TM 55-1520-211-20

'ARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL

ARMY MODELS UH-1A AND UH-1B HELICOPTER

This copy is a reprint which includes current pages from Changes 1 through 4

ADQUARTERS, DEPARTMENT OF THE ARMY
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Organizational Maintenance Manual

ARMY MODELS UH–1A AND UH–1B HELICOPTERS

TM 55–1520–211–20, 20 January 1966, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 3, section II	3–30A and 3–30B	3–30A and 3–30B
section III	3–49 and 3–50	3–49 and 3–50
Chapter 5, section II	5–21 and 5–22	5–21 and 5–22
sections II and III	5–31 thru 5–34	5–31 thru 5–34F
section IV	5–35 and 5–36	5–35 and 5–36
Chapter 7, section II	7–7 and 7–8	7–7 and 7–8
Chapter 8, section II	8–13 and 8–14	8–13 and 8–14
	8–33 and 8–34	8–33 and 8–34

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

To be distributed in accordance with DA Form 12–31 requirements for Organizational Maintenance Instructions for UH–1A–1B aircraft.

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AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO 27A	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Prior to every armed flight.		
		Make thorough inspection of fuel tank and fuel lines for leaks and the filler cap for proper seal, security and spillage.		
		After washing helicopter.		
1		Pitot-static system for moisture (drain plug removed).		
All Areas		**After the helicopter has been subjected to salt water or salt spray.**		
		Wash entire helicopter with fresh water, inside of engine compartment doors; wash all components which were exposed to salt water; wash engine; make a detail check of all surfaces for corrosion. Apply corrosion preventive compound to exposed non-painted, anodized or cadmium plated assemblies. (Refer to paragraph 1-100.)		
5		**After the helicopter has been operated in the rain**		
		Open engine inlet area and remove upper air filter assembly. Inspect and clean sand and dust separator parts.		
		12 Months		
		Replace cotton seat belt and shoulder harness. (Refer to TM 55-405-3).		
		5 Years		
		Replace nylon and dacron seat belt and shoulder harness. (Refer to TM 55-405-3).		
All Areas		**When available information indicates exposure to radioactivity.**		
		Accomplish the following: (Refer to TM 3-220.) a. Survey helicopter for level of radioactivity. b. Decontaminate helicopter as required.		
2		**Every Twelve Months:** Magnetic standby compass for discoloration of liquid and proper calibration; recompensate if necessary (TM 55-405-3). Turn in first aid kit for inspection per TB AVN10.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27B	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
All Areas		**Upon transfer and upon receipt of an aircraft, upon expiration of twelve months elapsed time since last inventory, and upon placing aircraft in storage and upon removing from storage. (Aircraft need not be inventoried while in storage.)** Inventory aircraft for availability of inventoriable property. (Reference DA Form 2408-17 and Appendix III.)		
All Areas		**After installation, removal or relocation of equipment and/or major modification which results in an unknown change in the basic weight and balance: After report of unsatisfactory flight characteristics.** Weigh helicopter and accomplish necessary entries in the Weight and Balance Data. (DD Forms 365) (Refer to TM 55-405-9.)		

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 5	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
	(9) Turn fuel boost pump switch off, allow approximately 30 seconds to purge air from system, then return switch to ON position.				
	(10) Check hydraulic servo controls for proper operation.				
	(11) Bleed air heater (check operation).				
	e. Check engine fuel system operation. (Only after engine change, after fuel control change, and during Intermediate Inspection.)				
	(1) Set nII speed with GOV RPM INCR/DECR switch		6600		
	(2) Retard throttle to flight idle, then advance and stabilize nI rpm as follows: L-5, -9, -9A, -11 L-13	 70% 72%			
	(3) Position ENGINE GOV switch to EMER for five seconds. (Do not exceed.) Note that indicated nI speed drops as fuel solenoid valve operates				
	(4) Return ENGINE GOV switch to AUTO. Note that indicated nI speed returns and stabilizes as follows: L-5, -9, -9A, -11 L-13	 70% 72%	70%		

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 6	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
8	Engine Acceleration Check. L-5, -9, -9A, -11 only. ***Warning*** Acceleration check not required on UH-1B helicopters equipped with T53-L-13 engines. a. Check anti-icing system by operating the hot air solenoid valve (not applicable if sand and dust separator installed). A slight rise in egt will indicate that system is operating. Turn off system. ***Note*** This check is performed only to ensure that the anti-icing system is operating satisfactorily and that the hot air solenoid valve is closed during the following engine operational checks. b. Set collective pitch to minimum position (flat pitch). ***Note*** On cool days, aircraft may need additional weight to prevent lift-off. c. Advance throttle to full open. d. Set nII rpm selector. e. Retard nI speed and allow to stabilize.		6400 60%		

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
		check for flow of hot air from vent holes at forward engine mounts. Air flow means valve is open. Repair electrical circuit or replace faulty valve ***Note*** Anti-icing system is inoperative when sand and dust separator system is installed.
	Faulty interstage airbleed band; external loss of air	Inspect band for severe bends, damage to teflon, teflon separating from band, and adjustment for proper closure. Repair or replace band if necessary
	Combustion chamber drain valve fails to close; external loss of air	With engine operating, place finger over end of drain line. If air is felt, valve is open; repair or replace
	Low air flow; dirty compressor	Clean engine internally with walnut shell grit
	Faulty exhaust gas temperature gaging system	Check system with Jet-Cal tester; repair or replace faulty wiring or units
	Internal loss of air; damaged first stage turbine nozzle or leaking asbestos seal	Internal inspection and repair of engine combustion section
	Fuel control not properly adjusted	Refer to item 11
17. High exhaust gas temperature during acceleration	All probable causes for same condition in steady-state operation	Refer to item 16
	ENGINE GOV switch in EMER position, or transfer solenoid faulty	Refer to item 9
18. Exhaust gas temperature fluctuating or not indicating	Faulty indicating system	Check indicating system with Jet-Cal tester. Repair wiring or replace faulty units
19. Fluctuating exhaust gas temperature, nI and nII speeds, and torquemeter pressure	Faulty overspeed governor	Replace governor
	Faulty fuel control	Replace fuel control
	Faulty indicating system	Check separate indicating systems; repair or replace faulty parts
20. Slow acceleration	Refer to item 17	Refer to item 17
	Faulty fuel control	Replace fuel control
	Improperly adjusted fuel control	On T53-L-11 series /L-13 engines replace fuel control; on all other engines adjust fuel control
21. Engine surge during acceleration	ENGINE GOV switch in EMER position, or transfer solenoid faulty	Refer to item 9

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Fuel control faulty or not correctly adjusted	Adjust or replace fuel control
	Interstage airbleed malfunction	Check operation. Clear any restriction in air lines. Replace faulty units
	Improper inlet guide vane operation (T53-L-13)	Check inlet guide vane operation
22. Low torquemeter indication	Faulty pressure indicator or transmitter	Check by using direct reading pressure gages at torquemeter and vent connections on engine. Replace faulty units.
	Low nI speed	Refer to item 12
	B C Low torquemeter boost oil pump pressure	Check and adjust torquemeter boost oil pump pressure, by instructions for oil system
	Damaged torquemeter sealing ring	Internal inspection and repair of engine reduction gear section
	Improper inlet guide vane operation on T53-L-13	Check inlet guide vane operation.
23. High torquemeter indication	Faulty pressure transmitter or indicator	Refer to item 22.
	B C Torquemeter valve fails to close	Check torquemeter valve as follows. Remove plug at front of overspeed governor and tachometer drive gearbox. Install fitting, P/N AN919-4D, into torquemeter booster pressure port. Disconnect pressure line at torquemeter transmitter. Apply 100 psi air pressure to installed fitting. No air flow will indicate that valve is functioning properly. If flow is observed, apply 100 psi air pressure to fitting at torquemeter transmitter port on inlet housing. This should free any foreign object and permit valve to close. Apply air pressure alternately to torquemeter booster pump port and torquemeter transmitter port until valve seats properly.
	High nI speed	Refer to item 11.
	Main drive shaft binding	Align drive shaft
	Faulty fuel control	Replace fuel control.
24. Torquemeter response slow	Clogged torquemeter filter	Remove and clean filter
25. No oil pressure	Loose hose connections	Check oil system for leaks
	Oil tank empty or shut-off valve closed	Fill tank. Test valve operation, replace if faulty

1. Accessory Drive Shaft
2. Packing
3. Packing
4. Washer
5. Bolt
6. Accessory Drive Gearbox Assembly
7. Washer
8. Shouldered Bolt
9. Bolt
10. Washer
11. Bolt
12. Washer
13. Packing
14. Screen and Transfer Tube
15. Packing

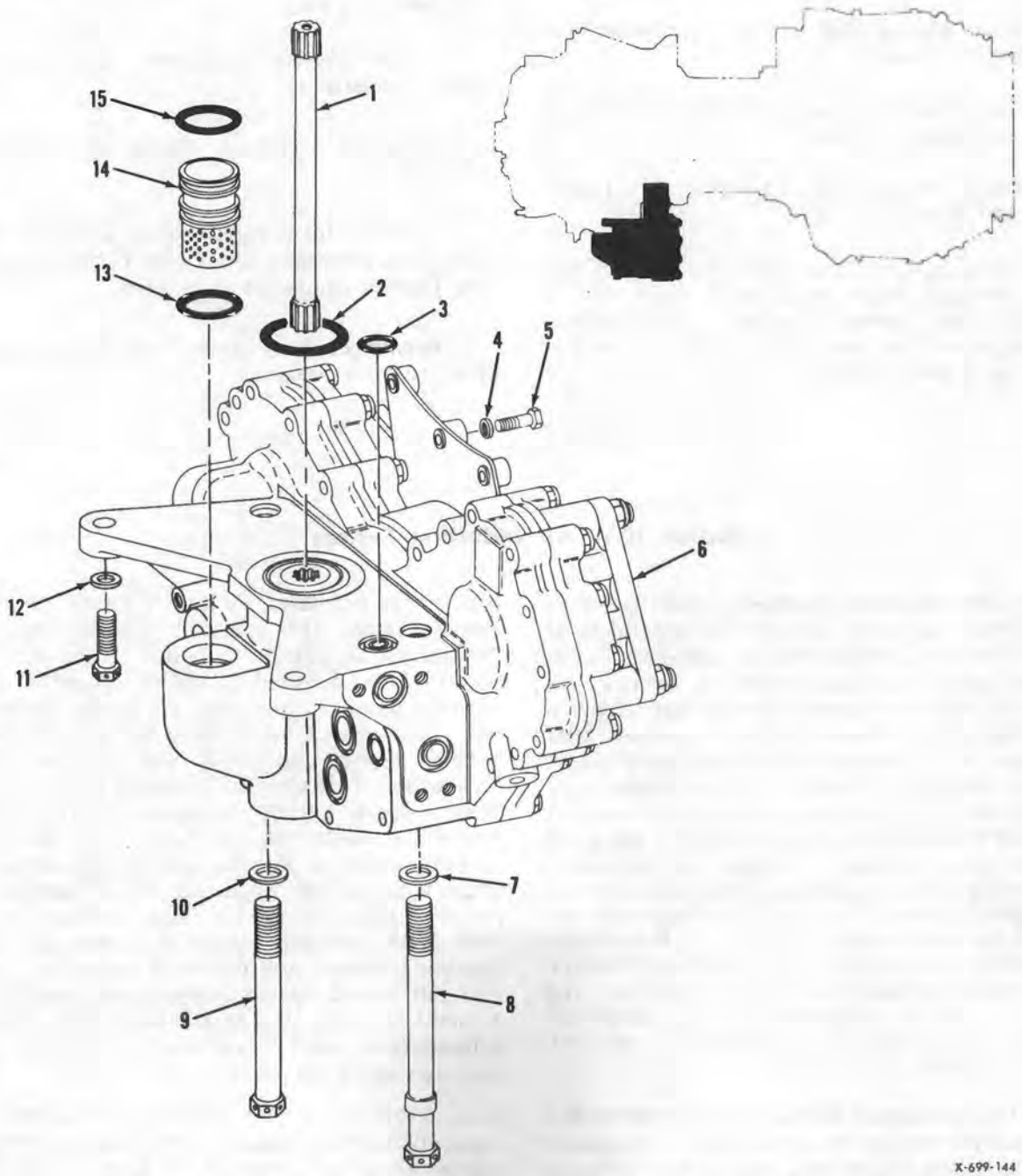


Figure 5-16. Accessory drive gearbox assembly and attaching parts (Typical)

e. Position gearbox on engine, ensuring that drive shaft drops and meshes with gearbox.

f. Carefully raise gearbox, inserting exposed end of drive shaft into inlet housing until the spline meshes with accessory drive gear and the gearbox mates with inlet housing.

g. Place washer (7) on shouldered bolt (8). Insert bolt and finger tighten.

h. Place washer (10) on bolt (9). Insert bolt and finger tighten.

i. Place washers (12) on bolts (11). Insert bolts and finger tighten.

j. Place washers (4) on bolts (5). Insert bolts and finger tighten.

k. Using ¼-inch drive extension and ratchet, turn gearbox tachometer drive gear. Check through inlet housing to ensure that compressor rotor is turning. This indicates proper meshing of drive shaft.

l. Tighten bolts (8 and 9) to 400 to 475 inch-pounds torque.

m. Tighten bolts (11) to 250 to 325 inch-pounds torque.

n. Tighten bolts (5) to 100 to 120 inch-pounds torque.

o. Lockwire bolts.

p. Install starter generator and nI tachometer generator.

q. Install fuel control. (Refer to paragraph 5-254F.)

r. Connect inlet guide vane actuator seal drain hose assembly to adapter fitting on gearbox. Tighten connector as required.

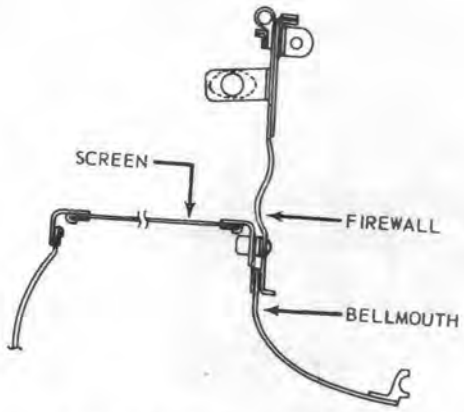
s. Reconnect hose assemblies to accessory drive gearbox assembly.

Section III — Air Induction System

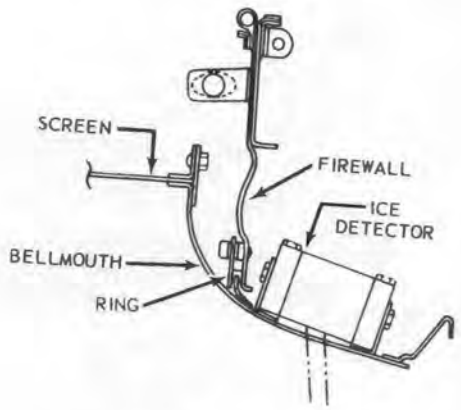
5-48. Air Induction System. (See figure 5-17.) Engine intake air enters through inlets at top of forward cowling into an induction baffle, consisting of panels assembled to form a box partially enclosing area between rear of pylon supports and forward firewall around inlet opening. A ring-shaped intake screen of coarse wire mesh covers front end of an intake bell-mouth, which is mounted in central opening of forward firewall and clamped on outer flange of engine inlet housing. A flange and gasket on bell-mouth forms a slip-joint seal with firewall. On UH-1A, screen is mounted on front and bell-mouth on rear of firewall. On UH-1B and UH-1C, bellmouth extends forward through firewall, has mounting brackets for ice detector, and screen is attached directly on its front end flange. (If sand and dust separator is installed, refer to paragraph 5-53A.)

5-49. *Engine Internal Airflow.* (See figure 5-18.) Air entering engine passes through compressor and is routed to several paths for different uses: (1) Anti-icing air is diverted at exit from centrifugal impeller into an annular chamber in its housing, to flow forward to inlet housing area. (2) Internal cooling and seal pressurization air is supplied from diffuser manifold and directed by baffles, deflectors, and internal passages to cool power shaft, compressor rotor sleeve, both faces of gas producer turbine wheel, and front face of power turbine wheel. This air also is routed to pressurize controlled-gap carbon or positive contact seals which are located behind No. 1 main bearing, at both sides of No. 2 main bearing on compressor rotor, and ahead of No. 3 bearing on power turbine shaft. (3) Main portion of air flow from diffuser manifold surrounds combustion chamber and enters it through a complex pattern of scoops, louvers, slots and holes to combine with fuel in combustion, to act as a flame-fence, and for sufficient cooling to prolong service life of parts.

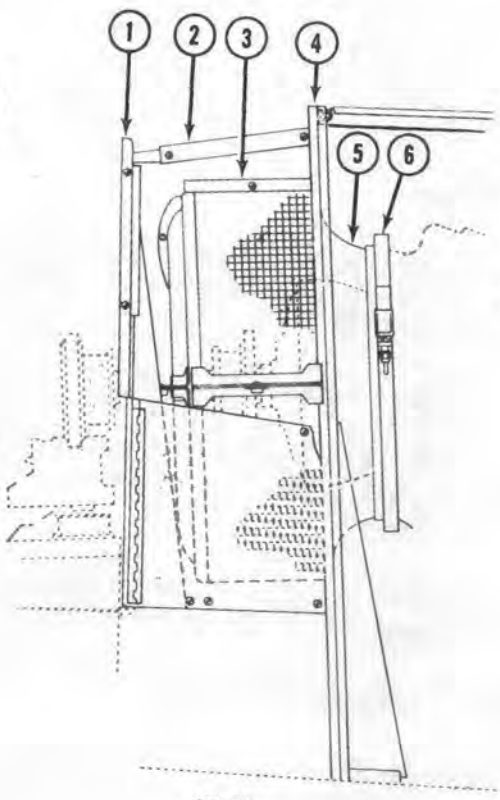
5-50. Atmospheric air, entering between exhaust diffuser and support cone, passes through hollow struts of exhaust diffuser to cool No. 3 and 4 bearing housing and rear face of power turbine wheel.



CROSS SECTION UH-1A
TOP CENTER OF FIREWALL

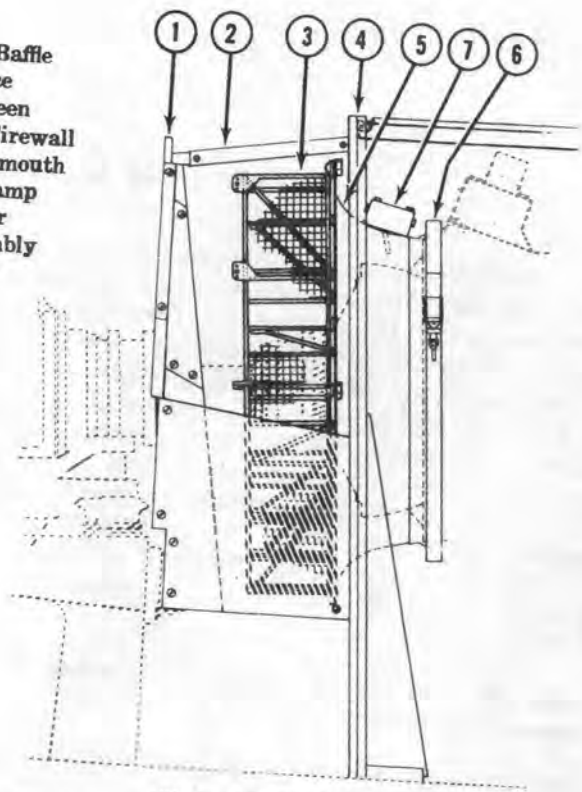


CROSS SECTION UH-1B
TOP CENTER OF FIREWALL



UH-1A

1. Induction Baffle
2. Baffle Brace
3. *Intake Screen
4. Forward Firewall
5. *Intake Bellmouth
6. V-Band Clamp
7. *Ice Detector
8. Ring Assembly
9. Baffle Door



UH-1B AND UH-1C

Note

*These items removed on UH-1B and UH-1C helicopters when sand and dust separator system is installed.

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Figure 5-17. Engine air induction areas

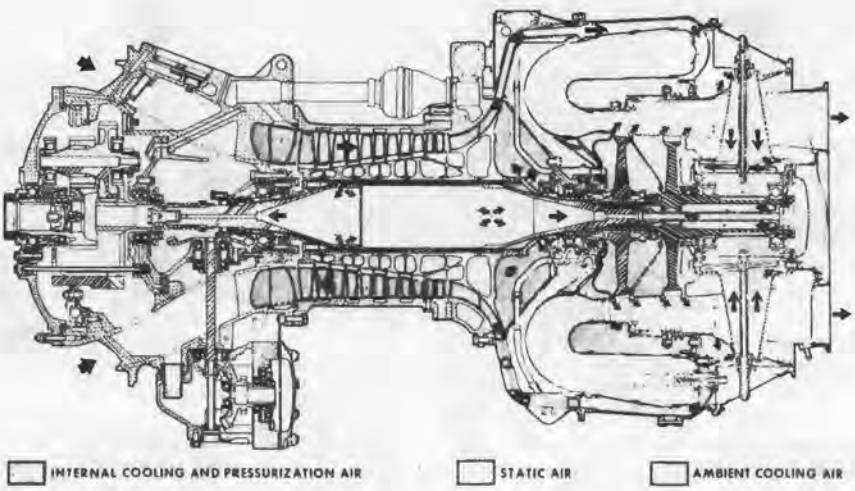


Figure 5-18. Engine internal air flow diagram

5-51. Portions of engine compressor air are also used for other purposes, which are more fully discussed in instructions for applicable systems. In brief: (1) Anti-icing air is diverted, when needed, to flow forward through an external valve and tube to inlet housing area. (2) Bleed air is taken off through an external hose to drive the oil cooling system blower. (3) On UH-1B and UH-1C, an interstage or acceleration airbleed system allows regulated escape of some air through ports at last stage of axial compressor during certain phases of engine operation.

5-52. *Removal — Intake Baffles, Screens, and Bellmouth.* (See figure 5-17.)

a. Open or remove forward cowling and engine cowling.

b. Remove access sections at upper left of intake screen and forward induction baffle panel by releasing fasteners.

c. Remove main drive shaft between engine and transmission. (Refer to paragraph 7-8.)

d. Remove induction baffle brace and panels by releasing fasteners from brackets on firewall and pylon supports.

e. Remove intake screen.

A (1) Remove 18 screws around bellmouth at aft side of firewall to remove screen assembly from front of firewall.

B C (2) Remove screws to detach screen assembly from front end of intake bellmouth.

f. Remove intake bellmouth.

A (1) Remove V-band clamp which secures bellmouth to ffange of engine inlet housing. Withdraw bellmouth from front side of firewall.

B C (2) Disconnect and remove ice detector. (Refer to paragraph 11-293.) Remove V-band clamp to release bellmouth from engine inlet housing. Remove screws with washers from

back of firewall to release retainer ring and bellmouth. Lift bellmouth and tilt lower flange forward to withdraw assembly forward out of firewall.

g. Install protective covers on engine inlet.

5-52A. ***Inspection — Intake Bellmouth, Screen and Baffles.*** a. Use a strong light beam to visually inspect inlet air ducts for oil streaks, foreign material, foreign object damage, cleanliness and oil seal leaks.

Caution

Look for accumulations of dirt conforming to contour of air inlet. Build-up of foreign material may escape the attention of inexperienced personnel because of windswept contour it assumes.

b. Visually inspect inlet guide vane through air inlet ducts for foreign material and foreign object damage.

Note

In critical environment areas where operational experience shows grass and foliage blockage to be a problem, it is recommended that this inspection be performed before each flight.

5-52B. ***Repair or Replacement—Intake Bellmouth, Screen and Baffles.*** Remove all deposits, dirt and obstructions. Replace severely damaged components.

5-53. ***Installation — Intake Bellmouth, Screen and Baffles.*** a. Check condition of flanges, gaskets and seals on intake bellmouth and screen.

b. Remove protective covers from engine inlet.

c. Insert bellmouth through firewall from front, align to mating flange on engine inlet housing, and secure temporarily with V-band clamp. On UH-1B and UH-1C, position ice detector mounting provisions at top.

d. Attach bellmouth and screen.

A (1) Position screen, with access opening at upper left, on front of firewall. Install 18 screws from back of firewall.

BC (2) Position bellmouth ring on front of firewall. Install screws, with thin washers under heads, from back of firewall. Position screen, with access opening at upper left, on front flange of bellmouth and secure with screws.

(3) On all models, before fully tightening screws, loosen V-band clamp and make sure bellmouth is properly aligned on inlet housing flange. Tap around clamp with soft mallet, from middle toward each end, to seat securely while tightening with 40 to 50-inch-pounds torque on clamp bolt nut. Lockwire nut. Complete tightening of screws through firewall.

e. Assemble and install induction baffle panels, securing fasteners to brackets on firewall and pylon supports. Install brace between top of forward panel and firewall.

f. Install engine-to-transmission drive shaft. (Refer to paragraph 7-12.) Install access sections of baffle and screen.

BCg. Install and connect ice detector. (Refer to paragraph 11-295.)

h. Close cowling.

5-53A. Air Induction System. (See figures 5-17A through 5-17C.) When MWO 55-1520-211-30/35 is incorporated on UH-1B and UH-1C helicopters, the engine inlet air section draws air in through three baffle screen filter sections. A sand and dust separator unit, mounted on the inlet housing, separates sand and dust particles from the air entering the engine. This reduces erosion of engine parts.

5-53B. ***Air Inlet Filter.*** The air inlet filter consists of three baffle screen filter units and supporting frames and brackets. (See figure 5-17B.)

5-53C. ***Removal — Air Inlet Filter.*** Proceed as follows:

a. Open engine and transmission fairing.

b. Remove eight screws (9) and eight washers (10) securing top screen filter (11) to frame (12). Lift filter, clamps (1), and clevis (2) as a unit clear of frame.

c. Remove 11 screws (13) and 11 washers (14) securing each side screen filter (15) to frames (16). Lift side screen filters clear.

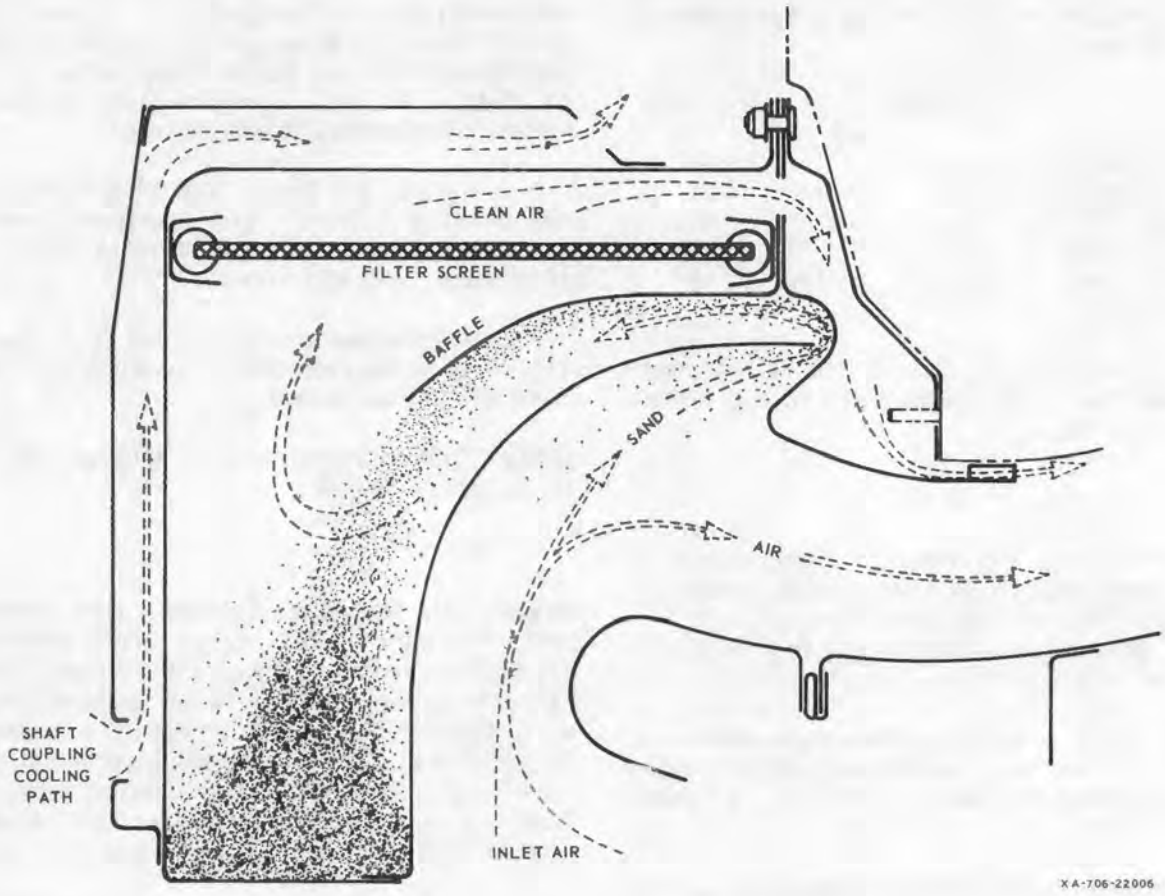
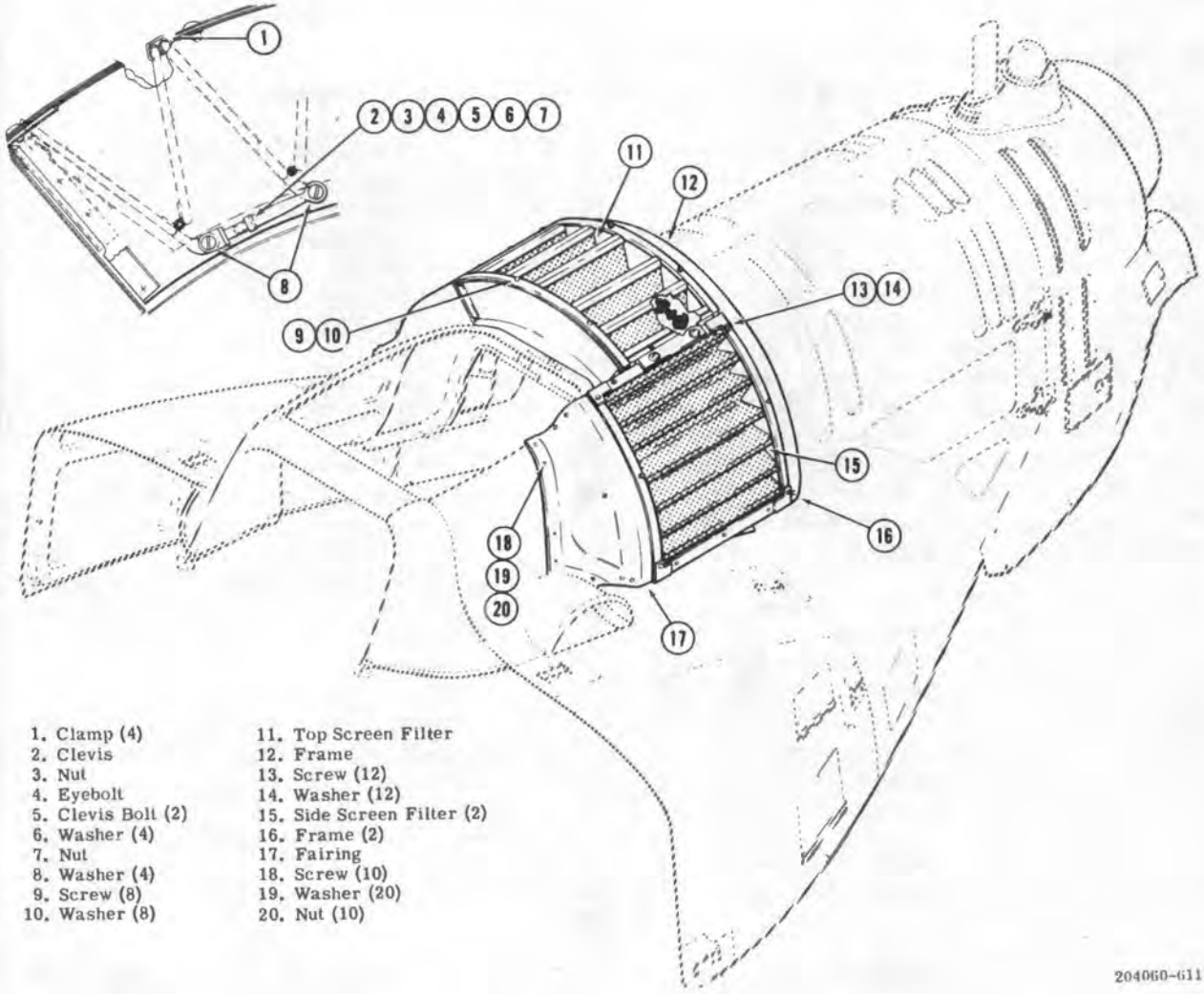


Figure 5-17A. Diagram of air flow paths



1. Clamp (4)
2. Clevis
3. Nut
4. Eyebolt
5. Clevis Bolt (2)
6. Washer (4)
7. Nut
8. Washer (4)
9. Screw (8)
10. Washer (8)
11. Top Screen Filter
12. Frame
13. Screw (12)
14. Washer (12)
15. Side Screen Filter (2)
16. Frame (2)
17. Fairing
18. Screw (10)
19. Washer (20)
20. Nut (10)

Figure 5-17B. Air inlet filter

d. Protect induction area from entry of dirt and foreign objects while filters are not in place.

5-53D. *Clearing — Air Inlet Filters.* Wash filters in a water solution of detergent soap. Flush from inside with clear water. Allow filters to drain and air dry thoroughly. Do not use compressed air for drying.

5-53E. *Inspection — Air Inlet Filters.* Examine filter assemblies for visible damage or shifting of filter material from normal position. Check condition and security of seals around edges.

5-53F. Sand and Dust Separator. The sand and dust separator is an inertial type particle separator made in two halves. Engine inlet air enters the separator through a curved, annular, radial inflow opening. Particles entering with the air are pulled out of the airstream, and follow along the curved inner wall. (See figure 5-17A.) A lip extending into the airstream deflects the particle-laden air into a large chamber, where the air velocity decreases. The larger particles in the air settle in the chamber, finer particles are removed as the air is drawn through a 230-mesh screen on the filter assembly. Removed particles are held in box assemblies which contain porous plastic foam inserts. The box assemblies can be easily removed and cleaned. Other components used with the sand and dust separator are ENG AIR FILTER CONT circuit breaker on overhead console, an engine air differential pressure switch on the firewall, and an ENGINE INLET AIR warning light on the instrument panel.

5-53G. *Removal — Sand and Dust Separator.* (See figures 5-17, 5-17B, and 5-17C.) Proceed as follows:

a. Open transmission fairing and remove right and left access doors. Remove air inlet filter screens from fairing. (Refer to paragraph 5-53C.)

b. Remove baffle door (9, figure 5-17). Remove top section of forward induction baffle by releasing fasteners.

c. Remove remaining sections of induction baffle.

Caution

Do not attempt to open catch without safety latch.

d. Release latches (21 and 23, figure 5-17C) on front and rear faces of air filters (1 and 19). Press safety latch up and hold before attempting to pull on release catch. (See View A.)

e. Release fasteners (6) at top of upper assembly air filter and remove assembly.

f. Remove gasket assemblies (10 and 11).

Caution

Filter assemblies shall be pulled vertically or inboard, maintaining form of curve. Pull on hard plastic tab provided at each end adjacent to screening. Handle assemblies with care to prevent damage to screen.

g. Remove filter assemblies (12). Push on one end while pulling at other end.

h. Using tab on box for fingerhold, remove box assemblies (13 through 16) from lower assembly air filter.

i. Remove main drive shaft as a complete assembly, and engine coupling adapter from engine and transmission. (Refer to paragraph 7-8.)

j. Remove nuts (17) and washers (18). Remove lower assembly air filter (19) and deflector assembly (28).

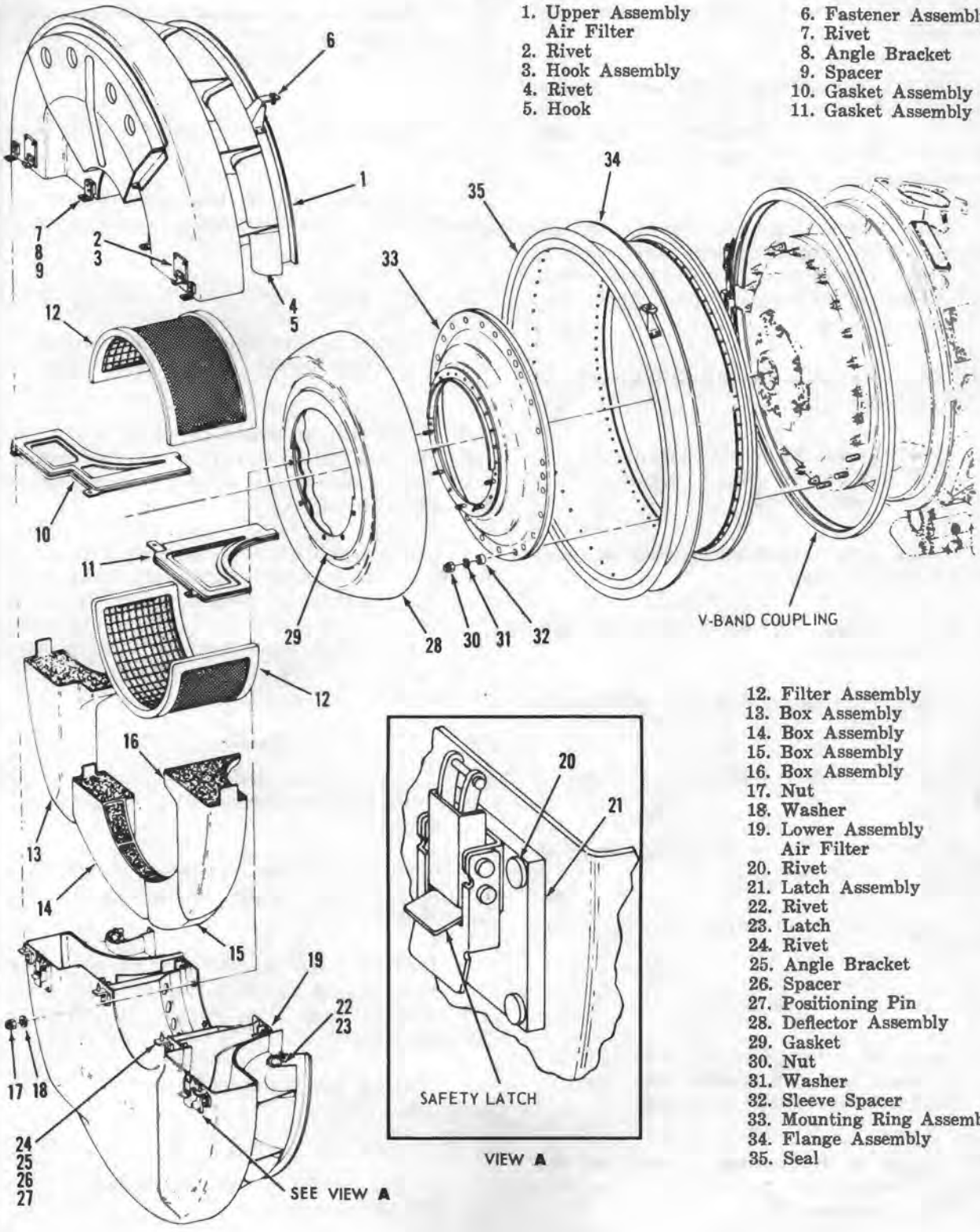
k. Remove nuts (30), washers (31), and spacers (32). Remove ring assembly (33). Loosely install spacers, washers, and nuts on engine.

l. Remove washers, screws, and split ring assembly (8, figure 5-17) that secure flange assembly (34, figure 5-13C) to firewall. Loosen V-band coupling clamp and remove flange assembly.

m. Cover front of engine inlet housing to keep out dirt and foreign objects.

5-53H. *Cleaning — Sand and Dust Separator.* (See figure 5-13C.) Clean as follows:

a. Empty box assemblies (13 through 16) of sediment and moisture. Wash mud from plastic box and foam insert with water. Shake off



1. Upper Assembly Air Filter
2. Rivet
3. Hook Assembly
4. Rivet
5. Hook
6. Fastener Assembly
7. Rivet
8. Angle Bracket
9. Spacer
10. Gasket Assembly
11. Gasket Assembly
12. Filter Assembly
13. Box Assembly
14. Box Assembly
15. Box Assembly
16. Box Assembly
17. Nut
18. Washer
19. Lower Assembly Air Filter
20. Rivet
21. Latch Assembly
22. Rivet
23. Latch
24. Rivet
25. Angle Bracket
26. Spacer
27. Positioning Pin
28. Deflector Assembly
29. Gasket
30. Nut
31. Washer
32. Sleeve Spacer
33. Mounting Ring Assembly
34. Flange Assembly
35. Seal

204060-612

Figure 5-17C. Sand and dust separator — exploded view

excess water. Allow to air-dry or wipe with clean cloth.

b. Remove and sand or water accumulation from well of lower assembly air filter (19). Wipe the well with a clean cloth. When filter assemblies (12) are in place, use care to prevent damage to the screen.

c. Shake filter assemblies (12) to remove loose dirt from screen. If necessary, wash in clean water, and scrub with soft-bristle brush. Shake off excess water; allow to air-dry or wipe with clean cloth.

5-53J. *Inspection — Sand and Dust Separator.* Inspect as follows:

a. Inspect gasket assemblies (10 and 11, figure 5-13B) for rubber severe separation from backing plate and for cuts.

b. Inspect gasket on mounting ring assembly (33) for cuts or looseness.

c. Inspect gasket (29) on deflector assembly for cuts or looseness.

d. Inspect filter assemblies (12) for tears in screen.

e. Inspect for loose rivets on air filters (1 and 19).

f. Inspect seal (35) on mounting flange assembly for cuts or looseness.

g. Inspect all metal parts for cracks and damage.

Note

Cracks in metal parts are acceptable provided there is little chance of fractured segments entering engine.

5-53K. *Repair or Replacement — Sand and Dust Separator.* Replace all parts that do not meet inspection requirements.

5-53L. *Installation — Sand and Dust Separator.* Install the separator on the inlet housing of the engine in the following manner. (See figure 5-17C.)

a. Remove cover from front of engine inlet housing.

b. Wipe inlet housing clean with cloth moistened with dry cleaning solvent (item 302, table 1-1).

c. Place ring assembly (8, figure 5-17) around flange assembly (34, figure 5-17C) and install flange in position on inlet housing of engine. Secure loosely with V-band coupling clamp.

d. Using ring assembly (8, figure 5-17), secure forward section of flange assembly to firewall. Insert screws and washers from rear of firewall to secure ring.

e. Install mounting ring assembly (33, figure 5-17C) on 24 studs of engine inlet housing so that the five studs on the ring assembly are at the bottom with center stud at 6 o'clock position. Secure with sleeve spacers (32), washers (31), and nuts (30). Torque nuts to 70 to 80 inch-pounds.

Caution

Carefully install deflector assembly to avoid cutting rubber seal of ring assembly.

f. Position deflector assembly (28) in place on the five ring assembly studs, and press in until firmly seated.

g. Position lower assembly air filter (19) on five studs of ring assembly. Secure with washers (18) and nuts (17). Torque nuts to 30 to 35 inch-pounds.

h. Position upper assembly air filter (1) on lower assembly.

Note

Do not install gasket assemblies (10 and 11) at this time.

i. Rotate mounting flange assembly (34) on inlet housing and ring assembly to align receptacles with fasteners (6) on filter assembly. Secure flange assembly with V-band coupling. Torque coupling nut to 40 to 50 inch-pounds. Tap around coupling from middle toward each end with mallet to set properly. Lockwire nut.

j. Tighten screws to secure flange assembly to firewall.

k. Remove upper assembly air filter.

l. Install engine coupling adapter in output shaft of engine. Torque bolt to 100 to 140 inch-pounds.

m. Install main drive shaft between engine and transmission. (Refer to paragraph 7-11.)

n. Install baffle panels. (Refer to paragraph 5-53.)

o. Install filter assemblies (12, figure 5-17C) in upper and lower assembly air filters, with backing screen on inside diameter. The filters should protrude equally at each end. If necessary, lubricate tracks with trichloroethylene (item 306, table 1-1).

Caution

Do not use oil or grease in track when installing screen filter assemblies. Push from back end while pulling into position.

p. Install four box assemblies (13 through 16) into lower assembly air filter.

q. Position gasket assemblies (10 and 11) over pins on lower assembly air filter.

r. Position upper assembly air filter on lower assembly air filter. Tilt top slightly forward to place on four positioning pins (27) first.

s. Secure air filter to flange assembly with fasteners (6) at top.

t. Engage latches (21) on front face of air filters; then lock.

Caution

Secure front latches before securing rear latches.

v. Engage latches (23) at rear of air filters; then lock.

Caution

Ensure that safety latch on latches is engaged by exerting a slight pull on release catch. Catch will not open. (See view A, figure 5-17C.)

w. Check for proper seating by appearance of seals. Approximately 1/8 inch of rubber on gasket assemblies will be uniformly exposed. Seal (35) on flange will be approximately half compressed.

x. Install baffle door (9, figure 5-17) and secure.

y. Secure engine and transmission cowling.

Section IV — Exhaust System

5-54. Exhaust System. Engine exhaust diffuser has inner and outer housings, separated by hollow struts across exhaust passage. Inner housing, which supports turbine assembly, is capped either by a tailcone on UH-1A through Serial No. 58-3047 or by a cover plate on UH-1A Serial No. 59-1607 and subsequent, and all UH-1B helicopters. (See figure 5-19.) A tailpipe, clamped on outer diffuser flange, directs hot exhaust gases aft and slightly up away from tail boom. Pipe has a drain hose from lowest point and, on UH-1B only, a flanged inlet on right side for connection of starter cooling air discharge duct. A support cone, around diffuser, provides mounting for rear firewall.

5-55. *Removal — Exhaust Tailpipe.* a. Through small access door at lower left on tailpipe fairing, disconnect antenna and anti-collision light wiring at deck connectors. Open section of drive

shaft access door which overlaps end of tailpipe fairing. Release fasteners and remove fairing.

b. Disconnect drain hose at coupling on tail boom.

Bc. On UH-1B, detach starter cooling duct from flanged neck on right side of tailpipe by removing V-band clamp.

d. Remove V-band clamp from mating flanges of engine exhaust diffuser and tailpipe. Lift off tailpipe.

e. To remove tailcone or cover plate from inner housing flange, cut lockwire and remove eight bolts.

f. Protect exhaust diffuser opening with fabric cover normally used on tailpipe.

5-56. *Inspection — Exhaust Tailpipe.* Inspect exhaust tailpipe for damage. Allowable damage is limited to small dents, shallow scratches, and small cracks which are away from connecting flange and which do not allow exhaust gasses to leak through and overheat structure. Overheated structure can be detected by discoloration.

5-57. *Repair or Replacement — Exhaust Tailpipe.* Replace tailpipe if damage exceeds inspection limits.

5-58. *Installation — Exhaust Tailpipe.* a. Remove protective cover from engine exhaust diffuser.

b. Position tailcone or cover plate over center opening of diffuser. Install eight bolts through cone or cover into captive nuts of mounting flange, using anti-seize compound

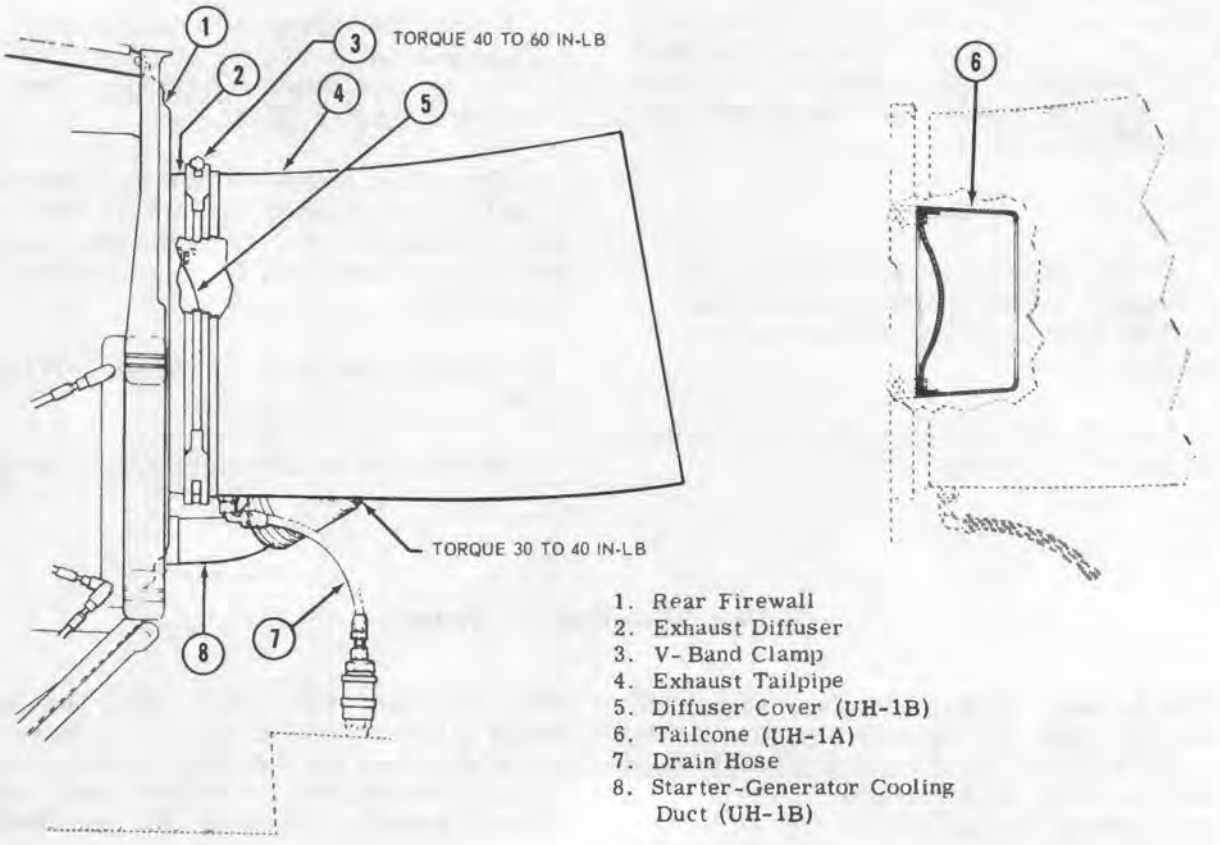


Figure 5-19. Exhaust tailpipe installation

Section II — Main Drive Shaft

7-7. Main Drive Shaft. (See figure 7-3.) A main drive shaft with crowned tooth couplings is installed between an adapter on engine output shaft and the freewheel coupling of transmission input drive quill. Two coupling clamp sets, of split V-band type, hold mating curvic faces of couplings in secure contact. Flexibility of couplings is provided by crowned tooth coupling sliding in splined teeth of outer coupling to accommodate movement of transmission on pylon mounts. On UH-1B, a spring in each coupling assists centering of shaft during operation, and tends to hold shaft assembly in place if clamps are removed during maintenance.

7-8. Removal — Main Drive Shaft. (See figure 7-3.) a. Open cowling on left side of pylon. Remove upper left sections of engine air intake baffle (14), and screen (15).

b. Remove coupling clamps (1) at each end of shaft, keeping parts together as sets after removal.

c. Push shaft (6) toward either end to shift one coupling inward and disengage coupling at opposite end. Remove shaft assembly.

Note

On Model UH-1B, apply enough force to compress springs in couplings.

d. To remove engine shaft adapter: Remove lockwire, retaining bolt (7), and washer (8). Pull adapter (9) out of engine output shaft.

7-9. Cleaning — Main Drive Shaft. a. Clean shaft assembly, adapter, and attaching parts by wiping with clean cloth. For external parts and surfaces only, cloth can be moistened with cleaning solvent (item 302, table 1-1).

Note

Do not use cleaning solvent (item 302, table 1-1) inside shaft couplings.

b. Remove all grease from inner and outer couplings.

7-10. Inspection and Lubrication — Main Drive Shaft Couplings. (See figures 7-3, 7-4 and 7-5, 7-6 and 7-7.) Check and lubricate couplings on main drive shaft at prescribed inspection interval.

a. Place shaft assembly in a suitable cradle.

b. Open either coupling by removing spiral lock-ring (2, figure 7-3) and retainer (3) with O-ring seal (4). On UH-1B, hold retainer against pressure of spring (5) while removing lock-ring, then remove retainer and spring.

c. Move outer coupling inward on shaft until male-splined inner coupling is disengaged and clear of outer coupling. Take necessary precautions to avoid surface damage to shaft while coupling is disassembled.

d. Remove all old grease from inner and outer couplings.

e. Inspect each spline tooth of inner coupling for excessive wear. (See figure 7-4 for UH-1A or figure 7-5 for UH-1B.) If coupling is worn beyond acceptable limits as illustrated, replace drive shaft and tag unserviceable assembly for overhaul by higher maintenance level.

f. Check to see if the lock spring can be seen in one of the aligning holes. Check the nut for security. (See figure 7-6, detail A.)

g. If coupling is in serviceable condition, check that inner and outer couplings are clean before reassembly. Also check area on outer coupling over which O-ring must pass to reach its groove, and remove any burrs or sharp edges by careful use of a fine Arkansas hand stone. (See figure 7-6, detail B.)

h. Apply a thin layer of grease on inboard surface of male (inner) coupling, using lubricant (item 9, table 1-1). (See figure 7-6, detail C.) Mate parts and move outer coupling to full outward position, with inner coupling bottomed. (See figure 7-6, detail D.)

i. Place a new O-ring seal (4, figure 7-3) in groove around retainer (3). Apply a coating of grease on O-ring. (See figure 7-6, details I and J.)

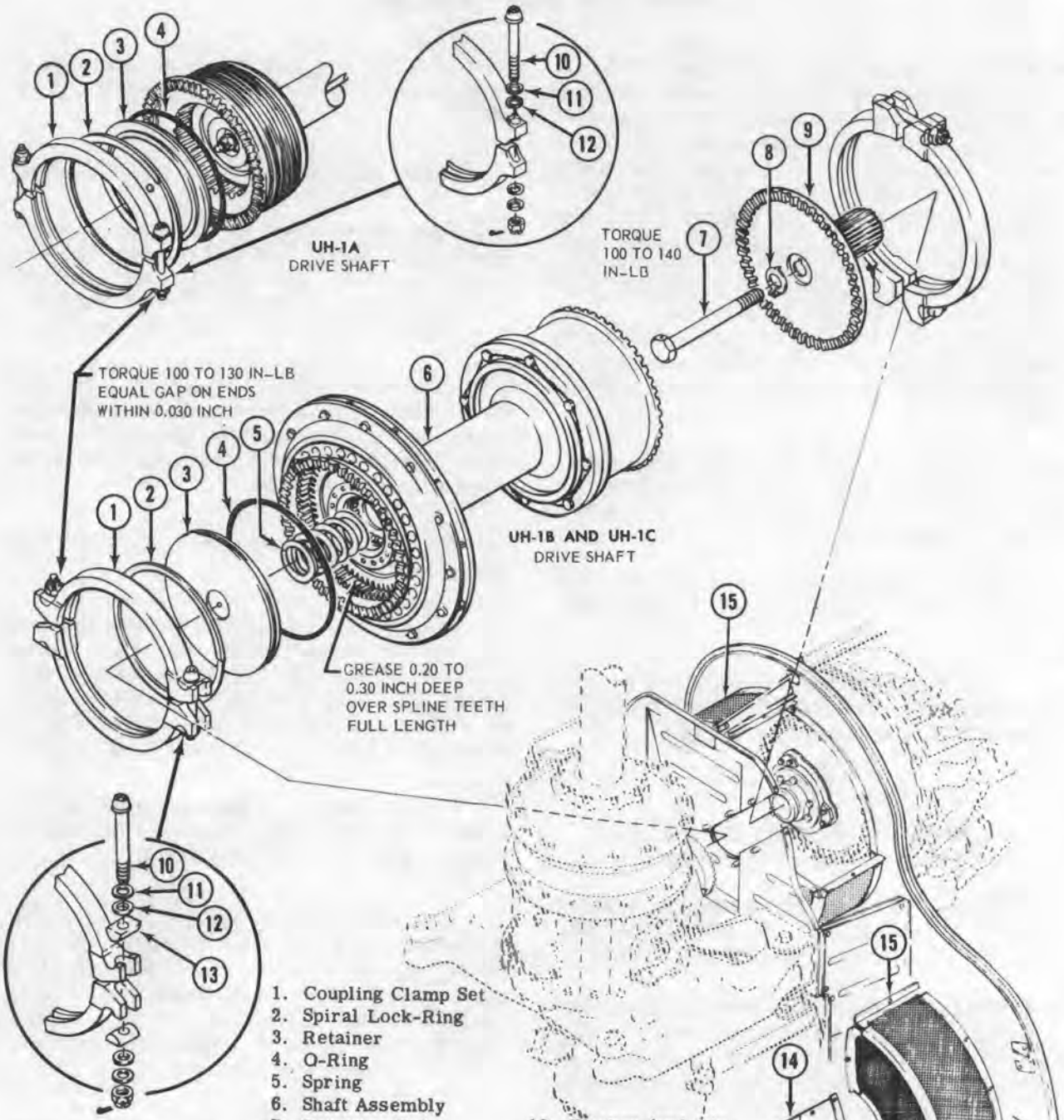


Figure 7–3. Main drive shaft

d. Attach damper control tube to damper arm. Refer to paragraph 8-33 for instructions relative to adjusting damper control tube.

8-27. Stabilizer Bar Dampers (UH-1A). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-28. Removal — Stabilizer Bar Dampers (UH-1A). a. Disconnect control tubes from lever arms.

b. Remove retainer ring adapter bolts (2, figure 8-7) and slide damper and adapter assembly from mast.

Caution

Refer to CAUTION notes, paragraph 8-31 on handling dampers after removal.

8-29. Inspection — Stabilizer Bar Dampers (UH-1A). Inspect dampers for damage, security, leakage and proper timing.

8-30. Repair or Replacement — Stabilizer Bar Dampers (UH-1A). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-29.)

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-33.)

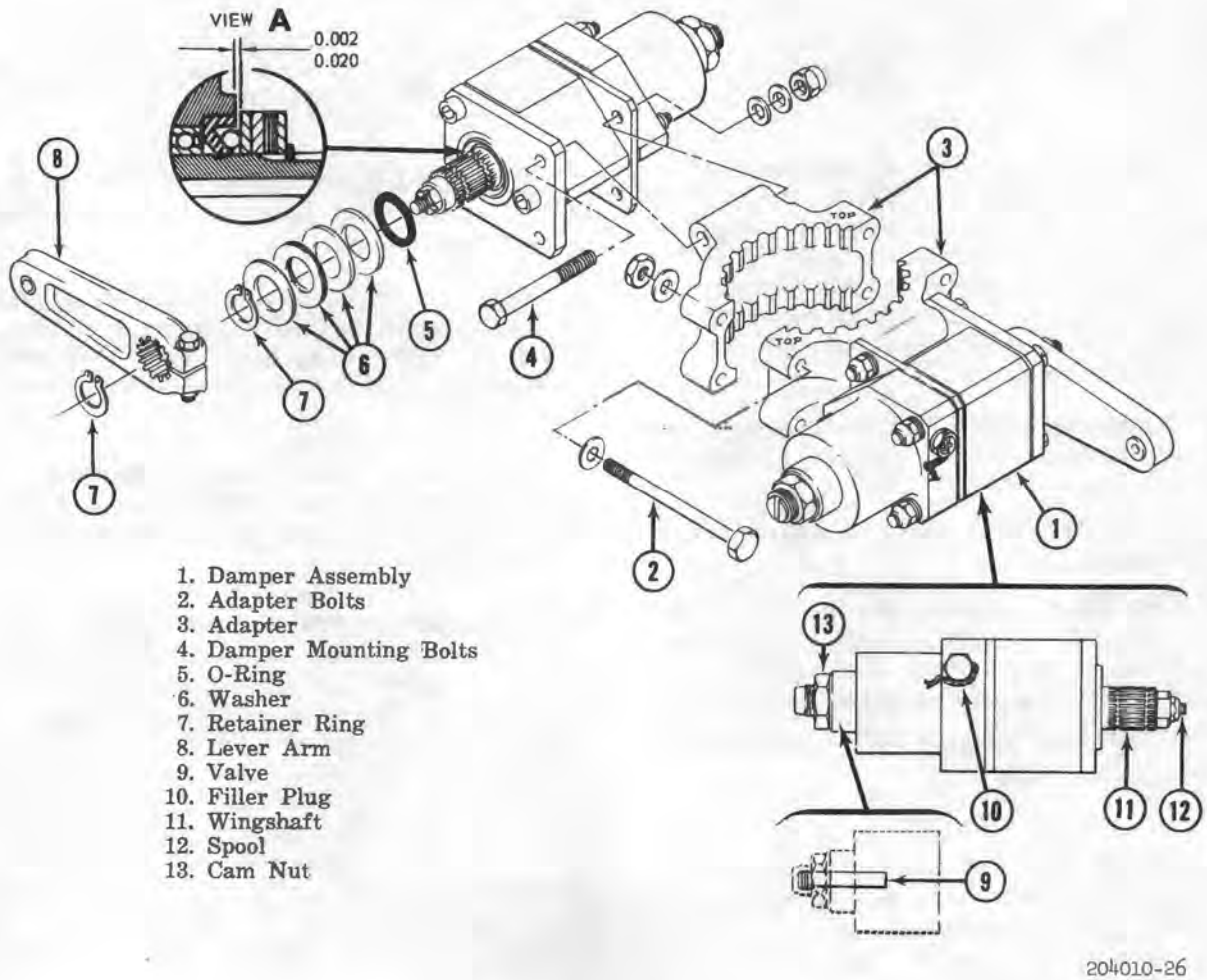


Figure 8-7. Stabilizer damper and adapter assembly (UH-1A)

8-31. ***Servicing — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** a. Position damper with spline end down.

Caution

Clamping damper around body will seize wing-shaft and damage internal parts.

b. Remove valve (9, figure 8-7) and fill cavity with hydraulic oil (item 3, table 1-1).

c. Pull spool (12) out and release several times to purge air from timing section.

d. With spool held in OUT position, oscilate the wing-shaft several times to purge air from the vane section. If any air remains it will cause a soft spot which will be felt when direction of rotation is changed.

e. Replace valve (9). Position damper as installed on the ship. Remove filler plug and check fluid level. Fluid level should be even with bottom of plug hole. Replace and safety wire plug.

Caution

From this point on do not hold damper with the splined end UP for any appreciable time and do not rotate wing-shaft with damper in this position. If wing-shaft is rotated in this position steps a. through e. must be repeated. Rapid rotation of wing-shaft will induce air into cavity.

8-32. ***Installation — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** Use two dampers of the same part number.

a. If adjusting and timing is required refer to paragraph 8-33.

b. Align adapter halves with the etched word "Top" facing upward. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring.

c. Install four adapter bolts, washers and nuts. Torque evenly.

Warning

Use alternate tightening procedure to draw four nuts down evenly. Torque each nut in increments of 10 inch-pounds, until a torque value of 50 to 70 inch-pounds is obtained.

d. Attach control tubes to lever arms (8, figure 8-7). Refer to paragraph 8-33 for adjustment of tubes.

8-33. ***Adjustment — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** a. Bottom stabilizer bar on its static stop in either direction and adjust damper cam nut (13, figure 8-7) to obtain a 0.170 (11/64) inch space between the orifice spool nut (12) and the end of the wing-shaft. Bottom stabilizer bar on its static stop. Return stabilizer bar square to mast and observe orifice spool return time. Adjust orifice timing at valve (9) to obtain a three to six second full travel to equal to each other within one second.

Caution

Do not adjust nut on lever end of damper. Do not bottom adjusting screw because this will cause damage to plastic needle valve (9).

b. Adjust stabilizer bar damper control tubes as follows:

(1) Position damper wing-shafts in the center of travel and square stabilizer bar with mast.

(2) Attach damper control tubes to stabilizer bar and lever arms (8) with lubrication fittings outboard.

(3) With stabilizer bar square to mast position lever arms (8) on nearest matching splines of damper wing-shaft. Refer to View A, for installation of O-ring and washers on wing-shaft.

(4) Adjust damper control tubes to obtain equal oriffice spool (12) travel when stabilizer bar is bottomed on its static stop in either direction.

8-34. Swashplate and Collective Sleeve (UH-1A).

The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control stick results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-35. ***Removal — Swashplate and Collective Sleeve (UH-1A).*** a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-6.)

8-70. *Inspection — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Inspect centerframes and supports for scratches, dents and burnish marks within 1.0 inch either side of bolt hole center line. Depth of damage shall not exceed 0.010 inch. Inspect mixing levers to criteria shown on figure 8-17A.

b. Burnish marks from sockets are permitted on the outboard attachment bolt holes of tube to centerframes. These marks shall have no depth and only be of a polished nature.

c. Inspect outboard 4.0 inches of centerframes for scratches which have no depth, but do remove the protective coating. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

d. Inspect for scratches which have a maximum depth of 0.002 inch. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

Note

If a burr is present on the end of a scratch, it shall be removed, without causing any damage to the surface of the centerframe, before the scratch is given corrosion protective treatment.

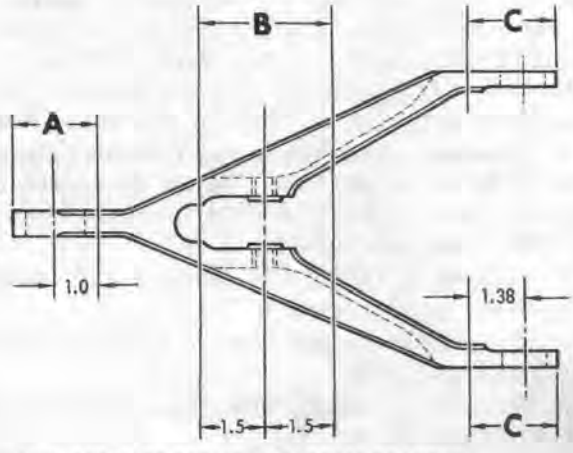


Figure 8-17A. Stabilizer bar mixing lever repair limits (UH-1B serial no. 60-3546 thru 64-14100)

e. Inspect the corner edges of the outboard 4.0 inches of the centerframes for dents which do not exceed a maximum depth of 0.010 inch and a maximum length of 0.5 inch.

f. Inspect all other areas of the centerframes, mixing levers and supports for scratches and dents. Maximum depth of such damage shall not exceed 0.035 inch.

g. Inspect all bearings for damage and freedom in race.

Note

Maximum allowable radial and axial play in the lever assembly bearings is as follows:

P/N	Radial	Axial
BR5R	0.010	0.007
AN 201KP6A	0.010	0.010

8-71. *Repair or Replacement — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Replace all parts that do not meet inspection requirements.

8-72. *Installation — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Position stabilizer bar supports in place over trunnion observing color code. Install four bolts with washers in each support. Lockwire bolts in pairs vertically.

b. Remove grip positioning tool and attach pitch links (3, figure 8-10) to pitch horns (4) and stabilizer bar mixing levers (2).

c. Attach control tubes to scissors levers.

d. Attach damper control tube to damper arm. Refer to paragraph 8-79 for instructions relative to adjusting damper control tube.

8-73. Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-74. Removal — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100.) a. Disconnect tubes from lever arms.

b. Remove retainer ring (3, figure 8-18) adapter bolts (2), and slide dampers and adapter assembly from mast.

8-75. Inspection — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Inspect dampers for damage, security, leakage and proper timing.

8-76. Repair or Replacement — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-75.)

Caution

No form of maintenance is authorized on dampers at this level.

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-79.)

8-77. Servicing — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Remove filler cap and fill dampers to full mark with hydraulic oil, (item 3, table 1-1).

8-78. Installation — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Use two dampers of the same part number.

a. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring (3, figure 8-18). Align adapter halves with the etched word "Top" facing upward.

b. Install four adapter bolts (3, figure 8-18), washers and nuts and torque evenly.

Warning

Use alternate tightening procedure to draw four nuts down evenly. Torque each nut in increments of 10 inch-pounds, until a torque value of 50 to 70 inch-pounds is obtained.

c. Install lever arms. (Refer to paragraph 8-79.)

d. Attach control tubes to lever arms. (Refer to paragraph 8-79 for adjustment of tubes.)

8-79. Adjustment —Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. To adjust damper lever and wingshaft of damper, Part No. 204-010-937, position wingshaft to line up pin (11, figure 8-18) with mark on cam (10) outside diameter as seen through window. Assemble lever (6) to wing-shaft horizontal to closest spline tooth. Connect damper links to stabilizer bar and damper lever. Position stabilizer bar perpendicular to mast. Adjust control tubes as required to line pins up with mark on outside diameter of cam while bar is square to mast.

b. To adjust dampening of damper, Part No. 204-010-937-1, position stabilizer bar against its limit stops while observing pin in window of damper. Rapidly return stabilizer bar to neutral position and measure the time required for the pin to return and contact the flat surface of the cam. Time for the above must measure five plus or minus one second. Adjust needle valve (9) in end of damper as required to accomplish above. Damper (Part Number 204-010-937-5) cannot be adjusted.

Note

If damper (Part Number 204-010-937-5) does not operate within the specified time limit (5 ±1 second) replace the damper.

8-80. Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control sticks results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-81. Removal—Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-51.)

b. Remove stabilizer bar dampers and adapter. (Refer to paragraph 8-74.)

c. Cut safetywire and remove boot (9, figure 8-19) and seal (10).

d. Disconnect control tube from trunnion of collective pitch lever (7).

Note

If only the scissors and sleeve assembly is to be removed proceed as outlined in paragraph 8-87. The following steps are required for removal of the swashplate and collective sleeve assembly as a complete unit.

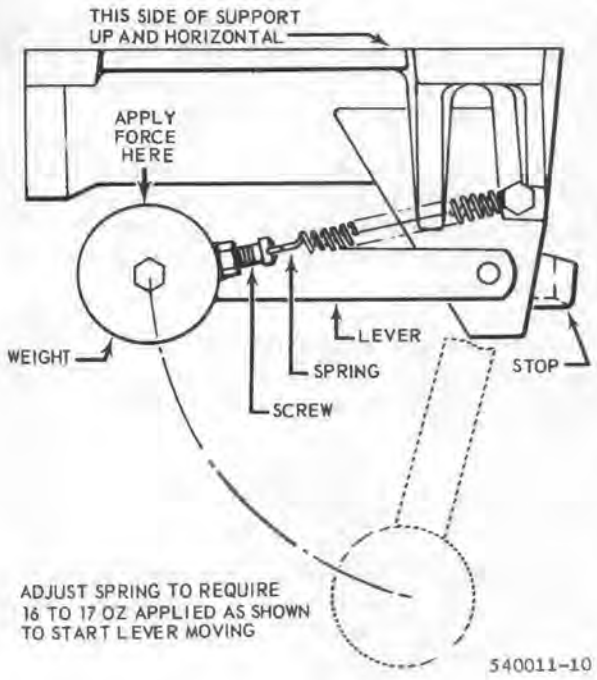


Figure 8-27. Checking spring tension on stop assembly (UH-1B Serial No. 64-14101 and subsequent)

means of an indicator pin and a cam mark, or for fluid level. Filler plugs are provided for replenishment of fluid lost by minor leakage.

8-116. *Removal — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).* a. To remove a damper assembly: Disconnect link tube from damper lever (13, figure 8-26) by removing bolt with cotter pin, nut, safety washer and standard washer. Detach damper (11) from support (10) by removing two bolts with nuts and washers.

b. To remove lever from damper: Remove snap-ring (12) from outer groove of damper wingshaft. Loosen nut on bolt at inboard end of lever (13). Pull lever from shaft. Remove snap-ring (14).

c. To remove damper support set: Remove dynamic stop assemblies (1). (Refer to paragraph 8-111.) Remove retaining ring (9) from mast groove above support (10). Detach support set from mast by removing four clamping bolts. Remove lower retaining ring (15) when necessary.

8-117. *Inspection — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).* a. If level shows slightly below top of damper window, fill with hydraulic fluid (item 3, table 1-1) at filler plug provided. Thereafter, check damper frequently for leakage.

Caution

No form of maintenance is authorized on dampers at this level.

b. If fluid level falls more than 1/8 to 3/16 inch below top of window, satisfactory filling without trapped air may not be possible and replacement of damper may be necessary.

c. Check damper timing as required to determine serviceability.

(1) Hold stabilizer bar against limit stops while observing indicator pin through damper window.

(2) Rapidly return bar to neutral position, and check time required for pin to return to flat surface of cam.

(3) Time required should be five (plus or minus one) seconds.

(4) Replace damper if unsatisfactory.

8-118. *Installation — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).* a. Coat splines of support set (10, figure 8-26) and mast with corrosion preventive compound (item 315 or 318, table 1-1). Install retaining ring (15) in lower groove of mast splines.

b. Position matched halves of support on mast according to master splines and TOP markings, and secure with four bolts installed from direction of rotation, with washers under heads and nuts. Install retaining ring (9) in mast groove above support.

c. Position damper (11) on support, with wingshaft toward rotation. Secure with two bolts, installed from direction of rotation, with washers under heads and nuts.

d. Install snap-ring (14) in inboard groove on damper shaft. Turn shaft to align pin with mark on cam, visible through damper window.

e. Place lever (13) on shaft, horizontal to nearest serration, with bushing at outboard end on trailing side. Tighten nut on clamp bolt at inboard end of lever. Install snap-ring (12) in outer groove of shaft.

f. Position stabilizer bar (1, figure 8-21) perpendicular to mast. Connect link tube (5),

with adjustable end down, between trailing sides of bar and damper lever, adjusting length to keep bar and lever at specified positions. Install bolt from leading side, with washers next to head. Use safety washer with tapered side against trailing side of rod-end bearing, and secure with nut and cotter pin.

8-119. Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772). The scissors and sleeve assembly consists of a rotating hub, splined to the mast and carrying two horizontally-pivoted scissor levers, mounted through ball thrust bearings on upper end of a non-rotating collective sleeve. The collective sleeve operates vertically between the swashplate support and the mast, actuated by the collective lever attached to its lower end. Outboard ends of scissors are connected to the swashplate outer ring by two drive links. Inboard ends of scissors are connected to stabilizer bar mixing levers by two control tubes, continuously transmitting collective and cyclic control settings to the main rotor. Alignment of collective sleeve in vertical movement is aided by a teflon guide bearing in the swashplate support, and by pivoting the collective lever on an offset idler link. An extension on top of the hub carries a friction collet which bears on a friction sleeve bonded around the mast.

8-120. *Removal — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772).* a. Remove stabilizer bar, main rotor, dynamic stops, and damper and support assemblies from upper part of mast.

b. Cut lockwire and remove spacer (1, figure 8-28) and upper boot (2).

c. Cut lockwire and use suitable spanner wrench to remove clamping nut (3), spring (4), and retaining nut (5). Separate and remove halves of friction collet set (6).

Note

On UH-1B helicopters, Serial No. 65-9416 and subsequent, spring (4) is replaced by a two piece, matched spring set. Be sure to keep both halves of set together for re-installation.

d. Disconnect control rod from collective lever assembly. Remove three bolts, with nuts and washers, which secure two levers (7) together. Remove cotter pin, nut, washer, and bushing (8) at each side and pull levers from idler and collective sleeve bearings.

e. Cut lockwire and remove bolt and washer attaching idler link and pivot pin to mounting boss on swashplate support. Remove pivot pin (9), idler link (10) and two thrust washers (11) from boss.

f. Remove cotter pin, nut and safety washer (12) to detach a drive link (13) and shoulder washer (14) from each of two pins on swashplate.

g. Cut lockwire to detach lower boot (15) from collective sleeve.

h. Remove lockwire, four screws, and a bearing and liner assembly (16) from each side of collective sleeve, accessible through openings in swashplate support.

i. Lift scissors and sleeve assembly (17) free of swashplate assembly and remove over top of mast, with care to avoid damage when passing over friction sleeve (18) and upper mast splines.

j. If swashplate is not being removed, leave lower boot attached to swashplate and secure upper end to mast with lockwire to protect pivot bearings and ball from dirt and foreign material.

8-120A. *Removal — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 66-491 and subsequent).* a. Remove stabilizer bar, main rotor, dynamic stops and damper and support assemblies from upper part of mast.

b. Cut lockwire and remove spacer (1, figure 8-28A) and upper boot (2).

c. Remove nuts, washers and bolts to release three clamps (3). Remove clamps and keep together as a set.

d. Cut lockwire and use wrench, AN8516-1, to back off friction nut (4). Remove rubber ring (5), retainer ring (6), collet set (7) and friction nut (4) from top of extension (8). Keep collet halves together for reinstallation.

e. Disconnect control rod from collective lever assembly. Remove nut, washer and bolt connecting outboards ends of collective levers (9) together.

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No. 12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 21 April 1967

Organizational Maintenance Manual

ARMY MODELS UH-1A AND UH-1B HELICOPTERS

TM 55-1520-211-20, 20 January 1966, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 3, section IV	3-57 thru 3-62	3-57 thru 3-62

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 requirements for Organizational Maintenance Instructions for UH-1A-1B aircraft.

Overhaul and Retirement Schedule
Model UH-1A Helicopters

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-010-051-1	Blade Assembly		1100
4	204-010-190-3, -7	Hub Assembly	1200	
4	204-010-190-9	Hub Assembly	1200	
4	204-010-161-1	*Grip		1200
4	204-010-173-7	*Strap Assembly		600
4	204-010-185-1	*Pitch Horn		1200
4	204-010-517-1	*Drag Brace Assembly		1200
4	204-010-133-7	Blade Retention Bolt	1200	
	Transmission			
4	204-040-001-13, -17	**Transmission Assembly	400	
4	204-040-151-9	*Planetary Spacer Case		400
4	204-040-214-1, -3	Mast Assembly	300	
4	204-040-214-5	Mast Assembly	1100	
4	204-040-136-1, -5	*Mast Bearing		300
	Tail Rotor and Drive System			
6	204-010-771-7, -9	Blade Assembly		3000
6	204-010-784-3	Hub Assembly	1100	
6	204-010-703-21	Hub Assembly	1100	
6	204-011-701-7, -21, 23	Hub Assembly		1100
6	204-010-706-9, -11	*Grip		1100
6	204-010-710-1	*Yoke		3300
6	204-010-781-1	*Yoke		3300
6	204-040-004-19, -19A, -25, -31	****90° Gear Box	800	
6	204-040-004-33	90° Gear Box	1100	
6	204-040-003-13, -23, -37	42° Gear Box	1500	
6	204-010-720-1	Slider		400

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	204-010-470-5, -9	Swashplate and Support Assembly	1100	
4	204-010-469-3, -7	Scissors and Sleeve Assembly	1100	
4	204-010-487-1, -3	Scissors and Sleeve Assembly	1100	
4	204-010-439-1	*Scissors		1100
4	204-010-440-1	*Drive Link		1100
4	204-010-370-3, -5, -7	Stabilizer Bar Assembly		
4	204-010-380-1	Stabilizer Bar Tube		400
4	204-010-368-17	Center Frame Set		1200
4	204-010-390-1	Mixing Lever		1200
4	204-010-348-13	Control Tube		1100
4	204-010-374-7	Pitch Link		1100
	Synchronized Elevator			
6	204-030-858-25, -26, -37, -38	Elevator Assembly		1100
	Rotating Control System Bolts (See Figure 3-2)			
4	NAS1304-26D (Index No. 4)	Pitch Horn to Pitch Link		100
4	NAS1304-26D (Index No. 3)	Pitch Link to Universal		400
4	NAS1304-30D (Index No. 2)	Universal to Mixing Lever		100
4	NAS1304-30D (Index No. 9)	Drive Link to (204-010-446-3) Trunnion		400
	Power Plant			
5	T53-L-1	***Engine	1200	
5	T53-L-1A	***Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled component.

**400 TBO if MWO 55-1520-207-50/6 has not been complied with or if planetary spacer case 204-040-151-9 is presently installed on the transmission; otherwise, 1100 hour TBO.

***Internal inspection required every 300 engine hours.

****Overhaul interval is 1100 hours if data plate is marked 50/15 CW.

Overhaul and Retirement Schedule
Model UH-1B Helicopters
Serial No. 60-3546 through 64-14100

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-011-001-7	Blade Assembly		400
4	204-011-001-15	Blade Assembly		1000
4	204-011-101-1	Hub Assembly	400	
4	204-011-101-3, -5, -9	Hub Assembly	1100	
4	204-011-113-1	*Strap Assembly		1100
	Transmission			
4	204-040-009-7, -13, -19, -31	Transmission Assembly	1100	
4	204-040-366-1, -3, -5	Mast Assembly	300	
4	204-040-366-7, -9	Mast Assembly	1100	
4	204-040-136-3, -5	*Mast Bearing		300
4	204-040-136-7	*Mast Bearing		1100
	Tail Rotor and Drive System			
6	204-011-702-11, -15	Blade Assembly		1100
6	204-011-701-7, -21, -23	Hub Assembly		1100
6	204-040-003-13, -23, -37	42° Gear Box	1500	
6	204-040-012-1	90° Gear Box	600	
6	204-040-012-7	90° Gear Box	1100	
	Mast Controls			
4	204-011-400-1, -3, -5, -7	Swashplate and Support Assembly	1100	
4	204-011-404-1, -5	*Support		3300
4	204-011-438-1	Collective Lever		3300
4	204-011-401-3, -5, -7	Scissors and Sleeve Assembly	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Synchronized Elevator			
6	204-030-858-43, -44	Elevator Assembly		3000
	Rotating Control System Bolts (See figure 3-2)			
4	NAS464-6-26 (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-31D (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-27D (Index No. 3)	Pitch Link to Universal		1000
4	NAS464-6-35 (Index No. 2)	Universal to Mixing Lever		1000
4	NAS1306-34D (Index No. 2)	Universal to Mixing Lever		1000
4	NAS464-5-27 (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS1305-27D (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS464-5-27 (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS1305-27D (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS464-8-90 (Index No. 6)	Scissors Pivot Bolt		1000
4	NAS464-8-69 (Index No. 7)	Scissors to Drive Link		1000
4	NAS464-5-30 (Index No. 9)	Drive Link to Swashplate		1000
4	NAS1305-30D (Index No. 9)	Drive Link to Swashplate		1000
4	AN175H16 (Index No. 8)	Cyclic Tubes to Swashplate		1000
4	AN175H16 (Index No. 8)	Collective Tube to Collective Levers		1000
	Power Plant			
5	T53-L-5	**Engine	1200	
5	T53-L-9	**Engine	1200	
5	T53-L-9A	**Engine	1200	
5	T53-L-11	**Engine	1200	
5	T53-L-13	**Engine	600	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

Overhaul and Retirement Schedule

Model UH-1B Helicopter

Serial No. 64-14101 and Subsequent

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	540-011-001-5	Main Rotor Blade Assembly		1100
4	540-011-101-3,-9	Main Rotor Hub Assembly	1100	
4	540-011-102-5	*Yoke		3300
4	540-011-153-9	*Extension Assembly		3300
4	204-012-112-7	*Retention Straps		2200
4	540-011-113-1	*Fitting		2200
4	540-011-177-1	*Nut		2200
4	540-011-112-1, -3	*Pin		2200
	Transmission			
4	204-040-009-53, -57	Transmission Assembly	1100	
4	204-040-359-1	Transmission Top Case		1100
4	204-040-366-11	Mast Assembly	1100	
4	540-040-010-5	Mast Bearing Plate		1100
4	204-040-136-7	*Mast Bearing		1100
	Tail Rotor and Drive System			
6	204-011-702-17	Blade Assembly, Tail Rotor		1100
6	204-011-701-13, -19***	Tail Rotor Hub Assembly		1100
6	204-011-706-9	Grip		1100
6	204-010-781-9	Yoke		1100
6	204-040-003-23, -37	42° Gear Box	1500	
6	204-040-012-7, -13	90° Gear Box	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	540-011-450-3	Swashplate and Support Assembly	1100	
4	540-011-452-5	Support Assembly		1100
4	540-011-454-5	Collective Lever		3300
4	540-011-451-1	Scissors and Sleeve Assembly	1100	
4	540-011-409-1	Drive Link		3300
4	540-011-300-3, -5, -7	Stabilizer Bar Assembly		2200
	Synchronized Elevator			
6	205-030-856-45	Elevator		3000
6	205-030-856-47	Elevator		3000
6	205-001-914-1	Horn, Elevator Control		3000
6	205-030-856-65	Elevator		3000
6	205-030-856-67	Elevator		3000
	Power Plant			
5	T53-L-11**	Engine	1200	
5	T53-L-13**	Engine	600	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

***Bearing set is not to be retired if higher maintenance inspection determines bearings are serviceable.

TM 55-1520-211-20
C 11

CHANGE
No. 11

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 17 March 1967

Organizational Maintenance Manual

ARMY MODELS UH-1A AND UH-1B HELICOPTERS

TM 55-1520-211-20, 20 January 1966, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 3, section IV	3-57 thru 3-62	3-57 thru 3-62
Chapter 8, section II	8-4A	8-4A
	8-21 thru 8-24	8-21 thru 8-24
	8-45 and 8-46	8-45 and 8-46

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 requirements for Organizational Maintenance Instructions for UH-1A-1B aircraft.

Overhaul and Retirement Schedule
Model UH-1A Helicopters

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-010-051-1	Blade Assembly		1100
4	204-010-190-3, -7	Hub Assembly	600	
4	204-010-190-9	Hub Assembly	600	
4	204-010-161-1	*Grip		1200
4	204-010-173-7	*Strap Assembly		600
4	204-010-185-1	*Pitch Horn		1200
4	204-010-517-1	*Drag Brace Assembly		1200
4	204-010-133-7	Blade Retention Bolt	1200	
	Transmission			
4	204-040-001-13, -17	**Transmission Assembly	400	
4	204-040-151-9	*Planetary Spacer Case		400
4	204-040-214-1, -3	Mast Assembly	300	
4	204-040-214-5	Mast Assembly	1100	
4	204-040-136-1, -5	*Mast Bearing		300
	Tail Rotor and Drive System			
6	204-010-771-7, -9	Blade Assembly		3000
6	204-010-784-3	Hub Assembly	1100	
6	204-010-703-21	Hub Assembly	1100	
6	204-010-706-9, -11	*Grip		1100
6	204-010-710-1	*Yoke		3300
6	204-010-781-1	*Yoke		3300
6	204-040-004-19, -19A, -25, -31	****90° Gear Box	800	
6	204-040-004-33	90° Gear Box	1100	
6	204-040-003-13, -23, -37	42° Gear Box	1500	
6	204-010-720-1	Slider		400

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	204-010-470-5, -9	Swashplate and Support Assembly	1100	
4	204-010-469-3, -7	Scissors and Sleeve Assembly	1100	
4	204-010-487-1, -3	Scissors and Sleeve Assembly	1100	
4	204-010-439-1	*Scissors		1100
4	204-010-440-1	*Drive Link		1100
4	204-010-370-3, -5, -7	Stabilizer Bar Assembly		
4	204-010-380-1	Stabilizer Bar Tube		400
4	204-010-368-17	Center Frame Set		1200
4	204-010-390-1	Mixing Lever		1200
4	204-010-348-13	Control Tube		1100
4	204-010-374-7	Pitch Link		1100
	Synchronized Elevator			
6	204-030-858-25, -26, -37, -38	Elevator Assembly		1100
	Rotating Control System Bolts (See Figure 3-2)			
4	NAS1304-26D (Index No. 4)	Pitch Horn to Pitch Link		100
4	NAS1304-26D (Index No. 3)	Pitch Link to Universal		400
4	NAS1304-30D (Index No. 2)	Universal to Mixing Lever		100
4	NAS1304-30D (Index No. 9)	Drive Link to (204-010-446-3) Trunnion		400
	Power Plant			
5	T53-L-1	***Engine	1200	
5	T53-L-1A	***Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled component.

**400 TBO if MWO 55-1520-207-50/6 has not been complied with or if planetary spacer case 204-040-151-9 is presently installed on the transmission; otherwise, 1100 hour TBO.

***Internal inspection required every 300 engine hours.

****Overhaul interval is 1100 hours if data plate is marked 50/15 CW.

Overhaul and Retirement Schedule
Model UH-1B Helicopters
Serial No. 60-3546 through 64-14100

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-011-001-7	Blade Assembly		400
4	204-011-001-15	Blade Assembly		1000
4	204-011-101-1	Hub Assembly	400	
4	204-011-101-3, -5, -9	Hub Assembly	1100	
4	204-011-113-1	*Strap Assembly		1100
	Transmission			
4	204-040-009-7, -13, -19, -31	Transmission Assembly	1100	
4	204-040-366-1, -3, -5	Mast Assembly	300	
4	204-040-366-7, -9	Mast Assembly	1100	
4	204-040-136-3, -5	*Mast Bearing		300
4	204-040-136-7	*Mast Bearing		1100
	Tail Rotor and Drive System			
6	204-011-702-11, -15	Blade Assembly		1100
6	204-011-701-7	Hub Assembly		1100
6	204-040-003-13, -23, -37	42° Gear Box	1500	
6	204-040-012-1	90° Gear Box	600	
6	204-040-012-7	90° Gear Box	1100	
	Mast Controls			
4	204-011-400-1, -3, -5, -7	Swashplate and Support Assembly	1100	
4	204-011-404-1, -5	*Support		3300
4	204-011-438-1	Collective Lever		3300
4	204-011-401-3, -5, -7	Scissors and Sleeve Assembly	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Synchronized Elevator			
6	204-030-858-43, -44	Elevator Assembly		3000
	Rotating Control System Bolts (See figure 3-2)			
4	NAS464-6-26 (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-31D (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-27D (Index No. 3)	Pitch Link to Universal		1000
4	NAS464-6-35 (Index No. 2)	Universal to Mixing Lever		1000
4	NAS1306-34D (Index No. 2)	Universal to Mixing Lever		1000
4	NAS464-5-27 (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS1305-27D (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS464-5-27 (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS1305-27D (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS464-8-90 (Index No. 6)	Scissors Pivot Bolt		1000
4	NAS464-8-69 (Index No. 7)	Scissors to Drive Link		1000
4	NAS464-5-30 (Index No. 9)	Drive Link to Swashplate		1000
4	NAS1305-30D (Index No. 9)	Drive Link to Swashplate		1000
4	AN175H16 (Index No. 8)	Cyclic Tubes to Swashplate		1000
4	AN175H16 (Index No. 8)	Collective Tube to Collective Levers		1000
	Power Plant			
5	T53-L-5	**Engine	1200	
5	T53-L-9	**Engine	1200	
5	T53-L-9A	**Engine	1200	
5	T53-L-11	**Engine	1200	
5	T53-L-13	**Engine	600	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

Overhaul and Retirement Schedule

Model UH-1B Helicopter

Serial No. 64-14101 and Subsequent

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	540-011-001-5	Main Rotor Blade Assembly		1100
4	540-011-101-3,-9	Main Rotor Hub Assembly	1100	
4	540-011-102-5	*Yoke		3300
4	540-011-153-9	*Extension Assembly		3300
4	204-012-112-7	*Retention Straps		2200
4	540-011-113	*Fitting		2200
4	540-011-177-1	*Nut		2200
4	540-011-112	*Pin		2200
	Transmission			
4	204-040-009-53, -57	Transmission Assembly	1100	
4	204-040-359-1	Transmission Top Case		1100
4	204-040-366-11	Mast Assembly	1100	
4	540-040-010-5	Mast Bearing Plate		1100
4	204-040-136-7	*Mast Bearing		1100
	Tail Rotor and Drive System			
6	204-011-702-17	Blade Assembly, Tail Rotor		1100
6	204-011-701-13, -19, -21, -29***	Tail Rotor Hub Assembly		1100
6	204-011-706-9	Grip		1100
6	204-010-781-9	Yoke		1100
6	204-040-003-23, -37	42° Gear Box	1500	
6	204-040-012-7, -13	90° Gear Box	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	540-011-450-3	Swashplate and Support Assembly	1100	
4	540-011-452-5	Support Assembly		1100
4	540-011-454-5	Collective Lever	1100	3300
4	540-011-451-1	Scissors and Sleeve Assembly	1100	
4	540-011-409-1	Drive Link		3300
4	540-011-300-3, -5, -7	Stabilizer Bar Assembly		2200
4	540-011-468-1	Stop Assembly	1100	
	Synchronized Elevator			
6	205-030-856-45	Elevator		3000
6	205-030-856-47	Elevator		3000
6	205-001-914-1	Horn, Elevator Control		3000
6	205-030-856-65	Elevator		3000
6	205-030-856-67	Elevator		3000
	Power Plant			
5	T53-L-11**	Engine	1200	
5	T53-L-13**	Engine	600	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

***Bearing set is not to be retired if higher maintenance inspection determines bearings are serviceable.

8-6. *Removal — Main Rotor Hub and Blade Assembly (UH-1A).* a. Remove pitch links and install grip positioning links, T101348, to hold grips and blades in position. (See figure 8-3.)

Warning

Grip positioning links must be installed to prevent damage to main rotor strap assemblies.

b. Remove stabilizer bar assembly (1, figure 8-1). (Refer to paragraph 8-23.)

c. Cut safety wire and remove bolt and lock (6).

d. Remove retaining nut (4) using wrench T101358.

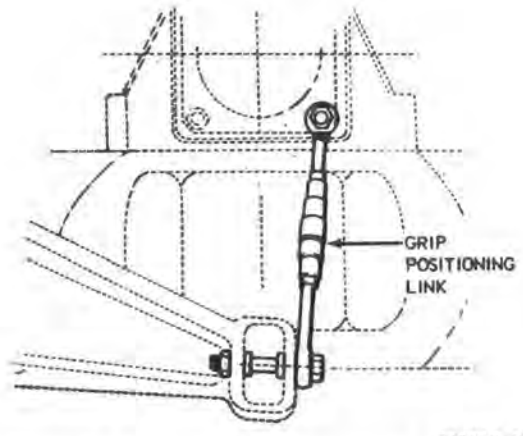
e. Install blade tie-down block to guide rotor while removing.

f. Install hoisting sling and using hoist T101413, lift off hub and blade assembly. Place hub on a stand and support blades. Remove split cones (9) from mast.

8-7. *Installation — Main Rotor Hub and Blade Assembly (UH-1A).* Installation of the main rotor hub and blade assembly shall be accomplished as follows.

Caution

All three bolts passing through the pitch link (3, figure 8-1) are high tensile close tolerance bolts. Install with a minimum of two steel washers under the head and two steel washers under the high castle nut and torque 80 to 100 inch pounds.



204010-58

Figure 8-3. Grip position links installed (UH-1A)

a. Install grip positioning links T101348 on grips. Install hoisting sling on hub assembly and with T101413, position rotor assembly over mast.

b. Lubricate splines with oil (item 8, table 1-1). Install cones (9) in groove in upper set of splines on mast with bevel side up to mate with bevel in hub trunnion.

c. Align mast and hub master splines and lower rotor onto mast and split cones.

Caution

Rotor must be aligned directly over mast to prevent damage to threads on mast.

d. Install washer (5) and nut (4). Torque nut 520 to 780 foot-pounds using wrench T101358.

e. Install lock (6) and lockwire bolt to hole in trunnion.

f. Install stabilizer bar. (Refer to paragraph 8-26.)

g. Remove grip positioning links. Adjust pitch links (3) to 8.80 inches between upper hole in universal fitting and lower hole in link assembly. Torque jam nuts on link assembly to 480 to 600 inch-pounds.

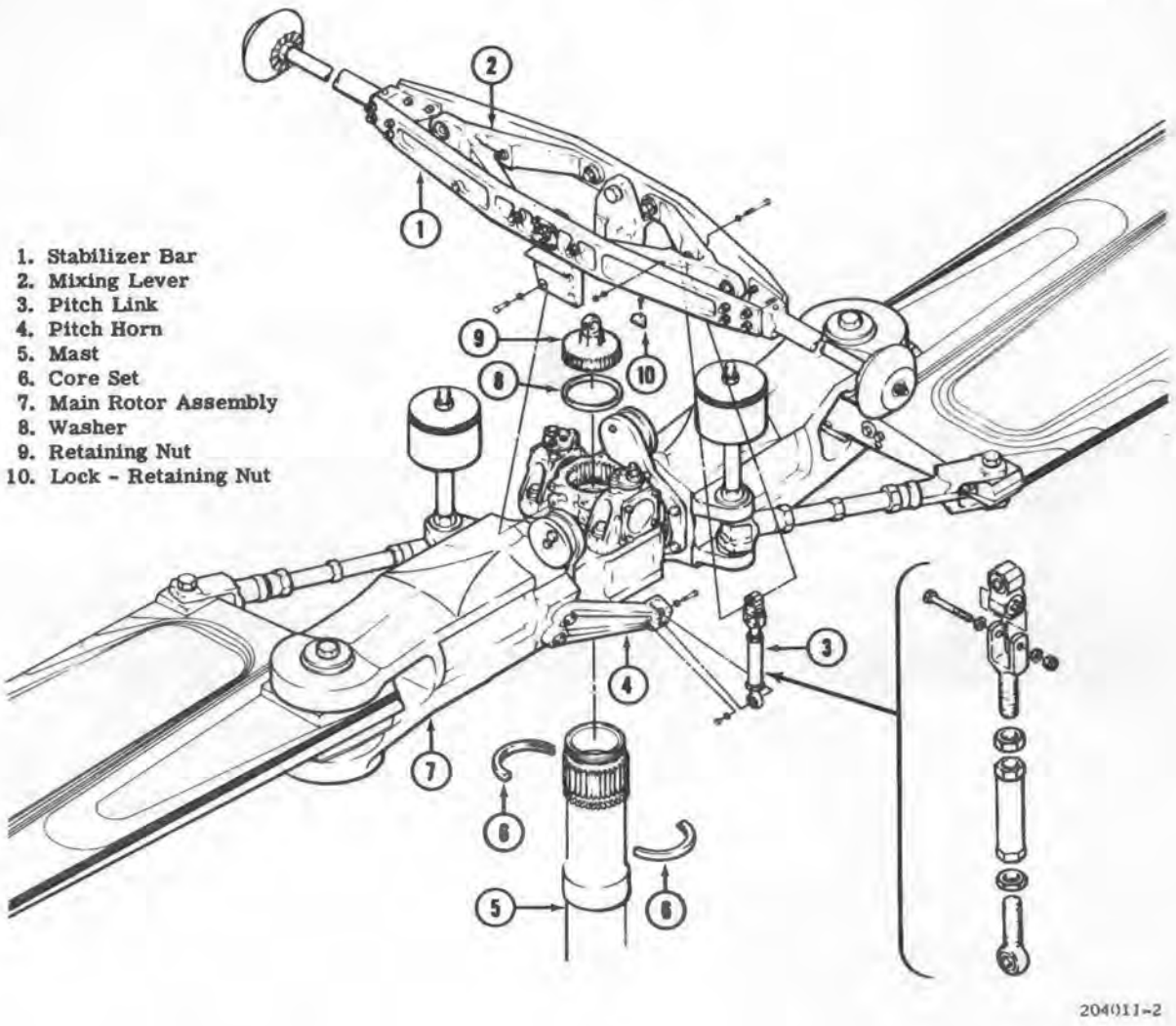


Figure 8-10. Main rotor assembly (UH-1B Serial No. 60-3546 thru 64-14100)

Note

Both ends of the drag brace are fitted with right-hand threads. Drag brace length is changed when rotating the barrel because one end has National Course threads and the other end has National Fine threads. Turn jam nuts to the left to loosen and turn barrel down as viewed from the trailing edge of the blade to sweep blade aft.

j. If improvement is noted continue sweeping selected blade aft until rotor is operating smoothly. Adjustment up to two turns is permissible on the B rotor and two flats on the A rotor which normally exceeds requirements.

k. If the condition becomes worse after making adjustment return blade to its original position and make similar adjustment to the opposite blade.

8-49. *Checking Main Rotor Counterweight Adjustment (UH-1B Serial No. 60-3546 through 64-14100).* At approximately 60 knots I. A. S. in cruise flight with hydraulic boost off the collective control should have a neutral or light force

Figure 8-11. Tracking main rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

between 14 and 15 pounds of engine torque. Above 15 pound torque collective shall become increasingly negative and below 14 pounds torque it shall become increasingly positive. Collective boost "OFF" forces in autorotation should be such that the collective pitch control can be lowered complete. To accomplish this it may be necessary to reduce the amount of weight originally determined. If applied force is greater when increasing collective pitch more counterweight is required and conversely if applied force is greater when decreasing collective pitch less counterweight is required. Refer to paragraph 8-50 for allowable counterweight limits.

Note

Due to irreversible valves incorporated in the boost system improperly adjusted counterweight may not be evident for fixed collective control positions.

8-50. Counterweight Limits (UH-1B Serial No. 60-3546 through 64-14100). When using the 204-011-172-3 counterweight bolt a maximum of one 204-011-173-3 counterweight and nine washer type weights may be used on each side. Use AN960-1016 washers as required between counterweight and retaining nut. Torque counterweight retaining nut 300 to 400 inch-pounds.

8-51. Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). a. Remove pitch links and install grip positioning links, T101402, to hold grips and blades in position. (See figure 8-12.)

Warning

Grip positioning links must be installed to prevent damage to main rotor strap assemblies.

b. Remove stabilizer bar assembly (1, figure 8-10). (Refer to paragraph 8-69.)

c. Cut lockwire and remove bolt and lock (10)

d. Remove retaining nut (9) using wrench T101358.

e. Install blade tie-down block to guide rotor while removing.

f. Install hoisting sling and with T101411 or other suitable hoist, lift off hub and blade assembly. Place hub on a stand and support blades. Remove split cones (6) from mast.

8-52. *Installation — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Installation of the main rotor hub and blade assembly shall be accomplished as follows.

a. Install grip positioning links T101402 on grips. Install hoisting sling on hub assembly and with T101411 or other suitable hoist, position rotor assembly over mast.

b. Lubricate splines with grease (item 8, table 1-1). Install cones (6, figure 8-10) in groove in upper set of splines on mast, with bevel side up to mate with bevel in hub trunnion.

c. Align mast and hub master splines and lower rotor onto mast and split cones.

Note

Rotor must be aligned directly over mast to prevent damage to threads on mast.

d. Install washer (8) and nut (9). Torque nut 520 to 780 foot-pounds using wrench T101358.

e. Install lock (10) and lockwire bolt to safetywire hole in trunnion.

f. Install stabilizer bar. (Refer to paragraph 8-72.)

g. Remove grip positioning links. Adjust overall length of pitch links between upper hole in universal fitting and lower hole in link assembly (3) to 10.2 inches and attach pitch horns (4).

Note

Install pitch horn to pitch link attaching hardware with nut facing in direction of rotation.

h. Check low pitch position of grips for a plus reading of seven and one-half degrees, plus or minus one-fourth degree, by placing a protractor chordwise on the outboard machined surface of the blade grip. Set blade in above position and hold in place while taking a protractor reading on the opposite blade. Adjust pitch change links equally until a total reading of fifteen degrees, plus or minus one-half degree is obtained. Tighten and lockwire barrel and nuts.

Note

If rotor overspeeds in autorotation shorten links equally. If rotor underspeeds, lengthen links equally. Normal rpm range is 294 to 324 (refer to TM 55-1520-211-10).

8-53. Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). The two main rotor blades are of all metal bonded construction with corrosion and scuff resistant leading edges.

8-54. *Removal — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).* a. Support hub assembly on a stand. Support blades so that leading edge is straight.

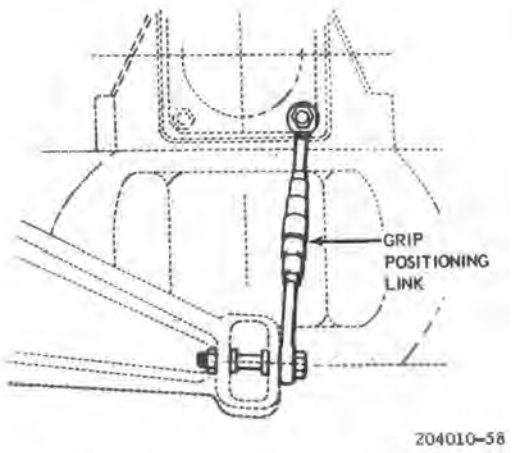


Figure 8-12. Grip positioning links installed (UH-1B Serial No. 60-3546 thru 64-14100)

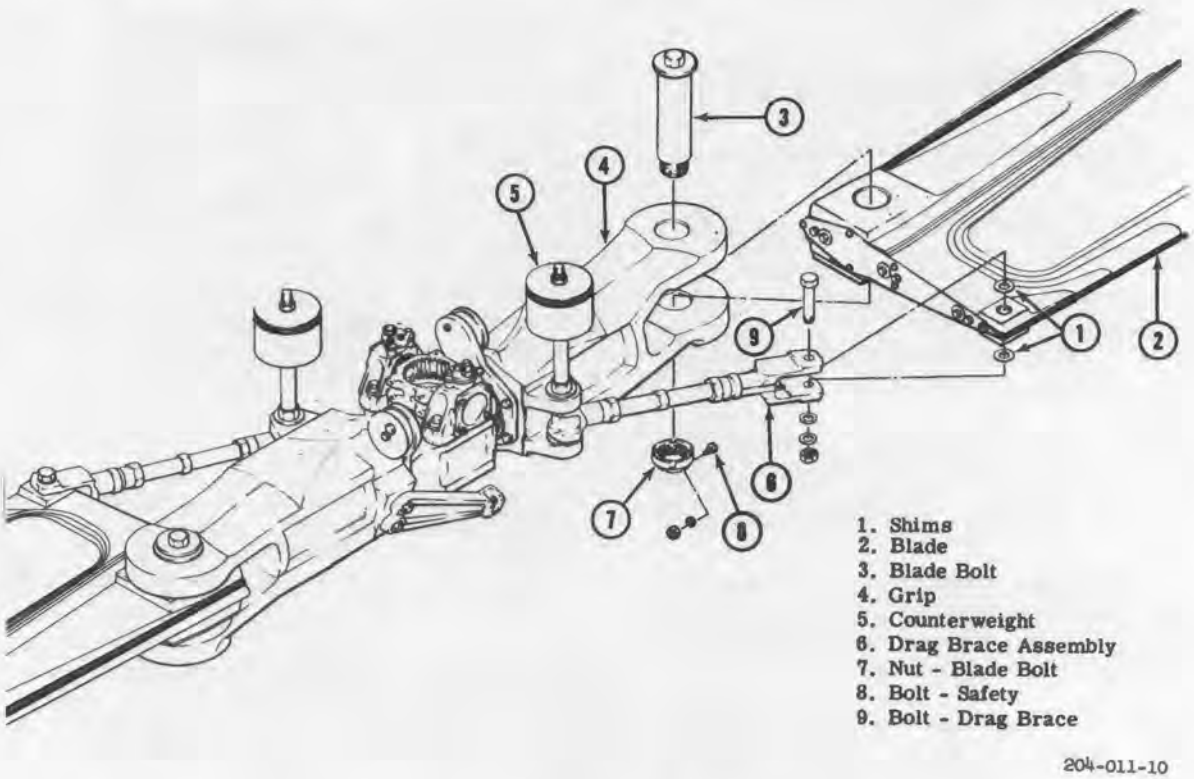


Figure 8-13. Main rotor hub and blade assembly (UH-1B Serial No. 60-3546 thru 64-14100)

b. Remove drag brace bolt (9, figure 8-13). Remove lock-bolt (8) that passes through blade bolt (3) and nut (7). Remove nut (7) from blade bolt. Secure shim (1) to either blade or clevis on drag brace (6) for reassembly.

Note

Do not change adjustment of drag braces. Identify blade retention bolts for installation in same grips from which they were removed.

c. Gently raise tip of blade until blade bolt (3) can be readily removed. Remove blade from grip.

Caution

Reason for lifting blades is because blades are pre-set to 4 degree cone, and elevation is necessary to free bolts. If difficulty is still encountered in removing bolts, use Main Rotor Blade Retention Bolt Extracting Fixture Assembly, which may be locally fabricated as shown on figure 8-14.

d. Repeat procedure on opposite blade.

8-55. ***Inspection and Repair — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).*** The following criteria covers organizational inspection and repair of main rotor blades used on UH-1B helicopters Serial No. 60-3546 through 64-14100.

a. Main rotor blades damaged to the following extent should be "condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility.

(1) Any penetration in the natched area as indicated on figure 8-15.

j. Correct spanwise balance by wrapping two-inch width masking tape around one blade tip as a trial weight. If condition becomes worse, change tape to opposite blade. Balance to best one-half wrap of tape. Remove tape and install lead as weight in blade retaining bolt, inserted through plugged hole at top. Use 2.4 ounces in bolt for each wrap of tape.

k. Correct chordwise balance by adjusting drag brace to sweep one blade aft. Loosen jam nuts enough to turn brace barrel one flat AFT, as shown by decal arrows, and tighten nuts with 150 to 200 foot-pounds torque. Record adjustment. If condition becomes worse, restore blade to original position and adjust opposite blade. If condition improves, continue adjusting by small amounts until rotor operates smoothly. Maximum permissible adjustment is two full turns, which exceeds normal requirements.

Note

If chordwise balance cannot be accomplished within the above limits, remove rotor hub and re-align.

l. Check rotor rpm in autorotation. (Refer to TM 55-1520-211-10.) If rotor overspeeds, lengthen both pitch change links equally. If rotor underspeeds, shorten both links equally.

8-97. *Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Remove stabilizer bar (1, figure 8-21) disconnecting lower ends of pitch change link (3), control tube (4) and damper link tube (5), and removing bolts at each support (6). (Refer to paragraph 8-106.) When disconnecting a pitch change link, install a T101466 grip positioning link with eyebolt in a bolt hole of trunnion bearing housing and lower end attached to pitch horn. (See figure 8-24.)

Warning

Grip positioning links must be installed to prevent damage to main rotor strap assemblies.

b. Remove lockwire, bolt and lock (7, figure 8-21). Use T101358 adapter wrench to remove retaining nut (8), with washer (9).

c. Install T101460 maintenance hoist, or position other suitable hoist directly above mast. Attach hoist to main rotor hub with suitable lifting slings.

d. Attach a tie-down assembly to rotor blade to guide and steady rotor. Lift hub clear of mast (12). Remove cone set (13).

e. Place rotor hub on a stand, T101356, and suitable supports under blades.

Caution

Do not apply corrosion preventive compound, cosmoline or any type of grease to the teflon bearings or in the area of the bearings on the 540 rotor configuration helicopters. This instruction will apply, regardless of the ship status, operational, in storage or in preparation for overseas movement. Assemblies affected are: stabilizer bar, main rotor hub, scissors and sleeve, swashplate and support, collective levers and elevator idler pivot bushings located on the aft side of the swashplate support.

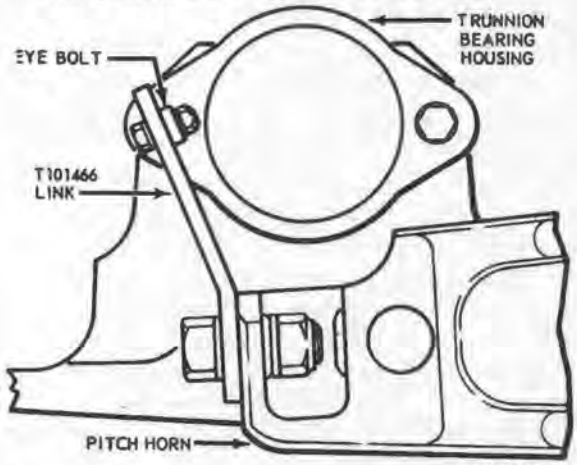


Figure 8-24. Grip positioning link (UH-1B Serial No. 64-14101 and subsequent)

8-97A. *Inspection — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* Inspect main rotor grip bearings for binding by leveling the main rotor and stabilizer bar, moving the stabilizer bar in either direction causing blade grips to change pitch, grips should operate smoothly and freely, any binding that occurs is cause for replacement.

8-98. *Installation — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Erect T101460 maintenance hoist on right side of engine deck, or provide other suitable hoist.

Caution

T101460 maintenance hoist has a steel support leg and is required for lifting [redacted] components.

b. Check that T101466 grip positioning links are installed at pitch horns to hold blades at normal position until control linkage is connected. (See figure 8-24.)

c. Attach suitable hoisting slings and lift main rotor to position with hub directly above mast. Rotor tie-down tool can be used to guide and steady rotor during handling.

d. Coat splines of mast (12, figure 8-21) and rotor hub trunnion (10) with corrosion preventive compound, (item 315 or 318, table 1-1). Place cone set (13) in groove of mast upper splines with bevel side up.

e. Align master splines and lower the rotor carefully on mast until trunnion is seated on cone set. Remove excess corrosion preventive compound.

Note

Rotor hub must be aligned carefully to avoid damaging mast threads.

f. Install washer (9) and retaining nut (8) on mast. Use T101358 wrench adapter to tighten nut to a torque of 550 to 780 foot-pounds. Install lock (7) engaged with nut splines and secured to hub trunnion by a bolt. Lockwire bolt head to hole provided in trunnion.

g. Lift stabilizer bar assembly (1) to position, observing color code markings, and attach supports (6) to rotor hub trunnion. Connect control tubes (4) and damper link tubes (5). (Refer to paragraph 8-109.)

Note

All close tolerance, high tensile bolts in main rotor linkage require high-strength washers with internal chamfer to accommodate radius at bolt head.

h. Remove T101466 grip positioning links, replacing each eyebolt with original bolt in trunnion bearing housing flange. Connect pitch change links (3) between stabilizer bar mixing levers (2) and pitch horns (11) according to applicable procedures below:

(1) If connecting pitch change links known to be satisfactory in adjustment: Check that rod-end with right-hand thread is attached to mixing lever by a bolt installed from leading side, with washers under head and nut, and with nut secured by cotter pin. Check that nut and retainer are in recess of pitch horn. Align lower end of link in horn and install bolt with washer next to head. Lockwire bolt head to hole provided in horn.

(2) If using new pitch change links or rigging is doubtful: Set each link to 9.64 inches between bearing centers, with rod-ends aligned and exposed thread areas equal at both ends within 0.03 inch. Tighten jam nuts with 650 to 800 inch-pounds torque. Lockwire barrel hole in banjo of rod-end. Install links as in (1) above.

(3) With controls at low pitch position, check for blade angle of plus 6 to 7 degrees as follows: Place protractor chordwise on machined surface of one blade grip near blade retaining bolt, then on opposite blade grip. Total reading for both blades should be 15 (plus or minus ½) degrees. If any adjustment is required, adjust both links equally.

Note

Further adjustment of pitch change links may be required in operational checks.

8-99 Main Rotor Blades (UH-1B Serial No. 64-14101 and sebsequent). Each main rotor blade is an all-metal bonded 27 inch chord airfoil section. They are secured in main rotor hub blade grip by a retaining bolt and are held in alignment by adjustable drag braces between trailing edge and grip.

8-100. *Removal—Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* a. Support main rotor hub on a stand. Support each blade (1, figure 8-22) so leading edge is straight.

b. Detach drag brace (2) from blade by removing bolt (3) with nut, washers, and shims (4). Keep shims for reassembly.

Note

Do not change drag brace adjustment.

c. Remove locking screw (5) with nut and washer. Use T101414 wrench to remove nut (6) and washer (7) from blade retaining bolt (8).

d. Remove retaining bolt and washer (9), raising blade tip as necessary to find position of best alignment which allows bolt removal without binding and possible damage. Leave pin (10) in place. Be sure bolt is identified for reassembly in same location.

TM 55-1520-211-20
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CHANGE
No. 10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 9 March 1967

Organizational Maintenance Manual

ARMY MODELS UH-1A AND UH-1B HELICOPTERS

TM 55-1520-211-20, 20 January 1966, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 4, section II	4-23 thru 4-24A	4-23 thru 4-24G

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 requirements for Organizational Maintenance Instructions for UH-1A-1B aircraft.

ley in pulley bracket located in the upper right-hand side of the cargo suspension unit compartment. Thread ball end of aft release cable through pulley and pulley bracket tube and install guard pin (13, figure 4-5 and 4-6; 14, figure 4-7 and 11, figure 4-8.)

b. Place cable tension spring, split guide and spacer (14, figure 4-5 and 4-6; 15, figure 4-7 and 12, figure 4-8) over cable ball end and slide into pulley bracket tube (15, figure 4-5 and 4-6; figure 4-7 and 13, figure 4-8).

c. Position aft release cable ball end in cable connector (4, figure 4-5 through 4-8) and install cotter pin.

d. Position pedal assembly (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8) against bulkhead and install attaching screws, bolts, washers and nuts.

e. Position clevis of main release cable (9, figure 4-5 and 4-6; 10, figure 4-7 and 7, figure 4-8) on pedal assembly and install attaching pin, washer and cotter pin.

f. Thread terminal end of main release cable through bulkhead grommets and pulley brackets to cargo suspension unit compartment.

g. If previously removed, install pulleys in pulley brackets located under the cabin deck just aft of the release pedal assembly, just forward of the aft cabin bulkhead and at the lower forward right-hand side of cargo suspension unit compartment. Install guard pins (12, figure 4-5 and 4-6; 13, figure 4-7 and 10, figure 4-8).

h. Connect aft end of main release cable to forward end of aft release cable with turnbuckle (10, figure 4-5 and 4-6; figure 4-7 and 8, figure 4-8) located in the cargo suspension unit compartment. Secure turnbuckle with safety wire.

i. Rig and check operation of emergency release. (Refer to paragraph 4-154.)

j. Install center panel in aft cabin bulkhead and access plates in cabin deck and lower skin to the right and center of helicopter.

4-154. *Adjustment — Cargo Suspension.* The following procedural steps are applicable to all cargo suspension units unless otherwise noted.

a. Check emergency release pedal assembly mounting shims for snug fit. (See figures 4-5 through 4-8.)

b. On UH-1A helicopters, only, a dimension of 0.12 to 0.25 inch must be maintained between the cargo hook release lever (16, figure 4-5) and the ball terminal (17) on the lower end of the hook release cable. The following steps are required for determination or procurement of this dimension:

(1) Open access door (18, figure 4-5) in release hook mechanism after determining that lever (19) has bottomed on slot in shaft, and apply slight downward pressure on ball terminal (17) to remove any slack in the cable. Check for 0.12 to 0.25 inch clearance between cargo hook release lever (16) and ball terminal (17).

(2) If clearance is below 0.12 inch minimum, remove nut, washers, screw and clamps (20, figure 4-5) attaching tube to yoke and turn adapter (21) clockwise to move tube out from shaft assembly. This action will obtain better alignment and will increase cable length at the measuring point.

(3) Install clamps, screw, washers and nut (20, figure 4-5) attaching tube to yoke, and close access door (18).

Note

Washers to be used as spacers between clamps (20) as required.

c. On UH-1B helicopter open access door (16, figure 4-6; 17, figure 4-7 and 14, figure 4-8) and make certain that the cargo hook release lever (17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) is parallel to the plane of the yoke bolts and that the adjustment bolt (18, figure 4-6; 19, figure 4-7 and 16, figure 4-8) in contact with top of hook assembly below the bolt. Check for 0.43 to 0.50 inch clearance between cargo hook release lever and ball terminal (19, figure 4-6; 20, figure 4-7 and 17, figure 4-8). Adjust bolt and nut to obtain required clearance. (Refer to Detail A, figure 4-6 through 4-8.)

d. On UH-1B helicopters make certain that the cargo hook release lever (17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) does not bottom out against the emergency release control cable shield (20, figure 4-6; 21, figure 4-7 and 18, figure 4-8). The control cable shield should extend 0.12 inch below the attaching clamps. (Refer to Detail B, figure 4-6 through 4-8.)

e. Loosen emergency release control cable (3, figure 4-5 through 4-8) in cable connector (4) by loosening cable clamps (1) and clamp assembly (2).

f. Adjust turnbuckle (10, figure 4-5 and 4-6; 11, figure 4-7 and 8, figure 4-8) to obtain 20 to 24 pounds tension on the forward and aft release cable assemblies. Safety wire turnbuckle.

g. Pull slack of emergency release control cable (3, figure 4-5 through 4-8) inboard (towards top of cargo suspension unit) until cable terminal is snug in connector (4).

h. Check emergency release control cable (3, figure 4-5 through 4-8) and electrical wiring assembly for sufficient slack to permit proper operation of the cargo suspension unit and tighten clamp assembly (2) and cable clamps (1).

i. Close cargo hook (22, figure 4-5; 21, figure 4-6; 22, figure 4-7 and 19, figure 4-8) to latched postion.

j. Turn pedal stop assembly screw (23, figure 4-5; 22, figure 4-6; 23, figure 4-7 and 20, figure 4-8) full in (away) from the emergency release pedal assembly. Push the pedal forward, observing for proper action of the linkage and for unlatching of the cargo hook. Adjust the pedal stop assembly screw so the actuator arm of the pedal just fails to touch end of shaft slot when the pedal is full forward.

k. Check the following in final adjustment:

(1) That the cable spring in the pulley bracket tube (15, figure 4-5 and 4-6; 16, figure 4-7 and 13, figure 4-8) does not bottom out when the emergency release pedal is full forward against the pedal stop screw (23, figure 4-5; 22, figure 4-6; 23, figure 4-7 and 20, figure 4-8).

(2) That when the emergency release pedal (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8) is full forward the cargo hook release lever (16, figure 4-5; 17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) is full up, and not bottomed out, and that the cargo hook (22, figure 4-5; 21, figure 4-6; 22, figure 4-7 and 19, figure 4-8) is unlatched.

(3) On UH-1B helicopters that the cargo hook release lever does not bottom out against the emergency release control cable shield (20, figure 4-6; 21, figure 4-7 and 18, figure 4-8).

(4) That the emergency release cable and lever return to locking position. Observe through access door (18, figure 4-5; 16, figure 4-6; 17, figure 4-7 and 14, figure 4-8).

l. Safety wire cable turnbuckle (10, figure 4-5 and 4-6; 11, figure 4-7 and 8, figure 4-8), and check security of cable connector (4, figure 4-5 through 4-8), guard pins (12 and 13, figure 4-5 and 4-6; 13, and 14, figure 4-7 and 10 and 11, figure 4-8) and pulley brackets.

BC 4-154A. Internal Rescue Hoist. (See figure 4-8A.) The UH-1B helicopters Serial No. 64-13902 through 64-14100 and UH-1C helicopters Serial No. 64-14101 and subsequent may be equipped with an internal rescue hoist. The rescue hoist is an electrically powered device with a maximum capacity of 600 pounds and usable cable length of 256 feet. Mounting of the hoist, which is completely internal, is provided for by fittings in the cabin roof and floor. The hoist is operated by means of a control pendant or by controls on the right-hand cyclic stick. The cyclic stick controls will override the pendant controls. A headset, wired to the hoist control box and controlled by a switch on the pendant, gives the hoist operator interphone communication with the flight crew. A cable cutting guillotine, employing an explosive charge, provides a means of cutting the cable free of the helicopter in an emergency. The cutter is electrically actuated by switches, protected by lockwired guards, and located on the hoist control box and on the pilot's pedestal.

4-154B. *Installation — Rescue Hoist.* (See figure 4-8A through 4-8C.) The hoist can only be installed in the right forward area of the cabin. (See figure 4-8B.) To install the hoist in the helicopter, proceed as follows:

a. Disconnect battery and external power.

b. Place hoist upright on stud on adapter plate.

c. Slide adapter locking collar downward to lock adapter jaws to stud.

d. Turn locknut (10, figure 4-8C) counterclockwise several turns until sufficient clearance is obtained to position top hoist adapter over stud in roof.

Figure 4-8A. Internal rescue hoist — UH-1B and UH-1C

e. Slide adapter collar up to lock adapter jaws to stud.

Caution

Do not use tools or extension bars to turn locknut (10). Turn only by hand. Excessive force applied in turning the nut may result in damage to the roof structure.

f. Hand tighten locknut.

g. Remove stud on adapter plate and position actuator on adapter plate and secure.

h. Install motor actuator (either side may be up) between actuator plate and hoist actuator lever and secure with knob and pin.

i. Insert power plug into receptacle located on bulkhead at Station 123.00.

j. Connect plug of boom actuator cable.

k. Remove pin (12), place boom in extended position, and reinstall pin.

l. Reconnect battery or external power.

m. Check oil level in hoist drive unit. (Refer to paragraph 4-154F.)

n. Test operation of hoist as follows:

(1) BAT Switch — ON

(2) NON-ESS Bus Switch — MANUAL-ON

(3) Operate hoist using both controls and note proper functioning of cable up limit switch. (Refer to paragraph 4-154G.)

Note

If external power is used, position BAT Switch to OFF and NON-ESS BUS switch to NORMAL-ON.

Caution

Check cargo doors fully open before operating hoist.

Caution

Maintain a minimum of five pounds tension when extending cable, since a slack cable will run out of winch groves. The hook provides this tension when its full weight is suspended on the cable.

4-154C. *Removal — Rescue Hoist.* (See figure 4-8C.) Proceed as follows:

a. Disconnect hoist power cable at receptacle on bulkhead at Station 123.0, and disconnect boom actuator cable at actuator.

b. Pull pin at actuator lever (16, figure 4-8C) knob at actuator plate, and remove actuator.

c. Remove nut from two stud adapters, remove adapters, and remove actuator plate.

Note

The hoist boom is normally left in the extended position.

d. Release hoist adapters at cabin floor and roof. Loosen locknut (10), and lower support (9).

e. Remove hoist from cabin.

Caution

Stow in upright position if possible. Lay the hoist down with the cable storage drum up. Weight of the hoist on the drum may bend the drum flanges.

4-154D. *Inspection — Rescue Hoist.* Inspect the hoist assembly for the following:

a. Hoist cable for cleanliness, broken or kinked wires, and interference anywhere along its routing.

b. Cable storage drum for wobble while hoist is operating and for uniform and flat winding of cable.

c. All rollers and pulleys for damage and freedom of rotation.

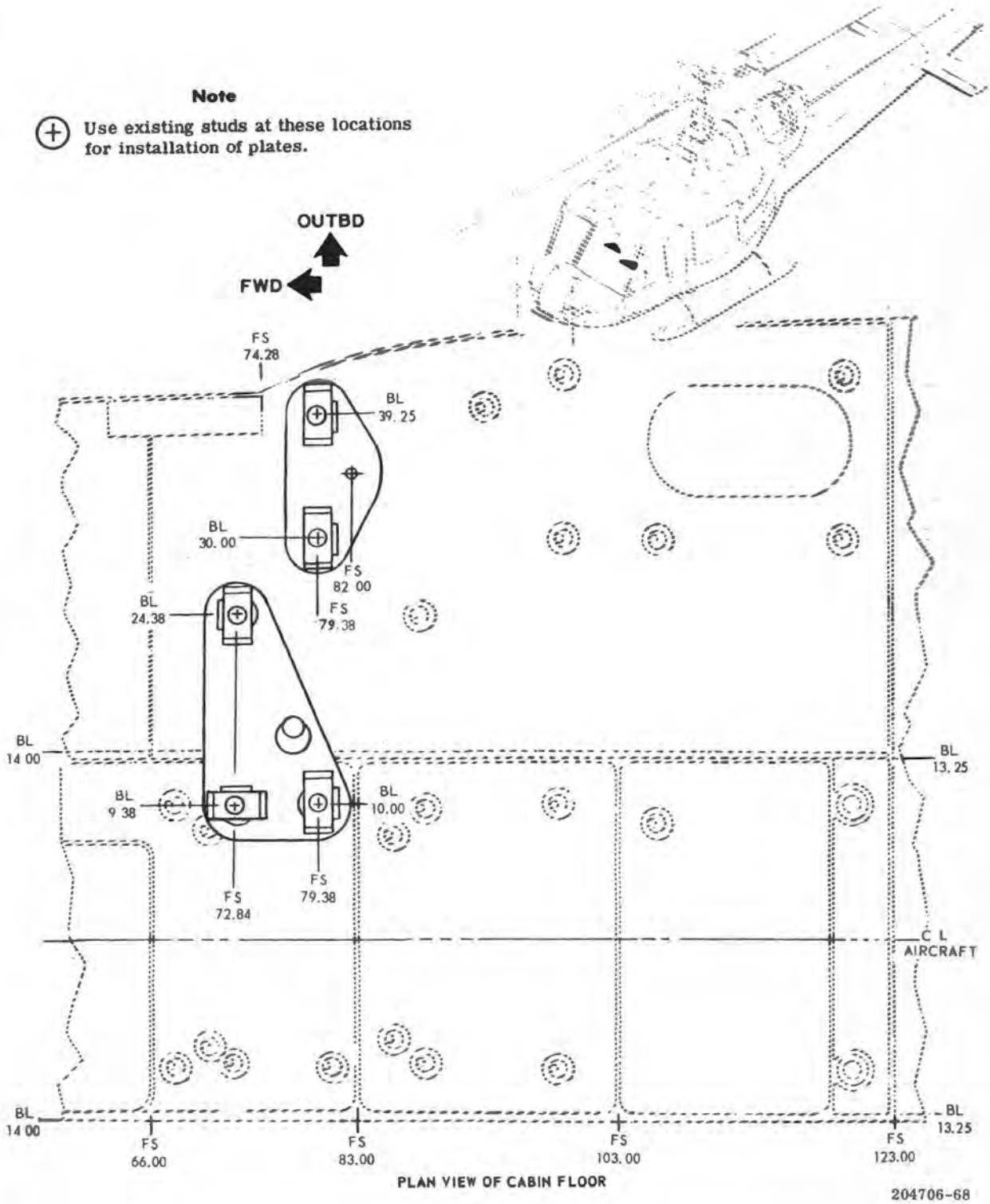
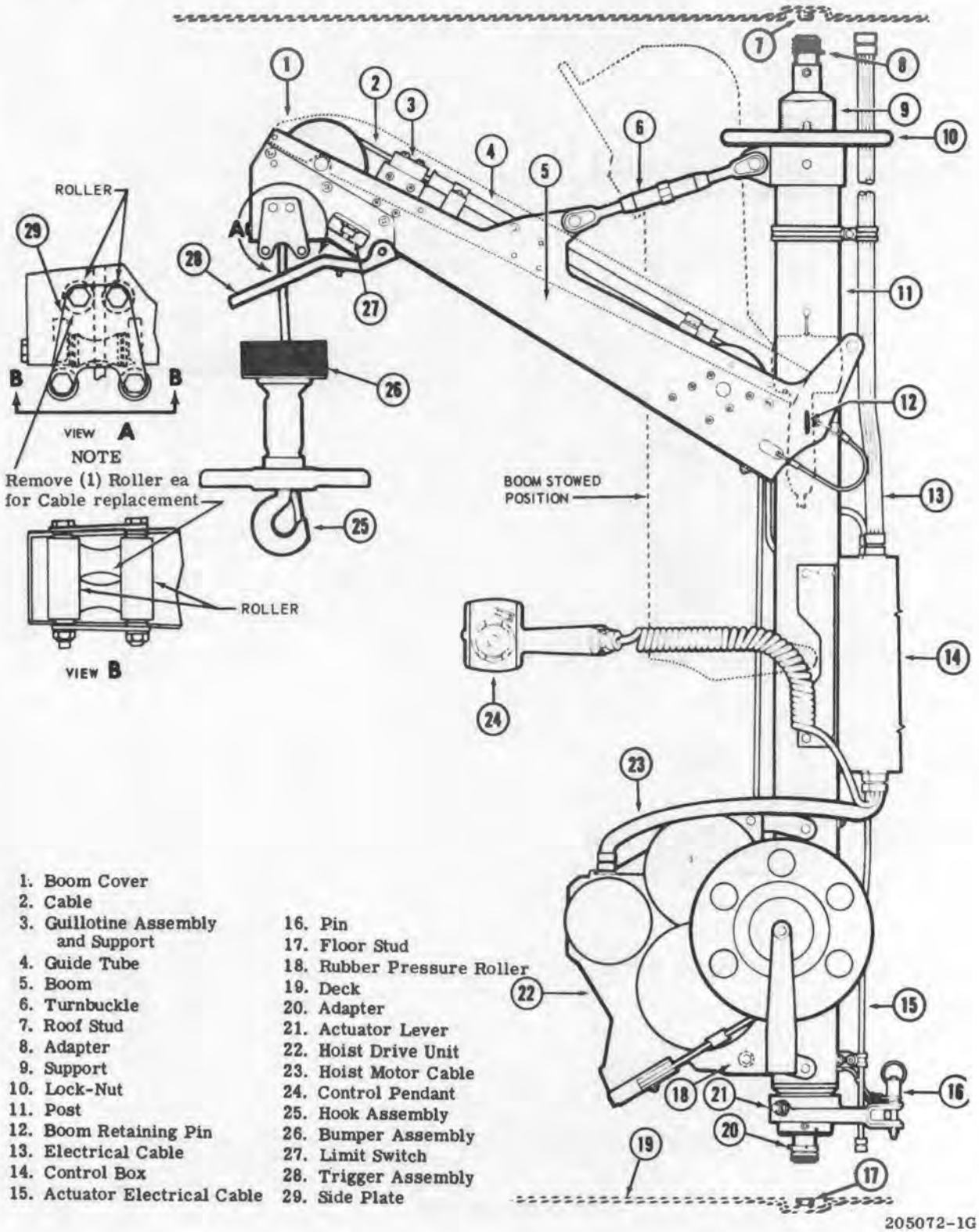


Figure 4-8B. Rescue hoist position — UH-1B and UH-1C



1. Boom Cover
2. Cable
3. Guillotine Assembly and Support
4. Guide Tube
5. Boom
6. Turnbuckle
7. Roof Stud
8. Adapter
9. Support
10. Lock-Nut
11. Post
12. Boom Retaining Pin
13. Electrical Cable
14. Control Box
15. Actuator Electrical Cable
16. Pin
17. Floor Stud
18. Rubber Pressure Roller
19. Deck
20. Adapter
21. Actuator Lever
22. Hoist Drive Unit
23. Hoist Motor Cable
24. Control Pendant
25. Hook Assembly
26. Bumper Assembly
27. Limit Switch
28. Trigger Assembly
29. Side Plate

Figure 4-8C. Rescue hoist installation — UH-1B and UH-1C

d. Pilot's and operator's guillotine switch guard for proper lockwire.

e. All electrical wiring and harnesses for condition and security of connections.

f. Security and installation of hardware, cotter pins, and lockwire.

4-154E. *Repair or Replacement — Rescue Hoist.* Repair or replace defective items as indicated.

a. Tighten loose nuts, bolts, or screws and replace missing, loose, or broken lockwire.

b. As conditions indicate, repair or replace defective electrical wiring and harnesses.

4-154F. *Lubrication — Rescue Hoist.*

Note

To properly check oil level of winch, the system must be operated and the cable run out and reeled in 25 feet. This will be accomplished by two men; one to operate the hoist and the other to walk the cable while maintaining a constant load or tension on the cable. The oil level should be checked at the completion of this cycle.

a. The hoist unit gear box is lubricated with oil (item 18, table 1-1), serviced through a filler port on the side of the gear case. With the hoist in operating position, fill the gear box to the center of the sight glass located below the filler port.

Note

Do not use the filler port dip stick to measure oil level in this installation.

4-154G. *Adjustment — Cable Up Limit Switch.* (See 27, figure 4-8C.) Adjust with up limit switch in the full down position. Adjust screw to clear switch approximately 0.010 inch and secure jamnut.

4-154H. *Inspection — Rescue Hoist Control Box.* Inspect control box as follows:

a. Check security of mounting to hoist post.

b. Check security of switches on control box.

c. Check security of cable connectors.

d. Check cables for fraying and wear.

5-154J. *Inspection — Rescue Hoist Boom and Post.* Inspect boom and post as follows:

a. Insure that latch in adapter collar snaps are locked into position.

b. Check for clearance between cabin roof and boom.

c. Check all hardware, screws, and safety-pin for installation and security.

d. Check electrical wiring for fraying and wear.

4-154K. *Removal — Rescue Hoist Hook Assembly.* (See figure 4-8D.) Disconnect cable from hook as follows:

a. Pull cotter pin and remove retaining pin from ring assembly.

b. Withdraw split insert from ring and separate halves from cable ball-end and hook.

c. Remove ring assembly by pulling cable through boot and bumper plate.

4-154L. *Installation — Rescue Hoist Hook Assembly.* (See figure 4-8D.) Connect cable to hook as follows:

a. Pass the ball on cable through rubber bumper and the ring and boot assembly from top end.

b. Assembly cable to hook with split insert and slide assembly into ring.

c. Align holes in ring and insert retaining pin, washer, and cotter pin.

4-154M. *Inspection — Rescue Hoist Hook Assembly.* Inspect hook assembly as follows:

a. Energize hoist and check that bumper (26, figure 4-8C) engages limit switch trigger (28) to stop hoist motor. (Refer to paragraph 4-154G for adjustment.)

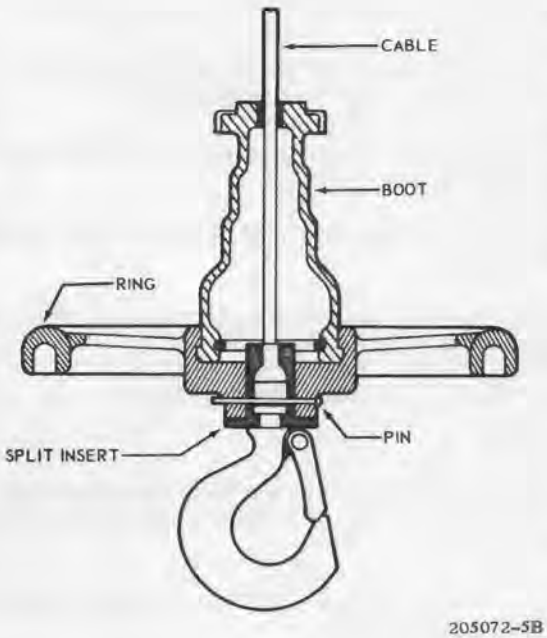


Figure 4-8D. Rescue hoist hook assembly

b. Check security of retaining pin and cotter pin in ring.

c. Check boot for wear and tears.

4-154N. ***Inspection — Rescue Hoist Pendant Control.*** Inspect pendant control as follows:

a. Inspect coil wire end and plug for security.

b. Inspect rubber boot for security.

Note

If pendant switch will not return to center and motor continues to run; rubber boot is not secure.

c. Inspect switch for security.

4-154P. ***Repair or Replacement — Rescue Hoist Pendant Control.*** (See 24, figure 4-8C.) Repair rubber boot as follows:

a. Remove retaining ring that secures boot and remove boot.

b. Secure boot to pendant control with a suitable adhesive, insuring that boot is centered.

c. Replace retaining ring.

4-154Q. ***Rescue Hoist Overload Sensing Control.*** The overload sensing control is mounted near the hoist power relay and serves to sense hoist overload current surges, and opens circuit to hoist power from hoist motor. Sensing control will reset automatically.

4-154R. ***Removal — Rescue Hoist Overload Sensing Control.*** Remove hoist overload sensing control as follows:

a. Disconnect battery and external power.

b. Remove electrical wires from overload sensing control terminal.

c. Tape ends of disconnected wires.

d. Remove mounting screws and washers from overload sensing relay.

e. Remove relay.

4-154S. ***Installation — Rescue Hoist Overload Sensing Control.*** Proceed as follows:

a. Remove protective tape from overload sensing control wire terminals.

b. Electrically ground sensing control mounting hole and contact surface.

c. Position sensing control on mounting bracket, install mounting screws and washers.

d. Place wire terminals on sensing control terminal post and secure with existing washers and nuts.

e. Reconnect battery.

4-155. Rear View Mirror. Model UH-1B helicopters are equipped with an adjustable rear view mirror (16, figure 4-1) located outside the forward cabin under the nose door. This mirror, when properly adjusted, enables the pilot to visually check the operation of the external

cargo suspension hook. When the helicopter is employed on missions which do not require use of the external cargo suspension, the rear view mirror may be removed to present a clean configuration.

4-156. *Removal — Rear View Mirror.* a. Remove cover from mirror.

b. Remove spring pins from adjustment handles and remove both handles. Remove mirror.

c. Remove bolts, washer and nuts, which attach braces and support to the structure, and remove braces and support as a unit.

d. Store rear view mirror, braces and support in upper baggage compartment area, using strap, bracket and hardware provided for this purpose.

4-157. *Installation — Rear View Mirror.* a. Install braces and support to the structure, using previously removed bolts, washers and nuts.

b. Position rear view mirror and align mounting holes.

c. Screw adjustment handles through mounting holes. Adjust mirror to desired angle, tighten adjustment handles, and insert spring pin in threaded ends of handles.

d. Slide protective cover over mirror.

4-158. *Adjustment — Rear View Mirror.* a. Remove spring pins and loosen adjustment handles.

b. Manually adjust mirror to desired angle.

CHANGE
NO. 9

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 23 *January* 1967

Organizational Maintenance Manual

ARMY MODEL UH-1A AND UH-1B HELICOPTERS

TM 55-1520-211-20, 20 January 1966, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 1, Section I, II	1-1 and 1-2	1-1 and 1-2
Section III	1-33 and 1-34	1-33 and 1-34
Chapter 2, Section II	2-5 thru 2-7/2-8	2-5 thru 2-7/2-8
Chapter 3, Section I	3-1 and 3-2	3-1 and 3-2
Section II	3-17 and 3-18	3-17 and 3-18
	3-29 thru 3-30B	3-29 thru 3-30B
Section II, III	3-31 and 3-32	3-31 and 3-32
Section III, IV	3-47 thru 3-62	3-47 thru 3-62
Section V		3-64A and 3-64B
	3-65 and 3-66	3-65 and 3-66
Chapter 4, Section I, II	4-1 thru 4-6	4-1 thru 4-6
Section II	4-9 and 4-10	4-9 thru 4-10B
	4-11 thru 4-14	4-11 thru 4-14
	4-15 and 4-16	4-15 and 4-16
	4-19 and 4-20	4-19 thru 4-20A
Sections II, III, IV, V, VI	4-29 thru 4-40A	4-29 thru 4-40
Section VI	4-41 and 4-42	4-41 and 4-42
Chapter 5, Section I, II	5-1 and 5-2	5-1 and 5-2
Section II	5-19 and 5-20	5-19 and 5-20
	5-24A and 5-24B	5-24A and 5-24B
Section V, VI	5-56A	5-56A
Section VII, VIII, IX	5-83, 5-83A and 5-84	5-83 thru 5-84A
Section X	5-103 thru 5-107/5-108	5-103 thru 5-108A
Chapter 6, Section I, II	6-1 and 6-2	6-1 thru 6-2B
Section II	6-7 thru 6-12	6-7 thru 6-12
	6-15 and 6-16	6-15 thru 6-16B
	6-18A thru 6-18D	6-18A thru 6-18Γ
	6-19 and 6-20	6-19 and 6-20
	6-24C and 6-24D	6-24C and 6-24D
Section II, III	6-25 and 6-26	6-25 thru 6-27/6-28
Chapter 7, Section II	7-15 and 7-16	7-15 and 7-16
Section II, III, IV	7-17 thru 7-18A	7-17 thru 7-18B
Section IV	7-19 and 7-20	7-19 and 7-20
	7-29 and 7-30	7-29 and 7-30
	7-33 thru 7-36A	7-33 and 7-34

	Remove pages	Insert pages
Chapter 7, Section IV (cont.)	7-37 and 7-38	7-37
	7-39 thru 7-40A	7-39 and 7-40
Section V	7-41 thru 7-42A	7-41 thru 7-42A
Section V, VI, VII	7-43 thru 7-46	7-43 thru 7-46
Chapter 8, Section I, II	8-1 thru 8-4	8-1 thru 8-4A
Section II	8-5 and 8-6	8-5 and 8-6
	8-9 and 8-10	8-9 and 8-10
	8-12A	8-12A
	8-13 thru 8-20	8-13 thru 8-20A
	8-21 and 8-22	8-21 and 8-22
	8-25 and 8-26	8-25 and 8-26
	8-29 thru 8-32	8-29 thru 8-32
	8-33 thru 8-40	8-33 thru 8-40
	8-42A and 8-42B	8-42A and 8-42B
	8-43 thru 8-46	8-43 thru 8-46
	8-48A and 8-48B	8-48A and 8-48B
	8-50C	8-50C
	8-52A	8-52A
	8-56A thru 8-56D	8-56A thru 8-56E
Section III	8-61 and 8-62	8-61 and 8-62
	8-67 and 8-68	8-67 thru 8-68A
	8-69 and 8-70	8-69 and 8-70
	8-75 thru 8-78	8-75 thru 8-78
	8-81/8-82	8-81/8-82
Chapter 9, Section I, II	9-1 and 9-2	9-1 and 9-2
Section II	9-6A	9-6A
	9-7 thru 9-8A	9-7 thru 9-8A
	9-9 and 9-10	9-9 and 9-10
	9-17 and 9-18	9-17 and 9-18
	9-21 thru 9-24	9-21 thru 9-24
	9-27 and 9-28	9-27 and 9-28
Chapter 10, Section I, II, III	10-1 thru 10-6	10-1 thru 10-6A
Section III, IV	10-7 thru 10-12	10-7 thru 10-12
Chapter 12, Section II	12-3 thru 12-8	12-3 thru 12-8A
	12-9 thru 12-10A	12-9 thru 12-10B
	12-11 and 12-12	12-11 thru 12-12C
Section II, III, IV, V, VI	12-13 thru 12-18	12-13 thru 12-18A
Section VII, VIII	12-19 and 12-20	12-19 thru 12-20A
Section VIII	12-69 thru 12-72	12-69 thru 12-72
		12-75 thru 12-86
Chapter 14, Section V, VI	14-17 and 14-18	14-17 and 14-18
Appendix II, Section II	AII-3 thru AII-26	AII-3 thru AII-26
Appendix III	AIII-3 and AIII-4	AIII-3 and AIII-4
Index	Index 1 thru Index 14	Index 1 thru Index 14

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 requirements for Organizational Maintenance Instructions for UH-1A-1B aircraft.

CHAPTER 1
INTRODUCTION

Section I — Scope

1-1. Scope. Part II of the multiple part manual is the Organizational Maintenance Manual and covers all assigned maintenance functions as outlined in the Maintenance Allocation Chart for organizational maintenance level.

1-2. Distribution and Revision System. Refer to AR 310-1.

1-3. Definitions of Notes, Cautions and Warnings. Throughout this manual adjuncts to the text are used, the definitions of which are as follows:

a. NOTE — An operating procedure, condition, etc., which is essential to highlight.

b. CAUTION — An operating procedure, practice, etc., which, if not correctly followed, will result in damage to or destruction of equipment.

c. WARNING — An operating procedure, practice, etc., which, if not strictly observed, will result in personal injury or loss of life.

1-4. Authorization for Issue. Refer to AR 310-3.

1-5. Mandatory Requirements. This manual, issued expressly for organizational maintenance, is the official document for Army Model UH-1A helicopters, (Serial No. 58-2078 through 58-2093; 58-3017 through 58-3047; 59-1607 through 59-1716; and 60-3530 through 60-3545), and Army Model UH-1B helicopters, (Serial No. 60-3546 through 60-3619; 61-686 through 61-803; 62-1872 through 62-2105; 62-4566 through 62-4605; 62-12515 through 62-12555; 63-8500 through 63-8738, 63-12903 through 63-12952; 64-13902 through 64-14191; 65-9416 through 65-9564; 65-12738 through 65-12744; 65-12772 and 66-491 and subsequent). The purpose of this manual is to supply you with the maintenance functions to be performed at the organizational maintenance level. A Table of Contents for this manual is provided to assist in determining the chapter in the manual in which individual functions are covered. The study and use of this manual will enable a maintenance crew of limited experience to perform the assigned functions with maximum efficiency. This manual provides all essential information for personnel to accomplish Army organizational maintenance on the complete airframe, its components and systems with functions and related functions of the same general scope and magnitude as prescribed for organizational maintenance activities in the Maintenance Allocation Chart. (Refer to Appendix II.)

Note

Do not destroy any pages in this manual unless the data contained thereon has been replaced, superseded, or included in the manual by a change or revision.

1-6. Reporting of Equipment Manual Improvements. The direct reporting of errors, omissions, and recommendations for improving this manual by the individual user, is authorized and encouraged. DA Form 2028 will be used for reporting these improvements. This form may be completed using pencil, pen or typewriter. DA Form 2028 will be completed by the individual user and forwarded directly to: Commanding General, U.S. Army Aviation Materiel Command, P.O. Box 209, St. Louis, Missouri 63166.

Section II — General Information

1-7. Summary of Manual Contents. This manual is divided into sixteen chapters, four appendices and an index. In several instances comparable systems vary between serial numbered blocks of helicopters. In such cases two or more sections with the same section number and title have been employed to cover the various configurations most accurately and efficiently.

1-8. *Chapter 1 — Introduction.* This chapter describes this part of the multiple part manual and gives a summary of the information contained herein. It also contains a detailed description of the entire aircraft, ground handling methods and procedures, servicing instructions, and a list of special tools and equipment.

1-9. *Chapter 2 — Lubrication Instructions.* This chapter covers the lubrication requirements of the aircraft by inclusion of complete lubrication instructions and applicable lubrication charts.

1-10. *Chapter 3 — Inspection Requirements.* This chapter contains complete requirements for special inspections, test flight inspections, overhaul and retirement schedule and standards of serviceabality applicable to the aircraft.

1-11. *Chapter 4 — Airframe and Alighting Gear.* The function of this chapter is to provide all the essential information for maintenance personnel to accomplish organizational maintenance on the complete airframe and alighting gear.

1-12. *Chapter 5 — Power Plant and Related Systems.* The purpose of this chapter is to provide necessary information to perform organizational maintenance on the complete power plant and its related systems.

1-13. *Chapter 6 — Hydraulic and Pneumatic Systems.* This chapter contains organizational maintenance instructions for components of all hydraulic systems used in the aircraft covered by this manual. Pneumatic systems data is not applicable.

1-14. *Chapter 7 — Power Train System.* Included in this chapter are detailed descriptions of the mast, transmission, driveshafts and gear boxes with organizational maintenance instructions as necessary.

1-15. *Chapter 8 — Main and Tail Rotor Groups.* This chapter contains organizational maintenance instructions for components of the main rotor system, including hub and blades, and for the tail rotor hub and blades.

1-16. *Chapter 9 — Flight Controls.* Necessary instruction for the performance of organizational maintenance to all fixed and movable flight control systems are contained in this chapter.

1-17. *Chapter 10 — Instruments.* Organizational maintenance instructions are provided herein for all flight, navigation, engine, and miscellaneous instruments.

1-18. *Chapter 11 — Utility Systems.* This chapter contains organizational maintenance instructions applicable to the various utility systems which may be installed in the aircraft covered by this manual.

1-19. *Chapter 12 — Electrical Systems.* Included in this chapter are instructions necessary for the performance of organizational maintenance on components of all electrical systems.

1-20. *Chapter 13 — Avionics and Photographic.* Necessary avionics organizational maintenance instructions are covered by reference to applicable manual. Photographic data is not applicable.

1-21. *Chapter 14 — Armament.* Necessary organizational maintenance instructions for the various armament systems which may be installed on these aircraft will be found in this chapter.

TYPES OF FUEL AND PERMISSIBLE HOURS OF OPERATION ON EACH BETWEEN SCHEDULED HOT END INSPECTIONS

ENGINE MODEL	SPECIFIED FUEL	ALTERNATE FUEL Type	ALTERNATE FUEL Hours	EMERGENCY FUEL Type	EMERGENCY FUEL Hours
T53-L-1A	JP-4	Gasoline, All Types JP-5 Type	50 Unlimited	None	None
T53-L-5	JP-4	Gasoline, All Types	50	JP-5 Type	10
T53-L-9/9A	JP-4	Gasoline, Unleaded	50	JP-5 Type Gasoline, Leaded	10 10
T53-L-11 and Scoopless T53-L-9A	JP-4 JP-5	Gasoline, Unleaded Diesel Fuel	50 150	Gasoline, Leaded Compression Ignition Fuel	30 10
T53-L-13	JP-4 JP-5	NONE		NONE	

Figure 1-12. Fuel usage chart

a. Remove filler cap (4, figure 1-13) and fill damper to full mark with hydraulic oil (item 3, table 1-1).

b. Replace and safety wire filler cap.

1-88. *Hydraulic Reservoir.* The hydraulic reservoir (5, figure 1-11) for UH-1A and UH-1B, Serial No. 60-3546 through 64-14100, helicopters is mounted on the right-hand side of the cabin aft bulkhead. Access to this reservoir is gained by opening right-hand transmission cowling. Oil level can be checked from inside cabin by means of a sight glass located on forward side of reservoir. Reservoir drain plug is located in bottom of reservoir.

Warning

To avoid contamination, do not use previously opened cans of hydraulic fluid. A new, sealed can of fluid must be opened and used.

1-89. *Servicing — Hydraulic Reservoir.* Service hydraulic reservoir for UH-1A and UH-1B, Serial No. 60-3546 through 64-14100, with hydraulic fluid (item 3, table 1-1).

HYDRAULIC CAPACITIES

Total Hydraulic Reservoir Capacity	4.0 U.S. Pints
Reservoir Refill Level	3.0 U.S. Pints
Total Hydraulic System Capacity	8.0 U.S. Pints

1-90. *Hydraulic Reservoir.* UH-1B helicopters, Serial No. 64-14101 and subsequent, are equipped with two hydraulic reservoirs (5, figure 1-11) mounted on the right-hand side of the cabin aft bulkhead. Access to these reservoirs is gained by opening right-hand transmission cowling. Outboard reservoir supplies System No. 2, and inboard reservoir supplies System No. 1. Oil level in each reservoir can be checked by means of sight glasses which are visble when right-hand transmission cowling is opened. A drain plug is located in the bottom of each reservoir.

Warning

To avoid contamination, do not use previously opened cans of hydraulic fluid. A new, sealed can of fluid must be opened and used.

Caution

On UH-1B helicopters Serial No. 66-491 and subsequent do not service reservoir with the accumulator charged hydraulically. Accumulator should be bled down. Bleed emergency collective accumulator in System No. 1. Proper accumulator gas precharge (gage needle in green zone of the dial) is mandatory for correct operation of secondary collective power.

1-91. *Servicing — Hydraulic Reservoir.* Service hydraulic reservoirs for UH-1B, Serial No. 64-14101 and subsequent, with hydraulic fluid (item 3, table 1-1).

HYDRAULIC CAPACITIES

Total System No. 1 Reservoir Capacity	3.25 U.S. Pints
Total System No. 2 Reservoir Capacity	3.25 U.S. Pints
Reservoir Refill Level	2.60 U.S. Pints
Total System No. 1 Capacity	6.60 U.S. Pints
Total System No. 2 Capacity	6.05 U.S. Pints

1-92. *Tires.* Two, six ply, tires (3, figure 1-11) are used on the helicopter ground handling gear. Those used on the Model UH-1A helicopters are 3.50 x 6; those on the Model UH-1B helicopters are 7.00 x 6.

1-93. *Servicing — Tires.* Inflate ground handling gear tires as follows:

Model Helicopter	Tire Size	Inflate To
UH-1A	3.50 x 6	75 to 80 PSI
UH-1B	7.00 x 6	38 PSI

1-94. *Ground Handling Hydraulic Pump.* A hydraulic pump (2, figure 1-11) is part of each ground handling gear. This manually activated pump facilitates raising and lowering of the ground handling wheels.

1-95. *Servicing — Ground Handling Hydraulic Pump.* a. Remove ground handling gear from helicopter and perform the following:

b. Position ground handling gear so that hydraulic pump is in vertical position with filling hole at top.

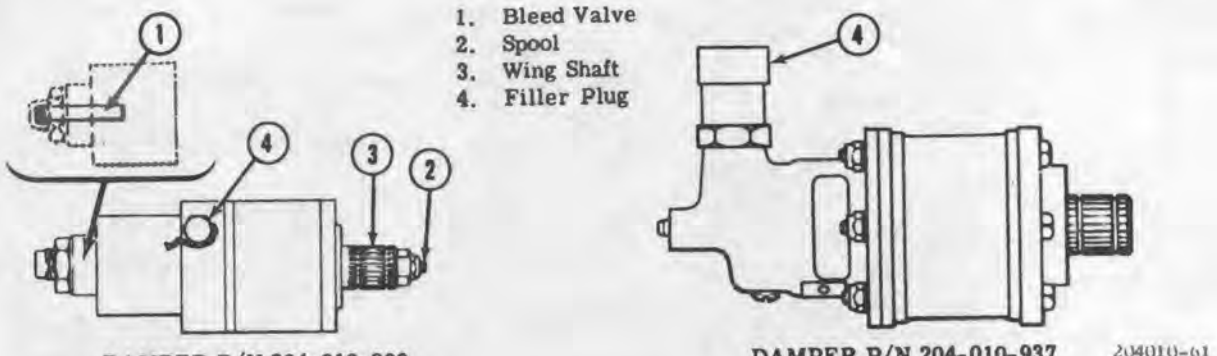
c. Remove filling screw and fill pump tank with hydraulic fluid, (item 3, table 1-1), until fluid comes out the filling hole.

d. Reinstall filling screw and tighten securely.

1-96. *Battery.* The nickel-cadmium battery (14, figure 1-11) is mounted in the lower section of the electrical compartment, and is connected to the helicopter's electrical system through a relay, which is controlled by the battery switch on the DC power panel. Two overflow, or vent, tubes extend from the battery to the underside of the fuselage. They are accessible through the lower left-hand door of the electrical compartment. The acceptable battery is a 24 volt, 34 ampere hour unit.

Caution

Battery failures and explosions may be caused by an excess of electrolyte in the cells. The specific gravity of a nickel-cadmium battery remains constant when the battery is in either a charged or discharged condition; consequently the state of charge cannot be determined by a test of the electrolyte. Neither can the state of charge be determined by a voltage test, due to the fact that the voltage remains constant over 90 percent of the discharge time. Since the state of charge cannot be determined by a check of either voltage or the electrolyte, the charging input to a completely discharged battery must be monitored in both current and time until the ampere hour capacity of the battery has been reached.



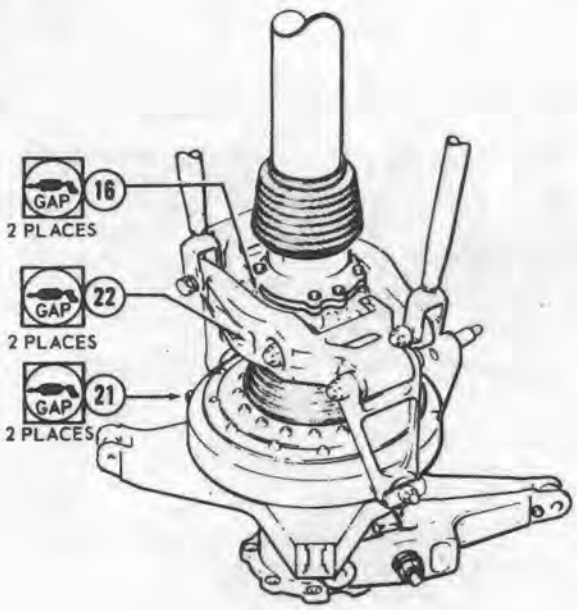
1. Bleed Valve
2. Spool
3. Wing Shaft
4. Filler Plug

DAMPER P/N 204-010-900

DAMPER P/N 204-010-937

Figure 1-13. Stabilizer bar dampers

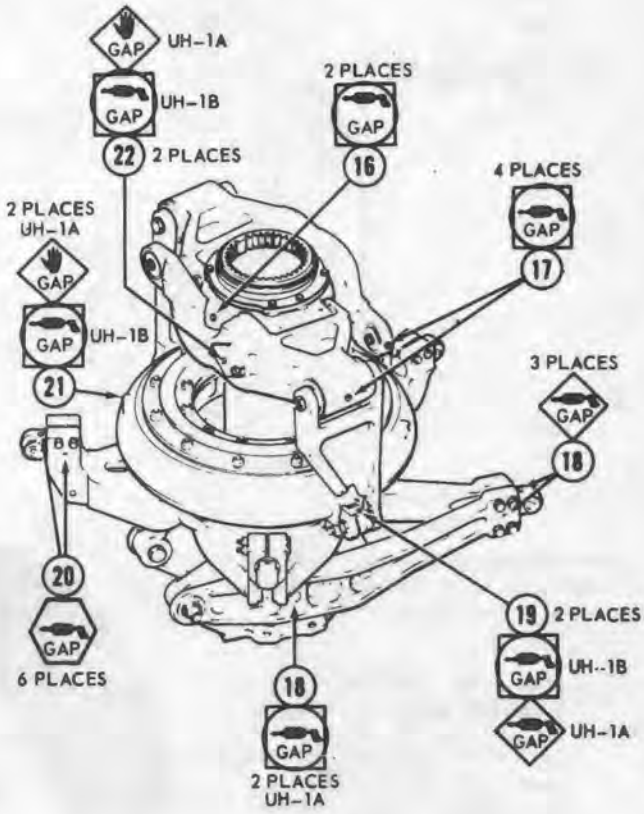
16. Hub - Scissors and Sleeve
17. Levers - Collective Scissors
18. Collective - Lever Trunnion
19. Trunnion Swashplate Outer Ring
20. Ring - Swashplate Inner
21. Ring - Swashplate Outer
22. Pivot Bearings, Scissors Trailing Side
22A. Collective Idler Link
22B. Collective Levers
22C. Collective Scissors



DETAIL B

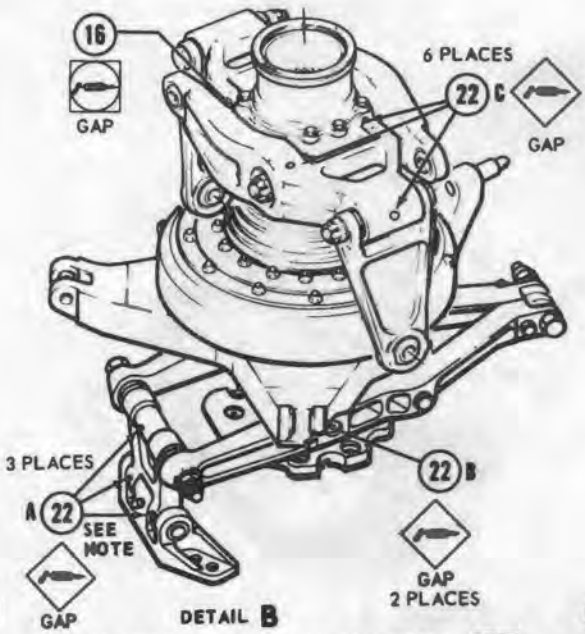
MODEL UH-1B
(Serial No. 64-14101 thru 65-12744 and 65-12772)

540



DETAIL B

MODEL UH-1A AND UH-1B (thru Serial No. 64-14100)



DETAIL B

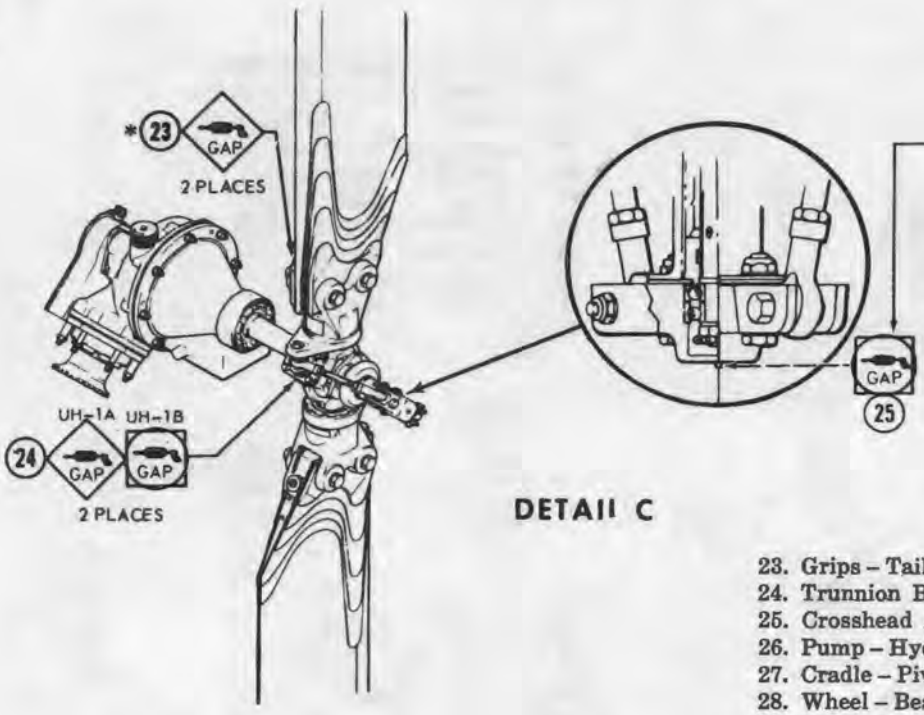
MODEL UH-1B (SERIAL NO. 66-491 AND SUB) 540

Note

Make sure grease shows each side of lever attachment bolt.

204900-59-4F

Figure 2-1. Lubrication chart (Sheet 4 of 6)



DETAIL C

23. Grips – Tail Rotor Hub and Blade
24. Trunnion Bearings
25. Crosshead Assembly
26. Pump – Hydraulic
27. Cradle – Pivot
28. Wheel – Bearing
29. Bellcrank – Actuating
30. Arm –Actuating

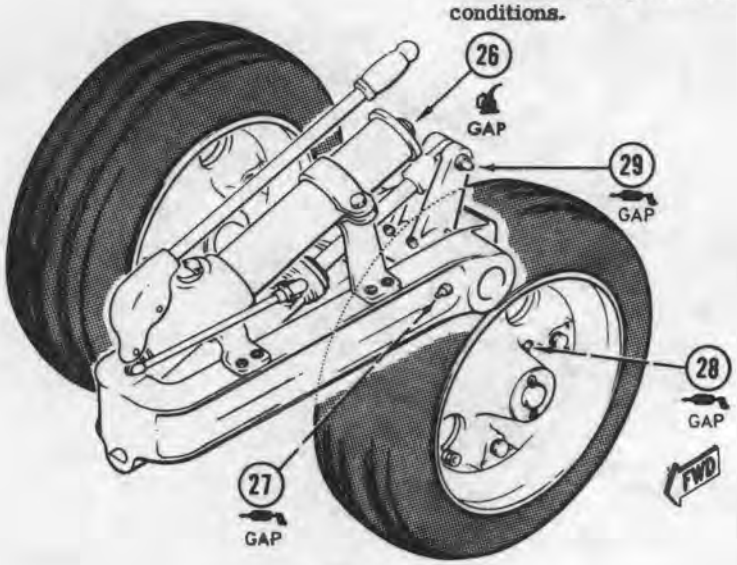
*** Note**

Purge lubricate tail rotor hub and blade grip bearings (23) every 25 hours if conditions warrant as follows:

1. Disconnect pitch link at one blade grip and purge bearing with grease, rotate grip several times in both directions. Repeat purging and rotating procedure. Wipe off excess grease and reconnect pitch link.
2. Disconnect pitch link on opposite blade grip and purge bearing in accordance with step 1. Reconnect pitch link.

Note

Lubricate ground handling gear at six months intervals or as required by climatic conditions.

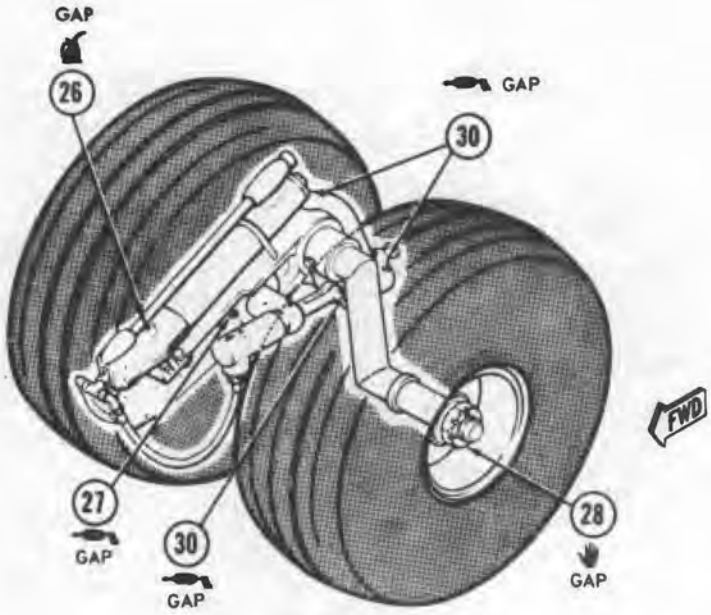


DETAIL D

MODEL UH-1A HELICOPTERS

204900-59-7

Figure 2-1. Lubrication chart (Sheet 5 of 6)

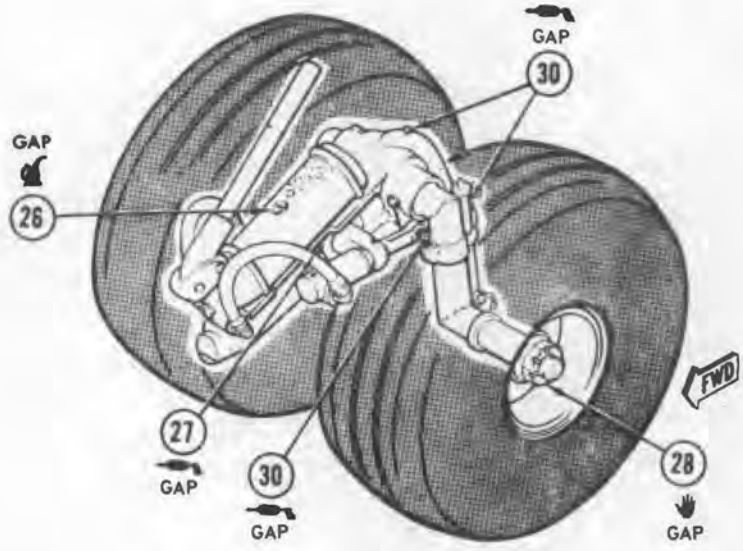


DETAIL D

MODEL UH-1B HELICOPTERS
(Serial No. 60-3546 through 61-803)

Note

Lubricate ground handling gear at six month intervals or as required by climatic conditions.



DETAIL D

MODEL UH-1B HELICOPTERS
(Serial No. 62-1872 and subsequent)

204900-59-5D

Figure 2-1. Lubrication chart (Sheet 6 of 6)

CHAPTER 3
INSPECTION REQUIREMENTS

Section I — General Information and Scope

3-1. General Information. This chapter contains complete requirements for special inspections, test flight, overhaul and retirement schedule, and standard of serviceability applicable to the aircraft. Equipment serviceability criteria applicable to the UH-1A and UH-1B aircraft are presented in TM 55-1520-211-ESC. It does not contain instructions for repair, adjustment, or other means of rectifying conditions, nor does it contain instructions for troubleshooting to find causes for malfunctioning. Applicable chapters covering the appropriate systems and higher echelon assistance should be consulted for instructions that are beyond the scope of this chapter.

3-2. Scope. The inspections prescribed in this chapter will be accomplished at specified periods by organizational maintenance activities with the assistance of direct support activities when required. The following conditions will be noted during the performance of these inspections.

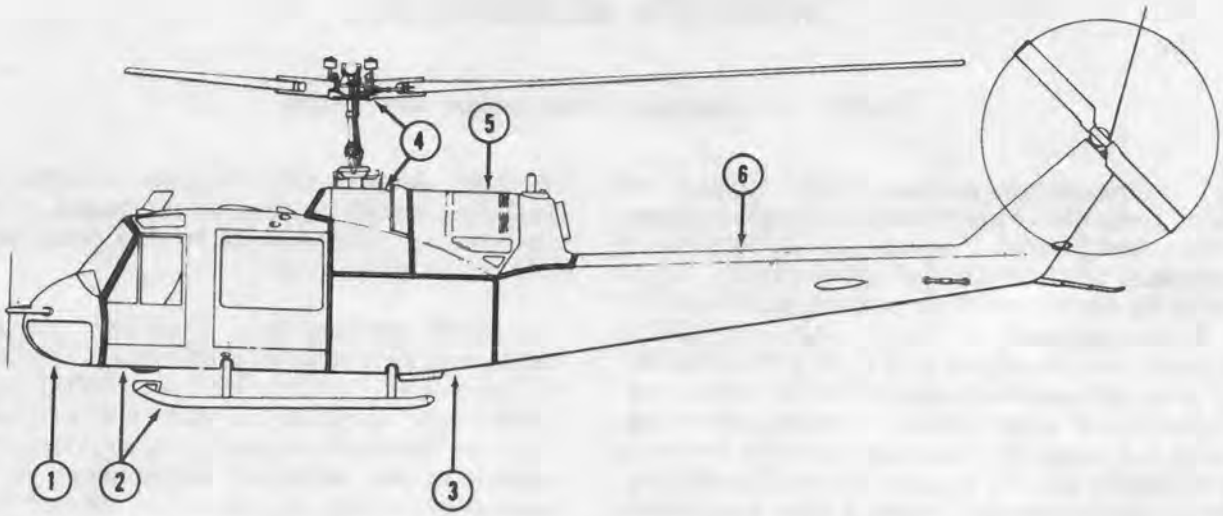
a. The inspection requirements are stated in such a manner as to establish what and when certain equipment is to be inspected and the condition to be sought. Compliance with the provisions outlined herein and with the Preventive Maintenance Inspection Checklists (TM 55-1520-211-20 PMD, -20 PMI, and -20 PMP) are required in order to assure that latent defects are discovered and corrected before malfunctioning or serious trouble results. In order to arrange inspection requirements as nearly as possible according to the manner in which work will be assigned, the requirements in each section are divided into groups under area headings. (See figure 3-1). This figure will be the same as the area diagram presented in the appropriate Preventive Maintenance Inspection Checklist. An area title indicates a specific aircraft location which may be comprised of several systems or groups of related components within this given area.

b. Inspection methods employed; environmental and geographical conditions: availability of specialized, skilled, or semi-skilled manpower; and facilities utilized are extremely variable; therefore, flexibility is provided with respect to the order of performance of the various inspections as required by efficient management of the inspection function assuring that the inspection requirements designated are adhered to and accomplished.

c. This manual pertains to all UH-1A and UH-1B series aircraft and may therefore contain inspection requirements applicable to specific equipment not installed on individual aircraft. When this situation is encountered, those requirements that are not applicable should be disregarded.

d. The inspection requirements contained herein are printed on inspection checksheets.

e. Revisions to this chapter shall be published when necessary to add, delete, revise, or change data. Frequency of revisions will be based on factual data accumulated as a result of maintenance experience. Data will be gathered by field studies, from equipment improvement recommendations, and from any other communications pertaining to this chapter and its requirements. Recommendations proposing changes to this chapter should be submitted on DA Form 2028 and forwarded to the Commanding General, U.S. Army Aviation Materiel Command, ATTN: SMOSM-M, P.O. Box 209, St. Louis, Missouri 63166.



AREA No. 1	Nose Area	All surfaces, components, and equipment in nose compartment and on exterior ahead of crew doors.
AREA No. 2	Cabin and Landing Gear	All surfaces, components, and equipment inside cabin and on cabin exterior between forward sides of crew doors and cabin bulkhead at Station 123. Includes complete landing gear.
AREA No. 3	Center Fuselage Area	All surfaces, components, and equipment in fuselage below engine deck level, between cabin aft bulkhead and tail boom attachment bulkhead. Includes fuel cells, compartment below main transmission, and compartments accessible through side doors on fuselage.
AREA No. 4	Pylon Area	All surfaces, components, and equipment of the main rotor pylon group, from top of mast to bottom of transmission and work deck area under forward cowling. Includes main rotor, mast and rotating controls, transmission with accessories and mounts, and main (input) drive shaft.
AREA No. 5	Engine Area	All surfaces, components, and equipment associated with engine installation, located above engine work deck and within engine cowling, tailpipe fairing, and air intake area.
AREA No. 6	Tail Boom Area	All surfaces, components, and equipment located in or on the tail boom and vertical fin structure. Includes tail rotor, synchronized elevator, and control linkages; also the complete drive train of shafts and gear boxes between main transmission and tail rotor.

204080-171

Figure 3–1. Model UH-1A and UH-1B area inspection diagram

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 14	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
2,5		e. If there is no accumulation of metal chips, lint, or other foreign material, or if the accumulation is slight and blade tip clearances are within allowable limits, inspect the engine in accordance with the following procedure. (1) Start the engine as outlined in TM 55-1520-211-10. Run engine at ground idle until stabilized. Check the instruments for proper engine operation. Increase the engine speed to 50 percent nI rpm and check the instruments. Increase engine speed to 75 percent nI rpm, and then to normal rated power, checking the instruments carefully at each speed setting. A variation from normal operation at any point is cause for engine shutdown. (2) Return to ground idle. Allow engine to stabilize, then shut down engine. Listen for unusual noises during engine coast-down. (3) When the engine has cooled sufficiently, check oil filter for metal chips, lint, or other foreign material.		
2,4, 5,6		f. After shut-down, repeat steps a., b., c., and d. If all engine operations are normal and inspected areas are within limits return engine to service.		
5		**Internal inspection of engine at every 300 hour engine period.** Perform internal inspection of engine at each 300-hour engine period. (Refer to TB 55-2800-200-30/1, T53 Engine Inspection Guide).		
5		*Note* UH-1A T53-L-1/1A Hot Section Inspection: Hot section will be inspected at each 300		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 15	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		operating hours. T53-L-1A engines that have not had the gas producer turbine wheel removed since overhaul are allowed to operate for 300 hours until the first hot section inspection. Units having the engine vibration kit, Part No. LTCT 484, available are allowed to continue hot section inspections at 300 hour intervals. If vibration equipment is not available, hot section inspection will then revert to 100 hour intervals until kit is received. Engines that have had the gas producer turbine wheel removed since overhaul will be limited to 100 hour hot section inspections until the vibration kit is available to run a vibration survey on that engine. At this time, hot section inspections can be extended to 300 hour intervals.		
5		Reduction Gear Inspection T53-L-1/1A: The engine reduction gear will be inspected at 300 operating hours. The planet gear bearing, clamp retainer, Part No. 1-030-038-01, and the planet gear front bearing, retainer nut, Part No. 1-030-037-01, will be disassembled only if a 0.004 inch feeler gage can be inserted between the rear face of the planet gear front bearing, retainer nut, Part No. 1-030-037-01, and the inner race of the roller bearing, Part No. 1-300-014-01. The disassembled parts must be cleaned in solvent and the threads of the planet gear bearing, clamp retainer, must be coated with Loctite Grade (AA) (Green). The planet gears will not be disassembled if the 0.004 inch feeler gage cannot be inserted between the planet gear front bearing retainer nut, and the roller bearing inner race.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 26	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		i. Perform engine run-up with complete operational vibration check.		
5		j. Inspect the following components for chips or foreign material: (1) Main fuel strainer. (2) Fuel control inlet screen. (3) Fuel control pump discharge screen. (4) Servo filter. (5) Oil filter. (6) Magnetic plug. (7) Externally accessible engine oil strainers.		
5		k. If oil filter and magnetic plug show excessive accumulation repeat check after 5 minutes operation at 75 percent power.		
		l. ***Deleted.***		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		**Engines dropped during handling.** a. If an engine is dropped during handling, make the following inspections and tests. (1) Check accessory gear box for cracked flanges. (2) Check overspeed governor and tachometer drive for cracks, distortion, and bent shafts. (3) Inspect oil filter for loose bolts and damaged filter element. (4) Inspect oil pump for loose bolts and cracked flanges. (5) Check fuel control assembly for cracked flanges. (6) Check engine mounting pads for cracks. (7) Check air, oil, and fuel hose connections for tightness. (8) Check all accessories for loose bolts, nuts, and connections. b. If no visual damage is apparent, the engine will be functionally tested on the mobile engine test unit (LTCT744). A complete operational test run shall be made and shall include a vibration check, coast-down check and post test inspection of oil filter, screens and chip detector for metal chips, lint or other foreign material. **Whenever fuel cell has been punctured. Replace fuel cell.** **At the first 25 hours of operation after overhaul, repair or replacement.** Drive shaft (engine to transmission). Visually inspect for cracks, excessive grease, leakage, security and condition.		

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 3	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	j. Fuel gage.				
	k. Caution panel warning light.				
	l. Cyclic control.				
6	Engine Starting.				
	a. Fire guard.				
	b. Check rotor blades.				
	c. Battery switch.				
	d. Main fuel switch — ON.				
	e. Starting fuel switch — ON. L-5, -9, -9A, -11				
	f. ENGINE GOV switch — AUTO.				
	g. Throttle — Just below ENG IDLE STOP release.				
	h. GOV RPM INCR/DECR switch — decreased to minimum rpm.				
	i. Starter switch — ON and HOLD.		40 sec.		
	j. START FUEL switch — OFF at L-5, -9, -9A, -11 (Not used with T53-L-13 engine)	23% or	28% 400°C		
	k. Starter switch — Release at L-5, -9, -9A, -11 L-13	35% 40%	42% 42%		
7	Engine warm-up.				
	a. Accelerate to FLIGHT IDLE (rpm) L-5, -9, -9A, -11, L-13	56% 70%	58% 72%		
	b. Check oil pressure (psig) and torquemeter (some indication)	25			

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 4	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	(1) Deleted.				
	(2) Deleted.				
	(3) Deleted.				
	c. Check operation of avionics equipment.				
	d. Advance throttle to full open and check the following:				
	(1) Exhaust gas temperature L-5 L-9, -9A, -11 L-13	 385°C 390°C 390°C	 590°C 640°C 625°C		
	Warning If temperature exceeds 650°C for five seconds perform hot end inspection on T53-L-11, -13 engines.				
	(2) Engine oil pressure (psig) L-5, -9, -9A, -11 L-13	 60 80	 80 100		
	(3) Engine oil temperature		93°C		
	(4) Transmission oil pressure (psig)	45	55		
	(5) Transmission oil temperature		110°C		
	(6) Torquemeter (check for indication).				
	(7) DC Voltmeter (volts)		28		
	(8) Check operation of GOV RPM INCR/DECR switch through range of rpm	6000 ±50	6700 ±50		

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 5	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
	(9) Turn fuel boost pump switch off, allow approximately 30 seconds to purge air from system, then return switch to ON position.				
	(10) Check hydraulic servo controls for proper operation.				
	(11) Bleed air heater (check operation).				
	e. Check engine fuel system operation. (Only after engine change, after fuel control change, and during Intermediate Inspection.)				
	(1) Set nII speed with GOV RPM INCR/DECR switch		6600		
	(2) Retard throttle to flight idle, then advance and stabilize nI rpm as follows: L-5, -9, -9A, -11 L-13	 70% 72%			
	(3) Position ENGINE GOV switch to EMER for five seconds. (Do not exceed.) Note that indicated nI speed drops as fuel solenoid valve operates				
	(4) Return ENGINE GOV switch to AUTO. Note that indicated nI speed returns and stabilizes as follows: L-5, -9, -9A, -11 L-13	 70% 72%			

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 6	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
8	Engine Acceleration Check. L-5, -9, -9A, -11 only. ***Warning*** Acceleration check not required on UH-1B helicopters equipped with T53-L-13 engines. a. Check anti-icing system by operating the hot air solenoid valve. A slight rise in egt will indicate that system is operating. Turn off system. ***Note*** This check is performed only to ensure that the anti-icing system is operating satisfactorily and that the hot air solenoid valve is closed during the following engine operational checks. b. Set collective pitch to minimum position (flat pitch). ***Note*** On cool days, aircraft may need additional weight to prevent lift-off. c. Advance throttle to full open. d. Set nII rpm selector. e. Retard nI speed and allow to stabilize.		6400 60%		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27A	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Prior to every armed flight.		
		Make thorough inspection of fuel tank and fuel lines for leaks and the filler cap for proper seal, security and spillage.		
		After washing helicopter.		
1		Pitot-static system for moisture (drain plug removed).		
All Areas		**After the helicopter has been subjected to salt water or salt spray.**		
		Wash entire helicopter with fresh water, inside of engine compartment doors; wash all components which were exposed to salt water; wash engine; make a detail check of all surfaces for corrosion. Apply corrosion preventive compound to exposed non-painted, anodized or cadmium plated assemblies. (Refer to paragraph 1-100.)		
		12 Months		
		Replace cotton seat belt and shoulder harness. (Refer to TM 55-405-3).		
		5 Years		
		Replace nylon and dacron seat belt and shoulder harness. (Refer to TM 55-405-3).		
All Areas		**When available information indicates exposure to radioactivity.**		
		Accomplish the following: (Refer to TM 3-220.) a. Survey helicopter for level of radioactivity. b. Decontaminate helicopter as required.		
2		**Every Twelve Months:** Magnetic standby compass for discoloration of liquid and proper calibration; recompensate if necessary (TM 55-405-3). Turn in first aid kit for inspection per TB AVN10.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27B	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
All Areas		**Upon transfer and upon receipt of an aircraft, upon expiration of twelve months elapsed time since last inventory, and upon placing aircraft in storage and upon removing from storage. (Aircraft need not be inventoried while in storage.)** Inventory aircraft for availability of inventoriable property. (Reference DA Form 2408-17 and Appendix III.)		
All Areas		**After installation, removal or relocation of equipment and/or major modification which results in an unknown change in the basic weight and balance: After report of unsatisfactory flight characteristics.** Weigh helicopter and accomplish necessary entries in the Weight and Balance Data. (DD Forms 365) (Refer to TM 55-405-9.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 28	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Every 6 Months: CF3Br type extinguisher weight check cylinder less valve. If cylinder is within 4 ounces of stenciled weight, reassemble and reseal		
All Areas		**See AR 95-16.** Weigh helicopter and accomplish necessary entries in the Handbook of Weight and Balance Data in accordance with criteria established in AR 95-16, paragraph 3f(2). (Refer to TM 55-405-9.)		
4		**S A D After every 200 hours of main rotor hub operating time, inspect main rotor hub.** *Note* The following inspection shall be performed by direct support personnel. a. Inspect carbon radius ring on main rotor hub extension for cracks, damage, excessive wear or bonding security. b. Inspect main rotor hub bearing housings, bearings, and seals for acceptability for continued usage. c. Inspect main rotor hub trunnion bearing housings, seals, and bearings for condition and acceptability for continued usage. d. Inspect trunnion bearing housing disks for security of bonding. e. Inspect main rotor hub trunnion spindle sleeves for security of bonding.		
2		**B Upon installation of XM16 or XM21 Weapon Subsystems.** Inspect support beam assemblies, P/N 204-071-514-5 and 204-071-516-5, every one hundred hours per MIL-I-6866 and TM 55-405-7 in an area to include three inches on either side of the upper hardpoint attachment lugs using penetrant method.		

Section III — Test Flight

3-4. Definition and General Information. This section contains test flight inspection requirements peculiar to the UH-1A and UH-1B aircraft. Conditions requiring accomplishment of test flight shall be in accordance with TB AVN 23-16 and changes thereto. The requirements herein are established to assure a thorough inspection of the aircraft before flight, during flight, and upon completion of test flight. When a test flight is performed for the purpose of determining if specific equipment or systems are in proper operating condition, requirements not related to such equipment or systems should be disregarded.

3-5. The test flight inspection checksheets are presented in a format for local reproduction. Continuation sheets shall be used when necessary for each part. Explanation of the checksheets is as follows:

Block 1 Aircraft Model and Series

Block 2 Complete Aircraft Serial Number

Block 3 Organizational Unit Performing Test Flight

Block 4 Day, Month, and Year

Block 5 Reason Test Flight is Being Performed

Block 6 Numerical Inspection Item Identification Number

Block 7 Inspection Requirements Arranged in Chronological Order

Block 8 Instrument Minimum and Maximum Operating Ranges

Block 9 Actual Indication Entered at Time of Test Flight

Block 10 Enter satisfactory or unsatisfactory symbol (as shown in note) at time of test flight. All unsatisfactory symbols will be explained in remarks (Test Flight Checklist, Part IV).

3-6. Additional information, relative to recording of inspection on applicable forms and the use of this manual, may be obtained by consulting applicable technical directives that are listed in Appendix I of the Five Part Manual.

TEMPERATURE	SEA LEVEL	1000 FT.	2000 FT.	3000 FT.	4000 FT.	5000 FT.
50°F (10°C)	0.0	0.0	0.1	0.2	0.3	0.4
60°F (16°C)	0.0	0.1	0.2	0.3	0.4	0.5
70°F (21°C)	0.2	0.3	0.4	0.5	0.6	0.7
80°F (27°C)	0.4	0.5	0.6	0.7	0.8	0.9
90°F (32°C)	0.5	0.7	0.8	0.9	1.0	1.1
100°F (38°C)	0.7	0.8	0.9	1.0	1.1	1.2

NOTE: All time correction factors are given in seconds and must be added to time attained at standard day conditions

204060-500

Figure 3-1A. Acceleration time correction factors

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 7	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
	f. Use clock to check engine acceleration as follows: (1) Rapidly open throttle and note time to 85% nI rpm. (2) Retard throttle and stabilize.		60%		
	g. Compare engine performance to specified max. acceleration time (4.5 seconds for T53-L-9/9A, or 3.5 seconds for T53-I-11 with correction for elevation and ambient temperature.				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II — IN FLIGHT CHECK				PAGE NO. 8	NO. OF PAGES 11
1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.	
NOTE: Symbol for Block 10	(✓) Satisfactory	(X) Unsatisfactory	(Explain in Remarks)		

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Take-off to hovering:				
	a. Engine for specified:				
	(1) RPM (engine and rotor synchronized)				
	(Rotor)	294	324		
	(Engine)	6000	6600		
	(2) Engine oil pressure (psig)				
	L-5, -9, -9A, -11	60	80		
	L-13	80	100		
	(3) Engine oil temperature		93°C		
	(4) Transmission oil pressure (psig)	30	70		
	(5) Transmission oil temperature		110°C		
	(6) Fuel pressure (psig)	5	20		
	(7) Tailpipe temperature				
	L-5	385°C	610°C		
	L-9, -9A, -11	390°C	640°C		
	L-13	390°C	625°C		
	Warning				
	If temperature exceeds 650°C for five seconds perform hot end inspection on T53-L-11, -13 engines.				
	(8) % RPM tachometer smooth operation in steady state.				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II — INFLIGHT CHECK (Continued)				PAGE NO. 9	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
	b. Helicopter for control, stability, proper response to control forces.				
	(1) Cyclic response.				
	(2) Collective pitch response.				
	(3) Directional control response.				
	c. Flight characteristics.				
	(1) Hovering 360 degree turns left and right.				
	(2) Sidewards.				
	(3) Rearwards.				
2	In-flight.				
	a Engine for specified:				
	(1) RPM (engine and rotor synchronized).				
	(Rotor)	294	324		
	(Engine)	6000	6600		
	(2) Engine Oil pressure (psig)				
	L-5, -9, -9A, -11	60	80		
	L-13	80	100		
	(3) Engine Oil temperature		93°C		
	(4) Transmission oil pressure (psig)	30	70		
	(5) Transmission oil temperature		110°C		
	(6) Fuel pressure (psig)	5	20		

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II – IN FLIGHT CHECK (Continued)				PAGE NO. 10	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)
		MIN	MAX		
	(7) Tailpipe temperature L-5 L-9, -9A, -11 L-13	 385°C 390°C 390°C	 590°C 640°C 625°C		
	Warning If temperature exceeds 650°C for five seconds perform hot end inspection on T53-L-11, -13 engines				
	(8) % RPM tachometer smooth operation in steady state.				
	b. Rotors				
	(1) RPM (engine and rotor synchronization).				
	(2) Observe tip path for in-track condition.				
	c. Instrument check.				
	(1) Airspeed indicator.				
	(2) Compass.				
	(3) Altimeter.				
	(4) Free air temperature.				
	d. Check communication equipment for proper operation.				
	e. Autorotation check (keep to a minimum).				

UH – 1 B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART III – AFTER FLIGHT CHECK	PAGE NO. 11	NO. OF PAGES 11

1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.

NOTE: Symbol for Block 10 (√) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Reduce Power to Flight Idle Position Prior to Shutdown and Observe the Following Readings:				
	a. Gas producer speed (rpm)				
	L-5	58%	62%		
	L-9, -9A, -11	56%	58%		
	L-13	70%	72%		
	b. Exhaust gas temperature				
	L-5	385°C	590°C		
	L-9, -9A, -11	427°C	±50		
	L-13	427°C	±50°C		
	c. Engine oil pressure (psig)				
	L-5, -9, -9A, -11	25	80		
	L-13	25	100		
	d. Engine oil temperature		93°C		
	e. Transmission oil temperature		110°C		
	f. Transmission oil pressure				
	L-5 (psig)	40	60		
	L-9, -9A, -11, -13 (psig)	30	70		
2	Engine Shutdown.				
	a. Exhaust gas temperatures — Stabilized				
	b. Throttle — Push and hold idle detent button, throttle to full off				
	c. Main fuel valve — Closed as soon as engine has stopped				
3	Note discrepancies on applicable forms.				

Section IV — Overhaul and Retirement Schedule

3-7. Scope. This section lists units of operating equipment that are to be overhauled or retired at the period specified. Removal of equipment for overhaul may be accomplished at the inspection nearest the time when overhaul may be accomplished at the inspection nearest the time when overhaul is due unless otherwise specified in TB AVN 23-10.

3-8. Overhaul Interval. The maximum authorized operating time of parts prior to removal for overhaul at echelon authorized in accordance with the Maintenance Allocation Chart.

3-9. Retirement Schedule. a. The operating time specified for removal, condemnation, and disposal of parts in accordance with applicable directives.

b. Upon replacement of items listed in this chapter, all applicable forms, records and worksheets will be completed and updated as required (TM 38-750).

Overhaul and Retirement Schedule
Model UH-1A Helicopters

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-010-051-1	Blade Assembly		1100
4	204-010-190-3, -7	Hub Assembly	600	
4	204-010-190-9	Hub Assembly	600	
4	204-010-161-1	*Grip		1200
4	204-010-173-7	*Strap Assembly		600
4	204-010-185-1	*Pitch Horn		1200
4	204-010-517-1	*Drag Brace Assembly		1200
4	204-010-133-7	Blade Retention Bolt	1200	
	Transmission			
4	204-040-001-13, -17	**Transmission Assembly	400	
4	204-040-151-9	*Planetary Spacer Case		400
4	204-040-214-1, -3	Mast Assembly	300	
4	204-040-214-5	Mast Assembly	1100	
4	204-040-136-1, -5	*Mast Bearing		300
4	204-040-005-19, -27, -31	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-010-771-7, -9	Blade Assembly		3000
6	204-010-784-3	Hub Assembly	1100	
6	204-010-703-21	Hub Assembly	1100	
6	204-010-706-9, -11	*Grip		1100
6	204-010-710-1	*Yoke		3300
6	204-010-781-1	*Yoke		3300
6	204-040-004-19, -19A, -25, -31	****90° Gear Box	800	
6	204-040-004-33	90° Gear Box	1100	
6	204-040-003-13, -23, -37	42° Gear Box	1100	
6	204-040-600-5, -7	Drive Shaft Hanger Assembly	1100	
6	204-010-720-1	Slider		400

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	204-010-470-5, -9	Swashplate and Support Assembly	1100	
4	204-010-469-3, -7	Scissors and Sleeve Assembly	1100	
4	204-010-487-1, -3	Scissors and Sleeve Assembly	1100	
4	204-010-439-1	*Scissors		1100
4	204-010-440-1	*Drive Link		1100
4	204-010-370-3, -5, -7	Stabilizer Bar Assembly	400	
4	204-010-380-1	*Stabilizer Bar Tube		400
4	204-010-368-17	*Center Frame Set		1200
4	204-010-390-1	*Mixing Lever		1200
4	204-010-348-13	Control Tube		1100
4	204-010-374-7	Pitch Link		1100
	Synchronized Elevator			
6	204-080-858-25, -26, -37, -38	Elevator Assembly		1100
	Rotating Control System Bolts (See Figure 3-2)			
4	NAS1304-26D (Index No. 4)	Pitch Horn to Pitch Link		100
4	NAS1304-26D (Index No. 3)	Pitch Link to Universal		400
4	NAS1304-30D (Index No. 2)	Universal to Mixing Lever		100
4	NAS1304-30D (Index No. 9)	Drive Link to (204-010-446-3) Trunnion		400
	Power Plant			
5	T53-L-1	***Engine		1200
5	T53-L-1A	***Engine		1200

*Parts will be retired by the maintenance level overhauling the assembled component.

**400 TBO if MWO 55-1520-207-50/6 has not been complied with or if planetary spacer case 204-040-151-9 is presently installed on the transmission; otherwise, 1100 hour TBO.

***Internal inspection required every 300 engine hours.

****Overhaul interval is 1100 hours if data plate is marked 50/15 CW.

Overhaul and Retirement Schedule
Model UH-1B Helicopters
Serial No. 60-3546 through 64-14100

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-011-001-7	Blade Assembly		400
4	204-011-001-15	Blade Assembly		1000
4	204-011-101-1	Hub Assembly	400	
4	204-011-101-3, -5, -9	Hub Assembly	1100	
4	204-011-113-1	*Strap Assembly		1100
	Transmission			
4	204-040-009-7, -13, -19, -31	Transmission Assembly	1100	
4	204-040-366-1, -3, -5	Mast Assembly	300	
4	204-040-366-7, -9	Mast Assembly	1100	
4	204-040-136-3, -5	*Mast Bearing		300
4	204-040-136-7	*Mast Bearing		1100
4	204-040-010-3, -7	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-011-702-11, -15	Blade Assembly		1100
6	204-011-701-7	Hub Assembly		1100
6	204-040-003-13, -23, -37	42° Gear Box	1100	
6	204-040-012-1	90° Gear Box	600	
6	204-040-012-7	90° Gear Box	1100	
6	204-040-600-5, -7	Drive Shaft Hanger Assembly	1100	
	Mast Controls			
4	204-011-400-1, -3, -5, -7	Swashplate and Support Assembly	1100	
4	204-011-404-1, -5	*Support		3300
4	204-011-438-1	Collective Lever		3300
4	204-011-401-3, -5, -7	Scissors and Sleeve Assembly	1100	
4	204-011-326-1	Stabilizer Bar Assembly	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Synchronized Elevator			
6	204-030-858-43, -44	Elevator Assembly		3000
	Rotating Control System Bolts (See figure 3-2)			
4	NAS464-6-26 (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-31D (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-27D (Index No. 3)	Pitch Link to Universal		1000
4	NAS464-6-35 (Index No. 2)	Universal to Mixing Lever		1000
4	NAS1306-34D (Index No. 2)	Universal to Mixing Lever		1000
4	NAS464-5-27 (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS1305-27D (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS464-5-27 (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS1305-27D (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS464-8-90 (Index No. 6)	Scissors Pivot Bolt		1000
4	NAS464-8-69 (Index No. 7)	Scissors to Drive Link		1000
4	NAS464-5-30 (Index No. 9)	Drive Link to Swashplate		1000
4	NAS1305-30D (Index No. 9)	Drive Link to Swashplate		1000
4	AN175H16 (Index No. 8)	Cyclic Tubes to Swashplate		1000
4	AN175H16 (Index No. 8)	Collective Tube to Collective Levers		1000
	Power Plant			
5	T53-L-5	**Engine	1200	
5	T53-L-9	**Engine	1200	
5	T53-L-9A	**Engine	1200	
5	T53-L-11	**Engine	1200	
5	T53-L-13	**Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 800 engine hours.

Overhaul and Retirement Schedule

Model UH-1B Helicopter

Serial No. 64-14101 and Subsequent

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	540-011-001-5	Main Rotor Blade Assembly		1100
4	540-011-101-3,-9	Main Rotor Hub Assembly	1100	
4	540-011-102-5	*Yoke		3300
4	540-011-153-9	*Extension Assembly		3300
4	204-012-112-7	*Retention Straps		2200
	Transmission			
4	204-040-009-53, -57	Transmission Assembly	1100	
4	204-040-359-1	Transmission Top Case		1100
4	204-040-366-11	Mast Assembly	1100	
4	540-040-010-5	Mast Bearing Plate		1100
4	204-040-136-7	*Mast Bearing		1100
4	204-040-010-7	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-011-702-17	Blade Assembly, Tail Rotor		1100
6	204-011-701-13***	Tail Rotor Hub Assembly		1100
6	204-011-706-9	Grip		1100
6	204-010-781-9	Yoke		1100
6	204-040-003-23, -37	42° Gear Box	1100	
6	204-040-012-7, -13	90° Gear Box	1100	
6	204-040-600-5	Drive Shaft Hanger Assembly	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	540-011-450-3	Swashplate and Support Assembly	1100	
4	540-011-452-5	Support Assembly		1100
4	540-011-454-5	Collective Lever	1100	3300
4	540-011-451-1	Scissors and Sleeve Assembly	1100	
4	540-011-409-1	Drive Link		3300
4	540-011-300-3, -5, -7	Stabilizer Bar Assembly	1100	2200
4	540-011-468-1	Stop Assembly	1100	
	Synchronized Elevator			
6	205-030-856-45	Elevator		3000
6	205-030-856-47	Elevator		3000
6	205-001-914-1	Horn, Elevator Control		3000
6	205-030-856-65	Elevator		3000
6	205-030-856-67	Elevator		3000
	Power Plant			
5	T53-L-11**	Engine	1200	
5	T53-L-13**	Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

***Bearing set is not to be retired if higher maintenance inspection determines bearings are serviceable.

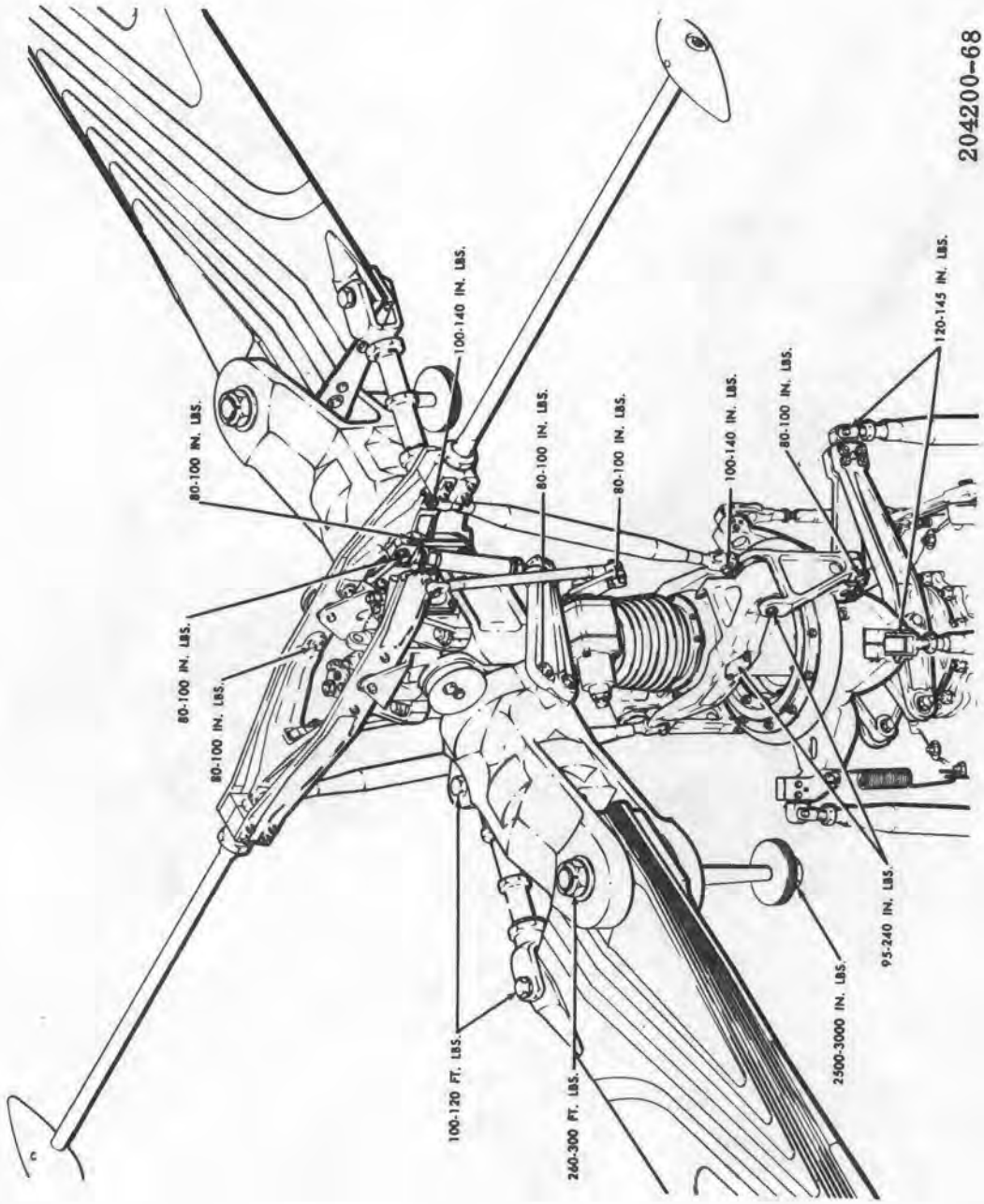


Figure 3-2B. Rotor system torque values (UH-1A)

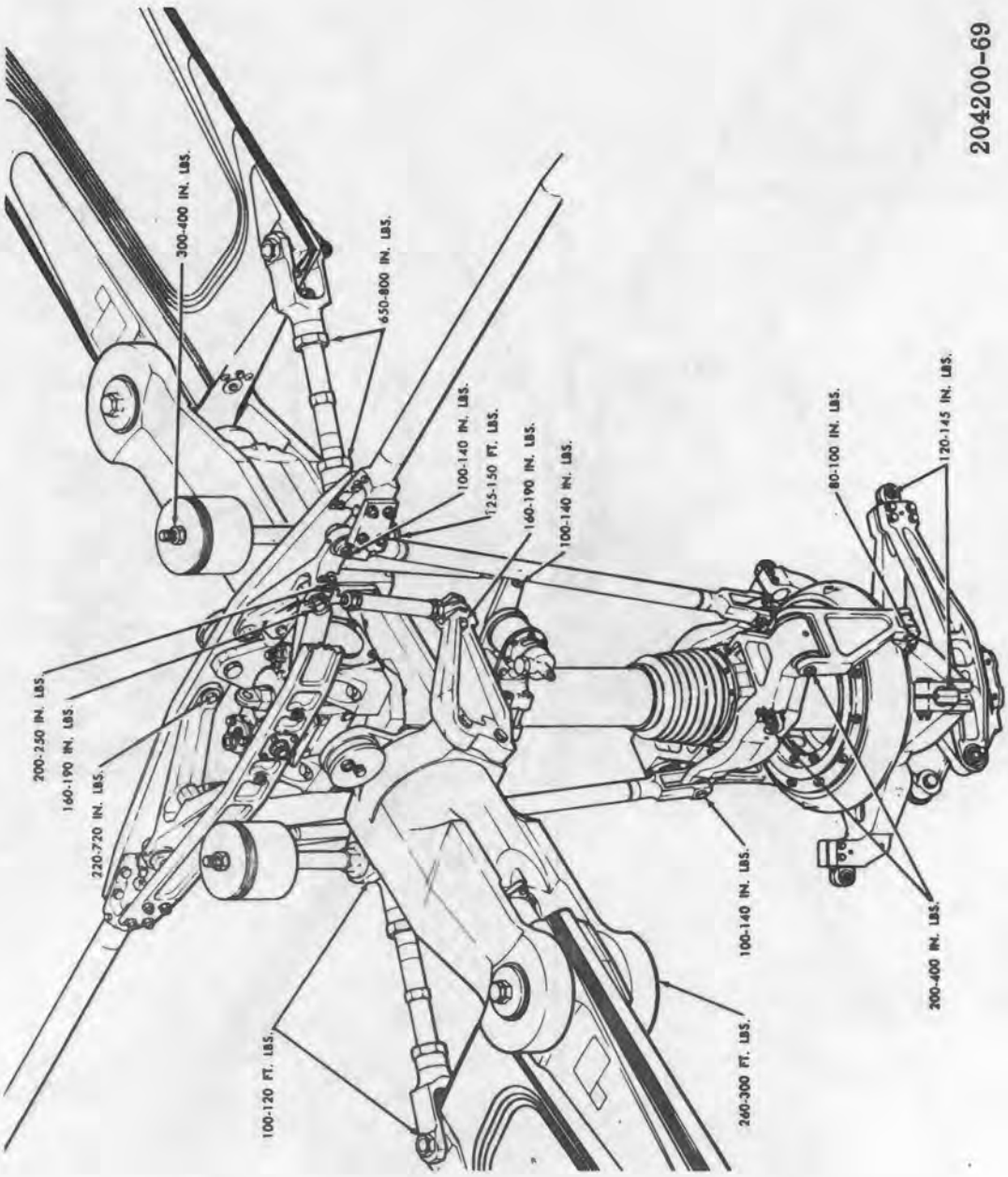


Figure 3-2C. Rotor system torque values (UH-1B)

ITEM NO.	ITEM	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM WITHIN CONUS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO OVERSEAS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO COMBAT OPERATION
	GENERAL			
1.	Inspection.	Perform next Intermediate Inspection; when next Periodic Inspection is due within 25 operating hours, perform next Periodic Inspection.	Perform next Periodic Inspection.	Perform next Periodic Inspection.
2.	Modification.	Accomplish all MWO or TCTM Organizational and Direct Support Maintenance Modifications.	Accomplish all MWO or TCTM Organizational through Depot Maintenance modifications which have an issue date of three months prior to date of transfer. Accomplish all Depot maintenance controlled modifications which are authorized by AMCPM-IRFO but not printed as MWOs.	Accomplish all MWO or TCTM Organizational through General Support maintenance modifications which have an issue date of one month prior to date of transfer.
3.	Mission Essential Equipment.	Assure mission essential equipment is installed.	Assure mission essential equipment is installed and is completely operational.	Assure mission essential equipment is installed and is completely operational.
	AIRCRAFT			
4.	Aircraft Paint Condition.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces; completely repaint if condition of existing paint warrants. Paint necessary peculiar markings on aircraft required by the theater of operations.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces. Paint necessary peculiar markings on aircraft required by theater of operations.
5.	COMPONENT REPLACEMENT			
	a. Items having a schedule replacement or retirement time below 500 hours.	Replace if less than 50 hours of scheduled operating time remains.	Replace if less than 100 hours of scheduled operating time remains.	Replace if less than 200 hours of scheduled operating time remains.

ITEM NO.	ITEM	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER WITHIN CONUS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO OVERSEAS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO COMBAT OPERATION
	b. Items having a scheduled replacement or retirement time over 500 hours.	Replace if less than 10% of scheduled operating time remains.	Replace if less than 25% of scheduled operating time remains.	Replace if less than 50% of scheduled operating time remains.
6.	CONTROL CABLES			
	a. 7 X 7	Replace when more than three strands are broken or corroded within a one inch distance.	Replace when more than three strands are broken or corroded within a one foot distance.	Replace when more than three strands are broken or corroded within a two foot distance.
	b. 7 X 9	Replace when more than six strands are broken or corroded within a one inch distance.	Replace when more than six strands are broken or corroded within a one foot distance.	Replace when more than six strands are broken or corroded within a two foot distance.
	c.	Replace cables having 'Flat Spots' as determined by a qualified inspector.	Replace cables having 'Flat Spots' as determined by a qualified inspector.	Replace cables having 'Flat Spots' as determined by a qualified inspector.
7.	STAND-BY OR MAGNETIC COMPASS	Swing compass and recompensate at interval specified in inspection requirements.	Swing compass and recompensate.	Swing compass and recompensate.
8.	TIRES	Replace if less than 25% of tread remains.	Replace if less than 50% of tread remains.	Replace if less than 75% of tread remains.
9.	COMMUNICATION EQUIPMENT	Assure equipment is completely operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.
10.	ELECTRONIC NAVIGATION	Assure equipment is completely operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.

CHAPTER 4
AIR FRAME AND ALIGHTING GEAR

Section I — Scope

4-1. Scope. The purpose of this chapter is to provide all necessary information to maintenance personnel for the accomplishment of organizational maintenance on the complete airframe and alighting gear in accordance with the maintenance allocation chart.

Section II — Fuselage Section

4-2. Description. The fuselage of UH-1A and UH-1B helicopters consists, basically, of the cabin and the tail boom. Fuselage components and standard furnishings are described in the following paragraphs, with comprehensive instructions for their maintenance by organizational personnel.

4-3. Description — Cabin. The cabin portion of the fuselage is an integrated, structural unit, complete with doors, windows, cowling and fairings. Furnishings contained in the cabin include seats, soundproofing, blackout curtains, cargo suspension unit, litters, first aid kit, fire extinguisher, paratroop static line cable and manual emergency jettison controls.

4-4. Equipment and Electrical Compartment Access Doors. Equipment and electrical compartment doors (5, figure 4-1) are located on each side of the aft portion of the cabin. These doors are attached to the cabin structure and are secured in the closed position by means of a latch or latches.

4-5. *Removal — Equipment and Electrical Compartment Access Doors.* Release spring loaded latch and remove hinge pins attaching door to structure.

4-6. *Inspection — Equipment and Electrical Compartment Access Doors.* Inspect door latch for proper operation. Visually inspect hinges and door panel for general condition.

4-7. *Repair or Replacement — Equipment and Electrical Compartment Access Doors.* Replace all items which appear to be unsuitable for continued use.

4-8. *Installation — Equipment and Electrical Compartment Access Doors.* Position door in opening and insert attaching hinge pin. Close door firmly, forcing spring loaded latch to lock.

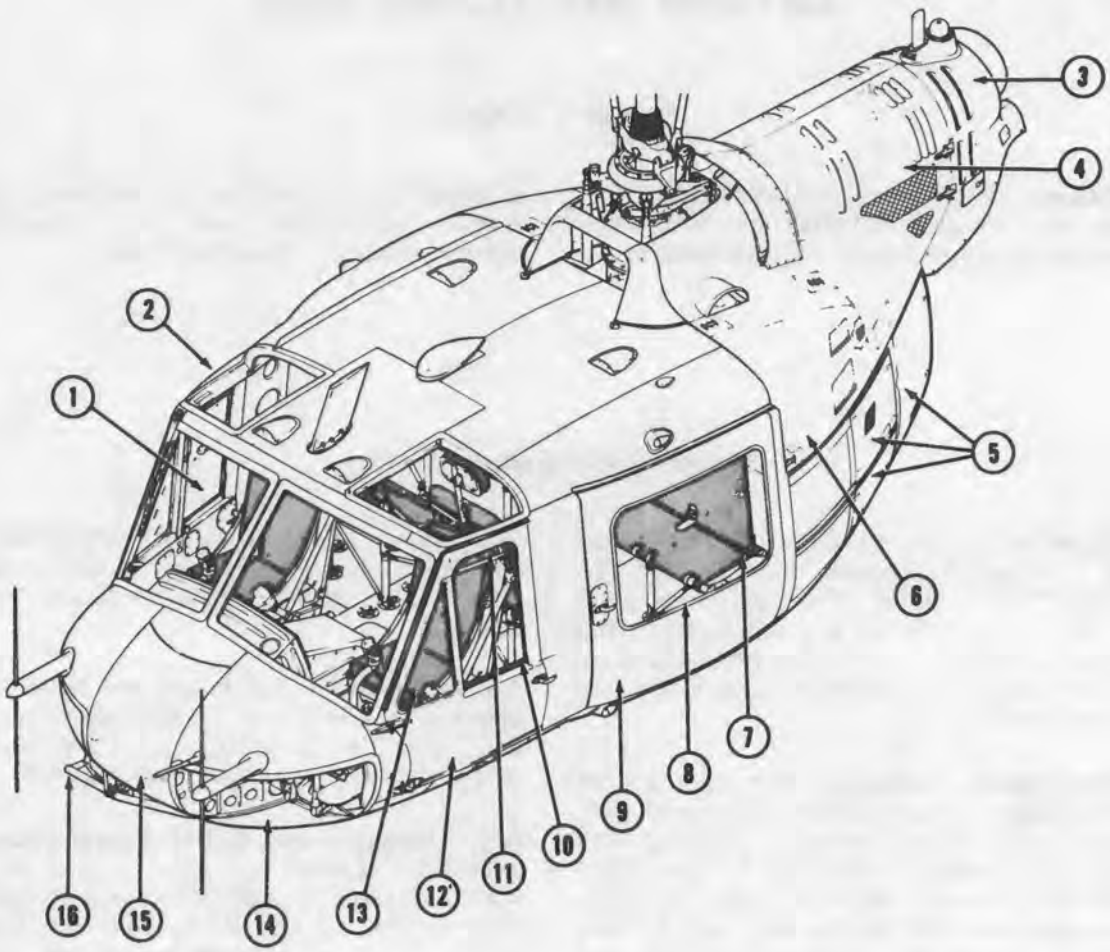
4-9. Miscellaneous Cabin Access Doors. Access to various internal areas of the cabin is provided by strategically located access doors. (See figures 4-2 and 4-3.) These doors are attached to the structure by hinges, and are secured in the closed position by means of a latch or latches.

4-10. *Removal — Miscellaneous Cabin Access Doors.* Refer to paragraph 4-5.

4-11. *Inspection — Miscellaneous Cabin Doors.* Refer to paragraph 4-6.

4-12. *Installation — Miscellaneous Cabin Access Doors.* Refer to paragraph 4-8.

4-13. Pilot and Copilot Door. (12, Figure 4-1.) Access to the pilot and copilot area is gained through two swinging doors, which are hinged on the forward side. A latch assembly, which may be operated from either side of each door, secures the door in the closed position. In an emergency, doors may be jettisoned



1. Windshield
2. Cabin Roof Window
3. Tailpipe Fairing
4. Engine Cowl
5. Access Doors
6. Transmission Cowl
7. Troop Seat
8. Cargo Door Window
9. Cargo Door
10. Copilot Adjustable Window
11. Copilot Upper Door Window
12. Copilot Door
13. Copilot Seat
14. Lower Forward Cabin Window
15. Cabin Nose Access Door
16. Mirror Installation

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Figure 4-1. Typical UH-1A and UH-1B cabin

by pulling the "EMERGENCY RELEASE" handle on the inside of each door.

4-14. *Removal — Pilot and Copilot Door.* Open door, pull "EMERGENCY RELEASE" handle, and lift door from helicopter.

4-15. *Inspection — Pilot and Copilot Door.* a. Inspect seal strips for deterioration and damage; hinges for cracks and damage; door structure for dents, cracks and damage and latches for damage and serviceability.

b. Check door roller assemblies (8) for smoothness of operation in channel and for condition of threads.

4-16. *Repair or Replacement — Pilot and Copilot Door.* Replace damaged or unserviceable seals, hinges and latches.

4-17. *Installation — Pilot and Copilot Door.* Position door on hinges and insert hinge pins.

4-18. *Adjustment — Pilot and Copilot Door.* a. With door handle in locked position, adjust latch tubes as follows:

(1) Adjust aft vertical latch tube so that clearance of 0.08 inch is obtained between top of door roller assembly (8, figure 4-4) and bottom of channel.

(2) Adjust forward vertical latch tube so that clearance of 0.08 inch is obtained between top of door roller assembly (8) and bottom of channel.

(3) Adjust emergency jettison hinge pins so that rounded end of pins is visible above the upper hinge and below the lower hinge.

Note

Actuate emergency jettison device to make certain that pins clear hinges and door can be properly jettisoned. If door does not jettison, readjust as necessary.

b. For final adjustment of door peel shims on upper and/or lower door hinges as necessary.

4-19. Pilot and Copilot Door Latch. Each door is equipped with a latch assembly which may be operated from either side.

4-20. *Removal — Pilot and Copilot Door Latch.* a. Remove screw holding inner handle to shaft and remove handle.

b. Remove access plate and disconnect two tube assemblies from bellcrank.

c. Remove screw from outer handle and remove handle from shaft.

d. Remove escutcheon attachment screws and remove escutcheon. Lift latch from door.

4-21. *Inspection — Pilot and Copilot Door Latch.* Visually inspect latch assembly for ease of operation, damage and general condition.

4-22. *Repair or Replacement — Pilot and Copilot Door Latch.* Replace door latch if damaged, binding, or unserviceable.

4-23. *Installation — Pilot and Copilot Door Latch.* a. Position latch in door and install outer escutcheon plate.

b. Install outer handle on shaft.

c. Connect two tube assemblies to latch bellcrank and install access plate.

d. Install inner handle on shaft.

4-24. Cabin Nose Access Door. (15, figure 4-1.) The cabin nose access door has two hinges on the upper side which are attached to door stays. The door is secured in the closed position by means of spring loaded latches.

4-25. *Removal — Cabin Nose Access Door.* a. With door in closed position, remove screws attaching hinges to top edge of door.

b. Release spring loaded latches and lift door from helicopter.

4-26. *Inspection — Cabin Nose Access Door.* a. Visually inspect door hinges, and structure for damage, dents, cracks; rubber seal for deterioration and security of attachment.

b. Inspect latches for proper operation and damage.

4-27. *Repair or Replacement — Cabin Nose Access Door.* Replace rubber seal, door latches, door hinges and door stays if unserviceable or damaged.

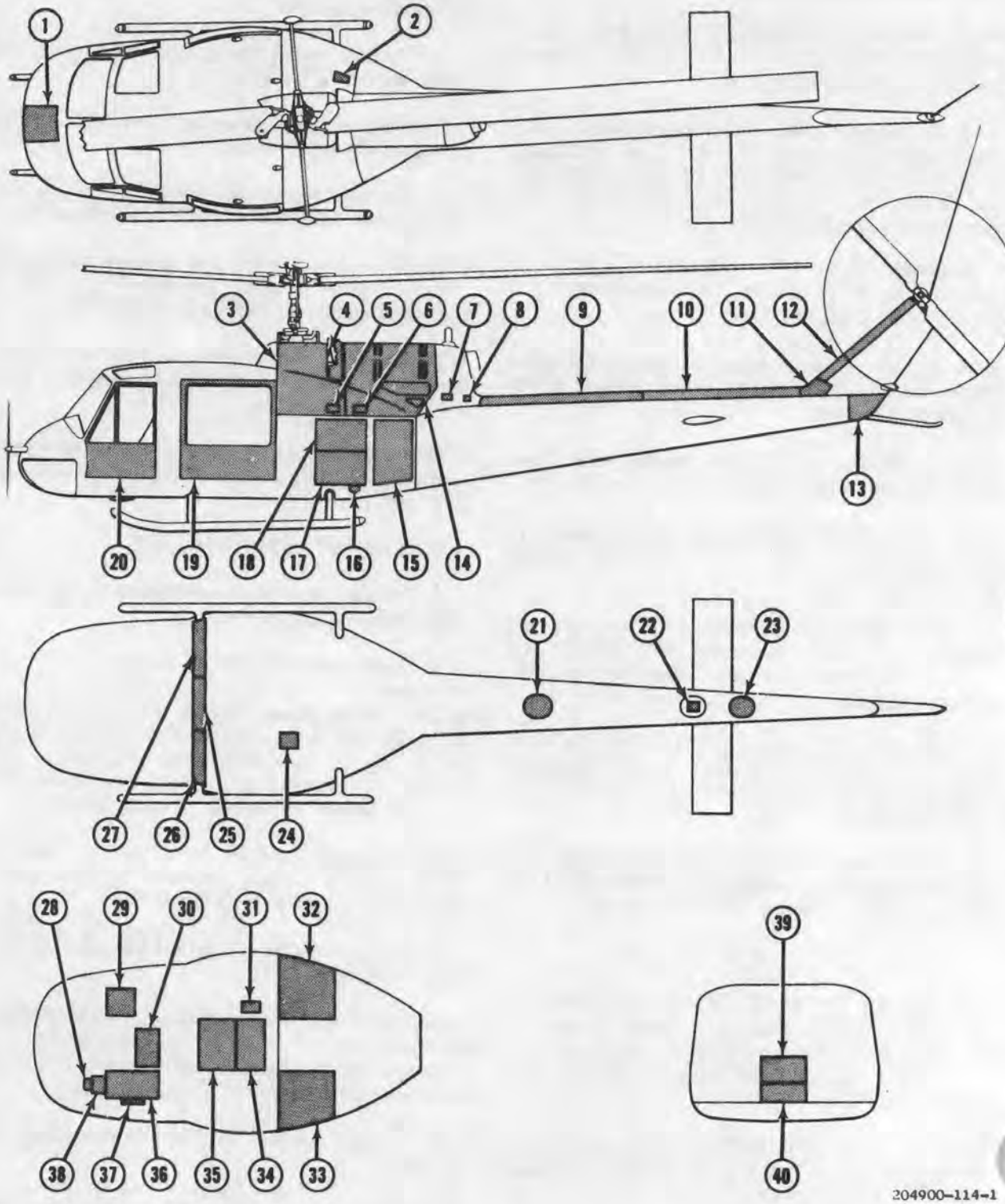

Figure 4–2. UH-1A Access and inspection provisions (Sheet 1 of 2)

1. Nose Communications Compartment Access
2. Oil Tank Filler Cap Access
3. Transmission Access
4. Engine to Transmission Driveshaft Access
5. Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
6. Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
7. Driveshaft Coupling Access - LH
   Driveshaft Coupling Access - RH
8. Elevator Control Cable Pulleys Access - LH
   Elevator Control Cable Pulleys Access - RH
9. Forward Tail Rotor Shaft Access
10. Aft Tail Rotor Shaft Access
11. Intermediate (42°) Gear Box Access
12. Vertical Fin Driveshaft Access
13. Tail Skid Attachment Access
14. Engine Access - LH
    Engine Access - RH
15. Baggage Compartment Door
16. External Power Access
17. Equipment Compartment Door
18. Equipment Compartment Door
19. Cargo Door
20. Crew Door
21. Elevator Controls Access
22. Elevator Access
23. General Access
24. Fuel Sump Access
25. Landing Gear Center Access
26. Landing Gear Access Cover - RH
27. Landing Gear Access Cover - LH
28. Dual Cyclic Control Stick Cover
29. Controls Access
30. Controls Access
31. Directional Control Idler Access
32. Fuel Cell Access - RH
33. Fuel Cell Access - LH
34. Auxiliary Fuel Tank Disconnects
35. Controls Access
36. Controls Access
37. Dual Collective Control Stick Cover
38. Cyclic Control Stick Electrical Access
39. Boost Cylinders Access
40. Boost Cylinders Access

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Figure 4-2. UH-1A Access and inspection provisions (Sheet 2 of 2)

4-28. *Installation — Cabin Nose Access Door.* a. Position door in opening and attach to hinges with screws.

b. Close door firmly against rubber seal, forcing spring loaded latches to lock.

4-29. *Adjustment — Cabin Nose Access Door.* Adjust door stay assemblies as necessary for proper fit and operation of door.

4-30. Cabin Inspection Plates. Inspection plates are provided wherever needed for fast, efficient inspection and maintenance of the helicopter. (See figures 4-2 and 4-3.)

4-31. *Removal — Cabin Inspection Plates.* Remove screws attaching inspection plate to structure and remove plate.

4-32. *Installation — Cabin Inspection Plates.* Position inspection plate in proper opening and attach to structure with screws.

4-33. Cargo Doors. Two sliding doors (9, figure 4-1) are provided for access to the passenger-cargo compartment. One door is located on each side of the aft cabin section, aft of the crew doors. A large plexiglas window is incorporated into each cargo door. The doors are attached to, and are operated by means of, rollers in metal tracks. On UH-1B helicopters, Serial No. 64-14035 and subsequent, the rollers are replaced by new, improved slider assemblies.

4-34. *Removal — Cargo Doors.* a. Remove cargo door holding-pin by removing three metal screws.

Note

Pin is located on upper, forward inboard side of cargo door.

b. Remove stop from aft end of lower track.

c. Slide door aft on tracks and guide rollers or sliders through cutouts at aft end of tracks.

4-35. *Inspection — Cargo Doors.* Check cargo door rollers and latch for freedom of action and smoothness of operation. Structure for dents, cracks or damage.

4-36. *Repair or Replacement — Cargo Doors.* Replace door rollers and latch if damaged or unserviceable.

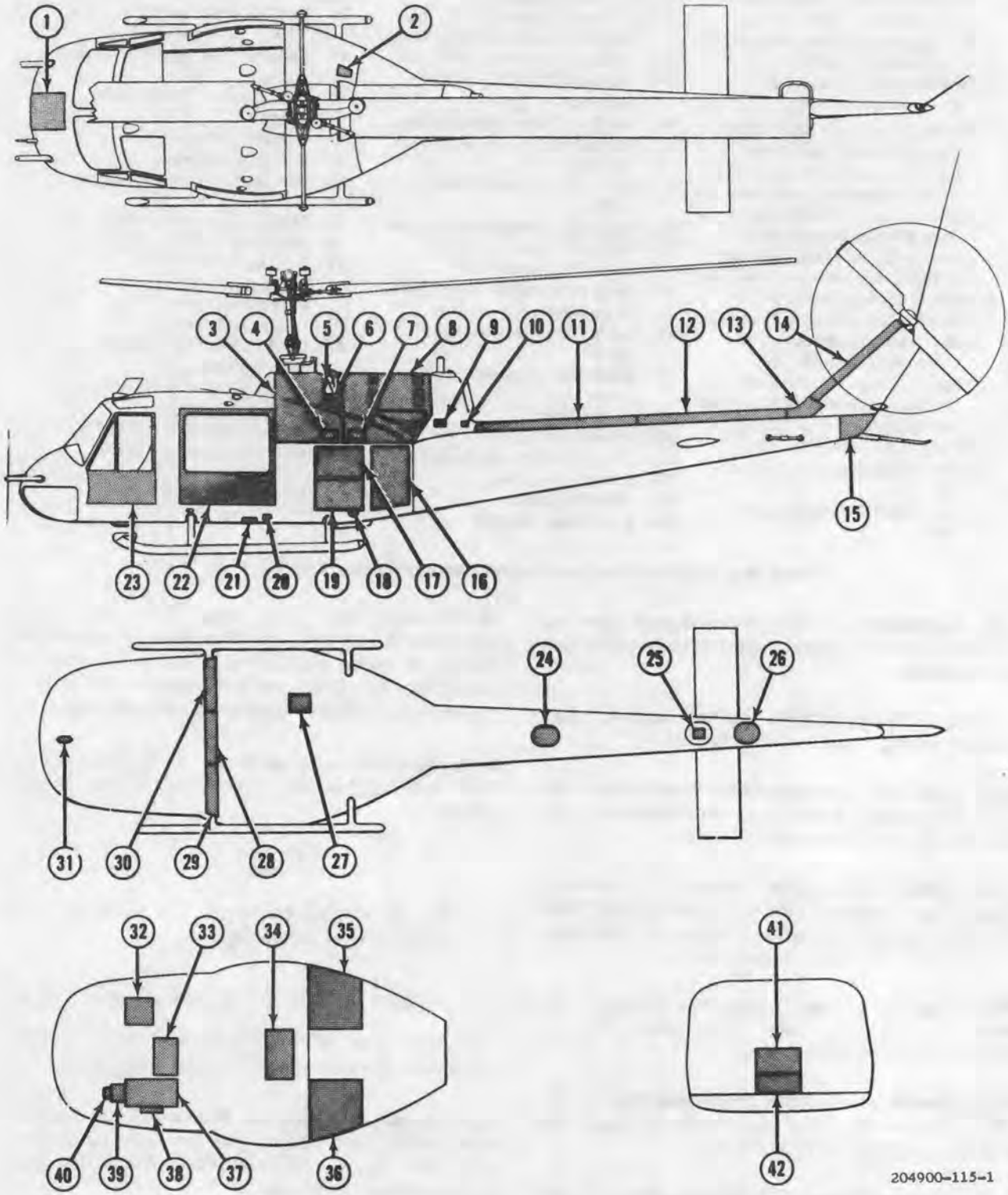


Figure 4-3. UH-1B Access and inspection provisions (Sheet 1 of 2)

4-43. *Removal — Engine Cowling.* a. Disconnect fasteners on transmission cowling and swing cowling to open position.

b. Disconnect forward fastener on engine cowling and open cowling. Pull pin from hinges on aft side of cowling and lift assembly from helicopter. Disconnect fire detector wiring.

4-44. *Inspection — Engine Cowling.* Inspect cowling for dents, cracks, or damage; fasteners and hinges for damage and serviceability.

4-45. *Repair or Replacement — Engine Cowling.* Replace unserviceable hinges, latches and fasteners.

4-46. *Installation — Engine Cowling.* a. Position cowling on hinges and install pins. Connect fire detector wiring and close cowling.

b. Close transmission cowling and fasten latch.

4-47. Transmission Cowling. The transmission cowling (6, figure 4-1) consists of a right and a left-hand section, each providing access to the transmission area. The cowling is secured in closed position with six latches. A frame attaches the cowling to the cabin structure, and acts as a hinge to swing the cowling forward (over the aft section of the cabin) to open position.

4-48. *Removal — Transmission Cowling.* a. Disengage cowling latches and swing cowling to forward position.

b. Remove cotter pins, washers and pins attaching cowling to frame assembly and lift cowling from frame.

c. Remove safety pin from lower hinge point of cowling frame.

d. Rotate piano hinge approximately 90 degrees to release locking lug.

e. Pull pin outboard until frame assembly is disengaged from attaching points.

f. Lift frame assembly from platform.

Warning

Do not fly helicopter without transmission cowling installed.

4-49. *Inspection — Transmission Cowling.* Refer to paragraph 4-44.

4-50. *Repair or Replacement — Transmission Cowling.* Refer to paragraph 4-45.

4-51. *Installation — Transmission Cowling.* a. Position cowling over frame and attach frame to mounting points on cowling. Install pins, washers and cotter pins.

b. Position cowling and frame assembly in lugs on work platform.

c. Install piano hinge pin and rotate approximately 90 degrees to engage locking lug. Install safety pin.

d. Swing cowling aft to closed position and fasten latches.

4-52. Engine Tail Pipe Fairing. A metal fairing (3, figure 4-1) encloses the engine tailpipe and supports an antenna and anti-collision light. This fairing is attached by means of snap-fasteners.

4-53. *Removal — Engine Tail Pipe Fairing.* a. Open access door on left-hand side of fairing.

b. Disconnect antenna and anti-collision light wiring at deck.

c. Open forward tail rotor drive shaft access door. Disconnect snap-fasteners around edge of fairing and lift fairing from tailpipe.

4-54. *Inspection — Engine Tail Pipe Fairing.* Inspect fairing for cracks or damage; fasteners for damage and serviceabality.

4-55. *Repair or Replacement — Engine Tail Pipe Fairing.* Replace unserviceable fasteners.

4-56. *Installation — Engine Tail Pipe Fairing.* a. Position fairing over tailpipe and connect snap-fasteners.

b. Connect antenna and anti-collision light wiring at deck.

c. Close access door on left-hand side of fairing.

4-57. Pilot and Copilot Seat. These seats (13, figure 4-1) are adjustable, non-reclining type, mounted on tracks fixed to the cabin floor. Adjustment lever is on the left side of the seat. The fore and aft adjustment lever is on the right of the seat. Each seat is equipped with a lap style safety belt and an inertia reel shoulder harness.

4-58. *Removal — Pilot and Copilot Seat.* a. Remove the stop bolts or quick release stop assembly at the aft end of the seat tracks.

b. Lift the handle located on the right side of the seat, to release the position pin, and slide the seat aft until it is clear of tracks.

4-59. *Inspection — Pilot and Copilot Seat.* Inspect for damage and operation.

4-60. *Repair or Replacement — Pilot and Copilot Seat.* Replace seat if unserviceable or will not operate properly.

4-61. *Installation — Pilot and Copilot Seat.* a. Position rollers on aft end of tracks. Lift handle on right side of seat, and slide seat forward on tracks to desired position.

b. Install stop bolts or quick release stop assembly at aft end of tracks.

4-61A. Pilot and Copilot Seat Armor. The seat armor, constructed from a composite ceramic-metal material, is designed to protect pilot and co-pilot against small arms ball and armor piercing ammunition. A segmented construction is used to permit the replacement of any damaged components.

4-61B. *Removal — Pilot and Copilot Seat Armor.*

Note

Retain removed hardware and serviceable parts for re-installation.

a. Remove inertia release lever from side panel.

b. Remove seat and armor from tracks in aircraft.

c. Remove twenty-three screws attaching assembled side and back assembly to bottom panel, slip assembled side and back assembly over pilot's seat.

d. Remove four nuts, washers, and bolt attaching inertia tension reel to back panel and remove inertia tension reel from panel.

e. Remove bolts and fore-aft adjustment mechanism. Tip entire seat assembly on its side to expose the bottom side of armor panel. Remove fourteen nuts, locfiwashers and bolt attaching bottom armor panel to seat frame and remove armor from seat.

f. Remove six nuts attaching front panel, to seat and remove panel

4-61C. *Inspection — Pilot and Copilot Seat Armor.* Inspect armor for damage, from enemy fire and other unserviceable conditions.

4-61D. *Repair or Replacement — Pilot and Copilot Seat Armor.* Replace any segment that is damaged or shows unserviceable condition.

4-61E. *Installation — Pilot and Copilot Seat Armor.* a. Install front panel to seat and secure with six nuts.

b. Slip curved lip of bottom panel under the rear horizontal tube and attach panel to seat frame with fourteen bolts, lockwashers and nuts.

Note

Do not tighten the bolts too tight; if bolts are too tight, they will prevent free movement of the seat on the tracks. A slight snugness of the bolts and nuts to the track is sufficient.

c. Install fore-aft adjustment mechanism and bolts.

d. Assemble the back sides and shoulder panels to each other. Slip completed assembly over pilot's seat and attach to bottom panel with twenty-three screws.

e. Install inertia tension reel to back panel with four bolts, lockwashers and nuts.

f. Place completed seat and armor assembly on tracks in aircraft.

g. Install inertia release lever on side panel with two washers and bolts.

4-61F. Pilot's and Copilot's Seat Covers. (See figure 4-3A.) Pilot's and Copilot's seat frames are covered with nylon mesh material. Metal eyes are provided in seat cover for lacing with nylon cord. Metal strips are attached to tabs of lower seat cover with eyelets for attachment of turnbuckles.

4-61G. *Inspection — Pilot's and Copilot's Seat Covers.* a. Forward (4, figure 4-3A) and aft (5) seat attachment fittings may be inspected by Fluorescent Penetrant method.

b. Inspect fabric for tears and frayed cord.

c. Visually inspect handle assembly (6) and bearings (7).

d. Visually inspect actuator handle and lifter for damage.

e. Visually inspect rollers for wear.

f. Check carriage assembly for damage and operation.

4-61H. *Removal — Pilot's and Copilot's Seat Covers.* a. Remove seat covers as follows:

(1) Lift flap on aft side of seat back cover for access to nylon cord.

(2) Untie nylon cord and loosen as necessary to remove cover.

b. Remove lower seat cover as follows:

(1) Cut lockwires and loosen turnbuckles underneath seat.

(2) Disconnect turnbuckles from metal reinforcing strips in seat cover tap.

4-61I. *Installation — Pilot's and Copilot's Seat Covers.* a. Install seat back cover as follows:

(1) Position cover on seat back.

(2) Use nylon cord laced through reinforcing eyes to tighten cover to desired tension.

(3) Secure in position by tying nylon cord.

b. Install lower seat cover as follows:

(1) Position cover on lower seat.

(2) Attach turnbuckles to metal reinforcing strips in seat cover through slots provided in material.

(3) Adjust seat cover to desired tension by tightening turnbuckle. Lockwire turnbuckles together for security.

4-61J. *Adjustment — Pilot's and Copilot's Seat Covers.* If turnbuckle has reached its extreme position and further tightening is desired, the seat cover may be tightened further as follows:

a. Cut lockwire securing turnbuckle.

b. Loosen and disconnect turnbuckles from metal reinforcing strip in seat cover tab.

c. Turn metal reinforcing strip one-half turn.

Note

Roll tab material evenly.

d. Connect turnbuckles to metal reinforcing strips through slots provided in material.

e. Adjust seat covers to desired tension by tightening turnbuckles.

f. Lockwire turnbuckles together for security.

1. Actuator Handle
2. Forward Fitting
3. Carriage Assembly
4. Aft Fitting
5. Fitting

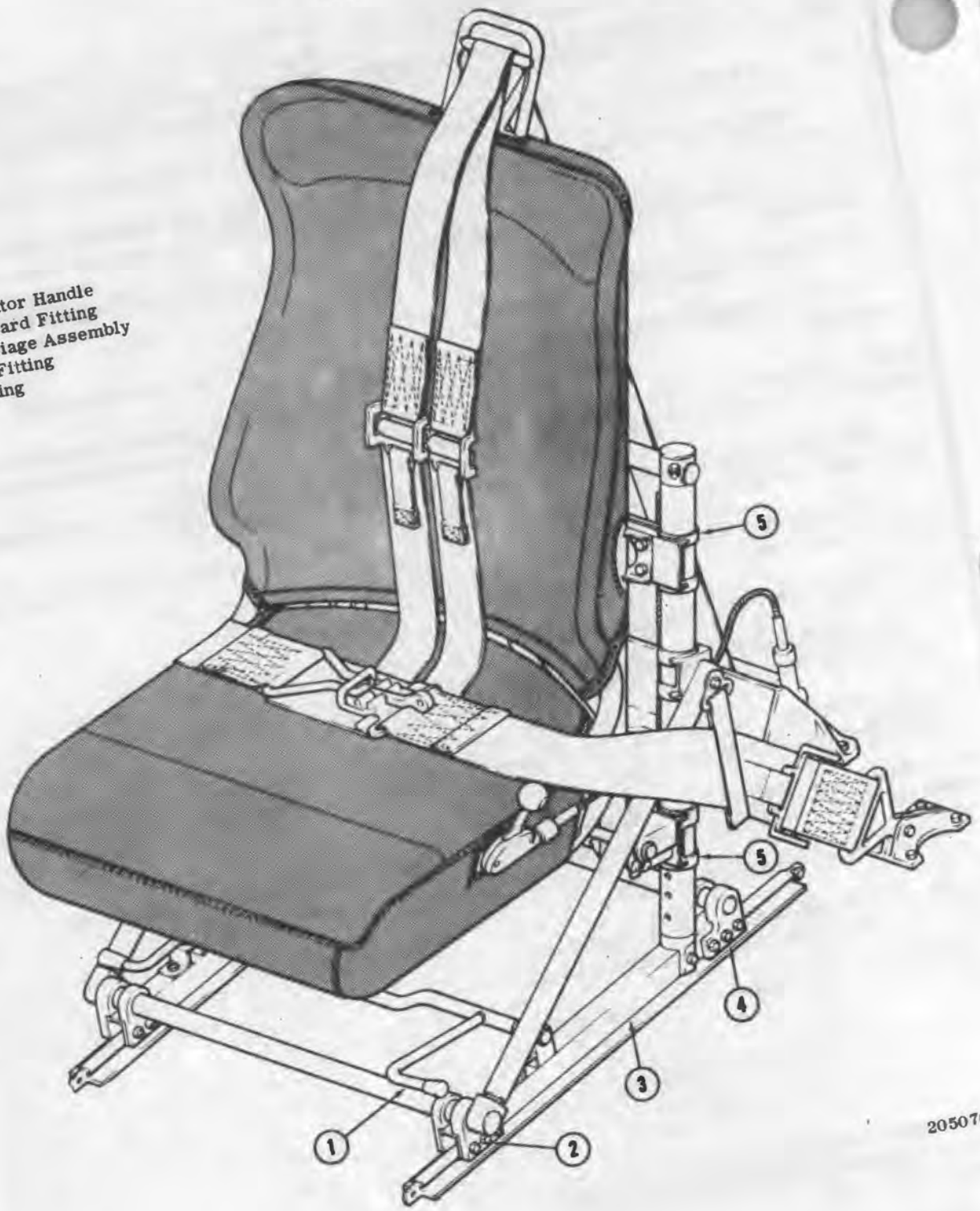


Figure 4-3A. Pilot's and copilot's seat cover

4-62. Aft Cabin Troop Seats. Two troop seats (7, figure 4-1) of tubular metal construction are secured to the cabin bulkhead and floor. In UH-1A helicopters these seats are each two man capacity, while the UH-1B helicopters are equipped with one two man, and one three man capacity seats. These seats can be stowed or removed for rescue or cargo missions as required.

4-63. *Removal — Aft Cabin Troop Seats.* a. On UH-1A and UH-1B helicopters, Serial No. 60-3546 through 65-12772, remove nuts, bolts and washers attaching upper seat back to bulkhead fittings.

b. Slide collar of floor attachment fittings upward on each of the forward seat support legs, and release legs from floor studs.

c. Remove nuts and bolts holding clamps on rear of seat and remove seat from helicopter.

4-64. *Inspection — Aft Cabin Troop Seats.* Visually inspect support tubes, legs and seat fabric for damage.

4-65. *Repair or Replacement — Aft Cabin Troop Seats.* Replace seat if support tubes and legs are damaged or unserviceable.

4-66. *Installation — Aft Cabin Troop Seats.* a. Unfold stowed seat in helicopter. On UH-1A and UH-1B helicopters, Serial No. 60-3546 through 65-12772, position seat back support tube to upper bulkhead fittings and install attaching bolts, washers and nuts.

b. Position aft seat bottom support tube in bulkhead clamps and install bolts and nuts.

c. Position forward seat support legs on floor studs. Secure legs to floor by sliding attachment fitting collar up on leg and then down as far as it will go.

4-67. *Adjustment — Aft Cabin Troop Seats.* Adjust seat tension by use of buckles on upper back support straps.

4-68. *Stowage — Aft Cabin Troop Seats.* a. Release forward seat support legs from floor studs.

b. Pull pip pins from seat leg braces and fold braces upward against seat legs. Fold seat legs aft under seat bottom.

4-69. One Man and Medical Attendant Seats. There are two additional one man seats which may be installed in UH-1B helicopters only. When installed these seats are located between, and aft of, the pilot's and copilot's seats. One man seats may be installed so that the occupant faces either outboard or aft. These seats are of tubular metal construction and can be folded for stowage. A medical attendant's seat, of the same construction as the one man seats, is provided for use when the helicopter is utilized for mercy and/or rescue missions. This seat is located on the helicopter center line, behind the pilot's and copilot's seats, and faces aft. Individual, lap type, safety belts are provided for the occupants of all seats.

4-70. *Removal — One Man and Medical Attendant Seats.* a. Slide collar of floor attachment fittings upward on each leg to release seat from floor.

b. Lift seat from position and remove from helicopter.

4-71. *Inspection — One Man and Medical Attendant Seats.* Inspect fabric, fittings, braces and leg assemblies for damage and general condition.

4-72. *Repair or Replacement — One Man and Medical Attendant Seat.* Replace seat if support tubes, legs or braces are damaged.

4-73. *Installation — One Man and Medical Attendant Seats.* a. Open seat back to normal position and secure support tubes at each side of the seat with quick release pins.

b. Unfold seat legs and position the seat in the helicopter with the legs over the floor studs. Press down on seat.

c. Slide the collar of each leg attachment fitting down to securely lock the legs to the floor.

d. Position diagonal leg brace tubes and secure with pip pins.

4-74. *Stowage — One Man and Medical Attendant Seats.* a. Pull the quick release pin attaching seat back support to each side of the seat.

b. Fold seat back forward onto seat bottom.

c. Remove pip-pins attaching diagonal braces to forward seat legs.

d. Fold each leg inboard against seat bottom.

4-75. Safety Belts. Individual, lap type, web safety belts are provided for the occupants of all seats.

4-76. *Removal — Safety Belts.* a. Remove nuts, washers and bolts attaching pilot and copilot seat safety belts to each side of seat and remove belt from seat.

b. Unsnap both ends of troop seat safety belts from rings, or link assembly bolts, and remove belt.

4-77. *Inspection — Safety Belts.* Inspect each belt and fitting for fraying, weakness of webbing and stitching; slippage of webbing through adjusters and deformation and corrosion of metal fittings.

4-78. *Repair or Replacement — Safety Belts.* Replace frayed and unserviceable seat belts. Replace unserviceable fittings.

Note

Every 12 months—Replace cotton seat belts and shoulder harness. Every 5 years replace nylon and dacron seat belts. (Refer to TM 55-405-3.)

4-79. *Installation — Safety Belts.* a. Position pilot and copilot safety belt end fittings on each side of seat and install bolts, washers and nuts.

b. Position troop seat safety belt on seat bottom and attach both ends of belt by snapping to rings or link assembly bolts.

Warning

Assemble each troop seat safety belt with release handle pointing left. Place belt end fittings on inner sides of eyebolt, bolts from right, and secure with nuts.

4-80. Shoulder Harness. An inertia reel shoulder harness, with manually operated lock-unlock handles located on the left-hand side of each seat, is incorporated in the pilot's and copilot's seats.

4-81. *Removal — Shoulder Harness.* Remove nut, bolt and washer attaching shoulder harness to inertia reel and lift harness from seat.

4-82. *Inspection — Shoulder Harness.* Inspect harness and end fittings for fraying, weakness of webbing and stitching; slippage of webbing through adjusters and deformation and corrosion of metal fittings.

4-83. *Repair or Replacement — Shoulder Harness.* Replace frayed and unserviceable shoulder harness. Replace unserviceable fittings.

Note

Every 5 years — Replace nylon and dacron seat belt and shoulder harness. (Refer to TM 55-405-3).

4-84. *Installation — Shoulder Harness.* Position shoulder harness over seat back and attach harness fitting to inertia reel with bolt, washer and nut.

4-85. Inertia Reel. The inertia reel is a mechanical restraining device that is designed to hold the pilot and/or copilot in a normal position, in relation to the seat back, during any maneuver which would tend to pitch the pilot and/or copilot forward. A reel is attached to the back of each seat, and is connected to a shoulder harness with a web strap. On UH-1B helicopters, Serial No. 63-8500 and subsequent, the inertia reel is attached to fittings on the cabin floor in back of the pilot and copilot seats. An automatic locking mechanism, a webbing roller and a manual control are incorporated in each unit.

4-86. *Removal — Inertia Reel.* a. Remove the shoulder harness. (Refer to paragraph 4-81.)

b. Loosen manual control nut at union of control cable and inertia reel.

c. Remove four nuts, washer and bolts attaching inertia reel, and remove reel from seat back or cabin floor.

d. Remove four nuts, washer and bolts attaching inertia reel, and remove reel from seat back or cabin floor.

e. Disconnect control cable from the manual control assembly.

f. Remove nuts, washers and bolts that attach the manual control assembly to the left-hand side of the seat. Remove control assembly.

4-87. *Inspection — Inertia Reel.* a. The automatic locking mechanism is designed to lock automatically at any increment of extension of

the shoulder harness webbing up to a maximum of ½ inch movement of the webbing under load. The lock must effectively and positively lock the webbing roller drum when subjected to an inertia load of two to three G's. Then the manual roller shall remain locked against further withdrawal of the webbing until unlocked. The reel shall automatically retract shoulder harness webbing when the inertia load, and the load on the shoulder harness, is released.

b. The webbing roller shall fully retract the webbing tension of not less than two pounds at the initial increment of extension and no more than six pounds at any additional increment of extension of the webbing. The roller shall lock the webbing at each ½ inch increment (or less) of extension.

c. The manual control has both "AUTO and "MANUAL" lock positions. The control lever will remain in the placed position until moved by seat occupant. Movement of the control handle forward to the "MANUAL" position locks the inertia reel, and movement aft to the "AUTO" position unlocks the reel. The reel shall be capable of being unlocked with a load of 25 pounds applied to the webbing. The "MANUAL" control shall lock the reel at any increment up to a maximum of ½ inch extension of the webbing.

4-88. *Repair or Replacement — Inertia Reel.* Replace inertia reel that does not meet inspection requirements above.

4-89. *Installation — Inertia Reel.* a. Position manual control assembly on left-hand side of seat and attach with bolts, washers and nuts.

b. Securely connect control cable to manual control assembly.

c. Position inertia reel on seat back or to fittings on floor and install four bolts, washers and nuts.

d. Attach manual control cable to inertia reel and tighten nut.

e. Attach shoulder harness to inertia reel. (Refer to paragraph 4-84.)

4-90. Windshield. The windshield (1, figure 4-1) is made of transparent plastic. It is set in weather tight sealer, and is bolted to the cabin structure.

4-91. *Removal — Windshield.* a. Cut lockwire, loosen socket head set screw, and lift windshield wiper blade from shaft.

b. Remove free air temperature gage.

c. Remove nuts, bolts and washers from around edge of windshield.

d. Separate windshield from sealing compound and remove windshield from helicopter.

4-92. *Inspection — Windshield.* Inspect for abrasions, scratches, cracks, holes or other damage. See figure 4-4A for critical areas and repair limits.

4-93. *Repair or Replacement — Windshield.* Replace if critical areas are damaged. (See figure 4-4A).

4-94. *Installation — Windshield.* a. Remove old sealing compound from mounting flange with putty knife, spatula or other suitable tool.

Note

Be careful not to scratch the surface.

b. Wipe and clean mounting flange with a soft, clean cloth dampened with naptha, (item 308, table 1-1).

c. Center windshield over opening. Mark edge of windshield oversize and trim sufficient edge to permit windshield to center in position against mounting flange.

Note

Do not trim windshield to final size until all mounting holes have been drilled.

d. Center windshield in position against mounting flange and back drill two holes on each edge of windshield. Use holes in mounting flange as template. Diameter of holes shall be 0.190 to 0.196 inch in diameter.

e. Secure windshield to mounting flange with four screws, washers and nuts lightly torqued. Finish back drilling holes in windshield.

f. Determine proper edge distance, mark windshield and remove. Trim windshield edge to proper size.

g. Remove all dust and foreign matter from windshield mating area and from windshield mounting flange.

h. Apply a 1/8 inch bead of water tightness sealing compound, (item 200, table 1-1) to the mating side of the windshield mounting flange.

i. Position windshield in mounting flange, align holes and install screws, washers and nuts.

j. Remove excess sealing compound from around windshield.

k. Install windshield wiper blade and free air temperature gage.

l. Clean windshield in accordance with instructions contained in paragraph 1-100.

4-95. Pilot and Copilot Upper Door Window. The pilot and copilot upper door window (11, figure 4-1) is a transparent plastic panel which is held in place by screws, washers and nuts.

4-96. Removal — Pilot and Copilot Upper Door Window. a. Remove nuts, screws and washers securing window to door.

b. Separate window from sealing compound and remove window from door.

4-97. Inspection — Pilot and Copilot Upper Door Window. (Refer to paragraph 4-92.)

4-98. Repair or Replacement — Pilot and Copilot Upper Door Window. (Refer to paragraph 4-93.)

4-99. Installation — Pilot and Copilot Upper Door Window. (Refer to paragraph 4-94, steps a. through j.) Procedure is the same except that diameter of holes shall be 0.146 to 0.152 inch in size.

4-100. Pilot and Copilot Adjustable Door Window. The pilot and copilot adjustable door window (10, figure 4-1) is a transparent plastic panel which may be raised or lowered as desired.

4-101. Removal — Pilot and Copilot Adjustable Door Window. a. Remove screws attaching plastic handle to window.

b. Remove screws holding cover plate to bottom door channel, in door frame, below the window.

c. Guide window downward through slot in bottom of door assembly and remove from door.

4-102. Inspection — Pilot and Copilot Adjustable Door Window. (Refer to paragraph 4-92.)

4-103. Repair or Replacement — Pilot and Copilot Adjustable Door Window. Replace if critical areas are damaged. (See figure 4-4A.)

4-104. Installation — Pilot and Copilot Adjustable Door Window. a. Guide window upward through slot in bottom of door channel, and into side window channels.

Note

Check progress through opening in aft edge of door.

b. Place window in partially closed position and attach window handle and bottom door channel cover plate with screws.

4-105. Cabin Roof Window. Two transparent plastic cabin roof windows (2, figure 4-1) are located directly above the pilot and copilot seats.

4-106. Removal — Cabin Roof Window. (Refer to paragraph 4-96.)

4-107. Inspection — Cabin Roof Window. (Refer to paragraph 4-92.)

4-108. Repair or Replacement — Cabin Roof Window. Replace if critical areas are damaged. (See figure 4-4A.)

4-109. Installation — Cabin Roof Window. (Refer to paragraph 4-94, steps a. through j.)

4-110. Lower Forward Cabin Window. Two transparent plastic lower forward cabin windows (14, figure 4-1) are located in the bottom of the forward cabin below, and forward of, the pilot's and copilot's tail rotor control pedals.

4-111. Removal — Lower Forward Cabin Window. a. Remove rear view mirror (refer to paragraph 4-156.)

b. Remove window. (Refer to paragraph 4-96.)

4-112. Inspection — Lower Forward Cabin Window. (Refer to paragraph 4-92.)

4-113. Repair or Replacement — Lower Forward Cabin Window. Replace if critical areas are damaged. (See figure 4-4A.)

4-114. *Installation — Lower Cabin Window.* a. Install window. (Refer to paragraph 4-94 steps a. through j.)

b. Install and adjust rear view mirror. (Refer to paragraph 4-157 and 4-158.)

4-115. Window — Cargo Door. A large plexiglas window (8, figure 4-1) is incorporated into each cargo door.

4-116. *Removal — Cargo Door Window.* (Refer to paragraph 4-96.)

4-117. *Inspection — Cargo Door Window.* (Refer to paragraph 4-92.)

4-118. *Repair or Replacement — Cargo Door Window.* Replace if critical areas are damaged. (See figure 4-4A.)

4-119. *Installation — Cargo Door Window.* (Refer to paragraph 4-94, steps a. through j.)

4-120. Soundproofing. The cabin interior is sound proofed to reduce noise level for the benefit of crew and passengers. Sound proof material is made into blankets cut to fit the interior of the helicopter.

4-121. *Removal — Soundproofing.* a. Remove screws, washers, nuts and clamps attaching roof blanket and stays to cabin roof.

b. Release snap buttons attaching roof blanket, and remove blanket.

c. Release snap buttons attaching balance of blankets to inside cabin surfaces, and remove blankets.

4-122. *Inspection — Soundproofing.* Visually inspect for cuts and tears in blankets and for damaged or missing buttons and sockets.

4-123. *Repair or Replacement—Soundproofing.* a. repair cuts and tears in blanket assemblies as follows:

(1) Cut a patch from vinyl coated cloth large enough to overlap all sides of the tear or cut.

(2) Apply a thin, even coating of adhesive to back side of the patch and allow to air dry until tacky.

(3) Center the patch over the tear or cut with the adhesive side against the blanket.

(4) Apply firm, even pressure to the patch in such a manner that the patch will adhere securely to the blanket without wrinkles or irregularities.

b. Replace damaged or missing buttons and sockets as follows:

(1) Cut a patch from vinyl coated cloth large enough to overlap all sides of the damaged area around the button or socket.

(2) Center patch over damaged area and sew securely in place with cotton binding thread.

(3) Install button or socket using press and dies.

4-124. *Installation — Soundproofing.* a. Position blankets in proper locations on vertical surfaces inside cabin, and attach by inserting snap buttons into corresponding sockets.

b. Position cabin roof blanket against roof, and attach with snap buttons, clamps, nuts, washers and screws.

4-125. Blackout Curtains. A black-out curtain is installed in the aft portion of the forward cabin section behind the pilot's and co-pilot's seats at station 75.00.

4-126. *Removal — Black Curtains.* a. Open zippers connecting top curtain assembly to right and left-hand assemblies.

b. Disconnect snap fasteners around outside edge and across bottom of curtains.

c. Remove nuts, washers and screws from attachment strips across top, and remove top curtain assembly.

4-127. *Inspection — Blackout Curtains.* Visually inspect blackout curtains for cuts, tears and condition of slide fasteners.

4-128. *Repair or Replacement—Blackout Curtains.* a. Repair cuts and tears in blackout curtains as follows:

(1) Cut a patch of black, one-side-coated nylon twill material.

1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Support Bracket
6. Brush Assemblies
7. Mounting Rod-End
8. Inspection Hole
9. Main Release Cable
10. Turnbuckle
11. Pedal Assembly
12. Guard Pins
13. Guard Pin
14. Spacer
15. Pulley Bracket Tube
16. Cargo Hook Release Lever
17. Ball Terminal
18. Access Door
19. Lever
20. Clamps
21. Adapter
22. Cargo Hook
23. Pedal Stop Assembly Screw

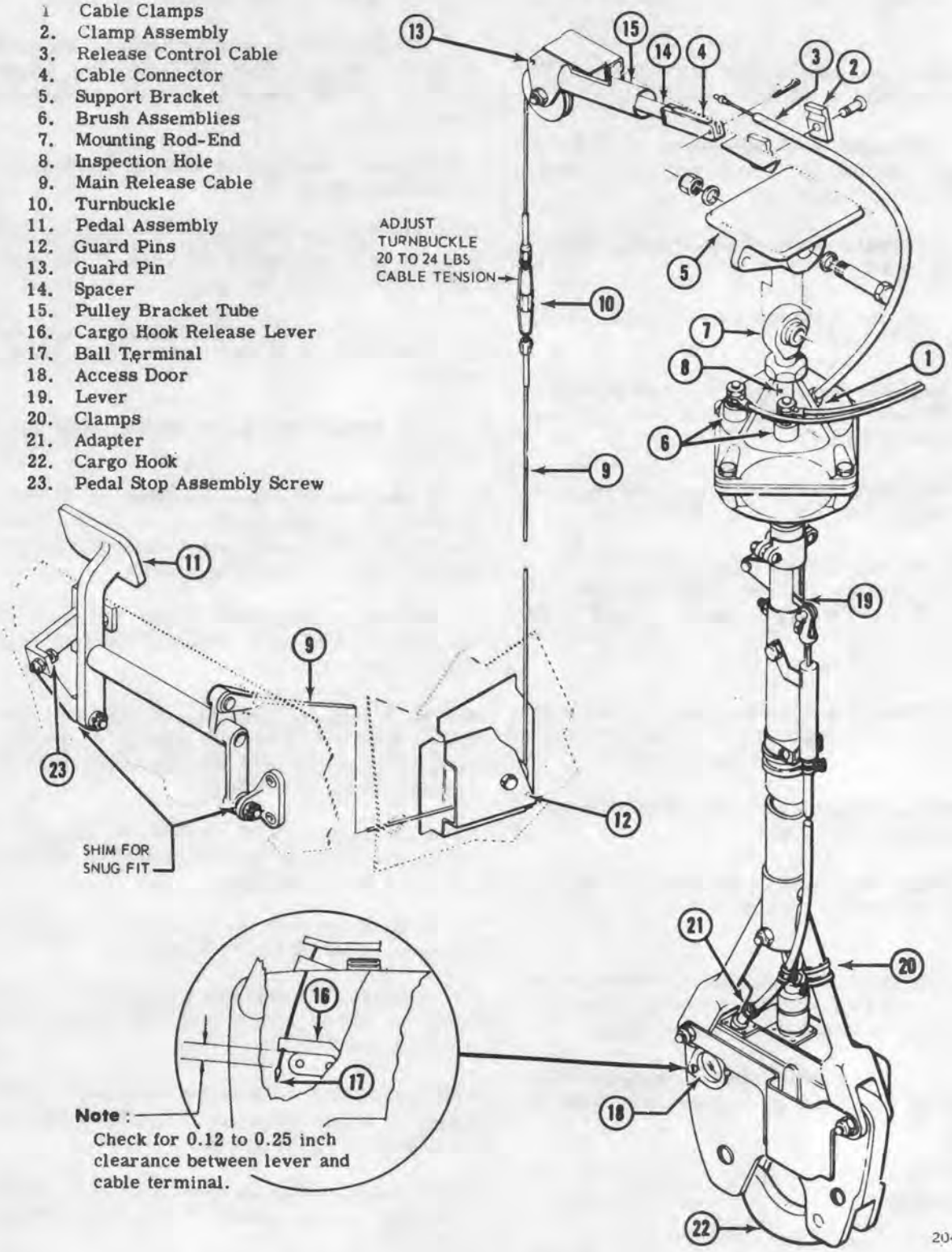


Figure 4–5. UH-1A Helicopter cargo suspension

1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Restraint Springs
6. Support Bracket
7. Main Release Cable
8. Turnbuckle
9. Pedal Assembly
10. Guard Pins
11. Guard Pin
12. Spacer
13. Pulley Bracket Tube
14. Access Door
15. Cargo Hook Release Lever
16. Adjustment Bolt
17. Ball Terminal
18. Control Cable Shield
19. Cargo Hook
20. Pedal Stop Assembly Screw

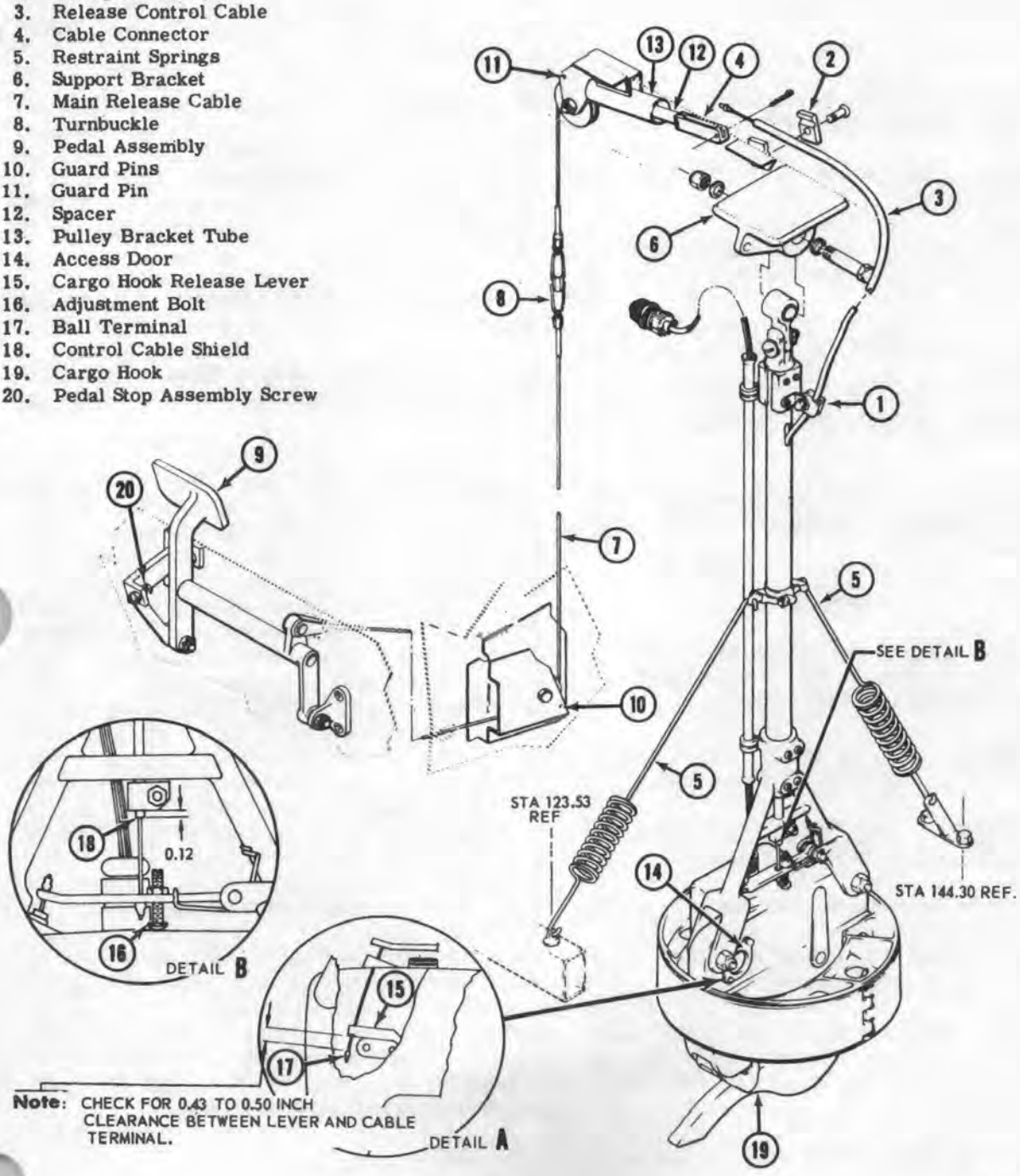


Figure 4-8. UH-1B Helicopter cargo suspension (Serial No. 62-1872 and subsequent)

large enough to overlap all sides of the cut or tear.

(2) Center the patch over the cut or tear and sew in place with black nylon thread.

Note

All sewing shall be in accordance with Federal Specification DDD-S-751.

b. Replace damaged or missing buttons and sockets as follows:

(1) Repair area surrounding damaged or missing buttons and sockets as outlined in step b.

(2) Install button or socket using press and dies.

c. Replace damaged slide fasteners as follows:

(1) Rip out stitching attaching slide fastener to curtain material and remove damaged slide fastener.

Note

Visually inspect 2.25 inch-wide flap of blackout material which is attached to curtain back of slide fastener.

(2) Repair area to which slide fastener and flap will be attached as outlined in step a.

(3) Position slide fastener and flap and sew in place with black nylon thread.

4-129. *Installation — Blackout Curtains.* a. Align holes in attaching strips and top curtain assembly with holes in bulkhead at station 75.00 and install screws, washers and nuts.

b. Connect fasteners on outboard sides and bottom of top curtain. Connect zippers of top curtain to corresponding zippers of lower curtains.

c. Connect outboard and bottom fasteners of lower curtains.

4-130. Work Platform. A fixed work platform is located in the upper part of the engine and transmission compartment beneath the cowling. With the engine and transmission cowling opened, or removed, this platform facilitates the performance of maintenance operations on the transmission and/or engine.

4-131. *Repair — Work Platform.* Minor ruptures can be repaired by filling with sealer (item 214, table 1-1) or equivalent.

4-132. Tiedown — Cargo. A quantity of combined cargo tie down ring and seat attachment stud units are located in the cabin floor panels. Their locations are such that cargo of various sizes, shapes and weights (within allowable limitations) can be accommodated and adequately secured.

4-133. *Removal — Cargo Tiedown.* Remove six screws from each unit, and lift unit from floor.

4-134. *Installation — Cargo Tiedown.* Position unit in floor location and attach with six screws.

4-135. Cargo Suspension. The external cargo suspension assembly is attached to the lateral beam of the transmission mount at the helicopter center of gravity. The cargo suspension assembly used on UH-1A helicopters and UH-1B helicopters Serial No. 60-3546 through 61-803 is suspended on a self-aligning bearing, with the cargo hook extending through a padded opening in the outer bottom skin. The assembly used on UH-1B helicopters Serial No. 62-1872 and subsequent is a non-rotating unit. All UH-1A helicopters (see figure 4-5) and UH-1B helicopters Serial No. 3546 through 60-3619 (see figure 4-6) are equipped with a free swinging suspension assembly. UH-1B helicopters Serial No. 61-686 through 61-803, (see figure 4-7). are equipped with a suspension hook assembly which incorporates a self-centering cam assembly. The cam assembly positions the cargo hook so that the load beam always opens facing forward, thus facilitating utilization of the self-loading feature. The non-rotating unit used on UH-1B helicopters Serial No. 62-1872 and subsequent (see figure 4-8) is maintained in a fixed position with the hook assembly always facing forward.

Caution

On the above serial numbered UH-1B helicopters equipped with a non-rotating cargo hook assembly a flexible loop or swivel device should be installed between the cargo hook and the

cargo load to prevent transfer of excessive torque loads to the hook by a rotating cargo load. A recommended device for this application is: Sling, Endless, Nylon webbing, Type I, 10 inch, Part No. PD101-10.

4-136. Cargo quick release can be actuated manually from a switch located on the pilot's cyclic control stick, or through cables by depressing a foot release pedal. UH-1A helicopters also incorporate an electrically operated automatic touchdown release feature, by means of which a minimum cargo of 125 pounds is automatically released upon contact with the ground. On UH-1A helicopters the manual and automatic release circuit is activated by means of a three-position toggle switch located on the miscellaneous panel of the overhead console. This switch is labeled CARGO RELEASE, and shows the three positions as AUTO, SAFE and MANUAL. UH-1B helicopters do not incorporate the automatic release feature. A two-position toggle switch, in the same location on the overhead console, is labeled CARGO RELEASE, and shows the two-positions as OFF and ARM. Electrical power to the cargo hook release relay is furnished from the 28 volt DC essential bus. Circuit protection is provided by a circuit breaker panel.

4-137. The cargo suspension unit is attached to the main rotor system supporting structure at station 132.138 on helicopter center of gravity. It is suspended vertically through a well in the lower fuselage structure.

4-138. The emergency release control mechanism consists of a foot pedal located at the pilot's station, two steel cables connected by a turnbuckle, which is located at the right-hand side of the cargo suspension compartment, and a spring loaded cable connector. (See figure 4-5 through 4-8.)

4-139. *Troubleshooting—Cargo Suspension.* Trouble shoot in accordance with the following chart:

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Emergency release inoperative	Improper rigging	Check rigging. (Refer to paragraph 4-143)
	Circuit breaker	Replace circuit breaker
	Broken electrical wire or loose connections	Inspect and replace wire if necessary. Tighten connections.
Electrical release inoperative	Damaged switch	Replace switch
	Brush assemblies	Replace brush assemblies
Hook continues to swivel	Shear pin broken	Replace shear pin

4-180. *Installation — First Aid Kit.* Position kit on snap fasteners and push to engage fasteners.

4-181. Fire Extinguisher. All helicopters are equipped with a monobromotrifluoromethane fire extinguisher pressurized with either nitrogen or air. This fire extinguisher is located in a hanger bracket which is attached to the left-hand side of the instrument pedestal.

Warning

Monobromotrifluoromethane is a solid agent, but smoke fumes are toxic. Avoid breathing fumes at all times.

4-182. *Removal — Fire Extinguisher.* a. Loosen retaining clamp from around upper section of the extinguisher by pulling the hinged lever aft. Tension on the extinguisher will be released so that the catch on the hinged lever will be disengaged from the attaching ring.

b. Grasp the fire extinguisher by the handle and remove from the hanger bracket.

c. Remove screws, washers and nuts attaching hanger bracket to left-hand side of instrument pedestal and remove hanger bracket.

4-183. *Inspection — Fire Extinguisher.* a. Pressure gage reading should be 380 psig at 86°F.

b. All fire extinguishers should be weighed every six months to determine that they are fully charged. The fully charged weight of fire extinguisher should not be less than four ounces below the gross weight stamped on the nameplate. If this weight is not met the extinguisher should be recharged.

4-184. *Installation — Fire Extinguisher.* a. Position hanger bracket on left-hand side of instrument pedestal, and install attaching nuts, washer and screws.

b. Position fire extinguisher in hanger bracket with extinguisher handle opposite bracket.

c. Hook the latch of the retaining clamp handle through ring on inboard section of the retaining clamp. Force free end of clamp handle to the left and forward. This will close the clamp and secure the fire extinguisher in the hanger bracket.

4-185. Paratroop Static Line Cable. A paratroop static line cable may be installed on the center of the aft cabin bulkhead. This installation consists of a cable (1, figure 4-11) a compression tube (2), attach plates (3), fitting (4) and attaching hardware.

4-186. *Removal — Paratroop Static Line Cable.* a. Remove cotter pins and washer attaching cable (1) to fitting (4) and remove cable.

b. Remove nuts, washers and bolts securing attach plates (3) to fittings (4) and remove attach plates.

c. Remove bolts and washers securing fittings (4) to aft cabin bulkhead and remove fittings and compression tube (2) from bulkhead.

d. Remove nuts (5) and washers on end of compression tube (2). Remove pins (6) from compression tube and separate tube from fittings (4).

4-187. *Inspection — Paratroop Static Line Cable.* Visually inspect all components for damage and general condition.

4-188. *Repair or Replacement — Paratroop Static Line Cable.* Replace damaged or unserviceable components.

4-189. *Installation — Paratroop Static Line Cable.* a. Install nut (5, figure 4-11) lock-washer and flat washer on compression tube, (2). Position fittings (4) on compression tube. Align holes in tube and fittings and insert pins (6).

b. Position static line cable (1) on pins (6) and install washers and cotter pins.

c. Install flat washer, lock-washer and nut (5) on end of compression tube.

Note

Passenger seat back tube must be removed or folded up against aft cabin bulkhead before installing paratroop static line cable.

d. Position compression tube (2) and fittings (4) to aft cabin bulkhead and install attaching washers and bolts. Tighten both nuts (5) on compression tube against fitting.

e. Position attach plates (3) to fittings (4) and install bolts, washers and nuts.

4-190. Manual Emergency Jettison Controls. A series of cables, actuated by a manually

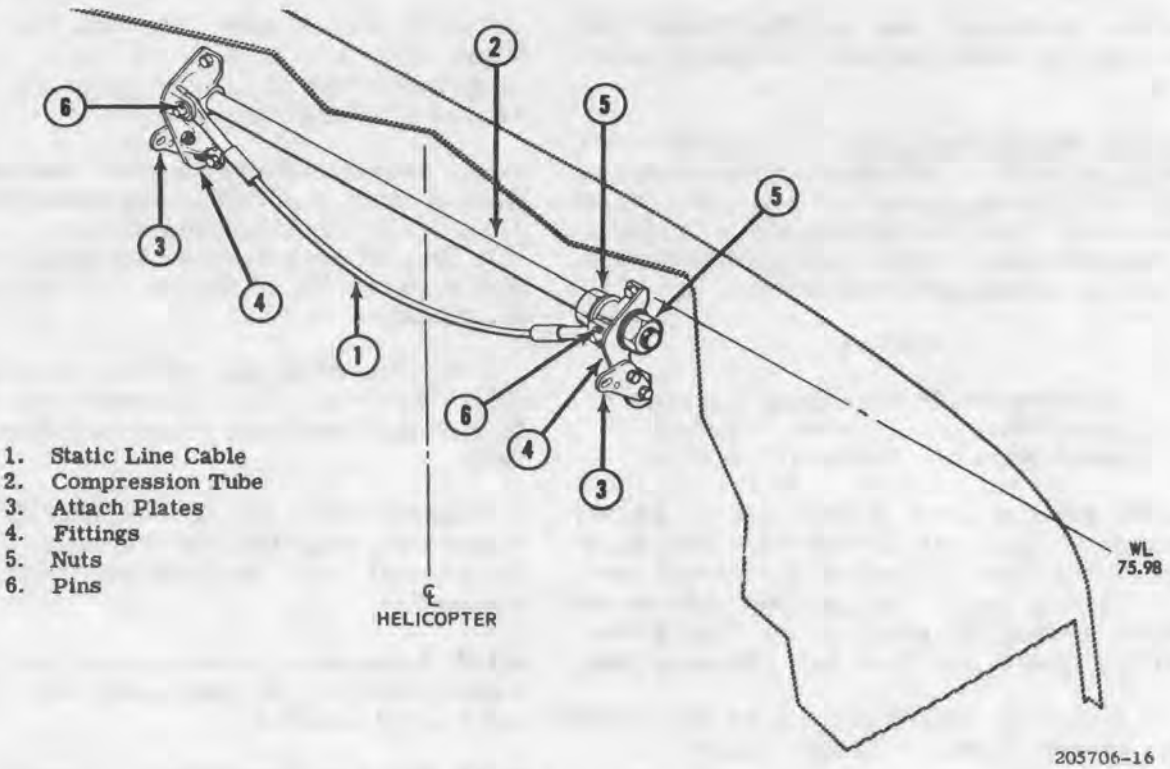


Figure 4–11. Paratroop static line cable

operated jettison lever located beside the pilot's seat, enables the pilot to mechanically jettison externally carried kits and equipment. Both left-hand and right-hand equipments are jettisoned simultaneously. These cables are equipped with adjustable fittings which facilitate final rigging and adjustment.

4-191. *Operational Check — Manual Emergency Jettison Controls.* a. Place emergency release lever assembly (13, figure 4-12) in full forward position.

b. Make certain that the mechanical release actuating lever is in the full down (locked) position.

c. Loosen attaching parts of upper guard tube (5) and slide guard tube down over lower guard tube (6) to expose barrel (7).

d. Adjust cable barrels to obtain a 1.30 inches dimension between the inside edge of lower helicopter skin and center of the terminal on the inboard end of the lower cable assembly (1). (See View A.)

Note

The 1.30 inches dimension is to be held when the system is in full locked (armed) position.

e. Safety wire all cable barrels.

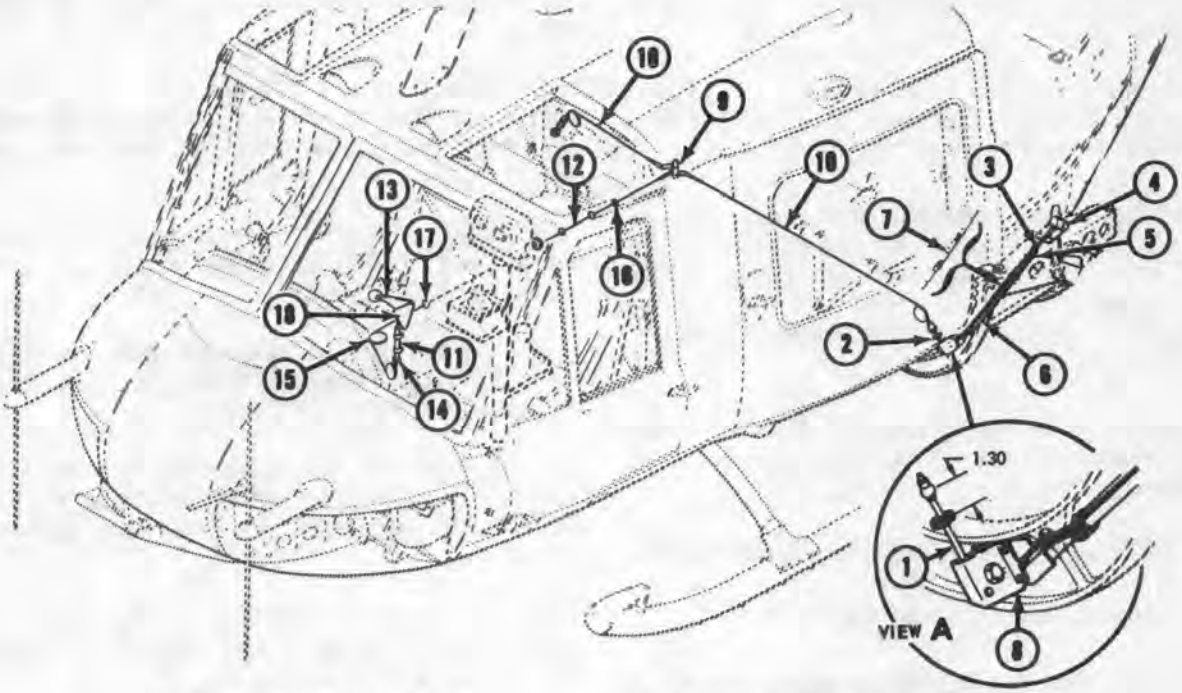
f. Slide upper guard tube (5) up from lower guard tube (6) and tighten attaching parts.

4-192. *Removal — Manual Emergency Jettison Controls.* a. Remove access plate from lower fuselage skin below external stores forward support beam.

b. Disconnect inboard end of lower cable assembly (1, figure 4-12) from quick disconnect on outboard end of emergency jettison cable assembly.

c. Remove grommet (2) from fuselage skin and pull lower cable assembly (1) outboard.

d. Remove cotter pin, washer and flat head pin attaching cable assembly (3) to mechanical release actuating lever.



1. Lower Cable Assembly
2. Grommet
3. Cable Assembly
4. Pulley Brackets
5. Upper Guard Tube
6. Lower Guard Tube
7. Barrel
8. Lateral Release Cable Pulleys
9. Bellcrank
10. Lateral Release Cable Assemblies
11. Cable Guard
12. Longitudinal Release Cable Assembly
13. Emergency Release Lever Assembly
14. Grommet
15. Longitudinal Release Cable Pulleys
16. Fairlead
17. Grommets
18. Support Assembly

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Figure 4–12. Manual emergency jettison controls

e. Remove cotter pins, pins, nuts, washers and bolts holding pulleys in pulley brackets (4) and remove pulleys.

f. Remove nuts, washers, screws and clamps attaching upper (5) and lower (6) guard tubes and remove guard tubes.

g. Remove cable assemblies and cut safety wire at barrel (7) to separate.

h. Remove cotter pins, pins, nuts, washers and bolts holding lateral release cable pulleys (8) in pulley brackets and remove pulleys.

i. Remove three cotter pins, washers and flat head pins attaching cable assemblies to bellcrank (9). Remove two lateral release cable assemblies (10) and cut safety wire on barrels.

j. Remove cotter pin, nut, washer and screw attaching bellcrank (9) and remove bellcrank.

k. Remove nuts, washers, spacers, screws and clamps attaching cable guard (11) to pedestal. Remove cotter pin and pin attaching longitudinal release cable (12) to emergency release lever assembly (13). Remove cable guard and grommet (14).

l. Remove cotter pins, pins, nuts, washers and bolts holding longitudinal release cable pulleys (15) in pulley brackets and remove pulleys.

m. Remove fairlead (16) and six grommets (17) which guide longitudinal release cable (12) and remove release cable.

n. Remove cotter pin, nut, washer and clevis bolt attaching lever assembly (13) to support assembly (18).

o. Remove three nuts, washers and bolts attaching support assembly (18) to pedestal and remove support assembly.

4-193. *Inspection — Manual Emergency Jettison Controls.* Visually inspect all pulleys and grommets for excessive wear and damage; all cables for broken or frayed wires and other components for general condition and suitability for continued service.

4-194. *Repair or Replacement — Manual Emergency Jettison Controls.* a. Replace worn or damaged pulleys and grommets.

b. Replace frayed and unserviceable cables.

c. Replace unserviceable components.

4-195. *Installation — Manual Emergency Jettison Controls.* a. Position support assembly (18, figure 4-12) on pedestal and install three attaching bolts, washers, and nuts.

b. Position emergency release lever assembly (13) on support assembly (18) and install attaching clevis bolt, washer, nut and cotter pin.

c. Thread longitudinal release cable (12) through bulkhead openings and install fairlead (16) and grommets (17).

d. Position longitudinal release cable pulleys (15) and cable (12) in pulley brackets and install attaching bolts, washers, nut, pins and cotter pins.

e. Thread forward end of longitudinal release cable (12) through cable guard (11) and attach to emergency release lever assembly (13) by installing pin and cotter pin.

f. Position cable guard (11) and install grommet (14) and attaching clamps, screws, spacers, washers and nuts.

g. Position bellcrank (9) and install attaching screw, washer, nut and cotter pin.

h. Position aft end of longitudinal release cable (12) and inboard end of lateral release cable assemblies (10) on bellcrank (9), and attach with flat head pins, washers and cotter pins.

i. Position lateral release cable pulleys (8) and cable (10) in pulley brackets and install attaching bolts, washers, nuts, pins and cotter pins.

j. Position upper (5) and lower (6) guard tubes and install attaching clamps, screws, washers and nuts.

k. Connect external support cable assemblies (1 and 3) by means of barrel (7) and thread through guard tubes (5 and 6).

l. Position external support cable pulleys and cables (1 and 3) in pulley brackets (4) and install attaching bolts, washers, nuts, pins and cotter pins.

m. Connect cable assembly (3) to mechanical release actuating lever by installing flat head pin, washer and cotter pin.

n. Thread inboard end of lower cable assembly (1) through opening in fuselage skin and install grommet (2).

o. Connect inboard end of lower cable assembly (1) to quick disconnect on outboard end of emergency jettison cable assembly.

4-196. Tail Boom. The tail boom is attached to the forward fuselage, at station 193.00, by four bolt, washer, nut combinations. Components of the tail boom, which require consideration by organizational personnel, include the tail rotor drive shaft doors, access doors and inspection plates, synchronized elevator, vertical fin fairing and the tail skid.

4-197. *Inspection — Tail Boom.* Inspect tail boom for damaged skin, fittings and general condition.

4-198. *Deleted.*

4-199. Miscellaneous Tail Boom Access Doors. Access to various internal areas of the tail boom is provided by strategically located access doors. (See figure 4-2 and 4-3.) These doors are attached to the structure by hinges, and are secured in the closed position by means of a latch or latches.

4-200. *Removal — Miscellaneous Tail Boom Access Doors.* Release latch, or latches, and remove hinge pins attaching door to structure.

4-201. *Inspection — Miscellaneous Tail Boom Access Doors.* Inspect doors, hinges and latches for wear or damage.

4-202. *Repair or Replacement — Miscellaneous Tail Boom Access Doors.* Replace damaged hinges, latch and doors.

4-203. *Installation — Miscellaneous Tail Boom Access Doors.* Position door in opening and insert attaching hinge pin. Close door firmly, forcing latch to lock.

4-204. Drive Shaft Doors. The tail rotor drive shaft is enclosed by three doors, (1, figure 4-13) two of which are located between the tailpipe fairing and the 42 degree gear box. The third door encloses the drive shaft between the 42 degree gear box and the 90 degree gear box. These doors are hinged along the right-hand side, and are secured, in the closed position, by snap fasteners on the left-hand side.

4-205. *Removal — Drive Shaft Doors.* a. Disconnect snap-fasteners along left side of door, and swing door to open position.

b. Pull hinge pin on right side of door, and remove door from tail boom.

1. Drive Shaft Doors
2. Access Panels
3. Synchronized Elevator
4. Vertical Fin Fairing
5. Tail Skid

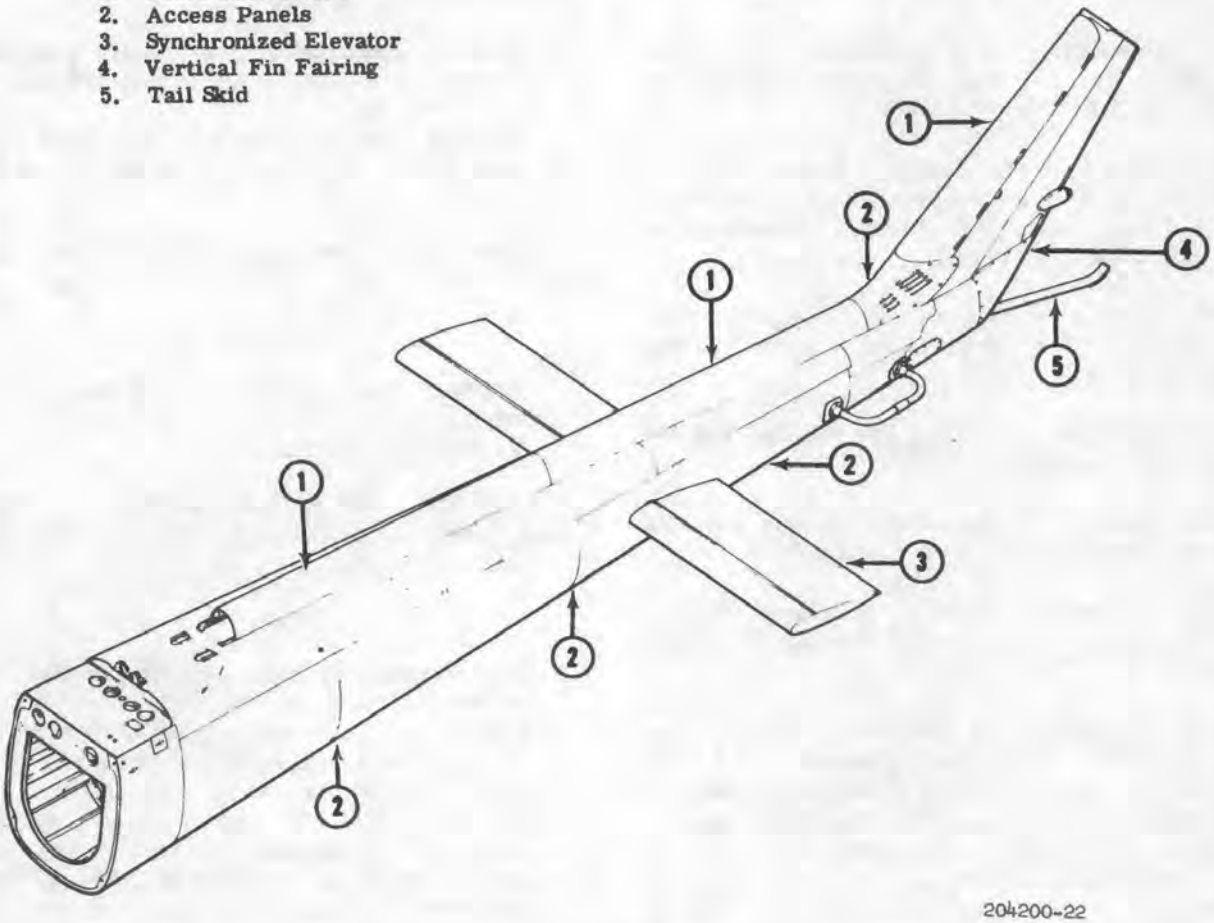


Figure 4–13. Typical tail boom

4-206. ***Inspection — Drive Shaft Doors.*** Inspect doors for cracks, dents or damage; hinges and fasteners for wear and damage.

4-207. ***Repair or Replacement — Drive Shaft Doors.*** Replace worn or damaged hinges and fasteners.

4-208. ***Installation — Drive Shaft Doors.*** a. Position door on tail boom and install hinge pin on right-hand side.

b. Close door and secure snap fasteners.

4-209. Tail Boom Inspection Plates. Inspection plates are provided as necessary in the tail boom for fast, efficient inspection and maintenance of the helicopter.

4-210. ***Removal — Tail Boom Inspection Plates.*** Remove screws attaching inspection plate to structure and remove plate.

4-211. ***Installation — Tail Boom Inspection Plates.*** Position inspection plate in proper opening and attach to structure with screws.

4-212. Vertical Fin Fairing. The vertical fin fairing is located at the junction of the vertical fin and tail boom, and provides access to the tail skid attachment point.

4-213. ***Removal — Vertical Fin Fairing.*** Remove screws attaching fairing, and remove fairing from helicopter.

4-214. ***Inspection — Vertical Fin Fairing.*** Inspect fairing for cracks and damage.

4-215. ***Repair or Replacement — Vertical Fin Fairing.*** Replace fairing if damaged.

4-216. ***Installation — Vertical Fin Fairing.*** Position fairing on helicopter and install attaching screws.

4-217. Synchronized Elevator. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) The synchronized elevator is mounted near the aft end of the tail boom. It is controlled through a series of bellcranks and control tubes, which are joined to the fore and aft cyclic control system by a bellcrank located on the aft side of the transmission. The fore or aft movement of the cyclic control stick changes the angle of attack of the elevator, which aids in controlling the stability of the helicopter.

4-218. ***Removal — Synchronized Elevator*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) Remove synchronized elevator as follows:

Note

Holes in elevator section tubes (6, figure 4-14) must be aligned and drilled on assembly, using pre-drilled holes in the horn assembly (3) as guides. Only one elevator section (4) will be replaced at a time, as new section must be aligned with remaining section. Removal procedure for both elevator sections is the same.

a. Remove screws attaching larger access panel to tail boom, below elevator assembly, and detach access panel.

b. Disconnect elevator control tube from elevator horn assembly (3).

c. Remove eight bolts that secure support bearing housings (5) to tail boom structure.

d. Remove two nuts, washers and bolts (1) that attach horn assembly (3) to elevator section (4).

e. Remove four bushings (2) from horn assembly (3).

Note

Inside of bushing flange is tapped to receive a 5/8 x 24 thread bolt to be used for pulling bushing.

f. Pull loosened elevator section (4) outboard from horn assembly (3) and support bearing housing (5).

Note

An exceptionally good bond of Loctite between elevator section tube bearing surfaces and support bearing (5) may result in difficulties in removing elevator section (4). In such cases, the use of a soft drift pin (micarta or brass) of appropriate size may be required. Release of bearing housing (5) from tail boom structure will allow a sufficient amount of play in elevator for pressure to be exerted outboard, horizontally, or vertically as required.

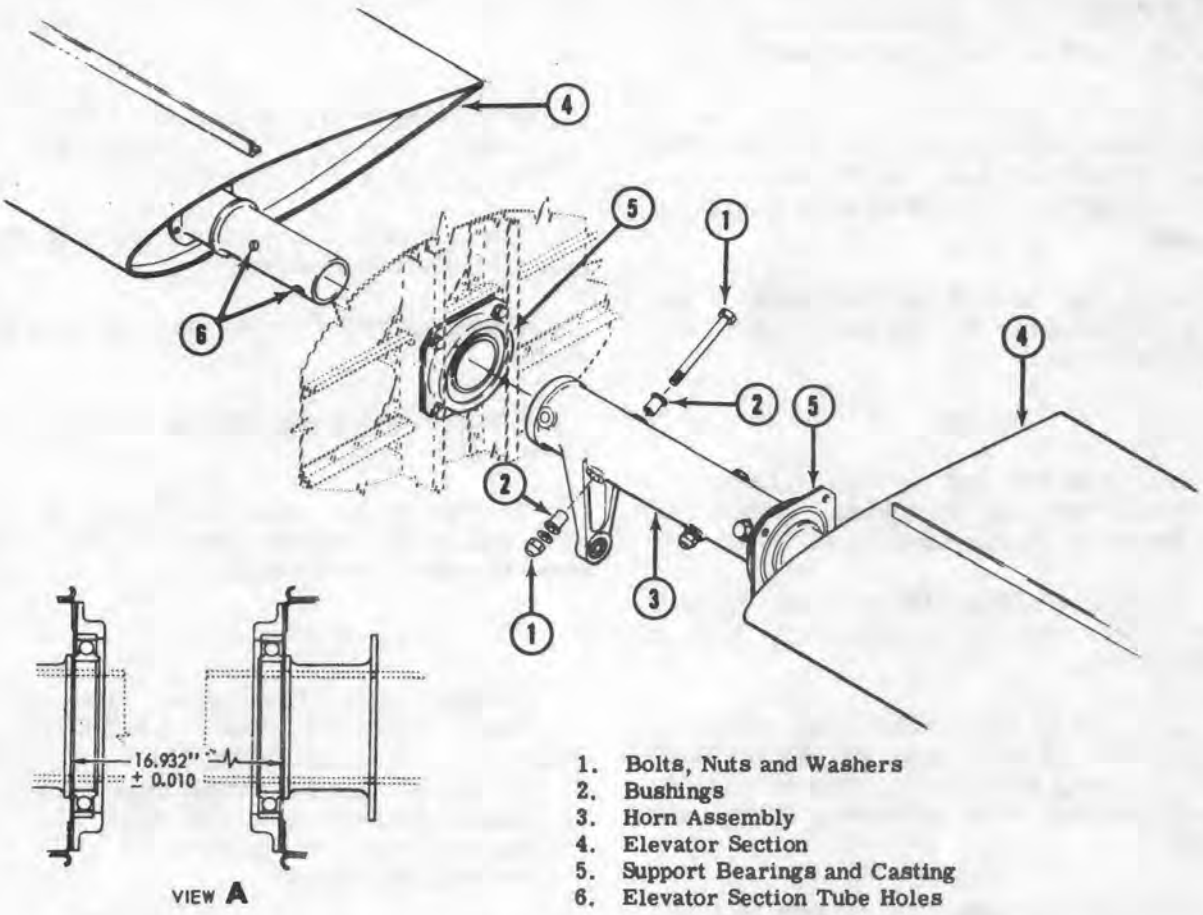


Figure 4-14. Synchronized elevator (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)

g. Place drift pin against inner race of support bearing and tap drift pin firmly with hammer equally all around bearing. Elevator section tube will then slip out of bearing.

Caution

Exercise care to avoid damage to surrounding tail boom skin, structural support, support bearing or shims between bearing housing and structural support.

Note

Steady horn assembly (3) inside tail boom as elevator section tube is slipped out of horn assembly.

Note

Removal of old Loctite from parts may be accomplished by using a soft, nonabrasive scraper and wiping parts clean with a soft cloth.

4-219. ***Inspection — Synchronized Elevator*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect elevator support bearing for roughness and wear.

b. Inspect skin for dents, damage and cracks.

c. Inspect elevators for dents, cracks and damage.

4-220. ***Repair or Replacement — Synchronized Elevator.*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Replace elevator if damaged. Replace unserviceable support bushings.

4-221. ***Installation — Synchronized Elevator*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Installation of both elevator sections is the same.

a. Insert the tube of the new elevator section (4, figure 4-14) through the support bearing (5) and horn (3).

Note

The minimum gap between inboard edge of elevator section and outside skin of tail boom shall be 0.18 inch.

b. Suspend trailing edge of both elevator sections (4) downward and align with a straight edge.

c. Maintain 16.932 inches (plus or minus 0.010 inch) dimension between support bearings (5) (refer to View "A", figure 4-14) by shimming equally between bearing fittings and support.

d. Place two bushings (2) opposite each other in horn assembly (3). Drill 0.265 to 0.272 inch holes through each side of the elevator section tube, using the bushings as a guide. Remove the bushings. Drill and line ream the holes in the elevator section tube to a finish dimension of 0.477 to 0.500 inch.

e. Remove elevator section (4) from horn assembly (3). Treat inner race of the AN200-KP47B bearing and bearing surface on tube of elevator section with Locquic Primer, (item 118, table 1-1). Apply with a swab and allow to dry. This agent is an accelerator which will substantially reduce curing time, but is not considered mandatory.

f. Apply Loctite (item 204, table 1-1) to the inner race of the bearing. Insert elevator section tube into the support bearing (5) but leave bearing surface of elevator section tube exposed. Apply Loctite to bearing surface of elevator section tube and complete insertion of tube through support bearing (5) and into horn assembly (3).

g. Insert bushings (2) in finished holes, and install bolts, washers and nuts (1).

Note

After completion of step g., above, remove excess Loctite compound by wiping with a soft, clean cloth.

h. Check that elevator has no end play, but does have freedom of travel.

i. Attach control tube to elevator horn assembly.

j. Check elevator rigging. (Refer to paragraph 9-75.)

k. Position access panel on bottom of tail boom, below the elevator assembly, and install attaching screws and washers.

Note

Loctite curing time when Locquic Primer, (item 118, table 1-1) has been used is approximately 30 minutes, at 75 degrees. Loctite curing time when Locquic Primer (item 118, table 1-1) has not been used is from 10 to 12 hours at 75 degrees.

4-222. Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent). Synchronized elevator installation on UH-1B helicopters, Serial No. 64-14101 and subsequent, consists of two elevator assemblies, a horn assembly, two support sets and attaching hardware. Horn assembly is mounted horizontally through sides of tail boom, and is secured to structure by support sets which serve as bearings for rotational movement. Linkage from fore and aft cyclic control system on swashplate connects to control arm on horn assembly. Each elevator is a horizontal airfoil section built up on a spar tube which is inserted into a projecting end of horn assembly and is secured by a special retaining bolt.

4-223. ***Removal — Synchronized Elevator*** (UH-1B Serial No. 64-14101 and subsequent). a. To remove either elevator; Remove special retaining bolt (1, figure 4-15) and washer to detach elevator fitting from lug (2) on horn assembly (3). Withdraw elevator (4) straight outboard until spar tube (5) is pulled free.

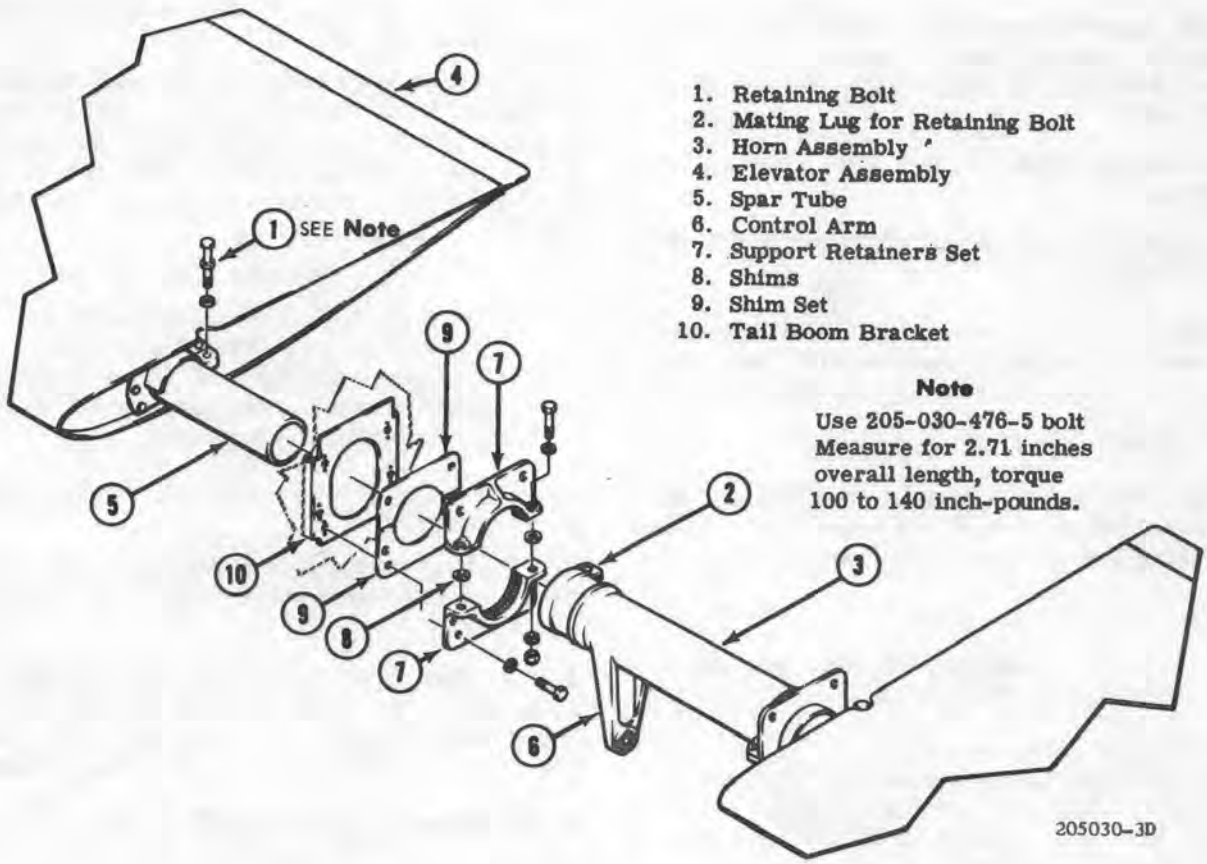


Figure 4–15. Synchronized elevator (UH-1B serial no. 64-14101 and subsequent)

Note

Horn assembly (3) may be left in place unless replacement of components is necessary.

b. To remove horn assembly (3) after removal of both elevators, proceed as follows:

(1) Remove bolts and washers attaching access door to bottom of tail boom below elevator and remove access door.

(2) Disconnect control tube from arm (6) on horn assembly (3).

(3) At each end of horn assembly (3) inside tail boom, remove nuts, washers, and bolts holding upper and lower retainers of support sets (7) together.

Note

Carefully remove support set shims (8) from between upper and lower retainers and save for re-installation.

(4) Remove bolts and washers attaching support sets (7) and shim sets (9) to tail boom bracket (10). Carefully remove support sets (7) and keep in sets with support set shims (8) and shim sets (9).

Note

Use extreme care in removing upper and lower retainers of support sets (7) to avoid damage to inner bushings which are dry bearing material bonded in place.

(5) Remove horn assembly (3) through access opening.

4-224. *Inspection — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent).* a. Inspect inner bushings of support sets for roughness and wear.

b. Inspect elevator for dents, cracks, and damage.

c. Visually inspect all components for general condition.

4-225. *Repair or Replacement — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent.* a. Replace unserviceable bushings.

b. Replace elevators if damaged.

4-226. *Installation — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent).* Install synchronized elevator as follows:

Note

If horn assembly (3) was not removed, proceed to step e.

a. Insert horn assembly (3, figure 4-15) into tail boom through access opening. Position assembly with ends through support brackets (10), and with control arm (6) at right of center pointing down.

b. Position shim sets (9) and support sets (7) against tail boom bracket (10) and install attaching washers and bolts. Peel shims as required to obtain 0.005 to 0.030 inch lateral chuck of horn assembly (3).

Note

Use extreme care in handling retainers of support set (7) to avoid damage to bearing surfaces of bushings.

c. Install bolts, washers, support set shims (8) and nuts in support sets (7). Install a thin aluminum washer under head of each bolt and under nut. Install shims (8) between upper and lower retainers of support set.

d. Adjust support set shims (8) to provide 50 to 70 inch - pounds drag on horn assembly (3).

e. Disassemble items installed in step c. and install additional shims (8) to increase diameter of each support set (7) by 0.0015 to 0.0030 inch and obtain a slight, even drag on horn assembly (3) rotation without chatter or binding.

f. Connect elevator control tube to arm (6) of horn assembly (3).

g. Position spar tube (5) of each elevator in end of horn assembly (3). Align elevator fitting hole with hole in horn assembly lug (2) and install attaching washer and special retaining bolt (1). Torque bolt 100 to 140 inch-pounds.

Warning

Be sure to use special retaining bolt, Part Number 205-030-476-5. Measure bolt for over-all length of 2.71 inches. Use of incorrect bolt may result in loss of elevator during flight.

h. Check synchronized elevator rigging. (Refer to paragraph 9-75.)

i. Position access door to bottom of tail boom below elevator and install attaching washers and bolts.

4-227. Tail Skid. A tubular steel tail skid is attached to the bottom aft section of the tail boom. The purpose of the tail skid is to warn the pilot of a tail low attitude when landing.

4-228. *Removal — Tail Skid.* a. Remove two inspection plates from side of tail boom.

b. Remove nut, bolt and washer attaching forward end of tail skid tube, and pull tube out through support block.

4-229. *Inspection — Tail Skid.* Inspect tail skid for nicks, scratches, dents, cracks and local permanent buckles.

4-230. *Repair or Replacement — Tail Skid.* a. Minor nicks, scratches or dents may be polished out.

b. Replace cracked or permanently buckled tail skid.

4-231. *Installation — Tail Skid.* a Insert tail skid tube through support block, align holes and install attaching bolt, washer and nut.

b. Position and attach inspection plates.

4-232. Minor Sheet Metal Repair. Minor Sheet metal repair consists only of repairs that do not offset the structural integrity or the performance of the helicopter. Repair shall be in accordance with TM 55-405-4.

Section III — Empennage Section

(Not Applicable)

Section IV — Pylon Section

(Not Applicable)

Section V — Wing Section

(Not Applicable)

Section VI — Alighting Gear

4-233. Alighting Gear. The skid type landing gear (figure 4-16) consists of two lateral mounted, arched cross tubes, which are attached to two formed longitudinal skid tubes provided with removable skid shoes. The landing gear structural members are made of formed aluminum alloy tubing. The gear assembly is attached to the fuselage structure with four clamps, and is easily removed or replaced. Two manually retractable, and quickly removable, wheel assemblies have been provided to facilitate ground handling.

4-234. Landing Gear Skid Shoes. Each landing gear skid tube is equipped with replaceable skid shoes, (1, 5 and 6, figure 4-16) the purpose of which are to absorb the wear caused by normal ground contacts of the helicopter. The use of skid shoes, therefore, prolongs the life of the skid tubes. The skid tubes on Model UH-1A helicopters each have a forward and rear skid shoe (1, figure 4-16). Each skid tube used on Model UH-1B helicopters is equipped with a short, forward skid shoe (5) as well as a long, full length shoe (6) which completely protects the bottom of the skid tube. Skid shoes are not repairable components. Skid shoes which are worn or damaged to such an extent that they no longer protect the skid tubes should be replaced.

4-235. *Removal — Landing Gear Skid Shoes.* a. Raise helicopter until skid shoes are clear of the ground. (Refer to paragraph 1-57 and figure 1-9.)

b. Remove bolts and washers which secure skid shoes to skid tube.

c. Remove skid shoes.

4-235A. *Inspection — Landing Gear Skid Shoes.* Inspect landing gear skid shoes for damage, wear and suitability for continued service.

4-235B. *Repair or Replacement — Landing Gear Skid Shoes.* Replace landing gear skid shoes which are considered unserviceable due to damage or wear.

4-236. *Installation — Landing Gear Skid Shoes.* a. Position skid shoes on skid tube and attach with bolts and washers.

b. Lower helicopter to ground by use of hydraulic jacks.

c. Remove jacks.

4-237. Landing Gear Skid Tubes. The landing gear skid tubes (2, figure 4-16) are formed of heavy aluminum alloy tubing and provide stable support for the helicopter when not in flight.

4-238. *Removal — Landing Gear Skid Tubes.* a. Elevate helicopter from ground.

b. Remove bolts and washer, which attach skid tube saddles to cross tubes, and remove skid tubes.

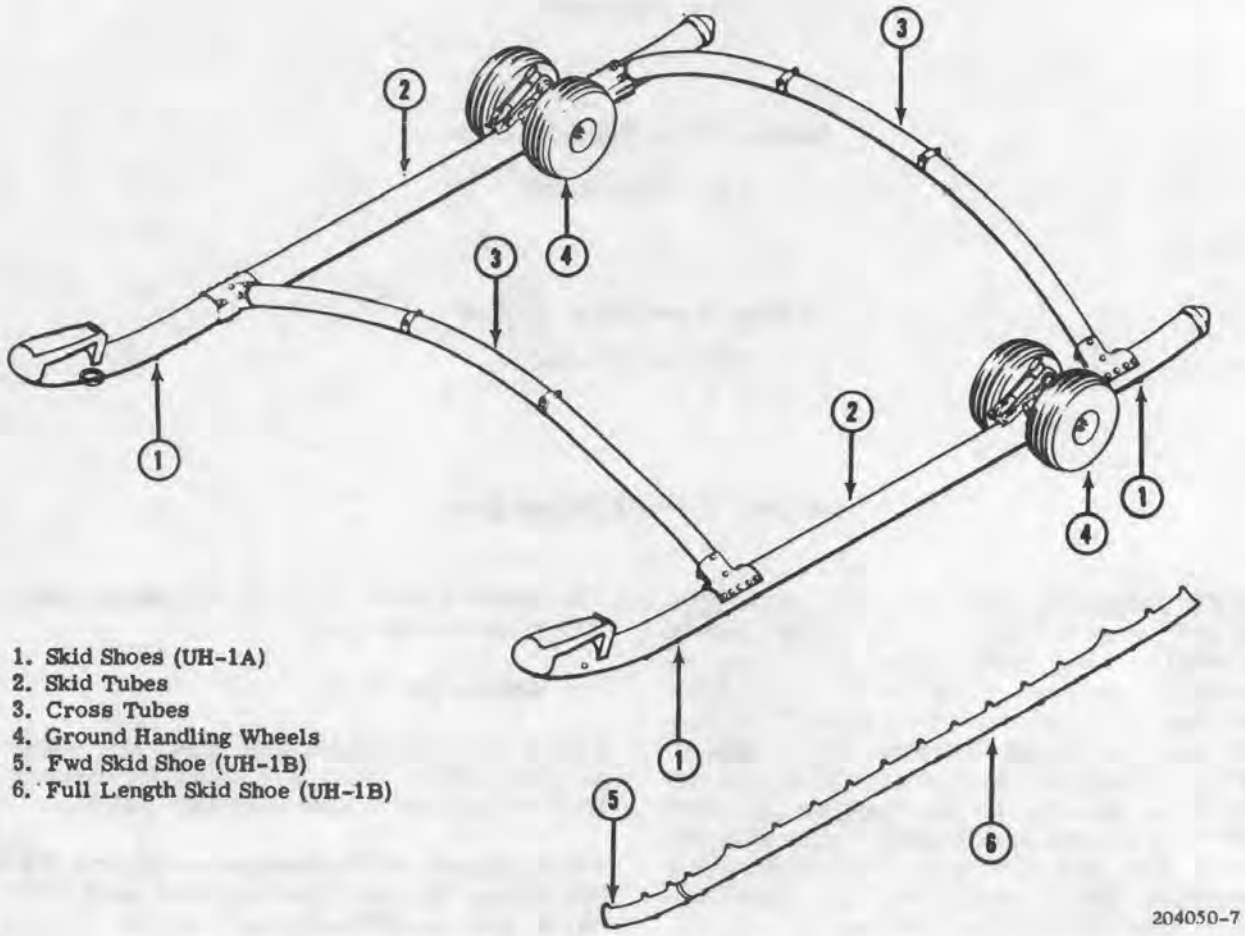


Figure 4–16. Typical skid landing gear

4-239. ***Inspection — Landing Gear Skid Tubes.*** a. Inspect landing gear skid tubes for slight scratches, scuffs, nicks and dents.

b. Inspect skid tubes in area between cross tube saddles for scratches, dents and holes.

Note

Smooth dents, not exceeding 0.25 inch in depth and 1.0 to 1.2 inches in diameter, between the cross tube saddles may be disregarded. Scratches, dents and holes in the skid tubes forward of forward cross tube saddle and aft of aft cross tube saddle may be repaired at discretion of local maintenance officer.

4-240. ***Repair or Replacement — Landing Gear Skid Tubes.*** a. Scratches up to 0.03 inch deep and 1.0 to 1.2 inches long, running directly across top of tube between cross tube saddles may be repaired by direct support personnel.

b. Scratches more than 0.03 inch deep and 1.0 to 1.2 inches long running directly across top of skid tube shall be repaired by direct support personnel.

c. Dents over 0.25 inch deep and 1.0 to 1.2 inches in diameter between the cross tube saddles shall be repaired by direct support personnel.

d. Holes in skid tubes shall be repaired by direct support personnel.

e. Replace skid tubes which show excessive wear or damage.

(1) Preparatory to removing landing gear take up slack with hoist. (Refer to paragraph 1-55, a.)

(2) All personnel in the immediate area shall exercise extreme caution not to bump or otherwise disturb the helicopter while it is being raised on jacks and/or while it is supported on jacks.

(3) Personnel shall not crawl into or onto the helicopter while it is being raised and/or supported on jacks.

(4) Rope off the area around the helicopter and prominently display warning signs to the effect that this HELICOPTER IS ON JACKS.

b. Remove nuts, washers, bolts and fitting assemblies, at four points where landing gear is attached to fuselage structure, and lower landing gear to the ground.

c. Remove bolts and washers attaching defective cross tube to upper part of skid tube saddles, and remove cross tube.

4-244. *Inspection — Landing Gear Cross Tubes.* a. Inspect cross tubes for light scratches, scuffs, nicks, cracks, dents or damage.

b. Inspect cross tube bearing plates for looseness.

c. Inspect rubber bumper pad on landing gear retention cap assemblies for looseness.

d. With landing gear installed on helicopter, inspect cross tubes for proper deflection, as follows: (See figure 4-17.)

(1) Position the helicopter on a smooth surface.

(2) Raise the helicopter off the surface with hydraulic jacks (refer to paragraph 1-56) removing all weight from the landing gear.

(3) Level the helicopter, as described in paragraph 1-66.

(4) Measure the distance between the cross tube bearing plates, and divide that distance to determine the helicopter's center line.

(5) Drop a plumb line from helicopter center line to ground, or floor, surface. (See figure 4-17.) Measure from plumb line to the center line of each skid tube at cross tube locations.

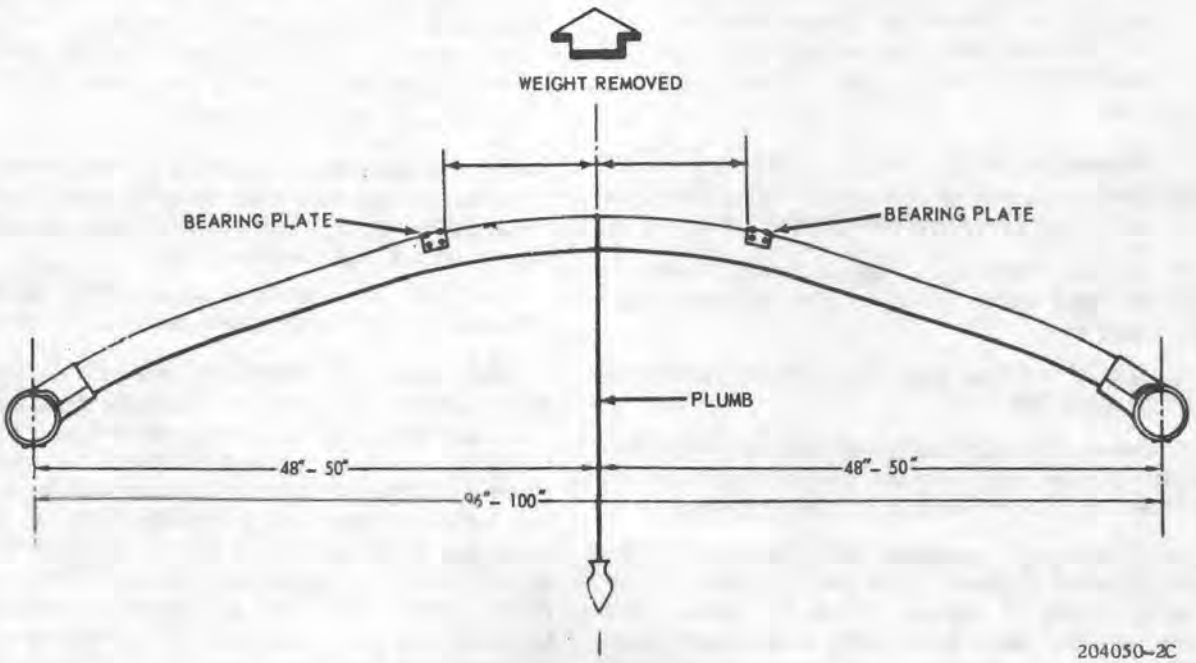


Figure 4-17. Landing gear cross tube deflection

Note

Distance should be 48 inches from center line of skid tube to plumb line. If distance exceeds 50 inches from either cross tube, replace cross tubes.

(6) Lower helicopter to surface and remove hydraulic jacks.

4-245. *Repair or Replacement — Landing Gear Cross Tubes.* a. Minor scratches, scuffs and nicks may be polished out to depth of damage, but not to exceed 10 percent of cross tube wall thickness, by Direct Support personnel.

b. All other damage requires replacement of cross tubes.

c. Replace cross tubes if deflection dimension exceeds inspection requirements.

4-246. *Installation — Landing Gear Cross Tubes.* a. Position aft cross tube assembly mounting opening in upper part of aft saddle on left-hand skid tube.

b. Use a 5/16 inch drift punch to align holes in aft skid tube saddle with holes in cross tube and install five washers and bolts.

Note

Do not install the lower inside washer and bolt at this time. These items will be installed later as attaching parts securing the skid shoe to the skid tube.

c. Repeat steps a., and b., above to attach the right-hand end of the aft cross tube to the aft saddle on the right-hand skid tube.

d. Repeat steps a., b., and c. above to attach the forward cross tube to the forward skid tube saddles.

e. Install landing gear skid shoes. (Refer to paragraph 4-236.)

f. Raise the landing gear and position the cross tube bearing straps in the four support fittings on the underside of the fuselage.

g. Position a cap assembly across each of the four support fittings. The pad of the cap assembly must be facing upward, against the underside of the cross tube, with the indentured radius of the pad outboard. Install four washers and bolts into permanently installed nut plates. Install two bolts, washers and nuts, one set on each side next to cross tube.

Caution

Insure bearing plates are centered; and fully seated in cross tube saddles. On forward and aft cross tubes, viewing from outside, no more than two bearing plate studs should be seen at each position. If more than two studs are seen, the aircraft is unsafe to fly.

Note

Tighten bolts through cap assemblies to a snug fit while aircraft is in a hoisted position. Lower aircraft to ground; tow forward to settle gear, then tighten bolts to proper torque.

4-247. Ground Handling Wheels. Two manually retractable, and quickly removable, wheel assemblies (4, figure 4-16) have been provided to facilitate ground handling of the helicopter.

4-248. *Removal — Ground Handling Wheels.* a. Release valve on side of wheel assembly to retract wheels.

b. Press aft pin from eyebolt and lift wheel assembly from skid gear.

4-249. *Inspection — Ground Handling Wheels.* Inspect all parts for damage, wear and/or distortion.

4-250. *Repair or Replacement—Ground Handling Wheels.* a. Repair punctured tires and tubes in accordance with TM 55-405-2 and TM 55-405-3. Inflate in accordance with paragraph 1-93.

b. Replace damaged wheels.

4-251. *Installation — Ground Handling Wheels.* a. Position wheel assembly on skid tube. Position forward pin in eyebolt; press forward on handle of aft pin, and lock in place.

b. Close valve and actuate pump to lower wheels, and lift skid gear clear of surface.

4-252. Ground Handling Wheel Actuating Mechanism. Two ground handling gear assemblies are provided for quick mounting on landing skids to allow moving helicopter on ground. Each assembly consists of two wheels on an offset axle, a supporting cradle, and a hand-operated hydraulic jack with two rams which actuate axle to extend or retract wheels. (See figure 4-18.) Cradle is mounted to eyebolts on landing skid by means of a fixed rear pin and a spring-loaded front pin. Two support rods stowed on axle can be engaged in holes on skid to secure assembly with wheels up, when handling gear is left in place during flight.

CHAPTER 5

POWER PLANT AND RELATED SYSTEMS

Section I — Scope

5-1. Scope. The purpose of this chapter is to provide all essential information for maintenance personnel to accomplish organizational maintenance on the complete power plant and related systems. This information includes a detail description and chronological instructions as to methods and procedures. It also includes the special tools and equipment required for accomplishment of these maintenance phases in accordance with the Maintenance Allocation Chart. Special tools required for performance of organizational maintenance will be found in TM 55-1520-211-20P, Repair Parts and Special Tools List.

Section II — Power Plant

5-2. Power Plant. Power plant installation consists of a shaft turbine engine, horizontally mounted above a service deck behind main rotor pylon, with adapting parts and connections to fuel, oil, electrical, instrument, and engine control systems. (Figures 5-1, 5-2, and 5-3.) A hinged cowling panel at each side provides access to engine compartment between forward and rear firewalls. Exhaust area, at rear end, is covered by a removable fairing. Air intake and drive shaft to main transmission are under forward cowling, and are also protected by an induction baffle and screen which have removable sections for access. Hoses and electrical cables between engine and fuselage have quick-disconnect couplings. Other connections, such as control linkages, firewalls, drive shaft couplings and engine mounts, have simple and rapid means of attachment so that engine with its fittings can be considered a quick-change assembly.

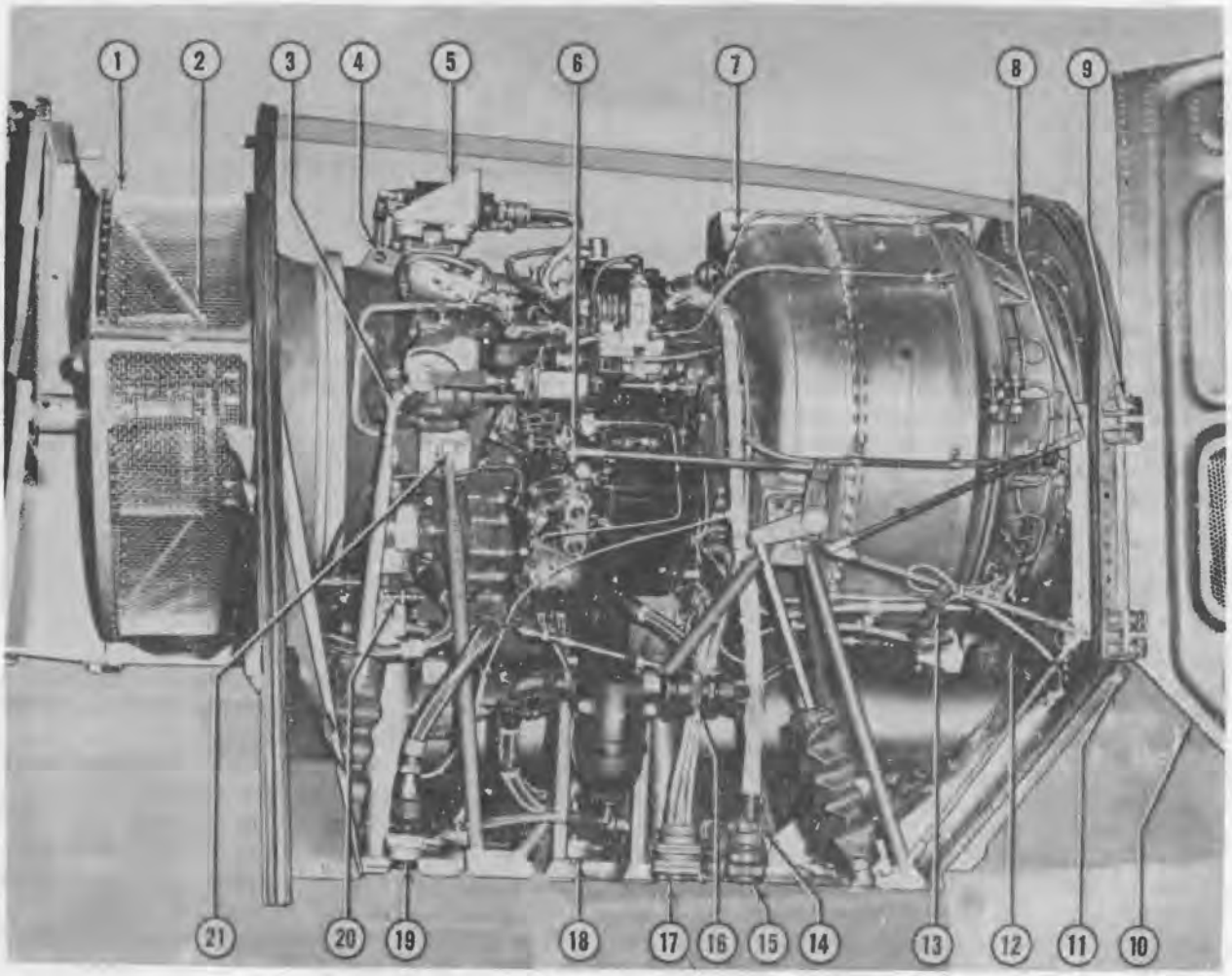
5-3. Engine. Seven engine models are used on helicopters covered by this manual. UH-1A helicopters are equipped with T53-L-1 or T53-L-1A engines. UH-1B helicopters are equipped with T53-L-5, T53-L-9, T53-L-9A, T53-L-11, T53-L-11B, or T53-L-13 engines.

Note

The suffix "A" after the engine serial number identifies T53-L-11/-11B engines that have the improved output reduction carrier and gear assembly.

5-54. *Engine Orientation.* (See figures 5-4 through 5-7.) All directions and locations of equipment on or around the engine will be stated as viewed from rear of engine looking forward. General size, shape, main sections arrangement, and output shaft rotation are alike for all engine models. The T53-L-1 and T53-L-1A engines differ from other models as to size and design of inlet housing, reduction gearing, arrangement of external parts, and internal parts of the combustion section. These engines use 2 igniter plugs, 5 starting fuel nozzles, and 11 vaporizers (fuel atomizers.) UH-1B helicopter engine models are successively improved versions of the same basic engine T53-L-9/9A and -11 engines are directly interchangeable. When T53-L-13 engine is used to replace T53-L-9/9A/11/11B engine, a different main driveshaft adapter is required. (Refer to Chapter 7.) The T53-L-5/9 and -9A unmodified use 2 igniter plugs, 5 starting fuel nozzles, and 11 vaporizers. The T53-L-9A modified and -11/-11B use 2 igniter plugs, 2 starting fuel nozzles, and 11 vaporizers. The T53-L-13 uses 4 igniter plugs, 4 starting fuel nozzles, and 22 fuel atomizers (vaporizers). Further detail differences are provided in maintenance procedural paragraphs.

5-5. *Engine Description.* Basic engine consists of an inlet housing and reduction gear section, an axial-centrifugal compressor, a diffuser, a combustion chamber, a gas producer turbine driving the compressor, a power turbine driving a power shaft, and an exhaust diffuser. Fuel



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1. Intake Screen Fasteners
2. Access to Drive Shaft Coupling
3. Droop Compensator Control Tube Bolt
4. Forward Hoist Point
5. Transmitter Support Assembly
6. Power Lever Control Rod Bolt
7. Rear Hoist Point
8. Firewall Brace Rod Pins
9. Cowling Hinge Pins
10. Access to Tailpipe Hose Coupling, Anti-Collision Light and Antenna Connectors
11. Tailpipe Fairing Fasteners
12. Upper Firewall Fasteners
13. Fire Detector Wiring Connectors
14. Combustor Drain Valve and Fuel Control Seal Drain Hose Coupling
15. Main Electrical Cable Connector
16. Fuel Control Inlet Hose Coupling
17. Starter Cable Connector
18. Starter Pad Seal Drain Hose Coupling
19. Oil Pump Return Hose Coupling
20. Oil Cooler Fan Drive Shaft Coupling
21. Forward Mount Tube Bolt

Figure 5-1. UH-1A Power plant installation — LH side (typical (Sheet 1 of 2)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
5. Hung start; engine fails to accelerate beyond approximately 30 percent nI rpm and exhaust gas temperature rapidly rises toward over-temperature limit	Excessive fuel used for start	Shut down engine. If necessary, motor engine to stabilize exhaust temperature. Use proper starting procedure
	Internal engine binding	Refer to item 2
6. Hot start; exhaust gas temperature limits exceeded	Weak battery	Replace battery
	Wrong starting procedure	Use correct procedure
	Starting fuel solenoid valve fails to shut off	Check operation: Disconnect starting fuel line from manifold. Motor engine with main fuel switch on, starting fuel switch off. If fuel flows, replace valve
	Air inlet obstructed	Clear air inlet
	Faulty fuel control	Replace fuel control
7. Torching start: flames shoot from exhaust	Wrong procedure: late introduction of starting fuel	Use correct procedure
	Fuel accumulation in tailpipe or combustion chamber	Check tailpipe and combustion chamber drain lines for obstruction. Remove and inspect combustion chamber drain valve. Replace faulty parts
	Check starting fuel nozzle for cracks around the disk orifice and for freeness of ball bearings.	Replace defective fuel nozzle.
8. Flame-out during start	Insufficient starting fuel	Maintain starting fuel longer in next start
	Defective starting fuel nozzles	Check starting fuel nozzles for cracks around the disc orifice and for freeness of ball bearing. Replace defective starting fuel nozzles.
	Power lever control linkage rigged incorrectly	Rig power control linkage.
9. Idle speed low	ENGINE GOV switch at EMER position, or not wired properly, or faulty transfer solenoid valve	Check operation with switch at AUTO; repair circuit or replace faulty solenoid and valve
	Wrong idle speed setting	Adjust rigging trim as required
	Fuel flow restricted	Check fuel strainers and lines
10. Idle speed high	Power lever control linkage rigged incorrectly	Rig power lever control linkage
	Wrong idle speed setting	Adjust rigging trim as required

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
11. Actual nI speed higher than computed speed at maximum power lever setting	Computation error	Check calculations, ambient temperature, use of correct engine data sheet and chart of allowable deviation due to temperature
	Faulty tachometer	Replace tachometer or generator
	Wrong maximum speed setting on fuel control	Adjust rigging trim as required
	Faulty fuel control	Replace fuel control
12. Actual nI speed lower than computed speed at maximum power lever setting	Computation error	Check as in item 11.
	ENGINE GOV switch in EMER position	With speed retarded to 60 percent switch to AUTO; speed should increase. If defective, repair circuit or replace solenoid
	Faulty tachometer system	Replace tachometer or generator
	Power lever control linkage rigging incorrect	Check and correct power lever control rigging
	Fuel flow restricted	Check all fuel strainers
	Wrong maximum speed setting on fuel control	Adjust fuel control trim as required
	Faulty fuel control	Replace fuel control
	Air leakage and high exhaust gas temperature	Refer to item 16.
	Improper inlet guide vane operation. T53-L-13 engine	Check inlet guide vane.
13. Low nII speed	Aircraft maximum gross weight exceeded	Correct loading
	Wrong governor control rigging	Correct rigging of linkage to governor control arm
	Low nI speed	Refer to item 12.
	Faulty overspeed governor	Replace governor
14. Excessive droop of nII speed	Aircraft maximum gross weight exceeded	Correct loading
	Droop compensator adjustment wrong	Adjust droop compensator cam setting and check rigging of linkage
	Low nI speed	Refer to item 12
15. Overspeed nII	Faulty overspeed governor	Replace governor
	ENGINE GOV switch in EMER position or faulty transfer solenoid	Refer to item 9
16. High exhaust gas temperature during steady-state operation	High setting of nI speed	Refer to item 11.
	Air inlet obstructed	Clear air inlet
	Anti-icing valve staying open; external loss of air	With anti-icing switch at closed position and engine operating,

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
		f. Replenish the airframe oil tank to capacity with new oil. g. Start engine and run at flight idle until temperatures have stabilized. Check the instruments for proper engine operation. **Caution** Any fluctuation in oil pressure in excess of plus or minus five psi, or rise in oil temperature above the established limits at any preset power setting, is cause for immediate engine shutdown. h. Shut down engine and again inspect oil filter elements, chip detector, and strainers. i. If the quantity of chips remains the same after the second engine run, forward the engine to next higher maintenance echelon for additional inspection. **Note** Chips in filter may come from tank, chips on chip detector come from engine.
30. Engine fails to shut-off	Faulty fuel system control circuits	Check operation of circuits, replace faulty switches or units
31. Coastdown noisy	Internal binding	Motor engine to check for noise and signs of binding. Refer to item 2.

1. Support Spring
2. Bipod
3. Pillow Block
4. Latching Eyebolt
5. Bearing
6. Trunnion
7. Bearing Cap
8. Bellcrank Bracket
9. Rear Firewall Brace Rods
10. Tripod
11. Support Tube
12. Forward Mount Fitting (UH-1A)
13. Forward Mount Fitting (UH-1B)
14. Cambox Bracket (UH-1B)

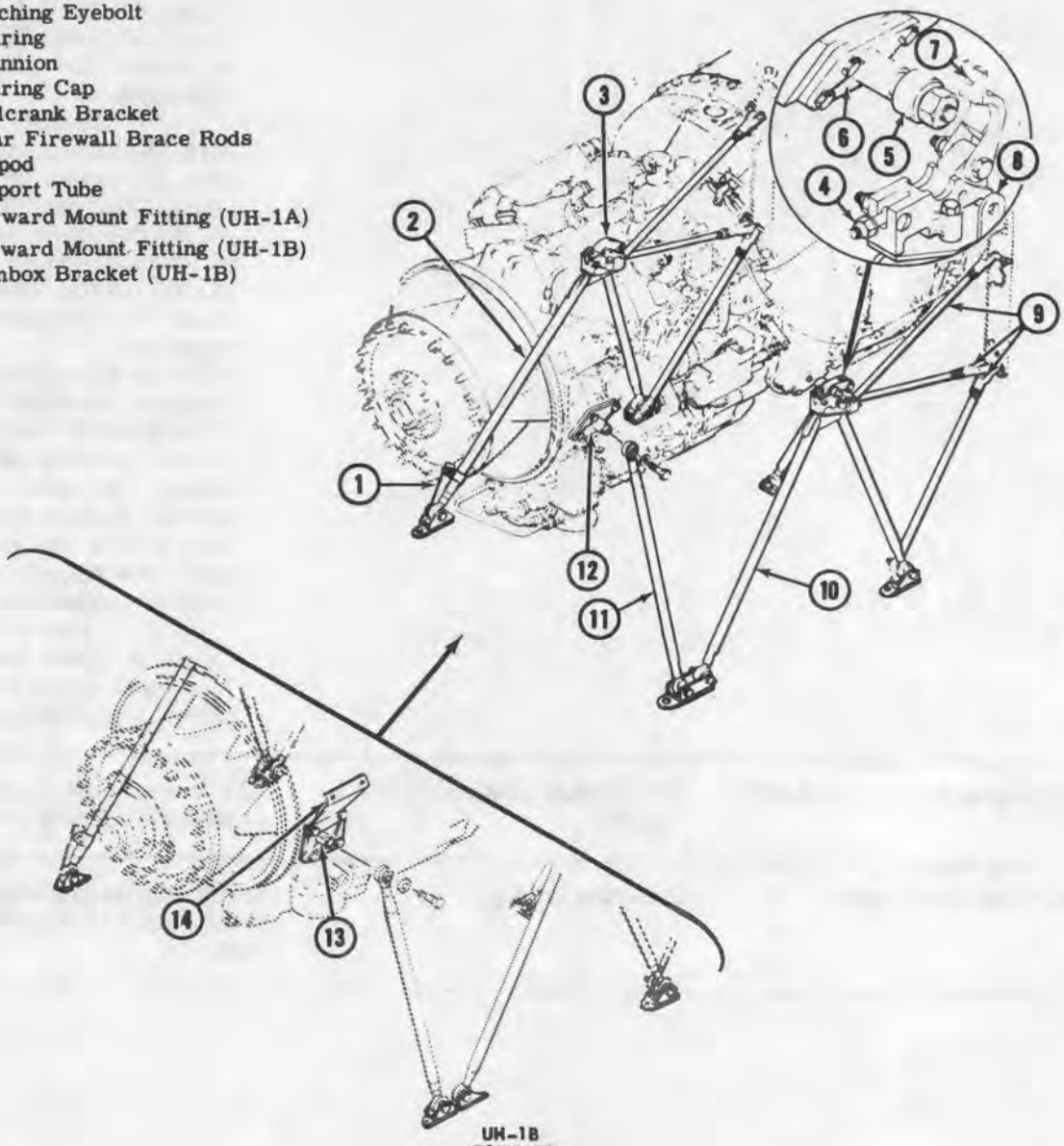

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Figure 5-10. Engine mounts

f. Remove each of four starting nozzles by removing screw and withdrawing nozzle from combustion chamber. Cover openings.

B B 5-150C. ***Cleaning — Starting Fuel Manifold and Nozzles (T53-L-13).*** a. Clean starting fuel manifolds, inside and out, with dry cleaning solvent (item 302, table 1-1).

b. Clean starting fuel nozzles with dry cleaning solvent and a soft wire brush.

Caution

To avoid enlarging holes in starting fuel nozzles, use brush with wire no larger than 0.010 inch diameter.

B B 5-150D. ***Inspection — Starting Fuel Manifold and Nozzles (T53-L-13).*** a. Inspect manifold sections for cracks and dents, connector nuts and tee for tripped or damaged threads.

b. Inspect starting fuel nozzles for clogging or damage.

B B 5-150E. ***Repair or Replacement — Starting Fuel Manifold and Nozzles (T53-L-13).*** a. Replace manifold sections found to have defects. Replace tee or attaching parts if damaged.

b. Replace nozzles if damaged or if clogging cannot be removed.

B B 5-150F. ***Installation — Starting Fuel Manifolds and Nozzles (T53-L-13).*** a. Install starting fuel nozzles into mounting pads located at approximately 2, 4, 8, and 10 o'clock positions in rear of combustion chamber housing. At each location: Uncover mounting pad, insert and align nozzle, install attaching screw, tighten and lockwire screw.

b. Disconnect and lay aside one section of starting fuel manifold from tee fitting. Place a washer over forward nipple of tee. Position assembly on support cone, with tee nipple through bracket at top of cone. Align manifold connector nuts with two starting nozzles and hand-tighten nuts. Install washer and nut on tee at front of bracket.

c. Position remaining section of manifold on opposite side of support cone. Hand tighten manifold connector nuts on tee fitting and two starting nozzles.

d. Tighten all connector nuts and nut attaching tee to bracket with 35 to 50 inch-pounds torque.

e. Install screws to attach four manifold clamps to support cone. Tighten and lockwire screws.

f. Connect hose from starting fuel solenoid valve to tee on starting fuel manifold. Tighten connector with 70 to 120 inch-pounds torque.

5-151. Auxiliary Fuel Provisions. Permanently installed provisions for use of internally installed auxiliary fuel tanks include drain, vent, and fuel transfer lines with quick-disconnect couplings. (See figures 5-20, 5-21, and 5-22.) Comparable provisions for use of externally installed auxiliary fuel tanks include interconnecting air lines between the tanks, and fuel lines which are connected to each fuel tank. (See figure 5-31.) A stowed transfer pump relay circuit with flow switch in the left-hand main fuel tank limits fuel level during transfer.

Note

On UH-1B Helicopters Serial No. 64-13902 and subsequent, and on all earlier UH-1B Helicopters when modified; one filter in the electrical circuit of the left and right-hand fuel pumps in the fuel system and a third filter in the electrical circuit provided for auxiliary fuel kits. This modification eliminates radio interference in the ADF system.

Section VI — Oil System

A 5-152. Engine Oil System — UH-1A. (See figure 5-32.) Oil is supplied from an external tank, on right side of deck ahead of forward firewall. An electrically operated shutoff valve controls flow through a quick-disconnect hose to an engine driven pump, located on front of accessory gear box. Pump is equipped with a pressure relief valve and a thermobulb for oil-in temperature gage, and delivers oil to a filter for distribution through engine lubrication system. Oil pressure gage transmitter and a pressure switch for ENGine OIL PRESsure LOW caution panel light, mounted at top and right on inlet housing, are connected by external lines to a pressure tap on filter. Torquemeter pressure transmitter, at top of engine, is connected to torquemeter tap on right side of inlet housing. On Serial No. 59-1607 and

f. Place O-ring packing on end of flexible inlet duct (27, figure 5-1). Insert duct end in blast cap inlet.

g. Connect cable to starter - generator terminals. (Refer to paragraph 12-125.) Connect cable at deck connector (17, figure 5-1). Close cowling.

B 5-246. Starter-Generator — UH-1B. (See figure 5-45.) A starter-generator unit, mounted to right rear side of accessory drive gear box and connected to the 28-volt electrical system, serves to drive compressor during engine starting cycle and also functions as an engine-driven stand-by generator at normal engine speeds. Cooling air from oil cooler blower is circulated through starter-generator by ducts and shrouds, and is discharged into exhaust tailpipe. A seal drain hose from starter drive mounting pad leads to deck coupling of a discharge line at left side.

B 5-247. *Removal—Starter-Generator — UH-1B.* a. Remove cover (8, figure 5-45) and disconnect electrical leads at aft end of starter-generator. Insulate wire terminals.

b. Disconnect air ducts from flanged necks on forward and aft cooling shrouds by removing V-band clamps (2 and 12). Loosen two clamping bolts at right side of forward shroud (12), and slide shroud aft to expose starter mounting studs.

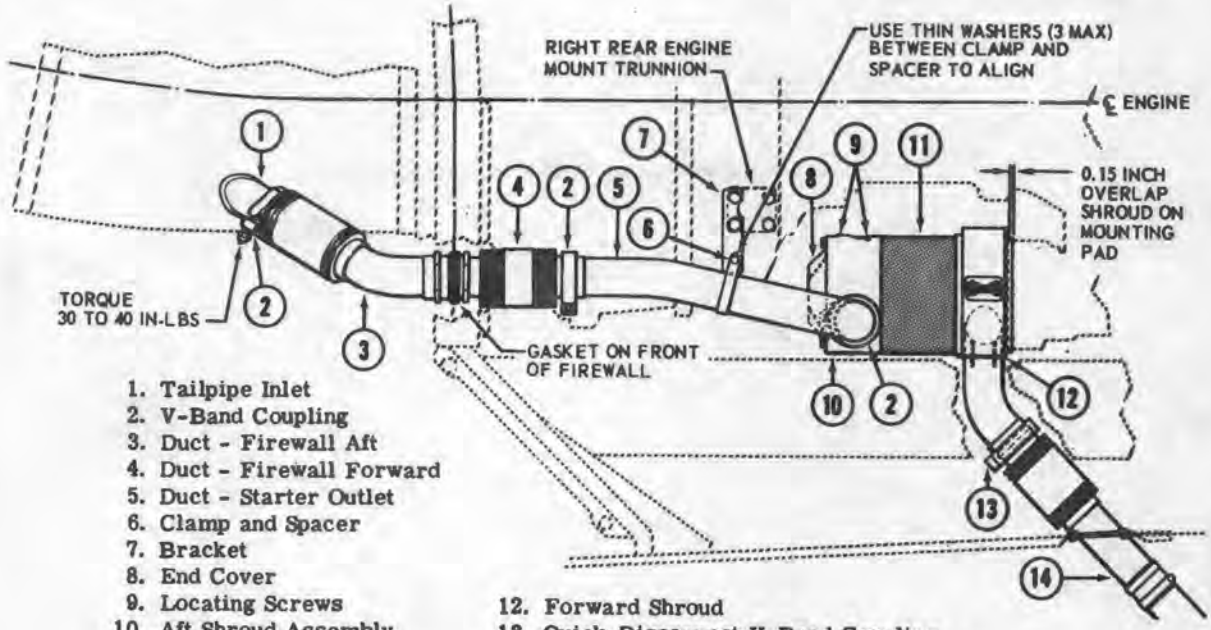
c. Loosen nuts and washers on six mounting studs. Turn starter-generator counterclockwise, and pull carefullly straight aft until free of studs and drive shaft engagement. Cover mounting pad.

d. Detach shroud from aft end of starter by removing two locating screws at top and two clamping bolts at joint on left side. Remove forward shroud.

B *5-248 Installation — Starter-Generator — UH-1B.* a. On a new starter, remove manufacturer's brush cover from aft end, keeping two small locating screws for installation of cooling shroud. Turn starter so these two screw holes are at top center for correct position when installed.

Note

When replacement starter generator is requisitioned the possibility exists of receiving a different manufactured component. If this occurs, wiring diagram and interchangeability chart (figure 5-45A) is to be utilized. Starter generator P/N 204-060-200-3 only shall be used with T53-L-13 engine.



1. Tailpipe Inlet
2. V-Band Coupling
3. Duct - Firewall Aft
4. Duct - Firewall Forward
5. Duct - Starter Outlet
6. Clamp and Spacer
7. Bracket
8. End Cover
9. Locating Screws
10. Aft Shroud Assembly
11. Starter - Generator
12. Forward Shroud
13. Quick-Disconnect V-Band Coupling
14. Duct - Intake from Oil Cooler Duct

Figure 5-45. Starter generator and cooling ducts — UH-1B

b. Place forward shroud around starter, far enough aft to allow access to mounting flange and with clamping joint on right-hand side.

c. Install aft shroud with two locating screws and washers, and two bolts with washers tightened in clamping joint at left side. Lockwire screws. Coat male splines with Plastilube Moly No. 3 (item 20, table 1-1) and pack female splines ⅔ full.

d. Lift starter to position on studs, meshing shaft splines, turn clockwise and tighten mounting nuts.

e. Slide forward shroud to position, overlapping 0.15 inch on mounting pad. Align intake neck to flange of duct, above deck at left of drive shaft tunnel, and install V-band clamp with nut tightened 30 to 40 inch - pounds. Tighten two bolts in shroud clamping joint.

f. Secure exit air duct to outlet of aft shroud with V-band clamp, tightened 30 to 40 inch-pounds. Install cover on aft end of starter with six screws and washers. Lockwire screw heads.

g. Connect electrical leads. (See figure 5-45A.)

Wire as shown when Bell Helicopter unit, Part No. 204-060-200-3, is installed.

Disconnect and stow wire K18A20N from terminal X2 when General Electric unit, Part No. STU6/A, is installed.

Disconnection and stowing of wire K18A20N from terminal X2 is optional when Lear Siegler unit, Part No. STU6/A, is installed.

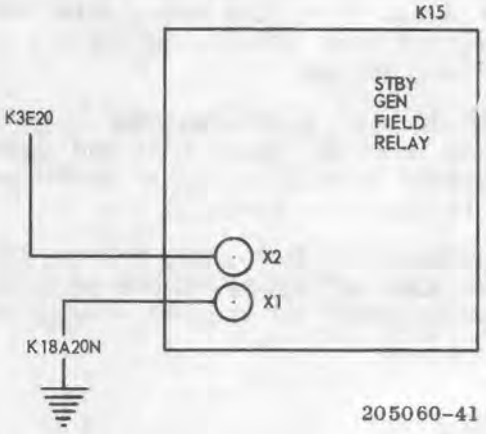


Figure 5-45A. Starter generator wiring diagram

Section VIII — Cooling System

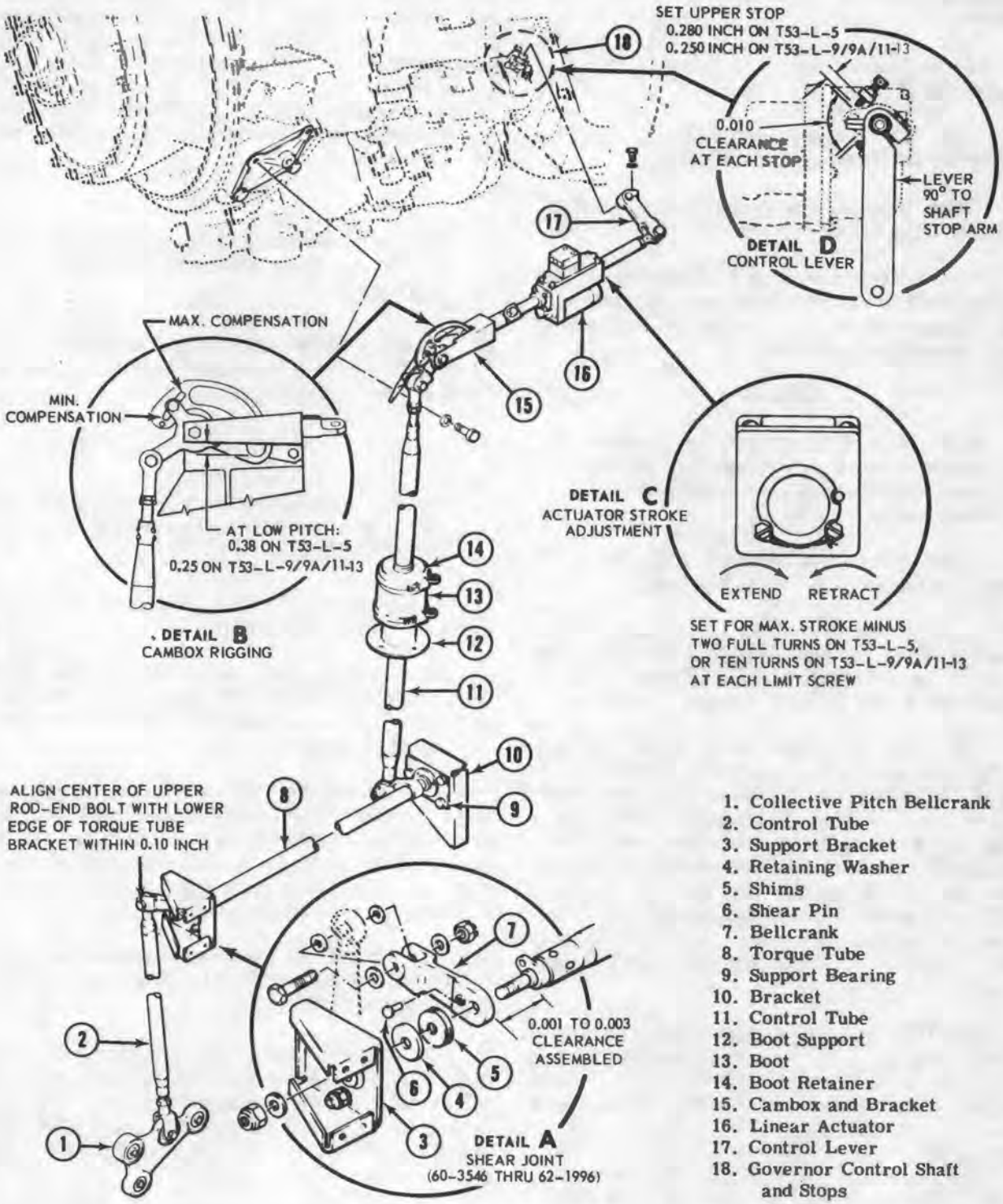
(Not Applicable)

Section IX — Fuel Control

5-249. Fuel Control. (See figure 5-46, 5-47, or 5-48.) Engine fuel control is a hydro-mechanical mechanism made up of a fuel regulator assembly and an overspeed governor assembly. Fuel regulator is mounted on a drive pad at left rear side of accessory drive gear box, driven through a gear train by compressor rotor and first-stage (nI) turbine. With solenoid operated changeover valve in AUTOmatic position for normal operation, a dual-element pump supplies fuel at high pressure through a strainer to main metering valve, bypassing excess fuel through main pressure regulator, then through a manually-controlled stop cock valve to main discharge port and external line. Fuel flow rate is determined by computer mechanisms in relation to first-stage turbine speed, air pressure, inlet air temperature (through an external sensing element) and power lever settings manually selected by means of linkage to twist-grip control. Overspeed governor, mounted on regulator and driven through gear train from power output shaft, acts through regulator to limit fuel flow when power turbine (nII) rpm tends to exceed speed selected by means of external control system.

5-250. In starting cycle of T53-L-1A and T53-L-5/9/9A engines without scheduled fuel, fuel flow is through servo filter directly to starting fuel discharge port and external line, and is controlled only by the starting fuel solenoid valve.

B 5-251. In starting cycle of T53-L-11 and T53-L-5/9/9A engines with scheduled fuel, starting fuel for normal conditions is a scheduled flow from the fuel regulator to a port with a banjo-type fitting to which the starting fuel solenoid hose is connected. There is another other port with an elbow fitting, which is capped in normal conditions and is called the unscheduled starting fuel port because it is not subject to flow control by the fuel regulator scheduling devices. The T53-L-13 engine functions in a similar manner. The starting fuel switch opens the starting fuel solenoid valve, allowing starting fuel from the fuel regulator to flow through the starting fuel manifold; four



1. Collective Pitch Bellcrank
2. Control Tube
3. Support Bracket
4. Retaining Washer
5. Shims
6. Shear Pin
7. Bellcrank
8. Torque Tube
9. Support Bearing
10. Bracket
11. Control Tube
12. Boot Support
13. Boot
14. Boot Retainer
15. Cambox and Bracket
16. Linear Actuator
17. Control Lever
18. Governor Control Shaft and Stops

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Figure 5-55. Power turbine governor RPM controls — UH-1B

(c) If serrations do not permit exact alignment, install lever on next serration clockwise.

(5) Adjust actuator jackshaft for total stroke of 0.82 inch.

(a) Extend actuator fully by holding GOVernor RPM switch to DECRease.

(b) Measure and pencil-mark jackshaft 0.82 inch from actuator body.

(c) Cut lockwire and loosen large jam nut on shaft, to permit adjustment of "retract" stop fitting. Screw stop fitting out enough to avoid premature bottoming.

Caution

Hold shaft with wrench on hexagon shoulder when adjusting stop fitting, to avoid damaging anti-rotation device in actuator.

(d) Electrically retract actuator shaft until pencil mark aligns with housing.

(e) Screw stop fitting in to contact with internal stop. Tighten large jam nut with 290 to 410 inch-pounds torque. Recheck shaft stroke. Lockwire jam nut to end of shaft.

(6) Lock collective pitch stick full up. Fully retract actuator shaft by holding GOV ernor RPM switch to INCRease. Move governor control lever to high rpm position, with 0.010 inch clearance between stop arm and upper stop screw by use of a thickness gage. Cut lockwire and loosen small jam nut on actuator shaft, and adjust rod-end to connect on control lever at position described. When connected, center rod-end in clevis, tighten jam nut and lockwire.

(7) Place collective pitch stick full down. Extend actuator to full decrease position. Check for 0.010 inch clearance at lower stop. If necessary, adjust lower stop screw, tighten and lockwire jam nut.

(8) On initial ground run, with collective pitch stick held full down, check for minimum to maximum rpm range controlled by GOVernor RPM switch. If necessary, readjust actuator stroke and length to obtain required range, repeating clearance checks and adjustments of governor stop screws.

(9) Make final adjustment of droop compensator cam as required by ground run and test flights. Set cam to maintain 6400 rpm from full low pitch to red line torque or full power available, whichever occurs first. If rpm droop occurs, move cam up toward maximum compensating setting. If adjustment cannot be made on cam, shorten control tube attached to cam bellcrank.

Note

Readjust governor stop screws for proper clearance after any change in rigging.

Ac. Model UH-1A helicopters equipped with 87000-B4 overspeed governor shall be rigged as follows. (See figure 5-52.)

Note

These instructions are for UH-1A aircraft with overspeed governor Part No. 87000-B4.

(1) Be sure collective pitch control system is rigged before proceeding.

(2) Open engine cowling at left side. Disconnect actuator jackshaft from governor control lever. Support actuator to permit free movement as required.

(3) Set cambox for maximum compensation: Loosen nut on cam adjustment bolt to free serrated washer from cam face. Move bolt clockwise in slot, to position nearest end of cam slot. Tighten nut on bolt so that serrated washer engages last serrations of cam.

(4) Check that governor stops are correctly set for use on T53-L-1A engine. (Refer to paragraph 5-277.)

(5) Set actuator shaft stop-fitting to 1.04 inch length from end of shaft, and rod-end fitting to 1.25 inch length from face of stop-fitting to center of rod-end bolt hole. (See figure 5-56.) Tighten but do not lockwire jam nuts.

(6) Fully retract actuator shaft by holding GOVernor RPM to INCRease. Loosen rod-end jam nut slightly to allow alignment. Place 0.010 inch thickness gage against upper governor stop screw, and hold governor shaft stop

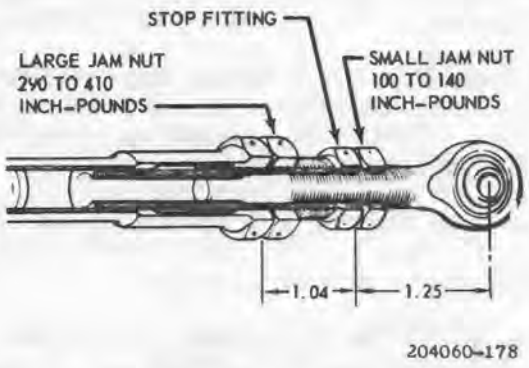


Figure 5-56. Actuator shaft dimensions — UH-1A with 87000 B4 overspeed governor

arm against gage. With collective pitch stick held full up, install control lever on serrated shaft of governor, so aligned as to allow connection of actuator shaft to lever. Turn shaft rod-end to enter lever clevis, and install bolt with washers, nut and cotter pin.

(7) Check for 0.010 inch clearance at lower governor stop with collective pitch stick full down and actuator extended to full decrease position. Readjust lower stop screw if necessary. Secure all adjustments, with lockwire where applicable.

(8) Make final checks and adjustments in ground run and after flight tests. (Perform sub-steps (8) and (9) of step b.)

Bd. Model UH-1B helicopters shall be rigged as follows. (See figure 5-53.)

(1) Be sure collective pitch control system is rigged.

(2) Lock collective stick in full down position.

(3) Adjust control tube (2) to align center of upper rod-end bolt with lower edge of torque tube bracket (3). Due to shimming, manufacturers tolerance, etc., variation of 0.250 inch from top of support bracket is possible and acceptable. (See Detail B.)

(4) Set cam adjustment bolt at middle of slot. (See Detail B.)

(5) Adjust control tube (11) to obtain required position of cam, by measurement of cam slot exposed below cambox housing. (See Detail B.)

B5 (a) On T53-L-5 engine, bottom of cam slot should be 0.38 inch below housing.

B9 B11 B13 (b) On T53-L-9, T53-L-11, and T53-L-13 engines, bottom of cam slot should be 0.25 inch below housing.

(6) Check installation of governor control lever, as nearly at 90° to stop arm as serration alignment will permit. (See Detail D.)

(7) Adjust upper governor stop screw by length measured from inner side of mounting boss. (See Detail D.) Remove and discard lead seal on lockwire, if existing.

B5 (a) On T53-L-5 engine, upper stop screw should extend 0.280 inch from inner side of boss.

B9 B11 B13 (b) On T53-L-9, T53-L-11, and T53-L-13 engines, upper stop screw should extend 0.250 inches from inner side of boss.

Caution

Never shorten either upper or lower stop screw to less than 0.060 inch length from inner side of boss.

(8) Disconnect actuator shaft from governor control lever by removing bolt.

(9) Electrically position actuator shaft to approximate midpoint of stroke. Turn both adjusting screws to obtain maximum stroke. (See Detail C.) Reduce stroke by turning each screw away from maximum adjustment, according to engine on which installed

B5 (a) On T53-L-5 engine, turn each screw two full turns.

9B B11 B13 (b) On T53-L-9, T53-L-11, and T53-L-13 series engines, turn each screw ten full turns.

(10) Fully retract actuator shaft by holding GOVernor RPM switch to INCRease. Lock collective stick in full up position.

(11) Reinstall bolt connecting actuator to governor control lever, adjusting actuator shaft rod-end to obtatin 0.010 inch clearance between governor stop arm and upper stop screw, measured with a thickness gage. (See Detail D.) If necessary, reposition control lever one serration on governor shaft to accomplish this adjustment while keeping safe thread engagement of rod-end.

Note

When tightening jam nut on actuator shaft, center rod-end in clevis of lever so that self-aligning bearing will absorb any rotation of shaft. Do not add shim washers between clevis and actuator governor arm. Clearance is necessary for proper operation.

(12) Fully extend actuator shaft by holding GOVernor RPM switch to DECRease. Lock collective pitch control stick in full down position.

(13) Adjust lower stop screw for 0.010 inch clearance with governor shaft stop arm, measured with a thickness gage. Remove and discard seal on lockwire, if existing. Observe minimum length limitation. (Refer to CAUTION, under step (7) (b).

(14) Check security of all adjustments and connections, installing lockwire where applicable.

(15) On initial ground run, with collective pitch control stick full down, check for 6000 to 6700 rpm range controlled by GOVernor RPM switch. If necessary, readjust actuator stroke and length to obtain required range, repeating clearance checks and adjustment at both governor stop screws.

(16) Make final adjustments of droop compensator cam as required by flight checks. Set cam to maintain 6700 rpm (plus or minus 50) from full low pitch to full power. If rpm droop occurs, rotate cam counterclockwise toward maximum compensation. If maximum compensation does not correct droop, adjust control tube rod-end attached to cambox bellcrank. (Refer to step (5).)

(a) If cambox assembly is Part No. 204-060-787-5, shorten control tube to reduce amount of cam slot showing below housing. Be sure roller does not bottom in cam slot.

(b) If cambox assembly is Part No. 204-060-787-7, lengthen control tube to increase amount of cam slot showing below housing, not to exceed 0.31 inch.

Note

Readjust governor stop screws for clearance after any change in rigging.

5-292. Power Turbine Governor Cambox and Linkage. (Refer to paragraph 5-286.)

5-293. Removal — Power Turbine Governor Cambox and Linkage. a. Disconnect control tube rod-end from bellcrank of cambox by removing bolt with nut and washer.

b. Remove cambox and bracket as an assembly. (If Part No. 204-060-741 series, cambox housing has integral bracket.)

[A] (1) On UH-1A, remove two nuts and washers which secure cambox assembly on tachometer generator mounting studs. Reinstall nuts on studs temporarily.

[B] (2) On UH-1B, cut lockwire and remove two bolts which secure cambox bracket on top of forward engine mount trunnion. Reinstall bolts temporarily.

c. Loosen clamps to detach boot from support or retainer. Disconnect push-pull tube by removing bolt from arm of torque tube in fuselage compartment. Pull tube up through deck. Remove snap-ring and push split bushing down out of retainer, remove retainer from either end of tube. Remove four screws to detach boot support from deck.

d. In cargo-sling compartment, disconnect push-pull tube by removing bolts at torque tube bellcrank and collective pitch bellcrank.

e. To remove torque tube: Detach forward support bracket from bulkhead by removing four screws. Remove retaining nut, bracket assembly, washer, shims shear pin, and bellcrank from forward end of tube. Keep attaching parts together for reinstallation. Enter fuselage compartment. Pull tube forward out of rear bearing then aft through hole in bulkhead. Rear bearing can be detached from bracket by removing three bolts.

5-294. Inspection — Power Turbine Cambox and Linkage. Inspect the following items as noted.

a. Shims on cambox bellcrank pivot bolt at each side of bearing should center cam in slot, and should provide 0.001 to 0.003 inch total clearance before nut is tightened on pivot bolt.

[A] b. On UH-1A cambox Part No. 204-060-777 series, nut on bellcrank pivot bolt should be finger tight plus one castellation.

A c. On UH-1A cambox Part No. 204-060-741 series, slider guide screw should be tightened enough to engage slot in slider and prevent turning movement, but should not bind slider in linear movement. When setting is satisfactory, threads should be upset to keep screw secure.

d. Check slider bolt hole for elongation or for security of bushing if so equipped.

B e. Inspect cambox assembly and bracket or attaching parts for evidence of damage or fouling. Inspect cam for wear, binding and smooth operation.

B f. Inspect linkage for damage, evidence of fouling, or other faulty condition.

B g. Inspect torque tubes, control rod, bell cranks, rod ends, and attaching parts for lost motion, excessive looseness or damage.

5-295. *Repair or Replacement — Power Turbine Cambox and Linkage.* a. Replace cambox assembly, bracket or attaching parts found to be unserviceable.

b. If necessary, replace cam as follows:

(1) Remove cotter pin, nut, washers, shims and bolt (1, figure 5-56A). Remove bellcrank assembly (2), cam (3) and slider assembly (4) from housing (5) and bracket as on assembled group.

(2) Remove nut, lock washer, flatwasher, and bolt (6). Remove rivet (7), and detach bellcrank assembly (2), from cam (3).

(3) Remove pin (8), and separate cam (3), bearing (9), and slider assembly (4).

Note

For replacement use cam, part No. 204-061-709-1, if cam box assembly is to be installed on T53-L-11 series engine. Use cam, part No. 204-061-705-1, if cam box is to be installed on T53-L-13 engine.

(4) Assemble cam (3), bearing and slider assembly (4) with pin (8).

(5) Position bellcrank assembly (2), on cam (3), and install rivet (7).

(6) Install bolt (6), with flat washer under head and lock washer under nut.

(7) Position assembled bellcrank assembly, cam and slider assembly in housing (5), and bracket. Install bolt, shims (1), washers, nut and cotter pin. Use maximum of four shims to obtain 0.001 to 0.003 inch clearance before torquing bolt. Torque bolt.

(8) Lubricate slider assembly in accordance with lubrication chart.

c. Replace shear pin in forward cam of torque tube in event of failure. Investigate cause of failure, and correct fouling of linkage or other faulty condition.

d. Replace damaged or unservicable torque tube, control rods, or removable rod ends or attaching parts.

e. Check rigging and operation of system after replacement of parts. (Refer to paragraph 5-29.)

Note

Cambox assembly, part No. 204-060-787-9 (with cam, part No. 204-061-705-1) must be used with T53-L-13 engine. Cambox assembly, part No. 204-061-787-3 (with cam, part No. 204-061-709-1) must be used with T53-L-11 series engine.

5-296. *Installation — Power Turbine Cambox and Linkage.* a. Install cambox and bracket assembly (or cambox with integral bracket, if Part No. 204-060-741 series).

A (1) On UH-1A, attach bracket on two outer mounting studs of tachometer generator on overspeed governor drive gear box, securing with nuts and washers. If required to align actuator shaft to governor control lever, one thin washer may be added under bracket, on either top or bottom stud.

B (2) On UH-1B, install cambox bracket on two upper bolts of left forward engine mount trunnion. Re-install thin steel washers, or stand-off clips for fuel differential pressure switch hose support clamps, as required. Lockwire bolt heads together.

Note

Lower forward bolt hole of bracket is oversize for alignment of actuator to governor control lever. Accomplish final tightening and lockwiring of bracket mounting bolts after connecting actuator to lever.

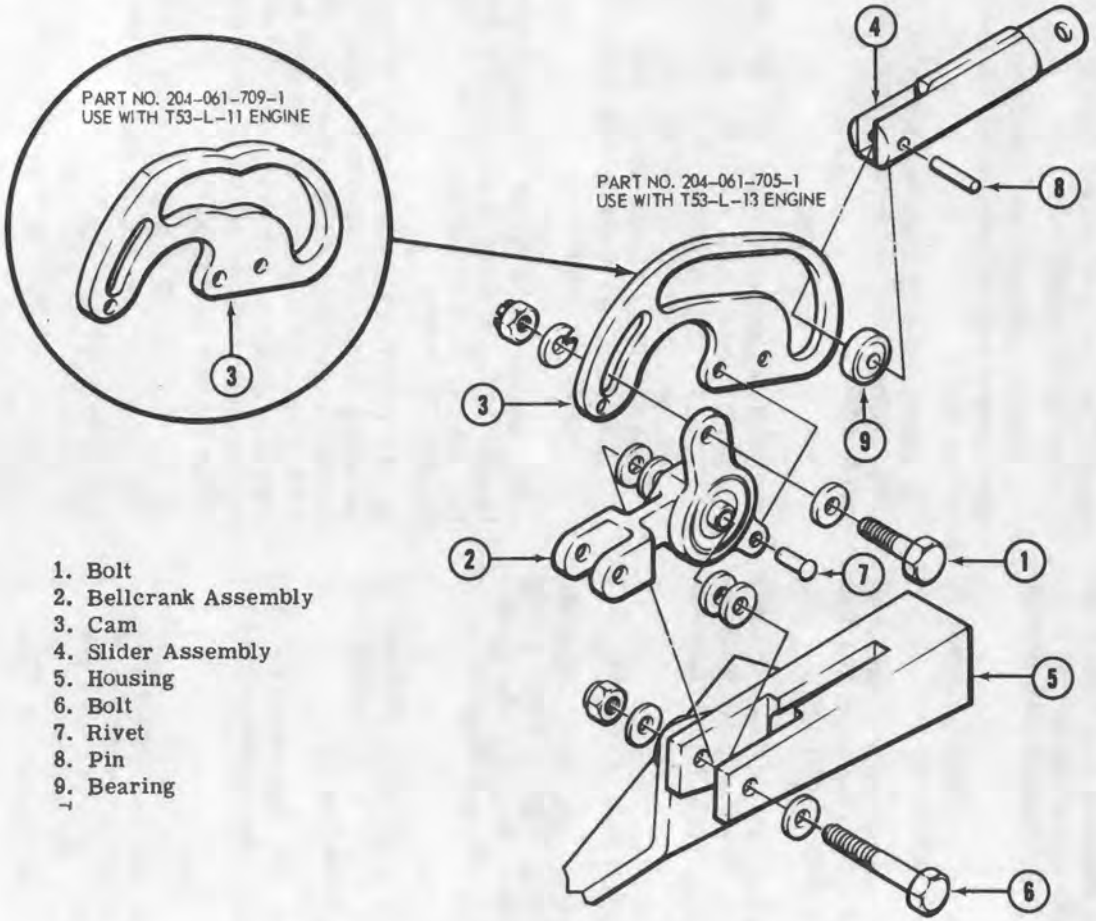


Figure 5-56A. Power turbine cam replacement

b. In fuselage compartment, install rear support bearing for torque tube on face of bracket located on left beam near top and 16.5 inches behind forward bulkhead. Secure bearing plate with three bolts, heads forward.

c. Insert forward end of torque tube, without bellcrank, through bulkhead into cargo-sling compartment. Engage opposite end through rear support bearing.

d. Enter cargo-sling compartment. Place bellcrank on torque tube and install shear pin, with head flush in counter-bore on front side. Assemble shims, retainer washer, support bearing and bracket assembly, and retaining nut with washer on torque tube. Check that shims provide 0.001 to 0.003 inch clearance between bellcrank and tube fitting. Secure bracket with four screws, in holes provided with anchor nuts, on left beam.

e. Install control tube between lever arm and collective pitch control bellcrank directly below.

f. Attach boot support over hole in service deck with four screws. Insert fixed end of control tube down through deck and attach to torque tube. Place boot over tube, and clamp to support. Place boot retainer on tube, install split bushing from lower side and secure with snap-ring at upper side of retainer. Secure boot on retainer with clamp. Attach tube rod-end to cambox bellcrank. Adjust control tubes in rigging procedure.

CHAPTER 6
HYDRAULIC AND PNEUMATIC SYSTEMS

Section I — Scope

6-1. Scope. The purpose of this chapter is to provide essential information for maintenance personnel to accomplish organizational maintenance on the hydraulic systems. Pneumatic systems are not applicable to Model UH-1A and UH-1B helicopters.

Section II — Hydraulic System

6-2. Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) (See figures 6-1 and 6-1A.) Hydraulic power is supplied by single hydraulic system to reduce the operational loads of the cyclic, collective and directional control systems. The system consists of a variable delivery axial piston pump, reservoir, servo cylinders, irreversible valves, relief, check and solenoid valve and connecting hardware. The pump is mounted on the transmission lower case and furnishes hydraulic pressure to the servo cylinders which are connected to the mechanical linkage of the flight control system. The irreversible valves are installed on the servo cylinders to prevent main rotor feedback in the event of hydraulic system malfunction. The pressure required for the system operation is preset to supply the demand.

B 6-3. On Model UH-1B helicopter (see figures 6-1 and 6-1A), the armament hydraulic power source consists of an electrically operated hydraulic power shut-off valve, a check valve, a filter and necessary fittings, lines, hoses and attaching hardware. The shut-off valve is located on the upper, aft side of the cabin aft bulkhead just left of helicopter center line, and is actuated from the control panel on the instrument pedestal. Actuation of this unit permits operation of the armament hydraulic system. The check valve is located on the upper, aft side of the cabin aft bulkhead slightly to the right and aft of the hydraulic shut-off valve. The purpose of this valve is to prevent loss of hydraulic fluid due to a failure of lines and fittings in armament system. The filter is attached to the aft side of the flight controls hydraulic filter. Common attaching parts mount both filters to the aft side of the cabin aft bulkhead approximately 17.5 inches to the right of helicopter center line and 43.0 inches up from cabin deck line. Hydraulic fluid is filtered through this unit before returning to the reservoir. Fluid is furnished this system from the flight controls hydraulic reservoir and pressure is provided by the transmission hydraulic pump.

6-4. Operation — Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (See figure 6-1.) Hydraulic fluid is supplied to the pump from the two-quart reservoir, through the inlet line (9). The variable delivery pump furnishes pressure to the system at 1000 psi at no flow to 950 psi at full flow. From the pump the fluid passes through the filter to the relief valve, which is set to relieve at 1100 to 1200 psi. Fluid then passes to the three way solenoid valve (7). The solenoid valve is a normally open valve from the pressure side to the boost cylinder. When the solenoid is energized the pressure port is closed and the valve is open from cylinders to reservoir return. Fluid pressure from the solenoid valve energizes the pressure switch (8) which is set to break the circuit to the pressure warning light at 800 psi plus or minus 100 psi on increasing pressure and to close the circuit to the light at 500 psi plus or minus 100 psi on decreasing pressure. From the solenoid valve, fluid is furnished to the main rotor power cylinders through the irreversible and servo valves and to the tail rotor servo cylinder.

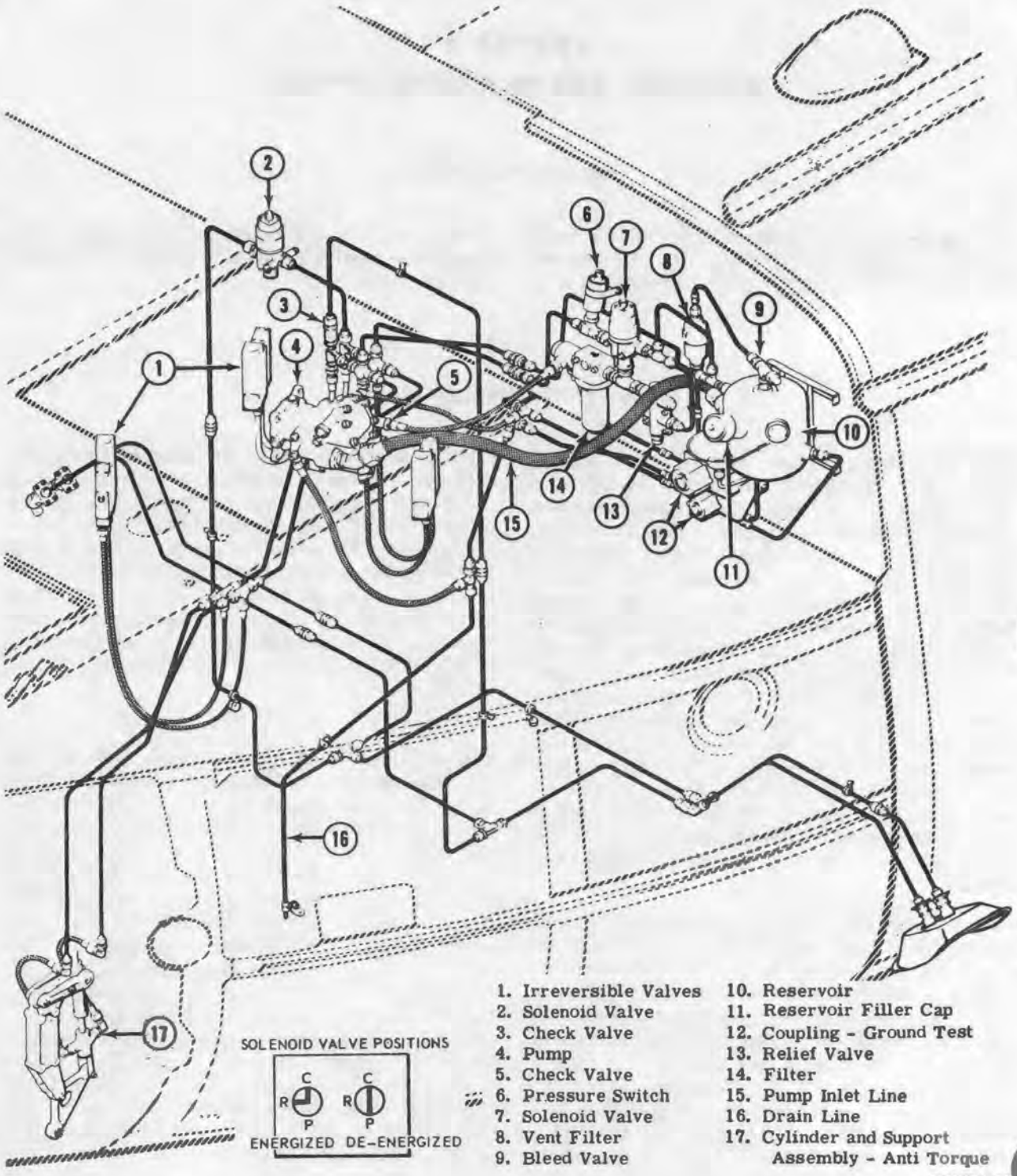
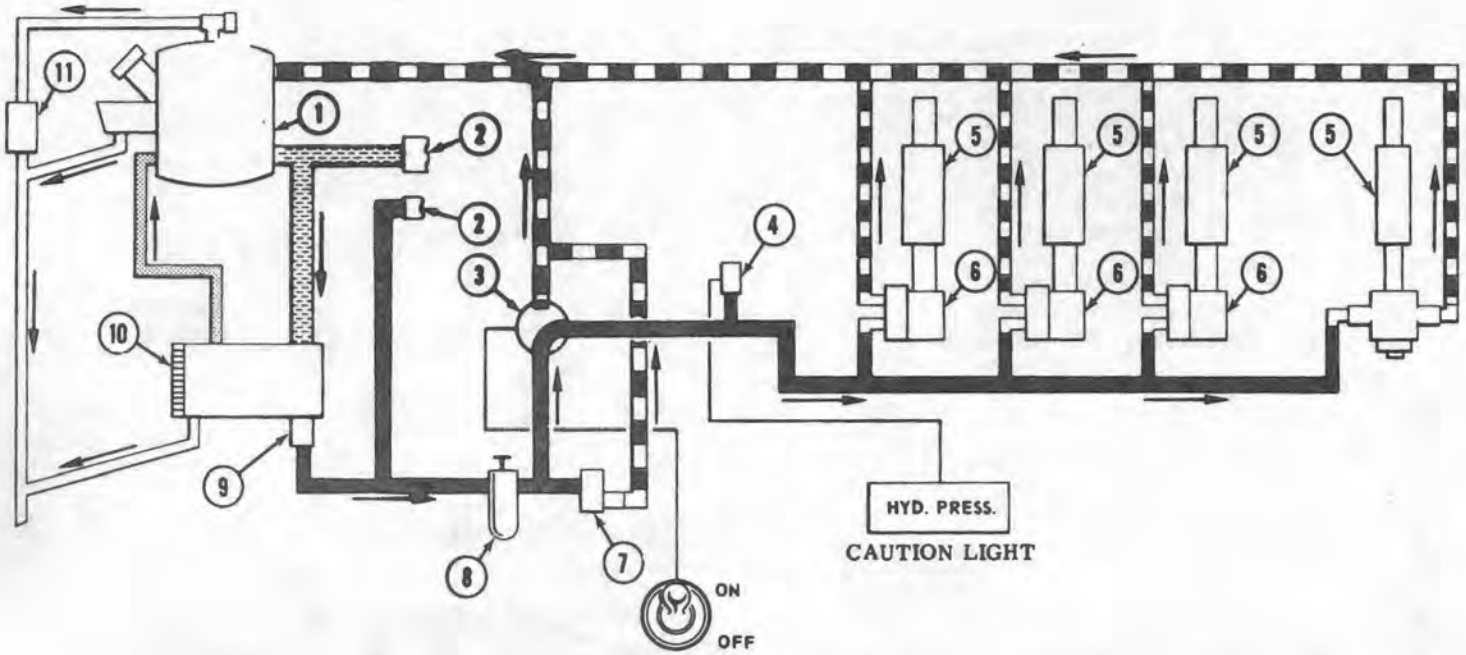


Figure 6-1. Hydraulic installation (typical) (UH-1A and UH-1B serial no. 60-3546 thru 64-14100)



PRESSURE

PRESSURE BY-PASS

SUPPLY

RETURN

VENT

1. Reservoir
2. Ground Test Connection
3. Solenoid Valve
4. Pressure Switch
5. Cylinder Assembly
6. Irreversible Valve
7. Relief Valve
8. Line Filter
9. Check Valve
10. Hydraulic Pump
11. Vent Filter

304476-1

Figure 6-1A. Hydraulic system schematic (UH-1B) (Sheet 1 of 2)

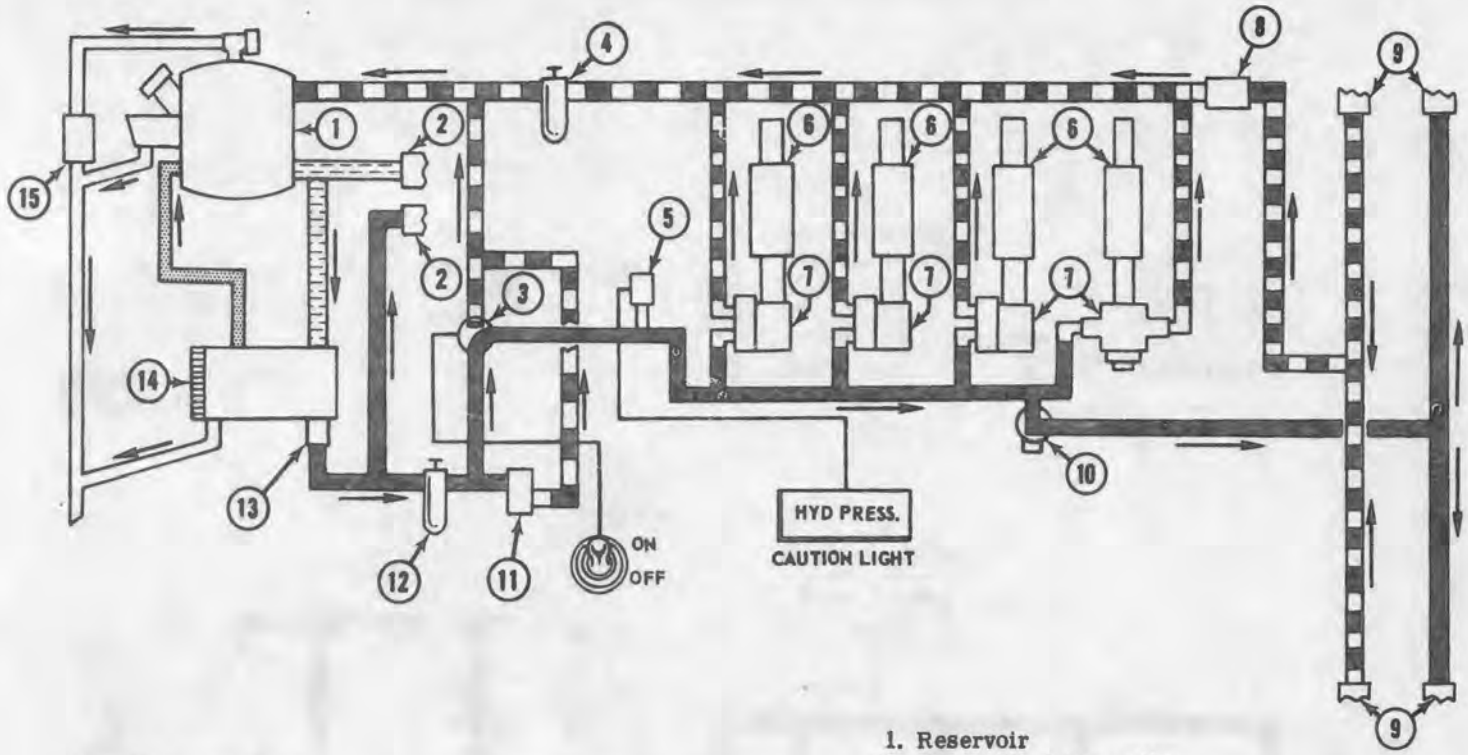


Figure 6-1A. Hydraulic system schematic (UH-1B with armament) (Sheet 2 of 2)

6-7. Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic pump is a variable delivery axial piston pump. The pump is mounted on the transmission lower case and furnishes hydraulic pressure to the servo cylinders which are connected to the mechanical linkage on the flight control system.

6-8. Removal — Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Drain hydraulic oil supply from hydraulic reservoir.

b. Disconnect suction line from hydraulic pump and drain oil from line. Disconnect remaining lines to pump and cover openings.

c. Remove four nuts which mount pump to transmission gear box and lift pump from helicopter.

6-9. Installation — Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Position hydraulic pump on mounting bolts. Align splines on pump shaft with splines in transmission gear box and install mounting bolts.

b. Remove covers from hydraulic lines and connect lines to pump.

c. Service hydraulic reservoir.

d. Bleed hydraulic system. (Refer to paragraph 6-5 and perform step b. (1) (c).

6-10. Fluid Pressure Filter (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The fluid pressure filter shall be replaced as necessary.

6-11. Removal — Fluid Pressure Filter (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Turn battery switch to "OFF" position and disconnect external power.

b. Disconnect hydraulic lines from filter and cap openings.

c. Remove nuts, washers and bolts holding filter to mounting bracket and lift filter from helicopter.

d. Cut lockwire and unscrew cap, with element, from filter (14, figure 6-1).

6-12. Installation — Fluid Pressure Filter (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Position filter on mounting bracket and install mounting bolts, washers and nuts.

b. Connect hydraulic lines to filter. Bleed hydraulic system according to paragraph 6-5.

c. Insert clean element into filter cap and place new O-ring on cap.

d. Screw cap into filter body. Tighten and lockwire.

6-13. Reservoir Vent Filter (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Replace the reservoir vent filter or filter element as necessary.

6-14. Removal — Reservoir Vent Filter (8 figure 6-1). a. Turn battery switch to "OFF" position and disconnect external power.

b. Disconnect hydraulic lines from filter and cap openings.

c. Remove nuts, washers and bolts holding filter to mounting bracket and lift filter from helicopter.

d. Cut lockwire and unscrew two halves of filter.

6-15. Installation — Reservoir Vent Filter (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Position filter on mounting bracket and install mounting bolts, washers and nuts.

b. Connect hydraulic lines to filter. Bleed hydraulic system according to paragraph 6-5.

c. Insert element into filter. Screw two halves of filter together and install lockwire.

6-16. Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic reservoir is mounted on the cabin bulkhead and has a capacity of four pints. A sight gage, which can be seen from inside the cabin indicates "FULL and REFILL" requirements. Some models of UH-1B helicopters have sight glass mounted on top aft side of reservoir and it is necessary to open the right side of transmission cowl to read quantity of fluid in reservoir.

Caution

Careful inspection must be made of oil level sight gages to be sure that they are not oil stained internally and are giving erroneous indications of proper oil level. Upon inspection faulty stained glasses should be cleaned or, if necessary, replaced.

6-17. Removal — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Drain hydraulic fluid by removing the drain plug from the bottom of the reservoir.

b. Disconnect inlet, outlet, scupper drain and by-pass lines from tank. Cap lines immediately after removal.

c. Remove four nuts which mount reservoir to bulkhead and remove reservoir.

6-18. Cleaning — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Thoroughly wash and clean all fittings and inside and outside of reservoir with dry cleaning solvent (item 302, table 1-1). Dry with compressed air.

b. Flush reservoir with hydraulic fluid (item 3, table 1-1).

6-19. Inspection — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect filler cap screen for rust, corrosion and breaks.

b. Inspect sight glass for scratches, cracks, discoloration or other damage which would impair visual or structural function.

c. Inspect mating parts for damage and crossed threads.

6-20. Repair or Replacement — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Replace all components which inspection (refer to paragraph 6-19) indicates are unsuitable for continued service.

6-21. Installation — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Position tank in place on bulkhead and install nuts and bolts.

b. Install lines and fittings. Refer to paragraph 6-46 for installation methods of hydraulic fittings. Replace all seals on reassembly. Install and lockwire drain plug.

c. Refill, bleed and test system (refer to paragraph 6-5).

6-22. Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The collective pitch control hydraulic cylinder (1, figure 6-2) reduces operational loads on the collective pitch control system and facilitates pilot control of the helicopter.

6-23. Removal — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Disconnect control tube (2, figure 6-2) from hydraulic cylinder (1). Disconnect control rod (3) from collective pitch control lever (4).

b. Remove irreversible valve (5). (Refer to paragraph 6-40.)

c. Remove nuts and washers attaching cylinder to support assembly (7, and remove cylinder assembly from support

6-24. Inspection — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect all parts for damage, corrosion or pitting, and check threads for distortion.

b. Inspect piston rod for nicks, scratches, or scoring, and check for smooth operation within cylinder. A friction drag of approximately 25 pounds is considered normal for the cylinder assembly.

c. Inspect bearing support area for looseness or wear. There must be no signs of bearing bind. Adjust nut assembly (15, figure 6-2) so that 25 to 50 inch-pounds of force is required to move bearing through its travel.

d. Inspect the cylinder assembly for leaks at all connections and fittings. Seepage around piston rod seals is permissible, but not to exceed one drop for every 20 cycles.

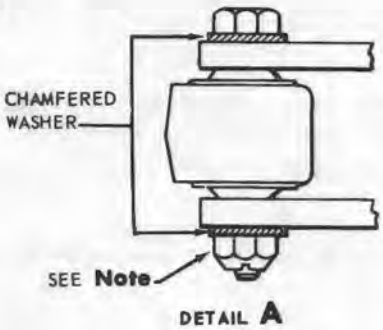
6-25. Repair or Replacement — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Replace cylinders that fail to meet inspection requirements. (Refer to paragraph 6-24.)

6-26. Installation — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Adjust cylinder and rod assembly before installation. (Refer to paragraph 6-27. Perform step a.)

b. Position cylinder assembly (1, figure 6-2) on studs of support assembly (7) and install attaching washers and nuts.

c. Install irreversible valve (5). (Refer to paragraph 6-41.)

d. Connect control rod (3) to pitch control lever (4) and control tube (2) to hydraulic cylinder (1).



1. Collective Pitch Control Hydraulic Cylinder
2. Control Tube
3. Control Tube
4. Pitch Control Lever
5. Irreversible Valve (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
6. Servo Control Valve
7. Support Assembly
8. Cyclic Control Hydraulic Cylinders
9. Control Tubes
10. Servo Control Valves
11. Control Tubes
12. Swashplate Horns
13. Irreversible Valves (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
14. Support Assembly
15. Nut Assembly

Note

Torque nuts 700 to 1200 inch-pounds

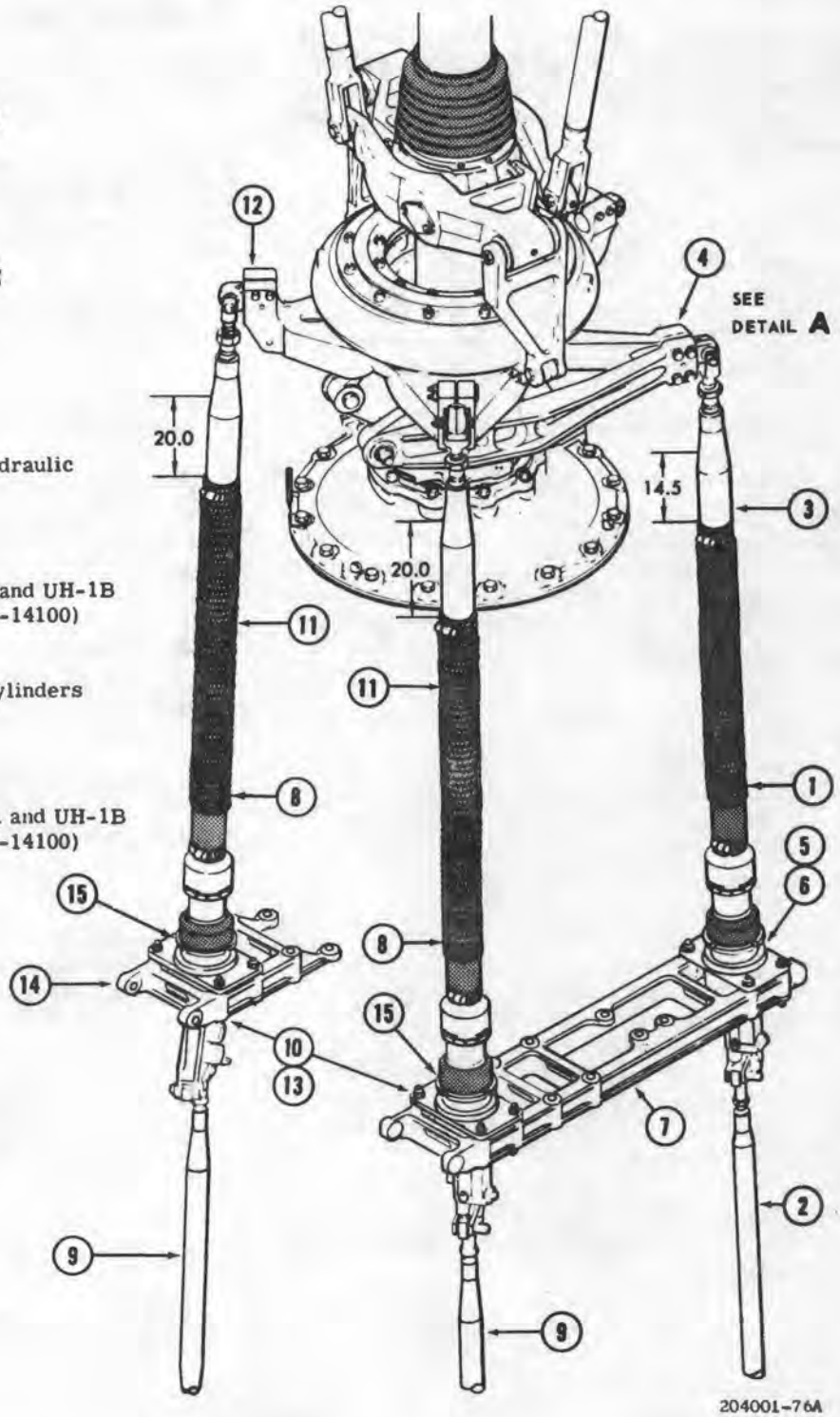


Figure 6-2. Typical hydraulic cylinders removal and installation

e. Check rigging of collective pitch control system. (Refer to paragraph 9-17 or 9-22.)

6-27. Adjustment — Collective Pitch Control Hydraulic Cylinder. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) a. Adjust cylinder and rod assembly with clevis set at 2.53 inches. (See figure 6-3.)

Note

Lost motion develops due to normal wear between the servo valve spool and pilot's input lever. (See figure 6-4.) This condition may be corrected by performing steps b. through e.

b. Break safetywire and loosen jam nut.

c. Insert 0.002 inch feeler gage in orifice in power cylinder and hold gently but firmly against bottom of spool valve. Carefully adjust screw in to reduce lost motion. Preferred clearance is 0.002 inch. Minimum clearance is plus 0.001 inch with a maximum of 0.004 inch permissible before adjustment is required.

Caution

Use extreme care in adjusting screw. After obtaining preferred clearance of 0.002 inch, ¼ additional turn of screw will break horseshoe washer and collective will lock in full up position.

Note

Care must be exercised when adjustments are made on a badly brinelled screw, as a side force on the servo valve may result in excessive servo valve wear and a higher valve operating force. Valve should operate freely, with no binding

d. After adjustment is complete, lock screw with jam nut, recheck valve operating force and safety-wire screw.

Note

If screw is being replaced, exercise care as ball is not secured to screw.

e. Final adjustments of hydraulic cylinder will be made concurrent with rigging. (Refer to paragraph 9-17 or 9-22.)

6-28. Cyclic Control Hydraulic Cylinders. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The cyclic control hydraulic cylinders (8, figure 6-2) reduce operational loads on the cyclic control system and facilitate pilot control of the helicopter.

6-29. Removal — Cyclic Control Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Disconnect control tubes (9, figure 6-2) from control valves (10).

b. Disconnect control tubes (11) from swashplate horns (12)

c. Remove irreversible valves (13). (Refer to paragraph 6-40.)

d. Remove nuts and washers attaching cylinders (8) to support assemblies (7 and 14) and remove cylinder assemblies (8) from supports.

6-30. Inspection — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (Refer to paragraph 6-24.)

6-31. Repair or Replacement — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (Refer to paragraph 6-25.)

6-32. Installation — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Adjust cylinder and rod assemblies before installation. (Refer to paragraph 6-27. Perform step a.)

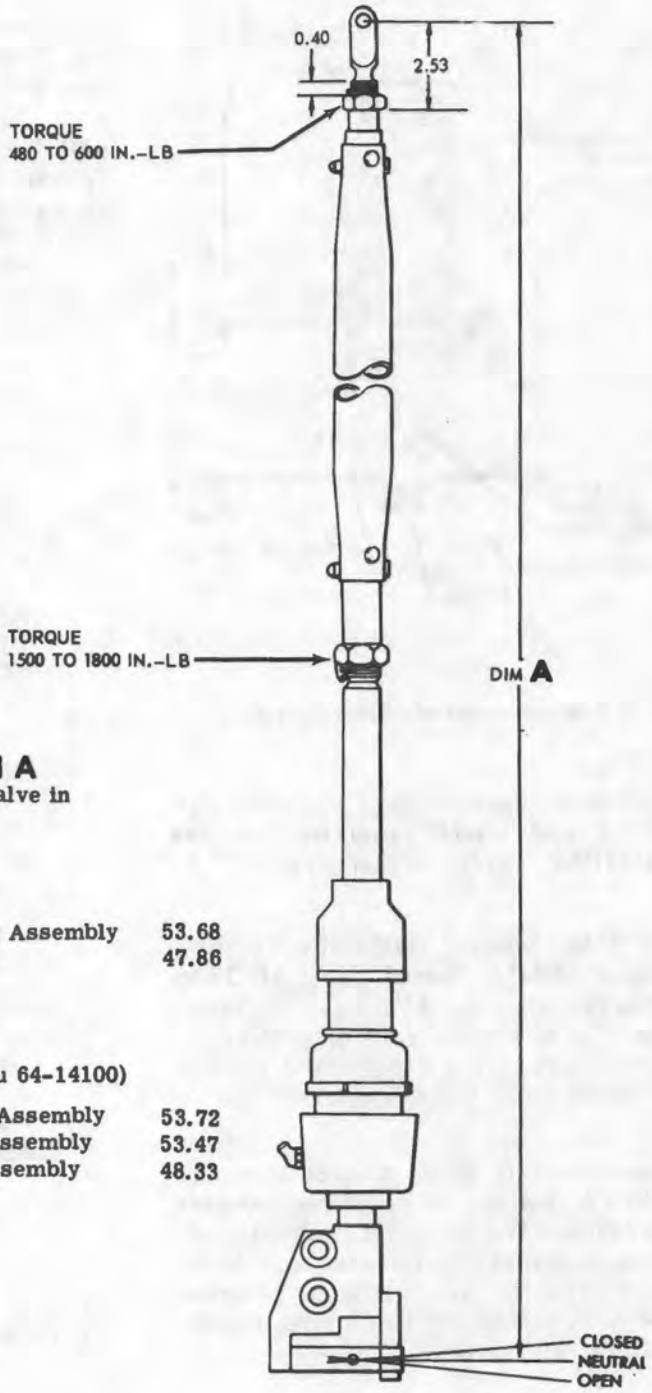
b. Position cylinder assemblies (8, figure 6-2) on studs of support assemblies (7 and 14) and install attaching washers and nuts.

c. Install irreversible valves (13). (Refer to paragraph 6-41.)

d. Connect upper control tubes (11) to swashplate horns (12).

e. Connect lower control tubes (9) to control valves (10).

f. Check rigging of cyclic control system. (Refer to paragraph 9-38 or 9-44.)



DIMENSION A
Is obtained with valve in neutral position.

UH-1A

Right and Left Cyclic Cylinder Assembly	53.68
Collective Cylinder Assembly	47.86

UH-1B

(Serial No. 60-3546 thru 64-14100)

Right Cyclic Cylinder Assembly	53.72
Left Cyclic Cylinder Assembly	53.47
Collective Cylinder Assembly	48.33

Figure 6-3. Cylinder assembly dimensions (UH-1A and UH-1B serial no. 60-3546 thru 64-14100)

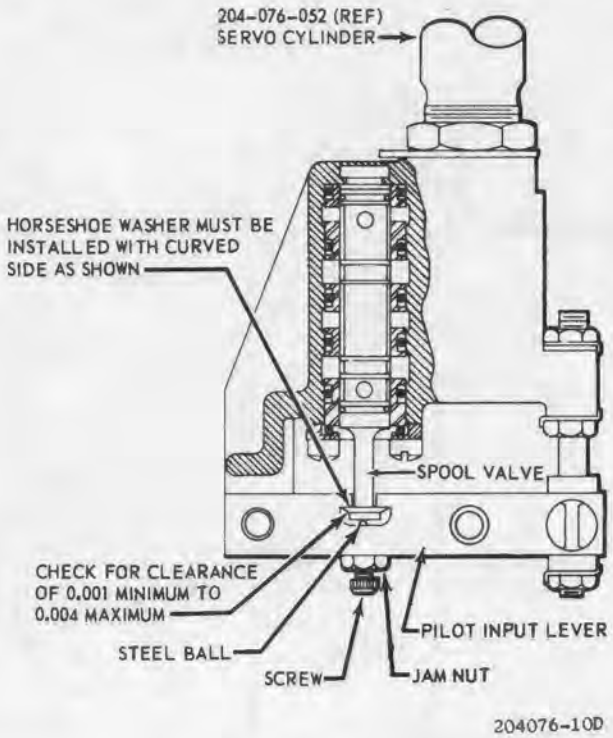


Figure 6-4. Adjustment of power cylinders

6-33. Adjustment— Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (Refer to paragraph 6-27.)

6-34. Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). A hydraulic cylinder mounted in the tail rotor control system reduces effort required for control and reduces feed-back forces from the tail rotor.

6-35. Removal — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The tail rotor hydraulic cylinder and mount may be removed as an assembly or the cylinder alone may be removed from the support assembly. To remove cylinder observe steps a. through c.

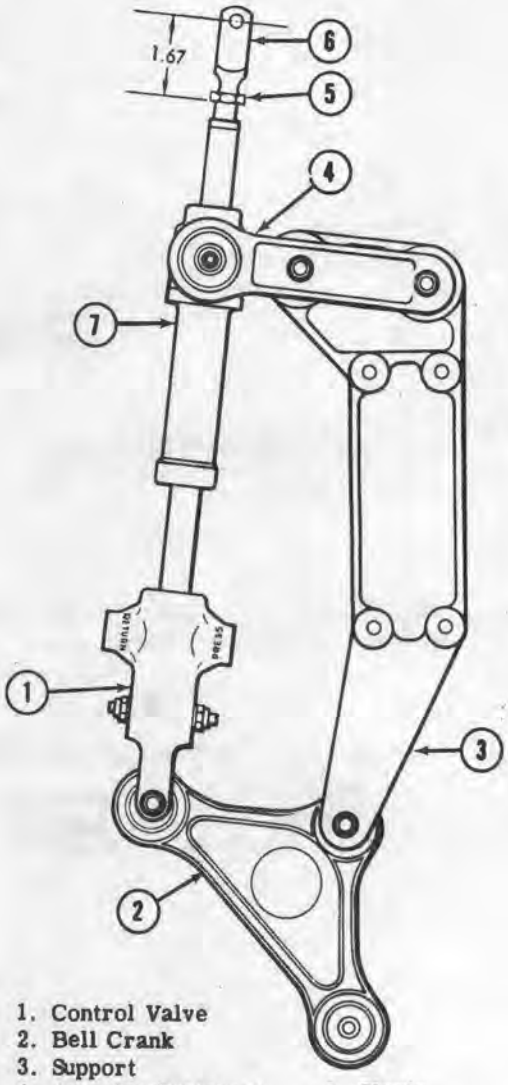
a. Disconnect and cap hydraulic pressure and return lines at cylinder control valve (1, figure 6-5).

b. Disconnect clevis (6) from cylinder (7) and control valve (1) from bellcrank (2).

c. Remove arm (4) from support (3) and remove cylinder (7).

d. Disconnect lower end of bellcrank (2) from control tube. Remove four bolts attaching support to structure and remove support assembly.

6-36. Inspection — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect bearing for wear and roughness.



1. Control Valve
2. Bell Crank
3. Support
4. Arm Set (Matched)
5. Nut
6. Clevis
7. Cylinder Assembly

204001-2A

Figure 6-5. Tail rotor control cylinder and support

c. Hold fitting and turn nut down tightly against boss. Slight extrusion of the ring is not detrimental.

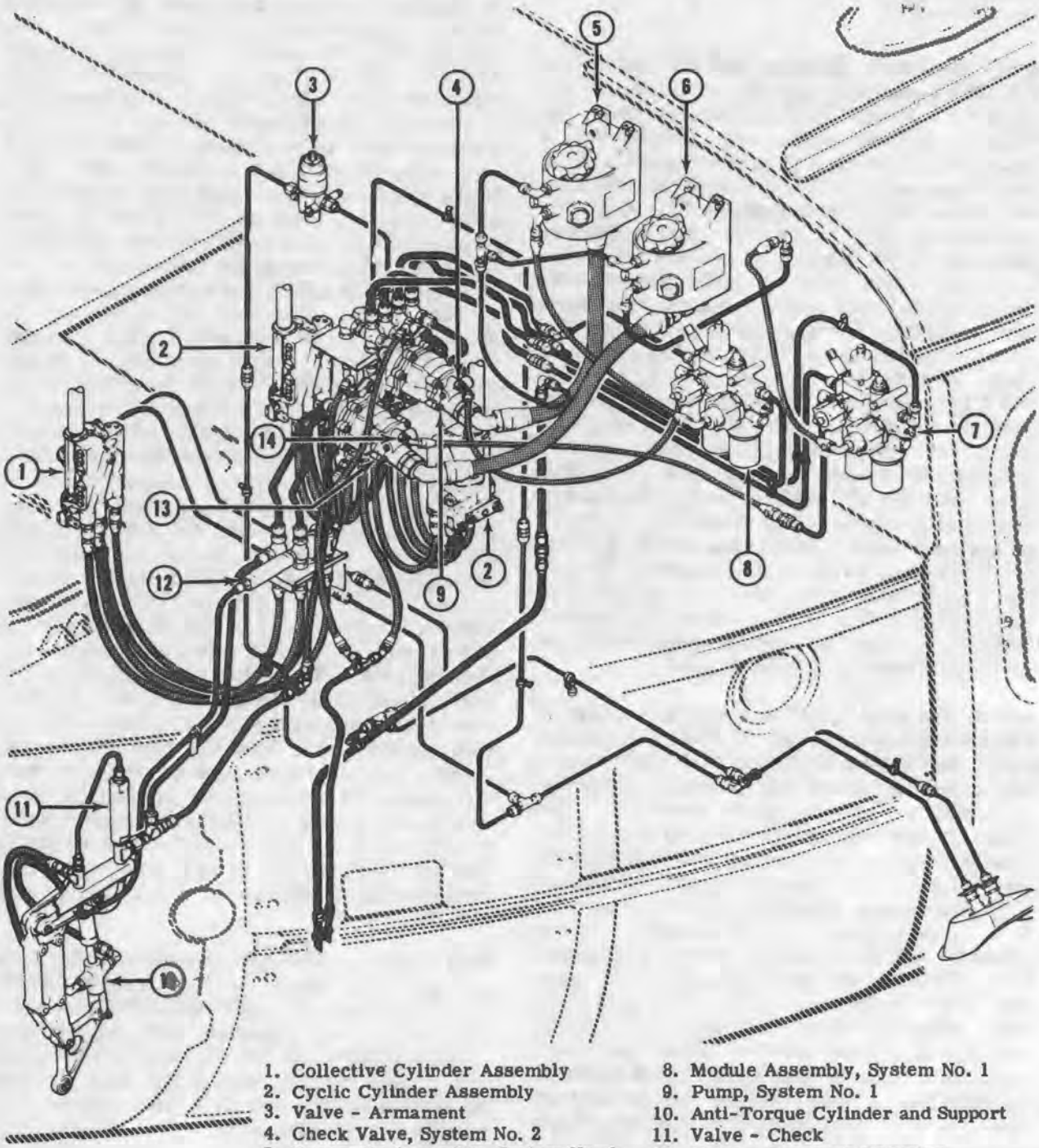
6-47. Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent). (See figures 6-7 and 6-7A.) Model UH-1B helicopters, Serial No. 64-14101 and subsequent, are equipped with a dual hydraulic system to reduce the operational loads required to activate the cyclic, collective and directional control systems. The dual system used in these helicopters provides greater safety of flight. Failure of one system leaves hydraulic power still available through the other system. Each system consists of a reservoir; a variable delivery, pressure compensated pump; a module assembly containing a solenoid valve, relief valve, pressure switch, pressure and return filters and magnetic type differential pressure indicators; control cylinders which incorporate irreversible features, and necessary attaching hardware. The reservoirs are mounted on the cabin aft bulkhead just to the right of helicopter centerline. The pumps are mounted on the transmission lower case and furnish hydraulic pressure to the control cylinders through the module assemblies, which are attached to the right-hand side of the cabin aft bulkhead. Pressure required for system operation is preset on each pump to supply demand.

6-47A. The dual hydraulic systems installed on UH-1B helicopters Serial No. 66-491 and subsequent (see figures 6-7B and 6-7C) incorporate the added feature of an emergency collective (accumulator) system on System No. 1. This added system maintains collective control hydraulic pressure for four control strokes minimum in the event both hydraulic systems fail. This emergency collective system also adds total irreversibility to the collective control system. An accumulator, pressure operated lock-out valve, nitrogen charging valve, pressure gage, drain valve, drain hose and drain valve coupling halves, with necessary tubes and fittings, constitute the added equipment required to obtain the above characteristics. System No. 1 also includes an emergency cyclic control (accumulator) system which serves to pressurize and lock out the cyclic actuators, as well as increase the amount of irreversibility in the cyclic system, if both hydraulic systems should fail. Components of this cyclic emergency system include a pressure operated lock-out valve and a small, spring loaded accumulator, with necessary fittings, tubing and check valves.

6-48. Operation — Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent). Hydraulic fluid is supplied to the pumps from the two-quart capacity reservoirs by means of hoses. The variable delivery pumps furnish fluid, under 1500 psi pressure, to their respective module assemblies. Operation of both module assemblies is the same. Fluid passes through the module pressure filter to the solenoid valve which is open when de-energized. A pressure relief valve limits system pressure, cracking at 1626 psi, with a full flow pressure of 2140 psi. Pressure line and return line filters both have differential pressure indicators which sense pressure on both sides of the filter. An indicator pin extends if inlet pressure exceeds outlet pressure by more than 70 psi differential. Fluid pressure from the solenoid valve energizes a pressure switch which is set to break the circuit to the pressure warning light on the caution panel at 800 psi. Pressure fluid is furnished to the cyclic and collective control cylinders from the solenoid valve of both sub-systems. Pressure fluid to the directional control cylinder is furnished only from hydraulic sub-system No. 2 solenoid valve on UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772. On UH-1B helicopter Serial No. 66-491 and subsequent this function is performed by the solenoid valve in sub-system No. 1. Return fluid from control cylinders passes through the module assembly return filters. With the solenoid valve energized the return fluid passage is connected to the system passage, with pressure passage blocked. Pump idles at system pressure with no flow. Armament hydraulic power is supplied from system No. 1 only, on UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772. On UH-1B Serial No. 66-491 and subsequent armament hydraulic power is supplied by system No. 2.

6-49. Testing — Hydraulic Systems (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772). The test equipment shall consist of a thoroughly clean portable hydraulic test unit, serviced to use hydraulic oil (item 3, table 1-1). The test unit shall include a ten micron filter to filter all oil leaving the test unit. The unit shall be capable of producing pressure to 2300 psig, and shall have a flow rate of at least six gpm. A calibrated pressure gage with a minimum of 2500 psig capacity shall be provided on the test unit. The test unit shall have provisions in the pressure and return lines for connecting to both hydraulic systems for simultaneous operation.

a. Prepare the systems for testing as follows:



1. Collective Cylinder Assembly
2. Cyclic Cylinder Assembly
3. Valve - Armament
4. Check Valve, System No. 2
5. Reservoir Assembly, System No. 1
6. Reservoir Assembly, System No. 2
7. Module Assembly, System No. 2
8. Module Assembly, System No. 1
9. Pump, System No. 1
10. Anti-Torque Cylinder and Support
11. Valve - Check
12. Valve - Pressure Reducing
13. Pump, System No. 2
14. Check Valve, System No. 1

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Figure 6-7. Hydraulic installation (UH-1B serial no. 64-14101 thru 65-12744 and 65-12772)

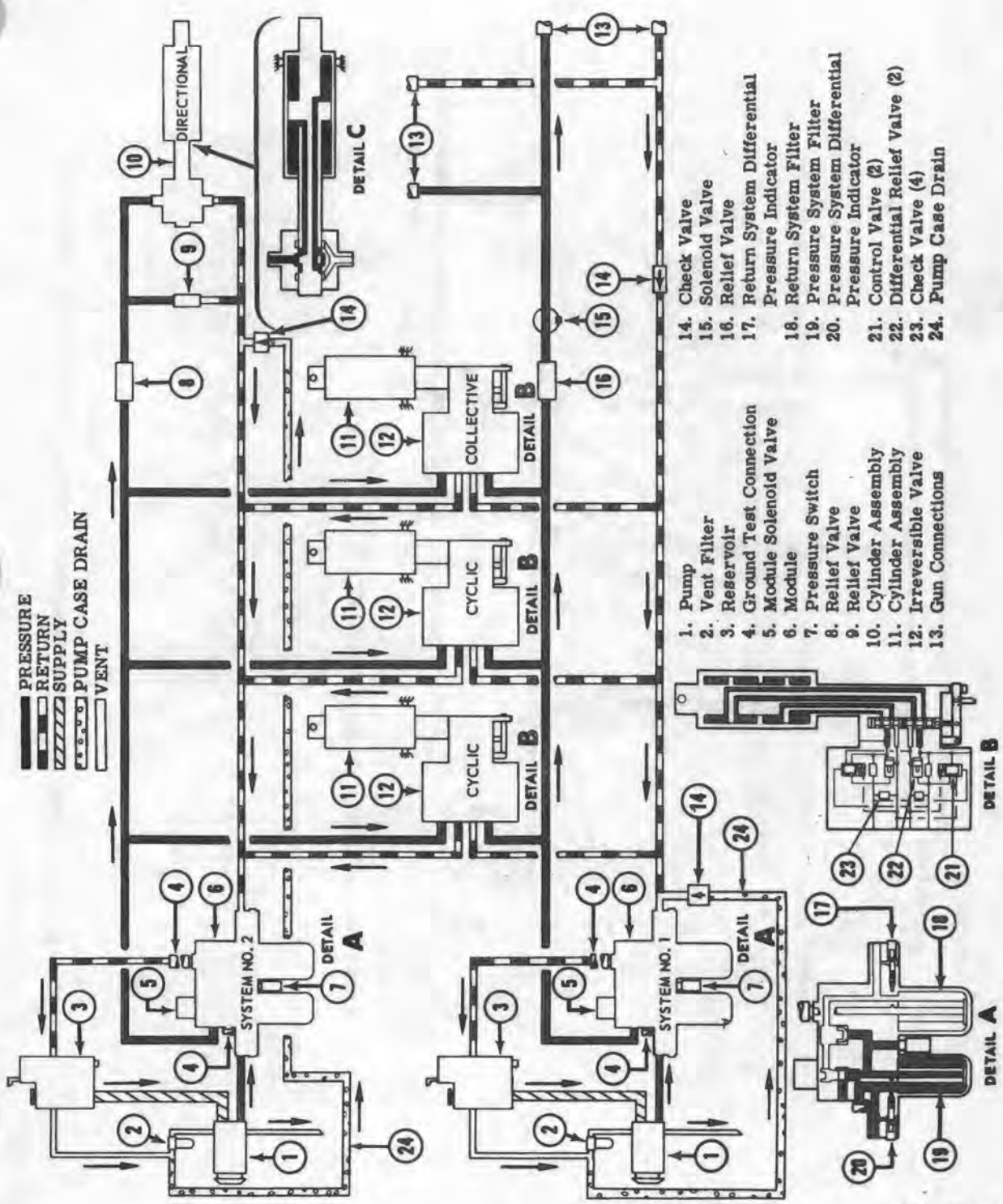
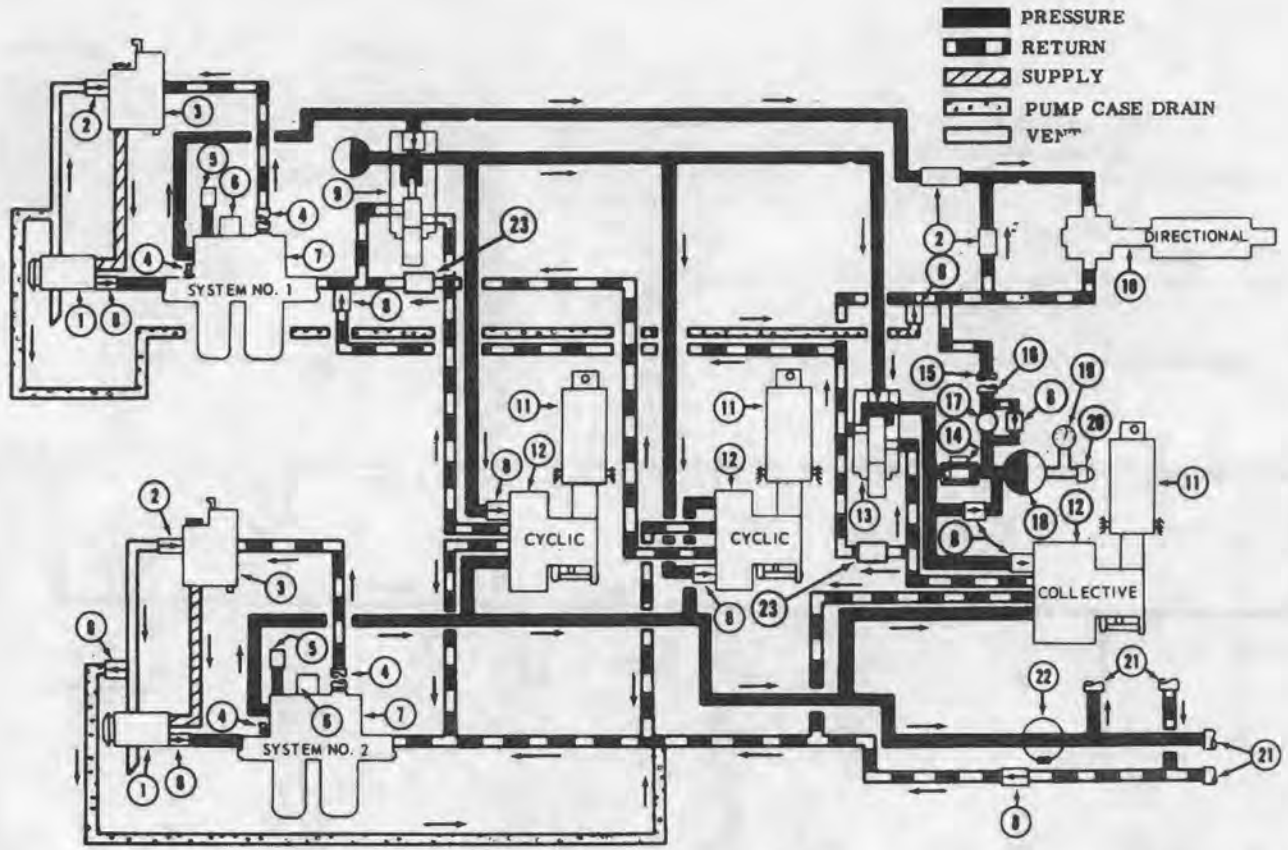


Figure 6-7A. Hydraulic system schematic (UH-1B serial no. 64-14101 thru 65-12744 and 65-12772)



1. Pump
2. Relief Valve
3. Reservoir
4. Ground Test Connection
5. Pressure Switch to CAUTION Panel
6. Module Solenoid Valve
7. Module
8. Check Valve
9. Pressurized Cyclic Lock-Out Valve and Accumulator
10. Cylinder Assembly
11. Cylinder Assembly
12. Irreversible Valve
13. Pressurized Collective Lock-Out Valve
14. Solenoid Valve
15. Socket and Plug Assembly
16. Nipple and Pressure Cap Assembly
17. Drain Valve
18. Collective Accumulator
19. Gage
20. Air Charge Valve
21. Armament Connections
22. Solenoid Valve
23. Relief Valve

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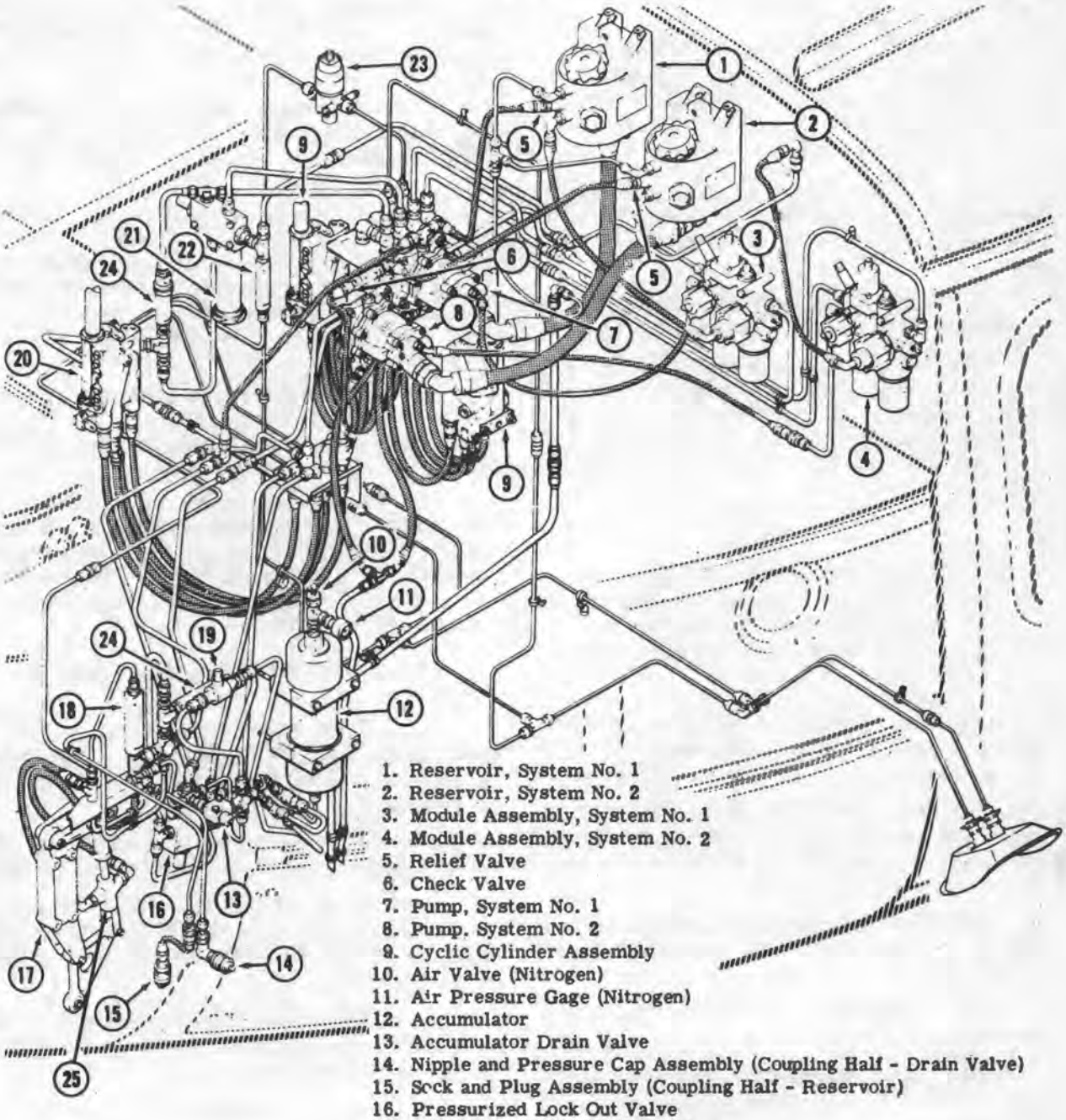
Figure 6-7B. Hydraulic system schematic (UH-1B serial No. 66-491 and subsequent)



1. Reservoir, System No. 1
2. Reservoir, System No. 2
3. Module Assembly, System No. 1
4. Module Assembly, System No. 2
5. Relief Valve
6. Check Valve
7. Pump, System No. 1
8. Pump, System No. 2
9. Cyclic Cylinder Assembly
10. Air Valve (Nitrogen)
11. Air Pressure Gage (Nitrogen)
12. Accumulator
13. Accumulator Drain Valve
14. Nipple and Pressure Cap Assembly (Coupling Half - Drain Valve)
15. Sock and Plug Assembly (Coupling Half - Reservoir)
16. Pressurized Lock Out Valve
17. Anti-Torque Cylinder Support
18. Relief Valve
19. Solenoid Valve
20. Collective Cylinder Assembly
21. Valve and Accumulator Assembly
22. Relief Valve
23. Valve - Armament
24. Relief Valve
25. Anti Torque Cylinder

204076-69B

Figure 6-7C. Hydraulic installation (UH-1B serial No. 66-491 and subsequent)

Note

Throughout performance of steps (6) and (7) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(8) Upon completion of steps (6) and (7) above, test unit shall be shut down and cyclic and collective hoses shall be connected to cylinders.

(9) Connect left and right- hand hydraulic armament system pressure and return lines.

(10) Set test unit to a minimum flow rate of at least three gpm. Use test unit pressure setting sufficient to maintain three gpm flow through system for at least five minutes. Activate test unit and flush system for at least five minutes.

Note

Throughout performance of step (10) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(11) Shut down test unit and disconnect left- and right-hand hydraulic armament system pressure and return lines. Cap lines.

(12) Disconnect hoses from tail rotor cylinder and connect hose ends together with reducer. Cap or cover ports in cylinder (25, figure 6-7C) to prevent entry of dirt.

(13) Disconnect test unit hoses from System No. 2, and connect to System No. 1 (Refer to step (4).

(14) Accomplish step (10) above, including note.

(15) Upon completion of step (14) above, test unit shall be shut down and hydraulic system hoses shall be reconnected to cylinder.

(16) Set test unit pressure relief valve for a cracking pressure of 2100 psig and set pump so that it is capable of at least six gpm flow. Set pressure compensation at 1475 to 1525 psig. System No. 1 and System No. 2 shall both be connected to the test unit at the ground test connections.

b. Perform functional tests by accomplishing the following steps. Tests shall be performed after successful completion of step a., above.

(1) Apply 1475 to 1525 psig to the hydraulic systems for at least 15 minutes. While pressure is maintained, accomplish the following:

(a) Observe all portions of both systems for external leakage. Appropriate action shall be taken to correct any cause of external leakage.

(b) Slowly cycle all controls to limits and observe movement of power cylinders. Clearance shall be such that fouling of adjacent parts cannot occur. Check flexible connections to ensure that pinching of hoses does not occur and that vibration does not loosen attaching fittings.

(c) Cycle the cyclic controls, collective control and tail rotor control pedals through full stroke at least ten times to bleed air from system.

(2) Apply pressure to the hydraulic systems. Slowly increase pressure and check warning lights. Lights should go OFF when pressure reaches 700 to 900 psig. Slowly decrease pressure. Lights should come ON when pressure reaches 600 to 400 psig.

(3) Test single system operation as follows:

(a) With pressure in systems at 1475 to 1525 psig, shut off System No. 1 by use of switch on console. System No. 1 warning light shall come ON.

(b) Operate cyclic and collective controls. Operation shall be smooth and positive.

(c) Shut off System No. 2 by use of switch on console. System No. 1 warning light shall go OFF and System No. 2 warning light shall come ON.

(d) Operate cyclic, collective and tail rotor controls. Operation shall be fully powered, smooth and positive.

Note

When testing System No. 2, tail rotor controls are not powered by hydraulic pressure and will require more force to operate.

(4) Connect System No. 1 to test unit and slowly increase pressure until relief valve on System No. 1 module opens. Relief valve shall open between 1626 and 2140 psig.

(5) Repeat step (4) above, for System No. 2.

(6) Disconnect hydraulic systems from ground test unit and remove ground test unit.

(7) Bleed emergency collective (accumulator) system by moving collective control stick through approximately six strokes. When stick can no longer be moved, accumulator has been depleted.

Note

Correct accumulator precharge is mandatory for proper operation of secondary collective power.

(8) Check accumulator (12, figure 6-7A) for proper pressure as follows:

(a) Connect reservoir drain hose coupling half (15) to drain valve coupling half (14).

(b) Depress drain valve (13) to drain oil from accumulator. Hold for 30 seconds minimum.

Caution

DO NOT depress drain valve (13) with rotor running or with auxiliary power on. If coupling half connections cannot be made, refer to trouble shooting, paragraph 6-50, for corrective action.

(c) Check pressure gage (11). Indicator on dial shall be in green area for correct accumulator air pressure.

(d) If indicator is in yellow area, BELOW green area, accumulator must be charged with nitrogen (item 325, table 1-1) to correct pressure, using 650 psig to 850 psig supply pressure.

(e) If indicator is in yellow area, ABOVE green area, drain excess pressure until indicator is in green area.

Caution

Precharge accumulator during heat of the day, only, to prevent overcharging due to thermal expansion.

(f) After correct pressure has been obtained, disconnect reservoir drain hose coupling half (15) from drain valve coupling half (14).

(9) Test system pressure by connecting calibrated (0 to 3000) gages to both hydraulic systems at pressure ground test fittings. With rotor turning at 285 to 314 RPM, hydraulic pressure shall be 1475 to 1525 psig on each system, with cyclic, collective and tail rotor controls fixed.

c. Upon completion of tests, remove gages, replace filter element in both module assemblies. Refill hydraulic systems, using test unit. Bleed systems in accordance with instructions in paragraph 6-49A, step b. (1) (c). Disconnect and remove test unit. Close all test ports on unit and on hydraulic systems. Connect hydraulic reservoirs to module assemblies and lockwire quick disconnect couplings. Service reservoirs in accordance with instructions contained in paragraph 1-91.

6-50. *Trouble Shooting — Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent).* Trouble shooting data for the hydraulic systems is as follows. Items peculiar to UH-1B helicopters Serial No. 66-491 and subsequent will be found at the end of the following chart.

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
Hydraulic oil leaks	Worn gaskets or seals		Replace gaskets or seals
	Caution Do not tighten leaky flareless fittings.		
	Leaky fittings	Disconnect tube assembly having leaky flareless fitting. Inspect for evidence of improper tightening, presence of foreign matter or defective part	Replace with new tube assembly if nut, sleeve, or tubing is defective Clean and remove all foreign matter Tighten fitting nut with wrench until a sharp increase in torque is noted

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
			Note
			If there is any doubt that the point of sharp torque increase has been reached rapidly loosen and tighten the nut several times (use light torque), until certain that increase in torque is due to the sleeve and tube touching the fitting seat, and is not due to thread friction.
			Tighten nut an additional 1/6 of a turn (one hex flat), from point of sharp torque increase
			If leak is present, tighten nut additional 1/6 of a turn (one hex flat)
			If leak still persists, remove tube assembly and install new tube assembly
Hydraulic warning light on	Hydraulic system turned OFF		Turn system ON
	Low hydraulic pressure	Loss of hydraulic fluid. Check for leak	Replace faulty gasket, fitting, tube assembly valve or component. Fill system with hydraulic oil (item 3, table 1-1).
		Relief valve locked open	Replace valve
		Pump not producing pressure	Replace pump
	Solenoid not operating properly		Replace solenoid
	Electrical wiring to warning light or solenoid valve not correct	Check for proper wiring hookup	Make proper hookup or replace wiring
	Check valve located at hydraulic pump pressure port installed backward	Remove and install properly	

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
	Module pressure switch inoperative		Replace pressure switch.
Collective stick will not stay in position	Springs on collective servo actuator mis-located		204-076-318-1 spring is the heavier of two springs used and shall be located in the top position between clip and nut on 204-076-005-5 hydraulic cylinder assembly. On the 204-076-005-9 assembly, the spring is positioned between clip and lower bracket. Refer to paragraph 9-17 or 9-22 for adjustment instructions.
Controls do not operate smoothly	Sticky servo control valve		Replace faulty servo actuator
	Servo valve requires more than 12 ounces to operate		Replace servo actuator
	Servo valve motoring		Adjust in accordance with instructions in paragraph 6-76.
Hydraulic system too hot	Pump generates excessive pressure, higher than relief valve cracking pressure		Replace pump
Relief valve cracking pressure set lower than system pump pressure	Check with hydraulic test stand		Replace module
Servo actuators chatter when moving controls	Air in servo actuators		Cycle controls through full stroke 10 times with more than 850 psi pressure applied to eliminate air. Some chatter is normal in the directional servo actuator when rotor is not rotating.
	Servo actuator mounting bearings loose		Adjust bearings

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
	Any looseness in hydraulic cylinders		Replace cylinder
Hydraulic control switch ineffective	Circuit breaker not pushed in		Close circuit
	Solenoid valve not connected		Connect wiring
	Improper electrical wiring		Repair or replace
	Solenoid valve not functioning properly		Replace with new solenoid valve
	Check valve located at hydraulic pump pressure port installed backward		Remove and install properly
Excessive feedback	Air in servo actuator or System has not been bled		Turn hydraulic system ON and cycle the cyclic controls, collective control, and tail rotor through a full stroke at least ten times to bleed air from system
	Improperly adjusted rotor	Refer to paragraph 8-7.	
Note: The following items are peculiar to the hydraulic system incorporated in UH-1B helicopters Serial No. 66-491 and subsequent:			
Coupling halves in drain circuit cannot be connected	Drain valve button has been depressed prematurely (before coupling halves were connected)		Open bleed valve in line between drain valve and drain valve coupling half to relieve pressure
Accumulator will not hold pressure in green band of gage	Accumulator piston seal leaking	If accumulator will not hold nitrogen pressure after charging	Replace accumulator
Less than four full strokes of collective control available	Improper nitrogen precharge in accumlator	Check accumulator pressure gage for proper precharge	Properly charge accumulator with nitrogen
	Improper hydraulic fluid charge in accumulator		Use hydraulic cart to charge accumulator
		Note: If hydraulic cart is not available, qualified personnel may run-up helicopter to provide necessary hydraulic power.	

c. Attach lines to pressurized lock out valve, relief valve and tee fitting.

6-71. Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). The collective pitch control hydraulic cylinder (1, figure 6-2) reduces operational loads on the collective pitch control system and facilitates pilot control of the helicopter.

6-72. Removal — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Disconnect control tube (2, figure 6-2) from hydraulic cylinder (1). Disconnect control rod (3) from collective pitch control lever (4).

b. Disconnect hydraulic lines from control valve (6) and cap or cover openings to prevent entrance of foreign material.

c. Remove nuts and washers attaching cylinder to support assembly (7) and remove cylinder assembly from support.

6-73. Inspection—Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-24.)

6-74. Repair or Replacement — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-25.)

6-75. Installation — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Adjust cylinder and rod assembly before installation. (Refer to paragraph 6-76, perform step a.)

b. Position cylinder assembly (1, figure 6-2) on studs of support assembly (7) and install attaching washers and nuts.

c. Uncap or uncover hydraulic lines and connect to control valve (6).

d. Connect control rod (3) to collective pitch control lever (4). Install one chamfered washer under bolt head and one under nut. (See View "A", figure 6-2.)

e. Connect control tube (2) to hydraulic cylinder (1).

f. Check rigging of collective pitch control system. (Refer to paragraph 9-17 or 9-22.)

6-76. Adjustment — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Adjust cylinder and rod assembly with clevis set at 2.19 inches. (See figure 6-9.)

(1) Adjust spring tension with 0.12 inch of threads showing above spring adjustment nut.

Note

When reverse collective system is installed on UH-1B Helicopters Serial No. 64-14101 through 65-9564 and 65-12772, reverse position of top and bottom springs to balance the collective control. (See view B, figure 6-10.) UH-1B Helicopters Serial No. 66-491 and subsequent springs have already been reversed.

(2) If motoring occurs in the collective controls during operation, correct as follows:

(a) Add washers between top nut and top spring as shown in figure 6-10.

(b) Add washers in multiples of one until tendency to motor stops. Do not exceed a maximum of six washers.

b. Final adjustments of hydraulic cylinder will be made concurrent with rigging. (Refer to paragraph 9-22.)

6-77. Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). The cyclic control hydraulic cylinders (8, figure 6-2) reduce operational loads on the cyclic control system and facilitate pilot control of the helicopter.

6-78. Removal — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). a. Disconnect lower control tubes (9, figure 6-2) from control valves (10).

b. Disconnect upper control tubes (11) from swashplate horns (12).

c. Disconnect hydraulic lines from control valves (10) and cap or cover openings to prevent entrance of foreign material.

d. Remove nuts and washers attaching cylinders (8) to support assemblies (7 and 14) and remove cylinder assemblies from supports.

6-79. *Inspection — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-24.)

6-80. *Repair or Replacement — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-25.)

6-81. *Installation — Cyclic Control Hydraulic Cylinders. (UH-1B Serial No. 64-14101 and subsequent).* a. Adjust cylinder and rod assemblies before installation. (Refer to paragraph 6-76. Perform step a.)

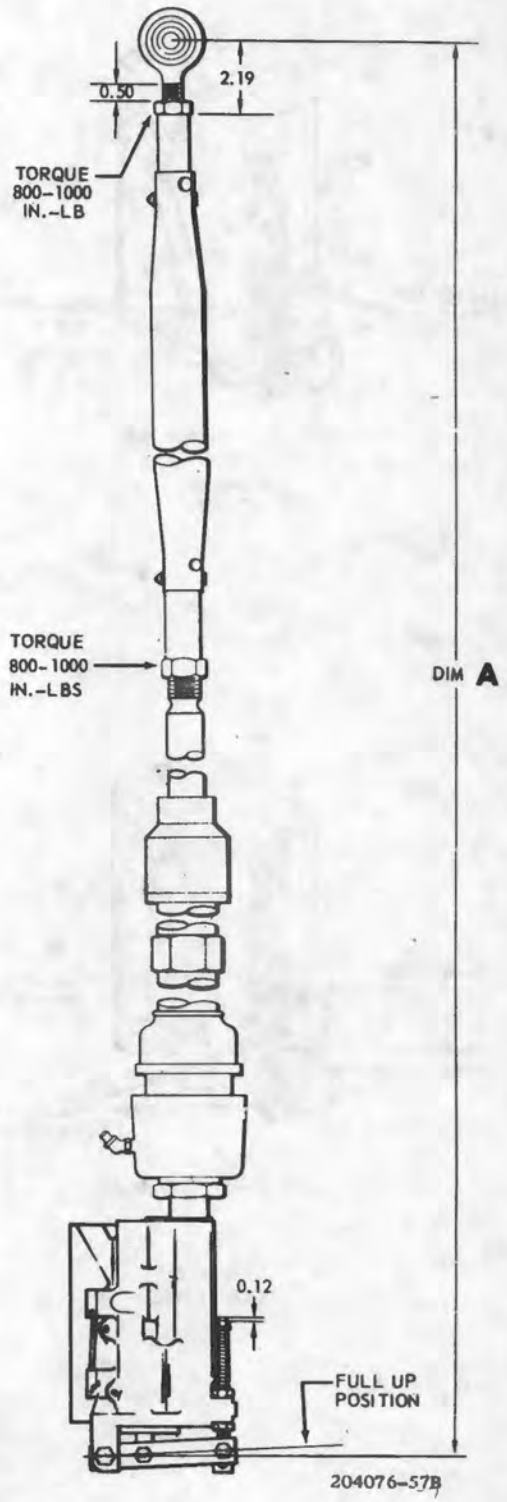
b. Position cylinder assemblies (8, figure 6-2) on studs of support assemblies (7 and 14) and install attaching washers and nuts.

c. Uncap or uncover openings in hydraulic lines and connect lines to control valves (10).

d. Connect upper control tubes (11) to swashplate horns (12). Install one chamfered washer under bolt head and one under nut, chamfered side of washer towards rod-end. (See View A, figure 6-2.)

e. Connect lower control tubes (9) to control valves (10).

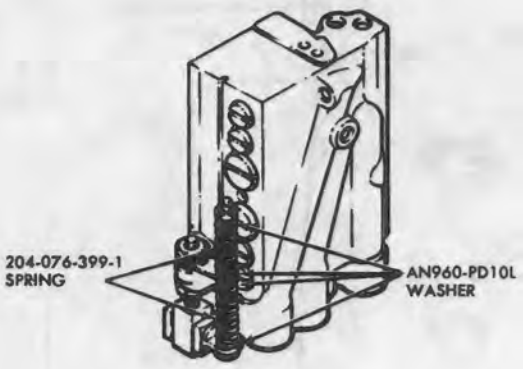
f. Check rigging of cyclic control system. (Refer to paragraph 9-38 or 9-44.)



DIMENSION A

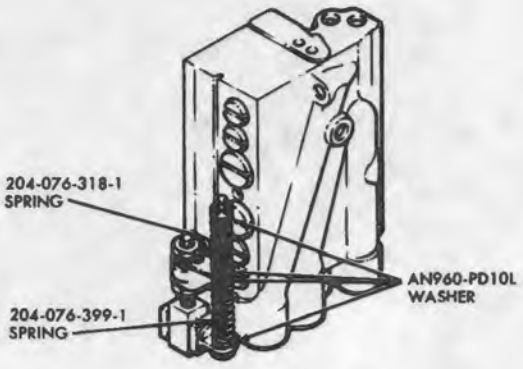
Right Cyclic Cylinder Assembly	55.20
Left Cyclic Cylinder Assembly	54.95
Collective Cylinder Assembly	49.70

Figure 6-9. Cylinder assembly dimensions (UH-1B serial no. 64-14101 and subsequent)



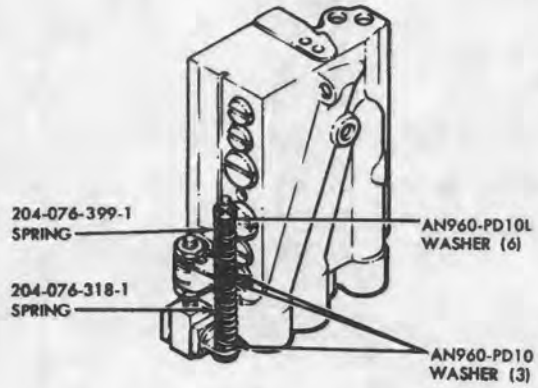
EFF. 64-14101 AND SUB.

VIEW **A**
CYLIC



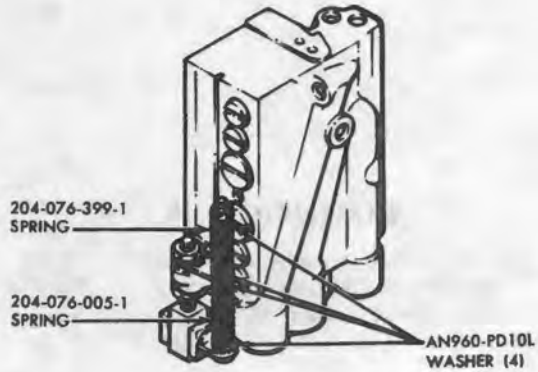
EFF. 64-14101 Thru 65-9564
AND 65-12772

VIEW **B**
COLLECTIVE



EFF. 66-491 THRU 66-643

VIEW **C**
COLLECTIVE



EFF. 66-644 AND SUB.

VIEW **D**
COLLECTIVE

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Figure 6-10. Hydraulic control springs

6-82. *Adjustment — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-76.)

6-83. Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-34.)

6-84. *Removal—Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-35.)

6-85. *Inspection — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-36.)

6-86. *Repair or Replacement — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-37.)

6-87. *Installation — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 6-38.)

6-88. Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-42.)

6-89. *Removal — Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent).* a. Disconnect hydraulic lines from servo valve (6 and 10, figure 6-2) and cap or cover openings to prevent entrance of foreign material.

b. Remove piston rod stop from collective cylinder (6) only.

c. Disconnect control tube (2 or 9) from servo valve lever.

d. Loosen jam nut sufficiently to release lock-tab washer from recess on top of servo valve. Unscrew valve from piston.

6-90. *Installation — Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent).* a. Place lock-tab washer on piston rod. Screw servo valve onto piston rod until rod bottoms in valve. Back valve off one-half to one and one-half turns as necessary to align servo valve with lock-tab washer.

b. Tighten jam nut to 200 to 225 inch-pounds torque.

c. Install piston rod stop (on collective cylinder only) to safety jam nut.

d. Connect control tube (2 or 9, figure 6-2) to servo valve lever.

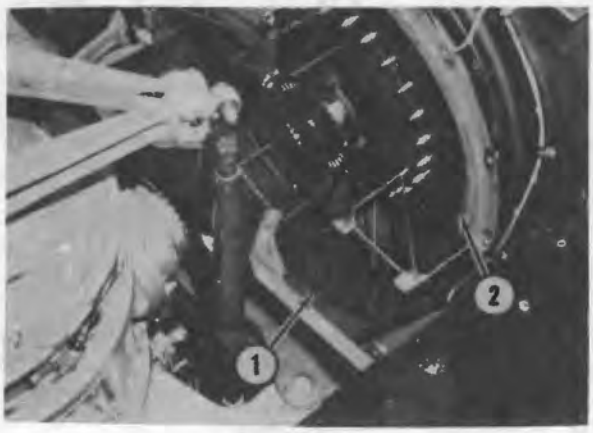
e. Uncap or uncover openings in hydraulic lines and connect lines to servo valve.

6-91. Hydraulic Components (UH-1B Serial No. 64-14101 and subsequent). a. Various components of the hydraulic systems may be removed and replaced in a similar manner by disconnecting lines and removing attaching hardware. Disconnect electrical plugs from electrical units when necessary. When installing components place large diameter washers between component and bulkhead. Refer to paragraph 6-46 for installation methods for hydraulic fittings.

b. Refill, bleed and test hydraulic systems after removal and installation of any component. (Refer to paragraph 6-49.) If hydraulic leaks are detected refer to paragraph 6-50 for corrective action.

Section III — Pneumatic System

(Not Applicable)



DETAIL **S**

DETAIL **T**

DETAIL **U**

DETAIL **V**

DETAIL **W**

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Figure 7–6. Inspection and lubrication main drive shaft (Sheet 4 of 4)

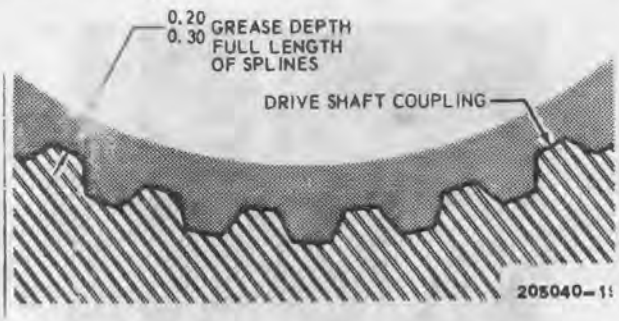


Figure 7-7. Drive shaft coupling

(1) Nicks and scratches, running within 15 degrees of shaft axis, which are not in excess of 0.005 inch in depth are permissible without polishing out.

(2) Nicks and scratches, running within 15 degrees of shaft axis, which are not in excess of 0.010 inch in depth are permissible if polished out provided total polished area does not exceed 20 percent of circumference of shaft at any point.

(3) Nicks and scratches not running within 15 degrees of shaft axis must be polished out. A maximum depth of 0.005 inch may be polished out on 100 percent of shaft circumference. A maximum depth of 0.010 inch may be polished out provided the total polished area does not exceed 20 percent of shaft circumference at any point.

b. A minimum radius of ½ inch should be used in polishing out nicks and scratches. Polished areas must be refinished with two coats of zinc chromate primer, (item 119, table 1-1).

7-12. *Installation — Main Drive Shaft.* Install main drive shaft as follows:

Note

Before installing drive shaft CAREFULLY wipe clean the area surrounding the drive shaft, especially the intake screen, fifth mount beam, synchronized elevator tube and collective tube. (See figure 7-6, details R and S.)

a Coat shaft splines of adapter (9, figure 7-3) and pack female splines of engine output shaft ⅔ full with Plastilube, Moly No. 3 (item 20, table 1-1).

Note

When a T53-L-13 engine is used to replace earlier engine models, or the L-13 engine is replaced by an earlier model, a different adapter must be used. T53-L-1A, L-5, L-9 and L-11 engines use adapter (Part No. 204-040-630), bolt (Part No. 204-040-631), and washer (Part No. 204-040-634). T53-L-11B and -13 uses adapter (Part No. 204-040-812), bolt (Part No. 204-040-813), and washer (Part No. 204-040-814.)

b. Insert adapter into engine shaft. Install countersunk washers with recess next to bolt head. Install retaining bolt (7, figure 7-3) and key washer (8), with short tab of washers in adapter slot. Tighten bolt with 100 to 140 inch-pounds torque, and lockwire head to outer tab of washer.

Caution

When installing driveshaft, be sure that coupling with cooling fins is at forward end, to reduce possibility of damage due to overheating in operation.

Note

On UH-1B Helicopters Serial No. 65-9525 and subsequent, and on all earlier UH-1B Helicopters when modified; an interference tab is attached to the engine inlet screen to prevent the drive shaft from being installed backward.

c. Place drive shaft assembly, with cooling fins at forward end, between engine adapter and transmission input drive coupling (see figure 7-6, detail T). Do not compress shaft couplings more than necessary, as this will tend to force grease past the micarta inboard seal rings.

d. Install clamp sets (1, figure 7-3)to secure each end of shaft as follows:

(1) Carefully wipe inside grooves clean of all traces of grease, (See figure 7-6, detail O and P) and fit clamp halves around coupling joint, checking that serial numbers on both halves are alike and on same side (see figure 7-6, detail Q). Clamp halves should fit snugly and hold themselves in place without bolts.

Note

On UH-1A, both serialized and non-serialized coupling sets may be used. DO NOT mismatch serialized coupling halves.

(2) Install clamp bolts (10, figure 7-3) with heads toward shaft rotation.

A (a) On UH-1A, use two washers (11) on each bolt with countersunk sides next to bolt head and nut. Additional washers may be used, equal on both sides for balance.

coupling. Reinstall upper left sections of air intake screen (15) and baffle (14). Close cowling.

e. After first ground run-up or flight, inspect areas around both main drive shaft couplings, in line with coupling clamps, for evidence of grease slinging. (See figure 7-6, details U. V and W.) If there are signs of grease leakage, investigate as follows:

(1) Remove clamp sets to check for grease in grooves.

(2) If no grease is found, reinstall clamps. Watch for further evidence of leakage in next run-up.

(3) If grease is found in clamp grooves, remove shaft and inspect couplings for lubrication and proper installation of O-rings. (Refer to paragraph 7-10.)

7-13. Preparation for Storage or Shipment—Main Drive Shaft. a. Clean and dry main drive shaft in accordance with Specification MIL-P-116.

b. Apply corrosion - preventive compound, (item 315, table 1-1), to unplated steel surfaces.

c. Wrap assembly in grease-proof barrier material, (item 506, table 1-1) and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of assembly.

d. Place drive shaft into contoured bottom cushion of metal container, and align to fit contour.

e. Align top contoured cushion to fit drive shaft and lower into container.

f. Place 10 eight-unit bags (total 80 units) of dessicant, (item 316, table 1-1) in container.

g. Place rubber gasket on lower half of container and install container lid.

h. Install locking ring over lip of container lid and container and secure with bolt and nut. Tighten nut sufficiently to insure a moisture-vapor proof closure.

Section III — Clutches

(Not Applicable)

Section IV — Main Transmission

7-14. Transmission. (See figure 7-8.) The transmission is located directly ahead of engine and is suspended by pylon-isolating mounts on structural supports extending above service deck. The unit is coupled to the engine through a short drive shaft and provides drive angle change and speed reduction, through a train of spiral bevel gears and two-stage planetary gears, to drive the main rotor mast. A freewheel clutch in the input drive quill coupling disengages to allow main rotor and gear train to turn freely when engine is stopped or is idling below rotor-driving speed, as in autorotational descent. Secondary gear trains drive tail rotor shaft, DC generator, rotor tachometer generator, hydraulic pump, and transmission oil pump.

7-15. Output reduction ratios, expressed as revolutions of each driven unit per engine ouput revolution are as follows:

Main Rotor Mast	0.0491
DC Generator	1.0
Tail Rotor Drive Shaft	0.6516
Hydraulic Pump	0.6516
Tachometer Generator (UH-1A)	0.6878
Tachometer Generator (UH-1B)	0.6516
Oil Pump	0.6274

Note

After further reduction in 90 degree gear box, tail rotor turns at 0.25 engine rpm.

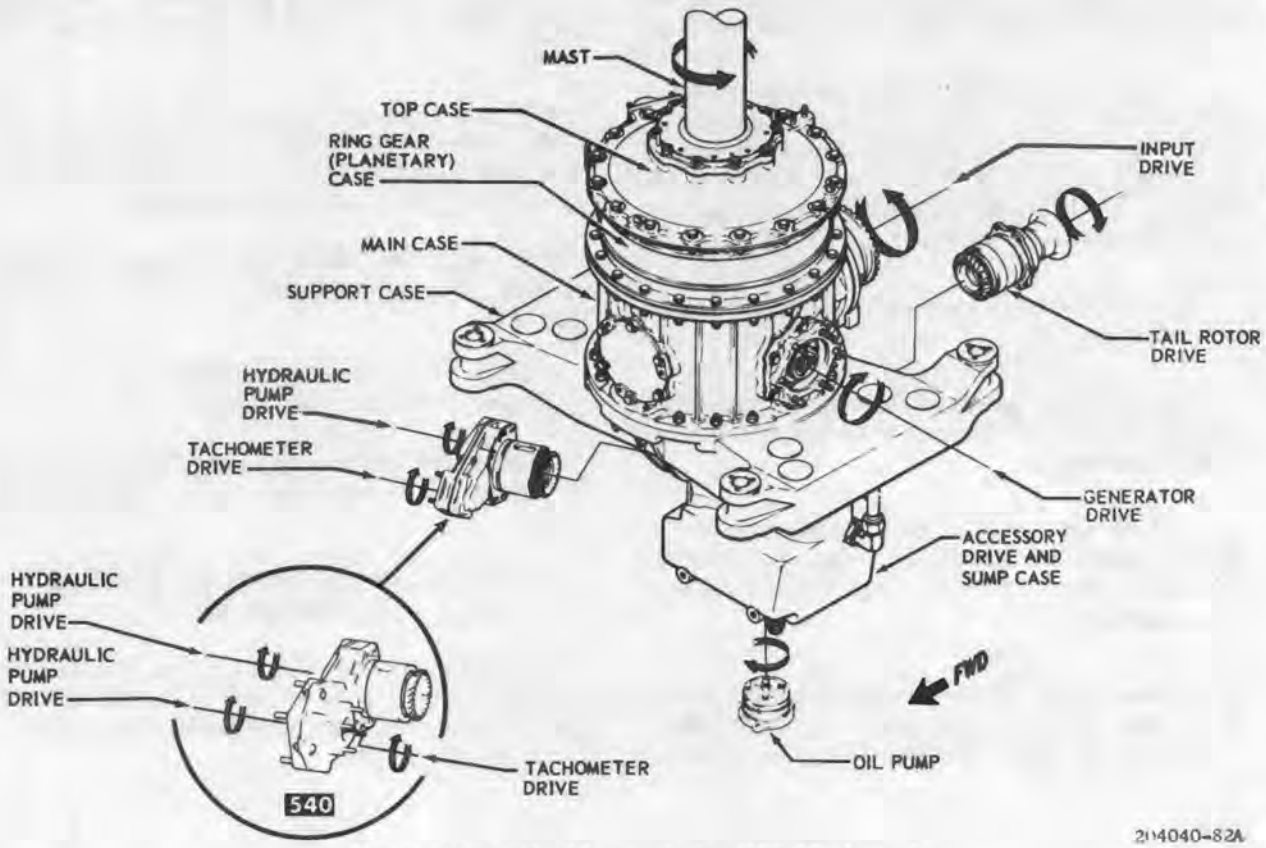


Figure 7-8. Typical transmission (UH-1B shown)

7-16. Transmission Mounts. (See figure 7-9.) A lift-link and pylon isolation mounts are used to attach transmission to the helicopter fuselage. Lift-link is of forged steel with self-aligning end bearings, and is connected between forward underside of transmission support case and a fuselage beam directly below. Four isolation mounts are located on pylon supports under corners of transmission support case. Each consists of a cylindrical molded rubber core bonded between steel outer and inner sleeves, with outer sleeve flange secured on pylon support by four bolts. A large mount bolt extends up through mount inner sleeve to seat in tapered bushing of transmission support case leg, and is secured by a retaining bolt installed from top through a broad special washer and threaded into tapped upper end of mount bolt. Silicone rubber protective boots, with supporting bushings, cover both ends of mount.

Note

It is important to note that a properly installed boot will extend the service life of the mount by keeping it free and clean of oil contamination. Any boot that is ripped or cut should be replaced.

B 7-17. On UH-1B, because of longer mast and increased engine power, two aft pylon isolation mounts are restrained by friction dampers and a fifth isolation mount is used. Friction dampers are cylindrical units connected between lower ends of aft main mount bolts and fittings on deck structure. Fifth isolation mount is similar to four main mounts, and is located at center aft of pylon on a support fitting bridged across rear side of pylon supports. Mount bolt has a self-aligning bearing at upper end, which is attached by a bolt to middle of a welded beam extending between aft legs of transmission support case.

7-17A. ***Inspection — Mount Boots.*** Inspect mount boots for proper installation and deterioration. Any boot that is deteriorated, ripped or cut should be replaced. If vibration, roughness or mount bottoming is noted, mount must be inspected for bond separation between rubber core and inner and outer sleeves using a 0.010 feeler

gauge. Any separation exceeding ¼ inch maximum depth for ⅓ the circumference or if separation exceeds ¾ of an inch at any one point, the mount should be replaced.

Caution

Exercise care in inserting feeler gauge to eliminate damaging rubber core.

7-17B. ***Installation — Pylon Brace.*** (See figure 7-8A.) a. Position pylon brace (1) in channel (2) and bracket (3) and align holes.

b. Install attaching bolts, washers, and nuts.

Note

Be sure to install bolt (4) with head inboard (towards transmission) as shown on figure 7-8A. Improper installation may cause damage to transmission lower support case.

7-18. Transmission Oil System. (See figure 7-10.) Transmission oil system is self-contained and entirely separate from that of engine. Oil supply in sump case is delivered under pressure from a mechanically driven pump through a filter to a series of internal passages, external tubes, and manifolds which constitute an oil pressure line. Distribution is through jets and internal channels to lubricate bearings and gears inside transmission, where oil drains back to sump. An adjustable relief valve regulates system pressure at 50 (plus or minus 5) psi. Oil temperature and pressure gage indications are provided by a thermobulb and a pressure transmitter. A thermoswitch and a pressure switch will light caution panels

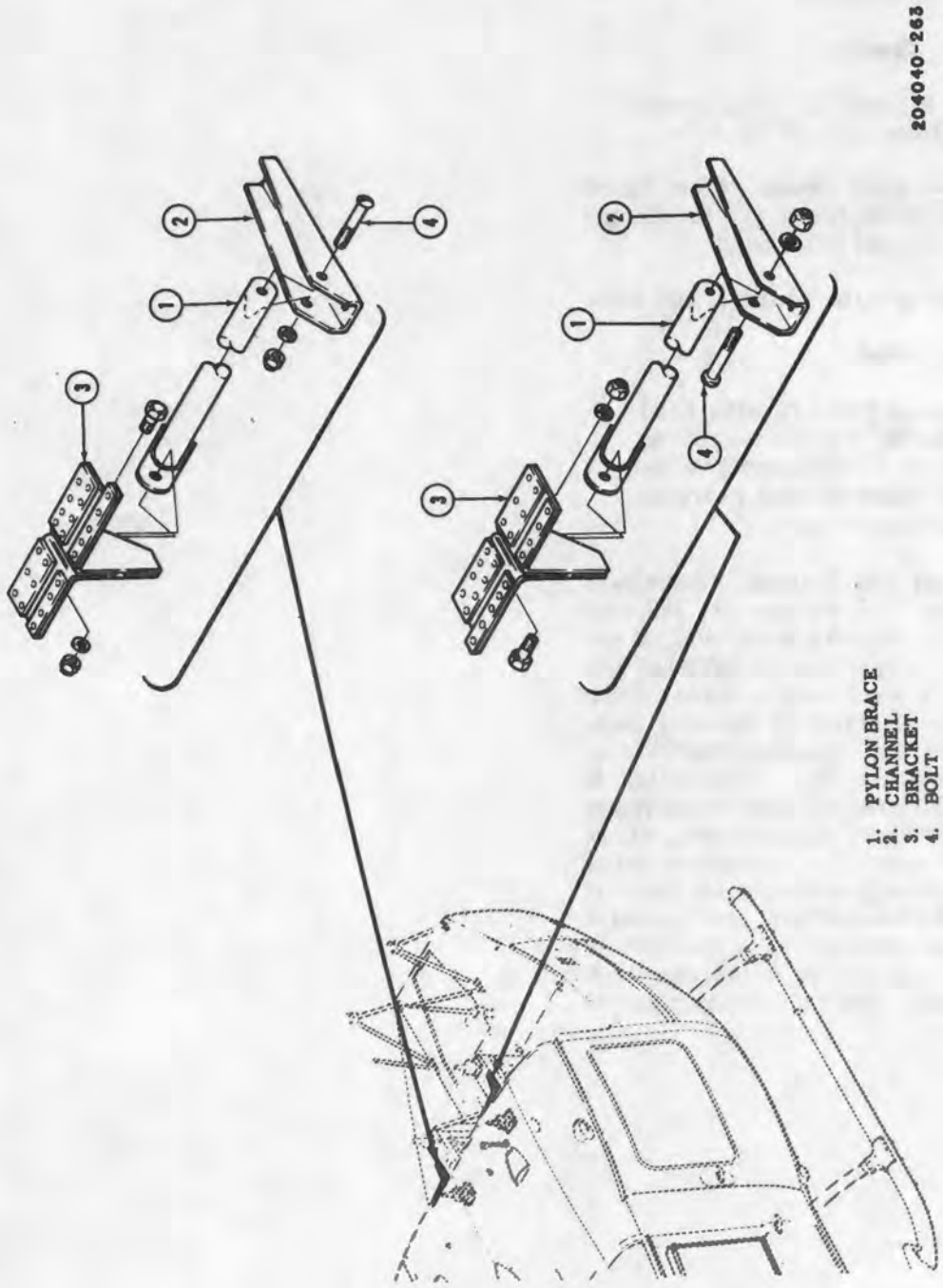
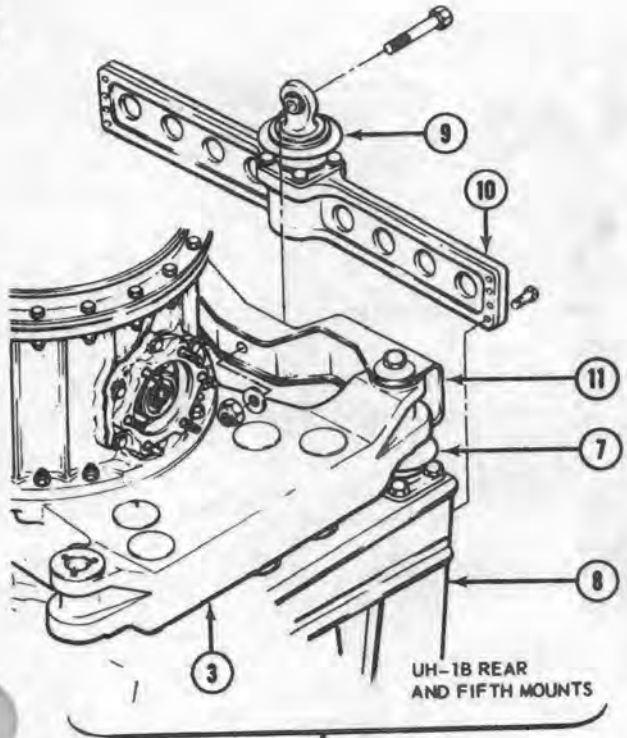
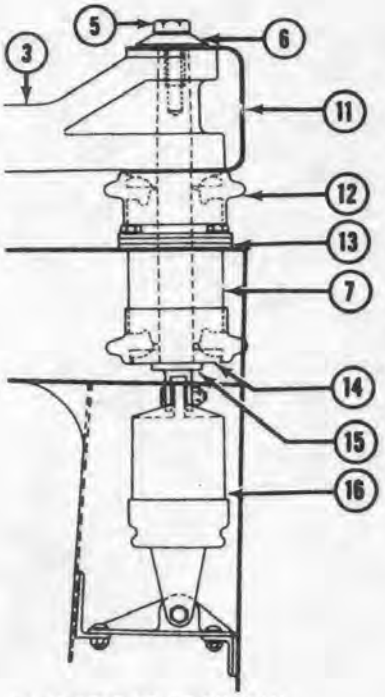


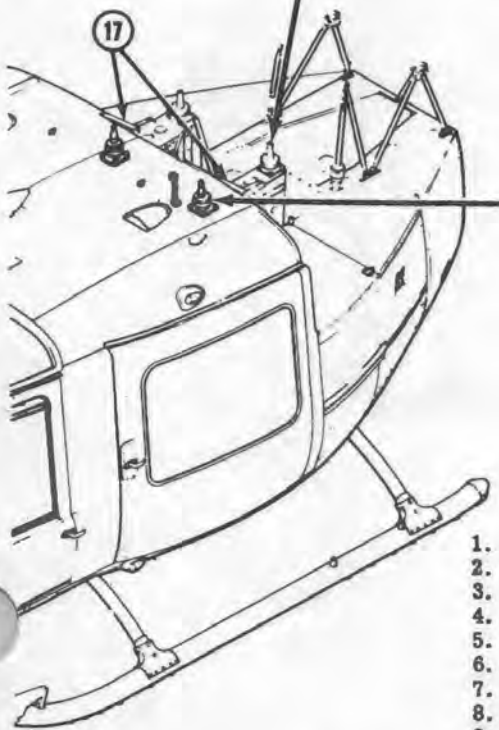
Figure 7-8A. Pylon brace installation

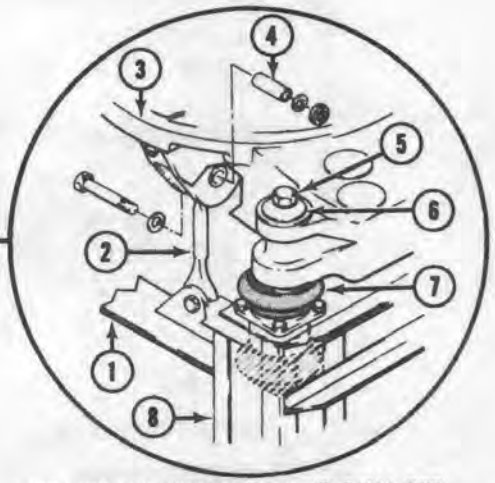


UH-1B REAR
AND FIFTH MOUNTS



UH-1B REAR MOUNT DIAGRAM





LIFT LINK AND PYLON MOUNT – TYPICAL FOR
UH-1A MAIN MOUNTS AND UH-1B FORWARD MOUNTS.

1. Fuselage Beam
2. Lift Link
3. Transmission Support Case
4. Spacer
5. Retaining Bolt
6. Shouldered Washer
7. Mount Assembly
8. Pylon Support
9. Fifth Mount
10. Support Fitting
11. Support Beam
12. Protective Boot
13. Filler
14. Boot Support Bushing
15. Mount Bolt
16. Friction Damper
17. Pylon Brace

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Figure 7-9. Transmission pylon mounts and lift link

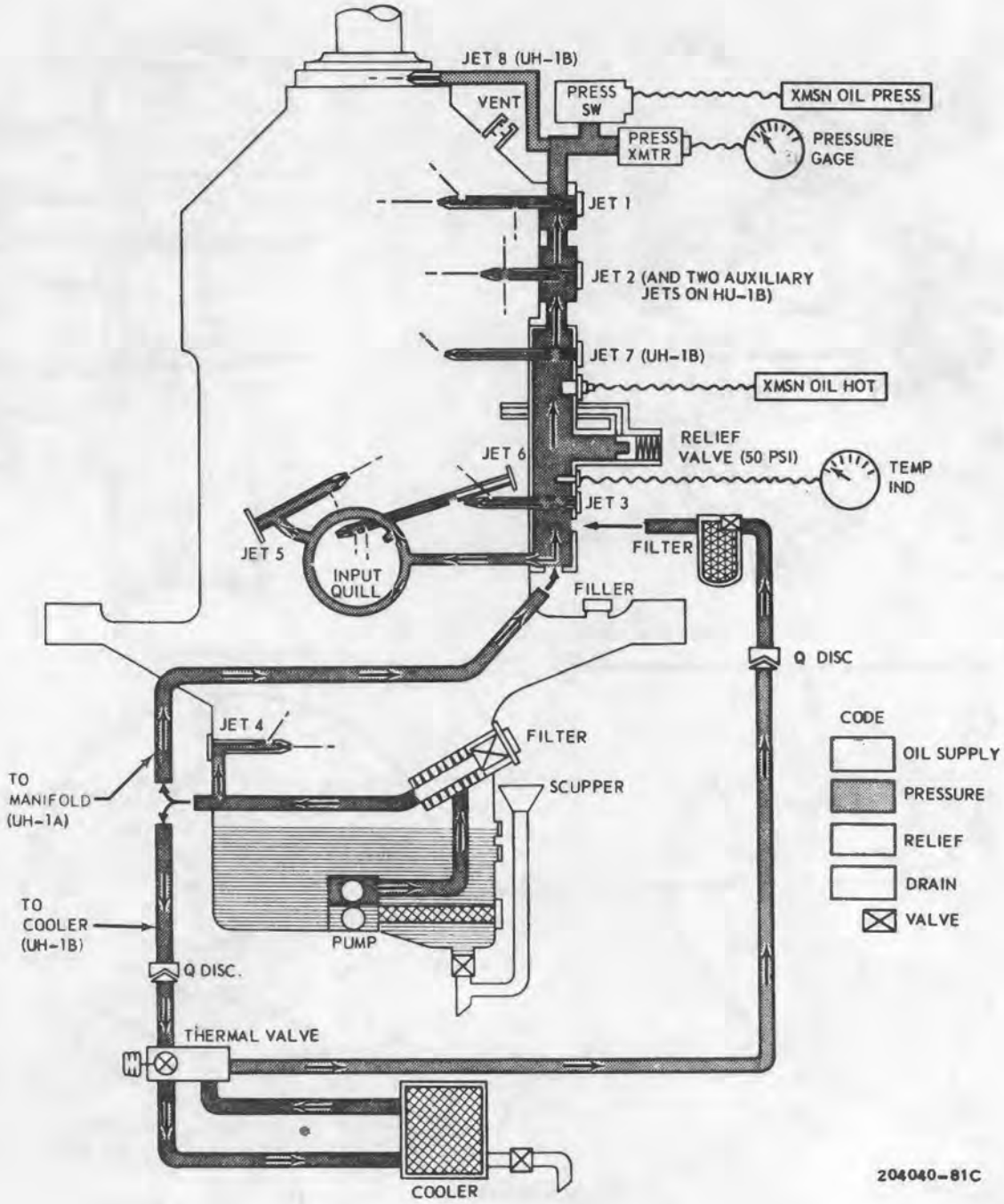

Figure 7–10. Transmission oil system schematic

7-45. *Installation – Thermobulb.* a. Lubricate threads and gasket with transmission oil and install gasket on thermobulb.

b. Install thermobulb in oil manifold. Lockwire to adjacent bolt head on manifold and to pressure relief valve.

c. Connect and lockwire electrical connector.

7-46. *Removal – Thermoswitch.* a. Disconnect electrical leads from thermoswitch terminal.

b. Remove lockwire and unscrew thermoswitch from oil manifold. Remove gasket.

7-47. *Inspection — Thermoswitch.* a. Check thermoswitch for damage and serviceability.

b. Inspect gasket for serviceability.

7-48. *Repair or Replacement — Thermoswitch.* a. Replace thermoswitch if damaged or unserviceable.

b. Replace gasket if damaged or unserviceable.

7-49. *Installation – Thermoswitch.* a. Lubricate threads and gasket with transmission oil, and place gasket on lower end of thermoswitch.

b. Install thermoswitch in top of oil manifold, using not more than 12 inch-pounds torque on hexagon shoulder of switch body.

c. Connect electrical leads, using not more than six inch-pounds torque on terminal stud nut.

7-50. *Removal — Oil Inlet Fitting.* a. Disconnect oil line tube from fitting.

b. Unscrew oil inlet fitting from oil manifold assembly. Remove gasket.

7-51. *Inspection – Oil Inlet Fitting.* a. Inspect threads of oil inlet fitting for damage.

b. Inspect gasket for damage and serviceability.

7-52. *Repair or Replacement – Oil Inlet Fitting.* a. Replace oil inlet fitting if unserviceable.

b. Replace gasket if damaged or unserviceable.

7-53. *Installation – Oil Inlet Fitting.* a. Install gasket on fitting.

b. Install fitting in oil manifold.

c. Attach hose to oil inlet fitting.

7-54. *Adjustment – Transmission Oil Pressure.* Spring-loaded bypass relief valve which regulates transmission oil pressure is readily accessible on manifold at right aft side of main case.

a. If transmission oil pressure indication is unsatisfactory during operation with transmission oil temperature stabilized in normal range, see trouble shooting chart for possible causes. (Refer to paragraph 7-3.)

b. When required, adjust pressure relief valve.

(1) Remove cotter pin passing through holes at top of valve body and slot of valve adjusting screw or back off jam nut on end of adjusting screw.

(2) Turn adjusting screw in to increase, or out to reduce, indicated oil pressure.

(3) Align screw slot with nearest set of holes and install cotter pin after adjustment, or tighten jam nut.

(4) Recheck oil pressure in operation.

c. Replace valve assembly if adjustment cannot be made satisfactory.

(1) Remove lockwire. Use wrench on hexagon shoulder of valve body to loosen and remove valve assembly, with O-ring.

(2) Check that threads of replacement valve are clean and undamaged. Lubricate threads and O-ring with transmission oil, and place O-ring on valve.

(3) Install valve in manifold. Lockwire separately from valve body to thermobulb and thermoswitch.

(4) Recheck oil pressure in operation.

7-55. Transmission Oil Pump. (See figure 7-8) Transmission oil pump is mounted in bottom of sump case. Pump is driven by a splined

shaft from an accessory drive gear train, and turns clockwise as viewed from drive end.

7-56. *Deleted.*

7-57. *Deleted.*

7-58. *Deleted.*

7-59. Transmission Oil Pump Screen. Intake screen for transmission oil pump is a wire mesh cylinder attached to a threaded plug, externally accessible at a marked location on lower right of sump case.

7-60. *Removal — Transmission Oil Pump Screen.* a. Drain oil sump as when removing pump. (Refer to paragraph 7-56.)

b. Remove lockwire from hexagonal plug head below cast legend "PUMP SCREEN." Remove screen assembly with gasket.

7-61. *Cleaning — Transmission Oil Pump Screen.* Wash with dry cleaning solvent, (item 302 table 1-1). Dry with filtered compressed air.

7-62. *Inspection – Transmission Oil Pump Screen.* Check for metallic particles or other material collected on pump screen as indication of oil contamination or internal failure of transmission. Inspect screen for holes or other damage.

Note

Refer to paragraph 7-4 and 7-5 for additional information.

7-63. *Repair or Replacement – Transmission Oil Pump Screen.* Replace screen if torn or damaged.

7-64. *Installation – Transmission Oil Pump Screen.* a. Place new gasket on screen assembly next to plug head.

(3) Install elbow, with nut and packing, in drain port at bottom of cooler with elbow pointing to right.

b. Position cooler in bulkhead opening from aft side. Secure to engine oil cooler with two pairs of bolts, nuts and washers at top and bottom of mating flanges.

c. Install four bolts, with thin washers under heads, through slotted holes of forward cooler flange in plate-nuts of bulkhead flange.

d. Reinstall turbo blower and duct.

e. Check installation of thermal valve support bracket (30) on bolts through flanges of cooling fan at upper right side.

f. Install thermal valve assembly (29) and connect oil lines as follows:

(1) Position valve assembly (29) with valve at bottom and flat side of valve body against support bracket (30).

(2) Install two bolts from right-hand side through support bracket (30) and valve body. Use thin aluminum alloy washers next to valve body on each side. Loosely install nuts.

Note

Elongated mounting holes in support bracket (30) permit slight movement of the valve assembly (29) to facilitate connection of oil lines.

(3) Install oil line between cooler outlet elbow and lower fitting on front of valve assembly (29).

(4) Install oil line between upper fitting on front of valve assembly and inlet elbow on top, right-hand side of oil cooler (32).

(5) Position clamp (34) on inlet fitting at top of valve assembly (29).

(6) Install oil line between deck fitting at left forward corner of compartment above oil cooler (32) and inlet fitting on top of valve assembly (29).

(7) Connect oil line extending through bulkhead at right of oil cooler (32) to outlet elbow on aft side of valve assembly (29).

(8) Tighten bolt, washers, nut combination securing valve assembly (29) to support bracket (30).

(9) Position valve assembly stiffener bracket (35) between clamp (34) and cooling fan with elongated hole in bracket positioned to clamp. Attach bracket to cooling fan with existing hardware. Attach stiffener bracket (35) to clamp (34) with screw, washer and nut.

Note

Elongated holes in thermal valve support bracket (30) and valve assembly stiffener bracket (35) permit necessary adjustment to insure a non-stressed positioning of parts.

g. During first ground run after installing cooler, check for oil leaks and for need to add oil because of filling empty lines and cooler.

Caution

Cooler and long vertical connecting lines should be filled with oil to extent possible during reinstallation. Shut down and check oil after short period of operation, to avoid possibility of sump oil supply being taken into an unfilled external system.

7-82. Main Rotor Mast. The main rotor mast assembly is a tubular steel shaft fitted with two bearings, which support it vertically in the transmission. Mast driving splines are engaged with transmission upper stage planetary gear providing counterclockwise rotation as viewed from above. Splines on upper portion of mast provide mounting for main rotor and control assemblies.

7-82A. Inspection — Main Rotor Mast Assembly. a. Inspect main rotor mast for pitting and scratches exceeding 0.010 inch in depth.

b. Inspect mast sleeve assembly as follows.

(1) Remove safetywire securing boot above collective sleeve friction assembly. Slide boot up mast to clear work area.

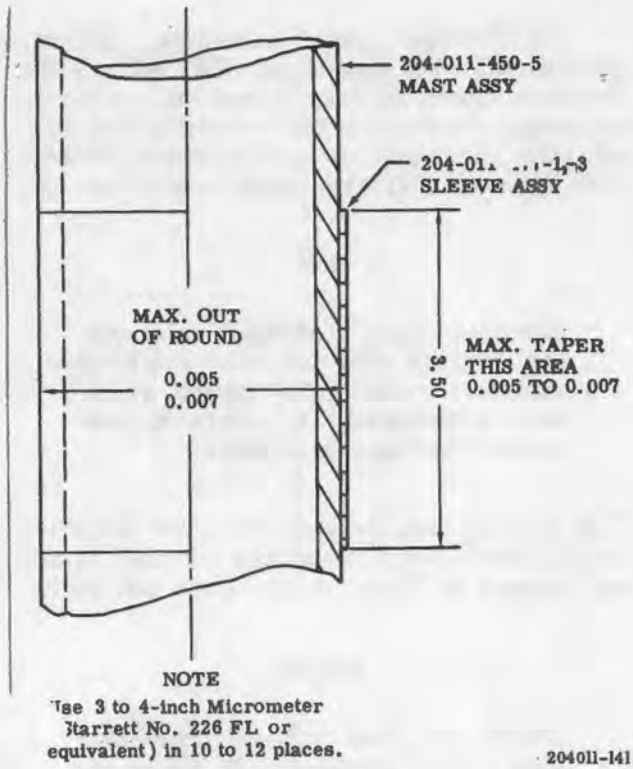

Figure 7-14A. Sleeve assembly inspection criteria

Note

Permissible bond void between mast assembly, P/N 204-011-450-5 and sleeve, P/N 204-011-477-1, is ¼ inch depth around circumference of mast at each end.

(2) Disconnect collective system boost cylinder to collective lever push-pull tube. Move collective levers to expose sleeve.

(3) Use soft carbon pencil to lay out reference marks 90° apart, four places, along entire length of sleeve.

(4) Use standard three to four inch micrometer to check sleeve for taper and out-of-round over full length using reference marks. Maximum allowable taper or out-of-round is 0.007 inch in areas shown on figure 7-14A.

7-82B. *Repair or Replacement — Main Rotor Mast Assembly.* If allowable tolerances permitted in paragraph are exceeded, replace mast assembly.

7-83. *Deleted.*

Pages 7-35 through 7-36A Deleted

Figure 7-16 Deleted

7-91. Input Drive Quill. An input drive quill equipped with a freewheel coupling is located on aft side of transmission main case section. Engine torque is transmitted through main drive shaft to this input quill, which drives transmission gear trains. Freewheel clutch in drive quill coupling operates automatically, engaging to allow engine to drive rotor or disengaging the idling engine during autorotational descent.

7-90. *Deleted.*

7-92. *Deleted.*

7-93. *Inspection—Input Drive Quill.* Inspect drive quill for security of mounting, evidence of oil leakage, damage and corrosion.

7-93A. *Repair or Replacement—Input Drive Quill.*
a. Replace O-ring packings on drive quill sleeve as necessary to prevent oil leakage. On UH-1B, also replace O-ring packings as necessary on oil tube.

b. Replace input drive quill as a complete assembly when quill does not meet inspection requirements.

Page 7-38 Deleted.

7-96. Generator Drive Quill. Drive quill for 28 volt DC electrical system generator is located on left side of transmission main case. (See figure 7-8.) This quill is driven from input bevel gear train, at same speed as input to transmission.

7-97. Deleted.

7-98. Inspection — Generator Drive Quill. a. Inspect O-ring packing for damage and serviceability.

b. Inspect quill for damage or corrosion.

7-98A. Repair or Replacement — Generator Drive Quill. a. Replace O-ring packing on quill sleeve if damaged or unserviceable.

b. Replace drive quill as a complete assembly when quill does not meet inspection requirements.

7-99. Deleted.

7-100. Deleted.

7-101. Hydraulic Pump and Tachometer Drive Quill. (See figure 7-8.) This drive quill is located on right side of transmission sump case and is driven by an accessory gear train. On UH-1A and UH-1B (Serial No. 60-3546 through 64-14100) helicopters the gear shaft of this quill directly drives the single hydraulic system pump. It also drives the rotor tachometer generator by means of a chain-and-sprocket offset drive. The quill used on UH-1B helicopters Serial No. 64-14101 and subsequent is also located on the right side of transmission sump case and is driven by an accessory gear train. The gear shaft of this drive quill activates a gear train, rather than a chain-and-sprocket type drive. The gear train drives the two hydraulic system pumps used on these helicopters as well as the rotor tachometer generator.

7-102. Deleted.

7-103. *Inspection — Hydraulic Pump and Tachometer Drive Quill.* Inspect drive quill for security of mounting, evidence of oil leakage, damage and corrosion.

7-104. *Repair or Replacement — Hydraulic Pump and Tachometer Drive Quill.* Replace drive quill as a complete assembly when quill does not meet inspection requirements.

7-105. *Deleted.*

7-106. Tail Rotor Drive Quill. Tail rotor drive shaft is driven from a transmission output quill located in aft side of sump case. (See figure 7-8.) This quill is driven by an accessory gear train, and is provided with a flexible splined coupling.

7-107. *Deleted.*

7-108. *Inspection—Tail Rotor Drive Quill.* Inspect quill for security of mounting, evidence of oil leakage, damage and corrosion.

7-109. *Repair or Replacement — Tail Rotor Drive Quill.* Replace tail rotor drive quill as a complete assembly when quill does not meet inspection requirements.

7-110. *Lubrication—Tail Rotor Drive Quill Coupling.* Internal splines of coupling on tail rotor drive quill are packed with grease during assembly. If need occurs between normal overhaul periods, coupling splines can be repacked as described below. This procedure can be accomplished with drive quill in place on transmission, with drive shaft disconnected.

a. Remove spiral lock-ring from coupling, while holding seal plate against spring pressure.

b. Remove seal plate and spring.

c. Hold coupling at full outward position. Remove all old grease and clean coupling splines thoroughly.

Note

If solvent is used for cleaning make sure that couplings are thoroughly dry before repacking.

d. Hand pack grease to 0.12 inch deep over top of internal spline teeth. Use lubricant, (item 9, table 1-1.)

e. Keeping coupling at full outward position, reinstall springs, seal plate, and spiral lock-ring.

7-111. *Deleted.*

Page 7–40A deleted.

Section V — Tail Rotor Drive Shaft

7-112. Tail Rotor Drive Shafts. (See figure 7-1.) Five identical drive shaft sections are incorporated in power train between transmission tail rotor drive quill, three bearing hanger assemblies and an intermediate gear box on tail boom, and a tail rotor gear box on the vertical fin. Each shaft section is an anodized aluminum alloy tube with a curvic coupling riveted to each end, and is statically balanced by metal strips bonded near middle on tube surface, with an identification plate showing part and serial numbers. Forward shaft section extends through a tunnel between engine firewalls, with ends connected by V-band clamps to mating curvic couplings on transmission tail rotor drive quill and on forward bearing hanger. Other shaft sections are mounted in similar manner along tail boom and vertical fin between hangers and gear boxes.

7-113. *Removal — Tail Rotor Drive Shafts.* a. Open hinged access doors along top of tail boom and vertical fin by releasing fasteners on left side. Also remove tailpipe fairing, and vented cover over intermediate gear box, as necessary.

b. Remove clamp set from coupling at each end of shaft. Push shaft against flexible coupling to disengage opposite end, and lift out shaft. Remove other shafts aft of forward bearing hanger in same manner.

Caution

Clamp set must be removed from both ends of shaft before removing either end of shaft from its mating curvic coupling to avoid coupling tooth or bearing damage.

c. To remove forward shaft, also open cowling at either side of transmission to remove clamp set from tail rotor drive quill coupling. With tailpipe fairing removed and shaft disconnected from forward hanger coupling, disengage and remove shaft carefully rearward and to right through firewall tunnel.

7-114. *Cleaning — Tail Rotor Drive Shafts.* Clean all shaft surfaces with dry cleaning solvent (item 302, table 1-1) with care to avoid marring anodized surfaces.

7-115. *Inspection — Tail Rotor Drive Shafts.* a. Replace shaft for any of the following conditions:

(1) Any crack.

(2) Any sign of rivet failure.

(3) Total indicated run-out, using dial indicator and V-blocks, in excess of 0.050 inch at any area on shaft. No straightening procedures are prescribed.

(4) Loss or partial detachment of balance strips which are bonded on tube near center.

Note

Do not mistake a single empty imprint, in bonding material next to balance strip, as an indication of a missing balance strip. This spot results from removal of a test coupon to inspect for bonding voids.

(5) Damaged or excessively worn curvic coupling teeth. There should be no radial play or back lash between mating teeth when fully meshed with V band clamp removed.

(6) Grooves worn by V-band clamp on shaft coupling to extent that such wear prevents proper clamping.

(7) Surface damage of shaft tube exceeding limits in b. below.

b. Classify surface damage on shaft tube as acceptable, repairable, or excessive by following limits. Define "Area A" as central portion of shaft, and "Area B" as portions within 14 inches of ends. (See figure 7-18.)

(1) Any damage to anodized finish requires anti-corrosion treatment in accordance with TM 55-405-4.

(2) Nicks or scratches aligned within 15 degrees of spanwise axis are acceptable without repair to maximum depth of 0.002 inch in "Area A" or 0.004 inch in "Area B."

(3) Other nicks or scratches must be polished out with fine abrasive cloth, provided depth of material removed does not exceed 0.008 inch in "Area A" or 0.012 inch in "Area B."

Note

Shaft must be checked for balance if total worked surface area of one side exceeds eight square inches, when compared with other side.

(4) Sharp dents are permissible to maximum depth of 0.010 inch in "Area A" and 0.015 inch in "Area B."

(5) Nonsharp dents are permissible to maximum depth of 0.020 inch in "Area A" and 0.030 inch in "Area B."

Note

All dents should be carefully inspected for cracks, nicks, and scratches. No cracks permitted. Nicks or scratches shall be within limits. Total depth of defect shall not exceed limits for dents.

7-115A. ***Inspection —Steel Tail Rotor Drive Shaft Clamps.*** a. Inspect clamps for distortion or burrs on clamping surface.

b. Inspect length of welds. Minimum length should be 0.500 inch.

c. Inspect clamp bolts for stripped or damaged threads and self-locking nuts for serviceable condition.

d. Inspect spot welds for evidence of failure.

e. Steel clamps may be inspected by Magnetic Particle method.

7-115B. ***Inspection — Aluminum Tail Rotor Drive Shaft Clamps.*** a. Inspect bolt holes for wear, nicks and scratches.

b. Inspect spot face, lug fillets and internal "V" groove for nicks and scratches in excess of 0.008 inch, and gouges or wear pattern extending into the fillet radius at bottom of internal "V".

c. Inspect all remaining surfaces for nicks and gouges exceeding 0.010 inch.

d. Aluminum clamps may be inspected by Fluorescent Penetrant method.

7-115C. ***Repair or Replacement — Tail Rotor Drive Shaft Clamps.*** Replace clamp sets which do not meet inspection requirements. (Refer to paragraph 7-115A and 7-115B.)

Note

Replace clamps as sets. Both halves of each set must be from same forging vendor and forging lot.

Note

Do not use intermix different part numbered nuts. All nuts used to install any clamp must have the same part number.

7-116. ***Repair or Replacement — Tail Rotor Drive Shafts.*** a. Replace shaft if dented or bent or failure to meet inspection requirements (Refer to paragraph 7-115).

b. Replace shaft for loss or partial detachment of balance strips which are bonded on tube near middle.

c. Replace shaft if damaged or excessively worn curvic coupling teeth are found.

d. Replace unserviceable clamp sets, bolts or nuts that fail to meet inspection requirements (refer to paragraph 7-115A or 7-115B.)

7-117. ***Installation — Tail Rotor Drive Shafts.*** a. Engage shaft couplings with mating and flexible couplings. Install clamp sets at each end, with nuts trailing direction of rotation, and with bolted joints indexed 90 degrees to those of adjacent clamps for balance in operation.

b. Tighten clamp bolts evenly. Use 20 to 25 inch-pounds torque for tee bolt type clamps, or 30 to 35 inch-pounds for through bolt type. Tap around outer surface to seat clamp and recheck torque.

c. Install tailpipe fairing or gear box cover as required. Close access doors and cowling.

7-118. Drive Shaft Hangers. Three hanger assemblies connect and support tail rotor drive shafts along top of tail boom. Each assembly consists of couplings on a short, splined shaft, mounted through a single-row sealed ball bearing in a ring-shaped hanger equipped with two mounting lugs for attachment on a support fitting.

7-119. *Removal — Drive Shaft Hangers.* a. Open hinged access doors along top of tail boom by releasing fasteners on left side.

b. Remove tail rotor drive shafts from each side of hanger. (Refer to paragraph 7-113.)

c. Remove bolt, with nut and washers, at each side to detach any hanger assembly from its support fitting.

7-120. *Cleaning — Drive Shaft Hangers.* Clean exterior surfaces by wiping with cloth moistened with dry cleaning solvent, (item 302, table 1-1).

Caution

Do not permit solvents or dirt to be forced into bearing or flexible coupling by use of compressed air for drying or cleaning.

7-121. *Inspection — Drive Shaft Hangers.* a. Check hanger assemblies for excessive bearing wear, roughness or binding.

b. Inspect hanger ring and attachment lugs for cracks, elongated bolt holes, or other visible damage.

c. Inspect couplings for damage or excessive wear using same standards as for couplings on drive shaft. (Refer to paragraph 7-115.)

d. Inspect bearing seal for leakage.

e. Inspect hanger support fitting, in place on tail boom for security of attachment and evidence of cracks or other damage.

Caution

Do not attempt to remove or change shims under fittings.

7-122. *Lubrication — Drive Shaft Hanger Bearings.* Bearings may be lubricated in the field as follows; except for bearing P/N 204-040-623-1.

Warning

Postively identify bearing before lubrication by the following procedure. Bearing P/N 204-040-623-1, SHALL NOT be lubricated. This bearing utilizes a special lubricant. Any attempts to lubricate this bearing will result in seal damage which is cause for bearing rejection. Bearing must be replaced.

Caution

The drive shaft hanger bearings are single row, double sealed ball bearings packed with grease by the bearing manufacturer. No attempt should be made to repack these sealed bearings.

Note

These instructions do not constitute, by defintion, a bearing repack.

Note

Prior to lubrication of bearing, drive train must be disconnected from each side of hanger assembly.

a. Wipe bearing seal area clean as possible using a clean dry cloth.

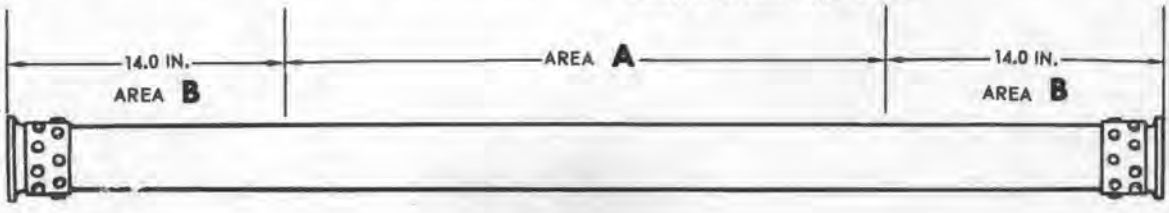

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Figure 7-18. Tail rotor drive shaft inspection diagram

b. Using a hypodermic syringe (Leur Lok, manufactured by Becton, Dickinson Company, or equivalent) 10 cc capacity, fitted with a No. 16 gage needle, one and one-fourth long, filled with grease (item 8, table 1-1), carefully insert tapered portion of needle under lip of bearing seal.

Note

Avoid damage to bearing seal. Any damage to seal is cause for rejection of bearing.

c. Inject 2 cc's of grease at three locations, 120° apart.

d. Wipe off all excess grease.

Note

Lubricate as necessary as required by environmental conditions (100 to 300 hours).

7-123. Repair or Replacement — Drive Shaft Hangers. a. Replace hanger assemblies for excessive bearing wear, roughness or binding.

b. Replace hanger ring or attachment lugs if cracked, holes are elongated or other visible damage exists.

c. Replace couplings if they fail to meet inspection requirements. (Refer to paragraph 115.)

7-124. Installation — Drive Shaft Hangers. a. Position hanger assembly, with flexible coupling forward, on support fitting.

b. Install bolt at each side, with thin aluminum alloy washers next to hanger and fitting, and thin steel washers next to bolt head and nut. Tighten bolts evenly with 50 to 70 inch-pounds torque.

c. Install drive shafts. (Refer to paragraph 7-117.)

Section VI — Intermediate Gear Box

7-125. Intermediate Gear Box. An intermediate gear box is located on tail boom, at base of vertical fin. (See figure 7-1.) This gear box provides a 42 degree change in direction of tail rotor drive shaft, with no speed change. Gear box assembly consists of a case with a gear quill in each end. On UH-1A and UH-1B, Serial No. 60-3546 through 64-14191 helicopters, the case is fitted with an oil filler cap, a vent breather, an oil level sight gage and a drain plug equipped with a magnetic insert. On UH-1B, Serial No. 65-9416 and subsequent helicopters, a chip detector warning system, which activates a warning light on the pedestal caution panel when excessive contamination occurs is used in place of the magnetic plug. Input and output quills have flexible couplings for attachment of drive shafts. Access is provided by a vented cover with quick-release fasteners.

Note

Magnetic plug in earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

7-126. Removal — Intermediate Gear Box. a. When replacing any gear box, unless condition prevents operation, accomplish preservation before removal as follows: Drain oil and service gear box with corrosion-preventive oil, (item 10, table 1-1). Ground run at least ten minutes. Do not drain gear box.

b. Remove gear box cover and open tail rotor drive shaft access doors.

c. Disconnect shafts from gear box input and output couplings. (Refer to paragraph 7-113.)

Caution

To avoid damage to drive shaft hanger bearing or coupling either remove clamp set from both ends of drive shaft before removing either end of shaft from its mating curvic coupling, or support unattached end of shaft to hold shaft aligned on normal operating axis while gear box is removed.

d. Remove lockwire and four bolts, with washers, which secure gear box on tail boom. Lift off gear box assembly. DO NOT attempt to remove shims from mounting points.

e. Remove oil level sight gage retaining ring, glass, O-ring, and indicator disc as required to clean, inspect, or replace parts.

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, disconnect electrical wiring and remove chip detector.

7-127. *Cleaning — Intermediate Gear Box.* a. Clean removed parts and exterior of gear box assembly with dry cleaning solvent, (item 302, table 1-1).

Caution

Do not permit dirt or solvent to be forced into bearings or flexible couplings by use of compressed air.

b. Clean oil level sight glass.

7-128. *Inspection — Intermediate Gear Box.* a. Inspect gear box case for cracks, damage or leakage.

b. Inspect oil filler cap for damage and serviceability.

c. Check O-ring packings for leakage or damage, and vent breather and gasket for damage and serviceability.

d. Inspect sight gage for damage or stain.

e. Inspect magnetic insert for steel particles as indication of gear or bearing wear.

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, inspect chip detector for excessive accumulation of metal particles.

Note

Refer to paragraph 7-4 and 7-5 for additional information.

g. Check condition and security of shims at gear box location on tail boom just ahead of vertical fin.

Caution

Do NOT attempt to remove or change shims installed on tail boom under gear box, as any resulting misalignment could cause excessive stresses, vibration, wear, and possibly eventual failure of components in tail rotor drive train.

7-129. *Repair or Replacement — Intermediate Gear Box.* a. If cracks are suspected in the intermediate gear box case, replace the gear box.

b. Replace oil filler cap, O-ring packings, vent breather or gasket if damaged or unserviceable.

Note

Do not interchange filler caps of 42 degree gear box and 90 degree gear box.

(1) Secure chain of cap by safety pin through drilled hole in case rib at right of filler neck.

(2) Lockwire breather to drilled hole in case rib just ahead.

c. To replace other gear box fittings, drain oil by removing drain plug from right side of gear box.

d. Place O-rings on magnetic insert plug or chip detector and gasket on drain plug, as required. Install plug or chip detector.

e. When installed, lockwire magnetic plug to drain plug.

Note

Lockwire drain plug in accordance with paragraph 7-131, step b.

f. Position sight gage indicator disc in port with indexing tab in notch of inner lip, place O-ring groove around glass, install glass with flat side out, and secure with spiral retaining ring.

7-130. *Lubrication — Intermediate Gear Box.* Fill gear box to sight gage level with oil, (refer to paragraph 1-80.) Splined couplings are lubricated at assembly with handpacked lubricant, (item 9, table 1-1), to 0.12 inch deep over internal spline teeth, in same manner as for tail rotor drive quill coupling. (Refer to paragraph 7-110.)

7-131. *Installation — Intermediate Gear Box.* a. Position intermediate gear box, with oil service fittings at right side, on tail boom shims.

b. Install four bolts through corners of gear box base into plate nuts in tail boom. Use thin aluminum alloy washers next to gear case and thin steel washers next to bolt heads. Tighten bolts evenly and lockwire. Lockwire left rear attachment bolt to left forward attachment bolt. Lockwire right rear attachment bolt through drain plug to right forward attachment bolt.

c. Install drive shafts. (Refer to paragraph 7-117.)

d. On UH-1B, Serial No. 65-9416 and subsequent helicopters, connect electrical wiring to chip detector.

e. Service gear box with oil.

7-132. ***Packaging Intermediate Gear Box.*** a. Clean and dry gear box in accordance with Specification MIL-P-116.

b. Flush gear box with corrosion-preventive compound, (item 10, table 1-1).

c. Wrap assembly in grease proof barrier material, (item 506, table 1-1), and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of gear box.

d. Place gear box in contoured bottom cushion of metal container.

e. Align top contoured cushion to fit gear box and lower in place in container.

f. Place 10 eight-unit bags (total 80 units) of desiccant, (item 316, table 1-1).

g. Install lid (with rubber gasket in place) on lower half of container.

h. Place locking ring on lip of container lid and secure with bolt and nut. Tighten nut sufficiently to insure a moisture-vapor proof closure.

Section VII — Tail Rotor Gear Box

7-133. Tail Rotor Gear Box. A gear box at top of tail boom vertical fin provides 90 degree change in direction of drive and 2.6:1 speed reduction between input drive shaft and its output shaft on which tail rotor is mounted. Gear box consists of mating input and output gear quill assemblies set into a gear case provided with a breather type oil filler cap, an oil level sight gage, and a drain plug which has a magnetic insert plug. UH-1B, Serial No. 65-4916 and subsequent helicopters, are equipped with a chip detector warning system instead of a magnetic insert plug. This system activates a warning light on the pedestal caution panel when excessive contamination occurs. Tail rotor gear box input quill has a flexible coupling for attachment of drive shaft.

Note

Magnetic plug in earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

7-134. ***Removal — Tail Rotor Gear Box.*** a. When replacing any gear box, unless condition prevents operation, accomplish preservation before removal: Drain oil and service gear box with corrosion-preventive oil, (item 10, table 1-1).

b. Remove tail rotor hub and blade assembly. (Refer to paragraph 8-6, 8-50, or 8-96.)

c. Remove pitch control mechanism; or detach cover from fin structure and chain from control cables if replacement of gear box or output gear quill is not required.

d. Remove drain plug at aft underside of gear box to drain oil.

e. Open hinged access door on front of vertical fin and remove or disconnect drive shaft from input coupling of gear box. (Refer to paragraph 7-113.)

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, disconnect electrical wiring and remove chip detector.

g. Detach gear box from support casting on vertical fin by removing nuts and washers from six mounting studs around input coupling. Lift off gear box assembly.

h. Install nuts with suitable spacers on two opposite studs to secure input gear quill in case during handling or shipping.

i. Remove oil level sight gage retaining ring, glass, O-ring, and indicator disc as required to clean, inspect, or replace parts

7-135. *Cleaning — Tail Rotor Gear Box.* a. Clean exterior of gear box assembly, or removed parts, with dry cleaning solvent (item 302, table 1-1).

Caution

Do not permit solvent or dirt to be forced into flexible coupling by use of compressed air.

7-136. *Inspection — Tail Rotor Gear Box.* a. Inspect gear box case for cracks and damage.

b. Check oil filler cap and O-ring packings for serviceability.

c. Inspect magnetic insert for steel particles as indication of gear or bearing wear.

d. On UH-1B, Serial No. 65-9416 and subsequent helicopters, inspect chip detector for excessive accumulation of metal particles.

Note

Refer to paragraphs 7-4 and 7-5 for additional information.

7-137. *Repair or Replacement — Tail Rotor Gear Box.* a. Replace gear box if cracks are found in the tail rotor gear box case.

b. Replace unserviceable oil filler cap or O ring packing as required.

Note

Never interchange filler caps of intermediate gear box and tail rotor gear box.

c. Secure cap chain by safety pin through drilled hole in filler neck boss of case.

d. To replace other gear box fittings, drain oil by removing drain plug.

e. Place O-rings on magnetic plug or chip detector, and gasket on drain plug, as required. Install magnetic plug or chip detector.

f. When installed, lockwire magnetic plug to drain plug, and drain plug to adjacent drilled hole in boss of case.

7-138. *Lubrication — Tail Rotor Gear Box.* Fill gear box to sight gage level with oil. Splined input coupling is lubricated at assembly with lubricant (item 9, table 1-1), handpacked to 0.12 inch deep over internal spline teeth, in same manner as for tail rotor drive quill coupling. (Refer to paragraph 7-110.)

7-139. *Installation — Tail Rotor Gear Box.* a. Remove nuts and shipping spacers from studs at input gear quill flange.

b. Position gear box with studs engaged through support casting at top of vertical fin. Install thin aluminum alloy washer, thin steel washer, and nut on each stud. Tighten nuts evenly with 50 to 70 inch-pounds torque.

c. Install drive shaft, connected to input coupling of gear box. (Refer to paragraph 7-117.)

d. Install pitch control mechanism. (Refer to paragraph 9-63.)

e. Install and rig tail rotor. (Refer to paragraph 9-69.)

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, connect electrical wiring to chip detector.

g. Service gear box with oil.

7-140. *Packaging Tail Rotor Gear Box.* a. Clean and dry gear box in accordance with Specification MIL-P-116.

b. Flush gear box with corrosion-preventive compound, (item 10, table 1-1).

c. Wrap assembly in grease-proof barrier material, (item 506, table 1-1), and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of gear box.

d. Place gear box in bottom contoured cushion of container.

CHAPTER 8
MAIN AND TAIL ROTOR GROUPS

Section I — Scope

8-1. Scope. The purpose of this chapter is to provide all essential information for maintenance personnel to accomplish organizational maintenance on the complete main and tail rotor groups. This information includes a detailed description and chronological instructions as to methods and procedures. It also includes special tools and equipment required for accomplishment of those maintenance phases as are applicable on the Maintenance Allocation Chart. Special tools required for performance of Organizational Maintenance can be found in TM 55-1520-211-20P.

Section II — Main Rotor Hub and Blade

8-2. Main Rotor Hub and Blade Assembly (UH-1A). The main rotor assembly is a two bladed, semi-rigid type employing preconing and underslinging to insure smooth operation. The assembly consists of two all metal bonded blades with corrosion and scuff resistant leading edges, connected to a common yoke through blade grips. The rotor assembly is attached to the mast through a trunnion mounted in pillow blocks to provide a flapping axis and is secured to the mast with a screw type cap. Blade pitch change is accomplished by changing the angle of the blade grips equally and simultaneously with the collective pitch lever. Tilting the rotor, to provide directional control, is accomplished by changing the pitch of each grip independently by means of the cyclic controls. The all metal rotor blades consist of four major sections, the main spar, a core, a trailing edge extrusion and a nose block extrusion all bonded to the skin, with an adhesive applied under heat and pressure.

8-3. *Operation Check — Main Rotor Hub and Blade Assembly (UH-1A).* Runup shall be performed by personnel authorized in accordance with AR95-13.

a. Operate engine at 6400 rpm with a collective setting less than required to become airborne (about 15 psi). Note torque pressure reading.

b. Set engine speed at 4700 rpm and collective the same as for the 6400 rpm. Check blade track.

c. From the track marks determine which blade is high at 4700 rpm. Roll the high blade down by lengthening its pitch link. One flat of rotation of pitch link barrel is equivalent to 3/8 inch of track (for all rpm). Blade trim tabs have no effect on track at 4700 rpm. The correct amount of roll can therefore be determined when trim tabs are improperly set. Once the blades have been rolled into track at 4700 rpm further rolling is not required.

d. Increase engine speed to 6400 rpm with collective positioned as in step a. Check blade track. If the track changes from 4700 to 6400 rpm one blade is climbing with rpm. This blade would also climb with increased airspeed in flight. To prevent blade from climbing bend tab on opposite blade up. One degree of tab is equivalent to 1/16 inch of track at 6400 rpm. If more than eight degrees of tab differential is required the diving blade tab should be set up to eight degrees and the climbing blade tab should be bent down the remaining amount. Use T101422 tool when adjusting trim tabs.

e. After the proper tab setting has been achieved based on ground track fly helicopter

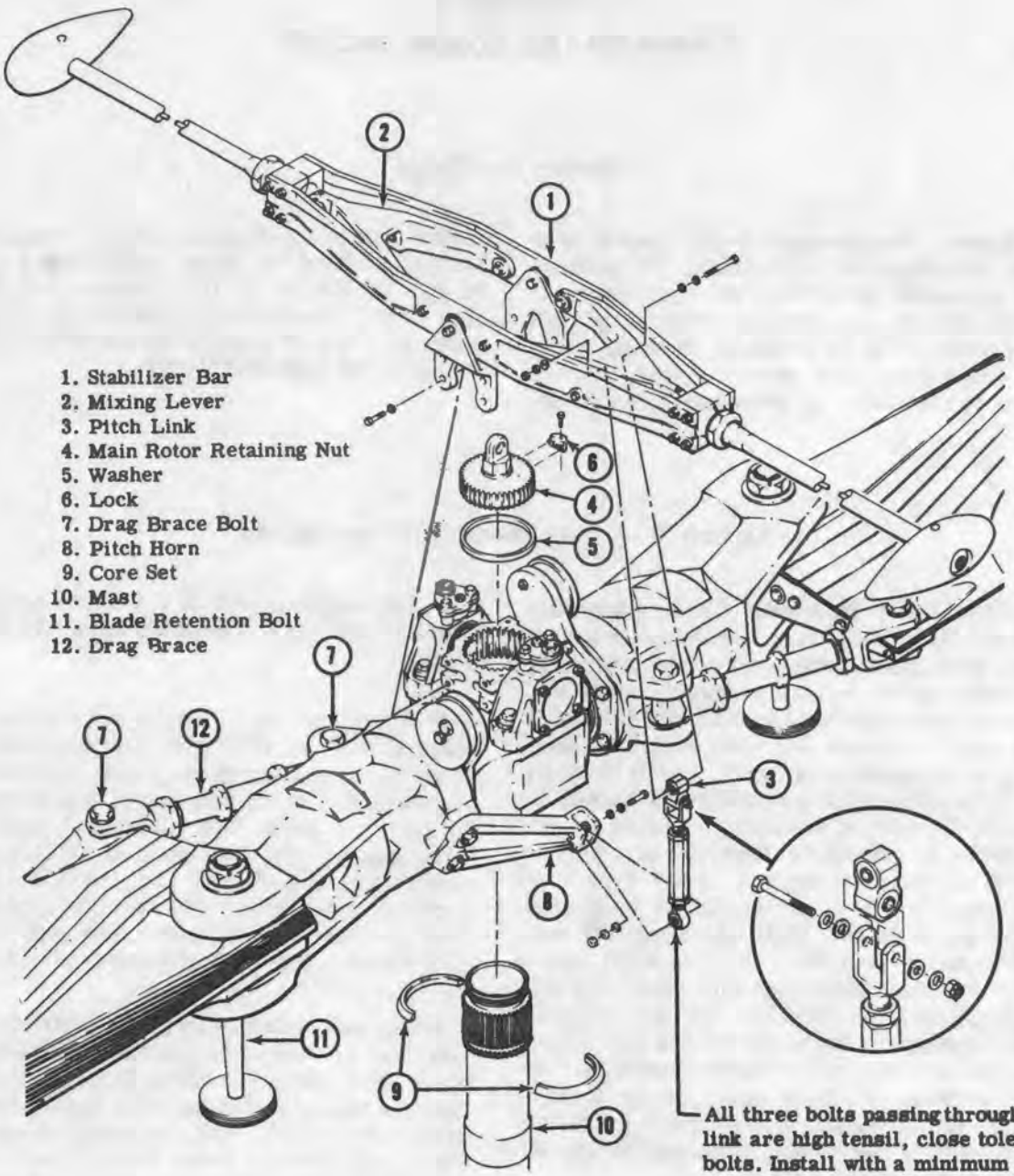

Figure 8-1. Main rotor assembly (UH-1A)

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Figure 8-2. Tracking main rotor blades (UH-1A)

through the operational speed range. If a vertical 1/rev. vibration is encountered at high speeds (the vibration will get progressively worse as speed increases) it will be necessary to refine the trim tab settings. Either an increase or decrease in the amount of tab differential will be required. Above 100 knots as little as one-half degree change in tab settings can be significant.

f. Check rotor balance through full airspeed range.

Warning

At no time will the acorn nut, P/N 204-011-116-1 or 204-010-525-1, be adjusted or tampered with.

g. Correct spanwise balance by installing two-inch masking tape on blade tip. If balance condition becomes worse remove tape and install on opposite blade. Balance to the best one-half wrap of tape.

h. When the correct amount of tape has been determined remove it and replace with lead installed in the blade retention bolt on the same side. One wrap of tape is equivalent to 3.1 ounces in the blade bolt.

i. Correct chordwise balance by selecting one drag brace and sweep blade aft by one full turn on the drag brace.

j. If improvement is noted continue sweeping selected blade aft until rotor is operating smoothly. Adjustment up to two flats is permissible on the A rotor which normally exceeds requirements.

k. If the condition becomes worse after making adjustment return blade to its original position and make similar adjustment to the opposite blade.

8-3A. Troubleshooting—Main Rotor Group. (UH-1A). Indications of troubles and their corrections are as follows.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1:1 Lateral vibration approximately five beats/second	Spanwise out of balance	Dynamically balance with weight in blade bolt
	Chordwise out of balance	Dynamically balance by sweeping blade
	Stabilizer bar out of balance	Balance stabilizer bar
1:1 Vertical vibration a. In hover and forward flight	Rotor out of track	Track rotor blades
b. In forward flight, but not in hover	Climbing blade	Compare high and low rpm track and adjust
2:1 Vibrations approximately 10 beats/second	Transmission mounts deteriorated	Replace mounts
	Loose or worn drag brace bolts or elongated holes	Replace bolts or components having elongated holes.
Collective pitch control forces not normal in cruise (Boost off)	Incorrect counterweights on rotors	Adjust counterweights
Rotor rpm high or low in autorotation	Minimum pitch blade angle incorrect	Adjust both pitch control links (increase or decrease length of both links equally)

8-4. *Checking Main Rotor Counterweight Adjustment (UH-1A).* At approximately 60 knots I.A.S. in cruise flight with hydraulic boost off the collective control should have a neutral or light force between 15 and 20 pounds of engine torque. Above 20 pounds torque collective shall become increasingly negative and below 15 pounds torque it shall become increasingly positive but should not be unmanageable. If applied force is greater when increasing collective pitch more counterweight is required and conversely if applied force is greater when decreasing collective pitch, less counterweight is required. Refer to paragraph 8-5 for allowable counterweight limits.

Note

Due to the irreversible valves incorporated in the boost system improperly adjusted counterweights may not be evident for fixed collective control positions.

8-5. *Counterweight Limits (UH-1A).* A maximum of 20 counterweight washers are used on hub assemblies Part No. 204-010-190-1 and -5. A maximum of 76 counterweight washers are used on hub assemblies Part No. 204-010-190-3, -7 and -9.

8-6. *Removal — Main Rotor Hub and Blade Assembly (UH-1A).* a. Remove pitch links and install grip positioning links, T101348, to hold grips and blades in position. (See figure 8-3.)

b. Remove stabilizer bar assembly (1, figure 8-1). (Refer to paragraph 8-23.)

c. Cut safety wire and remove bolt and lock (6).

d. Remove retaining nut (4) using wrench T101358.

e. Install blade tie-down block to guide rotor while removing.

f. Install hoisting sling and using hoist T101413, lift off hub and blade assembly. Place hub on a stand and support blades. Remove split cones (9) from mast.

8-7. *Installation — Main Rotor Hub and Blade Assembly (UH-1A).* Installation of the main rotor hub and blade assembly shall be accomplished as follows.

Caution

All three bolts passing through the pitch link (3, figure 8-1) are high tensile close tolerance bolts. Install with a minimum of two steel washers under the head and two steel washers under the high castle nut and torque 80 to 100 inch pounds.

a. Install grip positioning links T101348 on grips. Install hoisting sling on hub assembly and with T101413, position rotor assembly over mast.

b. Lubricate splines with oil (item 8, table 1-1). Install cones (9) in groove in upper set of splines on mast with bevel side up to mate with bevel in hub trunnion.

c. Align mast and hub master splines and lower rotor onto mast and split cones.

Caution

Rotor must be aligned directly over mast to prevent damage to threads on mast.

d. Install washer (5) and nut (4). Torque nut 520 to 780 foot-pounds using wrench T101358.

e. Install lock (6) and lockwire bolt to hole in trunnion.

f. Install stabilizer bar. (Refer to paragraph 8-26.)

g. Remove grip positioning links. Adjust pitch links (3) to 8.80 inches between upper hole in universal fitting and lower hole in link assembly. Torque jam nuts on link assembly to 480 to 600 inch-pounds.

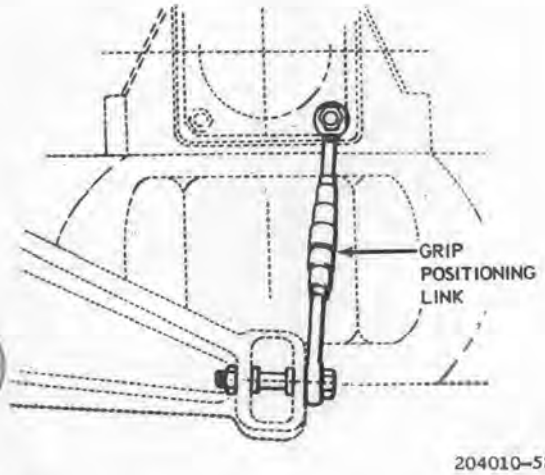


Figure 8-3. Grip position links installed (UH-1A)

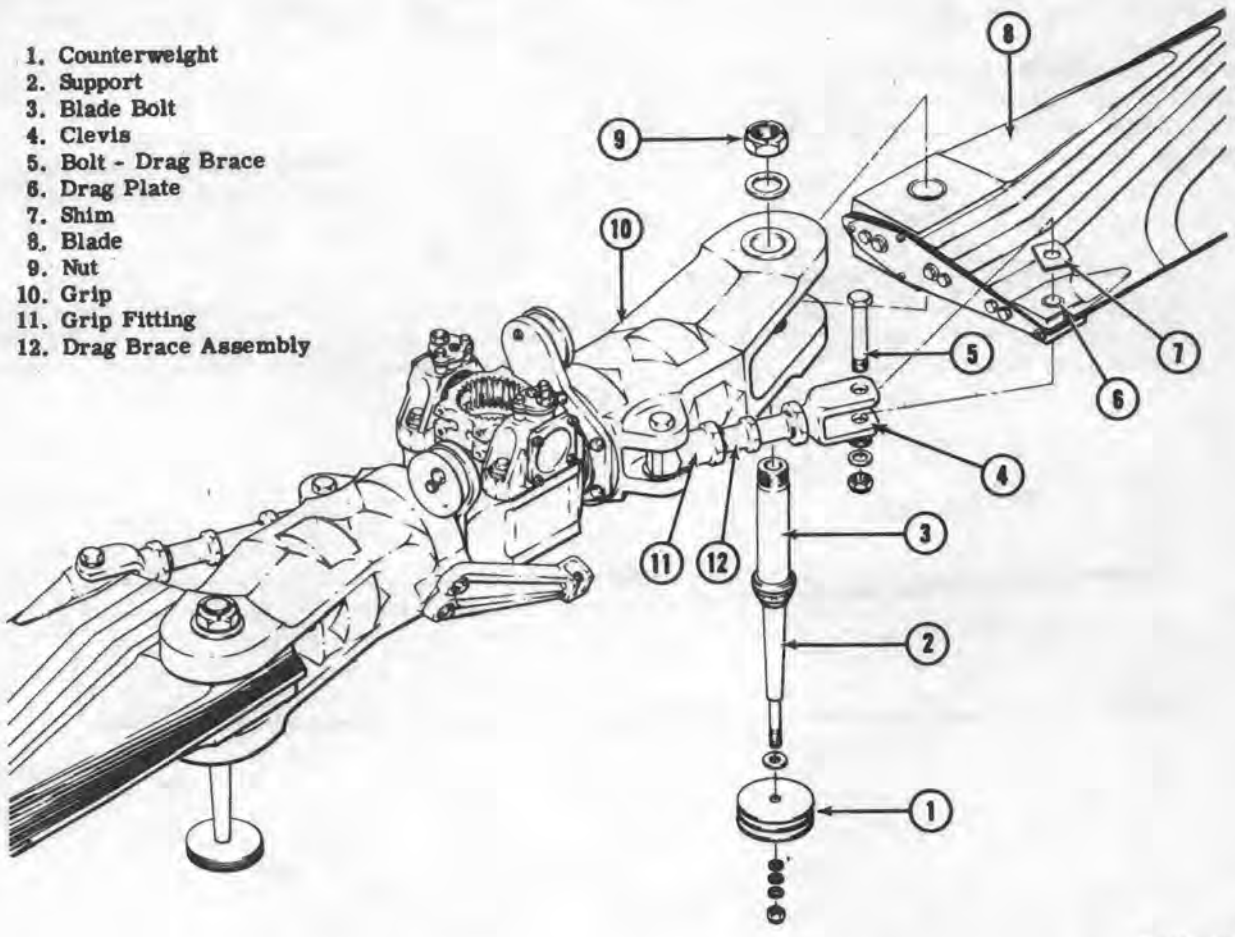


Figure 8-4. Main rotor hub and blade assembly (UH-1A)

h. Check low pitch position of grips for a plus reading of ten degrees, plus or minus one-half degree, by placing a protractor chordwise on the outboard machined surface of the blade grip. Set blade in above position and hold in place while taking a protractor reading on the opposite blade. Adjust pitch change links equally until a total reading of twenty degrees, plus or minus one-half degree is obtained. Torque jam-nuts on link assembly 480 to 600 inch-pounds.

Note

If rotor overspeeds in autorotation shorten links equally. If rotor underspeeds, lengthen links equally. Normal rpm range is 285 to 314 (refer to TM 55-1520-211-10).

8-8. Main Rotor Blades (UH-1A). The two main rotor blades are of all metal bonded construction with corrosion and scuff resistant leading edges.

8-9. Removal — Main Rotor Blades (UH-1A). a. Support hub assembly on a stand. Support blades so that leading edge is straight.

Note

If blade bolt (3, figure 8-4) and counterweight support (2) require disassembly for replacement of either, they must be disassembled before removal of blade bolt. For disassembly refer to following paragraph b.

b. Cut safety wire and remove lock screws (View A). Screw support out of blade bolt.

c. Remove drag brace bolt (5). Remove nut from blade retention bolt (3). Secure drag brace bolt to clevis on drag brace for reassembly.

Note

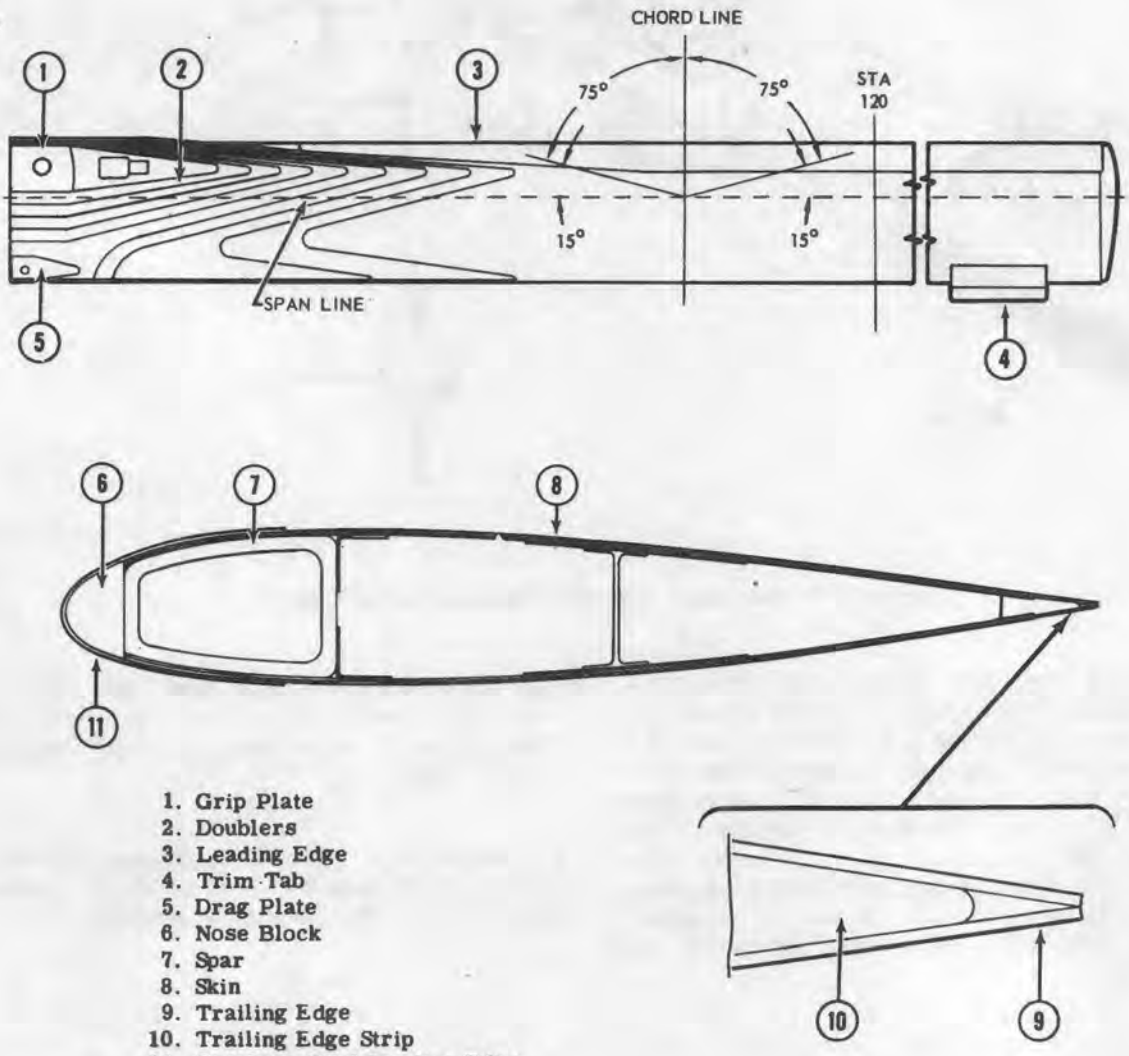
Do not change adjustment of drag braces. Identify blade retention bolts for installation in same grips from which they were removed.

d. Raise tip of blade until blade retention bolt (3) can be removed. Remove blade from grip.

Caution

Reason for lifting blades is because blades are preset to a 4 degree cone, and elevation is necessary to free bolts.

8-10. *Inspection and Repair — Main Rotor Blades (UH-1A).* a. Inspect grip plates (1, figure 8-5) for fretting corrosion. If depth of corrosion



1. Grip Plate
2. Doublers
3. Leading Edge
4. Trim Tab
5. Drag Plate
6. Nose Block
7. Spar
8. Skin
9. Trailing Edge
10. Trailing Edge Strip
11. Stainless Steel Leading Edge

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Figure 8-5. Main rotor blade (UH-1A)

8-12. ***Painting — Minor Refinish — Main Rotor Blades (UH-1A).*** Minor refinishing of main rotor blades containing bare spots, paint cracks, crazing, blisters or other such minor defects which do not show evidence of pitting or damage to the blade shell. Use the least amount of paint possible to adequately protect the blade and to disturb the blade balance as little as possible.

a. Degrease with aliphatic naphtha (item 308, table 1-1) or any good degreasing solvent.

Caution

Do not use solvent which damages paint finish.

b. Sand aged paint areas, using an abrasive grit which will not show marks in final finish. Remove dust with cloth dampened with naphtha or with filtered compressed air.

Caution

Do not sand areas of bare metal.

c. Remove all surface oxides and all aged chemical conversion coatings from areas to be refinished, using abrasive cloth (item 403, table 1-1).

d. Repair adhesive fairing (adhesive squeeze-out along the trailing edge of stainless steel leading edge strip) with resin paste (item 210, table 1-1) after removal of all paint finish. Remove damaged fairing only.

e. Wash blades with soap detergent (item 312, table 1-1). Achieve water-break-free surface which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing off soap.

Note

From completion of this step through final paint, do not touch prepared surfaces with bare hands.

f. Brush or spray on chemical conversion coating (item 317, table 1-1). If not available, use commercial metal-prep (alcoholic-phosphoric acid) or a 10 percent solution of chromic acid.

g. Dry and clean prepared surfaces thoroughly.

h. Apply one light coat (0.0003 to 0.0005 inch) of catalyzed epoxy primer (item 102, table 1-1). Air dry a minimum of 45 minutes or a maximum of 24 hours.

i. Apply finish coats of acrylic lacquer, Navy Formula P-95, in colors specified below (Federal Standard 595). Allow one hour drying time between coats. Use additional coats as required for full coverage and for a total film thickness (primer and lacquer) of 2.5 to 3.5 mils (0.0025 to 0.0035 inch).

(1) On upper surface of blade, apply two coats camouflage olive drab, (item 106, table 1-1).

(2) On lower surface of blade, apply two coats of camouflage black (item 105, table 1-1).

(3) On outer six inches (top and bottom) of blade, apply one coat of gloss orange-yellow (item 112, table 1-1).

(4) On one blade tip and outer two inches, apply one coat of gloss white (item 110, table 1-1).

(5) On opposite blade tip and outer two inches, apply one coat of gloss red (item 108, table 1-1).

j. Air dry blades a minimum of 48 hours before use.

8-13. ***Installation—Main Rotor Blades (UH-1A).*** Installation of the main rotor blades shall be accomplished as follows.

Note

Main rotor blades are interchangeable in sets of the same P/N only and shall not be installed in sets of mixed numbers on the same aircraft.

If drag braces are once properly adjusted, blades are interchangeable without further adjustment. To avoid disturbing rotor balance, install blade retention bolts in grips from which they were removed.

After installing new blades, it may be necessary to zero trim tabs before tracking.

a. Apply corrosion preventive compound (item 315, table 1-1) to blade retention bolt bushings in rotor grip and blade and to drag

brace and drag plate bushing. Support hub assembly on a stand. Insert blade into grip, observing color coding. Align bolt holes and insert blade retention bolt (8, figure 8-4) through grip and blade assembly. Gently moving tip of the blade up and down while inserting bolt will facilitate alignment of bolt holes.

Note

Foreign material or misalignment of bolt holes will result in damaged parts.

b. Support end of installed blade. Install nut on blade retention bolt. Align drag brace clevis hole and blade drag plate hole. Install shims between clevis and drag plate to take up clearance not to exceed 0.000 to 0.005 inch loose. Install clevis bolt with two washers next to nut.

c. Install second blade in the same manner. Torque nuts on drag brace bolts 100 to 120 foot-pounds.

d. Torque nuts on blade retention bolts (11) 260 to 300 foot-pounds using tool T101358.

e. Screw counterweight support (2) into blade bolt (3). Torque support 300 to 400 foot-pounds using wrench T101358. Install lock screws as illustrated in View A and secure with lockwire.

8-14. ***Preparation for Storage or Shipment—Main Rotor Blades (UH-1A).*** The following instructions cover storage or shipment of main rotor blades in either cardboard or metal containers.

Caution

Immediately upon removal of a blade or blades, the assembly must be thoroughly cleaned, oiled, the retention and drag brace bolt holes coated with grease, rust-preventive compound or cosmoline. The blade areas contacting the metal container cushions must be wrapped with water repellant paper and the blade/blades placed in the proper container, along with the historical records.

a. Clean and dry each blade assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to hub, retention bolt hole and drag brace bolt holes.

c. Wrap blade assembly with grease proof barrier material (item 506, table 1-1) at all locations where the contoured supports contact the blade and secure with pressure sensitive tape (item 402, table 1-1).

d. For storage or shipment in a cardboard container proceed as follows:

(1) Secure contours to blade assembly.

(2) Place blade assembly and contours in container with 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1).

(3) Band container shut with one-half inch steel bands.

e. For storage or shipment in a metal container proceed as follows:

(1) Secure blade assembly to shock mounted support in container in such a manner that all protruding components are completely protected from any possible damage.

(2) Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in container.

Note

Blades should not be in direct contact with contours at any time during storage or shipment.

(3) Install top half of container (with top cushions attached) on lower half of container and secure in place with cam lock fasteners.

8-15. Main Rotor Hub (UH-1A). The main rotor hub is a common yoke which attaches the main rotor blades, through the blade grips, to the main rotor mast.

8-16. ***Removal—Main Rotor Hub (UH-1A).*** a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-6.)

b. Remove main rotor blades. (Refer to paragraph 8-9.)

8-16A. ***Cleaning — Main Rotor Hub (UH-1A).*** Flush pillow block bearings as follows:

a. Remove pillow block reservoir.

b. Pump oil (item 2, table 1-1) into one oil inlet hole of pillow block bearing cup until clean oil emerges from the opposite hole. Move the main rotor blades so that trunnion rotates in pillow block bearings while pumping oil into the bearings.

8-17. ***Inspection — Main Rotor Hub (UH-1A).*** a. Maximum allowable play in pitch link universal assembly bearings is 0.017 inch in the axial direction and 0.0085 inch in the radial direction.

b. Maximum allowable play in pitch link rod end bearing is 0.020 inch in the axial direction and 0.020 inch in the radial direction.

c. Inspect blade retaining bolts for loss of dry film lubricant (bare metal exposed), pitting, and fretting corrosion. If inspection of blade retaining bolts reveals damaged areas, replace bolts.

d. Inspect for scratches which have a maximum depth of 0.002 inch. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-25.)

Note

If a burr is present on the end of a scratch, it shall be removed, without causing any damage to the surface of the centerframe, before the scratch is given corrosion protective treatment.

e. Inspect the corner edges of the outboard 4.0 inches of the centerframes for dents which do not exceed a maximum depth of 0.010 inch and a maximum length of 0.5 inch.

f. Inspect all other areas of the centerframes, mixing levers and supports for scratches and dents. Maximum depth of such damage shall not exceed 0.035 inch.

g. Inspect all bearings for damage and freedom in race.

Note

Maximum allowable radial and axial play in the lever assembly bearings is as follows:

P/N	Radial	Axial
BR5R	0.010	0.007
AN 201KP6A	0.010	0.010

8-25. ***Repair or Replacement—Stabilizer Bar (UH-1A.)*** Replace all parts that do not meet inspection requirements.

8-26. ***Installation — Stabilizer Bar (UH-1A).*** a. Position stabilizer bar supports in place over trunnion, observing color code. Install four bolts with washers, in each support. Safety wire bolts in pairs vertically.

b. Remove grip positioning tool and attach pitch links (3, figure 8-1) to pitch horns (8) and stabilizer bar mixing levers (2).

Caution

All three bolts passing through the pitch link (3, figure 8-1) are high tensile, close tolerance bolts. Install with a minimum of two steel washers under the head and two steel washers under the high castle nut. Torque 80 to 100 inch-pounds.

c. Attach control tubes to scissors levers.

d. Attach damper control tube to damper arm. Refer to paragraph 8-33 for instructions relative to adjusting damper control tube.

8-27. Stabilizer Bar Dampers (UH-1A). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-28. Removal — Stabilizer Bar Dampers (UH-1A). a. Disconnect control tubes from lever arms.

b. Remove retainer ring adapter bolts (2, figure 8-7) and slide damper and adapter assembly from mast.

Caution

Refer to CAUTION notes, paragraph 8-31 on handling dampers after removal.

8-29. Inspection — Stabilizer Bar Dampers (UH-1A). Inspect dampers for damage, security, leakage and proper timing.

8-30. Repair or Replacement — Stabilizer Bar Dampers (UH-1A). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-29.)

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-33.)

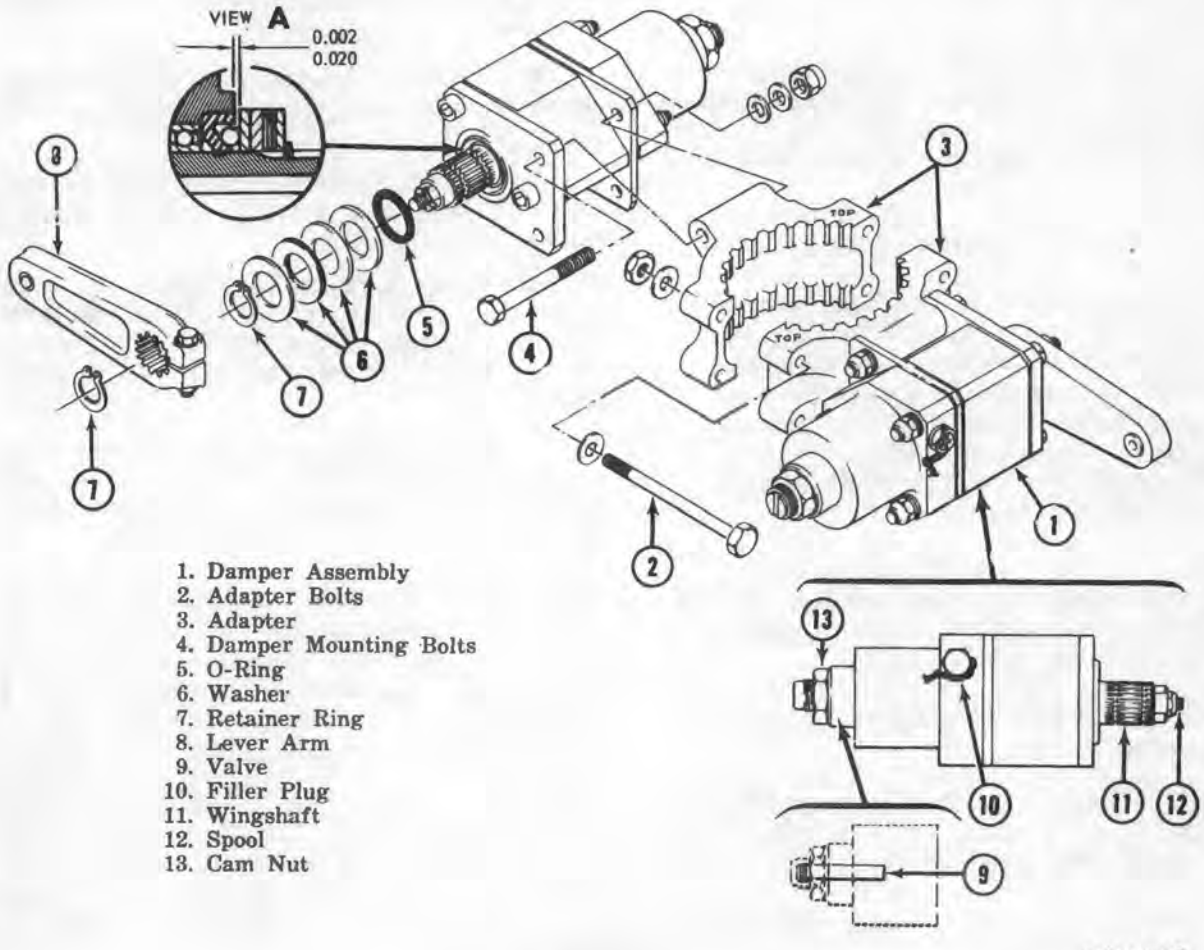


Figure 8-7. Stabilizer damper and adapter assembly (UH-1A)

8-31. ***Servicing — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** a. Position damper with spline end down.

Caution

Clamping damper around body will seize wing-shaft and damage internal parts.

b. Remove valve (9, figure 8-7) and fill cavity with hydraulic oil (item 3, table 1-1).

c. Pull spool (12) out and release several times to purge air from timing section.

d. With spool held in OUT position, oscilate the wing-shaft several times to purge air from the vane section. If any air remains it will cause a soft spot which will be felt when direction of rotation is changed.

e. Replace valve (9). Position damper as installed on the ship. Remove filler plug and check fluid level. Fluid level should be even with bottom of plug hole. Replace and safety wire plug.

Caution

From this point on do not hold damper with the splined end UP for any appreciable time and do not rotate wing-shaft with damper in this position. If wing-shaft is rotated in this position steps a. through e. must be repeated. Rapid rotation of wing-shaft will induce air into cavity.

8-32. ***Installation — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** Use two dampers of the same part number.

a. If adjusting and timing is required refer to paragraph 8-33.

b. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring.

c. Install four adapter bolts, washers and nuts. Torque evenly.

d. Attach control tubes to lever arms (8, figure 8-7). Refer to paragraph 8-33 for adjustment of tubes.

8-33. ***Adjustment — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A).*** a. Bottom stabilizer bar on its static stop in either direction and adjust damper cam nut (13, figure 8-7) to obtain a 0.170 (11/64) inch space between the orifice spool nut (12) and the end of the wing-shaft. Bottom stabilizer bar on its static stop. Return stabilizer bar square to mast and observe orifice spool return time. Adjust orifice timing at valve (9) to obtain a three to six second full travel to equal to each other within one second.

Caution

Do not adjust nut on lever end of damper. Do not bottom adjusting screw because this will cause damage to plastic needle valve (9).

b. Adjust stabilizer bar damper control tubes as follows:

(1) Position damper wing-shafts in the center of travel and square stabilizer bar with mast.

(2) Attach damper control tubes to stabilizer bar and lever arms (8) with lubrication fittings outboard.

(3) With stabilizer bar square to mast position lever arms (8) on nearest matching splines of damper wing-shaft. Refer to View A, for installation of O-ring and washers on wing-shaft.

(4) Adjust damper control tubes to obtain equal oriffice spool (12) travel when stabilizer bar is bottomed on its static stop in either direction.

8-34. Swashplate and Collective Sleeve (UH-1A). The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control stick results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-35. ***Removal — Swashplate and Collective Sleeve (UH-1A).*** a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-6.)

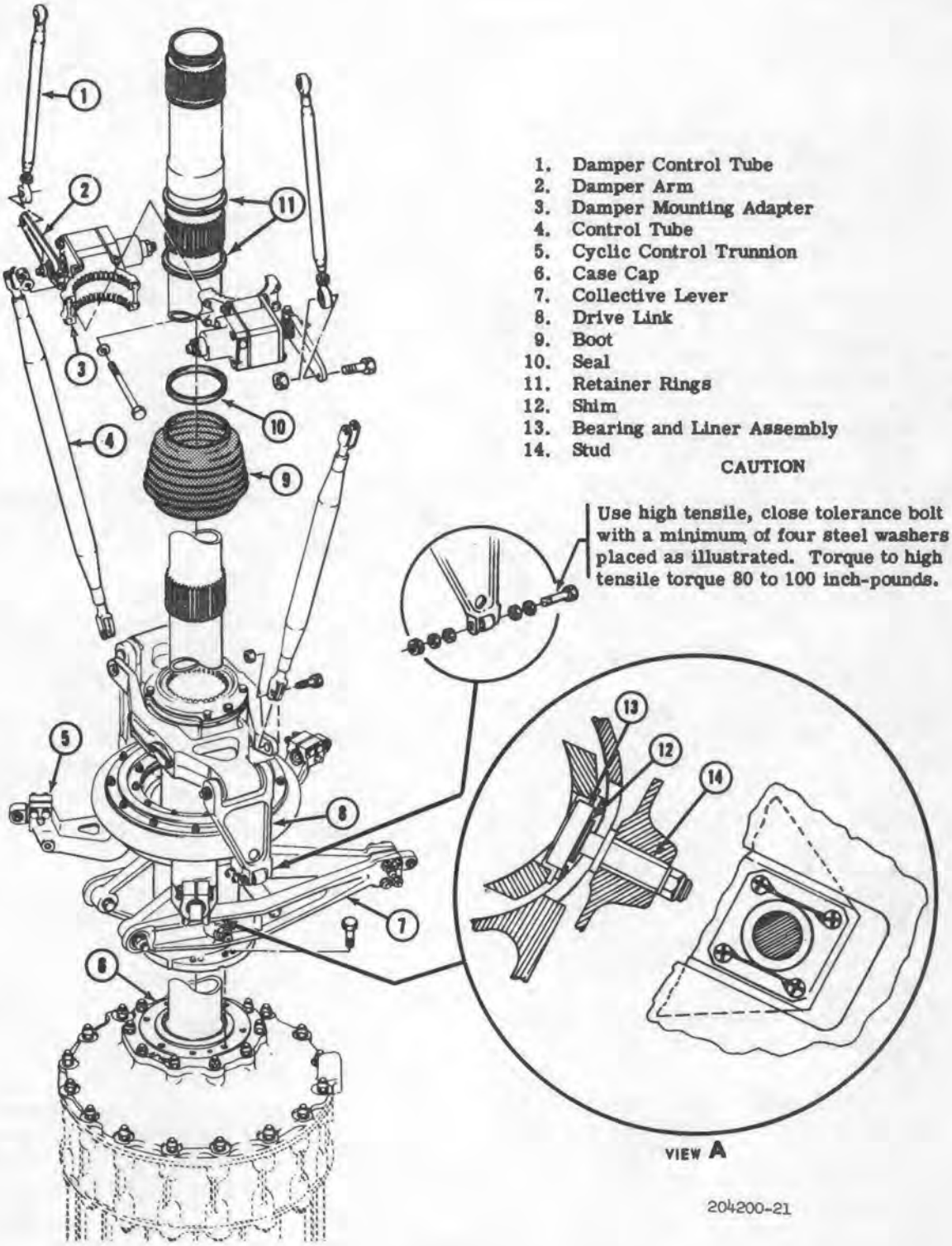


Figure 8-8. Mast controls (UH-1A)

b. Remove stabilizer bar dampers and adapter. (Refer to paragraph 8-28.)

c. Cut safety wire and remove boot (9, figure 8-6) and seal (10).

d. Disconnect control tube from trunnion of collective pitch lever (7).

Note

If only the scissors and sleeves assembly is to be removed proceed as outlined in paragraph 8-41. The following steps are required for removal of the swashplate and collective sleeve assembly as a complete unit.

e. Disconnect the cyclic and elevator control tubes from trunnions (5) on the swashplate. Insert a piece of folded paper or cardboard into each of the four gimbal support clevises to prevent damage while handling.

f. Remove eight bolts and washers securing swashplate support to transmission case cap (6) and carefully lift the swashplate and collective sleeve assembly from the mast.

8-36. *Inspection — Swashplate and Collective Sleeve (UH-1A).* a. Inspect for maximum allowable wear looseness across gimbal ring bearings and bolts of 0.010 inch.

b. Inspect support and inner and outer rings for nicks, burrs and scratches.

c. Inspect trunnion bearings (5, figure 8-8) for allowable axial chuck of 0.020 inch and general condition.

Note

The trunnion bearings are somewhat different than other bearings which normally can be "feel checked" for roughness and ease of rotation. The trunnion bearings are preloaded into the cylinder portion of the trunnion with a 0.0005 inch tight to 0.0005 inch loose tolerance. They are the roller type, having two separated roller cases and angular faced inner and outer races.

The normal feel of this assembly is one of tightness, due mainly to the 0.0005 inch tight tolerance. The feeling of roughness is due to the preload and the angular faces of the inner and outer races. When grease (item 8, table 1-1) is applied to the assembly as required, the normal bearing feel does not exist. The conditions described are inherent in the trunnion bearing assembly. Checking the bearing assembly for tightness should be accomplished by hand movement only of the barrel and the crosshead.

8-37. *Repair or Replacement — Swashplate and Collective Sleeve (UH-1A).* Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-36.)

8-38. *Installation — Swashplate and Collective Sleeve (UH-1A).* The swashplate and support assembly and the scissors and sleeve assembly can be installed as an assembled unit, or as separate assemblies. The following steps cover procedure for installation of the assembled unit. For installation of the scissors and sleeve as a separate assembly, refer to paragraph 8-44.

a. Lubricate splines with grease (item 8, table 1-1).

b. Carefully lower the assembled unit over the mast until swashplate support rests on transmission case cap (6, figure 8-8).

c. Align holes and install eight bolts, with aluminum alloy washers under heads, through support flange into case cap (6). Use two longest bolts between pivots of collective lever. Safetywire bolt heads in pairs.

d. Connect collective pitch control tube to collective lever. Connect cyclic and elevator control tubes to swashplate trunnions. Make certain lubrication fittings on trunnions are up.

e. Slide boot (9, figure 8-8) down over flange at top of sleeve assembly and secure with safetywire. Position seal (10) around mast and under top edge of boot (9). Safetywire seal.

f. Install stabilizer bar dampers and adapters. (Refer to paragraph 8-32.)

g. Install main rotor hub and blade assembly. (Refer to paragraph 8-7.)

h. Connect control tubes and links.

8-39. *Preparation for Storage or Shipment — Swashplate and Collective Sleeve (UH-1A).* The following steps cover procedure for installing swashplate and collective sleeve in metal container.

a. Clean and dry swashplate and support assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1), to bushings and exposed non-plated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1), to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 19 eight unit bags (total 152 units) of desiccant, (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid of container into place. Install locking ring over lip of lid and body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-40. Scissors and Sleeve Assembly (UH-1A). The collective sleeve, which is contained within the swashplate, is actuated by movement of the collective pitch lever. By this action collective control is transmitted to the main rotor hub.

8-41. *Removal — Scissors and Sleeve Assembly (UH-1A).* a. Refer to paragraph 8-35. Perform steps a. through d.

b. Remove nuts, washers, spacer (3, figure 8-9) and bolts attaching collective pitch levers (1) to swashplate support (6) and to each other. Keep all loose parts, including shims (5) together for use in reassembly.

c. Cut safetywire and remove four screws attaching each bearing and housing assembly (8, figure 8-9) to lower end of collective sleeve (7).

d. Remove nuts, washers and bolts and disconnect link from swashplate trunnions.

e. Carefully lift the scissors and sleeve assembly upward and remove from mast.

8-42. *Inspection — Scissors and Sleeve Assembly (UH-1A).* Clamp dial indicator to mast with plunger resting on the collective boot flange attaching bolt head. Rotate sleeve assembly and measure amount of play present. Maximum radial play allowed between mast and collective sleeve drive plate is 0.040 inch at point of measurement.

8-43. *Repair or Replacement—Scissors and Sleeve Assembly (UH-1A).* If inspection requirements (refer to paragraph 8-42) are not met request assistance from higher maintenance level.

8-44. *Installation — Scissors and Sleeve Assembly (UH-1A).* The following steps cover installation of scissors and sleeve assembly as a separate assembly.

a. Lubricate splines of collective sleeve (7, figure 8-9) and carefully lower scissors and sleeve assembly over mast and into swashplate support (6).

b. Attach drive links (8, figure 8-8) to trunnion bearings on swashplate outer ring. Make certain lubrication fittings are down and bolt heads toward rotation.

Caution

Use high tensile, close tolerance bolts with a minimum of four steel washers positioned as shown in figure 8-8. Torque to high tensile torque of 80 to 100 inch-pounds and check torque after first ten hours of operation.

c. Position bearing and housing assemblies (8, figure 8-9) to lower end of collective sleeve (7) and install attaching screws. Safetywire screws in vertical pairs.

d. Check wear between lever bearing and liner (9, figure 8-9). If wear exceeds 0.001 inch, perform step e. If wear exceeds 0.005 inch, bearing must be replaced.

e. Clean bore of liner bushing and outer race of bearing. Coat both surfaces with primer (item 118, table 1-1). Allow to dry. Coat both surfaces with sealant (item 201, table 1-1). Wipe off excess sealant and allow to dry.

f. Assemble collective pitch levers (1, figure 8-9) on swashplate support (6) with pins inserted into bearings on collective sleeve (7). Position trunnion (4) between collective pitch levers (1) and install bolts, washers and nuts. Torque bolts. Use feeler gage to measure clearance between shoulder on pin and bearing inner race at each side. Add two feeler gage clearances and divide by two to determine thickness of shims (12, figure 8-8) required. Prepare two shims to this dimension, equal to each other within 0.005 inch.

g. Remove levers (7, figure 8-8) install shims (12) and reassemble. Check for no end play of pins in bearings and for freedom of bearing rotation. Installation should be 0.000 to 0.002 inch tight.

8-45. *Preparation for Storage or Shipment — Scissors and Sleeve Assembly (UH-1A).* The following steps cover procedure for installing scissors and sleeve assembly in metal container.

a. Clean and dry scissors and sleeve assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to bushings and exposed non-plated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid on container into place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-46. Control Tubes. The following steps cover general information and minor repair to both rotating and non-rotating control tubes.

a. Minor damage to both rotating and non-rotating control tubes in the form of scratches may be polished out.

Note

No limitations apply to length or direction of scratches. Scratches should be blended out to extend over a minimum two inch area.

b. Scratches in all control tubes above the swashplate not in excess of 0.005 inch in depth may be polished out in accordance with step d.

c. Scratches, below and aft of the swashplate not in excess of 0.010 inch in depth may be polished out in accordance with step d.

d. Remove all scratches that are within limitations with wet or dry type sand paper, (item 508, table 1-1) or finer, to obtain a smooth scratch free surface. Apply two coats of zinc chromate primer (item 119, table 1-1) to repaired area.

e. Allowable wear limits for the damper control tube (1, figure 8-8) bearings permit a maximum of 0.010 inch radial play and 0.030 axial play. Some of these tube assemblies may be equipped with alternate rod end bearings, 47-140-252-5. Tube assemblies so equipped have 0.012 inch radial and 0.012 inch axial maximum allowable wear limits.

f. Tail rotor pitch change link bearings have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits.

1. Levers-Collective
2. Pin
3. Spacer
4. Trunnion
5. Shim
6. Swashplate Support
7. Collective Sleeve
8. Bearing and Housing
9. Lever Bearing and Liner

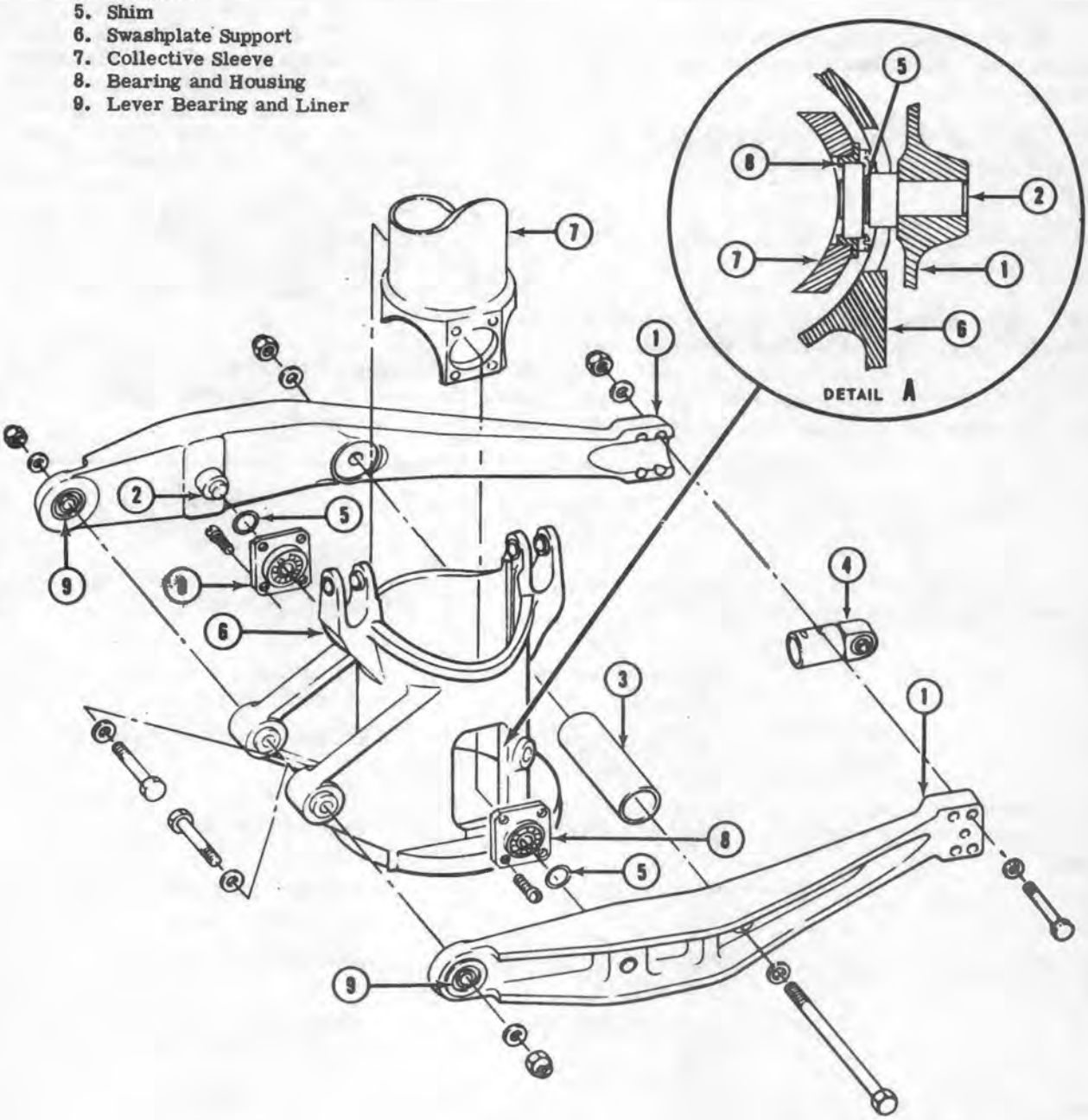


Figure 8-9. Collective pitch levers (UH-1A)

g. Bearing end of pitch change links (3, figure 8-1) have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits. Universal end of the pitch change links have 0.0085 inch radial and 0.017 inch axial maximum allowable wear limits.

h. Maximum allowable elongation to a bushing or clevis hole in the control system is 0.003 inch.

i. Any wear in excess of limits shown in steps e. through h., above, is cause for replacement.

j. For replacement of control system bolts refer to paragraph 3-7.

8-47. Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). The main rotor assembly is a two bladed, semi-rigid type employing preconing and underslinging to insure smooth operation. The assembly consists of two all metal bonded blades with corrosion and scuff resistant leading edges, connected to a common yoke through blade grips. The rotor assembly is attached to the mast through a trunnion mounted in pillow blocks to provide a flapping axis and is secured to the mast with a screw type cap. Blade pitch change is accomplished by changing the angle of the blade grips equally and simultaneously with the collective pitch lever. Tilting the rotor, to provide directional control, is accomplished by changing the pitch of each grip independently by means of the cyclic controls. The all metal rotor blades consist of four major sections, the main spar, a honeycomb core, a trailing edge extrusion and a nose block extrusion all bonded to the skin, with an adhesive applied under heat and pressure.

8-47A. Trouble Shooting — Main Rotor (UH-1B). Indication of troubles and their corrections are as follows.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1:1 Lateral vibration approximately five beats/second	Spanwise out of balance	Dynamically balance with weight in blade bolt
	Chordwise out of balance	Dynamically balance by sweeping blade
	Stabilizer bar out of balance	Balance stabilizer bar
1:1 Vertical vibration a. In hover and forward flight	Rotor out of track	Track rotor blades
b. In forward flight, but not in hover	Climbing blade	Compare high and low rpm track and adjust
2:1 Vibrations approximately 10 beats/second	Transmission mounts deteriorated	Replace mounts
	Loose or worn drag brace bolts or elongated holes	Replace bolts or components having elongated holes.
Collective pitch control forces not normal in cruise (Boost off)	Incorrect counterweights on rotors	Adjust counterweights
Rotor rpm high or low in autorotation	Minimum pitch blade angle incorrect	Adjust both pitch control links (increase or decrease length of both links equally)

8-48. *Operational Check — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Run-up shall be performed by personnel authorized in accordance with AR95-13.

a. Operate engine at 6600 rpm with a collective setting less than required to become airborne (about 15 psi). Note torque pressure reading.

b. Set engine speed at 4700 rpm and collective the same as for 6600 rpm. Check blade track.

c. From the track marks determine which blade is high at 4700 rpm. Roll the high blade down by lengthening its pitch link. One flat of rotation of pitch link barrel is equivalent to 5/8 inch of track (for all rpm). Blade trim tabs have no effect on track at 4700 rpm. The correct amount of roll can therefore be determined when trim tabs are improperly set. Once the blades have been rolled into track at 4700 rpm further rolling is not required.

d. Increase engine speed to 6600 rpm with collective positioned as in step a. Check blade track. If the track changes from 4700 to 6600 rpm one blade is climbing with rpm. This blade would also climb with increased airspeed in flight. To prevent blade from climbing bend tab on opposite blade up. One degree of tab is equivalent to 1/16 inch of track at 6600 rpm. If more than eight degrees of tab differential is required the diving blade tab should be set up to eight degrees and the climbing blade tab should be bent down the remaining amount. Use T101422 tool when adjusting trim tabs.

e. After the proper tab setting has been achieved based on ground track fly helicopter through the operational speed range. If a vertical 1/rev. vibration is encountered at high speeds (the vibration will get progressively worse as speed increases) it will be necessary to refine the trim tab settings. Either an increase or decrease in the amount of tab differential will be required. Above 100 knots as little as one-half degree change in tab settings can be significant.

f. Check rotor balance through full airspeed range.

Warning

At no time will the acorn nut, P/N 204-011-116-1 or 204-010-525-1, be adjusted or tampered with.

g. Correct spanwise balance by installing two-inch masking tape on blade tip. If balance condition becomes worse remove tape and install on opposite blade. Balance to the best one-half wrap of tape.

h. When the correct amount of tape has been determined remove it and replace with lead installed in the blade retention bolt on the same side. One wrap of tape is equivalent to 3.1 ounces in the blade bolt.

i. Correct chordwise balance by selecting one drag brace and sweep blade aft by one full turn on the drag brace.

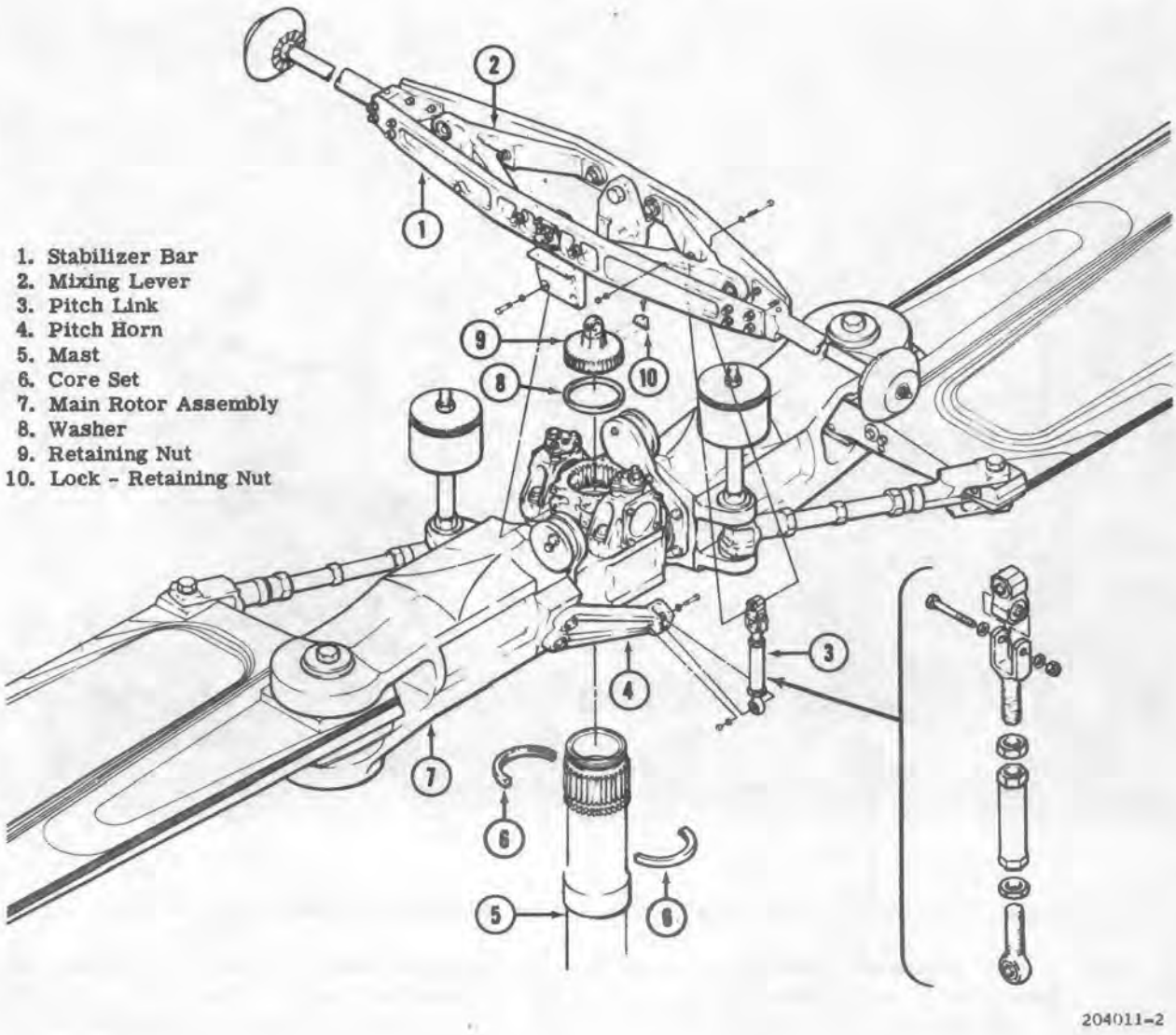


Figure 8-10. Main rotor assembly (UH-1B Serial No. 60-3546 thru 64-14100)

Note

Both ends of the drag brace are fitted with right-hand threads. Drag brace length is changed when rotating the barrel because one end has National Course threads and the other end has National Fine threads. Turn jam nuts to the left to loosen and turn barrel down as viewed from the trailing edge of the blade to sweep blade aft.

j. If improvement is noted continue sweeping selected blade aft until rotor is operating smoothly. Adjustment up to two turns is permissible on the B rotor and two flats on the A rotor which normally exceeds requirements.

k. If the condition becomes worse after making adjustment return blade to its original position and make similar adjustment to the opposite blade.

8-49. *Checking Main Rotor Counterweight Adjustment (UH-1B Serial No. 60-3546 through 64-14100).* At approximately 60 knots I. A. S. in cruise flight with hydraulic boost off the collective control should have a neutral or light force

Figure 8-11. Tracking main rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

between 14 and 15 pounds of engine torque. Above 15 pound torque collective shall become increasingly negative and below 14 pounds torque it shall become increasingly positive. Collective boost "OFF" forces in autorotation should be such that the collective pitch control can be lowered complete. To accomplish this it may be necessary to reduce the amount of weight originally determined. If applied force is greater when increasing collective pitch more counterweight is required and conversely if applied force is greater when decreasing collective pitch less counterweight is required. Refer to paragraph 8-50 for allowable counterweight limits.

Note

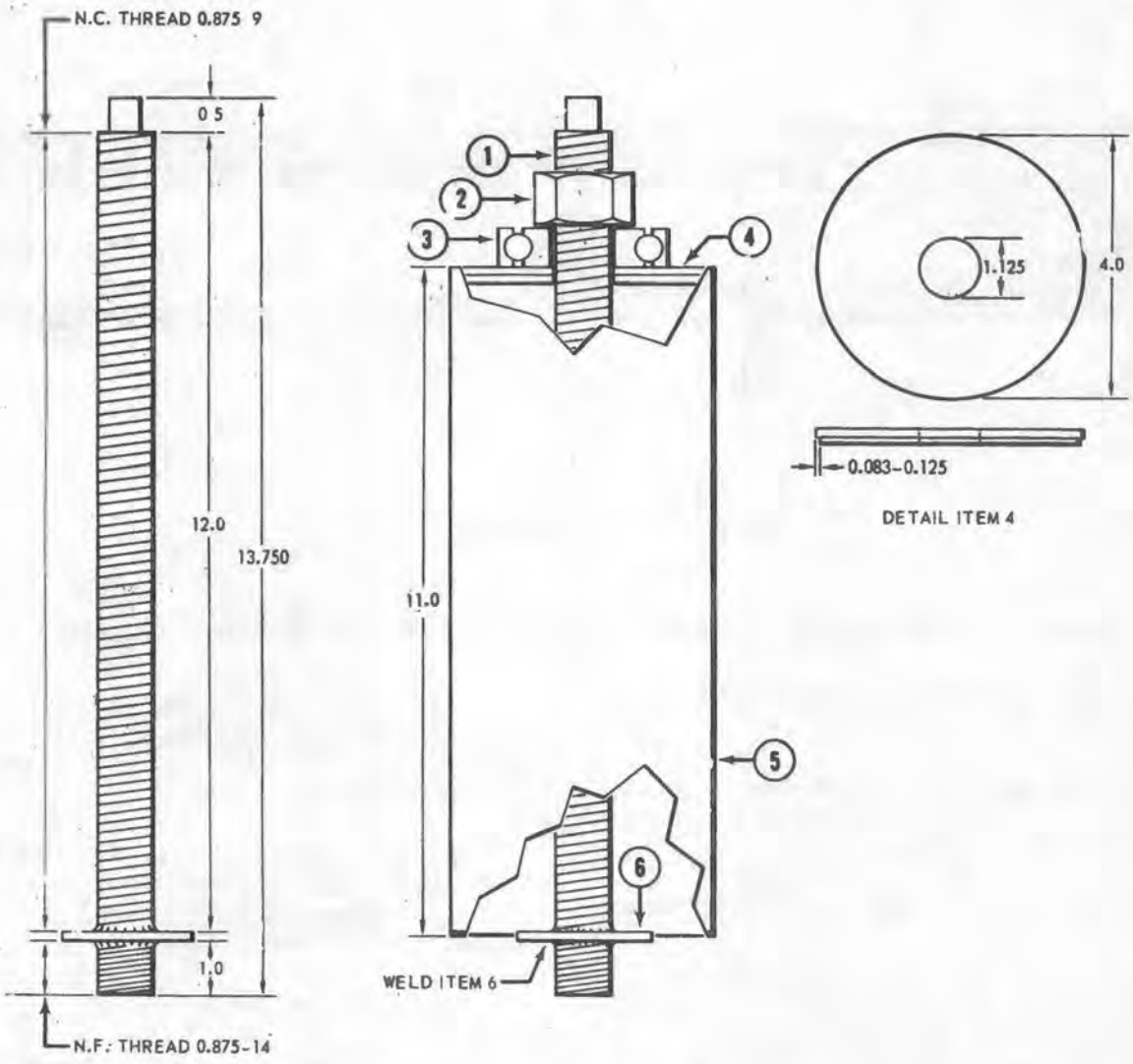
Due to irreversible valves incorporated in the boost system improperly adjusted counterweight may not be evident for fixed collective control positions.

8-50. Counterweight Limits (UH-1B Serial No. 60-3546 through 64-14100). When using the 204-011-172-3 counterweight bolt a maximum of one 204-011-173-3 counterweight and nine washer type weights may be used on each side. Use AN960-1016 washers as required between counterweight and retaining nut. Torque counterweight retaining nut 300 to 400 inch-pounds.

8-51. Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). a. Remove pitch links and install grip positioning links, T101402, to hold grips and blades in position. (See figure 8-12.)

b. Remove stabilizer bar assembly (1, figure 8-10). (Refer to paragraph 8-69.)

c. Cut lockwire and remove bolt and lock (10)



1. Puller Rod Assembly 4130 (or better), 1.0 O.D. - 13.750 Long
2. Hex Nut 0.875 NC (9) Thread
3. Bearing (Thrust) Inner Race I.D. 0.080 - 0.093
4. Plate, Steel or Aluminum, 4.0 O.D., 0.375 Thick
5. Tube, Steel or Aluminum, Wall Thickness 0.083 - 0.125
6. Steel Flat Washer, 2.0 O.D. - 0.875 I.D.

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Figure 8-14. Main rotor blade retention bolt extracting fixture (UH-1B Serial No. 60-3546 thru 64-14100)

(2) Skin penetration in any area larger than 2.0 inches in diameter or length.

(3) Water in the honeycomb core.

(4) Voids between the skin and honeycomb larger than ten square inches.

(5) Edge voids deeper than 1.0 inch at the tip end of any of the root end doublers or grip plates.

(6) Edge voids in the leading edge or trailing edge of the doublers that are 0.50 inch or more in depth and show indications of corrosion in the voids.

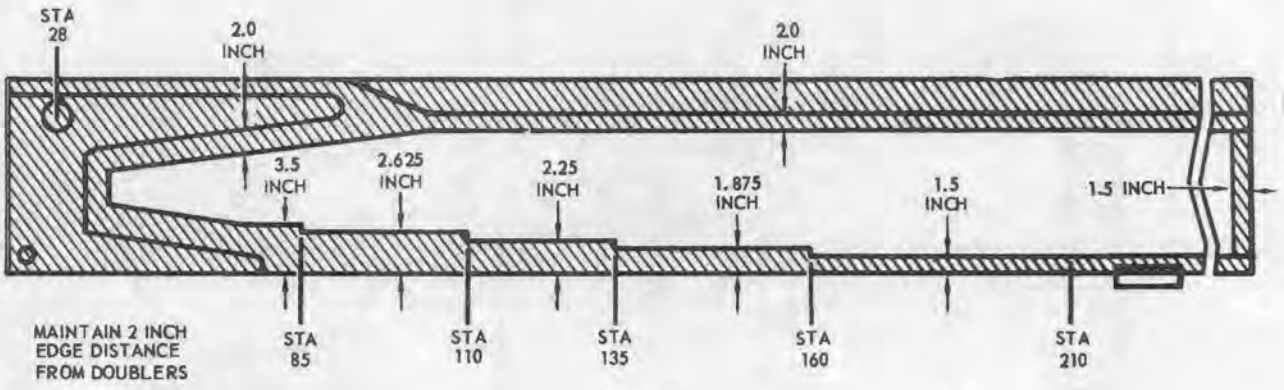


Figure 8-15. Areas of repair — main rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

(7) Any corrosion that penetrates entirely through the skin.

(8) Any blade that has reached maximum service life or which has less than 100 hours remaining service time.

b. Normal inspection and repair criteria are as follows:

(1) Inspect grip plates (1, figure 8-16) for fretting corrosion. If depth of corrosion exceeds 0.020 inch and fifty percent of any quadrant formed by intersection of chordwise and spanwise axis through center of retention bolt hole, polish out with abrasive cloth and fair edges of repair into surface contour.

(2) Nicks and scratches within the limits below are acceptable if repaired. In aluminum parts, the paint around the defect should be removed by light sanding, and the nick or scratch polished out with aluminum wool. The area should then be repainted per paragraph 8-58. On the stainless steel leading edge, the nicks or scratches may be polished out by sanding or with steel wool; however, steel wool must not be allowed to touch the aluminum parts.

Caution

Damage exceeding the following limits will require replacement of blade.

(a) In the skin, inboard of station 165 and the inboard abrasion strip, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(b) In the skin, inboard of station 165 and the inboard abrasion strip, running within zero and 75 degrees of the chordline and not in excess of 0.003 inch in depth.

(c) In the skin, outboard of station 165, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth

(d) In the skin, outboard of station 165, running within zero and 15 degrees of the spanline and not in excess of 0.008 inch in depth.

(e) In the outboard abrasion strip, inboard of station 165, not in excess of 0.003 inch in depth.

(f) In the outboard abrasion strip, outboard of station 165, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(g) In the outboard abrasion strip, outboard of station 165, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth.

Note

If tape (item 404, table 1-1) is not available, pressure sensitive tape (item 405, table 1-1) may be installed. Install pressure sensitive tape in accordance with following steps.

1. Lightly sand leading edge with sandpaper (item 508 or 509, table 1-1) and wipe off dust and other foreign material, using a clean cloth dampened with naptha or any approved cleaning agent. Wipe dry after cleaning.

2. Select or cut tape (two inch width desirable; four inch width acceptable) to desired length (maximum of six feet). Apply tape along center line of leading edge, overlapping an equal amount on top and bottom of blade. Use fingers to press tape in place.

8-57. Emergency Repairs — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Main rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or disposition of main rotor blades shall be accomplished at the earliest opportunity.

a. Any damage penetrating the skin or in excess of manual limits and at least 2.0 inches from the spar, the trailing edge of the blade and doublers may be repaired provided the repair does not exceed 2.0 inches in diameter. "REPAIRS INBOARD OF STATION 210 MUST BE INSPECTED FOR CRACKS DAILY".

b. If the blade is damaged within the limits of step a., above, it may be repaired in accordance with the following instructions.

(1) Draw a circle around the damaged area just large enough to encompass damage.

(2) Remove skin just inside the circled area, disturbing the honeycomb as little as possible.

(3) Deburr edges of hole, making sure skin is free of scratches and nicks.

(4) Remove paint from repair area with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

(5) Prepare a patch to cover the hole that will overlap by 0.75 inch. Patch may be fabricated from 0.016 or 0.020 2024ST T3 aluminum, Specification QQ-A-355-T3 or QQ-A-283-T6. Deburr and blend out edges. Sand the bond area of the patch and blade with 400 grit paper (item 509, table 1-1).

(6) Clean bond area on patch and blade with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

Note

Area must be clean, dry and free of grease, oil and wax.

(7) Apply adhesive (item 214 or 216, table 1-1) to patch and area around hole. Apply patch to blade, moving patch slightly under pressure to make sure voids in bond are expelled. Blend out excessive adhesive.

(8) Patch may be held in place while curing with rubber bands made from inner tube. Allow to cure at 60°F or above until completely firm. (Adhesive will resist fingernail penetration.) Overnight curing is usually sufficient. To accelerate curing time apply heat to area with a 200 watt lamp, 12 inches from patch. Heat should be applied until adhesive is completely firm. (Adhesive will resist fingernail penetration.)

(9) Refinish patch and adjacent area in accordance with touch-up procedures called out in paragraph 8-58.

c. One or more cracks developing and extending from a previously repaired area are cause for immediate local scrappage of blade.

Note

There is no limit as to the number of patches within the designated repair areas except that no two (2) patches may be on the same chord line and at least one-half inch edge distance must be maintained between patches.

8-58. Painting — Minor Refinish — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Minor refinishing or main rotor blades consists of reworking small areas containing bare spots, paint cracks, crazing, blisters or other such minor defects which do not show evidence of pitting or damage to the blade shell. Use the least amount of paint possible to adequately protect the blade and to disturb the blade balance as little as possible.

a. Degrease with aliphatic naptha (item 308, able 1-1) or any good degreasing solvent.

Caution

Do not use solvent which damages paint finish.

b. Sand aged paint areas, using an abrasive grit which will not show marks in final finish. Remove dust with cloth dampened with naptha or with filtered compressed air.

Caution

Do not sand areas of bare metal.

c. Remove all surface oxides and all aged chemical conversion coatings from areas to be refinished, using abrasive cloth (item 403, table 1-1).

d. Repair adhesive fairing (adhesive squeeze-out along the trailing edge of stainless steel leading edge strip) with resin paste (item 210, table 1-1) after removal of all paint finish. Remove damaged fairing only.

e. Wash blades with soap detergent (item 312, table 1-1). Achieve water-break-free surface which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing off soap.

Note

From completion of this step through final paint, do not touch prepared surfaces with bare hands.

f. Brush or spray on chemical conversion coating (item 317, table 1-1). If not available, use commercial metal-prep (alcoholic-phosphoric acid) or a 10 percent solution of chromic acid

g Dry and clean prepared surfaces thoroughly.

h. Apply one light coat (0.0003 to 0.0005 inch) of catalyzed epoxy primer, (item 102, table 1-1). Air dry a minimum of 45 minutes or a maximum of 24 hours.

i. Apply finish coats of acrylic lacquer, Navy Formula P-95, in colors specified below (Federal Standard 595). Allow one hour drying time between coats. Use additional coats as required for full coverage and for a total film thickness (primer and lacquer) of 2.5 to 3.5 mils (0.0025 to 0.0035 inch).

(1) On upper surface of blade, apply two coats camouflage olive drab, (item 106, table 1-1).

(2) On lower surface of blade, apply two coats of camouflage black, (item 105, table 1-1).

(3) On outer six inches (top and bottom) of blade, apply one coat of gloss orange-yellow (item 112, table 1-1).

(4) On one blade tip and outer two inches, apply one coat of gloss white (item 110, table 1-1).

(5) On opposite blade tip and outer two inches, apply one coat of gloss red, (item 108, table 1-1).

j. Air dry blades a minimum of 48 hours before use.

8-59. ***Installation — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).*** Installation of the main rotor blades shall be accomplished as follows.

Note

If drag braces are once properly adjusted, blades are interchangeable without further adjustment. To avoid disturbing rotor balance, install blade bolts in grips from which they were removed.

After installing new blades, it may be necessary to zero trim tabs before tracking.

a. Apply corrosion preventive (item 315, table 1-1) to blade retention bolt bushings in rotor grip and blade and to drag brace and drag plate bushing. Support hub assembly on a stand. Insert blade (2, figure 8-13) into grip, observing color coding. Align bolt holes and insert bolt (3) through grip and blade assembly from top side. Gently moving tip of the blade up and down while inserting bolt will facilitate alignment of bolt holes.

Note

Foreign material or misalignment of bolt holes will result in damaged parts.

b. Support end of installed blade. Install nut (7), on blade bolt. Align drag brace clevis hole and blade drag plate hole. Install shims (1), between clevis and drag plate to take up clearance, not to exceed 0.000 to 0.005 inch. Install clevis bolt with two washers next to nut.

c. Install second blade in the same manner. Torque nuts on drag brace bolts 100 to 120 foot-pounds.

d. Torque nuts (7) on blade bolts (3) 260 to 300 foot-pounds using tool T101414. Safety nut (7) by installing a bolt through nut and blade bolt.

e. Torque lower nut on counterweight bolt 125 to 150 foot-pounds.

8-60. *Preparation for Storage or Shipment — Main Rotor Blades (UH-1B Serial No. 60-3456 through 64-14100).* The following instructions cover storage or shipment of main rotor blades in either cardboard or metal containers.

Caution

Immediately upon removal of a blade or blades, the assembly must be thoroughly cleaned, oiled, the retention and drag brace bolt holes coated with grease, rust-preventive compound or cosmoline. The blade areas contacting the metal container cushions must be wrapped with water repellant paper and the blade/blades placed in the proper container, along with the historical records.

a. Clean and dry each blade assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to hub, retention bolt hole and drag brace bolt holes.

c. Wrap blade assembly with grease proof barrier material (item 506, table 1-1) at all locations where the contoured supports contact the blade and secure with pressure sensitive tape (item 402, table 1-1).

d. For storage or shipment in a cardboard container proceed as follows:

(1) Secure contours to blade assembly.

(2) Place blade assembly and contours in container with 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1).

(3) Band container shut with one-half inch steel bands

e. For storage or shipment in a metal container proceed as follows:

(1) Secure blade assembly to shock mounted support in container in such a manner that all protruding components are completely protected from any possible damage.

Note

Blades should not be in direct contact with contours at any time during storage or shipment.

(2) Place 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1) in container.

(3) Install top half of container (with top cushions attached) on lower half of container and secure in place with cam lock fasteners.

8-61. Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). The main rotor hub is a common yoke which attaches the main rotor blades, through the blade grips, to the main rotor mast.

8-62. *Removal — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100.)* a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-51.)

b. Remove main rotor blades. (Refer to paragraph 8-54.)

8-62A. *Cleaning — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* Flush pillow block bearings as follows:

a. Remove pillow block reservoir.

b. Pump oil (item 2, table 1-1) into one oil inlet hole at pillow block bearing cup until clean oil emerges from the opposite hole. Move the main rotor blades so that trunnion rotates in pillow block bearings while pumping oil into the bearings.

8-63. *Inspection — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* a. Maximum allowable play in pitch link universal assembly bearings is 0.017 inch in the axial direction and 0.0085 inch in the radial direction.

b. Maximum allowable play in pitch link rod end bearing is 0.020 inch in the axial direction and 0.020 in the radial direction.

c. Inspect blade retaining bolts for loss of dry film lubricant (bare metal exposed), pitting, and fretting corrosion. If inspection of blade retaining bolts reveals damaged area, replace bolts.

d. Dimensions of damaged areas on drag brace bolts, after polishing and cleanup, shall not exceed ¼ of the bolt circumference. Bolts shall be replaced if the outside diameter (in inches) is less than the values specified below.

(1) Inboard drag brace 0.8730

(2) Outboard drag brace 0.8721

e. Some seepage from the main rotor grip seal is normal. Seepage may be considered objectionable when loss of oil is equivalent to the amount contained in the reservoir during a flight of two hours duration. When helicopter is in a static position and seepage of oil in a 24 hour period results in not being able to obtain reading from sight gage, main rotor grip seal must be replaced.

f. Maximum allowable dimensions of main rotor grip bushing holes after polishing are as follows: (1 and 2, figure 8-17.)

Main Retention	2.5040
Drag Brace	0.8760

Score marks on the inner surface of bushings made during removal of bolts may not exceed 0.010 inch, maximum, in depth. Such score marks may be polished out. The area of clean-up should cover a maximum of ¼ of the bushing circumference. Bushings are to be replaced if the inside diameter dimensions specified above are exceeded.

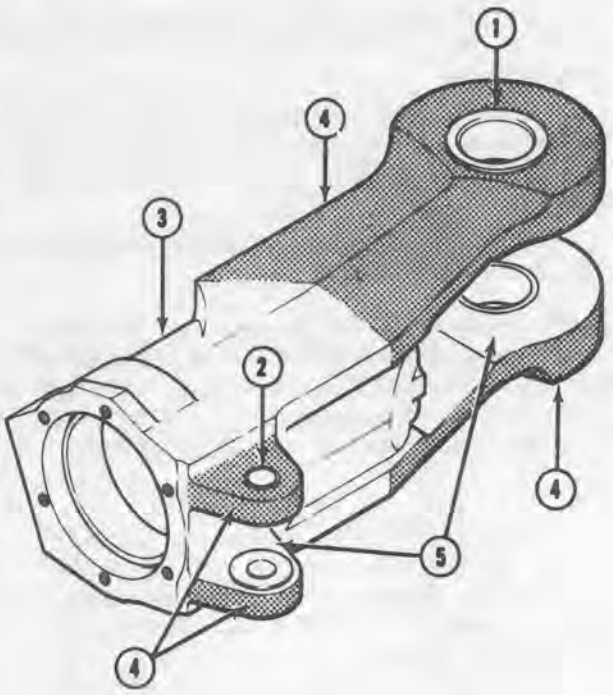
g. The following criteria define the limits of damage that are allowable on the external surfaces of the main rotor grips. (See figure 8-17.) Damaged surfaces in all areas of the grip should be improved by polishing out the area locally and blending edges of the damage into the surrounding surface with a smooth contour. Grips with discrepancies in excess of specified limits should undergo fifth echelon inspection.

(1) Damage to the barrel (3, figure 8-17) shall not exceed a maximum depth of 0.060 inch, up to 3.5 inches in length.

(2) Damage to the outside surface of blade tangs and drag brace tangs (4, figure 8-17) shall not exceed a maximum depth of 0.060 inch. Lengths shall not exceed ½ of maximum tang width inboard of bolt hole; ½ of edge distance between bushing and edge of tang, and/or ½ of dimension between inside and outside tang surfaces.

(3) Damage to the inside surface of blade tangs and drag brace tangs (5, figure 8-17) shall not exceed a maximum depth of 0.020 inch. Length inboard of bolt hole shall not exceed a maximum of ½ of tang width. Damage in bolt hole area should not exceed a maximum of ½ of edge distance between bushing and edge of tang.

8-64. Repair or Replacement — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-63.)



1. Main Retention Bushing
2. Drag Brace Bushing
3. Barrel
4. Outside Surface - Blade and Drag Brace Tangs
5. Inside Surface - Blade and Drag Brace Tangs

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Figure 8-17. Allowable damage—main rotor grips (UH-1B Serial No. 60-3546 thru 64-14100)

8-65. Installation — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). a. Install main rotor blades. (Refer to paragraph 8-59.)

b. Install main rotor hub and blade assembly. (Refer to paragraph 8-52.)

8-66. Preparation for Storage or Shipment — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). a. Clean and dry hub assembly in accordance with Specification MIL-P-116.

b. Apply corrosion-preventive compound (item 315, table 1-1) to bushings and exposed nonplated steel surfaces.

c. Place hub in container, and lower onto frame center block.

d. Secure frame end brackets over each end of hub and around hub bolt attached to frame.

e. Install washer and nut. Tighten nut securely.

8-70. *Inspection — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Inspect centerframes and supports for scratches, dents and burnish marks within 1.0 inch either side of bolt hole center line. Depth of damage shall not exceed 0.010 inch. Inspect mixing levers to criteria shown on figure 8-17A.

b. Burnish marks from sockets are permitted on the outboard attachment bolt holes of tube to centerframes. These marks shall have no depth and only be of a polished nature.

c. Inspect outboard 4.0 inches of centerframes for scratches which have no depth, but do remove the protective coating. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

d. Inspect for scratches which have a maximum depth of 0.002 inch. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

Note

If a burr is present on the end of a scratch, it shall be removed, without causing any damage to the surface of the centerframe, before the scratch is given corrosion protective treatment.

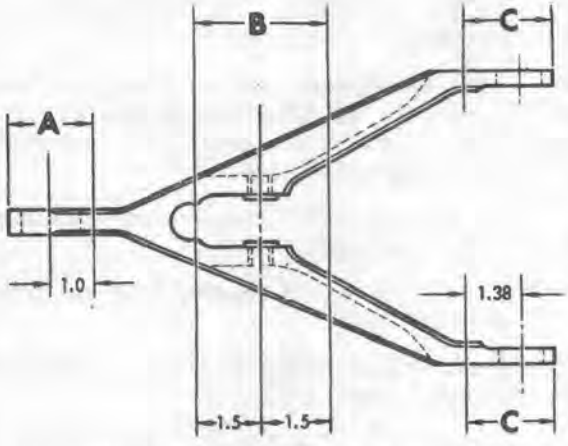

Figure 8-17A. Stabilizer bar mixing lever repair limits (UH-1B serial no. 60-3546 thru 64-14100)

e. Inspect the corner edges of the outboard 4.0 inches of the centerframes for dents which do not exceed a maximum depth of 0.010 inch and a maximum length of 0.5 inch.

f. Inspect all other areas of the centerframes, mixing levers and supports for scratches and dents. Maximum depth of such damage shall not exceed 0.035 inch.

g. Inspect all bearings for damage and freedom in race.

Note

Maximum allowable radial and axial play in the lever assembly bearings is as follows:

P/N	Radial	Axial
BR5R	0.010	0.007
AN 201KP6A	0.010	0.010

8-71. *Repair or Replacement — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Replace all parts that do not meet inspection requirements.

8-72. *Installation — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).* a. Position stabilizer bar supports in place over trunnion observing color code. Install four bolts with washers in each support. Lockwire bolts in pairs vertically.

b. Remove grip positioning tool and attach pitch links (3, figure 8-10) to pitch horns (4) and stabilizer bar mixing levers (2).

c. Attach control tubes to scissors levers.

d. Attach damper control tube to damper arm. Refer to paragraph 8-79 for instructions relative to adjusting damper control tube.

8-73. Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-74. Removal — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100.) a. Disconnect tubes from lever arms.

b. Remove retainer ring (3, figure 8-18) adapter bolts (2), and slide dampers and adapter assembly from mast.

8-75. Inspection — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Inspect dampers for damage, security, leakage and proper timing.

8-76. Repair or Replacement — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-75.)

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-79.)

8-77. Servicing — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Remove filler cap and fill dampers to full mark with hydraulic oil, (item 3, table 1-1).

8-78. Installation — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Use two dampers of the same part number.

a. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring (3, figure 8-18).

b. Install four adapter bolts (3, figure 8-18), washers and nuts and torque evenly.

c. Install lever arms. (Refer to paragraph 8-79.)

d. Attach control tubes to lever arms. (Refer to paragraph 8-79 for adjustment of tubes.)

8-79. Adjustment —Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. To adjust damper lever and wingshaft of damper, Part No. 204-010-937, position wingshaft to line up pin (11, figure 8-18) with mark on cam (10) outside diameter as seen through window. Assemble lever (6) to wing-shaft horizontal to closest spline tooth. Connect damper links to stabilizer bar and damper lever. Position stabilizer bar perpendicular to mast. Adjust control tubes as required to line pins up with mark on outside diameter of cam while bar is square to mast.

b. To adjust dampening of damper, Part No. 204-010-937-1, position stabilizer bar against its limit stops while observing pin in window of damper. Rapidly return stabilizer bar to neutral position and measure the time required for the pin to return and contact the flat surface of the cam. Time for the above must measure five plus or minus one second. Adjust needle valve (9) in end of damper as required to accomplish above. Damper (Part Number 204-010-937-5) cannot be adjusted.

Note

If damper (Part Number 204-010-937-5) does not operate within the specified time limit (5 ±1 second) replace the damper.

8-80. Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control sticks results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-81. Removal—Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-51.)

b. Remove stabilizer bar dampers and adapter. (Refer to paragraph 8-74.)

c. Cut safetywire and remove boot (9, figure 8-19) and seal (10).

d. Disconnect control tube from trunnion of collective pitch lever (7).

Note

If only the scissors and sleeve assembly is to be removed proceed as outlined in paragraph 8-87. The following steps are required for removal of the swashplate and collective sleeve assembly as a complete unit.

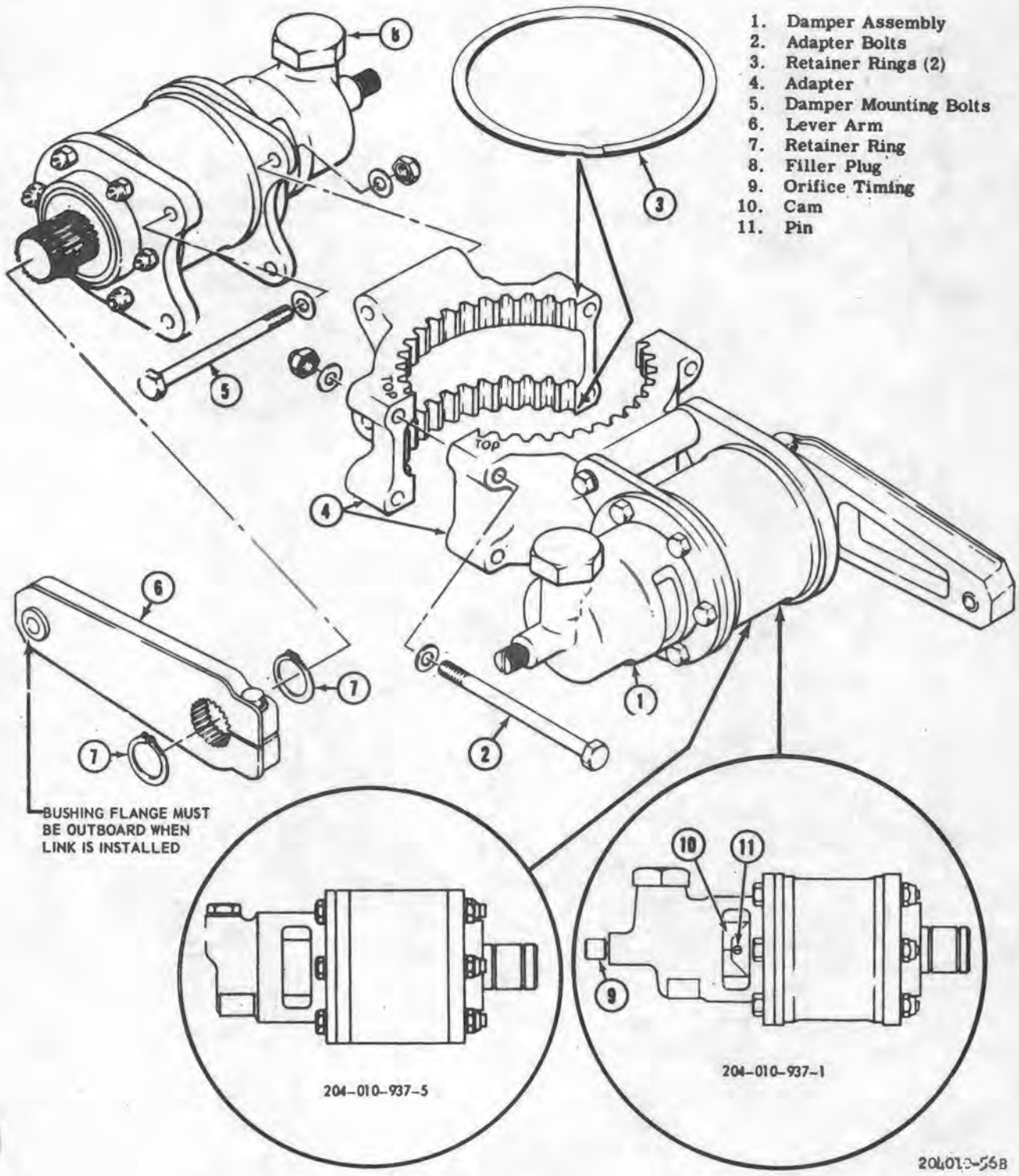

Figure 8-18. Sabilizer damper and adapter assembly (UH-1B serial No. 60-3546 thru 64-14100)

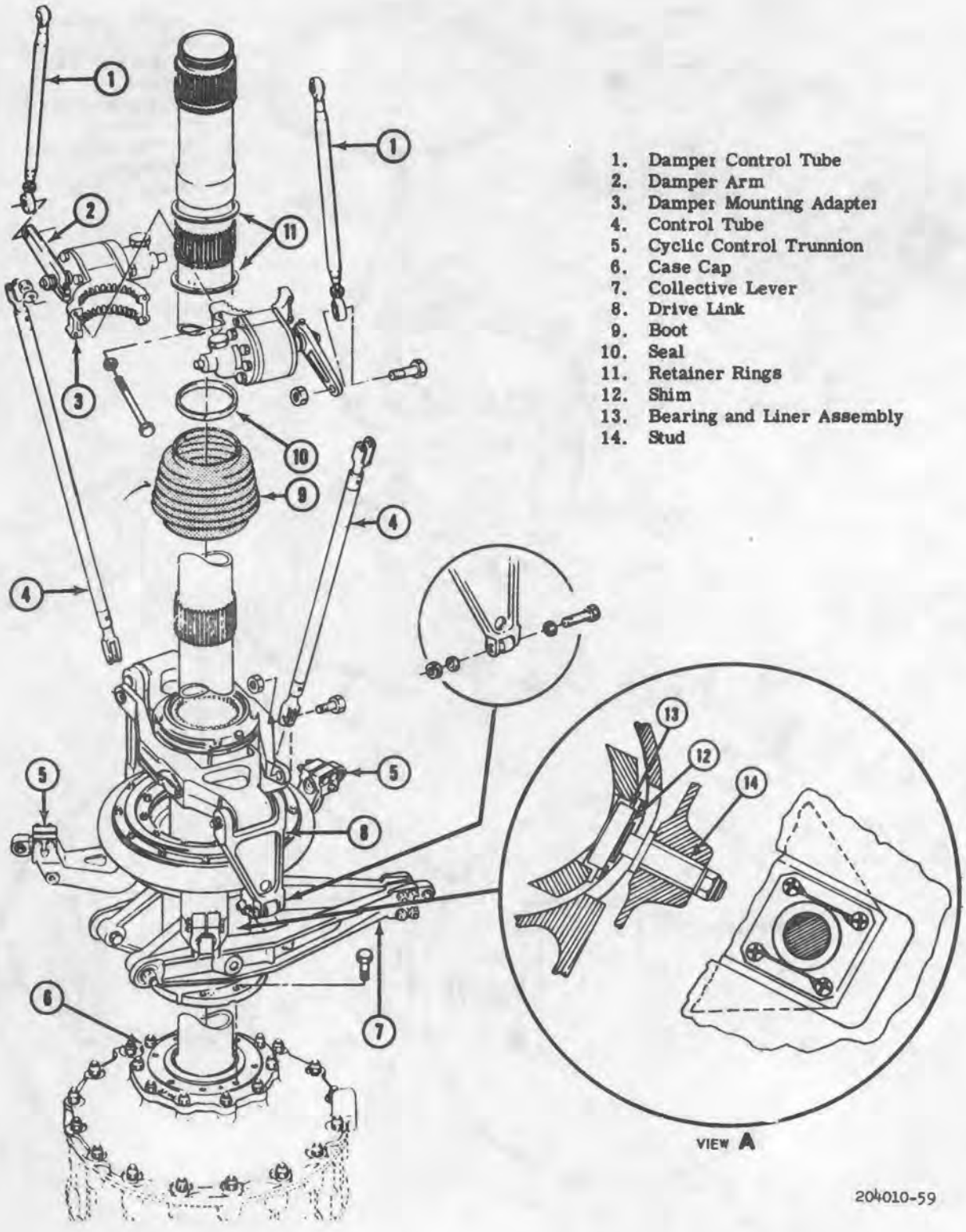

Figure 8-19. Mast controls (UH-1B Serial No. 60-3546 thru 64-14100)

e. Disconnect the cyclic and elevator control tubes from trunnions (5) on the swashplate. Insert a piece of folded paper or cardboard into each of the four gimbal support clevises to prevent damage while handling.

f. Remove eight bolts and washers securing swashplate support to transmission case cap (6) and carefully lift the swashplate and collective sleeve assembly from the mast.

8-82. *Inspection — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).* a. Inspect for maximum allowable wear looseness across gimbal ring bearings and bolts of 0.010 inch.

b. Inspect support and inner and outer rings for nicks, burrs and scratches.

c. Inspect trunnion bearings (5, figure 8-19) for allowable axial chuck of 0.020 inch and general condition.

Note

The trunnion bearings are somewhat different than other bearings which normally can be "feel checked" for roughness and ease of rotation. The trunnion bearings are preloaded into the cylinder portion of the trunnion with a 0.0005 inch tight to 0.0005 inch loose tolerance. They are the roller type, having two separated roller cases and angular faced inner and outer races.

The normal feel of this assembly is one of tightness, due mainly to the 0.0005 inch tight tolerance. The feeling of roughness is due to the preload and the angular faces of the inner and outer races. When grease (item 8, table 1-1) is applied to the assembly as required, the normal bearing feel does not exist.

The conditions described are inherent in the trunnion bearing assembly. Checking the bearing assembly for tightness should be accomplished by hand movement only of the barrel and the crosshead.

8-83. *Repair or Replacement — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).* Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-82.)

8-84. *Installation — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).* The swashplate and support assembly and the scissors and sleeve assembly can be installed as an assembled unit, or as separate assemblies. The following steps cover procedure for installation of the assembled unit. For installation of the scissors and sleeve as a separate assembly, refer to paragraph 8-90.

a. Lubricate splines with grease (item 8, table 1-1).

b. Carefully lower the assembled unit over the mast until swashplate support rests on transmission case cap (6, figure 8-19).

c. Align holes and install eight bolts, with aluminum alloy washers under heads, through support flange into case cap (6). Use two longest bolts between pivots of collective lever. Safetywire bolt heads in pairs.

d. Connect collective pitch control tube to collective lever. Connect cyclic and elevator control tubes to swashplate trunnions. Make certain lubrication fittings on trunnions are up.

e. Slide boot (9, figure 8-19) down over flange at top of sleeve assembly and secure with safetywire. Position seal (10) around mast and under top edge of boot (9). Safetywire seal.

f. Install stabilizer bar dampers and adapters. (Refer to paragraph 8-78.)

g. Install main rotor hub and blade assembly. (Refer to paragraph 8-52.)

h. Connect control tubes and links.

8-85. *Preparation for Storage or Shipment — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).* The following steps cover procedure for installing swashplate and collective sleeve in metal container.

a. Clean and dry swashplate and support assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1), to bushings and exposed nonplated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 19 eight unit bags (total 152 units) of desiccant, (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid of container into place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-86. Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). The collective sleeve, which is contained within the swashplate, is actuated by movement of the collective pitch lever. By this action collective control is transmitted to the main rotor hub.

8-87. Removal — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). a. Refer to paragraph 8-81. Perform steps a. through d.

b. Remove nuts, washers, spacers (3, figure 8-20) and bolts attaching collective pitch levers (1) to swashplate support (6) and to each other. Keep all loose parts, including shims (5), together for use in reassembly.

c. Cut safteywire and remove four screws attaching each bearing and housing assembly (8, figure 8-20) to lower end of collective sleeve (7).

d. Remove nuts, washers and bolts and disconnect links from swashplate trunnions.

e. Carefully lift the scissors and sleeve assembly upward and remove from mast.

8-88. Inspection — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). Clamp dial indicator to mast with plunger resting on the collective boot flange attaching bolt head. Rotate sleeve assembly and measure amount of play present. Maximum radial play allowed between mast and collective sleeve drive plate is 0.040 inch at point of measurement.

8-89. Repair or Replacement—Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). If inspection requirements (refer to paragraph 8-88) are not met request assistance from higher maintenance level.

8-90. Installation — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). The following steps cover installation of scissors and sleeve assembly as a separate assembly.

a. Lubricate splines of collective sleeve (7, figure 8-20) and carefully lower scissors and sleeve assembly over mast and into swashplate support (6).

b. Attach drive links (8, figure 8-19) to trunnion bearings on swashplate outer ring. Make certain lubrication fittings are down and bolt heads toward rotation. End play of .038 to .082 inch is normal and necessary between scissors and drive links.

Caution

Use high tensile, close tolerance bolts with a minimum of two steel washers positioned as shown in figure 8-19. Torque to 120 to 145 inch-pounds, and retorque after first ten hours of operation.

c. Position bearing and housing assemblies (8, figure 8-20) to lower end of collective sleeve (7) and install attaching screws. Safetywire screws in vertical pairs.

1. Levers-Collective
2. Pin
3. Spacer
4. Trunnion
5. Shim
6. Swashplate Support
7. Collective Sleeve
8. Bearing and Housing
9. Lever Bearing and Liner

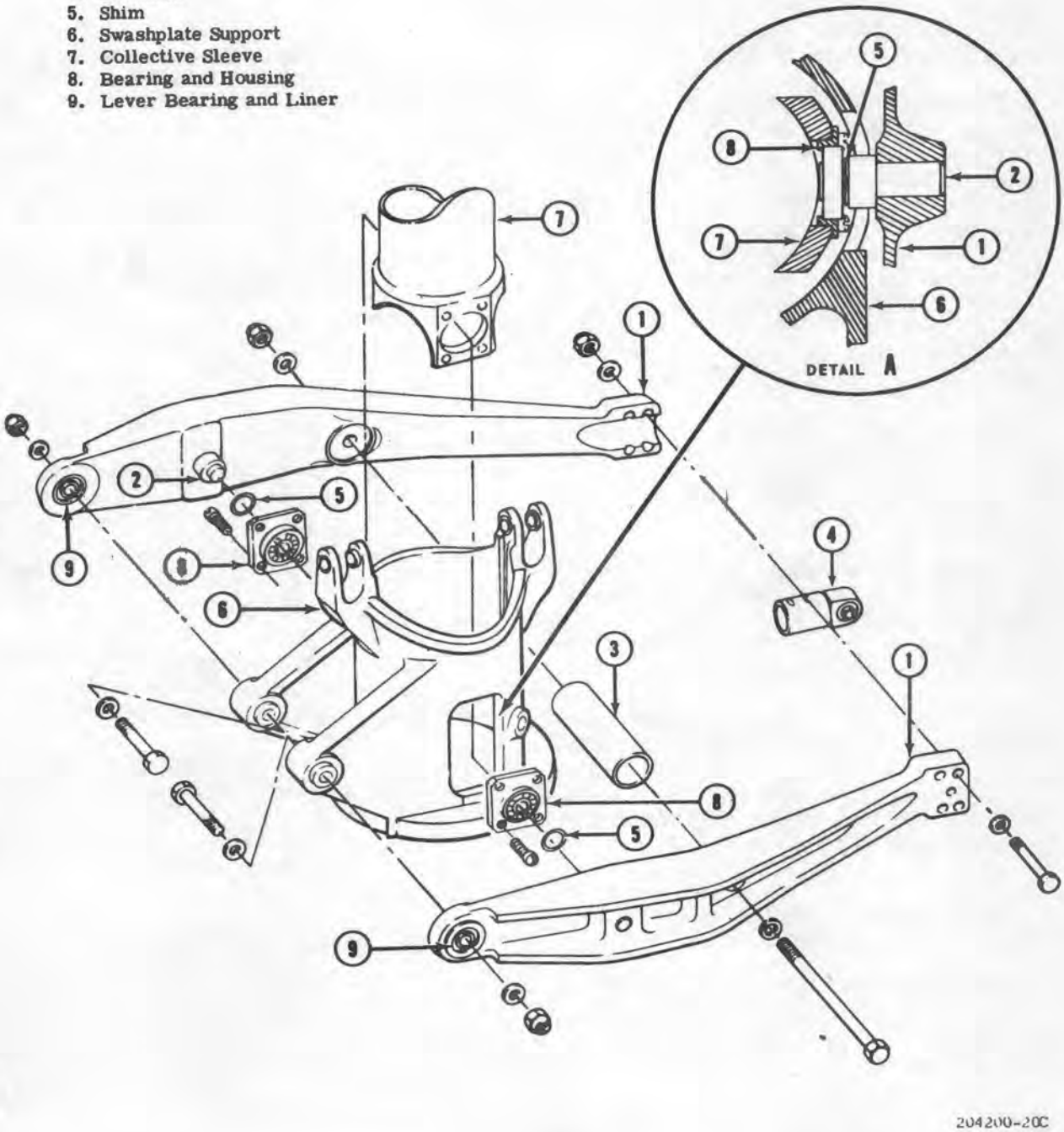

Figure 8-20. Collective pitch levers (UH-1B Serial No. 60-3546 thru 64-14100)

d. Check wear between lever bearing and liner (9, figure 8-20). If wear exceeds 0.001 inch, perform step e. If wear exceeds 0.005 inch, bearing must be replaced.

e. Clean bore of liner bushing and outer race of bearing. Coat both surfaces with primer (item 118, table 1-1). Allow to dry. Coat both surfaces with sealant (item 201, table 1-1). Wipe off excess sealant and allow to dry.

f. Assemble collective pitch levers (1, figure 8-20) on swashplate support (6) with pin inserted into bearings on collective sleeve (7). Position trunnion (4) between collective pitch levers (1) and install bolts, washers and nuts. Torque bolts. Use feeler gage to measure clearance between shoulder on pin and bearing inner race at each side. Add two feeler gage clearances and divide by two to determine thickness of shims (12, figure 8-19), required. Prepare two shims to this dimension, equal to each other within 0.005 inch.

g. Remove levers (7, figure 8-19) install shims (12) and reassemble. Check for no end play of pins in bearings and for freedom of bearing rotation. Installation should be 0.000 to 0.002 inch tight.

8-91. *Preparation for Storage or Shipment — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100).* The following steps cover procedure for installing scissors and sleeve assembly in metal container.

a. Clean and dry scissors and sleeve assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to bushings and exposed nonplated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid on container in place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-92. Control Tubes. The following steps cover general information and minor repair of both rotating and non-rotating control tubes.

a. Minor damage to both rotating and non-rotating control tubes in the form of scratches may be polished out.

Note

No limitations apply to length or direction of scratches. Scratches should be blended out to extend over a minimum two inch area.

b. Scratches in all control tubes above the swashplate not in excess of 0.005 inch in depth may be polished out in accordance with step d.

c. Scratches, below and aft of the swashplate not in excess of 0.010 inch in depth may be polished out in accordance with step d.

d. Remove all scratches that are within limitations with wet or dry type sand paper (item 508, table 1-1) or finer, to obtain a smooth scratch free surface. Apply two coats of zinc chromate primer (item 119, table 1-1) to repaired area.

e. Allowable wear limits for the damper control tube (1, figure 8-19) bearings permit a maximum of 0.010 inch radial play and 0.030 axial play. Some of these tube assemblies may be equipped with alternate rod end bearings, 47-140-252-5. Tube assemblies so equipped have 0.012 inch radial and 0.012 inch axial maximum allowable wear limits.

f. Tail rotor pitch change link bearings have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Vertical 1:1 vibration	Rotor blade out of track	Track blades
Steady or intermittent 1:1 vertical	Loose collective friction collet	Check for broken lockwire and retorque. Check for worn or damaged spring. Check concentricity of collet sleeve on mast if friction cannot be maintained.
	*Worn collective lever to collective sleeve bearing	Replace if radial play exceeds 0.010
	*Worn collective lever pivot bearing	Replace if radial play exceeds 0.010
	*Worn collective lever idler link pivot pin bearing	Replace if radial play exceeds 0.010
	Worn pitch change rod end bearings	Replace if wear exceeds 0.010 axial or 0.008 radial
	Worn stabilizer bar pivot bushings	Replace if radial play exceeds 0.010
	Worn mixing lever pivot bushings	Replace if radial play exceeds 0.010
	Worn self-align bearings (outboard end of mixing lever)	Replace if radial play exceeds 0.020
	Swashplate unibal torque incorrect	Check torque of inboard row of retaining nuts. Re-shim to obtain 17 to 21 pounds force to tilt swashplate.
	Worn scissors pivot bushing (short lug)	Replace if radial play exceeds 0.020
	Worn scissors bushings (drive link end)	Replace if radial play exceeds 0.020
	Scissors self-align bearings worn	Replace if radial play exceeds 0.020
	Worn or missing insert on extension radius rings	Replace ring if excessively worn or damaged
	Damaged extension seal	Replace seal
	Worn or deteriorated inboard or outboard extension and/or grip bearings in main rotor hub assembly	Replace bearings
	Worn drive link bearing(s), P/N 540-011-414	Replace if wear exceeds 0.010 axial radial, or as necessary
		*Tests indicate that in some cases less than 0.010 may contribute significantly to this vibration.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Sticking or inoperative dynamic stops	Incorrect weight spring adjustment	Readjust weight spring tension
	Sheared roll pin between lever and shaft or shaft and stop	Replace roll pin
Collective stick light or heavy in downstroke	Balance spring on collective cylinder out of adjustment	Adjust spring on servo valve to provide equal force to move collective either direction
Slow control response	Internal leakage in servo cylinder	Replace cylinder or seals as necessary
High frequency vibration	Loose elevator linkage at swashplate support	Check for worn bushings. Replace if wear exceeds 0.020 or evidence of metal to metal contact
	Loose elevator	Re-shim bearing
Pylon rock	Defective fifth mount	Replace mount
	Defective or dirty pylon dampers	Clean pylon dampers. If damaged, replace.
	Mount bolts bottomed or stripped	Replace bolts
	Fifth mount	Inspect mount and forging for damage

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
2:1 Vibration, approximately ten per second	Pylon mounts deteriorated	Replace mounts
Rotor rpm high or low in autorotation	Low pitch blade angle incorrect	Adjust both pitch change links equally

* Tests indicate that wear at one bearing or combined wear at these locations significantly contribute to vibration.

1. Main Rotor Blade
2. Drag Brace
3. Drag Brace Bolt
4. Shims
5. Locking Screw
6. Nut
7. Washer
8. Blade Retaining Bolt
9. Washer
10. Locating Pin
11. Grip
12. Extension
13. Yoke
14. Trunnion
15. Bearing Housing
16. Pitch Horn

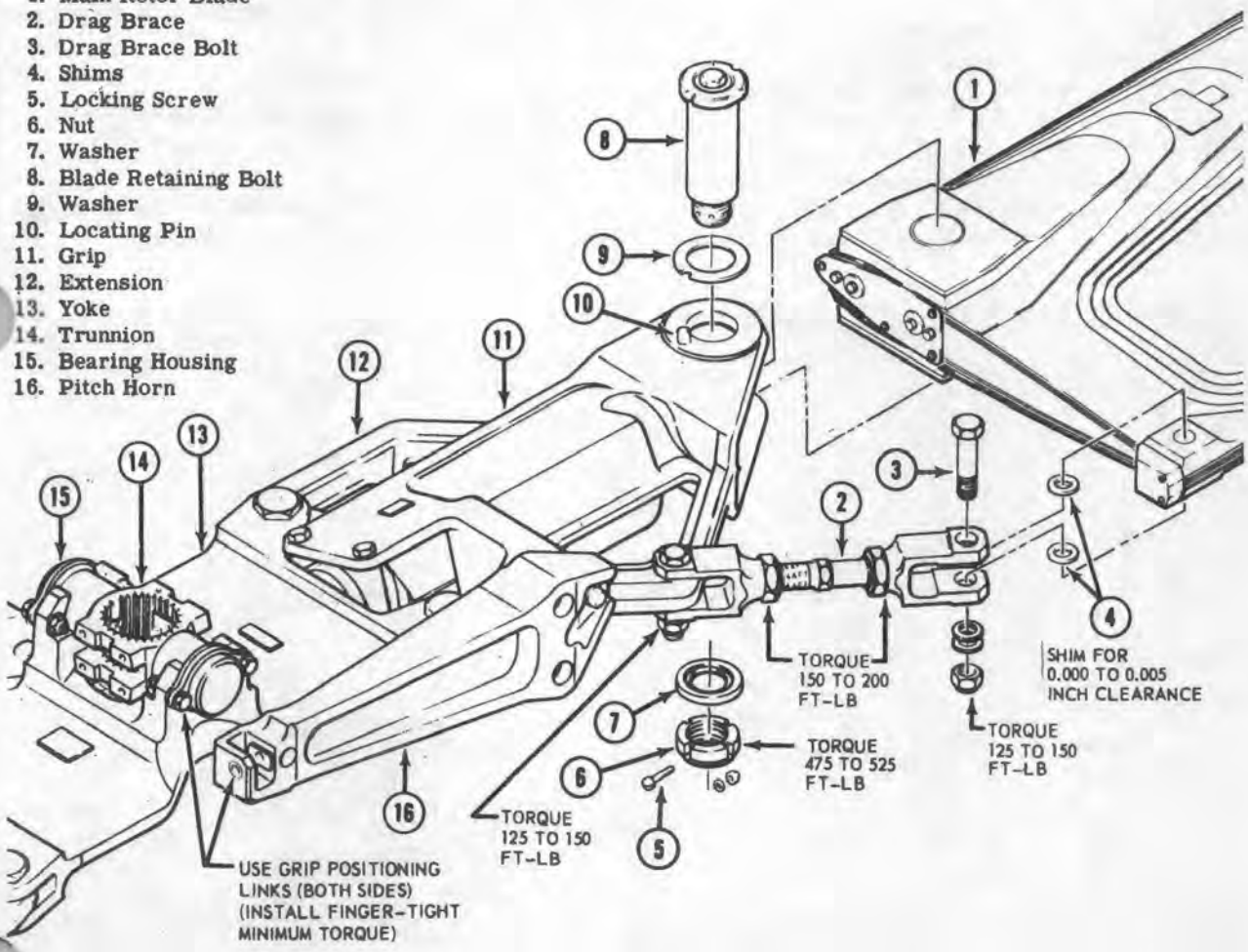

Figure 8-22. Main rotor hub and blade assembly (UH-1B serial no. 64-14101 and subsequent)

8-96. *Operational Check — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* Run-up shall be performed by personnel authorized in accordance with AR95-13.

a. Operate at 6600 engine rpm, with collective pitch setting low enough to avoid becoming airborne. Note torque reading.

b. Reduce engine speed to approximately 4700 rpm, with same collective setting. Perform a blade tracking check. (See figure 8-23.)

c. Make correction for any low-speed out-of-track by shortening pitch change link of high blade. Turning pitch link barrel one flat will change blade track approximately 5/8 inch. Tighten jam nuts on pitch change links and torque 650 to 800 inch-pounds. Repeat check and make further adjustments until low speed track is correct. Lockwire barrel to hole in banjo of each rod end.

d. Perform a tracking check at 6600 rpm, with collective setting as in step a.

e. Make correction for any high-speed out-of-track by adjusting blade trim tabs with T101486 bender and T101485 bending gage. Change tab angle by one degree for each 1/8 inch (approximate) track correction required, raising tab on low blade or lowering tab on high blade or adjusting in a combination which keeps both tabs nearest zero (trail) position. Repeat check and adjustment until track is correct in ground operation.

f. Change tab angle by one degree for each 1/8 inch (approximate) track correction required, raising tab on low blade or lowering tab on high blade or adjusting tabs in a combination which keeps both tabs nearest zero position. Maximum tab differential allowable is 14 degrees. Repeat check and adjustments until track is correct in ground operation.

g. After the proper tab setting has been achieved, based on ground track, test fly helicopter throughout operational range.

h. Test for smooth operation in flight. If a vertical 1/1 revolution occurs at high speeds (vibration will get progressively worse as speed increases), make further adjustments to refine trim tab settings.

Note

Above 100 knots as little as 1/2 degree change in tab settings can be significant.

i. Check for lateral vibrations due to rotor balance through full airspeed range.

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Figure 8-23. Tracking main rotor blades (UH-1B Serial No. 64-14101 and subsequent)

j. Correct spanwise balance by wrapping two-inch width masking tape around one blade tip as a trial weight. If condition becomes worse, change tape to opposite blade. Balance to best one-half wrap of tape. Remove tape and install lead as weight in blade retaining bolt, inserted through plugged hole at top. Use 2.4 ounces in bolt for each wrap of tape.

k. Correct chordwise balance by adjusting drag brace to sweep one blade aft. Loosen jam nuts enough to turn brace barrel one flat AFT, as shown by decal arrows, and tighten nuts with 150 to 200 foot-pounds torque. Record adjustment. If condition becomes worse, restore blade to original position and adjust opposite blade. If condition improves, continue adjusting by small amounts until rotor operates smoothly. Maximum permissible adjustment is two full turns, which exceeds normal requirements.

Note

If chordwise balance cannot be accomplished within the above limits, remove rotor hub and re-align.

l. Check rotor rpm in autorotation. (Refer to TM 55-1520-211-10.) If rotor overspeeds, lengthen both pitch change links equally. If rotor underspeeds, shorten both links equally.

8-97. *Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Remove stabilizer bar (1, figure 8-21) disconnecting lower ends of pitch change link (3), control tube (4) and damper link tube (5), and removing bolts at each support (6). (Refer to paragraph 8-106.) When disconnecting a pitch change link, install a T101466 grip positioning link with eyebolt in a bolt hole of trunnion bearing housing and lower end attached to pitch horn. (See figure 8-24.)

b. Remove lockwire, bolt and lock (7, figure 8-21). Use T101358 adapter wrench to remove retaining nut (8), with washer (9).

c. Install T101460 maintenance hoist, or position other suitable hoist directly above mast. Attach hoist to main rotor hub with suitable lifting slings.

d. Attach a tie-down assembly to rotor blade to guide and steady rotor. Lift hub clear of mast (12). Remove cone set (13).

e. Place rotor hub on a stand, T101356, and suitable supports under blades.

Caution

Do not apply corrosion preventive compound, cosmoline or any type of grease to the teflon bearings or in the area of the bearings on the 540 rotor configuration helicopters. This instruction will apply, regardless of the ship status, operational, in storage or in preparation for overseas movement. Assemblies affected are: stabilizer bar, main rotor hub, scissors and sleeve, swashplate and support, collective levers and elevator idler pivot bushings located on the aft side of the swashplate support.

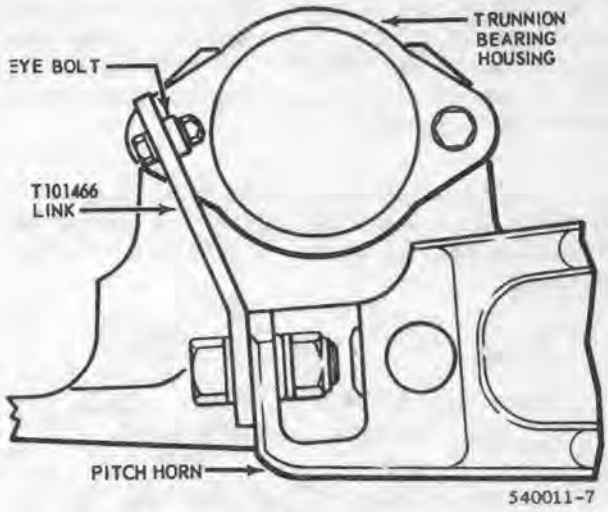


Figure 8-24. Grip positioning link (UH-1B Serial No. 64-14101 and subsequent)

8-97A. *Inspection — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* Inspect main rotor grip bearings for binding by leveling the main rotor and stabilizer bar, moving the stabilizer bar in either direction causing blade grips to change pitch, grips should operate smoothly and freely, any binding that occurs is cause for replacement.

8-98. *Installation — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Erect T101460 maintenance hoist on right side of engine deck, or provide other suitable hoist.

Caution

T101460 maintenance hoist has a steel support leg and is required for lifting 540 components.

b. Check that T101466 grip positioning links are installed at pitch horns to hold blades at normal position until control linkage is connected. (See figure 8-24.)

c. Attach suitable hoisting slings and lift main rotor to position with hub directly above mast. Rotor tie-down tool can be used to guide and steady rotor during handling.

d. Coat splines of mast (12, figure 8-21) and rotor hub trunnion (10) with corrosion preventive compound, (item 315 or 318, table 1-1). Place cone set (13) in groove of mast upper splines with bevel side up.

e. Align master splines and lower the rotor carefully on mast until trunnion is seated on cone set. Remove excess corrosion preventive compound.

Note

Rotor hub must be aligned carefully to avoid damaging mast threads.

f. Install washer (9) and retaining nut (8) on mast. Use T101358 wrench adapter to tighten nut to a torque of 550 to 780 foot-pounds. Install lock (7) engaged with nut splines and secured to hub trunnion by a bolt. Lockwire bolt head to hole provided in trunnion.

g. Lift stabilizer bar assembly (1) to position, observing color code markings, and attach supports (6) to rotor hub trunnion. Connect control tubes (4) and damper link tubes (5). (Refer to paragraph 8-109.)

Note

All close tolerance, high tensile bolts in main rotor linkage require high-strength washers with internal chamfer to accommodate radius at bolt head.

h. Remove T101466 grip positioning links, replacing each eyebolt with original bolt in trunnion bearing housing flange. Connect pitch change links (3) between stabilizer bar mixing levers (2) and pitch horns (11) according to applicable procedures below:

(1) If connecting pitch change links known to be satisfactory in adjustment: Check that rod-end with right-hand thread is attached to mixing lever by a bolt installed from leading side, with washers under head and nut, and with nut secured by cotter pin. Check that nut and retainer are in recess of pitch horn. Align lower end of link in horn and install bolt with washer next to head. Lockwire bolt head to hole provided in horn.

(2) If using new pitch change links or if rigging is doubtful: Set each link to 9.64 inches between bearing centers, with rod-ends aligned and exposed thread areas equal at both ends within 0.03 inch. Tighten jam nuts with 650 to 800 inch-pounds torque. Lockwire barrel to hole in banjo of rod-end. Install links as in (1) above.

(3) With controls at low pitch position, check for blade angle of plus 6 to 7 degrees as follows: Place protractor chordwise on machined surface of one blade grip near blade retaining bolt, then on opposite blade grip. Total reading for both blades should be 15 (plus or minus ½) degrees. If any adjustment is required, adjust both links equally.

Note

Further adjustment of pitch change links may be required in operational checks.

8-99 Main Rotor Blades (UH-1B Serial No. 64-14101 and sebsequent). Each main rotor blade is an all-metal bonded 27 inch chord airfoil section. They are secured in main rotor hub blade grip by a retaining bolt and are held in alignment by adjustable drag braces between trailing edge and grip.

8-100. *Removal—Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* a. Support main rotor hub on a stand. Support each blade (1, figure 8-22) so leading edge is straight.

b. Detach drag brace (2) from blade by removing bolt (3) with nut, washers, and shims (4). Keep shims for reassembly.

Note

Do not change drag brace adjustment.

c. Remove locking screw (5) with nut and washer. Use T101414 wrench to remove nut (6) and washer (7) from blade retaining bolt (8).

d. Remove retaining bolt and washer (9), raising blade tip as necessary to find position of best alignment which allows bolt removal without binding and possible damage. Leave pin (10) in place. Be sure bolt is identified for reassembly in same location.

the grip plate, drag plate and doublers up to 0.060 inch deep are acceptable if the total lengths of the voids in a bond line does not exceed 10 percent of the length of the bond line and no single void exceeds 2.0 inches in length. No edge voids are acceptable in the outboard 7.0 inches of the doublers, the outboard 3.0 inches of the grip plates, and the outboard 1.5 inches of the drag plate. Acceptable voids must be sealed with sealer (item 210, table 1-1). Unacceptable voids require blade replacement.

8-101A. *Emergency Repairs — Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* Main rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or disposition of main rotor blades shall be accomplished at the earliest opportunity.

a. Any damage penetrating the skin or in excess of manual limits and at least 2.0 inches from the doublers and outside of the hatched area shown on figure 8-24A may be repaired provided the repair does not exceed 2.0 inches in diameter. "REPAIRS INBOARD OF STATION 210 MUST BE INSPECTED FOR CRACKS DAILY."

Note

Dents may also be repaired. If dent is sharp, cut out dent and patch. If dent is not sharp, install patch only.

b. If the blade is damaged within the limits of step a., above, it may be repaired in accordance with the following instructions.

Note

There is no limit as to the number of patches within the designated repair areas, except that no two patches may be on the same chord line, and at least ½ inch edge distance must be maintained between patches.

(1) Draw a circle around the damaged area just large enough to encompass damage.

(2) Remove skin just inside the circled area, disturbing the honeycomb as little as possible.

(3) Deburr edges of hole, making sure skin is free of scratches and nicks.

(4) Remove paint from repair area with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

(5) Prepare a patch to cover the hole that will overlap by 0.75 inch. Patch may be fabricated from 0.016 or 0.020 2024ST T3 aluminum, Specification QQ-A-355-T3 or QQ-A-283-T6. Deburr and blend out edges. Sand the bond area of the patch and blade with 400 grit paper (item 509, table 1-1).

(6) Clean bond area on patch and blade with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

Note

Area must be clean, dry and free of grease, oil and wax.

(7) Apply adhesive (item 214 or 216, table 1-1) to patch and area around hole. Apply patch to blade, moving patch slightly under pressure to make sure voids in bond are expelled. Blend out excessive adhesive.

(8) Patch may be held in place while curing with rubber bands made from inner tube. Allow to cure at 60°F or above until completely firm. (Adhesive will resist fingernail penetration.) Overnight curing is usually sufficient. To accelerate curing time apply heat to area with a 200 watt lamp, 12 inches from patch. Heat should be applied until adhesive is completely firm. (Adhesive will resist fingernail penetration.)

(9) Refinish patch and adjacent area in accordance with touch-up procedures called out in paragraph 8-102.

c. One or more cracks developing and extending from a previously repaired area are cause for immediate local scrappage of blade.

8-102. *Painting — Minor Refinish — Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* Minor refinishing of main rotor blades consists of reworking small areas containing bare spots, paint cracks, crazing, blisters or other such minor defects which do not show evidence of pitting or damage to the blade shell. Use the least amount of paint possible to adequately protect the blade and to disturb the blade balance as little as possible.

a. Degrease with aliphatic naphtha (item 308, table 1-1) or any good degreasing solvent.

Caution

Do not use solvent which damages paint finish.

b. Sand aged paint areas, using an abrasive grit which will not show marks in final finish. Remove dust with cloth dampened with naphtha or with filtered compressed air.

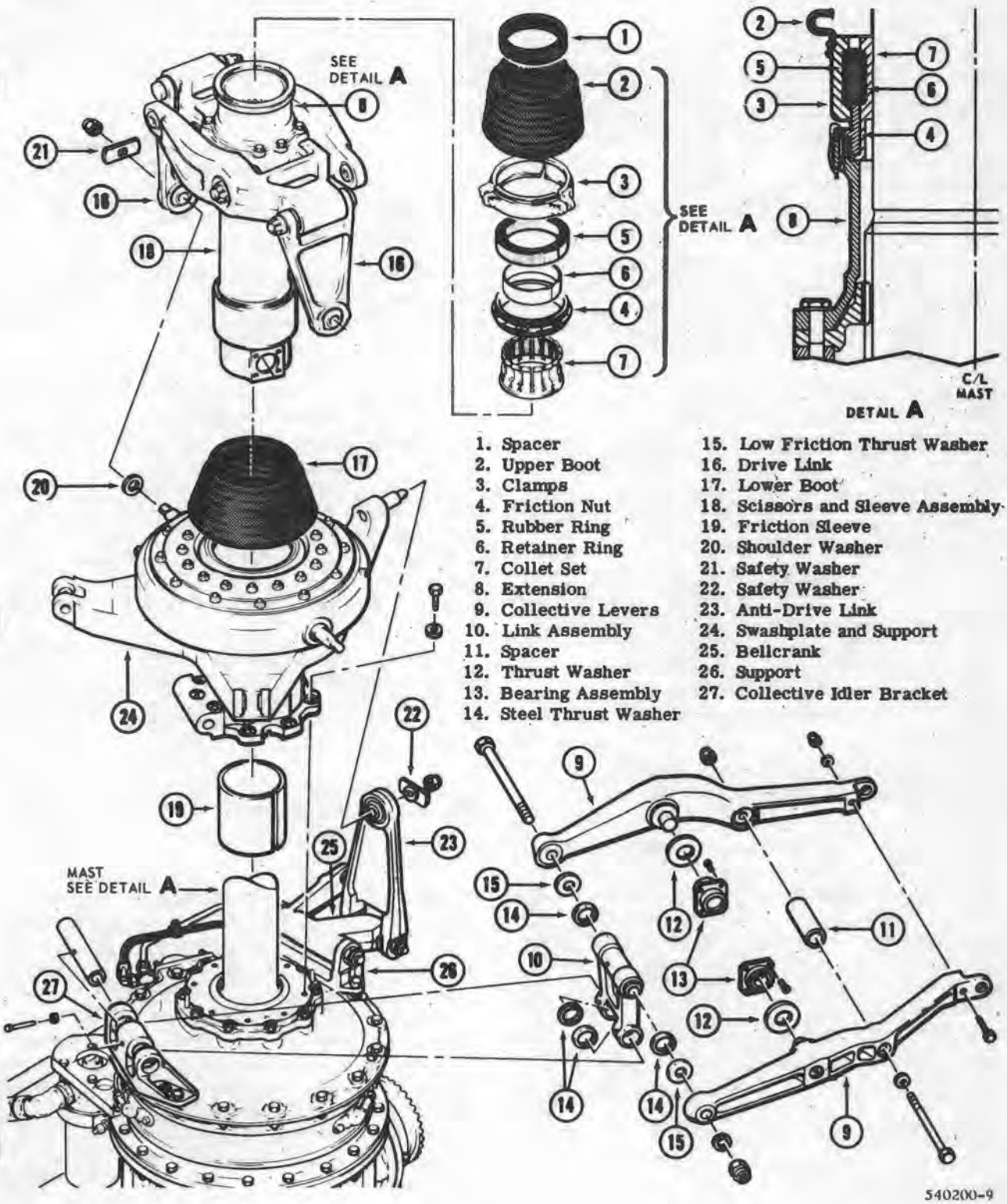
e. Inspect mixing levers for score marks caused by upper end of control tube (4).

8-108. ***Repair or Replacement — Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent).*** Replace all parts that do not meet inspection requirements.

c. Install shims (2) on upper bolts between stop supports to obtain 0.000 to 0.005 inch clamp-up on mast. Tighten nuts with 75 to 80 foot-pounds torque.

d. Tighten nuts on lower through-bolts. Tighten two locating bolts to seat lower flanges of stop supports, and lockwire each bolt head to exposed shank of upper bolt between damper supports.

8-115. Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent). Dampers are connected by link tubes to stabilizer bar and are non-adjustable, being pre-set for required stiffness of action. A window is provided in each damper for visual check of timing by



1. Spacer
2. Upper Boot
3. Clamps
4. Friction Nut
5. Rubber Ring
6. Retainer Ring
7. Collet Set
8. Extension
9. Collective Levers
10. Link Assembly
11. Spacer
12. Thrust Washer
13. Bearing Assembly
14. Steel Thrust Washer
15. Low Friction Thrust Washer
16. Drive Link
17. Lower Boot
18. Scissors and Sleeve Assembly
19. Friction Sleeve
20. Shoulder Washer
21. Safety Washer
22. Safety Washer
23. Anti-Drive Link
24. Swashplate and Support
25. Bellcrank
26. Support
27. Collective Idler Bracket

Figure 8-28A. Mast controls (UH-1B serial no. 66-491 and subsequent)

bearing cup facing out. Install four attaching screws and torque 20 to 25 inch pounds. Lockwire screws in pairs

d. Position collective levers (9) and thrust washers (12) to bearing assembly (13) with low friction thrust washer (15) and steel thrust washer (14) between collective levers and link assembly (10). Install steel thrust washer under bolt head and under nut. Install bolt through washers, levers and link. Install tension washer and nut on end of bolt. Tighten nut finger-tight.

Note

A total axial chuck of 0.015 to 0.060 inch (see figure 8-28B) is allowed between the collective levers (9, figure 8-28A) and the bearing housing assembly (13).

e. Install spacer (11), bolt, washer and nut. Torque nut 160 to 190 inch pounds.

f. Torque nut installed finger-tight in step d. 1250 to 1550 inch pounds and install cotter pin.

g. Install bolt, washer and nut connecting outboard ends of collective levers (9) together. Torque nut 50 to 70 inch-pounds.

h. Place a snoulder washer (20), with chamfer facing outboard, on one of two pins extending from swashplate outer ring. Connect a drive link (16) from scissors to pin, and install a safety washer (21) and nut. Torque nut 770 to 950 inch-pounds and install cotter pin. Install opposite link in same manner.

i. Slip ends of lower boot (17) on lip of swashplate shield and grooved ring on collective sleeve below hub. Secure each end with lockwire.

j. Check that friction sleeve (19) on mast is clean of any grease or dirt. Position halves of friction collet set (7) around mast sleeve and seated in top of collective sleeve extension (8). Install friction nut (4), with largest threaded diameter down, over mast and collet set. Start threads into extension and tighten 140 to 180 foot-pounds torque. Align holes in friction nut (4) with holes in extension (8).

k. Make sure there is no gap between teflon on friction collet set (7) and friction sleeve (19). Lockwire friction nut (4) in two places approximately 180 degrees apart.

l. Position retainer ring (6) and rubber ring (5) around collet set (7) and on top of friction nut (4). Place three matched clamps (3) around rubber ring (5) and install nuts, washers and bolts with washer under each nut and each bolt head.

m. Apply a suitable spring scale at input end of collective levers (9) and operate levers while adjusting friction of collet on mast sleeve. Torque clamp bolts evenly until a measured load of 125 to 135 pounds is required to move sleeve assembly.

Note

Do not exceed 130 inch-pounds torque on clamp bolts. If correct friction cannot be obtained within this limit, investigate for grease on mast sleeve or defective parts.

n. After friction adjustment, connect control rod from collective system hydraulic cylinder to collective levers (9) with bolt, washers, nut and cotter pin.

o. Install upper boot (2). Secure lower end of boot on grooved lip of collective sleeve extension with lockwire. Place spacer (1) around mast above friction sleeve and inside upper end of boot and secure with lockwire.

p. Install dampers, dynamic stops, main rotor and stabilizer bar. Connect control tubes from stabilizer bar mixing levers to scissors with bolts, washers and nuts. Install tension washer under bolt heads and plain washer under nuts. Torque nuts 700 to 1200 inch-pounds and install cotter pins.

q. After first flight following installation, disconnect control tubes from scissors and from collective lever. Repeat step m. to check friction setting and readjust if necessary due to seating of parts. Reconnect control tubes.

8-121B. ***Adustment — Friction Collet Assembly (UH-1B Serial No. 64-14101 and subsequent).*** Refer to paragraph 8-121, step l., or paragraph 8-121A, step m.

8-122. Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent). The swashplate support is an open cylinder with a mounting flange at lower end and a spherical surface at upper end. Side openings and a horizontally-drilled boss are provided to accommodate a lever which actuates the collective sleeve. The swashplate inner ring is clamped on the pivot ball of the support by upper and lower sets of contoured teflon-lined bearings, so as to tilt in any direction when actuated by cyclic control rods connected on two clevis-type horns at forward side of the ring. A pin-type horn at rear connects to a link which holds the ring from rotating and also transmits control motions to the elevator linkage. The swashplate outer ring tilts with the inner ring but rotates

with the mast, being mounted on the inner ring through a duplex ball thrust bearing and connected by two drive links to scissors on the collective sleeve.

8-123. *Removal — Swashplate and Support Assembly (UH-1B Serial No. 65-14101 and subsequent).* a. After removal of scissors and sleeve assembly (17, figure 8-28; 18, figure 8-28A) remove boot (15, figure 8-28; 17, figure 8-28A).

b. Remove cotter pin, nut and safety washer (19, figure 8-28; 22, figure 8-28A) to detach anti-drive link (20, figure 8-28; 23, figure 8-28A) from pin at rear on swashplate inner ring.

c. Disconnect cyclic control cylinder rods from two control horns at front of swashplate inner ring.

d. Remove lockwire, bolts and washers from bottom flange of swashplate support.

e. Lift off swashplate and support assembly (21, figure 8-28; 24, figure 8-28A) over top of mast, using care to avoid damaging splines and friction sleeve.

8-123A. *Inspection — Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* Inspect inner surface of swashplate control horn clevises that are contacted by boost cylinder rod end bearing housing for maximum allowable wear of 0.060 inch.

8-123B. *Repair or Replacement—Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* If inspection requirements are not met, replace swashplate with like, serviceable item.

8-124. *Installation — Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Lift swashplate and support assembly (21, figure 8-28; 24, figure 8-28A) over top of mast. Carefully lower assembly until resting on mast bearing plate.

Note

On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 make sure that swashplate support is aligned so aft locating pin on transmission case enters hole in bottom of collective idler mounting boss.

b. Install eight bolts, with washers, through support flange into mast bearing plate. Lockwire in pairs.

c. Turn swashplate inner ring to align pin-type control horn straight aft. Connect anti-drive link (20, figure 8-28; 23, figure 8-28A) from elevator control bellcrank to control horn pin, attached by safety washer (19, figure 8-28; 22, figure 8-28A) with AFT side out, and nut. Torque nut 690 to 990 inch-pounds. Install cotter pin.

d. Connect two control rods from cyclic system hydraulic cylinders to clevis-type control horns at front of swashplate inner ring, using bolts, washers, nuts and cotter pins.

e. Place lower boot (15, figure 8-28; 17, figure 8-28A) over mast and loosely on top of swashplate in preparation for installation of scissors and sleeve assembly.

8-124A. *Anti-Drive Link Assembly.* The anti-drive link assembly (20, figure 8-28; 23, figure 8-28A) connects to a pin-type horn on swashplate (21, figure 8-28; 24, figure 8-28A) and prevents rotation of the ring. It also transmits control motion to the elevator linkage through the bellcrank (25, figure 8-28 and 8-28A).

8-124B. *Removal — Anti-Drive Link Assembly.* a. Disconnect the anti-drive link assembly (20, figure 8-28; 23, figure 8-28A) from the swashplate horn.

b. Remove bolt through elevator bellcrank (25, figure 8-28 and 8-28A) and anti-drive link (20, figure 8-28; 23, figure 8-28A). Detach anti-drive link.

c. Remove bolt through elevator control tube clevis and elevator bellcrank arm.

d. Remove bolt through support (24, figure 8-28; 26, figure 8-28A) and elevator bellcrank (25, figure 8-28 and 8-28A) and detach bellcrank from support.

e. Remove nuts and washers securing support assembly (24, figure 8-28; 26, figure 8-28A) to transmission.

8-124C. *Inspection — Anti-Drive Link Assembly.* a. Check clearance between leg of anti-drive link (20, figure 8-28; 23, figure 8-28A) and elevator bellcrank (25, figure 8-28 and 8-28A). Maximum allowable is 0.015 inch.

b. Inspect bearing in anti-drive link (20, figure 8-28; 23, figure 8-28A) for wear or damage.

c. Inspect bushings in elevator bellcrank (25, figure 8-28 and 8-28A) for wear and serviceability.

d. Inspect bushings in support assembly (24, figure 8-28; 26, figure 8-28A) for wear and serviceability.

8-124C1. ***Inspection — Collective Idler Link Assembly (UH-1B Serial No. 64-14106 thru 64-14191; 65-9416 thru 65-9466 and 65-9468 thru 65-9564).*** (See figure 8-28.) Inspect all 540-011-458 link assemblies displaying point or punch staking for retention of the 540-011-418 bearing, should be visually inspected using a ten power glass for detecting cracks originating from point stake area. Any and all suspected or confirmed cracked link assemblies should be removed from service immediately

Note

A daily inspection should be continued until replacement parts incorporating segment staking are installed.

8-124D. ***Repair or Replacement — Anti-Drive Link Assembly.*** a. Replace anti-drive link (20, figure 8-28; 23, figure 8-28A) and bushing in elevator bellcrank (25, figure 8-28 and 8-28A) if clearance between bushing shoulder in elevator bellcrank and anti-drive link exceeds 0.015 inch.

b. Replace bushings in elevator bellcrank (25, figure 8-28 and 8-28A) if worn or unsuitable for continued usage.

c. Replace bushings in support assembly (24, figure 8-28; 26, figure 8-28A) if worn or unsuitable for continued usage.

8-124E. ***Installation — Anti-Drive Link Assembly.*** a. Position support assembly (24, figure 8-28; 26, figure 8-28A) on transmission and install washers and nuts.

b. Install bolt, with washer under head, through support assembly (24, figure 8-28; 26, figure 8-28A) and inboard end of elevator bellcrank (25, figure 8-28 and 8-28A). Install nut and cotter pin.

c. Install bolt, with washer under head, through legs of anti-drive link (20, figure 8-28; 23, figure 8-28A) and elevator bellcrank (25, figure 8-28 and 8-28A). Install nut and torque 190 to 210 inch-pounds.

d. Install end of anti-drive link (20, figure 8-28; 23, figure 8-28A) on horn of swashplate (21, figure 8-28; 24, figure 8-28A). Install washer and nut. Torque nut 690 to 990 inch-pounds. Install cotter pin.

e. Install bolt, with washer under head, through elevator control rod and arm of elevator control link. Install washer, nut and cotter pin.

8-124F. ***Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).*** The inboard ends of the collective levers (9, figure 8-28A) are attached to an idler link (10) which is mounted in a bracket (27) attached to the top transmission case by four bolts, washers and nuts. This pivot point arrangement reduces loads in the control system and improves vibration characteristics.

8-124G. ***Removal — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).*** a. Remove scissors and sleeve assembly (18, figure 8-28A). (Refer to paragraph 8-120A.)

b. Remove cotter pin, washer and straight pin (1, figure 8-28B) attaching idler link (2) to pivot shaft (3) through mounting bracket (4).

c. Withdraw shaft (3) from idler link and mounting bracket and remove link (2).

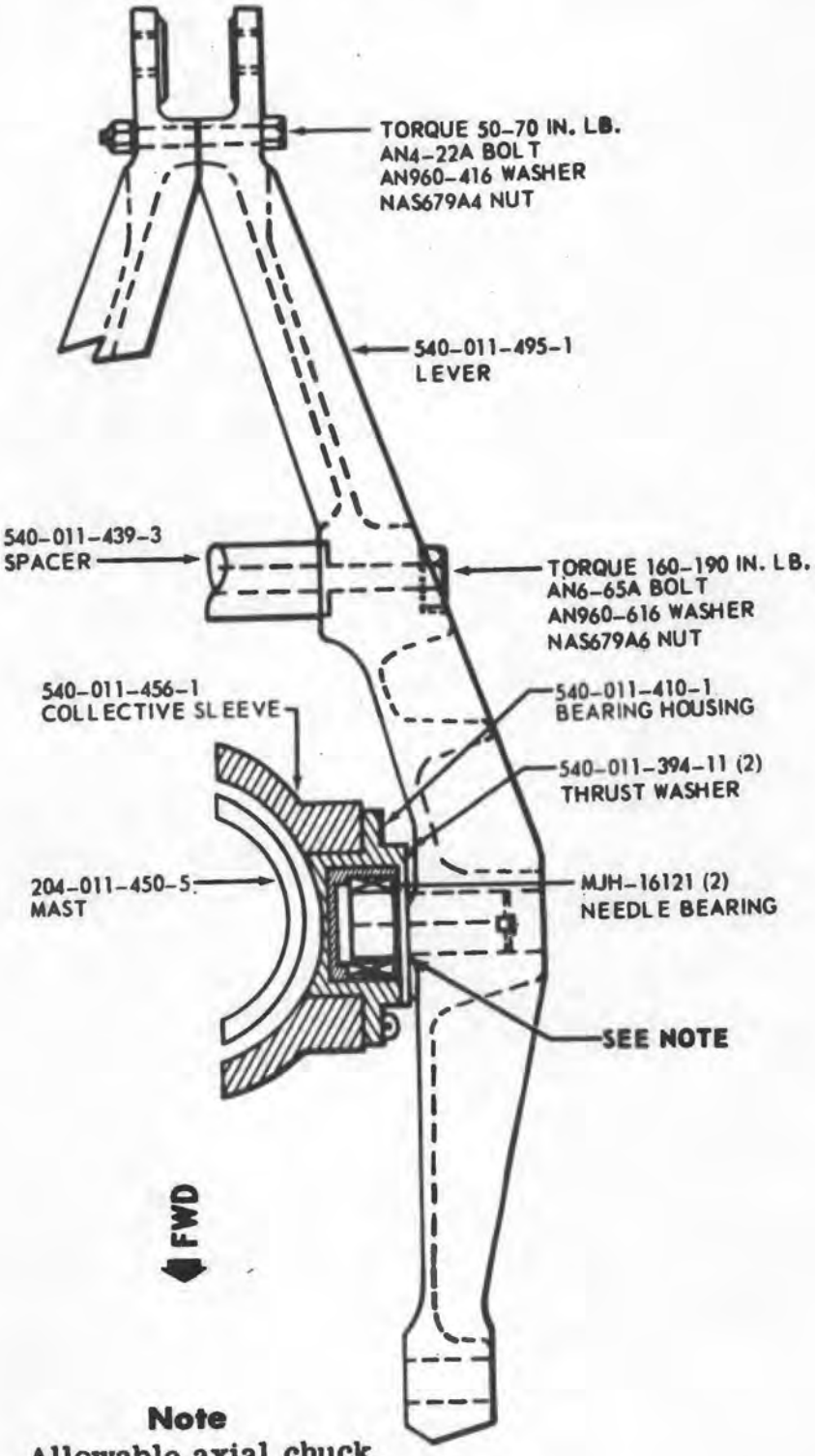
d. Remove four nuts, washers and bolts attaching mounting bracket (4) to top transmission case and remove mounting bracket.

8-124H. ***Inspection — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).*** a. Inspect three lubrication fittings in idler link (2, figure 8-28B) for cleanliness and damage.

b. Inspect idler link bearing seals (5) for damage and needle bearings for binding and wear.

c. Inspect pivot shaft (3) for scoring and hole elongation.

d. Inspect four bushings in mounting bracket (4) for damage and wear.



Note

Allowable axial chuck 0.015 to 0.060

Figure 8-28A-1. Needle bearing limits

d. Install static stop (11) and nut (10). Torque nut 300 to 400 inch-pounds. Hold assembly at hub when torquing nut. Safety wire nut to static stop. Slide boot (9) on shaft.

Note

Retorque nut after first five hours of operation. Retorque can be accomplished with slider and crosshead installed using care that wrench does not contact adjacent parts.

e Temporarily install bearings (5) in cap (3) and secure with slider (8) retainer plate (7) and two bolts with nuts. Tighten bolts sufficiently to secure assembly without distortion. Measure gap with a feeler gage between retainer plate and crosshead. Prepare a shim to measured thickness less 0.002 to 0.004 inch pinch of retainer plate against bearing.

f. Install slider (8) on shaft and into boot. Position retainer plate (7) and shim (6) next to slider. Install bearings (5) on pitch change rod (18) with machined surfaces together and retainer plate facing inboard. Install washer and nut (4) on rod. Torque nut 60 to 85 inch-pounds and secure with cotter pin.

g. Fill cavity of crosshead (3) with grease, (item 8, table 1-1). Position crosshead assembly (3) over bearings and insert bolts through crosshead shim (6), retainer plate (7), and slider (8). Install washers next to nuts and torque 50 to 70 inch-pounds.

h. Attach pitch change links (1) to pitch horns (16) with spacers and washers positioned as illustrated.

i. Install washers next to nuts and torque 50 to 70 inch-pounds. Install cotter pin through nut.

j. Install safety wire around each end of boot.

k. Check assembly for free flapping and pitch change in all positions.

l. Check rigging and rig if necessary.

m. Track blades. (Refer to paragraph 8-127.)

8-132. Tail Rotor Blades (UH-1A). Tail rotor blades are of all-metal bonded construction.

8-133. ***Removal — Tail Rotor Blades (UH-1A).*** Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-133A. ***Cleaning — Tail Rotor Blades (UH-1A).*** Wash tail rotor blades in a mild solution of soap and water.

8-134. ***Inspection and Repair — Tail Rotor Blades (UH-1A).*** The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-31.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skin, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.060 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

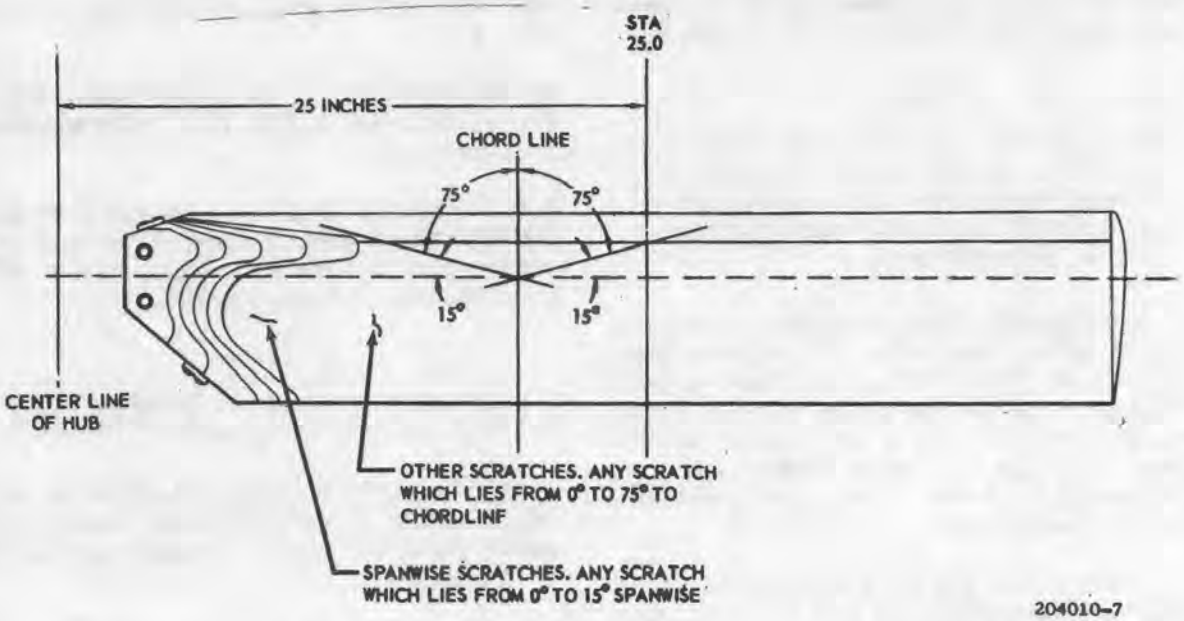


Figure 8-31. Inspection and repair — tail rotor blades (UH-1A)

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above, the blade must be replaced. The depth of the nicks and scratches may not exceed the allowables (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches, and cracks. If nicks or scratches exist in dents and the total depth is in excess of the maximum depths permitted (paragraph c. (3), (4), the blade should be replaced.

d. Inspect blades for edge voids. Replace blade if following limits are exceeded.

(1) Edge voids in any one bond line of the doublers or grip plates with total length in excess of 15 percent of the total length of the bond line.

(2) Any one edge void in a doubler or grip plate in excess of 0.060 inch in depth or 0.75 inch in length.

(3) Any edge void in the outboard 1.00 inch of a doubler or a grip plate (either finger).

8-138. Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). A single two blade controllable pitch tail rotor is located on the left side of the tail rotor gear box. It is composed of two assemblies, the blades and the hub, and is driven through the tail rotor gear box. The tail rotor hub is hinge mounted to provide automatic equalization of thrust on advancing and retreating blades. Control links provide equal and simultaneous pitch change to both blades. The tail rotor counteracts torque of the main rotor and provides directional control.

8-139. Troubleshooting. Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). A chart of possible troubles, causes and remedial actions is included below.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
High frequency vibration	Tail rotor blades out of track	Track tail rotor blades
	Tail rotor blades out of balance	Balance tail rotor blades
	Worn or loose hinge mounting	Replace hub assembly
	Loose retaining nut	Torque nut
	Bent pitch change link	Replace pitch change links
	Loose grip bearing	Replace hub assembly
	Loose pitch change link bearings	Replace pitch change links
	Worn or loose pitch change rod duplex bearings	Replace bearings
	Worn or loose pitch change slider	Replace slider
Inability to make normal right and left turns in flight	Blade angles not set properly	Check pitch settings and system rigging

8-140. Operational Check — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). Following replacement or installation of the tail rotor hub, blades or pitch change systems, check the tail rotor system rigging and track the tail rotor blades. (See figure 8-35.)

a. Attach a small piece of sponge rubber ⅛ to ¼ thick to end of a ½ x ½ inch pine stick or any other flexible device, and cover sponge rubber with Prussian blue (item 103, table 1-1) or similar type of coloring thinned with oil.

Note

The run-up shall be performed by personnel authorized in accordance with AR95-13.

b. Start engine. Run engine at 6600 rpm with pedals in neutral position. Rest marking device on under side of tail boom assembly. Slowly move marking device into disc of tail rotor just far enough to mark near blade approximately one inch from tip.

Figure 8-35. Tracking tail rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

c. When near blade is marked, stop engine and allow rotor to stop. Shorten pitch control link of marked blade and recheck track of blades.

8-141. *Removal — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* a. Disconnect pitch change links (1, figure 8-34) at pitch horn.

Note

Maximum allowable wear looseness of pitch change links is 0.020 inch for both axial and radial play. Wear in excess of this dimension is cause for replacement.

b. Cut lockwire wrapped around boot (9).

c. Remove bolts from crosshead assembly (3) and remove assembly.

d. Remove cotter pin, nut and washer (4) from pitch change rod (15). Remove bearings (5), shim (6), retainer plate (7), slider (8), and boot (9).

e. Cut lockwire and remove nut (10). Remove static stop (11) and shim (12).

f. Tap hub assembly off shaft and hold split cones (14) as they are released by hub trunnion.

8-142. *Inspection — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* a. Inspect for wear between pitch change links and bushings; between bushing and bolt, and between ball and socket in pitch change links. Inspection must be completed on both ends of pitch change links.

b. Use a dial indicator to inspect for maximum allowable play in either the radial or axial direction of 0.020 inch at each end of the pitch change link.

c. Measured total play beyond 0.020 inch shall be cause for replacement of the applicable parts.

Note

Procedures used in measuring wear between the parts of the pitch change link assembly shall be determined by the activities performing the inspection.

8-142A. *Inspection — Tail Rotor Blade (UH-1B Serial No. 60-3546 through 64-14100).* a. The maximum allowable movement of the tail rotor blade at the tip shall not exceed one inch either side of center. (See figure 8-35A.)

b. To determine the maximum movement of the blade, the hub must be held rigid and a 4 to 5 pound pull applied at the blade tip in the direction of rotation.

c. Free mechanical motion at the blade tip should not exceed ½ or ¼ inch either side of center with the hub and blade assembly installed on the helicopter.

d. Should blade movement exceed these limits, inspect the grip installation for proper torque on the grip retaining nut. Continued excessive movement after torque check is cause for rejection.

8-143. *Repair or Replacement — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Replace parts which do not meet inspection requirements. (Refer to paragraph 8-142.)

8-144. *Installation — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Install tail rotor hub and blade in accordance with the following instructions.

Caution

Install cones, 204-010-724-7, of cone set, 204-010-724-5, with static stop, 204-010-774-11 (or 204-010-774-9 which has been modified by MWO 55-1520-208-34/18 at a field maintenance facility).

a. Observe color coding on installation.

b. Position split cones (14, figure 8-34) in place on shaft (15) with bevel edge positioned to mate with bevel in trunnion.

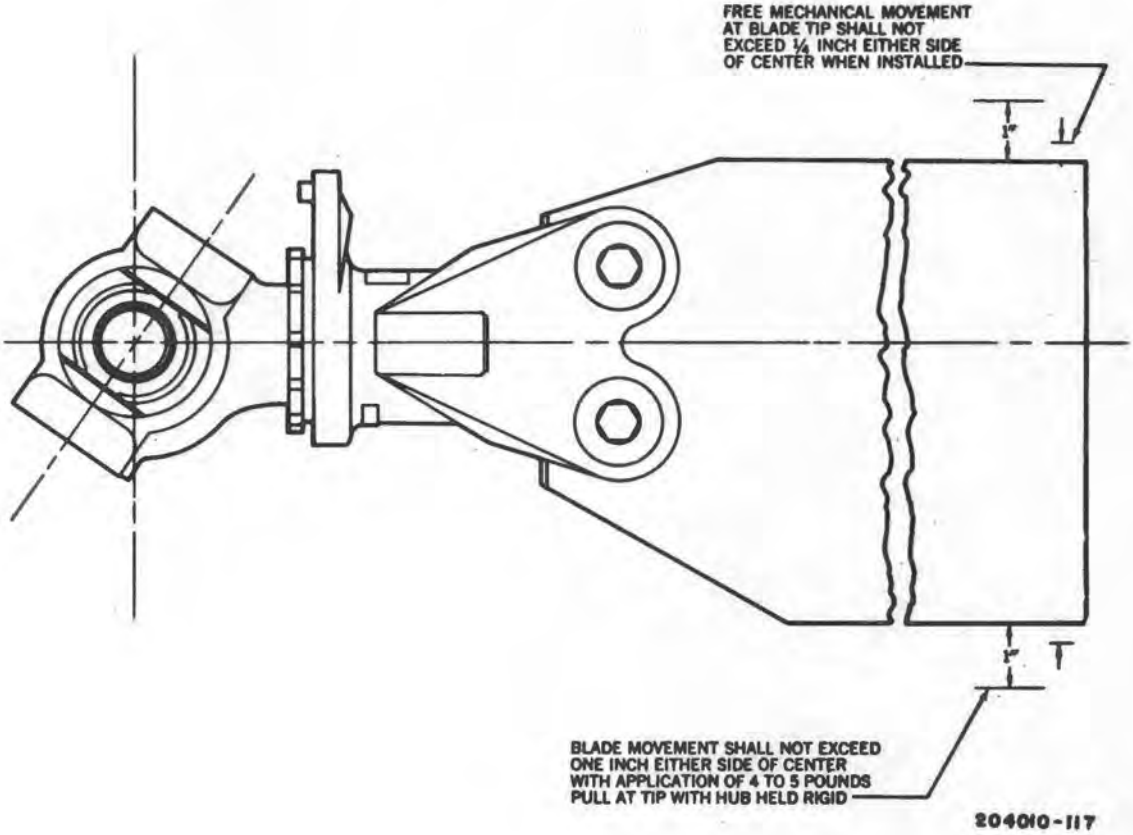


Figure 8-35A. Tail rotor blade (UH-1B Serial No. 60-3546 through 64-14100)

c. Align static stop (11), shim (12), and nut (10). Torque nut 300 to 400 inch-pounds. Hold assembly at hub when torquing nut. Lockwire nut to static stop. Slide boot (9) on shaft. Retorque nut after five hours of operation.

Note

Shim (12) should be of sufficient thickness as to allow 2.50 to 3.50 inches clearance between trailing edge and fin with edge of blade closest to fin in rigging condition. Use only bonded laminated shims.

d. Temporarily install bearings (5) in cap (3) and secure with slider (8), retainer plate (7) and two bolts with nuts. Tighten bolts sufficiently to secure assembly without distortion. Measure gap with a feeler gage between retainer plate and crosshead. Prepare a shim to measured thickness, less 0.002 to 0.004 inch. Assemble parts with prepared shim in place. Shim will provide a 0.002 to 0.004 inch pinch of retainer plate against bearing.

e. Install slider (8) on shaft and into boot. Position retainer plate (7) and shim (6) next to slider. Install bearings (5) on pitch change rod (15) with machined surfaces together and retainer plate facing inboard. Install washer and nut (4) on rod. Torque nut 60 to 85 inch-pounds and secure with a cotter pin.

Note

Use 204-010-721-3 retainer plate with the 204-011-761-1 bearing assembly.

f. Fill cavity of crosshead (3) with grease (item 8, table 1-1). Position crosshead assembly (3) over bearings and insert bolts through crosshead, shim (6), retainer plate (7) and slider (8). Install washers next to nuts and torque 50 to 70 inch-pounds.

g. Install pitch change links (1) on cross head (3) with spacers and washers positioned as illustrated. (Refer to figure 8-34.)

Note

Installation instructions for link assembly, part number 204-011-762, refer to paragraph 8-149.

Note

The maximum allowable wear looseness of tail rotor pitch change links is 0.020 inch which applies to both axial and radial play. Wear greater than 0.020 inch is cause for replacement.

h. Attach pitch change links (1) to pitch horns with spacers and washers positioned as illustrated.

i. Install washers next to nuts and torque 50 to 70 inch-pounds. Install cotter pin through nut.

j. Install safety wire around each end of boot.

k. Check asssembly for free flapping and pitch change in all positions.

l. Check rigging and rig if necessary.

m. Track blades. (Refer to paragraph 8-138.)

Note

Retorque nut (10, figure 8-34) after first five hours of operation. Retorque can be accomplished with slider and cross head installed using care that wrench does not contact adjacent parts.

8-145. Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Tail rotor blades are of all-metal bonded construction.

8-146. Removal — Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-146A. Cleaning — Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Wash tail rotor blades with a mild solution of soap and water.

8-147. Inspection and Repair — Tail Rotor Blades (UH1B Serial No. 60-3546 through 64-14100). The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-36.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skins, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

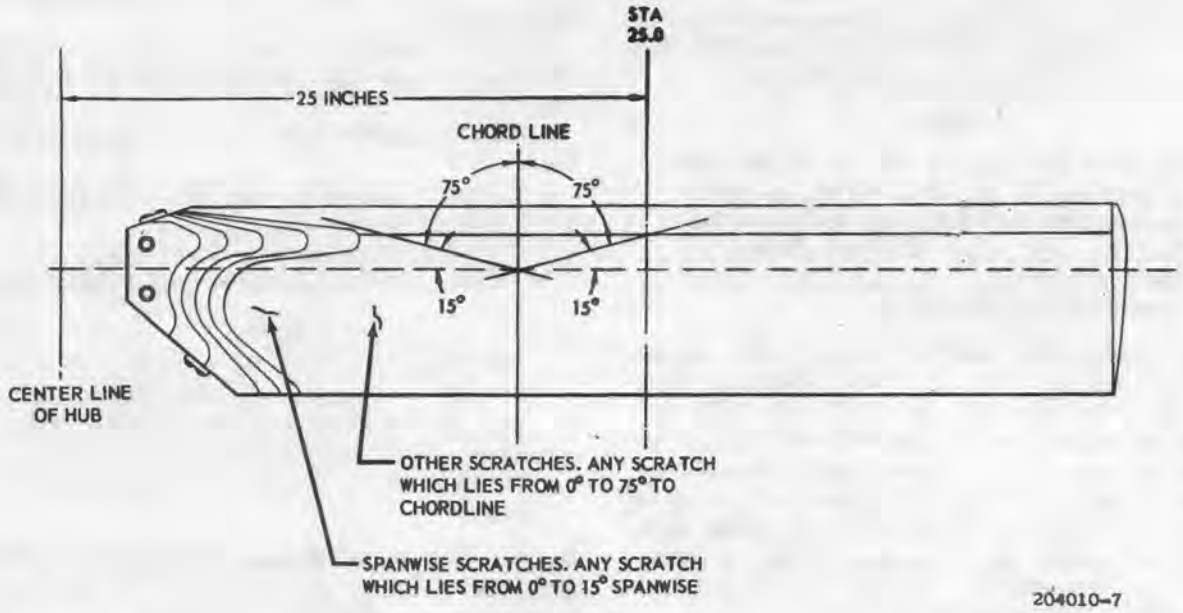


Figure 8-36. Inspection and repair — tail rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.060 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above) the blade must be replaced. The depth of the nicks and scratches may not exceed the allowables (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero and 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents

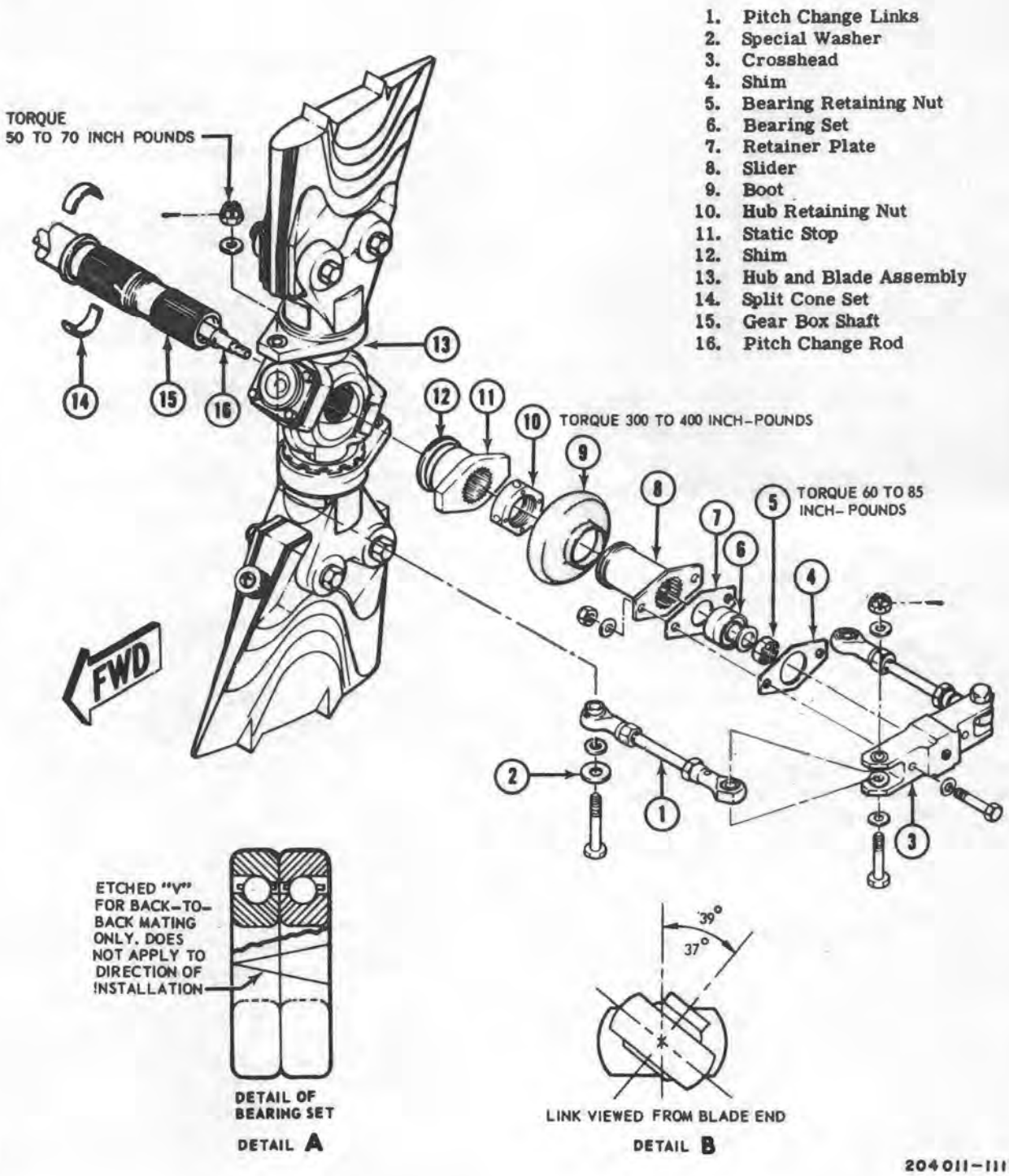


Figure 8-39. Tail rotor hub and blade assembly (UH-1B Serial No. 64-14101 and subsequent)

Figure 8-40. Tracking tail rotor blades (UH-1B Serial No. 64-14101 and subsequent)

c. When near blade is marked, stop engine and allow rotor to stop. Shorten pitch control link of marked blade and recheck track of blades.

8-154. ***Removal — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).*** a. Disconnect pitch change link (1, figure 8-39) for each tail rotor blade grip horn by removing nut, washer, bolt and special washer (2).

b. Remove crosshead assembly (3) and shim (4) by removing two attaching bolts with nuts and washers.

c. Remove cotter pin, nut (5), washer, bearing set (6) and retainer plate (7). Cut lockwire and remove slider (8) and boot (9).

d. Cut lockwire and remove hub retaining nut (10). Remove static stop (11) and shim (12).

e. Move tail rotor hub (13) outboard on splines, and remove cone set (14) as it is released. Remove tail rotor over end of gear box shaft (15) and pitch change rod (16).

8-155. ***Inspection — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).*** a. Inspect for wear between pitch change links and bushing; between bushing and bolt, and between ball and socket in pitch change links. Inspection must be completed on both ends of pitch change links.

b. Use a dial indicator to inspect for maximum allowable play in either the radial or axial direction of 0.020 inch at each end of the pitch change link.

c. Measured total play beyond 0.020 inch shall be cause for replacement of the applicable parts.

Note

Procedures used in measuring wear between the parts of the pitch change link assembly shall be determined by the activities performing the inspection.

d. Perform swaying and flapping check. (Refer to paragraph 8-142A.)

8-156. ***Repair or Replacement — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and Subsequent).*** Replace parts which do not meet inspection requirements. (Refer to paragraph 8-155.)

8-157. ***Installation — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).*** a. Position tail rotor assembly (13, figure 8-39) at end of shaft (15), with bearing bosses of hub inboard and flat side outboard. Be sure internal bevel of hub trunnion is inboard. Align master splines and slide hub on shaft until trunnion is just started on second set of splines.

b. Place cone set (14) with bevel outboard in groove between splines and shoulder on shaft. Slide hub inboard to seat trunnion on cones.

c. Place shim (12) on shaft against trunnion. Install static stop (11) and hub retaining nut (10). Hold rotor at hub while tightening nut with 300 to 400 inch-pounds torque. Lockwire nut to stop. Slip boot (9) on shaft.

d. Determine thickness of shim (4) required for a clamp-up of 0.002 to 0.004 inch on pitch change rod bearings as follows:

(1) With shim omitted, temporarily assemble crosshead (3), bearings (6), retainer plate (7), and slider (8) secured together by

two bolts with nuts and washers. Tighten nuts snug without distortion of assembly.

(2) With a feeler gage, measure gap between crosshead and retainer plate. Peel shim 0.002 to 0.004 inch thinner than this measurement. Disassemble parts.

e. Place slider on shaft and into boot. Assemble retainer plate, bearing set, washer and nut (5) on end of pitch change rod (16). Check that bearings are properly matched together according to V-mark etched on outer races. (See detail on figure 8-39.) Tighten nut with 60 to 85 inch-pounds torque and secure with cotter pin.

f. Fill cavity of crosshead with grease, (item 8, table 1-1). Place shim (prepared in step d.) and crosshead over bearings. Align parts and install two bolts, with washers under heads, through crosshead, shim, retainer plate, and flange of slider. Secure with washers and nuts.

Note

Observe color code markings on parts during installation.

g. Check that pitch change links (1) are a like pair in serviceable condition and are properly installed in crosshead, with bolt heads toward rotation. Bolts must be of same length, with a washer under each bolt head and nut (if length requires, add a thin washer under each nut). Observe the following points:

(1) Maximum allowable wear tolerance for rod-end bearings of pitch change links is 0.020 inch, either axial or radial play. Replace parts if worn to exceed these limits.

(2) Nominal length of new pitch change links is 5.42 inches between bearing centers, with rod-ends aligned at 37 to 39 degrees. (See detail on figure 8-39.) However, this length is approximate and may be varied in operational checks (one link may be shortened to obtain track, and both links may be shortened or lengthened to obtain proper performance in autorotation and in sideward flight to right).

h. Align a pitch change link rod-end with extended side of bearing inner race against pitch horn of tail rotor blade grip. Place special washer (2) and steel washer on bolt. Insert bolt through rod-end and horn, and install washer and nut tightened with 60 to 85 inch-pounds torque. Secure with cotter pin, tightening nut to next castellation if required. Connect opposite link in the same manner.

i. Lockwire ends of boot on gear box shaft and slider.

j. Check tail rotor for free flapping and pitch change action. Check and adjust rigging as necessary.

k. Check for 2.50 to 3.50 inch clearance between tail boom vertical fin and nearest edge of tail rotor at full right pedal position in rigged condition. If necessary, change thickness of shim installed between rotor hub trunnion and static stop for proper clearance. Use face-bonded laminated shims only.

l. Track tail rotor. (Refer to paragraph 8-153.)

Note

Retorque nut (10, figure 8-34) after first five hours of operation. Retorque can be accomplished with slider and crosshead installed using care that wrench does not contact adjacent parts

8-158. Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent). Tail rotor blades are of all metal bonded construction.

8-159. *Removal — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-159A. *Cleaning — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* Wash tail rotor blades in a mild solution of soap and water.

8-160. *Inspection and Repair — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-41.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skins, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

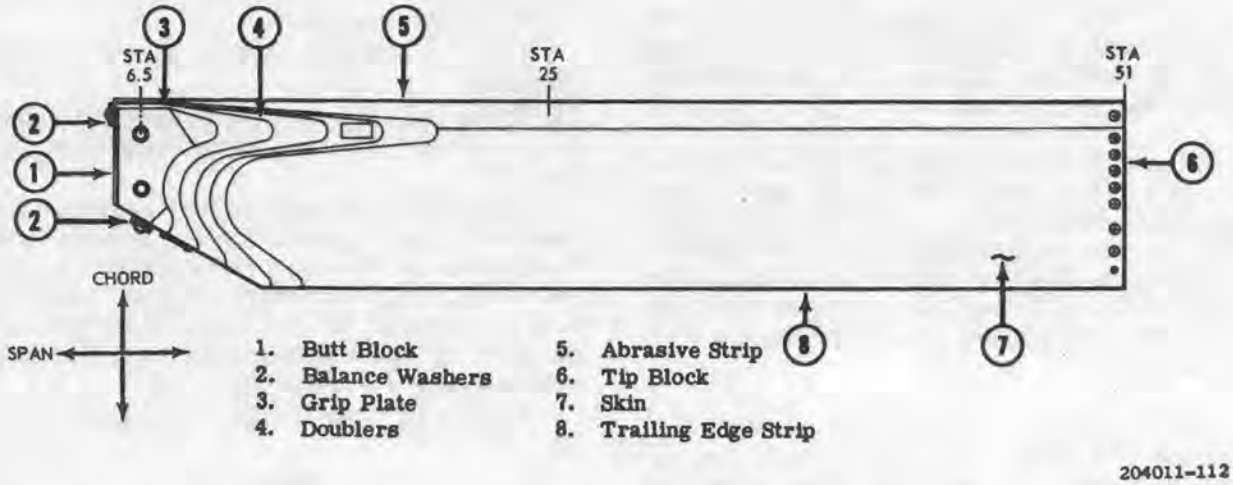


Figure 8-41. Inspection and repair — tail rotor blades (UH-1B serial no. 64-14101 and subsequent)

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above, the blade must be replaced. The depth of the nicks and scratches may not exceed the allowable (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or

blade attaching bolts may be installed with bolt heads either inboard or outboard, but all four bolt heads must be installed the same.

a. Installation of same blades.

(1) Same blades without repair, or same blades with allowable minor repair or minor touch up, may be installed without balancing of hub and blade assembly.

(2) Install blade with previously removed bolts, washers and nuts, and with bolts in same grip and hole from which previously removed. Torque nuts 270 to 300 inch-pounds.

b. Installation of new blades.

(1) New blades cannot be installed in same or new hubs at second echelon level due to requirement for balancing tail rotor hub and blade assembly as a complete assembly. This function must be performed at direct support facility.

(2) Installation of the balanced tail rotor hub and blade assembly may then be performed by organizational personnel.

Caution

Track blades after every installation.

CHAPTER 9
FLIGHT CONTROLS

Section I — Scope

9-1. Scope. The purpose of this chapter is to provide all the essential information for maintenance personnel to accomplish organizational maintenance on the complete flight controls. This information includes a detailed description and chronological instructions as to methods and procedures. It also includes special tools and equipment required for accomplishment of the maintenance phases as are applicable in accordance with the Maintenance Allocation Chart. Special tools required for performance of Organizational Maintenance will be found in TM 55-1520-211-20P.

Section II — Movable Flight Controls

9-2. Movable Flight Controls. The flight control system is a mechanical type, actuated by conventional helicopter controls which control the attitude and flight direction of the helicopter. The system includes the cyclic stick, used for fore and aft and lateral control; the collective pitch control for vertical control; the tail rotor pitch control pedals for directional control and a synchronized stabilizer linked to the fore and aft cyclic control system. Electrically operated force trims connected to the cyclic and directional controls induce artificial control feeling and stabilize the cyclic control stick and tail rotor pitch control pedals to prevent them from moving of their own accord.

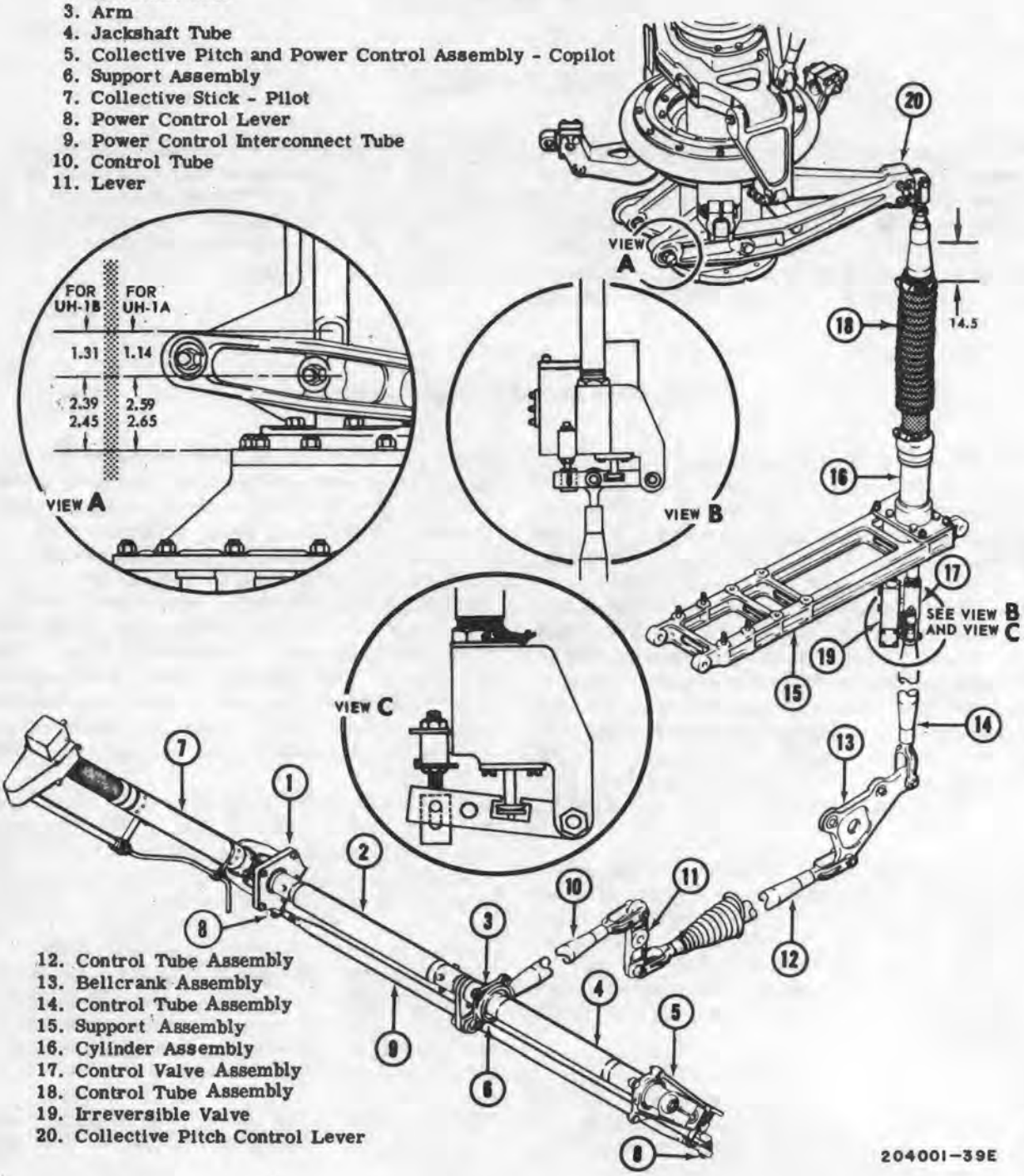
9-3. The collective pitch system through push-pull tubes, bellcranks and power cylinder transmits movement of the collective pitch control lever to the pitch change mechanism of the main rotor hub. The helicopter can be made to ascend vertically or remain at a constant altitude by means of the collective pitch control system.

9-4. A system of linkage transmits control movement from the cyclic control stick in the cabin to the swashplate, then through the rotating control linkage, controlling the main rotor and direction of movement of the helicopter. The fore and aft, and lateral controls are independent units from the cyclic stick until they reach the intermixing bellcrank. From this point on to the swashplate horns the cyclic controls are combined. A hydraulic power cylinder, incorporated in each linkage system, prevents rotor forces being transmitted to the controls. The right (pilot's) cyclic stick grip contains the cargo release switch, the trigger type three-position radio transmission switch, and force trim release switch. The force trim switch is located on the left top side of the stick grip. The copilot's cyclic pitch control stick is linked to the pilot's stick and has the same function except that the cargo release switch is not connected to the copilot's stick.

9-5. The tail rotor control system consists of a set of control pedals, pedal adjuster assembly, power cylinder, cable quadrant, cable pitch change mechanism and connecting linkage. Operation of the pedal provides power boosted pitch change of the tail rotor blades to control the torque and resultant directional control of the helicopter. The pedal position may be adjusted by depressing and turning a knob on the cabin floor. The force trim system is linked to the directional controls and is operated by a switch on the cyclic control stick.

9-6. A synchronized elevator is mounted near the aft end of the tail boom and is connected through push-pull tubes and bellcranks to the cyclic control system. Fore and aft movement of the cyclic control stick causes a change in the elevator angle, thereby aiding controllability.

1. Collective Pitch and Power Control Assembly - Pilot
2. Jackshaft Tube
3. Arm
4. Jackshaft Tube
5. Collective Pitch and Power Control Assembly - Copilot
6. Support Assembly
7. Collective Stick - Pilot
8. Power Control Lever
9. Power Control Interconnect Tube
10. Control Tube
11. Lever



12. Control Tube Assembly
13. Bellcrank Assembly
14. Control Tube Assembly
15. Support Assembly
16. Cylinder Assembly
17. Control Valve Assembly
18. Control Tube Assembly
19. Irreversible Valve
20. Collective Pitch Control Lever

Figure 9-1. Collective pitch control system (UH-1A and UH-1B serial No. 60-3546 thru 64-14100)

1. Collective Stick - Pilot
2. Collective Pitch and Power Control Assembly - Pilot
3. Power Control Lever
4. Jackshaft Tube
5. Power Control Interconnect Tube
6. Arm
7. Support Assembly
8. Collective Pitch and Power Control Assembly - Copilot
9. Jackshaft Tube
10. Control Tube Assembly
11. Lever Assembly
12. Control Tube Assembly
13. Bellcrank Assembly
14. Control Tube Assembly
15. Control Valve
16. Support Assembly
17. Cylinder Assembly
18. Control Tube Assembly
19. Collective Pitch Control Lever

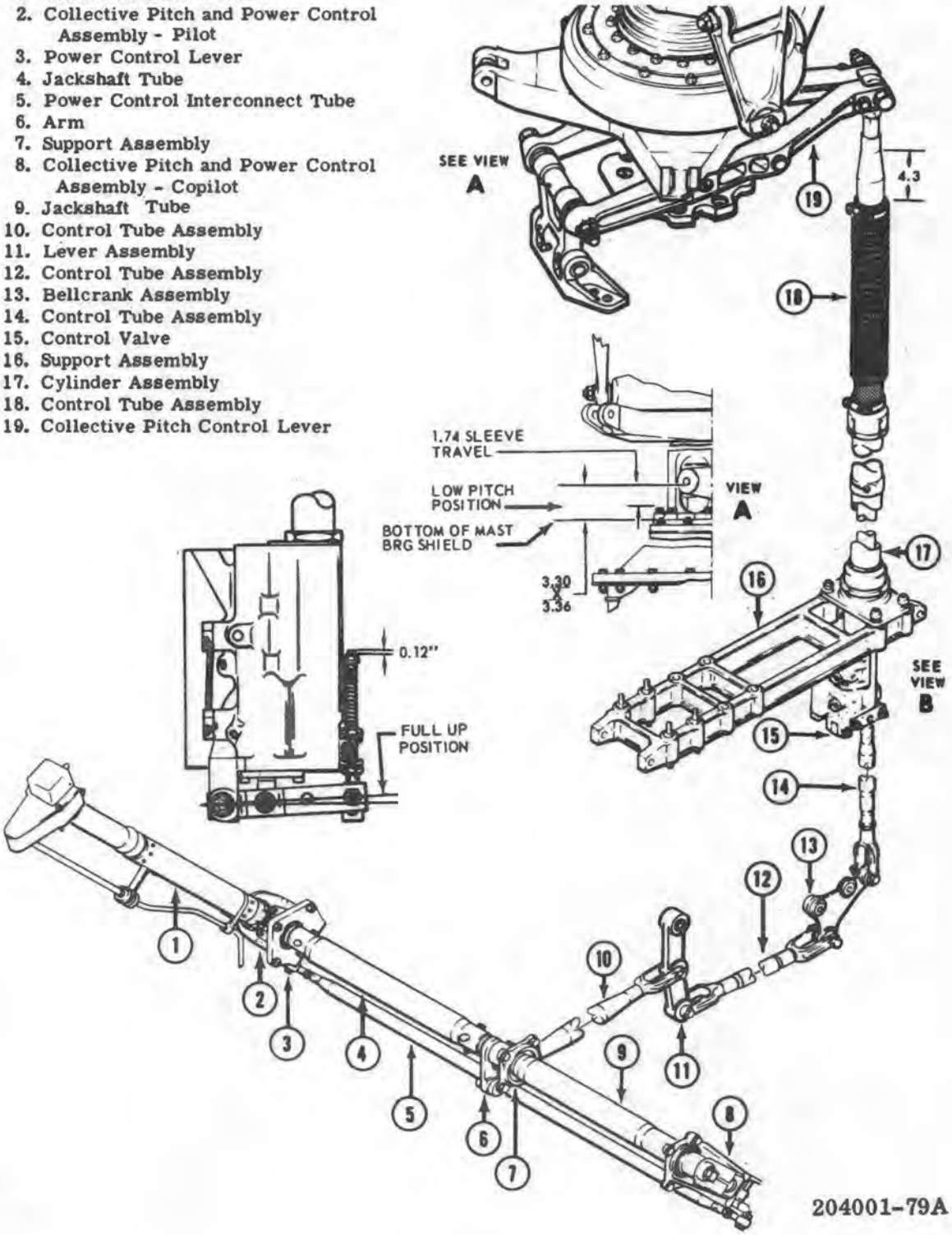


Figure 9-3A. Collective pitch control system (UH-1B serial no. 66-491 and subsequent)

b. Install bellcrank (13) and attach control tubes (12) and (14). Place boots over forward end of control tube (12).

c. Adjust and install power cylinder (16) with irreversible valve (19) and control valve (17). (Refer to paragraph 6-26.)

d. Uncover hydraulic lines and connect to irreversible valve (19) of power cylinder (16).

e. Check rigging of collective pitch control system and rig if necessary. (Refer to paragraph 9-17.)

9-17 *Adjustment — Collective Pitch Control Linkage (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).* a. Install all fixed length tubes and links in collective control system. (See figure 9-1.)

b. Position collective control lever against the UP stop and secure with friction adjustment.

c. Adjust control tube (14, figure 9-1) to the cylinder attachment point with the cylinder bottomed in the UP direction and servo control valve in UP position. (See View C.) Shorten tube (14) three turns and install bolt, nut and cotter pin.

d. Place the collective control lever against the LOW stop. Position the collective lever to dimension illustrated in View A.

e. Exert sufficient downward pressure on collective cylinder assembly to hold valve lever at top of travel (View B.) Adjust clevis or rod end of control tube (18) to fit collective pitch lever (20); shorten cylinder by one full turn, and connect.

Note

When bottoming valves do not exert a force on the collective lever that will cause the controls to move below the valve as a result of structure and/or component deflection, or misrigging will occur.

f. Check for full free travel of collective pitch control system with boost pressure off.

g. Apply boost pressure and check for travel of collective sleeve. (View A.)

h. Check minimum pitch angle of rotor hub.

i. Inspect complete collective control system for security and safetying of parts.

9-18. *Removal — Collective Pitch Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* a. Disconnect control tubes (10 and 12, figure 9-2 and 9-3A) from lever (11) and bellcrank (13). Remove bolt and lever (11).

Note

Tube (10) may be removed from the helicopter through the access opening in lower center nose section.

b. Disconnect control tube (14) from bellcrank (13) and remove bellcrank.

c. Disconnect control tube (14) from power cylinder (17). Disconnect control rod (18) from collective pitch control lever (19).

d. Disconnect and cover hydraulic lines from control valve (15) of power cylinder (17).

e. Remove power cylinder (17) with control valve (15). (Refer to paragraph 6-72.)

9-19. *Inspection — Collective Pitch Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 9-14.)

9-20. *Repair or Replacement — Collective Pitch Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* (Refer to paragraph 9-15.)

9-21. *Installation — Collective Pitch Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* a. Install lever (11 figure 9-2 and 9-3A) in bracket with long end down. Attach control tube (10) to lever (11).

b. Install bellcrank (13) and attach control tubes (12) and (14).

c. Adjust and install power cylinder (17) with control valve (15). (Refer to paragraph 6-75.)

d. Uncover hydraulic lines and connect to control valve (15) of power cylinder (17).

e. Check rigging of collective pitch control system and rig if necessary. (Refer to paragraph 9-22.)

9-22. *Adjustment — Collective Pitch Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* a. Install all fixed length tubes and links in collective control system. (See figure 9-2 and 9-3A.)

Note

For adequate clearance between bolt and cowling at attaching point of control tube (18) to collective lever (19) bolt head must be outboard.

Note

When reverse collective system is installed on UH-1B Helicopters Serial No. 64-14101 through 65-9564 and 65-12772, reverse position of top and bottom springs to balance the collective control. (See figure 6-10.) If motoring in the collective controls is encountered during operation, add washers in multiples of one (maximum of six) until motoring stops.

b. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 position collective control lever against the UP stop and secure with friction adjustment.

c. On UH-1B helicopters Serial No. 66-491 and subsequent position collective control lever against the LOW stop and secure with friction adjustment.

d. Adjust control tube (14) to the cylinder bottomed in the UP direction and servo control valve in UP position. (See View B, figure 9-2 and 9-3A.) Shorten tube (14) three turns and install bolt, nut and cotter pin.

e. Place the collective control lever against the LOW stop. Position the collective lever to dimension illustrated in View A.

f. Exert sufficient downward pressure on collective cylinder assembly to hold valve lever at top of travel (View B). Adjust clevis or rod end of control tube (18) to fit collective pitch lever (19); shorten cylinder by one full turn, and connect.

Note

When bottoming valves do not exert a force on the collective lever that will cause the controls to move below the valve as a result of structure and/or component deflection, or misrigging will occur.

g. Check cylinder boot location. (See figure 9-2 and 9-3A.)

h. Release adjustable friction with nut (1, figure 9-3B) and disconnect control tube (10, figure 9-2 and 9-3A) from collective jackshaft (9).

i. Tighten setscrews (2, figure 9-3B) in friction connector (3) until a spring scale applied at the center, plus or minus 0.050 inch, of and perpendicular to the throttle grip (4) indicates a breakaway force of 14 to 16 pounds up with collective stick positioned approximately one-third of full travel from bottom stop.

j. Apply boost pressure and check for travel of collective sleeve. (View A.)

k. Check minimum pitch angle of rotor hub.

l. Inspect complete collective control system for security and safetying of parts.

9-23. Cyclic Control Stick. The cyclic control stick is the means by which the pilot controls directional movement of the helicopter. When installed, the copilot's cyclic control stick is linked to the pilot's stick and has the same function.

9-24. *Removal — Cyclic Control Stick.* a. Disconnect fore and aft, and lateral control tubes.

b. Remove eight screws and remove boot.

c. Remove four bolts from support.

d. Disconnect wiring at bulkhead fitting and remove stick assembly from structure.

e. Remove opposite stick in the same manner.

9-25. *Installation — Cyclic Control Stick.* a. Position stick assembly in place. Install bolts through support. Install boot and plate and secure with eight screws.

b. Plug in electric fitting at bulkhead.

c. Attach fore and aft and lateral control tubes.

9-26. Cyclic Control Tube and Lever Assembly. The cyclic control tube and lever assembly interconnects the pilot and copilot control sticks for distribution of fore and aft control forces to the swashplate.

9-27. *Removal — Cyclic Control Tube and Lever Assembly.* a. Disconnect fore and aft control tubes (1 and 2, figure 9-6).

b. Disconnect control tube (8).

c. Disconnect fore and aft force gradient (4).

d. On UH-1B, Serial No. 64-14101 and subsequent, helicopters remove counterweight balance assembly (5).

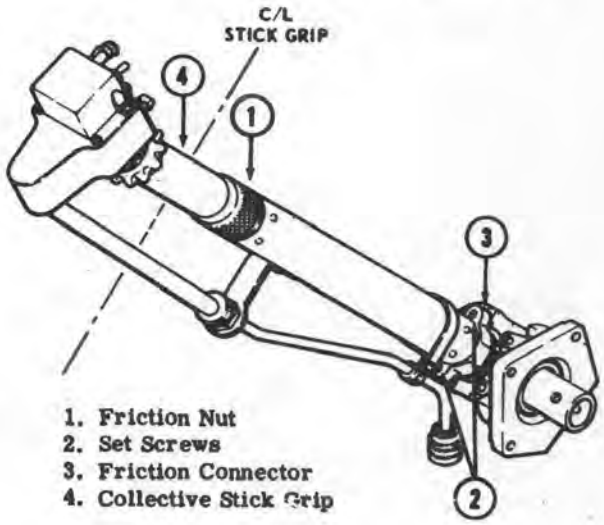
e. Remove bolts from right and left housing assemblies (6 and 7).

f. Remove bolts (8) and tapered bushings attaching arm (9) and tubes (10 and 11).

g. Withdraw tubes (10 and 11) through access openings in right and left sides of cabin.

9-28. *Inspection — Cyclic Control Tube and Lever Assembly.* a. Inspect bearings for wear and roughness.

b. Inspect assembly for maximum allowable 0.200 inch lateral chuck. (See figure 9-6.)



1. Friction Nut
2. Set Screws
3. Friction Connector
4. Collective Stick Grip

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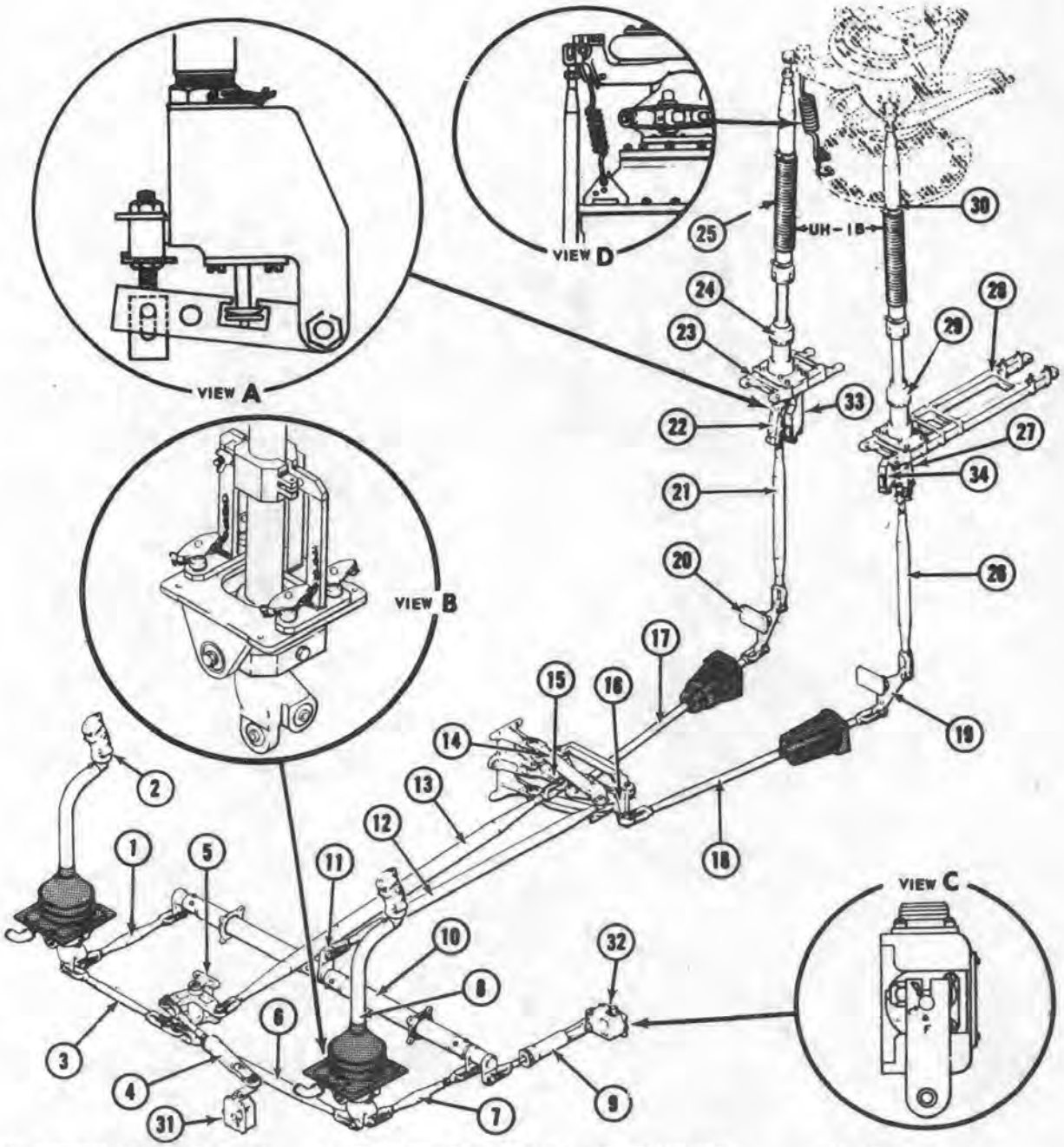
Figure 9-3B. Collective friction adjustment (UH-1B serial no. 64-14101 and subsequent)



1. Control Tube - Fore Aft
2. Cyclic Control Stick
3. Control Tube - Lateral
4. Force Gradient - Lateral
5. Bellcrank
6. Control Tube - Lateral
7. Control Tube - Fore Aft
8. Cyclic Control Stick
9. Force Gradient - Fore Aft
10. Tube and Lever Assy
11. Lever
12. Control Tube
13. Control Tube
14. Matched Link Set
15. Bellcrank
16. Bellcrank
17. Control Tube
18. Control Tube
19. Bellcrank
20. Bellcrank
21. Control Tube
22. Control Valve
23. Support
24. Cylinder Assy
25. Control Tube
26. Control Tube
27. Control Valve
28. Support
29. Cylinder Assembly
30. Control Tube
31. Magnetic Brake
32. Magnetic Brake
33. Irreversible Valve
34. Irreversible Valve

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Figure 9-4. Cyclic control system (UH1A and UH-1B serial no. 60-3546 thru 64-14100)

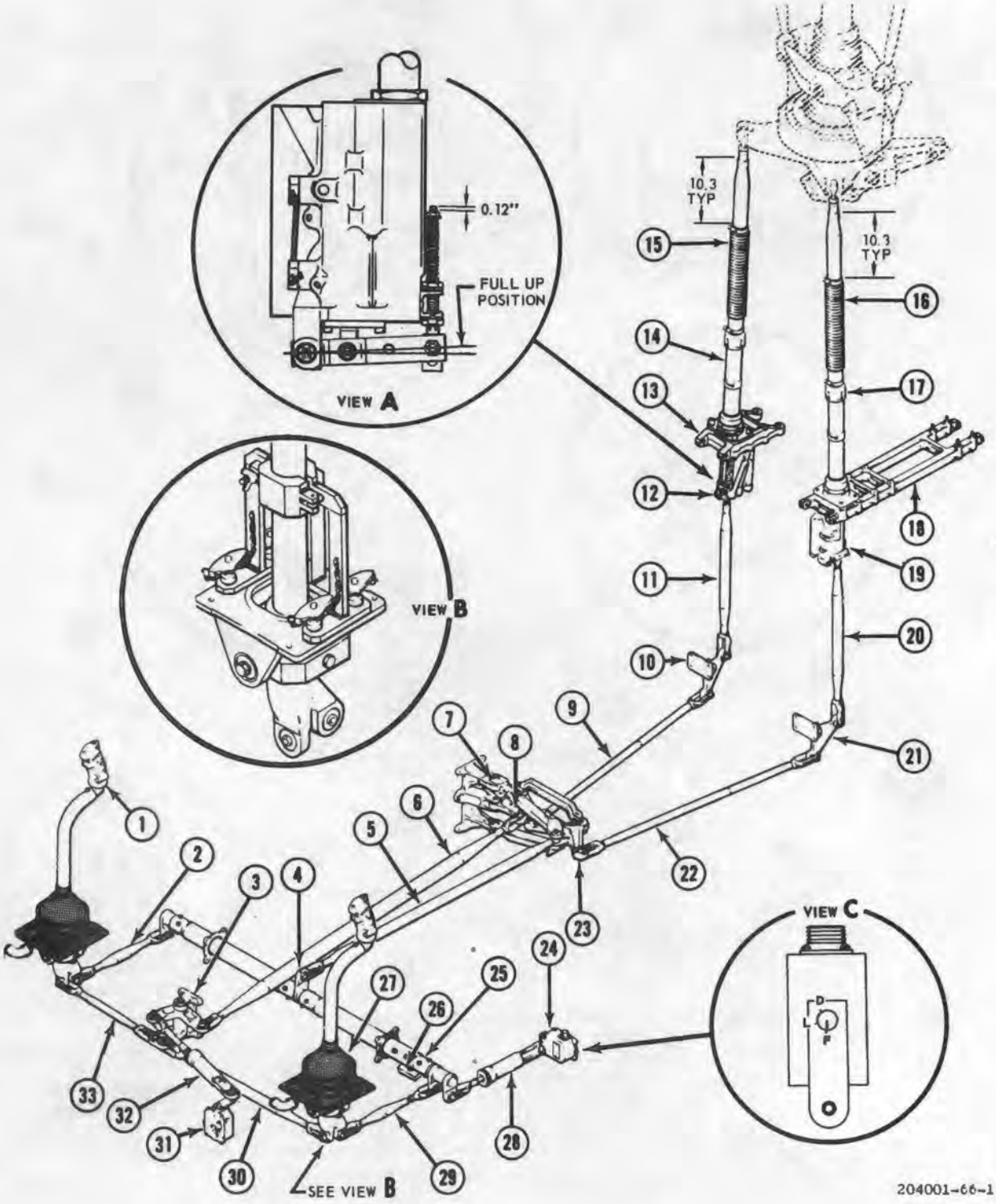


Figure 9-5. Cyclic control system (UH-1B serial no. 64-14101 and subsequent) (Sheet 1 of 2)

9-43. *Installation—Cyclic Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* a. Install bellcranks (8 and 23, figure 9-5) on support. (Refer to figure 9-8 for installation of mixing bellcranks.)

b. Install and attach all fixed length control tubes.

Note

If adjustable control tubes are not correct length to be attached, leave one end free until controls are rigged.

c. Adjust and install power cylinders (14 and 17, figure 9-5) with control valves (12 and 19). (Refer to paragraph 6-81.)

9-44. *Adjustment—Cyclic Control Linkage (UH-1B Serial No. 64-14101 and subsequent).* a. Install all fixed length tubes in cyclic control system.

b. Place pilot's and copilot's cyclic sticks in either extreme right or left lateral position against stops. Secure in this position and adjust and connect lateral control tube (30, figure 9-5).

c. Place pilot's and copilot's cyclic sticks in extreme forward or extreme aft position against stops. Secure in this position and adjust and connect fore and aft control tube (29).

d. Place pilot's cyclic stick in extreme aft left corner position so that upper arm of bellcrank (10) is in its uppermost position. With cyclic stick in this position bottom out piston in UP position at top of cylinder (14) and set control valve (12) in UP position, (View A). Adjust control tube (11) to fit; shorten three full turns and install bolt, nut and cotter pin.

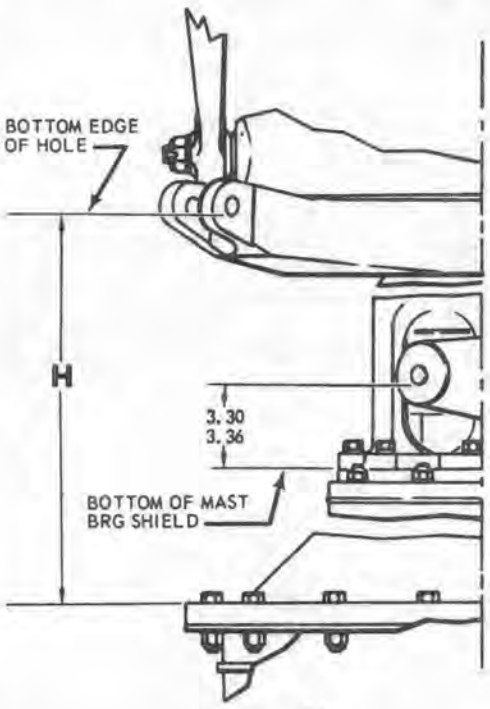
Note

When reverse collective system is installed on UH-1B Helicopters Serial No. 64-14101 through 65-9564 and 65-12772, reverse position of top and bottom springs to balance the collective control. (See figure 6-10.) If motoring in the collective controls is encountered during operation, add washers in multiples of one (maximum of six) until motoring stops.

e. Place pilot's stick in extreme aft right corner position and adjust control tube (20) in same manner as control tube (11) was adjusted in step d.

f. Install T101330 cyclic stick fixture on copilot's cyclic stick. (See View B.)

g. Position swashplate as illustrated in figure 9-10 and place cylinder valves in neutral. Maintain position and adjust control tubes (15 and 16, figure 9-5) to make proper fit with swashplate.



DIMENSION **H**

Rigging dimension tolerances are plus or minus 0.06

Left Horn		Right Horn
11.75	1/2° Down Left	11.88
11.66	1° Down Left	11.96
11.60	1-1/2° Down Left	12.03

Adjust from 1/2° to 1-1/2° down left as required for satisfactory flight.

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Figure 9-10. Adjusting swashplate (UH-1B serial No. 64-14101 and subsequent)

h. Position arm on fore and aft magnetic brake (24) as illustrated in View C, with scribe mark on shaft opposite "F" on arm. Position arm on lateral magnetic brake (31) with scribe mark on shaft opposite "L" on arm.

i. With cyclic stick in neutral, position arm on lateral magnetic brake (31) in center of travel. Adjust and install lateral force gradient (32).

j. Remove rigging fixture, T101330.

k. Position boots on control tube (15 and 16) to dimension shown on figure 9-5.

l. Place cyclic stick against forward stop, and arm on fore and aft magnetic brake (24) against its full aft stop. Adjust fore and aft force gradient (28) to fit and connect.

m. Check controls for full free travel with boost pressure applied.

n. Adjust cyclic control system balance to eliminate all motion of cyclic stick with hydraulic boost on and hands off. Adjust by moving washers (one at a time) on jackshaft counterweight balance assembly from location A to location B. (See figure 9-11.) Relocate washers in even quantities on both bolts.

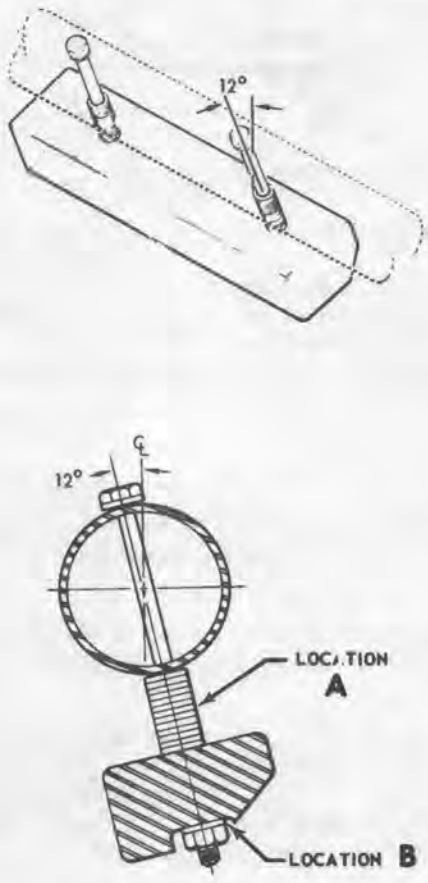


Figure 9-11. Counterweight balance assembly (UH-1B serial no. 64-14101 and subsequent)

o. Inspect complete cyclic control system for security and safetying of parts.

9-45. Magnetic Brake. A magnetic brake, used in conjunction with a force gradient assembly, is mounted in each control element; the fore and aft cyclic, the lateral cyclic and the tail rotor pitch control. All three assemblies are identical except for the position of the arm on the brake. By positioning one of the letters "D", "L" or "F" relative to the brake shaft the brake may be used in either the D-irectional, L-ateral, or F-ore and aft control assembly.

9-46. *Removal—Magnetic Brake.* Disconnect electrical plug from brake body. Remove attachment bolt through force gradient and brake arm. Remove four bolts attaching brake body to structure.

9-47. *Installation—Magnetic Brake.* a. Mount brake arm on brake in appropriate position. Secure arm with retaining bolt. Position brake in place on structure and install mounting bolts.

b. Attach force gradient assembly to brake arm with bolt, nut, and washers. Install cotter pin in bolt. Attach and lockwire electrical plug to brake body.

c. Check flight controls for unobstructed full travel.

9-48. Tail Rotor Control Pedal and Adjuster Assembly. Two sets of control pedals are mounted on a forward bulkhead located in the cabin floor, and are connected by control tubes to a pedal adjuster assembly. Pilot and copilot assemblies are connected by an adjustable tube assembly.

9-49. *Removal—Tail Rotor Control Pedal and Adjuster Assembly.* a. Disconnect two control tubes (4, figure 9-12) from pedal lever assembly (2), and pedal adjuster assembly (5).

b. Remove bolt, washers and nut securing each pedal lever assembly (2) to pedal support (3), and remove each pedal (1) and lever assembly (2) as a unit.

c. Remove four bolts, washers and nuts securing pedal support (3) to bulkhead and remove pedal support.

b. Disconnect speed rigs (1).

c. Remove clevis pins (2) and remove cable (3) from quadrant (6).

d. Disconnect links (4) from quadrant.

e. Remove bolt (5) and remove quadrant (6) and lower support (7) from structure.

f. Disconnect push-pull tube (9) from bellcrank (10).

g. Cut lockwire and remove four mounting bolts attaching upper support (11) to structure. Remove bellcrank assembly (10) and links (4) from structure. Disassemble support and bellcrank.

9-55. *Inspection — Tail Rotor Control Quadrant.* a. Inspect bearings for wear and roughness.

b. Inspect all parts for wear, elongated bolt holes, cracks, nicks and other damage.

9-56. *Repair or Replacement — Tail Rotor Control Quadrant.* Replace all parts which are considered unsuitable for continued service. (Refer to paragraph 9-55.)

9-57. *Installation — Tail Rotor Control Quadrant.* a. Position upper support assembly (11, figure 9-13) on structure and secure with four bolts. Lockwire heads of bolts.

b. Position wide section of bellcrank (10) in place in upper support (11) and install bolt.

c. Position quadrant (6), lower support (7) and shim (8) to provide 0.000 to 0.010 inch clearance between support and quadrant. Install bolt (5) with washer, nut and cotter pin.

d. Position links (4) and secure to bellcrank and quadrant.

e. Attach push-pull tube (9).

f. Position control cables (3) and secure to quadrant with clevis pins (2). Attach speed rigs (1).

9-58. Tail Rotor Pitch Control Mechanism. Tail rotor blade pitch control is accomplished by means of a control quill assembly mounted in right side of 90 degree gear box, with a control rod extending through hollow output shaft on which rotor is mounted. The control quill has a sprocket, operated by a chain attached to control cables, with a worm thread engagement to control rod. Rotation of sprocket is transmitted through rod as linear motion to a crosshead which is linked to rotor blades. Chain and sprocket are enclosed by a metal housing pan with a transparent hinged cover for inspection and access.

9-59. *Removal — Tail Rotor Pitch Control Mechanism.* a. Remove tail rotor, with control crosshead assembly.

b. Open hinged cover on control housing pan by removing lockwire and bolt near lower end of cover. Disconnect cables at quick disconnect.

c. Remove screw from housing pan bracket. Remove three nuts, with washers, from gear case studs to detach sprocket guard. Remove guard, chain and complete cover assembly.

d. Pull control quill with attached rod out of gear case port. Remove O-ring and cover case port. Detach rod from quill by turning sprocket to disengage threads.

9-60. *Cleaning — Tail Rotor Pitch Control Mechanism.* Clean metal parts with dry cleaning solvent (item 302, table 1-1). Dry with filtered compressed air. Clean transparent housing cover with materials and methods used for cabin windows.

9-61. *Inspection — Tail Rotor Pitch Control Mechanism.* a. Inspect sprocket guard (2, figure 9-14), cover (1) and pan (4) for cracks or other damage.

b. Inspect control rod (7) for faulty operation and visible damage such as cracks, bending and damaged threads or splines.

Note

Joint wear of control chain (3) may be checked by placing chain under tension and measuring length of any 32 pitches. Maximum allowable length is 6-3/16 inches. If chain has been removed from helicopter tension may be applied by suspending chain from one end and attaching 10 pound weight to opposite end.

c. Inspect chain (3) for faulty operation and excessive wear. To measure wear, chain should be removed and suspended with a 10 pound weight on one end. The chain shall be replaced when the measurement between hole center lines reaches a maximum limit of 41.96 inches.

d. Inspect control quill housing for oil leakage past internal seals and cork plugs. Inspect control quill assembly for roughness or binding during operation.

e. Check gap between quill housing and retainer.

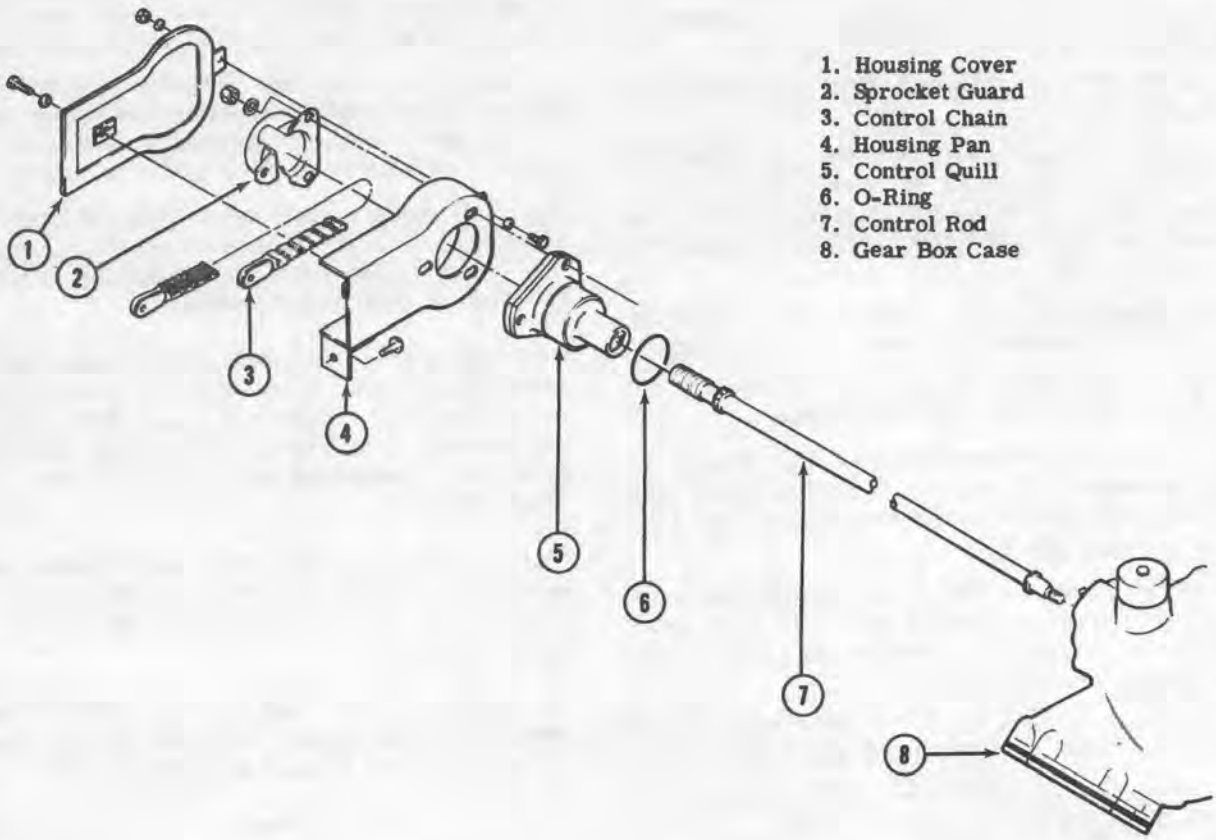


Figure 9-14. Tail rotor pitch control mechanism

f. Determine the amount of looseness between the internal spline of the slider assembly and the tail rotor shaft spline and looseness in the tail rotor pitch change thread by means of the following procedure. (See figure 9-15.)

(1) Mount dial indicator on tail rotor gear box shaft with indicator against crosshead as illustrated.

(2) Position left tail rotor control pedal in the full forward position and actuate the crosshead radially as illustrated. Radial play in this position should not exceed 0.020 inch.

(3) Position the right tail rotor control pedal in the full forward position and repeat above procedure. Radial play in this position should not exceed 0.035 inch.

(4) Position pedals in the neutral position and check axial play as illustrated. Move crosshead axially without producing radial play. Axial play in this position should not exceed 0.018 inch. Excessive axial play indicates worn or loose pitch change rod bearings and/or worn pitch change rod thread.

Note

If any item is replaced as a result of this inspection, the tail rotor must be tracked.

9-62. Deleted.

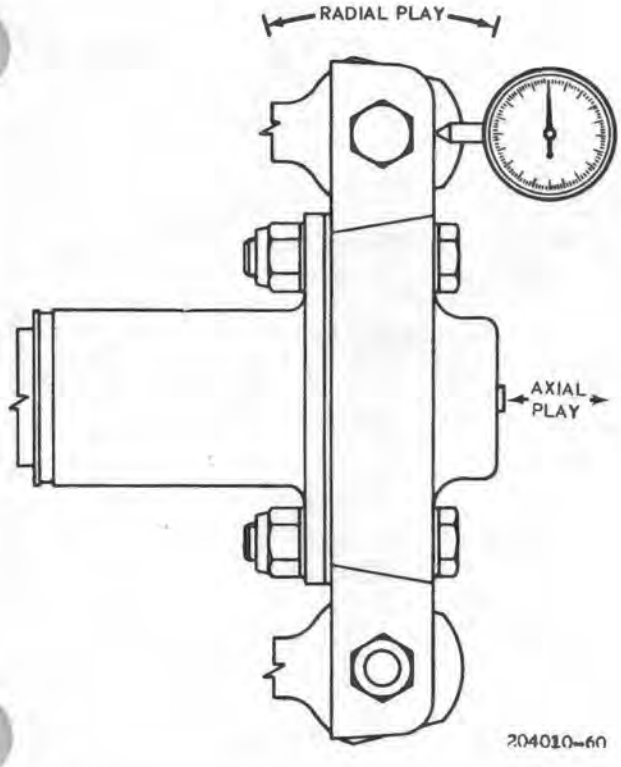


Figure 9-15. Checking tail rotor pitch control for looseness

9-63. ***Installation — Tail Rotor Pitch Control Mechanism.*** a. Insert control rod through inner end of control quill housing, engaging splines. Turn sprocket to engage control nut on threads of rod.

b. Uncover port on right side of 90 degree gear box. Insert control rod carefully through rotor shaft, and engage quill on gear box studs. Place cover pan on studs and attach temporarily with nuts and washers. Install screw through bracket on lower corner of pan into matching nut plate of vertical fin.

c. Install tail rotor. Install control chain, and sprocket guard, during rigging.

d. When rigging is complete, close transparent cover and secure with bolt through cover into bracket in pan. Lockwire bolt head to bolt at upper end of cover.

9-64. Tail Rotor Control Cables. The forward ends of the tail rotor control cables are attached to a quadrant. The cables run through a series of pulleys, grommets and fairleads to connect to the pitch control mechanism chain. Forward cables are connected to aft cables by means of speed rigs to facilitate removal and installation.

9-65. *Removal — Tail Rotor Control Cables.* a. Cut lockwire and disconnect cables at speed rigs. Disconnect cables from control chain.

b. Disconnect cables from control quadrant.

c. Remove clevis pins from pulley supports and remove pulleys, whenever necessary to remove cables.

d. Remove fairleads from brackets and remove cables.

9-66. *Inspection — Tail Rotor Control Cables.* a Inspect cables for worn sections and broken strands.

b. Inspect pulleys for flat spots, and damaged, tight or worn bearings.

c. Inspect grommets for wear and signs of misalignment.

d. Inspect supports for security and condition. Inspect chain and sprocket for wear.

9-67. *Repair or Replacement — Tail Rotor Control Cables.* Replace all parts that do not meet inspection requirements (Refer to paragraph 9-66.)

9-68. *Installation — Tail Rotor Control Cables.* a. Install forward ends of cable on quadrant with a spherical washer next to ball terminal. Secure with clevis pins and cotter pins.

b. Guide cables through pulley supports and grommet supports. Install grommets in supports.

c. Install aft sections of cable in support and temporarily secure aft ends with lockwire.

d. Install pulleys and clevis pins in support.

e. If supports have been disturbed, check alignment of cables through grommets and realign if necessary by altering shims under supports.

f. Attach ends of cables to pitch control chain.

g. Install pitch control chain on sprocket and adjust tension of cables. Refer to paragraph 9-69 for locating chain on sprocket and for tail rotor rigging.

h. Lockwire quick disconnects.

i. Check tail rotor controls for full travel.

9-69. *Adjustment — Tail Rotor.* Accomplish rigging with hydraulic boost off.

a. On UH-1A and UH-1B, Serial No. 60-3546 through 64-14100, helicopters adjust tail rotor pitch change links to 5.5 inches from bolt hole center to center when 204-010-733 crosshead is installed. If 204-011-711 crosshead in installed adjust links to 5.4 inches. On UH-1B helicopters, Serial No. 64-14101 and subsequent, adjust pitch change links to 5.4 inches. (See View C, (figure 9-18.) Install all fixed tubes and links in the tail rotor controls set pedals at approximately neutral adjustment by use of adjusting knob.

Caution

Use only 204-011-711 crosshead on UH-1B helicopters Serial No. 64-14101 and subsequent.

b. Depress both pilot's and copilot's left tail rotor control pedals and hold against stops. Adjust and install interconnect tube assembly (1, figure 9-18). Adjust tube assembly (11) to obtain condition shown in View B

c. At control assembly on right side of 90 degree gear box, remove housing cover, sprocket guard, upper cable speed rig, and chain from the sprocket. Check that sprocket guard nuts and washers are reinstalled.

d. Place reference mark, with grease pencil, on surface of retainer adjacent to any tooth on sprocket. (See View A.)

e. Turn sprocket clockwise to bottom out quill and mark tooth opposite retainer reference mark.

f. With sprocket bottomed, and left pedal held against stop, apply sufficient tension to lower cable to take out servo pilot-valve motion. Install chain over sprocket and connect upper speed rig.

g. Adjust cable tension to 40 to 50 pounds, maintaining sprocket position established to conditions in step f. above.

h. Actuate pedals through full travel. With full left pedal, sprocket should be off bottom 2½ to 3½ teeth. Manually push forward on top chain to actuate the power cylinder valve. Sprocket should again bottom.

1. Interconnect Rod
2. Force Gradient Assembly
3. Control Tube
4. Idler Arm
5. Control Tube
6. Boot (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
7. Bellcrank
8. Link Rod
9. Power Cylinder
10. Bellcrank
11. Control Tube
12. Magnetic Brake
13. ASW12 Actuator

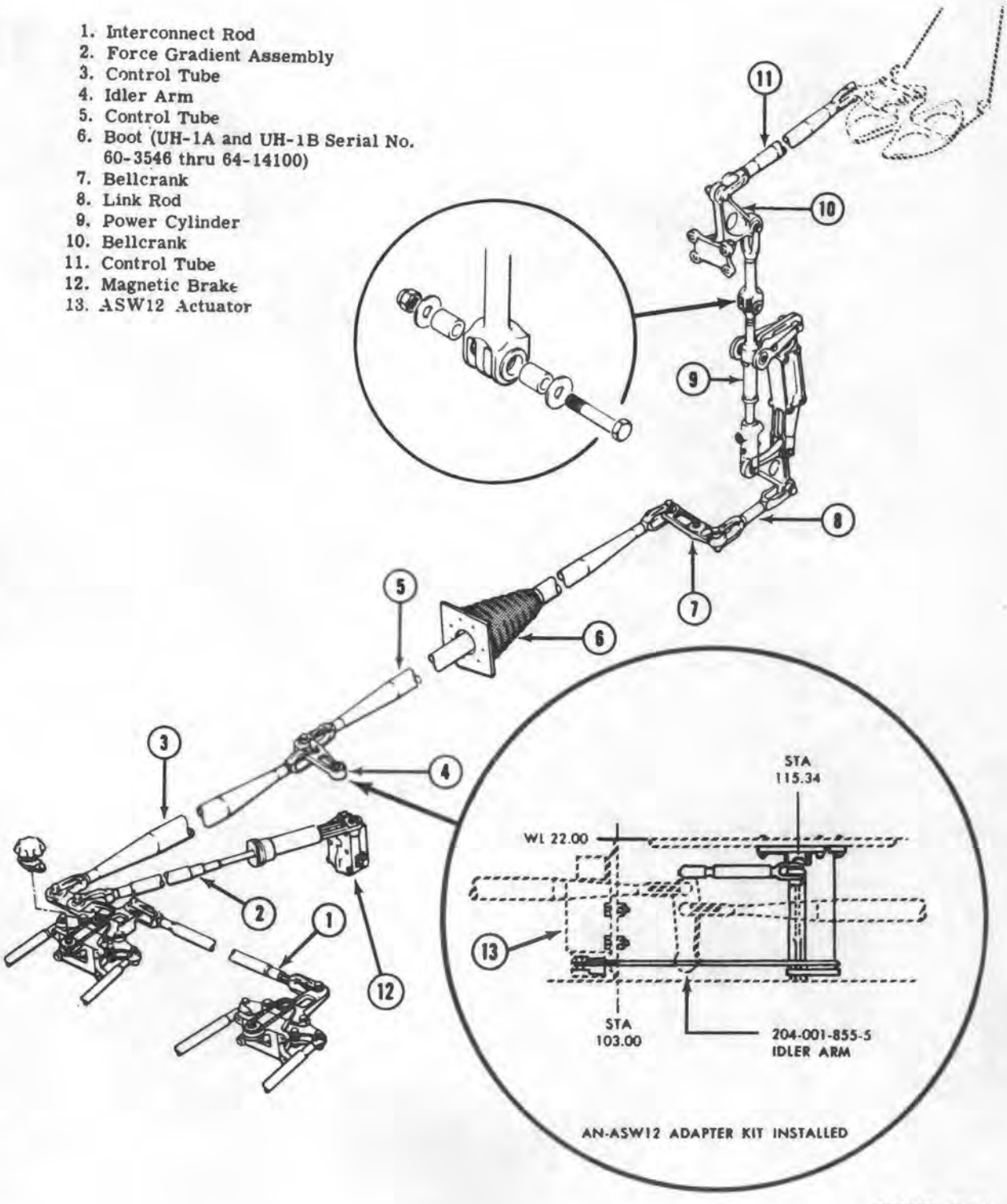


Figure 9-18. Tail rotor controls adjustment (Sheet 1 of 2)

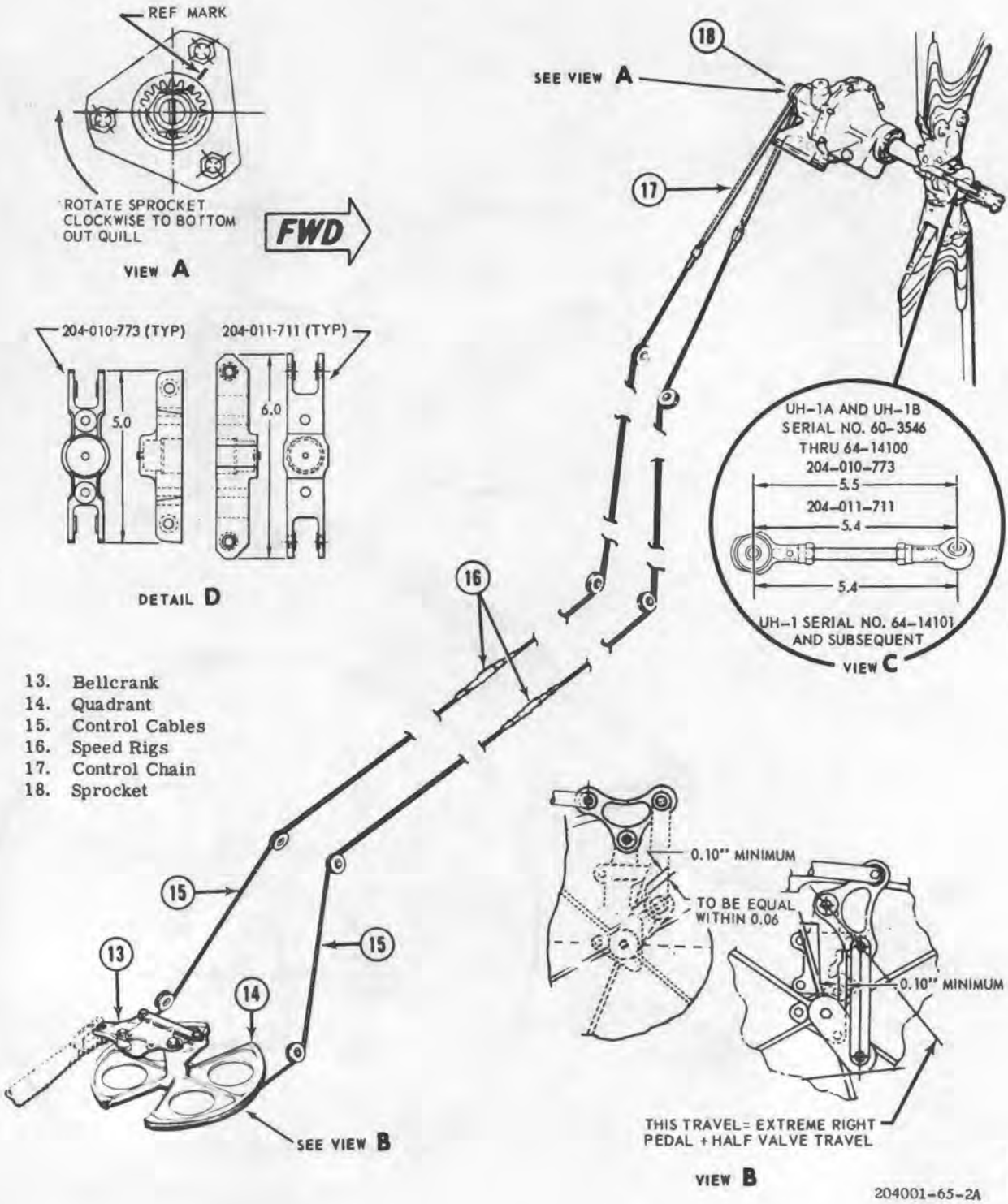


Figure 9-18. Tail rotor controls adjustment (Sheet 2 of 2)

CHAPTER 10
INSTRUMENTS

Section I — Scope

10-1. Scope. The purpose of this chapter is to provide essential information for maintenance personnel to accomplish organizational maintenance on the instruments. All flight, navigation, engine and miscellaneous instruments are mounted in a panel attached to the top forward side of the pedestal.

Note

The illustrations, pertaining to the information found in the following sections, are contained in TM 55-1520-211-10.

10-2. *Removal — Instruments.* The removal procedure for all instruments is relatively the same, except that it is necessary to disconnect wiring for one type of instrument or disconnect a tube from another type of instrument. A single removal procedure may be used for any instrument.

a. Turn battery switch to "OFF" position.

b. Disconnect wires or tubes from back of instrument and tape or place cover on ends. Cover openings in instrument. Remove mounting screws from instrument and panel. Remove instrument from panel.

10-3. *Cleaning — Instruments.* Wipe dust and clean instrument cover glass with a soft, clean, lint-free cloth.

10-3A. *Inspection — Instruments.* a. Inspect instruments for loose or cracked glasses.

b. Inspect for legibility of range markings.

c. Inspect for faulty decals.

10-4. *Repair or Replacement — Instruments.* Inspect instruments for loose or cracked glasses and for legibility of range markings. Replace instrument if cover glass is loose or cracked and replace range markings, if needed.

10-5. *Installation — Instruments.* Position instrument in panel and install mounting screws. Remove tape or covers from tube, wire ends and openings in instrument. Attach or connect tubes, wires, receptacles, etc., to instrument.

10-6. Instrument Panel. The instrument panel is mounted on the top forward section of the pedestal and contains all instruments for the pilot and copilot.

10-7. Deleted.

10-8. Deleted.

10-8A. *Adjustment — Instrument Panel.* Instrument panel vibration may be eliminated or minimized by adjusting the tube and brace assemblies provided for this purpose. The two outboard tube assemblies are attached to the helicopter structure by means of a pin, washer, and cotter pin. They are equipped with a clevis and check nut for adjustment. The two inboard brace assemblies are attached to the pedestal and may be adjusted by turnbuckles incorporated in the brace assemblies.

Section II — Flight Instruments

10-9. Altimeter. The altimeter furnishes a direct reading of height above sea level. The instrument is vented to the static air system.

10-10. *Troubleshooting — Altimeter.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Pointer indicates incorrectly	Leak in static line	Correct leak
	Static vent plugged	Clean vent
	Instrument defective	Replace instrument

10-11. *Removal — Altimeter.* (Refer to paragraph 10-2.)

10-12. *Cleaning — Altimeter.* (Refer to paragraph 10-3.)

10-12A. *Inspection — Altimeter.* (Refer to paragraph 10-3A.)

10-13. *Repair or Replacement — Altimeter.* (Refer to paragraph 10-4.)

10-14. *Installation — Altimeter.* (Refer to paragraph 10-5.)

10-15. Airspeed Indicator. The airspeed indicator is a standard pitot-static instrument. The single scale indicator provides an indication in knots by measuring the difference between the impact air pressure from the pitot tube and the static vent. The pitot tube is mounted on the left metal nose section of the cabin, or top right hand side of cabin roof. Static air pressure for instrument operation is derived from the two static vents located on the side cabin skins near the forward edges of the crew door.

10-16. *Troubleshooting — Airspeed Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Pointer fails to respond	Pressure line not connected properly	Connect line properly
	Line clogged	Disconnect line and blow lines clear
Pointer indicates incorrectly	Leak in line	Repair or replace line
	Defective or leaking instrument	Replace instrument

10-17. *Removal — Airspeed Indicator.* (Refer to paragraph 10-2.)

10-18. *Cleaning — Airspeed Indicator.* (Refer to paragraph 10-3.)

10-18A. *Inspection — Airspeed Indicator.* (Refer to paragraph 10-3A.)

10-19. *Repair or Replacement — Airspeed Indicator.* (Refer to paragraph 10-4.)

10-20. *Installation — Airspeed Indicator.* (Refer to paragraph 10-5.)

10-21. Pitot Static System. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) The pitot tube is mounted on the left metal nose section of the cabin. Static air pressure for instrument operation is derived from the two static vents located on the side cabin skins near the forward edges of the crew doors.

10-22. *Troubleshooting — Pitot Static System.* (Perform steps in paragraphs 10-10 and 10-16.)

10-23. Deleted.

10-24. *Cleaning — Pitot Static System. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.)* Clean pitot tube with a clean cloth dampened with dry cleaning solvent (item 302, table 1-1). Dry with filtered compressed air. Blow tube clear of any obstructions.

Note

Instrument MUST be disconnected from system when blowing lines.

10-24A. *Inspection — Pitot Static System. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.)* a. Inspect pitot tube for clogged drain hole on bottom of tube.

b. Inspect pitot tube for corrosion, dents or other visible damage.

c. Inspect pitot tube electrical receptacle, pins, and sockets for damage.

10-25. Deleted.

10-26. Deleted.

10-27. Pitot Static System. (UH-1B Serial No. 64-14101 and Subsequent.) These helicopters are equipped with pitot-static tube mounted just right of center line on the forward cabin roof.

10-27A. *Troubleshooting — Pitot Static System. (UH-1B Serial No. 64-14101 and subsequent.)* (Refer to paragraph 10-22.)

10-27B. *Cleaning — Pitot Static System. (UH-1B Serial No. 64-14101 and subsequent.)* (Refer to paragraph 10-24.)

10-27C. *Inspection — Pitot Static System. (UH-1B Serial No. 64-14101 and subsequent.)*

a. Inspect all tube connections for tightness, security, and freedom from obstructions.

b. Inspect static pressure drain for accumulation of moisture.

10-28. Deleted.

10-29. Deleted.

10-30. Deleted.

10-31. Turn and Slip Indicator. The turn and slip indicator is controlled by an electrically-actuated gyro which is DC powered. This instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function and operates independently of the other. The ball indicates when the aircraft is in directional balance either in turn or in straight and level flight. If the aircraft is yawing or slipping the ball will be off center. The needle indicates in which direction and at what rate the aircraft is turning.

10-32. *Troubleshooting — Turn and Slip Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Pointer remains at zero either constant or intermittent	Low voltage	Replace battery
	Defective instrument	Replace defective unit

10-33. *Removal — Turn and Slip Indicator.* (Refer to paragraph 10-2.)

10-34. *Cleaning — Turn and Slip Indicator.* (Refer to paragraph 10-3.)

10-34A. *Inspection — Turn and Slip Indicator.* (Refer to paragraph 10-3A.)

10-35. *Minor Repair — Turn and Slip Indicator.* (Refer to paragraph 10-4.)

10-36. *Installation — Turn and Slip Indicator.* (Refer to paragraph 10-5.)

10-37. Attitude Indicator. On model UH-1A helicopters, the attitude indicator is mounted on the top right-hand side of the instrument panel. On model UH-1B helicopters, two attitude indicators are mounted on the instrument panel, one each for the pilot and copilot, and the amplifier is located in the nose compartment. On model UH-1B, Serial No. 64-14191 and subsequent, the pilot's attitude indicator is a one piece unit containing both the indicator and the amplifier. This instrument indicates the flight attitude of the helicopter relative to the earth's surface.

10-38. *Troubleshooting — Attitude Indicator.* Perform steps as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator does not operate and power flag does not lift	Failure of power supply	Replace power supply
Systems functions properly but power failure flag does not lift	Failure of indicator	Replace indicator
Indicator oscillates (hunts in roll and pitch)	Failure of indicator	Replace indicator
Power failure flag lifts but indicator moves in one axis only	Failure of indicator	Replace indicator

10-39. *Removal — Attitude Indicator.* (Refer to paragraph 10-2.)

10-40. *Cleaning — Attitude Indicator.* (Refer to paragraph 10-3.)

10-40A. *Inspection — Attitude Indicator.* (Refer to paragraph 10-3A.)

10-41. *Repair or Replacement — Attitude Indicator.* (Refer to paragraph 10-4.)

10-42. *Installation — Attitude Indicator.* (Refer to paragraph 10-5.)

Note

One and two-piece attitude indicators are interchangeable for all helicopters prior to Serial No. 64-14191. However, when installing one piece attitude indicators in helicopters prior to Serial No. 64-14191, connectors of amplifier must be stowed when amplifier is removed. Connect remaining connector to receptacle on one piece attitude indicator.

10-43. Vertical Velocity Indicator. The vertical velocity indicator registers ascent and descent in feet. This instrument is actuated by the rate of atmospheric pressure change and is vented to the static air system.

10-44. *Troubleshooting — Vertical Velocity Indicator.* Perform steps as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Pointer off zero	Mechanism shifted	Return pointer to zero by turning adjustment knob; tap face of instrument lightly while adjusting
Inaccurate readings	Loose connections in static line	Tighten connections
Excessive pointer oscillation	Instrument case leaks Leak in static line Defective instrument	Replace instrument Tighten connections, replace leaky lines Replace instrument

10-45. *Removal — Vertical Velocity Indicator.* (Refer to paragraph 10-2.)

10-46. *Cleaning — Vertical Velocity Indicator.* (Refer to paragraph 10-3.)

10-46A. *Inspection — Vertical Velocity Indicator.* (Refer to paragraph 10-3A.)

10-47. *Repair or Replacement — Vertical Velocity Indicator.* (Refer to paragraph 10-4.)

10-48. *Installation — Vertical Velocity Indicator.* (Refer to paragraph 10-5.)

Section III — Navigation Instruments

10-49. Course Indicator. The ID-453/ARN course indicator functions to furnish the pilot visual bearing from or to the station being received. A knob is provided on the instrument for selection or adjustment of the bearing indicator needle to set up a desired omni (VOR) course or to change to course 180 degrees on the indicator, thereby reversing the TO-FROM meter. Operating in conjunction with the course selector is the cross pointer meter. The pilot by means of the omni system can set up any bearing to or from a station when he knows his general geographical location and he can determine that location by obtaining a position fix on two omni stations. The cross pointer will deflect right or left depending upon the relative bearing of the helicopter to the station.

10-50. *Removal — Course Indicator.* (Refer to paragraph 10-2.)

10-51. *Cleaning — Course Indicator.* (Refer to paragraph 10-3.)

10-51A. *Inspection — Course Indicator.* (Refer to paragraph 10-3A.)

10-52. *Repair or Replacement — Course Indicator.* (Refer to paragraph 10-4.)

10-53. *Installation — Course Indicator.* (Refer to paragraph 10-5.)

10-54. Radio Compass. The radio compass is a synchro-driven instrument which indicates the angular position of the synchro located in the loop, and the bearing of the incoming signal relative to the helicopter heading. A knob marked VAR (variation) is located on the radio compass indicator and permits the operator to adjust the face of the radio compass indicator to correct for local magnetic variation or to add in the helicopter magnetic heading to obtain a true magnetic bearing for radio direction finding.

10-55. *Removal — Radio Compass.* (Refer to paragraph 10-2.)

10-56. *Cleaning — Radio Compass.* (Refer to paragraph 10-3.)

10-56A. *Inspection — Radio Compass.* (Refer to paragraph 10-3A.)

10-57. *Repair or Replacement — Radio Compass.* (Refer to paragraph 10-4.)

10-58. *Installation — Radio Compass.* (Refer to paragraph 10-5.)

10-59. Bearing-Heading Indicator. The C-6H and ID-250/ARN indicators are dual pointer, moving type instruments. The C-6H provides additional isolated heading output by means of an external servo amplifier. The ID-250/ARN indicator (RMI) is a repeater type instrument. The dial on each indicator displays heading from the J-2 compass system. Pointer No. 1 of each indicator displays ADF magnetic bearing from ARN-59 system. Pointer No. 2 of each indicator displays omni magnetic bearing from the AN/ARN-30 ( ) system via the B-18A RMI converter.

10-60. *Removal — Bearing-Heading Indicator.* (Refer to paragraph 10-2.)

10-61. *Cleaning — Bearing-Heading Indicator.* (Refer to paragraph 10-3.)

10-61A. *Inspection — Bearing-Heading Indicator.* (Refer to paragraph 10-3A.)

10-62. *Repair or Replacement — Bearing-Heading Indicator.* (Refer to paragraph 10-4.)

10-63. *Installation — Bearing-Heading Indicator.* (Refer to paragraph 10-5.)

10-64. Gyro Magnetic Compass — Type V-7A. The gyro magnetic compass is an AC powered instrument. The compass may be used as a directional or it may be "slaved" to the remote transmitter control unit by a two position COMPASS SLAVING, IN-OUT, switch located at the lower center of the instrument panel. When the switch is in the "IN" position, the remote transmitter is in operation. The transmitter located in the lower center section

of the tail boom, picks up the lines of force from the earth's magnetic field and transmits these signals to the gyro, causing it to follow these signals. The gyro remains in constant synchronization with these signals. The switch in the out position disconnects the transmitter from the system, and the electrically actuated directional gyro then detects movement only about the vertical axis of the helicopter without reference to the earth's magnetic field.

Note

The AN/ASN-43 Gyro Magnetic compass system replaces the J2 Gyro Magnetic compass system on UH-1B Helicopters serial No. 66-15148 through 66-15245. Functionally the AN/ASN-43 system operates the same as the J2 system, but has been considerably simplified. Only ac power is required for operation.

10-65. *Removal — Gyro Magnetic Compass — Type V-7A.* (Refer to paragraph 10-2.)

10-66. *Cleaning — Gyro Magnetic Compass — Type V-7A.* (Refer to paragraph 10-3.)

10-66A. *Inspection — Gyro Magnetic Compass — Type V-7A.* (Refer to paragraph 10-3A.)

10-67. *Repair or Replacement — Gyro Magnetic Compass — Type V-7A.* (Refer to paragraph 10-4.)

10-68. *Installation — Gyro Magnetic Compass — Type V-7A.* (Refer to paragraph 10-5.)

10-69. Standby Compass. The standby compass is a standard magnetic type and is to be used in conjunction with the compass correction card, located adjacent to the compass.

10-70. *Troubleshooting — Standby Compass.* Perform steps as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive card error	Improper compensation	Compensate compass
	External magnetic interference	Refer to TM 55-405-3 Locate magnetic influence and eliminate if possible
	Air in bowl	Replace instrument
Excessive card oscillation	Insufficient liquid in bowl	Replace instrument
Card element not level	Leaking float chamber	Replace instrument
	Card magnets detached from card	Replace instrument
Card sluggish	Dirty jewels or pivots restricting rotation	Replace instrument
	Weak magnetic card	Replace instrument

10-71. *Removal — Standby Compass.* (Refer to paragraph 10-2.)

10-72. *Cleaning — Standby Compass.* (Refer to paragraph 10-3.)

10-72A. *Inspection — Standby Compass.* (Refer to paragraph 10-3A.)

10-73. *Repair or Replacement — Standby Compass.* (Refer to paragraph 10-4.)

10-74. *Installation — Standby Compass.* (Refer to paragraph 10-5.)

10-74A. *Calibration — Standby Compass.* a. Check condition of compass before positioning helicopter on compass rose. (Refer to paragraph 10-3A.)

b. Position helicopter on compass rose. Observe the following precautions prior to start of swinging procedure:

(1) Make sure that all magnetic material and equipment in helicopter is secured in normal flight position.

(2) Check that all controls and levers are set in normal flight position.

(3) Check that all observers or personnel near or in the helicopter have no magnetic materials on their person.

(4) Check that any magnetic objects, such as trucks, automobiles or other aircraft, are removed from the compass rose swing area to a distance at which they will have no magnetic effect on the compass.

c. Position helicopter on compass rose turntable and radial lines. Secure helicopter right-hand skid to compass rose holding fixture. Use helicopter ground handling wheels, or equivalent, to support helicopter when rotating to different headings.

Note

Any jack, lift, hoist or dolly which is used to lift helicopter to a level flight position shall be of non-magnetic materials.

d. Start helicopter power plant according to standard procedures. (Refer to TM 55-1520-211-10.) Turn on power to all equipment, including J-2 compass system, except landing light, searchlight, and windshield wipers. Allow helicopter to rest, facing east, for approximately three minutes to permit equipment functions to stabilize.

Note

Rotate helicopter under engine power to accomplish steps e. through i.

Note

Use non-magnetic screwdriver to adjust "N-S" and "E-W" degree compensators on face of compass. Purpose of compensators is to adjust standby compass indicator, as nearly as possible, to agree with helicopter heading on compass rose.

e. Rotate helicopter to south magnetic heading and observe compass indication. Adjust "N-S" compensator as necessary.

f. Rotate helicopter to west magnetic heading and observe compass indication. Adjust "E-W" compensator as necessary.

g. Rotate helicopter to north magnetic heading and observe compass indication. Adjust "N-S" compensator as necessary.

h. Rotate helicopter to east magnetic heading and observe compass indication. Adjust "E-W" compensator as necessary.

i. Repeat steps e. through h. two times to establish closest possible degree of compensation.

j. Record S, W, N and E degree deviations on standby compass correction card. Secure compass compensator screws with sealing compound (item 201, table 1-1).

k. Shut down helicopter power plant and electrical power. Remove helicopter from compass rose.

Section IV — Engine and Miscellaneous Instruments

10-75. Dual Tachometer. The dual tachometer indicates both the engine and rotor rpm The outer scale of the indicator is for power turbine rpm, and the smaller inner scale is for rotor rpm. Power for operation of the indicators is provided by two tachometer generators mounted on the engine and transmission. These systems are self generating; therefore, a connection to the electrical system is not required. Normal operation of the helicopter is evident when the power turbine (engine) and rotor rpm indicator needles are in synchronization.

10-76. *Troubleshooting — Dual Tachometer.* Perform steps as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive scale error	Weak magneto in tachometer	Replace tachometer
Pointer moves backwards	Leads reversed at generator	Change leads in generator plug
Indication only one-half actual speed	Leads connected to wrong terminal indicator	Refer to wiring diagram and indicator
No reading on instrument either constant or intermittent	Break or short circuit in leads	Repair or replace leads
	Poor connections at indicator or generator plugs	Clean or tighten connections
	Break in unit circuit	Replace unit affected
Low reading on indicator either constant or intermittent	Indicator resistance out of adjustment	Replace indicator
High reading on indicator either constant or intermittent	Indicator resistance out of adjustment	Replace indicator

10-77. *Removal — Dual Tachometer.* (Refer to paragraph 10-2.)

10-78. *Cleaning — Duel Tachometer.* (Refer to paragraph 10-3.)

10-78A. *Inspection — Dual Tachometer.* (Refer to paragraph 10-3A.)

10-79. *Repair or Replacement — Dual Tachometer.* (Refer to paragraph 10-4.)

10-80. *Installation — Dual Tachometer.* (Refer to paragraph 10-5.)

10-81. Engine Oil Pressure Indicator. The engine oil pressure gage receives pressure indications from the pressure transmitter and provides readings in pounds per square inch (psi). The oil pressure indicator and transmitter are electrically operated by 28 volt AC.

10-82. *Troubleshooting — Engine Oil Pressure Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Low reading on oil pressure indicator	Kinked tubing or air obstruction in tubing	Replace or change tubing
Inaccurate or sticking pressure indicator	Defective instrument	Replace instrument
Sluggish oil pressure reading or fluctuating oil pressure	Sludge or air in line	Bleed line

10-83. *Removal — Engine Oil Pressure Indicator.* (Refer to paragraph 10-2.)

10-84. *Cleaning — Engine Oil Pressure Indicator.* (Refer to paragraph 10-3.)

10-84A. *Inspection — Engine Oil Pressure.* (Refer to paragraph 10-3A.)

10-85. *Repair or Replacement — Engine Oil Pressure Indicator.* (Refer to paragraph 10-4.)

10-86. *Installation — Engine Oil Pressure Indicator.* (Refer to paragraph 10-5.)

10-87. Engine Oil Temperature Indicator. The engine oil temperature indicator is connected to an electrical resistance type thermocouple and indicator is powered by 28 volts DC and is connected to the essential bus.

10-88. *Troubleshooting — Engine Oil Temperature Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Oil temperature reading off scale at low temperature end, or low reading either constant or intermittent	Open or short in indicator	Replace indicator
	Short circuit in leads from resistance bulb to indicator Short circuit in bulb	Make continuity check and repair or replace indicator Replace bulb
Oil temperature reading off scale at high temperature end, or high reading either constant or intermittent	Break in leads or resistance bulb	Repair or replace leads
	Open or short circuit in indicator	Replace indicator
No reading on indicator either constant or intermittent	Break in leads Defective switch Defective indicator	Repair or replace leads Replace switch Replace indicator

10-89. *Removal — Engine Oil Temperature Indicator.* (Refer to paragraph 10-2.)

10-90. *Cleaning — Engine Oil Temperature Indicator.* (Refer to paragraph 10-3.)

10-90A. *Inspection — Engine Oil Temperature Indicator.* (Refer to paragraph 10-3A.)

10-91. *Repair or Replacement — Engine Oil Temperature Indicator.* (Refer to paragraph 10-4.)

10-92. *Installation — Engine Oil Temperature Indicator.* (Refer to paragraph 10-5.)

10-93. Transmission Oil Pressure Indicator. The transmission oil pressure indicator receives pressure indications from the pressure transmitter and provides readings in pounds per square inch (psi). The oil pressure indicator and transmitter are electrically operated by 28 volts AC.

10-94. *Troubleshooting — Transmission Oil Pressure Indicator.* Perform steps as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Low reading on oil pressure indicator	Kinked tubing or air obstruction in tubing	Replace or change tubing
Inaccurate or sticking pressure indicator	Defective instrument	Replace instrument
Sluggish oil pressure reading or fluctuating oil pressure	Sludge or air in line	Bleed line

10-95. *Removal — Transmission Oil Pressure Indicator.* (Refer to paragraph 10-2.)

10-96. *Cleaning — Transmission Oil Pressure Indicator.* (Refer to paragraph 10-3.)

10-96A. *Inspection — Transmission Oil Pressure Indicator.* (Refer to paragraph 10-3A.)

10-97. *Repair or Replacement — Transmission Oil Pressure Indicator.* (Refer to paragraph 10-4.)

10-98. *Installation — Transmission Oil Pressure Indicator.* (Refer to paragraph 10-5.)

10-99. Transmission Oil Temperature Indicator. The transmission oil temperature indicator is connected to an electrical resistance type thermobulb which electrically transmits the oil temperature reading to the indicator unit. The unit operates from 28 volt DC electrical system and is connected to the essential bus.

10-100. *Troubleshooting—Transmission Oil Temperature Indicator.* Perform necessary checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Oil temperature reading off scale at low temperature end, or low reading, either constant or intermittent	Open or short circuit in indicator	Replace indicator
	Short circuit in leads or resistance bulb	Repair or replace lead
	Ground in lead from resistance bulb to indicator	Make continuity check
	Open or short circuit in indicator	Replace indicator
	Short circuit in bulb	Replace bulb
Oil temperature reading off scale at high reading either constant or intermittent	Break in leads or resistance bulbs	Repair or replace leads
	Open circuit in resistance bulb	Replace resistance bulb
	Open or short circuit in indicator	Replace indicator

10-101. *Removal — Transmission Oil Temperature Indicator.* (Refer to paragraph 10-2.)

10-102. *Cleaning — Transmission Oil Temperature Indicator.* (Refer to paragraph 10-3.)

10-102A. *Inspection — Transmission Oil Temperature Indicator.* (Refer to paragraph 10-3A.)

10-103. *Repair or Replacement — Transmission Oil Temperature Indicator.* (Refer to paragraph 10-4.)

10-104. *Installation — Transmission Oil Temperature Indicator.* (Refer to paragraph 10-5.)

10-105. Gas Producer Tachometer Indicator. The gas producer tachometer registers the rpm of the gas producer turbine. The indicator is powered by a tachometer generator geared to the rotor shaft and does not depend on the helicopter's electrical system. The indicator readings are in percent rpm of gas producer turbine speed. The instrument when used in conjunction with the exhaust temperature gage, permits engine power to be accurately set without exceeding limitations.

10-106. *Removal — Gas Producer Tachometer Indicator.* (Refer to paragraph 10-2.)

10-107. *Cleaning — Gas Producer Tachometer Indicator.* (Refer to paragraph 10-3.)

10-107A. *Inspection — Gas Producer Tachometer Indicator.* (Refer to paragraph 10-3A.)

10-108. *Repair or Replacement — Gas Producer Tachometer Indicator.* (Refer to paragraph 10-4.)

10-109. *Installation — Gas Producer Tachometer Indicator.* (Refer to paragraph 10-5.)

10-110. Exhaust Temperature Indicator. The exhaust temperature indicator receives temperature indications from the bayonet type thermocouples mounted in the forward section of the tailpipe. The gage temperature indications are in degrees centigrade and electrical power is not required as the system is self generating.

10-111. *Troubleshooting — Exhaust Temperature Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No reading on instrument	Loose connections	Check and tighten connections
	Open circuit in indicator	Replace indicator

10-112. *Removal — Exhaust Temperature Indicator.* (Refer to paragraph 10-2.)

10-113. *Cleaning — Exhaust Temperature Indicator.* (Refer to paragraph 10-3.)

10-113A. *Inspection — Exhaust Temperature Indicator.* (Refer to paragraph 10-3A.)

10-114. *Repair or Replacement — Exhaust Temperature Indicator.* (Refer to paragraph 10-4.)

10-115. *Installation — Exhaust Temperature Indicator.* (Refer to paragraph 10-5.)

10-116. Torquemeter Indicator. The torquemeter indicator is connected to a single transmitter which is part of the engine oil system. The torquemeter indicates torque pressure in psi readings of the torque imposed upon the engine output shaft. The torquemeter circuit is powered by 28 volt AC power and is protected by a circuit breaker located on the overhead console panel.

10-116A. *Trouble Shooting — Torquemeter Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Low reading on indicator	Kinked or obstructed line	Replace or clean line
Inaccurate or sticking indicator	Defective indicator	Replace indicator
Sluggish or fluctuating pressure	Loose electrical connection	Check connections
No reading on indicator	Defective transmitter	Replace transmitter
	Open circuit between transmitter and indicator	Make continuity check and replace or repair leads

10-117. *Removal —Torquemeter Indicator.* (Refer to paragraph 10-2.)

10-118. *Cleaning — Torquemeter Indicator.* (Refer to paragraph 10-3.)

10-118A. *Inspection — Torquemeter Indicator* (Refer to paragraph 10-3A.)

10-119. *Repair or Replacement — Torquemeter Indicator.* (Refer to paragraph 10-4.)

10-120. *Installation — Torquemeter Indicator.* (Refer to paragraph 10-5.)

10-121. AC Voltmeter. The AC voltmeter indicates the voltage output from the inverter (main or spare), however, the voltage indicated is the voltage between only two of the three 115 volt AC phases.

10-122. *Removal — AC Voltmeter.* (Refer to paragraph 10-2.)

10-123. *Cleaning — AC Voltmeter.* (Refer to paragraph 10-3.)

10-123A. *Inspection — AC Voltmeter.* (Refer to paragraph 10-3A.)

10-124. *Repair or Replacement — AC Voltmeter.* (Refer to paragraph 10-4.)

10-125. *Installation — AC Voltmeter.* (Refer to paragraph 10-5.)

10-126. DC Voltmeter. The DC voltmeter indicates the output of voltage from the main generator, standby generator, essential bus, non-essential bus, or battery. These sources are selected by the VM selector on the DC Power panel in the overhead console.

10-127. *Troubleshooting — DC Voltmeter.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No reading or erratic reading	Malfunctioning generator	Replace generator
	Open or short circuit in instrument	Replace instrument
	Dirty or worn mechanism in instrument	Replace instrument

10-128. *Removal — DC Voltmeter.* (Refer to paragraph 10-2.)

10-129. *Cleaning — DC Voltmeter.* (Refer to paragraph 10-3.)

10-129A. *Inspection — DC Voltmeter.* (Refer to paragraph 10-3A.)

10-130. *Repair or Replacement — DC Voltmeter.* (Refer to paragraph 10-4.)

10-131. *Installation — DC Voltmeter.* (Refer to paragraph 10-5.)

10-132. Loadmeter. Two DC loadmeters are mounted in the instrument panel, one each for the main and standby generator. These instruments measure and indicate, in percentage, the output or load of the generator.

10-133. *Troubleshooting — Loadmeter.* (Refer to paragraph 10-127.)

10-134. *Removal — Loadmeter.* (Refer to paragraph 10-2.)

10-135. *Cleaning — Loadmeter.* (Refer to paragraph 10-3.)

10-135A. *Inspection — Loadmeter.* (Refer to paragraph 10-3A.)

10-136. *Repair or Replacement — Loadmeter.* (Refer to paragraph 10-4.)

10-137. *Installation — Loadmeter.* (Refer to paragraph 10-5.)

10-138. Clock. The clock has an elapsed time mechanism incorporating a sweep second pointer. The number of revolutions being counted by a minute totalizer hand indicating from 0 to 60 minutes and repeating, with on knob to control the start, stop and fly-back of both pointers by successive depressions. The control knob for the clock is located at the upper righthand corner of the clock face.

10-139. *Removal — Clock.* (Refer to paragraph 10-2.)

10-140. *Cleaning — Clock.* (Refer to paragraph 10-3.)

10-140A. *Inspection — Clock.* (Refer to paragraph 10-3A.)

10-141. *Repair or Replacement — Clock.* (Refer to paragraph 10-4.)

10-142. *Installation — Clock.* (Refer to paragraph 10-5.)

10-143. Fuel Quantity Indicator. The transistorized fuel quantity indicator is an electrical receiver which continuously indicates the quantity of fuel in pounds and is powered by 115 volt AC. The indicator is connected to a capacitor type fuel quantity transmitter mounted in each fuel cell, which transmits the fuel quantity in pounds to the indicator.

Note

UH-1B helicopters Serial No. 64-14101 and subsequent are equipped with only one fuel quantity transmitter. On these helicopters the transmitter is located in the left-hand fuel cell.

10-144. *Troubleshooting — Fuel Quantity Indicator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator reads low	System out of adjustment	Perform adjustment procedure
	Tank unit has low capacitance	Change tank unit
	Compensator capacitance too high	Change tank unit
Indicator reads high	System out of adjustment	Perform adjustment procedure
	Tank unit has high capacitance	Change tank unit
	Open lead on compensator circuit	Check wiring
	Compensator section of tank unit open	Change tank unit
Indicator remains at one point on scale	No power	Check 115 volts, 400 cycle power supply.
	Defective indicator	Replace indicator
	Coaxial lead grounded	Check wiring
	400 cycle lead grounded	Check wiring and/or replace indicator assembly
	Prolonged existence of this condition will burn out fire hazard resistor in indicator	
Indicator remains at zero or below	Open wiring	Check wiring
Indicator operation sluggish	Low insulation resistance of the circuit	Check wiring and tank unit

10-145. *Removal — Fuel Quantity Indicator.* (Refer to paragraph 10-2.)

10-146. *Cleaning — Fuel Quantity Indicator.* (Refer to paragraph 10-3.)

10-146A. *Inspection — Fuel Quantity Indicator.* (Refer to paragraph 10-3A.)

10-147. *Repair or Replacement — Fuel Quantity Indicator.* (Refer to paragraph 10-4.)

10-148. *Installation — Fuel Quantity Indicator.* (Refer to paragraph 10-5.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Contact springs of voltage regulator base do not make good contact with regulator prongs	Clean spring and prongs
Generator voltage too low	Voltage regulator not adjusted properly	Check generator output with voltmeter. Adjust rheostat for proper voltage
	Faulty connections in generator field circuit	Tighten connections
	Contact springs of voltage regulator base do not make good contact with regulator plugs	Clean springs and prongs
	Defective voltmeter	Check generator output with external voltmeter; replace defective voltmeter
Movement of regulator rheostat does not alter voltage within normal range	Defective rheostat	Check for smooth control of voltage between 26 and 30 volts; replace defective rheostat
	Carbon pile out of adjustment or defective	Replace regulator
	Faulty wiring between generator and regulator	Repair wiring
	Contact springs of voltage regulator base do not make good contact with regulator prongs	Clean spring and prongs
Loadmeter or voltmeter fluctuates rapidly under steady load conditions	Voltage regulator unstable	Replace faulty regulator
Voltage varies excessively with changes in engine speed or electrical load	Carbon pile out of adjustment or defective	Replace defective regulator
Battery will not hold charge	Charging rate too low	Adjust voltage regulator
	Level of electrolyte too low	Send to battery shop. (Refer to pargaraph 1-97.)
	Impurities in electrolyte	Replace battery

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive loss of electroylte	Charging rate too high	Adjust voltage regulator
	If loss is in individual cell(s) only, cell(s) is faulty	Send battery to shop for cell replacement
	Cracked cell cases	Check cell case for leaks; replace battery
Battery terminals corroded	Excessive charging or discharging rate	Reduce charging rate or load
Battery polarity reversed	Battery connections reversed	Check wiring to battery plug. Reverse wiring if necessary

12-7. Generator Field Control Relays. The generator field control relays are located in the aft electrical compartment. Each respective relay provides control of the main generator or standby generator by opening and closing the generator shunt field. The relay is tripped by the generator overvoltage applied through the overvoltage relay and may be reset electrically.

12-7A. ***Inspection — Generator Field Control Relay.*** Inspect relay for loose connections, damaged or broken contact pins or terminals, physical damage to case or insulation between contact pins, and discoloration that would indicate internal shorting or excessive overload.

12-7B. ***Repair or Replacement — Generator Field Control Relay.*** Replace item if inspection requirements are not met. (Refer to paragraph 12-7A.)

Paragraphs 12-8 and 12-9 Deleted

12-10. Battery Relay. The battery relay is mounted on a shelf in the aft electrical compartment. This unit is an electrically operated switch between the battery and the main bus bar. It is controlled by a switch which opens or closes the circuit to the actuating coil of the relay.

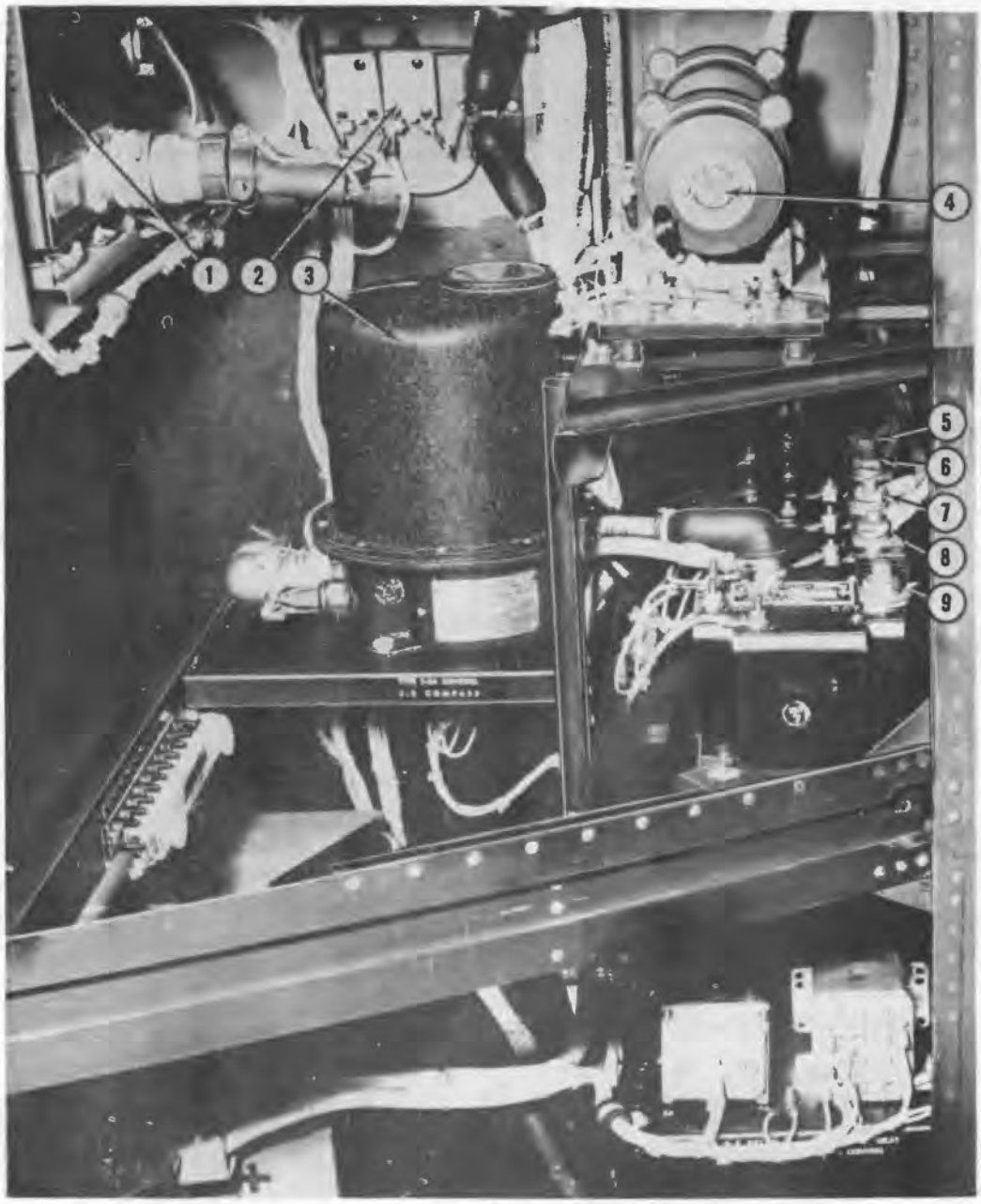
12-10A. ***Inspection — Battery Relay.*** Inspect relay terminal contact surfaces for evidence of corrosion, pits or discoloration (indicating arcing due to loose connections), damaged case and/or broken terminals or electrical overload.

12-10B. ***Repair or Replacement — Battery Relay.*** Replace item if inspection requirements are not met. (Refer to paragraph 12-10A.)

Paragraphs 12-11 and 12-12 Deleted.

12-13. Voltage Regulator. Two voltage regulators are located in the forward electrical compartment (one for the main generator and one for the standby generator) on the left hand side of the helicopter. The voltage regulator adjusts the charging of the generator by increasing or decreasing resistance in the shunt of the field coil winding. The voltage regulator of the standby generator is set at a lower voltage than that of main generator.

12-14. ***Removal — Voltage Regulator.*** a. Turn battery switch to "OFF" position.



1. Gyrosyn Compass Amplifier
2. Circuit Breakers
3. Gyrosyn Compass Control
4. Voltage Regulator
5. Starter Relay
6. External Power Relay
7. Non-Essential Bus Relay
8. Battery Relay
9. Reverse Current Relay (Main Generator)

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Figure 12-1. Electrical compartment (Typical)

b. Unlock snap-clamps and remove voltage regulator from mounting base.

12-14A. *Inspection — Voltage Regulator.* Visually inspect regulator case for physical damage that could impair normal efficient operation of the unit, (cracked case, damaged contact pins, loose terminal, etc.). Check for secure mounting of regulator into regulator base. Inspect regulator base for loose terminal connections, damaged or weak contact springs to regulator pins, cracked or damaged mounting plate or shock mounts.

12-14B. *Repair or Replacement — Voltage Regulator.* Replace item if inspection requirements are not met. (Refer to paragraph 12-14A.)

12-15. *Installation — Voltage Regulator.* Position voltage regulator on mounting base and lock snap-clamps.

12-16. Deleted.

12-17. Reverse Current Relay. The reverse current relay is mounted in the aft electrical compartment. This unit prevents the generator from being connected to the line until operating voltage is attained, protects the generator against overload, prevents reverse current flow and holds generator connected to line unless voltage drops to a point where continued operation would be detrimental to the electrical equipment.

12-17A. *Inspection — Reverse Current Relay.* Inspect for loose connections, damaged case or broken terminal studs.

12-17B. *Repair or Replacement — Reverse Current Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-17A.)

Paragraphs 12-18 and 12-19 Deleted.

12-20. Bus Control Relay. The bus control relay is actuated from the indicator terminal of the main generator reverse current relay. It also controls the nonessential bus relay; turns on non-essential bus when external power or main generator is on; prevents the starter generator from being on when generator is on and operates main generator failure caution lights. This unit is located in the aft electrical compartment.

12-20A. *Inspection — Bus Control Relay.* (Refer to paragraph 12-7A.)

12-20B. *Repair or Replacement — Bus Control Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-20A.)

Paragraphs 12-21 and 12-22 Deleted.

12-23. Overvoltage Relay. The over voltage relay is located in the aft electrical compartment. This unit actuates the trip coil on the field relay when 32 volts is reached and breaks the field of the generator which takes the generator off the line.

12-23A. *Inspection — Overvoltage Relay.* (Refer to paragraph 12-7A.)

12-23B. *Repair or Replacement — Overvoltage Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-23A.)

Paragraphs 12-24 and 12-25 Deleted.

12-26. Non-Essential Bus Relay. The non-essential bus relay is mounted on a shelf in the aft electrical compartment. This unit is an electrically operated switch between the main bus bar and the non-essential bus. It is controlled by a switch which opens or closes the circuit to the actuating coil of the relay.

12-26A. *Inspection — Non-Essential Bus Relay.* (Refer to paragraph 12-10A.)

12-26B. *Repair or Replacement — Non-Essential Bus Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-26A.)

Paragraphs 12-27 and 12-28 Deleted.

12-29. Starter Relay. The starter relay is located in the aft electrical compartment. This unit supplies direct current to the starter when the starter switch is depressed.

12-29A. *Inspection — Starter Relay.* (Refer to paragraph 12-10A.)

12-29B. *Repair or Replacement — Starter Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-30A.)

12-29C. Miscellaneous Electrical Components. Included in this category are relays, rheostats, switches, circuit breakers, plugs, leads, connectors, wiring, conduits, receptacles, shunts and shock mounts.

12-29D. *Removal — Miscellaneous Electrical Components.* Remove attaching hardware, clamps and/or connectors and remove component.

12-29E. *Inspection — Miscellaneous Electrical Components.* a. Inspect rheostats for security, corrosion, burned element, damaged wiper, and cracks.

b. Inspect switches for weak detents, security, corrosion, continuity in ON and OFF position.

c. Inspect circuit breakers for security, corrosion, actuation for circuit power on and power off and reset retentions.

d. Inspect plugs, connectors and receptacles for security, contact, corrosion, damaged contacts, broken wires, faulty contacts, insert cracks and faulty insulation.

e. Inspect leads and wiring for loose terminals, chaffing, corrosion or deteriorated conditions, faulty or damaged insulation, excessive mechanical stress, broken strands, damaged shielding, shorted shielding, routing and mounting conditions.

f. Inspect conduits for security, surface damage, cracks, corrosion and deterioration.

g. Inspect shunts for corrosion, security, deep scratches, physical damage and discoloration (indicating excessive overloading).

h. Inspect shockmounts for retention, security, cracks, distortion, corrosion and bonding.

12-29F. *Repair or Replacement — Miscellaneous Electrical Components.* a. Tighten loose terminal connectors, mounting and electrical components.

b. Replace miscellaneous electrical components that fail to meet inspection requirements. (Refer to paragraph 12-30E.)

12-29G. *Installation — Miscellaneous Electrical Components.* a. Install component and secure with attaching hardware or clamps

b. Attach terminals and/or connectors.

Paragraphs 12-30 and 12-31 Deleted.

12-32. Interior Lights. Interior light circuits include the instrument lights, instrument secondary lights located on the glare shield, console and pedestal panel lights, dome lights, and cockpit lights.

12-33. *Troubleshooting — Interior Lights.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Switch fails to operate lights	Defective switch rheostat	Replace switch rheostat
Circuit breaker breaking circuit	Short in switch or wires	Replace necessary parts
One light dim or intermittent	Poor ground	Remove light and clean ground
One light out	Burned out bulb Corroded lamp socket Broken wire	Replace bulb Clean terminals Replace wire

12-34. *Removal — Interior Lights.* a. Disengage appropriate circuit breaker.

b. Remove mounting hardware, lift out light assembly and disconnect light wire.

12-34A. *Inspection — Interior Lights.* Inspect lights for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulbs, or improper handling of light case to airframe.

12-34B. *Repair and Replacement — Interior Lights.* Light assembly may be repaired by replacing damaged or defective component parts. If light case is damaged beyond repair, complete unit must be replaced.

12-35. *Installation — Interior Lights.* a. Connect light wire and install light assembly with mounting hardware.

b. Engage appropriate circuit breaker and check light for proper operation.

12-36. Landing Light and Search Light. The landing light is mounted on the underside of the cabin forward of the aft cross tube. The search light is also mounted on the underside of the cabin forward of the front cross tube. Each light is retractable and is controlled by a switch on the pilot's collective stick. The circuit is protected by a circuit breaker on the overhead console panel.

12-37. *Troubleshooting — Landing or Search Light.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Light inoperative	Defective switch	Replace switch
Circuit breaker breaking circuit	Short in switch or wires	Replace necessary parts
One light dim constantly or intermittently	Poor ground	Remove light and ground
One light out	Burned out bulb or corroded lamp socket	Replace bulb. Clean terminals or replace light
	Broken wires	Repair wires

12-38. *Removal — Landing or Search Light.* a. Turn battery switch to "OFF" position.

b. Remove four mounting screws from lower side of helicopter. Remove and disconnect wires from terminals. Cover wires with tape.

12-38A. *Inspection — Landing or Searchlight.* a. Check light for defective or broken seal.

b. Check for loose connections, and damaged or defective component parts (terminal strips, limit switches, drive motors, relays, etc.).

12-38B. *Repair or Replacement — Landing or Searchlight.* a. Accomplish replacement of sealed beam lamp unit as follows: Remove three screws from lamp retainer ring, remove ring and gasket, lift lamp and disconnect wiring.

Note

Observe position of lamp before removal and install new unit in same position using reverse order of removal procedure.

b. Replace complete unit if inspection items in paragraph 12-38A, step b., are not met.

12-39. *Installation — Landing or Search Light.* Remove tape from wire ends. Attach wires to proper terminals on light and install wire clamp. Position light through hole and install mounting screws. Check light for operation.

12-40. Anti-Collision Light. The anti-collision light is mounted on top of the fuselage aft of the cabin area. Rotation of the light creates a flashing action that is visible for a considerable distance. This light is controlled by a switch on the exterior light panel on the overhead console.

12-41. *Removal — Anti-Collision Light.* a. Turn battery switch to "OFF" position. Remove mounting screws holding light to top of fuselage.

b. Pull light out as far as wiring will permit and disconnect electrical connector.

12-41A. *Inspection — Anti-Collision Light.* a. Inspect light for broken cover, lens or burned lamp bulb element.

b. Inspect light for damaged case, broken connector, pins, and damaged rotation motor or drive unit.

12-41B. *Repair and Replacement — Anti-Collision Light.* a. Loosen screw securing lens cover retaining ring, lift lens from light base. Install and secure new lens cover in reverse order of removal procedure.

b. Replace item if inspection requirements in paragraph 12-41A, step b., are not met.

12-42. *Installation — Anti-Collision Light.* Connect electrical connector. Position light in place and install mounting screws.

12-43. Navigation Lights. The navigation lights circuit consists of circuit breaker, two selector switches, flasher, two red lights on left side and two green lights on right side (one each above and below the cabin door), three white lights (one each above the cabin door and one on bottom right side of cabin), and one amber light in the vertical fin of the aft section assembly. On UH-1B Serial No. 64-14101 and subsequent two amber lights are mounted just below the vertical fin in the aft section assembly. On UH-1B Serial No. 65-9416 and subsequent the white lights are protected by a separate circuit breaker.

12-44. *Trouble Shooting — Navigation Lights.* (Perform steps in paragraph 12-37.)

12-44A. *Inspection — Navigation Lights.* (Refer to paragraph 12-34A.)

12-44B. *Repair and Replacement — Navigation Lights.* Replace faulty or damaged component parts (lens, lamp bulbs, etc.). If light case is damaged beyond repair complete unit must be replaced

12-45. *Removal — Navigation Lights.* a. Make sure battery switch and light switch are in "OFF" position.

b. Remove cover mounting screw and remove cover. Remove two screws mounting light assembly to bracket, pull assembly from ship and disconnect electrical connector. Remove light assembly from helicopter and cover wire with tape.

12-46. *Installation — Navigation Lights.* a. Remove tape from wire and connect light assembly.

b. Position light assembly and install two mounting screws. Place cover in position and install mounting screws.

12-47. Navigation Lights Flasher. The navigation lights flasher is mounted in the aft electrical compartment. On helicopters through UH-1B Serial No. 64-14191 this unit will cause the white and colored navigation lights to flash alternately. On UH-1B Serial No. 65-9416 and subsequent it will cause only the colored navigation lights to flash

12-48. *Removal — Flasher — Navigation Lights.* a. Make sure battery switch is in "OFF" position.

b. Disconnect electrical connector. Remove mounting nuts, washers, and bolts and lift flasher from helicopter.

12-48A. *Inspection — Navagation Lights Flasher.* Inspect flasher case for dents or damage that would impair normal operation of the unit. Check connector for broken or corroded pins and cracked inserts.

12-48B. *Repair or Replacement — Navigation Light Flasher.* Replace item if inspection requirements are not met. (Refer to paragraph 12-48A.)

12-49. *Installation — Navigation Lights Flasher.* Position flasher on shelf and install mounting bolts, washers and nuts. Connect electrical connector.

12-50. Rheostat. The rheostats are mounted on the overhead console. The rheostats are a means of turning on, and dimming instrument lights.

12-51. *Removal — Rheostat.* a. Make sure battery switch is in "OFF" position. Disengage fasteners and swing right-hand side of overhead console down.

b. Remove rheostat pointer knob. Remove nut and washer and disconnect wires from terminals of rheostat and lift rheostat from panel. Tape ends of wires.

12-51A. *Inspection — Rheostat.* (Refer to paragraph 12-29E.)

12-51B. *Repair or Replacement — Rheostat.* Replace item if inspection requirements are not met. (Refer to paragraph 12-51A.)

12-52. *Installation — Rheostat.* a. Position rheostat in panel and install washer and nut. Install pointer knob.

b. Remove tape from wires and install on proper posts of rheostat. Carefully raise panel into position, noting that wires stow without binding or interference and engage panel fasteners.

12-53. Control Panels. The control panels on the overhead console consist of the following: Dome lights and pitot heater, exterior lights, cabin heater instrument lights, AC power, DC power, and miscellaneous panels. The panels on the pedestal consist of hydraulic control and force trim, caution, and engine control panels.

12-54. *Removal — Control Panels.* Remove control panels as follows:

Note

The removal procedure for all panels are relatively the same. A single removal procedure may be used for any panel.

a. Turn battery switch to "OFF" position.

b. Release snap fasteners holding panel to pedestal or overhead console. Carefully lift panel away from mounting position. Disconnect electrical receptacle and lift panel from mounting position.

12-54A. *Inspection — Control Panels.* Visually inspect for scratched, chipped, or broken edge lit panels, loose wiring connections, damaged or faulty switches, damaged connectors and broken or missing mounting fasteners.

12-54B. *Repair or Replacement — Control Panels.* Replace items that fail to meet inspection requirements. (Refer to paragraph 12-54A.)

12-55. *Installation — Control Panels.* Connect electrical receptacle to under side of panel. Position panel in place being careful not to damage wiring. Connect fasteners.

12-56. DC Circuit Breakers. The DC circuit breakers are mounted on the overhead console. DC circuits can be opened and closed by operating these trip-free, push-pull type circuit breakers.

12-57. *Removal — DC Circuit Breakers.* Make sure battery switch is in "OFF" position. Open circuit breaker panel. Disconnect leads from circuit breakers and tape ends of leads. Remove mounting screws and lift circuit breaker from panel.

12-57A. *Inspection — DC Circuit Breakers.* (Refer to paragraph 12-29E.)

12-57B. *Repair or Replacement — DC Circuit Breakers.* Replace item if inspection requirements are not met. (Refer to paragraph 12-57A.)

12-58. *Installation — DC Circuit Breakers.* Position circuit breaker in panel and install mounting screws. Remove tape from leads and connect leads to circuit breaker terminals. Close circuit breaker panel.

12-59. Thermocouple Lead Spool Resistor. The thermocouple lead spool resistor is located in the aft electrical compartment. Two sections of chromel and alumel leads are used to connect the thermocouple to the indicator. The thermocouple lead spool resistor is a part of the tailpipe temperature indicator circuit.

12-60. ***Removal — Thermocouple Lead Spool Resistor.*** Disconnect leads from resistor. Remove mounting nuts, washers and screws and lift resistor from compartment.

12-60A. ***Inspection — Thermocouple Lead Spool Resistor.*** Inspect resistor for loose connections, corrosion, broken wires, broken terminals and damage to cover or cover fasteners.

12-60B. ***Repair or Replacement — Thermocouple Lead Spool Resistor.*** Replace item if inspection requirements are not met. (Refer to paragraph 12-60A.)

12-61. ***Installation — Thermocouple Lead Spool Resistor.*** Position resistor in compartment and install mounting screws, washers, and nuts. Connect leads from thermocouple and indicator circuits.

12-62. ***Adjustment — Thermocouple Lead Spool Resistor.*** a. Disconnect thermocouple leads at indicator and measure resistance of circuit. It shall be 8.0 ± 0.05 ohms.

b. If necessary, cut thermocouple lead spool resistor to attain this value.

12-63. Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic pressure warning switch on these helicopters is mounted on the bulkhead on the right-hand side of the transmission. When system pressure gets low, the pressure switch turns on the warning light on the instrument panel.

12-64. ***Removal — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Make sure battery switch is in "OFF" position.

b. Remove right-hand transmission cowling. Slide a small drain pan under pressure switch and disconnect hydraulic line. Cap all openings.

c. Disconnect electrical receptacle. Remove mounting nuts, washers, and bolts and lift switch from bracket.

12-64A. ***Inspection — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Inspect switch for loose connections, security, pressure leaks and actuation of switch at proper pressure.

12-64B. ***Repair or Replacement — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 60-3546 hrough 64-14100).*** Tighten connections, repair leaks or replace switch if faulty. (Refer to paragraph 12-64A.)

12-65. ***Installation — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Position pressure switch in bracket and install mounting bolts, washers and nuts. Remove caps from all openings. Connect electrical receptacle and hydraulic line.

b. Fill and bleed hydraulic system. Install cowling.

12-65A. Hydraulic Pressure Warning Switch (UH-1B Serial No. 64-14101 and subsequent). A pressure warning switch is located in each of the two hydraulic system module assemblies which are mounted on the bulkhead on the right-hand side of the transmission. When pressure in either system decreases, the pressure switch activates a warning light on the instrument panel.

12-65B. ***Removal — Hydraulic Pressure Warning Switch (UH-1B Serial No. 64-14101 and subsequent).*** a. Make sure battery switch is in "OFF" position.

b. Remove right-hand transmission cowling. Slide a small drain pan under pressure switch and disconnect hydraulic line. Cap all openings.

c. Disconnect electrical receptacle. Back off check nut and remove switch from module assembly. Cap opening in module.

12-65B1. ***Inspection — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 64-14101 and subsequent).*** Inspect switch for loose connections, security, pressure leaks and actuation of switch at proper pressure.

12-65B2. ***Repair or Replacement — Hydraulic Pressure Warning Switch (UH-1A and UH-1B Serial No. 64-14101 and subsequent).*** Tighten connections, repair leaks or replace switch if faulty. (Refer to paragraph 12-65B1A.)

12-65C. ***Installation — Hydraulic Pressure Warning Switch (UH-1B Serial No. 64-14101 and subsequent).*** a. Remove cap from module opening. Install pressure switch, with check nut, into module assembly. Tighten check nut with 40 to 50 inch-pounds torque.

b. Remove caps from all openings. Connect electrical receptacle and hydraulic line.

c. Fill and bleed hydraulic system. Install cowling.

12-66. Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic bypass solenoid valve on these helicopters is mounted on the bulkhead on the right-hand side of the transmission. This valve is controlled by a switch on the hydraulic control panel.

12-67. ***Removal — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Remove right-hand transmission cowling.

b. Slide a small drain pan under solenoid valve and disconnect hydraulic lines from valve. Cap all openings.

c. Disconnect electrical receptacle. Remove mounting nuts, washers and bolts and lift valve from mounting bracket.

12-67A. ***Inspection — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Check valve for security, pressure leaks and proper actuation of solenoid.

12-67B. ***Repair or Replacement — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Replace item if inspection requirements are not met. (Refer to paragraph 12-67A.)

12-68. ***Installation — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Position valve on mounting bracket and install mounting bolts, washers and nuts.

b. Remove caps from all openings. Connect hydraulic lines and electrical receptacle.

c. Fill and bleed hydraulic system. Install cowling.

12-68A. Hydraulic Bypass Solenoid Valve (UH-1B Serial No. 64-14101 and subsequent). A bypass solenoid valve is located in the top of each of the two hydraulic system module assemblies which are mounted on the bulkhead on the right-hand side of the transmission. This valve is controlled by a switch on the hydraulic control panel.

12-68B. ***Removal — Hydraulic Bypass Solenoid Valve (UH-1B Serial No. 64-14101 and subsequent).*** a. Remove right-hand transmission cowling.

b. Slide a small drain pan under solenoid valve and disconnect hydraulic lines from valve. Cap all openings.

c. Disconnect electrical receptacle. Remove screws attaching valve to module and remove valve from module. Cap opening in module.

12-68B1. ***Inspection — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 64-14101 and subsequent).*** Check valve for security, pressure leaks and proper actuation of solenoid.

12-68B2. ***Repair or Replacement — Hydraulic Bypass Solenoid Valve (UH-1A and UH-1B Serial No. 64-14101 and subsequent).*** Replace item if inspection requirements are not met. (Refer to paragraph 12-68A.)

12-68C. ***Installation — Hydraulic Bypass Solenoid Valve (UH-1B Serial No. 64-14101 and subsequent).*** a. Remove cap from module opening. Position valve in module and install attaching screws. Tighten screws with 35 to 40 inch-pounds torque.

b. Remove caps from all openings. Connect hydraulic lines and electrical receptacle.

c. Fill and bleed hydraulic system. Install cowling.

12-69. External Power Receptacle. The external power receptacle is mounted on a bracket just below the aft electrical compartment access door. The receptacle is covered by an access door. This receptacle is the contact point for external power plug-in.

Note

External power is not required for starting the helicopter.

12-70. *Trouble Shooting — External Power Receptacle.* Perform check as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Lack of power when external power plug is inserted	Reverse polarity in plug	Rework plug to correct polarity
	Relay points corroded or pitted	Replace points or relay
	Power supply from external source too low	Increase output of external power

12-71. *Removal — External Power Receptacle.* a. Disconnect battery.

b. Remove nuts and washers from terminal post and free wires from receptacle. Tape ends of wires. Remove mounting screws and washers and lift receptacle from bracket.

12-71A. *Inspection — External Power Receptacle.* (Refer to paragraph 12-29E.)

12-71B. *Repair or Replacement — External Power Receptacle.* Replace item if inspection requirements are not met. (Refer to paragraph 12-71A.)

12-72. *Installation — External Power Receptacle.* Position external power receptacle in bracket and install mounting washers and screws. Remove tape from wires and secure wires to terminal post. Connect battery.

12-73. External Power Door Limit Switch. The external power door limit switch is mounted on the external power receptacle bracket. This switch is actuated when the door is closed. If the door is left unlatched the EXTERNAL POWER segment of Caution panel on pedestal will illuminate.

12-74. *Removal — Limit Switch — External Power Door.* a. Disconnect battery.

b. Disconnect electrical wires from switch and tape ends of wires. Loosen jam nut on threaded portion of switch inside of electrical compartment. Remove mounting nut from switch through external power receptacle door and lift switch from helicopter.

12-74A. *Inspection — External Power Door Limit Switch.* (Refer to paragraph 12-29E.)

12-74B. *Repair or Replacement — External Power Door Limit Switch.* Replace item if inspection requirements are not met. (Refer to paragraph 12-74A.)

12-75. *Installation — Limit Switch — External Power Door.* a. Install jam nut approximately halfway on threaded portion of switch.

b. Place switch in position with threads extending through mounting bracket and install jam nut through external power receptacle door.

c. Connect battery.

12-76. *Adjustment — Limit Switch — External Power Door.* Adjust switch by loosening jam nut and adjusting screw so switch will actuate when door is closed.

12-77. External Power Relay. The external power relay is located in the aft electrical compartment. This relay connects an external source of power, through the external power receptacle, to the electrical system of the helicopter.

12-77A. *Inspection — External Power Relay.* (Refer to paragraph 12-10A.)

12-77B. *Repair or Replacement — External Power Relay.* Replace item if inspection requirements are not met. (Refer to paragraph 12-77A.)

Paragraphs 12-78 and 12-79 Deleted.

12-80. *RPM Limit Warning System.* The rpm limit warning system includes a detector unit in right side of nose compartment, a circuit breaker on overhead console, a warning light on instrument panel, audio oscillator device, ON/OFF audio switch on engine control panel and electrical wiring and connectors. Power is supplied by the 28-volt DC essential bus.

12-81. *Operational Check.* The rpm limit detector, operating on DC power, senses and interprets rotor and engine rpm through connection to tachometer circuits. If the rotor rpm exceeds normal limit, warning light will illuminate. When either rotor or engine rpm reaches low limit, an audio signal is produced in pilot's and copilot's headsets, and warning light is illuminated. For starting and ground operation, audio tone can be turned off by audio switch. Before installation the rpm warning system detector is adjusted. Readjustment may be required whenever a tachometer generator is replaced, due to tolerances on tachometer components. Replacement of an engine tachometer generator will not require a check of rotor high rpm setting.

Note

On UH-1B Helicopters Serial No. 66-491 and subsequent, and on all earlier UH-1B Helicopters when modified; an automatic reset switch replaces the existing two-position switch in the low RPM audio circuit of the RPM Warning System. This switch automatically deactivates the low audio signal during extended periods of low RPM ground run operation.

12-82. *Testing — RPM Limit Warning System.* The testing and alignment of this system shall be accomplished during ground runup.

Note

To facilitate adjustment of RPM warning detector box, the box may be moved from the helicopter and reconnected to helicopter power by means of an extender cable. Cable may be fabricated as shown on figure 12-2.

Note

To increase the RPM at which the warning light will illuminate, turn either R1, R2, or R3 clockwise. One half turn of the potentiometer shaft will cause a change of 5 rotor rpm or 100 engine rpm. (Do not adjust R4 and R5. These are bench check adjustments and are to be performed only by higher level maintenance facility.)

12-82A. *Testing — RPM Limit Warning System (Bell).* (See figure 12-3.) When RPM limit warning detector has nameplate shown on figure 12-4, perform check and alignment of low engine and low rotor rpm on aircraft as follows:

Note

If nameplate is like that shown on figure 12-4C, refer to paragraph 12-82B.

a. Using the dual tachometer indicator as a reference and with low rpm audio switch in ON position, run engine at 6300 rpm approximately.

and ascertain that the red RPM LIMIT warning light on the instrument panel is not illuminated and the audio warning signal is not audible in the pilot's and copilot's headsets.

b. Decrease engine speed very slowly to the point where the RPM warning light illuminates and an audio warning signal (series of audio bursts) is heard in the pilot's and copilot's headsets. Engine rpm should be 6000 plus or minus 100 rpm. (295 plus or minus 5 rotor rpm.)

c. Position the low rpm switch to OFF position. Run engine at slightly less than 5900 rpm (290 rotor rpm). The RPM LIMIT warning light should be illuminated, but the audio signal should not be heard in the pilot's and copilot's headsets.

d. Increase engine rpm slowly and verify that RPM LIMIT warning light extinguishes within limits of 6000 plus or minus 100 rpm (295 plus or minus 5 rotor rpm).

e. If the rpm warning system does not meet the requirements as outlined in steps a. through d., above, the system must be aligned in accordance with the following procedures:

Note

Steps (1) through (3) shall be performed with the engine OFF.

(1) Disengage the RPM WARN SYSTEM circuit breaker.

(2) Remove cover from the detector and connect test box leads to TP1 and TP2 as shown in figure 12-4A.

Note

Locally fabricate test box in accordance with instructions shown in figure 12-4B.

(3) Reset RPM WARN SYSTEM circuit breaker and position the low rpm switch to AUDIO. The audio warning signal should be heard in pilot's and copilot's headsets.

(4) Start engine and increase rpm to approximately 6300 rpm (310 rotor rpm).

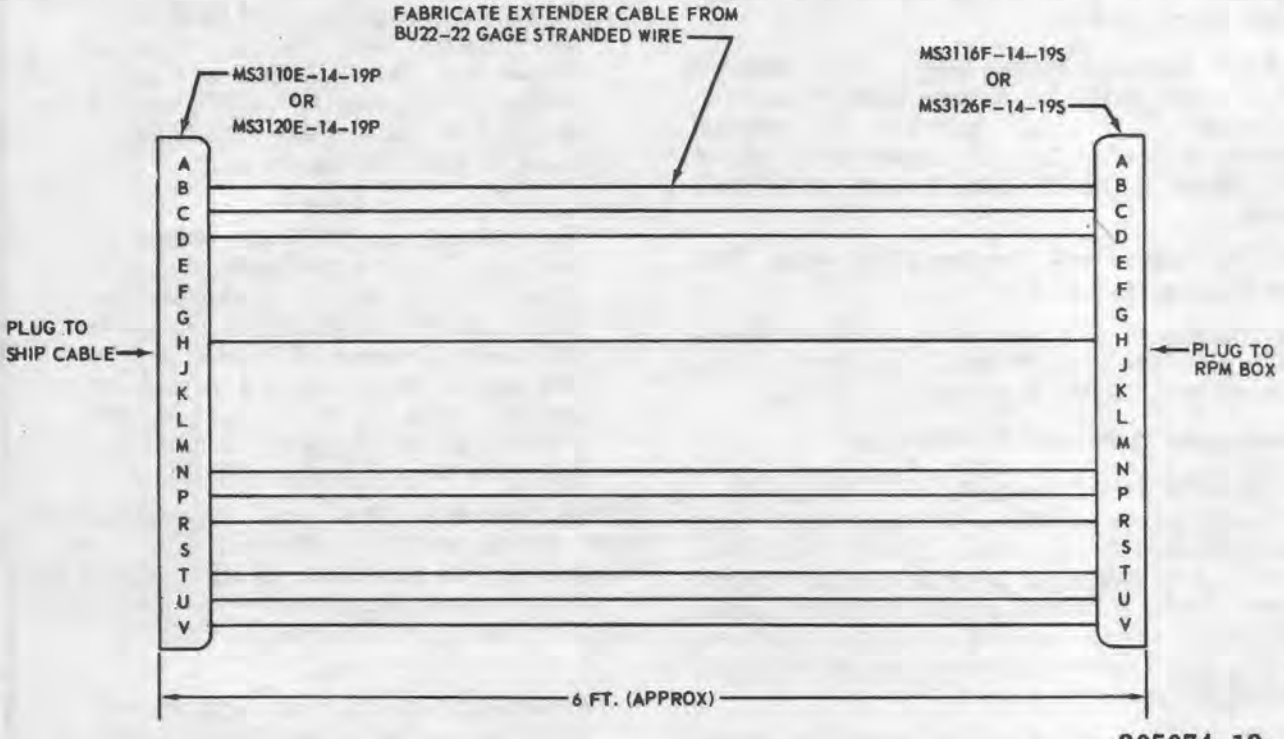


Figure 12-2. RPM limit detector extender cable

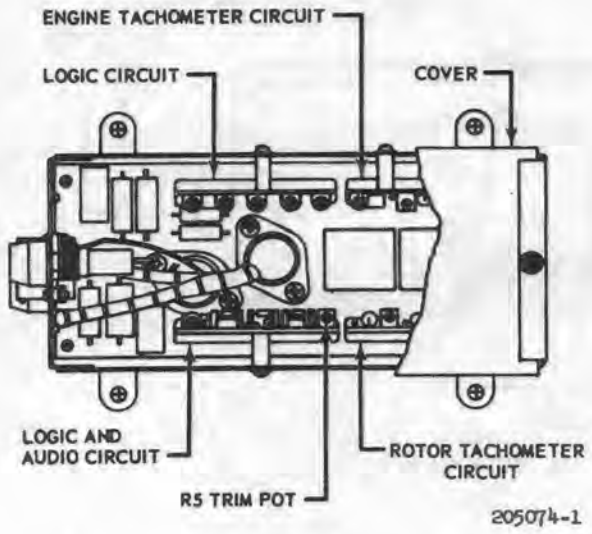


Figure 12-3. RPM limit detector (Bell)

(5) Position the ENGINE-NORMAL-ROTOR switch on the test box (figure 12-4A) to ENGINE position.

(6) Set engine to 6000 rpm (295 rotor rpm).

(7) If warning light illuminates, turn R3 slowly counterclockwise until warning light is off, then very slowly turn R3 clockwise until it illuminates again. If warning light is not illuminated at 6000 engine rpm (295 rotor rpm) turn R3 very slowly clockwise until light illuminates.

(8) To test for proper alignment, vary the engine rpm slowly above and below 6000 rpm (295 rotor rpm) and observe warning light. Verify that the warning light illuminates when engine reaches 6000 plus or minus 100 rpm.

(9) If light fails to illuminate, repeat steps (6), (7), and (8).

f. The low rotor rpm warning shall be aligned as follows:

(1) Place the ENGINE-NORMAL-ROTOR switch on the test box (figure 12-4A) to ROTOR position.

(2) Set rotor rpm to 295 (6000 engine rpm).

(3) If warning light is illuminated, turn R1 slowly counterclockwise until light goes off, then very slowly clockwise until light illuminates. If light is not illuminated at 295 rotor rpm (6000 engine rpm), turn R1 very slowly clockwise only until light illuminates.

(4) To test proper alignment, vary rotor rpm above and below 295 rpm (6000 engine rpm) and observe warning light. Verify that light comes on at 295 rpm, plus or minus 5 (6000, plus or minus 100, engine rpm). If light does not come on, repeat steps (2), (3) and (4).

(5) Place ENGINE - NORMAL - ROTOR switch in NORMAL position.

g. The high rotor rpm warning shall be tested and aligned as follows:

(1) Position the low rpm switch to AUDIO position.

(2) Set governor switch in EMERGENCY and, with the rotor in flat pitch, slowly increase the engine rpm until the warning light illuminates. The light should illuminate at a rotor speed of 335 plus or minus 5 rpm (engine speed 6800 plus or minus 100 rpm). No audio signal should be heard in the pilot's and copilot's headsets.

(3) The rpm limit warning system should meet the requirements outlined in step (2) above. If requirements are not met, the system shall be aligned as follows:

Note

The high engine potentiometer R4 (see figure 12-4A) is factory set and shall be adjusted ONLY by higher level maintenance facility.

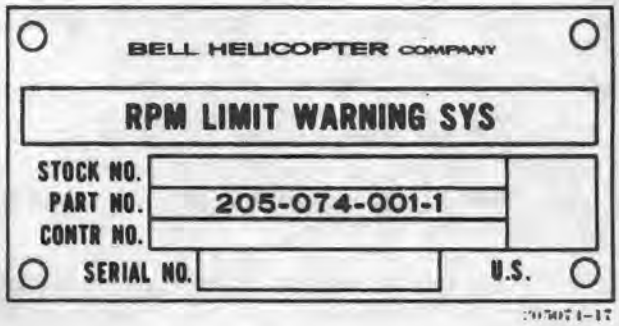


Figure 12-4. RPM limit warning detector nameplate (Bell)

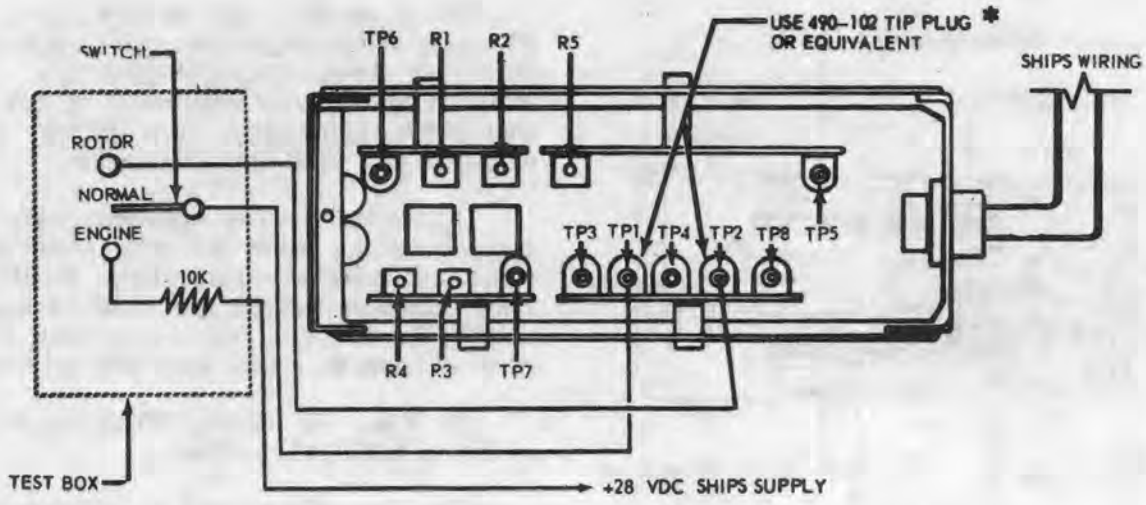


Figure 12-4A. Alignment of RPM limit warning system.

(a) Pull circuit breaker. Remove cover from detector and connect test box leads to TP1 and TP2 as shown in figure 12-4A.

Note

Locally fabricate test box in accordance with instructions shown in figure 12-4B.

(b) Reset the RPM WARN SYSTEM circuit breaker and position the low rpm switch to AUDIO position.

(c) Position the ENGINE-NORMAL-ROTOR switch on the test box (see figure 12-4A) to ROTOR position.

(d) Set the governor switch to EMERGENCY position and, with the rotor in flat pitch, slowly increase throttle to rotor speed of 335 (6800 engine rpm).

(e) If the warning light is illuminated, turn R2 slowly clockwise until the light goes off. Then turn, very slowly, counterclockwise until light illuminates again. If the light is not illuminated, turn R2 very slowly counterclockwise until light illuminates.

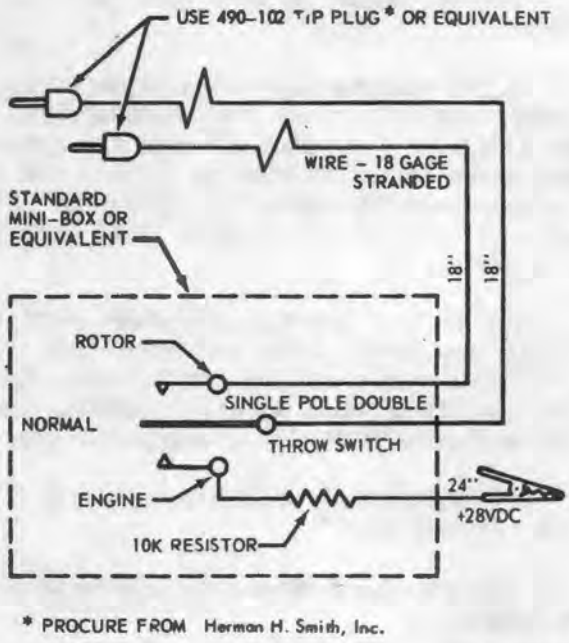


Figure 12-4B. Wiring diagram of RPM limit warning system test box

(f) To test for proper alignment, vary the engine rpm to determine that the warning light is illuminated and audio warning does not sound at 335 plus or minus 5 rotor rpm (6800 plus or minus 100 engine rpm). If warning light does not illuminate, repeat steps (d) through (f).

h. With engine off, pull RPM WARN SYSTEM circuit breaker and remove test box leads. If detector unit was removed from helicopter, disconnect extender cable and reinstall detector unit. Engage circuit breaker.

i. Repeat rpm tests for check. Perform steps a. through d. and steps g(1) and g(2).

12-82B. ***Testing — RPM Limit Warning System (Saturn).*** When RPM limit warning detector has nameplate shown on figure 12-4C perform check and alignment of low engine and low rotor rpm as follows:

Note

If nameplate is like that shown on figure 12-4, refer to paragraph 12-82A.

a. Using the dual tachometer indicator as a reference and with low rpm audio switch in ON position, run engine at 6300 rpm, approximately, and ascertain that the red RPM LIMIT warning light on the instrument panel is not illuminated and the audio warning signal is not audible in the pilot's and copilot's headsets.

b. Decrease engine speed very slowly to the point where the RPM warning light illuminates and an audio warning signal (series of audio bursts) is heard in the pilot's and copilot's headsets. Engine rpm should be 6000 plus or minus 100 rpm. (295 plus or minus 5 rotor rpm.)

c. Position the low rpm switch to OFF position. Run engine at slightly less than 5900 rpm (290 rotor rpm). The RPM LIMIT warning light should be illuminated, but the audio signal should not be heard in the pilot's and copilot's headsets.

d. Increase engine rpm slowly and verify that RPM LIMIT warning light extinguishes within limits of 6000 plus or minus 100 rpm (295 plus or minus 5 rotor rpm).

Figure 12-4C. RPM limit warning detector nameplate (Saturn)

e. If the rpm warning system does not meet the requirements as outlined in step a. through d., above, the system must be aligned in accordance with the following procedures:

(1) Apply power to the unit. Warning light and audio signals may or may not be seen and heard. Loosen screws and slide cover strips aft to expose potentiometer shafts.

(2) Install jumper lead between TP8 and TP6 to deactivate rotor signal. (See figure 12-4D.)

(3) Set engine to 6000 rpm (295 rotor rpm).

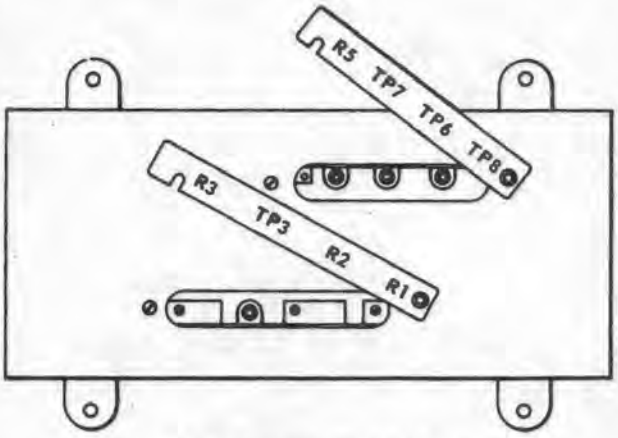
(4) If warning light illuminates, turn R3 slowly counterclockwise until warning light is off, then very slowly turn R3 clockwise until it illuminates again. If warning light does not illuminate the 6000 engine rpm (295 rotor rpm) turn R3 very slowly clockwise until light illuminates.

(5) To test for proper alignment, vary the engine rpm slowly above and below 6000 rpm (295 rotor rpm) and observe warning light. Verify that the warning light illuminates when engine reaches 6000 plus or minus 100 rpm.

(6) If light fails to illuminate, repeat steps (3), (4) and (5).

(7) Remove jumper.

f. The low rotor rpm warning shall be aligned as follows:



RPM LIMIT WARNING DETECTOR (SATURN)

"JUMPER" – 6 INCH 22 GA WIRF
(2) 490–102 TIP PLUGS
HERMAN H SMITH OR EQUV

205074–10

Figure 12-4D. RPM limit detector (Saturn)

(1) Install jumper lead between TP8 and TP7 to deactivate engine signal. (See figure 12-4D.)

(2) Set rotor rpm to 295 rpm (6000 engine rpm).

(3) If warning light illuminates, turn R1 slowly counterclockwise until warning light is off, then very slowly turn R1 clockwise until it illuminates again. If warning light does not illuminate at 295 rpm (6000 engine rpm) turn R1 very slowly clockwise until light illuminates.

(4) To test for proper alignment, vary the rotor rpm slowly above and below 295 rpm (6000 engine rpm) and observe warning light. Verify that the warning light illuminates when rotor reaches 295 plus or minus 5 rpm.

(5) If light fails to illuminate, repeat steps (2), (3) and (4).

(6) Remove jumper.

g. The high rotor rpm warning shall be tested and aligned as follows:

(1) Position the low rpm switch to AUDIO position.

(2) Set governor switch in EMERGENCY, and with the rotor in flat pitch, slowly increase the engine rpm until the warning light illuminates. The light should illuminate at a rotor speed of 335 plus or minus 5 rpm (engine speed 6800 plus or minus 100 rpm). No audio signal should be heard in the pilot's or copilot's headsets.

(3) The rpm limit warning system should meet the requirements outlined in step (2) above. If requirements are not met, the system shall be aligned as follows:

(a) With rotor set in flat pitch and governor set in EMERGENCY position, slowly increase throttle to a rotor rpm of 335 (6800 engine rpm).

(b) If warning light is illuminated, turn R2 clockwise until light goes off. Then turn, very slowly, counterclockwise until light illuminates again. If the light is not illuminated, turn R2 very slowly counterclockwse until light illuminates.

(c) To test for proper alignment, vary the engine rpm to determine that the warning light is illuminated and audio warning does not sound at 335 plus or minus 5 rotor rpm (6800 plus or minus 100 engine rpm). If warning light does not illuminate repeat steps (a), (b) and (c).

(d) Close cover strips and tighten screws.

(e) Repeat RPM tests for check. Perform steps a. through d. and steps g(1) and g(2).

Section III — Battery

12-83. Battery. The battery is mounted in the lower section of the aft electrical compartment on the left-hand side of the helicopter. Two overflow or vent tubes extend from the battery to the underside of the fuselage. The battery is connected to the helicopter's electrical system through a relay, which is controlled by the battery switch on the DC power panel. The Model UH-1A helicopters are equipped with a 24 volt, 22 ampere hour battery and Model UH-1B helicopters are equipped with a 24 volt, 34 ampere hour battery. Model UH-1A, Serial No. 59-1607 through 58-1716 and 60-3530 through 60-3545 have provisions for a 24 volt, 34 ampere hour battery. Model UH-1A helicopters, Serial No. 58-2078 through 58-3047, also will accommodate either battery after installation of battery shelf assembly, Part No. 204-030-965-1.

Caution

If forward battery attaching bracket is removed or replaced, check that inboard screw and nut are installed correctly. The correct installation is screw with head on underside of panel. The screw should be 100 degrees countersunk.

12-84. *Removal — Battery.* a. Turn battery switch to "OFF" position.

b. Remove battery terminal by turning knob counterclockwise and tape ends of terminals.

c. Cut safety wire, release clamps and loosen nuts. Loosen clamps on vent tubes and slide tubes off of battery case.

d. Remove tie down rods from case and lift battery from helicopter.

12-85. *Cleaning — Battery.* a. Clean battery with a dry stiff fiber brush or wash with water.

Caution

Do not use a wire brush. Make sure the vent plugs are closed before attempting to clean. Make sure the cell tops are dry before returning the battery to use.

b. The compartment in which the battery is installed must be clean, dry and free of all traces of alkaline. The compartment should be painted with an alkali resisting paint.

12-85A. *Inspection — Battery.* Inspect battery for the following conditions.

a. Loose connections at disconnect or between cells.

b. Electrolyte for proper level.

c. Clogged vent plugs or vent tubes.

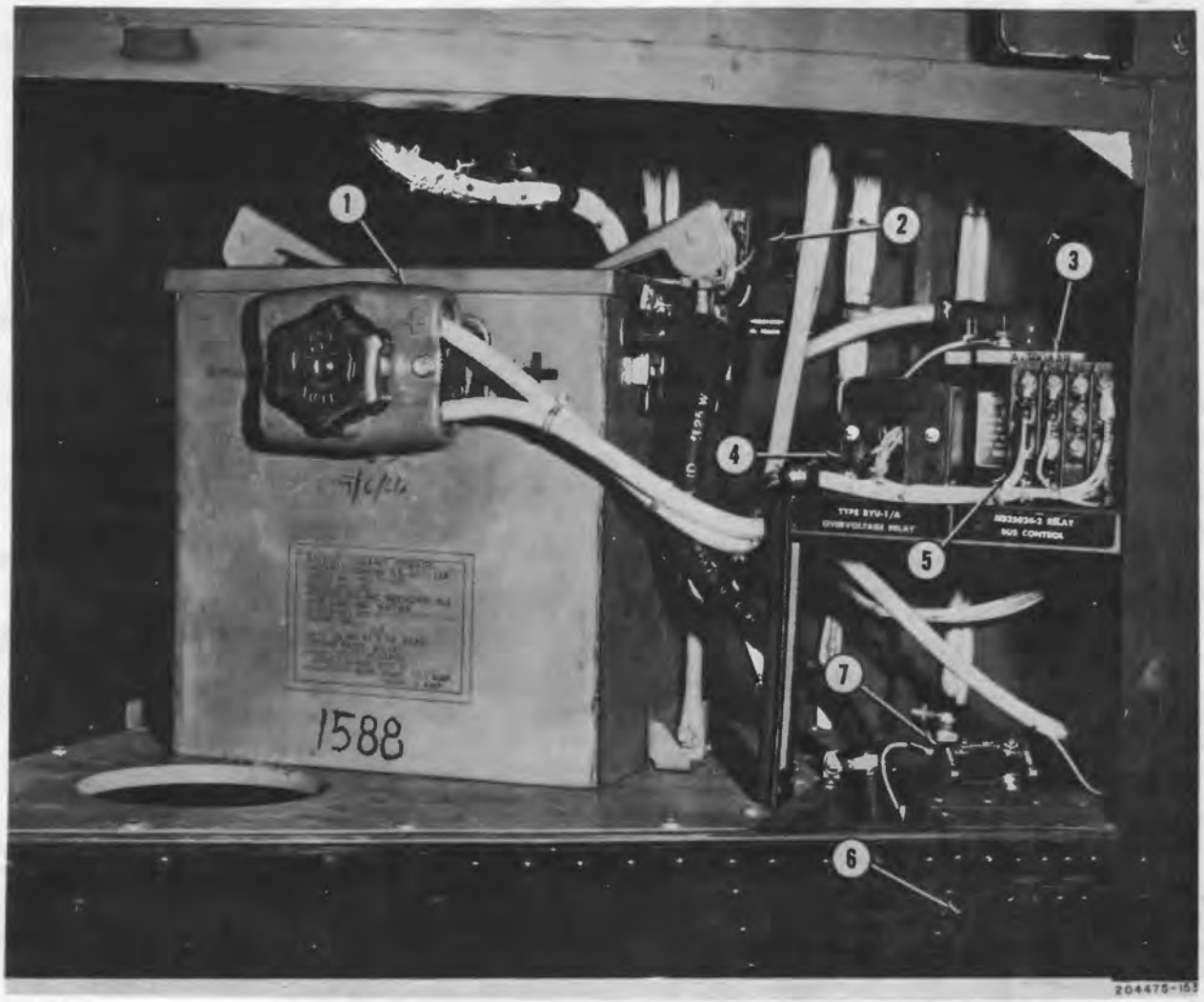
d. Damage to individual cell cases (distortion due to overcharge, cracks, or leaks).

e. A uniform specific gravity between cells.

Note

Specific gravity may range between 1240 and 1320 without any appreciable effect on battery as long as readings are uniform among cells.

12-85B. *Repair or Replacement — Battery.* Replace item if inspection requirements are not met. Repair of battery should be accomplished in an authorized battery repair station.



1. Battery
2. Relay - Transfer Pump
3. Reverse Current Relay (Standby Generator)
4. Overvoltage Relay
5. Bus Control Relay
6. External Power Receptacle
7. Limit Switch External Power Door

Figure 12-5. Battery compartment (Typical)

12-86. *Installation — Battery.* a. Place battery in battery rack, position tie down assembly on rods and engage clamps. Install safety wire.

b. Slide vent tubes onto battery case. Remove tape from battery terminal and connect to battery.

Paragraphs 12-87 through 12-90 Deleted.

Section IV — Generator

12-91. Main Generator. A 300 ampere main generator is installed on the left-hand side of the transmission, and is driven by a drive assembly in the transmission. The generator circuit is controlled by a reverse current cut-out and a voltage regulator. The generator output is connected to the electrical system by placing the generator switch on the overhead console to the "ON" position.

12-92. *Removal — Generator — Main.* a. Open cowling on left-hand side of transmission.

b. Disconnect electrical wires from generator and tape wires.

c. Remove mounting nuts and washers. Turn generator counterclockwise and pull generator outboard until shaft is free of drive assembly.

12-92A. *Inspection—Main Generator.* Inspect for cracks, excessive wear, or any visible damage. Check for warped or cracked terminal board or terminal damage. Check brush cover for dents, loose or bent pins, broken spring or damaged insulation.

12-92B. *Repair or Replacement — Main Generator.* Replace items that do not meet inspection requirements. (Refer to paragraph 12-92A.)

12-93. *Installation — Generator — Main.* a. Apply light coat of grease on drive shaft. Carefully position generator on studs, with splines of shaft engaged with splines on driving unit.

b. Install washers and nuts and tighten nuts.

c. Remove tape from wires. Connect electrical wires to generator and install cowling.

12-94. Rotor Tachometer Generator. The rotor tachometer generator is mounted on the transmission and is connected to the dual tachometer indicator on the instrument panel.

12-95. *Trouble Shooting — Rotor Tachometer Generator.* Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive scale error	Weak magnetos in tachometer	Replace tachometer generator
Pointer moves backward	Leads reversed at generator	Change leads at generator
Indicates only one half actual speed	Leads connected to wrong terminal on indicator	Refer to wiring diagram and install wires in indicator plug correctly
No reading on indicator either constant or intermittent	Break or short circuit in leads	Repair or replace leads
	Bad generator or bad indicator	Replace faulty unit

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Low reading on indicator either constant or intermittent	or generator plugs Poor connections at indicator	Clean or tighten connections
	Poor connections at indicator or generator	Clean and tighten connections
High reading on indicator either constant or intermittent	Indicator resistance out of adjustment	Replace indicator

12-96. *Removal — Rotor Tachometer Generator.* Remove cowling from right-hand side of transmission. Disconnect electrical receptacle, remove mounting nuts and washers and lift tachometer generator from helicopter.

12-96A. *Inspection — Rotor Tachometer Generator.* Inspect generator case for cracks, excessive wear, or any visible damage. Check connector for damaged or bent pins and cracked inserts. Check that rotor turns freely and there is no visible indication of excessive wear to bearings.

12-96B. *Repair or Replacement — Rotor Tachometer Generator.* Replace item if inspection requirements are not met. (Refer to paragraph 12-96A.)

12-97. *Installation — Rotor Tachometer Generator.* Position generator on mounting studs and install mounting washers and nuts. Connect electrical receptacle and install cowling.

12-98. Power Turbine Tachometer Generator. The engine tachometer generator is mounted on the governor and tachometer drive gear box on the left upper side of the engine and is connected to the dual tachometer indicator on the instrument panel.

12-99. *Trouble Shooting — Power Turbine Tachometer Generator.* (Refer to paragraph 12-95.)

12-100. *Removal — Power Turbine Tachometer Generator.* Remove cowling from left-hand side of engine. Disconnect electrical receptacle, remove mounting nuts and washers and lift tachometer from engine.

12-100A. *Inspection — Power Turbine Tachometer Generator.* Replace item if inspection requirements are not met. (Refer to paragraph 12-96A.)

12-100B. *Repair or Replacement — Power Turbine Tachometer Generator.* Replace item if inspection requirements are not met. (Refer to paragraph 12-100A.)

12-101. *Installation — Power Turbine Generator.* Position generator and gasket on studs and install washers and nuts. Connect electrical receptacle and install cowling.

12-102. Gas Producer Tachometer Generator. The gas producer tachometer generator, located on the right-hand side of the engine accessory gear box, registers the rpm of the gas producer turbine. This instrument is used in conjunction with the gas producer tachometer indicator on the instrument panel.

12-103. *Trouble Shooting — Gas Producer Tachometer Generator.* (Refer to paragraph 12-95.)

12-104. *Removal — Gas Producer Tachometer Generator.* (Refer to paragraph 12-100.)

12-104A. *Inspection — Gas Producer Tachometer Generator.* (Refer to paragraph 12-96A.)

12-104B. *Repair or Replacement — Gas Producer Tachometer Generator.* Replace item if inspection requirements are not met. (Refer to paragraph 12-104A.)

12-105. *Installation — Gas Producer Tachometer Generator.* (Refer to paragraph 12-101.)

Section V — Auxiliary Power

(Not Applicable)

Section VI — Alternating Current

12-106. AC Circuit Breakers. The AC circuit breakers are mounted on the right hand forward side of the pedestal. AC circuits can be opened and closed by operating these trip-free, push-pull type circuit breakers.

12-107. *Removal — AC Circuit Breakers.* a. Make sure battery switch is in "OFF" position. Remove mounting screws and washers of panel installation. Carefully lift panel away from mounting position.

b. Disconnect leads from circuit breakers and tape ends of leads. Remove mounting screws and lift circuit breaker from panel.

12-107A. *Inspection — AC Circuit Breakers.* (Refer to paragraph 12-29E.)

12-107B. *Repair or Replacement — AC Circuit Breakers.* Replace item if inspection requirements are not met. (Refer to paragraph 12-107A.)

12-108. *Installation — AC Circuit Breakers.* a. Position circuit breaker in panel and install mounting screws. Remove tape from leads and connect to circuit breaker terminals.

b. Position panel in place being careful not to damage wiring. Install mounting washers and screws.

12-109. Transformer. The transformer is mounted in the forward electrical compartment and reduces 115 volts AC to 28 volts AC for engine, transmission, and torquemeter instruments, and their transmitters.

12-110. *Removal — Transformer.* Disconnect electrical wires from transformer and tape ends of wires. Remove nuts, washers, and screws and lift transformer from helicopter.

12-110A. *Inspection — Transformer.* (Refer to paragraph 12-7A.)

12-110B. *Repair or Replacement — Transformer.* Replace item if inspection requirements are not met. (Refer to paragraph 12-110A.)

12-111. *Installation — Transformer.* Position transformer and install screws, washers, and nuts. Remove tape from wire ends and install wires on terminals.

12-112. Torque Pressure Transmitter. The torque pressure transmitter is mounted on a bracket on top of the engine and is connected to the torquemeter on the instrument panel.

12-113. *Removal — Torque Pressure Transmitter.* a. Remove cowling from engine.

b. Disconnect electrical connector and oil line and connector.

c. Cover openings of oil line and protect electrical connector.

d. Cut lockwire, remove mounting screws and washers and lift transmitter from helicopter.

12-113A. *Inspection — Torque Pressure Transmitter.* a. Visually inspect case for damage or cracks, check for proper security of unit on mounting bracket and tightness of all pressure fittings.

b. Check connectors for security, bent or damaged pins, broken or cracked inserts and check operation of unit.

12-113B. *Repair or Replacement — Torque Pressure Transmitter.* Repair connectors, tighten pressure fitting and replace item if other inspection requirements are not met. (Refer to paragraph 12-113A.)

12-114. *Installation — Torque Pressure Transmitter.* a. Position transmitter on mounting bracket and install washers and screws and lockwire.

b. Remove covers from openings and connect hose to transmitter. Connect electrical receptacle.

c. Install cowling.

12-115. Transmission Oil Pressure Transmitter. The transmission oil pressure transmitter is located on the right-hand side of the transmission. This unit is connected to the transmission oil pressure indicator on the instrument panel.

12-116. *Removal — Transmission Oil Pressure Transmitter.* a. Disconnect electrical receptacle from unit.

b. Cut lockwire and unscrew transmitter from manifold.

12-116A. ***Inspection — Transmission Oil Pressure Transmitter.*** (Refer to paragraph 12-113A.)

12-116B. ***Repair or Replacement — Transmission Oil Pressure Transmitter.*** (Refer to paragraph 12-113B.)

12-117. ***Installation — Transmission Oil Pressure Transmitter.*** a. Screw transmitter into manifold.

b. Connect electrical receptacle to transmitter. Install lockwire.

12-118. Engine Oil Pressure Transmitter. The engine oil pressure transmitter is mounted on a bracket on top of the engine and is connected to the engine oil pressure indicator on the instrument panel.

12-119. ***Removal — Engine Oil Pressure Transmitter.*** a. Remove cowling from engine. Turn battery switch to "OFF" position.

b. Disconnect electrical receptacle and oil line and cap or cover openings. Cut lockwire and remove mounting bolts and lift pressure transmitter from mounting bracket.

12-119A. ***Inspection — Engine Oil Pressure Transmitter.*** (Refer to paragraph 12-113A.)

12-119B. ***Repair or Replacement — Engine Oil Pressure Transmitter.*** (Refer to paragraph 12-113B.)

12-120. ***Installation — Engine Oil Pressure Transmitter.*** a. Position transmitter in mounting and install mounting washers and bolts.

b. Remove caps or covers on all openings. Connect electrical receptacle and oil line. Install lockwire. Install cowling.

Section VII — Inverter Systems

12-121. Inverters. The inverter is a motor generator set used to convert direct current to aternating current. It consists essentially, of a DC motor and an AC generator enclosed in a common housing. The DC armature and the rotor of the AC generator are mounted on a common shaft. When DC current is supplied to the DC armature, AC power is made available from armature windings through sliprings and brushes. Output voltage under varying load conditions is controlled by a carbon pile regulator and its associated circuit. A governor, mounted on the DC end of the armature shaft, regulates the motor field current to provide automatic speed and assure constant frequency. The inverters are located in the forward electrical compartment on the left-hand side of the helicopter.

12-122. ***Trouble Shooting — Inverters.*** Perform checks as necessary to isolate trouble.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Main or spare inverter fails to operate	Open circuit breaker	Reset circuit breaker
	Faulty wiring or connections in switch or power circuits	Check continuity of wiring
	Defective inverter power relay	Replace relay
	Defective inverter	Replace inverter
	Defective circuit breaker	Replace circuit breaker
Spare inverter runs but no voltage to instruments	Defective inverter changeover relay	Replace relay
		Check continuity of wiring; repair wiring
Improper inverter output voltage or frequency	Faulty inverter	Check inverter output voltage and frequency with voltmeter and frequency meter; replace faculty inverter
	Low input voltage	Check for proper input voltage to inverter; correct low input voltage condition

12-123. *Removal — Inverters.* a. Turn battery switch to "OFF" position. Remove hold-down screws and washers from inverter terminal box cover and remove cover.

b. Remove nuts and washers to disconnect terminals from posts Cover ends of terminals with tape.

c. Remove inverter mounting bolts and lift inverter from helicopter.

12-123A. *Inspection—Inverters.* Inspect inverters for cracked or damaged cases, proper bonding and security of mounting, broken connector pins or cracked connector inserts and proper operation.

12-123B. *Repair or Replacement — Inverters.* Repair connectors, replace brush caps or brushes as necessary and replace unit if other inspection requirements are not met.

12-124. *Installation — Inverters.* a. Position inverter on the deck floor and install inverter mounting bolts.

b. Remove tape and connect terminals to correct terminal posts. Install washers and nuts.

c. Position terminal box cover and install holddown washers and screws.

Section VIII — Wiring Diagrams

12-125. Wiring Diagrams. The following is a list of diagrams included in this section.

12-6	Symbols Chart
12-7	Wiring Identification Code
12-8	Electrical Schematic — UH-1A (58-2078 thru 58-2093, 58-3017 thru 58-3047, 59-1607 thru 59-1657, 59-1672 thru 59-1716, 60-3530 thru 60-3545.)
12-9 sht 1 thru sht 5	Electrical & Communication Wiring Diagram — UH-1A (58-2078 thru 58-2093, 58-3017 thru 58-3047, 59-1607 thru 59-1657, 59-1672 thru 59-1716, 60-3530 thru 3545)
12-10	Electrical Schematic — UH-1A (59-1658 thru 59-1671)
12-11 sht 1 sht 4	Electrical & Communication Wiring Diagram — UH-1A (59-1658 thru 59-1671)
12-12	Electrical Schematic — UH-1B (60-3546 thru 60-3619, 61-686 thru 61-740)
12-13 sht 1 thru sht 5	Electrical & Communication Wiring Diagram — UH-1B (60-3546 thru 60-3619 and 61-686 thru 61-740)
12-14	Electrical Schematic — UH-1B (61-741 thru 61-803)
12-15 sht 1 thru sht 3	Electrical & Communication Wiring Diagram (61-741 thru 61-803)
12-16	Electrical Schematic — UH-1B (62-1872 thru 62-2105, 62-4566 thru 62-4605, 62-12515 thru 62-12555)
12-17 sht 1 thru sht 4	Electrical & Communication Wiring Diagram (62-1872 thru 62-2105, 62-4566 thru 62-4605 and 62-12515 thru 62-12555)
12-18	Electrical Schematic (63-8500 thru 63-8738, 63-12903 thru 63-12952)
12-19 sht 1 thru sht 5	Electrical & Communication Wiring Diagram (63-8500 thru 63-8738 and 63-12903 thru 63-12952)
12-20	Electrical Schematic — UH-1B (64-13902 thru 64-14191)
12-21 sht 1 thru sht 5	Electrical & Communication Wiring Diagram (64-13902 thru 64-14191)
12-22	Electrical Schematic — UH-1B (65-9416 thru 65-9564, 65-12738 thru 65-12744 and 65-12722)

12-23 sht 1 thru 4	Electrical Communication Wiring Diagram (65-9416, 65-9564, 65-12738 thru 65-12744 and 65-12722)
12-24	Electrical schematic (66 - 491 thru 66-601)
12-25 sht 1 thru 5	Electrical and Communication Wiring Diagram (66-491 thru 66-601)
12-26	Electrical schematic (66-602 thru 66-15245)
12-27 sht 1 thru 6	Electrical and Communication Wiring Diagram (66-602 thru 66-15245)
12-28	M5 grenade launcher wiring diagram (63-8500 thru 63-13089 and 64-13902 thru 64-14191)
12-29	XM-16 modification kit wiring diagram
12-30 sht 1 thru 2	T366 VHF wiring diagram (UH-1B)
21-31	Decca 8 wiring diagram (UH-1B)

D C POWER

A C POWER

A C INSTRUMENTS

MISC EQUIPMENT

EXTERNAL PWR RECEPTACLE

LIMIT SW EXT PWR ACCESS DOOR

TO CAUTION PANEL PIN "AA" ZONE A18

INST TRANSFORMER 115/28 VOLTS

115V AC PHASE-C

115V AC PHASE-A

A C FAIL RELAY

TO CAUTION PANEL PIN "N" ZONE A9

AC FAILURE RELAY

TRANSFER RELAY

SHUNT STBY GEN

REV. CURRENT RELAY-STBY GEN

LOADMETER STBY GEN

POWER FACTOR CORRECTION

EXTERNAL POWER RELAY

STARTER-GENERATOR 28V. 300 AMP

SERIES FIELD

SHUNT FIELD

STARTER RELAY

VOLTAGE REGULATOR STBY. GEN

STBY GEN FIELD RELAY

NON ESSENTIAL BUS RELAY

BATTERY RELAY

MAIN INVTR

MAIN INVTR PWR REL.

SPARE INVTR

SPARE INVTR PWR REL.

MAIN ON INVTR

SPARE ON

AC POWER

ATTITUDE INDICATOR

AC VOLTMETER

DISPLACEMENT ROLL & PITCH GYRO

TO ZONE D8

FUEL QTY

TO TB 38 TERM 10

ENG VIB METER

PH B GND PIN

PILOT ATTD

CO-PILOT ATTD

TO J2 CMPS

COPILOT ATTITUDE INDICATOR

FUEL QUAN IND

FUEL QTY TEST SW

RATE SWITCHING GYRO

TANK UNIT UNSHIELDED

COMPENSATOR

TANK UNIT SHIELDED

LH TANK UNIT

COURSE IND

TO COURSE IND

28 VOLT A.C. INSTRUMENTS

TORQUE PRESS XMTR

TORQUE METER

XMSN OIL PRESS XMTR

XMSN OIL PRESS IND

ENGINE OIL PRESSURE

ENGINE OIL PRESS XMTR

ENGINE OIL PRESS IND

FUEL PRESSURE

FUEL PRESS XMTR

FUEL PRESS IND

ENGINE XMSN TACHS

ROTOR DUAL TACH IND PWR TURBINE

GAS PRODUCER TACH IND

ROTOR TACH GEN

PWR TURBINE TACH GEN

GAS PRODUCER TACH GEN

CARGO HOOK RELEASE RELAY

CARGO HOOK SWITCH

AUTO SW

MAN SW

CARGO HOOK

SLIP RING

RELEASE SWITCH PILOTS CYCLIC STICK

RELEASE SWITCH CO-PILOTS CYCLIC STICK

PILOT'S WINDSHIELD WIPER MOTOR

PARK LIMIT

RESISTOR PANEL

INST PANEL CARGO REL ARMED LT

CARGO REL

WINDSHIELD WIPERS

PILOT

COPILOT

NON ESSENTIAL BUS

ESSENTIAL BUS

MAIN INVTR PWR

INVTR CONT

SPARE INVTR PWR

ESSENTIAL BUS GEN RESET

STARTER RELAY

FUEL BOOST LEFT

FUEL VALVE

IGNITION SYSTEM START FUEL

FUEL BOOST RIGHT

AUX FUEL TRANS

IDLE STOP REL

ROV BOOST

FIRE DET

RPM WARN SYSTEM

CARGO HOOK REL

WINDSHIELD WIPER A51 ENGINE

COPILOT WINDSHIELD WIPER

UTILITY LIGHTS

ANTI-ICE

PILOTS COLL STICK

COPILOTS COLL STICK

STARTER SW

FUEL START

FUEL VALVE

A3 ENGINE CONTROL PANEL

FUEL TRANS PUMP GOV

IGNITER SOL VALVE

FUEL SHUT OFF VALVE

LH FUEL BOOST PUMP

RH FUEL BOOST PUMP

FILTER

WHITE LEAD REF

FUEL TRANSFER PUMP RELAY

TO J1024 PIN b TO J1017 PIN b ZONE A10

LOWER FLOAT SW

UPPER FLOAT SW

FUEL TRANSFER PUMP (FERRY TANK)

FUEL CONTROL

IDLE STOP REL SOL

GOV RPM SW N.O. INCR

GOV RPM SW N.C. INCR

IDLE STOP RELEASE SW

PILOTS COLLECTIVE STICK

COPILOTS COLLECTIVE STICK

NOTE: P107 J INSERTED INTO J107 RECP WHEN CO-PILOT'S COLL STICK IS REMOVED

FIRE WARNING LIGHT

FIRE DETECTOR TEST SW.

A9 FIRE DETECTION CONTROL

LH. ENGINE COWL FIRE DETECTION ELEMENT

R.H. ENGINE COWL FIRE DETECTION ELEMENT

RPM LIMIT WARNING

AUDIO R.P.M. HI-LO RPM WARN

ICE INTERPRETER

ICE DETECTOR PROBE

EXHAUST TEMP IND

HOT AIR VALVE

TO CAUTION PANEL ZONE B10

P24 PIN "C"

P24 PIN "B"

TO PIN "T" P56 ZONE A11

TO PIN "A" P56 ZONE A11

P24 PIN "E" TO CAUTION PANEL

TO CAUTION PANEL-GOV

TO P24 PIN B ZONE

TO XMSN OIL LEVEL LT. SW ZONE D7

TO CAUTION PANEL PIN "Z" ZONE A9

MAIN GEN VM

DC VOLTMETER

MAIN GEN. FIELD

BUS CONT RELAY

LOADMETER MAIN GEN

MAIN D.C. GENERATOR 28V 300 AMP.

REV. CURRENT RELAY MAIN GEN.

OVERVOLTAGE RELAY MAIN GEN

MAIN GEN

BATTERY

VOLTAGE REGULATOR MAIN GEN

FIELD RELAY-MAIN GENERATOR

IGNITER PLUGS

DIVIDER COILS

VIBRATOR

RECTIFIER

TRIGGER GAP

ENGINE ACCESSORIES

D

C

B

A

1

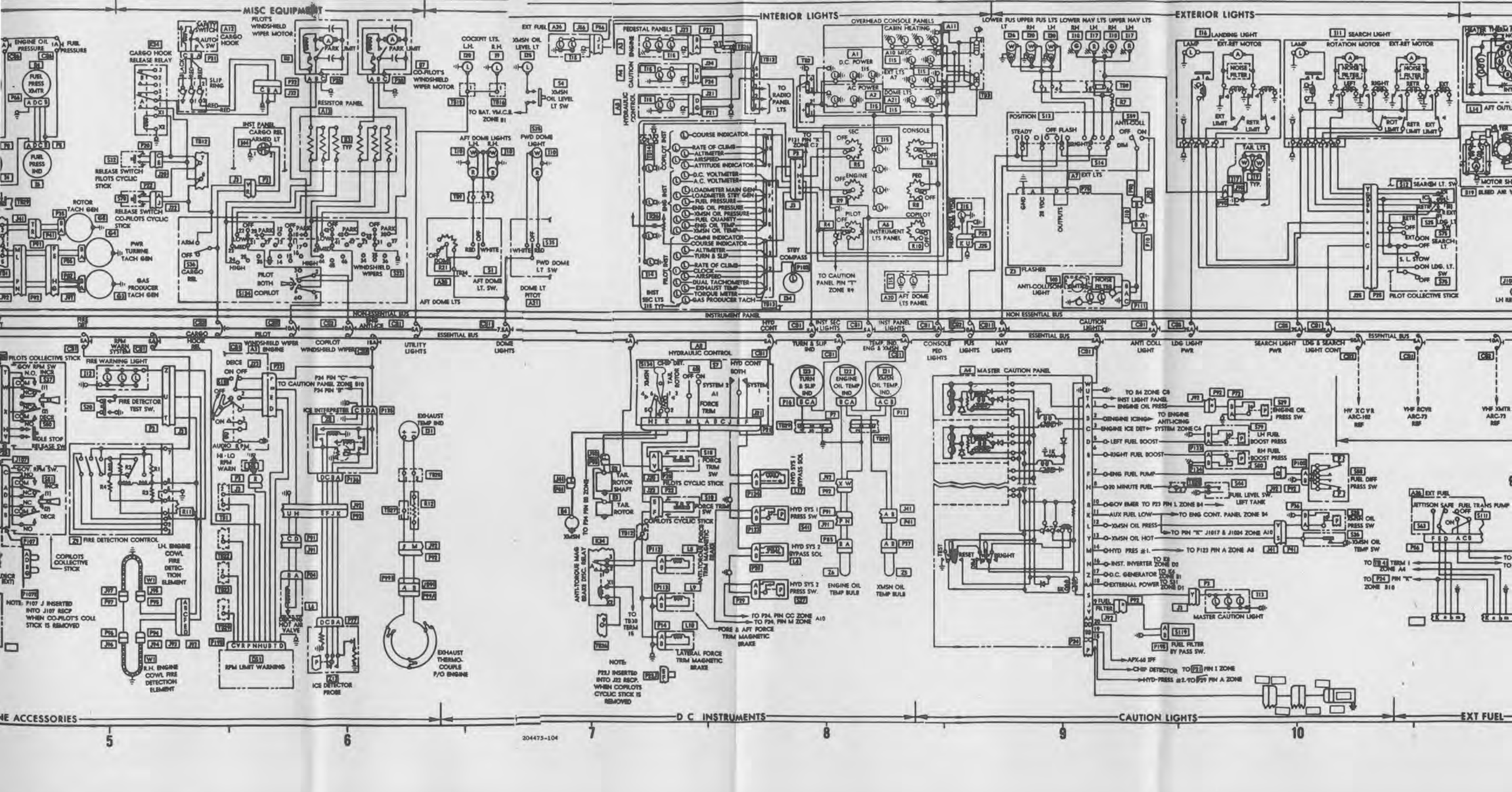
2

3

4

5

6


MISC EQUIPMENT
INTERIOR LIGHTS
EXTERIOR LIGHTS
ENGINE OIL PRESSURE
FUEL PRESSURE
FUEL PRESS XMTR
FUEL PRESS IND
CARGO HOOK RELEASE RELAY
CARGO HOOK
PILOT'S WINDSHIELD WIPER MOTOR
CO-PILOT'S WINDSHIELD WIPER MOTOR
RESISTOR PANEL
INST PANEL CARGO REL ARMED LT
RELEASE SWITCH PILOTS CYCLIC STICK
RELEASE SWITCH CO-PILOTS CYCLIC STICK
ROTOR TACH GEN
PWR TURBINE TACH GEN
GAS PRODUCER TACH GEN
WINDSHIELD WIPERS
COCKPIT LTS. L.H. R.H.
TO BAT. V.M.C.B. ZONE B1
EXT FUEL
XMSN OIL LEVEL LT
XMSN OIL LEVEL LT SW
AFT DOME LIGHTS L.H. R.H.
FWD DOME LIGHT
AFT DOME LT. SW.
FWD DOME LT SW
DOME LT PITOT
AFT DOME LTS
PEDESTAL PANELS
TO RADIO PANEL LTS
OVERHEAD CONSOLE PANELS
CABIN HEATING
D.C. POWER
A.C. POWER
EXT LTS
DOME LTS
SEC
ENGINE
CONSOLE
PED
PILOT
COPILOT
INSTRUMENT LTS PANEL
TO CAUTION PANEL PIN "T" ZONE B9
AFT DOME LTS PANEL
STBY COMPASS
COURSE INDICATOR
RATE OF CLIMB
ALTIMETER
AIRSPEED
ATTITUDE INDICATOR
D.C. VOLTMETER
A.C. VOLTMETER
LOADMETER MAIN GEN
LOADMETER STBY GEN
FUEL PRESSURE
ENG OIL PRESSURE
XMSN OIL PRESSURE
FUEL QUANTITY
ENG OIL TEMP
XMSN OIL TEMP
OMNI INDICATOR
COURSE INDICATOR
ALTIMETER
TURN & SLIP
RATE OF CLIMB
CLOCK
AIRSPEED
DUAL TACHOMETER
EXHAUST TEMP
TORQUE METER
GAS PRODUCER TACH
INST SEC LTS
LOWER FUS
UPPER FUS LTS
LOWER NAV LTS
UPPER NAV LTS
POSITION
STEADY
OFF FLASH
BRIGHT
DIM
ANTI-COLLISION
FLASHER
LANDING LIGHT
LAMP
EXT-RET MOTOR
SEARCH LIGHT
ROTATION MOTOR
TAIL LTS
SEARCH LT. SW
S. L. STOW
ON LDG. LT. SW
PILOT COLLECTIVE STICK
NON-ESSENTIAL BUS
ESSENTIAL BUS
CAUTION LIGHTS
FIRE DET
CARGO HOOK REL
PILOT WINDSHIELD WIPER
COPILOT WINDSHIELD WIPER
UTILITY LIGHTS
DOME LIGHTS
HYD CONT
INSY SEC LIGHTS
INST PANEL LIGHTS
TURN & SLIP IND
TEMP. IND ENG & XMSN
CONSOLE PED LIGHTS
FUS LIGHTS
NAV LIGHTS
ANTI COLL LIGHT
LDG LIGHT PWR
SEARCH LIGHT PWR
LDG & SEARCH LIGHT CONT
PILOTS COLLECTIVE STICK
GOV RPM SW
IDLE STOP RELEASE SW
RPM WARN SYSTEM
FIRE WARNING LIGHT
FIRE DETECTOR TEST SW.
FIRE DETECTION CONTROL
COPILOTS COLLECTIVE STICK
NOTE: P107 J INSERTED INTO J107 RECP WHEN CO-PILOT'S COLL STICK IS REMOVED
L.H. ENGINE COWL FIRE DETECTION ELEMENT
R.H. ENGINE COWL FIRE DETECTION ELEMENT
DBCS ON OFF
AUDIO R.P.M.
HI-LO RPM WARN
RPM LIMIT WARNING
P34 PIN "C" P34 PIN "B"
TO CAUTION PANEL ZONE B10
ICE INTERPRETER
ICE DETECTOR PROBE
EXHAUST TEMP IND
EXHAUST THERMO-COUPLE P/O ENGINE
HYDRAULIC CONTROL
CHIP DET.
TAIL ROTOR
OFF ON
SYSTEM 2
SYSTEM 1
FORCE TRIM
HYD CONT BOTH
FORCE TRIM SW
PILOTS CYCLIC STICK
COPILOTS CYCLIC STICK
TAIL ROTOR SHAFT
TAIL ROTOR
XMSN
TO P34 PIN BB ZONE
ANTI-TORQUE MAG BRAKE DISC. RELAY
ANTI-TORQUE HYDRAULIC BRAKE
TO TB30 TERM 16
NOTE: P22J INSERTED INTO J22 RECP. WHEN COPILOTS CYCLIC STICK IS REMOVED
LATERAL FORCE TRIM MAGNETIC BRAKE
FORE & AFT FORCE TRIM MAGNETIC BRAKE
TO P34, PIN CC ZONE A10
TO P34, PIN M ZONE
HYD SYS 1 BYPASS SOL
HYD SYS 1 PRESS SW
HYD SYS 2 BYPASS SOL
HYD SYS 2 PRESS SW.
TURN & SLIP IND
ENGINE OIL TEMP IND
XMSN OIL TEMP IND.
ENGINE OIL TEMP BULB
XMSN OIL TEMP BULB
MASTER CAUTION PANEL
TEST
RESET
BRIGHT
TO B4 ZONE C8
INST LIGHT PANEL
ENGINE OIL PRESS
ENGINE ICING
TO ENGINE ANTI-ICING SYSTEM ZONE C4
ENGINE ICE DET
LEFT FUEL BOOST
RIGHT FUEL BOOST
ENG FUEL PUMP
20 MINUTE FUEL
GOV EMER TO P23 PIN L ZONE B4
AUX FUEL LOW
TO ENG CONT. PANEL ZONE B4
XMSN OIL PRESS
TO PIN "K" J1017 & J1024 ZONE A10
XMSN OIL HOT
HYD PRES #1
TO P123 PIN A ZONE A8
INST. INVERTER
TO X8 ZONE D8
D.C. GENERATOR
TO X4 ZONE B1
EXTERNAL POWER
TO X31 ZONE D1
FUEL FILTER
APX-60 IFF
CHIP DETECTOR
TO P23 PIN I ZONE
HYD-PRESS #2
TO P29 PIN A ZONE
MASTER CAUTION LIGHT
FUEL FILTER BY PASS SW.
LH FUEL BOOST PRESS
RH FUEL BOOST PRESS
FUEL LEVEL SW. LEFT TANK
FUEL DIFF PRESS SW
ENGINE OIL PRESS SW
XMSN OIL PRESS SW
XMSN OIL TEMP SW
EXT FUEL
JETTISON SAFE FUEL TRANS PUMP
F E D A C B
HF XCVR ARC-102 RSF
VHF RCVR ARC-73 RSF
VHF XMTR ARC-73 RSF
AFT OUTLET
TO TB 43 TERM 1 ZONE A4
TO P34 PIN "K" ZONE B10
ENGINE ACCESSORIES
D C INSTRUMENTS
CAUTION LIGHTS
EXT FUEL
204475-104

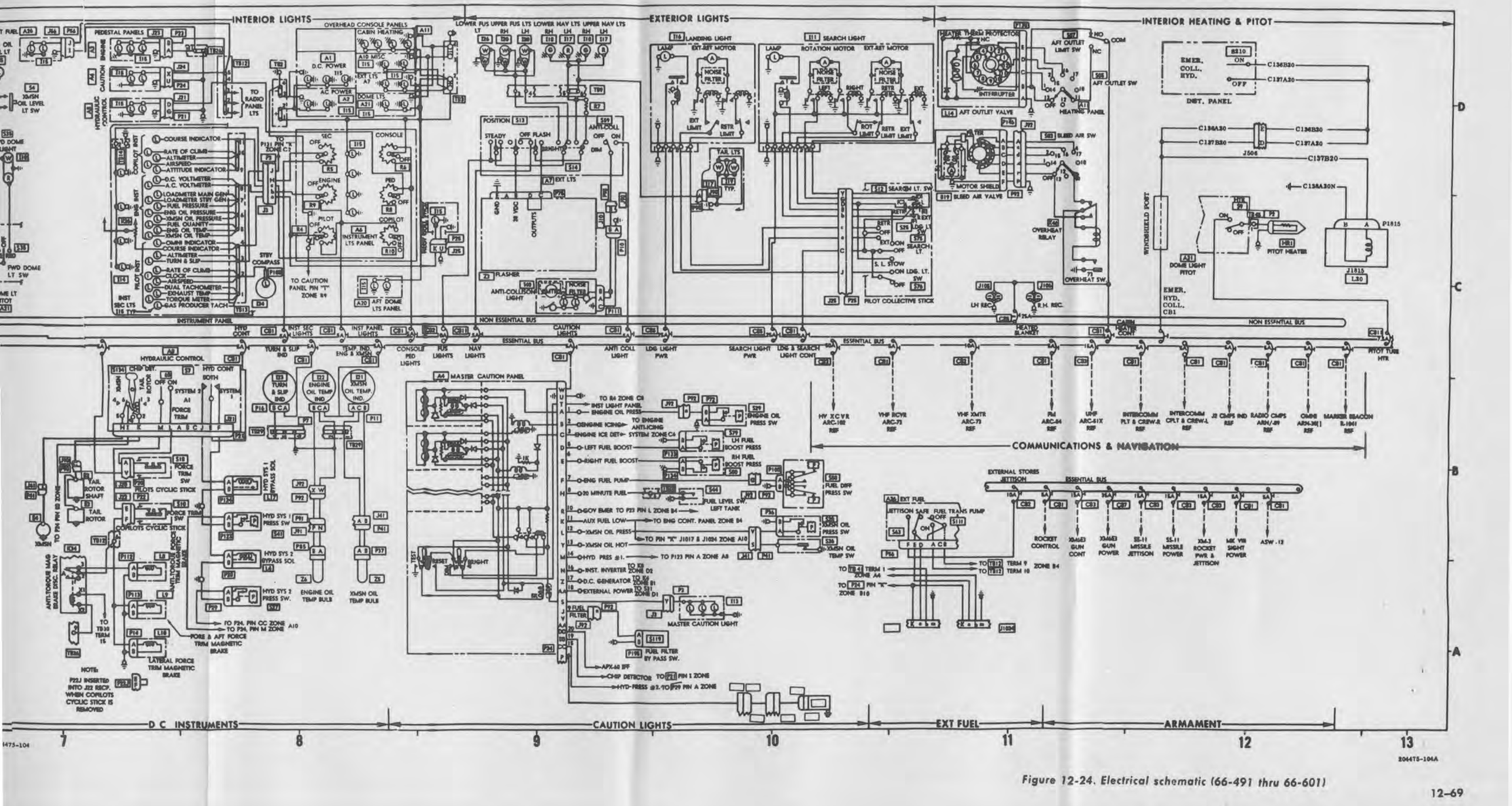


Figure 12-24. Electrical schematic (66-491 thru 66-601)

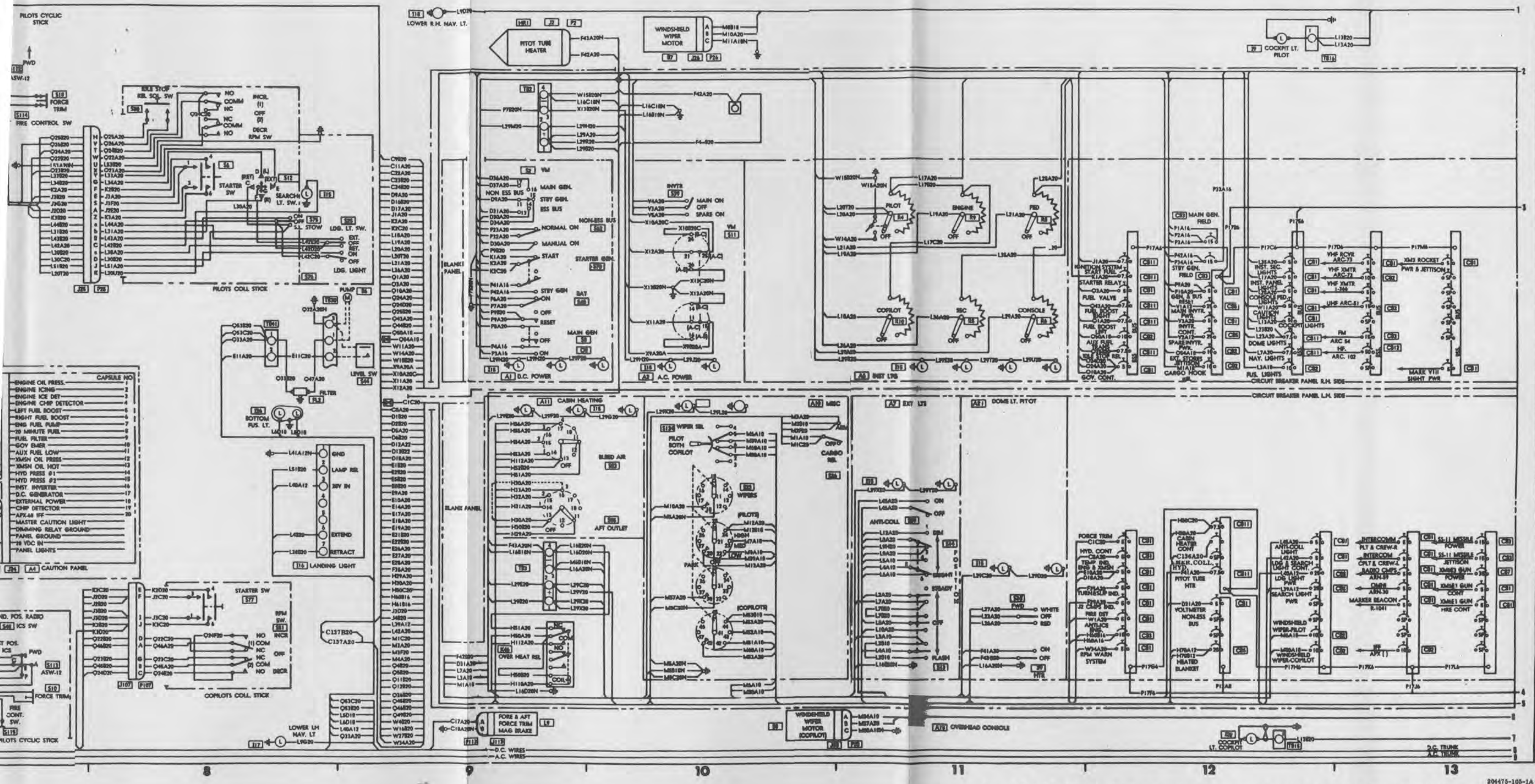
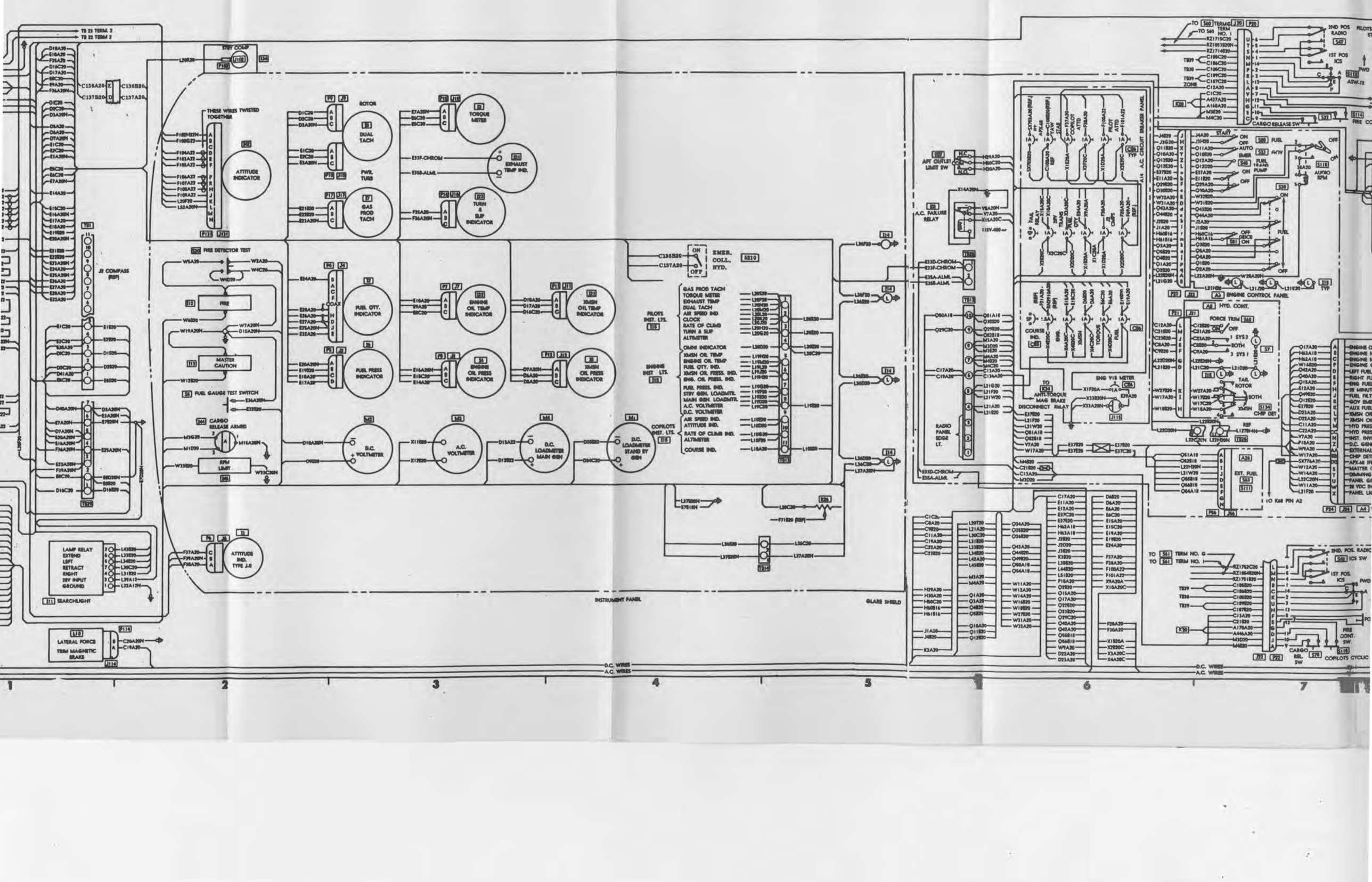
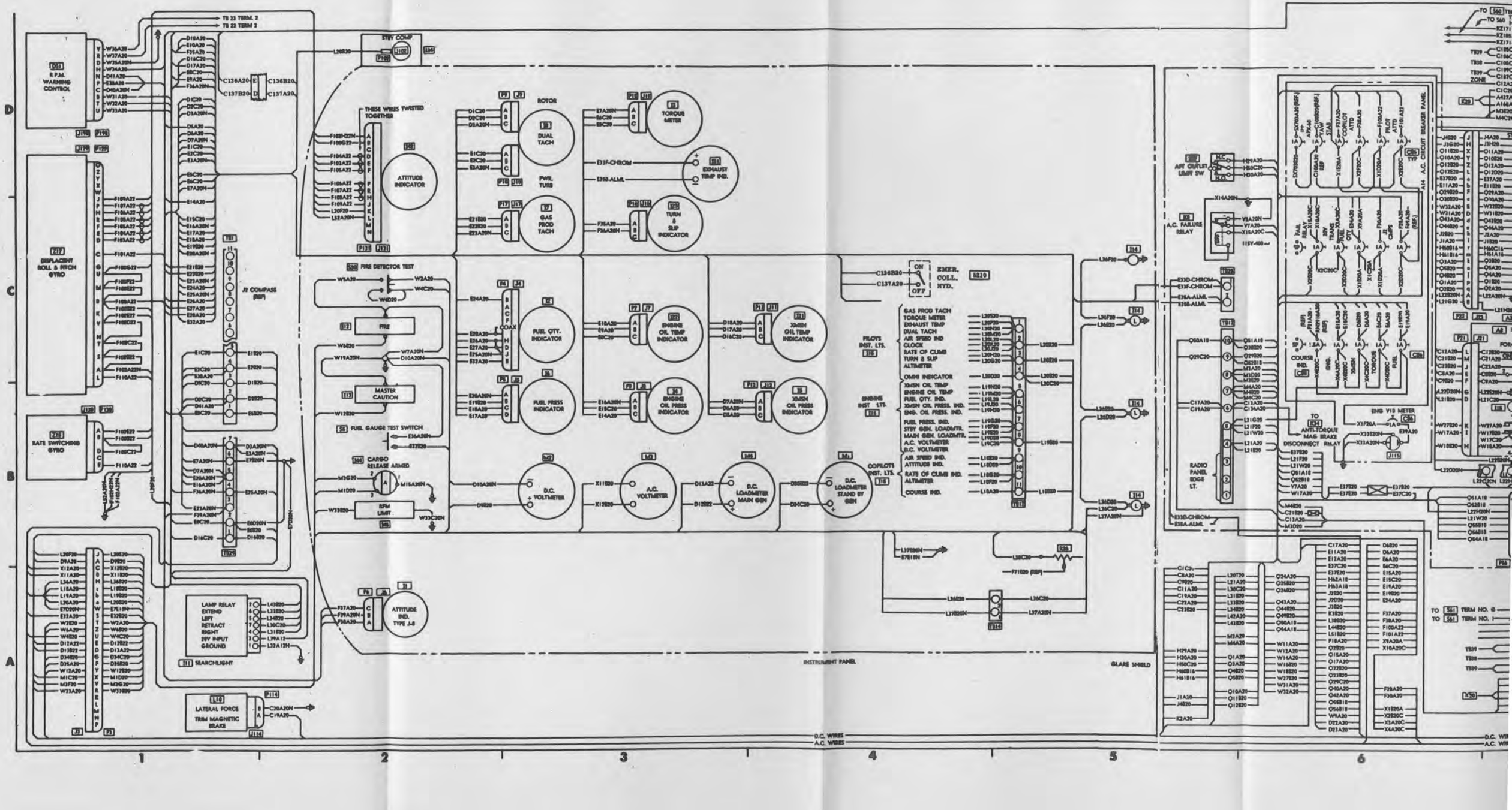


Figure 12-25. Electrical & communication wiring diagram (66-491 thru 66-601) (Sheet 1 of 5)


TB 23 TERM. 2
TB 22 TERM 2
STBY COMP
THESE WIRES TWISTED TOGETHER
ATTITUDE INDICATOR
ROTOR
DUAL TACH
PWR. TURB
GAS PROD TACH
TORQUE METER
EXHAUST TEMP IND.
TURN & SLIP INDICATOR
J2 COMPASS (RSP)
FIRE DETECTOR TEST
FIRE
MASTER CAUTION
FUEL GAUGE TEST SWITCH
CARGO RELEASE ARMED
RPM LIMIT
FUEL QTY. INDICATOR
FUEL PRESS INDICATOR
ENGINE OIL TEMP INDICATOR
ENGINE OIL PRESS INDICATOR
XMSN OIL TEMP INDICATOR
XMSN OIL PRESS INDICATOR
D.C. VOLTMETER
A.C. VOLTMETER
D.C. LOADMETER MAIN GEN
D.C. LOADMETER STAND BY GEN
COPILOTS INST. LTS.
EMER. COLL. HYD.
PILOTS INST. LTS.
ENGINE INST. LTS.
GAS PROD TACH
TORQUE METER
EXHAUST TEMP
DUAL TACH
AIR SPEED IND
CLOCK
RATE OF CLIMB
TURN & SLIP
ALTIMETER
OMNI INDICATOR
XMSN OIL TEMP
ENGINE OIL TEMP
FUEL QTY. IND.
XMSN OIL PRESS. IND.
ENG. OIL PRESS. IND.
FUEL PRESS. IND.
STBY GEN. LOADMTR.
MAIN GEN. LOADMTR.
A.C. VOLTMETER
D.C. VOLTMETER
AIR SPEED IND.
ATTITUDE IND.
RATE OF CLIMB IND.
ALTIMETER
COURSE IND.
LAMP RELAY
EXTEND
LEFT
RETRACT
RIGHT
28V INPUT
GROUND
SEARCHLIGHT
LATERAL FORCE TRIM MAGNETIC BRAKE
ATTITUDE IND. TYPE J-8
INSTRUMENT PANEL
GLARE SHIELD
D.C. WIRES
A.C. WIRES
APT OUTLET LIMIT SW
A.C. FAILURE RELAY
RADIO PANEL EDGE LT.
A14 A.C. CIRCUIT BREAKER PANEL
COURSE IND.
ANTI-TORQUE MAG BRAKE DISCONNECT RELAY
ENG VIB METER
TAIL ROTOR
CHIP DET.
EXT. FUEL
CARGO RELEASE SW
FUEL
AUTO IGN
FUEL PUMP
DEICE
ENGINE CONTROL PANEL
HYD. CONT.
FORCE TRIM
2ND POS RADIO
1ST POS ICS
FIRE CONT. SW.
COPILOTS CYCLIC
TO K68 PIN A2


R.P.M. WARNING CONTROL
DISPLACEMENT ROLL & PITCH GYRO
RATE SWITCHING GYRO
STBY COMP
THESE WIRES TWISTED TOGETHER
ATTITUDE INDICATOR
ROTOR
DUAL TACH
PWR. TURB
GAS PROD TACH
TORQUE METER
EXHAUST TEMP IND.
TURN & SLIP INDICATOR
FIRE DETECTOR TEST
FIRE
MASTER CAUTION
RPM LIMIT
FUEL GAUGE TEST SWITCH
CARGO RELEASE ARMED
FUEL QTY. INDICATOR
FUEL PRESS INDICATOR
ENGINE OIL TEMP INDICATOR
ENGINE OIL PRESS INDICATOR
XMSN OIL TEMP INDICATOR
XMSN OIL PRESS INDICATOR
D.C. + VOLTMETER
A.C. VOLTMETER
D.C. LOADMETER MAIN GEN
D.C. LOADMETER STAND BY GEN
COPILOTS INST. LTS.
EMER. COLL. HYD.
PILOTS INST. LTS.
ENGINE INST. LTS.
GAS PROD TACH
TORQUE METER
EXHAUST TEMP
DUAL TACH
AIR SPEED IND
CLOCK
RATE OF CLIMB
TURN & SLIP
ALTIMETER
OMNI INDICATOR
XMSN OIL TEMP
ENGINE OIL TEMP
FUEL QTY. IND.
XMSN OIL PRESS. IND.
ENG. OIL PRESS. IND.
FUEL PRESS. IND.
STBY GEN. LOADMTR.
MAIN GEN. LOADMTR.
A.C. VOLTMETER
D.C. VOLTMETER
AIR SPEED IND.
ATTITUDE IND.
RATE OF CLIMB IND.
ALTIMETER
COURSE IND.
J2 COMPASS (REF)
ATTITUDE IND. TYPE J-8
SEARCHLIGHT
LAMP RELAY
EXTEND
LEFT
RETRACT
RIGHT
28V INPUT
GROUND
LATERAL FORCE TRIM MAGNETIC BRAKE
A/P OUTLET LIMIT SW
A.C. FAILURE RELAY
A.C. CIRCUIT BREAKER PANEL
RADIO PANEL EDGE LT.
ANTI-TORQUE MAG BRAKE
DISCONNECT RELAY
ENG VIB METER
INSTRUMENT PANEL
GLARE SHIELD
D.C. WIRES
A.C. WIRES

circuit breakers to furnish protection for the system and equipment operating from the system. In the event of a main generator failure, the non-essential bus is automatically dropped when circuit is opened by means of the bus control relay and the non-essential bus relay actions; however, a switch has been provided, on the DC POWER control panel to override the automatic action, if the pilot so desires. The 28 volt main generator is rated at 300 ampere output and is mounted on and driven by the transmission, therefore, generator power is provided and battery drain prevented when autorotational landings are being performed. Also provided is a standby generator (starter-generator), rated at 200 ampere output and mounted on the helicopter's engine accessory drive section, to furnish 28 volt dc power in the event of a main generator failure. Direct current power control is accomplished from the DC POWER panel (see figure 2-11) located on the overhead console.

2-65. DC Power Control. The dc power is controlled by control panel, main generator switch, battery switch, starter generator switch, non-essential bus control switch, dc voltmeter selector switch and dc circuit breakers.

2-66. *Control Panel.* This panel is labeled DC POWER and contains the MAIN GENerator switch, BATtery ON-OFF switch, STARTER-GENerator START-STBY GEN switch, DC VM (volt-meter) selector switch and a NON-ESSential BUS MANUAL ON-NORMAL ON switch. Panel illumination is provided by three panel lights controllable from the instrument lights control, (see figure 2-11).

2-67. *Main Generator Switch.* The main generator switch is a three-position type, equipped with a guard and is located on the left area of the DC POWER panel (see figure 2-11). This switch is labeled MAIN GEN. RESET in the aft position, OFF in the center position and ON in the forward position. The RESET position is spring loaded to return to OFF position when released, therefore, to reset generator the switch must be held in the RESET position momentarily and then moved to ON position.

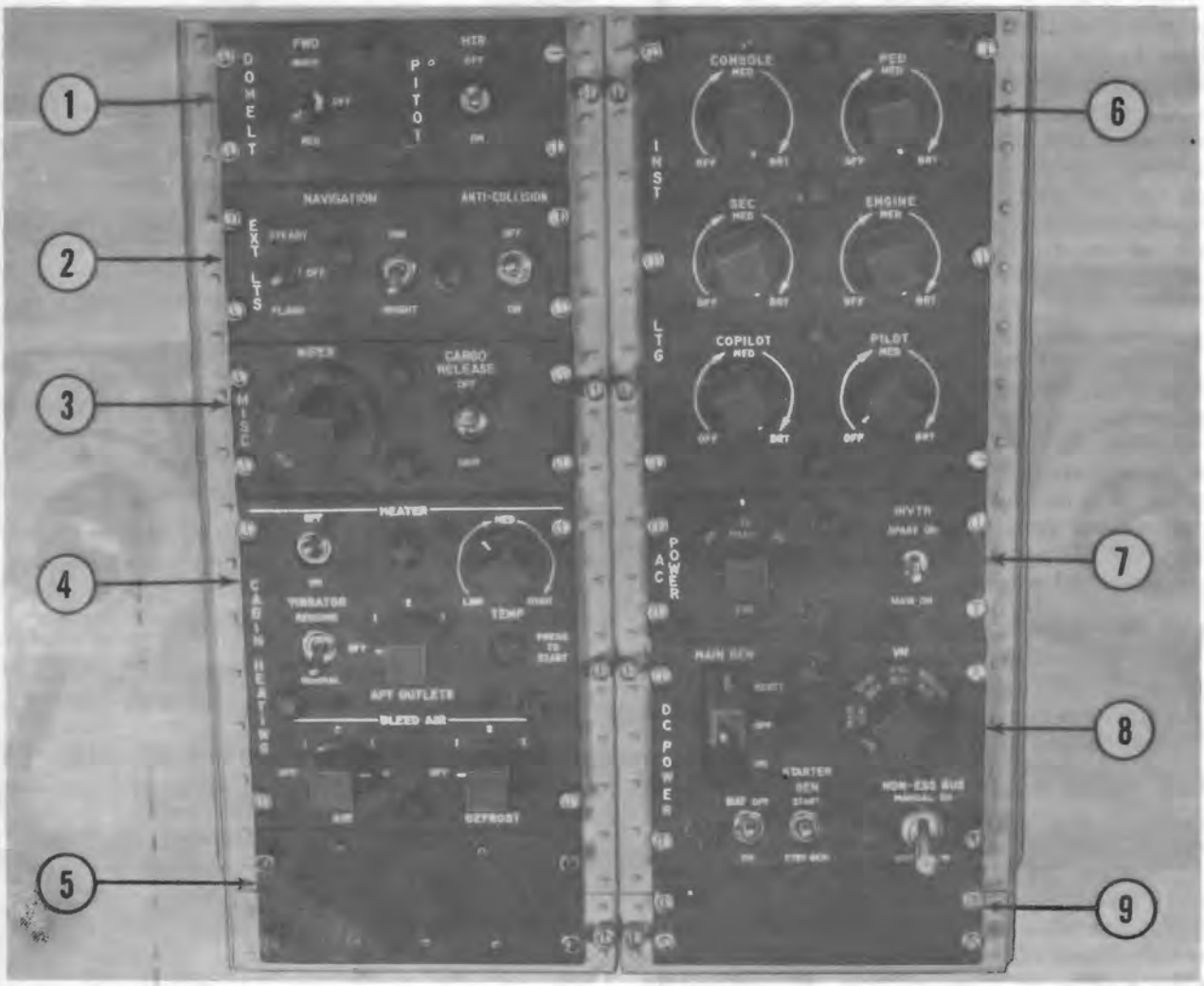
2-68. *Battery Switch.* The battery switch is located on the left area of the DC POWER control panel (see figure 2-11) below the main generator switch. This switch is a two-position toggle, labeled BAT OFF in the aft position and ON in the forward position. When the switch is placed in the ON position, it closes the circuit to the actuating coil of the battery relay and 28 volt dc is then being delivered from the battery to the primary bus. When switch is placed in OFF position it opens circuit to actuating coil of battery relay and no current is delivered from the battery.

2-69. *Starter Generator Switch.* The starter-generator switch is located in the lower center area of the DC POWER control panel (see figure 2-11). This switch has two positions labeled STARTER GEN START in aft position and STBY GEN in forward position. The START position of the switch activates the electrical circuits for starter functions of the starter-generator. The STBY GEN position activates the generator unit of the starter-generator and permits 28 volt dc to be supplied to the primary bus of the helicopter's electrical system in the event of a main generator failure.

2-70. *Non-Essential Bus Control Switch.* The non-essential bus control switch is located on the lower right area of the DC POWER control panel (see figure 2-11). This is a two-position switch labeled NON-ESS BUS MANUAL ON in the aft position and NORMAL ON in the forward position. The function of the switch is to permit the pilot, at his option, in the event of a generator failure, to switch to manual on, to override the automatic action when the non-essential bus is dropped by the electrical system's bus control relay and non-essential bus relay, thus restoring electrical current to the non-essential bus. NORMAL ON is the position for automatic action of the non-essential bus.

2-71. *DC Volt Selector Switch.* The direct current voltmeter selector switch located in the upper right area of the DC POWER control panel (see figure 2-11) is a rotatable type, identified by the VM label on the panel face. The switch is actuated by a knob and functions to monitor the voltage delivered from any of the following: BAT(battery) MAIN GEN (main generator), STBY GEN (standby generator), ESS BUS (essential bus) and NON-ESS BUS (non-essential bus). Voltage will be indicated on the instrument panel mounted DC VOLTMETER (see figure 2-5).

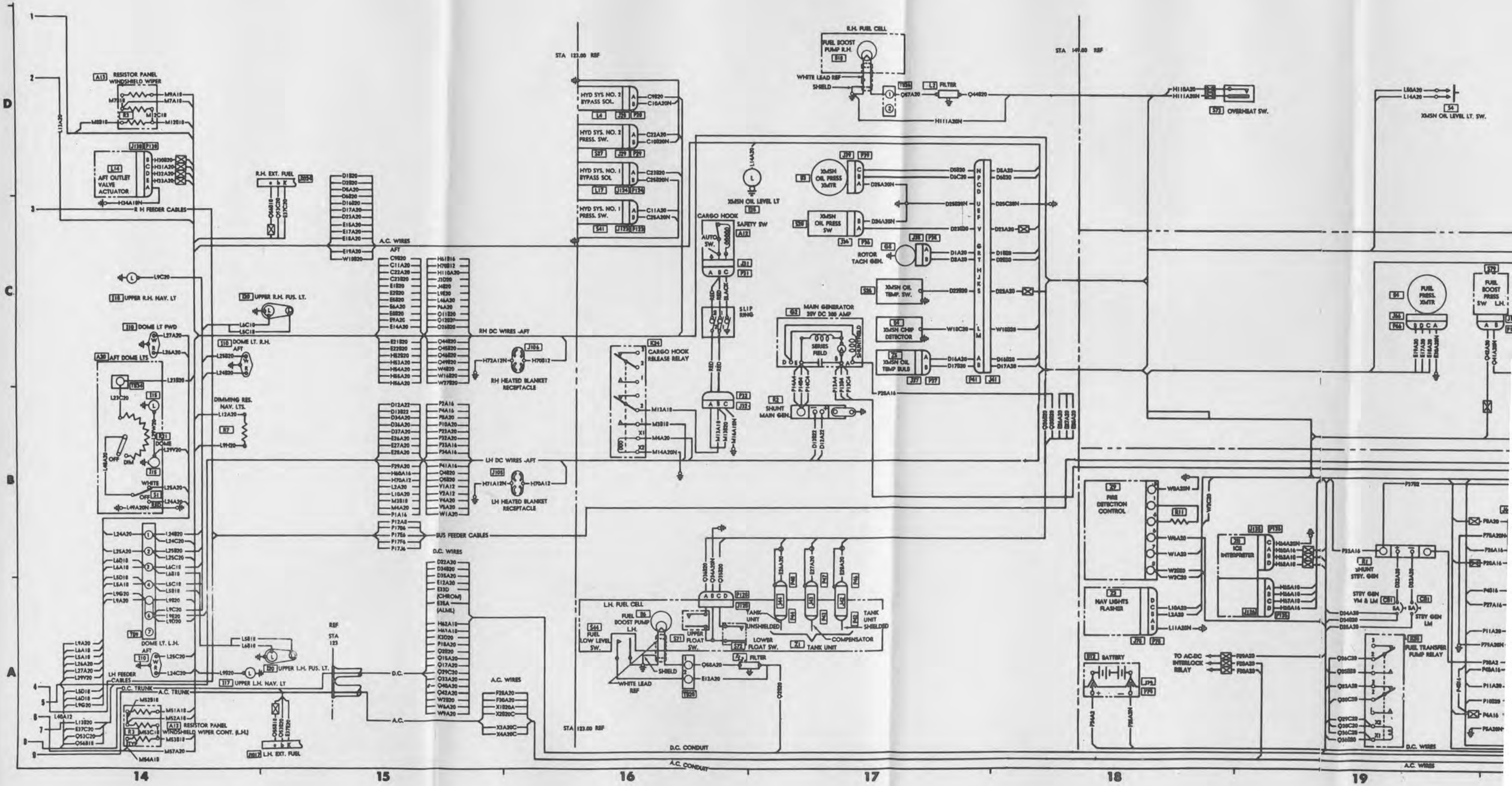
2-72. DC *Circuit Breaker Panel.* The direct current circuit breaker panel is located on the overhead console within easy reach of the pilot's and copilot's positions. Each individual breaker is clearly labeled for the particular electrical circuit protected. In the event a circuit is overloaded the circuit breaker protecting that particular circuit will pop out.



204075-22

1. Dome Lights Control Panel
2. External Lights Control Panel
3. Miscellaneous Control Panel
4. Cabin Heating Control Panel
5. Cover Plate
6. Instrument Lights Control Panel
7. AC Power Control Panel
8. DC Power Control Panel
9. Cover Plate

Figure 2–11. Overhead console –typical (UH-1B)


RESISTOR PANEL WINDSHIELD WIPER
AFT OUTLET VALVE ACTUATOR
R H FEEDER CABLES
R.H. EXT. FUEL
A.C. WIRES AFT
UPPER R.H. NAV. LT
UPPER R.H. FUS. LT.
DOME LT FWD
DOME LT. R.H. AFT
AFT DOME LTS
DIMMING RES. NAV. LTS.
RH DC WIRES -AFT
RH HEATED BLANKET RECEPTACLE
LH DC WIRES -AFT
LH HEATED BLANKET RECEPTACLE
BUS FEEDER CABLES
D.C. WIRES
DOME LT. L.H.
LH FEEDER CABLES
D.C. TRUNK
A.C. TRUNK
RESISTOR PANEL WINDSHIELD WIPER CONT. (L.H.)
UPPER L.H. FUS. LT.
UPPER L.H. NAV. LT
L.H. EXT. FUEL
STA 123
D.C.
A.C.
STA 123.00 REF
HYD SYS NO. 2 BYPASS SOL.
HYD SYS. NO. 2 PRESS. SW.
HYD SYS. NO. 1 BYPASS SOL.
HYD SYS. NO. 1 PRESS. SW.
CARGO HOOK SAFETY SW
AUTO SW.
XMSN OIL LEVEL LT
SLIP RING
CARGO HOOK RELEASE RELAY
L.H. FUEL CELL
FUEL BOOST PUMP L.H.
FUEL LOW LEVEL SW.
UPPER FLOAT SW.
LOWER FLOAT SW.
TANK UNIT UNSHIELDED
TANK UNIT SHIELDED
COMPENSATOR
TANK UNIT
FILTER
WHITE LEAD REF
SHIELD
D.C. CONDUIT
A.C. CONDUIT
R.H. FUEL CELL
FUEL BOOST PUMP R.H.
XMSN OIL PRESS XMTR
XMSN OIL PRESS SW
ROTOR TACH GEN.
MAIN GENERATOR 30V DC 300 AMP
SERIES FIELD
SHUNT FIELD
SHUNT MAIN GEN.
XMSN OIL TEMP. SW.
XMSN CHIP DETECTOR
XMSN OIL TEMP BULB
STA 149.00 REF
OVERHEAT SW.
XMSN OIL LEVEL LT. SW.
FIRE DETECTION CONTROL
NAV LIGHTS FLASHER
BATTERY
TO AC-DC INTERLOCK RELAY
ICS INTERPHONE
SHUNT STBY. GEN
STBY GEN VM & LM
STBY GEN LM
FUEL TRANSFER PUMP RELAY
FUEL PRESS. XMTR
FUEL BOOST PRESS SW L.H.
D.C. WIRES
A.C. WIRES
D
C
B
A
14
15
16
17
18
19

S71 OVERHEAT SW.

34 XMSN OIL LEVEL LT. SW.

B4 FUEL PRESS. XMTR

S72 FUEL BOOST PRESS SW L.H.

S98 FUEL BOOST PRESS SW R.H.

EMER COLL HYD SOLENOID

STA 173.00 RSF

B17 BLEED AIR VALVE

S119 FUEL FILTER BYPASS SW

G4 STARTER-GENERATOR

SHUNT FIELD

SERIES FIELD

STOW

OIL TEMP BULB

POWER TURB TACH

GAS PRODUCER TACH

IGNITION PACK

PRIMER VALVE

FUEL CONTROL SOLENOID VALVE

FUEL DIFF PRESS SW.

DEICING HOT AIR VALVE

COMMON

INC. RET.

DEC. EXT.

B12 LINER ACTUATOR GOV. RPM

W.L. SERVICE DECK (RSF) 84.82 (RSF)

AC WIRES (RSF)

B5 FUEL SHUT-OFF VALVE

OPEN NC NO CLOSE NC

E35A-ALML EXHAUST TEMP RES. R17 E35D CHROM

E35C-CHROM E34C ALML

V12 VOLTAGE REGULATOR STBY GEN FIELD

V11 VOLTAGE REGULATOR MAIN GEN.

S31 DOOR LIMIT SW. EXT. PWR.

K15 STBY. GEN. FIELD RELAY

D1 MAIN INVERTER

D2 SPARE INVERTER

K28 MAIN INVERTER PWR RELAY

K34 SPARE INVERTER PWR RELAY

P.F. CORRECT NETWORK

K27 TRANSFER RELAY

C496 TYP.

Y1 TRANSFORMER 115V/26V

FIRE DETECTION ELEMENT ENGINE COWL

J.B. ENTERPRISES

K7 SHUNT STBY. GEN

STBY GEN VM & LM

STBY GEN LM

K28 FUEL TRANSFER PUMP RELAY

TO AC-DC INTERLOCK RELAY

FIELD RLY MAIN GEN

OVER VOLTAGE RELAY

REV. CURRENT RELAY STBY. GEN.

BAT VMTR CIRC. BKR.

MAIN GEN VOLTMTR. CIRC. BKR.

BUS CONTROL RELAY

K3 STARTER RELAY

K1 EXT. PWR. RELAY

K4 NON-ESS BUS RELAY

K7 BATTERY RELAY

K5 REVERSE CURR. RELAY MAIN GEN

EXT PWR RSL DIODE CR2

EXT. PWR. RECPT. J199

D.C. WIRES

A.C. WIRES

19 20 21 22 23 24

Figure 12-25. Electrica

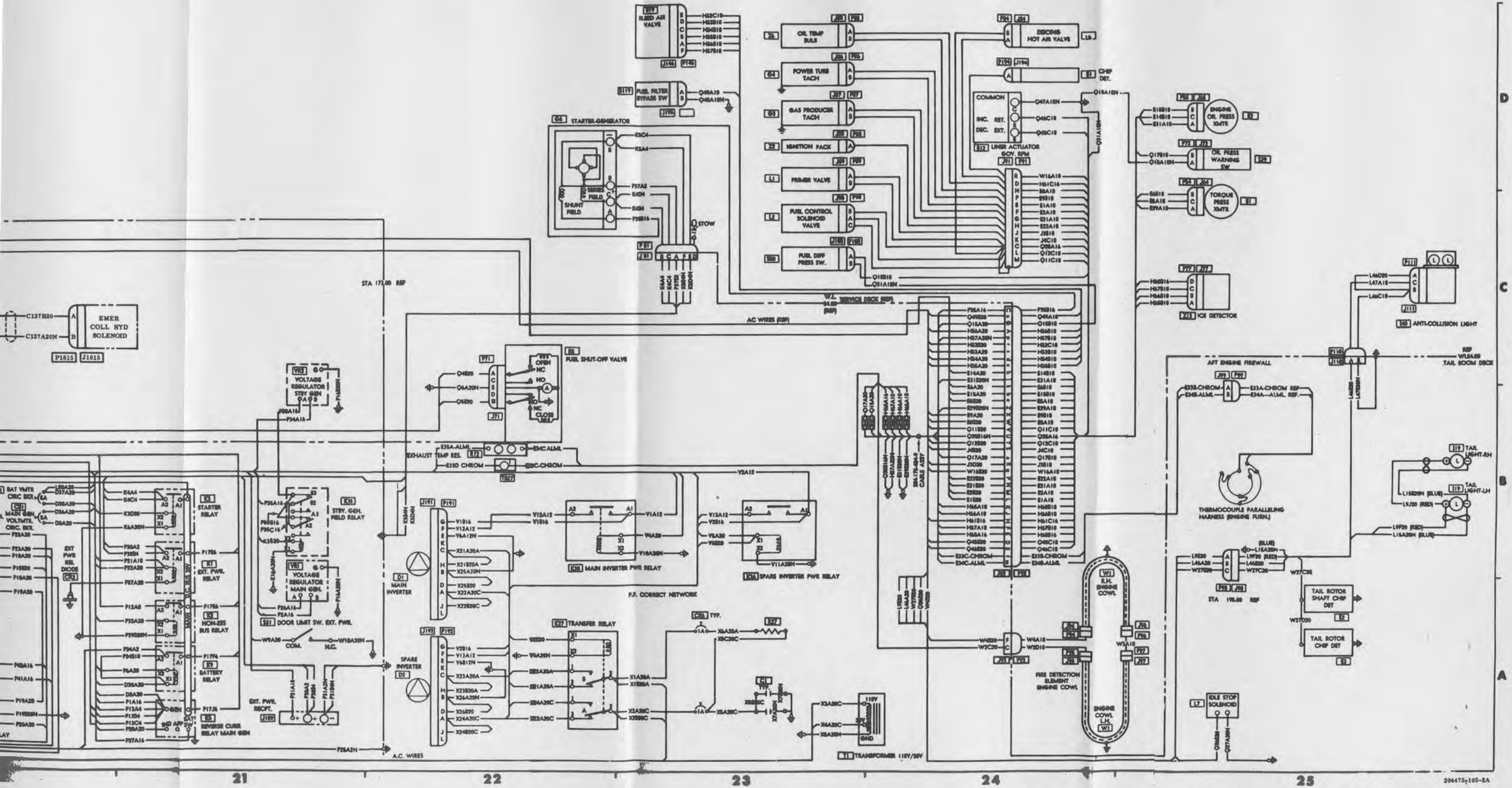
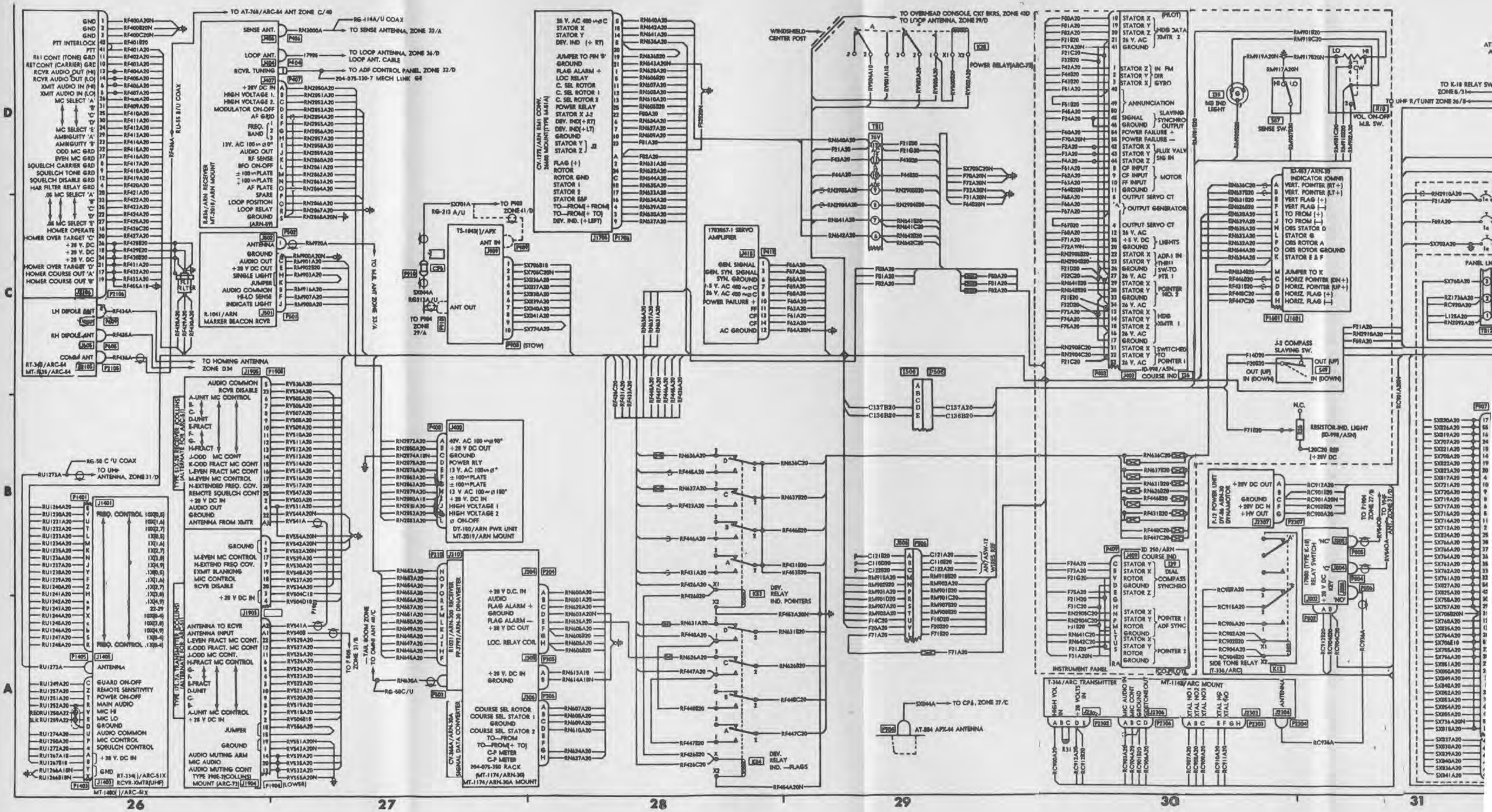
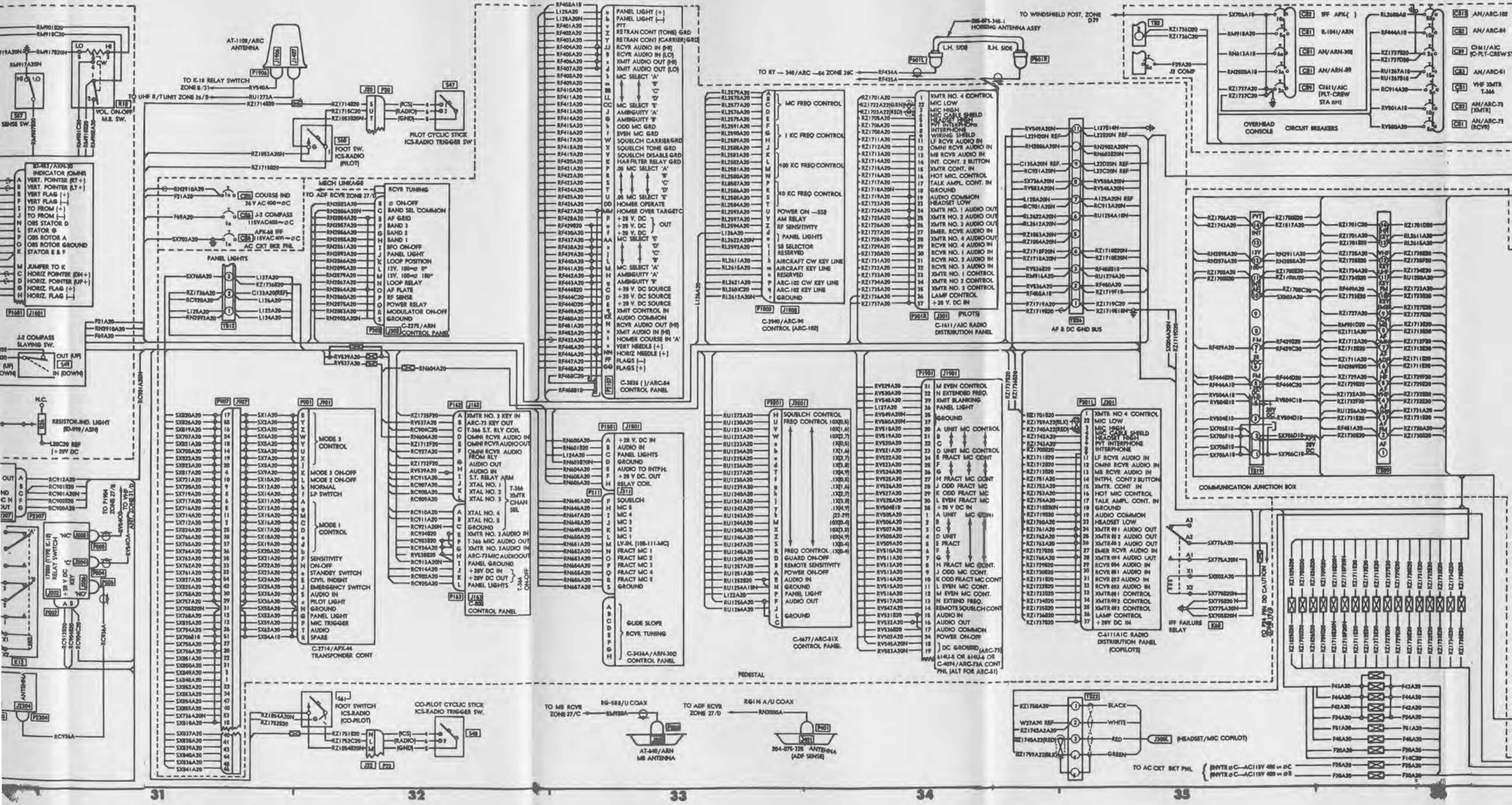


Figure 12-25. Electrical & communication wiring diagram (66-491 thru 66-601) (Sheet 2 of 5)



D
C
B
A
TO AT-768/ARC-84 ANT ZONE C/40
TO SENSE ANTENNA, ZONE 33/A
TO LOOP ANTENNA, ZONE 36/D
TO ADF CONTROL PANEL, ZONE 32/D
MARKER BEACON RCVR
TS-1843()/APX
TO HOMING ANTENNA
ZONE D34
TO UHF ANTENNA, ZONE 31/D
DY-150/ARN PWR UNIT
MT-2019/ARN MOUNT
1703867-1 SERVO AMPLIFIER
WINDSHIELD CENTER POST
TO OVERHEAD CONSOLE, CKT BKRS, ZONE 42D
TO LOOP ANTENNA, ZONE 29/D
POWER RELAY(ARC-73)
DEV. RELAY IND. POINTERS
DEV. RELAY IND. FLAGS
TO CP6, ZONE 27/C
AT-884 APX-44 ANTENNA
INSTRUMENT PANEL
ID-998/ASN COURSE IND
J-2 COMPASS SLAVING SW.
RESISTOR-IND. LIGHT (ID-998/ASN)
T-366/ARC TRANSMITTER
MT-1143/ARC MOUNT
SIDE TONE RELAY
26
27
28
29
30
31


AT-1108/ARC ANTENNA
TO K-18 RELAY SWITCH ZONE B/31
TO UHF R/T UNIT ZONE 26/B
VOL. ON-OFF M.B. SW.
SENSE SW.
PILOT CYCLIC STICK ICS-RADIO TRIGGER SW
FOOT SW. ICS-RADIO (PILOT)
ID-453/ARN-30 INDICATOR (OMNI)
J-2 COMPASS SLAVING SW.
RESISTOR-IND. LIGHT (ID-998/ASN)
MECH LINKAGE
TO ADF RCVR ZONE 27/D
C-2275/ARN CONTROL PANEL
PANEL LIGHTS
COURSE IND 26 V AC 400~ØC
J-2 COMPASS 115VAC400~ØC
APX-44 IFF 115VAC400~ØC
AC CKT BKR PNL
C-3835 ( )/ARC-54 CONTROL PANEL
C-3940/ARC-94 CONTROL (ARC-102)
C-1611/AIC RADIO DISTRIBUTION PANEL (PILOTS)
TO RT — 348/ARC — 54 ZONE 26C
HOMING ANTENNA ASSY
L.H. SIDE
R.H. SIDE
TO WINDSHIELD POST, ZONE D29
J2 COMP
OVERHEAD CONSOLE
CIRCUIT BREAKERS
IFF APX-( )
R-1041/ARN
AN/ARN-30E
AN/ARN-59
C1611/AIC (PLT-CREW STA RH)
AN/ARC-102
AN/ARC-54
C1611/AIC (C-PLT-CREW STA)
AN/ARC-51
VHF XMTR T-366
AN/ARC-73 (XMTR)
AN/ARC-73 (RCVR)
AF & DC GND BUS
COMMUNICATION JUNCTION BOX
C-2714/APX-44 TRANSPONDER CONT
C-808 CONTROL PANEL
T-366 XMTR CHAN SEL
C-3436A/ARN-30D CONTROL PANEL
C-4677/ARC-51X CONTROL PANEL
614U-5 OR 614U-6 OR C-4074/ARC-73A CONT PNL (ALT FOR ARC-51)
C-6111AIC RADIO DISTRIBUTION PANEL (COPILOTS)
IFF FAILURE RELAY
TO P54 PIN DD CAUTION
PEDESTAL
FOOT SWITCH ICS-RADIO (CO-PILOT)
CO-PILOT CYCLIC STICK ICS-RADIO TRIGGER SW.
TO MB RCVR ZONE 27/C
RG-58B/U COAX
AT-640/ARN MB ANTENNA
TO ADF RCVR ZONE 27/D
RG114 A/U COAX
204-075-120 ANTENNA (ADF SENSE)
(HEADSET/MIC COPILOT)
TO AC CKT BKT PNL
INVTR ØC—AC115V 400 ~ ØC
INVTR ØC—AC115V 400 ~ ØB
31
32
33
34
35
36

Fi

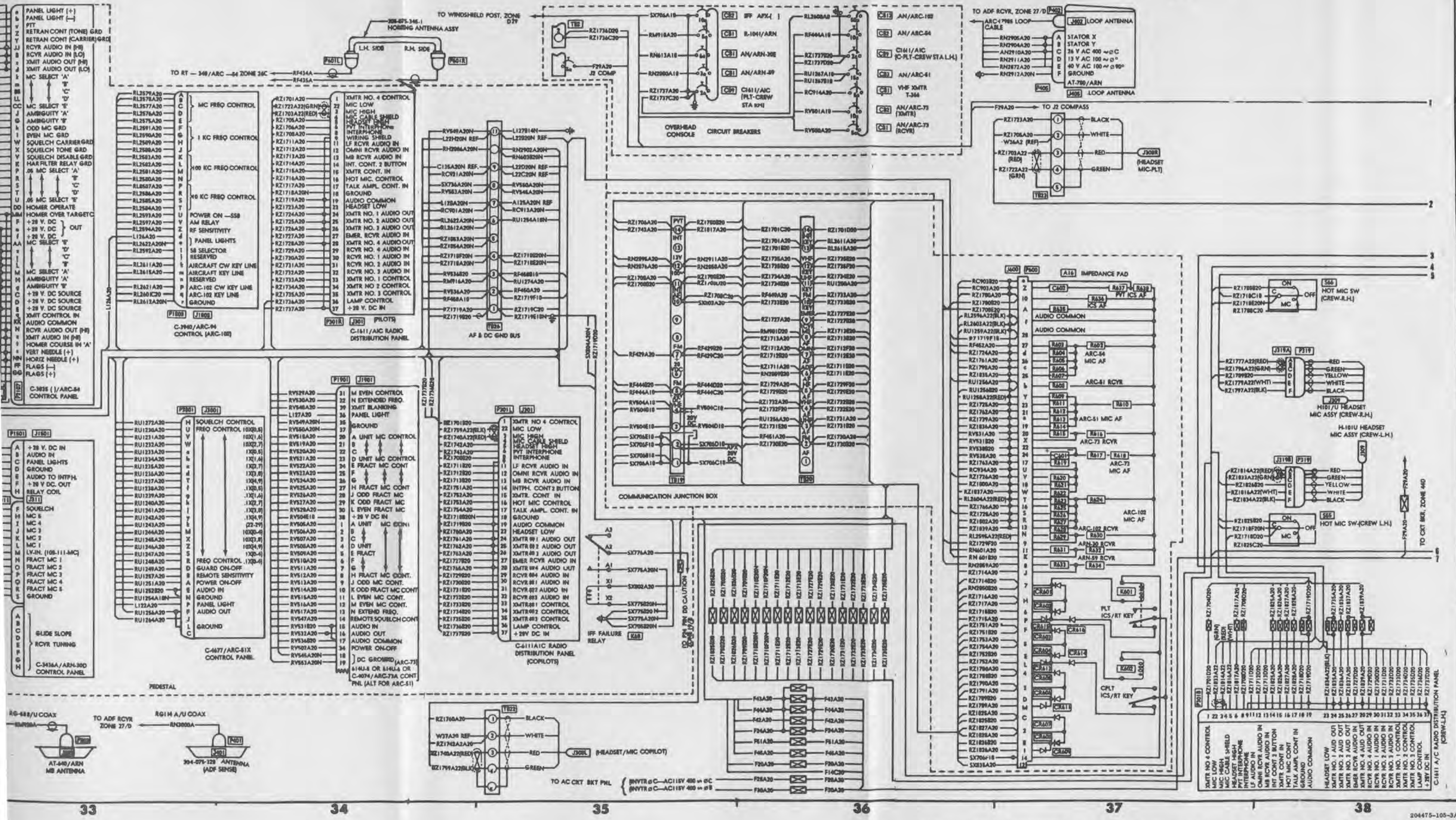


Figure 12-25. Electrical & communication wiring diagram (66-491 thru 66-601) (Sheet 3 of 5)

D C POWER

A C POWER

A C INSTRUMENTS

MISC EQUIPMENT

EXTERNAL PWR RECEPTACLE J109

LIMIT SW EXT PWR ACCESS DOOR S11

TO CAUTION PANEL PIN "AA" ZONE A16

INST TRANSFORMER 115/28 VOLTS T1

115V AC PHASE-C

115V AC PHASE-A

A C FAIL RELAY K26

TO CAUTION PANEL PIN "N" ZONE A9

AC FAILURE RELAY K9

TRANSFER RELAY K27

POWER FACTOR CORRECTION C1

MAIN INVERTER D1

SPARE INVERTER D2

MAIN INVTR PWR REL K12

SPARE INVTR PWR REL K24

MAIN ON SPST INVTR

SPARE ON

AC POWER A3

AC VOLTMETER M3

SHUNT STBY GEN

REV. CURRENT RELAY-STBY GEN K23

LOADMETER STBY GEN M1

STARTER-GENERATOR 28V, 300 AMP G6

SERIES FIELD

SHUNT FIELD

VOLTAGE REGULATOR STBY. GEN VR2

STBY GEN FIELD RELAY K16

EXTERNAL POWER RELAY K1

STARTER RELAY K3

NON ESSENTIAL BUS RELAY K7

BATTERY RELAY K9

BAT YM CB11

NORMAL ON OFF BAT S40

MANUAL START ON OFF BAT S42

STBY GEN BAT S70

NON ESS BUS

STBY GEN ESS BUS

RESET S52

DC YM

MAIN GEN S8

A1 D.C. POWER

OVERVOLTAGE RELAY MAIN GEN K6

BATTERY BT1

J74 P74

TO CAUTION PANEL PIN "Z" ZONE A9 P24

TO XMSN OIL LT. SW ZONE D7

DC VOLTMETER M2

MAIN GEN YM CB1 5A

MAIN GEN. FIELD CB3 15A

VOLTAGE REGULATOR MAIN GEN VR1

RESET

TRIP

FIELD RELAY-MAIN GENERATOR K7

BUS CONT RELAY K4

SERIES FIELD

SHUNT MAIN GEN B1

SHUNT FIELD

LOADMETER MAIN GEN M4

MAIN D.C. GENERATOR 28V 300 AMP. G1

REV. CURRENT RELAY MAIN GEN. K5

NON ESS BUS YM 25A

MAIN INVTR PWR 25A

INVTR CONT 25A

SPARE INVTR PWR 25A

ESS BUS 5A

GEN RESET 7.5A

STARTER RELAY

NON ESSENTIAL BUS

ESSENTIAL BUS

PILOT ATTD

CO-PILOT ATTD

TO J2 CMPS

TO GYRO COMPASS

TO COURSE IND

COURSE IND 1.5A

FUEL QTY

ENG VIB METER

GND PIN

FUEL QUAN IND

COPILOT ATTITUDE INDICATOR

DISPLACEMENT ROLL & PITCH GYRO

TO J1 PIN "J" ZONE D6

FUEL QTY TEST SW

RATE SWITCHING GYRO

LH TANK UNIT

ATTITUDE INDICATOR

28 VOLT A.C. INSTRUMENTS

TORQUE PRESS XMTR

XMSN OIL PRESS XMTR

ENGINE OIL PRESS XMTR

FUEL PRESS XMTR

TORQUE METER

XMSN OIL PRESS IND

ENGINE OIL PRESS IND

FUEL PRESS IND

ENGINE XMSN TACH'S

ROTOR TACH IND

ROTOR TACH GEN

PWR TURBINE TACH GEN

GAS PRODUCER TACH IND

GAS PRODUCER TACH GEN

CARGO HOOK RELEASE RELAY K34

CARGO HOOK SWITCH A15

AUTO SW

CARGO HOOK

SLIP RING

RELEASE SWITCH PILOTS CYCLIC STICK

RELEASE SWITCH CO-PILOTS CYCLIC STICK

CARGO HOOK REL

ARM

OFF

CARGO REL

PILOT'S WINDSHIELD WIPER MOTOR

CO-PILOT'S WINDSHIELD WIPER MOTOR

RESISTOR PANEL

INST PANEL CARGO REL ARMED LT

PARK LIMIT

WINDSHIELD WIPERS

COCKPIT LTS. L.H. R.H.

TO BAT. YM C.B. ZONE B1

AFT DOME LIGHTS L.H. R.H.

AFT DOME LT. SW.

AFT DOME LTS

PILOT BOTH COPILOT

HIGH LOW

NON ESSENTIAL BUS

ESSENTIAL BUS

MAIN INVTR PWR

INVTR CONT

SPARE INVTR PWR

GEN RESET

STARTER RELAY

FUEL BOOST LEFT

FUEL VALVE

IGNITION SYSTEM START FUEL

FUEL BOOST RIGHT

ATM FUEL TRANS

IDLE STOP REL

GOV CONT

FIRE DET

CARGO HOOK REL

PILOT WINDSHIELD WIPER

COPILOT WINDSHIELD WIPER

ANTI-ICE

UTILITY LIGHTS

DE-ICE

PILOTS COLL STICK

COPILOTS COLL STICK

STARTER SW

FUEL START

FUEL VALVE

A3 ENGINE CONTROL PANEL

FUEL TRANS PUMP GOV

IGNITER SOL VALVE

FUEL SHUT OFF VALVE

FILTER

LH FUEL BOOST PUMP

RH FUEL BOOST PUMP

WHITE LEAD REF

FUEL TRANSFER PUMP RELAY

TO J1024 PIN h

TO J1017 PIN h ZONE A10

TO PIN "A" P54 ZONE A11

TO PIN "K" ZONE B10 TO CAUTION PANEL

TO CAUTION PANEL-GOV. SWITCH TO P24 PIN R ZONE A9

IDLE STOP REL SOL

AUTO BMER

FUEL CONTROL

FILTER VIBRATOR RECTIFIER TRIGGER GAP

IGNITER PLUGS

DIVIDER COILS

LOWER FLOAT SW

UPPER FLOAT SW

FUEL TRANSFER PUMP (FERRY TANK)

PILOTS COLLECTIVE STICK

GOV RPM SW N.O. INCR

GOV. RPM SW N.C. DECR

IDLE STOP RELEASE SW

COPILOTS COLLECTIVE STICK

NOTE: P107 J INSERTED INTO J107 RECP WHEN CO-PILOT'S COLL STICK IS REMOVED

FIRE WARNING LIGHT

FIRE DETECTOR TEST SW.

FIRE DETECTION CONTROL

LH. ENGINE COWL FIRE DETECTION ELEMENT

R.H. ENGINE COWL FIRE DETECTION ELEMENT

RPM WARN SYSTEM

RPM LIMIT WARNING

DE-ICE ON OFF

AUDIO R.P.M.

HI-LO RPM WARN

ICE INTERPRETER

P34 PIN "C" TO CAUTION PANEL ZONE B10

P34 PIN "B"

DEICING HOT AIR VALVE

ICE DETECTOR PROBE

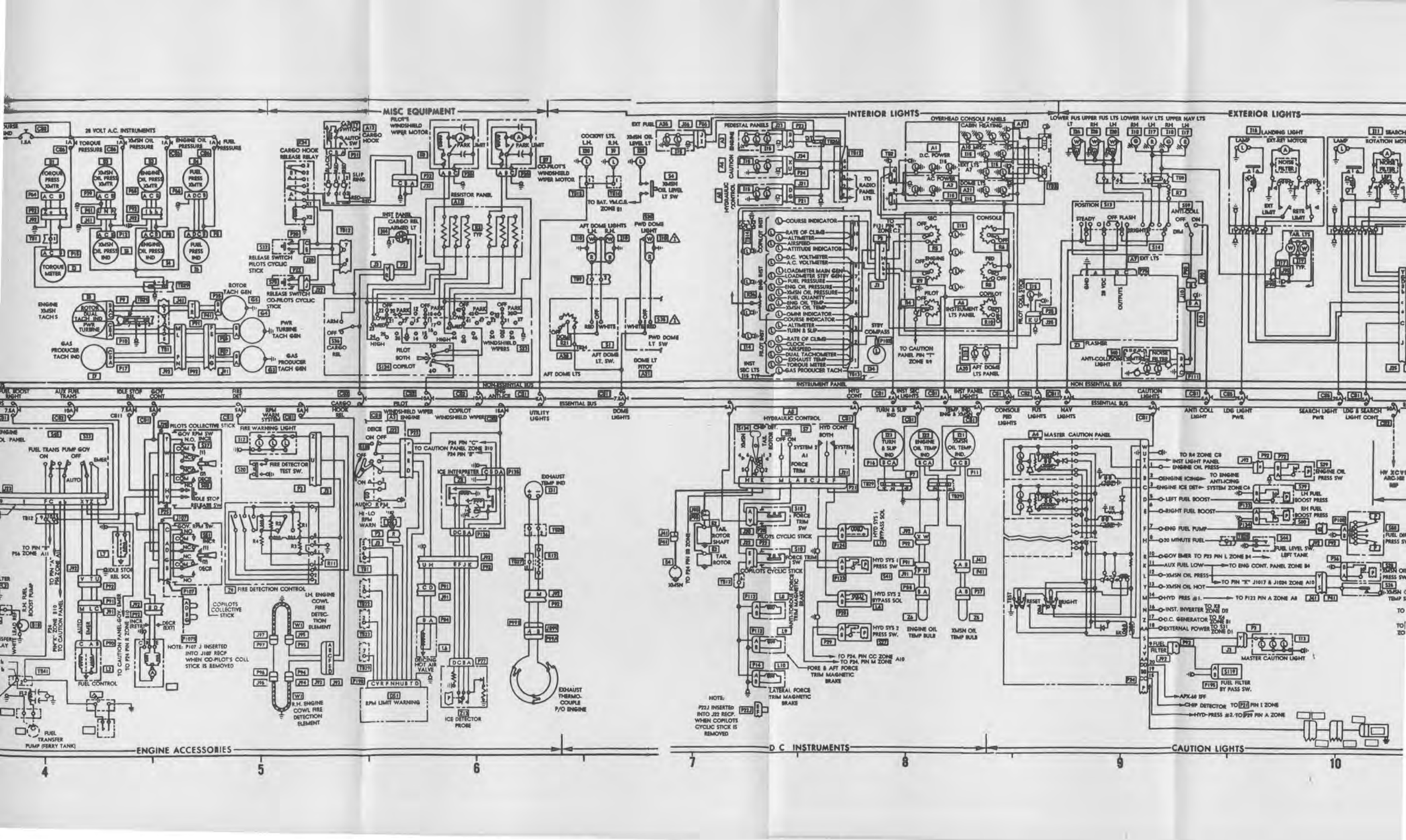
EXHAUST TEMP IND

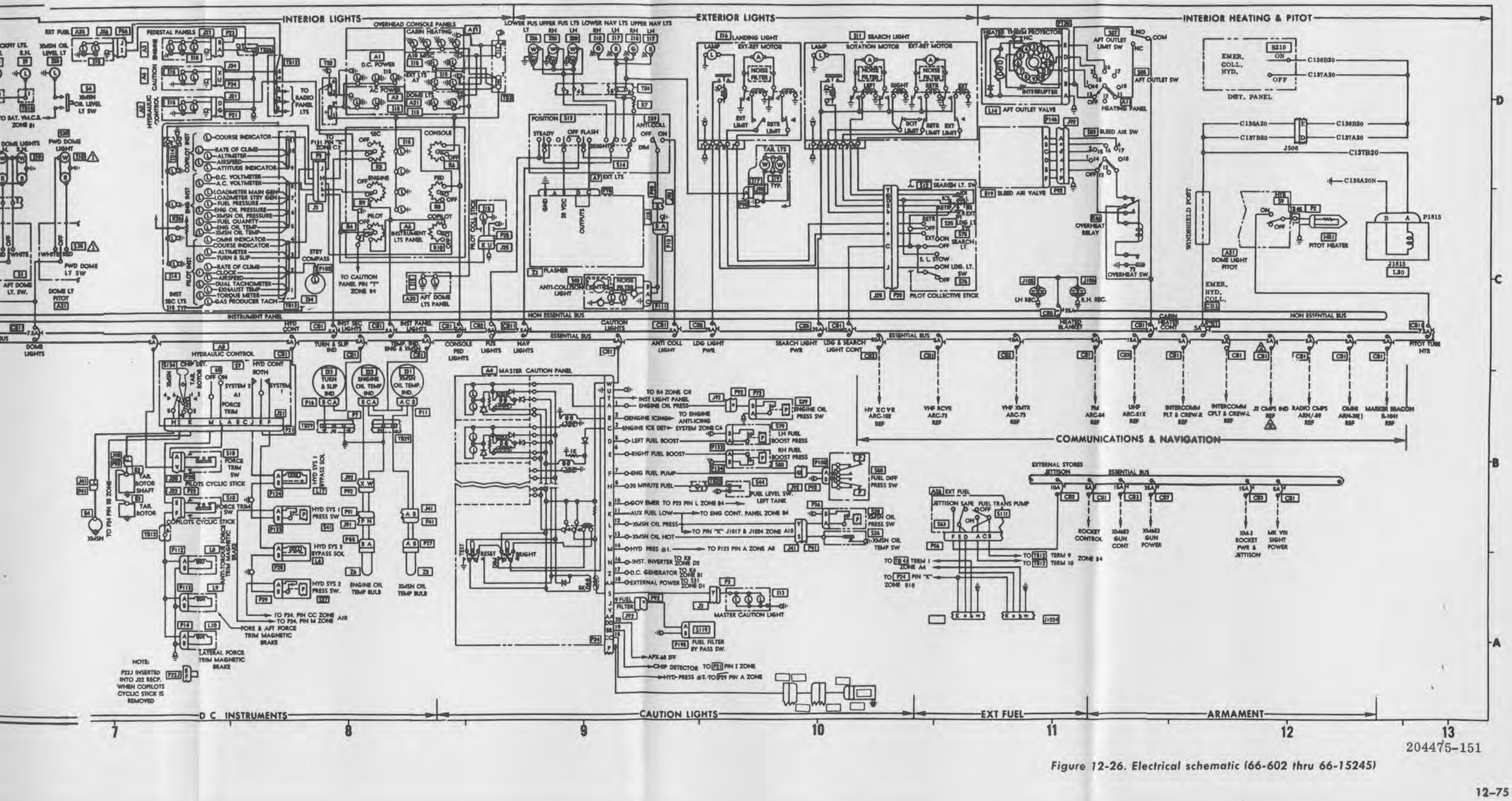
EXHAUST THERMO-COUPLE P/O ENGINE

ENGINE ACCESSORIES

1 2 3 4 5 6

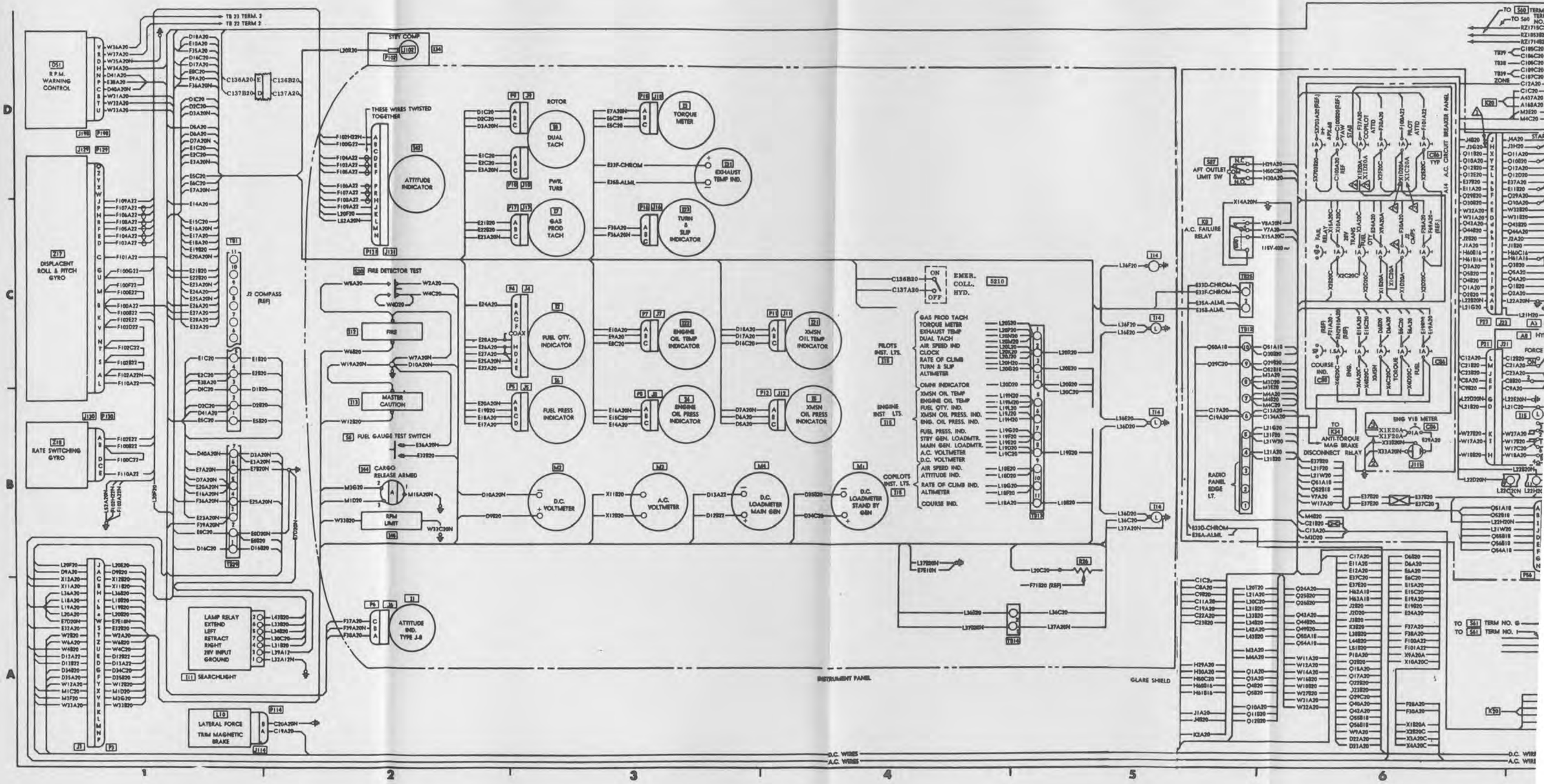
A B C D

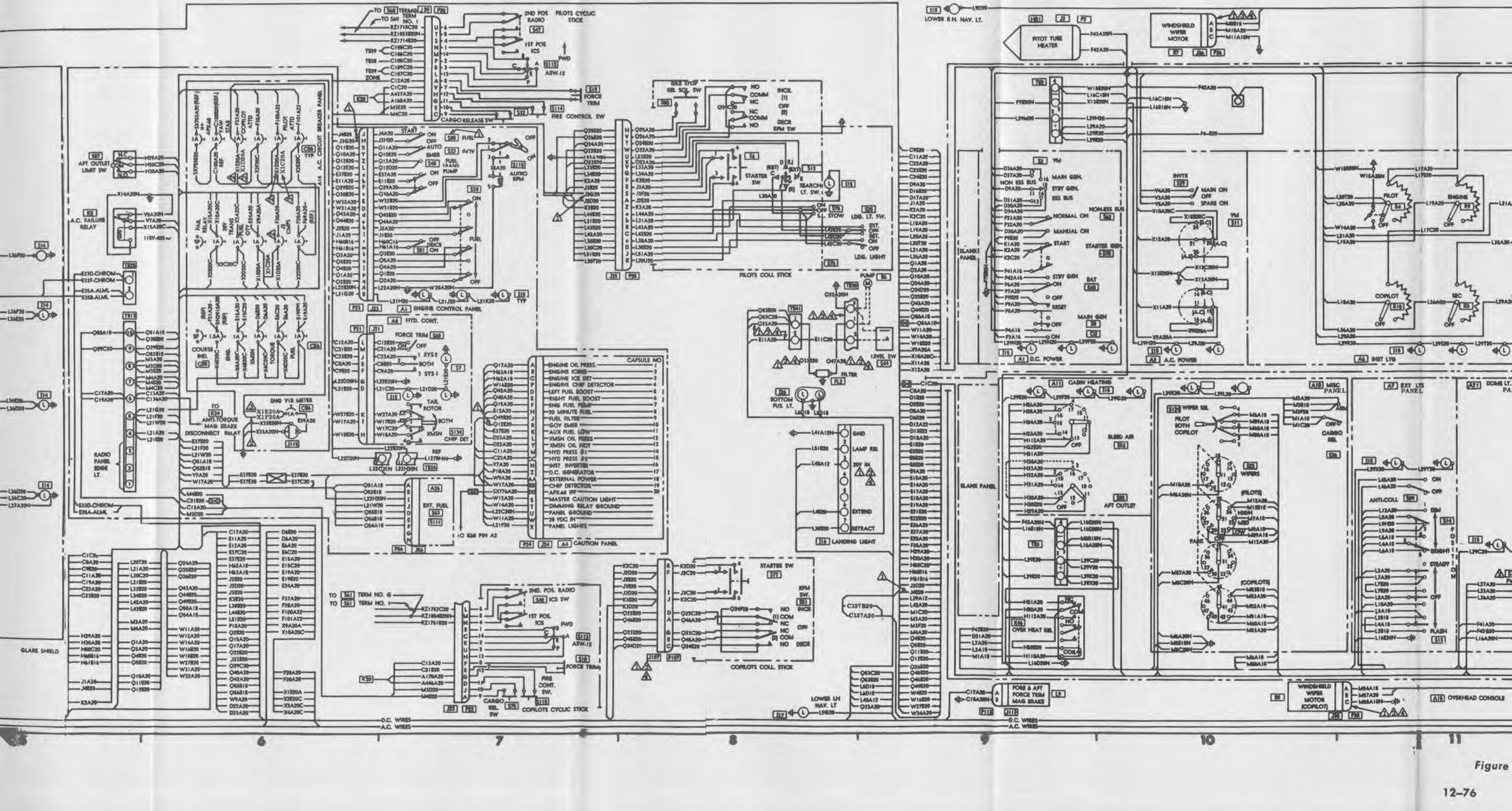

MISC EQUIPMENT
INTERIOR LIGHTS
EXTERIOR LIGHTS
28 VOLT A.C. INSTRUMENTS
TORQUE PRESS XMTR
XMSN OIL PRESS XMTR
ENGINE OIL PRESS XMTR
FUEL PRESS XMTR
TORQUE METER
XMSN OIL PRESS IND
ENGINE OIL PRESS IND
FUEL PRESS IND
ENGINE XMSN TACHS
ROTOR DUAL TACH IND
PWR TURBINE
GAS PRODUCER TACH IND
ROTOR TACH GEN
PWR TURBINE TACH GEN
GAS PRODUCER TACH GEN
CARGO HOOK RELEASE RELAY
CARGO SWITCH
AUTO SW
CARGO HOOK
SLIP RING
RELEASE SWITCH PILOTS CYCLIC STICK
RELEASE SWITCH CO-PILOTS CYCLIC STICK
INST PANEL CARGO REL ARMED LT
ARM
OFF
CARGO REL
PILOT'S WINDSHIELD WIPER MOTOR
RESISTOR PANEL
PARK
LIMIT
HIGH
LOW
PILOT
BOTH
COPILOT
WINDSHIELD WIPERS
CO-PILOT'S WINDSHIELD WIPER MOTOR
COCKPIT LTS. L.H.
COCKPIT LTS. R.H.
TO BAT. M.C.B. ZONE B1
EXT FUEL
XMSN OIL LEVEL LT
XMSN OIL LEVEL LT SW
AFT DOME LIGHTS L.H.
AFT DOME LIGHTS R.H.
AFT DOME LT. SW.
AFT DOME LTS
FWD DOME LIGHT
FWD DOME LT SW
DOME LT
PITOT
PEDESTAL PANELS
HYDRAULIC CONTROL
TO RADIO PANEL LTS
COURSE INDICATOR
RATE OF CLIMB
ALTIMETER
AIRSPEED
ATTITUDE INDICATOR
D.C. VOLTMETER
A.C. VOLTMETER
LOADMETER MAIN GEN
LOADMETER STBY GEN
FUEL PRESSURE
ENG OIL PRESSURE
XMSN OIL PRESSURE
FUEL QUANTITY
ENG OIL TEMP
XMSN OIL TEMP
OMNI INDICATOR
COURSE INDICATOR
ALTIMETER
TURN & SLIP
RATE OF CLIMB
CLOCK
AIRSPEED
DUAL TACHOMETER
TORQUE METER
EXHAUST TEMP
GAS PRODUCER TACH
INST SRC LTS
INSTRUMENT PANEL
STBY COMPASS
TO CAUTION PANEL PIN "T" ZONE B9
OVERHEAD CONSOLE PANELS
CABIN HEATING
D.C. POWER
A.C. POWER
DOME LTS
SEC
CONSOLE
OFF
ENGINE
PILOT
COPILOT
INSTRUMENT LTS PANEL
AFT DOME LTS PANEL
PILOT COLL STICK
LOWER FUS LTS
UPPER FUS LTS
LOWER NAV LTS
UPPER NAV LTS
POSITION
STEADY
OFF FLASH
BRIGHT
DIM
ANTI-COLL
OFF ON
A7 EXT LTS
GND
28 VDC
OUTPUTS
FLASHER
ANTI-COLLISION LIGHT
NOISE FILTER
LANDING LIGHT
EXT. RET MOTOR
EXT LIMIT
RETR LIMIT
TAIL LTS
TYP.
SEARCH LIGHT
ROTATION MOT
NON ESSENTIAL BUS
ESSENTIAL BUS
FUEL BOOST RIGHT
AUX FUEL TRANS
IDLE STOP REL
GOV CONT
FIRE DET
RPM WARN SYSTEM
CARGO HOOK REL
PILOT WINDSHIELD WIPER A1 ENGINE
COPILOT WINDSHIELD WIPER
ANTI-ICE
UTILITY LIGHTS
DOME LIGHTS
HYD CONT
INST SRC LIGHTS
INST PANEL LIGHTS
ENG & XMSN
CONSOLE PED LIGHTS
FUS LIGHTS
NAV LIGHTS
CAUTION LIGHTS
ANTI COLL LIGHT
LDG LIGHT PWR
SEARCH LIGHT PWR
LDG & SEARCH LIGHT CONT
ENGINE ACCESSORIES
FUEL TRANS PUMP GOV
ON
OFF
EMER
AUTO
PILOTS COLLECTIVE STICK
GOV RPM SW
INCR
DECR
IDLE STOP REFUEL SW
IDLE STOP REL SOL
R.H. FUEL BOOST PUMP
FUEL CONTROL
FUEL TRANSFER PUMP (FERRY TANK)
FIRE WARNING LIGHT
FIRE DETECTOR TEST SW.
FIRE DETECTION CONTROL
COPILOTS COLLECTIVE STICK
NOTE: P107 J INSERTED INTO J107 RECP WHEN CO-PILOT'S COLL STICK IS REMOVED
L.H. ENGINE COWL FIRE DETECTION ELEMENT
R.H. ENGINE COWL FIRE DETECTION ELEMENT
DEICE
ON OFF
ON A
AUDIO RPM
HI-LO RPM WARN
RPM LIMIT WARNING
DEICING HOT AIR VALVE
ICE INTERPRETER
ICE DETECTOR PROBE
EXHAUST TEMP IND
EXHAUST THERMO-COUPLE P/O ENGINE
HYDRAULIC CONTROL
TAIL ROTOR SHAFT
TAIL ROTOR
PILOTS CYCLIC STICK
COPILOTS CYCLIC STICK
FORCE TRIM SW
ANTI-TORQUE FORCE TRIM MAGNETIC BRAKE
FORE & AFT FORCE TRIM MAGNETIC BRAKE
LATERAL FORCE TRIM MAGNETIC BRAKE
HYD SYS 1 BYPASS SOL
HYD SYS 2 BYPASS SOL
HYD SYS 1 PRESS SW
HYD SYS 2 PRESS SW.
ENGINE OIL TEMP BULB
XMSN OIL TEMP BULB
NOTE: P22 J INSERTED INTO J22 RECP. WHEN COPILOTS CYCLIC STICK IS REMOVED
MASTER CAUTION PANEL
TEST
RESET
BRIGHT
TO ENGINE ANTI-ICING SYSTEM ZONE C4
LH FUEL BOOST PRESS
RH FUEL BOOST PRESS
FUEL LEVEL SW. LEFT TANK
TO ENG CONT. PANEL ZONE B4
TO PIN "K" J1017 & J1024 ZONE A10
TO P123 PIN A ZONE A8
TO X3 ZONE D2
TO X4 ZONE B1
TO X31 ZONE D1
MASTER CAUTION LIGHT
FUEL FILTER
FUEL FILTER BY PASS SW.
APX-60 IFF
CHIP DETECTOR TO P21 PIN I ZONE
HYD-PRESS #2 TO P29 PIN A ZONE
ENGINE OIL PRESS SW
TO P4 ZONE C8
INST LIGHT PANEL
ENGINE ICING
ENGINE ICE DET
LEFT FUEL BOOST
RIGHT FUEL BOOST
ENG FUEL PUMP
20 MINUTE FUEL
GOV EMER TO P23 PIN L ZONE B4
AUX FUEL LOW
XMSN OIL PRESS
XMSN OIL HOT
HYD PRES #1
INST. INVERTER ZONE D2
D.C. GENERATOR ZONE B1
EXTERNAL POWER ZONE D1
4
5
6
7
8
9
10



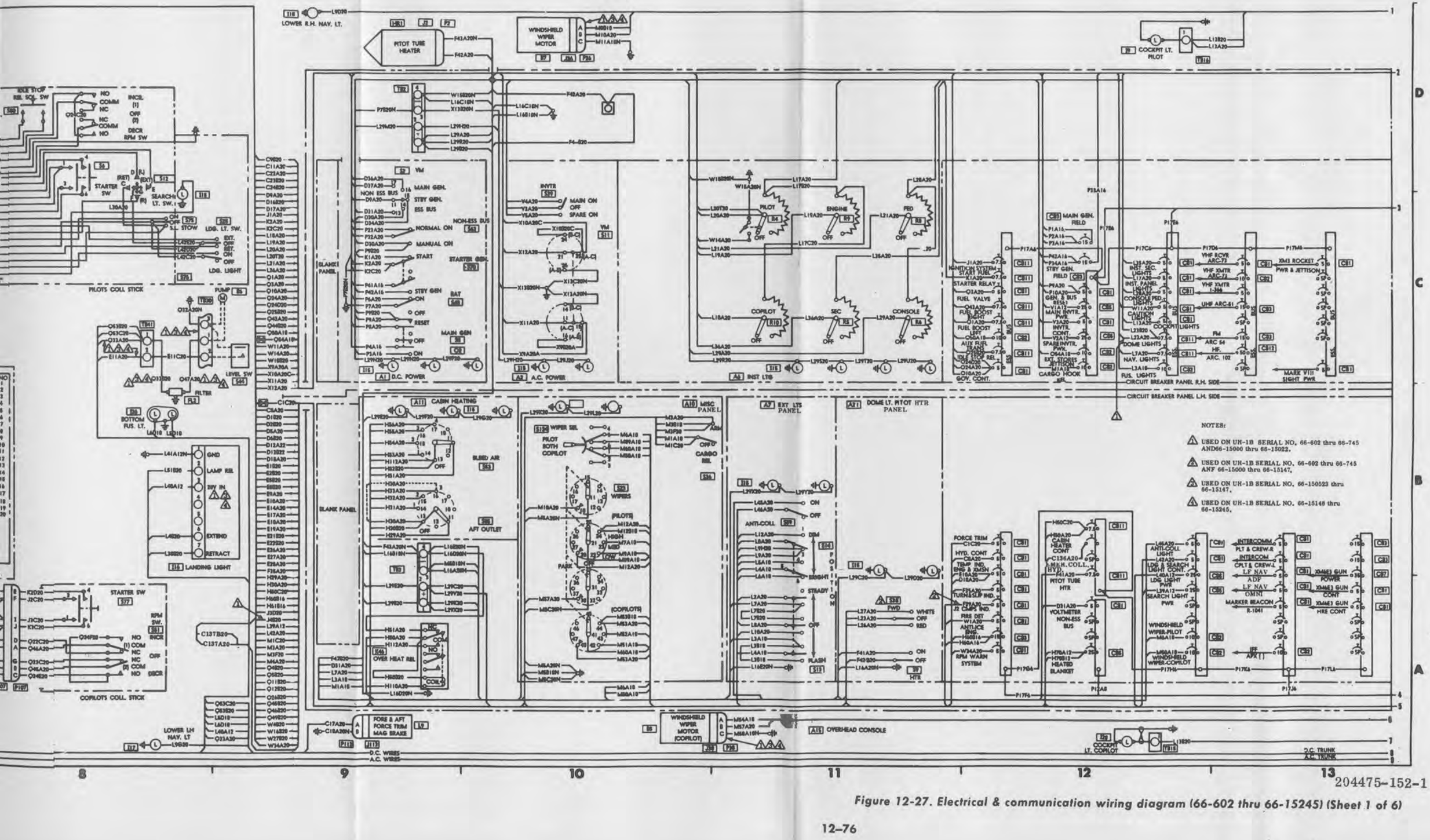
204475-151

Figure 12-26. Electrical schematic (66-602 thru 66-15245)


D51 R.P.M. WARNING CONTROL
Z17 DISPLACENT ROLL & PITCH GYRO
Z18 RATE SWITCHING GYRO
STBY COMP U102
THESE WIRES TWISTED TOGETHER
ATTITUDE INDICATOR
J49
ROTOR
B9 DUAL TACH
PWR TURB
B7 GAS PROD TACH
B3 TORQUE METER
E33F-CHROM
E35B-ALML
B21 EXHAUST TEMP IND.
B23 TURN & SLIP INDICATOR
J2 COMPASS (REF)
FIRE DETECTOR TEST
FIRE
MASTER CAUTION
FUEL GAUGE TEST SWITCH
CARGO RELEASE ARMED
RPM LIMIT
B8 FUEL QTY. INDICATOR
B22 ENGINE OIL TEMP INDICATOR
B1 30455N OIL TEMP INDICATOR
B6 FUEL PRESS INDICATOR
B24 ENGINE OIL PRESS INDICATOR
B5 30455N OIL PRESS INDICATOR
M2 D.C. + VOLTMETER
M3 A.C. VOLTMETER
M5 D.C. LOADMETER MAIN GEN
M1 D.C. LOADMETER STAND BY GEN
B11 ATTITUDE IND. TYPE J-8
L11 SEARCHLIGHT
LAMP RELAY EXTEND LEFT RETRACT RIGHT 28V INPUT GROUND
L10 LATERAL FORCE TRIM MAGNETIC BRAKE
C136B20
C137A20
5210 EMER. COLL. HYD.
PILOTS INST. LTS. I18
GAS PROD TACH
TORQUE METER
EXHAUST TEMP
DUAL TACH
AIR SPEED IND
CLOCK
RATE OF CLIMB
TURN & SLIP
ALTIMETER
OMNI INDICATOR
30455N OIL TEMP
ENGINE OIL TEMP
FUEL QTY. IND.
30455N OIL PRESS. IND.
ENG. OIL PRESS. IND.
FUEL PRESS. IND.
STBY GEN. LOADMTR.
MAIN GEN. LOADMTR.
A.C. VOLTMETER
D.C. VOLTMETER
AIR SPEED IND.
ATTITUDE IND.
RATE OF CLIMB IND.
ALTIMETER
COURSE IND.
ENGINE INST. LTS. I15
COPILOTS INST. LTS. I16
S07 AFT OUTLET LIMIT SW
K9 A.C. FAILURE RELAY
A14 A.C. CIRCUIT BREAKER PANEL
ENG VIB METER
TO ANTI-TORQUE MAG BRAKE DISCONNECT RELAY K34
RADIO PANEL EDGE LT.
R26
F71B20 (REF)
INSTRUMENT PANEL
GLARE SHIELD
D.C. WIRES
A.C. WIRES

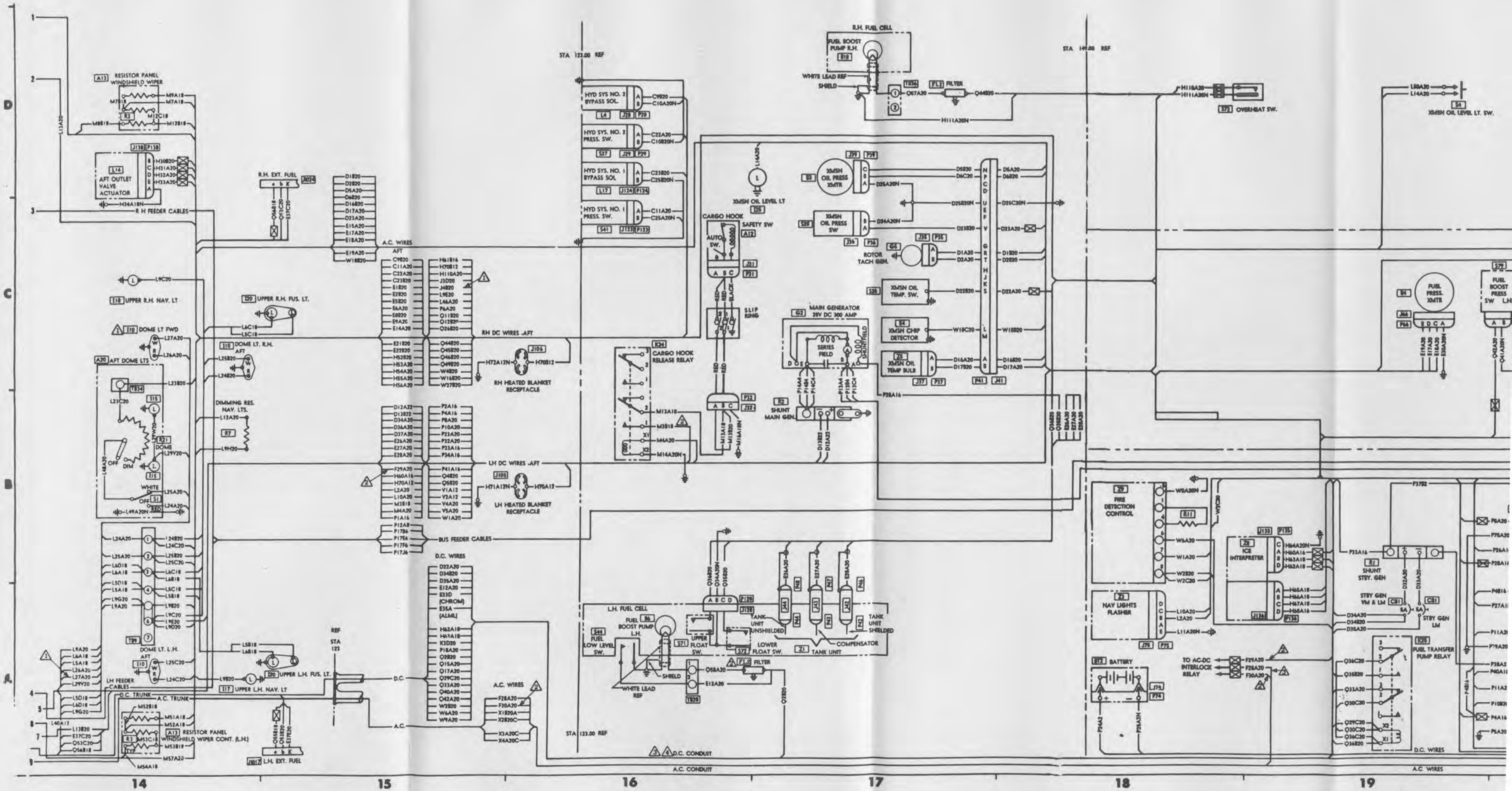

LOWER R.H. NAV. LT.
PITOT TUBE HEATER
WINDSHIELD WIPER MOTOR
A.C. CIRCUIT BREAKER PANEL
AFT OUTLET LIMIT SW
A.C. FAILURE RELAY
115V-400 ~
TO TERM NO. 1
2ND POS RADIO
PILOTS CYCLIC STICK
1ST POS ICS
ASW-12
FWD
CARGO RELEASE SW
FORCE TRIM
FIRE CONTROL SW
IDLE STOP REL SOL SW
INCR
DECR
RPM SW
STARTER SW
SEARCH LT. SW.
STOW
LDG. LT. SW.
EXT.
RET.
LDG. LIGHT
PILOTS COLL STICK
ENGINE CONTROL PANEL
HYD. CONT.
FORCE TRIM
ENG VIB METER
COURSE IND.
ENGL.
TORQUE
FUEL
RADIO PANEL EDGE LT.
TO ANTI-TORQUE MAG BRAKE
DISCONNECT RELAY
TAIL ROTOR
XMSN CHIP DET
EXT. FUEL
TO K48 PIN A2
CAUTION PANEL
CAPSULE NO
ENGINE OIL PRESS.
ENGINE ICING
ENGINE ICE DET.
ENGINE CHIP DETECTOR
LEFT FUEL BOOST
RIGHT FUEL BOOST
ENG. FUEL PRESS.
20 MINUTE FUEL
FUEL FILTER
GOV. EMER.
AUX FUEL LOW
XMSN OIL PRESS.
XMSN OIL HOT
HYD PRESS #1
HYD PRESS #2
INST. INVERTER
D.C. GENERATOR
EXTERNAL POWER
CHIP DETECTOR
APX-66 IFF
MASTER CAUTION LIGHT
DIMMING RELAY GROUND
PANEL GROUND
28 VDC IN
PANEL LIGHTS
GLARE SHIELD
2ND. POS. RADIO
ICS SW
1ST POS. ICS
FWD
ASW-12
FORCE TRIM
FIRE CONT. SW.
CARGO REL SW
COPILOTS CYCLIC STICK
STARTER SW
COPILOTS COLL. STICK
BOTTOM FUS. LT.
LAMP RTN
28V IN
EXTEND
RETRACT
LANDING LIGHT
LOWER LH NAV. LT
FILTER
LEVEL SW
PUMP
BLANK PANEL
YM
MAIN GEN.
NON ESS BUS
STBY GEN.
ESS BUS
NORMAL ON
MANUAL ON
START
STARTER GEN.
BAT
RESET
INVTR
MAIN ON
SPARE ON
A1 D.C. POWER
A2 A.C. POWER
A4 INST LTG
A11 CABIN HEATING
BLEED AIR
AFT OUTLET
A10 MISC. PANEL
WIPER SEL
PILOT
BOTH
COPILOT
WIPERS
(PILOTS)
PARK
(COPILOTS)
A7 EXT LTS PANEL
ANTI-COLL
POSITION
BRIGHT
STEADY
FLASH
OVER HEAT REL
FORE & AFT FORCE TRIM MAG BRAKE
WINDSHIELD WIPER MOTOR (COPILOT)
A18 OVERHEAD CONSOLE
D.C. WIRES
A.C. WIRES

Figure

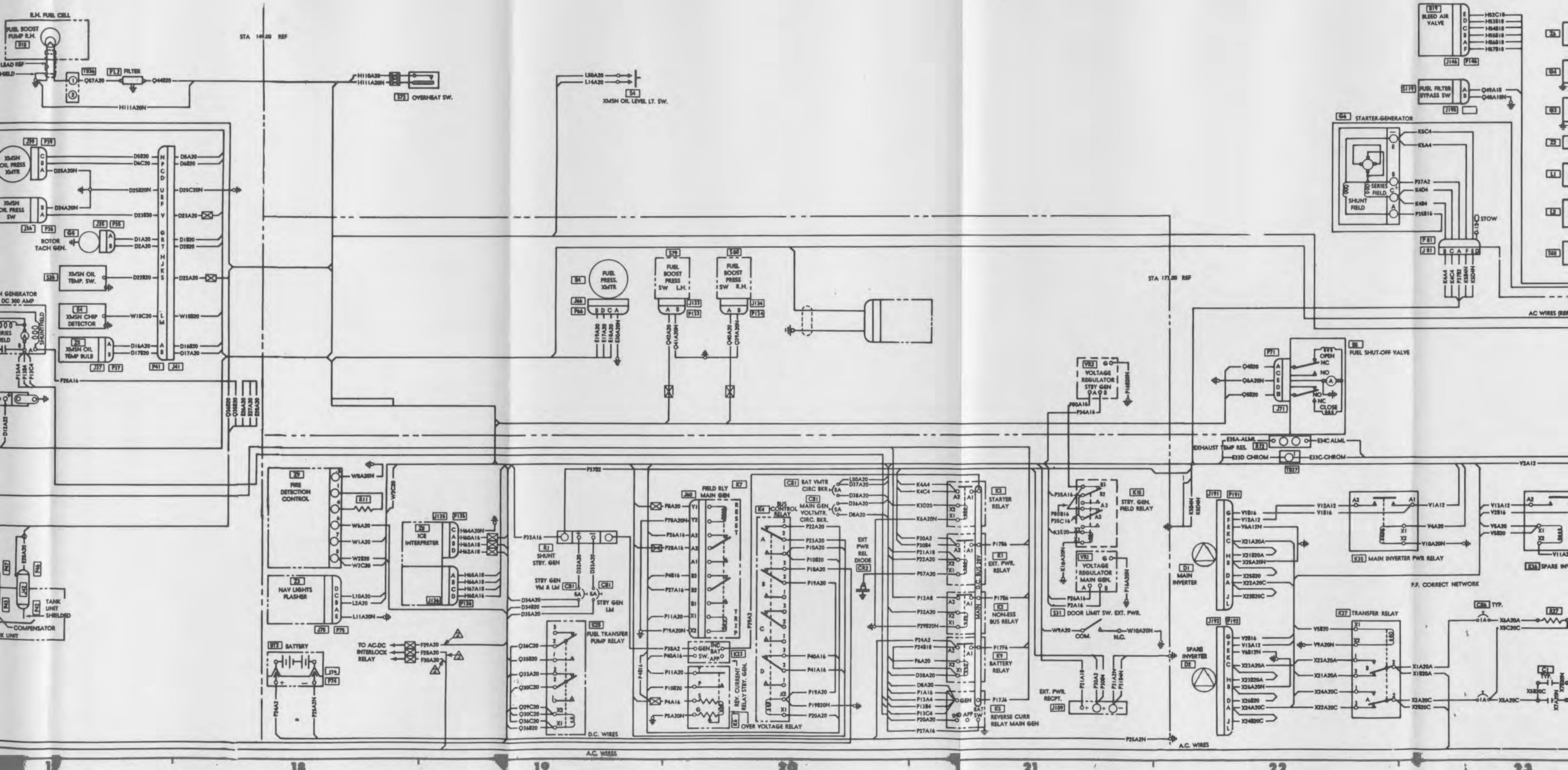


204475-152-1

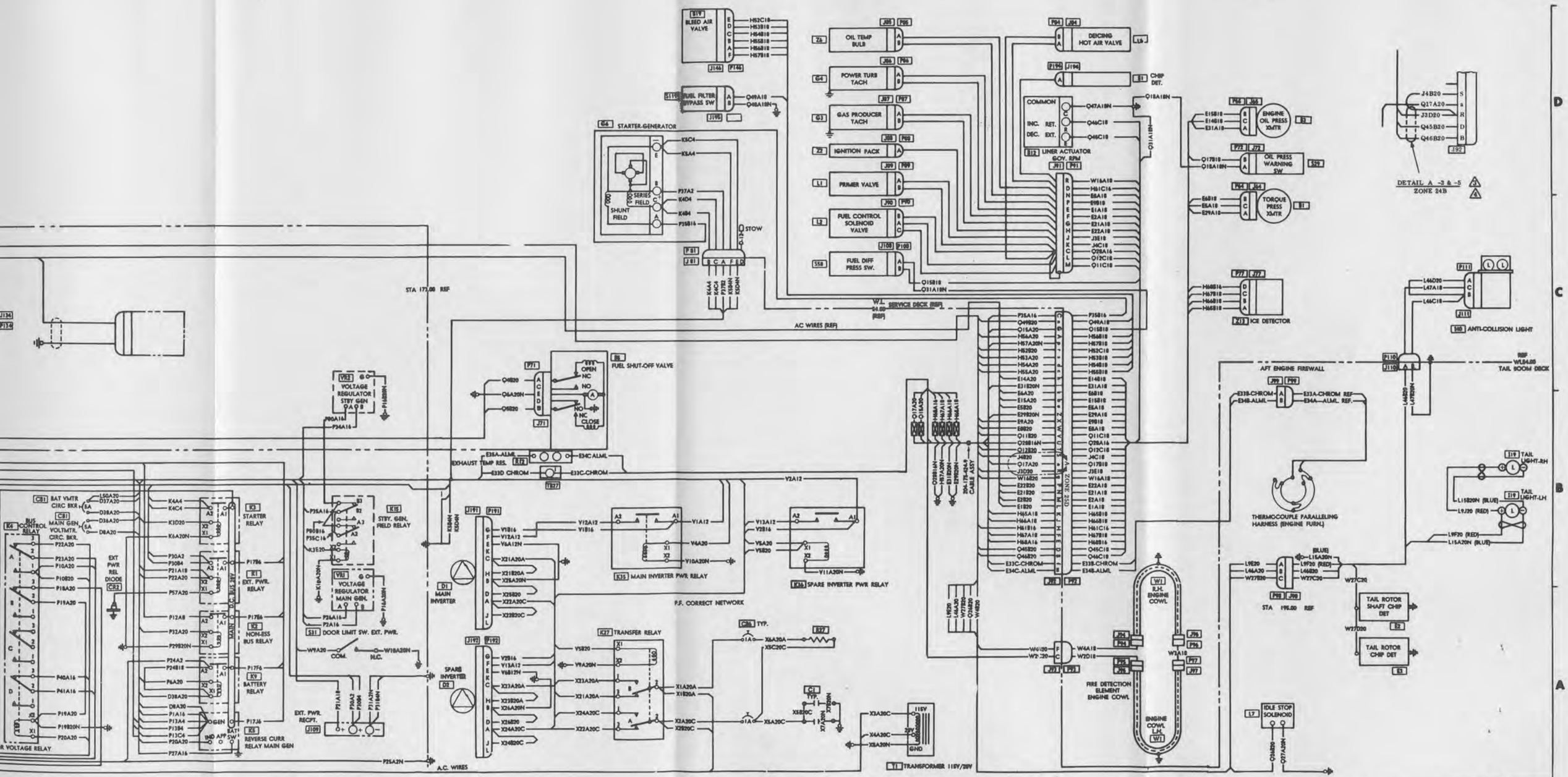
Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 1 of 6)



RESISTOR PANEL WINDSHIELD WIPER
AFT OUTLET VALVE ACTUATOR
R H FEEDER CABLES
R.H. EXT. FUEL
A.C. WIRES AFT
UPPER R.H. NAV. LT
UPPER R.H. FUS. LT.
DOME LT FWD
AFT DOME LTS
DOME LT. R.H. AFT
DIMMING RES. NAV. LTS.
RH DC WIRES -AFT
RH HEATED BLANKET RECEPTACLE
LH DC WIRES -AFT
LH HEATED BLANKET RECEPTACLE
BUS FEEDER CABLES
D.C. WIRES
DOME LT. L.H. AFT
UPPER L.H. FUS. LT.
UPPER L.H. NAV. LT
LH FEEDER CABLES
D.C. TRUNK
A.C. TRUNK
RESISTOR PANEL WINDSHIELD WIPER CONT. (L.H.)
L.H. EXT. FUEL
STA 123.00 REF
HYD SYS NO. 2 BYPASS SOL.
HYD SYS. NO. 2 PRESS. SW.
HYD SYS. NO. 1 BYPASS SOL.
HYD SYS. NO. 1 PRESS. SW.
R.H. FUEL CELL
FUEL BOOST PUMP R.H.
WHITE LEAD REF
SHIELD
FILTER
XMSN OIL LEVEL LT
CARGO HOOK
SAFETY SW
AUTO SW.
SLIP RING
CARGO HOOK RELEASE RELAY
XMSN OIL PRESS XMTR
XMSN OIL PRESS SW
ROTOR TACH GEN.
XMSN OIL TEMP. SW.
XMSN CHIP DETECTOR
XMSN OIL TEMP BULB
MAIN GENERATOR 28V DC 300 AMP
SERIES FIELD
SHUNT FIELD
SHUNT MAIN GEN.
L.H. FUEL CELL
FUEL BOOST PUMP L.H.
FUEL LOW LEVEL SW.
UPPER FLOAT SW.
LOWER FLOAT SW.
TANK UNIT UNSHIELDED
TANK UNIT SHIELDED
COMPENSATOR
TANK UNIT
WHITE LEAD REF
D.C. CONDUIT
A.C. CONDUIT
STA 149.00 REF
OVERHEAT SW.
XMSN OIL LEVEL LT. SW.
FIRE DETECTION CONTROL
NAV LIGHTS FLASHER
BATTERY
TO AC-DC INTERLOCK RELAY
ICE INTERPRETER
SHUNT STBY. GEN
STBY GEN VM & LM
STBY GEN LM
FUEL TRANSFER PUMP RELAY
FUEL PRESS. XMTR
FUEL BOOST PRESS SW
D.C. WIRES
A.C. WIRES
14
15
16
17
18
19

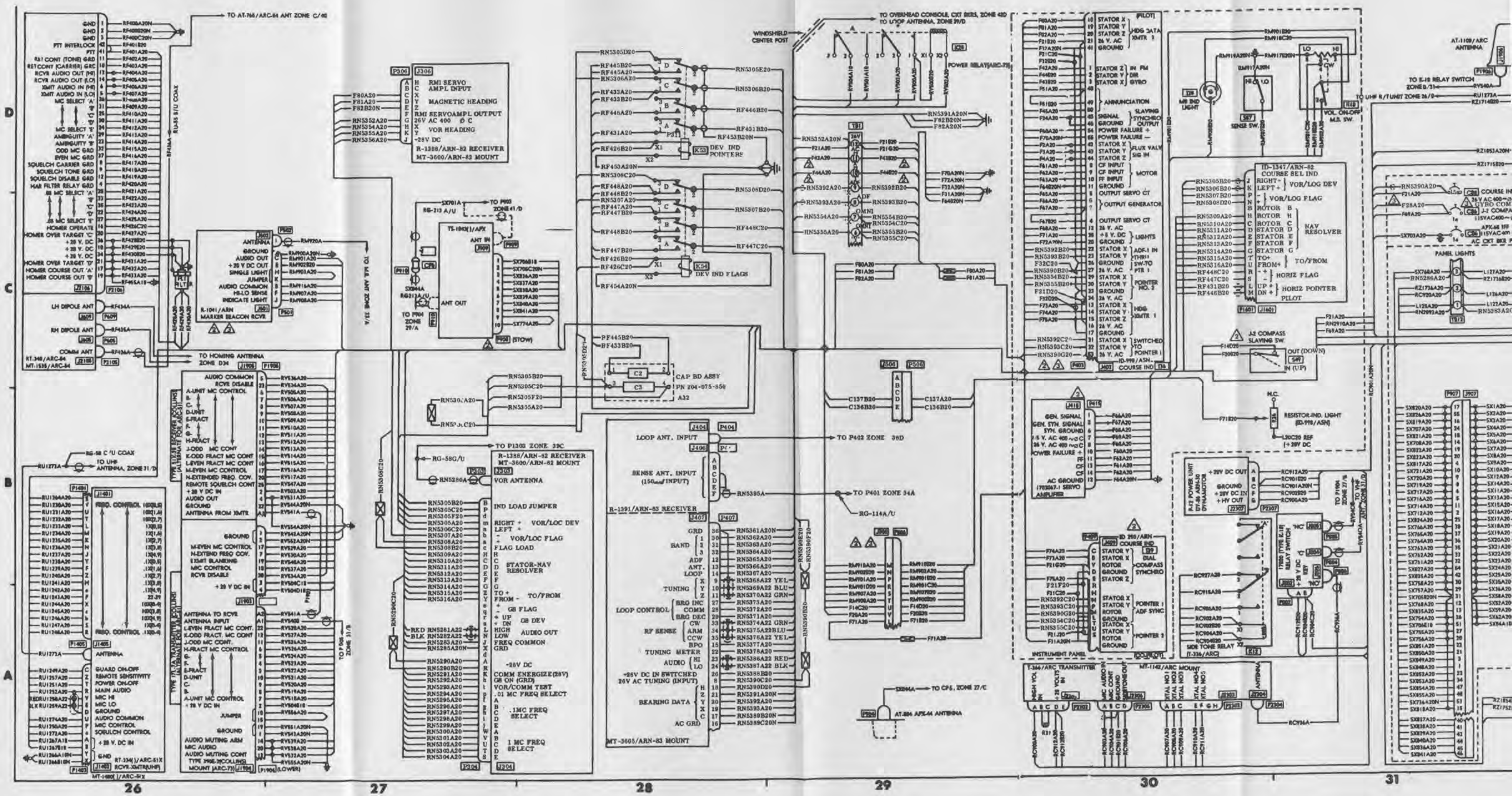


R.H. FUEL CELL
FUEL BOOST PUMP R.H.
FL2 FILTER
STA 149.00 REF
S73 OVERHEAT SW.
S4 XMSN OIL LEVEL LT. SW.
XMSN OIL PRESS XMTR
XMSN OIL PRESS SW
ROTOR TACH GEN.
XMSN OIL TEMP. SW.
XMSN CHIP DETECTOR
XMSN OIL TEMP BULB
GENERATOR DC 300 AMP
SERIES FIELD
SHUNT FIELD
TANK UNIT SHIELDED
COMPENSATOR
FUEL PRESS. XMTR
FUEL BOOST PRESS SW L.H.
FUEL BOOST PRESS SW R.H.
STA 173.00 REF
BLEED AIR VALVE
FUEL FILTER BYPASS SW
G4 STARTER-GENERATOR
STOW
AC WIRES
VOLTAGE REGULATOR STBY GEN
FUEL SHUT-OFF VALVE
OPEN
CLOSE
EXHAUST TEMP RES.
FIRE DETECTION CONTROL
ICE INTERPRETER
NAV LIGHTS FLASHER
BATTERY
TO AC-DC INTERLOCK RELAY
R1 SHUNT STBY. GEN
STBY GEN VM & LM
STBY GEN LM
FUEL TRANSFER PUMP RELAY
FIELD RLY MAIN GEN
RESET
TRIP
IND BAT APP
REV. CURRENT RELAY STBY. GEN.
OVER VOLTAGE RELAY
BUS CONTROL RELAY
BAT VMTR CIRC BKR
MAIN GEN VOLTMTR. CIRC. BKR.
EXT PWR REL DIODE
STARTER RELAY
EXT. PWR. RELAY
NON-ESS BUS RELAY
BATTERY RELAY
MAIN D.C. BUS 28V
REVERSE CURR RELAY MAIN GEN
STBY. GEN. FIELD RELAY
VOLTAGE REGULATOR MAIN GEN.
S31 DOOR LIMIT SW. EXT. PWR.
EXT. PWR. RECPT.
MAIN INVERTER
SPARE INVERTER
MAIN INVERTER PWR RELAY
SPARE INV
P.F. CORRECT NETWORK
K27 TRANSFER RELAY
D.C. WIRES
A.C. WIRES
18
19
20
21
22
23

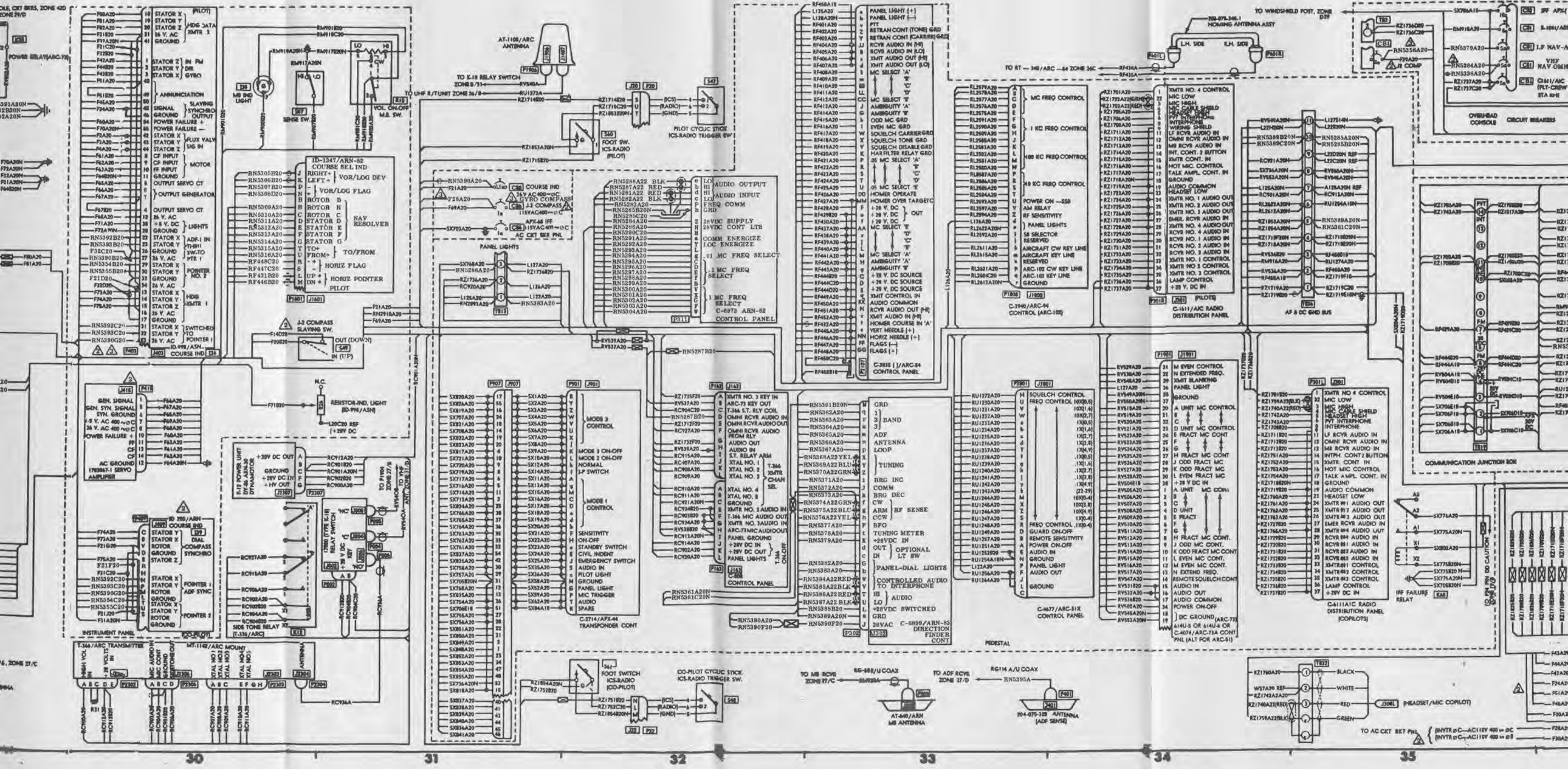


204475-152-2

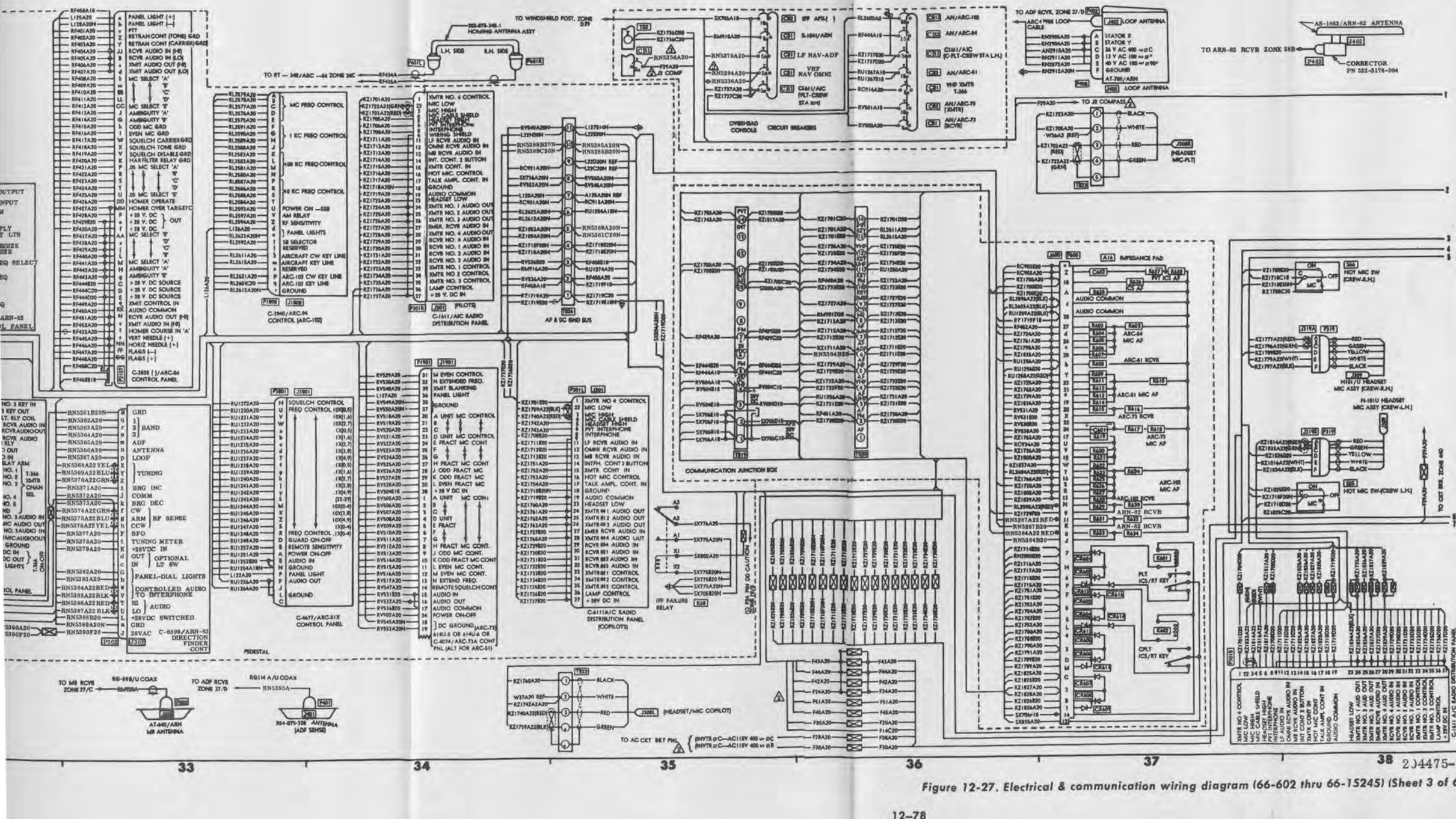
Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 2 of 6)



TO AT-768/ARC-84 ANT ZONE C/40
RU-55 B/U COAX
RT-348/ARC-84
MT-1536/ARC-84
LH DIPOLE ANT
RH DIPOLE ANT
COMM ANT
TO HOMING ANTENNA ZONE D34
R-1041/ARN MARKER BEACON RCVR
TO M.B. ANT ZONE 33/A
RMI SERVO AMPL INPUT
MAGNETIC HEADING
RMI SERVOAMPL OUTPUT
26V AC 400 Ø C
VOR HEADING
+28V DC
R-1388/ARN-82 RECEIVER
MT-3600/ARN-82 MOUNT
TS-1843( )/APX
ANT OUT
DEV IND POINTERS
DEV IND FLAGS
CAP BD ASSY
PN 204-075-850
A32
WINDSHIELD CENTER POST
TO OVERHEAD CONSOLE, CKT BKRS, ZONE 42D
TO LOOP ANTENNA, ZONE 29/D
POWER RELAY(ARC-73)
ID-998/ASN- COURSE IND
HDG DATA XMTR 2
IN FM DIR GYRO
ANNUNCIATION
SLAVING SYNCHRO OUTPUT
FLUX VALV SIG IN
MOTOR
OUTPUT GENERATOR
LIGHTS
ADF-1 IN THRU SW-TO PTR 1
POINTER NO. 2
HDG XMTR 1
SWITCHED TO POINTER 1
MB IND LIGHT
SENSE SW.
VOL. ON-OFF M.B. SW.
ID-1347/ARN-82 COURSE SEL IND
VOR/LOG DEV
VOR/LOG FLAG
NAV RESOLVER
TO/FROM
HORIZ FLAG
HORIZ POINTER
PILOT
J-2 COMPASS SLAVING SW.
OUT (DOWN)
IN (UP)
AT-1108/ARC ANTENNA
TO K-18 RELAY SWITCH ZONE B/31
TO UHF R/T UNIT ZONE 26/D
PANEL LIGHTS
TYPE 51X-2B RECEIVER (COLLINS) (ALTERNATE FOR ARC-51)
TYPE 17L-7A TRANSMITTER (COLLINS) (ALTERNATE FOR ARC-51)
TYPE 390E-2(COLLINS) MOUNT (ARC-73)
RT-334( )/ARC-51X RCVR-XMTR(UHF)
MT-1480( )/ARC-51X
TO UHF ANTENNA, ZONE 31/D
RG-58 C/U COAX
TO P1303 ZONE 39C
VOR ANTENNA
IND LOAD JUMPER
VOR/LOC DEV
VOR/LOC FLAG
FLAG LOAD
STATOR-NAV RESOLVER
GS FLAG
GS DEV
AUDIO OUT
FREQ COMMON
COMM ENERGIZE(28V)
GS ON (GRD)
VOR/COMM TEST
.01 MC FREQ SELECT
.1MC FREQ SELECT
1 MC FREQ SELECT
LOOP ANT. INPUT
TO P402 ZONE 38D
SENSE ANT. INPUT
TO P401 ZONE 34A
RG-114A/U
R-1391/ARN-83 RECEIVER
MT-3605/ARN-83 MOUNT
LOOP CONTROL
RF SENSE
TUNING METER
BEARING DATA
+28V DC IN SWITCHED
26V AC TUNING (INPUT)
TO CP5, ZONE 27/C
AT-884 APX-44 ANTENNA
1703067-1 SERVO AMPLIFIER
ID 250/ARN COURSE IND
DIAL COMPASS SYNCHRO
POINTER 1 ADF SYNC
POINTER 2
INSTRUMENT PANEL
RESISTOR-IND. LIGHT (ID-998/ASN)
PE-12 POWER UNIT DY-86 ARN-30 DYNAMOTOR
SIDE TONE RELAY (T-336/ARC)
K-18 RELAY SWITCH
T-366/ARC TRANSMITTER
MT-1142/ARC MOUNT
26
27
28
29
30
31
D
C
B
A

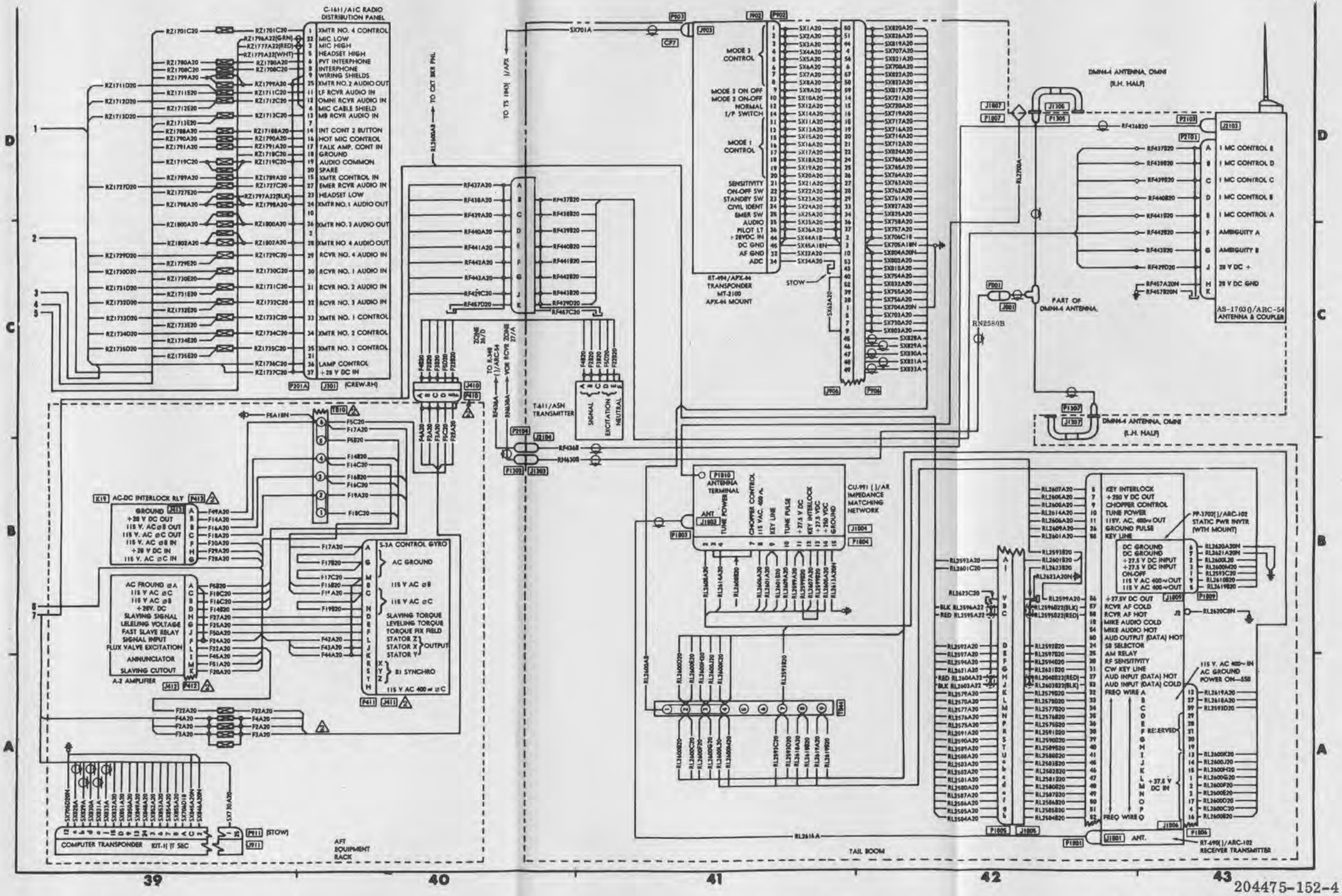


AT-1108/ARC ANTENNA
TO K-18 RELAY SWITCH ZONE B/31
TO UHF R/T UNIT ZONE 36/B
HDG DATA XMTR 2
DIR GYRO
ANNUNCIATION
SLAVING SYNCHRO OUTPUT
FLUX VALVE SIG IN
MOTOR
OUTPUT GENERATOR
LIGHTS
ADF-1 IN THRU SW-TO PTR 1
POINTER NO. 2
HDG XMTR 1
SWITCHED TO POINTER 1
ID-998/ASN COURSE IND
MB IND LIGHT
SENSE SW.
VOL. ON-OFF M.B. SW.
ID-1347/ARN-82 COURSE SEL IND
VOR/LOG DEV
VOR/LOG FLAG
NAV RESOLVER
TO/FROM
HORIZ FLAG
HORIZ POINTER
PILOT
J-2 COMPASS SLAVING SW.
OUT (DOWN)
IN (UP)
1783067-1 SERVO AMPLIFIER
RESISTOR-IND. LIGHT (ID-998/ASN)
P-12 POWER UNIT DY-86 ARN-30 DYNAMOTOR
17880 (TYPE K-18) RELAY SWITCH
ID 250/ARN COURSE IND
DIAL COMPASS SYNCHRO
POINTER 1 ADF SYNC
POINTER 2
INSTRUMENT PANEL
CO-PILOT
SIDE TONE RELAY (T-336/ARC)
T-366/ARC TRANSMITTER
MT-1142/ARC MOUNT
FOOT SW. ICS-RADIO (PILOT)
PILOT CYCLIC STICK ICS-RADIO TRIGGER SW
COURSE IND
GYRO COMPASS
J-2 COMPASS
APX-44 IFF
AC CKT BKR PNL
PANEL LIGHTS
C-6873 ARN-82 CONTROL PANEL
C-3835 ( )/ARC-54 CONTROL PANEL
C-2714/APX-44 TRANSPONDER CONT
C-808 CONTROL PANEL
C-6899/ARN-83 DIRECTION FINDER CONT
C-3940/ARC-94 CONTROL (ARC-102)
C-4677/ARC-51X CONTROL PANEL
C-1611/AIC RADIO DISTRIBUTION PANEL (PILOTS)
C-6111AIC RADIO DISTRIBUTION PANEL (COPILOTS)
614U-5 OR 614U-6 OR C-4074/ARC-73A CONT PNL (ALT FOR ARC-51)
AF & DC GND BUS
PEDESTAL
FOOT SWITCH ICS-RADIO (CO-PILOT)
CO-PILOT CYCLIC STICK ICS-RADIO TRIGGER SW.
TO MB RCVR ZONE 27/C
RG-58B/U COAX
AT-640/ARN MB ANTENNA
TO ADF RCVR ZONE 27/D
RG114 A/U COAX
204-075-329 ANTENNA (ADF SENSE)
TO WINDSHIELD POST, ZONE D29
209-075-346-1 HOMING ANTENNA ASSY
L.H. SIDE
R.H. SIDE
TO RT — 340/ARC — 54 ZONE 26C
OVERHEAD CONSOLE
CIRCUIT BREAKERS
COMMUNICATION JUNCTION BOX
IFF FAILURE RELAY
(HEADSET/MIC COPILOT)
TO AC CKT BKT PNL
30
31
32
33
34
35



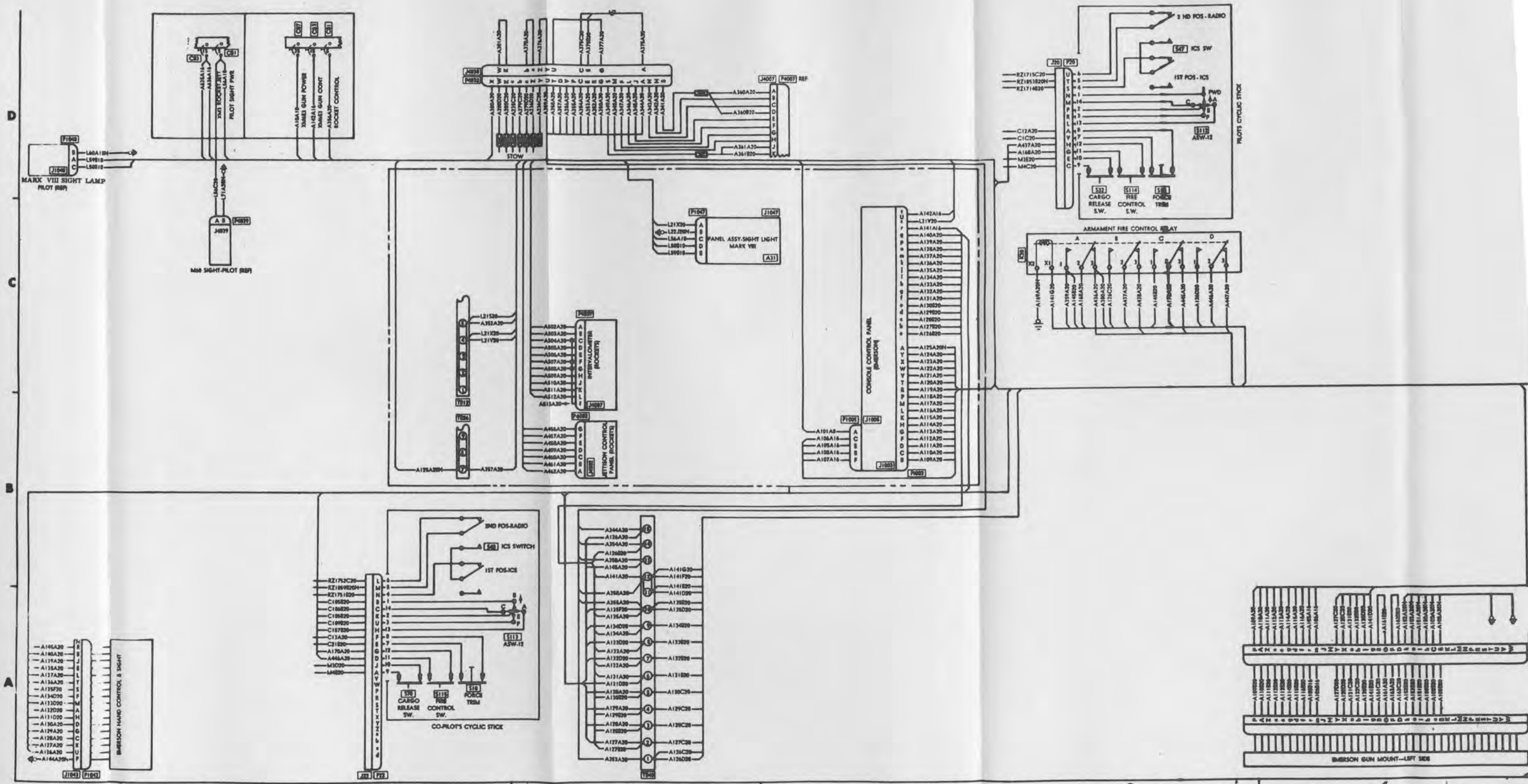
2J4475-152-3

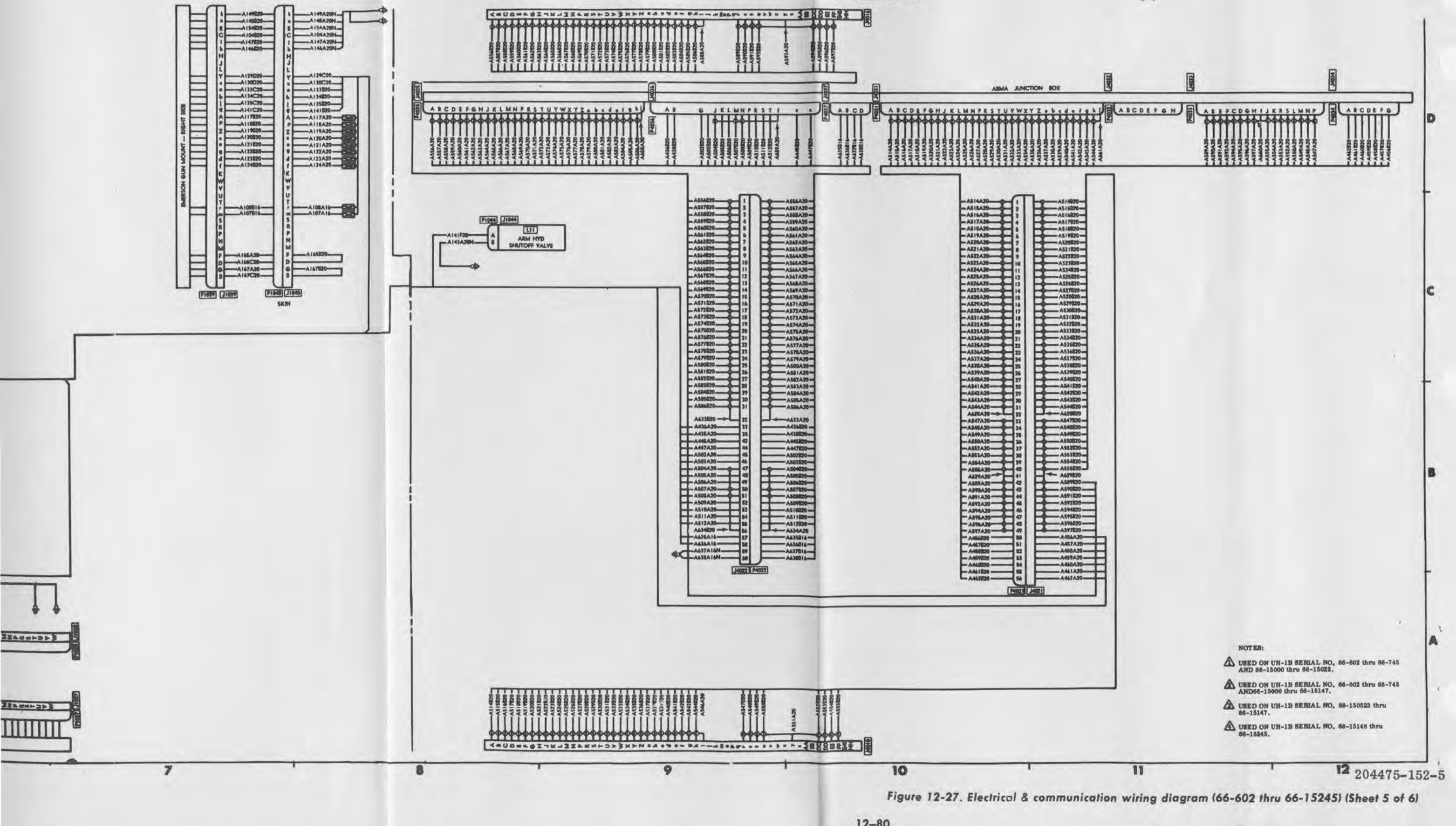
Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 3 of 6)



204475-152-4

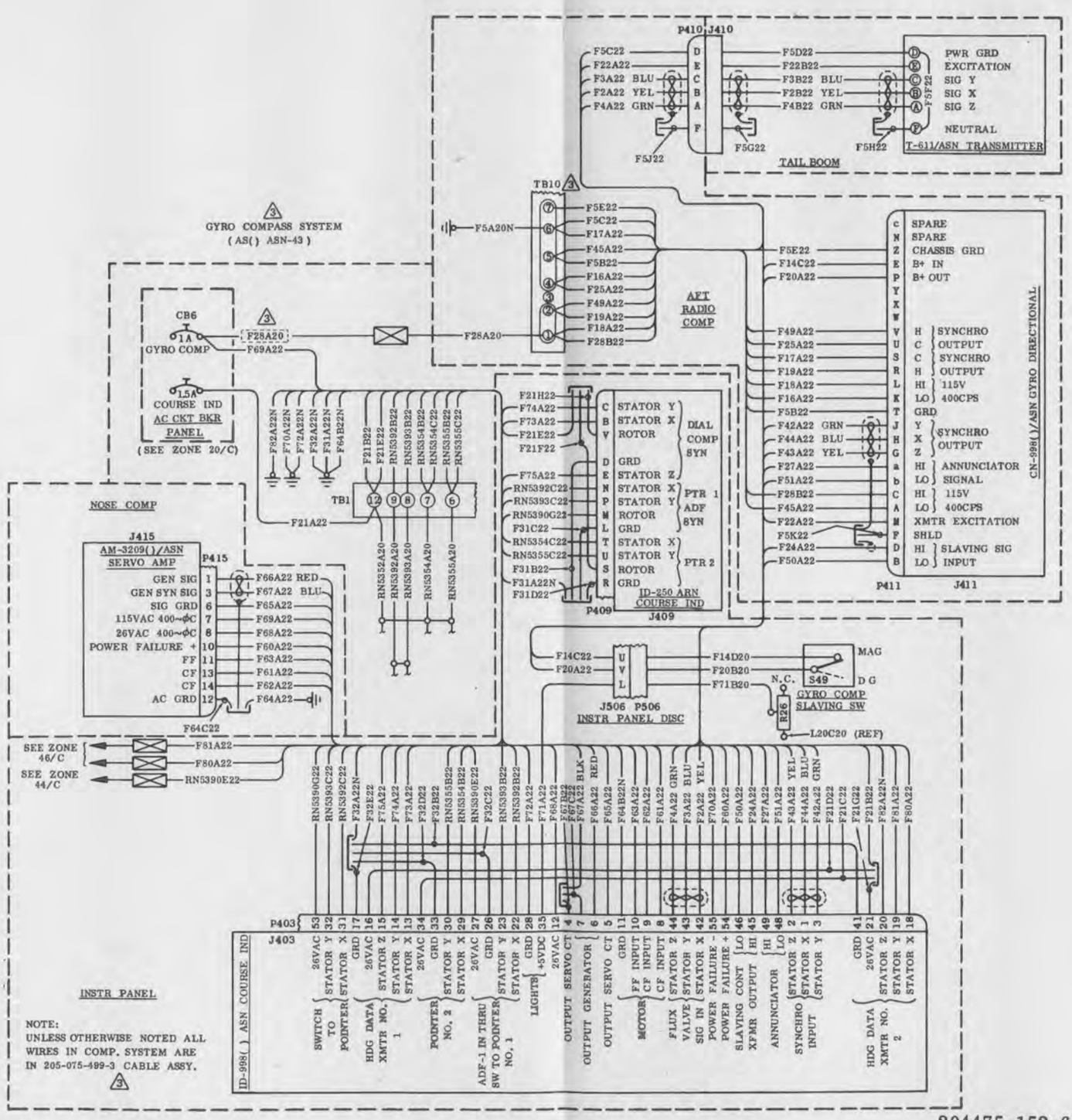
Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 4 of 6)


MARK VIII SIGHT LAMP
PILOT (RSP)
M60 SIGHT-PILOT (RSP)
PILOT SIGHT PWR
XM43 ROCKET JETT
XM43 GUN POWER
XM43 GUN CONT
ROCKET CONTROL
STOW
PANEL ASSY-SIGHT LIGHT MARK VIII
A31
INTERVALOMETER (ROCKETS)
SUBTRACTION CONTROL PANEL (ROCKETS)
CONSOLE CONTROL PANEL (EMERSON)
2 ND POS - RADIO
ICS SW
1ST POS - ICS
PILOTS CYCLIC STICK
ARMAMENT FIRE CONTROL RELAY
CARGO RELEASE S.W.
FIRE CONTROL S.W.
FORCE TRIM
ASW-12
EMERSON HAND CONTROL & SIGHT
CO-PILOT'S CYCLIC STICK
EMERSON GUN MOUNT—LEFT SIDE



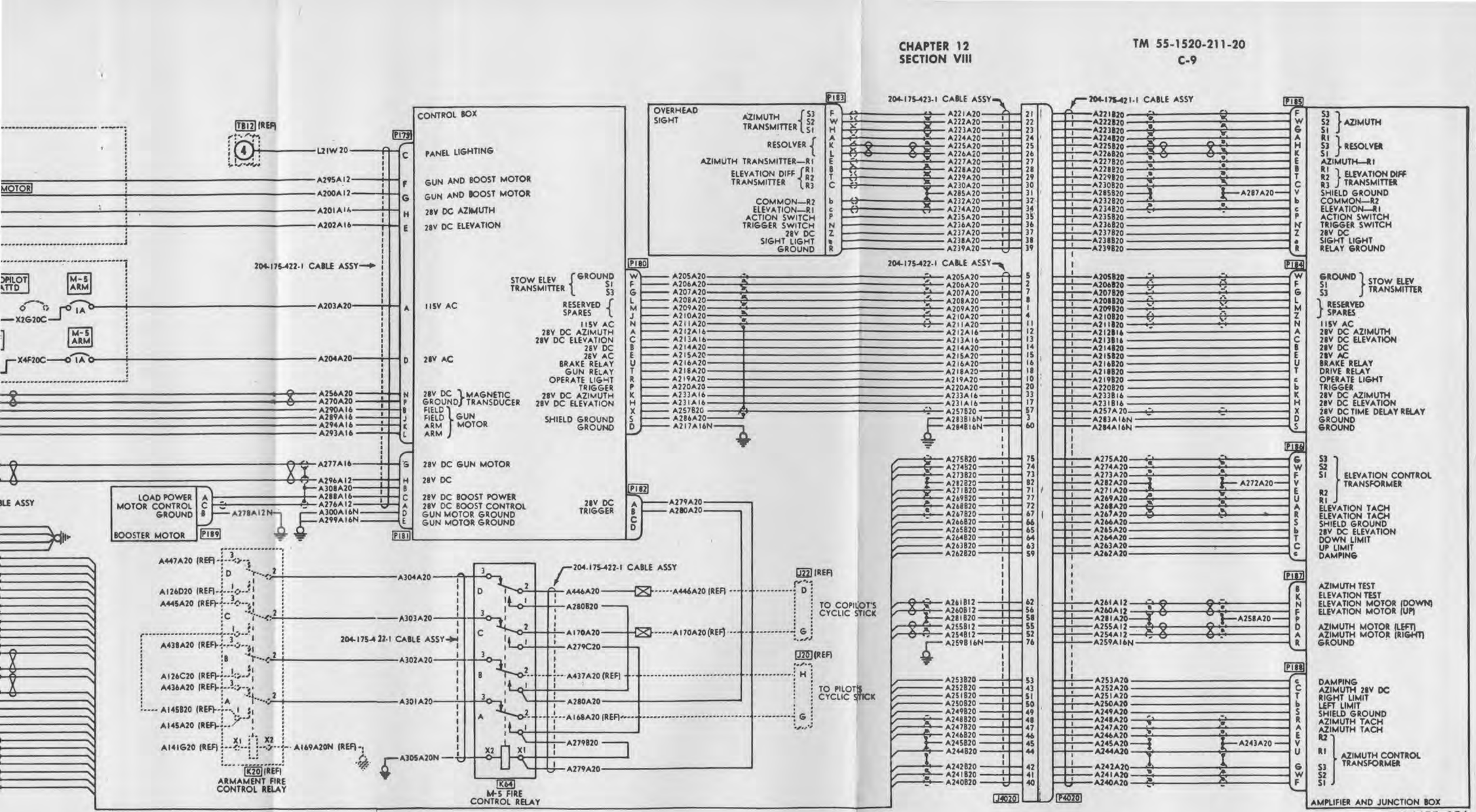
204475-152-5

Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 5 of 6)



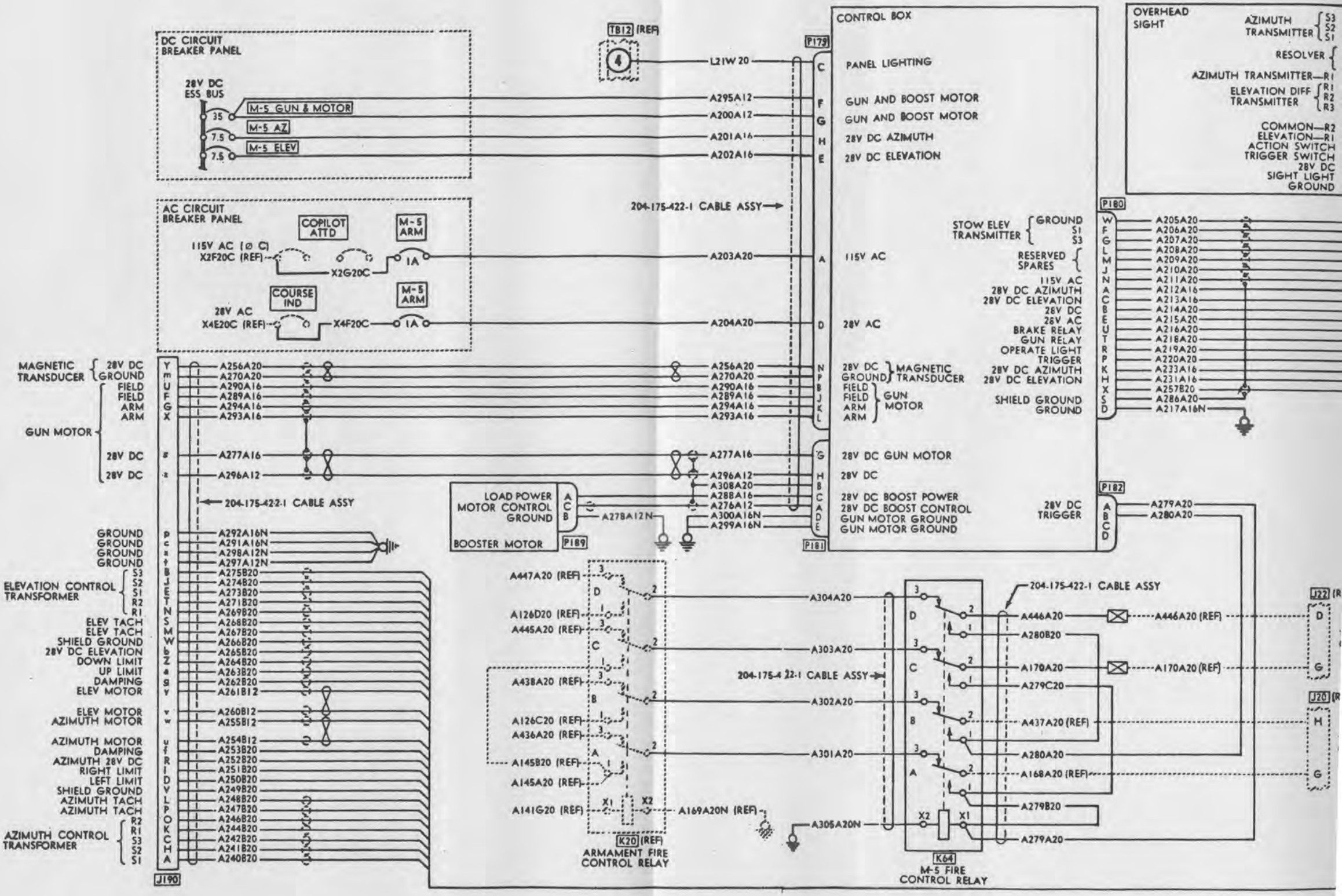
204475-152-6

Figure 12-27. Electrical & communication wiring diagram (66-602 thru 66-15245) (Sheet 6 of 6)



204475-154

Figure 12-28. M-5 grenade launcher wiring diagram (UH-1B Serial No. 63-8500 thru 63-13089 and 64-13902 thru 64-14191)


DC CIRCUIT BREAKER PANEL
28V DC ESS BUS
35
M-5 GUN & MOTOR
7.5
M-5 AZ
7.5
M-5 ELEV
AC CIRCUIT BREAKER PANEL
COPILOT ATTD
M-5 ARM
115V AC (Ø C)
X2F20C (REF)
X2G20C
1A
COURSE IND
M-5 ARM
28V AC
X4E20C (REF)
X4F20C
1A
TB12 (REF)
4
L21W20
P179
C
A295A12
F
A200A12
G
A201A16
H
A202A16
E
204-175-422-1 CABLE ASSY
A203A20
A
A204A20
D
CONTROL BOX
PANEL LIGHTING
GUN AND BOOST MOTOR
GUN AND BOOST MOTOR
28V DC AZIMUTH
28V DC ELEVATION
115V AC
28V AC
28V DC GROUND } MAGNETIC TRANSDUCER
FIELD FIELD ARM ARM } GUN MOTOR
28V DC GUN MOTOR
28V DC
28V DC BOOST POWER
28V DC BOOST CONTROL
GUN MOTOR GROUND
GUN MOTOR GROUND
OVERHEAD SIGHT
AZIMUTH TRANSMITTER { S3 S2 S1
RESOLVER {
AZIMUTH TRANSMITTER—R1
ELEVATION DIFF TRANSMITTER { R1 R2 R3
COMMON—R2
ELEVATION—R1
ACTION SWITCH
TRIGGER SWITCH
28V DC
SIGHT LIGHT GROUND
P180
STOW ELEV TRANSMITTER { GROUND S1 S3
RESERVED SPARES {
115V AC
28V DC AZIMUTH
28V DC ELEVATION
28V DC
28V AC
BRAKE RELAY
GUN RELAY
OPERATE LIGHT
TRIGGER
28V DC AZIMUTH
28V DC ELEVATION
SHIELD GROUND
GROUND
A205A20
A206A20
A207A20
A208A20
A209A20
A210A20
A211A20
A212A16
A213A16
A214A20
A215A20
A216A20
A218A20
A219A20
A220A20
A233A16
A231A16
A257B20
A286A20
A217A16N
MAGNETIC TRANSDUCER { 28V DC GROUND
GUN MOTOR { FIELD FIELD ARM ARM
28V DC
28V DC
A256A20
A270A20
A290A16
A289A16
A294A16
A293A16
A277A16
A296A12
204-175-422-1 CABLE ASSY
A256A20
A270A20
A290A16
A289A16
A294A16
A293A16
A277A16
A296A12
A308A20
A288A16
A276A12
A300A16N
A299A16N
LOAD POWER MOTOR CONTROL GROUND
BOOSTER MOTOR
P189
A278A12N
P181
P182
28V DC TRIGGER
A279A20
A280A20
GROUND
GROUND
GROUND
GROUND
A292A16N
A291A16N
A298A12N
A297A12N
ELEVATION CONTROL TRANSFORMER { S3 S2 S1 R2 R1
A275B20
A274B20
A273B20
A271B20
A269B20
ELEV TACH
ELEV TACH
SHIELD GROUND
28V DC ELEVATION
DOWN LIMIT
UP LIMIT
DAMPING
ELEV MOTOR
A268B20
A267B20
A266B20
A265B20
A264B20
A263B20
A262B20
A261B12
ELEV MOTOR
AZIMUTH MOTOR
A260B12
A255B12
AZIMUTH MOTOR
DAMPING
AZIMUTH 28V DC
RIGHT LIMIT
LEFT LIMIT
SHIELD GROUND
AZIMUTH TACH
AZIMUTH TACH
A254B12
A253B20
A252B20
A251B20
A250B20
A249B20
A248B20
A247B20
AZIMUTH CONTROL TRANSFORMER { R2 R1 S3 S2 S1
A246B20
A244B20
A242B20
A241B20
A240B20
J190
A447A20 (REF)
D
A126D20 (REF)
A445A20 (REF)
C
A438A20 (REF)
B
A126C20 (REF)
A436A20 (REF)
A
A145B20 (REF)
A145A20 (REF)
A141G20 (REF)
X1
X2
A169A20N (REF)
K20 (REF)
ARMAMENT FIRE CONTROL RELAY
A304A20
A303A20
A302A20
A301A20
A305A20N
204-175-422-1 CABLE ASSY
204-175-422-1 CABLE ASSY
A446A20
A280B20
A170A20
A279C20
A437A20 (REF)
A280A20
A168A20 (REF)
A279B20
A279A20
A446A20 (REF)
A170A20 (REF)
J22 (R
D
G
J20 (R
H
G
K64
M-5 FIRE CONTROL RELAY

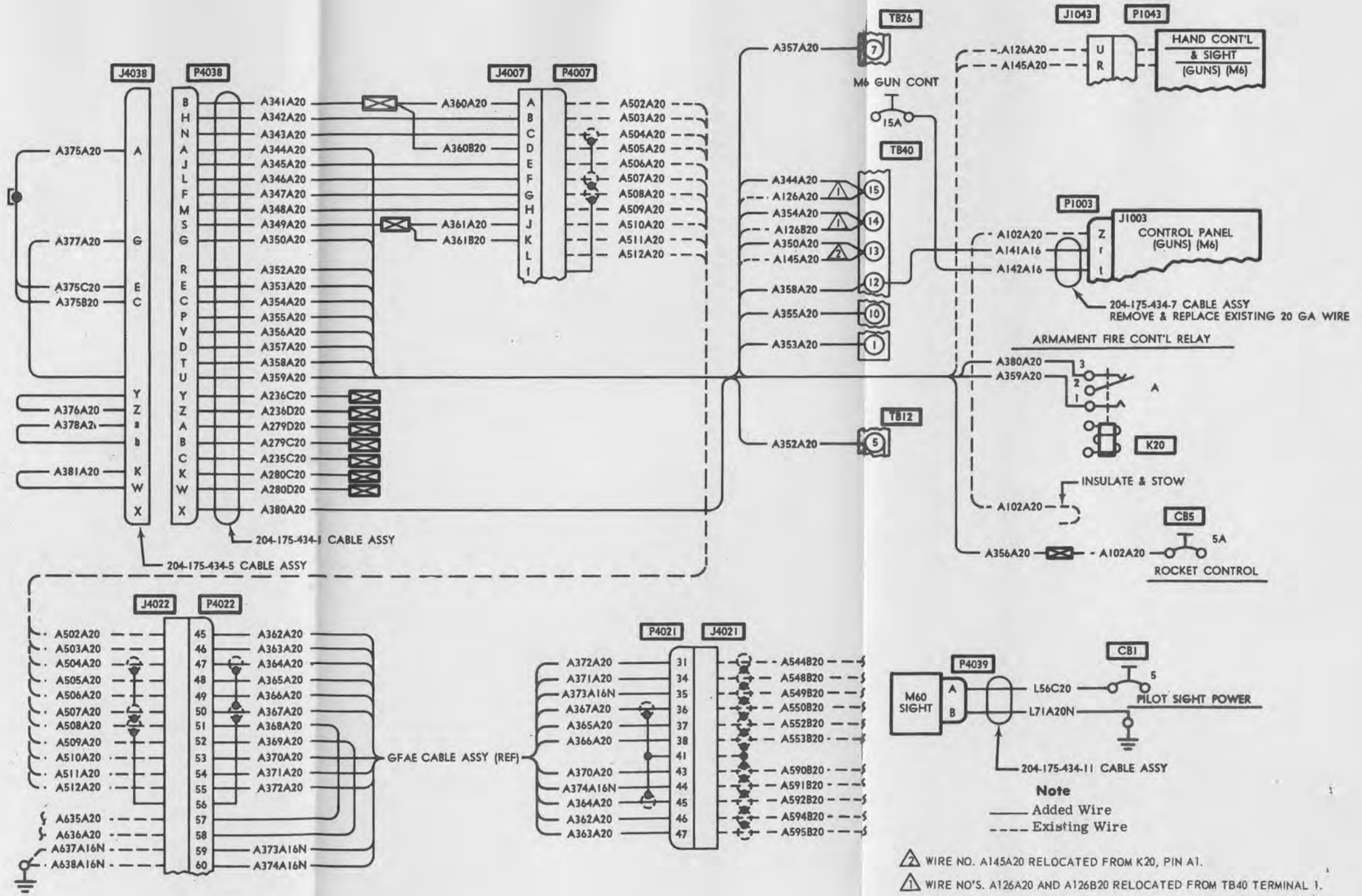
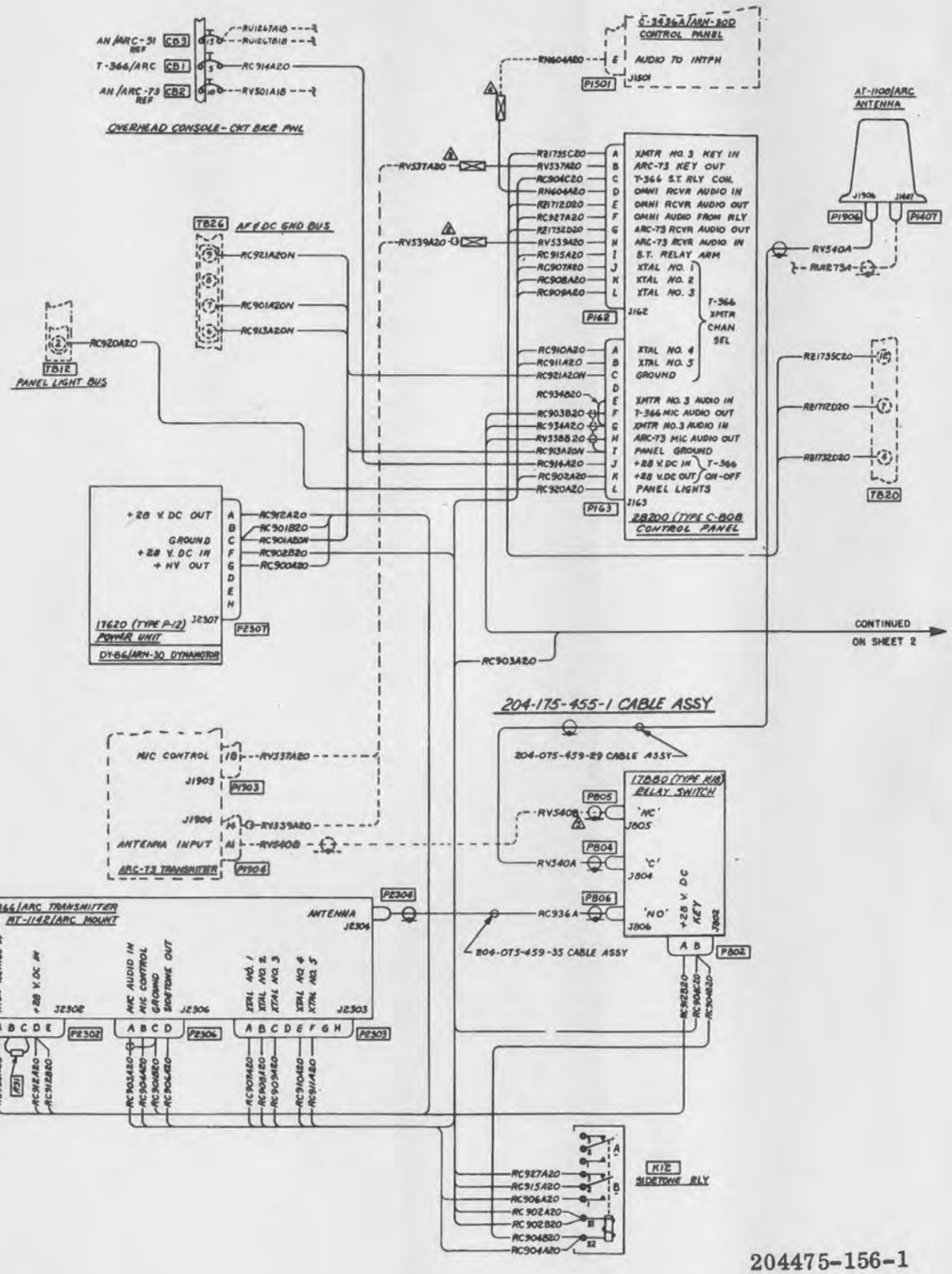
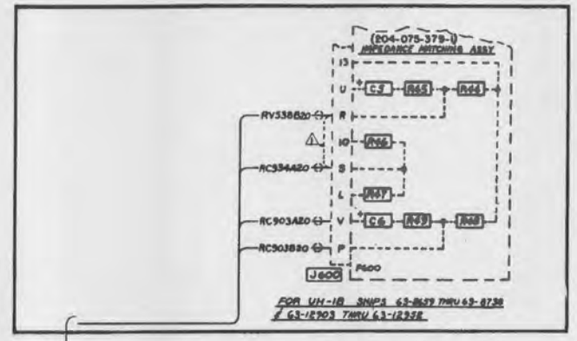


Figure 12-29. XM-16 modification kit wiring diagram



204475-156-1

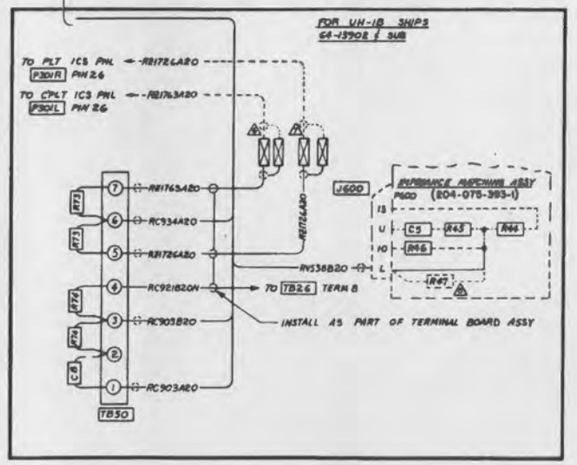
Figure 12-30. T366 VHF radio wiring diagram — UH-1B (Sheet 1 of 2)



CONTINUED FROM SHEET 1

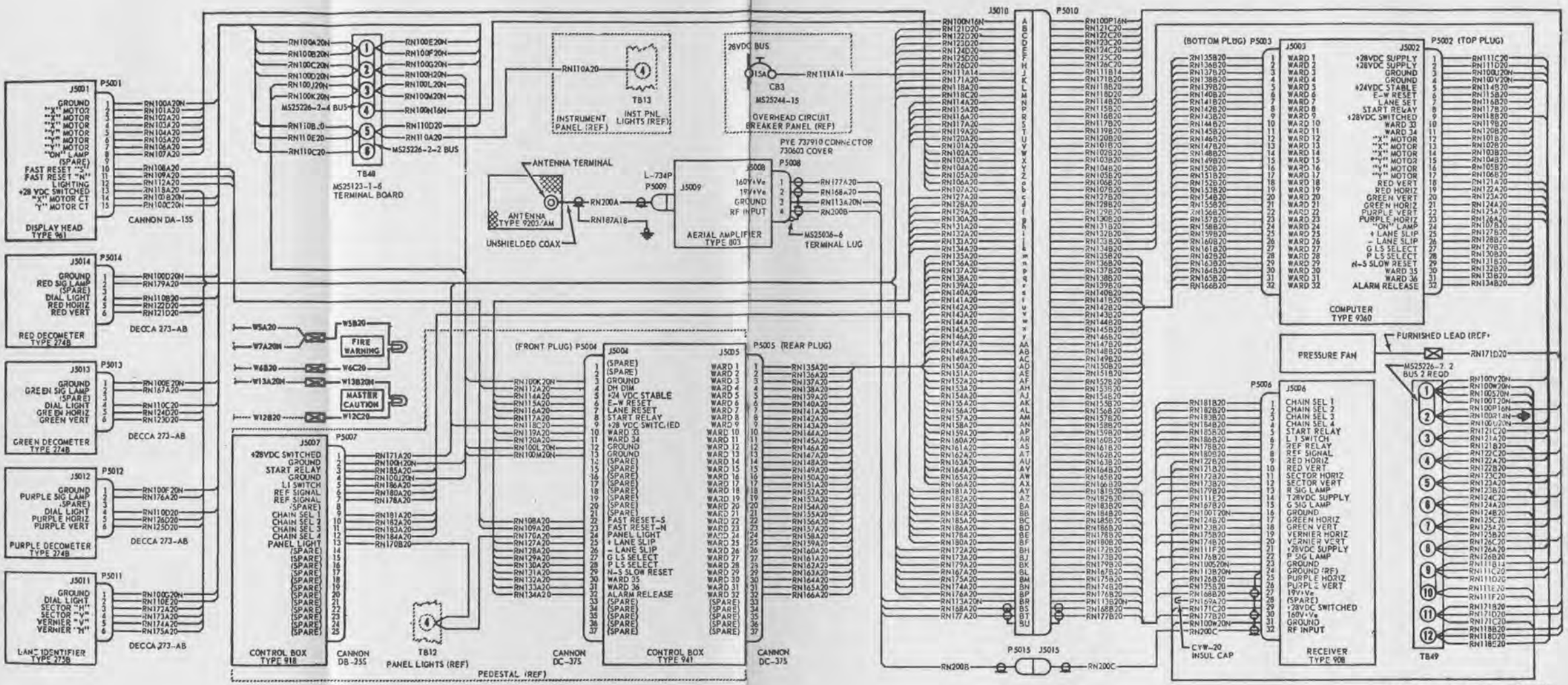
1. DASHED LINES INDICATE EXISTING AIRCRAFT EQUIPMENT.
⚠ REMOVE AND DISCARD R47. ADD JUMPER AS SHOWN
⚠ RELOCATED FROM J600 PIN 'J0'
⚠ RELOCATED FROM J600 PIN 'L'
⚠ RELOCATED FROM AT-1108/ARC ANTENNA
⚠ RELOCATED FROM TB20 TERM. 7
⚠ RELOCATED FROM TB20 TERM. 12
⚠ RELOCATED FROM TB20 TERM. 4
⚠ REMOVE AND DISCARD JUMPER BETWEEN PINS 'R' & 'S'

NOTES:



204475-156-2

Figure 12-30. T366 VHF radio wiring diagram — UH-1B (Sheet 2 of 2)



TM1520-211-20-79

Figure 12-31. Decca 8 wiring diagram — UH-1B

b. Position pilot sight (10) against support assembly and install attaching bolts and nuts.

14-1. Armament Junction Box. (See figure 14-4.) The junction box for the 2.75 XM3 Fixed Rocket installation connects to electrical connector at center of pylon in cabin and contains the circuitry necessary for firing the rockets and for jettisoning the two pod assemblies. It also contains a RESET button which cycles the stepping switch to zero and a zero indicator light which illuminates when stepping switch is in zero position.

14-42. ***Removal — Armament Junction Box.*** a. Make sure that the helicopter master battery switch is in the "OFF" position and that external power is disconnected.

b. Disconnect electrical connectors from junction box and cap or cover to prevent entrance of foreign material.

c. Remove six bolts and washers attaching junction box to shelf assembly and remove junction box from helicopter.

14-43. ***Installation — Armament Junction Box.*** a. Position junction box in helicopter and install six attaching washers and bolts.

b. Uncap or uncover electrical connectors and connect to junction box.

14-43A. 40 Millimeter Grenade Launcher M5. (Refer to Chapter 12 for electrical wiring diagram.) UH-1B Helicopters Serial No. 63-8500 through 63-13089 and 64-13902 through 64-14191 may be modified to accept the 40 millimeter grenade helicopter armament subsystem. This system consists of the 40 millimeter grenade launcher and grenade launcher mount. (Refer to TM 55-1520-211-10 for further information.)

Note

The M-16 provisions kit may be used in conjunction with 40 millimeter grenade launcher M5. (Refer to Chapter 12 for electrical wiring diagram.)

Section VI — Missiles

14-44. SS-11 Missile Installation. (See figure 14-5.) The SS-11 anti-tank missile system installation is designed for use on Model UH-1B helicopters, Serial Nos. 61-720 through 61-735 and converts those helicopters from passenger, cargo carrying vehicles to attack and assault weapons. The system contains six SS-11 missiles (1), launchers (2), and pylons (3), attached to boom assemblies which protrude from the helicopter fuselage. Each boom assembly is equipped with three missiles, launchers and pylons. The inboard end of each boom assembly is contained in a mechanical jettison device (5), which is attached to an external stores support assembly (6). A gunner sight assembly (7) is provided for maintenance of visual contact with the missile during flight. The gunner control stick assembly (8) is mounted on the forward side of the gunner sight pedestal. The pilot sight assembly (9) acts as a visual aid to maintain proper alignment of the helicopter with the target. A command box (10), located at the lower, left-hand forward corner of the center console, contains the controls necessary for operation of the SS-11 missile system. Switches on the command box enable the gunner to jettison individual missiles and launchers; simultaneously jettison all missiles and launchers, or jettison the junction box and missile guidance wires after a missile has been fired. Manual emergency jettison controls (11) enable the pilot to mechanically jettison both boom assemblies simultaneously. The pilot also has available an electrical, total jettison control which is located on the center console panel. This control jettisons all launchers simultaneously, but leaves the boom assemblies attached to the helicopter. The selector box (12) and signal generator (13), located in the helicopter baggage compartment, act in conjunction with the gunner control stick and the command box.

14-45. SS-11 Missile. (See figure 14-5.) The SS-11 missile is a self-propelled, autorotating remote-controlled missile for use against surface targets. The missile consists of a streamlined body fitted with four equally spaced fins. These fins are set at an angle of one degree to the center line in order to provide autorotation about the roll axis. The missile is propelled by a two-stage solid-propellant rocket motor, comprising a booster and a sustainer stage. The missile is guided by remote control. Command signals, produced by a control stick, are transmitted by a signal generator for control of the pitch and yaw relays in the missile. The command signals are fed to the missile through two guidance wires, which unwind from bobbins in the missile during flight. The pitch and yaw relays in the missile actuate jettavators in the jet stream of the sustainer motor to provide guidance control during flight.

14-46. ***Removal — SS-11 Missile.*** (See figure 14-5.) Remove missiles as follows:

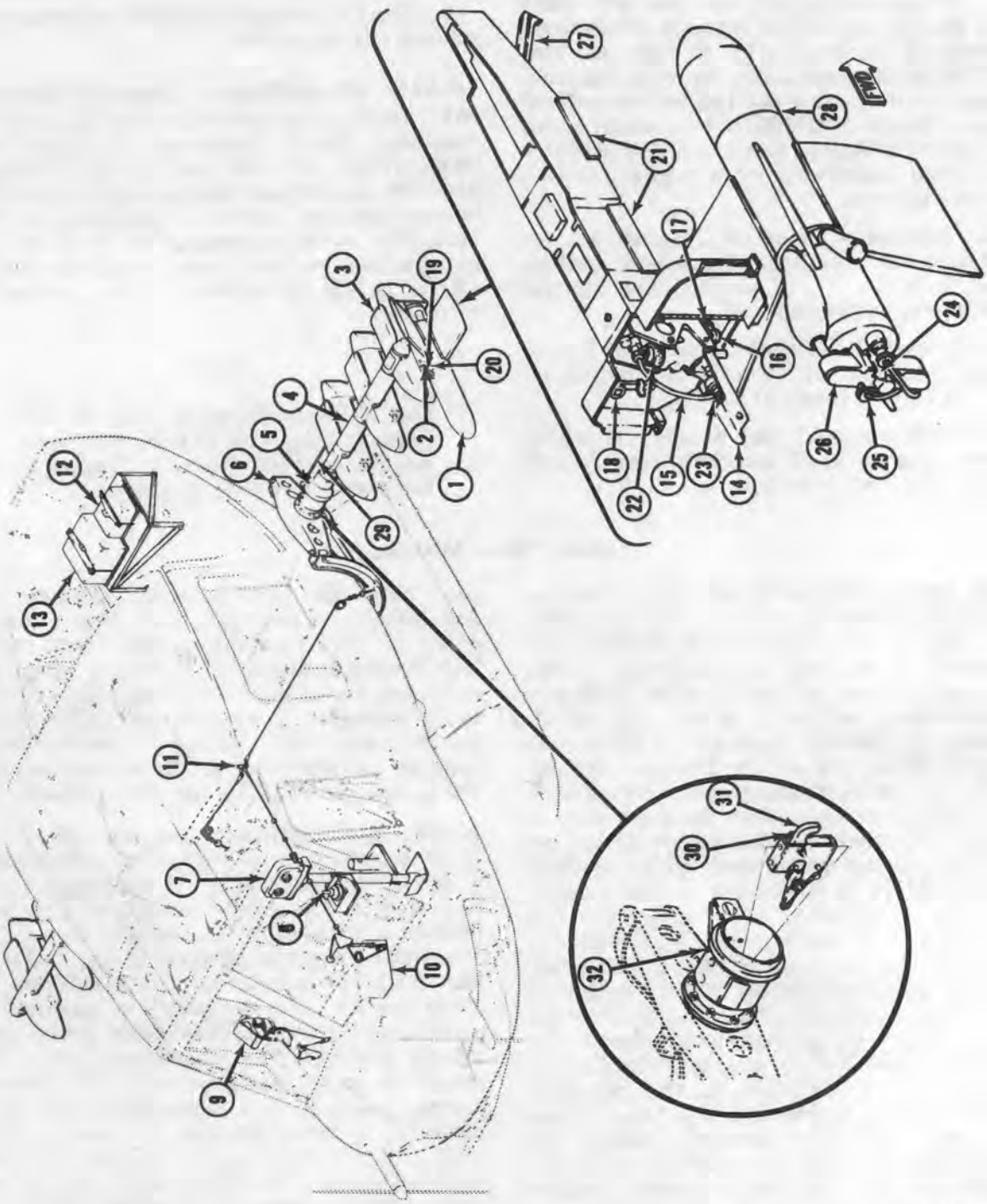


Figure 14–5. SS-11 missile installation (Sheet 1 of 2)

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
01	**Airframe**							
	Sheet metal and structural members not requiring jigs and fixtures							
	Repair			x				
	Sheet metal and structural members involving jigs and fixtures							
	Overhaul					x		
	Fire Detector Unit		x					
	Inspect		x					
	Replace			x				
	Repair							
	(Aft) Engine Mount Adapters							
	Inspect		x					
	Replace			x				
	Engine Mount Support Arms (Brace Rods & Tripod)							
	Inspect		x					(Replacement of rod ends)
	Replace			x				
	Repair			x				
	Engine Mount Trunnion and Bearing Assembly							
	Inspect		x					
	Replace			x				
	Repair			x				
	Engine Floor Mount Attaching Brackets							
	Inspect		x					
	Replace			x				
	Tail Boom							
	Inspect		x					
	Replace			x				
	Repair			x				
	Overhaul					x		
	Cargo & Cockpit Doors							
	Inspect		x					
	Repair			x				
	Adjust		x					
	Replace		x					

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
01	**Airframe (Cont)**							
	Windows All							
	Inspect		x					
	Replace		x					
	Repair			x				
	Windshield Wiper Blades and Linkages							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Windshield Wiper Motor							
	Inspect		x					
	Replace		x					
	Repair			x				
	Pilot's and Copilot's Seats							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Troop Seats							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Seat Belts, Shoulder Harness, Inertia Reel Webbing							
	Inspect		x					
	Replace		x					
	Inertia Reels							
	Inspect		x					
	Replace		x					
	Sound-Proofing and Blackout Curtains, Sun Visor							
	Inspect		x					
	Replace		x					
	Repair		x					
	Cowling and Fairings							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Weight and Balance of Aircraft			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
02	**Alighting Gear**							
	Tail Skid							
	Inspect		x					
	Replace		x					
	Skid Tubes, Cross Tubes & Skid Shoes							
	Inspect		x					
	Replace		x					
	Repair			x				
	Ground Handling Wheel Actuating Mechanism							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Wheels, Tires and Tubes							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					
08	**Engine and Related Systems**							
	Engine as a Complete Assembly							
	Inspect		x					
	Test				x			
	Align			x				
	Replace			x				
	Repair		x					
	Overhaul					x		
	Fuel and Oil Hoses							
	Inspect		x					
	Replace		x					
	Electrical Harness & Ignition Leads							
	Inspect		x					
	Replace		x					
	Ignition Exciter							
	Inspect		x					
	Replace		x					

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
03	**Engine and Related Systems (Cont)**							
	Igniter Plugs							
	Inspect		x					
	Replace		x					
	Fuel Control Assembly							
	Inspect		x					
	Service		x					
	Replace		x					
	Adjust		x					
	Overhaul					x		
	Electrical Solenoid Valve							
	Inspect		x					
	Replace		x					
	Overspeed Governor Assembly							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Overhaul					x		
	Fuel System Filter & Strainers							
	Inspect		x					
	Replace		x					
	Starting Fuel Solenoid Valve							
	Inspect		x					
	Replace		x					
	Main Fuel Manifolds							
	Inspect		x					
	Replace		x					
	Repair			x				
	Starting Fuel Manifold							
	Inspect		x					
	Replace		x					
	Starting Fuel Nozzles							
	Inspect		x					
	Replace		x					
	Repair				x			
	Oil Pump							
	Inspect		x					
	Replace		x					
	Adjust		x					
	Overhaul				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
03	**Engine and Related Systems (Cont)**							
	Bearing Housing Oil Strainers							
	Inspect		x					
	Service		x					
	Replace		x					
	Main Oil Filter							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					
	Engine Oil Coolers							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Engine Oil Cooler Blower							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Chip Detector							
	Inspect		x					
	Service		x					
	Replace		x					
	Interstage Airbleed Actuator							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul					x		
	Interstage Airbleed Band							
	Inspect		x					
	Replace		x					
	Adjust		x					
	Repair		x					
	Interstage Airbleed Hoses							
	Inspect		x					
	Replace		x					
	Inline Valve							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
03	**Engine and Related Systems (Cont)**							
	Airbleed Connecting Manifold and Adapter							
	Inspect		x					
	Replace		x					
	Exhaust Thermocouple Harness							
	Inspect		x					
	Test			x				
	Replace		x					
	Combustion Chamber Drain Valve							
	Inspect		x					
	Replace		x					
	Accessory Drive Gearbox							
	Inspect		x					
	Replace		x					
	Repair		*x				*Limited to replacement of seals	
	Overhaul					x		
	Overspeed Governor and Tachometer Drive Assembly							
	Inspect		x					
	Replace			x				
	Repair			x				
	Adjust		x				Pressure regulating valve	
	Torquemeter Booster Pump							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	Oil Transfer Tubes						For reduction gears	
	Inspect			x			During special inspection	
	Replace			x				
	Repair			x				
	Output Shaft Seal							
	Inspect (for leakage)		x					
	Replace			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
08	**Engine and Related Systems (Cont)**							
	Reduction Carrier and Gear Assembly							
	Inspect			x				During special inspection
	Replace			x				
	Repair			*x	x			*Limited to replacement of parts
	Overhaul					x		
	Overspeed Governor and Tachometer Drive Support and Gear							
	Inspect			x				
	Replace			x				
	Repair			x				
	Accessory Gear Carrier							
	Inspect			x				
	Replace			x				
	Combustion Chamber Housing							
	Inspect			x				
	Replace			x				
	Repair			x				
	Combustion Chamber Liner							
	Inspect			x				
	Replace			x				
	Repair			x				Stop-drill cracks
	Fuel Vaporizers							
	Inspect			x				
	Replace			x				
	Repair			x				
	Power Turbine Nozzle and Cylinder							
	Inspect			x				
	Replace			x				
	Repair			x				
	Fireshield							
	Inspect			x				
	Replace			x				
	Exhaust Diffuser							
	Inspect		x					
	Replace			x				
	Repair				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
03	**Engine and Related Systems (Cont)**							
	Second Stage Turbine Rotor Assembly							
	Inspect		x					
	Replace			x				
	Repair			x				
	First Stage Turbine Rotor Assembly							
	Inspect			x				
	Replace			x				
	Repair			x				
	First Stage Turbine Nozzle and Flange							
	Inspect			x				
	Replace			x				
	Repair			x				
	Combustion Chamber Deflector							
	Inspect			x				
	Replace			x				
	Diffuser Housing							
	Inspect		x					
	Replace					x		
	Repair			x				
	Rear Bearing Seal & Seal Housing							
	Inspect			x				
	Replace			x				
	Rear Bearing Seal Liner and Forward Rear Cones							
	Inspect			x				
	Replace			x				
	Impeller Housing							
	Inspect		x					
	Replace			x				
	Repair			x				
	Compressor Housing							
	Inspect		x					
	Replace			x				
	Repair			x				
	Compressor Stator Vanes							
	Inspect			x				
	Replace			x				
	Repair			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
03	**Engine and Related Systems (Cont)**							
	Compressor Rotor Blades							
	Inspect		x					
	Replace			x				
	Repair			x				
	Power Shaft							
	Inspect			x			During special inspection	
	Replace					x		
	Inlet Housing							
	Inspect		x					
	Replace					x		
	Repair			x				
	Inlet Guide Vanes							
	Inspect		x					
	Replace					x		
	Repair			x				
	Engine Oil Cooler Fan Assemblies and Oil Cooler Fan Drive							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	Engine Control Linkage							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
	Door Compensator							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
	Actuator							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
	Overhaul				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
04	**Rotor and Transmission Systems**							
	Main Rotor Hub and Blade Assembly							
	Inspect		x					
	Align			x				Balance
	Adjust		x					Track
	Replace		x					
	Main Rotor Blades							
	Inspect		x					
	Replace		x					
	Repair		x			x		
	Main Rotor Hub							
	Inspect		x					
	Service		x					
	Align			x				Balance
	Replace		x					
	Repair			x				
	Overhaul					x		
	Main Rotor Hub (540)							
	Inspect		x					
	Align			x				Balance
	Replace		x					
	Repair			x				
	Overhaul				x			
	Stabilizer Bar							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	Scissors and Sleeve Assembly							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	Swashplate and Support Assembly							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Overhaul				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
04	**Rotor and Transmission Systems (Cont)**							
	Dampers							
	Inspect		x					
	Service		x					
	Adjust		x					
	Replace		x					
	Repair				x			
	Tail Rotor Hub & Blade Assembly							
	Inspect		x					
	Service		x					
	Adjust		x					
	Align			x			Balance	
	Replace		x					
	Tail Rotor Blades							
	Inspect		x					
	Replace			x				
	Repair		x			x		
	Tail Rotor Hub							
	Inspect		x					
	Service		x					
	Replace			x				
	Repair			x				
	Overhaul				x		UH-1A & 540	
	Tail Rotor 42° and 90° Gear Boxes							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					
	Overhaul					x		
	Tail Rotor Gear Box Quills (42° and 90°)							
	Inspect		x					
	Replace			x				
	Repair			x				
	Overhaul					x		
	Tail Rotor Drive Shafting							
	Inspect		x					
	Replace		x					
	Repair		x					

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
04	**Rotor and Transmission Systems (Cont)**							
	Tail Rotor Drive Shaft Hanger Assemblies							
	Inspect		x					
	Service		x					
	Replace		x					
	Overhaul				x			
	Main Transmission							
	Inspect		x					
	Service		x					
	Replace			x				
	Repair			x				
	Overhaul					x		
	Transmission Mount Assemblies							
	Inspect		x					
	Replace			x				
	Repair			x				
	Drive Quill Assemblies							
	Inspect		x					
	Replace		%%	x				
	Repair			x				
	Overhaul					x		
	Main Drive Shaft (Engine to Transmission)							
	Inspect		x					
	Service		x					
	Replace		x					
	Overhaul				x			
	Transmission Lubrication System							
	Inspect		x					
	Service		x					
	Lines, Manifolds, Fittings, Magnetic Plugs, Oil Jets and Sight Gages							
	Inspect		x					
	Replace		x					
	Filters, Filter Housings, and Screens							
	Inspect		x					
	Service		x					
	Replace		x					

MAINTENANCE ALLOCATION CHAP
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
04	**Rotor and Transmission Systems (Cont)**							
	Transmission Oil Cooler Assembly, Housing, Tubing, Fittings and Valves							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Oil Pump							
	Replace		%%	x				
	Overhaul					x		
	Relief Valve							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
	Mast Assembly							
	Inspect		x					
	Replace		%%	x				
	Repair			x				
	Overhaul				x			
	Friction Collet (540)							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Dynamic Stops (540)							
	Inspect		x					
	Replace		x					
	Repair		x					
06	**Hydraulic System**							
	Pumps							
	Inspect		x					
	Replace		x					
	Overhaul					x		
	Reservoir							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
06	**Hydraulic System (Cont)**							
	Valves							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Hoses, Tubing and Fittings							
	Inspect		x					
	Replace		x					
	Hydraulic System Filters and Filter Housings							
	Inspect		x					
	Service		x					
	Replace		x					
	Hydraulic Module (540)							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					
	Hydraulic Power Cylinders							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	ırreversible Valves							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul					x		
08	**Instruments**							
	Instrument Panel							
	Inspect		x					
	Adjust		x					
	Replace			x				
	Repair			x				
	Miscellaneous Instruments							
	Clock							
	Inspect		x					
	Replace		x					
	Repair				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
08	**Instruments (Cont)**							
	Fuel Quantity Indicator & Amplifier							
	Inspect		x					
	Calibrate			x				
	Replace			x				
	Overhaul					x		
	Flight Instruments							
	Vertical Velocity Indicator							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Stand-by Compass							
	Inspect		x					
	Calibrate		x					
	Replace		x					
	Airspeed Indicator							
	Inspect		x					
	Test			x				
	Replace		x					
	Height Indicator							
	Inspect		x					
	Calibrate		x					
	Replace		x					
	Overhaul				x			
	Attitude Indicator							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul					x		
	Turn and Slip Indicator							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Free Air Temperature Gage							
	Inspect		x					
	Replace		x					
	Pitot System							
	Inspect		x					
	Service		x					
	Test			x				
	Replace			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
08	**Instruments (Cont)**							
	Engine Instruments							
	Engine and Rotor Tachometer							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			
	Exhaust Temperature Indicator							
	Inspect		x					
	Calibrate			x				
	Replace			x				
	Overhaul				x			
	Engine Oil Temperature Gage							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			
	Engine Oil Pressure Transmitter and Indicator							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			
	Fuel Pressure Indicator and Transmitter							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Torquemeter and Transmitter							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Gas Producer Tachometer							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
08	**Instruments (Cont)**							
	Transmission Instruments							
	Oil Temperature Gage							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			
	Oil Pressure Gage & Transmitter							
	Inspect		x					
	Test			x				
	Replace		x					
	Overhaul				x			
	Thermocouples & Temperature Bulbs							
	Inspect		x					
	Test			x				
	Replace		x					
09	**Electrical Systems**							
	AC Power System							
	AC Voltmeter							
	Inspect		x					
	Replace		x					
	Inverters							
	Inspect		x					
	Replace		x					
	Circuit Breakers, Conduits, Leads, Switches and Wiring							
	Inspect		x					
	Replace		%%	x				
	Repair			x				
	DC Power System							
	Relays, Rheostats, Switches, Circuit Breakers, Plugs, Leads, Connectors, Wiring, Conduits, Receptacles, Shunts and Shock Mounts							
	Inspect		x					
	Replace		%%	x				
	Repair			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
09	**Electrical Systems (Cont)**							
	Regulators							
	Inspect		x					
	Adjust		%%	x				
	Replace		x					
	Overhaul				x			
	Battery							
	Inspect		x					
	Service		x					
	Replace		x					
	Battery Sump Jar							
	Inspect		x					
	Service		x					
	Replace		x					
	Generator and Starter Generator							
	Inspect		x					
	Replace		x					
	Repair			x				
	Overhaul				x			
	Lights							
	Landing, Navigation, Instrument, Search, Interior Cabin, Anti-Collision and Flasher Units							
	Inspect		x					
	Replace		x					
	Repair		%%	x				
	Master Caution Panel							
	Inspect		x					
	Replace		x					
	Repair			x				
	RPM Warning System							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair				x			
	Test			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
10	**Fuel System and Lines**							
	Main Fuel Tanks							
	Inspect		x					
	Service		x					
	Test			x				
	Replace			x				
	Repair			x				
	Boost Pump							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Valves and Fittings							
	Inspect		x					
	Replace		x					
	Filters and Filter Housings							
	Inspect		x					
	Service		x					
	Replace		x					
	Hoses, Tubing and Filler Caps							
	Inspect		x					
	Replace		x					
	Auxiliary Fuel Tank Assembly							
	Inspect		x					
	Replace		x					
	Repair			x				
	Auxiliary Fuel Tank Bladder							
	Inspect			x				
	Replace			x				
	Repair			x				
11	**Flight Control Systems**							
	Align		x					Rigging
	Synchronized Elevator							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
11	**Flight Control Systems (Cont)**							
	Main Rotor Control Tubes, Rod End and Pitch Change Linkage							Rotating Control
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Force Gradient Assembly							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Control Stick (Collective & Cyclic)							
	Inspect		x					
	Replace		x					
	Repair			x				
	Magnetic Brake							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Collective and Cyclic Linkage							
	Inspect		x					
	Replace		x					
	Repair			x				
	Tail Rotor Pedal Assembly							
	Inspect		x					
	Replace		x					
	Repair			x				
	Pedal Adjusting Assembly							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Tail Rotor Pitch Control Linkage							
	Inspect		x					
	Replace		x					
	Repair			x				
	Tail Rotor Pitch Control Mechanism							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
11	**Flight Control Systems (cont.)**							
	Tail Rotor Pitch Change Rods & Links							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
12	**Utility Systems**							
	Anti-Icing System							
	Engine Anti-Icing Detector and Interpreter							
	Inspect		x					
	Replace		x					
	Repair			x				
	Hot Air Valve							
	Inspect		x					
	Replace		x					
	Overhaul				x			
	Heater Systems							
	Combustion Heater Assembly							
	Inspect		x					
	Service		x					
	Replace			x				
	Repair			x				
	Fuel Pumps, Solenoid Valve, Lockout Relay, Air Pressure Switch, Selector Valve, Fuel Pressure Regulator Filters, Filter Housings, Tubing, Fitting & Hoses							
	Inspect		x					
	Service		x					
	Replace		x					
	Ignition System							
	Inspect		x					
	Replace		x					
	Repair		x					
	Combustion Blower							
	Inspect		x					
	Replace		x					
	Repair			x				

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
12	**Utility Systems (Cont)**							
	Heater Vent Blower							
	Inspect		x					
	Replace			x				
	Repair			x				
	Combustion and Air Bleed Heaters, Nozzles, Registers, Ducts & Hoses							
	Inspect		x					
	Replace		x					
	Repair		x					
	Auxiliary Exhaust Heater Assembly							
	Inspect		x					
	Replace			x				
	Repair			x				
	Bleed Air Heater System							
	Inspect		x					
	Replace			x				
	Repair			x				
17	**Cargo and Personnel Handling**							
	Medical Attendant Seat & Litters							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair			x				
	Cargo Suspension Assembly							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair			x				
	Cargo Suspension Support Bearings and Slip-Rings							
	Inspect			x				
	Service			x				
	Replace			x				
	Emergency Release Cable and Pedal Assembly							
	Inspect		x					
	Adjust		x					
	Replace		x					

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
19	**Avionics**							
	Note							
	TM 11-1520-211-20 contains complete preventive maintenance service for avionics.							
	Communications Equipment Inter-Communications Equipment Navigaton Equipment							
30	**Armament**							
	External Stores, Supports and Struts							
	Inspect		x					
	Replace		x					
	Repair		x					
	Mechanical Release, Adapter Assembly							
	Inspect		x					
	Service		x					
	Replace		x					
	Repair		x					
	Emergency Manual Jettison System, Cables, Levers, Pulleys and Brackets							
	Inspect		x					
	Adjust		x					
	Replace		x					
	Repair		x					
	Note							
	Organizational maintenance of the armament subsystem will be performed by Aircraft Armament Repairmen.							

MAINTENANCE ALLOCATION CHART
FOR
UH-1A, UH-1B and 540

(1) GROUP NO.	(2) COMPONENT AND RELATED OPERATIONS	(3) O/C	(4) O	(5) DS	(6) GS	(7) D	(8)	(9) REMARKS
70	**Maintenance Supplies**							
	Dye Penetrant Inspection		x					
	Magnaflux and/or Fluorescent Penetrant Inspection			x				
	Annealing & Hardness Testing				x			
	Heat Treat				x			
	Cleaning		x					
	Preservation & Depreservation		x					
	Cadmium Plating				x			
	Chrome Plating					x		
	Spot Painting		x					
	Welding and Brazing			x				

Nomenclature		Aircraft Series and Number of Items Normally Installed		Remarks
		UH-1A	UH-1B	
Section B — Pilot's Compartment				
C-1611/AIC	Intercom		3	FY63 UH-1B
SB-329/AR	Intercom	3	3	
Clock 1⅞ inch Dial:	Type A-13A	1	1	
Compass, Magnetic:	Pilot Standby	1	1	
Pilot Seat and Back Cushions		1	1	
Copilot Seat and Back Cushions		1	1	
Pilot Seat Belt and Shoulder Harness		1	1	
Copilot Seat Belt and Shoulder Harness		1	1	
Fire Extinguisher:	Type A-20	1	1	FY61 UH-1B
Fire Extinguisher:	Vaporizing Liquid Type		1	
Blackout Curtains		3	3	
Section C — Cargo Compartment				
H-101/U	MIC-Headset	1	1	
First Aid Kit(s)		1	1 (3)	(3) on FY 62, 63, 64 UH-1B
Medical Attendant Seat		1	1	
Medical Attendant Seat Belt		1	1	
Passenger Seats Against Firewall		2	2	
Passenger Seat Belts Against Firewall		4	5	
Passenger Seats: Forward Arrangement	Includes Medical Attendant's Seat		2	
Passenger Seat Belts: Forward Arrangement			2	
Litter Rack (Number of Patients)		2	3	
Auxiliary Fuel Tank Kit (165 Gallon)		1	1	
Auxiliary Fuel Tank Kit (350 Gallon)			1	
External Fuel Tank Kit (200 Gallon)			1	Two 100 Gallon Tanks
External Fuel Tank Kit (120 Gallon)			1	Two 60 Gallon Tanks
Internal Fuel Tank Kit (60 Gallon)			1	FY64 UH-1B
Blood Bottle Hangers		2	3	
Aft Bulkhead Tiedown Fittings			8	
Cargo Restraint Device			1	
Parachute Anchor Line Cable Kit			1	FY 64 UH-1B
Section D — Aft Fuselage Compartment				
AN/APX-44	Transponder Set	1	1	
AN/ARC-102	HF Radio Set		1	FY 63 UH-1B
J-2	Gyro Compass	1	1	
Luggage Compartment Net		1	1	
100,000 BTU Heater Kit		1	1	
Blade Anti-Icing Kit			1	FY 64 UH-1B

Nomenclature	Aircraft Series and Number of Items Normally Installed		Remarks
	UH-1A	UH-1B	
	Section E — Exterior		
Pitot Tube All Weather Cover	1	1	
Rear View Mirror		1	
Engine Air Inlet All Weather Cover	1	1	FY 61 and Subsequent UH-1B
Hard Point Fittings		4	
External Stores Kit (SS-11)		1	FY 62, 63, 64, UH-1B
External Stores Kit (XM-6E3)		1	FY 62, 63, 64, UH-1B
External Stores Kit (XM-3)		1	FY 62, 63, 64, UH-1B
External Stores Kit (ASW-12)		1	FY 62, 63, 64, UH-1B
External Stores Kit (XM-153MG)		1	FY 62, 63, 64, UH-1B
External Stores Kit (XM-75)		1	FY 62 UH-1B
Engine Exhaust All Weather Cover	1	1	
Main Rotor Blade Tiedown Rig	1	1	
Tail Rotor Blade Tiedown Rig	1	1	

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