Chapter 4 INSTRUMENT POWER SUPPLIES

(completely revised)

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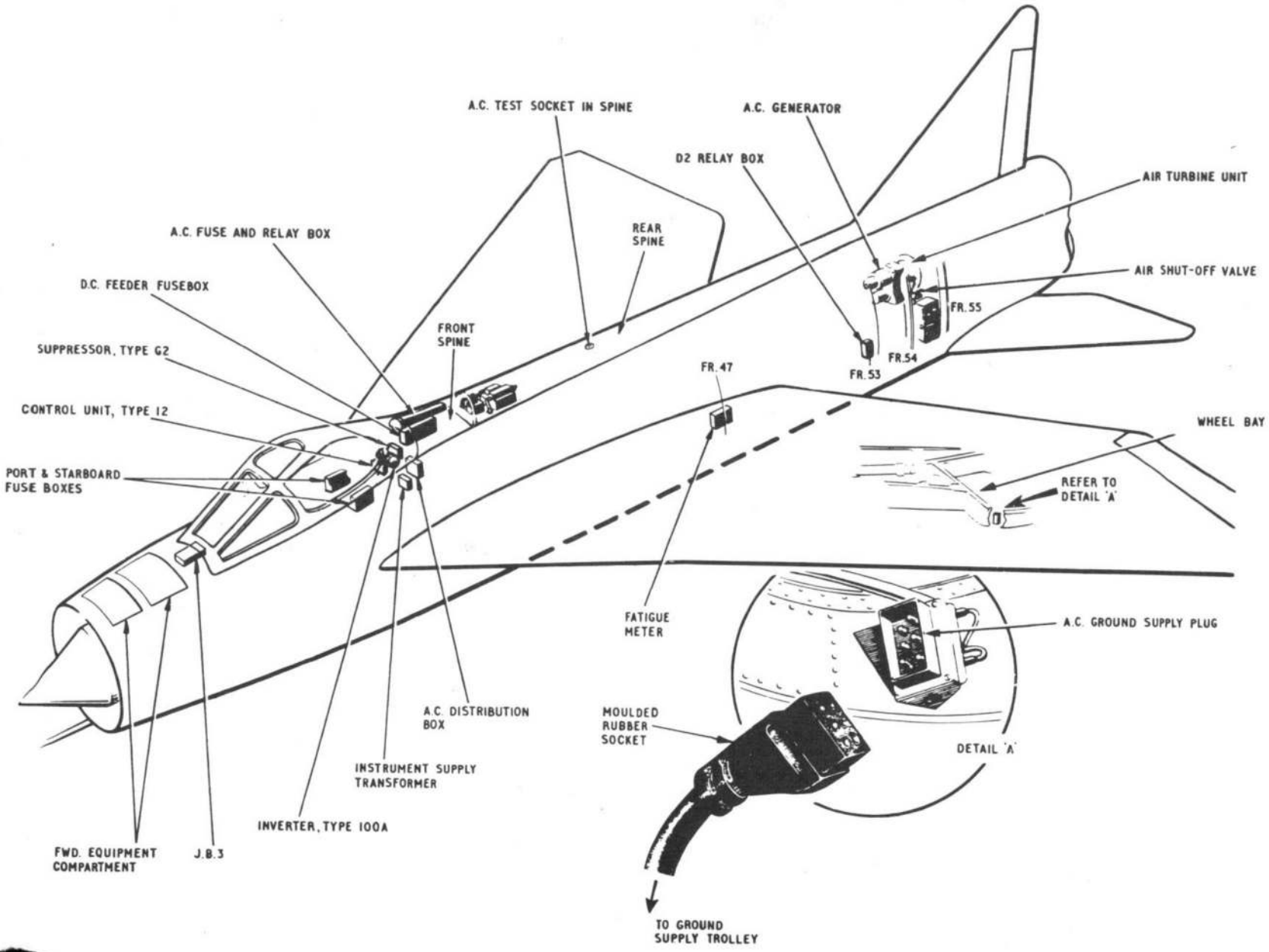

FIG.I. INSTRUMENT SUPPLIES EQUIPMENT

IA-9061-1

DESCRIPTION

General

1. The 115-volt, single-phase and 3-phase supplies required to operate the instruments are normally fed from the main distribution system via a 3-phase transformer. In the event of failure of the a.c. generator or supply transformer, the more important instruments are operated from a stand-by inverter supply. The circuits to these instruments are connected via a supply change-over relay which operates automatically on failure of the normal supply.

Normal supply

2. The 3-phase, 200/115 volt, 400 Hz instrument supply transformer, is installed in the main equipment compartment. Its input circuit is controlled by a Type S3 supply relay, located in the a.c. fuse-and-relay box, in conjunction with the INSTRUMENT MASTER switch on the starboard console. This double-pole switch also controls the 28-volt d.c. supplies required to operate certain instruments. From the transformer output, the 115-volt supply lines XF, XG and XHN are routed back to the a.c. fuse-and-relay box, whence the supply is distributed to the instruments, either directly, or via the supply change-over relay.

Inverter supply

3. The Type 100A inverter, which provides a.c. power to operate the essential instruments in the event of failure of the normal supply, is installed in the main equipment compartment. Its output voltage and frequency are regulated by a Type 12 control panel, from which the 3-phase, 115-volt, 400-Hz supply is connected via a Type G2 suppressor, adjacent to the inverter. The supply change-over relay and the inverter control relay operate in conjunction with an undervoltage phase sequence unit fitted in the a.c. distribution box. The windings of the undervoltage phase sequence unit, are energized from the output circuit of the instrument supply transformer, and should this supply fail, its contacts will open and trip the supply change-over relay. This in turn, will energize and close the inverter control relay, and the inverter will start up and supply power to the relevant instruments.

Note...

The circuit and routeing diagrams of the instrument supply system indicate those instruments which are transferable to the inverter supply, and those which can be energized from the normal supply only.

Supply change-over indicator

4. A magnetic indicator on the instrument flying panel operates in conjunction with the change-over relay. When the relay is de-energized to effect transfer of the instrument to the inverter supply, the indicator is also de-energized and shows a white disc.

Inverter control switch

5. The inverter system may be controlled manually by operating a switch labelled NORMAL/STANDBY INVERTER, on the starboard console. When the locking guard, which retains the switch in the NORMAL position, is raised and the switch set to STANDBY INVERTER, the d.c. supply to the torque switch is cut off, and the inverter starts up and supplies power to the relevant instruments.

Fuel contents gauges

6. Two Type AG127 fuel contents gauges, located on the starboard instrument panel, are controlled by Type F.A.B.18 amplifiers installed in the main equipment compartment. These amplifiers and the indicators are supplied from the d.c. feeder fusebox.

Voltmeter

7. Indication of busbar voltage is given by a coloured sector voltmeter ranging from 0 to 35 volts. The meter is located on a small sub-bracket assembly attached to the starboard shroud, forward of the auxiliary warnings panel, and is connected to the busbar via a fuse in the d.c. feeder fusebox. The fuse also controls the port fuel contents gauge circuit. For further particulars of the voltmeter refer to A.P.113F-1001-1.

Wheel brake pressure gauge

8. The wheel brake pressure gauge mounted on the starboard console panel is controlled by a pressure transmitter attached to the hydraulic brake system in the main equipment compartment. The

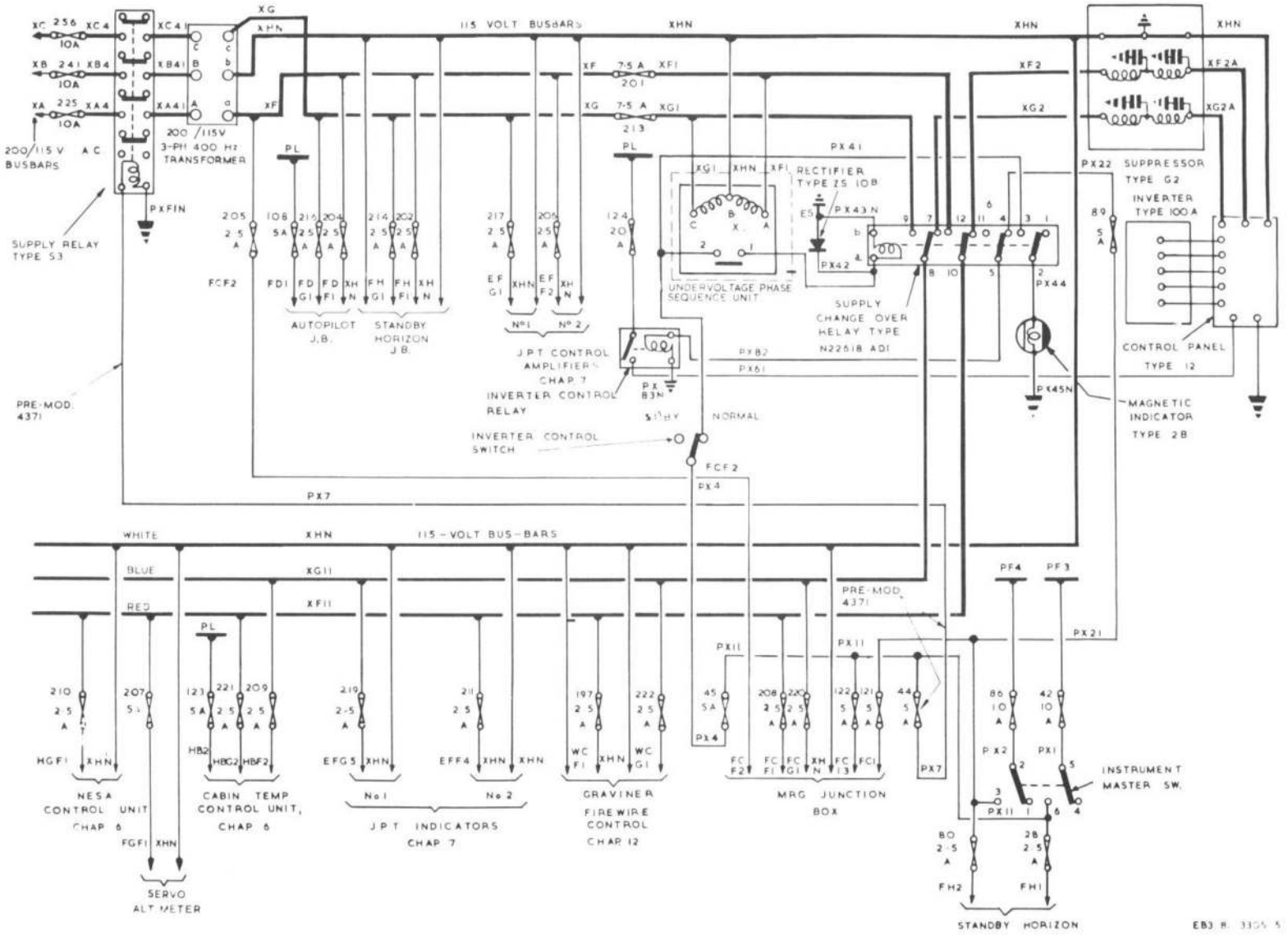

FIG. 2. INSTRUMENT POWER SUPPLIES

◄ MINOR AMENDMENTS ►

associated circuit is supplied from the d.c. system via the starboard fusebox. Details of this installation are given in Sect.7, Chap.6.

Fatigue meter

◀ **9.** A Type 14 fatigue meter is located between frames 46 and 47 at the starboard side of the rear fuselage. The fatigue ▶ meter operates in conjunction with the alighting gear up-lock microswitches. The circuit is fed from the d.c. system via the starboard fusebox. A description of the fatigue meter is given in Sect.7, Chap.6.

General services hydraulic pressure gauge

10. A Type A.I.756 remote reading pressure gauge, located on the port coaming is coupled electrically to a Type A.I. 757 transmitter unit in the services hydraulic pressure line. The circuit is supplied with 115-volt, single-phase a.c. *(Chap.13)* from busbar XK1 in the a.c. fuse-and-relay box. Details of the hydraulic pressure gauge circuit are included in Sect.7, Chap.6.

Flight instrument supplies

Autopilot and M.R.G.

11. Both installations recieve power from the 115-volt, 3-phase instrument supply system *(Chap.13)* and are also provided with 28-volt d.c. supplies. The junction boxes which distribute these supplies to the various units of each installation are located in the main equipment compartment. Further information relating to the autopilot system can be found in Sect.7, Chap.3.

Main altimeter supply

12. The main altimeter *(Sect.7, Chap.5)* operates in conjunction with an amplifier located at the port side of the port console. The amplifier operates from 115-volt single-phase a.c. derived from the main a.c. power supply system. During normal operation the altimeter supply is taken directly from fuse 198 which in turn is fed from busbar XF via fuse 201 and the contacts of the energized a.c. change-over relay. In the event of failure of the main a.c. supply, with the consequent opening of the change-over relay, the amplifier is automatically transferred to the stand-by inverter supply.

Stand-by artificial horizon supplies

13. This instrument, located on the port coaming panel, requires a 115-volt, 3-phase a.c. supply and two d.c. supplies for its operation. These are connected via the stand-by artificial horizon junction box and the associated control unit in the forward equipment compartment. The a.c. is derived from the instrument supply system *(Chap.13)* and the two d.c. lines are connected via the instrument master switch, and a change-over switch labelled ART, HORIZON NORMAL/ENERGY on the port coaming panel. The utilization of the respective supplies during starting, normal running and emergency operation is described in Sect.7, Chap.5.

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.

General

14. All equipment units, cables, and connectors, associated with the main a.c. supply and instrument supply systems, should be examined periodically for signs of damage, insecurity, and over-heating.

Functional tests

15. In addition to the normal operational and continuity checks, the following tests should be made at the intervals ◀ laid down in A.P.101B-1001-5 or whenever any major component of the system has been repaired or renewed.

Inverter setting-up procedure

16. The procedure for setting up the inverter is described in A.P.113D-0104-16, and this calls for the use of an inductive loading panel, Ref.No.5G/565, particulars of which are given in A.P.4343S, Vol.1, Sect.16, Chap.5. As this aircraft incorporates a Mk.1 M.R.G., changes must be made to the inductive loading panel before setting up the inverter. The changes involve connecting a 1mF, 200- ▶ volt capacitor between terminals 8 and 10, 10 and 12, and 12 and 8, to raise the specified power factor figure from between 0.8 and 0.82 to unity. If it is

found impossible to obtain the specified frequency regulation, the best possible regulation should be obtained and then adjusted on load to 395 Hz by means of the shunt field circuit.

System functioning check

17. *Equipment.*–

A.C. voltmeter (0-150 volts)

Phase-sequence indicator

◀ Frequency meter (400 Hz) ▶

Pitot-static test rig

18. *Procedure.*–

(1) Ensure that the Type 100A inverter and the Type 12 control panel have been bench tested and set up as a matched ◀ pair *(A.P.113D-0104-16).* ▶

(2) Remove fuses 216 and 204 (auto-pilot), 208 and 220 (M.R.G.), and 202 and 214 (stand-by horizon).

(3) Connect the phase sequence indicator to XF, XG and XHN (earth) as follows:–

Indicator terminal	Busbar connections
A	XF
B	XHN (earth)
C	XG

(4) Connect d.c. and a.c. ground supplies, and switch on.

(5) Switch on the instrument master switch, then check the phase sequence and voltage between XF and XHN, XHN and XG, and XG and XF. These voltages should be approximately 115 volts. The instrument supply change-over indicator should show black. The inverter should not run.

(6) Switch off the instrument master switch and connect the phase sequence indicator as follows:–

Indicator terminal	Busbar connections
A	XF 11
B	XHN
C	XG 11

(7) Replace fuses 202 and 214.

(8) Switch on the instrument master switch, and check the phase sequence and voltages between XF11 and XHN, XHN and XG11, and XG11 and XF11. These voltages should be approximately 115-volts. The instrument supply change-over indicator should show black. The inverter should not run, and the stand-by horizon should erect.

(9) Set the inverter switch to STAND-BY. The inverter should run, and the instrument supply change-over indicator should show white. Check the phase sequence, the frequency, and the voltages between XF11 and XHN, XHN and XG11, and XG11 and XF11. These voltages should be approximately 115-volts, and the frequency should be between 395 and 405 Hz.

(10) Return the inverter switch to NORMAL. The inverter should stop, and the instrument supply change-over indicator should show black.

(11) Reduce the static pressure and check that the servo altimeter operates.

(12) Return the static pressure to normal.

(13) Remove the a.c. ground supply. The inverter should run and the instrument supply change-over indicator should show white. The stand-by horizon should continue to run from the d.c. power supply.

(14) Reduce the d.c. supply to 24 volts; then select EMERGENCY on the stand-by horizon NORMAL/EMERGENCY switch. The stand-by horizon and the inverter should continue to run. The change-over indicator should show white.

(15) Return the stand-by horizon switch to its NORMAL position. Switch off the instrument master switch. Remove the d.c. ground supply.

(16) Disconnect and remove all test equipment, and refit fuses 204, 208, 216, and 220.

FIG. 3. INSTRUMENT POWER SUPPLIES

(Illustration overleaf)

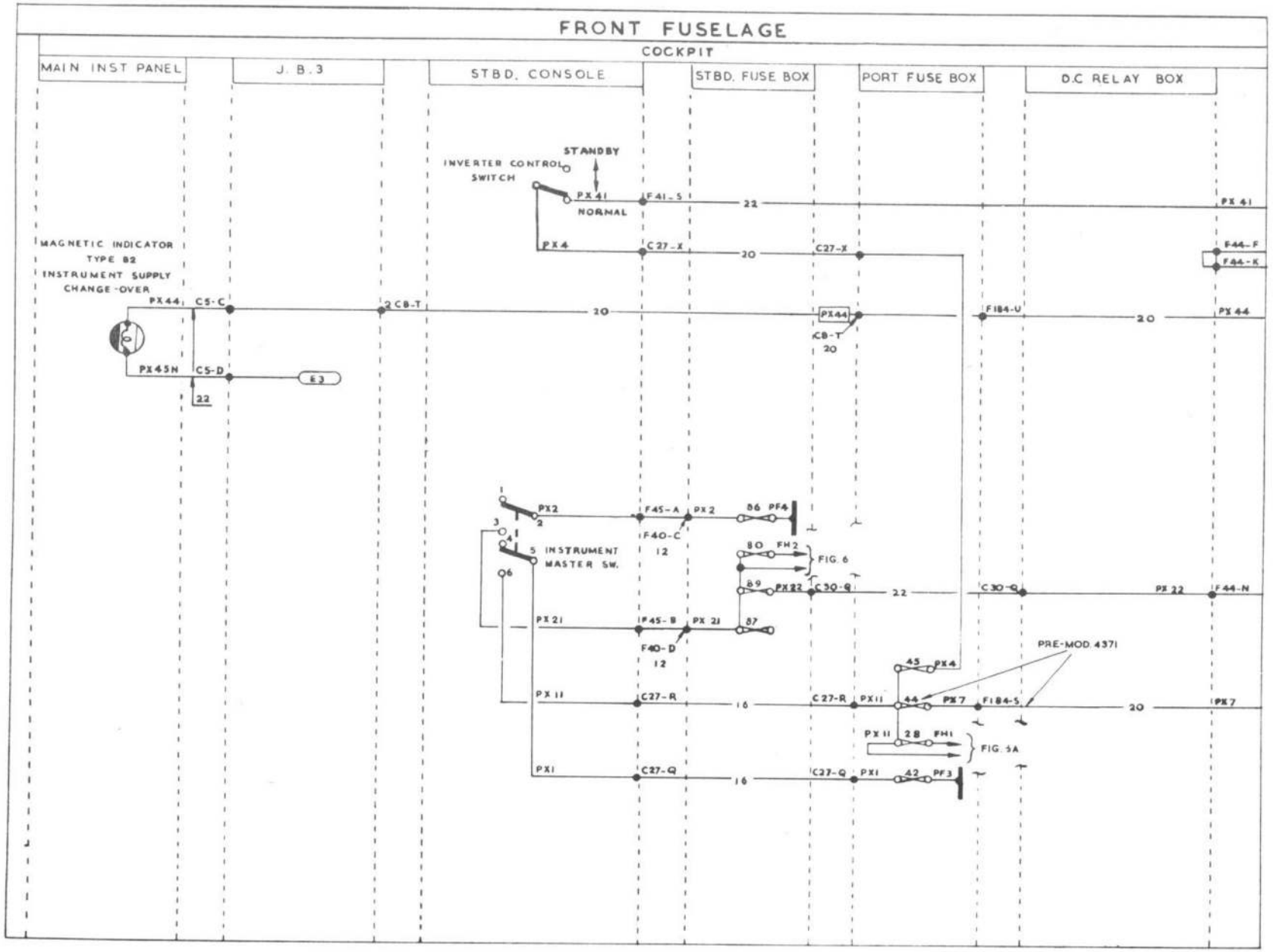

FIG.3. INSTRUMENT POWER SUPPLIES

◀ Minor alterations ▶

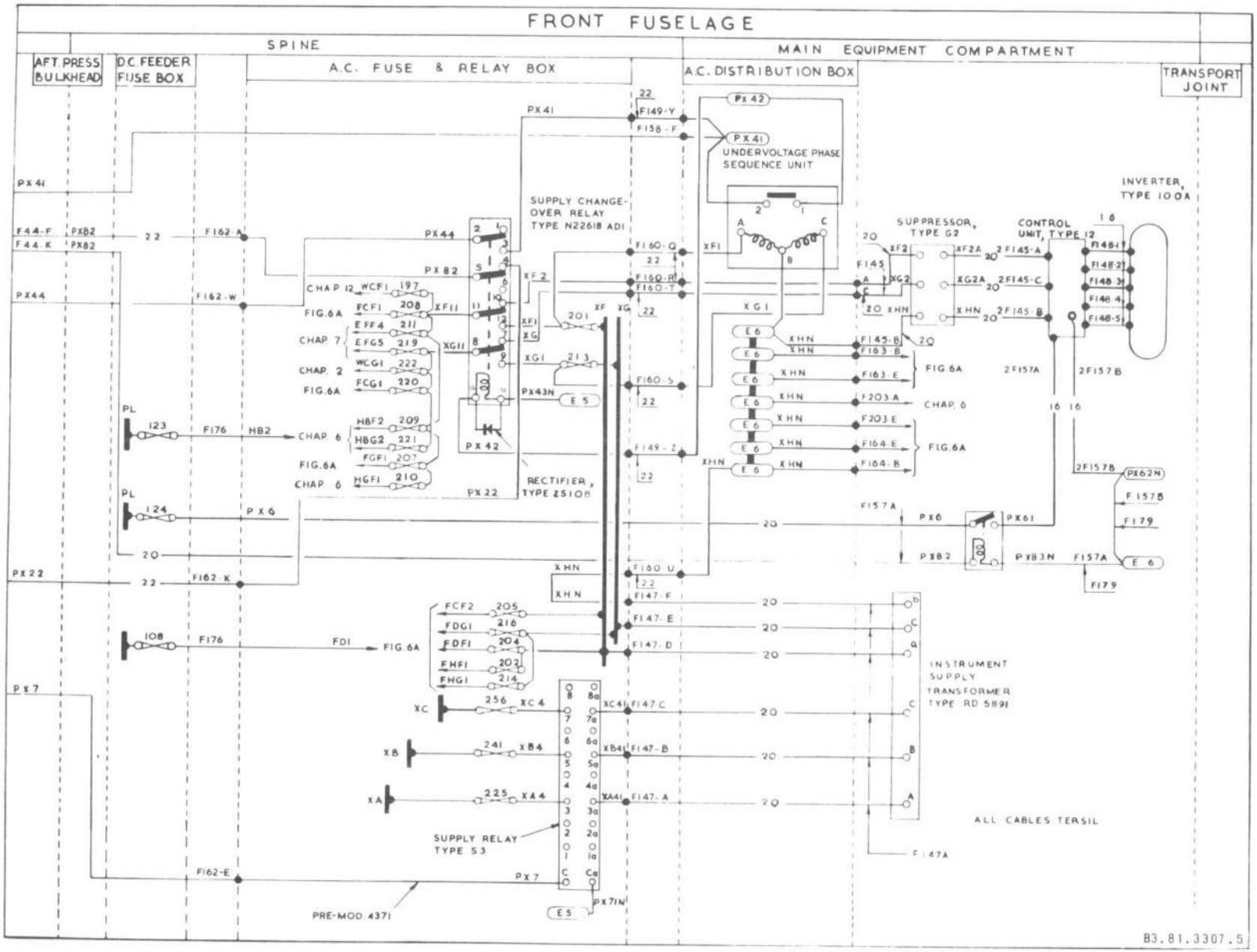

FIG. 3A. INSTRUMENT POWER SUPPLIES

◀ MINOR AMENDMENTS ▶

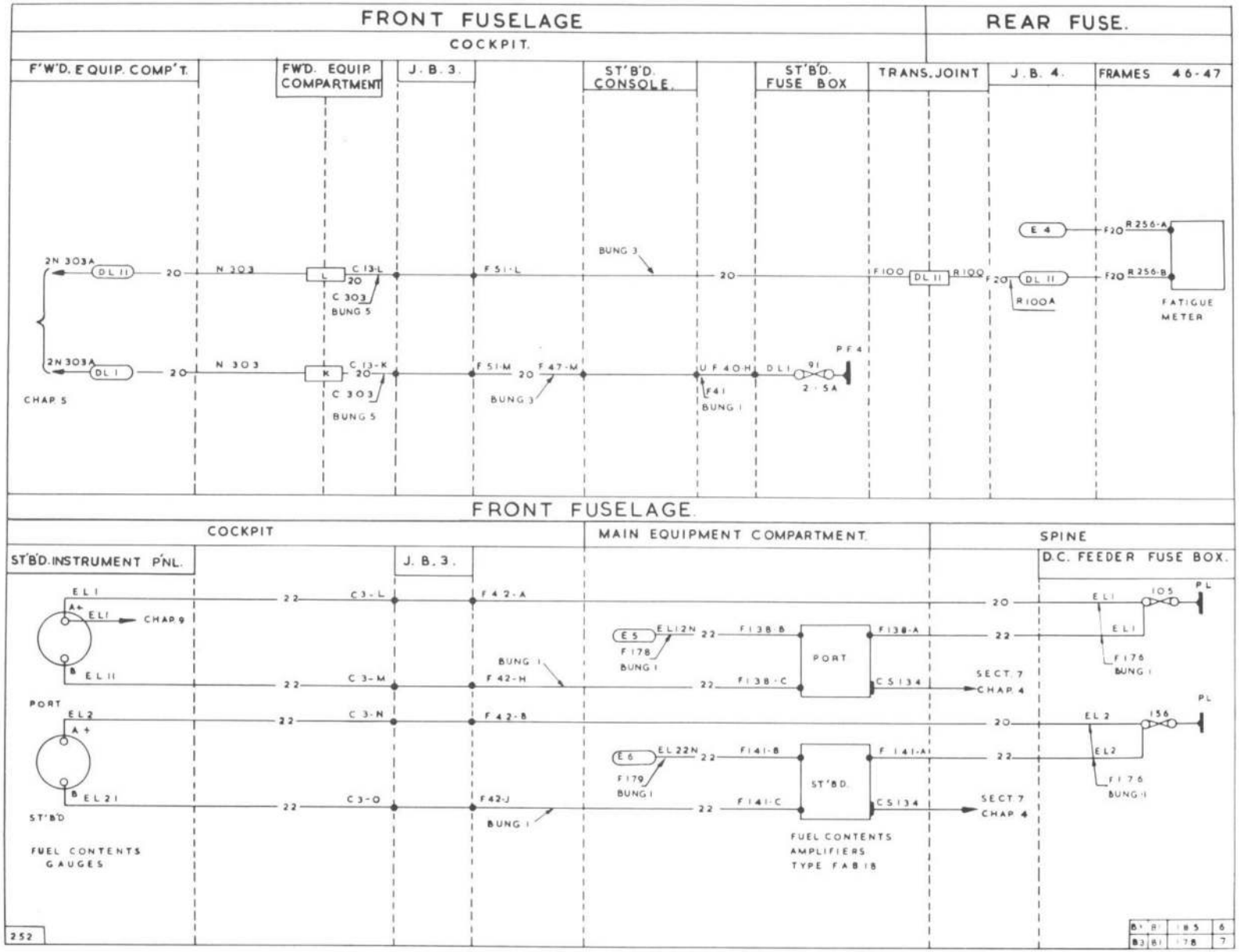

FIG. 4. FATIGUE METER–FUEL CONTENTS GAUGES

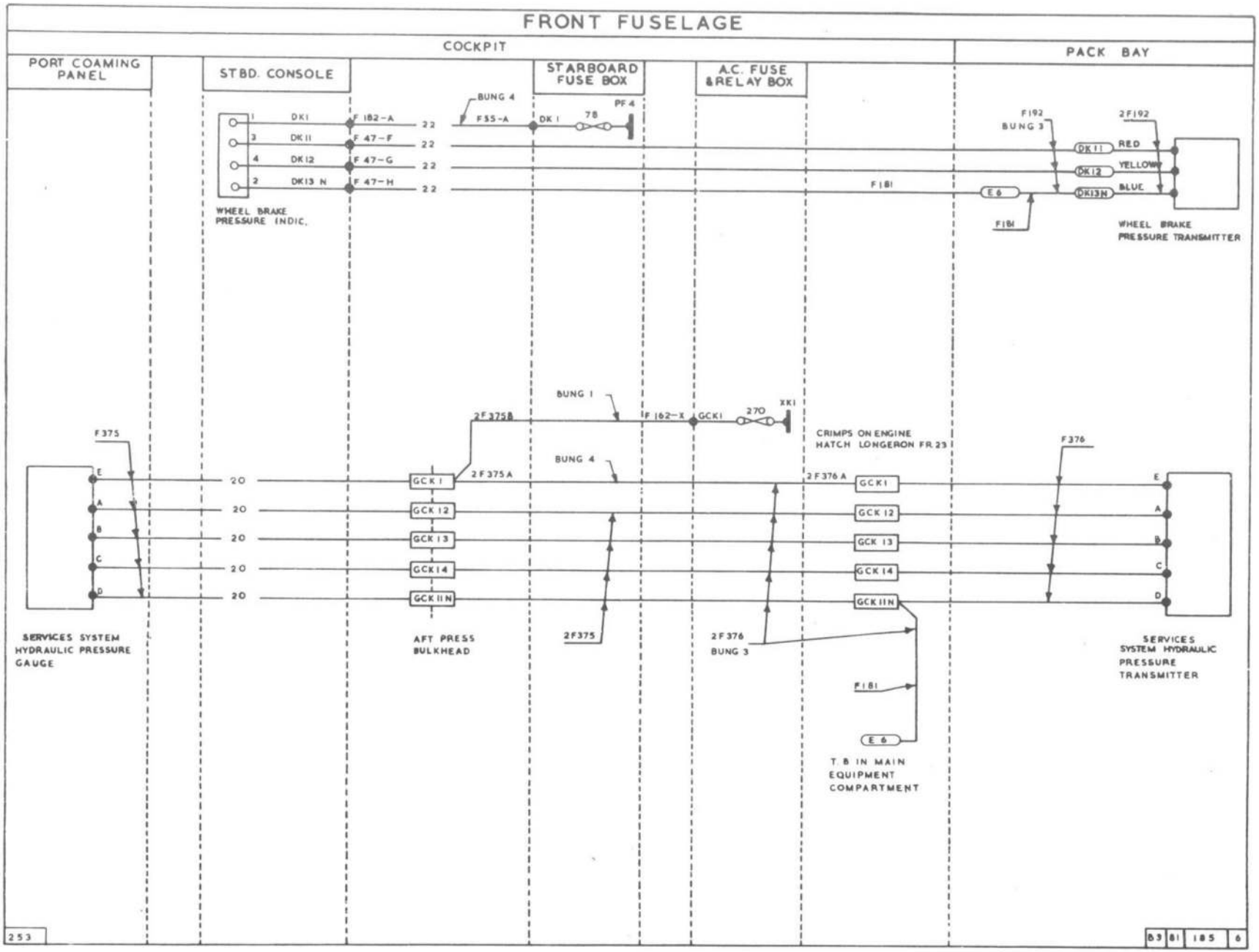

FIG. 5. BRAKE PRESSURE GAUGE-HYDRAULIC PRESSURE GAUGE

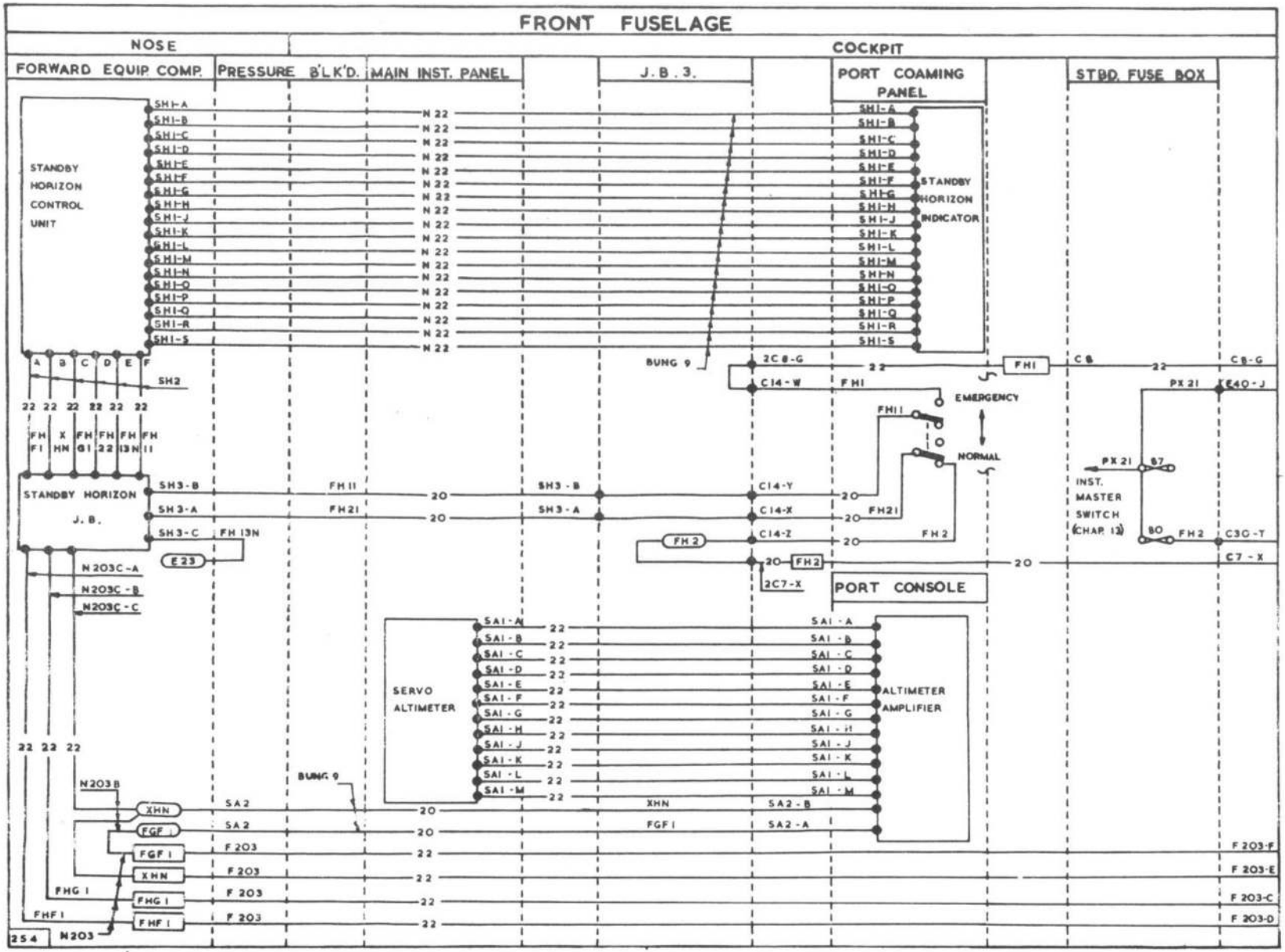

FIG.6. SUPPLIES TO FLIGHT INSTRUMENTS

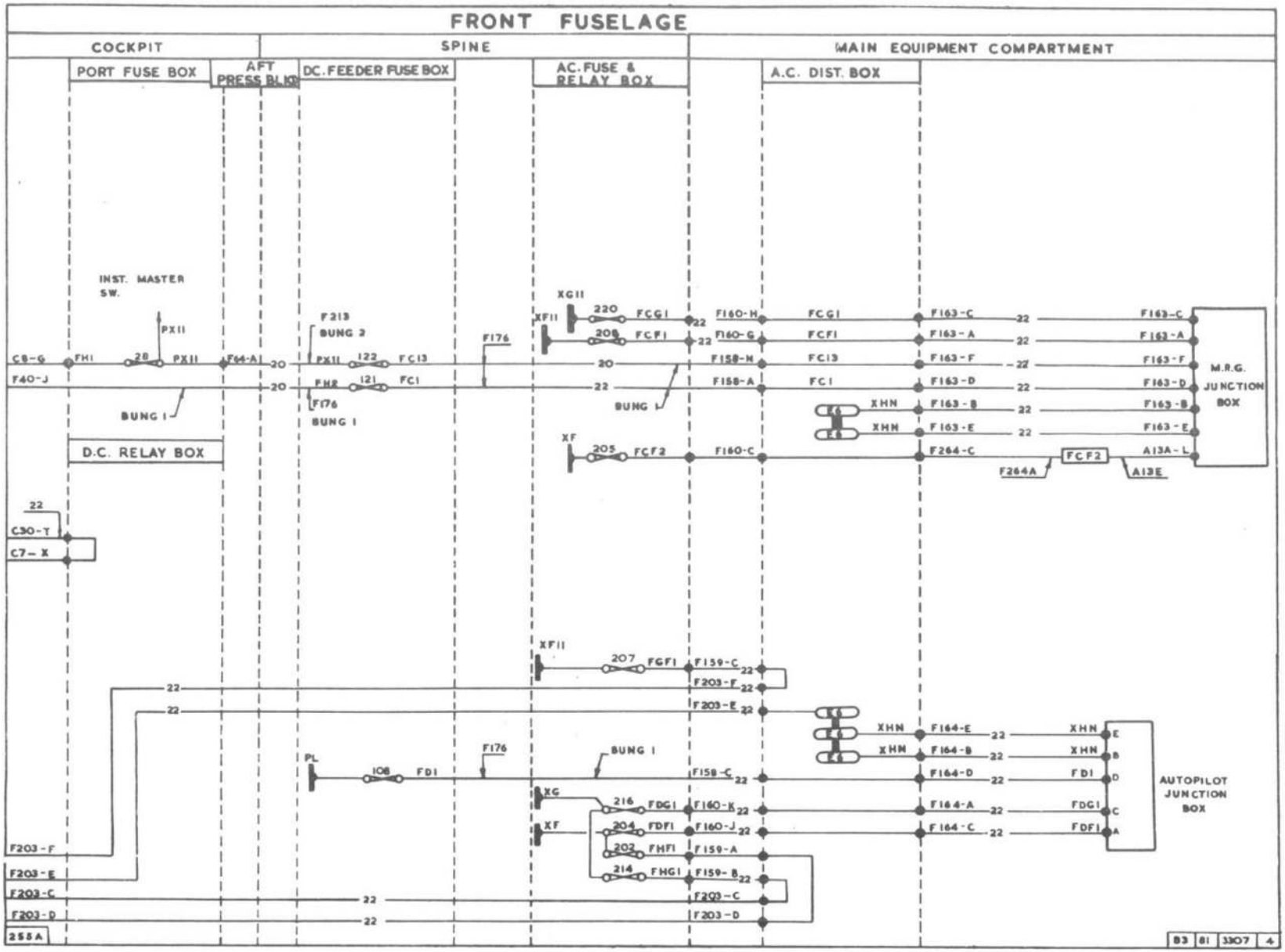

FIG. 6A. SUPPLIES TO FLIGHT INSTRUMENTS

Appendix I MODIFICATION 4371

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LIST OF ILLUSTRATIONS

General

1. Mod. 4371 disconnects the supply relay from the transformer input circuit and reconnects it in series with the output circuit. The main busbars XA, XB and XC are now connected directly to the transformer primary connections and the supply relay solenoid feed is obtained from the undervoltage phase sequence unit; this ensures that in a main supply failure condition, the instruments connected to the normal busbar are not incorrectly operated.

Operation

2. With the supply relay now interposed between the supply transformer secondary connections and normal busbars XF, XG and XHN, the undervoltage phase sequence unit, senses the transformer output voltage at the transformer/relay connections. The energizing feed to the supply relay is derived from the sealed relay contacts of the undervoltage phase sequence unit, so that, at the specified voltage level both the supply and the supply change-over relays are energized and normal supplies connected to the instruments. In the event of a main supply failure the supply and the supply change-over relays are de-energized, the inverter output is connected to the stand-by busbars and the normal busbars are isolated from the main supply.

Fuses

3. Two additional 5 amp fuses, No. 199 and 200 are located in the a.c. fuse and relay box and connected in the voltage sensing lines XGC1 and XFA1 respectively. Fuse No. 44 is replaced by a dummy fuse and cable PX7 is removed.

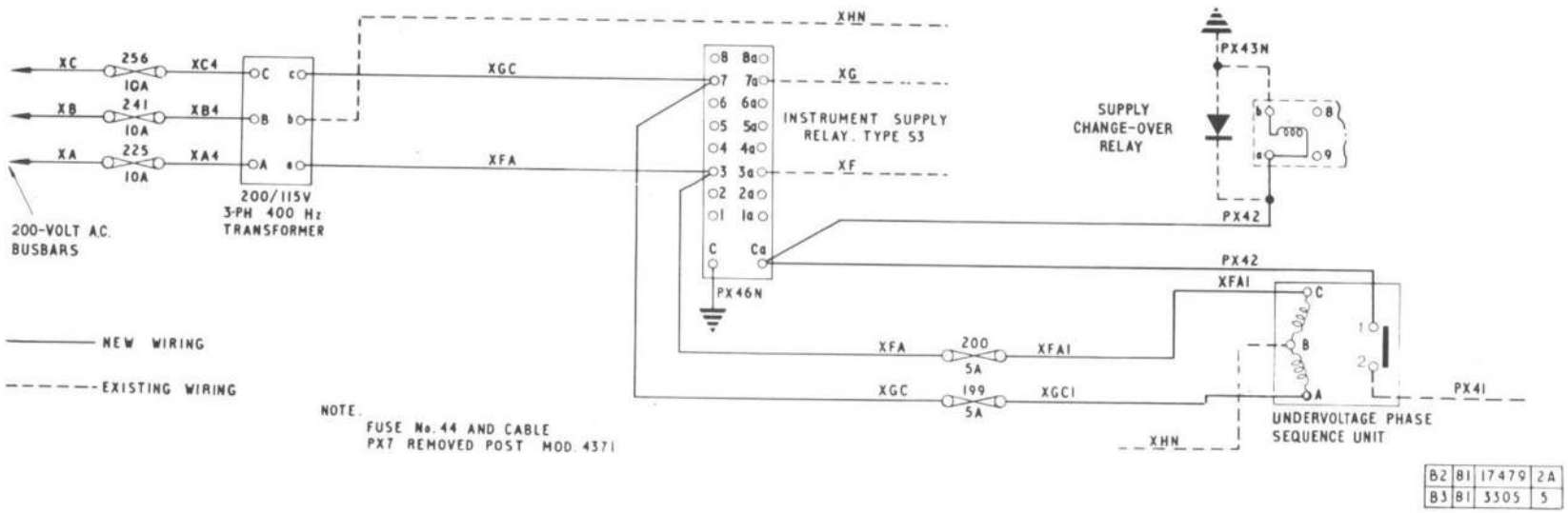

Fig. 1. Alterations to fig. 2 for Mod. 4371

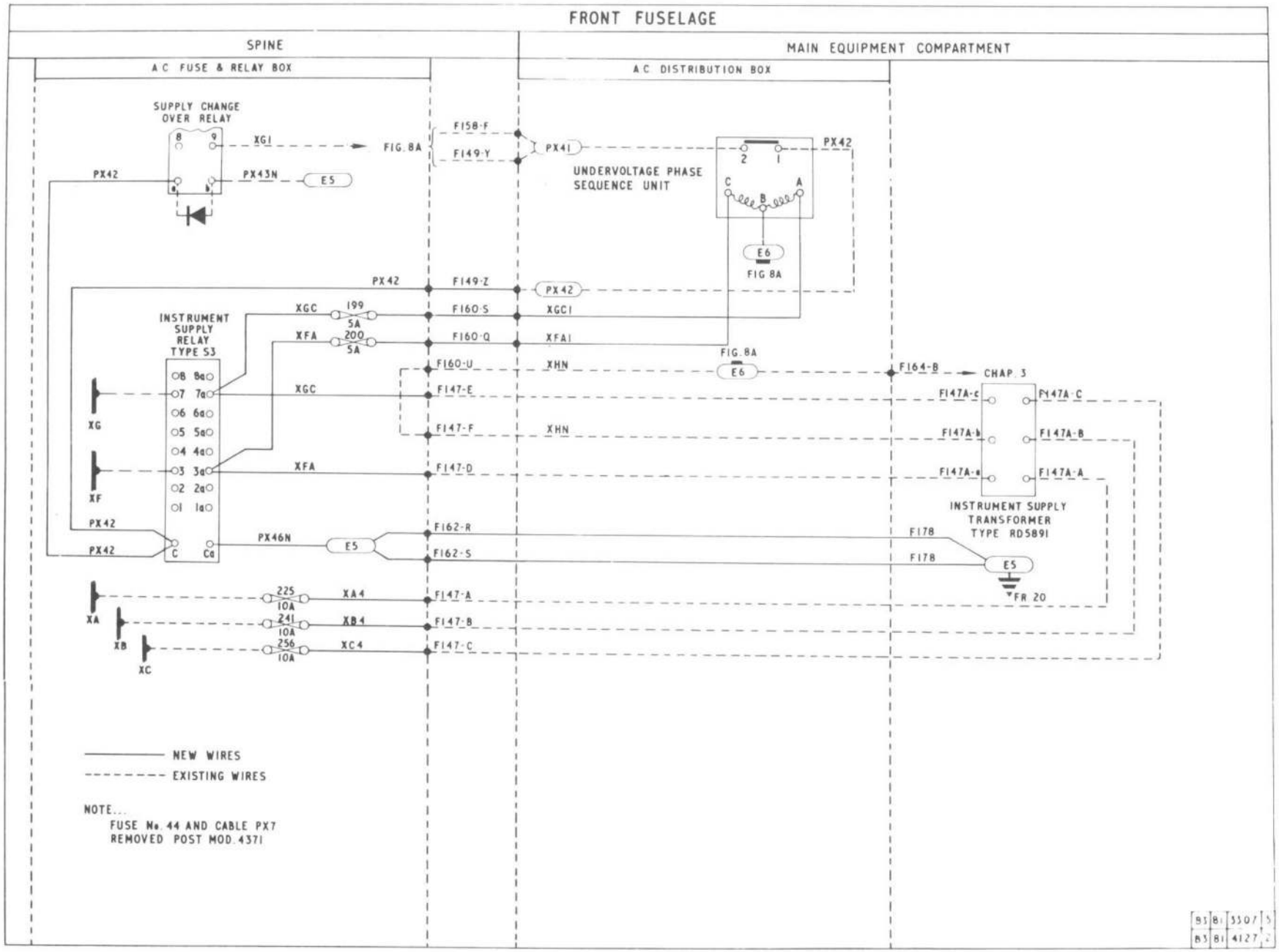

FIG. 2. ALTERATIONS TO FIG. 3-3A FOR MOD. 4371

◄ MINOR AMENDMENTS ►