Chapter 8D AIR SYSTEMS - AUXILIARY AIR SYSTEMS AND COOLING AIR

(completely revised)

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DESCRIPTION

Auxiliary air systems

General information

1. Compressed air from the engines is employed for pressurizing the fuel tanks, the fuel recuperators, and the hydraulic fluid reservoirs; it is also used to modify operation of the fuel tank vent valves and for driving the reheat fuel pumps. For details of its application to hydraulic and fuel systems, refer to Chap.6 and Sect.4, Chap.2 respectively.

Air supply

2. Two auxiliary air system tappings are provided on each engine at the 15th compressor stage. One of these tappings delivers air to the associated reheat fuel pump; the other supplies the fuel and hydraulic system services. For the latter purpose, the air passes through a non-return valve to a T-connection at frame 47 on the port side. From the T-connection a common pipeline directs the air through a heat exchanger, a filter, and a 16 lb/in^2 pressure-reducing valve to a pressure-relief valve; all these components are located between frames 46 and 49 in the lower port side of the fuselage. At the relief valve the air flow is divided to supply the fuel system and hydraulic system services.

Heat exchanger

3. This unit is mounted in the fuselage between frames 47 and 48. Engine air is passed through the matrix of the heat exchanger to be cooled by exhaust air from the air turbine oil cooler outlet *(para.8)*.

Test connections

4. Two test connections, one for a pressure gauge and the other for the air supply, are provided for ground servicing; they are accessible behind access panel 63P. A third connection, behind access panel 58S, provides attachment for a pressure gauge to check the ventral tank transfer air pressure.

Reheat fuel pumps

5. Two reheat pumps, one for each engine, are mounted in the fuselage on the port side, at frames 27 and 47 respectively. Each pump is driven by a two-stage air turbine controlled by a

stop valve bolted to the engine compressor casing. Exhaust air is vented to atmosphere through the fuselage skin.

Accessory, compartment, and reheat pipe cooling

General information

6. The electrical accessories driven by the air turbine, wireless and radar equipment in certain compartments, auxiliary air *(para.2)*, and engine reheat jet pipes are all cooled by ram air or overload air from the cockpit air system. For descriptive purposes, the cooling systems are divided under the headings of front, and rear, fuselage.

Front fuselage equipment cooling, F Mk.1 (pre Mod.177) (fig.3), F Mk.1 (post Mod.177) and F Mk.1A (fig.4)

7. Cooling air for the various items of wireless and radar equipment installed immediately behind the cockpit is obtained from either, or both, of two sources, depending upon the conditions under which the aircraft is operating. One supply is taken from the engine air intake duct through an inlet pipe leading to a temperature control valve *(Chap.8E)* which closes automatically when ram air temperature exceeds 60 deg C; the second supply is from the cockpit air supply through a spill valve *(Chap.8E)*. The spill valve opens to admit air to the cooling system only after the cockpit requirements have

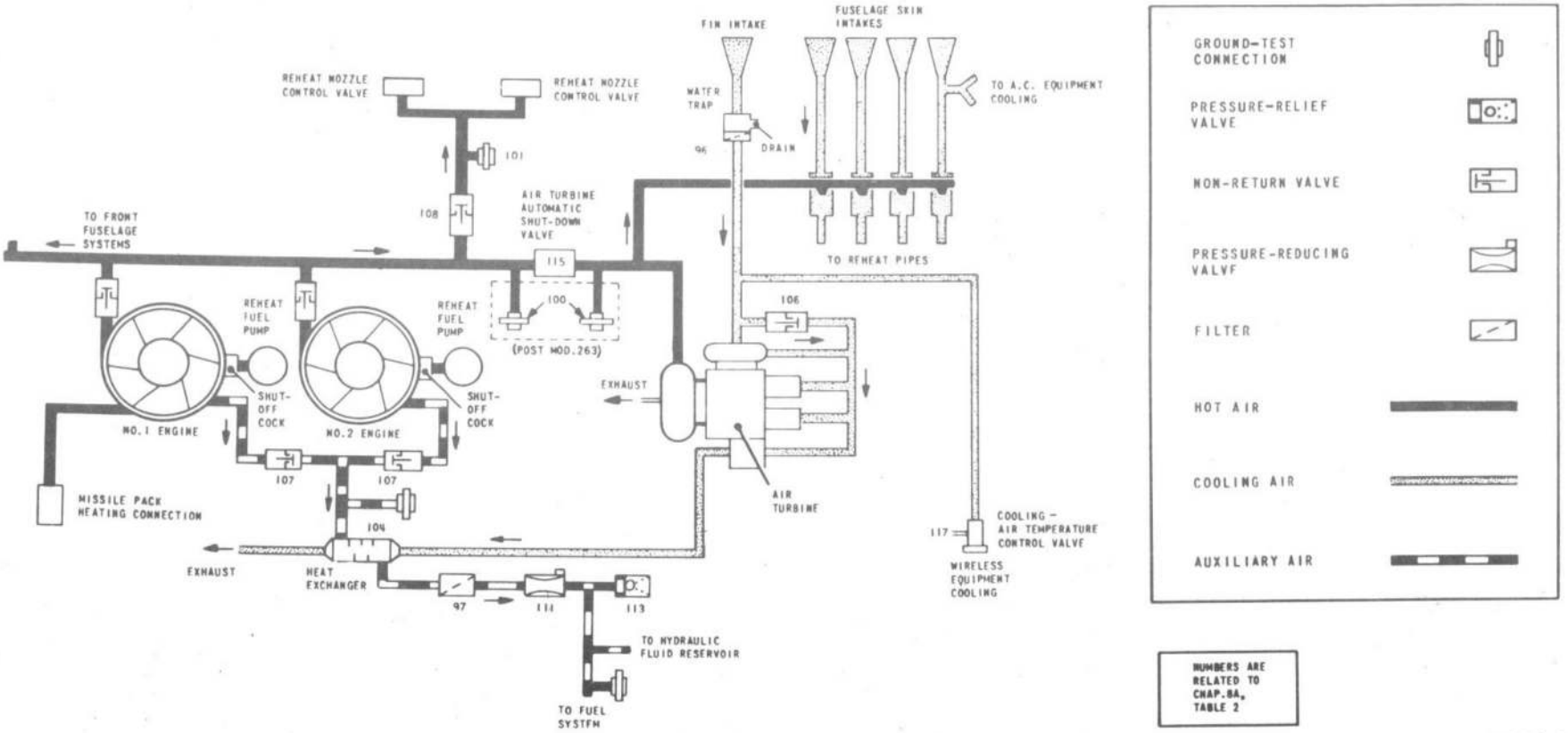

Fig.1. Theoretical diagram

been satisfied. Both supplies feed a common duct from which various branch pipes direct cooling air to Tacan, M.R.G., and V.H.F. or U.H.F. installations.

Rear fuselage equipment cooling

8. Air for cooling the a.c. and the d.c. generators, the air turbine gearbox oil, the wireless and radar equipment, and auxiliary air, is introduced through an intake in the leading edge of the fin, connected to a pipe around the starboard side of frame 54. The moisture content of the air is reduced by a water trap in the pipe between frames 53 and 54. The air flow is maintained during flight by ram pressure, and on the ground by a fan driven from the air turbine gearbox. Should the fan become blocked, or the ram-air intake pressure exceed the impellor capacity, a by-pass pipe incorporating a non-return valve diverts air to by-pass the fan. From the fan or by-pass pipe, cooling air flows through the a.c. and d.c. generators, and the air turbine oil cooler; it is then ducted forward to pass through the auxiliary air heat exchanger. A tapping from the cooling fan intake duct directs cooling air forward, through a temperature control valve *(Chap.8E)*, to a wireless compartment between frames 51 and 53 on the port side. Exhaust air from this compartment is used to cool a second compartment, between frames 49 and 50, from which the air is exhausted through a flap valve into the fuselage.

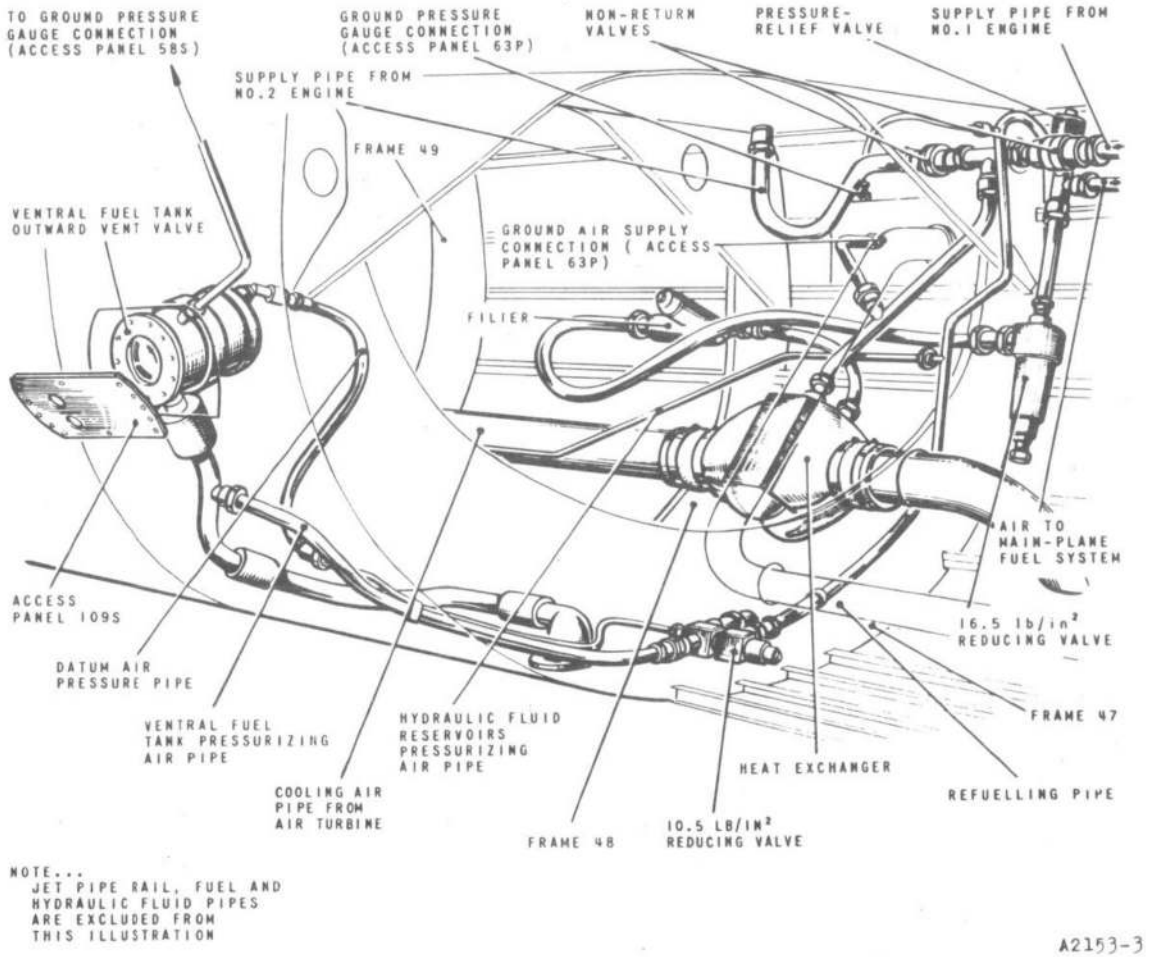

Fig.2. Auxiliary air system components between frames 46 and 49

Reheat jet pipe cooling

9. The engine reheat jet pipes are double-skinned, and the inner skins are covered with insulation blankets. Ram air is introduced to the interspaces through four intakes in the fuselage skin, one port and one starboard for each jet pipe. During ground running, cooling-air flow is induced by hot air injected into the intake ducts through a tapping from the air turbine supply pipe *(Chap.8A)*. Two small tappings from the lower intake duct on the port side *(access panel 81P)*, direct cooling air to the a.c. equipment located between frames 54 and 55.

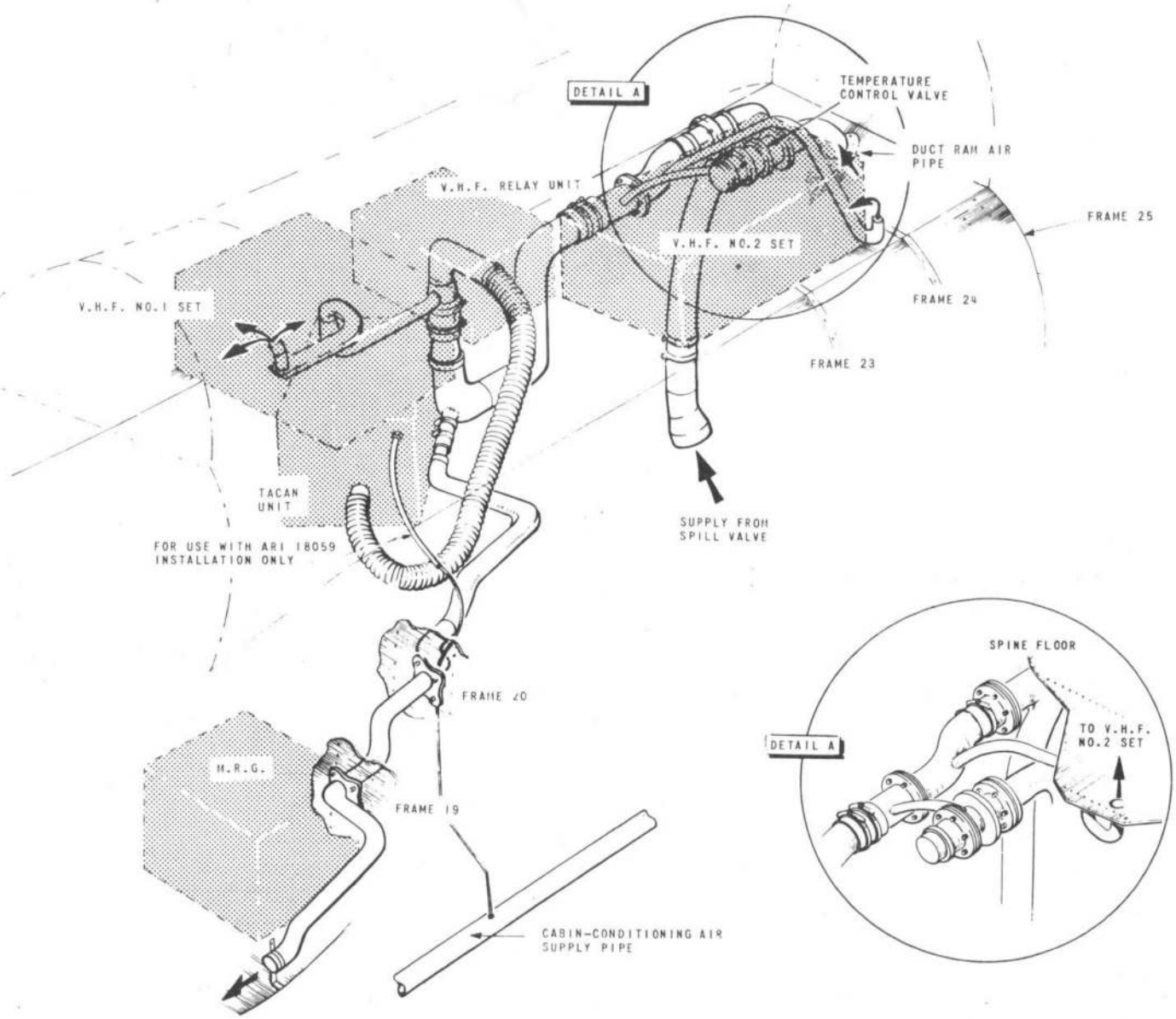

FIG.3. FRONT FUSELAGE–EQUIPMENT COOLING - F MK. 1 (PRE MOD. 177)

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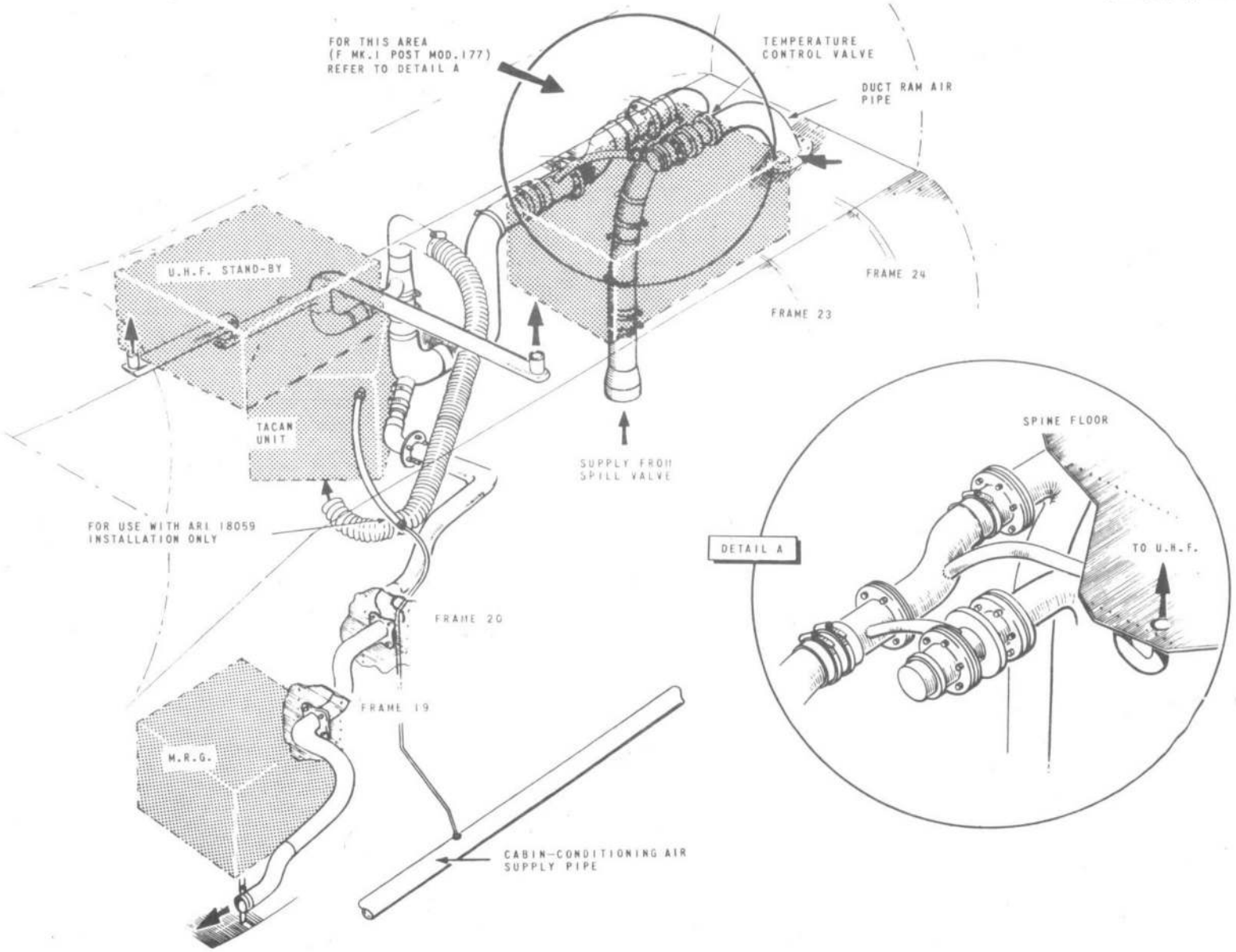

FIG.4. FRONT FUSELAGE-EQUIPMENT COOLING - F MK. 1 (POST MOD. 177), F MK. 1A

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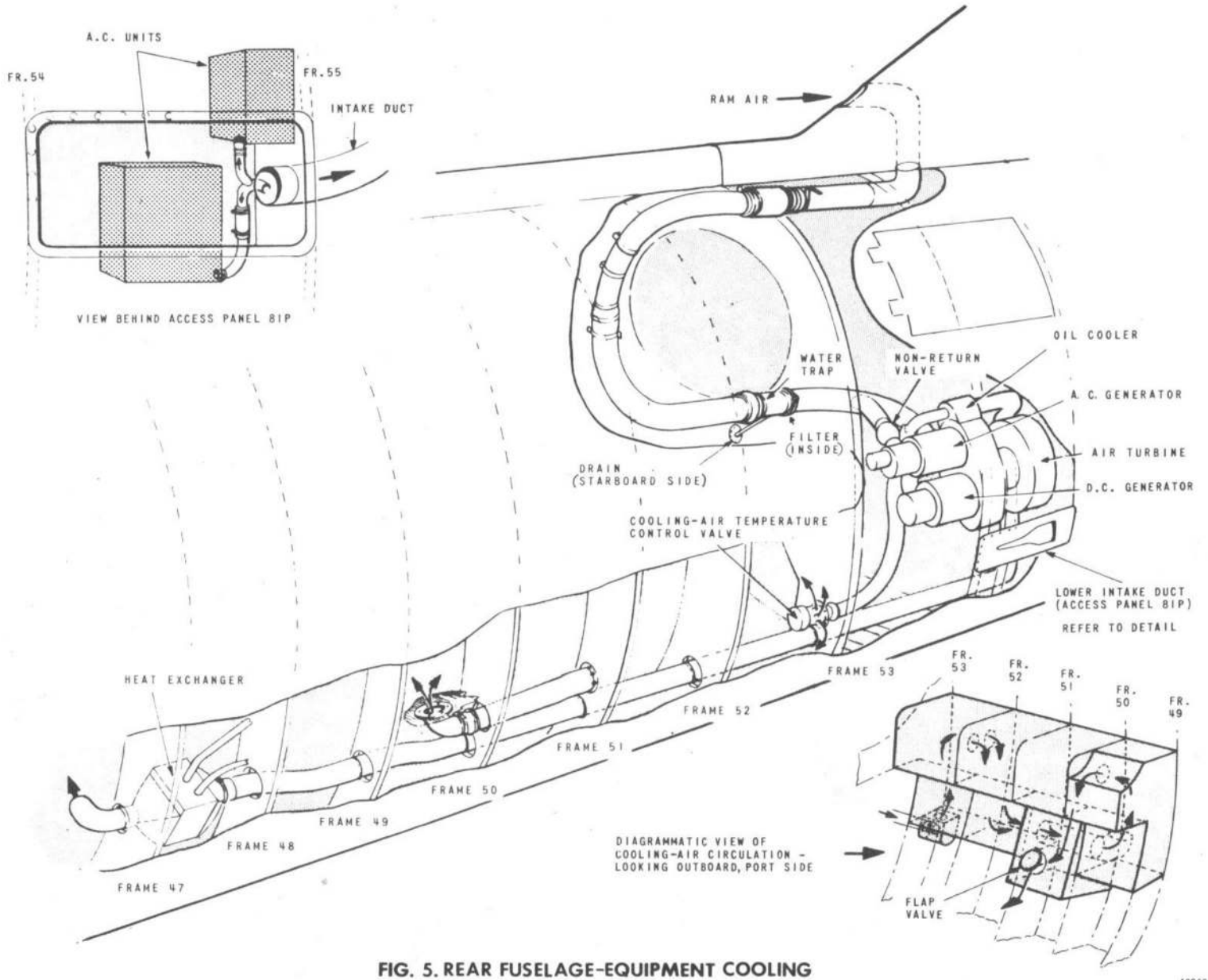

FIG. 5. REAR FUSELAGE-EQUIPMENT COOLING

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