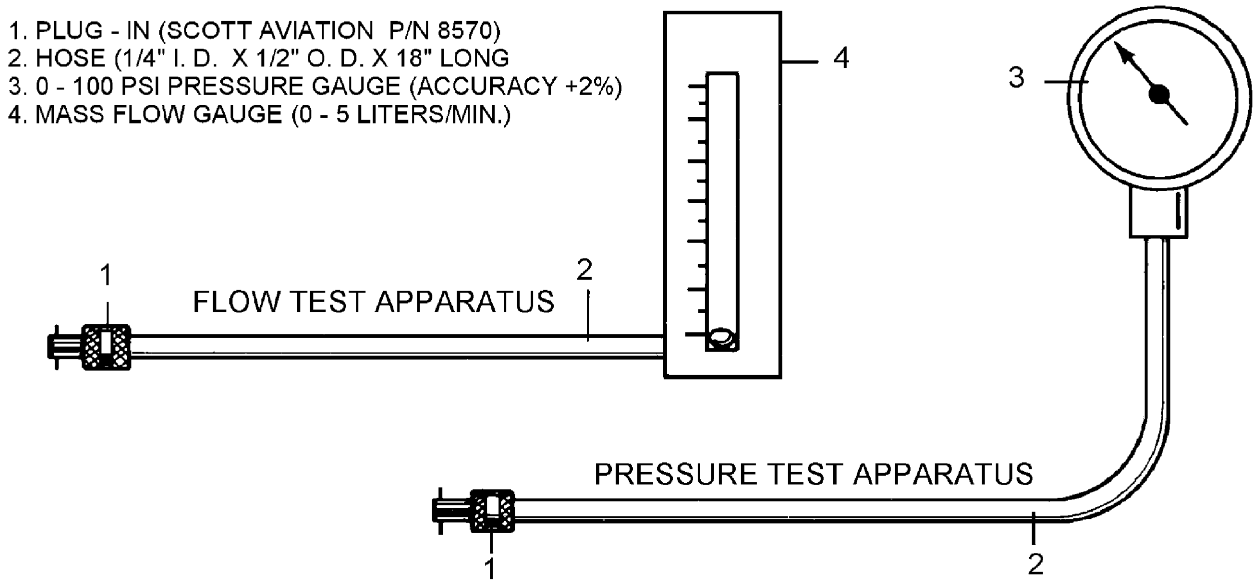
B. Inspections

(1) Check the outlets for leakage both in the use and non-use condition and for leakage around an inserted connector. See Leak Test, below.

(2) Check the high pressure gauge for accuracy by comparing its indicated pressure with that of a gauge of known accuracy connected to the fill port.

(3) Visually inspect tank weekly. Look for dents, bulges, corrosion, major strap chaffing marks, and current hydrostatic test date. Should any of these problems exist, the tank should be removed and hydrostatically tested.

NOTE: Oxygen cylinders are identified by the ICC or DOT identification stamped on the cylinder. On these airplanes, the lightweight cylinder of composite construction (DOT E8162), must be hydrostatically tested every 3 years, and the service life may not exceed 15 years. The month and year of the last test should be stamped on the cylinder beneath the ICC, DOT identification.



Oxygen System Test Apparatus
Figure 3

CHART 3
FIXED OXYGEN SYSTEM COMPONENT LIMITS

Component	Inspection	Overhaul
Cylinder	Weekly [1]	Each 3 Years
Regulator	On Condition / Each Use [2]	Each 6 Years
Pressure Gauge	On Condition / Each Use [2]	Replace On Condition
High Pressure Lines	On Condition / Each Use [2]	Replace On Condition
Low Pressure Lines	On Condition / Each Use [2]	Replace On Condition
Outlets	On Condition / Each Use [2]	Each 5 Years [3]
External Recharge Valve	On Condition / Each Use [2]	Replace On Condition [4]
Masks	On Condition / Each Use [2]	Each 5 Years

1. Visual inspection for dents, bulges, corrosion, or chafing.
2. Visual inspection in the normal course of use.
3. On condition, replace the rubber components in the assembly or replace assembly.
4. If the screen in front of valve is dirty, replace valve. Valve replacement is recommended every 5 years.

(4) An operational check of the regulator can be accomplished as follows: (Refer to Figure 3.)

(a) Using an 18 inch (45.72 cm) long hose having a 1/4 in. (0.635cm) I.D. x 1/2 in. (1.27cm) O.D., attach a Scott Aviation 8570-00 plug-in to a sensitive pressure gauge having a range of 0 to 100 psi. Connect the apparatus to the pilot's outlet in the overhead panel.

(b) Using a second 18 inch long hose having a 1/4 in. (0.635cm) I.D. x 1/2 in. (1.27cm) O.D., attach a Scott Aviation 8570-00 plug-in to a pneumatic flow apparatus having a range of 0-5 liters per minute. Connect the flow apparatus to the copilot's outlet.

(c) Insert a Scott plug-in in each of the other outlets and pull the oxygen control knob to the on position. The pressure and flow at sea level should be 55 to 80 psi and 3.3 to 5.3 liters per minute respectively.

(5) Check airframe logbook for last maintenance on oxygen system and perform as required per Chart 3.

(6) Test the oxygen for odor. Pure oxygen is odorless and tasteless. Any system having a significant odor present in the gas should be purged and the bottle replaced or removed and purged.

(7) Any fittings, connectors, and tubes which have imperfect threads, pitted or disfigured cones, or other damage should be replaced.

(8) Check plumbing for kinking, cracks, gouges, dents, deep scratches, or other damage. Replace as necessary.

CAUTION: OXYGEN TUBES MUST NOT BE CLAMPED TO, OR SUPPORTED BY ELECTRICAL WIRE BUNDLES, HYDRAULIC, PNEUMATIC OR OTHER LINES.

(9) Make sure to check the oxygen lines for proper clearance as follows: (Refer to Figure 4.)

(a) Two inch minimum between oxygen tubes and all flexible moving parts of the aircraft (flexible control cables, etc.). If enough space cannot be attained, protection from abrasion must be provided.

(b) At least 1/2 inch minimum between oxygen tubes and all rigid moving parts of the aircraft such as levers and rigid control rods.

(d) Six inch minimum separation between oxygen tubes and hydraulic, fuel and electrical system lines and components.

NOTE: When the six inch requirement cannot be complied with, one inch is allowed as long as electrical cables and other lines are supported at least every two inches; and, the oxygen tube(s) is protected by rubber neoprene hose fastened in place with cable ties at the location the specific item crosses or is near the oxygen tube(s). If an item is near the oxygen tube for a certain distance the oxygen tube for that distance must be covered.

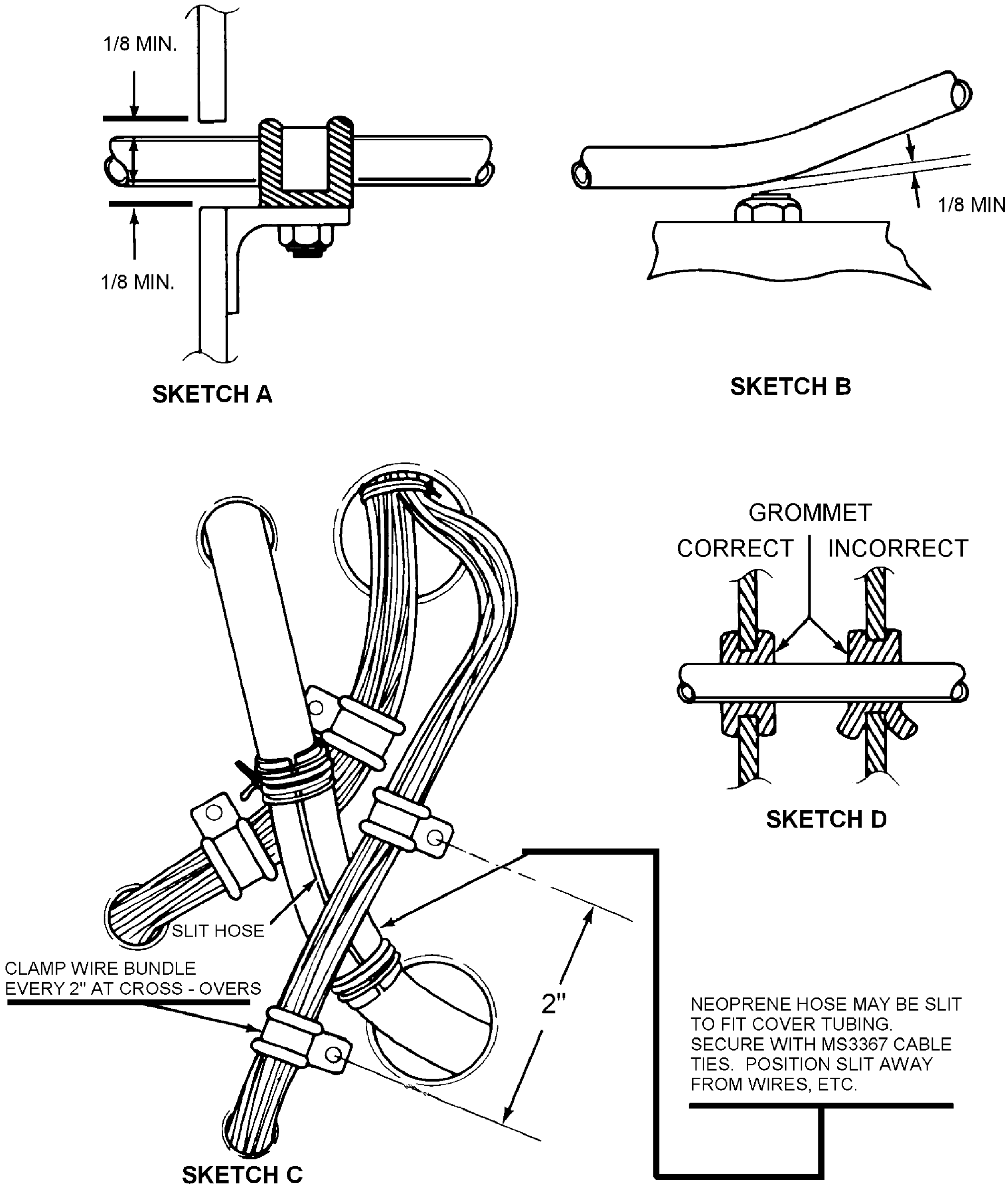
(d) A minimum of 1/8 inch between tubing and structure adjoining the supporting clamp as shown in Figure 4, Sketch A.

(e) Where a tube passes through a grommet, the tube must not bear on the grommet in any way that might cause cutting of the grommet in service as shown in Figure 4, Sketch D.

(f) While in service, items may receive vibrations causing them to come in contact with other parts of the aircraft. With this in mind, low pressure tubing that is supported well enough to prevent relative motion must have at least a minimum clearance of 1/8 inch from a projection (bolt, nut, etc). Low pressure tubing that cannot be supported well enough to prevent motion must have a minimum clearance of 1/8 inch allowed after the maximum travel of the tube. High pressure lines are affected similarly but require 1/2 inch minimum clearances. (Refer to Figure 4, Sketch B.)

(10 Perform any other required maintenance as directed in AC43.13-1 latest revision, Chapter 8.

(11) Clean components as necessary per Cleaning and Purging, below.



Oxygen Tubing Installation
Figure 4

C. Leak Tests

Solutions recommended for leak testing are Leak-Tec Formula #16-OX and is available from Scott Aviation. Refer to the List of Consumable Materials for consumer information.

(1) Remove the royalite covers in the baggage compartment and, with oxygen system turned off, disconnect the low pressure supply line and connect it to a regulated cylinder charged with dry nitrogen.

NOTE: Whenever a leak check is performed, all fitting connections as well as other questionable areas, should be inspected.

(2) Apply the leak detector solution to the test surface and watch for indication of leakage.

(3) Large leaks will produce bubbles immediately, but small leaks will form a white foam in 5 to 60 seconds.

(4) With outlets vacated of masks, connect a test pressure gauge to the copilot's outlet as described in Inspections, above. See also Figure 3.

(5) Adjust the regulator on the dry nitrogen cylinder for 100 psi and check for leakage at the outlets.

(6) Correct any leaks and wipe off excess leak detector solution.

(7) Close the valve on the nitrogen gas tank and insert a Scott plug-in to relieve system pressure.

(8) Disconnect test gauge, plug-in, and nitrogen tank.

(9) If the oxygen cylinder is not to be hooked up or installed immediately, cap and cover the exposed fittings with new clean plastic bags. Temporarily support lines as needed to prevent damage. Make sure caps and coverings are as clean as possible.

D. Cleaning and Purging

CAUTION: CARE MUST BE EXERCISED TO PREVENT CONTAMINATION OF COMPONENTS BY OIL, GREASE, WATER, OR FOREIGN MATTER. COMPRESSED AIR USED IN CLEANING AND FLUSHING TUBES MUST BE CLEAN, DRY, FILTERED (OIL FREE) AIR ONLY.

(1) Three methods are recommended for cleaning oxygen system components:

(a) Method I

1 Vapor degrease part(s) with trichlorethylene.

2 Blow part(s) dry with a stream of compressed air or dry nitrogen. See CAUTION, above.

(b) Method II

1 For tubing, flush with naptha per specification TT-N-95.

2 Blow clean and dry off all solvent with clean, dry, filtered air. Refer to previous caution.

3 Flush with isopropyl alcohol.

4 Rinse thoroughly with fresh water.

5 Dry with air as described in previous caution or by heating at a temperature of 250° to 300°F for one-half hour.

NOTE: Solvents can be reused provided they do not become badly contaminated with oil. This condition can be determined by thoroughly evaporating 100 millimeters of the liquid in a glass dish of a determined weight. Evaporation may be accomplished by heating the dish at 200°F (93°C) for one-half hour. If after evaporation and cool down, the residue exceeds 100 milligrams in weight, the solvent cannot be used for this purpose.

(c) Method III

1 Flush with hot inhibited alkaline cleaner until free from oil and grease.

2 Rinse thoroughly with fresh water.

3 Dry thoroughly with a stream of clean air as described in the previous caution or by heating 250°F to 300°F (121°C to 149°C) for one-half hour minimum.

CAUTION: DO NOT USE ADHESIVE TAPE FOR ATTACHING OR SECURING PROTECTIVE COVERINGS ON OXYGEN COMPONENTS. USE WAXED LACING TWINE OR TIE RAPS.

(2) After cleaning, all tubing must be protected by caps, plugs and/or plastic bags.

(3) Before installation, make sure fitting, tube, and fixture threads are in good condition and that the cones do not exhibit pitting or disfigurement.

E. Swageloc Fitting Installation (Refer to Figure 5.)

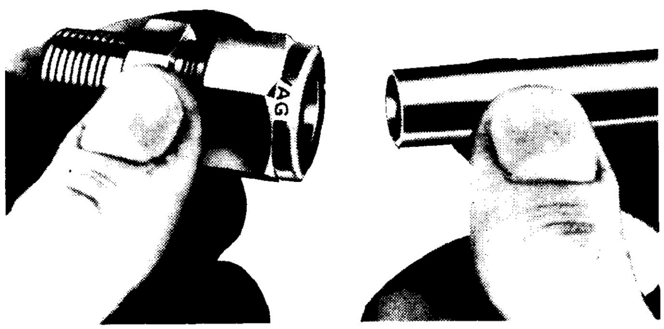
NOTE: The high pressure line fitting at the regulator should be tightened until it bottoms. Make sure to use teflon tape on all male pipe threads.

(1) For swageloc fittings not preswaged or for in-aircraft installation, proceed as follows:

(a) Turn the fitting nut onto the fitting finger tight and insert the tube until it bottoms firmly on the shoulder in the fitting.

(b) Tighten the nut with a wrench until the tube will not turn by hand.

(c) Mark the nut at the six o'clock position.

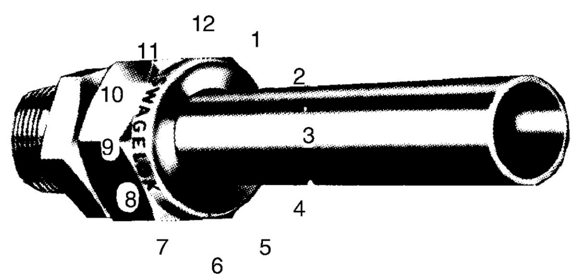


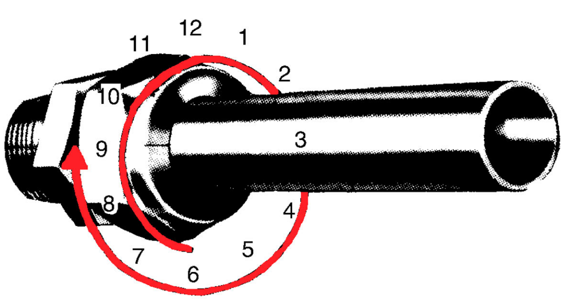
STEP 1

TURN THE FITTING NUT ONTO THE FITTING FINGER TIGHT AND INSERT THE TUBE UNTILL IT BOTTOMS FIRMLY ON THE SHOULDER IN THE FITTING

STEP 2

MARK THE NUT AT THE SIX O' CLOCK POSITION





STEP 3

HOLD THE FITTING WITH A WRENCH AND TIGHTEN THE FITTING NUT AS FOLLOWS:

A. TUBING WITH A DIAMETER GREATER THAN 3/16 INCH SHALL BE TIGHTENED 1 - 1/4 TURNS (THE NINE O' CLOCK POSITION)

B. TUBING WITH A DIAMETER OF 1/16, 1/8, OR 3/16 INCH SHALL BE TIGHTENED ONLY 3/4 TURN.

Swageloc Fitting Installation Procedure
Figure 5

(d) Hold the fitting body steady with a backup wrench and tighten as follows:

(a) On tubing with a diameter bigger than 3/16 inch, tighten 1 1/4 turns (to the nine o'clock position).

(b) On tubing of 1/16, 1/8, and 3/16 inch diameter, tighten only 3/4 turn.

(e) If nut and tube must be disconnected from the fitting, reconnect by seating the tube on the shoulder of the fitting and tightening the nut finger tight. Follow up by tightening the nut with a wrench, one quarter turn (if absolutely necessary the original 1 1/4 or 3/4 tight position) and then snug with wrench.

(2) Preswaged swageloc fittings are fabricated and installed as follows:

(a) Assemble the nut and ferrules finger tight on the preswaging tool and insert the tube until it firmly bottoms on the shoulder in the tool. The preswaging tool can be attained from Crawford Fitting Company, refer to List of Consumable Materials in Chapter 91.

(b) Tighten the nut on the fitting just enough that the tube within the fitting will not turn by hand.

(c) With a wrench, tighten the nut as follows:

1 On tubing with diameters over 3/16 inch, tighten 1 1/4 turns.

2 On tubing with 1/16, 1/8, or 3/16 inch diameter, tighten 3/4 of a turn.

(d) Unscrew the nut to release the ferrule-tube assembly from the tool.

(e) The assembly is installed on the fitting as follows:

1 Slide tube in fitting until it bottoms, turn nut to finger tight position and tighten one quarter turn with wrench.

2 Snug slightly with wrench.

F. Application of Teflon Tape Thread Sealant

All male pipe (tapered) threads of the oxygen system should be sealed with 3M No. 48 teflon tape. Teflon tape should not be used on straight threads. Do not use any other lubricants in place of the teflon or on any other threads.

(1) Wrap tape on the threads, starting with those farthest from the opening, in the direction of the thread spiral. Circle the threads, making sure that each side of the tape has a slight overlap.

(2) Wrap the tape such that it does not extend beyond the last thread on the fitting at the opening. The tape should then be pulled till it separates. Do not cut tape, it will not stick properly.

4. Oxygen System Components

Keeping in mind the effect of compressed oxygen on materials, oxygen system components must be handled carefully. Ports on regulators, indicators, and other opened components must also be kept capped or plugged to prevent ingestion of foreign material. Adjustments or modifications should only be initiated under the auspices of the FAA, Piper, or Scott Aviation.

NOTE: Replacement time for the recharge valve is on condition, but recommended each 5 years. The regulator requires overhaul every six (6) years. The lightweight composite cylinder must be removed every three (3) years for hydrostatic testing.

A. Oxygen Cylinder (Refer to Figure 6.)

(1) Removal

CAUTION: BEFORE ENTERING THE TAIL CONE, FIRST SUPPORT THE AIRCRAFT TAIL WITH A SUITABLE TAILSTAND.

From inside the aft cabin:

(a) Remove screws attaching finished bulkhead to fuselage bulkhead.

(b) Remove finished bulkhead.

(c) With immediate area clear of flammables (grease, hydraulic fluid, fuel, etc.) and oxygen system off; connect a mask or tube to an outlet to exhaust any pressure in the system.

NOTE: Continuous pressure is applied to high pressure line until it is disconnected from cylinder. A check valve will close when high pressure line is disconnected from cylinder. The closing of this valve is frequently accompanied by a loud popping sound.

(d) Carefully unscrew high pressure feed/recharge line at regulator until pressure decreases and then remove line. Cap line immediately after removal.

(e) Disconnect high pressure relief line from regulator. Cap line immediately after removal.

(f) Disconnect low pressure line from regulator. Cap line immediately after removal.

(g) Loosen and open clamps securing oxygen cylinder to its shelf.

(h) If necessary, move cylinder slightly to gain access to regulator valve control arm. Disconnect regulator valve control cable from cylinder by removing the retaining screw and clamp from the cable support bracket and the cotter pin attaching the cable to the control arm. Take care not to kink cable.

CAUTION: OPENING CONTROL VALVE DURING REMOVAL OF OXYGEN LOW PRESSURE LINE FROM CYLINDER WILL RESULT IN AN UNCHECKED FLOW OF OXYGEN INTO BAGGAGE COMPARTMENT UNTIL VALVE CAN BE CLOSED.

(i) Safety valve on cylinder in the OFF position.

(j) Remove cylinder from airplane.

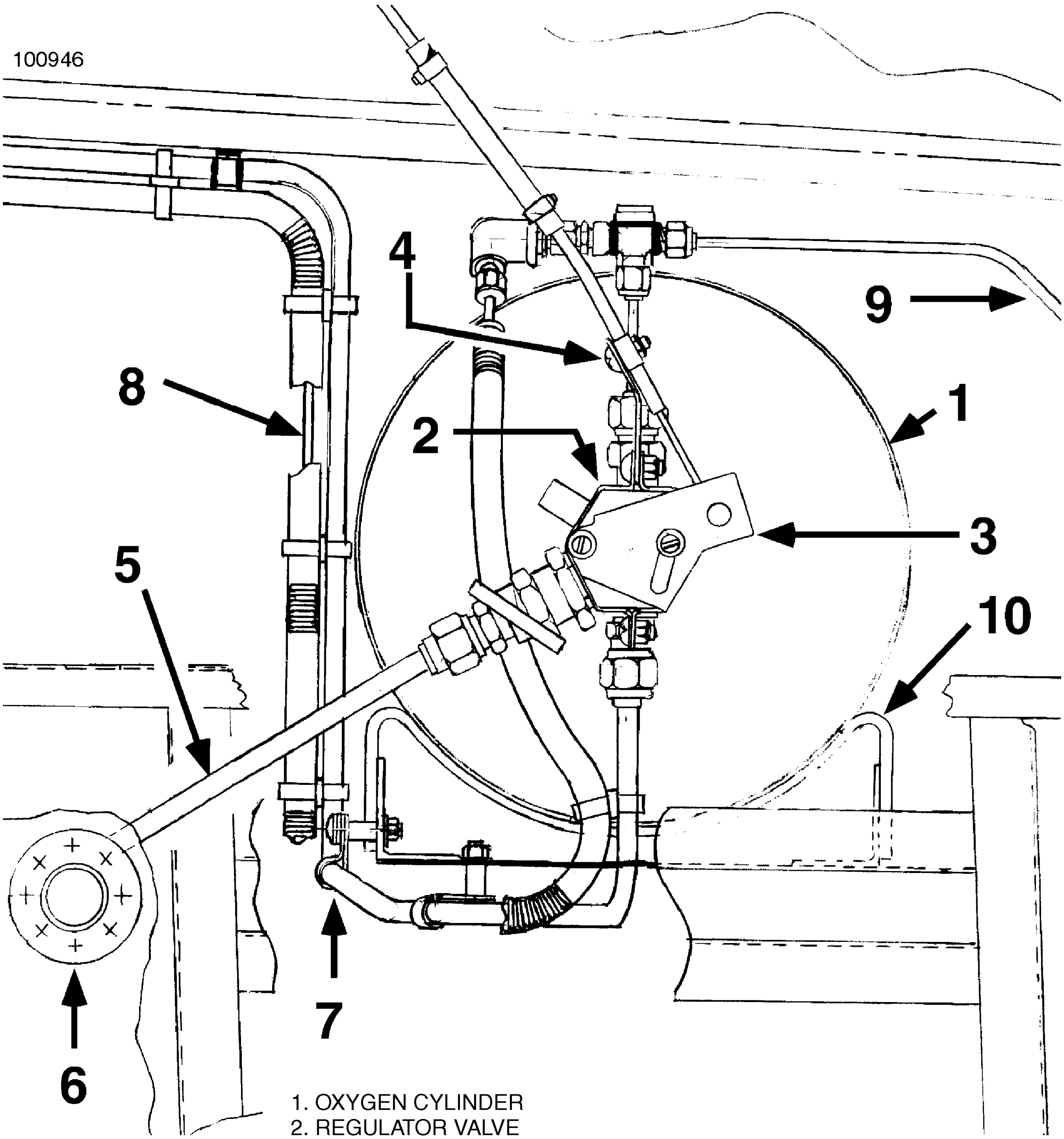
(2) Installation

(a) If cylinder mounting shelf has been removed, reinstall it first.

(b) Position cylinder in airplane as shown in Figures 1 and 5. Ensure that regulator valve control arm is free to move and does not contact surrounding area.

(c) Attach and secure regulator valve control cable (use a new cotter pin), before securing cylinder to shelf.

(d) Install and secure two cylinder hold down clamps.



1. OXYGEN CYLINDER
2. REGULATOR VALVE
3. REGULATOR VALVE CONTROL ARM
4. RETAINING SCREW, REGULATOR VALVE CONTROL CABLE (PULL ON)
5. H. P. RELIEF LINE
6. H. P. RELIEF VALVE EXHAUST PORT
7. L. P. OUTLET FEEDER LINE
8. H. P. GAUGE FEEDER LINE
9. H. P. RECHARGE LINE
10. OXYGEN CYLINDER MOUNTING BRACKET

Oxygen Cylinder and Regulator Valve
Figure 6

(e) Connect L. P. line to regulator. Insert tubing into fitting until ferrule seats in fitting. Tighten the nut by hand and then one quarter turn with a wrench. If fitting is relatively new the nut might be turned 3/4 of a turn. Follow up by snugging the nut slightly with a wrench.

NOTE: Apply teflon tape to all tapered male threads as advised above.

(f) Connect H. P. feed/recharge and relief lines to regulator. Insert tubing into fitting until ferrule seats in fitting. Tighten the nut by hand and then one quarter turn with a wrench. If fitting is relatively new the nut might be turned 3/4 of a turn. Follow up by snugging the nut slightly with a wrench.

(g) Unsafety valve on cylinder. Check that valve remains in OFF position.

(h) Check pressure and refill bottle as necessary.

(i) Inspect for leaks, especially at fittings that have been separated.

(j) Reinstall finished bulkhead in aft cabin, secure with screws.

(k) If used, remove tailstand from airplane.

B. Recharge Valve (See Figure 2.)

(1) Removal

The recharge valve is located on the left rear side of the aircraft and is covered by its own access door. This valve is connected to a T-fitting which interconnects the H. P. line from the regulator and the H. P. gauge feeder line. Accordingly, the recharge valve and its line are under constant cylinder pressure as long as the H. P. line is connected to the regulator.

(a) Remove oxygen cylinder (see above) before attempting work on the recharge valve assembly. Removal of the oxygen cylinder mounting shelf is also recommended to further improve access.

NOTE: Continuous pressure is applied to high pressure line until it is disconnected from cylinder. A check valve will close when high pressure line is disconnected from cylinder. The closing of this valve is frequently accompanied by a loud popping sound.

(b) Remove screws securing the recharge valve shroud to the valve mounting dish and slide the shroud back up the high pressure line.

(c) Disconnect the high pressure line from the recharge valve assembly. Cap line immediately after removal.

(d) Remove three screws from recharge valve mounting plate.

(e) Remove valve from airplane.

(2) Installation

NOTE: Apply teflon tape to all tapered male threads as cautioned in paragraph A, 4.

(a) Insert valve assembly into hole in mounting dish.

(b) Align screw holes in valve mounting plate with those in mounting dish.

(c) Install the three mounting screws. Attach cap chain, with information plate attached, with one of the screws.

CAUTION: CONNECT HIGH PRESSURE LINE TO VALVE BEFORE CONNECTING TO CYLINDER.

(d) Connect H. P. line to valve. Torque to 30 - 150 in. lbs.

(e) Slide shroud down H. P. line and secure with screws (3).

(f) Reinstall oxygen cylinder (and mounting shelf, if previously removed), per Oxygen Cyliner, Installation, above.

C. Pressure Gauge

The oxygen system pressure gauge is installed in the bottom center of the pilot's instrument panel below, and slightly right of, the control wheel. Access is obtained from beneath the instrument panel.

The pressure gauge is tied into the same high pressure (H.P.) line as the recharge valve, through a T-fitting near the tank regulator-control valve.

(1) Removal

CAUTION: BEFORE ENTERING THE TAIL CONE, FIRST SUPPORT THE AIRCRAFT TAIL WITH A SUITABLE TAILSTAND.

(a) At the oxygen cylinder:

1 Remove screws attaching finished bulkhead to fuselage bulkhead.

2 Remove finished bulkhead.

3 With immediate area clear of flammables (grease, hydraulic fluid, fuel, etc.) and oxygen system off; connect a mask or tube to an outlet to exhaust any pressure in the system.

NOTE: Continuous pressure is applied to high pressure line until it is disconnected from cylinder. A check valve will close when high pressure line is disconnected from cylinder. The closing of this valve is frequently accompanied by a loud popping sound.

4 Carefully unscrew high pressure line until pressure decreases and then remove line. Cap line immediately after removal.

(b) At the instrument panel:

1 Disconnect high pressure line from gauge and cap immediately.

2 Remove two nuts from brass studs securing gauge to panel.

3 Remove gauge from pilot's side of instrument panel.

(2) Installation

(1) Insert pressure gauge into instrument panel.

(2) Secure to panel by installing nuts on the two brass studs extending from gauge. Finger tighten, then snug with wrench. Be careful not to over torque; studs break off easily.

(3) Connect H. P. line to gauge.

(4) Connect H. P. line to cylinder.

(5) Inspect fittings that have been separated for leaks.

(6) Reinstall finished bulkhead in aft cabin, secure with screws.

(7) If used, remove tailstand from airplane.

D. Outlets

(1) Removal

(a) Check that the oxygen system is completely turned off. Insert an oxygen mask to release pressure and ensure the system is off.

(b) With a suitable spanner wrench, unscrew and remove the outlet retainer ring(s) and information plate(s).

(c) Remove or drop overhead panel sufficiently to gain access to low pressure (L. P.) line connections.

(d) Disconnect outlet(s) from L. P. feed lines:

1 If removing right side outlet(s), for each outlet, as appropriate: disconnect the two T-unions or the one elbow-union connecting the outlet to main L. P. feed line and one union connecting outlet to left outlet branch L. P. feed line.

2 If removing left side outlet(s), disconnect one union connected to branch L. P. feed line(s).

(e) Remove outlet(s) from airplane.

(2) Installation

(a) Position outlet(s) in airplane.

(b) Connect outlet(s) to L. P. feed lines:

1 If installing left side outlet(s), connect union(s) to branch L. P. feed line(s) from right side outlet(s).

2 If installing right side outlet(s), for each outlet, as appropriate: connect the two T-unions or the one elbow-union connecting the outlet to main L. P. feed line and one union connecting outlet to left outlet branch L. P. feed line.

(c) Inspect fittings that have been separated for leaks.

(d) Replace overhead paneling and secure in place.

(e) For each outlet, position the information plate so that the word “OXYGEN” can be read when viewed from the seat that is supported by that outlet. With a suitable spanner wrench, screw on the outlet retainer ring.

E. Oxygen On/Off Control

The oxygen system PULL ON (push off) control knob is installed in the bottom center of the pilot’s instrument panel below, and slightly right of, the control wheel. Access is obtained from beneath the instrument panel.

(1) Removal

CAUTION: BEFORE ENTERING THE TAIL CONE, FIRST SUPPORT THE AIRCRAFT TAIL WITH A SUITABLE TAILSTAND.

(a) Disconnect cable from regulator-control mechanism on cylinder:

1 Remove screws attaching finished bulkhead to fuselage bulkhead.

2 Remove finished bulkhead.

3 If necessary, move cylinder slightly to gain access to regulator valve control arm. Disconnect regulator valve control cable from cylinder / control arm by removing the retaining screw from the cable support bracket and the cotter pin attaching the cable to control arm. Cut loop off end of cable core.

4 Release cable from all clamps and cut the tie wraps securing cable to H. P. Gauge feed line. Note position of tie wraps for reinstallation.

(b) Remove or drop overhead panel sufficiently to gain access to the control cable running the entire length of the cabin.

(c) Release cable from all clamps and cut the tie wraps securing cable to H. P. Gauge feed line, both in the cabin overhead and under the instrument panel. Note position of tie wraps for reinstallation.

(d) Remove retaining nut from rear of control knob.

(e) Pull cable from airplane through instrument panel. Retrieve retainer nut as cable bitter end pulls through the instrument panel.

(2) Installation

(a) Insert cable through instrument panel. Slide retainer nut onto cable and secure control knob to instrument panel.

(b) Feed cable up through windshield centerpost and along H. P. Gauge feed line to cylinder.

(c) Secure cable to H. P. Gauge feeder line and structure with same number of tie wraps, CR-2M ring connectors and clamps installed at same locations as those cut or loosened to remove cable.

(d) Trim cable shield and core to allow sufficient material to make a two turn loop, two inches (5.08 cm) from the end of the shield.

(e) Bend core wire end for 1 1/2 to 2 turns with 0.188 (0.478 cm) inside diameter.

(f) Place loop over pin on regulator control arm and secure with washer and cotter pin. Secure cable with retaining screw and clamp to cable support bracket

(g) Check operation, adjust as required.

(h) Replace and secure overhead panels in the cabin.

(i) Replace and secure finished bulkhead in aft cabin. If used, remove tailstand.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

37

VACUUM

THIS PAGE INTENTIONALLY BLANK

CHAPTER 37

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 37 - VACUUM

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

1. Description and Operation (See Figures 1 and 2.)

NOTE: In 6X S/N's 3232014 & up and 6XT S/N's 3255015 & up, when equipped with the optional Avidyne Entegra Electronic Flight Display System, no vacuum system is installed.

The vacuum system operates the gyro instruments which provide critical flight information (i.e. - attitude and direction). It consists of the plumbing necessary to connect the components, and:

A. Two (2) engine-driven vacuum pumps located on the accessory case at the rear of the engine;

B. Two (2) vacuum regulators, two (2) vacuum switches, and a manifold located under the forward baggage compartment floor;

C. A filter located on the upper left, aft side of the forward bulkhead; and,

D. A vacuum gauge located at the lower left side of the instrument panel.

The two engine-driven pumps run continously, providing system redundancy. If either pump fails, the associated vacuum switch will activate the associated VACUUM INOP annunciator light when the suction from the failing pump drops below 3.5 psig.

Maintenance, other than that described in 37-10-00 and 37-20-00, must be performed by the instrument manufacturer or an authorized instrument repair station.

2. Troubleshooting

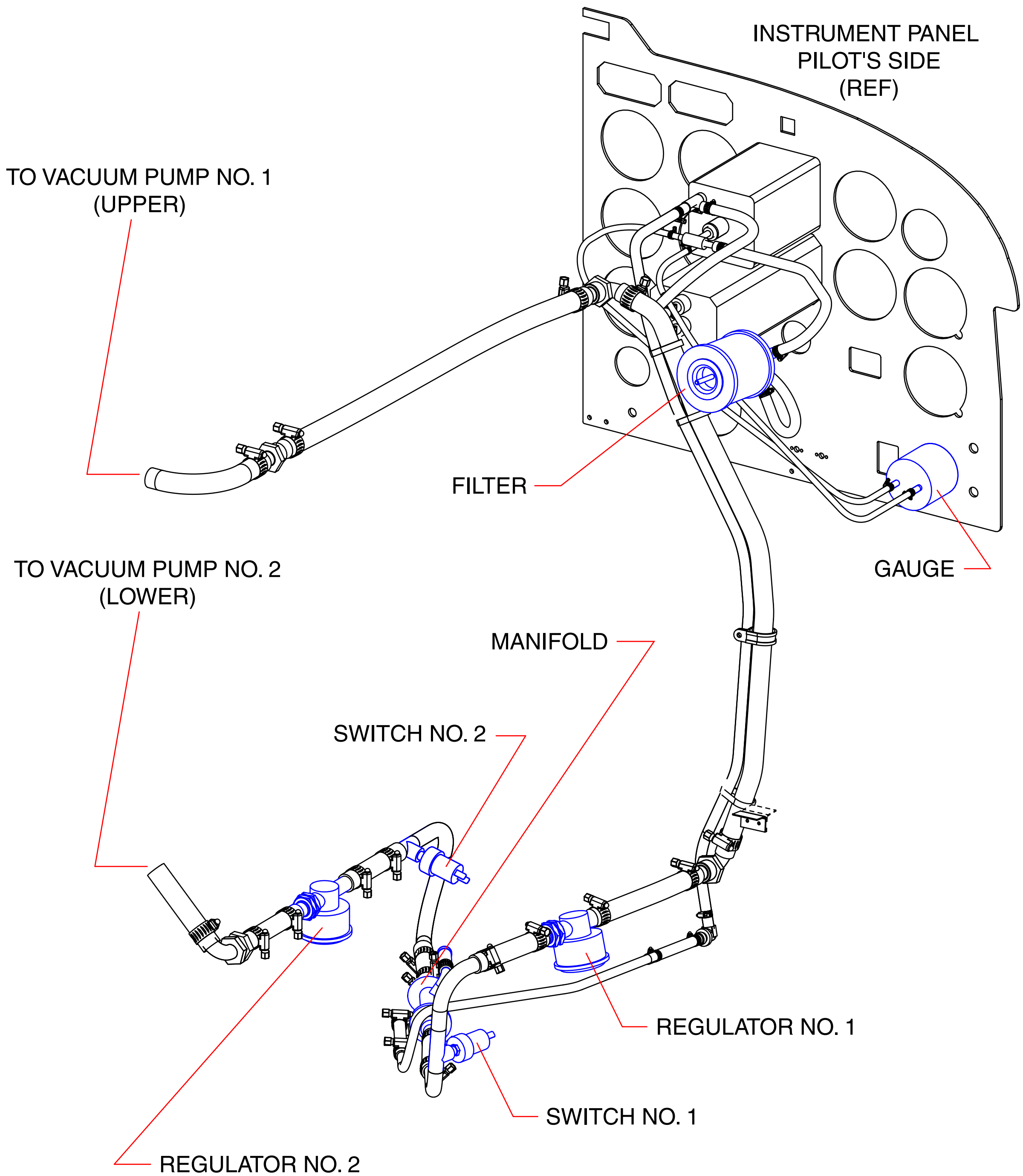
See Chart 1.

CHART 1 (Sheet 1 of 2)
TROUBLESHOOTING VACUUM SYSTEM

Trouble	Cause	Remedy
No vacuum gauge indication.	Open vacuum line.	Locate and repair.
	Faulty instrument.	Replace.
No vacuum gauge indication at instrument or source.	Faulty gauge and/or malfunctioning pump(s).	Replace gauge, and/or pump(s).
Low vacuum system indications.	Filter dirty.	Clean or replace filter.
	Vacuum regulator valve needs adjusting.	Adjust regulator valve as per adjustment instructions in 37-10-00.
	Restrictions in gyros to filter line.	Repair or replace line.
	Pump(s) to gyros line leaking.	Check all lines and fittings.
Abnormal gyro precession and vacuum gauge reading correct or at maximum pressure.	Dirty filter.	Replace filter and adjust regulator.
Normal vacuum indication but sluggish operation of instruments.	Faulty instrument.	Replace instrument.
	Dirty or clogged filter	Replace filter.
	Vacuum line kinked.	Repair lines.
High System vacuum.	Vacuum regulator is improperly adjusted.	Adjust regulator properly.
	Dirty or clogged filter.	Replace filter.
	Vacuum lines bent, kinked, or restricted.lines.	Repair or replace
	Vacuum regulator sticking or dirty screen.	Clean screen and check regulator operation.
Regulator cannot be adjusted to maintain correct pressure.	Lines leaking.	Check all lines and fittings.
	Vacuum pump(s) malfunctioning.	Replace pump(s).
Vacuum correct on ground, but will not maintain pressure at altitude.	Vacuum pump(s) malfunctioning.	Replace pump(s).
	Regulator sticky.	Clean regulator.

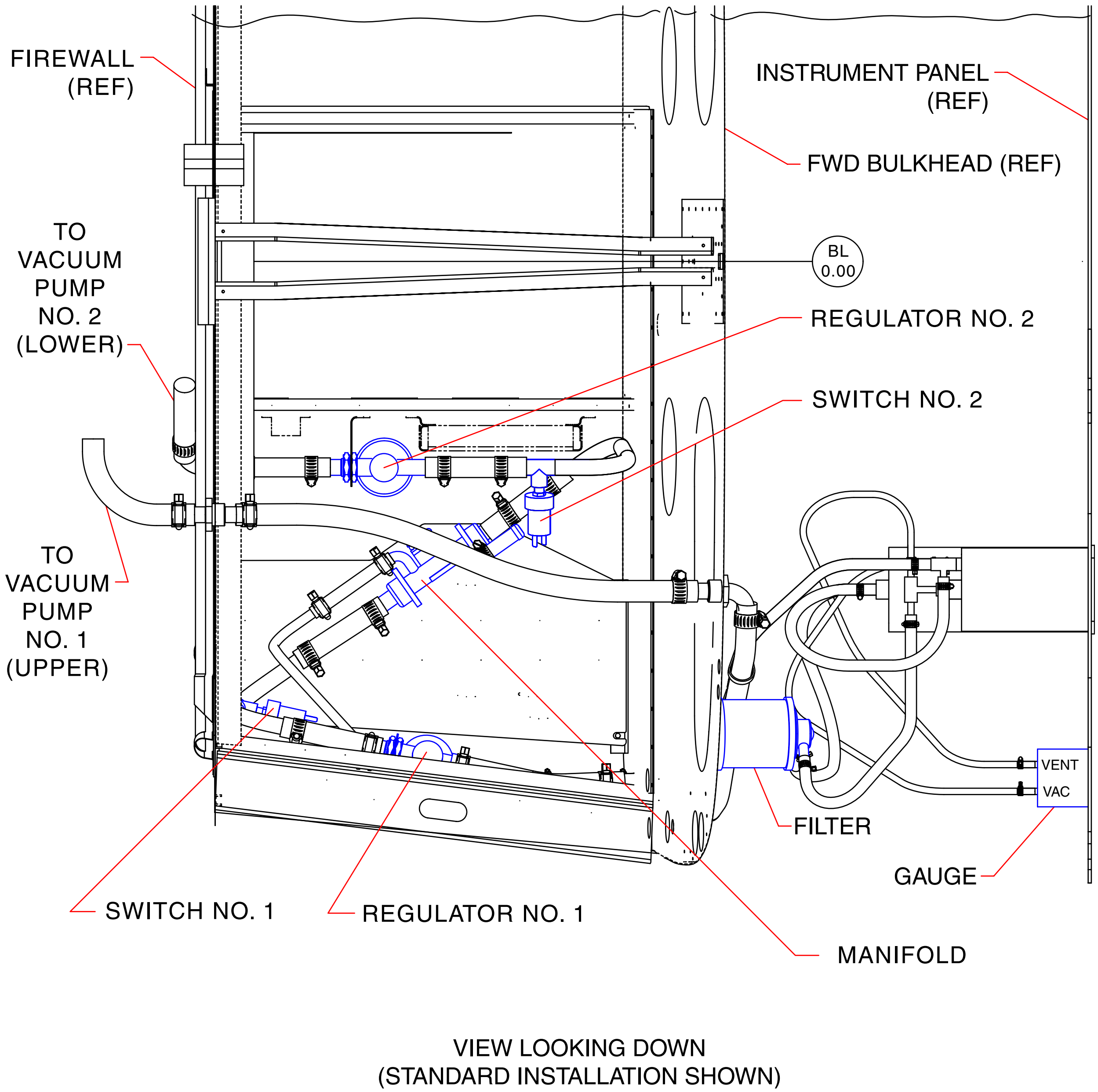
CHART 1 (Sheet 2 of 2)
TROUBLESHOOTING VACUUM SYSTEM

Trouble	Cause	Remedy
Vacuum correct but pilot reports pressure erratic or shows complete loss in flight.	Regulator sticky.	Clean regulator.
	Oil in pump(s) due to leaky engine seal or cleaning fluid blown into pump(s) while cleaning engine.	Replace pump(s).
Pressure can only be maintained at full throttle on ground.	Leak in system.	Repair or replace lines.
	Worn pump(s).	Replace pump(s).
	Stuck regulator.	Clean or replace regulator.



VIEW LOOKING AFT
(AIRCRAFT STRUCTURE REMOVED, STANDARD INSTALLATION SHOWN)

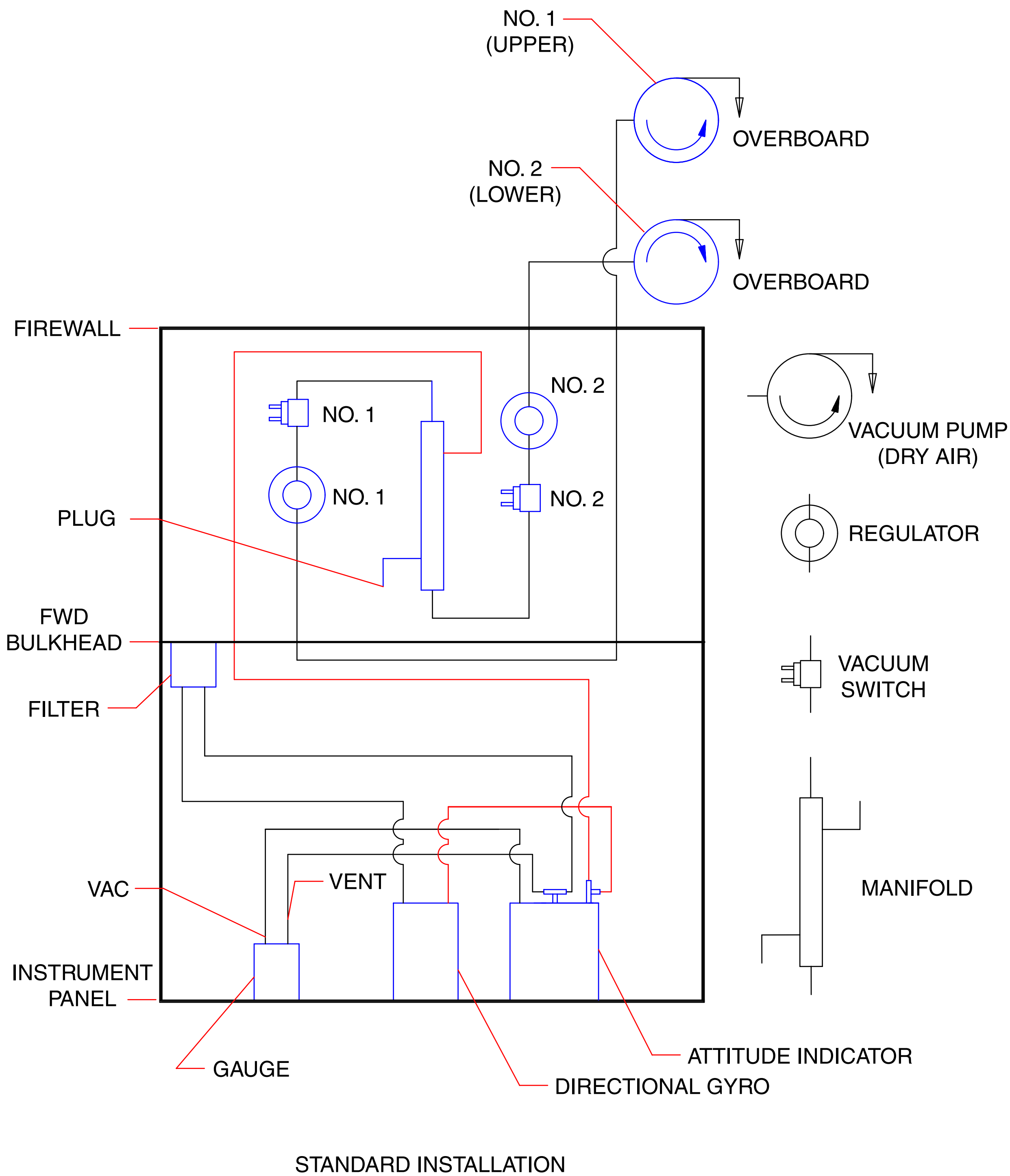
Vacuum System Installation
Figure 1 (Sheet 1 of 2)



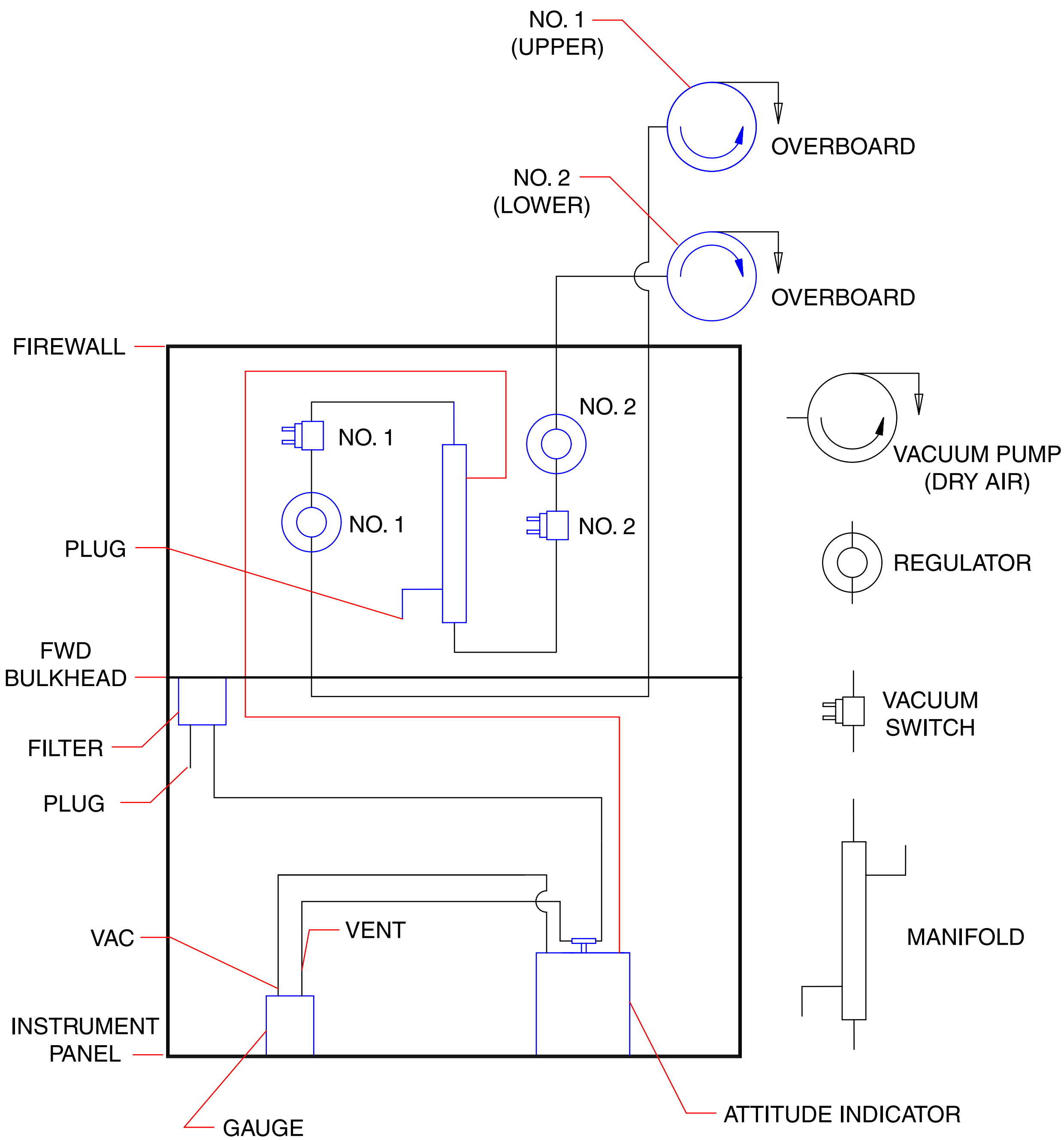
Vacuum System Installation
Figure 1 (Sheet 2 of 2)

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK



Vacuum System Schematic
Figure 2 (Sheet 1 of 2)



OPTIONAL INSTALLATION

Vacuum System Schematic
Figure 2 (Sheet 2 of 2)

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

The following information is intended to aid in diagnosing vacuum system service symptoms on those components which are serviced by removal and replacement - I.E. - hoses, clamps, gyro filters, vacuum pumps, and vacuum regulators.

1. Hoses and Clamps

   A. These items should be examined periodically and inspected carefully whenever maintenance activities cause hose disconnections to be made at the pumps, manifold, regulators, tube assemblies, gyros and/or vacuum gauge.

   B. Ends of hoses should be examined for rubber separation and slivers of rubber on inside diameter of hoses. These slivers can and do become detached. If this happens, the vacuum pump(s) will suck in the loose particles and eventually ingest them. This can cause pump failure.

   C. Replace old, hard, cracked or brittle hose. Sections of the inner layers may separate, causing pump failure.

   D. Ensure hoses are clear and clean by blowing them out with shop air. Remove from aircraft as required.

   CAUTION: DO NOT WIGGLE HOSE FROM SIDE TO SIDE DURING INSTALLATION. WIGGLING COULD CAUSE PARTICLES TO BE CUT FROM INNER WALL OF HOSE WHICH WOULD DAMAGE THE PUMP.

   E. Where hose clearance is tight, making it difficult to reinstall it onto a fitting or barb, spray the fitting or barb with silicone. Let dry, then install hose by pushing it straight on.

   CAUTION: WHEN REPLACING ANY OF THE THREADED FITTINGS, DO NOT USE PIPE DOPE, THREADLUBE, OR TAPE. PIPE DOPE / TAPE PARTICLES INGESTED BY THE VACUUM PUMP COULD CAUSE THE PUMP TO FAIL. USE ONLY SILCONE SPRAY, LETTING IT DRY BEFORE ASSEMBLY.

   F. Hose clamps and fittings should be replaced when broken, damaged or corroded.

2. Gyro Filter (See 37-00-00, Figures 1 and 2.)

   A. Gyro filter must be serviced on a scheduled basis, not to exceed 100 hours, and on condition.

   B. The system installation employs a large central filter (mounted on the upper left rear of the forward bulkhead (behind instrument panel)) and differential vacuum gauge that continuously monitors filter condition while indicating vacuum readings.

   NOTE: A decline in panel gauge reading indicates the filter is becoming clogged. Filters should be replaced when gauge reading declines; DO NOT adjust regulator(s).

3. Vacuum Pumps

Two (2) engine-driven dry-air pumps are mounted on the accessory section at the rear of the engine. Each vacuum pump is a rotary vane, positive displacement type. These units consist of an aluminum housing, a carbon rotor and carbon vanes. They are driven by means of a coupling mated to an engine-driven gear assembly.

A. Inspection (See Figure 1.)

The vacuum pump(s) feature a wear indicator inspection port on the back cover which allows direct observation of pump vane wear. Beginning at 500 hours time-in-service, and each 100 hours thereafter, remove the inspection port plug and observe vane wear as shown in Figure 1.

(1) As the vanes wear, they slide outboard in the vane slots in the rotor.

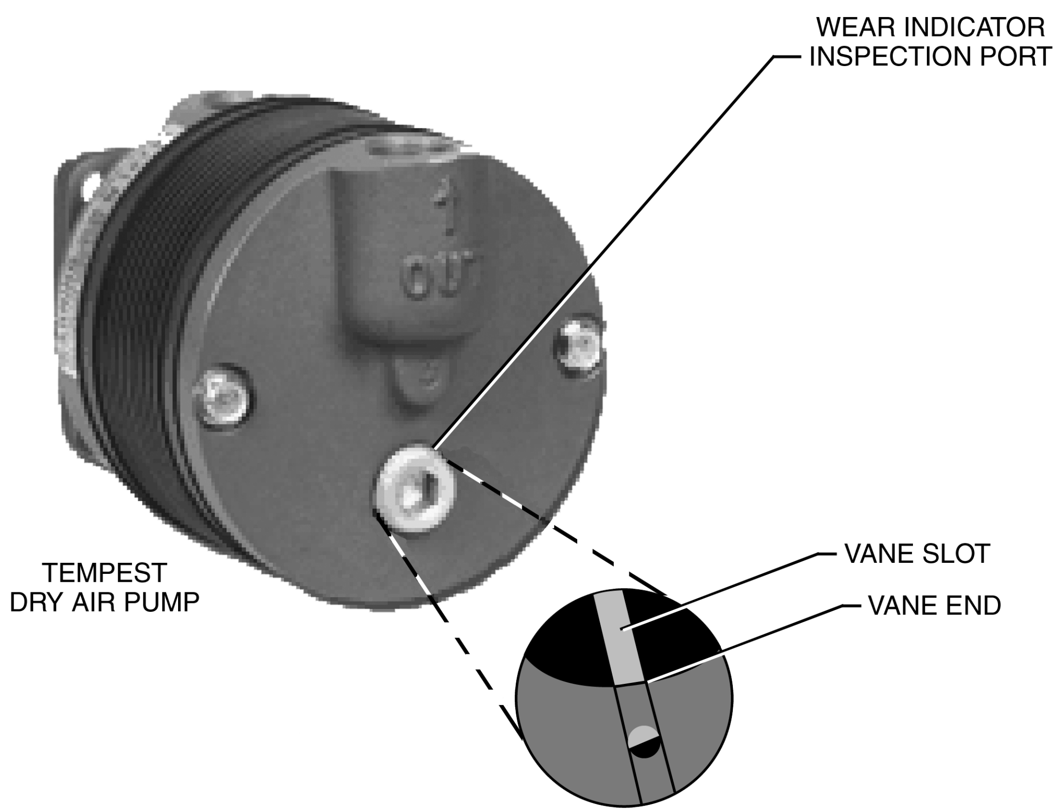
(2) When the portion of the vane that can be observed in the inspection port covers less than half of the inspection port, replace the pump.

B. Removal

(1) Remove engine cowling. (Refer to Chapter 71.)

(2) Loosen hose clamp and remove hose from pump fittings.

(3) Remove four retaining nuts, lock washers and plain washers used to secure pump to engine; then remove pump.



Vacuum Pump Vane Wear Inspection
Figure 1

C. Installation

NOTE: Change the vacuum system filter when installing a new pump.

(1) If required, install fittings on pump per Replacing Pump Fittings, below.

CAUTION: ONLY PUMP MOUNTING GASKET AUTHORIZED AND APPROVED FOR USE ON AIRBORNE VACUUM PUMP IS AIRBORNE GASKET B3-1-2, PIPER PART NUMBER 751-859. USE OF ANY OTHER GASKET MAY RESULT IN OIL SEEPAGE OR LEAKAGE AT MOUNTING SURFACE.

(2) Place pump gasket in its proper place and align spline on pump drive with spline on engine drive assembly.

(3) Secure pump to engine with four plain washers, lock washers and retaining nuts. Torque nuts 50 to 70 inch-pounds.

(4) Connect hoses to pump and secure with hose clamps.

(5) Reinstall engine cowling.

D. Replacing Pump Fittings

CAUTION: WHEN REPLACING ANY OF THE THREADED FITTINGS, DO NOT USE PIPE DOPE, THREADLUBE, OR TAPE. PIPE DOPE / TAPE PARTICLES INGESTED BY THE VACUUM PUMP COULD CAUSE THE PUMP TO FAIL. USE ONLY SILCONE SPRAY, LETTING IT DRY BEFORE ASSEMBLY.

(1) Before installing any fittings on pump, check for any external damage. A pump that has been damaged or dropped should not be installed.

CAUTION: DO NOT APPLY VISE PRESSURE TO OUTSIDE DIAMETER OR OVERALL LENGTH OF PUMP.

(2) When a vise is used to hold pump while installing fittings, suitable caution must be exercised to avoid pump damage. Square mounting flange must be held between soft wood blocks and only at right angles to vise jaws. Use only enough vise pressure to hold pump firmly.

(3) The ports of AIRBORNE pumps have been treated with a dry film lubricant and AIRBORNE fittings are cadmium plated thus eliminating any need for thread lubricants. If thread lubricant is required, use only a silicone spray. Apply sparingly to external threads of fittings only and let dry before assembly.

4. Vacuum Regulators (See 37-00-00, Figures 1 and 2.)

Two (2) vacuum regulators are incorporated in the system to control vacuum pressure to gyro instruments. The regulators are located below the forward baggage compartment floor.

A. Service Tips

(1) Vacuum regulators seldom need replacement. Symptoms that suggest replacement are:

(a) Chatter as indicated by rapid fluctuation of vacuum gauge needle or an audible sound.

(b) Non-repeatability of vacuum gauge reading when panel gauge is not suspect or has been checked against a known test gauge (cruise RPM only).

(2) All modes of regulator malfunction tend to increase vacuum power applied to gyros. Thus, although excess vacuum is applied, a loss of vacuum does not occur.

(3) Gyros themselves act as a limiting device to keep vacuum power applied from exceeding safe levels.

NOTE: If panel gauge has been checked and found OK and vacuum gauge reading does not repeat within the normal operating range as marked on the gauge, then the vacuum regulator(s) should be changed. Observe usual precautions for maintaining system cleanliness to avoid pump failure from ingested debris.

B. Removal and Replacement

(1) To remove regulator, disconnect the inlet and outlet lines and remove mounting nut. Remove valve from airplane.

(2) Replace regulator in reverse order given for removal.

(3) Check complete vacuum system for proper operation.

C. Adjustment (Ref. PPS 60198, Rev. New.)

NOTE: Do not reset the regulator until the filter and lines have been checked

(1) Disconnect inlet line going to Vacuum Regulator No. 2 (see 37-00-00, Figure 1).

(2) Cap the end of line and the vacuum regulator inlet to prevent foreign matter and debris from entering the system.

NOTE: Ensure the cap over the vacuum regulator inlet is sufficiently strong and secured so that it is not sucked into the inlet when the engine is started.

(3) Start the engine, allow it to warm up and run the engine at 2000 rpm.

(4) While running the engine at 2000 rpm, the suction gauge should indicate within the normal operating range as marked on the gauge. If the reading is not in this range, shut down the engine and adjust the vacuum regulator still connected. (Turn the valve adjustment screw clockwise to increase pressure and counterclockwise to decrease pressure.)

(5) Start the engine and repeat the check. Also, verify that the amber Vacuum No. 2 INOP annunciator light is ON.

(6) After the regulator has been properly adjusted, bend the locking tabs down over the adjustment screw.

(7) Uncap the line and the vacuum regulator inlet and reconnect.

(8) Disconnect inlet line going to Vacuum Regulator No. 1 (see 37-00-00, Figure 1).

(9) Cap the end of line and the vacuum regulator inlet to prevent foreign matter and debris from entering the system.

NOTE: Ensure the cap over the vacuum regulator inlet is sufficiently strong and secured so that it is not sucked into the inlet when the engine is started.

(10) Repeat Steps (3) through (7), except in step (5), verify that the amber Vacuum No. 1 INOP annunciator light is ON.

INDICATING

The following information is intended to aid in diagnosing vacuum system service symptoms on those components which are serviced by removal and replacement - I.E. - vacuum gauges and switches.

1. Vacuum (Suction) Gauge (See 37-00-00, Figures 1 and 2.)

The suction gauge is mounted on the left side of instrument panel. This gauge is calibrated in inches of mercury and indicates amount of vacuum created by the engine-driven vacuum pumps. The suction gauge has a direct pressure line and a vent line. Therefore, the gauge indicates differential pressure or actual pressure being applied to gyro instruments. As the system filter becomes clogged or lines become obstructed, the gauge will show a decrease in pressure. Do not reset/readjust the vacuum regulators until the filter and lines have been checked.

A. Service Tips

(1) Vacuum gauges seldom require service and usually are replaced when malfunctions occur.

NOTE: Vacuum gauge failure in a properly operating vacuum system does not impair safety of flight.

(2) If the vacuum gauge malfunctions in a manner to cause an incorrect reading in normal cruise conditions, the gauge must be checked by comparing its reading with a gauge of known accuracy. If the gauge is confirmed to be indicating correct values and system vacuum level is not in accordance with specified vacuum, then and only then should the vacuum regulators be reset/readjusted.

(3) Visual examination of gauge performance should cover the following steps:

(a) With engine stopped and no vacuum supplied to gauge, its pointer should rest against the the internal stop in the 9 o'clock position. Any other displacement from this position suggests need for replacement.

(b) A slight overshoot during engine startup, not to exceed half an inch of mercury, is normal and is not cause to replace gauge.

(4) With engine operating at normal cruise RPM, gauge should read within the normal operating range as marked on the gauge.

NOTE: The normal operating range is 4.8 to 5.2 IN. HG.

(5) At 1200 rpm, vacuum gauge reading should be more than four inches of mercury.

B. Removal and Installation

The vacuum gauge is a face-mounted instrument. See 39-10-00.

2. Vacuum Switches (See 37-00-00, Figures 1 and 2.)

Two (2) vacuum switches are located below the baggage compartment floor. Each activates its associated VACUUM INOP annunciator light when the suction from the associated pump drops below 3.5 psig.

A. Removal

(1) Disconnect the two electrical leads.

(2) Unscrew switch unit from tube assembly boss.

(3) Cap tube assembly boss to prevent foreign matter from entering system.

B. Installation

(1) Uncap tube assembly boss.

(2) Screw switch unit into tube assembly boss.

(2) Reconnect the two electrical leads.

(3) Perform vacuum system operational check.

THIS PAGE INTENTIONALLY BLANK

GRIDS 3K12 THRU 3L2
INTENTIONALLY BLANK

APPENDIX

2

ELECTRONIC FLIGHT DISPLAY SYSTEM

THIS PAGE INTENTIONALLY BLANK

APPENDIX 2

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

APPENDIX 2 - ELECTRONIC FLIGHT DISPLAY SYSTEM

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

ELECTRONIC FLIGHT DISPLAY SYSTEM

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.

The Avidyne Entegra Electronic Flight Display System (EFDS) is available as an option in 6X S/N's 3232014 and up and 6XT S/N's 3255015 and up.

1. Description

This system uses two large 10.4-inch diagonal, high-resolution, sunlight-readable full color displays (PFD and MFD), to provide primary flight and engine information as well as a wide variety of other data. Standard primary flight instruments (i.e. - airspeed, electric attitude indicator, and altimeter) provide redundancy. (See Figure 1.)

The EFDS installation consists of the following components Primary Flight Display (PFD), Multifunction Display (MFD), Data Acquisition Unit (DAU) and associated sensors, and Magnetometer/OAT Sensor Assembly.

Avidyne Entegra Instrument Panel (Optional)
Figure 1

Effectivity
3232014 & up
3255015 & up

2. Maintenance

The Instructions for Continued Airworthiness (ICA) published by Avidyne provide the necessary information for maintaining this system as installed in Piper airplanes, except as noted below.

A. Primary Flight Display (PFD)

Use 700-00006-0XX PFD & 700-00011-000 Mag/OAT ICA, Avidyne Document No. AVPFD-174, Revision 00-C, September 12, 2003, with the following exceptions:

(1) In para 6, Troubleshooting Information, in the chart where it says “OAT (Optional),” cross out “optional.” The OAT is standard in the Piper installation.

(2) In para 7.2 and Figure 7, where the standard Avidyne installation describes alignment pins and retaining clips on the sides of the PFD, the Piper installation uses a single alignment pin on the top of the PFD engaging a slot in the upper rear cross bracket (see Sheet 1, Figure 2.)

(3) In para 7.5.4.2, in the “Main RS232 Configuration Page” chart, for CHNL 3 under GNS-430 No 2, both Input and Output should read “Crossfill” instead of “Off.”

(4) In para 7.5.5.2, below the heading “S-Tec System 55x Autopilot Unit,” insert the following:

“If the PFD is replaced, the IRU calibration and Magnetometer calibration must be completed before continuing with the following steps.”

(5) In para 7.5.6.2, below the heading “Magnetometer Calibration Procedure,” insert the following:

“Complete the IRU calibration procedure before proceeding.”

B. Multifunction Display (MFD)

Use 700-00004-0XX-() Multifunction Display ICA, Avidyne Document No. AVMFD-167, with the following exceptions:

In para 2, items 7 and 8 are standard in the Piper installation.

C. Data Acquisition Unit (DAU)

Use 200-00041-000 DAU ICA, Avidyne Document No. AVSIU-011, with the following exceptions:

(1) In para 6, in “Table 2 - DAU Pinout,” pins J1-2 and J1-21 have “No Connection” in the Piper installation.

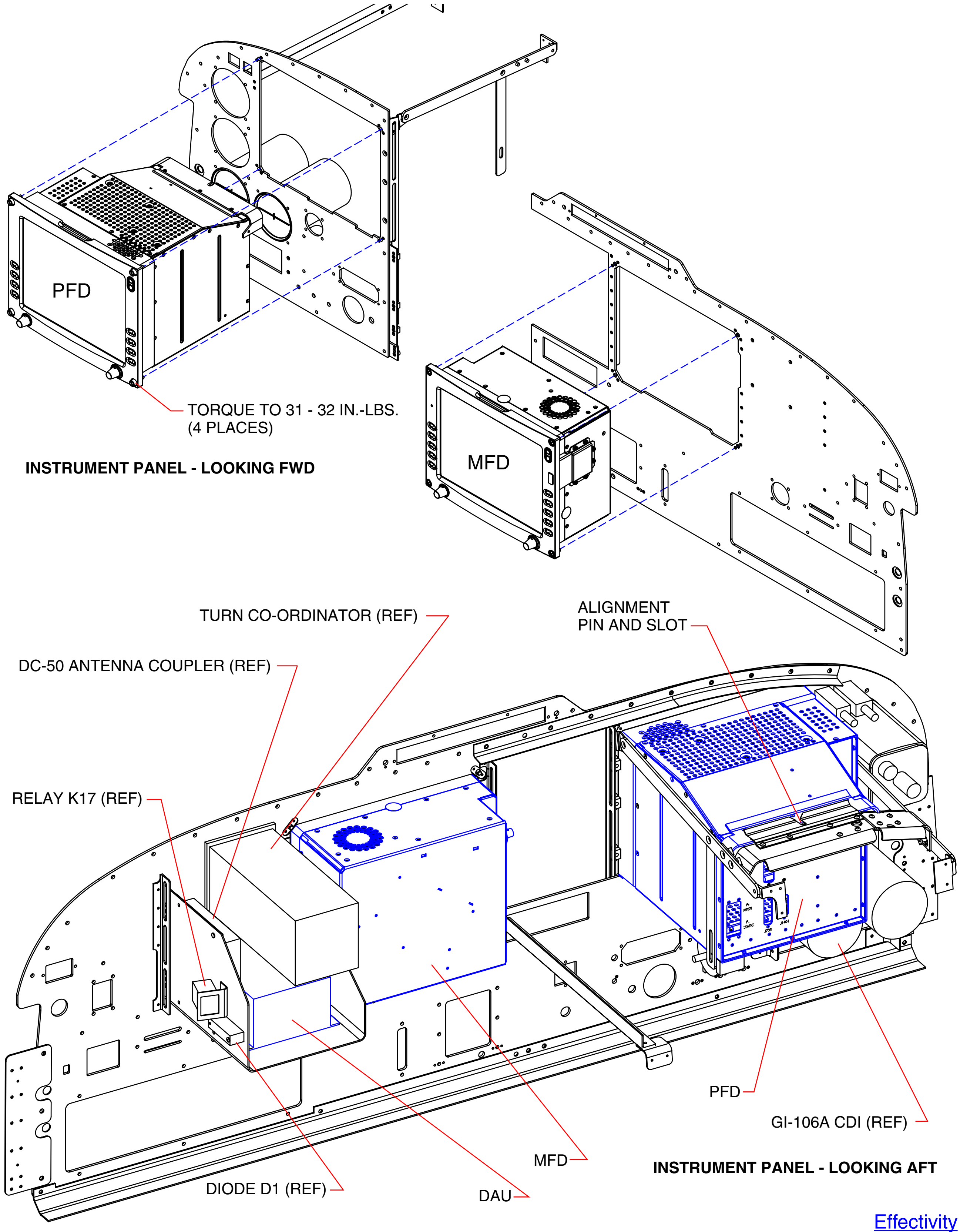
(2) In para 6, in “Table 4 - DAU Sensor Compatibility,” parameter “VAC” is not used in the Piper installation.

D. Magnetometer/OAT Sensor Assembly

See information under Primary Flight Display, above. Removal and installation instructions are provided under “Magnetometer/OAT Sensor Assembly,” below.

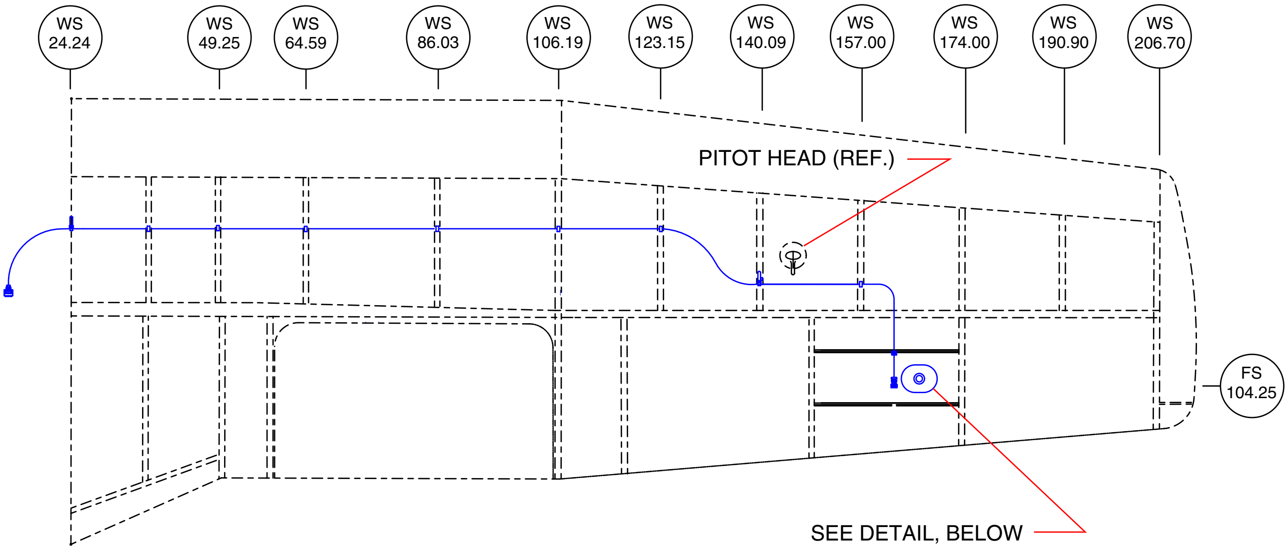
3. Component Locator

See Figure 2.

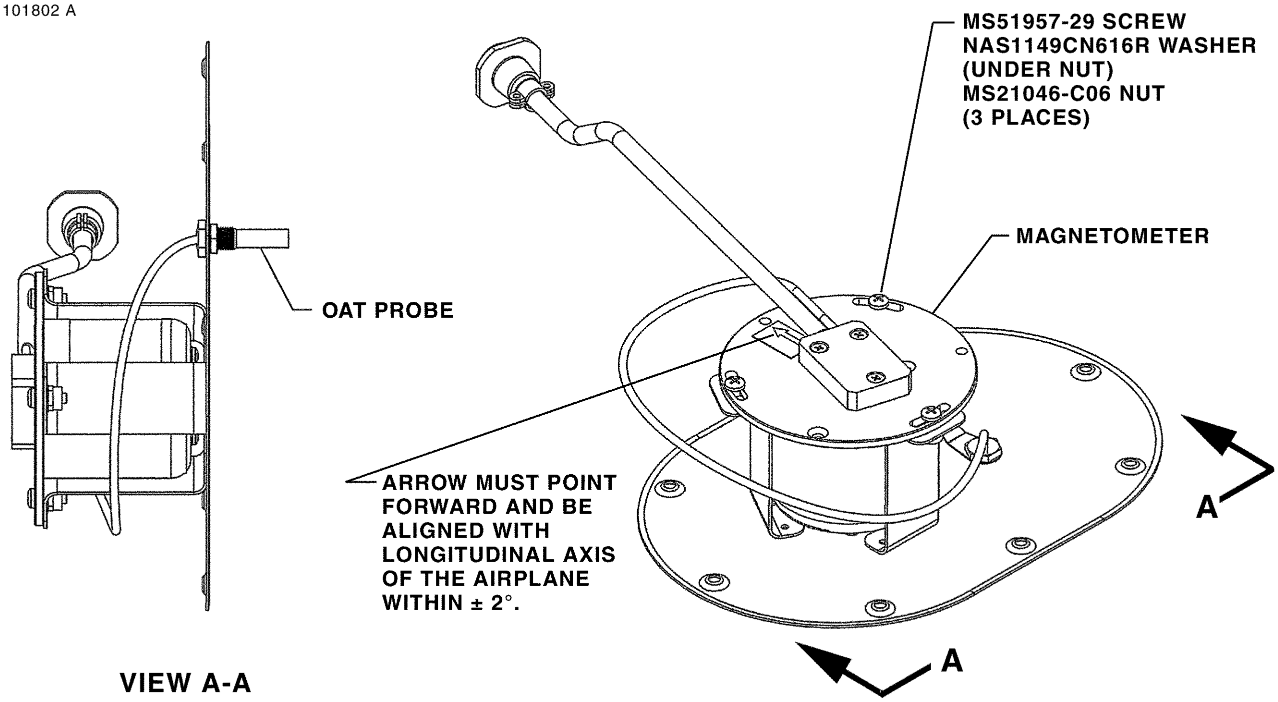


Effectivity
3232014 & up
3255015 & up

Component Locator
Figure 2 (Sheet 1 of 3)



101802 A



Effectivity
3232014 & up
3255015 & up

Component Locator
Figure 2 (Sheet 2 of 3)

4. Magnetometer/OAT Sensor Assembly (See Figure 2, Sheet 2.)

The Magnetometer / OAT Sensor Assembly (Mag/OAT) is mounted on a wing access cover plate in the underside of the outboard left wing and supplies magnetic heading information to the Primary Flight Display (PFD). The cover plate - Mag/OAT sensor assembly is removed and installed as a unit.

A. Removal

(1) Remove eight (8) screws and support cover plate with your hand.

(2) Drop cover plate down sufficient to reach inside and disconnect the wiring harness.

(3) Remove cover plate - Mag/OAT sensor assembly.

B. Installation

(1) Prior to installation, the arrow on the magnetometer must be aligned with the longitudinal axis of the airplane:

(a) Install the cover plate - Mag/OAT sensor assembly upside down with the arrow pointing forward. Secure with two (2) screws.

(b) Loosen the three (3) screws holding the magnetomer to its mounting brackets.

(c) Align the arrow. Arrow must point forward and be aligned with the longitudinal axis of the airplane within ± 2°.

(d) Tighten the three (3) magnetometer mounting screws.

(e) Remove the two (2) screws holding the cover plate - Mag/OAT sensor assembly the wing.

(2) Connect the Mag/OAT sensor assembly wiring harness.

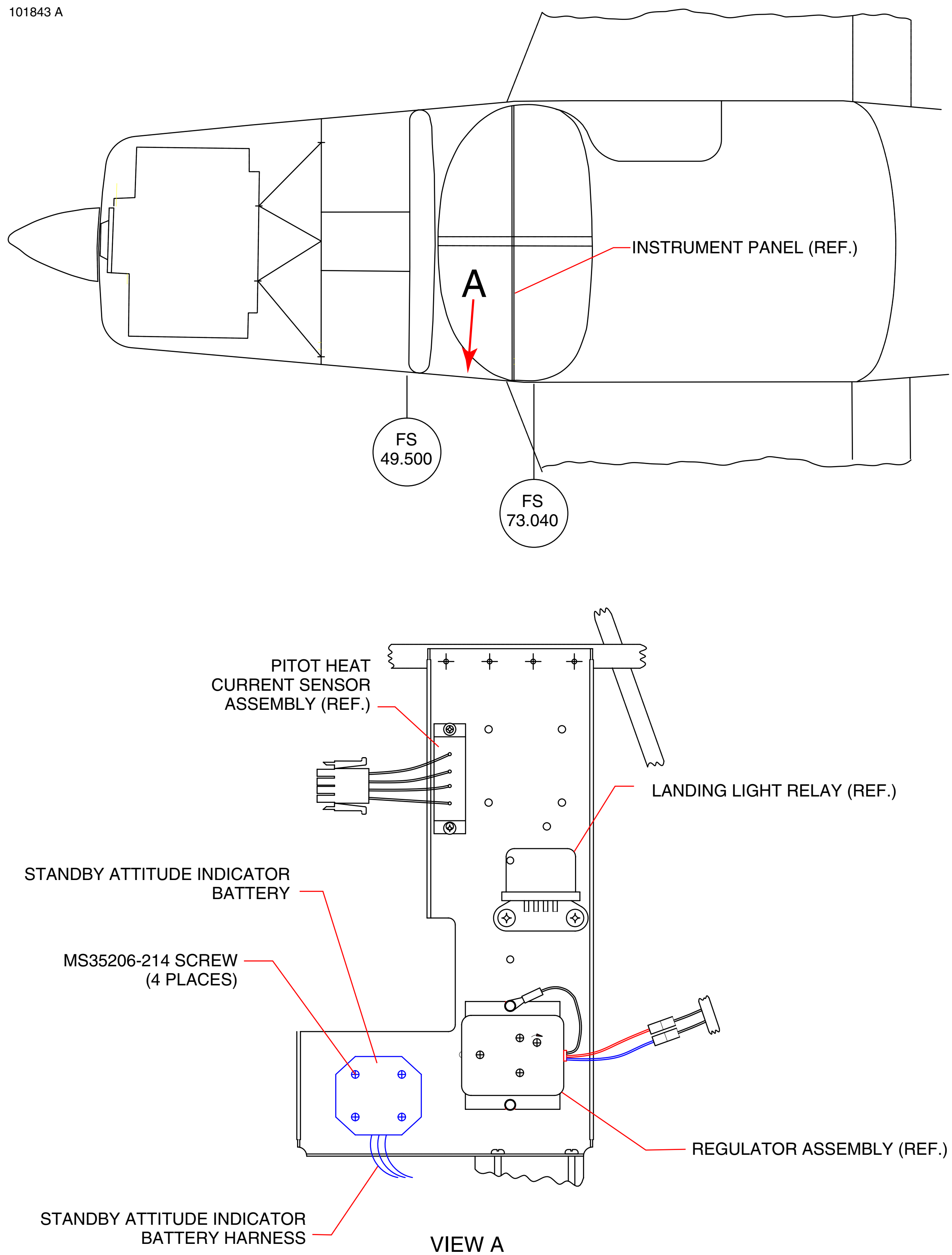
(3) Position the cover plate - Mag/OAT sensor assembly in the access hole with the arrow on the magnetometer pointing forward.

(4) Secure with screws (8).

5. Standby Attitude Indicator

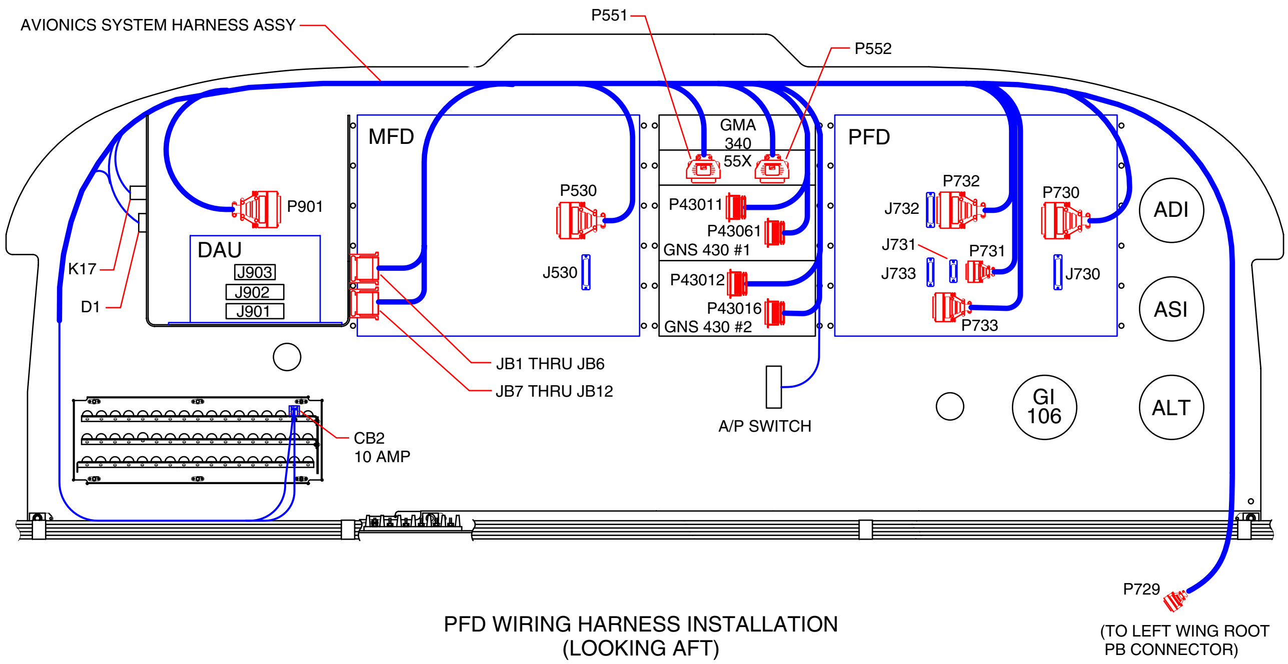
In 6X S/N's 3232014 & up and 6XT S/N's 3255015 & up with the optional Avidyne Entegra Electronic Flight Display System installed, an electric standby attitude indicator is installed to the left of the Primary Flight Display (PFD).

Other than removing and replacing the unit itself (see 39-10-00), the only line replaceable part is the emergency power battery which is located under the instrument panel mounted to a bracket on the left side of the fuselage. See Figure 2, Sheet 3.

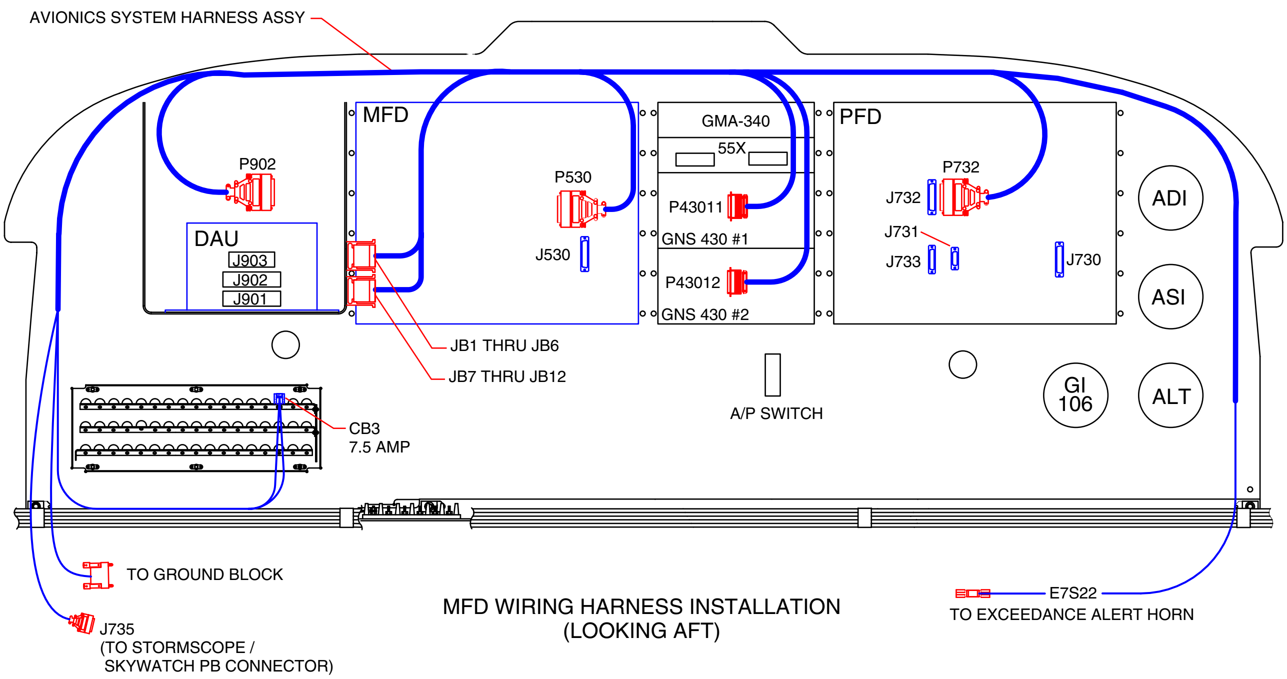


Effectivity
3232014 & up
3255015 & up

Component Locator
Figure 2 (Sheet 3 of 3)



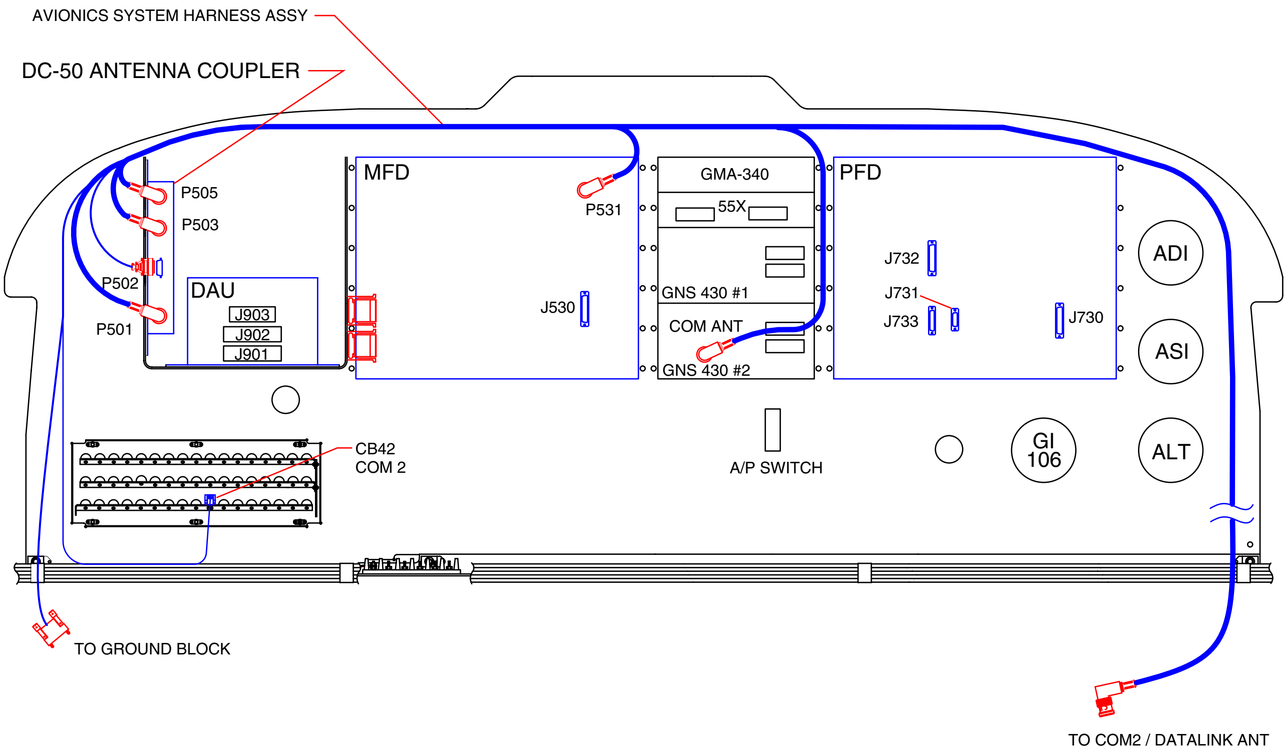
PFD WIRING HARNESS INSTALLATION
(LOOKING AFT)



MFD WIRING HARNESS INSTALLATION
(LOOKING AFT)

Wiring Harness Installation
Figure 3 (Sheet 1 of 2)

Effectivity
3232014 & up
3255015 & up



ANTENNA COUPLER WIRING HARNESS INSTALLATION
(LOOKING AFT)

Effectivity
3232014 & up
3255015 & up

Wiring Harness Installation
Figure 3 (Sheet 2 of 2)

THIS PAGE INTENTIONALLY BLANK

GRIDS 3L18 THRU 3L24
INTENTIONALLY BLANK

Piper™

AIRPLANE MAINTENANCE MANUAL

CARD 4 OF 5

PA-32-301FT

Piper™ 6X

(S/N's 3232001 & UP)

PA-32-301XTC

Piper™ 6XT

(S/N's 3255001 & UP)

THE NEW PIPER AIRCRAFT, INC.

PART NUMBER 766-854

February 19, 2004

Published by
Technical Publications

2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member
General Aviation
Manufacturers Association

AEROFICHE REVISION STATUS

Revisions to this Maintenance Manual 766-854 issued June 1, 2003 are as follows:

Revision	Publication Date	Aerofiche Card Effectivity
ORG030601	June 1, 2003	All
PR040219 *	February 19, 2004	All

*** PARTIAL REVISION OF MAINTENANCE MANUAL 766-854**

This revision contains changes in all five aerofiche cards. Accordingly, replace the entire existing Aerofiche Card Set with this one dated 2/19/04.

NOTE: For those few customers who received Temporary Revision No. 22-1, dated January 6, 2004, when taking delivery of a new airplane at the factory or in conjunction with Piper Service Bulletin No. 1145, this February 19, 2004 revision supercedes Temporary Revision No. 22-1 in its entirety - those yellow pages should be removed and destroyed.

Consult the Customer Service Information Aerofiche (P/N 1753-755) for current revision dates for this manual.

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
Intro-List of Effective Pages	1	Feb 19/04			
	2	Jun 1/03			
Intro-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
Introduction	1	Jun 1/03			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Jun 1/03			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Feb 19/04			
	14	Jun 1/03			
Index	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

1. Instructions for Continued Airworthiness

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

The PIPER PA-32-301FT 6X and PA-32-301XTC 6XT Maintenance Manual constitutes the Instructions for Continued Airworthiness as required by Federal Aviation Regulations (FAR) Part 23, Appendix G. Chapter 4 contains the Airworthiness Limitations section (4-00-00) and the Inspection Program is in Chapter 5 (5-20-00).

2. General

This publication is prepared in accordance with the General Aviation Manufacturers Association (GAMA) Specification No. 2, with respect to the arrangement and content of the System/Chapters within the designated Chapter/Section-numbering system.

WARNING: USE ONLY GENUINE PIPER AIRCRAFT PARTS OR PIPER AIRCRAFT APPROVED PARTS OBTAINED FROM PIPER APPROVED SOURCES, IN CONNECTION WITH THE MAINTENANCE AND REPAIR OF PIPER AIRPLANES.

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

THE NEW PIPER AIRCRAFT, INC. expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-PIPER approved parts.

NOTE: THE NEW PIPER AIRCRAFT, INC. expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

In any question concerning the care of your airplane, be sure to include the airplane serial number in any correspondence.

3. Effectivity

This maintenance manual is effective for PA-32-301FT Piper 6X airplane serial numbers 3232001 and up and for PA-32-301XTC Piper 6XT airplane serial numbers 3255001 and up.

This encompasses the following model years:

NOTE: The following is provided as a general reference only.

A. PA-32-301FT 6X

Model Year	Serial Numbers
2003	3232001 thru 3232013
2004	3232014 and up

B. PA-32-301XTC 6XT

Model Year	Serial Numbers
2003	3255001 thru 3255014
2004	3255015 and up

4. Serial Number Explanation

Example: 32 32 001

TYPE CERTIFICATE DESIGNATION (32)

MODEL CODE (32)
32 = PA-32-301FT 6X
55 = PA-32-301XTC 6XT

SEQUENCE NUMBER (001)

5. Assignment of Subject Material

This publication is divided into industry standard, three element, numeric subject groupings as follows:

A. System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. They are assigned a number, which becomes the first element of the standardized numbering system. Thus, the element “28” of the number 28-40-01 refers to the chapter “Fuel”. Everything concerning the fuel system will be covered in this chapter.

B. Sub-System/Section - The major systems/chapters of an airplane are broken down into subsystems. These sub-systems are identified by the second element of the standard numbering system. The element “40” of the number 28-40-01 concerns itself with the indicating section of the fuel system.

C. Unit/Subject - The individual units within a sub-system/section may be identified by the third element of the standard numbering system. The element “01” of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and is normally zeroed out by PIPER.

Refer to paragraph 14, Chapter/Section Index Guide, for a complete breakdown and list. The material is arranged in ascending numerical sequence.

6. Pagination

The Chapter - Section (i.e. - 28-40-00) numbering system (explained above) forms the primary page numbering system for this manual. Within each Section, pages are numbered consecutively beginning with Page 1 (i.e. - 28-40-00, Page 1). Additionally, the aerofiche grid numbering system (explained below) is also used to indicate location within the manual.

7. Aerofiche Effectivity

A. The General Aviation Manufacturers Association (GAMA) have developed specifications for microfiche reproduction of aircraft publications. The information compiled in this Aerofiche Maintenance Manual will be kept current by revisions distributed periodically. These revisions will supersede all previous revisions and will be complete Aerofiche card replacements and shall supersede Aerofiche cards of the same number in the set. The "Aerofiche Effectivity" page at the front of this manual lists the current revision for each card in this set.

B. Conversion of Aerofiche alpha/numeric grid code numbers:

First number is the Aerofiche card number.
Letter is the horizontal row reference per card
Second number is the vertical column reference per card.

Example: 2J16 = Aerofiche card number two, row J, column 16.

C. To aid in locating information, the following is provided at the beginning of each aerofiche card:

(1) A complete Introduction containing the Chapter/Section Index Guide for all fiche in this set.
(2) A complete subject Index for all fiche in this set.

8. Identifying Revised Material

A revision to a page is defined as any change to the printed matter that existed previously. Revisions, additions and deletions are identified by a vertical line (i.e. - change bar) along the left-hand margin of the page opposite only that portion of the printed matter that was changed.

A change bar in the left-hand margin opposite the footer (i.e. - chapter/section/subject, page number and date), indicates that the text was unchanged but the material was relocated to a different page.

Example.

NOTE: Change bars are not used in the title pages, list of effective pages, or index.

9. Indexing

An alphabetically arranged subject Index follows this introduction to assist the user in locating desired information. In addition, each System/Chapter begins with an individual Table of Contents.

10. List of Effective Pages

Each System/Chapter has a List of Effective Pages preceding the Table of Contents to identify the effective revision date for each page in that chapter.

11. Warnings, Cautions and Notes

These adjuncts to the text are used to highlight or emphasize important points when necessary. Warnings call attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons. Cautions call attention to methods and procedures which must be followed to avoid damage to equipment. Notes call attention to methods which make the job easier. Warnings and Cautions shall be located directly above and Notes directly beneath the text and be in line with the paragraphs to which they apply.

12. Accident/Incident Reporting

To improve our Service and Reliability system and aid in our compliance with FAR 21.3, knowledge of all incidents and/or accidents must be reported to Piper immediately. To expedite and assist in reporting all incidents and accidents, Piper Form 420-01 has been created. See Service Letter 1041 for latest revision. This procedure is to be used by all Dealers, Service Centers and Repair Facilities.

13. Supplementary Publications

The following publications/sources provide servicing, overhaul and parts information for the PA-32-301FT/301XTC airplanes and their various components. Use them to supplement this manual.

A. Piper Publications:

	PA-32-301FT	PA-32-301XTC
(1) Parts Catalogs:	P/N 766-856	P/N 766-855
(2) Periodic Inspection Reports:	P/N 766-857	P/N 766-858
(3) Progressive Inspection Manuals (pending)	P/N 767-027	P/N 767-028

B. Vendor Publications:

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY.

(1) AIR CONDITIONING COMPRESSOR:

Vendor Address: Sanden International (USA), Inc.
601 South Sanden Blvd.
Wylie, Texas 75098
http://www.sanden.com/
PH: - (972) 442-8400
FAX: - (972) 442-8700

(2) AIR CONDITIONING EVAPORATORS AND BLOWERS:

Vendor Address: Enviro Systems, Inc.
P.O. Box 1404
Seminole, Oklahoma 74868
PH: - (405) 382-0731

(3) ALTERNATOR:

Vendor Address: Electro Systems, Inc.
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/
PH: - (888) 461-6077

(4) AUTOPILOT:

Vendor Address: S-TEC Corporation
One S-TEC Way
Mineral Wells, Texas 76067-9236
http://www.s-tec.com
PH: - (940) 325-9406

(5) BATTERY:

Vendor Address: GILL Batteries
A Division of Teledyne Continental Motors
http://www.gillbatteries.com
PH: - (800) 456-0070

(6) BRAKES AND WHEELS:

Vendor Address:	Parker Hannifin Corp Aircraft Wheel and Brake Division 1160 Center Road Avon, Ohio 44011 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 272-5464

(7) ELECTRONIC FLIGHT DISPLAY SYSTEM (EFDS)

Vendor Address:	Avidyne Corporation 55 Old Bedford Road Lincoln, MA 01773 http://www.avidyne.com/index.htm	PH - (800) 284-3963

Instructions for Continued Airworthiness

Primary Flight Display and Magnetometer/OAT:	Document No. AVPFD-174
Multifuntion Display:	Document No. AVMFD-167
Data Acquisition Unit:	Document No. AVSIU-011

(8) EMERGENCY LOCATOR TRANSMITTER:

Vendor Address:	Artex Airccraft Supplies 14405 Keil Road NE Aurora, Oregon 97002 http://www.artex.net/	PH: - (800) 547-8901

(9) ENGINE:

Vendor Address:	Textron Lycoming 652 Oliver Street Williamsport, PA 17701 http://www.lycoming.textron.com/main.html	PH - (717) 323-6181 FAX - (717) 327-7101
Overhaul Manual:	DIRECT DRIVE MODELS - P/N 60294-7	
Parts Catalog:	IO-540- ..... - K1G5, ... ENGINES - P/N PC-615 TIO-540-AH1A ENGINES - P/N PC-615-12	
Operators Handbook:	O-540, IO-540 SERIES - P/N 60297-10 TIO-540 Series - P/N 60297-23	

NOTE: The above Lycoming publications can be ordered as a set on CD-ROM from Avantext. See www.avantext.com or PH - (800) 998-8857.

(10) FIRE EXTINGUISHER (PORTABLE):

Vendor Address:	H3R Inc. 43 Magnolia Ave # 4 San Francisco, California 94123-2911 http://www.h3r.com/index.htm	PH: - (800) 249-4289

(11) FUEL PUMP:

Vendor Address:	Weldon Pumps P.O. Box 46579 640 Golden Oak Parkway Oakwood Village, Ohio 44146 http://www.weldonpumps.com/index.html	PH: - (440) 232-2282 FAX - (440) 232-0606

(12) FUEL CELLS:

Vendor Address:	Engineered Fabrics Corporation 669 Goodyear Street Rockmart, Georgia 30153-0548 http://www.kfefc.com/index.htm	PH - (770) 684-7855 FAX - (770) 684-7438

(13) HI-LOK FASTENERS AND TOOLS:

Vendor Address:	Hi-Shear Corporation 2600 Skypark Drive Torrance, California 90509	PH: - (213) 326-8110

(14) LIGHTS - NAVIGATION, STROBE, AND STANDBY/MAP LIGHTS:

Vendor Address:	Whelen Engineering Co. Inc. Route 145, Winthrop Rd. Chester, Conneticut 06412 http://www.whelen.com/	PH: - (860) 526-9504 FAX - (860) 526-2009

(15) MAGNETOS:

Vendor Address:	Slick Aircraft Products Unison Industries Attn: Subscription Dept. 530 Blackhawk Park Ave. Rockford, IL 61104 http://www.unisonindustries.com/index4.html	PH - (815) 965-4700 FAX - (815) 965-2457
Installation, Operation and Maintenance Instructions:	F1100 MASTER SERVICE MANUAL, 4300/6300 SERIES MAGNETO MAINTENANCE AND OVERHAUL MANUAL - L-1363	

(16) NAVIGATION, COMMUNICATIONS, AND GPS (NAV/COM/GPS):

Vendor Address:	Garmin International 1200 East 151ST Street Olathe, KS 66062 http://www.garmin.com	PH: - (913) 397-8200

(17) OXYGEN SYSTEM (6XT only):

Vendor Address:	Scott Aviation 2225 Erie Street Lancaster, New York 14086 http://www.scottaviation.com/	PH - (716) 683-5100

(18) PROPELLER:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Standard Practices:	Manual No. 202A	
Overhaul and Maintenance:	Manual No. 113B	
Aluminum Blade Overhaul:	Manual No. 133C	
Propeller Owner's Manual and Logbook:	Manual No. 115N	

(19) PROPELLER GOVERNOR:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Governor Maintenance:	Manual No. 130B	

(20) STANDBY ATTITUDE INDICATOR:

Vendor Address:	Mid-Continent Instruments Co., Inc. 9400 E. 34 TH Street N. Wichita, KS 67226 http://www.mcico.com/index.html	PH - (316) 630-0101 FAX - (316) 630-0723
Installation Manual and Operating Instructions:	Manual No. 9015762	

(21) STARTER:

Vendor Address:	Sky-Tec 350 Howard Clemmons Rd. Granbury, Texas 76048 http://www.skytecair.com	PH - (800) 476-7896 FAX - (817) 573-2252

(22) VACUUM PUMPS:

Vendor Address:	Aero Accessories, Inc. 1240 Springwood Avenue Gibsonville, NC 27249 http://www.aeroaccessories.com/index.html	PH - (800) 822-3200

(23) VACUUM REGULATORS:

Vendor Address:	Parker Hannifin Corp. Airborne Division 711 Taylor Street Elyria, Ohio 44035 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 382-8422

(24) VOLTAGE REGULATOR:

Vendor Address:	Electro Systems, Inc. Airport Complex P. O. Box 273 Fort Deposit, Alabama 36032 http://www.kellyaerospace.com/index.htm/	PH: - (888) 461-6077

14. Chapter/Section Index Guide

NOTE: The following GAMA Specification No. 2 standard chapters are not included in this Maintenance Manual: 26, 29, 36, 38, 49, 53, 54, 60, 72, 75, 76, and 83. These chapters are omitted because the subject system is either: not installed in these airplanes; adequately covered in vendor or other manuals; or, for ease of use, has been combined with another chapter.

GRIDS 4A22 THRU 4A24
INTENTIONALLY BLANK

A

B

C

D

E

F

G

H

I

J

L

T

V

W

GRIDS 4B6 THRU 4B24
INTENTIONALLY BLANK

CHAPTER

39

ELECTRICAL / ELECTRONIC PANELS & MULTIPURPOSE PARTS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 39

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
39-List of	1	Feb 19/04			
Effective Pages	2	Jun 1/03			
39-Table of Contents	1	Feb 19/04			
	2	Jun 1/03			
39-10-00	1	Feb 19/04			
	2	Feb 19/04			
	3	Jun 1/03			
	4	Jun 1/03			
39-20-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 39 - ELECTRICAL / ELECTRONIC PANELS & MULTIPURPOSE PARTS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INSTRUMENT AND CONTROL PANELS

1. General

A. Face-Mounted Instruments

Most instruments are face-mounted and secured to the instrument panel by screws from the front of the panel. Most instruments are removed out the back of the panel, but a few are removed through the front of the panel. Take special care when any operation pertaining to the instruments is performed.

(1) Removal

(a) Disconnect the plumbing and/or electrical connectors from the back of the instrument. Where two or more lines connect to an instrument, identify and tag each line to facilitate installation. Attach a dust cap to each fitting.

NOTE: For those instruments which remove through the front of the panel, disconnecting and tagging plumbing and/or electrical connectors can be done after the instrument retaining screws are removed and the instrument is slid gently forward to expose the connections at the rear.

(b) Remove the screws that secure the instrument in the panel cutout.

(c) Remove the instrument from the panel.

(2) Installation

(a) Place the instrument in its proper panel cutout and secure with screws.

NOTE: For those instruments which install through the front of the panel, connecting plumbing and/or electrical connectors can be done from the front of the panel before the instrument retaining screws are installed. After the connections are secure, slide the instrument into place and install the retaining screws.

(b) Connect the plumbing and/or electrical connectors to back of instrument.

(c) Check instrument operation.

B. Rack-Mounted Avionics

Most avionics are rack-mounted front-removable units generally secured to the instrument panel tray/rack by a single jackscrew located in the center of their faceplate.

(1) Removal

(a) Insert an appropriate size (generally 3/32 inch) allen wrench into the jackscrew access hole in the faceplate.

(b) Unscrew the jackscrew in a counterclockwise direction.

(c) Slide the avionics unit aft and out of the instrument panel tray/rack.

(2) Installation

NOTE: Inspect the front of the panel-mounted avionics tray/rack to verify it is not significantly inset from the panel. If so, correct the tray/rack installation before proceeding.

NOTE: The high insertion forces required to seat a unit with "high density" connectors tend to limit the effectiveness of the first seating attempt. Accordingly, the following procedure requires sequential applications of force, and subsequent tightening of the jackscrew, to ensure all connectors seat properly.

(a) Slide the avionics unit into the instrument panel rack and forward applying a moderate insertion force.

(b) Insert an appropriate size (generally 3/32 inch) allen wrench into the jackscrew access hole in the faceplate and tighten to remove any slack, but do not try to "pull" unit into place with the jackscrew.

(c) Apply additional insertion force to front of unit.

(d) Tighten jackscrew again.

(e) Apply additional insertion force to front of unit.

(f) Finish tightening jackscrew.

(g) Ensure that unit bezel is "tight" against panel.

2. Circuit Breaker Panel

Circuit breakers are installed in the lower right instrument panel and are of the single hole mounting, pushbutton type, with manual reset.

Should a circuit breaker be replaced or added, exercise extreme caution ensuring the breakers are in proper mechanical alignment, any insulators that are called out are installed correctly, and all electrical wiring and connections meet aviation standards. Do not deviate from the parts manual requirements when replacing circuit breakers.

3. Switches

All switches are rocker-type. Most are located in the overhead switch panel, but a few are centrally located in the instrument panel.

CAUTION: ALTHOUGH SMALL SWITCH ASSEMBLIES ARE EASIER TO REMOVE IF WIRING IS FIRST DISCONNECTED, THE LIMITED WORK SPACE BEHIND THE PANEL CAN RESULT IN BURNED WIRE INSULATION. DO NOT ATTEMPT TO UNSOLDER THESE SMALL ELECTRICAL CONNECTIONS BEHIND THE INSTRUMENT PANEL UNDER ANY CONDITIONS. IF NECESSARY, CUT WIRES AT POINT OF CONNECTION. IN ANY CASE, IT'S BETTER TO DAMAGE THE SWITCH AND REPLACE IT, RATHER THAN DAMAGE THE WIRING HARNESS LEADS.

A. Removal

(1) Gain access to the switch from behind the instrument panel.

(2) Squeeze retainer blades on top and bottom of the switch together and push switch from the panel.

(3) Make note of the placement of, and/or tag, wires on the switch to facilitate installation.

(4) Disconnect wires from the switch. Remove switch.

B. Installation

(1) Connect wires to the switch.

(2) Squeeze retainer blades on top and bottom of the switch together and push switch into panel until retainer blades engage the panel.

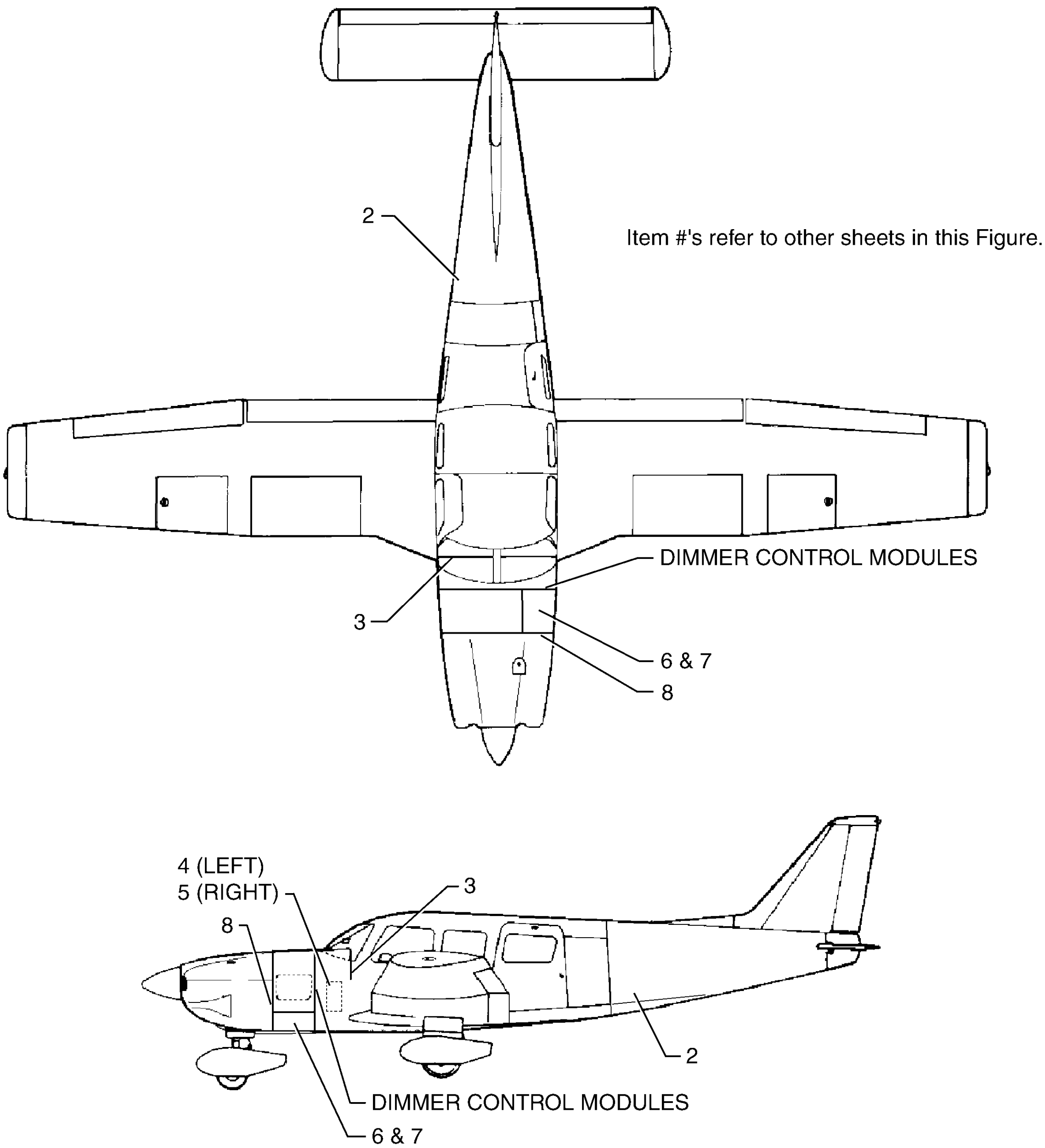
THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

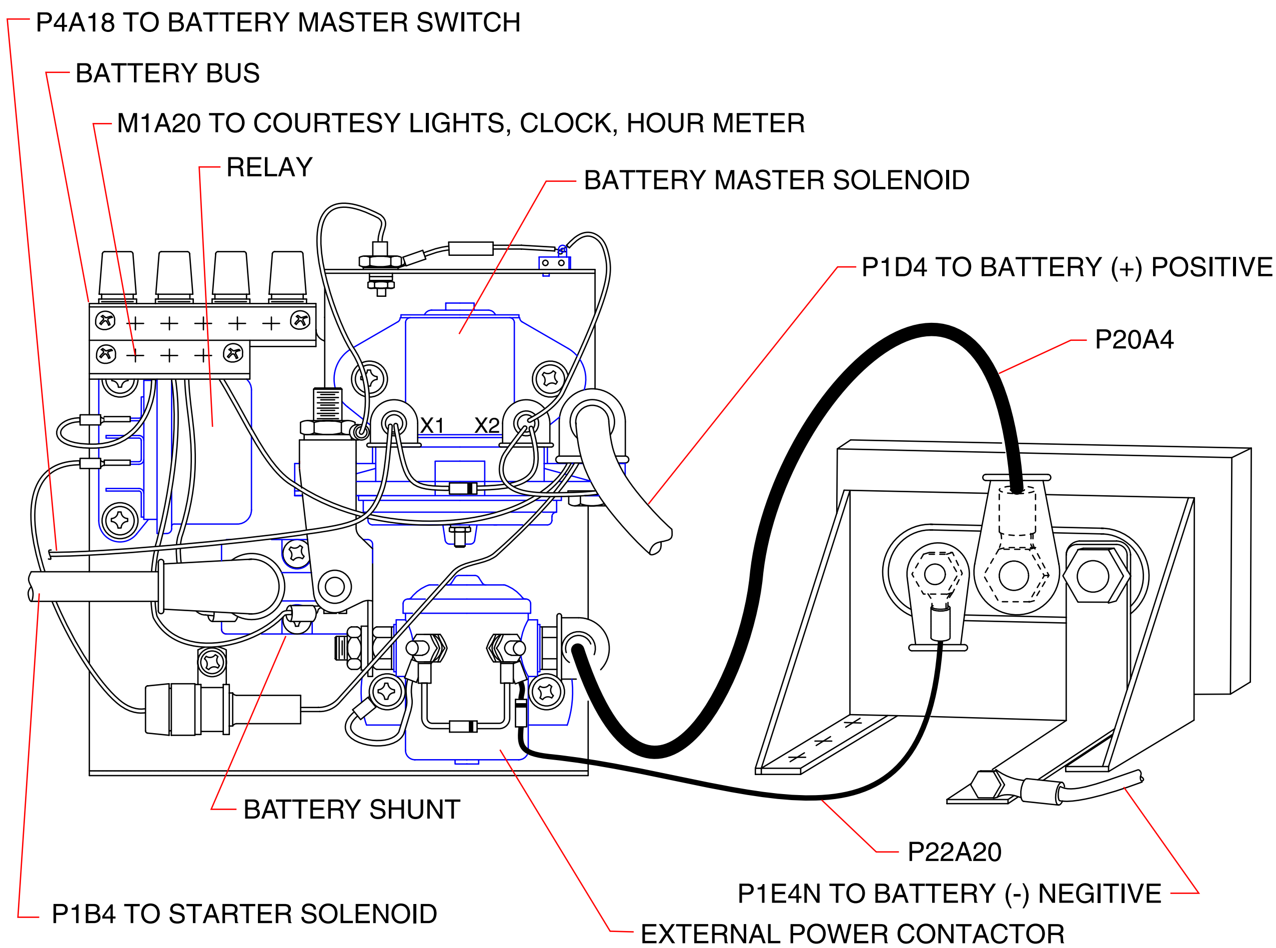
ELECTRICAL & ELECTRONIC EQUIPMENT

The following illustrations depict the location and installation of various electrical/electronic components.

Index

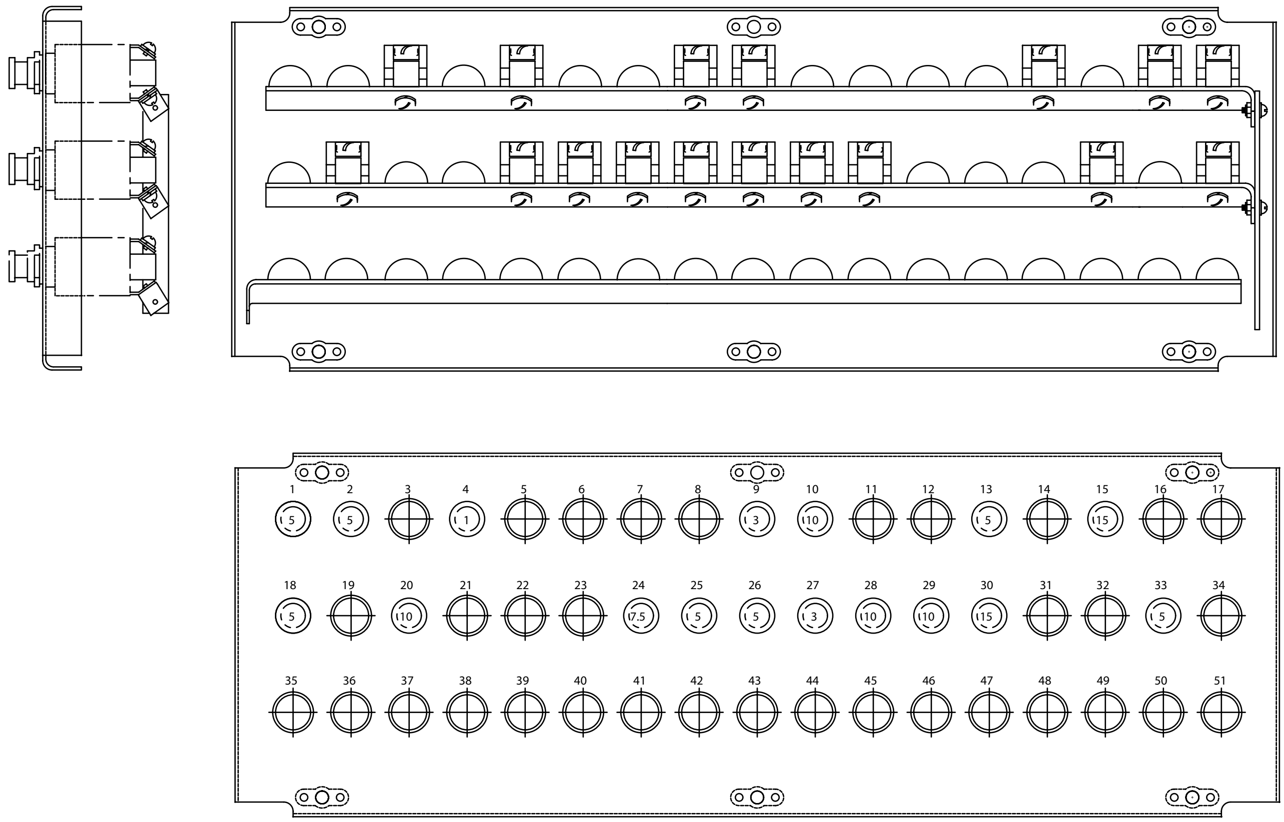


Electrical/Electronic Component Locator
Figure 1 (Sheet 1 of 8)



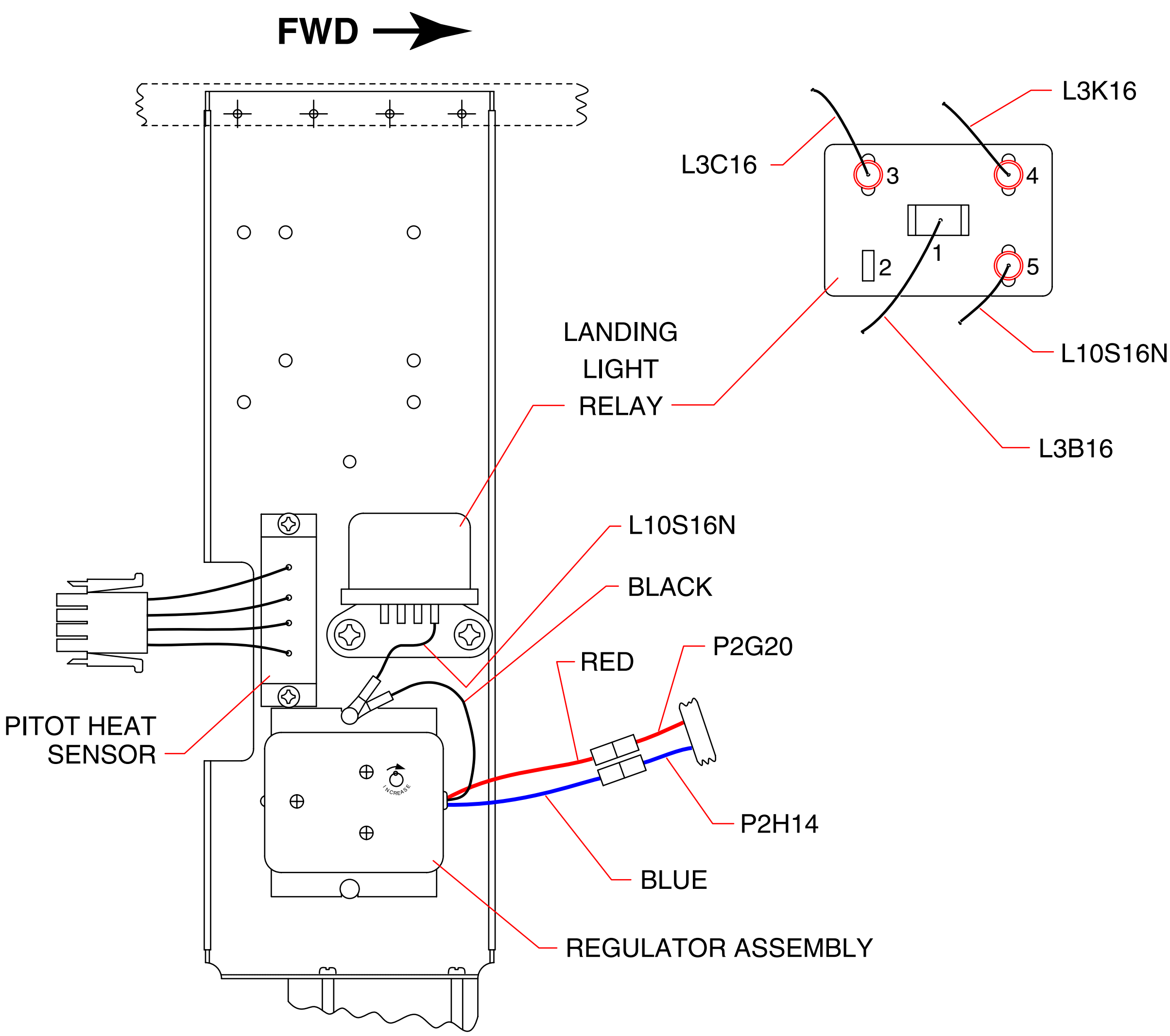
AFT OF CABIN CLOSEOUT PANEL
RIGHT SIDE, LOOKING OUTBOARD

Electrical/Electronic Component Locator
Figure 1 (Sheet 2 of 8)



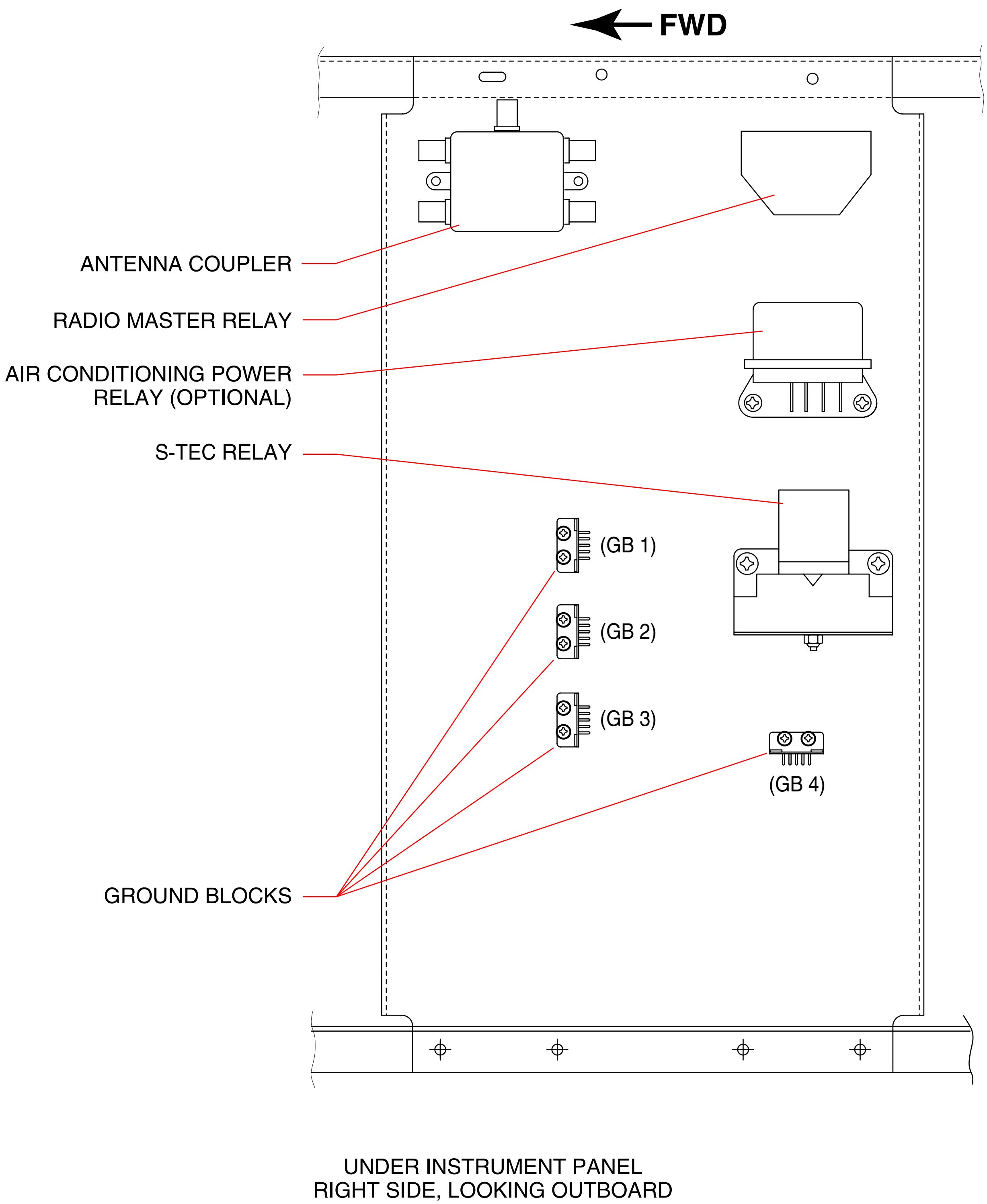
POSITION	RATING	FUNCTION	POSITION	RATING	FUNCTION
1	5A	ALTNR. FIELD	21	10A	AIR-COND/AIR BLOWER
2	5A	ENG. MONITOR	24	7.5A	PNL/SW. LIGHTS
4	1A	RPM	25	5A	RADIO LIGHTS
9	3A	FUEL QTY.	26	5A	READING LIGHTS
10	10A	FUEL PUMP	27	3A	FLOOD LIGHTS
13	5A	STALL WARN	28	10A	ANTI/COLL LIGHTS
15	15A	START & ACC.	29	10A	NAV LIGHTS
18	5A	ANNUN. PANEL	30	15A	LAND/TAXI LIGHTS
20	10A	PITOT HEAT	33	5A	TURN & BANK

Electrical/Electronic Component Locator
Figure 1 (Sheet 3 of 8)

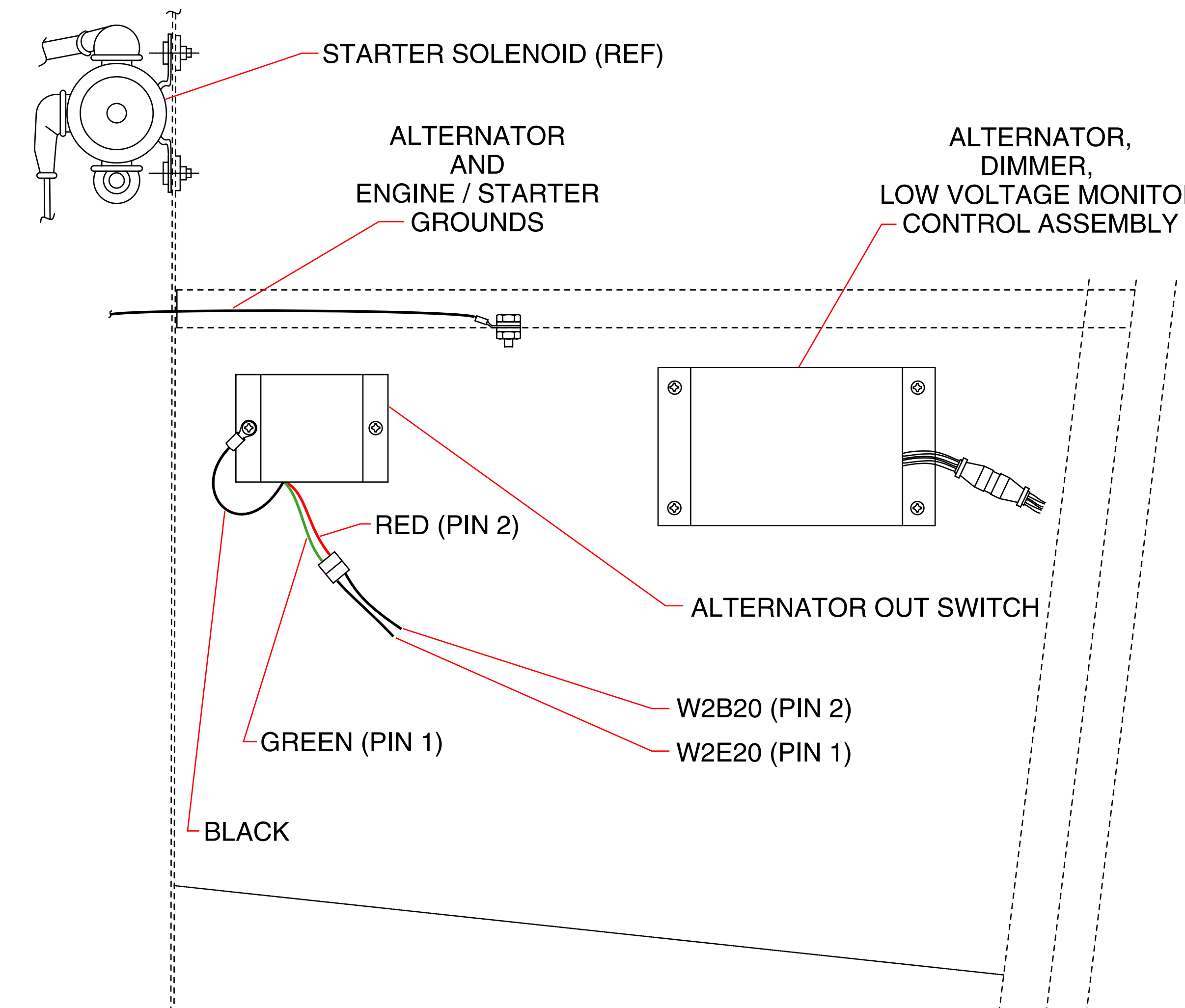


UNDER INSTRUMENT PANEL
LEFT SIDE, LOOKING OUTBOARD

Electrical/Electronic Component Locator
Figure 1 (Sheet 4 of 8)

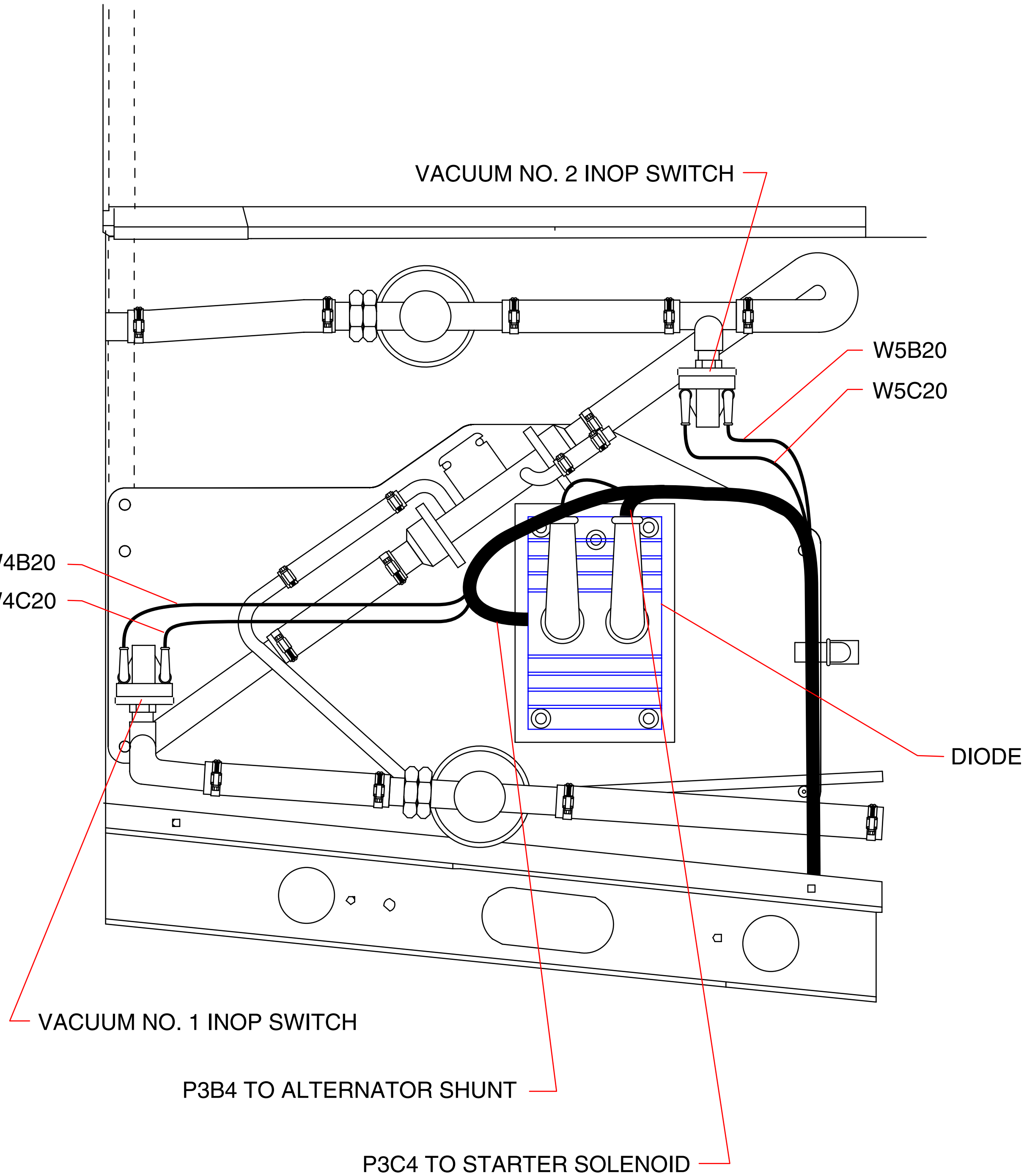


Electrical/Electronic Component Locator
Figure 1 (Sheet 5 of 8)



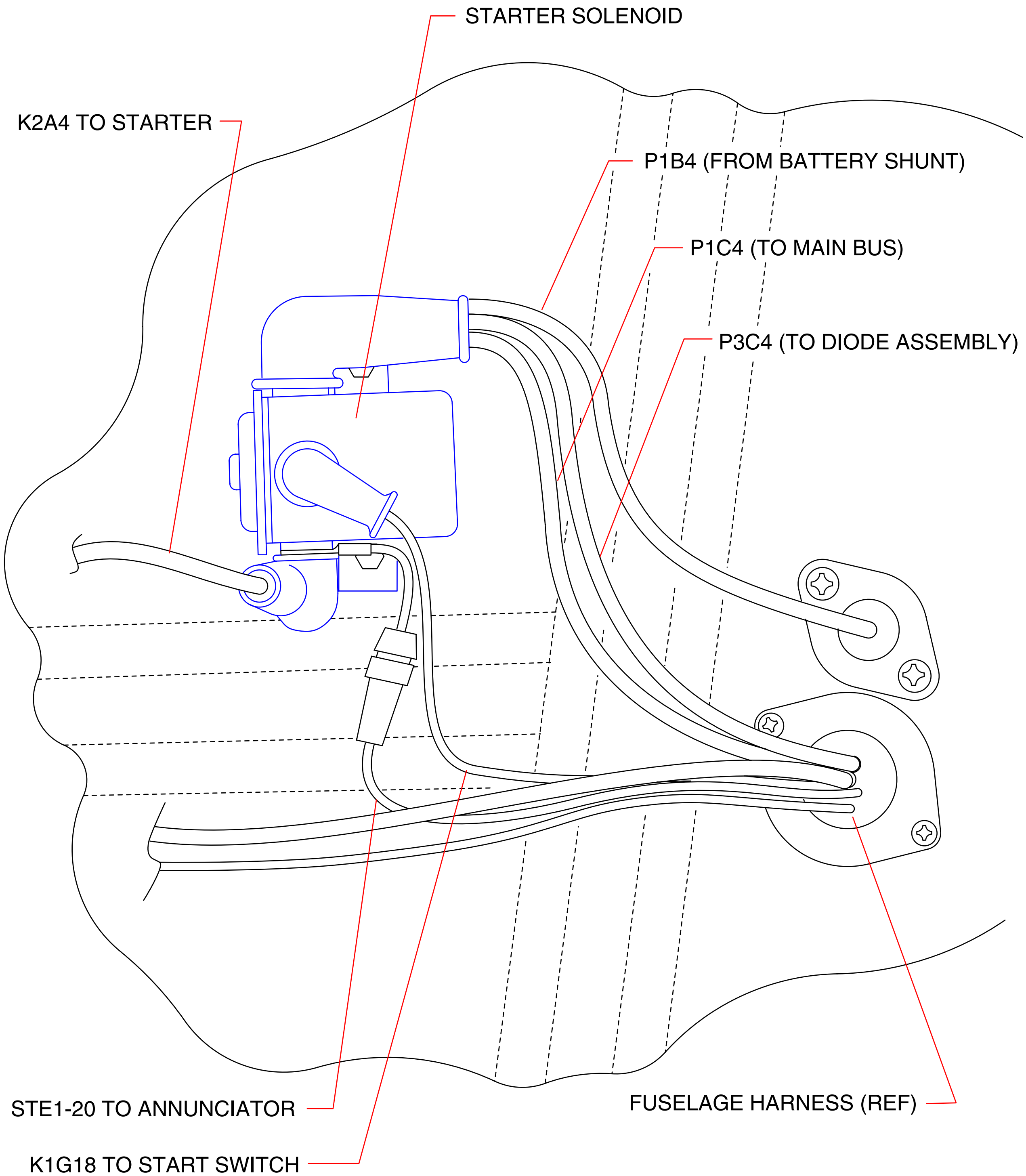
BENEATH FORWARD BAGGAGE COMPARTMENT FLOOR
LEFT SIDE, LOOKING INBOARD

Electrical/Electronic Component Locator
Figure 1 (Sheet 6 of 8)



BENEATH FORWARD BAGGAGE COMPARTMENT FLOOR
LEFT SIDE, LOOKING DOWN

Electrical/Electronic Component Locator
Figure 1 (Sheet 7 of 8)



ENGINE COMPARTMENT
REAR LEFT, VIEW AFT

Electrical/Electronic Component Locator
Figure 1 (Sheet 8 of 8)

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

51

STRUCTURES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 51

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
51-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
51-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
51-00-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Jun 1/03			
	14	Jun 1/03			
	15	Jun 1/03			
	16	Jun 1/03			
	17	Jun 1/03			
	18	Jun 1/03			
	19	Jun 1/03			
	20	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 51 - STRUCTURES

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

This airplane has an all metal semi-monocoque structure. The fuselage is constructed of bulkheads, stringers and stiffeners, to which all of the outer skin is riveted. Crew entrance door is located on right side of fuselage above wing. Forward baggage door is forward of the wing on the right side of fuselage, just aft of firewall. Passenger entrance door is provided on left side of fuselage aft of wing and is adjacent to the aft baggage door. Wings and empennage are all metal, full cantilever semi-monocoque type construction with removable tips.

Structural repair methods used must be in accordance with regulations set forth in FAA Advisory Circular 43-13-1, latest revision. To assist in making repairs and/or replacements, Figure 1 identifies type and thickness of various skin material used.

WARNING: NO ACCESS HOLES ARE PERMITTED IN ANY CONTROL SURFACE. USE OF PATCH PLATES FOR REPAIRS OF ALL MOVABLE TAIL SURFACES IS PROHIBITED. USE OF ANY FILLER MATERIAL NORMALLY USED FOR REPAIR OF MINOR DENTS AND/OR MATERIALS USED FOR FILLING INSIDE OF SURFACES IS ALSO PROHIBITED ON ALL MOVABLE TAIL SURFACES.

Never make a skin replacement or patch plate from material other than type of original skin, or of a different thickness than original skin. Repair must be as strong as original skin. However, flexibility must be retained so surrounding areas will not receive extra stress.

1. Fiberglass Repairs

Repair procedures in this manual will describe methods for repair of Fiberglass Reinforced Structures; Fiberglass Touch-Up and Surface Repairs such as blisters, open seams, delamination, cavities, small holes and minor damages that have not harmed fiberglass cloth material; and, Fiberglass Fracture and Patch Repairs such as puncture, breaks and holes that have penetrated through structure and damaged fiberglass cloth. A repair kit, part number 766-222 will furnish necessary material for such repairs, and is available through Piper Aircraft Distributorrs.

NOTE: Very carefully follow resin and catalyst mixing instructions furnished with repair kit.

A. Fiberglass Touch-Up and Surface Repairs

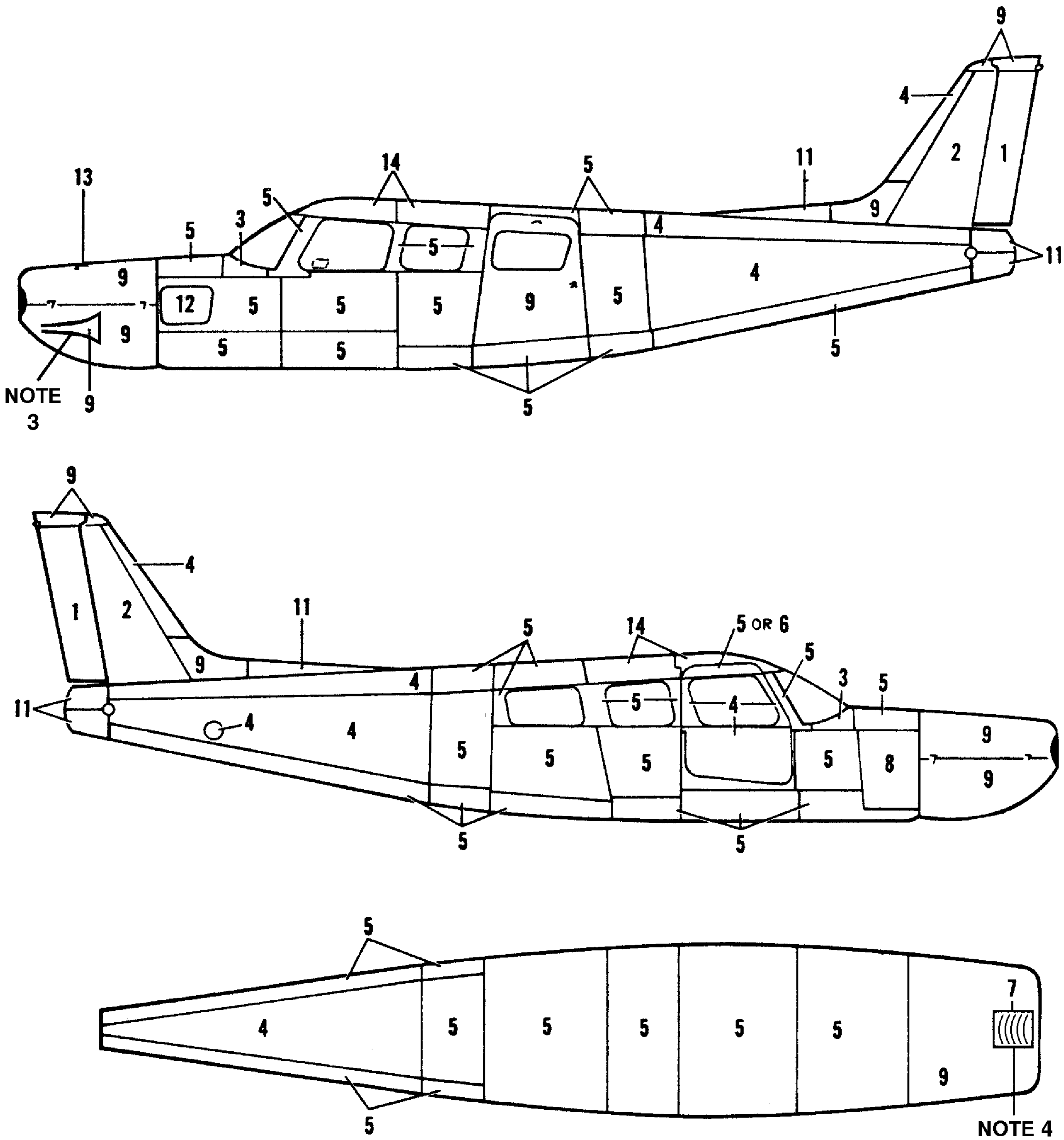
(1) Remove wax, oil and dirt from around damaged area with acetone, Methylethylketone or equivalent and remove paint to gel coat.

(2) Damaged area may be scraped with a fine blade knife or a power drill with a burr attachment to roughen bottom and sides of damaged area. Feather edge surrounding scratch or cavity. Do not undercut edge. (If scratch or cavity is shallow and penetrates only surface coat, continue to para h, below.)

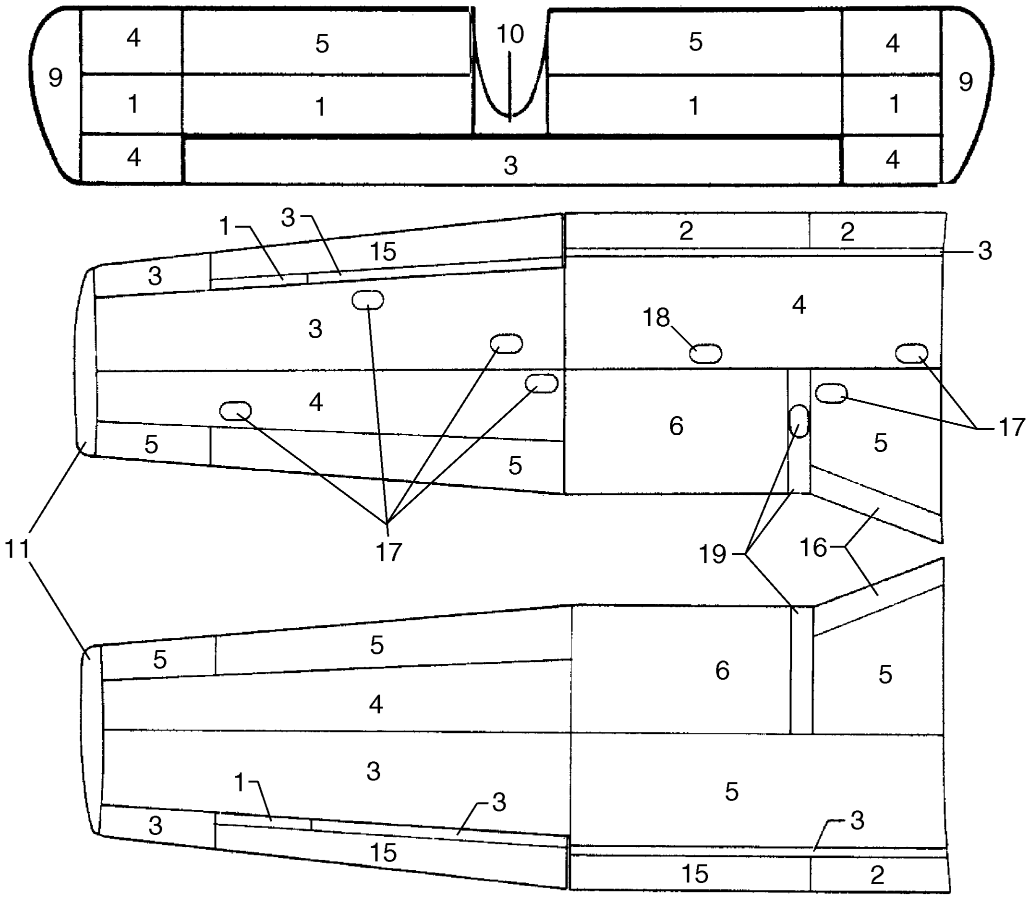
(3) Pour a small amount of resin into a jar lid or on a piece of cardboard, just enough to fill area being worked on. Mix an equal amount of milled fiberglas with resin, using a putty knife or stick. Add catalyst, according to kit instruction, to resin and mix thoroughly. A hypodermic needle may be used to inject gel into small cavities not requiring fiberglas millings mixed with gel.

(4) Work mixture of resin, fibers and catalyst into damaged area, using sharp point of a putty knife or stick to press it into bottom of hold and to puncture any air bubbles which may be present. Fill scratch or hole above surrounding undamaged area about 1/16 inch.

(5) Lay piece of cellophane or waxed paper over repair to cut off air and start cure of gel mixture.



Skin Materials and Thickness
Figure 1 (Sheet 1 of 2)



NUMBER	MATERIAL	THICKNESS
1	2024-T3	.016
2	2024-0 (1)	.020
3	2024-T3	.020
4	2024-T3	.025
5	2024-T3	.032
6	2024-T3	.040
7	2024-0 (1)	.040
8	2024-0 (2)	.032
9	FIBERGLASS	
10	2024-T3 (2)	.020
11	THERMOPLASTIC OR FIBERGLASS	
12	2024-T3 (2)	.040
13	5052-H34	.040
14	2024-T3 (2)	.032
15	2024-T3 (1)	.016
16	2024-T3 (1)	.040
17	5052-H34	.032
18	5052-0	.040
19	2024-T3	.051

NOTES: (LEFT WING SHOWN, RIGHT WING OPPOSITE)

1. HEAT TREAT TO 2024-T42 AFTER FORMING.
2. HEAT TREAT TO 2024-T3 AFTER FORMING.
3. 6X ONLY.
4. 6XT ONLY.

Skin Materials and Thickness
Figure 1 (Sheet 2 of 2)

(6) Allow gel to cure 10 to 15 minutes until it feels rubbery to touch. Remove cellophane and trim flush with surface, using a sharp razor blade or knife. Replace cellophane and allow to cure completely for 30 minutes to an hour. Patch will shrink slightly below structure surface as it cures. (If wax paper is used, ascertain wax is removed from surface.)

(7) Rough up bottom and edges of hole with electric burr attachment or rough sandpaper. Feather hole into surrounding gel coat, do not undercut.

(8) Pour out a small amount of resin, add catalyst and mix thoroughly, using a cutting motion rather than stirring. Use no fibers.

(9) Using tip of putty knife or fingertips, fill hole to about 1/16 inch above surrounding surface with gel coat mixture.

(10) Lay piece of cellophane over patch to start curing process. Repeat paragraph (6), above, trimming patch when partially cured.

(11) After trimming patch, immediately place another small amount of gel coat on cut edge of patch and cover with cellophane. Then, using a squeegee or back of a razor blade, squeegee level with area surrounding patch, leave cellophane on patch for one or two hours or overnight, for complete cure.

(12) After repair has cured for 24 hours, sand patched area using sanding block with fine wet sandpaper. Finish by priming, again sanding and applying color coat.

B. Fiberglass Fracture and Patch Repairs

(1) Remove wax, oil and dirt from around damaged area with acetone, methylethyketone or equivalent.

(2) Using a key hole saw, electric saber saw, or sharp knife cut away ragged edges. Cut back to sound material.

(3) Remove paint three inches back from around damaged area.

(4) Working inside structure, bevel edges to approximately a 30 degree angle and rough-sand hole and area around it, using 80-grit dry paper. Feather back for about two inches all around hole. This roughens surface for strong bond with patch.

(5) Cover a piece of cardboard or metal with cellophane. Tape it to outside of structure covering hole completely. Cellophane should face toward inside of structure. If repair is on a sharp contour or shaped area, a sheet of aluminum formed to a similar contour may be placed over area. Aluminum should also be covered with cellophane.

(6) Prepare a patch of fiberglas mat and cloth to cover an area two inches larger than hole.

(7) Mix small amount of resin and catalyst, enough to be used for one step at a time, according to kit instructions.

(8) Thoroughly wet mat and cloth with catalyzed resin. Daub resin on mat first, and then on cloth. Mat should be applied against structure surface with cloth on top. Both pieces may be wet out on cellophane and applied as a sandwich. Enough fiberglas cloth and mat reinforcements should be used to at least replace amount of reinforcements removed in order to maintain original strength. If damage occurred as a stress crack, an extra layer or two of cloth may be used to strengthen area.

(9) Lay patch over hole on inside of structure, cover with cellophane, and squeegee from center to edges to remove all air bubbles and assure adhesion around edge of hole. Air bubbles will show white in patch and they should all be worked out to edge. Remove excess resin before it gels on part. Allow patch to cure completely.

(10) Remove cardboard or aluminum sheet from outside of hole and rough-sand patch and edge of hole. Feather edge of hole about two inches into undamaged area.

(11) Mask area around hole with tape and paper to protect surface. Cut a piece of fiberglas mat about one inch larger than hole and one or more pieces of fiberglas cloth two inches larger than hole. Brush catalyst resin over hole, lay mat over hole and wet out with catalyzed resin. Use a daubing action with brush. Then apply additional layer or layers of fiberglas cloth to build up patch to surface of structure. Wet out each layer thoroughly with resin.

(12) With a squeegee or broad knife, work out all air bubbles in patch. Work from center to edge, pressing patch firmly against structure. Allow patch to cure for 15 to 20 minutes.

(13) As soon as patch begins to set up, but while still rubbery, take a sharp knife and cut away extra cloth and mat. Cut an outside edge of feathering. Strip cut edges of structure. Do this before cure is complete, to save extra sanding. Allow patch to cure overnight.

(14) Using dry 80-grit sandpaper on a power sander or sanding block, smooth patch and blend with surrounding surface. Should air pockets appear while sanding, puncture and fill with catalyzed resin. A hypodermic needle may be used to fill cavities. Let cure and resand.

(15) Mix catalyzed resin and work into patch with fingers. Smooth carefully and work into any crevices.

(16) Cover with cellophane and squeegee smooth. Allow to cure completely before removing cellophane. Let cure and resand.

(17) Brush or spray a coat of catalyzed resin to seal patch. Sand patch, finish by priming, again sanding and applying color coat.

NOTE: Brush and hands may be cleaned in solvents such as acetone or methylethylketone. If solvents are not available, a strong solution of detergent and water may be used.

THIS PAGE INTENTIONALLY BLANK

2. Thermoplastic Repairs

The following procedures will assist in making field repairs to items made of thermoplastic which are used throughout the airplane. A list of material needed to perform these repairs is given in Chart 1, along with suggested suppliers of the material. Common safety precautions should be observed when handling some of the materials and tools used while making these repairs.

A. Surface Preparation:

(1) Surface dirt and paint if applied must be removed from item being repaired. Household cleaners have proven most effective in removing surface dirt.

(2) Preliminary cleaning of damaged area with perchlorethylene or VM&P Naptha will generally insure a good bond betweenn epoxy compounds and thermoplastic.

B. Surface Scratches, Abrasion or Ground-in-Dirt: (Refer to Figure 2.)

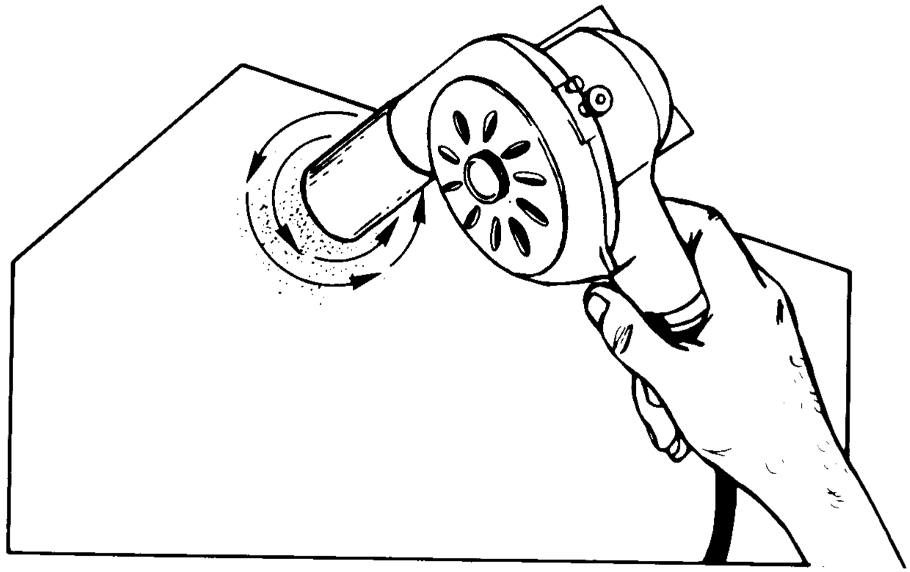
(1) Shallow scratches and abraded surfaces are usually repaired by following directions on containers of conventional automotive buffing and rubbing compounds.

(2) If large dirt particles are embedded in thermoplastic parts, they can be removed with a hot air gun capable of supplying heat in temperature range of 300°F to 400°F. Use care not to overheat material. Hold nozzle of gun about 1/4 of an inch away from surface and apply heat with a circular motion until area is sufficiently soft to remove dirt particles.

(3) Thermoplastic will return to its original shape upon cooling.

CHART 1
THERMOPLASTIC REPAIR LIST OF MATERIALS

Item	Description	Source
Buffing and Rubbing Compounds	Automotive Type - DuPone #7	DuPont Company Wilmington, DE 1998
	Ram Chemical #69 x 1	Ram Chemicals Gardena, CA 90248
	Mirror Glaze #1	Mirror Bright Polish Co., Inc. Irvin, CA 92713
Cleaners	Fantastic Spray	Local Suppliers
	Perchlorethylene	
	VM&P Naptha (Lighter Fluid)	
ABS-Solvent Cements	Solarite 11 Series	Solar Compounds Corp. Linden, NJ 07036
Solvents	Methylethyl Ketone	Local Suppliers
	Methylene Chloride	
	Acetone	
Epoxy Patching Compound	Solarite #400	Solar Compounds Corp. Linden, NJ 07
Hot Melt Adhesives Polyamids and Hot Melt Gun	Stick From 1/2 in. dia. 3 in. long	Sears Roebuck & Co., or most hardward stores
Hot Air Gun	Temp. Range 300° to 400°F	Local Suppliers



Surface Scratches - Abrasions or Ground in Dirt
Figure 2

Deep Screatches, Shallow Nicks and Small Holes
Figure 3

C. Deep scratches, Shallow Nicks and Small Holes: (Less than 1 inch diameter.) (See Figure 3.)

(1) Solvent cements will fit virtually any of these applications. If area to be repaired is very small, it may be quicker to make a satisfactory cement by dissolving thermoplastic material of the same type being repaired in solvent until desired paste-like consistency is achieved.

(2) This mixture is then applied to damaged area. Upon solvent evaporation, hard durable solids remaining can easily be shaped to desired contour by filing or sanding.

(3) Solvent adhesives are not recommended for highly stressed areas, on thin walled parts or for patching holes greater than 1/4 inch in diameter.

(4) For larger damages an epoxy patching compound is recommended. This type material is a two part, fast curing, easy sanding commercially available compound.

(5) Adhesion can be increased by roughing bonding surface with sandpaper and by utilizing as much surface area for bond as possible.

(6) Patching compound is mixed in equal portions on a hard flat surface using a figure eight motion. Damaged area is cleaned with perchlorethylene or VM&P Naptha prior to applying compound. (Refer to figure 4.)

(7) A mechanical sander can be used after compound is cured, providing sander is kept in constant motion to prevent heat buildup.

(8) For repairs in areas involving little or no shear stress, hot melt adhesives, polyamids which are supplied in stick form may be used. This type of repair has a low cohesive strength factor.

(9) For repairs in areas involving small holes, indentations or cracks in material where high stress is apparent or thin walled sections are used, welding method is suggested.

(10) Welding method requires a hot air gun and ABS rods. To weld, gun should be held to direct flow of hot air into fusion (repair) zone, heating damaged area and rod simultaneously. Gun should be moved continuously in a fanning motion to prevent discoloration of material. Pressure must be maintained on rod to insure good adhesion. (Refer to Figure 5.)

(11) After repair is completed, sanding is allowed to obtain surface finish of acceptable appearance.

D. Cracks: (Refer to Figure 6.)

(1) Before repairing a crack in thermoplastic part, first determine what caused crack and alleviate that condition to prevent it recurring after repair is made.

(2) Drill small stop holes at each end of crack.

(3) If possible, a double plate should be bonded to reverse side of crack to provide extra strength to part.

(4) Crack should be V-grooved and filled with repair material, such as solvent cement, hot melt adhesive, epoxy patching compound or hot air welded, whichever is preferred.

(5) Affter repair has cured, it may be sanded to match surrounding finish.

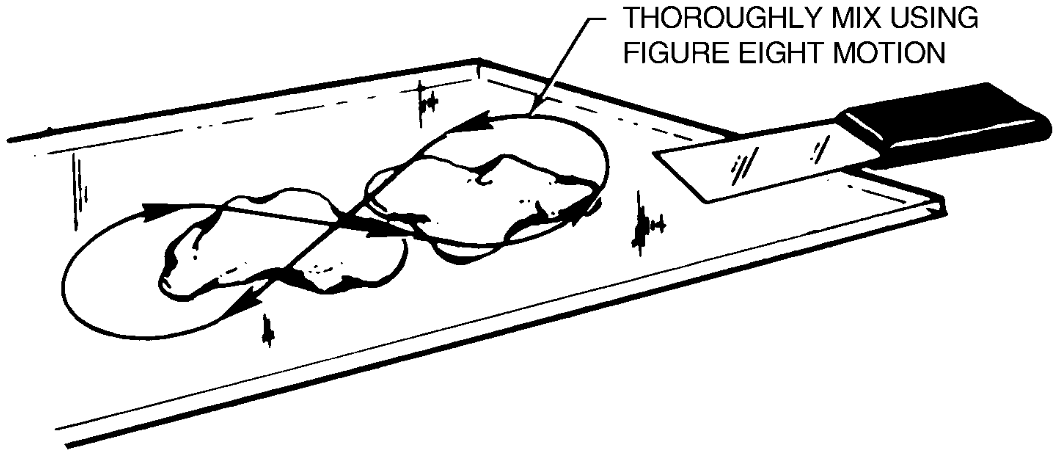
E. Repairing Major Damage: (Larger than 1 inch in diameter.) (Refer to Figure 7.)

(1) If possible a patch should be made of same material and cut slightly larger than section being repaired.

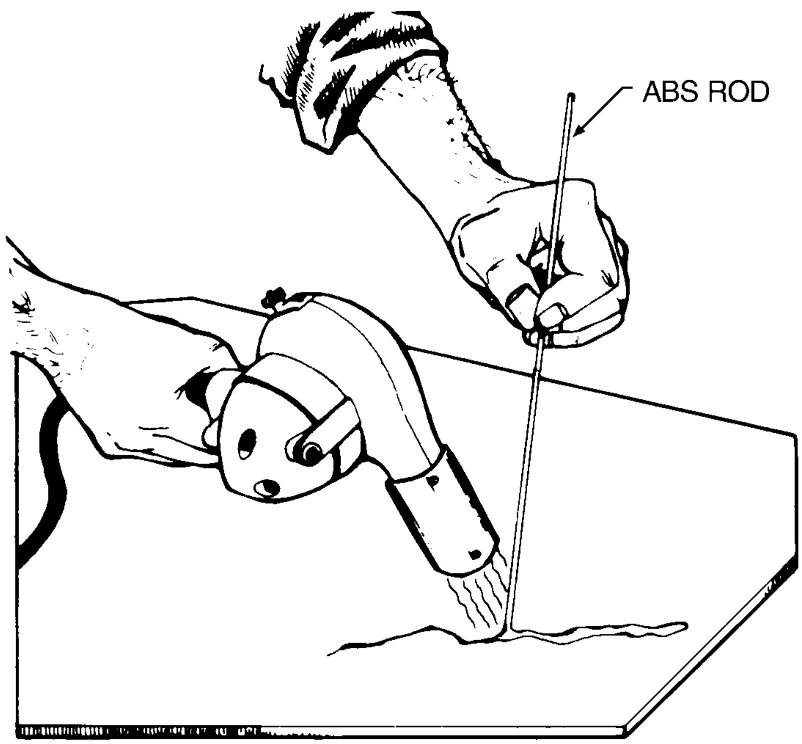
(2) When appearances are important, large holes, cracks, tears, etc, should be repaired by cutting out damaged area and replacing it with a piece of similar material.

(3) When cutting away damaged area, under cut perimeter and maintain a smooth edge. Patch and/or plug should also have a smooth edge to insure a good fit.

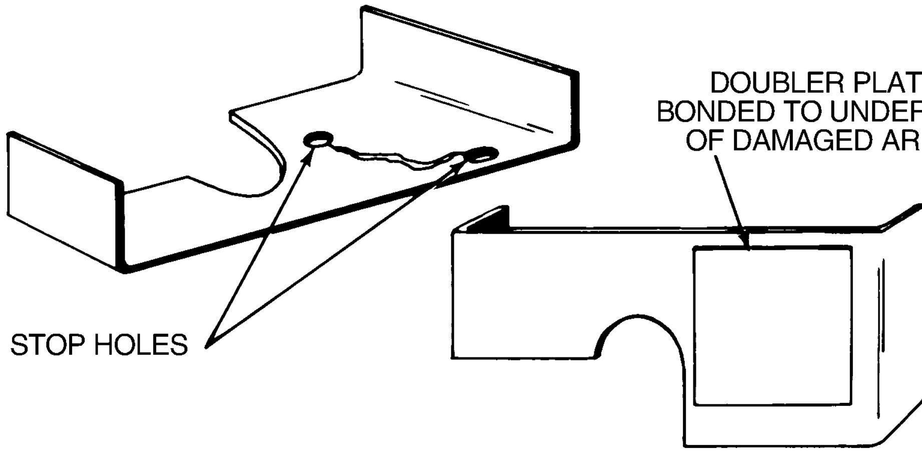
(4) Coat patch with solvent adhesive and firmly attach it over damaged area.



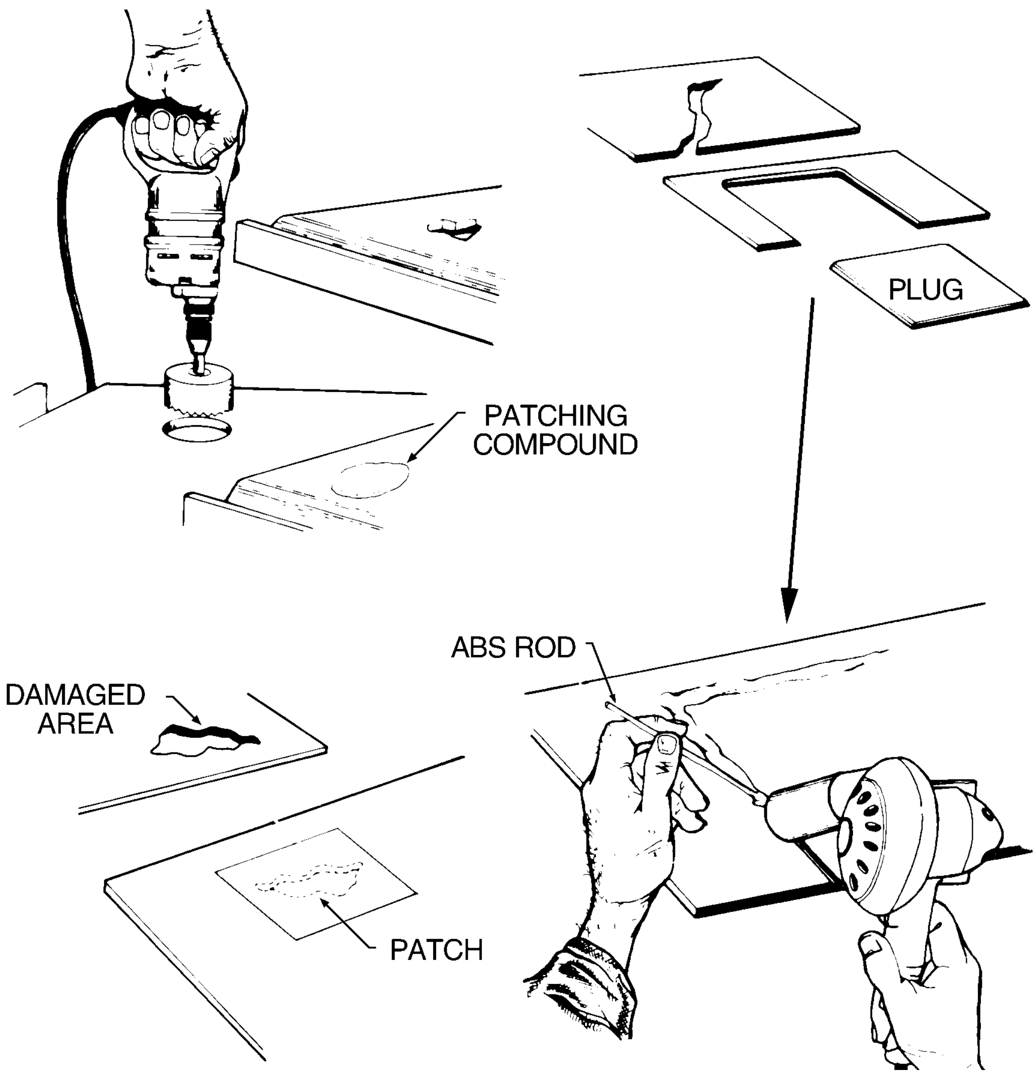
Mixing of Epoxy Patching Compound
Figure 4



Welding Repair Method
Figure 5



Repairing of Cracks
Figure 6



Various Repairs
Figure 7

(5) Let patch dry for approximately one hour before any additional work is performed.

(6) Hole, etc, is then filled with repair material. A slight overfilling of repair material is suggested to allow for sanding and finishing after repair has cured. If patching compound is used, repair should be made in layers, not exceeding a 1/2 inch in thickness at a time, thus allowing compound to cure and insuring a good solid buildup of successive layers as required.

F. Stress Lines: (Refer to Figure 8.)

(1) Stress lines produce a whitened appearance in a localized area and generally emanate from severe bending or impacting of material. (Refer to Figure 9.)

(2) To restore material to its original condition and color, use a hot air gun or similar heating device and carefully apply heat to affected area. Do not overheat material.

G. Painting the Repair:

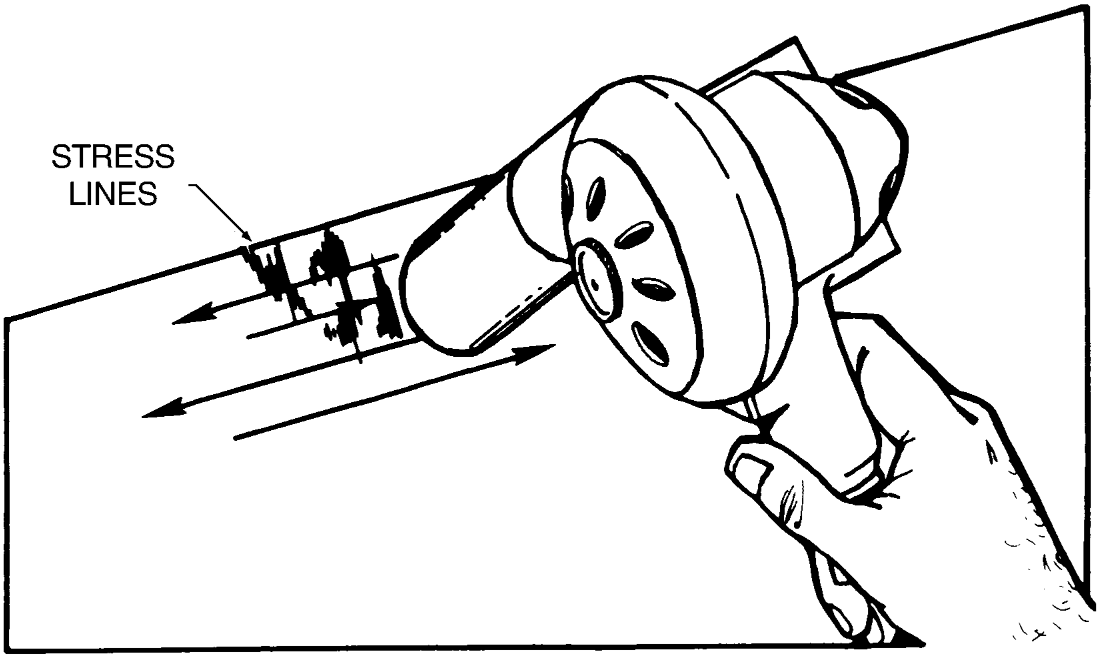
(1) An important factor in obtaining a quality paint finish is proper preparation of repair and surrounding area before applying any paint.

(2) It is recommended that parts be cleaned prior to painting with a commercial cleaner or a solution made from one-fourth cup of detergent mixed with one gallon of waer.

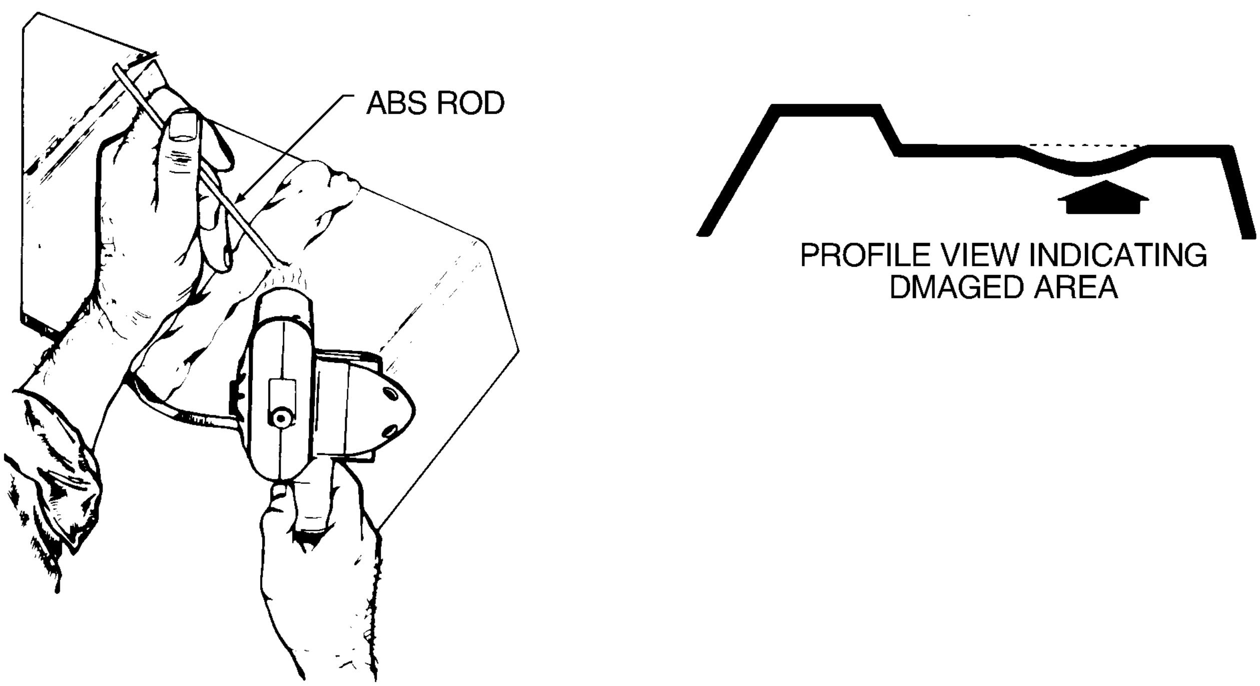
(3) Paint used for coating thermoplastic can be either lacquers or enamels depending on which is preferred by repair facility or customer. (See Note.)

NOTE: It is extremely important that solvent formulations be considered when selecting a paint, because not all lacquers or enamels can be used satisfactorily on thermoplastics. Some solvents used in paints can significantly affect and degrade plastic properties.

(4) Another important matter to consider is that hard, brittle coatings that are usually best for abrasion resistance should not be used in areas which incur high stress, flexing or impact. Such coating may crack, thus creating a weak area.



Repair of Stress Lines
Figure 8



Repair of Impacted Damage
Figure 9

3. Safety Walk Repair

A. Pressure Sensitive Safety Walk

(1) Surface Preparation For Pressure Sensitive Safety Walk

NOTE: Areas to which pressure sensitive safety walk is to be installed must be free from all contaminates and no moisture present.

If liquid safety walk is installed the area must be prepared as follows:

(a) Area must be masked off to protect painted surfaces.

(b) Apply suitable stripper MEK Federal Spec. TT-M-261, U.S. Rubber No. 3339 to windwalk compound. As compound softens remove by using putty knife or other suitable tool.

(c) Area must be clean and dry prior to painting.

(d) Prime and paint area.

(2) Application of Pressure Sensitive Safety Walk

NOTE: Newly painted surfaces shall be allowed to dry for 2.5 hours minimum prior to application of safety walk.

NOTE: Wipe area with a clean dry cloth to insure that no moisture remains on surface. Do not apply when surface temperature is below 50F.

(a) Peel back full width of protective liner approximately 2 inches from leading edge of safety walk.

(b) Apply safety walk to wing area, begin at leading edge, insure proper alignment and position from wing lap.

(c) Remove remaining protective liner as safety walk is being applied from front to back of wing area.

(d) Roll firmly with a long handled cylindrical brush in both lengthwise directions. Make sure all edges adhere to wing skin.

(e) Install and rivet leading edge retainer.

B. Liquid Safety Walk

These airplanes were delivered from the factory with Pressure Sensitive Safety Walk installed. Use of exisiting shelf stocks of Liquid Safety Walk Compound is an authorized replacement option.

(1) Surface Preparation

(a) Clean all surfaces with a suitable cleaning solvent to remove dirt, grease and oils. Solvents may be applied by dipping, spraying or mopping.

(b) Insure that no moisture remains on surface by wiping with a clean, dry cloth.

(c) Outline area to which liquid safety walk compound is to be applied, and mask adjacent surfaces.

(2) Product Listing For Liquid Safety Walk Compound

(a) Suggested Solvents:

Safety Solvent per MIL-S-18718
Sherwin Williams Lacquer Thinner R7KC120
Glidden Thinner No. 207

(b) Safety Walk Material:

Walkway Compound and Matting Nonslip (included in Piper Part No. 179872)

(3) Application Of Liquid Safety Walk Compound

NOTE: Newly painted surfaces shall be allowed to dry for 2.5 hours minimum prior to application of safety walk.

NOTE: Liquid safety walk compound shall be applied in an area free of moisture for a period of 24 hours minimum after application. Do not apply when surface to be coated is below 50°F. Apply liquid safety walk compound as follows:

(a) Mix and thin liquid safety walk compound in accordance with manufacturer's instructions on container.

(b) Coat specified surfaces with a smooth, unbroken film of liquid safety walk compound. A nap type roller or a stiff bristle brush is recommended, using fore and aft strokes.

(c) Allow coating to dry for 15 minutes to one hour before recoating or touchup, if required after application of initial coating.

(d) After recoating or touchup, if one, allow coating to dry for 15 minutes to one hour before removing masking.

NOTE: Coated surface shall not be walked on for six hours minimum after application of final coating.

4. Corrosion Control

Corrosion is the deterioration of metal by chemical or electrochemical attack. Water which is allowed to remain on the aircraft and industrial pollution are the major causes of corrosion in aircraft. The two general types of corrosion are:

-- Direct chemical attack. (i.e. spilled battery acid)

-- Electrochemical attack which requires a medium. (usually water)

The latter is the most common and is responsible for most forms of aircraft corrosion.

Since corrosion is a constant threat, the only effective method to control it is a routine of regular inspection, cleaning, and surface refinishing.

A. Forms of Corrosion

The following are the most common forms of corrosion:

(1) Surface corrosion appears as a general roughening or pitting on the surface usually accompanied by a powdery deposit of corrosion products. It may spread under the surface and not be recognized until the paint or plating is lifted off the surface in small blisters.

(2) Dissimilar metal corrosion may occur when two dissimilar metals are contacting each other. This type may be serious because it usually takes place out of sight. The only way to find it before structural failure is by disassembly and inspection. Insulating is necessary between two contacting dissimilar surfaces (2-3 coats of waterborne, chromated, fluid resistant, epoxy primer (i.e. - PRC Desoto) or a coat of epoxy polyamide on each surface; plus a .003 thick piece of vinyl tape if one of the surfaces is magnesium).

(3) Intergranular corrosion is difficult to detect in its early stages. When severe, it causes the surface of the metal to exfoliate (flake or lift).

(4) Stress Corrosion is the result of sustained tensile stresses and corrosive environment. It usually occurs in assemblies such as aluminum alloy bellcranks with pressed in bushings; landing gear shock struts with pipe thread grease fittings, clevis pin joints and shrink fit parts.

(5) Fretting Corrosion takes place when two parts rub together, constantly exposing fresh active metal to the corrosive effects of the atmosphere

(6) Filiform Corrosion is the appearance of numerous meandering thread-like filaments of corrosion on the surface of various types of metal.

CHART 2
TYPES OF METAL CORROSION

Type of Material	Type of Corrosion	Remedy**
Steel	Rust*	Complete removal of corrosion by mechanical means.
Aluminum	White to grey powdery material.	Mechanical polishing or brushing with material softer than aluminum.
Magnesium (highly susceptible to corrosion)	White powdery snow-like mounds and white spots.	
Cadmium (plating)	White to brown to black mottling of surface (plating is still protecting until iron appears).	Mechanical removal of corrosion should be limited to metal surfaces from which the cadmium has been depleted.
Chromium (plating)	May pit in chloride environment.	Promotes rusting of steel where pits occur in the coating.

* Red rust generally shows on bolt heads, hold-down nuts and other aircraft hardware. Its presence in these areas is generally not dangerous. However, it is indicative of a need for maintenance and also of the possibility of corrosive attack in more critical areas. Any corrosion on the surface of a highly stressed steel part is potentially dangerous. A careful removal of corrosion products using mild abrasives (rough or fine grit aluminum oxide paper) is necessary, using care not to overheat the metal when removing the corrosion.

** For abrasion, do not use dissimilar material (i.e. steel wool on aluminum). Remove only the material required to clean up the affected area.

B. Conditions Affecting Corrosion

Some conditions which affect the occurrence of corrosion are:

(1) Heat and humidity increase corrosion.

(2) Different metal and their relative sizes affect resistance or susceptibility to corrosion.

(3) Frequent contributing factors to corrosion are:

(a) Soil and atmosphere dust.

(b) Oil, grease and exhaust residues.

(c) Salt water and salt moisture condensation.

(d) Spilled battery acids and caustic cleaning solutions.

(e) Welding, brazing and soldering flux residue

A clean aircraft will resist corrosion better than a dirty one. Cleaning frequency depends on several factors (such as geographical location, type of operation, etc). Soil should be removed as soon as possible, especially when it is on a high temperature area.

After cleaning, ensure that no cleaning solution remains in any holes, crevices or joints, as it may lead to increased corrosion. Also, all exposed areas (landing gear, flap tracks, control surface, hinge parts, etc) should be lubricated after cleaning.

C. Corrosion Inspections

NOTE: Some areas of the airplane have been treated with a corrosion inhibiting compound which requires re-treatment at 7 year intervals. See Fuel Tank/Wing Spar Corrosion Inspection, 28-10-00.

Corrosion should be inspected for at every inspection. In trouble areas, the inspection frequency should be increased.

In addition to routine inspections:

(1) Aircraft operating around a marine environment should be given special checks on a weekly basis.

(2) Aircraft operating in a semi-acid condition should be inspected monthly. A semi-acid condition is likely to occur in industrialized areas where sulfur bearing particles in dust, smoke and smog attack painted surfaces.

(3) Inspections for corrosion should be performed by personnel familiar with corrosive problems and their remedies.

  (a) Daily and preflight inspections should include the engine frontal areas, all intake vents, engine compartments, gaps, seams, and faying surfaces in the exterior skins, wheel and wheel well areas, battery compartment, fuel cell and all other drains, and any bilge areas not requiring extensive removal of inspection access covers.

  (b) Detailed inspection should include the above referenced areas along with areas requiring removal of screw attached inspection plates and panels to thoroughly inspect the internal cavities of the aircraft.

(4) During inspection remember that paint tends to hide corrosion in its initial stages. However, the results of corrosion can sometimes be seen as blisters, flakes, chips and other irregularities in the paint.

D. Corrosion Removal and Control

CAUTION: REMOVAL OF "SEVERE CORROSION" MAY BE CONSIDERED A MAJOR REPAIR. ANY REPAIR OF THIS TYPE MUST BE APPROVED BY THE FAA BEFORE RETURNING THE AIRPLANE TO SERVICE.

Corrosion cannot be prevented or eliminated on aircraft; it can only be reduced to an acceptable level by proper control methods.

All corrosion products must be removed prior to refinishing. If they are not removed, corrosion will begin again, even though the affected area is refinished.

(1) Before beginning any rework:

  (a) Position the airplane in a wash rack or provide some type of washing apparatus for rapid rinsing of all surfaces.

  (b) Connect a static ground line to the airplane.

  (c) Remove the airplane battery if required.

  (d) Protect the pitot-static ports, engine openings, airscoops, louvers, wheels, tires and other portions of the airplane from moisture and chemical brightening agents.

  (e) Protect the surfaces next to the rework areas from chemical paint strippers, corrosion removal agents and surface treatment materials.

(2) An evaluation of the corrosion damage is necessary to determine the type and extent of repairs required.

The following are general guidelines:

(a) Light Corrosion: Discoloration or pitting; normally removed by light hand sanding or a small amount of chemical treatment.

(b) Moderate Corrosion: Similar to light corrosion except there could be some blistering or evidence of scaling and flaking. Removed by extensive hand sanding or mechanical sanding.

(c) Severe Corrosion: Similar to moderate corrosion with severe blistering, exfoliation, scaling and / or flaking, normally removed by extensive mechanical sanding or grinding.

NOTE: The depth of material removed should not exceed safe limits.

E. Corrosion Prone Areas

Certain areas are more prone to corrosion than others. The following list is intended to be a general guide to areas where corrosion is frequently found.

(1) Areas around steel fasteners are susceptible to corrosion. The paint on these areas cracks which allows moisture to seep in and corrode the underlying metal. Each time the fastener is removed, it should be coated with zinc chromate before reinstallation. The paint should be wet when the fastener is installed.

(2) Fluids tend to seep into faying surfaces, seams and joints due to capillary action. The effect of this type of intrusion is usually detectable by irregularities in the skin's surface.

(3) Spot welded assemblies are particularly prone to corrosion. The only means to prevent this type of corrosion is by keeping potential moisture entry points in the spot weld filled with a sealant or preservative compound. On an aluminum spot welded assembly, a chromate conversion coating before paint is applied will help prevent corrosion.

(4) Areas which are exposed to exhaust gases may have their finish damaged by deposits. These deposits may result in an aggressive attack on the metal by corrosion. Heat from the exhaust may also blister or otherwise damage the paint. Gaps, seams, hinges and fairings are some places where exhaust gas deposits may be trapped and not reached by normal cleaning methods.

(5) The wheels and landing gear are the most exposed parts of the aircraft. Due to the complexity of its shape, assemblies and fittings, maintaining a protective coverage is difficult. The especially troublesome areas are:

(a) Magnesium wheels: around bolt heads, lugs and wheel well areas:

(b) Exposed rigid tubing, B-nuts, ferrules, under clamps and tubing identification tape:

(c) Exposed electrical equipment:

(d) Crevices between stiffeners, ribs and lower skin surfaces.

(6) Flaps, flight control slots and equipment installed in these areas may corrode unnoticed unless a careful surveillance is maintained.

(7) Engine frontal areas, air inlet ducts and the leading edge of wings, because they are constantly exposed to abrasion by dirt, dust, gravel and rain, should be checked frequently for the beginning of corrosion.

(8) Hinges (piano hinges especially) are extremely vulnerable to corrosion due to the wearing away of their protective coating and their being a natural trap for dirt, salt and moisture.

(9) Control cables may have bare spots in their preservative coating which could lead to corrosion. Cables having external corrosion should be checked for internal corrosion. If internal corrosion is present, replace the cable. If only external corrosion is present, remove corrosion with a wire brush and recoat cable with preservative.

(10) Any area where water may be trapped is a trouble spot for corrosion. Drain holes should be checked and cleaned regularly.

(11) Battery compartment and vent openings are particularly prone to corrosion due to spilled electrolyte. Fumes from overheated battery electrolyte will spread to adjacent areas and cause rapid corrosion of unprotected surfaces. Frequent cleaning and neutralization of deposits will minimize corrosion from this cause.

(12) Due to magnesium parts being prone to corrosion, special attention should be given to their surface treatment, proper insulation (due to dissimilar metal corrosion) and paint coatings.

(13) Electrical components and connectors should be checked. Their inspection frequency should be based on their operational environment and past trouble with them.

(14) Skin joints and lap-overs are two areas which may contain moisture. Corrosion in these areas may go unnoticed unless particular attention is paid to them during inspection.

(15) Hoses having an internal wire braid which are located in a position where they are frequently water soaked need a protective treatment.

(16) Drilled holes and the trimmed end of sandwich panels should be protected. An inhibitor solution and/ or sealant application is recommended. Any gaps or cavities which allow dirt or moisture to enter should be filled with a sealant.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

52

DOORS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 52

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
52-List of Effective Pages	1	Jun 1/03			
	2	Jun 1/03			
52-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
52-00-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
52-10-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
52-30-00	1	Jun 1/03			
	2	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 52 - DOORS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

1. Description

These airplanes are equipped with a forward cabin (or crew) door located on the right side of fuselage over the wing and an aft cabin (or passenger door) on the left side of fuselage aft of the wing. A rear baggage compartment door adjoins the passenger door. The forward baggage compartment door is located on right side of fuselage at station 41.1.

2. Door Snubber Seals - Replacement

Door snubber seals are incorporated in the door jambs to improve door sealing in all doors except the forward cabin door. The latching mechanism used in the forward cabin door has improved sealing characteristics sufficient to allow the removal of snubber seals from those doors.

NOTE: If existing seal is torn or badly deteriorated, it should be replaced. If seal is loose or bond is "marginal", it should be rebonded. Adhesives listed below are recommended for rebonding:

3M EC 1300L (Preferred)

Proco Adhesive 6205-1

Scotch Grip 2210

A. To replace door snubber seal, proceed with the following steps:

(1) Remove windlace retainers, "roll" back windlace (tape to secure) out of way, remove all scuff plates and disconnect door holder.

(2) Remove all striker plates except where shown in Figure 1, Section A-A.

(3) With a plastic scraper or other appropriate instrument, scrape off snubber while applying mineral spirits as necessary to loosen strip and wipe off excess adhesive with a clean cloth.

B. Install snubber as follows:

(1) If door jamb is flaking or excessively scuffed, rub down with wet and dry emery cloth. Clean surface using Prep-Sol or equivalent cleaner which will not leave an oily residue.

(2) Mask jamb as shown in View E of Figure 1.

(3) Apply adhesive to door jamb as shown in View E of Figure 1.

(4) Apply adhesive to inside surface of snubber.

(5) Position snubber with protruding leg facing outboard beginning at lower center of door jamb and work progressively around jamb applying pressure to snubber to remove any trapped air and to ensure a proper bond. Do not prestretch snubber as this can induce cracks.

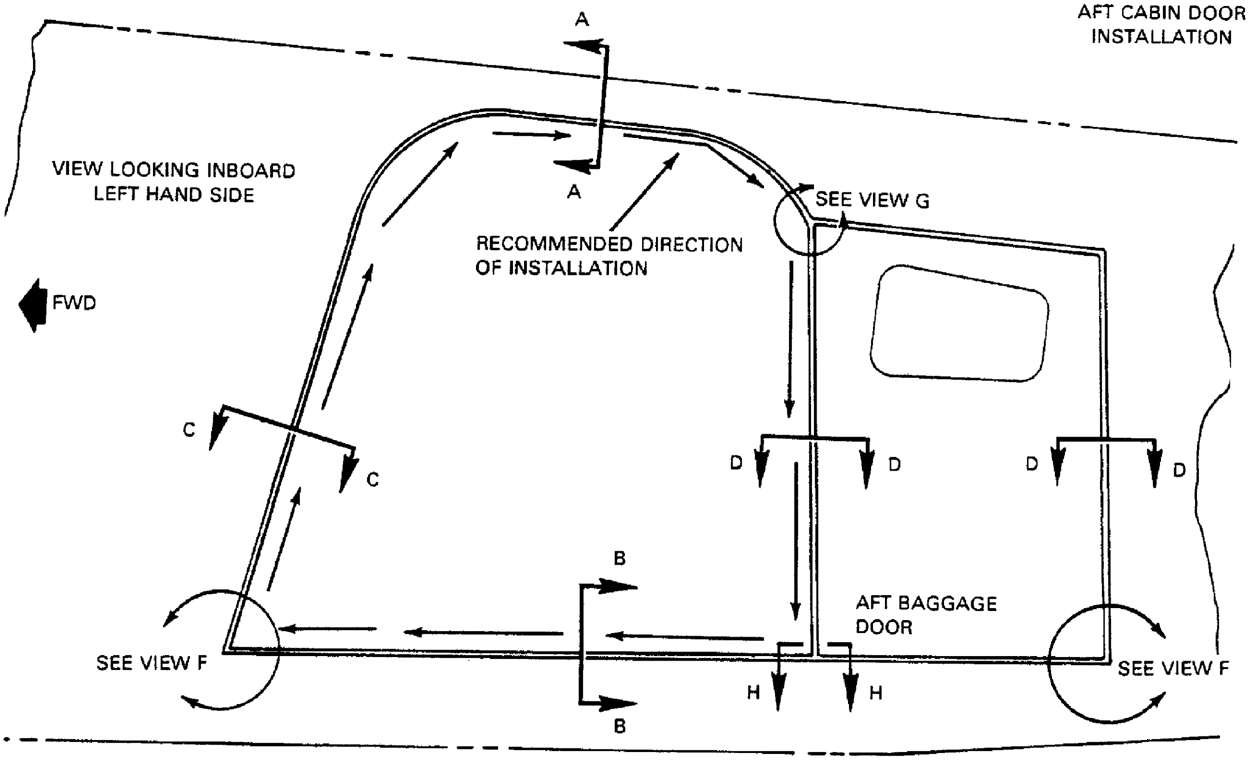
NOTE: Normal tack time for 3M EC 1300L is 30-45 minutes at 75°F. However, adhesive that has "set" may be reactivated by a clean rag moistened with Toluol or MEK.

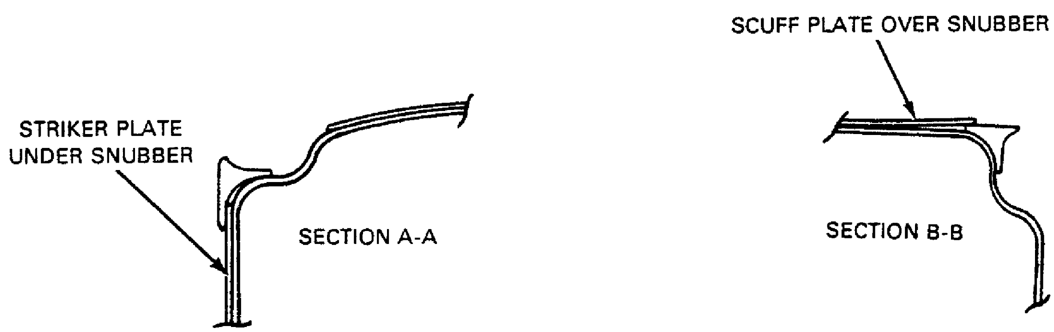
(6) It takes approximately 1 day for bond to cure. Do Not allow door to close during this period. It is recommended that door be left open as long as possible to effect curing.

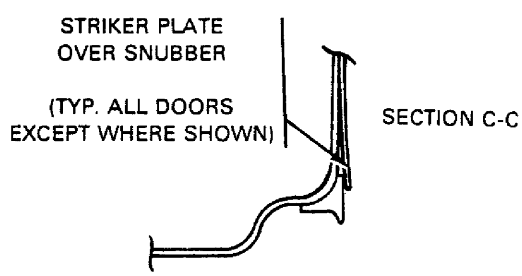
(7) Remove masking tape if used and clean off excessive adhesive smears using Mineral Spirits or Toluol and a clean cloth. Install striker plates and windlacing. Cut snubber for aft cabin door as shown in Figure 1.

(8) Check that doors close properly and readjust as necessary to achieve a flush fit. Latching effort must not have increased.

(9) With all hardware and plates installed, coat snubbers with silicone.



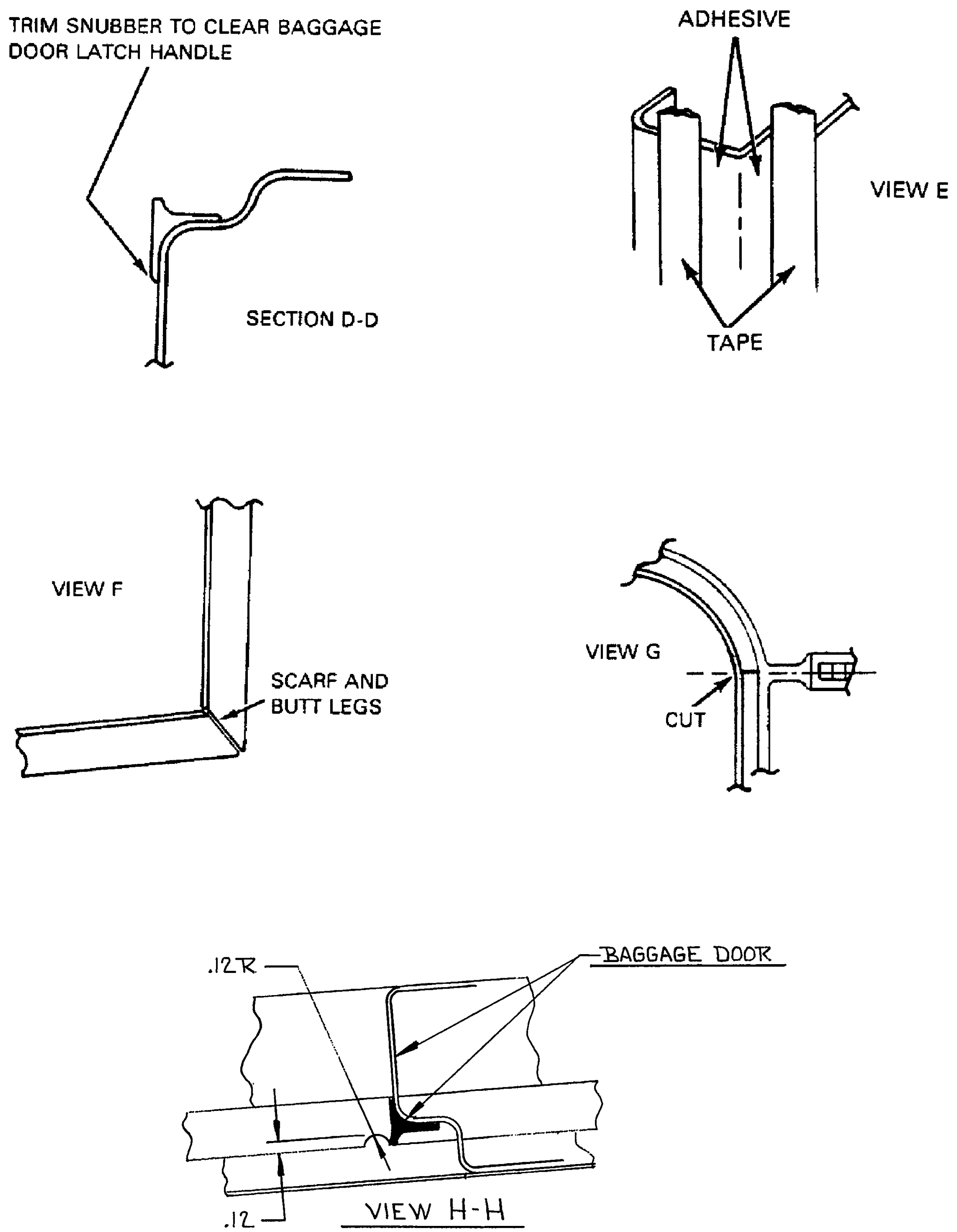




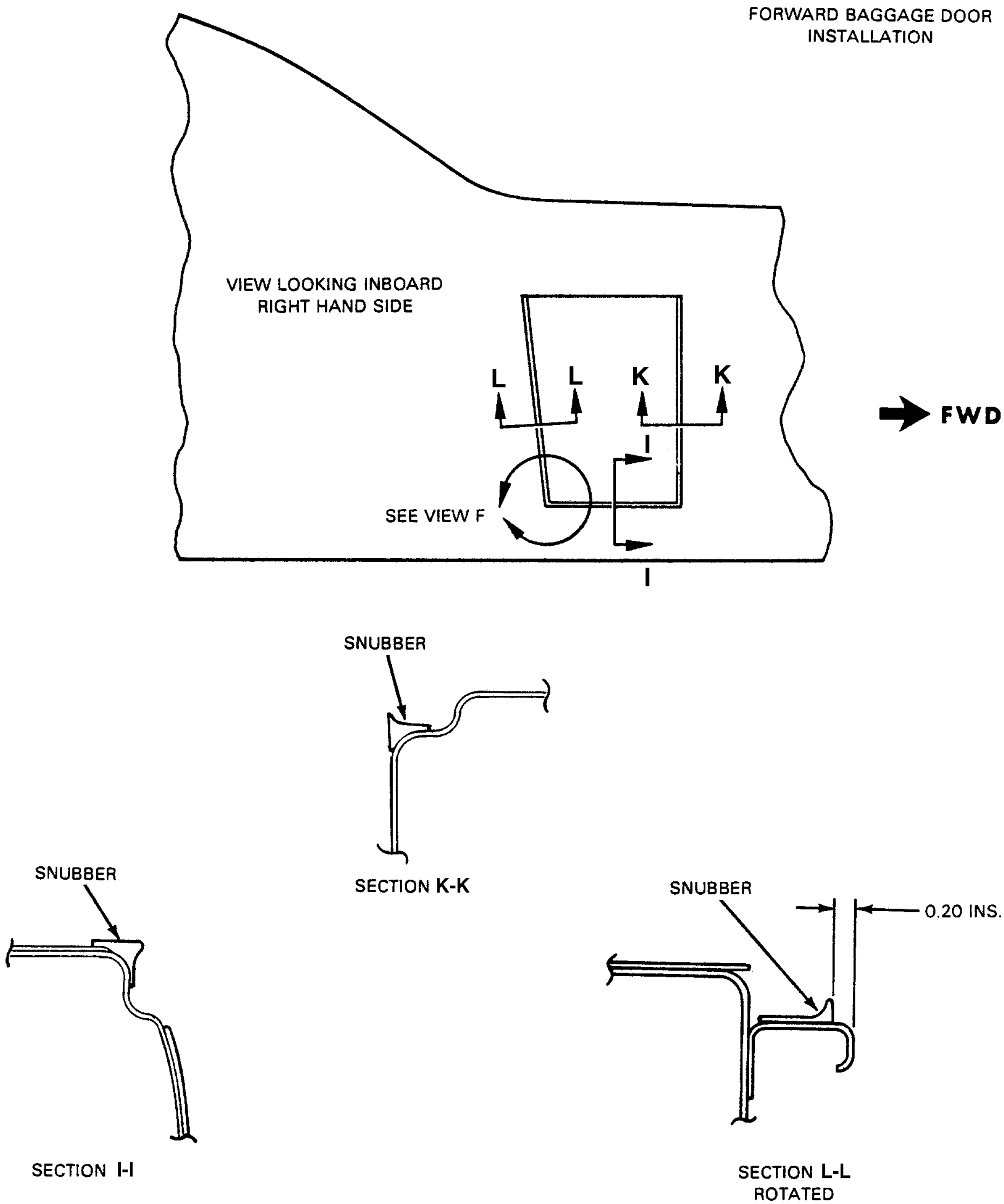
NOTES

1. ORIENT SNUBBER FLAT WITH THIS SURFACE.
2. BUTT JOINT SHALL BE AT CENTER OF DOOR JAMB ±2.0 INS.
3. TRIM SNUBBER TO CLEAR DOOR LATCH PINS WHEN APPLICABLE.

Door Snubber Seal Installation
Figure 1 (Sheet 1 of 3)



Door Snubber Seal Installation
Figure 1 (Sheet 2 of 3)



Door Snubber Seal Installation
Figure 1 (Sheet 3 of 3)

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

PASSENGER / CREW

1. Cabin Doors

A. Removal

(1) Remove the clevis bolt, washer and bushing from the door holder assembly.

(2) Remove cotter pins, clevis pins and washers from door hinges.

(3) Remove the door from the airplane.

B. Installation

(1) Insert the door into position and install the washers, clevis bolts and cotter pins on the door hinges.

(2) For adjustment of door, refer to Adjustment, below.

(3) Hook up and install the clevis bolt, bushing and washer into the door holder assembly.

C. Adjustment

(1) To acquire the proper vertical adjustment of the door, insert the necessary washer combination between the cabin door hinge and fuselage bracket assembly.

(2) Additional adjustments may be made by tapping out the serrated door hinge bushings and rotating them to obtain the hinge centerline location that will provide proper door fit.

(3) To ensure long life of door seals and improve sealing characteristics, lubricate with a dry lubricant in a spray can.

2. Door Locks

A. Removal

(1) Remove the door trim upholstery by removing the attachment screws.

(2) Loosen the nut on the lock assembly and remove the lock by turning it sideways.

B. Installation

(1) Install the lock in the door by turning it sideways and placing it through the opening provided.

(2) Replace the nut on the back of the lock assembly and tighten.

(3) Replace the door trim upholstery and secure with the attachment screws.

3. Door Latch Mechanisms

A. Forward Cabin Door - Upper - Adjustment (Refer to Figure 1.)

CAUTION: DO NOT LUBRICATE LOCK PIN / LOCK PIN TEFLON GUIDE BEARING.

(1) Remove the door trim upholstery by removing the attachment screws.

(2) Remove upper cabin door access cover on inside of door to gain access to the upper door latch assembly.

(3) Remove lockwire from nut at aft end of pin assembly.

(4) Back nut off from lock plate.

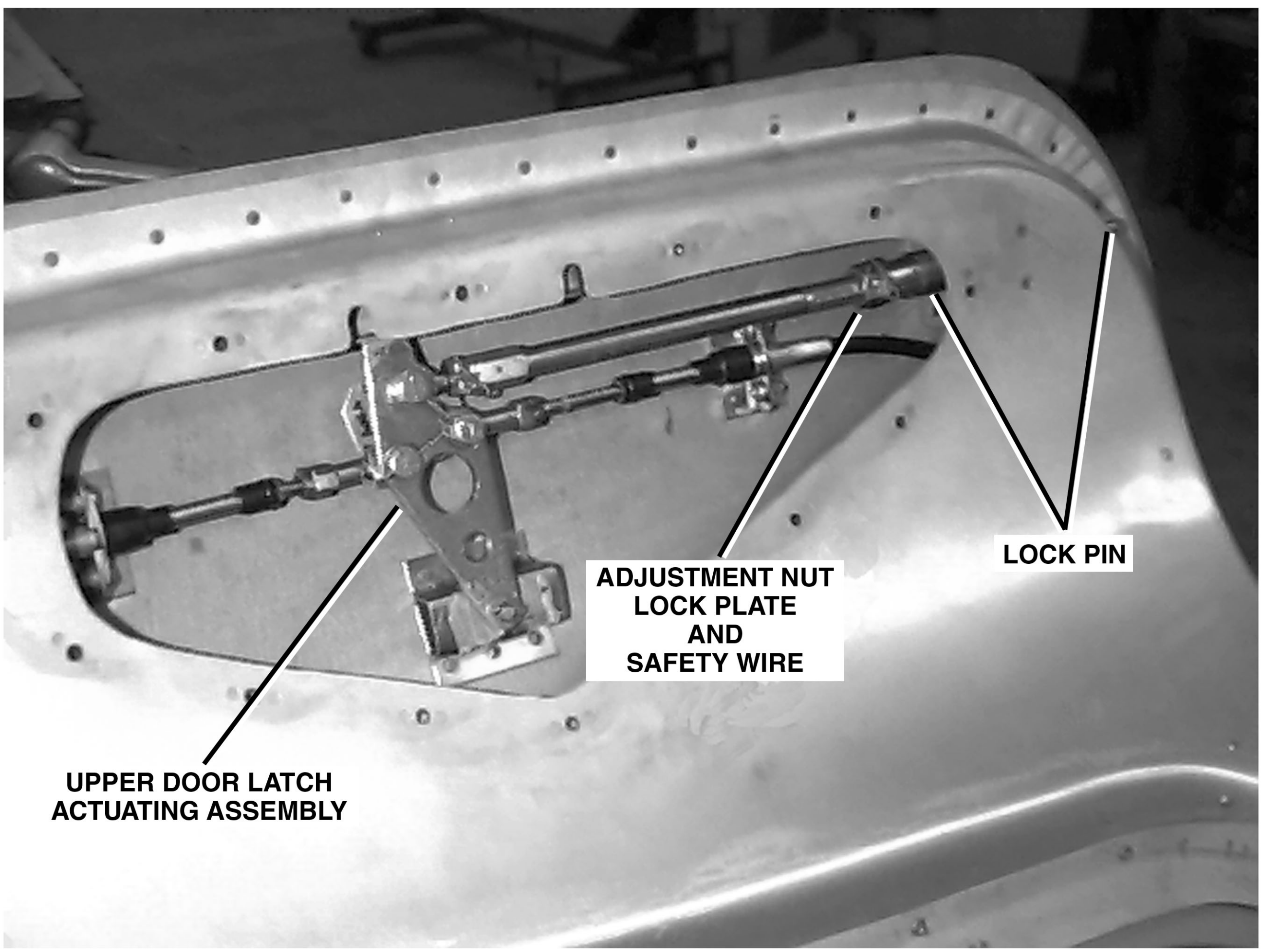
(5) Move lock plate to disengage from aft pin.

(6) Adjust pin so that, in extended position, rigging groove on pin aligns with forward face of pin receptacle on aft door frame.

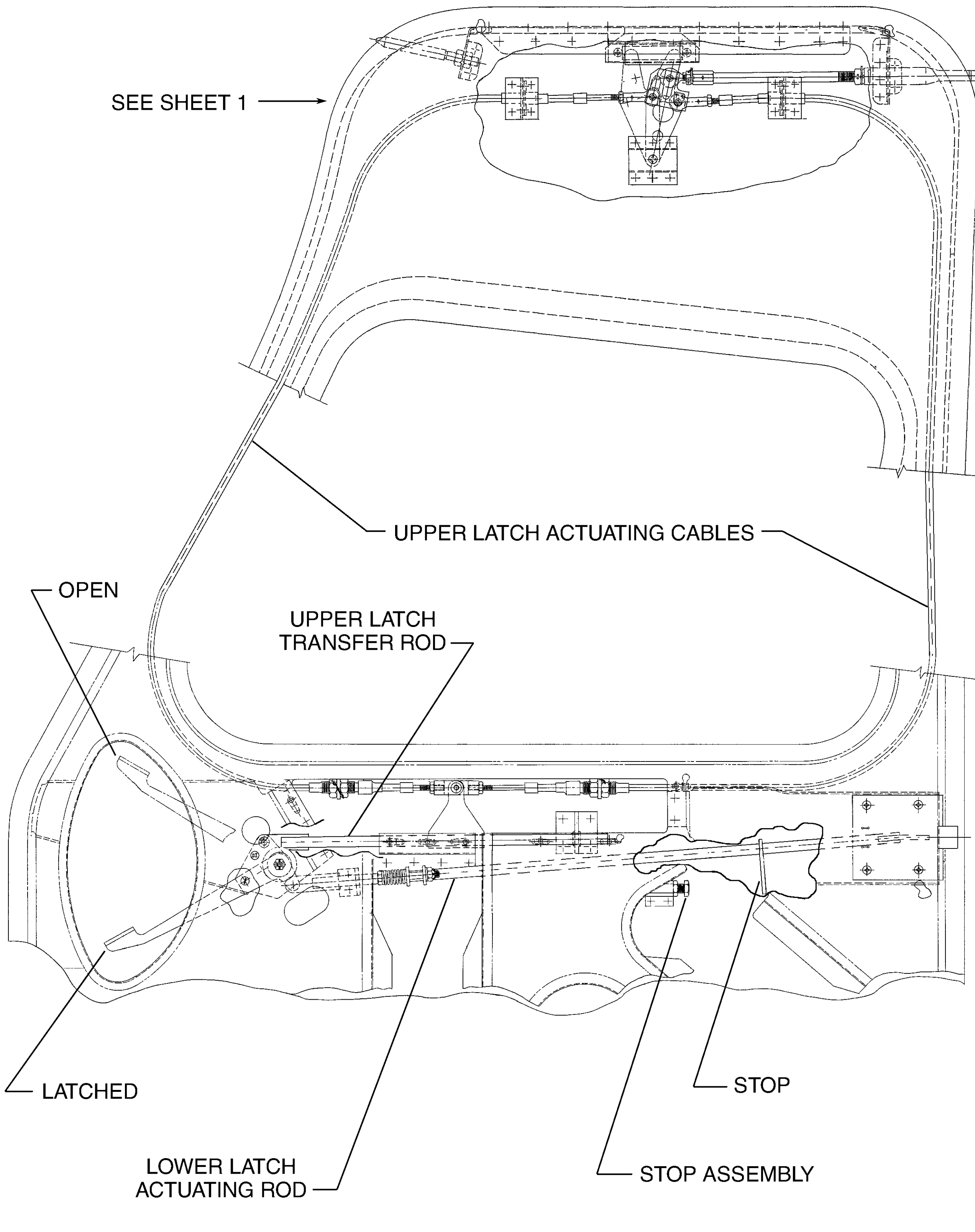
(7) Engage lock plate, making sure safety wire tab on lock plate is facing inboard.

(8) Tighten nut.

(9) Install safety wire.



Fwd Cabin Door Latch Installation
Figure 1 (Sheet 1 of 2)



VIEW OUTBOARD, SHOWN LATCHED

Fwd Cabin Door Latch Installation
Figure 1 (Sheet 2 of 2)

B. Aft Cabin Door

(1) Lower Latch

(a) Removal

1 Remove the door latch mechanism by removing the door trim upholstery and the screws that attach the latch plate and latch mechanism to the door.

2 Disconnect the latch pull rod from the inside door handle.

3 Remove the complete latch mechanism.

(b) Installation

1 Place the latch assembly into position on the door.

2 Connect the latch pull rod to the inside door handle.

3 Replace the screws that attach the latch plate and mechanism to the door. Install the door trim upholstery and secure with screws.

(c) Adjustment

To adjust the door latch, loosen the screws on the striker plate, make necessary adjustment, and retighten the screws.

(2) Upper Latch

(a) Removal

1 Remove the inside and outside handles and the screws holding the pan on the inside of the door.

2 Remove the pan and pull the latch assembly through the opening on the door. With the aft door only, pull the pan and latch forward to ensure the locking pin assembly comes free from its receptacle and exits the opening without bending.

(b) Installation

1 Place the latch assembly into position for installation. With the aft door only, insert the locking pin assembly first and guide it into its receptacle as the latch assembly reaches its final position.

2 Replace the pan and install the screws and handles.

3 Check the latch assembly for operation and be certain that it is free of rubbing on the trim panels.

(c) Adjustment

1 To adjust the door safety latch, remove the two screws from latch plate found at the top of the door opening.

2 Remove the plate and turn the loop assembly in or out to make necessary adjustments.

3 Replace the latch plate and secure with the two attachment screws.

4 In the aft door only, the locking pin may be adjusted through the opening near the locking pin receptacle.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CARGO

1. Baggage Doors

   A. Removal

   With door open remove hinge pin from hinge and remove the door.

   B. Installation

   Place door in position so that hinge halves are properly matched and install hinge pin. It will not be necessary to replace hinge pin with a new pin if it is free of bends and wear.

2. Forward Baggage Door Lock

   A. Removal

   (1) With door open remove nut from back of lock assembly by use of a special made wrench. (This tool may be fabricated from dimensions given in 95-00-00, Figure 3.)

   (2) Remove lock assembly through front of door.

   B. Installation

   (1) Place lock into position for installation.

   (2) Install nut on lock assembly and tighten with use of a special wrench.

3. Baggage Door Hinges

   A. Removal

   (1) Remove door from airplane as described in Baggage Doors, Removal.

   (2) Remove hinge half from airplane or door by drilling out rivets and removing hinge.

   B. Installation

   (1) Place hinge halves together and install hinge pin.

   (2) Install door into closed position and drill two end rivet holes and install rivets.

   (3) Operate door and check for proper fit and installation. Drill remaining holes and install rivets.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

55

STABILIZERS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 55

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
55-List of	1	Jun 1/03	55-30-00	1	Jun 1/03
Effective Pages	2	Jun 1/03		2	Jun 1/03
55-Table of Contents	1	Jun 1/03	55-50-00	1	Jun 1/03
	2	Jun 1/03		2	Jun 1/03
				3	Jun 1/03
55-20-00	1	Jun 1/03		4	Jun 1/03
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 55 - STABILIZERS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

STABILATOR

CAUTION: CONTROL SURFACE SKINS MUST BE REPLACED IF THEY SUSTAIN DAMAGE OR ARE CRACKED.

1. Checking Free Play

   A. Stabilator

   Check the stabilator for any free play at its attachment points by grasping each half near the tip and gently trying to move it up and down, fore and aft, and in and out. No play is allowed.

   B. Stabilator Trim Tab

   Set the stabilator trim tab in neutral position. This neutral position is determined with the airplane properly rigged per instructions given in 27-30-00 and the trim indicator at its neutral position. Obtain a straightedge long enough to extend from the ground up to a few inches above the trim tab trailing edge. Place the straightedge next to the trim tab inboard (center) trailing edge, secure the stabilator in neutral and grasping the tab, gently move it up and down, mark the limit of tab free play on the straightedge. The overall travel (free play) must not exceed 0.15 of an inch. The use of a dial indicator and fixed stand is recommended.

2. Removal (Refer to Figure 1.)

   CAUTION: AT EACH REMOVAL OF THE STABILATOR, CONDUCT ATTACH BRACKETS CORROSION CONTROL INSPECTION, BELOW.

   A. Remove the tail cone assembly.

   B. Relieve the tension on the trim cable and remove the trunnion assembly.

   C. From inside the fuselage, disconnect the two stabilator control cables from the stabilator balance arm assembly.

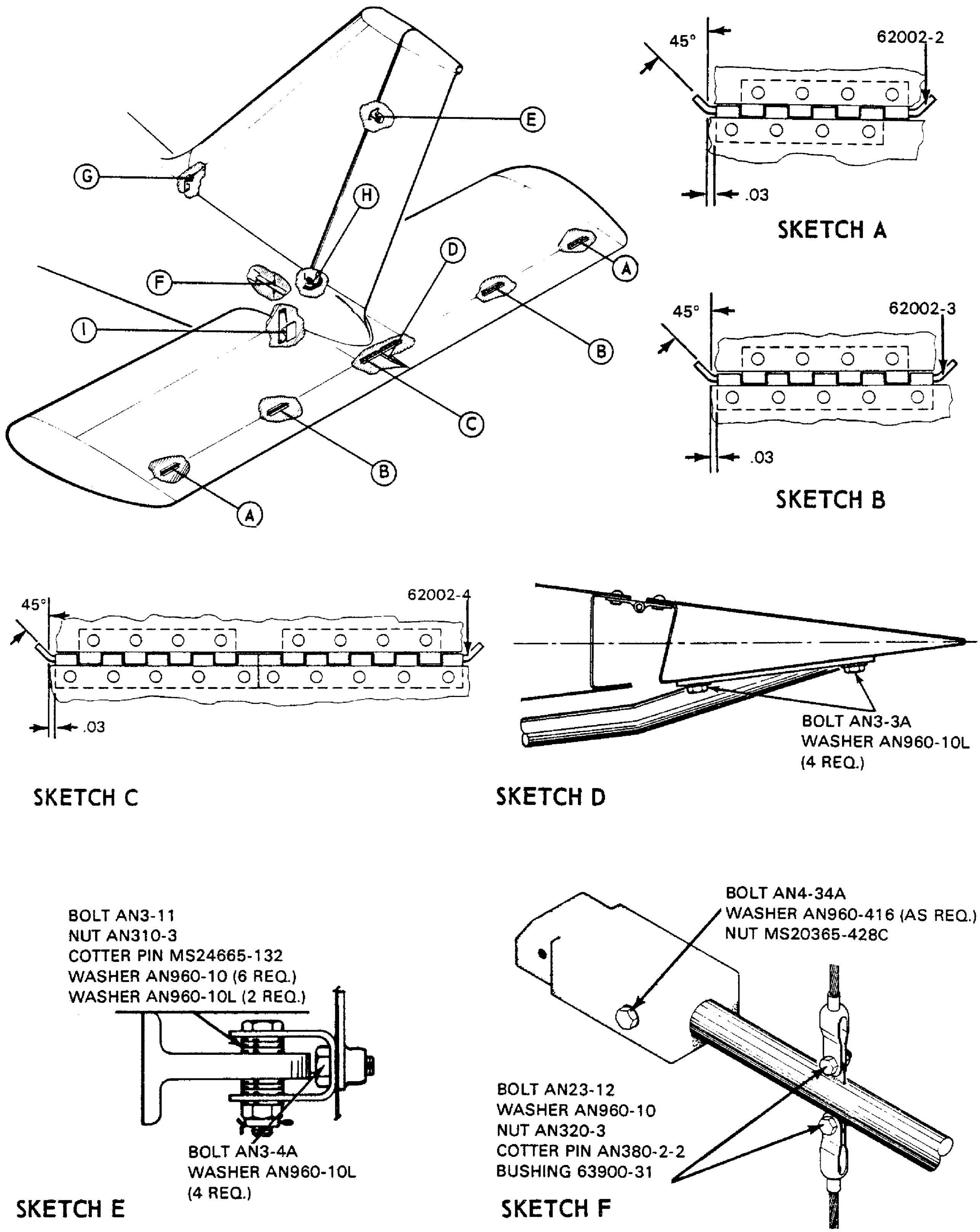
   D. Remove the two hinge bolts at the pivot points and remove the stabilator as a complete assembly.

3. Installation (Refer to Figure 1.)

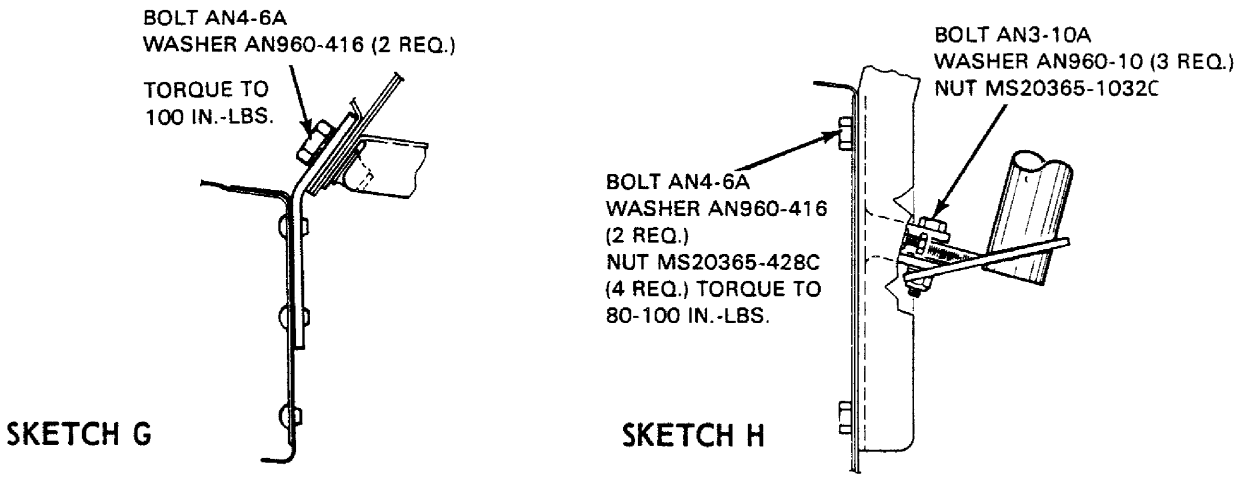
   WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION PER INSTRUCTIONS IN BALANCING, BELOW.

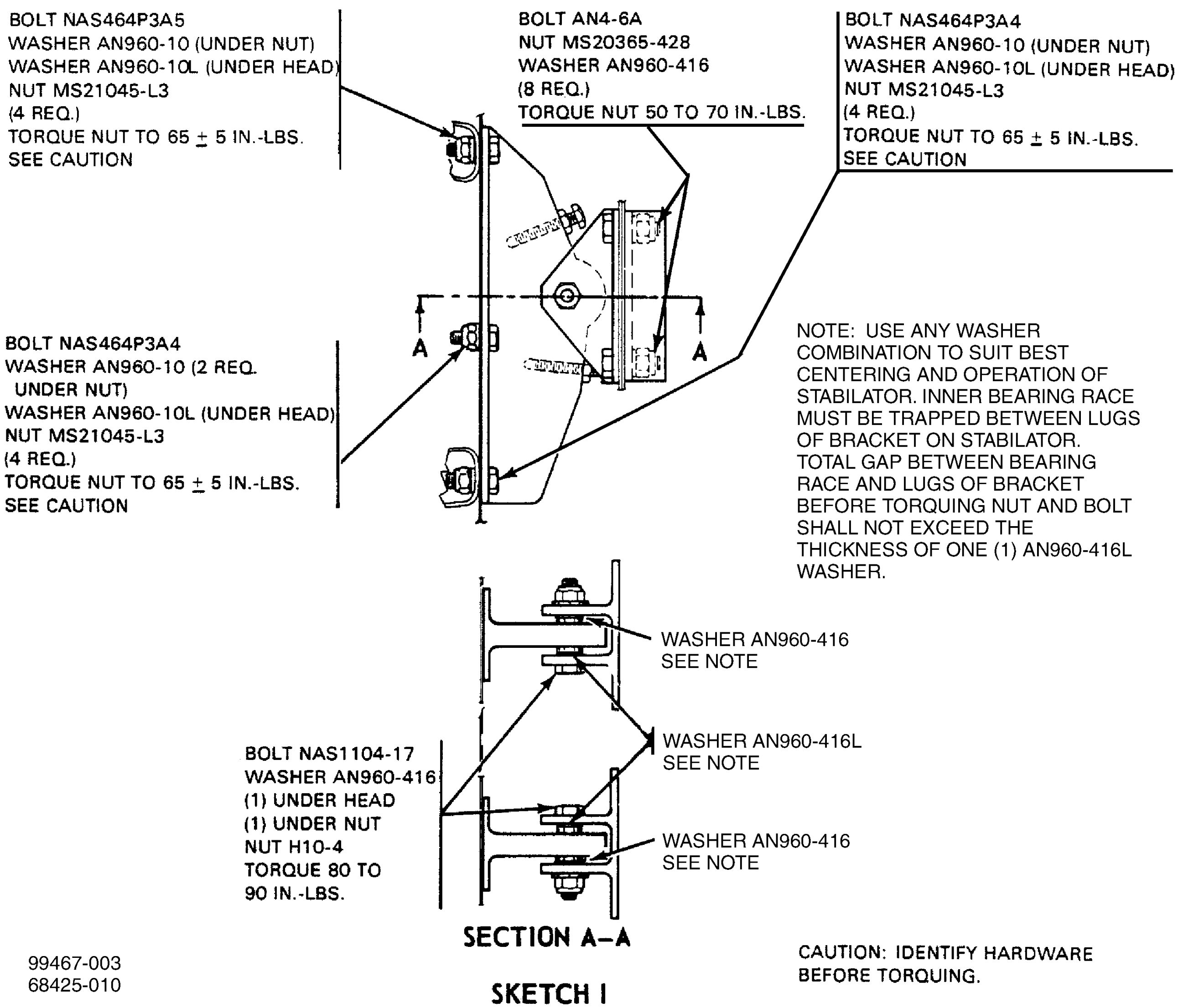
   A. Reinstall the stabilator in reverse of removal instructions, above.

   B. Rig and adjust stabilator, stabilator trim cables and stabilator control cables per 27-30-00.



Empennage Installation
Figure 1 (Sheet 1 of 2)





NOTE: USE ANY WASHER COMBINATION TO SUIT BEST CENTERING AND OPERATION OF STABILATOR. INNER BEARING RACE MUST BE TRAPPED BETWEEN LUGS OF BRACKET ON STABILATOR. TOTAL GAP BETWEEN BEARING RACE AND LUGS OF BRACKET BEFORE TORQUING NUT AND BOLT SHALL NOT EXCEED THE THICKNESS OF ONE (1) AN960-416L WASHER.

CAUTION: IDENTIFY HARDWARE BEFORE TORQUING.

99467-003
68425-010

Empennage Installation
Figure 1 (Sheet 2 of 2)

4. Balancing

WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION.

A. Balancing Equipment (Refer to Figure 2.)

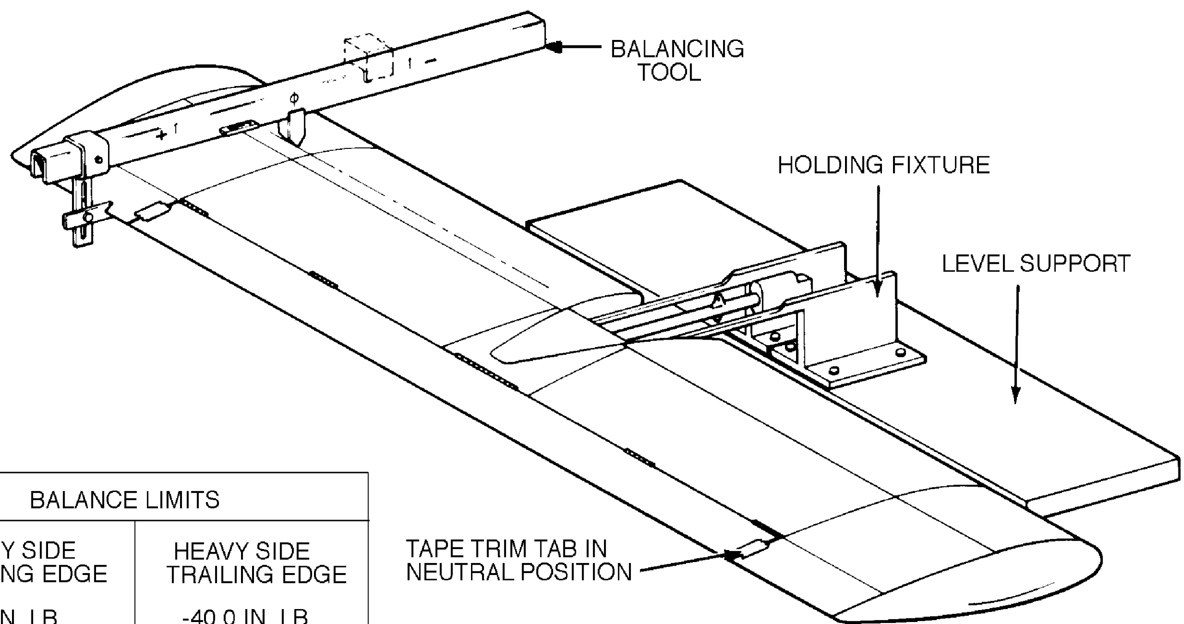
Balancing must be done using a suitable tool capable of measuring unbalance in inch-pounds from centerline of control surface hinge pin. A suggested tool configuration is shown in 95-00-00, Figure 2. Other tool configurations may be used, provided accuracy is maintained and recalibration capability is provided. The tool shown in 95-00-00 may be calibrated by placing it on the control surface to be balanced with balance points over control surface hinge centerline and balance bar parallel to cord line. Position trailing edge support to align tool with control surface cord line and secure in this position. Remove tool without disturbing trailing edge support and balance tool by adding weight to light end as required. (Movable weight must be at centerline.) Place tool on control surface perpendicular to hinge centerline. Read scale when bubble level has been centered by adjustment of movable weight.

B. Balancing Stabilator (Refer to Figure 2.)

To balance stabilator, assembly must be complete including trim tab, tab pushrod and end bearing, stabilator tips and all attaching screws. Before balancing, tape trim tab in neutral position with a small piece of tape. Place complete assembly on knife edge supports in a draft-free beam perpendicular to hinge centerline. Do not place tool on trim tab. Calibrate tool as described in Balancing Equipment, above. Read scale when bubble level has been centered by adjustment of movable weight and determine static balance limit. If static balance is not within limits given, proceed as follows:

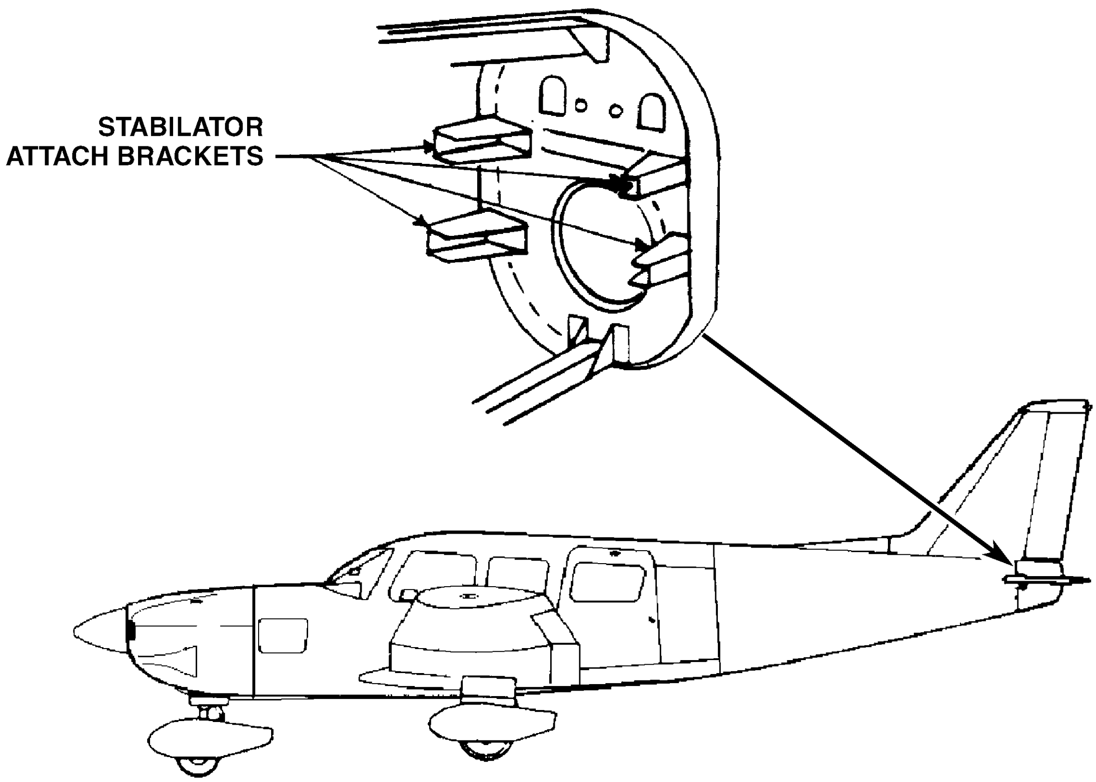
(1) If the stabilator is out of limits on the leading edge heavy side, remove balance plates from the mass balance weight until the static balance is within limits.

(2) If stabilator is out of limits on trailing edge heavy side, add balance plates (4 Maximum) to mass balance weight until static balance is within limits.



BALANCE LIMITS	
HEAVY SIDE LEADING EDGE	HEAVY SIDE TRAILING EDGE
0 IN. LB.	-40.0 IN. LB.

Balancing Stabilator
Figure 2



Stabilator Attach Brackets (Typical)
Figure 3

5. Attach Brackets Corrosion Control Inspection (Refer to Figure 3.)

During each annual inspection, use the following method to inspect stabilator attach brackets for rust and corrosion between the steel attach fittings and the adjacent fuselage structure. Take corrective action as required.

A. Remove upper and lower tail cone fairing assembly.

B. Remove the aft fuselage closeout plate assembly on the applicable models.

C. Inspect the steel stabilator attach fittings (4 places) and adjacent fuselage structure for the presence of rust and/or corrosion. (Refer to Figure 3.)

NOTE: Refer to F.A.A. Advisory Circular (AC) 43-4A, Corrosion Control for Aircraft.

D. If rust and/or corrosion is present, repair or replace as required. Add corrosion protection per AC43-4A.

E. Install aft fuselage closeout plate assembly. Verify integrity of rubber seals; replace if required

F. Install upper and lower tail cone fairing assembly.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

VERTICAL STABILIZER

Vertical Fin (Refer to 55-20-00, Figure 1.)

A. Removal

(1) Remove tail cone fairing and fairing at forward edge of fin.

(2) Remove rudder.

(3) Disconnect antenna wire from antenna assembly, attach a fish line to antenna cable before removing it from fin.

(4) Separate stabilator trim cable at turnbuckle, and remove cable from trim mechanism.

(5) Remove one bolt at leading edge of fin.

(6) Remove the two bolts which secure trim mechanism to fin spar. Remove the four bolts which secure fin spar to aft bulkhead. Remove fin.

B. Installation

(1) Install fin in reverse of removal instructions, above.

(2) Torque per 55-20-00, Figure 1.

(3) Check all bolts for safety.

THIS PAGE INTENTIONALLY BLANK

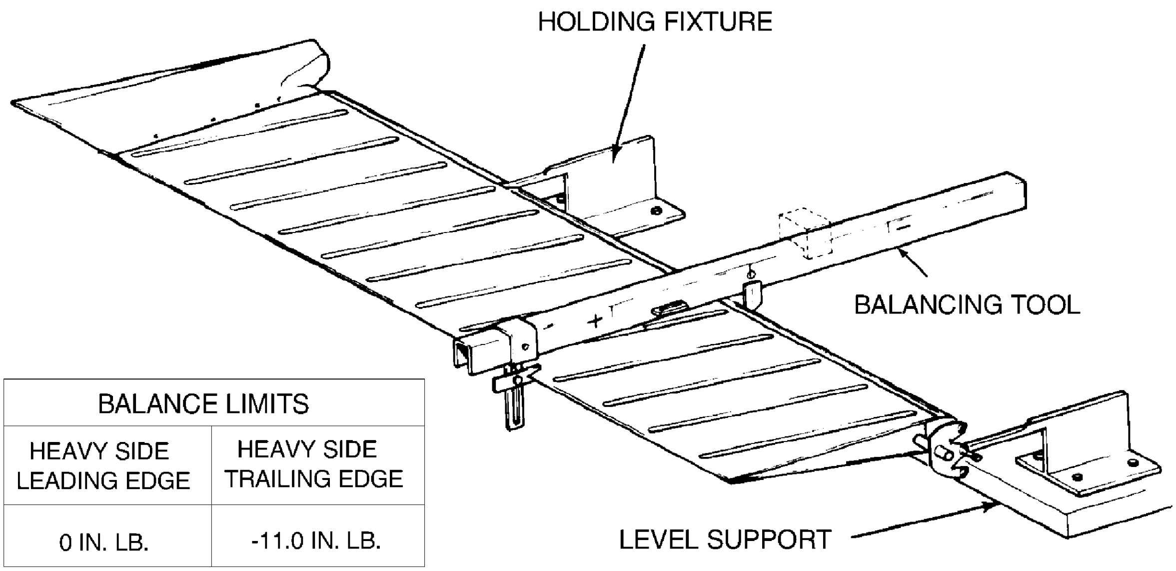
RUDDER

CAUTION: CONTROL SURFACE SKINS MUST BE REPLACED IF THEY SUSTAIN DAMAGE OR ARE CRACKED.

1. Removal (Refer to 55-20-00, Figure 1.)
   A. Remove tail cone fairing.
   B. Disconnect the two control cables from rudder horn.
   C. Disconnect rudder from lower rudder hinge bracket.
   D. Remove the one remaining hinge bolt. Disconnect tail light electrical wire and remove rudder.
2. Installation

   WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION PER INSTRUCTIONS IN BALANCING, BELOW.

   A. Install rudder in reverse of removal instructions, above.
   B. Torque per 55-20-00, Figure 1.
   C. Check all bolts and pins for safety.



BALANCE LIMITS	
HEAVY SIDE LEADING EDGE	HEAVY SIDE TRAILING EDGE
0 IN. LB.	-11.0 IN. LB.

Balancing Rudder
Figure 1

3. Balancing (Refer to Figure 1.)

WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION.

To balance rudder, assembly must be complete including sector assembly. Place complete assembly horizontally on knife edge support in a draft-free area in a manner that allows unrestricted movement. Place tool on rudder with beam perpendicular to hinge centerline. Calibrate tool as described in Control Surface Balancing Tool, 95-00-00. Read scale when bubble level has been centered by adjustment of moveable weight and determine static balance limit. If static balance is not within limits given proceed as follows:

A. Nose Heavy: This condition is highly improbable; recheck calculations and measurements.

B. Nose Light: In this case, the mass balance weight is too light or the rudder is too heavy because of painting; it will be necessary to strip the paint and repaint. If the rudder is too heavy as a result of repairs, the repair must be removed and the damaged parts replaced.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

56

WINDOWS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 56

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 56 - WINDOWS

TABLE OF CONTENTS

GRIDS 4F22 THRU 4F24
INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

FLIGHT COMPARTMENT.

Windshield (Refer to Figure 1.)

A. Removal

(1) Remove the collars from around the bottom of the windshield and the trim strip from between the windshield halves by removing the attaching screws.

(2) Remove the windshield by raising the lower portion of the windshield and carefully pulling it out and down to release the top and side edges.

NOTE: A damaged windshield should be saved to provide a pattern for shaping the new window.

(3) Clean old tape and sealer off the affected mating surfaces.

B. Installation

(1) Match new winshield to old. If necessary, cut or grind the new windshield to matching dimensions.

(2) Apply 1/8 in. by 1 in. vinyl foam tape, Norton V510 or equivilent (i.e. - Tape - Vinyl Foam, Type 2; 91-10-00, Consumable Materials), around entire edge of windshield.

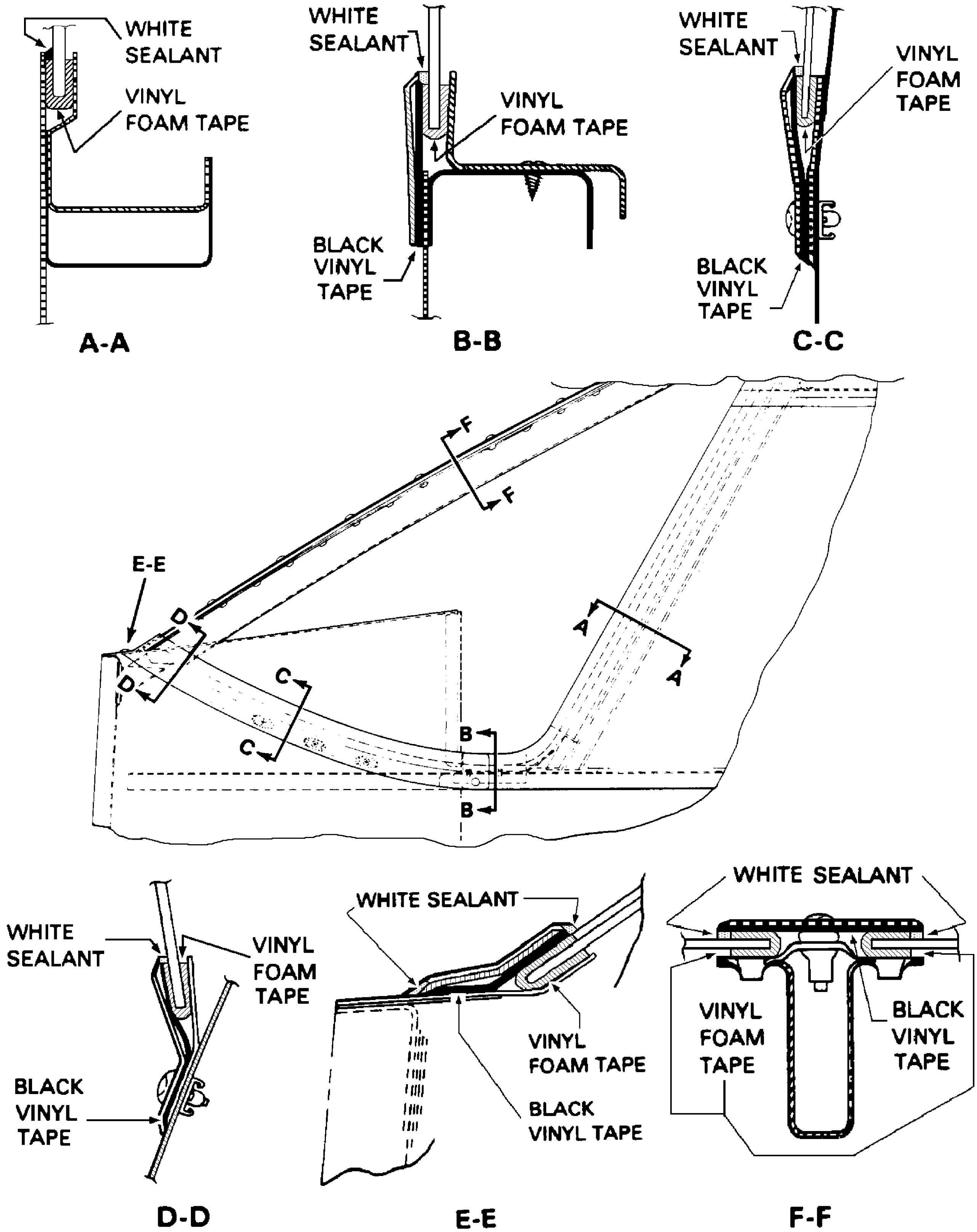
(3) Place windshield into position, sliding aft and up into place. Take care not to dislocate vinyl foam tape. Allow clearance for expansion between the two windshield sections at the center post.

(4) Apply 1.5 in., 9 mil, black vinyl tape covering the previously applied vinyl foam tape and sealing the joint between the windshield and airframe as indicated in Figure 1.

(5) Apply polyurethane, urethane, acrylic, or polysulfide sealant (i.e. - Sealant - Window and Airframe; 91-10-00, Consumable Materials), to seal the forward edge of the vinyl tape at the bottom of the center post, as indicated in Figure 1, View E-E.

(6) Reinstall collars and trim strip. Apply sealant as indicated in Figure 1 by forcing the sealant between the mating parts. Mating parts may be separated slightly using a soft wooden wedge or a tongue depressor. Force sealant deep into the gap. Take care to avoid bending or scratching aluminum or windshield surfaces. Joints should be completely filled, and blended smoothly with adjacent surfaces after clean-up.

(7) Remove excess sealant and exposed tape. Sealant may be cleaned from window areas using rags, disposable wipers or plastic scrapers. A tool made of acrylic sheet with a wedged end (.25 in. thick and 1.5 in. wide) can be fabricated and used. Tirpolene solvent or Apperson solvent No. 120 may be used to clean polysulfide sealants.



Windshield Installation (Typical)
Figure 1

THIS PAGE INTENTIONALLY BLANK

PASSENGER COMPARTMENT

Side Windows (Refer to Figure 1.)

These airplanes are equipped with single pane side windows.

A. Removal

(1) Remove the molding and retainer from around the window by removing attaching screws.

(2) Carefully remove the damaged window from the frame.

(3) Remove old tape and sealer from window frame and molding.

NOTE: A damaged window should be saved to provide a pattern for shaping the new window.

B. Installation

(1) Match new window to old. If necessary, cut or grind the new window to the same dimensions.

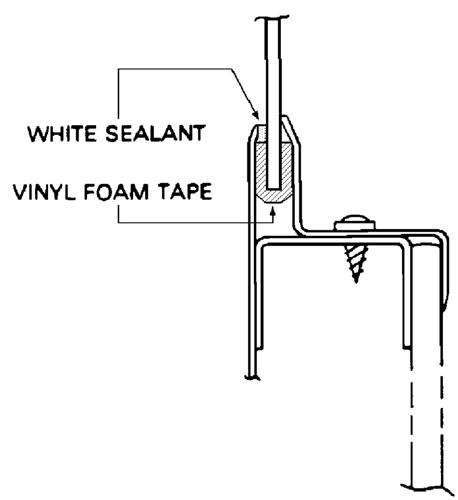
(2) Apply 1/8 in. by 1 in. vinyl foam tape, Norton V510 or equivilent (i.e. - Tape - Vinyl Foam, Type 2; 91-10-00, Consumable Materials), around entire edge of window.

(3) Insert the window into the frame, install the retainer moldings and attachement screws, but do not tighten. Take care not to damage or dislocate the vinyl foam tape.

(4) Apply polyurethane, urethane, acrylic, or polysulfide sealant (i.e. - Sealant - Window and Airframe; 91-10-00, Consumable Materials), completely around the outer surface of the window at all attachment flanges as indicated in Figure 1. Force the sealant between the mating parts, which may be separated slightly using a soft wooden wedge or a tongue depressor. Force sealant deep into the gap. Take care to avoid bending or scratching aluminum or window surfaces. Joints should be completely filled, and blended smoothly with adjacent surfaces after clean-up.

(5) Tighten attachment screws until vinyl foam tape is compressed approximately 25 percent.

(6) Remove excess sealant from window areas using rags, disposable wipers or plastic scrapers. A tool made of acrylic sheet with a wedged end (.25 inch thick and 1.5 inch wide) can be fabricated and used. Tirpolene solvent or Apperson solvent No. 120 may be used.to clean polysulfide sealants.



Side Window Installation
Figure 1

THIS PAGE INTENTIONALLY BLANK

CHAPTER

57

WINGS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 57

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 57 - WINGS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

Description

Each wing is an all metal, full cantilever, semi-monocoque type structure with removable tips and access panels. Attached to each wing are the aileron, flap, main landing gear and fuel tank. The wings are attached to each side of the fuselage by inserting the butt ends of the main spars into a spar box carry through. The spar box is an integral part of the fuselage structure which provides, in effect, a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the front and rear spars.

NOTE: The major subassemblies of the wing may be removed individually or the wing may be removed as a unit. To remove a wing, a fuselage and wing supporting cradle is required.

THIS PAGE INTENTIONALLY BLANK

AXUILIARY STRUCTURE

Wing Tip

A. Removal

(a) Remove the screws holding the wing tip to the wing, being careful not to damage the wing or wing tip.

(b) Pull off the wing tip far enough to disconnect the landing light and navigation and strobe light wire assemblies. Be sure to unscrew the ground lead at the wing rib.

(c) Inspect the wing tip to ascertain that it is free of cracks, severe nicks and minor damage. If repair is required, refer to Repair, below.

B. Installation

(a) Place the wing tip in a position that the landing light and navigation and strobe light leads may be connected. Be sure to connect the navigation/strobe ground lead to the wing rib by use of a screw and nut. Ensure that the ground lead is free of dirt and film to insure a good connection.

(b) Insert the wing tip into position and install the screws round the tip. Take care to refrain from damaging the wing tip or wing. Check operation of the lights.

C. Repair

See 51-00-00.

THIS PAGE INTENTIONALLY BLANK

ATTACH FITTINGS

Wing to Fuselage (Refer to Figure 1.)

A. Removal of Wing

(1) Close the fuel valve and drain the fuel from the wing to be removed. (Refer to 12-10-00, Fuel System, Fuel Tanks, Draining Entirely.)

(2) Drain the brake line and reservoir. (Refer to 12-10-00, Brake System, Draining.)

(3) Remove the access plate at the wing butt rib and wing inspection panels. (Refer to 6-00-00, Figure 3.)

(4) Remove the front and back seats from the airplane.

(5) Expose the spar box and remove the cockpit side trim panel assembly that corresponds with the wing being removed.

(6) Place the airplane on jacks. (Refer to Jacking, 7-10-00.)

NOTE: To help facilitate reinstallation of control cables, and fuel and hydraulic lines, mark cable and line ends in some identifying manner and attach a line where applicable to cables before drawing them through the fuselage or wing.

(7) Disconnect the aileron balance and control cables at the turnbuckles that are located within the fuselage aft of the spar.

(8) If the left wing is being removed, remove the cotter pin from the pulley bracket assembly to allow the left aileron balance cable end to pass between the pulley and bracket.

(9) Disconnect the flap from the torque tube by extending the flap to its fullest degree, and removing the bolt and bushing from the bearing at the aft end of the control rod.

CAUTION: TO PREVENT DAMAGE OR CONTAMINATION OF FUEL, HYDRAULIC AND MISCELLANEOUS LINES, PLACE A PROTECTIVE COVER OVER THE LINE FITTINGS AND ENDS.

(10) Disconnect the fuel line at the fitting located forward of the spar at the wing butt line.

(11) Remove the clamps necessary to release the electrical harness assembly. Disconnect the leads from the terminal strip assembly by removing the cover, and appropriate nuts and washers.

(12) With the appropriate trim panel removed, disconnect the hydraulic brake line at the fitting located within the cockpit at the leading edge of the wing.

(13) If the left wing is being removed, it will be necessary to disconnect the pitot static tube at the elbows located within the cockpit at the wing butt line.

(14) Arrange a suitable fuselage cradle and supports for both wings.

(15) Remove the jacks.

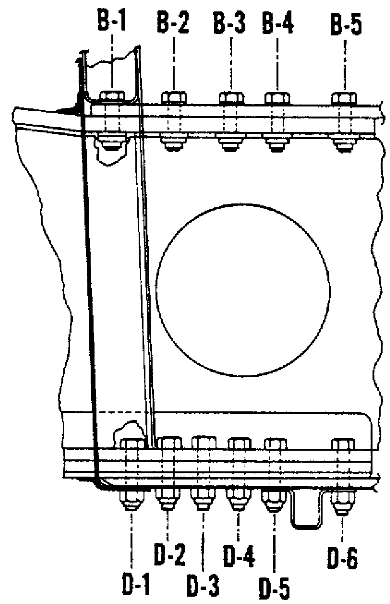
(16) Remove the front and rear spar nuts, washers and bolts.

WARNING: DO NOT DRIVE BOLTS IN OR OUT OF THE MAIN SPAR ATTACHING BOLT HOLES (C AND D IN FIGURE 1). TAKE EXTRA CARE IN REMOVING AND REPLACING THESE BOLTS TO PRECLUDE DAMAGING THE BOLT HOLES.

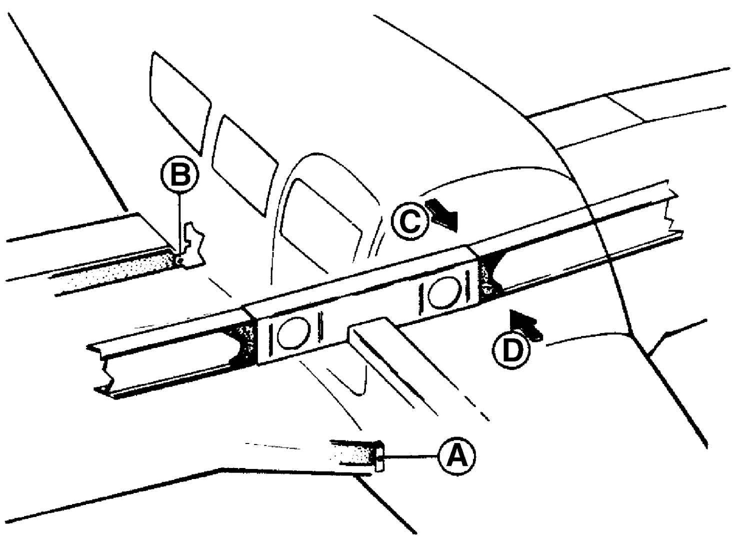
(17) Remove the eighteen (18) main spar bolts. Do not drive out bolts. Take care not to damage bolt holes. Number bolts and bolt holes to ensure that, if reused, each bolt is reinstalled in the same hole it came out of. Replacement of all eighteen (18) nuts is recommended.

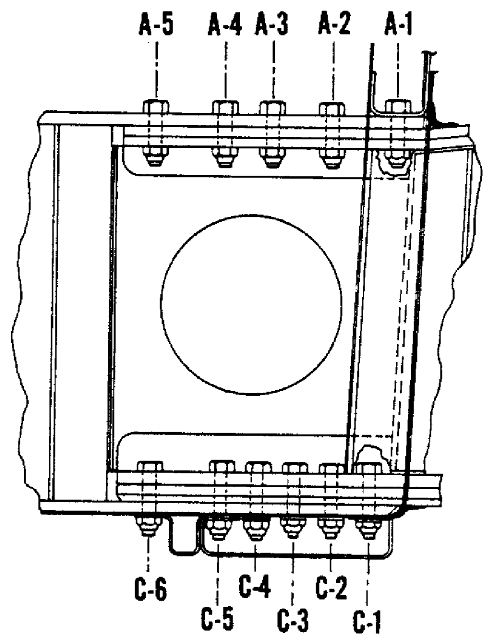
(18) Slowly remove the wing being certain that all electrical leads, cables and lines are disconnected.

	BOLT LEGEND		WASHER	
POSITION	BOLT	NUT	UNDER HEAD	UNDER NUT
A1	NAS464P6LA17	MS21042-6	AN960-616	AN960-616 (2 Max)
A2	NAS464P6LA16	MS21042-6	AN960-616	AN960-616 (2 Max)
A3	NAS464P6LA16	MS21042-6	AN960-616	AN960-616 (2 Max)
A4	NAS464P6LA16	MS21042-6	AN960-616	AN960-616 (2 Max)
A5	NAS464P6LA16	MS21042-6	AN960-616	AN960-616 (2 Max)
B1	NAS464P6LA15	H19300-6	AN960-616L	K19301-6
B2	NAS464P6LA14	H19300-6	AN960-616	K19301-6
B3	NAS464P6LA14	H19300-6	AN960-616	K19301-6
B4	NAS464P6LA14	H19300-6	AN960-616	K19301-6
B5	NAS464P6LA14	H19300-6	AN960-616	K19301-6
C1	NAS464P5LA20	MS21042-5	AN960-516L	AN960-516 (2 Max)
C2	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
C3	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
C4	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
C5	NAS464P6LA21	MS21042-6	AN960-616L	96352-3
C6	NAS464P5LA21	MS21042-5	AN960-516L	96352-2
D1	NAS464P5LA20	MS21042-5	AN960-516L	AN960-516 (2 Max)
D2	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
D3	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
D4	NAS464P6LA20	MS21042-6	AN960-616L	AN960-616 (2 Max)
D5	NAS464P6LA21	MS21042-6	AN960-616L	96352-3
D6	NAS464P5LA21	MS21042-5	AN960-516L	96352-2
TORQUE BOLT HEADS ON UPPER SPAR CAP & NUT ON LOWER SPAR CAP AS FOLLOWS: 5/16 INCH BOLT = 205-225 IN-LBS; 3/8 INCH BOLT = 360-390 IN-LBS				



SKETCH C





SKETCH D

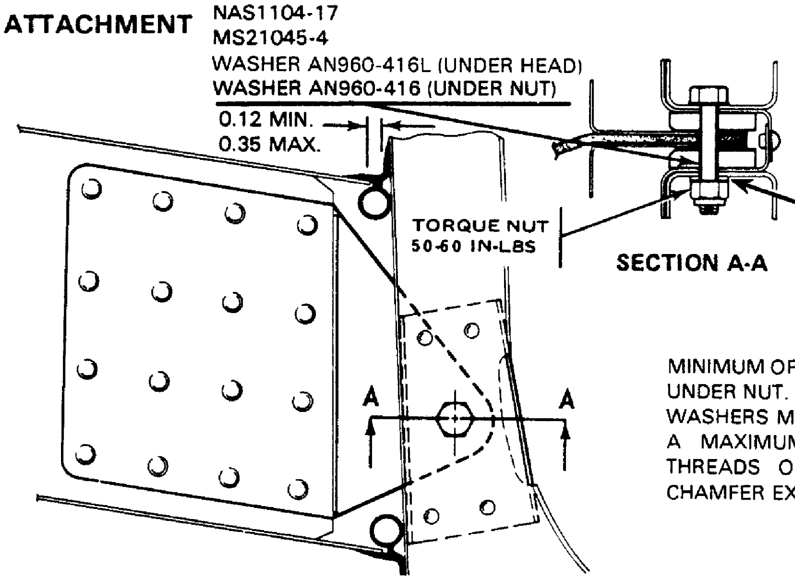
— WARNING —

DO NOT DRIVE BOLTS IN OR OUT OF THE MAIN SPAR ATTACHING BOLT HOLES (C AND D). TAKE EXTRA CARE IN REMOVING AND REPLACING THESE BOLTS TO PRECLUDE DAMAGING THE BOLT HOLES.

Wing Installation
Figure 1 (Sheet 1 of 2)

FORWARD SPAR ATTACHMENT

SKETCH A



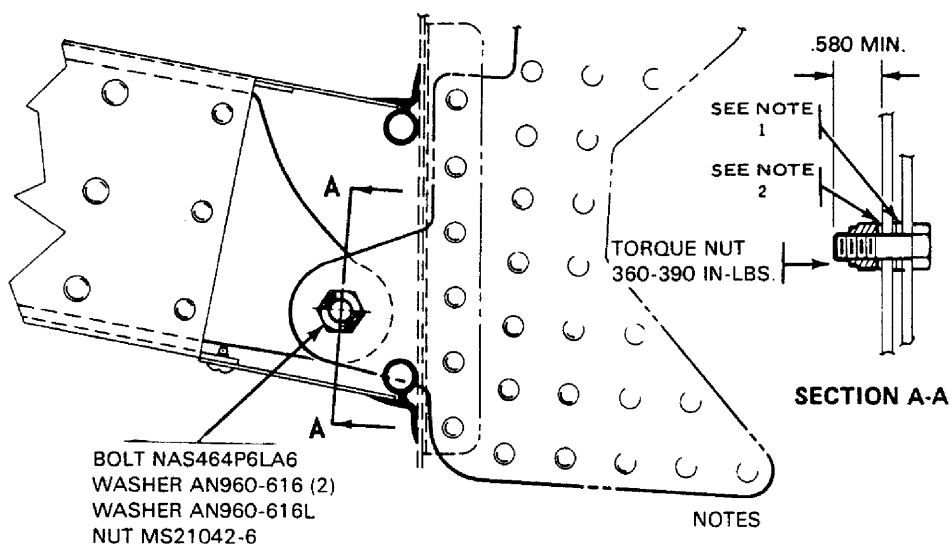
NOTE

MINIMUM OF ONE (1) WASHER REQ'D. UNDER NUT. ADDITIONAL AN960-616 WASHERS MAY BE ADDED TO LEAVE A MAXIMUM OF 1 1/2 VISIBLE THREADS OR MINIMUM OF BOLT CHAMFER EXPOSED.

REAR SPAR ATTACHMENT
(LOOKING AFT, RIGHT SIDE)

NEW SERVICE WINGS ARE NOT DRILLED FOR THE REAR SPAR ATTACHMENT BOLT. THIS WILL NECESSITATE DRILLING A .3745-.3765 HOLE IN THE REAR SPAR ATTACHMENT POINT.

SKETCH B



NOTES

1. MAXIMUM NUMBER OF WASHERS ALLOWED BETWEEN FORWARD FACE OF WING FITTING AND AFT FACE OF FUSELAGE FITTING IS ONE AN960-616L & TWO AN960-616. (ALL THREE WASHERS ALWAYS REQUIRED WITH ONLY THE AN960-616L WASHER ALLOWED UNDER BOLT HEAD).

2. AFTER REQUIRED WASHERS ARE INSERTED BETWEEN FITTINGS, INSTALL BOLT AND CHECK TO INSURE THAT NO THREADS ARE BEARING ON THE FORWARD FITTING PRIOR TO INSTALLING THE NUT. USE SHORTEST BOLT WHICH WILL LEAVE 0.580 MINIMUM FROM FITTING TO END OF BOLT.

Wing Installation
Figure 1 (Sheet 2 of 2)

B. Installation of Wing

(1) Ascertain that the fuselage is positioned solidly on a support cradle.

(2) Place the wing in position for installation, with the spar end a few inches from the side of the fuselage and set on trestles.

(3) Prepare the various lines, control cables, etc., for inserting into the wing or fuselage when the wing is slid into place.

(4) Slide the wing into position on the fuselage.

WARNING: DO NOT DRIVE BOLTS IN OR OUT OF THE MAIN SPAR ATTACHING BOLT HOLES (C AND D IN FIGURE 1). TAKE EXTRA CARE IN REMOVING AND REPLACING THESE BOLTS TO PRECLUDE DAMAGING THE BOLT HOLES.

(5) Install the eighteen main spar bolts in accordance with the bolt legend. Do not drive bolts in. Take care not to damage bolt holes. If reusing bolts, ensure that each bolt goes back into the same hole that it came out of. Use of new nuts (18) is recommended.

NOTE: When replacing a wing assembly, ascertain the wing butt clearance is maintained (Refer to Sketch A, Figure 1.)

(6) Install the bolt, washers and nut that attaches the front spar with the fuselage fitting. A minimum of one washer under the nut and one washer under the head is required. Then add washers as needed to leave a maximum of one and one-half threads visible or a minimum of the bolt chamfer exposed.

(7) Insert the number of washers required between the forward face of the wing fitting and aft face of the fuselage fitting of the rear spar attachment. The maximum number of washers allowed is one AN960-616L and two AN960-616. It is also acceptable to have the faces of the fittings against each other. After the required washers are inserted between the plates, install the bolt and check to insure that no threads are bearing on the forward plate prior to installing the nut. Use the shortest bolt which will leave 0.580 of an inch minimum from the fitting to the end of the bolt.

(8) Torque the eighteen main spar bolt nuts or bolt heads to the required torque. Be certain that the bolts, nuts and washers are installed in accordance with the bolt legend. The forward spar attachment bolt should be torqued in accordance with the chart of recommended torque requirements given in 91-00-00. Torque the rear spar attachment bolt as specified in Figure 1.

(9) Install the wing jacks and the tail support to the tail skid with approximately 250 pounds of ballast on the base of the tail support. Remove the fuselage cradle and wing supports.

(10) If the left wing was removed, it is necessary that the pitot static tube to be connected at the elbows located within the cockpit at the wing butt line. Replace or install clamps where found necessary. In the event that a heated pitot is installed, the plus lead must be connected at the fuselage.

(11) Connect the hydraulic brake line onto the fitting located within the cockpit at the leading edge of the wing.

(12) Connect the leads to the appropriate posts on the terminal strip and install the washers and nuts. (For assistance in connecting the electrical lead, refer to the Electrical Schematics in Chapter 91.) Place the clamps along the electrical harness to secure it in position and install the terminal strip dust cover.

(13) Remove the cap from the fuel line and connect it at the fitting located forward of the spar at the wing butt line.

(14) Connect the aileron balance and control cables at the turnbuckles that are located within the fuselage, aft of the spar. After the left balance cable has been inserted through the bracket assembly and connected, install a cotter pin cable guard into the hole that is provided in the bracket assembly.

(15) Connect the flap by placing the flap handle in the full flap position, place the bushing on the outside of the rod end bearing and insert and tighten bolt.

(16) Check the rigging and control cable tension of the ailerons and flaps. (Refer to 27-10-00, Rigging and Adjustment; and 27-50-00, Wing Flap Controls, Rigging and Adjustment.)

(17) Service and refill the brake system with hydraulic fluid in accordance with 12-10-00, Brake System, Filling. Bleed the system as given in 32-40-00, Bleeding Brakes, and check for fluid leaks.

(18) Service and fill the fuel system in accordance with 12-10-00, Fuel System, Filling. Open the fuel valve and check for leaks and flow.

(19) Check the operation of all electrical equipment, and pitot system.

(20) Remove the airplane from the jacks.

(21) Install the cockpit trim panel assembly, spar box carpet, the front and back seats, and wing butt rubber molding.

(22) Replace all the access plates and panels on the wing involved.

GRIDS 4G22 THRU 4G24
INTENTIONALLY BLANK

FLIGHT SURFACES

1. Aileron (Refer to Figure 1.)

CAUTION: CONTROL SURFACE SKINS MUST BE REPLACED IF THEY SUSTAIN DAMAGE OR ARE CRACKED.

A. Checking Free Play

(1) Set the aileron in its neutral position and secure.

(2) Obtain a straightedge long enough to extend from the ground up to a few inches above the aileron trailing edge. Place the straightedge next to the aileron trailing edge and gently move the aileron up and down, mark the limit of travel (free play) on the straightedge.

(3) The overall travel (free play) must not exceed 0.24 of an inch. Should free play exceed the limit stated make necessary repairs as required to eliminate free play.

(4) Grasp the aileron and move it spanwise (inboard/outboard) to insure maximum end play of 0.035 of an inch is not exceeded.

B. Removal

(1) Disconnect the aileron control rod at the aileron attachment point by removing the nut, washers and bolt from the rod end bearing. To simplify installation note location of washers removed.

(2) Remove the attaching nuts, bolts and washers from the hinges at the leading edge of the aileron, and remove the aileron.

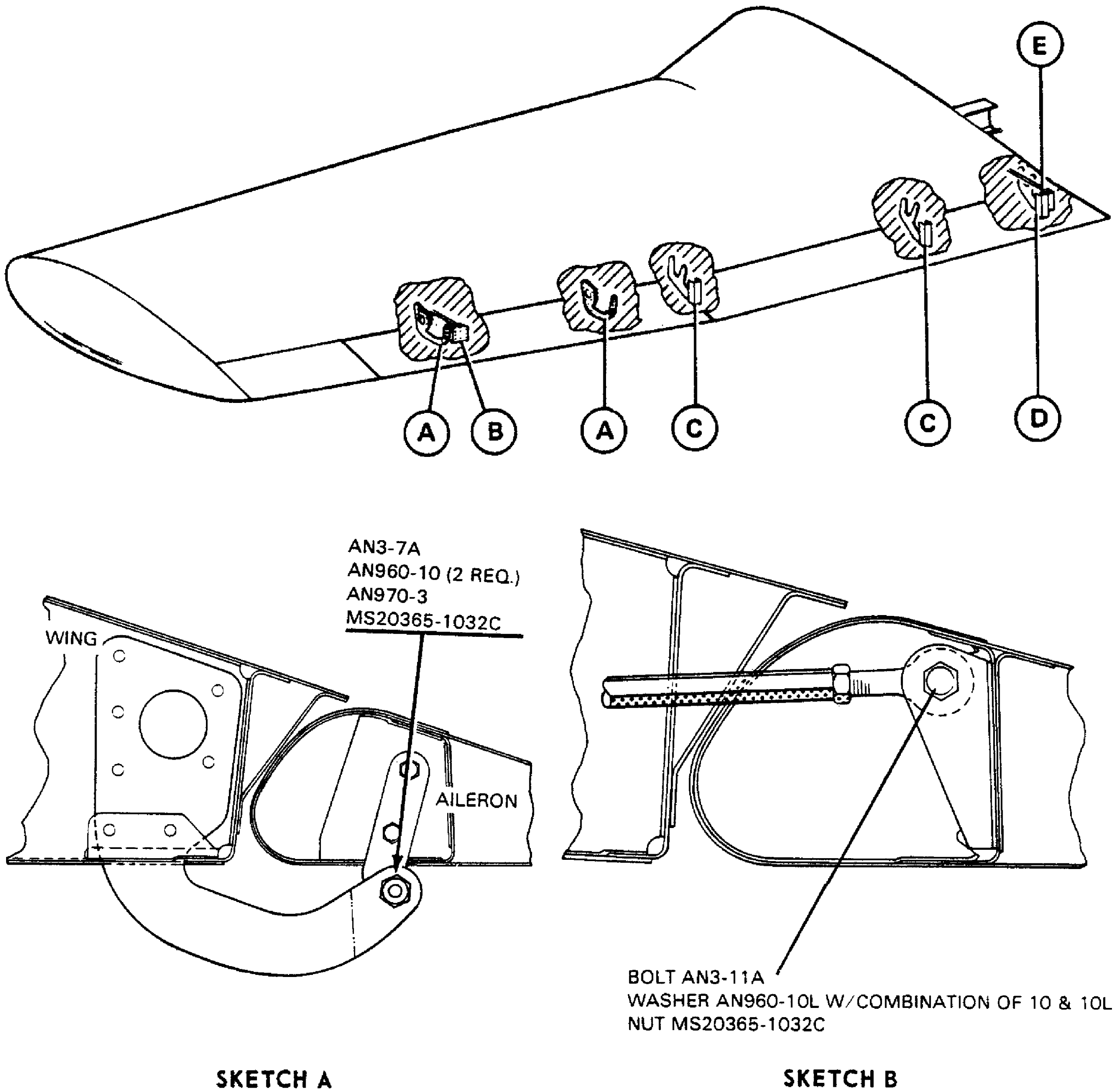
C. Installation

WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION PER INSTRUCTIONS IN BALANCING, BELOW.

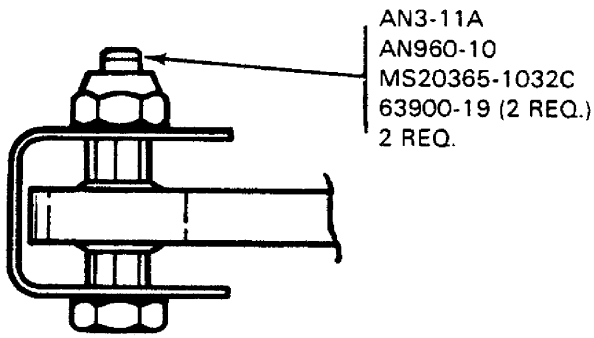
(1) Move the aileron into place and install attaching bolts, washers and nuts. Ascertain that the aileron is free to move with no interference.

(2) Attach the aileron control rod with bolts, washers and nut, dividing the washers so that the aileron is free to rotate from stop to stop without the control rod binding or rubbing on the opening in the aft spar. Be certain that the rod end bearing has no side play when tightening the bolt and that the rod does not contact the side of the bracket.

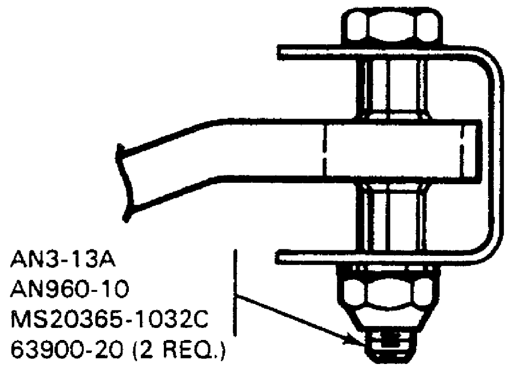
(3) Actuate the aileron controls to insure freedom of movement.



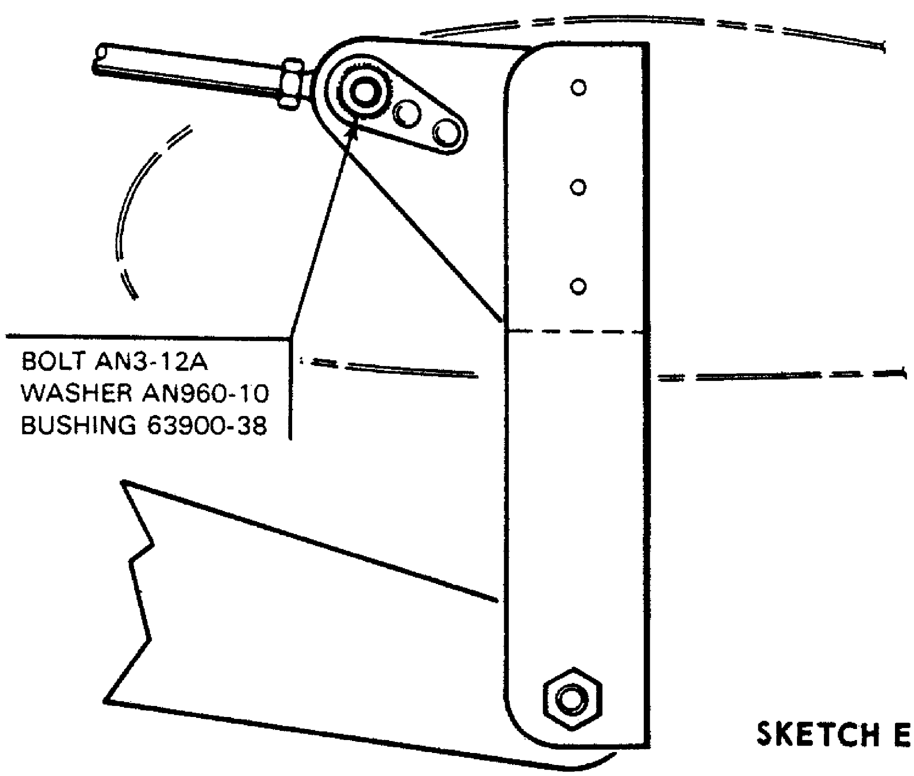
Aileron and Flap Installation
Figure 1 (Sheet 1 of 2)



SKETCH C



SKETCH D



SKETCH E

Aileron and Flap Installation
Figure 1 (Sheet 2 of 2)

D. Balancing (Refer to Figure 2.)

WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION.

Position the aileron on the balancing fixture in a draft free area and in a manner which allows unrestricted movement of the aileron. Place the tool (see 95-00-00, Figure 2) on the aileron, avoiding rivets, and keep the beam perpendicular to the hinge centerline. Read the scale when the bubble level has been centered by adjustment of the movable weight and determine the static balance. If the static balance is not within the limits specified in Figure 2, proceed as follows:

(1) Leading edge heavy: This condition is highly improbable; recheck measurements and calculations.

(2) Trailing edge heavy: There are no provisions for adding weight to balance weight to counteract a trailing edge heavy condition. Therefore, it will be necessary to determine the exact cause of the unbalance. If the aileron is too heavy because of painting over old paint, it will be necessary to strip all paint from the aileron and repaint. If the aileron is too heavy resulting from repair to the skin or ribs, it will be necessary to replace all damaged parts and recheck the balance.

2. Wing Flap (Refer to Figure 1.)

CAUTION: CONTROL SURFACE SKINS MUST BE REPLACED IF THEY SUSTAIN DAMAGE OR ARE CRACKED.

A. Removal

(1) Extend the flaps to their fullest degree and remove the bolt and bushing from the rod end bearing.

(2) Remove the nuts, washers, bushing and hinge bolts that hold the flap to the wing assembly.

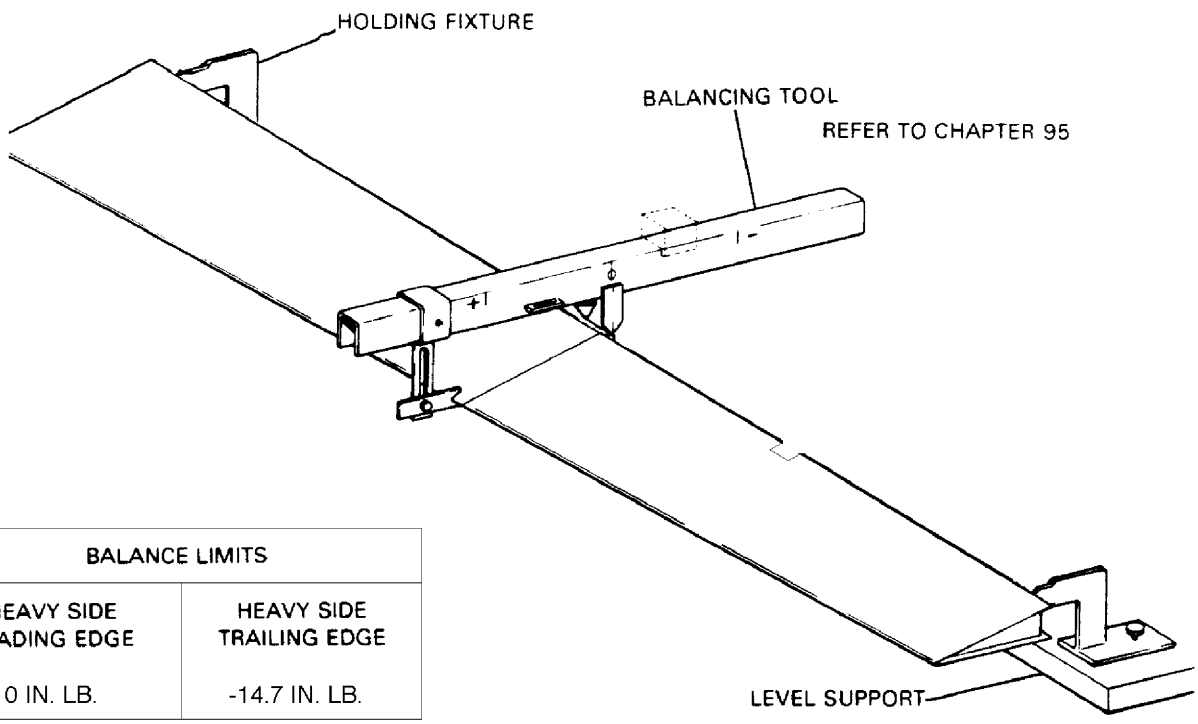
(3) Pull the flap straight back off the wing.

B. Installation

(1) Replace the wing flap by placing the flap onto its proper position and inserting the hinge bolts, bushings, washers and nuts.

(2) With the flap control in the full flap position, place the bushing on the outboard side of the rod end bearing and insert and tighten the bolt.

(3) Operate the flap several times to be certain it is operating freely. (Refer to 27-50-00, Wing Flap Controls, Rigging and Adjustment.)



BALANCE LIMITS	
HEAVY SIDE LEADING EDGE	HEAVY SIDE TRAILING EDGE
0 IN. LB.	-14.7 IN. LB.

Balancing Aileron
Figure 2

THIS PAGE INTENTIONALLY BLANK

CHAPTER

61

PROPELLERS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 61

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 61 - PROPELLERS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

PROPELLER ASSEMBLY

This section lists procedures for the removal, cleaning, inspection, repair, and installation of the propeller assembly. Servicing information may be found in 12-20-00.

1. Removal

   A. Insure that the master and magneto switches are off.

   B. Move fuel selector to off position.

   C. Place the mixture control in idle cut-off.

   D. Note position of each component to facilitate reinstallation.

   E. Remove the screws from around the spinner assembly and remove spinner.

   F. Remove the safety wire from the six propeller mounting nuts on studs and remove studs.

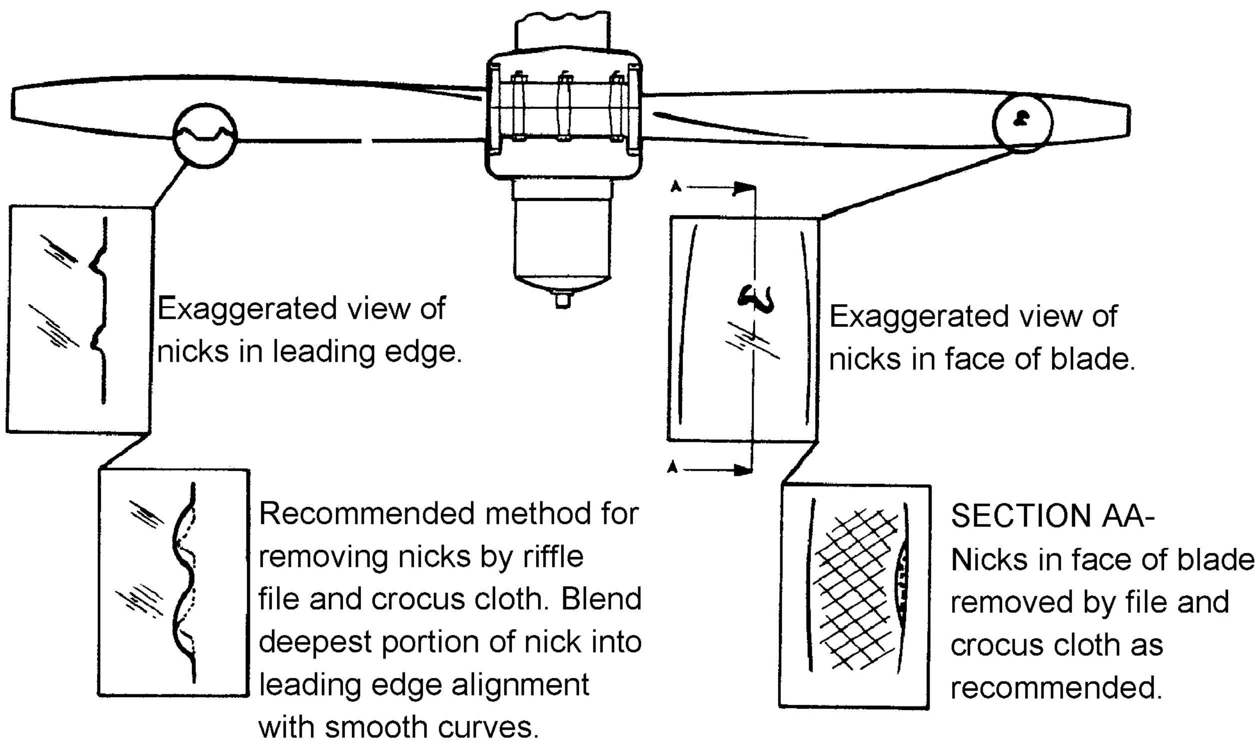
   G. Place a drip pan under the propeller to catch oil spillage, then remove the propeller.

2. Cleaning, Inspection, and Repair

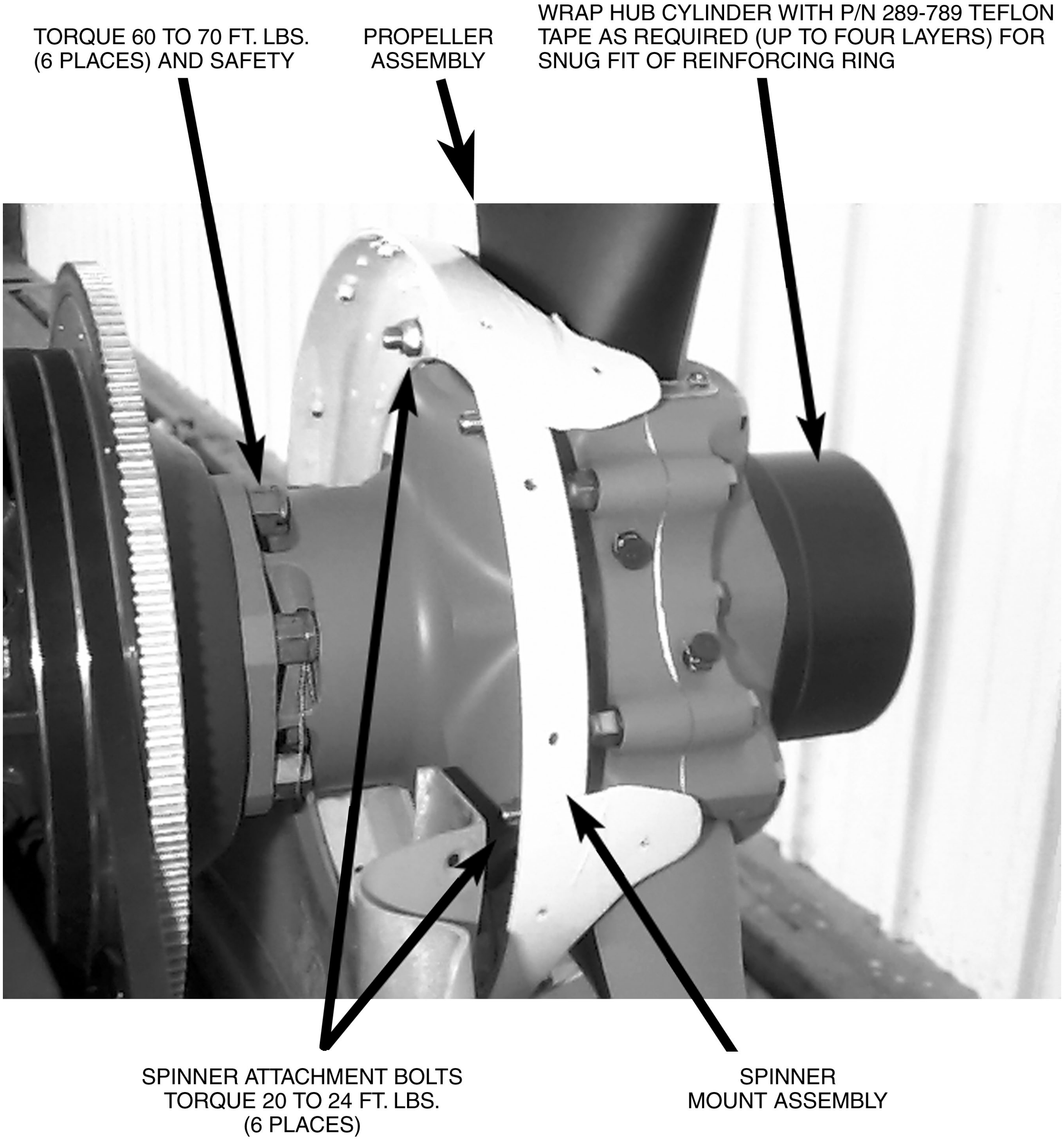
   A. Check for oil and grease leaks.

   B. Clean the spinner, propeller hub interior and exterior, and blades with a non-corrosive solvent.

   C. Inspect the hub parts for cracks.



Typical Nicks and Removal Methods
Figure 1



Propeller Installation
Figure 2 (Sheet 1 of 2)

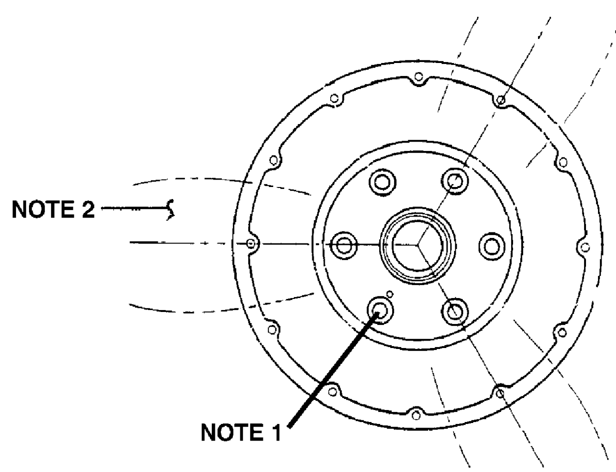
CHART 1
PROPELLER TORQUE LIMITS

Description	Required Torque (Dry)
Propeller Mounting Nuts	60-70 foot-pounds
Fwd. Bulkhead Attachment Bolts	20-24 inch-pounds
Spinner Attachment Screws	20-22 inch-pounds

NOTES

1. LOCATION OF BOLT HOLE MARKED "0" WHEN #1 PISTON IS ON TOP DEAD CENTER.

2. INSTALL PROPELLER WITH BLADES INDEXED TO "O" BOLT HOLES AS SHOWN.



Propeller Installation
Figure 2 (Sheet 1 of 2)

D. Steel hub parts should not be permitted to rust. Use aluminum paint to touch up if necessary, or replate during overhaul.

E. Check all visible parts for wear and safety.

F. Check blades to determine whether they turn freely on the hub pivot tube. This can be done by rocking the blades back and forth through the slight freedom allowed by the pitch change mechanism. If they appear tight and are properly lubricated, the pitch change mechanism should be removed so that each blade can be checked individually. If blades are tight, the propeller should be disassembled.

G. Inspect blades for damage or cracks. Nicks in leading edges of blades should be filed out and all edges rounded, as cracks sometimes start from such places. Use fine emery cloth for finishing. Refer to Figure 1 for propeller blade care.

3. Installation

A. Insure master and magneto switches are off.

B. Place fuel selector to off position.

C. Place mixture control in idle cut-off.

D. Observe the starter ring gear to make sure it is mounted properly on the engine crankshaft flange. One of the bushings on the crankshaft is stamped with an “O” mark and it must be inserted in the starter ring gear hole, likewise identified with an “O” mark.

E. Wipe crankshaft and propeller pilot to assure that no chips or foreign matter enter the propeller mechanism.

F. Check interior of propeller hub for proper seating of “O” ring. Wipe inside of hub to remove any traces of dirt. Check to see that “O” ring is covered with grease.

G. Install rear spinner bulkhead.

H. Slide propeller carefully over pilot, taking care that “O” ring is not damaged.

I. Install the six hexagon head propeller hub mounting bolts and torque per Chart 1.

J. Check propeller blade track as given in Blade Track.

K. Safety the propeller mounting bolts with MS20995-C41 safety wire.

L. Grease blade hub through zerk fittings. Remove one of the two fittings for each propeller blade, alternate the next time. Apply grease through the zerk fitting until fresh grease appears at the fitting hole of the removed fitting. Care should be taken to avoid blowing out hub gaskets.

M. Install spinner. Torque all attachment screws per Chart 1.

4. Blade Track

Blade track is the ability of one blade tip to follow the other while rotating in almost the same plane. Excessive difference in blade track - more than .0625 inch - may be an indication of bent blades or improper propeller installation. Check blade track as follows:

A. With the engine shut down and blades vertical, secure to the aircraft a smooth board just under the tip of the lower blade. Move the tip fore and aft through its full “blade-shake” travel, making small marks with a pencil at each position. Then center the tip between these marks and scribe a line on the board for the full width of the tip.

B. Carefully rotate propeller by hand to bring the opposite (or next) blade down. Center the tip and scribe a pencil line as before and check that lines are not separated more than .0625 inch.

C. Propellers having excess blade track should be removed and inspected for bent blades, or for parts of sheared “O” ring, or foreign particles, which have lodged between hub and crankshaft mounting faces. Bent blades will require repair and overhaul of assembly.

THIS PAGE INTENTIONALLY BLANK

CONTROLLING

Propeller Governor

A. Removal

(1) Remove the upper engine cowl.

(2) Disconnect the control cable end from the governor control arm.

(3) Remove the governor mounting stud nuts. It will be necessary to raise the governor as the nuts are being removed before they can be completely removed.

(4) Remove the mounting gasket. If the governor is to be removed for a considerable length of time and another unit not substituted, it is advisable to cover the mounting pad to prevent damage caused by foreign matter.

B. Installation

(1) Clean the mounting pad thoroughly, making very certain that there are no foreign particles in the recess around the drive shaft.

(2) Place the governor mounting gasket in position with the raised portion of the screen facing awav from the engine.

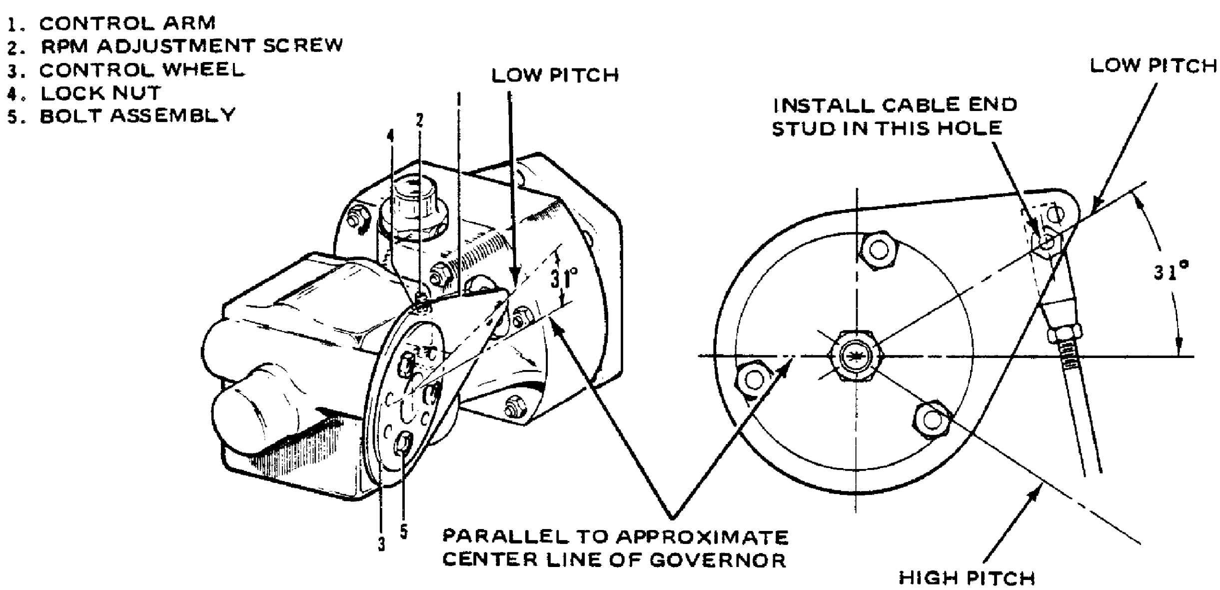
(3) Align the splines on the governor shaft with the engine drive and slide the governor into position.

(4) With the governor in position, raise the governor enough to install washers and start mounting nuts. Torque nuts even.

(5) Connect the control cable end to the governor control arm. The ball stud is installed in the inner hole of the control arm.

(6) Adjust governor control per Rigging and Adjustment of Propeller Governor.

(7) Install engine cowl.



Propeller Governor
Figure 1

C. Rigging and Adjustment (Refer to Figure 1.)

(1) Prior to adjusting the propeller governor high rpm setting, the control linkage should be thoroughly checked for correct function.

NOTE: A calibrated tachometer must be used to ascertain propeller high rpm setting. Final high rpm adjustment must be checked in flight or during high speed taxi.

To check rigging, move propeller control full forward. The propeller governor high rpm stop must contact the adjusting screw when the cockpit control is 0.010 to 0.030 inch from the cockpit mechanical stop.

(2) If adjustment is required complete the following steps.

(a) Insure that the governor control arm is located approximately as shown on Figure 1.

(b) Adjust control cable end hardware to obtain cockpit control cushion. Insure there is adequate thread engagement of clevis end and rod end bearing (witness holes) after adjustment.

(c) Insure that the control cable assembly is not bottoming internally.

(3) Start engine, park 90° to wind direction and warm in normal manner.

(4) To check high rpm low pitch setting, move the propeller control all the way forward. At this position the governor speed control arm should be against the high rpm fine adjusting screw. With the throttle full forward, observe engine rpm which should be adjusted as follows:

(a) Shut down the engine and remove the upper engine cowl.

(b) Adjust the governor by means of the fine adjustment screw to:

1 2700 RPM for 6X; and,

2 2500 RPM for 6XT.

To do this, loosen the high RPM fine adjustment screw locknut and turn the screw in a clockwise direction to decrease engine speed or in a counterclockwise direction to increase engine speed.

NOTE: One revolution of the fine adjustment screw will increase or decrease the engine speed approximately 20 rpm.

(c) Reinstall upper engine cowl and repeat step b to ascertain proper rpm setting.

(d) After setting the proper high rpm adjustment, run the self-locking nut on the fine adjustment screw against the base projection to lock.

(e) Ascertain that the governor control arm is adjusted to the proper angle on the control wheel as shown in Figure 1.

(5) With the high rpm adjustment complete, the control system should be adjusted so that the governor control arm will contact the high rpm stop when the propeller lever is 0.010 to 0.030 of an inch from forward stop on the power quadrant. To adjust the control travel, disconnect the control cable end from the control arm, loosen the cable end jam nut and rotate the rod end to obtain the desired lever clearance. Reconnect the cable end and tighten jam nut.

(6) It is usually only necessary to adjust the high rpm setting of the governor control system, as the action automatically takes care of the positive high pitch setting.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

70

STANDARD PRACTICES - ENGINE

THIS PAGE INTENTIONALLY BLANK

CHAPTER 70

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
70-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
70-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
70-00-00	1	Jun 1/03			
	2	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 70 - STANDARD PRACTICES - ENGINE

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

Review the following suggestions before working on the power plant.

1. To insure proper reinstallation and/or assembly, tag and mark all parts, clips, and brackets as to their location prior to their removal and/or disassembly.
2. During removal of various tubes or engine parts, inspect them for indications of scoring, burning or other undesirable conditions. To facilitate reinstallation, observe the location of each part during removal. Tag any unserviceable part and/or units for investigation and possible repair.
3. Extreme care must be taken to prevent foreign matter from entering the engine, such as lockwire, washers, nuts, dirt, dust, etc. This precaution applies whenever work is done on the engine, either on or off the aircraft. Suitable protective caps, plugs, and covers must be used to protect all openings as they are exposed.

   NOTE: Dust caps used to protect open lines must always be installed OVER the tube ends and NOT IN the tube ends. Flow through the lines may be blocked off if lines are inadvertently installed with dust caps in the tube ends.

4. Should any items be dropped into the engine, the assembly process must stop and the item removed, even though this may require considerable time and labor. Insure that all parts are thoroughly clean before assembling.
5. Never reuse any lockwire, lockwashers, tablocks, tabwashers or cotter pins. All lockwire and cotter pins must fit snugly in holes drilled in studs and bolts for locking purposes. Cotter pins should be installed so the head fits into the castellation of the nut, and unless otherwise specified, bend one end of the pin back over the stud or bolt and the other end down flat against the nut. Use only corrosion resistant steel lockwire and/or cotter pins. Bushing plugs shall be lockwired to the assembly base or case. Do not lockwire the plug to the bushing.
6. All gaskets, packings and rubber parts must be replaced with new items of the same type at reassembly. Insure the new nonmetallic parts being installed show no sign of having deteriorated in storage.
7. When installing engine parts which require the use of a hammer to facilitate assembly or installation, use only a plastic or rawhide hammer.

   CAUTION: ENSURE THAT ANTI-SEIZE COMPOUNDS ARE APPLIED IN THIN EVEN COATS, AND THAT EXCESS COMPOUND IS COMPLETELY REMOVED TO AVOID CONTAMINATION OF ADJACENT PARTS.

8. Anti-seize lubrication should be applied to all loose-fit spline drives which are external to the engine and have no other means of lubrication. For certain assembly procedures, molybdenum disulfide in either paste or powdered form mixed with engine oil or grease may be used.
9. Temporary marking methods are those markings which will ensure identification during ordinary handling, storage and final assembly of parts.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

71

POWER PLANT

THIS PAGE INTENTIONALLY BLANK

CHAPTER 71

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
71-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
71-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
71-00-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
	9	Jun 1/03			
	10	Jun 1/03			
71-10-00	1	Jun 1/03			
	2	Jun 1/03			
71-20-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 71 - POWER PLANT

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

1. Description

   A. 6X (S/N's 3232001 & up)

   This airplane is powered by a 300 horsepower Lycoming engine, Model IO-540-K1G5. The engine is furnished with a starter, a 90 ampere 28-volt alternator, a voltage regulator, a shielded ignition system, two vacuum pump drives, both engine-driven and electric fuel pumps, a fuel injector and a dry paper element induction air filter. In the event of air stoppage through the filter, an alternate air source can be opened manually by the use of a lever in the cockpit.

   The exhaust system consists of two individual mufflers, one on each side of the engine. The left side cylinders feed into a muffler on the left side of the engine and the right side cylinders feed into a muffler on the right side of the engine. A heat shroud encircles each muffler to provide heat for both the cabin and defrosting.

   The engine is provided with a constant speed propeller controlled by a governor mounted on the engine supplying oil through the propeller shaft at various pressures.

   B. 6XT (S/N's 3255001 & up)

   This airplane is powered by a 300 horsepower turbocharged Lycoming engine, Model TIO-540-AH1A. The engine is furnished with a starter, a 90 ampere 28-volt alternator, a voltage regulator, a shielded ignition system, two vacuum pump drives, both engine-driven and electric fuel pumps, a fuel injector and a dry paper element induction air filter. In the event of air stoppage through the filter, an alternate air source can be opened manually by the use of a lever in the cockpit.

   Exhaust from the left cylinders is collected into a single pipe and routed through a heat shroud above the induction air filter to provide heat for both the cabin and defrosting. The left side exhaust joins the right side above the turbocharger installation. Exhaust is then alternately routed through the turbocharger or the wastegate and out a single tailpipe on the right side.

   The engine is provided with a constant speed propeller controlled by a governor mounted on the engine supplying oil through the propeller shaft at various pressures.

2. Troubleshooting

   WARNING: GROUND THE MAGNETO PRIMARY CIRCUIT BEFORE PERFORMING ANY CHECKS OF THE ENGINE.

   Troubles peculiar to the power plant are listed in Chart 1 along with their probable causes and suggested remedies.

CHART 1 (Sheet 1 of 4)
TROUBLESHOOTING ENGINE

Trouble	Cause	Remedy
Failure of engine to start.	Lack of fuel.	Check fuel system for leaks.
		Fill Fuel tank.
		Clean dirty lines, strainers or fuel valves.
		Check fuel selector valve for proper tank.
		Check fuel pressure with electric boost pump ON.
		Check mixture control knob for full rich.
	Overpriming	Open throttle and “unload” engine by engaging starter.
		Mixture in idle cut-off.
	Incorrect throttle setting.	Open throttle to one-eighth of its range.
	Defective spark plugs.	Clean and adjust, or replace spark plugs.
	Defective ignition wire.	Check with electric tester and replace defective wires.
	Defective battery.	Replace with charged battery.
	Improper operation of magneto breaker.	Clean points. Check internal timing of magnetos.
	Lack of sufficient fuel flow.	Disconnect fuel line at fuel injector and check fuel flow.
	Water in fuel injector.	Drain fuel injector and fuel lines.
	Internal failure.	Check oil screens for metal particles. If found, complete overhaul of engine may be indicated.

CHART 1 (Sheet 2 of 4)
TROUBLESHOOTING ENGINE

Trouble	Cause	Remedy
Failure of engine to idle properly.	Incorrect idle mixture.	Adjust mixture.
	Leak in the induction system.	Tighten all connections in the induction system. Replace any parts that are defective.
	Incorrect idle adjustment.	Adjust throttle stop to obtain correct idle.
	Uneven cylinder compression.	Check condition of piston rings and valve seats.
	Faulty ignition system.	Check entire ignition system.
	Insufficient fuel pressure.	Adjust fuel pressure.
Lower power and uneven running.	Mixture too rich; indicated by sluggish engine operation, red exhaust flame at night. Extreme cases indicated by black smoke from exhaust.	Readjustment of fuel injector by authorized personnel is indicated.
	Mixture too lean; indicated by overheating or backfiring.	Check fuel lines for dirt or other restrictions. Check fuel injection nozzles.
	Leaks in induction system.	Tighten all connections in the induction system. Replace any parts that are defective.
	Defective spark plugs.	Clean and gap, or replace spark plugs.
	Improper fuel.	Drain and refill tank with recommended fuel.
	Magneto breaker points not working properly.	Clean points. Check internal timing of magnetos.
	Defective ignition wire.	Check wire with electric tester. Replace defective wire.
	Defective spark plug terminal connectors.	Replace connectors on spark plug wire.

CHART 1 (Sheet 3 of 4)
TROUBLESHOOTING ENGINE

Trouble	Cause	Remedy
Failure of engine to develop full power.	Leak in the induction system.	Tighten all connections in the induction system. Replace any parts that are defective.
	Throttle lever out of adjustment.	Adjust throttle lever.
	Improper fuel flow.	Check strainer, gauge, and flow at fuel injector inlet.
	Restriction in air scoop.	Examine air scoop and remove restrictions.
	Improper fuel.	Drain and refill tank with recommended fuel.
	Faulty ignition.	Tighten all connections.
		Check system with tester.
		Check ignition timing.
Rough engine.	Cracked engine mount.	Replace or repair mount.
	Defective mounting bushings.	Install new mounting bushings.
	Uneven compression.	Check compression.
Low oil pressure.	Insufficient oil.	Fill sump with recommended oil.
	Air lock or dirt in relief valve.	Remove and clean oil pressure relief valve.
	Leak in suction line or pressure line.	Check gasket between accessory housing and crankcase.
	Dirty oil strainers.	Remove and clean oil strainers.
	Defective pressure gauge.	Replace gauge.
	Stoppage in oil pump intake passage.	Check line for obstruction.
		Clean suction strainer.
	High oil temperature.	See “High Oil Temperature” in “Trouble” column.

CHART 1 (Sheet 4 of 4)
TROUBLESHOOTING ENGINE

Trouble	Cause	Remedy
High Oil Temperature.	Insufficient air cooling.	Check air inlet and outlet for deformation or obstruction.
	Insufficient oil supply.	Fill oil sump to proper level with specified oil.
	Low grade of oil.	Replace with oil conforming to specifications.
	Clogged oil lines or strainers.	Remove and clean oil strainers.
	Excessive blow-by.	Usually caused by worn or stuck rings.
	Failing or failed bearing.	Examine sump for metal particles. If found, overhaul of engine is indicated.
	Defective temperature gauge.	Replace gauge.
Excessive oil consumption.	Low grade of oil.	Fill tank with oil conforming to specifications.
	Failing or failed bearings.	Check sump for metal particles.
	Worn piston rings.	Install new rings.
	Incorrect installation of piston rings.	Correctly install new rings.
	Failure of rings to seat (new nitrided cylinders).	Use mineral base oil. Climb to cruise altitude at full power and operate at 75% cruise power setting with high oil temperature until oil consumption stabilizes.

3. Engine (Refer to Figure 1)

A. Removal

(1) Turn off all electrical switches in the cockpit and then disconnect the battery ground wire at the battery.

(2) Ascertain that the fuel selector lever is in the “OFF” position.

(3) Remove the cowling and propeller. (See 71-10-00 and 61-10-00.)

NOTE: Tag hoses, lines and wires at separation to facilitate reinstallation. Open fuel, oil, vacuum lines and fittings should be covered to prevent contamination.

(4) Disconnect the following electrical systems/components:

(a) starter positive and ground leads.

(b) alternator leads and the cable attachment clamps.

(c) magneto “P” leads at the magnetos.

(d) tachometer magnetic sensor lead at the left magneto.

(e) oil temperature, cylinder head temperature (CHT), and exhaust gas temperature (EGT) (6X) or turbine intlet temperature (TIT) (6XT) leads.

(5) Disconnect the following mechanical systems/components:

(a) governor control cable at the governor and cable attachment clamps.

(b) throttle and mixture cables at the injector. (The injector may be removed if desired.)

(c) induction air intake duct hose.

(d) cooling ducts to vacuum pump and fuel pump shroud.

(e) in 6XT only, the injector intake ducting and associated lines.

(6) Disconnect the following environmental systems/components:

(a) heater and defroster hoses.

(b) air conditioning compressor lines (if installed).

(7) The following engine lines should also be disconnected:

(a) fuel pump supply line at the left side of the pump. Disconnect pump vent line.

(b) both lines from each oil cooler at the coolers.

(c) engine vent tube at the engine.

(d) Untie the ignition harness hoses and lines at the aft of the engine.

(e) vacuum pump lines at pumps and remove the fittings from pumps.

(f) oil pressure line at the engine.

(g) deck pressure and fuel flow lines.

(h) manifold pressure line.

(i) injector line at the flow divider.

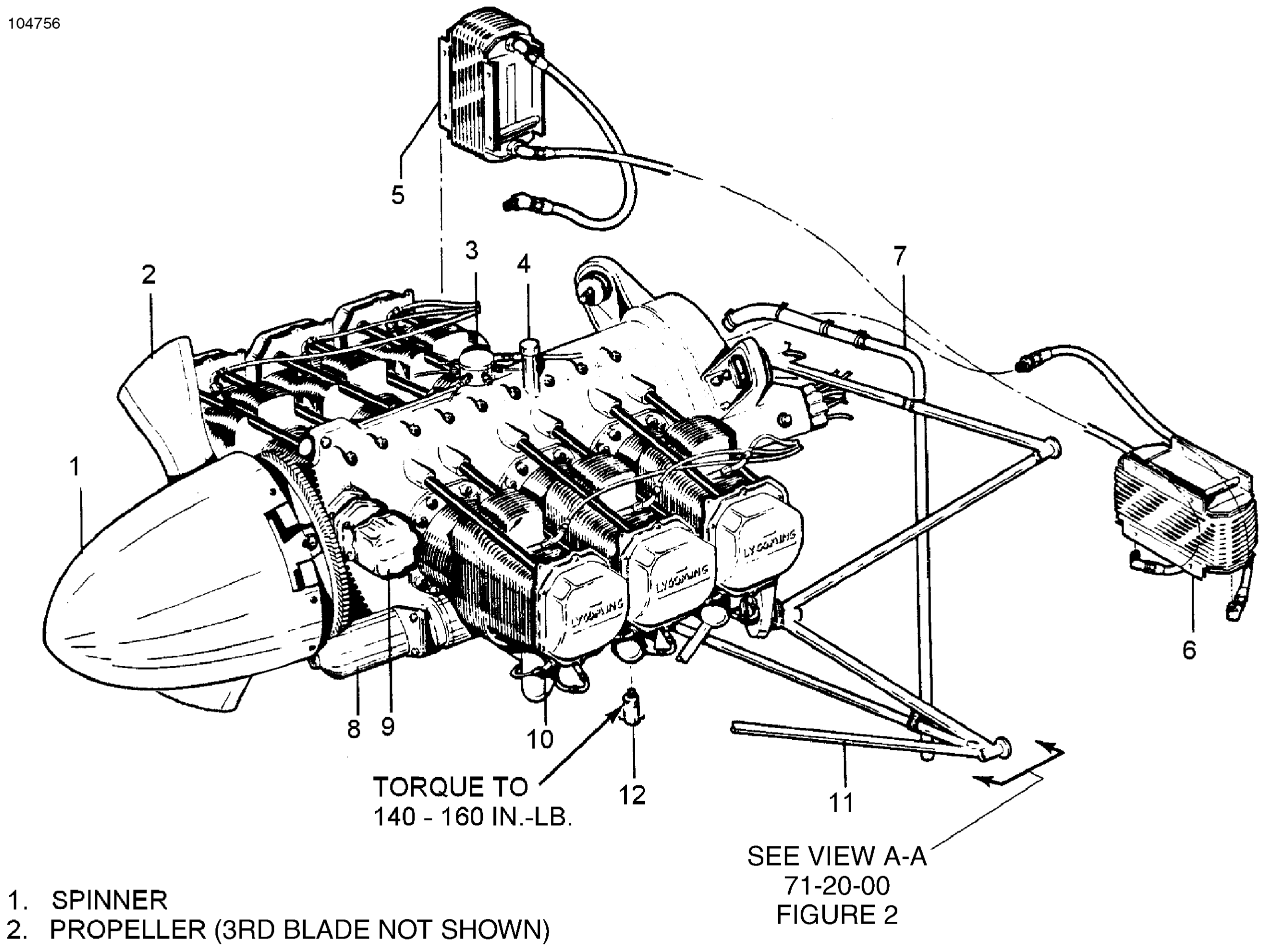
(8) Attach a one-half ton (minimum) hoist to the hoisting straps and relieve the tension from the engine mounts.

CAUTION: PLACE A TAIL STAND UNDER THE TAIL OF THE AIRPLANE BEFORE REMOVING THE ENGINE.

(9) Check the engine for any attachments remaining to obstruct its removal.

(10) Drain the engine oil, if desired, and then close drain.

(11) Remove the four engine mount assemblies and swing the engine free, being careful not to damage any attaching parts.



1. SPINNER
2. PROPELLER (3RD BLADE NOT SHOWN)
3. FUEL FLOW DIVIDER
4. OIL FILLER
5. OIL COOLER, RIGHT
6. OIL COOLER, LEFT
   (6XT IS VERTICAL ORIENTATION)
7. VENT TUBE
8. STARTER
9. GOVERNOR
10. FUEL NOZZLE
11. ENGINE MOUNT
12. VALVE, OIL DRAIN

6X SHOWN
6XT SIMILAR

SEE 71-20-00, FIGURE 1 FOR ENGINE SHOCK MOUNTS

Engine Installation
Figure 1

B. Installation

(1) Attach a one-half ton (minimum) hoist to the engine hoisting straps and swing the engine into alignment with its attaching points.

(2) Insert an engine mount bolt, with washer against head, in the engine mount and slide half of the mount assembly on the bolt. (Refer to 71-20-00, Figure 1 for proper shock mount assembly.) Repeat this procedure for the other three attachment parts.

NOTE: Shock mount Part No. J-7763-1 sandwich must be positioned on the compression side of the engine lugs, with the upper mounts on the forward side, and the lower mounts on the aft side. The part number is stamped on the metalface of the mount.

(3) Position the mounting lugs of the engine so that they align with the engine mount attaching points, then move the engine rearward onto the mounts.

(4) Slide onto each mounting bolt a spacer and the forward half of the mount. Install washers and nut, and torque the nuts of the bolts to 550 to 600 inch-pounds.

(5) Turn off all electrical switches in the cockpit and, if not already done, disconnect the battery ground wire at the battery.

(6) Ascertain that the fuel selector lever is in the “OFF” position.

(7) Connect the following engine lines:

(a) fuel pump supply line, at the left side of the pump, and pump vent line.

(b) both lines from each oil cooler at the coolers.

(c) engine vent tube at the engine.

(d) resecure the ignition harness hoses and lines at the aft of the engine.

(e) reinstall the fittings on the pumps and connect the vacuum pump lines at pumps.

(f) oil pressure line at the engine.

(g) deck pressure and fuel flow lines.

(h) manifold pressure line.

(i) injector line at the flow divider.

(8) Connect the following environmental systems/components:

(a) heater and defroster hoses.

(b) air conditioning compressor lines (if installed).

(9) Connect the following mechanical systems/components:

(a) governor control cable at the governor and cable attachment clamps.

(b) throttle and mixture cables at the injector. (Reinstall the injector if previously removed.)

(c) induction air intake duct hose.

(d) cooling ducts to vacuum pump and fuel pump shroud.

(e) in 6XT only, the injector intake ducting and associated lines.

(10) Connect the following electrical systems/components:

(a) starter positive and ground leads.

(b) alternator leads and the cable attachment clamps.

(c) magneto “P” leads at the magnetos.

(d) tachometer magnetic sensor lead at the left magneto.

(e) oil temperature, cylinder head temperature (CHT), and exhaust gas temperature (EGT) (6X) or turbine intlet temperature (TIT) (6XT) leads.

(11) Secure the ignition harness, lines, and any hoses, wires, etc. that may be loose.

(12) Check the engine for any additional components/systems still disconnected.

(13) Fill engine oil, if previously drained.

(14) Install cowling and propeller. (Refer to Chapter 61.)

NOTE: To avoid possible high speed bearing failure resulting from lack of lubrication during initial starts after engine installation, refer to the latest revision of Lycoming Service Instruction No. 1241 for instructions on Pre-Oiling engines.

(15) Reconnect the battery ground wire at the battery.

(16) Perform an engine operation check.

GRIDS 4I22 THRU 4I24
INTENTIONALLY BLANK

COWLING

1. Removal

   A. Release quarter-turn fasteners (5 on each side, 2 on top aft).

   B. Remove machine screws from around cooling intakes (2 each side).

   C. Pull slightly aft and then up, and remove upper cowling.

   D. Remove the screws securing plate behind the nose gear and remove plate.

   E. Loosen hose clamps securing landing light to nose gear and rotate landing light assembly 180°.

   F. Remove the screws securing the bottom cowling aft end to the fuselage firewall flange.

   G. In 6XT only: remove screws (12) from around the induction air intake grill and remove grill.

   H. In 6X only: remove screws securing induction air filter housing to lower cowling (8 places) and disengage housing from NACA duct.

   I. Remove clamps securing fresh air inlet hose.

   J. Remove clamps securing alternator cooling air hose.

   K. Remove bottom cowling.

2. Cleaning, Inspection and Repair

   A. Clean cowling with a suitable cleaning solvent and wipe dry with a clean cloth.

   B. Inspect cowling for dents, cracks, loose rivets, elongated holes and damaged or missing fasteners.

   C. Repair all defects to prevent further damage.

3. Installation

   A. Position the bottom cowling in place.

   B. In 6X only: engage filter housing to NACA duct.

   C. Secure bottom cowling with screws along the sides and firewall flange.

   D. Rotate landing light assembly to its operating postion (i.e. - aimed forward) and tighten hose clamps.

   E. Position plate behind nose gear and secure with screws.

   F. In 6XT only: replace the induction air intake grill and reinstall and secure screws (12).

   G. In 6X only: secure lower cowling assembly to induction air filter housing with screws (8).

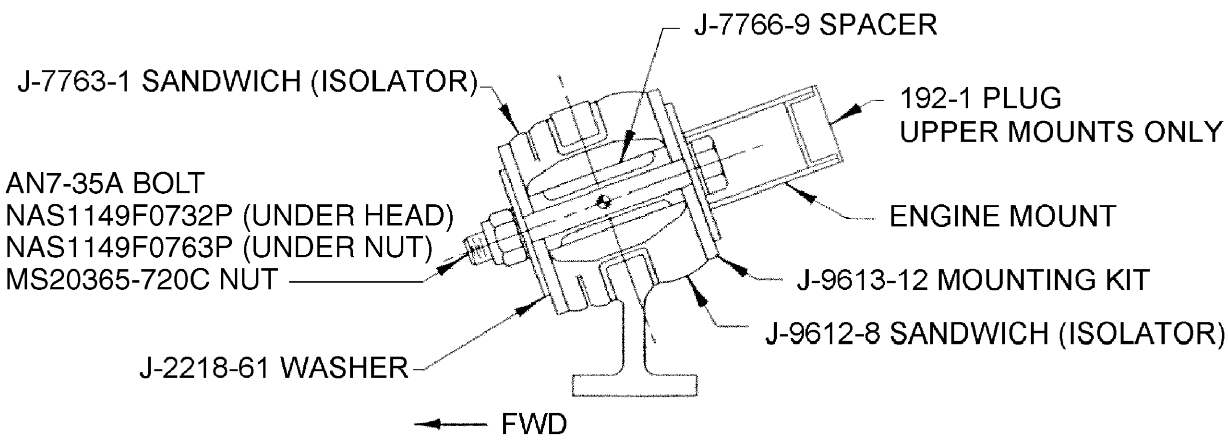
   H. Install hose and secure clamp for fresh air inlet.

   I. Install hose and secure clamp for alternator cooling air.

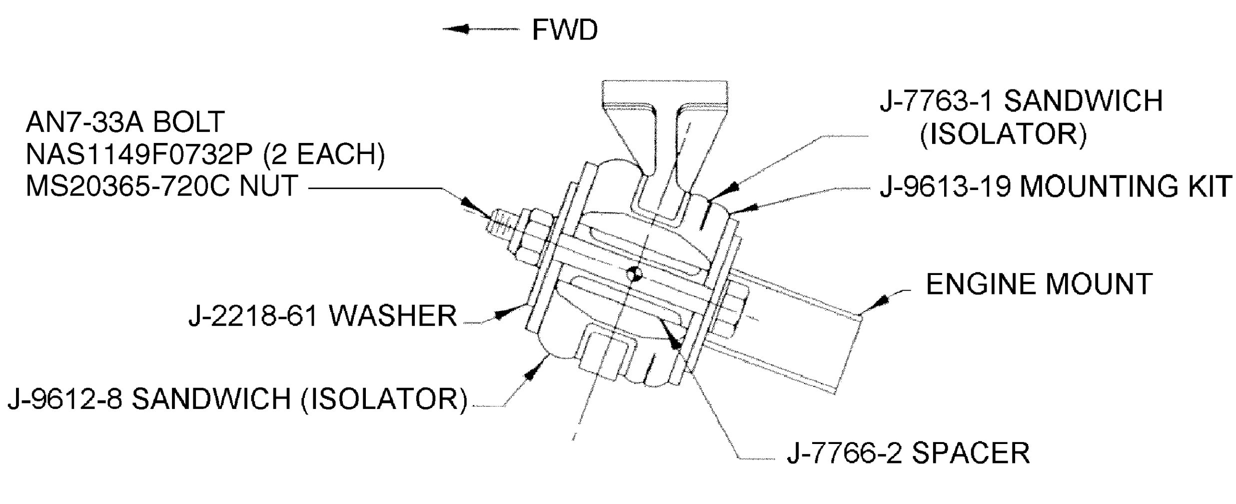
   J. Install the upper cowling.

THIS PAGE INTENTIONALLY BLANK

MOUNTS



UPPER MOUNTS



LOWER MOUNTS

Engine Shock Mounts
Figure 1

Engine Mount Corrosion Inspection, Immersion in Water

The following inspection and corrosion prevention procedure is required whenever all or part of the tubular engine mount has been immersed in water. Proceed as follows:

A. Inspection

(1) Level the aircraft in accordance with 8-20-00.

(2) In the two lower tubes as indicated in Figure 2; drill a 3/16 inch hole in each tube, at the approximate mid-point.

(3) Visually inspect the interior surface of each tube through the 3/16 inch hole for evidence of internal corrosion.

(4) Should evidence of corrosion be detected in step (3), above, replace the engine mount. If no corrosion is detected, proceed with corrosion prevention, paragraph B, below.

B. Corrosion Prevention

If no evidence of corrosion is detected in step (3), above, proceed as follows:

(1) Place a drip pan below the inspection holes in each engine mount tube.

(2) Insert a plastic tube thru each inspection hole and feed it up to the high point of the engine mount tube.

(3) Using a syringe inserted into the end of the plastic tube, pump linseed oil into the upper end of the engine mount tube while rotating the syringe/plastic tube assembly to assure maximum coverage. Continue pumping until the lower end of the engine mount tube is filled with linseed oil to the level of the inspection hole.

(4) Now, draw the plastic tube out of the upper end of the engine mount tube and reinsert it in the opposite direction, feeding it to the lower end of the engine mount tube.

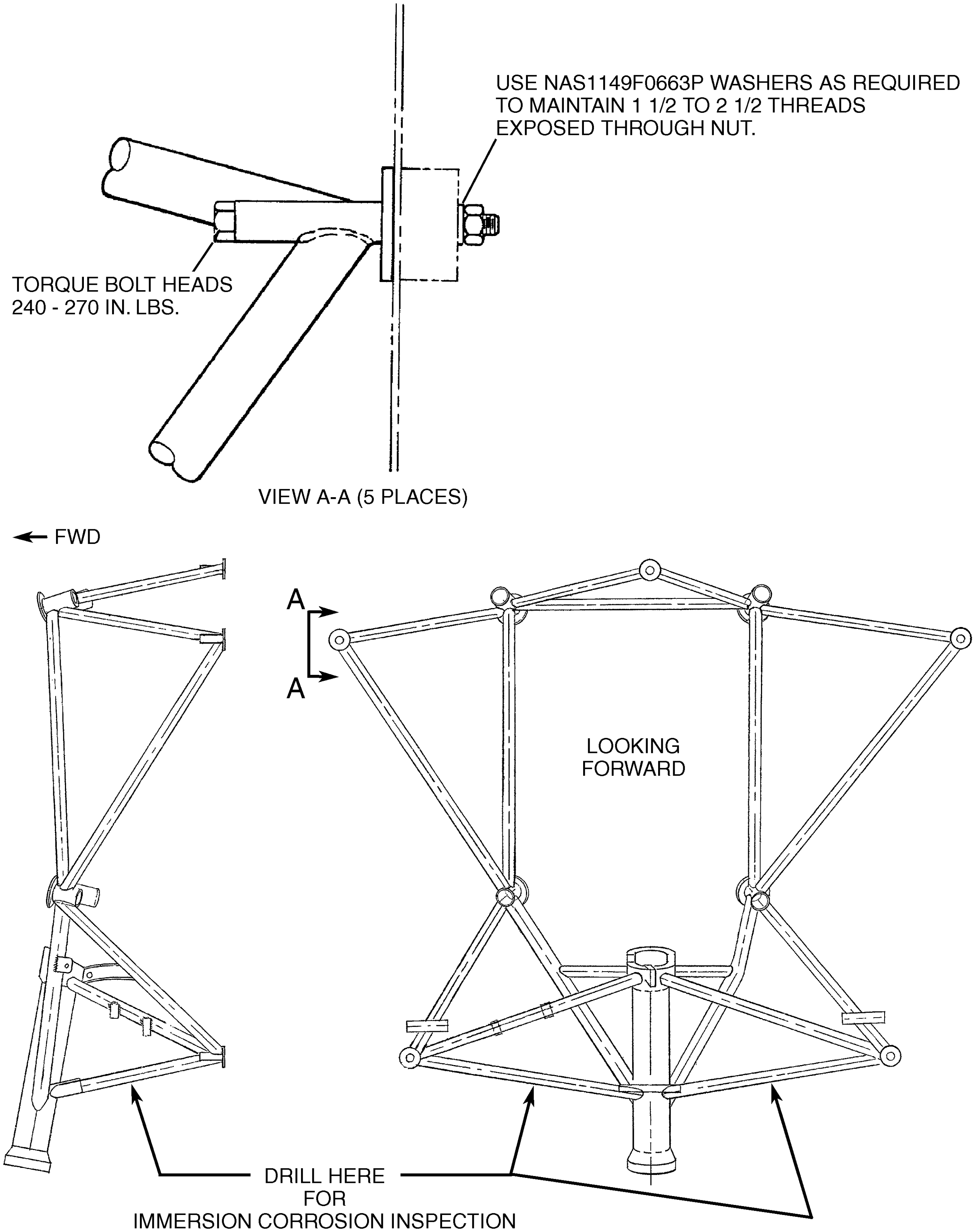
(5) Suck excess linseed oil out of the engine mount tube with the syringe/plastic tube assembly.

(6) When linseed oil can no longer be picked up by the syringe/plastic tube assembly, remove it and allow the engine mount tube to drain into drip pans for approximately two hours.

(7) Purge excess oil from tubes by applying air pressure to each 3/16 inch inspection hole, one at a time.

(8) Insure that roughly the same amount of linseed oil that was pumped in is retrieved in the drip pans.

(9) Apply a liberal coating of an approved fuel tank sealant (see List of Consumables, 91-00-00) to each inspection hole and seal the hole with an appropriate blind rivet. After installing the rivet, apply a liberal coating of the approved fuel tank sealant over the head of the rivet.



Engine Mount Installation
Figure 2

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

73

ENGINE FUEL SYSTEMS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 73

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
73-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
73-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
73-10-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
73-20-00	1	Jun 1/03			
	2	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 73 - ENGINE FUEL SYSTEMS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

1. Fuel Injector Maintenance (Refer to Figures 2 and 3.)

   In general, little attention is required between injector overhauls. However, it is recommended that the following items be checked during periodic inspection of the engine:

   A. Check tightness and lock of all nuts and screws which fasten the injector to the engine, torquing all nuts to 135-150 inch-pounds.

   B. Seat the pal type locknuts and finger tighten them against the plain nuts. After this has been done tighten the locknuts an additional 1/3 to 1/2 turn.

   C. Check all fuel lines for tightness and evidence of leakage. A slight fuel stain adjacent to the air bleed nozzles is not cause for concern.

   D. Check throttle and mixture control rod ends and levers for tightness and lock.

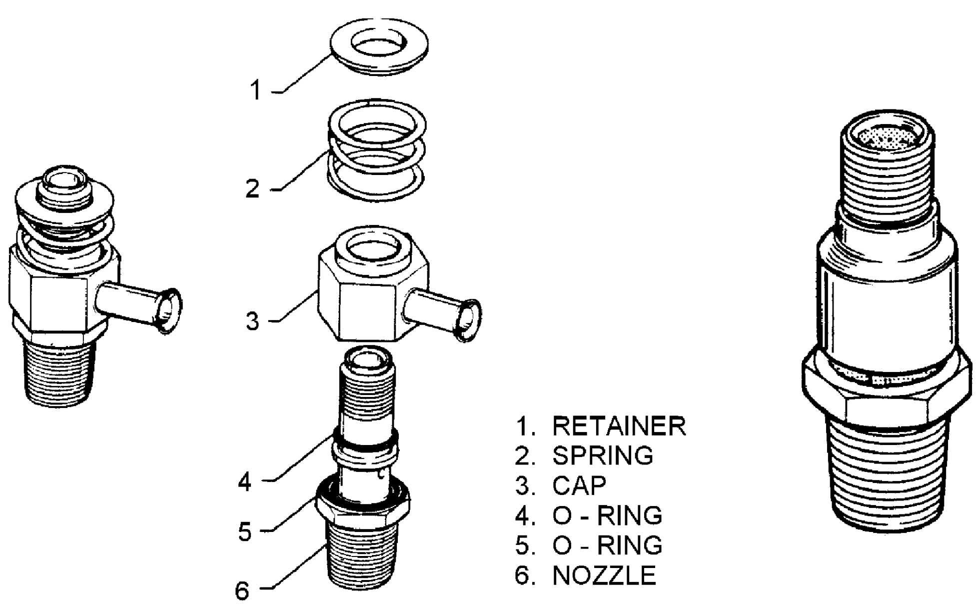
   E. Remove and clean the injector inlet strainer at the first 25 hours of operation and each 50 hour inspection thereafter. Check the screen for distortion or openings in the strainer. Replace for either of these conditions. Clean screen assembly in solvent and dry with compressed air. Damaged strainer O-rings should be replaced. To install the screen assembly, place the gasket on the screen assembly and install the assembly in the throttle body and tighten to 35-40 inch-pounds torque.

2. Fuel Nozzles (Air Bleed) (Refer to Figure 1.)

   A. Removal

   CAUTION: THE FUEL NOZZLES MUST BE CAREFULLY REMOVED, OR THE CYLINDERS MAY BE DAMAGED.

   (1) Remove the lower engine cowl.
   (2) Disconnect the fuel line from the nozzle.
   (3) Carefully remove the nozzle, using the correct size deep socket.
   (4) Clean and inspect the nozzle as given in the next paragraph.



Fuel - Air Bleed Nozzles
Figure 1

B. Cleaning and Inspection

(1) Clean the nozzle with acetone or equivalent and blow out all foreign particles with compressed air in the direction opposite that of fuel flow. Do not use wire or other hard objects to clean orifices. Refer to Lycoming Service Instruction No. 1275, latest revision.

(2) Inspect the nozzle and cylinder threads for nicks, stripping or cross-threading.

(3) Inspect for battered or rounded hexagons.

(4) A test procedure for air bleed nozzles is described in Lycoming Service Instruction No. 1275, rev. B or latest revision.

C. Installation

CAUTION: WHEN INSTALLING THE FUEL NOZZLES, BE CAREFUL AS YOU APPROACH THE CYLINDERS TO AVOID DAMAGING THE CYLINDERS AND FUEL NOZZLES.

(1) Installation and torque procedures for the fuel nozzles are per Lycoming Service Instruction No. 1275, rev. B or latest revision.

(2) Carefully install the nozzle, using the correct size deep socket.

(3) Connect the fuel line to the nozzle.

(4) Install the lower engine cowl.

3. Idle Speed and Mixture Adjustment

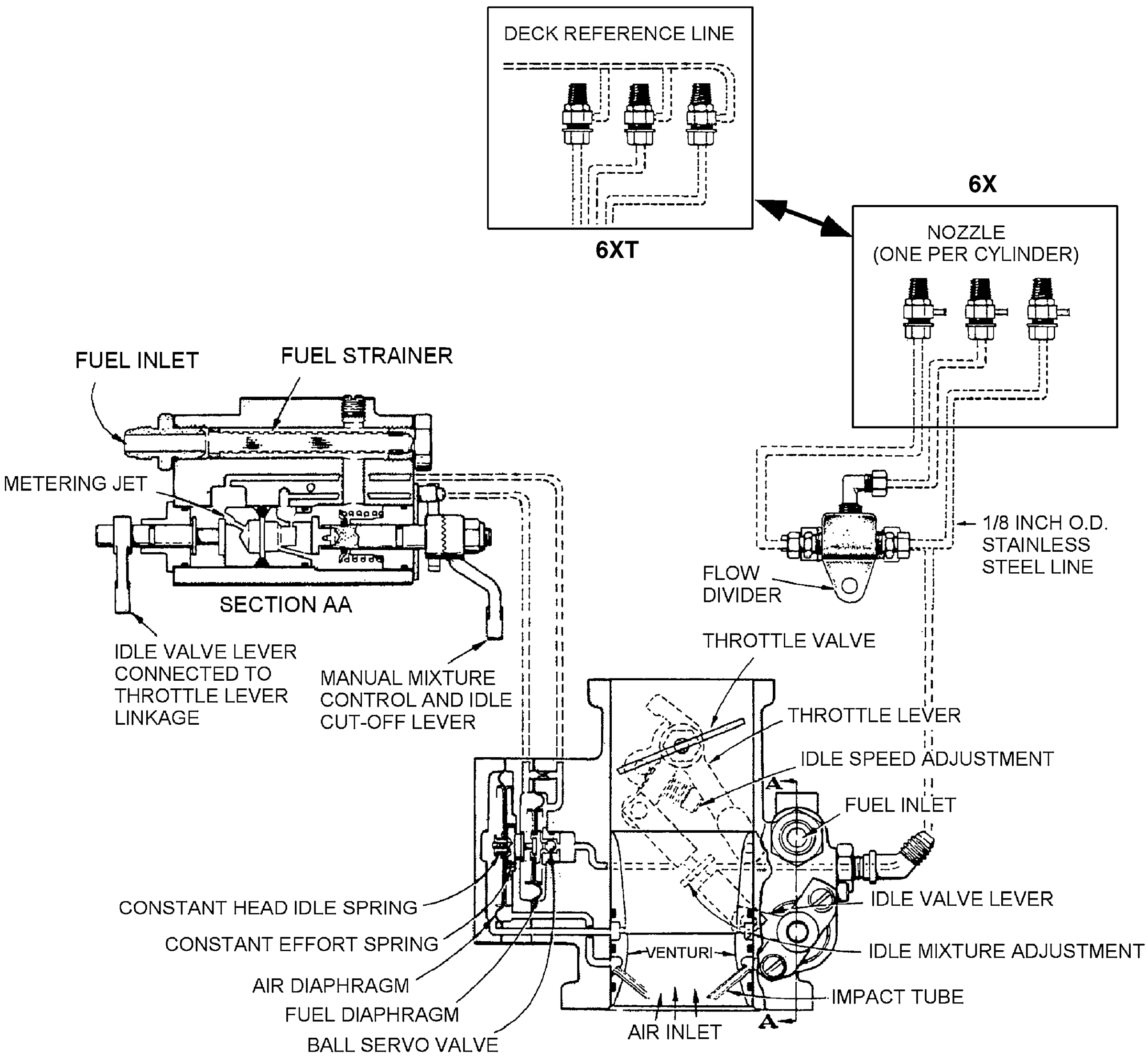
A. Start the engine and warm up in the usual manner until oil and cylinder head temperatures are normal.

B. Check magnetos. If the “mag-drop” is normal, proceed with idle adjustment.

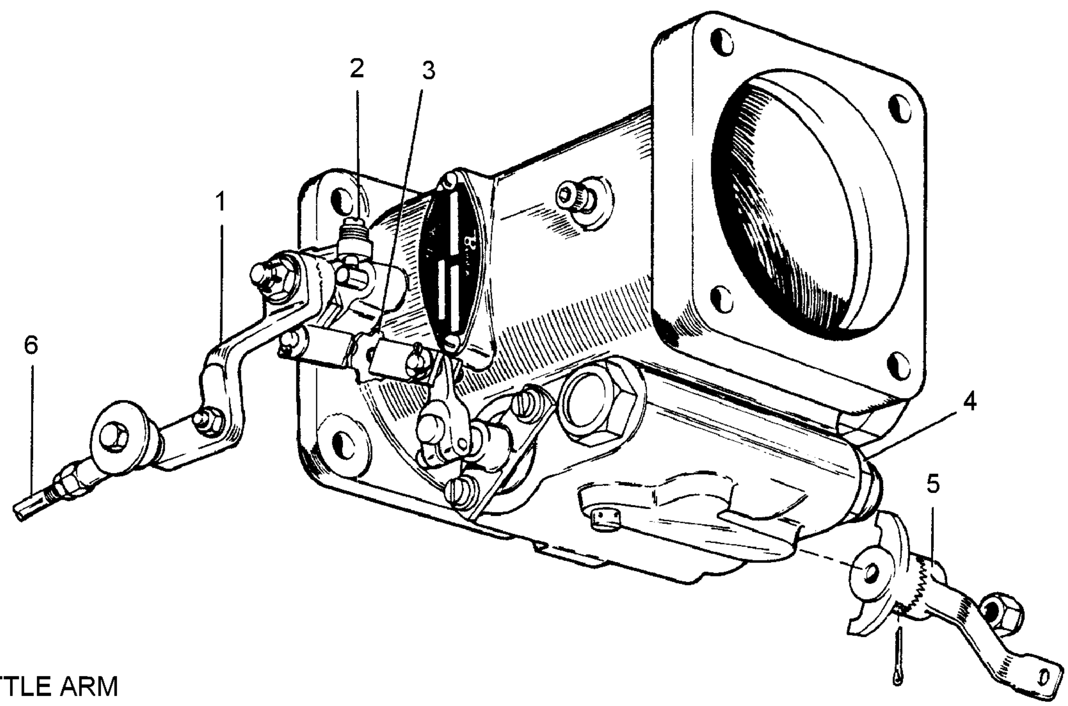
C. Set throttle stop screw so that the engine idles at 700 RPM (± 50 RPM). If the RPM changes appreciably after making the mixture adjustment during the succeeding steps, readjust the idle speed to the desired RPM.

D. When the idling speed has been stabilized, move the cockpit mixture control lever with a smooth, steady pull toward the “Idle Cut-Off” position and observe the tachometer for any change during the leaning process. Caution must be exercised to return the mixture control to the “Full Rich” position before the RPM can drop to a point where the engine cuts out. An increase of more than 10 RPM while “leaning out” indicates an excessively rich idle mixture. An immediate decrease in RPM (if not preceded by a momentary increase) indicates the idle mixture is too lean.

E. If the above indicates that the idle adjustment is too rich or too lean, turn the idle mixture adjustment in the direction required for correction, and check this new position by repeating the above procedure. Make additional adjustments as necessary until a check results in a momentary pick-up of approximately 5 (never more than 10) RPM. Each time the adjustment is changed, the engine should be run up to 2000 RPM to clear the engine before proceeding with the RPM check. Make final adjustment of the idle speed adjustment to obtain the desired idling RPM with closed throttle. The above method aims at a setting that will obtain maximum RPM with minimum manifold pressure. In case the setting does not remain stable, check the idle linkage; any looseness in this linkage would cause erratic idling. In all cases, allowance should be made for the effect of weather conditions and field altitude upon idling adjustment.



RSA Fuel Injection System - Functional Schematic
Figure 2



1. THROTTLE ARM
2. IDLE SPEED ADJUSTMENT
3. IDLE MIXTURE ADJUSTMENT
4. FUEL SCREEN
5. MIXTURE ARM
6. THROTTLE CONTROL CABLE

Fuel Injector
Figure 3

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CONTROLLING

Throttle and Mixture Controls Adjustment (Refer to Figure 1.)

Throttle and Mixture Controls are adjusted so that when the throttle arm on the fuel injector is rotated forward against its full throttle stop and the mixture control is rotated forward against its full rich stop, the cockpit control levers of the throttle and mixture should have 0.010 to 0.030 of an inch spring back on instrument panel stop when in full throttle or full rich position.

A. The throttle may be adjusted as follows:

(1) At the fuel injector, disconnect the clevis end of the throttle control cable from the control arm. Loosen the jam nut that secures the clevis end.

(2) Adjust the linkage by rotating the clevis end on the cable to obtain 0.010 to 0.030 of an inch spring back on instrument panel stop when in full throttle position.

(3) On aircraft equipped with air conditioning systems, a micro switch is located below the throttle control which is set to actuate in the full open position. With the throttle adjusted to obtain a clearance of .010 to .030, adjust the micro switch to actuate at this point also.

(4) Reconnect the clevis end to the control arm and safety.

B. The mixture may be adjusted as follows:

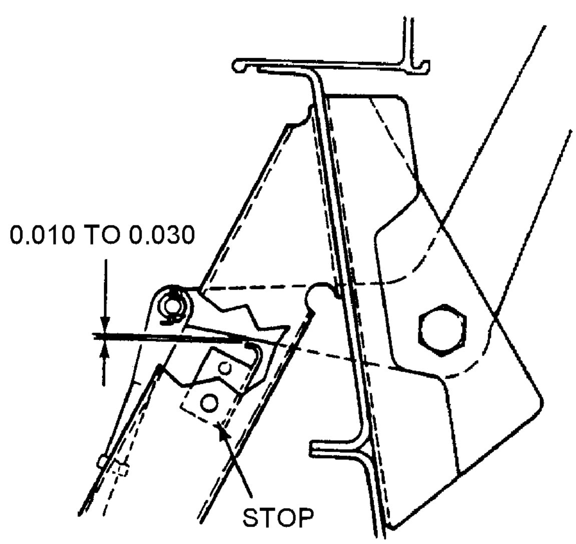
(1) At the fuel injector, disconnect the clevis end of the mixture control cable from the control arm. Loosen the jam nut that secures the clevis end.

(2) Adjust the linkage by rotating the clevis end on the cable to obtain 0.010 to 0.030 of an inch spring back on the instrument panel stop when in full rich position.

(3) Reconnect the clevis end to the control arm and safety.

C. Check security of cable casing attachments.

D. Pull the throttle and mixture levers in the cockpit full aft to ascertain that the idle screw contacts its stop and the mixture control arm contacts its lean position. A mixture control lock is incorporated in the quadrant cover which prevents the mixture control from being moved to the idle cutoff position inadvertently. The lock must be depressed before the control can be moved completely aft. Ascertain that the lock operates freely without any tendency to bind or hang up.



Engine Controls Adjustment
Figure 1

GRIDS 4J22 THRU 4L24
INTENTIONALLY BLANK

AIRPLANE MAINTENANCE MANUAL

CARD 5 OF 5

PA-32-301FT

(S/N's 3232001 & UP)

PA-32-301XTC

(S/N's 3255001 & UP)

THE NEW PIPER AIRCRAFT, INC.

PART NUMBER 766-854

February 19, 2004

Published by
Technical Publications

2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

AEROFICHE REVISION STATUS

Revisions to this Maintenance Manual 766-854 issued June 1, 2003 are as follows:

Revision	Publication Date	Aerofiche Card Effectivity
ORG030601	June 1, 2003	All
PR040219 *	February 19, 2004	All

*** PARTIAL REVISION OF MAINTENANCE MANUAL 766-854**

This revision contains changes in all five aerofiche cards. Accordingly, replace the entire existing Aerofiche Card Set with this one dated 2/19/04.

NOTE: For those few customers who received Temporary Revision No. 22-1, dated January 6, 2004, when taking delivery of a new airplane at the factory or in conjunction with Piper Service Bulletin No. 1145, this February 19, 2004 revision supercedes Temporary Revision No. 22-1 in its entirety - those yellow pages should be removed and destroyed.

Consult the Customer Service Information Aerofiche (P/N 1753-755) for current revision dates for this manual.

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
Intro-List of Effective Pages	1	Feb 19/04			
	2	Jun 1/03			
Intro-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
Introduction	1	Jun 1/03			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Jun 1/03			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Feb 19/04			
	14	Jun 1/03			
Index	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

INTRODUCTION

1. Instructions for Continued Airworthiness

WARNING: INSTRUCTIONS FOR CONTINUED AIRWORTHINESS (ICA) FOR ALL NON-PIPER APPROVED STC INSTALLATIONS ARE NOT INCLUDED IN THIS MANUAL. WHEN A NON-PIPER APPROVED STC INSTALLATION IS INCORPORATED ON THE AIRPLANE, THOSE PORTIONS OF THE AIRPLANE AFFECTED BY THE INSTALLATION MUST BE INSPECTED IN ACCORDANCE WITH THE ICA PUBLISHED BY THE OWNER OF THE STC. SINCE NON-PIPER APPROVED STC INSTALLATIONS MAY CHANGE SYSTEMS INTERFACE, OPERATING CHARACTERISTICS AND COMPONENT LOADS OR STRESSES ON ADJACENT STRUCTURES, THE PIPER PROVIDED ICA MAY NOT BE VALID FOR AIRPLANES SO MODIFIED.

The PIPER PA-32-301FT 6X and PA-32-301XTC 6XT Maintenance Manual constitutes the Instructions for Continued Airworthiness as required by Federal Aviation Regulations (FAR) Part 23, Appendix G. Chapter 4 contains the Airworthiness Limitations section (4-00-00) and the Inspection Program is in Chapter 5 (5-20-00).

2. General

This publication is prepared in accordance with the General Aviation Manufacturers Association (GAMA) Specification No. 2, with respect to the arrangement and content of the System/Chapters within the designated Chapter/Section-numbering system.

WARNING: USE ONLY GENUINE PIPER AIRCRAFT PARTS OR PIPER AIRCRAFT APPROVED PARTS OBTAINED FROM PIPER APPROVED SOURCES, IN CONNECTION WITH THE MAINTENANCE AND REPAIR OF PIPER AIRPLANES.

Genuine PIPER parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in PIPER airplane applications. Parts purchased from sources other than PIPER, even though identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Additionally, reworked or salvaged parts or those parts obtained from non-PIPER approved sources, may have service histories which are unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or may have other hidden damage not discernible through routine visual or nondestructive testing. This may render the part, component or structural assembly, even though originally manufactured by PIPER, unsuitable and unsafe for airplane use.

THE NEW PIPER AIRCRAFT, INC. expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-PIPER approved parts.

NOTE: THE NEW PIPER AIRCRAFT, INC. expressly reserves the right to supersede, cancel and/or declare obsolete any part, part numbers, kits or publication that may be referenced in this manual without prior notice.

In any question concerning the care of your airplane, be sure to include the airplane serial number in any correspondence.

3. Effectivity

This maintenance manual is effective for PA-32-301FT Piper 6X airplane serial numbers 3232001 and up and for PA-32-301XTC Piper 6XT airplane serial numbers 3255001 and up.

This encompasses the following model years:

NOTE: The following is provided as a general reference only.

A. PA-32-301FT 6X

Model Year	Serial Numbers
2003	3232001 thru 3232013
2004	3232014 and up

B. PA-32-301XTC 6XT

Model Year	Serial Numbers
2003	3255001 thru 3255014
2004	3255015 and up

4. Serial Number Explanation

Example:

32 32 001

TYPE CERTIFICATE DESIGNATION

SEQUENCE NUMBER

MODEL CODE
32 = PA-32-301FT 6X
55 = PA-32-301XTC 6XT

5. Assignment of Subject Material

This publication is divided into industry standard, three element, numeric subject groupings as follows:

A. System/Chapter - The various groups are broken down into major systems such as Environmental Systems, Electrical Power, Landing Gear, etc. They are assigned a number, which becomes the first element of the standardized numbering system. Thus, the element “28” of the number 28-40-01 refers to the chapter “Fuel”. Everything concerning the fuel system will be covered in this chapter.

B. Sub-System/Section - The major systems/chapters of an airplane are broken down into subsystems. These sub-systems are identified by the second element of the standard numbering system. The element “40” of the number 28-40-01 concerns itself with the indicating section of the fuel system.

C. Unit/Subject - The individual units within a sub-system/section may be identified by the third element of the standard numbering system. The element “01” of the number 28-40-01 is a subject designator. This element is assigned at the option of the manufacturer and is normally zeroed out by PIPER.

Refer to paragraph 14, Chapter/Section Index Guide, for a complete breakdown and list. The material is arranged in ascending numerical sequence.

6. Pagination

The Chapter - Section (i.e. - 28-40-00) numbering system (explained above) forms the primary page numbering system for this manual. Within each Section, pages are numbered consecutively beginning with Page 1 (i.e. - 28-40-00, Page 1). Additionally, the aerofiche grid numbering system (explained below) is also used to indicate location within the manual.

7. Aerofiche Effectivity

A. The General Aviation Manufacturers Association (GAMA) have developed specifications for microfiche reproduction of aircraft publications. The information compiled in this Aerofiche Maintenance Manual will be kept current by revisions distributed periodically. These revisions will supersede all previous revisions and will be complete Aerofiche card replacements and shall supersede Aerofiche cards of the same number in the set. The “Aerofiche Effectivity” page at the front of this manual lists the current revision for each card in this set.

B. Conversion of Aerofiche alpha/numeric grid code numbers:

First number is the Aerofiche card number.
Letter is the horizontal row reference per card
Second number is the vertical column reference per card.

Example: 2J16 = Aerofiche card number two, row J, column 16.

C. To aid in locating information, the following is provided at the beginning of each aerofiche card:

(1) A complete Introduction containing the Chapter/Section Index Guide for all fiche in this set.
(2) A complete subject Index for all fiche in this set.

8. Identifying Revised Material

A revision to a page is defined as any change to the printed matter that existed previously. Revisions, additions and deletions are identified by a vertical line (i.e. - change bar) along the left-hand margin of the page opposite only that portion of the printed matter that was changed.

A change bar in the left-hand margin opposite the footer (i.e. - chapter/section/subject, page number and date), indicates that the text was unchanged but the material was relocated to a different page.

Example.

NOTE: Change bars are not used in the title pages, list of effective pages, or index.

9. Indexing

An alphabetically arranged subject Index follows this introduction to assist the user in locating desired information. In addition, each System/Chapter begins with an individual Table of Contents.

10. List of Effective Pages

Each System/Chapter has a List of Effective Pages preceding the Table of Contents to identify the effective revision date for each page in that chapter.

11. Warnings, Cautions and Notes

These adjuncts to the text are used to highlight or emphasize important points when necessary. Warnings call attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons. Cautions call attention to methods and procedures which must be followed to avoid damage to equipment. Notes call attention to methods which make the job easier. Warnings and Cautions shall be located directly above and Notes directly beneath the text and be in line with the paragraphs to which they apply.

12. Accident/Incident Reporting

To improve our Service and Reliability system and aid in our compliance with FAR 21.3, knowledge of all incidents and/or accidents must be reported to Piper immediately. To expedite and assist in reporting all incidents and accidents, Piper Form 420-01 has been created. See Service Letter 1041 for latest revision. This procedure is to be used by all Dealers, Service Centers and Repair Facilities.

13. Supplementary Publications

The following publications/sources provide servicing, overhaul and parts information for the PA-32-301FT/301XTC airplanes and their various components. Use them to supplement this manual.

A. Piper Publications:

	PA-32-301FT	PA-32-301XTC
(1) Parts Catalogs:	P/N 766-856	P/N 766-855
(2) Periodic Inspection Reports:	P/N 766-857	P/N 766-858
(3) Progressive Inspection Manuals (pending)	P/N 767-027	P/N 767-028

B. Vendor Publications:

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY.

(1) AIR CONDITIONING COMPRESSOR:

Vendor Address: Sanden International (USA), Inc.
601 South Sanden Blvd.
Wylie, Texas 75098
http://www.sanden.com/
PH: - (972) 442-8400
FAX: - (972) 442-8700

(2) AIR CONDITIONING EVAPORATORS AND BLOWERS:

Vendor Address: Enviro Systems, Inc.
P.O. Box 1404
Seminole, Oklahoma 74868
PH: - (405) 382-0731

(3) ALTERNATOR:

Vendor Address: Electro Systems, Inc.
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/
PH: - (888) 461-6077

(4) AUTOPILOT:

Vendor Address: S-TEC Corporation
One S-TEC Way
Mineral Wells, Texas 76067-9236
http://www.s-tec.com
PH: - (940) 325-9406

(5) BATTERY:

Vendor Address: GILL Batteries
A Division of Teledyne Continental Motors
http://www.gillbatteries.com
PH: - (800) 456-0070

(6) BRAKES AND WHEELS:

Vendor Address:	Parker Hannifin Corp Aircraft Wheel and Brake Division 1160 Center Road Avon, Ohio 44011 http://www.parker.com/cleveland/Universe/book.pdf	PH: - (800) 272-5464

(7) ELECTRONIC FLIGHT DISPLAY SYSTEM (EFDS)

Vendor Address:	Avidyne Corporation 55 Old Bedford Road Lincoln, MA 01773 http://www.avidyne.com/index.htm	PH - (800) 284-3963

Instructions for Continued Airworthiness

Primary Flight Display and Magnetometer/OAT:	Document No. AVPFD-174
Multifuntion Display:	Document No. AVMFD-167
Data Acquisition Unit:	Document No. AVSIU-011

(8) EMERGENCY LOCATOR TRANSMITTER:

Vendor Address:	Artex Aircraft Supplies 14405 Keil Road NE Aurora, Oregon 97002 http://www.artex.net/	PH: - (800) 547-8901

(9) ENGINE:

Vendor Address:	Textron Lycoming 652 Oliver Street Williamsport, PA 17701 http://www.lycoming.textron.com/main.html	PH - (717) 323-6181 FAX - (717) 327-7101
Overhaul Manual:	DIRECT DRIVE MODELS - P/N 60294-7	
Parts Catalog:	IO-540- ..... - K1G5, ... ENGINES - P/N PC-615 TIO-540-AH1A ENGINES - P/N PC-615-12	
Operators Handbook:	O-540, IO-540 SERIES - P/N 60297-10 TIO-540 Series - P/N 60297-23	

NOTE: The above Lycoming publications can be ordered as a set on CD-ROM from Avantext. See www.avantext.com or PH - (800) 998-8857.

(10) FIRE EXTINGUISHER (PORTABLE):

Vendor Address:	H3R Inc. 43 Magnolia Ave # 4 San Francisco, California 94123-2911 http://www.h3r.com/index.htm	PH: - (800) 249-4289

(11) FUEL PUMP:

Vendor Address:	Weldon Pumps P.O. Box 46579 640 Golden Oak Parkway Oakwood Village, Ohio 44146 http://www.weldonpumps.com/index.html	PH: - (440) 232-2282 FAX - (440) 232-0606

(12) FUEL CELLS:

Vendor Address:	Engineered Fabrics Corporation 669 Goodyear Street Rockmart, Georgia 30153-0548 http://www.kfefc.com/index.htm	PH - (770) 684-7855 FAX - (770) 684-7438

(13) HI-LOK FASTENERS AND TOOLS:

Vendor Address:	Hi-Shear Corporation 2600 Skypark Drive Torrance, California 90509	PH: - (213) 326-8110

(14) LIGHTS - NAVIGATION, STROBE, AND STANDBY/MAP LIGHTS:

Vendor Address:	Whelen Engineering Co. Inc. Route 145, Winthrop Rd. Chester, Conneticut 06412 http://www.whelen.com/	PH: - (860) 526-9504 FAX - (860) 526-2009

(15) MAGNETOS:

Vendor Address:	Slick Aircraft Products Unison Industries Attn: Subscription Dept. 530 Blackhawk Park Ave. Rockford, IL 61104 http://www.unisonindustries.com/index4.html	PH - (815) 965-4700 FAX - (815) 965-2457
Installation, Operation and Maintenance Instructions:	F1100 MASTER SERVICE MANUAL, 4300/6300 SERIES MAGNETO MAINTENANCE AND OVERHAUL MANUAL - L-1363	

(16) NAVIGATION, COMMUNICATIONS, AND GPS (NAV/COM/GPS):

Vendor Address:	Garmin International 1200 East 151ST Street Olathe, KS 66062 http://www.garmin.com	PH: - (913) 397-8200

(17) OXYGEN SYSTEM (6XT only):

Vendor Address:	Scott Aviation 2225 Erie Street Lancaster, New York 14086 http://www.scottaviation.com/	PH - (716) 683-5100

(18) PROPELLER:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Standard Practices:	Manual No. 202A	
Overhaul and Maintenance:	Manual No. 113B	
Aluminum Blade Overhaul:	Manual No. 133C	
Propeller Owner's Manual and Logbook:	Manual No. 115N	

(19) PROPELLER GOVERNOR:

Vendor Address:	Hartzell Propeller Inc. One Propellor Place Piqua, OH 45356-2634 http://www.hartzellprop.com/index2.htm	PH - (937) 778-4379 FAX - (937) 778-4321
Governor Maintenance:	Manual No. 130B	

(20) STANDBY ATTITUDE INDICATOR:

Vendor Address:	Mid-Continent Instruments Co., Inc. 9400 E. 34 TH Street N. Wichita, KS 67226 http://www.mcico.com/index.html	PH - (316) 630-0101 FAX - (316) 630-0723
Installation Manual and Operating Instructions:	Manual No. 9015762	

(21) STARTER:

Vendor Address:	Sky-Tec 350 Howard Clemmons Rd. Granbury, Texas 76048 http://www.skytecair.com	PH - (800) 476-7896 FAX - (817) 573-2252

(22) VACUUM PUMPS:

Vendor Address:	Aero Accessories, Inc. 1240 Springwood Avenue Gibsonville, NC 27249 http://www.aeroaccessories.com/index.html	PH - (800) 822-3200

(23) VACUUM REGULATORS:

Vendor Address: Parker Hannifin Corp. PH: - (800) 382-8422
Airborne Division
711 Taylor Street
Elyria, Ohio 44035
http://www.parker.com/cleveland/Universe/book.pdf

(24) VOLTAGE REGULATOR:

Vendor Address: Electro Systems, Inc. PH: - (888) 461-6077
Airport Complex
P. O. Box 273
Fort Deposit, Alabama 36032
http://www.kellyaerospace.com/index.htm/

14. Chapter/Section Index Guide

NOTE: The following GAMA Specification No. 2 standard chapters are not included in this Maintenance Manual: 26, 29, 36, 38, 49, 53, 54, 60, 72, 75, 76, and 83. These chapters are omitted because the subject system is either: not installed in these airplanes; adequately covered in vendor or other manuals; or, for ease of use, has been combined with another chapter.

GRIDS 5A22 THRU 5A24
INTENTIONALLY BLANK

A

B

C

D

E

F

M

O

P

R

S

GRIDS 5B6 THRU 5B24
INTENTIONALLY BLANK

CHAPTER

74

IGNITION

THIS PAGE INTENTIONALLY BLANK

CHAPTER 74

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE
74-List of Effective Pages	1	Jun 1/03
	2	Jun 1/03
74-Table of Contents	1	Jun 1/03
	2	Jun 1/03
74-10-00	1	Jun 1/03
	2	Jun 1/03
	3	Jun 1/03
	4	Jun 1/03
	5	Jun 1/03
	6	Jun 1/03
	7	Jun 1/03
	8	Jun 1/03
	9	Jun 1/03
	10	Jun 1/03
	11	Jun 1/03
	12	Jun 1/03
	13	Jun 1/03
	14	Jun 1/03
	15	Jun 1/03
	16	Jun 1/03
	17	Jun 1/03
	18	Jun 1/03
	19	Jun 1/03
	20	Jun 1/03
74-20-00	1	Jun 1/03
	2	Jun 1/03
	3	Jun 1/03
	4	Jun 1/03
	5	Jun 1/03
	6	Jun 1/03
	7	Jun 1/03
	8	Jun 1/03
	9	Jun 1/03
	10	Jun 1/03
74-30-00	1	Jun 1/03
	2	Jun 1/03

THIS PAGE INTENTIONALLY BLANK

CHAPTER 74 - IGNITION

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

ELECTRICAL POWER SUPPLY

1. Ignition System

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

A. Description

Ignition of the fuel charge in each cylinder is accomplished by two spark plugs independently excited by one of two Slick 6300 series magnetos. Each magneto separately generates, times and distributes high tension (voltage) through leads to each cylinder. In 6XT S/N's 3255001 & up only, both magnetos are pressurized by turbo compressor bleed air to improve magneto efficiency at altitude.

The magnetos are controlled by two switches in the overhead switch panel. With its switch OFF, the magneto is grounded and will not produce spark. The right magneto fires all the lower spark plugs. The left magneto fires all the upper spark plugs.

The right magneto is standard and the left magneto is an impulse-coupled type installed to retard magneto ignition timing (see lag angle on magneto dataplate) and provide spark for engine starting. As the engine is cranked, a spring in the impulse coupling is wound. When the engine crankshaft reaches the proper position for starting, the spring in the impulse coupling is released to spin the rotating magnet and produce the spark required to fire the engine. After the engine starts, the impulse coupling flyweights disengage the coupling due to centrifugal action. The coupling then acts as a straight drive and the magneto fires at the normal firing position of the engine.

NOTE: Check the magneto data plate to verify the specific model number and series of the magneto being worked on.

B. Troubleshooting

See Chart 1.

C. Replacement Magnetos

An alternative to overhaul is complete magneto replacement with a new Slick magneto. New Slick magnetos incorporate all the latest design features and may be a cost effective alternative to overhaul.

D. Overhaul

Overhaul is required as conditions indicate, but in no case may Slick 6300 series magnetos time-in-service exceed the TBO for the engine. Magnetos must also be overhauled after a lightning strike or following a sudden engine stoppage.

Information provided in this section is intended to support magneto removal, cleaning, inspection, replacement and timing. For magneto overhaul procedures, see Slick's F-1100 Master Service Manual available from:

Slick Aircraft Products　　PH: 815-965-4700
Unison Industries
Attn: Subscription Dept.
530 Blackhawk Park Avenue
Rockford, IL 61104

CHART 1
TROUBLESHOOTING MAGNETOS

Trouble	Cause	Remedy
Failure of engine to start.	Defective spark plugs.	Clean and adjust or replace spark plugs.
	Defective ignition wire.	Check with electric tester and replace defective wires.
	Defective battery.	Replace with charged battery.
	Improper operation of magneto breaker.	Check points. Check internal timing of magnetos.
Failure of engine to idle properly.	Faulty ignition system.	Check entire ignition system.
Low power and uneven running.	Defective spark plugs.	Clean and gap or replace spark plugs.
	Magneto breaker points not working properly.	Clean points. Check internal timing of magnetos.
	Defective ignition wire.	Check wire with electric tester. Replace defective wire.
	Defective spark plug terminal connectors.	Replace connectors on spark plug wire.
Failure of engine to develop full power.	Faulty ignition.	Tighten all connections.
		Check system with tester.
		Check ignition timing.

2. Magnetos

A. 100 Hour Inspection

Every 100 hours or at annual inspection, whichever comes first, perform the following checks.

WARNING: BE SURE IGNITION SWITCH IS IN THE "OFF" POSITION AND THE CONDENSER P-LEAD IS GROUNDED.

(1) Adjust timing to engine. (See Figure 1.)

(a) Turn the engine crankshaft in the normal direction of rotation until the No. 1 cylinder is in the full-advance firing position.

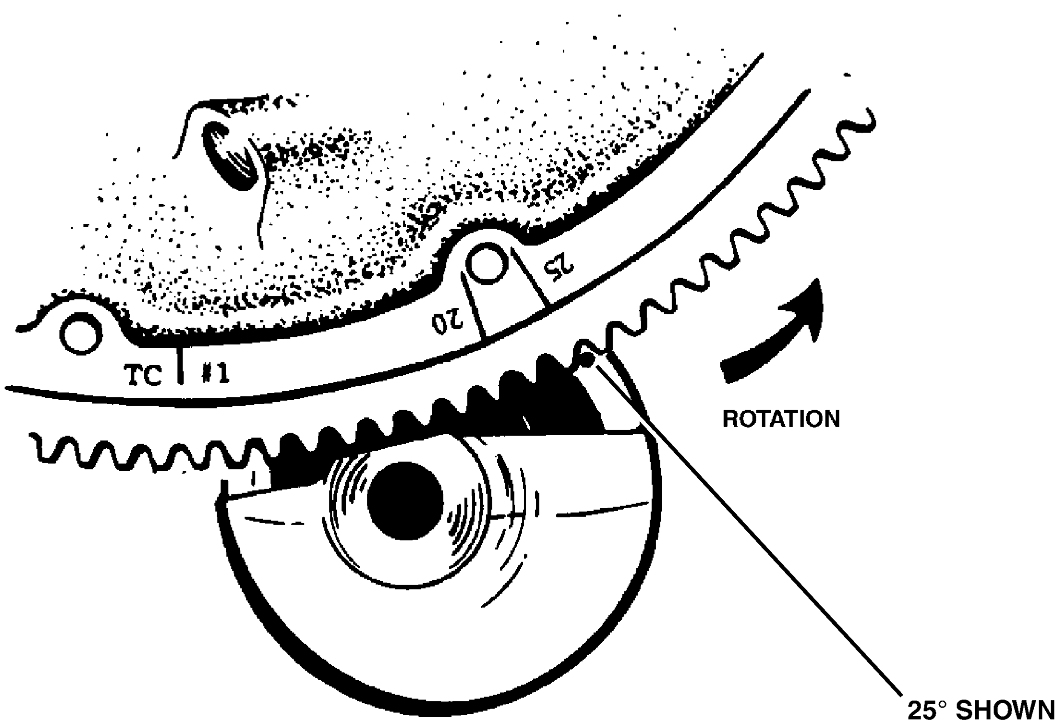
1 Cover spark plug hole of number one cylinder with thumb. Rotate crankshaft until pressure is felt on thumb.

2 Rotate crankshaft slowly until the advance timing mark on the starter ring gear is in alignment with the small hole located at the two (2) o'clock position on the front face of the starter housing. When the 20° mark on the gear is aligned with the small hole, number one piston is at 20° BTC.

NOTE: Always verify correct BTC on the engine data plate.

(b) Scribe a reference mark on the magneto mounting flange and engine accessory case.

(c) Loosen the magneto mounting bolts, and connect a standard timing light between engine ground and the magneto condenser terminal.



Engine Timing Marks (Typical)
Figure 1

WARNING: DO NOT ROTATE PROPELLER WHEN IGNITION SWITCH IS IN THE "ON" POSITION. THE MAGNETOS WILL FIRE THE SPARK PLUGS IF THE PROPELLER IS ROTATED - FATAL INJURY IS POSSIBLE.

(d) Turn ignition switch ON.

(e) Rotate the magneto, in its mounting, in the direction of normal operating rotation until the timing light indicates the contact breaker points are open.

(f) Slowly rotate the magneto opposite normal rotation of the magneto on the engine mounting until the timing light (or audible signal) goes out.

(g) Measure the distance from the reference mark previously scribed on the accessory case and the corresponding reference mark on the magneto. If this measurement is more than 1/8 inch, remove the magneto (paragraph B) and inspect/adjust the contact breaker points per paragraphs C (4) & (5) and E (9) & (10), respectively. A 1/8 inch change corresponds to an approximate 5° change in internal magneto timing.

(h) Secure the magneto in this position, alternately tightening the magneto mounting clamps - first to 8 ft-lbs. and finally to 17 ft-lbs. of torque.

(i) Turn ignition switch OFF.

(2) Inspect harness. See Section 74-20-00.

(3) In 6X S/N's 3232001 & up only (i.e. - non-pressurized magnetos), inspect vent holes. Ensure vent holes are clean and clear of any obstruction.

(4) Inspect P-lead attachment. The P-lead connects the magneto primary circuit to the ignition switch. If the P-lead is disconnected, the magneto will be "HOT" and will fire the spark plug if the propeller is rotated. Verify that the P-lead is attached to the condenser stud. Torque to 13 to 15 in-lbs.

(5) In 6XT S/N's 3255001 & up only (i.e. - pressurized magnetos):

(a) Inspect turbo filter. Look for yellow or red color, condensation, water, or foreign matter in the filter element. If the filter is contaminated: replace filter; inspect and repair pressurization system; and remove and inspect magnetos.

(b) Inspect and clean inlet nozzle. Yellow or white particles or any oily film indicates moisture contamination and possible lack of pressurization. Inspect and repair pressurization system.

(c) Inspect and clean ofifice vent. Maximum orifice diameter is .025 inch.

B. Removal

CAUTION: ASCERTAIN THAT THE PRIMARY CIRCUIT OF THE ENGINE IS GROUNDED BEFORE WORKING ON THE ENGINE.

Before removing the magnetos, make sure the magneto switches are OFF.

WARNING: THE MAGNETO IS NOT INTERNALLY GROUNDED, WHEN THE GROUND LEAD IS DISCONNECTED THE MAGNETO IS HOT. REMOVING THE HARNESS ASSEMBLY FIRST AND INSTALLING THEM LAST, MINIMIZES THE DANGER OF STARTING THE ENGINE ACCIDENTALLY WHEN THE GROUND LEAD IS REMOVED FROM THE MAGNETO.

(1) Turn the engine crankshaft in the normal direction of rotation until the No. 1 cylinder is in the full-advance firing position.

(2) Remove the harness cap from the magneto. Before doing this, place an index mark on the harness cap and distributor housing to ensure proper alignment upon reassembly.

(3) Disconnect the P-lead and pressurization tube from magneto.

(4) Remove the nuts, washers and clamps, and remove the magnetos from the engine.

(5) Cover the magneto accessory opening with suitable material to prevent internal engine contamination.

C. 500 Hour Inspection and Cleaning

Each 500 hours, remove magneto per paragraph B, above, and disassemble magneto, as necessary, per procedures in paragraph D, below. Inspect and clean magneto as follows:

(1) Inspect ball bearing assembly by rotating rotor shaft. Shaft should rotate freely without binding or sticking, but should not appear loose. If not, replace bearings.

(2) Inspect rotor for damage or worn keyway. Check rotor surfaces for wear.

(a) Inspect oil seal location on shaft.

(b) Assemble bearings and rotor per paragraph E (1) & (2), below.

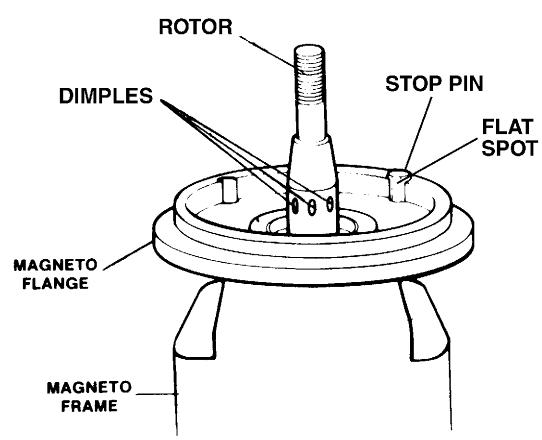
(c) In the left magnetos only (i.e. - impulse coupled), inspect magneto rotor shaft at impulse coupling (see Figure 2). If the heel of the pawl has struck the shaft and caused the shaft to dimple in excess of .006 inch per side, the rotor shaft must be replaced.

(3) In the left magnetos only (i.e. - impulse coupled), clean and inspect the impulse coupling:

(a) Clean to bare metal to ensure a reliable inspection. Use a suitable degreasing solvent to remove all oil or sludge buildups.

(b) Inspect impulse coupling shell and hub for cracks, rust or corrosion. Replace impulse coupling, if found.

(c) Inspect hub shaft and keyway for deformation or damage. Replace impulse coupling, if found.



Rotor and Stop Pin
Figure 2

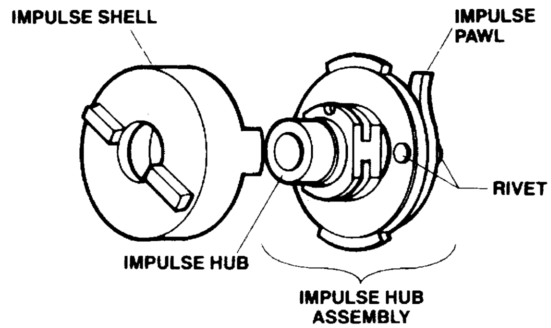
(d) Inspect impulse coupling pawl latching ends (see Figure 4). If rounded, peened, or excessively worn, replace impulse coupling.

NOTE: Stringers, inclusions, and heat checks may appear on the surfaces of impulse coupling components. These conditions are normal and, by themselves, generally do not require impulse coupling replacement.

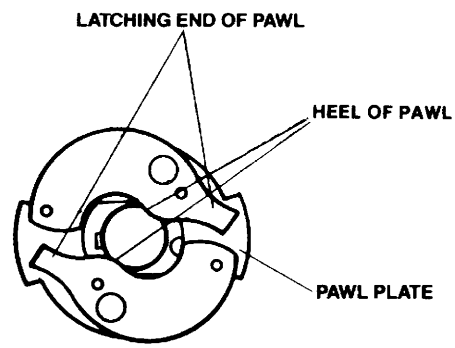
(e) Inspect pawl retaining rivets. If loose or, if they show indications of movement, replace impulse coupling.

(f) Measure the clearance between the boss on the underside of each impulse pawl and the pawl plate using a feeler gauge. Position the latching end of the impulse pawl over the pawl plate as shown in Figure 4.

(g) Maximum clearance for pawls with one boss is .150 inch (see Figure 5). Maximum clearance for pawls with two bosses is .150 inch for left-hand rotation couplings and .140 inch for right-hand rotation couplings. If the feeler gauge passes between the full width of the boss(es) and the pawl plate, replace the impulse coupling.



Impulse Coupling
Figure 3



Impulse Coupling Pawls
Figure 4

(4) In the left magnetos only (i.e. - impulse coupled), reassemble and install the impulse coupling:

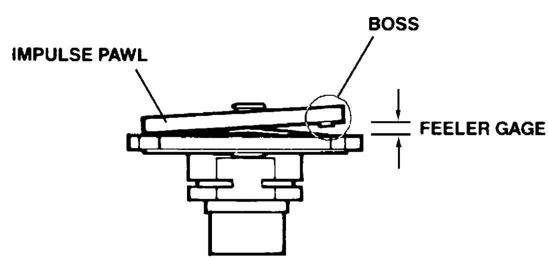
(a) Lubricate the pawl assembly, hub and spring with aircraft engine oil. Verify that pawls move freely.

(b) Reassemble impulse coupling per paragraph E (5), below.

(c) Inspect stop pin for looseness, cracks or corrosion (see Figure 2). Replace magneto frame, if found.

(d) Inspect stop pin for flat spots. These are a normal sign of wear and do not, of themselves, mandate component replacement. However, if the flat spots allow the impulse coupling pawls to slip past the stop pin, then either or both the impulse coupling and the magneto frame must be replaced.

(e) Install impulse coupling per paragraph E (6), below.



Measuring Pawl Clearance
Figure 5

(5) Inspect coil for visible radial cracks. Replace coil if cracks evident. Inspect coil for primary and secondary circuit resistance and continuity, as follows: primary coil - .50 to 1.2 ohms; secondary coil - 13,000 to 20,500 ohms. Replace, if required.

(6) Inspect primary contact points for signs of pitting and discoloration. If points are not discolored and have a white, frosty surface around the edges, points are functioning properly and can be reused. If points are blue (indicating excessive arcing) or pitted, they should be discarded. Replace primary contact point assembly, condenser and cam.

(7) Clean and inspect condenser.

(a) If the external surfaces of the condenser are dirty, clean with light soapy water. Rinse thoroughly with clear water and pat dry before reinstalling into the magneto housing.

(b) Using a magnifying lens, examine the glass bead end seals of the capacitor for broken glass or for glass separation from the retaining steel rings. Replace, if required.

(c) Inspect the condenser for signs of corrosion. Replace, if required.

(d) Inspect the condenser P-lead stud for twisting or "pulled" condition. Replace, if required.

(e) Test the electrical properties of the condenser using appropriate calibrated test equipment. Test for capacitance value with condenser charged to 400 volts DC. Service limit: .35 microfarad + 10 percent. Test for resistance, measured between condenser lead wire and condenser shell. Resistance should be greater than 10 megaohms.

NOTE: No field repairs of any type to the condenser are approved.

(f) Install condenser per paragraph E (12), below.

(8) Clean and Inspect Distributor Block

CAUTION: DO NOT PUT CLEANER IN EITHER BRONZE OILITE BUSHING. THESE BUSHINGS ARE IMPREGNATED AT THE FACTORY AND CLEANER WILL DRAW THE LUBRICANT OUT OF THE BUSHING.

(a) Disassemble and clean the distributor block bearing bar. Use standard non-filming non-conductive cleaner. Clean distributor gear with soapy water and rinse with clean water.

(b) Clean all surfaces free of dirt, oil, carbon dust and other contaminants using a cotton swab or "Q-Tip".

(c) Inspect the distributor block for cracks or other physical damage. Replace, as required.

(d) Inspect the brass electrode posts for signs of physical wear. Replace block assembly, as required, but note that during normal operation, the post will experience an electrical-metal transfer with the distributor gear electrode.

(e) Inspect oilite bushing for gumming oil. The bushing should be free of contamination and the gear should turn freely in the distributor block with no appreciable drag. If the bushing is gummed, wipe the bushing with MEK and lubricate with one drop of Exxon Teresstic 100 or Slick P/N M-3306. No other oils should be placed in these bushings.

(f) Ensure the distributor block surfaces are free of all oil and carbon dust prior to reassembly.

(g) Inspect distributor gear teeth for wear and general integrity. Replace block assembly as required.

(h) Inspect the electrode finger for looseness. The electrode should be held securely to the shaft when tested with light finger pressure. If loose, replace block and gear.

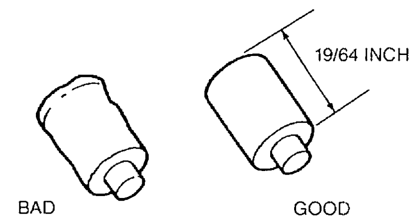
(i) Clean the end of the electrode to remove electrical deposits.

(j) Inspect bearing bar for cracks or other physical damage. Replace as required.

(k) Ensure the bearing bar is free of all and carbon dust prior to reassembly.

(9) Inspect the carbon brush. Overall length must be greater than 19/64 (.297) inch and the outside diameter must be uniform (see Figure 6). Replace as required.

(10) Inspect the loading spring. Overall free standing length should be greater than 19/32 (.594) inch. Springs that appear worn, that have flat spots or are too short must be replaced.



Carbon Brush Assembly
Figure 6

(11) In 6XT S/N's 3255001 & up only (i.e. - pressurized magnetos):

(a) Inspect turbo filter. Look for yellow or red color, condensation, water, or foreign matter in the filter element. If the filter is contaminated: replace filter; inspect and repair pressurization system; and remove and inspect magnetos.

(b) Inspect and clean inlet nozzle. Yellow or white particles or any oily film indicates moisture contamination and possible lack of pressurization. Inspect and repair pressurization system.

(c) Inspect and clean ofifice vent. Maximum orifice diameter is .025 inch.

(d) Inspect frame gasket for wear. Replace as required. Use only Slick replacement gaskets as gasket contains a metal mesh to insure proper ground between magneto frame and housing. Inspect screw gaskets for wear. Replace as required.

(e) Inspect harness cap O-ring for wear. Replace as required.

D. Disassembly (see Figures 7 and 8.)

NOTE: Use of the Slick T-100 Assembly and Timing Kit (Figure 7) is strongly recommended. The tools contained in this kit will greatly facilitate magneto disassembly/assembly and help prevent damage to parts.

(1) Remove impulse coupling:

CAUTION: THE SHELL OF THE IMPULSE COUPLING ASSEMBLY IS UNDER CONSIDERABLE SPRING TENSION.

(a) Remove cotter pin, nut, washer and bushing; and drive gear, where applicable.

(b) Firmly holding the shell of the impulse coupling assembly, gently pull shell of impulse coupling assembly out enough to clear the latching ears of the impulse hub assembly.

(c) Turn shell to release spring tension. Remove shell and attached impulse spring.

(d) Engage T-106 hub puller into grooves in the hub assembly. Tighten T-106 puller bolt to remove impluse coupling hub assembly.

(2) Remove Woodruff key by prying key from rotor shaft using pliers.

(3) Remove distributor housing assembly

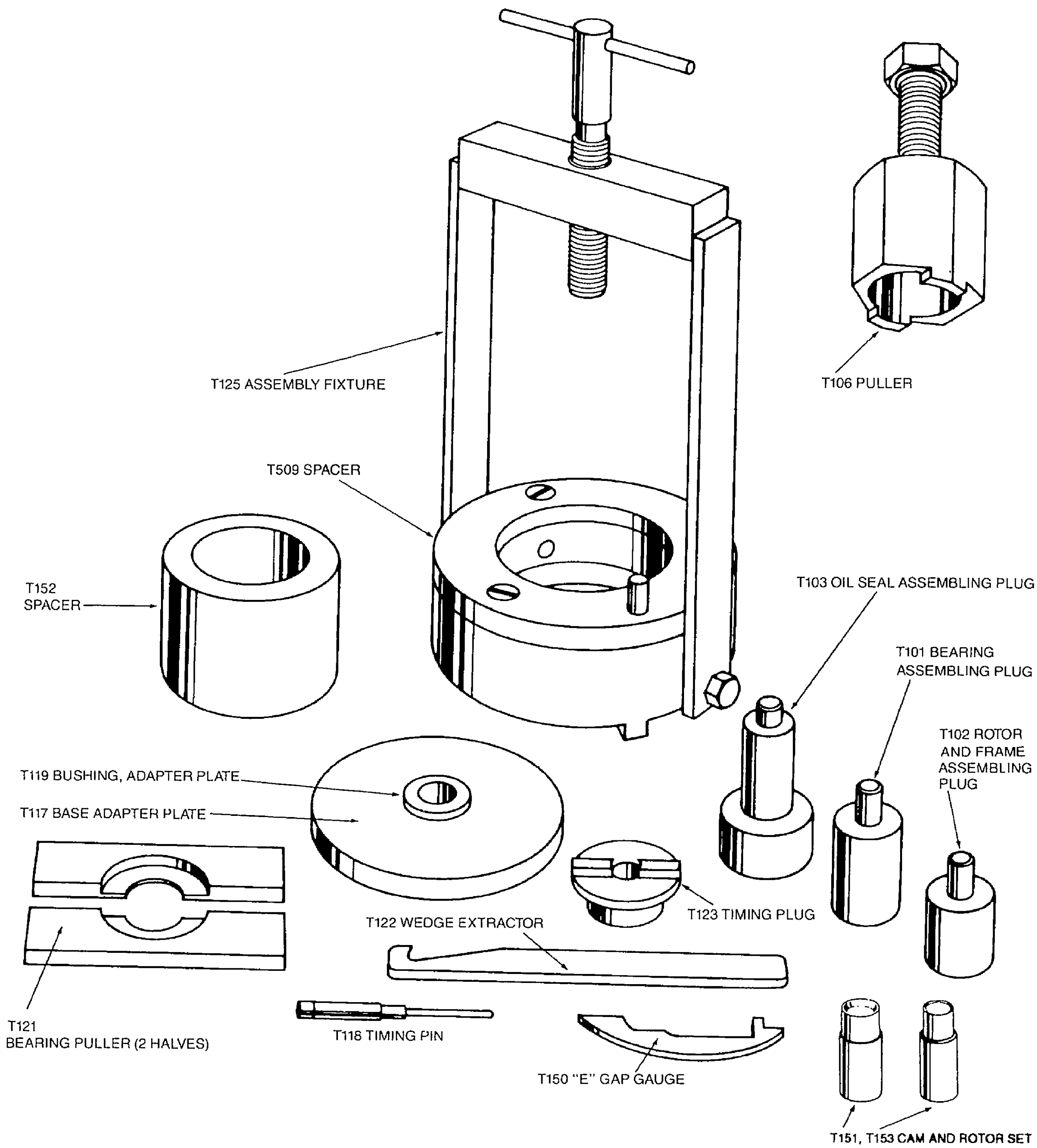
(a) Remove three long screws and single short screw from distributor housing.

(b) Separate distributor housing from magneto frame.

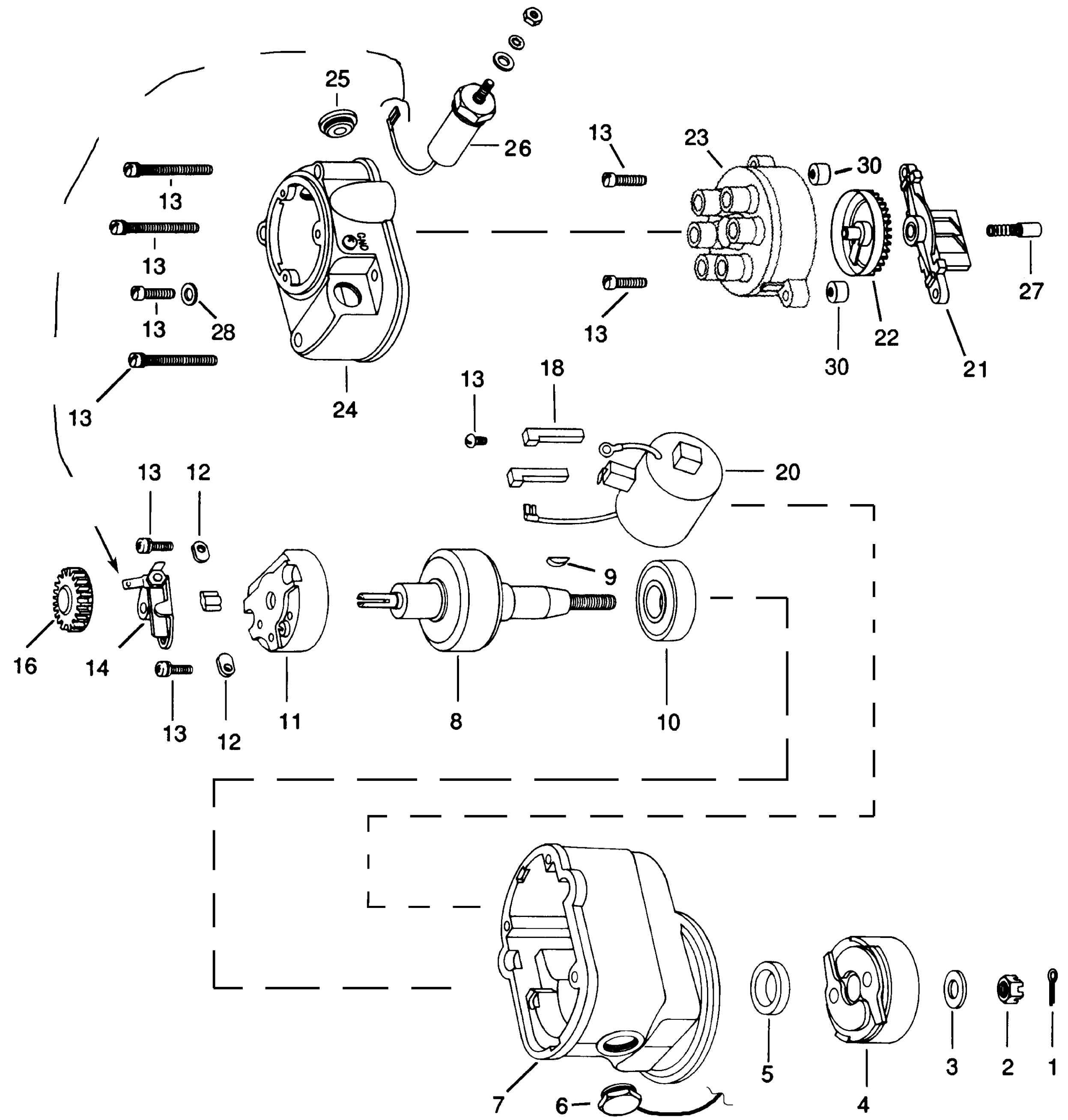
(c) Disconnect condenser lead from contact breaker assembly.

(4) Remove the distributor block assembly by removing two screws and remove distributor bearing bar, distributor gear and distributor block from the housing.

(5) Remove condenser. When removing the condenser from the distributor housing, carefully rotate the condenser wire counterclockwise in the same direction as the condenser to eliminate twisting the condenser lead.



Slick T-100 Assembly and Timing Tool Kit
Figure 7



1. COTTER PIN
2. NUT
3. WASHER
4. * IMPULSE COUPLING ASSY.
5. OIL SEAL
6. TACH MAGNETIC SENSOR
7. MAGNETO FRAME
8. ROTOR
9. WOODRUFF KEY
10. BALL BEARING

* - LEFT MAGNETO ONLY.

11. BEARING CAP ASSEMBLY
12. BEARING CAP CLAMP
13. SCREW (VARIOUS)
14. CONTACT POINTS
15. NOT USED
16. ROTOR GEAR
17. NOT USED
18. COIL WEDGE
19. NOT USED
20. COIL
21. BEARING BAR
22. GEAR, DISTRIBUTOR
23. BLOCK, DISTRIBUTOR
24. HOUSING, DISTRIBUTOR
25. AIR VENT WITH HOOD.
26. CONDENSOR
27. CARBON BRUSH
28. WASHER
29. NOT USED
30. SPACER

Exploded View of 6300 Series Magneto
Figure 8

(6) Remove rotor gear by prying it out of the end of the rotor assembly using two flat-blade screwdrivers.

(7) Remove contact breaker assembly - Impulse Coupled and Direct Drive Magnetos
   (a) Disconnect coil lead wire from contact breaker assembly.
   (b) Remove screws and washers from breaker assembly.
   (c) Remove contact breaker assembly from bearing cap.
   (d) Remove cam by prying straight up with a screwdriver blade.

(8) Remove rotor assembly

   CAUTION: DO NOT ALLOW ROTOR TO COME INTO CONTACT WITH METAL CHIPS OR FILINGS. ROTOR IS MAGNETIZED.

   (a) Remove two screws and two bearing plate clamps.
   (b) Press against the drive end of the rotor shaft and withdraw the rotor and bearing cap assembly from the drive frame.

(9) Remove bearings from shaft and discard

   CAUTION: DO NOT DISASSEMBLE BEARING CAP ASSEMBLY SLICK PART NUMBER M-3485. THIS ASSEMBLY HOLDS A DOUBLE-SHIELDED BEARING CAPTIVE IN THE BEARING CAP AND IS PRE-LUBRICATED AT THE FACTORY WITH SPECIAL GREASE THAT TOLERATES THE OZONE RICH ENVIRONMENT WITHIN THE MAGNETO.

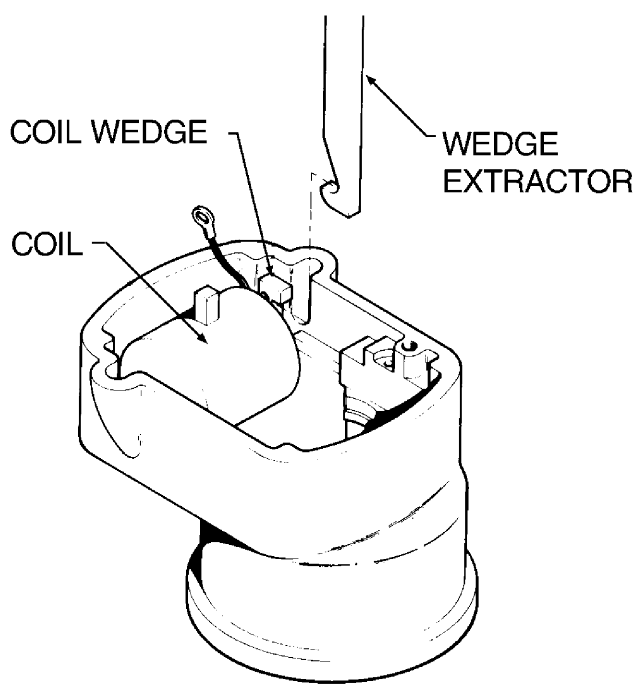
   CAUTION: DO NOT ALLOW ROTOR TO COME INTO CONTACT WITH METAL CHIPS OR FILINGS. ROTOR IS MAGNETIZED.

   (a) Place rotor on T-152 spacer with drive end down. Using T-125 assembly fixture, press rotor shaft, removing bearing cap assembly.
   (b) Reverse rotor shaft and insert T-121 bearing puller (both halves) between the drive end bearing and the rotor magnet head.
   (c) Place rotor and T-121 on T-152 spacer.
   (d) Press rotor shaft and remove drive end bearing.

(10) Remove coil (See Figure 9.)
   (a) Remove coil primary ground screw.
   (b) Using coil wedge extractor T-122, remove coil wedges and lift out coil.

(11) Remove air vent/pressure vent plug from magneto.

(12) Remove oil seal from magneto.



Coil Wedge Removal
Figure 9

E. Assembly

NOTE: The following parts MUST BE REPLACED at engine overhaul (refer to Slick Service Bulletin No. SB-2-80C). Condenser, drive end bearing, bearing cap assembly, impulse coupling, coil, rotor gear, oil seal, contact point kit and distributor block and gear assembly. Refer to Slick Part List for part numbers. At each 500 hour inspection replace parts that are worn or damaged.

(1) Assemble new bearings onto shaft (see Figure 10.)

CAUTION: DO NOT ALLOW ROTOR TO COME INTO CONTACT WITH METAL CHIPS OR FILINGS. ROTOR IS MAGNETIZED.

(a) Insert the base plate (T-117) and adapter plate bushing (T-119) into T-125 assembly fixture.

(b) Place one drive-end bearing and one bearing cap assembly onto the rotor shaft.

(c) Insert the rotor shaft into the adapter plate bushing (threaded end down).

(d) Place the bearing assembly plug (T-101) onto the exposed end of the rotor shaft.

(e) Turn T-handle screw to seat the bearings against the bearing shoulders on the rotor shaft.

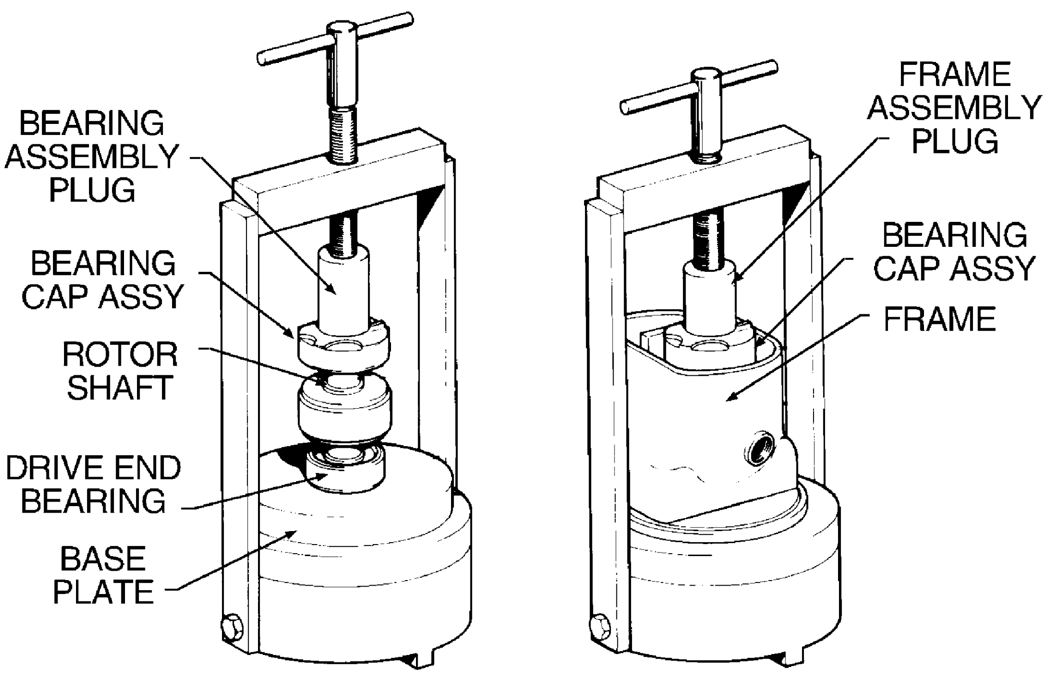
(f) Remove the rotor shaft, adapter bushing, adapter plate and bearing assembly plug from T-125 assembly fixture.

(2) Install rotor shaft assembly (see Figure 10.)

(a) Place magneto frame in T-125 assembly fixture (flange down).

(b) Position rotor shaft assembly in the magneto frame.

(c) Insert rotor and frame assembly plug (T-102) into the T-handle.



Installing Bearings
Figure 10

(d) Tum T-handle until the bearing cap bottoms in the frame. Place cap over end of rotorshaft first.

(e) Place T-151 cam and rotor set onto the end of the rotor shaft and turn T-handle until the shaft bottoms in magneto frame.

(f) Install bearing clamps and the hold-down screws.

(g) Torque screws to 20-24 in-lbs.

(3) Install oil seal (see Figure 11.)

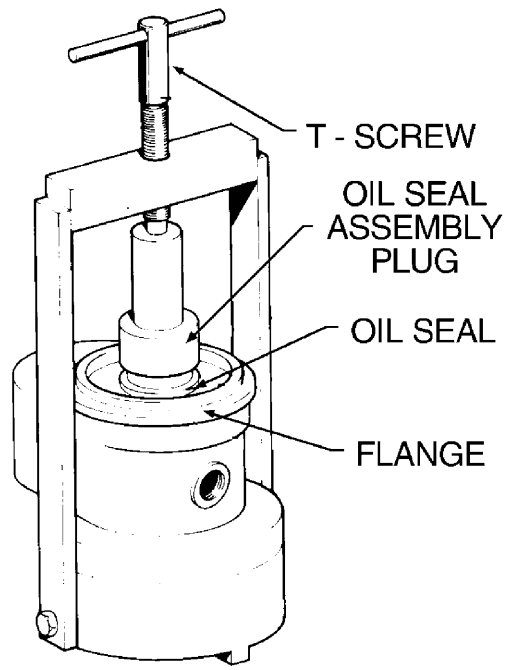
(a) Lubricate oil seal with engine oil.

(b) Reverse the magneto on the T-125 assembly fixture so the flange is facing up.

(c) Insert the oil seal over the rotor shaft.

(d) Press the oil seal flush into the frame using the oil seal assembly plug (T-103) and the T-handle screw.

(4) Install Woodruff Key by pressing Woodruff Key into the key slot of the rotor shaft.



Oil Seal Installation
Figure 11

(5) In the left magnetos only (i.e. - impulse coupled), assemble impulse coupling:

(a) Assemble inner eye of the impulse spring into the grooves in the impulse hub.

(b) Set the impulse shell and untensioned impulse spring on the hub.

(c) Holding the shell in one hand and the pawls with the thumb and forefinger of the other hand, pull the hub slowly, straight back, until its far enough to clear the projections on the shell.

CAUTION: DO NOT WIND THE IMPULSE SPRING MORE THAN 1/4 TURN.

(d) Hold the shell stationary and rotate the hub to wind the impulse spring until the projections on the other section of the pawl plate pass the projections on the shell. (Approximately 1/4 revolution or 90 degrees.)

(e) Ensure the shell is seated squarely on the hub and turns freely.

(6) In the left magnetos only (i.e. - impulse coupled), install impulse coupling:

(a) Install impulse coupling assembly onto the rotor shaft and install impulse washer.

(b) Install coupling nut and torque to 120 to 320 in. lbs. to seat the coupling on the rotor shaft. If cotter pin will not align with pin hole within the specified torque range, remove the nut and lightly lap its bottom surface with emory cloth.

(c) Verify that the coupling is free by snapping it through 3 or 4 times.

(7) Install coil

(a) Place the frame on the T-125 assembly fixture. Insert the coil into the frame, being sure that it is back against the stops. Insert coil wedges between the bridge and the frame.

(b) Drive the two wedges tight, using a hammer and flat punch. Attach the ground wire coil (either black or white - depending on coil type) to the frame with a screw. Torque to 20 in-lbs.

CAUTION: IF THE HIGH TENSION LEAD PROTRUDES ABOVE THE MAGNETO FRAME, IT CAN MAKE DIRECT CONTACT WITH THE DISTRIBUTOR GEAR AND CAUSE THE MAGNETO TO MALFUNCTION.

(c) Position the coil high tension lead flush to 1/32 (.031) inch below the parting surface of the magneto frame.

(8) Install contact points - All magnetos

Attach contact point assembly on the bearing cap using appropriate screw.

(9) Install rotor cam

(a) Install cam using a light hammer and T-151 cam and rotor set.

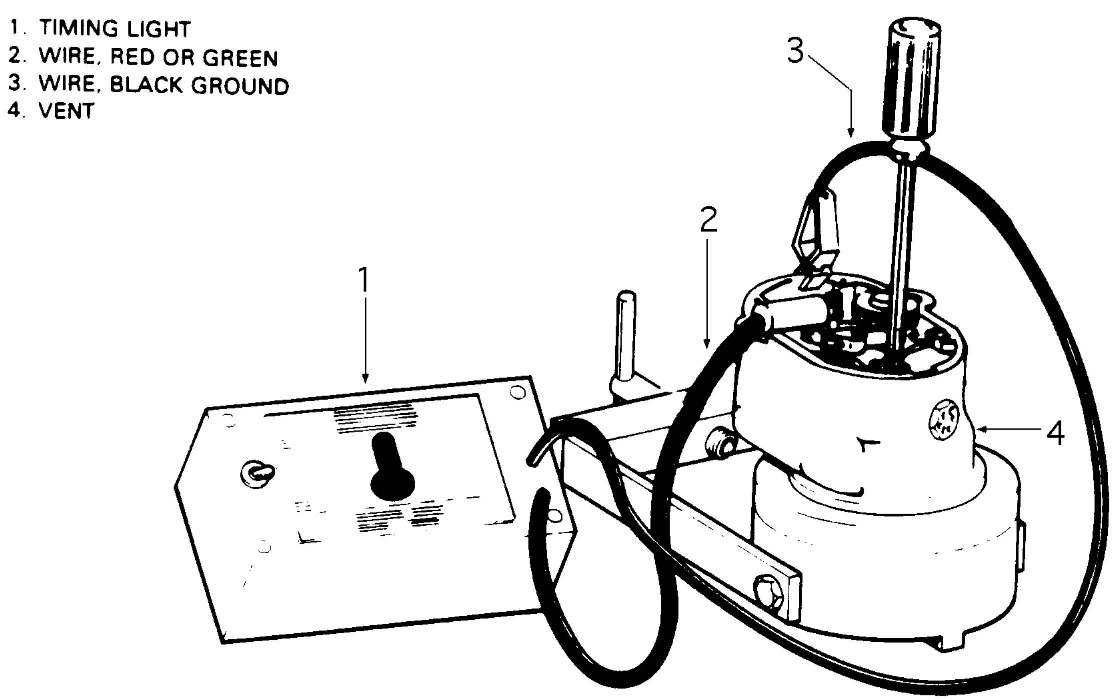
(b) Drive the cam until it bottoms in the rotor cam slot.

(10) Time the magneto internally - Set primary points - All magnetos

(a) Place the magneto on the T-125 assembly fixture, flange down, with the T-509 timing base adapter removed.

(b) In the right magnetos only (i.e. - non-impulse coupled), install the T-123 timing plug on the rotor shaft before placing the magneto on the T-125 assembly fixture.

(c) Looking directly down on the magneto, align the magneto so that the coil is oriented in the 12 o'clock position.



Magneto Internal Timing
Figure 12

(d) Insert T-150 "E" Gap Gauge between the pole laminations in the rotor shaft and the pole laminations in the frame. Read the magneto data plate for magneto rotation.

1 For old style rotor (i.e. - no slots on the magnet head), insert flat end of T-150 "E" Gap Gauge. Insert the "E" Gap Gauge against the right lamination for right-hand rotation magnetos and against the left laminations for left-hand rotation magneto.

2 For new style rotors (with slots on magnet head), insert notched end of T-150 "E" Gap Gauge. Locate the appropriate "L" or "R" timing slot on the rotor magnet head and insert the notched end of the "E" gap gauge. Use the "L" slot for left-hand rotation magnetos and the "R" slot for right-hand rotation magnetos.

(e) Rotate the magneto frame on the T-125 assembly fixture until the T-150 "E" Gap Gauge rests against the pole lamination in the magneto frame. Rotate the magneto frame clockwise for left-hand rotation magnetos and counterclockwise for right-hand rotation magnetos. The magneto rotor shaft is now in "E" Gap position.

(f) Using a timing light (see Figure 12), adjust the contact points to be just opening when the frame is against the T-150 gauge. This will provide a point gap opening of .008-.012 inches.

(g) Secure the points in this position by tightening the screws. Torque adjusting screw to 18-20 in-lbs. Torque the pivot screw to 15-18 in-lbs.

(h) Apply cam grease sparingly to each lobe of the cam.

(i) Attach coil lead wire to the vertical bronze male terminal of the primary point assembly.

(11) Assemble the condenser into the distributor housing, being sure to rotate the condenser wire the same rotation as the condenser is tightened in the housing..

(12) Distributor gear assembly

(a) Install carbon brush into spring.

1 Insert small end of carbon brus tapered end of spring.

2 Turn carbon brush clockwise until shoulder of carbon brush seats spring.

(b) Install carbon brush assembly into distributor gear.

1 Insert the open end of the spring into open end of the distributor gear shaft.

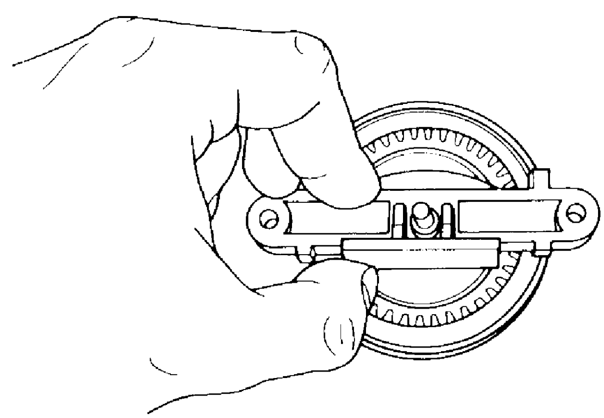
2 Gently press the carbon brush and spring assembly into the shaft until the spring seats on the bottom of the shaft. The top of the carbon brush should protrude from the top of the shaft approximately 1/4 inch.

(13) Install distributor block

(a) Assemble the distributor gear in the distributor block with the L&R facing you.

(b) Assemble the bearing bar to the distributor block as shown in Figure 13.

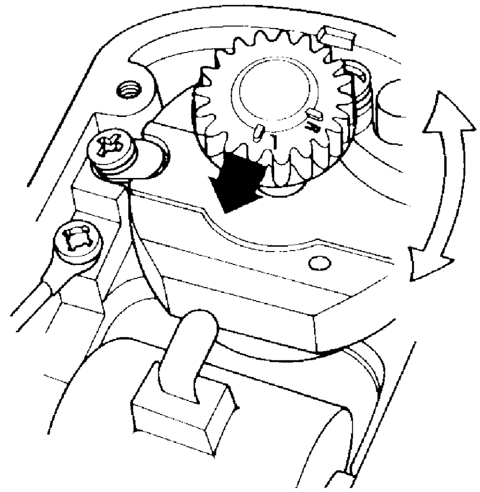
(14) Install rotor gear onto end of rotor shaft.



Bearing Bar Assembly
Figure 13

(15) Align the "L" or "R" (depending on the rotation of the magneto—look at data plate) on the rotor gear so that it points up, toward the high tension lead of the coil. Secure rotor shaft to prevent rotation during assembly. Alignment of rotor gear is critical. (See Figure 14.)

(16) Align the "L" or "R" hole in the distributor gear with the "L" or "R" in the distributor block. Use "L" for left-hand rotation and "R" for right-hand rotation magnetos.



Rotor Gear Alignment
Figure 14

CAUTION: DO NOT ROTATE MAGNETO ROTOR SHAFT WITH THE T-118 TIMING PIN INSERTED IN THE DISTRIBUTOR BLOCK. IF ROTOR SHAFT IS ROTATED WITH TIMING PIN INSERTED, THE MAGNETO MUST BE DISASSEMBLED AND INSPECTED FOR DISTRIBUTOR BLOCK AND GEAR DAMAGE.

(17) Lock the distributor gear in place with the T-118 timing pin through the appropriate hole in the block and gear. Then:

(a) Place distributor block spacers on magneto frame.

(b) Place distributor block on magneto frame. The distributor gear and rotor gear are properly meshed when the index mark on the rotor gear aligns with the index mark on the distributor block.

(c) Secure distributor block to frame with screws provided.

(18) Connect condenser wire

(a) Connect condenser wire to the remaining terminal of the contact assembly.

(b) Attach the terminal with the lead pointing left.

(19) In 6XT S/N's 3255001 & up only (i.e. - pressurized magnetos), install the distributor housing gasket.

(20) Insert the top boss of the distributor housing into its mating pilot on the magneto frame.

CAUTION: MAKE SURE THE CARBON BRUSH IS CONTAINED WITHIN THE DISTRIBUTOR SHAFT DURING ASSEMBLY. IF THE CARBON BRUSH CATCHES ON THE SIDE OF THE DISTRIBUTOR SHAFT, THE COIL STRAP WILL BE BENT INTO THE WRONG POSITION DURING ASSEMBLY.

(21) Gently rotate the distributor housing onto the magneto frame.

(22) Secure the housing with three long screws and one short screw. Torque all four to 24 in-lbs.

(23) Remove T-118 timing pin.

F. Testing

Complete Magneto Reassembly, above. Verify that the T-118 Timing Pin has been removed.

(1) Mount the magneto on a suitable test stand in the same relative position as installed on the engine.

(2) Install a Slick High-Temperature Ignition Harness on the magneto and connect each output lead to a 5mm spark gap.

CAUTION: DO NOT OPERATE THE MAGNETO UNLESS THE IGNITION HARNESS IS INSTALLED AND THE OUTPUT LEADS ARE CONNECTED TO THE 5MM GAP.

(3) Impulse Coupling

(a) Rotate the test stand drive pulley in the same direction of rotation stated on the magneto data plate.

(b) The impulse coupling should engage the stop pin in the magneto frame below approximately 200 RPM. If the impulse coupling pawls slip past the stop pin or engage intermittently, the impulse coupling is not operating properly.

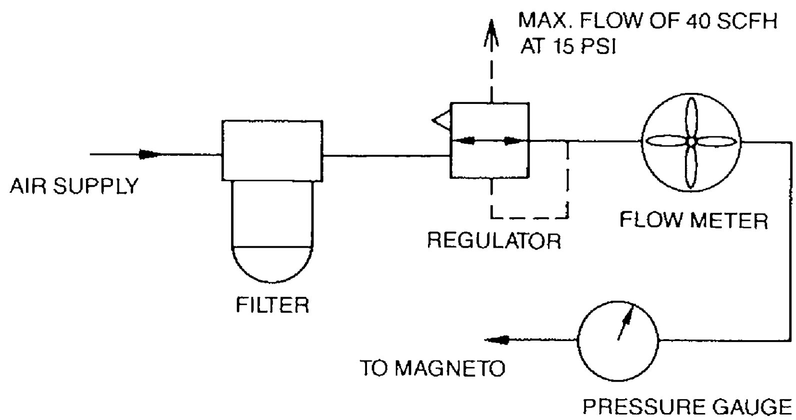
(4) Coming-in Speed

(a) Determine the lowest speed at which the magneto can be turned and still spark all 5mm gaps without missing.

(b) The test gap must fire consistently at 200 RPM on non-impulse coupled magnetos and 350 RPM on impulse coupled magnetos.

(5) Pressure Testing - In 6XT S/N's 3255001 & up only (i.e. - pressurized magnetos)

After magneto reassembly, install a pressurized harness cap and apply 15 psi filtered air to the inlet nozzle of the magneto (see Figure 15). Air flow at 15 psi is not to exceed 40 standard cubic feet per hour (SCFH). If flow is excessive, reposition gaskets and retorque housing and harness cap screws. Screws should be torqued to 21-25 in-lbs. for 6300 series magnetos. Testing should be conducted with magneto at room temperature.



Pressurized Magneto Pressure Testing
Figure 15

G. Installation

WARNING: BE SURE SWITCH IS IN OFF POSITION AND THE P LEAD IS GROUNDED.

When installing new or adjusting breaker points and before timing the magneto to the engine, it is important that the internal timing of the magneto be correct. To find number one tower, the following instructions should be performed:

NOTE: No need to spark out these magnetos.

(1) Insert the T - 118 timing pin in the L or R hole in the distributor block (depending on rotation of the magneto).

(2) Turn rotor opposite the rotation of the magneto until the pin engages the gear.

(3) If the pin is binding and will not go in the hole in the gear, you have hit the pointer on the gear. Pull the pin out, enough to continue opposite rotation until the pointer has passed, re-insert pin.

(4) When the pin sticks through the hole in the gear about 1/4 inch, you are now ready to fire number one cylinder.

(5) Turn the engine crankshaft in the normal direction of rotation until the No. 1 cylinder is in the full-advance firing position.

(a) Cover spark plug hole of number one cylinder with thumb. Rotate crankshaft until pressure is felt on thumb.

(b) Remove plug in front of number six cylinder. Rotate crankshaft slowly to observe timing mark on alternator drive gear. When the mark on the gear (see Figure 1) is centered in the viewing hole, number one piston is at 20° BTC.

NOTE: Always verify correct BTC on the engine data plate.

(6) Place a new gasket on magneto flange. Install magneto carefully so drive coupling lugs mate with slots of drive bushings. Install holding washers, lockwashers, and nuts.

NOTE: Do not tighten completely. Allow for turning magneto for final timing.

(7) After the magneto is installed on engine, remove the timing pin. The magneto is now ready to be timed to the engine.

(8) Complete magneto to engine timing procedure listed under 100 Hour Inspection, above.

WARNING: THE MAGNETO IS NOT INTERNALLY GROUNDED, WHEN THE GROUND LEAD IS DISCONNECTED THE MAGNETO IS HOT. REMOVING THE HARNESS ASSEMBLY FIRST AND INSTALLING IT LAST, MINIMIZES THE DANGER OF STARTING THE ENGINE ACCIDENTALLY WHEN THE GROUND LEAD IS REMOVED FROM THE MAGNETO.

(9) Replace the harness cap onto the magneto. Align the index marks made on the harness cap and distributor housing when removed.

(10) Connect the P-lead and pressurization tube to magneto. Connect the retard breaker lead to the starting circuit to the left magneto.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

1. Ignition Harness

A. Inspection

(1) Check lead assemblies for nicks, cuts, mutilated braiding, badly worn section or any other evidence of physical damage. Inspect spark plug sleeves for chafing or tears, and damage or stripped threads on coupling nuts. Check compression spring is not broken or distorted. Inspect grommet for tears. Check all mounting brackets and clamps to see that they are secure and not cracked.

(2) Use an ohmmeter, buzzer, or other suitable low voltage device, and check each lead for continuity. If continuity does not exist, wire is broken and must be replaced.

(3) For electrical test of harness assembly, use high voltage, direct current tester such as TAKK model 86 or 86A or equivalent direct current high voltage tester capable of delivering test potential of 10,000 volts. Connect ground lead to high voltage tester to outer shielding braid of a single lead. Connect plug terminal. Turn tester ON and apply 10,000 volts. Insulation resistance should be 100 megohms minimum. Check all other harness leads in same manner.

(4) Minor repair to harness assembly, such as replacement of contact springs, spring retainer assemblies, insulating sleeves, or of one lead assembly, is done with harness assembly mounted on engine. To replace more than one lead assembly or cable outlet plate, harness should be removed from engine and sent to an overhaul shop.

B. Removal

(1) Disconnect clamps holding wires to engine and accessories.

(2) Loosen coupling nuts at spark plugs and remove insulators from spark plug barrel well. Do not damage insulator spring when withdrawing insulator.

(3) Place a guard over harness insulators.

(4) Remove harness assembly terminal plate from magneto.

(5) Remove harness from airplane.

C. Disassembly

(1) To remove spring, Slick M-2929, from damaged lead, turn spring counterclockwise while pulling gently. This will remove spring and M-1498 electrode screw from end of coiled conductor.

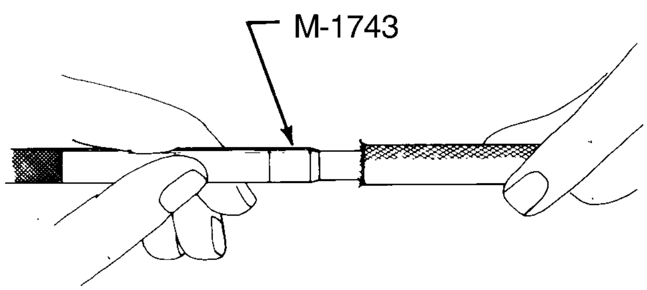
(2) To separate spring and screw, hold electrode screw with pliers and turn spring clockwise until it is through the threaded portion.

(3) Remove insulator sleeve from end of wire.

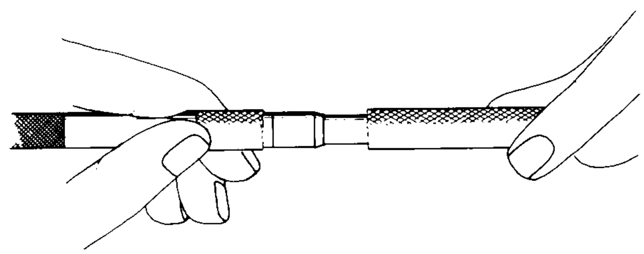
(4) To remove lead from M-1568 harness cap, use diagonals or cutting pliers and cut lead off close to cap. Use drift or punch to tap ferrule loose from harness cap.

NOTE: Further service on Slick harnesses will require the use of Slick T-200 or M-1495 Service Tool Kit, obtained from:

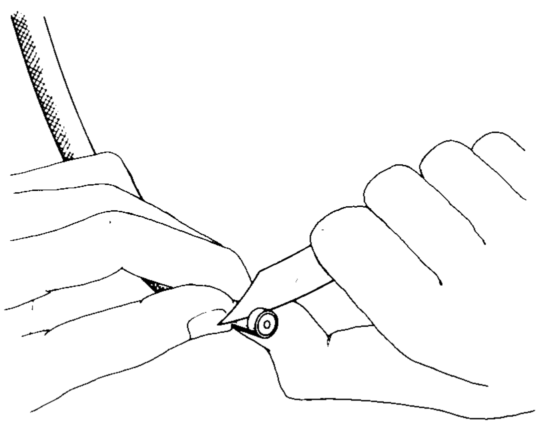
Unison Industries.
530 Blackhawk Park Avenue
Rockford, IL 61161



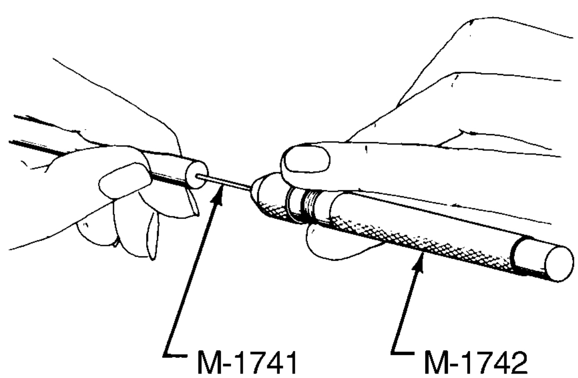
Stipping Tool
Figure 1



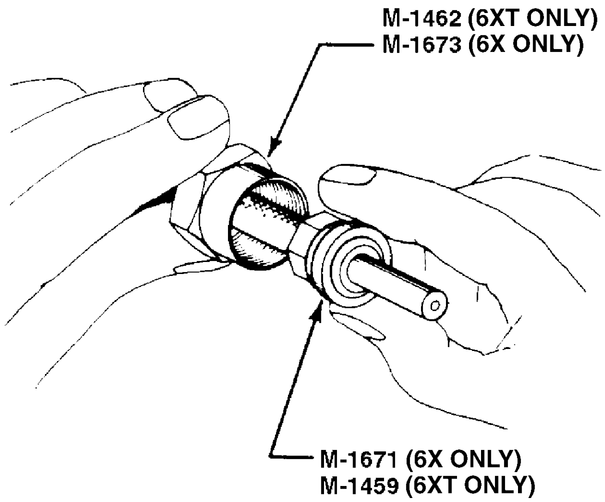
Inserting Stipping Tool
Figure 2



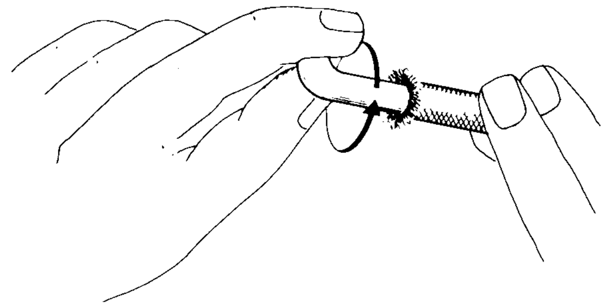
Cutting Insulation
Figure 3



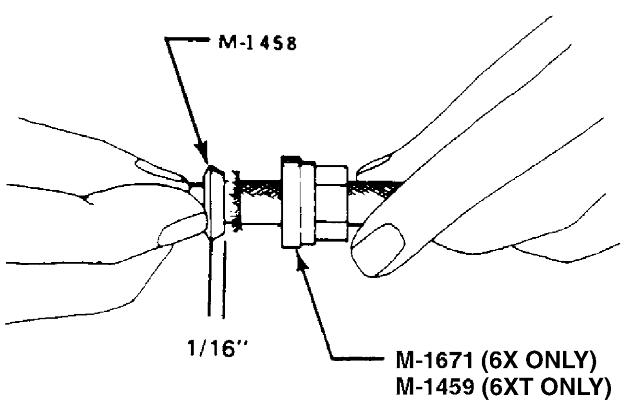
Removing Silicone Rubber from Wire
Figure 4



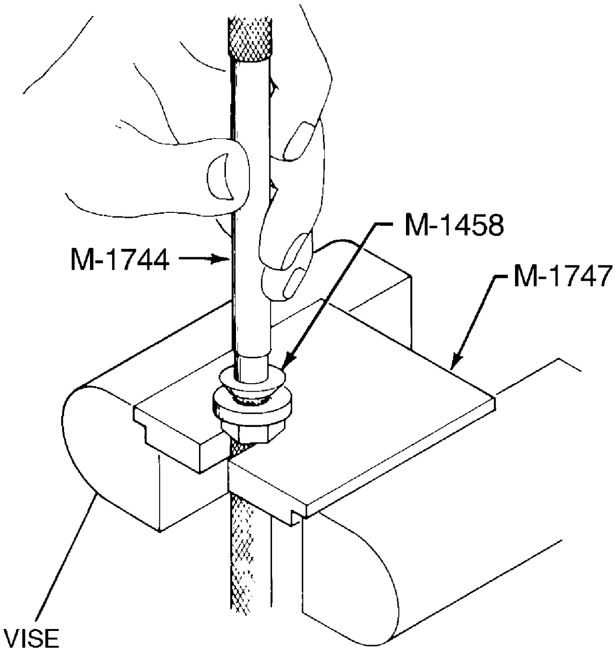
Installation of Plug Endnut
Figure 5



Flaring out the Shielding
Figure 6



Installation of Ferrule
Figure 7



Driving Tool
Figure 8

D. Assembly

NOTE: The 6X (S/N's 3232001 & up) uses spark plugs with 5/8"-24 harness connectors while the 6XT (S/N's 3255001 & up) uses spark plugs with 3/4"-20 harness connectors.

(1) Cut a piece of harness wire to length required. Do not stretch wire when measuring it.

(2) On magneto end, make a final mark one inch from wire end. Another mark must be made 0.9375 inch from spark plug end of wire.

(3) Flare out shielding, then without allowing any shielding to fold under, insert Slick T-112 or M-1743 stripping tool under braided shielding. (Refer to Figure 1.)

(4) Make sure stripping tool is inserted past cutting mark, and cut shielding with a sharp knife using a rolling motion. Remove shielding and stripping tool. Do not cut silicone insulation. (Refer to Figure 2.)

(5) Cut exposed insulation 0.125 inch back from end and roll insulation clockwise to remove. Do not use a pulling motion when removing insulation. Trim end of coiled conductor to make a clear hole for inserting stud. (Refer to Figure 3.)

(6) Using T-111 or M-1742 pin vise, insert T-110 or M-1741 drill (#72 drill), drill out silicone rubber from inside coiled conductor approximately 0.5 inch deep. (Refer to Figure 4.)

(7) On spark plug end of wire install M-1673 (6X only) / M-1462 (6XT only) nut followed by M-1671 (6X only) / M-1459 (6XT only) female taper hex ferrule. (Refer to Figure 5.)

(8) After installation of nut and ferrule, bend and rotate silicone insulation as per Figure 6 to flare out shielding so drive ferrule can be inserted. Do not cut silicone insulation with sharp braiding while wire is being rotated.

CAUTION: DO NOT REUSE THE M-1458 DRIVE FERRULE.

(9) On spark plug end of wire install M-1458 male tapered drive ferrule over silicone insulation and under shielding to within 0.0625 inch from flange of ferrule. Make sure that shielding is away from ferrule flange then slide ferrule M-1671 (6X only) /M-1459 (6XT only) over the M-1458 drive ferrule until tight. (Refer to Figure 7.)

(10) For spark plug end, mount M-1747 drive plate in a bench vise. Set hex ferrule in drive plate slot. Drive M-1458 drive ferrule flush against the hex ferrule using the M-1744 drive tool. (Refer to Figure 8.) Or, press into place using T-109 pressing tool.

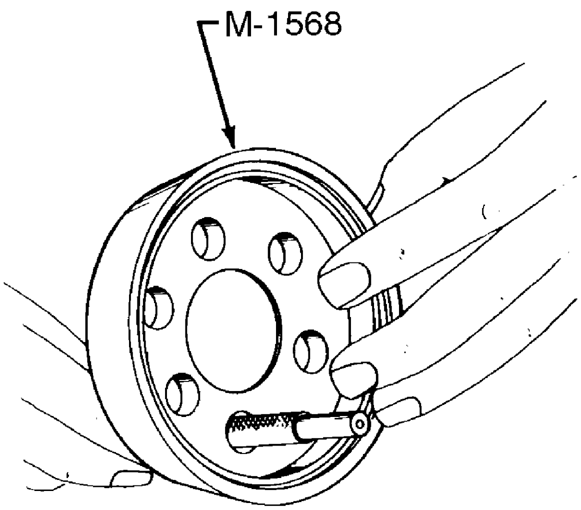
(11) For magneto end of wire, insert wire through hole in M-1568 harness cap so shielding is through hole as shown in Figure 9.

(12) Install an M-1458 male tapered drive ferrule over insulation and under shielding as in step 9, then drive ferrule into M-1568 harness cap using M-1744 drive tool, similar to step 10. (Refer to Figure 10.) Or, press into place using T-109 pressing tool.

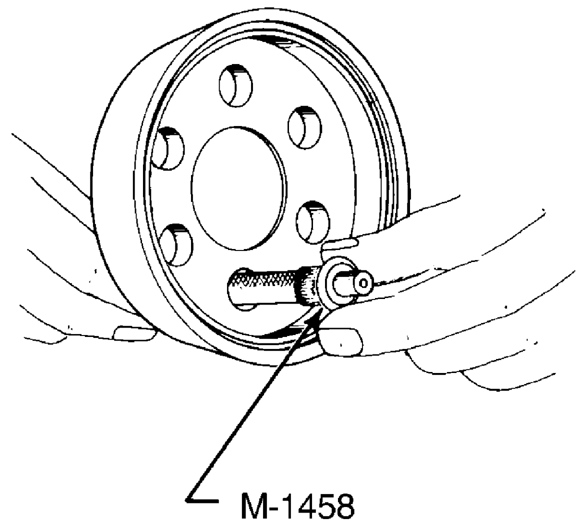
(13) Clamp threaded end of M-1498 electrode screw in T-111 or M-1742 pin vise. Insert tapered pin of electrode screw into center of coiled conductor by turning pin vise counterclockwise and pushing at same time until screw is flush with insulation. This is done at both ends of the wire assembly. (Refer to Figure 11.)

(14) On magneto end of wire, place M-3168 insulator sleeve over silicone insulation. On spark plug end of wire, use M-1677 insulator sleeve (6X only) or K-3300 insulator sleeve and washer (6XT only). (Refer to Figure 12.)

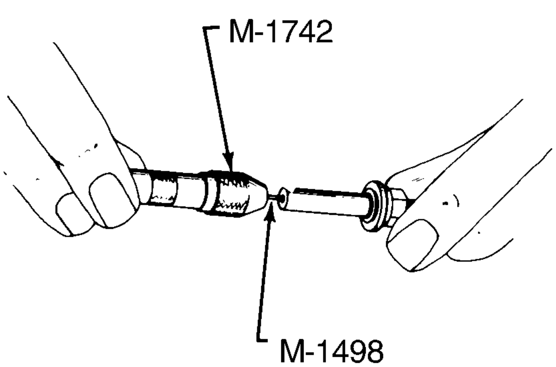
(15) Turn M-2929 spring clockwise on electrode screw three full turns until end is flush with first large coil of spring. This applies to both ends of wire. (Refer to Figure 13.)



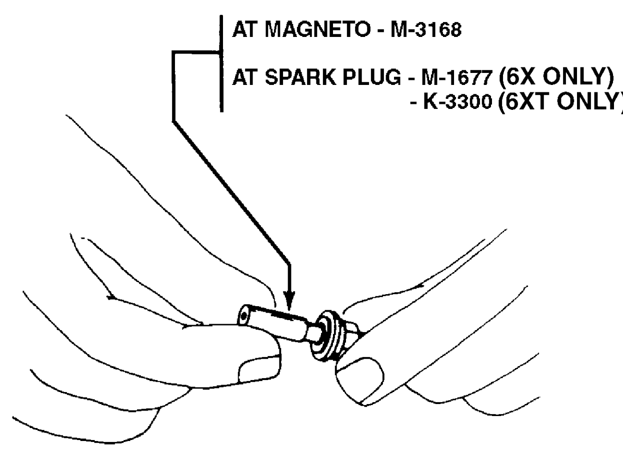
Installation of Harness Cap
Figure 9



Securing Wire in Harness Cap
Figure 10



Installation of Electrode Screw
Figure 11



Installation of Insulator Screw
Figure 12

E. Installation

(1) Before installing harness on magneto, check mating surfaces for cleanliness.

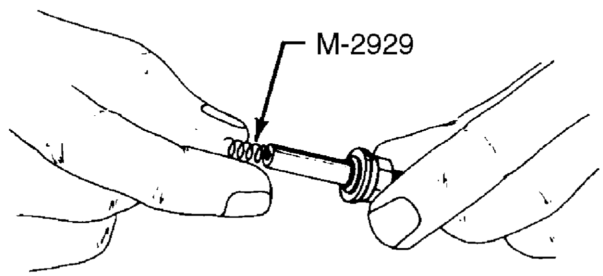
(2) Place harness terminal plate on magneto and tighten nuts around plate alternately to seat cover squarely on magneto.

NOTE: The left magneto is wired to fire all top spark plugs in this engine. The right magneto fires all bottom plugs.

(3) Route ignition wires to their respective cylinders.

(4) Clamp harness assembly in position and replace engine baffle plate.

(5) Connect leads to spark plugs.



Installation of Spring
Figure 13

2. Spark Plugs (Refer to Figure 14.)

A. Removal

CAUTION: WHEN WITHDRAWING IGNITION CABLES LEAD CONNECTION FROM PLUG, CAREFULLY PULL LEAD STRAIGHT OUT AND IN LINE WITH CENTER LINE OF PLUG BARREL; OTHERWISE, A SIDE LOAD WILL BE APPLIED WHICH FREQUENTLY RESULTS IN DAMAGE TO BARREL INSULATOR AND CONNECTOR. A LEAD CANNOT BE REMOVED EASILY IN THIS MANNER, RESISTING CONTACT BETWEEN NEOPRENE COLLAR AND BARREL INSULATOR WILL BE BROKEN BY A ROTARY TWISTING OF COLLAR. AVOID UNDUE DISTORTION OF COLLAR AND POSSIBLE SIDE LOADING OF BARREL INSULATOR.

(1) Loosen coupling nut on harness lead and remove terminal insulator from spark plug barrel well.

CAUTION: DUE TO GREATER TORQUE VALUE REQUIREMENTS, TORQUE WRENCHES SHOULD NOT BE USED TO REMOVE SPARK PLUG.

CAUTION: DO NOT ALLOW FOREIGN OBJECTS TO ENTER SPARK PLUG HOLE.

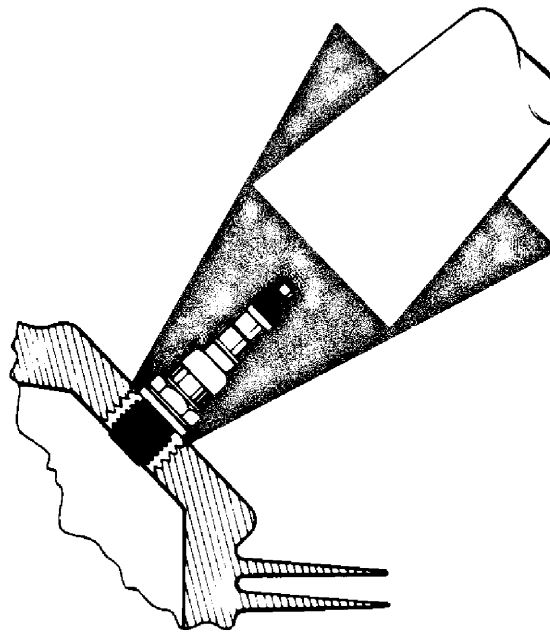
(2) Remove spark plug from engine.

(a) In the course of engine operation, carbon and other combustion products are deposited on the end of spark plugs and will penetrate lower threads to some degree. As a result, a greater torque is required for removing a plug than for installation. Torque limitations given do not apply to plug removal, as sufficient torque must be used to unscrew plug.

(b) The higher torque required to remove plugs is not as detrimental as in installation, since it cannot stretch the threaded section. It does, however, impose a shearing load on this section and may, if sufficiently severe, produce a failure in this location.

(3) Immediately upon removal, place spark plugs in a tray in a manner that will identify their position in the engine.

(4) Removal of seized spark plugs in cylinder is done by application of liquid carbon dioxide (CO_2) by a conical metal funnel adapter with a hole at the apex just large enough to accommodate the funnel of a 20 lb bottle. (Refer to Figure 14.) When a seized spark plug cannot be removed by normal means, funnel adapter is placed over and around spark plug. Place funnel of CO_2 bottle inside funnel adapter and release carbon dioxide to chill and contract spark plug. Break spark plug loose with a wrench. A warm cylinder head at the time carbon dioxide is applied will aid in removal of excessively seized plug.



Removing Frozen Spark Plug
Figure 14

B. Inspection And Cleaning

(1) Visually inspect each spark plug for the following non-repairable defects.

(a) Severely damaged shell or shield; threads nicked up, stripped, or crossthreaded.

(b) Badly battered or rounded shell hexagons.

(c) Out-of-round or damaged shielding barrel.

(d) Chipped, cracked, or broken ceramic insulator portions.

(e) Badly eroded electrodes worn to approximately 50 percent of original size.

(2) Clean spark plug as required; remove carbon and foreign deposits.

(3) Test spark plug both electrically and for resistance.

(4) Set electrode gap at 0.016 to 0.022 inch.

C. Installation

CAUTION: DO NOT INSTALL ANY SPARK PLUG THAT HAS BEEN DROPPED.

(1) Before installing spark plugs, make sure that threads within cylinder are clean and not damaged.

CAUTION: MAKE CERTAIN DEEP SOCKET IS PROPERLY SEATED ON SPARK PLUG HEXAGON AS DAMAGE TO PLUG WILL RESULT IF WRENCH IS COCKED TO ONE SIDE WHEN PRESSURE IS APPLIED.

(2) Apply anti-seize compound sparingly on threads; install gasket and spark plugs. Tighten to a torque of 420 inch-pounds.

(3) Carefully insert terminal insulator in spark plug and tighten coupling nut per Chart 1.

CHART 1
SPARK PLUG COUPLING TORQUE

Application	Spark Plug Coupling Threads	Torque (In. - lb.)
6X (S/N's 3232001 & UP)	5/8-24	90 - 95
6XT (S/N's 3255001 & UP)	3/4-20	110 - 120

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

SWITCHING

Magneto and Starter Switches

The magneto switches and the starter switch are located in the overhead switch panel.

Removal and Installation

See Switches, 39-10-00.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

77

ENGINE INDICATING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 77

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
77-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
77-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
77-00-00	1	Jun 1/03			
	2	Jun 1/03			
77-10-00	1	Jun 1/03			
	2	Jun 1/03			
77-20-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 77 - ENGINE INDICATING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

1. Description

   These airplanes use traditional 3-inch analog engine instruments, which are electrically or mechanically actuated. These instruments and their specific functions are addressed in 77-10-00, 77-20-00, and 79-30-00.

2. Removal and Installation

   See Face Mounted Instruments, 39-10-00.

THIS PAGE INTENTIONALLY BLANK

POWER

1. Manifold Pressure Gauge

A. Description

The manifold pressure gauge is a vapor proof, absolute pressure type instrument. Pressure from the intake manifold of the engine is transmitted to the instrument through a line. A pointer indicates the manifold pressure available at the engine in inches of mercury.

B. Troubleshooting

See Chart 1.

CHART 1
TROUBLESHOOTING MANIFOLD PRESSURE GAUGE

Trouble	Cause	Remedy
Excessive error at existing barometric pressure.	Pointer shifted.	Replace instrument.
Excessive error when engine is running.	Line leaking.	Tighten line connections.
Sluggish or jerky pointer movement.	Defective instrument.	Replace instrument.
Dull or discolored marking.	Age.	Replace instrument.
Incorrect reading.	Moisture or oil in line.	Disconnect lines and blow out.

2. Tachometer Indicator

The tachometer is electric and provides an indication of crankshaft speed in revolutions per minute. It receives its information from a magnetic sensor mounted on the left magneto.

3. Engine Oil Pressure Gauge

See 79-30-00.

THIS PAGE INTENTIONALLY BLANK

TEMPERATURE

1. Oil Temperature Indicator

   See 79-30-00.

2. Exhaust Gas Temperature (EGT) Gauge

   A. Description

   This instrument aids the pilot in selecting the most economical fuel-air mixture for cruising flight at a power setting of 75% or less. It is a sensing device to monitor the fuel-air mixture leaving the engine cylinders. This gauge is adjustable. If it is found defective after checking with troubleshooting chart, it should be replaced. If the leads to the gauge are defective in any way, they should be replaced. When replacing leads, it is very important to use the same type and length of wire, as the resistance of the leads is critical for the proper operation of this gauge. The EGT probe is the clamp mounted type which is adjusted for proper depth into the exhaust stream.

   B. Troubleshooting

   See Chart 1.

   C. Removal

   (1) Gauge
   (a) Disconnect wires from the EGT gauge at the instrument panel.
   (b) Remove four bolts which secure the gauge to the instrument panel and remove the gauge.

   (2) Probe
   (a) Remove wires from the wire harness going to the engine.
   (b) Loosen the nut or clamp which secures the EGT probe to the exhaust system and remove the probe.

CHART 1
TROUBLESHOOTING EGT GAUGE (ALCOR)

Trouble	Cause	Remedy
Gauge inoperative.	Defective gauge, probe, or wiring.	Check probe and lead wires for chafing, breaks or shorting between wires and/or metal structure.
	Adjusting potentiometer turned off scale.	Recalibrate instruments.
Fluctuating reading.	Loose, frayed or broken electrical leads or faulty connections.	Clean and tighten connections. Repair or replace defective leads.

D. Cleaning and Inspection

Unless mechanical damage is evident, broken glass, bent or broken pointer, or broken case, the following checks should be performed before removing the instrument.

(1) Remove probe and check for broken weld (at the tip end) or burnt off end. Measured resistance of probe should be .8 ohms. Clean the connections with steel wool before reassembly.

(2) Disconnect lead wires at instrument and measure. Resistance with lead wires connected to probe should be 3.3 ohms. Clean connections with steel wool before reassembly.

CAUTION: DO NOT CONNECT OHMMETER. IT WILL BURN OUT THE MOVEMENT OF THE METER.

(3) With leads connected to instrument, heat probe with propane torch to dull red. The meter should read up to the fourth graduation or approximately 1500°F. Before making this check, make sure that the adjustment screw, which is located in the rear of the instrument case, is in the center of its travel. If this screw has been turned to either end of full travel, it will shut instrument off and no indication will be shown on the pointer. If meter still does not read. replace it.

E. Installation

(1) Probe

(a) Install the probe and secure with locknut or clamp.

(b) Route the thermocouple wires along with the existing wire harness to the instrument panel.

(2) Gauge

(a) Install the EGT gauge into the instrument panel and secure with four bolts.

(b) Connect the thermocouple wires to the rear of the EGT gauge.

3. Cylinder Head Temperature (CHT) Gauge

A. Description

The cylinder head temperature gauge is part of the combination engine gauge which also includes the oil pressure gauge and the oil temperature gauge. This instrument measures the cylinder head temperature using a sender located in the #2 cylinder head. It is an electrical instrument and it is wired through the instruments circuit breaker.

B. Troubleshooting

See Chart 2.

CHART 2
TROUBLESHOOTING CHT GAUGE

Trouble	Cause	Remedy
Instrument shows no indication.	Power supply wire broken.	Repair wire.
	Defective instrument.	Replace instrument.
	Master switch off.	
Instrument goes all the way to upper stop.	Wire broken between sender and gauge.	Repair wire.
	Defective sender	Replace sender.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

78

EXHAUST

THIS PAGE INTENTIONALLY BLANK

CHAPTER 78

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
78-List of	1	Jun 1/03			
Effective Pages	2	Jun 1/03			
78-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
78-00-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 78 - EXHAUST

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

100 Hour Inspection (See Figures 1 and 2.)

WARNING: A VERY THOROUGH INSPECTION OF THE ENTIRE EXHAUST SYSTEM, INCLUDING EXHAUST HEATER MUFF ASSEMBLY, CROSSOVER TUBES, MUFFLER AND MUFFLER BAFFLES, STACKS AND ALL EXHAUST CONNECTIONS AND WELDS MUST BE ACCOMPLISHED AT EACH 100 HOUR INSPECTION.

The possibility of exhaust system failure increases with use. Check the system even more carefully as the number of hours increase; for example an inspection at the 700 hour period would be more critical than one in the 100 hour period. The system should also be checked carefully before winter operation when cabin heat will be used.

NOTE: Piper recommends 6X/6XT airplanes be fitted with a new muffler at or near 1000 hours time-in-service.

CAUTION: WHEN REMOVING OR INSTALLING COUPLING CLAMP, SLIDE CLAMP OVER END OF PIPE BEFORE ASSEMBLY. EXCESSIVE SPREADING CAN LEAD TO PREMATURE FAILURE OF CLAMP.

A. Removal of the tail pipe and stacks are required for inspection of the muffler baffles.

B. Remove or loosen all exhaust shields, cabin heat shroud, heat blankets, etc., as required to permit inspection of the complete system.

C. Perform the necessary cleaning operations and inspect all external surfaces for dents, cracks and missing parts.

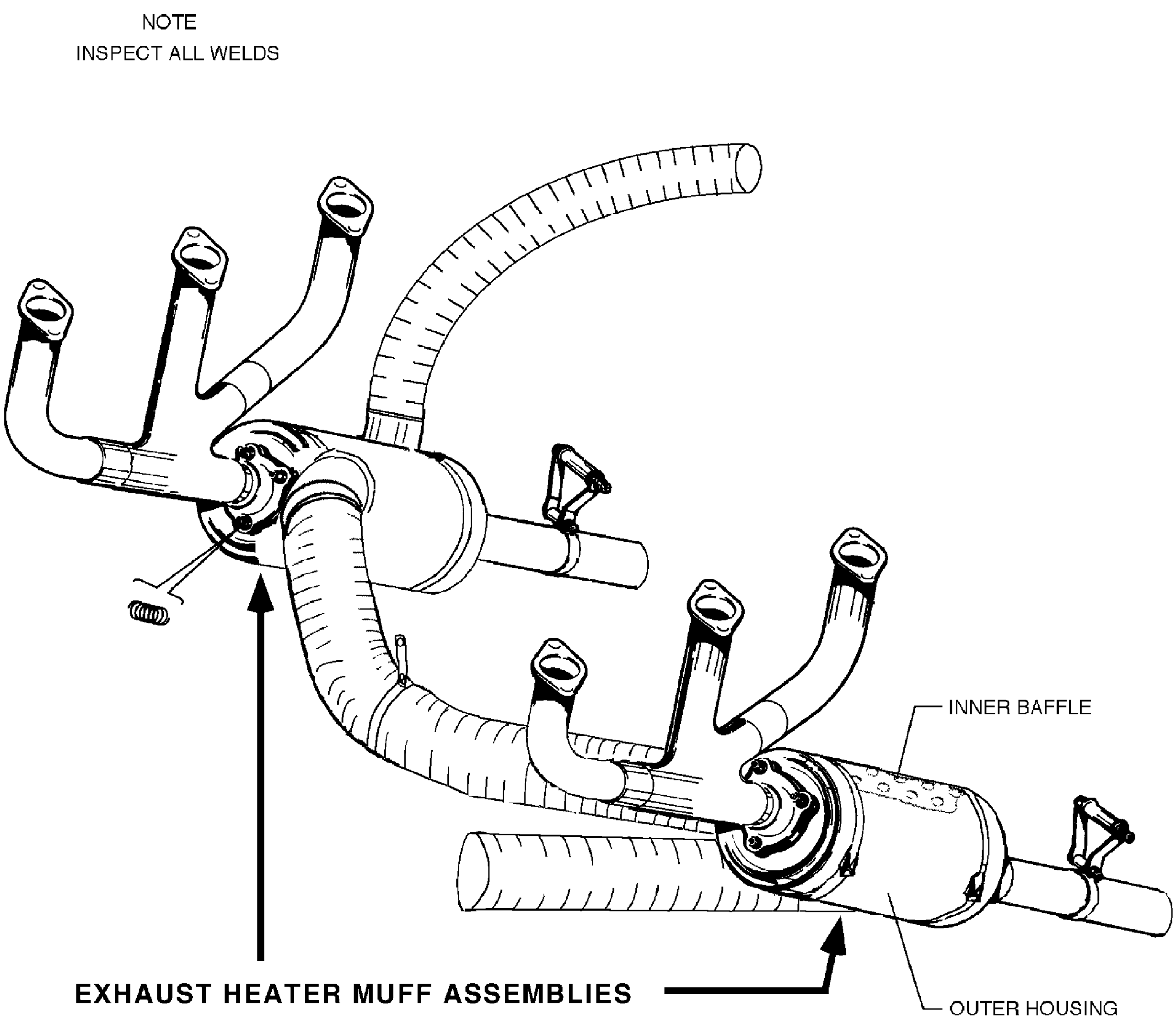
D. Pay particular attention to welds, clamps, supports and support attachment lugs, slip joints, stack flanges and gaskets.

E. Inspect internal baffles or diffusers for any cracks, warpage or severe oxidation are cause for replacement of muffler or tail pipe assembly.

F. If any component is inaccessible for a thorough visual inspection, accomplish one of the following:

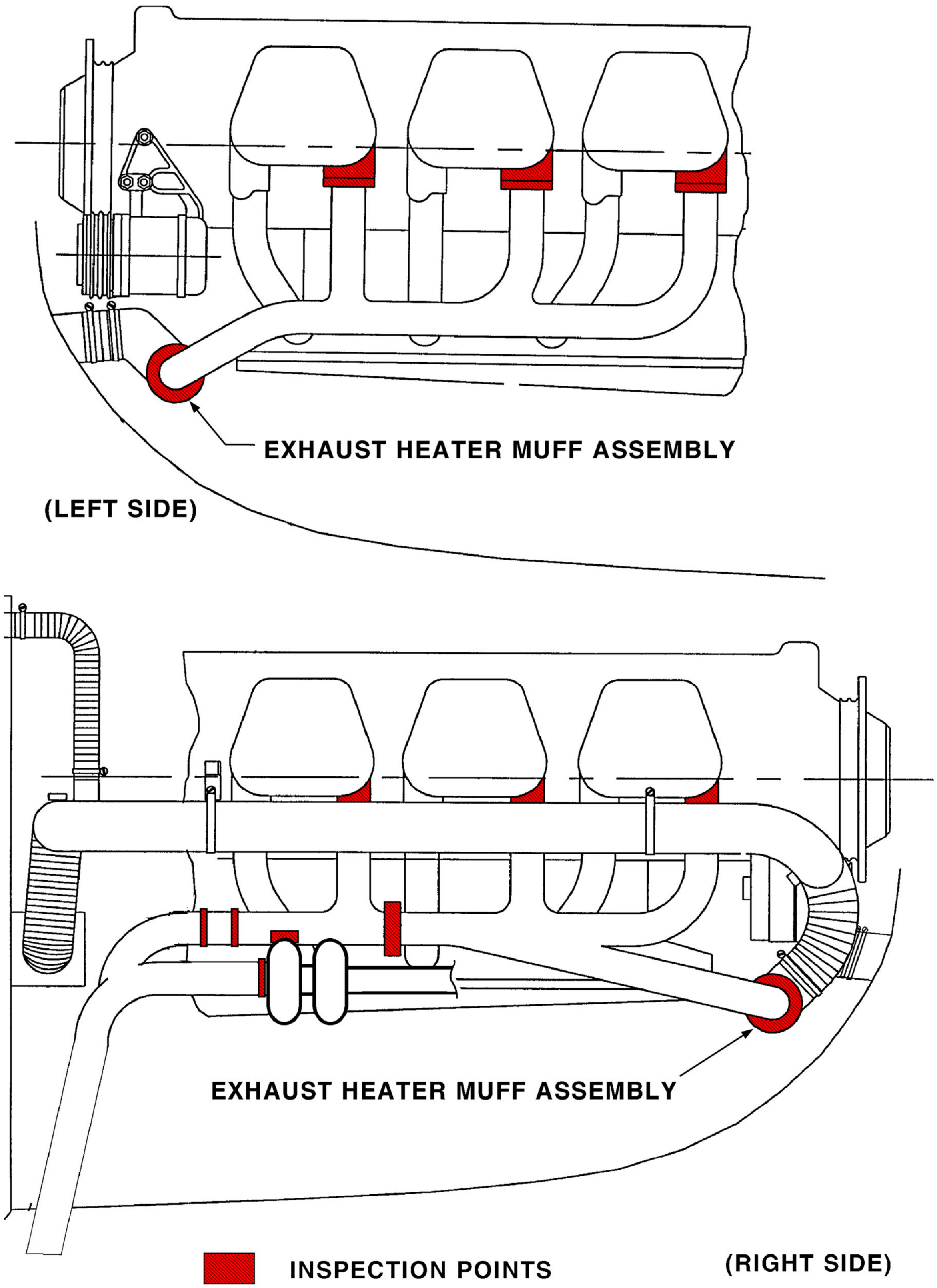
(1) Perform a submerged pressure check of the muffler and exhaust stack at 2 psi air pressure.

(2) Conduct a ground test using a carbon monoxide indicator by heading the airplane into the wind, warming the engine on the ground, advancing the throttle to full static RPM with cabin heat valves open, and taking readings of the heated airstream inside the cabin at each outlet. Appropriate sampling procedures applicable to the particular indicator must be followed. If carbon monoxide concentration exceeds .005 percent or if a dangerous reading is obtained on an indicator not calibrated in percentages, the muffler on must be replaced.



Effectivity
3232001 & UP

Exhaust System Inspection Points - 6X
Figure 1



Exhaust System Inspection Points - 6XT
Figure 2

Effectivity
3255001 & UP

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

79

OIL

THIS PAGE INTENTIONALLY BLANK

CHAPTER 79

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
79-List of Effective Pages	1	Jun 1/03			
	2	Jun 1/03			
79-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
79-20-00	1	Jun 1/03			
	2	Jun 1/03			
79-30-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 79 - OIL

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

DISTRIBUTION

Oil Cooler

A. When installing fittings in the oil coolers, care should be used to prevent excessive torque being applied to the cooler. When a rectangular fitting boss is provided, backup wrench should be used, employing a scissor motion, so that no load is transmitted to the cooler. When the oil cooler has a round fitting boss. care should be taken not to permit excessive torque on the fittings.

B. If a pipe thread fitting is used, it should be installed only far enough to seal with sealing compound.

C. Apply Lubon No. 404 to all male pipe thread fittings; do not allow sealant to enter the system.

D. If fitting cannot be positioned correctly using a torque of 10 to 15 foot-pounds, another fitting should be used.

E. When attaching lines to the cooler, a backup wrench should be used.

F. After installation, inspect the cooler for distorted end cups.

G. Run-up engine. After run-up, check for oil leaks.

THIS PAGE INTENTIONALLY BLANK

INDICATING

1. Oil Pressure

   A. Gauge

      (1) Description

      The oil pressure gauge is part of the combination engine gauge which also includes the oil temperature and the cylinder head temperature gauges. This gauge will indicate the amount of oil pressure available at the pressurized engine oil passage.

      (2) Troubleshooting

      See Chart 1.

      (3) Removal and Installation

      See Face-mounted Instruments, 39-10-00.

   B. Transducer

   The transducer is mounted on the right rear of the forward bulkhead, under the instrument panel.

      (1) Removal

         (a) Disconnect the two electrical leads.

         (b) Unscrew the transducer from the T-fitting on the bulkhead.

         (c) Catch spillage and cover hole to prevent foreign matter from entering oil line.

      (2) Installation

         (a) Seal transducer pipe threads with thread sealant tape.

         (b) Screw the transducer into the bulkhead fitting.

         (c) Reconnect the two electrical leads.

         (d) Perform operational check.

CHART 1
TROUBLESHOOTING OIL PRESSURE GAUGE

Trouble	Cause	Remedy
Excessive error at zero.	Pointer loose on shaft. Overpressure or seasoning of bourdon tube.	Replace instrument.
Excessive scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation	Air in line or rough engine relief.	Disconnect line and fill with light oil. Check for leaks. If trouble persists, clean and adjust relief valve.
Sluggish operation of pointer or pressure fails to build up.	Engine relief valve open.	Clean and check.

2. Oil Temperature

A. Indicator

(1) Description

The oil temperature indicator is part of the combination engine gauge which also includes the oil pressure gauge and the cylinder head temperature gauge. This instrument will display a temperature indication of the engine oil in degrees Fahrenheit.

(2) Troubleshooting

See Chart 2.

(3) Removal and Installation

See Face-mounted Instruments, 39-10-00.

B. Bulb

A standard temperature bulb, located in the oil filter housing on the engine accessory section, provides a signal to the indicator.

(1) Removal

(a) Remove safety wire from electrical connector and temperature bulb.

(b) Remove electrical connector.

(c) Unscrew and remove temperature bulb.

(2) Installation

(a) Screw in and tighten temperature bulb, then safety.

(b) Connect electrical connector and safety.

CHART 2
TROUBLESHOOTING OIL TEMPERATURE INDICATOR

Trouble	Cause	Remedy
Instrument fails to show any reading.	Broken or damaged bulb, or open wiring.	Check engine unit and wiring.
Excessive scale error.	Improper calibration adjustment.	Repair or replace.
Pointer fails to move as engine is warmed up.	Broken or damaged bulb, or open wiring.	Check engine unit and wiring.
Dull or discolored marking.	Age.	Replace instrument.

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

80

STARTING

THIS PAGE INTENTIONALLY BLANK

CHAPTER 80

LIST OF EFFECTIVE PAGES

THIS PAGE INTENTIONALLY BLANK

CHAPTER 80 - STARTING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

CRANKING

1. Description (See Figure 1.)

   A Sky-Tec Flyweight™ Starter is installed in these aircraft. A permanent magnet design, these starters feature internal gear reduction, high-torque, low weight, and Bendix-free, electromechanical engagement and disengagement. Gear reduction is 4.3:1 and the starter draws 95A current.

2. Troubleshooting

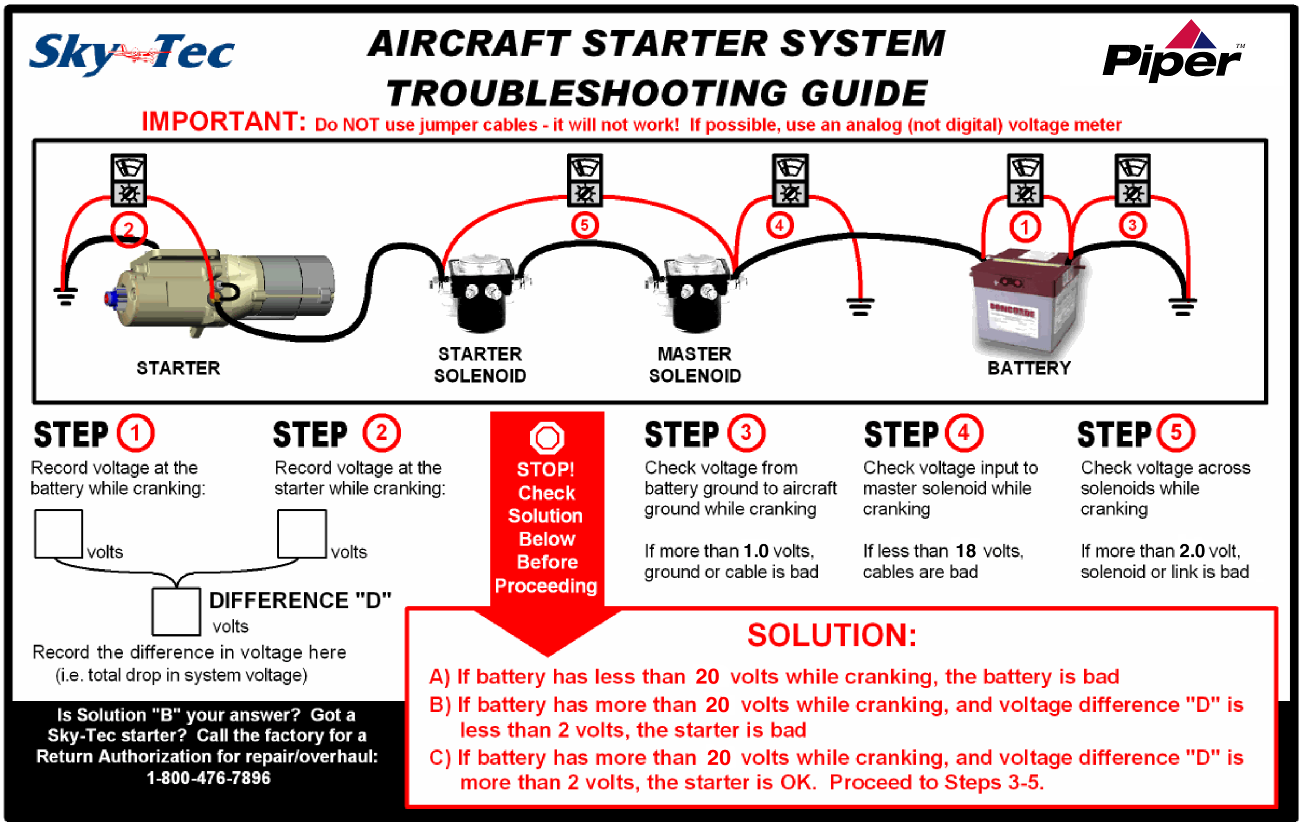
   See Chart 1.

   NOTE: NEVER USE JUMPER CABLES to test voltage to the starter. The "toothed" jaws of jumper cables are meant to "bite" into soft, leaded terminals on car batteries, and simply WILL NOT provide enough contact with the starter terminal to supply the needed amperage to engage the starter properly.

   NOTE: Use an analog voltage meter if you can. Digital meters take intermittent 'snap shots' of voltage. In situations where voltage is being supplied intermittently (even in rapid cycles), the digital meter will simply not provide the correct 'picture' of the aircraft's voltage situation.

Sky-Tec Flyweight Starter
Figure 1

CHART 1
TROUBLESHOOTING STARTER



3. Inspections

A. Starter

NOTE: NEVER USE JUMPER CABLES to test voltage to the starter. The "toothed" jaws of jumper cables are meant to "bite" into soft, leaded terminals on car batteries, and simply WILL NOT provide enough contact with the starter terminal to supply the needed amperage to engage the starter properly.

NOTE: Use an analog voltage meter if you can. Digital meters take intermittent 'snap shots' of voltage. In situations where voltage is being supplied intermittently (even in rapid cycles), the digital meter will simply not provide the correct 'picture' of the aircraft's voltage situation.

The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of service and the conditions under which the vehicle is operated. It is recommended that such inspection be made at each 100 hours and include the following:

(1) The battery should be checked with a hydrometer to be sure it is fully charged and filled to the proper level with approved water.

(2) A load test should be made to determine battery condition.

(3) If dirt and corrosion have accumulated on the battery, it should be cleaned with a solution of baking soda and water. Be sure none of the solution enters the battery cells.

(4) The starting circuit wiring should be inspected to be sure that all connections are clean and tight and that the insulation is sound.

(5) A voltage loss test should be made to locate any high resistance connections that would affect starting motor efficiency (see Chart 1).

(6) The starting motor should be operated for a few seconds with the ignition switch off to make sure that the pinion engages properly and that it turns freely without binding or excessive noise. Then the engine should be started two or three times to see that the pinion disengages properly when the engine is turned off.

B. Starter Control Circuit

(1) Inspect the control circuit wiring between the battery, solenoid and manual starting switches for breaks, poor connections and faulty insulation. Tighten all connections and make sure solenoid is firmly mounted and makes a good ground connection.

(2) Check the voltage loss across the switch contacts during normal starting. If loss is in excess of 0.2 volts per 100 amperes, the solenoid should be replaced.

(3) If solenoid fails to operate when the manual starting switch is turned on or if it fails to release when the manual starting switch is released, it should be removed and tested to specifications. If either opening or closing voltages are not to specifications, replace the solenoid.

4. Starter (See Figure 1.)

A. Removal

CAUTION: TO PREVENT SHORT CIRCUITING, DISCONNECT THE GROUND CABLE FROM THE BATTERY BEFORE REMOVING THE STARTER FROM THE ENGINE.

(1) Disconnect the electrical leads from the starter terminals.

(2) Remove mounting bolts.

(3) Remove starter.

B. Installation

(1) Position starter on engine.

(2) Insert mounting bolts and secure.

(3) Connect the electrical leads to the starter terminals.

(4) Reconnect the ground cable to the battery.

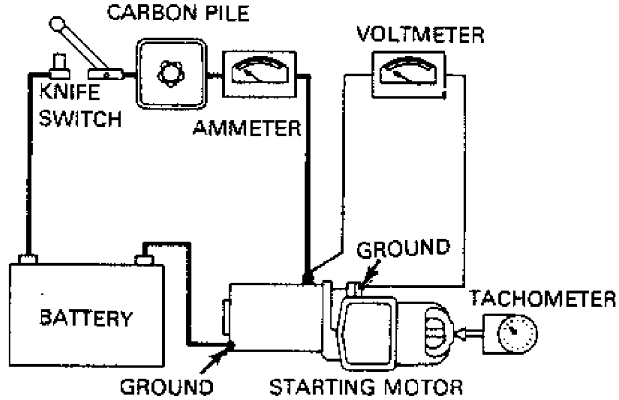
C. Bench Tests (See Figures 2 and 3.)

(1) No-Load Test

(a) Connect as shown in Figure 2.

(b) Current measured on voltmeter should be within specifications shown in Chart 2. If current is too high, check the bearing alignment and end play to make sure there is no binding or interference. Two or three sharp raps on the frame with a rawhide hammer will often help to align the bearings and free the armature.

(c) If the starter passes the No-Load Test, proceed to the Stall-Torque Test, below.



No-Load Test Set-up
Figure 2

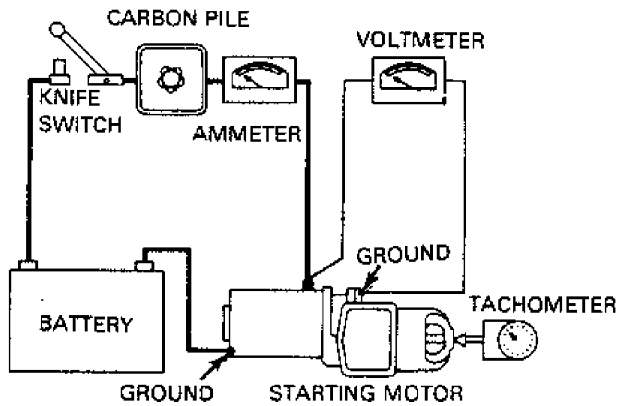
(2) Stall-Torque Test

To see if the starter is producing its rated cranking power.

(a) Make test connections and set-up as shown in Figure 3.

(b) Current measured on voltmeter should be within specifications shown in Chart 2.

(3) If torque and current are not within specifications, overhaul or replace the starter.



Stall-Torque Test Set-up
Figure 3

CHART 2
SKY-TEC STARTER MODEL 149-12PM SERVICE TEST SPECIFICATIONS

Brush Tension (oz.)			
Minimum	32		
Maximum	48		
No-Load Test (75 °F)		**Stall-Torque Test**	
Volt	23	Amps	270
Maximum Amps	40	Minimum Torque (Ft. Lbs.)	27
Minimum RPM	1000	Approximate Volts	18

5. Starting Using External Power Receptacle

Use the following procedure for starting with a 28-volt external power supply when the airplane's battery is nearly depleted:

CAUTION: CARE SHOULD BE EXERCISED WHEN SHIPS BATTERY IS DEPLETED. IF THE BATTERY SWITCH IS POSITIONED ON, THE EXTERNAL POWER SUPPLY CAN BE REDUCED TO THE LEVEL OF THE AIRPLANE'S BATTERY.

A. Position battery master switch OFF.

B. Position alternator switch OFF.

C. Position magneto switches OFF.

D. Check that all electrical switches are positioned OFF.

E. Plug a standard 28 Vdc external power source into fuselage external power receptacle.

F. Start engine using normal starting procedure.

G. After engine starts:

(1) Reduce power to lowest possible rpm.
(2) Disconnect external power cable from fuselage external power receptacle.
(3) Position battery master and alternator switches ON. Check ammeter for electrical output.

THIS PAGE INTENTIONALLY BLANK

CHAPTER

81

TURBINES

(6XT ONLY)

THIS PAGE INTENTIONALLY BLANK

CHAPTER 81

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
81-List of Effective Pages	1	Jun 1/03			
	2	Jun 1/03			
81-Table of Contents	1	Jun 1/03			
	2	Jun 1/03			
81-20-00	1	Jun 1/03			
	2	Jun 1/03			
	3	Jun 1/03			
	4	Jun 1/03			
	5	Jun 1/03			
	6	Jun 1/03			
	7	Jun 1/03			
	8	Jun 1/03			
	9	Jun 1/03			
	10	Jun 1/03			
	11	Jun 1/03			
	12	Jun 1/03			
	13	Jun 1/03			
	14	Jun 1/03			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 81 - TURBINES

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

TURBO - SUPERCHARGER

WARNING: FAILURE TO CONSULT APPLICABLE VENDOR PUBLICATION(S), WHEN SERVICING OR INSPECTING VENDOR EQUIPMENT INSTALLED IN PIPER AIRCRAFT, MAY RENDER THE AIRCRAFT UNAIRWORTHY. (SEE INTRODUCTION - SUPPLEMENTARY PUBLICATIONS.)

1. Description

A turbocharger on the engine is operated by the engine exhaust gases. The exhaust gases drive a turbine wheel which is coaxial with a compressor impeller. Induction air entering the compressor impeller is compressed and flows to the engine induction distribution system and subsequently to each cylinder. The amount of induction air compression is a function of engine power - low power = low compression; high power = high compression. Excessive pressure and flow above the established limit is expelled by the overboost valve.

The turbocharger control system consists of a hydraulically activated wastegate bypass valve, a sloped controller and turbocharger. Automatic wastegate control of the turbocharger provides a constant manifold pressure from sea level to critical altitude.

The turbocharger system requires little attention between turbo overhauls, with the exception of routine inspections as specified in 5-20-00. Should trouble occur, refer to the Troubleshooting, below, and seek out the possible cause. Do not break the clamp seal joining the turbine and compressor units.

2. Troubleshooting

Troubles peculiar to the turbocharger are listed in Chart 1 along with their probable causes and suggested remedies.

CHART 1 (Sheet 1 of 2)
TROUBLESHOOTING TURBOCHARGER

Trouble	Cause	Remedy
Waste gate won't close completely.	Broken linkage.	Repair linkage and adjust wastegate to open or closed position.
	Improper adjustment.	Re-rig actuator control.
Turbine won't come up to speed.	Worn or coked bearings.	Replace or overhaul turbocharger.
	Damage to turbine or compressor wheel.	Replace or overhaul turbocharger.
	Exhaust leaks.	Repair leaks.
Excessive noise or vibration.	Improper bearing lubrication.	Supply required oil pressure.
		Clean or replace oil line; clean oil strainer.
		If trouble persists, overhaul turbocharger.
	Leak in engine intake or exhaust manifold.	Tighten loose connections or replace manifold gaskets as necessary.
	Dirty impeller blades.	Disassemble and clean.
Engine will not deliver rated power.	Clogged manifold system.	Clear all ducting.
	Foreign material lodged in compressor impeller or turbine.	Disassemble and clean.
	Excessive dirt build-up in compressor.	Thoroughly clean compressor assembly.
		Service air cleaner and check for leakage.
	Leak in engine intake or exhaust.	Tighten loose connections or replace manifold gaskets as necessary.
	Rotating assembly bearing seizure.	Overhaul turbocharger.
	Wastegate butterfly not closing.	Butterfly shaft binding. Check bearings.
	Turbocharger impeller binding, frozen or fouling housing.	Check bearings. Replace turbocharger.

CHART 1 (Sheet 2 of 2)
TROUBLESHOOTING TURBOCHARGER

Trouble	Cause	Remedy
Critical altitude lower than specified.	Waste gate valve sticking.	Clean and free action. Check actuator system.
Engine surges or smokes.	Clogged induction duct.	Check induction duct for restrictions to air flow.
	Bootstrapping.	Operate engine within range outlined in operation manual.
NOTE: Smoke would be normal if engine has idled for a prolonged period.		
High deck pressure. (Compressor discharge pressure.)	Waste gate sticking closed.	Butterfly shaft binding. Check bearings. Replace waste gate valve or correct actuator rigging.
Oil in induction housing.	Engine idles too slow, turbo doesn't turn allowing oil to leak from compressor seal.	Increase engine idle speed to a maximum of 700 RPM, if turbo still smokes, it must be replaced. Check interconnect control for proper adjustment.
NOTE: A new turbo may smoke for a short period of time.		
	Turbine oil bearing check valve not closing at engine shut down.	Check spring actuated check valve at turbo oil inlet fitting.
White exhaust.	Leaking oil seal in turbine (coked oil drain passages.)	Clean drain passages. It is sometimes necessary to overhaul or replace turbo.
	Engine idles too slow, turbo not turning.	Increase engine idle speed to a maximum of 700 RPM, if turbo still smokes, it must be overhauled or replaced. Check interconnect control for proper adjustment.

3. Nomenclature

The following is a list of commonly used terms that apply to turbocharging.

Term	Definition
Supercharge	To increase the air pressure (density) above or higher than ambient conditions.
Supercharger	A device that accomplishes the increase in pressure.
Turbo-supercharger	More commonly referred to as a “Turbocharger” this device is driven by a turbine. The turbine is spun by energy extracted from the engine exhaust gas.
Compressor	The portion of a turbocharger that takes in ambient air and compresses it before discharging it to the engine.
Turbine	The exhaust driven end of the turbocharger unit.
Wastegate	The wastegate is a butterfly type valve in the exhaust by-pass which, throughout its travel from open to closed, allows varied amounts of exhaust pressure to by-pass the turbine, controlling its speed, hence the output of the compression.
Ground Boosted or Ground Turbocharged	These phrases indicate that the engine depends on a certain amount of turbocharging at sea level to produce the advertised horsepower. An engine that is so designed will usually include a lower compression ratio to avoid detonation.
Deck Pressure	The pressure measured in the area downstream of the turbo compressor discharge and upstream of the engine throttle valve. This should not be confused with manifold pressure.
Manifold Pressure	The pressure measured downstream of the engine throttle valve and is almost directly proportioned to the engine power output.
Normalizing	If a turbocharger system is used only to regain power losses caused by decreased air pressure of high altitude, it is considered that the engine has been “normalized.”
Overboost	An overboost condition means that manifold pressure is exceeding the limits at which the engine was tested and FAA certified and can be detrimental to the life and performance of the engine. Overboost can be caused by malfunctioning controllers or improperly operating wastegate in the automatic system or by pilot error in a manual controlled system.

NOTE: Refer to the latest revision of Lycoming Service Bulletin No. 369 for recommended engine inspections after any Overspeed or Overboost conditions.

Term	Definition
Overshoot	Overshoot is a condition of the automatic controls not having the ability to respond quickly enough to check the inertia of the turbocharger speed increase with rapid engine throttle advance. Overshoot differs from overboost in that the high manifold pressure lasts only for a few seconds. This condition can usually be overcome by smooth throttle advance.

Bootstrapping — This is a term used in conjunction with turbo machinery. If you were to take all the air coming from a turbocharger compressor and duct it directly back into the turbine of that turbocharger, it would be called a bootstrap system and if no losses were encountered, it would theoretically run continuously. It would also be very unstable because if for some reason the turbo speed would change, the compressor would pump more air to drive the turbine faster, etc. A turbocharged engine above critical altitude (wastegate closed) is similar to the example mentioned above, except now there is an engine placed between the compressor discharge and turbine inlet. Slight system changes cause the exhaust gas to change slightly, which causes the turbine speed to change slightly, which causes the compressor air to the engine to change slightly, which in turn again affects the exhaust gas, etc.

Critical Altitude — A turbocharged engine's wastegate will be in a partially open position at sea level. As the aircraft is flown to high altitude (lower ambient pressures) the wastegate closes gradually to maintain the preselected manifold pressure. At the point where the wastegate reaches its full closed position, the preselected manifold pressure will start to drop and this is considered critical altitude.

THIS PAGE INTENTIONALLY BLANK

4. Turbocharger (See Figures 1 and 2.)

A. Removal

(1) Remove the engine cowling. (Refer to 71-10-00.)

(2) Remove the turbocharger by the following procedure:

(a) At the center section of the turbocharger, remove four (4) bolts and washers (2 each, top and bottom) and disconnect the oil line (top) and oil drain tank (bottom). Remove bolt and washers securing oil drain tank support bracket to turbine housing.

(b) Remove hose clamps and disconnect the air ducts from the compressor inlet and outlet.

(c) Remove four (4) bolts, nuts, and washers and disconnect the exhaust transition pipe from the turbine inlet.

CAUTION: IF LOCKWIRE ON V-BAND COUPLING IS FOUND BROKEN, CLOSELY INSPECT V-BAND T-BOLT FOR STRETCHING, CRACKING, OR OTHER DAMAGE BEFORE REUSING THAT V-BAND COUPLING.

CAUTION: WHEN REMOVING OR INSTALLING V-BAND COUPLINGS, SLIDE COUPLING OVER THE END OF THE PIPE BEFORE ASSEMBLY/ DISASSEMBLY. EXCESSIVE SPREADING CAN LEAD TO PREMATURE COUPLING FAILURE.

(d) Remove V-band coupling and disconnect the tailpipe at the turbine outlet.

(e) Remove two (2) bolts and washers that attach the turbine to the mounting bracket and remove the turbocharger.

B. Installation

(1) Immediately prior to mounting the unit, prime the lubrication system as follows:

(a) Invert turbocharger and fill center housing with new clean oil through oil drain.

(b) Turn rotating assembly by hand to coat bearings and thrust washer with oil.

(c) Coat threads of attaching bolts or studs with high temperature thread lubricant.

NOTE: If the turbocharger is to be installed on a new or newly overhauled engine, operate the engine with a separate oil filter in the oil supply line to the turbocharger during the first hour of operation. This must be done to ensure that no metal particles are carried from the engine into the turbocharger lubrication system.

(2) Position the turbocharger in the mounting bracket and secure the mounting bracket to the turbine housing with two (2) bolts and washers.

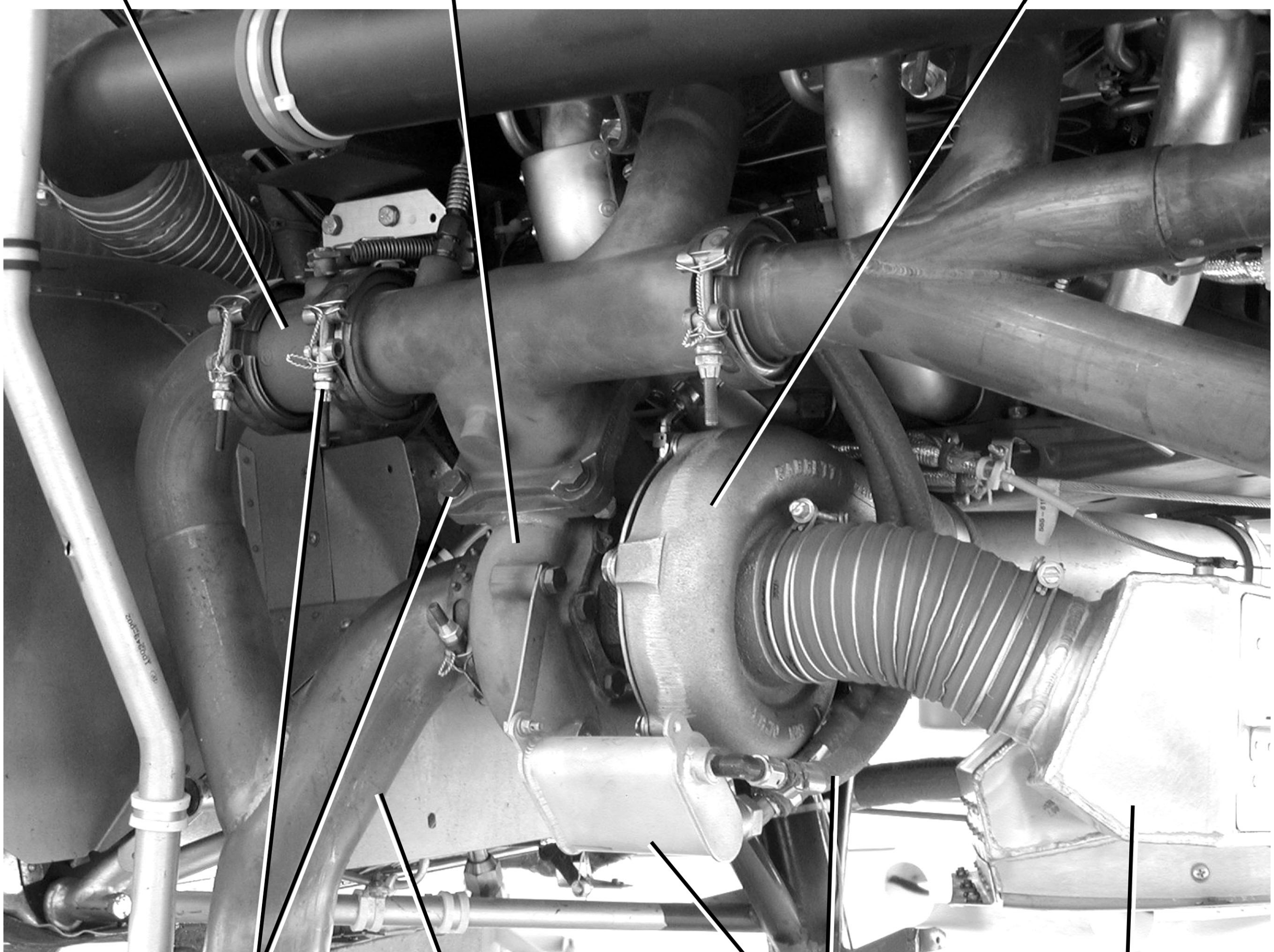
(3) Align transition pipe with the turbine inlet and secure with four (4) bolts, nuts, and washers.

(4) Position the tailpipe at the turbine outlet and secure with V-band coupling as follows:

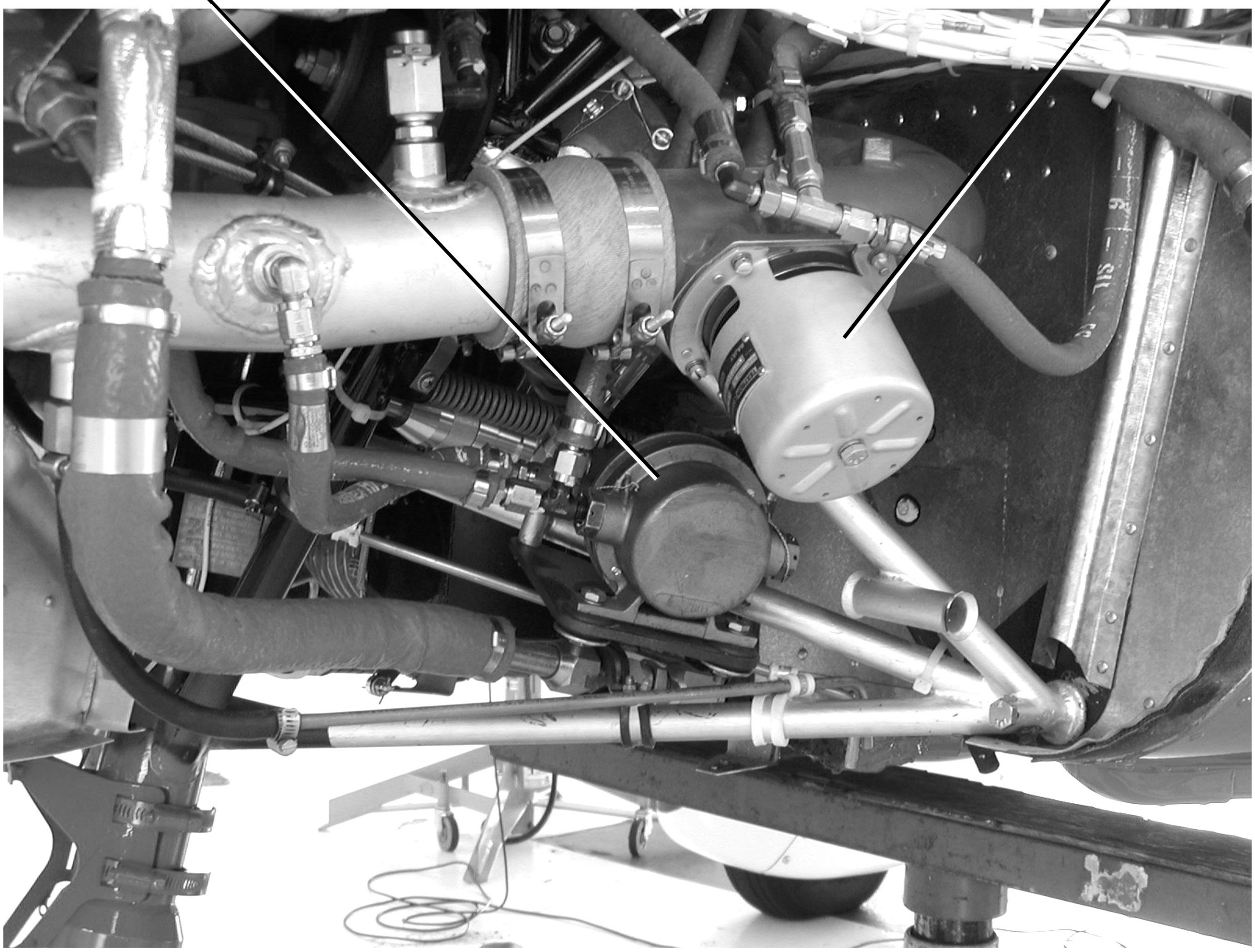
CAUTION: IF LOCKWIRE ON V-BAND COUPLING IS FOUND BROKEN, CLOSELY INSPECT V-BAND T-BOLT FOR STRETCHING, CRACKING, OR OTHER DAMAGE BEFORE REUSING THAT V-BAND COUPLING.

CAUTION: WHEN REMOVING OR INSTALLING V-BAND COUPLINGS, SLIDE COUPLING OVER THE END OF THE PIPE BEFORE ASSEMBLY/DISASSEMBLY. EXCESSIVE SPREADING CAN LEAD TO PREMATURE COUPLING FAILURE.

Install V-band coupling and while tightening the coupling nut, gently tap around the periphery of the coupling with a soft mallet while shaking the tailpipe. This will distribute the band tensions evenly. Continue tightening the coupling nut until a torque of 40-50 inch pounds is reached on the turbine to tailpipe coupling. Secure with lockwire (see Figure 4).



Turbocharger Installation
Figure 1 (Sheet 1 of 2)



LEFT SIDE, LOOKING INBOARD

Turbocharger Installation
Figure 1 (Sheet 2 of 2)

(5) Connect the induction tube to the compressor outlet and the diverter box assembly to the compressor inlet. Secure with hose clamps.

(6) Secure oil drain tank support bracket to turbine housing with bolt and washers and secure oil drain tank to turbocharger oil outlet with two (2) bolts and washers.

(7) After installing turbocharger, flush oil through oil inlet line and ensure that line is clean and unobstructed.

(8) Fill engine and oil inlet line with new, clean lubricating oil, and connect line to turbocharger oil inlet with two (2) bolts and washers.

(9) Install the engine cowling. (Refer to 71-10-00.)

C. Decoking

Mouse Milk lubricant may be used to decoke the turbine and compressor drive shaft by the following procedure:

(1) Disconnect the oil inlet and outlet lines from the turbocharger and allow all oil to drain.

(2) Cap the outlet port on the turbocharger.

(3) Pour the Mouse Milk into the oil inlet port of the turbocharger and allow the unit to soak overnight.

(4) Drain all Mouse Milk from the turbocharger and flush the unit with engine oil.

(5) Prime the turbocharger lubrication system as described in Installation, above.

5. Exhaust Wastegate Assembly (See Figures 2 and 3.)

A. Removal

(1) Remove engine cowling. (Refer to 71-10-00.)

CAUTION: IF LOCKWIRE ON V-BAND COUPLING IS FOUND BROKEN, CLOSELY INSPECT V-BAND T-BOLT FOR STRETCHING, CRACKING, OR OTHER DAMAGE BEFORE REUSING THAT V-BAND COUPLING.

CAUTION: WHEN REMOVING OR INSTALLING V-BAND COUPLINGS, SLIDE COUPLING OVER THE END OF THE PIPE BEFORE ASSEMBLY/DISASSEMBLY. EXCESSIVE SPREADING CAN LEAD TO PREMATURE COUPLING FAILURE.

(2) Remove lockwire and remove V-band couplings (2) securing wastegate to exhaust transition and tail pipes.

(3) Pull exhaust wastegate assembly outboard to gain access to the hoses at the rear of the servo.

(4) Disconnect hose fittings, cap hose ends, and remove exhaust wastegate assembly.

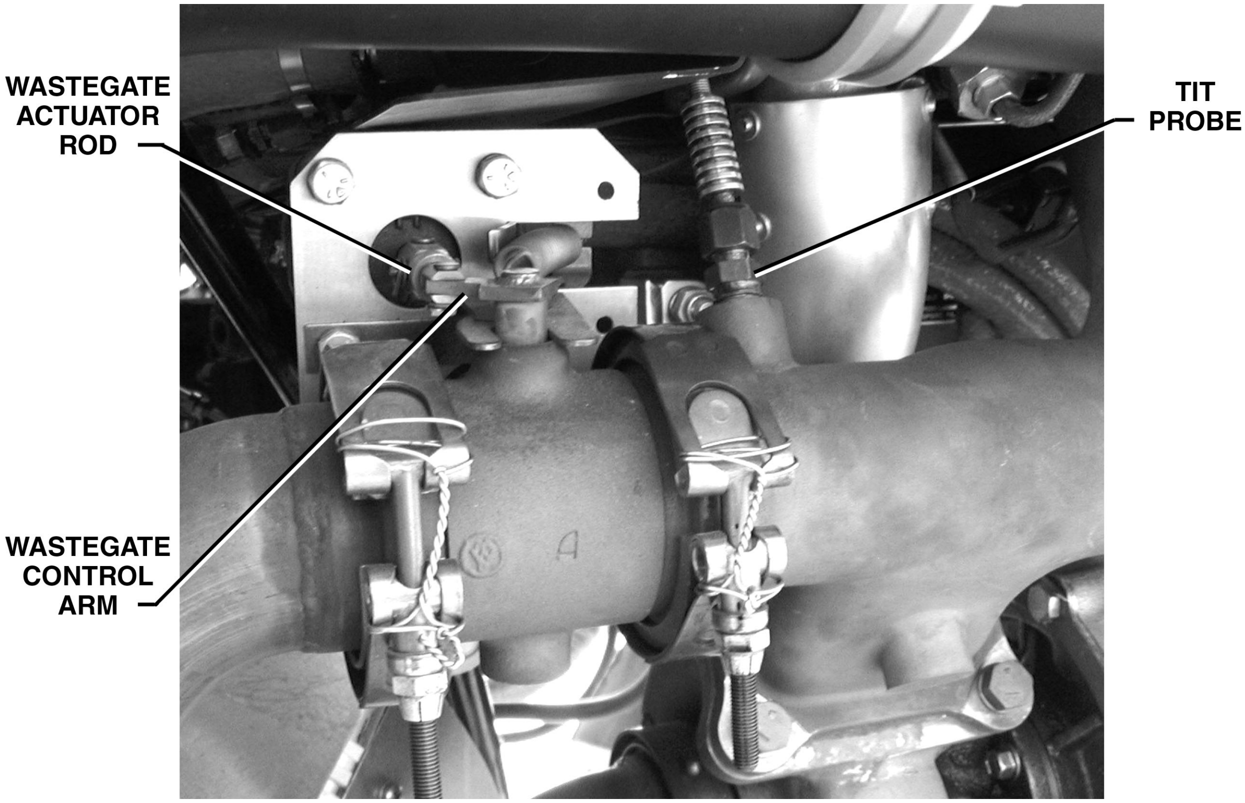
B. Installation

(1) Position exhaust wastegate assembly close to its final installed position. Uncap and connect and secure hose fittings to rear of servo.

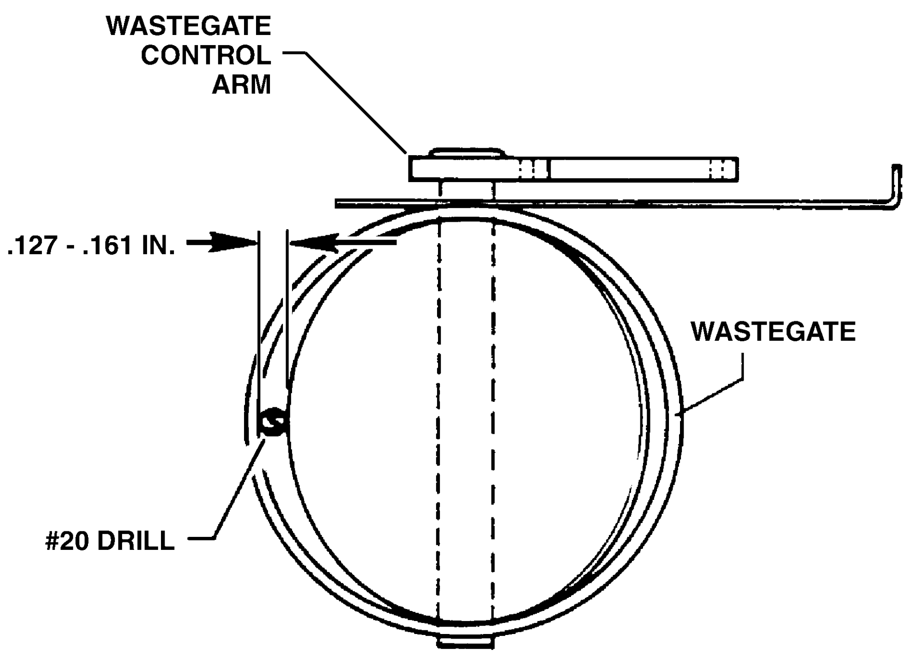
(2) Install exhaust wastegate assembly with gasket between exhaust transition and tail pipes.

(3) Secure wastegate with V-band couplings and torque couplings to specifications given in Lycoming Special Service Publication (SSP) 1776, Table of Limits. Secure with lockwire (see Figure 4).

NOTE: The wastegate valve should be lubricated with Mouse Milk or WD-40 at the butterfly pivot points every 50 hours. Mouse Milk may be purchased from: Worldwide Aircraft Filter Corp., 1685 Abram Ct., San Leandro, CA 94577.



Wastegate Installation
Figure 2



Wastegate Adjustment
Figure 3

C. Adjustment (See Figures 2 and 3.)

The exhaust wastegate (butterfly) valve is mechanically linked to a hydraulically-driven servo by the wastegate actuator rod. The butterfly valve/actuator rod orientation is set at the factory, but may occasionally require adjustment in the field.

(1) Remove the engine cowling as described in 71-10-00.

CAUTION: IF LOCKWIRE ON V-BAND COUPLING IS FOUND BROKEN, CLOSELY INSPECT V-BAND T-BOLT FOR STRETCHING, CRACKING, OR OTHER DAMAGE BEFORE REUSING THAT V-BAND COUPLING.

CAUTION: WHEN REMOVING OR INSTALLING V-BAND COUPLINGS, SLIDE COUPLING OVER THE END OF THE PIPE BEFORE ASSEMBLY/ DISASSEMBLY. EXCESSIVE SPREADING CAN LEAD TO PREMATURE COUPLING FAILURE.

(2) Remove the V-band coupling securing the tailpipe assembly to the wastegate and separate wastegate and tailpipe assembly sufficiently to allow access to the butterfly valve within the wastegate.

(3) Place the shank end of a #20 drill bit between the inner wall of the wastegate assembly and the butterfly valve (Refer to Figure 3.)

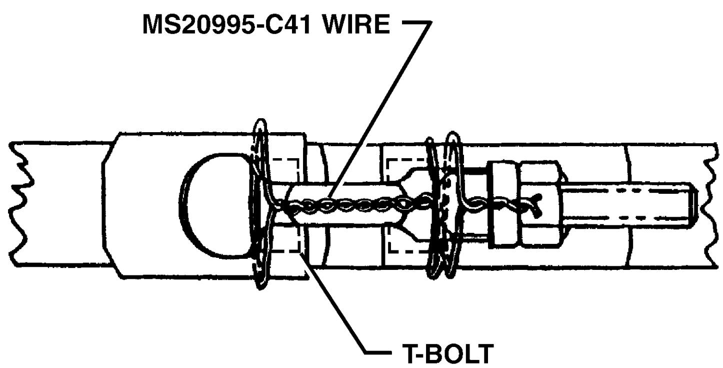
(4) A slight drag should be felt when the drill bit is moved in and out. If the drill bit is too loose, adjust the actuator rod end to obtain the proper clearance.

(5) Place the tailpipe assembly in position and secure with the appropriate V-band couplings. Lockwire couplings as shown in Figure 4.

(6) Install upper and lower cowling as described in 71-10-00.

(7) Flight test the aircraft to determine critical altitude (12,000 feet minimum) at MAX power of 2500 RPM and 38 inches Hg.

(8) If the above criteria is not met, see Chart 1.



Lockwiring V-Band Couplings
Figure 4

THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

CHAPTER

91

CHARTS & WIRING DIAGRAMS

THIS PAGE INTENTIONALLY BLANK

CHAPTER 91

LIST OF EFFECTIVE PAGES

CHAPTER 91

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
91-33-40	1	Feb 19/04			
	2	Feb 19/04			
91-34-20	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
91-74-30	1	Feb 19/04			
	2	Feb 19/04			
91-77-10	1	Feb 19/04			
	2	Feb 19/04			
91-77-20	1	Feb 19/04			
	2	Feb 19/04			
91-77-40	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			
91-80-10	1	Feb 19/04			
	2	Feb 19/04			

CHAPTER 91 - CHARTS & WIRING DIAGRAMS

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

CHARTS

1. Torque Requirements

CAUTION: DO NOT OVERTORQUE FITTINGS.

NOTE: When installing flared fittings, verify that male threads are properly lubricated. Use torque fittings values in Chart 1.

The torque values given in Chart 2 are derived from oil-free cadmium-plated threads and are recommended for all airframe installation procedures where torquing is required, unless otherwise noted in sections where other values are stipulated. Engine torque values are found in the latest revision of Lycoming SSP-1776, and propeller torque values are found in 61-10-00. Chart 1 lists the torque values for flared fittings of various sizes and material.

A. Calibrate the torque wrench periodically to assure accuracy, and recheck frequently.

B. Unless otherwise specified, torque all nuts to the applicable torque in Chart 2. If the nut (or bolt) is listed but not its mating fastener, use the lower torque in Chart 2 for the listed nut (or bolt).

NOTE: If normal operation requires movement between any of the components being clamped together, tighten the nut (or bolt) enough to insure intended operation of the assembly.

C. Bolt and nut threads should be clean and dry unless otherwise specified. If the threads are to be lubricated, reduce the recommended nut torque given in Chart 2 (plus the friction drag torque) by 50%.

D. For thread sizes 10 through 7/16, add the friction drag torque (in Chart 2) for all self-locking fasteners. For non-self locking fasteners, assume the friction drag torque to be zero.

CHART 1
FLARE FITTING TORQUE VALUES

TORQUE — INCH-POUNDS						
TUBING OD INCHES	ALUMINUM - ALLOY TUBING FLARE - AND 10061 OR AND 10078		STEEL TUBING FLARE AND 10061		HOSE END FITTING AND HOSE ASSEMBLIES	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8	———	———	———	———	———	———
3/16	———	———	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	500	1150
1-1/4	600	900	———	———	———	———
1-1/2	600	900	———	———	———	———
1-3/4	———	———	———	———	———	———
2	———	———	———	———	———	———

E. For other bolt sizes, determine the friction drag torque by attaching a scale type torque wrench to the nut and determining the torque required to turn the nut on the bolt. (Before the nut makes contact with the bearing surface.) Add the friction drag torque to the specified torque to get the final torque.

NOTE: If the bolt is stationary and the nut is torqued, use the lower side of the torque range. If the nut is stationary and the bolt is torqued use the higher side of the torque range.

F. When torquing castellated nuts, begin with minimum torque plus friction drag torque, but do not exceed maximum torque plus friction drag torque when aligning cotter key hole with the castellations in the nut. If they do not align change washers and retorque.

NOTE: When using castellated nuts on movable joints, do not torque as described above. Tighten nuts only enough to remove looseness in the joint and install the cotter pin.

G. Unless otherwise specified, when parts are used on Lycoming engines, using Piper furnished or existing Lycoming threaded fasteners, use the torque specified in Lycoming Service Table of Limits SSP-1776 latest revision.

H. After the final torque, apply slippage mark to the nut or bolt or screw head as applicable.

NOTE: For more details on torquing, refer to FAA Manual AC 43.13-1, latest revision.

2. Conversion Tables

The following charts contain various conversion data that may be useful when figuring capacities, lengths, temperatures, and various weights and measures from the English system to the metric system or back again:

Chart 3, Decimal Conversions

Chart 4, Temperature Conversion

Chart 5, Weights and Measures Conversion

Chart 6, Metric Conversion

Chart 7, Drill Sizes

3. Consumable Materials

See Chart 8.

4. Vendor Contact Information

See Chart 9.

5. Electrical Wire Coding

See Chart 10.

6. Electrical Symbols

See Chart 11.

CHART 2 (Sheet 1 of 2)
RECOMMENDED NUT TORQUES

TORQUES: The importance of correct application can not be overemphasized. Undertorque can result in unnecessary wear of nuts and bolts as well as the parts they are holding together. When insufficient pressures are applied, uneven loads will be transmitted throughout the assembly which may result in excessive wear or premature failure due to fatigue. Overtorque can be equally damaging because of failure of a bolt or nut from overstressing the threaded areas. The following procedures should be followed to assure that the correct torque is applied:

1. Self-Locking Fasteners - Add the friction torque from Chart “A” for sizes 8 through 7/16 to the recommended torque from Chart “B” to get the final torque. This would be the actual reading on the torque wrench. To determine friction drag torque for sizes 1/2 through 1 1/4, turn the nut fully on to the bolt and determine the torque required to turn the nut. Add this friction drag torque to the torque given in Chart “B”.
2. Castellated and Non-Self Locking Nuts - Use only the torque given in Chart “B”. Unless otherwise specified, when castellated nuts are used with a cotter pin on moving joints, do not torque the nut. Turn the nut onto the bolt until proper grip is established and alignment with the cotter pin hole is achieved. Then install the cotter pin.

GENERAL REQUIREMENTS.

1. Calibrate the torque wrench periodically to assure accuracy. Recheck frequently.
2. Ascertain that the bolt and nut threads are clean and dry (unless otherwise specified by the manufacturers.) If the bolt or nut is required to be lubricated prior to tightening, the torque range should be reduced 50 percent.
3. Use a bolt long enough to prevent bearing loads on the threads. The complete chamfer or end radius of the bolt or screw must extend through the nut.
4. Unique torques specified in the text of this manual supercede the torques given in Charts “A” and “B”.
5. Refer o the latest revision of Lycoming Service Table Limits, SSP1776, for torques on parts used on Lycoming engines.
6. A maximum of two AN960 washers may be added under bolt heads or nuts to correct for variations in material thickness within the tolerances permitted.
7. Self-Locking Fasteners - Limitations of the use of self-locking nuts, bolts and screws including fasteners with non-metallic inserts are as follows:
   A. Fasteners incorporating self-locking devices shall not be reused if they can be run-up using only fingers. They may be reused if hand tools are required to required to run them up providing there is no obvious damage to the self-locking device prior to installation.
   B. Bolts 5/16 inch diameter and over with cotter pin holes may be used with self-locking nuts. Nuts with non-metallic locking devices may be used in this application only if the bolts are free from burrs around the cotter pin hole.
   C. Do not use self-locking nuts at joints which subject either the nut or bolt to rotate.
   D. Never tap or rethread self-locking fasteners. Do not use nuts, bolts or screws with damaged threads or rough ends.

CHART A

BOLT SIZE	FRICTION DRAG TORQUE (IN. -LB.)
8 (course thread)	15
10	18
1/4	30
5/16	60
3/8	80
7/16	100

CHART B

COARSE THREAD SERIES

BOLTS
Steel Tension

AN 3 THROUGH AN 20
AN 42 THROUGH AN 49
AN 73 THROUGH AN 81
AN 173 THROUGH AN 186
MS 20033 THROUGH MS 20046
MS 20073
MS 20074
AN 509 NK9
MS 24694
AN 525 NK525
MS 27039

NUTS

Steel Tension	Steel Shear
AN 310 AN 315 AN 363 AN 365 NAS 1021 MS 17825 MS 21045 MS 20365 MS 20500 NAS 679	AN 320 AN 364 NAS 1022 MS 17826 MS 20364

Nut-bolt size	Torque Limits in-lbs. (Steel Tension)		Torque Limits in-lbs. (Steel Shear)	
	Min.	Max.	Min.	Max.
8-32	12	15	7	9
10-24	20	25	12	15
1/4-20	40	50	25	30
5/16-18	80	90	48	55
3/8-16	160	185	95	110
7/16-14	235	255	140	155
1/2-13	400	480	240	290
9/16-12	500	700	300	420
5/8-11	700	900	420	540
3/4-10	1,150	1,600	700	950
7/8-9	2,200	3,000	1,300	1,800
1-8	3,700	5,000	2,200	3,000
1-1/8-8	5,500	6,500	3,300	4,000
1-1/4-8	6,500	8,000	4,000	5,000

CHART 2 (Sheet 2 of 2)
RECOMMENDED NUT TORQUES

FINE THREAD SERIES												
	BOLTS Steel Tension				BOLTS Steel Tension				BOLTS Aluminum			
	AN 3 THRU AN 20 AN 42 THRU AN 49 AN 73 THRU AN 81 AN 173 THRU AN 186 MS 20033 THRU MS 20046 MS 20073 MS 20074 AN 509 NK9 MS 24694 AN 525 NK525 MS 27039				MS 20004 THRU MS 20024 NAS 144 THRU NAS 158 NAS 333 THRU NAS 340 NAS 583 THRU NAS 590 NAS 624 THRU NAS 644 NAS 1303 THRU NAS 1320 NAS 172 NAS 174 NAS 517 Steel shear bolt NAS 464				AN 3DD THRU AN 20DD AN 173DD THRU AN 186DD AN 509DD AN 525D MS 27039D MS 24694DD			
	NUTS Steel Tension		NUTS Steel Shear		NUTS Steel Tension		NUTS Steel Shear		NUTS Alum. Tension		NUTS Alum. Shear	
	AN 310 AN 315 AN 363 AN 365 NAS 1021 MS 17825 MS 21045 MS 20365 MS 20500 NAS 679		AN 320 AN 364 NAS 1022 MS 17826 MS 20364		AN 310 AN 315 AN 363 AN 365 MS 17825 MS 20365 MS 21045 NAS 1021 NAS 679 NAS 1291		AN 320 AN 364 NAS 1022 MS 17826 MS 20364		AN 365D AN 310D NAS 1021D		AN 320D AN 364D NAS 1022D	
Nut-bolt size	Torque Limits in-lbs.		Torque Limits in-lbs.		Torque Limits in-lbs.		Torque Limits in-lbs.		Torque Limits in-lbs.		Torque Limits in-lbs.	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
8-36	12	15	7	9					5	10	3	6
10-32	20	25	12	15	25	30	15	20	10	15	5	10
1/4-28	50	70	30	40	80	100	50	60	30	45	15	30
5/16-24	100	140	60	85	120	145	70	90	40	65	25	40
3/8-24	160	190	95	110	200	250	120	150	75	110	45	70
7/16-20	450	500	270	300	520	630	300	400	180	280	110	170
1/2-20	480	690	290	410	770	950	450	550	280	410	160	260
9/16-18	800	1,000	480	600	1,100	1,300	650	800	380	580	230	360
5/8-18	1,100	1,300	660	780	1,250	1,550	750	950	550	670	270	420
3/4-16	2,300	2,500	1,300	1,500	2,650	3,200	1,600	1,900	950	1,250	560	880
7/8-14	2,500	3,000	1,500	1,800	3,550	4,350	2,100	2,690	1,250	1,900	750	1,200
1-14	3,700	4,500	2,200	3,300	4,500	5,500	2,700	3,300	1,600	2,400	950	1,500
1-1/8-12	5,000	7,000	3,000	4,200	6,000	7,300	3,600	4,400	2,100	3,200	1,250	2,000
1-1/4-12	9,000	11,000	5,400	6,600	11,000	13,400	6,600	8,000	3,900	5,600	2,300	3,650

CHART 3
DECIMAL CONVERSIONS

4ths	8ths	16ths	32nds	64ths	TO 3 PLACES	TO 2 PLACES	M.M. EQUIV
				1/64	.016	.02	.397
			1/32		.031	.03	.794
				3/64	.047	.05	1.191
		1/16			.062	.06	1.587
				5/64	.078	.08	1.984
			3/32		.094	.09	2.381
				7/64	.109	.11	2.778
	1/8				.125	.12	3.175
				9/64	.141	.14	3.572
			5/32		.156	.16	3.969
				11/64	.172	.17	4.366
		3/16			.188	.19	4.762
				13/64	.203	.20	5.159
			7/32		.219	.22	5.556
				15/64	.234	.23	5.593
1/4					.250	.25	6.350
				17/64	.266	.27	6.747
			9/32		.281	.28	7.144
				19/64	.297	.30	7.540
		5/16			.312	.31	7.937
				21/64	.328	.33	8.334
			11/32		.344	.34	8.731
				23/64	.359	.36	9.128
	3/8				.375	.38	9.525
				25/64	.391	.39	9.922
			13/32		.406	.41	10.319
				27/64	.422	.42	10.716
		7/16			.438	.44	11.112
				29/64	.453	.45	11.509
			15/32		.469	.47	11.906
				31/64	.484	.48	12.303
					.500	.50	12.700

4ths	8ths	16ths	32nds	64ths	TO 3 PLACES	TO 2 PLACES	M.M. EQUIV
				33/64	.516	.52	13.097
			17/32		.531	.53	13.494
				35/64	.547	.55	13.891
		9/16			.562	.56	14.288
				37/64	.578	.58	14.684
			19/32		.594	.59	15.081
				39/64	.609	.61	15.478
	5/8				.625	.62	15.875
				41/64	.641	.64	16.272
			21/32		.656	.66	16.669
				43/64	.672	.67	17.065
		11/16			.688	.69	17.462
				45/64	.703	.70	17.859
			23/32		.719	.72	18.256
				47/64	.734	.73	18.653
3/4					.750	.75	19.050
				49/64	.766	.77	19.447
			25/32		.781	.78	19.844
				51/64	.797	.80	20.241
		13/16			.812	.81	20.637
				53/64	.828	.83	21.034
			27/32		.844	.84	21.431
				55/64	.859	.86	21.828
	7/8				.875	.88	22.225
				57/64	.891	.89	22.622
			29/32		.906	.91	23.019
				59/64	.922	.92	23.416
		15/16			.938	.94	23.812
				61/64	.953	.95	24.209
			31/32		.969	.97	24.606
				63/64	.984	.98	25.003
					1.000	1.00	25.400

CHART 4
TEMPERATURE CONVERSION

CENTIGRADE - FAHRENHEIT

Example: To convert 20°C, to Fahrenheit, find 20 in the center column headed (°F - °C); then read 68.0°F, in the column (°F) to the right. To convert 20°F, to Centigrade; find 20 in the center column and read -6.67°C, in the (°C) column to the left.

°C	°F - °C	°F	°C	°F - °C	°F
-56.7	-70	-94.0	104.44	220	428.0
-51.1	-60	-76.0	110.00	230	446.0
- 45.6	-50	-58.0	115.56	240	464.0
- 40.0	-40	-40.0	121.11	250	482.0
- 34.0	-30	-22.0	126.67	260	500.0
- 38.9	-20	-4.0	132.22	270	518.0
- 23.3	-10	14.0	137.78	280	536.0
- 17.8	0	32.0	143.33	290	554.0
-12.22	10	50.0	148.89	300	572.0
-6.67	20	68.0	154.44	310	590.0
-1.11	30	86.0	160.00	320	608.0
4.44	40	104.0	165.56	330	626.0
10.00	50	122.0	171.11	340	644.0
15.56	60	140.0	176.67	350	662.0
21.11	70	158.0	182.22	360	680.0
26.67	80	176.0	187.78	370	698.0
32.22	90	194.0	193.33	380	716.0
27.78	100	212.0	198.89	390	734.0
43.33	110	230.0	204.44	400	752.0
38.89	120	248.0	210.00	410	770.0
54.44	130	266.0	215.56	420	788.0
60.00	140	284.0	221.11	430	806.0
65.56	150	302.0	226.67	440	824.0
71.00	160	320.0	232.22	450	842.0
76.67	170	338.0	257.78	460	860.0
82.22	180	356.0	243.33	470	878.0
87.78	190	374.0	248.89	480	896.0
93.33	200	392.0	254.44	490	914.0
98.89	210	410.0	260.00	500	932.0

CHART 5
WEIGHTS AND MEASURES CONVERSION

MULTIPLY	BY	TO OBTAIN
CENTIMETERS	0.3937	IN.
	0.03281	FT.
CU. CENTIMETERS	0.001	LITERS
	0.06102	CU. IN.
	0.0002642	U.S. GAL.
CU. FT.	28.320	CU. CM.
	1.728	CU. IN.
	7.481	U.S. GAL.
	28.32	LITERS
CU. IN.	16.39	CU. CM.
	0.01639	LITERS
	0.004329	U.S. GAL.
	0.01732	QUARTS
CU. METERS	1000000	CU. CM.
	35.314	CU. FT.
	61.023	CU. IN.
	264.17	GAL.
	999.97	LITERS
FEET	0.3048	METERS
	12.000	MILS
	304.8	MM.
	0.3333	YARDS
FT.-LB.	0.1383	M-KG
	0.001285	BTU
	0.000000376	KW-HR
FLUID OZ.	8	DRAM
	29.6	CU. CM.
GAL., IMPERIAL	277.4	CU. IN.
	1.201	U.S. GAL.
	4.546	LITERS
GAL., U.S. DRY	268.8	CU. IN.
	0.1556	CU. FT.
	1.164	U.S. GAL., LIQ.
	4.405	LITERS
GAL., U.S. LIQ.	231.0	CU. IN.
	0.1337	CU. FT.
	3.785	LITERS
	0.8327	IMPERIAL GAL.
	128	FLUID OZ.
IN.	2.540	CM.
	.08333	FT.
JOULES	0.000948	BTU
	0.7376	FT.-LB.
KILOGRAMS	2.205	LB.
	35.27	OZ.
	1000	GRAMS
LITERS	1000	CU. CM.
	61.03	CU. IN.
	0.03532	CU. FT.
	0.2642	U.S. GAL.
	0.22	IMPERIAL GAL.
	1.057	QUARTS
METERS	39.37	IN.
	3.281	FT.
	1000	MM.
METER-KILOGRAM	7.233	FT.-LB.
	9.807	JOULES
OUNCES, AVDP	0.0625	LB., AVDP
	28.35	GRAMS
	437.5	GRAINS
OUNCES, FLUID	29.57	CU. CM.
	1.805	CU. IN.
LB., AVDP	453.6	GRAMS
	7000	GRAINS
	16.0	OUNCES
SQUARE INCH	6.4516	SQ. CM.
POUND PER SQUARE INCH (PSI)	0.0703	KG.-CM SQUARED
STATUTE MILE	1.609	KILOMETER
	0.8684	NAUTICAL MILE
NAUTICAL MILE	1.151	STATUTE MILE
QUART	.9463	LITER
MILLIMETER	1000	MICRON
MICRON	0.001	MILLIMETER
	0.000039	INCH
INCH POUNDS	11.521	METER GRAMS
INCH OUNCES	0.72	METER GRAMS
POUNDS	0.453	KILOGRAMS

CHART 6
METRIC CONVERSION

Example: Convert 1.5 inches to millimeters.

(1) Read down inches column to 1. inches.
(2) Read across top inch column to 0.5.
(3) Read down and across to find millimeters (1.5 inches is 38.10 millimeters).

INCHES TO MILLIMETER

INCHES	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
	MILLIMETER									
0.000		0.0025	0.0050	0.0076	0.0101	0.0127	0.0152	0.0177	0.0203	0.0228
0.001	0.0254	0.0279	0.0304	0.0330	0.0355	0.0381	0.0406	0.0431	0.0457	0.0482
0.002	0.0508	0.0533	0.0558	0.0584	0.0609	0.0635	0.0660	0.0685	0.0711	0.0736
0.003	0.0762	0.0812	0.0838	0.0863	0.0889	0.0914	0.0939	0.0965	0.0965	0.0990
0.004	0.1016	0.1041	0.1066	0.1092	0.1117	0.1143	0.1168	0.1193	0.1219	0.1244
0.005	0.1270	0.1295	0.1320	0.1346	0.1371	0.1397	0.1422	0.1447	0.1447	0.1498
0.006	0.1524	0.1549	0.1574	0.1600	0.1625	0.1651	0.1676	0.1701	0.1727	0.1752
0.007	0.1778	0.1803	0.1828	0.1854	0.1879	0.1905	0.1930	0.1955	0.1981	0.2006
0.008	0.2032	0.2057	0.2082	0.2108	0.2133	0.2159	0.2184	0.2209	0.2235	0.2260
0.009	0.2286	0.2311	0.2336	0.2362	0.2387	0.2413	0.2438	0.2463	0.2489	0.2514
INCHES	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	MILLIMETER									
0.00		0.025	0.050	0.076	0.101	0.127	0.152	0.177	0.203	0.228
0.01	0.254	0.279	0.304	0.330	0.355	0.381	0.406	0.431	0.457	0.482
0.02	0.508	0.533	0.558	0.584	0.609	0.635	0.660	0.685	0.711	0.736
0.03	0.762	0.787	0.812	0.838	0.863	0.889	0.914	0.939	0.965	0.990
0.04	1.016	1.041	1.066	1.092	1.117	1.143	1.168	1.193	1.219	1.244
0.05	1.270	1.295	1.320	1.346	1.371	1.397	1.422	1.447	1.473	1.498
0.06	1.524	1.549	1.574	1.600	1.625	1.651	1.676	1.701	1.727	1.752
0.07	1.778	1.803	1.828	1.854	1.879	1.905	1.930	1.955	1.981	2.006
0.08	2.032	2.057	2.082	2.108	2.133	2.159	2.184	2.209	2.235	2.260
0.09	2.286	2.311	2.336	2.362	2.387	2.413	2.438	2.463	2.489	2.514
INCHES	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
	MILLIMETER									
0.0		0.254	0.508	0.762	0.016	1.270	1.524	1.778	2.032	2.286
0.1	2.540	2.794	3.048	3.302	3.556	3.810	4.064	4.318	4.572	4.826
0.2	5.080	5.334	5.558	5.842	6.096	6.350	6.604	6.858	7.112	7.366
0.3	7.620	7.874	8.128	8.382	8.636	8.890	9.144	9.398	9.652	9.906
0.4	10.160	10.414	10.668	10.922	11.176	11.430	11.684	11.938	12.192	12.446
0.5	12.700	12.954	13.208	13.462	13.716	13.970	14.224	14.478	14.732	14.986
0.6	15.240	15.494	15.748	16.002	16.256	16.510	16.764	17.018	17.272	17.526
0.7	17.780	18.034	18.288	18.542	18.796	19.050	19.304	19.558	19.812	20.066
0.8	20.320	20.574	20.828	21.082	21.336	21.590	21.844	22.098	22.352	22.606
0.9	22.860	23.114	23.368	23.622	23.876	24.130	24.384	24.638	24.892	25.146
INCHES	0.00	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	MILLIMETER									
0.		2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86
1.	25.40	27.94	30.48	33.02	35.56	38.10	40.64	43.18	45.72	48.26
2.	50.80	53.34	55.88	58.42	60.96	63.50	66.04	68.58	71.12	73.66
3.	76.20	78.74	81.28	83.82	86.36	88.90	91.44	93.98	96.52	99.06
4.	101.60	104.14	106.68	109.22	111.76	114.30	116.84	119.38	121.92	124.46
5.	127.00	129.54	132.08	134.62	137.16	139.70	142.24	144.78	147.32	149.86
6.	152.40	154.94	157.48	160.02	162.56	165.10	167.64	170.18	172.72	175.26
7.	177.80	180.34	182.88	185.42	187.96	190.50	193.04	195.58	198.12	200.66
8.	203.20	205.74	208.28	210.82	213.36	215.90	218.44	220.98	223.52	226.06
9.	228.60	231.14	233.68	236.22	238.76	241.30	243.84	246.38	248.92	251.46

CHART 7
DRILL SIZES

Decimal/Millimeter Equivalents of Drill Sizes From 1/2" to No. 80

Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.
1/2	0.500	12.7000	G	0.261	6.6294	5/32	0.1562	3.9687	51	0.067	1.7018
31/64	0.4843	12.3031	F	0.257	6.5278	23	0.154	3.9116	52	0.0635	1.6129
15/32	0.4687	11.9062	E-1/4	0.250	6.3500	24	0.152	3.8608	1/16	0.0625	1.5875
29/64	0.4531	11.5094	D	0.246	6.2484	25	0.1495	3.7973	53	0.0595	1.5113
7/16	0.4375	11.1125	C	0.242	6.1468	26	0.147	3.7338	54	0.055	1.397
27/64	0.4218	10.7156	B	0.238	6.0452	27	0.144	3.6576	55	0.052	1.3208
Z	0.413	10.4902	15/64	0.2343	5.9531	9/64	0.1406	3.5719	3/64	0.0468	1.1906
13/32	0.4062	10.3187	A	0.234	5.9436	28	0.1405	3.5687	56	0.0465	1.1811
Y	0.404	10.2616	1	0.228	5.7912	29	0.136	3.4544	57	0.043	1.0922
X	0.397	10.0838	2	0.221	5.6134	30	0.01285	3.2639	58	0.042	1.0668
25/64	0.3906	9.9212	7/32	0.2187	5.5562	1/8	0.125	3.1750	59	0.041	1.0414
W	0.386	9.8044	3	0.213	5.4102	31	0.120	3.048	60	0.040	1.016
V	0.377	9.5758	4	0.209	5.3086	32	0.116	2.9464	61	0.039	0.9906
3/8	0.375	9.5250	5	0.2055	5.2197	33	0.113	2.8702	62	0.038	0.9652
U	0.368	9.3472	6	0.204	5.1816	34	0.111	2.8194	63	0.037	0.9398
23/64	0.3593	9.1262	13/64	0.2031	5.1594	35	0.110	2.794	64	0.036	0.9144
T	0.358	9.1281	7	0.201	5.1054	7/64	0.1093	2.7781	65	0.035	0.899
S	0.346	8.7884	8	0.199	5.0546	36	0.1065	2.7051	66	0.033	0.8382
11/32	0.3437	8.7300	9	0.196	4.9784	37	0.104	2.6416	1/32	0.0312	0.7937
R	0.339	8.6106	10	0.1935	4.9149	38	0.1015	2.5781	67	0.032	0.8128
Q	0.332	8.4328	11	0.191	4.8514	39	0.0995	2.5273	68	0.031	0.7874
21/64	0.3281	8.3337	12	0.189	4.8006	40	0.098	2.4892	69	0.029	0.7366
P	0.323	8.2042	3/16	0.1875	4.7625	41	0.096	2.4384	70	0.028	0.7112
O	0.316	8.0264	13	0.185	4.699	3/32	0.0937	2.3812	71	0.026	0.6604
5/16	0.3125	7.9375	14	0.182	4.6228	42	0.0935	2.3749	72	0.025	0.635
N	0.302	7.6708	15	0.180	4.572	43	0.089	2.2606	73	0.024	0.0696
19/64	0.2968	7.5387	16	0.177	4.4958	44	0.086	2.1844	74	0.0229	0.58166
M	0.295	7.4930	17	0.173	4.3942	45	0.082	2.0828	75	0.021	0.5334
L	0.290	7.3660	11/64	0.1718	4.3656	46	0.081	2.0574	76	0.020	0.508
9/32	0.2812	7.1425	18	0.1695	4.3053	47	0.0785	1.9939	77	0.018	0.4572
K	0.281	7.1374	19	0.166	4.2164	5/64	0.0781	1.9844	1/64	0.0156	0.3969
J	0.277	7.0358	20	0.161	4.0894	48	0.076	1.9304	78	0.016	0.4064
I	0.272	6.9088	21	0.159	4.0386	49	0.073	1.8542	79	0.0145	0.3683
H	0.266	6.7564	22	0.157	3.9878	50	0.070	1.778	80	0.0135	0.3429
17/64	0.2656	6.7462									

DRILL SIZES AVAILABLE

Drill may be obtained in regular sizes to a 4 inch diameter, and increase in 64ths of an inch. The regular metric drills vary from 2 to 76mm and increase in 0.5mm variations.

THIS PAGE INTENTIONALLY BLANK

CHART 8 (Sheet 1 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
ABS-Solvent/ Cements		Solarite, #11 Series	Solar Compounds Corp.
Adhesive		EC 801 EC 807 EC 1357 Scotch Grip 210	Minnesota Mining and Manufacturing Adhesive Coating and Sealers Division
	Neoprene Rubber	3M EC 1300L	
Anti-Galling Solution	MIL-A-907	Ease-Off	Taxacone Company
Anti-Seize Compound (Graphite Petrolatum)	MIL-T-5544	Armite Product	Armite Laboratories
		Anti-Seize Compound	Exxon Oil Company
		Royco 44	Royal Lubricants Co.
Anti-Seize Compound (White Lead Base)	TT-A-580 (JAN-A-669)	Armite Product	Armite Laboratories
Anti-Seize Thread Compound “HIGH TEMPERATURE”		Fel-Pro C5-A	Fel-Pro Incorporated
Buffing and Rubbing Compounds		Automotive Type DuPont #7	DuPont Company
		Ram Chemical #69	Ram Chemicals
Compound for Polishing		Mirror Glaze	Mirror Bright Polish Co., Incorporated
Plexiglas Polish and Cleaner	P-P-560	Part Number 403D	Permatex Co., Inc. Kansas City, Kansas 66115
Corrosion Retardant Compounds	MIL-C-16173 D (Piper P/N 197-508)	LPS-3 Heavy Duty Rust Inhibitor	Holt Lloyd Corp.
	(Piper P/N 197-509)	Metal Parts Protector Protector Flex	Chemi-Cap. Chemical Packaging Corp.
Cleaners		Fantastic Spray	Local Supplier
		Perchlorethylene	
		VM&P Naphtha (Lighter Fluid)	
Deicer Boot Surface Coatings		Agemaster	B.F. Goodrich
Dry Lubricant	MIL-L-60326	MS-122-6075	Local Supplier
		MS-122DF (PTFE)	Miller-Stephenson

CHART 8 (Sheet 2 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Epoxy Patching Compound		Solarite #400	Solar Compounds Corp.
Gasket Cement		Permatex No. 2	Permatex Company, Inc.
Grease, Actuator		2196-74-1	Dukes Astronautics Co.
Grease, Aircraft Instrumentation, Gear and Actuator Screw (Temp. Range - (100°F to +250°F)	MIL-G-23827A (See Note 1)	Supermil Grease No. A72832	Amoco
		Royco 27A	Royal Lubricants Co.
		Shell 6249 Grease	Shell Oil Company
		RR-28	Socony Mobil Oil Co.
		Castrolease A1	Burmah-Castrol LTD.
		Low-Temp. Grease E.P.	Texaco Incorp.
		5114 E.P. Grease AV55	Standard Oil of Calif.
		Aeroshell Grease 7 Braycote 627S	Shell Oil Company
		Mobil Grease 27	Mobil Oil Corporation
		B.P. Aero Grease 31B	B.P. Trading Limited
Grease, Aircraft Instrumentation, Gear and Actuator Screw (Temp. Range - 65°F to +250°F)	MIL-G-3278	Unitemp E.P.	Texaco Incorporated
		RPM Aviation Grease 5, Supermil Grease No. 8723	Standard Oil of Calif.
		Aeroshell Grease 7A	Shell Oil Corporation
		Royco 78	Royal Lubricants Company
		L-1212	Sinclair Refining Co.
		1916 Uni-Temp Grease	California Texas Oil Corporation

CHART 8 (Sheet 3 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Grease, Ball and Roller Bearing	MIL-G-18709	Regal ASB-2 Formula TG-10293	Texaco Incorporated
		Andok B	Exxon Company, U.S.A.
		Code 1-20481, Darina Grease 1 XSG-6213	Shell Oil Company
		Code 71-501, Darina Grease 2 XSG-6152	
		Code 71-502, Alvania Grease 2 XSG-6151	
		Code 71-012, Cyprina Grease 3 XSG-6280	
		Code 71-003	
Grease, General Purpose Wide Temperature	MIL-G-81322	Marfax All Purpose	Texaco Incorporated
		Aeroshell No. 6	Shell Oil Company
		Mobil Grease 77 or Mobilux EP2	Mobil Oil Corporation
		Shell Alvania EP2	Shell Oil Company
		Royco 22	Royal Lubricants Company
		Mobil Grease 28	Mobil Oil Corporation
		Aeroshell No. 22	Shell Oil Company
Grease, High Temperature	MIL-G-3545C	High Temp. Grease, Marfak All Purpose	Texaco Incorporated
		Shellaire Grease HT	Shell Oil Company
		Alvania E.P. Grease 2	
		Aeroshell Grease 5	
		Grease 77, Mobilux E.P. 2	Mobil Oil Corporation
		Royco 45A	Royal Lubricants Co.
		L-1231	Sinclair Refining Company

CHART 8 (Sheet 4 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Grease, Aircraft General Purpose	MIL-G-7711	Regal AFB2 Regal Starfak Premium	Texaco Incorporated
		PED 3040	Standard Oil of Calif.
		Aeroshell Grease 6	Shell Oil Company
		Royco II	Royal Lubricants Company
Grease, Lubricating, Molybdenum Disulfide, Low and High Temperature	MIL-G-21164	Aeroshell Grease No. 17	Shell Oil Company
		Royco 64C	Royal Lubricants Co.
		Castrolease MSA (c)	Burmah Castrol LTD.
Grease, Lubricating, Plug Valve, Gasoline and Oil Resistant	MIL-G-6032	Royco 32	Royal Lubricant Company
		Castrolease PV	Burmah Castrol LTD.
		Parker Fuel Lube 44	Parker Seal Company
		B.P. Aero Grease 32	B.P. Trading Limited
		L-237	Lehigh Tenneco Chemicals Co., Inc.
		Rockwell 950	Rockwell International
Grease, Waterproof, High and Low Temperature		Aero Lubriplate	Fiske Brothers Refining Company
"Hot Melt" Adhesive Polyamids and "Hot Melt" Gun.	Stick Form 1/2 in. diameter, 3 in. long		Sears, Roebuck and Company or most hardware stores.

CHART 8 (Sheet 5 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Company
		TL-5874	Texaco Incorporated
		PED 3565	Standard Oil Company of California
		Aircraft Hydraulic Oil AA	Texaco Incorporated
		RPM Aviation Oil No. 2 Code PED 2585 PED 3337	Standard Oil Company of California
		3126 Hydraulic oil (uniuisyo)	Exxon Company U.S.A
		Aeroshell Fluid 4, SL-7694	Shell Oil Company
		Aero HF	Mobil Oil Corporation
		Royco 756, 756A and 756B	Royal Lubricants Co.
Isopropyl Alcohol	Fed. Spec. TT-I-735		Local Supplier
Kevlar		Kevlar	Kevlar Special Products
Leak Detector Solution for Oxygen Systems	MIL-L-25567C	ALPHA 73 Oxygen Leak Detector Type 1	U.S. Gulf Corporation
		Leak Tec #16-OX	American Gas and Chemical Co. LTD.
Loctite	MIL-S-22473 Grade AA	Loctite 290	Loctite Corporation
	MIL-S-22473 Grade H and HV	Loctite 222	
Methylethylketone	Fed. Spec. TT-M-261		Local Supplier
Molybdenum Disulfide	MIL-M-7866	Molykote-Type G (Paste)	Dow Corning Corp.
		Molykote - Type 2 (Powder)	

CHART 8 (Sheet 6 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Oil, Air Cond., HFC-134a	Piper P/N 923-384	PAG-21941	
Oil Lubricating, General Purpose, Low Temperature	MIL-L-7870	Caltex Low Temp. Oil	Caltex Oil Products Company
		Sinclair Aircraft Orbit Lube	Sinclair Refining Company
		1692 Low Temp Oil	Texaco Incorporated
		Aviation Instrument Oil	Standard Oil Company of California
		Royco 363	Royal Lubricants Co.
Rain Repellent	FSCM 50150	Repcon	Unelco Corporation
Safety Walk Pressure Sensitive		Flextred 300	Wooster Products, Incorporated
Sealant	MIL-S-11031B	PRC 5000 PRC 383	Products Research Company
Sealant, Fuel Tank Sealing		RS-36b, Stripper (thin)	CEE BEE Chemical Co.
		RS-24b, Stripper (thick)	
		PR 1422 A-2 Sealant (Brushing Consistency)	Products Research Company
		PR 1422 B-2 Sealant (Trowling Consistency)	
		PR 1431G, Faying Surface Seal, Type 1	
		PR 1321-B 1/2, Access Panel Sealant	
		PR 1560 MK, Primer (Anti-Bacteriological Coating)	Products Research Company

CHART 8 (Sheet 7 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Sealant, Fuel Tank Sealing (continued)		BJO-0930, Phenolic Balloons	Union Carbide Plastics Division
		ERL-2795, Epoxy Resin	
		22LA-0340 Polyamid Hardener	
	Class A-2	Thiokol MC-236	
Sealant, Fuselage Structure	Class A-1/2, A-2, B-2 B-4, B-6, B-8		H.S. Bancroft Corp.
		EC 1239	Minnesota Mining and Manufacturing Industrial Specialties Division
		EC 612 (Leak Marker or Weatherstripping, etc)	
		G.E.-SS-4004 (Primer) RTV-88 with RTV-9811	General Electric Silicone Products Department
Sealant, Window & Airframe	Piper P/N 279-063	Bostik Chem-Calk 915 (Polyurethane); or,	
	Piper P/N 279-058	Bostik 1100FS (Urethane); or,	
	Piper P/N 179-853	3M Weatherban 606 (Acrylic); or,	Minesota, Mining & Mfg., 3M Center
		3M Weatherban 101 (Polysulfide); or,	
		PR-307 (Polysulfide);	Product Research Company
Sealing Compound, Gasket and Joint		Tite-Seal	Radiator Specialty Co.
Sealer		PR 1321 B-1/2	Products Research Company
Silicone Compound	MIL-S-8660 (MIL-C-21567)	DC-4, DC-6 Compound	Dow Corning
		G-624	General Electric Co. Silicone Products Department

CHART 8 (Sheet 8 of 8)
CONSUMABLE MATERIALS

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Solvents		Methylethyl Ketone	Local Suppliers
		Methylene Chloride	
		Acetone	
		Y2900	Union Carbide; Plastic Division
	Fed. Spec. PD 680 Type I - Stoddard Solvent		Local Supplier
	Type II - High Temperature		Local Supplier
Propeller Slip Ring Cleaning Solvent		CRC-2-26	Corrosion Reaction Consultants, Inc.
Tape, Vinyl Foam, Type 2, l/8 in. x 1 in.	Piper P/N 189-721	V510 or V740 Series; or,	Norton Tape Division
		VF-1100 Series; or,	Pres-On Products, Inc. Addison, IL 60101
		V1500 Series	Gaska Tape Inc. Elkhart, IN 46515-1698
Toluol	TT-M-261		Local Supplier
Trichlorethylene	MIL-T-7003	Perm-A-Clor	Dextrex Chemical Industries, Inc.
		Turco 4217	Turco Products, Inc.
Teflon Tape	.003" x .5" wide/-1		Minnesota Mining and Manufacturing Company
			Shamban W.S. and Co.
	.003" x .25" wide/-2		Johnson & Johnson, Inc. Permacel Division
Thread Sealant for High Pressure Oxygen System	MIL-T-27730	Permacel 412	Johnson & Johnson, Inc. Permacel Division
Vinyl Foam	1 in. x 1/8 in.	530 Series, Type I	Norton Tape Division
Vinyl, Black Plastic	2 in. x 9 mil. and/or 1 1/2 in. x 9 mil.		

NOTE: Take precautions when using MIL-G-23827 and engine oil. These lubricants contain chemicals harmful to painted surfaces.

CHART 9 (Sheet 1 of 2)
VENDOR CONTACT INFORMATION

A

American Gas and
Chemical Co. LTD
220 Pegasus Avenue
Northvale, NJ 07647
201-767-7300

Amoco Oil Co.
200 E. Randolph Drive
Chicago, IL 60601
312-856-5111

Armite Laboratories
1845-49 Randolph Street
Los Angeles, CA 90001
213-587-7744

B

BP Trading Limited
Moore Lane
Brittanic House
London E.C. 2
England

Bray Oil Company
1925 N. Marianna Avenue
Los Angeles, CA 98103
213-268-6171

Burmah - Castrol Inc.
30 Executive Avenue
Edison, NJ 08817
201-287-3140

C

California Texas Oil Corp.,
380 Madison Avenue
New York, NY 10017

Caltex Oil Products Co.
New York, NY 10020

CEE BEE Chamical Co.
9520 E. CEE BEE Drive
Box 400
Downey, CA 92041

Chemi-cap
Chemical Packaging Corp.
1100 N.W. 70th Street
Ft. Lauderdale, FL 33309
305-665-9059

Corrosion Reaction
Consultants, Inc.
Limekin Pike
Dresher, PA 19025

D

Dextrex Chemical
P. O. Box 501
Detroit, MI 48232

Dow Corning Corporation
Alpha Molykote Plant
64 Harvard Avenue
Stanford, CT 06902

Dukes Astronautics Co.
7866 Deering Avenue
Canoga Park, CA 91304

DuPont Company
Finishes Div.
DuPont Building
Wilmington, DE 19898
302-774-1000

E

Exxon Oil Company
1251 Avenue of the Americas
New York, NY 10020
212-398-3093

F

Fel-Pro Incorporated
7450 N. McCormick Blvd.
Box C1103
Skokie, IL 60076
312-761-4500

Fiske Brothers
Refining Company
120 Lockwood Street
Newark, NJ 07105
201-589-9510

G

General Electric Co.
Silicone Products Dept.
Waterford, NY 12188
518-237-3330

H

H. S. Bancroft Corp.
One Rockhill
Industrial Park
Cherry Hill, NJ 08003
609-854-8000

Holt Lloyd Corp.
4647 Hugh Howell Rd.
Tucker, GA 30084
404-934-7800

J

Johnson & Johnson, Inc.
Permacel Division
501 George Street
New Brunswick, NJ 08901
201-524-0400

K

Kevlar Special Products
E.I. DuPont de
Nemours & Co., (Inc.)
Textile Fibers
Department
Centre Road Building
Wilmington, DE 19898
302-999-3156

L

Lehigh - Tenneco Chemicals
Co., Inc.
Chestertown, MD 21620
301-778-1991

Loctite Corporation
777 N. Mountain Road
Newington, CT 06111
800-243-8160
In CT 800-842-0225

CHART 9 (Sheet 2 of 2)
VENDOR CONTACT INFORMATION

M

Miller-Stephenson
George Washington Hwy
Danbury, CT 06810
203-743-4447

Minnesota Mining and MFG
3M Center
St. Paul, MN 55144
612-733-1110

Mirror Bright Polish Co., Inc.
Irvine Industrial Complex
P.O. Box 17177 Irvin, CA 92713
714-557-9200

Mobil Oil Corporation
150 E. 42nd Street
New York, NY 10017
212-883-4242

N

Norton Tape Division
Department 6610
Troy, NY 12181
518-273-0100

P

Parker Seal Company
17325 Euclid Avenue
Cleveland, OH 44112
216-531-3000

Permatex Co., Inc.
P.O. Box 11915
Newington, CT 06111
203-527-5211

Products Research Co.
2919 Empire Avenue
Burbank, CA 91504
213-849-3992

R

Radiator Specialty Co.
P.O. Box 34689
Charlotte, NC 28234
704-377-6555

Ram Chemicals
201 E. Alondra Blvd.
Gardena, CA 90248
213-321-0710

Rockwell International
600 Grant Street
Pittsburgh, PA 15219
412-565-2000

Royal Lubricants Company
River Road
E. Hanover, NJ 07936
201-887-3100

S

Shamban W.S. and Co.
1857 Centinela Avenue
Santa Monica, CA 90404
213-397-2195

Shall Oil Company
One Shell Plaza
Houston, TX 77003
713-220-6697

Sinclair Refining Co.
600 Fifth Avenue
New York, NY 10020

Socony Mobil Oil Co.
Washington 5, DC 20005

Solar Compounds Corp.
1201 W. Blancke Street
Linden, NJ 07036
201-862-2813

Standard Oil of California
225 Bush Street
San Francisco, CA 94104
415-894-7700

Sun Oil Company of Penna
5 Penn Center Plaza
Philadelphia, PA 19103
215-972-2000

T

Taxacone Company
P.O. Box 10823 TR
Dallas, TX 75208

Texaco, Inc.
2000 Westchester Avenue
White Plains, NY 10650
914-253-4000

Turco Products Inc.
24600 S. Main Street
Box 6200
Carson, CA 90749
213-835-8211

U

U.S. Gulf Corp.
P.O. Box 233
Stoney Brook, NY 11790
212-683-9221

Unelko Corporation
727 E. 110th Street
Chicago, IL 60628

Union Carbide; Plastic Div.
270 Park Avenue
New York, NY 10017
212-551-3763

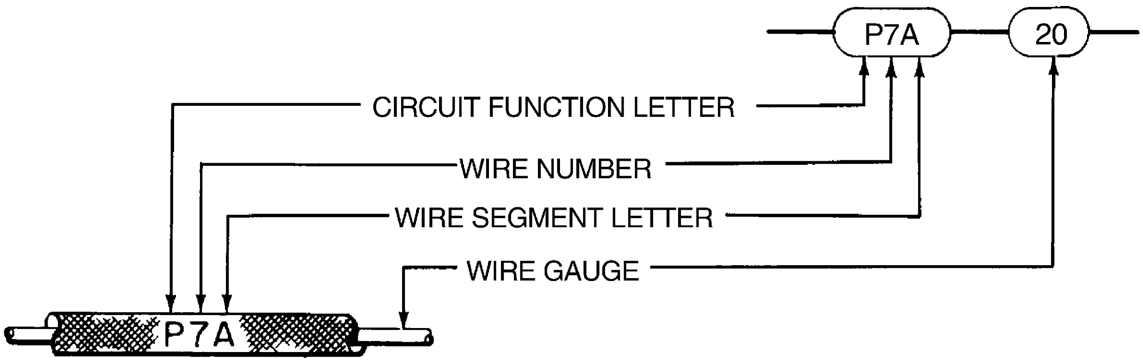
V

Virginia Chemical
3340 W. Norfolk Rd.
Portsmouth, VA 23703
703-484-5000

W

Wooster Products, Inc.
1000 Spruce Street
Wooster, OH 44691
800-321-4936
In OH 216-264-2844

CHART 10
ELECTRICAL WIRE CODING



CIRCUIT FUNCTION LETTER	CIRCUIT
A	AUTOPILOT
C	CONTROL SURFACE
E	ENGINE INSTRUMENT
F	FLIGHT INSTRUMENT
G	LANDING GEAR
H	HEATER - VENTILATING & DEICING
L	LIGHTING
P	POWER
Q	FUEL & OIL
RP	RADIO POWER
RZ	RADIO AUDIO
J	IGNITION
W	WARNING
K	STARTER

CHART 11 (Sheet 1 of 2)
ELECTRICAL SYMBOLS

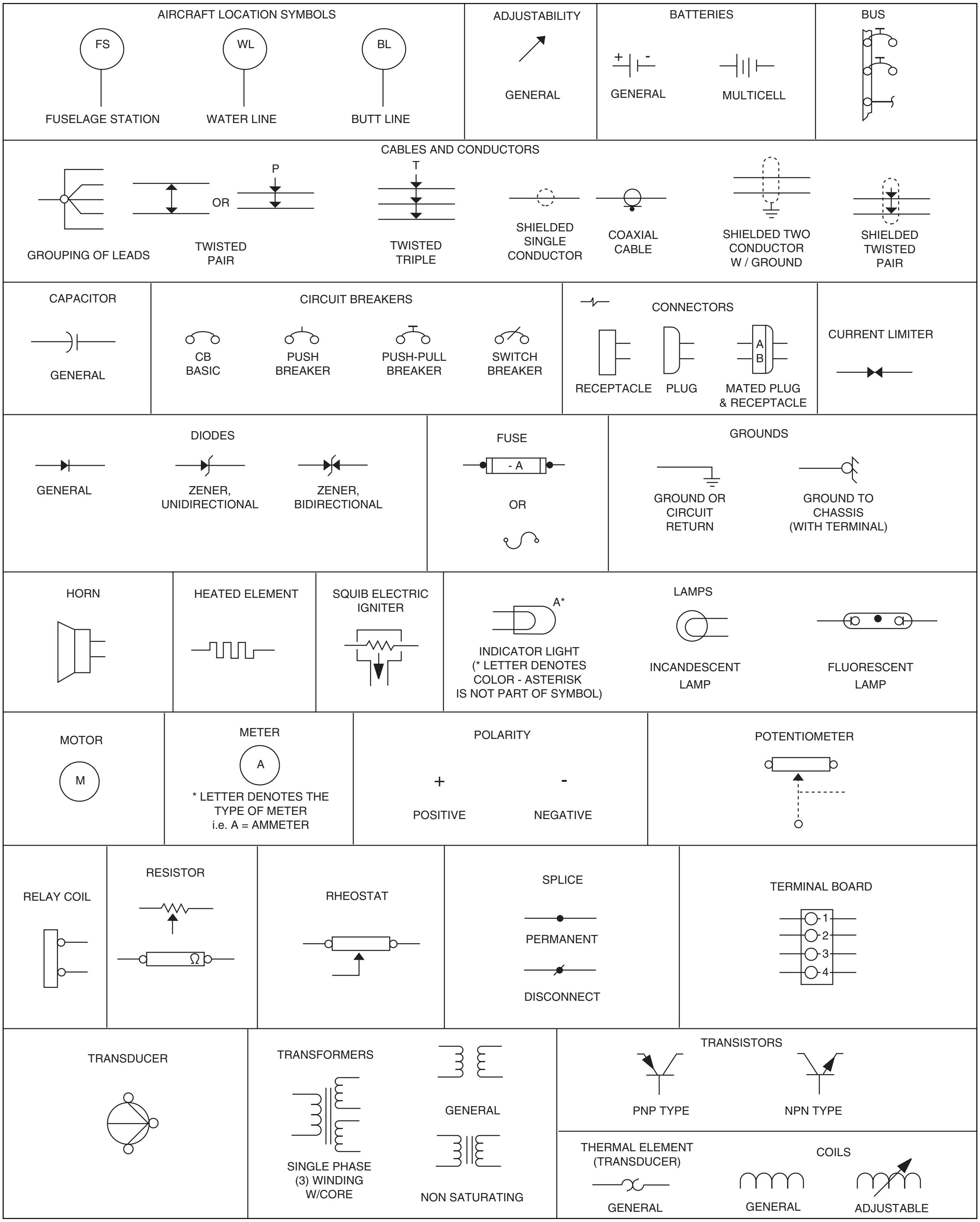
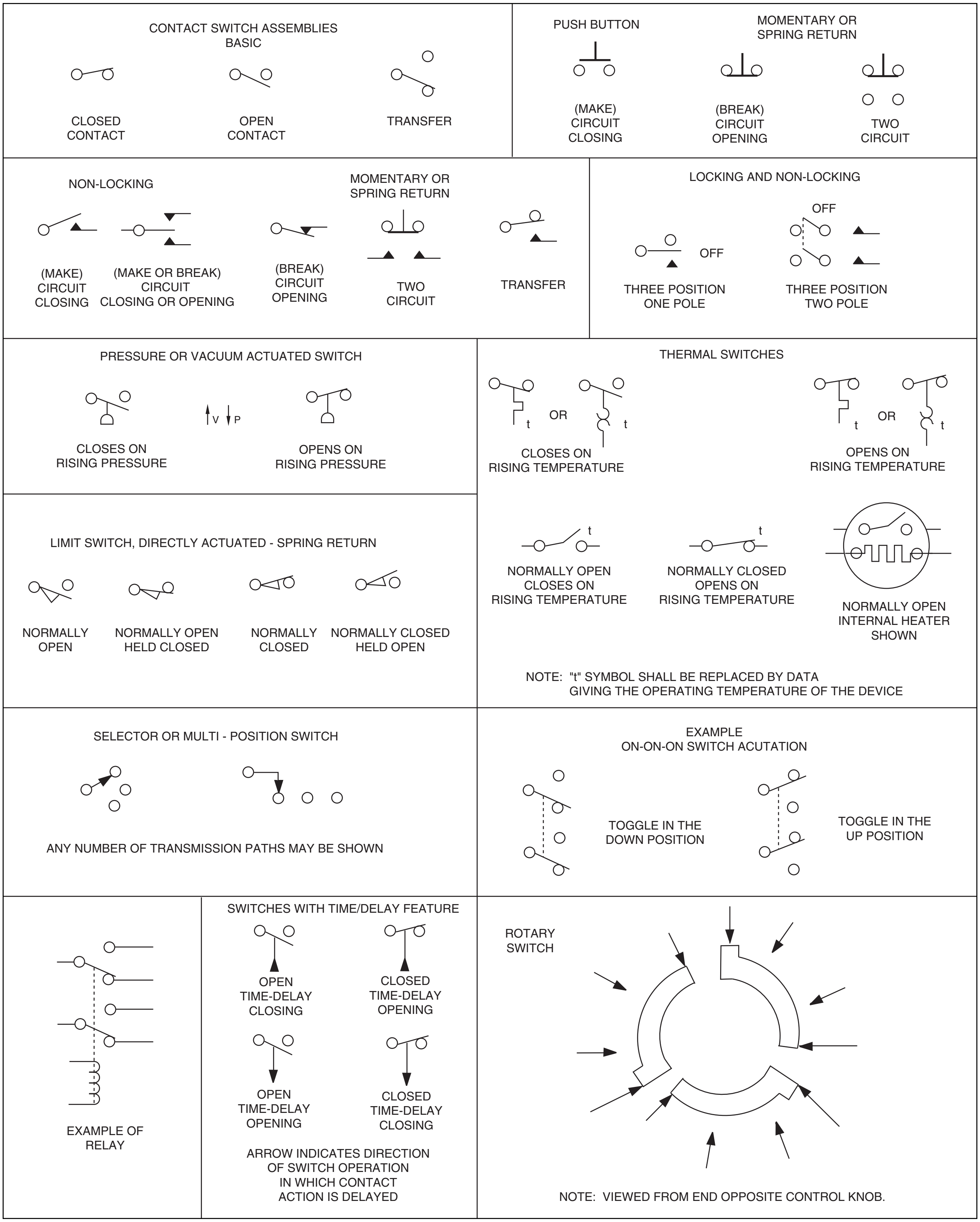


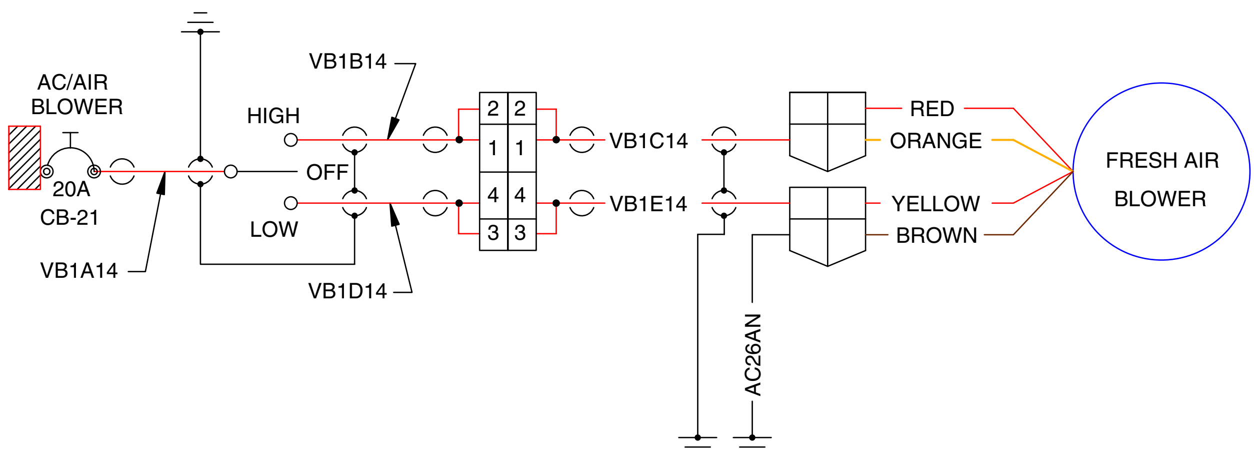
CHART 11 (Sheet 2 of 2)
ELECTRICAL SYMBOLS



THIS PAGE INTENTIONALLY BLANK

THIS PAGE INTENTIONALLY BLANK

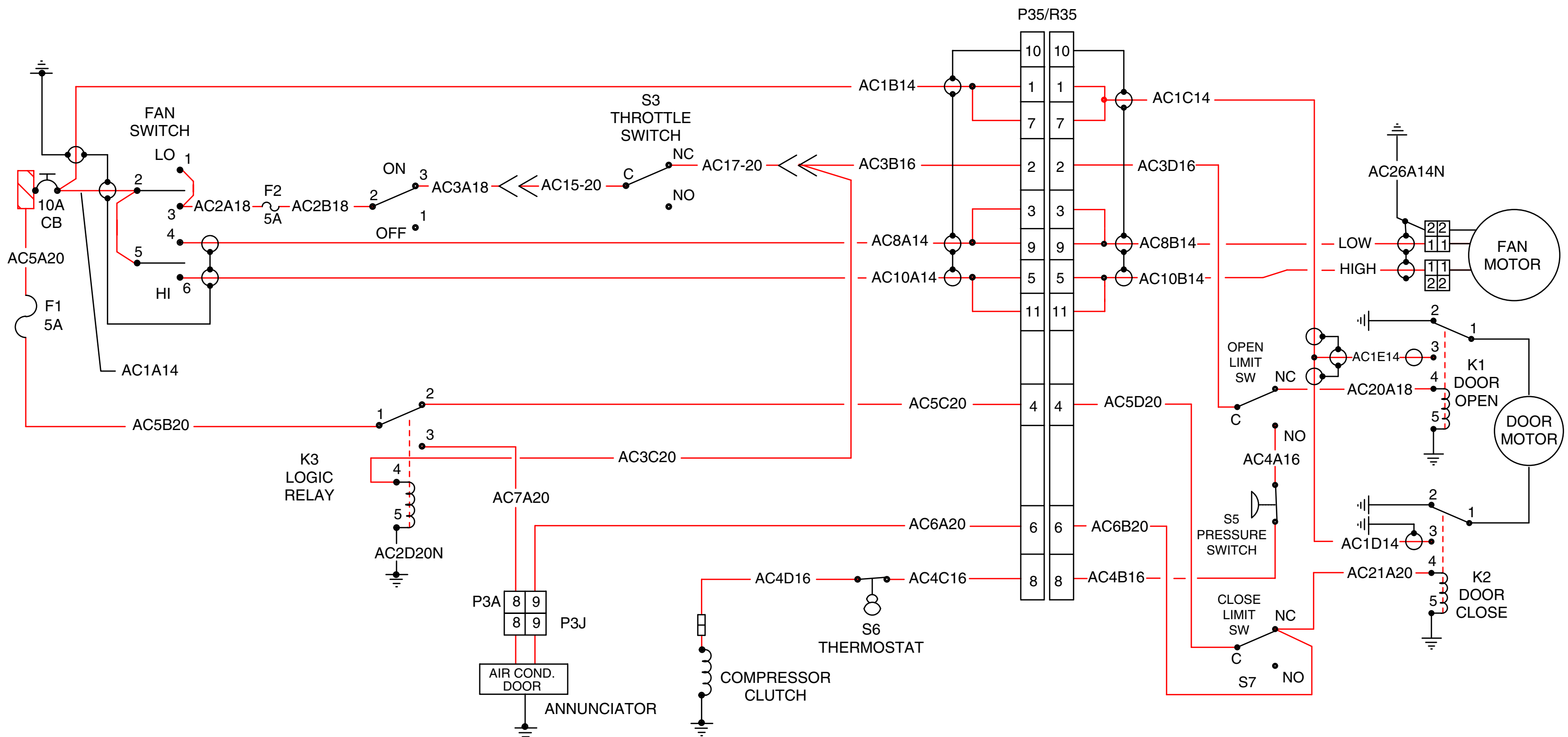
THIS PAGE INTENTIONALLY BLANK



105232 11.0 NEW / G
101849 10.0 NEW

Fresh Air Blower (Optional)
Figure 1

THIS PAGE INTENTIONALLY BLANK

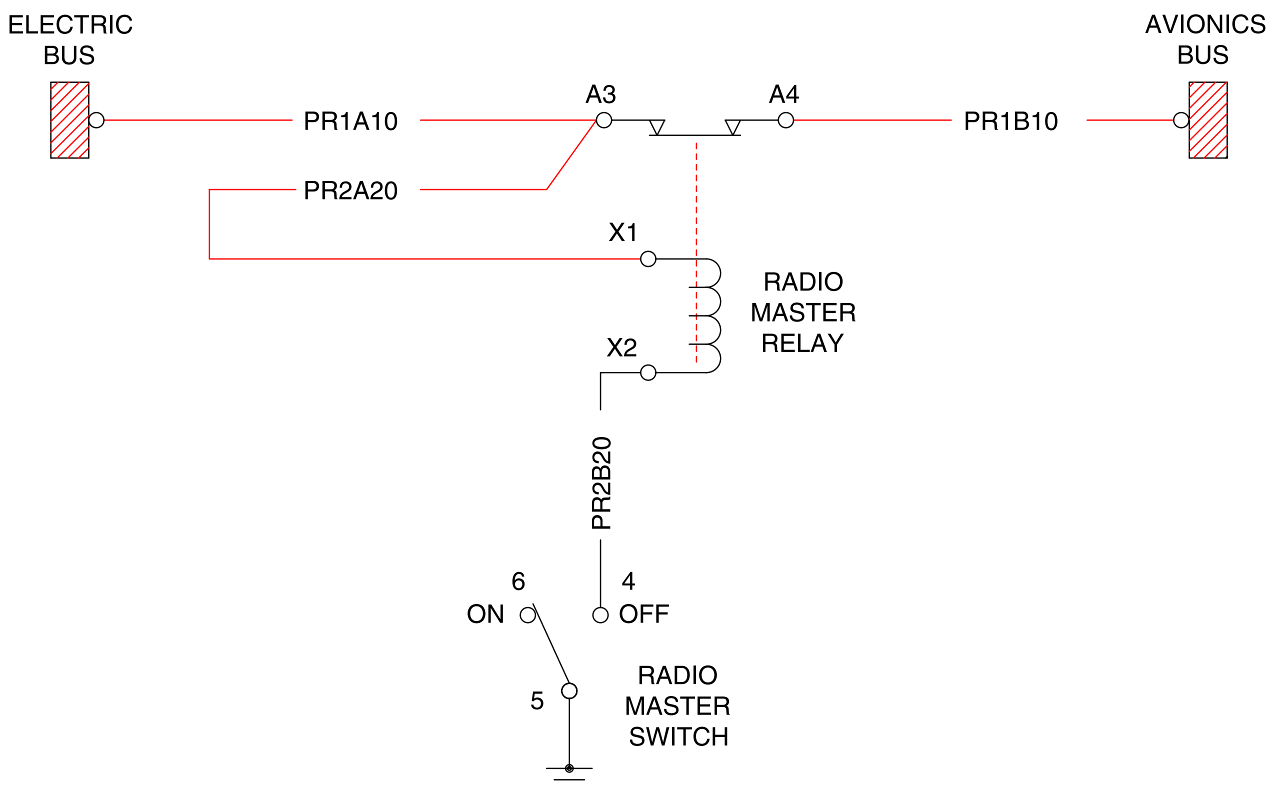


SHOWN WITH FAN SWITCH OFF, AIR COND SWITCH IN ON POSITION, THROTTLE NOT WIDE OPEN, PRESSURE SWITCH BELOW MAX PRESSURE, THERMOSTAT CALLING FOR COOLING AND CONDENSER DOOR CLOSED.

105232 24.0 NEW / G
101849 23.0 NEW

Air Conditioning (Optional)
Figure 1

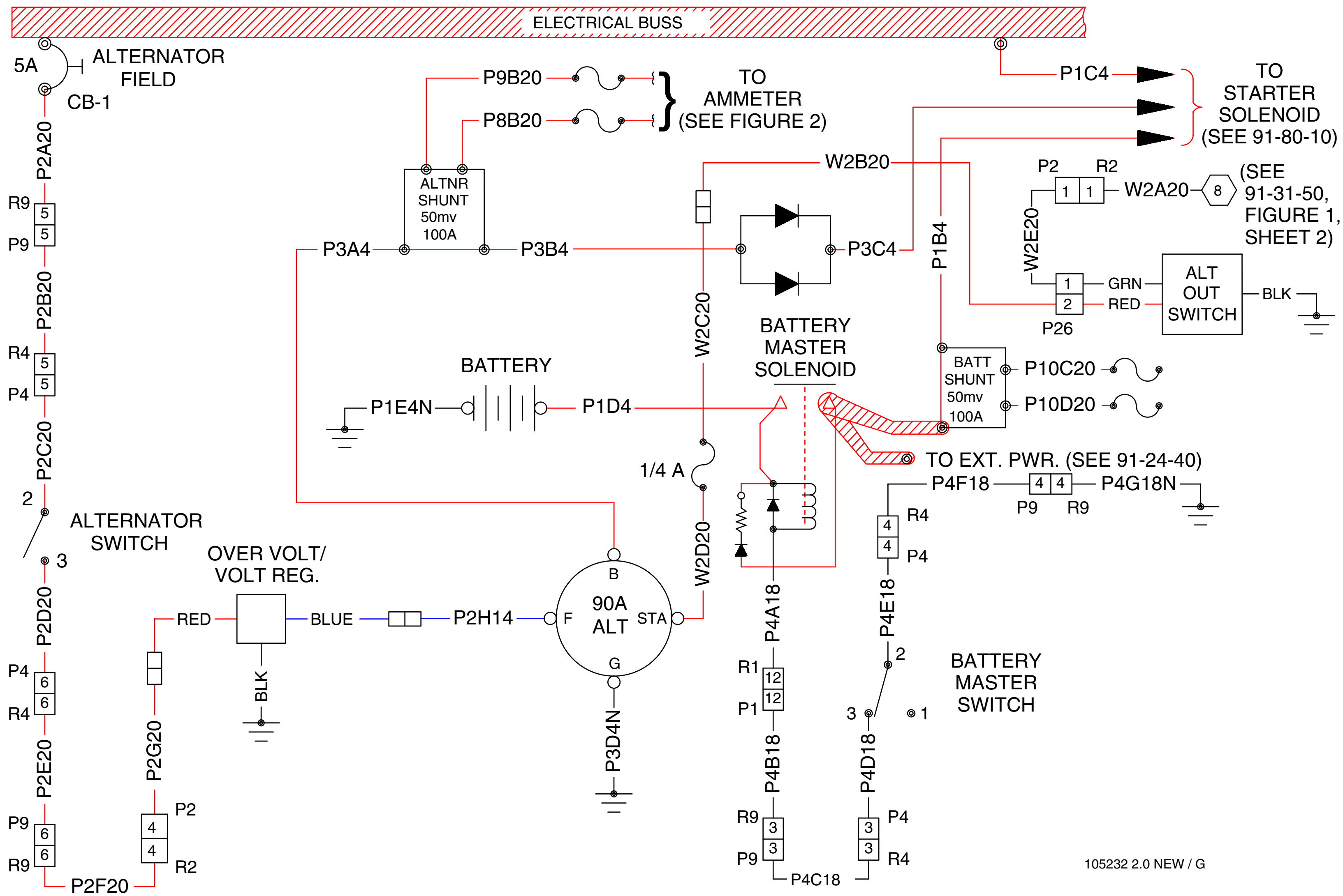
THIS PAGE INTENTIONALLY BLANK



105232 13.0 NEW / G
101849 12.0 NEW

Radio Master Switch
Figure 1

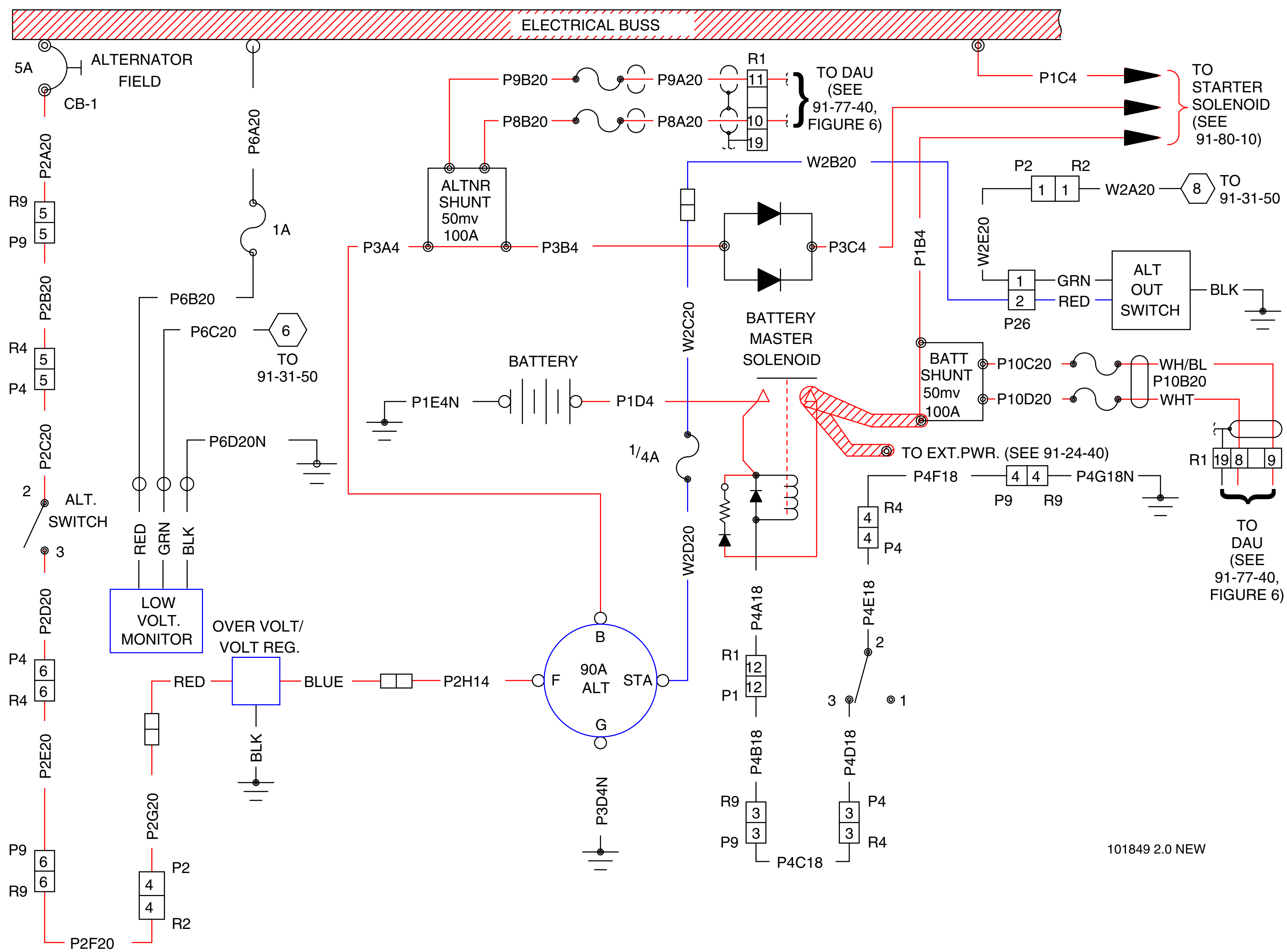
THIS PAGE INTENTIONALLY BLANK



Alternator Power
Figure 1 (Sheet 1 of 2)

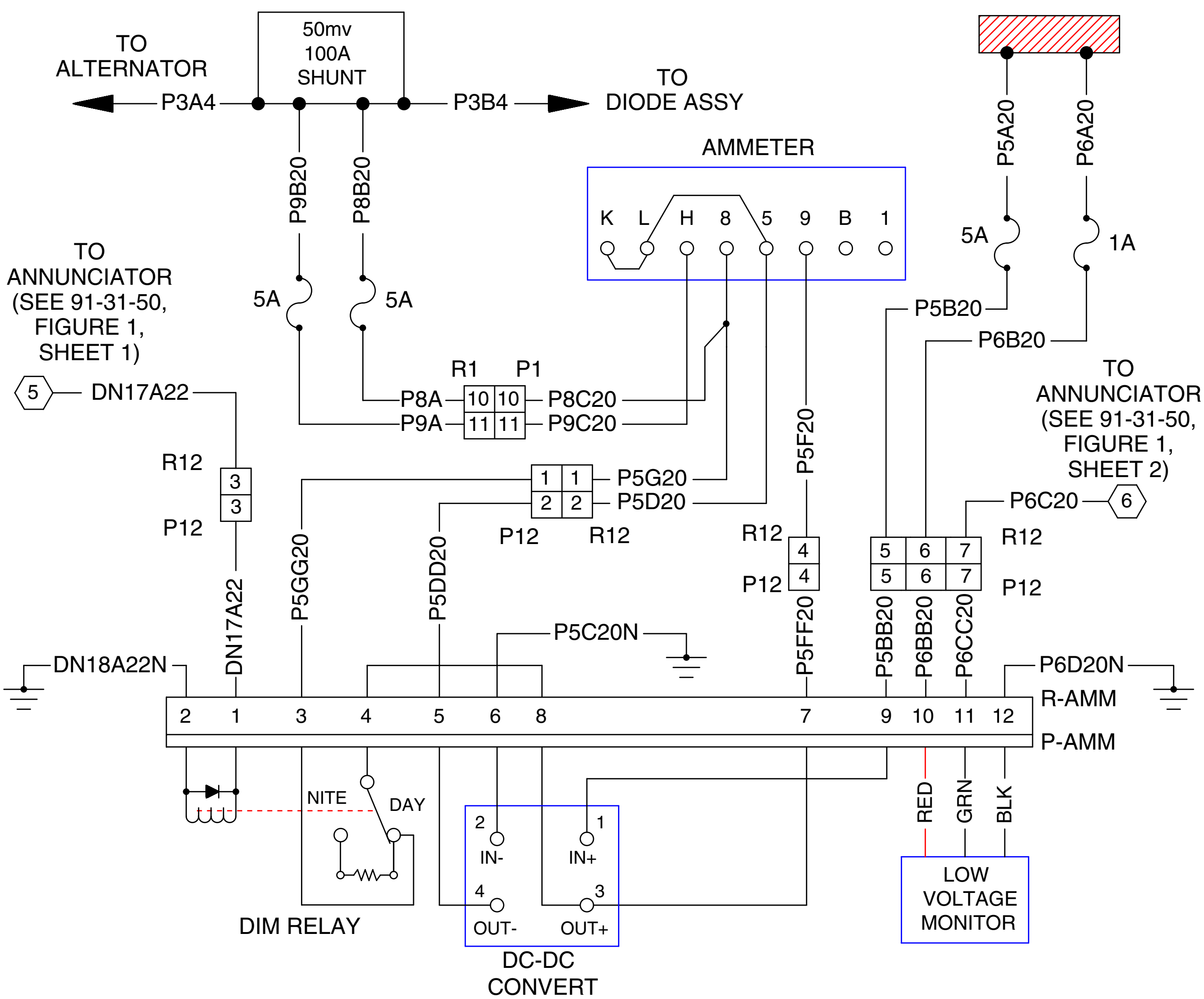
Effectivity
3232001 & up
3255001 & up

Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up



Alternator Power
Figure 1 (Sheet 2 of 2)

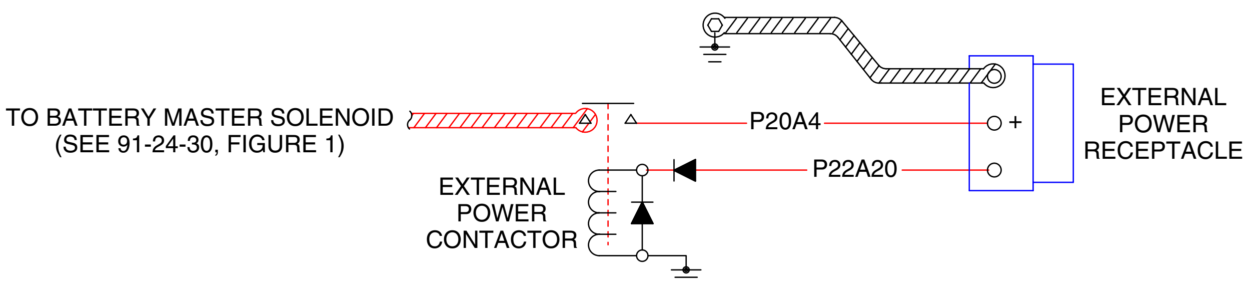
105232 5.0 F / G



Ammeter / Low Volt Monitor
Figure 2

THIS PAGE INTENTIONALLY BLANK

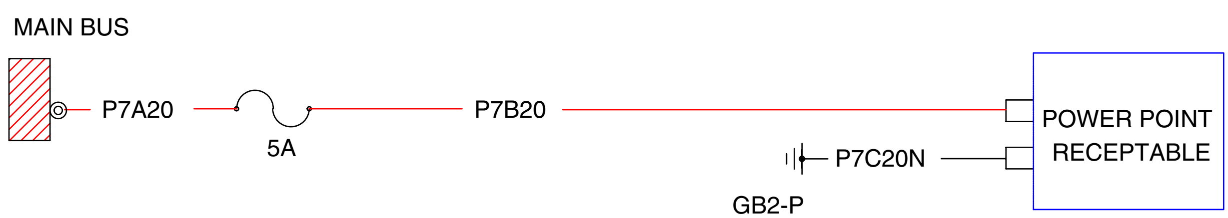
105232 23.0 NEW / G
101849 22.0 NEW



External Power
Figure 1

THIS PAGE INTENTIONALLY BLANK

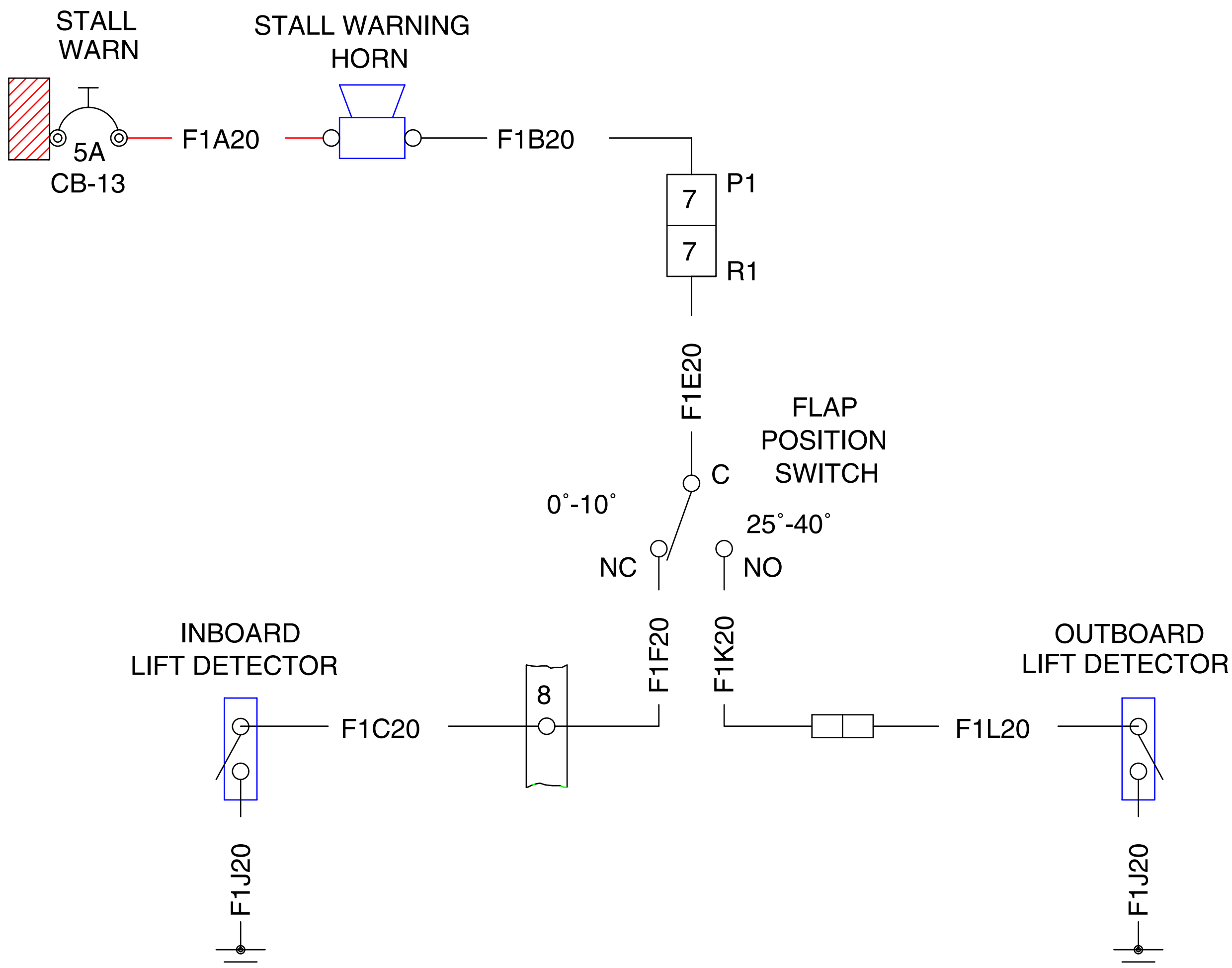
105232 25.0 NEW / G
101849 24.0 NEW



Power Point
Figure 1

THIS PAGE INTENTIONALLY BLANK

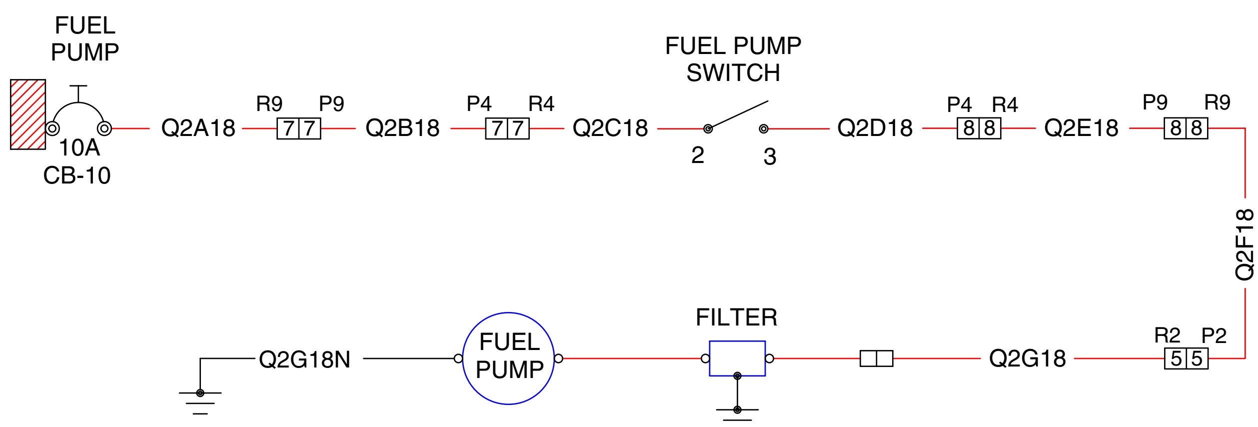
105232 8.0 NEW / G
101849 8.0 NEW



Stall Warning
Figure 1

THIS PAGE INTENTIONALLY BLANK

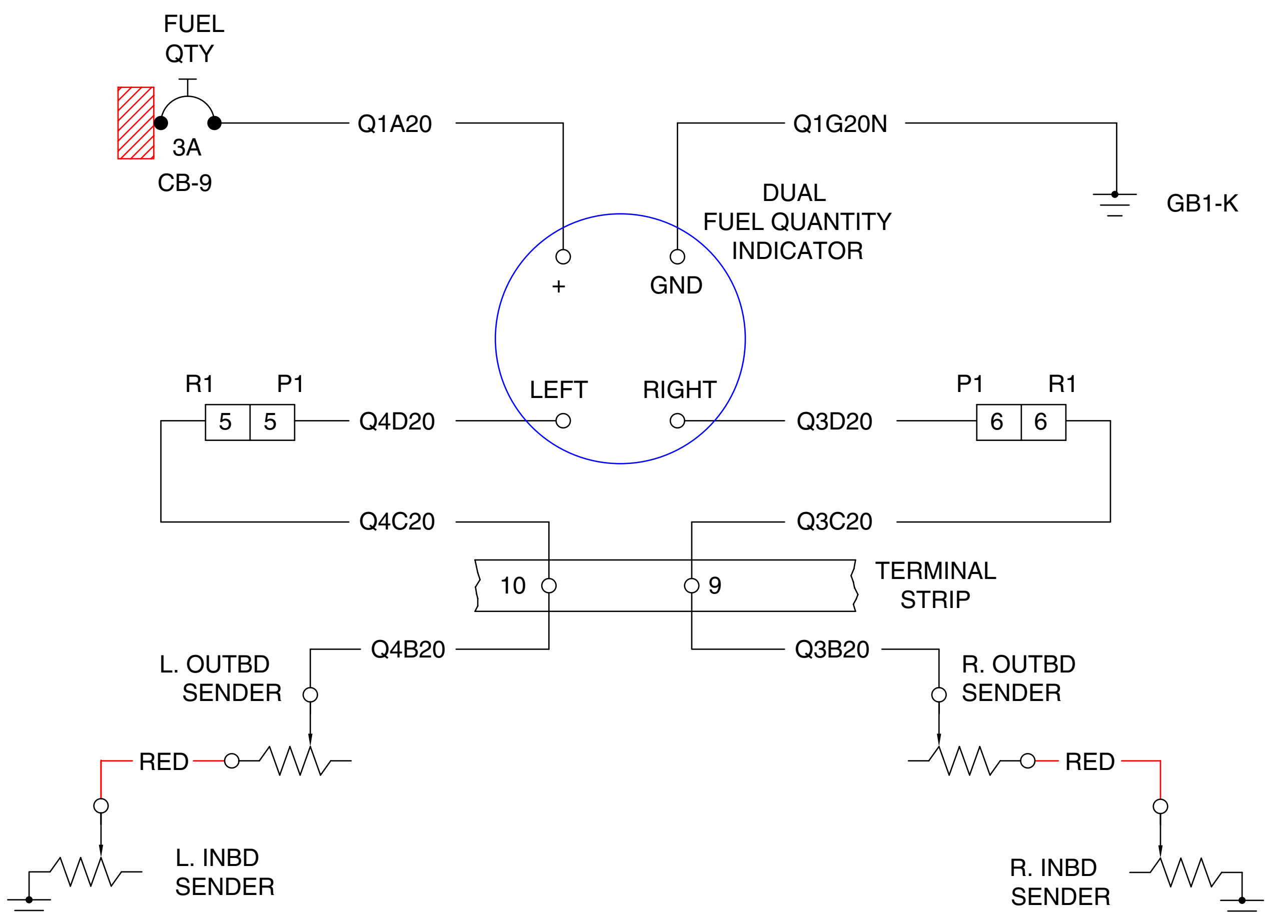
105232 7.0 NEW / G
101849 7.0 NEW



Fuel Pump
Figure 1

THIS PAGE INTENTIONALLY BLANK

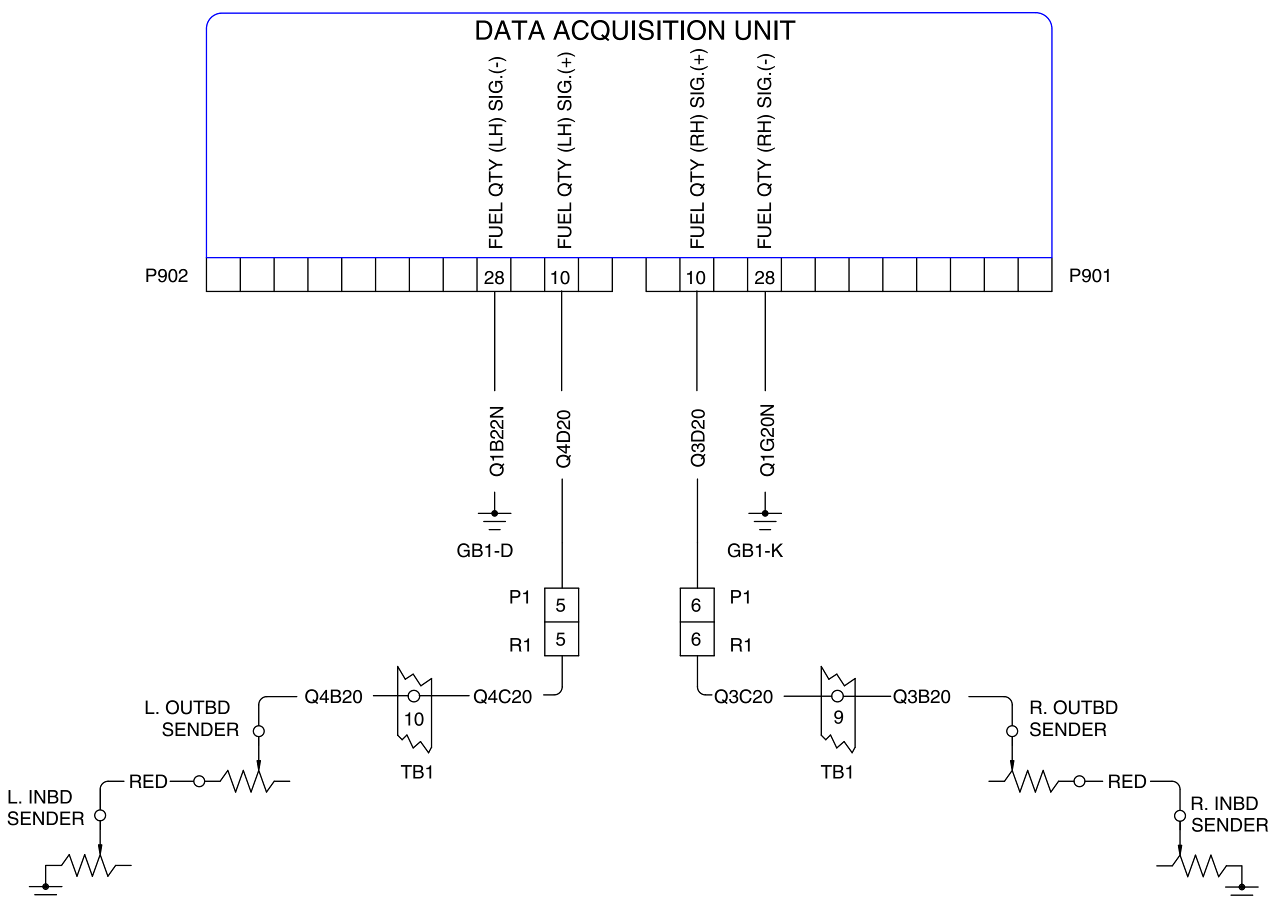
105232 6.0 NEW / G



Fuel Quantity
Figure 1 (Sheet 1 of 2)

Effectivity
3232001 & up
3255001 & up

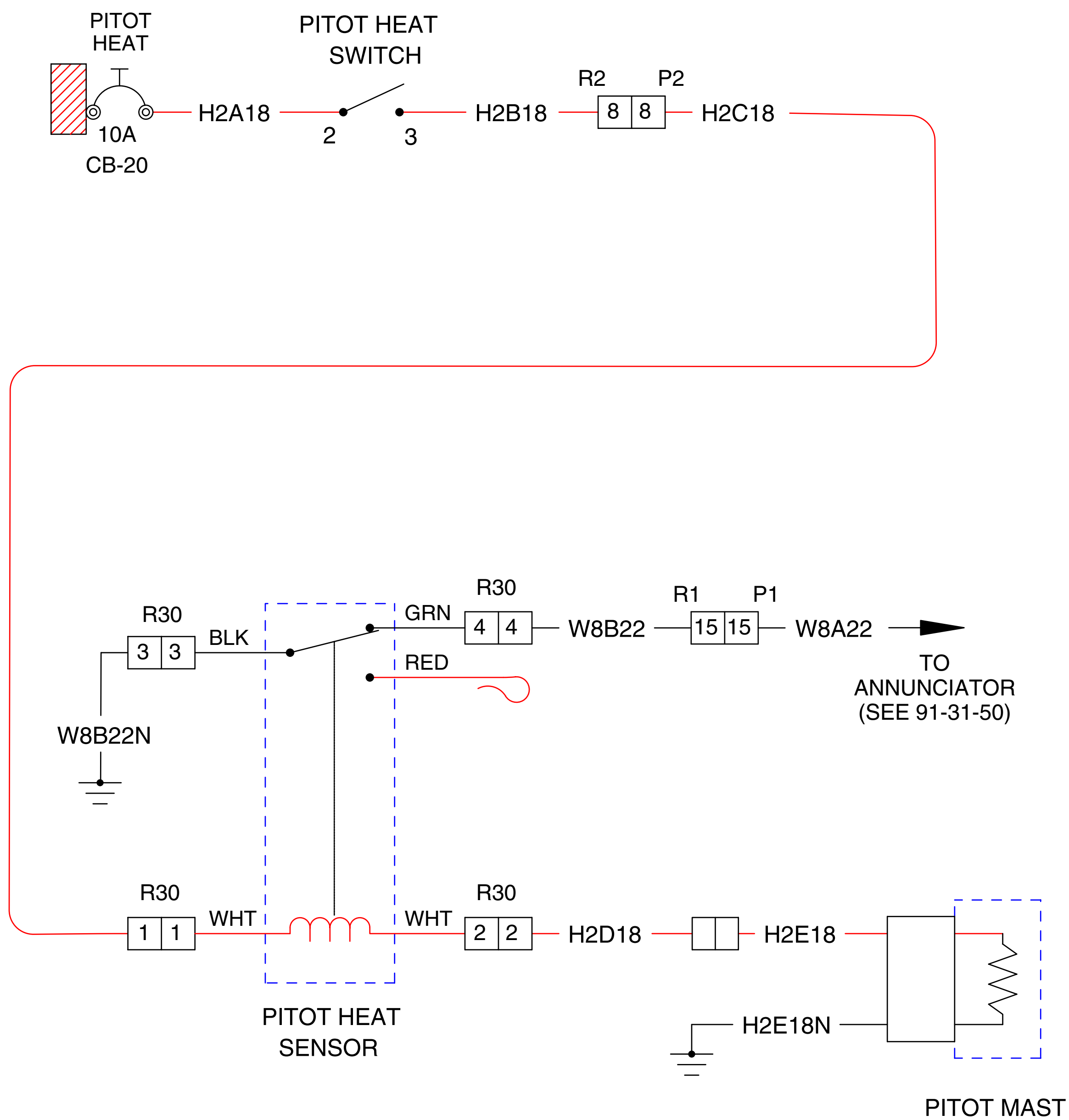
101849 6.0 NEW



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

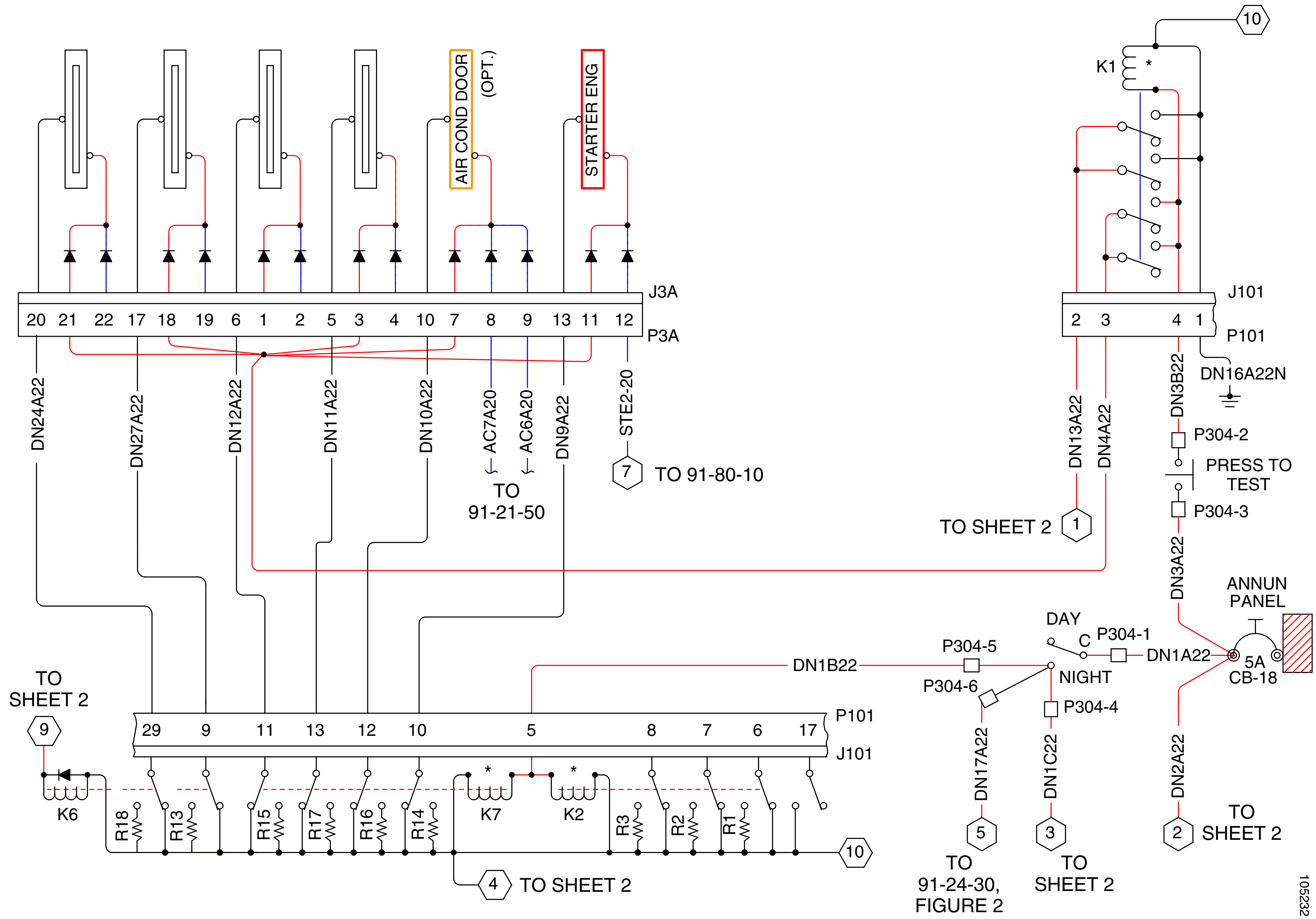
Fuel Quantity
Figure 1 (Sheet 2 of 2)

105232 9.0 NEW / G
101849 9.0 NEW



Pitot Heat
Figure 1

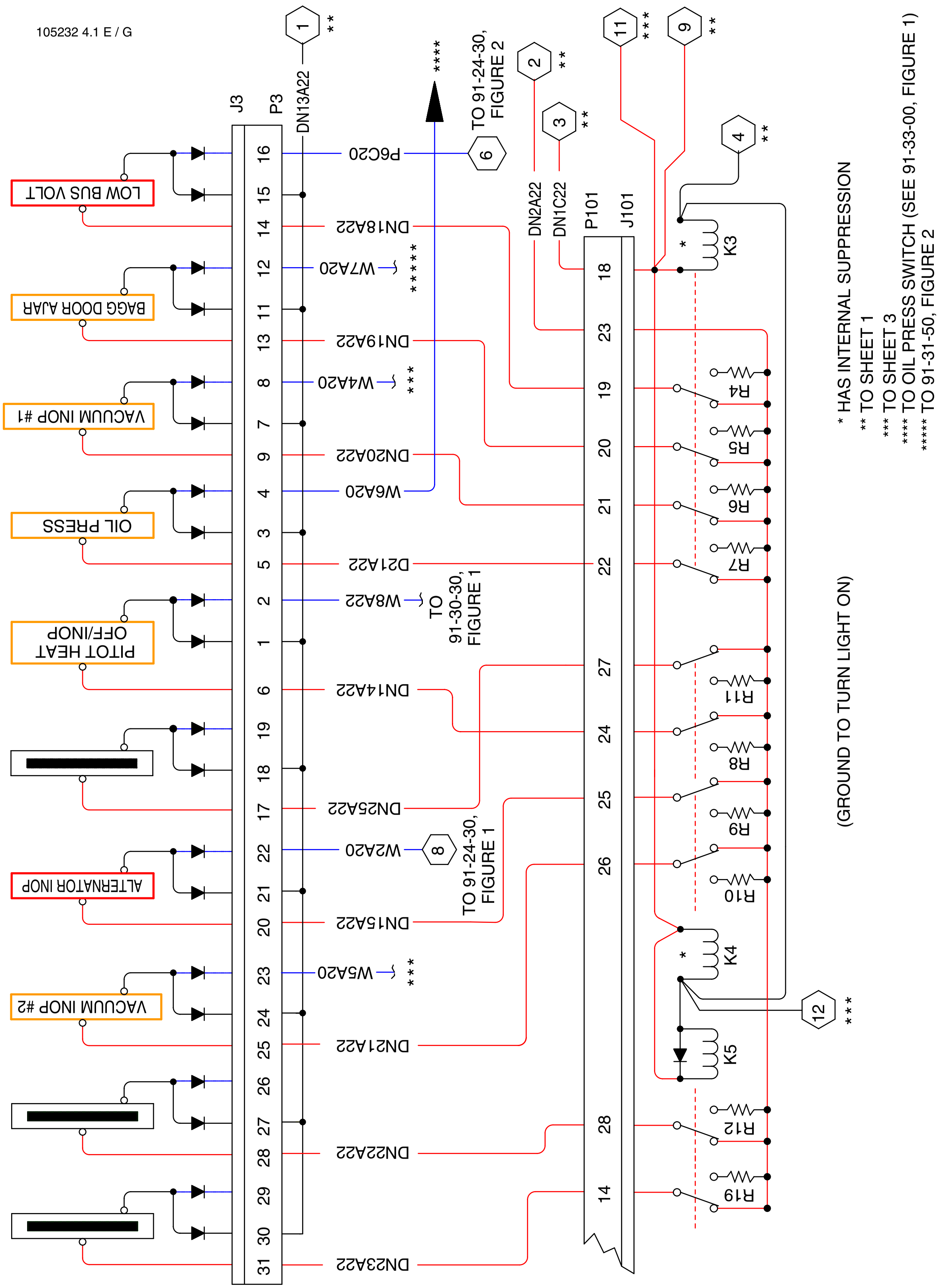
THIS PAGE INTENTIONALLY BLANK



Annunciator
Figure 1 (Sheet 1 of 6)

* HAS INTERNAL SUPPRESSION (POSITIVE TO TURN LIGHT ON)

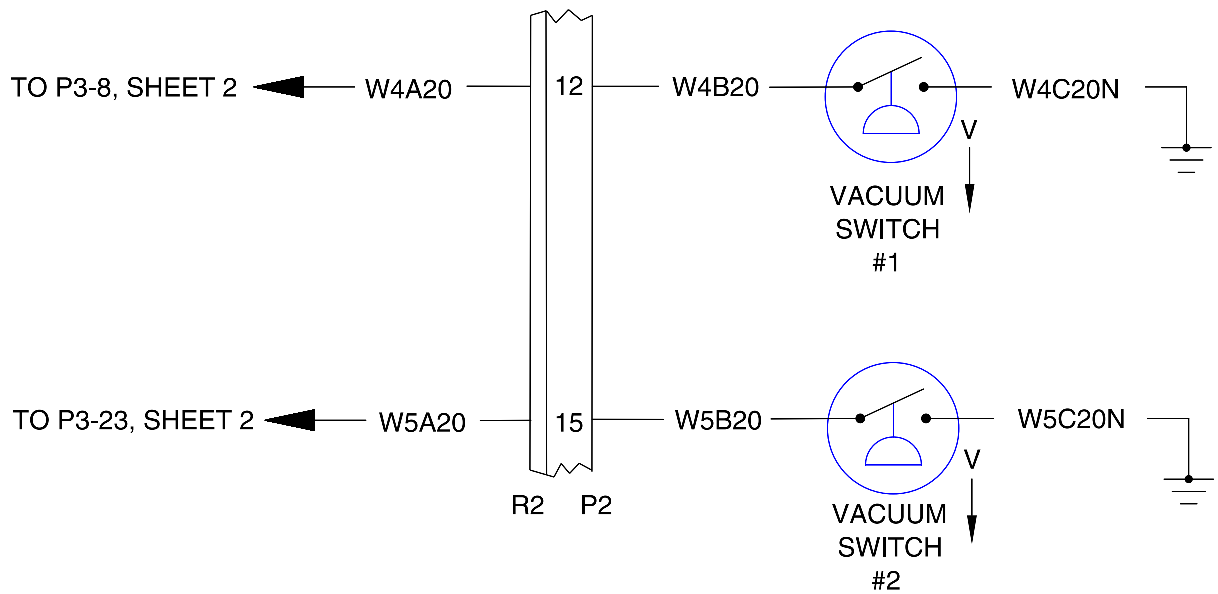
Effectivity
3232001 & up
3255001 & up

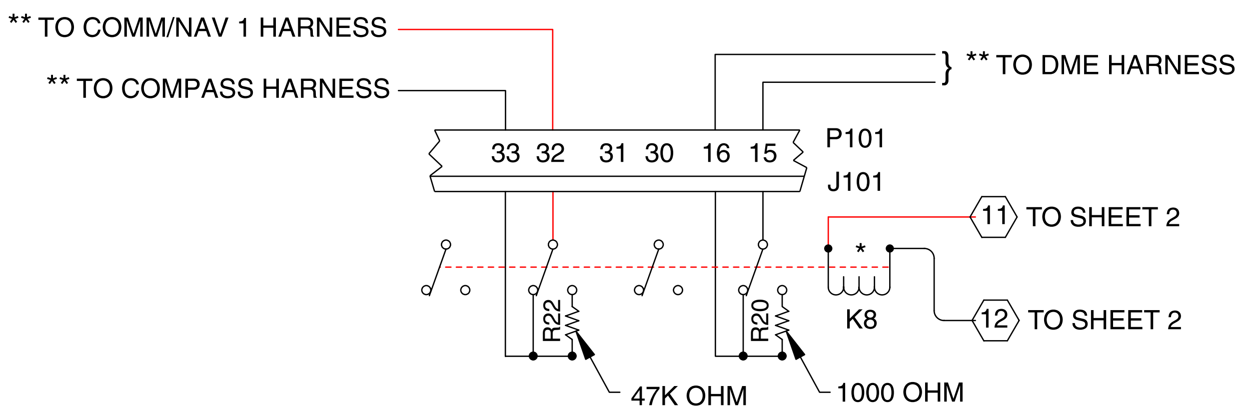


Effectivity
3232001 & up
3255001 & up

Annunciator
Figure 1 (Sheet 2 of 6)

105232 4.2 E / G



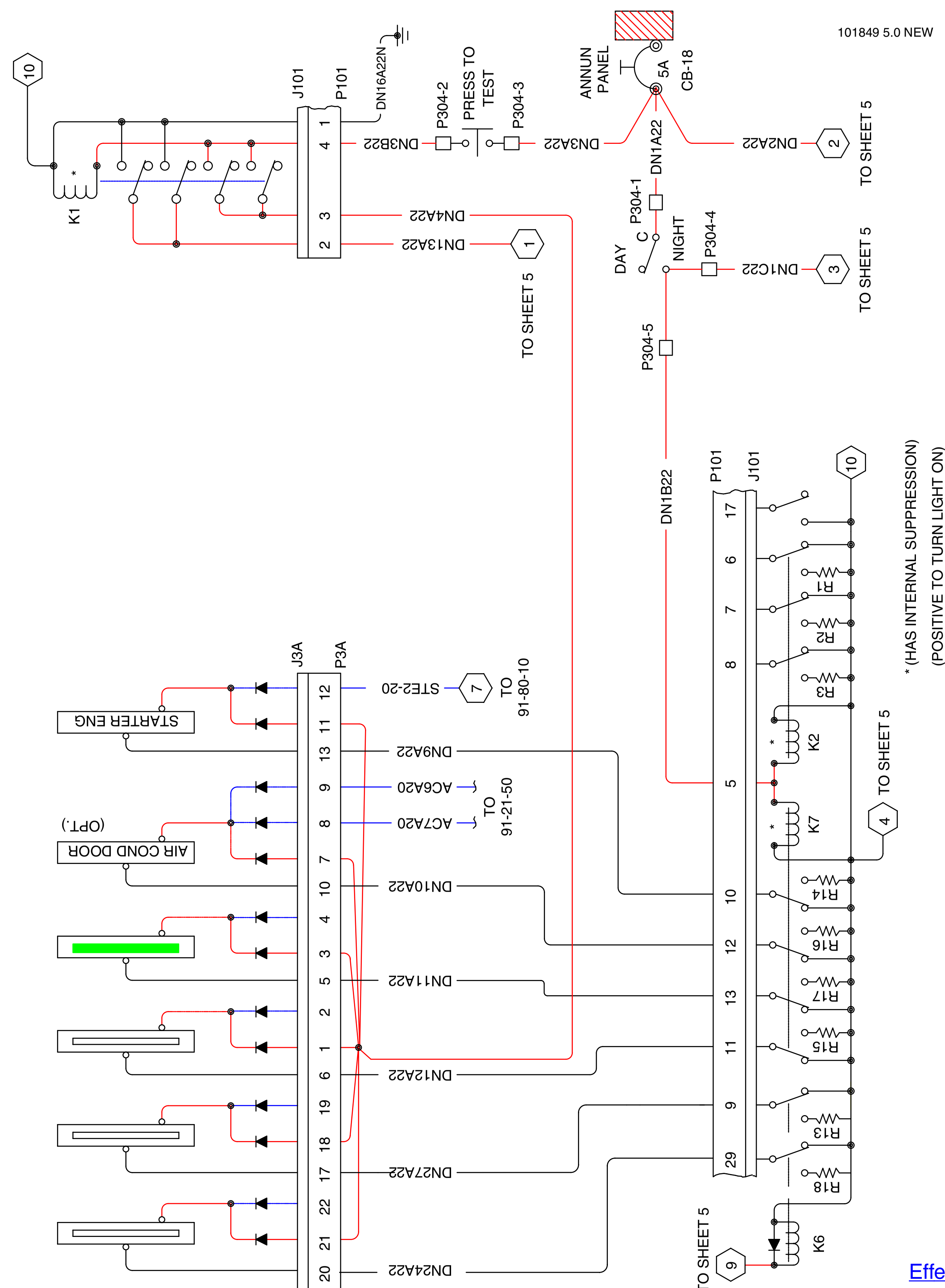


* HAS INTERNAL SUPPRESSION
** SEE AVIONICS INSTALLATION DRAWINGS

Annunciator
Figure 1 (Sheet 3 of 6)

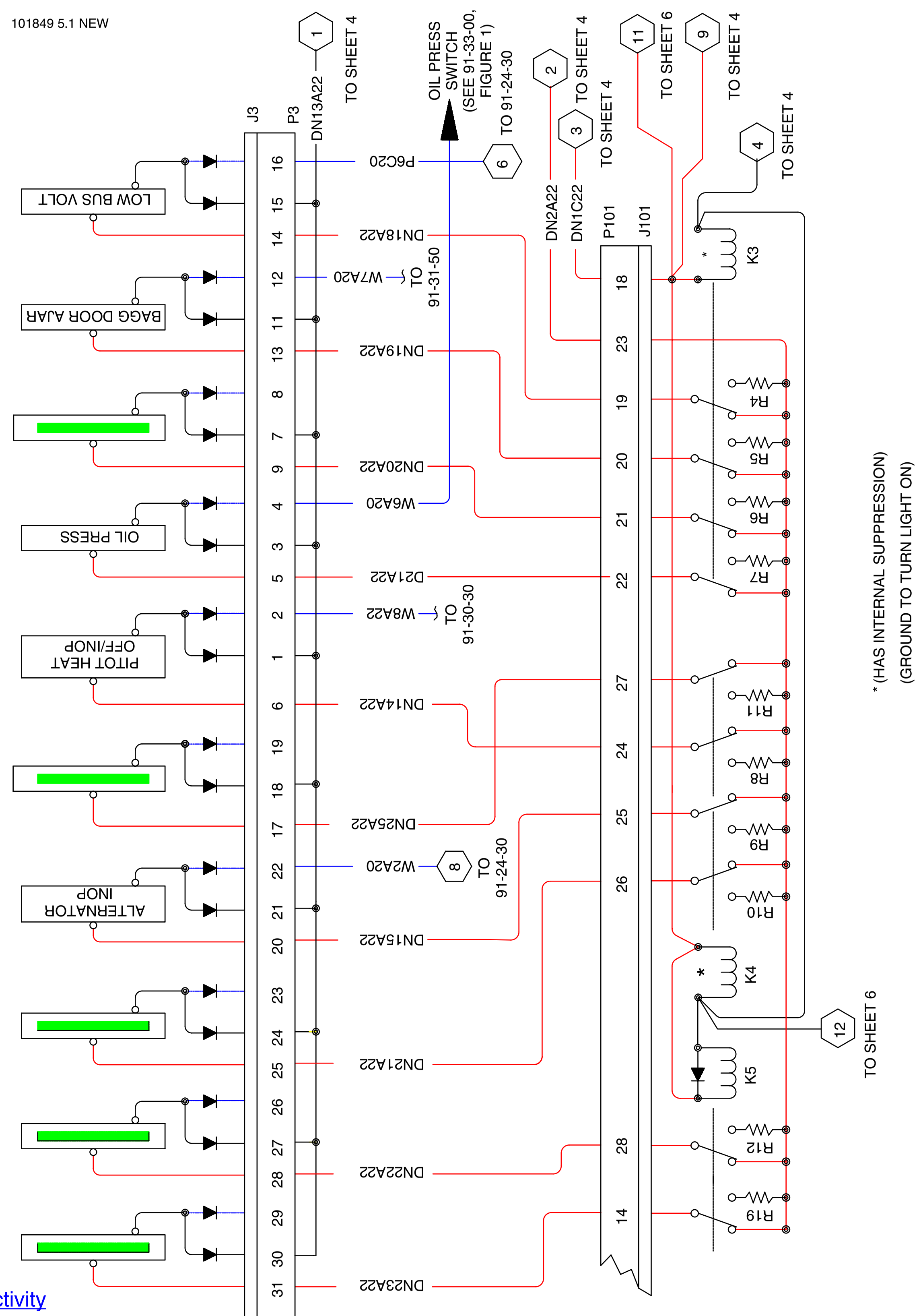
Effectivity
3232001 & up
3255001 & up

THIS PAGE INTENTIONALLY BLANK



Annunciator
Figure 1 (Sheet 4 of 6)

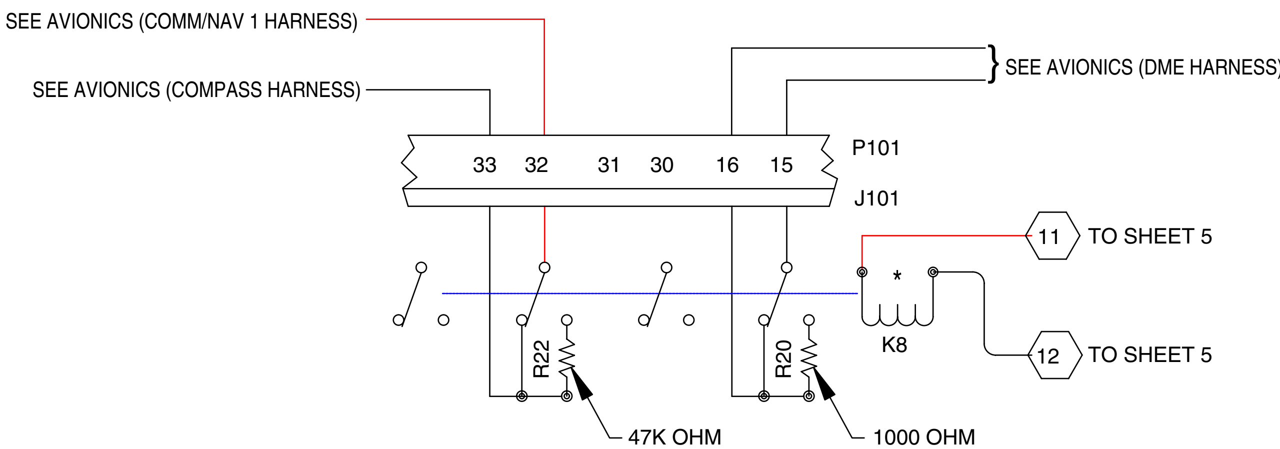
Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

Annunciator
Figure 1 (Sheet 5 of 6)

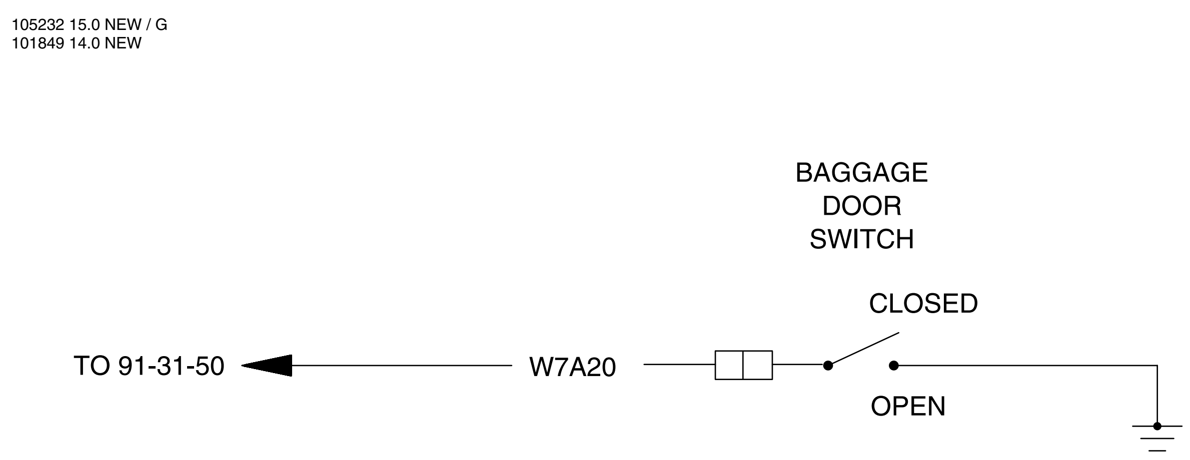
101849 5.2 NEW



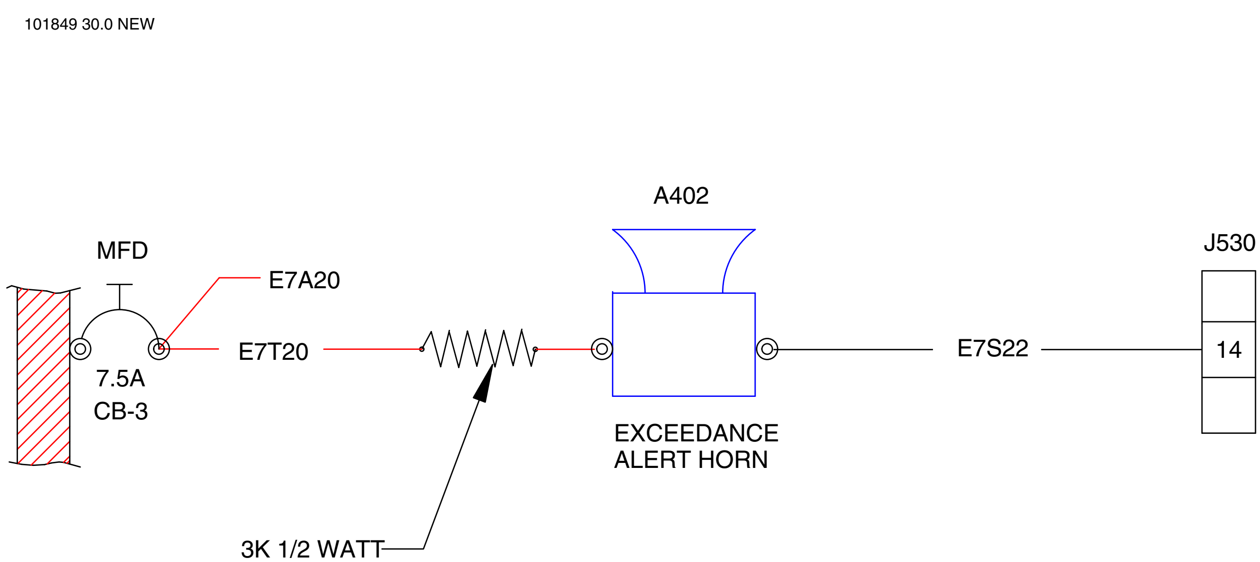
* (HAS INTERNAL SUPPRESSION)

Annunciator
Figure 1 (Sheet 6 of 6)

Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

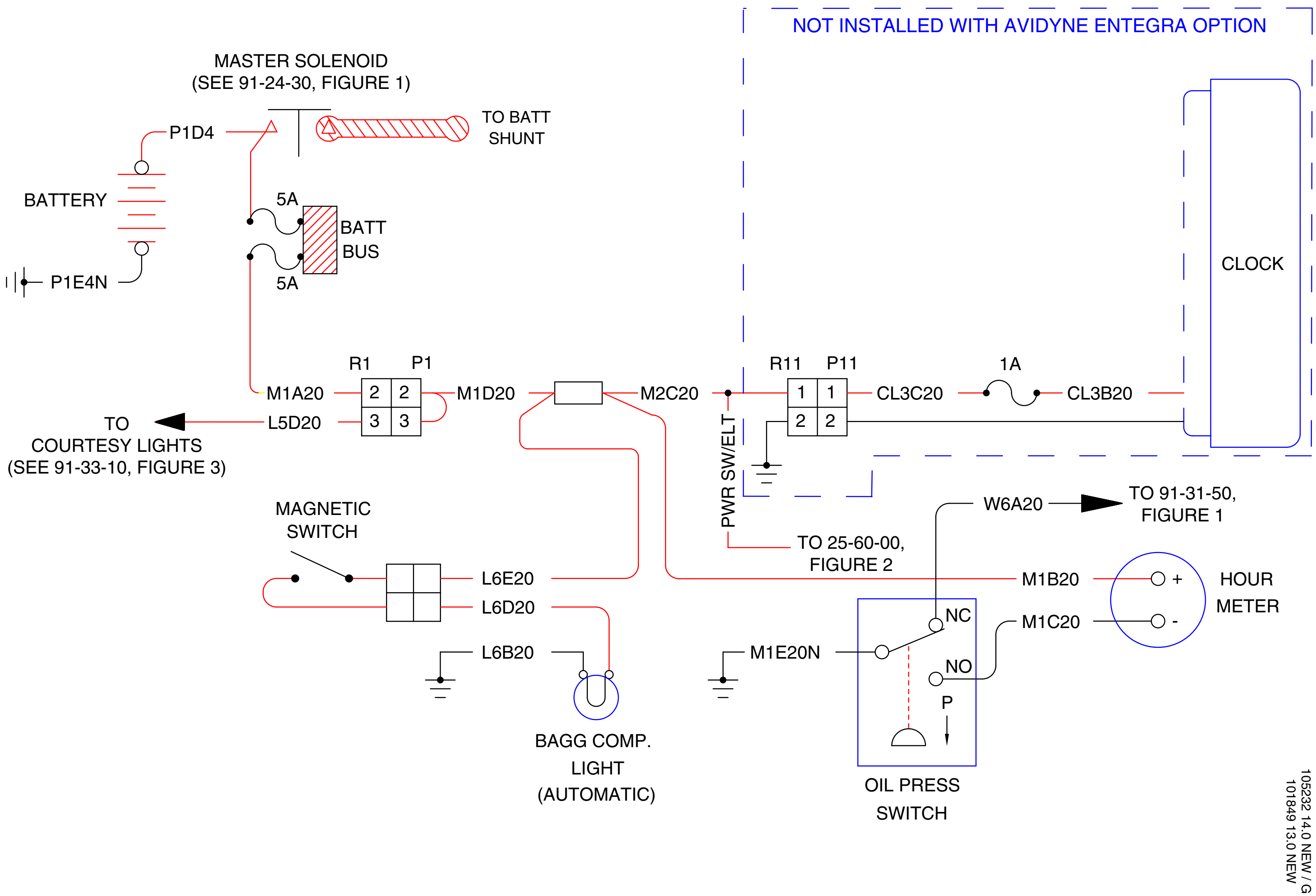


Baggage Door Ajar
Figure 2



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

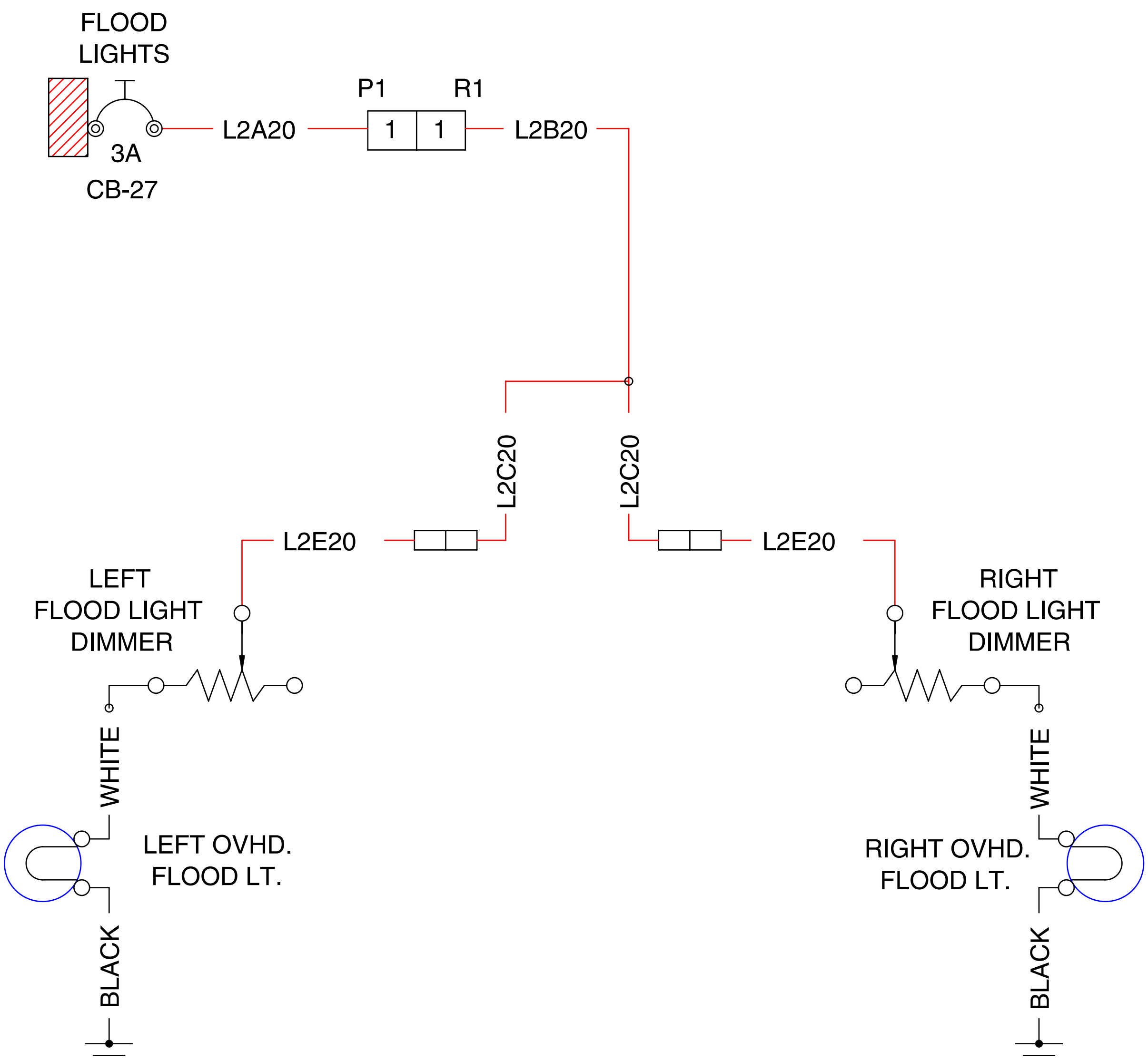
Exceedance Audio Alert
Figure 3



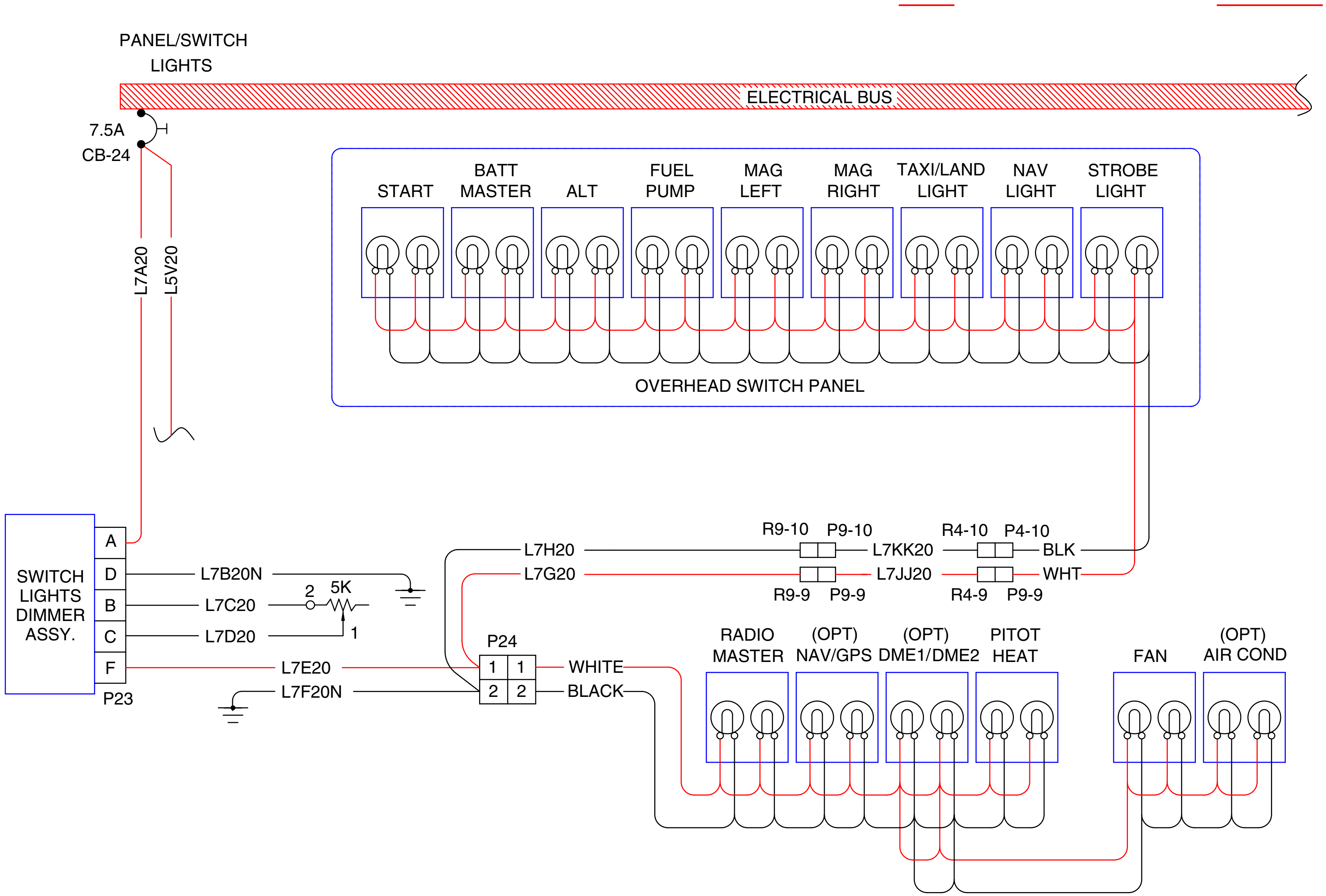
Baggage Light, Clock, Hour Meter
Figure 1

THIS PAGE INTENTIONALLY BLANK

105232 17.0 NEW / G
101849 16.0 NEW



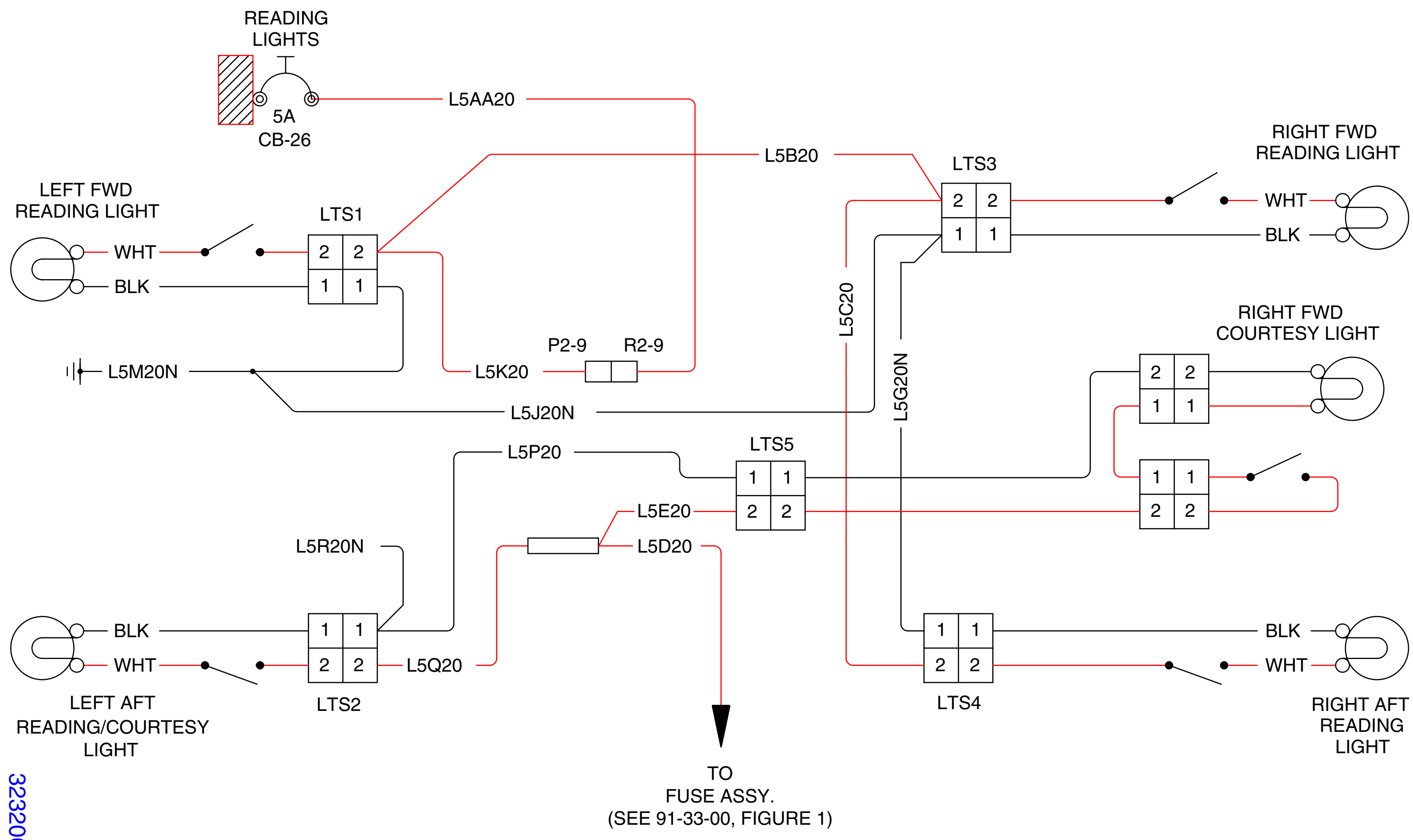
Flood Lights
Figure 1



Switch Lights
Figure 2

105232 19.0 A / G
101849 18.0 NEW

105232 20.0 F / G

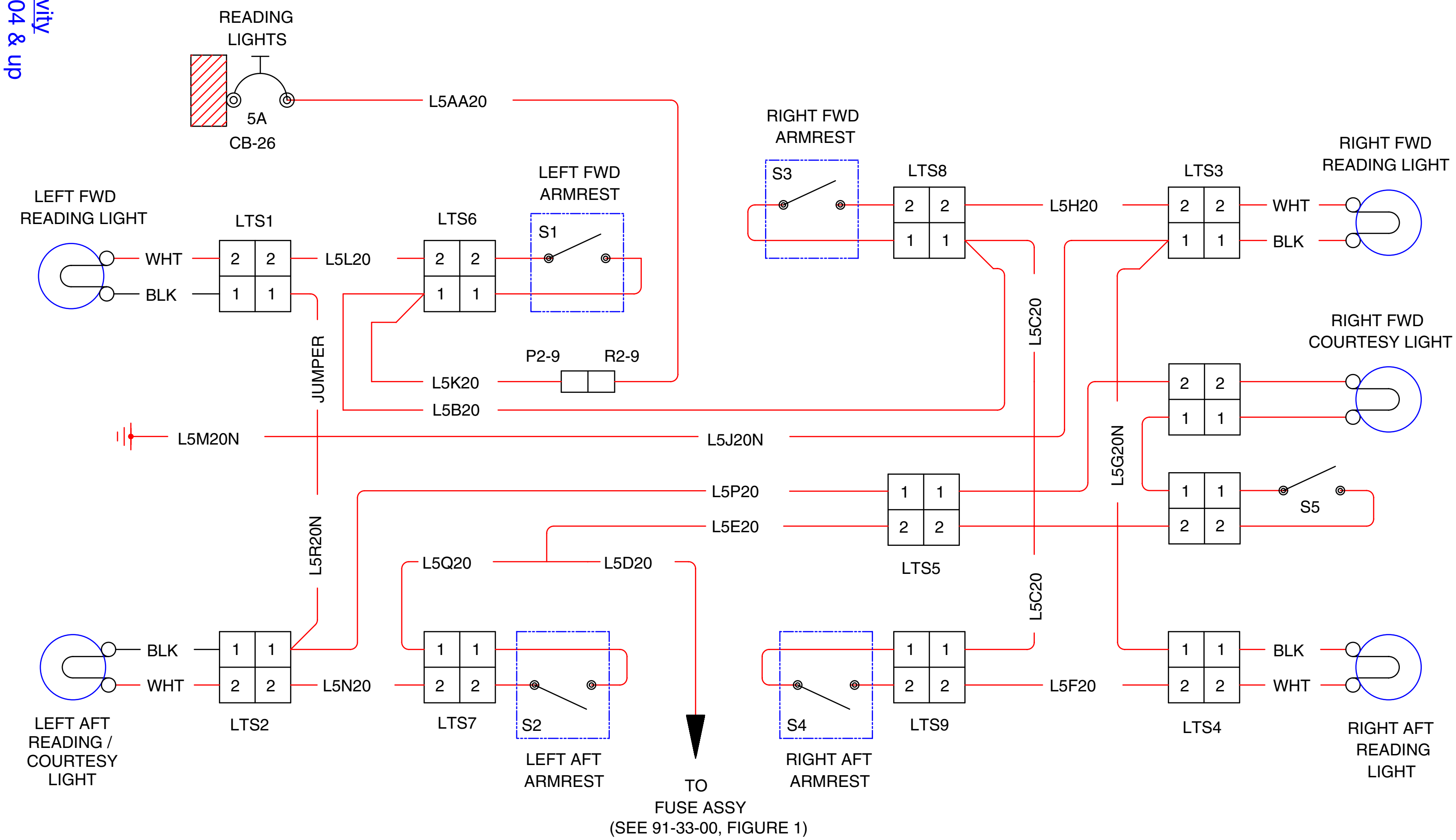


Courtesy and Reading Lights
Figure 3 (Sheet 1 of 2)

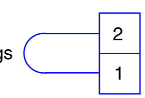
Effectivity
3232001 thru 3232003
3255001 thru 3255003
and
3255005 thru 3255007

Effectivity
3232004 & up
3255004,
3255008 & up

101849 19.0 NEW



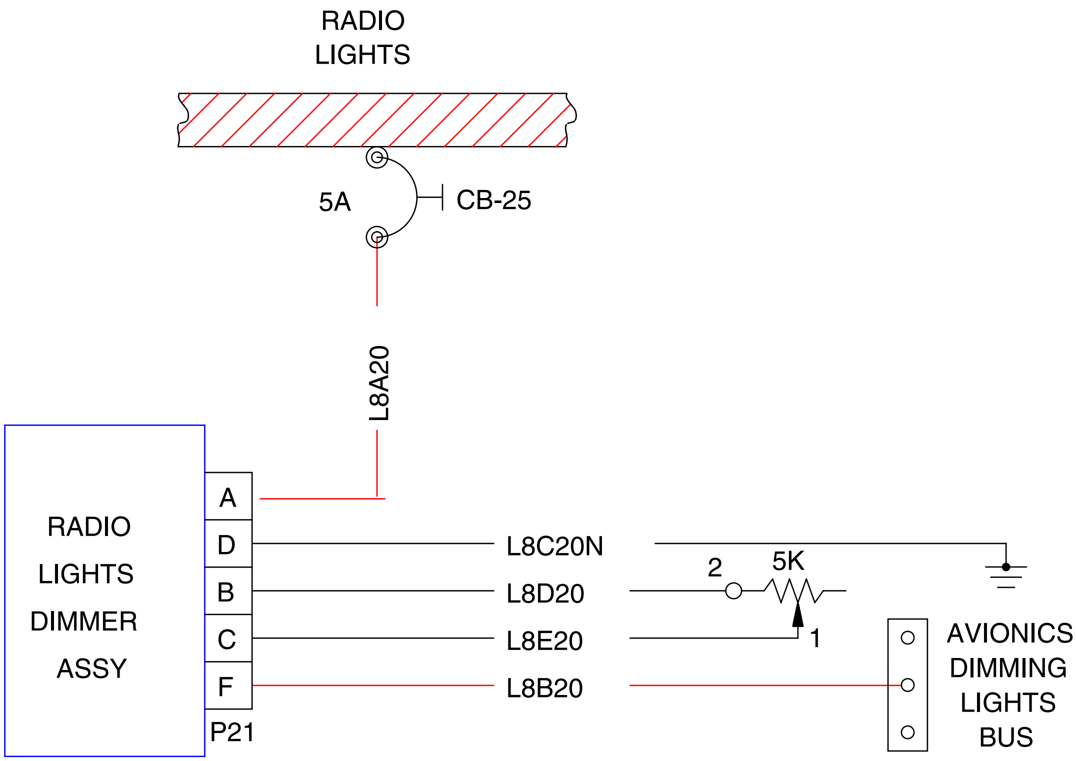
NOTE: Premium interior option shown.
In standard interior, arm rest switches S1, S2, S3, and S4 are replaced by jumper plugs



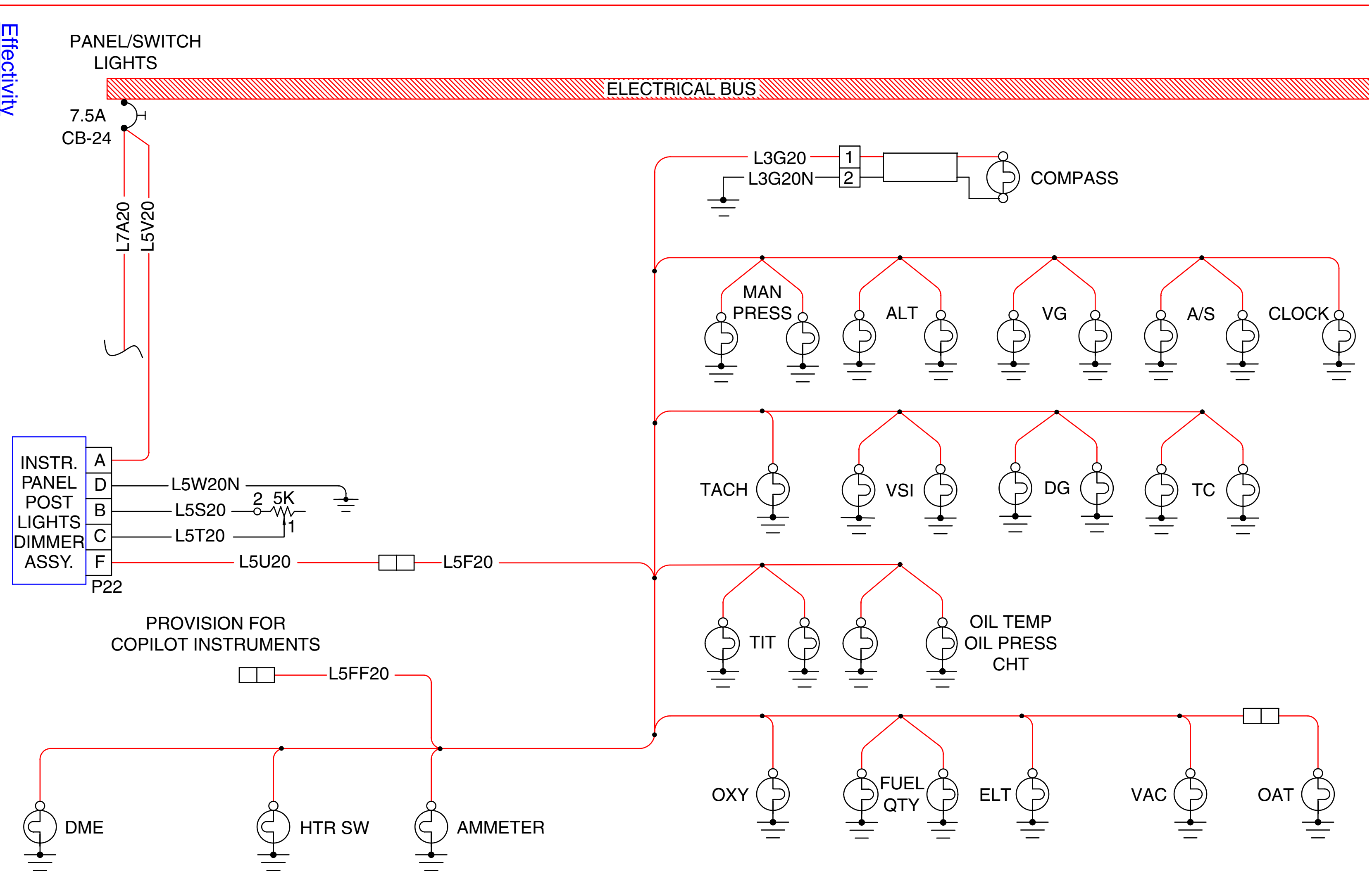
JP6, JP7, JP8, and JP9.

Courtesy and Reading Lights
Figure 3 (Sheet 2 of 2)

105232 22.0 NEW / G
101849 21.0 NEW

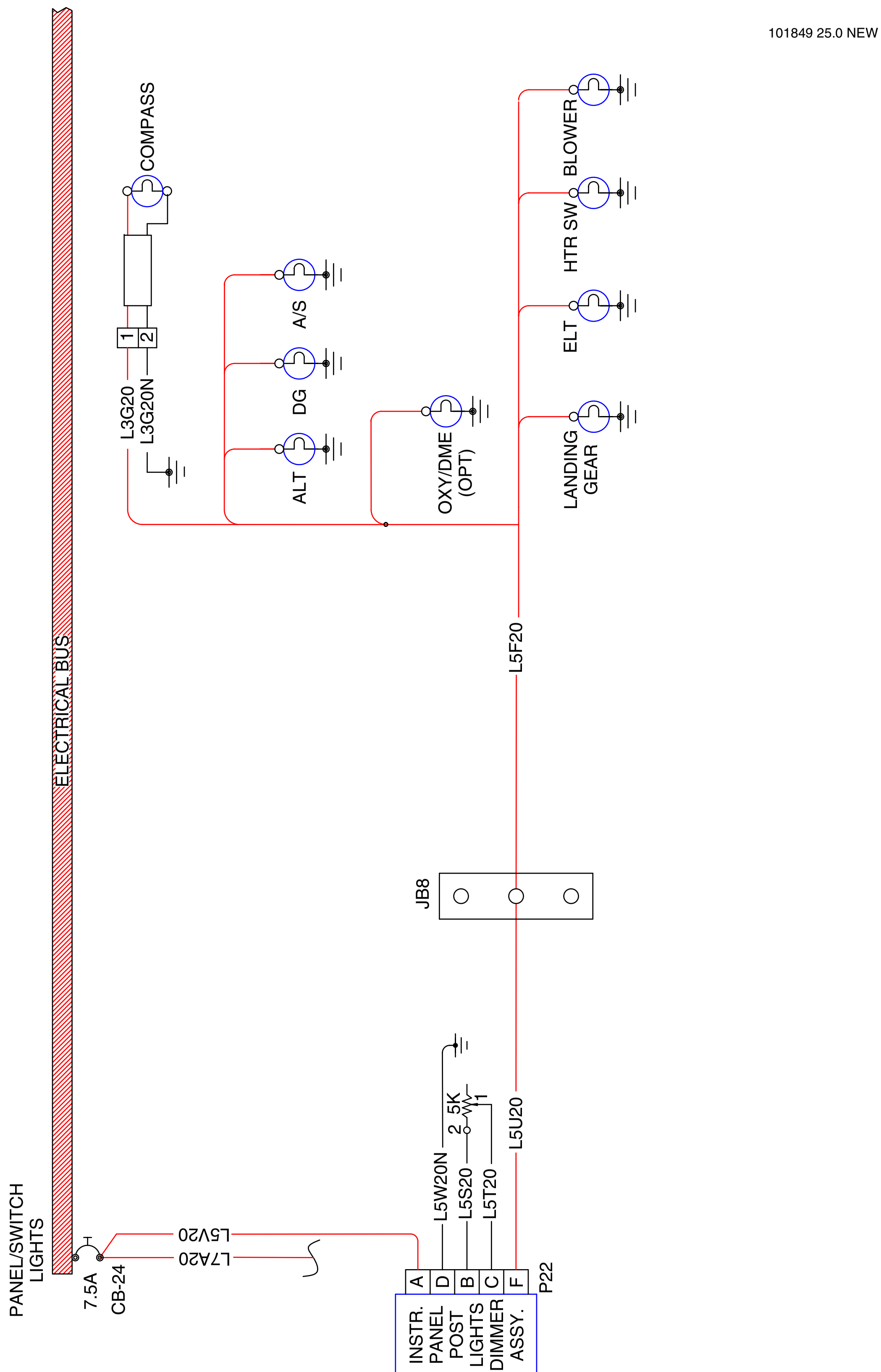


Radio Lights
Figure 4



Panel Lights
Figure 5 (Sheet 1 of 2)

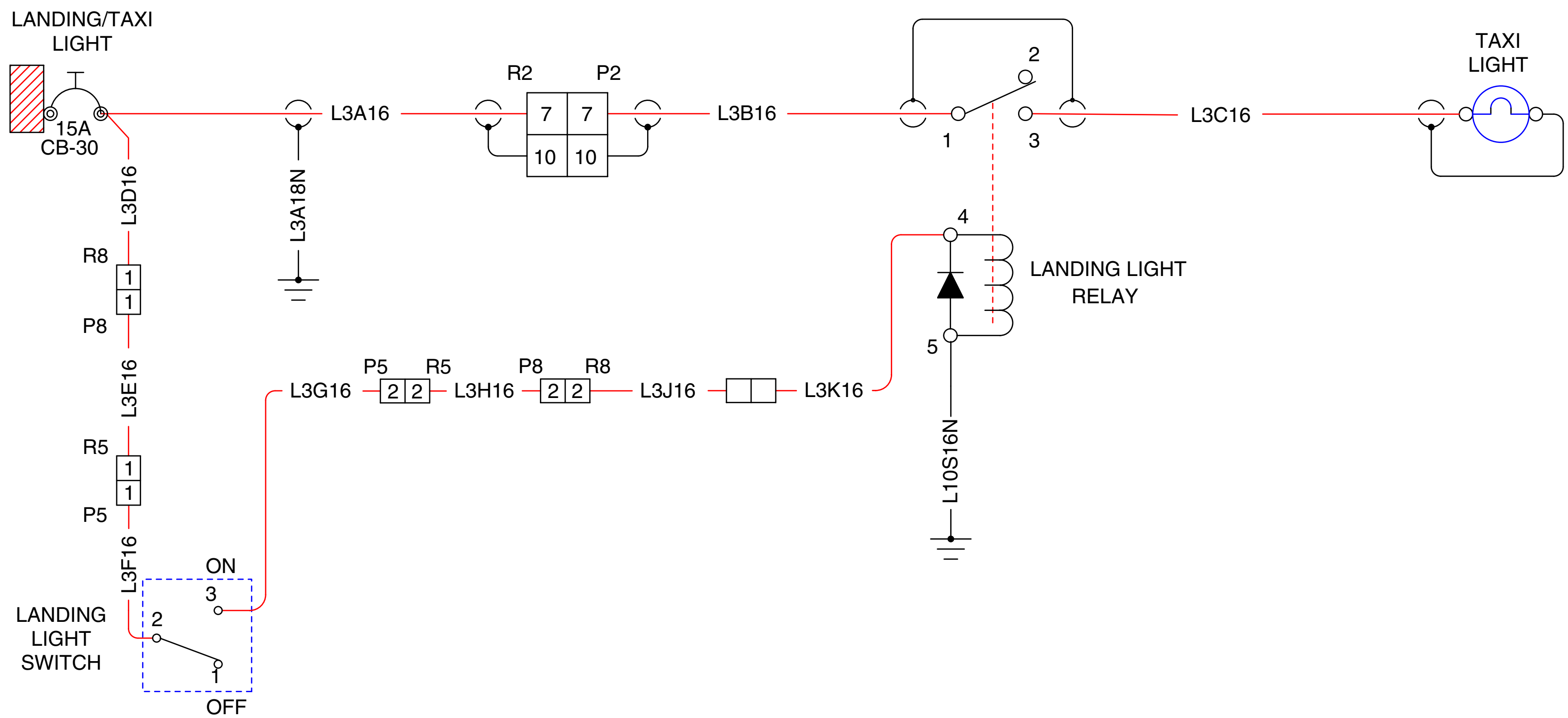
Effectivity
3232001 & up
3255001 & up



Panel Lights
Figure 5 (Sheet 2 of 2)

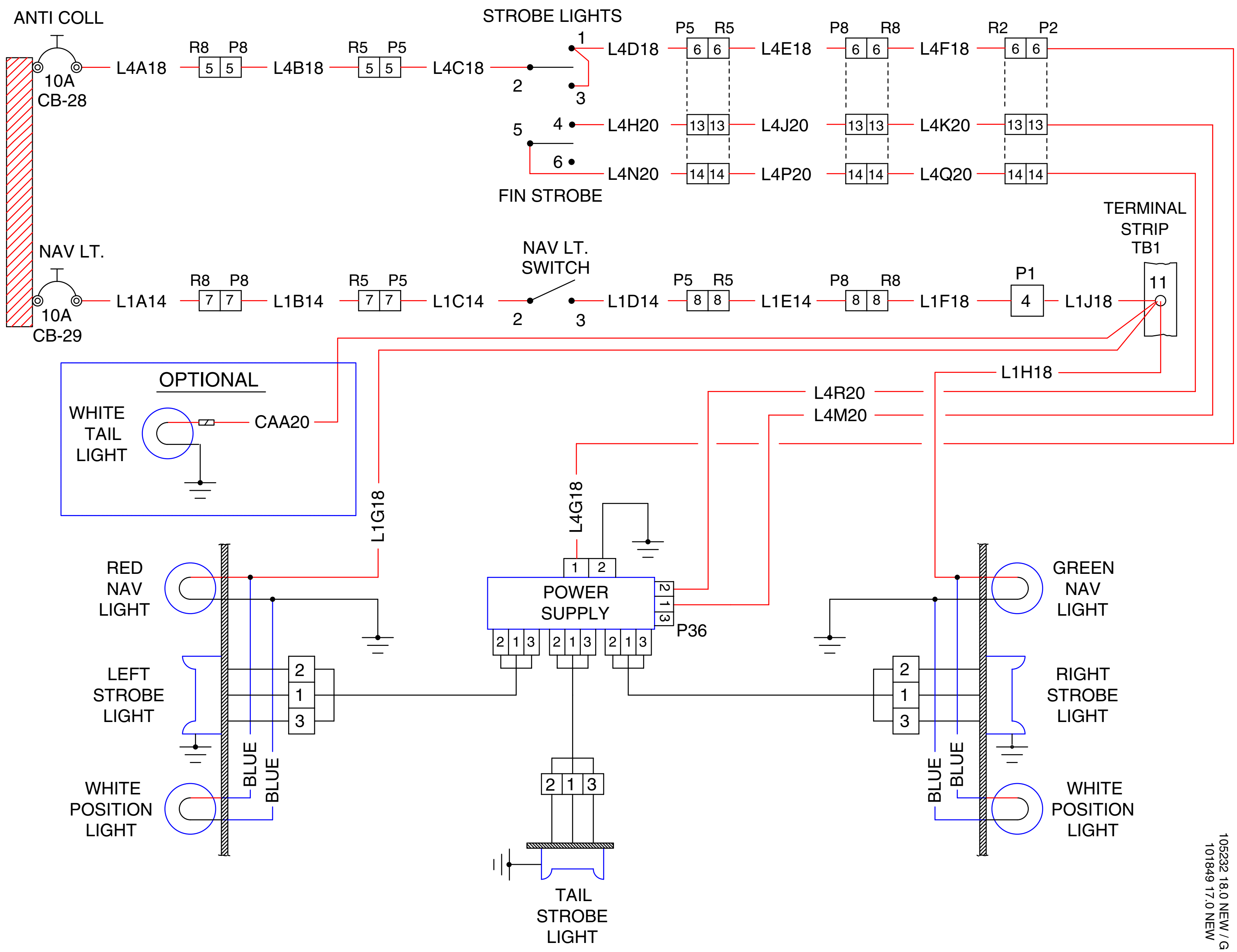
Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

THIS PAGE INTENTIONALLY BLANK



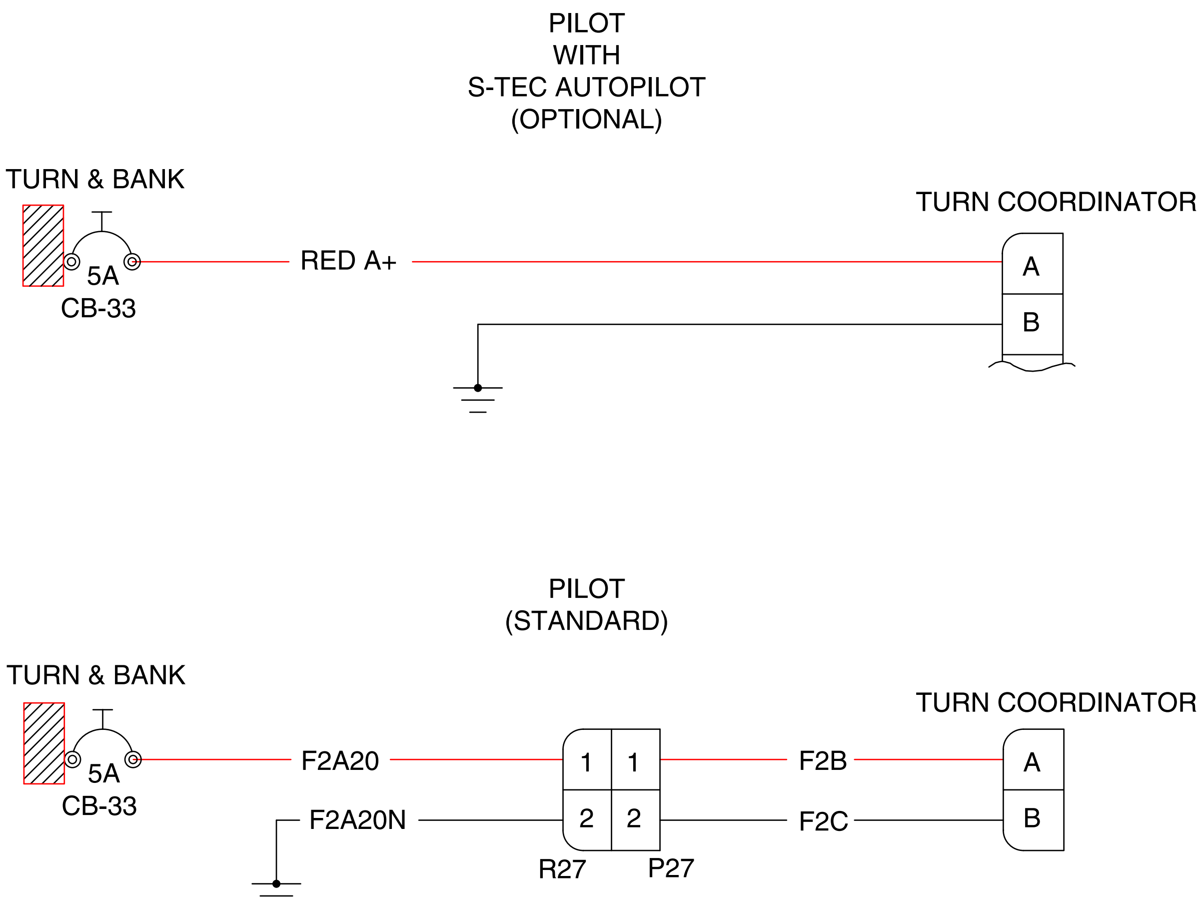
105232 16.0 G

Landing/Taxi Light
Figure 1

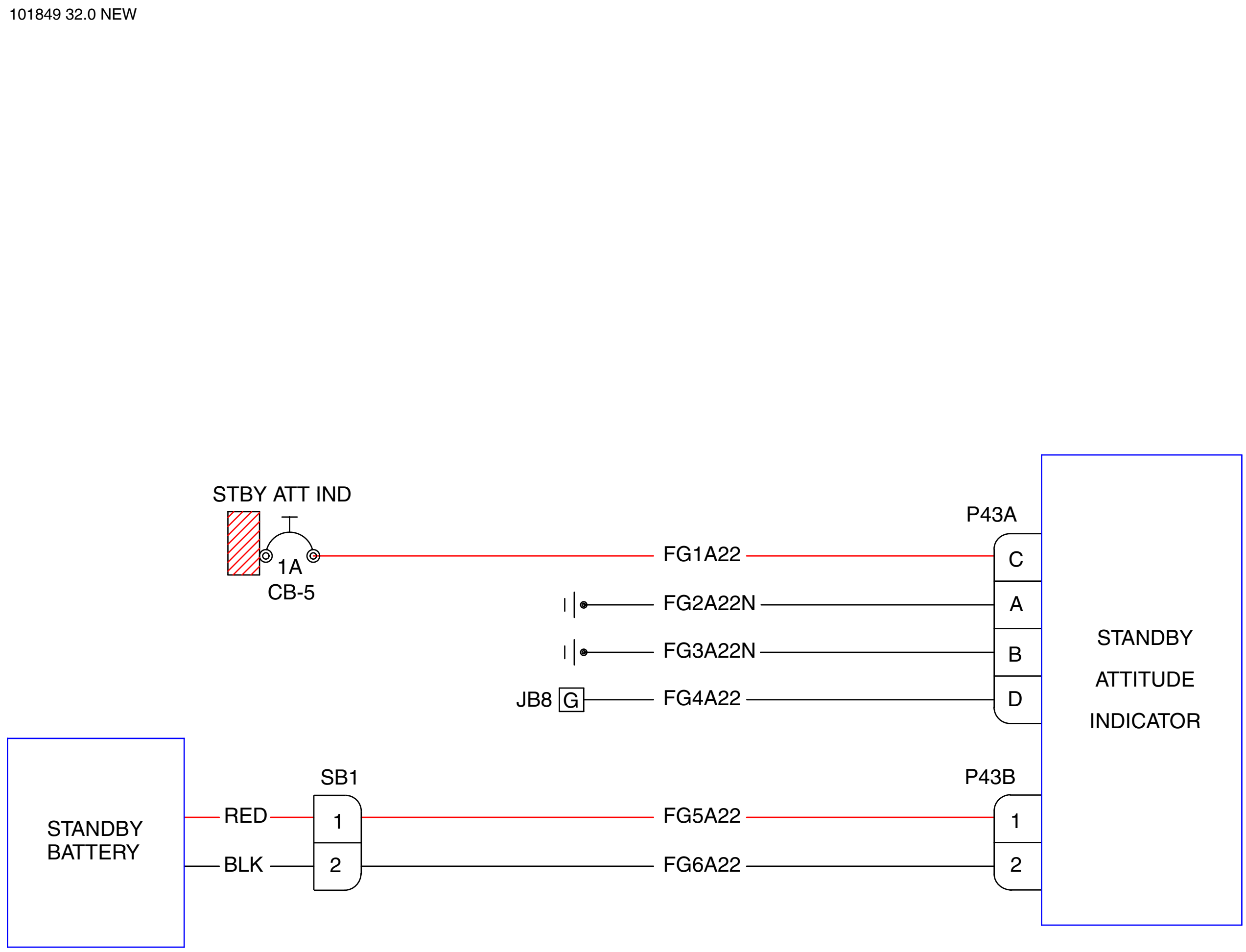


Navigation and Strobe Lights
Figure 2

105232 10.0 NEW / G



Turn and Bank Indicator
Figure 1



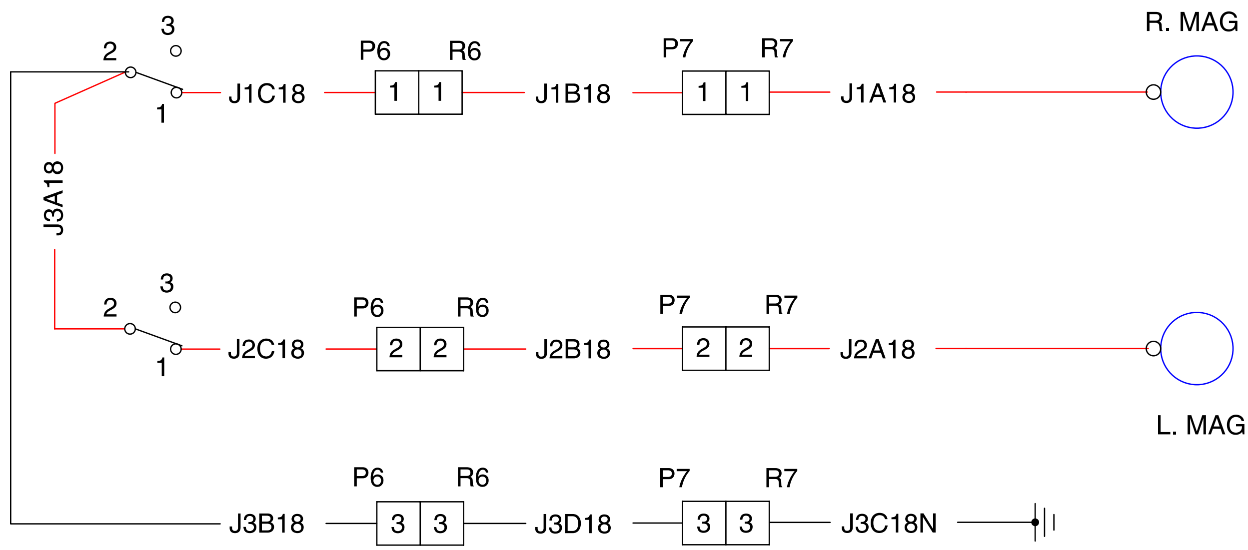
Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

Standby Attitude Indicator
Figure 2

THIS PAGE INTENTIONALLY BLANK

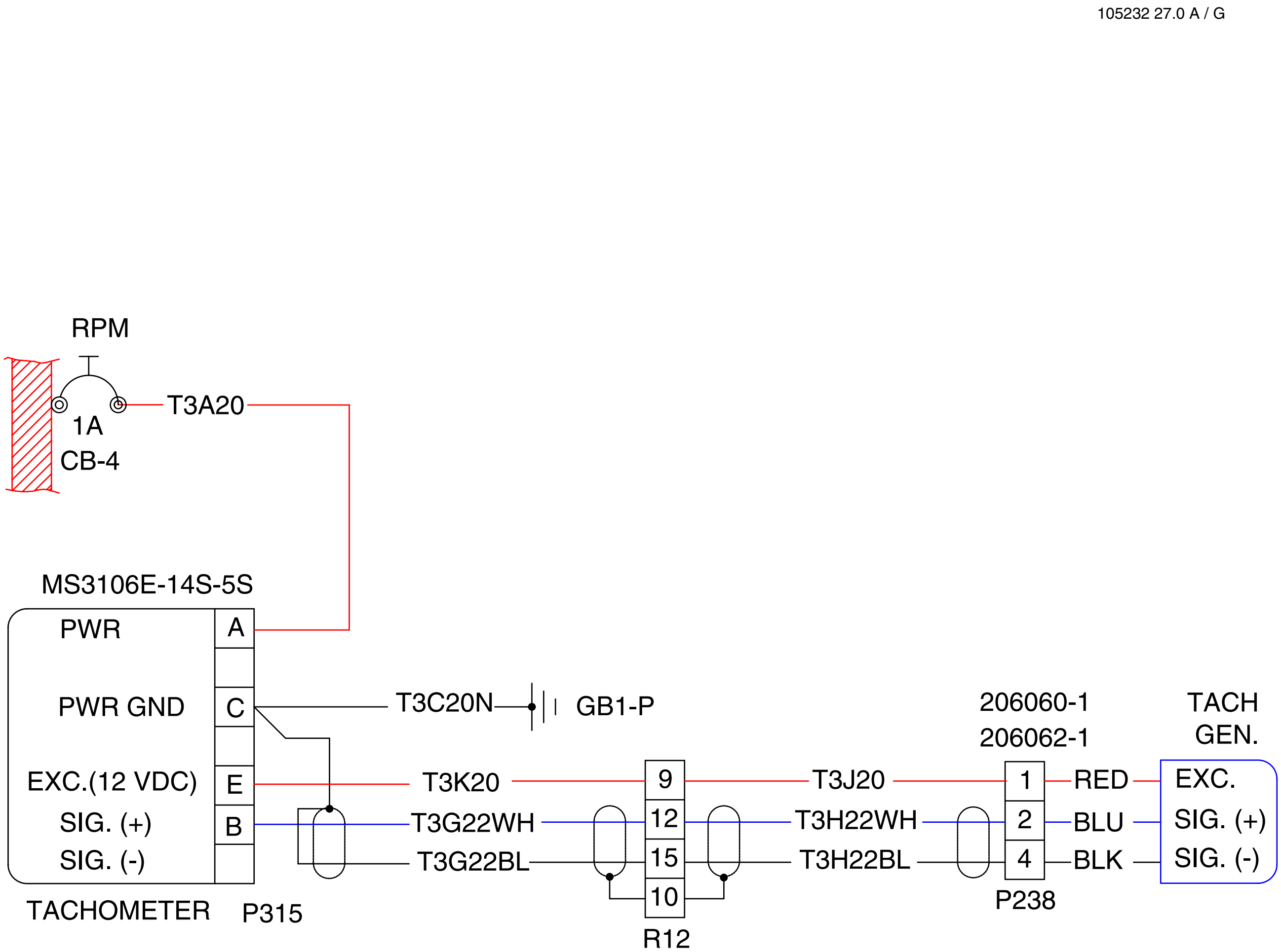
THIS PAGE INTENTIONALLY BLANK

105232 21.0 NEW / G
101849 20.0 NEW



Magneto Switches
Figure 1

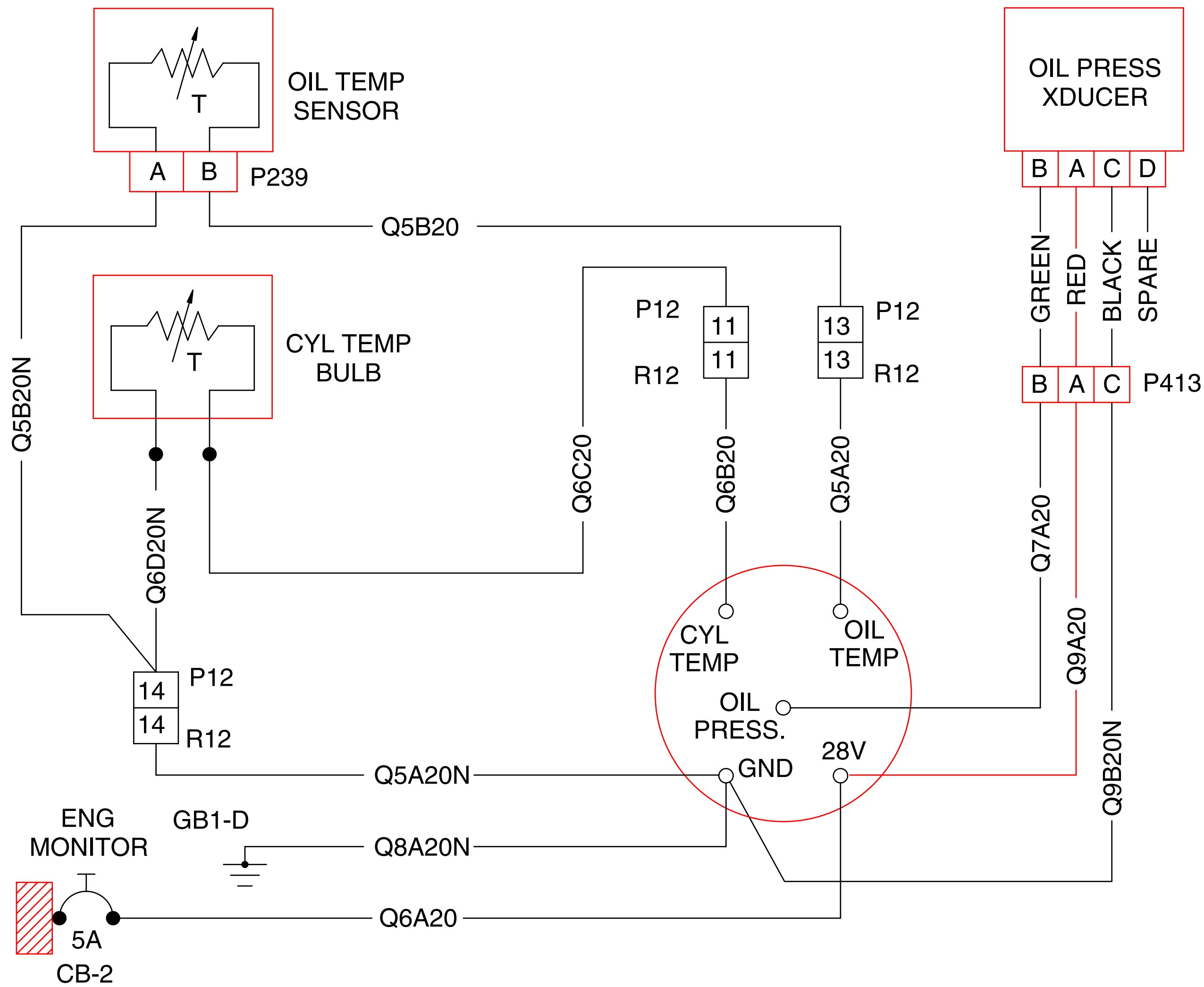
THIS PAGE INTENTIONALLY BLANK



Engine RPM (Tachometer)
Figure 1

THIS PAGE INTENTIONALLY BLANK

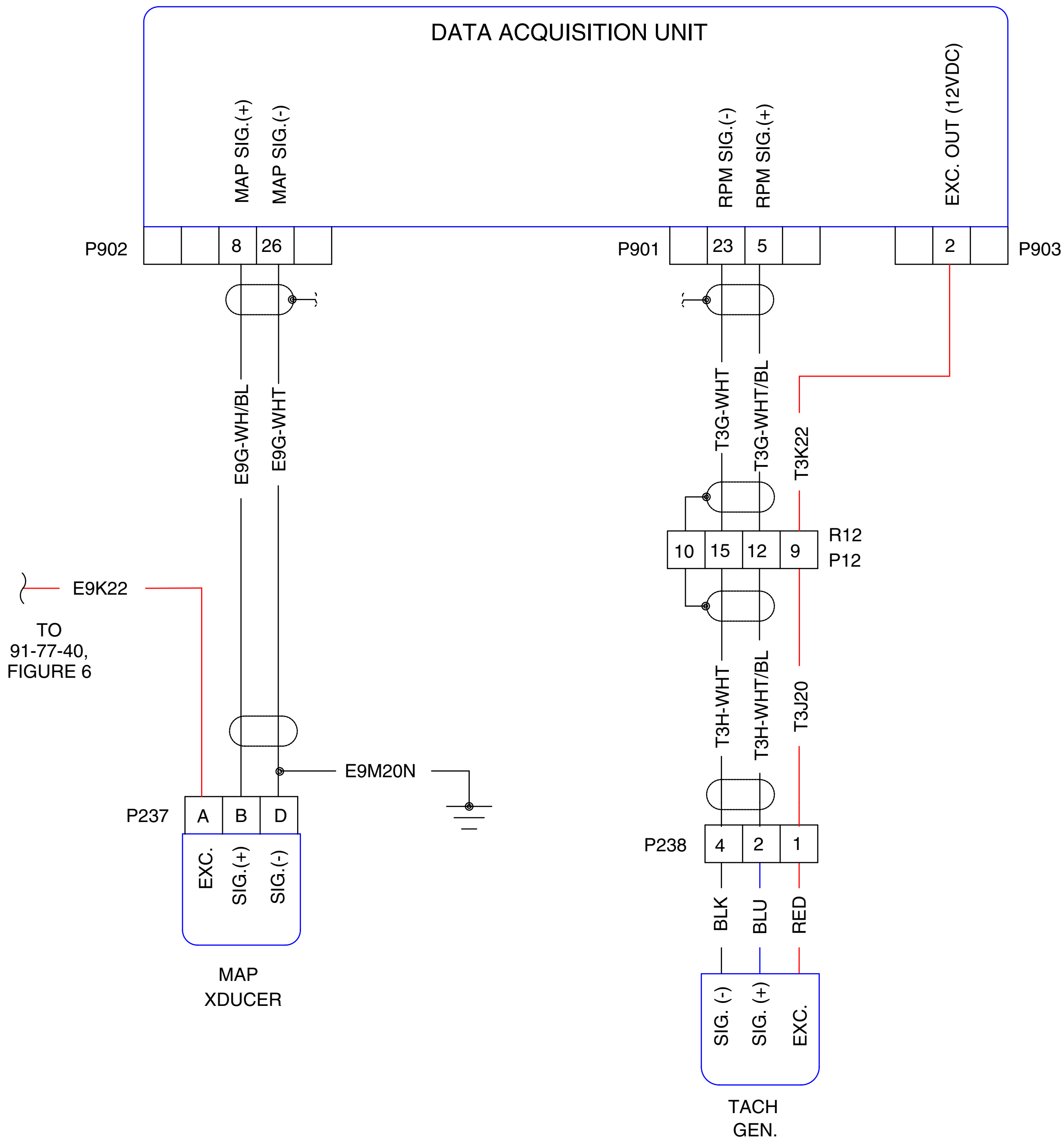
105232 3.0 NEW / G



Engine Combination Gauge (Oil Temp / Oil Press / CHT)
Figure 1

THIS PAGE INTENTIONALLY BLANK

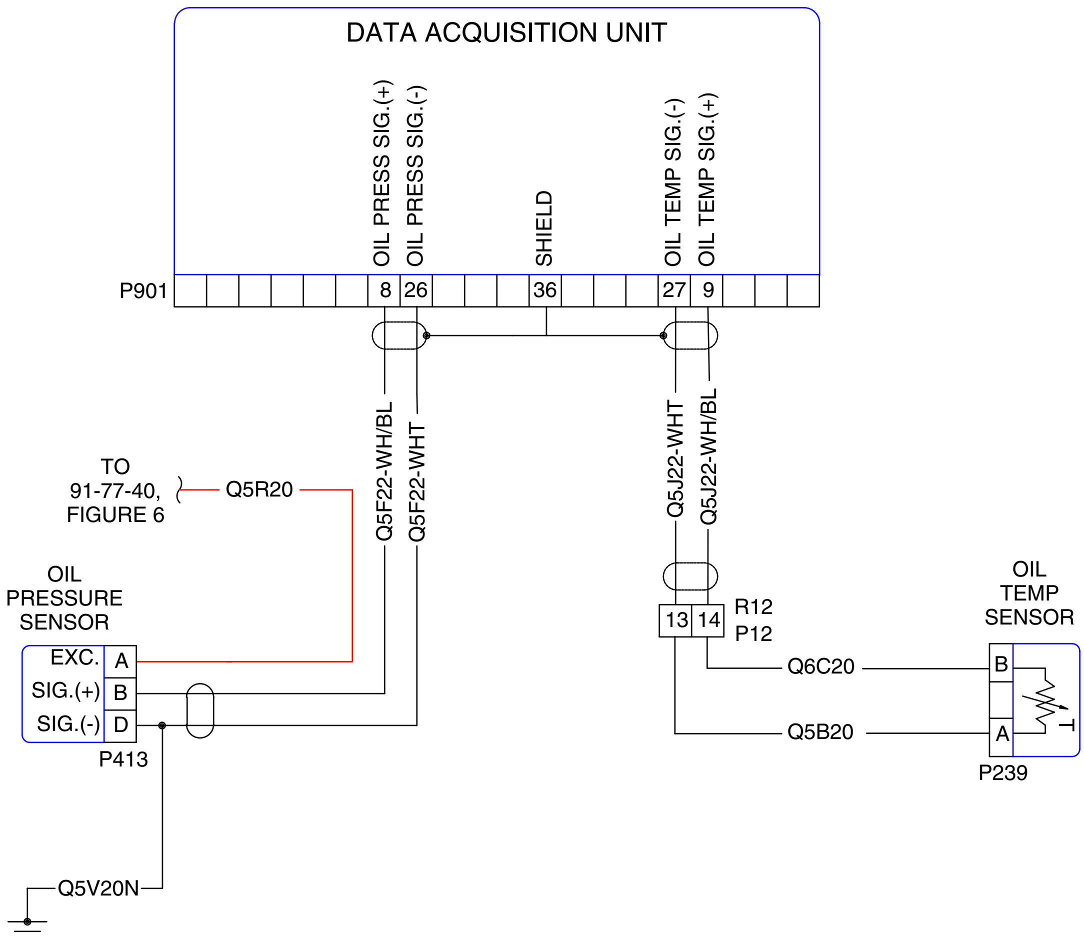
101849 26.0 NEW



MAP / RPM
Figure 1

Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

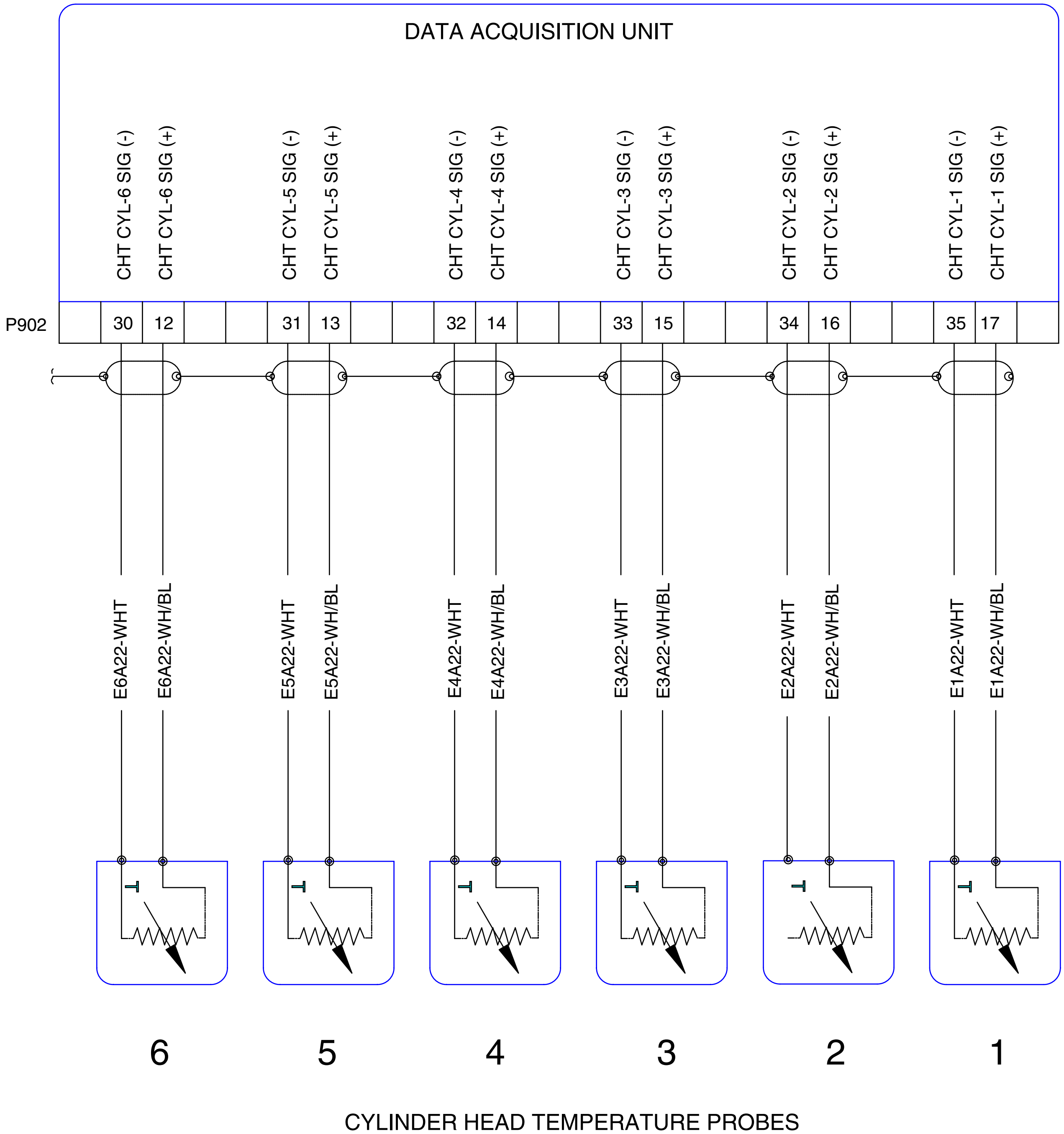
101849 4.0 NEW



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

Oil Pressure / Oil Temperature
Figure 2

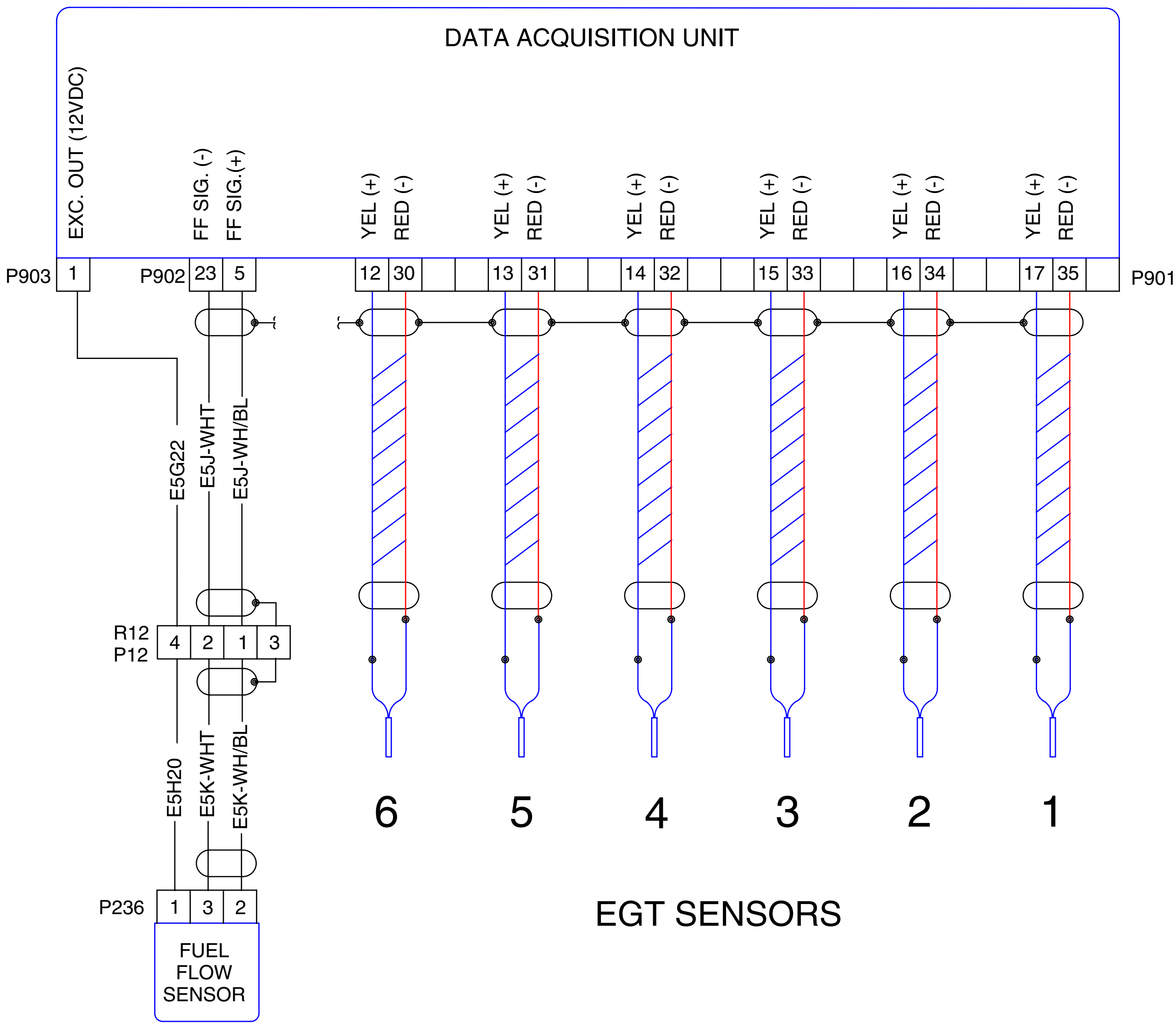
101849 27.0 NEW



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

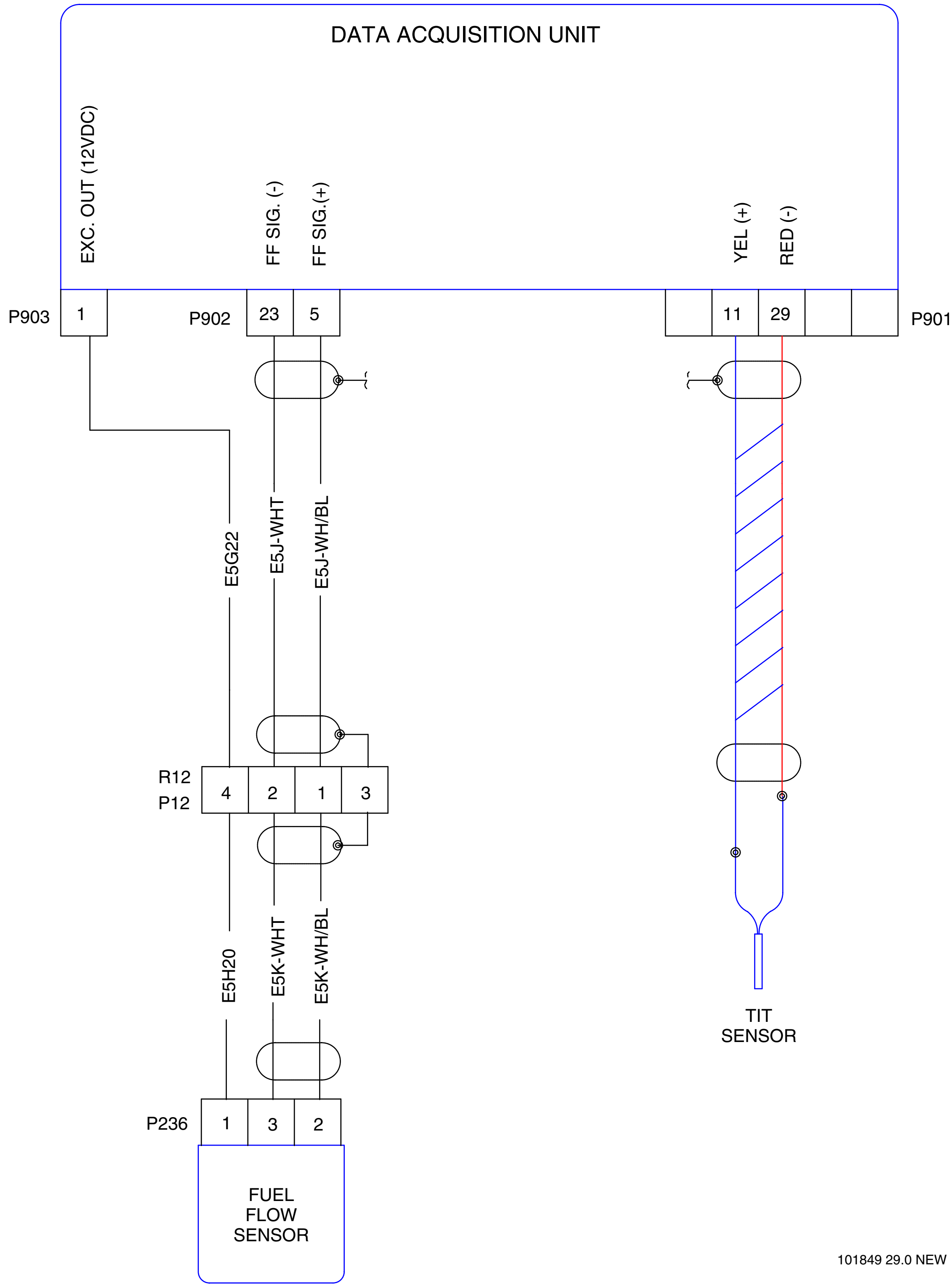
Cylinder Head Temperature
Figure 3

101849 28.0 NEW



Effectivity
with Avidyne Entegra option
3232014 & up

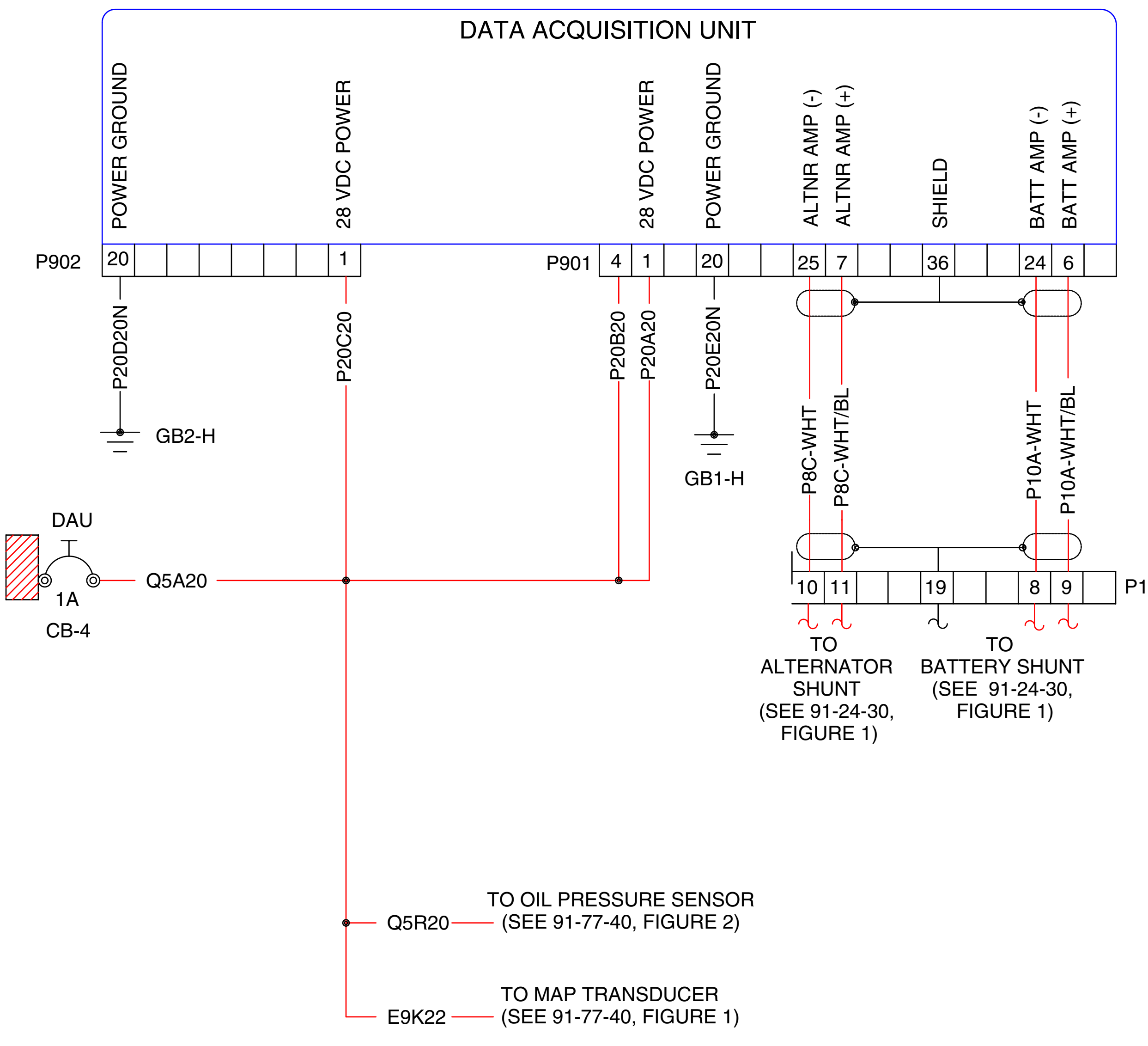
EGT / Fuel Flow
Figure 4



TIT / Fuel Flow
Figure 5

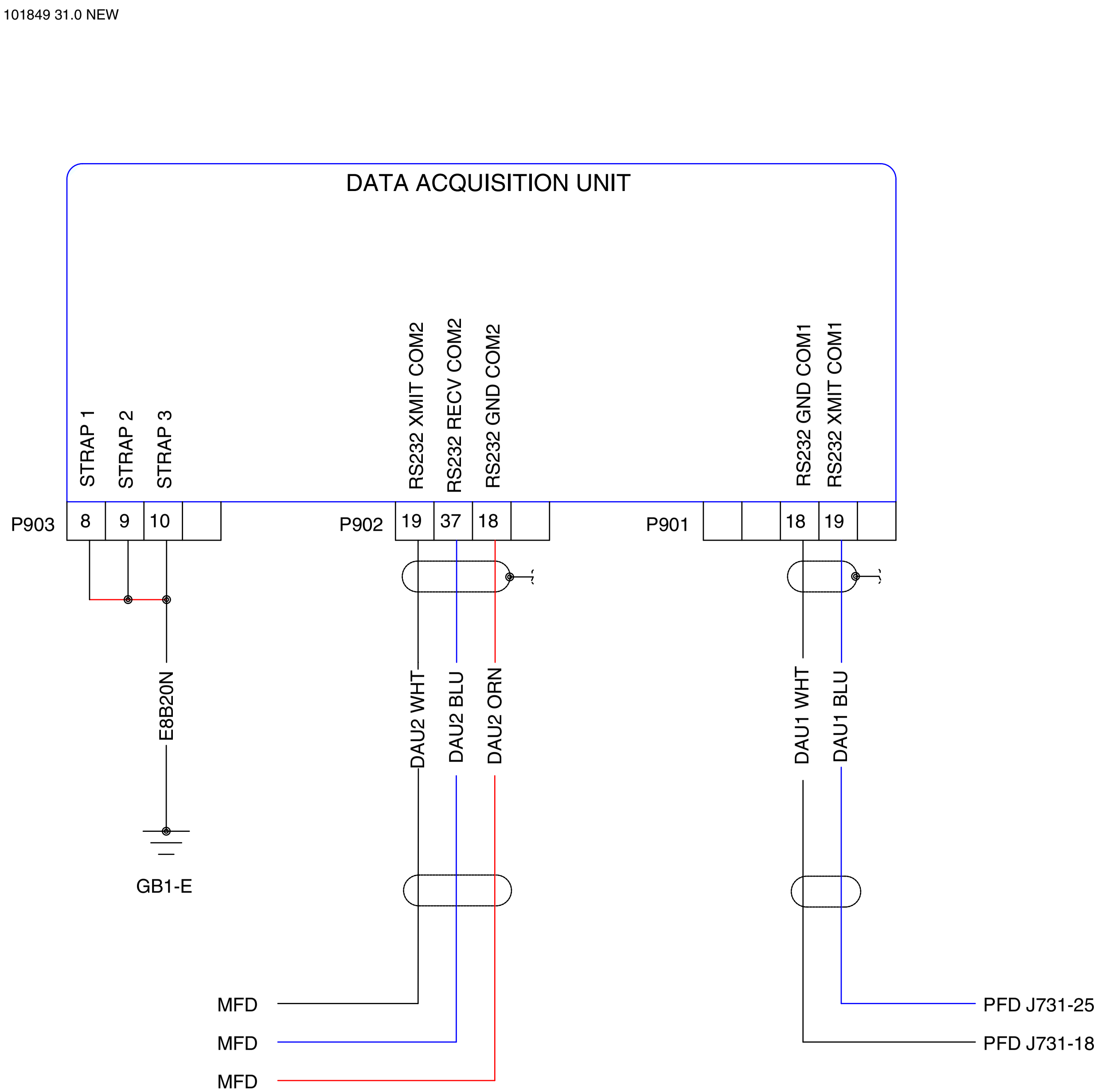
Effectivity
with Avidyne Entegra option
3255015 & up

101849 3.0 NEW



Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

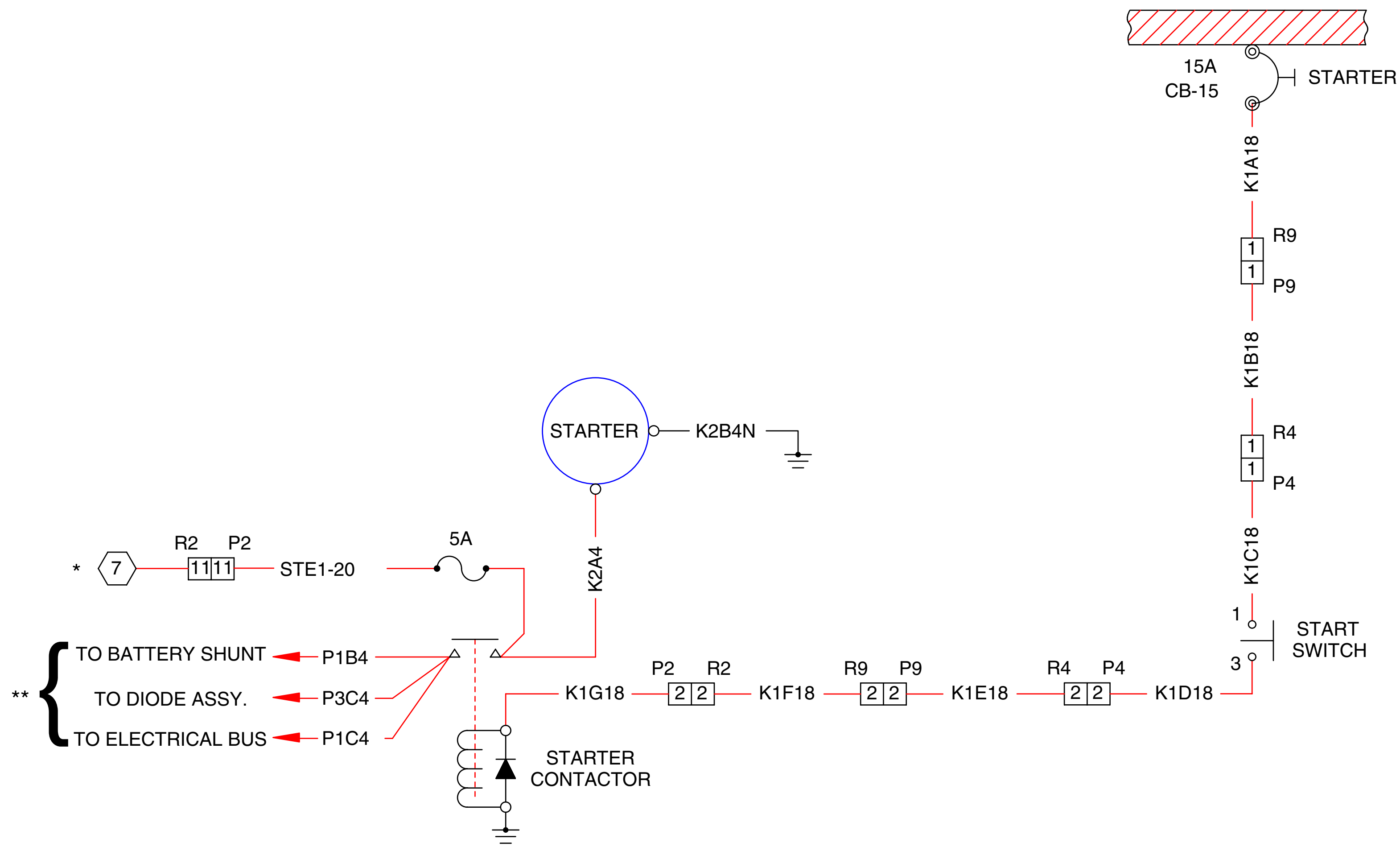
Data Acquisition Unit (DAU)
Figure 6 (Sheet 1 of 2)



Data Acquisition Unit (DAU)
Figure 6 (Sheet 2 of 2)

Effectivity
with Avidyne Entegra option
3232014 & up
3255015 & up

THIS PAGE INTENTIONALLY BLANK



* TO ANNUNCIATOR
(SEE 91-31-50, FIGURE 1)

** SEE 91-24-30, FIGURE 1

Starter
Figure 1

105232 12.0 NEW / G
101849 11.0 NEW

GRIDS 5K12 THRU 5K24
INTENTIONALLY BLANK

CHAPTER

95

SPECIAL PURPOSE EQUIPMENT

THIS PAGE INTENTIONALLY BLANK

CHAPTER 95

LIST OF EFFECTIVE PAGES

CHAPTER SECTION	PAGE	DATE	CHAPTER SECTION	PAGE	DATE
95-List of	1	Feb 19/04			
Effective Pages	2	Feb 19/04			
95-Table of Contents	1	Feb 19/04			
	2	Feb 19/04			
95-00-00	1	Feb 19/04			
	2	Feb 19/04			
	3	Feb 19/04			
	4	Feb 19/04			
	5	Feb 19/04			
	6	Feb 19/04			
	7	Feb 19/04			
	8	Feb 19/04			

THIS PAGE INTENTIONALLY BLANK

CHAPTER 95 - SPECIAL PURPOSE EQUIPMENT

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY BLANK

GENERAL

1. Tire Balancer (See Figure 1.)

   A useful tire balancing fixture can be built as follows:

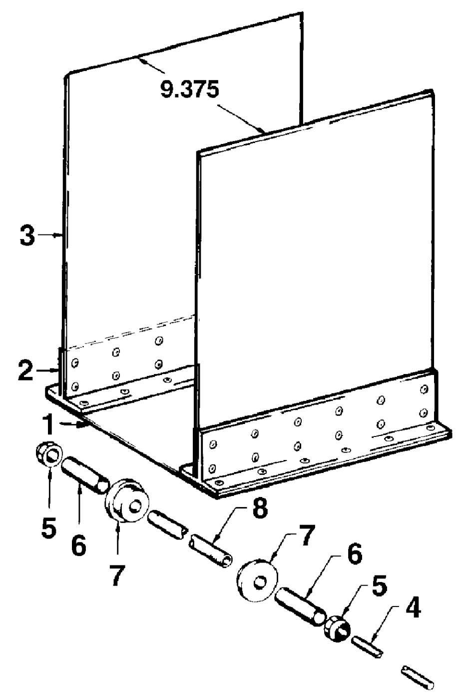
   A. Chamfer top edges of -3 sides, leaving 1/16 inch flat on top of the inboard edge. Rivet -2 tee's to -3 sides using AN 470-AD5 rivets, with 2 inch spacing, and using AN 426-AD5 rivets (2 inch center to center) to secure -2 tee's to -1 base. If tee extrusion is unavailable, heavy angle extrusion could be used. -3 sides must be vertical.

   B. The -4 axle must slide through the -8 pipe, the -5 nuts are made by reaming the existing threads in the AN 365-624 nuts with an R drill, then tapping them with a 1/8-27 pipe tap.

   C. The -6 spacers were made from 1/2 inch aluminum tubing, the two lengths of spacers are suitable for balancing most any aircraft wheel.

   D. The -7 bushings may be made from one inch phenolic or aluminum using a 1-1/2 inch hole saw to cut out the smaller bushing and a 1-3/4 hole saw to cut out the larger. By inserting a 1/4 inch long threaded bolt through the pilot hole and securing with a washer and nut, a drill press and file may be used to make the off-set on the bushing. The turned-down part should just slide inside the bearing race and then ream the pilot hole to slide over the -8 pipe threads.

   E. The -8 pipe was made from a piece of 1/8 inch black pipe and threaded with a 1/8-27 pipe die, this will be thread 3 inches in from each end of the pipe.



USE THE FOLLOWING LIST OF MATERIALS TO MAKE THE BALANCER

- 1. 1 EA BASE	12 X 11	0.190 2024 T3 CLAD ALUMINUM ALLOY
- 2. 2 EA TEE	2.5 X 2 X 11	0.190 2024 T4 EXTRUDED ALUMINUM ALLOY
- 3. 2 EA SIDES	14 X 11	0128 2024 T3 CLAD ALUMINUM ALLOY
- 4. 2 EA AXLE	0.125 X 10.25	4130 STEEL, NOMALIZED
- 5. 2 EA NUTS	AN 365-624	
- 6. 2 EA SPACER	0.50 X 2.25	5052-0 ALUMINUM TUBING
2 EA SPACER	0.50 X 1.25	5052-0 ALUMINUM TUBING
- 7. 2 EA BUSHING	1.480 X 1.625 X 1.00	PHENOLIC OR ALUMINUM
2 EA BUSHING	2.240 X 1.37 X 1.00	PHENOLIC OR ALUMINUM
- 8. 1 EA PIPE	1/8 X 9.3	BLACK STEEL PIPE
* 2 EA BEARINGS	SAVE TWO OF EACH SIZE WORN WHEEL BEARINGS FROM PREVIOUS INSPECTIONS.	

Tire Balancing Fixture
Figure 1

2. Control Surface Balancing Tool (See Figure 2.)

WARNING: ALL CONTROL SURFACES THAT HAVE BEEN REPLACED OR REPAINTED MUST BE BALANCED BEFORE INSTALLATION.

Balancing must be done using a suitable tool capable of measuring unbalance in inch-pounds from centerline of control surface hinge pin. A suggested tool configuration is shown in Figure 2. Other tool configurations may be used, provided accuracy is maintained and recalibration capability is provided.

The tool described in Figure 2 is used as follows:

A. Ensure that the control surface is in its final flight configuration, static wicks, trim tabs, trim tab pushpull rod and control surface tip (as applicable) should be installed. The surface should be painted and trim/servo tabs should be in the neutral position.

NOTE: Paint is a considerable balance factor. Remove existing paint prior to repainting a control surface.

B. Place hinge bolts through control surfaces and place control surface on a holding fixture.

C. Avoiding rivets, place the balancing tool on the control surface with the tool's hinge centerline directly over the hinge line of the control surface.

D. Adjust the movable trailing edge support to fit the width of the control surface, then tighten the set screw on the trailing edge support.

E. Adjust the trailing edge support vertically until the beam is parallel with the control surface chordline.

F. Remove the tool from the control surface and balance the tool itself by adding or removing nuts or washers from the beam balance bolt. When balancing the tool, the movable weight must be at the bar's hinge centerline.

G. After balancing tool, reattach it to the control surface, but keep the beam positioned 90 degrees from the control surface hinge line.

H. Determine balance control surface by sliding movable weight along the balance beam.

I. Read the scale when the bubble in the level has been centered. Since the movable weight weighs threepounds, every inch it is moved from the center of the beam equals three inch-pounds of force.

3. Baggage Door Lock Tool

A suitable tool can be fabricated as shown in Figure 3.

4. Aileron Bellcrank Rigging Tool

A suitable tool can be fabricated as shown in Figure 4.

5. Rudder Rigging Tool

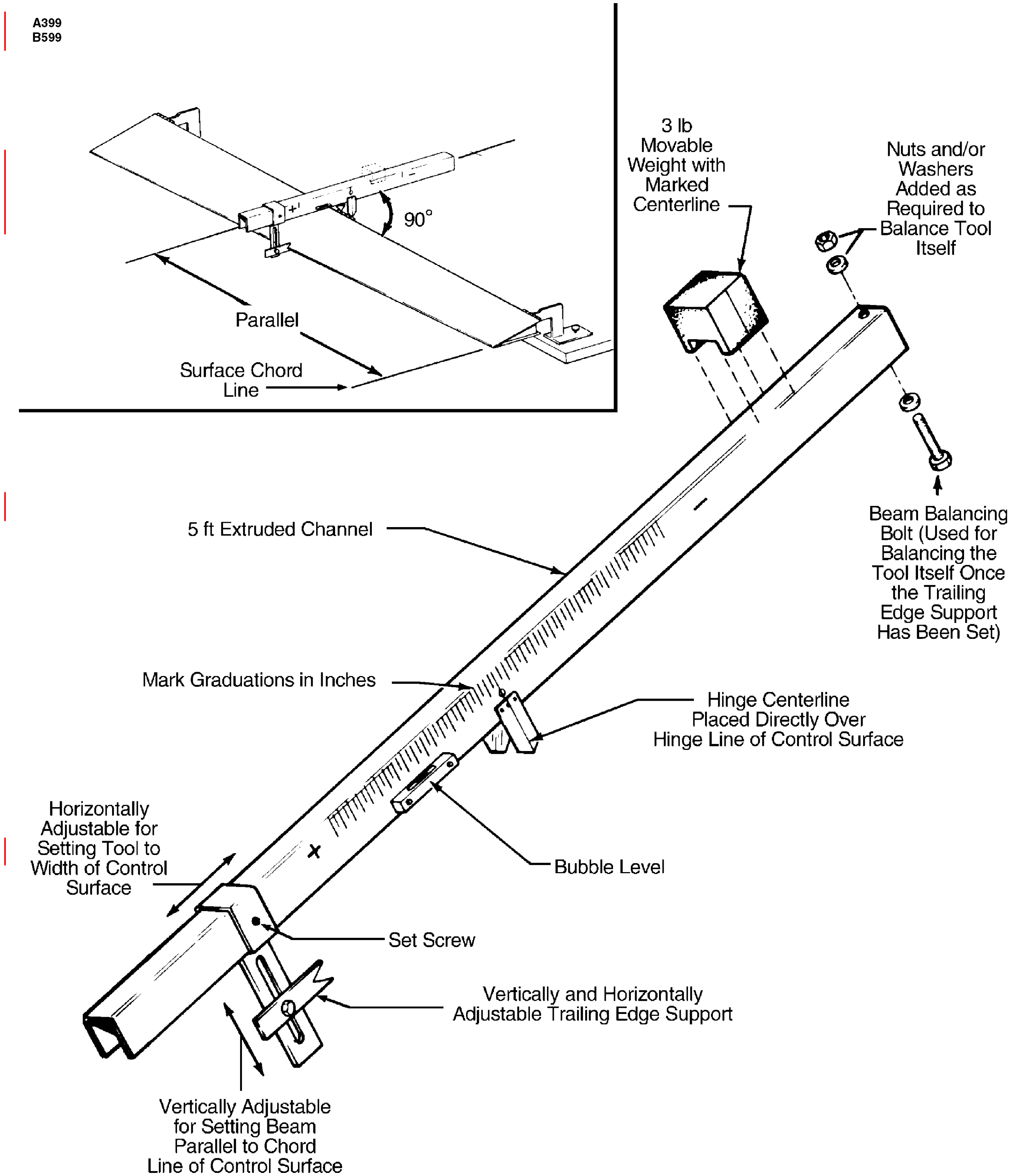
A suitable tool can be fabricated as shown in Figure 5.

6. Flap Rigging Tool

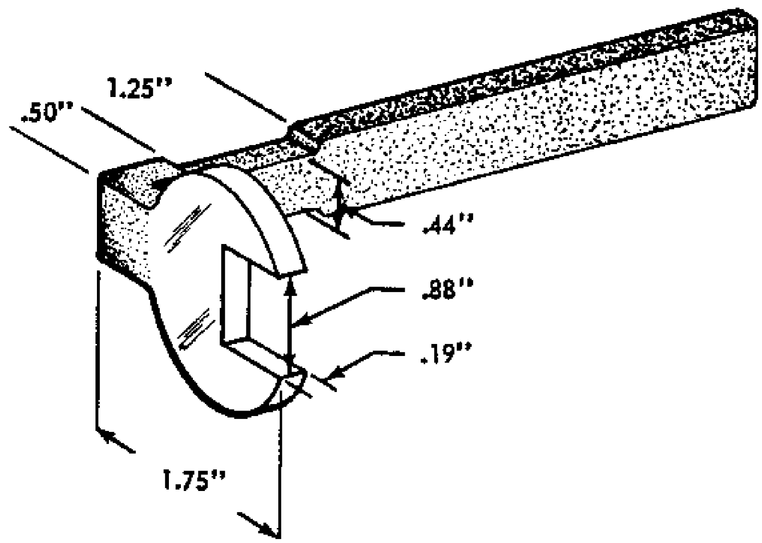
A suitable tool can be fabricated as shown in Figure 6.

7. Stabilator Rigging Tool

A suitable tool can be fabricated as shown in Figure 7.

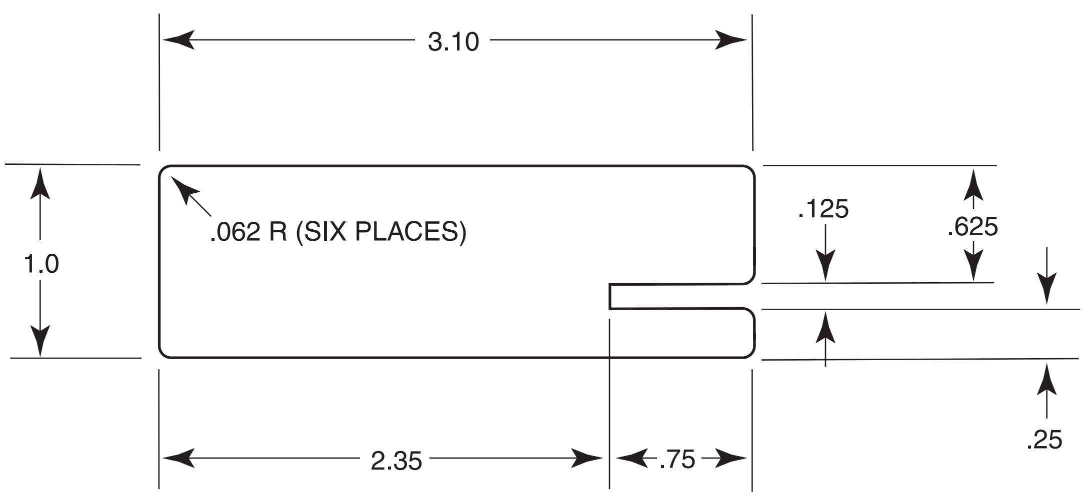


Control Surface Balancing Tool
Figure 2

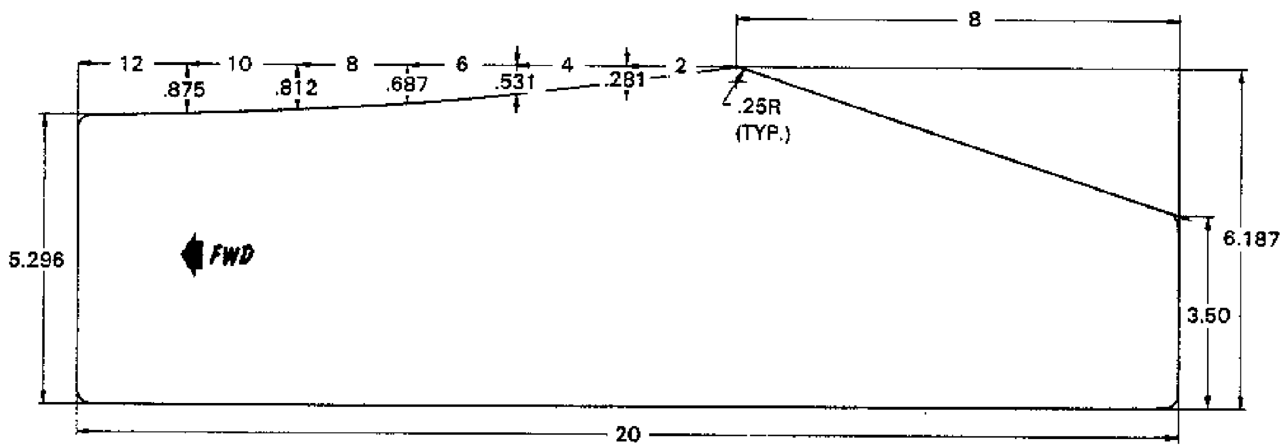


Baggage Door Lock Tool
Figure 3

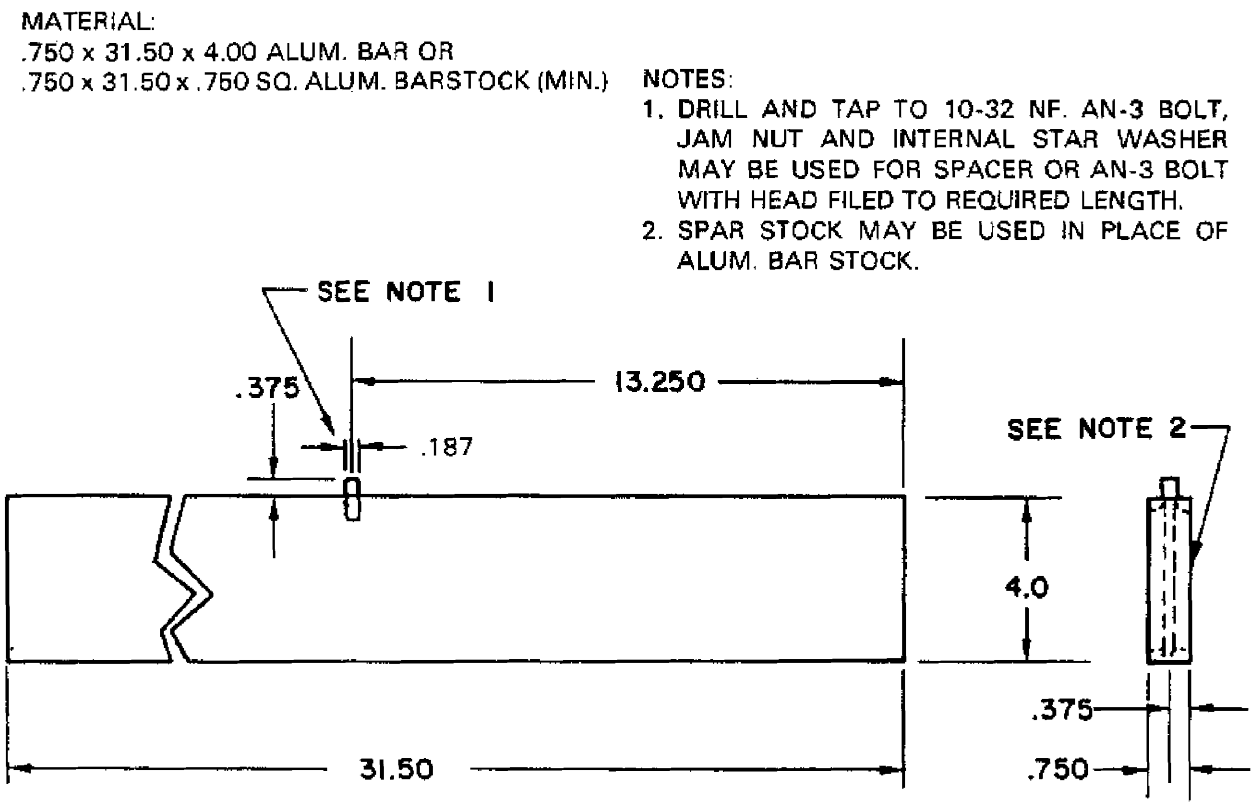
MATERIAL - .125 X 1.0 ALUMINUM PLATE



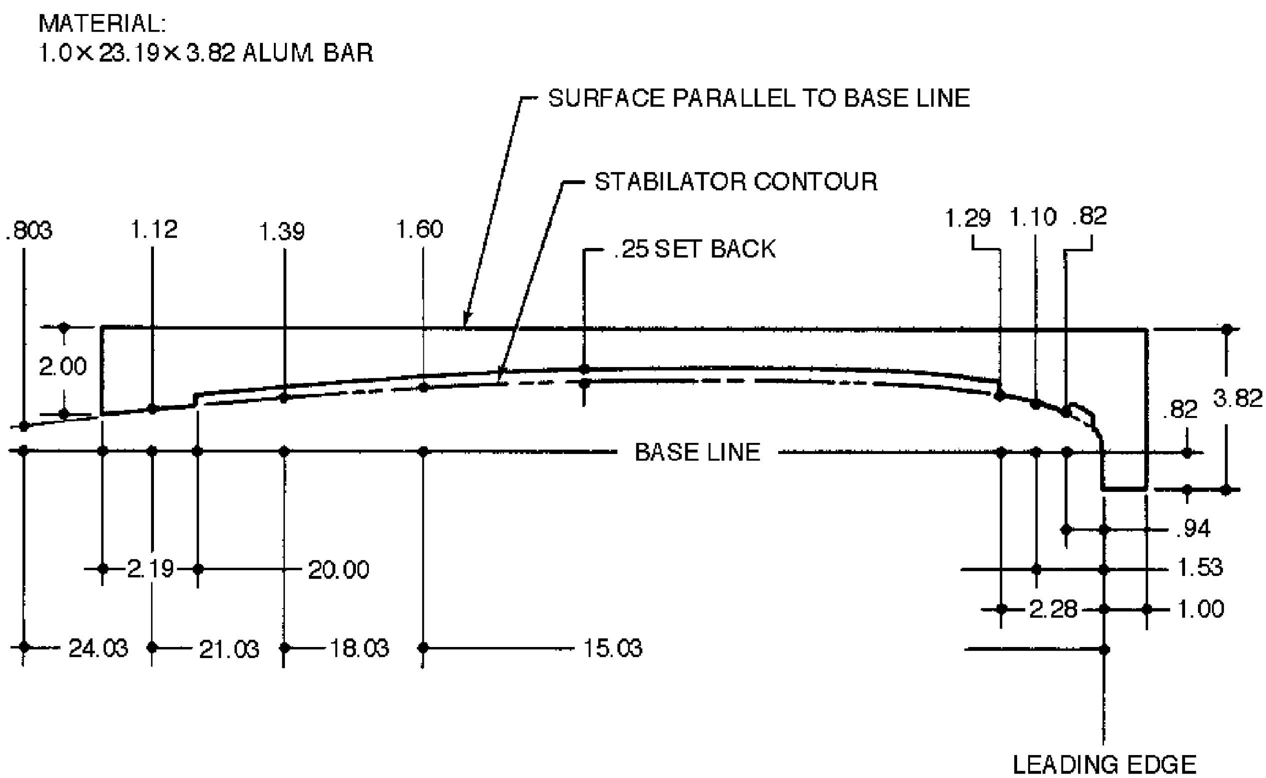
Aileron Bellcrank Rigging Tool
Figure 4



Rudder Rigging Tool
Figure 5



Flap Rigging Tool
Figure 6



Stabilator Rigging Tool
Figure 7

GRIDS 5L14 THRU 5L24
INTENTIONALLY BLANK