

Chapter 8A AIR SYSTEMS - GENERAL INFORMATION, MAIN AIR SUPPLY AND  
AUXILIARY POWER SUPPLIES SYSTEMS

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## DESCRIPTION

## General information

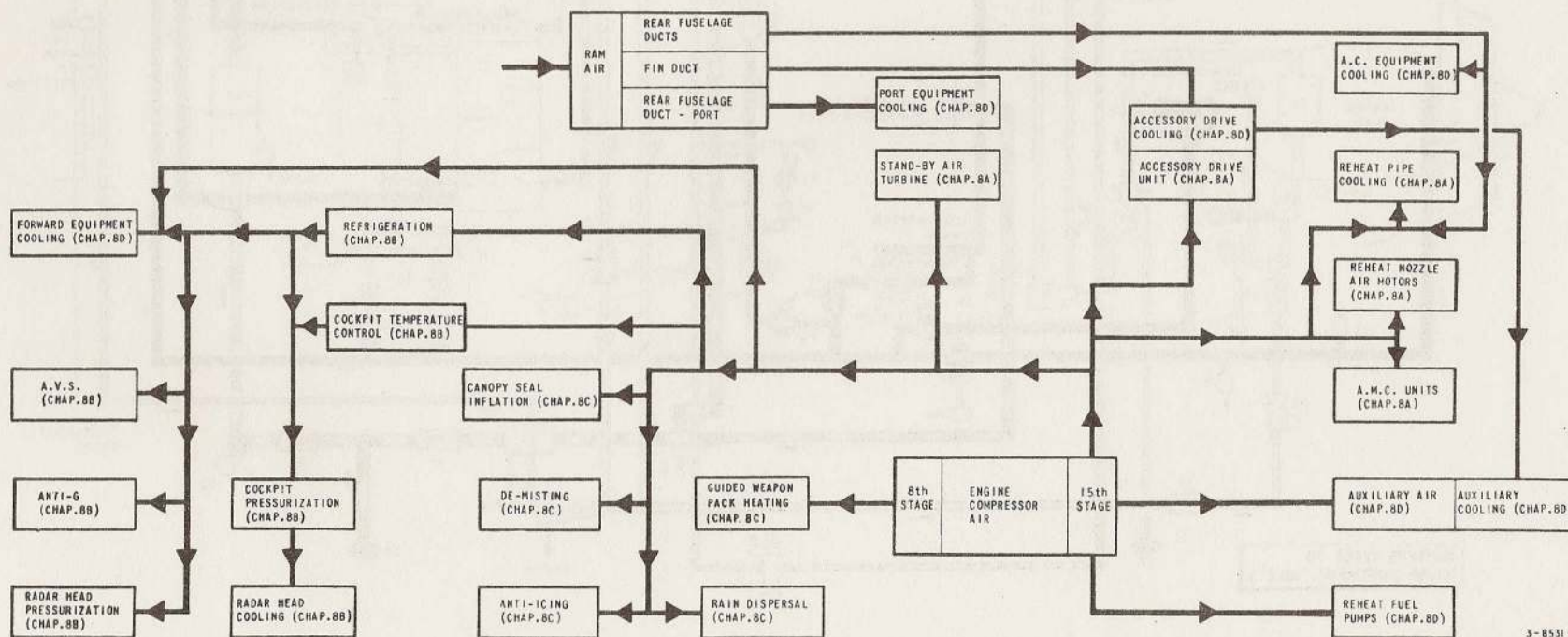
1. This chapter contains information about the main air system, the accessory drive unit, the stand-by turbine/generator system and reheat jet-pipe services. A list of major components is provided in Tables 3 and 4.

## Main air supply (fig.4, 5 and 6)

2. The air employed for the main supply, with the exception of some cooling air, is derived from two interconnected 15th-stage compressor tapplings, one from each engine, and passes through non-return valves to the main air duct.

3. The main air duct, which comprises several interconnected lengths of stainless steel ducting, runs along the starboard side of the rear fuselage, approximately parallel with the horizontal datum line, from frame 25 to frame 55. Thermal expansion is provided for by the inclusion of sliding and bellows-type expansion couplings, and Conoseal-type clamp couplings. Refrasil-type lagging secured to the duct by hose clips reduces the heat transfer. Two valves are inserted in the duct at frames 46 and 53 respectively, that at frame 46 being the isolating valve for the stand-by turbine/generator system and the other the accessory drive unit

turbine shut-down valve. The duct is divided, at its forward end, into two pipes which supply the cabin air system (Chap.8B) and the canopy seal, demisting, anti-icing and rain dispersal systems (Chap.8C) respectively. A tapping downstream of the isolating valve directs hot air to the equipment cooling system (Chap.8D). The aft end of the duct traverses the fuselage at frame 55 to terminate on the volute casing of the accessory drive unit turbine. Intermediate tapplings divert air to drive the stand-by turbine (para. 7), to operate the reheat nozzles (para. 9), and to assist the induction of reheat pipe cooling air (para.10). A branch



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Fig.1. Layout of systems



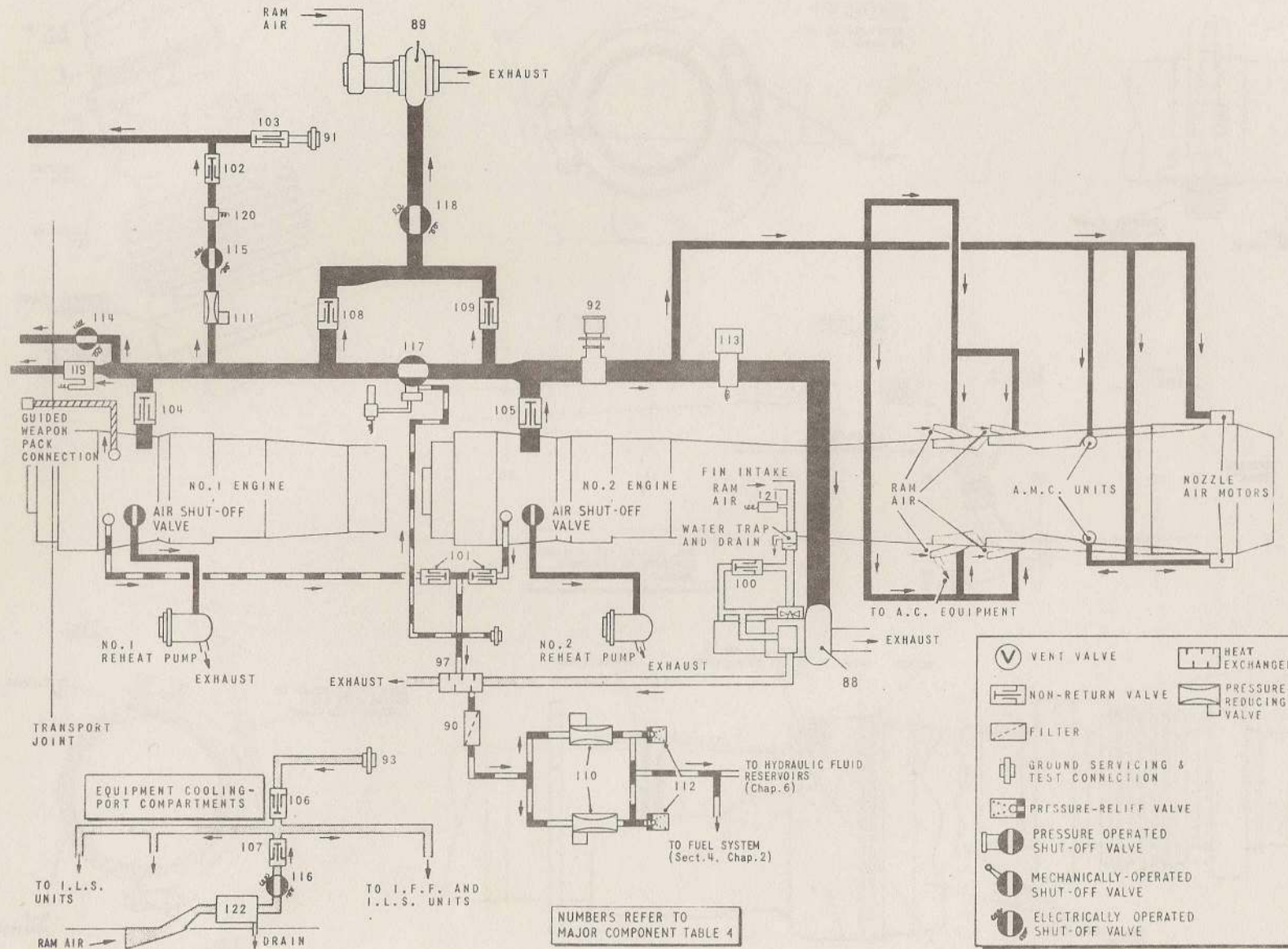
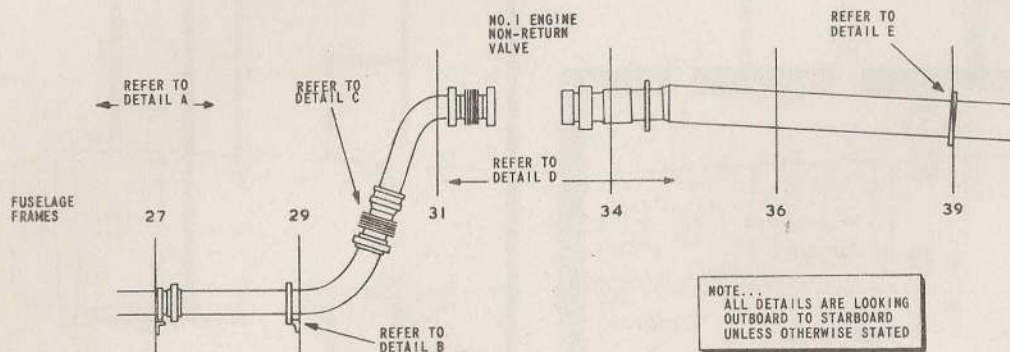
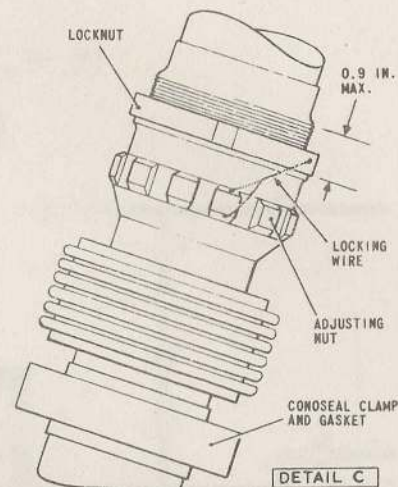
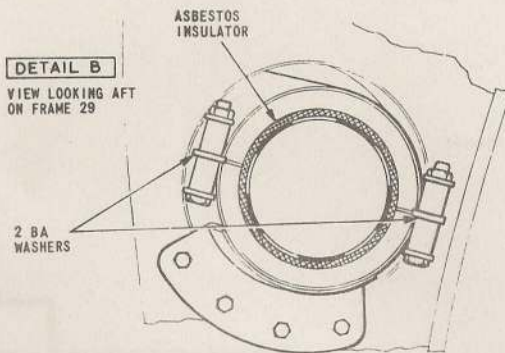
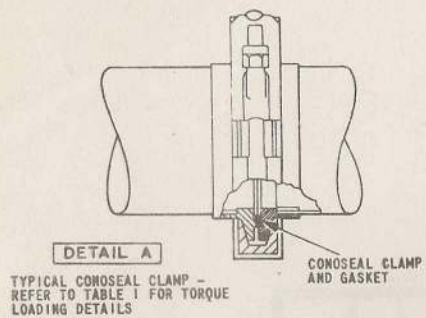


FIG.3. AIR SYSTEMS DIAGRAM-REAR FUSELAGE

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NOTE...  
ALL DETAILS ARE LOOKING  
OUTBOARD TO STARBOARD  
UNLESS OTHERWISE STATED

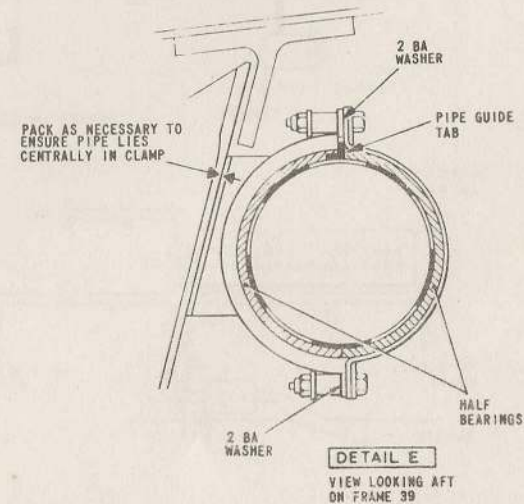
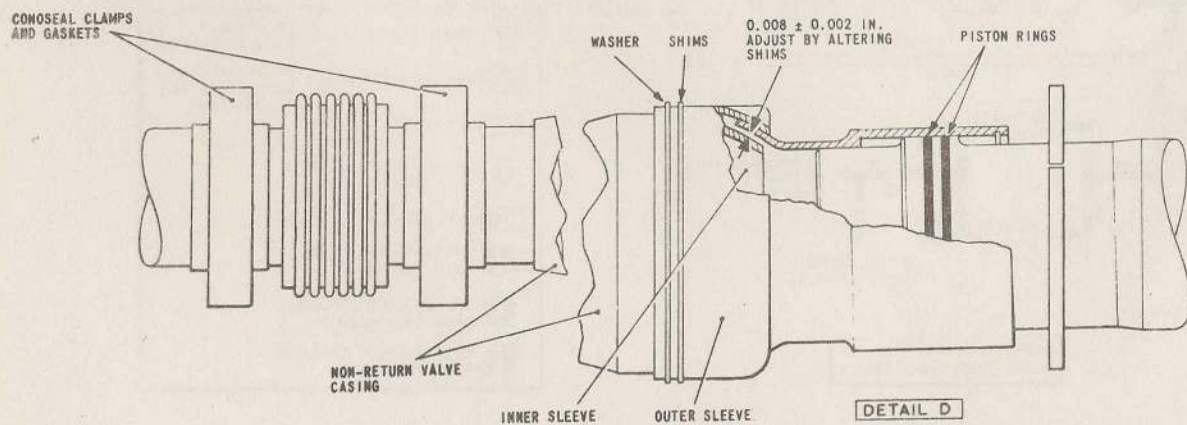


FIG. 4. MAIN AIR SUPPLY-FRAMES 25B TO 39

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pipe upstream of the isolating valve communicates with a main ground test coupling (*para.11*).

#### Accessory drive unit (*fig.8*)

4. The accessory drive unit, located in the port side of the fuselage between frames 53 and 55, comprises a constant speed air turbine, gearbox, governor, control switch, shut-off valve, over-speed cut-out switch, cooling fan, and various ducts. The turbine is operated by air from the engine compressors and it drives, through the gearbox, the fan, an a.c. generator and main d.c. generator. For further information on the accessory drive unit refer to A.P.2240A, Book 15, Vol.1 and 6.

5. Air supplied to the turbine via a shut-down valve (*para.6*), passes through the turbine and is then discharged into the fuselage. Ram air from the fin intake is ducted to the fan casing where it is distributed to various ducts for cooling gearbox oil, the a.c. generator, and the main d.c. generator. The exhaust air then passes through the auxiliary air heat exchanger into the fuselage.

#### Accessory drive unit shut-down valve (*fig.6 and 7*)

6. The valve is an electro-mechanically-operated butterfly type, incorporating a manual reset lever (access panel 47S), and is interposed in the main air duct between frames 53 and 54 on the starboard side of the fuselage. It is a safety device which automatically shuts off the main air supply to the air turbine (*para.4*) should overspeeding of the turbine occur, and is electrically

controlled by an over-speed cut-out switch incorporated in the turbine. Once overspeeding has occurred and the valve has operated, it can only be reset manually on the ground. For a detailed description and the resetting procedure refer to A.P.2240A, Book 15, Vol.1, Sect.3, and to *para.19* of this chapter.

#### Stand-by turbine/generator unit (*fig.9*)

7. The stand-by turbine/generator, located in the spine of No.2 engine hatch, comprises a governor-controlled air turbine and d.c. generator. The turbine, used in conjunction with a control valve which regulates the air pressure of  $20 \pm 1\%$  lb/in<sup>2</sup>, drives the generator at a constant speed. For further information on the stand-by turbine/generator refer to A.P.4343A, Vol.1, Sect.3, Chap.18.

#### Stand-by turbine/generator air supply

8. Two tapplings, one from each side of the isolating valve (*para.3*), combine to form a single pipe which conducts air through a shut-off cock to the turbine. Each tapping incorporates a non-return valve so arranged that if the supply from one engine fails, the remaining engine supply will continue to drive the turbine, provided that the isolating valve is closed. For details of the system refer to Sect.6, Chap.9.

#### Reheat nozzle control (*fig.7*)

9. Reheat nozzle area is varied by an air-motor-driven screwjack. The air supply is drawn from the main air duct through a tapping upstream of the pressure-regulating valve (*para.3*). The

pipe from the tapping is divided into two at frame 57, one pipe continuing along the starboard side and the other crossing the fuselage and continuing along the port side, both terminate at their respective motors on No.1 and No.2 reheat pipes. A small tapping from each branch pipe directs compressed air to the associated air motor control unit. For detailed information of the reheat system refer to Sect.4, Chap.1 and to A.P.102C-1520-1, Sect.1, Chap.5.

#### Reheat pipe cooling (*fig.7*)

10. The reheat pipes are cooled by air passed between their inner and outer skins. The air is introduced from outside through four intakes in the fuselage skin (*Chap.8D*); in flight, this is effected by ram pressure. To maintain the cooling air flow during ground running when no ram pressure exists, each duct from the intakes incorporates an injector nozzle through which compressed air flows to induce the flow of cooling air. The compressed air is directed to the nozzles from two tapplings at frame 55 in the air motor supply pipe (*para.9*).

#### Main ground-test coupling (*fig.10*)

11. The main ground-test coupling, located between frames 49 and 50 (access panel 149S) provides for the connection of a hose from a Palouste low-pressure rig. From this source compressed air can be pumped into the main duct to drive the air turbine and to supply the system services, thus enabling the air system and the electrical services to be functioned whilst the aircraft is on the ground and the engines are stationary.

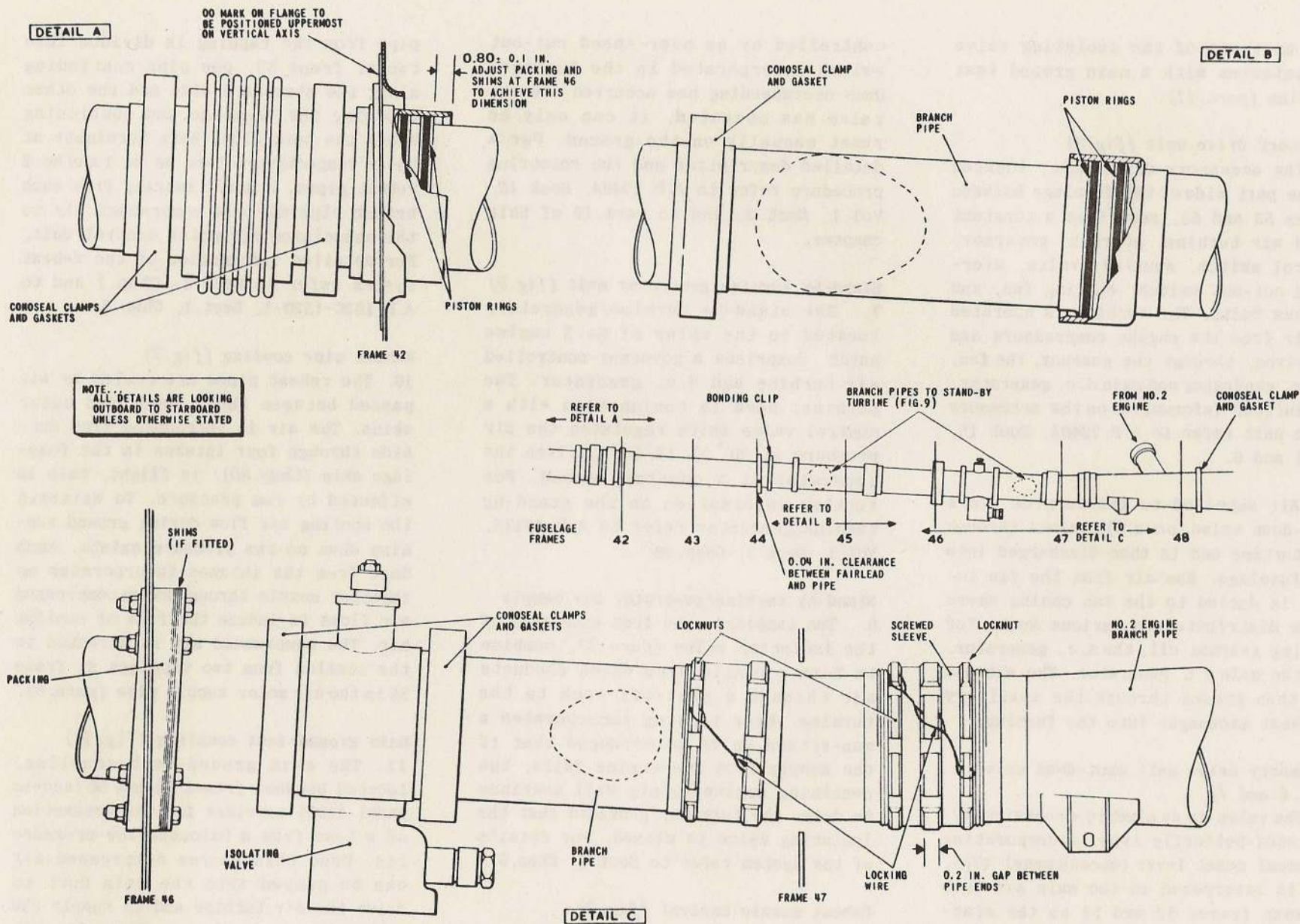


FIG. 5. MAIN AIR SUPPLY-FRAMES 39 TO 48

◀ DETAIL A DIMENSIONS AMENDED ▶

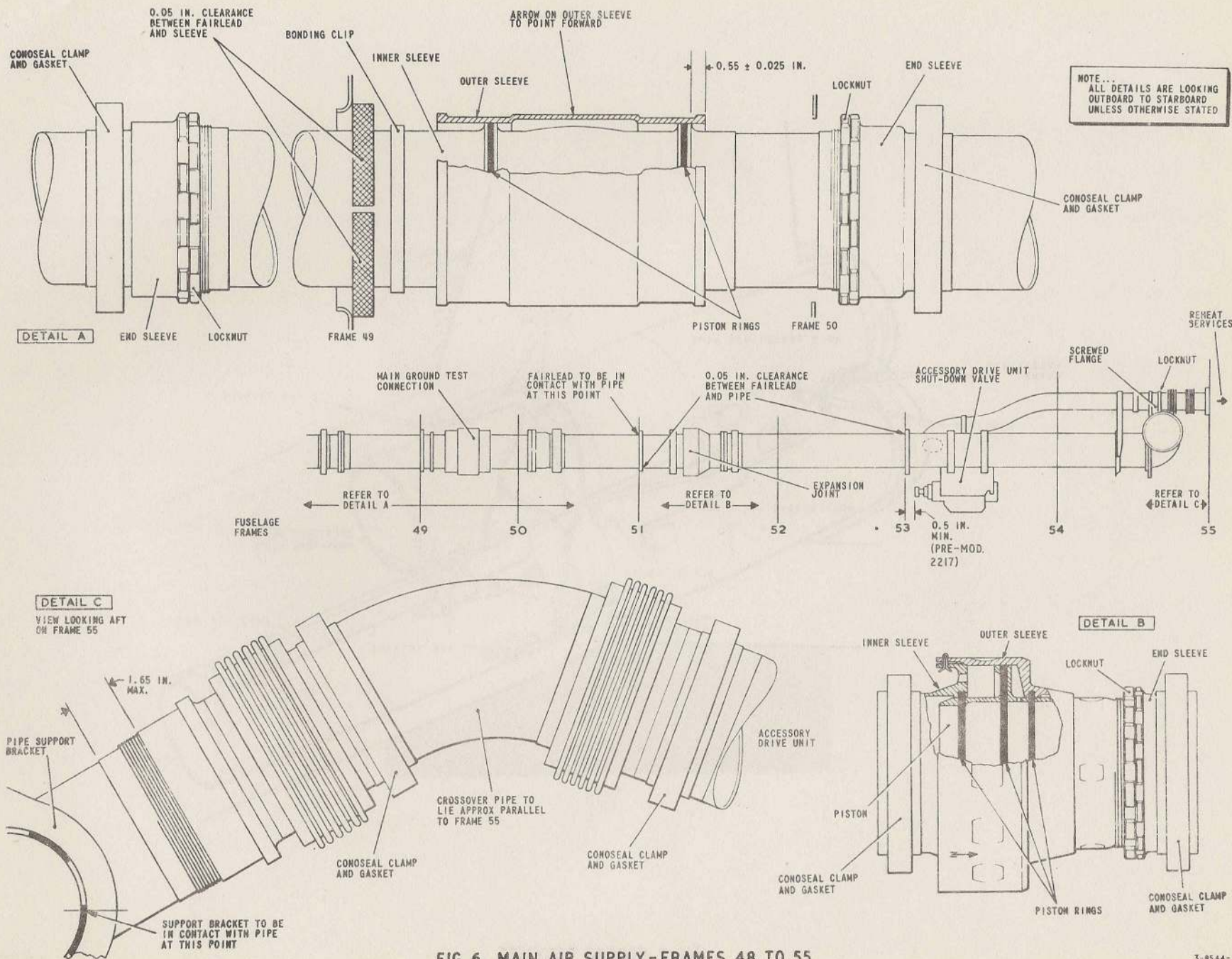
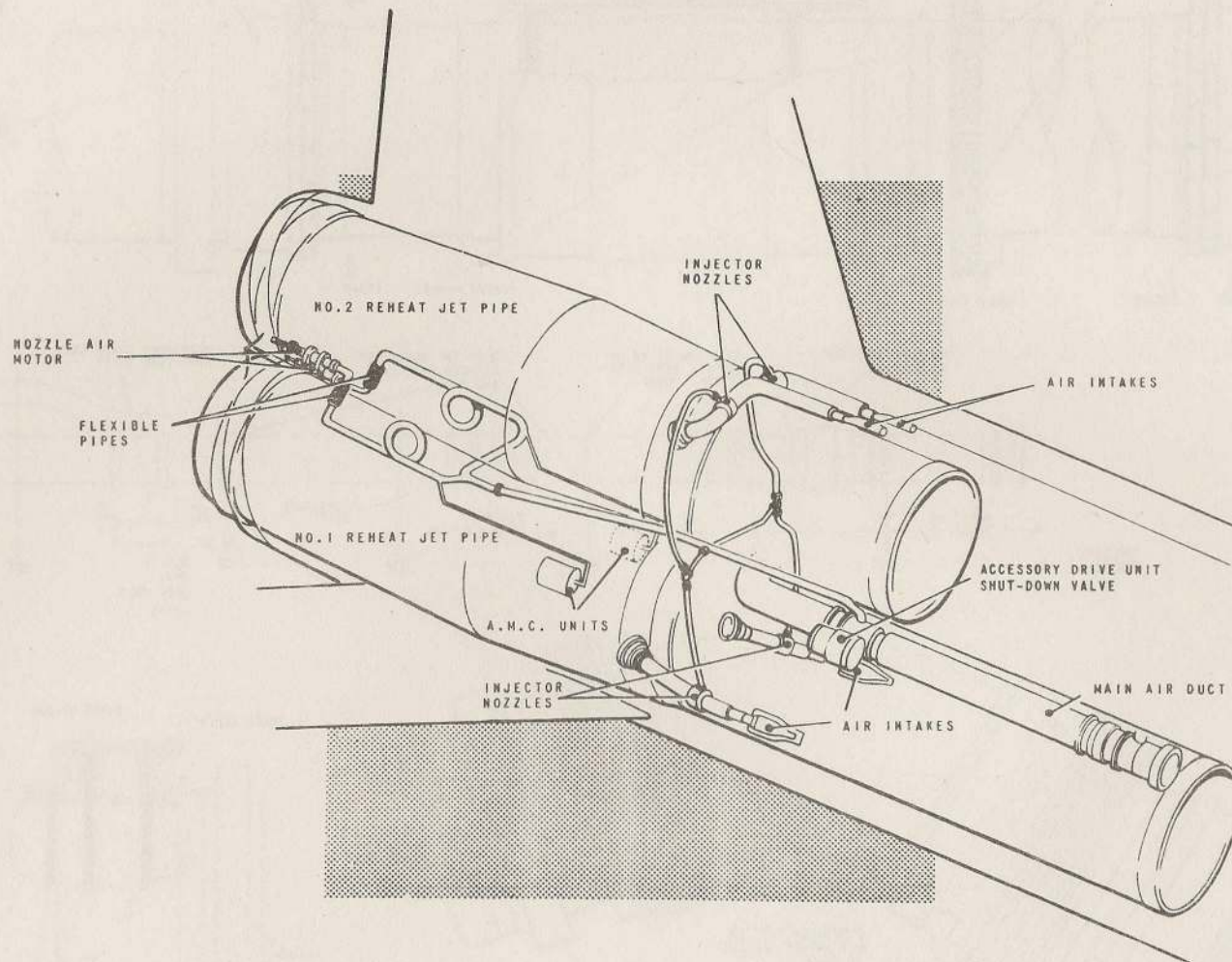


FIG. 6. MAIN AIR SUPPLY-FRAMES 48 TO 55

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**FIG. 7. REHEAT SERVICES**

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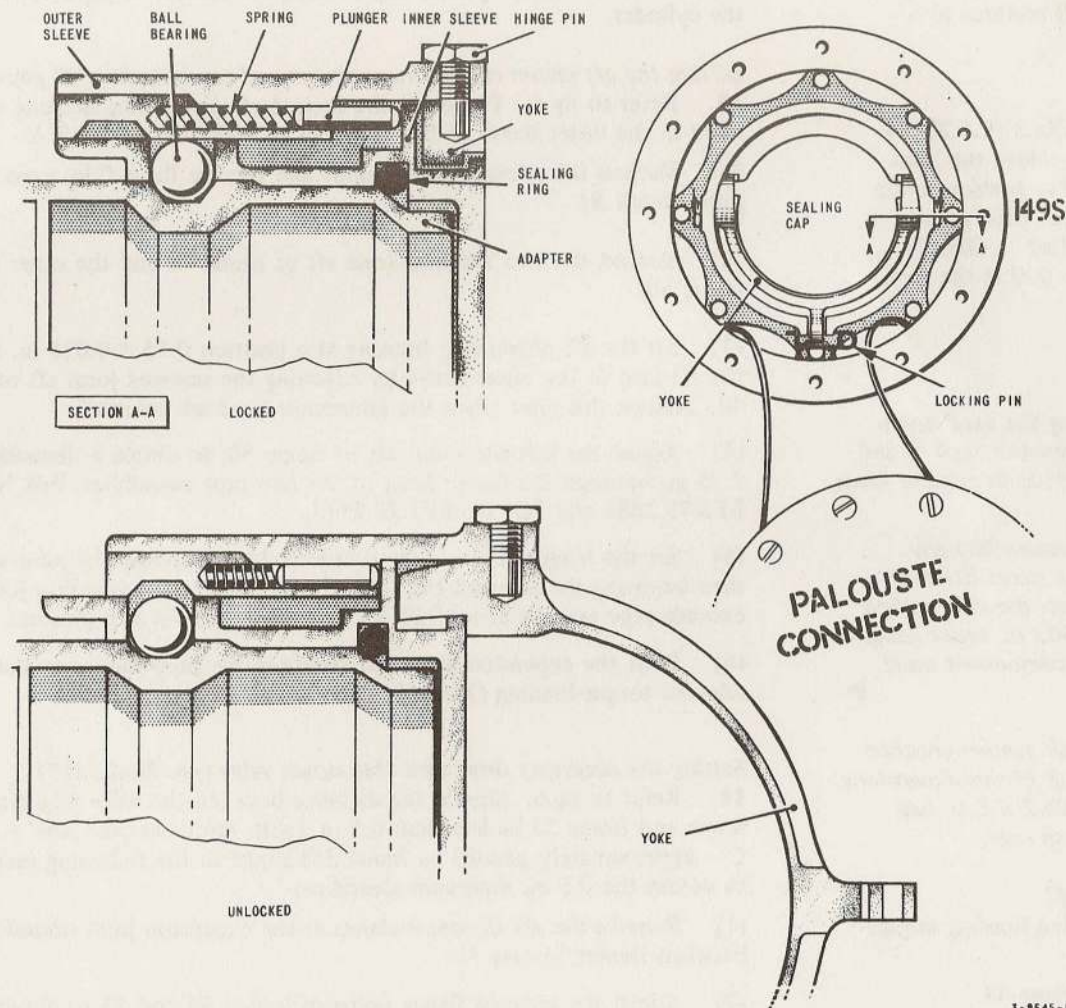


Fig. 10. Main ground-test coupling

12. The coupling comprises an adapter incorporating a double-flap type non-return valve and a removable sealing cap. The cap assembly consists of an inner sleeve and a sliding outer sleeve

actuated by a yoke. The inner sleeve accommodates six diametrically-opposed ball bearings for locking purposes and an internal sealing ring. The outer sleeve houses six horizontal spring-

loaded plungers which abut a flange on the inner sleeve and tend to force the outer sleeve on to the inner. The yoke is hinged on two pins protruding inside the outer sleeve, and two chamfered lugs, formed on the yoke ends, extend beyond the pins to engage two grooves on the end face of the inner sleeve. A lug formed on the centre portion of the yoke is drilled for a locking pin.

13. When the cap is fitted, locking is effected by the sliding outer sleeve, actuated by the operation of the yoke, forcing the six ball bearings to protrude through holes in the bore of the inner sleeve and engage a peripheral groove around the adapter; the yoke is locked in the vertical position by a locking pin. To release the cap the locking pin is removed and the yoke lifted to the horizontal position; the cap can then be removed from the adapter.

#### SERVICING

##### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft.

##### Lubrication

14. After breakdown of pipe joints and components:-

- (1) Ensure good ventilation.
- (2) Thoroughly clean with trichloroethane, Ref.No.33D/2201949 the surfaces to be lubricated.

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(3) (a) *Screw threads*

Using a soft brush, apply grease ZX-24. Allow 30 minutes to elapse before assembly.

(b) *Sliding joints*

Using a soft clean cloth, apply Molybypaul powder No.3 (C.S.2819) to the sliding surfaces of the joints to be treated. Move the joint repeatedly to bed-in both surfaces. Remove surplus powder before assembly. If a new component is being fitted, treat sliding surfaces with Molybdenum disulphide (*A.P.101B-1000-6, Part 1, Chap.1*), substituting Molybypaul powder No.3 for Molypaste 300 in the final operation.

### Main air supply duct

#### Checks and adjustments

15. On completion of any servicing operation involving the breakdown of the main air supply duct, the relevant dimensions shown in fig.4, 5 and 6 must be checked and, where necessary, adjustments made to achieve them.

#### Note. . .

1. All piston sealing rings must be discarded on dismantling any component, sliding joint, or expansion joint, and new items fitted on reassembly. Prior to reassembly the clearance between the new sealing ring and bearing surface must be checked using a 0.002 in. feeler gauge. If the feeler gauge can be inserted at any point, the component must be replaced.

2. If the No.2 E.C.U. has been removed and the air system checked for leaks on a ground test 'Palouste' run, a final check of the dimensions, shown in fig.4, 5 and 6, of the sliding joints in the No.2 E.C.U. bay must be made after the air system has been allowed to cool.

#### Setting the aft piston ring in the sliding joint at frame 42

16. Refer to fig.5. To obtain the desired aft piston ring housing engagement in the cylinder assembly, as indicated in detail A:-

- (1) Remove the Conoseal clamp immediately aft of frame 48.
- (2) Remove the packing, Part No.EF2.75.1743, and shims (if fitted), Part No.EF2.75.1789, at frame 46 (*detail C*); remove relevant fairleads.
- (3) Set the aft piston ring housing at a position  $0.3 \pm 0.1$  in. from the aft face of the cylinder.
- (4) Adjust by filing down the packing or by adding two shims, Part No. EF2.75.1789, as applicable to correctly set the aft piston ring housing.
- (5) Refit the Conoseal clamp, aft of frame 48, and the relevant fairleads.

(6) Re-check the aft piston ring housing for correct engagement in the cylinder.

#### Setting the aft piston ring in the main ground-test coupling 'T' piece

17. Refer to fig.6. To obtain the desired aft piston ring housing engagement in the outer sleeve of the 'T' piece, as indicated in detail A:-

- (1) Slacken the relevant pipe clamps and remove the 4.0 in. expansion joint (*detail B*).
- (2) Slacken the two locknuts (one aft of frame 48 and the other aft of frame 50).
- (3) Set the aft piston ring housing at a position  $0.55 \pm 0.025$  in. from the aft face of the outer sleeve by adjusting the screwed joint aft of frame 48. Relock this joint when the dimension has been achieved.
- (4) Adjust the screwed joint, aft of frame 50, to obtain a dimension of 7.25 in. between the flange faces of the two pipe assemblies, Part No. EF3.75.2581 and Part No.EF3.75.2543.

(5) Set the length of the expansion joint by expanding the joint and then adjusting the screwed end until the length of the expansion joint exceeds pipe assemblies by 0.05 in. Lock the joint in this position.

(6) Refit the expansion joint and retighten the pipe clamps to the relevant torque-loading (*Table 1*).

#### Setting the accessory drive unit shut-down valve (pre Mod.2217)

18. Refer to fig.6. Should the distance between the valve adjustment screw and frame 53 be less than 0.5 in. (with the cross-over pipe — detail C — approximately parallel to frame 55) adjust in the following manner to obtain the 0.5 in. minimum clearance:-

- (1) Remove the aft Conoseal clamp at the expansion joint (*detail B*) between frames 51 and 52.
- (2) Adjust the screwed flange between frames 54 and 55 to obtain the desired clearance.
- (3) Refit the Conoseal clamp and tighten to the relevant torque-loading (*Table 1*).

#### Resetting the accessory drive unit shut-down valve solenoid (post Mod.2217)

19. To reset the solenoid of the valve (post Mod.2217), move the reset lever forward until the position indicator on the valve is aligned with the white dot on the solenoid.

◀ **Torque-loading Conoseal couplings**

20. The torque-loading figures given in Table 1 are applicable when tightening clamp bolts incorporated on all Conoseal-type couplings, with the exception of the upper coupling in the stand-by turbine supply line (fig.9).

**REMOVAL AND ASSEMBLY****Accessory drive unit***Equipment required*

21. The special-to-type tools and equipment required during removal and assembly operations are listed in Table 2.

*Removal (fig.8 and 11)*

22. To remove the accessory drive unit:-

(1) Ensure that the necessary precautions in Sect.4, Chap.1, are being observed.

(2) Remove the intermediate and reheat pipes (Sect.4, Chap.1).

(3) Fit the rear fuselage walkway (Sect.2, Chap.4).

(4) Remove the cross-over pipe by releasing the two clamps, and screwing down on the large nut at the starboard end to release the flexible metal gaskets at the flanged joints.

(5) Remove the cooling air duct by disconnecting at:-

(a) The joint on frame 53, starboard side.

(b) The cooling fan inlet.

(c) The downstream end of the 2½-inch non-return valve.

(6) Remove the accessory drive unit cooling manifold by disconnecting at:-

(a) The cooling fan outlet.

(b) The a.c. generator.

(c) The d.c. generator.

(d) The oil cooler inlet.

(7) Disconnect the fibreglass pipe at the oil-cooler outlet, and release the clip at frame 55.

(8) Remove the breather pipe between the turbine adapter casing and the fuselage skin.

(9) Disconnect the turbine exhaust duct, and slide it aft.

(10) Disconnect the cables from the a.c. and d.c. generator terminal blocks (access panel 77P).

(11) Disconnect the cables from the turbine underspeed/overspeed switch and the stall-warning switch.

(12) Release the d.c. generator mounting clamp, withdraw the generator and remove it from the aircraft.

(13) Release the a.c. generator mounting clamp, withdraw the a.c. generator (weight about 60 lb) and remove it from the aircraft.

(14) Remove completely the aft, and the forward inboard, tie-rods connecting the gearbox with the fuselage. Disconnect the forward outboard tie-rod at the gearbox and swivel it upwards about its remaining bolt.

(15) Attach the hoist to the slinging point at frame 54.

(16) Attach the lifting hook of the hoist to the lifting eye on the air turbine casing, and take the weight of the unit.

(17) Mount the accessory drive unit handling cradle on the jet pipe rails and move it forward to frame 54.

(18) With two assistants, one to operate the hoist and the other to assist in handling, withdraw the mounting bolts, bottom bolt first, from the gearbox. Lift the drive unit to clear the jet pipe rail, whilst applying restraint to prevent damage to the gearbox or fuselage components.

(19) Remove the pin and roller assembly from its stowage on the handling cradle and insert it through the bottom attachment bolt hole in the drive unit (fig.11).

(20) Rotate the accessory drive unit until the turbine casing faces to starboard, and lower it carefully until the rollers contact the aft end of the cradle rails. Move the rollers forward, whilst still lowering the unit, until the upper mounting hole is aligned with the holes in the cradle locating brackets.

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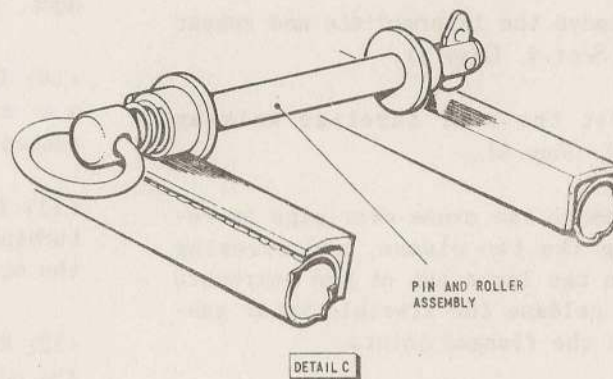
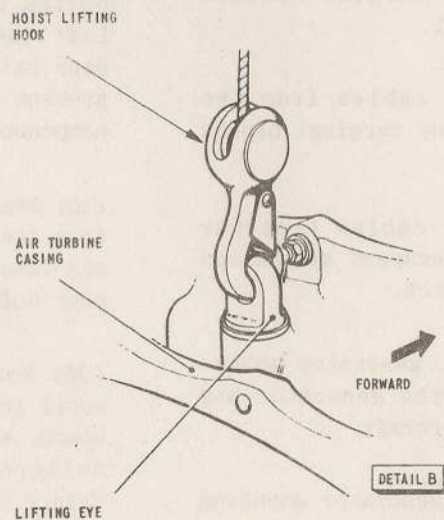
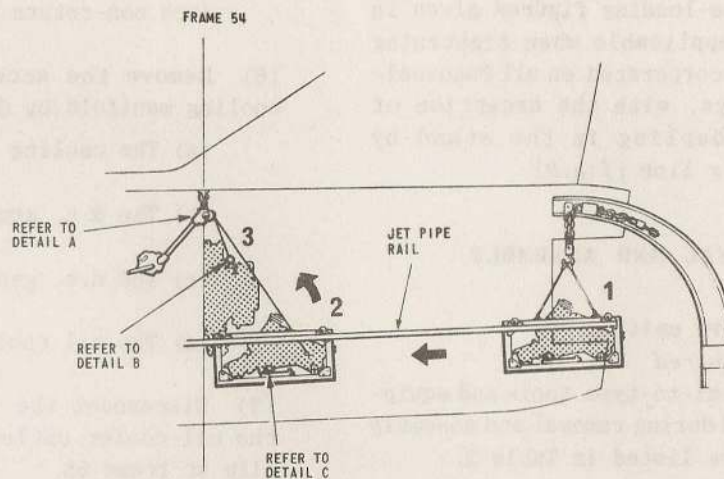
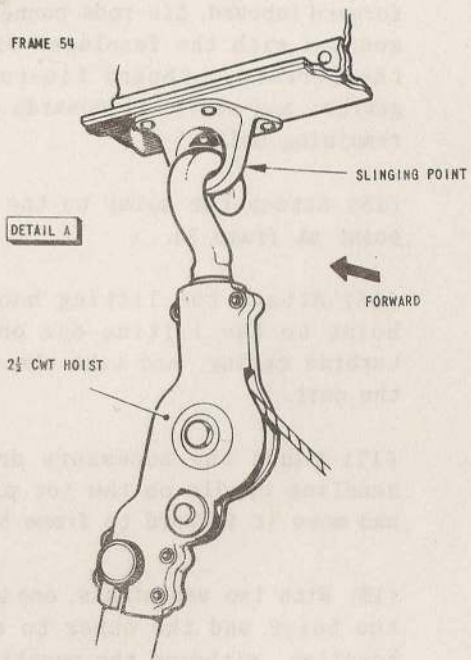


FIG. II. ACCESSORY DRIVE UNIT-REMOVAL AND ASSEMBLY

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Fit the locating pin and disconnect the hoist.

(21) Roll the cradle aft, and lift it away from the aircraft.

#### Assembly

23. To install the accessory drive unit:-

(1) Ensure that the necessary precautions (Sect.4, Chap.1) are being observed.

(2) Mount the accessory drive unit in the handling cradle (para.22 (19) and (20)).

(3) Lift the cradle and drive unit on to the jet pipe rails and move them forward to a convenient point near frame 54.

(4) Attach the hoist to the slinging point at frame 54 and to the drive unit lifting eye.

(5) Take the weight of the drive unit on the hoist, and withdraw the cradle locating pin.

(6) With two assistants, one to operate the hoist and the other to assist in handling, lift the drive unit out of the cradle until the lower jet pipe rail is cleared. Remove the cradle. Remove the pin and roller assembly from the drive unit and stow in the cradle.

(7) Manoeuvre the drive unit into position between frames 53 and 55, rotating it so that the gearbox is facing forward; lower the unit slowly

until the top mounting bolt can be inserted.

(8) Locate and fit the bottom bolt (eye-end forward) and align the eye-end of the bolt with the tie-rod. Bolt in position and lock with a new split pin. Refit nuts on both mounting bolts and secure with new split pins.

(9) Fit the tie-rods.

(10) Assemble the breather pipe and wire-lock the unions.

(11) Refit the a.c. and d.c. generators, in that order, after first:-

(a) Immersing the drive quills in gearbox oil and ensuring an unbroken film of oil on the splines (the quills are fitted wet).

(b) Lubricating the a.c. generator drive shaft with gearbox oil.

(c) Lubricating the d.c. generator drive shaft with grease XG-287.

(d) Lubricating the clamp-ring adapter flanges and screw threads with grease XG-287.

#### Note...

Ensure that the white lines on the clamp ring and adapter flange are aligned in each case. Tighten the clamp ring nuts with a torque wrench, tightening each at least three times to a loading of:-

A.C. generator	100 lb in.
D.C. generator	◀ 100 lb in. ▶

(12) Connect the electrical cables to the a.c. and d.c. generator terminal blocks and the overspeed/underspeed, and stall-warning switches.

(13) Fit the accessory drive cooling ducts, ensuring correct locking and bonding at all joints.

#### Note...

*The pipe clamp latches at each end of the 2 1/2 in. non-return valve must be vertically disposed and facing forward.*

(14) Fit the turbine exhaust duct.

(15) Fit the air turbine inlet cross-over pipe:-

(a) Insert the metal gaskets and position the pipe, bellows to port, between the turbine and the fuselage pipe.

(b) Unscrew the large union nut to bring the faces of the flanged joints together.

(c) Fit the clamps and, after ensuring correct setting of the flexible pipe adapter, tighten them to the relevant torque-loading.

(d) Tighten the large union nut until the inboard face of the fuselage pipe contacts the pipe support bracket.

(16) Refer to A.P. 2240A, Vol.1, and 6, (Book 15), Sect.4, Chap.1, and ensure

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that the turbine nozzle is in the open condition.

(17) Remove the handling equipment and assemble the jet pipes (*Sect. 4, Chap. 1*).

### D. C. generator

#### Removal

24. To remove the d.c. generator:-

(1) Remove access panel 77P.

(2) Disconnect the electrical cables from the generator terminal block.

(3) Detach the cooling pipe from the generator by unfastening the quick-release clamp.

(4) Support the generator and remove the securing clamp.

(5) Move the generator forward approximately 2 in. to free the drive from the accessory drive unit gearbox and remove it from the fuselage.

#### Assembly

25. To assemble the d.c. generator reverse the removal procedure (*para. 24*) first lubricating the quill, drive shaft adapter flange and clamp-ring, using grease XG-287. The white lines on the clamp-ring and adapter flange should first be aligned and the clamp-ring nut tightened at least three times to a torque load of 100 lb in. ▶

### A. C. generator

#### Removal (*fig. 12*)

26. To remove the a.c. generator:-

(1) Remove the d.c. generator (*para. 24*).

(2) Remove the outboard tie-rod from the accessory drive unit gearbox, through the access aperture.

(3) Disconnect the a.c. generator cooling duct.

(4) Disconnect and stow the electrical cables from the terminal blocks on the a.c. generator casing.

(5) Attach the handling arm to the access panel landing (*detail A*).

(6) Assemble the hoisting equipment and attach it to the handling arm.

(7) Fit the cradle to the handling arm (identification plate outboard) and, with the handling arm fully lowered, insert the cradle through the access aperture.

(8) Raise the cradle to support the a.c. generator, positioning it as in detail A.

(9) Remove the a.c. generator clamp-ring.

(10) Swing the handling arm and a.c. generator forward to disengage the drive from the gearbox and unwind the hoist to align the a.c. generator with the access aperture.

(11) Swivel the a.c. generator through 90 deg and manoeuvre it through the access aperture.

(12) Lift the a.c. generator (weight approx. 60 lb) from the handling arm.

#### Assembly

27. To assemble the a.c. generator:-

(1) Lubricate the drive quill and drive shaft (*para. 23 (11)*) and insert the quill.

(2) Mount the a.c. generator in the handling arm cradle and manoeuvre it through the skin aperture, drive-end first.

(2) Rotate the a.c. generator through 90 deg and hoist it into alignment with the drive unit gearbox flange.

(4) Insert the drive and fit the attachment clamp-ring (after first lubricating the clamp-ring and adapter flange with grease XG-287). Ensure that the white lines on the clamp-ring and adapter flange are aligned, and tighten the clamp-ring nut at least three times to a torque loading of 100 lb in.

(5) Dismantle the hoisting equipment.

(6) Connect the a.c. generator cooling duct.

(7) Connect the electrical cables.

(8) Fit the d.c. generator (*para. 25*).

(9) Replace the gearbox tie-rod and the access panel.

### Main ground-test coupling 'T' piece

(*fig. 6*)

Removal (*with No. 2 engine removal*)

28. To remove the 'T' piece:-

(1) Remove the coupling access panel between frames 49 and 50.

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◀ (2) Remove the lagging from the 'T' piece.

(3) Remove the eight bolts and shims and unscrew the coupling ground connection assembly, Part No.HTE. 205/A.

(4) Disconnect the expansion joint, Part No.EF2. 75.851, between frames 51 and 52.

(5) Remove the half fairleads at frame 51, disconnect the pipe joint aft of frame 50 and remove the pipe assembly, Part No.EF3. 75. 2581.

(6) Remove the half fairleads at frame 49, disconnect the pipe joint aft of frame 48 and remove the 'T' piece.

Note...

*Avoid expanding the piston rings into the well of the 'T' piece by slowly sliding the 'T' piece forward along the pipe until the aft piston ring is released. Remove the ring from the housing.*

(7) Slide the 'T' piece aft until the forward piston ring is released. Remove this ring from the housing.

(8) Remove the lock nut and the piston ring from the aft end and slide the 'T' piece off the pipe.

Assembly (No. 2 engine removed)

29. To assemble the 'T' piece:-

(1) Slide the 'T' piece onto the pipe.

Note...

*If there is no direction-indicating ▶*

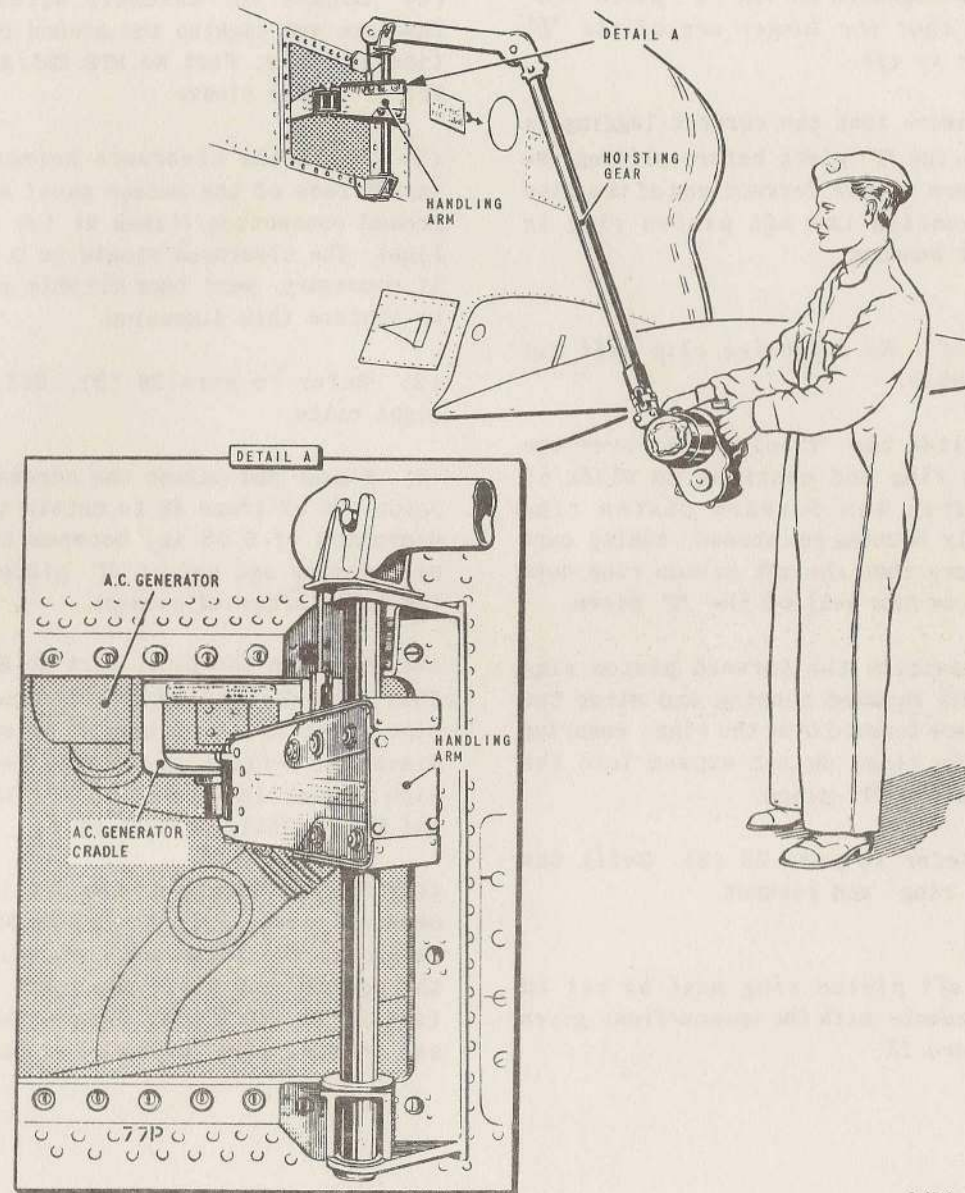


Fig. 12 A.C. generator - removal and assembly

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◀ arrow engraved on the "T" piece, ensure that the longer arm of the "T" piece is aft.

(2) Ensure that the correct lagging is beneath the "T" piece before sliding the "T" piece to the forward end of the pipe and locating the aft piston ring in the aft housing.

Note...

*Use of a No.6 jubilee clip will aid assembly.*

(3) Slide the "T" piece aft over the piston ring and continue to slide it aft until the forward piston ring assembly housing is exposed, taking care to ensure that the aft piston ring does not enter the well of the "T" piece.

(4) Position the forward piston ring into the forward housing and slide the "T" piece forward over the ring, ensuring that the rings do not expand into the well of the "T" piece.

(5) Refer to para.28 (8). Refit the piston ring and locknut.

Note...

*The aft piston ring must be set in accordance with the instructions given in para.17.*

(6) Locate the assembly within the fuselage and tighten the ground connection assembly, Part No.HTE.205/A, onto the "T" piece sleeve.

(7) Check the clearance between the inside face of the access panel and the ground connection (taken at the centre line). The clearance should be 0.40 in; if necessary, peel back the shim packing to achieve this dimension.

(8) Refer to para.28 (3). Refit the eight bolts.

(9) Remake and adjust the screwed pipe joint aft of frame 48 to obtain the gap dimension of 0.55 in. between the aft piston ring and end of "T" piece. Lock the joint after adjustment.

(10) Position the pipe, Part No.EF3.75.2581. Remake and adjust the screwed pipe joint aft of frame 50 to set the dimension between the flange faces of pipe assemblies, Part No.EF3.75.2543 and EF3.75.2581, to 7.25 in.

(11) Set the length of the 4.0 in. expansion joint, Part No.EF2.75.851, by expanding the joint and then adjusting the screwed end until the joint length is 7.30 in. (0.05 in. longer than the gap between pipe assemblies, Part No.

EF3.75.2543 and EF3.75.2581). Lock the joint in this position.

(12) Assemble the expansion joint and refit the pipe clamps.

(13) Refit the half fairleads at frames 49, ensuring a 0.05 in. clearance on the pipe diameter; refit the half fairleads at frame 51, ensuring that the top half is in contact with the pipe at its highest point and that there is a 0.05 in. clearance on the pipe diameter.

(14) Lock relevant locknuts with 22 s.w.g. locking wire (D.T.D.189) and restore the lagging around the "T" piece.

(15) Refit the coupling access panel.

TABLE 1

Torque-loading Conoseal couplings

Bolt size (UNF)	Max. torque-loading (lb in.)
¼	85
10	35

Note...

*This table must be read in conjunction with para.20.* ▶

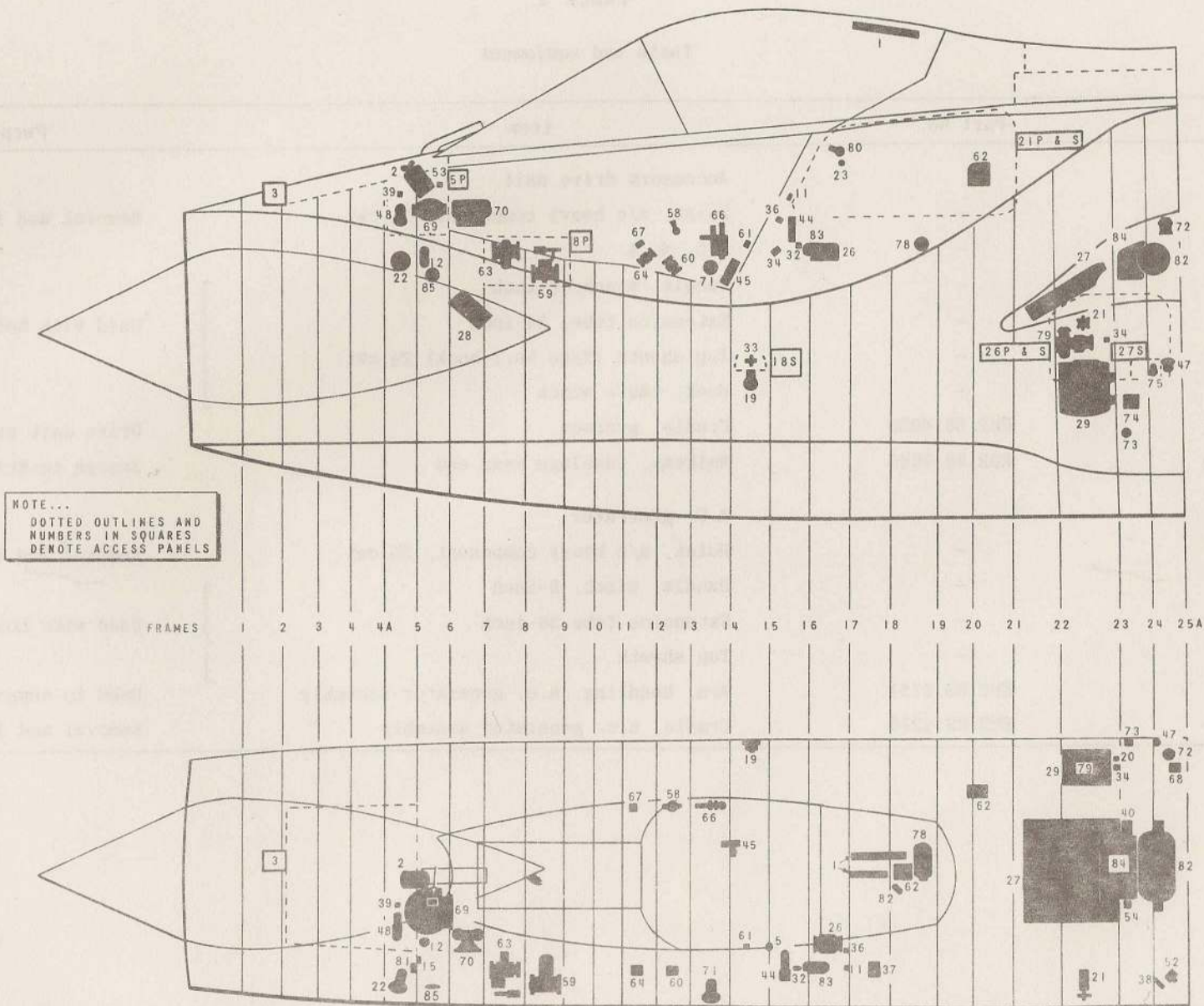


FIG. 13. LOCATION OF MAJOR COMPONENTS-FRAMES 1-25A

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TABLE 2

Tools and equipment

Ref. No.	Part No.	Item	Purpose
<b>Accessory drive unit</b>			
4GC/5699	-	Hoist, a/c heavy component, 2½ cwt.	Removal and installation
4GC/6673	-	Jib, No. 4	} Used with hoist
4GC/5743	-	Handle, winch, 9-inch	
4GC/5427	-	Extension tube, 24-inch	
4GC/5700	-	Top sheath (Type No.1 hook) 2½ cwt.	
4GC/5429	-	Hook, cable winch	
◀ 26DK/95137	EB2. 88. 4939	Cradle, gearbox	Drive unit handling
26DK/95055	EB2. 88. 3943	Walkway, fuselage rear end	Access to drive unit
<b>A. C. generator</b>			
4GC/5699	-	Hoist, a/c heavy component, 2½ cwt.	Removal and installation
4GC/5743	-	Handle, winch, 9-inch	} Used with hoist
4GC/5443	-	Extension tube 36-inch	
4GC/5432	-	Top sheath	
26DK/95209	EB2. 88. 3151	Arm, handling, a. c. generator assembly	Used to support cradle
26DK/95296	EB2. 88. 4215	Cradle, a. c. generator assembly	Removal and installation ▶

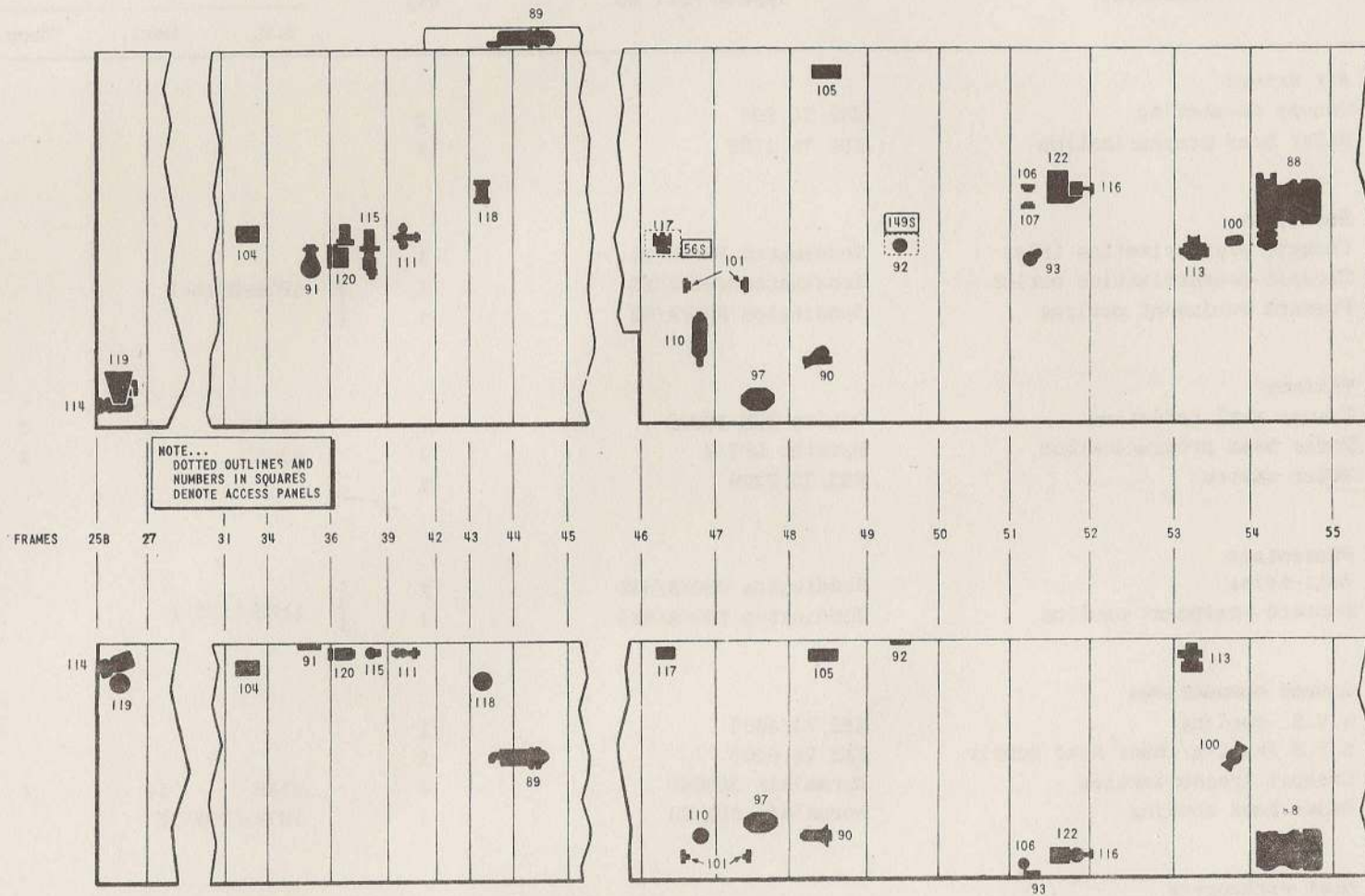


FIG. 14. LOCATION OF MAJOR COMPONENTS—FRAMES 25B-57

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TABLE 3

Major components - frames 1-25A

Item No.	Component	Type or Part No.	Qty.	A. P. Reference			
				A. P.	Sect.	Chap.	App.
<b>Air driers</b>							
1	Canopy de-misting	EB2. 76.393	2				
2	Radar head pressurization	EB3. 75. 1135	1				
<b>Ductstats</b>							
5	Cockpit pressurization inlet	Teddington FHG/A/35	1	}	107B-0216-1		
6	Cockpit pressurization outlet	Teddington FHG/A/35	1				
7	Forward equipment cooling	Teddington FHG/A/52	1				
<b>Filters</b>							
11	Canopy seal inflation	Dunlop ACM/18302	2	4303B	2	7	
12	Radar head pressurization	Hymatic LF7/4	1	4303C	2	5	2
13	Water system	EB2. 75.2299	1				
<b>Flamestats</b>							
15	Anti-icing	Teddington FHO/A/583	1	}	112G-1122-1		
16	Forward equipment cooling	Teddington FHO/A/629	1				
<b>Ground connections</b>							
19	A. V. S. cooling	EB2. 75. 4937	1				
20	A. V. S. /anti-g/radar head supply	EB2. 75.6405	1				
21	Cockpit pressurization	Normalair 505560	1	4340	13	1	8
22	Radar head cooling	Normalair 504300	1	107B-1108-16			
<b>Heat exchangers</b>							
26	A. V. S. and anti-g system	Marston Excelsior D934/3A	1	4340	8	1	35
27	Pre-cooler	Marston Excelsior D158/130A	1	4340	8	1	52
28	Radar head	Marston Excelsior D603/3A	1	4340	8		
29	Water boiler	Marston Excelsior D695/4A	1	4340	8	4	

continued...

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TABLE 3 Major components - frames 1-25A - continued

Item No.	Component	Type or Part No.	Qty.	A. P. Reference			
				A. P.	Sect.	Chap.	App.
<i>Valves</i>							
<i>Non-return</i>							
32	A.V.S. supply	} Flight refuelling B9811155/E	1	} 106D-1000A-1			
33	A.V.S. cooling		1				
34	A.V.S./anti-g/radar head supply		2				
35	Canopy de-misting	Normalair 521480	1	107B-0905-16AD			
36	Canopy seal inflation	Hymatic NAR131/002	2	4303C	4	40	
37	Cockpit pressurization (flap type)	Normalair 504390	1	107B-1021-16			
38	Cockpit pressurization (insert type)	Normalair 520290	1	107B-0905-16AD			
39	Radar head pressurization	Flight refuelling B9811000/C	1	} 106D-1000A-1			
40	Water header-tank inlet (irreversible type)	Flight refuelling B9811245/C	1				
41	Windscreen de-misting	Normalair 521480	1	107B-0905-16AD			
<i>Pressure reducing</i>							
44	A.V.S. supply	Hymatic PS60/31	1	4303C	4	34	6
45	Canopy demisting	Hymatic PS48/73 Mk.2	1	4303C	4	21	7
46	Canopy seal inflation	Hymatic PS29/18	1	4303C	4	15	13
47	Cockpit pressurization	EF2.75.1935	1				
48	Radar-head pressurization	Hymatic PAS/160/046	1	4303C	4	34	14
<i>Pressure relief</i>							
52	Cockpit pressurization	EB2.75.2693	1				
53	Radar head pressurization	Hymatic RAV 150/005	1	4303C	4	39	2
54	Water header-tank outlet	EB2.75.6467	1				
<i>Stop valves</i>							
58	Anti-g	Hymatic SV35/1	1	4303C	6	10	
59	Anti-icing						
	Butterfly valve	Teddington FMP/A/298 or 299	1	107C-233-16A			
	Solenoid valve	Teddington FGB/A/16	1	4303E	2	8	2
60	Canopy de-misting	Normalair 522070	1	4340	5	1	4
61	Canopy seal inflation	Hymatic SV19/2	1	4303C	6	6	4
62	Forward equipment cooling (pre Mod.4343)	Ferranti D95/15136 or 15138	2				
63	Rain dispersal						
	Butterfly valve	Teddington FMP/A/298 or 299	1	107C-233-16A			
	Solenoid valve	Teddington FGB/A/16	1	4303E	2	8	2
64	Windscreen de-misting	Normalair 520210	1	4340	5	1	4

continued...

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TABLE 3 Major components - frames 1-25A - continued

Item No.	Component	Type or Part No.	Qty.	A.P. Reference			
				A.P.	Sect.	Chap.	App.
<b>Miscellaneous valves</b>							
66	Anti-g	Hymatic VAG109/006	1	4303C	4	38	1
67	A.V.S. flow control	Hymatic FC2/5	1	4303C	6	9	2
68	Cockpit temperature regulation	English Electric 5109/003/000	1	4303E	2	14	
69	Combined valve unit	Normalair 520200	1	107B-1409-1			
70	Pressure controller	Normalair 517500	1	1275A	20	3	4
71	Emergency air	EB2.75.1689	1				
72	Spill	EB2.75.3871	1				
<b>Water system</b>							
73	Drain valve	EB2.75.6507	1				
74	Float valve	EB2.75.3511	1				
75	Replenishing valve	Lockheed AVA1485/D	1				
<b>Miscellaneous components</b>							
78	Canopy seal inflation storage bottle	Hymatic RES 4 Mk.1 (pre Mod.4669)	1				
79	Cold-air unit	Hymatic BAT 210.001 (post Mod.4669)	1	4303C	3	5	
80	Canopy seal inflation pressure gauge	De Havilland RU45/04	1				
81	Anti-icing pressure switch	Smiths EU/13/LN/K006	1	1275A	15	24	
82	Water extractor	Teddington FRJ/A/47	1	112G-1107-1			
83	Water extractor	Godfrey WE30 Mk. 1	1	4340	9	2	
84	Anti-g and A.V.S. system water trap	EF3.75.1547	1				
84	Water tank	EF2.75.479	1				
85	Radar head pressurization bursting disc	EF3.75.3639	1				

Note... Certain item numbers have been omitted to allow for any additional components that may be introduced in the future.

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TABLE 4

## Major components - frames 25B-57

Item No.	Component	Type or Part No.	Qty.	A. P. Reference			
				A. P.	Sect.	Chap.	App.
<i>Note... Certain item numbers have been omitted to allow for any additional components that may be introduced in the future.</i>							
<b>Air driven accessories</b>							
88	Accessory drive unit	Rotol ADE 383	1	2240A			
89	Stand-by turbine/generator unit	Rotax BT0102	1	4343A	3	18	
<b>Filter</b>							
90	Auxiliary air supply	Hymatic LF/1	1	4303C	2	5	1
<b>Ground connections</b>							
91	Forward equipment cooling	EF3. 75. 2403	1				
92	Main ground test						
	Adapter	High Temperature Engineers HTE205/A	1				
	Non-return valve	High Temperature Engineers HTE203/A	1				
	Sealing cap	High Temperature Engineers HTE/220/3	1				
93	Port equipment cooling	EF3. 75. 2173	1				
<b>Heat exchanger</b>							
97	Auxiliary air supply	Marston Excelsior D555/2A	1	4340	8	1	36
<b>Valves</b>							
<i>Non-return</i>							
100	Accessory drive unit cooling	Flight refuelling B9807795	1	106D-1000-1			
101	Auxiliary air supply	Saunders 706AA-11/B or M10295	2	107B-0905-16AD			
<b>Forward equipment cooling</b>							
102	Hot air bleed	Normalair 521480	1	107B-0905-16AD			
103	Ground supply	Normalair 520300	1	107B-0905-16AD			
<b>Main air supply</b>							
104	No.1 engine	EF2. 75. 303	1				
105	No.2 engine	EF2. 75. 305	1				
<b>Port equipment cooling</b>							
106	Ground supply	Normalair 516410	1	107B-0905-16AD			
107	Ram air supply	Normalair 513930	1	107B-0905-16AD			
<b>Stand-by turbine/generator supply</b>							
108	No.1 engine	Normalair 520310	1	107B-0905-16AD			
109	No.2 engine	Normalair 520300	1	107B-0905-16AD			

*continued...*

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TABLE 4 Major components - frames 25B-57 - continued

Item No.	Component	Type or Part No.	Qty.	A. P. Reference			
				A. P.	Sect.	Chap.	App.
	<i>Pressure reducing</i>						
110	Auxiliary air supply	Hymatic PS48/42	2	4303C	4	21	6
	Forward equipment cooling						
▶ 111	Hot air bleed	EF2. 75. 1935	1				
	<i>Pressure relief</i>						
112	Auxiliary air supply	Hymatic RV37/23	2	4303C	4	28	2
	<i>Stop valves</i>						
113	Accessory drive unit shut-down (pre Mod. 2217)	Rotol ATPR. 2/3					
	(post Mod. 2217)	Rotol 6.1301.0002	1	2240A Bk. 15	3	6	1
114	Cockpit pressurization	Teddington FMP/A/5100	1	4303E	2	5	12
	Forward equipment cooling						
115	Hot air bleed	Hymatic MAD. 214/002 or 003	1				
116	Port equipment cooling						
	Actuator (pre Mod. 4171)	English Electric AE4529 Mk. 2 or 3	1				
	(post Mod. 4171)	English Electric AE4529 Mk. 4	1				
	Butterfly valve	EF3. 75. 2795	1				
117	Stand-by turbine/generator isolating						
	Butterfly valve	Teddington FMP/A/240	1	4303E	2	5	62
	Solenoid valve	Teddington FGB/A/16	1	4303E	2	8	2
	Filter and body	Teddington FGB/SA/462	1	4303E			
118	Stand-by turbine/generator control	EF2. 75. 1917	1				
	<i>Miscellaneous valves</i>						
119	Constant-flow	EF2. 75. 153	1				
	Forward equipment cooling						
120	Hot air bleed temperature-control (pre Mod. 4188)	Teddington FOZ/A/5020	1	4303E	2	14	
	(post Mod. 4188)	English Electric 5109/003/000	1				
	<i>Miscellaneous components</i>						
121	Rear equipment cooling flamestat	Teddington FHO/A/630	1	112G-1122-1			
122	Water trap	EF3. 75. 2775	1				

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