Group D A.R.I.5860 (A.I.Mk.21) INSTALLATION

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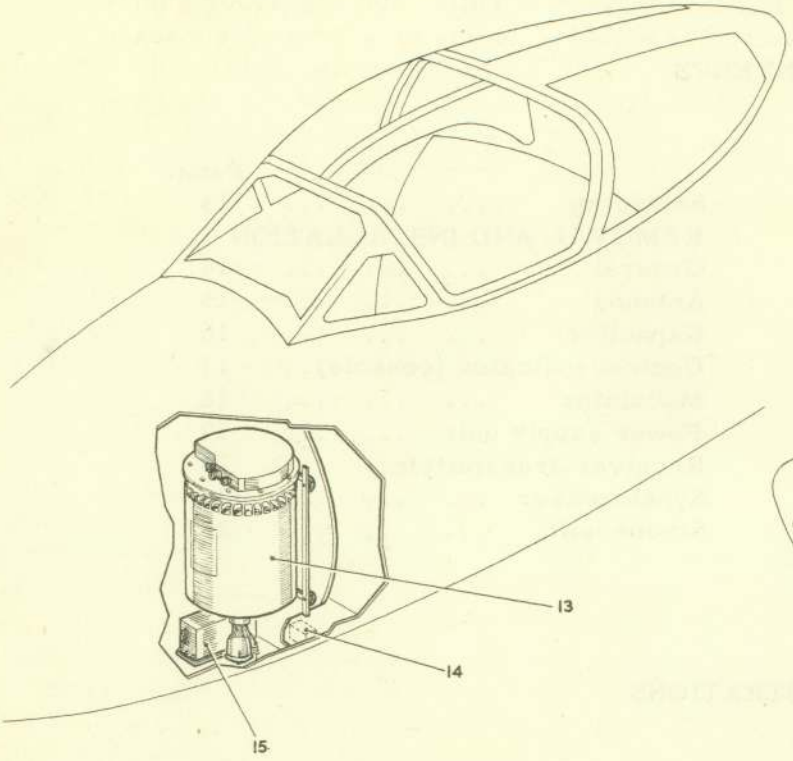
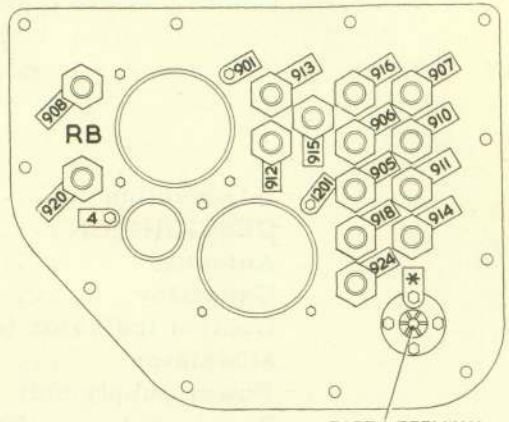
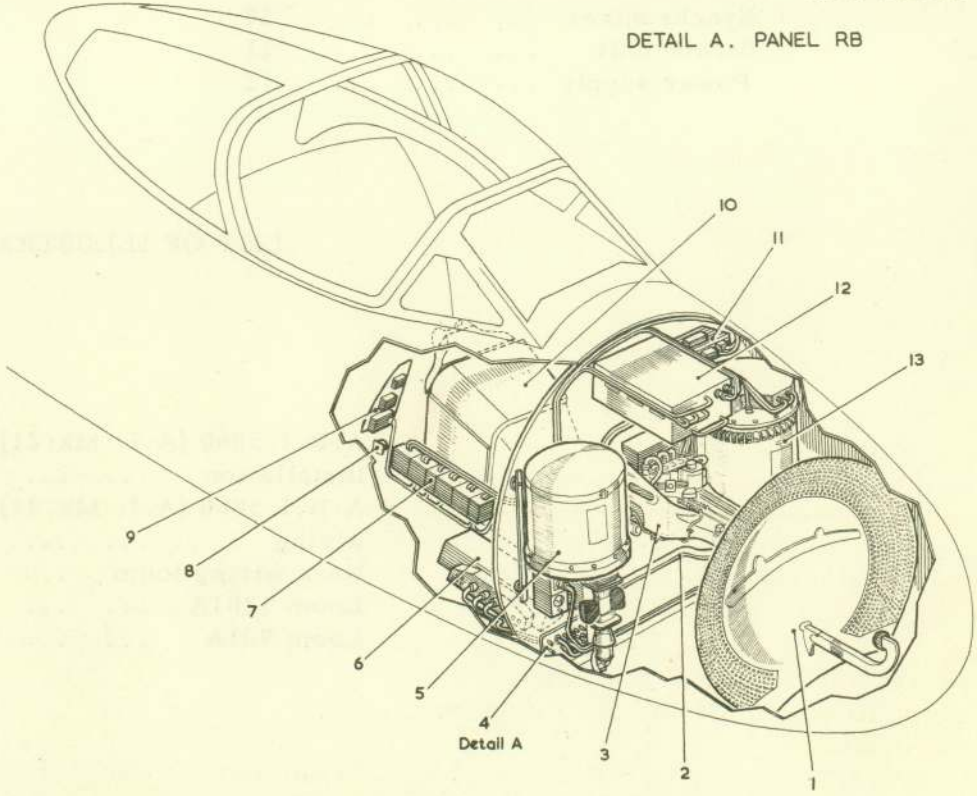
LIST OF ILLUSTRATIONS





DETAIL A. PANEL RB



1	SCANNER
2	WAVEGUIDE
3	ANTENNA ASSEMBLY
4	SEALING PANEL RB
5	RECEIVER TRANSMITTER, TYPE RT-258/APQ-43
6	POWER SUPPLY UNIT, TYPE PP-784/APQ-43
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14	CAPACITOR, TYPE CB-2/APQ-35
15	STROBE UNIT, TYPE 103

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Fig.1. A.R.I. 5860 (A.I.Mk. 21) installation

Introduction

1. The information in this group describes the A.I. Mk.21 search radar installation. Each item of equipment involved is described briefly with regard to its location in the aircraft and its function as a part of the installation. Further information may be obtained from the handbook dealing with the equipment which should be read as a supplement to this group. The block schematic wiring diagram (fig.2) shows the interconnection of units, cable breakdown points and a reference to the source of power supply. The diagrams (fig.3, 4 and 5) are breakdowns of the main cable looms, giving the origin, routing and termination of each lead and connector contained in the looms.

DESCRIPTION

2. The A.I. Mk.21 is a forward-searching radar used as an aid to air interception with a secondary function of beacon reception for homing purposes. The aerial forms part of a scanner assembly or antenna unit, which can be made to move automatically over pre-set arcs in azimuth and elevation to search a wide area ahead of the aircraft. It also provides ranging data for the equipment associated with the gyro gunsight up to the time at which the guns are fired. The installation comprises the following main units :

Antenna	Type	AS.596/APQ-43
Capacitor	Type	CB2/APQ-35
Control indic.	"	C1035/APQ-43
Modulator	"	MD175/APQ-43
Power supply unit	"	PP784/APQ-43
Receiver-transmitter	"	RT258/APQ-43
Synchronizer	"	SN103/APQ-43
Strobe unit	"	103

3. A full description of the A.I. Mk.21 radar equipment will be found in the American handbooks AN.16/30/APS.57-2 and -4 until such time as a relevant British Air Publication is printed.

Antenna

4. The antenna unit is mounted on the forward face of bulkhead 1 and is used for both transmitting and receiving the radar pulses and echoes. The scanning limits are from 60 degrees above to 30 degrees below the horizontal for elevation, and 85 degrees on either side from right ahead for azimuth. The waveguide system includes a flexible section at the antenna end, the other end being attached to the receiver-transmitter. The waveguide has two rotating joints, one for azimuth and one for elevation, and is pressurized to 15 p.s.i. with dry air from an air pump fitted to the antenna structure.

Capacitor

5. The capacitor unit is introduced to improve the power factor of the 115 volts, 400 c/s power supply. It consists of a bank of condensers with a total capacity of 15 mFd. Terminal connections permit the selection of a suitable capacitance for this particular installation. The unit is located on the underside of the pilot's false floor in the port forward corner of the cockpit. A short connector leads to a socket and plug RT in the false floor, and thence to terminal block RA on the starboard side of the cockpit.

Control indicator (console)

6. The control indicator, or console as it is more generally called, is mounted on the starboard side of the cockpit and contains all the necessary controls for the operation of the radar equipment. A visor is provided to exclude unwanted light from the cathode ray screens. The front panel of the control indicator is edge-lighted by seven panel lamps controlled by a rheostat control on panel RC, the radar switch panel.

Modulator

7. The modulator, mounted on the forward side of bulkhead 1, port side, is contained in a cylindrical triple-walled container pressurized to 5 lb. per sq. in. Heat is removed from the unit by means of ducting which is trunked to take ram air from the outside of the aircraft when in flight or from an axial flow blower when the

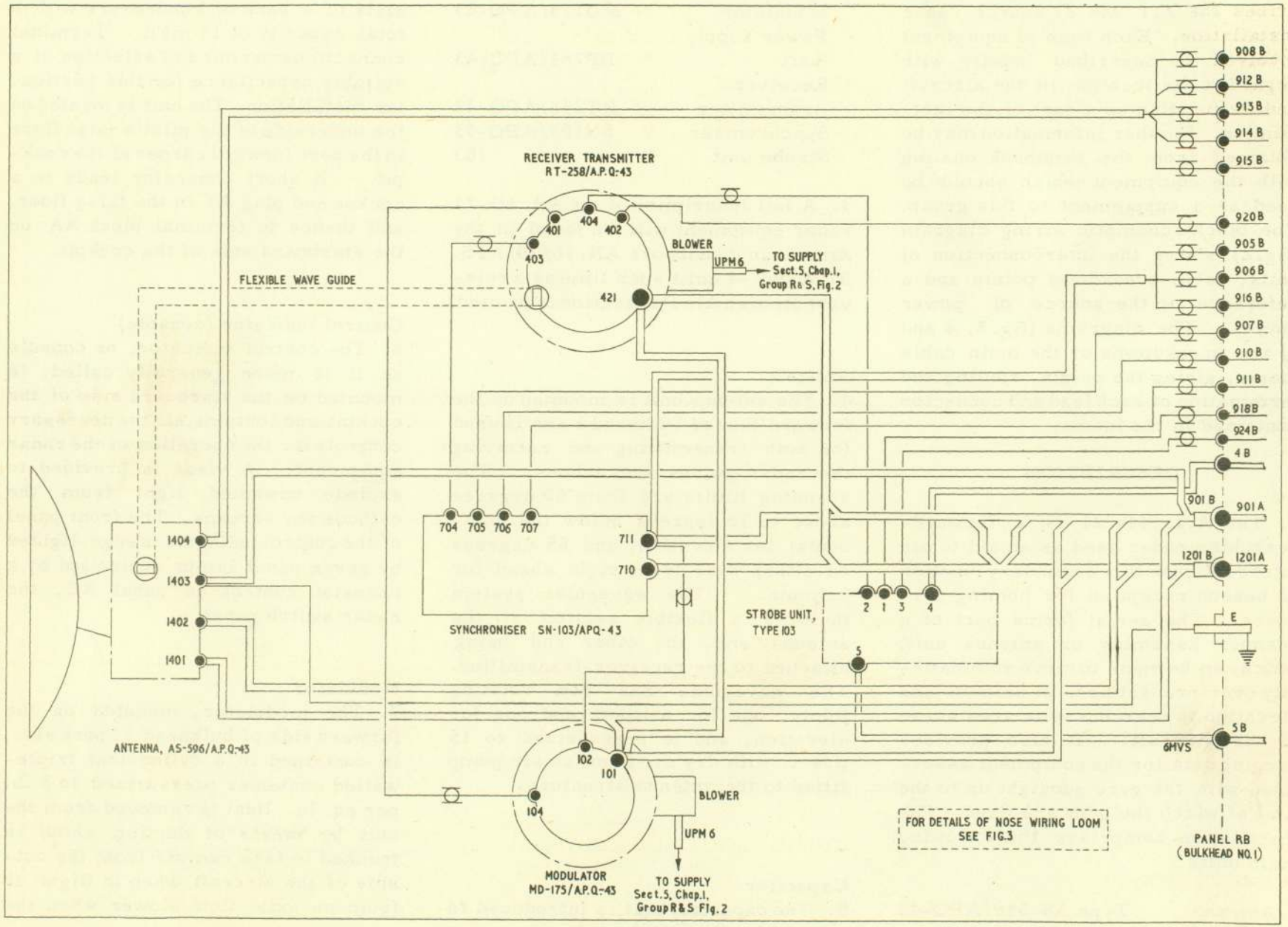
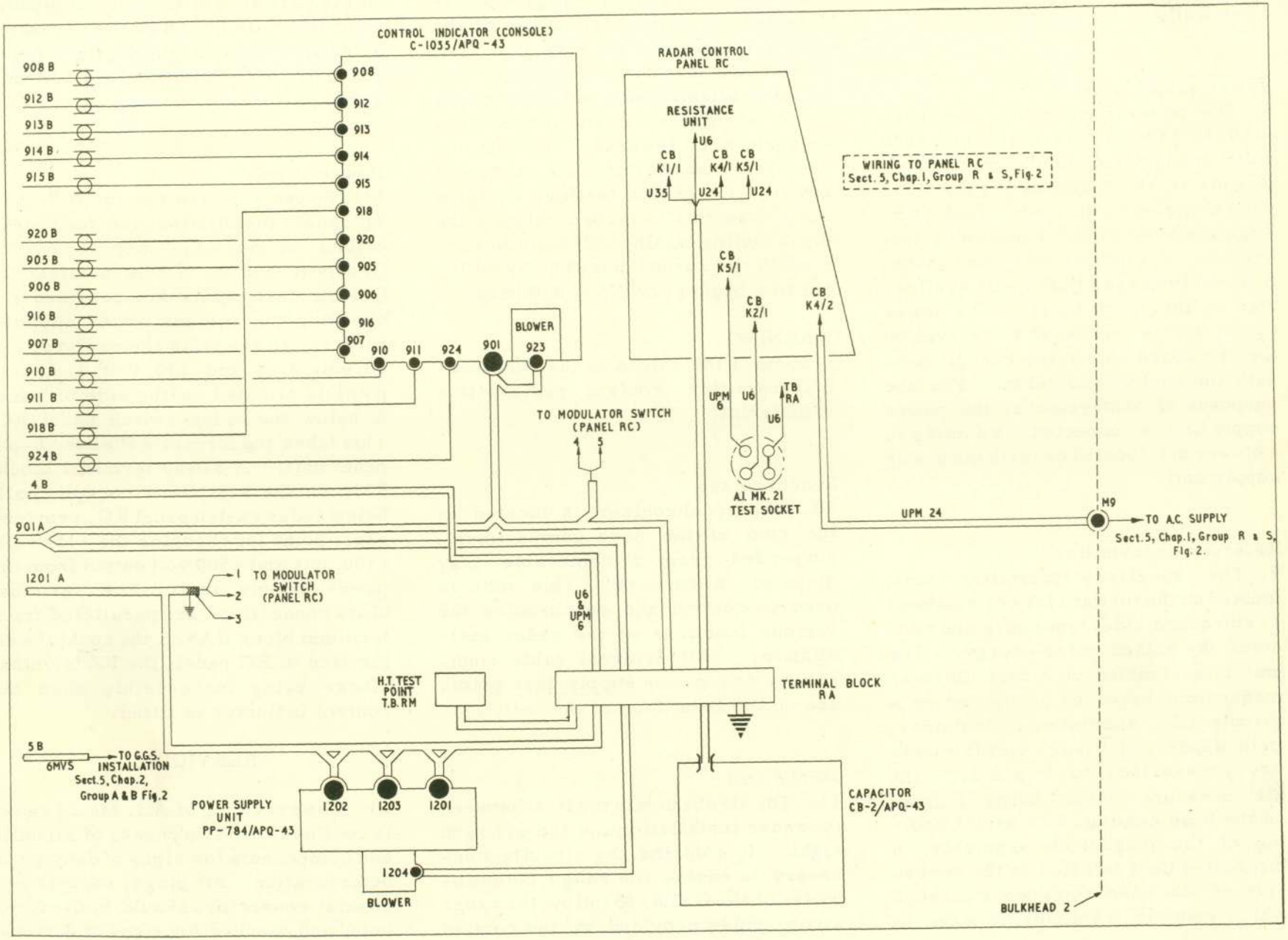


Fig. 2 A.R.I. 5860



(A.I. Mk. 21) Wiring

machine is on the ground. This cooling air is directed between the two outer walls of the container.

Power supply unit

8. The power supply unit furnishes +150 and +300 volts regulated and +500 volts unregulated to the main components of the installation, the +500 volts being fed to the control indicator. Regulation is within 1 per cent. tolerance. All plugs, test point jacks, fuses and voltage adjustments are located on the front panel. The power supply unit is located at floor level on the starboard side of the cockpit beneath the control indicator. For the purposes of heat removal the power supply unit is connected via ducting to a blower unit located beneath the power supply unit.

Receiver-transmitter

9. The receiver-transmitter unit, located on the forward face of bulkhead 1, starboard side, transmits and receives the pulsed radar energy. The unit is assembled on a cast circular magnesium base and is housed in a cylindrical aluminium container. Both upper and lower compartments are pressurized to 5 p.s.i., the air pressure valve being located on the base casting. To assist cooling of the magnetron assembly, a bifurcated duct is fitted to the underside of the base component through which ram air from outside when in flight, or an air stream from an axial flow blower when on the ground, is directed on to the cooling fins of the magnetron assembly. This axial flow blower and that on the modulator unit is automatically switched off when the undercarriage is raised, and switched on again when lowered. To hold the receiver-transmitter in the swung-out position for ground testing, a folding strut assembly is incorporated in the top mounting casting which can be secured in the spread position by a Pippin to a bracket on No. 1 bulkhead.

WARNING

Some of the valves in the receiver-transmitter contain radio-active material.

Synchronizer

10. The synchronizer is located in the roof of the nose compartment, suspended from a removable tray mounted in runners. This unit is used to control and synchronize the various functions of the radar installation. All external cable connections and power supply test points are on the front face of the unit.

Strobe unit

11. The strobe unit is the link between the radar installation and the gyro gun sight. It contains the circuits necessary to enable the range potentiometer of the G.G.S. to follow the range strobe pulse provided by the control indicator. The strobe unit is located on the port side of the nose compartment floor, as shown in Sect.5, Chap. 2, App. 1, Group A and B, fig. 1 (gyro gun sight installation) and fig.1 of this group.

Power supply

12. Power supplies for the A.I. Mk. 21 radar installation are fully described in Sect. 5, Chap. 1, App. 1, Group R and S of this publication. Certain test points are provided for checking the various power supplies external to the units themselves. A 28 volt d.c. and 115 volt a.c. test point is situated on the side of panel A below the radar switch panel RC. This takes the form of a Plessey 6-pin panel unit. A 3-way terminal block, RM, on the starboard cockpit wall, below radar switch panel RC, provides a test point for checking the +150 volt, +300 volt and +500 volt output from the power supply unit. The terminal block connections are paralleled from terminal block RA5 on the cockpit wall forward of RC panel, the RA terminal blocks being inaccessible when the control indicator is fitted.

SERVICING

13. The servicing of A.I. Mk.21 radar is confined to in situ checks of all units and components for signs of damage or deterioration. All plugs, sockets and coaxial connectors should be disconnected and checked for signs of dirt and

corrosion. The locking rings on plugs and sockets should be tightened to ensure good bonding of the braiding cables and the connector casing. All controls on the control indicator should be manipulated to ensure that their mechanical operation is correct. The units must be checked for security in their mountings, ensuring that all Pip-pins and latching rods are home and wire-locking intact. The units must be secure in their mountings and all bonding connections clean and tight. Beyond carrying out the checks outlined above nothing more in the way of servicing may be carried out in situ. Before servicing or removing any equipment, the aircraft must be rendered electrically safe by opening the battery isolation switch. Full servicing instructions and setting up procedure are contained in the specialist publication dealing with this equipment. After the equipment has been set up, the following is the procedure for switching on :-

(1) Switch on circuit breakers K1 to K5 (fitted to panel RC).

(2) Search power switch to STAND-BY.

(3) High power/low power switch to LOW.

(4) Modulator switch on panel RC to ON.

(5) Search antenna scan (S.A.S.) switch to A.S.V.

(6) Inverter switch on RC panel to ON.

The scanner should now be scanning at slow speed in a single line scan from side to side. Check the operation of the search antenna position (S.A.P.) switch at WIDE and NARO, and UP and DOWN. Check that the console lights are dimmed or brightened by the RADAR CONSOLE LIGHTS dimmer control. Allow 5 minutes for the valve heaters to reach their operating temperature, then switch the search power switch to RAD. Adjust the focus and intensity controls on the console (picture should be showing on the P.P.I. and C scope screens). Tune up on permanent echoes.

Note...
The 28-volt ground supply must be capable of delivering 150 amp. for the duration of the inspection.

REMOVAL AND INSTALLATION

General
14. The method of removing A.I. Mk. 21 equipment from the aircraft is described in the following paragraphs, and provided due care is taken during each operation little difficulty should be experienced. Certain of the units are bulky and heavy enough to require the efforts of at least two men, if damage to, or fouling of equipment or adjacent aircraft structure is to be avoided.

Antenna
15. The antenna unit complete weighs over 130 lb. and will require at least two men to remove it from its mounting on the forward face of bulkhead 1. Access to the antenna is gained after raising the radome. The RT and modulator will also require to be swung out in order to gain access to the securing nuts and safety pins. To remove the antenna adopt the following procedure :-

(1) Disconnect the four sockets on the top of the unit.

(2) Uncouple the waveguide from the base of the antenna and remove it from the aircraft. (The R/T unit end of the waveguide will have already been disconnected to swing the unit out).

(3) Remove the safety pins locking the six securing nuts on the baseplate.

(4) Detach the four bottom nuts securing the antenna to the bulkhead 1.

(5) Supporting the weight, remove the two remaining nuts and lift the unit clear of the bulkhead. To refit the antenna reverse the procedure listed above.

Note...
On no account should the antenna be lifted by means of the scanner reflector dish or waveguide.

Capacitor
16. To gain access to the capacitor unit it will be necessary for the outboard section of the pilot's false floor to be removed. Before this is done ensure that the plug and socket connection RT is disconnected. When the floor is removed the capacitor can be detached from the underside of the floor member by removing the two 2 B.A. mush/hd. screws and nuts, and the two special studs and nuts. Refitting is the reverse of removal.

Control indicator (console)
17. The control indicator weighs 85 lb. and will require two men to remove it from the cockpit. To remove the indicator, adopt the following procedure :-

(1) Remove the two Pip-pins on the front of the mounting below the indicator panel.

(2) Withdraw the indicator as far as the observer's seat then turn it on its side. Remove the 100-pin socket and all coaxial connectors, and the blower motor connector. (A special tool is provided for removing the coaxial connectors).

(3) Remove the control indicator from the cockpit taking care not to foul adjacent equipment or aircraft structure. Refitting is the reverse of removal.

Modulator
18. Though the modulator weighs 91 lb. it is readily accessible and in consequence can be removed from the aircraft without undue difficulty. One should remember that the major portion of the weight is concentrated in the top half of the unit. Access is gained after opening up the port nose compartment door and the radome. It will be necessary to release the Pip-pin securing the port radome strut and allow the strut to hang free, having first ensured that the starboard support strut is secure in the extended position. To remove the modulator adopt the following procedure :-

(1) Disconnect the blower motor and ducting by loosening the jubilee clip at the entry into the modulator.

(2) Disconnect all plugs and sockets.

(3) Withdraw the two latch pins at the rear of the unit and swing the unit out in order to obtain a good hold.

(4) Support the weight and remove the two Pip-pins, bottom one first. Remove the unit. Refitting is the reverse of removal.

Power supply unit
19. To remove the power supply unit from the aircraft adopt the following procedure :-

(1) Remove the two Pip-pins at the after end of the unit.

(2) Partially withdraw the unit until the three multi-pin sockets are readily accessible, and disconnect them.

(3) Remove the unit from the aircraft.

Refitting is the reverse of removal. Ensure that the end of the blower ducting fits correctly into the aperture at the end of the unit.

Receiver-transmitter
20. The receiver-transmitter weighs 60 lb. and may be handled by one man. To gain access to the receiver-transmitter open the starboard nose compartment door and the radome. To remove the unit adopt the following procedure :-

(1) If the antenna has not already been removed from the aircraft it will be necessary to uncouple the waveguide from the directional coupler. This is done by unscrewing the four American screws at the lower end of the coupler, and allowing the waveguide to rest on the structure below the scanner.

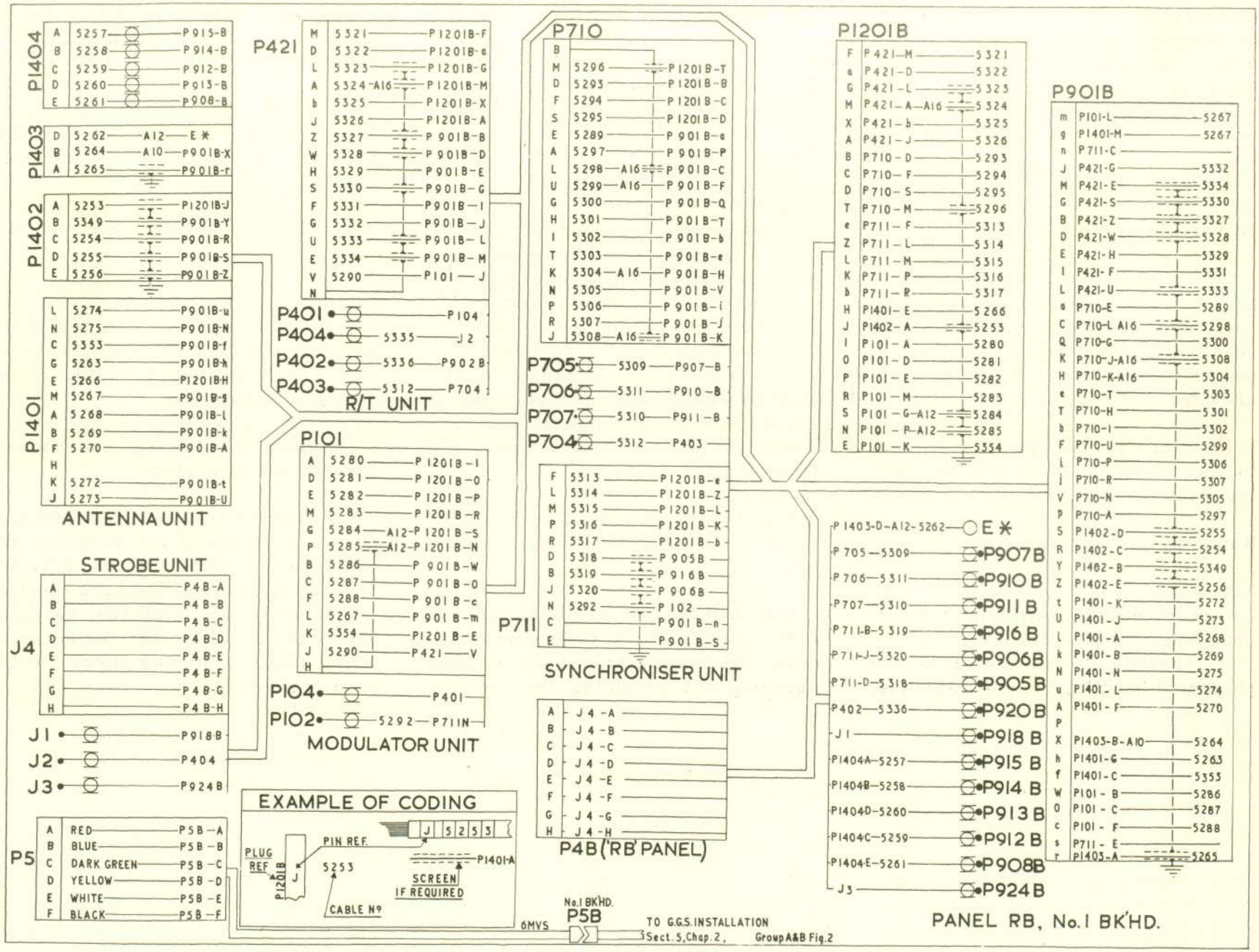


Fig. 3 Nose wiring loom

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(2) Remove the blower assembly by unscrewing the slotted bolt securing the duct to the receiver-transmitter and loosening the two bolts at the rear of the ducting. The complete blower and duct assembly can then be pulled forward clear of the unit.

(3) Disconnect all plugs and sockets.

(4) Withdraw the two spring-loaded latch rods at the rear of the unit and swing it out. Lock the latch rods in the withdrawn position by twisting them behind the latch stops provided.

(5) Support the unit and release the two Pip-pins, top one first. Remove the unit.

Refitting is the reverse of removal.

Note...
The receiver-transmitter unit incorporates a very powerful magnet. For this reason it is advisable for personnel handling the unit to remove their wrist watches.

Synchronizer

21. The synchronizer weighs 40 lb., but owing to its location it is suggested that two men carry out the removal and refitting procedures. Also, if the antenna unit has not been removed from the aircraft, it will be necessary to tilt the scanner to its lowest limit to allow the synchronizer to be withdrawn from its mounting runners. This must only be done electrically using the search antenna position switch on the control indicator with power on. Under no circumstances should attempts be made to move the scanner manually. To remove the synchronizer, adopt the following procedure :-

(1) Disconnect the two multi-pin sockets and the four coaxial connectors.

(2) Lift the two catches in the front of the mounting above the unit and withdraw the spring-loaded latch bolts securing the mounting tray in the mounting rails. Hold the bolts in the open position by placing the catches in the two inboard slots in the mounting above the unit.

(3) Slide the synchronizer in its tray forward, clear of the mounting rails, at the same time supporting its weight.

Reverse the procedure when refitting.

Strobe unit

22. It will be necessary to open up the radome to gain access to the strobe unit. When this has been done, proceed as follows :-

(1) Remove all plugs and sockets and coaxial connectors.

(2) Release the knurled securing nut at the front of the mounting and withdraw the unit. Refitting is the reverse of removal but care must be taken to ensure that the carrying handle is secured under the securing latch when tightening down on the securing nut.

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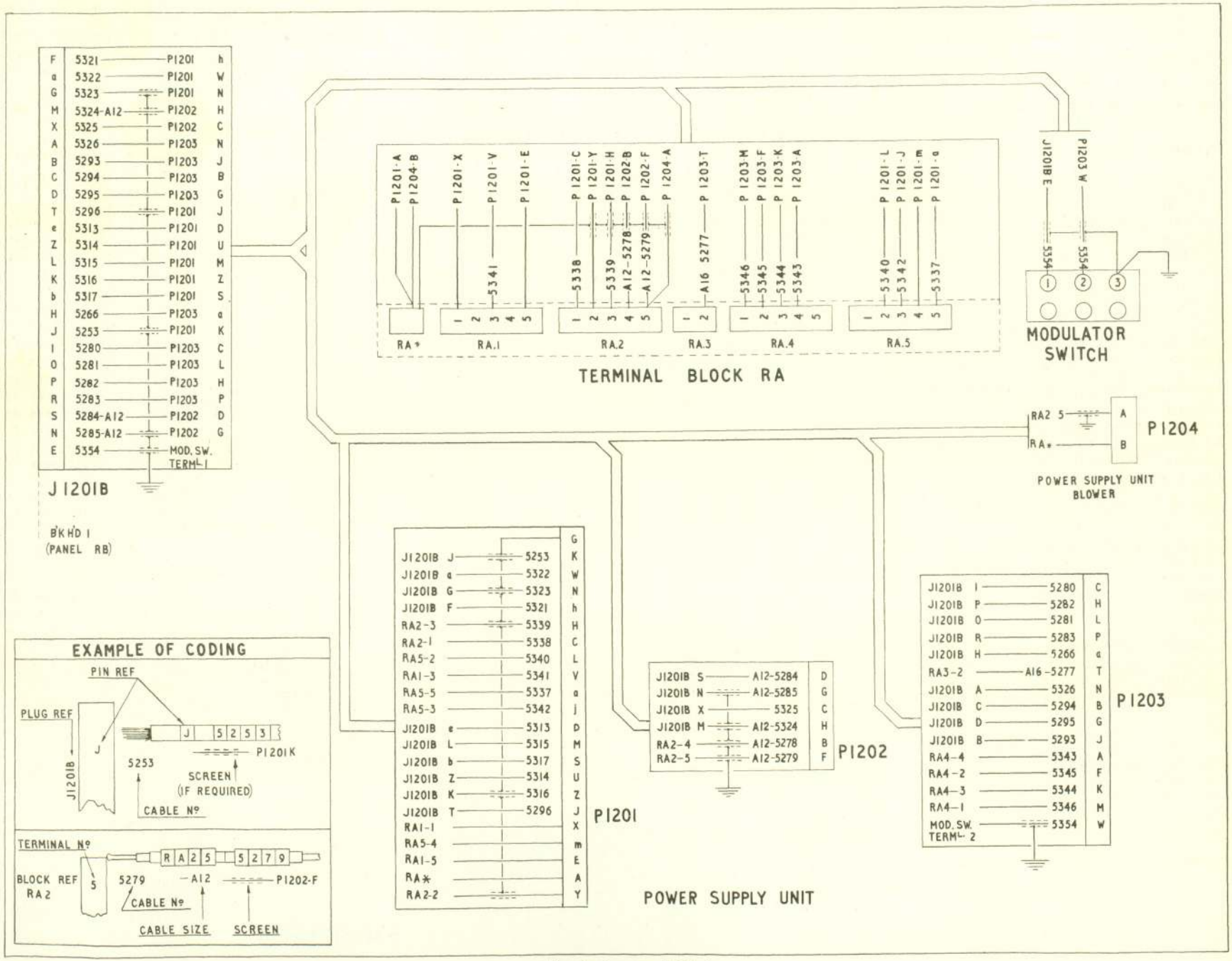

Fig. 4 Loom 1201A

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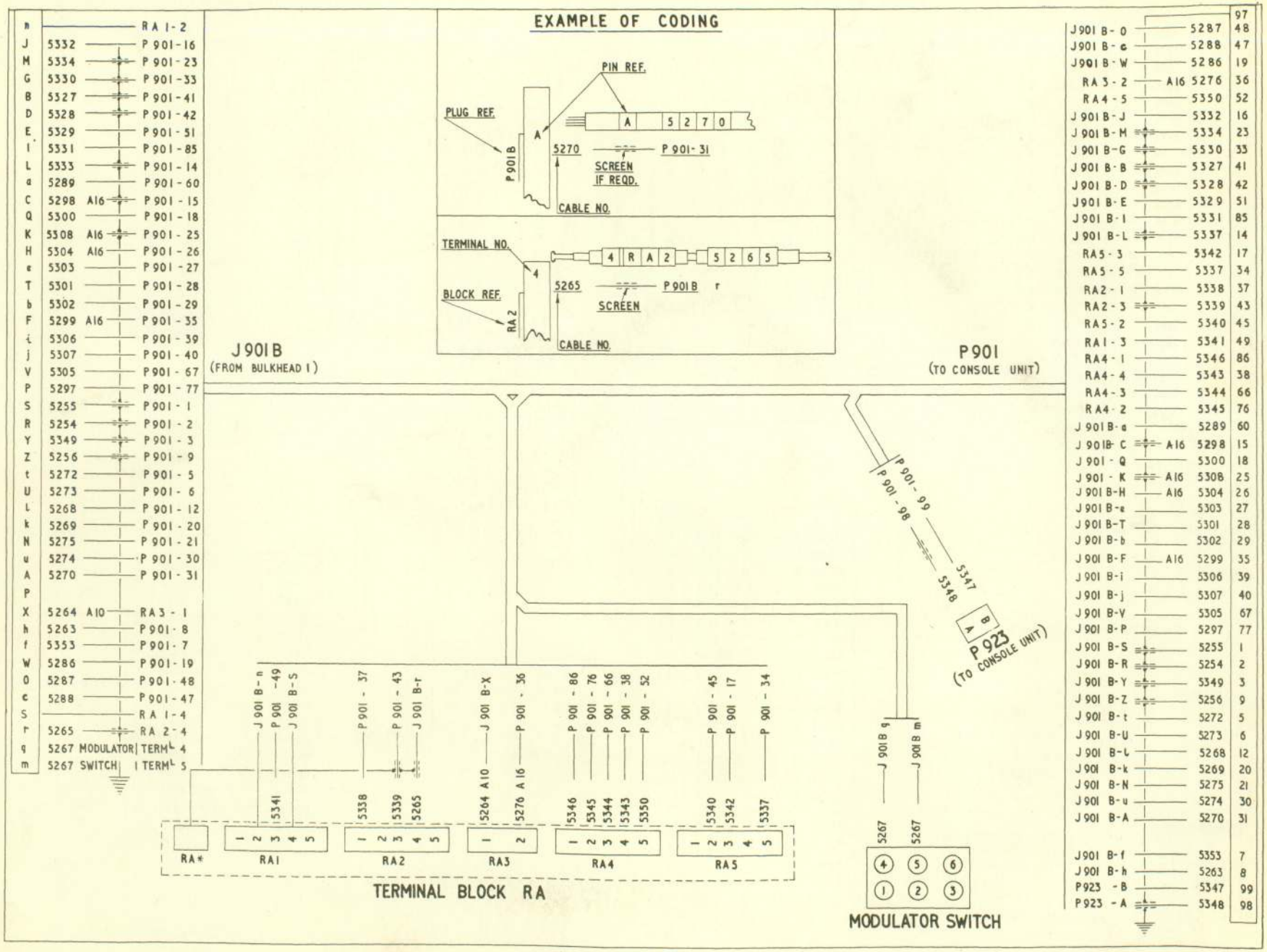

Fig. 5 Loom 901A

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