Publication No. CSP-H-3

MDHC 500

MODEL 369H SERIES HELICOPTER

APPENDIX A

OPTIONAL EQUIPMENT MANUAL

HANDBOOK OF MAINTENANCE INSTRUCTIONS

McDonnell Douglas Helicopter Company
5000 East McDowell Road
Mesa, Arizona 85205-9797

Reissue No. 2, 15 October 1982
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MCDONNELL DOUGLAS
HELICOPTER SYSTEMS

RECORD OF TEMPORARTY REVISIONS

MANUAL TITLE CSP–H–3 OPTIONAL EQUIPMENT MANUAL

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93–001	26 July 1993	MDHI							

TEMPORARY REVISION
TO
CSP-H-3, APPENDIX A

Optional Equipment Manual
Handbook of Maintenance Instructions
(Reissued October 15, 1982, Revised April 15, 1993)
MODEL 369H SERIES HELICOPTERS

REFERENCE: Field Report:

FILING INSTRUCTIONS:

(1) Insert this page in front of Page A of the List of Effective Pages:

(2) Replace the following pages in the CSP-H-3 with the enclosed revision pages.

Temporary Revision Number / Date	Section	Page	Page Date
*93-001 / July 26, 1993	T.O.C.	v	Original
	T.O.C.	vi	July 26, 1993
	12	31	July 26, 1993
	12	32	Original
	12	41	July 26, 1993
	12	42	Original
	12	42A	July 26, 1993

* Denotes latest Temporary Revision.

LIST OF EFFECTIVE PAGES

INSERT LASTEST CHANGED PAGES, DESTROY SUPERSEDED PAGES.
*** The asterisk indicates pages changed, added, or deleted by the change.**
 # The page is not dated and is part of the current manual.

Date of issue for original and change pages are:

Current Manual:

Reissue No. 2 . . . (#) 15 October 1982
Revision No. 1 . . . . 15 April 1993

Page	Issue
*Cover	Hard Cover
*Title	15 Apr 1993
*TR	15 Apr 1993
*A/(B blank)	15 Apr 1993
*CR-1A	#
*CR-2B	#
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vii/viii(blank)	#
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1-1 thru 1-18	#
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3-1 and 3-2	#
4-1 thru 4-22	#
5-1 thri 5-11/5-12(blank)	#
6-1 thru 6-17/6-18(blank)	#
7-1 thru 7-21/7-22(blank)	#
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*7-24A/(7-24B blank)	15 Apr 1993
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*7-59/(7-60 blank)	15 Apr 1993
*7-61/(7-62 blank)	15 Apr 1993
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8-11 thru 8-23/8-24(blank)	#
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11-1 thru 11-16	#
12-1 thru 12-47/12-48(blank)	#
13-1 thru 13-5/13-6(blank)	#

SERVICE INFORMATION SUMMARY

INFORMATION FROM THE FOLLOWING SERVICE DOCUMENTS
HAS BEEN INCORPORATED INTO THIS APPENDIX

Number	Date	Number	Date
HL-22	18 Dec 72	*HN-60	12 Jul 73
HL-28	1 May 73	*HN-63.1	9 Jun 75
HL-33	18 Feb 74	HN-64	3 Mar 74
HL-36	5 Aug 74	*HN-69	10 Jun 74
*HL-65	10 Dec 79	*HN-76	3 Sep 74
HN-26.1	19 Jul 71	*HN-100	1 Aug 76
HN-30	21 Dec 70	*HN-107.1	23 Jan 78
HN-32	5 Apr 71	HN-143	20 Aug 79
HN-38	23 Aug 71	HN-144	23 Jul 79
HN-45	29 Feb 72	*HN-149	22 Oct 79
HN-47	10 Apr 72	HN-151	15 Jan 80
*HN-52.1	9 Apr 73	HN-152	3 Mar 80
HN-55	1 May 73	HN-157	1 Aug 80
HN-57	1 May 73	HN-159	18 Aug 80
HN-58	29 May 73	HN-166	21 Apr 81
*HN-59	22 Jun 73	HN-174	28 Aug 81

NOTE: An asterisk (*) indicates that all data from the document are incorporated into the text. Otherwise, only those maintenance requirements of a continuing nature are incorporated or, when appropriate for incorporation, only a reference to the document is made in the text.

TABLE OF CONTENTS

INTRODUCTION

PURPOSE OF THIS APPENDIX.

Appendix A is part of the primary information file for the Hughes 500 (Model 369H) Helicopter Series, manufactured by Hughes Helicopters, Inc., Culver City, California, and should always be kept with the 500 Series Basic Handbook of Maintenance Instructions. This appendix contains descriptive and maintenance information on the various accessory and system equipment options available for each of the three helicopter model configurations.

ORGANIZATION OF APPENDIX CONTENTS.

Unlike the Basic HMI and the Configuration Supplements, which contain systems information by Section, this appendix contains option groupings of equipment and items that are of a similar type or are in a related category, as outlined by the Table of Contents. Information in each option group applies to all helicopter models (500S/E and M) unless otherwise indicated. When optional equipment pertains only to a specific model, or certain models, the data indicates the applicable model(s).

COMPATIBILITY OF COMBINED KITS.

Table I-1 identifies which optional kits and equipment may or may not be used in combination at the same time.

Table I-1. Kit Compatibility and Helicopter Usability

Option (Kit) Name	Part Number 369H	Compatibility (Blank = No; X = Yes; X = Installable/Not Usable													Usability (Blank = No; X = Yes)						
		90017	90065	90070	90121 (Standard)	90121 (Extended)	90086	90007	90011	90085	90060	90045*	90030(8)	90035	Model 369H S	Model 369H E	Model 369H M	Serial Number All	Serial Number 0030 & subq	Serial Number 0101 & subq	Serial Number 0201 & subq
Cargo Swing	90017				(1) X	(1) X	X		X	X		X	X	X	X	X	X	X			
Cargo Hook	90065			(1) X	(1) X	(1) X	X	X	X	X	X	X	X	X	X	X	X			X	
Hoist	90070		(1) X		(1)(2) X	(1)(2) X	⊗	(3) X	⊗	X	(3) X	⊗	⊗	X	X	X	X			X	
Emergency Floats	90121 (Standard)	(1) X	(1) X	(1)(2) X				(5)(6) X	X	X	(4) ⊗		X	X	X /	X /	/ X		/ X	X /	
Emergency Floats	90121 (Extended)	(1) X	(1) X	(1)(2) X				(5)(6) X	X	X	(4) ⊗		X	X	X	X	X			X	
Utility Floats	90086	X	X	⊗				X	X	X			X	X	X	X	X			X	
Luggage Pods	90007		X	(3) X	(5)(6) X	(5)(6) X	X		X	X		X	X	X	X	X	X			X	
Litters	90011	X	X	⊗	X	X	X	X			X	X	(7)		X	X	X				X
Bubble Doors	90085	X	X	X	X	X	X	X			X	X	(7)	(9) X	X	X	X				X
Passenger Step	90060		X	(3) X	(4) ⊗	(4) ⊗			X	X		X	X	X	X	X	X	X			
Wheels (Pneumatic)	90045*	X	X	⊗				X	X	X	X		X	X	X	X	X	X			
Auxiliary Fuel System	90030(8)	X	X	⊗	X	X	X	X	(7)	(7)	X	X			X	X	X	X			
Floor Seating(4)	90035	X	X	X	X	X	X	X		(9) X	X	X			X	X	X	X			
Automatic Engine Reignition	90118	Each kit is compatible with any kit or compatible combination of kits identified above.													X /	X /	/ X	X /	/ X (10)		
Automatic Engine Reignition	90140																X				X
Rotor Brake	90123														X	X	X			X	
Winterization: Standard Landing Gear	90127-503														X	X	X			X	
Winterization: Extended Landing Gear	90127-504														X	X	X			X	
Extended Landing Gear	90006														X	X	X			X	
Heated Pitot	90034														X	X				X	
Heated Pitot	90015-547																X				X
Wheels (Rubber Tread)	90126														X	X	X	X			
Particle Separator Filter	90148														X	X	X			X	X

Footnotes:

- * Remove before flight.
- (1) Cyclic stick grip kit 369H90129 must be installed.
- (2) For functional use of hoist, emergency floats must be in stowed configuration for either standard or extended landing gear.
- (3) Single component only installed on side opposite hoist.
- (4) Do not use in flight.
- (5) Compatible if installed on extended landing gear 369H90006.
- (6) Not compatible if installed on standard landing gear.
- (7) Not compatible with litter kit in use.
- (8) For export only, with approval of country concerned.
- (9) Compatible with bubble doors, if litters are removed.
- (10) S/N 0001 and subsequent.

OPTION GROUP 1
FUSELAGE FURNISHINGS AND ASSOCIATED EQUIPMENT

1-1. SEATING.

1-2. PILOT'S MESH SEATS. Mesh seats are two-part seats installed in the pilot's compartment (fig. 1-1). The seat section is attached by two bolts to the fuselage seat structure. The backrest section is attached to the station 78.50 canted frame and the fuselage seat structure with four screws. Each two-part seat consists of frames made of aluminum tubing that supports the nylon webbing; rubber pads are cemented to the seat leg mounting plates.

1-3. PASSENGER'S INDIVIDUAL MESH SEATS. Two passenger seats (fig. 1-2) are installed in the aft compartment. The seats are of welded tubular aluminum structure with nylon mesh covers. Upholstered cushions for the seats are an additional option. The seats may be folded for clear cargo space and are easily removed, by means of quick disconnect attachments, if desired.

1-4. BENCH SEAT. Aft compartment passenger's bench type seat (fig. 1-3) is a welded tubular steel structure furnished with either nylon mesh webbing or upholstered cushions. The seat is adjustable fore and aft as well as up and down and may be folded, or quickly removed, when clear cargo space is desired.

1-5. REPLACEMENT OF PILOT'S MESH SEATS.

a. Clear seat of obstructions. Remove attaching hardware, seat back and seat bottom.

b. Install replacement seat back or bottom with bolts or screws and washers as shown in figure 1-1.

1-6. REPLACEMENT OF PASSENGER'S INDIVIDUAL MESH SEATS.

a. Depress pushbutton quick disconnect at front legs of seat and move legs inboard to release from keyhole fittings in floor.

b. Remove clevis pins in seat rear support fitting and remove seat.

c. Install seats in reverse of procedure above.

NOTE: For height adjustment, any one of the three clevis pin holes in the rear support fitting may be used.

1-7. REPLACEMENT OF BENCH SEAT. (See fig. 1-3.)

a. Lift and turn the release pins on the outboard side of the two vertical support legs.

b. Move each support leg to the left to disengage it from the keyhole fitting in the floor.

c. Remove the two ball-lock pins securing the seat to the support fittings on the aft bulkhead. Remove seat.

d. Install the seat in reverse of the procedure above.

NOTE: For height adjustment, install ball-lock pins in any one of the three attachment holes in the vertical support legs and in the aft support fittings. For fore and aft adjustment, insert the seat back lower legs in either of the holes in the lower frame.

1-8. INSPECTION OF MESH SEATS.

a. Inspect seat frame for distortion, breaks, cracks, corrosion or any other visible damage.

b. Inspect rubber mounting plate pads (pilot's seats) for damage and security of attachment.

c. Inspect nutplates (pilot's seats) for condition and security.

d. Inspect nylon webbing for damage or excessive wear.

1-9. REPAIR OF MESH SEATS.

a. Lapstitch frayed or torn nylon webbing or replace if damaged beyond repair.

b. Replace damaged nutplate (pilot's seats).

c. Replace damaged leg mounting plate rubber pad (pilot's seats).

(1) Clean mounting plate with clean cloth dampened with solvent (item 1, table 2-4, Basic HMI).

(2) Apply cement (item 3) and attach pad to seat mounting plate.

d. Make welded or riveted sleeve type repairs on tubular structure according to FAA AC 43.13-1, Aircraft Inspection and Repair.

1-10. YOKE TYPE HARNESS WITH INERTIA REELS.

1-11. GENERAL. The pilot's and copilot's yoke-type shoulder harnesses (fig. 1-4) are of nylon web material having sewn-in length adjusters and

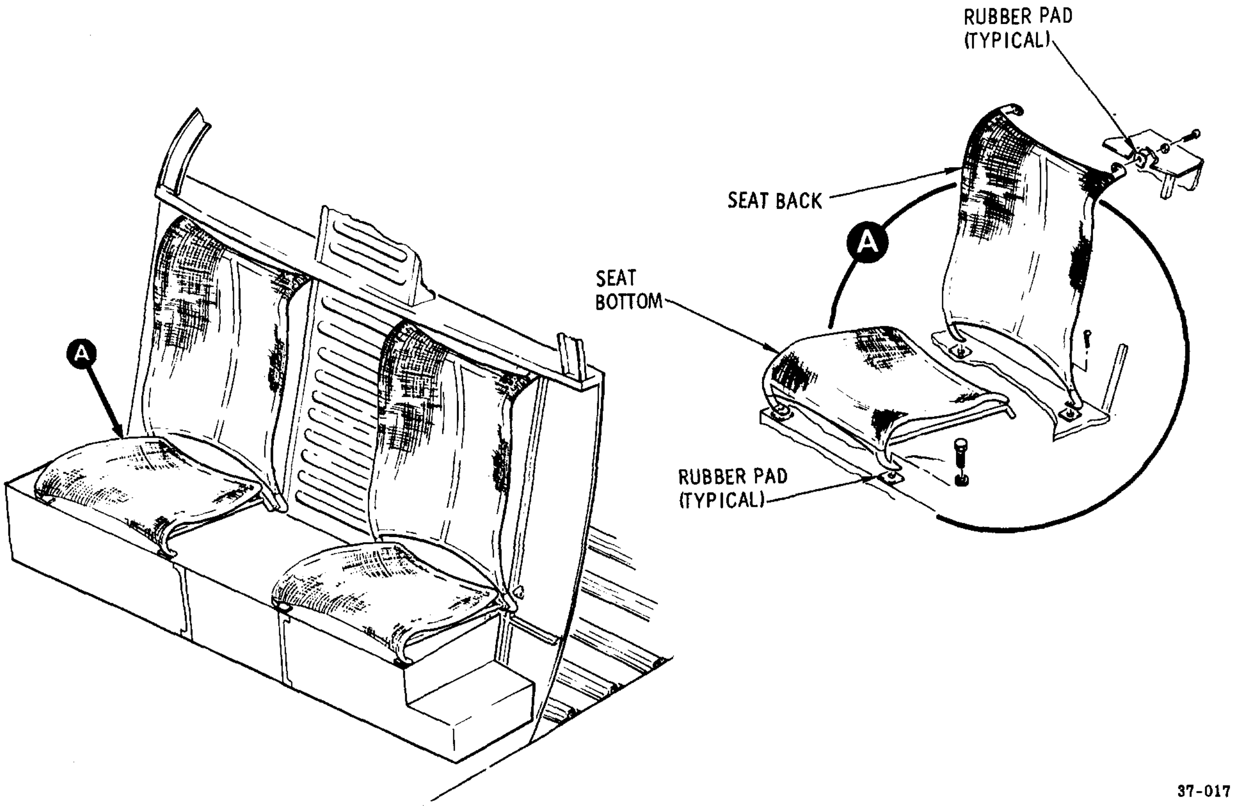


Figure 1-1. Pilot's mesh seat installation

NOTE:
THIS TYPE SEAT IS STANDARD EQUIPMENT FOR CURRENT CONFIGURATION 500M.

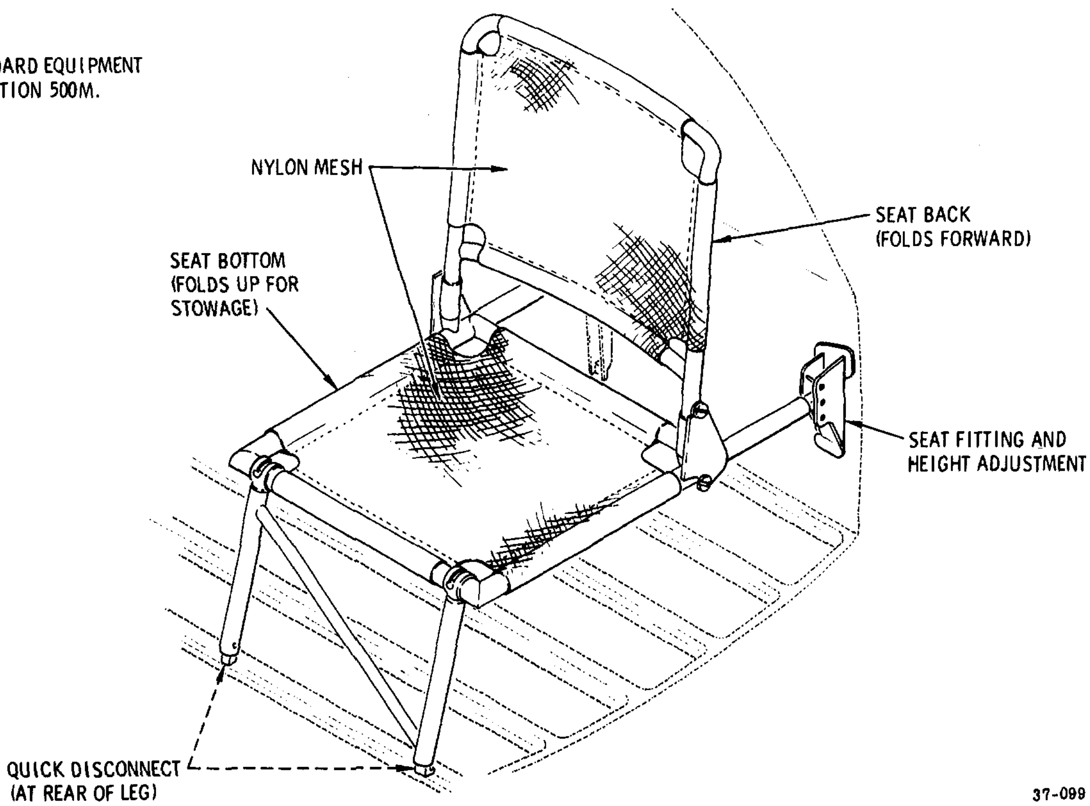


Figure 1-2. Passenger's individual mesh seat installation

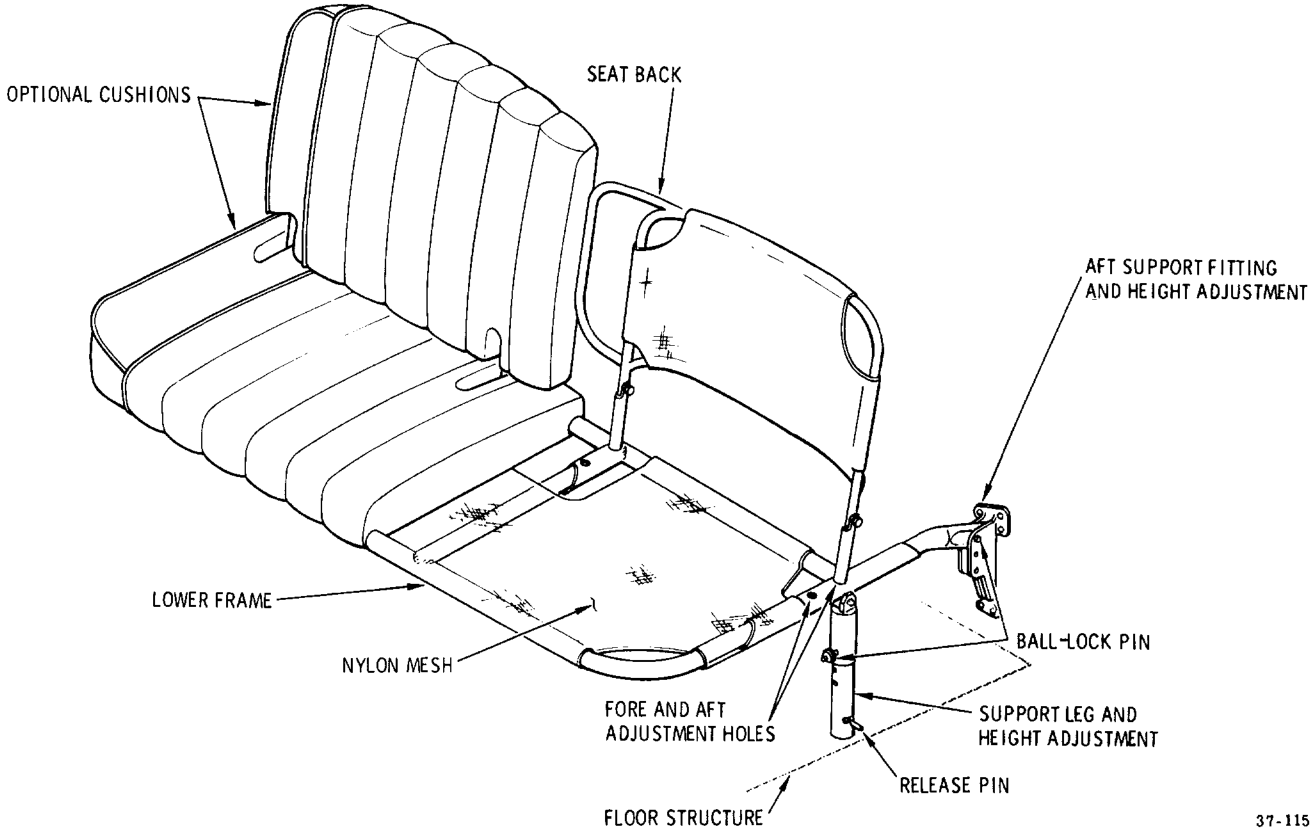


Figure 1-3. Passenger's bench seat installation

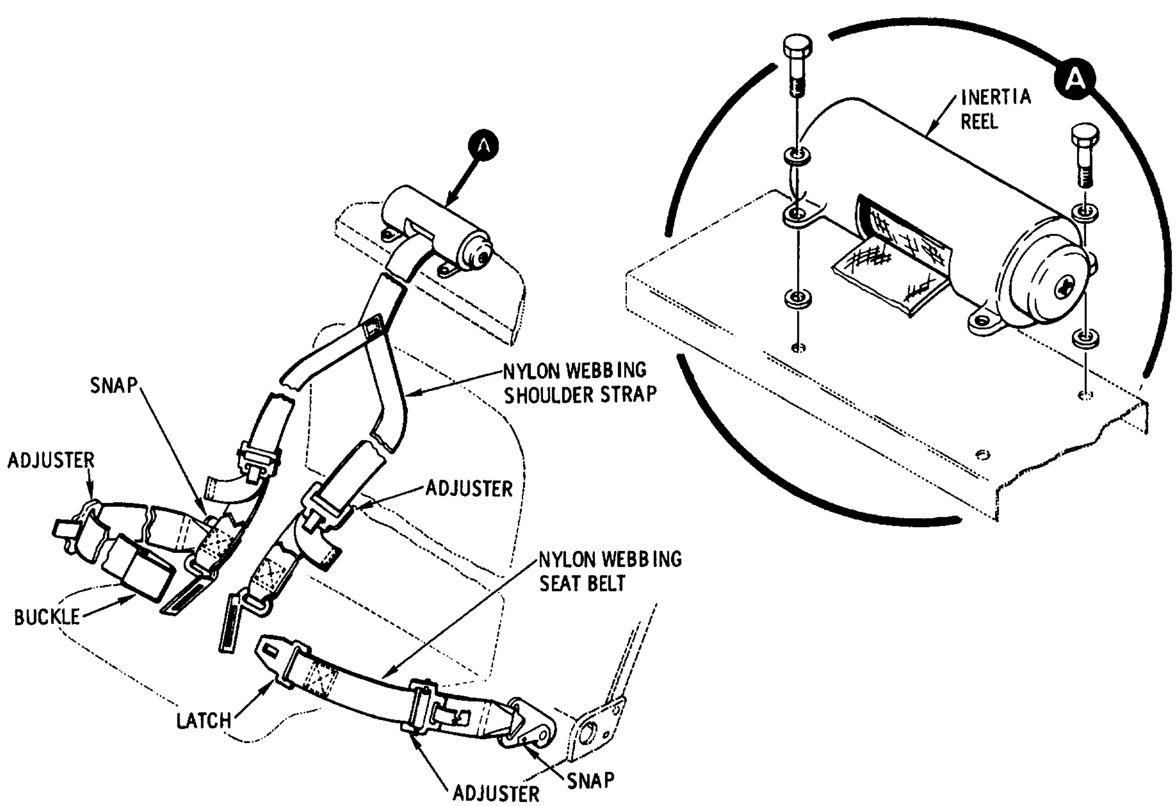


Figure 1-4. Yoke type harness and inertia reels

end adapters for attachment to the seat belts. Inertia reels, a part of the shoulder harness assemblies, are mounted on the station 78.50 canted frame. These reels allow the pilots freedom for slow deliberate shoulder movement but lock with any sudden forward movement. Full extension or retraction of the straps on the spring-loaded reels is approximately 25 inches. The reels are entirely automatic in action; no manual controls are provided.

1-12. INSPECTION OF YOKE TYPE HARNESS WITH INERTIA REELS. The following inspection may be performed without removal of the shoulder harness assembly.

a. Pull harness strap out of inertia reel to full extended length (approximately 25 inches). Release tension slowly and check that inertia reel fully retracts the strap.

b. Exert a sudden forward pull on the shoulder strap and observe that the inertia reel locks.

c. Inspect shoulder yoke and full length of strap for fraying and for signs of fabric deterioration. Check stiching carefully at end adapters and length adjusters. If any doubt exists as to the strength of the harness assembly, remove harness and inertia reel for pull test as specified in Section 4 of the Basic HMI.

1-13. REPLACEMENT OF YOKE TYPE HARNESS WITH INERTIA REELS. Replace harness and inertia reel assembly by removing reel from the canted frame (fig. 1-4) and installing a serviceable assembly. Use one thick washer under each of the inertia reel legs and one thin washer under each of the four boltheads.

1-14. CLEANING OF YOKE TYPE HARNESS WITH INERTIA REELS. The shoulder harness may be cleaned with a mild solution of warm water and laundry detergent. Use a soft bristle brush. Keep strap extended full length until dry before retracting into the inertia reel.

1-15. COMFORT CLIPS FOR SEAT BELT AND SHOULDER HARNESS ASSEMBLIES. A comfort clip designed to maintain proper strap tension and relieve excessive pressure of the inertia reel shoulder harness on the pilot or passenger during flight is available for installation on helicopters equipped with Sam Browne seat belt assemblies (Model 369HS SN 0801S through 0874S and Model 369HM SN 0270M through 0292M). The installation set out in figures 1-5 and 1-6 requires four PN E3403 comfort clips and three PN 369D24042-3 decals for each helicopter.

1-16. FIRE EXTINGUISHER.

1-17. GENERAL. The fire extinguisher (fig. 1-7) is a pressurized dry chemical type which is mounted on the forward door frame structure between the pilot's door and the canopy. On the 500M, the extinguisher is mounted on the right side. The 500S and 500E have the extinguisher mounted on the left side. The extinguisher can be quickly detached from its mounting bracket by unlatching a quick-release clasp. Normal pressure, as indicated on the fire extinguisher gage, is 150 psi (white sector). The extinguisher requires service if the pointer is in either red sector marked RECHARGE and OVERCHARGE.

1-18. SEATING AND BELTS FOR FOUR ON THE FLOOR.

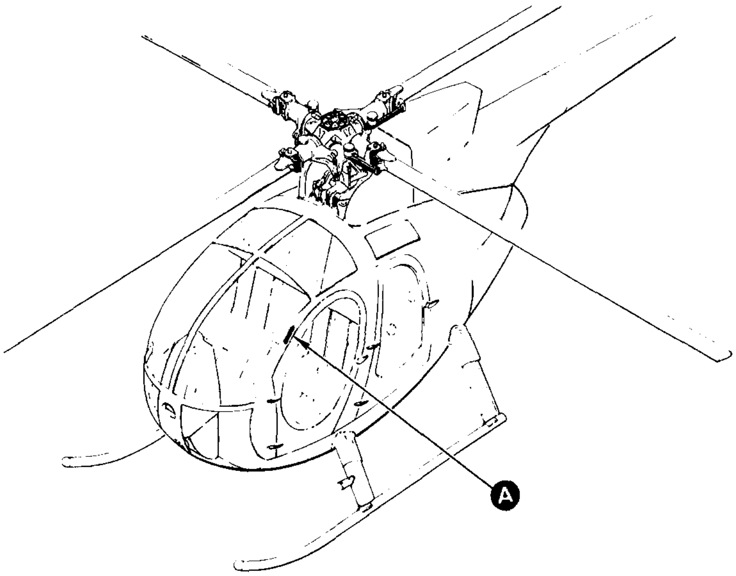
1-19. GENERAL. Seating and belts for four on the floor of the cargo compartment consists of four seat cushions, four shoulder straps, four belt assemblies, eight fittings and attaching hardware located in the cargo/passenger compartment as shown in figure 1-8. Four snap-on cushions are provided for passenger floor seating. Foam rubber cushions are attached to a seat base constructed of a honeycomb phenolic paper core with an aluminum and fiberglass facing. The fabric covering is attached to the seat base with hook and pile fasteners for ease of removal. Three aluminum angle positioning brackets attached to the seat base, and two snap-on fastener tabs secure the seat to the floor structure. Holddown tab location on early type seat cushions is at the center forward and aft edges; current type seat tabs are located at two opposite corners. On each helicopter, cushion floor positions are interchangeable. The shoulder straps are installed and adjusted to cross each passenger's chest from the outboard shoulder to the center lap area. The short length belts (two are nonadjustable) are installed on the center fittings. Seat belts are installed as shown and as noted on cloth identification tags attached to each seat belt assembly. The four shoulder strap attach fittings are attached to existing nutplates on the forward and aft bulkheads. The three existing aft cargo floor fittings are used as attach points for the two aft belt assemblies.

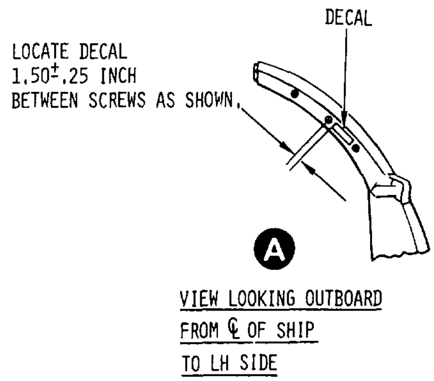
1-20. INSPECTION OF SEATING AND BELTS FOR FOUR ON THE FLOOR.

a. Inspect seat belts and shoulder straps for worn or frayed condition and loose stitching. If any doubt exists as to strength of straps or belts, pull test as specified in Section 4 of the Basic HMI. Replace unserviceable belts and/or shoulder straps.

b. Inspect seat belt and shoulder strap attachment fittings for wear and deformation. Replace unserviceable attachment fittings.

c. Inspect bulkhead and cargo floor fittings for security and obvious damage. Tighten as required; replace damaged fittings.





TO APPLY DECAL:

1. CLEAN DOOR FRAME AREA WHERE DECALS ARE TO BE APPLIED. DECALS WILL NOT ADHERE TO A GREASY OR SOAPY FILM.
2. MARK LOCATION OF DECAL PER THE ILLUSTRATION. REPEAT ON THE OTHER DOOR FRAME.
3. PEEL BACKING OFF DECAL AND POSITION. USE A CLOTH TO SQUEEZE ALL BUBBLES FROM UNDER THE DECAL, WORKING FROM THE CENTER OUTWARD. REPEAT ON THE OTHER DOOR FRAME.

TO INSTALL COMFORT CLIP:

1. PRY OPEN SLOT ON UNDERSIDE OF CLIP.
2. INSERT HARNESS STRAP IN SLOT.

AFTER SEAT BELT AND SHOULDER HARNESS ASSEMBLY IS FASTENED AND ADJUSTED FOR INDIVIDUAL COMFORT AND SAFETY:

3. SLIDE COMFORT CLIP UP ON HARNESS STRAP AND POSITION AS CLOSE AS POSSIBLE NEXT TO INERTIA REEL.

AFTER EACH FLIGHT:

4. REPOSITION COMFORT CLIP ON HARNESS STRAP AT ORIGINAL POSITION NEXT TO BUCKLE.

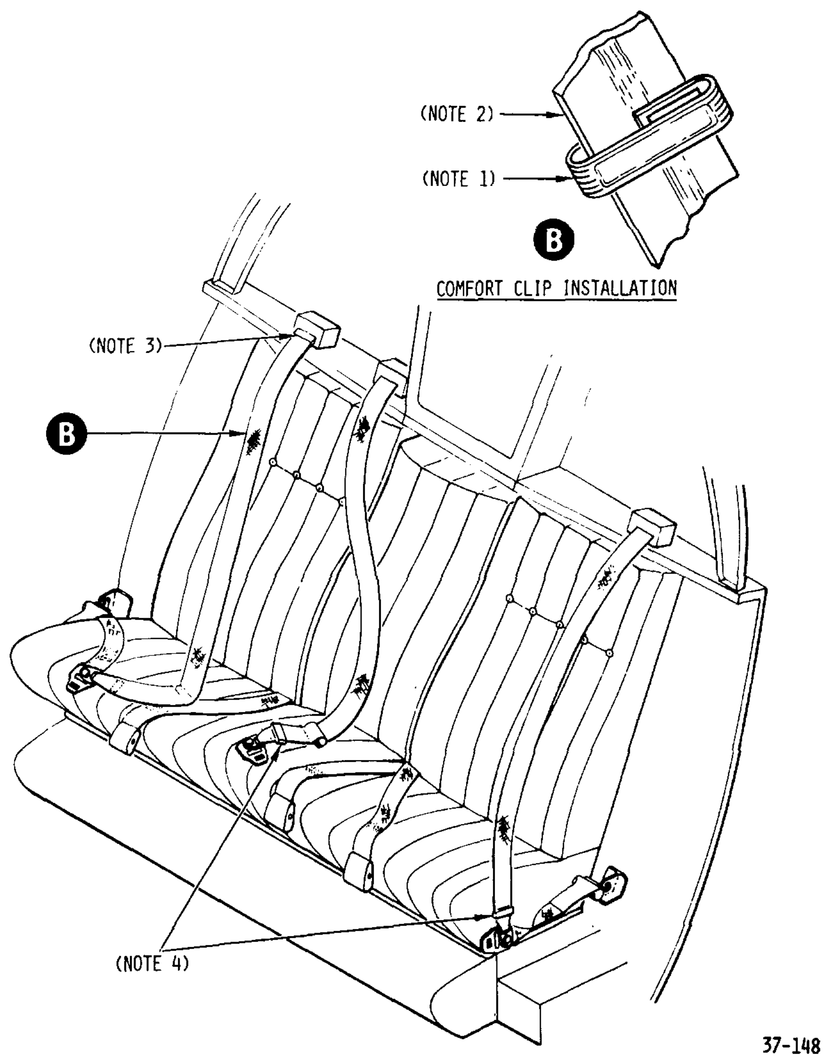


Figure 1-5. Comfort clip and decal installation - pilot area

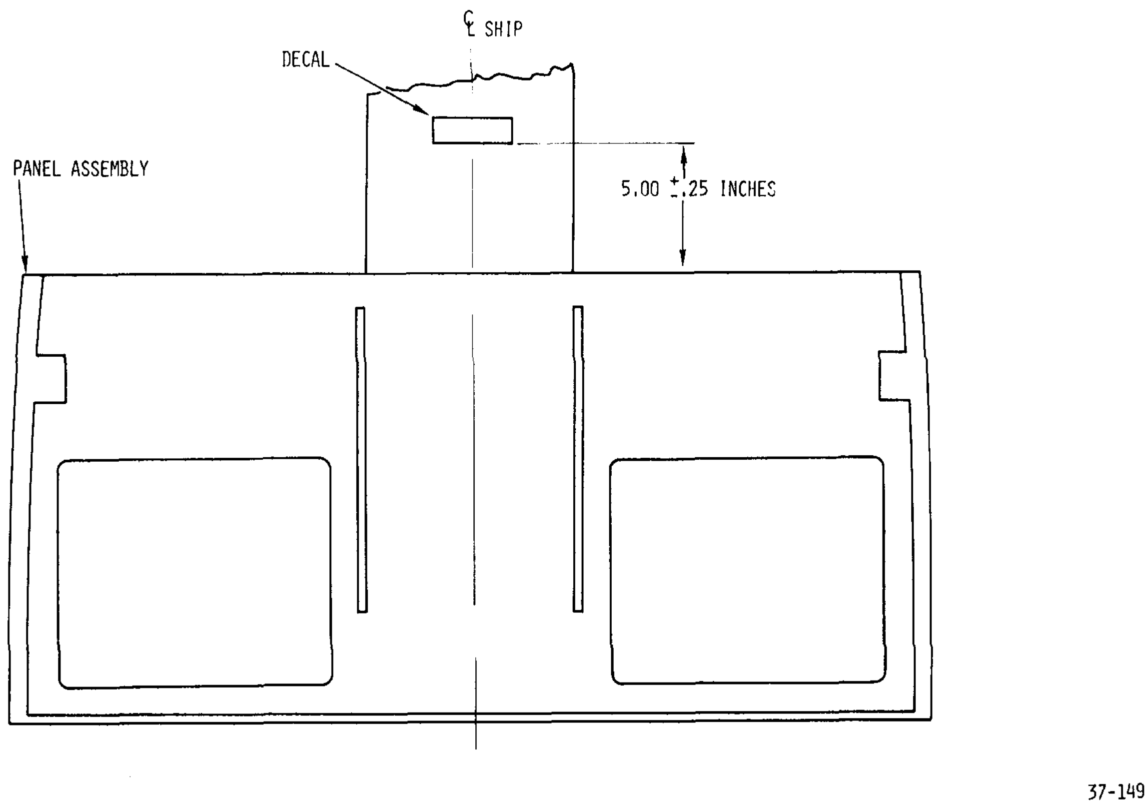


Figure 1-6. Comfort clip decal application - rear seat

1-21. TINTED CANOPY WINDSHIELD AND WINDOWS.

1-22. GENERAL. The tinted glass canopy windshield and window installation kit provides grey cast acrylic panels for both right and left front and rear doors and both upper and lower canopy windshields. The tinted glass installation reduces glare and provides softer lighting in the pilot's and cargo compartments. The tinted panels are maintained, replaced and repaired as instructed in the Basic HMI for the standard configuration panels.

1-23. CLEAR CANOPY WINDSHIELD AND WINDOWS.

1-24. GENERAL. The clear glass canopy windshield and window installation kit provides clear stretched acrylic panels for both right and left front and rear doors and both upper and lower canopy windshields. The clear glass installation provides maximum sunlight illumination of the pilot's and cargo compartment. The clear panels are maintained, replaced and repaired as instructed in the Basic HMI for the standard configuration panels.

1-25. CANOPY UPPER WINDSHIELD ASSEMBLY STIFFENERS FOR DOORS-OFF FLIGHT.

1-26. GENERAL. Addition of PN 369A2405-29 and -30 stiffeners (one each) strengthens the canopy upper windshield assemblies to permit doors-off flight with forward speeds in excess of 85 knots (98 mph) indicated air speed on these models:

369HE Serial No. 0101E through 0215E
369HM Serial No. 0101M through 0204M
369HS Serial No. 0101S through 0247S; 0260S; 0261S

Refer to figure 1-9 for modification procedure. Priof to doors-off flight, ensure that removal or security of interior trim and components has been accomplished per Section II of the Rotorcraft Flight Manual.

1-27. FIRST AID KIT INSTALLATION.

1-28. GENERAL. The first aid kit installation contains a first aid kit installed on the lower right front face of the seat structure in the pilot's

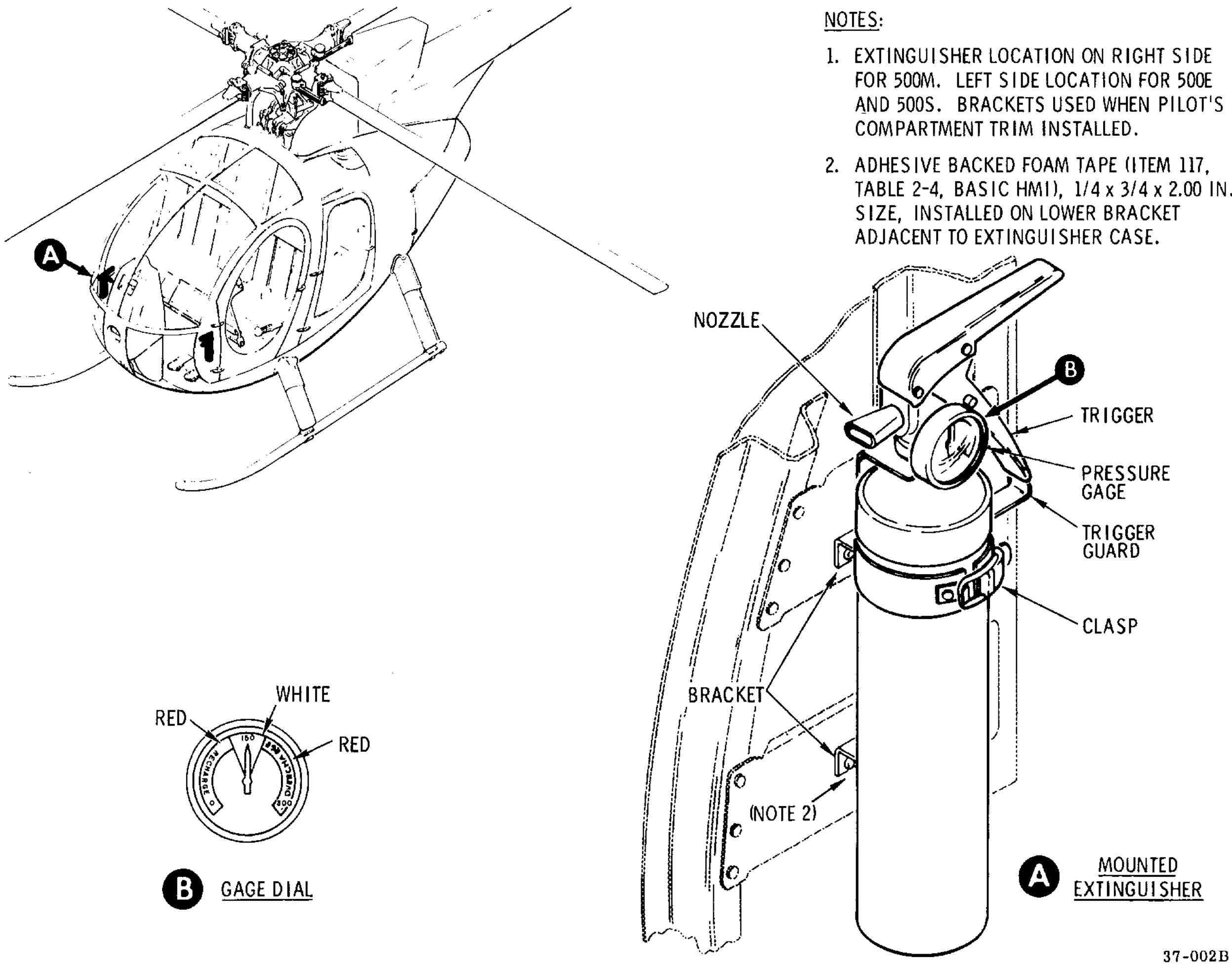


Figure 1-7. Fire extinguisher installation

compartment. The kit meets requirements of FAA Specification 121, Appendix A and consists of a rectangular polypropylene case containing first aid items for one to five persons. On a current installation, two strips of velcro tape secure the case to the seat structure. On an early installation, two screws and a single release fastener are used.

1-29. REMOVAL OF FIRST AID KIT. (See fig. 1-10.) For a current installation, removal of the first aid kit is accomplished by pulling the first aid case forward, straight away from the seat structure. For an early installation, remove by pulling the bottom of the first aid case slightly forward and lifting the case upward, removing the handle mounting holes from attaching screws on the front face of the pilot's seat structure.

1-30. INSTALLATION OF FIRST AID KIT. (See fig. 1-10.) For a current installation, install the first aid case by mating velcro hook fasteners and pressing in place on seat structure. For an early configuration, install by placing the case handle mounting holes over the two attachment screws on the front face of the pilot's seat structure and pressing the case against the seat structure.

1-31. PASSENGER STEPS.

1-32. GENERAL. Two steel passenger steps (fig. 1-11), easily installed and removed at the helicopter side jacking fittings, make entering or leaving the cargo/passenger compartment more convenient. Each step assembly has a step plate attached to a tubing arm with a step support pin, and is rated for 340 pounds. An attached locking pin secures the support pin in the jacking fitting when the step is installed. Passenger steps may be stowed in the cargo/passenger compartment when not in use.

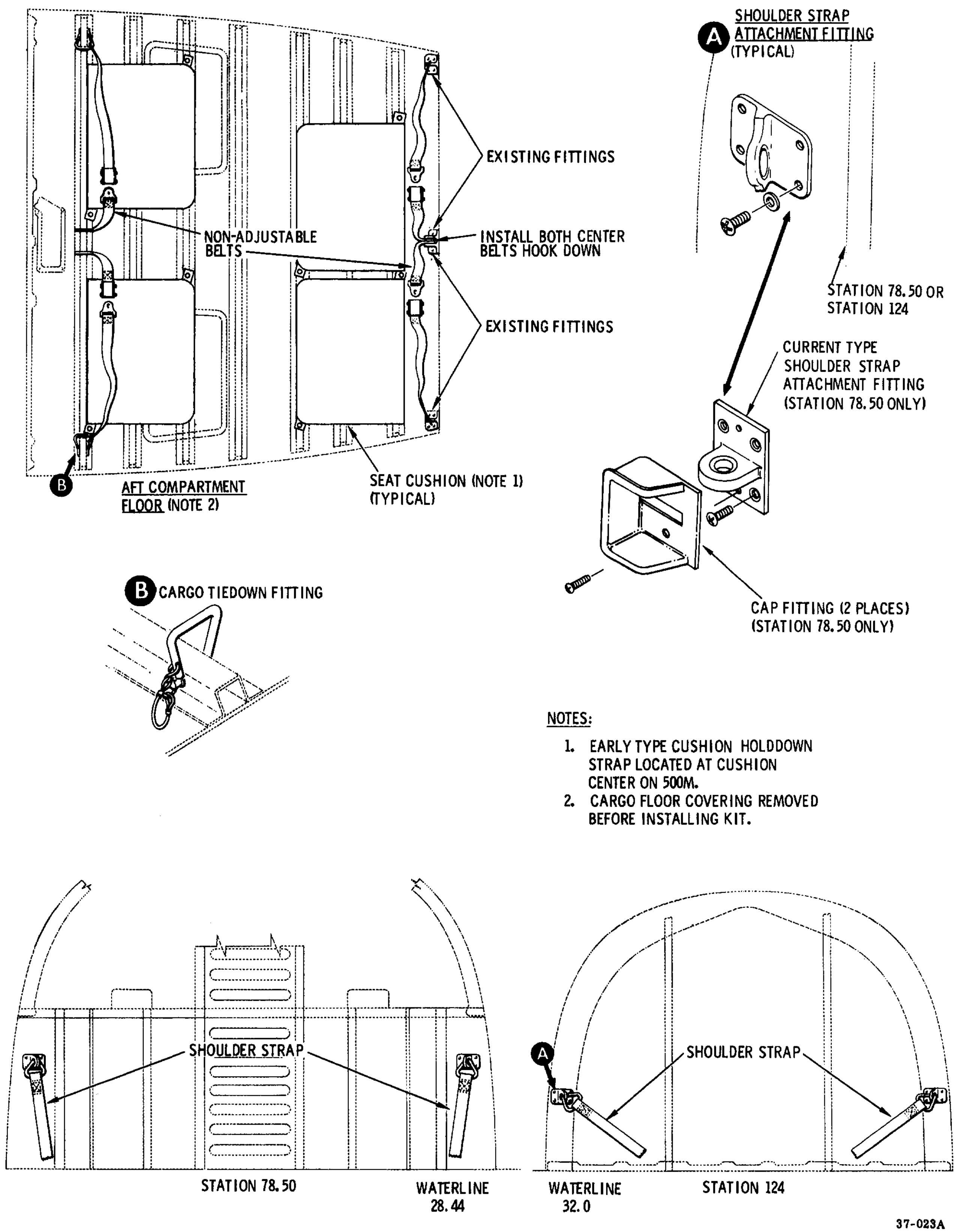
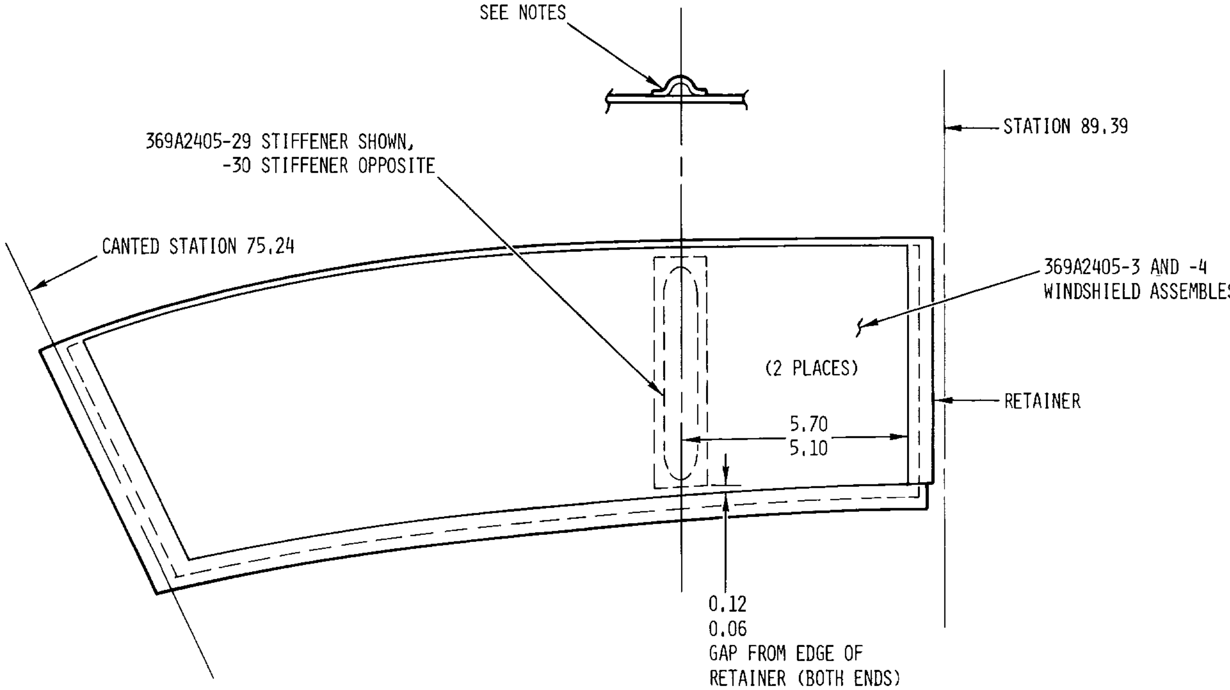


Figure 1-8. Seating and belts for four on the floor



NOTES:

1. THOROUGHLY CLEAN FAYING SURFACES OF 369A2405-29 AND -30 STIFFENERS AND INBOARD AREA OF UPPER WINDSHIELD ASSEMBLIES; RUB LIGHTLY WITH CLEAN FLANNEL CLOTH OR EQUIVALENT DAMPENED WITH ALIPHATIC NAPTHA TO REMOVE ALL DIRT, GREASE, ETC.
2. MASK WINDSHIELD AREA ADJACENT TO FAYING SURFACES WITH MASKING TAPE. APPLY MASKING TAPE TO WITHIN 0.125 INCH OF FAYING SURFACE.
3. APPLY CEMENT AT ONE OR BOTH SURFACES TO BE JOINED. IMMEDIATELY ASSEMBLE STIFFENERS TO WINDSHIELD WITH CONTACT PRESSURE AT DIMENSIONS SHOWN
4. APPLY LIGHT PRESSURE ON STIFFENERS TO PRESS OUT ANY AIR BUBBLES. REMOVE ANY EXCESS CEMENT BY SCRAPING IT ONTO MASKING TAPE, THEN REMOVING TAPE.
5. SECURE STIFFENERS TO WINDSHIELD WITH MASKING TAPE. CURE FOR 25 HOURS. REMOVE MASKING TAPE.
6. CHECK AREA FOR DISCREPANCIES.

37-155

Figure 1-9. Addition of stiffeners to canopy windshield

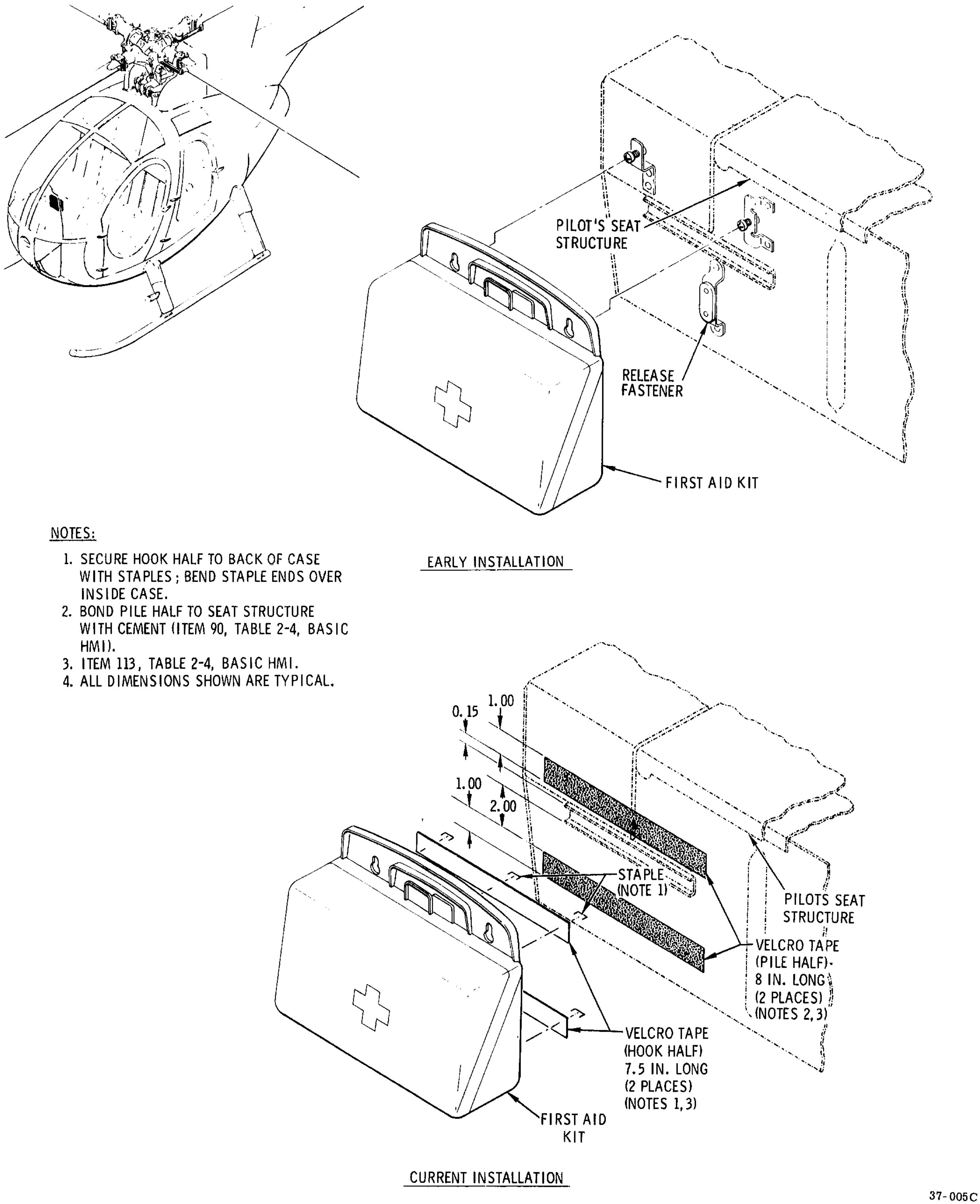


Figure 1-10. First aid kit installation

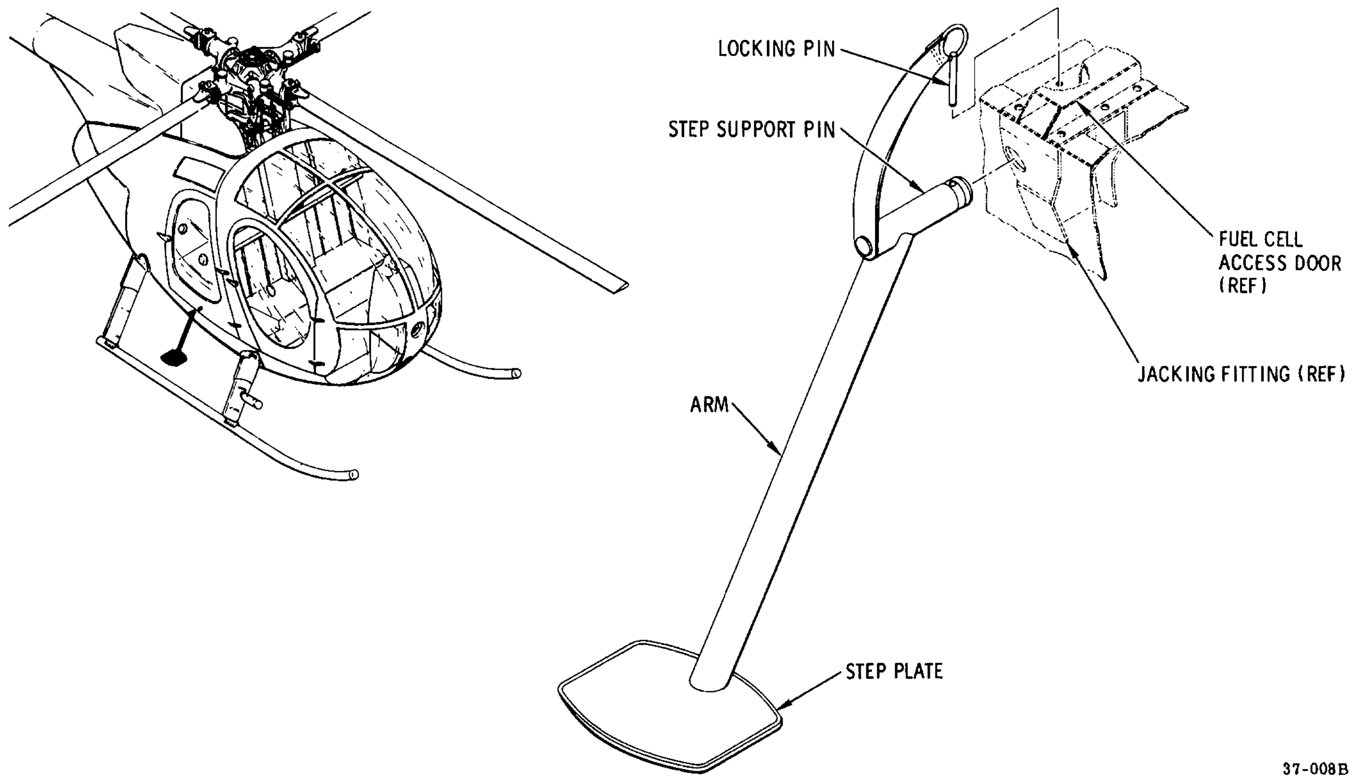


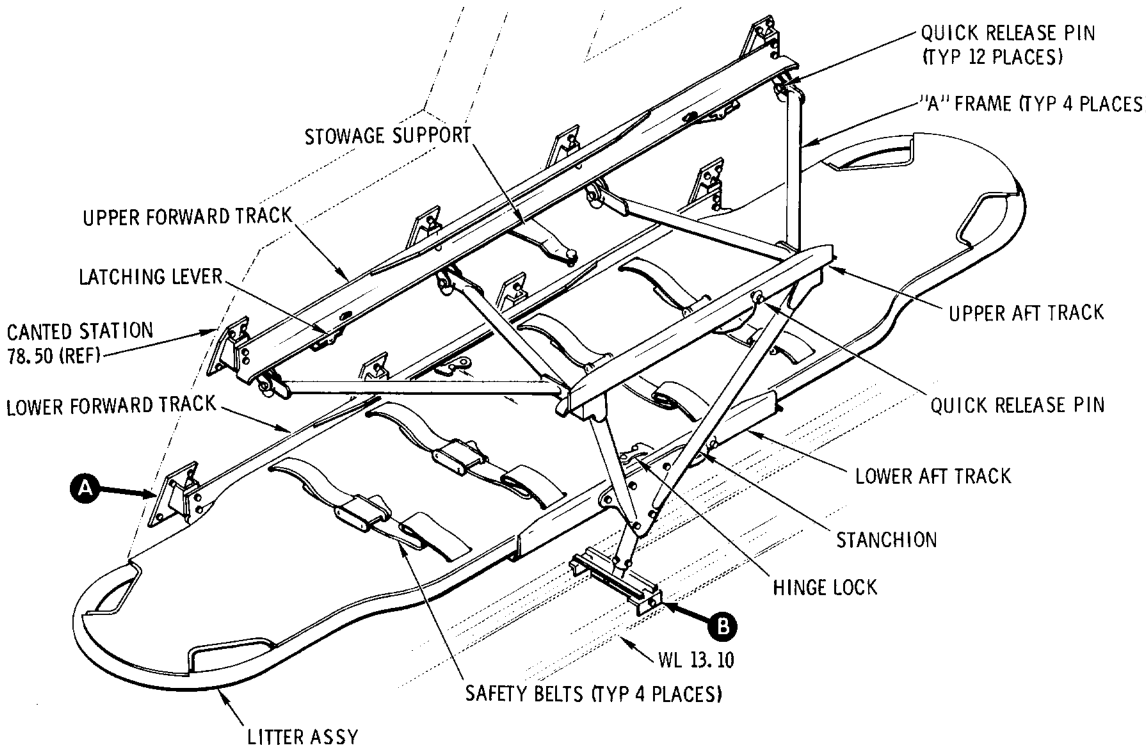
Figure 1-11. Passenger step

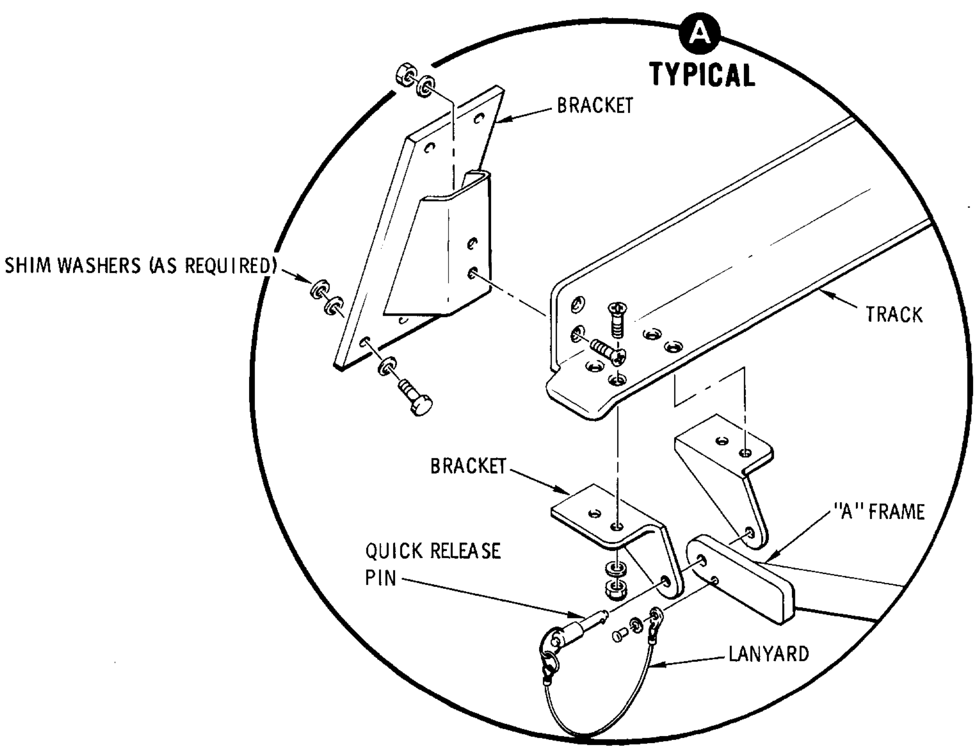
1-33. LITTER INSTALLATION.

1-34. GENERAL. The litter installation (fig. 1-12) consists of two litters mounted on an aluminum alloy framework in the passenger/cargo compartment and optional equipment including special litter doors, a door hold-open retainer (bar) equipment and four on the floor seating. Litter doors (para 1-38) may be equipped with flat or bubble windows (para 1-41) that permit closing doors with litters installed. Door hold-open bar equipment retains cargo doors at the open position when litters are installed and bubble windows are not installed on doors. Installations may contain various combinations of components, litters only, litter structural attachment hard points only, doors only, and with or without bubble windows, four on the floor seating and door hold-open bar. (For information on four on the floor seating, refer to para 1-18. The door hold-open bar is identical to the hoist cargo door bar described in Group 10.) Dual extruded aluminum alloy channels (tracks) engage and support each litter assembly. The forward tracks are attached to the aft side of the station 78.50 bulkhead and the aft tracks are supported by the tubular framework. "A" frame type members attached with quick-release pins form a supporting box between the forward and aft tracks. Teflon runners attached to the tracks allow each litter to slide on the track until two automatic latching levers on each forward track snap into place. A quick-release pin locks each litter on the aft tracks. The litters may be removed from either side of the compartment by releasing the nearest latching lever and the quick-release pin. When the litters are removed the support frame may be folded and stowed against the station 78.50 bulkhead by releasing a floor latch on the framework stanchion leg and swinging the assembly upward to catch a stowage support mounted on the forward track. The litter support framework, except for the upper and lower forward tracks, is removed from the helicopter by pulling the eight quick-release pins at the "A" frame-to-forward track pivot points. The litters are constructed of sheet aluminum tack-welded to aluminum tubing. The litters are hinged at the center for folding and are secured in the open position with hinge locks. Four safety belts are attached to each litter assembly. Litter bubble doors (para 1-38) are used when the litters are installed.

1-35. INSPECTION OF LITTER INSTALLATION.

a. Inspect litters and supporting framework for cracks, corrosion, deformation and other visible damage.





37-080-1

Figure 1-12. Litter installation (sheet 1 of 2)

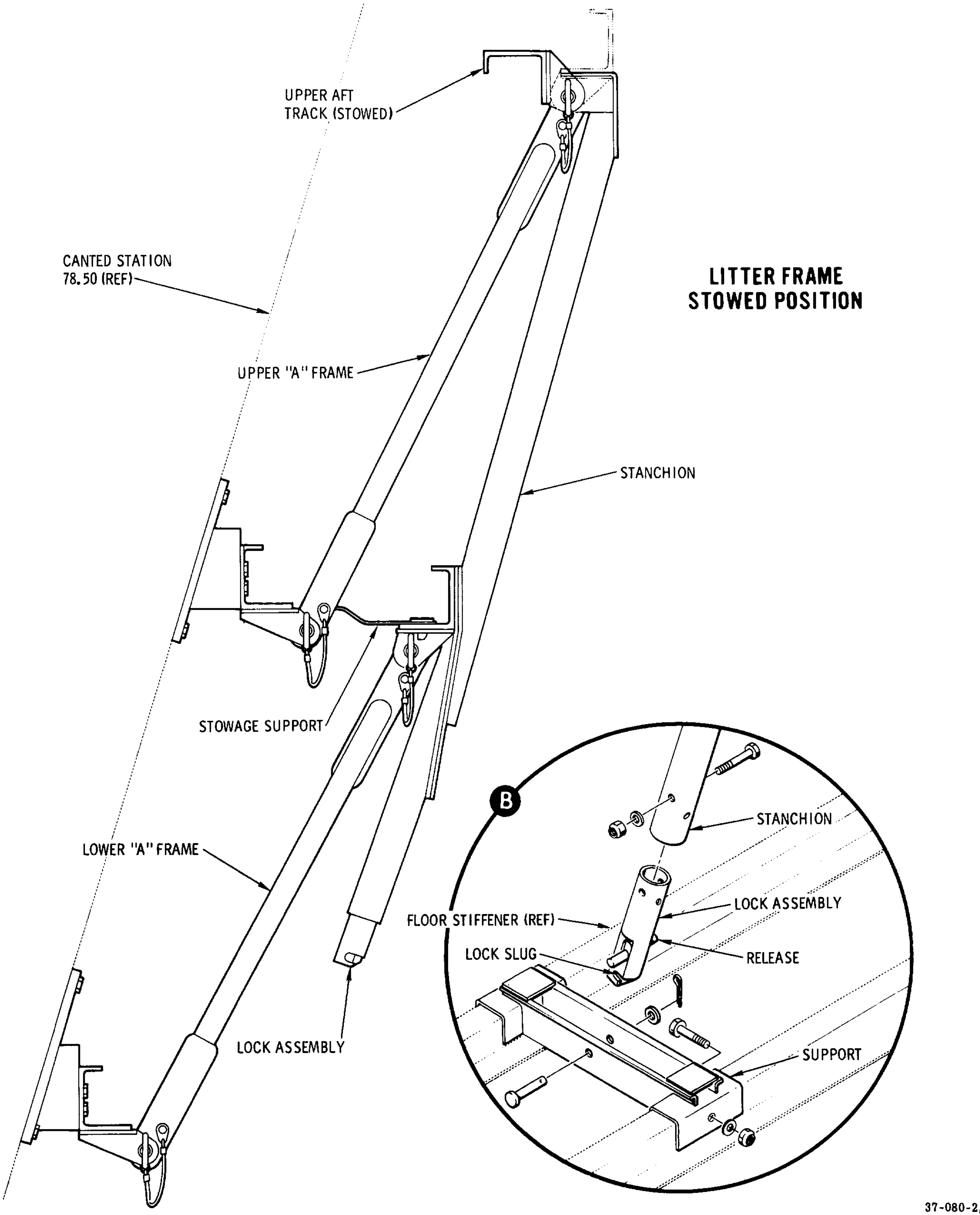


Figure 1-12. Litter installation (sheet 2 of 2)

b. Inspect pivot points and attaching hardware for wear and positive locking.

c. Inspect litter safety belts for worn or frayed condition and loose stitching. If any doubt exists as to belt strength, pull test with 1500 pound test load as specified in Section 4 of the Basic HMI. Replace unserviceable belts.

NOTE: Before litters are installed, the ash tray must be removed from the cargo compartment forward bulkhead on helicopters so equipped.

1-36. REPLACEMENT OF LITTER INSTALLATION COMPONENTS. See fig. 1-12 and remove or install sufficient attaching hardware for individual component replacement or repair.

1-37. REPAIR OF LITTERS AND SUPPORT FRAMEWORK. Perform tubular weld repairs and repair damaged sheet metal according to instructions in FAA AC 43.13-1, Aircraft Inspection and Repair.

1-38. LITTER DOOR INSTALLATION.

1-39. GENERAL. The litter door installation (fig. 1-13) consists of a door frame complete with hinges, door latching mechanism and two alternate window configurations. Either a bubble window, used with litters installed, or a standard window panel may be installed on the door frame with quick-release Camloc fasteners.

1-40. LITTER DOOR FRAME. The litter door frame (fig. 1-13) consists of a complete door frame assembly without window panel installed. Door frame types with either a manual (early configuration) or automatic (current configuration) latching mechanism may be installed as applicable. Camloc fastener receptacles are also provided in 15 locations that match the fasteners on either a bubble window or standard window panel. Refer to the Basic HMI for inspection and maintenance of the applicable door frame, hinges and automatic latching mechanism. See fig. 1-13 for replacement of Camloc fastener receptacles.

1-41. LITTER DOOR BUBBLE WINDOW. The removable bubble window assembly (fig. 1-13) is installed on the litter door frame when the helicopter is equipped with litters. The clear stretched acrylic bubble is fastened to the outside of the door frame with 15 Camloc fasteners. Two plastic snap vents provide for intake or exhaust of ventilating air. Clear acrylic ribs and a Geon plastic airfoil-shaped deflector control airflow over the window surface. The ribs are bonded to the window bubble and the air deflector is attached with screws and barrel nuts to every other rib. Refer to FAA AC 43.13-1 for repair of plastic and to the Basic HMI for door window maintenance. Replace Camloc fasteners and deflector as shown in fig. 1-13.

1-42. LITTER DOOR STANDARD WINDOW. The removable standard window assembly (fig. 1-13) is used with the litter door frame when the litter door bubble is not installed. The clear acrylic window is bonded in extruded plastic retainers. The window is fastened through the edge retainers to the outside of the door frame with 15 Camloc fasteners. Two plastic snap vents provide for intake or exhaust of ventilating air. Refer to FAA AC 43.13-1 for repair of plastics and to the Basic HMI for inspection and maintenance procedures. Replace Camloc fasteners as shown in fig. 1-13.

1-43. LUGGAGE PODS.

1-44. GENERAL. (See fig. 1-14.) The luggage pods are constructed of a semi-rigid plastic material bonded and riveted to a light metal framework. The pods are attached to each side of the fuselage under the cargo/passenger compartment doors. A hinged, pull-down step is incorporated in the side of each pod for use by passengers entering or exiting the rear compartment. The pod doors, in the top of each pod, open outward and are secured by two key-lock type latches. Maximum loading is 60 pounds per square foot on the inside supporting structure of the pods.

NOTE: When luggage pods are used in conjunction with night lighting, an additional anticollision light is required. Refer to Option Group 4 for information.

1-45. LUGGAGE POD INSTALLATION. (See fig. 1-14.)

a. Open the cargo door. Hold pod in position and insert pod support pin into the jacking fitting.

b. Insert locking pin through jacking fitting and pod support pin.

c. Install bolt and washers in pod forward support fitting and fuselage attach point. Note the correct position and size of washers as shown on fig. 1-14.

d. Adjust rod length as required and then install washer and bolt to secure end to the belly attach point. Note that washers are not required when pods are installed in conjunction with cargo hook.

e. Tighten the rod until pod is pulled in snugly against the fuselage (12 ±2 inch-pounds torque).

f. Tighten and safety wire the rod end jam nuts.

g. Inspect the installation for completeness and safety.

1-46. LUGGAGE POD REMOVAL. Remove the luggage pods in essentially the reverse of installation procedure (para 1-45 above).

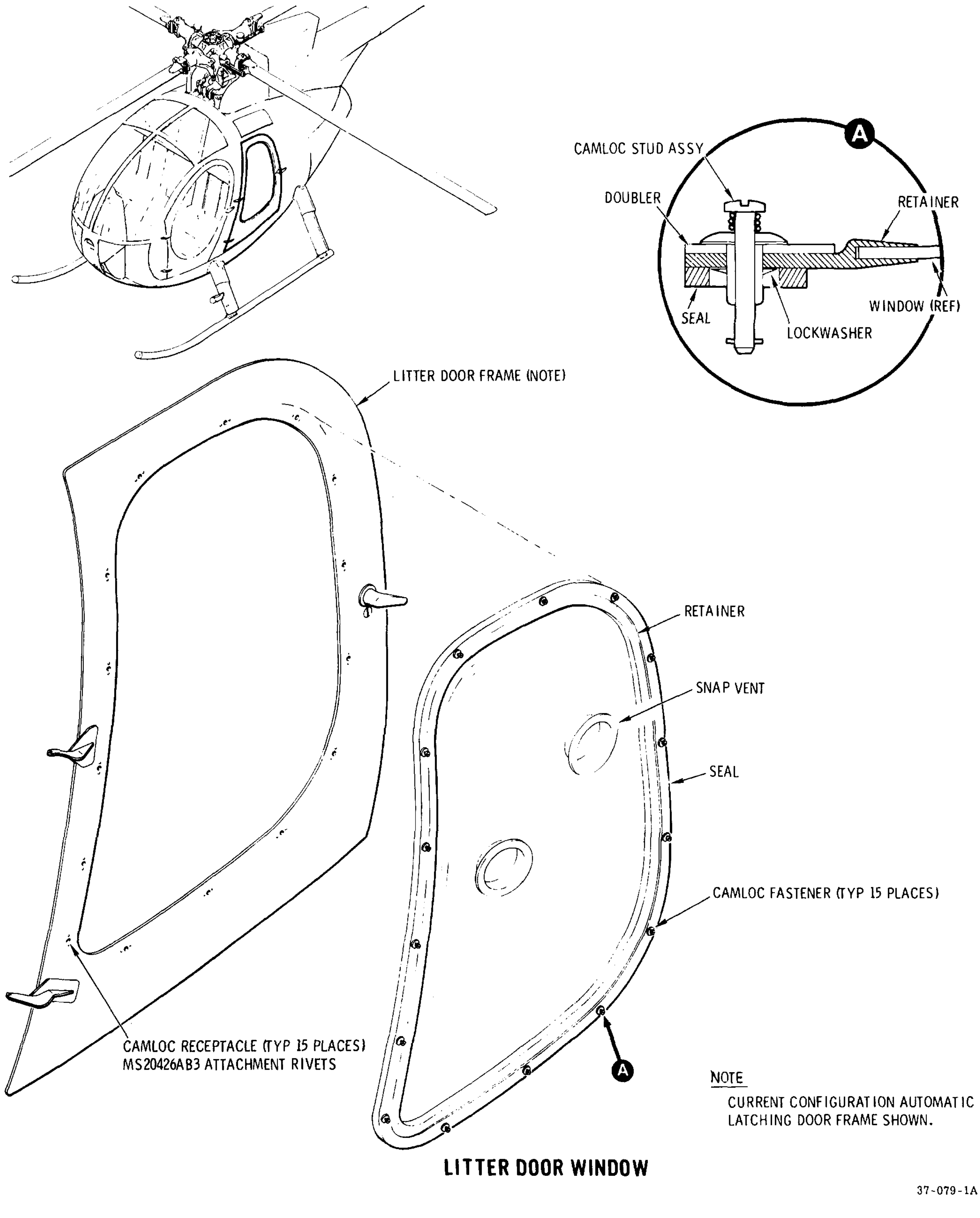


Figure 1-13. Litter door installation (sheet 1 of 2)

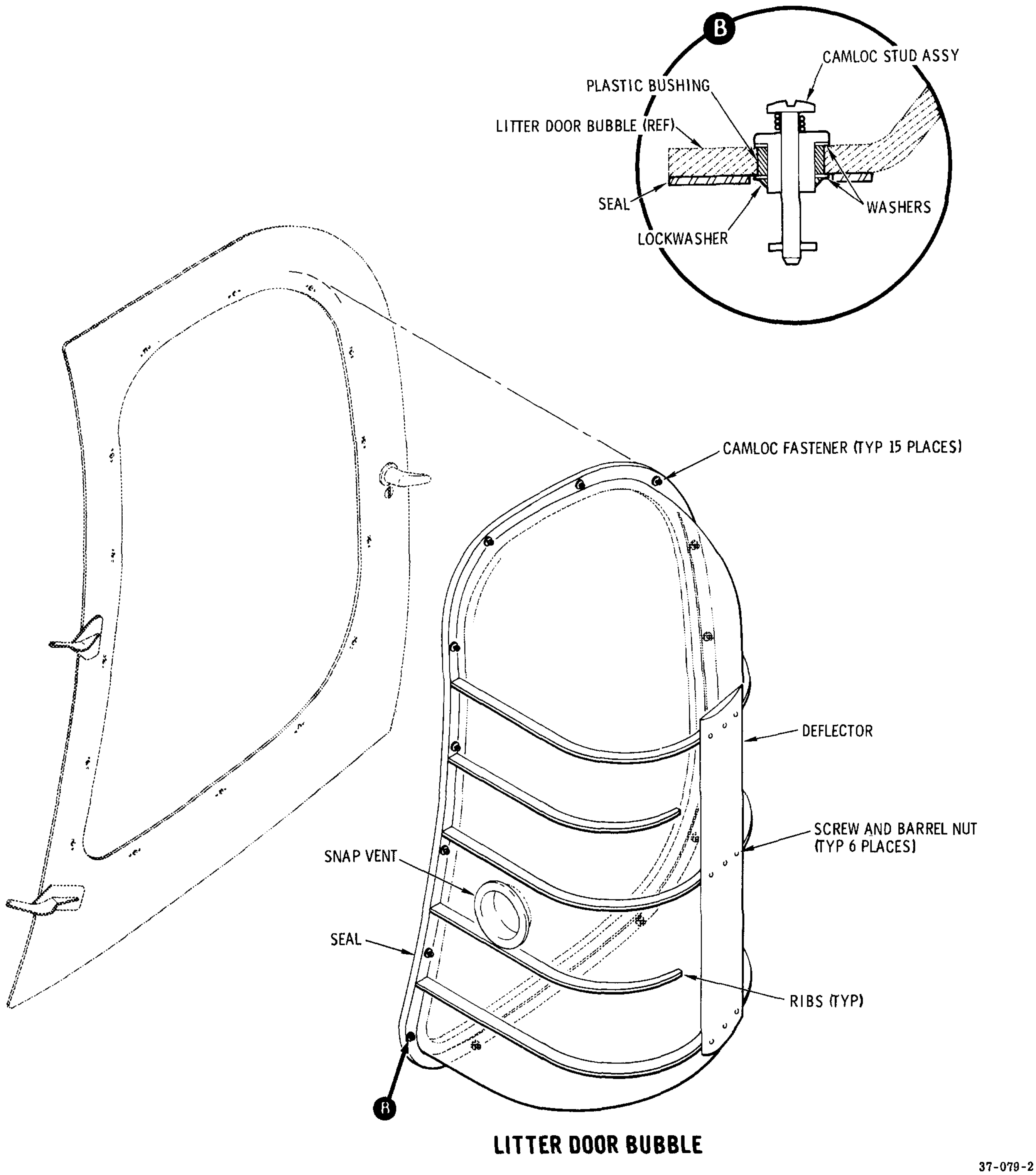
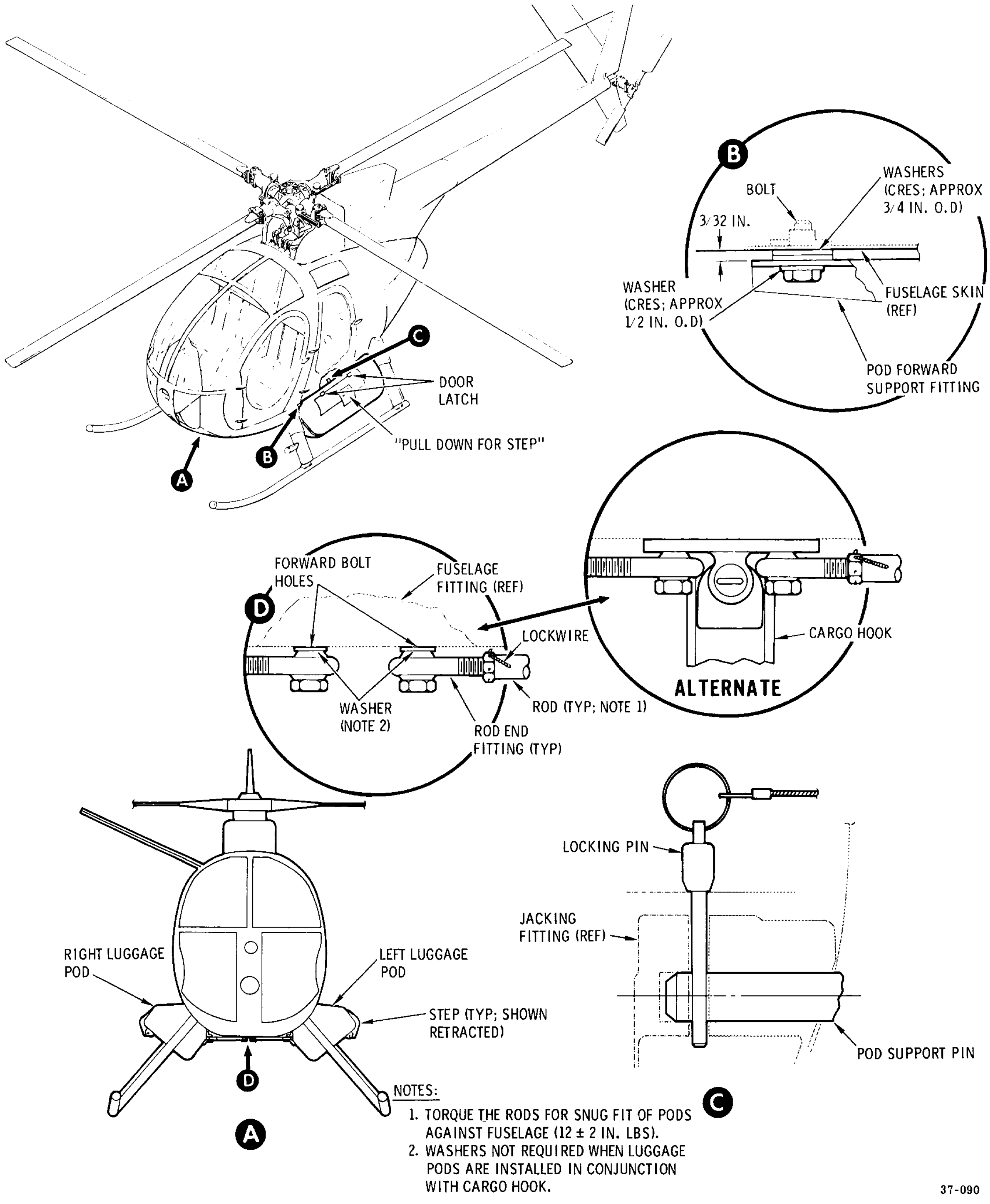


Figure 1-13. Litter door installation (sheet 2 of 2)



NOTES:

1. TORQUE THE RODS FOR SNUG FIT OF PODS AGAINST FUSELAGE (12 ± 2 IN. LBS).
2. WASHERS NOT REQUIRED WHEN LUGGAGE PODS ARE INSTALLED IN CONJUNCTION WITH CARGO HOOK.

Figure 1-14. Luggage pod installation

1-47. LUGGAGE POD REPAIRS.

a. Structure. The metal components of the pod structure can be repaired using standard repair methods according to Appx D. Metal parts are riveted and bonded to the exterior plastic material using adhesive (item 19, table 2-4). The exterior plastic material (Kydex by Rohm and Haas Co.) can be repaired by bonding on patches of Kydex with adhesive (item 19).

NOTE: When riveting the plastic material, use a washer under any shop formed rivet head that will be in contact with the plastic.

b. Step. The pod step will normally not require repair other than tightening the step hinges or replacing the spring washers so that friction will hold the step in the retracted position.

NOTE: When replacing spring washers in the step hinge, be sure spring washers are placed between flat washers for proper compression and to prevent wear of hinge or step brackets.

c. Key Latches. Repair of key latches will usually be found impractical. Replace a faulty latch using standard shop practices.

1-48. CONVERSION, MODEL 369HS TO MODEL 369HE.

1-49. GENERAL. The standard model helicopter may be converted to the executive model by making the following changes. Replace seats and carpets in both the pilot's and passenger compartments. Change exterior paint (colors optional). Install passenger compartment steps.

OPTION GROUP 2
INSTRUMENTS AND ASSOCIATED EQUIPMENT

2-1. INSTRUMENTS AND ASSOCIATED EQUIPMENT.

2-2. GENERAL. Various optional instruments and associated equipment may be used on the helicopter. Figure 2-1 shows instruments and other associated equipment that may be installed on instrument panel type A. See figure 2-2 for differences when optional equipment is installed in instrument panel type B. The following paragraphs provide maintenance information for available instrument equipment options.

2-3. HUMPHREY AH08-0105-11 ARTIFICIAL HORIZON (ATTITUDE) GYRO INDICATOR INSTALLATION.

2-4. GENERAL. The Humphrey AH08-0105-11 artificial horizon gyro indicator(fig. 2-1 and 2-2), also known as an attitude gyro and slip indicator, is an all-electric gyro indicator with a pictorial horizon and rotating dial that continuously present helicopter pitch and roll reference established by an internal gyro. The indicator is mounted upper-center in the instrument panel (fig. 2-1). The instrument provides attitude indication by means of a horizon bar, a turn index mark, and a reference airplane model. The attitude indication is the result of internal gyro reactance to a corresponding pitch and roll attitude of the helicopter. Slip indication is provided by means of a conventional ball and tube in the lower front portion of the instrument face. The instrument requires and uses 28 Vdc electrical power from the GYROS circuit breaker and operates any time the circuit breaker is depressed and the helicopter electrical system is energized. For an installation with a shielded wiring harness, an electrical noise filter is also used for the +28 Vdc power input when King KR 85 ADF equipment (Group 7) is installed. A striped red and white flag appears in the face to provide a warning when the instrument is not operating. A knob at the lower center of the instrument provides a means of aligning the airplane reference model with the horizon bar when the helicopter is in level flight and permits pilot selection of desired pitch attitude reference. Figure 2-3 provides a wiring diagram for the installation and an internal schematic for the indicator.

NOTE: Optional noise filter installation modification M50039 incorporates a noise filter and a shielded wiring harness on an installation without these components, to eliminate possibility of electrical interference with KR 85 ADF equipment.

2-5. MAINTENANCE OF HUMPHREY AH08-0105-11 ARTIFICIAL HORIZON GYRO INDICATOR. Maintain the indicator as outlined for instruments in Section 17 of the Basic HMI, except replace the indicator according to paragraph 2-6 herein.

2-6. REPLACEMENT OF HUMPHREY AH08-0105-11 ARTIFICIAL HORIZON GYRO INDICATOR. (See fig. 2-4.)

a. Check that all electrical power is OFF.

b. Remove screws from the front of the instrument.

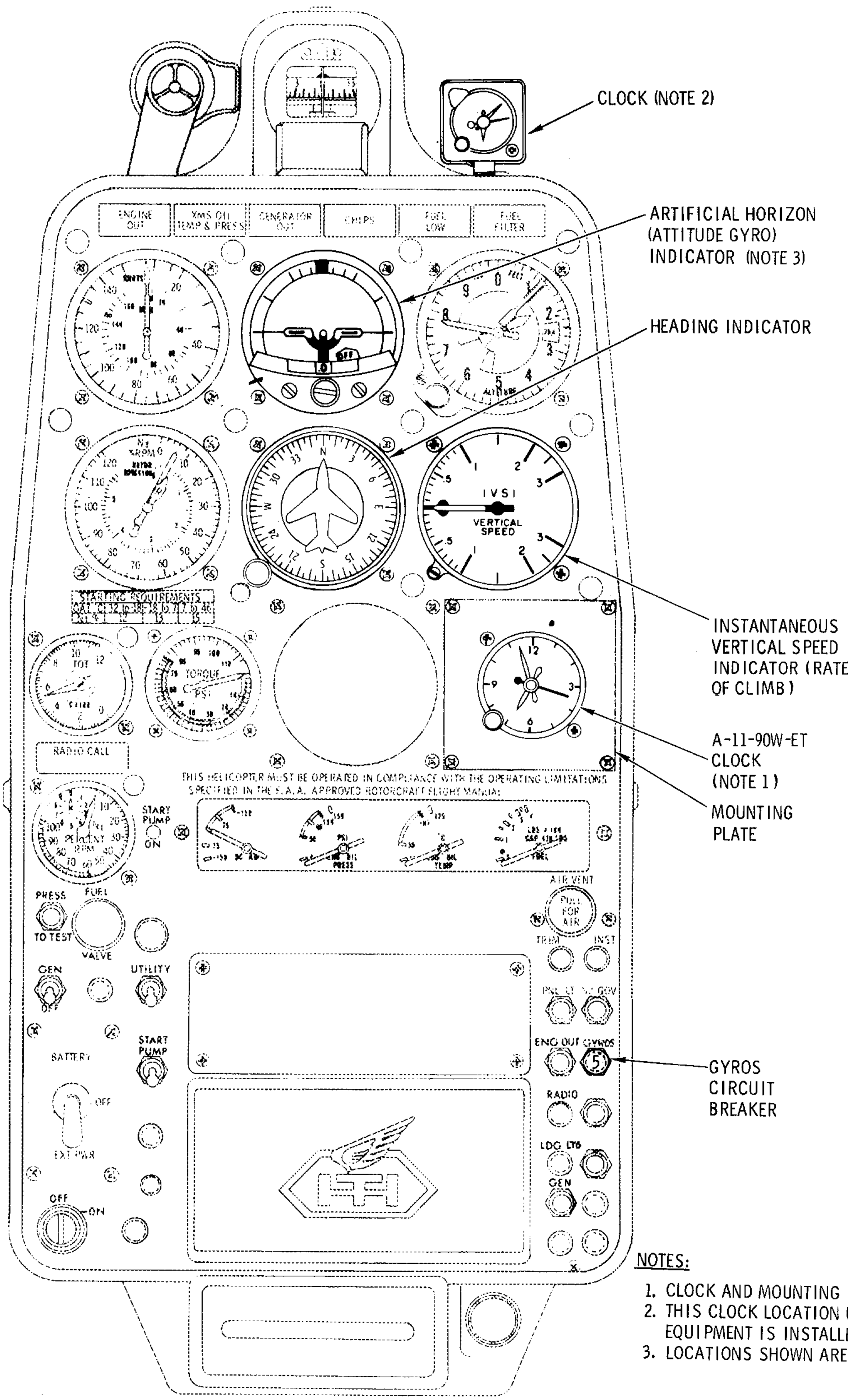
c. Disconnect electrical plug at the back of the instrument. Remove instrument clamp. Remove instrument.

NOTE: Install rubber strips under clamp as required to obtain a firm fit when screws are tightened.

e. Install replacement instrument in the reverse order of removal.

2-7. HEADING INDICATING SYSTEM.

2-8. GENERAL. The directional (heading) gyro indicating system (fig. 2-5) presents accurate helicopter heading information referenced to a free directional gyro. Either a single or dual unit heading indicating system may be used. The single unit system consists of an Aviation Instrument Manufacturing Corp. AIM 200 DC(28) Directional Gyro, electrical wire harness, a GYRO circuit breaker and associated electrical and mounting components and hardware. The dual unit system consists of a Humphrey DG04-0111-1 Directional Gyro, Humphrey GR06-0104-1 Gyro Repeater (Heading Indicator), two electrical wire harnesses, a GYRO circuit breaker and associated electrical and mounting components and hardware. The AIM 200 DC(28) Directional Gyro of the single unit system,

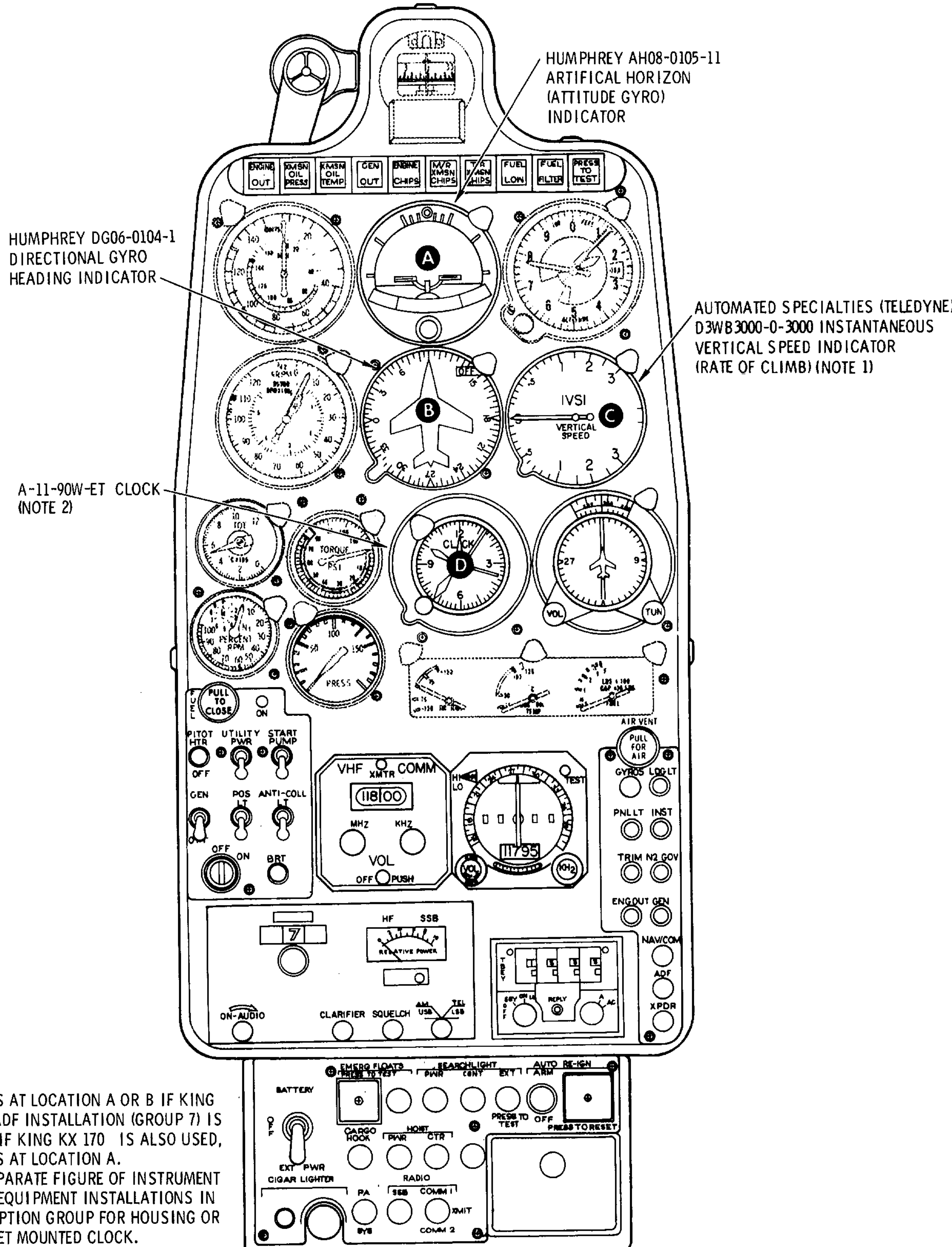


NOTES:

1. CLOCK AND MOUNTING PLATE ARE TYPICAL.
2. THIS CLOCK LOCATION USED WHEN CERTAIN AVIONICS EQUIPMENT IS INSTALLED. (REFER TO OPTION GROUP 7.)
3. LOCATIONS SHOWN ARE TYPICAL.

37-003A

Figure 2-1. Instrument equipment options - instrument panel type A

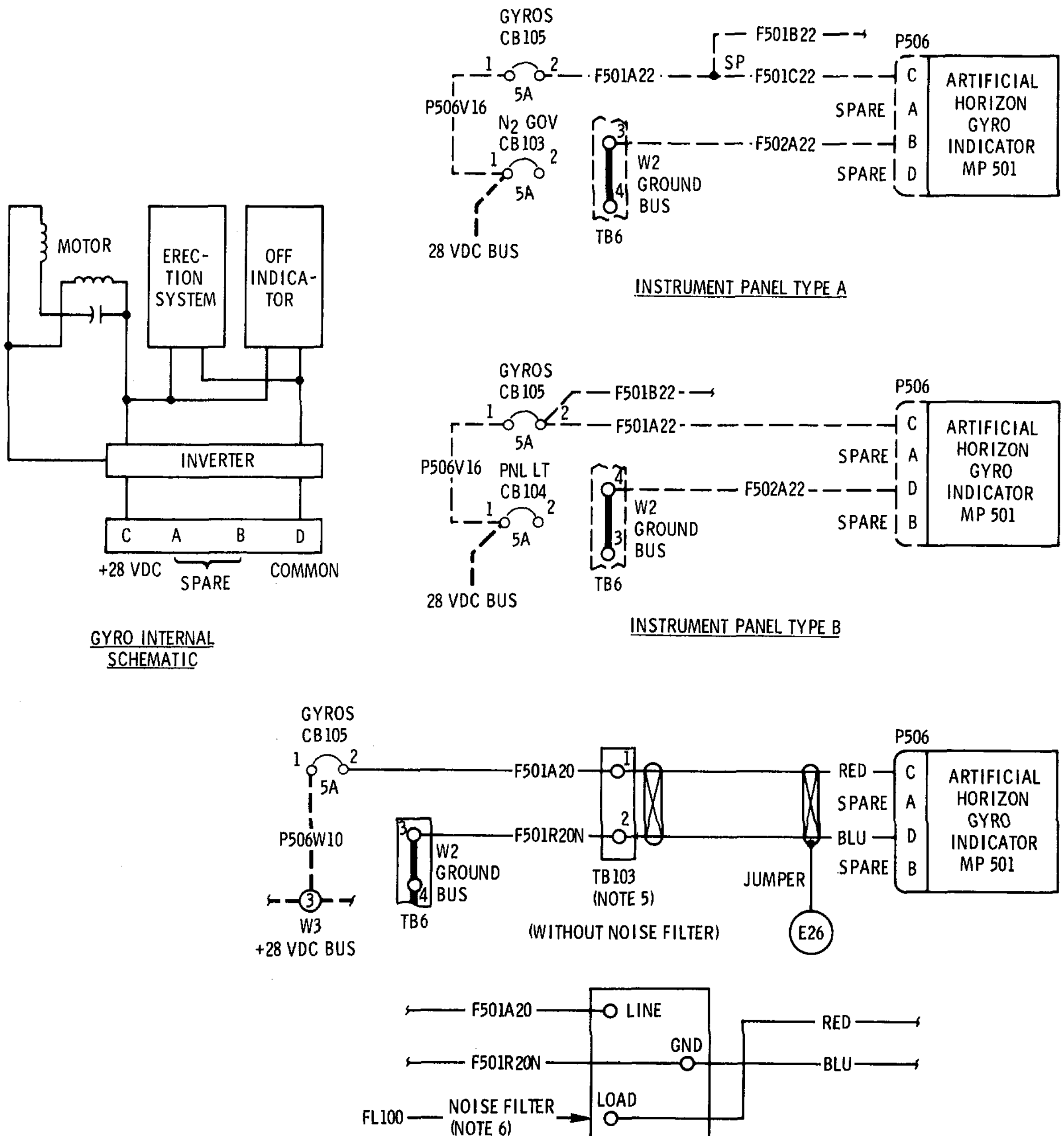


NOTES:

1. IVSI IS AT LOCATION A OR B IF KING KR 85 ADF INSTALLATION (GROUP 7) IS USED. IF KING KX 170 IS ALSO USED, IVSI IS AT LOCATION A.
2. SEE SEPARATE FIGURE OF INSTRUMENT PANEL EQUIPMENT INSTALLATIONS IN THIS OPTION GROUP FOR HOUSING OR BRACKET MOUNTED CLOCK.
3. LOCATIONS SHOWN ARE TYPICAL.

37-113B

Figure 2-2. Instrument equipment options - instrument panel type B



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (----) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
4. FOR INSTALLATION WITH TB103 AND SHIELDED WIRING HARNESS.
5. ELECTRICAL NOISE FILTER IS USED INSTEAD OF TB103, IF KING KR 85 ADF EQUIPMENT IS INSTALLED.
6. CASE ELECTRICALLY BONDED TO STRUCTURE (SECTION 19, BASIC HMI).

37-076C

Figure 2-3. Humphrey AH08-0105-11 attitude gyro installation - wiring diagram

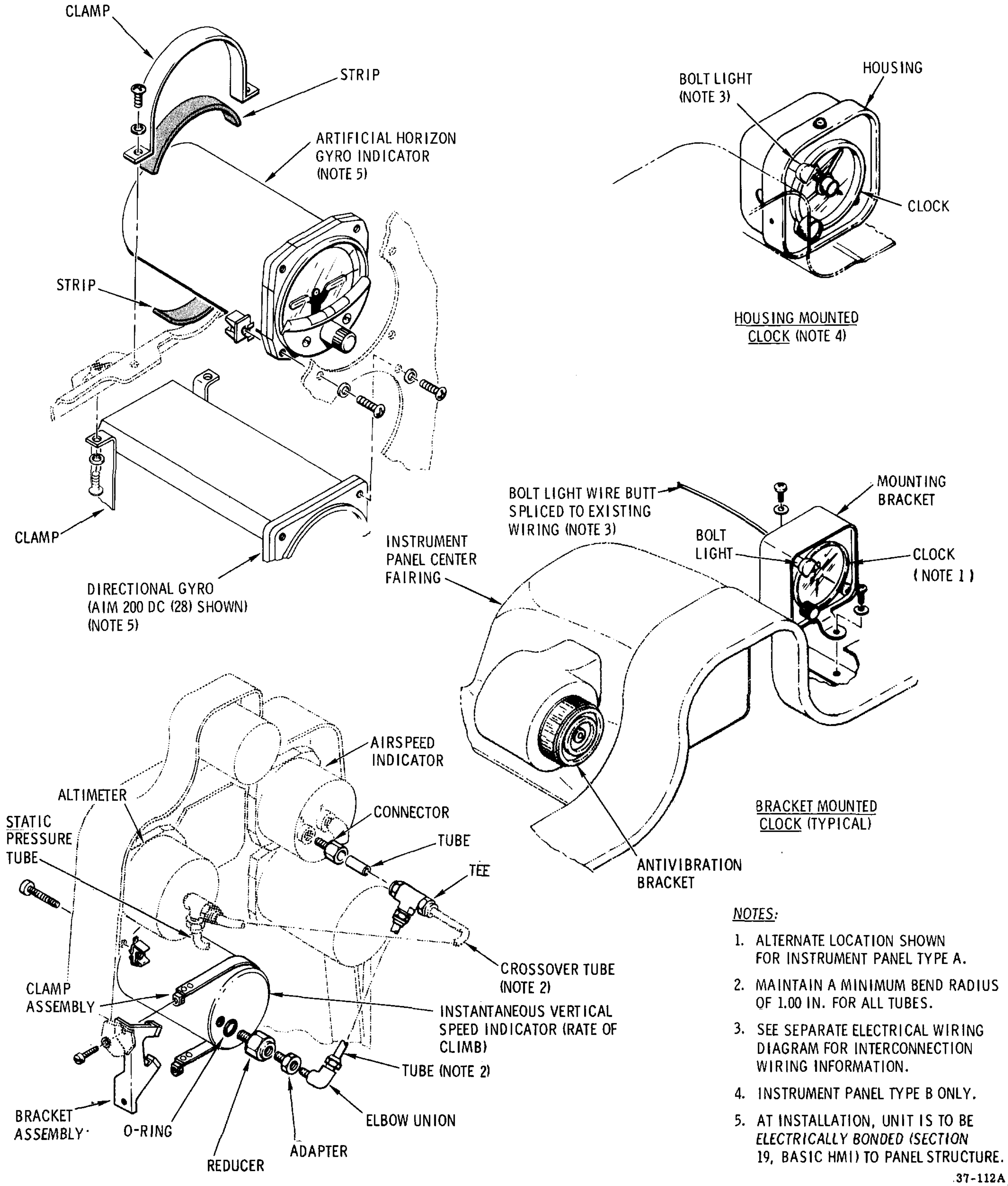


Figure 2-4. Instrument equipment in instrument panel

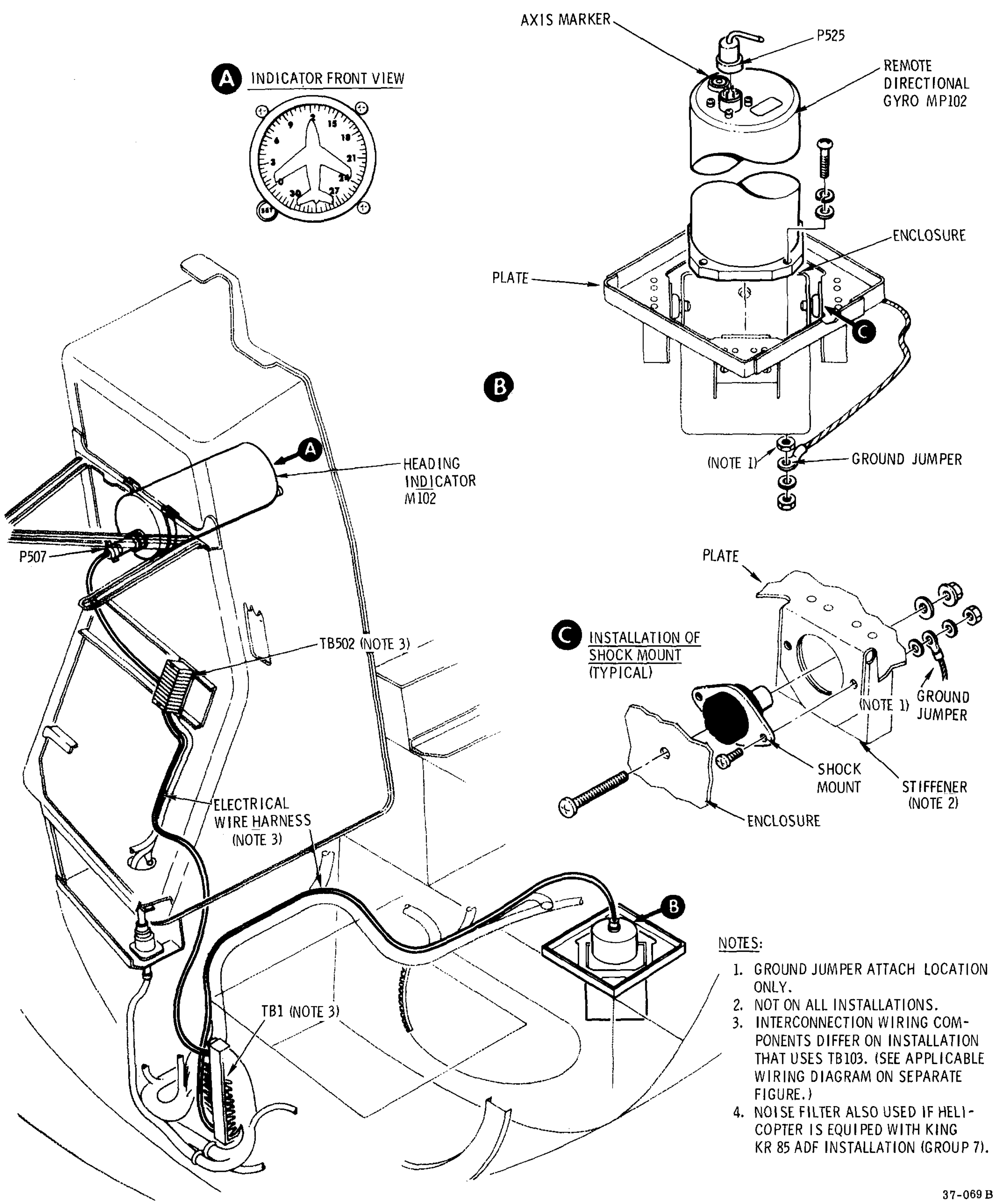


Figure 2-5. Humphrey heading indicating system

or the Humphrey GR06-0104-1 Heading Indicator of the dual unit system, is installed upper-center in the instrument panel. The GYROS circuit breaker, located on the instrument panel, provides electrical 28 Vdc power and circuit protection for the system. Wire harnesses interconnect heading indicating system components with the helicopter basic electrical system. Figure 2-6 is an electrical wiring diagram for the single unit directional gyro system. Figures 2-7 and 2-8 are wiring diagrams for dual unit systems; figure 2-8 is for a system that uses TB103 and a shielded wiring harness. For a system with a shielded wiring harness, an electrical noise filter is also used for the +28 Vdc power input when King KR 85 ADF equipment (Group 7) is installed.

NOTE: Optional noise filter installation modification M50039 incorporates a noise filter and a shielded wiring harness on an installation without these components, to eliminate possibility of electrical interference with KR 85 ADF equipment.

2-9. TROUBLESHOOTING THE HEADING INDICATING SYSTEM. Refer to table 2-1. See figure 2-7 for an interconnecting wiring diagram of the heading indicating system.

2-10. HUMPHREY GR06-0104-1 HEADING INDICATOR.

2-11. GENERAL. The dual unit system heading indicator (fig. 2-5) is a synchro repeating indicator that provides a continuous heading indication from a heading signal supplied by the directional gyro (para 2-16). A SET knob permits selection of desired heading. An OFF flag provides a visual indication when power is off. The unit contains a built-in inverter that converts 27.5 (nominal 28) Vdc to both 115 Vac, 400 Hz and 26 Vac, 400 Hz electrical power for use by the associated directional gyro. Figure 2-9 provides an internal schematic diagram for the heading indicator.

2-12. MAINTENANCE OF HUMPHREY GR06-0104-1 HEADING INDICATOR. Maintain the heading indicator as outlined for instruments in Section 17 of the basic HMI, except replace the indicator according to paragraph 2-6 herein.

2-13. AVIATION INSTRUMENT AIM 200 DC(28) DIRECTIONAL GYRO.

2-14. GENERAL. This is a single unit system with a directional gyro and heading indicator combined in one unit. The unit also contains a built-in inverter. The internal inverter converts 27.5 Vdc electrical power to ac electrical power for operation of the gyro indicator. The unit essentially provides the same indications and controls as described in paragraphs 2-11 and 2-16. Figure 2-6 provides a wiring diagram for the indicating directional gyro.

2-15. MAINTENANCE OF AIM 200 DC(28) DIRECTIONAL GYRO. Maintain the directional gyro as outlined for instruments in Section 17 of the Basic HMI, except replace the gyro according to paragraph 2-6 herein.

CAUTION: Always be sure that the gyro is completely run down (gyro internal motor rotation stopped) before moving the gyro. Handle the gyro carefully. Do not drop or jar the unit.

2-16. HUMPHREY DG04-0111-1 DIRECTIONAL GYRO.

2-17. GENERAL. The underseat-mounted remote directional gyro (fig. 2-5) of the dual unit heading indicating system establishes a free yaw (heading) reference and furnishes a heading signal for operation of the heading indicator (para 2-10). The directional gyro requires and is supplied 115 Vac, 400 Hz and 26 Vac, 400 Hz electrical power from the heading indicator. The directional gyro is shock-mounted in the left side underseat structure area. An internal schematic diagram for the directional gyro is shown in figure 2-9.

2-18. REMOVAL OF HUMPHREY DG04-0111-1 DIRECTIONAL GYRO. (See fig. 2-5.)

a. Check that all electrical power is OFF.

b. Gain access to the directional gyro through the left foot support fairing in passenger/cargo compartment (Section 2, Basic HMI).

CAUTION: Always be sure that the gyro is completely run down (gyro internal motor rotation stopped) before moving the gyro. Handle the gyro carefully. Do not drop or jar the unit.

c. Disconnect electrical wiring harness connector from top of directional gyro.

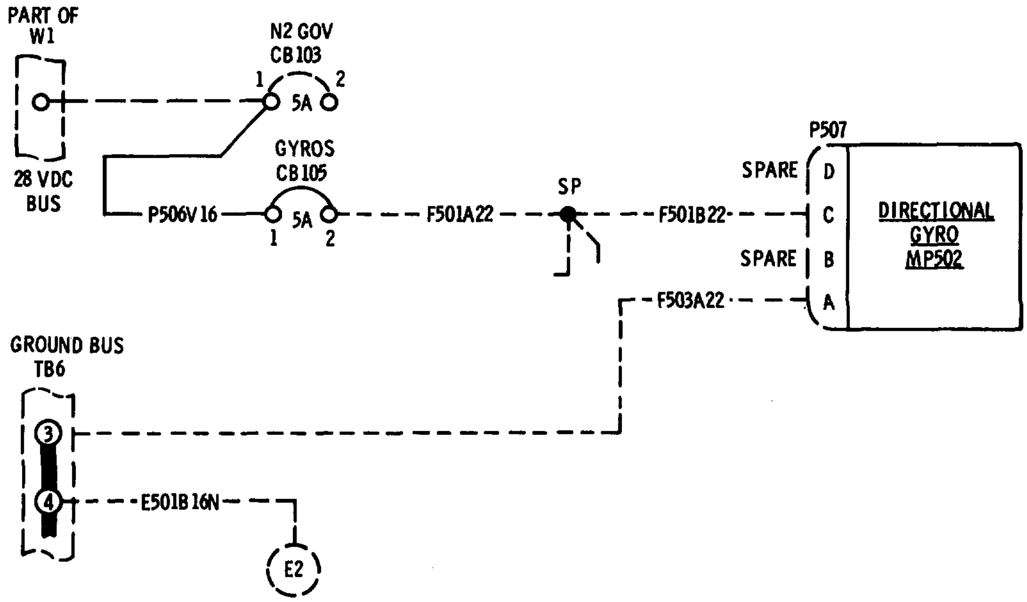
d. Observe and record axis marker orientation in regard to helicopter longitudinal and lateral axes to ensure reinstallation at same position with identical orientation.

e. Remove the four screws and washers that secure directional gyro base and bonding jumper to bottom of gyro mounting enclosure. Lift gyro clear of enclosure.

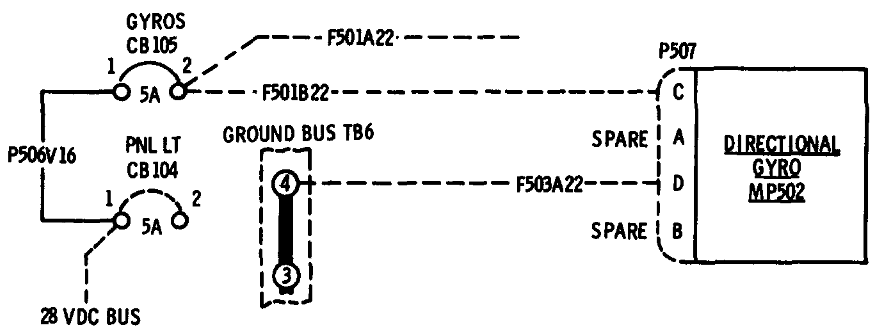
2-19. INSTALLATION OF HUMPHREY DG04-0111-1 DIRECTIONAL GYRO. (See fig. 2-5.)

a. Check that all electrical power is OFF.

b. Replace any serviceable shock-mount as shown in detail A before installation of directional gyro.



WIRING DIAGRAM
(INSTRUMENT PANEL TYPE A)



WIRING DIAGRAM
(INSTRUMENT PANEL TYPE B)

NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (----) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.

37-114

Figure 2-6. AIM 200 DC(28) directional gyro installation - wiring diagram

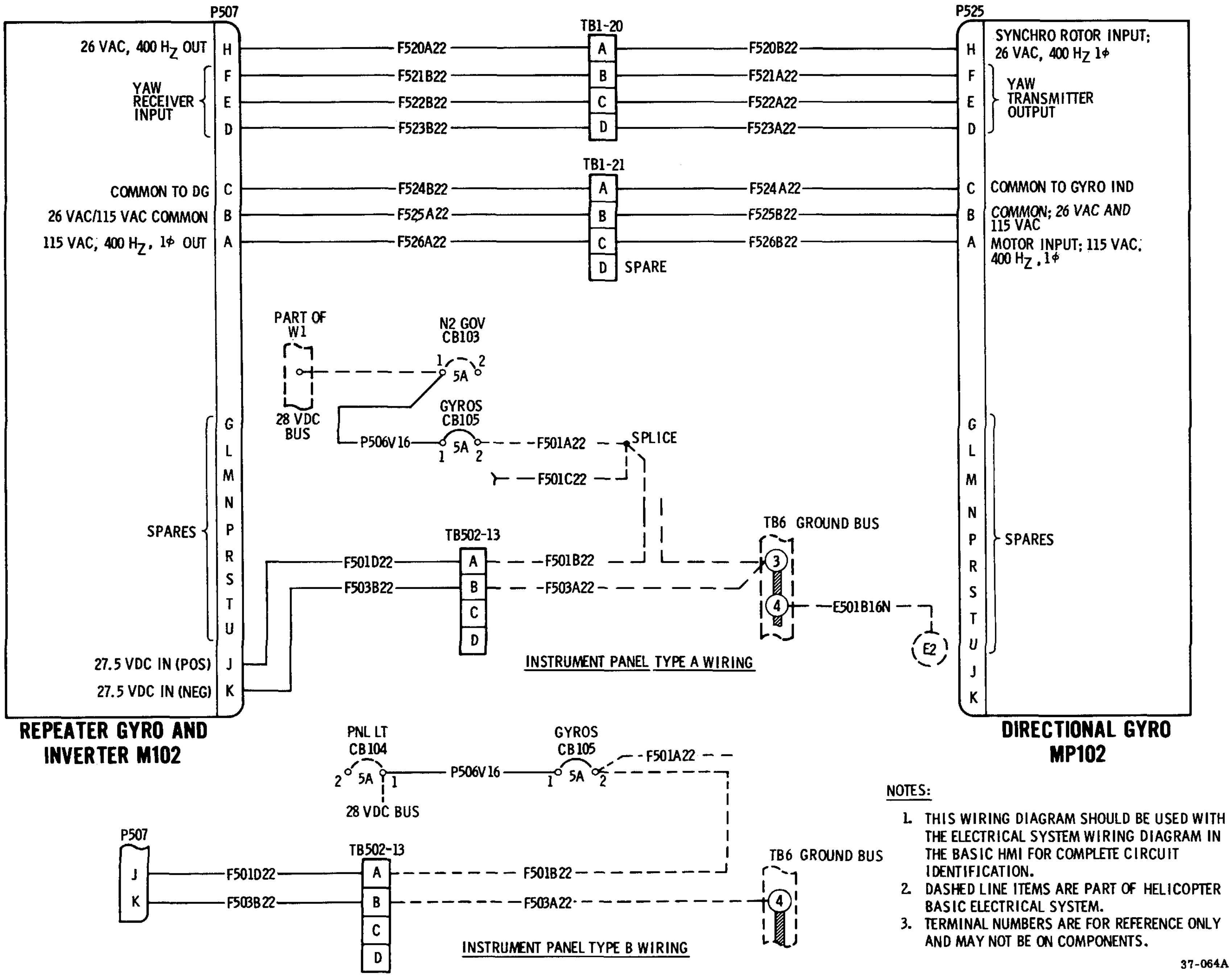
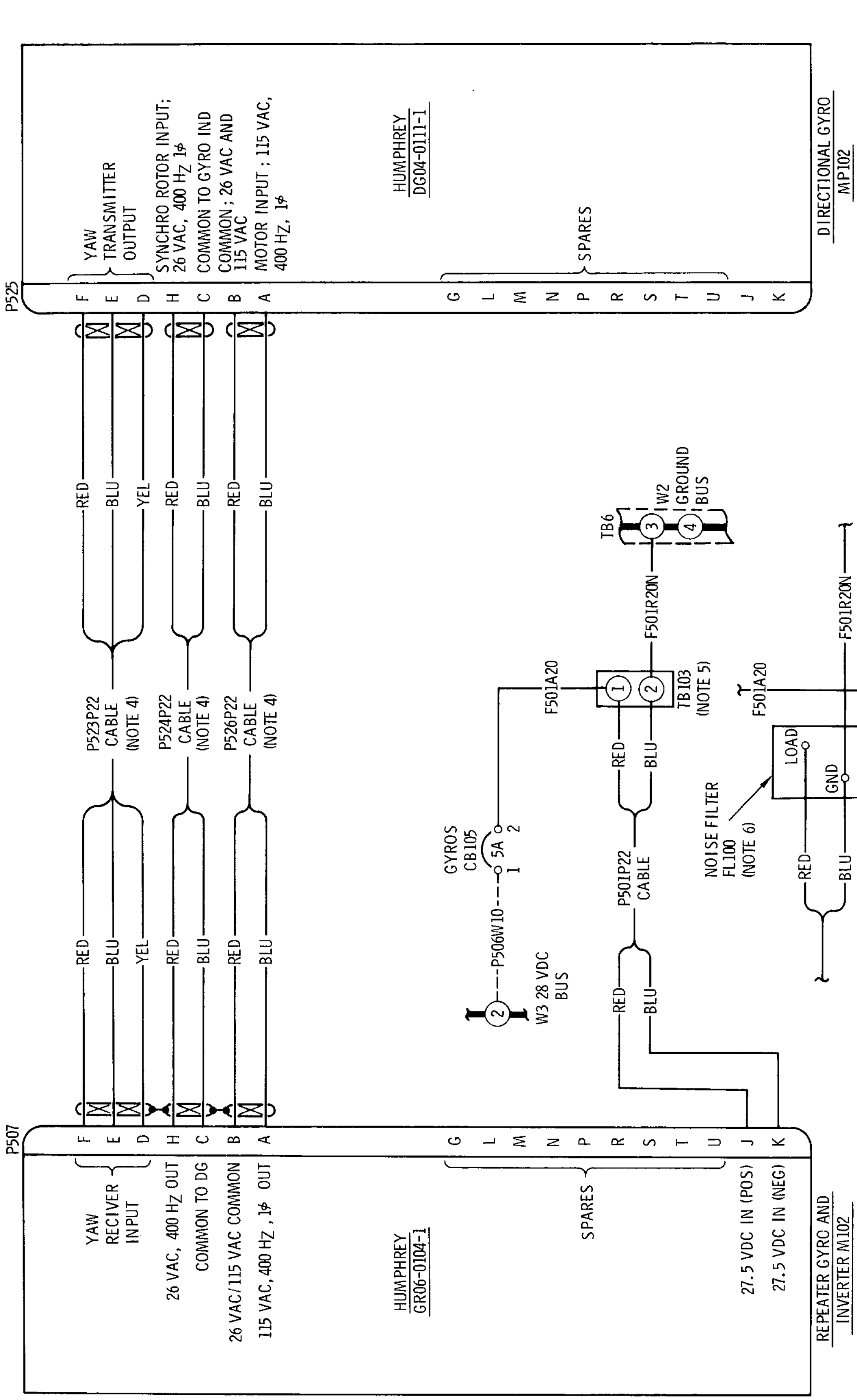


Figure 2-7. Humphrey heading indicating system - wiring diagram (without TB103 and shielded wiring harness)



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (---) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
4. PART OF A SINGLE SHIELDED HARNESS.
5. ELECTRICAL NOISE FILTER IS USED INSTEAD OF TB103, IF KING KR 85 ADF EQUIPMENT IS INSTALLED.
6. CASE ELECTRICALLY BONDED (GROUNDED) TO STRUCTURE (SECTION 19, BASIC HMI).

37-143

Figure 2-8. Humphrey heading indicating system - wiring diagram (with TB103 and shielded wiring harness)

Table 2-1. Troubleshooting heading indicating system

Symptom	Probable Trouble	Corrective Action
Off indication with system energized; incorrect heading	Disconnected or electrical wiring defective.	Reconnect or repair electrical wiring.
	Single Unit System	
OFF and/or incorrect heading indication(s) on heading indicator.	Heading indicator defective.	Replace heading indicator.
Erroneous heading indicated, no OFF indication on heading indicator.	Heading indicator defective.	Replace heading indicator.
	Dual Unit System	
OFF and incorrect heading indications on heading indicator.	Heading indicator defective.	Replace heading indicator.
Incorrect heading indicated, no OFF indication.	Directional gyro defective.	Replace directional gyro.
	Defective heading indicator.	Replace heading indicator.

c. Install gyro in reverse order of removal (para 2-18). Be sure that gyro orientation is correct and that bonding jumper is properly attached.

d. Perform an operational check of the heading indicating system.

2-20. MILLIBAR SCALE ALTIMETER.

2-21. GENERAL. The millibar scale altimeter is similar to the standard altimeter in that it has three pointers to indicate altitude in hundreds, thousands and ten-thousands of feet. The dial is marked in 20-foot increments and the instrument has an effective range of -1000 to +20,000 feet. The barometric scale is marked in millibars rather than in standard inches of mercury and is adjusted to ambient pressure by means of a front-mounted knob.

2-22. REPLACEMENT OF MILLIBAR SCALE ALTIMETER. Refer to Basic HMI for general instrument replacement procedures.

2-23. INSTANTANEOUS VERTICAL SPEED INDICATOR (IVSI).

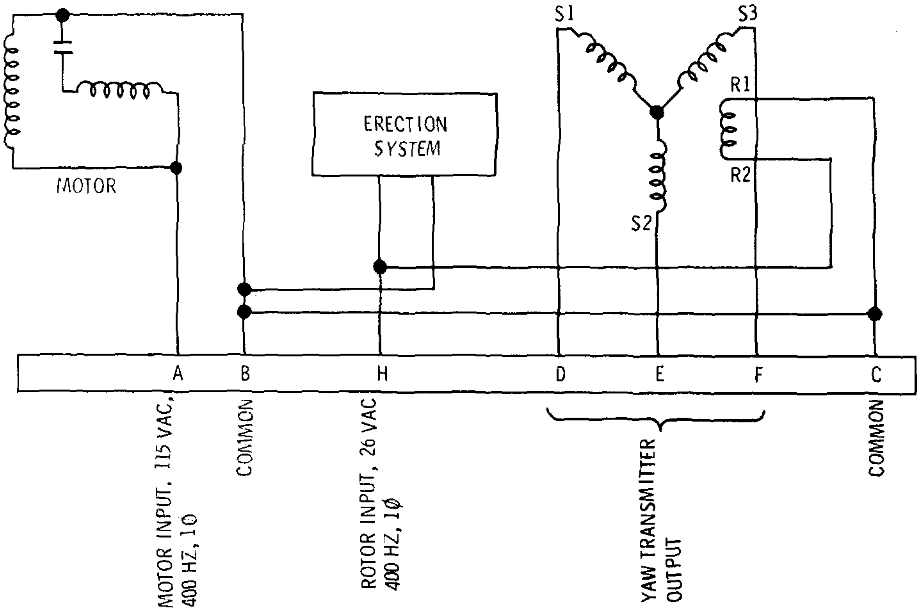
2-24. GENERAL. The instantaneous vertical speed indicator (fig. 2-1 and 2-2) is a coupled inertial lead and barometric pressure instrument that indicates the rate of change in feet-per-minute due to climb or dive maneuvers. A pendulum mass within the instrument provides an instantaneous reaction to change that is sustained by barometric pressure. The instrument is coupled to airspeed indicator static pressure. The IVSI indicator is mounted on a bracket inside the panel, just to the right of the directional gyro. A small screw slot in the lower left face of the instrument provides for zero adjustment.

2-25. REPLACEMENT OF INSTANTANEOUS VERTICAL SPEED INDICATOR (IVSI). Refer to figure 2-4 and the Basic HMI for general instrument replacement procedures.

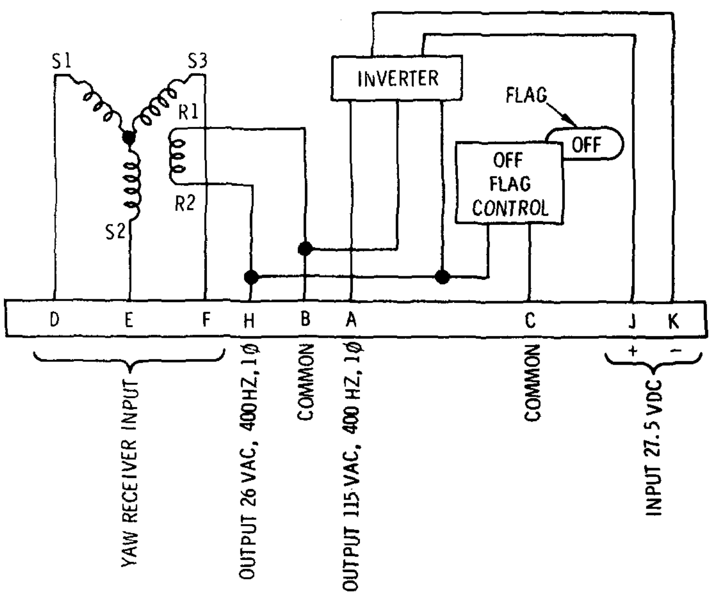
2-26. CLOCK.

2-27. GENERAL. The clock (fig. 2-1 and 2-2) is a high quality, manual wind type that provides time of day in hours, minutes and seconds as well as indicating elapsed time from start to stop, also in hours, minutes and seconds. A knob on the front of the clock permits winding, setting and control of elapsed time start-stop functions. The clock may be mounted in one of several different locations dependent upon other equipment installations in the instrument panel. On helicopters equipped with a night lighting system, a bolt-light provides for clock face illumination. Figure 2-10 shows electrical wiring interconnections for the clock.

2-28. REPLACEMENT OF CLOCK. Refer to the Basic HMI for general instrument replacement procedures.



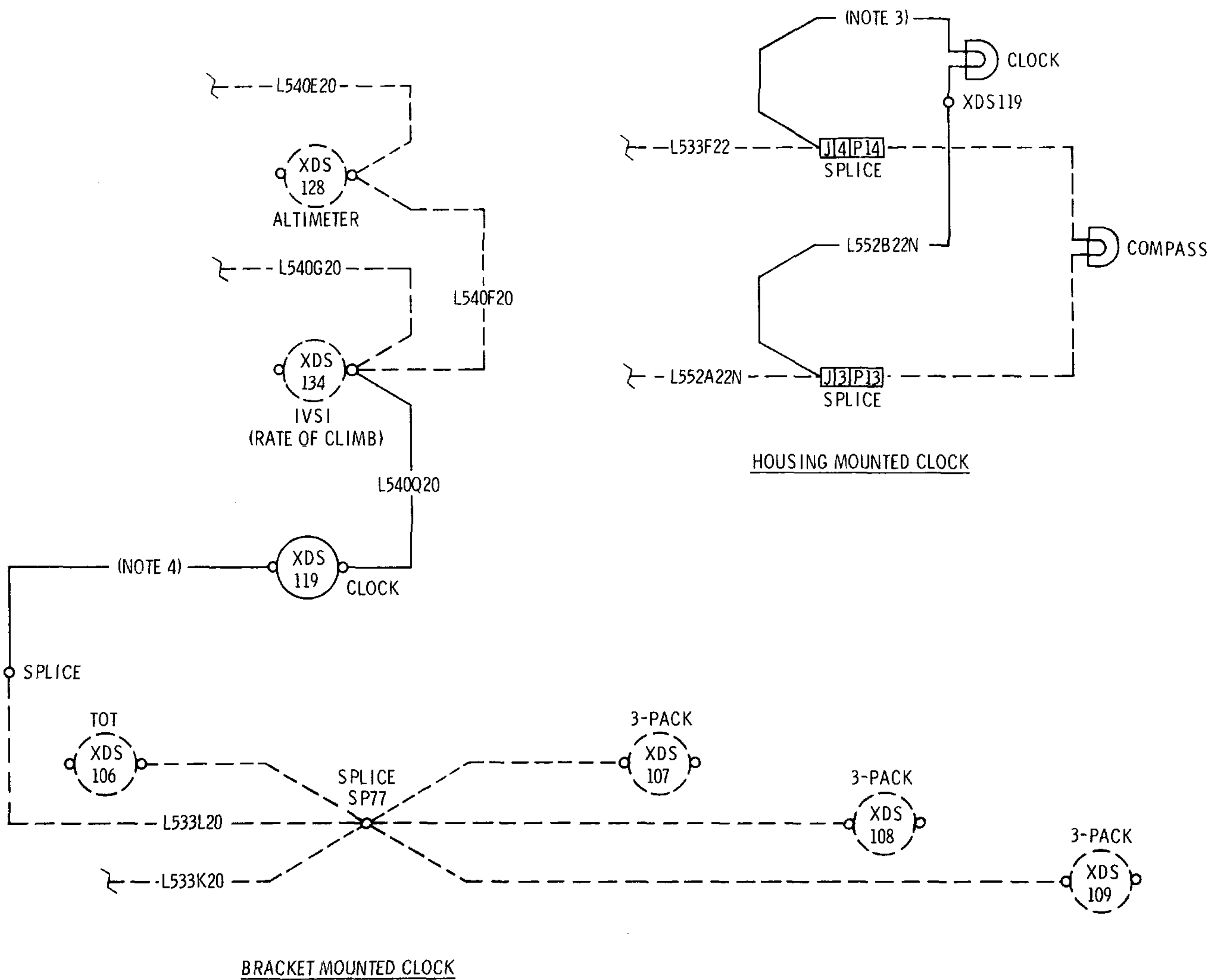
DIRECTIONAL GYRO



HEADING INDICATOR

37-066A

Figure 2-9. Humphrey heading indicating system component schematics



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. SOLID LINE (——) INDICATES ADDED WIRING; DASHED LINE (- - -) INDICATES HELICOPTER BASIC ELECTRICAL SYSTEM WIRING.
3. WIRE FURNISHED WITH AND AS PART OF LIGHT.
4. WIRE FURNISHED WITH AND AS PART OF CLOCK.

37-142

Figure 2-10. Clock installation - wiring diagram

2-29. RUNNING TIME METER.

2-30. GENERAL. The running time meter (fig. 2-11) is basically an electric clock that provides an accurate record of engine and/or transmission operating time in hours and tenths of hours. The meter operates whenever an oil pressure switch in the main transmission is closed by transmission operating oil pressure. See schematic diagram on figure 2-11. The meter receives 28 Vdc power from the INST 5-ampere circuit breaker. The circuit is completed to ground through the normally open contacts of the transmission pressure switch (S203). A second set of normally closed contacts in the switch operates the XMSN oil pressure warning light when below normal operating pressure exists. The running time meter is installed in a cover panel on the left side of the instrument panel structure just below floor level and is visible from outside the helicopter.

2-31. REPLACEMENT OF RUNNING TIME METER. Refer to the Basic HMI for general instrument replacement procedures and for oil pressure switch information.

NOTE: If wire connections at the transmission oil pressure switch are disconnected for any reason, be sure to reconnect them as shown in figure 2-11. If wires are reversed, the time meter will operate on low oil pressure and transmission low oil pressure warning light will operate on high pressure.

2-32. HEATED PITOT TUBE.

2-33. GENERAL. The heated pitot tube is used during helicopter operation when outside air temperature is below freezing to prevent ice from forming in the pitot tube. The heated pitot tube assembly is installed in the lower center canopy section (fig. 2-12) and consists of an enclosed electric heating element over the outside end of the pitot tubing. The pitot pressure line is routed upward through instrument panel structure to the airspeed indicator. The heating element is controlled by a switch-circuit breaker located lower-left in the instrument panel. The switch-circuit breaker is placarded HEATED PITOT TUBE-OFF or PITOT HEATER-OFF. Indexing and range marker decals are applied to the airspeed indicator in conformity with the applicable Vne card. Refer to Hughes Notice HN-45 for Vne card applicability.

2-34. TROUBLESHOOTING HEATED PITOT TUBE. Refer to table 17-1, Basic HMI and table 2-2 herein.

2-35. REMOVAL OF HEATED PITOT TUBE. (See fig. 2-11.)

a. Check that all electrical power is OFF.

b. Disconnect electrical wiring and electrical ground connection.

c. Remove clamps securing pitot line to fuselage structure. Disconnect pitot line fitting from airspeed indicator.

d. Break sealant used to secure and seal pitot tube where it exits through rubber extrusion in canopy structure.

2-36. INSTALLATION OF HEATED PITOT TUBE. (See fig. 2-11.)

a. Check that all electrical power is OFF.

b. Install pitot tube assembly in position through mounting hole in canopy structure. Connect pitot line fitting to airspeed indicator.

c. Secure pitot line with clamps and clamp strap to fuselage structure.

CAUTION: The pitot line must be free of leaks or kinks. Do not allow clamps to crush or deform the line tubing as inaccurate airspeed indication may result.

d. Connect electrical wiring and ground connection.

e. Be sure pitot tube assembly is properly aligned. Apply a bead of sealant (item 24, table 2-4, Basic HMI) on inside joint between pitot tube and rubber extrusion (detail B).

2-37. AUXILIARY ELECTRICAL PANELS.

2-38. GENERAL. Auxiliary electrical panels are provided for mounting additional control switches, indicators, and circuit breakers used with optional equipment systems. The various styles of panels are shown in fig. 2-13.

2-39. AUXILIARY ELECTRICAL PANEL INSTALLATION. The auxiliary electrical panel is installed in the position normally occupied by the cigarette lighter and ashtray assembly on instrument panel type A. See fig. 2-14 for installation details.

NOTE: When reinstalling the cigarette lighter and ashtray assembly, it will be necessary to lengthen wires P517B16 and H501A16 in order to reconnect to the cigarette lighter. Use approximately 18.00 inches of 16 gage wire, two splices (MS25181-2), and sleeving (MIL-I-613) to cover the splices.

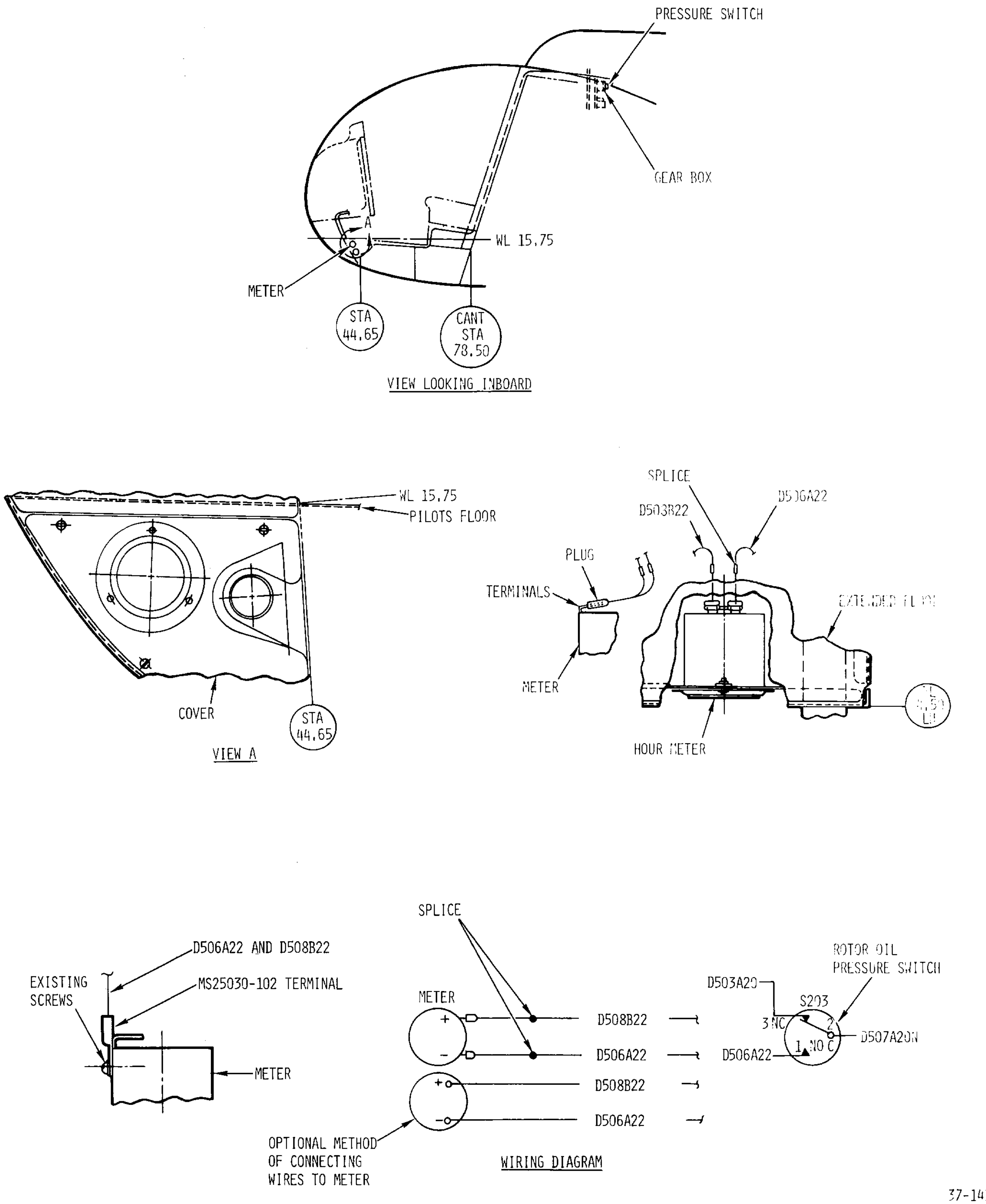
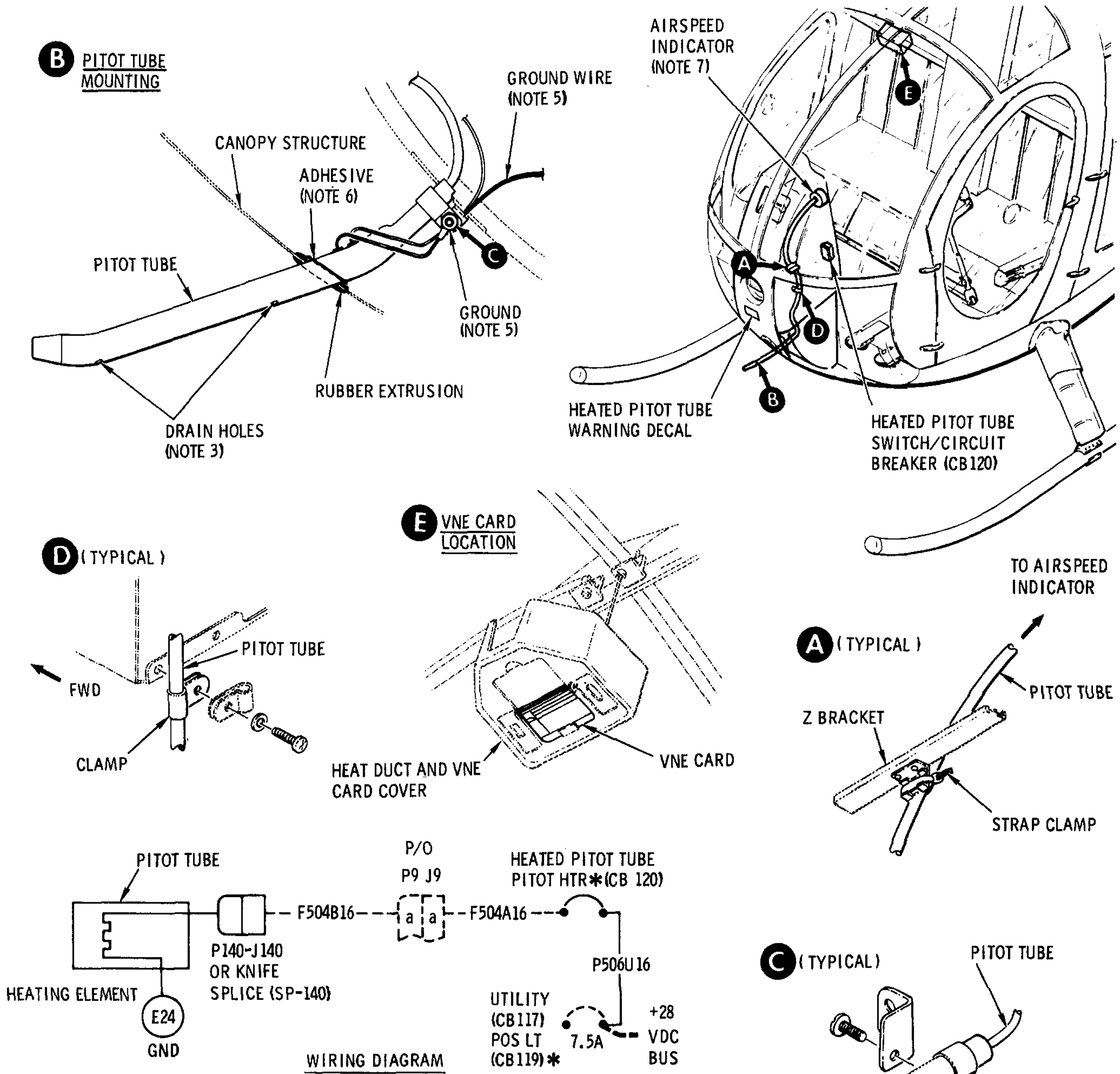


Figure 2-11. Running time meter



NOTES:

1. DASHED LINE (----) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
2. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
3. REAR DRAIN HOLE ON CURRENT TYPE.
4. ASTERISK (*) INDICATES USAGE ON INSTRUMENT PANEL TYPE B.
5. GROUND WIRE TERMINAL IS ELECTRICALLY BONDED (GROUNDED) TO FUSELAGE STRUCTURE IN THE RIGHT AVIONICS COMPARTMENT. EXCEPT ON EARLY INSTALLATION, TERMINAL IS SECURED TO CLAMP ON AFT END OF PITOT TUBE.
6. SEAL PITOT TUBE TO EXTRUSION WITH ADHESIVE (ITEM 24, TABLE 2-4, BASIC HMI).
7. INDEX AND RANGE MARKER DECALS ARE APPLIED THAT CONFORM TO APPLICABLE VNE CARD.

37-043C

Figure 2-12. Heated pitot tube installation

Table 2-2. Troubleshooting the heated pitot tube

Symptom	Probable Trouble	Corrective Action
Pitot tube will not heat.	Heating element defective.	Replace heated pitot tube.
	Switch-circuit breaker or wiring defective.	Repair wiring or replace defective switch-circuit breaker.

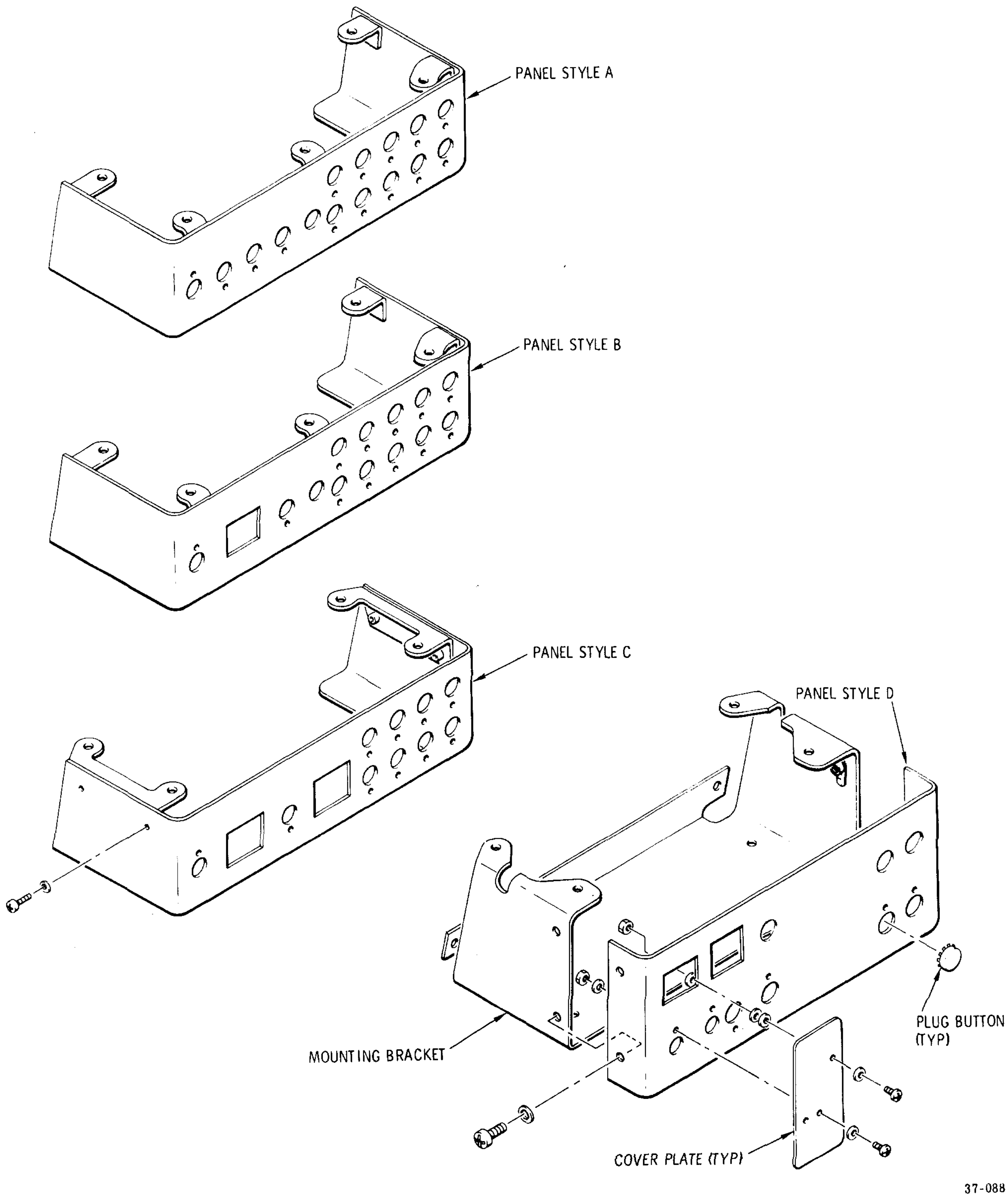


Figure 2-13. Auxiliary electrical panels for instrument panel type A

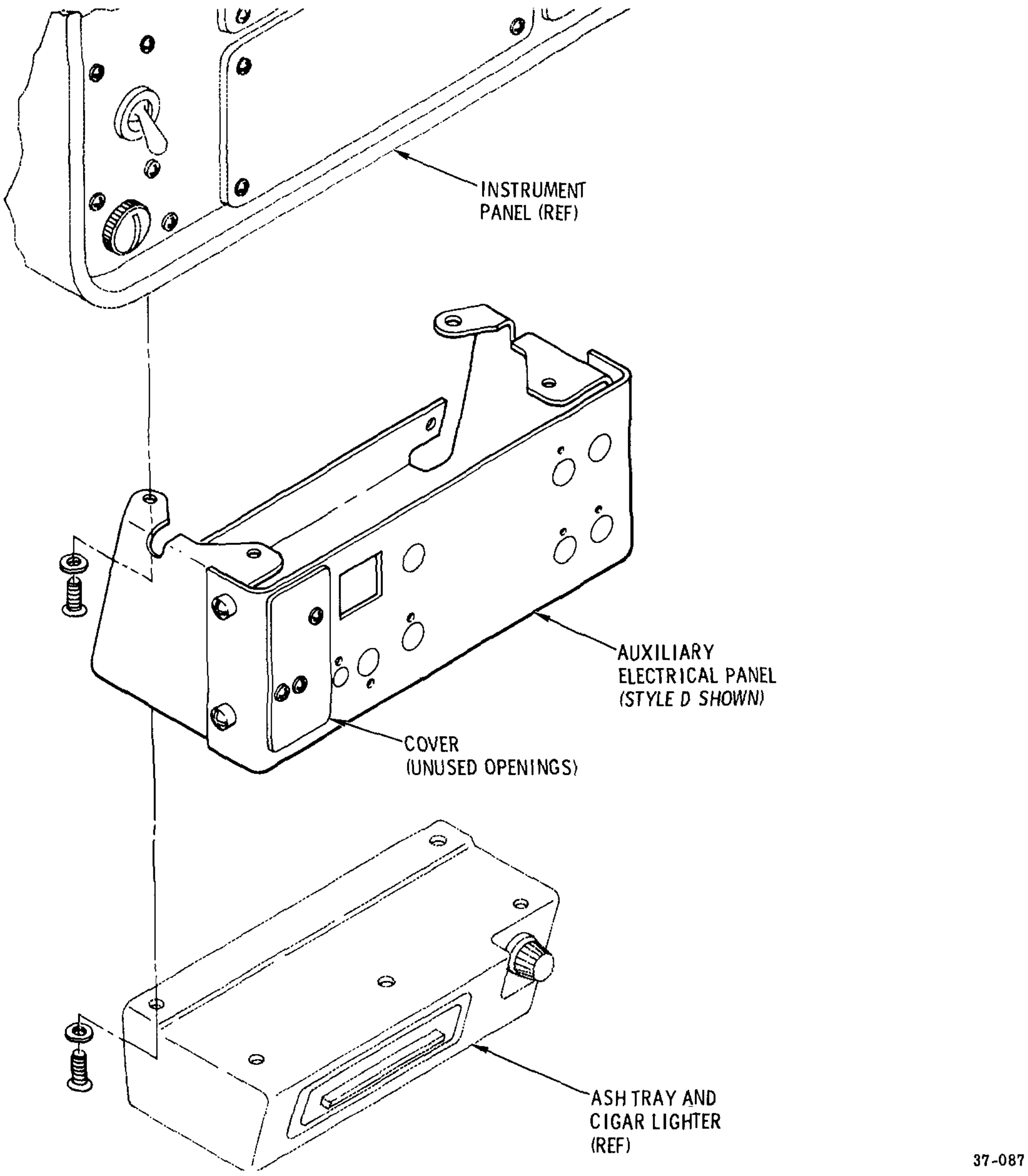
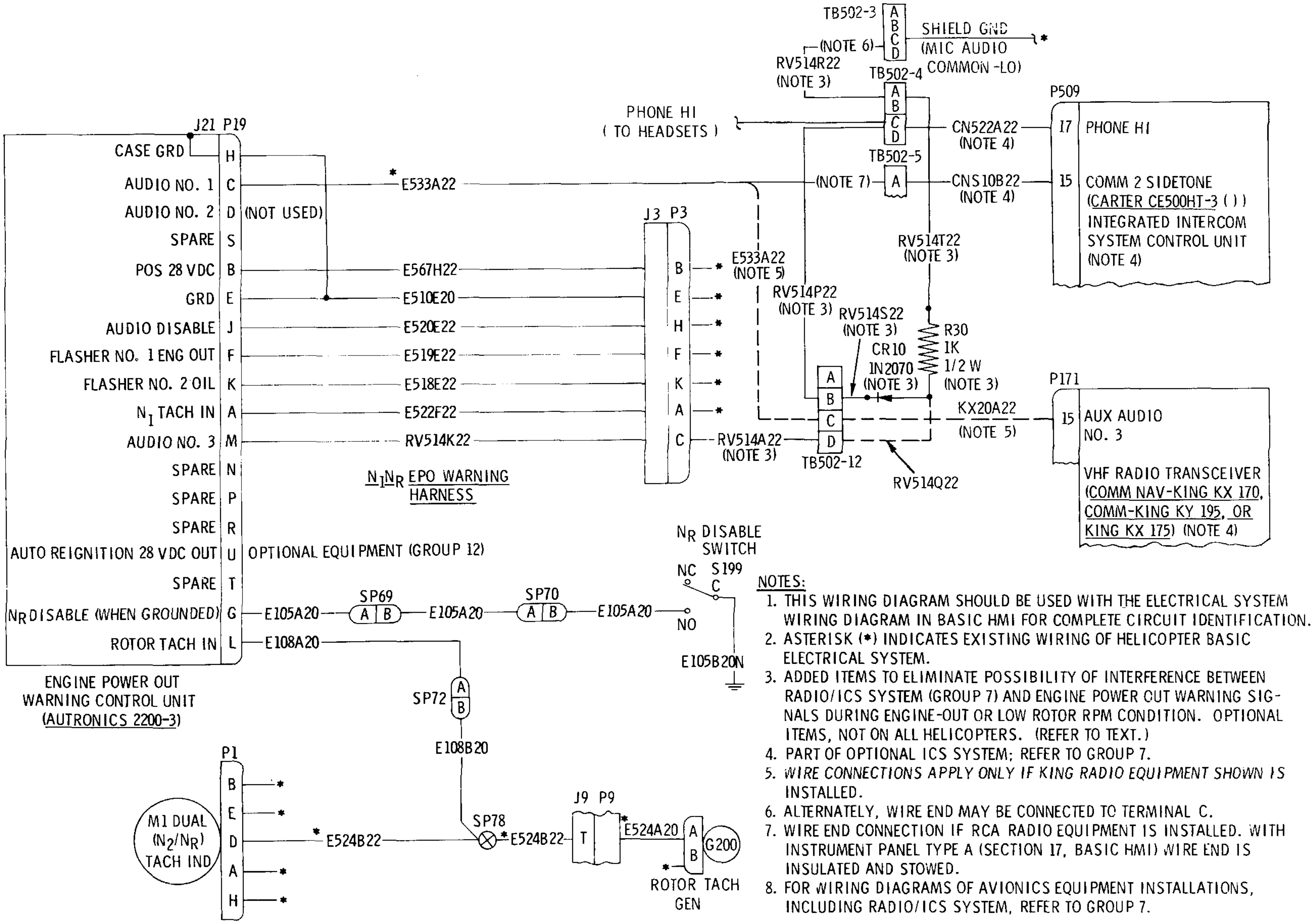


Figure 2-14. Typical auxiliary electrical panel installation on instrument panel type A

2-40. N_1/N_R ENGINE POWER OUT WARNING SYSTEM.

2-41. GENERAL. This engine power out (EPO) system (M50033) is used on helicopters with the 250-C20 Series engine and automatic reignition. The system may be installed as optional equipment on other helicopters. The system consists of an Autronics 2200-3 EPO control unit, an N_R disable switch mounted on the inboard collective pitch base and interconnecting wiring. The system interconnects and functions with existing warning lights and the warning horn of the caution and warning lights indicating system (Section 17, Basic HMI). The EPO control unit (fig. 2-15) monitors main transmission oil temperature and pressure, engine N_1 rpm and main rotor (N_R) rpm. When the main transmission oil temperature is high or oil pressure is low, a flashing output, at J21, pin K powers the warning light. When N_1 tachometer input is below 50 to 55% rpm (35 to 38.5 Hz) or if N_R tachometer input is below approximately 98% rpm (68.6 ±0.7 Hz) a flasher output is provided at J21, pin F for the warning light and horn and an amplified audio tone is provided at pin M for pilot's headset. At this time, a steady state 28 Vdc output is provided at pin U for engine automatic reignition. Main rotor rpm sensing is



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. ASTERISK (*) INDICATES EXISTING WIRING OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. ADDED ITEMS TO ELIMINATE POSSIBILITY OF INTERFERENCE BETWEEN RADIO/ICS SYSTEM (GROUP 7) AND ENGINE POWER OUT WARNING SIGNALS DURING ENGINE-OUT OR LOW ROTOR RPM CONDITION. OPTIONAL ITEMS, NOT ON ALL HELICOPTERS. (REFER TO TEXT.)
4. PART OF OPTIONAL ICS SYSTEM; REFER TO GROUP 7.
5. *WIRE CONNECTIONS APPLY ONLY IF KING RADIO EQUIPMENT SHOWN IS INSTALLED.*
6. ALTERNATELY, WIRE END MAY BE CONNECTED TO TERMINAL C.
7. WIRE END CONNECTION IF RCA RADIO EQUIPMENT IS INSTALLED. WITH INSTRUMENT PANEL TYPE A (SECTION 17, BASIC HMI) WIRE END IS INSULATED AND STOWED.
8. FOR WIRING DIAGRAMS OF AVIONICS EQUIPMENT INSTALLATIONS, INCLUDING RADIO/ICS SYSTEM, REFER TO GROUP 7.

Figure 2-15. N_1/N_R engine power out warning system M50033 - wiring diagram disabled (grounded) by N_R disable switch S199 when the pilot's collective pitch stick is fully down and the throttle grip is at idle or cutoff position. N_R sensing remains disabled for 3.5 seconds after the ground is removed (N_R disable switch S199 deactuated). The warning horn and the audio tone headset warning are disabled at any time the generator switch is off although the EPO warning light continues to flash as long as engine power is out and 28 Vdc electrical power is present.

NOTE: Hughes Notice HN 63-1 provides instructions for optional modification of N_1/ N_R EPO system to eliminate possibility of interference between radio/ICS system (Group 7) and EPO warning signals during engine out or low rotor rpm condition, for a system without this feature.

2-42. INSTALLATION OF M50033 N_1/N_R ENGINE OUT WARNING KIT.

a. Remove fairing from right side of instrument panel.

b. Disconnect and remove existing EPO unit, amplifier, and wire harness.

c. Install new 369A4514-3 control unit using existing hardware. Connect 369H4520 wire harness as shown and secure with tie-strap.

d. Remove controls access door (refer to Section 2 of Basic HMI).

e. Install N_R disable switch (S199) and actuating arm to inboard collective stick socket housing and gas producer bellcrank as follows:

(1) Remove nuts and washers securing two upper bolts to inboard collective stick socket. Insert slotted attaching bracket under bolt heads and washers. Install -3 clip under existing nut and washer (two places) and tighten bolts.

(2) Install N_R switch with JM-5 roller leaf attaching bracket and attach plate. Use two MS35275-208 screws, two MS35338-39 washers, and two NAS620-2 washers. Do not tighten screws until final adjustment of switch.

NOTE: Actuating cam is used in place of slotted actuating arm for later N_R disable switch installations.

(3) Remove bolt, washers, nut, and cotter pin securing link assembly to bellcrank next to housing cap. Reinstall bolt without washer under bolt head and insert slotted actuating arm under bolt head. Install washer and nut. Tighten bolt and secure nut with cotter pin.

f. Install and connect wiring for N_1/N_R engine out warning system as shown in figure 2-4.

NOTE: Do not tie wires from S199 switch to wires to P19 connector or to removable collective stick. Allow sufficient slack in wires to permit movement of controls.

g. Cover knife splices with fiberglass sleeving and tie sleeving in place. Cut existing wire two inches from S199 switch position NC and heat shrink TC4003 end cap in place. Secure switch wiring to -3 clips with tie-straps and bend clips to suit.

h. Install TC-814 tie base to inner side of inboard partition of right hand seat assembly and back-to-back with existing tie base. Use MS20600AD4W3 rivet and AN960PD6L washer.

i. Adjust N_R disable switch (refer to paragraph 2-48).

2-43. AUTRONICS 2200-3 ENGINE POWER OUT WARNING CONTROL UNIT. (See fig. 2-15.) The Autronics 2200-3 EPO control unit is an encapsulated solid-state device powered by 28 Vdc. Inputs to the unit are from the main rotor tachometer, engine N_1 tachometer, and main transmission oil temperature and pressure switches. Two flashing outputs (3 to 5 Hz) are provided; J21, pin K for transmission oil pressure/oil temperature and pin F for engine power out. Interrupted audio tone outputs are provided at pins C, D and M. Pins M and C audio outputs are used in this installation. A steady 28 Vdc output of 0.5 ampere is provided at pin U for optional engine automatic reignition (Group 12). A ground at pin G through an N_R disable switch on the base of the pilot's collective pitch stick disables the N_R monitoring circuit. A time delay causes this circuit to remain disabled for 3.5 seconds after the ground is removed so that transient conditions will not cause an engine out warning.

NOTE: Audio tone outputs are amplified within this EPO unit and a separate amplifier is not required.

2-44. REPAIR OF AUTRONICS 2200-3 EPO WARNING UNIT. This unit contains encapsulated (potted) solid-state components. Repair or replacement of the internal components is not practical. Replace the complete unit when troubleshooting (Section 17, Basic HMI) indicates an internal fault.

2-45. REPLACEMENT OF AUTRONICS 2200-3 EPO WARNING UNIT. Refer to Section 17, Basic HMI, for an illustration of EPO unit location in instrument panel structure.

a. Check that electrical power is OFF.

b. Remove fairing on the right side of the instrument panel.

c. Disconnect electrical plug P19 from the control unit.

d. Remove the four mounting screws and washers and remove the unit.

e. Place replacement unit in position and install mounting screws and washers.

f. Connect electrical plug P19. Turn on electrical power and check that red warning lights flash. Turn generator switch ON and check for warning signal tone in pilot's headset. Turn off electrical power.

g. Reinstall instrument panel fairing.

2-46. N_R DISABLE SWITCH. This switch is mounted on the inboard collective stick socket on those helicopters with the N_1/N_R engine power out warning system. The installation may be an early or current type. See figures 2-16 and 2-17 for differences. The purpose of the switch is to disable N_R (rotor speed) sensing and prevent engine out warning indications when the pilot's collective pitch stick is in the full down position and the throttle is at idle. These control positions are normal during engine starting, idling, autorotation flight, and engine shut-down when an engine out warning is not desired.

NOTE: Modification of an early N_R disable switch installation to a current type can be accomplished with this procedure:

a. Remove center seat cover and controls access door (Section 2, Basic HMI).

b. Check that all electrical power is OFF.

c. Remove N_R disable switch by removing two screws and the threaded attach plate.

d. Remove existing 369A7387 switch attaching bracket by loosening two upper bolts in the inboard collective pitch stick socket housing cap and slipping out the slotted attaching bracket. Discard bracket.

e. Install new 369A7387-3 switch attaching bracket under bolt heads and tighten the two upper bolts.

f. Remove the existing 369A7390 switch actuating striker arm by loosening the bolt in the gas producer bellcrank and slipping out the slotted actuating arm. Discard the actuating arm.

g. Remove the two bolts securing link arm to gas producer bellcrank and to gas producer idler.

h. Install new M50033-5 actuating cam with existing bolts to bellcrank and idler, as shown in figure 2-18. Install cam with elongated hole at gas producer idler. Install new HS306-224L washers under bolt heads; install NAS630C10L washers as spacers. Secure existing nuts with MS24665-153 cotter pins.

i. Install N_R disable switch to new 369A7387-3 attaching bracket and to existing threaded attach plate using existing screws.

j. Check that inboard collective pitch stick is in the full down position and that the throttle grip is at ground idle position.

k. Move the switch fore and aft to locate point of switch actuation (click) as switch is depressed by cam. Mark the switch actuating bracket at point of actuation. Advance throttle grip to open position, then move switch toward the actuating cam an additional 0.030 inch.

l. Tighten the switch mounting screws to secure the switch in the 0.030-inch overtravel position.

m. Remove bolt from stick socket housing cap and install additional M50033-3 clip (see fig. 2-18, view B-B). Position switch wiring and three clips to remove all slack on wire and secure wiring with cable straps. Bend clips to suit.

n. Check that throttle grip will rotate to the cutoff position. Check inboard collective stick operation through full range to determine that switch wiring does not interfere with movement.

o. Perform operational check of N_1/N_R disable switch with collective pitch stick full down and throttle at ground idle position.

p. Install controls access door and center seat cover.

2-47. REPLACEMENT OF N_R DISABLE SWITCH.

a. Remove center seat cover and controls access door (Section 2, Basic HMI).

b. Check that electrical power is off. Disconnect wire E105B20N at ground terminal and wire E105A20 at splice. Cut all tie straps attaching wires to inboard collective stick socket (fig. 2-16 or 2-17).

c. Remove the switch by removing the two screws and the threaded attach plate.

d. Remove the switch attaching bracket by loosening the two upper bolts in the inboard collective stick socket housing cap and slipping out the slotted attaching bracket.

e. Remove the switch actuating arm by loosening the bolt in the gas producer bellcrank and slipping out the slotted actuating arm. Remove the actuating cam used in the current installation by removing the bolts in each end of the gas producer bellcrank.

f. Install replacement components in essentially reverse order of removal; adjust N_R disable switch (para 2-48).

2-48. ADJUSTMENT OF N_R DISABLE SWITCH. (See fig. 2-16 or 2-17.)

a. Check that pilot's collective pitch stick is in the full down position and that the throttle grip is at idle position.

b. (Early type only - fig. 2-16) Position switch at an angle of 10° to 20° from parallel to stick socket.

c. Move switch fore and aft to locate point of actuation (click) as switch is depressed. Mark switch mounting bracket at point of actuation and then continue to move switch toward actuating arm an additional 0.030 inch.

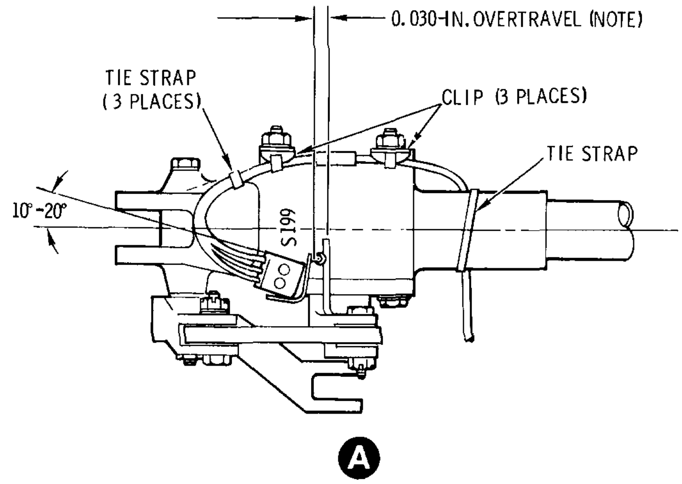
d. Tighten switch mounting screws to secure switch at the 0.030-inch overtravel position.

e. Check that pilot's throttle grip will rotate to the cutoff position. Check pilot's collective pitch stick operation through full range to determine that switch wiring does not interfere with movement.

f. Perform operational check of N_R disable switch with collective pitch stick full down and throttle at idle position.

NOTE:

ADJUST SWITCH TO ACTUATE WITH COLLECTIVE STICK FULL DOWN AND THROTTLE GRIP AT IDLE; THEN MOVE SWITCH AN ADDITIONAL 0.030 INCH TOWARD ACTUATING ARM. REFER TO TEXT.



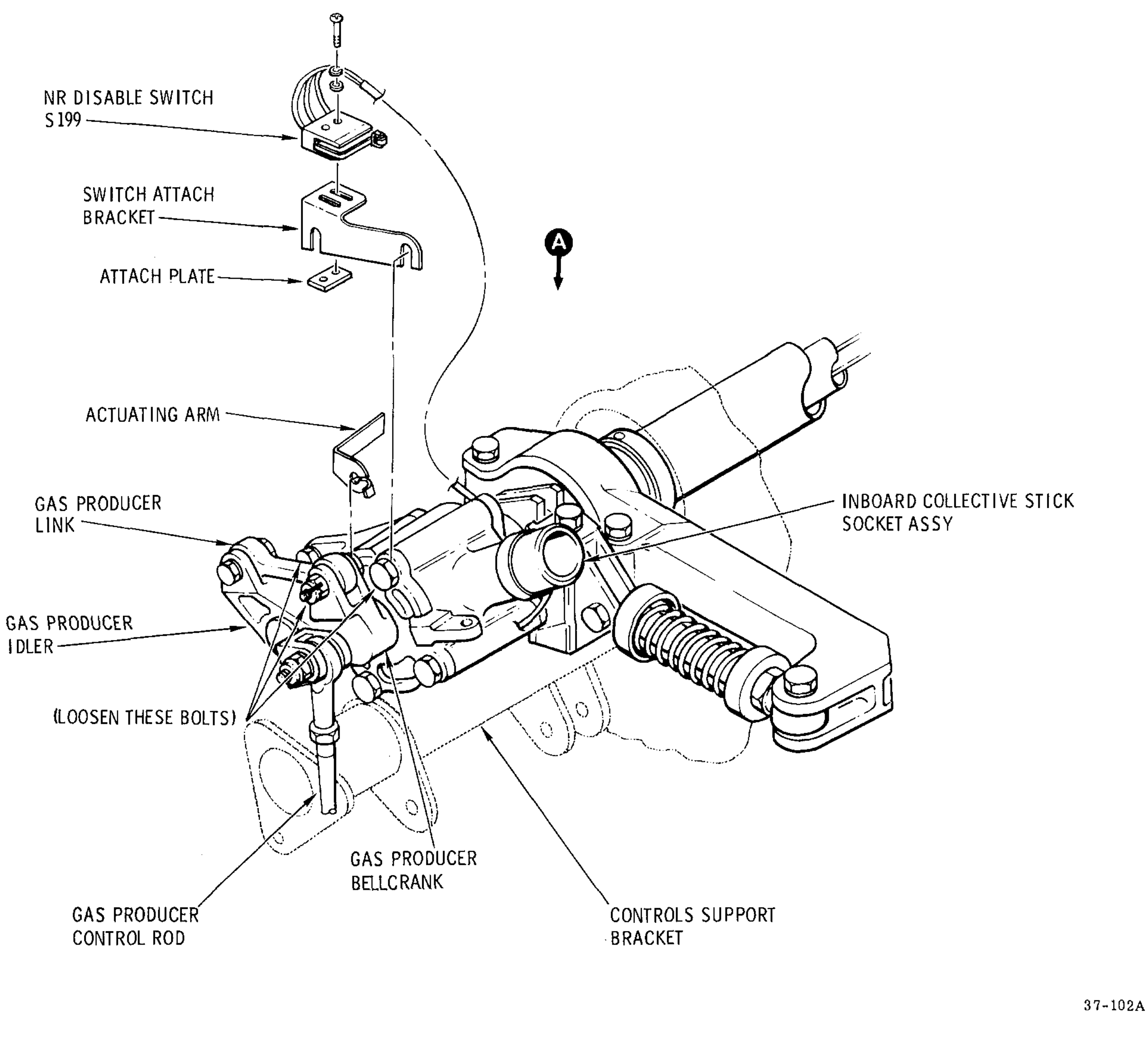
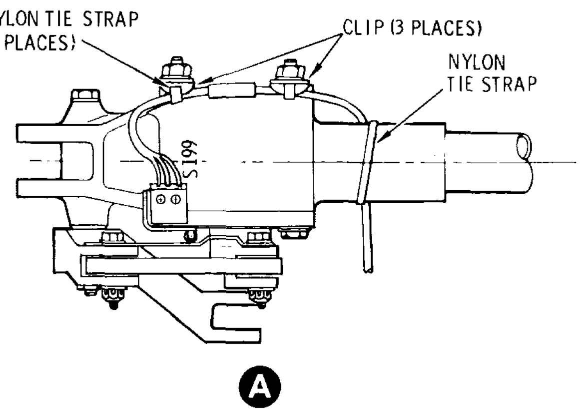


Figure 2-16. N_1/N_R disable switch installation (early type)

NOTE:

ADJUST SWITCH TO ACTUATE WITH COLLECTIVE STICK FULL DOWN AND THROTTLE GRIP AT IDLE; THEN MOVE SWITCH AN ADDITIONAL 0.030 IN. TOWARD ACTUATING ARM. SECURE IN PLACE. (REFER TO TEXT.)



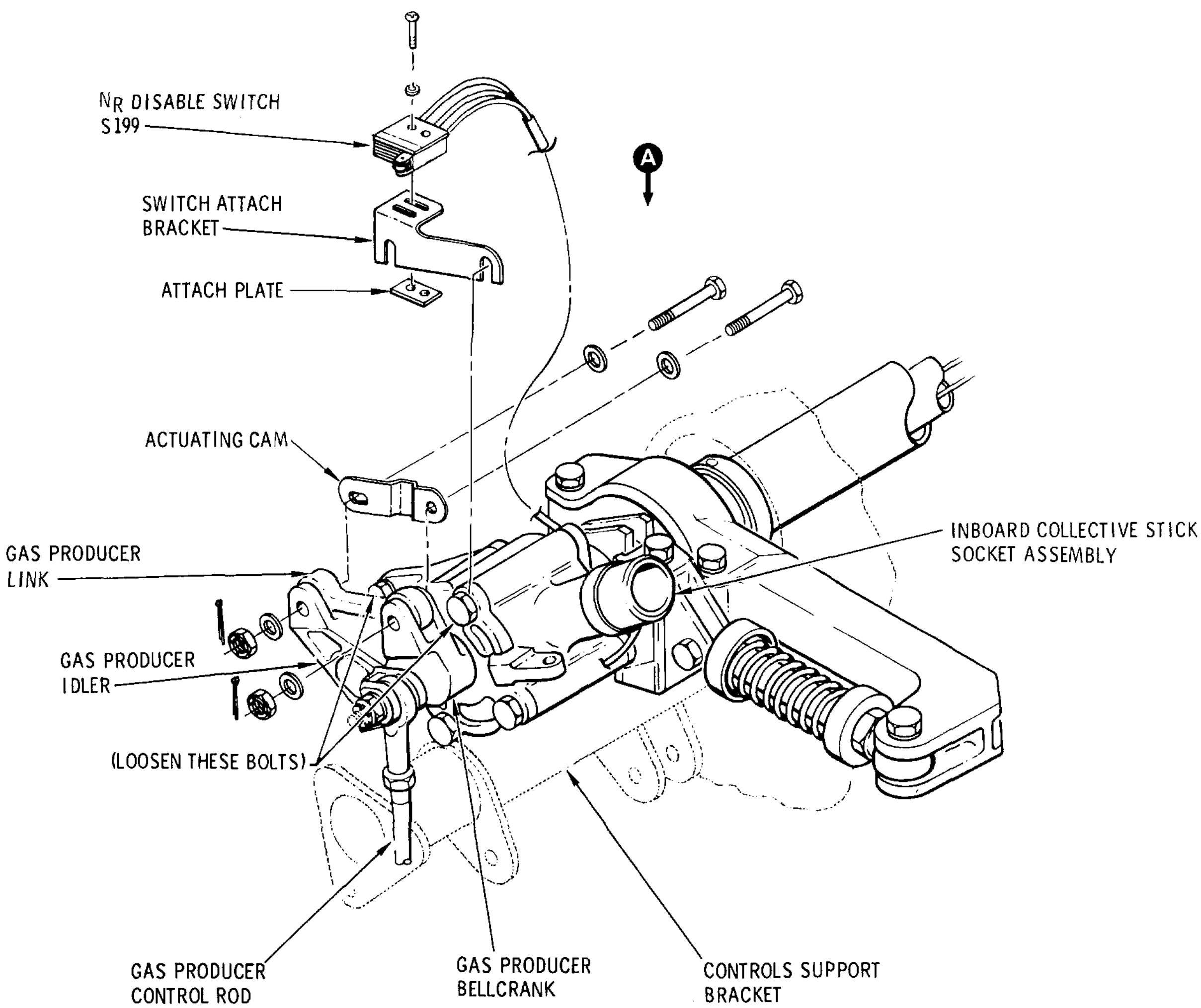


Figure 2-17. N_1/N_R disable switch installation (current type)

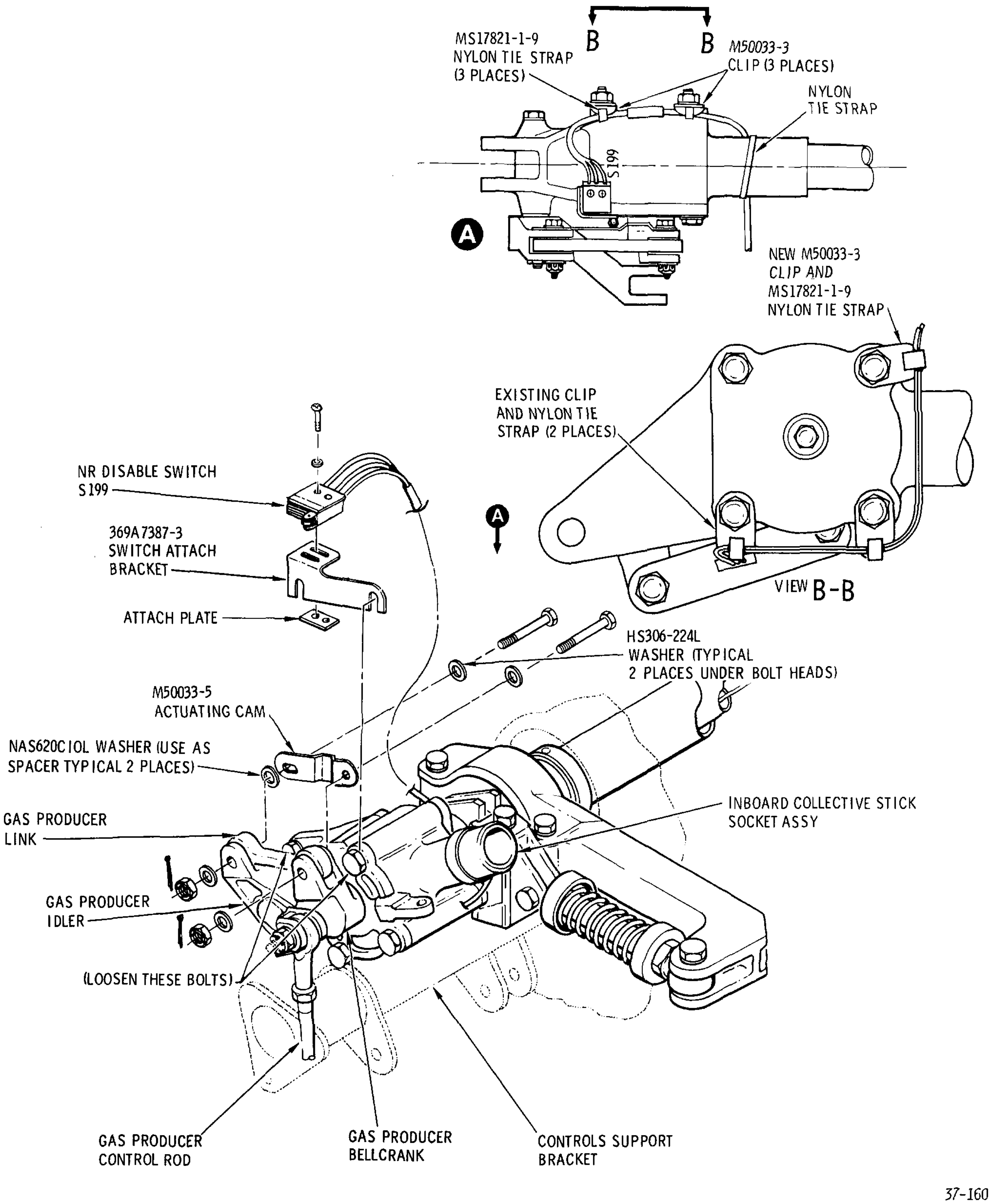


Figure 2-18. Installation of current N_R disable switch with M50035-5 actuating cam

OPTION GROUP 3
WINTERIZATION EQUIPMENT

3-1. WINTERIZATION PROVISIONS.

3-2. GENERAL. Winterization of the helicopter (figure 3-1) consists in general of changing material specifications of existing parts to provide functional protection of the part during cold weather operation below +10°F. Hughes Service Information Notice HN-26.1 provides instructions for installation of the winterization kit. Refer to the Basic HMI for individual component maintenance information. With the exception of landing gear dampers, most current configuration helicopters are already equipped with parts having the required material changes. If the majority of operations are conducted at temperatures above +40°F, the applicable standard landing gear dampers should be used. Refer to table 6-2, Basic HMI for damper application. The following items are installed when winter operation of the helicopter is required.

a. A tail rotor swashplate with oilite bronze liners and a swashplate retaining nut. (Current configuration)

b. A molded natural rubber tail rotor blade stop. (Current configuration)

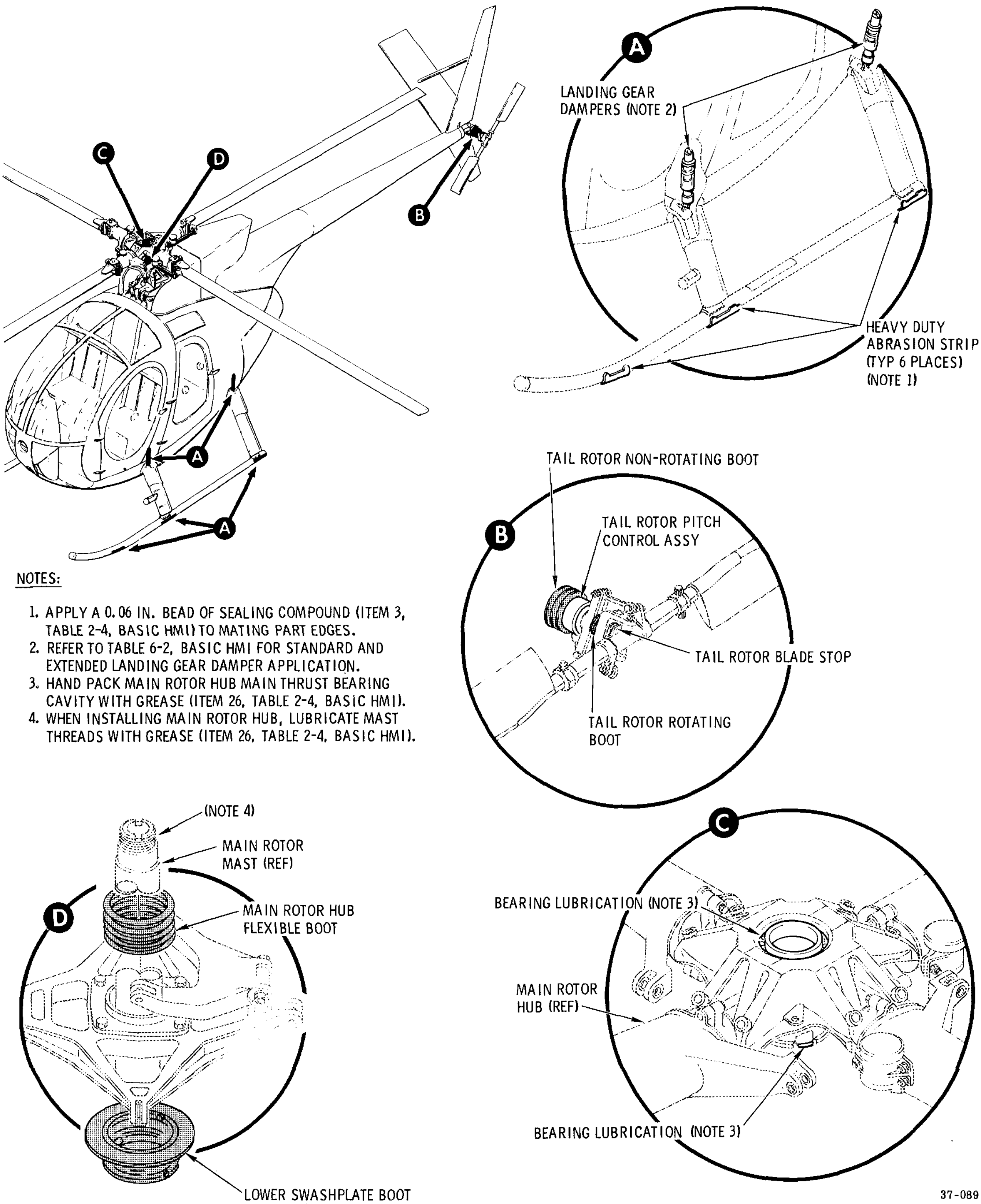
c. A synthetic rubber main rotor hub flexible boot and lower swashplate boot with improved low temperature characteristics. (Current configuration)

d. A main rotor hub (P/N 369A1200-501) with upper and lower mast thrust bearings packed with MIL-G-23827 grease (item 26, table 2-4, Basic HMI). (Current configuration)

e. A synthetic rubber tail rotor rotating boot and non-rotating boot with improved low temperature characteristics. (Current configuration)

f. Heavy duty replaceable landing gear abrasion strips. (Current configuration)

g. Winterized landing gear dampers. Poppet-type dampers with increased internal pressure are used as listed in table 6-2 of the Basic HMI.



NOTES:

1. APPLY A 0.06 IN. BEAD OF SEALING COMPOUND (ITEM 3, TABLE 2-4, BASIC HMI) TO MATING PART EDGES.
2. REFER TO TABLE 6-2, BASIC HMI FOR STANDARD AND EXTENDED LANDING GEAR DAMPER APPLICATION.
3. HAND PACK MAIN ROTOR HUB MAIN THRUST BEARING CAVITY WITH GREASE (ITEM 26, TABLE 2-4, BASIC HMI).
4. WHEN INSTALLING MAIN ROTOR HUB, LUBRICATE MAST THREADS WITH GREASE (ITEM 26, TABLE 2-4, BASIC HMI).

Figure 3-1. Winterization installation

OPTION GROUP 4
LIGHTING EQUIPMENT

4-1. NIGHT LIGHTING SYSTEM.

4-2. GENERAL. The night lighting system (fig. 4-1) includes interior and exterior lights. Standard exterior lighting consists of the landing light, position lights, and upper and lower anti-collision lights. The anticollision lights may be either strobe or incandescent type. Exterior lighting configuration varies if emergency floats, utility floats or luggage pods are installed in conjunction with lighting; these variations are described in following paragraphs describing side position lights and anticollision lights. The interior lighting consists of instrument lights and utility lights for the pilot's compartment and passenger/cargo compartment. All lights receive dc power from the 28 Vdc bus. Individual circuits are controlled and protected by circuit breakers located on the instrument panel.

4-3. *TROUBLESHOOTING THE NIGHT LIGHTING SYSTEM.* Refer to table 4-1 and figure 4-2.

NOTE: When possible, use an auxiliary power source during power-on troubleshooting to avoid excessive current drain from the battery. Do not leave the landing light on for more than 1 minute; the lamp will overheat and lamp life will be shortened.

4-4. INSPECTION OF NIGHT LIGHTING SYSTEM.

a. Inspect visible lengths of wiring for damage and check that ground terminal connections are secure.

b. Inspect electrical connectors for cracks and other evidence of damage.

c. When lamps are removed, inspect base, lens and retainers for security, condition, and moisture accumulation.

4-5. REPLACEMENT OF NIGHT LIGHTING LAMPS.

a. Position Light and Anticollision Incandescent Light Lamps. Remove the light lens according to applicable light replacement paragraph.

NOTE: When removing or installing the tail-light lamp, be sure to first loosen the connector on the light base. If the wire is not free to move through the connector seal; the lamp may break.

b. Strobe Type Anticollision Flashtube. Replace complete flashtube and lamp base assembly (fig. 4-3).

c. Landing Light Lamp. Replace lamp according to paragraph 4-19.

d. Instrument Post Light Lamps. Pull post light hood straight off the retainer (fig. 4-4).

e. Instrument Cluster Four-Pack Lamps. Replace lamps by removing lamp holder from back of instrument cluster (fig. 4-4).

f. Edgelighted Circuit Breaker and Switch Panels. Failure of the integral light elements requires replacement of the entire plastic panel according to paragraph 4-40.

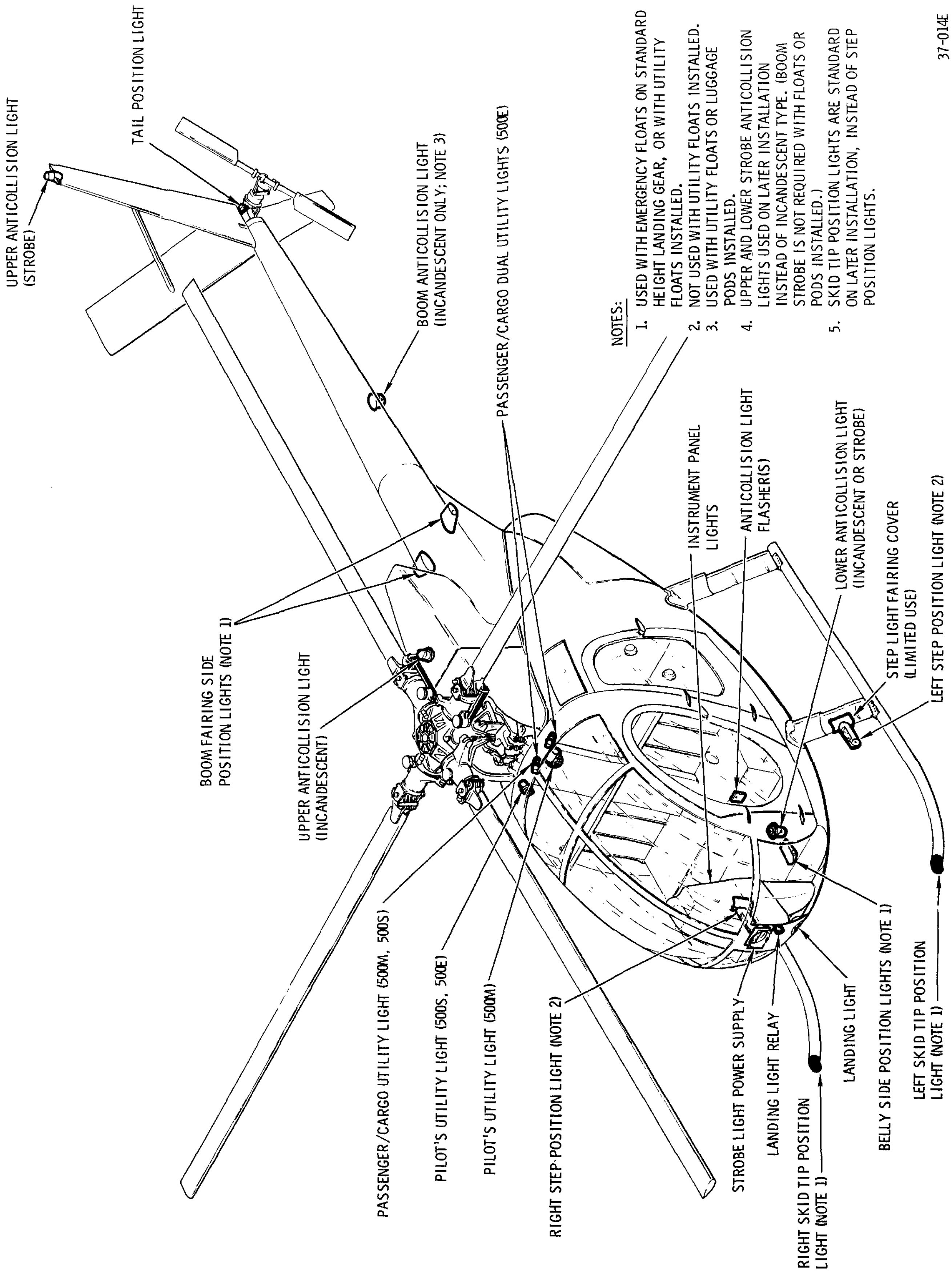
g. Magnetic Compass Lamp. Replace lamp by removing contact cover (fig. 4-4).

h. Utility Light Lamps. Replace lamp in socket mounted type by removing the snap ring that secures the lens to the lamp body. Replace lamp in panel-mounted type by pulling off nozzle assembly. (See fig. 4-5.)

4-6. REPLACEMENT OF CONTROL SWITCHES, WIRING, CONNECTORS, AND MAINTENANCE OF BONDING CONNECTORS. Accomplish maintenance on circuit wiring components according to instructions in the Basic HMI. Cover instrument panel switch and circuit breaker wire connections with electrical insulation sleeving (item 31, table 2-4, Basic HMI).

4-7. SIDE POSITION LIGHTS.

4-8. GENERAL. Two standard side position lights are installed at the forward tips of the landing gear skid tubes, on a current installation. On an early installation, side position lights are installed in the right and left landing gear entry steps on the landing gear forward struts. (See fig. 4-6.) The lens used on the right side is green and on the left side is red. On early configuration helicopters, the cabin entry step is part of the night lighting system. On current models the cabin entry step is standard equipment (Section 6, Basic HMI). Entry step lights are not used when utility floats are installed, or when emergency floats are installed on standard height landing gear. For either optional float configuration, four fuselage-mounted side position lights may alternately be used, with two on the fuselage underside and two on the tail boom. The fuselage-mounted lights are also part of alternate standard night lighting.



NOTES:

1. USED WITH EMERGENCY FLOATS ON STANDARD HEIGHT LANDING GEAR, OR WITH UTILITY FLOATS INSTALLED.
2. NOT USED WITH UTILITY FLOATS INSTALLED.
3. USED WITH UTILITY FLOATS OR LUGGAGE PODS INSTALLED.
4. UPPER AND LOWER STROBE ANTICOLLISION LIGHTS USED ON LATER INSTALLATION INSTEAD OF INCANDESCENT TYPE. (BOOM STROBE IS NOT REQUIRED WITH FLOATS OR PODS INSTALLED.)
5. SKID TIP POSITION LIGHTS ARE STANDARD ON LATER INSTALLATION, INSTEAD OF STEP POSITION LIGHTS.

Figure 4-1. Night lighting installation

Table 4-1. Troubleshooting the night lighting system

Symptom	Probable Trouble	Corrective Action
	EXTERIOR LIGHTING	
Landing light inoperative	Defective lamp or loose connections	Replace lamp or tighten connections.
	Defective landing light relay or loose connections	Replace relay or repair connections.
	Defective pilot's collective pitch landing light switch or cold solder connection	Replace switch or remove switch and resolder connection.
	Defective landing light circuit breaker	Replace circuit breaker.
All position lights inoperative	Defective position light circuit breaker	Replace circuit breaker.
Individual position lights	Lamp or wiring defective	Replace lamp or repair wiring.
Taillight inoperative (side position lights operative and taillight lamp not defective)	Disconnected or defective taillight wire pin connector in tailboom	Connect or replace pin connector.
Incandescent anticollision lights inoperative	Misconnected splices at flasher(s) or flasher ground defective	Check splices for proper connection. Check flasher ground for security and presence of corrosion.
	Defective anticollision light flasher(s)	Replace flasher.
	Defective lamp	Replace lamps.
	Defective switch-type circuit breaker	Replace switch-type circuit breaker.
One incandescent anticollision light inoperative (other light functions)	Defective lamp	Replace lamp.
	Disconnected or defective splice at flasher or anticollision light	Connect or replace splice.
	Defective anticollision light socket	Replace light socket.
	Defective ground wire connection	Restore ground contact at terminal.
	Defective anticollision light flasher (utility floats or luggage pods installed)	Replace flasher.
Strobe anticollision lights inoperative	Helicopter 28 Vdc power not supplied to strobe power supply unit	Check for defective switch-type circuit breaker and replace if required. Check input splices at strobe power supply unit and repair if required.

Table 4-1. Troubleshooting the night lighting system (cont)

Symptom	Probable Trouble	Corrective Action
	EXTERIOR LIGHTING (CONT)	
	Defective wiring	Perform continuity check. See wiring diagram (fig. 4-2). Observe WARNING note in paragraph 4-27.
	Defective strobe power supply unit	Substitute a strobe light assembly of known good quality (para 4-28) in either position. Replace power supply (para 4-35) if light does not operate. WARNING: If an attempt is made to check operating voltage, do so at wire splices without disconnecting the splices. Use caution when handling high voltages. See figure 4-2 for values.
One strobe anticollision light inoperative	Faulty strobe light assembly or power supply unit	Switch positions of connectors P556 and P557 on the power supply unit. Observe WARNING note in paragraph 4-26. If light still does not operate it is faulty. If light does operate but previously good one does not, the power supply is faulty. Replace as required.
	INTERIOR LIGHTING	
Utility light does not illuminate	Burned-out lamp	Replace lamp.
	Faulty utility light switch or rheostat	Replace light assembly or switch.
	Defective knife splice or ground connection	Repair connection; replace splice.
Edgelighted panel does not illuminate	Burned-out element or defective panel connector	Replace edgelighted panel or replace connector in instrument panel.
Instrument light does not illuminate	Burned-out lamp	Replace lamp.
All instrument and edgelighted panel lights do not illuminate	Faulty potentiometer control switch or dimmer assembly	Replace potentiometer or dimmer.

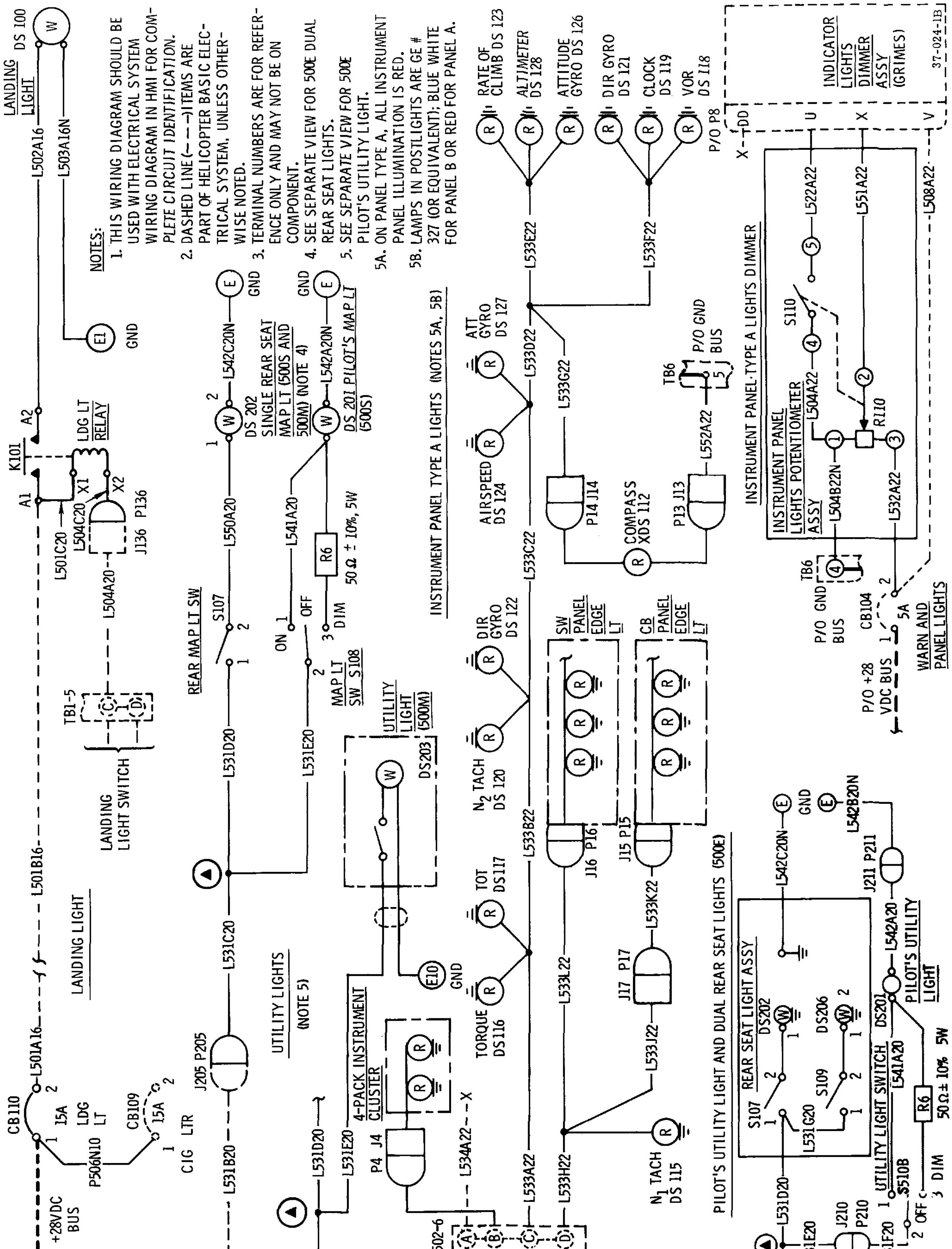


Figure 4-2. Night lighting system - wiring (sheet 1 of 4)

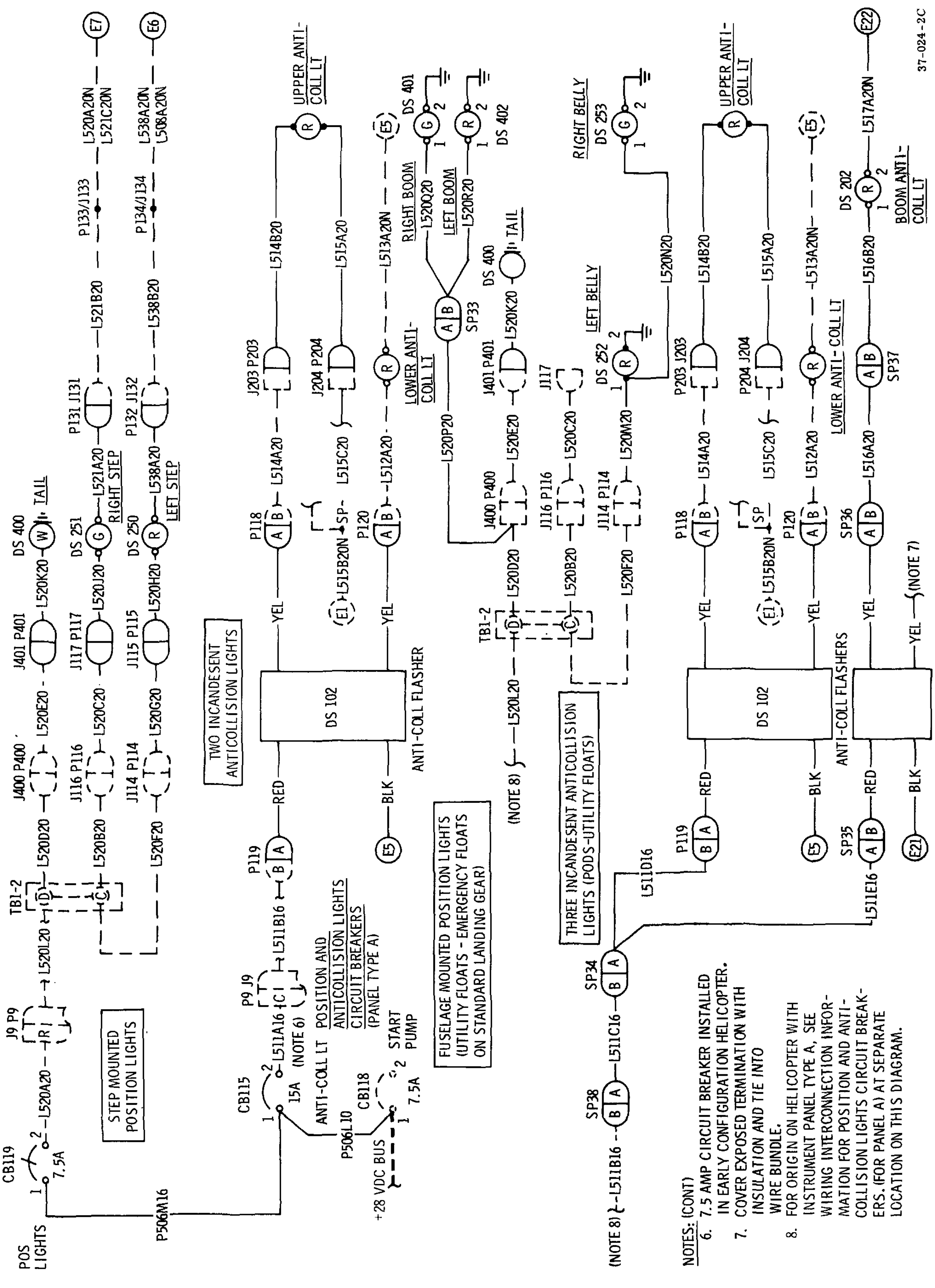


Figure 4-2. Night lighting system - wiring (sheet 2 of 4)

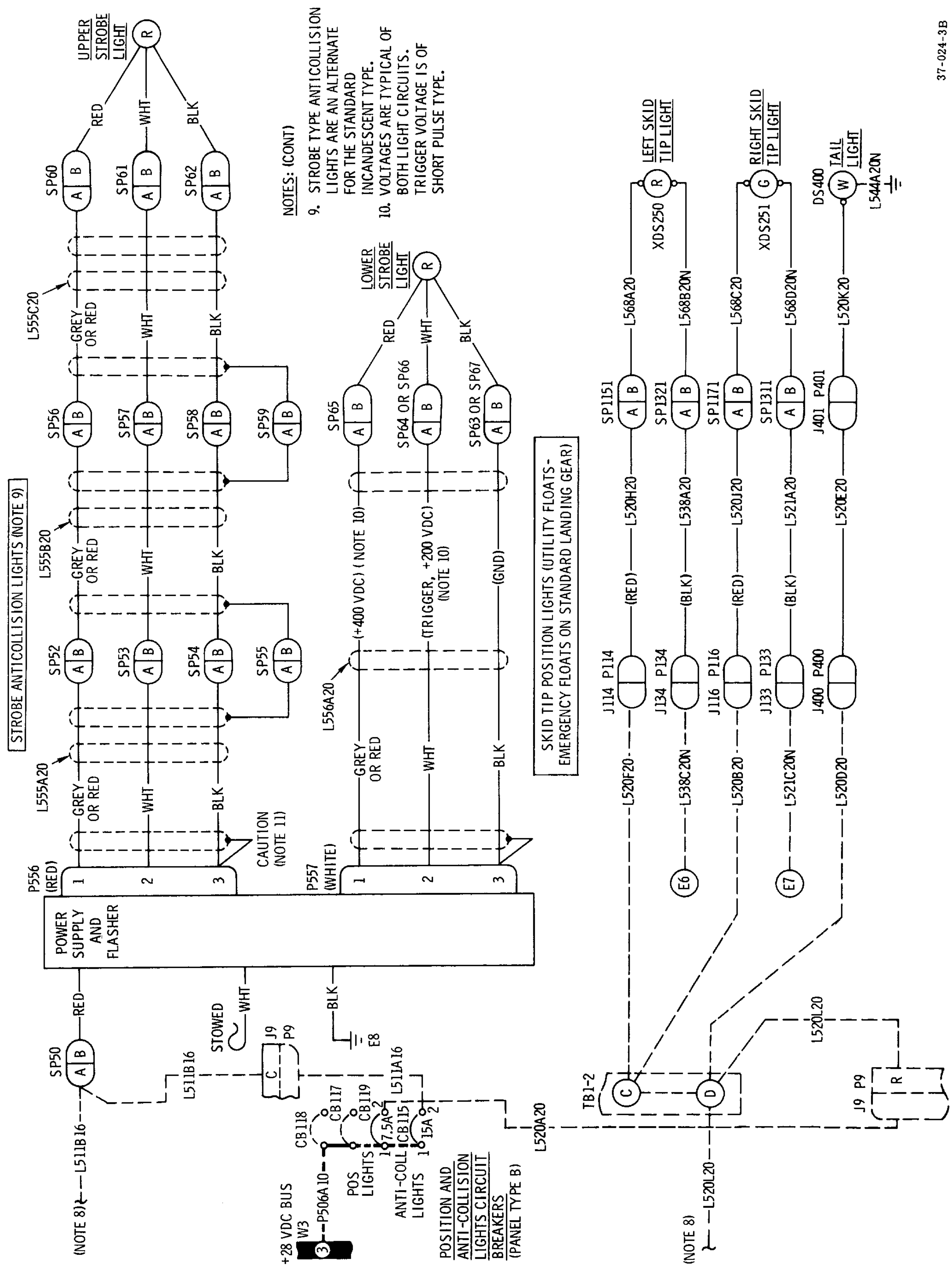
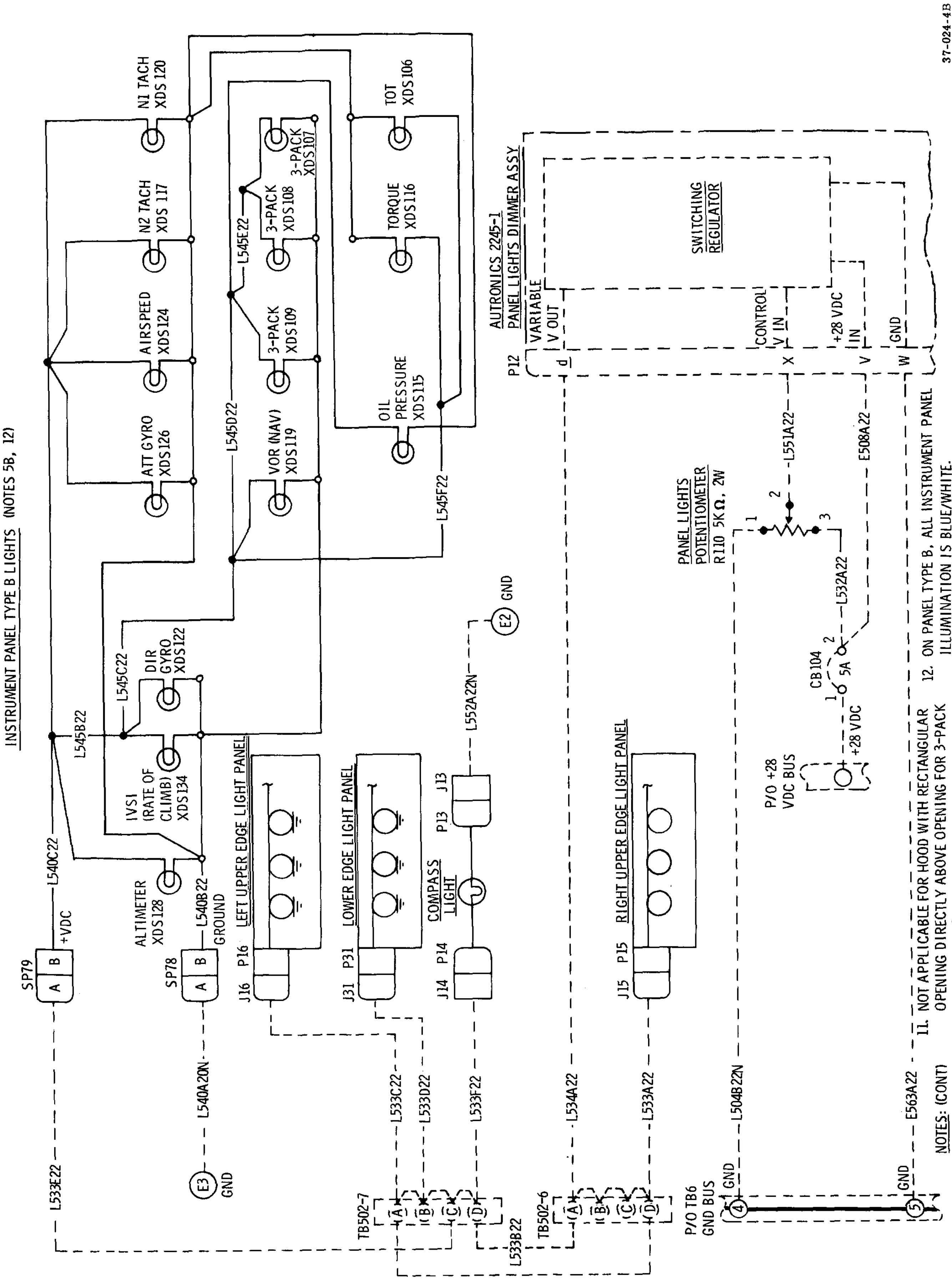


Figure 4-2. Night lighting system - wiring (sheet 3 of 4)



NOTES: (CONT)

11. NOT APPLICABLE FOR HOOD WITH RECTANGULAR OPENING DIRECTLY ABOVE OPENING FOR 3-PACK INSTRUMENT CLUSTER.

12. ON PANEL TYPE B, ALL INSTRUMENT PANEL ILLUMINATION IS BLUE/WHITE.

Figure 4-2. Night lighting system - wiring (sheet 4 of 4)

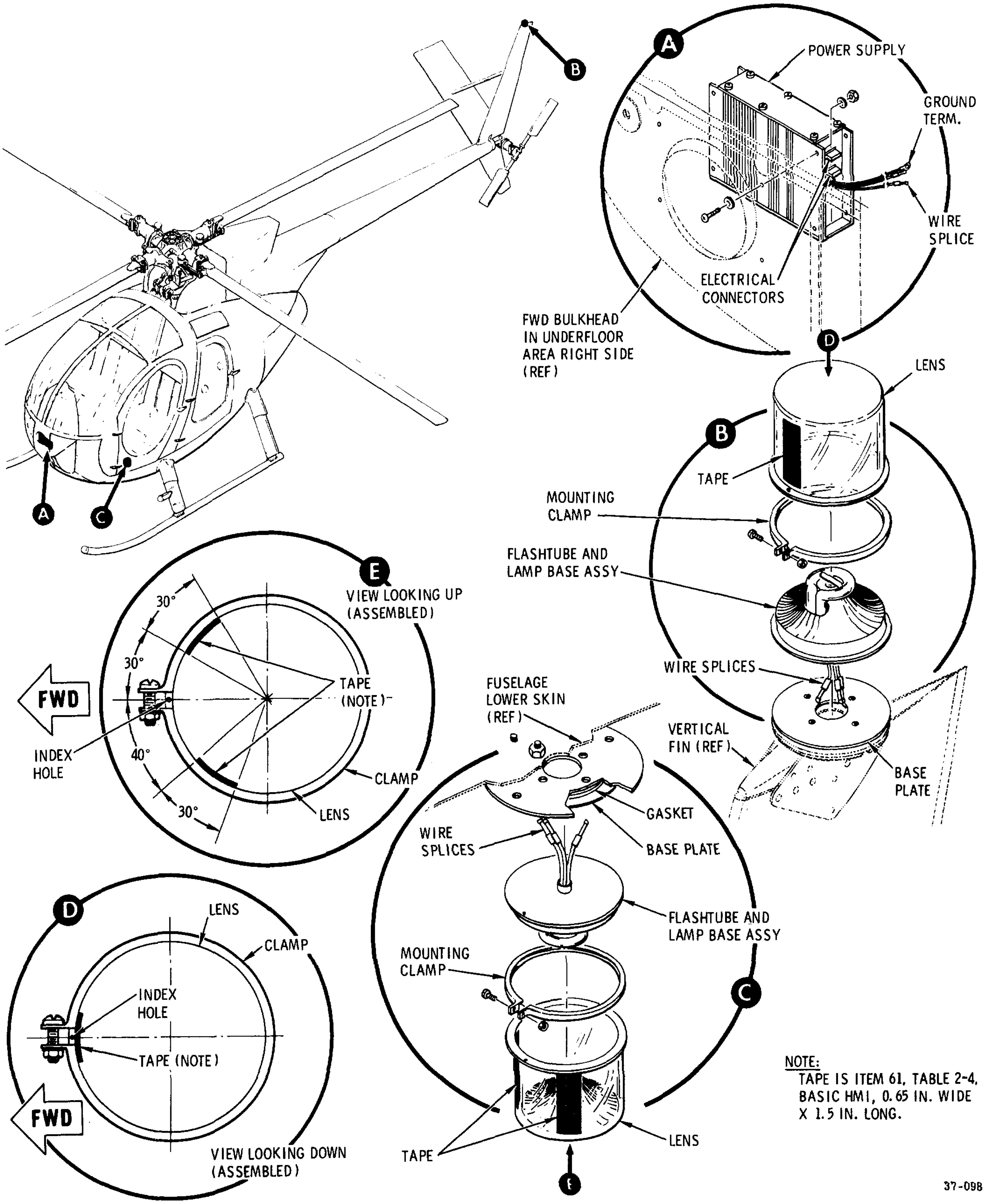
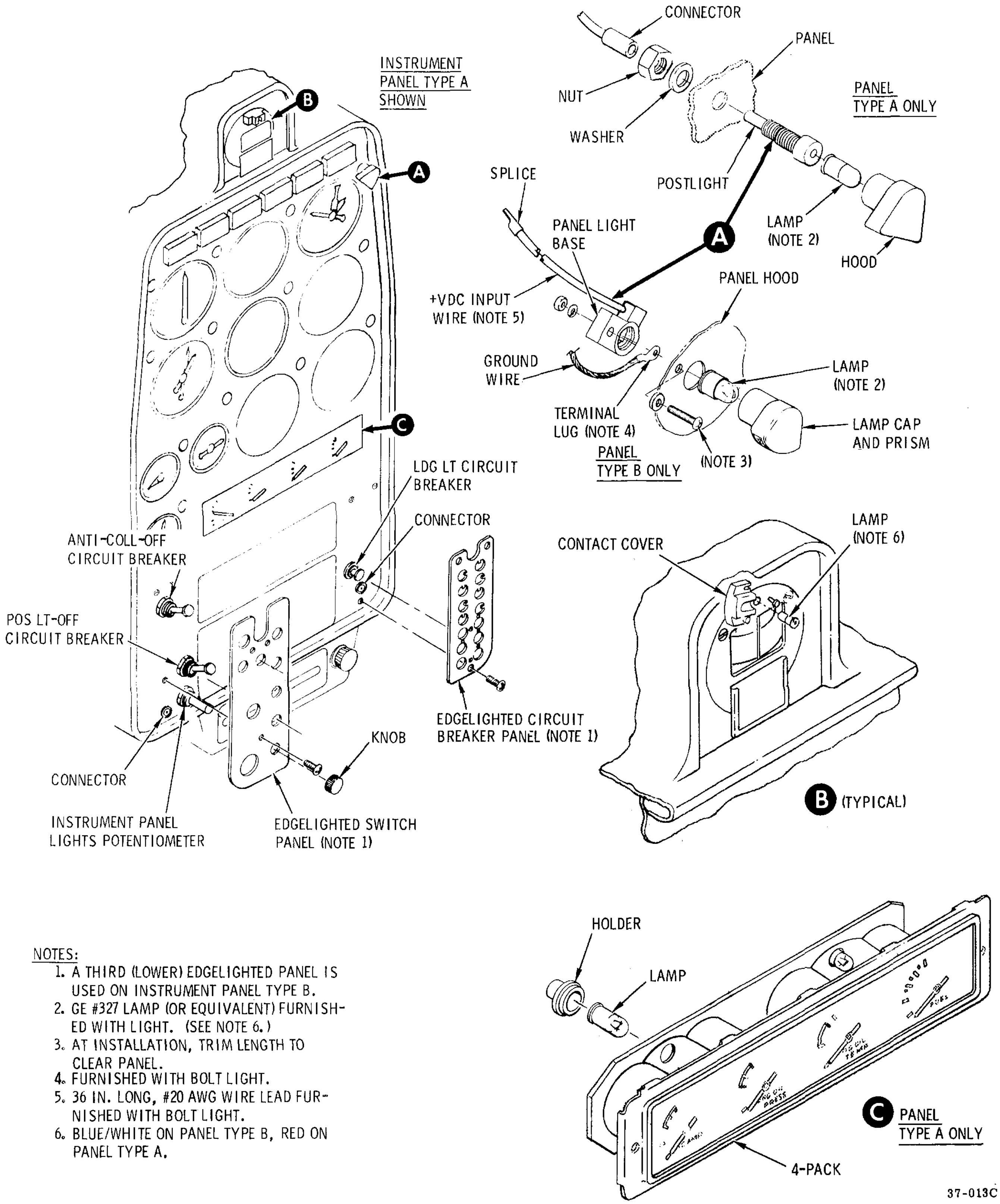


Figure 4-3. Replacement of strobe anticollision lights and power supply



NOTES:

1. A THIRD (LOWER) EDGELIGHTED PANEL IS USED ON INSTRUMENT PANEL TYPE B.
2. GE #327 LAMP (OR EQUIVALENT) FURNISHED WITH LIGHT. (SEE NOTE 6.)
3. AT INSTALLATION, TRIM LENGTH TO CLEAR PANEL.
4. FURNISHED WITH BOLT LIGHT.
5. 36 IN. LONG, #20 AWG WIRE LEAD FURNISHED WITH BOLT LIGHT.
6. BLUE/WHITE ON PANEL TYPE B, RED ON PANEL TYPE A.

Figure 4-4. Replacement of instrument panel lights

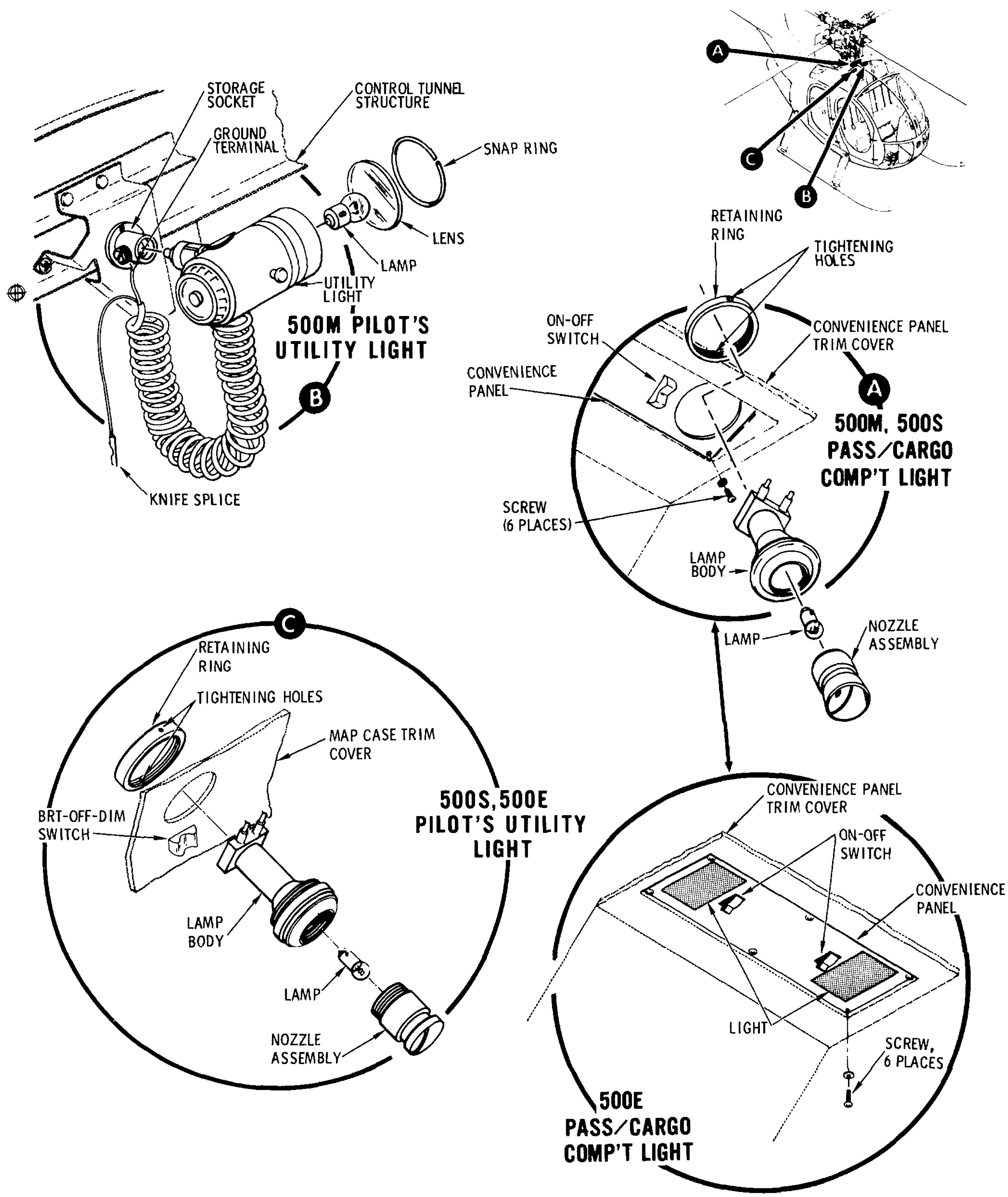


Figure 4-5. Replacement of utility lights

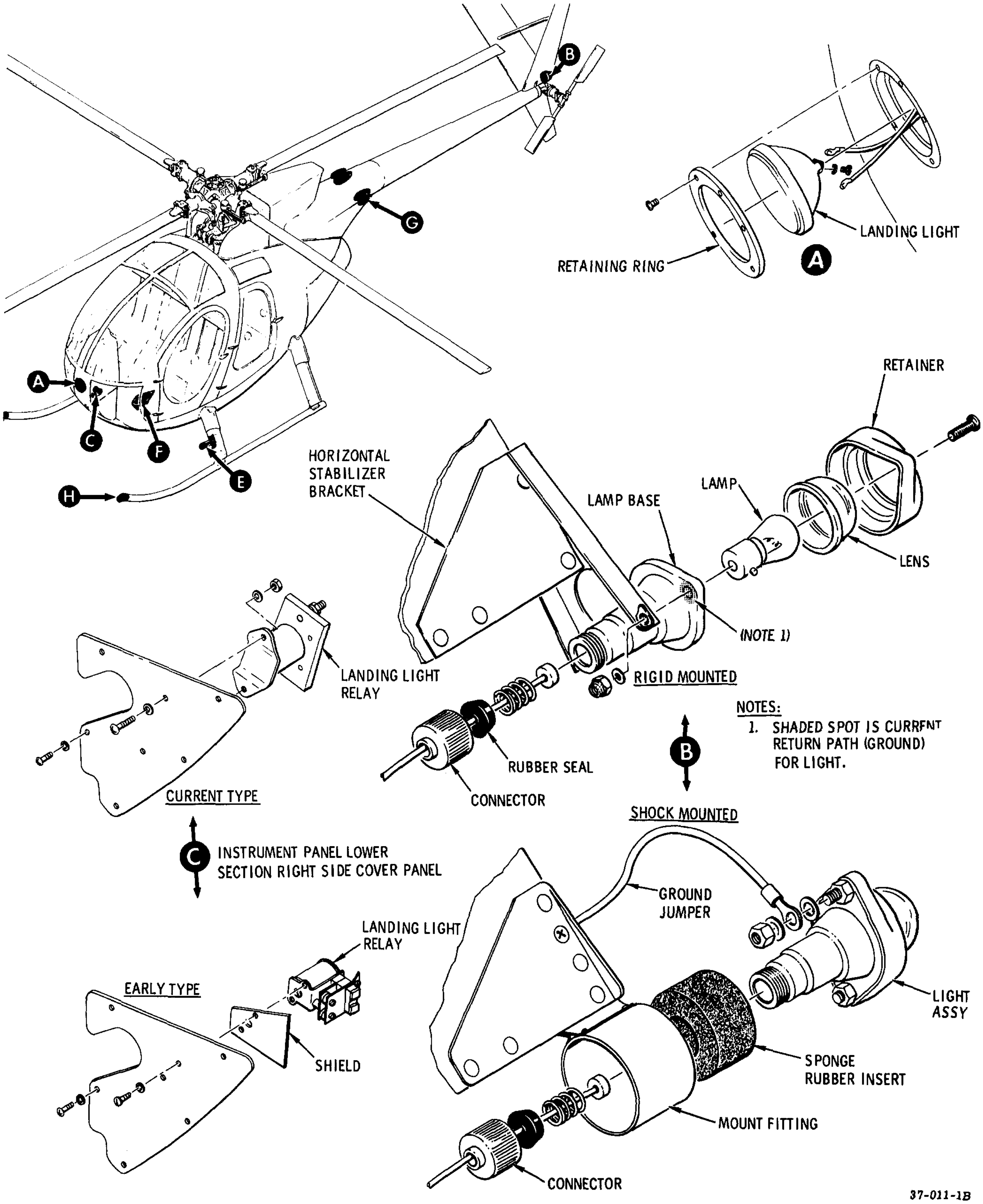


Figure 4-6. Replacement of position and landing lights (sheet 1 of 2)

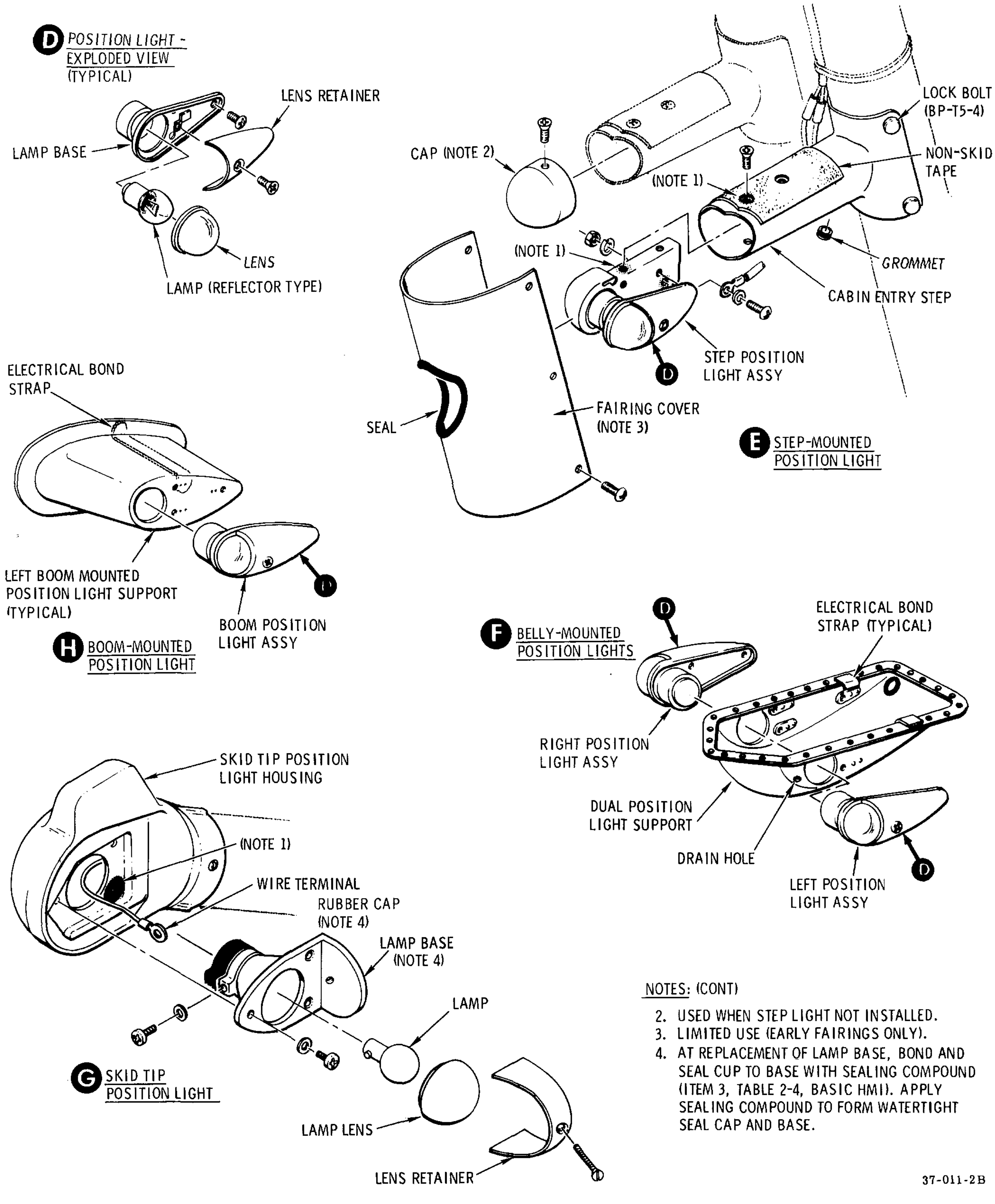


Figure 4-6. Replacement of position and landing lights (sheet 2 of 2)

NOTE: Rubber cap should be sealed to lamp base in skid-mounted position light to eliminate possibility of water damage. For information on sealing either a replacement or installed light, see figure 4-6.

4-9. REMOVAL OF STEP MOUNTED SIDE POSITION LIGHTS. (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. On early configuration helicopters, remove the fairing cover from the landing gear fairing assembly.

NOTE: Fairing cover is not used on current configuration helicopters.

c. Disconnect the Wire-Mate locking type pin connectors, using appropriate connector insertion/extraction tool (item 42 or 43, table 2-2, Basic HMI). Refer to Section 19, Basic HMI for use of tool.

d. Remove the four position light mounting (fairing) assembly screws to release the position light and mounting assembly. Push electrical wiring slack through support/step grommet.

e. Remove position light assembly (para 4-12).

f. Remove ground wire.

4-10. INSPECTION OF STEP MOUNTED SIDE POSITION LIGHT MOUNTING ASSEMBLY.

a. Inspect mounting cover and cover seal for serviceable condition, cracks and security.

b. Inspect cabin entry step as specified in Section 6, Basic HMI.

4-11. INSTALLATION OF STEP MOUNTED SIDE POSITION LIGHTS. (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. Install grounding wire to mounting assembly; check that bond surfaces are maintained according to the Basic HMI.

c. Install position light assembly (para 4-12).

d. Push electrical wire slack through step/support grommet and secure position light and fairing with four screws.

e. Connect splices and check operation of position light.

f. Install fairing cover on landing gear fairing assembly (early configuration helicopters only).

4-12. REPLACEMENT OF POSITION LIGHTS. (See fig. 4-6.)

NOTE: On helicopters with step mounted position lights, remove the side position light mounting base (para 4-9).

a. Remove retaining screw, lens retainer and lens from lamp base.

b. Push in slightly and turn lamp to remove lamp from socket.

c. Remove the three screws that attach lamp base to mounting assembly or support and release lamp base.

NOTE: Belly mounted and boom mounted position lights are attached to non-conductive polycarbonate supports. An electrical bonding strap is an integral part of each support. Electrical ground for the lights is provided by strap attachment to structure and one of the lamp base attachment screw nut plates.

d. Disconnect electrical connector or electrical wire terminal from lamp base.

e. Install replacement light assembly in essentially the reverse of the procedure above and as shown on figure 4-6.

4-13. INSPECTION OF POSITION LIGHTS.

a. Inspect light assembly for security and serviceable condition.

b. Replace defective lamp or lens.

4-14. TAIL POSITION LIGHT.

4-15. GENERAL. The tail position light (fig. 4-6), mounted on a bracket at the lower aft corner of the horizontal stabilizer, may be rigidly mounted or shock mounted. Electrical connection is made to wiring routed internally through the boom. Light operation is simultaneous with the side position lights.

4-16. REPLACEMENT OF TAIL POSITION LIGHT (RIGID MOUNTED). (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. Remove electrical connector.

c. Remove two retaining screws, washers and nuts that secure base to bracket; remove base, lens and retainer.

d. Position replacement lamp base, lens and retainer and secure with screws, washers and nuts. Check that bond surfaces are maintained according to the Basic HMI.

e. Install electrical connector.

4-17. REPLACEMENT OF TAIL POSITION LIGHT (SHOCK MOUNTED). (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. Remove electrical connector.

c. Remove nut and washers from light retaining screw and then remove ground lead.

d. Pull light assembly aft while cutting it free of sponge rubber mount.

e. Use a scraper and naphtha (item 58, table 2-4, Basic HMI) to remove all sponge rubber from the mount fitting and light assembly.

f. Apply a coat of cement (item 68, table 2-4, Basic HMI) to the mating surfaces of the replacement sponge rubber insert, the light assembly and the mount fitting. Allow cement to air-dry for approximately 15 minutes; then apply a second coat and assemble the light and sponge rubber insert in the mount while cement is wet. Wipe off excess cement and allow curing time of approximately 4 hours.

g. Connect ground lead to retainer screw with nut and washers.

h. Install electrical connector.

4-18. LANDING LIGHT.

4-19. GENERAL. The landing light (fig. 4-6) is a flush-mounted, clear glass sealed-beam lamp. It is recessed in a lower canopy panel housing that protects the screw terminal base and back of the lamp. It is retained in the housing by a ring secured to the canopy panel. Power from the landing light circuit breaker is connected to a relay that is controlled by the switch on the pilot's collective pitch stick.

CAUTION: Do not allow landing light to be illuminated for more than 1 minute while the helicopter is on the ground; the lamp will overheat and can burn out.

4-20. REPLACEMENT OF LANDING LIGHT. (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. Remove five retaining screws that secure retaining ring and remove ring.

c. Withdraw lamp from housing far enough to disconnect wiring from filament terminals and remove lamp.

d. Connect wiring to the replacement lamp.

e. Position lamp in housing with locating lug in detent.

f. Install retaining ring with five screws.

4-21. LANDING LIGHT RELAY.

4-22. GENERAL. The landing light relay is mounted on the inside of the lower instrument panel support right side cover panel. The relay is a single-pole, single-throw, normally open, double-break, non-sealed unit. (See fig. 4-6.)

4-23. REPLACEMENT OF LANDING LIGHT RELAY. (See fig. 4-6.)

a. Check that all electrical power is OFF.

b. Remove cover panel from lower right instrument panel support. Loosen terminal screws and disconnect wiring from relay.

NOTE: Tag-identify wiring to aid reinstallation.

c. Remove screws and washers that secure relay to cover panel and remove relay.

d. Install replacement relay with two screws and washers.

e. Connect electrical wiring and remove identifying tags, if used.

f. Check operation of landing light and reinstall cover panel.

4-24. ANTICOLLISION LIGHTS (INCANDESCENT)

4-25. GENERAL. Incandescent anticollision lights (fig. 4-7) are located on the engine air inlet fairing and lower fuselage skin. With utility floats or luggage pods installed, an additional anticollision light is shock mounted to a support located on the tailboom underside at canted station 223.00. Each light consists of a double-contact, bayonet-base lamp, mounting plate, socket, red lens and split ring retainer. The red lens and mounting plate are separated by a gasket that provides a weather seal when the split ring retainer is tightened in place. On the two-light configuration, power from a single anticollision light flasher is connected to both anticollision lights through wiring splices. On the three-light configuration, a second flasher controls power to the tailboom anticollision light. The flashers have a flashing rate of 40 to 65 flashes per minute.

4-26. ANTICOLLISION LIGHTS (STROBE).

4-27. GENERAL. Strobe type anticollision lights (fig. 4-3) are used on later installations instead of the two-light incandescent configuration described in paragraph 4-24 above. (Note that a third strobe is not required with utility floats or luggage pods installed.) One strobe light is belly mounted and the other is mounted on the top of the upper vertical stabilizer. The flashtube in each light is a circular type that is imbedded in potting compound in the lamp base. The lamp base also includes a trigger coil (transformer) and the lower half of a spool shaped reflector. This entire assembly must be replaced as a unit when faulty. Each light assembly includes a red plastic lens and the upper half of the spool shaped reflector. The lens is equipped with strip(s) of aluminum backed tape to prevent flash reflections on the pilot's canopy.

NOTE: Upper and lower strobe light lenses are not interchangeable unless the tape(s) on the inner surface of each lens are repositioned as shown in figure 4-3.

The power supply and flashing rate control for the strobe anticollision lights are provided by a single unit mounted in the forward right underfloor compartment.

WARNING: High voltages are present in the circuits between the power supply and the strobe lights. Be sure that the circuit is turned OFF for a minimum of 10 minutes before performing any maintenance that requires disconnection of wiring or disassembly of any component. The waiting period allows stored electrical charge to bleed off through a resistor incorporated in the power supply circuit for that purpose.

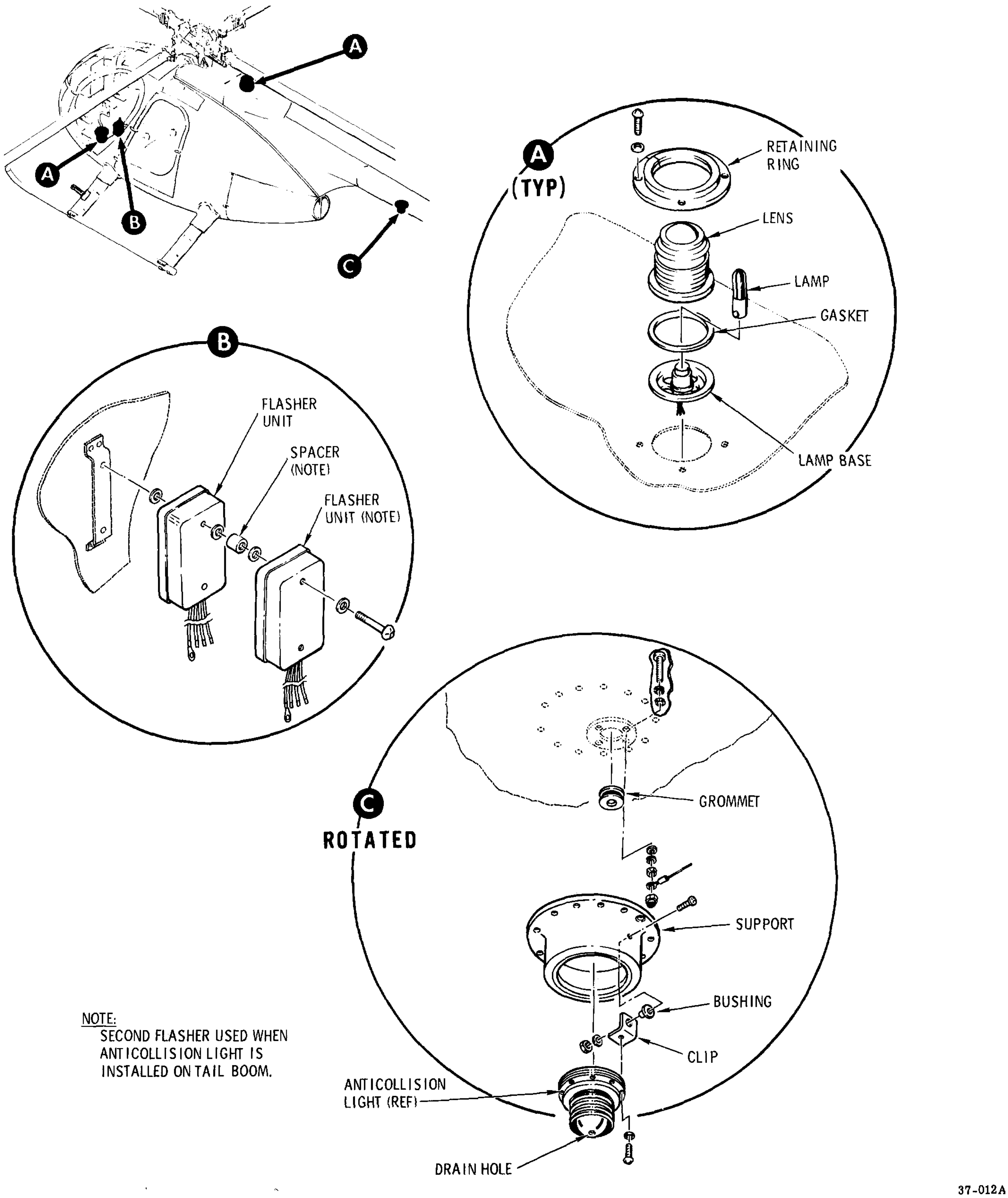


Figure 4-7. Replacement of incandescent anticollision lights and flashers

4-28. REPLACEMENT OF INCANDESCENT ANTICOLLISION LIGHTS. (See fig. 4-6.)

a. Check that all electrical power is OFF.

NOTE: Any time maintenance work is being performed near the engine air inlet, use care to prevent entry of foreign objects that could be sucked into the engine.

b. Remove screws that secure light assembly split ring to structure.

c. Remove ring, lens, gasket and mounting plate with assembled socket.

d. Disconnect wiring from lamp socket.

e. Disassemble socket from mounting plate by removing hex nut that secures socket to plate.

f. Connect electrical wiring to replacement lamp socket.

g. Assemble lamp socket to mounting plate with hex nut.

h. Position mounting plate, gasket, lens and split ring retainer on structure and secure with four screws and washers.

4-29. REPLACEMENT OF STROBE ANTICOLLISION LIGHTS. (See fig. 4-3.)

a. Check that all electrical power is OFF.

WARNING: High voltage is involved in the circuit between the lights and the power supply. The circuit must be OFF for at least 10 minutes to allow voltage bleed-off prior to disconnecting wiring or disassembling the unit in anyway.

b. Disconnect wiring splices near the light.

c. Remove clamp and remove light assembly.

d. Remove and retain red lens.

e. Assemble lens and replacement flashtube base assembly.

NOTE: If the lens is also replaced, be sure that antiglare tape is installed in the position shown in figure 4-3.

f. Position lamp assembly on base plate with wiring routed through base plate and in proper position for connection. Be sure that index hole is forward and lens is properly positioned. Install and tighten clamp.

g. Connect wire splices in accordance with color codes shown on wiring diagram, figure 4-2.

CAUTION: Reversed polarity connections can cause damage and failure of the strobe light circuit components.

h. Connect electrical power and check operation of the strobe anticollision lights.

4-30. REPLACEMENT OF TAILBOOM ANTI-COLLISION LIGHT SHOCK MOUNT BUSHINGS. (See fig. 4-7.)

a. Remove the anticollision light (para 4-28).

b. Remove the nut, washer, attaching clip and screw from the light housing.

c. Install replacement bushing and assemble as shown in figure 4-7.

d. Install anticollision light (para 4-28).

4-31. INCANDESCENT ANTICOLLISION LIGHT FLASHER.

4-32. GENERAL. The standard static state anti-collision light flasher (fig. 4-7) is located within the pilot's compartment seat structure at the left side. A second flasher is installed at the same location with utility floats or luggage pods to energize an additional anticollision light. The flasher energizes the anticollision lights at a continuous rate of 40 to 65 flashes per minute. The flasher operates continuously once the switch-type circuit breaker is on.

4-33. STROBE ANTICOLLISION LIGHT POWER SUPPLY.

4-34. GENERAL. The strobe anticollision light power supply is a static state type unit that is mounted on the aft side of the forward bulkhead in the right under-floor area in the pilot's compartment (fig. 4-3). This unit converts the 28 Vdc input to the pulsating high voltage output required for strobe operation and controls the flashing rate at 90 flashes (alternating) per minute. The unit receives 28 Vdc power through the ANTI-COLL switch/circuit breaker on the instrument panel.

4-35. REPLACEMENT OF INCANDESCENT ANTICOLLISION LIGHT FLASHER. (See fig. 4-7.)

a. Check that all electrical power is OFF.

b. Remove the left foot support fairing.

c. Disconnect splices in wiring to flasher and disconnect flasher ground lead. Tag-identify leads, if necessary, to aid reconnection.

d. Replace flasher on single flasher installation by removing two screws and washers that secure flasher to the seat structure and lift out the flasher.

e. Replace flasher on dual flasher installation by removing two screws, washers and spacers. Assemble units before replacement.

f. Install the flasher ground lead. Check that bond surfaces are maintained according to the Basic HMI.

g. Connect wiring splices and remove identifying tags, if used.

4-36. REPLACEMENT OF STROBE ANTICOLLISION LIGHT POWER SUPPLY. (See fig. 4-3.)

a. Check that all electrical power is OFF.

b. Open the access door in the right side floor of the pilot's compartment.

WARNING: High voltage is involved in the circuit between the power supply and the strobe lights. The circuit must be OFF for at least 10 minutes to allow voltage bleed-off prior to disconnecting wiring or disassembling the unit in any way.

c. Disconnect electrical plugs P556 and P557, splice SP50, and ground connection E8.

d. Remove four screws, washers and nuts attaching power supply to bulkhead and remove power supply unit.

e. Place replacement power supply in position and secure with four screws, washers and nuts.

f. Connect electrical connectors P556 and P557, power lead splice SP50, and ground lead E8.

CAUTION: Reversed polarity connections can cause damage to this equipment. Use wiring diagram, figure 4-2, to determine proper connections.

g. Close floor access door and check strobe anticollision light operation.

4-37. INSTRUMENT PANEL LIGHTS.

4-38. GENERAL. (See fig. 4-4.) Instrument indicator and panel lights provided for instrument panel types A and B are as follows. Illumination is blue/white on panel type B and red on panel type A. Individual instruments and indicators are lighted by postlights on the face of the hood on panel type B and on the face of panel type A. The three-pack instrument cluster on panel type B is illuminated by three postlights. On panel type A, the four-pack instrument cluster is internally illuminated. Both instrument panels have an internally illuminated magnetic compass. Panel type A has two edgelighted switch and circuit breaker panels while panel type B has three. The edgelighted panels have lighting elements imbedded in the plastic covers to illuminate the panel openings and markings for controls. Failure of an imbedded lighting circuit requires replacement of the plastic panel. Power to all instrument lights is supplied through the warning and panel lights circuit breaker and controlled by a switch potentiometer. Refer to the Basic HMI, Section 17 for additional information concerning instrument panel types A and B.

4-39. REPLACEMENT OF INSTRUMENT PANEL POSTLIGHTS. Instrument panel type A postlights are attached directly to the metal face of the panel. Replacement is illustrated on figure 4-4. Instrument panel type B postlights are attached to the face of the hood. Replacement is as follows.

a. Remove instrument panel hood by disconnecting instrument light wire splices and removing screws attaching hood to panel. Refer to the Basic HMI, Section 17 for additional information.

b. Remove screw, nut and lockwasher attaching light assembly and ground terminal to hood (fig. 4-4).

c. Disconnect pigtail wire on light assembly at the first nearby splice inside hood. Remove light assembly.

d. Install replacement light in essentially the reverse of procedure above.

4-40. REPLACEMENT OF EDGELIGHTED CIRCUIT BREAKER AND SWITCH PANELS. (See fig. 4-4.)

a. Check that all electrical power is OFF.

b. On the left switch panel, loosen setscrew in panel light brightness control knob and remove the knob.

c Remove attaching screws to release panel.

d. Position replacement panel and make sure that the plastic panel and instrument panel electrical connectors mate; press panel flush to engage connector and secure with screws.

e. On the left switch panel, install panel light brightness control knob and tighten the setscrew.

4-41. PILOT'S UTILITY LIGHT.

4-42. GENERAL.

a. 500M. The pilot's utility light (fig. 4-5) on the 500M consists of an adjustable lamp fixture, a power switch-rheostat, and a coiled extension cord. Rotation of the front section selects white spot, white flood, red flood or red spot. The color setting cannot be changed accidentally as the lock button on the side of the fixture must be depressed simultaneously while turning the front section. The switch-rheostat has an override pushbutton that provides full lamp output regardless of the knob setting. The light fixture is normally stowed in a socket mounted on the right side of the canted bulkhead control tunnel. An alternate stowage socket is located on the left side of the tunnel. The utility light circuit is protected by the engine out circuit breaker.

b. 500S, 500E. The pilot's utility light (fig. 4-5) on the 500S and 500E consists of an adjustable light fixture, mounted beside the upper canted frame on the mast support, and a three-way switch with off, dim and bright positions for controlling the light. Rotation of the light nozzle selects red or white light. The pilot's utility light circuit is protected by the engine out circuit breaker.

4-43. REPLACEMENT OF PILOT'S UTILITY LIGHT. (See fig. 4-5.)

a. 500M. Replace the pilot's utility light on the 500M as follows.

(1) Check that all electrical power is OFF.

(2) Separate the splice in cord power lead and disconnect ground lug from socket flange by loosening mounting screw.

(3) Remove utility light by using direct pull away from socket. (If overtightened, loosen socket setscrew to remove utility light fixture from stowage socket.)

(4) Insert replacement utility light fixture in its stowage socket. (Tighten setscrew if necessary to increase socket friction.)

(5) Secure and insulate extension cord splice connection. Install ground lug of coiled cord on stowage socket flange with flange mounting screw.

b. 500S, 500E. Replace the pilot's utility light on the 500S and 500E as follows.

(1) Check that all electrical power is OFF.

(2) Remove convenience panel attach screws.

(3) Lower panel sufficiently to gain access to back of panel; disconnect utility light wiring.

(4) Remove the light housing retaining nut.

NOTE: Suitable rods may be inserted in the two diametrically opposite 0.093-inch tightening holes to loosen the nut.

(5) Remove light housing from panel.

(6) Insert replacement utility light housing through face of convenience panel and install retaining nut. (Refer to NOTE above for final tightening.)

(7) Connect wiring to light terminals.

(8) Reposition convenience panel and install attaching screws.

4-44. PASSENGER/CARGO COMPARTMENT UTILITY LIGHTS.

4-45. GENERAL. The passenger/cargo compartment is equipped with utility lights as follows:

a. 500M, 500S. A utility light (fig. 4-5) with an adjustable light fixture is provided in the left side of the passenger/cargo compartment convenience panel located above the compartment forward bulkhead. A panel-mounted switch with off and on positions controls the light. The utility light circuit is protected by the engine out circuit breaker.

b. 500E. Two utility lights (fig. 4-5) are located on the passenger/cargo compartment convenience panel located above the compartment forward bulkhead. Two panel-mounted switches with off and on positions control operation of the lights. The utility lights circuit is protected by the engine out circuit breaker.

4-46. REPLACEMENT OF PASSENGER/CARGO COMPARTMENT UTILITY LIGHTS (500M, 500S, 500E). (See fig. 4-5.) The passenger/cargo compartment light is replaced the same way as the pilot's utility light (para 4-43).

4-47. SEARCHLIGHT.

4-48. GENERAL. (See fig. 4-8.) The searchlight is a dual, incandescent, sealed beam type that is mounted in the floor at the right side of the pilot's compartment. The light is manually extended during flight to clear the landing gear skids or floats and may be rotated and tilted as required. Manual locks are incorporated in the searchlight control column to lock the light in retracted and stowed position when not in use and prior to landing. A switch, operated by the lock, actuates a warning light on the instrument panel whenever the searchlight is not retracted. Other controls are power and control circuit breakers on the instrument panel and an ON-OFF switch at the top of the searchlight control column.

4-49. REMOVAL OF SEARCHLIGHT. (See fig. 4-8.)

a. Remove access panel in floor just aft of searchlight column.

b. Locate searchlight wiring and disconnect at the following points shown on wiring diagram (fig. 4-8); splices SP66 and SP67, ground connections at E27, and connections at relays K302 and K303.

c. Remove wiring clamp block and seal in bottom of fuselage (fig. 4-8) and slide out exterior wire cable.

d. Remove bolts in searchlight control column bearing blocks, one in the bottom of the fuselage and one on the floorline. Note that the upper bearing block will remain attached to the control column.

e. Hoist or jack up the helicopter until skids are approximately 2 feet off the ground.

f. Pull the extend/retract slide lock and lower slightly for access to the setscrew attaching the lock to the top of the inner telescoping tube.

CAUTION: Have an assistant hold the searchlight to prevent its falling to the ground when slidelock is removed. Also use care to retain the lockpin which is under spring tension.

g. Loosen slidelock setscrew, remove slidelock housing, spring and lockpin.

h. Lower the searchlight with inner telescoping tube and raise the interior control column until the two assemblies are completely disengaged.

i. Remove searchlight components. Lower helicopter to the ground. Install plug buttons in holes in helicopter floor and lower skin if required.

4-50. INSTALLATION OF SEARCHLIGHT.

a. Place upper section of searchlight control column with bearing blocks in position but do not install bolts at this time.

b. Hoist or jack up the helicopter far enough to insert the lower telescoping tube with searchlight

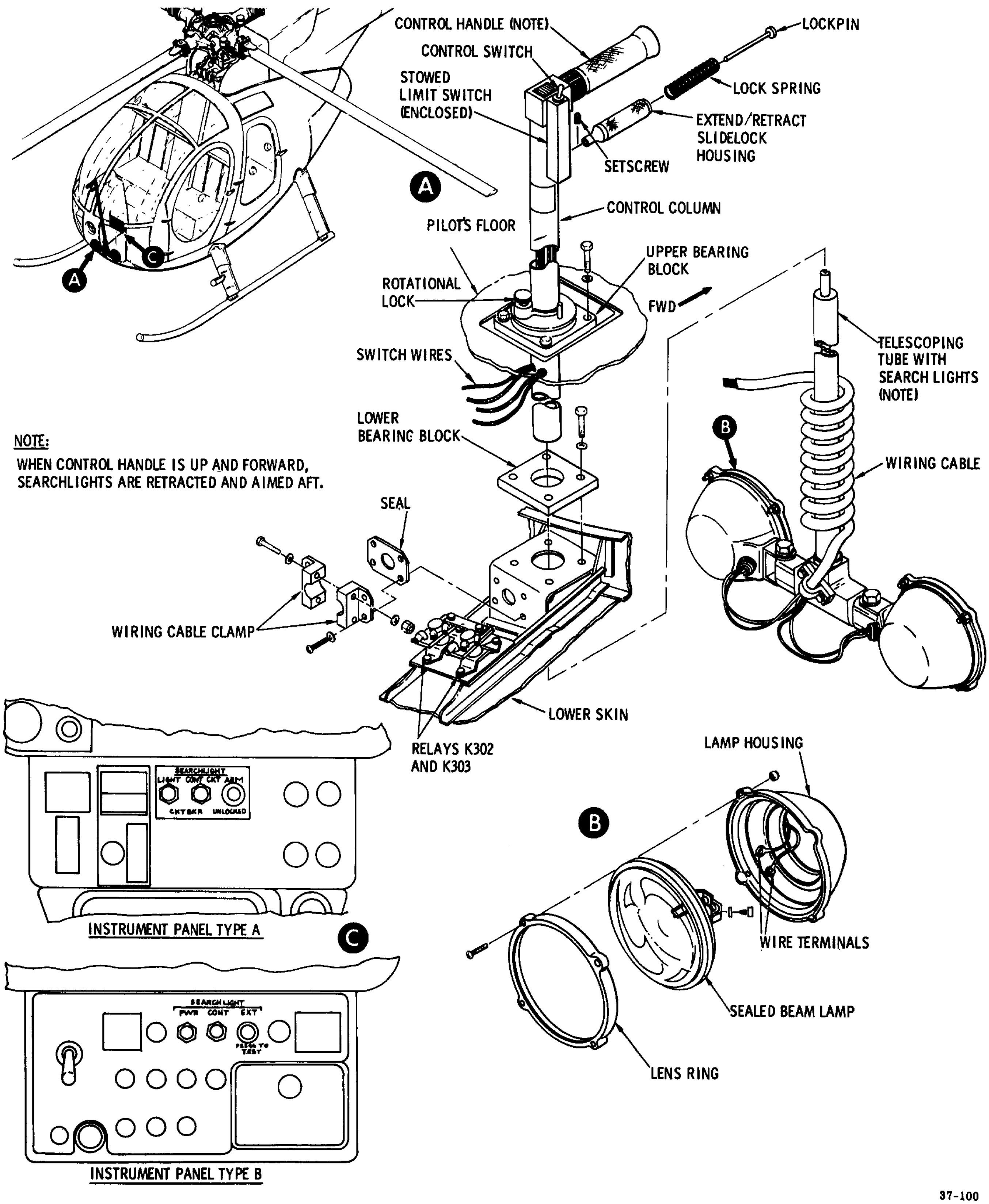


Figure 4-8. Searchlight installation

into the end of the upper column. The upper column may be raised to the edge of the belly skin so that the helicopter need not be hoisted to an excessive height.

c. Engage the upper and lower sections by turning the twist grip until the single key and keyway mate. Hold the searchlight in assembled position while lowering the helicopter to the ground.

d. Rotate upper bearing block so that rotational lock slot is aft. Install and tighten bolts in both the upper and the lower bearing blocks.

e. Assemble slidelock housing, spring and pin. Compress spring by inserting a suitable tool in end of housing and clamping it to hold the spring compressed and lockpin protruding from housing.

f. Insert the end of lockpin in slot in searchlight column and into hole in the top of the inner telescoping tube. Tighten setscrew in the top of the inner tube to secure the lockpin. Remove tools used to hold slidelock spring in compression.

g. Check mechanical operation of the searchlight; extend, retract, rotation, tilt and stow. Lubricate telescoping parts lightly with oil (item 35, table 2-4, Basic HMI) if excessive friction is evident.

h. Check that searchlight cable is properly wrapped around column and then route cable through hole in lower bearing block structure.

i. Install seal and wiring clamp block on lower structure to retain wiring cable.

j. Connect wiring at splices SP66, SP67, relays K302 and K303, and at ground terminal E27 according to wiring diagram (fig. 4-9).

CAUTION: When operating the searchlight for ground check, do not allow the light beam to impinge on floats (if installed) and do not allow light to remain on longer than necessary to verify operation.

k. Connect external electrical power and check that the warning light on the instrument panel operates when the searchlight is not in the retracted and stowed position. Aim searchlight downward and switch ON momentarily to check operation of both lamps.

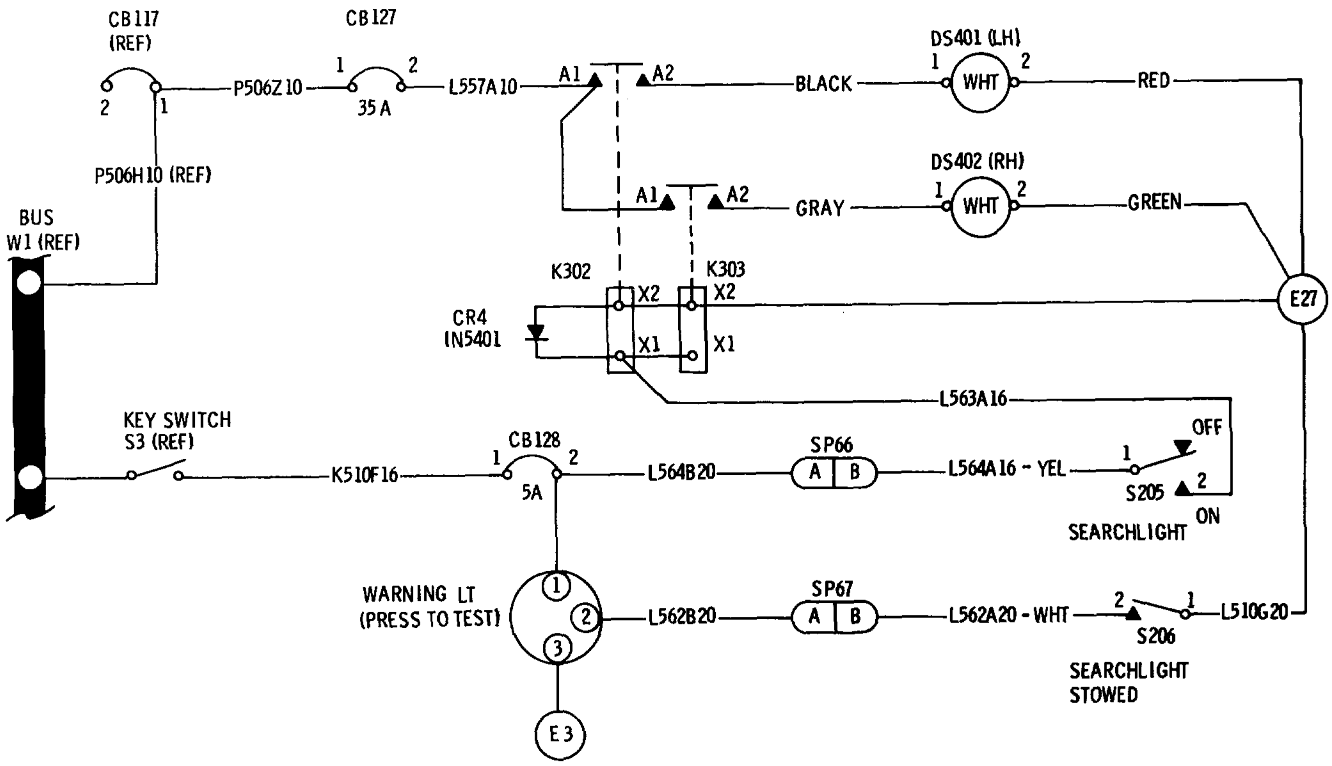
4-51. REPLACEMENT OF SEARCHLIGHT LAMPS. (See fig. 4-8.)

a. Remove four screws from lens ring and remove ring.

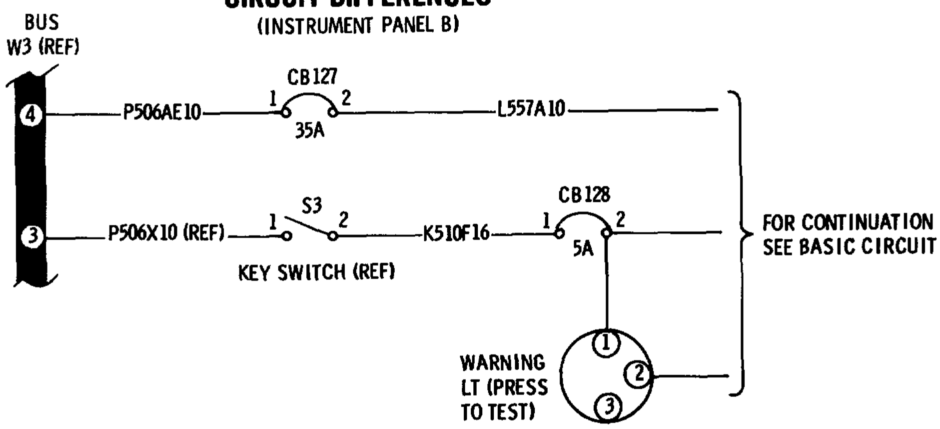
b. Lift sealed beam lamp from housing and remove screws from wire terminals at back of lamp. Remove lamp.

c. Install replacement lamp in reverse of removal procedure above.

BASIC CIRCUIT
(INSTRUMENT PANEL A)



CIRCUIT DIFFERENCES
(INSTRUMENT PANEL B)



NOTE:
ITEMS INDICATED AS (REF) ARE PART OF THE BASIC HELICOPTER ELECTRICAL SYSTEM.

37-101

Figure 4-9. Searchlight wiring diagram

OPTION GROUP 5
FLIGHT CONTROL EQUIPMENT

5-1. DUAL CONTROLS (RIGHT POSITION).

5-2. GENERAL. The dual controls installation equips the helicopter with flight controls for the copilot's seat (right position). (See figure 5-1.) The dual controls are essentially the same as those provided for the pilot (left position) except that the longitudinal and lateral cyclic friction controls are not duplicated, collective friction is preset and not adjustable by the copilot, and there is no landing light switch or engine starting switch on the collective stick.

5-3. RIGGING THE POWER CONTROLS SYSTEM. When dual controls are installed an additional adjustment must be made using copilot's collective pitch stick during rigging of the gas producer controls. (Refer to Basic HMI.)

5-4. COPILOT'S COLLECTIVE PITCH CONTROL STICK.

5-5. GENERAL. The copilot's collective pitch stick is attached to the inboard collective stick housing mounted on the end of the collective interconnecting torque tube. The collective stick consists primarily of a switch housing, throttle grip, collective stick tube, and a gas producer control tube having a torsion strap and splined adapter. Stick controls include the N1 throttle and the N2 governor trim switch.

5-6. REMOVAL OF COPILOT'S COLLECTIVE PITCH STICK.

WARNING: Install bungee installation tool (item 17, table 2-2, Basic HMI) before disconnecting ANY collective stick hardware (either pilot's or copilot's). There is strong bungee spring pressure present in the stick linkage; if suddenly released, spring reaction in the linkage can cause personal injury, or parts damage.

a. Remove collective pitch stick cover from seat structure (para 5-14 or 5-17).
b. Disconnect the electrical plug (figure 5-2).
c. Remove nut, washer and bolt from stick tube socket adapter and remove stick by sliding if forward and off the inboard stick housing.

5-7. DISASSEMBLY OF COPILOT'S COLLECTIVE PITCH STICK.
a. Cut the nylon strap that secures wiring to stick tube (figure 5-2).
b. Remove setscrews that secure switch housing.
c. Push wire slack into stick and carefully pull switch housing from end of the stick tube; disconnect wiring from N2 switch. (Refer to Basic HMI for switch replacement.)
d. Remove grip attach bolts and grip.
e. Remove adjusting nut pin and throttle end play adjusting nut only if stick tube replacement is necessary, or if end play must be adjusted. (Refer to para 5-10.)
f. Remove setscrew and wire guide. Tie a "fish" string on end of wire bundle to aid reassembly, and then remove the wiring.
g. Remove downstop assembly from stick tube only if replacement is necessary.
h. Remove gas producer control tube. Remove spring pin and pinion spline adapter from aft end of tube only if replacement is necessary.

5-8. INSPECTION OF COPILOT'S COLLECTIVE PITCH STICK.
a. Inspect stick tube and gas producer control tube for corrosion, deformation and loose rivets.
b. Inspect housing socket adapter for obvious damage.

5-9. REPAIR OF COPILOT'S COLLECTIVE PITCH STICK.
a. Replace a deformed gas producer control tube.
b. Replace loose rivets in the gas producer control tube.

5-10. REASSEMBLY OF COPILOT'S COLLECTIVE PITCH STICK.
a. Using grease (item 26, table 2-4, Basic HMI), lubricate the stick tube interior where the as producer control tube fitting makes contact.
b. Attach the "fish" string routed through the stick during disassembly, and thread the electrical wire bundle from the electrical plug through the exit hole in the stick tube and out the front end of the tube.
c. Install wire guide in stick tube so that it positions the wire bundle in the right cutout of the guide. Align guide with matching hole in stick tube and install setscrew. When tightened, setscrew must be at least flush and not recessed more than 0.010 inch below outer surface of tube.

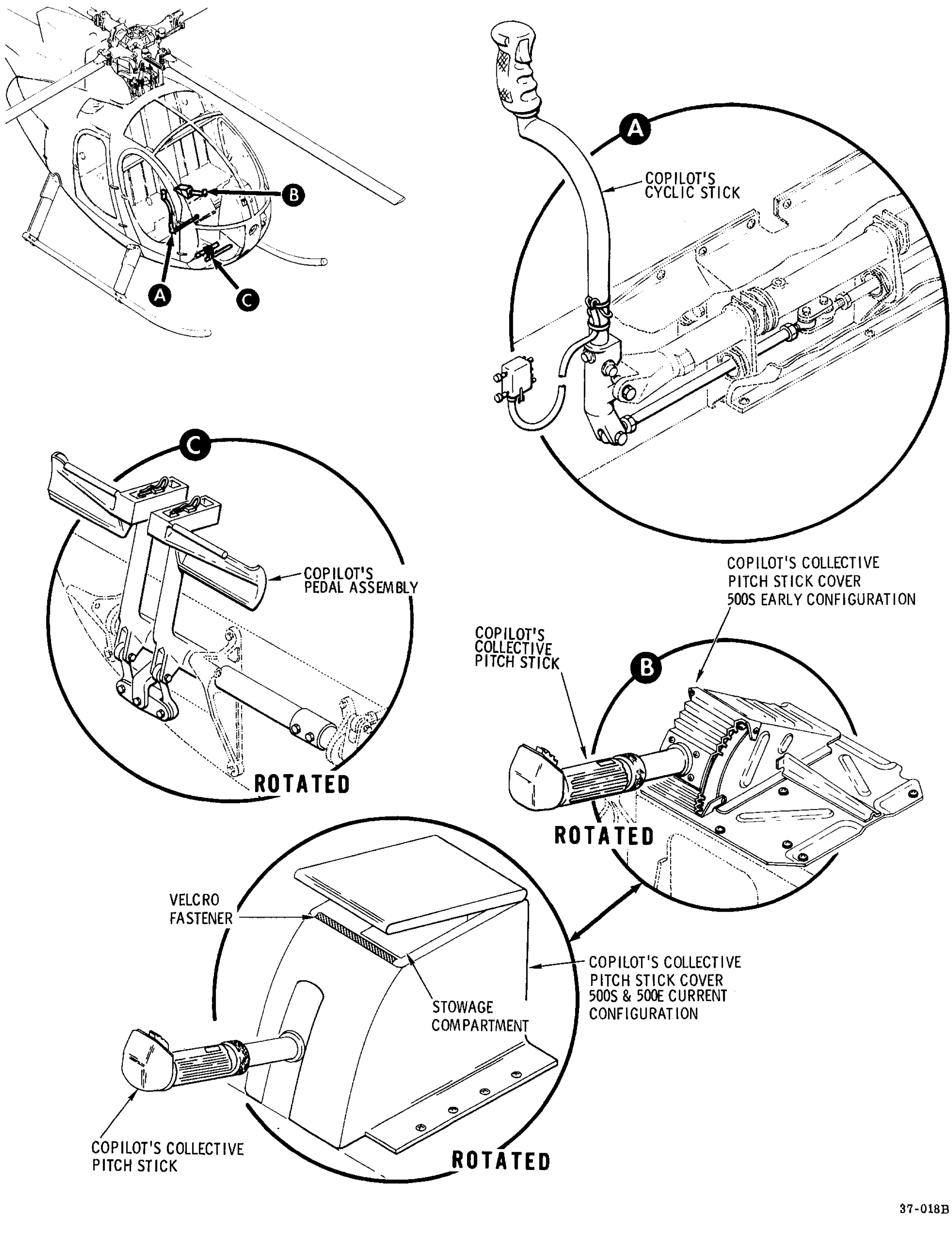
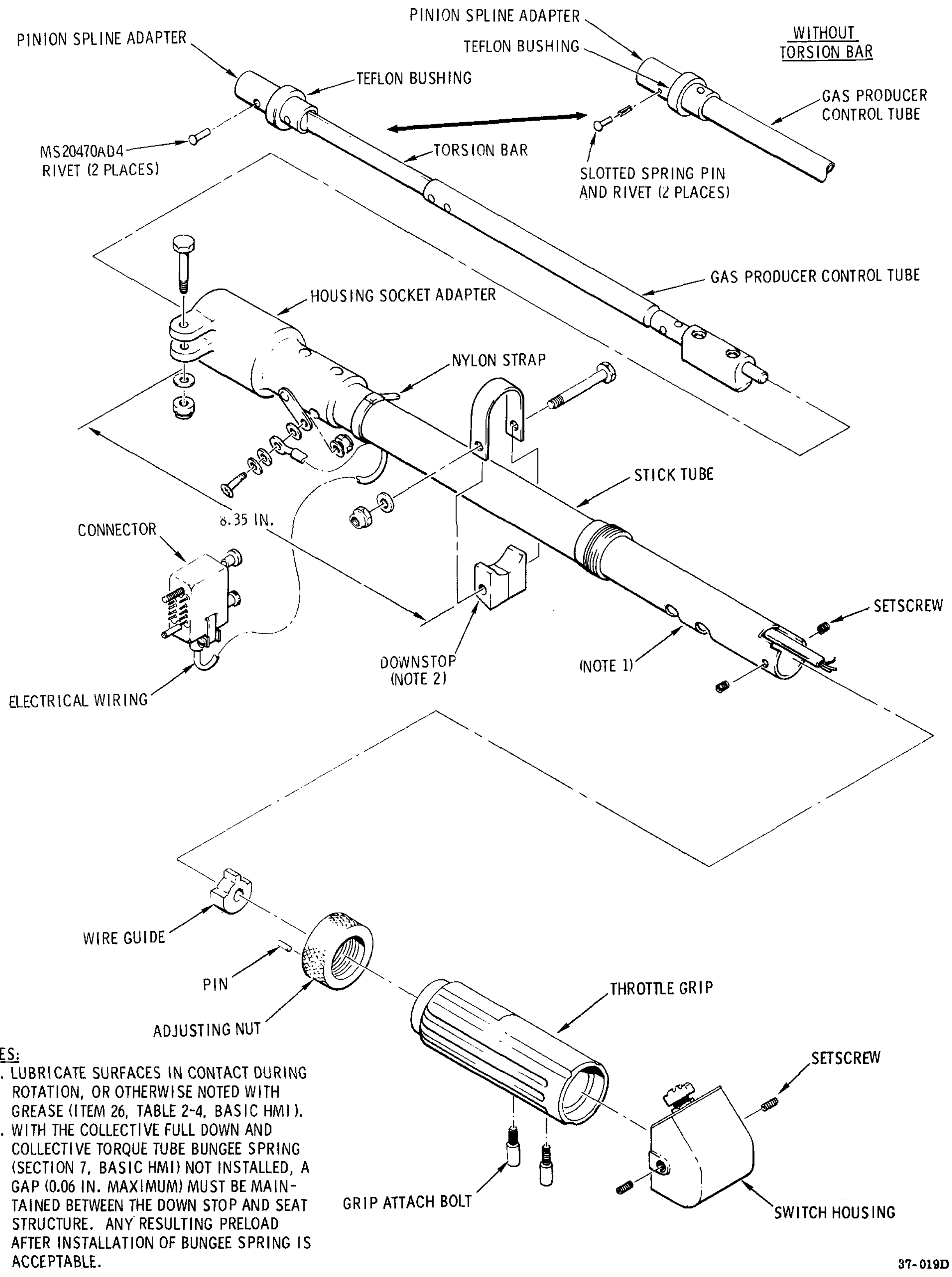


Figure 5-1. Dual controls option kit



NOTES:
1. LUBRICATE SURFACES IN CONTACT DURING ROTATION, OR OTHERWISE NOTED WITH GREASE (ITEM 26, TABLE 2-4, BASIC HMI).
2. WITH THE COLLECTIVE FULL DOWN AND COLLECTIVE TORQUE TUBE BUNGEE SPRING (SECTION 7, BASIC HMI) NOT INSTALLED, A GAP (0.06 IN. MAXIMUM) MUST BE MAINTAINED BETWEEN THE DOWN STOP AND SEAT STRUCTURE. ANY RESULTING PRELOAD AFTER INSTALLATION OF BUNGEE SPRING IS ACCEPTABLE.

Figure 5-2. Copilot's collective stick, right position

d. Install gas producer control tube through stick tube until control tube fitting engages the wire guide bore and the teflon bushing is seated at end of stick tube inside the adapter.

e. Using grease (item 26, table 2-4, Basic HMI), lubricate ID of throttle grip and install grip on stick tube. Align grip and gas producer control tube fitting and install grip attach bolts. When tightened, bolts must be at least flush and not recessed more than 0.010 inch below outer surface of grip.

f. Check throttle grip for zero end play on stick tube and that not more than 5 pounds torque is required to rotate the grip. If these conditions exist, proceed with g, below. If there is end play, or too much torque is required to rotate the grip, perform the following.

(1) Remove grip attach bolts and grip.

(2) Insert a 3/64-inch-diameter drift punch into access hole on forward face of adjusting nut and drive the grooved taper pin from adjusting nut and threaded fitting of stick tube.

(3) Reinstall grip with grip attach bolts and establish zero end play and correct rotational friction (5 pounds maximum) between nut and grip. Then match-drill (3/64 inch maximum diameter) the stick tube fitting threads to the existing pin groove in the nut and install pin.

g. Using solder (item 48, table 2-4, Basic HMI), connect wiring to N2 switch. Pull electrical wiring slack out through exit hole in stick tube and install switch housing with setscrews. Using a nylon strap, or twine (item 30) secure electrical wiring to stick tube aft of the exit hole.

5-11. INSTALLATION OF COPILOT'S COLLECTIVE PITCH STICK. (See fig. 5-2.)

a. Lubricate stick housing socket with grease (item 26, table 2-4, Basic HMI).

b. Rotate the pilot's and copilot's throttle grips so that the grip attach bolts are down. Install copilot's stick socket adapter on the inboard housing socket extension and, while moving the copilot's throttle back and forth slightly to get engagement of the socket pinion and adapter splines, slide the adapter into place.

c. Install attaching bolt, washer and nut to secure socket adapter.

d. Connect electrical plug.

e. Position the downstop assembly as shown in fig. 5-2. Check that a minimum of 0.06-inch clearance exists between down stop and seat structure with collective stick full down.

f. Install collective pitch stick cover on seat structure (para 5-16 or 5-19). Check that wiring is not fouled when stick is raised and lowered.

5-12. INBOARD COLLECTIVE PITCH STICK COVER.

5-13. GENERAL. The inboard collective pitch stick cover (fig. 5-3) provides access to the underseat flight controls linkage, and forms a protective guard for the collective friction mechanism on the inboard collective pitch stick. On early configuration helicopters, a flexible, two-part curtain enclosure on the cover is snap-fastened around the stick to prevent foreign matter from entering the underseat controls area. The cover is made of formed and spot-welded sheet aluminum. On current configuration helicopters a plastic trim cover incorporating an armrest/stowage compartment protects the collective friction mechanism. A sliding protective cover at the collective pitch stick slotted opening guards against foreign object entry.

5-14. REMOVAL OF INBOARD COLLECTIVE PITCH STICK COVER.

a. Unsnap upper curtain from lower curtain and slide curtains away from the stick (fig. 5-3).

b. Remove the five attaching screws and washers to release the cover from the seat structure.

c. If required, remove the flexible closure from the cover as follows:

(1) Remove the support tube clamp and four screws and washers that attach closure to cover and remove closure.

(2) Remove top curtain, then lower curtain, from curtain support tubes.

5-15. INSPECTION OF INBOARD COLLECTIVE PITCH STICK COVER.

a. Inspect cover (fig. 5-3) for obvious damage.

b. Inspect the flexible closure for cuts, holes, deterioration, defective snap fasteners, and freedom of movement on curtain support tubes.

5-16. INSTALLATION OF INBOARD COLLECTIVE PITCH STICK COVER.

a. Secure the cover to the seat structure using five screws and washers. The one longer screw is used at the front (fig. 5-3).

b. Install a removed flexible cover as follows.

(1) Place lower curtain, then top curtain, on curtain support tubes.

(2) Install curtain stops, cotter pins, lower curtain and then upper curtain on curtain support tubes.

CAUTION: Curtains must not fold inward through full travel of the collective stick. Folding inward might result in entanglement with the collective stick friction gear mechanism.

(3) Place closure on cover; secure closure to cover with support tube clamp and four screws and washers. Bottom edge of lower curtain must be tucked under support.

c. Close upper and lower curtains around pitch stick and connect the curtain together with the snap fasteners.

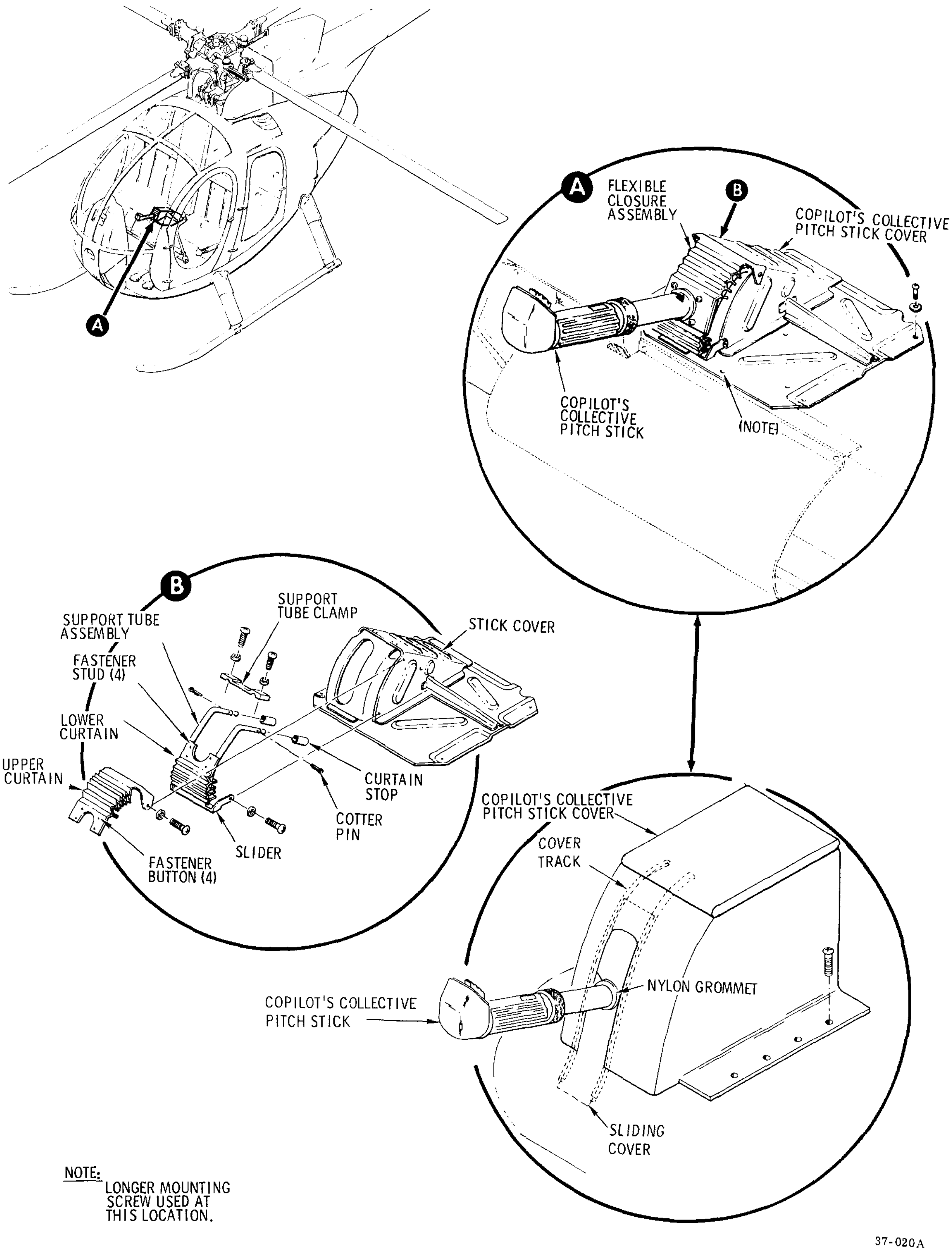


Figure 5-3. Inboard collective pitch stick cover

5-17. REMOVAL OF INBOARD COLLECTIVE PITCH CONTROL TRIM COVER. (See figure 5-3.)

a. Remove seats. (Refer to the appropriate seat configuration information in the applicable HMI Supplement.)

b. Remove nine collective control trim cover attaching screws and carefully remove cover, allowing sliding protective cover to remain fixed to collective stick. Partial removal of the cyclic controls trim cover may be required. (Refer to applicable HMI Supplement.)

c. Spread sliding cover at collective stick and remove. Remove nylon grommet on stick, if required.

5-18. INSPECTION AND REPAIR OF INBOARD COLLECTIVE PITCH CONTROL TRIM COVER.

a. Inspect trim cover (figure 5-3) for tears, cuts or breaks, and other damage.

b. Inspect sliding cover for freedom of movement in cover tracks.

c. Inspect stowage lid for condition and positive fastening.

5-19. INSTALLATION OF INBOARD COLLECTIVE PITCH TRIM COVER. (See figure 5-3.)

a. Install nylon grommet on collective stick; spread sliding cover at collective hole and fit over nylon grommet.

b. Position collective trim cover over collective and start upper end of sliding cover into cover tracks.

c. Slowly lower control trim cover and guide remainder of sliding cover upward in cover tracks.

d. Secure collective control cover with nine screws.

e. Install seats. (Refer to applicable HMI Supplement.)

5-20. COPILOT'S CYCLIC CONTROL STICK.

5-21. GENERAL. The copilot's cyclic control stick is similar to the pilot's except the copilot's stick does not have longitudinal or lateral control friction and the electrical wiring exits above the stick socket. The copilot's cyclic stick is detachable and may be removed or installed by use of two quick-release pins.

5-22. REMOVAL OF COPILOT'S CYCLIC CONTROL STICK AND SOCKET.

a. Disconnect control stick electrical plug and pull the two quick-release pins to remove cyclic stick.

b. Remove the cotter pin, nut, washers, and bolt that secure the copilot's lateral control rod to the stick socket (figure 5-4).

c. Remove the cotter pin, nut, washers, and bolt that attach the stick socket to the end of the cyclic torque tube. Remove stick socket.

5-23. REMOVAL OF COPILOT'S CYCLIC CONTROL STICK GRIP. Remove grip from copilot's cyclic control stick according to instructions in the Basic HMI for removal of pilot's cyclic control stick grip; use figure 5-4 and note that there are two nylon straps that secure the stick wiring.

5-24. INSPECTION OF COPILOT'S CYCLIC CONTROL STICK.

a. Inspect stick tube and socket for security, distortion and corrosion (figure 5-4). Check for the presence of a light coating of grease in the socket and on the stick tube end. Reapply a thin coating of petrolatum (item 34, table 2-4, Basic HMI) to the contact surfaces when they become dry.

5-25. REPAIR OF COPILOT'S CYCLIC CONTROL STICK. Disassemble the cyclic control stick (figure 5-4) only as necessary to replace damaged or faulty parts.

5-26. INSTALLATION OF COPILOT'S CYCLIC CONTROL STICK GRIP. Install grip according to instructions in the Basic HMI for installation of pilot's cyclic control stick grip; use figure 5-4 and secure wiring to stick with two nylon straps.

5-27. INSTALLATION OF COPILOT'S CYCLIC CONTROL STICK AND SOCKET.

a. Insert stick tube into stick socket and secure with two quick-release pins (figure 5-4).

b. Position cyclic stick to align holes in socket with mating holes in torque tube.

c. Install bolt, two washers, nut, and new cotter pin.

d. Check that slotted bushing is in place; then align copilot's lateral control rod with stick socket. Install bolt, two washers, nut, and new cotter pin.

e. Connect electrical plug.

f. Move cyclic stick forward, then full aft and set copilot's lateral control rod end bearing angularity so that the bearings do not jam at the full throw positions (minimum of 34° longitudinal stick travel - fore-to-aft positions); hold rod end and tighten jam nut.

5-28. COPILOT'S LATERAL CYCLIC CONTROL LINKAGE. The copilot's lateral control rod is identical to the pilot's lateral control rod, with initial length and bearing angularity set to the same requirements. Refer to the Basic HMI for replacement, inspection and repair procedures.

5-29. CYCLIC CONTROL LINKAGE COVERS.

5-30. GENERAL. A polycarbonate plastic control guard or a cyclic controls trim cover (figure 5-4) protects the cyclic control linkage from objects that might jam or foul control linkage. The guard is installed on early configuration

NOTES:

1. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. TO A MAXIMUM OF 0.060 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. CONTROL ROD END BEARINGS MUST NOT JAM THROUGHOUT FULL RANGE OF LONGITUDINAL TRAVEL (34°).

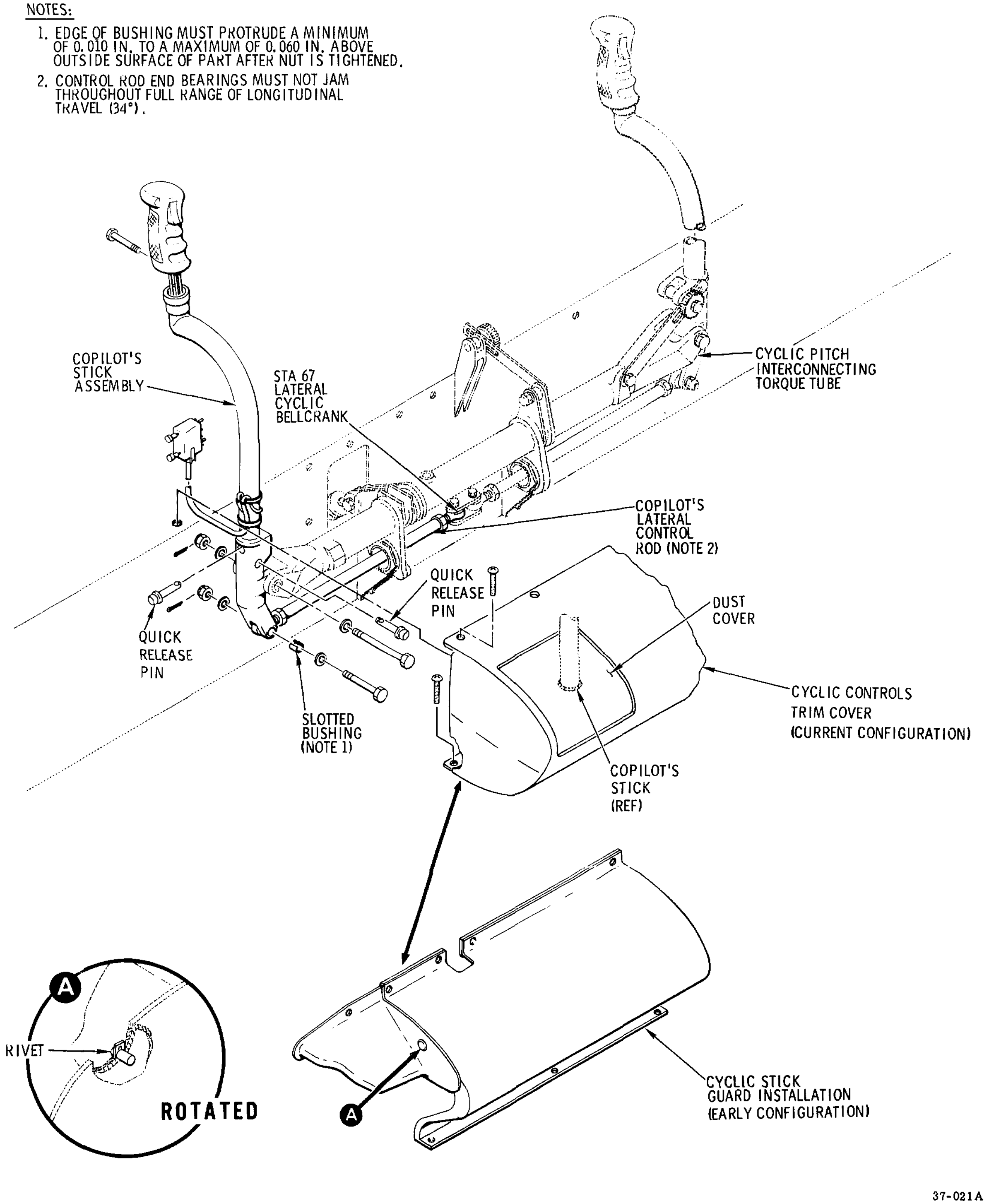


Figure 5-4. Copilot's cyclic stick, right position

helicopters and blocks entry of objects above the control linkage. On current configuration helicopters, a cyclic controls trim cover extends between the pilot's and copilot's cyclic sticks at the seat bulkhead and covers the cyclic control linkage. Cyclic stick openings in the cover are protected by dust covers secured to the cover with Velcro hook andpile fasteners. The cyclic sticks pass through an elastic-ringed opening in each cover.

5-31. REPLACEMENT OF CYCLIC CONTROL LINKAGE COVERS.

a. Replace the cyclic stick guard by removing and reinstalling the attaching screws and washers shown in figure 5-4.

b. Replace the cyclic controls trim cover by releasing the cyclic stick dust covers and removing eight attaching trim cover screws as shown in figure 5-4. After removing four upper screws, tip the cover forward to reach four lower attaching screws.

5-32. DUAL TAIL ROTOR PEDAL INSTALLATION.

5-33. GENERAL. The copilot's pedal installation is essentially the same as the pilot's. (See fig. 5-5.) A sleeve couples a torque tube extension to the pilot's torque tube. Current type dual pedal installation is also equipped with pedal stop nuts, heel strips, retaining springs and attachment hardware. Refer to the Basic HMI for removal, inspection, repair and installation of the tail rotor pedal installation.

NOTE: Before disassembly, matchmark mating pedal arms, links, and bellcranks with pedal brackets to avoid intermixing components between the pilot's and copilot's installations at time of reassembly.

5-34. RIGGING OF DUAL TAIL ROTOR CONTROLS. Rigging of tail rotor controls is accomplished according to Section 8 of the Basic HMI; also perform the following.

CAUTION: Remove both the pilot's and copilot's pedals to prevent possible contact with the lower windshield during the rigging sequence.

a. Loosen both pedal stop nuts; screw in both pedal stop bolts approximately 1/2 inch before adjusting pedal arm travel.

b. Adjust the pilot's pedal stop bolts to match pilot's pedal travel (with a 0.001-to 0.003-inch gap between stop bolts and pedals); secure pedal stop bolts in place by tightening pedal stop nuts.

c. Check both sets of pedals for clearance from the canopy glass.

5-35. CYCLIC STICK GRIP KIT.

5-36. GENERAL. A special cyclic stick grip assembly is provided for use when a combination of the cargo hook kit, hoist kit, or float kit is installed on the helicopter at the same time. The cyclic stick grip kit can be procured in two forms. The 369H90129 Basic kit contains a complete pilot's cyclic stick assembly that is easily installed (Section 7, Basic HMI). The 369H90129-501 kit contains only the stick grip and necessary parts for installation on the existing cyclic stick in the helicopter.

NOTE: The special cyclic stick grip is required if more than one of the following options is installed at the same time: cargo hook – emergency floats – hoist.

5-37. GRIP ASSEMBLY SWITCHES. The cyclic stick grip (fig. 5-6) contains the following switches: a four-way cyclic trim switch, a communications trigger-type switch (XMIT - ICS), and three guarded control switches. The guarded switches are the hoist cable cutter (CUT), the float inflation (FL) and the cargo hook release (CARGO HOOK REL). Additional covered openings are provided for installation of optional switches. A wiring diagram for the cyclic stick and grip assembly is shown on figure 5-7.

5-38. REPLACEMENT OF CYCLIC STICK GRIP SWITCHES.

a. Check that all electrical power is OFF.

b. Remove the grip cap (fig. 5-6) by removing six screws.

NOTE: The grip should be disassembled only to the extent required for replacement of the switches. The wiring through the grip assembly is tied with nylon twine (item 30, table 2-4, Basic HMI) and covered with a 2-inch insulating sleeve. Do not remove the twine and sleeves unless wire replacement is required.

c. Unscrew the trigger pin and carefully withdraw it while holding the trigger switch in place.

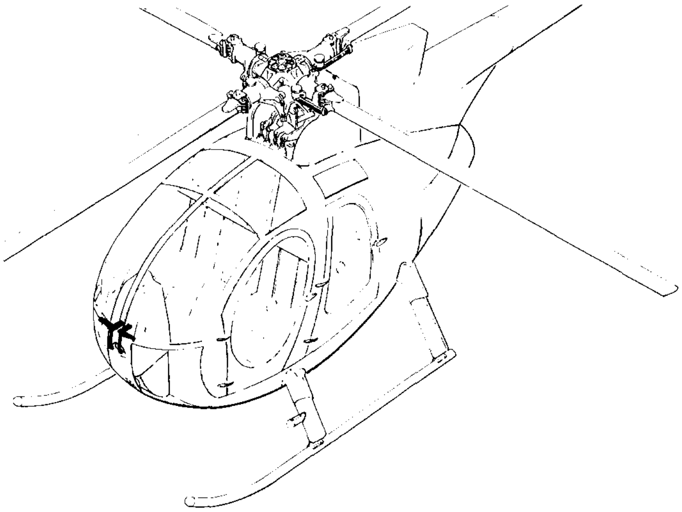
d. Unsolder wiring terminals on the switch to be disconnected. Tag-identify wires to facilitate correct reinstallation.

e. Solder wiring to the terminals of the replacement switch. Remove identification tags from wires.

f. Insert replacement switch at the mounting position on the grip subassembly.

g. Secure or attach the switch and trigger to the grip housing using the original attaching hardware.

NOTE: Be sure that switch is correctly positioned with any applicable keyway, pin hole, etc for proper alignment of matching parts.



NOTES:

1. SHIM BETWEEN BULKHEAD AND BRACKET WITH AN960PD416 AND/OR 416L WASHER AS REQUIRED TO GET ALIGNMENT WITHIN 0.010 IN.
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. DIRECTION OF BOLTS IS OPTIONAL.
4. *INSTALL SO ADJUSTABLE BUSHINGS PROTRUDE 0.002 IN.* MINIMUM AT EACH END WHEN TIGHTENED. TIGHTEN NUTS ONLY. TORQUE 50-80 IN. LB HIGHER THAN THE DRAG TORQUE OF THE NUT.
5. DIRECTION OF PIN HEAD IS OPTIONAL.
6. RIGHT HEEL STRIP WITH ATTACHMENT HARDWARE IS SHOWN; LEFT HEEL STRIP INSTALLATION IS IDENTICAL EXCEPT OPPOSITE.
7. CURRENT CONFIGURATION; NOT ON ALL HELICOPTERS.

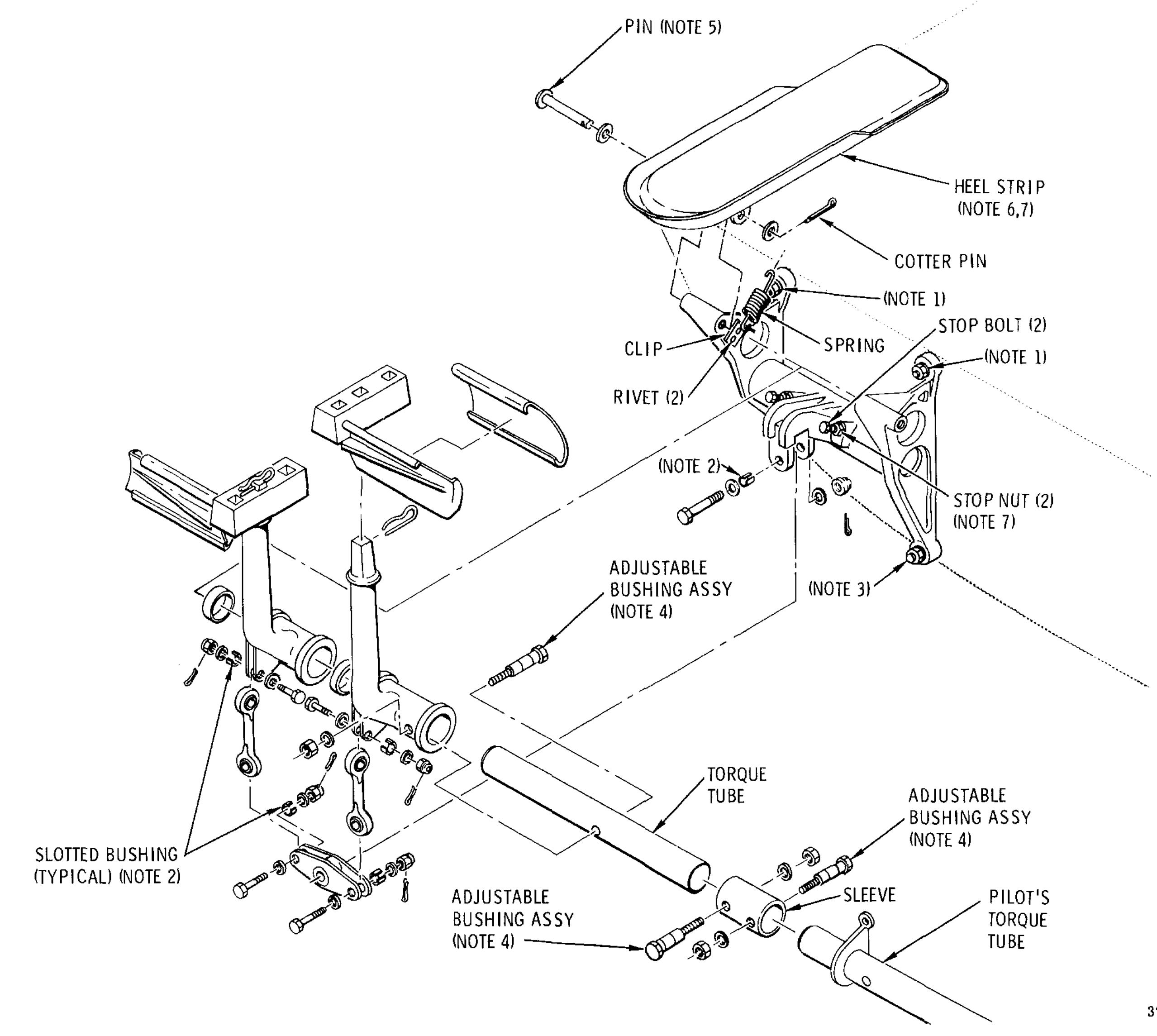


Figure 5-5. Copilot's tail rotor control pedals, right position

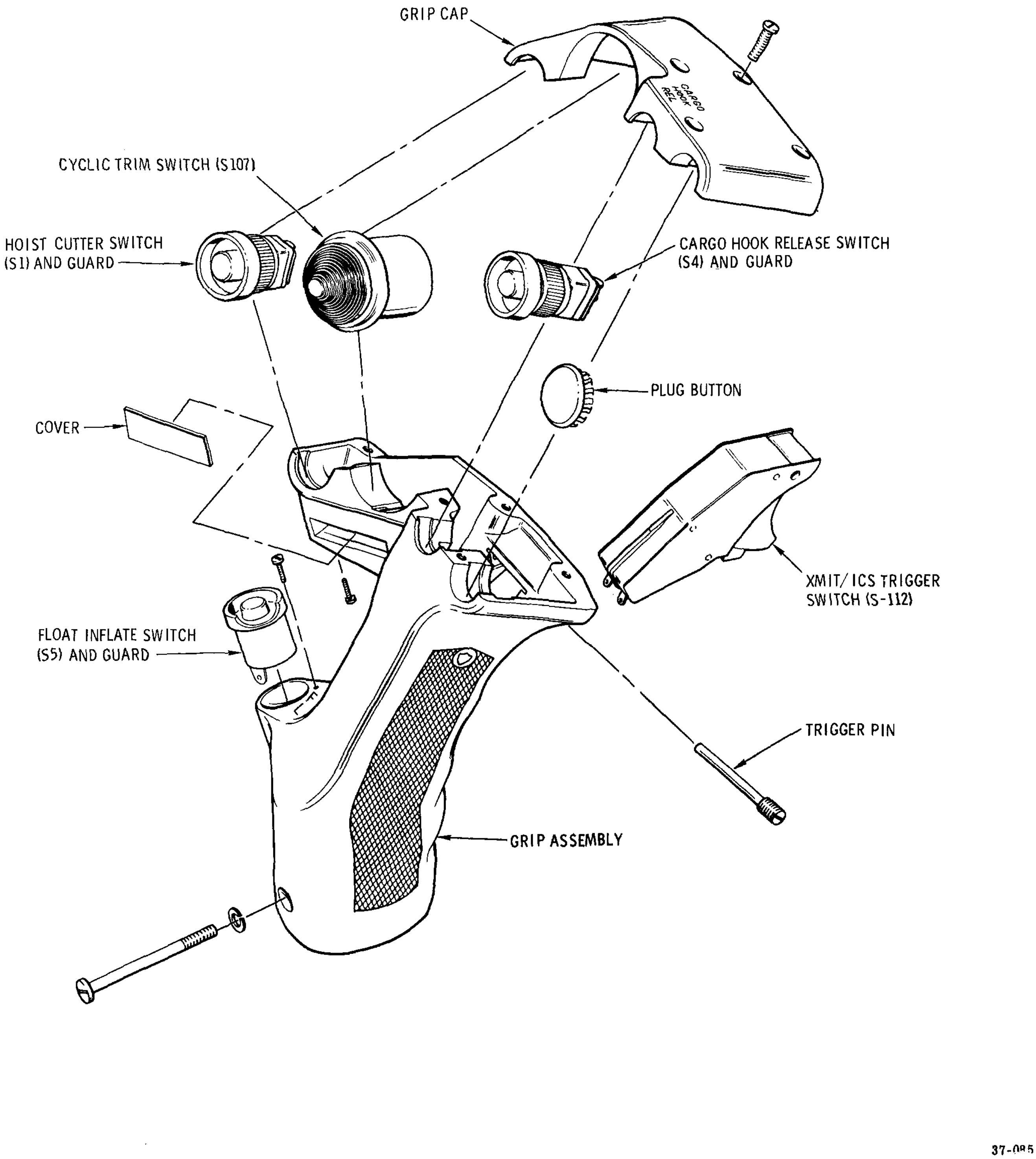


Figure 5-6. Exploded view of special cyclic stick grip

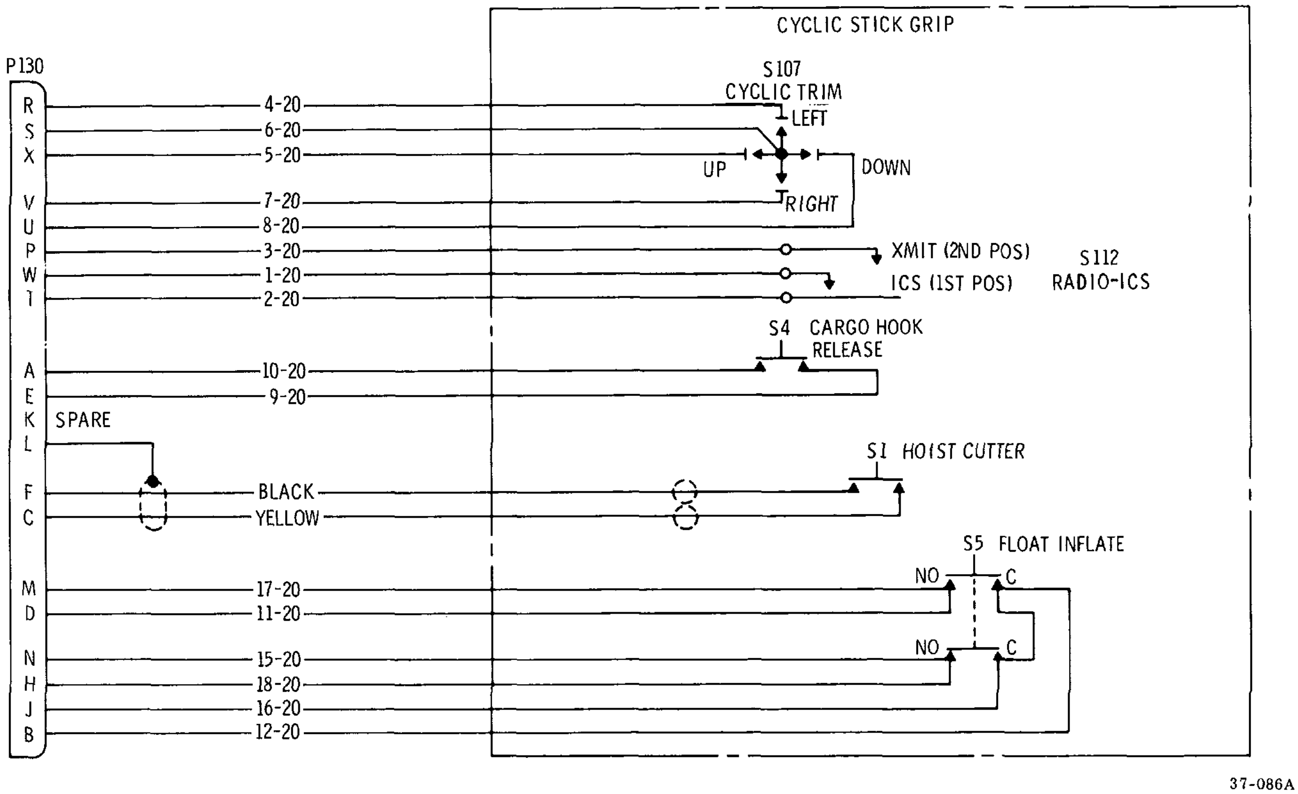


Figure 5-7. Pilot's special cyclic stick (369H90129) wiring diagram

h. *Secure the grip cap to the grip subassembly* with six screws. Coat the screws with varnish (item 47, table 2-4, Basic HMI) before installation into grip.

i. Check the switches for correct operation as follows.

(1) Energize the electrical system.

CAUTION: Operate cyclic trim actuators only momentarily to prevent damage to equipment.

(2) Check operation of the four-way trim switch by momentarily actuating it and ensuring that both lateral and longitudinal cyclic trim actuators operate momentarily.

CAUTION: Do not actuate the hoist cable cutter or float inflation switches. Remove all electrical power. Disconnect electrical plug P130 and make a continuity check through the switches, using an ohmmeter.

5-39. *CAMBERED METAL-BLADE TAIL* ROTOR ASSEMBLY.

5-40. GENERAL. The cambered metal-blade tail rotor (Kit 369H90005-5) is required on helicopters with the Allison 250-C20 Series engine and is optional for use on other helicopters originally equipped with a fiberglass-blade tail rotor (Section 8, Basic HMI). The change to the metal-blade tail rotor requires a modification to the control linkage by the addition of a bungee spring at the aft end of the floor-routed control rod. Refer to paragraph 12-31 for instructions for installation of the metal-blade tail rotor kit at conversion to the Allison 250-C20 engine. For maintenance information on the *metal-blade tail rotor and associated bungee* installation, refer to Section 8, Basic HMI. Overhaul information is provided in Part VIII, HMI Appx C.

OPTION GROUP 6
CABIN HEATING EQUIPMENT

6-1. HEATING SYSTEM (ELECTRICALLY CONTROLLED).

6-2. GENERAL. The heating system (fig. 6-1) consists of a CABIN HEAT switch, an electrically actuated heat control valve for mixing compressor bleed air and ambient outside air (referred to herein as cold air), and a system of rigid and flexible ducts and tubes for heated air distribution through a muffler to the cargo/passenger and pilot's compartments. The heating duct system is associated with the engine cooling duct system (described in Basic HMI). Both duct systems receive forced cold air input from a manifold duct attached to the oil cooler blower that is driven by the engine. Cargo/passenger compartment heat selection is by mechanical actuation only. Automatic sensing controls or temperature indicating system are not used in the heating system. *Instructions for optional conversion of an electrically controlled to a manually controlled cabin heating system are provided in Hughes Notice HN-57.*

6-3. TROUBLESHOOTING THE HEATING SYSTEM. Refer to table 6-1.

Table 6-1. Troubleshooting the heating system (electrically controlled)

Symptom	Probable Trouble	Corrective Action
Actuation of heat control valve produces no heated air or insufficient heated air at outlets.	Control valve pulley drive belt broken.	Replace faulty parts and adjust valve.
	Pulley shaft retaining pin sheared.	Replace faulty parts and adjust valve.
	Heat valve ball and cold air vane in valve assembly not coupled correctly.	Check control valve rigging.
	Heat valve ball binding in housing.	Shim between valve housing and elbow fitting.
	Heat control valve internally defective.	Replace valve.
	Actuator and valve timing belts incorrectly adjusted.	Adjust control valve and actuator rigging.
	Cracked, broken or disconnected ducting in system.	Replace defective ducts.
Movement of CABIN HEAT switch does not shut off hot air distribution.	Circuit breaker not set.	Push in TRIM circuit breaker. Check trim and heater circuits if breaker remains open.
	Faulty switch.	Replace switch.
	Actuator inoperative.	Replace actuator.
	Same as troubles 1 through 6 of preceding symptom.	
Air excessively hot at diffusors*.	Improper cold air mixing.	Adjust valve rigging.

*CAUTION: Do not operate engine until this condition is corrected. Canopy plastic or ducting may be badly damaged if operation is continued.

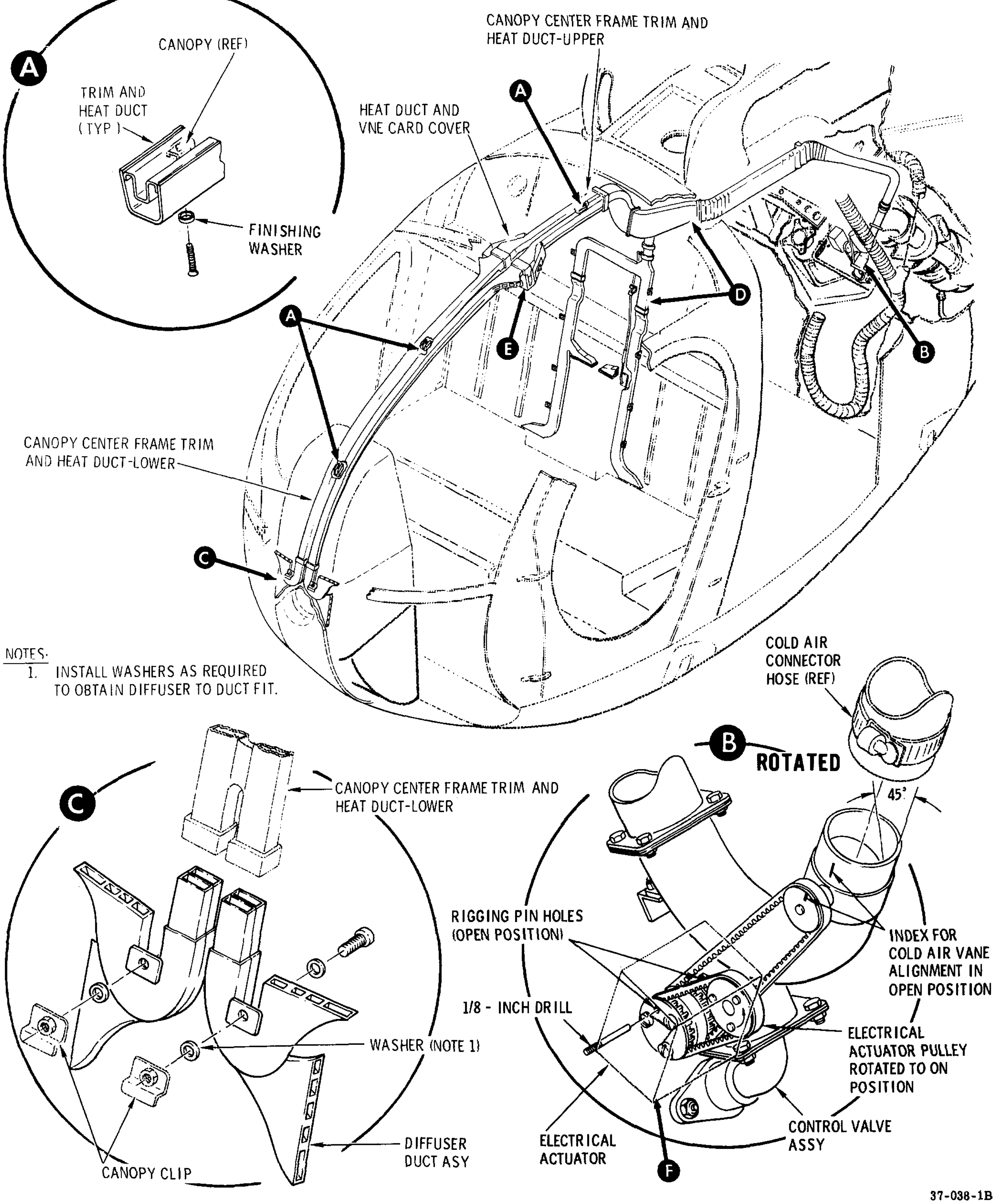
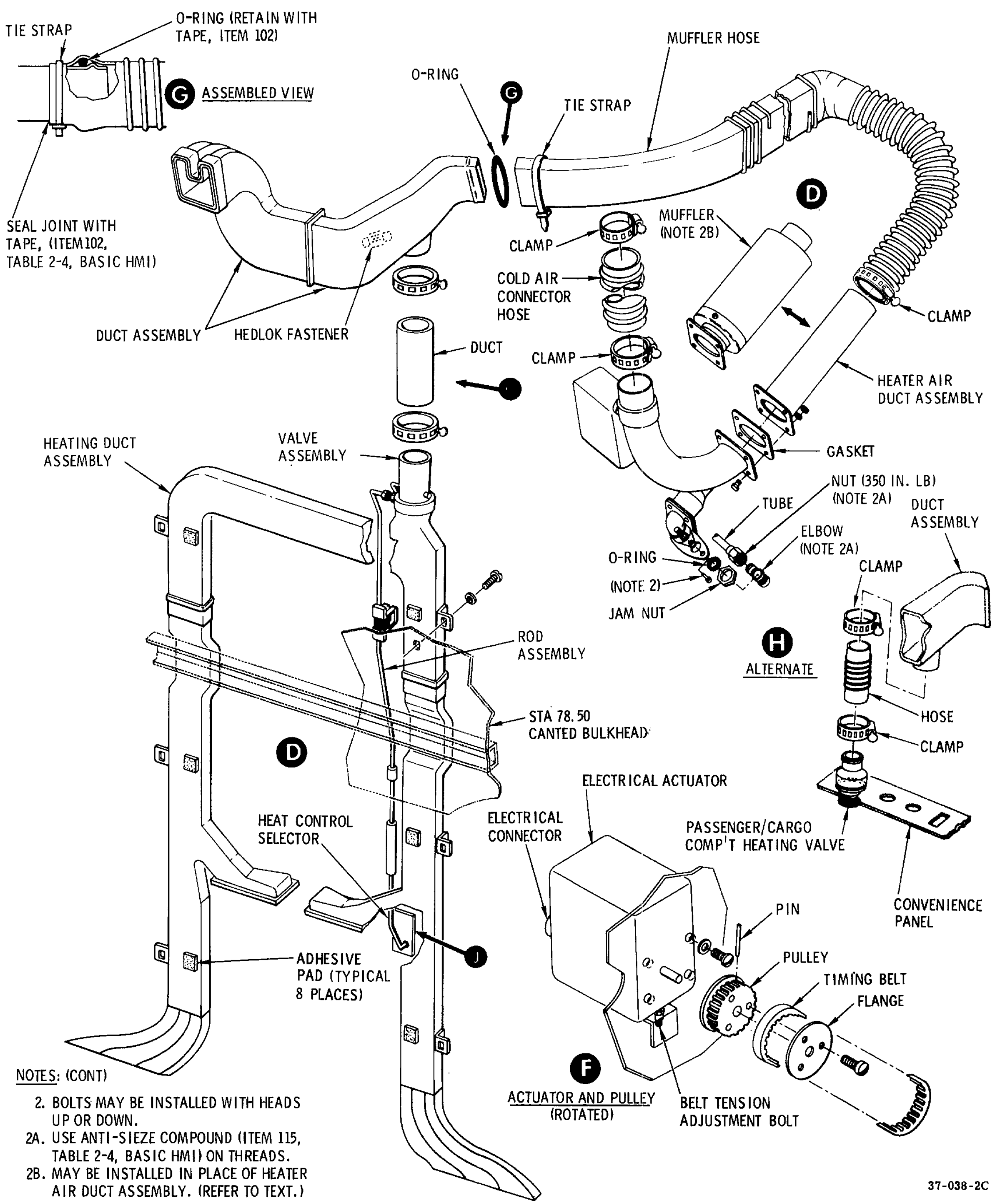


Figure 6-1. Heating system (electrically controlled) (sheet 1 of 3)



NOTES: (CONT)

2. BOLTS MAY BE INSTALLED WITH HEADS UP OR DOWN.
2A. USE ANTI-SIEZE COMPOUND (ITEM 115, TABLE 2-4, BASIC HMI) ON THREADS.
2B. MAY BE INSTALLED IN PLACE OF HEATER AIR DUCT ASSEMBLY. (REFER TO TEXT.)

Figure 6-1. Heating system (electrically controlled) (sheet 2 of 3)

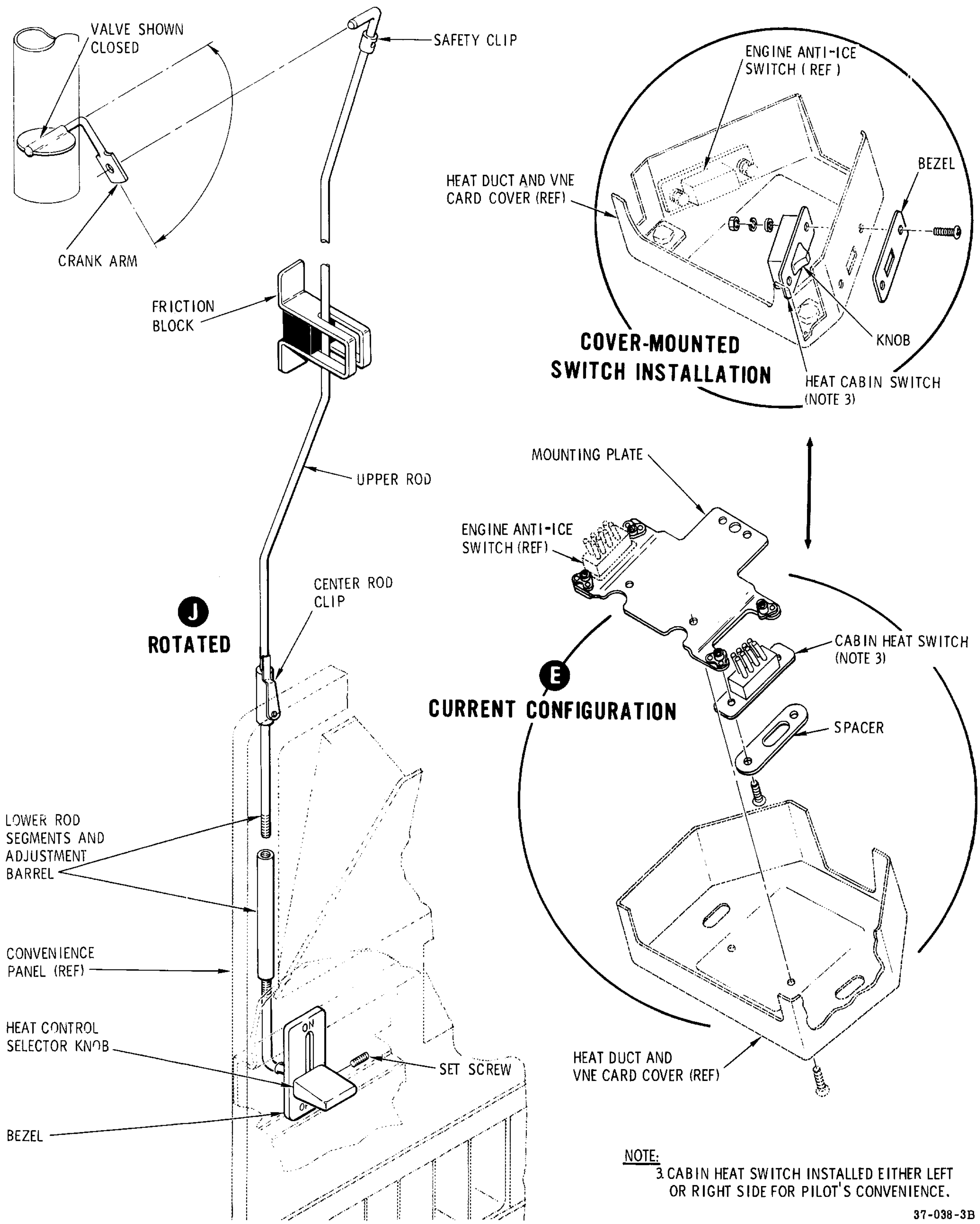


Figure 6-1. Heating system (electrically controlled) (sheet 3 of 3)

6-4. INSPECTION OF HEATING SYSTEM (ELECTRICALLY CONTROLLED).

a. Inspect CABIN HEAT switch for condition and security.

b. Remove interior trim and left aft bulkhead access cover in cargo compartment. Inspect heat valve actuator motor for condition and security.

c. Inspect pulley belts for condition.

d. Inspect security of heat control valve to firewall; check pulley belt for condition.

e. Inspect flexible fiberglass hose for tears and for deformation due to failure of inner supporting wire or short radius bends.

f. Inspect rubber hose for tears and evidence of deterioration.

g. Inspect all ducts and muffler for security of attachment and coupling hardware, and any duct section or muffler damage that would allow heated air leaks. Inspect diffusor outlets for condition of cemented joints on distribution ducts.

h. In engine compartment, inspect tube connecting engine air bleed fitting to control valve for cracks and security of hex nuts.

i. Perform an operational check (para 6-5).

6-5. OPERATIONAL CHECK OF HEAT VALVE CONTROL AND ELECTRICAL ACTUATOR.

a. Remove interior trim and left aft bulkhead access cover.

b. Turn on power and set the TRIM circuit breaker. Slide the CABIN HEAT switch to the forward (ON) position. Hold the switch at the ON position until the pulley on the installed actuator rotates to the full clockwise position (viewed from pulley end).

c. Rotate pulleys on heat control valve to the open position (rigging pin holes aligned). Insert a 1/8-inch-diameter rigging pin (or drill) through rigging pin holes in valve pulley and valve body to maintain alignment.

d. If holes or marks do not align, adjust heat control timing belts according to paragraph 6-6.

e. Remove rigging pin from heater valve pulleys and valve body.

f. Alternately slide and hold the CABIN HEAT switch to the aft (OFF) and forward (ON) positions, while making sure that the actuator operates the valve through the full range of travel. Allow a minimum of 30 seconds for the actuator pulleys to travel between the full throw positions.

g. If valve does not have sufficient travel, adjust actuator belt on pulley according to paragraph 6-6.

h. Reinstall left aft bulkhead cover and interior trim.

6-6. RIGGING OF ELECTRICALLY ACTUATED HEAT CONTROL VALVE.

a. Remove interior trim and left aft bulkhead cover.

b. Cut lockwire, loosen four actuator attaching screws and actuator stop bolt; remove timing belt from actuator pulley.

c. Turn on power and set TRIM circuit breaker. Slide the CABIN HEAT switch to the forward (ON) position. Hold the switch at the ON position until the pulley on the installed actuator rotates to the full clockwise position (viewed from pulley end).

d. Rotate pulleys on heat control valve to the open position (rigging pin holes aligned). Insert a 1/8-inch-diameter rigging pin (or drill) through rigging pin holes in valve pulley and valve body to maintain alignment.

NOTE: Valve open position is indicated by alignment of index marks on valve upper pulley and housing (para 6-13).

e. With actuator valve pulley rotated fully clockwise and heater at open position, connect the actuator-driven timing belt between the actuator pulley and heater valve pulley.

f. Remove rigging pin from heater valve pulleys and valve body.

g. Adjust actuator belt tension by tightening the NAS563-29 bolt head against underside of actuator. Tension is correct when a 6-to 7-ounce force applied at belt mid-span will produce a deflection of 0.040 inch.

h. Tighten four actuator attaching screws to secure the actuator. Safety screws in pairs with lockwire.

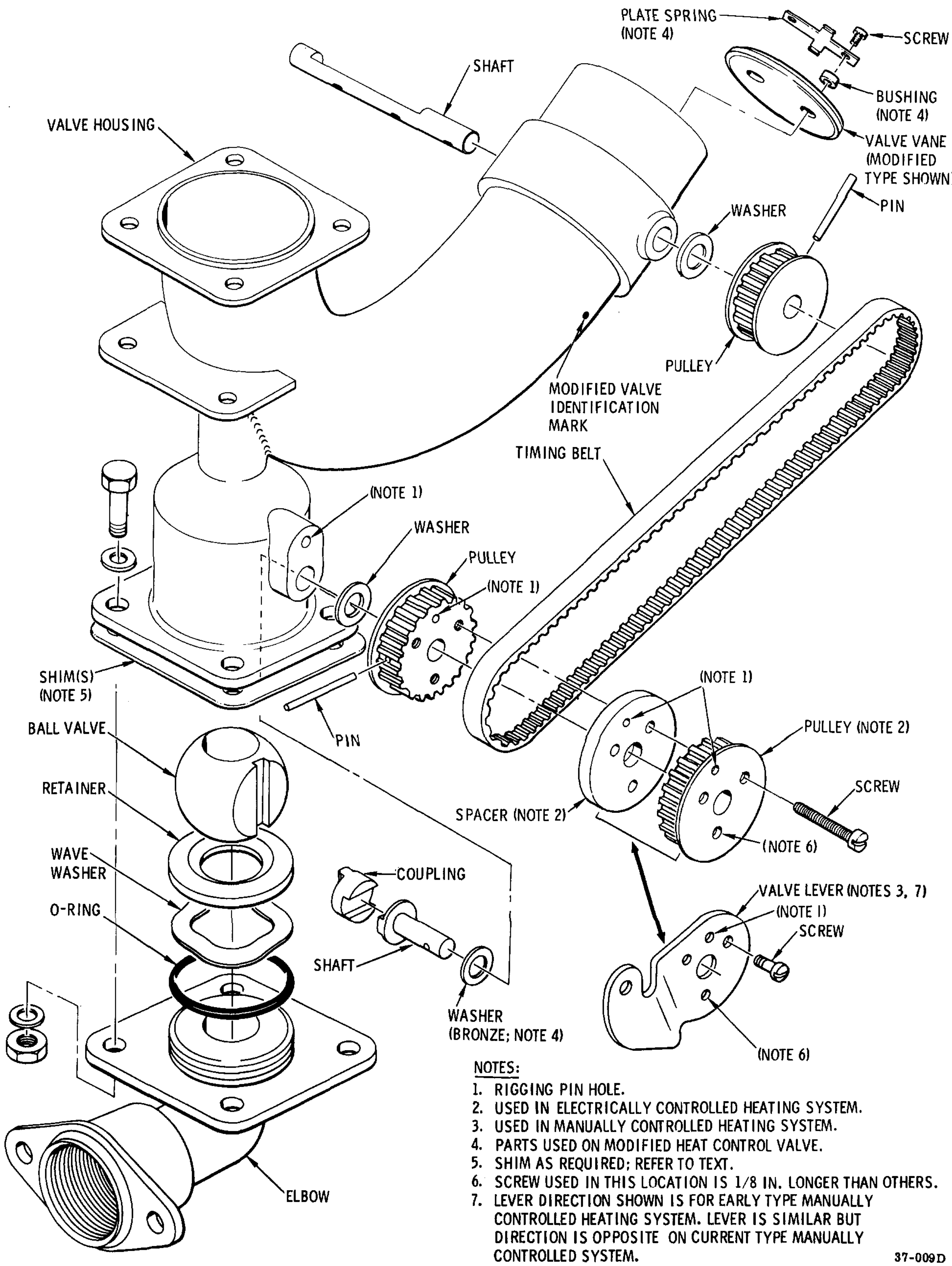
i. Alternately slide and hold the heater valve control switch to the aft (OFF) and forward (ON) positions, while making sure that the actuator operates the valve through the full range of travel. Allow a minimum of 30 seconds for the actuator pulleys to travel between the full throw positions.

NOTE: Actuator shaft and pulleys travel through approximately 108 degrees of rotation. At clockwise end of stroke, the centerline of the pin that secures pulley to actuator shaft should be at a 90-degree angle to the long vertical side of the actuator. Preset internal actuator limit switches limit the actuator shaft rotation.

j. Reinstall left aft bulkhead access cover and interior trim.

6-7. HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED).

6-8. GENERAL. The heat control valve (fig. 6-2) consists of a valve housing that contains the air control ports for mixing hot and cold airflow, and a 90-degree inlet elbow that attaches and ports the control valve through the firewall to the engine air bleed tube. The control valve is mounted on the forward left side of the station 124 canted bulkhead. The housing inlet body contains a center-bored



NOTES:
1. RIGGING PIN HOLE.
2. USED IN ELECTRICALLY CONTROLLED HEATING SYSTEM.
3. USED IN MANUALLY CONTROLLED HEATING SYSTEM.
4. PARTS USED ON MODIFIED HEAT CONTROL VALVE.
5. SHIM AS REQUIRED; REFER TO TEXT.
6. SCREW USED IN THIS LOCATION IS 1/8 IN. LONGER THAN OTHERS.
7. LEVER DIRECTION SHOWN IS FOR EARLY TYPE MANUALLY CONTROLLED HEATING SYSTEM. LEVER IS SIMILAR BUT DIRECTION IS OPPOSITE ON CURRENT TYPE MANUALLY CONTROLLED SYSTEM.

37-009D

Figure 6-2. Heating system control valve stainless steel ball valve that is rotated by actuation of the drive pulley to control the inlet of engine bleed air. On current type valve housings, a support is riveted to the inside bore of the housing to seat the ball valve and prevent it from shifting. (Refer to Hughes Notice HN-55 for information on modification of early type valve housings.) A nozzle on the inlet body injects the hot air downstream of the cold air inlet. The housing tube fitting supports the cold air vane and driven pulley that are rotated by the drive belt. Hot air is mixed with blower (cold) air at a variable ratio, depending on the relative positions of the hot air valve check ball and the cold air vane. Because engine bleed air is approximately 260°C (500°F), cold air is never completely shut off. A modified valve assembly, identified by either a green paint dot or M50023 ink-stamped on the valve housing, is installed on current configuration helicopters. Refer to Hughes Notice HN-30 (Modification Kit M50023 - Heat Control Valve Assembly) for modification of early type valve assemblies. There are no functional differences between valves. Changes in materials and assembly/disassembly procedures are reflected in the following paragraphs.

6-9. REMOVAL OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED). (See fig. 6-1.)

a. Remove interior trim and left aft bulkhead cover.

b. Cut lockwire and loosen four actuator mounting screws. Loosen actuator stop bolt; remove timing belt from actuator pulley.

c. In the left side of the engine compartment, disconnect the hot bleed air line at the heat control valve elbow fitting.

d. Loosen the elbow fitting jam nut and remove elbow and O-ring.

e. Remove hardware attaching the lower end of control valve assembly to the canted bulkhead.

f. Remove clamp securing cool air connector hose to valve.

g. Remove valve-to-warm air duct (or muffler, if installed) attaching hardware; remove control valve assembly and gasket.

6-10. DISASSEMBLY OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED). (See fig. 6-2.)

a. Rotate ball valve lever fully counterclockwise to position the ball valve open.

b. Remove hardware attaching elbow to valve housing and remove elbow and shims, if installed.

c. The O-ring, wave washer, retainer, ball valve and coupling are now free for removal.

d. Cut lockwire and remove three screws from actuator belt pulley, timing belt pulley and spacer. Remove timing belt.

e. Remove pin from ball valve pulley. Remove pulley from shaft. Remove shaft from valve housing; inner and outer washers will fall free.

f. Remove screws attaching cold air valve vane to shaft. Remove plate spring and bushings, if installed. Remove valve vane.

g. Remove pulley, shaft and washer from valve housing.

h. Remove pin from pulley to complete the disassembly.

6-11. INSPECTION OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED).

a. Inspect timing belt for deterioration, stretching, worn teeth or evidence of slipping.

b. Inspect valve housing for deep dents and cracks; mating flanges and connection area for bends or dents which would prevent tight connections; bearing bosses for galling and excessive wear; interior seat and ball valve for galling.

c. Inspect pulley shafts for galling and evidence of wear.

d. Inspect ball valve and retainer for cracks, galling and evidence of wear; cold air valve vane for flatness and evidence of excessive edge wear.

6-12. REPAIR OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED).

a. Repair small dents in valve housing by bumping out and burnishing. Repair warped flanges by straightening on a surface plate. No weld repairs are permitted.

b. No repairs are permitted on moving parts, ball valve, retainer, coupling, or shafts which are cracked, bent or badly worn.

6-13. REASSEMBLY OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED). (See fig. 6-2.)

a. Place valve housing upside down on a suitable workbench. Find the thickness of shims required between valve body and elbow fitting as follows.

NOTE: All dimensions are in inches.

(1) See figure 6-3. Measure diameter of the ball valve using an outside micrometer. Record as dimension A.

(2) Place ball valve in valve housing and use a depth micrometer to find distance from housing flange to top of ball. Record as dimension B.

(3) Multiply dimension A times 0.933; then subtract the result from 1.627. Record as dimension C.

Example: Ball diameter A = 1.441
1.441 x 0.933 = 1.344
1.627 - 1.344 = 0.283
= dimension C

(4) Compare dimension B with dimension C. If B is greater than C, no shims are required. If C is greater than B, add shims 369H8007 until B equals or is greater (0.010 maximum) than C.

Example: B = 0.270 and C = 0.283

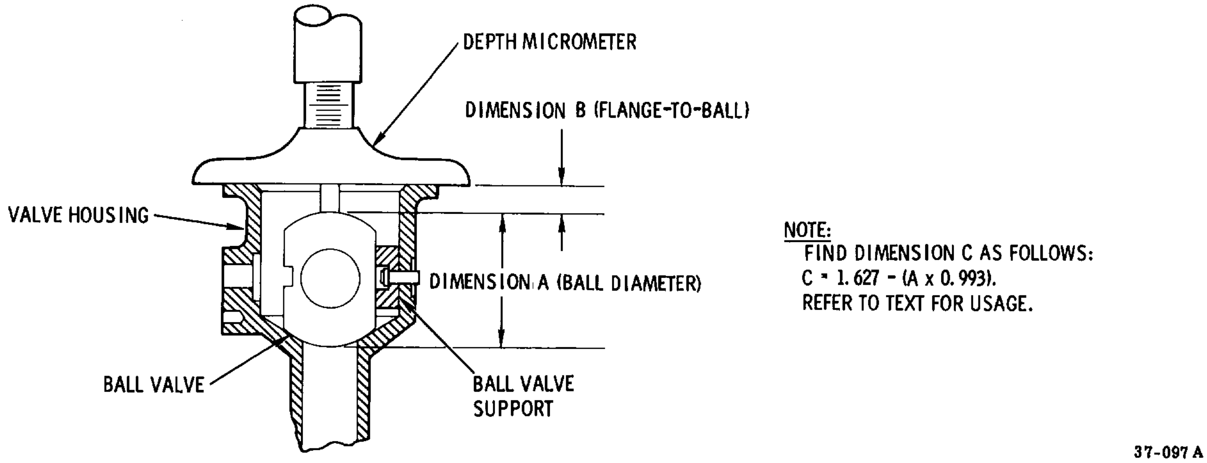


Figure 6-3. Control valve shim thickness determination

Add a 0.015 shim to dimension B. B now equals 0.285 or 0.002 more than dimension C and is a correct total shim thickness for use.

b. Install washer on ball valve shaft (a bronze washer is used on modified valves); then insert this assembly into valve housing boss.

c. Install coupling on shaft (check that the ball drive lug is chamfered); then position ball valve in housing to engage coupling (ball valve in open position).

d. Install new O-ring in elbow flange groove.

e. Install retainer and wave washer in housing on ball valve.

NOTE: A 1/2-inch wood dowel may be inserted through top of assembly to temporarily hold these parts in position.

f. Install shim(s) of thickness determined in a above; then install elbow on valve housing flange with four bolts and nuts. Washers are installed under both the bolthead and the nut. Use care to avoid nicking or cutting the O-ring during mating.

CAUTION: The flanges of the valve housing and elbow should mate without use of undue force. If flanges do not mate easily, the internal parts of valve may be misaligned. Investigate before tightening bolts.

g. Install washer and ball valve pulley on shaft so that rigging pin holes in pulley and in valve housing boss are aligned (ball valve in open position).

h. Install pin through ball valve pulley and shaft.

i. Remove 1/2-inch dowel if used to align internal parts; then rotate pulley through full travel several times to assure ease of operation and positive closing of ball valve. A valve torque check (step p below) is made after the timing belt is installed.

j. Install cold air pulley and washer on shaft. Install pin through pulley and shaft.

k. Insert cold air pulley and shaft assembly into valve housing.

l. Attach cold air vane to shaft using two screws. On the modified valve the cold air vane is assembled as shown in figure 6-2.

m. Rotate ball valve pulley so that rigging pin hole aligns with hole in valve body boss. Insert a 1/8-inch pin to hold the assembly in position (ball valve open).

n. Rotate cold air pulley so that the vane is 45 degrees from fully closed position, or align yellow rigging marks if present. (The heads of vane attachment screws should be visible.)

o. Install a serviceable timing belt between pulleys while maintaining valve position located in m and n above.

p. Check valve operation by applying 6 to 11 inch-ounces of torque on the ball valve shaft drive pulley. Hold heat control valve assembly in vertical position during check. If valve does not operate within this range, change thickness of shims between valve elbow and housing as required. Shims are provided in 0.015-, 0.010- and 0.005-inch thicknesses.

NOTE: Final total shim thickness should not exceed dimension C (step a above) by more than 0.010 inch.

(1) Check that all electrical power is OFF; as applicable, check that CABIN HEAT switch is in OFF position.

(2) Remove crew compartment left bulkhead trim panel, and left aft bulkhead access cover.

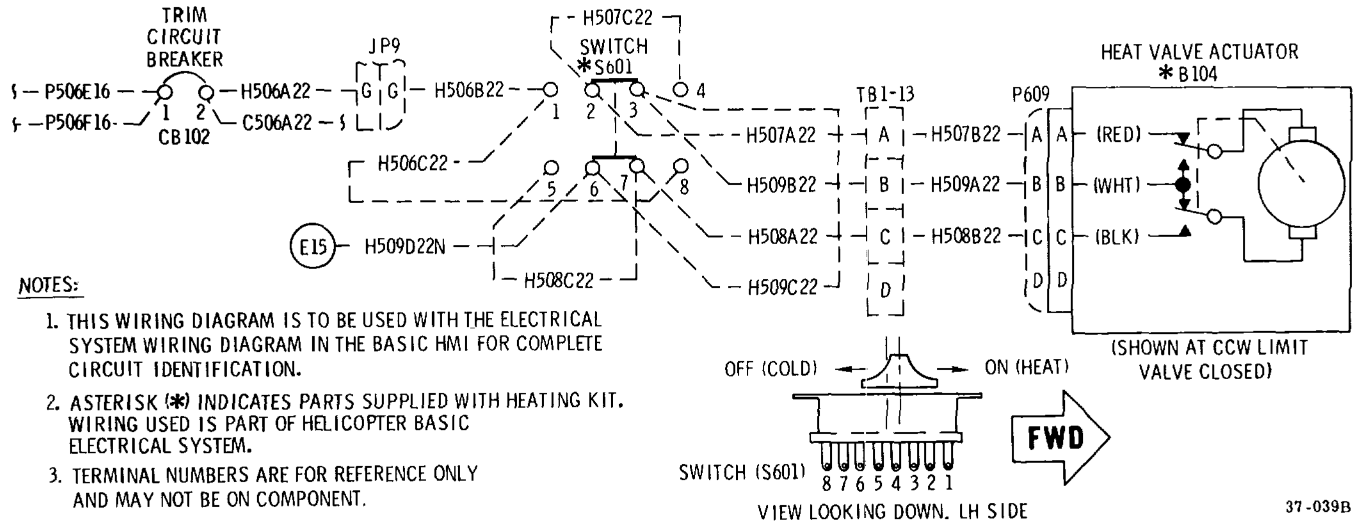


Figure 6-4. Heating system wiring diagram

(3) Remove heat control valve assembly per paragraph 6-9.

(4) With timing belt installed on both valve pulleys, rotate drive pulley on ball valve coupling shaft to position ball valve in full open position.

(5) Wrap length of twine five or six times around drive pulley; attach spring scale to twine and pull until ball valve is in full closed position. Repeat procedure with ball valve from the full closed to full open position.

(6) With valve housing placed upside down on workbench, remove hardware securing elbow to valve housing. Insert 0.005-inch shim and reinstall elbow to housing.

(7) Perform step (5) above; add or subtract increments of shims until actuation load (torque) on coupling shaft is between 9.5 and 17.5 ounces (6 and 11 inch-ounces) on the spring scale.

q. If rigging marks have not been applied, paint a yellow index mark (1/16-inch width) on pulley and housing (fig. 6-1).

r. Install spacer and actuator belt pulley on ball valve pulley, using three screws. Note that the screw located 180° from the rigging pin hole is 1/8 inch longer than the others. Remove rigging pin installed in m above. Safety screws to each other with lockwire.

6-14. INSTALLATION OF HEAT CONTROL VALVE (ELECTRICALLY CONTROLLED). (See fig. 6-1.)

a. Install control valve assembly on forward left side of canted bulkhead, using two bolts, washers and nuts.

NOTE: On threaded fittings, use anti-seize compound (item 115, table 2-4, Basic HMI).

b. In the left side of the engine compartment, install new O-ring, nut and elbow. Connect engine hot bleed air line to elbow. Torque nut to 350 inch-pounds.

c. Connect control valve flange to warm air duct (or muffler, if installed), using new gasket and four bolts, washers and nuts.

d. Install cool air connector hose on control valve inlet and secure with clamps.

e. Install actuator belt and adjust rigging according to paragraph 6-6.

6-15. HEAT CONTROL VALVE ELECTRICAL ACTUATOR. The heat control valve electrical actuator (fig. 6-1) is mounted slightly above the valve, on the canted bulkhead left side channel (station 124). A pulley and belt mounted to the actuator shaft rotate the heat control valve. The actuator is operated in either direction by a momentary, center-off control switch located overhead in the pilot's compartment. The actuator is a motor driven shaft with internal preset limit switches adjusted to allow travel through a stroke of approximately 108 degrees. The actuator circuit is protected by the TRIM circuit breaker on the instrument panel. Figure 6-4 is an electrical wiring diagram for the heat control valve actuator circuits.

6-16. REPLACEMENT OF HEAT CONTROL VALVE ELECTRICAL ACTUATOR. (See fig. 6-1.)

a. Remove interior trim and left aft bulkhead cover.

b. Disconnect actuator electrical connector.

c. Cut lockwire, loosen four actuator mounting screws and actuator stop bolt; remove timing belt from actuator pulley.

d. Cut lockwire and remove three screws attaching flange to actuator pulley; remove flange.
e. Remove pin from actuator pulley and remove pulley.
f. Remove four screws and washers attaching actuator to canted channel.
g. Position replacement actuator and install four screws with washers. Do not tighten.
h. Install pulley on shaft and install pin through pulley and shaft.
i. Install pulley flange with three screws; secure with lockwire.
j. Connect electrical connector.
k. Install timing belt and adjust rigging and belt tension according to paragraph 6-6c through i.
l. Reinstall left aft bulkhead cover and interior trim.

6-17. HEAT DISTRIBUTION DUCTS AND MUFFLER (ELECTRICALLY CONTROLLED SYSTEM).

6-18. GENERAL. The heat distribution ducting system (fig. 6-1) consists of various lengths of rigid and flexible tube shapes made of: rubber compound; laminated, 3-ply, resin impregnated fiberglass; spring supported, 2-ply fiberglass fabric; aluminum alloy; or clear polycarbonate plastic. The ducting system originates forward of the firewall where it is enclosed behind the heating system access cover and routed through a direct air flow muffler also located forward of the firewall. Heat passes through an inlet elbow and moves through the muffler in an unrestricted flow. Ducting is routed overhead from the muffler through the cargo/passenger compartment into the pilot's compartment where six fan-shaped diffusors are positioned for the most effective heated air distribution. When the helicopter is furnished with executive trim, heated air is provided for the cargo/passenger compartment through forward bulkhead-mounted ducts. The ducting system includes a lever-actuated butterfly valve that can be adjusted as desired at the cargo/passenger compartment convenience panel. When standard trim is furnished, heat is distributed through a diffusor valve located in the upper convenience panel. Refer to the 500S/E-HMI Supplement for information on the convenience panel. Duct coupling is by bolted flanges, closely fitted slip joints (some sealed by O-rings), clamp retention, or by bonding with ethylene dichloride at the two lowest diffusors.

NOTE: Hughes Notice HN-151 provides instructions for replacement of existing cabin heat duct assemblies with new fiberglass types which are designed to provide greater resistance against heat, deformation, and wear. Existing control cable assemblies must be replaced or reworked per the notice to be compatible with the new fiberglass duct installation.

6-19. REPAIR OF HEAT DISTRIBUTION DUCTS AND MUFFLER (ELECTRICALLY CONTROLLED SYSTEM). Repair of heating system ducting will depend upon the type of material used in the section that requires repair. Rubber hose or flexible fiberglass hose that is torn, flattened or deteriorated should be replaced. When removing ducting for repair or replacement, use figure 6-1 as a guide.
a. Repair rigid fiberglass or the muffler according to the fiberglass repair procedures outlined in HMI Appx D except use fire retardant resin.
b. Repair rigid polycarbonate plastic sections by bonding a patch according to the criteria and methods specified for acrylic plastic in FAA AC 43.13-1A, Aircraft Inspection and Repair. Use dichloromethane (item 38, table 2-4, Basic HMI) or ethylene dichloride as the bonding agent.
c. Repair small areas of rib or seam separation in plastic sections by injecting ethylene dichloride (item 39, table 2-4, Basic HMI) into the void area and clamping together under light pressure.

6-20. HEAT-REDUCING MUFFLER ASSEMBLY INSTALLATION (ELECTRICALLY CONTROLLED SYSTEM). Replacement of the heater air duct assembly with a muffler at the heating system control valve, to reduce cabin noise from airflow within the heating system, may be accomplished with this procedure:
a. Place BATT-OFF-EXT switch in OFF position.
b. Remove interior trim as necessary to gain access to forward left-hand face of upper firewall.
c. Disconnect flexible air ducts as necessary to gain access to heat control valve assembly and existing PN 369A8052-3 heat duct assembly. See figure 6-5.
d. Detach hose clamp and four nuts, washers and bolts securing PN 369A8052-3 duct assembly to heat valve and upper flex hose.
e. Remove and discard PN 369A8052-3 duct assembly and PN 369H92491 gasket. Retain all remaining parts for reinstallation.
f. Install the new PN 369H8052-503 muffler assembly at the location from which the discarded duct assembly was removed, using a new PN 369H92491 gasket and the original hose clamp, bolts, washers, and nuts.
g. Reinstall flexible air ducts and interior trim that were removed for access during steps b and c.

6-21. CARGO/PASSENGER COMPARTMENT LEVER-ACTUATED HEAT CONTROL.

6-22. GENERAL. When the helicopter is furnished with executive trim, cargo/passenger heat

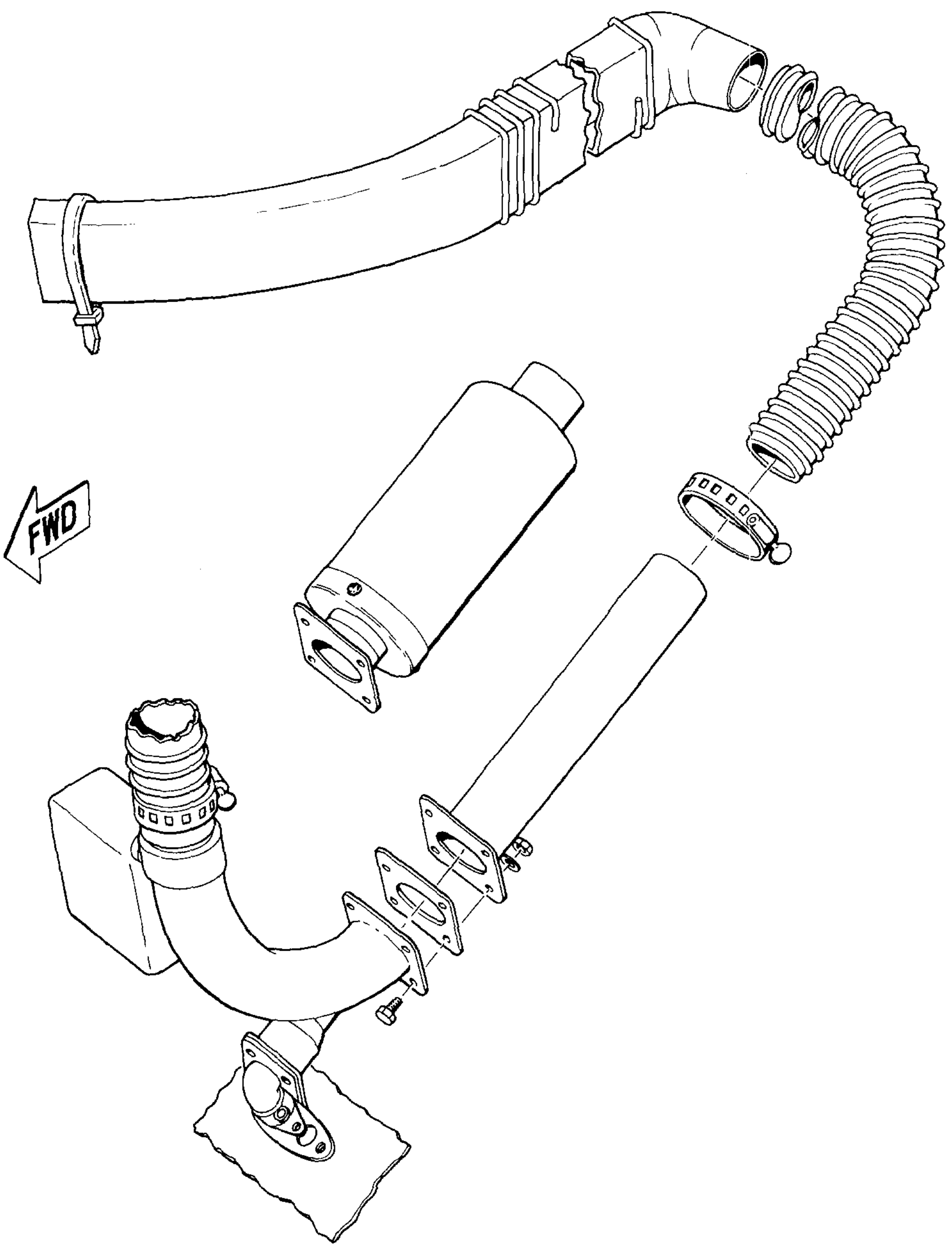


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Figure 6-5. Heat-reducing muffler assembly installation is controlled by a butterfly valve located in the forward bulkhead heat inlet duct (fig. 6-1). The valve is operated by a heat control knob and an adjustable control rod sliding through a friction block. The heat control knob is located on the left side of the forward bulkhead convenience panel. Moving the heat knob up from the CLOSED position opens the valve and allows a selected amount of heated air to pass through the ducting and into the cargo/passenger compartment. The heat control valve is held in any selected position by the friction block.

6-23. CARGO/PASSENGER COMPARTMENT HEAT VALVE AND CONTROL REPLACEMENT. (See fig. 6-1.)

a. At the convenience panel, release setscrew and remove heat control knob.

b. Remove forward bulkhead trim panel to gain access to heat controls. (Refer to 500S/E-HMI Supplement.)

c. Release center rod clip and remove lower adjustable rod.

d. Release upper rod-to-valve crank clip and remove upper rod.

e. Friction block may be removed by pulling away from attaching tape.

f. Remove valve assembly by releasing connecting hose clamp and removing sufficient ducting to free valve.

g. Position replacement valve assembly and secure ducting and hose clamp.

h. Attach upper rod to valve crank and secure with safety clip.

i. Assemble lower rod segments and adjustment barrel; position in convenience panel slot and attach to upper rod. Snap rod clip in place.

NOTE: Install sufficient paneling to check action of heat control knob in convenience panel slot. Final installation is accomplished after completion of valve adjustment.

j. Install control knob and secure with retaining setscrew.

k. Position friction block so rod assembly lines up with valve crank arm and convenience panel control slot. Attach friction block to structure with tape (item 89, table 2-4, Basic HMI).

l. Adjust length of rod assembly by rotating adjustment barrel so that the knob is at the bottom (OFF) position in the convenience panel slot and the heat valve butterfly is against the closed position stop. The heat valve is closed when the valve crank points downward at a 45-degree angle from the pivot point.

m. Slide control knob upward; knob should remain at any position selected. With knob placed at the top of the convenience panel slot (ON), the valve crank should point upward at a 45-degree angle from the pivot point.

n. Install forward bulkhead paneling. Remove and reinstall knob, if required.

6-24. HEATING SYSTEM (MANUALLY CONTROLLED).

6-25. GENERAL. The heating system (fig. 6-6) is essentially the same as the electrically actuated heating system described in paragraph 6-2 with the exception of heat control valve actuation and muffler differences. Cabin heat is mechanically controlled by a pilot actuated cabin heat and defog control lever (early system) or handle (current system) and cable. No electrical switching is used in the manually controlled heating system. Wiring and associated components normally installed in earlier helicopters to provide for optional future installation of an electrically controlled system are not incorporated in the current helicopter electrical system.

6-26. TROUBLESHOOTING THE HEATING SYSTEM (MANUALLY CONTROLLED). Refer to table 6-2.

6-27. INSPECTION OF HEATING SYSTEM (MANUALLY CONTROLLED).

a. Inspect heat valve control lever and cable for freedom of operation.

b. Remove interior trim and left aft bulkhead access cover in cargo compartment. Inspect cable for condition and security.

c. Inspect universal joint at valve end of cable for offset angle from cable centerline in excess of 5 degrees (early system only).

d. Inspect cable clevis for security of lockwire that safeties the spring pin in the valve pulley arm.

e. Refer to paragraph 6-4 and accomplish inspection steps d through h.

f. Perform an operational check as described in paragraph 6-28.

6-28. OPERATIONAL CHECK OF HEAT VALVE MANUAL CONTROL AND CABLE.

a. Move control lever knob to full aft (early system) or control handle to full forward (current system) position to open heat valve. Control knob or handle should not creep away from heat valve full open position.

b. Remove left aft bulkhead access cover.

c. Check that valve is in full open position by inserting a 1/8-inch drill shank (or rod) into the drive pulley alignment hole (fig. 6-6). The drill shank should pass through the pulley and enter a mating alignment hole in the valve housing inlet body.

d. Check the cold air vane drive pulley alignment mark. The mark should align with a similar mark on the cold air vane housing.

Table 6-2. Troubleshooting the heating system (manually controlled)

Symptom	Probable Trouble	Corrective Action
Actuation of heat valve control lever produces no heated air or insufficient heated air at outlets.	Control valve pulley drive belt broken.	Replace faulty parts and adjust valve.
	Pulley shaft retaining pin sheared or control cable spring pin sheared.	Replace faulty parts and adjust valve.
	Heat valve ball and cold air vane in valve assembly not coupled correctly.	Check rigging of control valve.
	Heat valve ball binding in housing.	Shim between valve housing and elbow fitting.
	Heat control valve internally defective.	Replace valve.
	Heat control cable clevis improperly adjusted for length.	Adjust control cable clevis.
	Cracked, broken or disconnected ducting in system.	Replace defective ducts.
Movement of heat valve control lever does not shut off hot air.	Cable to control lever piston retaining pin sheared inside lever housing (early system only).	Replace faulty parts and adjust valve.
	Same as troubles 1 through 6 of preceding symptom.	
Movement of heat valve control lever very difficult.	Control cable crushed or one or more routing bend radii less than a 3-inch minimum.	Check cable operation with clevis detached from pulley arm.
	Universal joint at heater valve end of cable defective causing binding (early system only).	Replace faulty parts.
Heat valve control lever does not remain in selected position.	Cable sleeve (sheath) damage causing preload springback.	Replace defective parts.
Air excessively hot at diffusors*.	Improper cold air mixing.	Adjust valve.

*CAUTION: Do not operate engine until this condition is corrected. Canopy plastic or ducting may be badly damaged if operation is continued.

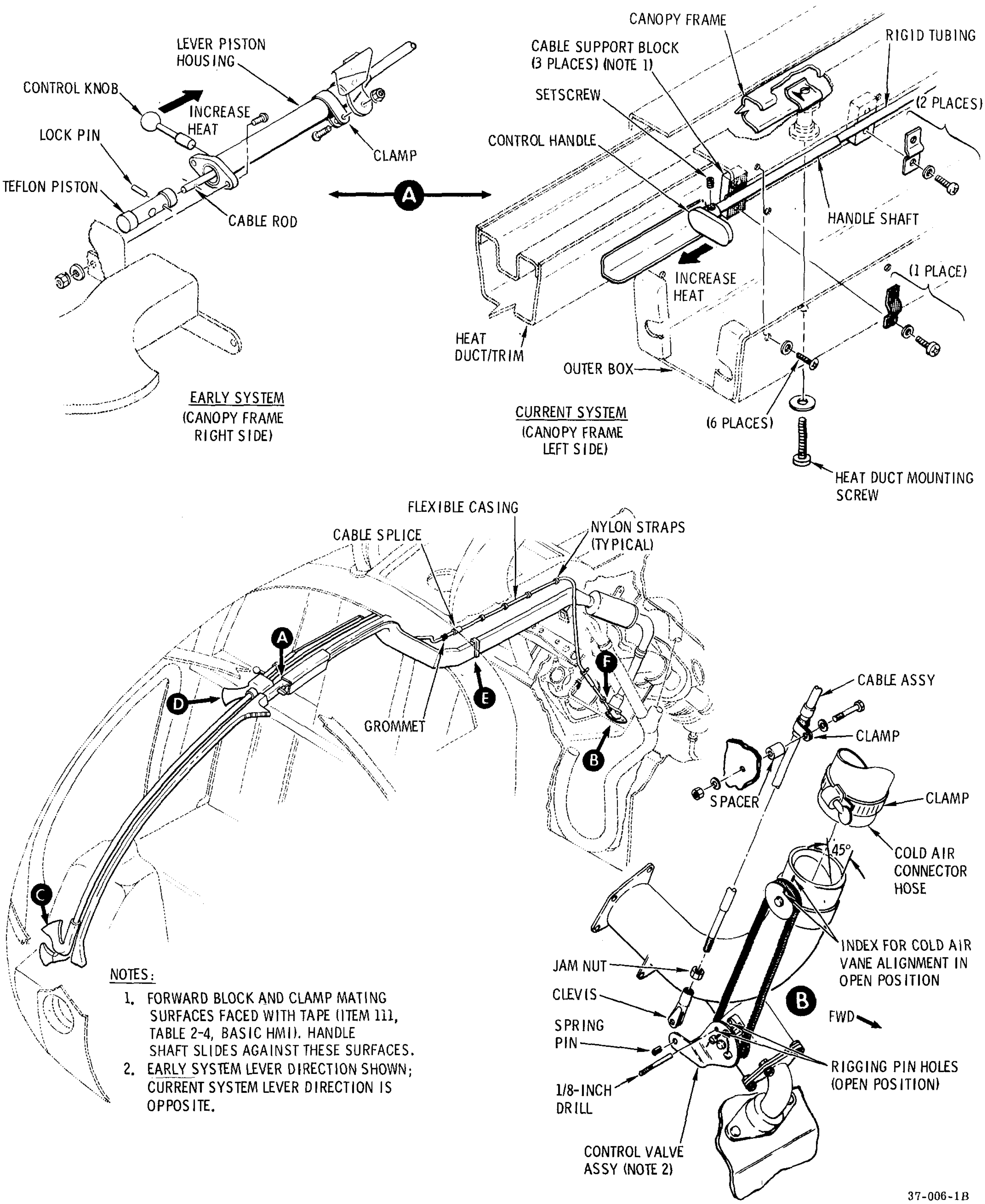
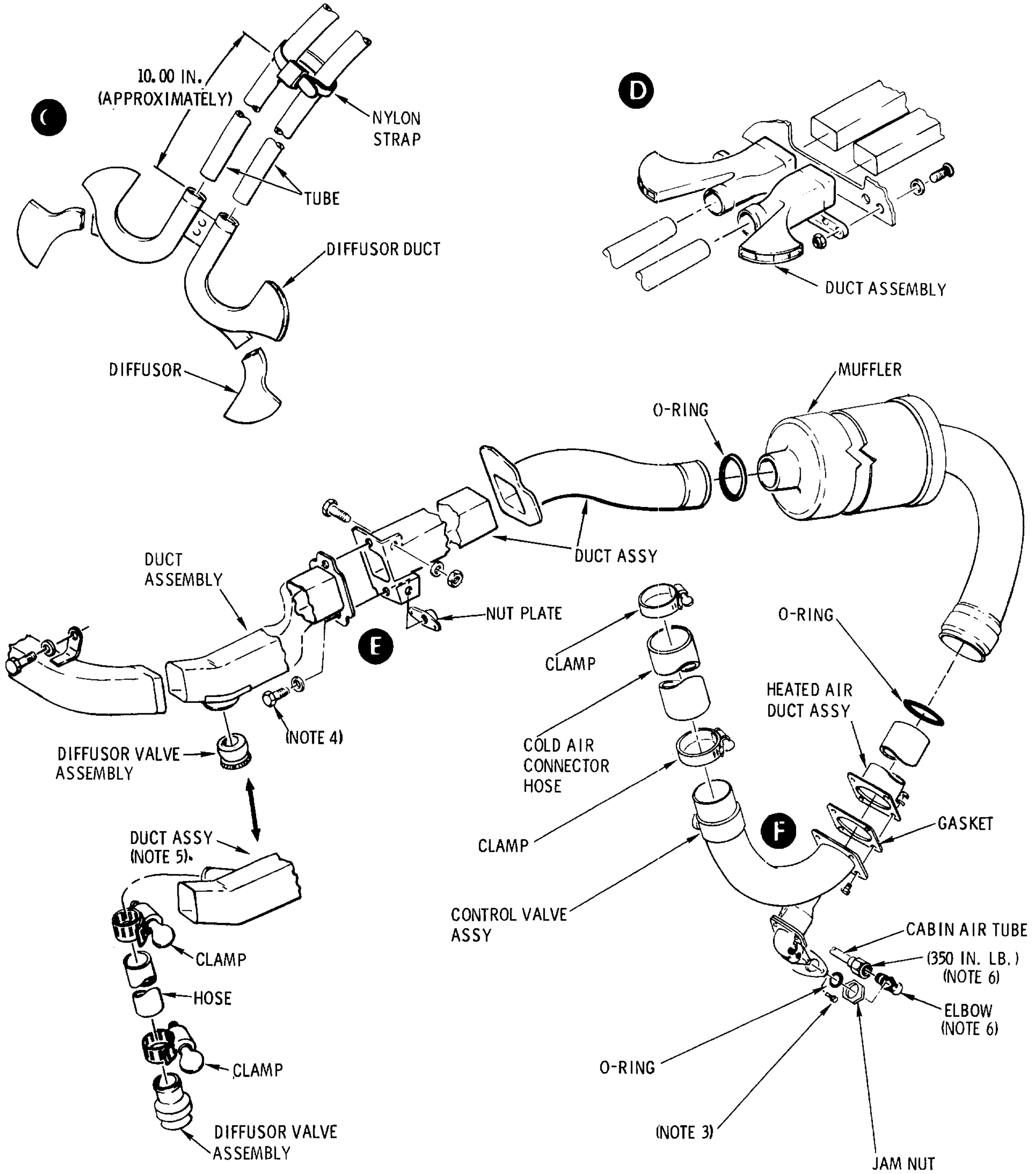


Figure 6-6. Heating system (manually controlled) (sheet 1 of 2)



NOTES: (CONT)

3. BOLTS MAY BE INSTALLED WITH HEADS UP OR DOWN.
4. INSTALL LOWER BOLT ONLY.
5. USED WHEN PASSENGER CARGO COMPARTMENT CONVENIENCE PANEL IS INSTALLED.
6. USE ANTI-SIEZE COMPOUND (ITEM 115, TABLE 2-4, BASIC HMI) ON THREADS.

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Figure 6-6. Heating system (manually controlled) (sheet 2 of 2)

e. Remove drill shank from pulley alignment hole. Move control lever knob to full forward (early system) or control handle to full aft (current system) position to close heat valve. Control knob or handle should not creep.

f. If valve lever does not have sufficient travel, adjust cable attachment clevis according to paragraph 6-35b through e.

g. When control cable operation is stiff, isolate the trouble by removing the lockwire and spring pin from the cable clevis and checking the pull at the lever end with a suitable spring scale. Pull required to actuate the cable should not exceed 1 pound. Reinstall spring pin and safety with lockwire following the pull test.

h. Reinstall left aft bulkhead cover and interior trim.

6-29. HEAT CONTROL VALVE (MANUALLY CONTROLLED).

6-30. GENERAL. The manually controlled heat valve is the same as the electrically controlled heat valve described in paragraph 6-8.

6-31. REMOVAL OF HEAT CONTROL VALVE (MANUALLY CONTROLLED).

a. Remove interior trim and left aft bulkhead access cover.

b. Remove spring pin attaching cable clevis to control valve lever.

c. Refer to paragraph 6-9 and proceed with steps c through g.

6-32. DISASSEMBLY OF HEAT CONTROL VALVE (MANUALLY CONTROLLED). Disassembly of the manually controlled heat valve is essentially the same as for the electrically controlled heat valve. Refer to paragraph 6-10 for heat valve disassembly except accomplish step d as follows: Cut lockwire and remove three screws from valve lever and pulley. Remove valve lever and timing belt.

6-33. INSPECTION AND REPAIR OF HEAT CONTROL VALVE (MANUALLY CONTROLLED). Inspection and repair of the manually controlled heat valve is the same as for the electrically controlled heat valve described in paragraphs 6-11 and 6-12.

6-34. REASSEMBLY OF HEAT CONTROL VALVE (MANUALLY CONTROLLED). Reassembly of the manually controlled heat valve is essentially the same as for the electrically controlled heat valve. Refer to paragraph 6-13 for reassembly of heat control valve except accomplish step r by installing valve lever with three screws rather than installing spacer and actuator belt pulley.

6-35. INSTALLATION OF HEAT CONTROL VALVE (MANUALLY CONTROLLED). (See fig. 6-6.)

a. Refer to paragraph 6-14 and accomplish steps a through d.

b. Position heat control knob fully aft (early system) or control handle fully forward (current system). Position lever on control valve to open and insert a 1/8-inch rigging pin through lever and into valve boss.

c. Loosen jam nut on control cable and adjust clevis so attach holes align with hole in valve lever. Install spring pin through clevis and valve lever and safety with lockwire.

d. Tighten clevis jam nut. Remove rigging pin from valve lever.

e. Move pilot's control knob or handle full back and forward several times to check ease of heat control operation.

f. Reinstall left aft bulkhead access cover and interior trim.

6-36. HEAT CONTROL VALVE MANUAL CONTROL CABLE.

6-37. GENERAL. There are two types of manually operated heat control valve cable installations (fig. 6-6). The early type heat control valve control cable consists of a flexible, enclosed wire-type cable assembly bonded to a control housing. The control housing, with cable actuating knob, is attached to the overhead canopy structure in the pilot's compartment. Movement of the control lever to the aft limit opens the hot air control valve. Control lever piston travel in the housing is approximately 2-3/4 inches, from open to closed positions. The last 4-inch section of the cable incorporates a universal joint that provides up to 10 degrees total movement for heat control valve arm throw, and a clevis for attachment to the control valve pulley arm. The current type heat control valve has a control handle and the push-pull wire and conduit assembly incorporated in the left side of a duct attached to the overhead canopy structure. Movement of the cable actuating control handle to the forward limit opens the hot air control valve completely. Minimum travel for the control handle is approximately 2-3/4 inches, from open to closed positions. Cable routing for both early and current installations is along the left side of the main rotor mast support structure and then downward to the control valve on the firewall.

6-38. REMOVAL OF HEAT CONTROL VALVE MANUAL CONTROL CABLE. (See fig. 6-6.)

a. Remove left half of engine air inlet forward fairing, interior trim and left aft bulkhead access cover.

b. Remove two screws, washers and nuts that attach cable housing to structure (early system); or remove seven screws attaching heat duct outer box to heat duct and canopy frame (current system).

c. Remove clamps and straps that attach cable to structure along its full length.

d. Cut lockwire and remove spring pin or remove cotter pin and clevis pin from clevis at heater control valve arm.

e. Remove control cable.

6-39. DISASSEMBLY OF HEAT CONTROL VALVE MANUAL CONTROL CABLE (EARLY TYPE). (See fig. 6-5.) The control assembly is normally replaced as a unit. However, disassembly to the extent shown in figure 6-6 can be accomplished for inspection purposes. No repairs are recommended except for replacement of lever mechanism parts.

a. Move control knob to full extent of forward travel.

b. Pull control knob shaft out of piston.

c. Pull piston out of housing.

d. Remove lock pin from piston to separate cable and piston.

6-40. INSPECTION OF HEAT CONTROL VALVE MANUAL CONTROL CABLE.

a. Inspect cable for kinks, crushed sleeve and corrosion.

b. (Early type only) Inspect piston for wear or elongation of knob shaft or lock pin holes.

6-41. REPAIR OF HEAT CONTROL VALVE MANUAL CONTROL CABLE. No repairs are recommended except for replacement of early type lever mechanism parts.

6-42. REASSEMBLY OF HEAT CONTROL VALVE MANUAL CONTROL CABLE (EARLY TYPE). (See fig. 6-6.)

a. Extend cable rod through housing so parts can be assembled.

b. Fit serviceable piston on cable rod and secure with lockpin.

c. Push piston into housing until large hole in piston is aligned with large hole in end of housing slot.

d. Insert control knob rod through housing slot and into piston.

e. Use masking tape or lockwire to retain control knob in position until installed.

6-43. INSTALLATION OF HEAT CONTROL VALVE MANUAL CONTROL CABLE. (See fig. 6-6.)

a. Route the cable assembly into position. Check that grommets (two on early type, one on current type cable) are in place on the cable.

b. (Early type only) Attach control housing to canopy structure bracket with two screws, washers and nuts.

c. Install clamps and straps that attach cable to structure. Seal hole at structure fairing that cable passes through, using adhesive (item 101, table 2-4, Basic HMI).

NOTE: The clamp nearest to the valve should not be tightened until after travel is checked.

d. (Current type only) Attach heat duct outer box to heat duct and canopy frame with seven screws.

e. Adjust clevis at heat control valve (para 6-35).

f. When assured that control will operate the valve freely through full range of travel, tighten the clamp nearest the valve.

g. Reinstall aft bulkhead access cover, interior trim, and left half of engine air inlet fairing.

h. (Current type only) After installation, adjust handle to be parallel with windshield glass.

6-44. HEAT DISTRIBUTION DUCTS AND MUFFLER (MANUALLY CONTROLLED).

6-45. GENERAL. The heat distribution ducting system is essentially the same as the heat distribution ducting described in paragraph 6-18 with the exception of the muffler and cargo/passenger heating arrangement. The muffler consists of a laminated fiberglass housing, a perforated aluminum core and fiberglass wool packing that forms a 1-inch-thick padding around the muffler core. A heated air outlet is also provided for the cargo/passenger compartment area through an overhead duct diffusor valve. On helicopters equipped with a passenger convenience panel, the heated air is ducted from the overhead duct through a hose to a diffusor valve mounted in the panel. The valve air flow can be adjusted as required. Refer to the 500S/E or 500M HMI Supplement for information on the panel.

6-46. REPAIR OF HEAT DISTRIBUTION DUCTS AND MUFFLER (MANUALLY CONTROLLED SYSTEM). Refer to paragraph 6-19 for repair of heat distribution ducts and muffler. Repairs are the same as those described for the electrically controlled system.

OPTION GROUP 7
AVIONICS INSTALLATIONS

7-1. AVIONICS EQUIPMENT.

7-2. GENERAL. Optional avionics equipment for the helicopter includes the installations listed at the end of this paragraph. Individual installations or equipment can be installed in the helicopter according to applicability and helicopter configuration. (Refer to the 369 Series Illustrated Parts Catalog (369 IPC) or the separate Installation Instructions for the specific avionics installation that is furnished with the equipment, as applicable.) The following information provides maintenance procedures for all the installations; however, only the applicable information should be consulted when maintenance is performed. For applicable maintenance information on the avionics installations and equipment beyond the scope of coverage in this optional group (such as internal repairs of radio equipment components, radio internal schematics, etc), refer to the applicable manufacturer's publications. Manufacturer's instruction manuals on equipment components are listed in table 2-12 of the Basic HMI. Available wiring and schematic interconnection diagrams for complete optional avionics installations are located within this option group. When using diagrams, be sure to use the applicable diagram. Figures 7-1 and 7-2 show the various combinations of avionics equipment that may be installed on instrument panels type A and B (Basic HMI) for the avionics installations.

Avionics Equipment

Four- or five-station interphone systems

Hf SSB communications (COMM) installation

Vhf communications (COMM) installations

Vhf navigation (NAV) installations

Vhf communications/navigation (COMM/NAV) installation

Dual vhf communications/navigation (COMM/NAV) installations

Automatic direction finding (ADF) installations

Distance measuring equipment (DME) installation

Air traffic control radar beacon transponder installations

Public address (PA) sound and siren system installations

7-3. TROUBLESHOOTING AVIONICS INSTALLATIONS. Refer to table 7-1 for troubleshooting procedures for all avionics equipment and installations that may be installed in the helicopter. The information is typical of troubles that may be encountered and is grouped according to functional nomenclature of the installations. Use the applicable portions of the information for the equipment installed. See the applicable wiring diagrams for the installations at the end of this option group for complete interconnection wiring information. Use the schematic diagrams and other related data provided in this option group as necessary. Where appropriate, use applicable manufacturer's instruction manuals (table 2-12, Basic HMI) for troubleshooting systems and equipment components internally.

NOTE: A trouble in one installation may affect a function of another installation when installations use equipment in common or function with equipment of related installations. This especially applies to intercom and vhf radio control equipment and associated radio installations.

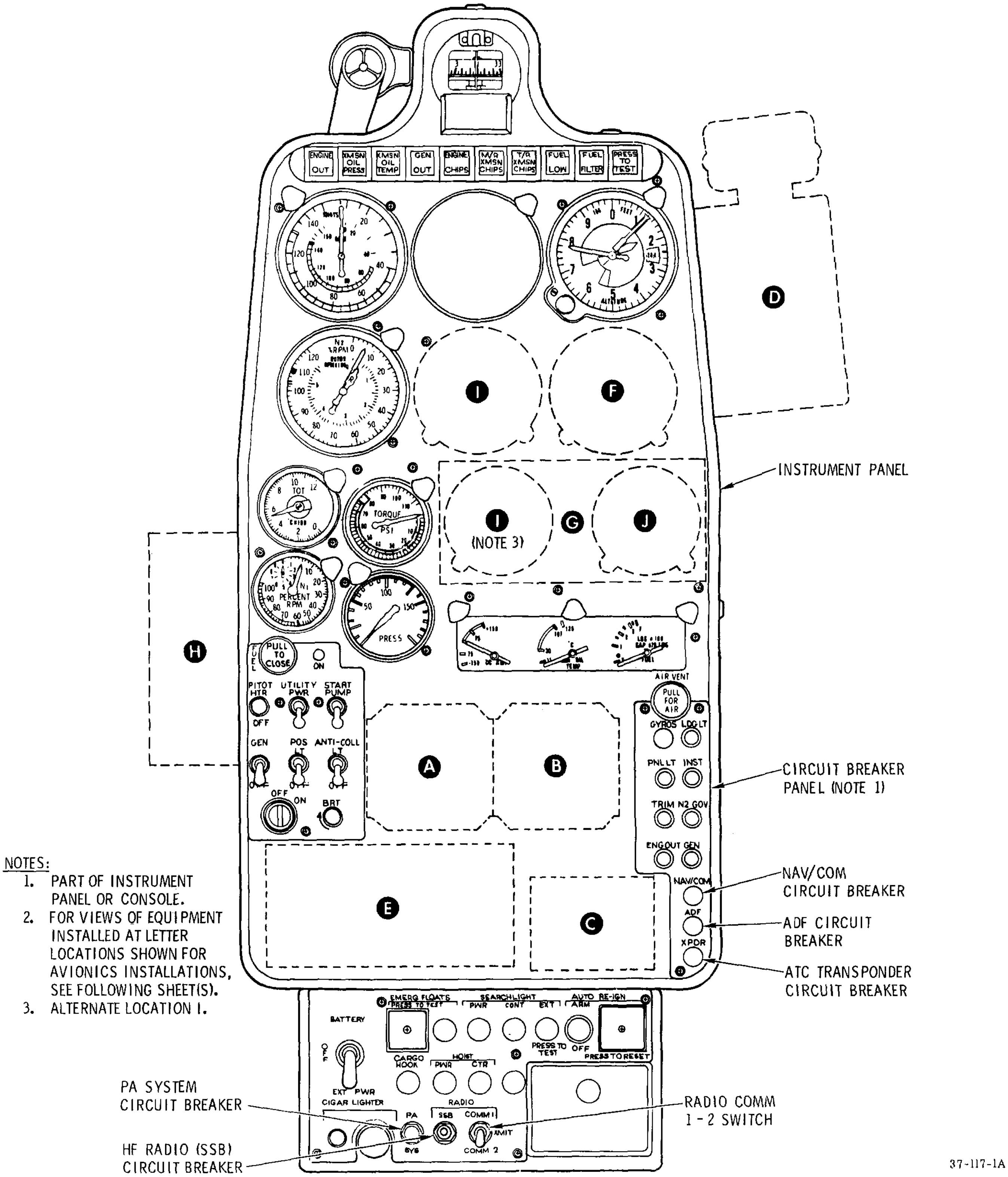
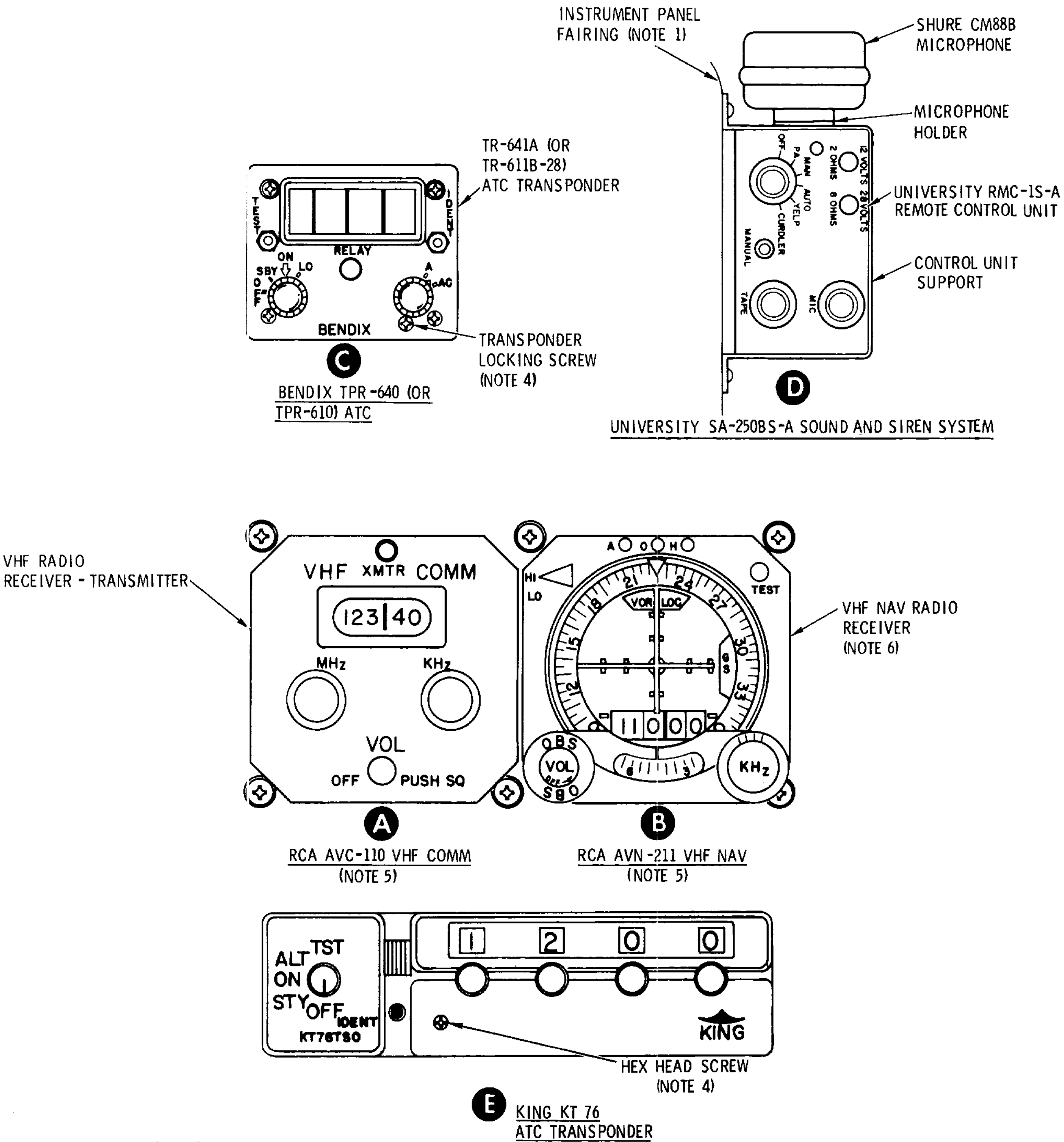


Figure 7-1. Avionics equipment in instrument panel type B (sheet 1 of 4)

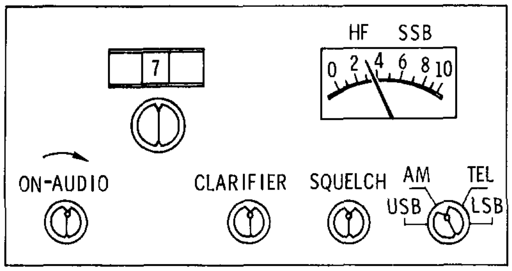


NOTES: (CONT)

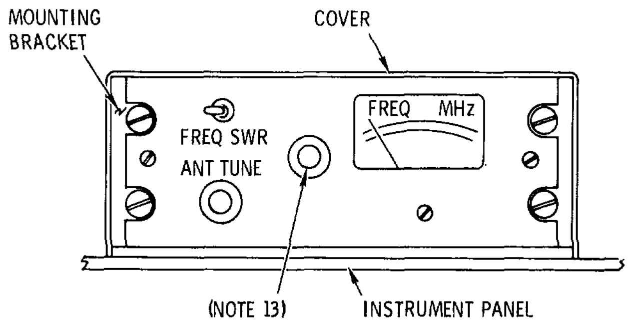
4. LOOSEN BEFORE REMOVAL OF UNIT. TIGHTEN AT INSTALLATION.
5. RCA AVC-110 AND AVN-211 BOTH USED FOR RCA DUAL VHF COMM/NAV INSTALLATION.
6. AT REPLACEMENT, INTERNAL MODIFICATION REQUIRED. (SEE INTERCONNECTION WIRING DIAGRAM IN THIS OPTION GROUP FOR APPLICABLE AVIONICS INSTALLATION.)

37-117-2B

Figure 7-1. Avionics equipment in instrument panel type B (sheet 2 of 4)

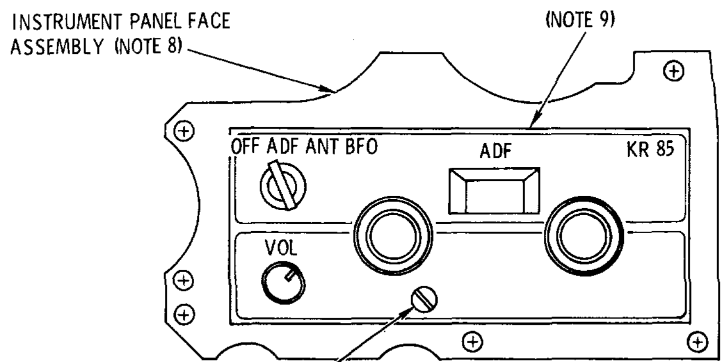


E SUNAIR RE1200 RECEIVER/EXCITER (NOTES 7, 12)



H S&T AC-31-1 HF COMM ANTENNA CONTROL HEAD (NOTES 7, 12, 13)

SUNAIR ASB/125 SSB HF COMM

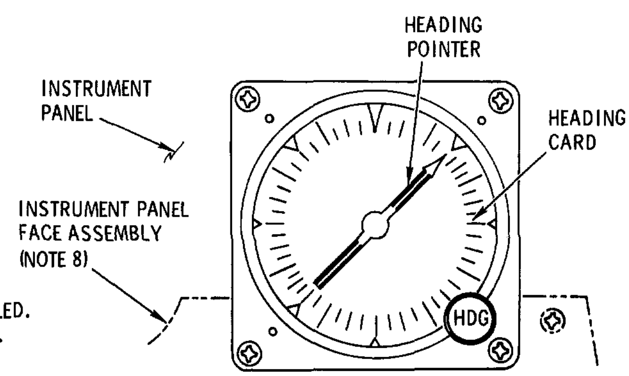


G KING KR 85 ADF RECEIVER (NOTES 7, 10)

KING KR 85 ADF

NOTES: (CONT)

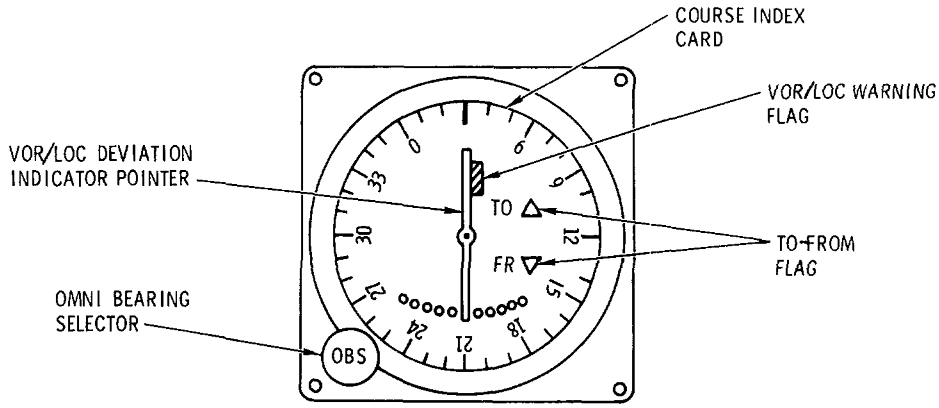
7. AT REPLACEMENT, REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL ADJUSTMENTS REQUIRED FOR ALIGNMENT, CALIBRATION, ETC.
8. MOUNT FOR KR 85 ADF RECEIVER.
9. INSERT THRU RECTANGULAR CUTOUT IN INSTRUMENT PANEL.
10. PART OF KR 85 ADF INSTALLATION. UNIT MAY BE INSTALLED AT LOCATION E (SHEET 1) IF KX 170 VHF COMM/NAV IS INSTALLED.
11. LOOSEN BEFORE REMOVAL OF UNIT. TIGHTEN AT INSTALLATION.
12. PART OF SUNAIR ASB-125 SSB HF COMM INSTALLATION.
13. THIS VIEW ROTATED 90°CLOCKWISE. AT REPLACEMENT, MAKE SURE THAT GE #327 LAMP IS INSTALLED.
14. PART OF KING KR 85 ADF INSTALLATION, MAY BE INSTALLED AT LOCATION B (SHEET 1) IF AVC-110 VHF COMM IS INSTALLED; OR AT LOCATION I IF KX 170 VHF COMM/NAV IS INSTALLED.



F KING KI 225 ADF INDICATOR (NOTE 14)

37-117-3A

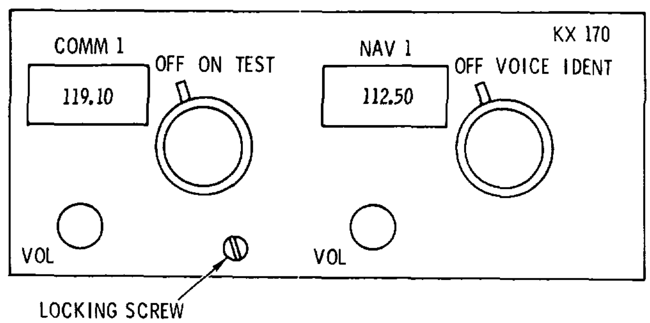
Figure 7-1. Avionics equipment in instrument panel type B (sheet 3 of 4)

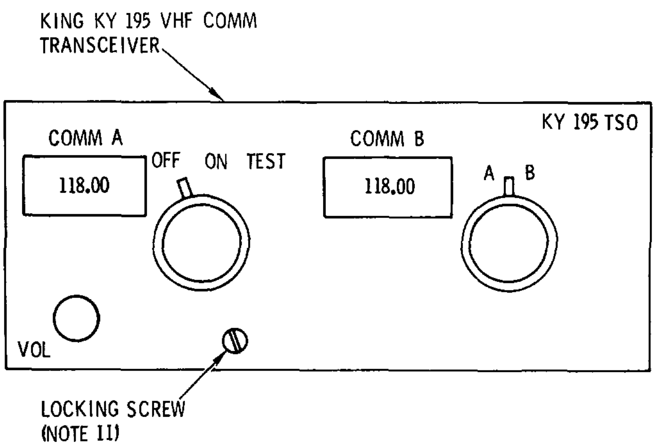


I KING KI 201C NAV INDICATOR (NOTES 7, 15, 16)

KING KX 170 OR KX 175 VHF COMM/NAV

A B KING KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER (NOTES 7, 16)

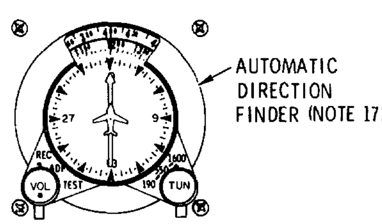




A B KING KY 195 VHF COMM (NOTE 7)

NOTES: (CONT)

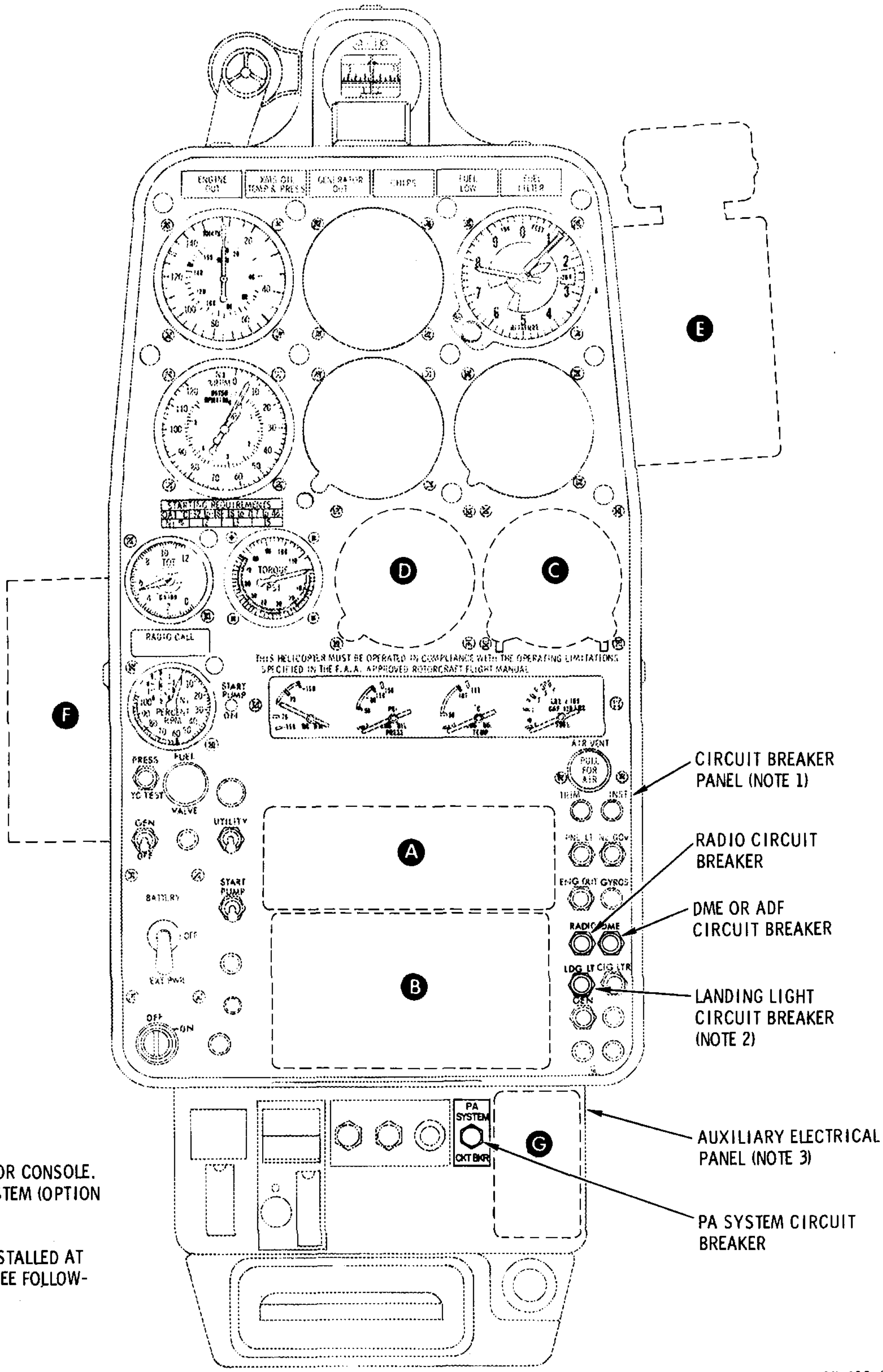
15. USED ONLY WITH KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER. MAY BE INSTALLED AT ALTERNATE LOCATION I. MAY BE INSTALLED AT LOCATION J IF KR 85 ADF IS INSTALLED WITH KI 225 ADF INDICATOR AT LOCATION I.
16. PART OF KING KX 170 OR KX 175 VHF COMM/NAV INSTALLATION.
17. AT REPLACEMENT, REFER TO TEXT.
18. SUFFIX LETTER FOR MANUFACTURER'S MODEL NUMBER MAY VARY. (EXAMPLE - KX 170A OR KX 170B; REFER TO TEXT.)



J KING KR-80 ADF

37-117-4A

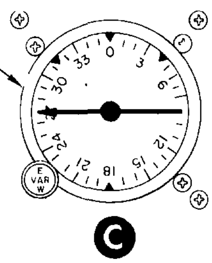
Figure 7-1. Avionics equipment in instrument panel type B (sheet 4 of 4)

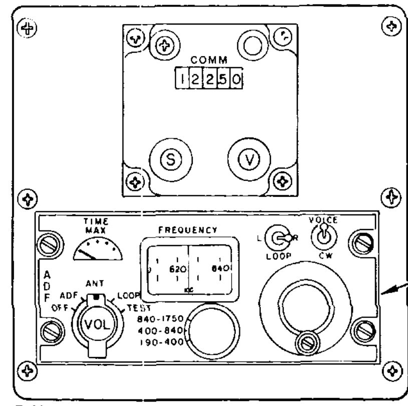


NOTES:

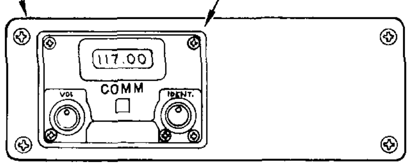
1. PART OF INSTRUMENT PANEL OR CONSOLE.
2. PART OF NIGHT LIGHTING SYSTEM (OPTION GROUP 4).
3. REFER TO OPTION GROUP 2.
4. FOR VIEWS OF EQUIPMENT INSTALLED AT LETTER LOCATIONS SHOWN, SEE FOLLOWING SHEETS.

Figure 7-2. Avionics equipment in instrument panel type A (sheet 1 of 4)

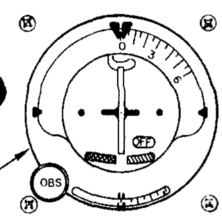


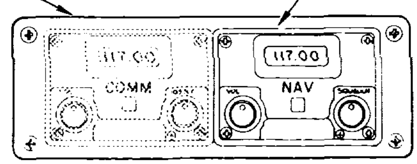


BENDIX DFA-73A-1 ADF (NOTE 5)

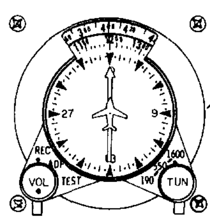


A BENDIX RT-221( )E-28 VHF COMM (NOTE 6)

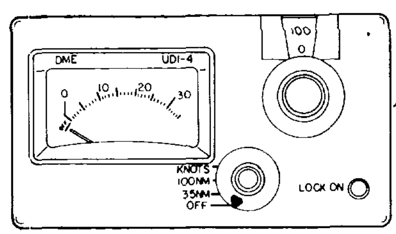




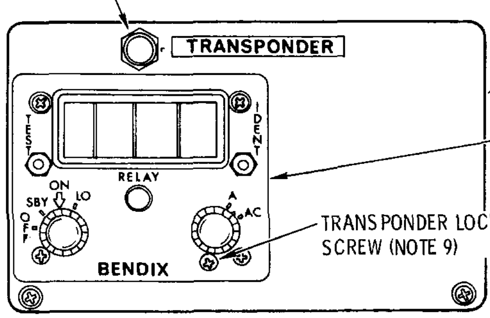
BENDIX RN-222AE-28 VHF NAV (NOTE 7)



C KING KR-80 ADF



B NARCO UDI-4 DME



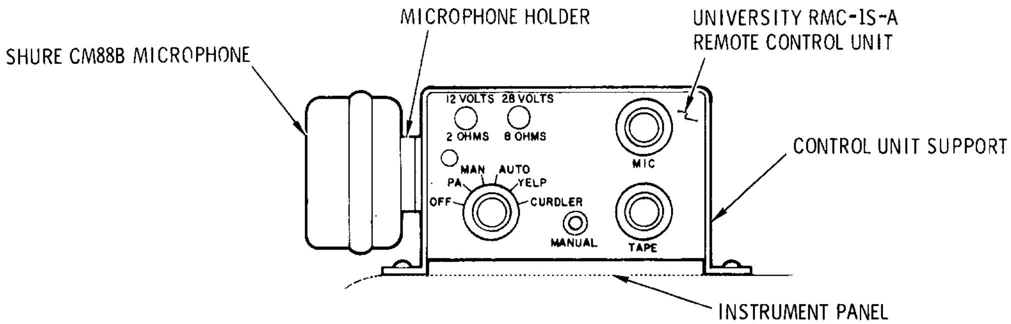
B BENDIX TPR-640 (OR TPR-610) ATC

NOTES: (CONT)

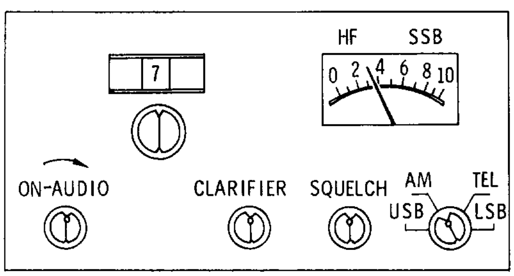
5. USED ONLY WITH VHF COMM INSTALLATION.
6. BENDIX RT-221AE-28 OR RT-221BE-28.
7. USED ONLY WITH BENDIX RT-221( )E-28 VHF COMM INSTALLATION.
8. AT REPLACEMENT OF UNIT, REFER TO TEXT.
9. LOOSEN BEFORE REMOVAL OF TRANSPONDER. TIGHTEN AT INSTALLATION.

37-026-2A

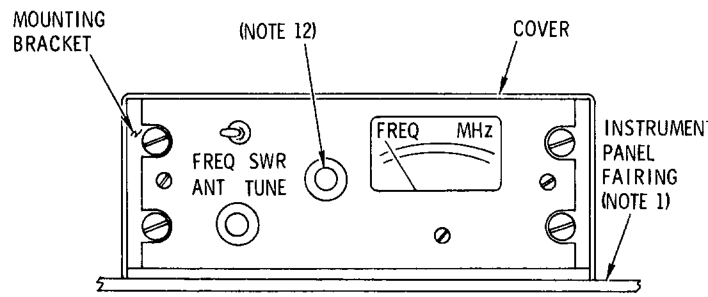
Figure 7-2. Avionics equipment in instrument panel type A (sheet 2 of 4)



E UNIVERSITY SA-250S SOUND AND SIREN SYSTEM
(NOTE 10)

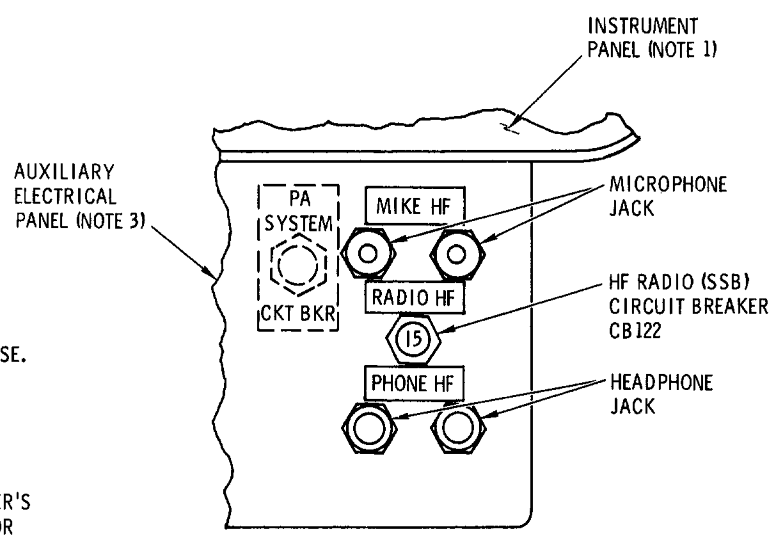


B SUNAIR RE-1200 RECEIVER/EXCITER
(NOTES 11, 13)



F S & T AC-31-1 HF COMM ANTENNA CONTROL HEAD
(NOTES 11, 12, 13)

SUNAIR ASB/125 SSB HF COMM



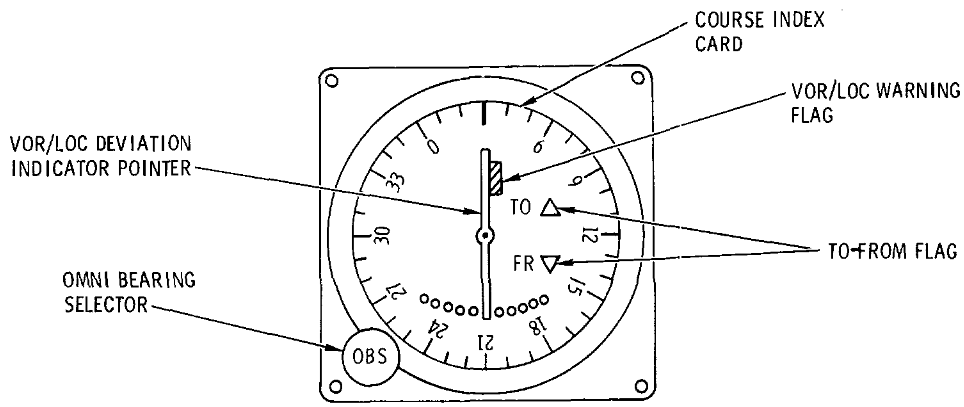
G HEADPHONE AND MICROPHONE JACKS
(NOTE 11)

NOTES: (CONT)

10. THIS VIEW ROTATED 90° COUNTERCLOCKWISE.
11. PART OF SUNAIR ASB/125 SSB HF COMM INSTALLATION.
12. THIS VIEW ROTATED 90° CLOCKWISE. AT REPLACEMENT, MAKE SURE THAT GE #327 LAMP IS INSTALLED.
13. AT REPLACEMENT, REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL ADJUSTMENTS REQUIRED.

37-026-3A

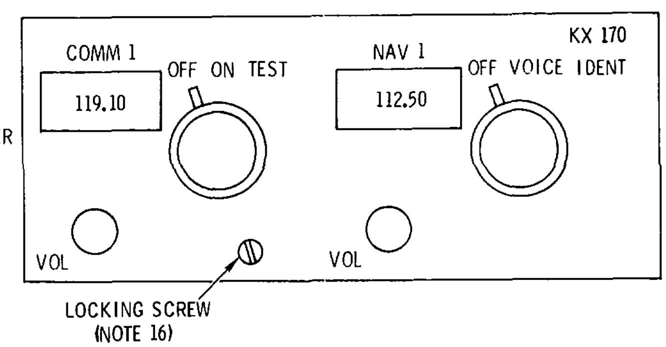
Figure 7-2. Avionics equipment in instrument panel type A (sheet 3 of 4)

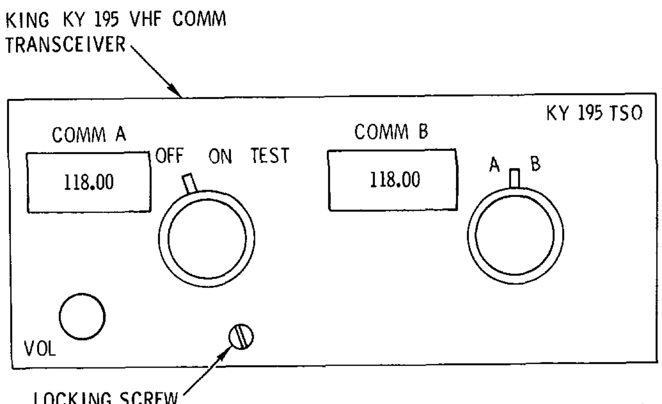


D KING KI 201C NAV INDICATOR (NOTES 13, 14, 15)

KING KX 170 OR KX 175 VHF COMM/NAV

A KING KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER (NOTES 13, 15)





A KING KY 195 VHF COMM (NOTE 13)

NOTES: (CONT)

14. USED ONLY WITH KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER.
15. PART OF KX 170 OR KX 175 VHF COMM/NAV INSTALLATION.
16. LOOSEN BEFORE REMOVAL OF UNIT. TIGHTEN AT INSTALLATION.
17. SUFFIX LETTER FOR MANUFACTURER'S MODEL NUMBER MAY VARY. (EXAMPLE - KX 170A OR KX 170B; REFER TO TEXT.)

37-026-4A

Figure 7-2. Avionics equipment in instrument panel type A (sheet 4 of 4)

Table 7-1. Troubleshooting avionics installations

Symptom	Probable Trouble	Corrective Action

WARNING: Before removing or installing components connected to the electrical system, check that all electrical power is OFF. If units are not immediately replaced, ensure that all electrical connectors are suitably capped and stowed and all loose cable ends are properly insulated to prevent the possibility of shorting. Serious injury or death could result from voltages present in the electrical system.

NOTE: Following troubleshooting information covers equipment for all the installation configurations that may be installed in the helicopter. Equipment of the installations varies according to whether the helicopter has an instrument panel type A or B. See figures 7-1 and 7-2 to determine which equipment installations apply to each of the two types of instrument panels. Disregard information that pertains to equipment or installations that are not installed.

GENERAL - ALL INSTALLATIONS

Symptom	Probable Trouble	Corrective Action
No dc power to equipment of an installation	Defective associated circuit breaker	Replace circuit breaker.
	No dc power on helicopter main dc bus	Refer to Section 19, Basic HMI.
Circuit breaker trips	Overload or short circuit in equipment of associated installation	Isolate to the specific installation; then troubleshoot the installation.

NOTE: A single circuit breaker that is part of a specific installation may also be used for other installations. Be sure to check all installations that can affect the circuit breaker.

Symptom	Probable Trouble	Corrective Action
Identical trouble symptom common to two or more installations	Defective equipment in one installation that is also used by other installation(s)	Isolate defective equipment to the applicable installation; then troubleshoot the installation.
Trouble isolated to one function or location	Faulty terminal block connection or wiring in affected circuit	Check and repair connection or wiring.
Panel lamp does not light	Lamp filament open	Replace lamp in affected unit.

NOTE: Before troubleshooting installations for audio troubles, or other functions that are dependent upon intercom and vhf radio control equipment, be sure to first check that intercom and vhf radio equipment functions correctly. Troubles that may occur in intercom and vhf radio control equipment that affect radio operation are listed in the troubleshooting procedures for intercom and vhf radio control equipment. Also, troubles that may occur in equipment or other installations that affect intercom and radio operation are listed in the troubleshooting procedures for intercom and vhf radio control equipment.

INTERCOM AND RADIO CONTROL EQUIPMENT

NOTE: One of two different intercom master control units may be used. On helicopters with an instrument panel type B, an integrated interphone control unit is used. On a helicopter with instrument panel type A, an intercom adapter is used. A microphone filter is used only on a helicopter with instrument panel type A. Station in following procedures refers to radio/intercom station in the helicopter.

Symptom	Probable Trouble	Corrective Action
PA, SSB or RADIO circuit breaker trips	Overload or short circuit in interphone control unit or intercom adapter	Repair or replace control unit or adapter.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
INTERCOM AND RADIO CONTROL EQUIPMENT (CONT)		
Radio and ICS modes of operation are inoperative at all stations	Defective interphone control unit or intercom adapter	Repair or replace control unit or adapter.
Cannot transmit audio from one station to any other station; normal ICS and radio operation from other stations	Defective microphone in headset-microphone	Repair or replace headset-microphone.
	Defective associated RADIO-ICS switch	Repair or replace switch.
Cannot receive intercom and receiver audio at one station; normal ICS and radio operation at other stations	Defective headset in headset-microphone	Repair or replace headset-microphone.
Cannot transmit and receive audio between any stations for ICS operation; radio transmission and reception normal at all stations	Defective interphone (ICS) keying circuit in interphone control unit or intercom adapter	Repair or replace control unit or adapter.
	Defective microphone audio circuit or amplifier in interphone control unit	Repair or replace control unit.
	Defective audio circuits in vhf COMM radio associated with intercom adapter	Repair or replace vhf COMM radio.
Cannot transmit radio signals and cannot transmit and receive audio between any stations; radio reception normal at all stations	Incorrectly adjusted ICS control R8 on interphone control unit or microphone audio level control R3 on intercom adapter	Adjust control as necessary.
	Defective microphone filter	Replace microphone filter.
	Defective microphone audio circuit or amplifier in interphone control unit; or defective microphone audio circuit in intercom adapter	Repair or replace control unit or adapter.
Cannot transmit and receive audio between any stations and cannot receive radio signals; radio transmission normal at all stations	Incorrectly adjusted internal phone gain control (if incorporated) in interphone control unit, or sidetone level control R501 used with intercom adapter	Adjust control as necessary.
	Defective phone audio amplifier circuits in interphone control unit	Repair or replace control unit.
	Defective audio circuits in intercom adapter	Repair or replace intercom adapter.
	Defective audio circuits in vhf COMM radio associated with intercom adapter	Repair or replace vhf COMM radio.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
INTERCOM AND RADIO CONTROL EQUIPMENT (CONT)		
Cannot transmit or receive radio signals; ICS operation normal between stations	Defective radio equipment in associated radio installation	Repair or replace defective radio equipment.
	Defective interphone control unit or intercom adapter	Repair or replace control unit or intercom adapter.
Cannot transmit radio signals; can receive radio signals and ICS operation is normal at stations	Defective audio circuits in vhf COMM radio associated with intercom adapter	Repair or replace vhf COMM radio.
	Defective transmit (XMIT) keying circuit in interphone control unit or intercom adapter	Repair or replace control unit or intercom adapter.
Cannot receive radio signals; radio transmission and ICS operation normal at stations	Defective audio circuits in interphone control unit or intercom adapter	Repair or replace control unit or intercom adapter.
	Defective receiver in associated radio	Repair or replace radio.
	Defective audio circuits in vhf COMM radio associated with intercom adapter	Repair or replace vhf COMM radio.
No transmitter sidetone audio at any station during radio transmission; otherwise, ICS, radio transmission and radio reception normal	Incorrectly adjusted COMM 1 (or COMM 2) sidetone level control R22 (or R25) on interphone control unit	Adjust applicable control as necessary.
	Incorrectly adjusted vhf COMM radio sidetone level control R501 associated with intercom adapter	Adjust control as necessary.
	Defective sidetone audio circuits or amplifier in interphone control unit	Repair or replace control unit.
	Defective sidetone circuits in associated vhf or hf COMM radio	Repair or replace vhf or hf COMM radio.
VHF COMMUNICATIONS (COMM) INSTALLATION		
NAV/COMM or RADIO circuit breaker trips	Overload or short circuit in vhf COMM radio	Repair or replace vhf COMM radio.
	Overload or short circuit in voltage converter	Repair or replace voltage converter.
Cannot receive radio signals from vhf COMM radio at any stations; radio reception from other radios (if installed) and ICS operation normal	Defective receiver in vhf COMM radio	Repair or replace vhf COMM radio.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
VHF COMMUNICATIONS (COMM) INSTALLATION (CONT)		
Cannot transmit vhf radio signals; radio reception and ICS operation at stations normal	Defective transmitter in vhf COMM radio	Repair or replace vhf COMM radio.
Cannot receive or transmit vhf radio signals; ICS and other radio reception at stations normal	Defective vhf COMM radio	Repair or replace vhf COMM radio.
	Disconnected uhf/vhf antenna cable	Connect uhf/vhf antenna cable.
	Disconnected uhf/vhf COMM antenna	Connect uhf/vhf antenna.
	Disconnected or defective uhf/vhf antenna matching unit	Connect or replace matching unit.
VHF NAVIGATION (NAV) INSTALLATION		
NAV/COMM or RADIO circuit breaker trips	Overload or short circuit in vhf NAV receiver	Repair or replace receiver.
	Overload or short circuit in VOR/LOC converter indicator	Repair or replace indicator.
Erroneous or no visual indications on VOR/LOC indicator; can receive NAV voice signals	Defective VOR/LOC indicator for separate indicator; defective vhf NAV receiver for receiver with built-in indicator	Repair or replace indicator or receiver, as applicable.
Cannot receive NAV voice signals; correct visual indications on VOR/LOC indicator for received signals	Defective vhf NAV receiver	Repair or replace receiver.
Cannot receive NAV voice signals and no visual indications on VOR/LOC indicator	Defective vhf NAV receiver	Repair or replace receiver.
	Disconnected vhf NAV antenna cable	Connect antenna cable.
	Disconnected vhf NAV (VOR) antenna	Connect antenna.
	Defective vhf NAV (VOR) antenna	Repair or replace antenna.
AUTOMATIC DIRECTION FINDING (ADF) INSTALLATION		
ADF, ADF/DME or RADIO circuit breaker trips	Overload or short circuit in ADF receiver	Repair or replace receiver.
	Overload or short circuit in ADF indicator	Repair or replace indicator.
	Overload or short circuit in ADF control unit	Repair or replace control unit.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
AUTOMATIC DIRECTION FINDER (ADF) INSTALLATION (CONT)		
	Overload or short circuit in dc to ac inverter	Repair or replace inverter.
Erroneous or no bearing indication on ADF indicator; ADF audio signals received	Defective dc to ac inverter	Repair or replace inverter.
	Defective ADF loop antenna	Repair or replace loop antenna.
	Disconnected or defective ADF loop antenna cable	Connect or repair loop antenna cable.
	Defective ADF indicator	Repair or replace indicator.
No ADF audio signals received; correct bearing indication present on ADF indicator	Disconnected or broken ADF sense antenna	Connect or repair sense antenna.
	Disconnected ADF sense antenna cable	Connect sense antenna cable.
	Defective ADF sense antenna coupler	Repair or replace sense antenna coupler.
	Disconnected or broken ADF sense antenna lead-in wire	Connect or repair sense antenna lead-in wire.
No bearing indication or voice signals received	Defective ADF receiver	Repair or replace ADF receiver.
	Defective ADF control unit	Repair or replace ADF control unit.
DISTANCE MEASURING EQUIPMENT (DME) INSTALLATION		
DME or ADF/DME circuit breaker trips	Overload or short circuit in DME interrogator unit	Repair or replace unit.
Erroneous or no indications on DME interrogator unit	Defective DME interrogator unit	Repair or replace unit.
	Disconnected or defective DME antenna	Connect or replace antenna.
	Disconnected DME antenna cable	Connect cable.
AIR TRAFFIC CONTROL RADAR BEACON (ATC) INSTALLATION		
TRANSPONDER circuit breaker trips	Overload or short circuit in ATC transponder	Repair or replace transponder.
Erroneous or no indications on ATC transponder	Defective ATC transponder	Repair or replace transponder.
	Disconnected or defective ATC transponder antenna	Connect, repair or replace antenna.
	Disconnected ATC transponder antenna cable	Connect cable.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
	PUBLIC ADDRESS (PA) SOUND AND SIREN SYSTEM	
PA circuit breaker trips	Overload or short circuit in audio amplifier	Repair or replace amplifier.
	Overload or short circuit in remote control unit	Repair or replace control unit.
System does not operate in either pa (sound) or siren mode	Open fuse in audio amplifier	Replace fuse.
	Defective audio amplifier	Repair or replace amplifier.
	Defective remote control unit	Repair or replace control unit.
	Defective loudspeaker	Repair or replace loudspeaker.
Sound mode inoperative; siren mode operation normal	Defective microphone	Repair or replace microphone.
	Defective remote control unit	Repair or replace control unit.
Siren mode inoperative; sound mode operation normal	Defective remote control unit	Repair or replace control unit.
	VHF COMMUNICATIONS/NAVIGATION (COMM/NAV) INSTALLATION	
NAV/COMM circuit breaker trips	Overload or short circuit in vhf COMM/NAV transceiver	Repair or replace vhf COMM/ NAV transceiver.
	Overload or short circuit in voltage converter	Repair or replace voltage converter.
Cannot receive or transmit vhf COMM radio signals; ICS, vhf NAV and other radio reception is normal at stations	Defective voltage converter	Repair or replace voltage converter.
	Defective COMM transceiver in vhf COMM/NAV transceiver	Repair or replace vhf COMM/ NAV transceiver.
	Disconnected or defective component used with COMM transceiver in vhf COMM/NAV transceiver	Refer to troubleshooting information for vhf COMM installation.
Other vhf COMM receive or transmit problems; ICS, vhf NAV and other radio operation is normal at stations	Defective COMM transceiver of vhf COMM/NAV transceiver	Refer to troubleshooting information for vhf COMM installation.
Cannot receive vhf NAV radio signals; ICS, vhf COMM and other radio operation is normal at stations	Defective voltage converter	Repair or replace voltage converter.
	Defective NAV receiver in vhf COMM/NAV receiver	Repair or replace vhf COMM/ NAV transceiver.
	Disconnected or defective component used with NAV receiver of vhf COMM/NAV transceiver	Refer to troubleshooting information for vhf NAV installation.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
	HF SSB COMMUNICATIONS (COMM) INSTALLATION	
SSB circuit breaker trips	Overload or short circuit in power amplifier/power supply	Repair or replace power amplifier/power supply.
	Defective receiver/exciter	Repair or replace receiver/exciter.
Cannot tune hf COMM antenna; open fuse in hf antenna control head	Defective hf antenna control head	Repair or replace control head.
	Defective hf COMM antenna	Repair or replace antenna.
	Temporary overload	Replace fuse.
Cannot receive hf COMM radio signals; ICS and other radio operation is normal at stations	Defective receiver/exciter	Repair or replace receiver/exciter.
	Defective power amplifier/power supply	Repair or replace power amplifier/power supply.
	Disconnected or defective hf COMM receive rf cable	Reconnect, repair or replace cable.
Cannot transmit hf COMM radio signals; ICS and other radio operation is normal at stations	Defective power amplifier/power supply	Repair or replace power amplifier/power supply.
	Defective receiver/exciter	Repair or replace receiver/exciter.
	Disconnected or defective hf COMM transmit rf cable	Reconnect, repair or replace cable.
Cannot receive or transmit hf COMM radio signals; ICS and other radio operation is normal at stations	Disconnected or defective hf COMM antenna	Reconnect, repair or replace antenna.
	Disconnected or defective hf amplifier to swr detector rf cable	Reconnect, repair or replace cable.
	Defective power amplifier/power supply	Repair or replace power amplifier/power supply
	Defective receiver/exciter	Repair or replace receiver/exciter.
Transmit or receive weak hf COMM radio signals; ICS and other radio operation is normal at stations.	Hf COMM antenna mistuned	Tune antenna.
	Defective hf COMM antenna	Repair or replace antenna.
	Defective swr detector	Repair or replace swr detector.

Table 7-1. Troubleshooting avionics installations (cont)

Symptom	Probable Trouble	Corrective Action
	HF SSB COMMUNICATIONS (COMM) INSTALLATION (CONT)	
Erroneous or no tuning indications on antenna control head	Disconnected or defective hf COMM swr detector cable	Reconnect, repair or replace cable.
	Disconnected hf COMM control head to antenna cable	Reconnect, repair or replace cable.
	Defective swr detector	Repair or replace swr detector.
	Defective antenna control head	Repair or replace control head.
	Defective hf COMM antenna	Repair or replace antenna.

7-4. BENDIX RT-221AE-28 OR RT-221BE-28 VHF COMMUNICATIONS INSTALLATION (INSTRUMENT PANEL TYPE A).

7-5. GENERAL. The Bendix RT-221AE-28 or RT-221BE-28 vhf communications installation provides air-to-ground, air-to-air and interphone two-way voice communication. The installation consists primarily of a vhf receiver-transmitter, uhf/vhf antenna, uhf/vhf antenna matching unit (current configuration), uhf/vhf antenna cable, and intercommunication and vhf radio control equipment. The range of the vhf communications installation is limited to an approximate line-of-sight distance. The vhf receiver-transmitter is flush-mounted with the face of the instrument panel (fig. 7-2). All dc power to vhf communications equipment is supplied through the RADIO circuit breaker. The uhf/vhf antenna and uhf/vhf antenna cable, furnished as part of the basic helicopter configuration, and uhf/vhf antenna matching unit are located in the helicopter as shown in figure 7-3. The intercommunication and vhf radio control equipment is installed at the locations shown in figure 7-4. A factory installed RT-221AE-28 or RT-211BE-28 provisions installation basically consists of the equipment described, except the vhf COMM receiver-transmitter is not furnished.

7-6. BENDIX RT-221AE-28 OR RT-221BE-28 VHF RECEIVER-TRANSMITTER.

7-7. GENERAL. The Bendix RT-221AE-28 or RT-221BE-28 vhf receiver-transmitter (fig. 7-2), a solid state amplitude-modulated device, operates on any one of 360 available channels within the frequency range of 118.00 to 135.00 MegaHertz (MHz). The vhf receiver-transmitter transmits and receives rf signals on the same frequency, using the uhf/vhf antenna. Internal circuits in the receiver-transmitter provide microphone audio and phone signal amplification for interphone operation. An RT-221AE-28 vhf receiver-transmitter may be used in place of the RT-221BE-28, with a minor change in internal wiring (para 7-9). The RT-221BE-28 is identical to the RT-221AE-28, except the RT-221BE-28 has the wiring change incorporated and also contains a glide slope receiver. The glide slope receiver operates on any one of 20 available channels within the frequency range of 329.30 to 335.00 MHz.

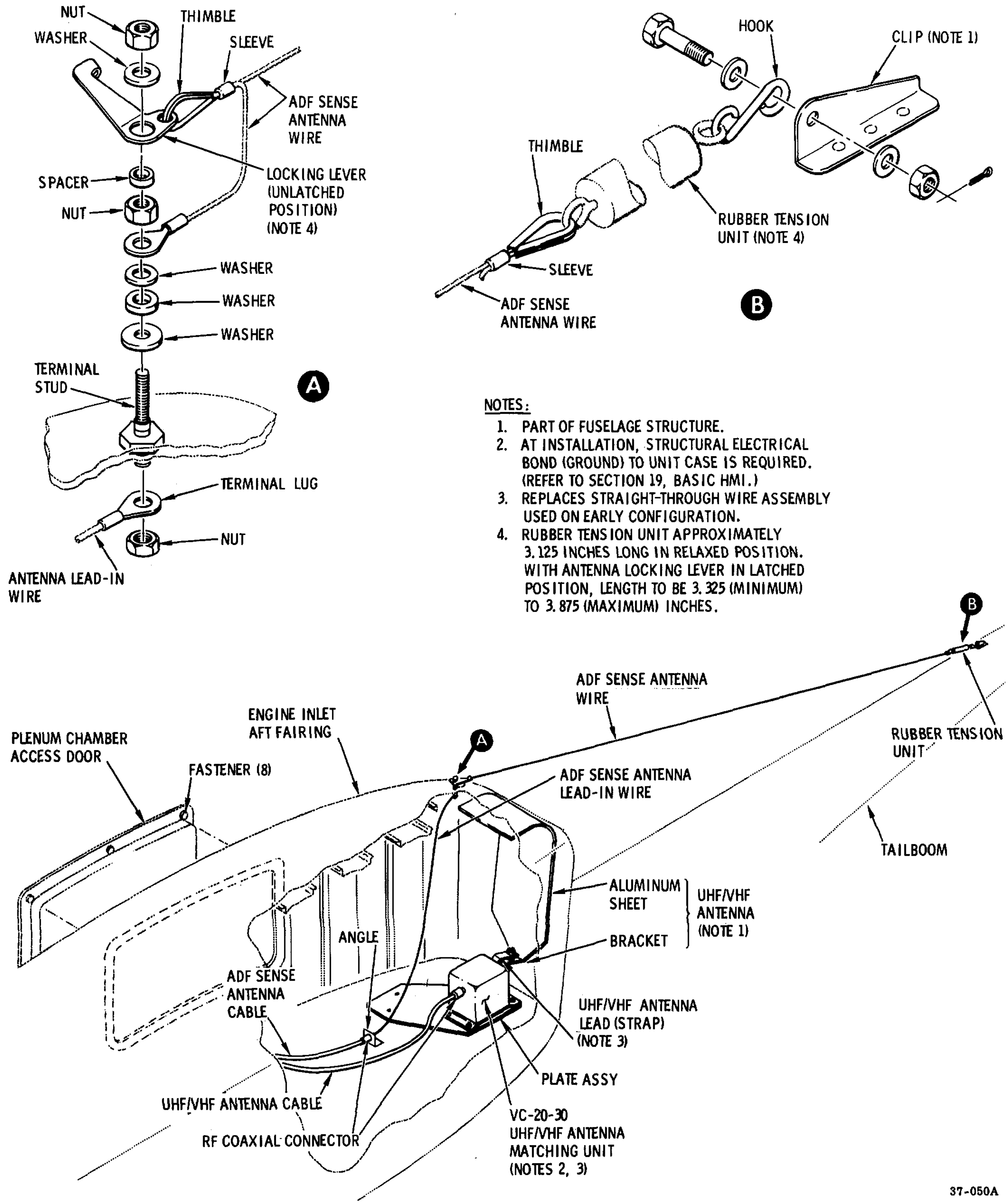


Figure 7-3. Uhf/vhf antenna and ADF sense antenna

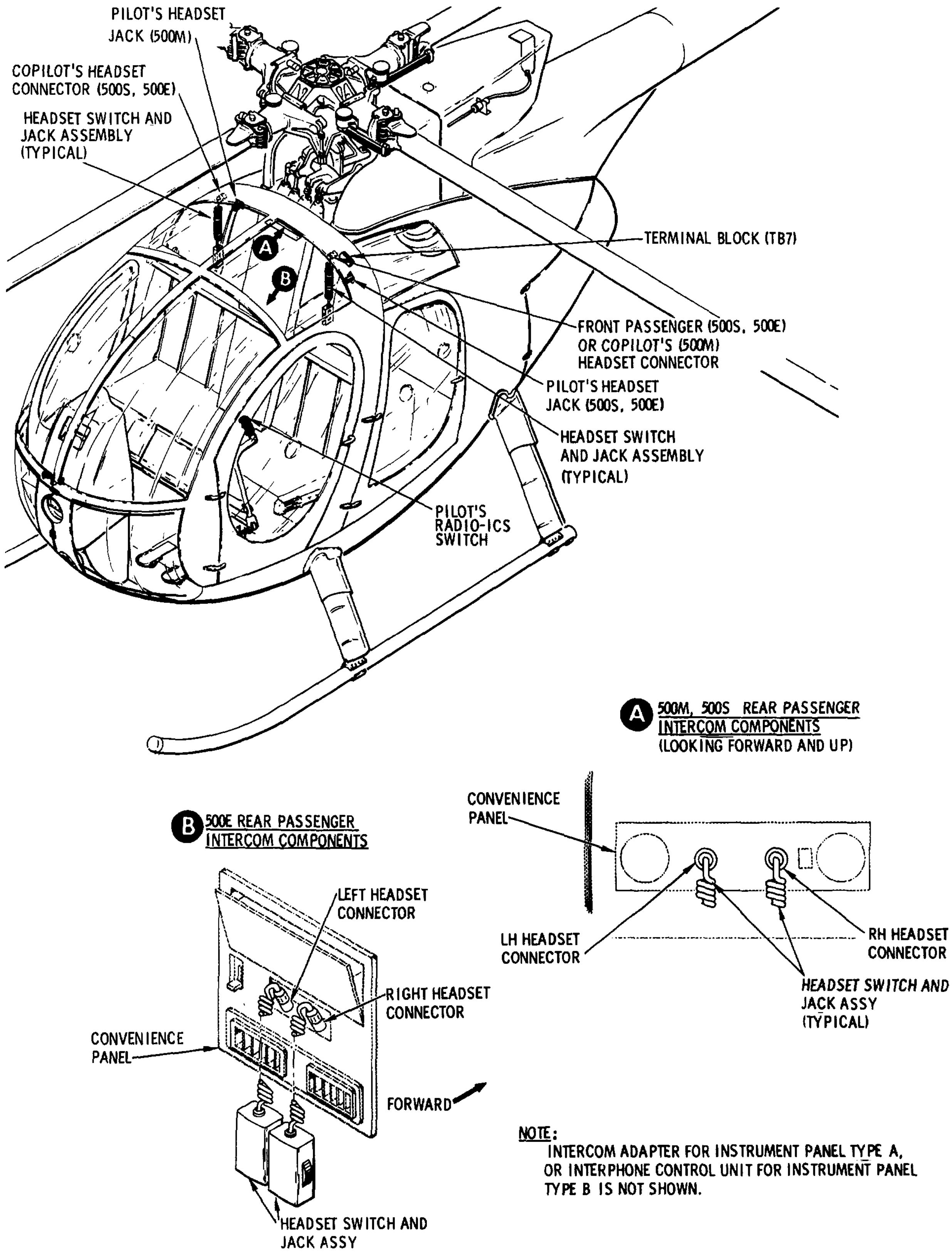


Figure 7-4. Intercommunication and vhf COMM radio control equipment

7-8. REMOVAL OF BENDIX RT-221AE-28 OR RT-221BE-28 VHF RECEIVER-TRANSMITTER.

a. Check that all electrical power is OFF.

b. Gain access to the back of the vhf receiver-transmitter by removing the instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect the uhf/vhf antenna cable and the lower/control cable from the receiver-transmitter fig. 7-5).

d. Loosen the clamp screw at the back of the receiver-transmitter to release the clamp for removal of the unit.

e. Release the locking tab at the back and remove receiver-transmitter from the front of the instrument panel.

7-9. INSTALLATION OF BENDIX RT-221AE-28 OR RT-221BE-28 VHF RECEIVER-TRANSMITTER.

NOTE: If the RT-221AE-28 is to be installed in place of the RT-221BE-28, a minor change to internal wiring must be made. In such a case, make the change according to figure 7-6 before installing the RT-221AE-28.

a. Check that all electrical power is OFF.

b. Slide the receiver-transmitter through the opening in the instrument panel into mounting position and engage the locking tab at the back of the unit.

c. Secure the back of the receiver-transmitter with the clamp screw.

d. Connect the uhf/vhf antenna cable, and the power/control cable to the receiver-transmitter.

e. Perform an operational check of the vhf communications installation, including a check of both the interphone and vhf radio operation.

f. Install the instrument panel side fairings (Section 2, Basic HMI).

7-10. COMMUNICATIONS COMPONENTS VC-20-30 UHF/VHF ANTENNA MATCHING UNIT.

7-11. GENERAL. The VC-20-30 uhf/vhf antenna matching unit couples vhf radio signals from the uhf/vhf antenna cable to the uhf/vhf antenna and provides impedance matching for rf signals. The matching unit (fig. 7-7) is housed in a sealed rectangular case on a rectangular mounting base, contains an rf coaxial connector and a threaded terminal stud. An insulator electrically isolates the terminal stud from the case. A strap lead, secured to the terminal stud, connects the matching unit to a bracket of the uhf/vhf antenna.

NOTE: The VC-20-30 matching unit replaces a straight-through wire assembly used to connect the uhf/vhf antenna cable to the uhf/vhf antenna on the early configuration.

7-12. REMOVAL OF UHF/VHF ANTENNA MATCHING UNIT. (See fig. 7-7.)

a. Make sure that all electrical power is OFF.

b. Open or remove the plenum chamber access door on the right side of the engine air inlet aft fairing (Section 2, Basic HMI).

c. Disconnect the uhf/vhf antenna cable from the front of the uhf/vhf matching unit.

d. Remove the top nut and two washers that secure the rear of the uhf/vhf antenna lead (a flat lead) to the uhf/vhf antenna bracket inside the engine inlet fairing.

e. Remove the four screws and washers that secure the uhf/vhf matching unit to the plate on the boom fairing structure and remove the matching unit.

7-13. INSTALLATION OF UHF/VHF ANTENNA MATCHING UNIT. (See fig. 7-7.)

a. Place the matching unit inside the engine air inlet aft fairing on the boom fairing structure or mounting plate (if installed). Position with the uhf/vhf antenna lead to the rear.

b. Attach the uhf/vhf matching unit with four screws and washers.

c. If unit is attached to boom fairing, apply sealing compound (item 3, table 2-4, Basic HMI) to seal mounting base edges of unit to boom fairing.

d. Place one washer over the permanently secured nut on the uhf/vhf antenna bracket installed in the rear wall of the aft fairing. Place the terminal lug of the antenna lead over the washer and secure with another washer and nut.

e. Connect the uhf/vhf antenna cable to the rf coaxial connector on the front of the uhf/vhf matching unit.

f. Close or reinstall the plenum chamber access door.

7-14. UHF/VHF ANTENNA.

7-15. GENERAL. The uhf/vhf antenna (fig. 7-3) is designed to radiate and receive radio signals in the range of 225 to 400 MegaHertz (MHz) for uhf or 116.00 to 149.95 MHz for vhf radio communication. The uhf/vhf antenna consists of a triangular-shaped aluminum sheet, approximately 17 inches long and 8 inches wide, that is formed and bonded to the aft skin panel of the air inlet fairing. A bracket is spotwelded to the lower end of the antenna and extends forward through the skin of the fairing into the area above the plenum chamber. The bracket is the electrical connection point for the uhf/vhf antenna matching unit. The uhf/vhf antenna is electrically isolated from all metal structure.

7-16. REPLACEMENT OF UHF/VHF ANTENNA. Replacement of the uhf/vhf antenna requires

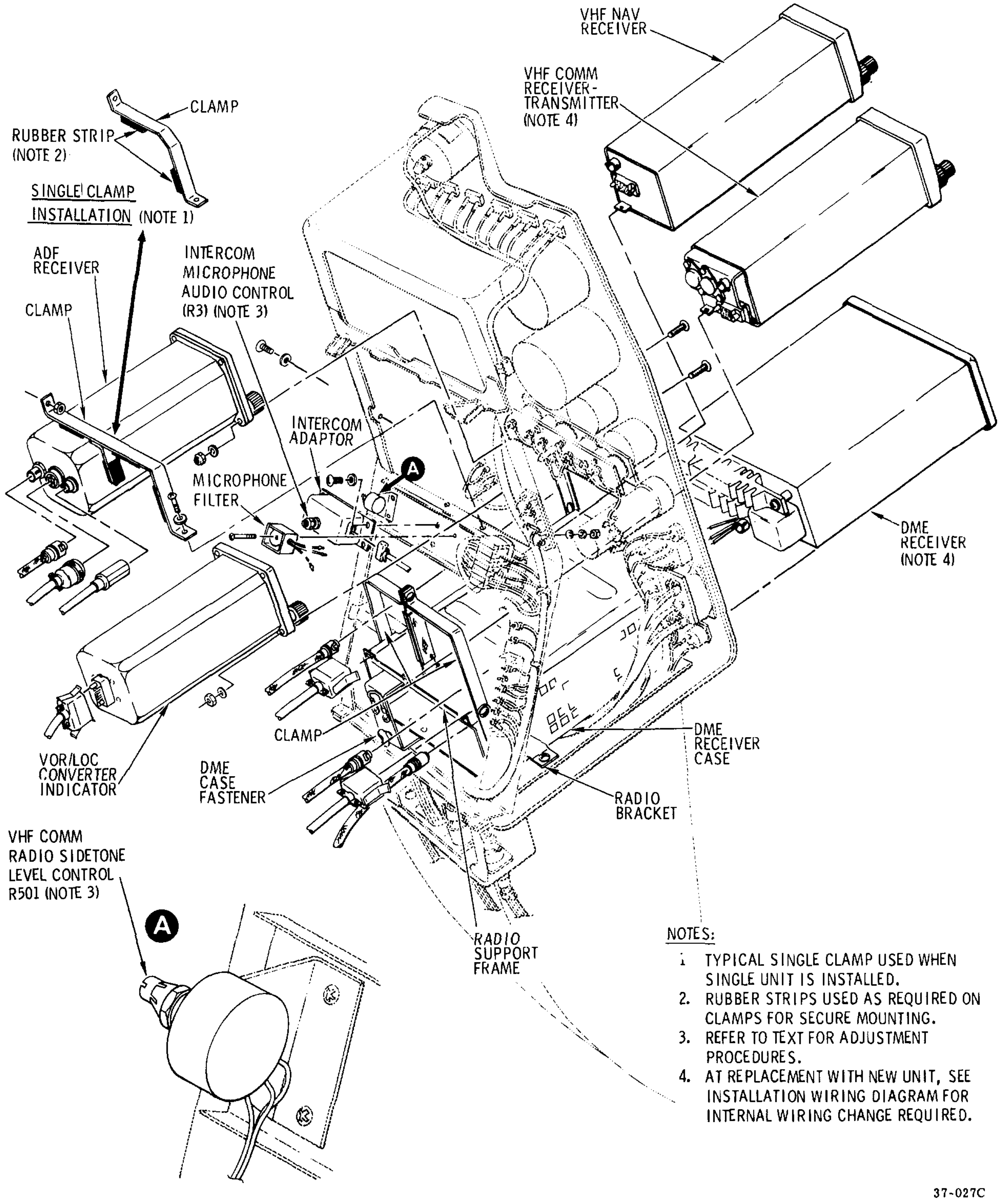


Figure 7-5. Typical replacement of equipment (Bendix RT-221AE-28 or RT-221BE-28 vhf COMM, Bendix RN-222AE-28 vhf NAV, King KR-80 ADF and Narco UDI-4 DME equipment) in instrument console

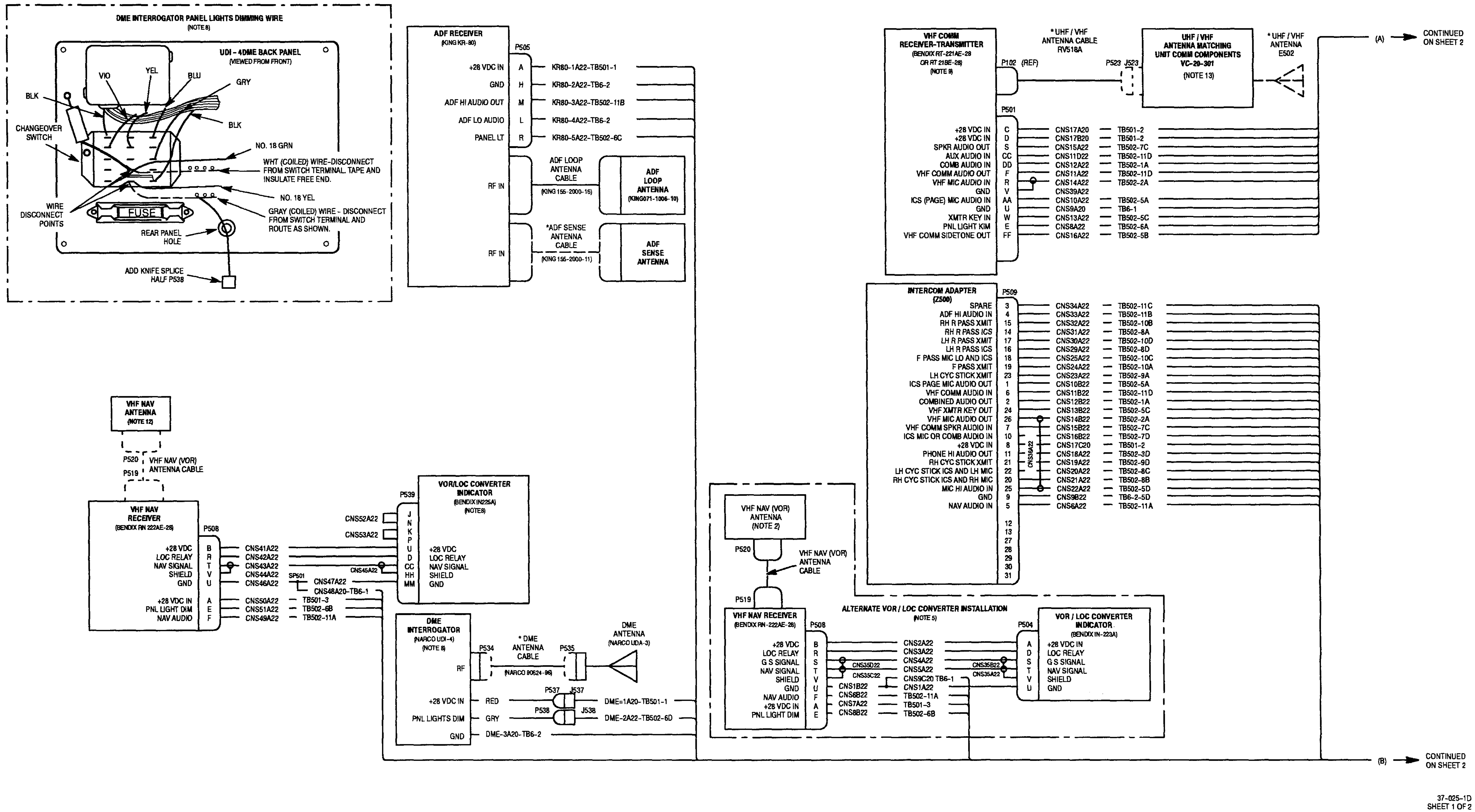
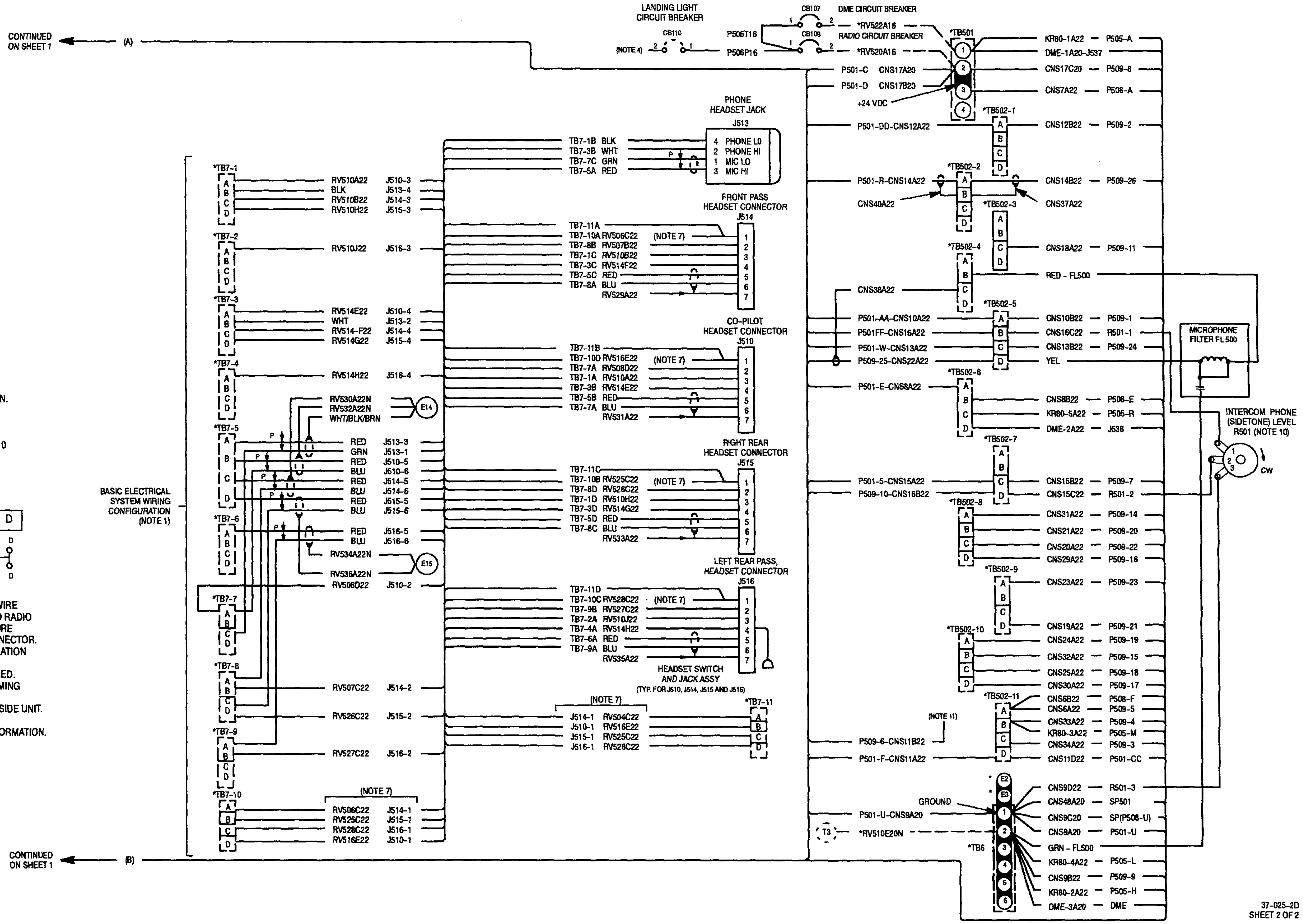
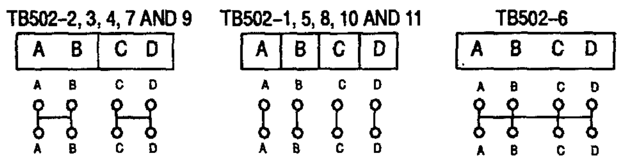


Figure 7–6. Bendix RN–221AE–28 VHF COMM, Bendix RN–222AE–28 VHF NAV, King KR–30 ADF and Narco UDI–4 DME Installations (Instrument Panel Type A) – Wiring Diagram (Sheet 1 of 2)



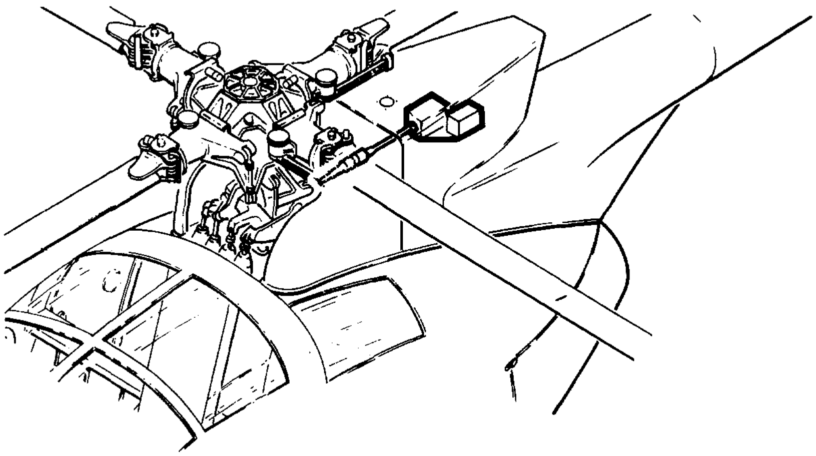
NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. ASTERISK (*) INDICATES PART OF HELICOPTER ELECTRICAL SYSTEM.
3. ALL ITEMS IN SOLID LINES PROVIDED WITH THE INSTALLATION.
4. CB110 IS PART OF OPTIONAL NIGHT LIGHTING (HMI, PEENDIX A). WIRE NUMBER P506P16 CONNECTS TO CIGARETTE LIGHTER CB109–1 IF CB110 IS NOT INSTALLED.
5. IN–225A SUPERSEDES AND IS ONE–WAY INTERCHANGEABLE WITH IN223–A.
6. TERMINAL BLOCK MODULES ARE INTERNALLY BUSED AS SHOWN:



7. THIS WIRE USUALLY FURNISHED WITH WIRE END OPEN, AND INSULATED IN WIRE HARNESS. THIS ALLOWS ONLY INTERPHONE OPERATION FROM ASSOCIATED RADIO INTERCOM STATION CONNECTOR (FROM ALL STATIONS EXCEPT PILOT'S). WIRE CONNECTED TO TB7–11 ALLOWS ONLY INTERPHONE OPERATION FROM CONNECTOR. WIRE CONNECTED TO TB7–10 ALLOWS BOTH RADIO AND INTERPHONE OPERATION FROM CONNECTOR.
8. AT REPLACEMENT OF UNIT, MINOR INTERNAL WIRING CHANGES ARE REQUIRED. DME INTERROGATOR WIRING MUST BE AS INDICATED FOR PANEL LIGHT DIMMING CAPABILITY IN THE INSTALLATION. (REFER TO TEXT.)
9. INSULATED WIRE MUST BE CONNECTED BETWEEN P501–4F AND K1101–13 INSIDE UNIT. AT INSTALLATION OF UNIT, CHECK AND WIRE, IF NECESSARY. (REFER TO MANUFACTURER'S PUBLICATION (SECTION 12, BASIC HMI FOR INTERNAL INFORMATION.
10. VIEWED FROM SHAFT END.
11. WIRE END OPEN, INSULATED AND TIED TO WIRE HARNESS.
12. COMMUNICATIONS COMPONENTS PA113 VHF ANTENNA.
13. REPLACES UHF–VHF ANTENNA WIRE ASSEMBLY ON EARLY CONFIGURATION.

Figure 7–6. Bendix RN–221AE–28 VHF COMM, Bendix RN–222AE–28 VHF NAV, King KR–30 ADF and Narco UDI–4 DME Installations (Instrument Panel Type A) – Wiring Diagram (Sheet 2 of 2)



NOTES:

1. MOUNTED ON BOOM FAIRING IF ADF EQUIPMENT IS INSTALLED.
2. PART OF ENGINE INLET AFT FAIRING.
3. *FURNISHED WITH UHF/VHF ANTENNA MATCHING UNIT.*
4. MOUNTS TO BOOM FAIRING IF MOUNTING PLATE IS NOT INSTALLED (NOTE 1). AT INSTALLATION ON BOOM FAIRING, APPLY SEALING COMPOUND (ITEM 3, TABLE 2-4, BASIC HMI) TO SEAL EDGES OF BASE TO FAIRING.
5. COMPONENTS SHOWN ARE TYPICAL; SIZE AND SHAPE MAY VARY.

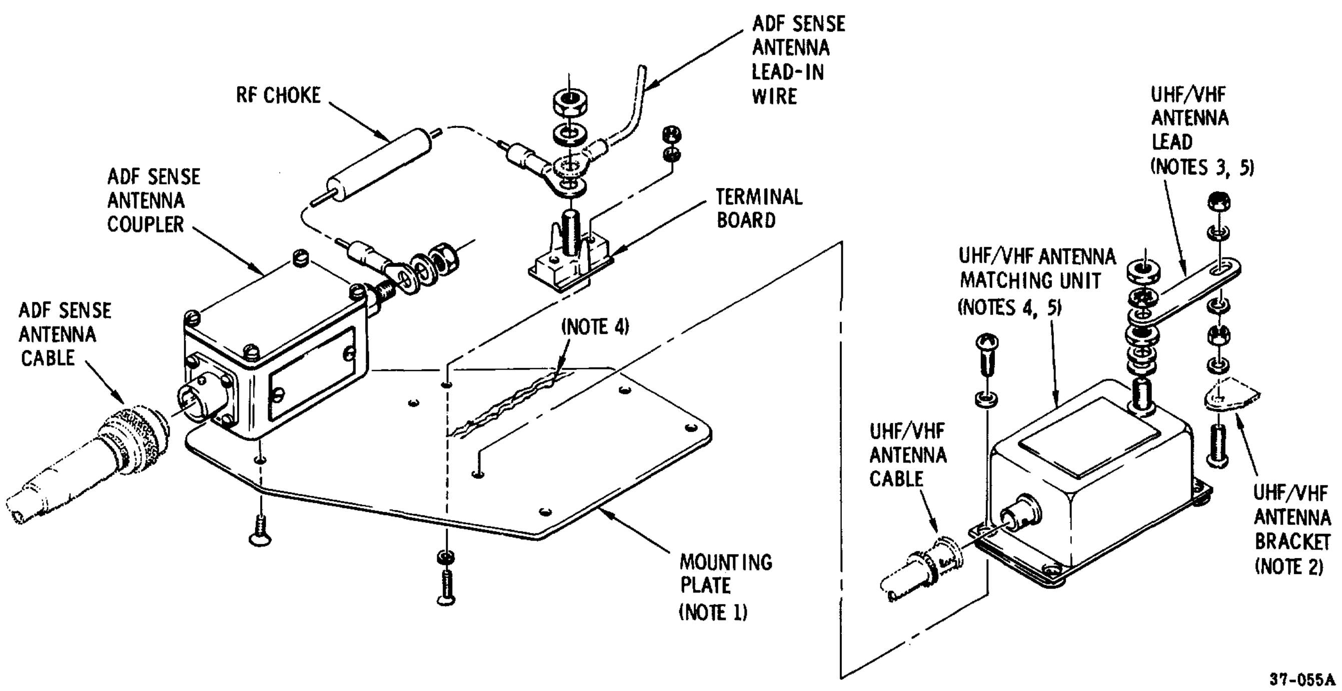


Figure 7-7. Vhf-COMM installation and DFA-73-A1 ADF antenna equipment

replacement of the aft engine air inlet fairing because they are a bonded assembly.

7-17. UHF/VHF ANTENNA CABLE.

7-18. GENERAL. The uhf/vhf antenna cable (fig. 7-3) is an RG-58/U coaxial cable terminated on the receiver-transmitter end with coaxial connector plug P102 and on the uhf/vhf antenna end with coaxial connector plug P523. The antenna cable is furnished as part of the basic helicopter configuration.

NOTE: When removal and installation or replacement of an antenna cable is required, the cable should not be shortened and it should be routed and installed in the same manner as originally installed.

7-19. INTERCOMMUNICATION AND VHF RADIO CONTROL EQUIPMENT (INSTRUMENT PANEL TYPE A).

7-20. GENERAL. The intercommunication and vhf radio control equipment (fig. 7-4) provides selection of interphone operation or vhf COMM radio operation, and permits monitoring of received audio signals from vhf COMM, ADF and vhf NAV receivers (if installed). The equipment provides two-way interphone communication between the pilot and all passengers at the radio/intercom stations and permits personnel at all stations to monitor received radio signals. In addition, an optional capability is available to permit personnel at desired stations to select and use the radio transmitting mode of operation. The four-station configuration (used in 500M) provides a radio-intercom station for the pilot, one for a passenger in the pilot's compartment, and one for each passenger in the passenger/cargo compartment. The five-station configuration (used in 500S and 500E) has an additional station for a second passenger in the pilot's compartment. A headset switch and jack assembly, containing a radio-interphone (RADIO-ICS) switch, is provided at each station, except the pilot's position where the RADIO-ICS switch on the cyclic stick is used for selection of operation desired. Audio amplifier circuits in the vhf receiver-transmitter amplify microphone and phone audio signals. Microphone audio is filtered by a microphone filter. An intercom adapter interconnects the headset-jacks, switches and associated avionics equipment. A schematic diagram is provided in figure 7-8 for a typical station.

NOTE: Intercom interconnection wiring may be connected to provide both radio and interphone operation from radio/intercom stations or only interphone operation from desired stations. (See fig. 7-6.)

7-21. INTERCOM ADAPTER (INSTRUMENT PANEL TYPE A).

7-22. GENERAL. The intercom adapter (fig. 7-5) is a non-amplifying, solid state device that is part of the intercommunication and vhf radio control equipment of the Bendix RT-221AE-28 or RT-221BE-28 vhf communications installation. It is the master control unit used in conjunction with the vhf receiver-transmitter, vhf navigation receiver of the vhf navigation installation (when installed) and the ADF receiver of the ADF installation (when installed). The intercom adapter controls intercommunication within the helicopter, air-to-ground and air-to-air communication, and monitors the output of the ADF and navigation receivers (when installed). An external intercom microphone audio level adjustment control R3 on the unit permits adjustment of microphone audio level for headset earphones (para 7-26). The intercom adapter contains transmitter keying and audio switching circuits, and is mounted on the instrument console structure. Intercom adapter internal circuits are schematically shown in figure 7-9.

7-23. REMOVAL OF INTERCOM ADAPTER.

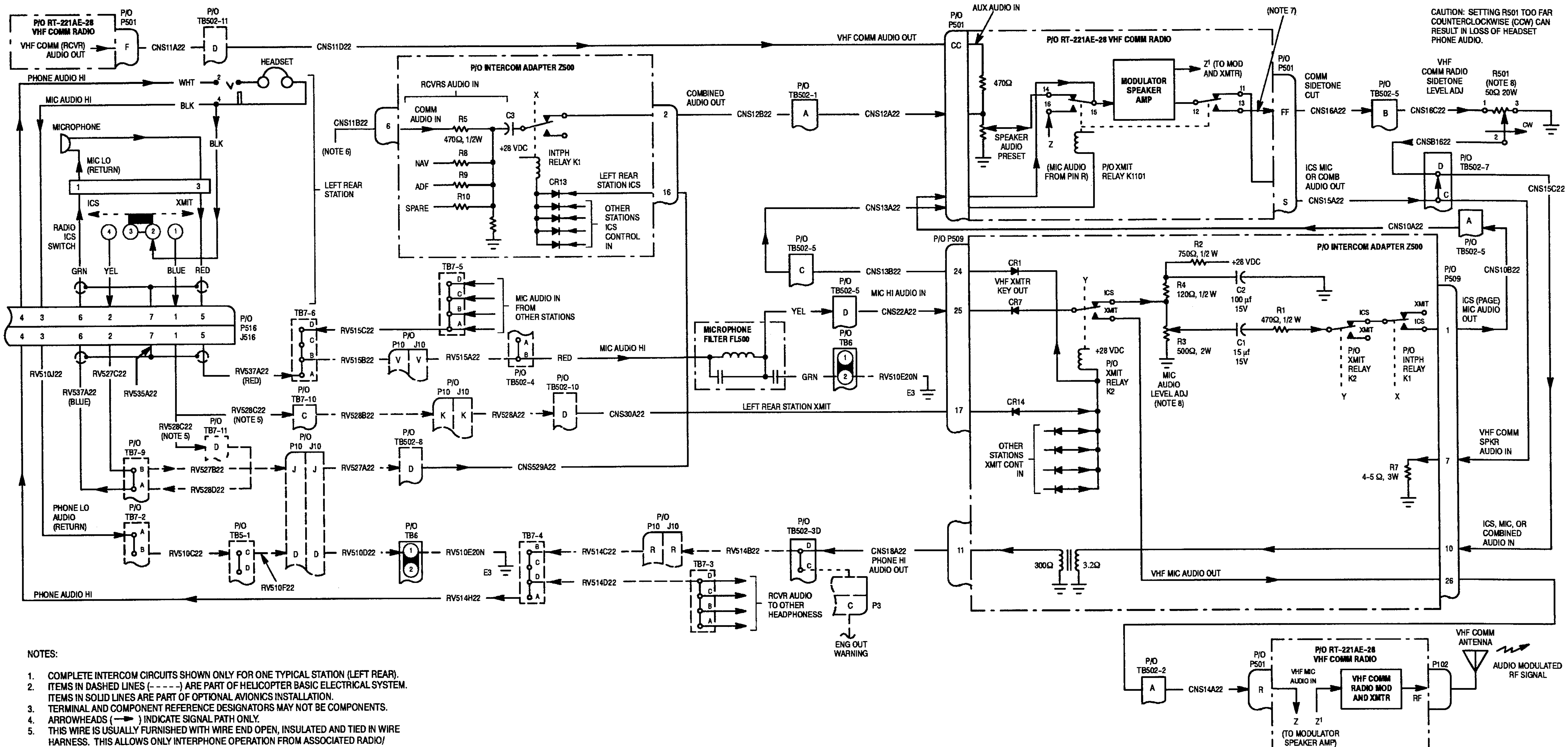
NOTE: If the adapter is not to be replaced, do not disturb the setting of the microphone audio level adjustment control R3 on top of the adapter when removing the intercom adapter.

a. Check that all electrical power is OFF.
b. Gain access to the intercom adapter (fig. 7-5) by removing the instrument panel side fairings (Section 2, Basic HMI).
c. Disconnect plug P509 from the intercom adapter.
d. Remove the four screws and washers that secure the intercom control to the instrument panel structure; lift out the adapter.

7-24. INSTALLATION OF INTERCOM ADAPTER.

NOTE: Do not disturb the setting of the microphone audio level adjustment control R3 on the top of the intercom adapter when reinstalling the same unit, unless necessary.

a. Check that all electrical power is OFF.
b. Secure the intercom adapter (fig. 7-5) to the instrument panel structure, using four screws and washers.
c. Connect plug P509 to the intercom adapter.
d. Perform an operational check of vhf radio transmission. Adjust microphone audio level as necessary (para 7-26) and check both interphone and vhf radio operation.
e. Install the instrument panel side fairings (Section 2, Basic HMI).



NOTES:

1. COMPLETE INTERCOM CIRCUITS SHOWN ONLY FOR ONE TYPICAL STATION (LEFT REAR).
2. ITEMS IN DASHED LINES (- - - - -) ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM. ITEMS IN SOLID LINES ARE PART OF OPTIONAL AVIONICS INSTALLATION.
3. TERMINAL AND COMPONENT REFERENCE DESIGNATORS MAY NOT BE COMPONENTS.
4. ARROWHEADS (—▶) INDICATE SIGNAL PATH ONLY.
5. THIS WIRE IS USUALLY FURNISHED WITH WIRE END OPEN, INSULATED AND TIED IN WIRE HARNESS. THIS ALLOWS ONLY INTERPHONE OPERATION FROM ASSOCIATED RADIO/ INTERCOM STATION CONNECTOR (FROM ALL STATIONS EXCEPT PILOT'S).
6. WIRE END IS OPEN-ENDED, INSULATED AND TIED IN WIRE HARNESS.
7. WIRE ADDED AT INSTALLATION OF UNIT, IF NOT PREVIOUSLY INSTALLED. (REFER TO NOTE ON ASSOCIATED WIRING DIAGRAM.)
8. FOR ADJUSTMENT PROCEDURE, REFER TO TEXT.
9. P/O = PART OF

37-093A

Figure 7–8. Intercomm System Schematic Diagram (Typical Station) – Instrument Panel Type A With Intercom Adapter

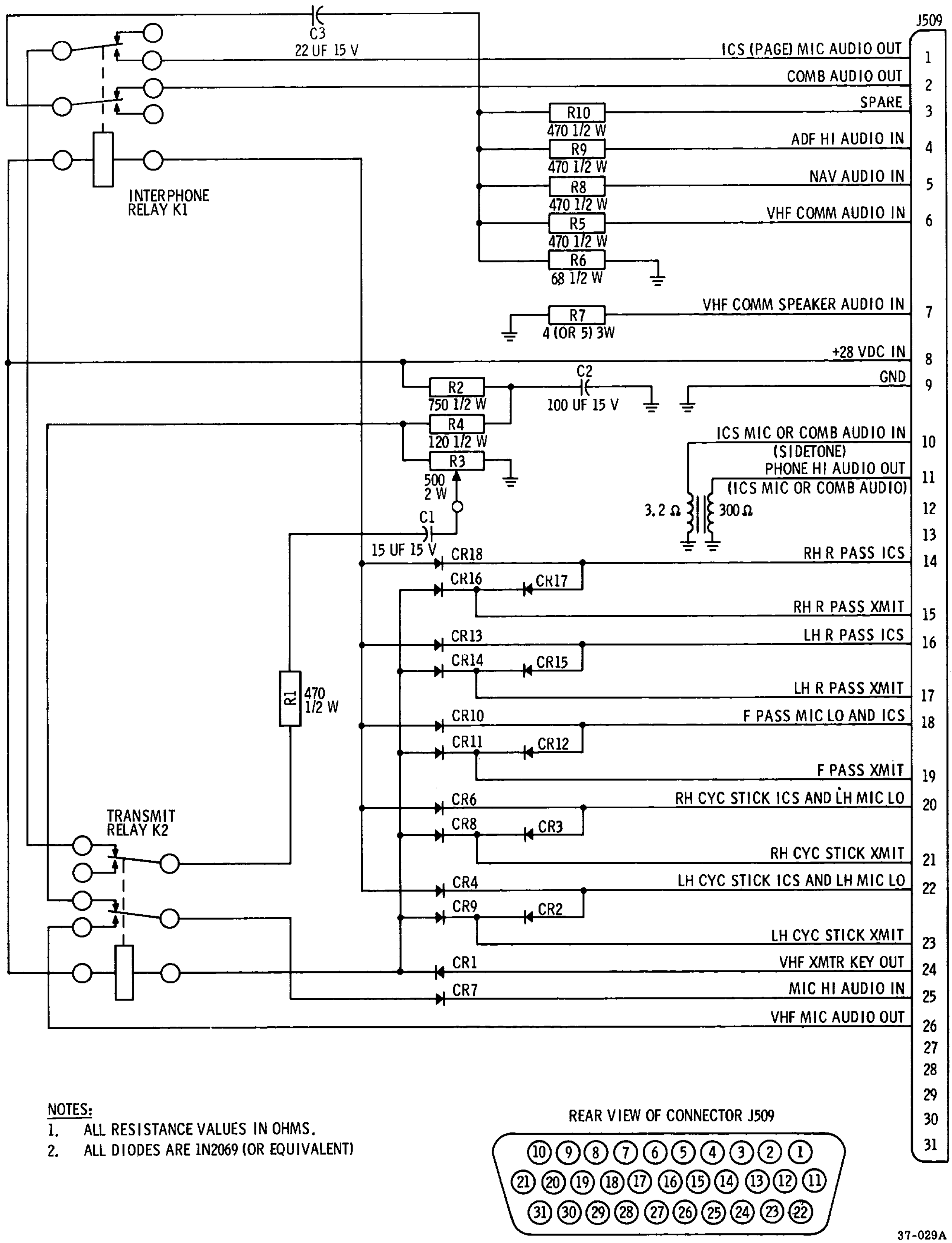


Figure 7-9. Intercom adapter-schematic diagram (instrument panel type A)

7-25. ADJUSTMENT OF VHF COMM RADIO SIDETONE (INSTRUMENT PANEL TYPE A).

NOTE: Vhf COMM radio sidetone level control R501 adjusts the level of vhf COMM radio sidetone audio signals, after the signals are amplified by the audio amplifier in the vhf COMM receiver-transmitter, to control headset earphone volume of vhf COMM radio sidetone during vhf COMM radio transmission. If improperly set, R501 adversely affects earphone volume of amplified microphone intercom audio and received audio signals from installed radio receivers.

a. Gain access to vhf COMM sidetone level control R501, located at the right of the intercom adapter on the instrument panel structure (fig. 7-5), by removing the instrument panel right side fairing (Section 2, Basic HMI).
b. Connect microphones and headsets at all radio/intercom stations.
c. Loosen the locking nut on control R501.
d. Energize the vhf COMM and all other radio installations.

CAUTION: Setting R501 too far counterclockwise (CCW) can cause the adverse effects described in the note above.

e. While keying the vhf COMM radio and speaking into the microphone, adjust control R501 for desired sidetone audio volume in headset earphones.
f. While speaking into the microphone during interphone operation check that adequate headset earphone volume of amplified microphone intercom audio is obtained.
g. Operate all installed radio receivers. Independently set the audio volume control on each receiver for desired headphone volume. Check that required volume is obtained.

NOTE: The radio receivers are to be operated one at a time and the earphone volume is to be set using a received audio signal. Each receiver volume control should have adequate adjustment range above and below its initial setting to permit subsequent independent adjustment of received audio level.

h. Repeat procedures in e through g above, until required headset earphone volume is obtained for vhf COMM radio sidetone during vhf COMM radio transmission, for amplified microphone intercom audio during interphone operation and for received audio signals from all installed radio receivers.

NOTE: If sufficient volume cannot be obtained for amplified intercom audio, microphone audio level control R3 on the intercom adapter may require adjustment (para 7-26).

i. Tighten the locking nut on control R501 making sure that the adjustment is not changed.
j. Reinstall the instrument panel right side fairing (Section 2, Basic HMI).

7-26. ADJUSTMENT OF MICROPHONE AUDIO LEVEL (INSTRUMENT PANEL TYPE A).

NOTE: Microphone audio level control R3 adjusts the level of microphone audio signals, before amplification by the audio amplifier in the vhf COMM receiver. Control R3 affects the headset earphone volume of amplified microphone audio during interphone operation. R3 does not affect the level of received audio signals from any installed radio receiver.

a. Gain access to microphone audio level control R3, located on top of the intercom adapter (fig. 7-5), by removing the instrument panel right side fairing (Section 2, Basic HMI).
b. Connect microphones and headsets at all radio/intercom stations.
c. Energize the vhf COMM installation with the RADIO circuit breaker.

NOTE: All headsets and microphones should be used to make sure the final adjustment is correct.

d. Loosen the locking nut on control R3.
e. Adjust control R3 until the desired headset earphone volume is obtained while operating the intercom and speaking into a microphone.

NOTE: Headset earphone volume of intercom audio can also be affected by the vhf COMM sidetone level control R501. If sufficient headset earphone volume is not obtained, readjustment of R501 may be required (para 7-25).

f. While transmitting to a vhf radio station with the vhf COMM radio, check that the remote operator at radio station receives a clear audio signal and that there is sufficient vhf COMM sidetone audio volume in headset earphones at the helicopter.

g. When communicating with remote operator, make sure that headset earphone volume of received audio signals is adequate with vhf COMM receiver audio volume control on vhf COMM receiver-transmitter at approximate midrange position.
h. If there is insufficient headset earphone volume for either vhf COMM radio sidetone or received audio signals, readjust the vhf COMM radio sidetone control R501 (para 7-25).
i. Repeat procedures in e through h above as required, until required headset earphone volume

is obtained for amplified microphone intercom audio during interphone operation, vhf COMM radio sidetone during vhf COMM radio transmission and for received audio signals from any installed radio receivers.

j. Tighten the locking nut on control R3 making sure the adjustment is not changed.

k. Reinstall the instrument panel right side fairing (Section 2, Basic HMI).

7-27. MICROPHONE FILTER (INSTRUMENT PANEL TYPE A).

7-28. GENERAL. The microphone filter (fig. 7-5) is a sealed rectangular unit containing inductive and capacitive filtering circuits that filter all microphone audio signals for both interphone and radio operation. The microphone filter is located at the approximate lower center of the instrument console to the left of the intercom adapter. The filter is used only when the intercom adapter (para 7-22) is installed.

7-29. REPLACEMENT OF MICROPHONE FILTER. (See fig. 7-5.)

a. Check that all electrical power is OFF.

b. Gain access to the microphone filter by removing the instrument panel side fairings (Section 2, Basic HMI).

c. Extract and tag-identify the microphone filter lead Hytip terminal contacts from terminal block TB502. (Refer to Section 19, Basic HMI.)

d. Disconnect ground terminal lug from attachment point on terminal board TB6.

e. Loosen and remove nut, two washers and microphone filter from stud on the instrument console.

f. Place replacement microphone filter in mounting position and secure it to the stud on instrument console with two washers and nut.

g. Connect ground terminal lug to approximate location on terminal board TB6. (See fig. 7-6 for interconnection information.)

h. Insert microphone filter lead terminal contacts into proper locations on terminal block TB502. (Refer to Section 19, Basic HMI.)

i. Using microphones at all radio/intercom stations, perform an operational check of the vhf communications installation, for both interphone and radio operation.

j. Reinstall the instrument panel side fairings (Section 2, Basic HMI).

7-30. PILOT'S HEADSET-JACK.

7-31. GENERAL. The installed pilot's headset-jack (fig. 7-4) contains a phone jack that mates with a standard U-174/U phone plug for connection of the pilot's headset.

7-32. REMOVAL OF PILOT'S HEADSET-JACK.

a. Check that all electrical power is OFF.

b. Extract and tag-identify the headset-jack Hytip terminal contacts from terminal block TB7 (fig. 7-4) and the terminal lug from its attachment point. (Refer to Section 19, Basic HMI.)

NOTE: Nutplates on brackets at each side of the headset-jack secure the attaching hardware.

c. Remove the two screws and washers to release the headset-jack from its mounting.

7-33. INSTALLATION OF PILOT'S HEADSET-JACK.

a. Check that all electrical power is OFF.

b. Insert the headset-jack in mounting position (fig. 7-6) and secure it with two screws and washers.

c. Insert headset-jack Hytip terminal contacts into proper locations on terminal block TB7. Remove the identification tags from wires. (Refer to paragraph 7-161.)

d. Perform an operational check of both the interphone and vhf radio operation.

7-34. HEADSET SWITCH AND JACK ASSEMBLY.

7-35. GENERAL. A headset switch and jack assembly is furnished at all stations used (fig. 7-4), except the pilot's position. The RADIO-ICS switch on the pilot's cyclic stick grip is normally used for selection of radio transmission, in addition to selection of radio reception or interphone operation. The headset switch and jack assembly (switch/jack) is used for selection of radio reception and interphone operation. At customer option, the avionics installation wiring may be interconnected to provide selection of radio transmission as well as radio reception and interphone. (See fig. 7-6.) The switch/jack consists of a switch and jack assembly case with an attached coiled cord. The case contains a RADIO-ICS switch and a headset jack. A headset connector is attached to the free end of the coiled cord. The headset connector mates with a bulkhead mounted headset connector. A clip is provided on the side of the case for attachment to clothing. The headset jack is a four-contact phone jack and mates with a standard U-174/U phone plug for connection to a headset. The RADIO-ICS switch on the cyclic stick at the pilot's position is used to select the mode of operation. Voice transmission over the interphone from any intercom station except the pilot's station is selected by setting the switch/jack at that station to ICS. Positioning the RADIO-ICS switch to ICS on the pilot's cyclic stick selects voice transmission over the interphone. Setting the switch/jack to ICS at the copilot's station (500M) selects voice interphone transmission. The XMIT position of the RADIO-ICS switch on the pilot's cyclic stick keys the transmitter of the vhf receiver-transmitter. Setting the switch/jack to XMIT at the copilot's station (500M) selects vhf radio transmission. The middle (released) switch position selects vhf receiver audio and is the listening position for interphone and monitoring the vhf COMM, vhf NAV, ADF and DME receivers. Switch/jack assemblies are removed or installed by disconnecting the unit at the bulkhead headset connector. Figure 7-10 provides a schematic diagram for the headset switch/jack assembly.

7-36. HEADSET-MICROPHONES.

7-37. GENERAL. Either one of two optional types of headset-microphones (carbon or dynamic microphone) is used with the vhf communications installation (para 7-5). One headset with a carbon microphone is supplied as standard equipment on current configuration helicopters. Additional headset-microphones are optional. Each type contains two earphones attached to a coiled retractable cord with a headset plug. The headset plug contains a standard U-174/U phone plug to mate with the headset jack of a headset switch and jack assembly (para 7-35). A noise canceling microphone is mounted on the end of an adjustable wire boom on the headset. Each of the two earphones on the headset is encircled with a padded headband. The Carter CEH157-H-V dynamic microphone type of headset also contains an earphone volume control on the outside of one earcup and a small microphone preamplifier in the other earcup. Figure 7-11 is a schematic diagram for the Carter CEH157-H-V headset-microphone.

7-38. BENDIX RN-222AE-28 VHF NAVIGATION INSTALLATION (INSTRUMENT PANEL TYPE A).

7-39. GENERAL. The vhf navigation installation receives ground-to-air vhf radio signals for voice reception and visual display for navigation purposes. The installation consists primarily of a vhf navigation (NAV) receiver (fig. 7-2), VOR/LOC converter indicator, vhf NAV antenna and a NAV antenna cable. The range of the vhf NAV installation is limited to an approximate line-of-sight distance. The vhf NAV receiver is flush mounted to the right of the vhf COMM receiver in the instrument panel. The vhf NAV antenna and NAV antenna coupler are located on the center canopy panel and lower canopy windshield (fig. 7-12).

NOTE: Only those helicopters with the Bendix RT-221AE-28 or RT-221BE-28 vhf communications installation (para 7-5) can be optionally equipped with the Bendix RN-222AE-28 vhf navigation installation.

7-40. BENDIX RN-222AE-28 VHF NAV RECEIVER.

7-41. GENERAL. The Bendix RN-222AE-28 vhf NAV receiver (fig. 7-2), a solid state device, operates on any one of 100 available channels within the frequency range of 108.00 to 117.90 MegaHertz (MHz). Voice NAV signals from the NAV receiver are routed to the intercommunication and radio control equipment of the vhf communications installation for amplification and distribution to all intercom stations. The NAV receiver supplies electrical signals to the VOR/LOC converter indicator for display of navigation data.

7-42. REMOVAL OF BENDIX RN-222AE-28 VHF NAV RECEIVER. Removal of the NAV receiver (fig. 7-4) is the same as for the vhf receiver-transmitter (para 7-8), except disconnect the NAV receiver power and control cable and the antenna cable from the NAV receiver.

7-43. INSTALLATION OF THE BENDIX RN-222AE-28 VHF NAV RECEIVER. The NAV receiver (fig. 7-5) is installed in the same way as the vhf receiver-transmitter (para 7-9), except as follows.

a. Connect the NAV receiver power/control and antenna cables to the NAV receiver.

b. After installation, perform an operational check on the vhf NAV installation. Check for NAV receiver audio and for proper displays on the VOR/LOC converter indicator.

7-44. COMMUNICATIONS COMPONENTS PA113 VHF NAV ANTENNA.

7-45. GENERAL. Communications Components Corp. PA113 vhf NAV antenna (fig. 7-12) consists of upper and lower folded dipoles and a coupler. Each dipole is formed of 300-ohm twin-lead. Twin-leads, attached to the center of each folded dipole inside a molded epoxy case, connect the dipoles to the coupler. A BNC rf coaxial connector, on the right side of the coupler, is used for connection of the vhf NAV antenna cable. A plastic fastener on the forward side of the coupler secures the coupler to the inside of the lower center forward canopy. The forward half of the fastener contains adhesive backing for attachment to the canopy panel. The rear half of the fastener is bonded to the forward side of the coupler. The two halves of the fastener interlock, are pressure sensitive and adhere to each other. The upper and lower dipoles are attached to the inside of horizontal canopy frames by clips bonded to the frames.

7-46. REMOVAL OF COMMUNICATIONS COMPONENTS PA113 VHF NAV ANTENNA. (See fig. 7-13.)

a. Remove instrument panel side fairings (Section 2, Basic HMI).

b. Disconnect the vhf NAV antenna and cable from the right side of the coupler on the vhf NAV antenna.

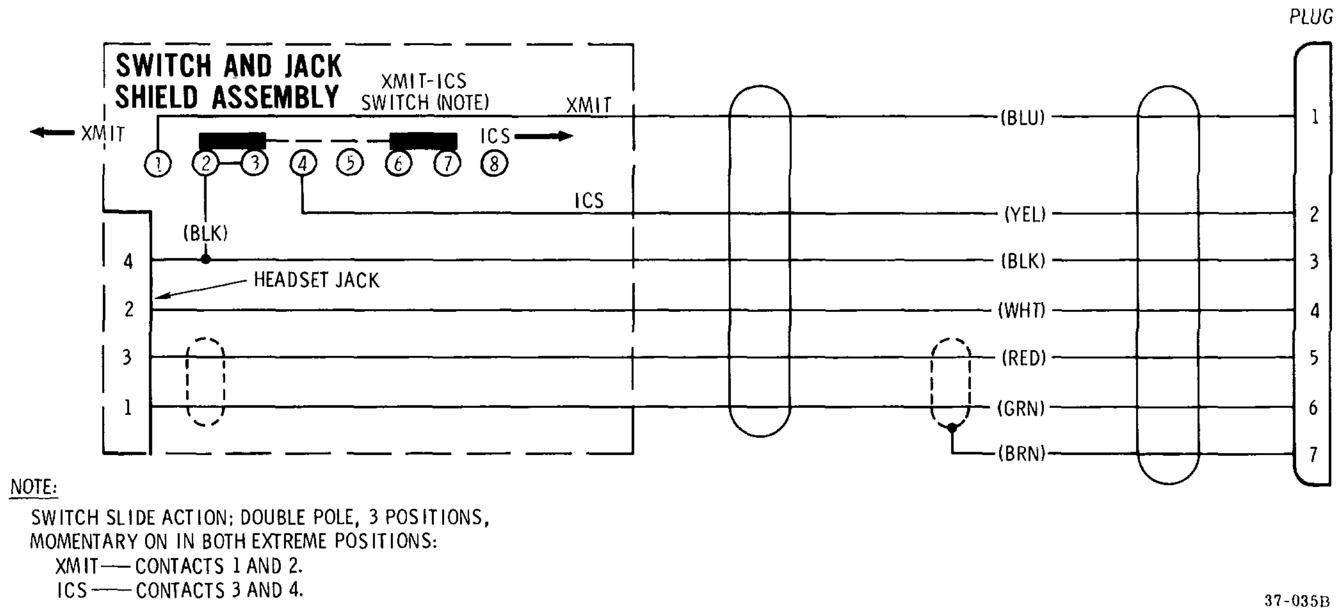


Figure 7-10. Headset switch and jack assembly

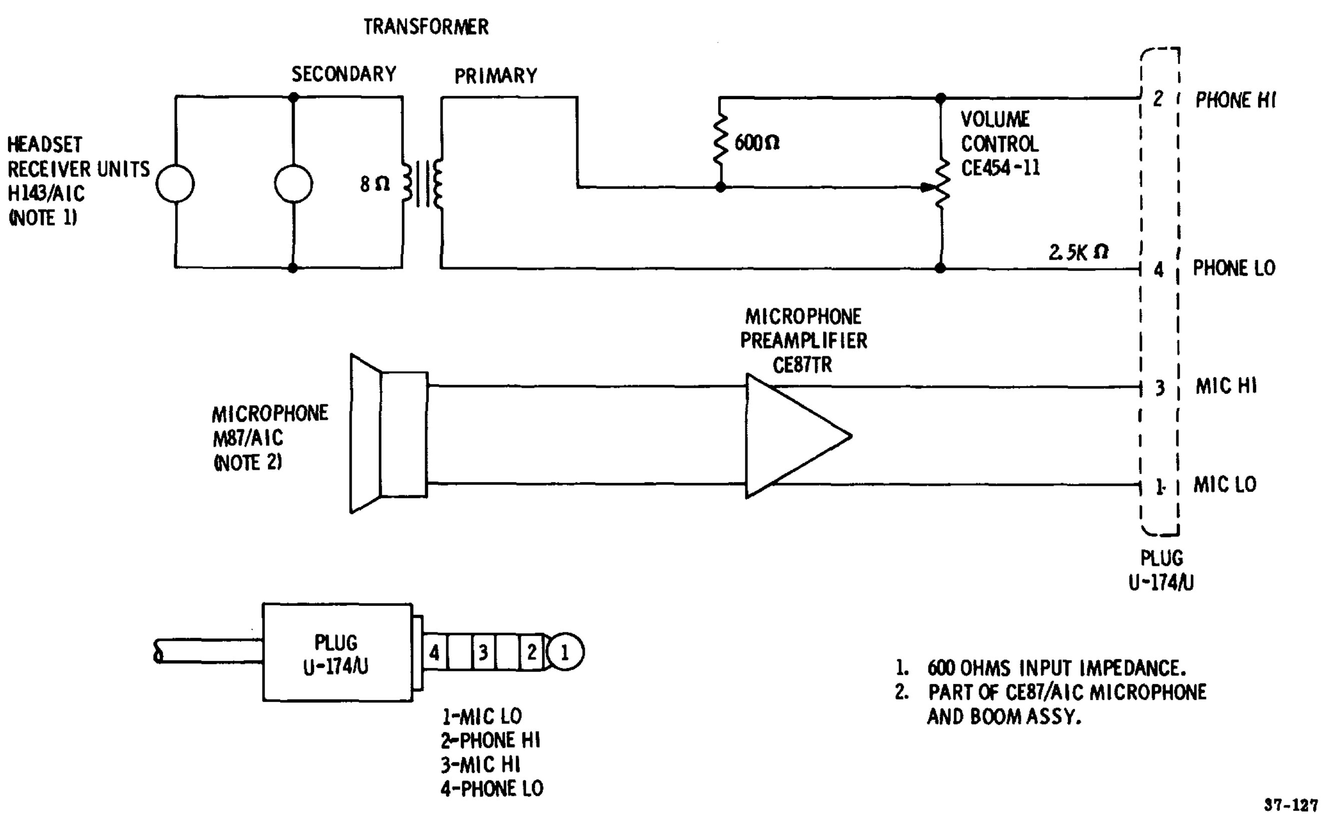


Figure 7-11. Carter CEH157-H-V headset-microphone - schematic diagram

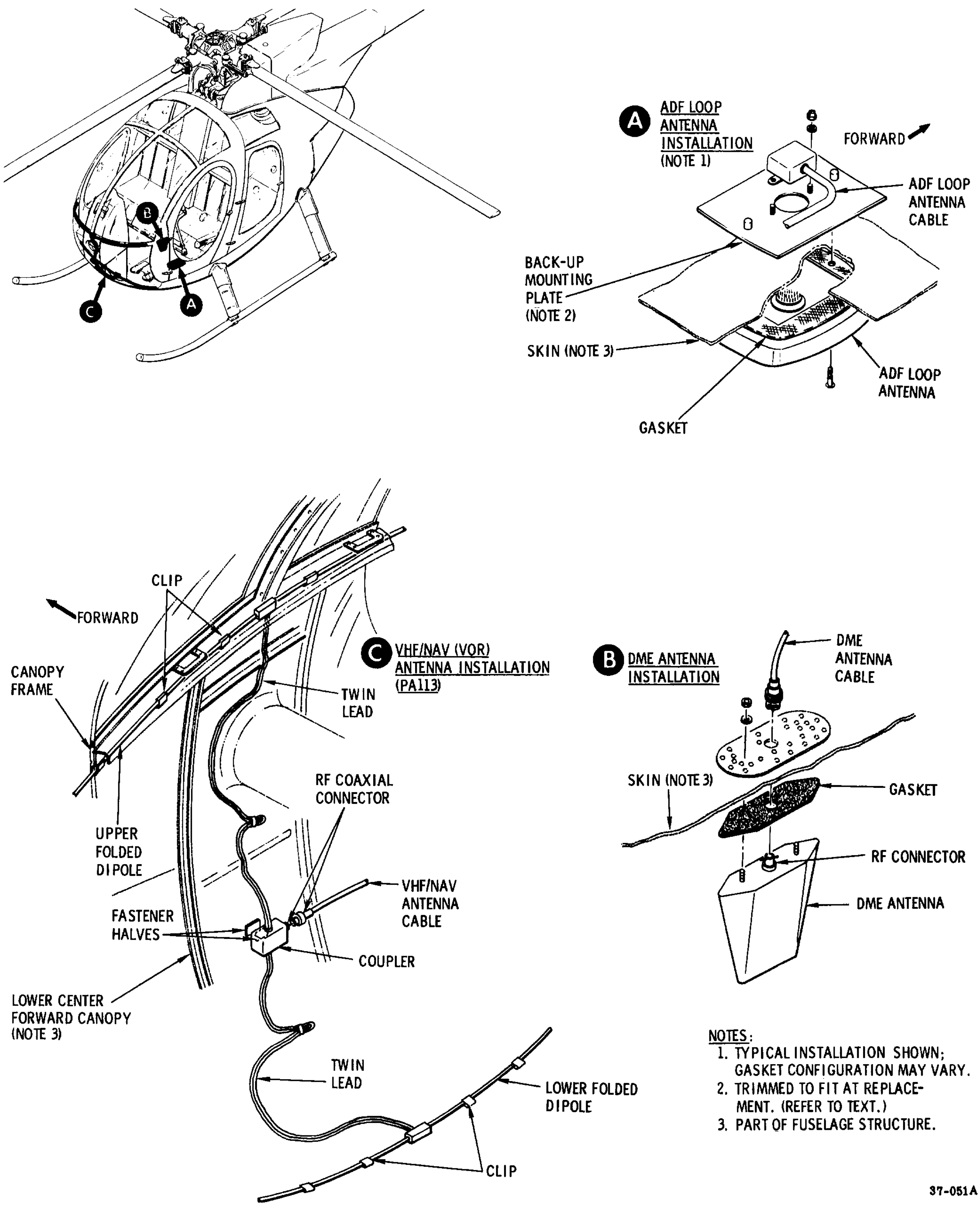


Figure 7-12. Bendix RN-222AE-28 vhf NAV, King KR-80 ADF loop and Narco UDI-4 DME antennas

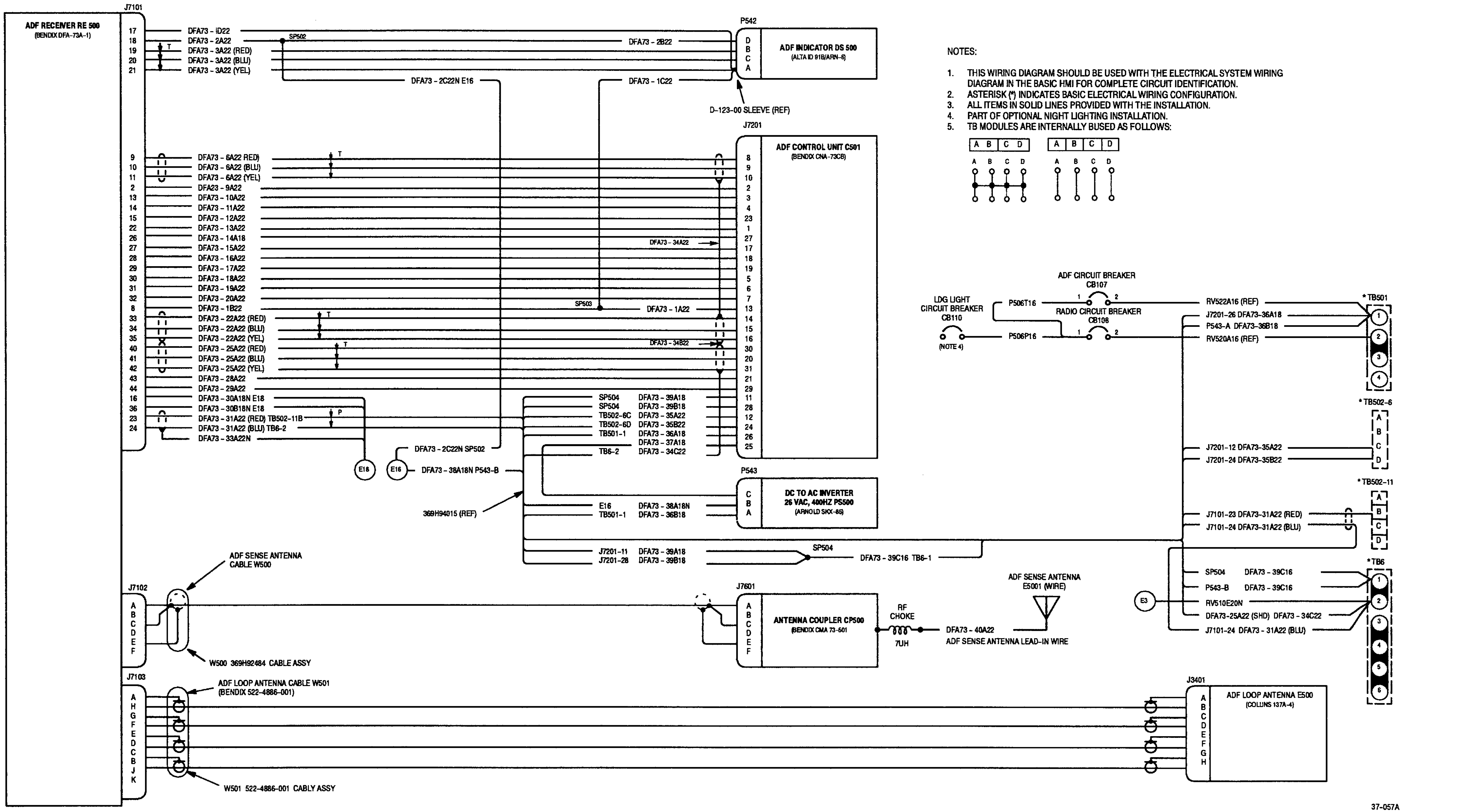


Figure 7–13. Bendix DFA–73A–1 ADF Installation (Instrument Panels) – Wiring Diagram

c. Remove the upper and lower folded dipoles from clips on the horizontal canopy frames.

d. Pull the coupler away from the inside of the canopy panel, separating the two halves of the coupler fastener.

7-47. INSTALLATION OF COMMUNICATIONS COMPONENTS PA113 VHF ANTENNA. (See fig. 7-12.)

a. Secure the vhf NAV antenna coupler to the lower center forward canopy panel by pressing the fastener on back of the coupler against the mating fastener half bonded to the canopy panel.

NOTE: The shorter twin-lead, attached to the coupler, must be positioned upward.

b. Place the upper and lower folded dipoles of the vhf NAV antenna in the clips on the horizontal canopy frames.

c. Connect the vhf NAV antenna cable to the connector on the right side of the coupler.

d. Install instrument panel fairings (Section 2, Basic HMI).

7-48. VHF NAV ANTENNA CABLE.

7-49. GENERAL. The vhf NAV antenna cable (fig. 7-12) is a coaxial cable terminated on the NAV receiver end with coaxial connector plug P519 and on the vhf NAV antenna end with coaxial connector plug P520.

7-50. VOR/LOC CONVERTER INDICATOR.

7-51. GENERAL. Visual displays of VOR and localizer (LOC) navigation data from the vhf NAV receiver are presented by the VOR/LOC converter indicator mounted in the center of the instrument panel (fig. 7-2).

7-52. REMOVAL OF VOR/LOC CONVERTER INDICATOR. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Gain access to the VOR/LOC converter indicator by removing the instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect the electrical cable from the indicator.

d. Loosen the clamp screw that secures the back of the indicator to the instrument panel structure.

e. Loosen and remove the four screws, washers and nuts that secure the indicator to the panel and remove the indicator.

7-53. INSTALLATION OF VOR/LOC CONVERTER INDICATOR. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Place VOR/LOC converter indicator in mounting position, through the support clamp behind the instrument panel. Secure indicator to the panel with four screws, washers and nuts.

c. Secure the back of the indicator by tightening the clamp screw.

d. Connect the electrical cable to the indicator.

e. Perform an operational check of the vhf NAV installation. Ensure proper operation of both the NAV receiver and the VOR/LOC indicator.

f. Install the instrument panel side fairings (Section 2, Basic HMI).

7-54. KING KR-80 AUTOMATIC DIRECTION FINDING (ADF) INSTALLATION (INSTRUMENT PANEL TYPE A).

7-55. GENERAL. The ADF installation is used for homing and obtaining accurate bearing information on selected radio stations. The ADF installation consists primarily of an ADF receiver (fig. 7-2), ADF loop antenna, ADF sense antenna, ADF loop antenna cable and an ADF sense antenna cable (fig. 7-4).

7-56. KING KR-80 ADF RECEIVER.

7-57. GENERAL. The King KR-80 ADF receiver (fig. 7-2), a solid state device, is used for homing and direction finding on low-frequency radio ranges or standard broadcast stations throughout the frequency range of 190 to 1600 kHz. The ADF receiver provides a visual indication of the bearing from which an incoming radio signal is received. The receiver also provides for the reception of voice and code signals. The reception range of the ADF receiver is dependent on the altitude of the helicopter and weather conditions. The ADF receiver is flush mounted in the instrument panel.

7-58. REMOVAL OF KING KR-80 ADF RECEIVER.

a. Check that all electrical power is OFF.

b. Gain access to the ADF receiver by removing the instrument panel side fairings (Section 2, Basic HMI).

c. Remove the intercom adapter (para 7-23) to the extent required to permit removal of the receiver from the back of the instrument panel (fig. 7-5).

d. Disconnect the power/control and the sense and loop antenna cables from the receiver.

e. Remove the four screws, washers and nuts that secure the receiver to the instrument panel.

f. Remove the clamp at the back of the receiver to permit removal of the receiver.

7-59. INSTALLATION OF KING KR-80 ADF RECEIVER.

NOTE: In the event the ADF receiver is replaced, the levers under the volume and tuning knobs are to be interchanged on shafts with levers straight downward, before replacement receiver is installed. With levers straight downward, mode and range indications are ADF and 550, respectively.

a. Place the ADF receiver in mounting position, through the support clamp behind the instrument panel. Secure receiver to the panel with four screws, washers and nuts (fig. 7-5).
b. Secure the back of the receiver with the clamp.
c. Connect the ADF power/control and the sense and loop antenna cables to the receiver.
d. Reinstall the intercom adapter as necessary (para 7-24).
e. Perform an operational check of the ADF receiver to ensure proper operation.
f. Install the instrument panel side fairings (Section 2, Basic HMI).

7-60. KING 071-1006-10 ADF LOOP ANTENNA.

7-61. GENERAL. The ADF receiver loop antenna (fig. 7-12) is located on the underside of the fuselage structure below the pilot's compartment. The ADF loop antenna is connected to the receiver by the ADF loop antenna cable.

7-62. REMOVAL OF ADF LOOP ANTENNA. (See fig. 7-12.)
a. Check that all electrical power is OFF.

NOTE: Note the orientation of the antenna. The FORWARD end must be installed toward the front of the helicopter when reinstalled.

b. Loosen and remove the two screws that secure the front and back of the ADF loop antenna to the fuselage skin.
c. Carefully lower the loop antenna and remove the gasket.

7-63. INSTALLATION OF ADF LOOP ANTENNA.
a. With the gasket in place (fig. 7-12), connect the antenna to the ADF antenna cable connector and position the loop antenna for mounting in the fuselage skin.

NOTE: The antenna must be oriented so that the FORWARD end is the same as when removed. The connector pins that protrude at the top of the antenna must be fully mated to the cable receptacle attached to the antenna mounting backup plate.

b. Secure the loop antenna with two screws.
c. Perform an operational check of the ADF receiver to ensure proper operation.

7-64. KING 155-2000-16 ADF LOOP ANTENNA CABLE.

7-65. GENERAL. The ADF loop antenna cable (fig. 7-12) is a multiconductor, shielded cable, cut to exact length for the ADF receiver, with an electrical connector on each end for connecting the ADF loop antenna to the ADF receiver. Access to the antenna connector is through the left floor door in the pilot's compartment. Refer to the manufacturer's instruction manual (table 2-12, Basic HMI) for additional information on the cable.

7-66. KING 155-2000-11 ADF SENSE ANTENNA.

7-67. GENERAL. The ADF sense antenna (fig. 7-3) consists of an ADF sense antenna wire, lead-in wire, rubber tension unit and associated electrical, mounting and suspension hardware. The antenna wire, approximately 83 inches long, is suspended between the rubber tension unit attached to a clip on the helicopter tailboom and a terminal stud at the top right rear of the engine aft inlet fairing. Because the fairing is made of fiberglass material, the terminal stud is electrically isolated. A locking lever on the terminal stud latches the antenna wire in the taut position, causing the rubber tension unit to apply and maintain tension on the wire. The aft end of the antenna lead-in wire is connected to the underside of the terminal stud inside the fairing. The lead-in wire forward end connects to an rf coaxial connector on an angle mounted to a plate assembly. The plate is attached to the boom fairing structure under the engine aft inlet fairing. The rf coaxial connector provides the connection point for the ADF sense antenna cable from the ADF receiver.

7-68. REMOVAL OF ADF SENSE ANTENNA. (See fig. 7-3.) It will seldom be necessary to remove all parts of the ADF sense antenna. In the following procedure perform only those steps necessary for proper repair. Steps a through d pertain to the external antenna wire and steps e through g pertain to the lead-in wire.
a. Unlock the locking lever from the antenna wire and swing the arm forward to relieve the tension.
b. Remove the upper two nuts, washer and spacer from the terminal stud.
c. Pull forward on the antenna wire to slide the locking lever and then the terminal lug from the terminal stud.
d. Disconnect the aft end of the antenna wire by removing the cotter pin, nut, washers and bolt from the clip on the tailboom.
e. Open or remove the plenum chamber access door on the right side of the engine air inlet aft fairing (Section 2, Basic HMI).
f. Remove the nut securing the terminal lug of the lead-in wire to the base of the terminal stud and remove the lead-in wire lug.

g. Unsolder the lower end of the lead-in wire from the coaxial connector mounted to the plate assembly on the boom fairing structure.

7-69. INSTALLATION OF ADF SENSE ANTENNA. (See fig. 7-3.) The following instructions describe the replacement of the entire ADF sense antenna. Steps a through d pertain to the lead-in wire; steps e through k apply to the external antenna wire.

a. Install the antenna lead-in wire through the access door in the right side of the engine air inlet aft fairing. Place the lead-in wire terminal lug on the underside of the terminal stud inside the fairing.

b. With the lead-in wire positioned toward the forward end of the fairing, install the terminal nut to secure the lug.

c. Solder the forward end of the lead-in wire to the rear terminal of the rf coaxial connector mounted on the boom fairing structure.

d. Close or reinstall the plenum chamber access door.

CAUTION: The external antenna wire, installed according to the following steps, includes a rubber tension unit that provides the wire with constant tension as well as electrical insulation from the tailboom. The tension unit should have a free (relaxed) length of 3-1/8 inches. The installed (stretched) length must be from 3-3/8 to 3-7/8 inches. If the installed length of the tension unit is not within this range, the length of the antenna wire or the connecting hooks must be altered to obtain the necessary tension.

e. The external antenna wire is installed with the locking lever and terminal lug at the forward end and the rubber tension unit at the aft end. Before installing the antenna wire, attach the chain hook to the rubber tension unit; bend the hook closed to make the attachment permanent.

f. Attach the rear hook to the clip on the tailboom, using the nut, bolt and washer. Do not tighten the nut at this time.

g. Place the terminal lug on the terminal stud located in the aft end of the air inlet fairing.

h. Slide the spacer over the terminal stud and install the locking lever so that the spacer is centered inside the hole in the lever. Install the washer and nut, checking to be sure the lever pivots freely on the spacer.

i. Pull the wire taut by swinging the arm of the locking lever toward the rear. Lock the lever by hooking the arm on the antenna wire.

j. With all parts properly aligned, check length of rubber tension unit. (Refer to Caution preceding step e.) Tighten the nut at the aft end and secure the nut with a cotter pin.

k. Apply corrosion preventive compound (item 69, table 2-4, Basic HMI) to thimbles and connecting hooks at both ends of the antenna wire and to metal ends of the rubber tension unit.

7-70. ADF SENSE ANTENNA CABLE.

7-71. GENERAL. The ADF sense antenna cable (fig. 7-3) is a coaxial cable, terminated at the ADF receiver with a coaxial connector and at the ADF sense antenna lead-in wire with coaxial connector receptacle J302. Refer to the manufacturer's instruction manual (table 2-12, Basic HMI) for additional information on the cable.

7-72. NARCO UDI-4 DISTANCE MEASURING EQUIPMENT (DME) INSTALLATION (INSTRUMENT PANEL TYPE A).

7-73. GENERAL. The Narco UDI-4 distance measuring equipment (DME) installation includes the instrument panel mounted DME interrogator unit (fig. 7-1 or 7-2), a DME antenna cable (fig. 7-12) and a DME antenna. The installation provides for distance measurement (in miles) from the helicopter to a selected ground station and also indicates radial ground speed in knots. The DME equipment operates in conjunction with the Federal Aviation Agency VORTAC system. It may also be used with the distance feature of the TACAN system in use by the Military. All dc electrical power is supplied to the DME installation through the DME (or ADF/DME) circuit breaker (fig. 7-2).

7-74. NARCO UDI-4 DME INTERROGATOR UNIT.

7-75. GENERAL. The Narco UDI-4 DME interrogator (fig. 7-2) is a receiver-transmitter that measures and displays the distance from the helicopter to a particular ground station. The unit operates on any one of 100 available uhf channels in the frequency range of 978 to 1213 MegaHertz (MHz), paired with 100 corresponding vhf omni and localizer channels in the 108.00 to 117.90 MHz range. The DME interrogator unit is mounted in the instrument panel below the vhf COMM receiver-transmitter and vhf NAV receiver.

7-76. REMOVAL OF NARCO UDI-4 DME INTERROGATOR UNIT.

a. Check that all electrical power is OFF.

b. Gain access to the DME interrogator unit (fig. 7-5) at the back of the instrument console by removing the instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect the DME antenna cable.

d. Disconnect the three electrical wires routed out the back of the unit (fig. 7-6). Tag-identify the wires to aid reinstallation.

e. To remove only the unit, unlock the case fastener at the back and slide the unit out of the case from the front of the instrument panel. To remove the entire unit (with case), remove only the four screws securing the front and the two screws and washers securing the back of the case to the instrument console.

7-77. INSTALLATION OF NARCO UDI-4 DME INTERROGATOR UNIT.

NOTE: When a new DME interrogator unit is to be installed, minor internal wiring changes must be made for panel lamp dimming, or verification that the internal changes have been made is required if a replacement unit is to be used. In such cases, perform a below. If the same unit that was removed is being reinstalled, omit performance of the step.

a. Be sure that DME interrogator unit internal panel lamp wiring is connected as follows.

NOTE: Refer to the manufacturer's maintenance manual (table 2-12, Basic HMI) for DME unit maintenance and internal wiring information. However, note that the grey wire is to be used for panel lamp dimming instead of the white wire indicated in the manufacturer's maintenance manual.

(1) Remove the DME unit from the case.
(2) Remove four screws holding back panel and rotate back panel carefully for access to rear side of voltage changeover switch.
(3) Disconnect the end of coiled white wire from switch terminal; cover and insulate the loose, free end with tape.
(4) Disconnect the end of coiled grey wire from terminal on changeover (bottom) switch; uncoil the grey wire and route the free end out through the back panel hole with the metal grommet.
(5) Resecure the back panel to the unit with four screws.
(6) Attach a knife splice half or single pin connector (as applicable) to the loose, free end of the grey wire. The splice or connector is to mate with the existing electrical disconnect device existing on the end of wire DME-2A22 (fig. 7-6) in the instrument panel.

b. Check that all electrical power is OFF.
c. To install only the unit, support the loose wires and slide the unit through the front of the instrument panel and into its case (fig. 7-5). Secure the unit by locking the case fastener at the back. To install the entire unit (with case), secure the case to the instrument console, using four screws at the front and two screws and washers at the back.
d. Connect the three electrical wires routed out the back of the unit (fig. 7-6). Remove wire identification tags.

NOTE: The red wire is the +28 Vdc input, the grey wire is for panel light dimming and the remaining wire is a grounding wire.

e. Connect the DME antenna cable.
f. Perform an operational check on the DME installation to ensure proper operation.
g. Install the side fairings on the instrument console (Section 2, Basic HMI).

7-78. NARCO UDI-4 DME ANTENNA.

7-79. GENERAL. The Narco UDI-4 DME antenna (fig. 7-12) is a small blade antenna mounted on the fuselage underside below the pilot's compartment and to the right of the ADF loop antenna. The DME antenna is connected to the DME interrogator unit for both transmitting and receiving. The base of the antenna is equipped with two studs and a coaxial connector for the DME antenna cable. Refer to the manufacturer's instruction manual (table 2-12, Basic HMI) for additional information.

7-80. REMOVAL OF NARCO UDI-4 DME ANTENNA.

a. Check that all electrical equipment is OFF.
b. Remove the pilot's compartment floor right access door (Section 2, Basic HMI).
c. Gaining access through the floor opening, disconnect the DME antenna cable (fig. 7-12) from the rf connector at the top of the DME antenna.
d. Loosen and remove the two nuts and lockwashers securing the antenna to the doubler on the fuselage skin.
e. Lower and remove the antenna and gasket from the fuselage underside.

7-81. INSTALLATION OF NARCO UDI-4 DME ANTENNA. Install the DME antenna in reverse order of removal (para 7-80).

7-82. DME ANTENNA CABLE.

7-83. GENERAL. The DME antenna cable is low loss coaxial cable approximately 8 feet long and terminated on each end with a coaxial cable connector (P534 and P535). The antenna cable interconnects the DME antenna and DME interrogator unit. Refer to the manufacturer's instruction manuals (table 2-12, Basic HMI) for additional information on the antenna cable.

7-84. BENDIX DFA-73A-1 AUTOMATIC DIRECTION FINDING (ADF) INSTALLATION (INSTRUMENT PANEL TYPE A).

7-85. GENERAL. The Bendix DFA-73A-1 ADF installation is used for homing and obtaining accurate bearing information on selected radio stations. The ADF installation consists primarily of an ADF receiver control unit, ADF receiver, ADF receiver mount, ADF indicator, ADF loop antenna, ADF loop antenna cable, ADF sense antenna, ADF sense antenna coupler, ADF sense antenna cable and a direct current (dc) to alternating current (ac) inverter. All direct current (dc) electrical power to the ADF installation is supplied through the ADF circuit breaker on the instrument panel.

NOTE: Intercom equipment (para 7-20) must also be installed in the helicopter for use of the DFA-73A-1 ADF installation. The associated audio components (intercom adapter, headset connectors, headsets, interconnecting wiring, etc) are required for reception of ADF audio signals. See figure 7-13, which shows intercom audio equipment required and interconnection wiring for the equipment.

7-86. BENDIX CNA-73CB ADF CONTROL UNIT.

7-87. GENERAL. The Bendix CNA-73CB ADF control unit (fig. 7-2), a solid-state device used for control and operation of the Bendix DFA-73A-1 ADF installation, is flush mounted on the face of the instrument panel. The ADF control unit selects mode of ADF operation, selects operating frequency and tunes the Bendix DFA-73A-1 ADF receiver, selects and controls type and level of ADF audio output signals and contains all switches and controls for operation of the ADF installation.

7-88. REMOVAL OF BENDIX CNA-73CB ADF CONTROL UNIT. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Loosen the four captive fasteners securing the ADF control unit to the face of the instrument panel.

c. Extract the control unit from the face of the instrument panel far enough to disconnect the electrical wiring harness connector from the back of the control unit; then remove control unit.

7-89. INSTALLATION OF BENDIX CNA-73CB ADF CONTROL UNIT. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Partially insert ADF control unit into instrument panel and connect electrical wiring harness connector to the back of the control unit.

c. Position control unit and secure in instrument panel with the four captive fasteners.

d. Perform an operational check on the ADF installation.

7-90. ALTA ID-91B/ARN-6 ADF INDICATOR.

7-91. GENERAL. The Alta ID-91B/ARN-6 ADF indicator (fig. 7-2), flush mounted on the instrument panel, provides a visual indication of the bearing from which an incoming radio signal is received. The ADF indicator operates with bearing synchro signals received from the Bendix DFA-73A-1 ADF receiver.

7-92. REMOVAL OF ID-91B/ARN-6 ADF INDICATOR. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Remove the instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect the electrical wiring harness connector from the back of the ADF indicator inside the instrument console.

d. Remove the three screws, washers and nuts securing the front of the indicator to the back of the plate on the instrument panel. Remove indicator from instrument console.

7-93. INSTALLATION OF ID-91B/ARN-6 ADF INDICATOR. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Place the ADF indicator in mounting position inside the instrument console. Secure the front of the indicator to the back of the plate on the instrument panel, using three screws, washers and nuts.

c. Connect the wiring harness electrical connector to the connector on the back of the indicator.

d. Install the instrument panel side fairings (Section 2, Basic HMI).

e. Perform an operational check on the ADF installation.

7-94. BENDIX DFA-73A-1 ADF RECEIVER.

7-95. GENERAL. The Bendix DFA-73A-1 ADF receiver (fig. 7-2), a solid-state device, is used for homing and direction finding on low-frequency ranges or standard broadcast stations throughout the frequency range of 190 to 1750 kiloHertz (kHz). The ADF receiver provides bearing synchro signals for operation of the ADF indicator. The ADF receiver also provides for reception of voice and continuous wave (CW) signals. The reception range of the ADF receiver is dependent on the altitude of the helicopter and atmospheric conditions. The ADF receiver is secured to the ADF receiver mount in the right underfloor area below the pilot's compartment.

7-96. REMOVAL OF BENDIX DFA-73A-1 ADF RECEIVER. (See fig. 7-14.)

a. Check that all electrical power is OFF.

b. Remove the pilot's compartment floor right access door (Section 2, Basic HMI).

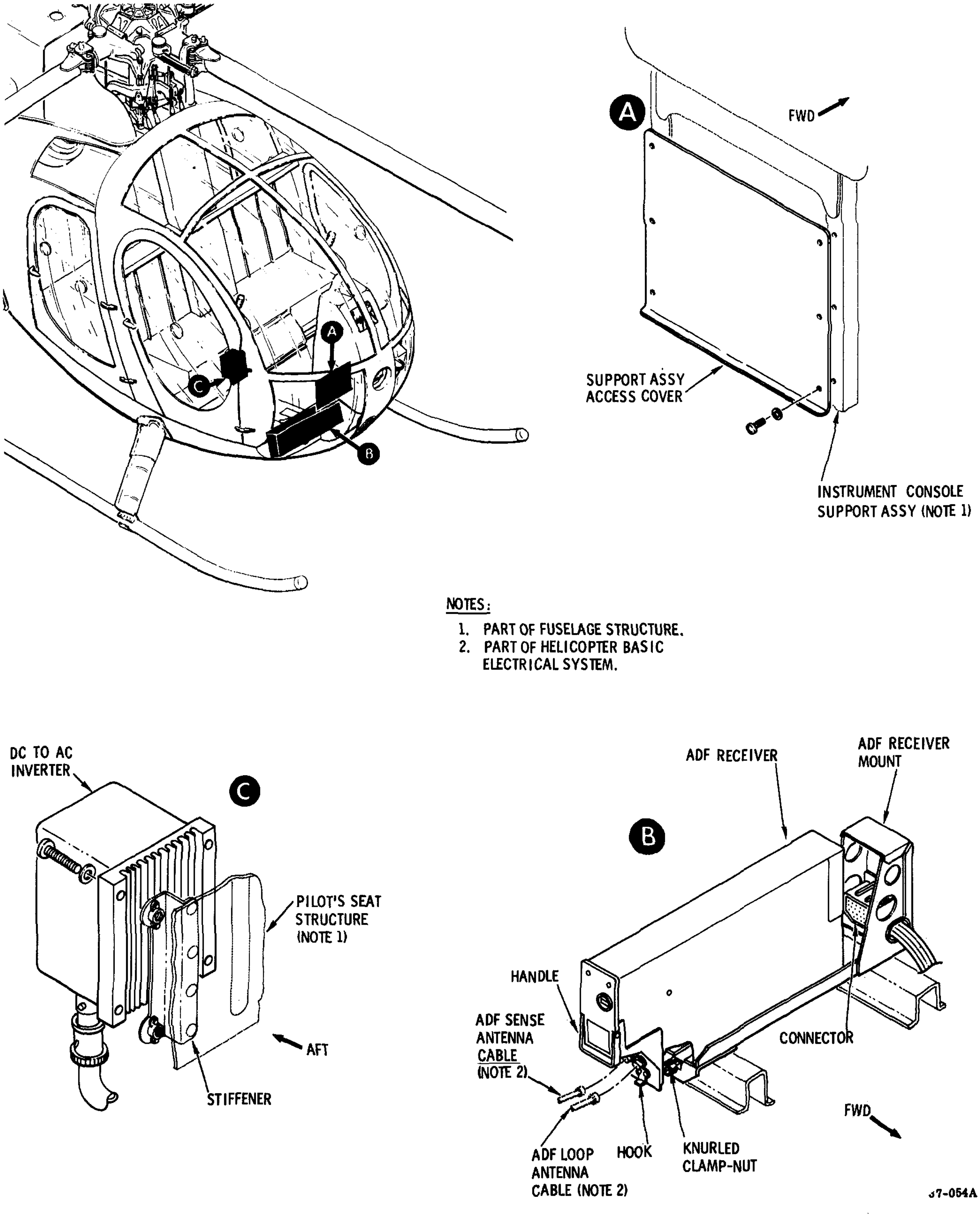


Figure 7-14. Bendix DFA-73A-1 ADF equipment in avionics compartment and underseat area

c. Disconnect the ADF loop and sense antenna connectors from the front of the ADF receiver.

d. Loosen the knurled clamp-nut securing the receiver to the receiver mount. Slide the receiver off the mount.

e. Grasp the front handle on the receiver and slide it straight out and off the mount.

7-97. INSTALLATION OF BENDIX DFA-73A-1 ADF RECEIVER. (See fig. 7-2.)

a. Check that all electrical power is OFF.

b. Slide the ADF receiver on the receiver mount in the right underfloor compartment, mating the receiver rear connector with the mount connector.

c. Secure the receiver to the shock mount with the knurled clamp-nut at the front of the mount. Push in receiver to fully mate rear connector and tighten knurled clamp-nut.

d. Connect the loop and sense antenna cable connectors to the receiver front connectors.

e. Reinstall the pilot's compartment floor right access door (Section 2, Basic HMI).

f. Perform an operational check of the ADF installation.

7-98. COLLINS 137A-4 ADF LOOP ANTENNA.

7-99. GENERAL. The Collins 137A-4 ADF loop antenna (fig. 7-15) is a fixed type loop antenna that receives low frequency radio signals for the Bendix DFA-73A-1 ADF receiver to determine bearing information. The ADF loop antenna is located on the underside of the fuselage structure below the pilot's compartment.

7-100. REMOVAL OF 137A-4 ADF LOOP ANTENNA. (See fig. 7-15.)

a. Check that all electrical power is OFF.

b. Loosen the six screws and remove the washers securing the ADF loop antenna to the fuselage skin.

NOTE: Observe the number and location of the washers for replacement at same locations on reinstallation.

c. Lower the loop antenna and disconnect the antenna cable.

d. Remove the loop antenna and mounting pads.

NOTE: Observe the mounting locations from which the mounting pads are removed for replacement at same locations on reinstallation.

7-101. INSTALLATION OF 137A-4 ADF LOOP ANTENNA. (See fig. 7-15.)

a. Place the two larger mounting pads in approximate mounting positions on top of the ADF loop antenna.

b. Connect ADF loop antenna cable to the loop antenna connector with the ADF loop antenna positioned below opening in fuselage skin.

c. Reposition the washers and two smaller mounting pads at locations from which removed. Secure the loop antenna to the underside of the fuselage skin, using six screws.

NOTE: The washers are used to provide a level mounting surface for the loop antenna. The mounting pads function as a gasket and mounting surface.

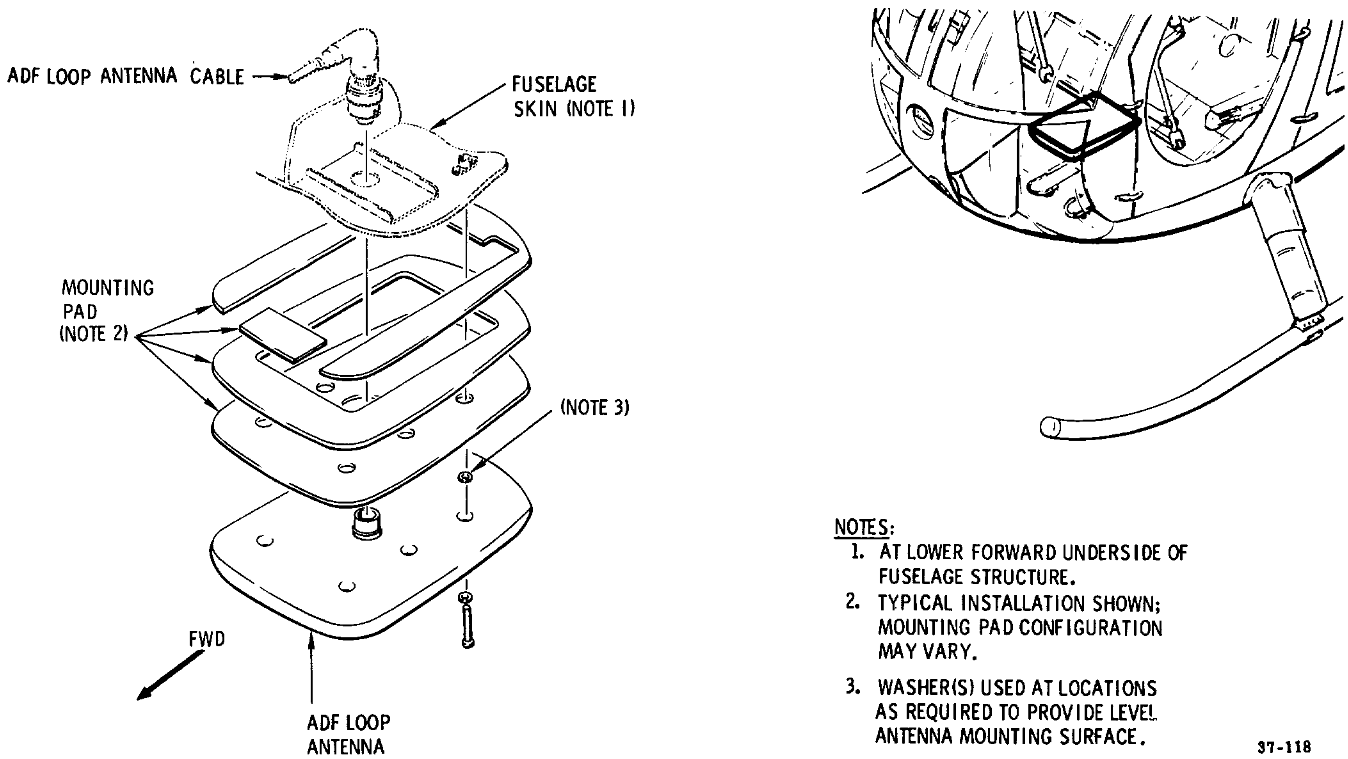


Figure 7-15. Installation of Collins 137A-4 ADF loop antenna for Bendix DFA-73A-1

d. Perform an operational check on the ADF installation.

7-102. DFA-73A-1 ADF LOOP ANTENNA CABLE.

7-103. GENERAL. The ADF loop antenna cable for the Bendix DFA-73A-1 installation is identical with that used on the King KR-80 ADF installation (para 7-65).

7-104. DFA-73A-1 ADF SENSE ANTENNA.

7-105. GENERAL. The ADF sense antenna for the Bendix DFA-73A-1 ADF installation is identical with that used on the King KR-80 ADF installation (para 7-67), except that a coupler is used. The ADF sense antenna lead-in wire connects the sense antenna, through an rf choke, to a terminal stud on the rear of a Bendix CMA-73A-50 ADF sense antenna coupler. The coupler is mounted on a plate assembly attached to the boom fairing structure under the engine air inlet aft fairing. A connector on the front of the coupler provides the connection point for the ADF sense antenna cable.

7-106. REPLACEMENT OF ADF SENSE ANTENNA. Replace the ADF sense antenna as instructed in paragraphs 7-68 and 7-69, except as follows: Disconnect/reconnect the nut, washer and forward end of the ADF sense antenna lead-in wire from the antenna coupler rear terminal stud.

7-107. BENDIX CMA-73A-50 ADF SENSE ANTENNA COUPLER.

7-108. GENERAL. The Bendix CMA-73A-50 ADF sense antenna coupler (fig. 7-7) couples the ADF sense antenna to the ADF receiver, provides impedance matching and compensates for a short ADF sense antenna cable. The ADF sense antenna coupler is mounted on a plate assembly attached to the boom fairing structure under the engine air inlet aft fairing.

7-109. REMOVAL OF BENDIX CMA-73A-50 ADF SENSE ANTENNA COUPLER. (See fig. 7-7.)

a. Check that all electrical power is OFF.

b. Gain access to the ADF sense antenna coupler by opening or removing the plenum chamber access door on the right side of the engine air inlet aft fairing (Section 2, Basic HMI).

c. Disconnect the sense antenna cable from the front of the sense antenna coupler.

d. Disconnect the rf choke from the coupler rear terminal stud by removing a nut and washer.

e. Remove two screws securing the antenna coupler to the plate assembly. Remove antenna coupler from inside fairing.

7-110. INSTALLATION OF BENDIX CMA-73A-50 ADF SENSE ANTENNA COUPLER. (See fig. 7-7.)

a. Check that all electrical power is OFF.

b. Position the ADF sense antenna coupler with connector forward on the plate assembly inside the engine air inlet aft fairing. Secure coupler with two screws.

c. Connect the rf choke to the coupler terminal stud with a nut and washer.

d. Connect the sense antenna cable to the coupler.

e. Close or reinstall the plenum chamber access door.

f. Perform an operational check of the ADF installation.

7-111. DFA-73A-1 ADF SENSE ANTENNA CABLE.

7-112. GENERAL. The ADF sense antenna cable used on the Bendix DFA-73A-1 ADF installation is identical with that used on the King KR-80 ADF installation (para 7-71), except the aft end is terminated with an rf coaxial connector for connection to the ADF sense antenna coupler.

7-113. ADF INSTALLATION - ARNOLD SKX-85 DC TO AC INVERTER.

7-114. GENERAL. The Arnold SKX-85 dc to ac inverter is a solid-state device that converts 28-volt dc power to 26-volt, 400-cycle, ac power for use by the ADF receiver and ADF indicator. The inverter is the power source for the synchro bearing signals used by the ADF indicator.

7-115. REMOVAL OF ARNOLD SKX-85 DC TO AC INVERTER.

a. Remove the right foot support fairing in the passenger/cargo compartment (Section 2, Basic HMI).

b. Disconnect electrical wiring connector from the dc to ac inverter (fig. 7-14) at the right rear side of the pilot's seat structure.

NOTE: Tag-identify the wiring for use at reinstallation.

c. Remove the attaching hardware that secures the dc to ac inverter on the back side of the vertical seat structure; remove inverter.

7-116. INSTALLATION OF ARNOLD SKX-85 DC TO AC INVERTER.

a. Check that all electrical power is OFF.

b. Secure inverter (fig. 7-14) with connector down on the vertical mounting brackets of the seat structure, using attaching hardware.

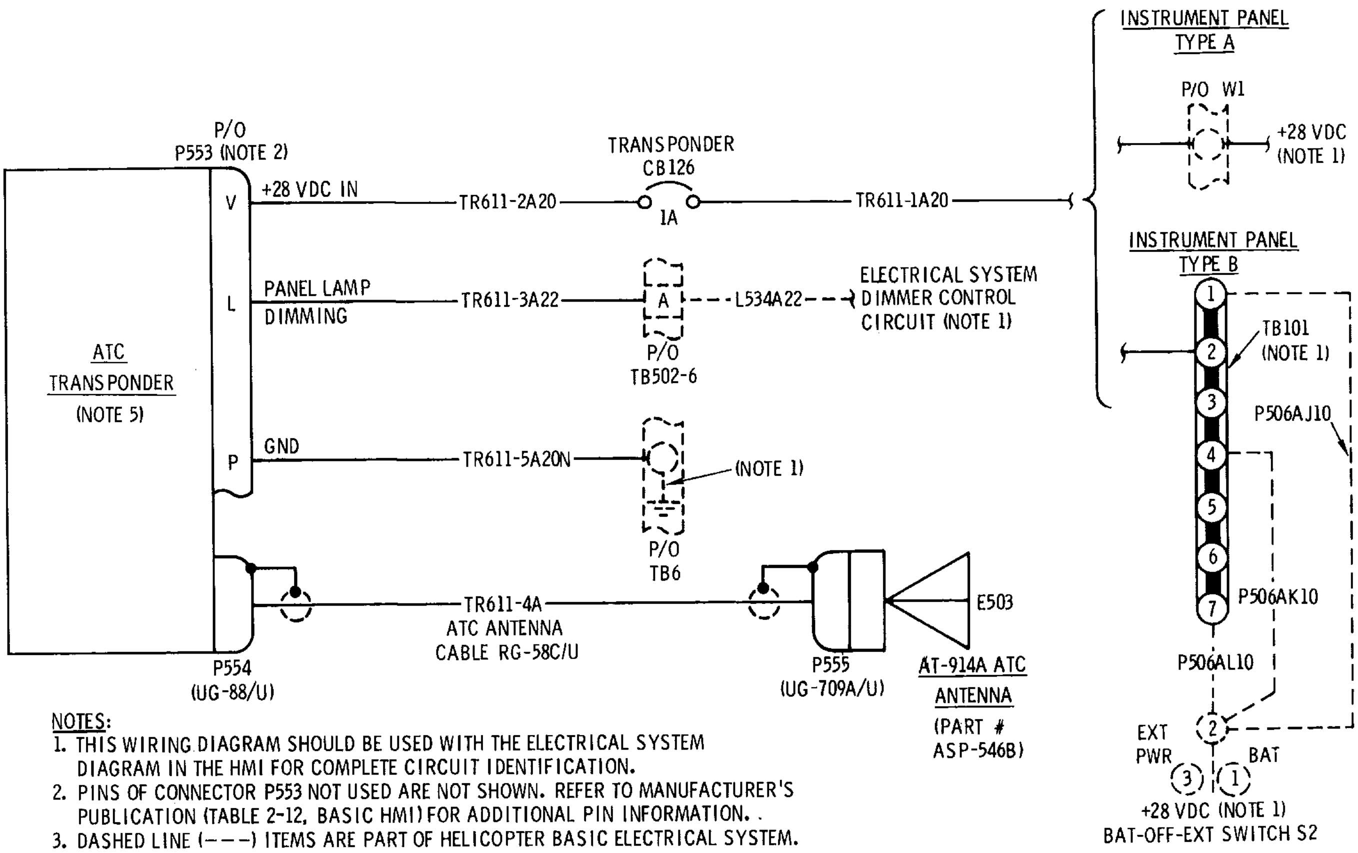
c. Connect electrical wiring harness connector to inverter connector.

d. Reinstall the right foot support fairing in the passenger/cargo compartment.

e. Perform an operational check on the ADF installation.

7-117. BENDIX TPR-640 (OR TPR-610) TRANSPONDER INSTALLATION.

7-118. GENERAL. The Bendix TPR-640 Transponder installation consists of a Bendix TR-641A ATC (Air Traffic Control) Transponder (part #4000 416-4103), Bendix AT-914A Transponder Antenna (part #ASP-546B), transponder antenna cable, a circuit breaker with attached wiring harness, transponder unit mounting bracket, transponder panel assembly, and miscellaneous mounting and attachment hardware. The TR-641A Transponder and AT-914A ATC Transponder Antenna are components of the Bendix TPR-640 Transponder System. The early type TPR-610 Transponder System is similar but uses a Bendix TR-611B-28 transponder (part #4000094-1103) in place of the TPR-641A. The transponder system provides automatic radar identification of the helicopter to any interrogating ground station. The system furnishes helicopter identification in operation mode A, and Special Position identification (SPI) pulse information, to all suitably equipped interrogating stations within the operational range of the system. A self-test mode is also provided that visually verifies system operation. The system also contains provisions for altitude reply codes in operation mode AC, to furnish an interrogating station with helicopter altitude information, when additional altitude digitizer equipment (not furnished) is installed. The Transponder receives +28 Vdc from the main electrical system when the TRANSPONDER circuit breaker on the instrument panel is ON. The following paragraphs provide maintenance information for the system relating to system installation in the helicopter. For maintenance information on system components beyond the scope of coverage in the following paragraphs (such as transponder repairs, internal schematics, etc) refer to the manufacturer's publications (table 2-12, Basic HMI). Figure 7-16 is a wiring diagram for the system. See the electrical system wiring diagram in Section 20 of the Basic HMI for electrical system interconnection wiring information.



NOTES:
1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. PINS OF CONNECTOR P553 NOT USED ARE NOT SHOWN. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR ADDITIONAL PIN INFORMATION.
3. DASHED LINE (– – –) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
4. REFERENCE DESIGNATORS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
5. BENDIX TR-641 (PART # 4000416-4103) FOR TPR-640, OR BENDIX TR-611B-28 (PART # 4000094-1103) FOR EARLY TYPE TPR-610 SYSTEM.

37-092B

Figure 7-16. Bendix TPR-640 (or TPR-610) transponder installation - wiring diagram

7-119. BENDIX TR-641A (OR TR-611B-28) TRANSPONDER.

7-120. GENERAL. (See fig. 7-1 or 7-2.) The Bendix TR-641A (or TR-611B-28) Transponder receives radio frequency (rf) interrogating signals from the Bendix AT-914A Transponder Antenna through the antenna cable and automatically transmits coded reply rf signals in answer through the same antenna cable and antenna. The transponder contains a receiver-transmitter that receives and transmits rf signals in the L frequency band; the receiver at 1030 MHz and the transmitter at 1090 MHz. The transponder requires approximately 0.5 ampere of current (maximum) at +28 Vdc. Transmitter power is 250 watts (peak) for the TR-641A (200 watts for the TR-611B-28) and antenna circuit output impedance is 50 ohms. The transponder is a completely solid state device, except for the transmitter stage, and contains controls and indicators that protrude through the transponder panel at the lower center of the helicopter instrument panel. A transponder mounting bracket secures the transponder inside the instrument panel console. Transponder internal panel lamp dimming is controlled by external dimming circuits (Section 17, Basic HMI).

7-121. REMOVAL OF BENDIX TR-641A (OR TR-611B-28) TRANSPONDER. (See fig. 7-1 or 7-2.)

a. Check that all electrical power is OFF.

b. Remove the instrument panel side fairings (Section 2, Basic HMI) for access to the clamping screw at top of the transponder mounting bracket inside the instrument panel console.

c. Disconnect electrical wiring connector P553 and antenna cable connector P554 from rear of transponder.

d. Loosen the screw and nut at the top of the transponder mounting bracket.

e. Loosen the locking screw head at the lower right on the transponder face panel to disengage the transponder internal locking device.

f. Remove the transponder, pulling it straight outward from the transponder panel on the instrument panel.

7-122. INSTALLATION OF BENDIX TR-641A (OR TR-611B-28) TRANSPONDER. (See fig. 7-1 or 7-2.) Install the transponder by performing removal procedures (para 7-121) in reverse order. At installation, check and be sure that the transponder is secured and correctly held by the transponder internal locking device.

7-123. BENDIX AT-914A TRANSPONDER ANTENNA.

7-124. GENERAL. (See fig. 7-17.) The transponder system uses a Bendix AT-914A Transponder Antenna. It is an exterior-mounted, 50-ohm impedance, quarter-wave, rod antenna. The antenna is omnidirectional, vertically polarized and is designed to receive and radiate rf signals in the L frequency band with a vswr of 1.2 to 1.5 (maximum) at the transponder transmitting and receiving frequencies (para 7-120). A type "C" rf connector on the antenna base is used for connection of the antenna cable. The antenna is mounted on the fuselage left underside below the pilot's compartment.

7-125. REMOVAL OF BENDIX AT-914A TRANSPONDER ANTENNA. (See fig. 7-17.)

a. Check that all electrical power is OFF.

b. Gain access to the antenna by opening the pilot's compartment floor left access floor (Section 2, Basic HMI).

c. Disconnect the antenna cable from the connector of the antenna.

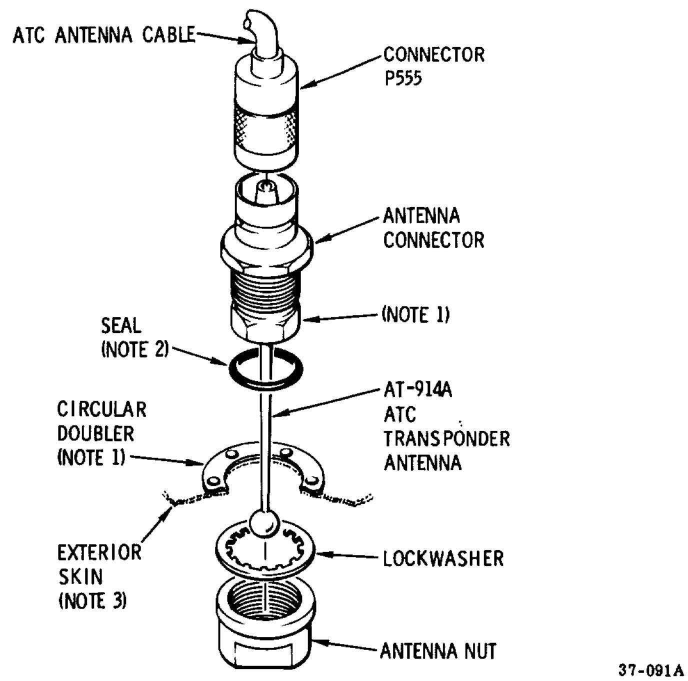
d. While holding the mounting base inside the pilot's underfloor compartment, loosen and remove the antenna nut and lockwasher from the lower exterior helicopter underside skin.

e. Remove the antenna, with the antenna seal, upward from the circular doubler in the underfloor compartment.

7-126. INSTALLATION OF BENDIX AT-914A TRANSPONDER ANTENNA. (See fig. 7-1 or 7-2.) Install the antenna by performing removal procedures (para 7-125) in reverse order. At installation make sure that adequate electrical bonding exists between the helicopter structure and antenna base. (Refer to Section 19, Basic HMI for electrical bonding information.)

7-127. BENDIX TPR-640 (OR TPR-610) TRANSPONDER ANTENNA CABLE.

7-128. GENERAL. (See fig. 7-17.) The antenna cable connects the transponder to the antenna. The antenna cable is an RG-58C/U, 50-ohm rf coaxial cable, 64 inches long, terminated on each end with an rf coaxial connector.



NOTES:

1. STRUCTURAL ELECTRICAL BOND REQUIRED. (REFER TO SECTION 19, BASIC HMI.)
2. SEAT CORRECTLY TO ENSURE MOISTURE-PROOF INSTALLATION.
3. AT LOWER FORWARD LEFT SIDE OF FUSELAGE STRUCTURE.

Figure 7-17. Installation of antenna for Bendix TPR-640 (or TPR-610) transponder installation

7-129. BENDIX TPR-640 (OR TPR-610) TRANSPONDER CIRCUIT BREAKER.

7-130. GENERAL. (See fig. 7-1 or 7-2.) The 1-ampere TRANSPONDER circuit breaker for the transponder system on the instrument panel controls application of +28 Vdc to the transponder. For information on the circuit breaker, refer to Section 19, Basic HMI.

7-131. RCA AVC-110 VHF COMMUNICATIONS INSTALLATION (INSTRUMENT PANEL TYPE B).

7-132. GENERAL. The RCA AVC-110 vhf communications (COMM) installation provides air-to-ground and air-to-air two-way voice communication. The installation consists primarily of a vhf COMM transceiver (para 7-133), uhf/vhf antenna cable (para 7-18), uhf/vhf antenna matching unit (para 7-11), uhf/vhf antenna (para 7-15), associated mounting hardware and interconnection wiring harnesses. The range of the vhf COMM installation is limited to an approximate line-of-sight distance. The vhf COMM transceiver is flush mounted to the left of the vhf NAV receiver (if installed) in the instrument panel. All dc power to the installation is supplied through the 7.5-ampere NAV/COM circuit breaker CB108 on the instrument panel, that also simultaneously supplies power to the integrated interphone system and radio control equipment (para 7-149) and RCA AVN-211 vhf NAV installation (if installed). The uhf/vhf antenna and uhf/vhf antenna cable are furnished as part of the basic helicopter. A factory installed RCA AVC-110 vhf COMM provision installation basically consists of all the equipment described, except the vhf COMM transceiver is not furnished.

NOTE: Interconnection wiring for the installation is shown in figure 7-18 for a current helicopter, and in figure 7-19 for an early helicopter. The integrated interphone system and radio control equipment must also be installed in the helicopter for use of the vhf COMM installation. The associated audio and radio control equipment (interphone control unit, headset connectors, control switches, headset-microphones, interconnection wiring, etc) are necessary for operation of the installation.

7-133. RCA AVC-110 VHF COMMUNICATIONS TRANSCEIVER.

7-134. GENERAL. The RCA AVC-110 (model MI592114) vhf communications transceiver (fig. 7-1), a solid state amplitude-modulated device, operates on any one of 360 available channels within the frequency range of 118.00 to 135.95 MegaHertz (MHz) with 50 kiloHertz (kHz) channel spacing. The vhf transceiver transmits and receives rf signals on the same frequency, using the uhf/vhf antenna. The transceiver rf output power is 20 watts minimum with 28 Vdc input power. The unit requires an average 0.50 ampere of current at 28 Vdc input power and 4.5 amperes for transmit. All switches and controls are on the face of the unit.

7-135. REMOVAL OF RCA AVC-110 VHF COMMUNICATIONS TRANSCEIVER. (See fig. 7-1.)

a. Check that all electrical power is OFF.

b. Gain access to back of vhf COMM transceiver by removing instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect uhf/vhf antenna cable and power/control cable from back of transceiver.

d. Loosen and remove attaching hardware and clamp assembly securing transceiver to instrument console support.

e. Loosen the upper right and lower left screws beside the transceiver on the instrument panel to loosen the panel mounted clamp holding the transceiver.

f. Remove vhf COMM transceiver from instrument console.

7-136. INSTALLATION OF RCA AVC-110 VHF COMMUNICATIONS TRANSCEIVER. Install the vhf COMM transceiver in reverse order of removal (para 7-135). At installation, place face of transceiver flush with instrument panel. Tighten upper right and lower left clamp screws to 5 to 8 inch-pounds. Make sure that there is a structural electrical bond from transceiver to instrument console. (Refer to Section 19, Basic HMI.) After installation, perform an operational check of the vhf COMM installation and integrated interphone system and radio control equipment.

7-137. RCA AVN-211 VHF NAVIGATION INSTALLATION (INSTRUMENT PANEL TYPE B).

7-138. GENERAL. The vhf navigation installation receives ground-to-air vhf radio signals for visual display and voice reception for navigation purposes. The installation primarily consists of a vhf navigation (NAV) receiver (fig. 7-1), Narco VRP-37 vhf NAV antenna installation, vhf NAV interconnection antenna cable, associated mounting hardware and interconnecting wiring harnesses. The range of the vhf NAV installation is limited to an approximate line-of-sight distance. The vhf NAV receiver is flush mounted to the right of the vhf COMM receiver (if installed) in the instrument panel. The vhf NAV antenna is located externally on the center underside of the center fuselage structure (fig. 7-20). The vhf NAV interconnection cable is an RG-58/U coaxial cable terminated on each end with coaxial connectors. All dc power to the installation is supplied through the 7.5-ampere NAV/COM circuit breaker CB108 on the instrument panel, that also simultaneously routes power to the RCA AVC-110 vhf COMM installation (if installed) (para 7-134) and integrated interphone system and radio control equipment (para 7-149). A factory installed RCA-211 vhf NAV provision installation basically consists of all the equipment described, except the vhf NAV receiver and vhf NAV antenna installation is not furnished.

NOTE: Interconnection wiring for the installation is shown in figure 7-18 for a current helicopter, and in figure 7-19 for an early helicopter. The integrated interphone system and radio control equipment must also be installed in the helicopter for use of the vhf NAV installation. The associated audio components (interphone control unit, headset connectors, headsets, interconnection wiring, etc) are required for reception of NAV audio signals.

7-139. RCA AVN-211 VHF NAVIGATION RECEIVER.

7-140. GENERAL. The RCA AVN-211 (model MI592100-2) vhf navigation (NAV) receiver, a

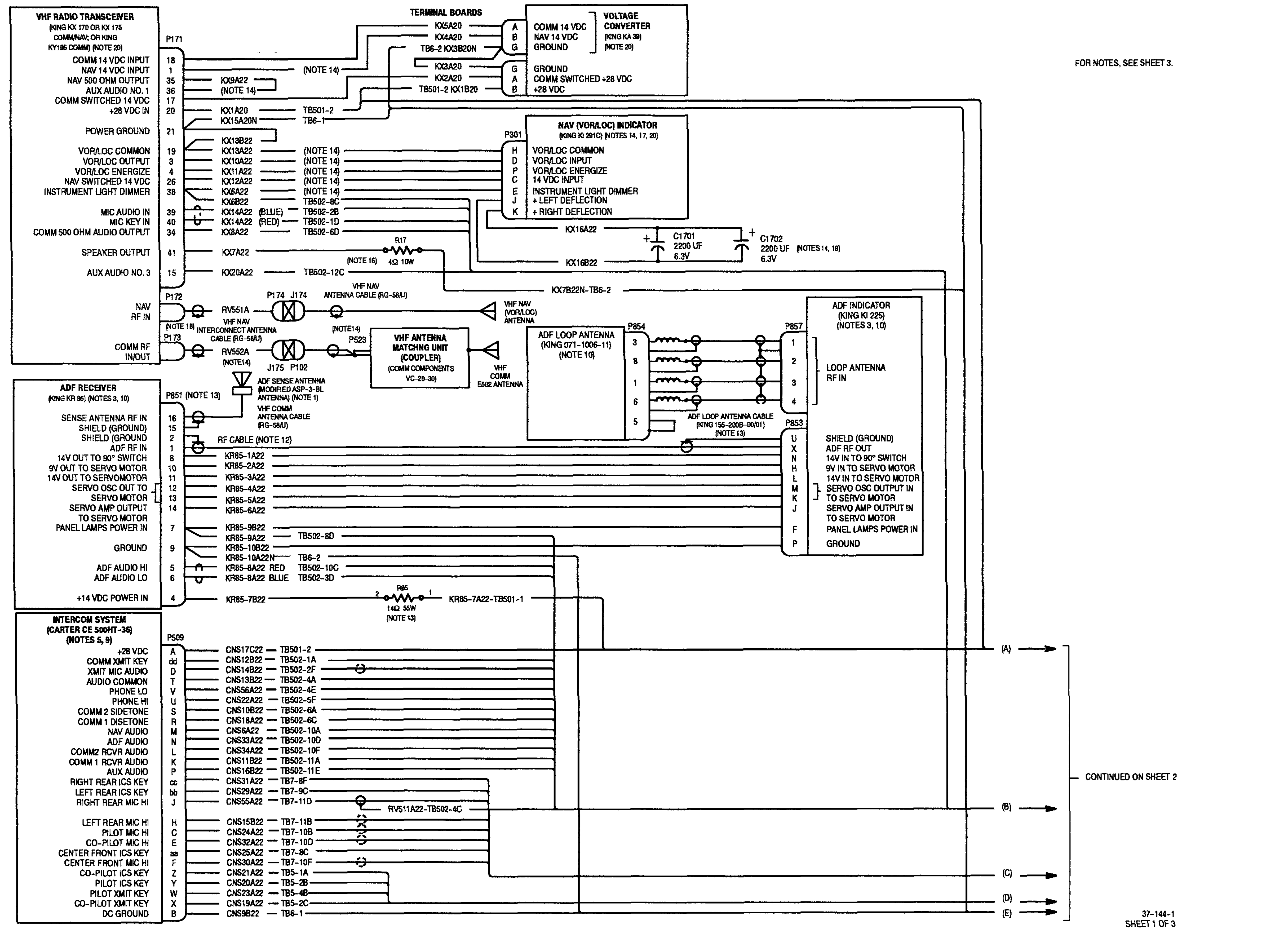


Figure 7–18. Avionics Installations Wiring Diagram (500HS Serial Numbers 0626 and later / 500HE Serial Numbers 0216 and later – With Instrument Panel Type B) (Sheet 1 of 3)

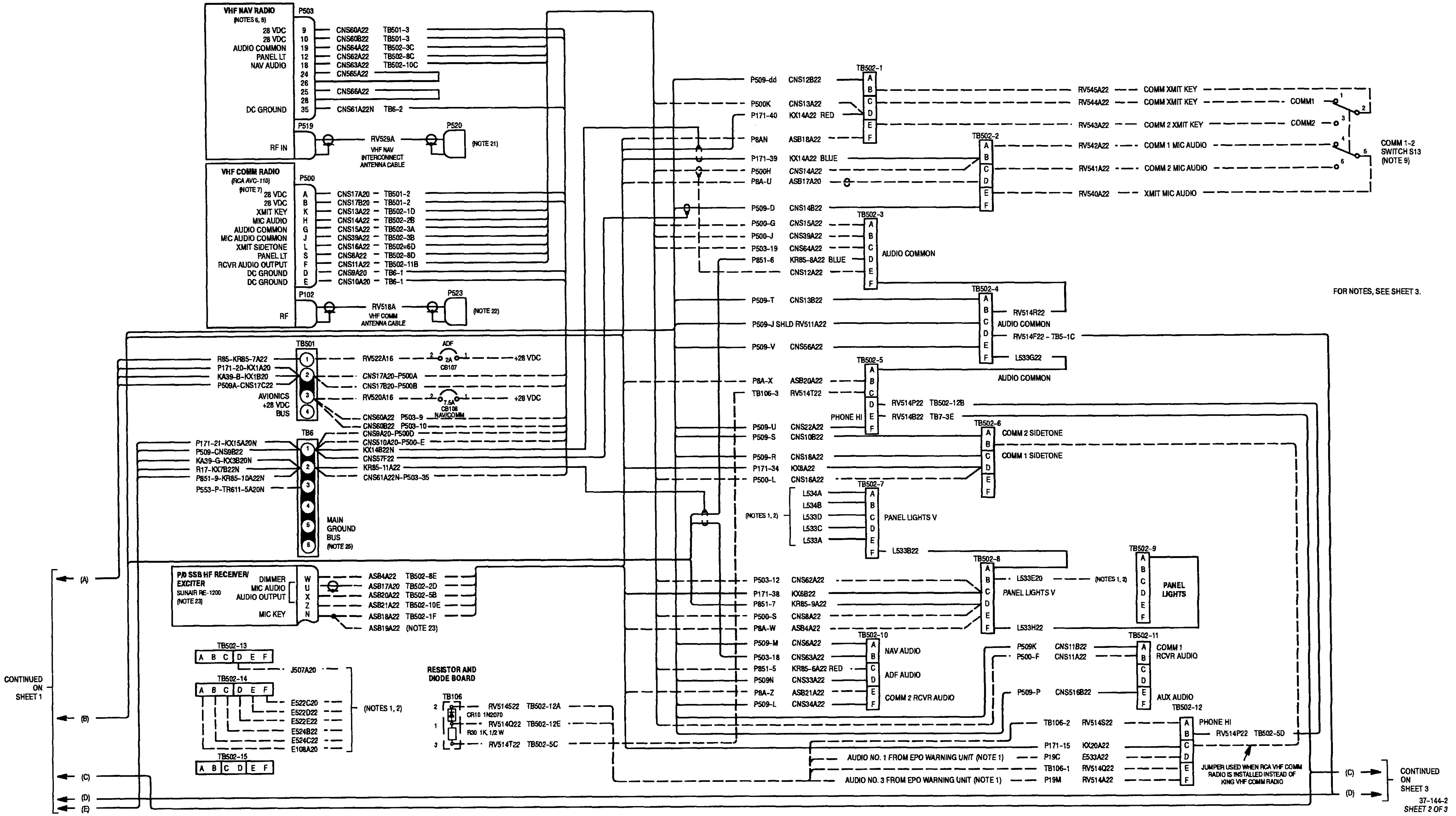


Figure 7–18. Avionics Installations Wiring Diagram (500HS Serial Numbers 0626 and later / 500HE Serial Numbers 0216 and later – With Instrument Panel Type B) (Sheet 2 of 3)

NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION. (FOR AVIONICS INFORMATION OTHER THAN INTERCONNECTION WITING INFORMATION, REFER TO HMI APPENDIX A.)
2. UNLESS SPECIFIED OTHERWISE, DASHED (- - - -) LINES INDICATE ITEM IS PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL MAINTENANCE OF MAJOR COMPONENTS, ANY INTERNAL ADJUSTMENTS REQUIRED AND FOR ANY REQUIRED ALIGNMENT INFORMATION AT REPLACEMENT OF UNIT.
4. TERMINAL BLOCK MODULES ARE INTERNALLY BUSED AS FOLLOWS:
   A B C D | A B C D | A B C D | A B C D E F | A B C D E F | A B C D E F
5. AT REPLACEMENT, CONTROLS ON NEW UNIT MAY REQUIRE ADJUSTMENT. (REFER TO HMI APPENDIX A.)
6. ADDITIONAL METER DAMPING FOR THIS UNIT MUST BE PROVIDED BY REPLACING INTERNAL CAPACITOR C441 WITH A 1000 MFD CAPACITOR (KEMET PART NO. T1400108K006AS OR EQUAL). (REFER TO MANUFACTURER'S PUBLICATION, TABLE 2-12, BASIC HMI).
7. PART OF RCA AVC-110 VHF COMM INSTALLATION.
8. PART OF RCA AVC-211 VHF NAV INSTALLATION.
9. USED WITH INTEGRATED INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT.
10. PART OF KING KR 85 ADF SYSTEM.
11. ASP-3-BL ANTENNA MANUFACTURED BY ANTENNA SPECIALISTS PRODUCTS.
12. DO NOT ALTER LENGTH.
13. PART OF KR 85 ADF WIRE HARNESS ASSEMBLY THAT ALSO INCLUDES WIRING ATTACHED TO AND BETWEEN CONNECTORS.
14. USED ONLY WITH KING KX 170 OR KX 175. WHEN KING KY195 IS INSTALLED, VHF NAV ANTENNA IS NOT INSTALLED AND VHF NAV ANTENNA CABLE AND CONNECTOR P301 ARE STOWED.
15. ALL WIRING, EXCEPT WIRE NO. P506AM16 AND ANTENNA CABLES, IS PART OF VHF COMM/NAV WIRING HARNESS ASSEMBLY.
16. TERMINATION IMPEDANCE USED IN PLACE OF SPEAKER.
17. AT INSTALLATION OR REPLACEMENT, REFER TO MANUFACTURER'S PUBLICATION FOR INFORMATION ON INTERNAL CALIBRATION. (SEE NOTE 3.)
18. VIEWING TRANSCEIVER FROM REAR, P172 IS ON RIGHT AND P173 ON LEFT.
19. LOCATED ON CONNECTOR P171 AT AFT END OF KX170.
20. PART OF KING KX 170 OR KX 175 VHF COMM/NAV INSTALLATION, OR KING KY 195 VHF COMM INSTALLATION.
21. CONNECTS TO VHF NAV ANTENNA CABLE AND ANTENNA, (SHOWN ELSEWHERE ON THIS FIGURE).
22. CONNECTS TO VHF ANTENNA MATCHING UNIT. (SHOWN ELSEWHERE ON THIS FIGURE).
23. PART OF SUNAIR ASB-125 HF COMM INSTALLATION. ONLY INTERCOM WIRING INTERCONNECTIONS SHOWN. (FOR OTHER WIRING INFORMATION ON SSB HF COMM INSTALLATION, SEE WIRING DIAGRAMS IN HMI APPENDIX A.)
24. WIRE END IS OPEN, INSULATED AND SECURED (STOWED) ON BASIC ELECTRICAL SYSTEM.
25. FOR INTERCONNECTION WIRING INFORMATION ON AN INSTALLATION NOT SHOWN, REFER TO SEPARATE FIGURE IN THIS OPTION.

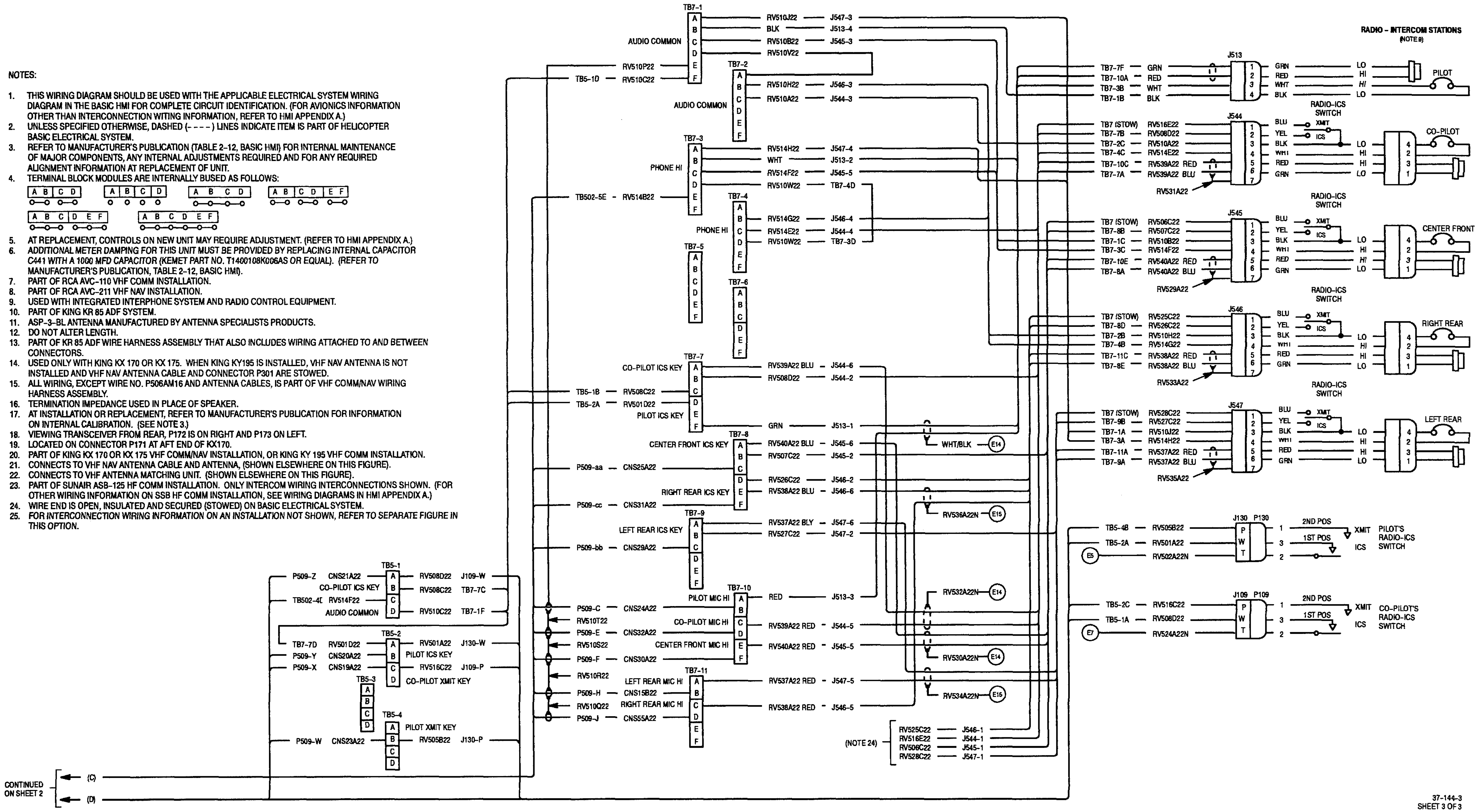


Figure 7–18. Avionics Installations Wiring Diagram (500HS Serial Numbers 0626 and later / 500HE Serial Numbers 0216 and later – With Instrument Panel Type B) (Sheet 3 of 3)

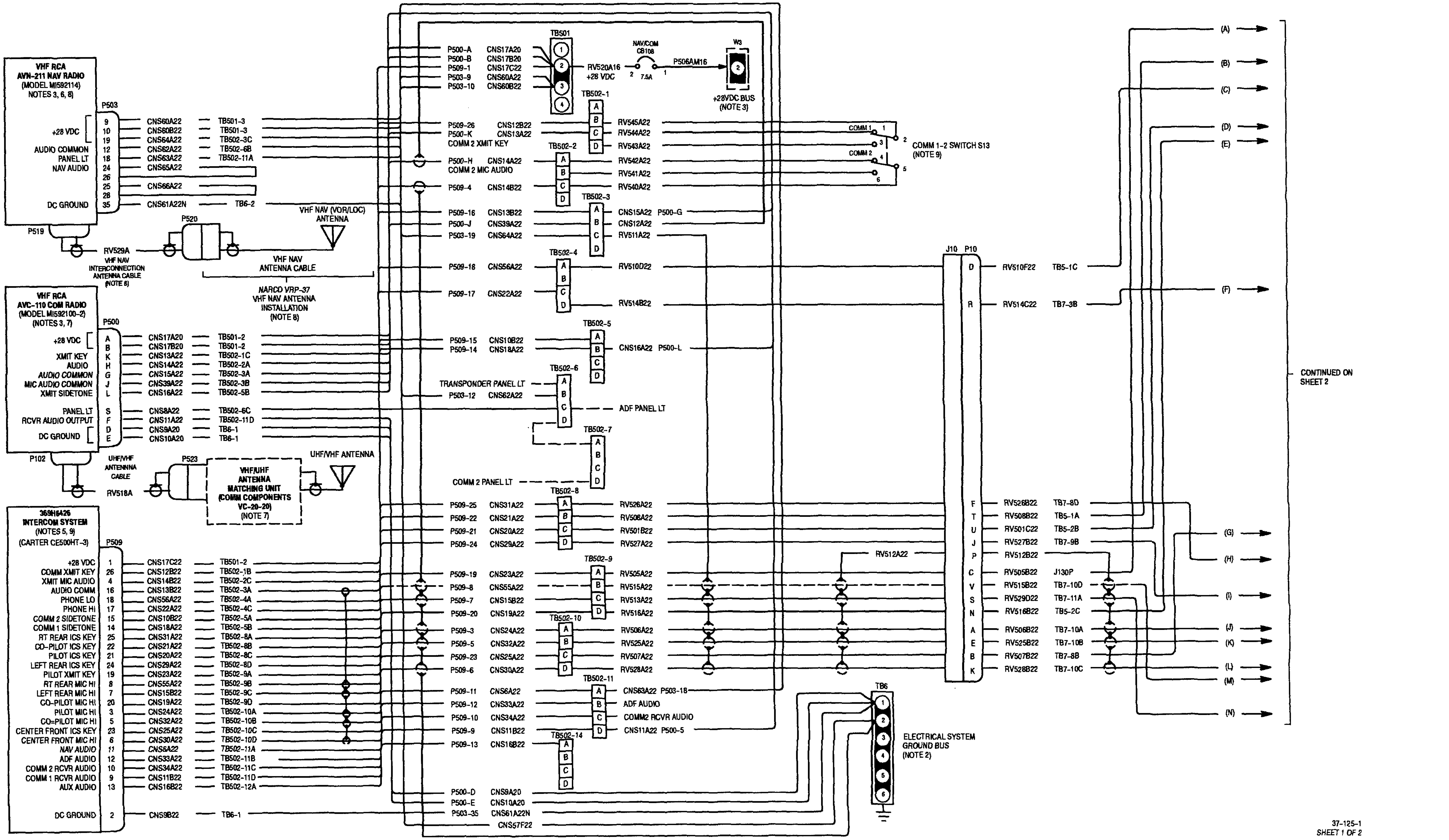
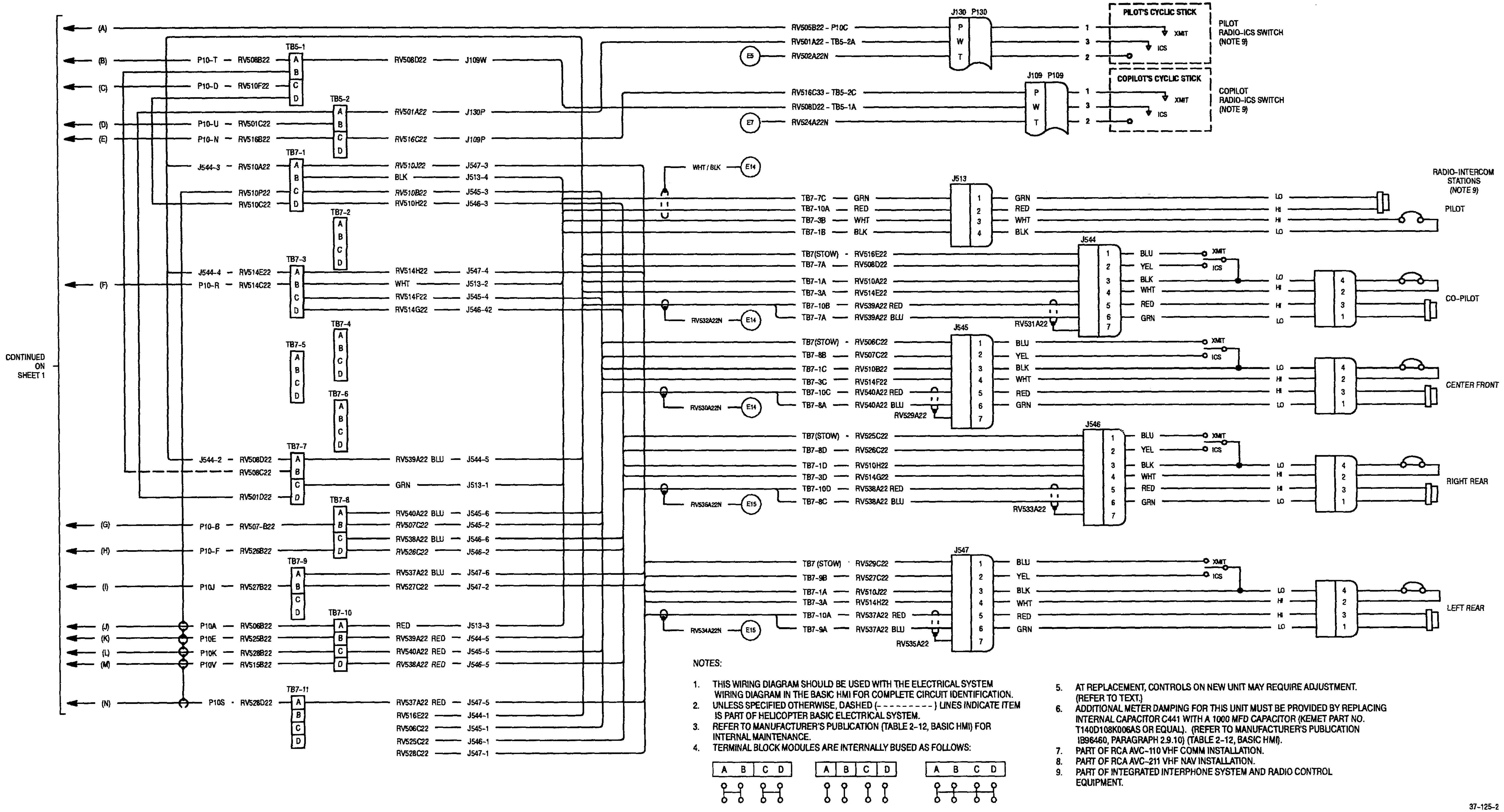


Figure 7–19. RCA AVC–110 VHF COMM, AVN–211 VHF NAV and Carter CE500HT–3 Interphone System Installations (Instrument Panel Type B) Wiring Diagram
(Sheet 1 of 2)

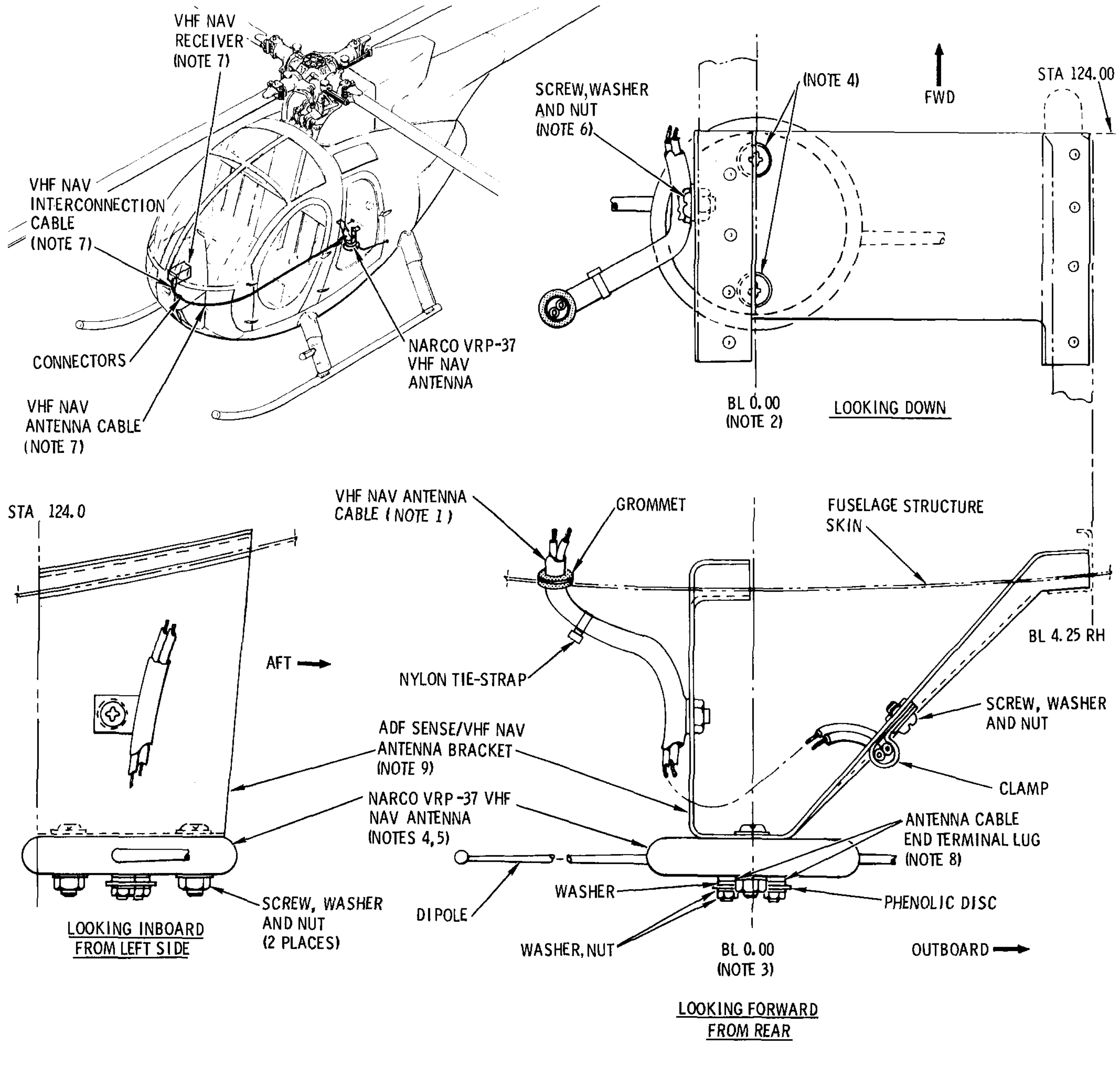


NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. UNLESS SPECIFIED OTHERWISE, DASHED (- - - - - - - - - -) LINES INDICATE ITEM IS PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL MAINTENANCE.
4. TERMINAL BLOCK MODULES ARE INTERNALLY BUSED AS FOLLOWS:
5. AT REPLACEMENT, CONTROLS ON NEW UNIT MAY REQUIRE ADJUSTMENT. (REFER TO TEXT.)
6. ADDITIONAL METER DAMPING FOR THIS UNIT MUST BE PROVIDED BY REPLACING INTERNAL CAPACITOR C441 WITH A 1000 MFD CAPACITOR (KEMET PART NO. T140D108K006AS OR EQUAL). (REFER TO MANUFACTURER'S PUBLICATION IB96460, PARAGRAPH 2.9.10) (TABLE 2-12, BASIC HMI).
7. PART OF RCA AVC-110 VHF COMM INSTALLATION.
8. PART OF RCA AVC-211 VHF NAV INSTALLATION.
9. PART OF INTEGRATED INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT.

37-125-2
SHEET 2 OF 2

Figure 7-19. RCA AVC-110 VHF COMM, AVN-211 VHF NAV and Carter CE500HT-3 Interphone System Installations (Instrument Panel Type B) Wiring Diagram (Sheet 2 of 2)



NOTES:

1. CONTAINS BUILT-IN BALUN AND IS SUPPLIED WITH AND AS PART OF VHF NAV ANTENNA.
2. HELICOPTER FORE-AND-AFT CENTERLINE.
3. HELICOPTER VERTICAL CENTERLINE.
4. AT ANTENNA REPLACEMENT, DRILL TWO 0.198 TO 0.204-IN.-DIAMETER HOLES THROUGH ANTENNA BASE AT LOCATIONS SHOWN.
5. AT INSTALLATION, POSITION DIPOLES TO SWEEP AFT. DO NOT PAINT ANTENNA.
6. STRUCTURAL ELECTRICAL BOND REQUIRED. (REFER TO SECTION 19, BASIC HMI.)
7. PART OF VHF NAV INSTALLATION.
8. CONNECT TERMINAL LUGS TO THREADED STUD TERMINAL ON ANTENNA BASE.
9. AN ADF SENSE ANTENNA MAY ALSO BE MOUNTED ON BRACKET. (SEE SEPARATE FIGURE IN THIS OPTION GROUP.)
10. ABBREVIATIONS: BL - BUTT LINE, STA - STATION, RH - RIGHT HAND.

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Figure 7-20. Narco VRP-37 vhf NAV antenna installation solid state device, is Vhf Omnidirectional Range and Localizer (VOR/LOC) radio receiver equipment that operates on any one of 100 available vhf channels in the frequency range of 108.00 to 117.90 MegaHertz (MHz) paired with 100 corresponding vhf omni and localizer channels in the same frequency range. The vhf NAV receiver receives rf signals from the vhf NAV antenna (para 7-142). Voice NAV signals from the receiver are routed to the integrated interphone system and radio control equipment (para 7-149) for amplification and distribution to headset earphones at all intercom stations. All switches and controls for operation and VOR/LOC navigation indicators are on the face of the unit. The unit requires an average of 0.19 ampere of current at 28 Vdc input power and approximately 0.75 ampere under self-test.

7-141. MAINTENANCE OF RCA AVN-211 VHF NAVIGATION RECEIVER. Remove and install the vhf NAV receiver in the same manner as the vhf COMM transceiver (para 7-135 and 7-136, respectively). After installation, perform an operation check of the vhf NAV installation and integrated interphone system and radio control equipment.

NOTE: At replacement of RCA AVN-211 vhf NAV receiver, an internal capacitor must be changed in the replacement receiver before installation in instrument console. (See note in fig. 7-19.)

7-142. NARCO VRP-37 VHF NAV ANTENNA INSTALLATION.

7-143. GENERAL. The Narco VRP-37 vhf NAV antenna installation consists of a Narco VRP-37 vhf navigation antenna secured externally to a mounting bracket with attaching and clamping hardware at the center lower underside of the fuselage structure (fig. 7-20). The vhf NAV antenna is secured to a sheet metal antenna bracket. Clips, clamps and other miscellaneous hardware furnish attachment for the vhf NAV antenna cable at various routing locations. The vhf NAV antenna installation receives vhf NAV radio signals for the RCA AVN-211 vhf navigation receiver of the RCA AVN-211 vhf navigation installation (para 7-138).

7-144. NARCO VRP-37 VHF NAVIGATION ANTENNA.

7-145. GENERAL. The Narco VRP-37 vhf navigation antenna (fig. 7-20) consists of two dipoles extending from a circular antenna base and an attached vhf NAV antenna cable. The dipoles extend outward horizontally and are swept aft from the base to a specific length for pickup of vhf NAV radio signals in the frequency range of 108.00 to 117.90 MegaHertz (MHz). Vhf NAV radio signals received by the antenna are routed through the vhf NAV antenna cable and a second short vhf NAV antenna interconnection cable to the RCA AVN-211 vhf navigation receiver (para 7-141) in the instrument panel. Two terminal lugs at the aft end of the vhf NAV antenna cable connect to threaded terminal studs on the antenna base. A coaxial connector at the forward end of the cable connects to a mating connector on the interconnection cable. The cable is formed of RG-58 coaxial cable and contains a built-in balun (impedance matching line balance converter).

7-146. REMOVAL OF NARCO VRP-37 VHF NAVIGATION ANTENNA. (See fig. 7-20.)

a. Check that all electrical power is OFF.

b. Remove two screws and washers securing protective phenolic disc cover to two threaded terminal studs at underside of the circular base on the vhf NAV antenna. Remove disc cover.

c. Disconnect the two end terminals of the vhf NAV antenna cable (fig. 7-19) from the two threaded terminal studs.

d. Loosen and remove the two nuts, washers and screws securing the antenna base to the vhf NAV antenna bracket. Remove the antenna.

7-147. INSTALLATION OF NARCO VRP-37 VHF NAVIGATION ANTENNA. (See fig. 7-20.) Install the vhf navigation antenna in reverse order of removal (para 7-146). If the antenna is being replaced, before installation perform the following.

NOTE: At installation, make sure that a good structural electrical bond (ground) exists between components at all locations indicated on figure 7-20. (Refer to Section 19, Basic HMI.) Antenna base and dipoles are not to be painted. If the vhf NAV antenna is to be replaced in the helicopter, the manufacturer's antenna cable must be used. The cable contains a built-in balun and cannot be directly replaced with a length of coaxial cable.

a. If connected, disconnect the two end terminals of the antenna cable supplied with the replacement antenna from the threaded terminal studs of the circular antenna base. The antenna cable supplied with the antenna is not used unless the equivalent cable in the helicopter requires replacement.

b. Drill two 0.198- to 0.204-inch diameter mounting holes through the circular antenna base at locations shown in figure 7-20. Locations can be determined with the antenna base held in mounting position against the vhf NAV antenna bracket and antenna dipoles positioned to sweep aft.

7-148. CARTER CE500HT-3( ) INTEGRATED INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT (INSTRUMENT PANEL TYPE B).

7-149. GENERAL. The Carter CE500HT-3 interphone system and radio control equipment provides selection and control of intercom or vhf radio operation and permits monitoring received audio signals from any installed vhf COMM 1 and COMM 2 radio installations (para 7-132), vhf NAV installation (para 7-138) and automatic direction finding (ADF) radio equipment. The interphone system also contains provisions for an auxiliary audio input for use with any other optional audio source. The interphone system functions with or without radio equipment installed. The equipment provides two-way interphone communications between the pilot and all passengers at the intercom stations and permits personnel at all stations to monitor received radio signals. In addition, the pilot's and copilot's radio/intercom stations may select and use radio transmission for a vhf COMM 1 radio and/or a vhf COMM 2 radio (if installed). Individual radio/intercom stations are provided for the pilot and copilot in the pilot's compartment, and one intercom station is furnished for each of the two passengers in the passenger compartment and the passenger in the pilot's compartment. A headset switch and jack assembly, containing a radio-interphone (RADIO-ICS) switch, is used at each station, except the pilot's position where a RADIO-ICS switch on the cyclic stick is used for selection of operation desired. The headset jack, RADIO-ICS switches, and headset switch and jack assemblies are as described in paragraphs 7-30 through 7-37, except the RADIO-ICS switch on the assembly selects only ICS operation at the ICS switch position for the front center and two rear intercom stations. The XMIT position on the RADIO-ICS switch at the pilot's and copilot's radio intercom stations selects vhf radio transmit operation. A Carter CE500HT-3( ) integrated interphone system control unit (para 7-151) contains microphone filtering, audio amplification, switching and control circuits and interconnects the headset-jacks, switches and associated avionics equipment. Five Carter CEH157-H-V headset-microphones (para 7-37) are used with the interphone system. A COMM 1-COMM 2 switch is provided for selection of vhf COMM 1 or COMM 2 radio equipment (if installed) operation (para 7-132). Wire harness assemblies interconnect the interphone system components. A 7.5-ampere NAV/COM circuit breaker CB108 protects the interphone system and vhf radio equipment from circuit overloads. A schematic diagram of the interphone and associated radio control circuits for a typical (pilot's) intercom station on a current helicopter is shown in figure 7-21, and in figure 7-22 for an early helicopter.

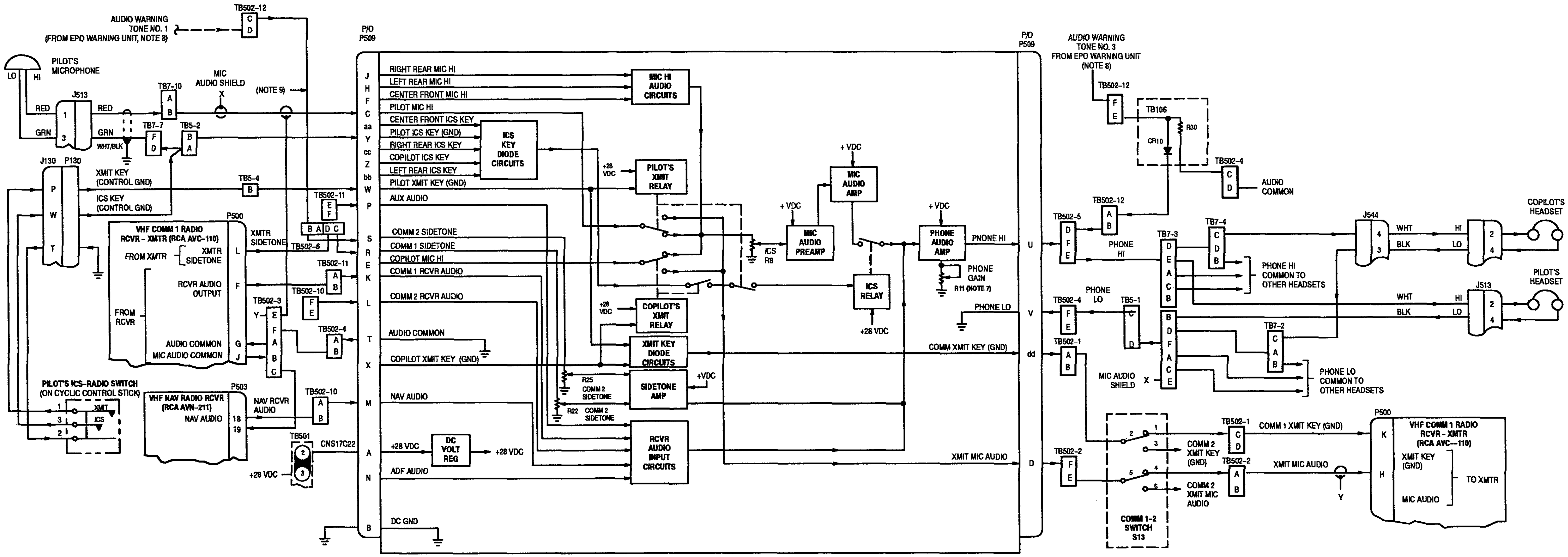
NOTE: Interconnection wiring for the equipment is shown in figure 7-18 for a current helicopter, and in figure 7-19 for an early helicopter. Hughes Notice HN-63 provides instructions for optional modification of early N_1/N_R EPO system (Group 2) to eliminate possibility of interference between radio/ICS system and EPO warning signals during engine out or low rotor rpm condition.

7-150. CARTER CE500HT-3( ) INTEGRATED INTERPHONE SYSTEM CONTROL UNIT (INSTRUMENT PANEL TYPE B).

7-151. GENERAL. The integrated interphone system control unit is a solid state device containing audio filtering, amplification, switching, radio transmitter keying and control circuits. The system control unit is the common interconnection and master control unit for all intercom audio and radio keying, control and audio circuits. It is installed in the lower right forward area of the instrument console (fig. 7-23). A removable cover on the unit provides access to internal components on circuit boards. An external ICS audio level control permits adjustment of microphone audio level in headset earphones. External COMM 1 and COMM 2 sidetone level controls are used to set audio sidetone levels for headset earphones when vhf COMM radio(s) are installed. On an early unit, an internal phone gain adjustment control may be incorporated to set phone audio level for received audio signals from radio receivers. Microphone audio is amplified by the unit for intercom operation or switched directly to the associated vhf radio without amplification for radio transmission. The unit amplifies sidetone audio from vhf COMM 1 or COMM 2 radio equipment for application to headphones during vhf radio transmission. The following information describes interphone system control unit operation.

NOTE: The CE500HT-3 is an early unit; CE500HT-3G is a later unit. Electrical connectors physically differ on the two units and also internal circuit differences exist. Transistor circuits are used in the CE500HT-3G for the microphone preamplifier, microphone amplifier and sidetone amplifier, instead of integrated circuits (IC) used in the CE500HT-3. Although the units are electrically interchangeable, they are not directly interchangeable due to the connector differences. Unless otherwise indicated, information in following paragraphs apply to both units. Immediately following descriptions of internal circuits specifically apply to the CE500HT-3; however, both units function similarly.

a. Control Unit Circuits. A block diagram of the integrated system control unit is shown in figure 7-22. Figure 7-24 provides an internal



NOTES:

1. COMPLETE INTERCOM CIRCUITS SHOWN ONLY FOR ONE TYPICAL STATION (PILOT'S).
2. SOLID ARROWHEADS (—▸) INDICATE SIGNAL PATH ONLY.
3. THIS DIAGRAM SHOULD BE USED WITH APPLICABLE AVIONICS INTERCONNECTION WIRING DIAGRAM IN THIS OPTION GROUP FOR REMAINING INTERCOM STATION CIRCUITS.
4. REFERENCE DESIGNATORS MAY NOT BE ON COMPONENTS.
5. SOLID TERMINAL BLOCKS WITH MULTIPLE LETTERS INDICATE ALL CONNECTIONS ARE COMMON ON THAT BLOCK.
6. BLOCK DIAGRAM SHOWN IS FOR CE500HT-3, WHICH HAS INTERNAL DIFFERENCES FROM BUT FUNCTIONS SIMILARLY TO CE500HT-3G. CONNECTOR J509 OF CE500HT-3 DIFFERS FROM THAT SHOWN. (FOR CE500HT-3 SEE SEPARATE FIGURE FOR SCHEMATIC DIAGRAM OF CIRCUITS IN BLOCKS AND REFER TO TEXT.)
7. INTERNAL ADJUSTMENT CONTROL.
8. FROM N1 / NR EPO WARNING EQUIPMENT (SECTION 17, BASIC HMI).
9. THIS CIRCUIT CONNECTION (TB JUMPER WIRE) USED ONLY WITH RCA VHF COMM (OR COMM/NAV) RADIO EQUIPMENT.

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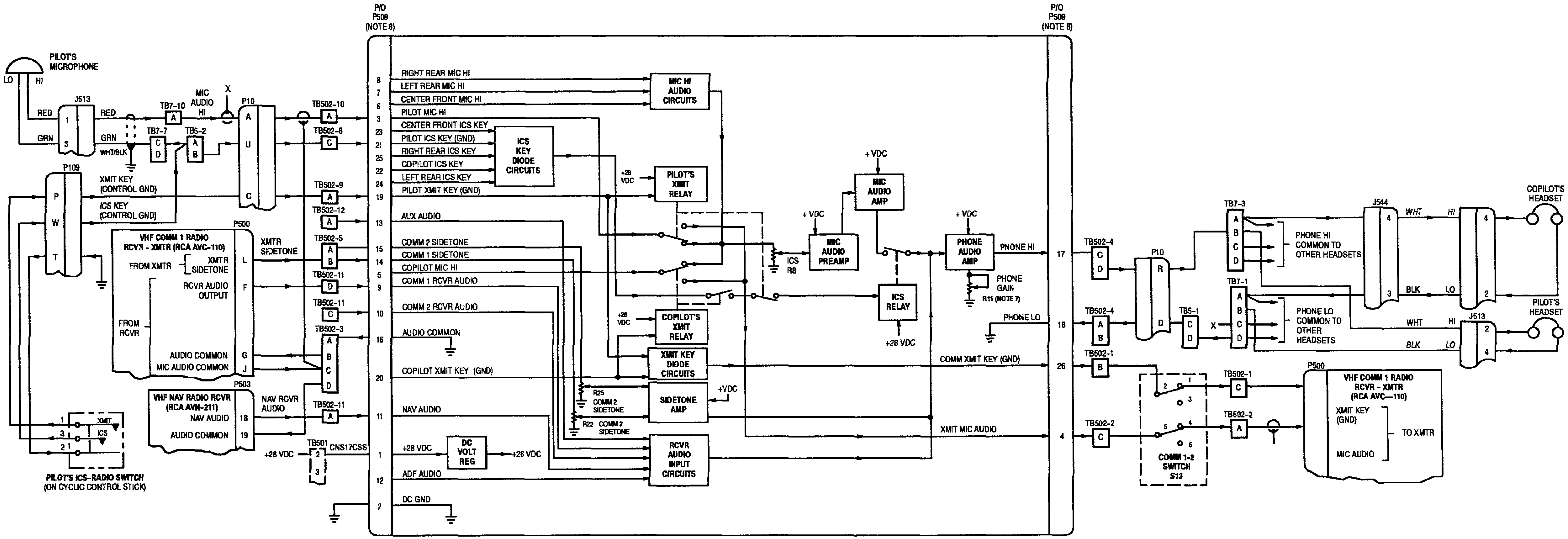
Figure 7–21. Carter CE500HT–3G Intergrated Interphone System and RCA COMM/NAV Control Circuit (Typical Station) – Instrument Panel Type B (Current Configuration)



NOTES:

1. COMPLETE INTERCOM CIRCUITS SHOWN ONLY FOR ONE TYPICAL STATION (PILOT'S).
2. SOLID ARROWHEADS (➝) INDICATE SIGNAL PATH ONLY.
3. THIS DIAGRAM SHOULD BE USED WITH APPLICABLE AVIONICS INTERCONNECTION WIRING DIAGRAM IN THIS OPTION GROUP FOR REMAINING INTERCOM STATION CIRCUITS.
4. REFERENCE DESIGNATORS MAY NOT BE ON COMPONENTS.
5. SOLID TERMINAL BLOCKS WITH MULTIPLE LETTERS INDICATE ALL CONNECTIONS ARE COMMON ON THAT BLOCK.
6. BLOCK DIAGRAM SHOWN IS FOR CE500HT-3. CONNECTOR J509 OF CE500HT-3G DIFFERS FROM THAT SHOWN. (SEE NOTE 8.) ALSO, INTERNAL CIRCUITS OF CE500HT-3G DIFFER. (SEE SEPARATE FIGURE FOR SCHEMATIC DIAGRAM OF CIRCUITS IN BLOCKS AND REFER TO TEXT.)
7. INTERNAL ADJUSTMENT CONTROL.
8. LETTERS AND NUMBERS DIFFER FOR PINS OF CONNECTORS J509 OF CE500HT-3G AND CE500HT-3. LETTERS SHOWN APPLY FOR CE500HT-3. EQUIVALENT PIN NUMBERS FOR J509 OF CE500HT-3G ARE AS FOLLOWS:

CE500HT-3G	CE500HT-3	CE500HT-3G	CE500HT-3	CE500HT-3G	CE500HT-3
A	1	L	10	W	19
B	2	M	11	X	20
C	3	N	12	Y	21
D	4	P	13	Z	22
E	5	R	14	aa	23
F	6	S	15	bb	24
H	7	T	16	cc	25
J	8	U	17	dd	26
K	9	V	18		

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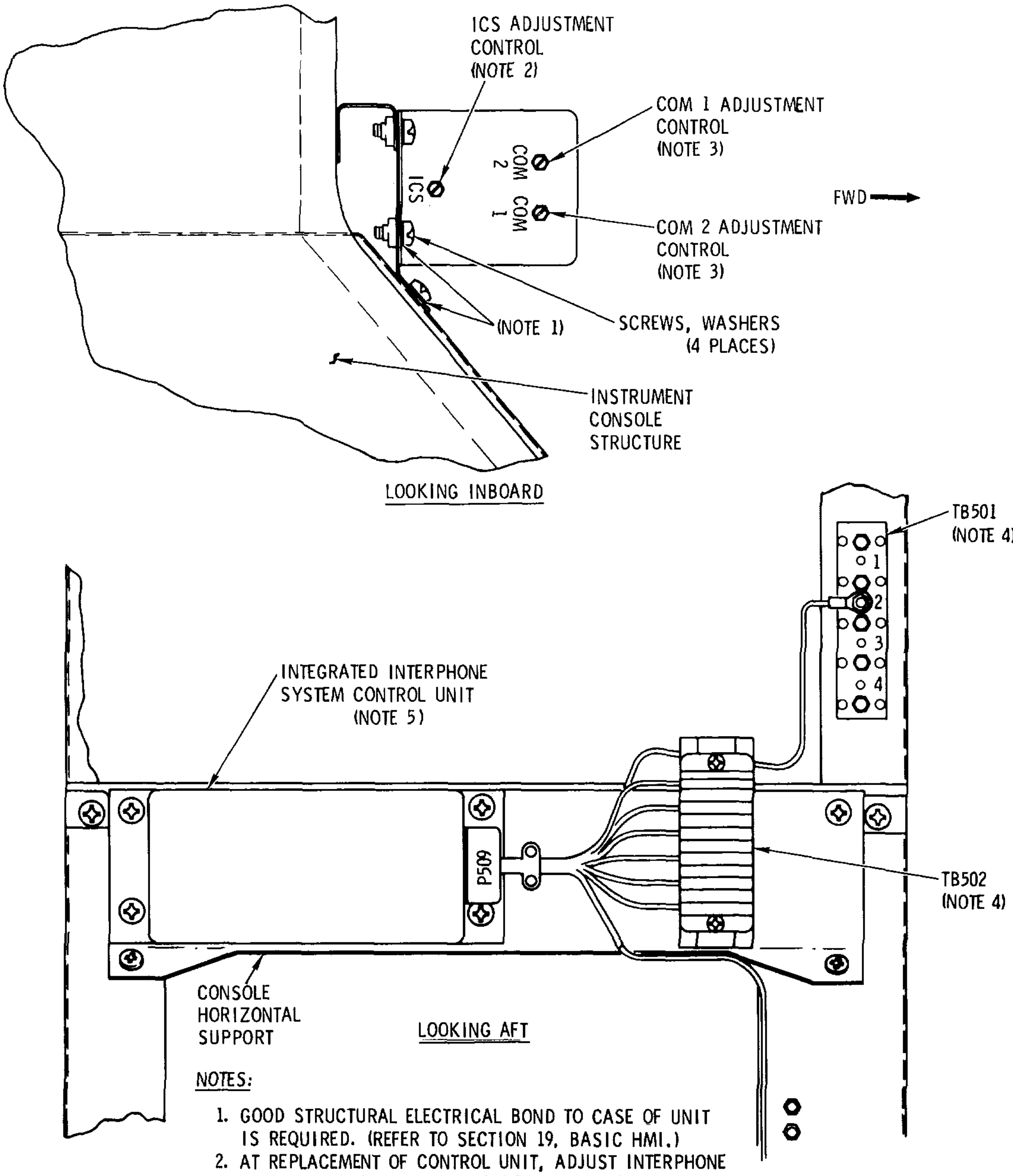
Figure 7–22. Carter CE500HT-3( ) Intergrated Interphone System and RCA COMM/NAV Control Circuit (Typical Station) – Instrument Panel Type B (Early Configuration)



NOTES:

1. GOOD STRUCTURAL ELECTRICAL BOND TO CASE OF UNIT IS REQUIRED. (REFER TO SECTION 19, BASIC HMI.)
2. AT REPLACEMENT OF CONTROL UNIT, ADJUST INTERPHONE MICROPHONE AUDIO LEVEL. (REFER TO TEXT.)
3. AT REPLACEMENT OF CONTROL UNIT, ADJUST SIDETONE AUDIO LEVEL FOR ASSOCIATED VHF COMM RADIO. (REFER TO TEXT.)
4. PART OF HELICOPTER BASIC ELECTRICAL SYSTEM. (SECTION 19, BASIC HMI.)
5. CONNECTORS ON EARLY AND LATE UNITS PHYSICALLY DIFFER. AT REPLACEMENT, USE UNIT WITH SAME TYPE CONNECTOR. EARLY UNIT MAY HAVE INTERNAL PHONE LEVEL CONTROL THAT REQUIRES ADJUSTMENT. (REFER TO TEXT.)

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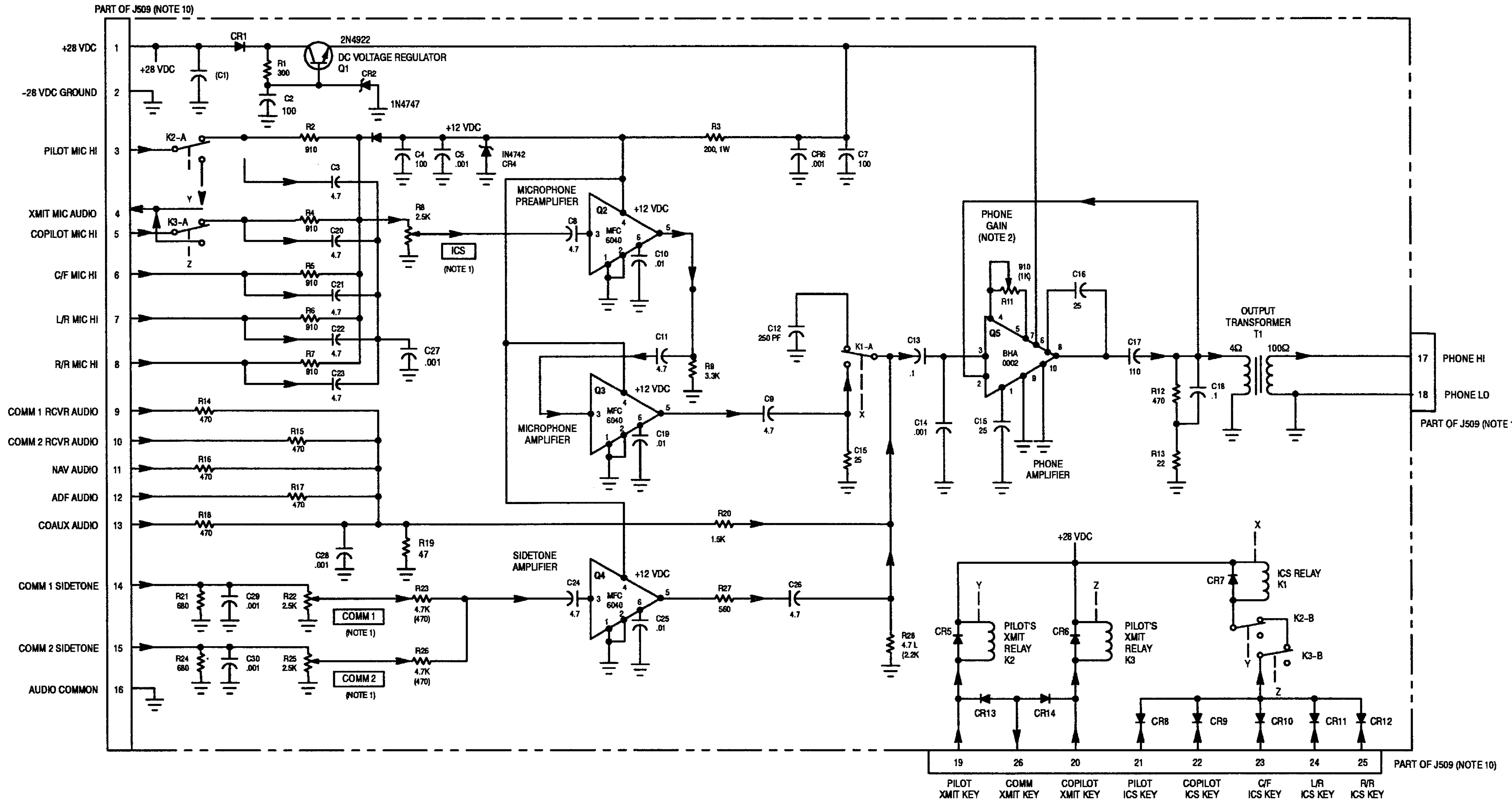
Figure 7-23. Installation of Carter CE500HT-3( ) integrated interphone system control unit (instrument panel type B)



NOTES:

1. EXTERNAL ADJUSTMENT CONTROL.
2. INTRNAL ADJUSTMENT CONTROL – EARLY TYPE ONLY. (ACCESSIBLE ONLY AT REMOVAL OF COVER.) R11 IS FIXED, 910–OHM RESISTOR ON CURRENT TYPE.
3. ARROWHEAD (⟶) INDICATES AUDIO OR CONTROL SIGNAL FLOW PATH.
4. XMIT AND ICS KEY CONTROL INPUTS ARE –28 VDC GROUNDS.
5. REFERENCE DESIGNATORS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
6. UNLESS OTHERWISE INDICATED, CAPACITATIVE VALUES IN MICROFARADS AND RESISTANCE VALUES IN OHMS.
7. UNLESS OTHERWISE INDICATED, ALL DIODES ARE1N4002.
8. ABBREVIATIONS USED TO INDICATE INTERCOM STATION LOCATIONS AS FOLLOWS:
   C/F – CENTER FRONT
   L/R – LEFT REAR
   R/R – RIGHT REAR
9. EXCEPT FOR NOTES, ALL ITEMS OR VALUES IN PARENTHESES APPLY ONLY TO EARLY TYPE.
10. DIAGRAM SHOWN IS FOR CE500HT–3. INTERNAL CIRCUITS AND CONNECTOR J509 FOR CE500HT–3G DIFFER. (REFER TO TEXT.) EQUIVALENT PIN NUMBERS OF J509 FOR CE500–3G ARE AS FOLLOWS:

CE500HT–3G	CE500HT–3	CE500HT–3G	CE500HT–3	CE500HT–3G	CE500HT–3
A	1	L	10	W	19
B	2	M	11	X	20
C	3	N	12	Y	21
D	4	P	13	Z	22
E	5	R	14	aa	23
F	6	S	15	bb	24
H	7	T	16	cc	25
J	8	U	17	dd	26
K	9	V	18		

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Figure 7–24. Carter CE500HT–3( ) Intergrated Interphone System Control Unit (Instrument Panel Type B) – Schematic Diagram

schematic diagram of the unit. Microphone audio circuits in the unit are used for both ICS operation and vhf COMM radio transmission. Microphone audio amplification circuits amplify microphone audio only for ICS operation. ICS keying circuits control routing of amplified microphone audio signals for intercom use. Transmit keying circuits control routing of microphone audio for radio transmission. Sidetone audio amplification circuits amplify radio transmitter sidetone audio signals during vhf radio transmission. A phone audio amplifier amplifies receiver audio signals during radio reception, microphone audio during interphone operation and sidetone audio at radio transmission. An internal dc voltage regulator regulates dc voltage for external microphones and amplifier circuits in the unit. The following information briefly describes operation of the circuits.

b. Microphone Audio Circuits. During ICS operation, microphone audio signals from an intercom station are applied through resistance-capacitance (RC), input impedance matching, voltage dropping and coupling components and the ICS microphone audio level control R8 to the input of the microphone preamplifier. When the pilot's or copilot's station is used, the signals also pass through normally closed contacts of the pilot's or copilot's transmit relay, as applicable. The ICS control adjusts the level of microphone audio signal applied to the microphone audio preamplifier and controls microphone amplifier audio output signal level. The preamplifier and series-connected microphone amplifier amplify the microphone audio signal for application to the phone audio amplifier. When the ICS keying circuit (c below) operates, ICS relay K1 energizes to close contacts K1-A and apply the amplified microphone audio signals to the phone audio amplifier (h below). The phone amplifier further amplifies the microphone audio signals which are then routed to the common phone hi audio line for distribution to headset earphones of the headset-microphones at all intercom stations. During radio transmission, the pilot's (or copilot's) microphone audio signal is routed through contacts of the energized pilot's (or copilot's) transmit relay to the transmitter of the vhf COMM radio transceiver, instead of the microphone preamplifier. (Refer to e below.) During radio transmission, pilot's (or copilot's) microphone audio signals are not amplified prior to application to the radio transmitter. Microphones are supplied operating voltage through diode CR3 and series-connected and voltage-dropping 910 ohm resistors from the cathode of zener diode CR4.

c. ICS Keying Circuits. When a RADIO-ICS switch (para 7-35) at one of the intercom stations is depressed to the ICS position, an ICS keying control signal (ground) is applied through a diode, and series-connected and closed contacts K2-B and K3-B of pilot's and copilot's transmit relays, to the ICS relay K1. This energizes ICS relay K1, closes K1-A contacts and applies amplified microphone audio signals from the output of the microphone amplifier to the input of the phone audio amplifier (b above). Diode CR7 across ICS relay K1 ensure correct activation of the relay.

d. Receiver Audio Circuits. Received audio signals from associated receivers (if installed) are routed through impedance matching and terminating resistors to the input of the phone audio amplifier for amplification and distribution to headsets at intercom station (h below). When received, the receiver audio signals are amplified by the phone amplifier and routed to the headsets at all intercom stations during both ICS operation and radio transmission.

e. Transmit Keying Circuits. When the pilot's (or copilot's) RADIO-ICS switch (para 7-35) is depressed to the XMIT position, a transmit keying control signal (ground) is applied to the pilot's transmit relay K2 (or copilot's transmit relay K3, as applicable). Relay K2 (or K3) energizes, contacts K2-B (or K3-B) open and the path for the ICS keying ground is opened, disabling the ICS keying circuits (c above). The transmit keying ground is also simultaneously applied through diode CR13 (or CR14) to the transmitter of the vhf COMM radio transceiver to actuate radio transmission. When the transmit relay energizes, radio transmit audio circuits are also enabled (f below). Diodes CR5 and CR6 across transmit relays K2 and K3 ensure correct operation of the relays.

f. Radio Transmit Audio Circuits. When radio transmit keying circuits are actuated the pilot's transmit relay K2 (or copilot's transmit relay K3) is energized (e above). When the relay energizes, relay K2 (or K3) also closes contacts K2-A (or K3-A) that switch the associated microphone audio signal from the input of the microphone preamplifier and route it to the vhf COMM radio transceiver for radio transmission. Microphone audio signals are not amplified prior to application to the radio transmitter.

g. Sidetone Audio Circuits. During radio transmission, sidetone audio signals from the transmitter of the vhf COMM transceiver (para 7-134) are applied through an impedance matching resistor, a COMM 1 sidetone level adjustment control and coupling components to the sidetone amplifier. The COMM 1 control R22 adjusts the level of the sidetone audio signal applied to the input of the sidetone amplifier. After amplification by the sidetone amplifier, the amplified sidetone signal is further amplified by the phone amplifier and applied to the phone hi line for distribution to headsets at all intercom stations (h below). A second identical sidetone input circuit, except with a COMM 2 control R25, is furnished that operates in the same manner for a second vhf COMM radio (if installed).

h. Phone Radio Amplifier. The phone audio amplifier amplifies all received receiver audio signals and radio transmit sidetone signals. In addition, the phone audio amplifier further amplifies microphone audio signals between intercom stations during interphone operation. On an early configuration unit, an internal adjustable phone gain control R11 may be incorporated to set amplification to the desired level. If incorporated, the control directly adjusts the phone audio level for received radio receiver signals. And the control indirectly controls the phone audio level for amplified microphone and sidetone audio signals. On the current configuration, R11 is a fixed, 910-ohm, nonadjustable resistor. The amplified audio output signal from the phone amplifier is coupled through output transformer T1 to the phone hi audio line for distribution to the earphones in headsets at all intercom stations.

i. DC Voltage Regulator Circuits. Transistor Q1 functions as a dc voltage regulator to maintain a constant dc voltage source for external microphones and all amplifier circuits in the unit. Zener diode CR2 maintains a steady dc bias voltage for the base of transistor Q1. Internal resistance of and current conduction through Q1 varies with amplifier circuits dc loads to maintain a stable dc voltage at the emitter of Q1. Zener diode CR4 assists in maintaining a steady dc supply voltage for the microphone audio preamplifier, audio amplifier and microphones. Pilot's and copilot's transmit relays K2 and K3 and ICS relay K1 operate directly from +28 Vdc, independent of the voltage regulator.

7-152. ADJUSTMENT OF INTERCOM MICROPHONE AUDIO LEVEL (INTEGRATED INTERPHONE SYSTEM).

NOTE: The ICS control R8 adjusts the level of interphone microphone audio signals, before amplification by the microphone amplifier in the control unit, to control headset phone volume during interphone operation. The ICS control does not affect the level of received audio signals from any installed radio equipment.

a. Gain access to the ICS control, located on the right end of the Carter CE500HT-3 integrated intercom system control unit, by removing the instrument panel right side fairing (Section 2, Basic HMI).

NOTE: If incorporated, the phone gain control (para 7-151) setting also affects interphone microphone and vhf COMM sidetone audio volume in addition to setting headset phone audio volume. Therefore, the phone gain setting must be correct or it may be impossible to obtain correct setting of ICS control.

b. If the interphone unit contains an internal phone gain control (para 7-151), make sure that the phone gain control is properly adjusted for correct headset phone audio volume (para 7-154).

c. Connect headset-microphones at all radio/intercom stations.

d. Energize the interphone system with the NAV/COM circuit breaker.

e. Adjust the ICS control until the desired headset earphone volume is obtained in the headsets while operating the intercom and speaking into a microphone.

NOTE: If sufficient intercom microphone audio volume cannot be obtained in headset earphones by adjustment of the ICS control, readjustment of the phone gain control may be required (para 7-154).

f. Reinstall the instrument panel right side fairing (Section 2, Basic HMI).

7-153. ADJUSTMENT OF VHF COMM RECEIVER-TRANSMITTER SIDETONE LEVEL (INTEGRATED INTERPHONE SYSTEM).

NOTE: The COMM 1 and 2 sidetone controls R22 and R25 adjust the level of sidetone audio from vhf COMM radio No. 1 and 2 (respectively), that is applied to headset earphones during vhf COMM radio transmission. COMM 1 and 2 sidetone controls do not affect the level of microphone audio or of any received audio signals from any installed radio equipment.

a. Gain access to the COMM 1 (or COMM 2) control as applicable, located on the right end of the Carter CE500HT-3 integrated intercom system control unit, by removing the instrument panel right side fairing (Section 2, Basic HMI).

NOTE: If incorporated, the phone gain control (para 7-151) setting also affects interphone microphone and vhf COMM sidetone audio volume in addition to setting headset phone audio volume. Therefore, the phone gain control setting must be correct or it may be impossible to obtain correct setting of COMM 1 or 2 sidetone controls.

b. Make sure that any incorporated internal phone gain control in the interphone control unit is properly adjusted for correct headset phone audio volume (para 7-154).

c. Connect headset-microphones at all radio/intercom stations.

d. Energize the intercom system and vhf COMM radio(s) with the NAV/COM circuit breaker.

e. While transmitting with vhf COMM radio No. 1 or 2, adjust COMM 1 or 2 control as applicable for desired sidetone audio volume in headset earphones.

NOTE: If sufficient sidetone audio volume cannot be obtained in headset earphones by adjustment of COMM 1 and 2 controls, readjustment of phone gain control may be required (para 7-154).

f. Reinstall the instrument panel right side fairing (Section 2, Basic HMI).

7-154. ADJUSTMENT OF INTERCOM PHONE AUDIO LEVEL (INTEGRATED INTERPHONE SYSTEM - EARLY TYPE INTERPHONE CONTROL UNIT).

NOTE: The following information and procedures apply only to an early type interphone control unit with an internal phone gain control (para 7-151). The phone gain control (fig. 7-24) is used for adjusting the level of the amplified microphone audio. This control is also used to adjust the audio level of signals from any installed radios and COMM 1 and COMM 2 sidetone audio after amplification by the sidetone amplifier. Therefore, the ICS, COMM 1 and COMM 2 controls may require readjustment (para 7-152 and 7-153, respectively) after adjustment of the phone gain control.

a. Gain access to the phone gain control inside the system control unit (fig. 7-23) by removing the instrument panel side fairings (Section 2, Basic HMI) and removing cover from system control unit.
b. Connect a headset-microphone at any radio/intercom station.
c. Energize the integrated interphone system with the NAV/COM circuit breaker.
d. Loosen any locking nut on the phone gain control in the system control unit.
e. Adjust the phone gain control until the desired earphone audio volume is obtained in the headset while receiving a radio signal with the vhf COMM transceiver. Also check that earphone audio level is correctly adjusted for all other radio communication equipment that may be installed.
f. Tighten any locking ring on the phone gain control making sure the adjustment is not changed.
g. Reinstall cover on system control unit.
h. Recheck and readjust intercom audio level as necessary (para 7-152).
i. Recheck and readjust vhf COMM receiver-transmitter sidetone level as necessary (para 7-153).
j. Reinstall the instrument panel side fairings (Section 2, Basic HMI).

7-155. REMOVAL OF CARTER CE500HT-3( ) INTEGRATED INTERPHONE SYSTEM CONTROL UNIT. (See fig. 7-23.)

NOTE: If the control unit is not to be replaced, do not disturb the setting of external ICS audio level and COMM 1 and COMM 2 sidetone level controls on the side of the unit when removing the system control unit.

a. Check that all electrical power is OFF.
b. Gain access to the system control unit by removing the instrument panel side fairings (Section 2, Basic HMI).
c. Disconnect plug P509 from connector of the system control unit.
d. Remove the four screws and washers that secure the system control unit to the instrument panel structure; lift out the control unit.

7-156. TESTING OF CARTER CE500HT-3( ) INTEGRATED INTERPHONE SYSTEM CONTROL UNIT.

NOTE: For letter or number of connector pins to be used, see figure with schematic diagram of integration interphone control unit.

a. Connect a 100-ohm ±5 percent, 2-watt resistor between PHONE HI and LO pins of connector J509 on the unit.
b. Apply 28 ±0.5 Vdc to +28 Vdc and -28 Vdc (GROUND) pins of connector J509; comply with polarity requirements.
c. Connect an ac voltmeter between PHONE HI and LO pins of connector J509.
d. Test the unit as indicated in table 7-2.

7-157. INSTALLATION OF CARTER CE500HT-3( ) INTEGRATED INTERPHONE SYSTEM CONTROL UNIT. (See fig. 7-23.)

NOTE: When reinstalling the same unit, do not disturb setting of the external ICS audio level and COMM 1 and COMM 2 sidetone level controls on side of the unit, unless necessary.

a. Reinstall the system control unit in reverse order of removal (para 7-155).

NOTE: Two longer mounting screws are used at upper mounting holes. Good electrical bond (ground) must exist between control unit case and instrument panel structure at installation. (Refer to Section 19, Basic HMI.)

b. Perform an operational check of integrated interphone system (para 7-149) operation. Check both interphone and all installed radio equipment for correct operation. As necessary, adjust intercom phone audio level (para 7-154), interphone microphone audio level (para 7-152) and vhf COMM receiver-transmitter sidetone level (para 7-153).
c. Install the instrument panel side fairings (Section 2, Basic HMI).

7-158. COMM 1 - 2 RADIO SELECTOR SWITCH ASSEMBLY.

7-159. GENERAL. The COMM 1 - 2 radio selector switch assembly provides for selection between vhf COMM 1 and 2 radio equipment (if

Table 7-2. Input and output test signals for interphone control unit

Input						Output		
Check No.	Signal (Vac at 1000 Hz - rms)	J509 Pin No. and Letter		Enable Ground at J509 Pin No. or Letter		Signal (Vac at 1000 Hz - rms)	J509 Pin No. or Letter	
		CE500HT-3	CE500HT-3G	CE500HT-3	CE500HT-3G		CE500HT-3	CE500HT-3G
1	$8.00^{+0.2}_{-0.0}$	9 to 16	K to T	None	None	6.0 to 9.0	17 to 18	U to V
2	$8.00^{+0.2}_{-0.0}$	10 to 16	L to T	None	None	6.0 to 9.0	17 to 18	U to V
3	$8.00^{+0.2}_{-0.0}$	11 to 16	M to T	None	None	6.0 to 9.0	17 to 18	U to V
4	$8.00^{+0.2}_{-0.0}$	12 to 16	N to T	None	None	6.0 to 9.0	17 to 18	U to V
5	$8.00^{+0.2}_{-0.0}$	13 to 16	P to T	None	None	6.0 to 9.0	17 to 18	U to V
6	$1.8^{+0.2}_{-0.0}$	14 to 16	R to T	None	None	6.0 ±0.5	17 to 18	U to V
7	$1.8^{+0.2}_{-0.0}$	15 to 16	S to T	None	None	6.0 ±0.5	17 to 18	U to V
8	$0.100^{+0.010}_{-0.000}$	3 to 16	C to T	19	W	0.100 ±0.010	4 to 16	D to T
9	$0.100^{+0.010}_{-0.000}$	5 to 16	E to T	20	X	0.100 ±0.010	4 to 16	D to T
10	$0.100^{+0.010}_{-0.000}$	6 to 16	F to T	23	aa	6.0 ±0.5	17 to 18	U to V
11	$0.100^{+0.010}_{-0.000}$	7 to 16	H to T	24	bb	6.0 ±0.5	17 to 18	U to V
12	$0.100^{+0.010}_{-0.000}$	8 to 16	J to T	25	cc	6.0 ±0.5	17 to 18	U to V
13	$0.100^{+0.010}_{-0.000}$	3 to 16	C to T	21	Y	6.0 ±0.5	17 to 18	U to V
14	$0.100^{+0.010}_{-0.000}$	5 to 16	E to T	22	Z	6.0 ±0.5	17 to 18	U to V
15	Use ohmmeter	19 to 26	W to dd	None	None	Diode continuity check	None	None
16	Use ohmmeter	20 to 26	X to dd	None	None	Diode continuity check	None	None

NOTES:

1. For checks No. 8 through 14: Input signals are to be applied through a series connected 10 mfd capacitor. With input signal applied, enable ground (electrical connection between pin 2 of J509 to connector pin listed) is to be applied to obtain output signal. Pin 16 is audio common connection.
2. For diode continuity checks No. 15 and 16: With ohmmeter positive lead connected to pin 26 and negative lead to other pin listed, ohmmeter should indicate low forward resistance. With ohmmeter leads reversed, ohmmeter should indicate high back resistance.
3. If necessary, adjust controls on the unit to obtain the listed outputs. (Refer to para 7-151 through 7-154 for information on internal circuits and adjustable controls.)

installed). The assembly consists of a DPDT toggle switch and attached wire assemblies. The switch is mounted at the lower center of the instrument panel (fig. 7-1). The COMM 1 - 2 switch controls application of transmit keying microphone audio signals to either vhf COMM 1 or vhf COMM 2 radio equipment. A schematic diagram of the switch assembly is shown in figure 7-25.

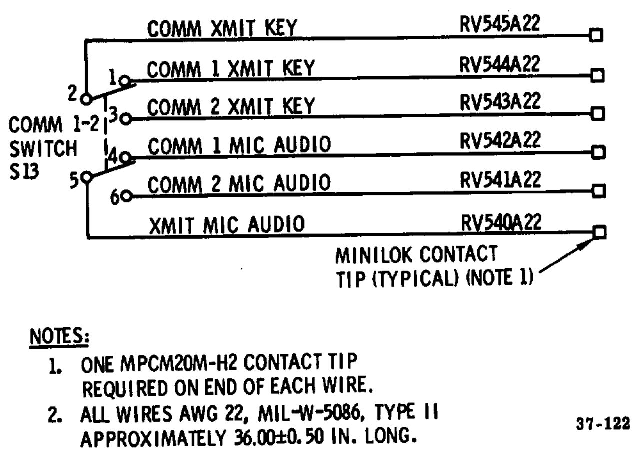


Figure 7-25. COMM 1 - 2 switch assembly - schematic diagram

7-160. UNIVERSITY SA-250BS-A HIGH POWER SOUND AND SIREN SYSTEM.

7-161. GENERAL. The University SA-250BS-A high power sound and siren system (fig. 7-26) is a solid-state, 300-watt audio public address (pa) sound system with built-in manual and automatic siren operation. The system may be installed on a helicopter with instrument panel type A or B and functions independently of all other installed avionics equipment. The SA-250BS-A sound system includes the following: a University MA-500 audio amplifier, a University RMC-1S-A remote control unit, a University loudspeaker kit KS-150, a Shure CM88B microphone, and interconnecting cabling, miscellaneous electrical wiring, brackets and attachment hardware. Interconnecting cables used are a modified University CB7-12 control input cable, CB6-12 power input cable and CB5-12 loudspeaker output cable. The remote control unit receives dc power from the amplifier and is mounted on the upper right side of the instrument console for access by both pilot and copilot. The microphone is attached to a microphone holder on the top of the remote control unit support. The audio amplifier is installed in the lower left electronics compartment under the pilot's compartment floor. The loudspeaker kit is mounted with supports and brackets on the exterior of the fuselage at the lower forward corner of the pilot's compartment right door. (See fig. 7-27 for wiring diagram.)

7-162. UNIVERSITY RMC-1S-A REMOTE CONTROL UNIT.

7-163. GENERAL. The University RMC-1S-A remote control unit (fig. 7-26) is a solid-state device and contains all controls and indicators for operation of the University SA-250BS-A sound and siren system (para 7-161). Dc power for the remote control unit is provided by the University MA-500 audio amplifier (para 7-167). The unit turns the pa/siren sound system on and off and permits selection of public address or siren operation. Connectors at the aft side of the unit allow connection of cables and the cable plug of the Shure CM88B microphone (para 7-171). Built-in siren circuits allow selection of either manual or automatic, yelp or curdler siren operation. Both microphone (mic) and input audio auxiliary circuits enable pa operation using either the microphone or optional tape recording/playback, radio or other optional equipment (not furnished). A 10-millivolt audio input signal to the 200-ohm-impedance unbalanced microphone input circuit produces full audio output power from the audio amplifier. The 20,000-ohm-impedance tape (auxiliary) input circuits will produce full audio output power from the audio amplifier with a 0.5-volt input audio signal. (See fig. 7-1 for a front panel view of the unit.)

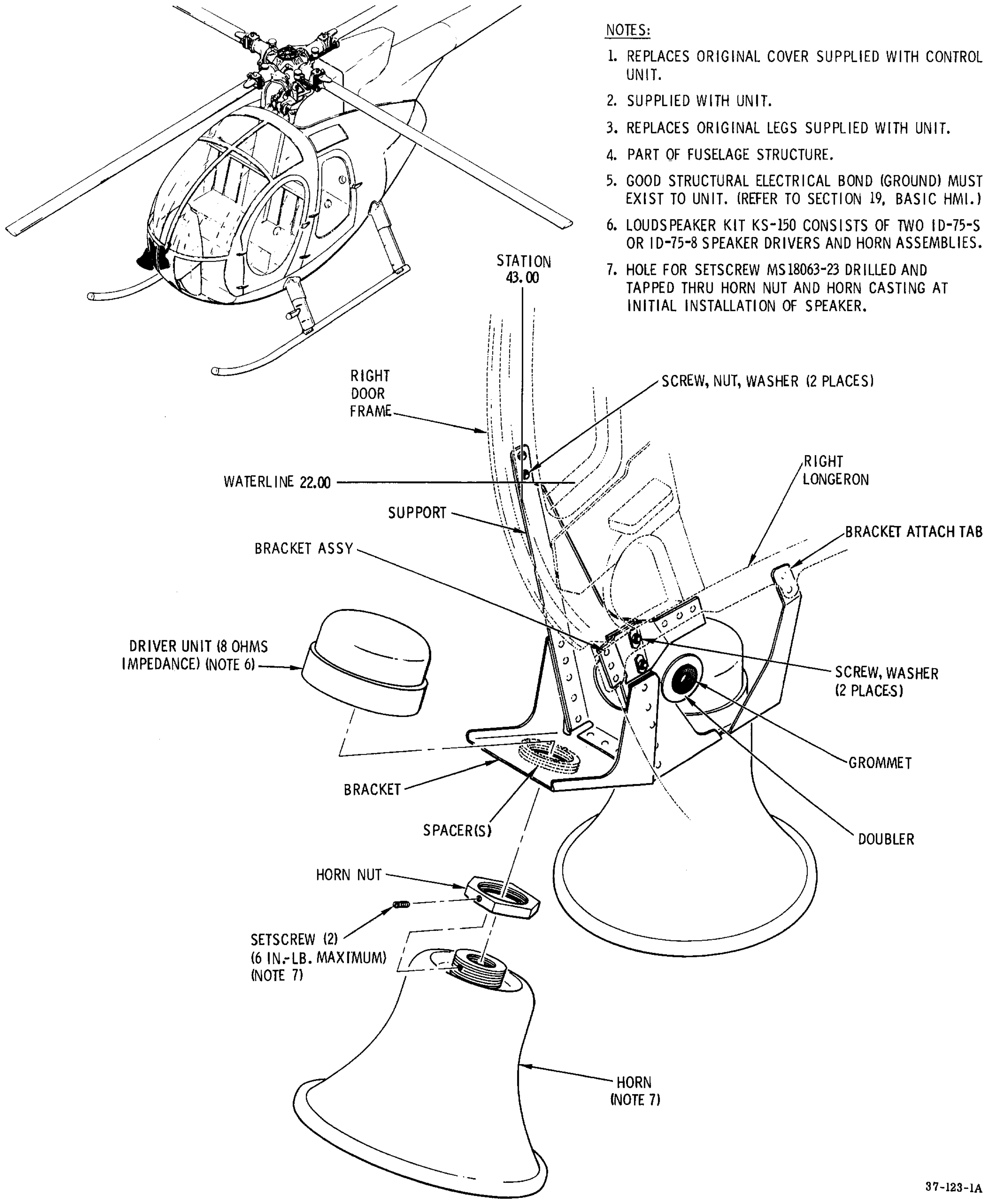


Figure 7-26. University SA-250BS-A high power sound and siren system (sheet 1 of 2)

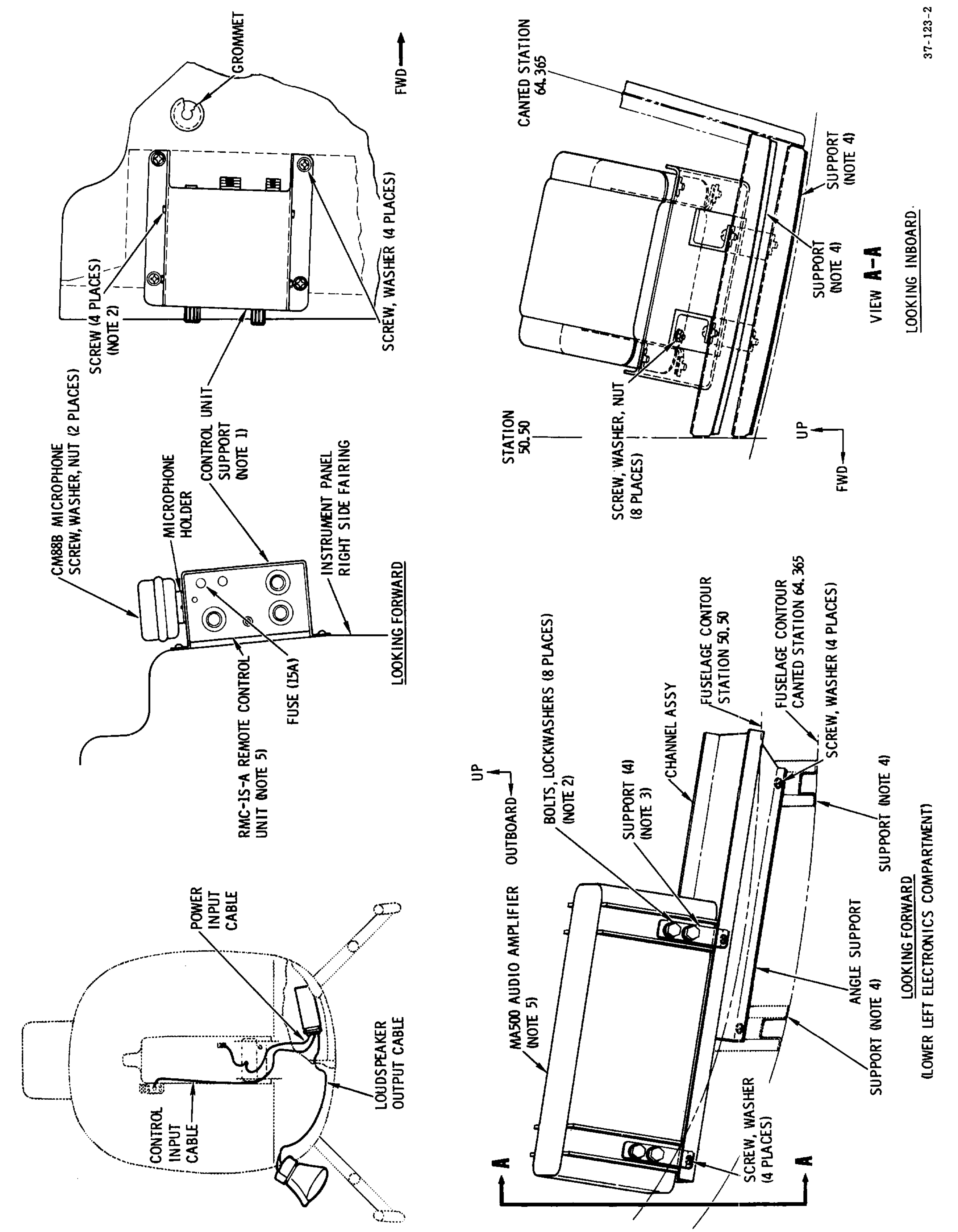
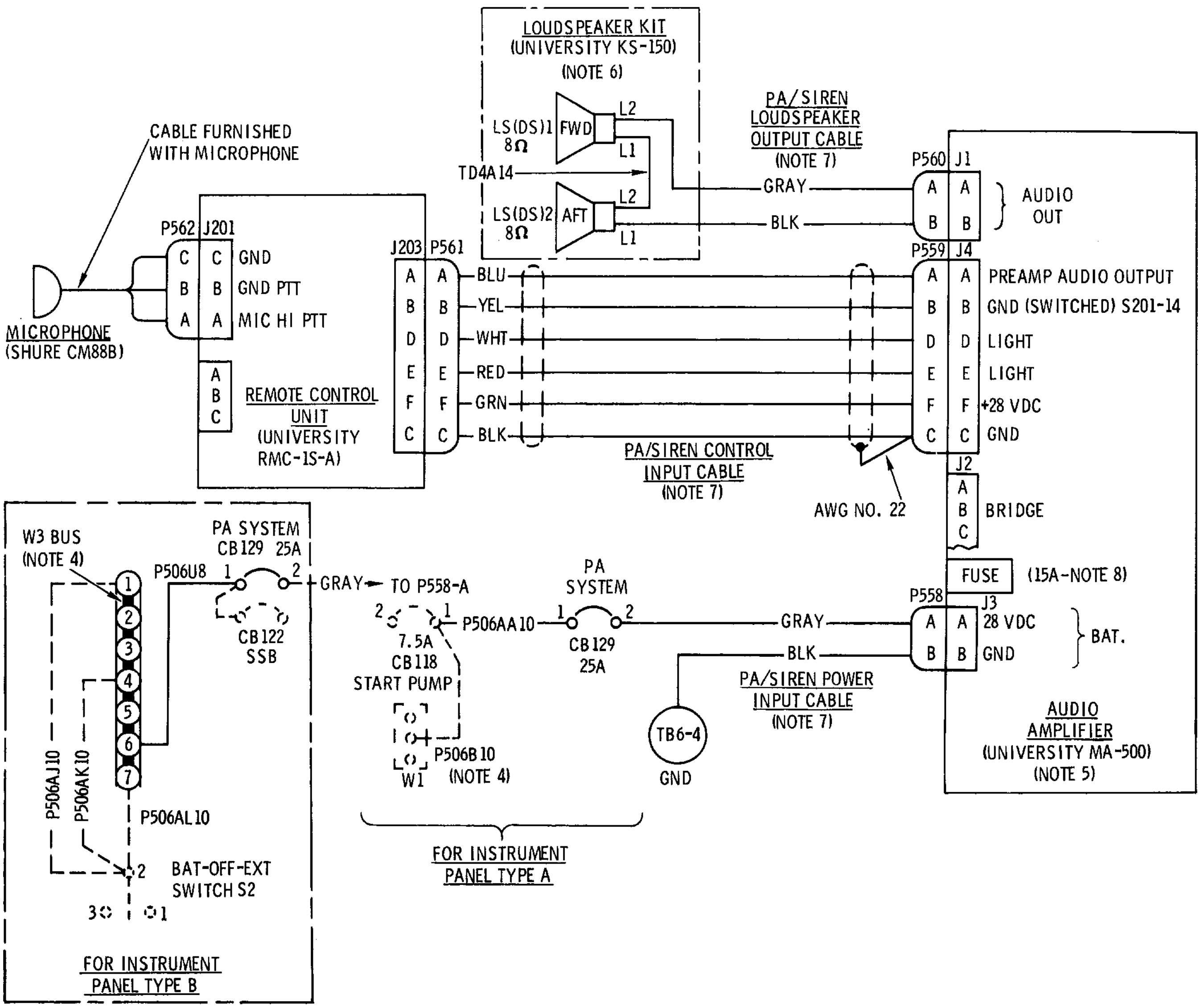


Figure 7-26. University SA-250BS-A high power sound and siren system (sheet 2 of 2)



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. UNLESS SPECIFIED OTHERWISE, DASHED (– – – –) LINES INDICATE ITEM IS PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL MAINTENANCE OF MAJOR COMPONENTS.
4. PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
5. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) AT INSTALLATION OF NEW UNIT.
6. DRIVER IMPEDANCE IS 8 OHMS FOR EACH SPEAKER (UNIVERSITY ID-75-S OR ID-75-8 DRIVER AND HORN).
7. MODIFIED CABLE OF SA-250BS SYSTEM. (REFER TO TEXT.)
8. FOR OPERATION WITH 24 VDC ELECTRICAL SYSTEM.

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Figure 7-27. University SA-250BS-A high power sound and siren system - wiring diagram

7-164. REMOVAL OF UNIVERSITY RMC-1S-A REMOTE CONTROL UNIT. (See fig. 7-26.)

a. Check that all electrical power is OFF.

b. Remove microphone from microphone holder and disconnect microphone cable from rear of remote control unit.

c. Disconnect electrical connector of control input cable from rear of control unit.

d. Loosen and remove four screws and washers securing control unit support to instrument panel right side fairings to remove control unit.

7-165. INSTALLATION OF UNIVERSITY RMC-1S-A REMOTE CONTROL UNIT. (See fig. 7-26.) Install the remote control unit in reverse order of removal (para 7-164). If the remote control unit is being replaced, before installation, perform the following.

NOTE: At installation, a good structural electrical bond (ground) must exist between remote control unit, support and instrument console structure. (Refer to Section 19, Basic HMI.)

a. Remove four screws to detach control unit support from the removed control unit.

NOTE: Detached control unit support has attached microphone holder.

b. Remove the original cover supplied with the replacement control unit.

c. Install the control unit support on the replacement control unit using the four screws supplied with the control unit.

7-166. UNIVERSITY MA-500 AUDIO AMPLIFIER.

7-167. GENERAL. The University MA-500 audio amplifier (fig. 7-26) is a solid-state, 500-watt audio amplifier. The unit contains built-in automatic voltage sensing and switching circuits for operation with the 24 Vdc helicopter electrical system. Internal circuits are protected against electrical overloads and damage by an internal 15-ampere fuse. Amplifier frequency response is 200 to 5000 Hz ±3 db. Average current drain is 5 to 8 amperes for 24 Vdc operation. Peak current for 24 Vdc is 18 amperes. Although a 0.5 volt audio signal applied to the 10,000-ohm-impedance audio input circuit will produce 500 watts of audio output power, the amplifier is used in a 300-watt audio power sound system on the helicopter. Output impedance for 250 watts is 16 ohms. The audio amplifier is also protected from electrical overloads and supplied dc power through the pa circuit breaker (fig. 7-1 for helicopter with instrument panel type B or fig. 7-2 for instrument panel type A). The audio amplifier supplies main dc power to the University RMC-1S-A remote control unit (para 7-163).

7-168. REMOVAL OF UNIVERSITY MA-500 AUDIO AMPLIFIER. (See fig. 7-26.)

a. Check that all electrical power is OFF.

b. Gain access to audio amplifier in lower left electronics compartment through pilot's compartment floor access door (Section 2, Basic HMI).

c. Disconnect electrical cable connectors from audio amplifier.

d. Loosen and remove four screws and washers to detach four audio amplifier supports from channel assembly. Remove audio amplifier from compartment.

7-169. INSTALLATION OF UNIVERSITY MA-500 AUDIO AMPLIFIER. (See fig. 7-26.) Install the audio amplifier in reverse order of removal (para 7-168). If the audio amplifier is being replaced, before installation perform the following.

NOTE: At installation, a good structural electrical bond (ground) must exist between amplifier case, supports and channel assembly. (Refer to Section 19, Basic HMI.)

a. Remove the eight bolts and lockwashers securing supports to the removed audio amplifier.

b. Remove the four support legs furnished with the replacement audio amplifier.

c. Install the supports (from the removed amplifier) on the replacement amplifier using the eight bolts and lockwashers supplied with the replacement amplifier.

d. Check and make sure that a 15-ampere fuse is installed in the audio amplifier.

7-170. SHURE CM88B MICROPHONE.

7-171. GENERAL. The Shure CM88B microphone is furnished and used with the University SA-250BS-A high power sound and siren system (para 7-161) (fig. 7-26). The microphone is the hand-held type with a coiled cord and built-in switch for keying the pa sound system. A connector on the end of the coiled cord mates with a connector at the aft side of the University RMC-1S-A remote control unit (para 7-163). A microphone holder, used to support microphone on remote control unit, is supplied with the microphone.

7-172. UNIVERSITY LOUDSPEAKER KIT KS-150.

7-173. GENERAL. Two University ID-75-S or ID-75-8 speaker drivers and horns form University loudspeaker kit KS-150, have a frequency response of 400 to 5000 Hz and together are capable of handling 300 watts of audio power. The two speakers are mounted with supports on the exterior of the fuselage at the lower forward corner of the pilot's compartment right door. Speaker orientation directs sound downward and to the right from the helicopter. Total input impedance of the two series connected units is 16 ohms (8 ohms for each unit). Sound dispersion angle is 130 degrees.

7-174. REMOVAL OF UNIVERSITY LOUDSPEAKER KIT KS-150. (See fig. 7-26.)

a. Check that electrical power is OFF.

b. Disconnect loudspeaker output cable from loudspeaker terminals.

c. Loosen and remove setscrews securing nut and horn casting.

d. Loosen horn nut and disassemble and remove driver unit and horn from mounting bracket.

e. Repeat above procedures for second loudspeaker (driver and horn assembly).

7-175. INSTALLATION OF UNIVERSITY LOUDSPEAKER KIT KS-150. (See fig. 7-26.) Install the loudspeaker kit in reverse order of removal (para 7-174). After tightening horn nut at installation, install and tighten setscrew securing horn nut and horn to 6 inch-pounds maximum. If a loudspeaker is being replaced, at installation perform the following.

a. After reassembly of replacement driver unit and horn on the support bracket and tightening the horn nut, drill a hole through one side of the horn nut and horn casting and tap the hole for a MS18063-23 setscrew (6-32NC).

b. Install the setscrew and tighten to a maximum torque of 6 inch-pounds.

7-176. KING KR 85 AUTOMATIC DIRECTION FINDER (ADF) INSTALLATION (INSTRUMENT PANEL TYPE B).

7-177. GENERAL. The King KR 85 ADF installation (fig. 7-1) is used in helicopters with a type B instrument panel (Basic HMI) for homing and obtaining accurate bearing information on selected radio stations. The installation primarily consists of a King KR 85 ADF receiver, King KI 225 ADF indicator, King 071-1006-11 ADF loop antenna, King 155-2008-00/01 ADF loop antenna cable, ADF sense antenna installation, ADF wire harness assembly, a replacement hood for the instrument console, an instrument panel face assembly, miscellaneous electrical parts and attaching hardware. If installed, early type dual air ducts inside the instrument console (Basic HMI) are modified for cooling the ADF receiver. All direct current (dc) electrical power (approximately 1.0 ampere, maximum) to the ADF installation is supplied through a 2-ampere ADF circuit breaker on the instrument panel. Figure 7-28 is a wiring interconnections diagram for the King KR 85 ADF installation. A factory installed KR 85 ADF provisions installation consists of all the equipment described, except the King KR 85 ADF receiver and King KI 225 ADF indicator are not supplied.

NOTE: Interconnection wiring for the installation is shown in figure 7-18 for a current helicopter, and for an early helicopter in figure 7-28. An integrated interphone system and radio control equipment (para 7-148) must also be installed in the helicopter for use with the ADF installation. The associated audio components (interphone control unit, headset connectors, headsets, etc) are required for reception of ADF voice and code signals. For information on noise filter and shielded wiring to eliminate interference with King KR 85 ADF when directional and/or attitude gyro is used, refer to paragraph 7-195.

7-178. KING KR 85 ADF RECEIVER.

7-179. GENERAL. The King KR 85 ADF receiver (fig. 7-1), a solid state device, is used for homing and direction finding on low-frequency, amplitude modulated, radio signals or standard broadcast stations throughout the frequency range of 200 to 1699 kHz. Frequency selection is accomplished by 1500 digitally tuned, crystal controlled channels spaced in 1 kHz increments. The ADF receiver provides for the reception of voice and code signals, contains switches and controls for operation of the ADF installation and is flush mounted on the face of the instrument panel. The ADF receiver selects mode of operation and operating frequency, selects and controls type and level of ADF audio output signals and provides a bearing output signal for the King KI 225 ADF indicator (para 7-182). Reception range of the ADF receiver is dependent on the altitude of the helicopter and weather conditions.

7-180. REMOVAL OF KING KR85 ADF RECEIVER.

a. Check that all electrical power is OFF.

b. For removal of King KR 85 ADF receiver (fig. 7-1), loosen locking screw on front panel of receiver and slide receiver from mounting rack in instrument console.

NOTE: The following steps provide instructions for removal of receiver mounting rack from instrument console.

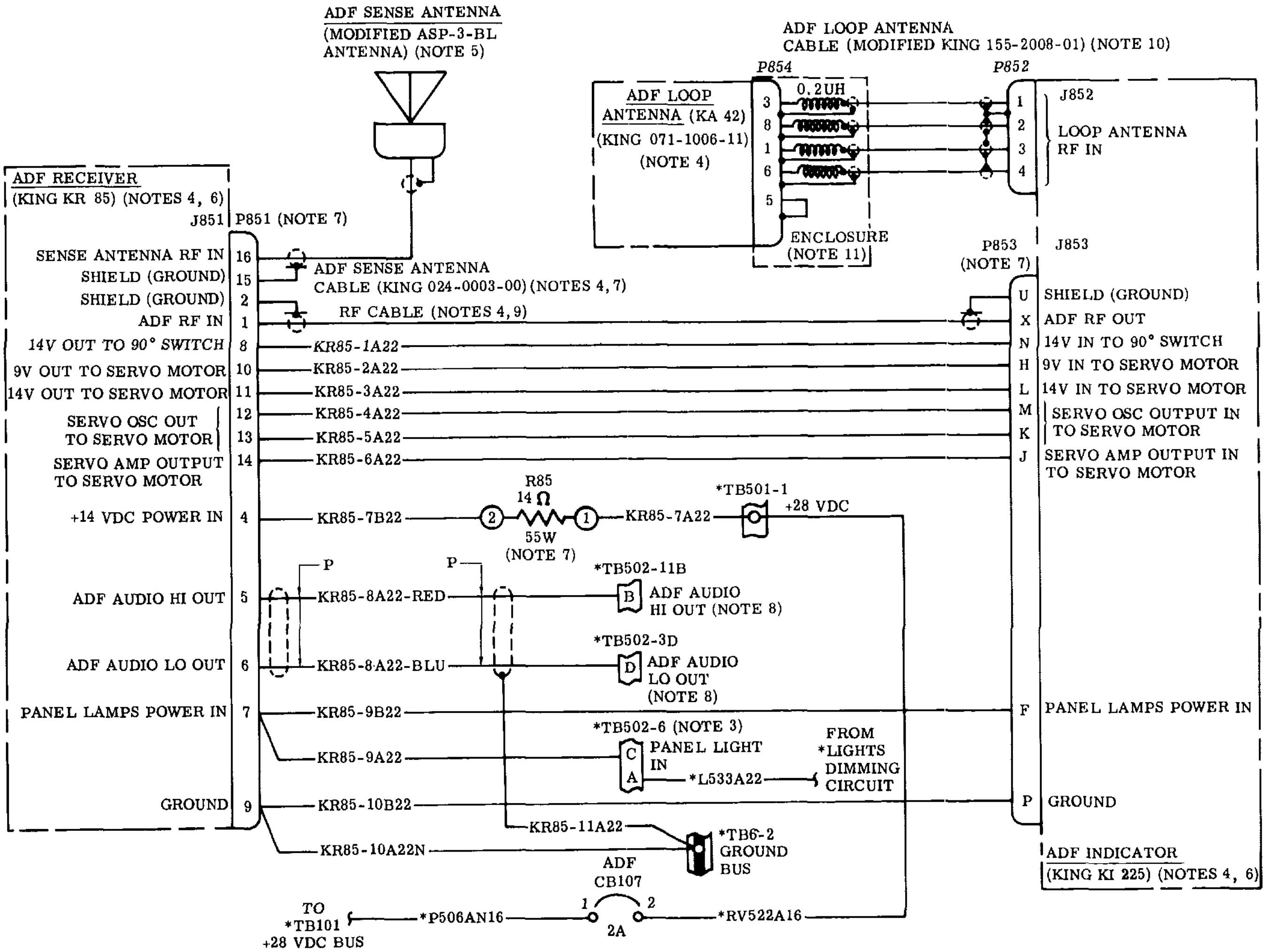
c. Gain access to receiver mounting rack by removing instrument panel side fairings (Section 2, Basic HMI).

d. As necessary, remove equipment inside instrument console for access to mounting rack.

e. Disconnect electrical wiring connector from end of rack.

f. Loosen and remove hardware attaching clamp that holds end of rack; remove clamp.

g. Loosen and remove hardware attaching instrument panel face assembly to front of instrument panel (fig. 7-1). Remove panel face assembly and attached rack from instrument panel.



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE WIRING DIAGRAM FOR THE HELICOPTER BASIC ELECTRICAL SYSTEM IN THE HMI FOR COMPLETE WIRING INTERCONNECTION INFORMATION.
2. ASTERISK (*) INDICATES PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. BOTH TERMINALS SHOWN ARE INTERNALLY INTERCONNECTED.
4. PART OF KING KR 85 ADF SYSTEM.
5. ASP-3-BL ANTENNA MANUFACTURED BY ANTENNA SPECIALISTS PRODUCTS.
6. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL MAINTENANCE OF MAJOR COMPONENTS, AND FOR ALIGNMENT INFORMATION AT REPLACEMENT OF UNIT.
7. PART OF KR 85 ADF WIRE HARNESS ASSEMBLY THAT ALSO INCLUDES WIRING ATTACHED TO AND BETWEEN CONNECTORS.
8. FOR WIRING INTERCONNECTIONS, REFER TO INFORMATION ON THE INTEGRATED INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT IN THIS OPTION GROUP.
9. DO NOT ALTER LENGTH.
10. AT REPLACEMENT, REPLACEMENT CABLE MUST BE WIRED ON END AT P854 AS SHOWN AND MODIFIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS FOR CORRECT PHASING WITH UNDERSIDE MOUNTED LOOP AND ADF SENSE ANTENNA.
11. ALL INDUCTORS ARE SAME VALUE (0.2 MICROHENRIES).
12. FOR WIRING INTERCONNECTION AND OTHER INFORMATION ON NOISE FILTER AND SHIELDED WIRING TO ELEMINATE INTERFERENCE WITH KING KR 85 ADF WHEN DIRECTIONAL AND/OR ATTITUDE GYRO IS USED, REFER TO GROUP 2.

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Figure 7-28. King KR 85 ADF installation - wiring diagram (instrument panel type B - early helicopter)

h. Remove attachment hardware securing rack to panel face assembly.

7-181. INSTALLATION OF KING KR 85 ADF RECEIVER. Install King KR 85 ADF receiver in reverse order of removal (para 7-180). If ADF receiver is replaced, alignment of ADF indicator with ADF receiver is required. (Refer to manufacturer's publication - table 2-12, Basic HMI.) After installation, check ADF installation for correct operation.

7-182. KING KI 225 ADF INDICATOR.

7-183. GENERAL. The King KI 225 ADF indicator (fig. 7-1), flush mounted on the instrument panel, provides a visual indication of the bearing from which an incoming radio signal is received. A heading (HDG) control manually positions the heading card and a heading pointer indicates bearing of radio station on the face of the indicator. The ADF indicator operates with power and bearing signals received from the ADF loop antenna and King KR 85 ADF receiver.

7-184. REMOVAL OF KING KI 225 ADF INDICATOR.

a. Check that all electrical power is OFF.

b. Gain access to end of ADF indicator by removing instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect electrical wiring connectors from end of ADF indicator.

d. As necessary, remove any equipment inside instrument console for access to clamp holding ADF receiver mounting rack.

e. Loosen hardware securing clamp that holds mounting rack inside instrument console. Make sure that clamp is sufficiently loose to permit movement of mounting rack.

f. Remove hardware attaching ADF indicator to instrument panel. Remove ADF indicator from instrument panel.

7-185. INSTALLATION OF KING KI 225 ADF INDICATOR. Install King KI 225 ADF indicator in reverse order of removal (para 7-184). If ADF indicator is replaced, alignment with ADF receiver is required. (Refer to manufacturer's publication - table 2-12, Basic HMI.) After installation, check ADF installation for correct operation.

7-186. KING 071-1006-11 ADF LOOP ANTENNA.

7-187. GENERAL. The King 071-1006-11 ADF loop antenna used with the King KR 85 ADF installation is similar to that covered in paragraph 7-61 and shown in figure 7-12.

7-188. KING 155-2008-01 ADF LOOP ANTENNA CABLE.

7-189. GENERAL. The King 155-2008-01 ADF loop antenna cable is similar to that described in paragraph 7-65 and shown in figure 7-11.

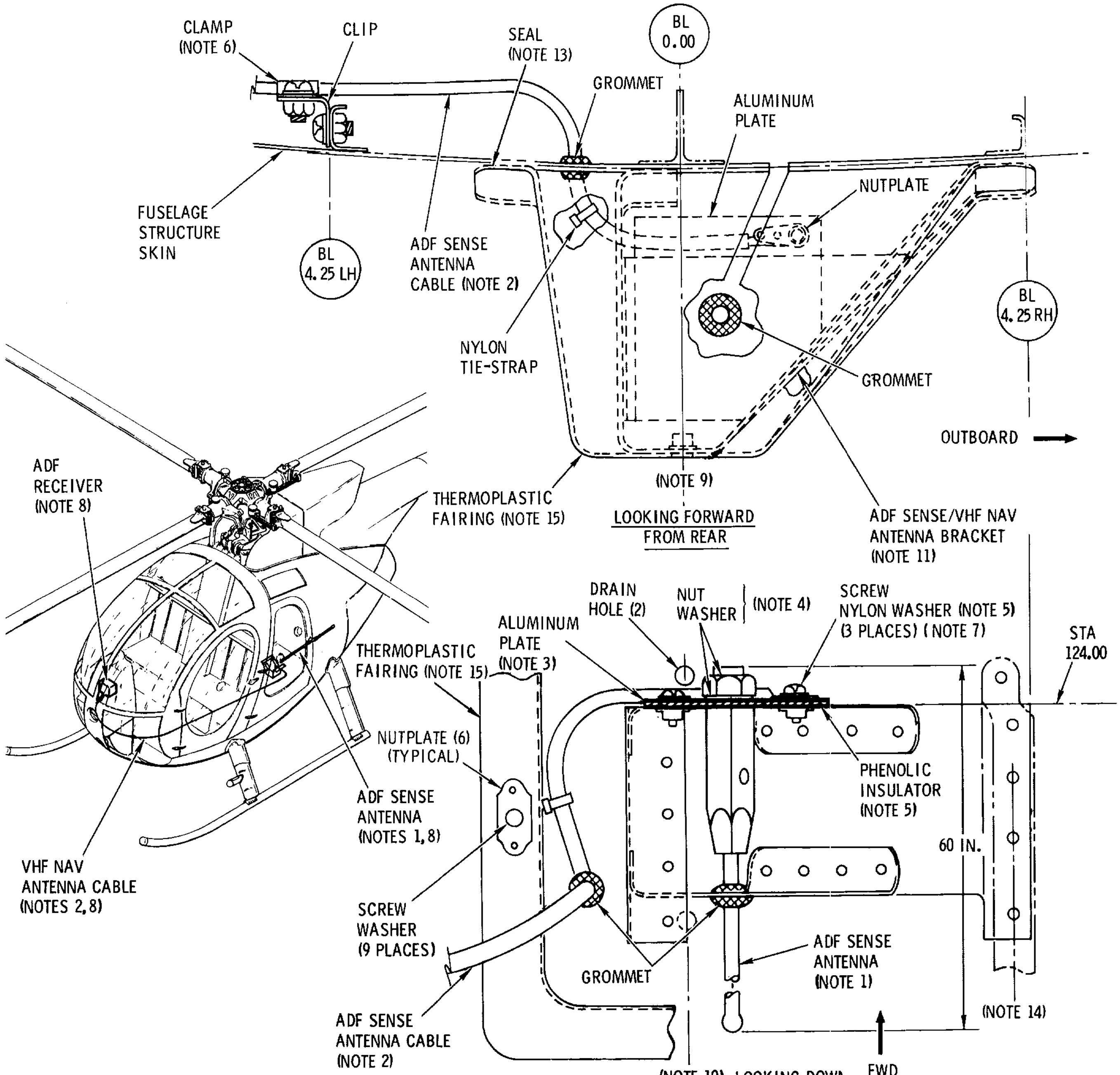
NOTE: At replacement of ADF loop antenna cable, replacement cable must be modified according to manufacturer's instructions and wired as shown in figure 7-28, for correct phasing. (Refer to manufacturer's publications, table 2-12, Basic HMI.)

7-190. KR 85 ADF SENSE ANTENNA INSTALLATION.

7-191. GENERAL. The ADF sense antenna used with the KR 85 ADF installation is a modified Antenna Specialists Products ASP-3-BL whip antenna. The ADF sense antenna is mounted fore-and aft on the ADF sense/vhf nav antenna bracket at the center underside of the fuselage structure (fig. 7-29). A nut and washer secure the antenna base to an aluminum plate and phenolic insulator on the forward side of the antenna bracket with the antenna rod element extending aft through a grommet in the aft side of the antenna bracket. The grommet, phenolic insulator and three nylon flanged washers electrically isolate the antenna element from the metal antenna bracket. The sense antenna has an overall length of 60 inches, including the antenna base. The ADF sense antenna cable, a part of the ADF wire harness assembly (para 7-193), connects to the antenna base at the forward side of the antenna bracket. Clips, clamps and other miscellaneous hardware furnish attachment for the ADF sense antenna cable at various routing locations. A thermoplastic fairing is secured to the fuselage underside with sponge rubber seal with adhesive backing and screws and washers, over the antenna bracket. When the helicopter is also equipped with a vhf navigation antenna installation (para 7-143), a vhf navigation antenna (para 7-145) is secured to the underside of the antenna bracket.

7-192. KR 85 ADF WIRE HARNESS ASSEMBLY.

7-193. GENERAL. The KR 85 ADF wire harness assembly provides interconnections for the KR 85 ADF receiver, KI 225 ADF indicator and ADF sense antenna with the electrical and optional avionics wiring in the helicopter. The ADF wire harness assembly is formed by two electrical connectors, a 14-ohm, 55-watt, fixed wire-wound resistor (R85), an ADF sense antenna cable and miscellaneous wires. Resistor R 85 is a voltage dropping resistor to reduce 28 Vdc from the



NOTES:

1. MODIFIED ANTENNA SPECIALISTS PRODUCTS ASP-3-BL WHIP ANTENNA.
2. PART OF AND FURNISHED WITH KR 85 ADF WIRE HARNESS ASSEMBLY; COVERED WITH SILICONE SLEEVING.
3. ELECTRICAL CONTACT PLATE FOR ANTENNA BASE (0.032 IN. THICK).
4. STRUCTURAL ELECTRICAL BOND TO ALUMINUM PLATE REQUIRED. (REFER TO SECTION 19, BASIC HMI.)
5. INSULATES ALUMINUM PLATE AND ANTENNA FROM ANTENNA BRACKET (0.062-IN.-THICK INSULATOR).
6. TYPICAL SINGLE CLAMP SHOWN. DOUBLE CLAMP USED FOR COMBINED VHF NAV/ADF SENSE ANTENNA INSTALLATION.
7. HELD BY NUTPLATE (NOT SHOWN) ON AFT SIDE OF FORWARD END OF ANTENNA BRACKET.
8. PART OF KING KR 85 ADF INSTALLATION.
9. HELICOPTER VERTICAL CENTERLINE.
10. HELICOPTER FORE-AND-AFT CENTERLINE.
11. NAV ANTENNA MAY ALSO BE INSTALLED ON BRACKET. (SEE SEPARATE FIGURE IN THIS OPTION GROUP.)
12. ABBREVIATIONS: BL - BUTTLINE; STA - STATION; RH - RIGHT HAND; IN. - INCHES.
13. SPONGE RUBBER SEAL WITH ADHESIVE BACKING.
14. THREE WASHERS BETWEEN FAIRING AND SKIN THIS SIDE AT ATTACHMENT POINTS.
15. NOT USED ON LATER INSTALLATION.

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Figure 7-29. ADF sense antenna installation for King KR 85 ADF helicopter electrical system to 14 Vdc required for operation of the KR 85 ADF installation. The ADF sense antenna cable is a shielded wire that connects the ADF sense antenna to the KR 85 ADF receiver. The ADF wiring harness interconnects components of the King KR 85 ADF installation

7-194. ACE COIL 1471 NOISE FILTER.

7-195. GENERAL. The Ace Coil 1471 noise filter FL100 is a sealed and potted, capacitive and inductive, solid-state device for filtering ac noise. The unit filters 400 cycle, ac noise that may be present on the +28 Vdc power line to the King KR 85 ADF, from any installed directional and/or attitude gyro. The noise filter and shielded wiring are furnished and installed with a current King KR 85 ADF installation, if the helicopter is also equipped with either of the gyro installations. The filter is non-repairable due to potting and is replaced if defective. The noise filter is installed in the right forward inner area of the instrument console support. For wiring interconnection information for the filter and shielded wiring harness, refer to the wiring diagram for the applicable gyro installation in Group 2.

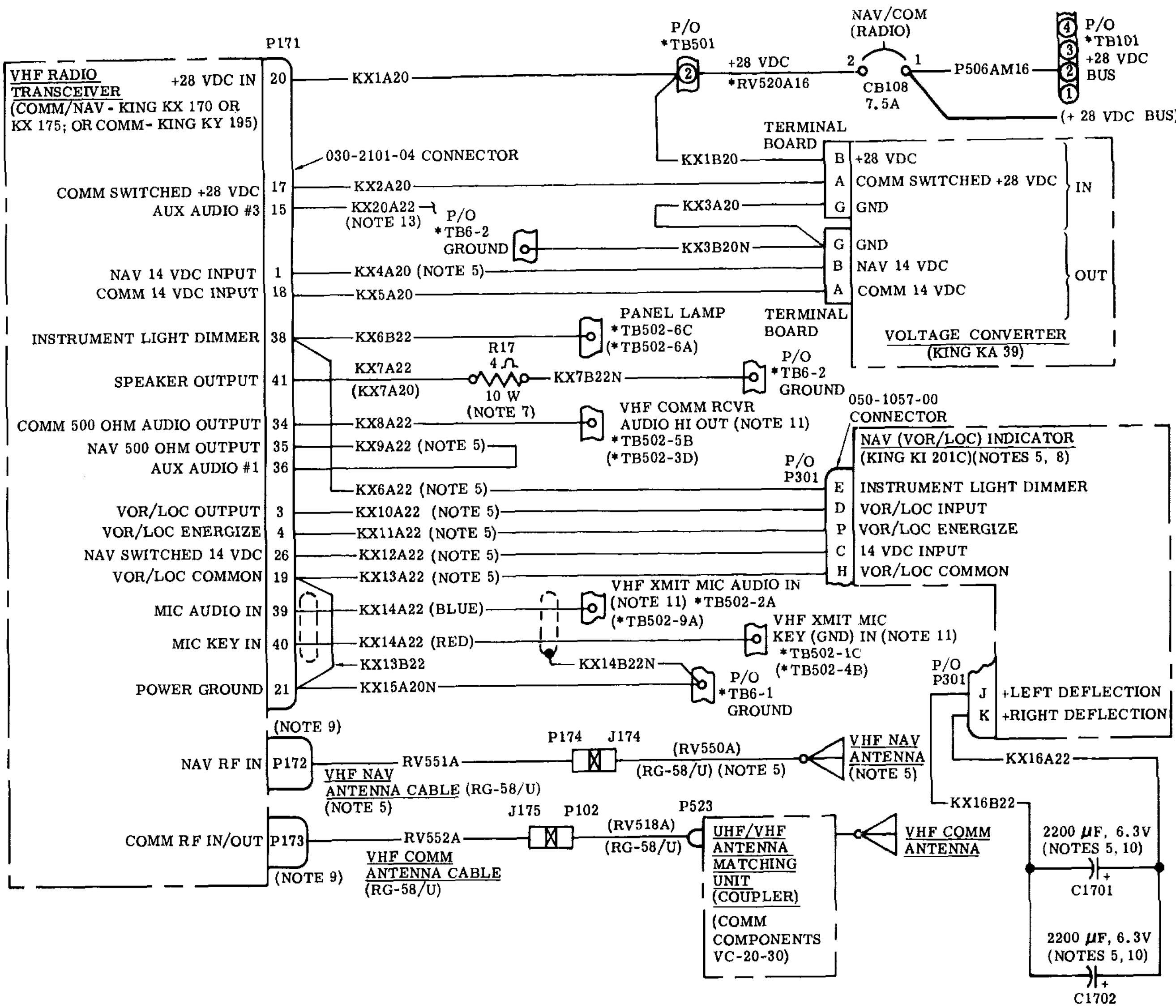
7-196. KING KX 170 OR KX 175 VHF COMM/NAV INSTALLATION.

7-197. GENERAL. The King KX 170 or KX 175 vhf communications/navigation (COMM/NAV) installation provides air-to-ground and air-to-air two-way voice communication, and receives ground-to-air Omnidirectional Range and Localizer (VOR/LOC) vhf radio signals for voice reception and visual display for navigation purposes. The installation primarily consists of a King KX 170 or KX 175 vhf COMM/NAV transceiver, King KI 201C NAV indicator, King KA 39 voltage converter, Communications Components VC-20-30 uhf/vhf antenna matching unit (coupler), uhf/vhf COMM antenna, uhf/vhf COMM antenna cable, Narco VRP-37 vhf NAV antenna installation, vhf COMM/NAV wiring harness, associated mounting hardware and electrical interconnection wiring. The range of the vhf COMM/NAV installation is limited to an approximate line-of-sight distance. The vhf COMM/NAV transceiver and vhf NAV indicator are flush mounted on the instrument panel (fig. 7-1 or 7-2). The vhf NAV antenna is located on the center underside of the fuselage structure (fig. 7-20) and the vhf NAV antenna installation is identical to that described in paragraph 7-143. The voltage converter is mounted to a voltage converter support on the forward side of the lower structure support for the instrument panel console. The uhf/vhf antenna matching unit is located on the fuselage boom fairing inside the engine inlet aft fairing (fig. 7-3) and is as described in paragraph 7-10. The uhf/vhf COMM antenna (fig. 7-3) is identical to that described in paragraph 7-14. All dc power (approximately 5.0 amperes, maximum) to the installation is supplied through a 7.5-ampere NAV/COM circuit breaker CB108 on the instrument panel (fig. 7-1 or 7-2); CB108 also simultaneously routes dc power to the interphone system and radio control equipment (para 7-148 or 7-20). A factory installed King KX 170 or KX 175 vhf COMM/NAV provision installation basically consists of all the equipment described, except the vhf COMM/NAV transceiver, vhf NAV indicator and voltage converter are not furnished. Interconnection wiring for the installation is shown in figure 7-18 for a current helicopter, and in figure 7-30 for an early helicopter.

NOTE: The KX 170 and KX 175 vhf COMM/NAV installations are essentially identical, except for differences in vhf COMM/NAV transceivers. Suffix letters for manufacturer's model number may vary (example - KX 170A or KX 170B). For difference information, refer to general information paragraph (para 7-199). An integrated interphone system and radio control equipment (para 7-148) must also be installed in a helicopter with instrument panel type B for use of the vhf COMM/NAV installation. Or, for a helicopter with instrument panel type A, interphone communication and vhf radio control equipment (para 7-20) must also be installed. The associated audio components (interphone control unit or intercom adapter, headset connectors, headset-microphones, interconnection wiring, etc) are required for reception and transmission of vhf COMM and reception of vhf NAV signals.

7-198. KING KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER.

7-199. GENERAL. The King KX 170 or KX 175 vhf COMM/NAV transceiver (fig. 7-1 or 7-2) is a single unit that contains both a vhf COMM transmitter and a vhf NAV receiver which operate separately and independently with amplitude modulated signals. The vhf COMM transceiver covers the frequency range of 118.00 to 135.95 MHz. The vhf COMM transceiver transmits and receives vhf rf signals on the same frequency using the uhf/vhf COMM antenna (para 7-15). Output power from the transistorized transmitter of the transceiver is 5 watts minimum into a 50-ohm load. The vhf NAV receiver covers the frequency range of 108.00 to 117.95 MHz using 200 crystal



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. ASTERISK (*) INDICATES PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INTERNAL MAINTENANCE OF MAJOR COMPONENTS AND ANY INTERNAL ADJUSTMENTS REQUIRED.
4. UNLESS SPECIFIED OTHERWISE, WIRE NO. IN PARENTHESIS ( ) APPLIES FOR HELICOPTER WITH INSTRUMENT PANEL TYPE A.
5. USED ONLY WITH KING KX 170 OR KX 175. WHEN KING KY 195 IS INSTALLED, VHF NAV ANTENNA IS NOT INSTALLED AND VHF NAV ANTENNA CABLE AND CONNECTOR P301 ARE STOWED.
6. ALL WIRING, EXCEPT WIRE NO. P506AM16 AND ANTENNA CABLES, IS PART OF VHF COMM/NAV WIRING HARNESS ASSY.
7. TERMINATION IMPEDANCE USED IN PLACE OF SPEAKER.
8. AT INSTALLATION OR REPLACEMENT, REFER TO MANUFACTURER'S PUBLICATION FOR INFORMATION ON INTERNAL CALIBRATION. (SEE NOTE 3.)
9. VIEWING TRANSCEIVER FROM REAR, P172 IS ON RIGHT AND P173 IS ON LEFT.
10. LOCATED ON CONNECTOR P171 AT AFT END OF KX 170 OR KX 175.
11. FOR WIRING INTERCONNECTION INFORMATION, REFER TO INFORMATION ON INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT IN THIS OPTION GROUP.
12. SUFFIX LETTER FOR MANUFACTURER'S MODEL NUMBER MAY VARY. (EXAMPLE - KX 170A/B; REFER TO TEXT.)
13. PART OF N_1/N_R EPO WARNING SYSTEM, TO ELIMINATE POSSIBILITY OF INTERFERENCE BETWEEN THAT SYSTEM AND RADIO/ICS SYSTEM. (REFER TO OPTION GROUP 2.)

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Figure 7-30. King KX 170 or KX 175 vhf COMM/NAV and King KY 195 vhf COMM installations - wiring diagram (early helicopter) controlled channels with 50 kHz spacing. The vhf NAV receiver receives vhf NAV rf signals from the vhf NAV antenna installation (para 7-143) and supplies VOR/LOC navigation information to the King KI 201C NAV indicator (para 7-200) for visual display. The unit requires electrical current at 14 Vdc, supplied by the voltage converter (para 7-207). All switches and controls for operation are on the face of the unit.

NOTE: The King KX 170A, KX 170B or KX 175B vhf COMM/NAV transceiver may be used. The KX 170A and KX 170B vhf COMM/NAV transceivers are basically identical, except the frequency range of 118.00 to 139.95 MHz is covered with 720 channels having 25 kHZ separation for the KX 170B, and with 360 channels having 50 kHZ separation for the KX 170A. The KX 175B is identical to the KX 170B, except the KX 175B also complies with specific FAA Technical Standard Order (TSO) specifications. (Refer to manufacturers publications, table 2-12, Basic HMI.) Otherwise, KX 170A/B and KX 175B vhf COMM/NAV transceivers are directly interchangeable.

7-200. REMOVAL OF KING KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER.

a. Check that all electrical power is OFF.

b. For removal of vhf COMM/NAV transceiver, loosen locking screw on front panel of vhf COMM/NAV transceiver (fig. 7-1 or 7-2) and slide transceiver from transceiver mounting rack on instrument console.

NOTE: Following procedures provide instructions for removal of transceiver mounting rack from instrument console.

c. Gain access to transceiver mounting rack by removing instrument side panels (Section 2, Basic HMI).

d. As necessary, remove equipment inside instrument console for access to mounting rack.

e. Disconnect electrical wiring connector and uhf/vhf COMM and vhf NAV antenna cable connectors from end of rack.

f. Loosen and remove hardware attaching clamp that holds end of rack. Remove clamp and support filler (if used) from underside of rack.

g. Loosen and remove hardware securing top and bottom (or sides, as applicable) of rack to upper and lower (or side) rack mounting brackets on instrument panel. Remove rack from instrument panel.

7-201. INSTALLATION OF KING KX 170 OR KX 175 VHF COMM/NAV TRANSCEIVER. Install the vhf COMM/NAV transceiver in reverse order of removal (para 7-200). At replacement or reinstallation, check manufacturer's publication (table 2-12, Basic HMI) for information on internal sidetone audio level adjustment and calibration of NAV indicator with transceiver. Instructions for intercom sidetone level adjustment are provided in paragraph 7-153, or in paragraph 7-25 for helicopter with instrument panel type A. After installation, check vhf COMM/NAV installation for correct operation.

NOTE: At installation, be sure to connect uhf/vhf COMM antenna cable to left connector, and vhf NAV antenna cable to right connector of transceiver rack, as viewed from rear.

7-202. KING KI 201C NAV INDICATOR.

7-203. GENERAL. The King KI 201C NAV indicator (fig. 7-1 or 7-2) is a solid-state device that visually displays VOR/LOC navigation information received from the vhf COMM/NAV transceiver (para 7-199). A VOR/LOC deviation (left-right) indicator pointer, VOR warning flag and VOR TO and FROM flag are provided on the face of the indicator. The Omni Bearing Selector (OBS) control manually rotates and positions the course index card. Received vhf radio signals containing NAV information from the vhf NAV antenna installation (para 7-143) are routed through the vhf NAV indicator to the vhf COMM/NAV transceiver that supplies navigation signals to the indicator for display.

7-204. REMOVAL OF KING KI 201C NAV INDICATOR.

a. Check that all electrical power is OFF.

b. Gain access to end of NAV indicator (fig. 7-1 or 7-2) by removing instrument panel side fairings (Section 2, Basic HMI).

c. Disconnect electrical wiring connector from indicator.

d. If clamp secures indicator, remove hardware securing clamp and remove clamp. If clamp is not used, remove foam rubber strip from under indicator.

e. Loosen and remove hardware attaching indicator to instrument panel; remove indicator from panel.

7-205. INSTALLATION OF KING KI 201C NAV INDICATOR. Install NAV indicator in reverse order of removal (para 7-204). At replacement or reinstallation, check manufacturer's publication (table 2-12, Basic HMI) for information on adjustment of omni error adjustment potentiometer inside indicator for final calibration of indicator in helicopter with KX 170 or KX 175 vhf COMM/NAV transceiver. After installation, check vhf COMM/NAV installation for correct operation.

7-206. KING KA 39 VOLTAGE CONVERTER.

7-207. GENERAL. The King KA 39 voltage converter is a solid state unit that contains dual 28 Vdc to 14 Vdc converters, one for the vhf COMM transceiver and one for the vhf NAV receiver of the vhf COMM/NAV transceiver (para 7-199). A removable cover on the unit shields terminal board connections.

7-208. REMOVAL OF KING KA 39 VOLTAGE CONVERTER.

a. Check that all electrical power is OFF.

b. Remove hardware attaching cover and remove from voltage converter.

c. Disconnect wiring from terminals of converter. Tag-identify wiring as necessary for reinstallation.

d. Remove hardware attaching converter to converter support on forward side of lower structure support for instrument console; remove converter.

7-209. INSTALLATION OF KING KA 39 VOLTAGE CONVERTER. Install King KA 39 voltage converter in reverse order of removal (para 7-208). See figure 7-30 for wiring interconnections. At replacement or reinstallation, refer to manufacturer's publication (table 2-12, Basic HMI) for sidetone audio level adjustment in vhf COMM/NAV transceiver and for information on adjustment of omni error potentiometer in NAV indicator for calibration of that unit in helicopter. After installation, check vhf COMM/NAV installation for correct operation.

7-210. KING KY 195 VHF COMM INSTALLATION.

7-211. GENERAL. The King KY 195 vhf COMM installation provides air-to-ground and air-to-air two-way voice communication. The installation essentially consists of a King KY 195 vhf COMM transceiver, King KA 39 voltage converter, Communications Components VC-20-30 uhf/vhf antenna matching unit (coupler), uhf/vhf COMM antenna, uhf/vhf COMM antenna cable, vhf COMM wiring harness, associated mounting hardware and electrical interconnection wiring. The King KY 195 vhf COMM installation is identical to the King KY 170 or KX 175 vhf COMM/NAV installation (para 7-197), except the King KY 195 vhf COMM transceiver is used in place of the King KX 170 or KX 175 vhf COMM/NAV transceiver, the King KI 201C vhf NAV indicator and the vhf NAV antenna installation are not used, the installation has no provisions for reception or display of navigation information, and differs as follows. A King KY 195 vhf COMM provisions installation for a helicopter with instrument panel type B basically consists of all the equipment described, except the King KY 195 vhf COMM transceiver is not supplied. The installation is supplied a maximum of approximately 4.5 amperes of dc current through 7.5-ampere circuit breaker CB108 on the instrument panel. Maintain the installation according to following paragraphs, except disregard information that does not apply. Interconnection wiring is shown in figure 7-18 for a current helicopter, and in figure 7-30 for an early helicopter.

NOTE: Suffix letter for manufacturer's model number may vary (example - KY 195 or KY 195B). For difference information, refer to general information paragraph (para 7-213.) An integrated interphone system and radio control equipment (para 7-148) must also be installed in a helicopter with instrument panel type B. Or, for a helicopter with instrument panel type A, interphone communication and vhf radio control equipment (para 7-20) must be installed. The associated audio components (interphone control unit or intercom adapter, headset connectors, headset microphones, etc) are required for reception and transmission of vhf COMM signals. The King KY 195 or KY 195B vhf COMM transceiver may be used. The KY 195 and KY 195B are basically identical, except the frequency range of 118.00 to 135.95 MHz is covered with 720 channels having 25 kHz separation for the KY 195B, and with 360 channels having 50 kHz separation for the KY 195. Both the KY 195 and KY 195B comply with specific FAA Technical Standard Order (TSO) specifications. (Refer to manufacturer's publications. Table 2-12, Basic HMI.) Otherwise, KY 195 and KY 195B vhf COMM transceivers are directly interchangeable.

7-212. KING KY 195 VHF COMM TRANSCEIVER.

7-213. GENERAL. The King KY 195 vhf COMM transceiver (fig. 7-1 or 7-2) receives and transmits voice, amplitude-modulated, rh signals in the frequency range of 118.00 to 135.95 MHz. Dual, independent frequency selectors in the unit provide switch selection of either one of two previously chosen frequencies. The vhf COMM transceiver has no provisions for reception of vhf radio navigation signals. Except for these differences, the vhf COMM transceiver is basically identical to the King KX 170 or KX 175 vhf COMM/NAV transceiver (para 7-199).

7-214. SUNAIR ASB-125 SSB HF COMM INSTALLATION.

7-215. GENERAL. The Sunair ASB-125 Single Sideband (SSB) high frequency (hf) communications (COMM) installation provides long range air-to-ground and air-to-air two-way voice communication, in SSB or compatible amplitude-modulated (AM) modes of operation, within the high frequency radio range. The SSB hf COMM installation basically consists of a modified Sunair ASB-125 SSB hf COMM transceiver (para 7-215), a modified Sunair ASB-125 SSB hf COMM transceiver (para 7-217), a modified Spilsbury and Tindall Model AC-31 Mobile Antenna System (para 7-225), an hf COMM wire harness, hf receive rf cable, hf transmit rf cable, a 15-ampere SSB circuit breaker CB122, miscellaneous hardware and electrical interconnection wiring. The SSB hf COMM installation on a helicopter with instrument panel type A is also furnished with a Shure 488T (or equivalent) microphone and two each phone and microphone jacks. A factory installed provision installation for a helicopter with instrument panel type B basically consists of the installation equipment described, except the modified hf COMM transceiver, hf COMM receiver/exciter, and hf COMM power amplifier/supply are not furnished. Figure 7-31 shows electrical wiring interconnections for the SSB hf COMM installation on an early helicopter; wiring interconnection differences for a current helicopter are shown in figure 7-18.

NOTE: Refer to FCC requirements and manufacturer's publication on SSB hf COMM transceiver (table 2-12, Basic HMI) for information on legal requirements and limitations applicable to transmission using sideband and amplitude modulation (AM) modes of operation. An integrated interphone system and radio control equipment (para 7-148) must also be installed in a helicopter with instrument panel type B.

7-216. SUNAIR ASB-125 SSB HF COMM TRANSCEIVER.

7-217. GENERAL. The Sunair ASB-125 SSB hf COMM transceiver is single sideband (SSB), amplitude-modulated equipment that covers the high radio frequency range of 2 to 18 MHz using 10 channels single-frequency simplex, or 8 channels double-frequency simplex. The SSB hf COMM transceiver can operate in compatible amplitude modulation (AM) or SSB modes and transmit in either upper or lower sidebands. The SSB hf COMM transceiver requires approximately 7.5 amperes maximum of electrical power at 28 Vdc and provides approximately 30 watts average carrier output power for AM operation, or 125 watts for SSB operation, into a 50-ohm output impedance (antenna). The Sunair ASB-125 SSB hf COMM transceiver consists of two separate units, a Sunair RE-1200 hf COMM Receiver/Exciter (para 7-219) and a modified Sunair PA-1010B hf COMM Power Amplifier/Power Supply (para 7-223).

7-218. SUNAIR RE-1200 HF COMM RECEIVER/ EXCITER.

7-219. GENERAL. The Sunair RE-1200 hf COMM receiver/exciter is a solid-state device containing the operating controls and indicators, the receiver and exciter for the rf power amplifier of the Sunair PA-1010B hf COMM power amplifier/power supply (para 2-223) of the Sunair ASB-125 SSB hf COMM transceiver (para 2-217). The hf COMM receiver/exciter is flush mounted on the instrument panel (fig. 7-1 or 7-2).

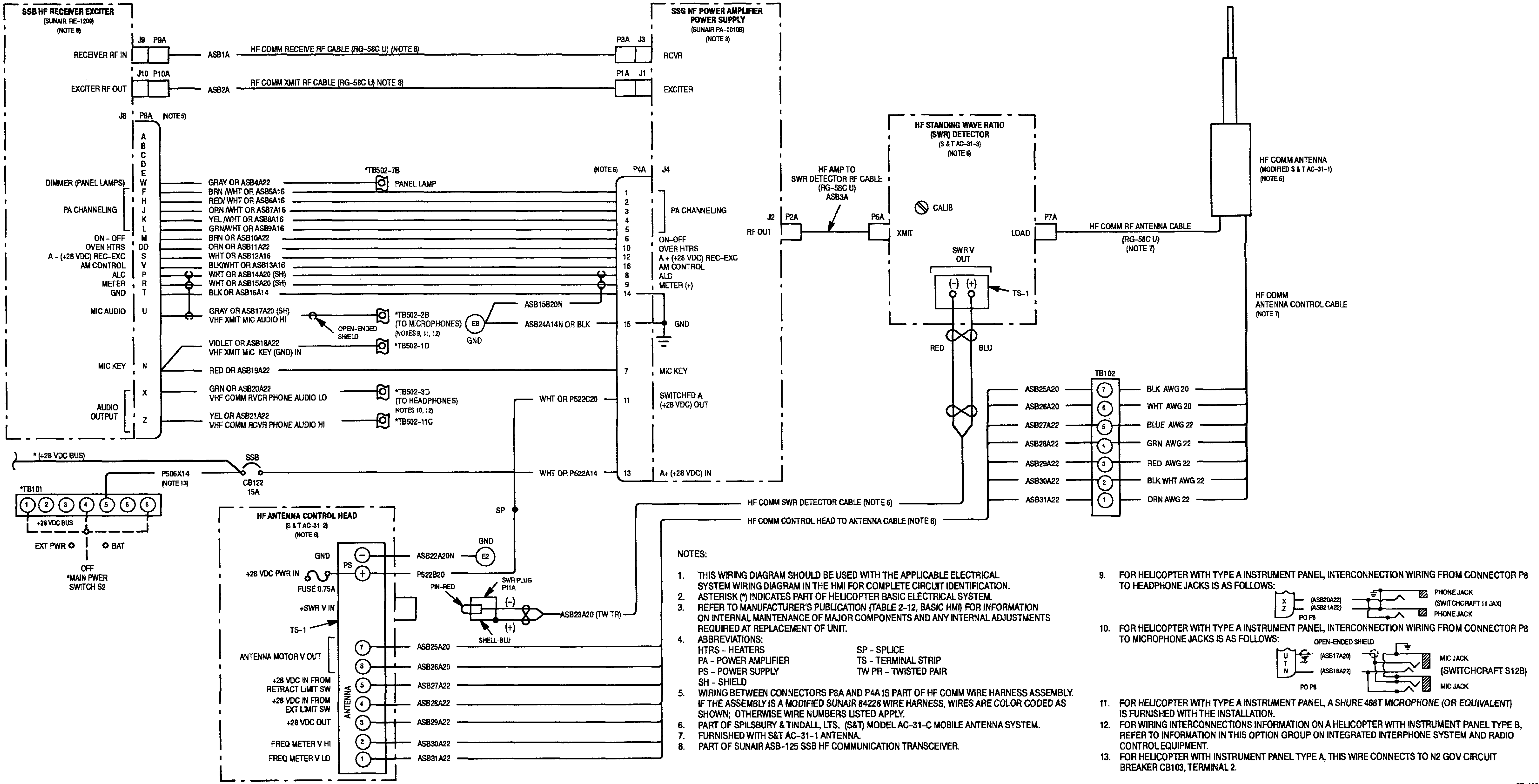
7-220. REMOVAL OF SUNAIR RE-1200 HF COMM RECEIVER/EXCITER.

a. Check that all electrical power is OFF.
b. Gain access to end of hf COMM receiver/exciter (fig. 7-1 or 7-2) by removing instrument panel side fairings (Section 2, Basic HMI).
c. Disconnect connectors of hf COMM receive and transmit rf cables from two connectors on side of hf COMM receiver/exciter.
d. Loosen and remove screws securing hf COMM receiver/exciter to equipment dust cover inside instrument console; remove hf COMM receiver/exciter.

NOTE: The following steps provide instructions for removal of dust cover from instrument console.

e. Remove hardware securing dust cover to support at underside of dust cover on instrument panel, and to bracket at side of dust cover.
f. Detach electrical wiring connector from side of dust cover.
g. Remove dust cover from instrument console.

7-221. INSTALLATION OF SUNAIR RE-1200 HF COMM RECEIVER/EXCITER. Install the Sunair RE-1200 hf COMM receiver/exciter (fig. 7-1 or 7-2) in reverse order of removal (para 7-220). See figure 7-31 for wiring interconnections.



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. ASTERISK (*) INDICATES PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. REFER TO MANUFACTURER'S PUBLICATION (TABLE 2-12, BASIC HMI) FOR INFORMATION ON INTERNAL MAINTENANCE OF MAJOR COMPONENTS AND ANY INTERNAL ADJUSTMENTS REQUIRED AT REPLACEMENT OF UNIT.
4. ABBREVIATIONS:
   HTRS - HEATERS
   PA - POWER AMPLIFIER
   PS - POWER SUPPLY
   SH - SHIELD
   SP - SPLICE
   TS - TERMINAL STRIP
   TW PR - TWISTED PAIR
5. WIRING BETWEEN CONNECTORS P8A AND P4A IS PART OF HF COMM WIRE HARNESS ASSEMBLY. IF THE ASSEMBLY IS A MODIFIED SUNAIR 84228 WIRE HARNESS, WIRES ARE COLOR CODED AS SHOWN; OTHERWISE WIRE NUMBERS LISTED APPLY.
6. PART OF SPILSBURY & TINDALL, LTS. (S&T) MODEL AC-31-C MOBILE ANTENNA SYSTEM.
7. FURNISHED WITH S&T AC-31-1 ANTENNA.
8. PART OF SUNAIR ASB-125 SSB HF COMMUNICATION TRANSCEIVER.
9. FOR HELICOPTER WITH TYPE A INSTRUMENT PANEL, INTERCONNECTION WIRING FROM CONNECTOR P8 TO HEADPHONE JACKS IS AS FOLLOWS:
10. FOR HELICOPTER WITH TYPE A INSTRUMENT PANEL, INTERCONNECTION WIRING FROM CONNECTOR P8 TO MICROPHONE JACKS IS AS FOLLOWS:
11. FOR HELICOPTER WITH TYPE A INSTRUMENT PANEL, A SHURE 488T MICROPHONE (OR EQUIVALENT) IS FURNISHED WITH THE INSTALLATION.
12. FOR WIRING INTERCONNECTIONS INFORMATION ON A HELICOPTER WITH INSTRUMENT PANEL TYPE B, REFER TO INFORMATION IN THIS OPTION GROUP ON INTEGRATED INTERPHONE SYSTEM AND RADIO CONTROL EQUIPMENT.
13. FOR HELICOPTER WITH INSTRUMENT PANEL TYPE A, THIS WIRE CONNECTS TO N2 GOV CIRCUIT BREAKER CB103, TERMINAL 2.

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Figure 7–31. Sunair ASB–125 SSB HF Communications (COMM) Installation (Early Configuration)

Refer to manufacturer's publication (table 2-12, Basic HMI) for internal sidetone adjustment required at installation or replacement of unit. Instructions for adjustment of intercom sidetone level on helicopter with instrument panel type B are provided in paragraph 7-153, and in paragraph 7-25 for helicopter with instrument panel type A. After installation, check hf COMM installation for correct operation.

NOTE: Prior to installation of new dust cover on receiver/exciter for helicopter with instrument panel type B, remove four dimples on side of dust cover by cutting 1/2-inch-diameter hole through each dimple. At installation, make sure that hf receive and transmit cable connectors are connected correctly. When unit is viewed from rear, connector for hf COMM receive rf cable is on right, and connector for hf COMM transmit rf cable is on left.

7-222. SUNAIR PA-1010B HF COMM POWER AMPLIFIER/POWER SUPPLY.

7-223. GENERAL. The Sunair PA-1010B hf COMM power amplifier/power supply contains the rf driver amplifier, rf power amplifier and the power supply for the Sunair ASB-125 SSB hf COMM transceiver (para 2-215). The hf COMM power amplifier/power supply amplifies hf radio signals from the hf COMM receiver/exciter (para 2-217) and provides power required by the vhf COMM receiver/exciter. The hf COMM power amplifier/power supply is mounted on an amplifier installation bracket in the right avionics compartment below the pilot's compartment floor (fig. 7-32).

NOTE: The hf COMM power amplifier/power supply is modified to reinforce the dust cover and for side mounting for the installation.

7-224. REMOVAL OF SUNAIR PA-1010B HF COMM POWER AMPLIFIER/POWER SUPPLY.

a. Check that all electrical power is OFF.

b. Gain access to hf COMM power amplifier/power supply (fig. 7-32) in the right avionics compartment through pilot's floor door (Section 2, Basic HMI).

c. Disconnect electrical wiring and rf cable connectors from forward end of hf COMM power amplifier/power supply.

d. Loosen wingnut securing side-mounting bracket on power amplifier/power supply to shock mount.

e. Lift and remove power amplifier/power supply from shock mount and out of avionics compartment.

7-225. INSTALLATION OF SUNAIR PA-1010B HF COMM POWER AMPLIFIER/POWER SUPPLY. Install hf COMM power amplifier/power supply in reverse order of removal (para 2-224). At replacement, side-mounting bracket must be installed on replacement unit prior to installation. After installation, check hf COMM installation for correct operation.

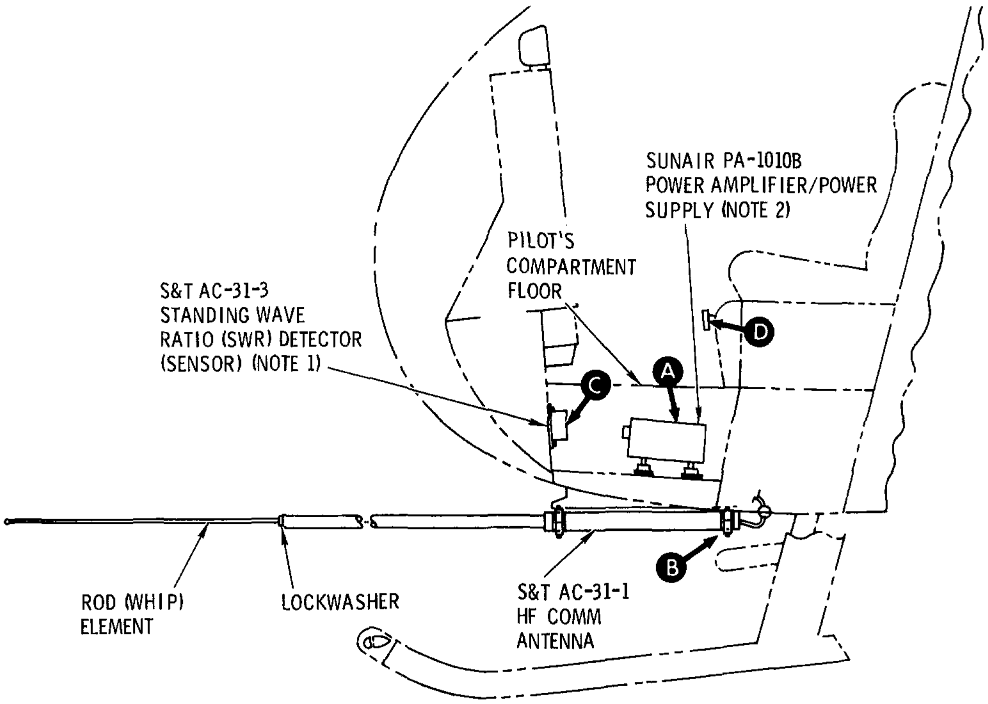
NOTE: For a replacement unit not previously modified, chassis and dust cover are to be modified and side mounting plate is to be attached as on original unit. Or chassis is to be modified and original cover with side mounting plate is to be installed on replacement unit.

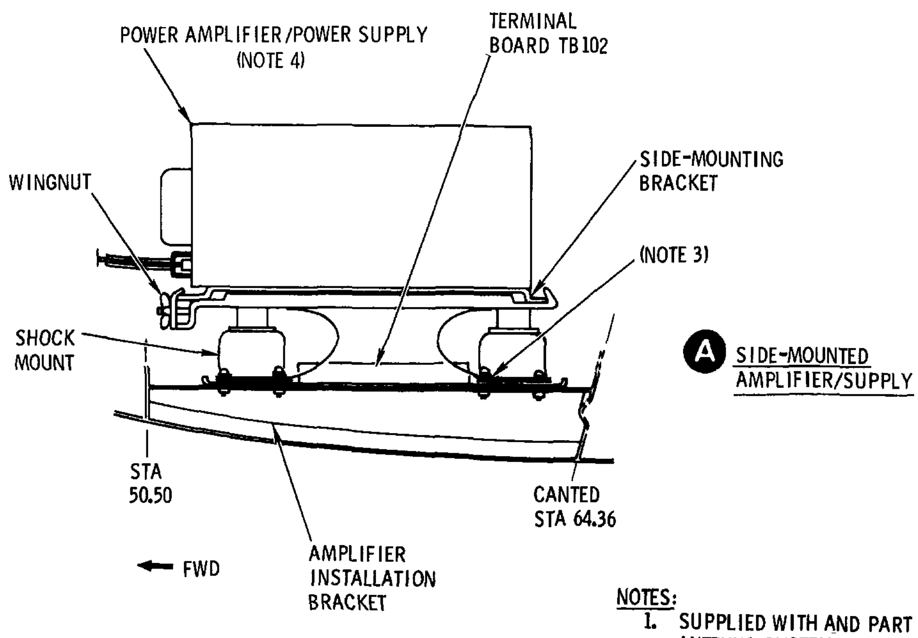
7-226. SPILSBURY AND TINDALL MODEL AC-31-C MOBILE HF ANTENNA SYSTEM.

7-227. GENERAL. The Spilsbury and Tindall (S & T) AC-31-C hf antenna system is the hf COMM antenna system of the Sunair ASB-125 SSB hf COMM installation (para 7-215). The hf COMM antenna system consists of a modified S & T AC-31-1 tuneable hf COMM antenna (fig. 7-32), S & T AC-31-2 hf COMM antenna control head (fig. 7-1 or 7-2), S & T AC-31-3 hf COMM standing wave ratio (swr) detector (fig. 7-32), hf COMM amplifier to swr detector rf cable, hf COMM rf antenna cable, hf COMM receive rf cable, hf COMM transmit rf cable, hf COMM control head to antenna control cable and hf COMM swr detector cable. The hf COMM antenna system couples hf radio signals to and from the hf COMM power amplifier/power supply of the hf COMM transceiver (para 7-217) and provides a tuneable antenna to receive and radiate the hf radio signals. The hf COMM antenna system requires up to a maximum of approximately 0.75 ampere electrical current at 28 Vdc.

7-228. MODIFIED S & T AC-31-1 HF COMM ANTENNA.

7-229. GENERAL. The modified S & T AC-31-1 hf COMM antenna (fig. 7-32) is a 50-ohm, weatherproof, whip antenna, tuneable over the frequency range of 2.3 to 9.1 MHz. The hf COMM antenna has a power handling capacity of approximately 125 watts for SSB or 60 watts for AM. The hf COMM antenna is basically formed by an aluminum base assembly, fiberglass body and a





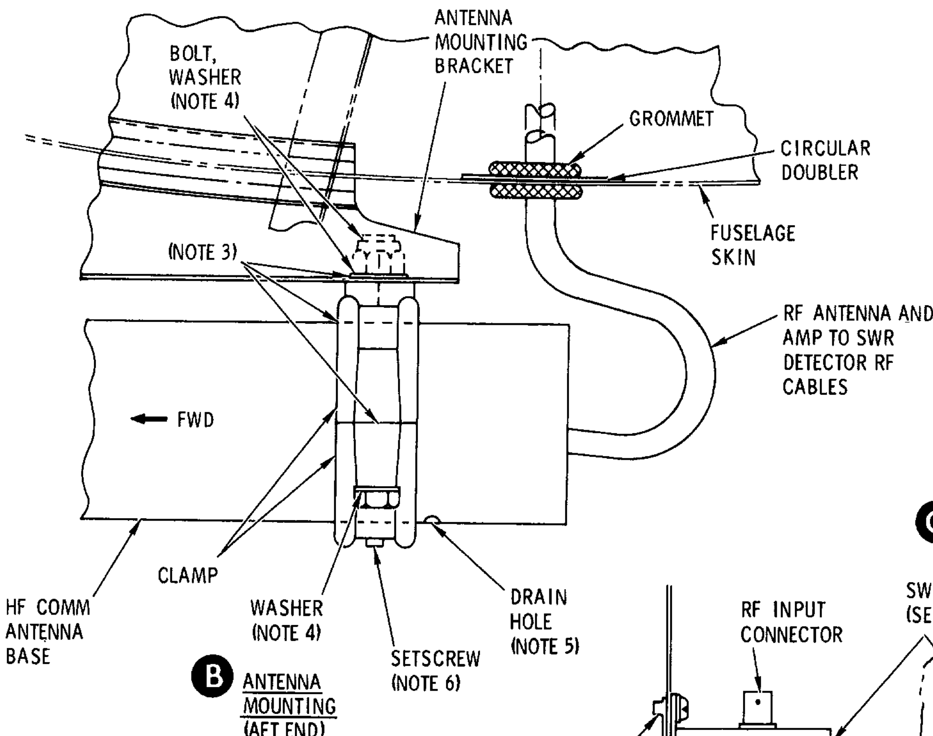
NOTES:

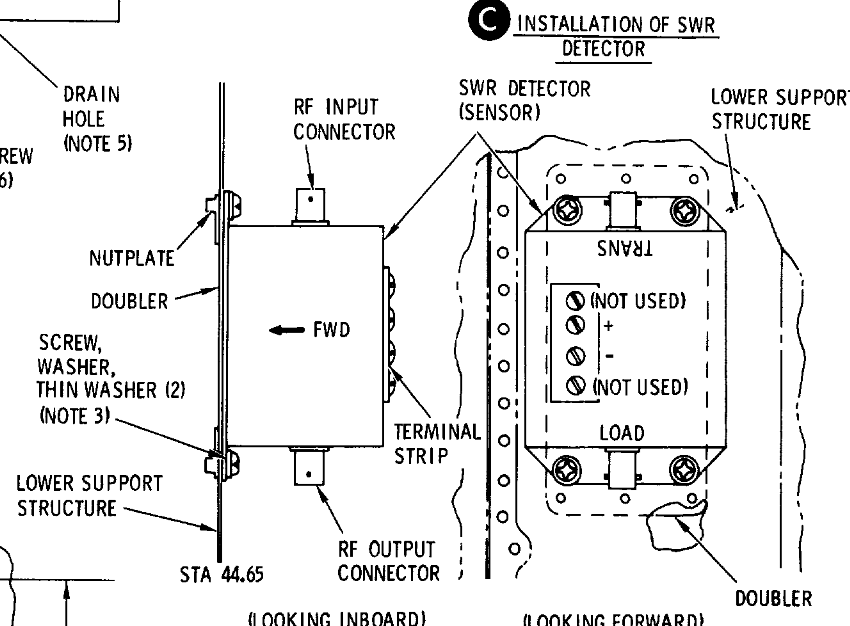
1. SUPPLIED WITH AND PART OF S&T AC-31-C HF COMM ANTENNA SYSTEM.
2. SUPPLIED WITH AND PART OF SUNAIR ASB-125 SSB HF COMM TRANSCEIVER.
3. STRUCTURAL ELECTRICAL BOND REQUIRED. (REFER TO SECTION 19, BASIC HMI.)

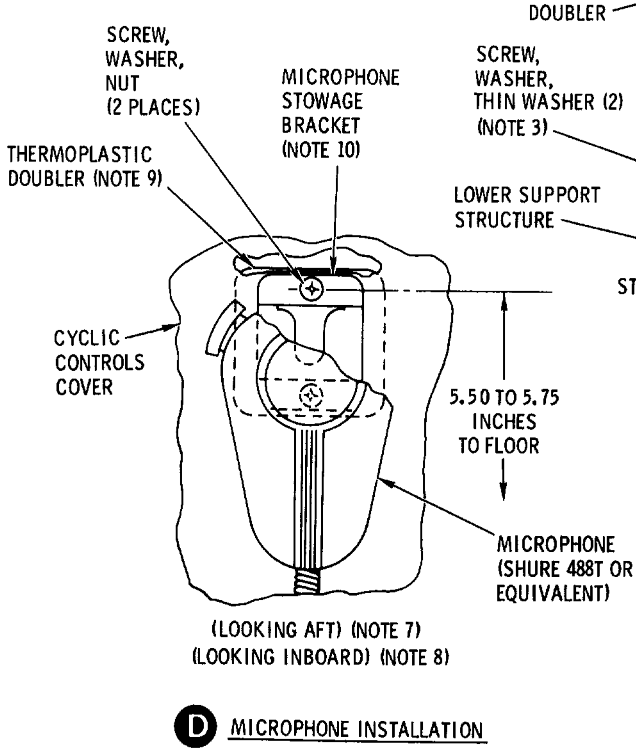
3A. AT REPLACEMENT, UNIT NOT PREVIOUSLY MODIFIED MUST BE MODIFIED FOR SIDE MOUNTING. (REFER TO TEXT.)

37-130-1A

Figure 7-32. Power amplifier/power supply, standing wave ratio (swr) detector and hf COMM antenna of hf COMM installation (sheet 1 of 2)







NOTES: (CONT)

4. ORIGINAL HARDWARE SUPPLIED WITH ANTENNA CLAMP IS REPLACED WITH HARDWARE SHOWN.
5. AT INSTALLATION, POSITION BASE SO THAT DRAIN HOLE IS DOWN.
6. TIGHTEN SETSCREW TO PROVIDE STRUCTURAL ELECTRICAL BOND BETWEEN ANTENNA BASE AND CLAMP.
7. FOR HELICOPTER WITH INSTRUMENT PANEL TYPE B.
8. ROTATED 90° COUNTERCLOCKWISE FOR HELICOPTER WITH INSTRUMENT PANEL TYPE A.
9. BONDED TO COVER PANEL WITH TETRAHYDROFURAN (ITEM 46, TABLE 2-4, BASIC HMI) OR EQUIVALENT (ITEMS 38 OR 39).
10. FURNISHED WITH MICROPHONE.

37-130-2

Figure 7-32. Power amplifier/power supply, standing wave ratio (swr) detector and hf COMM antenna of hf COMM installation (sheet 2 of 2)

42 inch-long rod (whip) element. An hf COMM rf antenna cable and an hf COMM antenna control cable are furnished with the antenna. High frequency radio signals are routed to and from the hf COMM antenna through the hf COMM amplifier to swr detector cable, hf COMM swr detector (para 7-235) and hf COMM rf antenna cable. The hf COMM antenna control head (para 7-230) controls a dc tuning motor in the antenna base. The base is clamped to the underside of the hf COMM antenna mounting bracket at the right forward underside of the fuselage structure below the pilot's compartment, with the whip element extending forward.

7-230. MAINTENANCE OF MODIFIED S & T AC-31-1 HF COMM ANTENNA. When maintaining the hf COMM antenna comply with the following.

a. Make sure electrical bonding requirements shown in figure 7-32 are met.

b. Be sure that drain hole in antenna base is positioned down.

c. If replaced, reuse hardware shown in figure 7-30 in place of hardware supplied with antenna.

d. Electrical wiring interconnections for the antenna are shown in figure 7-31.

7-231. S & T AC-31-2 HF COMM ANTENNA CONTROL HEAD.

7-232. GENERAL. The S & T AC-31-2 hf COMM antenna control head (fig. 7-1 or 7-2), mounted on the instrument panel left side fairing, is a solid-state device used to tune the hf COMM antenna (para 7-229) to the frequency of the hf COMM transceiver (para 7-217). A meter on the face of the unit provides a visual indication for tuning using switches on the unit. The hf COMM antenna control head is secured to upper and lower mounting brackets inside a thermoplastic cover that is bonded to the left side fairing.

7-233. REMOVAL OF S & T HF COMM ANTENNA CONTROL HEAD.

a. Check that all electrical power is OFF.

b. Loosen four screws securing front panel of hf antenna control head to mounting brackets inside cover.

c. Loosen and remove two screws securing top and bottom of control head to mounting brackets.

d. Pull control head out of cover and disconnect electrical wiring from terminal strip TS-1 on control head. Tag-identify wiring for reinstallation.

7-234. INSTALLATION OF S & T HF COMM ANTENNA CONTROL HEAD. Install hf COMM antenna control head (fig. 7-1 or 7-2) in reverse order of removal (para 2-233). Figure 7-31 shows electrical wiring interconnections for hf COMM antenna control head. At replacement, make sure that a GE #327 (24V dc) lamp is installed in antenna control head and refer to manufacturer's publication (table 2-12, Basic HMI) on adjustments necessary for swr meter calibration, adjustment of motor tuning speed, etc. After installation, use control head to tune hf COMM antenna (manufacturer's publication) and check hf COMM installation for correct operation.

7-235. S & T AC-31-3 HF COMM STANDING WAVE RATIO (SWR) DETECTOR.

7-236. GENERAL. The S & T AC-31-3 hf COMM swr detector (sensor), a solid-state device, is mounted to a doubler on the lower support structure for the instrument console (fig. 7-32). The hf COMM swr detector senses standing wave voltage on the hf COMM antenna cable for application to and use by the hf COMM antenna control head (para 2-232) for tuning the hf COMM antenna.

7-237. MAINTENANCE OF S & T AC-31-3 HF COMM SWR DETECTOR. When maintaining hf COMM swr detector, comply with the following.

a. See figure 7-32 for installation and mounting information.

b. At replacement or installation, observe the structural electrical bond requirements shown in figure 7-32.

c. At replacement, refer to manufacturer's publication (table 2-12, Basic HMI) for internal adjustment required to hf COMM antenna control head (para 7-232) for swr meter calibration.

d. After installation, tune hf COMM antenna (manufacturer's publication) and check operation of hf COMM installation.

7-238. KING KT 76 TRANSPONDER INSTALLATION.

7-239. GENERAL. The King KT 76 Transponder installation consists of a King KT 76 Transponder, King KA 48 Transponder Antenna, two transponder antenna cables, transponder unit mounting bracket, interconnecting wiring, a circuit breaker and miscellaneous mounting hardware. The KT 76 Transponder and KA 48 Transponder Antenna are components of the King KT 76 Transponder Equipment. The transponder system provides automatic radar identification of the helicopter to any interrogating ground station. The system furnishes helicopter identification in Mode A, Special Pulse Identification (SPI) pulse information, to all suitably equipped interrogating stations within operational range of the system. The equipment also contains provisions for altitude reply codes in operation Mode C, to furnish an interrogating station with helicopter altitude information, when additional altitude digitizer equipment (not furnished) is installed. The transponder receives

+28 Vdc from the main electrical system when the XPDR (transponder) circuit breaker on the instrument panel is ON. The following paragraphs provide maintenance information for the transponder system relating to system installation in the helicopter. For maintenance information on transponder system components beyond the scope of coverage in following paragraphs (such as transponder repairs, internal schematics, etc) refer to manufacturer's publications (table 2-12, Basic HMI).

7-240. MAINTENANCE OF KING KT 76 TRANSPONDER INSTALLATION. For maintenance of the King KT 76 ATC system installation, note the following:

a. The King KT 76 ATC transponder is internally protected with a 2 ampere fuse.

b. For all internal repairs to transponder, refer to manufacturer's publications (table 2-12, Basic HMI).

c. For electrical system interconnection wiring information, see the applicable electrical system wiring diagram in Section 20 of the Basic HMI.

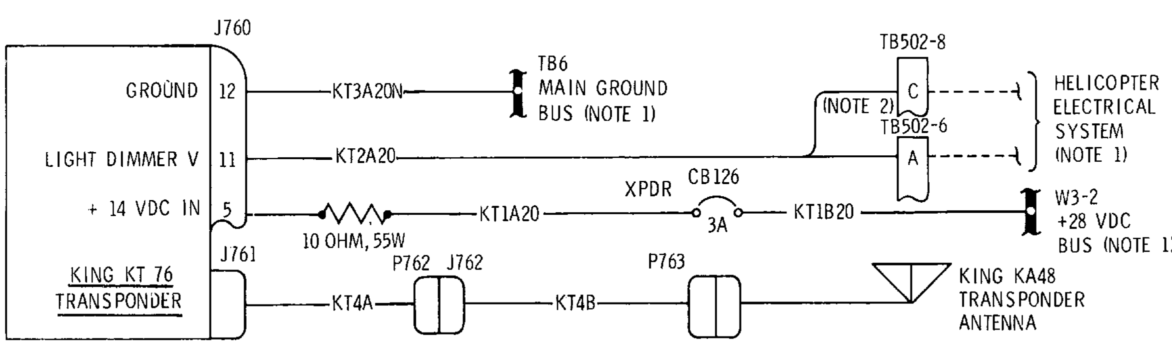
d. Figure 7-33 provides a wiring diagram for the system installation.

e. For transponder removal and replacement information, refer to manufacturer's publications.

f. Transponder unit to structure electrical bonding (grounding) is required.

7-241. KING KT 76 TRANSPONDER.

7-242. GENERAL. (See fig. 7-1.) The King KT 76 Transponder receives radio frequency (rf) interrogating signals from the King KA 48 Transponder Antenna through the transponder antenna cable and automatically transmits coded reply rf signals in answer through the same antenna cable and antenna. The transponder contains a receiver-transmitter that receives and transmits rf signals in the frequency band; the receiver at 1030 MHz and the transmitter at 1090 MHz. The transponder is internally fused and requires approximately 1.3 amperes of current (maximum) at +28 Vdc. Transmitter power is 200 watts (peak) minimum and antenna output impedance is 50 ohms. The transponder is a completely solid state device, except for the transmitter oscillator, and contains controls and indicators that protrude through the transponder panel at the lower center of the helicopter instrument panel. A transponder mounting rack and bracket secures the transponder inside the instrument panel console. Transponder internal panel light dimming is controlled by external dimming circuits (Section 17, Basic HMI). A heat shield on the aft side of the transponder houses a 10-ohm, wire-wound, 55-watt resistor that drops +28 Vdc supply voltage to +14 Vdc for transponder operation. The transponder weight is approximately 3.0 pounds, including mounting rack.



NOTES:
1. THIS DIAGRAM SHOULD BE USED WITH APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. APPLIES FOR EARLY HELICOPTER.

37-146

Figure 7-33. King KT 76 transponder installation - wiring diagram

7-243. KING KA 48 TRANSPONDER ANTENNA.

7-244. GENERAL. The King KA 48 transponder antenna is an exterior-mounted, quarter-wave rod antenna. The King KA 48 antenna is omnidirectional, vertically polarized and is designed to receive and radiate rf signals at the transponder receiving and transmitting frequencies (para 7-240). An rf coaxial connector on the base of the antenna is used for connection of the transponder antenna cable. The antenna is mounted on the fuselage left underside below the pilot's compartment. For other information on the antenna, refer to manufacturer's publications (table 2-12, Basic HMI).

7-245. KING KT 76 TRANSPONDER ANTENNA CABLES.

7-246. GENERAL. Two system antenna cables connect the King KT 76 transponder to the King KA 48 transponder antenna. Both cables are RG-58C/U, 50-ohm rf coaxial cables, terminated on each end with an rf coaxial connector. One 6-inch long antenna cable connected to the aft end of the transponder interconnects to the second 78-inch long antenna cable that connects the transponder antenna.

OPTION GROUP 8
LANDING GEAR EQUIPMENT

8-1. EMERGENCY FLOTATION EQUIPMENT.

8-2. GENERAL. Emergency flotation equipment for either standard or extended height landing gear may be installed on the helicopter (fig. 8-1). Each consists of a collapsed float equipped with an emergency inflation system attached to each landing gear skid. The floats may be inflated in flight by the pilot. The floats are fully inflated in approximately 5 seconds. The electrically controlled inflation system includes a self-test capability to provide the pilot with visual indication of inflation reliability. When inflated, emergency flotation equipment permits landing on both land and water. Installed stowed flotation equipment does not restrict normal land operation of the helicopter. The inflated floats will support the helicopter on water at maximum gross weight. After emergency inflation, the emergency inflation systems may be recharged (serviced with full compressed air cylinders) and the floats may be repackaged to the streamlined stowed configuration for reuse (fig. 8-2). All information in the following paragraphs applies to each type of emergency floats unless specifically indicated otherwise.

NOTE: If the helicopter is equipped with either a cargo hook or a hoist or both, optional cyclic stick grip (Option Group 5) must be installed. Refer to the wiring diagrams in figures 8-3 and 8-4 for wiring differences.

a. Standard Height Landing Gear. The standard height landing gear emergency floation equipment (fig. 8-1) consists of two inflatable emergency floats, electrically controlled inflation equipment, four narrow chord landing gear fairings, extended landing gear skid tubes with heavy duty abrasion strips, and landing gear skid tube extensions. Nutplates on each skid tube and an extension provide for float attachment. A cabin entry step is not used.

b. Extended Height Landing Gear. The extended height landing gear flotation equipment is the same as the standard emergency flotation equipment except for lengthened landing gear struts and fairings. A cabin entry step is also used with the extended height landing gear. Refer to paragraph 8-18 for information on extended landing gear fairings.

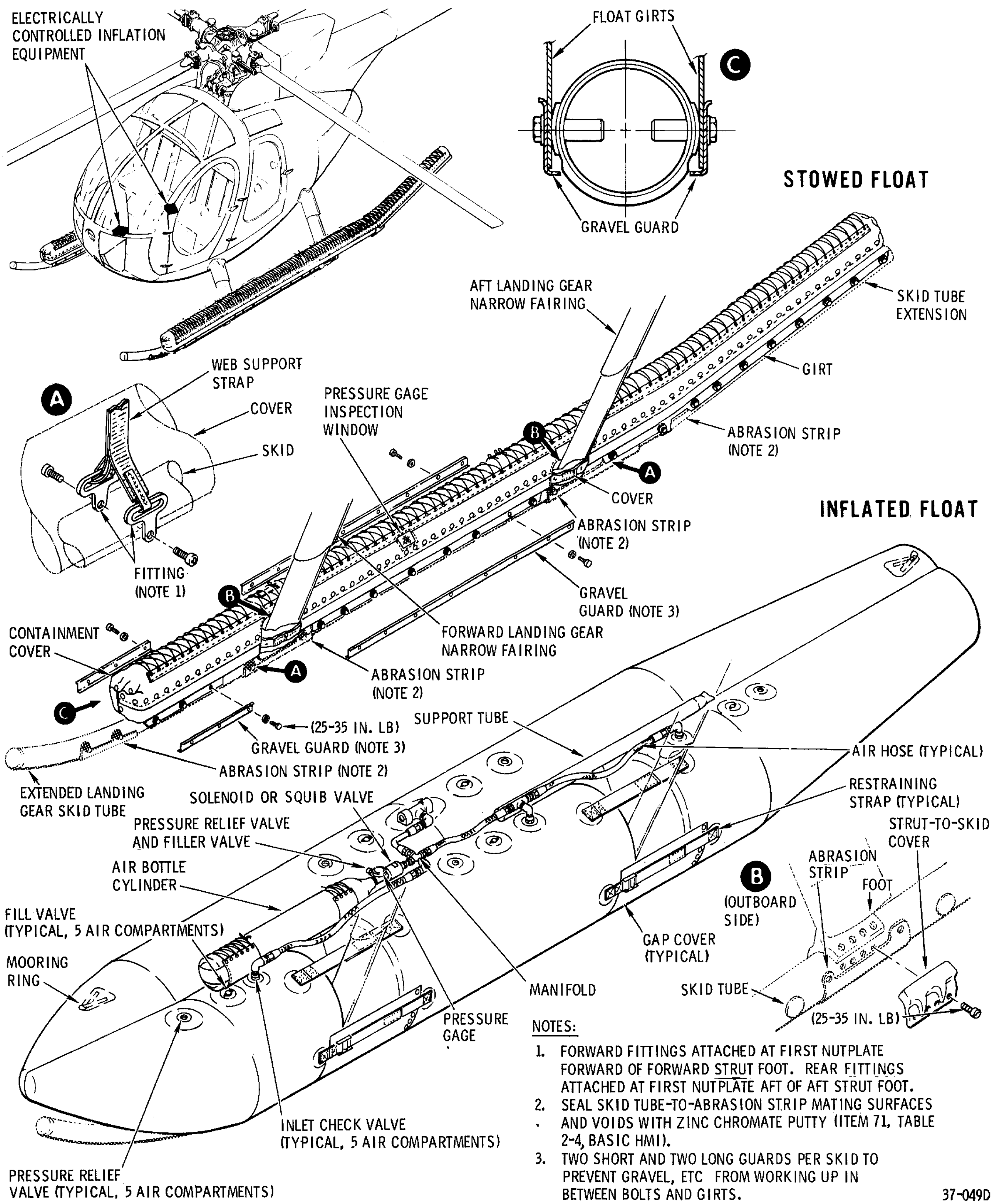
c. Standard Height Landing Gear (Short Floats). Helicopters may also be equipped with emergency floats attached to standard landing gear skid tubes without skid tube extensions. Except for float folding (fig. 8-2) maintenance information is identical to both the standard and extended emergency float installations.

8-3. TROUBLESHOOTING OF EMERGENCY FLOTATION EQUIPMENT. Refer to table 8-1.

8-4. EMERGENCY INFLATION SYSTEM.

8-5. GENERAL. The emergency inflation system (fig. 8-1) consists of a charged 425-cubic-inch compressed air reservoir (cylinder), air hoses, valves and associated components for inflation of the emergency floats. A complete emergency inflation system is installed on and is part of each float. When actuated by inflation system electrical control equipment (para 8-24), a solenoid valve or squib valve (refer to paragraph 8-7) attached to the air cylinder releases compressed air for distribution through the air hoses and inlet check valves for the five float compartments. A relief valve on each float compartment opens if compartment pressure exceeds 5 ±0.5 psi. The air cylinder operating pressure is between 3000 and 3575 psig at 75° ±10° F; 3500 ±75 psig at 75° ±10° F is preferred. The manifold is attached to the air cylinder along with an indicating pressure gage, filler valve and a pressure relief valve. The air cylinder relief valve operates at and above 4250 ±250 psig. Detachable rubber boots cover the filler and pressure relief valves for protection against chafing. The air cylinder may be detached from the float for servicing. (To provide early type ground handling wheel assemblies with protective padding and fender guards to help prevent chafing and damage to floats and/or shearing of bolts attaching floats and gravel guards to landing gear skids, refer to Hughes Notice HN-143.)

8-6. REPLACEMENT AND SERVICING OF EMERGENCY AIR CYLINDER. Due to temperature rise (maximum allowable 250° F) during servicing, detaching the air cylinder is the preferred method. Nominal air cylinder pressure is 3500 psig at room temperature (75° F). Minimum cylinder pressure at 75° F is 3000 psig. As outside air temperature will affect the day to day gage reading, temperature versus pressure readings are important during servicing or inspection of the cylinder air pressure. The indicated pressure on the gage will increase or decrease 6.6 psig per 1° F increase or decrease,

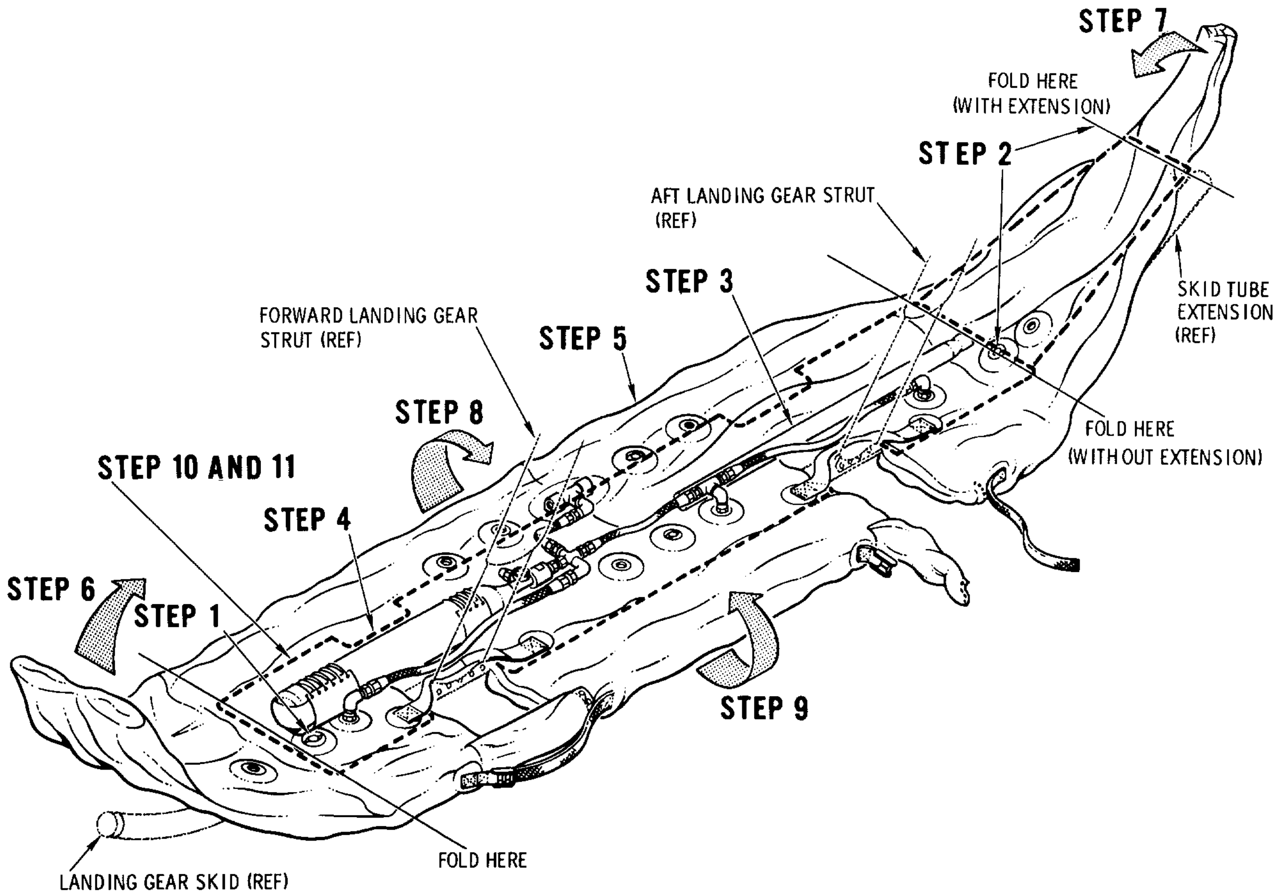


NOTES:

1. FORWARD FITTINGS ATTACHED AT FIRST NUTPLATE FORWARD OF FORWARD STRUT FOOT. REAR FITTINGS ATTACHED AT FIRST NUTPLATE AFT OF AFT STRUT FOOT.
2. SEAL SKID TUBE-TO-ABRASION STRIP MATING SURFACES AND VOIDS WITH ZINC CHROMATE PUTTY (ITEM 71, TABLE 2-4, BASIC HMI).
3. TWO SHORT AND TWO LONG GUARDS PER SKID TO PREVENT GRAVEL, ETC FROM WORKING UP IN BETWEEN BOLTS AND GIRTS.

37-049D

Figure 8-1. Emergency flotation equipment



STEP 1 OPEN ALL THE FILL VALVES OF THE INFLATED FLOAT AND COMPRESS THE CELLS LIGHTLY BY HAND SO THAT THE FLOAT IS FLAT AND AS SMOOTH AS POSSIBLE.

STEP 2 FOR A FLOAT WITH SKID TUBE EXTENSIONS, PLACE FOLD AT AFT END OF SKID EXTENSION THEN EVACUATE THE AFT OUTBOARD AIR COMPARTMENT (CELL) UNTIL THE FOLD IS FIRM AND SHARP. CLOSE THE FILL VALVE. FOR A FLOAT WITHOUT EXTENSION, PLACE A FOLD IN THE AFT OUTBOARD CELL BETWEEN THE DOUBLE INLET CHECK VALVE AND FILL VALVE BY PUSHING THE UPPER SUPPORT TUBE AS HARD FORWARD AS POSSIBLE WHILE PRESSING THE SUPPORT TUBE FORWARD, THEN EVACUATE BEFORE CLOSING FILL VALVE.

STEP 3 WHILE PRESSING THE SUPPORT TUBE AND HOLDING FLOAT CENTER FORWARD AND DOWN, PLACE A FOLD IN THE INBOARD CENTER CELL BETWEEN THE INLET CHECK VALVE AND FILL VALVE REARRANGE THE AIR HOSE AS REQUIRED. STILL KEEPING THE PRESSURE ON THE SUPPORT TUBE, EVACUATE FIRST THE CENTER CELL THEN THE AFT INBOARD CELL UNTIL THE FOLDS ARE SHARP AND THE SUPPORT TUBE IS FIRMLY HELD FROM MOVING AFT. CLOSE THE FILL VALVE.

STEP 4 POSITION AIR CYLINDER SNUG AGAINST THE OUTBOARD SIDE OF THE FORWARD STRUT. WHILE HOLDING THE CYLINDER IN THAT POSITION, EVACUATE THE FORWARD OUTBOARD CELL THEN THE FORWARD INBOARD CELL UNTIL THE CREASES ARE FIRM AND SHARP. CLOSE THE FILL VALVE.

STEP 5 RECHECK THE FLOAT MAKING SURE THAT IT IS AS FLAT AS POSSIBLE AND FREE OF ANY AND ALL AIRPOCKETS. DOUBLE CHECK THE FIRMNESS OF ALL CREASES AND RE-EVACUATE THE CELLS AS NECESSARY.
NOTE: ANY REMAINING AIR MAY CAUSE FLOAT OPENING AT ALTITUDE AND/OR DIFFICULTY IN PACKING.

STEP 6 FOLD FLOAT FORWARD AT AFT END. REPOSITION HOSES AS REQUIRED. STOWAGE COVER MUST BE OUTSIDE OF FOLD LINE.

STEP 7 FOLD FLOAT FORWARD AT AFT END OF SUPPORT TUBE END. REPOSITION AIR HOSES AS REQUIRED. STOWAGE COVER MUST BE OUTSIDE OF FOLD LINE.

STEP 8 ROLL AND FOLD LENGTH OF FLOAT TOWARDS CENTER. DO NOT COVER PRESSURE GAGE.

STEP 9 ROLL AND FOLD LENGTH OF FLOAT TOWARDS CENTER. FASTEN SNAPS STARTING AT FORWARD END. **ENSURE** THAT PRESSURE GAGE IS VISIBLE IN INSPECTION WINDOW. DO NOT FASTEN END COVER SNAPS.

STEP 10 TIGHTEN LACING. **ENSURE** THAT SNAP FASTENERS REMAIN CLOSED

STEP 11 SECURE END COVER SNAPS. ALL SNAP FASTENERS MUST BE USED.

37-058B

Figure 8-2. Emergency float folding

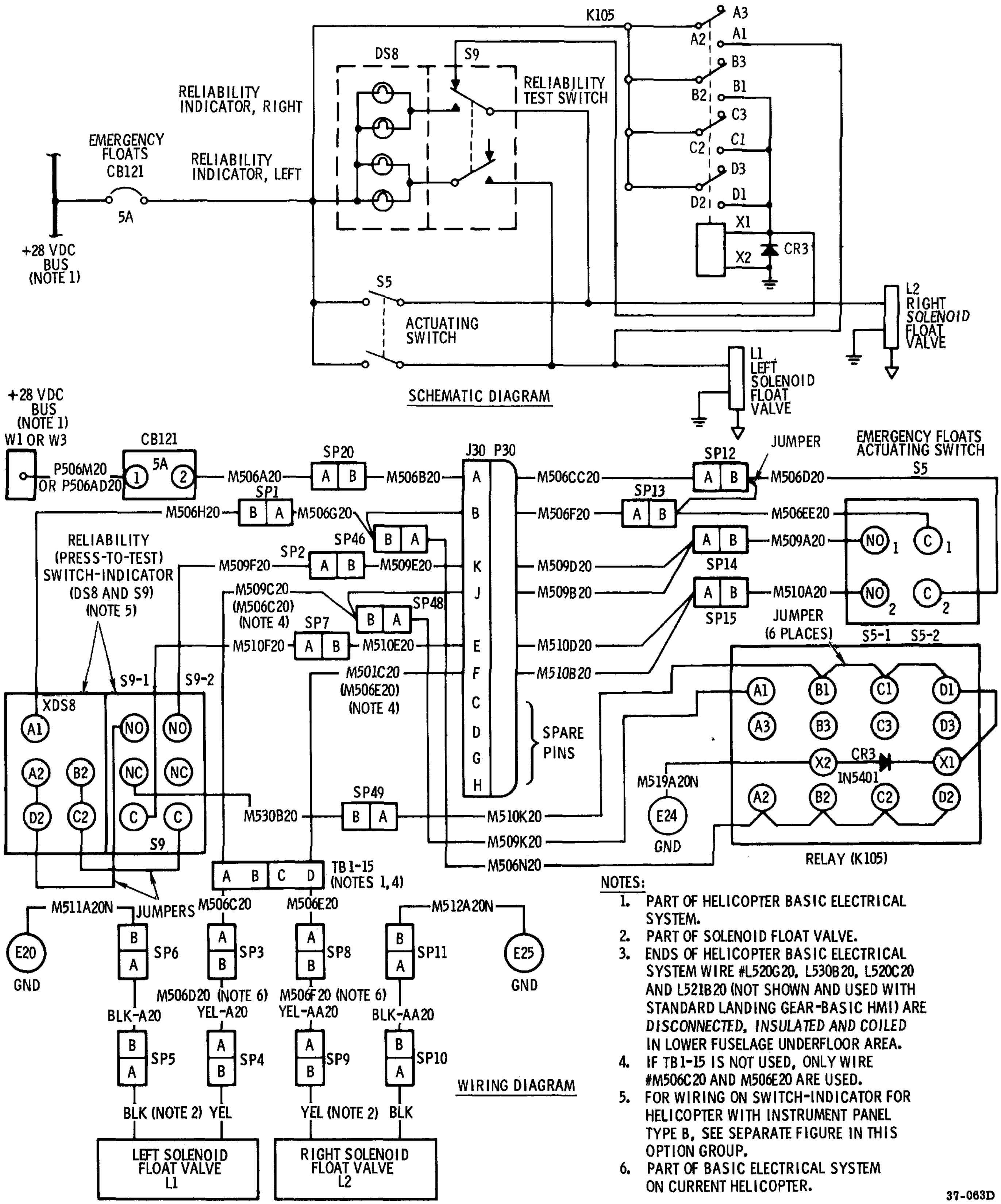
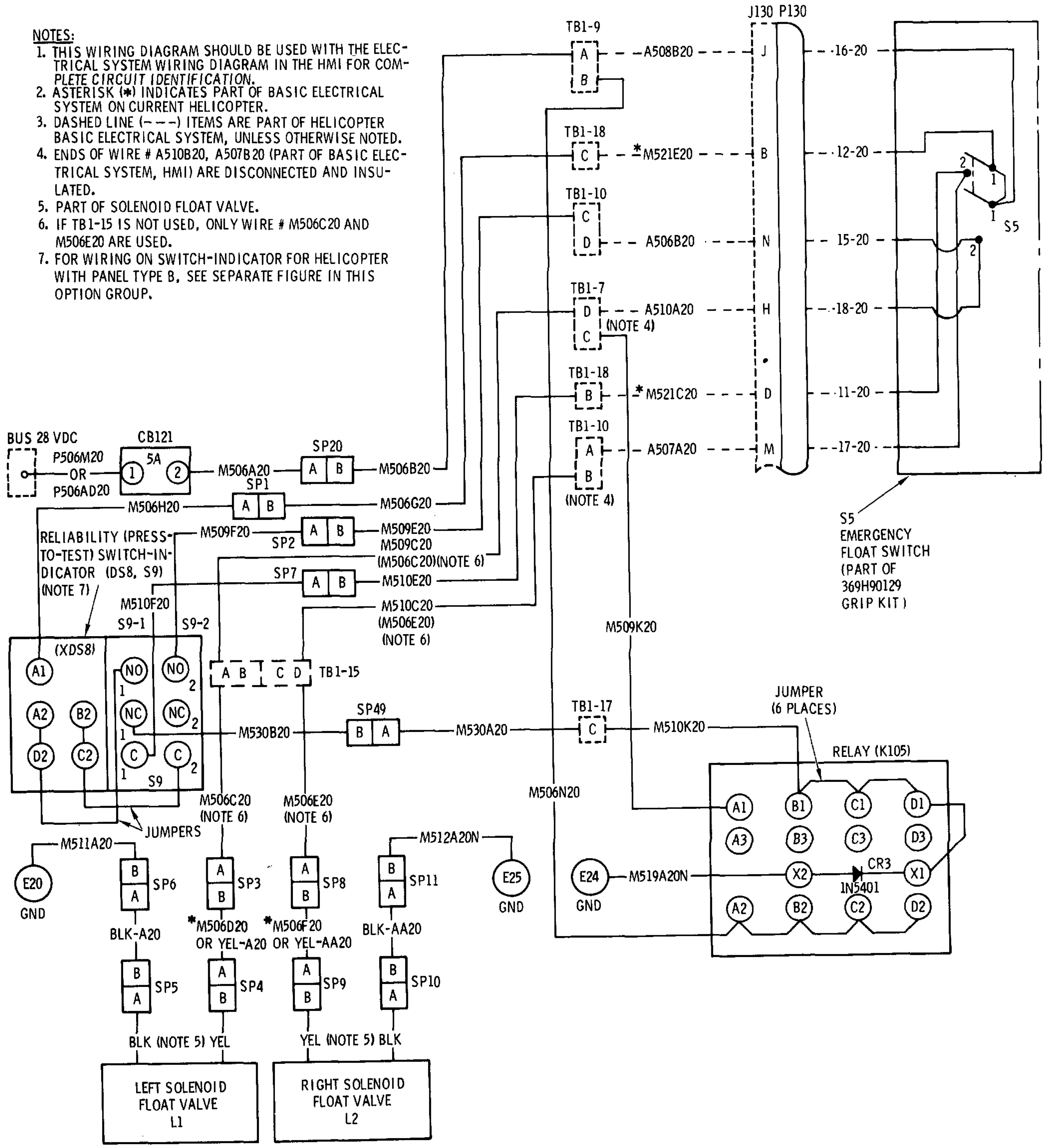


Figure 8-3. Emergency float inflation system wiring interconnection diagrams - solenoid valve (used with stick mounted actuating switch)

NOTES:
1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. ASTERISK (*) INDICATES PART OF BASIC ELECTRICAL SYSTEM ON CURRENT HELICOPTER.
3. DASHED LINE (– – –) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM, UNLESS OTHERWISE NOTED.
4. ENDS OF WIRE # A510B20, A507B20 (PART OF BASIC ELECTRICAL SYSTEM, HMI) ARE DISCONNECTED AND INSULATED.
5. PART OF SOLENOID FLOAT VALVE.
6. IF TB1-15 IS NOT USED, ONLY WIRE # M506C20 AND M506E20 ARE USED.
7. FOR WIRING ON SWITCH-INDICATOR FOR HELICOPTER WITH PANEL TYPE B, SEE SEPARATE FIGURE IN THIS OPTION GROUP.



37-096C

Figure 8-4. Emergency float inflation system wiring diagram - solenoid valve (used with optional 369H90129 grip assembly)

Table 8-1. Troubleshooting emergency flotation equipment

Symptom	Probable Trouble	Corrective Action
CAUTION: A charged float air cylinder must be discharged before the associated float valve is removed from the cylinder. Use care to prevent accidental float inflation.		
No reliability light indication; either left or right.	Burned out lamp.	Replace lamp.
	Defective connection or wiring.	Repair connection or wiring.
	Open solenoid in float valve.	Replace float valve.
No reliability light indication; both left and right.	Defective connection or wiring.	Repair connection or wiring.
Reliability light indication for both floats; neither float inflates.	Defective actuating switch.	Replace actuating switch.
	Defective actuating switch wiring.	Repair wiring.
Float leaks air.	Damaged float.	Repair float.

respectively, in cylinder air temperature. Slow variations in ambient air temperature will be reflected in the cylinder air temperature; however, it must be considered that direct or reflected solar radiation will result in higher pressure than would be anticipated for the existing ambient air temperature.

a. If float is stowed, unsnap containment cover (fig. 8-1) to extent required for access to air cylinder.

b. Remove the three air hoses at air manifold (fig. 8-1). Do not allow the manifold to turn when disconnecting the hoses.

NOTE: Do not remove solenoid (or squib) and relief valve assembly from the air cylinder.

c. Disconnect solenoid (or squib) valve electrical wiring knife splice at solenoid (squib).

d. Detach restraining lacing and remove air cylinder from float.

e. Recharge air cylinder with nitrogen (or compressed air) to between 3000 and 3500 psig at 75° F; 3500 psig at 75° F is preferred. Cool cylinder with water and charge slowly to maintain cylinder surface temperature below 250° F.

NOTE: The air cylinder may also be serviced by weight. When servicing by weight, use a scale and weigh the empty cylinder with attaching hardware installed. Charge the empty cylinder until a weight increase of 3. 7 to 4. 4 pounds is obtained; 4. 4 ±0. 1 pounds is preferred. When charging by weight, air temperature variation will have no affect. Observe cylinder cooling precaution.

f. Test for air leaks by submerging the cylinder manifold valve assemblies in water for not less than 10 minutes. After initial immersion, no air bubbles are permitted.

g. Dry with a clean lint-free cloth and then allow to air-dry completely.

h. Inspect the emergency inflation system (para 8-9).

i. Cover cylinder with bag and tie closure lacing.

j. Reinstall cylinder and bag on float; reconnect air hose fittings and solenoid/squib valve electrical wiring knife splice. The air cylinder must be positioned so that air hose connections place no strain on the solenoid/squib and the pressure gage is visible through the pressure gage inspection window when the floats are stowed.

k. Reinstall manifold cover.

l. Perform an inflation system electrical control equipment reliability test (para 8-27).

8-7. REPLACEMENT OF SOLENOID VALVE WITH SQUIB VALVE. Nonavailability from the manufacturer of Tavco PN 23111369 solenoid valve, in the emergency float inflation system, will necessitate its replacement at service life expiration with a Tavco squib valve. To accomplish this rework, remove the solenoid valve assembly and install Kit No. M50458. The kit includes both left hand and right hand valves; distinguish between the kit for valves with button-type cover and the kit for valves with sealed cover. The emergency float electrical system must also be rewired. The squib valve only must be replaced after each actuation of the squib valve assembly. Rework procedures follow.

a. Removal of solenoid valve.

(1) Turn off electrical power.

(2) Unpack emergency floats.

(3) Remove valve protector and unlace cylinder sling lacing cords. (Refer to figure 8-5.)

(4) Disconnect solenoid valve electrical wiring knife splice at solenoid.

(5) Loosen nut at outlet port of solenoid valve. Disconnect solenoid valve assembly from union by unscrewing cylinder and valve assembly in counterclockwise direction. Remove cylinder and valve assembly.

WARNING: Discharge cylinder with care to avoid injury to personnel from high-pressure air or flying debris.

(6) If cylinder is not empty, discharge as follows:

(a) Secure cylinder in chain vise or equivalent. Point filler valve outlet in safe direction.

(b) Engage one open-end wrench on filler valve body and a second wrench on nut; turn nut slowly counterclockwise two and one-quarter turns. Allow all pressure to escape. Check gage to verify absence of pressure in cylinder.

(7) Remove solenoid valve from cylinder. Discard solenoid valve and packing.

(8) Install new squib valve with packing on cylinder. Torque to 360 - 504 inch-pounds.

(9) Install Tavco fitting with packing on existing union.

(10) Recharge cylinder and test for air leaks.

(11) Install charge cylinder and squib valve assembly with packing on fitting.

b. *Rewire of electrical system.*

(1) Remove access panels and/or covers as necessary to expose emergency float wiring. (Refer to Basic HMI.)

(2) Remove all emergency float wiring except as noted in figure 8-6.

(3) Remove and discard relay installation, doubler and attaching hardware located on pilot's floor support, left bulkhead.

(4) Remove emergency float switch light assembly; install new switch light assembly.

(5) Install wiring per figure 8-6. Do not plug in electrical connectors until after electrical system check.

(6) Reinstall access panels and/or covers. (Refer to Basic HMI.)

(7) Turn on electrical power.

c. Inflation system electrical control equipment inspection.

(1) Test light.

(a) Check ship voltage with volt-ohmmeter (vom). Voltage should be 27.5 VDC.

(b) Open emergency float circuit breaker.

(c) Install one lead of 0.5 ohm ±5%, 10W resistor in pin A of left hand connector (P101). Connect one test lead of vom to other lead of resistor. Connect other test lead of vom to pin D of connector.

(d) Close emergency float circuit breaker.

(e) Press PRESS TO TEST switch and observe current reading on meter and brilliance of lamps. Current should be 75 milliamperes maximum and lamps should be fairly bright.

(f) Open emergency float circuit breaker.

(g) Remove meter and resistor from connector.

(h) Repeat steps (c) through (g) for right hand connector (P102).

(2) System.

(a) Ensure that circuit breaker is open and connectors are disconnected.

(b) Install one lead of 40 ohm ±1%, 20W resistor in pin A of left hand connector (P101) and install other lead of resistor in pin D of connector.

(c) Connect test leads of voltmeter across resistor.

(d) Close emergency float circuit breaker.

(e) Press firing switch on pilot's grip and observe voltage on meter. Voltage should be 25.5 VDC minimum.

(f) Open circuit breaker.

(g) Remove meter and resistor from connector.

(h) Repeat steps (b) through (g) for right hand connector (P102).

(3) Connect connectors to squib valves.

(4) Close emergency float circuit breaker.

(5) Press PRESS TO TEST switch and observe that lamps light.

(6) Open circuit breaker.

(7) Ensure that cylinder is positioned so that pressure gage is visible through inspection window when floats are stowed (pressure gage axis inclined outboard approximately 40 degrees).

(8) Repack emergency floats.

(9) Remove existing V_{NE} cards for solenoid valve, floats inflated (one) and install V_{NE} cards for squib valve, floats stowed and squib valve, floats inflated.

d. Replacement of actuated squib valve (sealed cover).

(1) Open manifold charge valve (fig. 8-7) to verify absence of pressure in the pressure vessel.

(2) Note orientation of squib with respect to pressure gage.

(3) Using X-acto knife, cut through black plastic cover all around valve body to manifold joint, exposing four screw heads near outlet port.

(4) Remove the four screws near the outlet port. Retain screws to use with new valve.

(5) Pull actuated valve straight off manifold until separated and discard.

(6) Lightly lubricate O-ring on new valve with MIL-G-4343 or equivalent pneumatic grease.

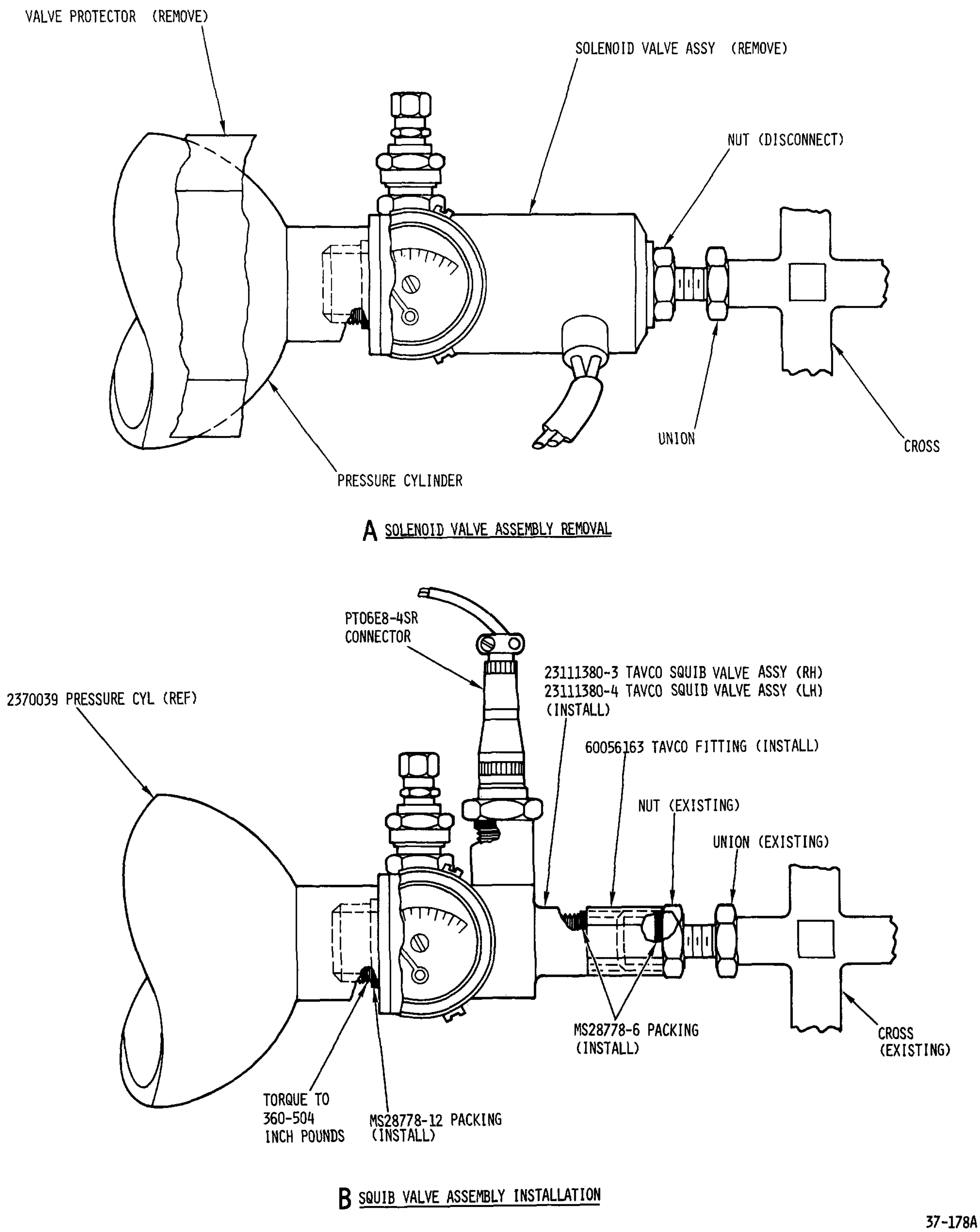
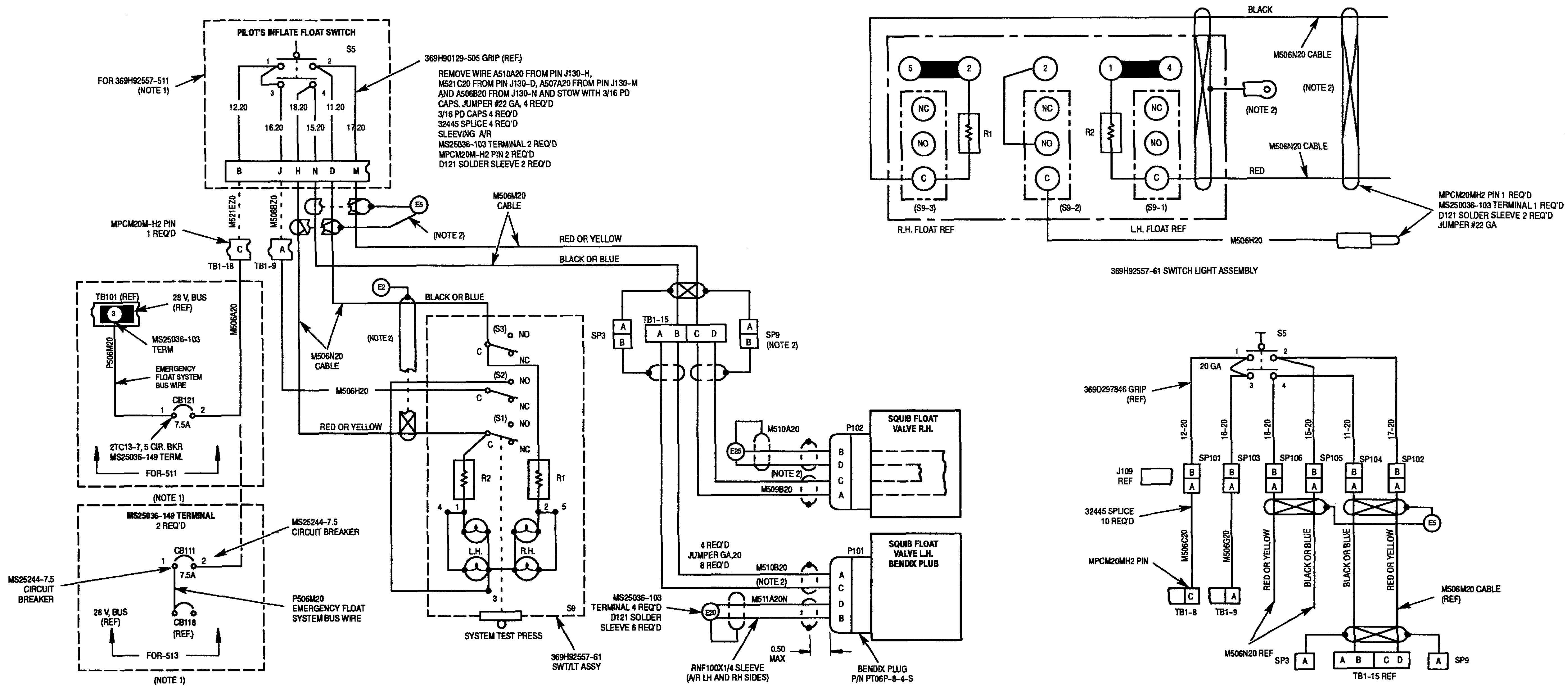


Figure 8-5. Solenoid valve-to-squib valve assembly conversion



NOTES:

1. EXISTING EMERGENCY FLOAT SYSTEM WIRING, DO NOT REMOVE.
2. SHIELDS TO BE TERMINATED 0.50 INCH MAXIMUM FROM END OF INSULATION ON WIRE (EXCEPT AS NOTED), JUMPERS TO BE A MINIMUM LENGTH.

37-179A

Figure 8–6. Emergency Float Inflation System Wiring Diagram – Squib Valve

(7) Install new valve onto manifold, maintaining squib orientation noted in (2). Valve must bottom metal to metal on the face of the manifold. Minor trimming of the plastic cover may be required. Remove trimmed-away material.

(8) Install the four screws handtight. Note that helicoil insert in manifold has locking thread.

(9) Tighten the four screws evenly until bottomed. Apply 38 - 43 inch-pounds torque to the screws.

(10) Reseal the black plastic cover by cleaning the surface with alcohol and applying a thin coat of the black fluid supplied with the kit to the valve body and manifold joint. Cure with hot air until it turns shiny, then remove heat source. Multiple coats may be required to seal the joints completely for maximum protection from corrosion in a humid environment.

e. Replacement of actuated squib valve (button-type cover).

(1) Perform steps (1) and (2) of d.

(2) Spread plastic cover at its parting line until the small round end of the white plastic buttons pull through the black plastic and over the squib connector, allowing access to the four screws that retain the valve body.

(3) Perform (4) through (8) of d.

(4) Remove plug from squib connector; note that the plug fits one way only. Realign the black plastic cover and pull it back over the squib connector. Replace the squib connector plug. Snap the white plastic buttons back through the holes in the black plastic cover as they were previously. Check the plug in squib connector to ensure that it is bottomed.

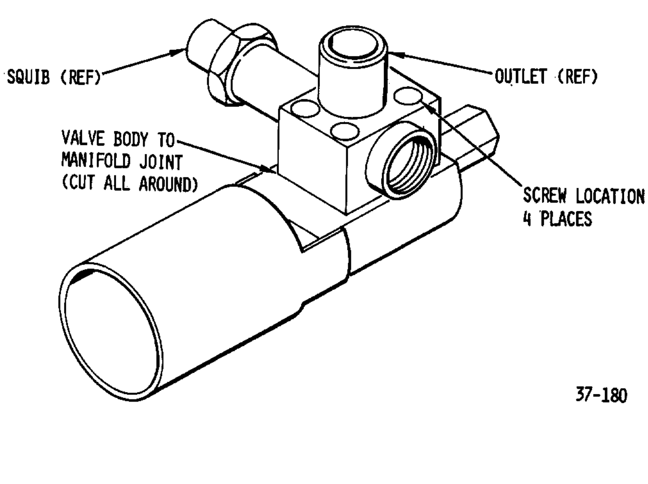


Figure 8-7. Squib valve replacement (sealed cover)

8-8. CERTIFICATION AND SHELF/SERVICE LIFE. The Federal Aviation Agency (FAA) has granted Squib PN 12522-1 (HLX-1-1) of the squib actuated emergency float valve a provisional five year life limit. This life limit is established by (1) date of manufacture, which is ink-stamped on the body of the squib, and (2) successful completion of a series of tests of squibs in accordance with the following plan. Functionally test two squibs after 24, 36, and 48 months of service, and 60 months after date of manufacture. No squib shall remain in service five years after date of manufacture. For Hughes Helicopters to comply with these FAA requirements, it will be necessary to procure two squibs from the user in accordance with the above schedule as soon as practicable after each of the service terms is reached. Squibs should be forward to Hughes Helicopters, Customer Service Department for test.

8-9. INSPECTION OF EMERGENCY INFLATION SYSTEM. (See figure 8-1.)

a. Check for proper air pressure indication on pressure gage. (Refer to paragraph 8-6 for required pressure indication.)

b. If float is stowed, unsnap containment cover and loosen restraining lacing for access to emergency inflation system components.

c. Remove air cylinder (para 8-6), inspect cylinder for damage and scratched, nicked, or otherwise damaged paint coating.

NOTE: Superficial paint coating damage should be repaired by paint touchup (Section 2, Basic HMI).

d. Inspect valves, air hoses, and other air distribution components for damage, deformity, strain and chafing.

e. Perform an inflation system electrical control equipment reliability test (para 8-28) to ensure electrical continuity and connection of solenoid/squib valve.

f. Tighten and re-tie the lacing and snap the containment cover in place.

8-10. INFLATABLE EMERGENCY FLOATS.

8-11. GENERAL. Each of the two inflatable neoprene emergency floats consists of sealed airtight chambers separated by internal walls that provide five individual watertight compartments. Skid attachment strips (girts), bonded to the underside of the floats, are bolted to the landing gear skids. In addition, fore and aft web supoort straps secure the floats to the skids. The floats are inflated to a nominal operating pressure of 4.0 psig by the emergency inflation system (para 8-4) upon pilot actuation of the inflation system electrical control equipment (para 8-24). Relief valves provide for air pressure release at a compartment pressure of 4.5 psi or above. A snap-on containment cover with lacing restrains the float in the stowed configuration until the emergency inflation system inflates the float. The containment cover inboard side automatically unsnaps and is pushed outboard as the float inflates. After emergency float use, deflation, air cylinder recharging and folding, the cover is again snapped in place over the float and replaced for subsequent reuse. A mooring ring atop each end of the float is furnished for towing and mooring. A longitudinal tube provides additional support for the aft section of the float. An extended landing gear skid tube extension supports the float aft section on the landing gear. Forward and aft restraining straps are provided at landing gear strut and fairing locations. Gap covers close off the inboard cutouts for the strut fairings.

8-12. REMOVAL OF EMERGENCY FLOATS (INFLATED OR STOWED).

a. If float is in stowed configuration, release fasteners to gain access to float package. (See figure 8-1.)

b. Detach lower restraining strap and gap cover at forward and aft struts.

c. Disconnect solenoid/squib valve electrical wiring at knife splice at solenoid/squib valve.

d. Remove strut fairing, insulate strut wire end knife splices, attach wiring to strut in a stowed position and reinstall fairing.

e. Remove bolts and washers attaching fore and aft web support strap fittings to skid tube.

f. Remove bolts and washers attaching float girts to skid tube and extension; remove float assembly.

g. Install screws in all skid tube nutplate holes to protect the threads from foreign matter.

8-13. FOLDING AND INSTALLATION OF EMERGENCY FLOATS. (See figure 8-2.) Folding instructions contained in this paragraph and shown in figure 8-2 are provided as a general guide for float packing. Float folding will require the aid of an assistant and considerable care in preparing the smallest float package possible during the initial folding steps. A minimum amount of wrinkles and complete air evacuation is essential to final closure of cover snap fasteners. Evacuation of air from float compartments also minimizes expansion of the stowed float chambers at altitude.

a. Position helicopter in a clean dry area and remove ground handling wheels.

NOTE: Moving the helicopter with stowed emergency floats installed requires use of special ground handling wheels (item 5, table 2-2, Basic HMI). (Refer to paragraph 8-28.)

b. Open the float package and release restraining straps. Position float girts over skid tube attach points. Attach float web support strap fittings at fore and aft locations with bolts and washers. (See fig. 8-1.) Secure girts to skid tube. Position abrasion strip and secure float girt aft end to extension tube with bolts and washers. (See fig. 8-1.)

c. Perform float inspection (para 8-13). Clean as required and apply talc to floats during folding.

d. Position deflated float (five fill valves OPEN) as shown in fig. 8-2.

NOTE: The float assembly must be removed from the stowage envelope for installation. Do not attempt to position the float for packing with the float chambers fully collapsed.

e. Refer to fig. 8-2 and fold the float as outlined in the figure. On completion, the folded float must be contained within the float stowage cover, all snaps must be closed and the air cylinder pressure gage must be visible in the inspection window. Special attention should be paid to the following information which is presented as an aid in establishing a final float folding technique.

(1) Accomplish float folding in two stages, first performing float arrangement (prefolding) to the extent necessary to position the float and float components in approximate required positions and then proceeding with final folding.

NOTE: Partial inflation of float compartments is required to enable float arrangement during initial preloading.

(2) During prefolding and before air evacuation of the forward compartments (cells) as outlined in Step 4, fig. 8-2, do the following. Gather and compress the float fabric tightly against the cylinder and pull the cover over the inboard-facing pressure gage to estimate final cover window-to-gage relationship. This fabric bunching/cover pulling action may be required several times before an approximation (best guess) of final window position in established. When cover position appears good, evacuate all air from the forward cells and recheck the window-to-gage relationship.

(3) As soon as a float chamber is arranged in the desired position, hold the components in place, flatten as many wrinkles as possible and evacuate air from the float chamber. While the vacuum is still being applied, close the fill valves.

8-14. INSPECTION OF EMERGENCY FLOAT (STOWED CONFIGURATION).

NOTE: The following inspections must be performed daily and before each flight.

a. Observe cylinder pressure through inspection window.
b. Check girt to skid tube attaching hardware for condition and corrosion.
c. Check float cover fasteners and lacing for security.
d. Examine float stowage cover for abrasive damage and damage that may have disturbed packaged float.
e. Perform an inflation reliability test of float inflation system electrical control equipment (para 8-29).

8-15. INSPECTION OF FLOAT ASSEMBLY (AFTER EMERGENCY ACTUATION).
a. Clean float assembly as follows.
(1) Clean away any oil or grease with naphtha (item 58, table 2-4, Basic HMI).
(2) Wash down with soapy water; flush with clear fresh water and allow to air-dry.
(3) Clean air pressure gage inspection window with a clean cloth and fresh water.
(4) After inspection is complete, dust with talc.
b. Recharge air cylinder to 3500 psig at 75°F (para 8-6).
c. Inspect float bags for abrasion and chafing.
d. Inspect pressure relief valves for condition and closure.
e. Inspect check valves for condition.
f. Inspect all hoses and connectors for condition and security.
g. Check float girts, web support and restraining straps for condition and secure attachment to skid tube.
h. Check all release snaps and fasteners for condition and serviceability.
i. Check that air cylinder relief valve and filler valve boots are installed.

8-16. PRESSURE TEST OF FLOAT COMPARTMENTS.
a. Inflate all five float compartments to 2.0 psi and let stand for 24 hours.

NOTE: Changes in atmospheric pressure and temperature during pressure test of float compartments will affect pressure gage readings. A temperature change of 1 degree equals 0.032 psig.

b. Check the pressure drop with a pressure gage that indicates 0 to 15 psi, graduated in 1/2 psi increments. The maximum allowable pressure drop in 24 hours is limited to 1/2 psi per compartment.
c. If a pressure drop occurs, check floats for soundness.

8-17. REPAIR OF EMERGENCY FLOATS. Repair materials and information are available from the float manufacturer. Make repairs to emergency floats using materials according to manufacturers instructions. (Refer to Table 2-12, Basic HMI.) For information on inflatable float service, maintenance and repair facilities, refer to Hughes Letter HL-36.

8-18. EMERGENCY FLOATS STRUT FAIRINGS.

8-19. GENERAL. The emergency floats forward and aft strut fairings for standard landing gear are shown in figure 8-8. The fairings are basically the same as the two-piece landing gear fairing described in Section 6, Basic HMI except for rounded trailing edges and an added step fairing cover. The standard and extended versions (para 8-31) differ only in length and number of attachment points on strut, and a forward fairing cover is used to cover the open step hole on the standard version.

8-20. REMOVAL OF EMERGENCY FLOATS STRUT FAIRINGS. (See figure 8-8.) The following removal instructions are typical for all four strut fairing assemblies.
a. Remove the lower fairing assembly as follows:
(1) Remove screws and washers that secure trailing edge of lower fairing, and the screws and washers that secure lower fairing to the strut fairing mounting brackets.
(2) Carefully spread trailing edge of lower fairing and remove in a forward direction.

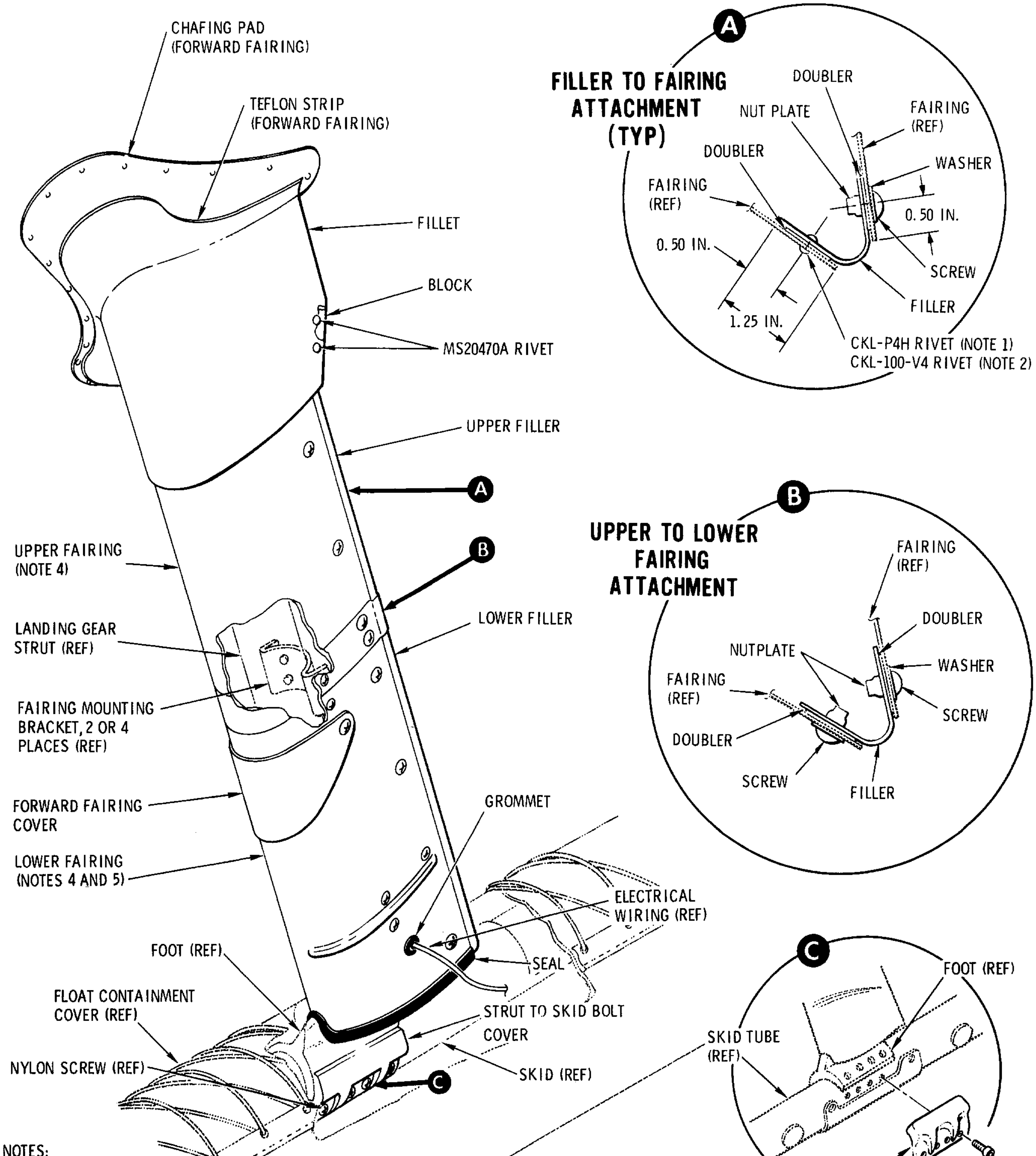
NOTE: Be sure that doublers used between aft inboard side of fairing and trailing edge filler are retained for reuse.

b. Remove the fillet from the upper part of the fairing assembly as described in Section 6, Basic HMI; also remove the fillet attaching hardware shown in figure 8-8.
c. Remove the upper fairing as follows:
(1) Remove screws and washers that secure trailing edge of fairing, and the screws and washers that secure fairing to strut fairing mounting bracket.
(2) Carefully spread trailing edge of upper fairing and remove in a forward direction. Retain doublers for reuse.

8-21. INSPECTION OF EMERGENCY FLOATS STRUT FAIRINGS. Inspect the strut fairing assembly as described for the two-piece fairing in Section 6, Basic HMI.

8-22. REPAIR OF EMERGENCY FLOATS STRUT FAIRINGS. Repair the emergency floats landing gear fairing fiberglass as instructed in HMI Appx D.

8-23. INSTALLATION OF EMERGENCY FLOATS STRUT FAIRINGS. (See figure 8-8.) The following



NOTES:
1. USED ON UPPER FAIRING.
2. USED ON LOWER FAIRING.
3. SEAL MATING SURFACES AND VOIDS WITH ZINC CHROMATE PUTTY (ITEM 71, TABLE 2-4, BASIC HMI).
4. REFER TO HMI APPX D FOR FIBER-GLASS REPAIR.
5. EMERGENCY FLOAT FAIRINGS FOR STANDARD LANDING GEAR SHOWN. LOWER FAIRING USED WITH EXTENDED LANDING GEAR IS LONGER WITHOUT FORWARD FAIRING COVER AND HAS INCREASED NUMBER OF STRUT ATTACH POINTS.

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Figure 8-8. Strut fairings (normal and extended), emergency floats installation instructions are typical for all four strut fairing assemblies. Install the fairing assembly as instructed for the two-piece fairing in Section 6, Basic HMI except as follows:

a. Secure upper and lower fairings to strut fairing mounting brackets with screws and washers.

b. Secure the trailing edges of the upper and lower fairings, using screws and washers.

NOTE: Be sure that doublers are installed between aft inboard side of fairing and trailing edge filler.

c. When installing fillet, use two additional rivet to secure the fillet trailing edge together as shown in figure 8-8.

8-24. EMERGENCY FLOAT SYSTEM ELECTRICAL CONTROL EQUIPMENT.

8-25. GENERAL. (See figure 8-9.) Emergency float inflation is accomplished either by raising a switch guard and pressing a momentary contact toggle switch mounted on the cyclic stick or by pressing the float inflate switch mounted on the optional cyclic stick grip. Momentary actuation of either switch (S5) closes a relay (K105). The relay remains closed and applies electrical current to both float solenoids until the circuit breaker is pulled out. The solenoids simultaneously open a valve on each float assembly releasing compressed air into the floats. Emergency float circuits are protected by an EMERGENCY FLOAT circuit breaker located on the left side of the auxiliary circuit breaker and switch panel. Inflation reliability test circuits are provided by a combination press-to-test light switch located adjacent to the circuit breaker. Depressing the LH/FLT - RH/FLT press-to-test switch applies low voltage (insufficient to energize solenoid) to the emergency float solenoid circuit. Dual internal lamps in the switch will light if the circuit is operational.

8-26. MAINTENANCE OF FLOAT INFLATION SYSTEM ELECTRICAL CONTROL EQUIPMENT. Maintain the float inflation electrical control equipment as instruction in Sections 17 and 19, Basic HMI for electrical system components using the illustrated information in figure 8-3 for solenoid valves and figure 8-6 for squib valves. Lamps may be replaced by removing or sliding out the indicator module and removing the defective lamp. Figure 8-6 is the wiring diagram for the replacement squib valve installation. Figures 8-3 and 8-4 for the original solenoid valve installations provide wiring diagrams for the emergency float release system using either the stick mounted actuation switch or the optional cyclic stick grip. Figure 8-10 is a wiring diagram for instrument panel type B switch-indicator module.

CAUTION: Do not remove the solenoid/squib or connector from the air cylinder manifold.

8-27. INFLATION RELIABILITY TEST OF FLOAT INFLATION SYSTEM ELECTRICAL CONTROL EQUIPMENT. Depress the LH/FLT and RH/FLT press-to-test switches to test float inflation reliability. Observe that each switch faceplate is illuminated when depressed and goes out when the switch is released.

NOTE: Failure to light or extreme brightness indicates defective circuit.

8-28. EMERGENCY AND UTILITY FLOATS GROUND HANDLING WHEELS.

8-29. GENERAL. (See figure 8-11.) Special ground handling wheels (item 5, table 2-2, Basic HMI) are needed in place of standard ground handling wheels for moving a helicopter equipped with emergency or utility floats. These optional wheels are specially designed for use with the emergency floats and raise the skids higher off the ground than standard ground handling wheels. A channel provides support for the underside of the landing gear skid. A rubber pad on the channel furnishes sufficient skid retaining friction without need for attachment of wheel assembly to skid. Guards above the wheel on each side of the channel prevent wheel chafing of floats. Use the wheels as follows:

a. Jack up one side of the helicopter for clearance to place the ground handling wheel assembly under the landing gear skid.

b. Position the ground handling wheel assembly under the skid at approximate center-of-gravity (CG) point below the ground handling fittings.

NOTE: Positioning the wheel assemly at or near the CG point makes helicopter ground handling easier.

CAUTION: Be sure the float containment cover is not pinched by the channel to prevent fabric damage.

c. Lower the helicopter, placing and resting the skid in the ground handling wheel channel.

d. Repeat the procedures to install the second wheel assembly under the opposite landing gear skid.

e. Manually move the helicopter on ground handling wheels by balancing at the tailboom and pushing on the rear fuselage portion of the airframe.

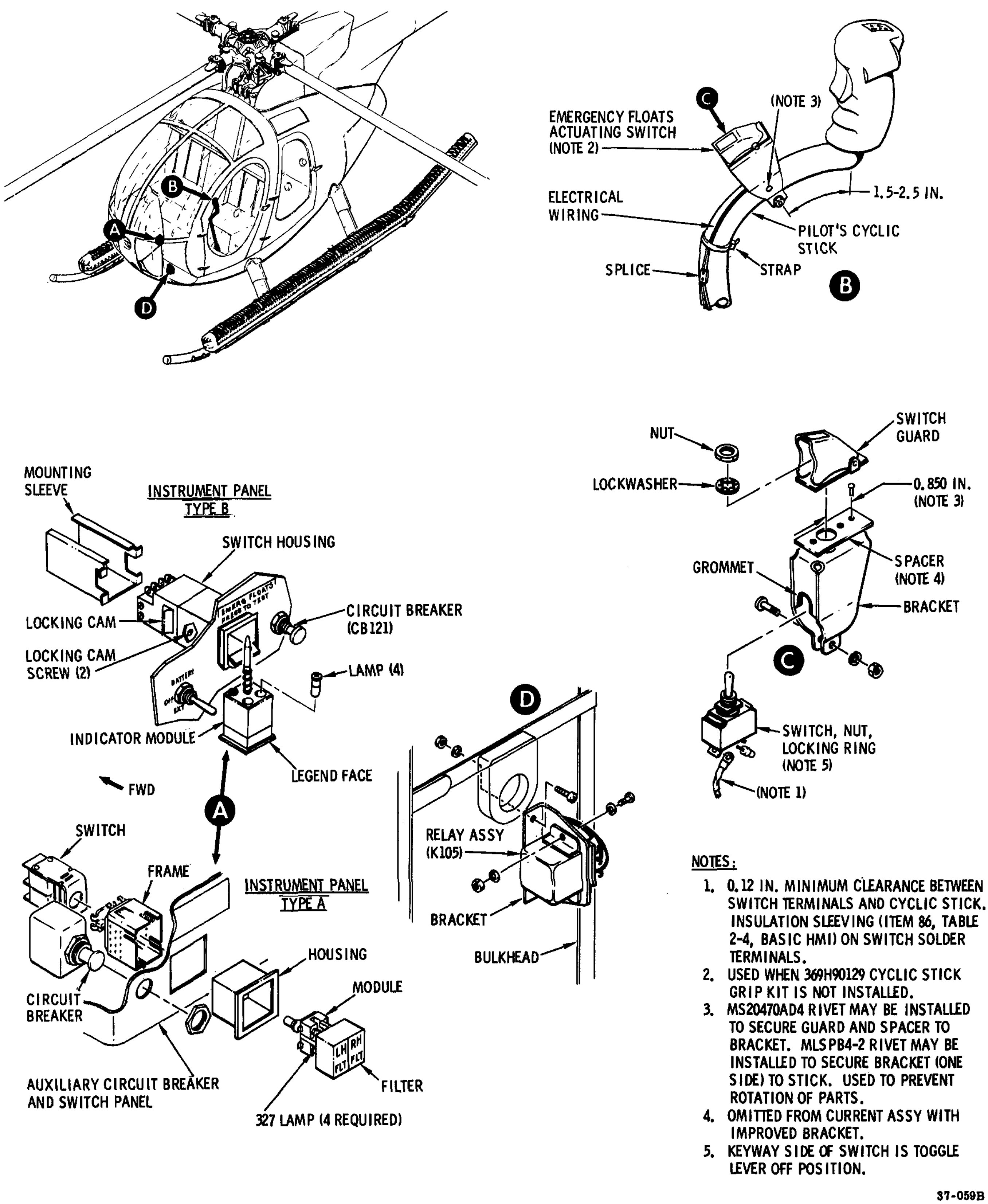


Figure 8-9. Emergency float inflation system electrical control equipment

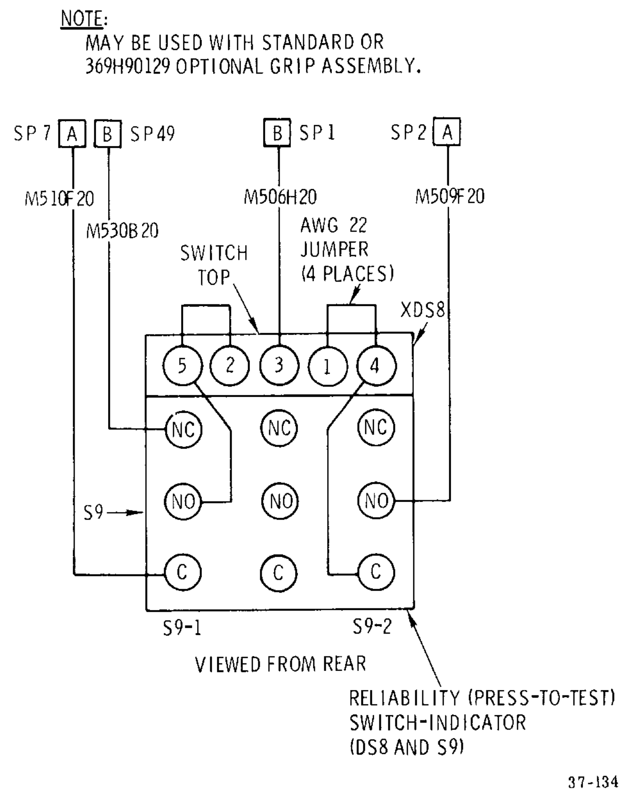


Figure 8-10. Switch-indicator module wiring diagram, instrument panel type B

8-30. EXTENDED LANDING GEAR.

8-31. GENERAL. The extended landing gear (fig. 8-12) raises the helicopter fuselage approximately 9 inches higher than the standard landing gear. The installation consists of longer skid tubes, lengthened strut feet, lengthened strut fairings and different landing gear dampers; other landing gear components are standard configuration. Emergency float attach points are provided (standard) on each skid tube. The barrel and lower cap on the two forward extended dampers are color-coded blue. The aft two dampers are coded orange. Dampers must be replaced with a like color-coded damper of specific part number as detailed in table 6-2, Basic HMI. Maintenance of the extended landing gear is identical with that described in the Basic HMI, except for slight differences with strut fairings, nutplate fittings, and skid to strut attachment as described in following paragraphs. Extended landing gear fairings have a greater number of strut attachment points. Parts replacement requires use of components peculiar to the extended landing gear. Refer to emergency flotation equipment information (para 8-18) for maintenance information on extended landing gear fairings used with emergency floats, and to paragraph 8-41 for information on those used with utility floats.

NOTE: If a helicopter with extended landing gear is tilted back on the tail skid to install ground handling wheels, approximately 1 pint of oil is trapped in the tail rotor gearbox. This condition will give a false sight plug oil level indication after return to a level attitude. The oil will return to normal after ground runup.

8-32. LANDING GEAR SKID TUBE ABRASION STRIPS.

8-33. GENERAL. Extended landing gear skid tubes may be equipped with either three heavy duty abrasion strips or five small abrasion strips. Maintenance information on either abrasion strip is presented in the Basic HMI.

8-34. INSTALLATION OF EXTENDED LANDING GEAR SKID. Installation of the extended landing gear skid is identical to that described in the Basic HMI except a maximum gap of 0.050-inch between extended foot and skid on strut centerline is permissible.

8-35. INSTALLATION OF LANDING GEAR SKID VIBRATION DAMPER KIT.

8-36. GENERAL. The skid vibration damper kit (Modification Kit No. M50045) may be installed on standard or extended landing gear skids equipped with heavy duty or cobalt insert-type abrasion strips to reduce excessive skid vibration by adding weight to the aft end of each skid tube.

a. Secure two-pound weight (shot bag or equivalent) with tape at intersection of aft landing gear strut on each skid tube. Test fly helicopter to determine if skids have stopped vibrating in flight.

b. Increase weight in half-pound increments to five pounds maximum, as required, until skid vibration is eliminated or minimized. Note the amount of test weight added at each skid to eliminate or minimize skid vibration.

c. Remove test weights from skids.

d. Remove landing gear skids or jack up aft portion of skids to accomplish work required.

e. Remove 369H6102 heavy duty abrasion strip (if installed) from aft end of each skid tube per Basic HMI. Removal of 369A6109 cobalt insert type abrasion strip (if installed) is not required.

f. Remove skid plug from aft end of each skid tube per Basic HMI.

NOTE: Each of the two M50045-9 vibration damper assemblies provided in the kit incorporates a 5-pound lead weight. Cut and remove appropriate amount of lead as required from each damper assembly to match test weights determined in step b.

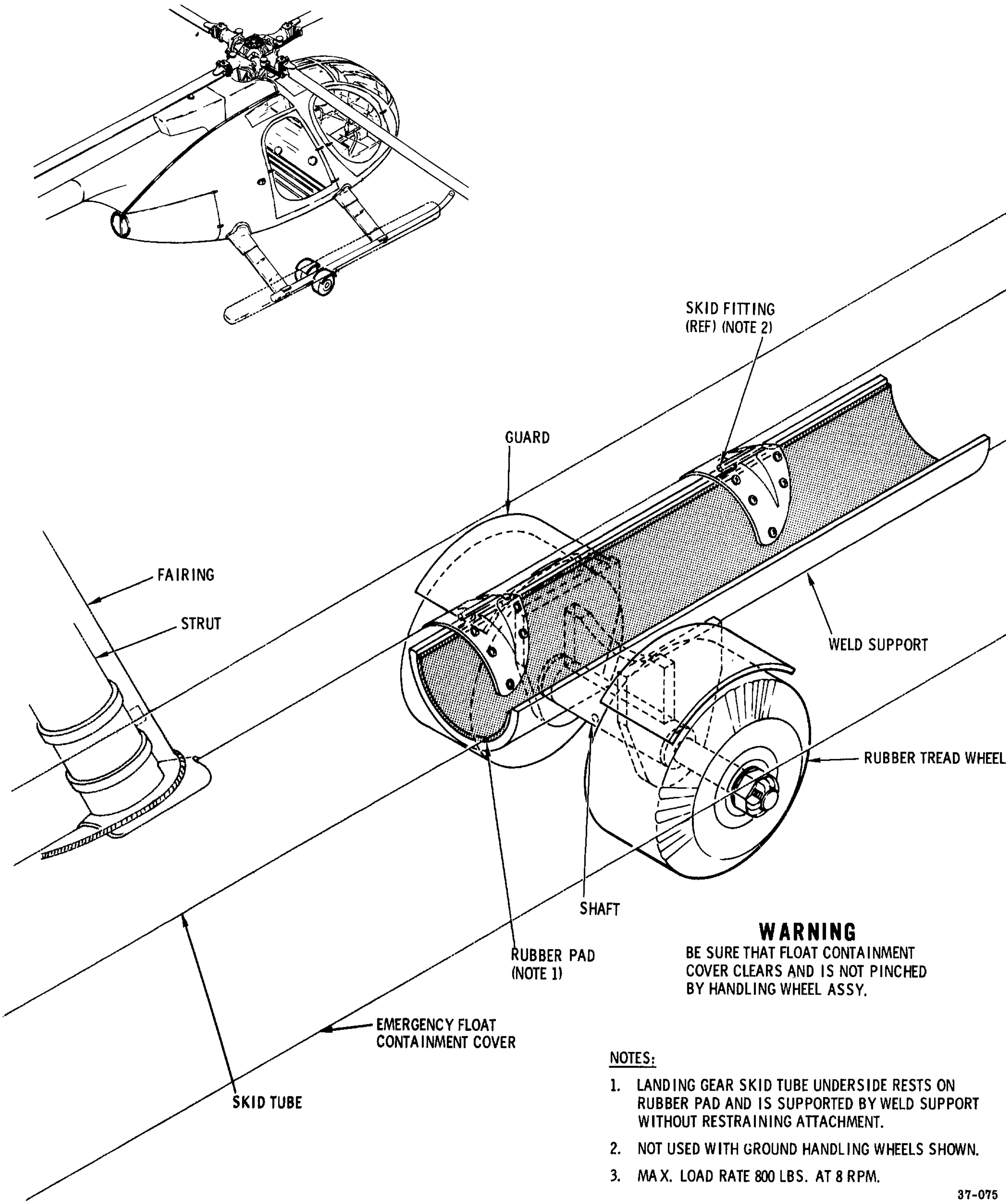


Figure 8-11. Emergency floats ground handling wheels

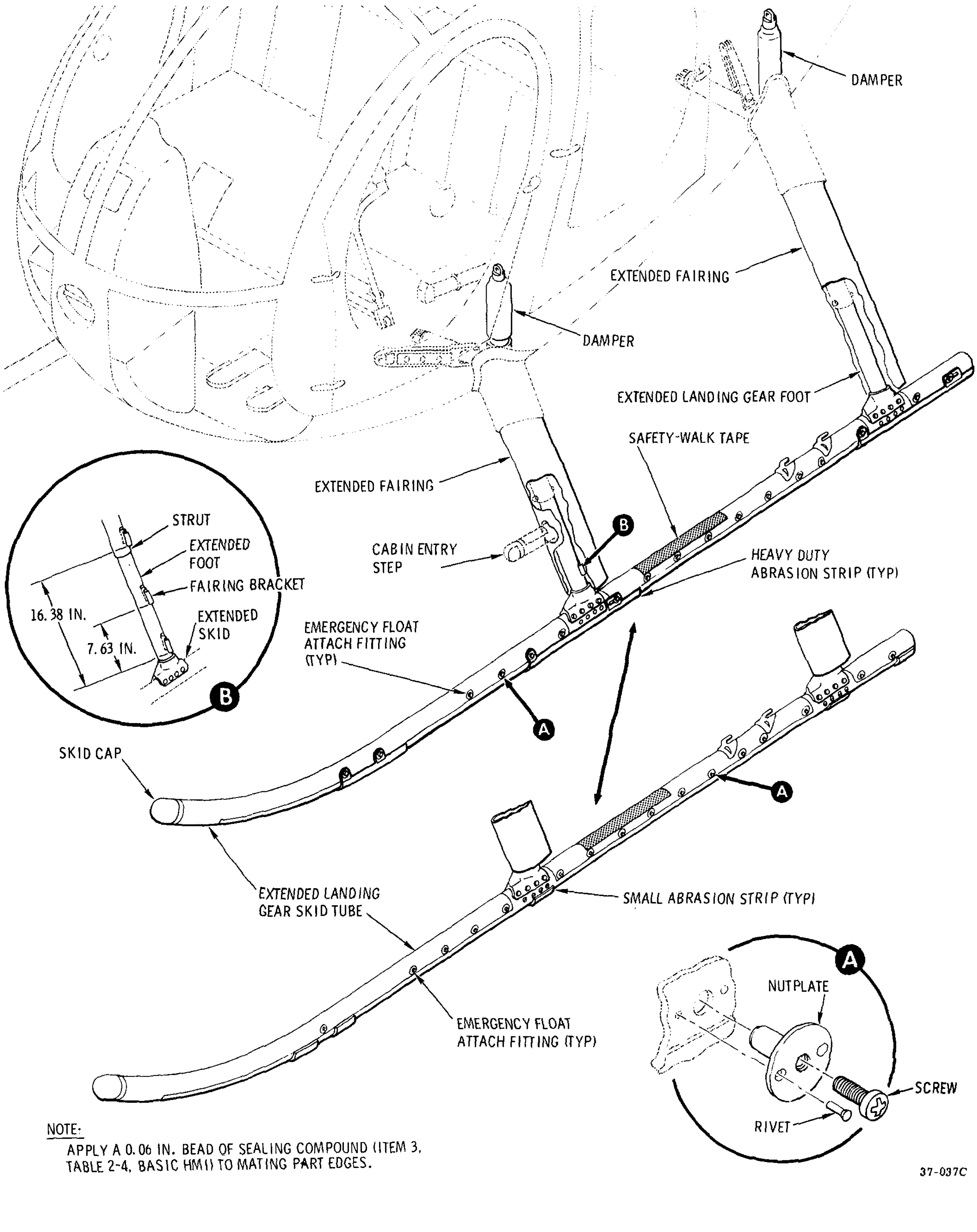


Figure 8-12. Extended landing gear

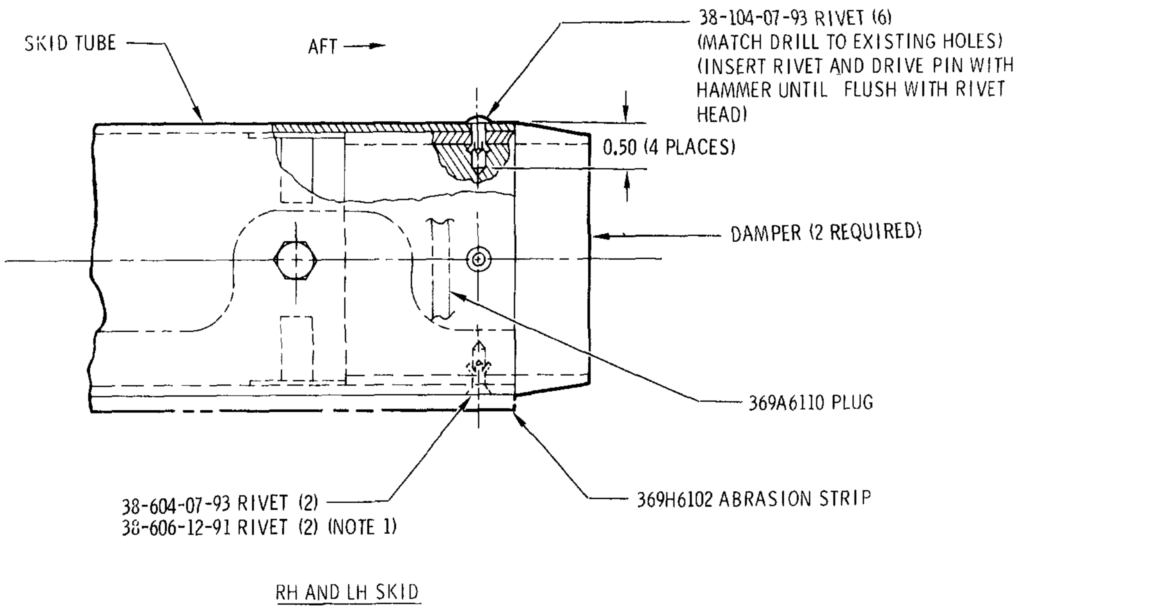


Figure 8-13. Installation of vibration damper kit

g. Install new vibration damper assembly in aft end of each skid tube. Coat faying surfaces with zinc chromate putty to ensure water-tight assembly.

h. Match drill through existing holes in skid tube to depth shown in figure 8-13.

i. Install drive rivets of proper length, as shown, to secure damper assembly; coat with wet zinc chromate.

j. Reinstall heavy duty abrasion strips as applicable per Basic HMI.

k. Reinstall landing gear skid assemblies as applicable per Basic HMI.

8-37. UTILITY FLOATS.

8-38. GENERAL. Each of the neoprene floats (fig. 8-14) consists of airtight chambers separated by internal walls that provide six individual water-tight compartments. Skid attachment strips (girts), bonded to the underside of the floats, are bolted to the landing gear skids and extensions. The floats are inflated to a normal operating pressure of 2.0 psig. Relief valves provide for air pressure release if compartment pressure becomes excessive.

8-39. INSPECTION OF UTILITY FLOATS.

a. Check float chambers for proper air pressure (2.0 psig).

b. Inspect float bags for abrasion and chafing.

c. Check float girts for condition and secure attachment to skid tube and extension.

d. Inspect pressure relief and fill valves for condition and closure.

8-40. PRESSURE TEST AND REPAIR OF FLOAT COMPARTMENTS. For testing of float compartments and repairs refer to paragraphs 8-16 and 8-17.

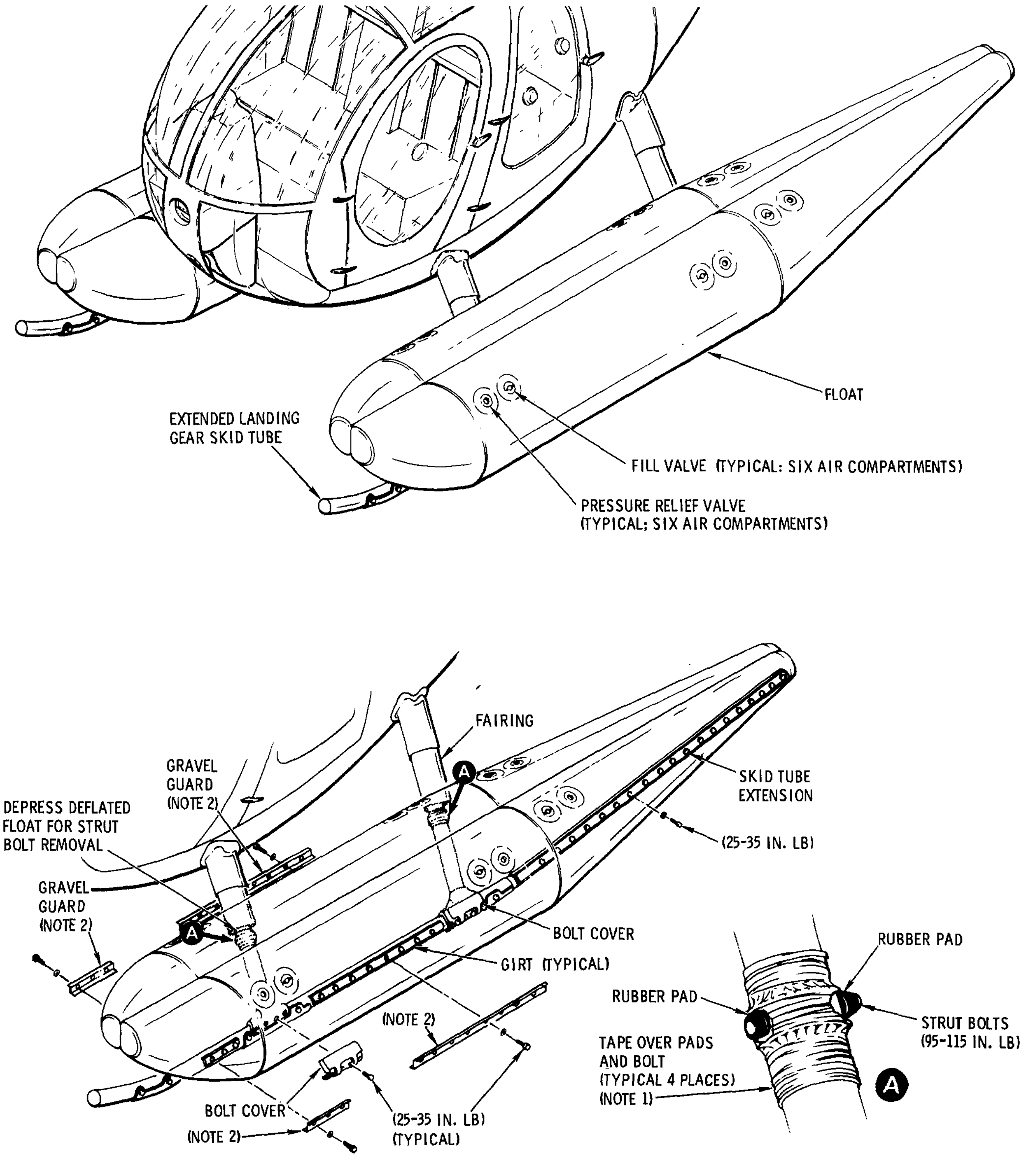
8-41. REMOVAL OF UTILITY FLOATS. (See figure 8-14.)

a. Open the fill valve at each of the six float chambers and deflate the float. A suction device such as a vacuum cleaner will speed up air evacuation.

b. Remove each of the four strut lower fairings (para 8-46).

CAUTION: Do not jack one side of the helicopter at a time. Maintain the helicopter in a level attitude during jacking or use a hoist.

c. Hoist or jack up the helicopter (Basic HMI) until the landing gear dampers are fully extended and the landing gear skid tubes are at least 6 inches from the ground.



NOTES:

1. USE TAPE (ITEM 42, TABLE 2-4, BASIC HMI).
2. TWO SHORT AND TWO LONG GUARDS PER SKID TO PREVENT GRAVEL, ETC FROM WORKING UP IN BETWEEN BOLTS AND GIRTS.

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Figure 8-14. Utility flotation equipment

d. Depress the floats around the struts and remove the tape and pads from the lower ABC bolt. Remove two ABC bolts attaching each strut foot to the strut; remove the skid tube and skid extension with the float attached.

e. Remove bolts and washers attaching the float girt to the skid tube and extension.

f. Pull float off landing gear strut feet.

8-42. INSTALLATION OF UTILITY FLOATS. (See figure 8-14.)

a. With the extended landing gear skid and attached extension removed, insert the landing gear strut feet through the strut openings in the float. The float is positioned with strut openings inboard and the pointed bow of the float forward.

b. Position float girt attachment holes over skid tube and extension nutplates and install bolts with washers. Torque bolts to 25-35 inch-pounds.

c. Install landing gear skid and float on struts. Install ABC bolts (two per strut) and torque to 95-115 inch-pounds.

d. Position pads over lower ABC bolts as shown in figure 8-14 and secure in place with overlapping wraps of 1.00- or 2.00-inch-wide tape (item 42, table 2-4, Basic HMI).

e. Open fill valves and inflate the six float chambers with nitrogen or compressed air to 2.0 psig. Inflate chambers gradually to maintain equal volume in each chamber. Close the fill valves.

8-43. REPAIR OF UTILITY FLOATS. Repair materials and information are available from the float manufacturer. Make utility float repairs using materials according to manufacturer's instructions. (Refer to table 2-12, Basic HMI.)

For information on inflatable float service, maintenance and repair facilities, refer to Hughes Letter HL-36.

8-44. UTILITY FLOAT STRUT FAIRINGS.

8-45. GENERAL. The utility floats forward and aft strut fairings (fig. 8-15) are basically the same as the two-piece landing gear fairing described in Section 6, Basic HMI except that the lower fairing assembly is shortened and extends only to the upper surface of the float. A split cap seals off the lower fairing end.

8-46. REPLACEMENT OF UTILITY FLOATS STRUT FAIRINGS. (See figure 8-15.) The following replacement instructions are typical for all four strut fairing assemblies.

a. Remove the lower fairing assembly as follows.

(1) Remove the nuts, washers and screws that secure trailing edge of the lower fairing, and the screws and washers that secure lower fairing to the strut fairing mounting bracket.

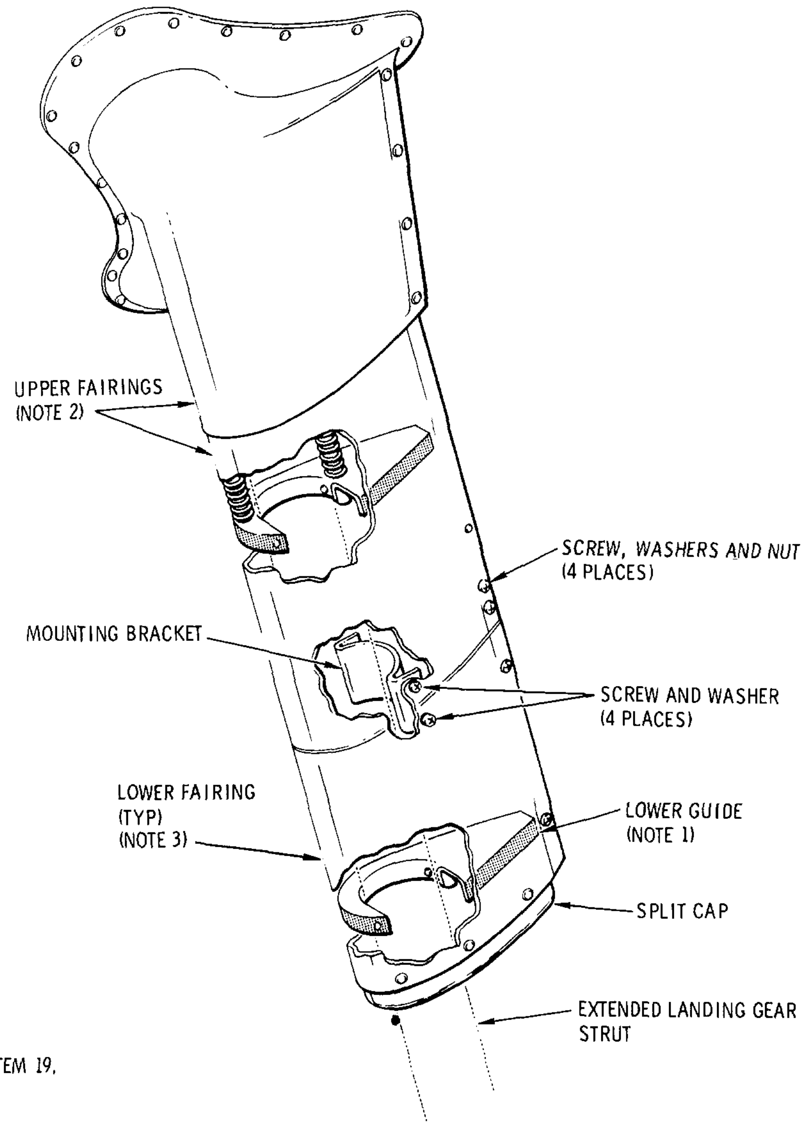
(2) Carefully spread the trailing edge and lower split cap and remove in a forward direction.

b. Replace the upper fairings as described in Section 6 of the Basic HMI.

c. Install replacement lower fairings in reverse order of removal described in a above.

8-47. INSPECTION OF UTILITY FLOATS STRUT FAIRINGS. Inspect the strut fairing assembly as described for the two piece fairing in Section 6 of the Basic HMI.

8-48. REPAIR OF UTILITY FLOATS STRUT FAIRINGS. Refer to HMI Appx D and the Basic HMI for repair of fiberglass strut fairings.



NOTES:

1. BONDED AREA; USE ADHESIVE (ITEM 19, TABLE 2-4, BASIC HMI).
2. REFER TO THE BASIC HMI FOR MAINTENANCE INSTRUCTIONS.
3. AFT FAIRING SHOWN.

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Figure 8-15. Strut fairings, utility floats

OPTION GROUP 9
EXTERNAL CARGO EQUIPMENT

9-1. CARGO HOOK INSTALLATION.

9-2. GENERAL. The cargo hook installation consists of a cargo hook assembly, electrical release equipment and backup emergency manual release equipment. The cargo hook assembly is externally attached to the center beam of the helicopter. The hook is normally released electrically by the pilot with a switch on the cyclic stick grip. (See fig. 9-1.) A manual emergency release is also provided on the pilot's cyclic stick, collective stick, or mounted on the fairing between the pilot's seats or at the pilot's left door frame. The cargo hook has an operational rating of 1800 pounds. Due to hook location, helicopter cg limits are not significantly affected by hook-slung loads.

NOTE: On a cargo hook installation originally equipped with an arming switch, the optional cyclic stick grip kit 369H90129 is required when the cargo hook is used in conjunction with emergency floats, hoist or both. Refer to Option Group 5.

9-3. TROUBLESHOOTING OF CARGO HOOK INSTALLATION. Refer to table 9-1.

9-4. OPERATIONAL CHECK OF CARGO HOOK RELEASE SYSTEM.

a. Turn electrical power ON.

b. With circuit breaker pushed in (and arming switch ON, if installed) depress cyclic stick release button. The cargo hook release solenoid should operate and the hook open (latching bar retract). Action of solenoid and latching bar can usually be heard in pilot's compartment when engine is not operating.

NOTE: Manually close latching bar after each operational check.

c. For an installation with arming switch, check that cargo hook solenoid does not operate when release button is depressed with arming switch OFF.

NOTE: Arming switch is not used on helicopters on which release switch is installed in cyclic stick grip with a guard (including those 369H90129 cyclic stick grip kit installed).

d. With hook closed, operate pilot's emergency cargo release lever or T-handle and check that hook opens.

e. Actuate cargo hook external release and check hook for operation.

f. For an installation on which the emergency release cable is on the pilot's collective or cyclic stick in pilot's compartment, check emergency release cable for sufficient slack when pilot's collective stick is in full up position or cyclic stick is in full aft position, as applicable. Release lever should not move from the full closed position.

9-5. INSPECTION OF CARGO HOOK INSTALLATION.

a. Inspect cargo hook swivel for freedom of motion and security of attachment to helicopter and hook.

b. Inspect control cable and wiring for serviceable condition and security.

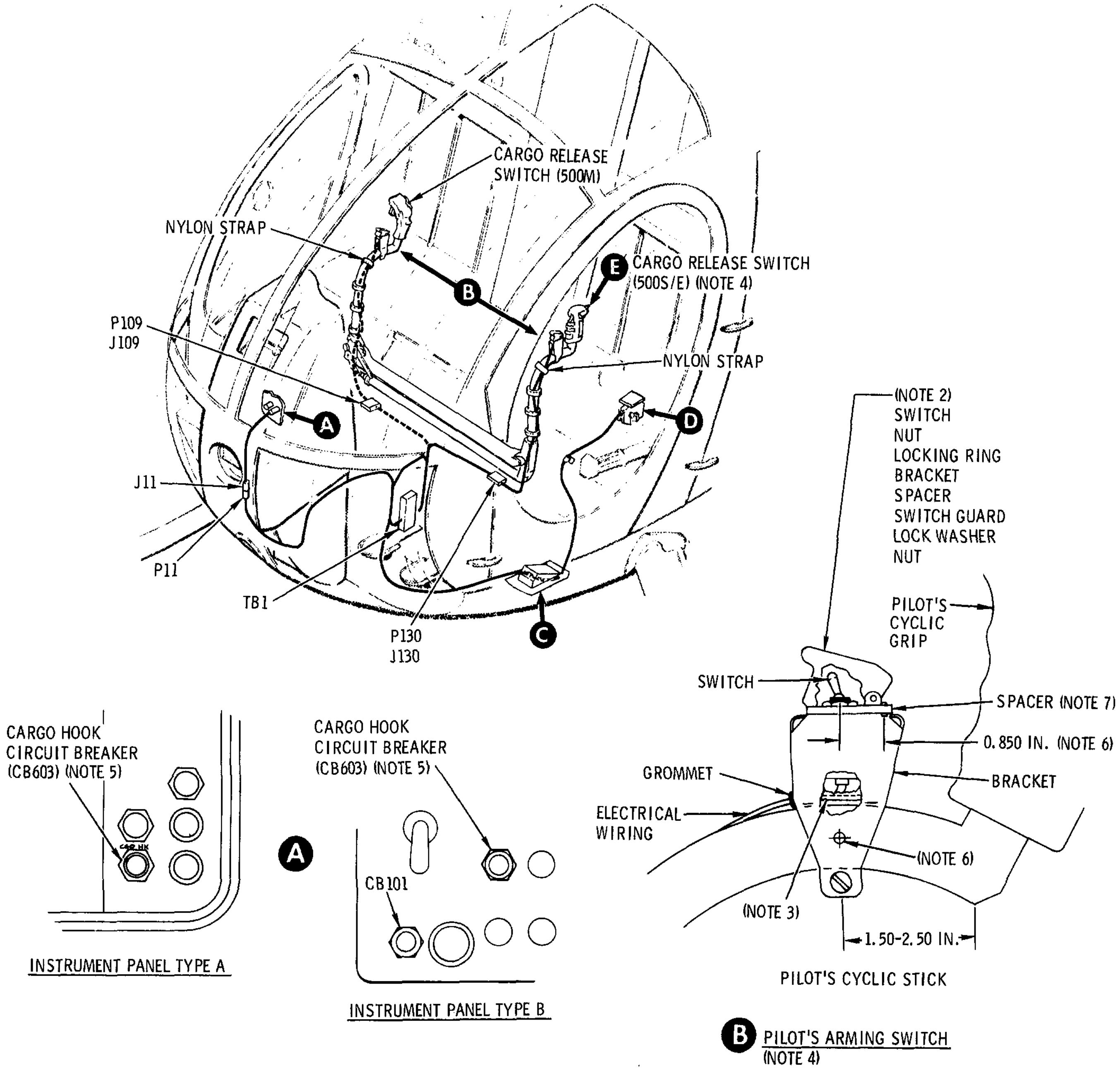
c. Inspect lever mechanism at collective stick for serviceable condition, freedom of motion and positive return of actuating lever.

d. Check that release cable is lubricated with grease (item 97, table 2-4, Basic HMI).

e. Perform operational check as described in paragraph 9-4.

9-6. CARGO HOOK ASSEMBLY.

9-7. GENERAL. Four different cargo hook assemblies are used. These are the Norco CL344-1, Norco CL 1181, Eastern Rotorcraft 17036-1 and Eastern Rotorcraft 17086-2. The hooks are identical in function and similar in appearance with the exception that a 28 Vdc pulser unit is supplied for use with the Norco CL 344-1 hook, and the Eastern Rotorcraft 17086-2 has a 73.5 instead of 37-38-inch long release cable. All hooks include attached electrical harness and a manual release cable. The manual release cable is detachable from the Eastern Rotorcraft hook. See figure 9-1. The hook is mounted to the helicopter structure with a stainless steel swivel assembly attached by four bolts to the cargo hook fitting on the center beam. The swivel assembly allows the cargo hook to swing in any direction through a 30-degree arc. When energized by 28 Vdc electrical power, an internal solenoid in

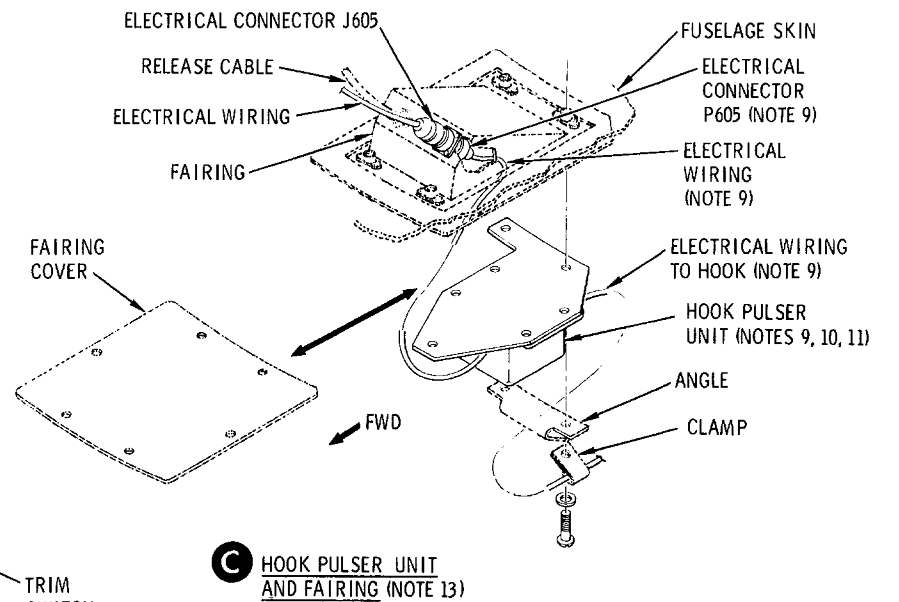


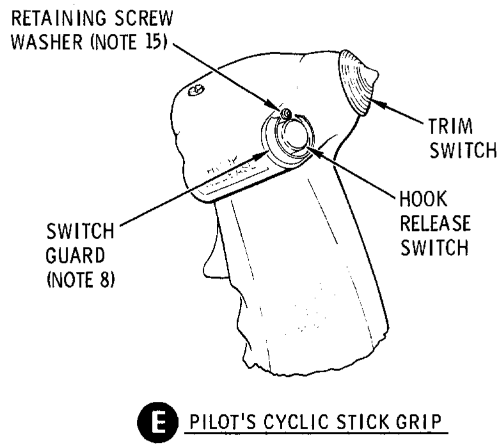
NOTES:

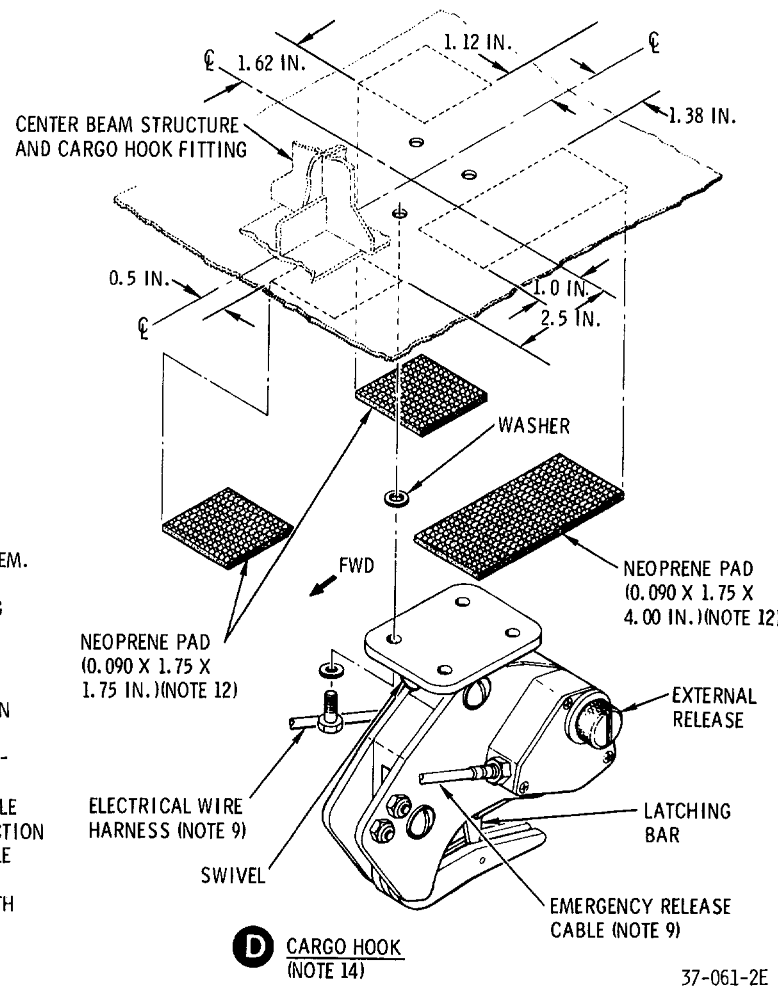
1. HEAVY DASH LINE (---) APPLIES ONLY TO 500M.
2. ITEMS AND HARDWARE LISTED IN INSTALLATION SEQUENCE. TOGGLE LEVER OFF POSITION IS AT KEYWAY SIDE OF SWITCH.
3. 0.12 IN. MINIMUM CLEARANCE BETWEEN SWITCH TERMINALS AND CYCLIC STICK. INSULATION STRIP BETWEEN SWITCH TERMINALS AND STICK.
4. USE 369H90129 GRIP KIT WHEN CARGO HOOK WITH 37-38 IN. LONG RELEASE CABLE IS INSTALLED IN CONJUNCTION WITH HOIST KIT, EMERGENCY FLOAT KIT, OR BOTH. ARMING SWITCH NOT USED IF RELEASE SWITCH IS INSTALLED WITH GUARD IN CYCLIC STICK GRIP(INCLUDING WHEN 369H90129 GRIP KIT IS INSTALLED).
5. ITEM INSTALLED MAY BE 7.5 OR 15-AMPERE CIRCUIT BREAKER. AT REPLACEMENT, USE ONLY 15-AMPERE UNIT.
6. MS20470AD4 RIVET MAY BE INSTALLED TO SECURE GUARD AND SPACER TO BRACKET. MLSPB4-2 RIVET MAY BE INSTALLED TO SECURE BRACKET (ONE SIDE) TO STICK. USED TO PREVENT ROTATION OF PARTS.
7. OMITTED FROM CURRENT ASSEMBLY WITH IMPROVED BRACKET.

37-061-1A

Figure 9-1. Cargo hook electrical equipment (sheet 1 of 2)







NOTES: (CONT)

8. USED ON INSTALLATIONS WITHOUT ARMING SWITCH.
9. PART OF HOOK ASSEMBLY.
10. CYLINDRICAL PULSER UNIT USED ONLY ON EARLY SYSTEM.
11. PULSER AND MOUNTING PLATE USED ONLY WITH NORCO CL344-1 HOOK ASSEMBLY. SHAPE OF PULSER MOUNTING PLATE MAY VARY.
12. PADS LOCATED TO PREVENT SKIN DAMAGE WHEN HOOK SWINGS. PADS BONDED TO SKIN WITH ADHESIVE (ITEM 68, TABLE 2-4, BASIC HMI). PADS REQUIRED IF EASTERN ROTOCRAFT HOOK 17085-1 OR 17085-2 IS INSTALLED.
13. ON CURRENT TYPE HELICOPTER WITHOUT FAIRING, ELECTRICAL CONNECTORS MATE THRU DOUBLER.
14. AT INSTALLATION, PROVIDE SUFFICIENT SLACK IN CABLE AND WIRING TO PERMIT 30° HOOK SWING IN ANY DIRECTION FROM VERTICAL POSITION, WITHOUT TENSIONING CABLE OR WIRING.
15. USED ON INSTALLATIONS WITHOUT SWITCH GUARD (WITH ARMING SWITCH).

Figure 9-1. Cargo hook electrical equipment (sheet 2 of 2)

Table 9-1. Troubleshooting cargo hook installation

Symptom	Probable Trouble	Corrective Action
Cargo release pushbutton switch does not open (unlatch) hook.	Defective electrical connection or wiring.	Repair connection or wiring.
	Defective safety arming switch (if installed).	Replace switch.
	Defective cargo release pushbutton switch.	Replace switch.
	Defective cargo hook circuit breaker.	Replace circuit breaker. (Use only 15A circuit breaker for replacement.)
	Defective cargo hook assembly.	Replace cargo hook assembly.
Manual emergency release equipment does not open hook.	Disconnected release cable.	Connect release cable.
	Defective cable.	Replace cable.
	Defective cargo hook internal release mechanism.	Replace cargo hook assembly.
External release at hook does not release hook.	Defective hook.	Replace hook assembly.

the cargo hook releases a spring-loaded load beam (latching bar) to release the cargo. The latching bar remains in the open (retracted) position until manually pushed closed or until a load (D) ring is inserted up into the lock throat. The latching bar returns to the open position when positive closure is not accomplished. Automatic closure is accomplished by pushing the auto-latching bar upward with the load ring during sling load hookup operation. The auto-latching bar pivots to move an internal cam that closes the load beam (latching bar). In an emergency the hook can be mechanically opened for cargo release by squeezing a manual emergency lever attached to either the pilot's cyclic or collective stick, or by pulling a T-handle located either between the pilot's seats or at the pilot's left door frame. An external pull release on the hook permits manual release of the latching bar at the cargo hook. Load rings with a cross-section thickness up to 3/4 inch (maximum hook throat opening) may be used.

9-8. <u>REMOVAL OF CARGO HOOK ASSEMBLY.</u> (See fig. 9-1.)

a. Check that all electrical power is OFF.

b. Remove attaching hardware securing pulser unit mounting plate at fairing recess forward of cargo hook. Disconnect pulser unit wiring from fairing electrical connector and lower pulser unit.

<u>NOTE</u>: The pulser unit is used only with Norco CL 344-1 hook assembly.

c. For an installation with interconnected forward and aft control cables, release the control cable quick-disconnect device at the cargo hook fairing.

d. Remove screws, washers, and clamps securing control cable and wire harness to the underside of fuselage.

e. Remove four bolts and washers mounting hook swivel to helicopter and lower hook and attached swivel. Remove hook and connected pulser unit as an assembly.

f. For helicopter with fairing, install the cargo hook fairing cover (Section 2, Basic HMI).

9-9. <u>MAINTENANCE OF CARGO HOOK ASSEMBLY.</u> Refer to manufacturer's maintenance instructions provided with cargo hook assembly. Disassembly of cargo hook mechanism is not approved by cargo hook manufacturer.

9-10. <u>INSTALLATION OF CARGO HOOK.</u> (See fig. 9-1.)

a. Check that all electrical power is OFF.

b. Position cargo hook and swivel assembly below cargo hook fitting at center beam and install four bolts with washers.

c. If installed, remove cargo hook fairing cover (Section 2, Basic HMI).

d. For Norco CL 344-1 hook only, hold pulser unit under cargo hook fairing electrical connector. Secure pulser unit mounting plate to fairing underside with attaching hardware.

e. Route the cargo hook control cable forward and couple to forward attachment point. For an installation with a single control cable, couple to release lever on cyclic stick (fig. 9-2). For dual control cables, couple to quick-disconnect cable coupling on aft end of forward cable (fig. 9-1). Install attaching clamps and associated hardware to secure hook control cable and wiring.

NOTE: Ensure that hook is free to swivel 30 degrees in all directions before tightening clamps.

f. Perform an operational check as described in paragraph 9-4.

9-11. PILOT'S CARGO HOOK ELECTRICAL RELEASE EQUIPMENT.

9-12. GENERAL. Electrically operated equipment (fig. 9-1) releases cargo from the cargo hook. Depressing the cargo release pushbutton switch on the pilot's cyclic stick energizes a solenoid in the cargo hook which opens the movable load beam (latching bar) of the hook. On a 500M helicopter with an arming switch, depressing the switch activates a cargo hook relay K104 that energizes the hook solenoid. The safety toggle (arming) switch, on helicopters without 369H90129 cyclic stick grip kit or a release switch on cyclic stick grip without a switch guard, is wired in series with the pushbutton switch to prevent inadvertent release of cargo if the pushbutton is pushed accidentally. The cargo hook circuit breaker on the instrument panel must be depressed (button in) and the arming toggle switch must be ON for the pushbutton switch to release the cargo. On installations without the arming switch, a switch guard around the release switch on the cyclic stick grip protects against accidental actuation. An electrical wire harness and associated wiring interconnect the electrical components. See figure 9-3 or 9-4 for the applicable electrical wiring diagram.

9-13. PILOT'S CARGO HOOK EMERGENCY RELEASE EQUIPMENT.

9-14. GENERAL. The manual release equipment consists of a cable routed from the pilot's position to the cargo hook release mechanism on the belly of the helicopter. Four different types of pilot controls are used. A release lever may be attached to the pilot's cyclic stick (fig. 9-2), collective stick (fig. 9-5) or a T-handle may be mounted either on the center fairing between the pilot's seats or at the forward edge of the pilot's left door frame (fig. 9-6). Hughes Service Information Notice HN-47 provides instructions for required modification of manual release from collective pitch stick to T-handle configuration mounted on the left door frame, using Cargo Hook Mechanical Release System Modification Kit M50034. Modification of any installation with forward and aft control cables, to the current type installation that has a cargo hook with a single 73.5 inch long release cable and the release lever on the pilot's cyclic stick, is accomplished according to Cargo Hook Installation Modification M50041. On an installation with forward and aft release cables, the forward release cable is routed and secured inside the fuselage. The release cable is designed for an operating load of 20 pounds. Test load limit for the cable is 60 pounds, without cable yield or permanent set. For a cargo hook with a 73-38 inch long release cable, a quick-disconnect device connects the forward release cable to the external aft release cable and cargo hook (fig. 9-7). For a hook with a 73.5 inch long release cable, a single continuous cable is used (fig. 9-2). Swaged ball terminals connect the cable end to the hand release lever and cargo hook actuating mechanism. The release cable that is attached to the hook is part of the cargo hook assembly.

9-15. REMOVAL OF EMERGENCY RELEASE LEVER AND CABLE.

a. For a helicopter with forward and aft release cables - at the cargo hook fairing, release cable quick-disconnect coupling (fig. 9-7). Remove spring retainer, return spring and washer.

b. At the collective or cyclic stick grip, as applicable; cut lockwire and remove cable swaged ball terminal from lever slot (fig. 9-5 or fig. 9-2).

c. For an installation with lever on collective stick (fig. 9-5), perform the following:

(1) Remove pulley guard and pulley by removing attaching nut, screw and two washers. Catch the four spacer washers from between guard and bracket.

(2) Remove the two lever pivot screws and remove lever and return springs.

(3) Cut lockwire and remove the cable housing slotted terminal from the lever support bracket.

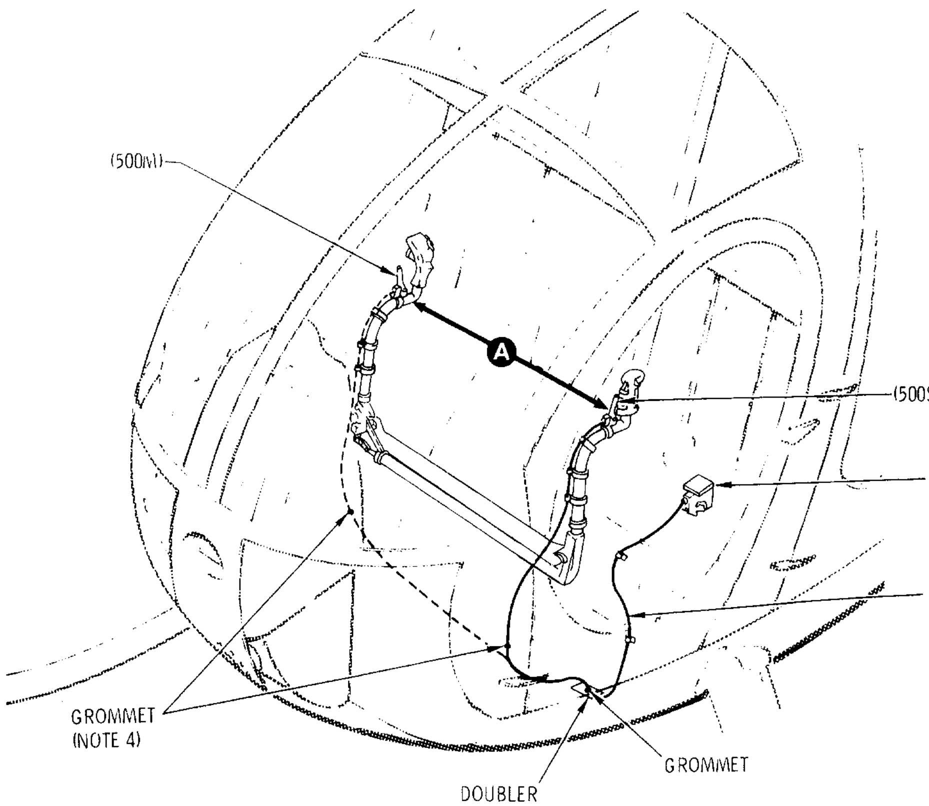
(4) Remove the four screws and washers from the lever support bracket and remove bracket. Catch right side spacer and shim washers, if any, from between bracket and switch button plate.

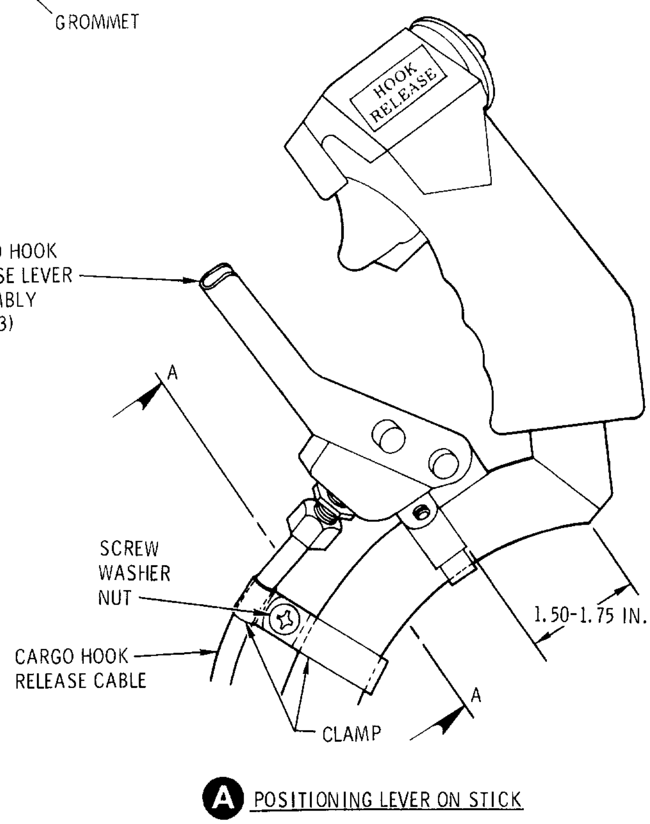
d. For an installation with lever on cyclic stick, remove lever as shown in figure 9-2.

e. The control cable may be removed by removing the necessary covers to gain access to mounting hardware. Remove nylon straps, attaching hardware and remove cable.

9-16. REMOVAL OF EMERGENCY RELEASE T-HANDLE CABLE.

a. At cargo hook fairing, release cable at quick-disconnect coupling (fig. 9-7). Remove spring retainer, return spring and washer. Remove nut and washers securing cable housing in the fairing.





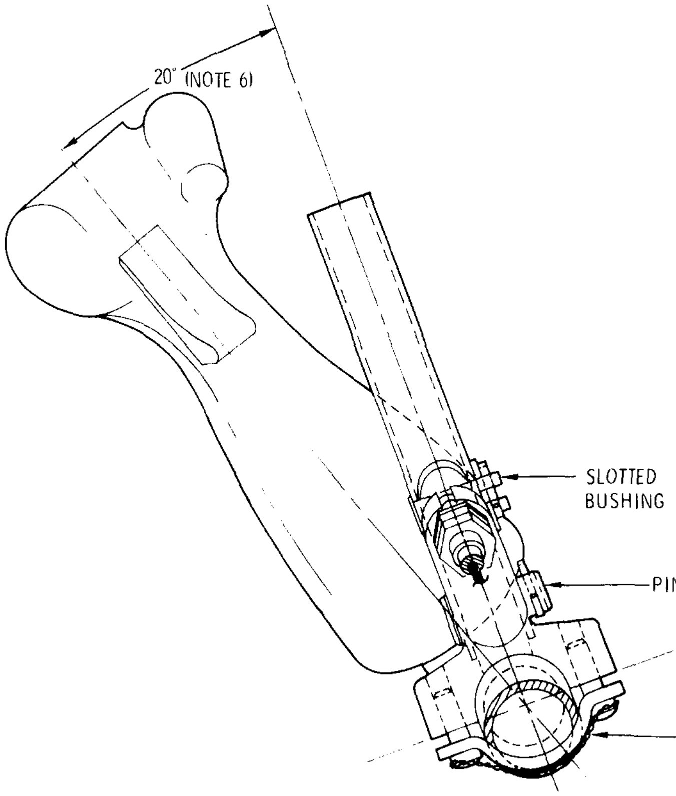
NOTES:

1. FOR DETAILS, SEE VIEW ON SEPARATE FIGURE.
2. SINGLE CABLE, 73.5 IN. LONG, FROM HOOK TO RELEASE LEVER ASSEMBLY.
3. INSTALL AT LOCATION SHOWN USING DIMENSION INDICATED. FOR ANGULAR POSITION INFORMATION, SEE DETAIL VIEW A-A.
4. IN FLOOR OF PILOT'S COMPARTMENT.

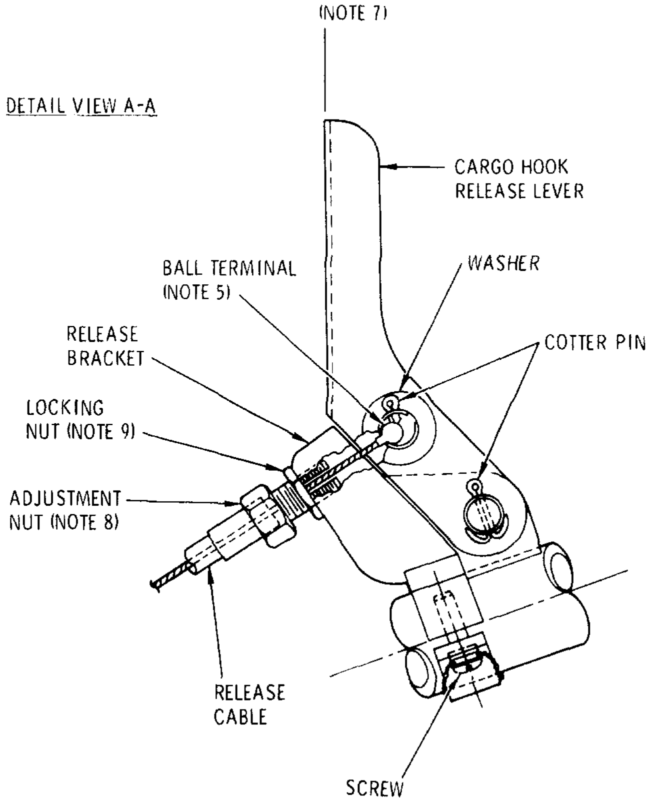
A POSITIONING LEVER ON STICK

37-136-1

Figure 9-2. Cargo hook emergency release equipment - on cyclic stick (sheet 1 of 2)



DETAIL VIEW A-A

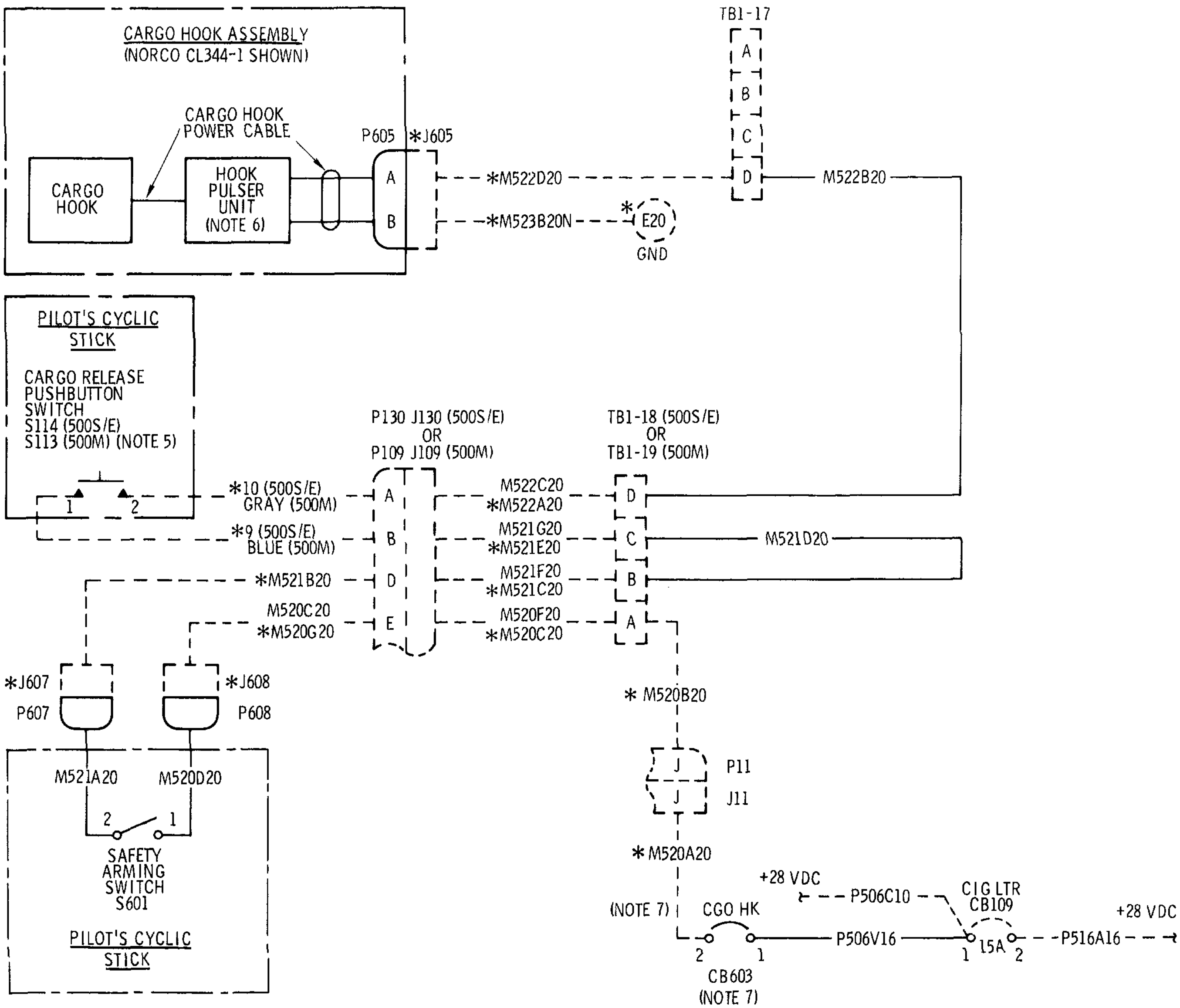


NOTES: *(CONT)*

5. INSIDE BORE OF SLOTTED BUSHING.
6. APPROXIMATE POSITION. INSTALL AT ANGULAR POSITION DESIRED AND REQUIRED FOR PROPER CABLE RELEASE OPERATION OF CARGO HOOK. (SEE NOTE 8.)
7. HOOK RELEASE POSITION FOR LEVER IS AFT TO POSITION REQUIRED FOR BALL TERMINAL AFT TRAVEL OF APPROXIMATELY 1/2 IN. (SEE NOTE 8.)
8. WITH LOCKING NUT LOOSENED, ADJUST TO SET LEVER AT DESIRED HOOK ENGAGED POSITION. ADJUSTMENT SIMULTANEOUSLY SHIFTS BOTH ENGAGED AND RELEASED POSITIONS SAME DIRECTION AND DISTANCE. (SEE NOTE 6.)
9. TIGHTEN AFTER RELEASE LEVER IS CORRECTLY POSITIONED. (SEE NOTE 8.)
10. ITEM 2, TABLE 2-4, BASIC HMI.

37-136-2

Figure 9-2. Cargo hook emergency release equipment - on cyclic stick (sheet 2 of 2)

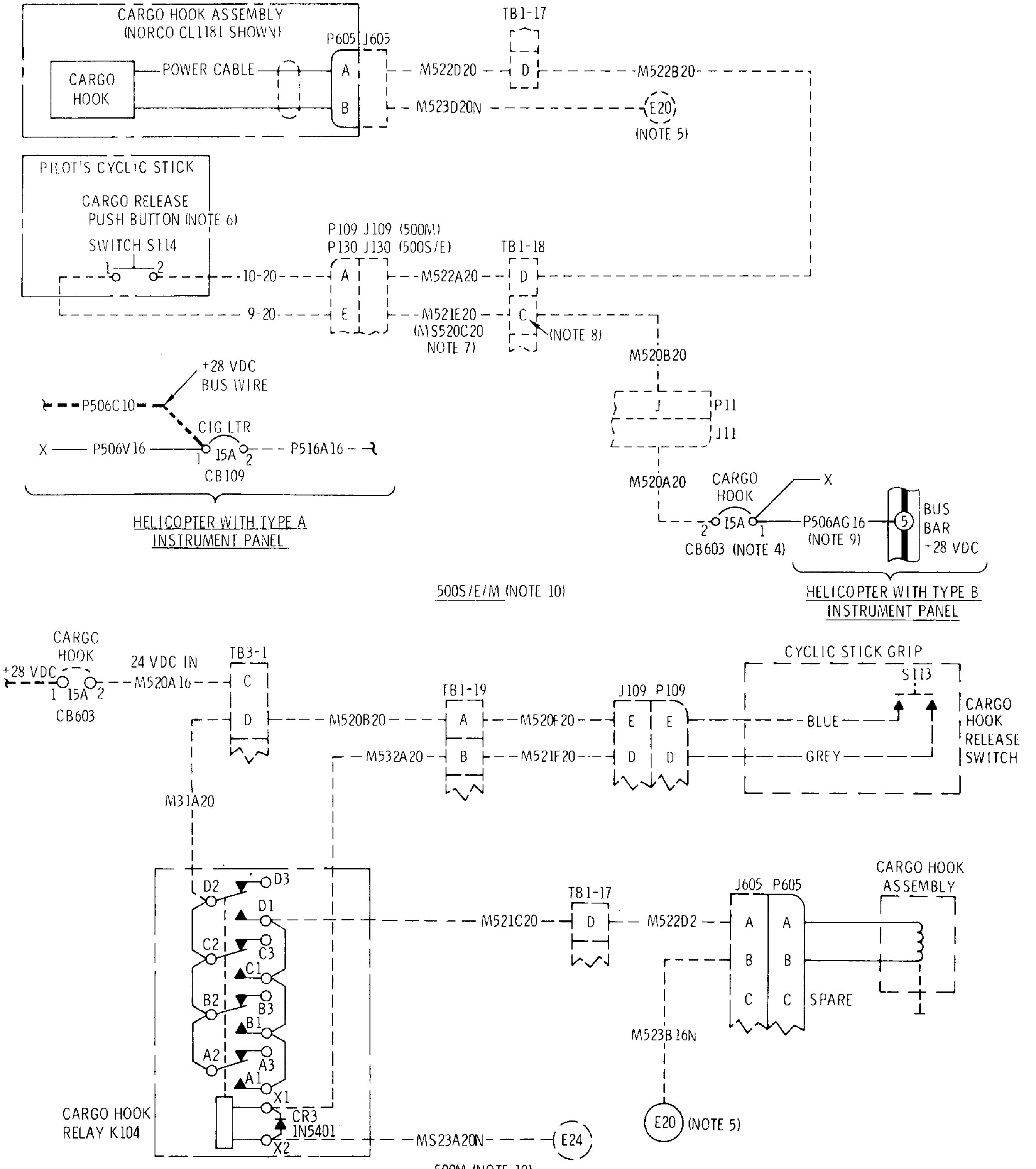


NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (--) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM, UNLESS OTHERWISE NOTED.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENT.
4. ASTERISK (*) INDICATES PART OF CARGO HOOK ELECTRICAL EQUIPMENT (NOT PART OF HELICOPTER BASIC ELECTRICAL SYSTEM) ON EARLY CONFIGURATION 500S/E.
5. PART OF HELICOPTER BASIC ELECTRICAL SYSTEM, EXCEPT ON CURRENT CONFIGURATION USED FOR 500M.
6. PULSER UNIT IS USED ONLY WITH NORCO CL344-1 HOOK ASSY.
7. ITEM INSTALLED MAY BE 7.5-AMPERE OR 15-AMPERE CIRCUIT BREAKER. ONLY USE 2TC12-15 AT TIME OF REPLACEMENT.

37-074C

Figure 9-3. Cargo hook installation - wiring diagram (installation with arming switch)

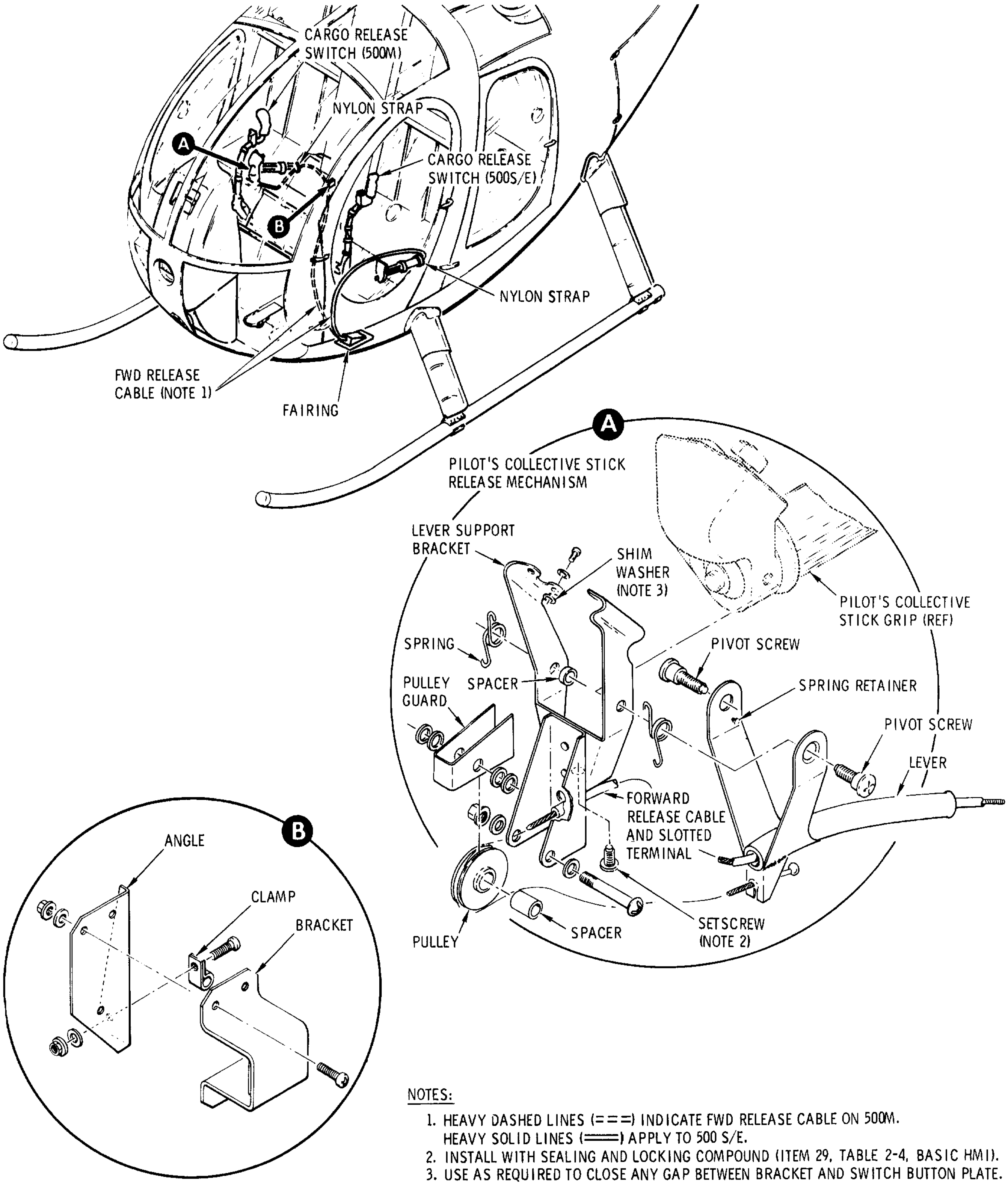


NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN HMI FOR COMPLETE CURCUIT IDENTIFICATION.
2. DASHED LINE (---) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM; SOLID LINE (——) ITEMS ARE PART OF HOOK KIT.
3. REFERENCE DESIGNATORS AND TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENT.
4. MAY BE 7.5-AMPERE OR 15-AMPERE CIRCUIT BREAKER. REPLACE ONLY WITH 15A CIRCUIT BREAKER.
5. TERMINAL E1 MAY BE USED.
6. S4, IF NOTE 7 APPLIES.
7. FOR CARGO HOOK KIT WITH 369H90129 CYCLIC STICK GRIP KIT.
8. TERMINAL A, IF NOTE 7 APPLIES.
9. WIRE NO. P506A16 ON SOME INSTALLATIONS.
10. LOWER DIAGRAM APPLIES TO 500M WITH T-HANDLE EMERGENCY RELEASE EQUIPMENT.

37-081B

Figure 9-4. Cargo hook installation - wiring diagram (installation without arming switch)



NOTES:

1. HEAVY DASHED LINES (= = =) INDICATE FWD RELEASE CABLE ON 500M.
   HEAVY SOLID LINES (═══) APPLY TO 500 S/E.
2. INSTALL WITH SEALING AND LOCKING COMPOUND (ITEM 29, TABLE 2-4, BASIC HMI).
3. USE AS REQUIRED TO CLOSE ANY GAP BETWEEN BRACKET AND SWITCH BUTTON PLATE.

37-062

Figure 9-5. Cargo hook emergency release equipment - on collective stick

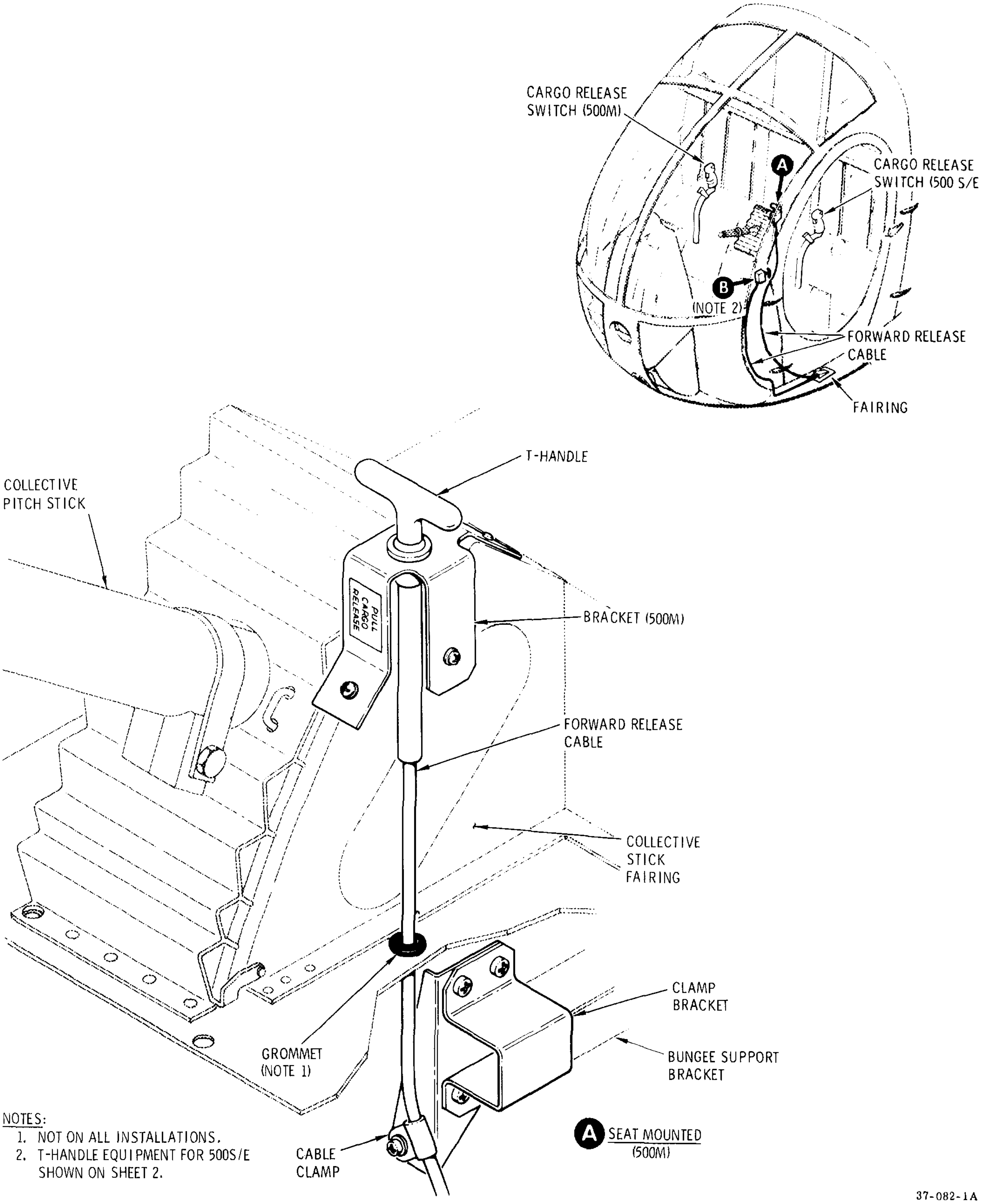


Figure 9-6. T-handle emergency release equipment (sheet 1 of 2)

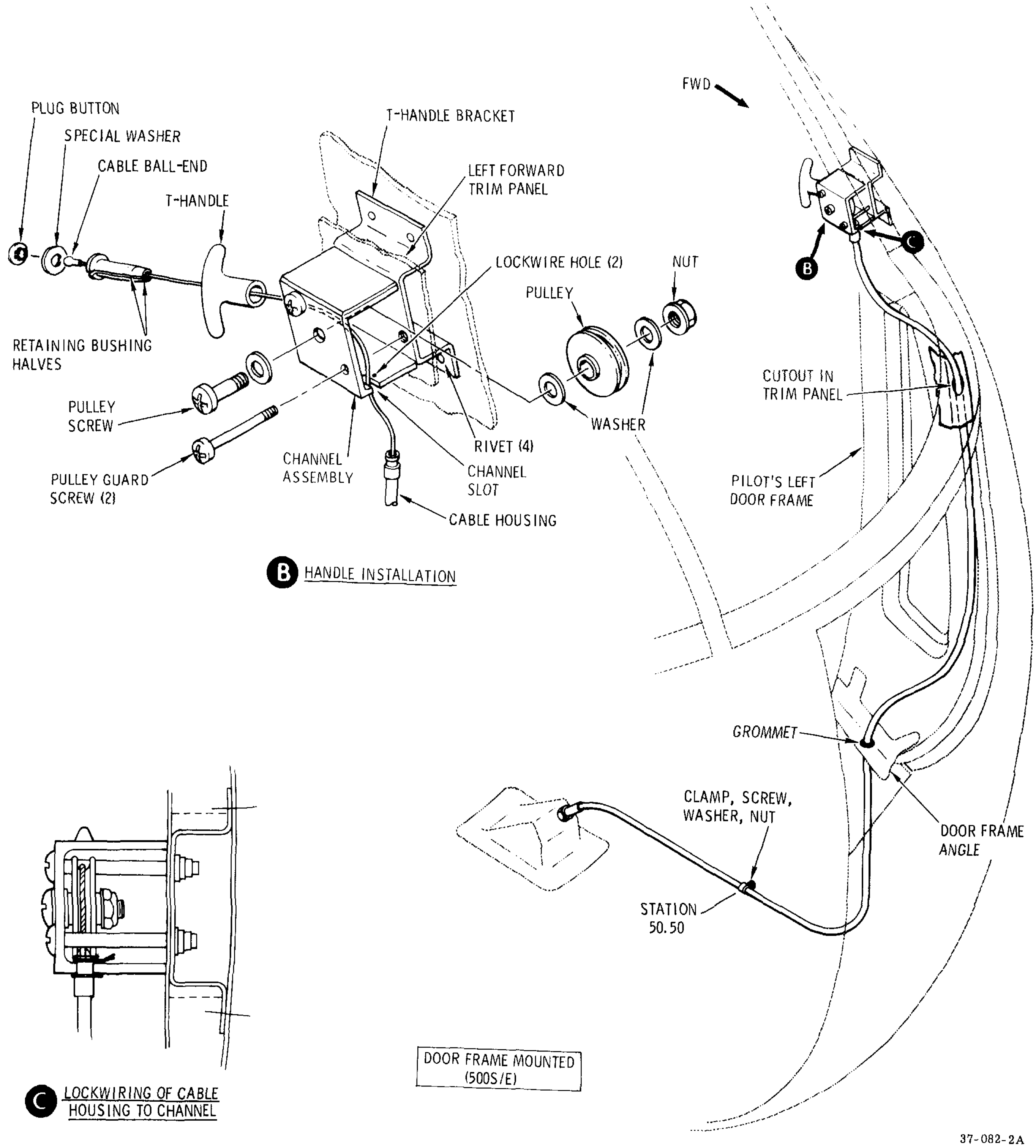
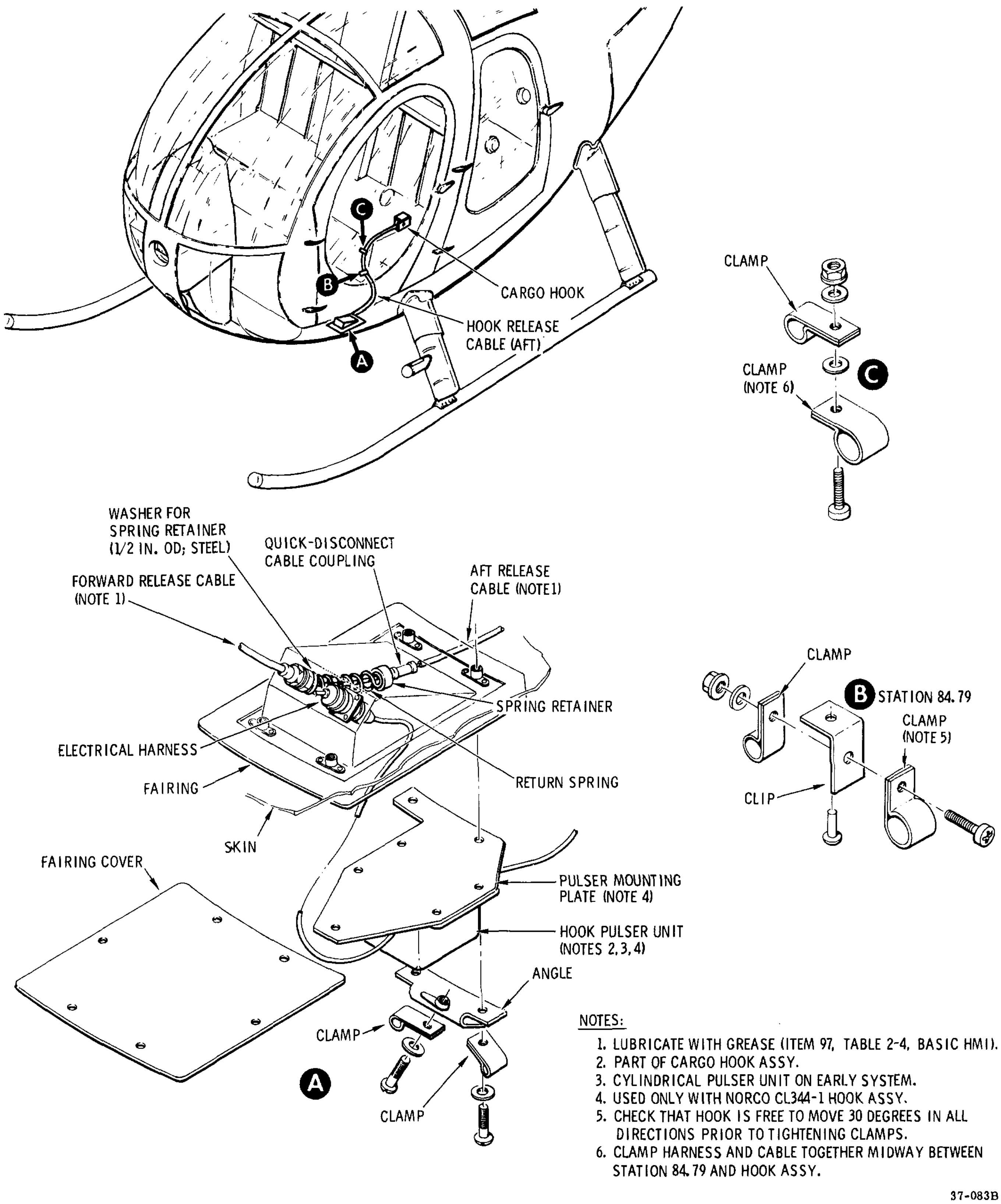


Figure 9-6. T-handle emergency release equipment (sheet 2 of 2)



NOTES:

1. LUBRICATE WITH GREASE (ITEM 97, TABLE 2-4, BASIC HMI).
2. PART OF CARGO HOOK ASSY.
3. CYLINDRICAL PULSER UNIT ON EARLY SYSTEM.
4. USED ONLY WITH NORCO CL344-1 HOOK ASSY.
5. CHECK THAT HOOK IS FREE TO MOVE 30 DEGREES IN ALL DIRECTIONS PRIOR TO TIGHTENING CLAMPS.
6. CLAMP HARNESS AND CABLE TOGETHER MIDWAY BETWEEN STATION 84.79 AND HOOK ASSY.

Figure 9-7. Fairing and aft emergency release equipment - cargo hook installation with forward and aft cables

b. In the pilot's compartment left side underfloor area, pull cable out of fairing and remove cable housing locknut and washer.

c. Remove all cable clamps and tie straps in the underfloor area.

d. For T-handle mounted between the pilot's seats (fig. 9-6):

(1) Remove locknut and washers securing the cable in the bracket on the collective stick fairing between the pilot's seats.

(2) Remove screws in the collective stick fairing and raise sufficiently for access to cable clamp under the fairing. Remove clamp.

(3) Remove T-handle cable assembly by pulling it upward through fairing bracket and grommet.

NOTE: Catch locknut and washers as they will slide off the end of cable as it is removed.

e. For T-handle mounted at pilot's left door frame (fig. 9-6):

(1) Remove safety wire retaining cable housing in T-handle channel assembly slot.

(2) Remove the lower pulley guard screw in the T-handle channel; also remove the center screw, nut and washers retaining the pulley. Remove pulley.

(3) Remove plug button, special washer and the two halves of the retaining bushing in the T-handle and release cable ball-end from T-handle.

(4) Detach door frame forward trim panel. Pull cable assembly downward out of trim panel and through floor grommet into the pilot's underfloor area. Remove cable assembly.

9-17. INSTALLATION OF EMERGENCY RELEASE LEVER AND CABLE.

a. Route cable and install attaching clamps. Do not tighten clamps as sufficient slack must be provided at the stick during subsequent steps.

b. For an installation with lever on pilot's collective stick (fig. 9-5), perform the following:

(1) At the stick grip, temporarily install the lever support bracket with two pivot screws and spacer. Check that no gap exists between the switch button plate and the bracket. Insert shims, if required, and install four screws and washers. Remove pivot screws.

(2) Position the two lever return springs and install lever with two pivot screws.

(3) Route the cable and housing through the lever handle. Secure the cable housing slotted terminal end to the lever support bracket. Safety with lockwire.

(4) Assemble the pulley guard and pulley with the cable routed as shown in figure 9-9.)

(5) Insert cable ball terminal in lever slot and secure with lockwire.

c. For an installation with lever on cyclic stick, install lever as shown in figure 9-2.

d. Check that sufficient slack is available with collective stick at full up position, or cyclic stick at full aft position, as applicable. Cargo hook release lever must not move from full closed position. Tighten cable attaching hardware.

e. At cargo hook fairing for an installation with forward and aft control cables, install washer, return spring, and spring retainer on forward release cable (fig. 9-7). Connect cable ball-end to quick-disconnect.

f. Perform an operational check of cargo hook as described in paragraph 9-4.

9-18. INSTALLATION OF EMERGENCY RELEASE T-HANDLE CABLE.

a. For T-handle mounted between pilot's seats (fig. 9-6):

(1) Remove screws in collective stick fairing between pilot's seats.

(2) Route lower end of cable through fairing bracket and through a plain washer, lockwasher and locknut.

(3) Secure T-handle end of cable to fairing bracket.

(4) Route cable through grommet and then left to hook fairing.

(5) Install locknut and washer on lower end of cable housing and slip cable through inboard hole in fairing until it bottoms on washer and locknut.

(6) Install clamps and ties in underfloor area and under collective stick fairing.

(7) Secure collective stick fairing with screws.

b. For T-handle mounted at pilot's left door frame (fig. 9-6):

(1) Route forward end of cable assembly upward from left underfloor area, through floor grommet, and through left door frame forward trim panel to T-handle channel.

(2) Slip cable housing into slot in T-handle channel and secure with safety wire as shown.

(3) Route cable ball-end over pulley and install pulley using screw, nut and washer.

(4) Insert cable ball-end in T-handle and secure in place with retaining bushing halves. Install special washer and plug button.

(5) Install lower pulley guard screw in T-handle bracket.

(6) In underfloor area, install cable housing clamp to structure. Install locknut and washer on lower end of cable housing and slip cable through inboard hole in fairing until it bottoms on washer and locknut.

c. At hook fairing exterior, install washer and locknut to secure cable housing in fairing (fig. 9-7). Install washer (or spring retainer), return spring, and aft spring retainer on forward release cable. Connect cable ball-end to aft cable quick-disconnect.

d. Perform operational check as described in paragraph 9-4.

9-19. CARGO SWING INSTALLATION.

9-20. GENERAL. The cargo swing installation consists of a cargo swing hook suspended beneath the helicopter on a swivel-mounted beam (fig. 9-8), electrical release equipment, and manual emergency release equipment. The cargo swing hook retracts to a stowed position when cargo is released. The beam (swing) and swing hook may be quickly detached from the helicopter when not in use. The cargo hook release is electrically actuated by the pilot through a cyclic control grip switch. A manual emergency release is also provided on the pilot's collective stick, or mounted on the collective stick fairing between the pilot's seats. The cargo hook and swing have an operational rating of 1400 pounds. Due to hook configuration, helicopter cg limits are not significantly affected by slung loads.

9-21. OPERATIONAL CHECK OF CARGO SWING RELEASE SYSTEM.

a. Turn electrical power ON.

NOTE: Manually close movable hook jaw after each operational check.

b. With circuit breaker pushed in (ON) and arming switch ON, depress cyclic stick release button. The cargo hook release solenoid should operate to release the cargo hook.

NOTE: The cargo hook jaw will not open unless a 1-1/2 pound minimum load is applied downward on the movable jaw. An assistant must apply this pressure for a complete operational check. Actuation of the solenoid can be heard in the pilot's compartment when the engine is not operating.

c. With the arming switch in the OFF position, check that the cargo hook solenoid does not operate when the cyclic stick release button is depressed.

d. With the cargo hook closed, operate the pilot's collective stick lever or T-handle emergency release and check that the hook opens.

e. At the cargo hook, actuate the manual release knob and check hook for operation.

f. Check lower release cable and reel for operation.

9-22. INSPECTION OF CARGO SWING INSTALLATION.

a. Inspect cargo hook and support cables for serviceable condition and security.

b. Inspect the beam and swivel assemblies for freedom of motion and security of attachment.

c. Inspect control cable and electrical wiring for serviceable condition and security.

d. Inspect lever mechanism at collective stick or T-handle for serviceable condition, freedom of motion, and positive return of actuating lever.

e. Check hook retracting mechanism for positive action.

NOTE: Reel assembly spring is set to exert a 7.5-pound retracting force on hook at the retracted (stowed) position.

f. Perform operational check as described in paragraph 9-21.

9-23. CARGO SWING HOOK.

9-24. GENERAL. The cargo swing hook (figure 9-8) has a lower movable jaw that locks in position for attachment of cargo. When electrically energized, an internal solenoid in the cargo hook releases and opens the movable jaw for release of cargo. A manual release knob on the hook also permits manual release of the cargo at the cargo hook. In an emergency, the hook can be mechanically opened for cargo release by squeezing a manual emergency release lever attached to the pilot's collective stick or by pulling a T-handle located between the pilot's seats. When the cargo hook is not in use a spring-wound reel mounted on the lower right side of the cargo beam automatically winds up and pulls the cargo hook to the stowed position. A corrosion-resistant-steel cable from the reel is attached to the hook.

9-25. REMOVAL OF CARGO SWING. (See fig. 9-8.)

a. Check that all electrical power is OFF.

b. Disconnect the electrical wire harness at the cargo swing fairing recess.

c. Disconnect the upper and lower cargo release cables, using the quick-disconnect device.

d. Remove the attaching hardware that secures the electrical wire harness and lower cargo release cable to the lower exterior of the fuselage.

NOTE: The harness and cable are to remain attached to the cargo beam.

e. Remove the fuel cell cover-attached locking pins from the cargo beam attachment pins.

f. Pull the attachment pins from the two forward side jack points while supporting the beam and remove the cargo swing.

NOTE: The left attachment pin is removed first by use of the movable link. The upper release cable and electrical cargo release components inside the fuselage remain installed.

NOTES:
1. LUBRICATE WITH GREASE (ITEM 97, TABLE 2-4, BASIC HMI).
2. REEL EXERTS 7.5 LB RETRACTING FORCE ON HOOK.

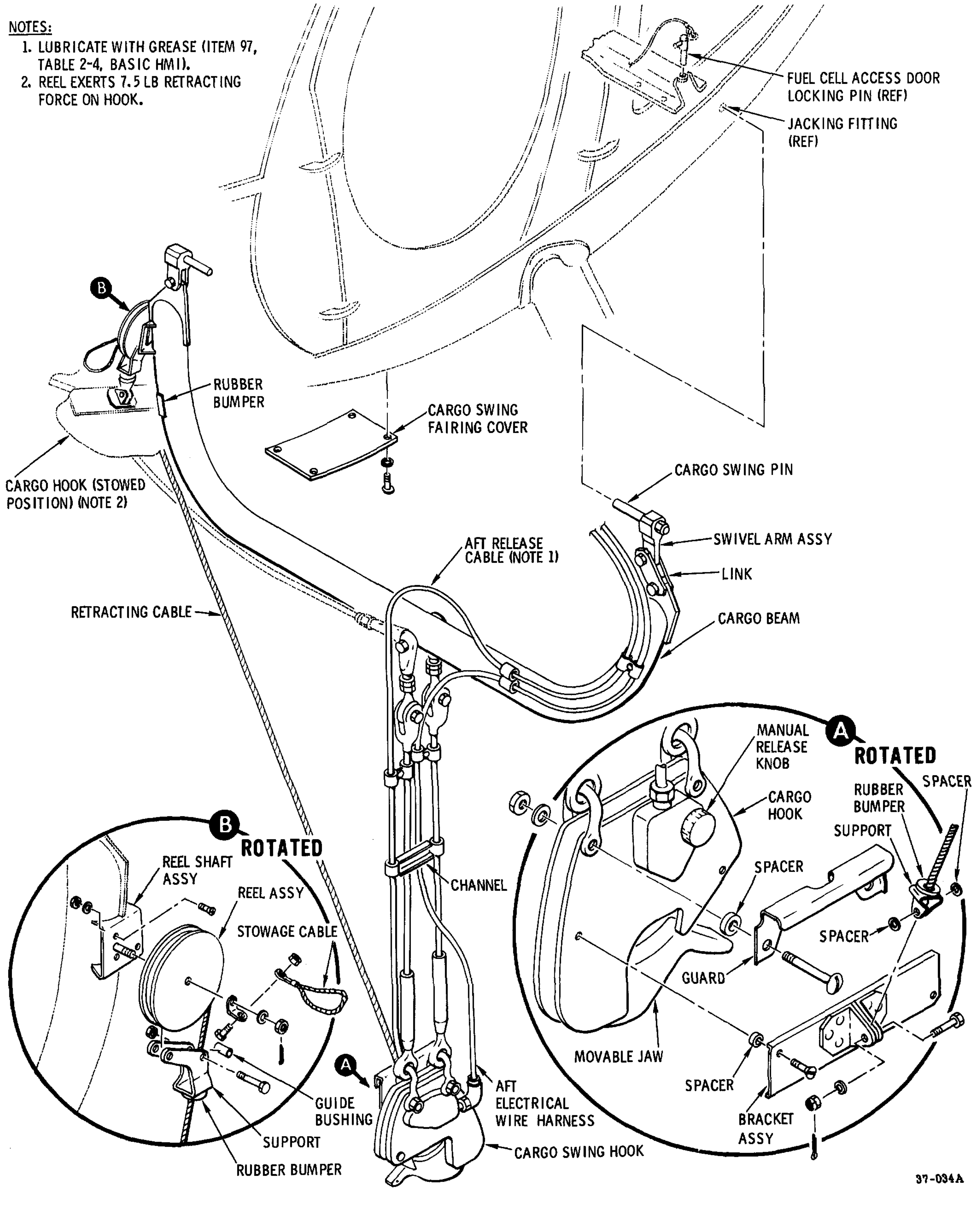


Figure 9-8. Cargo swing beam and hook installation

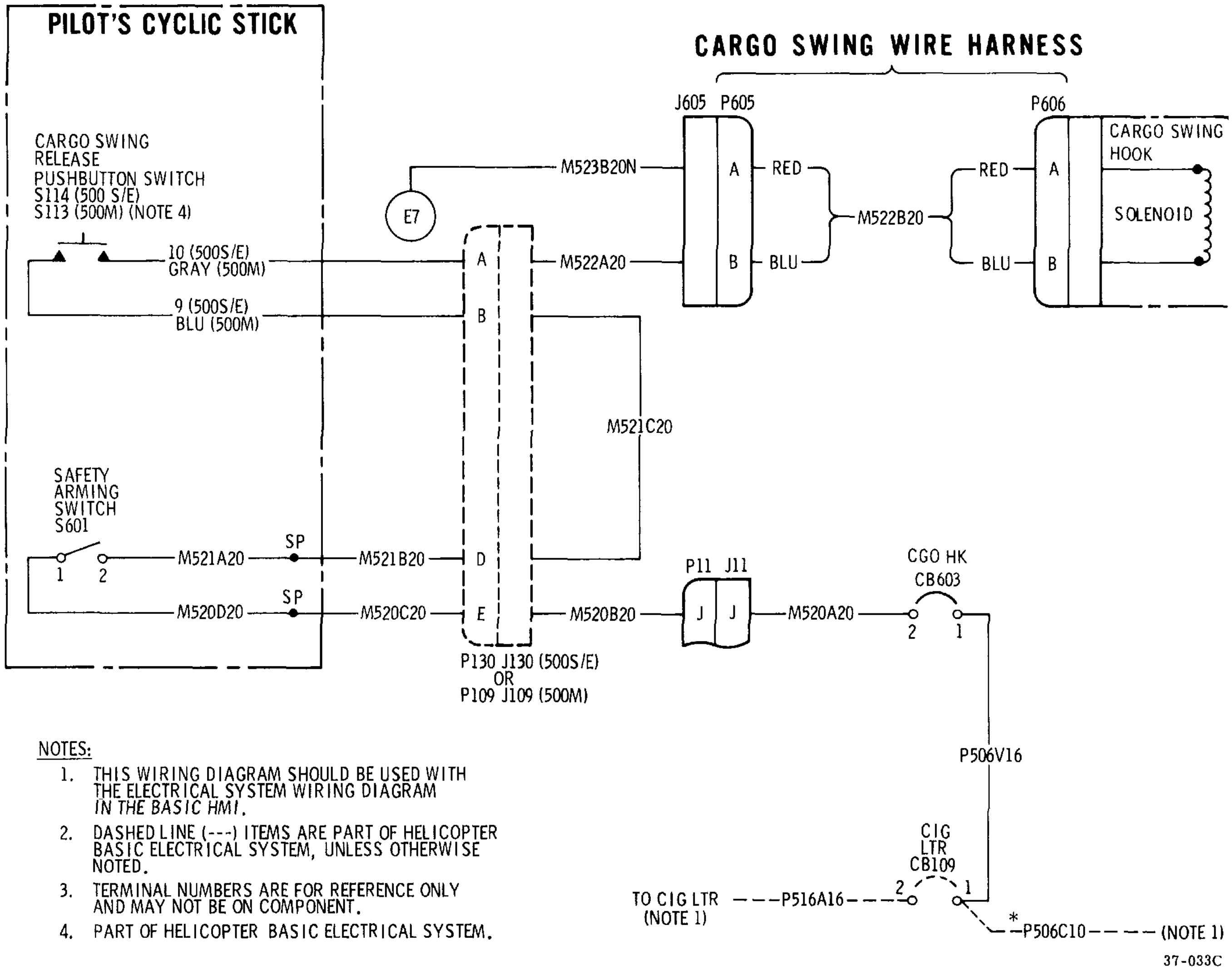


Figure 9-9. Cargo swing electrical wiring diagram

g. Install the cargo swing fairing cover (Section 2, Basic HMI).

9-26. INSTALLATION OF CARGO SWING. (See fig. 9-8.)

a. Remove the cargo swing fairing cover (Section 2, Basic HMI).

b. Insert the attachment pins on the cargo beam into the two side jack points. Secure the pins in place by using the two locking pins that are attached to the fuel cell covers.

NOTE: The left attachment pin is inserted first by use of the movable link.

c. Secure the cargo beam electrical wire harness and lower cargo release cable to the lower exterior of the fuselage, using attaching hardware.

NOTE: Be sure to provide enough slack in cable and wire harness to allow free movement of cargo swing.

d. Connect the lower and upper release cables, using the quick-disconnect device.

e. Connect the electrical wire harness at the cargo swing fairing recess.

f. Perform an operational check as described in paragraph 9-21.

9-27. PILOT'S CARGO SWING ELECTRICAL RELEASE EQUIPMENT.

9-28. GENERAL. The cargo swing electrical release equipment (fig. 9-9) is similar to cargo hook electrical release equipment described in paragraph 9-12. except for swing hook and electrical wiring differences. See figure 9-9 for an electrical wiring diagram.

9-29. PILOT'S CARGO SWING EMERGENCY RELEASE EQUIPMENT.

9-30. GENERAL. The cargo swing emergency release equipment (figure 9-4 and 9-7) is the same as the cargo hook emergency release equipment described in paragraph 9-14 with minor differences. These are the exterior release cable which is not part of the cargo swing hook, and slight variations in release cable routing and attachment to the fuselage.

9-31. REPLACEMENT OF CARGO SWING EMERGENCY RELEASE CABLE. Removal and installation of the cargo swing emergency release cable (figures 9-4 and 9-6) are the same as for the cargo hook release cable described in paragraphs 9-15, 9-16, 9-17, and 9-18.

OPTION GROUP 10
HOIST EQUIPMENT

10-1. HOIST SYSTEM.

10-2. GENERAL. The passenger/cargo hoist kit assembly consists of an electrically operated winch mounted on a support tube, a hoist operator's safety harness, a passenger door (hold-open) retainer assembly, a antichafing bar assembly, a control pendant, and associated electrical equipment. The hoist provides a means for lifting and lowering personnel or objects weighing up to 300 pounds. The hoist system employs lightweight, readily attachable and detachable exterior-mounted equipment without using passenger or cargo space in the helicopter. For safety purposes a guillotine-type cable cutting device is incorporated in the hoist winch assembly. The hand-cutting device is incorporated in the hoist winch assembly. The hand-held pendant control, for use in the passenger/cargo or pilot's compartments, contains a three-position switch, spring-loaded to the off position, for raising and lowering the swivel hook, and a guarded switch for cutting the cable at the winch in an emergency. On the current configuration and those earlier configuration helicopters with the hoist which also have the cargo hook kit and/or the emergency float kit, there must be installed a pilot's cyclic stick kit with a cable cutter switch which allows the pilot to cut the hoist cable independently of the pendant control. The circuit breakers are mounted on the lower switch and circuit breaker panel. The cable cutter circuits are independently protected by a separate lower amperage circuit breaker located adjacent to the hoist power circuit breaker. The antichafing bar, installed just below the passenger/cargo door sill, prevents the hoist cable from cutting the door frame during hoisting operations. Figures 10-1 and 10-2 for current and early configurations shows the hoist installed on the right side of the helicopter. The hoist functions identically when operated on the left side.

NOTE: When the hoist kit is installed on helicopters equipped with emergency floats, the floats must be in a stowed condition during hoisting operations.

10-3. REFERENCE DATA. Refer to Section 20, Basic HMI for interfacing schematics and wiring diagrams. Differences in electrical circuitry are described in subsequent text and illustrations. Refer to manufacturer's publications (BL-16600 Series 300-Pound-Capacity Hoist Operating Instructions - Hoist Winch Assembly, Breeze Corporation, 700 Liberty Avenue, Union, NJ) for additional hoist, hook, cable, and parts information.

10-4. TROUBLESHOOTING. Use information in table 10-1 for troubleshooting the hoist system.

10-5. REMOVAL OF HOIST ASSEMBLY.

10-6. GENERAL. The hoist system winch is mounted on a support tube and attached with quick-release safety pins to three fittings installed on either side and above the passenger/cargo compartment door. The support tube positions the winch to raise and lower the cable between the side of the fuselage and the landing gear skid.

Table 10-1. Troubleshooting hoist

Symptom	Probable Trouble	Corrective Action
Winch will not raise or lower cable.	Tripped circuit breaker.	Reset circuit breaker.
	Defective pendant control.	Repair pendant control.
	Defective winch assembly.	Repair winch assembly.
Improper lower cable travel limit.	Down (full out) limit switch out of adjustment.	Reset lower limit adjustment.

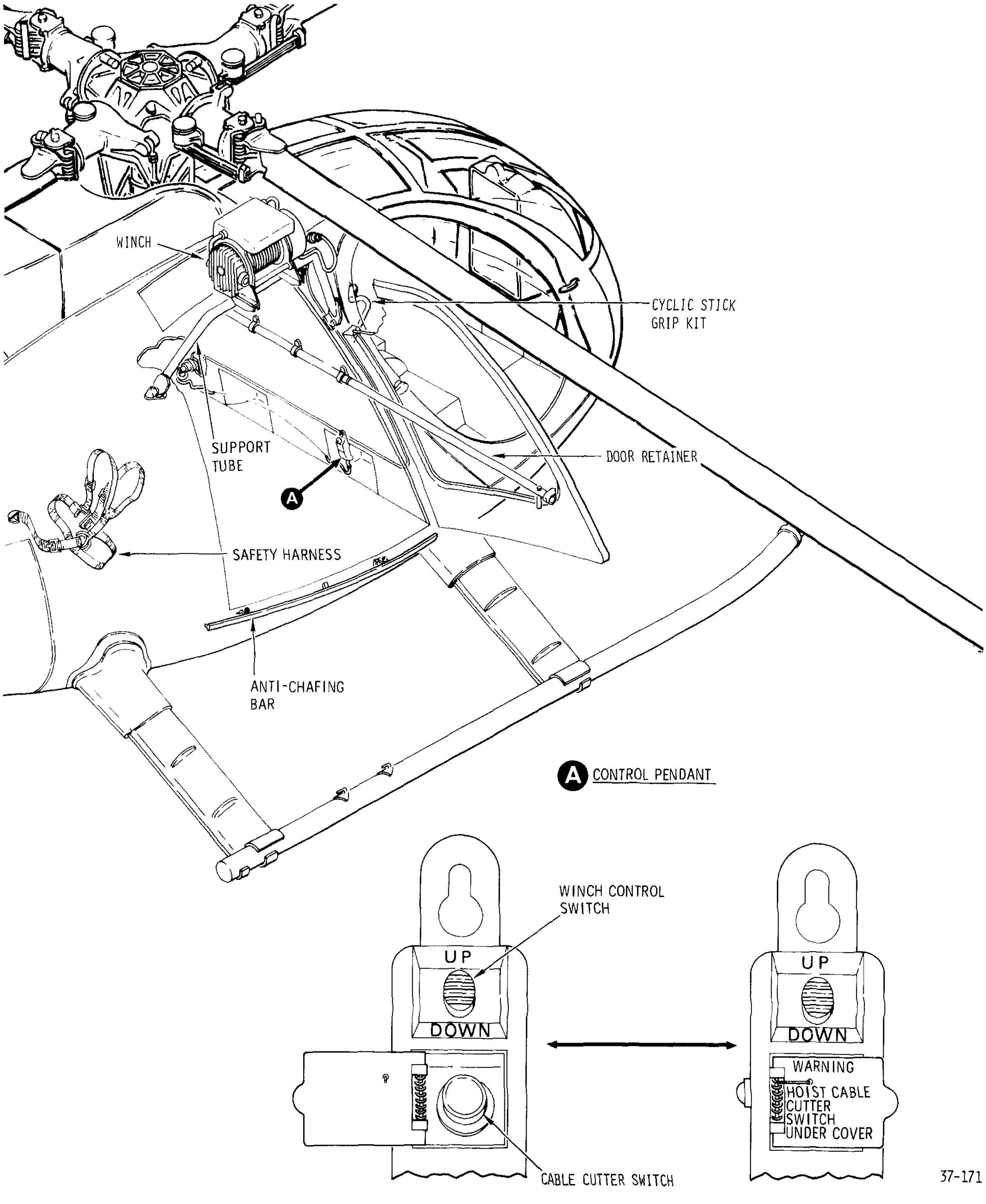


Figure 10-1. Hoist components – current configuration

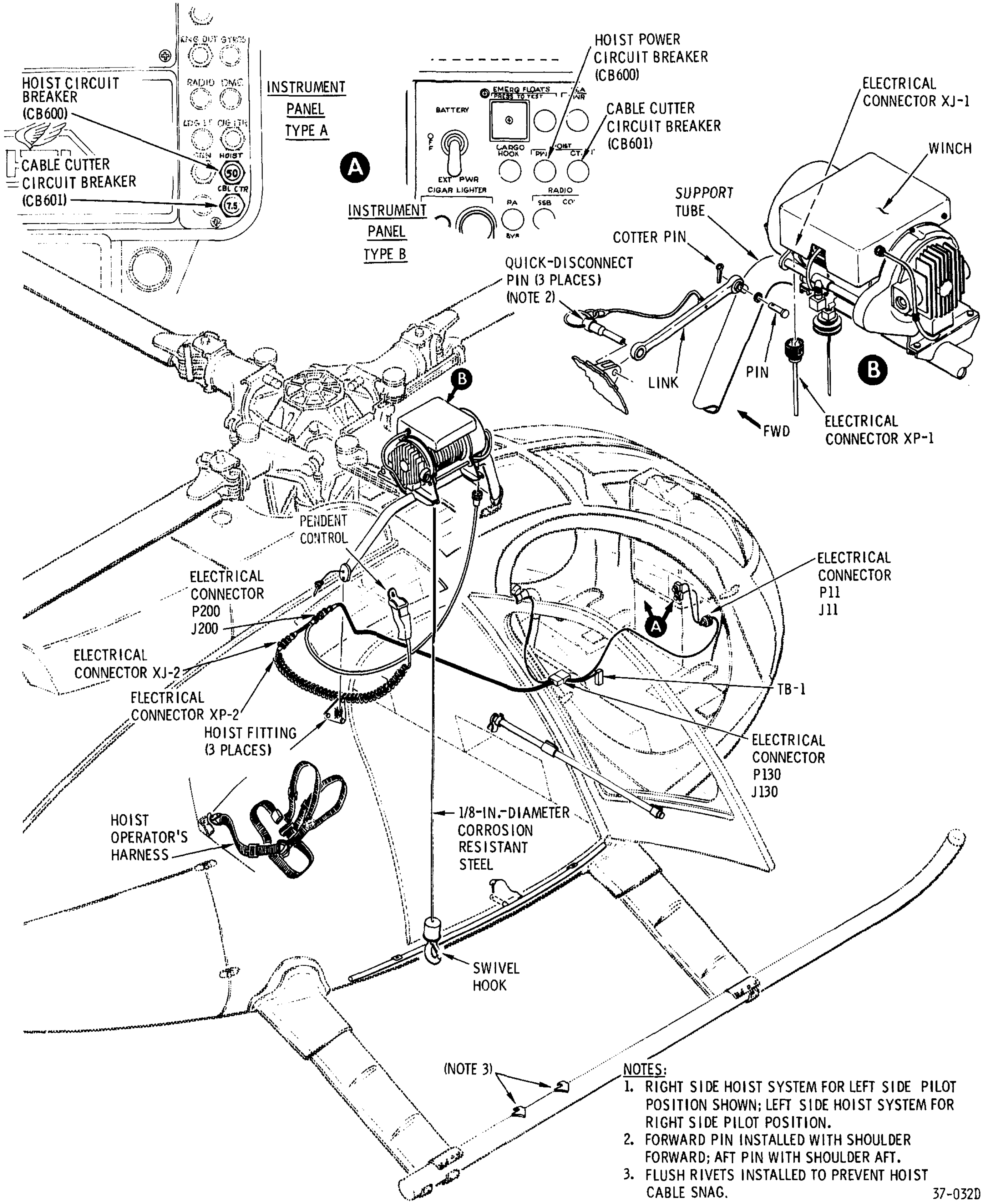


Figure 10-2. Hoist components – early configuration

10-7. PROCEDURE.

a. Check that cable is fully retracted on winch drum.
b. Check that BATTERY switch is in OFF position.
c. Install safety jumper wire on cable cutter electrical terminals (see figure 10-3).

CAUTION: Protective jumper wire should remain on cable cutter electrical terminals until winch is reinstalled for use.

d. Disconnect winch electrical plug from receptacle on fuselage; install protective cap on receptacle.
e. Support winch; remove three quick-disconnect safety pins securing winch support tube to fittings on fuselage.
f. Remove winch and support tube from fuselage.
g. Remove cotter pin, washer, and bearing pin securing link assembly to winch support tube.

NOTE: If support tube fittings are to be removed from fuselage, make certain nylon screws are installed in attachment holes.

h. Remove bolts securing winch to support tube brackets.

10-8. INSPECTION OF HOIST EQUIPMENT.

a. Inspect components for security of attachment, damage, deformation, cracks, and excessive wear.

WARNING: Human life may depend on cable condition. Inspect full length of cable carefully and thoroughly.

WARNING: Use heavy leather gloves to protect hands from broken cable strands, which can inflict serious injury.

CAUTION: Keep cable clean. Provide a clean area to coil cable during inspection. Dirt and oil grime will create an abrasive wear on cable and winch components.

b. Inspect cable for fraying, corrosion, broken strands, and security of attachment to winch drum and cable ball swivel hook attachment. General criteria for cable replacement are as follows:

(1) Any single broken strand (cluster of seven individual wires) requires cable replacement.

(2) Both ends of individual broken wires should be tucked into cable to prevent fouling when cable travels through cable guides and nonfouling mechanisms. Breaks of individual wires are allowable, unless the number is excessive as defined in (3) below.

(3) Generally, one individual broken wire (two ends) for each foot of cable is permissible, up to a total of 20 individual wire breaks for each 100-foot length of cable. A greater number of breaks requires cable replacement.

c. Refer to winch manufacturer's operating instructions for additional information.

CAUTION: Make certain BATTERY switch is in OFF position.

10-9. REMOVAL OF EQUIPMENT.

a. Remove panels, access doors, and equipment as applicable to accommodate installation of the hoist system components:
b. Remove battery (section 19, Basic HMI).
c. Remove left and right foot support fairings in passenger/cargo compartment (section 2, Basic HMI).
d. Remove passenger/cargo compartment forward bulkhead trim panel (commercial models) and controls access door (sections 2 and 4, Basic HMI).
e. Remove fuel cell forward vent from control tunnel (section 12, Basic HMI).

NOTE: Fuel vent must be removed to avoid damage during structural modification hole drilling operations.

f. Remove crew compartment seat and back cushions.
g. Remove left (outboard) collective stick cover (sections 2 and 4, Basic HMI).
h. Remove crew compartment lower aft trim panels (left and right) (section 4, Basic HMI).
i. Remove crew compartment left or right bulkhead panel and lower portion of right upper side panel (section 4, Basic HMI).
j. Remove edgelighted panel face from lower switch and circuit breaker panel. Loosen lower switch and circuit breaker panel to accommodate installation of additional circuit breakers (sections 17 and 19, Basic HMI).

10-10. MODIFICATION.

10-11. PROCEDURE. Modification of the helicopter (fig. 10-4) involves cutting a hole in the fuselage skin to facilitate installation of an

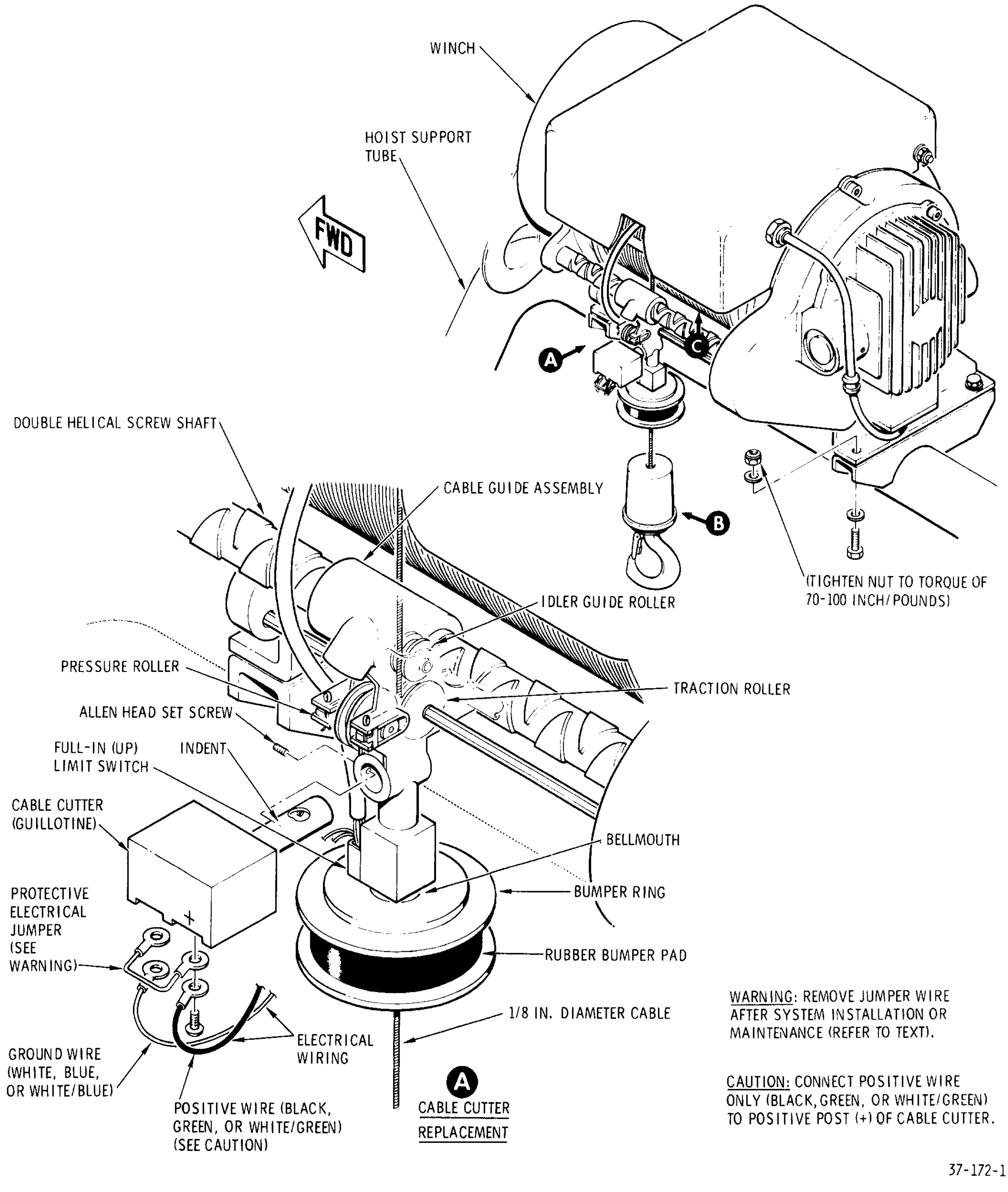
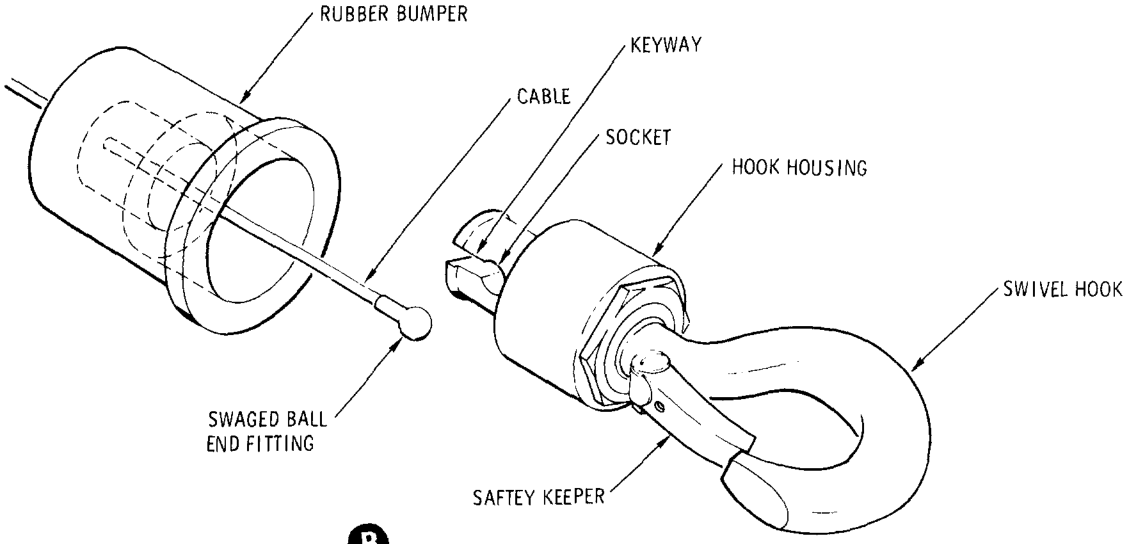
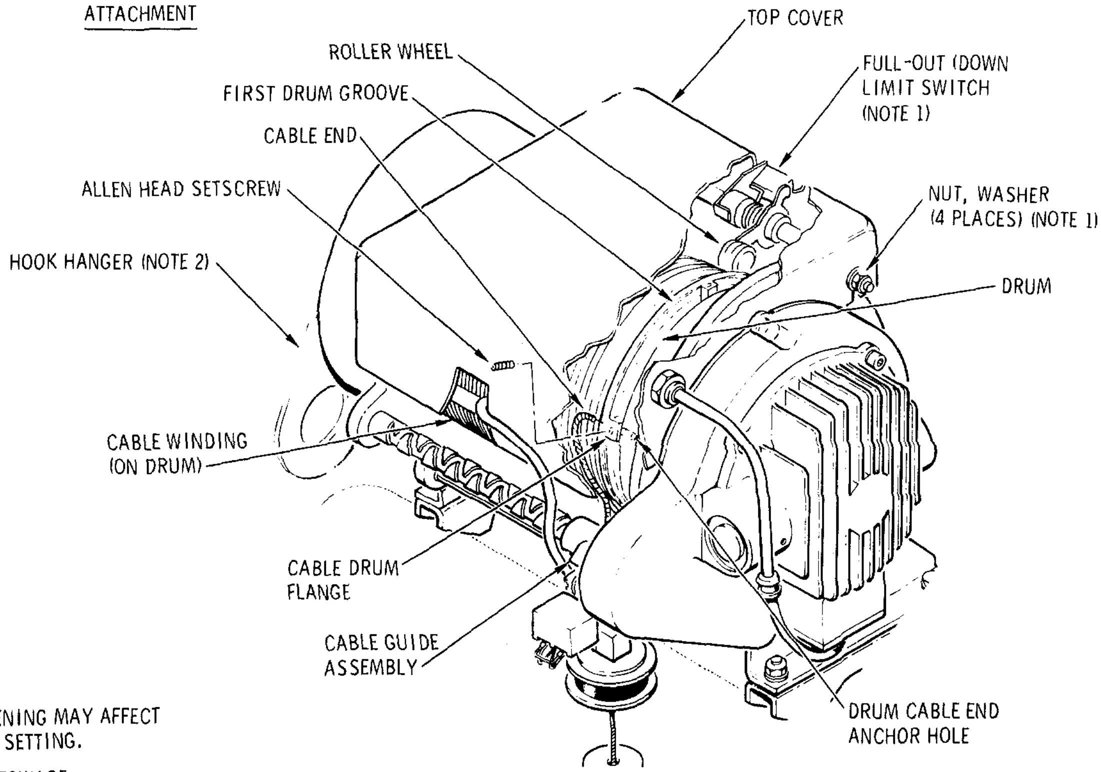


Figure 10-3. Winch cable, cable cutter, and swivel hook replacement (sheet 1 of 2)



B
CABLE TO HOOK
ATTACHMENT



NOTES:

1. EXCESSIVE TIGHTENING MAY AFFECT FULL-OUT SWITCH SETTING.
2. USED FOR HOOK STOWAGE

C
CABLE TO DRUM
ATTACHMENT

37-172-2

Figure 10-3. Winch cable, cable cutter, and swivel hook replacement (sheet 2 of 2)

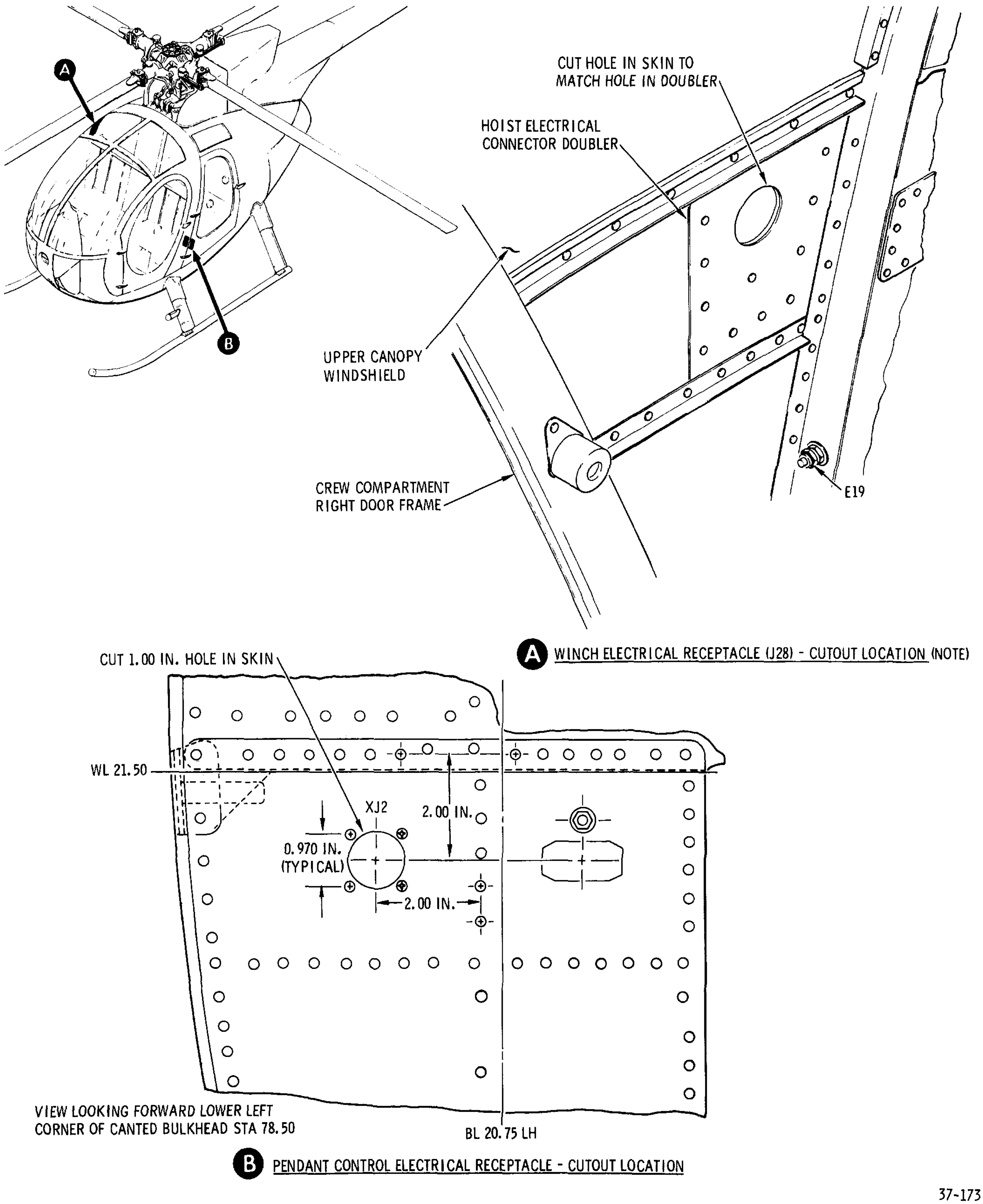


Figure 10-4. Modification of helicopter

electrical receptacle (J28) to receive a winch electrical plug, and a hole in the lower left area of the canted bulkhead and forward bulkhead trim panel to facilitate installation of an electrical receptacle (XJ2) to receive a control pendant plug.

a. Cut and deburr holes, remove chips, and apply a thin coat of zinc chromate primer to exposed metal surfaces.

b. Fit forward bulkhead trim panel to canted bulkhead, locate and cut hole in trim panel to match XJ2 receptacle hole in bulkhead. Remove trim panel to accommodate installation of door retainer assembly.

NOTE: Hoist electrical connector (J28) doubler is located in the crew compartment, below the aft lower corner of the upper canopy windshield, and immediately forward of the canted frame (station 78.50).

10-12. WIRING AND SCHEMATIC DIAGRAMS. Figures 10-5 and 10-6 are the wiring diagrams for the hoist system for current and early configurations. Figures 10-7 and 10-8 are schematic diagrams of the winch.

10-13. INSTALLATION OF HOIST.

10-14. PROCEDURE. The winch and support can be used on either the left or right side of the helicopter as applicable. Install the hoist system as follows:

a. Remove nylon screws installed in support fitting attachment holes on fuselage. Early configuration only.

b. Install support tube attachment fittings on fuselage using screws and washers.

c. Attach winch to support tube using bolts, washers, and nuts. Tighten bolts to a torque of 70-100 inch-pounds.

d. Attach link assembly to support tube using bearing pin, washer, and cotter pin.

e. Attach winch support tube to fuselage fittings using quick-disconnect pins.

CAUTION: Check that all electrical power is off, eliminating possibility of inadvertent firing of cable cutter.

f. Remove protective cap from electrical receptacle on side of fuselage. Connect winch electrical plug to fuselage receptacle. Secure wire harness to support tube using tie-straps.

WARNING: Remove protective electrical jumper wire (fig. 10-3) from cable cutter whenever winch is installed on helicopter. Jumper wire will prevent operation of cable cutter.

g. Install the hoist operator's body harness.

10-15. REPLACEMENT OF DOOR SILL CHAFING BAR ASSEMBLY.

10-16. GENERAL. PN 369D292551 bar type assembly is designed to provide additional protection against possible wear or damage to the cable assembly or fuselage structure during hoist operations. Required parts may be obtained without charge from Hughes Helicopters Service Center or distributor.

10-17. INSTALLATION PROCEDURE.

a. Remove hardware securing existing door sill chafing tube assembly to two 369H92559 clips on fuselage; remove attach screws and clips from fuselage.

b. Withdraw pin from jacking fitting; remove chafing tube assembly.

c. Install new 369D292553 clips with screws and washers as shown in figure 10-9.

d. Install new chafing bar assembly, using hardware as shown. Insert pin into jacking fitting.

e. Check installation of new door sill chafing bar assembly for discrepancies.

NOTE: For helicopters equipped with right-hand command station (left-side hoist) and standard landing gear assemblies, perform the following:

(1) Remove two inboard bolts and washers from aft abrasion strip on LH landing gear skid as shown in figure 10-10.

(2) Remove inboard bolt and washer from forward abrasion strip on LH landing gear skid as shown.

(3) Install skid tube chafing bar assembly to inboard side of skid tube with screws. Install middle screw before installing the chafing bar assembly.

NOTE: Steps f thru h not required if Breeze rubber bumper PN BL-10375-1 is used.

f. Remove swivel hook assembly and rubber bumper from cable assembly.

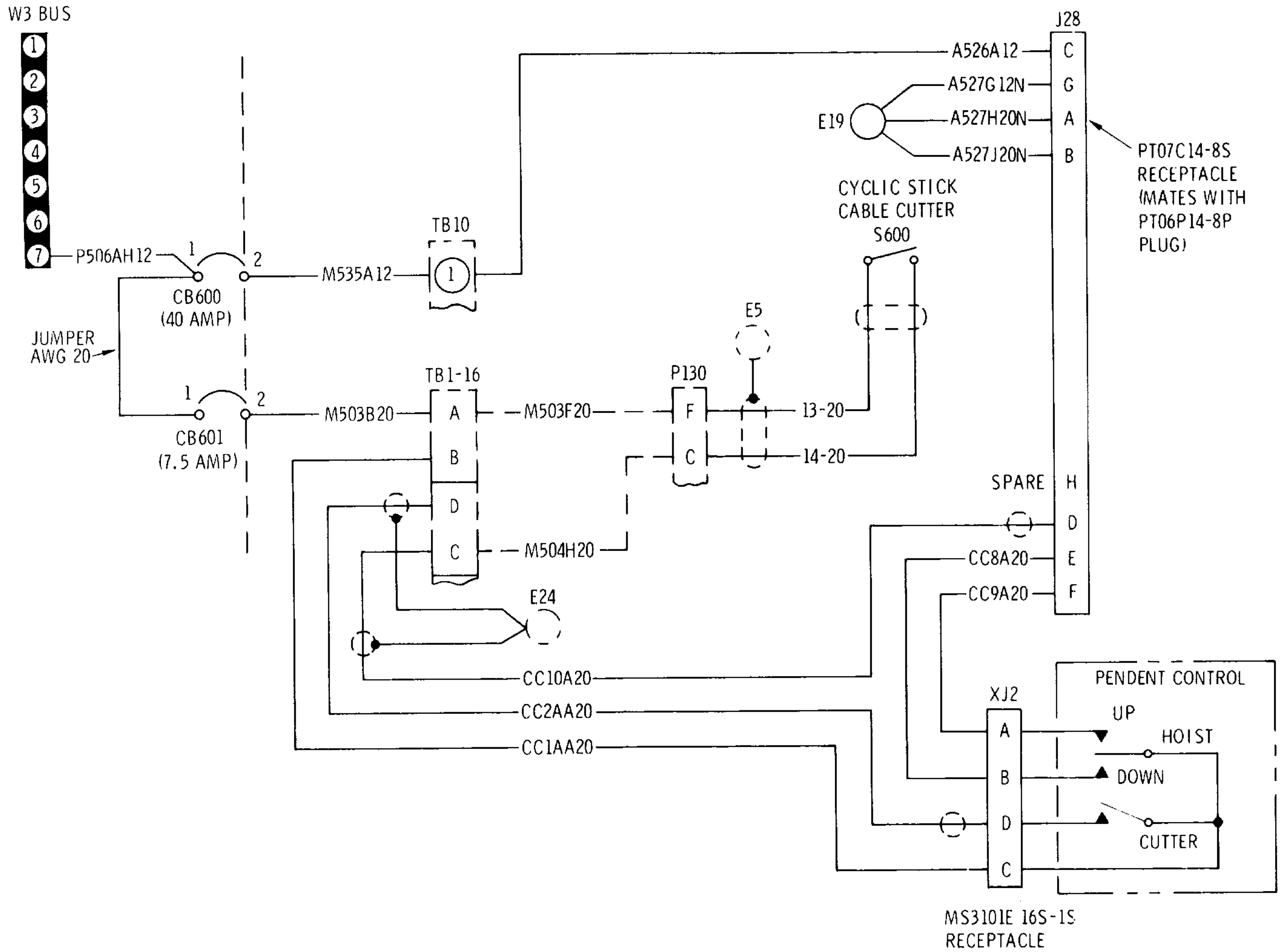
g. Rework existing rubber bumper by grinding or shaving to dimensions shown in figure 10-11.

h. Reinstall rubber bumper and swivel hook assembly on cable.

10-18. REPLACEMENT OF GUILLOTINE (CABLE CUTTER).

10-19. PROCEDURE. Cable must be removed from winch before guillotine can be replaced. Replace a spent guillotine on the winch as follows:

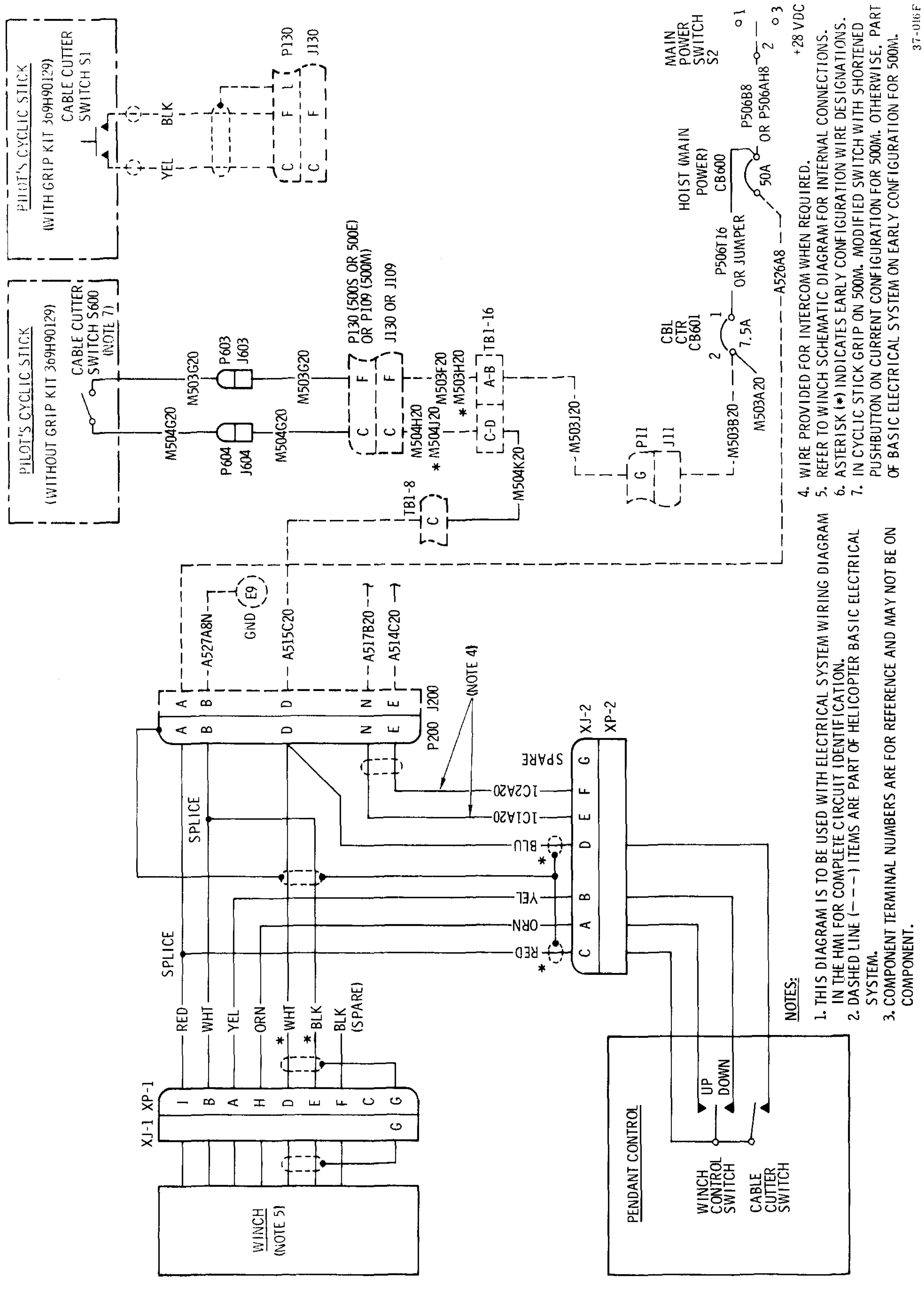
WARNING: The guillotine contains an explosive squib that is electrically fired. A protective



NOTES:

1. THIS DIAGRAM IS TO BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI BASIC FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (— —) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. COMPONENT TERMINAL NUMBERS ARE FOR REFERENCE AND MAY NOT BE SHOWN ON COMPONENT.
4. REFER TO WINCH SCHEMATIC DIAGRAM FOR INTERNAL CONNECTIONS.

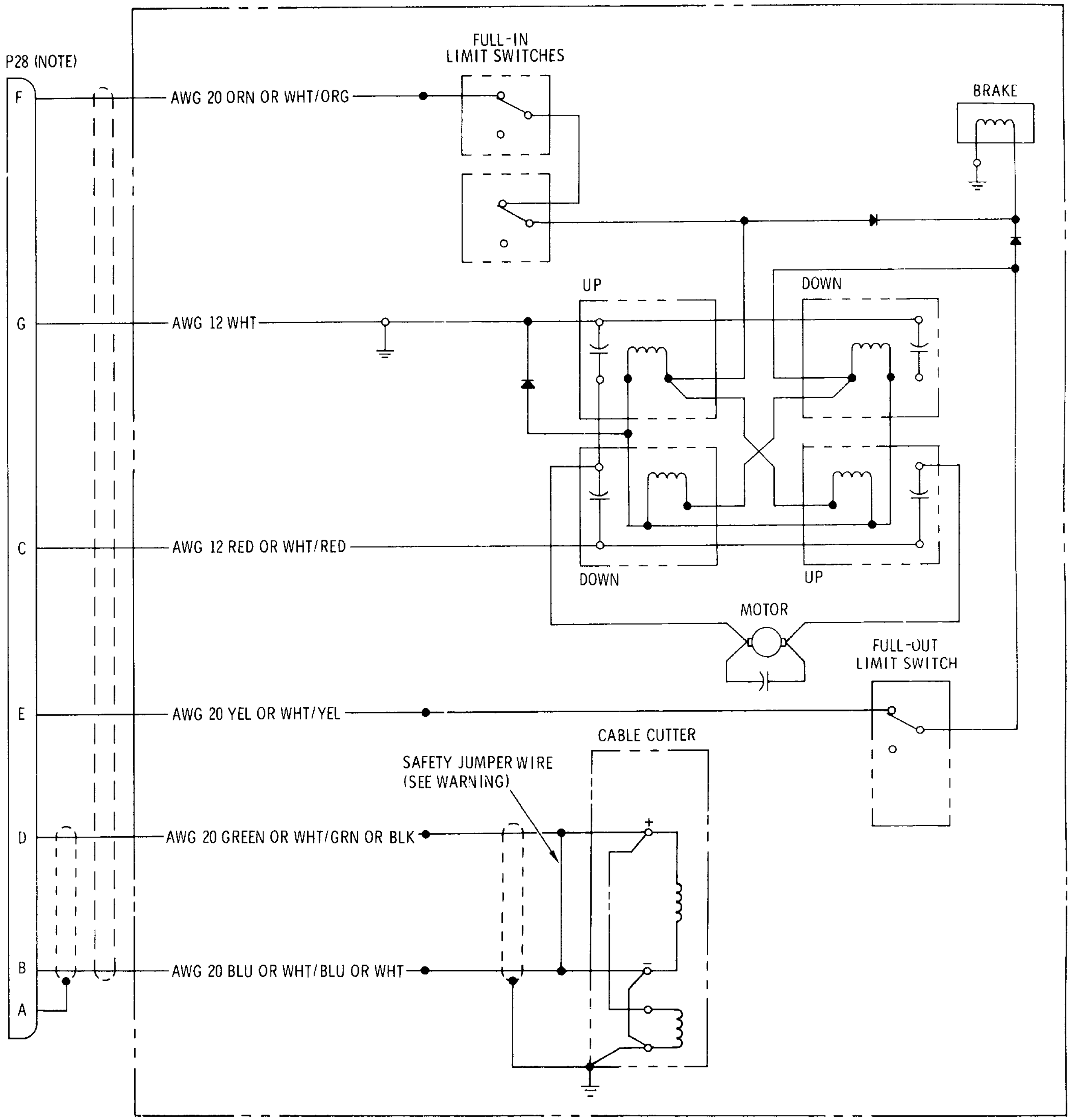
Figure 10-5. Hoist wiring diagram – current configuration



NOTES:

1. THIS DIAGRAM IS TO BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (– – –) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. COMPONENT TERMINAL NUMBERS ARE FOR REFERENCE AND MAY NOT BE ON COMPONENT.
4. WIRE PROVIDED FOR INTERCOM WHEN REQUIRED.
5. REFER TO WINCH SCHEMATIC DIAGRAM FOR INTERNAL CONNECTIONS.
6. ASTERISK (*) INDICATES EARLY CONFIGURATION WIRE DESIGNATIONS.
7. IN CYCLIC STICK GRIP ON 500M. MODIFIED SWITCH WITH SHORTENED PUSHBUTTON ON CURRENT CONFIGURATION FOR 500M. OTHERWISE, PART OF BASIC ELECTRICAL SYSTEM ON EARLY CONFIGURATION FOR 500M.

Figure 10-6. Hoist system wiring diagram — early configuration



NOTE:
REFER TO HOIST SYSTEM INTERCONNECTION WIRING DIAGRAM FOR EXTERNAL CONNECTION.

WARNING: REMOVE JUMPER WIRE AFTER INSTALLATION OR MAINTENANCE (REFER TO TEXT).

37-175

Figure 10-7. Winch schematic diagram – current configuration

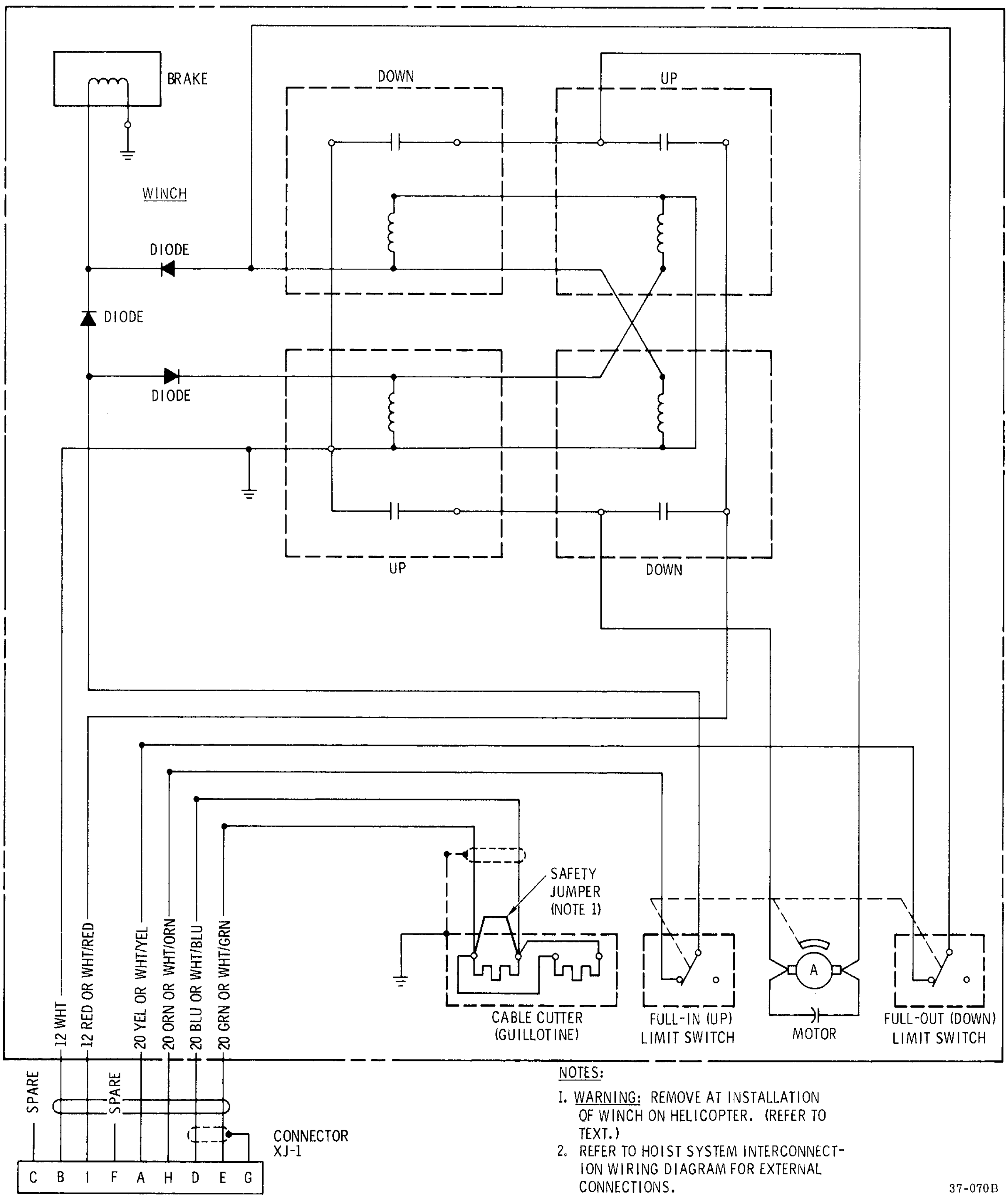


Figure 10-8. Winch schematic diagram – early configuration

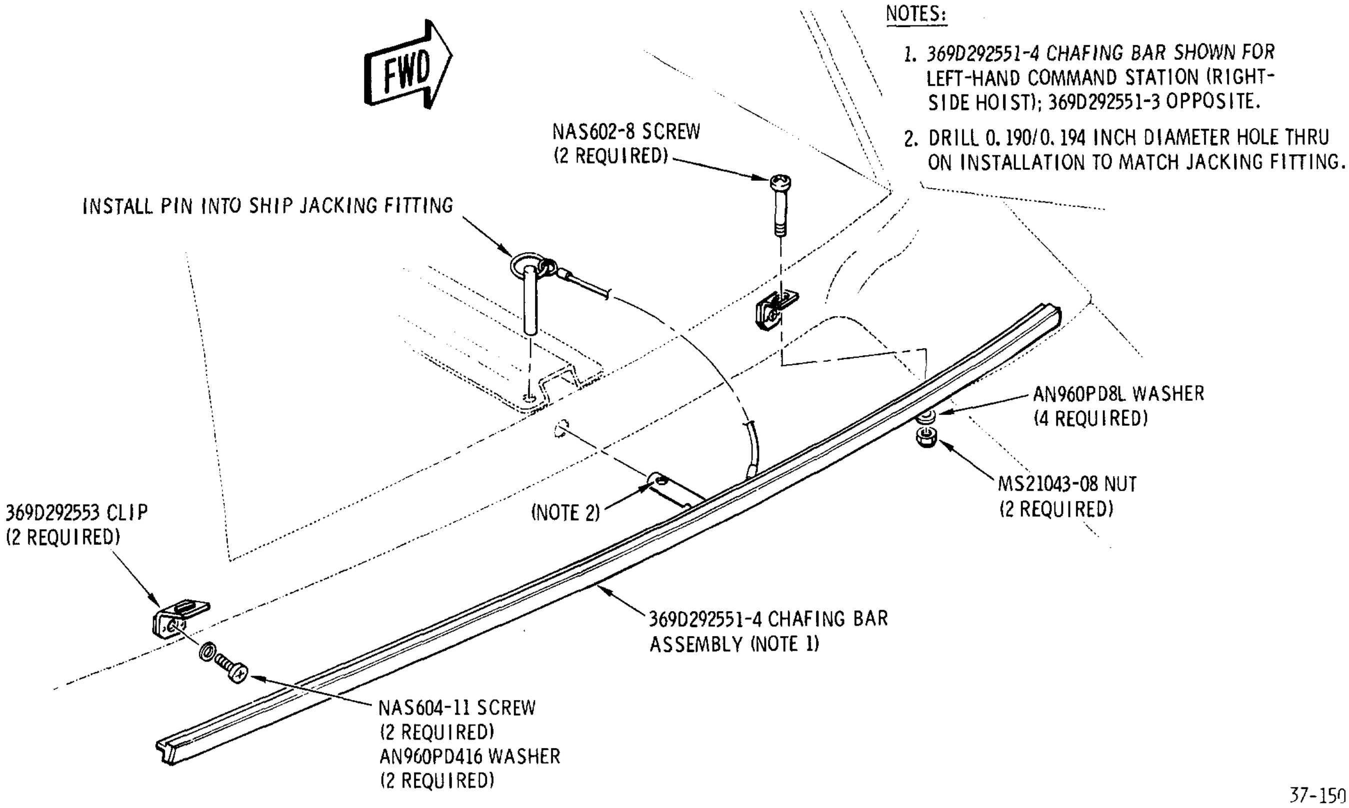


Figure 10-9. Door sill chafing bar installation

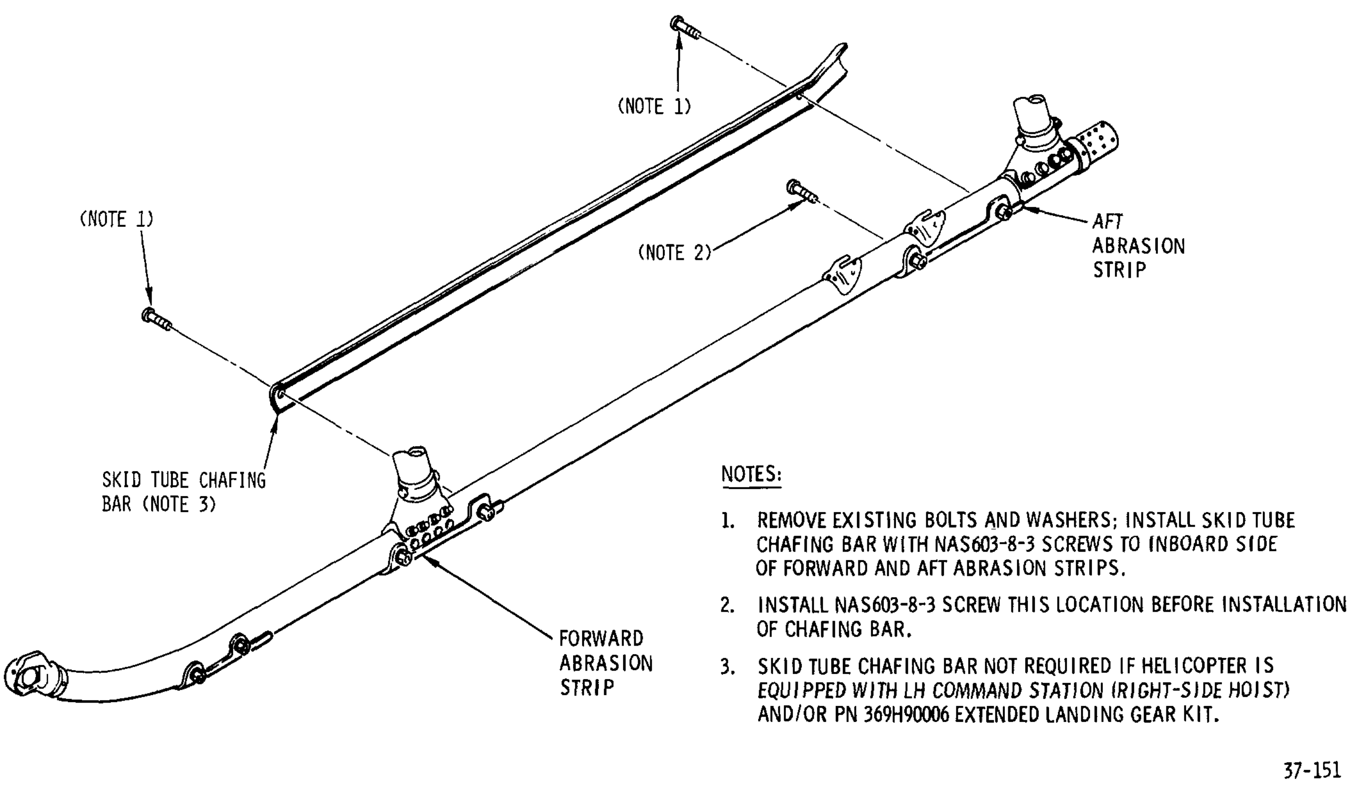


Figure 10-10. Skid tube chafing bar installation

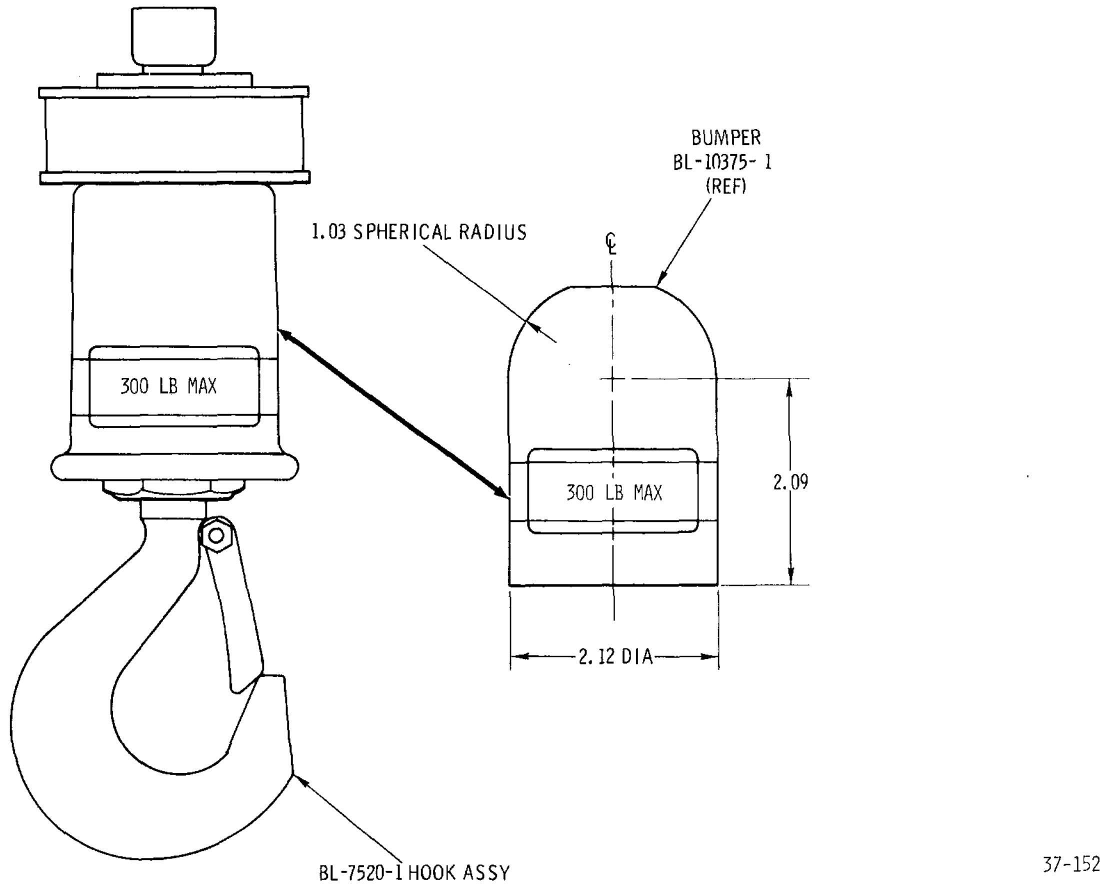


Figure 10-11. Rubber bumper modification

short-circuiting electrical jumper should remain connected to a guillotine not installed on the winch to eliminate possibility of accidental firing.

a. Disconnect two electrical wire terminal lugs from spent guillotine.
b. Loosen two Allen head setscrews at side of movable cable guide and remove spent guillotine from guide.
c. Check that all electrical power is OFF.

WARNING: Do not use an ohmmeter or any other device containing an internal voltage source which could fire the guillotine.

d. Using a voltmeter, check for zero voltage between electrical wiring terminal lugs; also check for zero current between lugs with a milliammeter.
e. Insert cylindrical end of new guillotine into winch movable cable guide, with shorting jumper positioned downward, and secure guillotine to guide with two Allen head setscrews. Setscrew mates with indent on guillotine barrel.

f. Connect one electrical terminal lug to guillotine terminal, leaving protective short-circuiting jumper installed on guillotine. Then connect second wire to remaining guillotine terminal in the same way.

CAUTION: Protective jumper should remain connected to guillotine electrical terminals until hoist is to be used.

g. Cover exposed electrical terminal areas with sealing compound.

10-20. INSTALLATION OF PASSENGER/CARGO DOOR RETAINER.

10-21. GENERAL. The passenger/cargo door retainer installation consists of a tubular assembly attached to the aft side of station 78.50 canted bulkhead with four clamps. With the passenger/cargo doors in the open position a telescoping tube slides out of the tubular assembly to engage a bracket attached to the door frame, and thus retains the door in an open position.

10-22. PROCEDURE.

a. Locate doubler angles on forward side of station 78.50 canted bulkhead using two existing 0.070-inch tooling holes (fig. 10-12). Use angles as templates and determine rivet hole locations on station 78.50 bulkhead. Drill rivet attach holes, 0.069- to 0.074-inch diameter. Attach angles to 78.50 bulkhead using rivets.

b. Position structural reinforcement brackets on forward side of station 78.50 canted bulkhead as shown in figure 10-12. Locate nine existing rivets which must be removed prior to installation of reinforcement brackets; remove rivets. Use brackets as template and determine rivet hole locations on 78.50 bulkhead. Drill rivet attach holes, 0.069- to 0.074-inch diameter. Attach brackets to 78.50 bulkhead using rivets.

c. Drill eight 0.190-to 0.199-inch diameter holes through station 78.50 canted bulkhead and structural reinforcement angles and brackets at locations shown in figure 10-12.

NOTE: Drill retainer tube outboard clamp holes first; install retainer tube and outboard clamps to ensure proper alignment for marking and drilling inboard clamp holes.

d. Install the retainer assembly on station 78.50 canted bulkhead using clamps, washers, spacers, screws, and nuts.

e. Locate bracket on applicable passenger/cargo door in such a manner as to allow tube to engage bracket when door is in open position. Install bracket on passenger/cargo door frame using rivnuts, washers, and screws.

10-23. BUMPER CLIP KIT.

10-24. GENERAL. Breeze PN BL-8858 retrofit bumper clip kit must be installed on any winch not already so equipped (Breeze serial numbers preceding 154) to prevent any possible damage to the Up limit switch if the bumper is rotated by hand when depressed during preflight testing in accordance with manufacturer's handbook.

10-25. PROCEDURE.

a. Reel cable out a sufficient length so that bellmouth and bumper assembly can be lowered to provide access to work area.

b. Disconnect all power to winch.

c. Remove two screws securing limit switch (see figure 10-13) and position limit switch away from bellmouth.

d. Loosen setscrew and remove combined bellmouth-bumper assembly from winch.

e. Drill hole through top plate of the bumper at location shown.

f. Install clip; position clip so that it just clears face of bellmouth, still permitting free up and down motion of the bumper.

g. Reinstall bellmouth-bumper assembly and tighten setscrew.

h. Reposition full in limit switch and secure with two screws.

i. Reidentify winch by stamping or etching "AJ" after serial number on cover.

j. Reconnect electrical power.

k. Reel in cable and check full in limit switch action, both by manually tripping the switch while reeling in and by allowing the hook to trip the switch.

10-26. INSTALLATION OF EQUIPMENT.

CAUTION: Remove all tools and foreign materials from helicopter before panel installations.

a. Prior to closing access areas, check entire hoist system installation for completeness.

b. Install edgelighted and circuit breaker panels as applicable (sections 17 and 19, Basic HMI).

c. Install crew compartment left or right bulkhead panel and lower portion of left or right upper side panel as applicable (section 4, Basic HMI).

d. Install crew compartment lower aft trim panels (left and right) (section 4, Basic HMI).

e. Install left (outboard) collective stick cover (sections 2 and 4, Basic HMI).

f. Install seats and back cushions.

g. In passenger/cargo compartment, install fuel cell forward vent in control tunnel (section 12, Basic HMI).

h. In passenger/cargo compartment, install controls access door and foot support fairings.

NOTE: The forward bulkhead (station 78.50) trim panel is not installed during use of the hoist system door retainer equipment.

i. Install battery (section 19, Basic HMI).

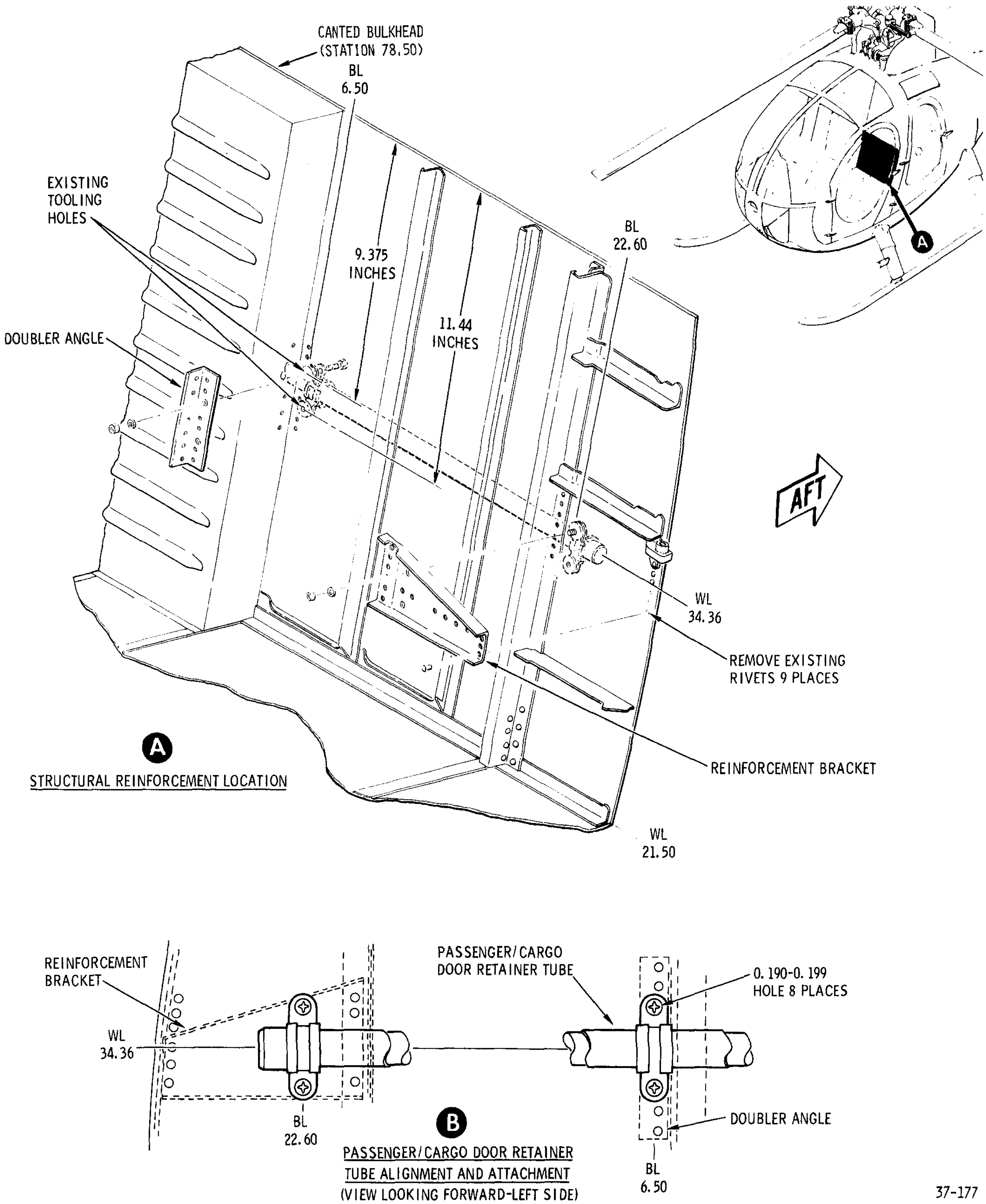


Figure 10-12. Passenger/cargo door retainer tube installation

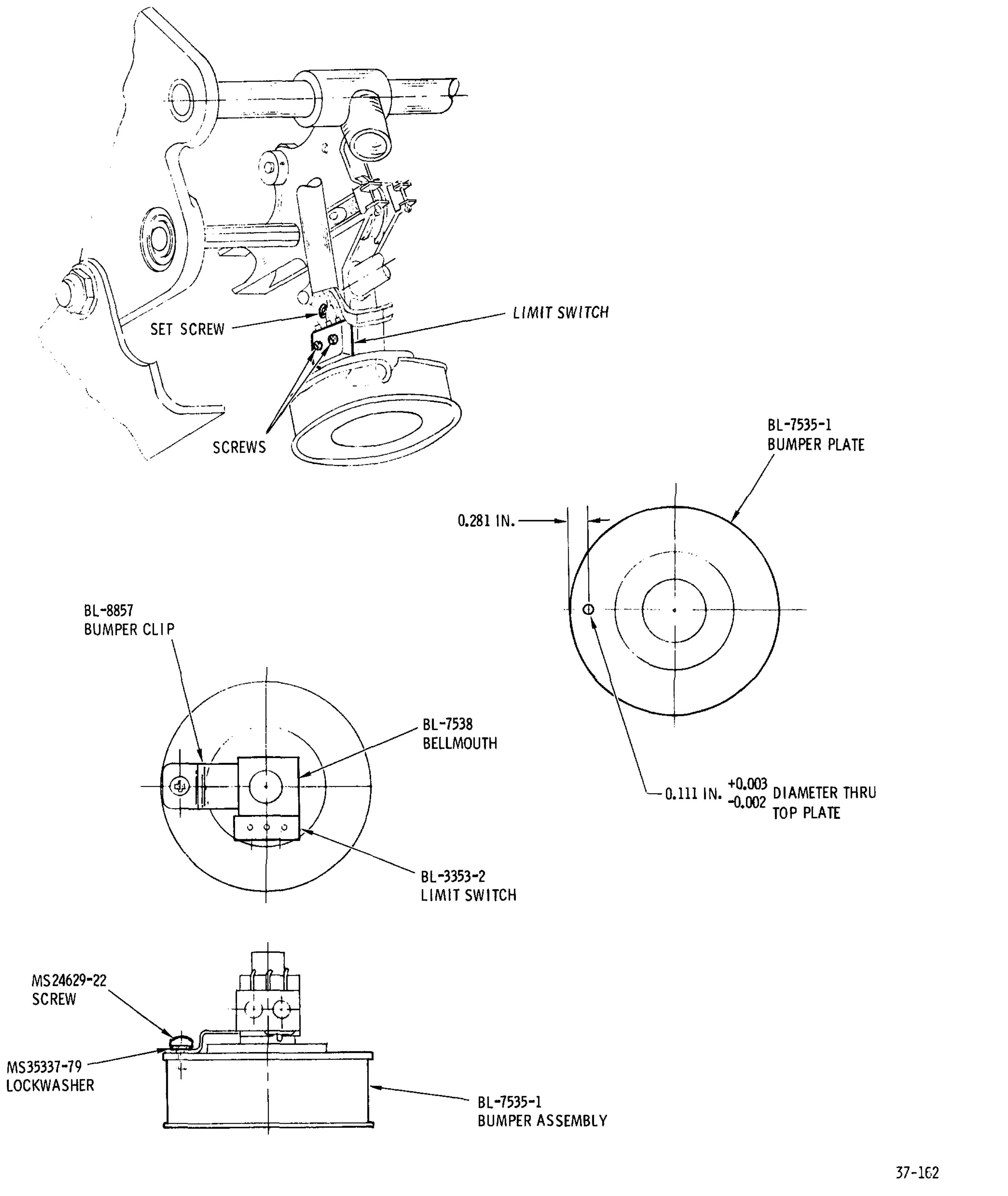


Figure 10-13. Bumper clip kit installation

OPTION GROUP 11
SELF-SEALING SYSTEMS AND ARMOR PROTECTIVE EQUIPMENT

11-1. ARMOR PROTECTIVE EQUIPMENT.

11-2. GENERAL. Armor protective equipment includes crew and/or engine protective armor (figure 11-1) and special self-sealing provisions in the fuel and oil systems. Crew protection consists of removable seatback and underseat armor provided for the pilot's compartment. Engine protection includes removable compressor and fuel control armor units, and fuel inlet supply line self-sealing hose assembly. Oil system protection consists of a self-sealing oil tank and oil cooler bypass equipment. The crew seatback armor and the fuel controls armor units consist of facing, backing and spall shield. The backing (side next to engine or crew) is fiberglass and resin lamination that supports the facing. The facing is a ceramic panel of boron-carbide tiles covered by a spall shield. The spall shield (projectile side) is a layer of nylon ballistic fabric. Each unit of crew seatback armor is provided with a back cushion attached to the armor with nylon tape hook and pile fasteners. The crew underseat armor and the engine compressor armor units consist of steel sheets fused together to form a laminated thickness. Self-sealing fuel cells are not included as part of the armor installation. Refer to paragraph 11-40 for self-sealing fuel cell information.

CAUTION: If the helicopter is to be operated with part or all of the armor units removed, depending on mission requirements and helicopter loading, a weight and balance check must always be made to ensure that center of gravity limits will not be exceeded. If the helicopter is to be operated with the fuel controls armor removed, check that the engine gearcase cooling duct has been converted to the unarmored configuration. Failure to make this conversion will result in improper cooling of the engine gearcase and possibly cause engine damage.

11-3. SEATBACK ARMOR.

11-4. GENERAL. The seatback armor (figure 11-2) consists of reinforced ceramic tile winged plates mounted to the bulkhead in back of the pilot's and copilot's seat. Each plate is mounted to bulkhead attaching lugs with four straight pins and cotter pins. The right-side armor wing rests on a support cushion at its lower forward edge. Seatback cushions are attached to the plate with Velcro hook and pile fasteners.

11-5. REPLACEMENT OF SEATBACK ARMOR PANEL. (See figure 11-2.)

a. Remove seat bottom attaching hardware and seat bottom.

b. Remove cotter pins, straight pins and seatback armor.

c. Release Velcro fasteners and remove backrest cushions.

d. Position replacement armor seatback panel. Install four straight pins and secure with cotter pins.

NOTE: Tilting the left-side seatback armor forward provides greater access for attaching fittings at lower outboard side. These fittings are to be attached first.

e. Observe and note fit of right-side seatback armor between lower wing and padded bracket.

f. Use washers as required (four thick washers maximum) to position padded bracket for contact with underside of lower armor wing. Install two washers and locking nuts to secure padded bracket.

NOTE: Shimming washers may be used in place of the two nuts next to the bracket pad when these nuts do not allow enough downward adjustment. No more than four shimming washers are to be used on each stud of the bracket for upward adjustment.

g. Position backrest cushions and firmly press mating Velcro fasteners together.

h. Install seat bottom.

11-6. UNDERSEAT ARMOR.

11-7. GENERAL. The underseat armor (figure 11-2) consists of laminated steel plates attached to aluminum alloy support brackets. The brackets are riveted to the seat support structure beneath the pilot's compartment seat positions. The right-side underseat armor is one piece, while the left-side is in two pieces to facilitate installation.

11-8. REMOVAL OF UNDERSEAT ARMOR PANELS. (See figure 11-2.)

a. Remove foot support fairings (Basic HMI) as applicable. For left-side armor removal, lay enough padding on collective interconnecting torque tube to prevent damage of tube.

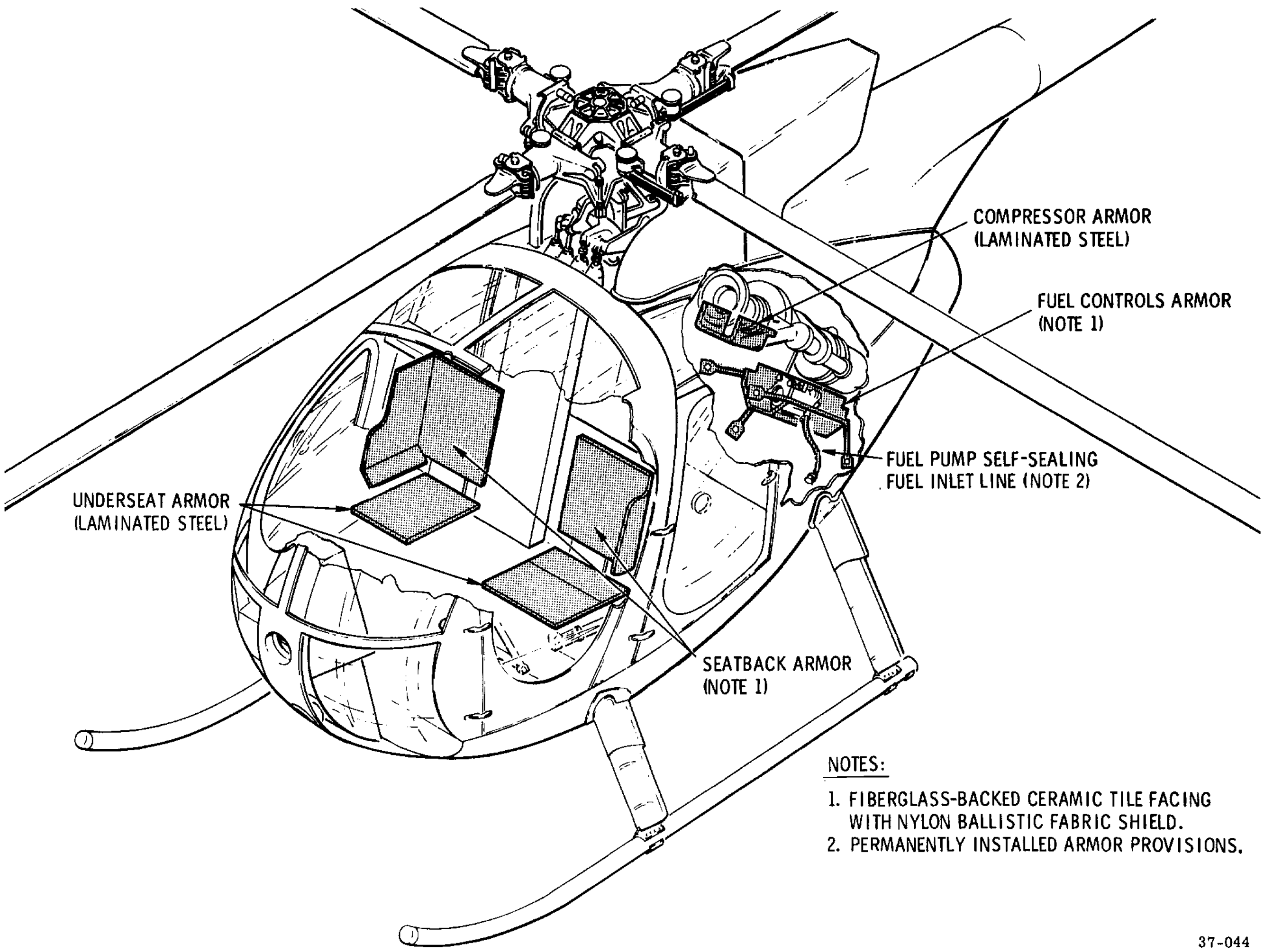


Figure 11-1. Crew and engine armor

b. Remove nut and washer at forward slotted bracket. Armor panel will remain supported by slotted brackets.

c. Support armor panel and remove bolts and washers from aft (inboard and outboard) mounting brackets.

d. On left-side armor panel only, remove the two nuts and washers that join the forward and aft panel sections. Raise the forward panel far enough to get clearance and remove the aft panel.

e. Remove armor panel supported by slotted bracket.

f. Remove attaching nuts and washers to remove aft mounting brackets, as required.

g. Remove torque tube padding.

h. Install foot support fairings.

11-9. INSTALLATION OF UNDERSEAT ARMOR PANELS. (See figure 11-2.)

a. Remove foot support fairings (Basic HMI) as applicable.

b. When installing left-side armor, lay enough padding on collective interconnecting torque tube to prevent damage of tube.

c. If not already installed, attach aft mounting brackets to armor panel with nuts and washers. Torque nuts to 20 to 25 inch-pounds.

d. Insert armor panel through foot fairing opening so that single mounting stud is down and in front. Place forward stud into slotted bracket.

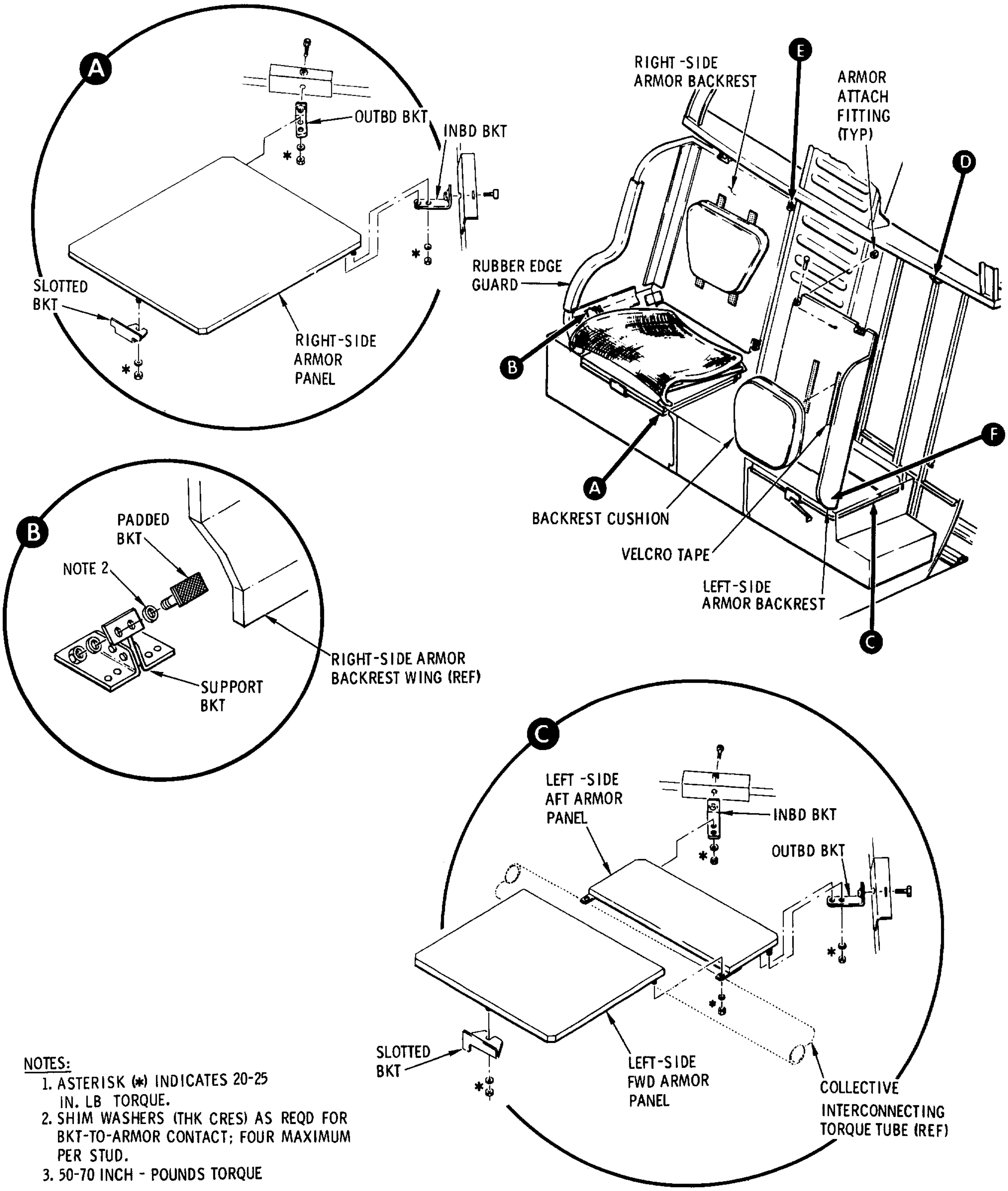
e. On left side only, insert armor panel aft section so that panel joint brackets are forward and install two new nuts with washers. Torque nuts to 20 to 25 inch-pounds.

f. Align the two aft (inboard and outboard) mounting brackets with mating holes in structure brackets and install two bolts with washers.

NOTE: Check that each aft corner of armor panel clears end of mounting bracket bolts by a minimum of 1/8 inch. Ensure that armor does not contact underseat equipment such as collective interconnecting torque tube, electrical units and wiring.

g. Secure panel to slotted bracket with washer and new nut. Torque nut to 20 to 25 inch-pounds.

h. Remove torque tube padding and reinstall foot support fairings.



NOTES:
1. ASTERISK (*) INDICATES 20-25 IN. LB TORQUE.
2. SHIM WASHERS (THK CRES) AS REQD FOR BKT-TO-ARMOR CONTACT; FOUR MAXIMUM PER STUD.
3. 50-70 INCH - POUNDS TORQUE

37-048-1

Figure 11-2. Pilot's compartment armor (sheet 1 of 2)

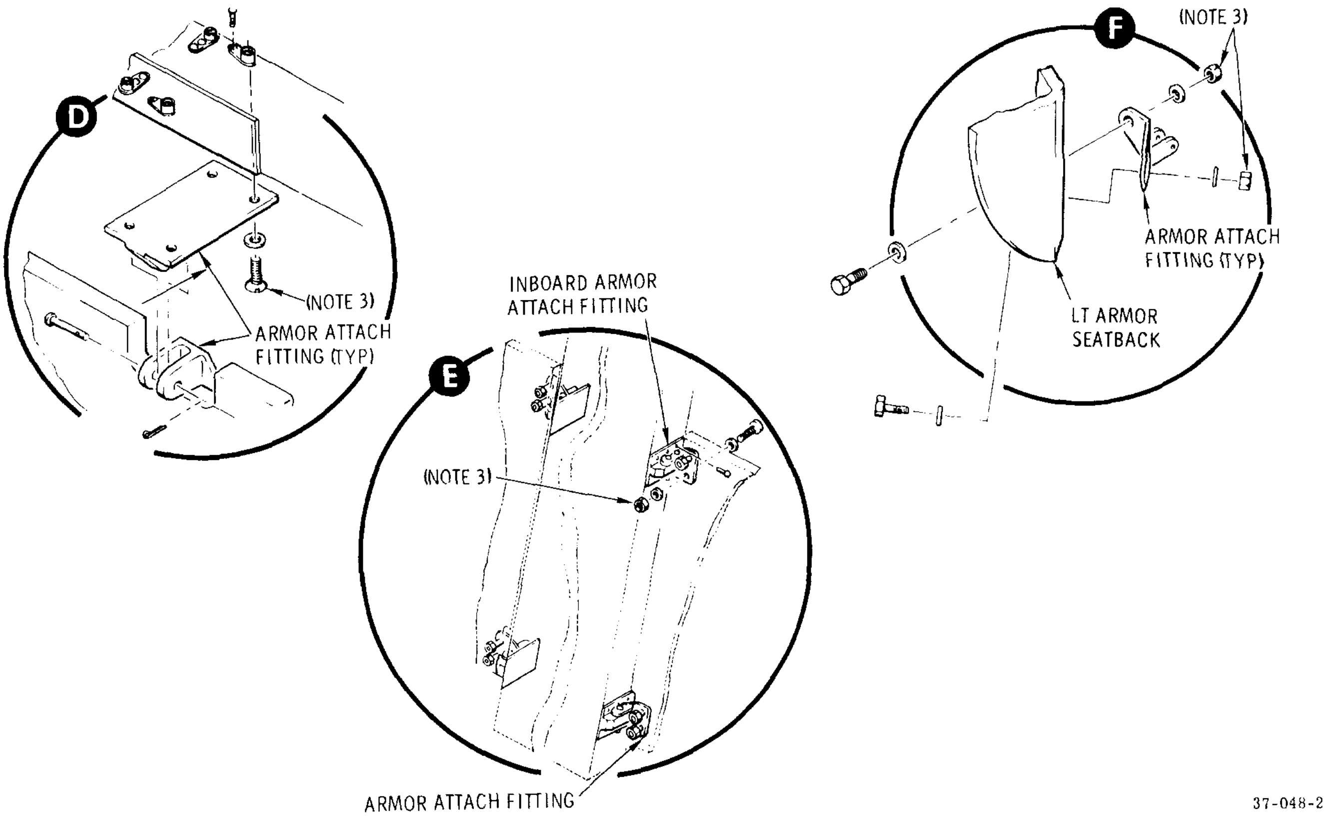


Figure 11-2. Pilot's compartment armor (sheet 2 of 2)

11-10. INSPECTION OF CREW ARMOR PANELS.

a. Inspect armor panel for bullet and shrapnel strikes and for loose or damaged attaching hardware.

b. Inspect armor panel for secure attachment, and helicopter mounting brackets and fittings for breaks, cracks and distortion.

11-11. ENGINE COMPRESSOR ARMOR.

11-12. GENERAL. The engine compressor armor (figure 11-3) consists of two channel-shaped steel plates fused together to form a single laminated thickness. The armor is mounted in the air inlet recess to provide protection for the bottom and sides of the compressor.

11-13. REMOVAL OF ENGINE COMPRESSOR ARMOR. (See figure 11-3.)

a. Remove the engine (Section 10, Basic HMI).

b. Insert suitable wood blocking (approximately 2 in. x 2 in. x 3/8 in. thick) between the bottom of the compressor armor and the air inlet panel. (Blocking will support armor when hardware is removed.)

c. Remove attach bolt from lower support bracket. Remove the two (upper) bolts from each side bracket.

NOTE: The lower and side brackets must be kept with the compressor armor to which they are attached to ensure armor interchangeability.

d. Slide armor from air inlet recess and remove wood blocks. Tie shims to the compressor armor brackets to prevent loss. Do not disassemble side brackets from armor unless brackets are questionable.

11-14. INSPECTION OF ENGINE COMPRESSOR ARMOR.

a. Inspect compressor armor for any evidence of cracks, security of support brackets and mounting to the structure, and clearance on all sides.

b. Check for any evidence of bullet or shrapnel strike.

c. Check that a minimum clearance of 1/8 inch exists between the compressor armor and the torquemeter oil pressure line.

11-15. INSTALLATION OF ORIGINAL ENGINE COMPRESSOR ARMOR. (See figure 11-3.)

NOTE: The engine must be removed for compressor armor installation. If the armor to be installed was previously removed from the same helicopter use the following sequence. If replacement armor is to be installed, use the sequence in paragraph 11-16.

a. Place compressor armor in approximate mounting position in air inlet recess. Support armor on wood blocks (approximately 2 in. x 2 in. x 3/8 in. thick).

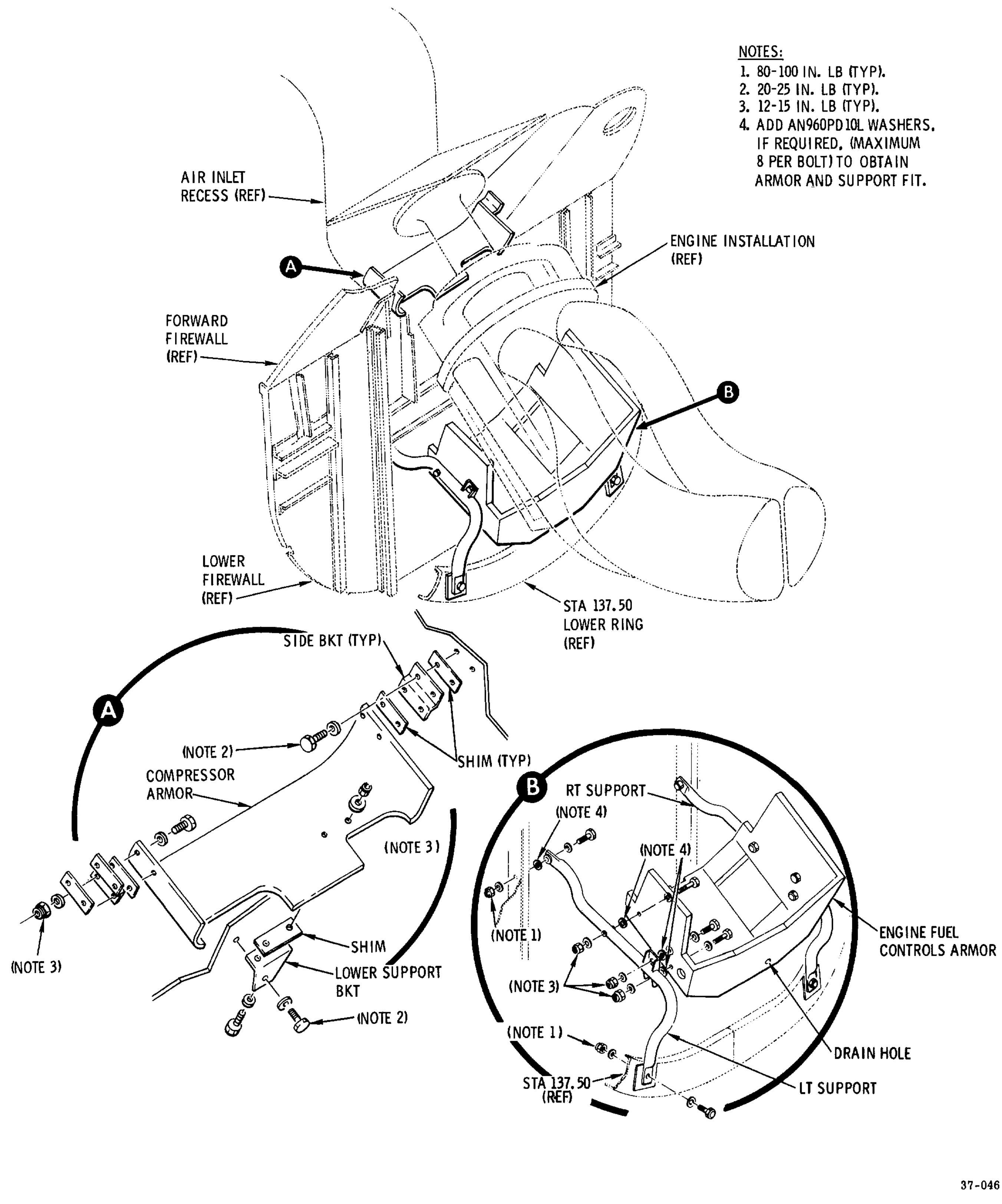


Figure 11-3. Engine armor

b. Align shims between side brackets and matching holes. Start bolts and washers into the four nutplates.

c. Install bolt and washer to secure lower support bracket. Torque bolt to 20-25 inch-pounds.

d. Torque the four side bolts to 20-25 inch-pounds. Remove wood blocks.

e. Check armor for rigidity and clearance on all sides. Ensure that a minimum of 1/8-inch clearance exists between torquemeter oil pressure line and armor.

f. Install engine (Section 10, Basic HMI).

11-16. INSTALLATION OF REPLACEMENT ENGINE COMPRESSOR ARMOR. (See figure 11-3.)

NOTE: The following sequence must be used for the installation of new armor or armor originally fitted to another helicopter.

a. Install wood blocks (2 in. x 2 in. x 3/8 in. thick) on the horizontal panel of the air inlet recess. Secure with general purpose masking tape.

b. Place compressor armor in approximate mounting position, resting on the two blocks. Hold armor in place.

c. Move armor until right side bracket is flush against right vertical firewall panel. Align bracket holes with nutplate holes.

d. While holding armor in this position, measure any gap between left side bracket and vertical firewall panel. Shims are required if gap is 0.012 inch or more.

NOTE: Check that not more than five shims are installed between each bracket and the armor. Additional shimming must be between the brackets and firewall panels.

e. If drilled shims are unavailable remove armor from recess. Fabricate the necessary shim thickness from aluminum alloy sheet stock. Finish dimensions are 0.012 inch x 0.70 inch x 2.12 inches. Material shall be 2024-T3 conforming to Federal Specification QQ-A-250/5. Drill the shims with a No. 7 drill to match the armor and mounting hole patterns.

f. Remove wood blocks. Reposition armor in firewall recess.

g. Install 0.012-inch-thick shims to eliminate gap measured in step d, above. Use approximately equal division of shims between sides if more than one shim is required. Install bolts and washers to secure each side bracket and shim(s) to firewall. Torque bolts to 20-25 inch-pounds.

h. Observe whether hole in vertical portion of lower bracket is vertically aligned with nutplate hole. If not aligned continue with i, below. If aligned, secure lower bracket with bolt and washer. Torque bolt to 20-25 inch-pounds.

i. If holes in lower bracket and firewall are not vertically aligned, remove bracket from armor and install on firewall with bolt and washer. Torque bolt to 20-25 inch-pounds.

j. Measure any gap existing between lower bracket and underside of armor. Determine the number of shim(s) required. Shim(s) are required if gap is 0.012 inch or more.

k. Install 0.012-inch-thick shim(s) to eliminate gap between bracket and armor.

l. If drilled shims are unavailable, fabricate the necessary shim thickness according to step e, above, except for finish size dimensions. Dimensions are 0.012 inch x 0.80 inch x 1.50 inches.

m. Insert required shim(s) between bracket and armor. Use two bolts, two washers, and two nuts to secure bracket to armor. Torque nuts to 20-25 inch-pounds.

n. Check armor for rigidity and clearance on all sides. Ensure that a minimum of 1/8-inch clearance exists between torquemeter oil pressure line and armor.

o. Install engine (Section 10, Basic HMI).

11-17. ENGINE FUEL CONTROLS ARMOR.

11-18. GENERAL. The engine fuel controls armor (figure 11-3) consists of a box-shaped unit fabricated of reinforced ceramic tile mounted below the engine on two support arms. The box shape provides protection for the engine fuel pump, gas producer fuel control, power turbine governor and most of the related interconnecting lines. The mounting position also gives protection to the lower section of the power and accessories gearbox. The armor unit has a large rectangular opening in the lower right side for installation and operational movement of the N1 gas producer control rod. The lower left side has an oblong hole for entry of the fuel supply line. A 3/8-inch hole is centered in the bottom of the rear panel to drain any fuel or oil leakage.

11-19. REMOVAL OF FUEL CONTROLS ARMOR. (See figure 11-3.)

a. Without loosening rod end bearings, disconnect both ends of the gas producer control rod. Carefully remove rod from between armor and engine.

b. With a container in place to catch trapped fuel, disconnect lower end of engine fuel supply hose. Drain fuel from line into container. Cap fuel line fitting.

c. Remove the bolts, washers, and nuts that secure the right and left supports to the firewall.

d. While an assistant supports the armor unit, remove the bolts, washers and nuts that secure the supports to the structural ring. With one man to support each side, slowly start to lower the armor unit. As the armor assembly is lowered, feed the fuel line through the hole in the left side of the armor. Continue lowering downward and aft until armor assembly clears the engine and structure.

e. The fuel controls armor may be further disassembled by removing the bolts, washers and nuts attaching the right and left supports to the armor unit. Observe that the two forward bolts are longer than the others.

f. If aircraft is to be operated without fuel controls armor installed perform steps g and h below.

g. Remove cap and reconnect lower end of fuel line. Torque nut to 150-250 inch-pounds.

CAUTION: If the aircraft is to be operated with the fuel controls armor removed, the engine gearcase cooling duct must be converted back to the configuration used in an unarmored helicopter. Failure to make this conversion will result in improper cooling of the engine gearcase and possibly cause engine damage.

h. Convert engine gearcase cooling duct to the installation used in an unarmored helicopter. (Refer to paragraph 11-24.)

11-20. INSPECTION OF FUEL CONTROLS ARMOR.

a. Inspect armor supports for security of mounting to the fuselage structure, abnormal bends in the supporting tubing, and cracks.

b. Inspect the armor installation for a minimum clearance of 1/8 inch between all surfaces and edges of the armor and the engine, and the armor and the fuel inlet line. Check that clearance also exists between the left support and the engine gearcase cooling duct clamped to the firewall.

c. While an assistant rotates the throttle grip through full travel on the pilot's collective pitch stick, check that there is no interference between the armor and the gas producer control rod.

d. Inspect for any evidence of cracks; rigidity and security of mounting to the right and left support (figure 11-3); signs of fuel or oil leakage at the drain hole; and any evidence of a bullet or shrapnel strike. Completely remove and make a thorough inspection of the engine where there is evidence of fuel or oil leakage at the drain hole.

11-21. REPAIR OR REPLACEMENT OF FUEL CONTROLS ARMOR.

a. Replace the armor if it is cracked or has received a strike.

b. Repair cracked supports (figure 11-3) by metallic or inert arc welding. Splices may be used in repair of cracked or kinked tubes provided the original tube angularity is maintained or restored. The supports are fabricated of Type 321 or 347 corrosion-resistant steel tube with 0.020-inch wall.

11-22. INSTALLATION OF FUEL CONTROLS ARMOR. (See figure 11-3.)

a. Reassemble by attaching the right and left supports to the armor unit with bolts, washers, and nuts. Install the two longer bolts at the forward attach points. Torque the nuts to 12-15 inch-pounds.

b. With the help of an assistant, slowly lift assembled armor upward and forward into position under engine.

c. As the armor is lifted, feed the fuel line out through the hole in the left side of the armor. Continue lifting until armor attach points are in line and install the lower bolts, washers and nuts. Torque the nuts to 80-100 inch-pounds.

d. Continue to support the back of the armor and install the bolts, washers and nuts that attach the forward ends of the supports to the firewall. Torque the nuts to 80-100 inch-pounds.

e. Uncap the fuel line and connect the lower end of the hose to the station 124 bulkhead union. Torque hose nut to 150-250 inch-pounds.

f. Carefully guide gas producer control rod through right side armor cutout and into place. Check that both rod ends are correctly aligned and install the attaching hardware. Secure nuts with new cotter pins.

g. Make a thorough inspection of the installation. (Refer to paragraph 11-20, above.)

11-23. ENGINE COOLING SYSTEM.

11-24. GENERAL. A special gearcase cooling duct (figure 11-4) is installed on helicopters equipped with armor. The duct is tilted left at a 15-degree angle to produce best possible cooling of the gearcase with the fuel controls armor installed.

CAUTION: If the helicopter is to be operated with the fuel controls armor removed, the engine gearcase cooling duct must be converted to the configuration used in an unarmored helicopter. (Refer to Section 10 of Basic HMI for standard installation.) Failure to make this conversion will result in improper cooling of the engine gearcase and possibly cause engine damage.

11-25. *ENGINE PUMP FUEL HOSE (SELF-SEALING).*

11-26. GENERAL. The engine pump fuel hose (figure 11-4) in the engine compartment is self-sealing but the coupling is not self-closing. The hose is routed from a straight reducer fitting at the fuel pump, through the left side of the armor, and to a bulkhead union at station 124. All other fuel lines are the same as those described in the Basic HMI.

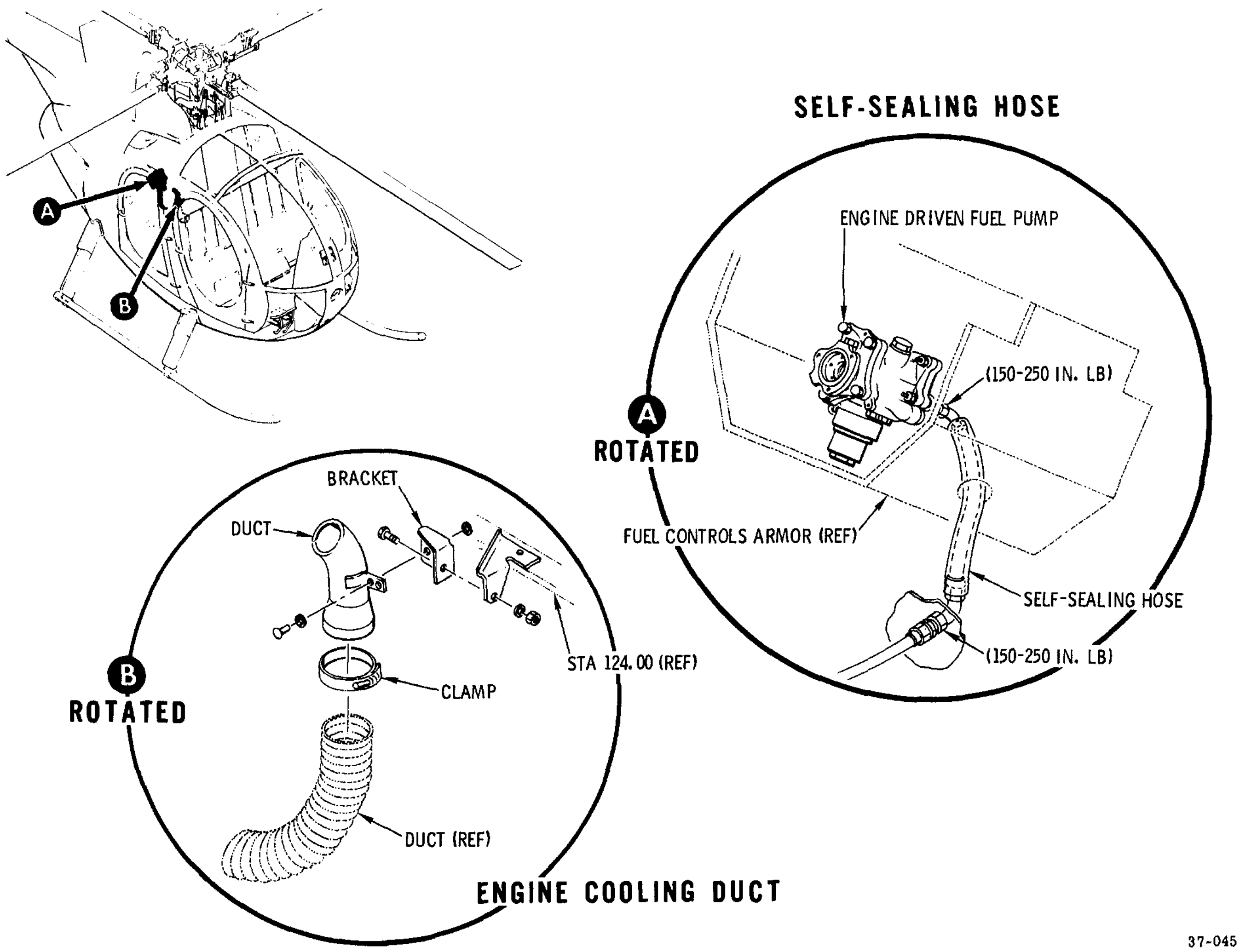


Figure 11-4. Fuel line and cooling duct armored installation

11-27. REMOVAL OF ENGINE PUMP FUEL HOSE. (See figure 11-4.)

a. Check that all electrical power is OFF and disconnect battery and external power.

b. Close the fuel shutoff valve by pulling outward on the fuel control knob.

c. With a container placed to catch trapped fuel, disconnect lower end of fuel hose. Drain fuel from line into container. Cap fuel line fitting.

d. Disconnect fuel hose at fuel pump and remove the hose assembly by feeding it out through the hole in the armor. Cap the open fitting.

11-28. INSPECTION OF ENGINE PUMP FUEL HOSE.

a. Inspect hose assembly for damage and signs of leakage.

b. Inspect hose unions for damaged threads and corrosion.

11-29. INSTALLATION OF ENGINE PUMP FUEL HOSE. (See figure 11-4.)

CAUTION: Care should be taken during installation not to twist the hose couplings from their original position. A twisted fuel hose will result in a possible blockage in the line, causing flameout at high power settings. The outer self-sealing hose prevents visual detection of a twisted inner hose.

a. Feed 90-degree end of hose through hole in left side of armor.

b. Remove caps and connect line at fuel pump and bulkhead union. Torque hose nuts to 150-250 inch-pounds. Check that there is at least 1/8-inch clearance between hose and edges of armor hole.

11-30. ARMOR INSTALLATION ENGINE OIL SYSTEM.

11-31. GENERAL. Armor installation engine oil system (figure 11-5) consists of a self-sealing oil tank, an oil cooler bypass valve, oil system interconnecting hoses and lines, and associated electrical equipment. The welded aluminum alloy oil tank is externally coated with a compound approximately 3/8 inch thick that provides for self-sealing of tank punctures. A float switch is installed in the top of the tank. An oil cooler bypass solenoid valve and tank-to-engine bypass oil line, with associated electrical equipment, allow selection of automatic oil cooler bypass operation in the event of oil loss from cooler damage. During oil cooler bypass operation, engine oil is diverted to flow directly from the engine to the oil tank, bypassing the oil cooler. Oil flow from tank back to engine is normal. Bypass operation occurs when oil quantity decreases below the low level operating limit (system approximately 1 quart low) and closes the tank float switch.

11-32. OPERATIONAL CHECK OF ARMOR INSTALLATION ENGINE OIL SYSTEM.

a. Energize the helicopter electrical system.

b. Set OIL CLR BYPASS circuit breaker ON to select bypass operation.

NOTE: The START PUMP circuit breaker must be ON for oil cooler bypass operation.

c. Depress OIL CLR BYPASS switch-indicator, on the control box at the instrument panel right side, and check that the indicator lights when depressed.

d. Check that oil level is at the full line on the oil tank sight plug.

e. Drain oil into clean container (Section 2, Basic HMI) until OIL CLR BYPASS caution indicator lights and the bypass valve is energized.

f. Measure the oil drained; 32 to 48 ounces of oil should have drained before the actions in e above occurred.

NOTE: If drained oil and/or system operation are not within the specified oil loss range the oil tank float switch is faulty and should be replaced.

g. Return drained oil to tank and repeat check, if necessary.

11-33. TROUBLESHOOTING ARMOR INSTALLATION ENGINE OIL SYSTEM. Refer to table 11-1. Refer to paragraph 11-37 for electrical equipment information.

11-34. REMOVAL OF ENGINE OIL TANK. (See figure 11-5.)

NOTE: Drain and cap open ends of lines, hoses, fittings and components as required during oil tank removal.

a. Drain oil system (Section 2, Basic HMI).

b. Remove oil cooler duct for access to oil tank (Basic HMI).

c. Loosen clamp securing the fire sleeve on engine vent line and slide the clamp and fire sleeve back to clear the vent fitting. Disconnect vent line at oil tank vent fitting.

d. Loosen clamp securing the fire sleeve on oil supply line and slide the clamp and fire sleeve back to clear outlet fitting. Disconnect oil supply line coupling at oil tank supply outlet fitting.

e. Disconnect oil cooler bypass line at oil tank fitting.

f. Disconnect oil cooler out line at oil tank fitting.

g. Disconnect tank drain tube at oil tank fitting.

h. Disconnect tank float switch wiring ground connection and knife splice.

i. Remove oil tank filler seal clamp. Remove four nuts, washers, and screws, the cap retaining plate, and the filler seal.

Table 11-1. Troubleshooting armor installation engine oil system

Symptom	Probable Trouble	Corrective Action
NOTE: START PUMP circuit breaker must be ON for oil cooler bypass operation.		
No OIL CLR BYPASS light indication during oil cooler bypass operation, and when switch-indicator depressed.	Burned out lamp.	Replace lamp.
No OIL CLR BYPASS light indication when switch-indicator depressed; light indication during cooler bypass operation.	Open CR610 diode.	Replace diode.
No cooler bypass operation with low oil level; no OIL CLR BYPASS light indication. Light indication when switch-indicator depressed.	Defective electrical connection or wiring.	Repair connection or wiring.
	Defective oil tank float switch.	Replace tank switch.
No cooler bypass operation with low oil level; OIL CLR BYPASS light indication.	Defective electrical connection or wiring.	Repair connection or wiring.
	Defective oil cooler bypass valve.	Replace bypass valve.
	Defective oil cooler bypass relay.	Replace bypass relay.
	Defective OIL CLR BYPASS circuit breaker CB605.	Replace circuit breaker.

j. Remove four bolts and washers that secure tank cradle to firewall and remove the tank.

k. Remove liquid level plug and O-ring when tank replacement is necessary or the plug is defective.

l. Remove engine oil temperature sender when tank replacement is necessary or if the sender is defective (Section 17, Basic HMI).

m. Remove the tank vent line assembly when replacement is required. The boss of the assembly is riveted to the tank cradle.

11-35. REPAIR OF ENGINE OIL TANK.

a. Replace damaged or unserviceable nutplates.

b. Replace damaged or unserviceable components such as vent tube assembly, liquid level plug and float switch.

c. Repair separation between tank cradle and self-sealing tank as follows.

NOTE: The self-sealing material on the tank itself cannot be removed or repaired. The tank is not reparable by welding. Replace unserviceable tanks.

(1) Carefully scrape away any residual bonding material at tank-to-cradle separation.

(2) Clean surfaces using a cloth dampened with naphtha (item 58, table 2-4, Basic HMI) and allow to dry for a minimum of 20 minutes.

(3) Using two-part adhesive (item 91, table 2-4, Basic HMI), mix 100 parts resin with 22 parts catalyst by weight. Mixed adhesive has a 1- to 1-1/2-hour working life.

(4) Completely fill the separation (gap) with adhesive and allow to cure for approximately 24 hours at room temperature.

11-36. INSTALLATION OF ENGINE OIL TANK. (See fig. 11-5.)

a. If removed, install replacement liquid level plug (Basic HMI).

b. If removed, install replacement tank vent line assembly.

c. Coat switch threads with lubricating oil (item 3, table 2-3, Basic HMI), install tank float switch with new O-ring and secure with lockwire.

d. Install new O-rings, and new unions as required.

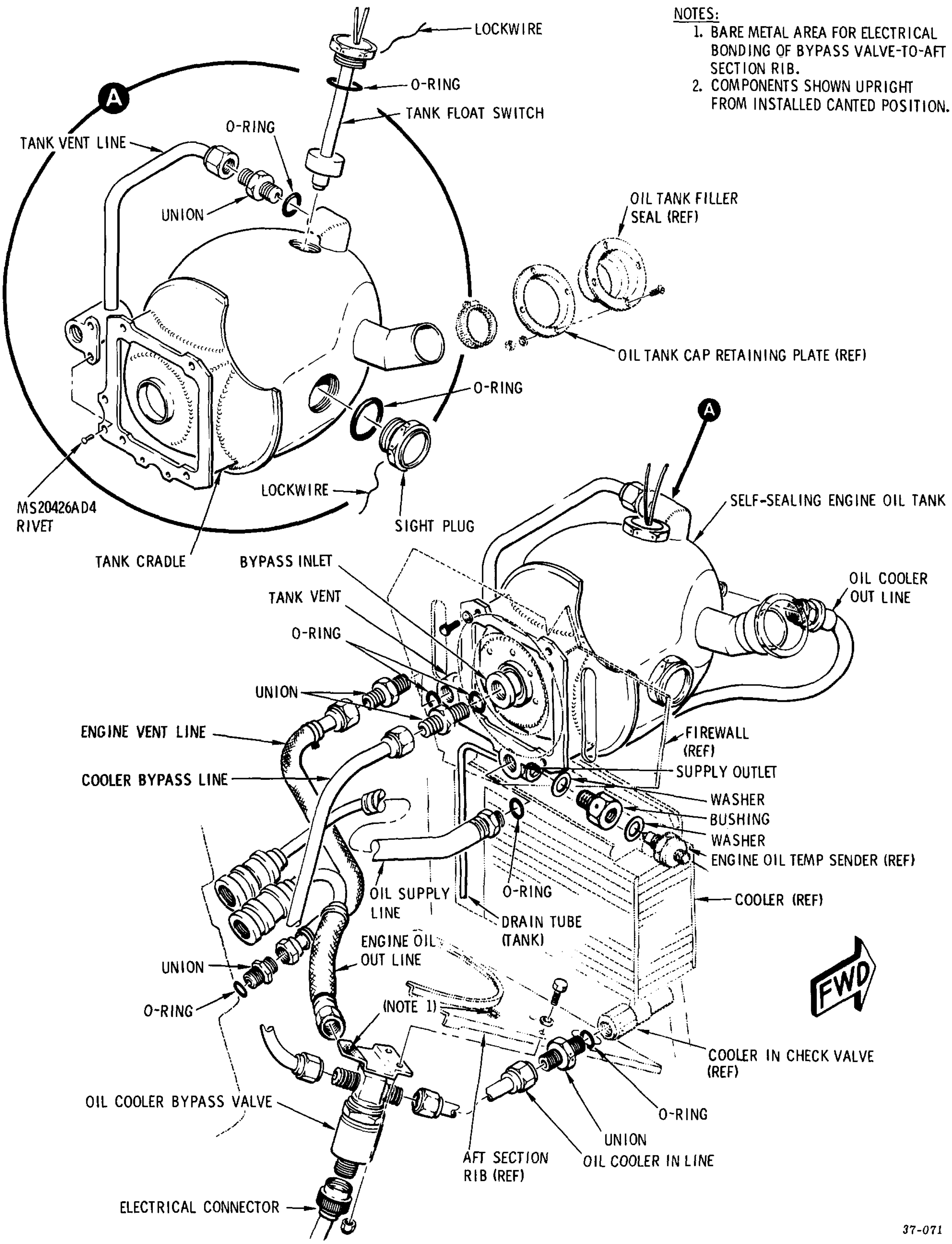


Figure 11-5. Armor installation engine oil system

e. If removed, install replacement oil temperature sender; torque to 100 to 135 inch-pounds. (Refer to Basic HMI.)

f. Place tank in mountingposition and secure tank cradle to firewall with four bolts and washers.

g. Install oil tank filler seal and cap retaining plate with clamp. Be sure that filler seal fits properly over filler neck and secure with four screws, washers and nuts. Tighten filler seal clamp.

h. Connect all oil and vent lines previously disconnected. Pull fire sleeves into position and tighten clamps.

i. Connect electrical wiring for tank float switch ground connection, knife splice and oil temperature sender.

j. Install oil cooler duct (Basic HMI).

k. Refill engine oil system (Basic HMI).

l. Perform check of normal engine operation (Basic HMI) and oil cooler bypass operation (para 11-32).

11-37. INSTALLATION OF ENGINE OIL TANK AND OIL COOLER DRAIN KIT. The below procedure for incorporating PN 369D28300-501 Engine Oil Tank and Oil Cooler Drain Kit applies to Model 369HS Serial No. 0201 and subsequent and Model 369HE Serial No. 0201E and subsequent helicopters. This more readily accessible oil drain facilitates draining and maintaining the engine oil system.

a. Open engine access doors; remove aft compartment interior trim and aft bulkhead access covers. (Refer to Section 2 of Basic HMI.)

b. Drain engine oil system. (Refer to Section 2 of Basic HMI.)

c. Remove existing PN 369A8324 quick drain valve, overboard drain tube, and related components as follows:

(1) Disconnect and remove PN 369A8010-41 overboard drain tube from drain valve and helicopter structure. (Refer to Section 13 of HMI.)

(2) Disconnect and remove drain valve from PN 369A8010-601 and -603 tube assemblies (or 369D28314-11 and -21 tube assemblies, if installed) from engine oil tank and oil cooler.

(3) Remove two PN NAS1303-1 bolts, MS2104-3 nuts, and AN960PD10L washers securing PN 369A8325 drain valve bracket (with drain valve) to firewall. Discard valve and bracket; retain attaching hardware.

d. Rework helicopter structure as follows:

(1) Using PN 369H2532-17 doubler as template, mark and drill two 0.453 inch diameter holes and six 0.094 inch diameter rivet holes in RH side of PN 369H2532 ring assembly. Install doubler on aft side of ring, using MS20615-3M rivets with zinc chromate primer. (See figure 11-6.)

(2) Drill 0.437 inch diameter hole outboard of existing hole in 369D23016-6 rib at dimensions shown in detail A. Install MS35489-6 grommet in hole in rib.

(3) Using PN 369D28300-3 doubler as template, mark and drill 0.500 inch diameter hole and six 0.140 inch diameter rivet holes in 369D23020 firewall at dimensions shown in detail B. Install doubler using NAS1738M4-1 rivets with zinc chromate primer.

e. Install new drain tubes and fittings as follows:

(1) Assemble AN815-4J union on AN939-4J elbows as shown, using NAS617 packings. Install SS-400-61 unions on 369D28315 bracket and AN939-4J elbows and secure with AN924-4J nuts.

(2) Install 369D28315 bracket on firewall, using existing attach hardware.

(3) Connect 369D28313 drain tubes to unions with SS-402-1 nuts, SS-403-1 and SS-404-1 ferrules as shown. Do not tighten nuts at this time.

(4) Route 369D29313 tube assemblies between firewall and ring assembly as shown; secure tubes at ring assembly using AN833-4J elbows, AN960-C716 washers, and AN924-4J nuts as shown.

(5) Connect existing 369D8010-601 and -603 (or 369D28314-11 and -21) tube assemblies to unions on elbows as shown.

(6) Secure 369D28313 tube assemblies to 369H8306 oil OUT hose assembly with tie straps as shown. Tighten SS-402-1 nuts (securing drain tubes to unions) 1.25 turns from fingertight.

(7) Install AN929-4J cap assemblies.

(8) Install 369D24044 engine oil drain decal on aft side of ring assembly as shown.

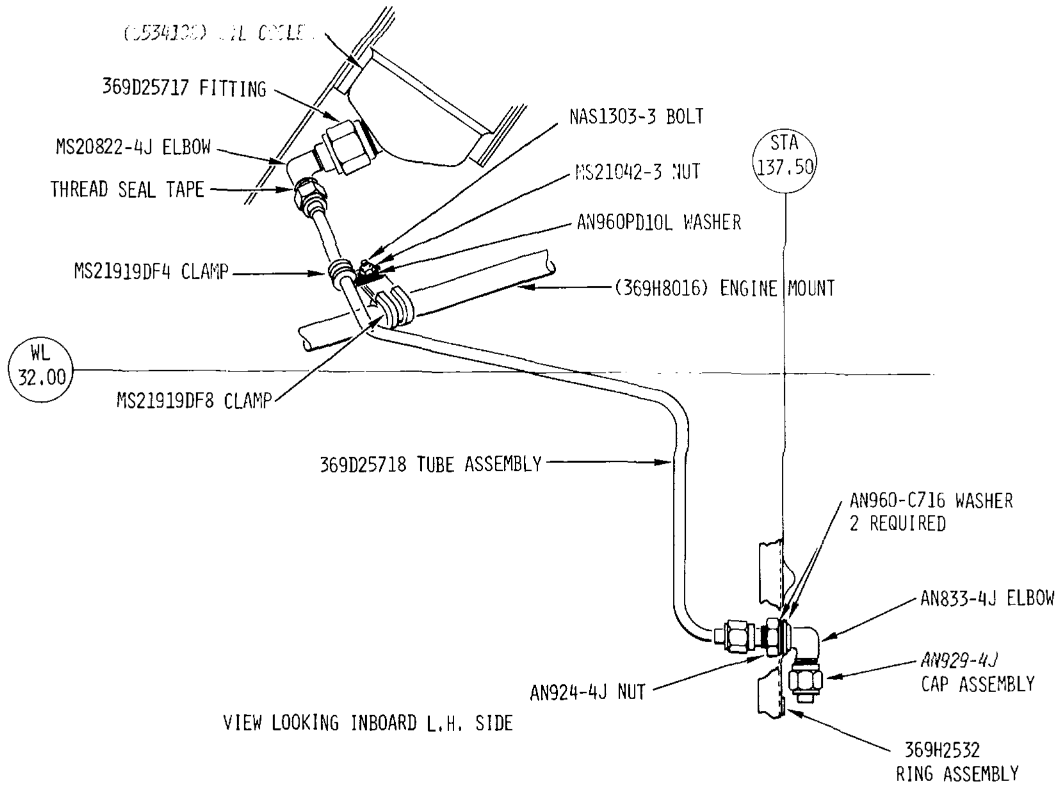
f. Check new engine oil system drain installation for discrepancies.

g. Service engine oil system per Section 2 of Basic HMI.

h. Reinstall interior trim and aft bulkhead access covers; close engine access doors.

11-38. OIL COOLER BYPASS ELECTRICAL EQUIPMENT.

11-39. GENERAL. Oil cooler bypass electrical equipment (fig. 11-7) consists of an OIL CLR BYPASS circuit breaker, OIL CLR BYPASS switch-indicator, oil cooler bypass relay, diode, and miscellaneous electrical wiring and hardware. The circuit breaker, relay, diode and switch-indicator light are mounted on panels of a control box attached to the right side of the instrument panel. When the oil cooler bypass circuit breaker is ON and oil supply level decreases to the low limit because of loss through cooler damage the oil tank float switch completes an electrical grounding circuit for the oil cooler bypass relay.



NOTES:
1. POSITION DECAL APPROXIMATELY AS SHOWN
2. ALL DIMENSIONS IN INCHES.

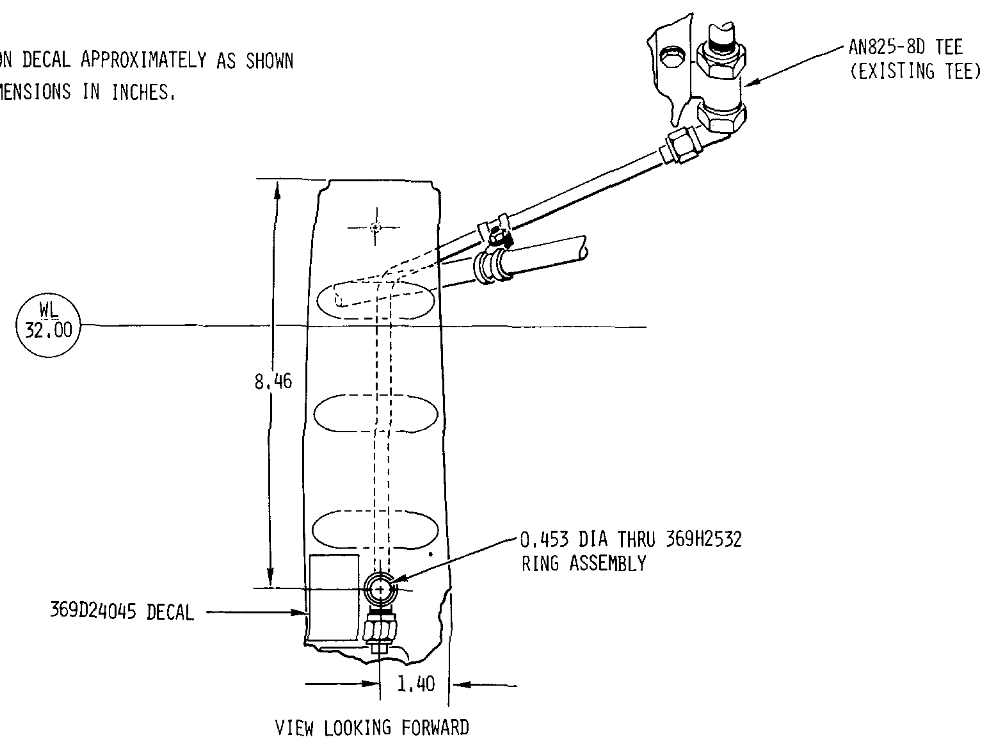


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Figure 11-6. Engine oil tank and oil cooler drain kit installation

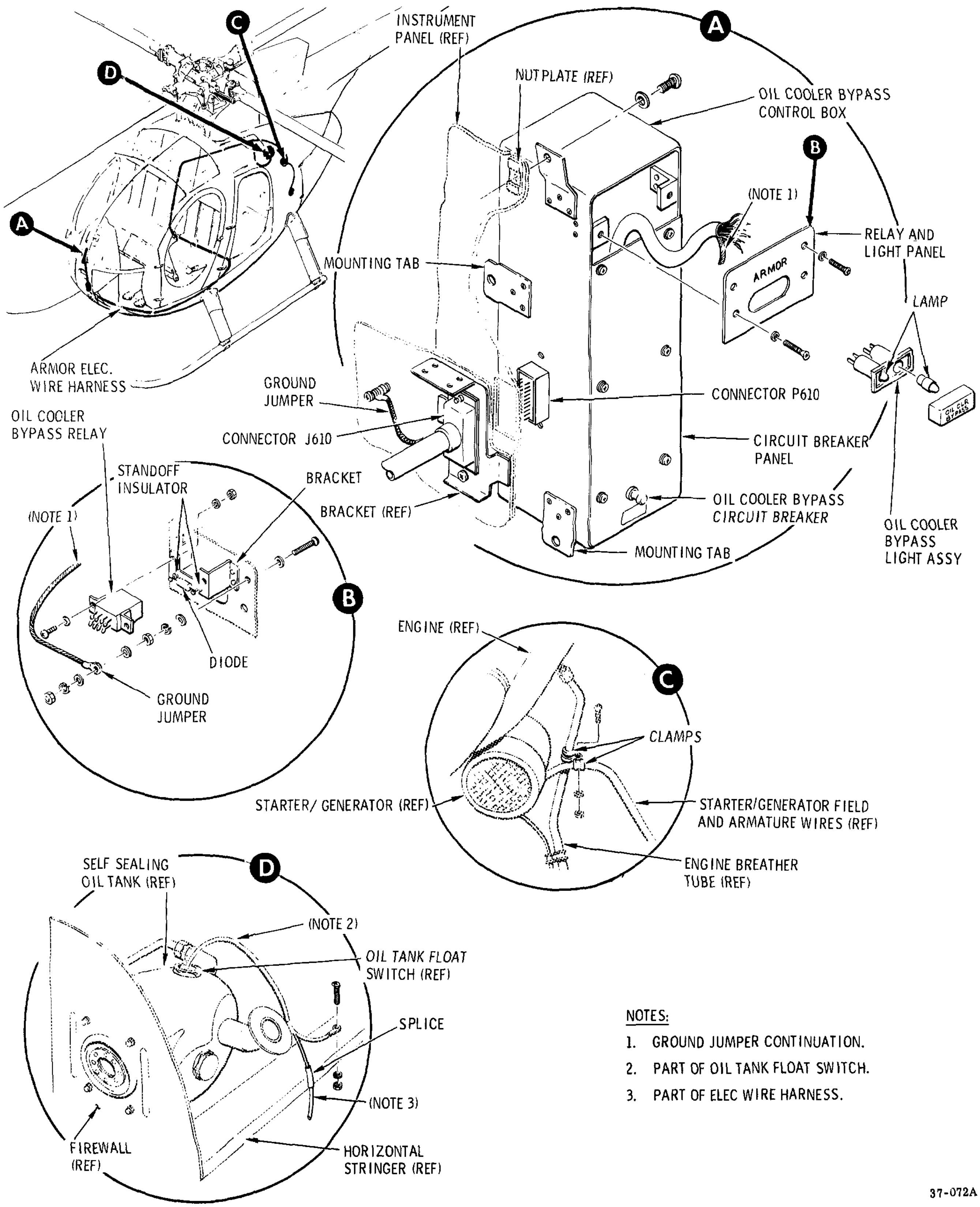


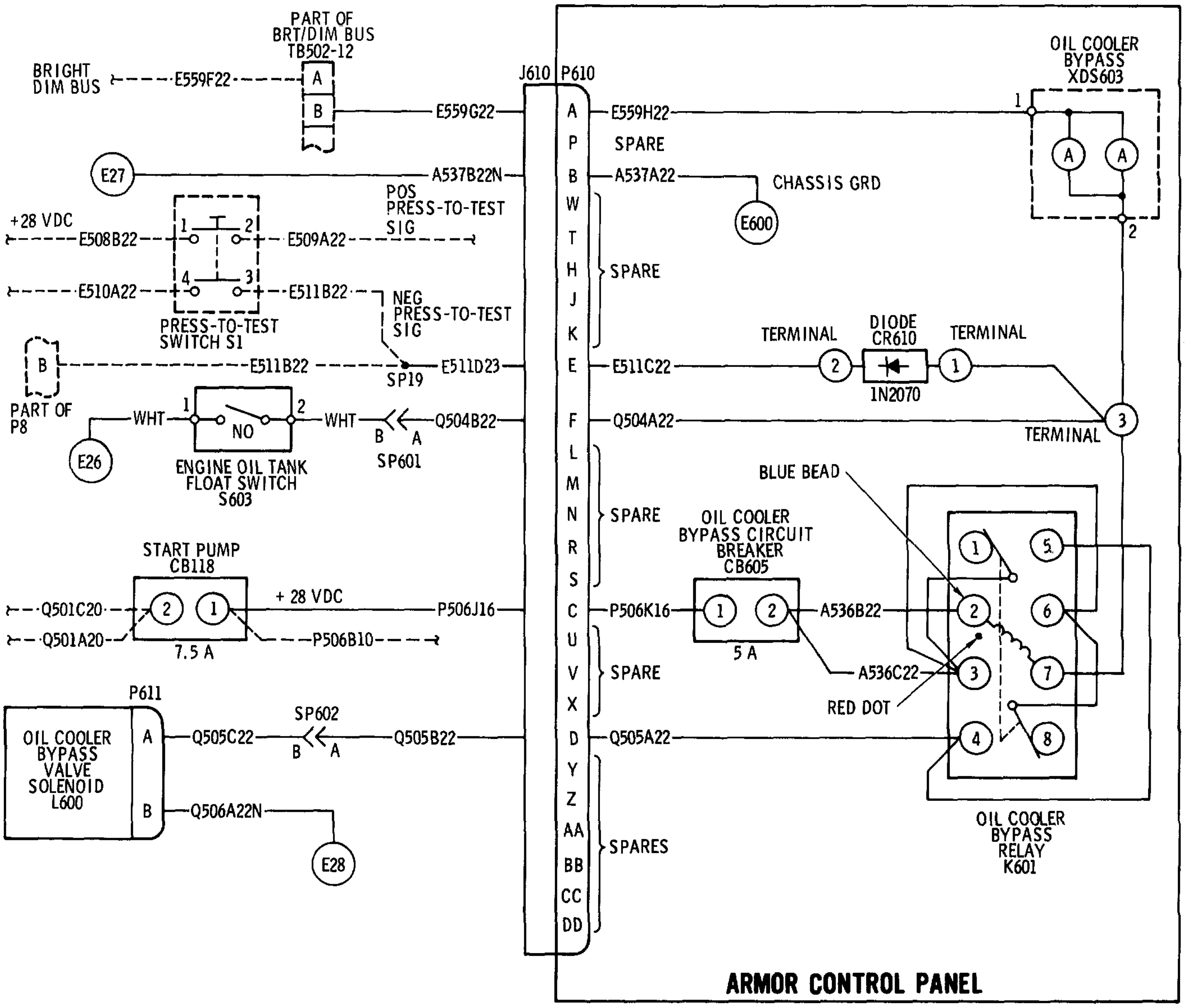
Figure 11-7. Oil cooler bypass electrical equipment

Actuation of the relay energizes the oil cooler bypass valve solenoid and the bypass valve redirects oil flow to bypass the oil cooler. The press-to-test switch-indicator provides a visual indication of circuit and indicator light operation when depressed. Figure 11-8 is an interconnection wiring diagram for the oil cooler bypass electrical equipment.

11-40. MAINTENANCE OF OIL COOLER BYPASS ELECTRICAL EQUIPMENT. Repair, replace and maintain the electrical equipment as generally outlined for electrical items in Section 19 of the Basic HMI, using figure 11-5 through 11-8 herein. Note that the oil cooler bypass relay, diode and OIL CLR BYPASS switch-indicator have solder terminals.

11-41. SELF-SEALING FUEL CELLS.

11-42. GENERAL. The self-sealing fuel cells prevent loss of fuel from punctures. Both fuel cells have a self-sealing capability sufficient to retain 50 percent of the usable fuel capacity for all practical cruising flight attitudes. Maintenance and repair procedures for the fuel cells are the same as those for the standard fuel cells described in the Basic HMI, except that the pressure test of fuel cells is accomplished with 3 psi of air pressure.



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (---) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENT.
4. WIRES CONNECTING COMPONENTS TO CONNECTOR J610 ARE PART OF ARMOR EQUIPMENT ELECTRICAL WIRE HARNESS.

37-073

Figure 11-8. Armor installation electrical equipment wiring diagram

OPTION GROUP 12
ENGINE AND DRIVE SYSTEM ASSOCIATED EQUIPMENT

12.1. ENGINE AUTOMATIC REIGNITION EQUIPMENT.

12.2. GENERAL. The engine automatic reignition equipment (fig. 12-1) provides an automatic engine restart capability in the event of engine flame-out during flight, without using the starter-generator. Two different reignition systems are provided: one for the 250-C18 Series engine and one for the 250-C20 Series engine. The systems are not interchangeable and the 250-C18 type system must be modified before use with a 250-C20 engine. The primary difference in these systems is the source of the engine power out signals which start the reignition sequence. The 250-C18 engine system utilizes a pressure switch in the torque gage pressure line to provide an engine out signal whenever torque pressure is below approximately 25 psi. The 250-C20 engine system receives the power out signal from the N_1/N_R engine power out warning system (Option Group 2) whenever N_1 rpm is below 50% to 55% or rotor rpm (N_R) is below approximately 98%.

12-3. REIGNITION SYSTEM OPERATION. The following general description of reignition sequence is applicable to both types of reignition systems. The guard-covered switch/circuit breaker on the circuit breaker and switch panel below the instrument panel is used to arm the automatic reignition circuits for automatic restart. The ARMED sector of the press-to-reset RE-IGN and ARMED indicator legend face on the same panel provides visual indication that circuits are armed. When the engine power out signal is received, the reignition circuits are energized (ignition exciter and igniter) to reignite (restart) the engine. Reignition system operation is indicated by the RE-IGN light illuminating. After engine restart and an increase in power to above the engine out signal point, the reignition system can be reset by pressing the indicator legend face. The ARMED light will remain illuminated and the RE-IGN light will go off. The system operates, providing ignition spark, whenever it is armed and the engine power out signal is supplied. Two diodes provide electrical isolation between the normal engine start circuit and the automatic reignition circuits.

12-4. ENGINE AUTOMATIC REIGNITION COMPONENTS. (See fig. 12-1.)

a. Common Components. Components common to both the 250-C18 Series engine and the 250-C20 Series engine reignition systems are: a guarded switch/circuit breaker for circuit arming and an indicator module, both located on the switch/circuit breaker panel at the lower side of the instrument panel; a special ignition exciter (only as specified in b and c below) and special igniter Allison PN 6843984 (Champion PN FHE 161-9 or PN FHE 161-9A); and isolation diodes CR1 and CR2 mounted on the start relay bracket in the engine compartment. Diode CR1 conducts during automatic reignition without energizing the starter-generator. Diode CR2 conducts during normal engine starting.

b. Components for 250-C18 Series Engine Reignition System Only. A pressure switch is installed in the torque meter pressure line at the engine to supply the engine out (low pressure) signal. This switch closes on decreasing pressure at 25 ±2 psig and opens on increasing pressure at 30 +4, -3 psig. An auxiliary switch/circuit breaker panel is installed on the lower side of instrument panel type A to mount the system control components. Either the special ignition exciter Allison 6870885 (GLA 43754) or the high energy ignition exciter Allison 6870891 (Bendix 10-387150-1) may be used on the 250-C18 engine. Current type automatic reignition equipment incorporates a modification that adds a silicon rectifier (SCR) assembly (fig. 12-2) to reduce flow through contacts of the pressure switch for longer service life. The SCR assembly is mounted on the left side of the helicopter center beam in the underfloor area below the instrument panel.

NOTE: Early reignition equipment may be modified to the current type with SCR modification M50036. Refer to Hughes Notice HN-58.

c. Components for 250-C20 Series Engine Reignition System Only. A relay, K104, is mounted on a bracket on the left side of instrument panel structure. This relay connects to

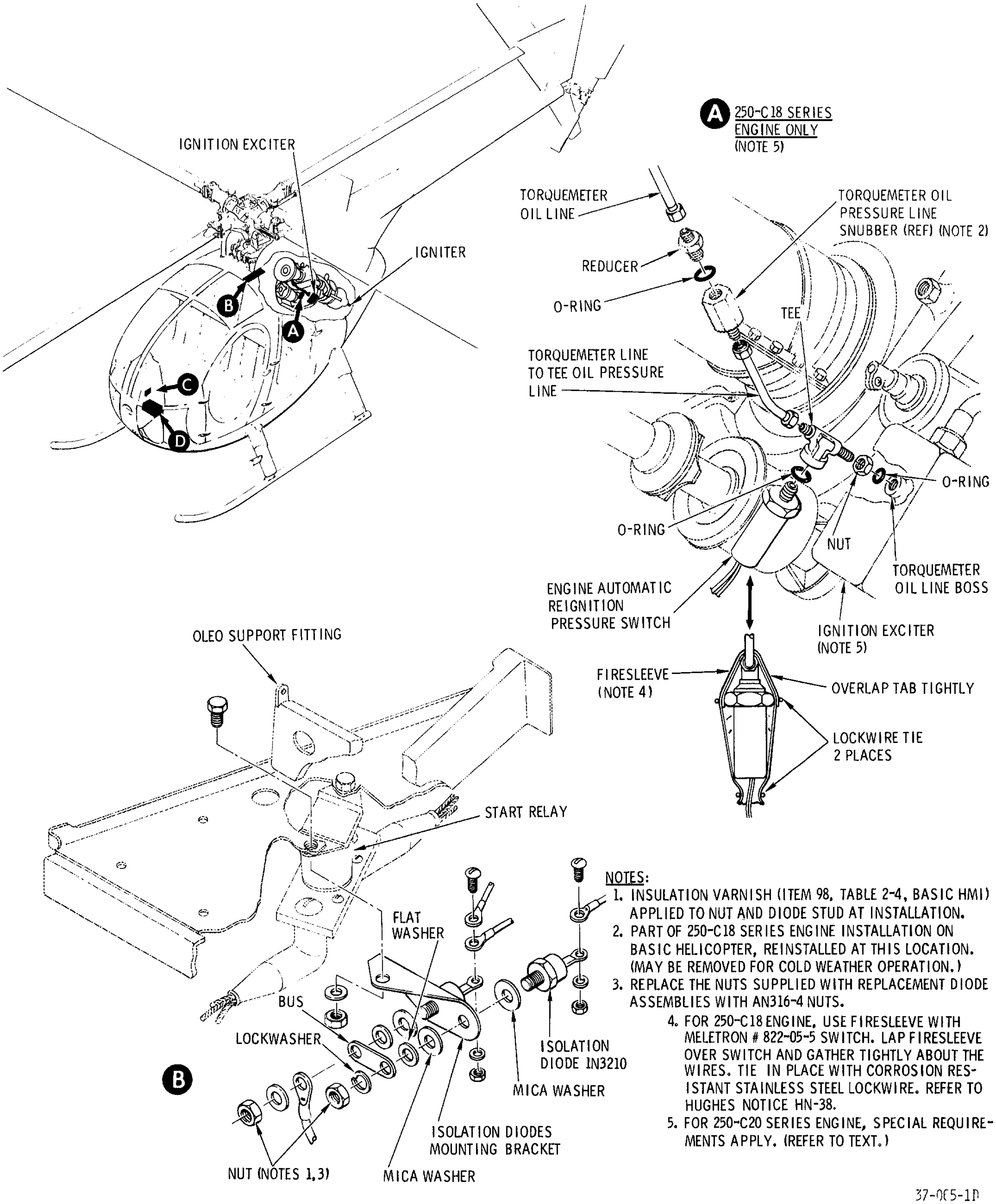


Figure 12-1. Engine automatic reignition equipment (sheet 1 of 2)

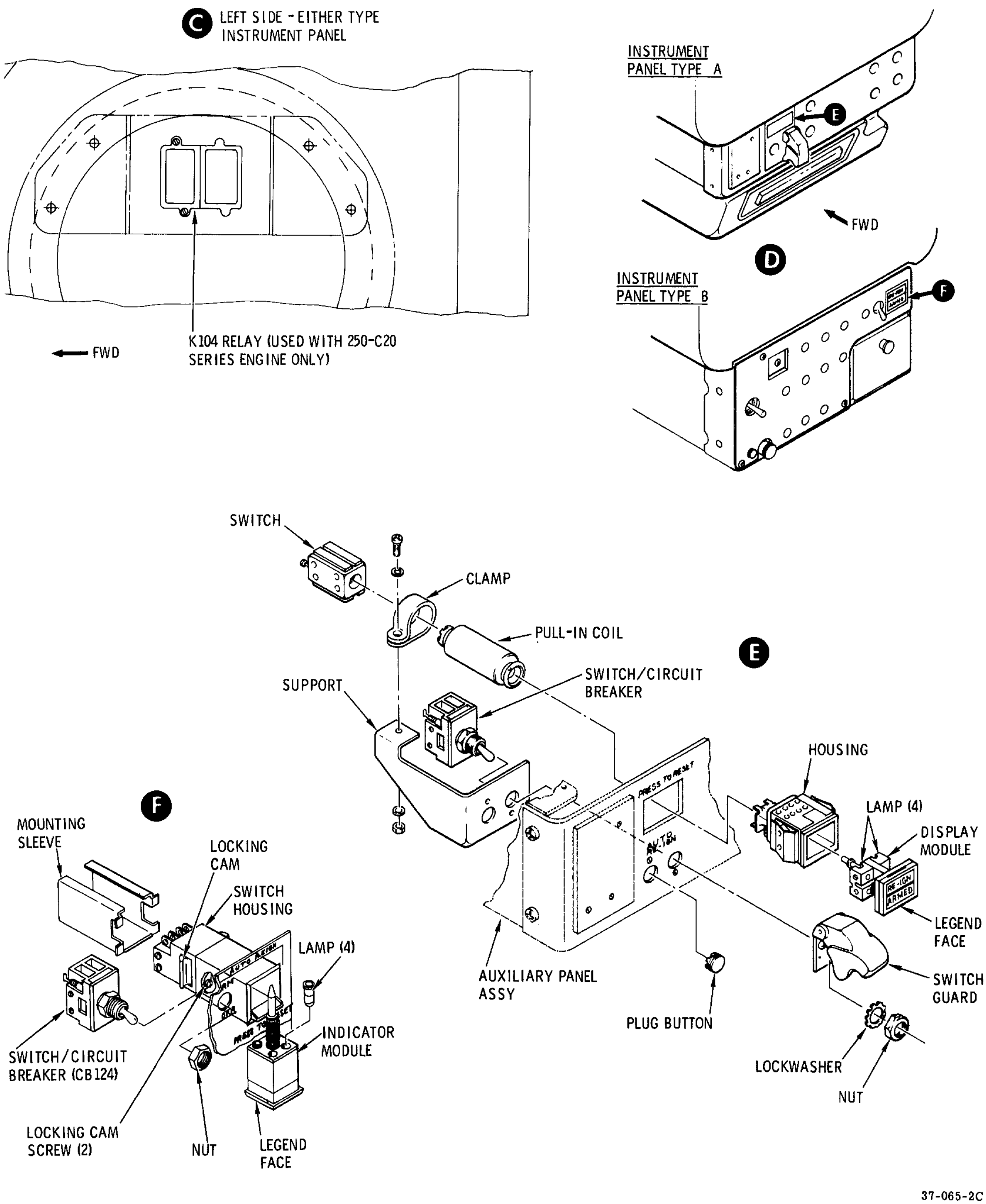
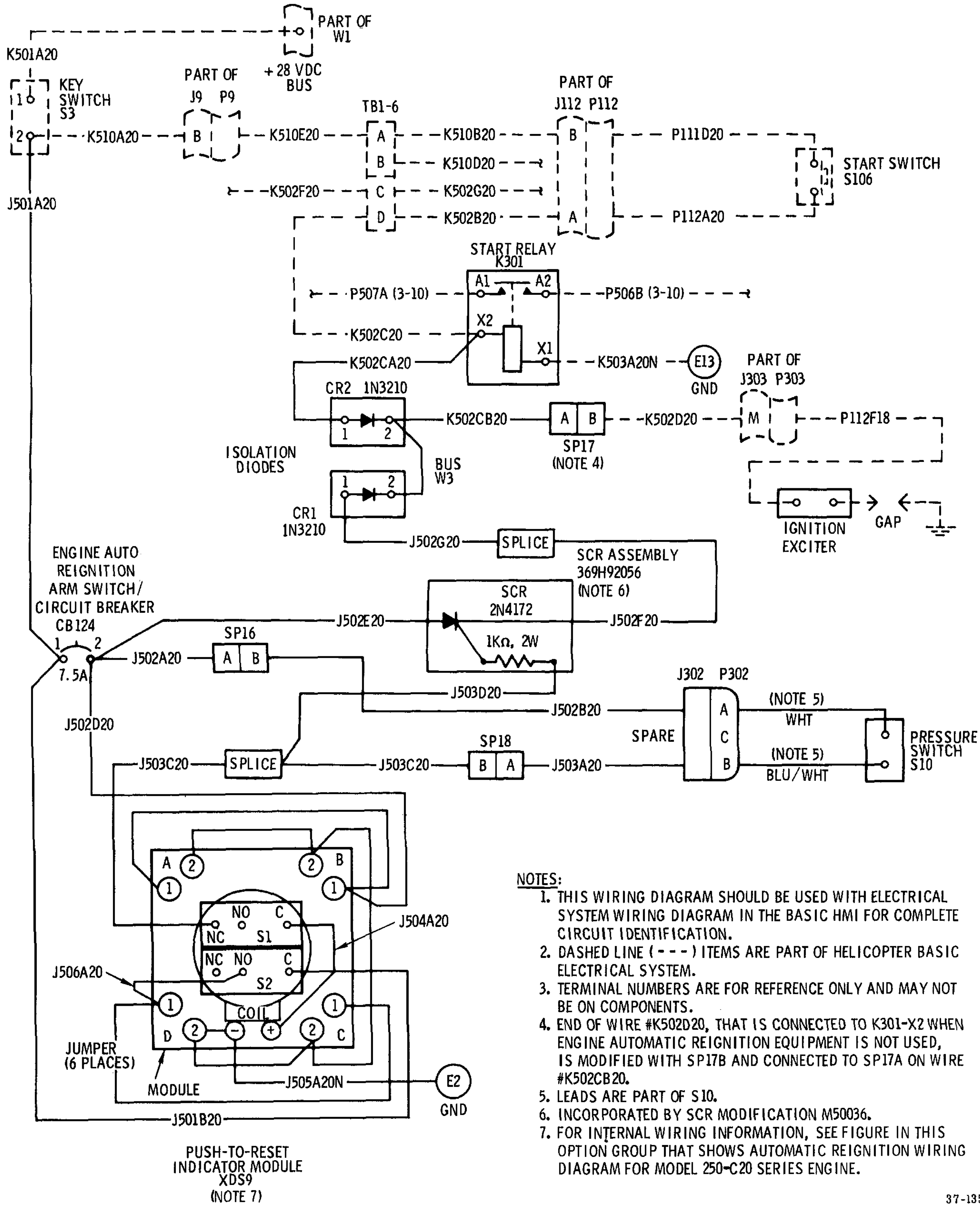


Figure 12-1. Engine automatic reignition equipment (sheet 2 of 2)



NOTES:

1. THIS WIRING DIAGRAM SHOULD BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN THE BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (- - -) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
4. END OF WIRE #K502D20, THAT IS CONNECTED TO K301-X2 WHEN ENGINE AUTOMATIC REIGNITION EQUIPMENT IS NOT USED, IS MODIFIED WITH SP17B AND CONNECTED TO SP17A ON WIRE #K502CB20.
5. LEADS ARE PART OF S10.
6. INCORPORATED BY SCR MODIFICATION M50036.
7. FOR INTERNAL WIRING INFORMATION, SEE FIGURE IN THIS OPTION GROUP THAT SHOWS AUTOMATIC REIGNITION WIRING DIAGRAM FOR MODEL 250-C20 SERIES ENGINE.

Figure 12-2. Model 250-C18 Series engine automatic reignition wiring diagram (current system) the N_1/N_R engine power out (EPO) control unit and closes to energize the reignition system when EPO sensed N_1 is below 50 to 55% rpm (35 to 38.5 Hz) or when N_R is below approximately 98% rpm (68.6 ±0.7 Hz). Only the special ignition exciter Allison 6870885 (GLA 43754) may be used on the 250-C20 Series engine.

12-5. TROUBLESHOOTING THE ENGINE AUTOMATIC REIGNITION EQUIPMENT. Refer to table 12-1. Figures 12-2, 12-3 and 12-4 provide electrical interconnection wiring diagrams.

12-6. CONVERSION OF 250-C18 SERIES ENGINE REIGNITION SYSTEM FOR USE ON 250-C20 SERIES ENGINE.

a. Remove torquemeter oil pressure switch and associated wiring.

b. Replace existing engine out warning system with the N_1/N_R warning system kit M50033 (Option Group 2).

c. If installed, remove high energy ignition exciter Allison 6870891 (Bendix 10-387150-1) and replace with special ignition exciter Allison 6870885 (GLA 43754).

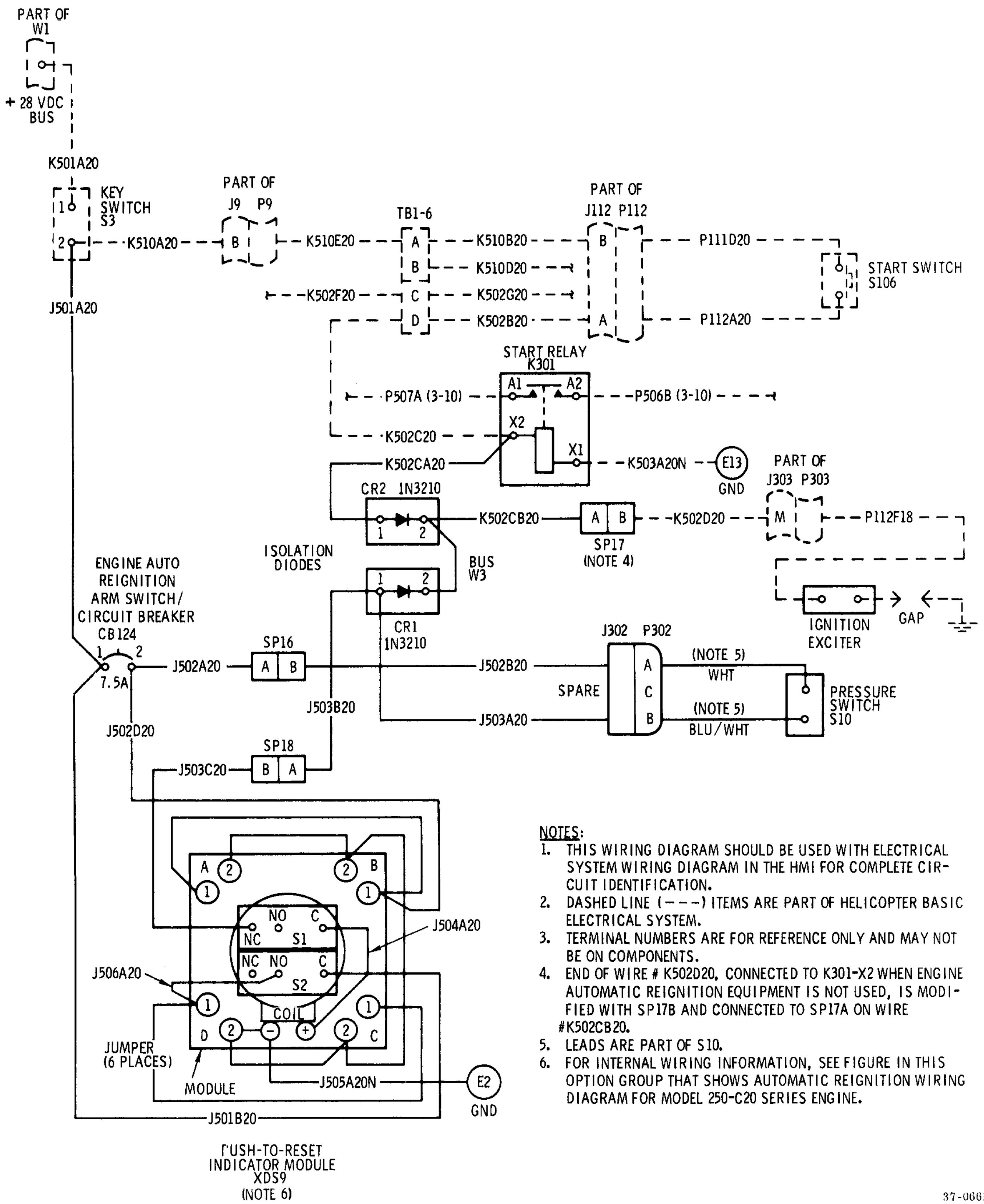
d. Install other components and wiring required for conformance to reignition system 369H90118-507. A wiring diagram is shown on figure 2-4.

12-7. CONVERSION FROM PRESSURE SWITCH-ACTUATED TO ENGINE POWER OUT-ACTUATED AUTOMATIC REIGNITION SYSTEM (250-218 SERIES ENGINE).

a. Remove fairing from right side of instrument panel.

Table 12-1. Troubleshooting engine automatic reignition equipment

Symptom	Probable Trouble	Corrective Action
Automatic engine restart functions normally, no ARMED and/or RE-IGN indication.	Indicator lamps burned out.	Replace indicator lamps.
	Defective pull-in coil.	Replace pull-in coil and switch assembly.
Regular engine start is normal. Automatic engine restart does not occur when power decreases to reignite level; ARMED indicator does not light.	Electrical wiring or connections defective.	Repair electrical wiring or connections.
Same symptoms as above except ARMED indicator lights.	Electrical wiring or connections defective.	Repair electrical wiring or connections.
	Isolation diode CR1 defective.	Replace isolation diode CR.
	Reignition pressure switch or SCR defective (250-C18 Series engine).	Replace pressure switch or SCR.
	N_1/N_R EPO control unit defective (250-C20 Series engine.	Refer to Option Group 2 for information.
Regular engine start and automatic engine restart function normally, except cannot reset auto reignition circuits to ARMED after restart.	Press-to-reset switch defective.	Replace defective press-to-reset switch.
Engine cranks with start switch but does not ignite; helicopter basic electrical start circuit components functional; engine ignites only when cranking with automatic restart switch on.	Isolation diode CR2 defective.	Replace isolation diode CR2.



NOTES:
1. THIS WIRING DIAGRAM SHOULD BE USED WITH ELECTRICAL SYSTEM WIRING DIAGRAM IN THE HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. DASHED LINE (– – –) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
3. TERMINAL NUMBERS ARE FOR REFERENCE ONLY AND MAY NOT BE ON COMPONENTS.
4. END OF WIRE # K502D20, CONNECTED TO K301-X2 WHEN ENGINE AUTOMATIC REIGNITION EQUIPMENT IS NOT USED, IS MODIFIED WITH SP17B AND CONNECTED TO SP17A ON WIRE #K502CB20.
5. LEADS ARE PART OF S10.
6. FOR INTERNAL WIRING INFORMATION, SEE FIGURE IN THIS OPTION GROUP THAT SHOWS AUTOMATIC REIGNITION WIRING DIAGRAM FOR MODEL 250-C20 SERIES ENGINE.

Figure 12-3. Model 250-C18 Series engine automatic reignition wiring diagram (early system)

NOTES:
1. DASHED LINE (– – –) ITEMS ARE PART OF HELICOPTER BASIC ELECTRICAL SYSTEM.
2. ALLISON # 6870885 OR GLA # 43754.
3. SEE SEPARATE VIEW FOR INSTRUMENT PANEL TYPE B.

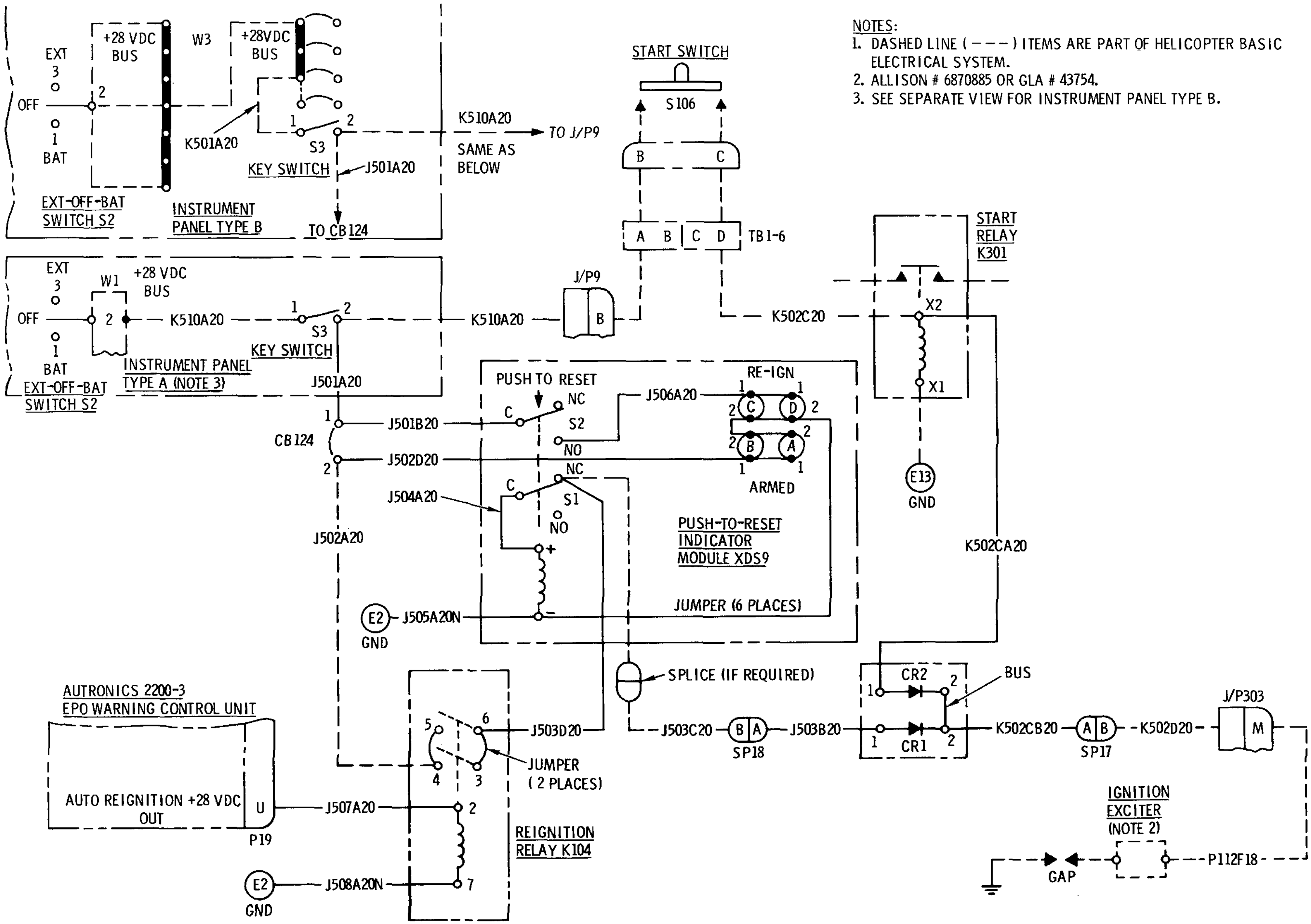


Figure 12-4. Model 250-C20 Series engine automatic reignition wiring diagram

b. Remove 369H92025-3 or 369H92040 pressure switch from AN783C3 tee.

c. Plug tee with 369H90118-61 assembly. (See fig. 12-5.)

d. Remove wire No. J503A20 and J502B20, 369H90118-31 angle and CA3100E10SL-35F80 connector (J302).

e. Install 369H90118-71 relay assembly as follows (fig. 12-5):

(1) Remove fairing from left side of instrument panel. (Refer to Section 2 of Basic HMI.) As required, drill four 0.140 to 0.152 inch diameter holes.

(2) Install 369H2505-111 bracket on left side of instrument panel as shown.

(3) Install 369A4557 relay (K104) on bracket as shown.

f. Remove MS25224-1 switch guard and MS24509-7 1/2 circuit breaker (CB124) located on automatic reignition switch panel.

g. Install MS35059-22 switch (S11) in hole where circuit breaker was.

NOTE: The following changes to automatic reigniton wiring result in reidentification of 369H90118-11 diode isolator assembly and 369H90118-21 switch panel assembly to 369H90118-51 and 369H90118-81, respectively.

h. Install wiring as shown in wiring diagram (fig. 12-6). Cover jumpers with insulation sleeving.

i. Reinstall fairing on left and right sides of instrument panel, center seat cover, and controls access door. (Refer to Section 2 of Basic HMI.)

12-8. GENERAL MAINTENANCE OF ENGINE AUTOMATIC REIGNITION COMPONENTS.

Maintain the automatic reignition electrical components as instructed in Section 19 of the Basic HMI, and as outlined in following paragraphs. Refer to Option Group 2 for the N_1/N_R engine out warning system information. Refer to manufacturer's publications (table 2-12, Basic HMI) for maintenance information on the special engine ignition exciter and igniter. Check operation of the engine automatic reignition equipment as instructed in the 500 Owner's Manual.

12-9. REPLACEMENT OF INDICATOR DISPLAY MODULE LAMPS.

a. For Instrument Panel Type A.

(1) Grasp edges of the legend face (fig. 12-1) and pull display module out of housing.

(2) Note location of the four lamps installed in the rear of the module. Remove defective lamp by moving it out through the slotted opening in the module and rear retaining bar.

NOTE: To ease tension of retaining bar on base of lamp, squeeze legend face and module together.

(3) Install replacement lamp and reinstall module in housing.

b. For Instrument Panel Type B.

(1) Grasp edges of legend face, slide indicator module out of housing, and allow it to hinge downward.

(2) Replace faulty lamp and slide indicator module back into housing.

12-10. REPLACEMENT OF AUTOMATIC REIGNITION INDICATOR COMPONENTS.

a. For Instrument Panel Type A. The automatic reignition indicator components (fig. 12-1) are locked together (stacked) by means of mating flanges and spring type locks. These components are detached from each other by using a tilting movement to unlatch the spring lock and then separating the mating flanges. Note that the pull-in coil is additionally supported by a clamp that must be removed. The module housing pulls out from the face of the panel. All electrical connections at the components are soldered.

b. For Instrument Panel Type B. The switch housing is retained in the instrument panel by means of a mounting sleeve and locking cams (fig. 12-1). Remove the switch housing by sliding the indicator module from the housing and then loosening the two locking cam screws inside the housing. The mounting sleeve will then slide forward off the housing and the housing will slide aft out of the panel. Electrical wire connections on the housing will require unsoldering and then resoldering to the replacement unit.

12-11. ROTOR BRAKE INSTALLATION.

12-12. GENERAL. The rotor brake installation (fig. 12-7) provides pilot actuated rotor braking. A brake handle is located on either the upper left or right side of the pilot's compartment station 78.50 bulkhead tunnel depending on pilot position. The handle normally remains in a stowed position. Actuation of the brake handle actuates a hydraulic cylinder causing dual pistons to grip a brake disc attached to the main transmission tail rotor driveshaft coupling. A system pressure relief valve prevents excessive braking pressure regardless of force applied at the brake handle. The brake handle may be swung upwards and stowed when not in operation.

12-13. OPERATIONAL CHECK OF ROTOR BRAKE SYSTEM.

CAUTION: Incorrect application of the rotor brake can result in sudden stoppage or rebounding of the main rotor and cause damage to the rotor blades and strap packs in the hub. For the same reasons, never apply collective pitch to slow the rotor.

a. Run up helicopter to operational rpm and make a normal shutdown (Owner's Manual).

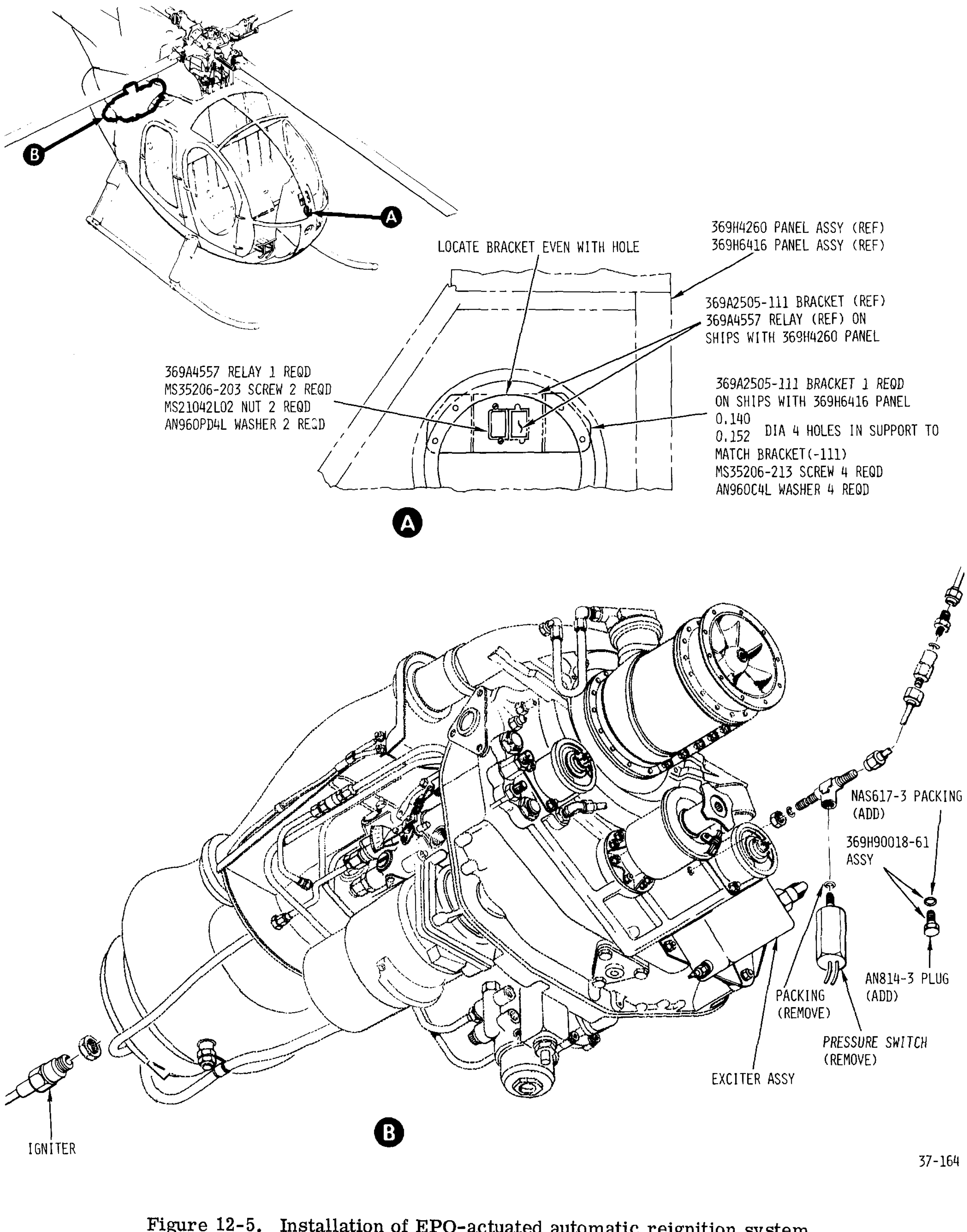
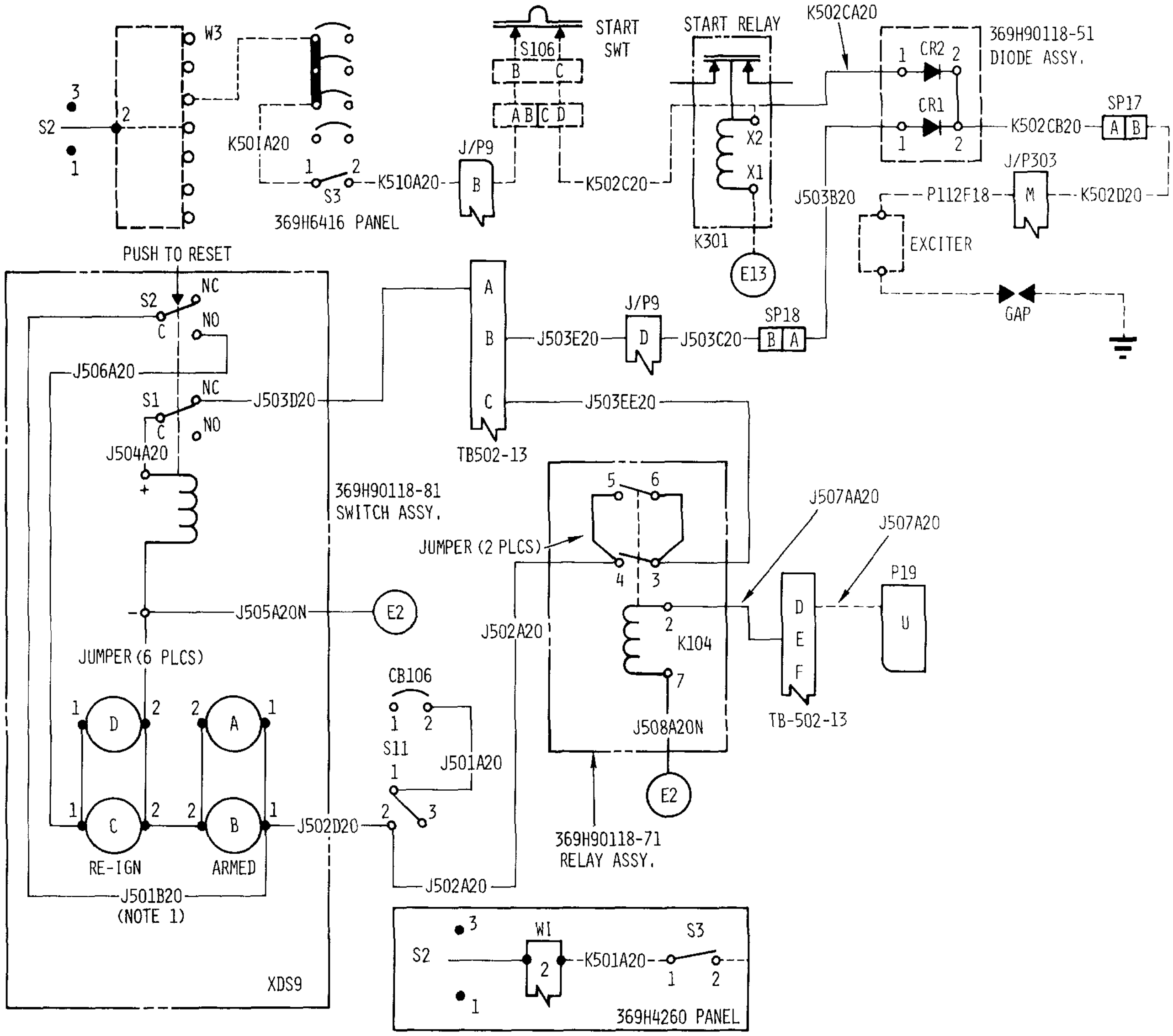


Figure 12-5. Installation of EPO-actuated automatic reignition system (369H90118-61 and 369H90118-71 assemblies)



NOTES:

1. WIRE NO. J501B20 MAY BE TERMINATED AT SII-1 AS AN ALTERNATE CONNECTION
2. WIRES SHOWN DOTTED REPRESENT BASIC SHIP WIRING

Figure 12-6. Wiring diagram for EPO-actuated automatic reignition system (sheet 1 of 2)

NOTES:

1. COVER JUMPERS WITH INSULATION SLEEVING, MIL-1-631 NO. 20
2. MIL-W 5086 TYPE II WIRE OR MIL-W-16878/4 (19STRD) WIRE MAY BE LISTED AS AN ALTERNATE FOR GENERAL CABLE CO. WIRE NO. 47108-B
3. HARDWARE SUPPLIED WITH IN3210 DIODE

J503E20		TB502 -13C	MPCM20M-H2	K104-3	SOLDER	NOTE 2		
JUMPER	NOTE 1	K104-4		K104-5				
		K104-3		K104-6				
		XDS9-C1		XDS-D1				
		-D2		-C2				
		-C2		-B2				
		-B2		-A2				
		-A1		-B1				
JUMPER	NOTE 1	XDS9-D2	SOLDER	XDS9-(-)	SOLDER	BUS WIRE		
J507A20		P19-u		K104-2	SOLDER			
J503E20		TB502 -13-B	MPCM20M-H2	J/P9-D	CRIMP	NOTE 2		
J507AA20		TB502-13E	MPCM20M-H2	K104-2	SOLDER	NOTE 2		
J508A20N		K104-7	SOLDER	E2	MS25036-103	NOTE 2		
J503D20		TB502-13A	MPC20M-H2	XDS9-51-NC	SOLDER	NOTE 2		
J503020		J9-D	CRIMP	S11-1	32445	MIL-W-7139		
J501A20		CB106-2	MS25036-149	CB124-1	MS25036-149	NOTE 2		
J501B20		XDS9-B1	SOLDER	XDS9 -S2-C	SOLDER	NOTE 2		
J502D20		SII-2	MS25036-149	XDS9-B1	SOLDER	NOTE 2		
J502A20		CB124-2	MS25036-105	K104-4	SOLDER	NOTE 2		
J503B20		CR1-1	MS25036-107	SP18-A	32445	MIL-W-7139		
K502CA20		CR2-1	MS25036-107	K301-X2	MS25036-102	MIL-W-7139		
K502CB20		CR1-2	NOTE 3	SP17-A	32445	MIL-W-7139		
K502D20		J303-M	CRIMP	SP17-B	32445	MIL-W-7139		
J505A20N		XDS9(-)	SOLDER	E2	MS25036-103	NOTE 2		
J504A20		XDS9(+)		XDS9-S1-C	SOLDER	NOTE 2		
J506A20		XDS9-S2-NO	SOLDER	XDS9-S1	SOLDER	NOTE 2		
WIRE NO.	LENGTH	FROM	TERMINATION	TO	TERMINATION	REMARKS		
WIRE TABLE								

37-165-2

Figure 12-6. Wiring diagram for EPO-actuated automatic reignition system (sheet 2 of 2)

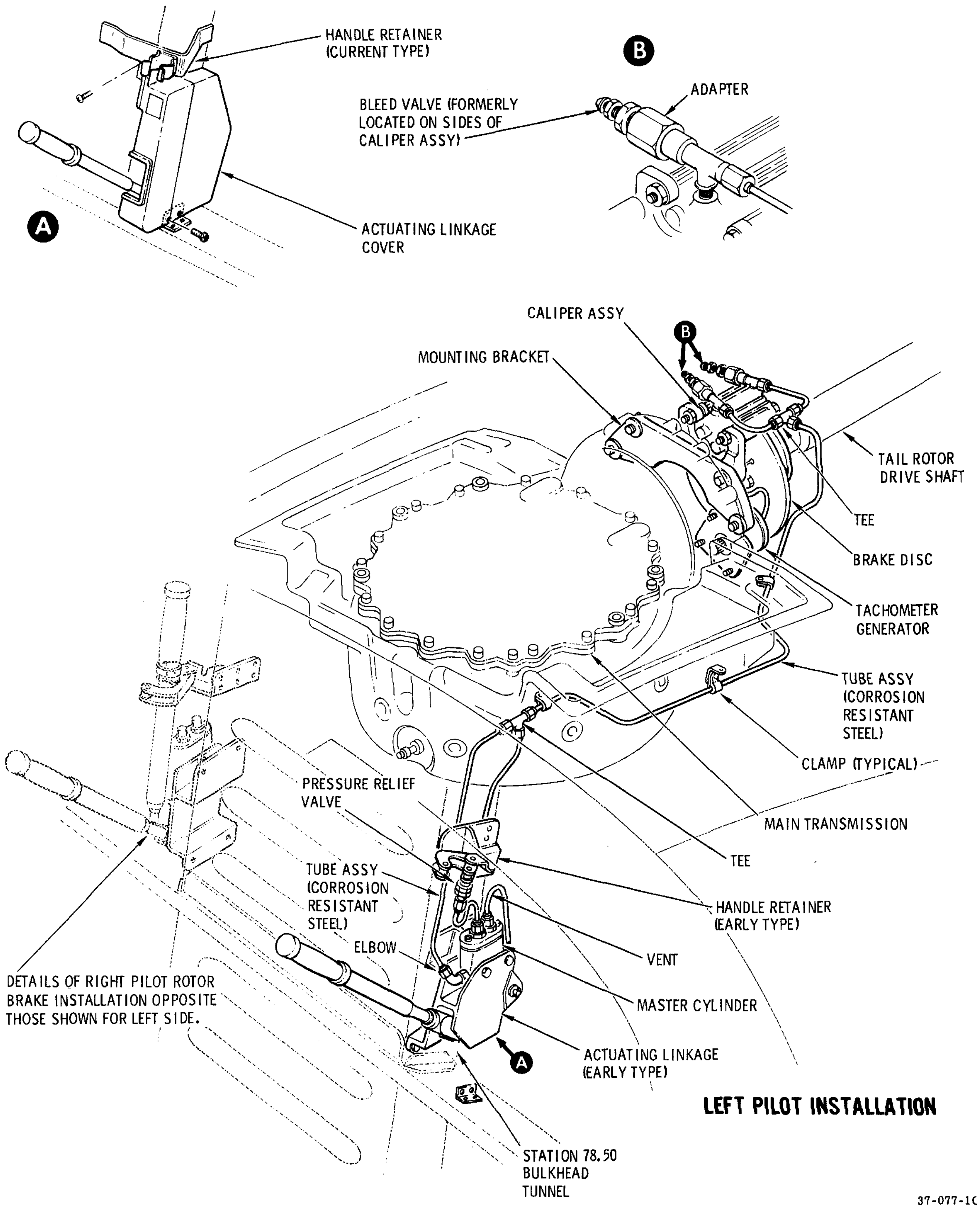


Figure 12-7. Rotor brake installation (sheet 1 of 3)

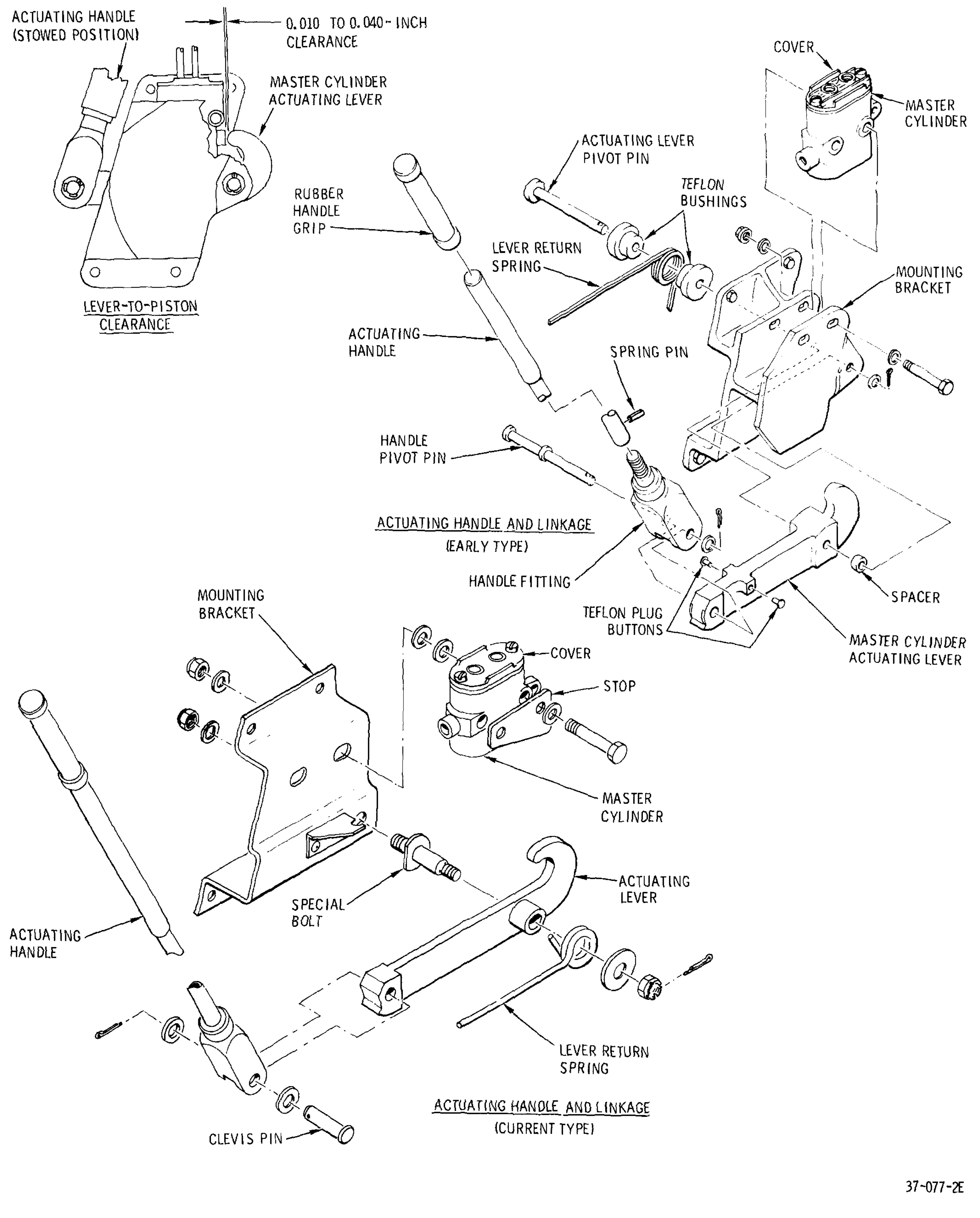


Figure 12-7. Rotor brake installation (sheet 2 of 3)

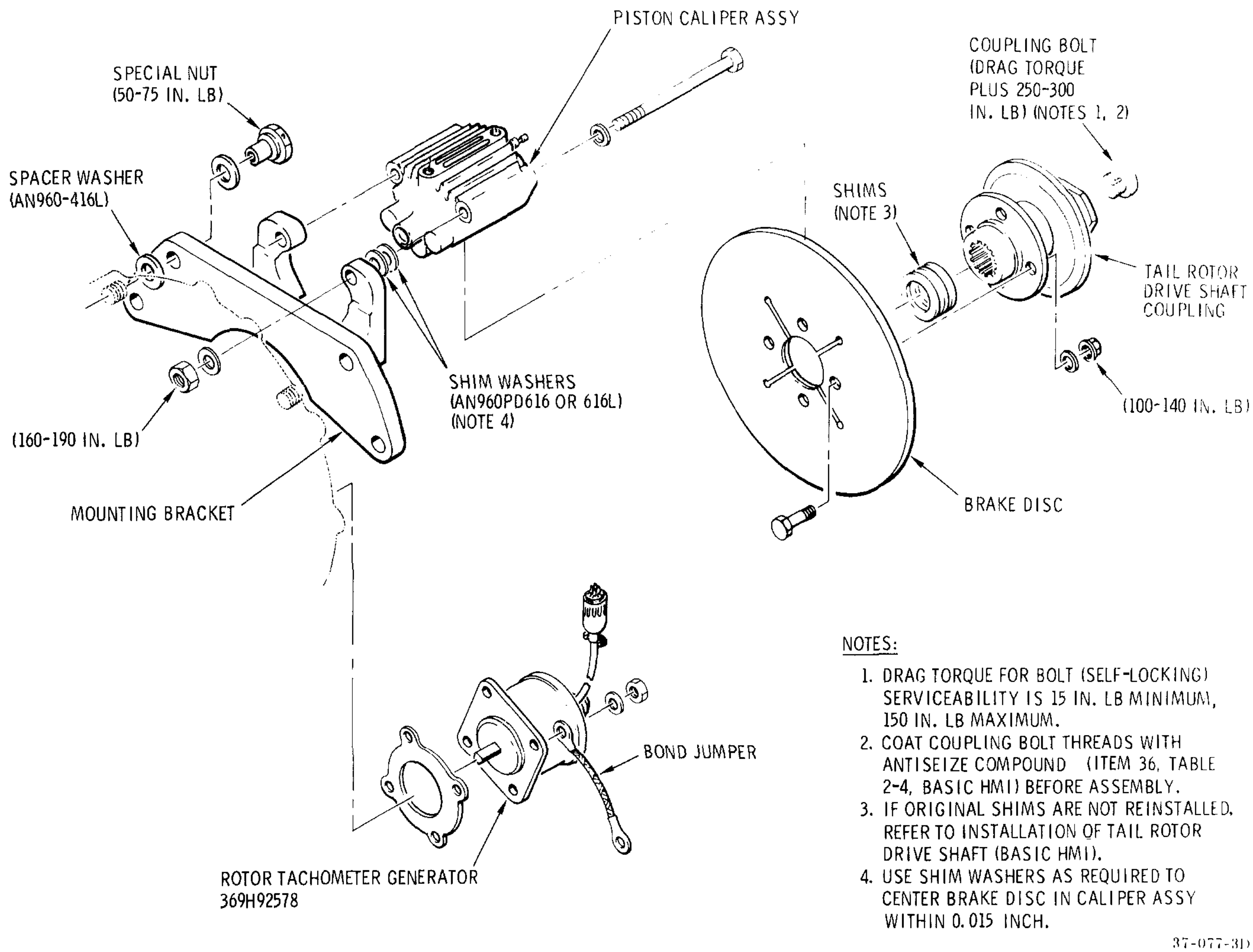


Figure 12-7. Rotor brake installation (sheet 3 of 3)

b. When rotor rpm decreases to 70 percent (330 rpm), unlatch rotor brake handle, pull and hold it down. During application of rotor brake, collective pitch stick should be full down and cyclic stick should be at neutral.

c. Just before blades stop rotating, release handle and manually decrease braking pressure as necessary to slowly and smoothly stop the rotor blades.

d. Return and latch rotor brake handle at the up position.

12-14. INSPECTION OF ROTOR BRAKE INSTALLATION.

a. Remove linkage cover and check rotor brake actuation mechanism for freedom of action and excessive play at pivot points.

b. Inspect rotor brake installation for hydraulic oil leaks.

c. Check rotor brake disc for excessive galling and brake pucks for conditions.

d. Rotate drive system and check that caliper brake pucks are not dragging on the disc.

e. Perform an operational check (para 12-13).

12-15. MASTER CYLINDER LINKAGE AND ACTUATING HANDLE.

12-16. GENERAL. The rotor brake master cylinder and actuating handle (fig. 12-7) is mounted on a bracket attached to the side of the station 78.50 bulkhead tunnel. The bracket supports the brake actuating lever pivot and return mechanism. Pulling down on the brake handle pivots a J-shaped actuating lever that depresses the master cylinder hydraulic plunger. The handle mechanism is spring-loaded to the release position.

NOTE: Stop as shown in figure 12-7 (sheet 2) must be installed on the master cylinder and actuating lever to prevent overtravel of the cylinder plunger. Refer to Hughes Notice HN-174.

12-17. DISASSEMBLY OF MASTER CYLINDER LINKAGE AND ACTUATING HANDLE.

Disassembly of the two different types of actuating handle and linkage is shown in exploded views on figure 12-7.

12-18. REASSEMBLY OF MASTER CYLINDER LINKAGE AND ACTUATING HANDLE.
Reassembly of the two different types of actuating handle and linkage is shown in exploded views on figure 12-7. Also note the following.

a. Be sure that the lever return spring is positioned under the handle pivot pin or clevis pin and operates properly for brake off action.

b. Check actuating lever-to-master cylinder piston clearance according to paragraph 12-19 before final tightening of master cylinder mounting bolts.

12-19. REPLACEMENT OF MASTER CYLINDER. (See fig. 12-7.)

NOTE: The hydraulic pressure line fitting at the master cylinder is the lowest point in the brake system. Take suitable action to prevent excessive hydraulic oil spillage before removing the master cylinder.

a. Disconnect the pressure line and relief valve return line at the brake master cylinder.

b. Remove two nuts, washers and bolts from the master cylinder mounting bracket and remove the master cylinder.

c. Remove master cylinder vent line and fittings and install on replacement master cylinder.

d. Position replacement master cylinder as shown in figure 12-7, install two bolts, washers and nuts. With actuating handle in stowed position, move master cylinder in slotted mounting holes to provide a positive clearance of 0.010- to 0.040-inch gap between actuating lever and master cylinder piston; tighten attaching hardware.

e. Connect the pressure line and the relief valve return line.

f. Service and bleed the brake system (para 12-24).

12-20. REMOVAL OF DISC BRAKE COMPONENTS. (See fig. 12-7.)

a. Disconnect hydraulic tubing at caliper assembly.

b. Remove two bolts, nuts and washers attaching the caliper assembly to mounting bracket. Note number of shim washers between the caliper assembly and mounting bracket. Shim washers are used to position the caliper pucks so there is approximately equal space on each side of the brake disc at installation.

c. Remove the tail rotor driveshaft (Basic HMI).

d. Remove tail rotor driveshaft coupling bolt, coupling/disc and shims. Retain shims for reinstallation.

e. Remove four bolts, nuts and washers attaching the brake disc to the transmission tail rotor driveshaft coupling.

f. Remove safety wire and four special nuts and washers attaching mounting bracket to main transmission housing. Note spacer washers and remove transmission mounting bracket.

g. Remove four spacer washers remaining on transmission mounting studs.

h. If transmission is to be removed, install standard washers and nuts on studs. Torque to 50-70 inch-pounds.

12-21. INSTALLATION OF DISC BRAKE COMPONENTS. (See fig. 12-7.)

a. Position brake disc on transmission tail rotor driveshaft coupling with raised flange side against the splined side of the coupling flange. Install four bolts (heads forward), washers and nuts. Alternately torque to 100 to 140 inch-pounds.

b. With tail rotor driveshaft removed, install shims and driveshaft coupling/brake disc. If original shims are not reinstalled, shim according to tail rotor driveshaft installation procedures described in the Basic HMI.

c. If installed, remove hardware securing the main transmission tail rotor housing cover at the 1, 2, 10 and 11 o'clock locations.

d. Install a washer (AN960-416L) on transmission studs (four places).

e. Position caliper mounting bracket on transmission studs and install four special nuts and washers. Torque the nuts to 50 to 75 inch-pounds and lockwire in pairs.

f. Position the caliper assembly as shown in figure 12-7 and install two bolts, washers and nuts. Tighten nuts fingertight.

g. Insert equal thicknesses of shim stock between both sides of the brake disc and the caliper. Back off nuts on caliper assembly mounting bolts to allow insertion of shim stock.

h. Use a feeler gage and measure dimension between caliper assembly and mounting bracket and select spacer washers of equal thickness for each mounting bolt.

i. Remove caliper assembly from mounting bracket and reinstall with selected spacer washer thickness between mounting bracket and caliper assembly. Torque nuts to 160 to 190 inch-pounds.

j. Use a feeler gage to measure the clearance from each side of the brake disc to the inner parallel face of the caliper. The clearance must be equal (disc centered) within 0.015 inch. Adjust spacer washer thickness (step i above) as required.

NOTE: Measure from face of the brake disc to the inner parallel face of the caliper. Do not use face of the brake pucks as a measurement reference.

k. Connect hydraulic tubing and bleed brake system (para 12-22). Apply brake to make pucks touch disc, release brake and check to be sure that pucks retract and are clear of disc.

12-22. ROTOR BRAKE HYDRAULIC SYSTEM. (See fig. 2-7.)

12-23. GENERAL. The rotor brake hydraulic system consists of a master cylinder/reservoir, stainless steel tubing, a caliper type brake assembly and a pressure relief valve. When pressure is applied through the brake lever to the master cylinder piston, hydraulic pressure is transmitted through the stainless steel tubing to the caliper brake assembly where it actuates dual pistons with bonded brake liners (pucks). The pucks then apply clamping pressure to the tail rotor driveshaft brake disc. If system pressure exceeds 500 psi, the pressure relief valve opens returning oil to the vented master cylinder. The relief valve will maintain system pressure within safe limits regardless of the amount of force applied at the brake handle. When hydraulic pressure is removed, return springs retract the brake assembly pucks.

12-24. BLEEDING THE ROTOR BRAKE HYDRAULIC SYSTEM.

a. Disconnect relief valve return line at the master cylinder reservoir cover (fig. 12-7).

b. Slip one end of a hose over the relief valve return line and place the other end of the hose in a container to catch any fluid flow from the relief valve.

c. Remove master cylinder reservoir cover by removing two attaching screws. Fill reservoir with fluid (item 6, table 2-3, Basic HMI) to within 1/8 to 1/4 inch from the top.

d. Slip one end of a hose over the end of one of the bleed valves at the top of the caliper assembly. Submerge the other end of the hose in a container partially filled with fluid (item 6, table 2-3, Basic HMI).

e. Pull rotor brake handle downward, open bleed valve, and watch for air bubbles in container of fluid. Close bleed valve while brake handle is in the down position, release the handle, and repeat the process until air bubbles are no longer visible in the container.

NOTE: Maintain master cylinder reservoir fluid level at 1/8 to 1/4 inch from the top.

f. Close bleed valve, remove hose, and then connect hose to the opposite bleed valve.

g. Repeat the bleeding process of step e bove.

h. Check that bleed valve are closed, remove all hoses, check fluid level in reservoir, install reservoir cover, and connect relief valve line to cover fitting.

i. Perform operation check of rotor brake system (para 12-13).

12-25. ALLISON 250-C20 SERIES ENGINE.

12-26. GENERAL INFORMATION. A helicopter originally equipped with an Allison Model 250-C18 engine may be reequipped with an Allison Model 250-C20 Series turboshaft engine. C-20 engine installation kit M50031 is required to accomplish the installation. The engine is basically identical to the 250-C18 Series in external appearance. Variations in fuel control system components are the main visual differences. Internal differences in the engines allow the 250-C20 Series to operate at higher turbine outlet temperatures (TOT) and consequently higher output power, particularly at high altitudes. A start (cycle) counter is included on the 250-C20. Electrical connections for the counter are modified for this installation to prevent counter operation when engine automatic reignition is energized. For more detail information and theory of operation on the engine, refer to the engine operation and maintenance manual. For information on changes required when the C-20 engine installation kit is incorporated, refer to paragraph 12-27 and 12-29 for engine installation and cooling system and to paragraph 12-32 for the engine control system. For maintenance information on both the 250-C18 and 250-C20 engine installations, and associated engine fuel, oil, exhaust, cooling, control, ignition, and air induction systems, refer to the appropriate sections in the Basic HMI.

12-27. MODIFICATIONS REQUIRED FOR 250-C20 SERIES ENGINE INSTALLATION. Modifications required by Kit M50031 for installation and use of the 250-C20 engine are as follows.

a. Airframe Modifications. Provided in paragraph 12-28.

b. Changes in Engine Buildup Instructions. Provided in paragraph 12-30.

c. Changes in Engine Installation Instructions. Provided in paragraph 12-31.

d. Installation of Cambered Metal Bladed Tail Rotor and Linkage Bungee. Refer to Group 5 of this Appendix.

e. Installation of N_1/N_R Engine Out Warning System (Kit M50033). Refer to Group 2 of this Appendix.

f. Modification of Engine Reignition System (if installed). Provided in paragraph 12-6.

g. Changes to Engine Instrument Markings. Provided in paragraph 12-33.

h. Main Transmission Requirements. The required transmission is 369A5100-705, -707 or -709 equipped with temperature switch 369A5186-11 and a transmission cover 369H8063-505 with cooling baffles. This switch is not required if transmission is identified with a 1/2-inch white dot located next to the identification plate. Refer to Section 9 of the Basic HMI for installation instructions.

NOTE: After completion of the 250-C20 Series engine installation, the helicopter model designation may be changed to Hughes 500C by application of 369H6615-145 decals.

12-28. AIRFRAME MODIFICATIONS FOR 250-C20 SERIES ENGINE.

a. Remove engine air inlet bellmouth seal from firewall and install larger diameter seal 369H8012.

b. Remove Lexan oil cooler blower scroll and cover. Install fiberglass scroll and cover 369H5650 and 369H5651. Refer to Section 13 of Basic HMI for installation instructions.

c. Remove 1/16-inch nylon torque gage line from fitting at the top of the pilot's canted bulkhead (station 78.50) to the instrument. Install 1/8-inch nylon line 369A8010-669. Service and bleed the torque gage system according to procedure in Section 17 of Basic HMI after completion of engine installation.

d. Install oil cooler shields 369H8303-11 and -12 (Kit M50024). Refer to Section 13 of Basic HMI for procedure.

e. Install CECO gas producer fuel control drain line 369A8010-667 on firewall. This line will parallel existing fuel pump seal drain line and clamp to it. Replace existing grommet in lower engine compartment skin with larger grommet AN931-6S10. Direct both lines through the grommet and overboard. (See fig. 12-8.)

f. Install CECO power turbine governor control drain line 369A8010-675 on firewall. This line will be routed forward through a support clamp located left of center on a lower firewall longeron and downward and overboard through a newly installed grommet in the fuselage skin. (See fig. 12-8.)

g. If the helicopter is equipped with a cabin heating system, remove the hot air tube from the connection on the aft side of the firewall fitting. Install a Stratoflex PN 124001-12CR-0140 hose assembly in its place.

h. Redirect the engine cooling air by positioning the duct outlet at the angle shown in figure 12-6.

i. Modify the airframe portion of the engine start counter circuit as follows. Install a new wire K502J18 (fig. 12-9) from engine disconnect J303, pin B, to start relay terminal stud X2. Crimp on terminal MS25036-102 and make connection at J303 according to instructions in Section 19 of Basic HMI.

j. Modify the airframe portion of the TOT indicating system as follows.

(1) Install thermocouple terminal block, Allison PN 6855369, on the lower surface of upper rib of the engine compartment right door frame (fig. 12-8). Location is approximately 2.5 inches aft of forward corner.

(2) Route airframe thermocouple wires along vertical member of engine door frame (station 137.5) and install a clamp approximately 4.0 inches below the forward corner.

(3) Connect thermocouple wires to terminal block studs, using the chromel and alumel nuts provided.

(4) Locate an existing 1/4-inch tooling hole in the lower surface of the upper rib, approximately 10 inches aft of forward corner, and install a rivnut, PN S10-075, for later installation of an engine thermocouple harness clamp.

12-29. MODEL 250-C20 SERIES ENGINE BUILDUP. Build up the engine according to procedure in Section 10 of the Basic HMI for the 250-C18 Series engine except as follows.

a. If the helicopter is equipped with a cabin air heating system, install bleed air tee fitting 369H8013-3.

b. Install O-ring and reducer for torque gage line connection but DO NOT install pressure snubber.

c. Install large diameter engine air inlet bellmouth 369H8011.

d. Modify the engine electrical harness and engine start counter circuit as follows (see figure 12-9):

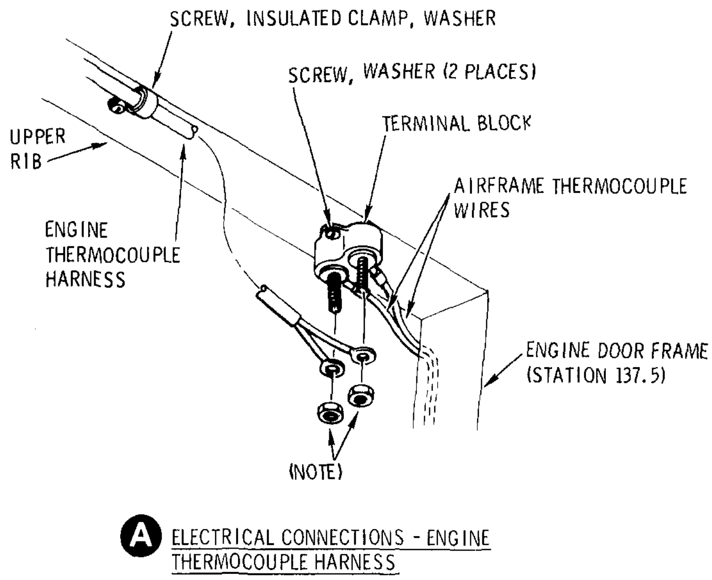
(1) Disconnect start counter wire connection at ignition exciter.

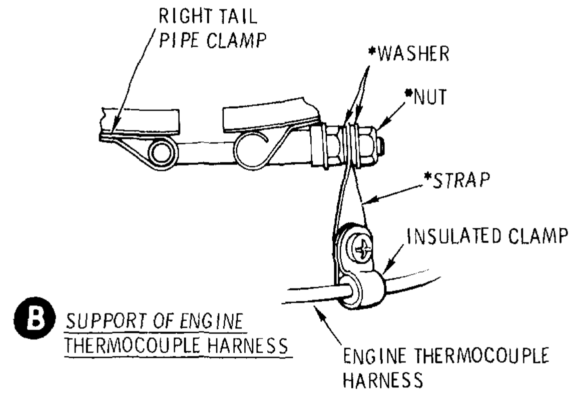
(2) Cut terminal off wire and splice wire end to new wire K502H18. Route new wire along engine harness to engine disconnect plug P303, using MS17821-1-9 tie straps.

(3) Connect wire K502H18 to pin B of plug P303. For information concerning wire splicing or plug connection, refer to Section 19 of Basic HMI.

12-30. MODEL 250-C20 SERIES ENGINE INSTALLATION. Install the engine according to procedure in Section 10 of the Basic HMI for the 250-C20 Series engine.

12-31. MODEL 250-C20 SERIES ENGINE CONVERSION KIT INSTALLATION. This installation requires PN M50031 Model 250-C20 Engine Conversion Kit and PN 369H6615-145 decal (2). If not installed previously, these kits are required: PN 50033 Low rpm Warning N_1/N_R and PN 369H90005-5 Metal Tail Rotor and Bungee; also, these parts: 369H5650 Oil Cooler Blower Scroll, 369H5651 Oil Cover Blower Cover, 369H8303-11 Oil Cooler Blower Shield, 369H8303-21 Oil Cooler Blower Shield; and 369A5100-705 or -707 Main Transmission, 369A5186-11 Main Transmission Sender, and 369H8063-505 Main Transmission Cover Assembly. Required where autoreignition is present and capability is wanted: PN 379H90118-61 and -71 Engine Auto-Reignition Modification Kit; also PN MS35206-203 Screw (2), MS21042L02 Nut (2) and AN960PD3L Washer (2). Use of PN 369H90118-71 Modification Kit on Model 369HS helicopter Serial No. 0325S and 0411S and subsequent requires PN 369A 2505-111 Bracket, PN MS35206-213 Screw (4), and





NOTES:

1. USE ONLY THE CHROMEL AND ALUMEL NUTS SUPPLIED WITH THE TERMINAL BLOCK.
2. ASTERISK (*) INDICATES CORROSION RESISTANT STEEL.
3. AFTER POSITIONING DUCT END AT ANGLE SHOWN, TIGHTEN SCREW ON CLAMP.

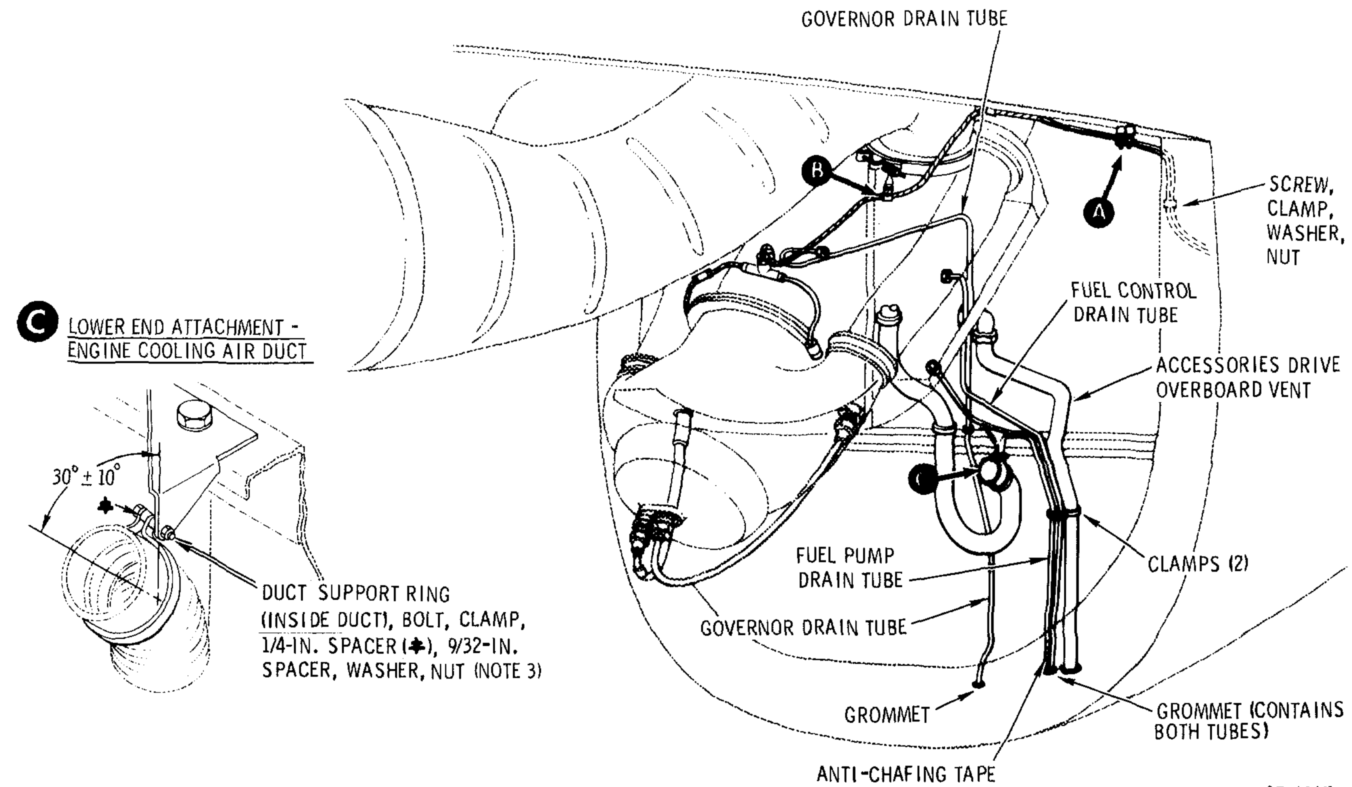


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Figure 12-8. Model 250-C20 Series engine installation differences

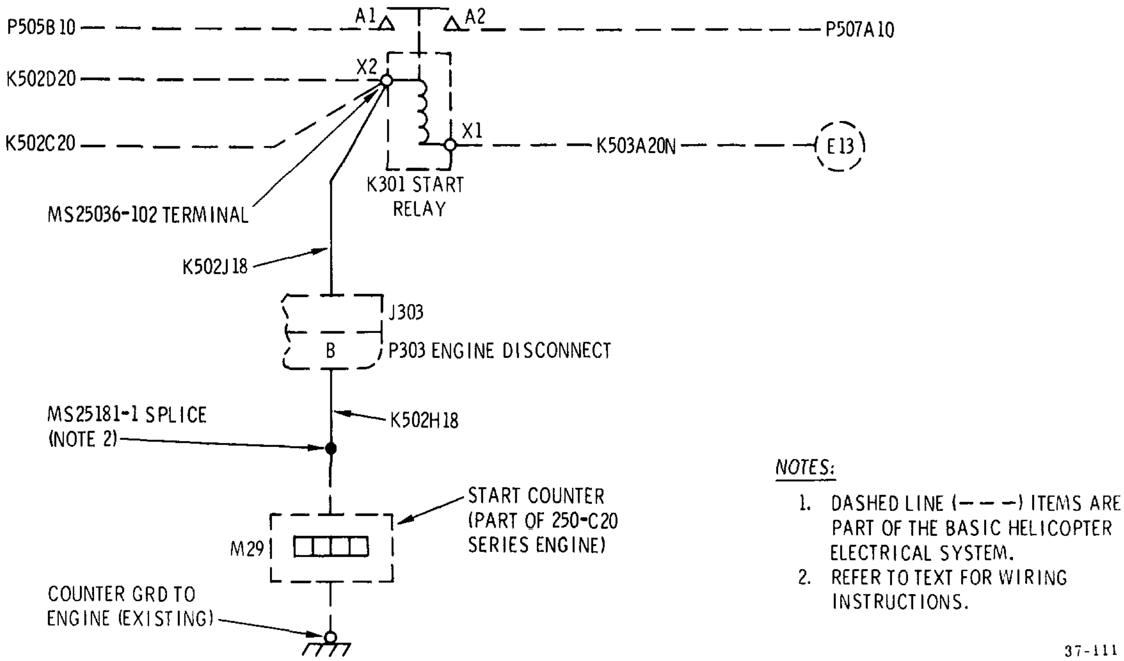


Figure 12-9. Model 250-C20 Series engine start counter circuit modification

PN AN960CL4 Washer (4). Required where auto-reignition is not present but capability is wanted: PN 369H90118-507 Engine Auto-Reignition Modification Kit.

NOTE: Allison exciter for PN 369H90118-507 Engine Auto-Reignition Modification Kit is not included; procure from Allison distributor. *(Refer to paragraph 12-6.)*

Helicopter Model 369HS and 369HE, Serial No. 0101 to 0200 require V_{ne} Card PN 369H6594-505.

a. Disconnect, remove and strip existing 250-C18 Series engine. (Refer to Section 10 of Basic HMI.)

b. Perform airframe modifications for 250-C20 Series engine (refer to paragraph 12-27.

c. Install 369A5100-705 or 369A5100-707 main transmission assembly, 369H8063-505 transmission cover, and 369A5186-11 temperature sender. (Refer to Section 9 of Basic HMI for transmission installation instructions.)

d. Remove existing fiberglass-bladed tail rotor assembly; inspect split rings; install new metal tail rotor assembly. (Refer to Section 8 of Basic HMI.)

NOTE: The 369H90005-5 metal tail rotor kit does not include the tail rotor pitch control subassembly. Use existing tail rotor pitch control subassembly.

e. Install metal tail rotor bungee as follows (see figure 12-10):

(1) Remove access cover between pilot's seat and left passenger's footwell on aft side of canted bulkhead.

(2) Remove the control rod from helicopter to accomplish rework if the riveted bearing is installed at aft end of floor-routed control rod.

(3) Remove the nonriveted bearing installed at one end of control rod; discard bearing. Do not remove riveted bearing.

(4) Place locknut and 369A7522 fitting on new 369A7951-51 bearing and install on end of rod assembly. Adjust rod assembly to 30.06-inch length as shown.

(5) Drill 0.190 to 0.194-inch-diameter hole through 369A2541 bracket and touch up with zinc chromate primer.

(6) Install AN42B-C3A eyebolt on 369A2541 bracket.

(7) Install AN42B-C3A eyebolt on 369A7522 fitting at new bearing.

(8) Install floor-routed control rod, with new bearing and fitting at aft end.

(9) Install 369A7521 bungee spring as shown in figure 12-10.

(10) Reinstall footwell.

f. Install M50033 low rotor speed warning system:

(1) Remove fairing from right side of instrument panel.

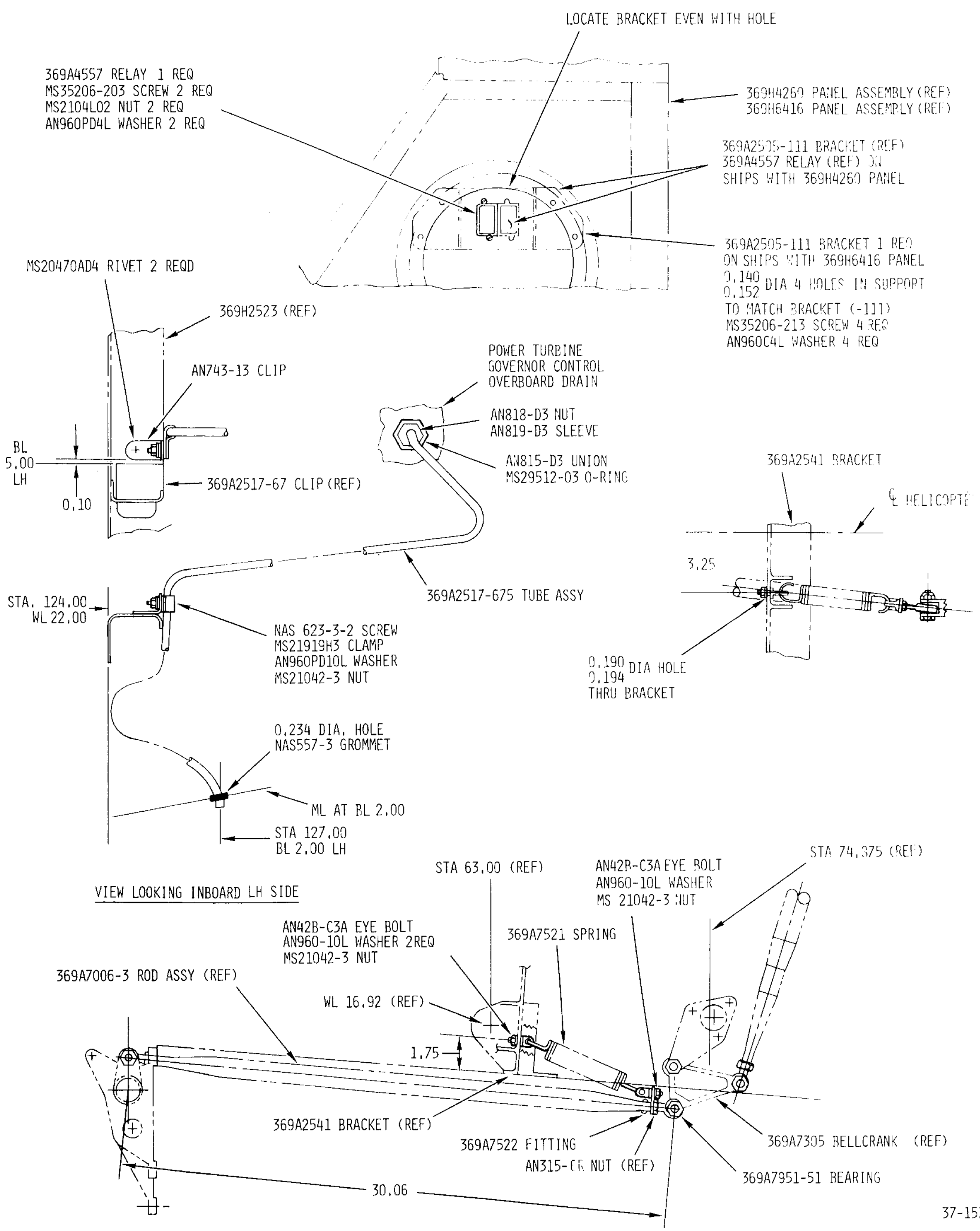


Figure 12-10. Structural modifications for Model 250-C20 engine conversion kit installation

(2) Disconnect and remove existing EPO control unit and amplifier; remove wire harness.

(3) Install new 369A4514-3 control unit, using existing hardware; connect 369H4520 wire harness as shown and secure with tie-strap.

(4) Remove controls access door (refer to Section 2 of Basic HMI).

(5) Install N_R disable switch S199 and actuating arm to inboard collective stick socket housing and gas producer bellcrank. (Refer to paragraph 2-43.)

(a) Remove nuts and washers securing two upper bolts to inboard collective stick socket housing cap; insert slotted attaching bracket under bolt heads and washers. Install -3 clip under existing nut and washer, two places; tighten bolts.

(b) Install N_R switch with JM-5 roller leaf to attaching bracket and attach plate, using MS35275-208 screw, MS35338-39 lock washer and NAS620-2 washer, two places. Do not tighten screw until final adjustment of switch.

NOTE: Actuating cam is used in place of slotted actuating arm for later N_R disable switch installations.

(c) Remove bolt, washers, nut, and cotter pin securing link assembly to bellcrank next to housing cap. Reinstall bolt without washer under bolt head; insert slotted actuating arm under bolt head. Install washer and nut; tighten bolt and secure nut with cotter pin.

(6) Install and connect wiring for N_1/N_R low rotor speed warning system as shown in wiring diagram (fig. 2-10).

NOTE: Do not tie wires from S199 switch to wires going to P19 connector or to removable collective stick. Allow sufficient slack in wires to permit movement of controls. Cover knife splices with fiberglass sleeving and tie sleeving in place. Cut existing wire two inches from S199 switch position NC and heat shrink TC4003 end cap in place. Secure switch wiring to -3 clips with tie straps; bend clips to suit.

(7) Install TC-814 tie base to inner side of inboard partition of right-hand seat assembly, and back to back with existing tie base. Use MS20600AD4W3 rivet and AN960PD6L washer.

(8) Adjust N_R disable switch (paragraph 2-45).

(9) Reinstall fairing on right side of instrument console, center seat cover, and controls access door.

g. Modify instrument markings for 250-C20 Series engine. (Refer to paragraph 12-31.)

h. If engine restart capability is desired, perform one of the following:

(1) For original installation, install engine automatic reignition system per 369H90118-507 kit instructions.

(2) If engine restart system is already installed, modify the system using 369H90118-61 and -71 modification kits as follows:

(a) Remove torquemeter oil pressure switch, associated wiring, and attaching hardware.

(b) Install AN814-3C plug and NAS617-3 packing in tee; safety-wire plug.

(c) Remove fairing from left side of instrument panel. As required, drill four 0.140 to 0.152-inch-diameter holes and install 369A 2505-111 bracket on left side of instrument panel as shown. (See figure 12-8.)

(d) Install 369A4557 relay (K104) on bracket as shown.

(e) Install wiring as shown in Wire Table (fig. 12-9) and in wiring diagram (fig. 12-2) for 250-C20 Series engine automatic reignition system.

(f) Reinstall instrument panel fairing.

i. Build up and install 250-C20 Series engine; rig the 250-C20 Series engine power controls system. (Refer to paragraph 12-30.)

NOTE: During engine buildup remove and discard MS9015-03 plug from burner aft drain location. Relocate 6854255 burner drain valve from forward drain to aft burner drain location. Install 6954519 plug at burner forward drain location, replacing all associated hardware.

j. Install new terminal block and connect thermocouple wiring (see figure 12-11):

(1) Install 6855369 terminal block on underside of rib of upper aft structural section over right-hand engine door, using rivnuts.

(2) Connect existing wiring from TOT gage to terminal block; connect engine-furnished thermocouple wiring to terminal block.

(3) Secure wiring to rib and to frame assembly, two places, with clamps (install clamp to rib assembly, using rivnut).

(4) Install -3 strap to right-hand tailpipe clamp, with clamp hardware positioned at top of tailpipe.

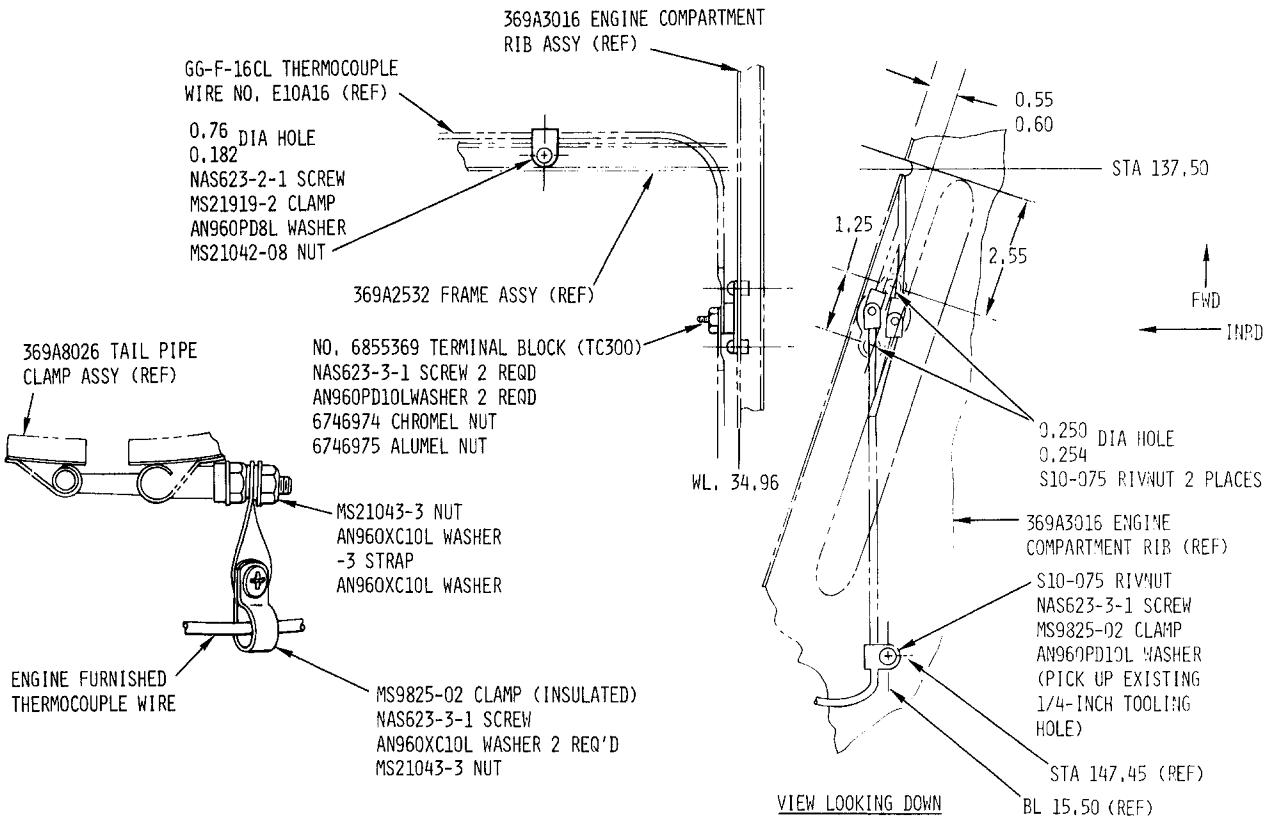
(5) Secure engine furnished thermocouple wiring with clamp attached to -3 strap on tailpipe.

(6) Adjust variable resistor at TOT gage, as required. (Refer to Section 17 of Basic HMI.)

k. Install new overboard drain line at CECO power turbine governor control (see figure 12-10).

(1) Install AN743-13 clip to 369H2523 longeron at station 124.00 lower section; use MS20470AD4 rivets.

(2) Drill 0.234-inch-diameter hole in fuselage skin at station 127.00; install NAS557-3 grommet.



WIRE TABLE						
WIRE NO.		FROM	TERMINATION		TERMINATION	REMARKS
JUMPER		K104-4	SOLDER	K104-5	SOLDER	BUS WIRE
		K104-3		K104-6		
		XDS9-C1		XDS9-D1		
		-D2		-C2		
		-C2		-B2		
		-B2		-A2		
		-A2		-B1		
JUMPER		XDS9-D2	SOLDER	XDS9-(-)	SOLDER	BUS WIRE
J508A20N		K104-7	SOLDER	E2	MS25036-103	
J507A20		P19-U		K104-2	SOLDER	
J503D20		K104-6		XDS9-S1-NC	SOLDER	
J503C20		XDS9-S1-NC	SOLDER	SP18-B	32445	MIL-W-7139
J501A20		S3-2	MS25036-149	CB124-1	MS25036-149	
J501B20		CB124-1	MS25036-149	XDS9-S2-C	SOLDER	
J502D20		CB124-2	MS25036-149	XDS9-B1	SOLDER	
J502A20		CB124-2	MS25036-149	K104-4	SOLDER	
J503B20		CR1-1	MS25036-102	SP18-A	32445	MIL-W-7139
K502CA20		CR2-1	MS25036-102	K301-X2	MS25036-102	MIL-W-7139
K502CB20		CR1-2		SP17-A	32445	MIL-W-7139
K502D20		J303M	CRIMP	S917-B	32445	MIL-W-7139
J505A20N		XDS9(-)	SOLDER	E2	MS25036-103	
J504A20		XDS9(+)	SOLDER	XDS9-S1-C	SOLDER	
J506A20		XDS9-S2-NO	SOLDER	XDS9-C1	SOLDER	

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Figure 12-11. Electrical modifications for Model 250-C20 engine conversion kit installation

(3) Install 369A8010-675 tube assembly to overboard drain of power turbine governor control as shown.

(4) Route overboard drain line forward to station 124.00 and secure to clip on LH longeron with hardware as shown; route drain line down and through grommet in fuselage skin.

NOTE: When rigging engine power controls, replace 369A1717 droop compensation adjustment fork with 369A1717-3 fork and adjust to nominal 2.30 inch length as shown.

l. As required, adjust balance of metal-bladed tail rotor assembly. (Refer to Section 8 of Basic HMI.)

m. Install 369H6615-145 decals on engine air inlet fairing, left- and right-hand sides.

n. Insert applicable V_{ne} card in cardholder.

NOTE: Use 369H6594-505 V_{ne} card for helicopter Serial No. 0101 through 0200. Use 369H6528-509 V_{ne} card for helicopter Serial No. 0201 and subsequent. For helicopter Serial No. 0201 and subsequent equipped with Litter Kit, use 369H6528-503 V_{ne} card (no change from 250-C18 engine installation required).

12-32. MODEL 250-C20 SERIES ENGINE CONTROL SYSTEM – GENERAL INFORMATION. The gas producer fuel control and power turbine governor normally furnished with the 250-C20 Series engine are manufactured by Chandler-Evans (CECO). However, Bendix fuel controls used with the 250-C18 Series engine may be modified for use with the new 250-C20 Series engine according to Allison Commercial Engine Bulletin 250CEB-126 and 250-C20 Installation Bulletin 1005. (Refer to paragraphs 12-4 and 12-6 if automatic reignition equipment will also be installed.) The engine control linkage is the same as described in Section 11 of the Basic HMI, except that when CECO fuel controls are used a longer droop compensation fork 369A7717-3 is used on the station 63.00 bellcrank. Refer to the engine operation and maintenance manual for fuel system theory of operation and detail information. Refer to Section 11 of the Basic HMI for other fuel control system maintenance information.

12-33. MODIFIED INSTRUMENT MARKINGS FOR 250-C20 SERIES ENGINE. Apply new engine limit markings to the face of the glass of each applicable instrument, using instrument marking tape of proper colors. Also apply a slippage marker at the 6 o'clock position bridging across edge of glass to instrument bezel. After markings are properly positioned, apply a coat of clear varnish over the markings to seal them in place. New markings are as follows.

a. Dual Tachometer. Rotor speed (N_R) red lines are at 400 and 524 rpm. N_2 red dot is at 113% rpm.

b. Torque Indicator. Red line is at 64.5 psi, yellow arc is from 56.3 to 64.5 psi, and green arc is from 0 to 56.3 psi.

c. TOT Indicator. Red line is at 793°C, yellow arc is from 737°C to 793°C, green arc is from 360°C to 737°C and red dot is at 843°.

12-34. ENGINE COMPRESSOR WATER WASH KIT INSTALLATION.

12-35. GENERAL. The engine compressor water wash kit PN 369H2537 provides a quick, convenient method for removing any contaminants or corrosive air particles from compressor components. Use of the kit also helps ensure optimum performance/service life of the engine. A daily water rinse is recommended for helicopters operating in a corrosive environment, and this optional equipment is designed specifically for compressor rinsing with a clean water spray only. No soap or cleaning solvents are used, nor is it necessary to disconnect the compressor discharge pressure sensing tube.

12-36. PROCEDURE FOR INSTALLATION.

a. Perform the following, per HMI, to gain access to work area:

(1) Remove aft compartment seat assemblies, LH bulkhead trim, access cover and insulation; also remove gearbox access cover.

(2) Remove engine air inlet forward fairings, and open plenum chamber access door.

CAUTION: Install temporary cover of cardboard or suitable material over engine air intake.

(3) Remove engine air shield screen or engine air inlet screen, as applicable; remove access cover from mast support structure panel.

(4) Open LH engine compartment access door.

b. Position 369H3047 support on station 137.50 lower section ring at dimensions shown in figure 12-12, view E-E. Mark and drill rivet holes and install support with six NAS1738M4-2 rivets. Install rivets with zinc chromate primer.

c. Drill No. 8 hole in ring assembly as shown; locate from existing hole in support.

d. Install AN807-4D hose adapter in support with hardware as shown; install lanyard clip in No. 8 hole with hardware as shown. Install 369H3046 cap on hose adapter.

e. Drill or cut 29/64 (0.4531 inch diameter) hole in firewall assembly at dimensions shown in view AA. Position and install AN848-4D hose elbow in firewall with hardware as shown.

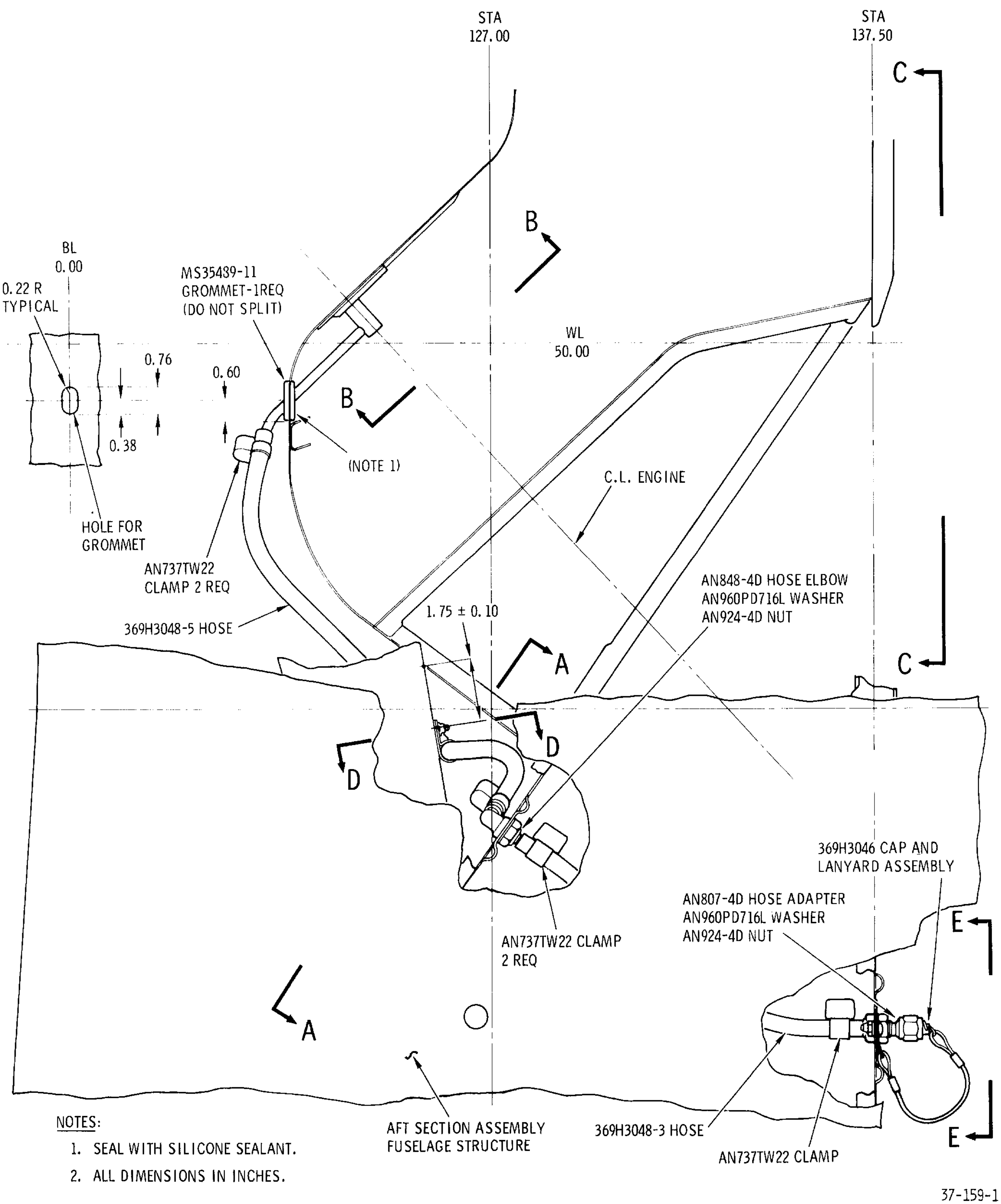
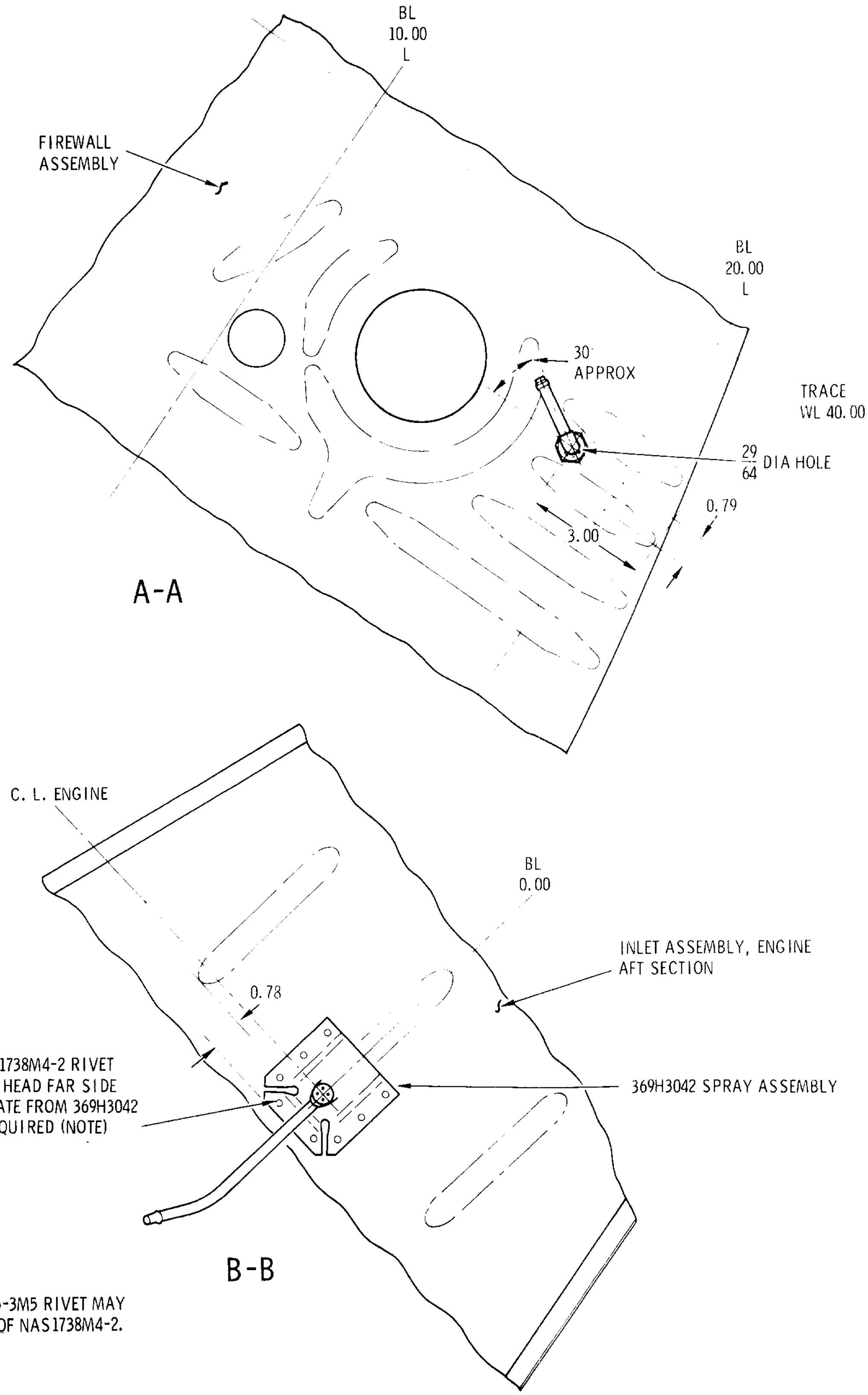


Figure 12-12. Installation of engine compressor water wash kit (sheet 1 of 3)



NOTE:

ALTERNATE MS20615-3M5 RIVET MAY BE USED IN PLACE OF NAS1738M4-2.

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Figure 12-12. Installation of engine compressor water wash kit (sheet 2 of 3)

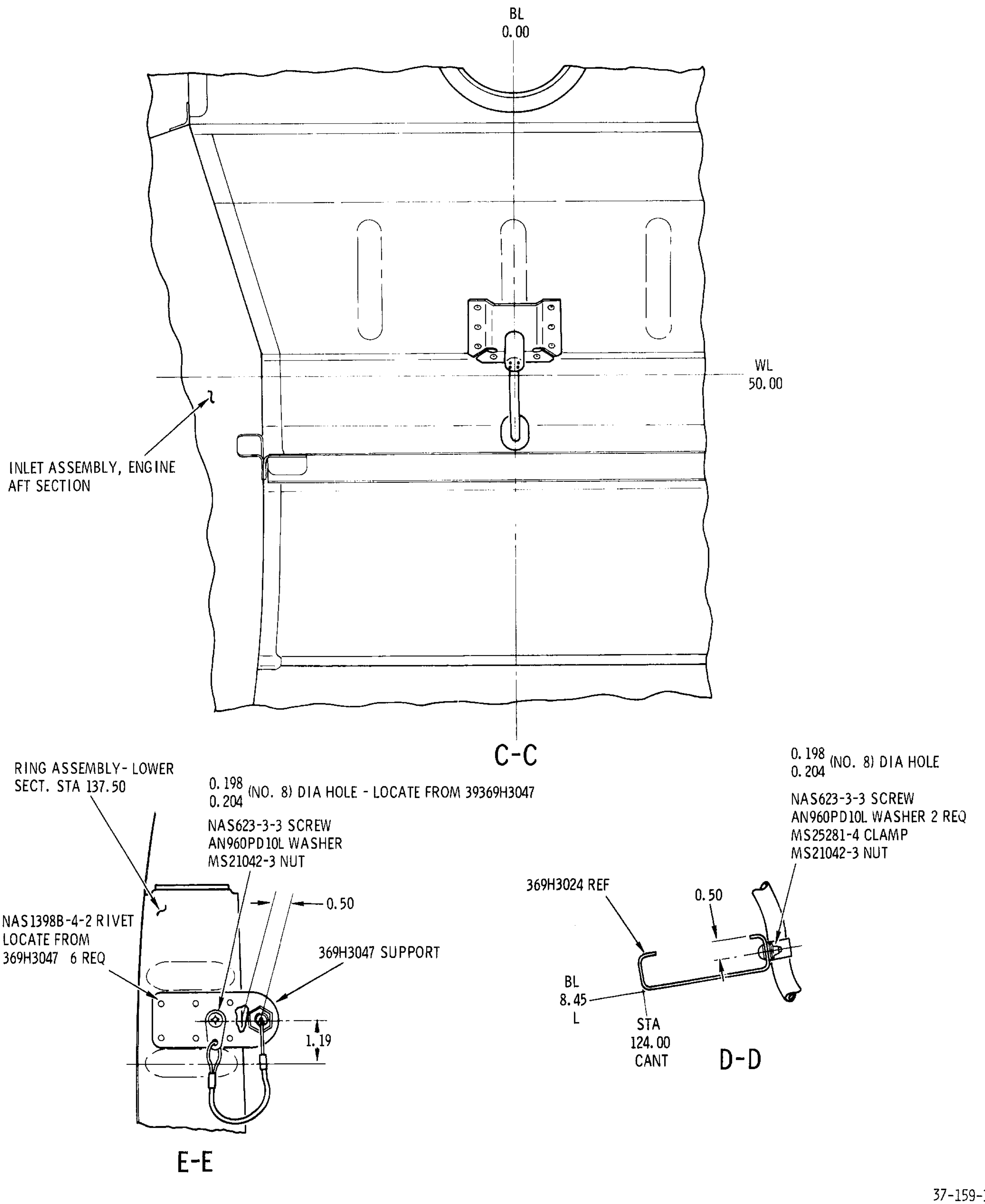


Figure 12-12. Installation of engine compressor water wash kit (sheet 3 of 3)

f. Cut hole for MS35489-11 grommet in forward wall of plenum chamber per dimensions shown; install grommet with silicone sealant.

g. Position 369H3042 spray assembly on inner side of plenum chamber forward wall as shown in figure 12-12, view B-B, with tube inserted forward through grommet. Mark and drill rivet holes and install spray assembly with eight NAS1738M4-2 rivets. Install rivets with zinc chromate primer.

h. Install 369H3048-5 hose on spray assembly tube and on hose elbow at firewall; secure hose at each end with AN737TW22 clamps.

i. Mark and drill No. 8 hole in 369H3024 channel and install MS25281-4 clamp with hardware as shown. Secure -5 hose with clamp.

j. Install 369H3048-3 hose on hose elbow at aft side of firewall, and on hose adapter at forward side of lower section ring. Secure hose at each end with AN737TW22 clamps.

k. Check installation of water wash kit for discrepancies.

l. Carefully check and/or vacuum the plenum chamber for any foreign objects or debris. Remove protective cover from engine air intake.

NOTE: Spray kit using 369H3042 nozzle requires 60 psi to establish water flow rate of one quart in 9 to 10 seconds. A bypass valve or equivalent installed at source hose connection is recommended to relieve pressure and facilitate disconnection at hose adapter. A five-minute ground run is required to purge and evaporate any residual water after rinsing.

m. Perform operational check of water wash kit installation.

n. Reinstall removed components and assemblies; install and secure access covers and doors.

12-37. ENGINE AIR PARTICLE SEPARATOR FILTER.

12-38. GENERAL INFORMATION. A helicopter with a belt-driven oil cooler blower and a hinged plenum chamber access door may be equipped with an engine air particle separator filter installation instead of the standard engine air inlet screen (Section 16, Basic HMI). The installation modifies the helicopter with electrical, mechanical and scavenge air equipment for control of filter operation, discharge of air contaminants, sensing a clogged filter and controlling intake air bypass in event of clogging. The inertial particle separator contains internal particle separator and filtering components. Electrical control, sensing and indicating equipment permits the pilot to control application of engine compressor bleed air for ejection of filtered contaminants and senses a clogged filter to provide a visual indication for such condition. A solenoid air valve and air lines route engine compressor bleed air to a nozzle manifold of the filter for filtered particle ejection through a filter outlet duct. Mechanical door operating equipment opens a hinged plenum chamber access door for intake air bypass of a clogged filter. Opening the door allows inlet air to flow directly into the plenum chamber, bypassing the filter. Initial installation is accomplished in accordance with Installation Instructions for the Engine Air Particle Separator Filter Installation Kit. Maintain the engine air particle separator filter installation according to information in following paragraphs.

CAUTION: When performing any maintenance on components in the plenum chamber area according to following paragraphs, always place and secure a protective cover in the plenum chamber to prevent entry of foreign materials into the engine air inlet. Failure to do so may cause subsequent engine damage.

12-39. TROUBLESHOOTING ENGINE AIR PARTICLE FILTER INSTALLATION. Refer to Table 12-2 for troubleshooting procedures for all particle filter installation equipment.

12-40. PARTICLE SEPARATOR FILTER ASSEMBLY.

12-41. GENERAL. The particle separator filter assembly is located within the engine air inlet aft fairing and contains a particle filter (separator), nozzle manifold and ejector assembly with associated gaskets and assembly hardware. Atmospheric intake air for the engine enters the particle separator filter and passes through a group of parallel screened filter tubes in the particle separator. (See fig. 12-13.) Swirl guides within each of the filter tubes swirl inlet air within the filter tubes. Heavier air concentrates (contaminants) are separated (filtered) from the air due to the swirling action and are forced into the separator portion of the particle separator. Contaminants collected within the separator portion are withdrawn and discharged out through a nozzle manifold, tubes of the ejector assembly, outlet duct, outlet screen and outlet hole in left side of aft fairing. Scavenge air equipment applies engine compressor bleed air from the heating system control valve elbow to the nozzle manifold for ejection of contaminants. The particle separator is shaped to fit inside the front portion of the aft fairing, above the plenum chamber, and is secured to the fairing with three mounting bolts. Each of the filter tubes in the separator contains a filter screen, an air swirl guide and an opening

Table 12-2. Troubleshooting engine air particle filter installation

Symptom	Probable Trouble	Corrective Action
FILTER CLOGGED caution light does not illuminate when depressed	Interior lamp has open filament	Replace lamp.
	Disconnected or loose wiring	Reconnect or secure loose wiring.
FILTER CLOGGED caution light illuminated without air bypass; not illuminated with air bypass (plenum chamber access door open)	Clogged filter	Service filter.
FILTER CLOGGED caution light illuminated with or without air bypass	Shorted wiring	Correct wiring.
	Shorted air pressure switch	Replace air pressure switch.
	Defective light-switch	Replace CLOGGED FILTER light-switch.
FILTER CLOGGED caution light does not illuminate with clogged air filter; illuminates when depressed	Disconnected or defective wiring	Reconnect or correct wiring.
	Defective air pressure switch	Replace air pressure switch.
Plenum chamber access door does not open properly or sufficiently when FILTER BY-PASS CONTROL handle is pulled fully forward	Cable stop is misadjusted	Adjust cable stop.
	Disconnected forward and aft cables	Reconnect forward and aft cables.
FILTER BY-PASS CONTROL handle does not return to full aft position after door is opened	Defective return spring	Replace return spring.
Air not exhausted thru outlet duct with SCAV AIR circuit breaker ON, engine running and door closed	Disconnected wiring	Reconnect wiring.
	Disconnected or broken scavenge air line	Reconnect or replace scavenge air line.
	Defective solenoid air valve	Replace solenoid air valve.

to the separator section. The nozzle manifold contains a fitting for bleed air and seven air jets for air scavenging of contaminants. The ejector assembly consists of a mounting flange with seven tubes and seven hinged, air operated flapper valves. The nozzle manifold is mounted on the aft side of the separator and the ejector is attached to the aft end of the nozzle manifold.

12-42. REMOVAL OF PARTICLE SEPARATOR FILTER ASSEMBLY.

a. Remove engine air inlet fairings (Section 2, Basic HMI).

b. Open plenum chamber access door by pulling FILTER BY-PASS CONTROL handle (fig. 12-14) forward.

CAUTION: Install protective cover in plenum chamber to prevent foreign material or objects from entering engine air inlet.

c. Disconnect forward end of station 100.00 control rod (Section 8, Basic HMI).

d. Remove door operating forward cable as follows:

(1) Inside plenum chamber, disconnect forward and aft cables at quick-disconnect connector and remove return spring and two retainers from aft end of forward cable.

(2) In pilot's compartment, remove FILTER BY-PASS CONTROL handle from forward end of forward cable.

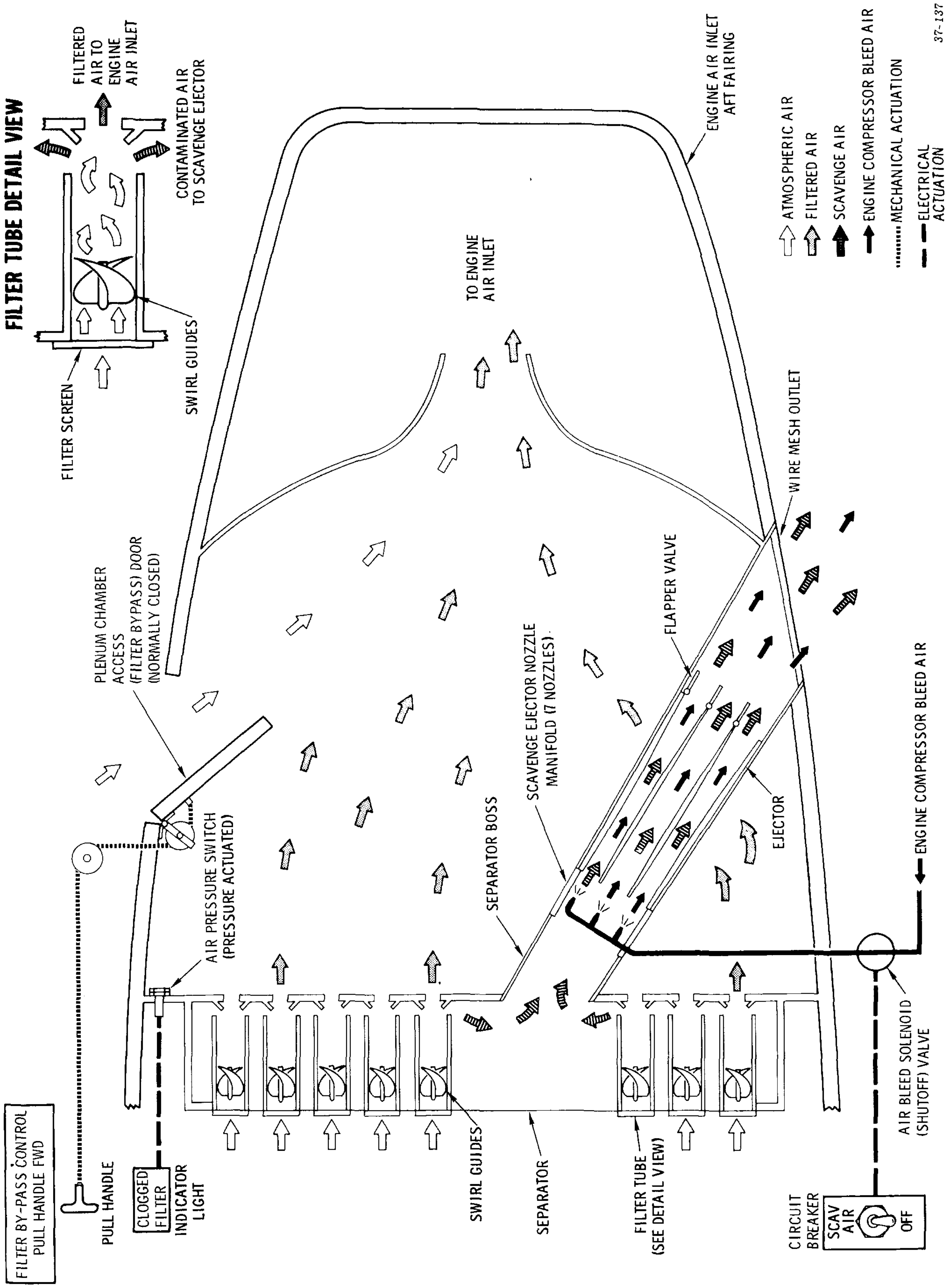


Figure 12-13. Simplified schematic of inertial particle-separator filter

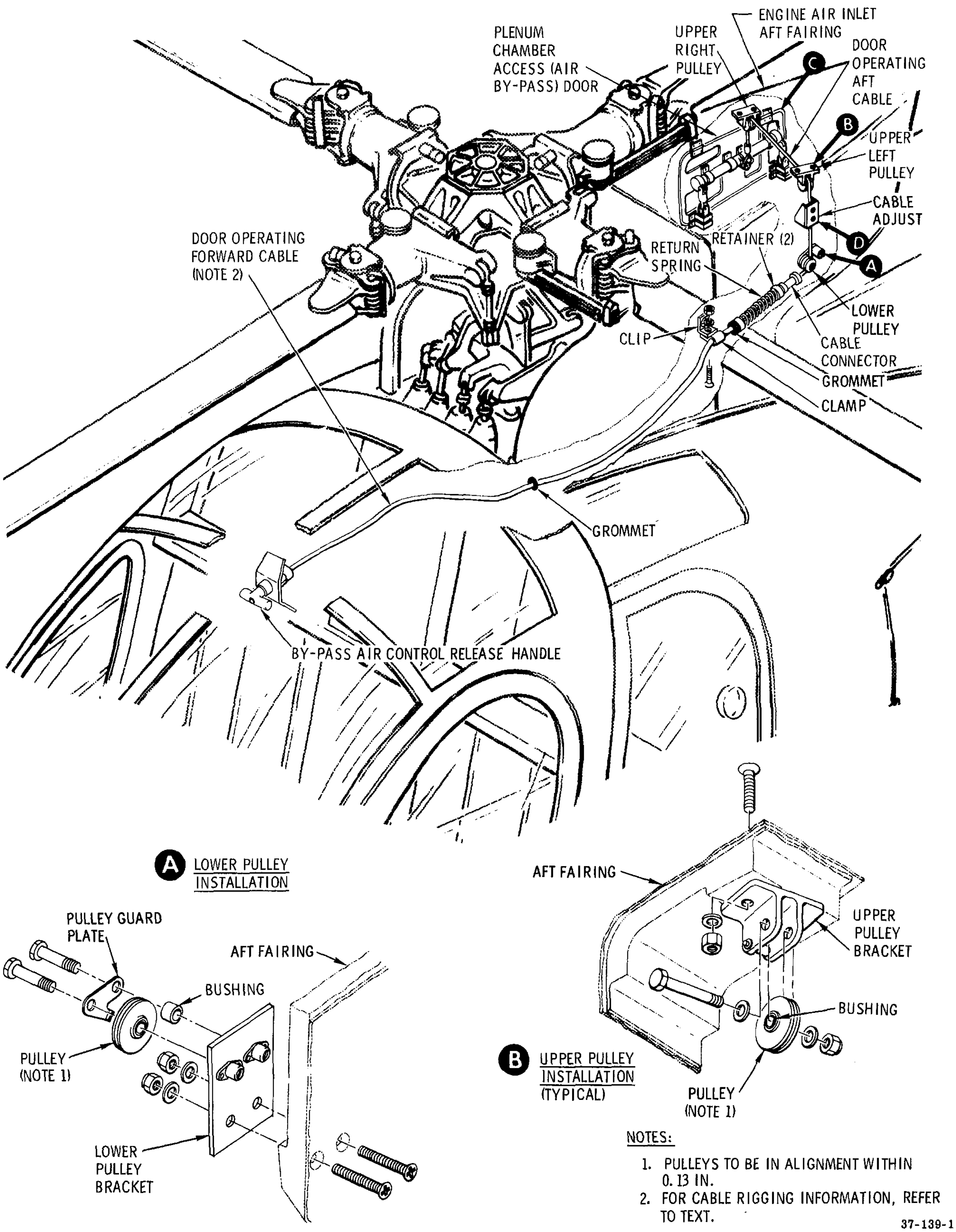
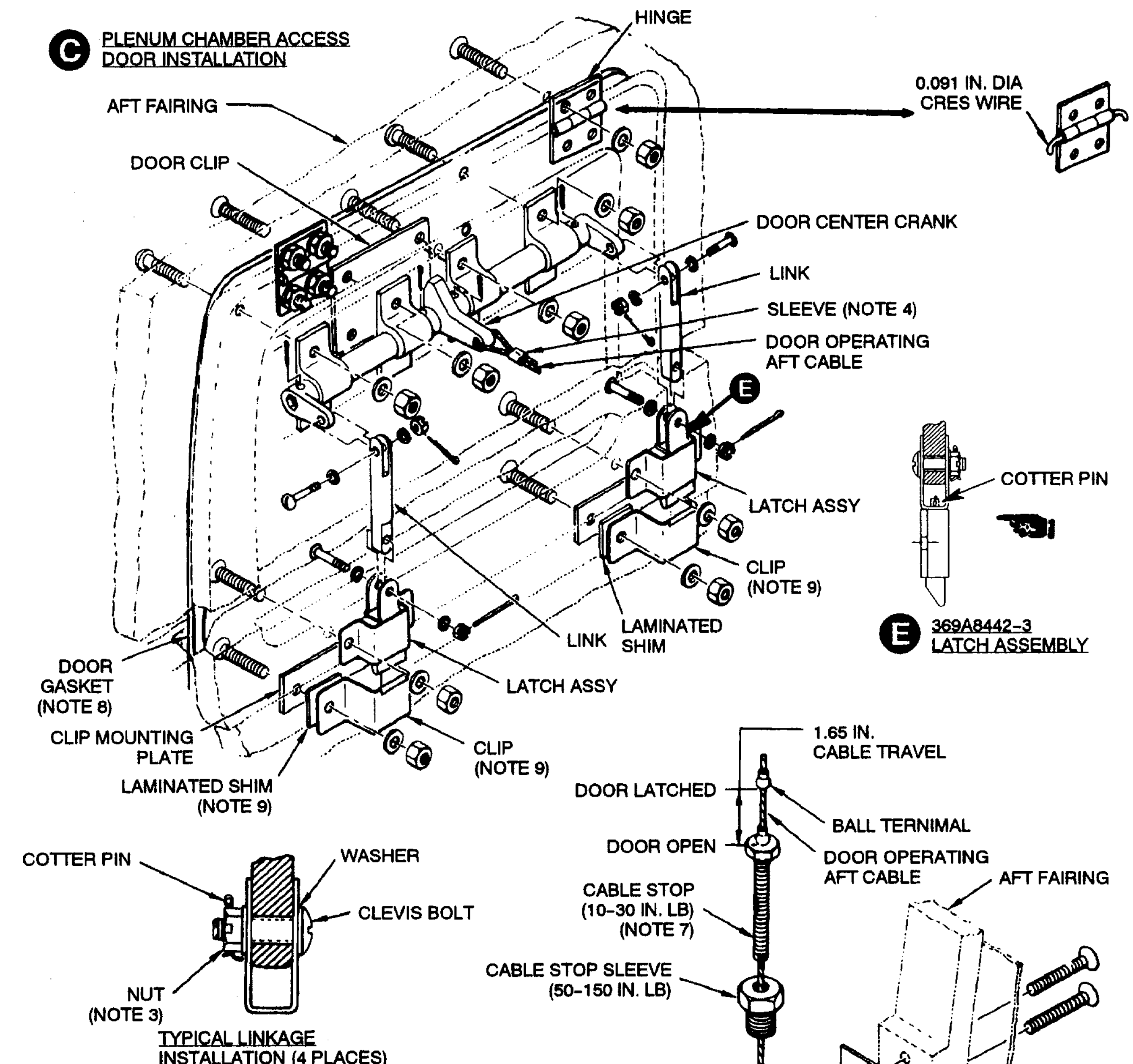
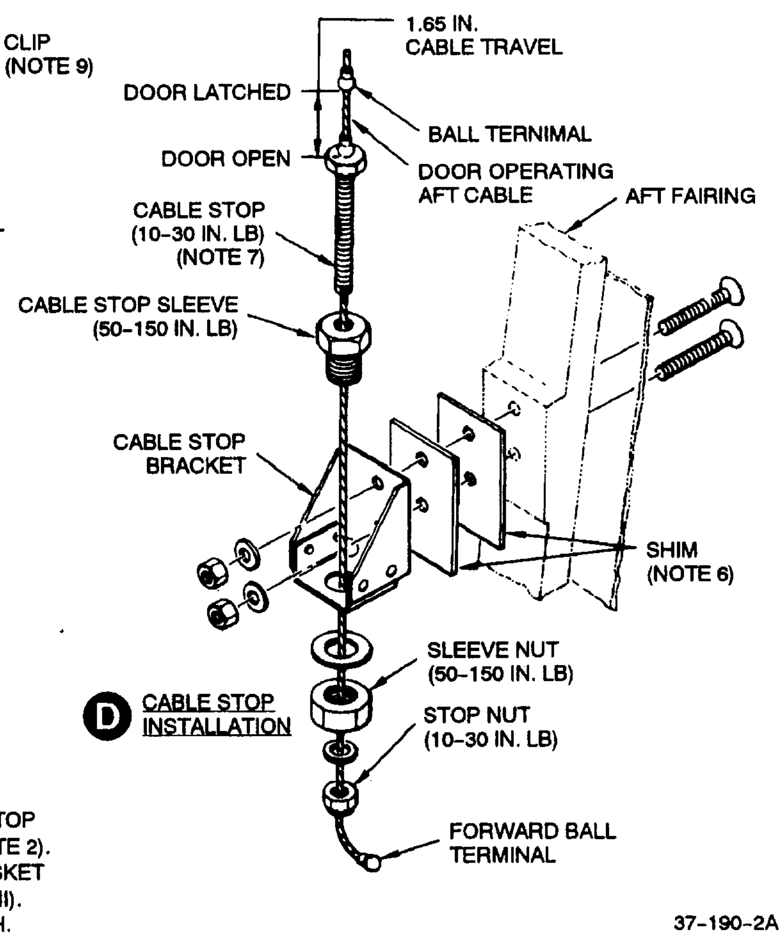


Figure 12-14. Particle separator filter door opening equipment (sheet 1 of 2)





NOTES: (CONT)

3. INSTALL NUT FINGERTIGHT, THEN BACK-OFF 2 TO 4 CASTELLATIONS FOR INSTALLATION OF COTTER PIN.
4. SWAGED IN PLACE TO POSITION DOOR AT MINIMUM OPEN POSITION (SEE NOTE 2).
5. ADJUST LAMINATE THICKNESS FOR CORRECT DOOR LATCHING AND ALIGNMENT.
6. SHIM TO ALIGN CABLE WITH CABLE STOP WITHIN 0.060 IN.
7. WITH BALL TERMINAL AGAINST STOP, ADJUST STOP TO PROVIDE MINIMUM DOOR OPENING (SEE NOTE 2).
8. FOR OPERATION BELOW 40°F, SPRAY DOOR GASKET WITH DRY LUBRICANT (116, TABLE 2-4, BASIC HMI).
9. CHAMFERED EDGE POSITIONED TOWARD LATCH.

37-190-2A

Figure 12-14. Particle Separator Filter Door Opening Equipment (Sheet 2 of 2)

NOTE: Handle is removed by removing center plug from handle, pulling handle forward and removing two cable retainer halves around cable from inside bore of handle.

(3) In pilot's compartment, remove all trim necessary for access to cable fitting on forward end of forward cable (applicable HMI Supplement).

(4) Detach forward cable at cable support bracket on cable forward end and along length of cable; remove cable by pulling forward into pilot's compartment.

e. In plenum chamber, remove hardware securing particle separator left fairing to tail rotor access door and forward side of particle separator.

f. Remove left fairing by raising it forward and upward off Station 100.00 control rod.

NOTE: On underside of left fairing, disconnect wiring splices from air pressure switch as fairing is raised upward.

g. Remove three bolts and washers securing aft side of particle separator to aft fairing (fig. 12-10).

h. Remove six bolts and washers securing nozzle manifold to aft side of particle separator.

NOTE: Prior to removing ejector from nozzle manifold, paint a mark across flange of ejector and nozzle manifold to permit reinstallation of ejector with flapper valves in correct position.

i. Tip the top of separator filter forward and remove from aft fairing.

j. Remove forward O-ring from ejector and slide onto sleeve. Disconnect upper air tube from nozzle manifold; remove ejector and nozzle manifold from aft fairing.

k. Remove aft O-ring from sleeve and slide onto outlet duct.

l. Remove attaching hardware, outlet duct and screen from aft fairing.

12-43. CLEANING OF PARTICLE SEPARATOR FILTER ASSEMBLY
(fig. 12-15)

a. Remove filter tube screens and clean with a soft brush to remove dirt accumulations.

b. Immerse separator in a solution of detergent soap (62, Table 2-4, Basic HMI) and allow to soak approximately 15 minutes. Flush out with clear water. Allow filter assembly to drain and air-dry thoroughly. Reinstall filter tube screens.

c. Clean nozzle manifold with compressed air. Use care to prevent damaging the nozzles.

NOTE: Remove gasket material bonded to aft side of particle separator filter assembly in lower area where gasket does not contact mounting structure by trimming and cutting off gasket seal following removal of assembly.

12-44. INSPECTION OF PARTICLE SEPARATOR FILTER ASSEMBLY
(fig. 12-13)

a. Inspect filter screens for damage and secure attachment. Inspect air swirl guides for damage and for broken or missing vanes. Up to five damaged swirl guide tubes may be blocked off (para 12-15). Inspect particle separator openings in filter tubes for clogging.

b. Inspect separator for cracks, holes and distortion. Evidence of cracking may require realignment of the filter (para 12-45). Check that gasket installed on edge of separator is securely attached and not damaged.

c. Inspect rubber sleeving and O-rings for cuts, holes and deterioration.

d. Inspect ejector tubes for cuts, breaks and distortion. Check condition of flange area. Check condition of flapper valves and that valves swing freely on hinges. Ejectors with missing flapper valves may be continued in operation until replacements are installed.

e. Inspect nozzle manifold for breaks, cracks and distortion. Inspect fitting for crossed or stripped threads. Check that the seven nozzles are not plugged, bent or damaged.

f. Check that air filter overboard vent screen is not damaged or clogged.

12-45. REPAIR OF PARTICLE SEPARATOR FILTER ASSEMBLY
(fig. 12-15)

a. Repair - Particle Separator Repairs to the air filter separator are accomplished using standard laminated fiberglass methods and fiberglass repair kit (80, table 2-4, Basic HMI) as described in Section 2, Basic HMI. Take care that no structural interference or potential foreign object damage to the engine can occur as a result of filter repair.

(1) Rebond loose or missing fiberglass attachment bolt spacers.

(2) Rebond seams that join the front and back walls to the center section.

(3) Rebond manifold nozzle attachment tube.

(4) Patch repair or fill any other damaged or cracked areas.

(5) Replace missing or damaged guide tubes by pulling loose and rebonding in place. Up to five swirl guides may be temporarily blocked out by installing an aluminum patch, attached with a minimum of three mechanically expanded rivets, over the aft side of the swirl guide hole.

b. Repair or Replacement - Separator Gasket Repair, rebond or replace worn or loose gasket on separator.

NOTES:
1. STRUCTURAL ELECTRICAL BOND (GROUND) REQUIRED (SECTION 19, BASIC HMI).
2. CONNECTS TO HEATING SYSTEM CONTROL VALVE ELBOW (GROUP 9) FOR APPLICATION OF ENGINE COMPRESSOR BLEED AIR.
3. INSTALL AT POSITION SHOWN.
4. INSTALL WITH ANTI-SIEZE COMPOUND (ITEM 115, TABLE 2-4, BASIC HMI). *USE COMPOUND ON ALL ALUMINUM-ALLOY THREADED* FITTINGS OF AIR LINE COMPONENTS.

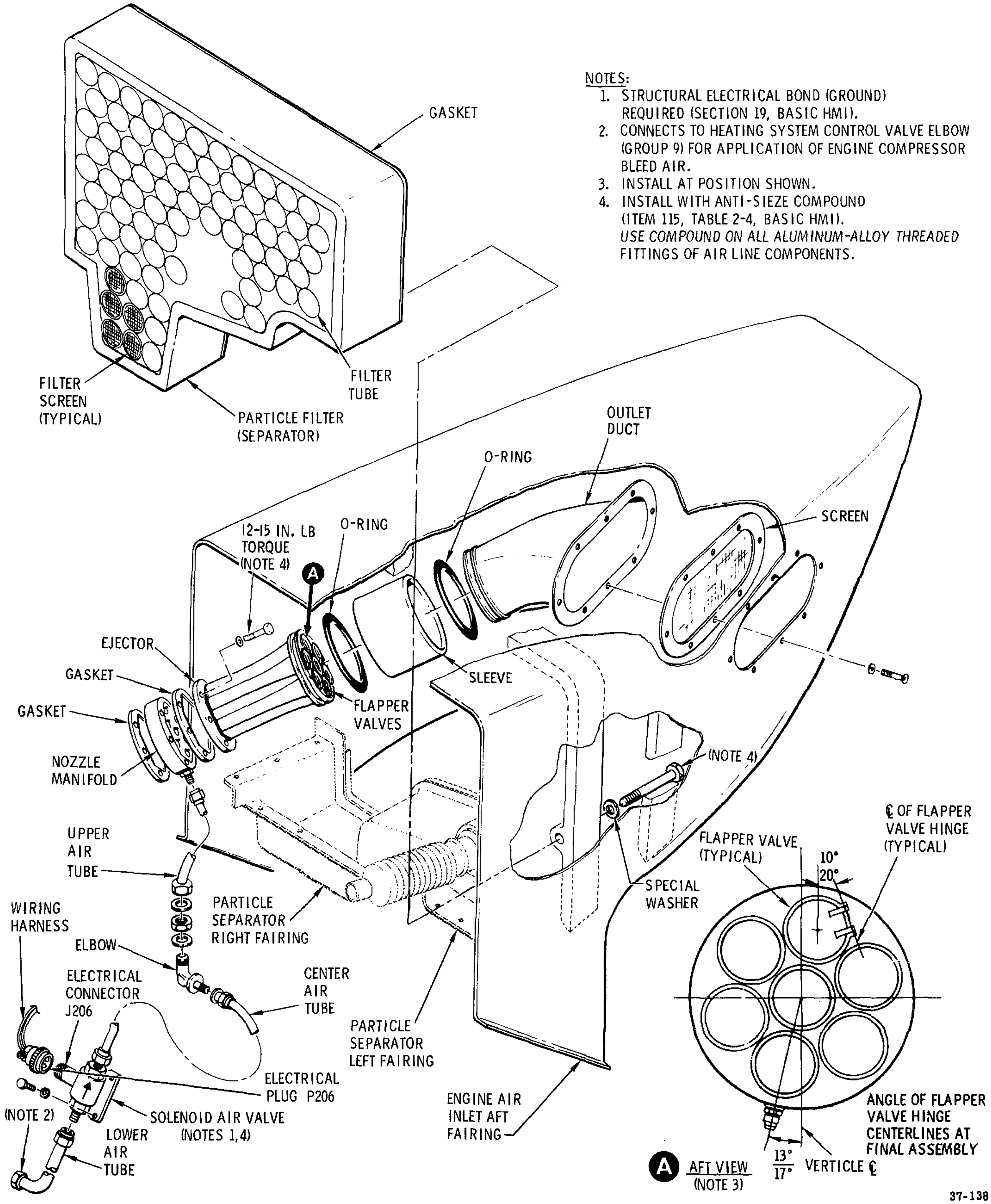


Figure 12-15. Particle separator assembly and scavenge air equipment

c. Alignment and Surface Flatness Repair - Separator and Duct. (See fig. 12-15.)

(1) Using plywood of phenolic sheet of 1/2-inch minimum thickness, locally fabricate a flat template surface. Use particle separator as a guide to draw and then cut out template.

(2) Position template against engine air inlet aft fairing-to-filter mounting surface and install three bolts and nuts. Tighten fingertight so that template is held firmly in place without twisting.

(3) Use a thickness gage and check for gap(s) at three mounting bolt attach points. Gap should not exceed 0.030 inch.

(4) Eliminate excessive gap by bonding an equivalent thickness shim at engine air inlet fairing bolt attach point. Shim may consist of aluminum sheet stock bonded to the fairing with catalyzed resin (item 81, table 2-4, Basic HMI) or layers of fiberglass cloth installed according to fiberglass repair procedures (HMI Appx D).

(5) Reinstall particle separator (para 12-46).

(6) With rubber sleeve removed, use a straight-edge and check for misalignment between the ejector and outlet duct. Maximum misalignment is 1/4 inch.

(7) If duct and ejector are misaligned, install tapered shim(s) between duct and screen rubber rim using at least two attachment screws for shim retention.

NOTE: Existing screen and duct attachment screws are long enough to allow addition of a 1/4-inch-thick shim.

12-46. INSTALLATION OF PARTICLE SEPARATOR FILTER ASSEMBLY. Install particle separator filter assembly in reverse order of removal (para 12-38) as shown in figure 12-15. When making the installation, comply with the following.

a. Bench assemble rubber sleeve and one O-ring on grooved end of ejector.

b. When installing nozzle manifold and ejector inside aft fairing, position them so paint stripe marks and bolt holes in nozzle manifold are aligned.

NOTE: Ejector position should place vertical hinge line of top flapper valve at an angle of approximately 10° to 20° counterclockwise from ejector vertical centerline. (See view of flapper valves on fig. 12-15.)

c. Free length of installed forward boot on station 100.00 control rod is to be approximately 7.13 to 7.22 inches, with tail rotor pedals at mid-travel position.

d. When reinstalling door operating forward cable and return spring with two retainers, make sure that same or identical hardware is used at original hardware locations where cable fitting is secured at forward end of cable. (Repositioning cable fore-and-aft can affect plenum chamber door rigging - para 12-51.)

e. On threads of aluminum-alloy fittings, bolts attaching nozzle manifold and separator to particle separator and bolts securing separator, use anti-sieze compound (item 115, table 2-4, Basic HMI).

f. Do not torque ejector and nozzle manifold bolts in excess of 12 - 15 inch-pounds.

g. Make sure that plenum chamber access door is rigged correctly (para 12-51). Re-rig as necessary.

h. At completion of installation, perform an operational check of plenum chamber door operating equipment and scavenge air equipment.

12-47. INSTALLATION OF AUXILIARY FAIRINGS AND SEALS, AIR PARTICLE SEPARATOR (KIT PN 369D290140).

12-48. GENERAL. This auxiliary fairings and seals kit is to preclude possible entry of foreign materials or objects through gaps between the particle separator filter assembly and the fuselage structure. In addition to the instructions for field fabrication of auxiliary fairings, supports, and seals included with the installation procedure, complete kits are available through authorized Hughes Helicopters Service Centers and distributors.

12-49. AUXILIARY FAIRINGS AND SEALS KIT INSTALLATION PROCEDURE.

a. Remove engine air inlet forward fairings. (Refer to Basic HMI.)

b. Remove, clean and inspect particle separator filter assembly (para 12-43).

c. Install auxiliary fairings and seals to LH side of helicopter as follows:

(1) Position -5 support aft of filter mounting frame on LH aft engine air inlet fairing, per dimensions shown in figure 12-16, detail A and section B-B. Install -5 support to fairing with two NAS1738B4-2 rivets. Apply -13 seal to support as shown in detail A.

(2) Apply -25 seal to aft inlet fairing, with -25 seal forward of and in line with -13 seal as shown in detail A.

NOTE: 1 – The 369D290140-5 and -7 supports and the -11 and -12 fairing assemblies may be field fabricated per dimensions shown in figure 12-17. Apply coat of primer to parts.

2 – Seal dimensions (inches) are as follows:

369D290140-13 seal	0.88 x 0.75 x 3.00
369D290140-15 seal	0.88 x 0.75 x 4.00
369D290140-17 seal	0.13 x 1.00 x 2.50
369D290140-19 seal	0.13 x 2.00 x 10.00
369D290140-23 seal	0.13 x 2.00 x 11.00
369D290140-25 seal	0.50 x 0.75 x 1.75

Fabricate seals of 3M No. Y-9132B pressure sensitive tape or equivalent.

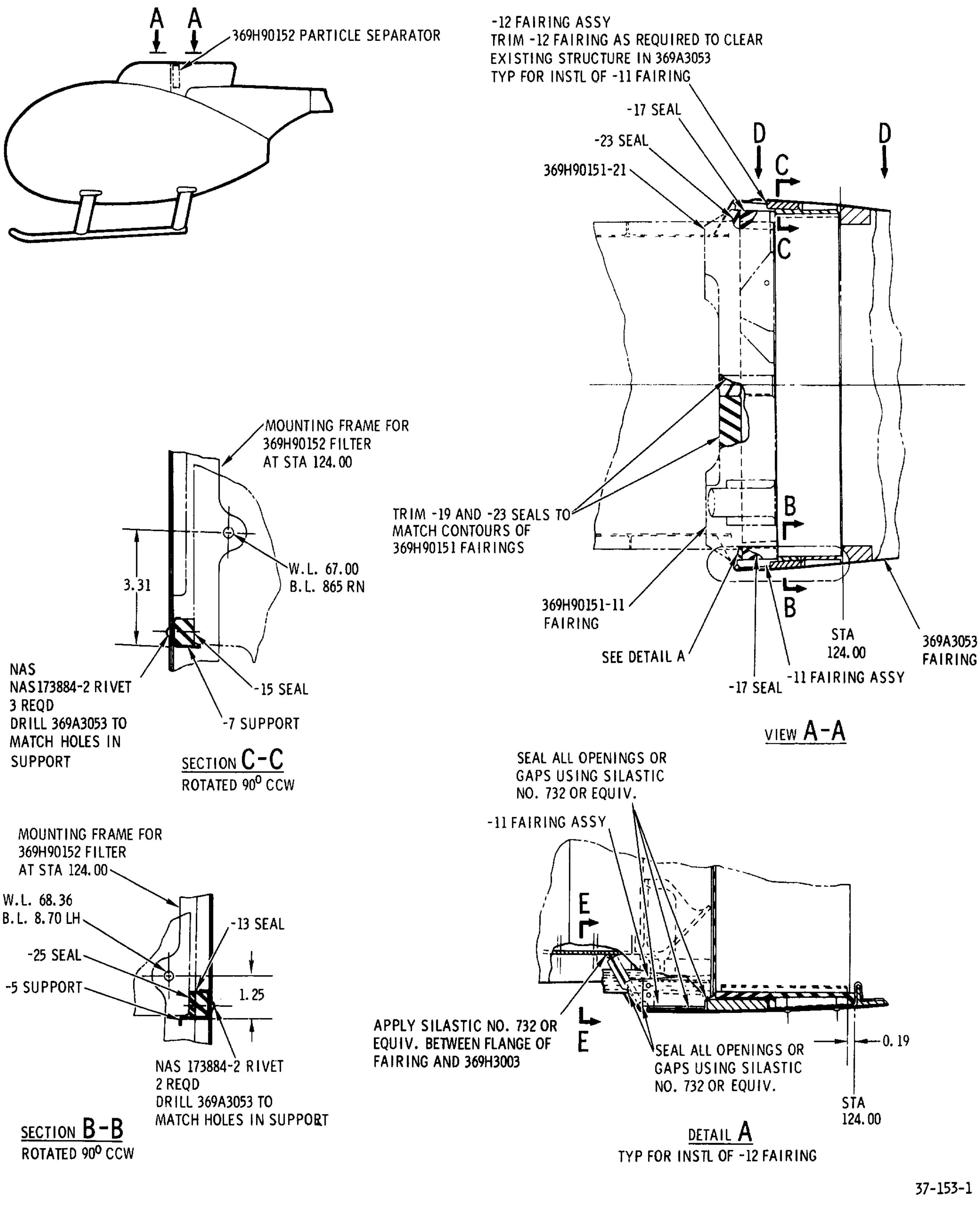


Figure 12-16. Installation of auxiliary fairings and seals, particle separator (sheet 1 of 2)

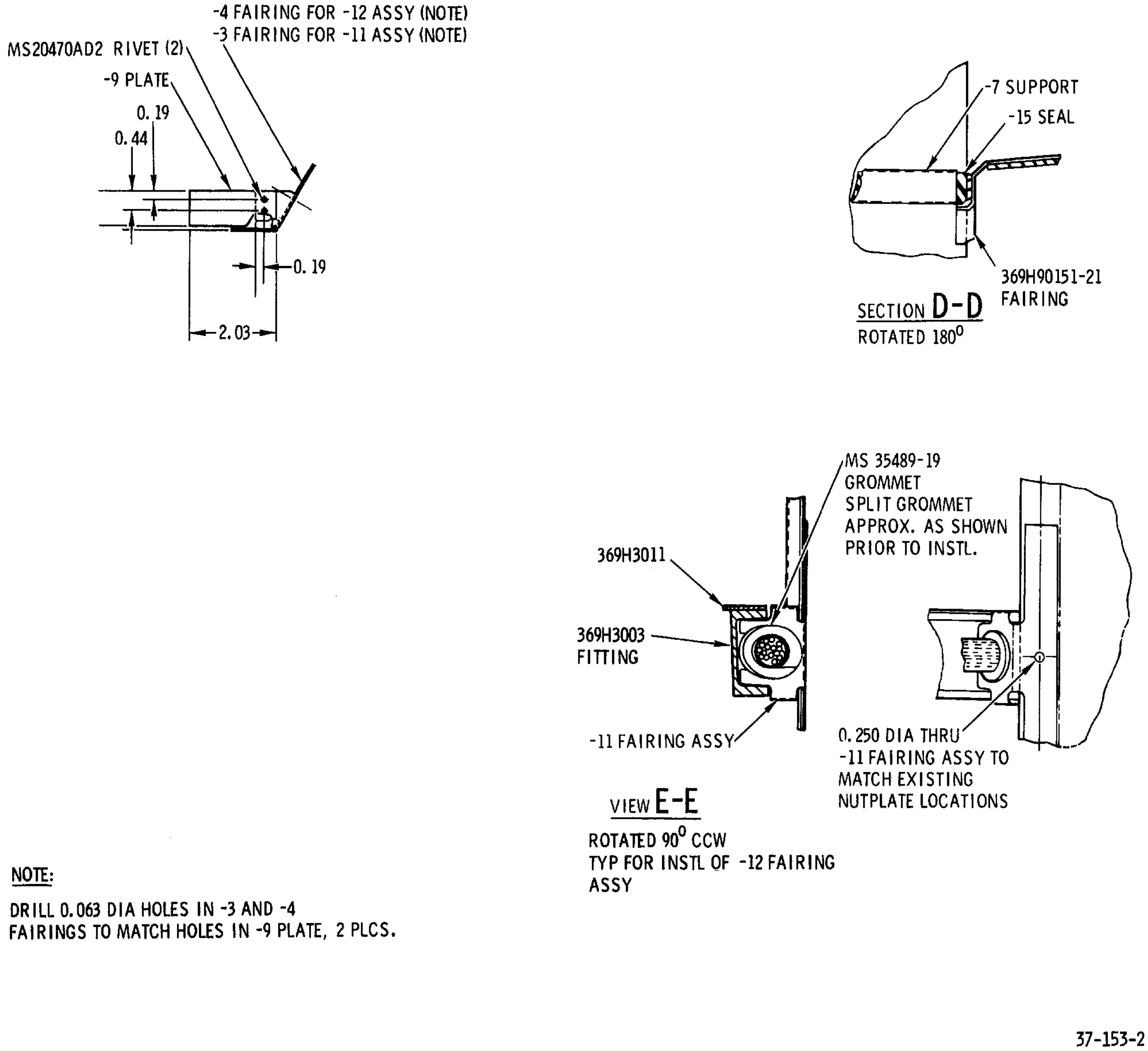
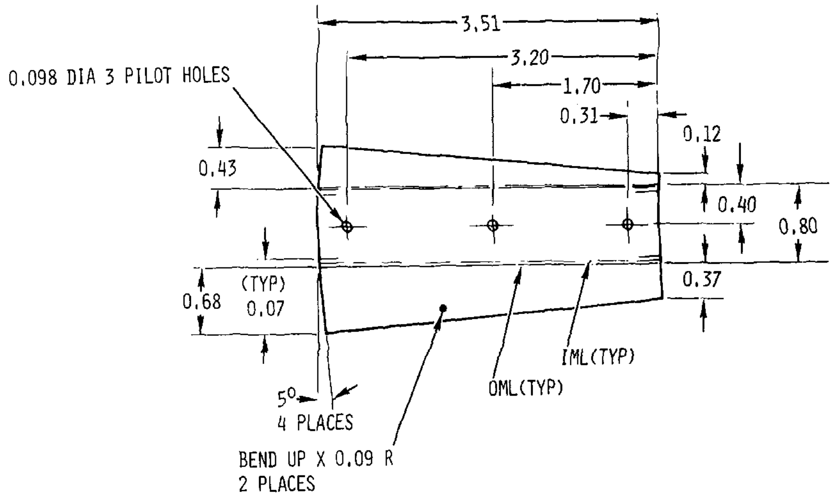
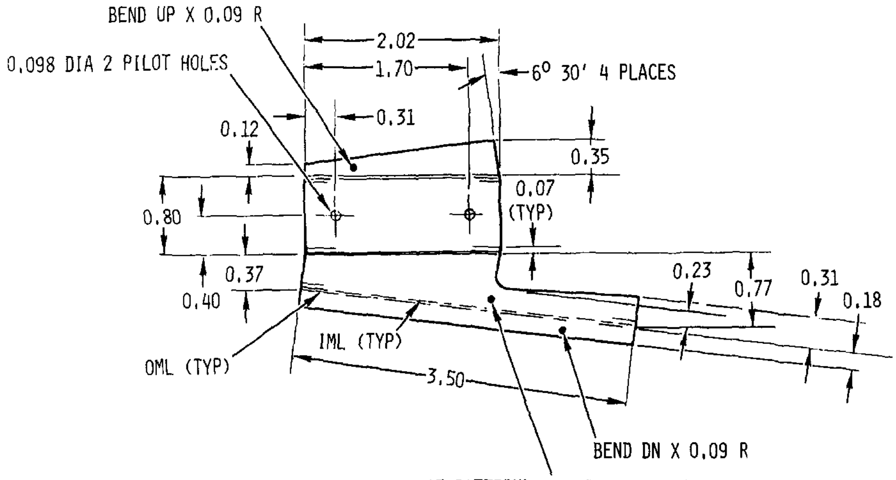


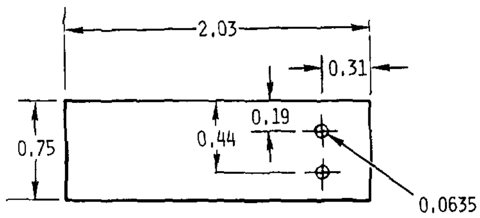
Figure 12-16. Installation of auxiliary fairings and seals, particle separator (sheet 2 of 2)



-7 SUPPORT (FLAT PATTERN)



-5 SUPPORT (FLAT PATTERN)



-9 PLATE

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Figure 12-17. Field fabrication - auxiliary fairings and supports (sheet 1 of 2)

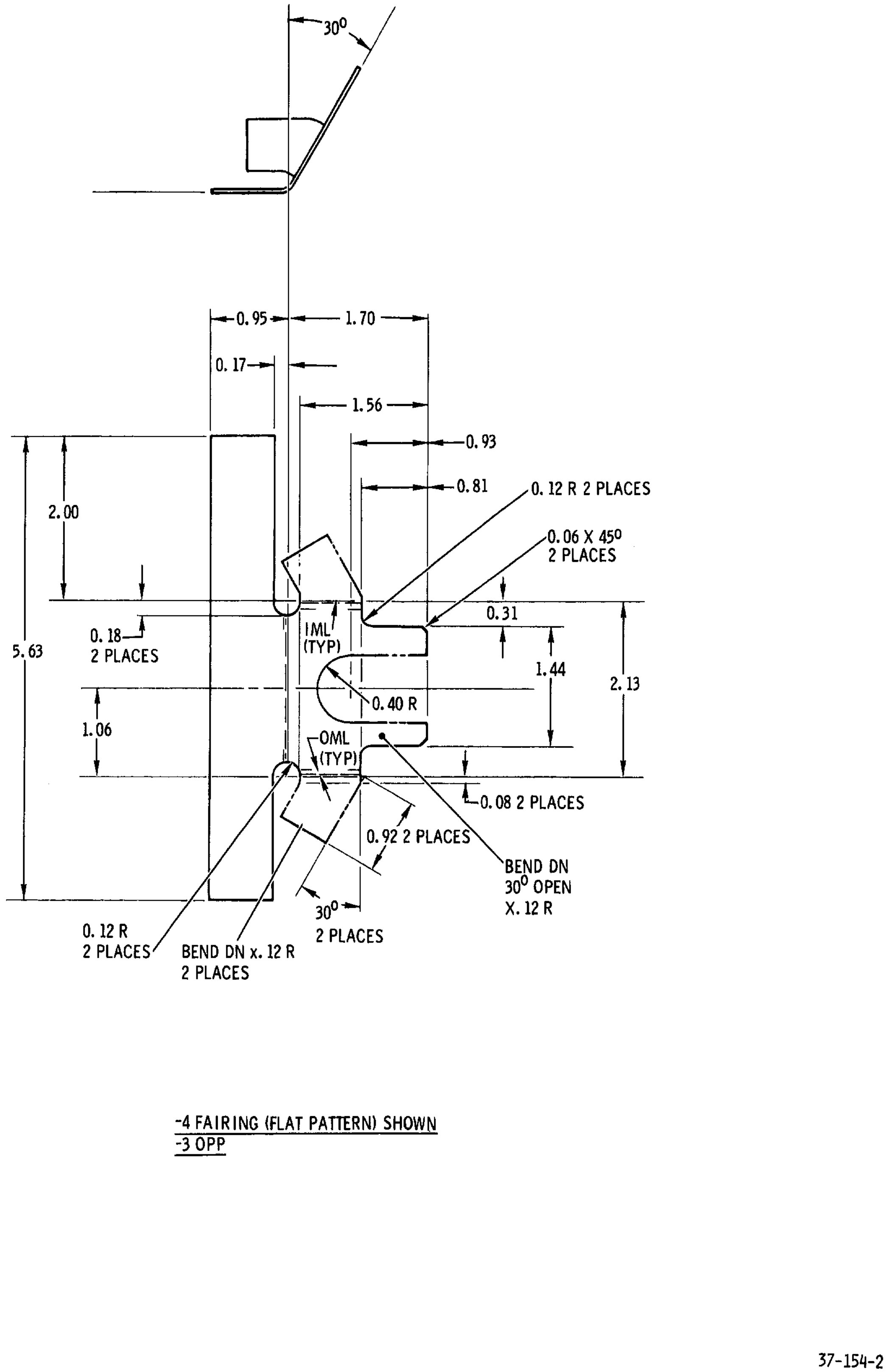


Figure 12-17. Field fabrication - auxiliary fairings and supports (sheet 2 of 2)

(3) Position -11 fairing with flanges in mast support structure fitting and on forward side of mounting frame of aft inlet fairing. Mark and drill 0.250 inch diameter hole in -11 fairing to match existing nutplate location on aft engine air inlet fairing.

(4) Split grommet and install grommet on wiring/controls bundle; insert grommet into -11 fairing as shown.

(5) Temporarily install -11 fairing with grommet to aft engine air inlet fairing with existing hardware.

(6) Install -17 seal on underside of 369H90151-11 fairing; locate -17 seal on aft outboard side of fairing as shown.

(7) Install -19 seal on underside of 369H90151-11 fairing; locate -19 seal at forward edge of fairing as shown. Trim -19 seal at forward edge of fairing as shown. Trim -19 seal to match contour of fairing.

(8) Seal gaps between flanges of -11 fairing and mast support structure fitting. Also seal all openings and gaps in areas shown in detail A.

d. Install auxiliary fairings and seals to RH side of helicopter as follows:

(1) Position -7 support aft of filter mounting frame on RH aft engine air inlet fairing, per dimensions shown in figure 12-16, view A-A and section C-C. Install support to fairing with three NAS1738B4-2 rivets. Apply -15 seal to support as shown.

(2) Position -12 fairing with flanges in mast support structure fitting on forward side of mounting frame of aft inlet fairing. Mark and drill 0.250 inch diameter hole in -11 fairing to match existing nutplate location on aft engine air inlet fairing.

(3) Split grommet and install grommet on wiring/controls bundle; insert grommet into -12 fairing as shown.

(4) Temporarily install -12 fairing with grommet to aft engine inlet fairing with existing hardware.

(5) Install -17 seal on underside of 369H90151-21 fairing; locate -17 seal on aft outboard side of fairing as shown.

(6) Install -23 seal on underside of 369H90151-21 fairing; locate -23 seal at forward edge of fairing as shown. Trim -23 seal to match contour of fairing.

(7) Seal gaps between flanges of -12 fairing and mast support structure fitting. Also seal all openings and gaps in areas shown in detail A.

e. Check installation of auxiliary fairings and seals for discrepancies.

f. Replace existing 369A8402 or 369A8402-3 pressure switch with new 369A8402-7 pressure switch.

g. Reinstall particle separator filter assembly per HMI Appx A.

h. Remove hardware that is temporarily holding the -11 and -12 fairings to the aft engine inlet fairing.

i. Reinstall forward engine air inlet fairing assemblies per HMI; ensure that hole in -11 and -12 fairings align with nutplate on aft engine inlet fairing.

12-50. PARTICLE SEPARATOR FILTER SCAVENGE AIR EQUIPMENT.

12-51. GENERAL. Scavenge air equipment for the particle separator filter installation consists of a solenoid air valve and three tube assemblies (fig. 12-15) for applying engine compressor bleed air to the nozzle manifold for ejection of filtered contaminants from the separator and out the outlet duct. The solenoid air valve is electrically actuated (opened) by manually using the SCAV AIR circuit breaker of particle separator electrical equipment (para 12-53) for application of bleed air. The solenoid air valve is mounted on the left forward side of the aft canted (station 124.00) bulkhead in the passenger/cargo compartment.

12-52. MAINTENANCE OF FILTER SCAVENGE AIR EQUIPMENT. Maintain the scavenge air equipment using standard procedures for air equipment. In addition, the following information applies.

a. Access to solenoid air valve, lower and center air tubes is obtained by removal of trim from forward left side of aft bulkhead in passenger compartment (applicable HMI Supplement).

b. When installing air line equipment, use anti-seize compound (item 115, table 2-4, Basic HMI) on all aluminum-alloy fittings.

c. Structural electrical bond (ground is required between solenoid air valve, valve mounting bracket and bulkhead structure (Section 19, Basic HMI).

d. Do not torque mounting bolts for air valve in excess of 22 - 27 inch-pounds.

e. Cleaning and flushing of solenoid air valve may be accomplished with valve in or out of aircraft, using suitable hoses at inlet and outlet fittings and alternately energizing and deenergizing valve and routing low-pressure clean water through valve. This flushes valve poppet seat.

NOTE: A 28 Vdc electrical power source is used if valve is flushed outside of helicopter.

f. At replacement of upper, center or lower air tube, remove identification tape from tube; otherwise, high temperature will char tape.

12-53. PARTICLE SEPARATOR FILTER DOOR OPERATING EQUIPMENT.

12-54. GENERAL. Door operating equipment, for air bypass of the particle separator filter in event of a clogged particle separator, includes a hinged plenum chamber access (air bypass) door, door operating forward and aft cables, a return spring with two retainers, three cable pulleys, an adjustable cable stop, a handle and associated mounting and attachment hardware (fig. 12-14). The handle in the pilot's compartment, at the forward end of the forward cable, permits manual pulling of an attached aft cable forward to operate a door insert assembly on the plenum chamber access door. This releases two door latches inside the engine air inlet aft fairing to open the door inward. The return spring and two retainers on the aft end of the forward cable returns and holds the handle at the aft position. The adjustable door stop permits cable travel adjustment for plenum chamber door rigging (para 12-56).

12-55. MAINTENANCE OF DOOR OPERATING EQUIPMENT. (See fig. 12-14.) When maintaining door operating equipment, comply with the following.

CAUTION: A serviceable door gasket in good condition is necessary at all times with the particle separator installation. Gasket is to be replaced (Section 2, Basic HMI) before any deterioration occurs. Flaking or disintegration of gasket can result in foreign material entry with engine intake air and cause engine damage.

a. At plenum chamber access door removal, removal of the quick-disconnect cable connector, and door with door operating aft cable attached to door, eliminates cable sleeve removal and replacement or aft cable replacement at reinstallation of door.

NOTE: Remove hinge pins to remove door. Removal of aft cable with door requires removal of cable stop from cable stop sleeve on cable stop bracket, and removal of cable stop with aft cable.

b. Replace loose or missing door hinge pins with 0.091-inch-diameter CRES wire. Bend pin ends over as shown.

c. After replacement of either forward or aft cable, or any change in length of cable travel, check plenum chamber access door rigging and re-rig as necessary (para 12-56).

d. Inspect door operating equipment in aft fairing to assure security of attachment and proper operation.

CAUTION: Loose, missing or improperly installed door operating equipment can cause foreign object damage to the engine.

e. As necessary, adjust shimming of door latch clips as shown for correct door latching and alignment.

f. For operation below 40°F, spray door gasket and door edge with dry lubricant (item 116, table 2-4, Basic HMI).

12-56. RIGGING OF PLENUM CHAMBER ACCESS DOOR. (See fig. 12-14.) If replacement of door operating forward or aft cable finds reattachment of aft cable with sleeve to door center crank on plenum chamber access door or door opening to be incorrect due to improper cable travel, cable rigging of door must be checked and/or adjusted. Rig the doors as follows.

NOTE: Following procedures cover both attachment of aft cable to door and adjusting components for correct cable travel and door opening. Select and perform those applicable steps for rigging check or adjustment as necessary.

a. Attach door operating aft cable to door as follows:

(1) Make sure FILTER BY-PASS CONTROL handle in crew compartment is fully aft against forward cable fitting.

(2) With plenum chamber door closed, pull connected forward and aft cables taut and loop aft end of aft cable through door center crank. With cables taut, rigidly secure cable loop to crank temporarily.

CAUTION: Do not permanently install sleeve or cut off excess cable length.

(3) At cable stop bracket, thread cable stop in or out of stop sleeve to position top of stop approximately 1.56 inches below ball terminal on aft cable.

(4) Pull FILTER BY-PASS CONTROL handle in crew compartment fully forward, until ball terminal on aft cable is pulled down against cable stop at cable stop bracket. Temporarily maintain forward pull, or otherwise spring-load handle, to retain cable ball terminal against stop.

(5) With plenum chamber door pulled outward to maintain aft cable taut, rotate cable stop in or out of cable sleeve as necessary until plenum chamber door moves to minimum open position.

CAUTION: Ball terminal on aft cable must remain against cable stop as stop is adjusted, or erroneous adjustment results.

NOTE: At door minimum open position, door outer surface should be at a 45° angle to outboard surface of inlet aft fairing (along mold line at Station 136.00).

(6) Release FILTER BY-PASS CONTROL handle; observe that it returns aft against forward cable fitting.

(7) Carefully close plenum chamber access door; with door closed, check that aft cable is just taut and that ball terminal rests against top of cable stop. Also check that pulleys are correctly aligned and that aft cable travels properly around pulleys.

NOTE: Upper left pulley is to be aligned with lower left pulley, and upper right with upper left pulley, within 0.13 inch for correct pulley alignment and cable travel around pulleys.

(8) As necessary, adjust thickness of cable stop bracket shim to align cable stop with aft cables within 0.060 inch. Peel shim to thickness required.

(9) As necessary, repeat procedures in steps 4 through 7 above.

(10)After correct adjustment of cable stop, pull FILTER BY-PASS CONTROL handle forward to open plenum chamber access door. Using sleeve installation tool, swage sleeve on cable loop at predetermined correct location to secure aft cable end to center crank on door. Cut off excess cable length.

b. Make final adjustment of cable travel and minimum door open position at cable stop and stop sleeve as follows:

(1) As necessary, repeat procedures in steps a 4 through 7 above to make final adjustment of stop nut.

(2) At completion of stop nut adjustment, torque sleeve nut to **50 - 150 inch-pounds** and stop nut to **10 - 30 inch-pounds**, in that sequence.

(3) Check for correct operation of FILTER BY-PASS CONTROL handle, opening and closing of plenum chamber door.

12-56A. ENGINE AIR INLET BY-PASS DOOR 300-HOUR INSPECTION (Ref. Fig. 12-14)

CAUTION: Prevent engine FOD. Secure a cover over the engine intake prior to working inside plenum chamber. Use extreme care when working around engine inlet to prevent any foreign object from entering engine. Remove cover after completing work.

a. Remove engine inlet bypass door and inspect air bypass door gasket seal for condition and secure attachment. No gasket seal deterioration or debonding allowed. Replace door gasket as required.

b. Inspect door surfaces for cracking, chaffing or damage. Repair door per Appx D, Structural Repair Manual.

c. Inspect cable for fraying and chaffing.

d. Remove and replace the latch retention cotter pin (located inside the attach cable "U" clamp).

e. Replace latch assembly if:

(1) The cotter pin hole in the latch stem is elongated more than 0.080 inch.

(2) The cotter pin has worn into the surface of the cable attach "U" clip more than 1/2 the thickness of the clip (0.025 inch deep).

(3) The latch engagement faying surface, where it contacts the plenum, is worn more than 0.050 inch below the original surface.

f. Inspect door hinges for wear and hinge fastening hardware for security. Repair or replace hinges as required.

g. Inspect door for worn or damaged latching and attachment hardware.

h. Check insert assembly and latch linkages for wear and lost motion. Repair or replace latch hardware as required.

i. Inspect door system cable, cable connections, pulleys, pulley bushings and brackets for wear, damage, freedom of movement and security.

j. Reinstall engine inlet bypass door.

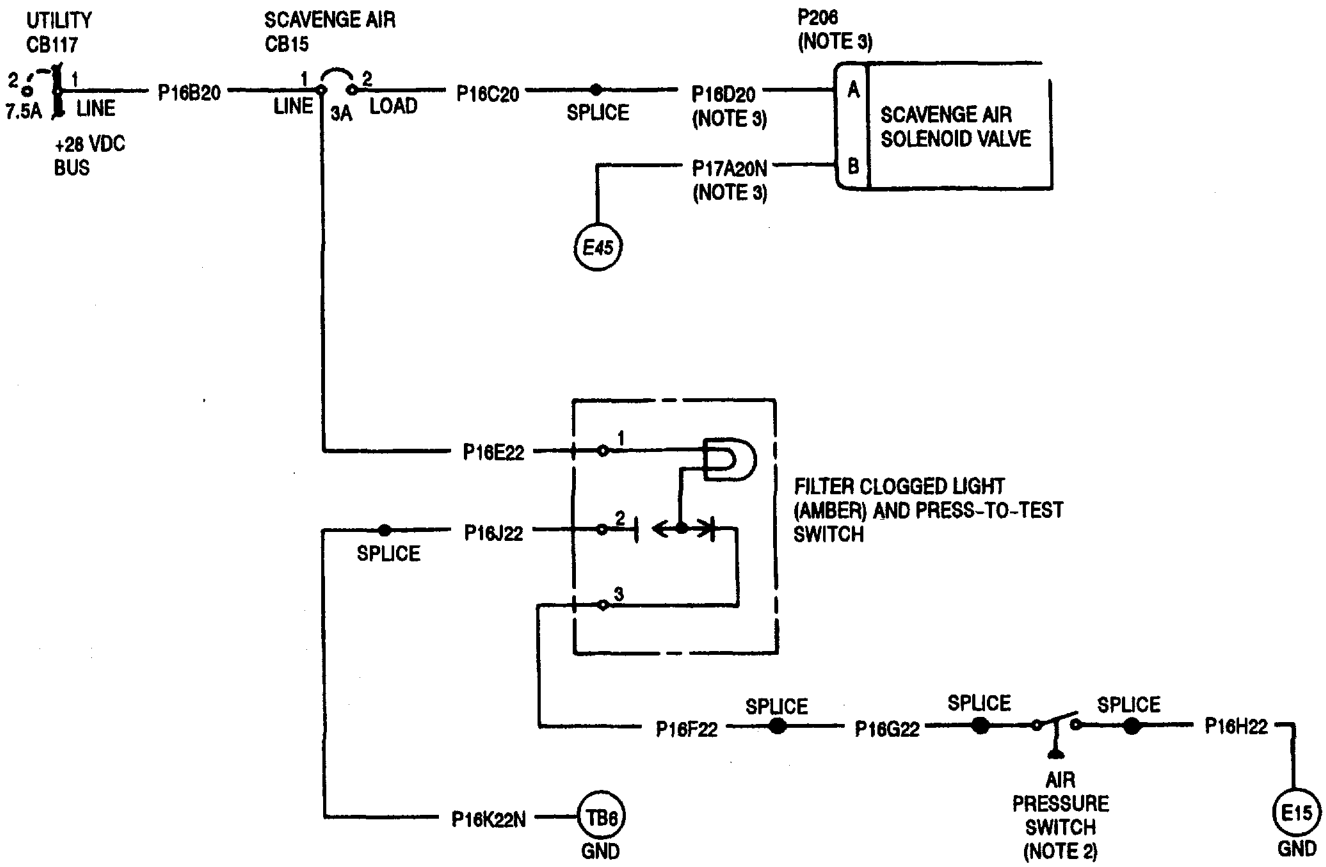
k. Inspect door for proper alignment when closed. Door must fit snug against seal with obvious seal compression.

l. Inspect latches for positive latching.

m. Pull FILTER BY-PASS CONTROL handle. Action to be a smooth, positive door opening with no binding. Release handle. Handle should snap back to stowed position.

12-57. PARTICLE SEPARATOR FILTER ELECTRICAL EQUIPMENT

12-58. GENERAL Electrical equipment for the particle separator filter installation consists of a scavenge air (SCAV AIR) circuit breaker, solenoid air valve, air pressure switch, FILTER CLOGGED light-switch, interconnecting electrical wiring and attaching hardware. The circuit breaker and light-switch are installed in a bracket assembly with a cover at the side of the instrument console. The air pressure switch is mounted on the particle separator left fairing inside the plenum chamber below the engine air inlet aft fairing. When the circuit breaker is set to ON, +28 Vdc is applied to and actuates (opens) the solenoid air valve, which applies engine bleed air to the filter assembly for particle ejection. The air pressure switch senses filter outlet air pressure in the plenum chamber and closes when the particle separator clogs sufficiently to reduce air pressure to a predetermined level. This applies +28 Vdc power to and illuminates the FILTER CLOGGED light to provide the pilot a visual indication. The light-switch contains a built-in press-to-test switch to check the internal lamp. Figure 12-18 is a wiring diagram for the electrical equipment of the particle separator installation.



NOTES:
1. THIS WIRING DIAGRAM SHOULD BE USED WITH THE ELECTRICAL SYSTEM WIRING DIAGRAM IN BASIC HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
2. MOUNTED ON PARTICLE SEPARATOR LEFT FAIRING IN PLENUM CHAMBER.
3. PART OF WIRING DIAGRAM.

37-140

Figure 12-18. Particle Separator Filter Installation – Wiring Diagram

12-59. MAINTENANCE OF PARTICLE SEPARATOR ELECTRICAL EQUIPMENT

Maintain the electrical equipment for the particle separator filter installation as generally instructed in Section 19, Basic and in accordance with the following information.

NOTE: To obtain complete access to air pressure switch, it is necessary to remove door operating forward cable, remove particle separator and raise particle separator left fairing (para 12-42).

a. Install without auxiliary fairings: Sensing of air pressure by air pressure switch and FILTER CLOGGED light operation may be checked by applying a vacuum of 4.0 ±0.4 inches H_2O to nipple end of air pressure switch. With vacuum applied, FILTER CLOGGED light should illuminate. At removal of vacuum, light should go out.

NOTE: For normal operation, switch senses differential air pressure between engine air intake (filter inlet side) and plenum chamber (filter outlet side) air pressure.

b. Install with auxiliary fairings: Sensing of air pressure by air pressure switch and FILTER CLOGGED light operation may be checked by applying a vacuum of 10.25 - 10.75 inches H_2O to nipple end of air pressure switch. With vacuum applied, FILTER CLOGGED light should illuminate. At removal of vacuum, light should go out.

c. For operation of air solenoid valve, a structural electrical bond (ground) is required between valve, valve mounting bracket and canted aft bulkhead structure. (Refer to Section 19, Basic HMI.)

12-60. OPERATIONAL CHECK OF PARTICLE SEPARATOR FILTER INSTALLATION

WARNING: All operation and flight of the helicopter must be accomplished in accordance with requirements and limitations specified in the Hughes 500 Owner's Manual and the applicable optional equipment Supplement to the Owner's Manual for the specific model helicopter.

a. Functional Check - Scavenge Air Operation.

(1) Prepare helicopter for and ground run the engine (Owners Manual).

(2) Make sure that plenum chamber access door is closed.

(3) Set SCAV AIR circuit breaker to ON; check that solenoid air valve opens and that scavenge air is exhausted through outlet duct and screen at left aft side of engine air inlet aft fairing.

NOTE: A slight but discernible increase in TOT should occur when SCAV AIR circuit breaker is set to ON.

(4) Set SCAV AIR circuit breaker to OFF; check that solenoid air valve closes and air exhaust from screen ceases.

(5) Shut down engine (Owners Manual).

b. Operational Flight Check - Clogged Filter and Air Bypass.

(1) With engine air inlet forward fairings removed (Section 2, Basic HMI), cover approximately 40 screened, circuit air openings on forward side of particle separator with tape. When covering openings, tape alternate (every other) accessible rows of openings.

NOTE: Covering openings reduces airflow through particle separator sufficiently to cause air pressure drop in plenum chamber and actuate air pressure sensing switch to provide a FILTER CLOGGED light indication during flight test.

(2) Ballast helicopter to normal gross weight (Owners Manual).

(3) Reinstall engine air inlet forward fairings and prepare helicopter for flight test.

(4) Make sure plenum chamber access door is closed.

(5) In flight during a maximum continous power climb, set SCAV AIR circuit breaker to ON and observe that FILTER CLOGGED light illuminates.

(6) While FILTER CLOGGED light is illuminated, pull the FILTER BY-PASS CONTROL handle fully forward and observe that the light goes out when plenum chamber access door opens.

(7) Land helicopter and shut down engine.

(8) If required, repeat steps (1) through (7) above and cover additional air openings (in increments of 2 up to a maximum of 44 openings) on particle separator as necessary to obtain correct light indication.

CAUTION: When removing tape, exercise care to avoid damage to screened openings.

(9) Remove tape covering air openings on particle separator.

12-61. ENGINE AIR INLET DEFLECTOR KIT.

12-62. GENERAL. Engine Air Inlet Deflector Kit PN M30287-501 (fig. 12-19) operates to prevent/impede passage into the air inlet of large sand and dust particles which could damage the engine. The deflector reduces ingestion of foreign objects of sufficient mass to puncture the inlet screen or particle separator; it reduces ingestion of snow and slush which may accumulate on the canopy at very slow speeds and subsequently be swept along the surface, toward the inlet, as forward speed is increased. The engine air inlet deflector kit includes a hub and cover to protect against entry of snow and water into the inlet while the helicopter is parked. The engine air inlet deflector must be removed for helicopter operation in hot weather to avoid any necessity for reducing operational horsepower. (Maximum permissible engine inlet oil temperature is 107°C.)

a. Trim and affix canopy upper windshield stiffeners as follows (see figure 12-20).

(1) Trim 0.75 inch from outboard of each stiffener.

(2) Remove rough edges with suitable sandpaper.

WARNING: Naphtha is extremely flammable. Prohibit smoking inside helicopter when working with naphtha. Keep only small quantity of naphtha in working area. Wipe off spilled naphtha immediately; open doors on both sides of helicopter, if possible, to expedite rapid drying and dilution of fumes.

(3) Wash stiffeners and inner surfaces of left and right upper windshields carefully with naphtha, using soft cloth or industrial wiping tissues only.

(4) Apply clear masking tape to inner surface of each windshield to delineate area to receive stiffener.

(5) Completely cover windshields beyond taped area with cellophane sheets. Hold sheets in place with masking tape. Cement must not contact acrylic windshield where solvent action is not desired, e.g., by seeping under edges of tape.

(6) Apply a thin film of mixed cement to windshields and stiffeners. Join stiffeners to windshields immediately.

(7) Press lightly on stiffeners to remove air bubbles and then scrape off excess cement. Secure stiffeners in position with sufficient masking tape to maintain pressure.

(8) Allow cement to cure at least two hours before removing masking tape from stiffeners.

b. Remove screws and washers securing tail rotor shaft access door (fig. 12-21) to right fairing and aft section fairing; remove door. Retain door for reuse.

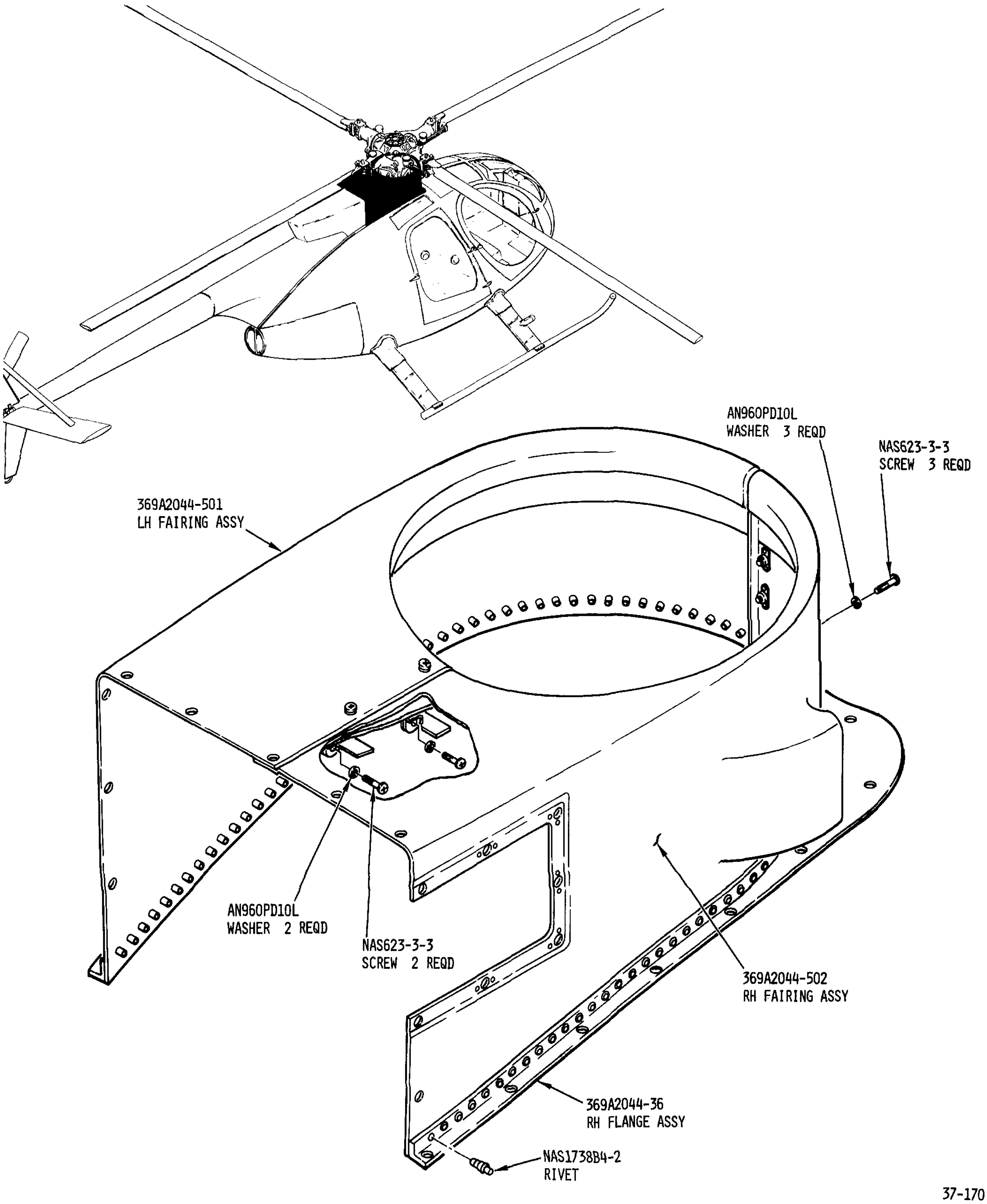


Figure 12-19. Engine air inlet deflector kit

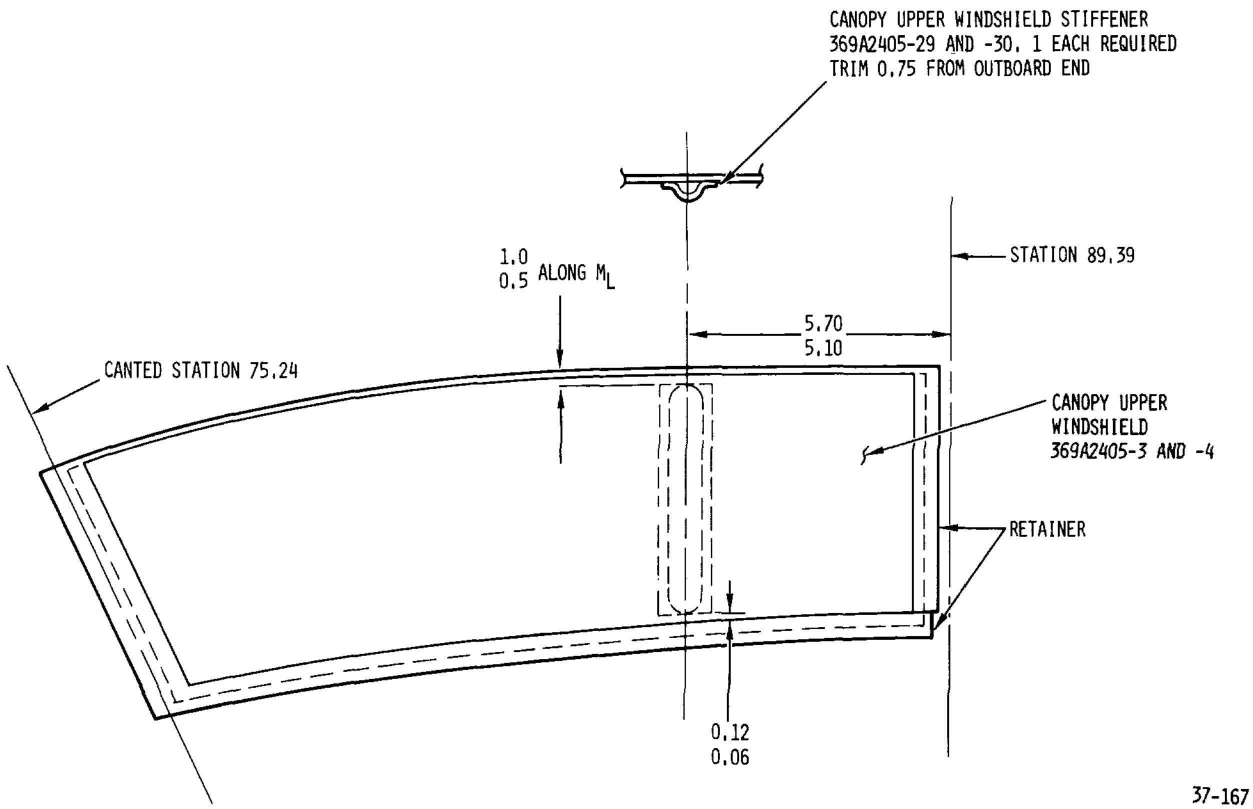


Figure 12-20. Canopy upper windshield stiffener bonding details

c. Remove screws and washers securing original left and right engine inlet fairing assemblies; remove fairing assemblies.

d. Remove original left and right lower vanes, and replace them with new, reinforced, lower vane assemblies (fig. 12-22).

e. Set new left and right fairings in correct installed position, then install fasteners in front, top, and inside to hold fairing halves together. (See figure 12-19.)

f. Set new left and right flange assemblies in place. Secure assemblies to fuselage and against fairings with masking tape to simulate proper installation position.

g. Insert drill bit into front pilot holes in left and right flanges and drill pilot holes in fairings.

h. Install fasteners in holes, readjust flanges to proper position as required, then drill through remaining pilot holes on each side. Install fasteners in approximately every other pilot hole.

i. Remove fairings from helicopter and enlarge pilot holes in fairings to 0.128 inch for 1/8-inch rivets.

j. Install NAS1738B4-3 rivets.

NOTE: Before installing rivets, deburr holes as required, and coat holes in aluminum flanges with zinc chromate primer. Install rivets while coating is wet.

k. Reinstall left and right fairing assemblies; secure each with screws as before.

NOTE: Before drilling pilot holes in flanges, remove interior paneling from ceiling so frequent checks of accuracy can be made.

l. Use hole finder to locate, then drill holes in new left and right flange assemblies. Deburr holes as required.

m. Remove fairing assemblies from helicopter and install plate nuts on right fairing assembly for tail rotor access door (fig. 12-21).

n. Apply two top coats of acrylic lacquer to match original pattern.

o. Reinstall fairing assemblies. Apply zinc chromate primer inside clearance holes in flanges and on screw threads. Install screws while primer is wet.

p. Reinstall ceiling paneling.

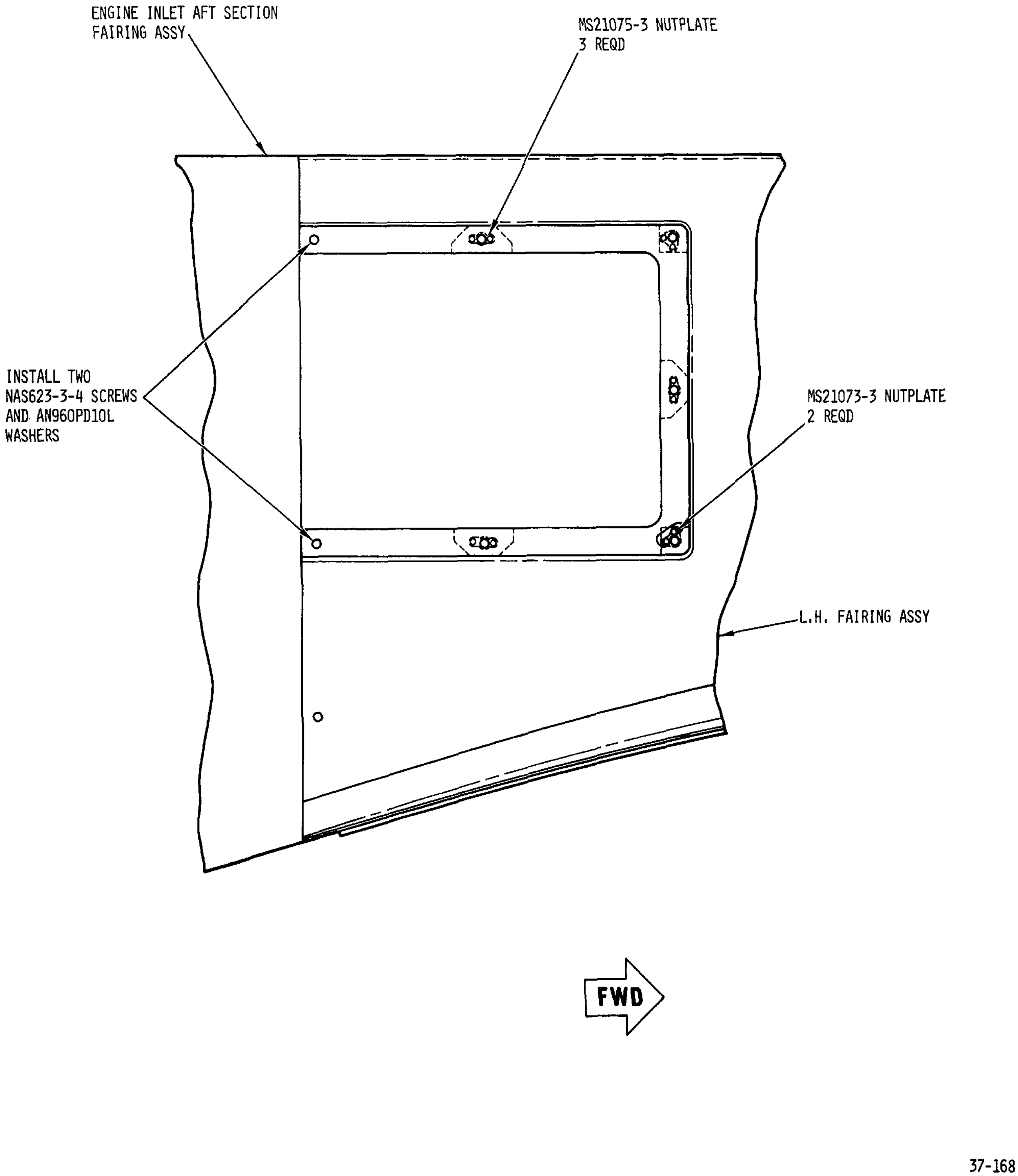


Figure 12-21. Tail rotor shaft access door installation details

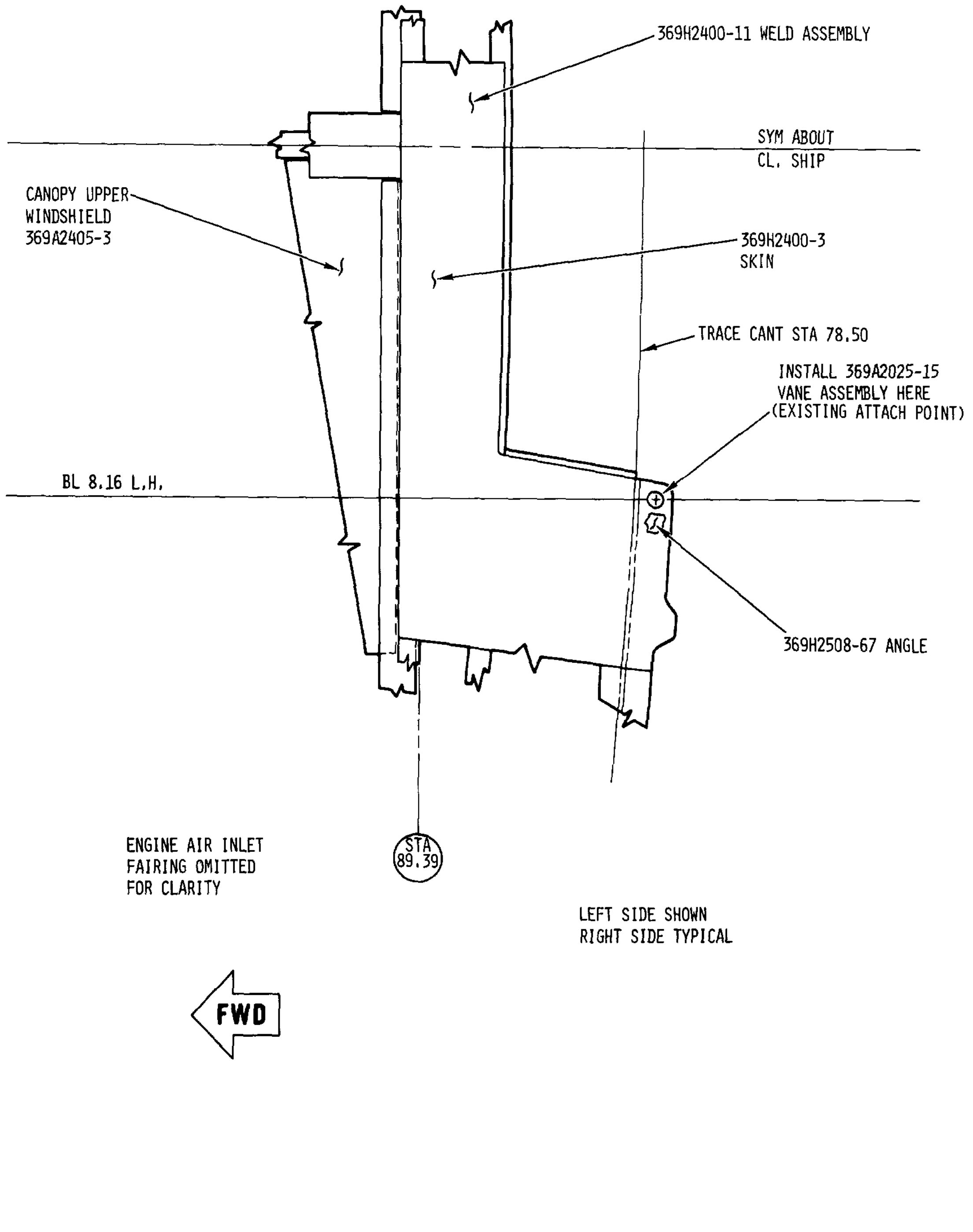


Figure 12-22. Left and right lower vane assembly mounting hole locations

OPTION GROUP 13

MISCELLANEOUS EQUIPMENT

13-1. MAGNESIUM TO ALUMINUM CONVERSION KIT M30251.

13-2. GENERAL. Magnesium to aluminum conversion kit M30251 provides for replacement of magnesium bellcranks, supports, brackets and other miscellaneous and controls parts throughout the helicopter with equivalent forged or cast aluminum parts. The conversion is specifically recommended when the helicopter is to be operated over or near salt water, to reduce the susceptibility of the particular parts to corrosion from salt-laden air. Approximately 50 parts are included for change: these are in the cyclic, collective and mixer controls and vibration absorbers on main rotor blades of the main rotor and control system; in the pedal installation, controls linkage and tail rotor of the tail rotor and control system; and in gas producer controls and governor linkages of the engine control system. Any applicable maintenance differences for the replacement aluminum parts will be specified in the appropriate section of the Basic HMI. Complete or piecemeal conversion may be accomplished, at the discretion of the owner or operator.

13-3. BATTERY TEMPERATURE SENSING EQUIPMENT.

13-4. GENERAL INFORMATION. The battery temperature monitor (sensing) modification kit basically consists of low and high temperature sensing switches, two temperature indicator light-switches, a wire harness, a light-switch and horn housing, interconnecting wiring and associated attaching and mounting hardware. (See fig. 13-1.) There are two versions of the kit, M50037 and M50038. Kit M50037 applies for all 500 Series helicopters, not equipped with battery temperature sensing equipment, except as follows. Kit M50038 applies only to a 500M helicopter with a Grimes 80-0204-1 master caution and control unit, and on which two SPARE caution light indicators are available on the caution light assembly of the instrument panel. Both kits are identical and contain the items listed above, except M50038 contains two light indicator decals with an insert in place of the temperature indicator light switches and the light switch and horn housing is not included. Battery temperature sensing equipment monitors battery temperature and provides a visible amber caution light indication when battery temperature reaches 140° F, and a red warning light indication at 160° F. Both indicator light switches contain a built-in press-to-test switch for testing internal lamps. For M50038, two existing spare light indicators in the caution light assembly on the instrument panel are used. At installation of the equipment the existing battery is modified by the addition of a connector, the two temperature sensing switches are added to a battery bus bar, and interconnecting wiring supplied between the dual switch assembly and added connector. For the M50037 kit, the existing engine out warning horn is also installed with the two light switches in a light switch and horn housing that is added to the instrument panel hood. The wire harness electrically interconnects the lights and added switches on the battery.

13-5. MAINTENANCE OF BATTERY TEMPERATURE SENSING EQUIPMENT. Maintain battery temperature sensing equipment according to Section 19, Basic HMI and using information furnished on figure 13-1. At hourly service intervals specified in HMI Appendix B, perform the following.

a. Perform an operational check of battery temperature sensing equipment; replace lamps with open filaments as required.

b. Inspect electrical wiring for security, physical damage and continuity.

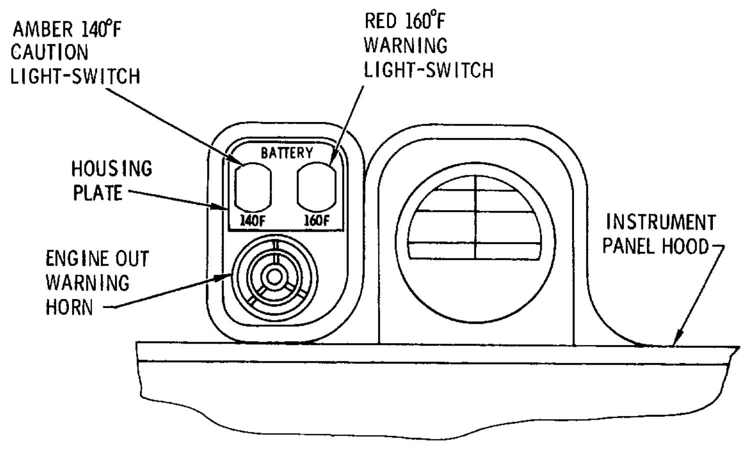
c. Remove low and high temperature sensing switches from battery and check for proper operation using container, oil or water, thermometer and heat source.

(1) Low temperature switch -
Closes on temperature rise at 140 ±8° F;
Opens on temperature decrease at 110 ±8° F.

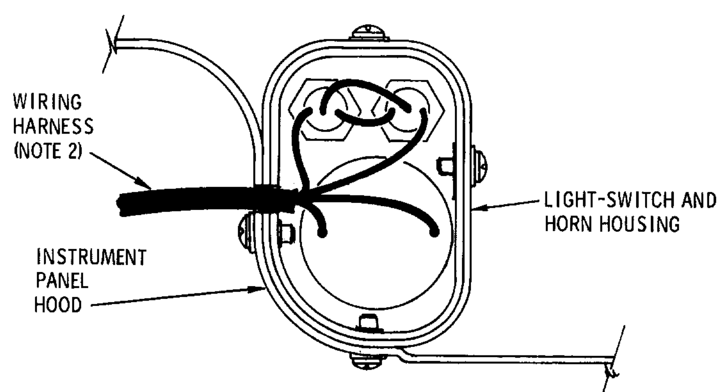
(2) High Temperature switch -
Closes on temperature rise at 160 ±8° F;
Opens on temperature decrease at 130 ±8° F.

NOTES:

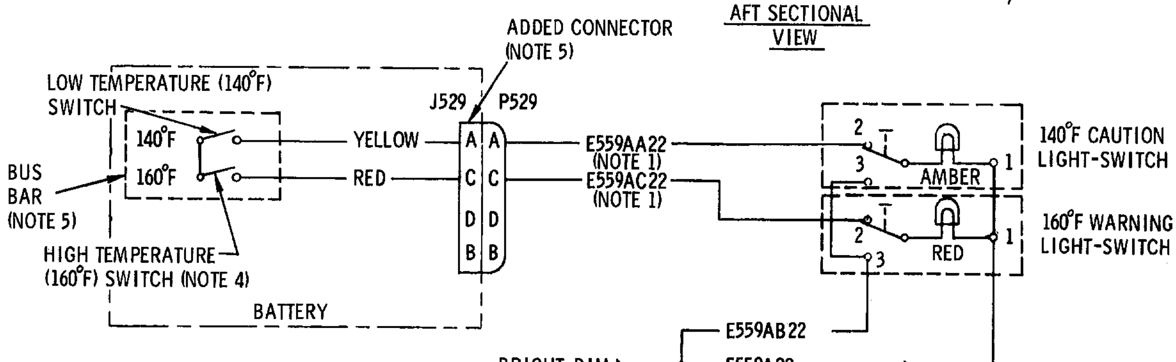
1. PART OF WIRING HARNESS.
2. ROUTE WITH EXISTING WIRING.
3. APPLIES ONLY TO 500S WITH TYPE A INSTRUMENT PANEL (SECTION 17, BASIC HMI) AND INCREASED GROSS WEIGHT CAPABILITY.
4. IDENTIFIED BY RED PAINT MARK ON BUS BAR.
5. SWITCHES INSTALLED IN TAPPED HOLES; SEAL WITH ADHESIVE (ITEM 101, TABLE 2-4, BASIC HMI) AT INSTALLATION.
6. THIS WIRING DIAGRAM SHOULD BE USED WITH APPLICABLE ELECTRICAL SYSTEM WIRING DIAGRAM IN HMI FOR COMPLETE CIRCUIT IDENTIFICATION.
7. SOLID (——) LINE INDICATES ADDED WIRING; DASHED (----) LINE INDICATES EXISTING WIRING.
8. SHEET 1 OF THIS FIGURE APPLIES TO ALL 500 SERIES HELICOPTERS NOT ORIGINALLY EQUIPPED WITH BATTERY TEMPERATURE SENSING EQUIPMENT, EXCEPT AS SPECIFIED IN TEXT. SHEET 2 APPLIES TO 500M HELICOPTER WITH MASTER CAUTION CONTROL UNIT INDICATED, AS SPECIFIED IN TEXT.



FRONT VIEW



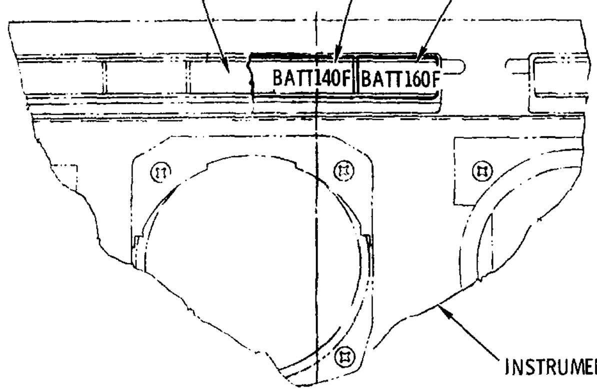
AFT SECTIONAL VIEW



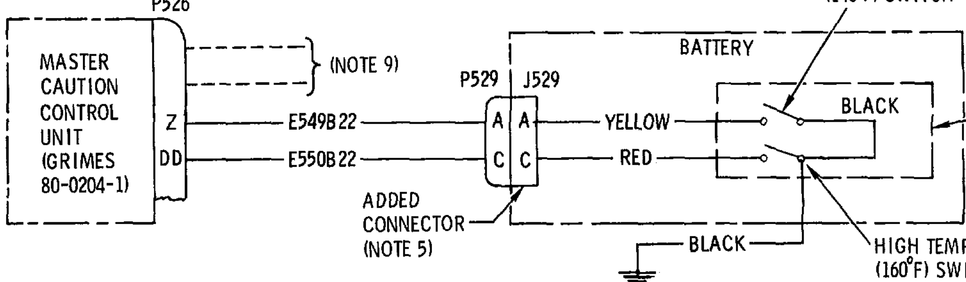
WIRING DIAGRAM (NOTES 6, 8)

37-141-1

Figure 13-1. Battery temperature sensing equipment (sheet 1 of 2)



FRONT VIEW



WIRING DIAGRAM - 500M
(NOTES 6, 8)

NOTES: (CONT)

9. EXISTING WIRING TO EXISTING SPARE LIGHT INDICATORS. (SEE NOTE 6.)
10. ADDED TO EXISTING SPARE LIGHT INDICATOR.

37-141-2

Figure 13-1. Battery temperature sensing equipment (sheet 2 of 2)

13-6. BATTERY COMPARTMENT VENTILATION SCOOP INSTALLATION.

13-7. INSTALLATION PROCEDURE. PN 369H3015 ventilation scoop will provide improved circulation of cooling air in the battery compartment during flight.

a. Remove existing two rivets from station 50.50 rib at locations shown in figure 13-2.

b. Position scoop in place on outer fuselage skin; secure scoop at two rivet holes with Cleco fasteners or equivalent.

c. Using scoop as template, mark and drill No. 41 rivet holes for scoop in fuselage skin. Remove scoop and deburr rivet holes.

d. Position 369H3000-43 doubler in place with outer fuselage skin as shown, and secure with Cleco fasteners or equivalent. Mark and drill remaining five rivet holes in fuselage skin for doubler installation. Also mark 1.62-inch-diameter vent hole in fuselage skin. Remove doubler and deburr rivet holes.

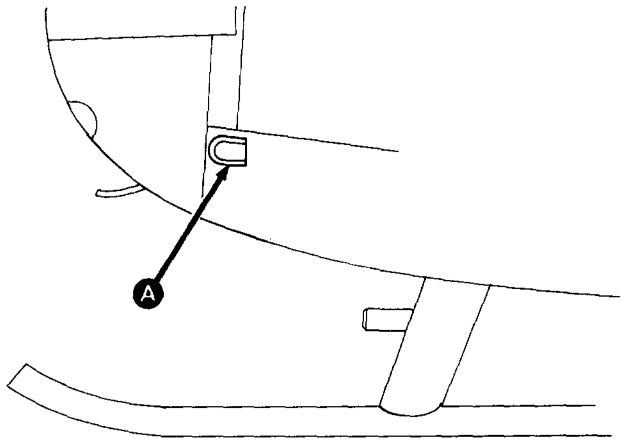
e. Using flycutter or equivalent, cut 1.62-inch-diameter vent hole in fuselage skin.

f. Position doubler in place on interior side of fuselage skin and install with five MS20470AD3-3 rivets. Install rivets with zinc chromate primer.

g. Trim scoop as required to provide clearance with existing rivet pattern, then position scoop in place on exterior side of fuselage skin and install with seventeen MS20470AD3-3 rivets; install rivets with zinc chromate primer.

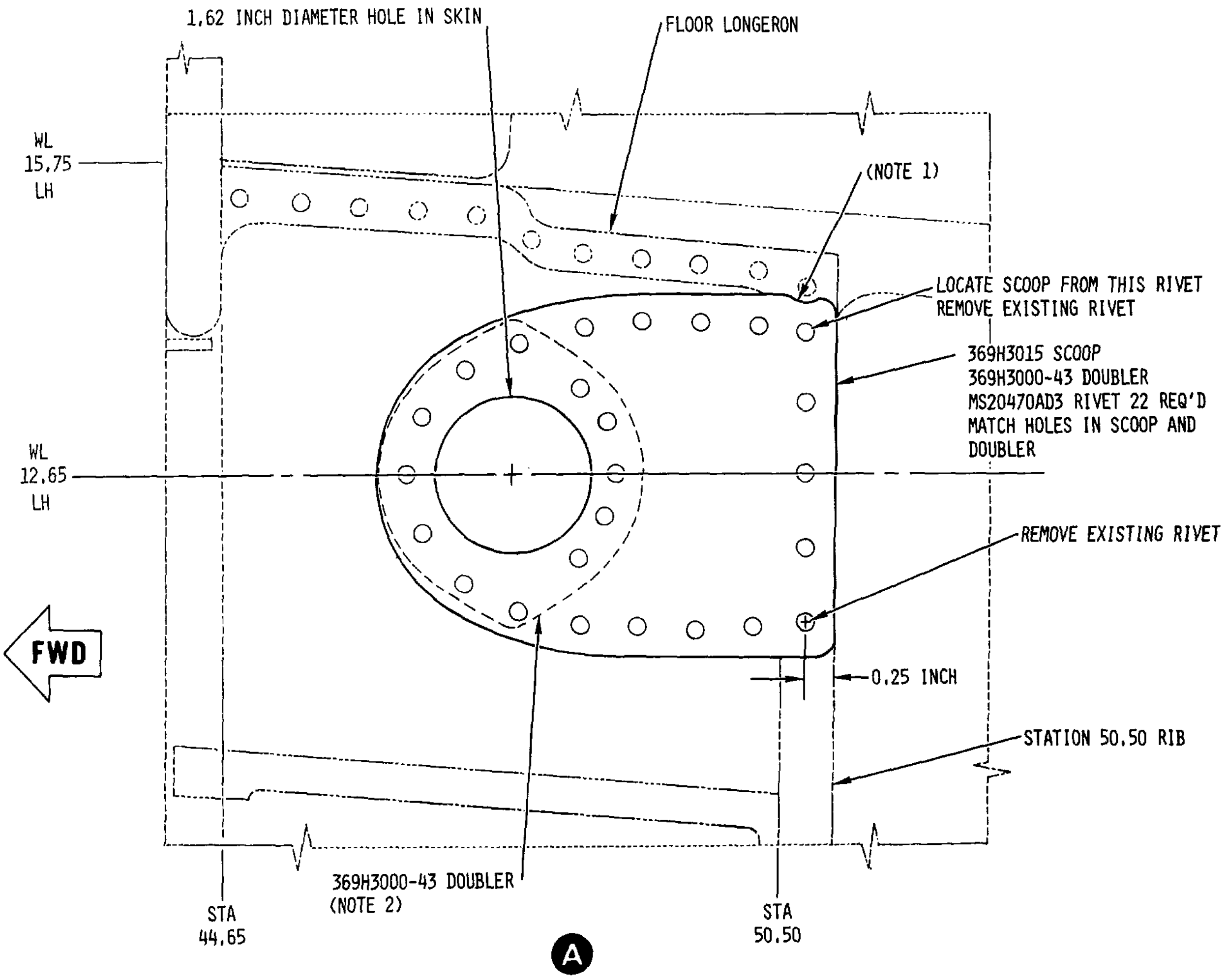
h. Check installation of battery compartment ventilation scoop for discrepancies.

i. Apply color-match paint finish to ventilation scoop per Basic HMI.



NOTES:

1. TRIM SCOOP AS REQUIRED TO PROVIDE CLEARANCE WITH EXISTING RIVET PATTERN.
2. INSTALL DOUBLER ON INTERIOR SIDE OF FUSELAGE SKIN.



37-163

Figure 13-2. Battery compartment ventilating scoop installation