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TEST SET, RADIO COMMUNICATIONS GP (GMAV 8920C)

OPERATING INFORMATION

This publication contains information covering the requirements of Category 2, 3 and 5 at information level 1.

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8920C
RADIO TEST SYSTEM
OPERATING MANUAL

ISSUE 3

BAE SYSTEMS AVIONICS LIMITED

6 South Gyle Cresent, Edinburgh,
EH12 9EA
Scotland

8920C RADIO TEST SYSTEM

OPERATING MANUAL

MAIN CONTENTS

ASSOCIATED PUBLICATIONS

Marconi 2955B Radio Communications Test Set Publications:

Introductory Guide	Part No. 46882-115K
Operating Manual	Part No. 46882-113R
Service Manual	Part No. 46882-114B

Farnell AP60-50 Power Supply Publications:

Operators Manual	Part No. AP60-50 OM
Programming Manual	Part No. AP60-50 GPIB OM

PREFACE

Amendment Status

1 Each page bears the date of its original issue or the date and number of the latest amendment.

Hazard Symbols

2 The following hazard symbols appear on this equipment:

Symbol	Type of Hazard	Manual Reference
	Dangerous Voltages	Page (iv)
 or 	Static Sensitive Components	Page (v)
	Input Overload	Page (v)

Warnings Cautions and Notes

3 The following terms have specific meanings in this manual:

3.1 WARNINGS contain information to prevent personal injury.

3.2 CAUTIONS contain information to prevent damage to the equipment.

3.3 Notes contain important general information.

WARNINGS

(1) VOLTAGE HAZARD.

VOLTAGES IN EXCESS OF 42.4 V DC OR AC PEAK CAN BE DANGEROUS UNDER CERTAIN CIRCUMSTANCES. PERSONNEL ARE TO ENSURE THAT THIS EQUIPMENT IS ELECTRICALLY SAFE BEFORE SERVICING IS UNDERTAKEN. WHEN TESTS OR ADJUSTMENTS ARE TO BE CARRIED OUT WITH ELECTRICAL POWER CONNECTED, CARE MUST BE TAKEN TO AVOID HIGH VOLTAGE HAZARDS.

(2) MAINS EARTH.

SYSTEM MAINS PLUGS SHALL ONLY BE CONNECTED TO SUPPLY SOCKETS THAT HAVE A PROTECTIVE EARTH CONTACT. ANY INTERRUPTION OF THE PROTECTIVE CONDUCTOR INSIDE OR OUTSIDE THE EQUIPMENT IS LIKELY TO RESULT IN A HAZARDOUS CONDITION.

(3) ELECTRICAL FUSES.

WHEN REPLACING SYSTEM EQUIPMENT FUSES, ENSURE THAT THE EQUIPMENT IS DISCONNECTED FROM THE MAINS SUPPLY AND ONLY FUSES OF THE CORRECT TYPE WITH THE SPECIFIED CURRENT RATING ARE USED.

(4) TOXIC HAZARD.

TOXIC FUMES ARE PRODUCED BY INCINERATION OF MANY OF THE ELECTRONIC COMPONENTS USED IN THIS EQUIPMENT. APPROPRIATE PRECAUTIONS MUST THEREFORE BE TAKEN WHEN DISPOSING OF UNSERVICEABLE ITEMS.

(5) HANDLING HAZARDS.

ALTHOUGH EVERY ENDEAVOUR HAS BEEN MADE TO REMOVE SHARP POINTS AND EDGES FROM METAL PRESSINGS, CARE MUST BE TAKEN, PARTICULARLY WHEN SERVICING THE EQUIPMENT, TO AVOID CUTS AND SCRATCHES.

(6) HAZARDOUS MATERIALS

THE SYSTEMS CONTAINS A SMALL AMOUNT OF CADMIUM, THE CORRECT LOCAL PROCEDURES SHOULD BE FOLLOWED FOR ITS DISPOSAL.

(7) TOPPLE RISK

SHOULD THE SYSTEM BE ASSEMBLED INTO A FULL SIZE SINGLE RACK, THEN A TOPPLE RISK IS PRESENT, CARE MUST BE TAKEN WHEN MOVING THESE SYSTEMS.

CAUTIONS

(1) RF INPUT OVERLOAD.

An RF input overload to the 2955B is indicated by the message 'REMOVE RF INPUT' and an audible warning. Failure to respond could result in damage to the equipment.

(2) STATIC SENSITIVE COMPONENTS.

The units that make up this system contain static-sensitive components, which may be damaged by normal handling. Refer to the manufacturer's publications for handling precautions.

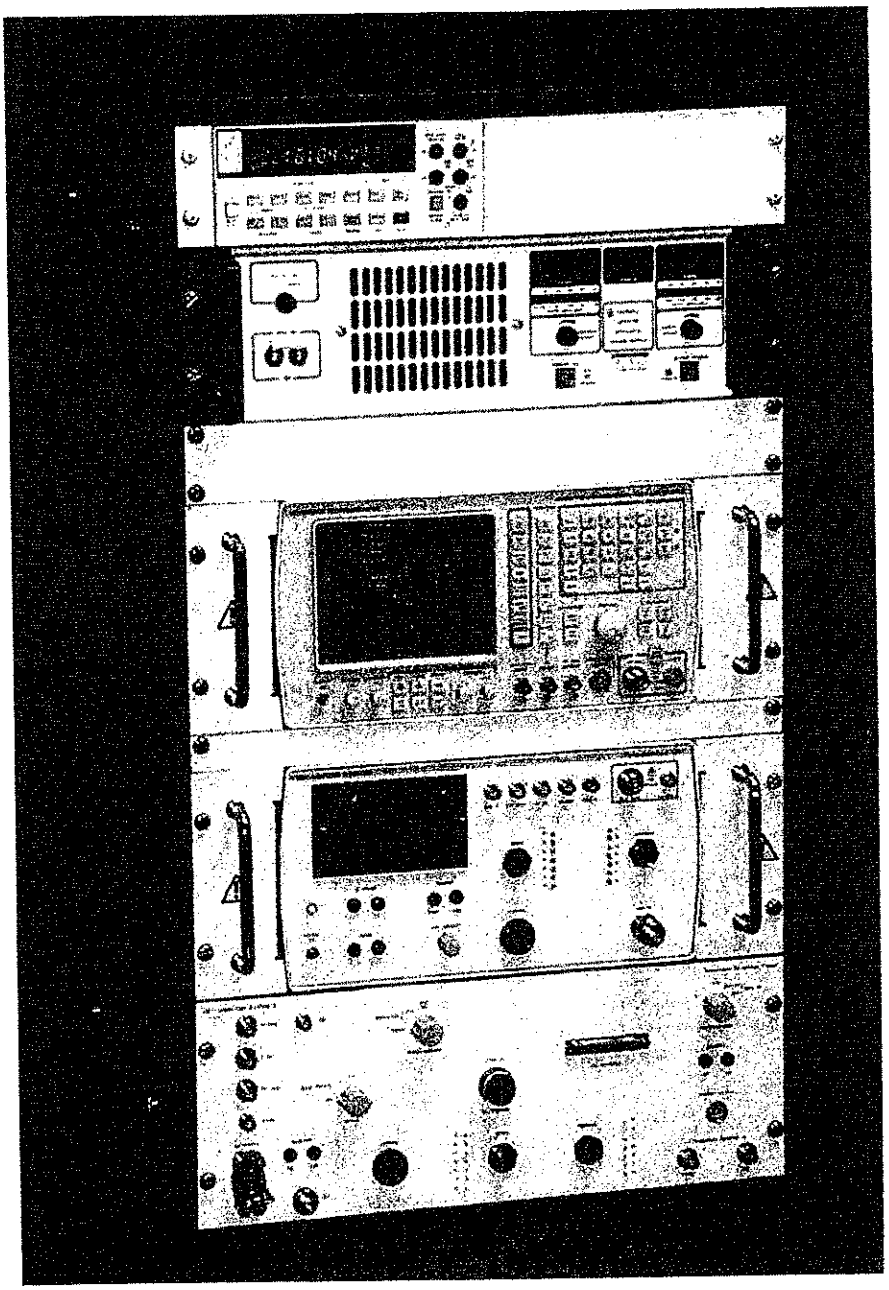
(3) FAN GRILLS.

The system fan grills on both the Farnell PSU (AP60-50) and the MI2955B Radio Test Set should be cleaned on regular basis.

NOTES

(1) DISPLAY SCREEN EQUIPMENT.

The system should be used in conjunction with the local Display Screen Equipment (DSE) procedures.



8920C Radio Test System - Typical Arrangement in Rack

CHAPTER 1

GENERAL INFORMATION

CONTENTS

INTRODUCTION

1 This chapter provides general information on the capabilities of the GEC-Marconi Avionics (GMAV) 8920C Radio Test System. The information level is such that both technician and associated non-technical personnel will acquire a good, overall appreciation of the system.

SYSTEM OVERVIEW

Role and Purpose

2 The 8920C Radio Test System provides the measurement facilities necessary for testing some types of Clansman radios and some ancillary test equipment. Radio testing can be performed in either automatic or manual mode. Application test programs (ATPs) for testing these radios are an integral part of the system.

Construction

3 The 8920C system consists of the following equipment which may be mounted in a standard 19-inch rack:

3.1 A Marconi 2955B Radio Communications Test Set (2955B).

3.2 A GMAV Radio Interface Unit (RIU).

3.3 A Farnell AP60-50 Power Supply (PSU).

3.4 A GMAV Connector Interface Panel (CIP).

3.5 A Hewlett Packard 34401A Digital Multimeter (DMM). (Government furnished equipment.)

3.6 Rack mounting kits and trays.

4 A typical equipment mounting arrangement when installed in a standard 19-inch rack is shown in Fig 1.

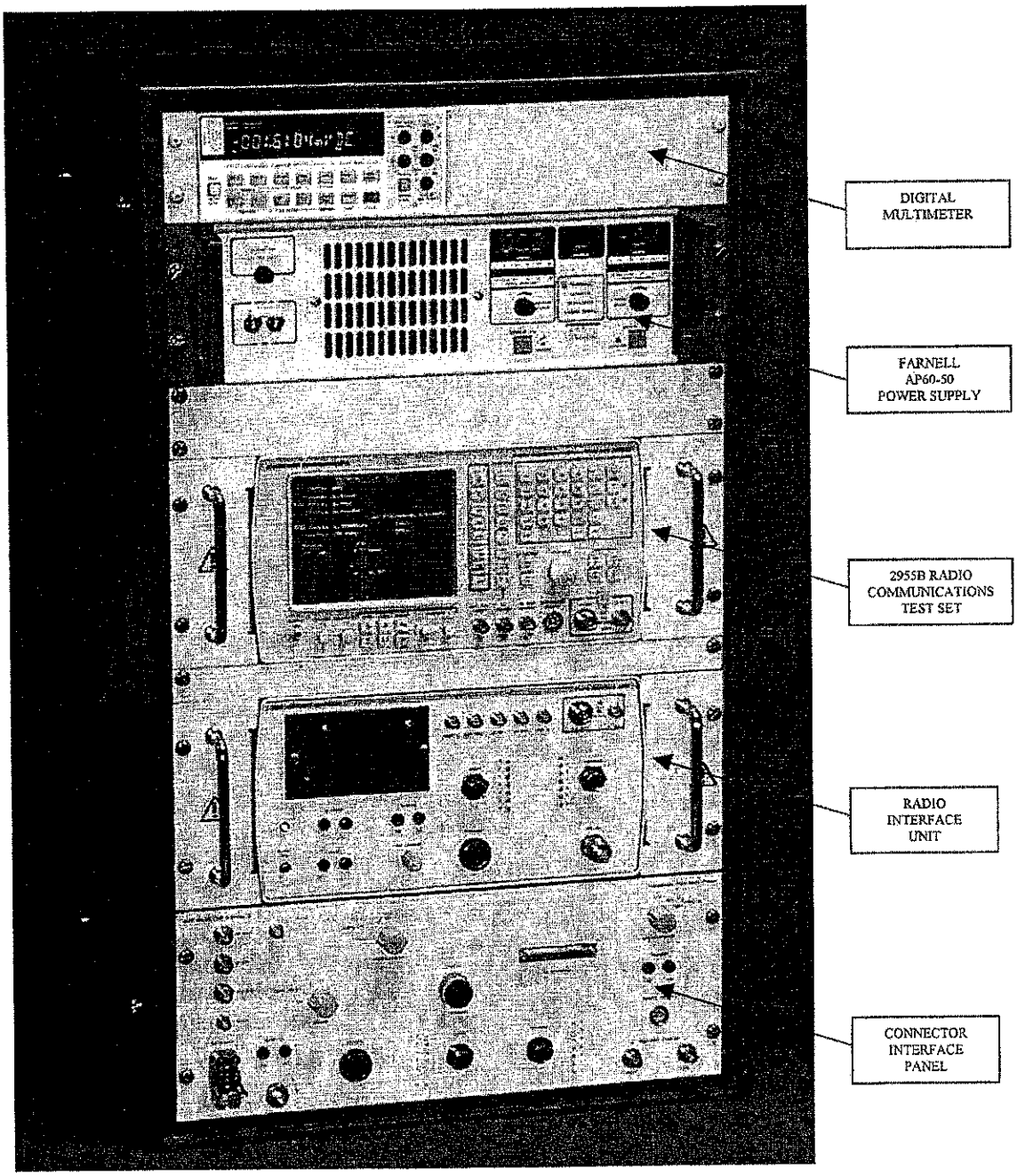


Fig 1 8920C Radio Test System Equipment

BRIEF FUNCTIONAL DESCRIPTION

5 The following functional description is supported by the simplified system block diagram shown in Fig 2.

Measurement and Stimulus Functions

6 Most of the measurement and stimulus functions required for testing the Clansman equipments are contained within the 2955B. This equipment is a combination of several instruments providing the following functions:

6.1 RF signal generation.

6.2 RF frequency measurement.

6.3 RF power measurement.

6.4 AF signal generation.

6.5 AF voltage measurement.

6.6 Modulation measurement.

6.7 Distortion measurement.

Radio Interfacing and Control

7 The 2955B operates in association with the RIU, which provides the facilities for switching and routeing the required functions between the radio under test and the 2955B. The RIU also provides facilities for performing system delay and bit error rate tests.

Application Test Programs

8 Application test programs (ATPs) required for testing each type of Clansman radio reside in EPROM (Erasable Programmable Read-Only Memory) within the RIU.

Radio Power Supply

9 The programmable AP60-50 Power Supply provides the d.c. power required by each radio. In automatic test mode, the output voltage level is set by the ATP for the radio under test.

Radio Line Current Monitoring

10 Line current to a radio under test can be monitored by the CIP for each type of radio. The CIP evaluates the line current by measuring the voltage drop across a resistor placed in series with the radio supply.

GPIB Control

11 System control is provided by a computer within the RIU. The 2955B, RIU, AP60-50 Power Supply and DMM communicate with the computer via the GPIB (General Purpose Interface Bus).

Connector Interface Panel

12 The Connector Interface Panel provides a connection interface for:

12.1 System input/output connections to/from the rear panel connectors of the 2955B and RIU units.

12.2 AP60-50 Power Supply d.c. output to the equipment under test.

13 The four switch controls are used for setting up the interface line connections and circuit conditions for particular tests.

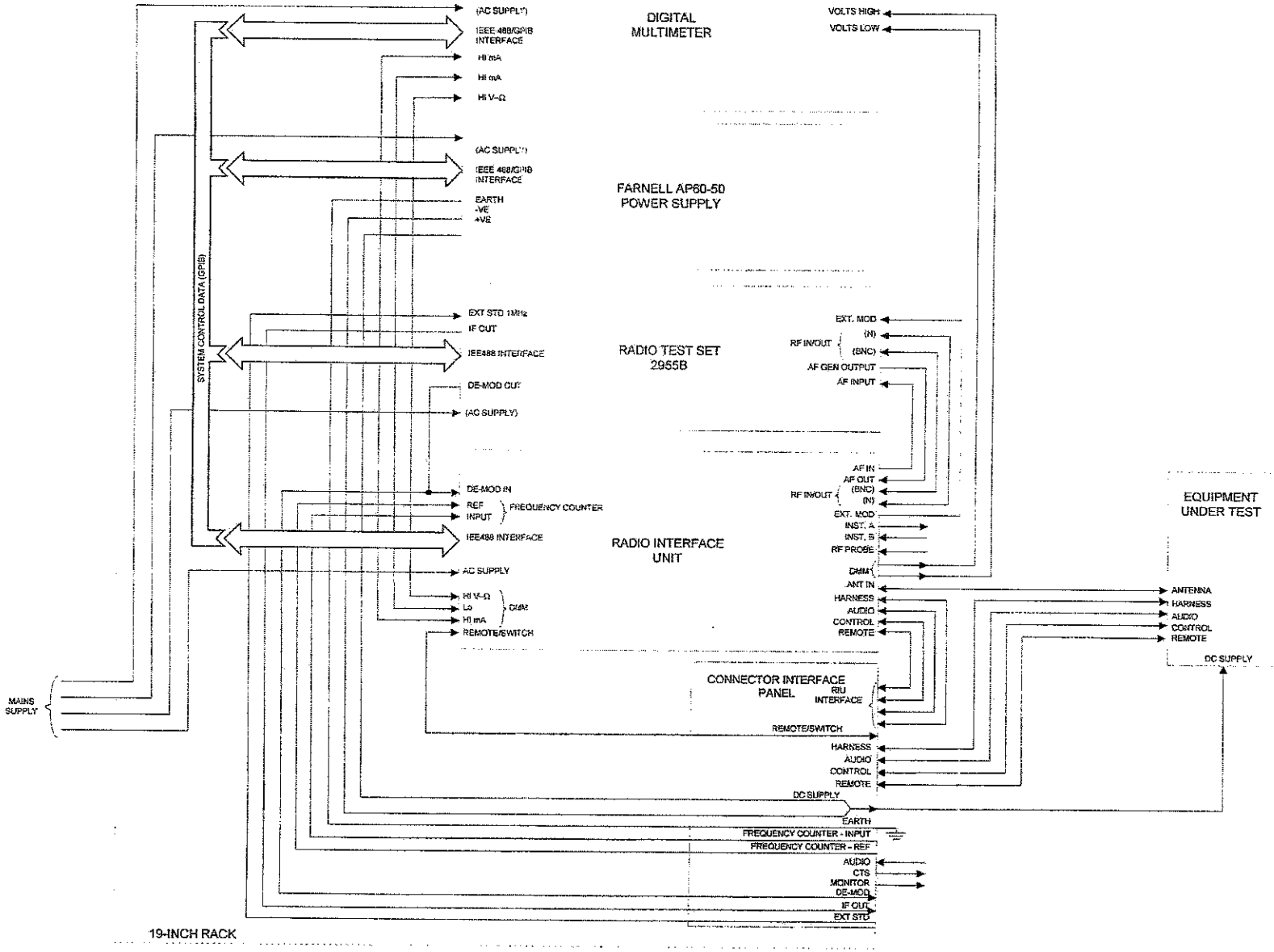


Fig 2 Simplified System Block Diagram

EQUIPMENT TESTED

14 Clansman radio types, which can be tested using the 8920C Radio Test System, are detailed in Table 1.

TABLE 1 CLANSMAN RADIO TYPES TESTED

Radio Type (1)	Modulation (2)	Input Power (3)	Transmit Power (4)
RT320	AM/SSB	+24 V d.c.	3.3 W
RT321	AM/SSB	+28 V d.c.	40.0 W
RT351m	FM	+24 V d.c.	40.0 W
RT349	FM	+12 V d.c.	250 mW
RT350	FM	+15 V d.c.	2.0 W
RT351	FM	+24 V d.c.	4.0 W
RT353	FM/Data	+24 V d.c.	50.0 W

15 The 8920C is also used to test some ancillary and special-to-type test equipment.

SYSTEM SPECIFICATION

Software Version

16 The software version applicable to this configuration of the 8920C system is **6.02- 26-04-02.**

Physical Details

17 Radio Communications Test Set 2955B:

17.1	Width	: 389 mm
17.2	Depth	: 584 mm
17.3	Height	: 176 mm
17.4	Height with feet	: 197 mm
17.5	Rack height	: 4U
17.6	Weight	: 15.5 kg

For full details on the 2955B, refer to the manufacturer's publication.

18 Radio Interface Unit:

18.1	Width	: 345 mm
18.2	Depth	: 445 mm
18.3	Height	: 176 mm
18.4	Height with feet	: 197 mm
18.5	Rack Height	: 4U
18.6	Weight	: 15 kg

For full details on the RIU, refer to Chapter 5, RADIO INTERFACE UNIT.

19 Farnell AP60-50 Power Supply:

19.1	Width	: 435 mm
19.2	Depth	: 520 mm
19.3	Height	: 145 mm
19.4	Rack Height	: 3U
19.5	Weight	: 16 kg

For full details on the AP60-50 Power Supply, refer to the manufacturer's publication.

20 HP 34401A Digital Multimeter:

20.1	Width	: 212.6 mm
20.2	Depth	: 348.3 mm
20.3	Height	: 88.5 mm
20.4	Rack Height	: 2U
20.5	Weight	: 3.6 kg

For full details on the 34401A Digital Multimeter, refer to the manufacturer's publication.

21 Connector Interface Panel:

21.1	Width	: 483 mm
21.2	Height	: 177 mm
21.3	Rack height	: 4U

For full details on the CIP, refer to Chapter 6, CONNECTOR INTERFACE PANEL.

Power Requirements

22 Mains Input - 2955B:

22.1	Voltage	: 190 - 260 V a.c. (can also be configured for 110 V a.c. operation)
22.2	Frequency	: 45 - 400 Hz
22.3	Power Input	: 100 VA Max

23 23 Mains Input - RIU:

23.1	Voltage	: 195 - 260 V a.c. (can also be configured for 110 V a.c. operation)
23.2	Frequency	: 45 - 400 Hz
23.3	Power Input	: 120 VA Max

24 24 Mains Input - AP60-50 Power Supply Unit:

24.1	Voltage	: 198 - 262 V a.c. (can also be configured for 110 V a.c. operation)
24.2	Input Current	: 9 A r.m.s. (20 A pk)
24.3	Inrush Current	: 31 A max.

25 25 Mains Input – 34401A Digital Multimeter

25.1	Voltage	: 100V/120V/220V/240V ±10%.
25.2	Frequency	: 45 to 66 and 360 to 440 Hz (Automatically sensed at power on)
25.3	Power Input	: 25 VA Peak

Transit Cases

26 Transit cases are provided for the 2955B, RIU and AP60-50 Power Supply. For details of the dimensions and weights of the three cases (with the equipment packed), refer to Category 101 of this AESP.

Inputs and Outputs

27 Descriptions of the 2955B, AP60-50 Power Supply and HP34401A Digital Multimeter inputs and outputs used by the system can be found in the relevant manufacturer's publications. Descriptions of the RIU inputs and outputs can be found in Chapter 5 of this manual. Descriptions of the CIP inputs and outputs can be found in Chapter 6 of this manual.

28 Front and rear panel views of the racked 8920C Radio Test System equipment are shown in Fig 3.

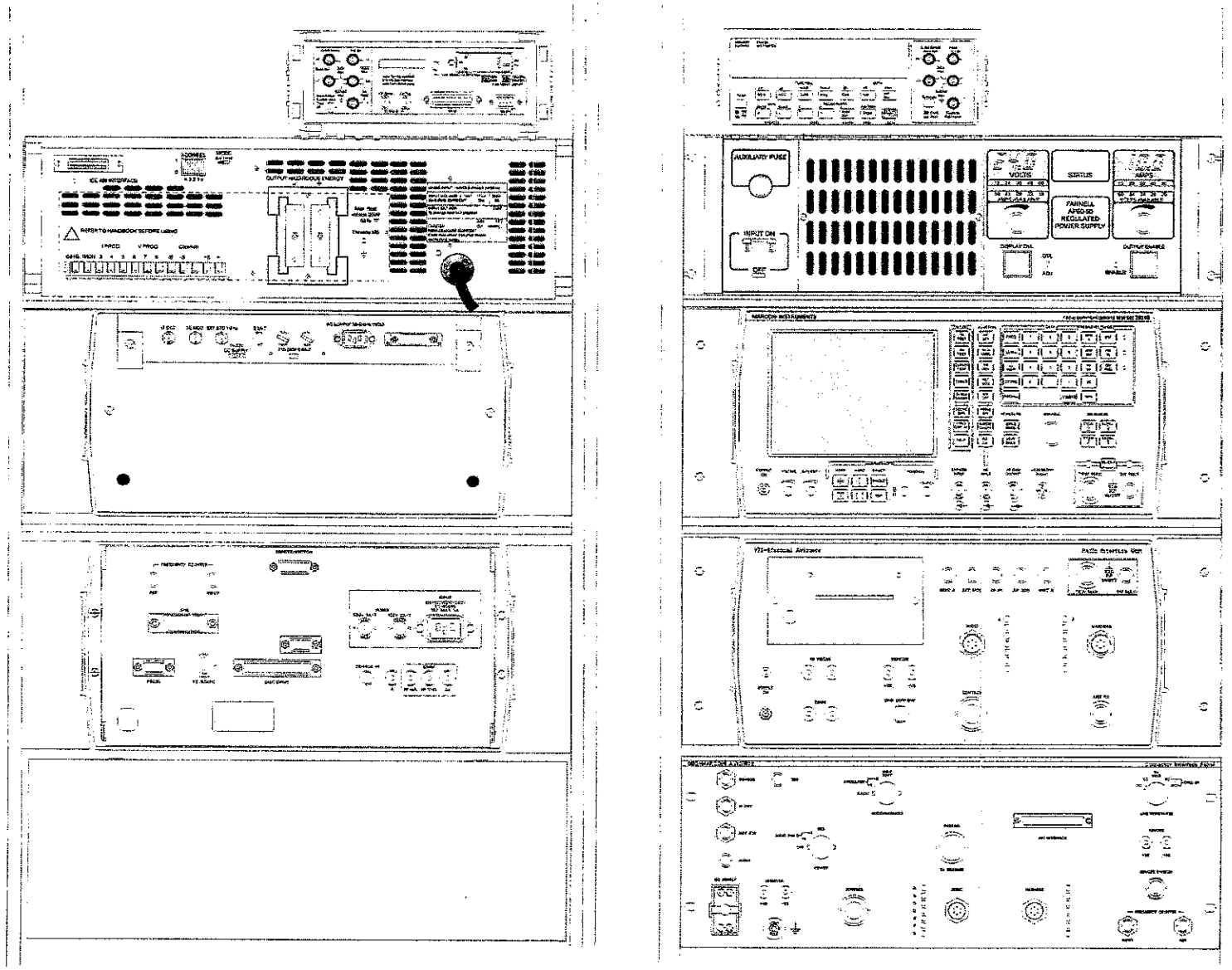


Fig 3.8920C Radio Test System Equipment Panel Views

Performance

29 Details on overall system performance are as follows:

29.1	Frequency range	: 400 kHz to 500 MHz.
29.2	Radio Frequency Interference	: System is designed in accordance with BS 6527 Class B for radiated and conducted emissions.
29.3	Safety	: Protected in accordance with IEC Safety Class 1. Designed according to IEC Publication 348. For 400 Hz supply, use special industrial mains plug. (Not applicable to the AP60-50 and HP34401A.)

Environmental Conditions

30 The environmental conditions under which the 8920C Radio Test System may be operated are as follows:

30.1	Temperature Range	: 0° C to +40° C
30.2	Humidity	: < 70%

Storage and Transport Conditions

31 Conditions under which the 8920C can be stored and transported are as follows:

31.1	Temperature Range	: -40° C to +70° C

ACCESSORIES

32 The accessories supplied with the 8920C Radio Test System are detailed in Table 2.

TABLE 2 SUPPLIED ACCESSORIES

Item (1)	Nato Stock Number (2)	Quantity (3)
8920C Radio Test System Operating Manual		1
DMM Shorting Link	6625-99-864-6561	1
Radio Earth Cable	5995-99-729-4022	1
Antenna Cable (RT350)	6625-99-125-7478	1
Audio Cable	6625-99-940-4784	1
Harness Cable	6625-99-438-6923	1
Control Cable	6625-99-477-4448	1
BNC/BNC Cable (RIU-2955B)	6625-99-125-7479	4
BNC/BNC Cable (RIU RF)	5995-99-149-8252	1
N/N Cable (RIU-2955B)	5995-99-660-9118	1
Digital Multimeter Cable (Red)	6625-99-887-3660	1
Digital Multimeter Cable (Black)	6625-99-370-9174	1
Remote Cable	6625-99-918-3495	1
GPIB Cable (PSU to 2955B)	6625-99-352-7982	1
GPIB Cable (2955B to RIU)	5995-01-124-9989	1
CIP Cable (CIP to RIU)	5995-99-215-4675	1
RCLU Cable (CIP to RCLU)	5995-99-016-8594	1

(continued)

TABLE 2 SUPPLIED ACCESSORIES (continued)

Item (1)	Nato Stock Number (2)	Quantity (3)
Remote Switch Cable (CIP)	5995-99-972-4732	1
Digital Multimeter Cable (Red)	5995-99-126-1124	1
Digital Multimeter Cable ((Black)	5995-99-930-7000	1
Digital Multimeter Cable (Brown)	5995-99-853-3496	1
Mains Cable (Fused 5 A)	5995-99-771-5543	2
BNC T-Piece Adaptor	5935-99-947-2524	2
N-BNC Adaptor	5935-99-648-2114	1
Test Adaptor 50 ohm (BNC shorting plug)	6625-99-786-1644	1
Fuse Link, 1.0 - T (RIU 120 V)	5920-99-104-7722	2
Fuse Link, 2.0 - T (RIU 240 V)	5920-99-107-7637	2
Rack Mounting Bracket	6625-99-362-7708	4
Locating Bar	6625-99-301-0930	4
Rack Mounting Tray	5995-99-256-3848	3
Cassette, Paper and Ink Ribbon	6625-99-588-0127	1
Screw, Pan Head, M5 16 mm, St Steel	ESM No. 2006-0054	4
Screw, C/Sunk, M5 12 mm, St Steel	ESM No. 2007-0053	8
Washer, Crinkle, M5, St Steel	ESM No. 2085-0008	8
Washer, Spring, M5, St Steel Coil	ESM No. 2080-0008	4
Nut, Full Hex, M5, St Steel	ESM No. 2044-0008	8

CHAPTER 2

SYSTEM INSTALLATION

CONTENTS

Para

Table

Fig

SITING

1 The 8920C Radio Test System equipment can be mounted in a standard 19-inch rack system.

Note ...

If the 8920C equipment is to be used free standing, the connection interface panel must be supported in some way (e.g. framework, angle brackets, etc.).

2 Siting arrangements must be such that no equipment is placed against or near sources of heat (e.g. heating ducts, radiators).

RACK MOUNTING

Installation into a 19-inch Rack

3 With reference to Fig 1, install the 8920C Radio Test System equipment into the 19-inch racking, as follows:

Note ...

It is recommended that the DMM be fitted at the top position of the rack.

3.1 Fit the DMM at the top position in the rack, using a suitable mounting method.

3.2 Fit three mounting trays to the rack using suitable fixings. Ensure that tray spacing allows the RIU to be situated immediately below the 2955B (to enable front panel cable connections to be made between these units).

3.3 Fit the two rack mounting brackets provided to the front end of the AP60-50 Power Supply, as described in the manufacturer's publication, and install it into the rack below the DMM.

3.4 Fit the two rack mounting brackets provided to the sides of the 2955B, as follows:

3.4.1 Remove the carrying handle by first pulling off the plastic at the handle ends, and remove the exposed retaining screws.

3.4.2 Remove the handle by easing it apart and away from the unit.

3.4.3 Fit a locating bar (Fig 1) to each rack mounting bracket, using the M5x12 counter-sunk screws provided.

3.4.4 Fit the rack mounting bracket/locating bar assemblies to the unit, using the M5x12 pan head screws provided.

3.5 Install the 2955B into the rack below the Farnell AP60-50 Power Supply.

3.6 Fit the two rack mounting brackets provided to the sides of the RIU, using the same procedure as used for the 2955B (Para 3.4.1 to 3.4.4), and install the RIU into the rack below the 2955B.

3.7 Fit the Connector Interface Panel to the rack immediately below the RIU.

3.8 Connect the system cables between the units and Connector Interface Panel as detailed under 'System Equipment Interconnections' (Para 4).

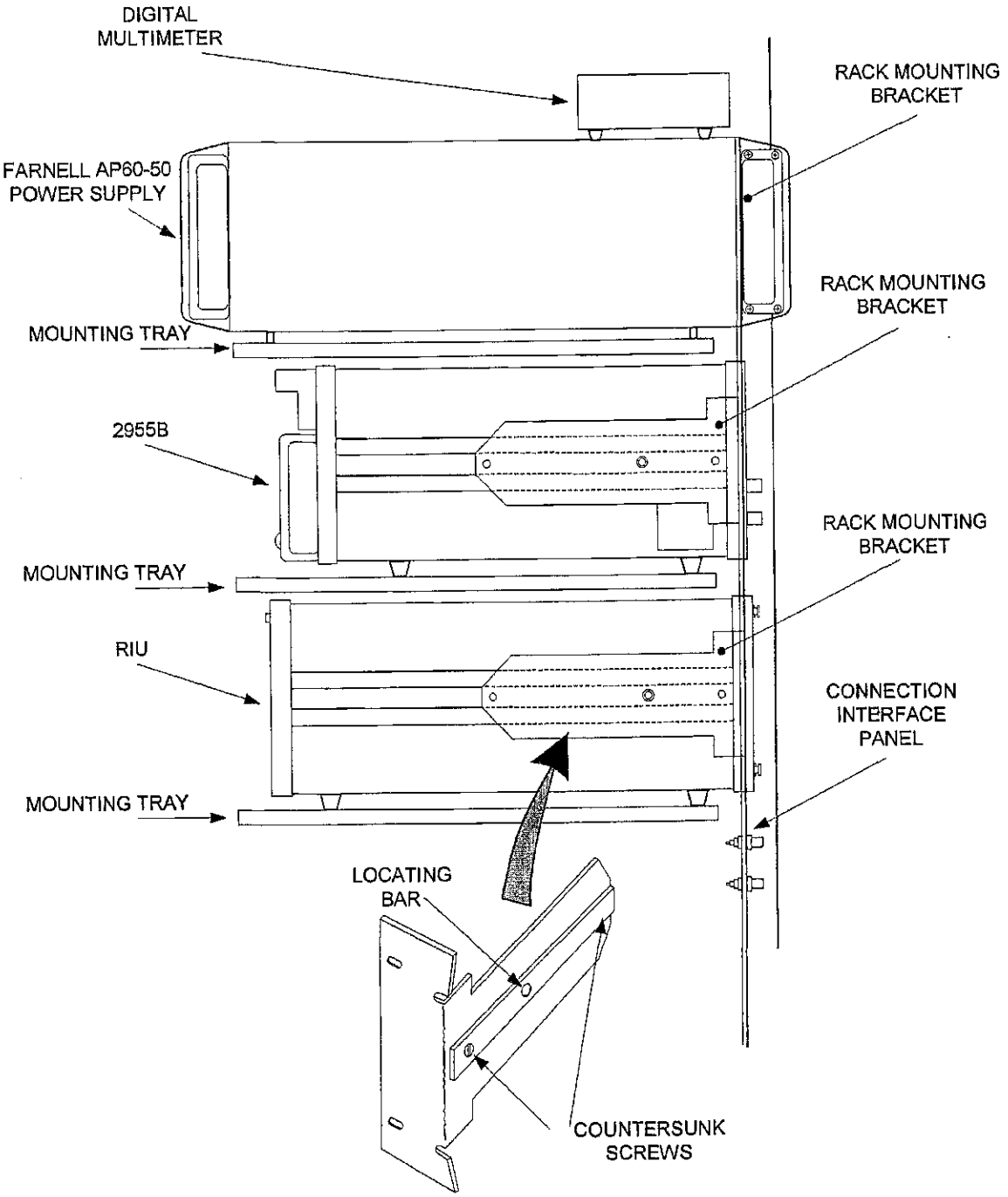


Fig 1 Rack Installation

SYSTEM CONNECTIONS

System Equipment Interconnections

4 Details on the system cable/connector type and interconnection between the units and Connector Interface Panel are given in Table 1 (for front panel connections) and Table 2 (for rear panel connections). Front and rear panel connections are shown in Fig 2 and Fig 3 respectively.

Note ...

The rear view of the AP60-50 Power Supply (Fig 3) is shown with terminal cover removed.

TABLE 1 SYSTEM CONNECTIONS - FRONT

Cable Item No. (1)	Description (2)	Connections (3)	Nato Stock No. (4)
1	Data Signal BNC-to-BNC	2955B - EXT MOD INPUT to RIU - EXT MOD	6625-99-125-7479
2	Audio signal BNC-to-BNC	2955B - AF INPUT to RIU - AF IN	6625-99-125-7479
3	Audio signal BNC-to-BNC	2955B - AF GEN OUTPUT to RIU - AF GEN	6625-99-125-7479
4	RF signal N-to-N	2955B - RF IN/OUT to RIU - RF IN/OUT	5995-99-660-9118
5	RF signal BNC-to-BNC	2955B - RF IN/OUT to RIU - RF IN/OUT	6625-99-125-7479
6	Harness signals Multi-way	CIP - RIU INTERFACE to RIU – HARNESS	5995-99-215-4675
7	Audio signals Multi-way	CIP - RIU INTERFACE to RIU - AUDIO (Multi-way)	
8	Control signals Multi-way	CIP - RIU INTERFACE to RIU – CONTROL	
9	Remote signals 'Banana' Plugs black)	CIP - RIU INTERFACE to RIU - REMOTE –VE	
10	Remote signals 'Banana' Plugs (red)	CIP - RIU INTERFACE to RIU REMOTE +VE	
11	Volts d.c. 'Banana' Plugs (red)	RIU - DMM (red) to DMM - Volts High	6625-99-887-3660
12	Volts d.c. 'Banana' Plugs (black)	RIU - DMM (black) to DMM - Volts Low	6625-99-370-9174

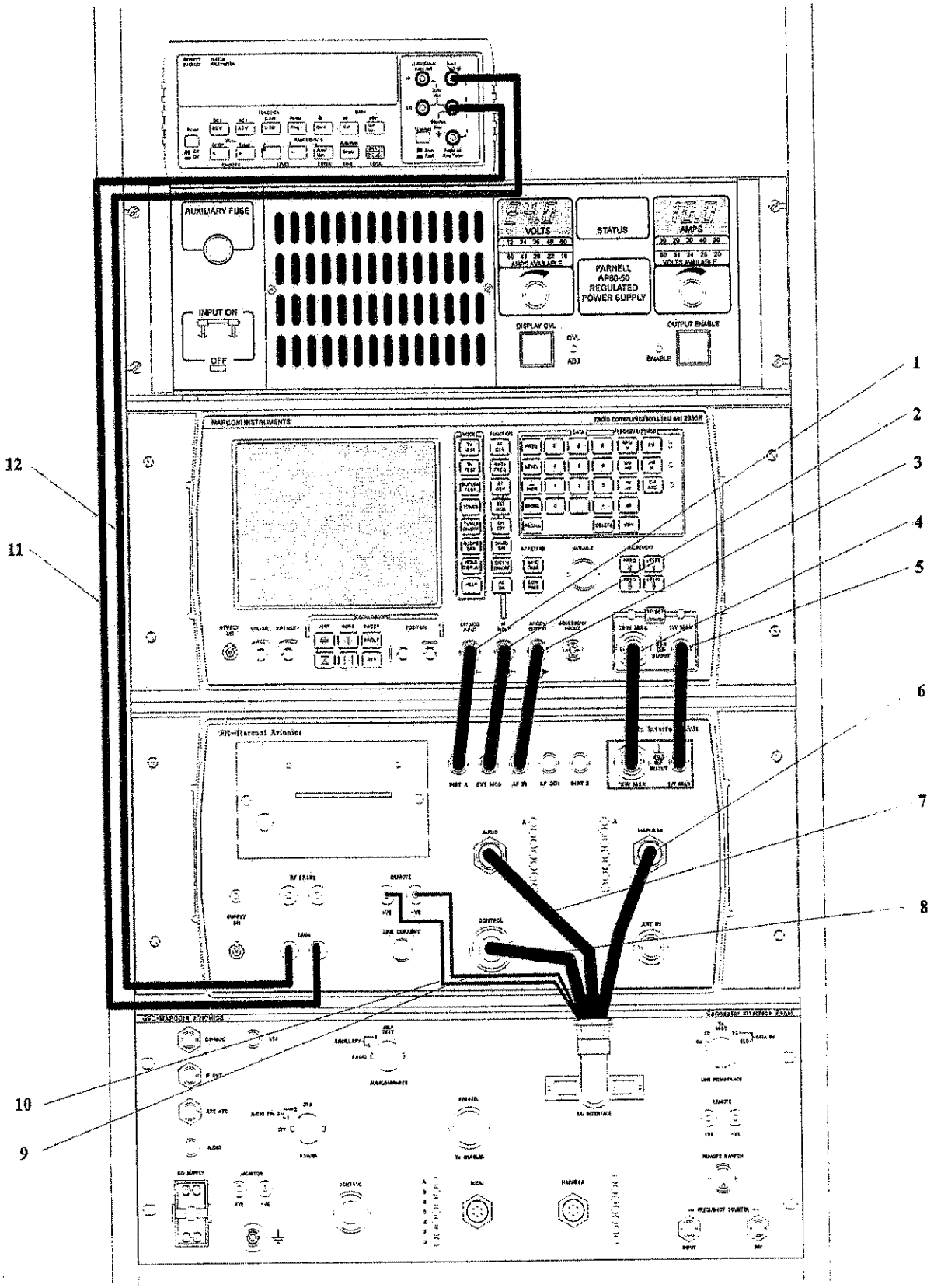


Fig 2 System Equipment Interconnections - Front

Notes ...

(1) Rear cable item Nos 6, 7, 8, 12, 13 and 14 must be routed and secured along the insides of the right-hand (viewed from rear) rear rack supports as shown in Fig 3.

(2) Rear cable item Nos 15 and 16 must be routed and secured along the insides of the left-hand (viewed from rear) rear rack supports, as shown in Fig 3.

(3) Rear cable item Nos 6, 7, and 8 are to be connected to the Digital Multimeter front panel (Fig 2) when instructed via the 2955B screen during automatic tests.

TABLE 2 SYSTEM CONNECTIONS - REAR

Cable Item No. (1)	Description (2)	Connections (3)	Nato Stock No. (4)
1	GPIB	DMM – SK501 to Farnell AP60-50 Power Supply - IEEE 488 INTERFACE	5995-99-124-9989
2	Mains	DMM - Mains connector	5995-99-771-5543
3	GPIB	2955B - GPIB to Farnell AP60-50 Power Supply - IEEE 488 INTERFACE Note ... The copper fingers end of this cable is at the PSU end	6625-99-352-7982
4	GPIB	2955B - GPIB to RIU - GPIB	5995-99-124-9989
5	Mains	2955B - AC SUPPLY	5995-99-771-5543
6	Volts/Current/ Resistance Common - 'Banana' Plugs (Black)	RIU - DMM Lo to Digital Multimeter - Lo	5995-99-930-7000
7	Volts/Resistance - 'Banana' Plugs (Red)	RIU - DMM HI V-Ω to Digital Multimeter - HI V-Ω	5995-99-126-1124
8	Current - 'Banana' Plugs (Brown)	RIU - DMM HI mA to Digital Multimeter - HI mA	5995-99-853-3496

(continued)

TABLE 2 SYSTEM CONNECTIONS - REAR (continued)

Cable Item No. (1)	Description (2)	Connections (3)	Nato Stock No. (4)
9	Mains	RIU - AC INPUT	5995-99-771-5543
10	T-piece BNC	RIU - DE- MOD	5935-99-947-2524
11	Audio Signal BNC	RIU - DE-MOD IN (T-adaptor) rom CIP - DE-MOD	-
12	Radio Power Supply Output - Spade Terminal	Farnell AP60-50 Power Supply - +VE from CIP - DC SUPPLY	-
13	Radio Power Supply Output - Spade Terminal	Farnell AP60-50 Power Supply - -VE from CIP - DC SUPPLY	-
14	Radio Power Supply Output - Spade Terminal	Farnell AP60-50 Power Supply - EARTH from CIP - ⏚ (Earth)	-
15	RF Signal BNC	2955B - IF OUT from CIP - IF OUT	-
16	RF Signal BNC	2955B - EXT. STD 1MHz from CIP - EXT STD	-
17	19-way D-type	RIU - REMOTE SWITCH from CIP - REMOTE SWITCH	-
18	RF Signal BNC	RIU - FREQUENCY COUNTER-INPUT from CIP - FREQUENCY COUNTER-INPUT	-
19	RF Signal BNC	RIU - FREQUENCY COUNTER-REF from CIP - FREQUENCY COUNTER-REF	-
20	Audio Signal BNC-to-BNC	RIU - DE-MOD IN (T-adaptor) to 2955B - DE-MOD OUT	6625-99-811-4594

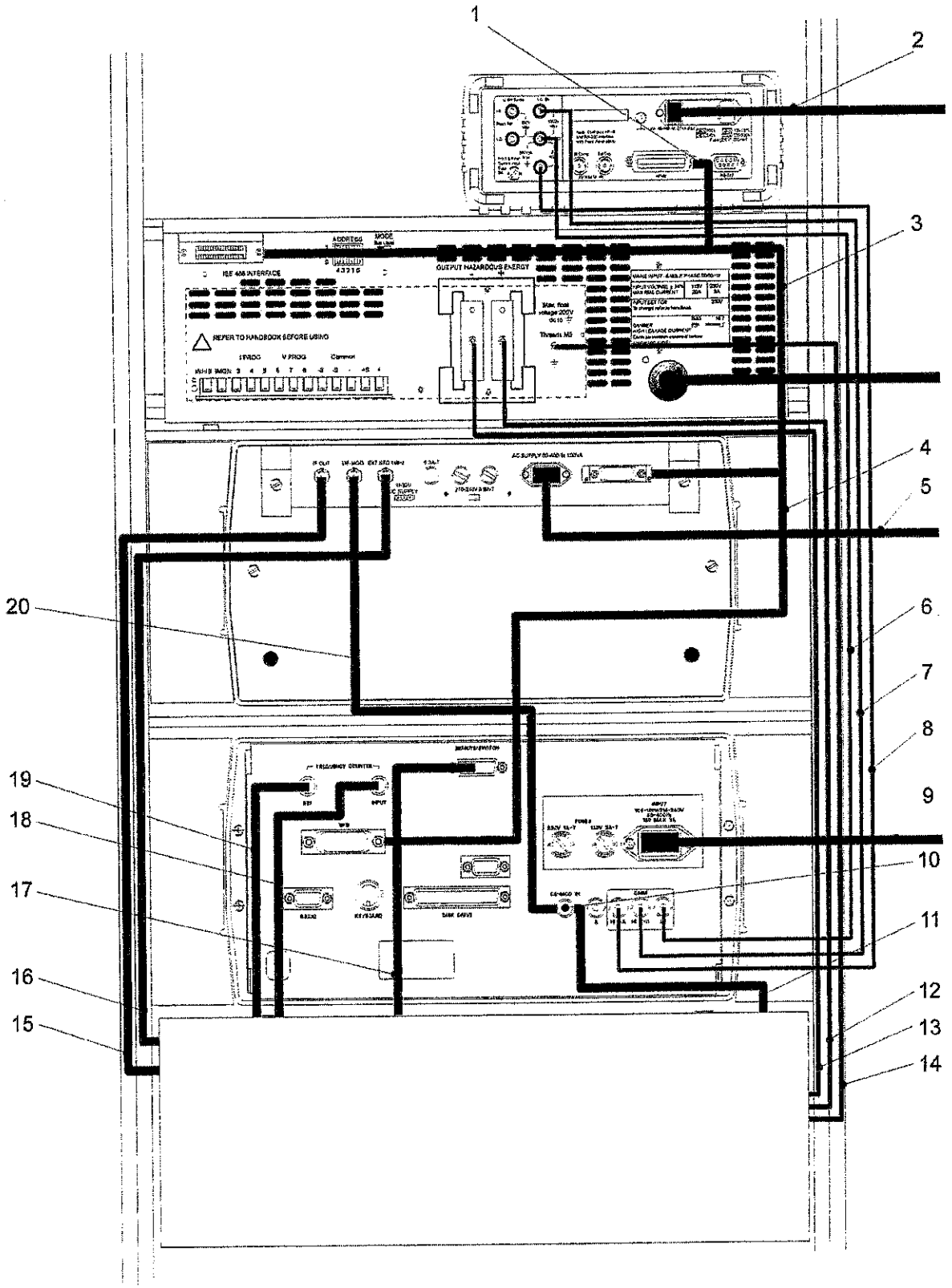


Fig 3 System Equipment Interconnections - Rear

System/EUT Cable Connections

5 System-to-EUT connections vary depending on the particular equipment being tested and the type of test being carried out. Cabling details for each equipment test are described in the EMER XY4 Part 4 publications for automatic mode testing and the EMER XY4 Part 2 publications for manual mode testing.

6 For automatic mode testing, the application test program supplies the requirements by displaying such details on the 2955B screen.

INITIAL SETTINGS

RIU Settings

7 Set up the RIU as follows:

7.1 Set the LINE CURRENT control on the RIU front panel fully counter-clockwise.

2955B Settings

8 Set up the 2955B, as follows:

8.1 Set the 2955B GPIB address to '2' (Fig 4). The 2955B is automatically set in the correct default state when powered up.

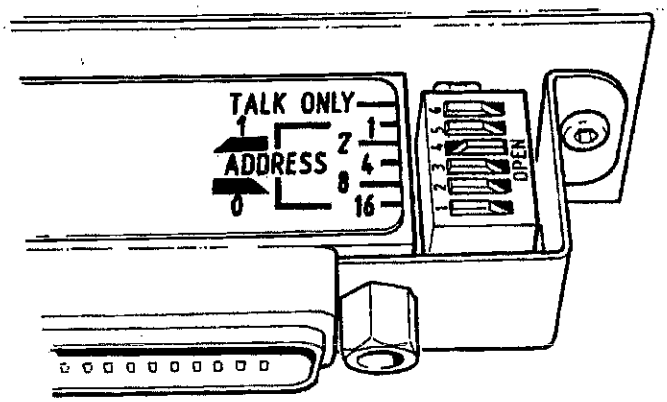


Fig 4 2955B GPIB Address Setting

AP60-50 Power Supply Settings

9 Set up the AP60-50 Power Supply, as follows:

9.1 Set the VOLTAGE ADJUST and CURRENT ADJUST controls on the AP60-50 Power Supply fully counter-clockwise.

9.2 Set the front panel OUTPUT ENABLE pushbutton switch to the out position.

9.3 On the rear panel, check that the MODE switch is set to Bus and the GPIB address is set to '4' (Fig 5).

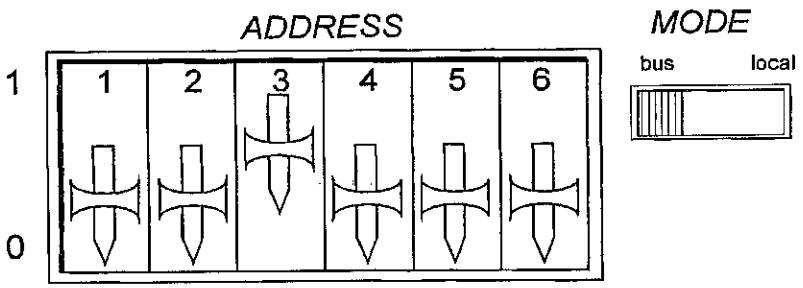


Fig 5 AP60-50 PSU Mode and GPIB Address Settings

9.4 The AP60-50 Power Supply is available in IEEE488.1 and IEEE488.2 versions. For the .1 version, the overvoltage must be set manually by pressing the front panel DISPLAY OVL button and adjusting the OVL ADJUST control. For the .2 version, the overvoltage is set automatically in the application by bus command. Both versions are catered for in the application software.

HP 34401A Digital Multimeter Settings

10 Set up the HP 34401A Multimeter, as follows:

10.1 Turn on the front panel menu, using `shift` then `<`.

A:	MEAS MENU

10.2 Move across to the I/O MENU choice on this level, using `<`, `<`.

E:	I/O MENU

10.3 Move down a level to the HP-IB ADDR command, using `v`.

1:	HP-IB ADDR

10.4 Move down to the "parameter" level to set the address, using `v`

^xx	ADDR

10.5 Save the change and turn off the menu, using `Enter`.

Note:

The address is stored in *non-volatile* memory, and *does not* change when power has been off or after a remote interface reset.

SAFETY TESTS

11 Prior to powering up the system, earth continuity and insulation resistance tests should be carried out on the a.c. circuits of the 2955B, RIU and the AP60-50 Power Supply.

Earth Continuity Testing

12 Once every twelve months, perform earth continuity tests on the RIU, 2955B and AP60-50 Power Supply equipment, in turn, as follows:

12.1 Remove the mains plug of the equipment under test from the wall socket.

12.2 At the Robin KMP 3075 DL:

12.2.1 Set the TRAC/LOC switch to TRAC.

12.2.2 Set the right-hand selector switch to CONTINUITY (20 Ω range).

12.2.3 Set the left-hand selector switch to AUTO NULL position.

12.2.4 Short together the red and black test leads.

12.2.5 Press and release the PRESS TO TEST button (this will measure the resistance of the lead set, and store the result in memory).

12.2.6 Set the left-hand selector switch to Ω.

12.3 At the equipment under test, connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the chassis.

12.4 Press the PRESS TO TEST button. The true continuity measurement is displayed, with the resistance of the test leads deducted. Compare the measured resistance value with the appropriate specified value:

12.4.1 RIU : <0.1 Ohms

12.4.2 2955B : <0.5 Ohms

12.4.3 AP60-50 Power Supply : <0.1 Ohms (@ 25 A)

12.5 If this test should fail, the equipment must not be operated until the fault has been cleared.

12.6 Disconnect the Robin KMP 3075 DL.

Insulation Resistance Testing

13 Once every twelve months, perform an insulation resistance test on the RIU, 2955B and AP60-50 Power Supply equipment, in turn, as follows:

13.1 Earth continuity must be verified before proceeding with the insulation resistance test.

13.2 At the equipment under test:

13.2.1 Remove the mains plug from the wall socket and link together the L and N pins.

13.2.2 Connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the linked L and N pins.

13.2.3 Set the mains power switches to ON.

13.3 At the Robin KMP 3075 DL:

13.3.1 Set the left-hand selector switch to 500 V range.

13.3.2 Set the right-hand selector switch to INSULATION (20 MΩ range).

13.3.3 Press and hold the PRESS TO TEST button until the tester beeps. The tester should show the over range indicator.

13.4 Repeat the test, using higher insulation ranges as appropriate to take the measurement.

13.5 Reset the insulation range to 20 MΩ before testing the next equipment.

13.6 Compare the measured insulation resistance with the appropriate specified value:

13.6.1	RIU	: >20 Megohms
13.6.2	2955B	: >2 Megohms
13.6.3	AP60-50 Power Supply	: >10 Megohms

13.7 If this test should fail, the equipment must not be operated until the fault has been cleared.

13.8 Disconnect the Robin KMP 3075 DL and remove the link from the live and neutral pins.

SYSTEM FUNCTIONAL CHECKS

14 A system self-test procedure is provided in Chapter 4, SYSTEM MAINTENANCE. This procedure should be carried out on installation of the equipment to ensure the system is fully operational.

CHAPTER 3

OPERATING INSTRUCTIONS

CONTENTS

(continued)

CONTENTS (continued)

INTRODUCTION

1 This chapter provides system operating information. For detailed information on the operation of the 2955B Radio Communications Test Set, AP60-50 Power Supply (PSU) and 7150plus Digital Multimeter (DMM), refer to the manufacturer's publications. Information on the operation of the GMAV Radio Interface Unit (RIU) is contained in Chapter 5 of this manual. Information on the operation of the GMAV Connector Interface Panel is contained in Chapter 6 of this manual.

CONTROLS AND CONNECTORS

2 Before operating the 8920C Radio Test System it is first necessary to become familiar with the location and function of all external system controls and connectors.

3 System controls and connectors are located on the 2955B, the RIU, the PSU, the Connector Interface Panel (CIP), and the DMM.

2955B Radio Communications Test Set

4 The 2955B controls and connectors used in performing system functions are situated on the front and rear panels of the unit. System connections are made between the 2955B and RIU via the front and rear panels. Some 2955B rear panel connections are brought out to the Connector Interface Panel (Fig 1).

5 Full details on the controls, connectors, and operation of the 2955B can be found in the manufacturer's publications. System operation information is provided later in this chapter.

Radio Interface Unit

6 The RIU controls and connectors used in performing system functions are situated on the front and rear panels of the unit. System connections are made between the RIU and 2955B via the front and rear panels. Some RIU rear panel connections are brought out to the Connector Interface Panel (Fig 1).

7 Details on the controls, connectors, and operation of the RIU are contained in Chapter 5 of this manual. System operation information is provided later in this chapter.

AP60-50 Power Supply

8 The AP60-50 Power Supply controls and connectors are situated on the front and rear panels. When the 8920C system is used in automatic mode, the system software controls the output d.c. power via the GPIB connector on the rear panel. In this situation, the front panel controls become inoperative. In manual mode, the power supply controls have to be set manually.

9 Full details on the controls, connectors, indicators and operation of the AP60-50 Power Supply can be found in the manufacturer's publications. System operation information is provided later in this chapter.

HP34401A Digital Multimeter

10 The DMM controls and connectors are situated on the front and rear panels of the unit. When the 8920C is used in automatic mode, the system software sets the DMM operating mode (i.e. range, voltage, current and resistance), via the GPIB connector on the rear panel, for the particular test being performed. In this situation, the front panel controls become inoperable. In manual mode of system operation, the DMM controls have to be set by the operator.

11 Full details on the controls, connectors, indicators, and operation of the HP34401A Digital Multimeter can be found in the manufacturer's publication. System operation information is provided later in this chapter.

Connector Interface Panel

12 The Connector Interface Panel (CIP) contains a number of system connectors and controls. The connectors are used for connecting the radio under test to the system equipment. The controls are used for signal routing and for setting certain test conditions.

13 Details on the controls, connectors, indicators, and operation of the CIP can be found in Chapter 6 of this manual. System operation information is provided later in this chapter.

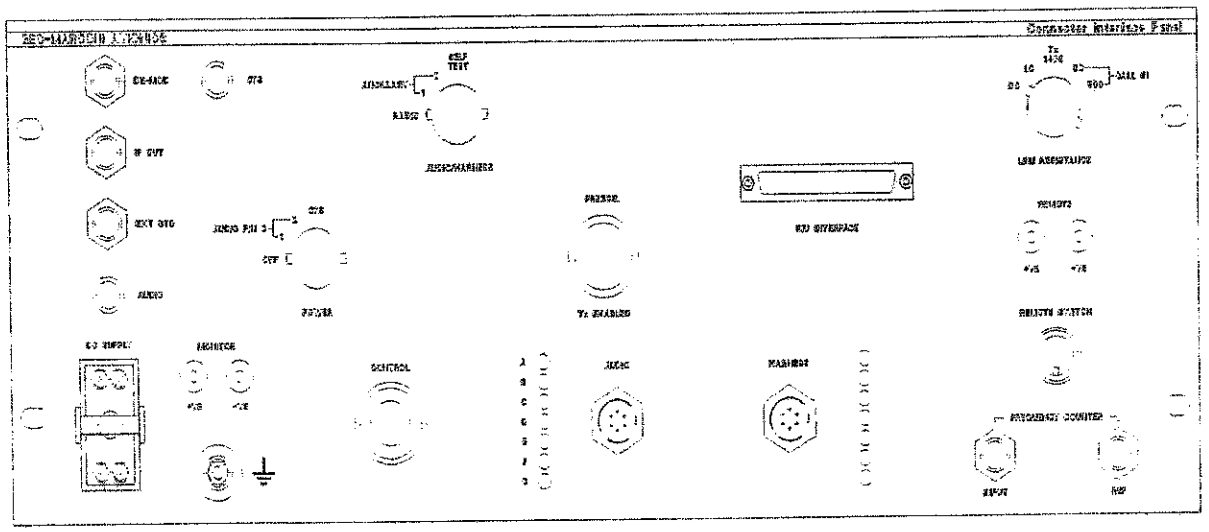


Fig 1 Connector Interface Panel - Front View

SYSTEM START UP

14 To start up the 8920C system and access the Clansman Main Menu, proceed as follows:

14.1 Check that the mains input cables to the system equipment connected to the mains supply.

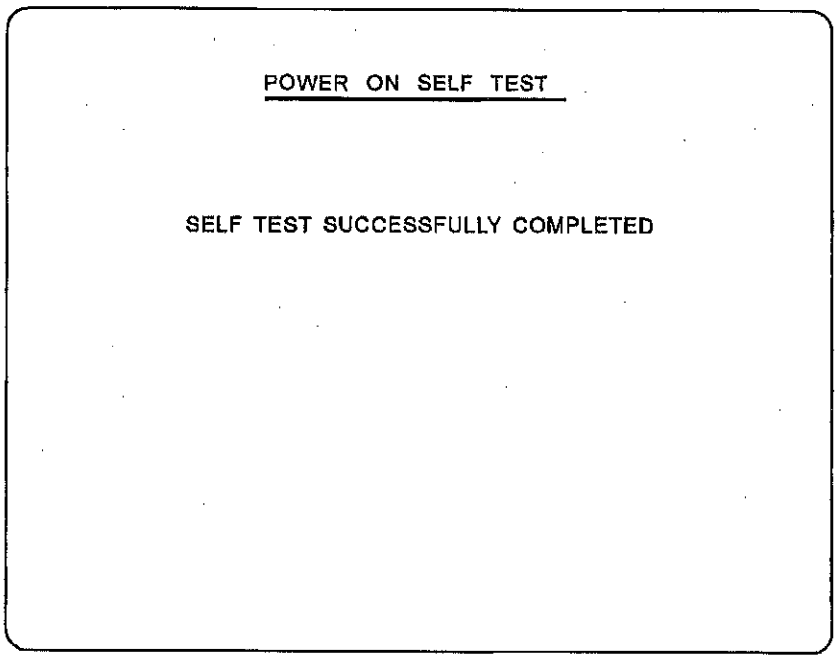
14.2 Switch on the 2955B, DMM, AP60-50 Power Supply and then the RIU.

14.3 The Receiver Test screen appears momentarily on the 2955B display, then an "exercising relays sequence" followed by the Power On Self Test screen (shown next) stating that the self test was completed successfully.

Notes...

(1) If a printer is not connected, the Instrument Check screen appears before the Power On Self Test screen asking the operator to either continue without one or to exit. If 'continue' is selected, the Power On Self Test screen is displayed.

(2) If the system does not complete the power on self test, the errors are indicated. For full details on the error indications and the remedial actions, refer to Chapter 4, SYSTEM MAINTENANCE.



1501000-26

14.4 A few seconds after the Power On Self Test screen is presented, the Receiver Test screen is momentarily displayed, followed by the Clansman Main Menu.

14.5 The Clansman Main Menu options are described under THE CLANSMAN MAIN MENU OPTIONS (Para 17).

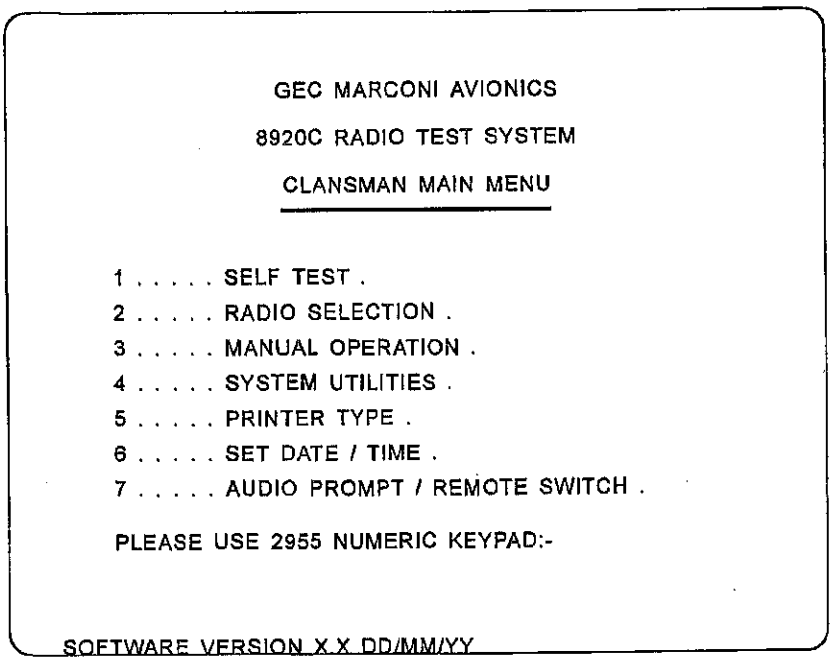
SYSTEM SHUTDOWN

15 The 8920C system software does not require a sequenced shutdown operation. To shut the system down, switch the 2955B, RIU and AP60-50 Power Supply equipment off and disconnect the a.c. supply cables from the source.

16 On completing test activities, it is good practice to disconnect test cables from the system equipment and stow them in a suitable storage place.

THE CLANSMAN MAIN MENU OPTIONS

17 The Clansman Main Menu screen is shown next.



1501000-28

The Main Options

18 The main system operation options are described next.

Option 2 - RADIO SELECTION

19 The RADIO SELECTION option sets the 8920C in the automatic test mode of operation. Enables selection of the application test program (ATP) for the radio under test and the required print mode.

Option 3 - MANUAL OPERATION

20 The MANUAL OPERATION option sets the 8920C in the manual test mode of operation. Provides a number of manual test configurations (skeleton test set-ups) which can be selected for the test being carried out.

The General Options

21 The general subsidiary operations options are described next.

Option 1 - SELF TEST

22 The SELF TEST option enables a system self test to be carried out prior to carrying out test operations or when a fault is suspected.

Option 4 - SYSTEM UTILITIES

23 On entering the appropriate password, the SYSTEM UTILITIES option enables access to the system utilities list.

Option 5 - PRINTER TYPE

24 The PRINTER TYPE option enables the type of printer (ticket printer or Centronics printer) to be selected and fitted for use.

Option 6 - SET DATE/TIME

25 The SET DATE/TIME option enables the system clock time and date to be set. This may be indicated by the screen error message "00A0H".

Option 7 - AUDIO PROMPT/REMOTE SWITCH

26 The AUDIO PROMPT/REMOTE SWITCH option enables the operator to select one or both of the following facilities for automatic mode testing:

26.1 An AUDIO PROMPT (bleep), which occurs when operator intervention is required.

26.2 The use of the REMOTE SWITCH to enable the operator to remotely 'continue' the test programs.

SYSTEM OPERATION

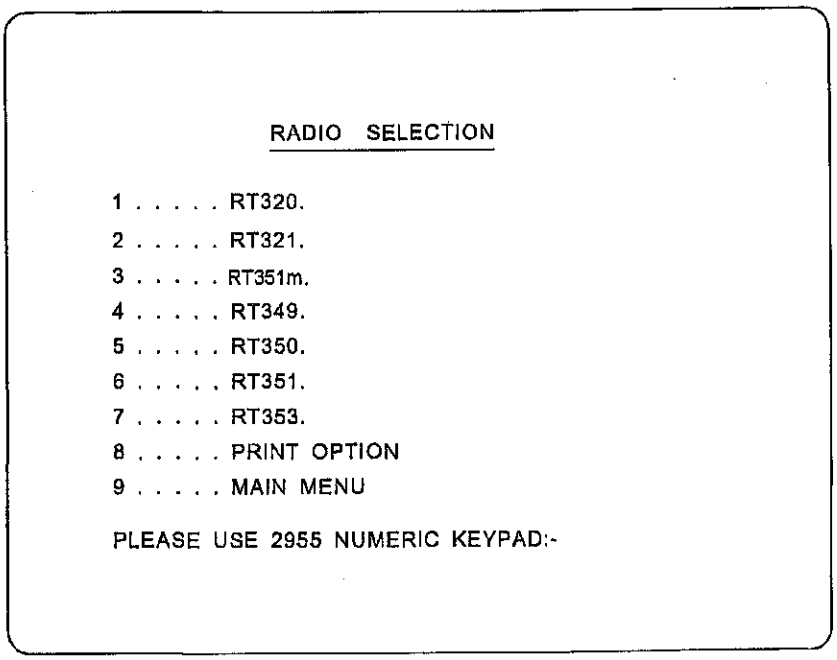
General

27 System operation is set up by selecting the appropriate menu options in response to prompts displayed on the 2955B. Selections are made using the appropriate keys on the 2955B. Some options are selected using the numeric keys and others by using the MODE keys, which are reassigned by software. The eight MODE keys make up the first column to the right of the screen. An option selected by a MODE key is displayed alongside the key used to select it.

Automatic Test Mode Operation

28 Before entering the 8920C automatic mode of operation, carry out any required general option operations (e.g. selecting a printer type). Descriptions of how to carry out the general option operations can be found under Using the Main Menu General Options (Paras 55 to 61).

29 To set the 8920C system in the automatic test mode, select RADIO SELECTION (option 2) on the Clansman Main Menu to obtain the Radio Selection menu screen (shown next).



1501000-49

Radio Type Selection

30 When one of the radio type options (1-7) is selected, the application test program for that radio is invoked. Tests are carried out by following the sequence of test prompts and the radio test instructions. Descriptions of these prompts (in the order in which they appear) are given next (Para 31). If option 6 or 7 (RT351 or RT353) is requested an additional screen for "FIELD / BASE" selection is presented.

Radio Application Test Program Prompts

31 The selected application test program issues a sequence of prompts, as given in Table 1.

TABLE 1 RADIO TEST PROGRAM PROMPTS

Screen Prompt (1)	Option (2)	Function (3)
EQUIPMENT LIST	SKIP	No equipment information is given.
	DISPLAY	An equipment list is displayed.
CONNECTION DETAILS	SKIP	No connection details are given.
	DISPLAY	Connection details are given.
LOG RADIO OPTION	SKIP LOG	No information requested for logging.
	LOG RADIO	Date, Equip No. and Operator No. are requested to be printed with the test results.
CLANSMAN RTXXX TESTS	RUN ALL TESTS	All tests in the selected module are run.
Note ... Safety tests must be completed before "Run All" or "Select Test" options are run	SELECT TEST	Gives a further screen prompt to enable individual tests to be run.
	CHANGE PRINT OPTION	Enables all test results to be printed, or test failures only, or no results printed – printing can be at the end of a run or during a run.
	NEXT RADIO	Enables selection of a different radio.

Using the PRINT OPTION Option

32 The PRINT OPTION option on the Radio Selection menu enables selection of the available print modes, as follows:

32.1 Select either 'Print at End' of a run or 'Print During' (default setting) a run.

32.2 Then select one of the following options:

32.2.1 'Print None' - nothing will be printed.

32.2.2 'Print All' - print all test results.

32.2.3 'Print on Fail' - print test failures only (default setting).

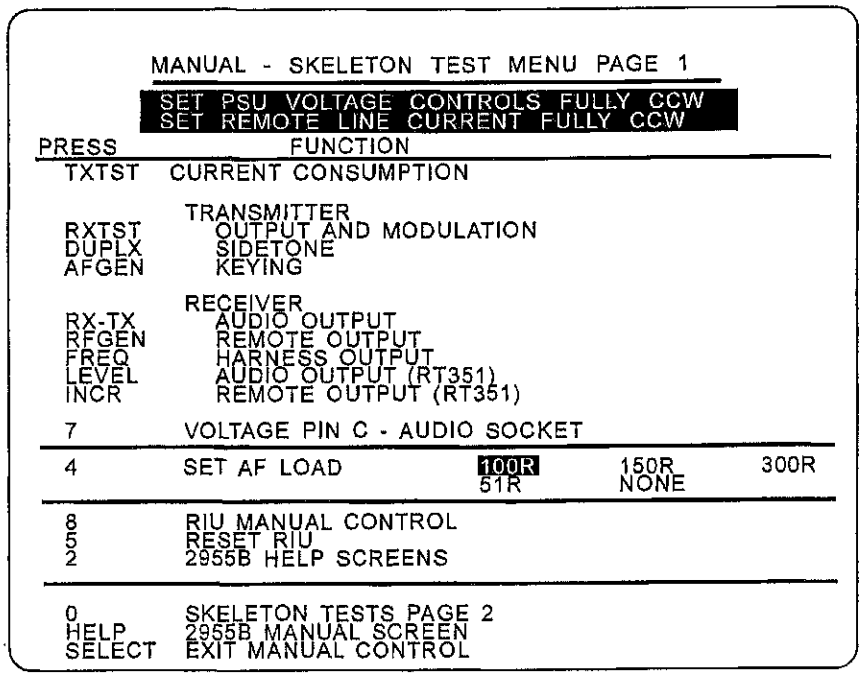
32.3 Then select 'Return'.

Using the MAIN MENU Option

33 The MAIN MENU option on the Radio Selection menu returns to the Clansman Main Menu screen (Para 17).

Manual Test Mode Operation

34 To set the 8920C system in the manual test mode, select MANUAL OPERATION (option 3) on the Clansman Main Menu to obtain the Manual - Skeleton Test Menu Page 1 screen (shown next).



1501000-24

35 The two messages displayed at the top of the screen prompting the operator to set the PSU and LINE CURRENT controls fully counter-clockwise are displayed on the first occurrence only of this screen.

Using the Skeleton Test Set-Up Options

36 The skeleton test set-ups listed on the Skeleton Test Menu Page 1 and Page 2 are test condition configurations, which are selected at the start of and during the manual test procedures.

37 The purpose of the skeleton test set-ups is to set up the RIU signal routeing and the required 2955B test page (e.g. Receiver Test) for the test being performed. Descriptions of each skeleton test set-up are provided in Annex A to this chapter.

38 To select the required skeleton test set-up, press the appropriate 2955B function key or numeric key, as indicated in the left-hand column of the display (e.g. RX-TX [Rx-Tx FREQ] for Receiver - Audio Output on Page 1). Pressing 0 on Page 1 of the Skeleton Test Menu displays Page 2 of the Skeleton Test Menu (shown next).

MANUAL - SKELETON TEST MENU PAGE 2

PRESS	FUNCTION
	REMOTE
TXTST	LOC-REM LINE CURRENT
RXTST	LOC-REM AF OUTPUT
DUPLX	REM-LOC LINE CURRENT
AFGEN	REM-LOC AF OUTPUT
RX-TX	OPEN CIRCUIT DC VOLTAGE
	DATA
RFGEN	TRANSMIT DELAY TEST
FREQ	TRANSMIT MODULATION
LEVEL	VOLTAGE PIN E-HARNESS SOCKET
INCR	RECEIVE 1KHZ
7	RECEIVE 2KHZ
4	BER TEST RECEIVE
1	BER TEST TRANSMIT
8	RIU MANUAL CONTROL
5	RESET RIU
2	2955B HELP SCREENS
0	SKELETON TESTS PAGE 1
HELP	2955B MANUAL SCREEN
SELECT	EXIT MANUAL CONTROL

1501000-25

Using the SET AF LOAD Option

39 The SET AF LOAD option enables any one of four or no AF load to be used in association with the chosen skeleton test set-up.

Note...

If the default AF load is to be changed, the new load must be selected before selecting the required skeleton test set-up.

40 The selected AF load becomes the default for the chosen skeleton test set-up and for subsequent skeleton test set-ups until such time it is changed.

41 The AF load may be changed during a test by setting it using the RIU MANUAL CONTROL option (Para 42), however, when returning to the Skeleton Test Set-Up Menu, the default AF load will be as previously selected.

Using the RIU MANUAL CONTROL Option

42 The RIU MANUAL CONTROL option provides additional selectable RIU control elements, which are used to temporarily modify the selected skeleton test set-up, as required, during manual testing.

43 On selecting RIU MANUAL CONTROL on the Skeleton Test Menu Page 1 or 2, the RIU Manual Control Page 1 screen is displayed (shown next).

RIU MANUAL CONTROL PAGE 1

PRESS	FUNCTION	SELECTION		
TXTST	AF GENERATOR	AUDIO	REMOTE	
RXTST	AF ATTENUATION	0DB	20DB	40DB
DUPLX	AF LOAD	100R	150R	300R
		51R	NONE	
AFGEN	AF INPUT	AUDIO	HRNS/REM	
RX-TX	HARNESS LOAD	NONE	30R	300R
RFGEN	RF SELECT	NORMAL	RF-AMP	
		HISENS	INTERMOD	
FREQ	DC MEASURE	OFF	ON	
LEVEL	CURRENT MEAS.	OFF	ON	
INCR	REMOTE PATH	OFF	REBRO-SLAVE	
		AUDIO		
7	REMOTE XFORMER	STIM	MEASURE	
4	TRANSMIT	OFF	ON	
1	AUDIO C LOAD	NONE	1R	
8	KEYING	4-4	27-54	
5	SIGNAL	AUDIO	DATA	
0	RIU MANUAL CONTROL PAGE 2			
HELP	2955B MANUAL SCREEN			
SELECT	EXIT RIU MANUAL CONTROL			

1501000-22

44 The selections highlighted in reverse video are the default settings, which are applied to the selected skeleton test set-up until changed. To select the required RIU facility, press the appropriate 2955B function key or numeric key (as indicated in the left-hand column of the display) the appropriate number of times (e.g. press DUPLEX TEST [DUPLX] three times to select an AF LOAD of 51R).

45 The functions of all the RIU manual control selections are deemed to be self explanatory, except for the FREQUENCY-A and FREQUENCY-B options. Both of these selections are available on the RIU Manual Control Page 2 screen (shown next), which is accessed by pressing 0 on the RIU Manual Control Page 1 screen.

RIU MANUAL CONTROL PAGE 2

PRESS	FUNCTION	SELECTION	
TXTST	FREQUENCY-A	OFF	CIP
RXTST	FREQUENCY-B	OFF	RF-AMP
DUPLX	RF PROBE	OFF	ON
AFGEN	PIN K	O/C	0V
RX-TX	PIN L	O/C	0V
RFGEN	PIN M	O/C	0V
FREQ	PIN O	O/C	DMM
LEVEL	PIN P	O/C	0V
INCR	PIN S	O/C	DMM
7	PIN A	O/C	0V
4	PIN B	O/C	0V
		5V	10V
8	PIN C	O/C	DMM
5	PIN D	O/C	DMM
2	PIN E	0V	MEASURE
9	PIN F	150HZ	CLR - SPEECH
6	DATA	RX	TX
3	DATA TRANSMIT	OFF	ON
0	RIU MANUAL CONTROL PAGE 1		
HELP	2955B MANUAL SCREEN		
SELECT	EXIT RIU MANUAL CONTROL		

1501000-23

The FREQUENCY A - CIP Measurement

46 This RIU manual control selection enables RF frequencies of between 100 kHz and 999 kHz to be measured and displayed on the 2955B screen. Frequencies to be measured are applied to the FREQUENCY COUNTER - INPUT connector on the CIP.

47 To make a frequency measurement, proceed as follows:

47.1 Press TX TEST (TXTST) once to select CIP on the RIU Manual Control Page 2 screen to display the Frequency Measurement A...CIP screen (shown next).

FREQUENCY MEASUREMENT A . . . CIP

000.000 KHZ

PRESS	FUNCTION	SELECTION	
TXTST	GATE TIME	0.5S	5S
HELP	EXIT MEASUREMENT		

1501000-29

47.2 If the frequency display is required to be to three decimal places, select a GATE TIME of 0.5 S (default setting).

47.3 If the frequency display is required to be to four decimal places, select a GATE TIME of 5 S by pressing Tx TEST (TXTST) once.

Note...

The frequency will take 5 seconds to update the measured frequency. Pressing Tx TEST (TXTST) toggles between 0.5 S and 5 S gate times.

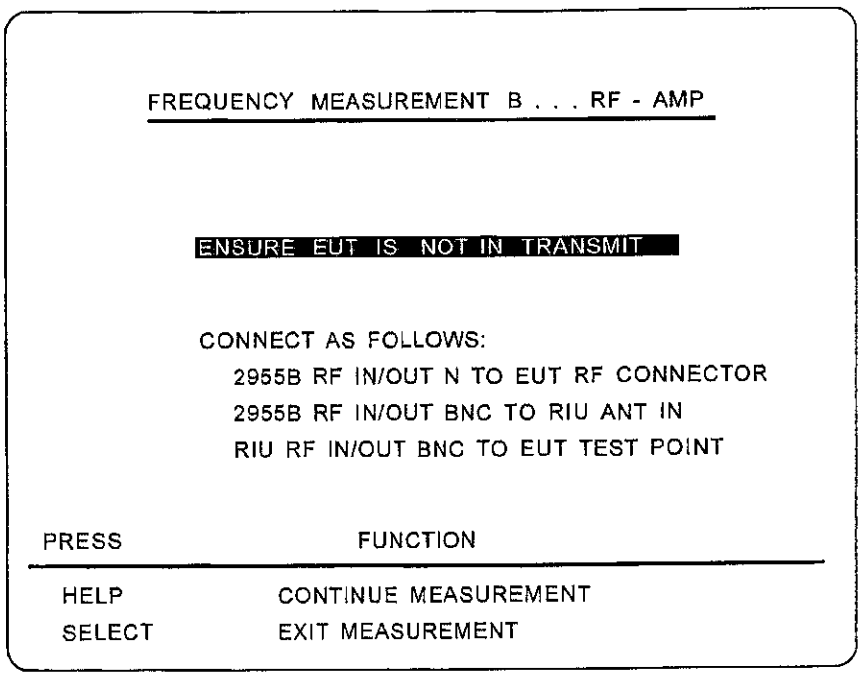
47.4 Press HELP to return to the RIU Manual Control screen.

The FREQUENCY B - RF AMP Measurement

48 This RIU manual control selection enables low level RF signals to be measured. This measurement method is to be used for frequencies of 1.5 MHz and above.

49 To make a low level RF signal measurement, proceed as follows:

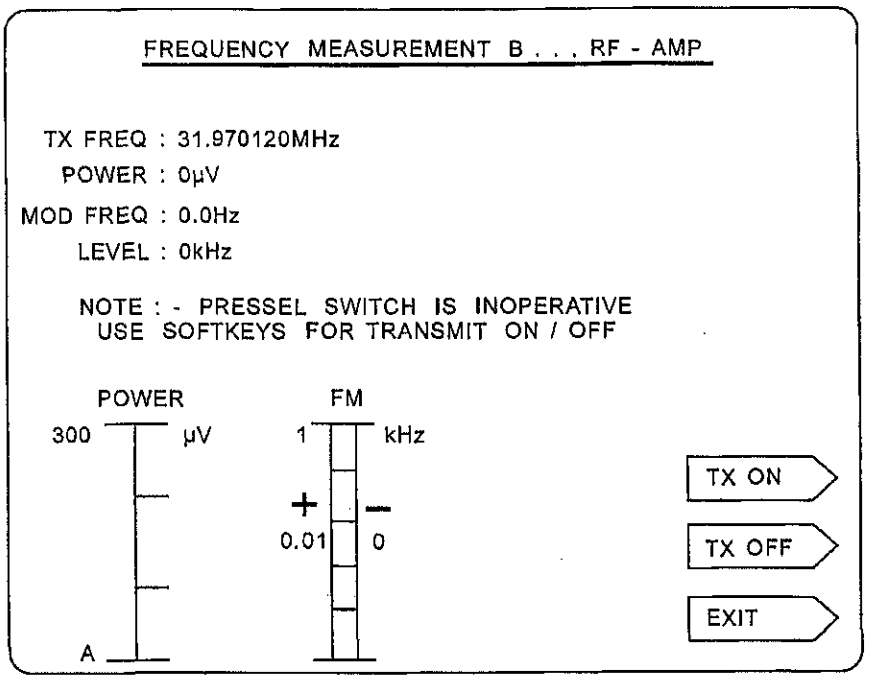
49.1 Press Rx TEST (RXTST) once to select RF-AMP on the RIU Manual Control Page 2 screen to display the first Frequency Measurement B frequency measurement screen (shown next).



1501000-30

49.2 Make the equipment interconnections as stated on the Frequency Measurement B screen.

49.3 Press HELP to display the second Frequency Measurement B screen (shown next).



1501000-31

Note...

This is the only case in system operation where the system safety interlocks are overridden and the operator is allowed to set transmit function with the RIU integral RF amplifier in circuit.

49.4 The transmit mode is set on and off using the two 2955B soft keys indicated by the screen display. The PRESSEL switch is disabled for measurement, but the PRESSEL lamp illuminates when the TX ON soft key pressed.

49.5 On completing the measurement, configure the equipment cables to the standard configuration.

49.6 Press HELP to return to the RIU Manual Control screen.

The RESET RIU Option

50 The RESET RIU option is used to reset the RIU functions to the default state.

The 2955B HELP SCREENS Option

51 The 2955B HELP SCREENS option provides help information for each instrument contained within the 2955B.

The 2955B MANUAL SCREEN Option

52 The 2955B MANUAL SCREEN option returns to the current 2955B test screen (e.g. Receiver Test screen).

The EXIT RIU MANUAL CONTROL Option

53 The EXIT RIU MANUAL CONTROL option returns to the Clansman Main Menu.

Manual Operation Screens Connectivity

54 The main manual operation screens and how they are linked by the system is illustrated in Fig 2. The 2955B keys used to move between screens are indicated.

Note ...

When the RIU Manual Control Page 1 or Page 2 screen is accessed for the second and subsequent times during a test, pressing the HELP key on 2955B Manual Screen moves directly to the RIU manual control page used previously (indicated by dashed lines).

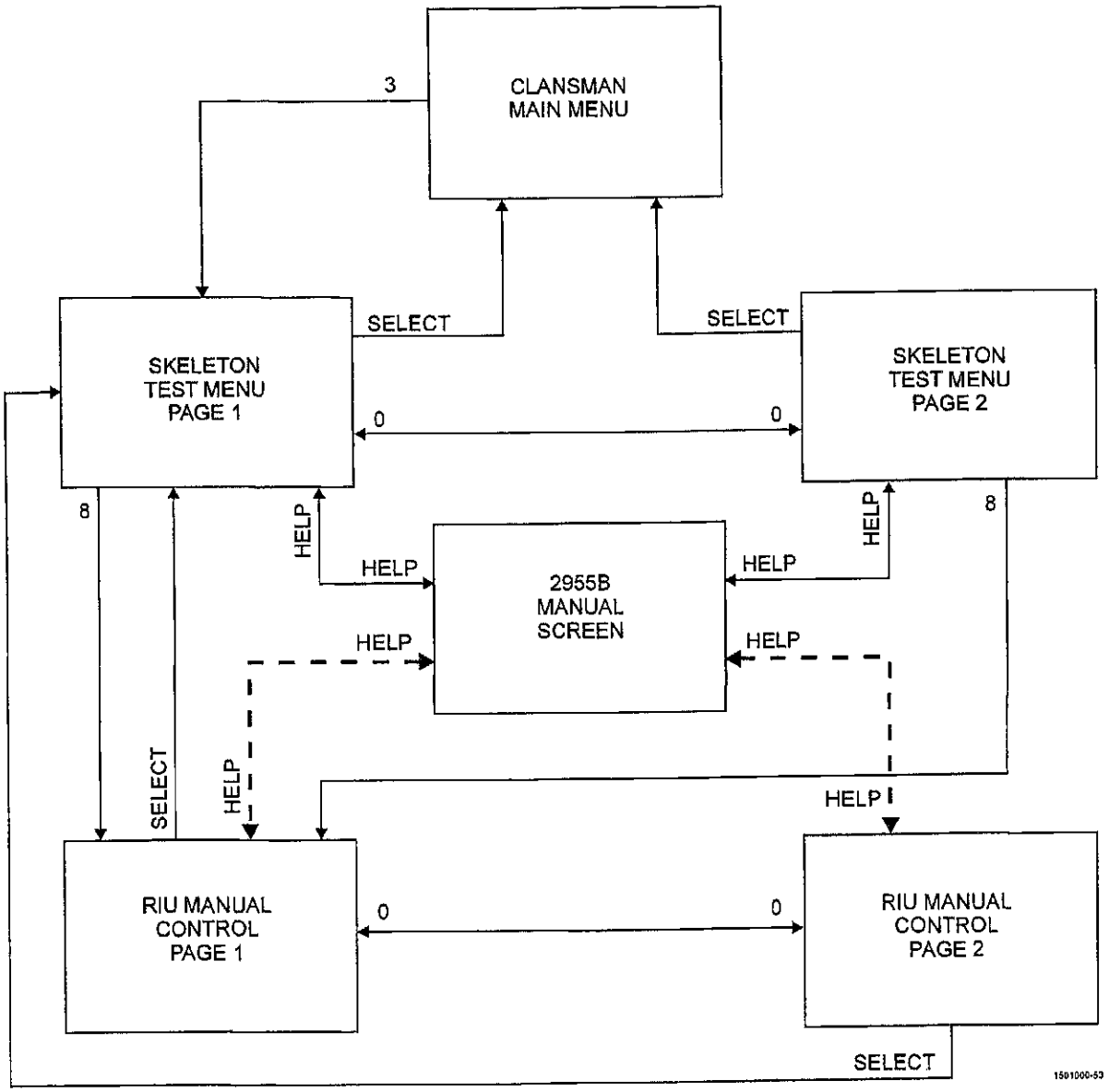


Fig 2 Manual Operation Screens Connectivity

Using the Main Menu General Options

Option 1 - SELF TEST

55 The system self test procedure is contained in Chapter 4 (SYSTEM MAINTENANCE) of this manual.

Option 4 - SYSTEM UTILITIES

56 The SYSTEM UTILITIES option requires a password entry to access the system utilities list. The system utilities are used for initial system configuration of the RIU before delivery and are for manufacturer's use only.

Option 5 - PRINTER TYPE

57 The PRINTER TYPE option enables the system to be configured for an alternative type of printer (ticket printer or Centronics printer).

58 To fit a Centronics type printer in place of the ticket printer, proceed as follows:

58.1 Select PRINTER TYPE on the system main menu to display the Printer Type menu.

58.2 Select CENTRONICS PRINTER.

58.3 Select RETURN to return to the system main menu.

58.4 Switch off the RIU and release the ticket printer from the RIU front panel by unscrewing the two knurled thumb-screws.

Note ...

The RIU must always be switched off after selecting a different printer type option.

58.5 Carefully withdraw the ticket printer from the RIU front panel.

58.6 Connect the external printer signal cable to the 25-way 'D' type connector located inside the ticket printer aperture in the RIU panel. Alternatively, fit the external printer adaptor plate and cable and connect the external printer to the adaptor plate connector.

58.7 Switch the RIU On.

58.8 Reverse the above procedure operations to refit the ticket printer.

Option 6 - SET DATE/TIME

59 The SET DATE/TIME option is used to set the system clock to the current date and time.

60 To set the clock, proceed as follows:

60.1 Select SET DATE/TIME on the system main menu to display the Set Date and Time menu.

60.2 After the DATE prompt, enter the day, month and year using the '-' key character as the separator. All leading/trailing zeros must be entered.

60.3 After the TIME prompt, enter the current time using the '-' key character as the separator. All leading/trailing zeros must be entered.

60.4 On completing the time entry, the display returns automatically to the system main menu.

Option 7 - AUDIO PROMPT/REMOTE SWITCH

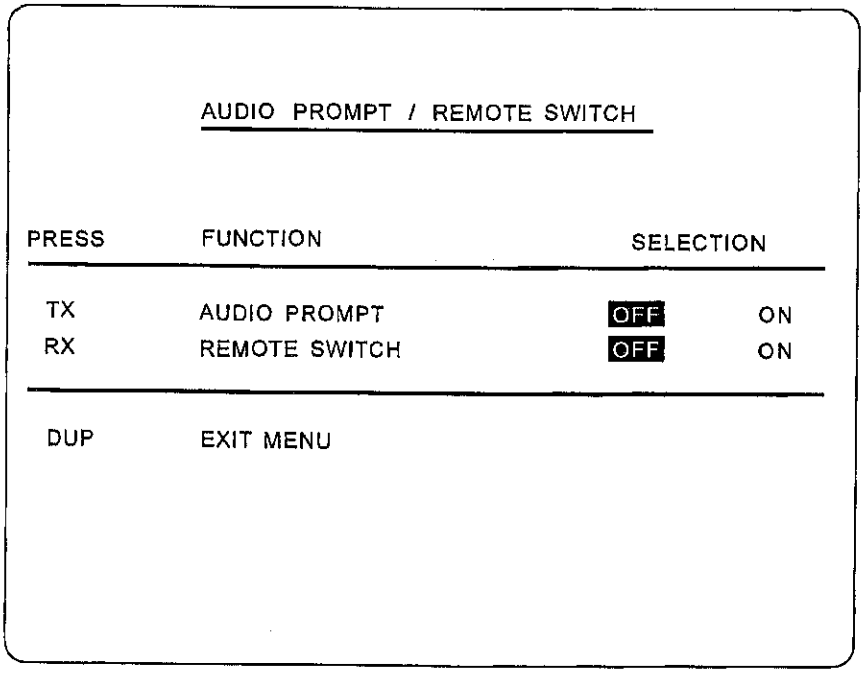
61 The AUDIO PROMPT/REMOTE SWITCH option enables the operator to select the use of the AUDIO PROMPT facility and/or the REMOTE SWITCH facility. Both facilities are available for automatic test mode only.

62 The AUDIO PROMPT facility produces an audible prompt (bleep) when operator intervention is required during automatic testing.

63 The REMOTE SWITCH facility enables a remote switch to be used for 'continuing' the automatic test programs, as opposed to pressing the 2955B HELP key to 'continue'.

64 To select either or both of these facilities, proceed as follows:

64.1 Press 7 on the 2955B to display the Audio Prompt/Remote Switch screen (shown next).



1501000-27

64.2 Press TX once to select the AUDIO PROMPT facility and/or RX to select the REMOTE SWITCH facility.

64.3 Press DUPLEX to return to the Clansman Main Menu.

ANNEX A

SKELETON TEST SET-UP INFORMATION

CONTENTS

CONTENTS (continued)

INTRODUCTION

1 Annex A provides 8920C Skeleton Test Set-Up description information in the form of functional diagrams. Each diagram indicates the signal paths between the EUT, CIP, RIU, and 2955B, and includes RIU configuration information, 2955B instrument settings and, when applicable, CIP control settings.

2 The Skeleton Test Set-Up descriptions are sequenced in the same order as given on Page 1 and Page 2 of the Skeleton Test Menu.

CURRENT CONSUMPTION SKELETON TEST SET-UP

3 The equipment configuration and functions set by the Current Consumption Skeleton Test Set-Up are illustrated in Fig 1.

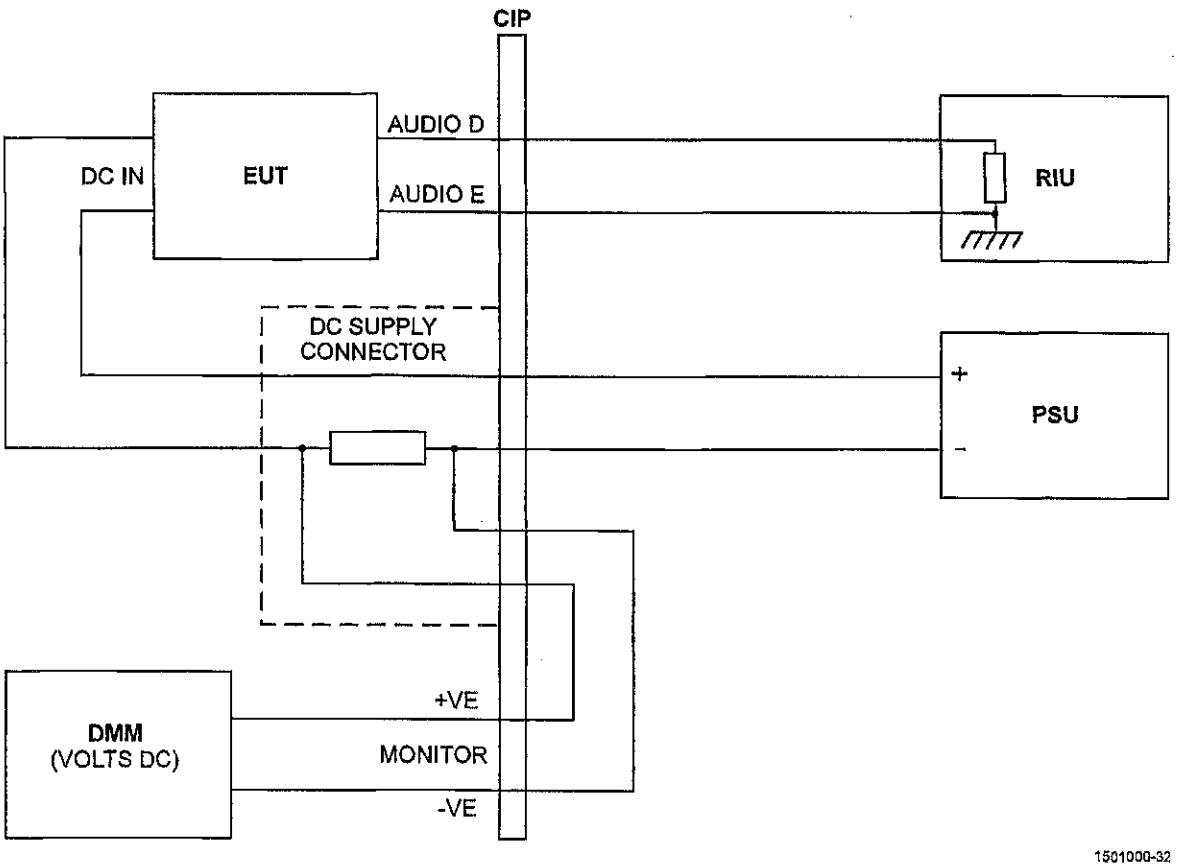


Fig 1 Current Consumption Skeleton Test Set-Up

TRANSMITTER SKELETON TEST SET-UPS

Output and Modulation

4 The equipment configuration and functions set by the Transmitter – Output and Modulation Skeleton Test Set-Up are illustrated in Fig 2.

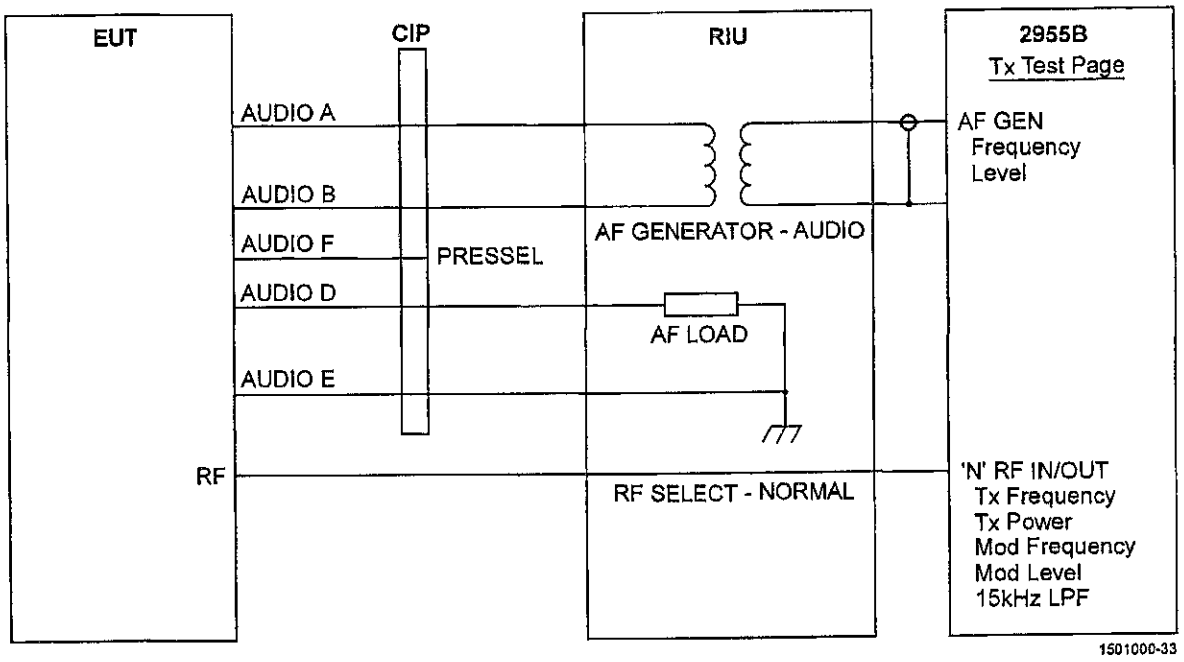


Fig 2 Transmitter - Output and Modulation Skeleton Test Set-Up

Sidetone

5 The equipment configuration and functions set by the Transmitter - Sidetone Skeleton Test Set-Up are illustrated in Fig 3.

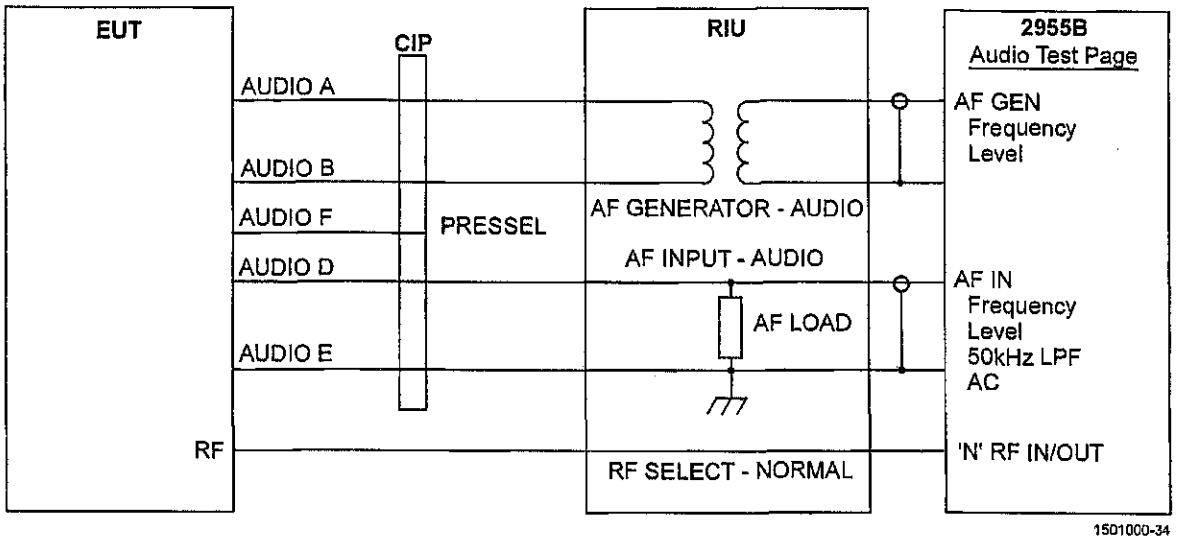


Fig 3 Transmitter - Sidetone Skeleton Test Set-Up

Keying

6 The equipment configuration and functions set by the Transmitter - Keying Skeleton Test Set-Up are illustrated in Fig 4.

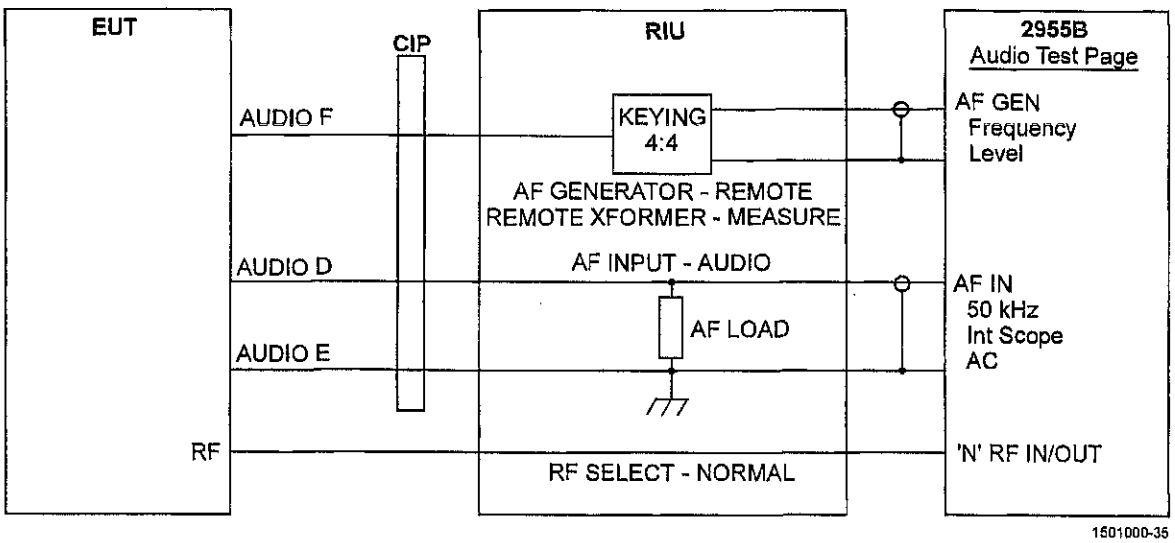


Fig 4 Transmitter - Keying Skeleton Test Set-Up

RECEIVER SKELETON TEST SET-UPS

Audio Output

7 The equipment configuration and functions set by the Receiver - Audio Output Skeleton Test Set-Up are illustrated in Fig 5.

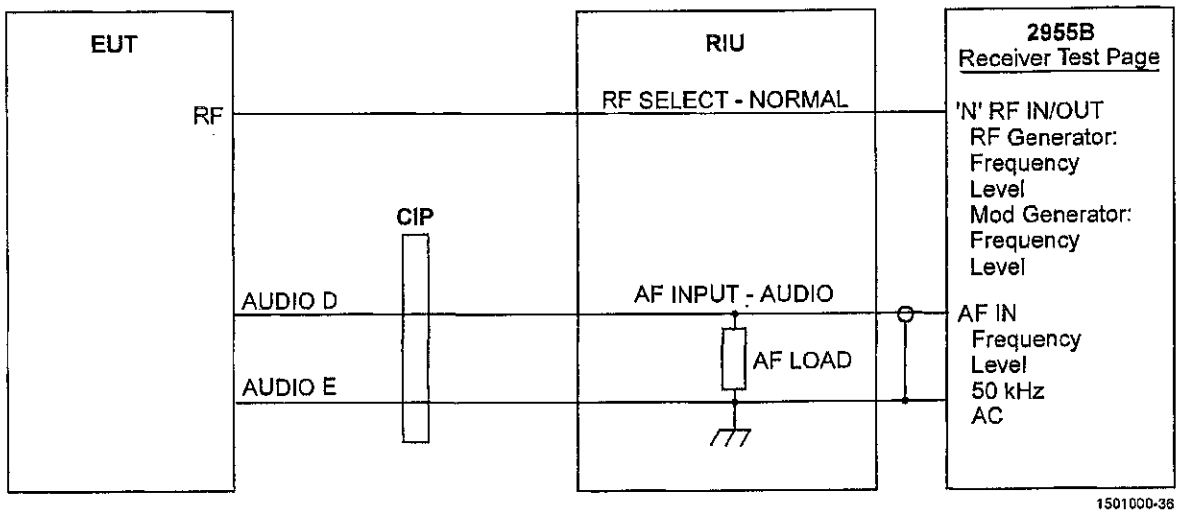


Fig 5 Receiver - Audio Output Skeleton Test Set-Up

Remote Output

8 The equipment configuration and functions set by the Receiver - Remote Output Skeleton Test Set-Up are illustrated in Fig 6.

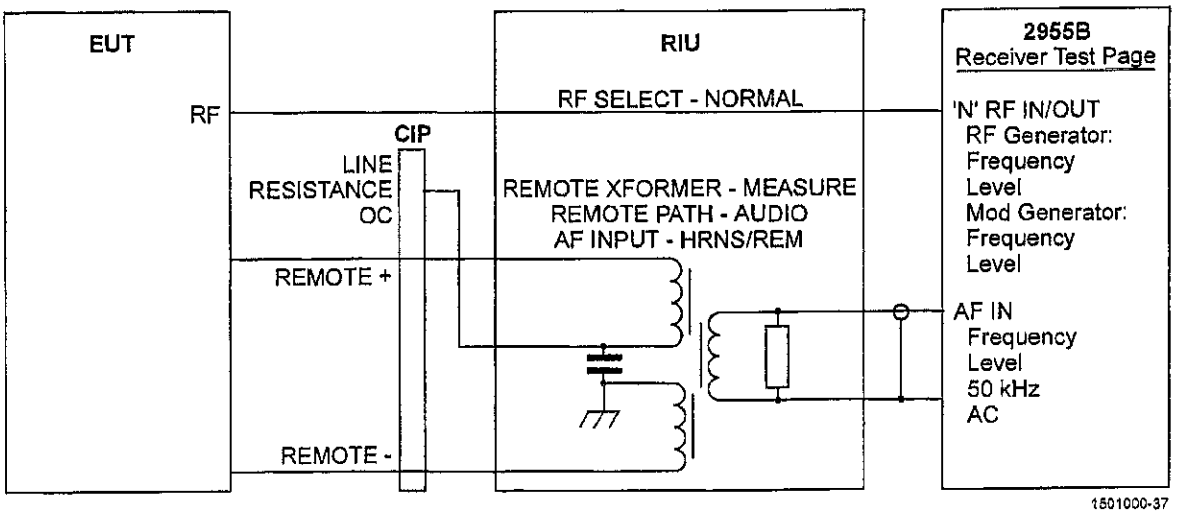


Fig 6 Receiver - Remote Output Skeleton Test Set-Up

Harness Output

9 The equipment configuration and functions set by the Receiver - Harness Output Skeleton Test Set-Up are illustrated in Fig 7.

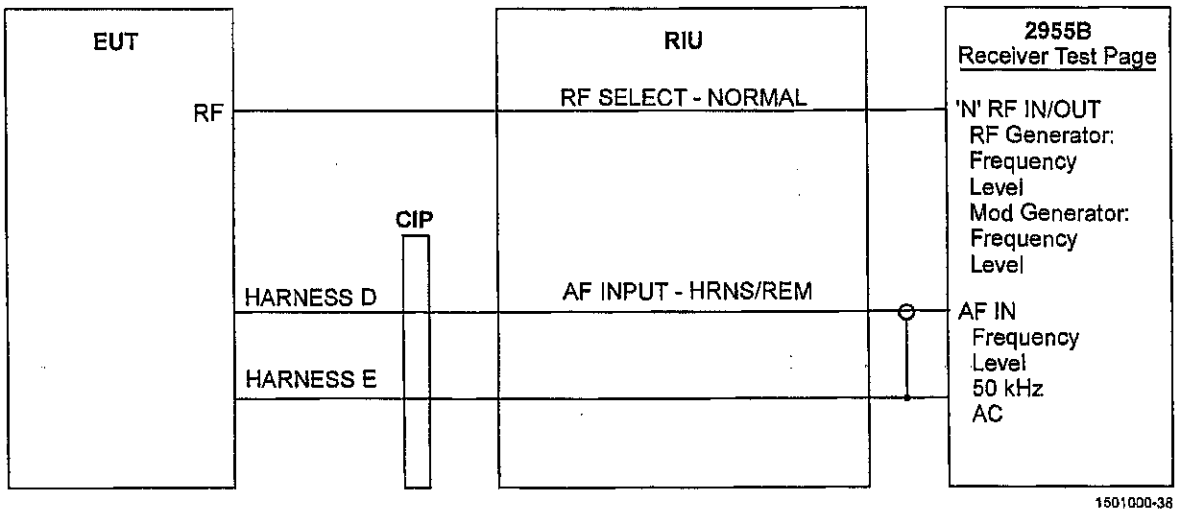


Fig 7 Receiver - Harness Output Skeleton Test Set-Up

Audio Output (351)

10 The equipment configuration and functions set by the Receiver - Audio Output (351) Skeleton Test Set-Up are illustrated in Fig 8.

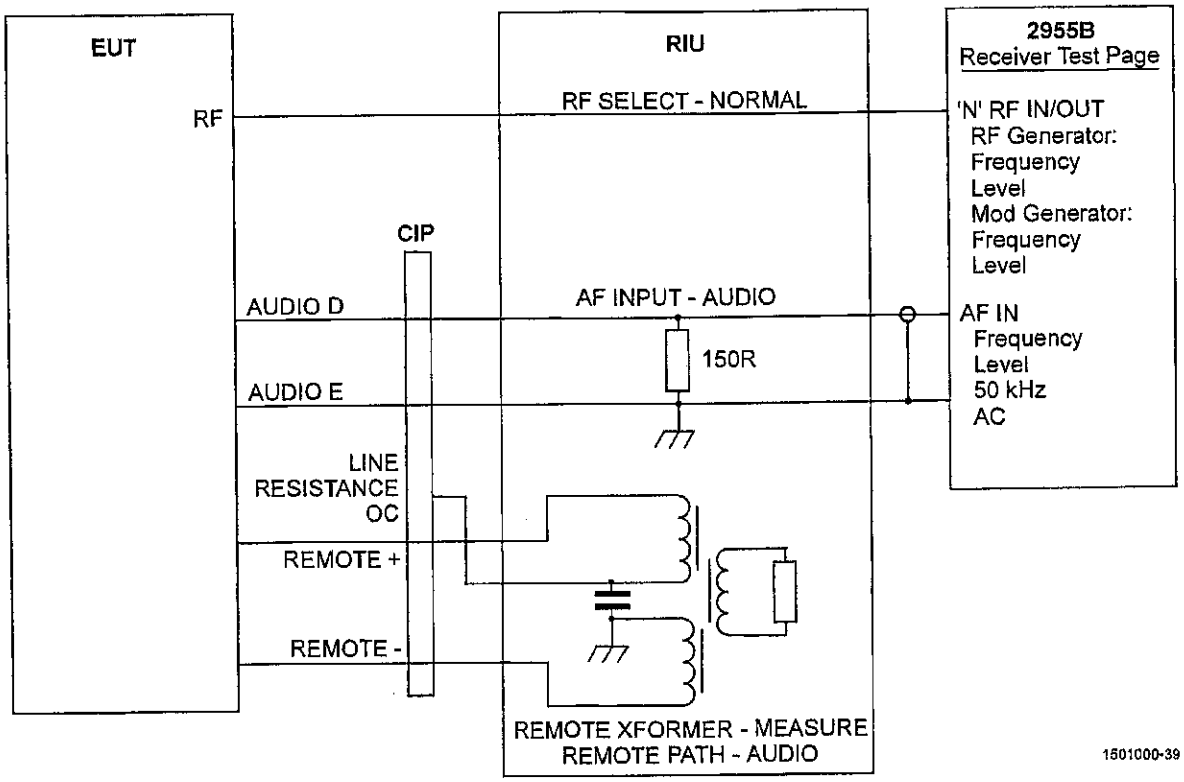


Fig 8 Receiver - Audio Output (351) Skeleton Test Set-Up

Remote Output (351)

11 The equipment configuration and functions set by the Receiver – Remote Output (351) Skeleton Test Set-Up are illustrated in Fig 9.

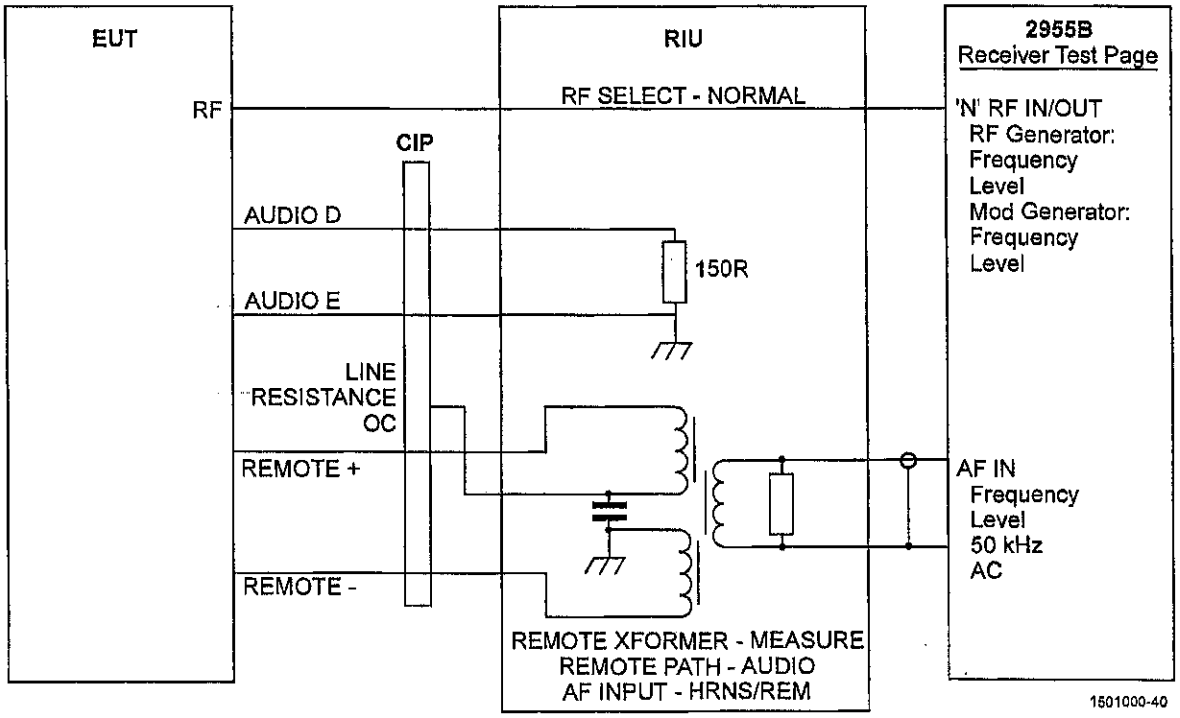


Fig 9 Receiver - Remote Output (351) Skeleton Test Set-Up

VOLTAGE PIN C - AUDIO SOCKET SKELETON TEST SET-UP

12 The equipment configuration and functions set by the Voltage Pin C - Audio Socket Skeleton Test Set-Up are illustrated in Fig 10.

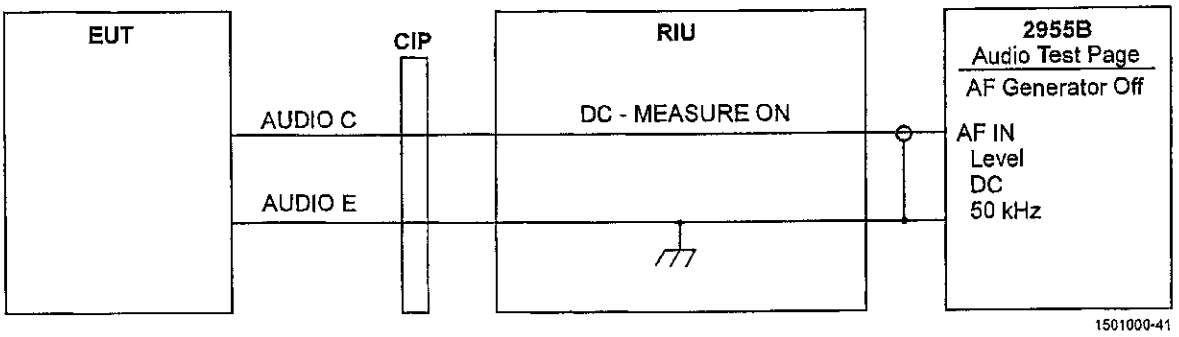


Fig 10 Voltage Pin C - Audio Socket Skeleton Test Set-Up

REMOTE SKELETON TEST SET-UPS

13 The d.c. conditions for all 'remote' tests, apart from the Open Circuit DC Voltage test, are set by the CIP LINE RESISTANCE switch. The LINE RESISTANCE switch settings and remote line current measurement configuration is illustrated in Fig 11.

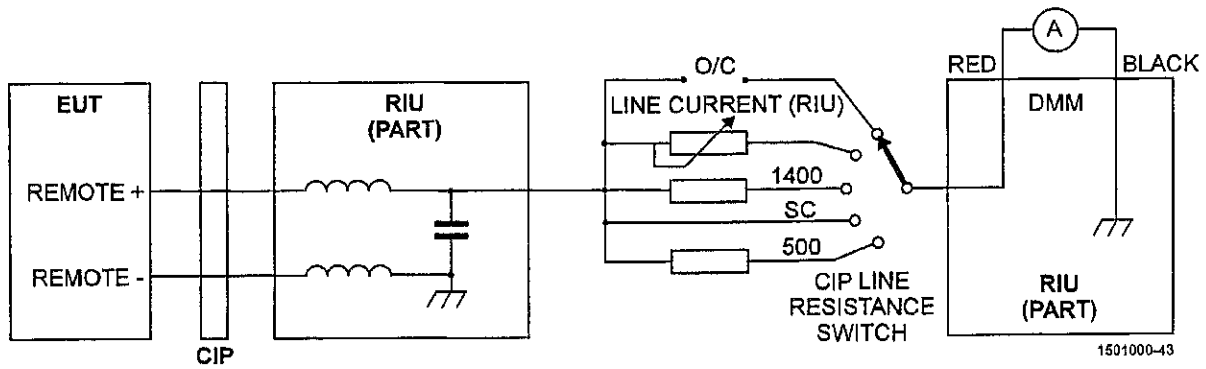


Fig 11 Remote - Line Current Measurement Circuit

Loc-Rem Line Current

14 The equipment configuration and functions set by the Remote - Loc-Rem Line Current Skeleton Test Set-Up are illustrated in Fig 12.

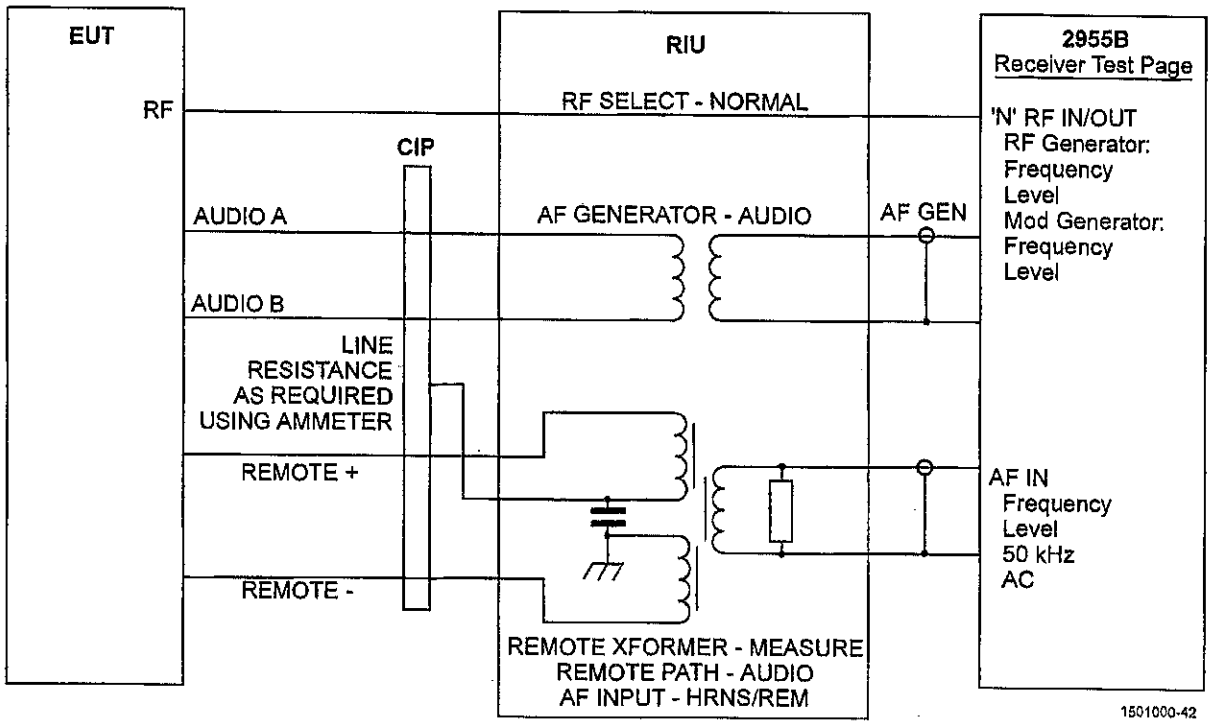


Fig 12 Remote - Loc-Rem Line Current Skeleton Test Set-Up

Loc-Rem AF Output

15 The equipment configuration and functions set by the Remote - Loc-Rem AF Output Skeleton Test Set-Up are illustrated in Fig 13.

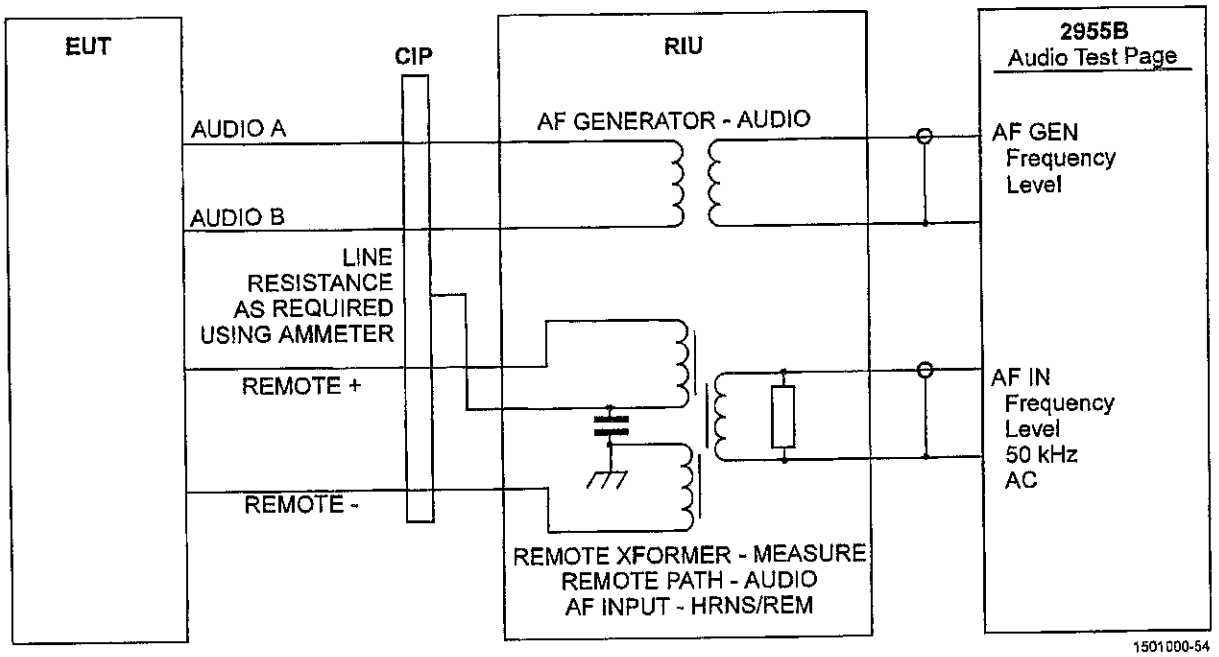


Fig 13 Remote - Loc-Rem AF Output Skeleton Test Set-Up

Rem-Loc Line Current

16 The equipment configuration and functions set by the Remote - Rem-Loc Line Current Skeleton Test Set-Up are illustrated in Fig 14.

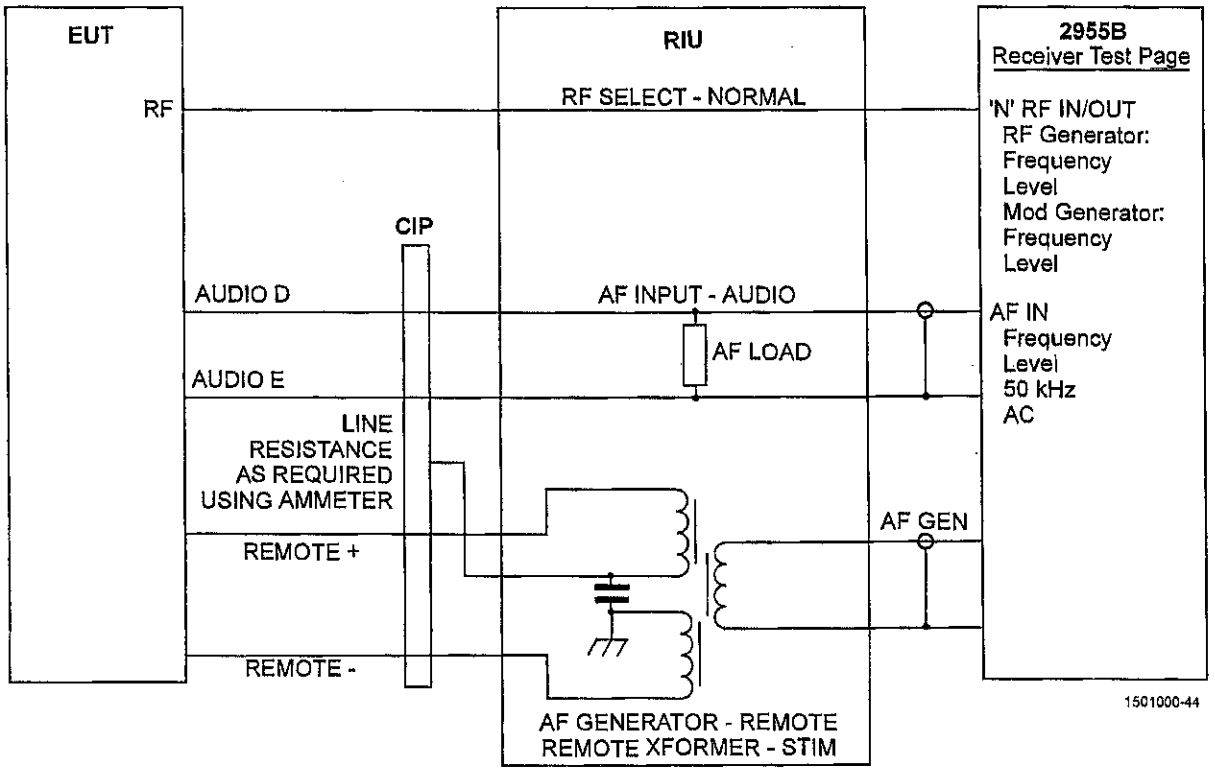


Fig 14 Remote - Rem-Loc Line Current Skeleton Test Set-Up

Rem-Loc AF Output

17 The equipment configuration and functions set by the Receiver - Remote Output Skeleton Test Set-Up are illustrated in Fig 15.

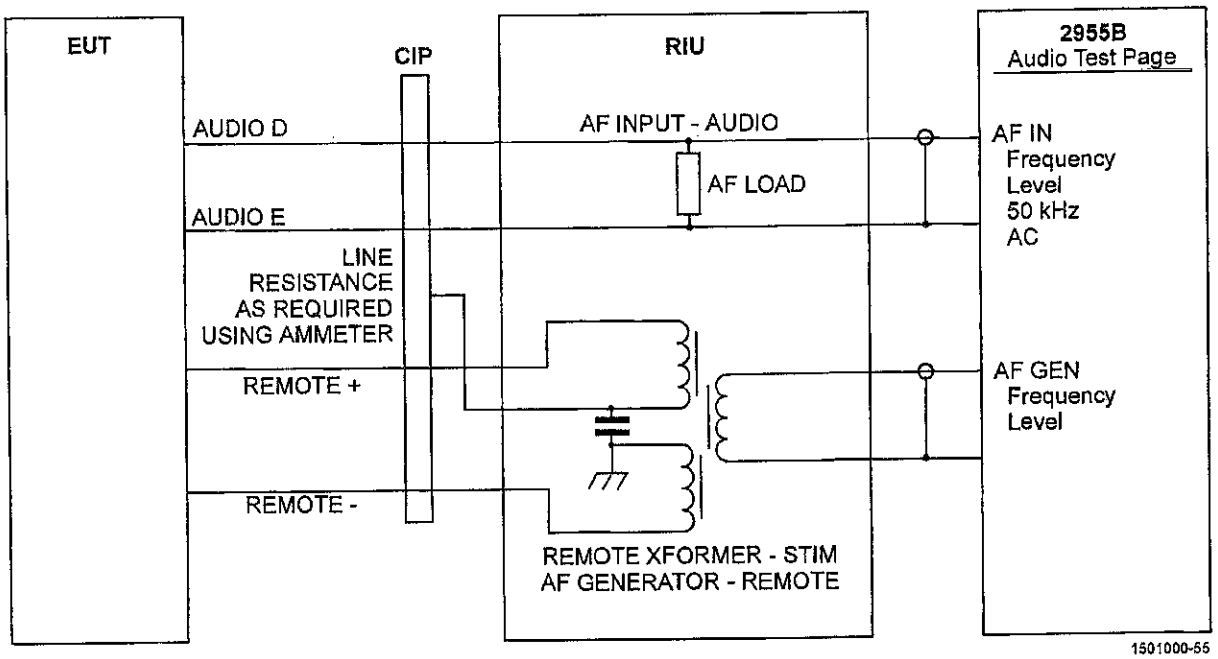


Fig 15 Remote - Rem-Loc AF Output Skeleton Test Set-Up

Open Circuit DC Voltage

18 The equipment configuration and functions set by the Remote - Open Circuit DC Voltage Skeleton Test Set-Up are illustrated in Fig 16.

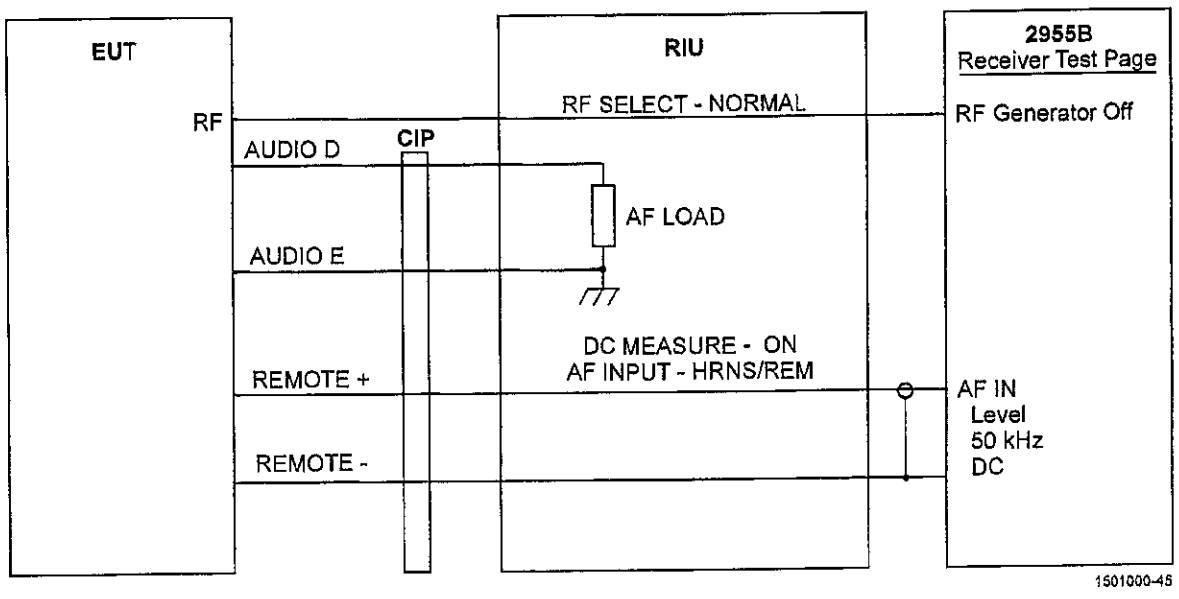


Fig 16 Remote - Open Circuit DC Voltage Skeleton Test Set-Up

DATA SKELETON TEST SET-UPS

Transmit Delay Test

19 This is not a skeleton test set-up, it is a test which measures the delay in the transmission path from the RIU data generator and the RIU delay timing/BER measurement facility. An oscilloscope is connected to the CIP DE-MOD connector to view the 'eye pattern' waveform.

20 The Transmit Delay Test configuration is illustrated in Fig 17.

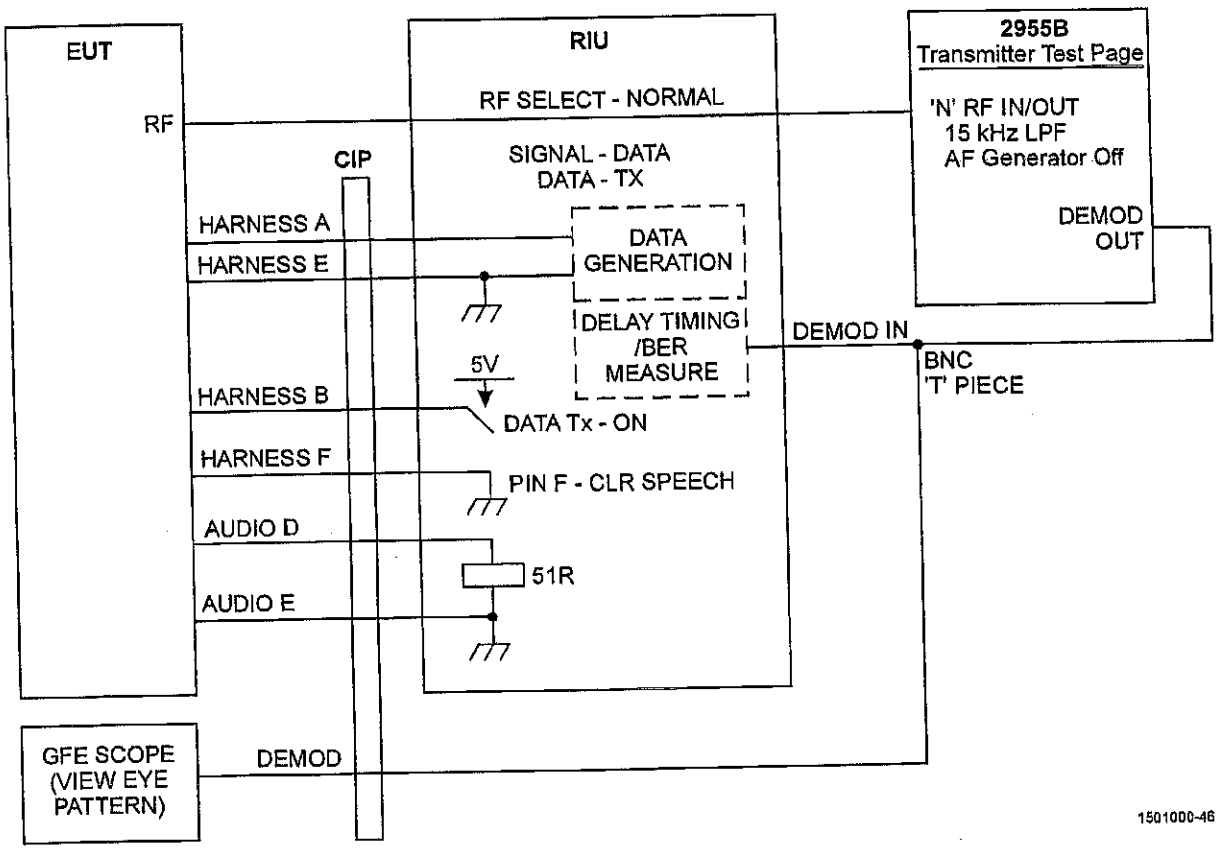


Fig 17 Data Transmit Delay Test Configuration

21 When Transmit Delay Test is selected on Page 2 of the Skeleton Test Menu, a sequence of screens is presented for carrying out the test, as follows:

21.1 The first screen displays instructions for setting the radio controls.

21.2 The second screen displays the transmission delay result to indicate that the test function is operating.

21.3 The third screen displays instructions for connecting an oscilloscope.

21.4 The fourth screen displays a message concerning the 'eye pattern' display.

Transmit Modulation

22 The equipment configuration and functions set by the Data – Transmit Modulation Skeleton Test Set-Up are illustrated in Fig 18.

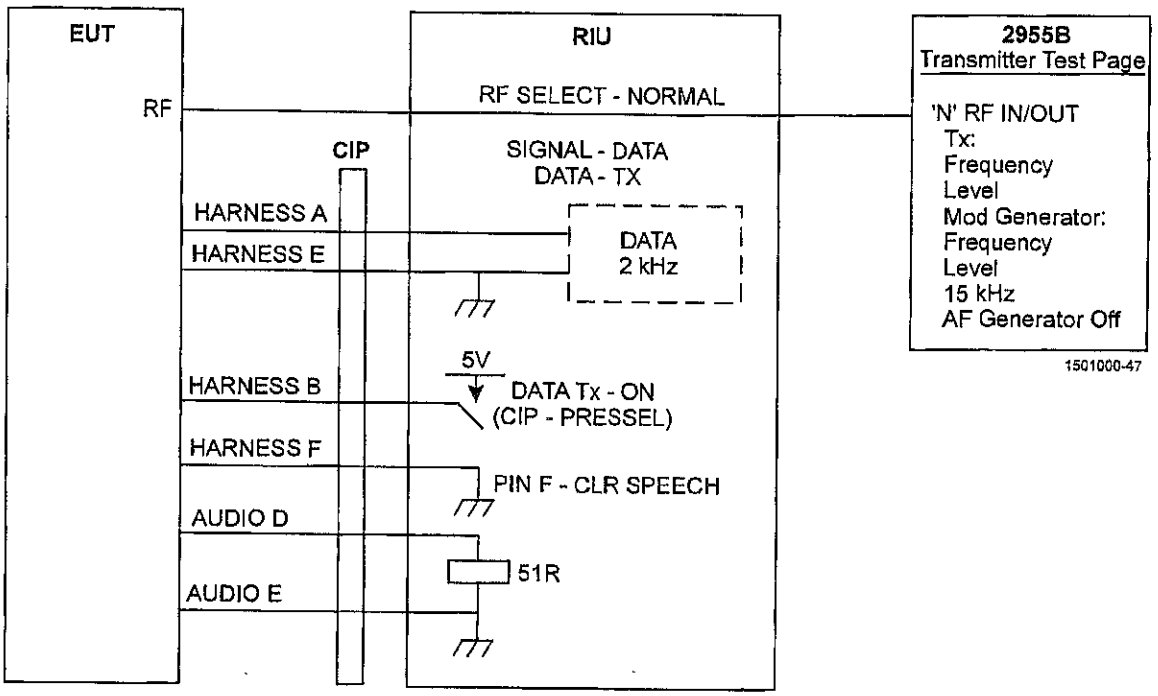


Fig 18 Data - Transmit Modulation Skeleton Test Set-Up

Voltage Pin E - Harness Socket

23 The equipment configuration and functions set by the Data - Voltage Pin E - Harness Socket Skeleton Test Set-Up are illustrated in Fig 19.

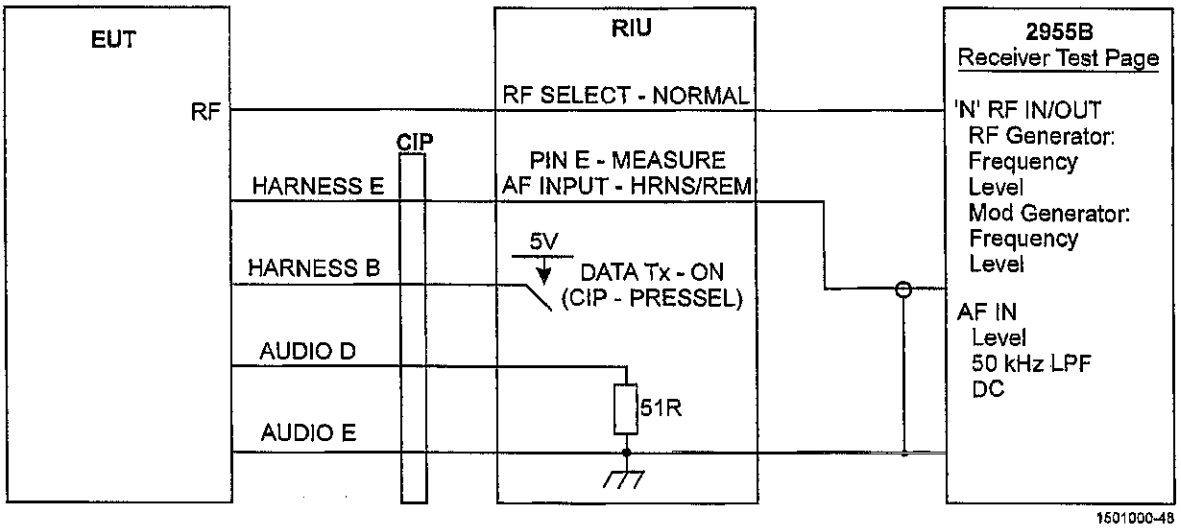


Fig 19 Data - Voltage Pin E - Harness Socket Skeleton Test Set-Up

Receive 1 kHz

24 The equipment configuration and functions set by the Data - Receive 1 kHz Skeleton Test Set-Up are illustrated in Fig 20.

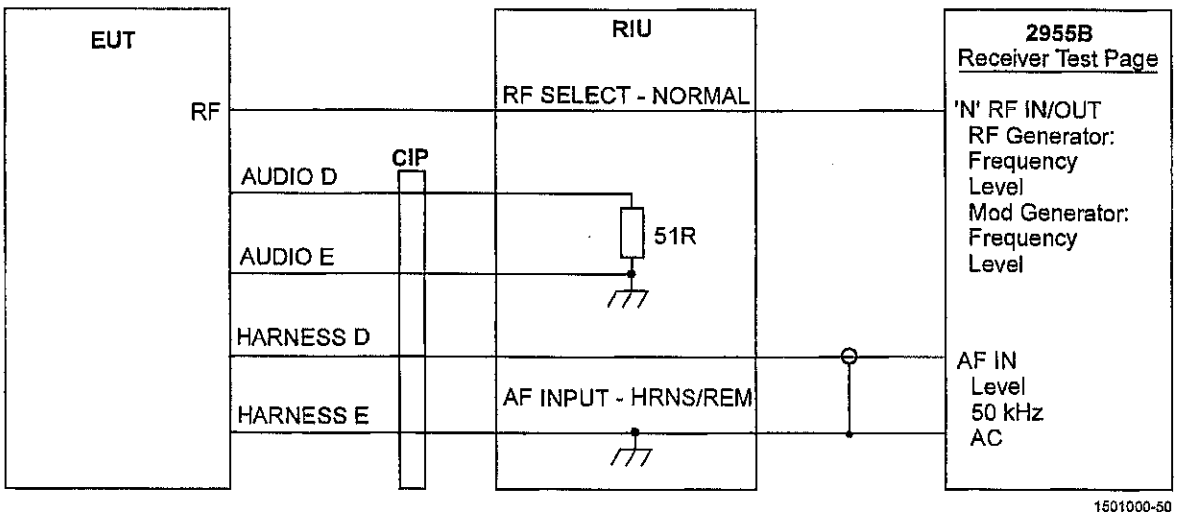


Fig 20 Data - Receive 1 kHz Skeleton Test Set-Up

Receive 2 kHz

25 The equipment configuration and functions set by the Data - Receive 2 kHz Skeleton Test Set-Up are illustrated in Fig 21.

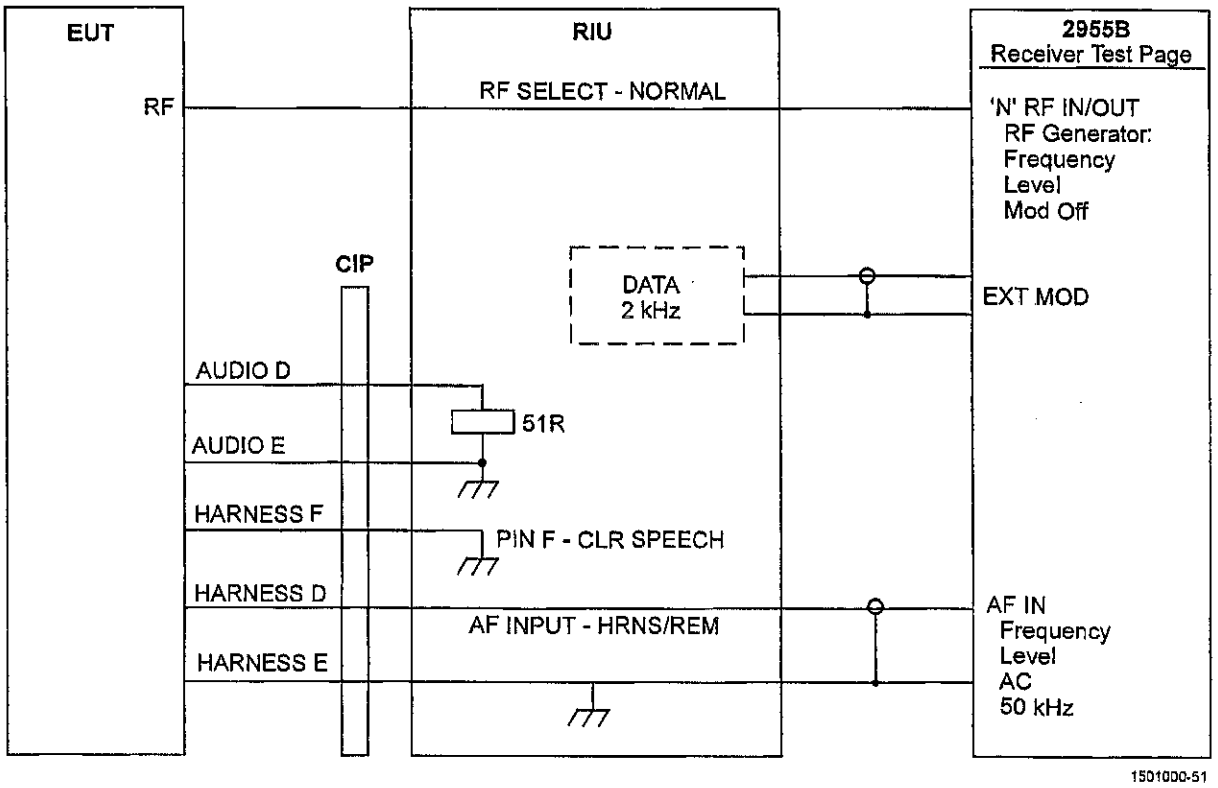


Fig 21 Data - Receive 2 kHz Skeleton Test Set-Up

BER Test Receive

26 This is not a skeleton test set-up, it is a test which measures the BER (bit error rate) as a percentage of total bits sent. Test results are displayed on the 2955B screen.

27 The Data - BER Test Receive configuration is illustrated in Fig 22.

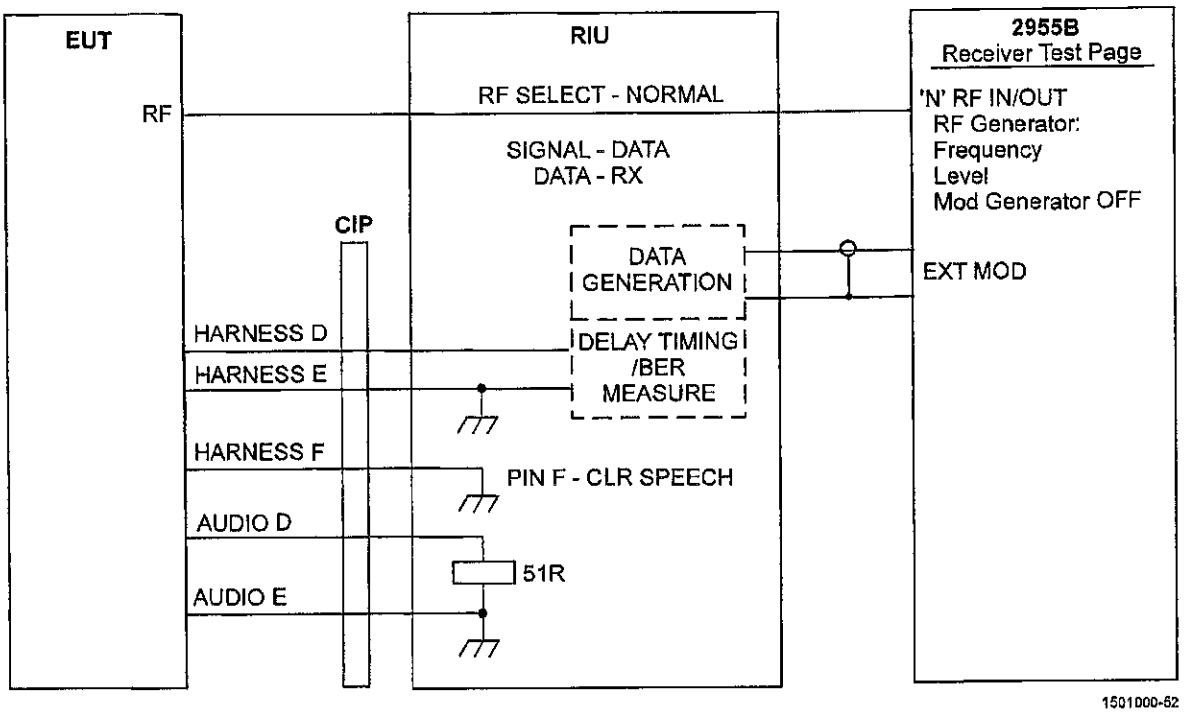


Fig 22 Data - BER Test Receive Configuration

28 When BER Test Receive is selected on Page 2 of the Skeleton Test Menu, a sequence of screens is presented for carrying out the test, as follows:

28.1 The first screen display asks for a BER test frequency to be entered, which must be within the stated range. The default frequency is 70 MHz.

28.2 The second screen displays instructions for setting the radio controls.

28.3 The third screen displays an Rx Delay value (nominally 90 microseconds for the RT-353) to verify test path operation. Then the BER test results for the four RF levels (i.e. -110 dBm, -113 dBm, -116 dBm and -119 dBm) are displayed.

BER Test Transmit

29 This is not a skeleton test set-up, it is a test which measures the BER (bit error rate) as a percentage of total bits sent. Test results are displayed on the 2955B screen.

30 The Data - BER Test Transmit configuration is illustrated in Fig 23.

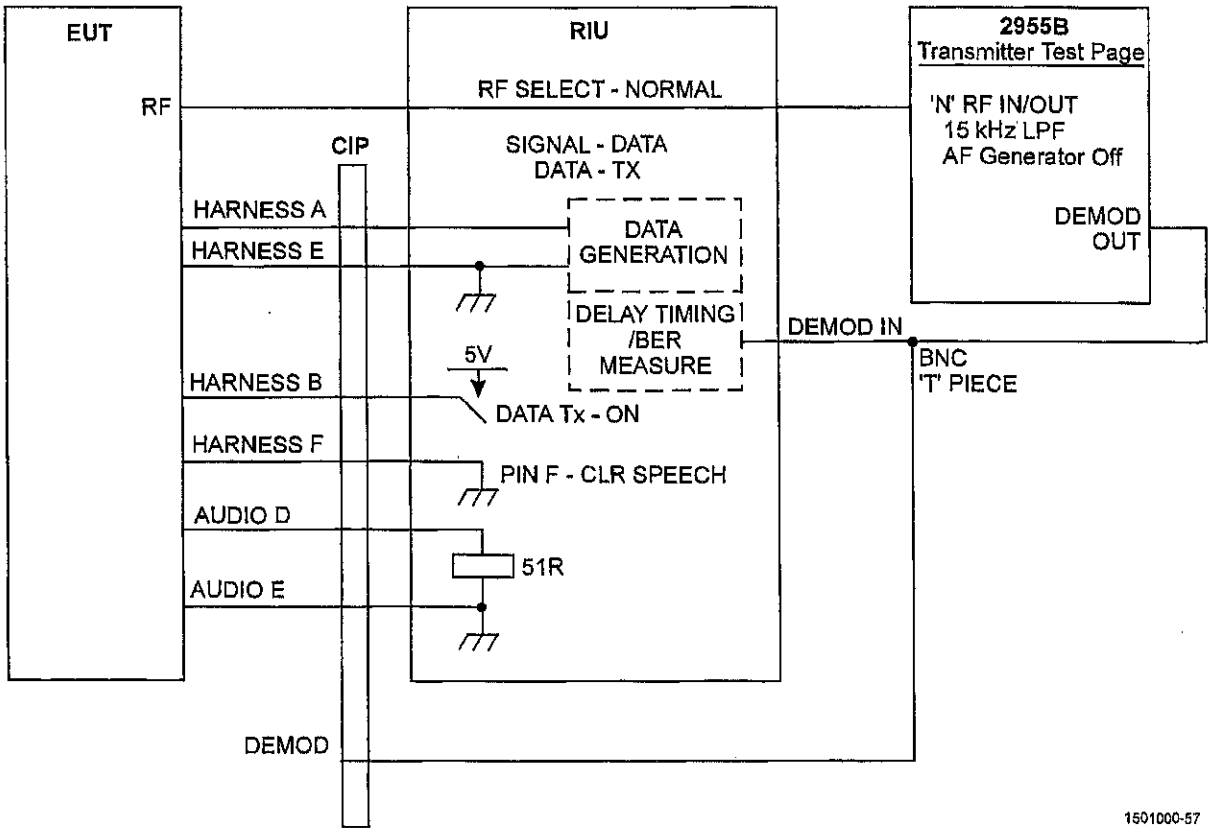


Fig 23 Data - BER Test Transmit Configuration

31 When BER Test Transmit is selected on Page 2 of the Skeleton Test Menu, a sequence of screens is presented for carrying out the test, as follows:

31.1 The second screen displays instructions for setting the radio controls.

31.2 The second screen displays a Tx Delay value (nominally 60 microseconds for the RT-353) to verify test path operation. Then the BER test result is displayed.

CHAPTER 4

SYSTEM MAINTENANCE

CONTENTS

56 CIP Tests

(continued)

CONTENTS (continued)

INTRODUCTION

1 This chapter provides information on the general maintenance requirements of the GMAV 8920C Radio Test System. If the 8920C system is operated within the specified environmental limits, it will provide reliable service and require minimal maintenance.

SAFETY PRECAUTIONS

2 Although the system equipment has been designed and constructed in accordance with international safety standards, it is important that the safety notices in the preliminary pages of this manual are read and understood.

GENERAL MAINTENANCE

Replacement of Parts

3 Do not substitute parts or perform unauthorised modifications upon the equipment.

Cleaning

4 External surfaces of the system equipment should be kept clean and dust free using proprietary computer cleaning products.

Mains Cables Inspection

5 Once every three months, disconnect the a.c. supply cables from the RIU, 2955B and DMM, and examine the cable assemblies for signs of damage. Pay particular attention to the cable exits from the connectors at each end. Inspect the connectors internally for damage, tightness of electrical connection, overheating and effectiveness of the cable grip. Carry out a similar check on the Farnell power supply mains cable.

6 Renew a cable assembly if it is defective. Reconnect the RIU, 2955B, DMM and AP60-50 power supply mains cables to the a.c. supply and power the system up to verify soundness of the cable connections.

System Cable Inspection

7 Once every three months, inspect all system cables for serviceability. Replace any that are damaged or show signs of wear.

Earth Continuity Testing

8 Once every twelve months, perform earth continuity tests on the RIU, 2955B and AP60-50 Power Supply equipment, in turn, as follows:

8.1 Remove the mains plug of the equipment under test from the wall socket.

8.2 At the Robin KMP 3075 DL:

8.2.1 Set the TRAC/LOC switch to TRAC.

8.2.2 Set the right-hand selector switch to CONTINUITY (20 Ω range).

8.2.3 Set the left-hand selector switch to AUTO NULL position.

8.2.4 Short together the red and black test leads.

8.2.5 Press and release the PRESS TO TEST button (this will measure the resistance of the lead set, and store the result in memory).

8.2.6 Set the left-hand selector switch to Ω.

8.3 At the equipment under test, connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the chassis.

8.4 Press the PRESS TO TEST button. The true continuity measurement is displayed, with the resistance of the test leads deducted. Compare the measured resistance value with the appropriate specified value:

8.4.1	RIU	: <0.1 Ohms
8.4.2	2955B	: <0.5 Ohms
8.4.3	AP60-50 Power Supply	: <0.1 Ohms (@ 25 A)

8.5 If this test should fail, the equipment must not be operated until the fault has been cleared.

8.6 Disconnect the Robin KMP 3075 DL.

Insulation Resistance Testing

9 Once every twelve months, perform an insulation resistance test on the RIU, 2955B and AP60-50 Power Supply equipment, in turn, as follows:

9.1 Earth continuity must be verified before proceeding with the insulation resistance test.

9.2 At the equipment under test:

9.2.1 Remove the mains plug from the wall socket and link together the L and N pins.

9.2.2 Connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the linked L and N pins.

9.2.3 Set the mains power switches to ON.

9.3 At the Robin KMP 3075 DL:

9.3.1 Set the left-hand selector switch to 500 V range.

9.3.2 Set the right-hand selector switch to INSULATION (20 MΩ range).

9.3.3 Press and hold the PRESS TO TEST button until the tester beeps. The tester should show the over range indicator.

9.4 Repeat the test, using higher insulation ranges as appropriate to take the measurement.

9.5 Reset the insulation range to 20 MΩ before testing the next equipment.

9.6 Compare the measured insulation resistance with the appropriate specified value:

9.6.1	RIU	: >20 Megohms
9.6.2	2955B	: >2 Megohms
9.6.3	AP60-50 Power Supply	: >10 Megohms

9.7 If this test should fail, the equipment must not be operated until the fault has been cleared.

9.8 Disconnect the Robin KMP 3075 DL and remove the link from the live and neutral pins.

RIU Ticket Printer

Paper Roll Replacement

10 When replacing a paper roll, use only 57-58 mm (2.5 inch), wood free, high quality paper. Paper roll diameter must not exceed 50 mm.

11 To load a new paper roll, proceed as follows:

11.1 Power down the system (as detailed in the chapter entitled OPERATING INSTRUCTIONS) and disconnect the RIU from the mains supply.

11.2 Release the ticket printer from the RIU front panel by unscrewing the two knurled thumb-screws.

11.3 Carefully withdraw the printer assembly from the RIU front panel.

11.4 Release the paper roll spindle by removing the spindle retaining thumb-screw. Take care not to lose the nylon washer.

11.5 Withdraw the paper roll spindle and discard the old paper roll core.

11.6 Prepare the new paper roll by cutting a shallow "arrowhead" at the leading edge as shown in Fig 1.

11.7 Install the new paper roll so that the leading edge is fed from the bottom of the roll. Place the spindle in position and secure it with the thumb-screw and nylon washer.

11.8 Straighten the first 20 mm (1 inch) of the leading edge.

11.9 Feed the paper over the paper guide bar and then, ensuring the paper is correctly centred, into the printer paper slot as far as it will go.

11.10 Refit the ticket printer to the RIU by tightening the two knurled thumb-screws.

11.11 Reconnect the mains supply to the RIU and power up the system (as detailed in the chapter entitled OPERATING INSTRUCTIONS).

11.12 Press the paper feed button and check that paper is fed from the paper exit slot.

11.13 The printer is now ready for use.

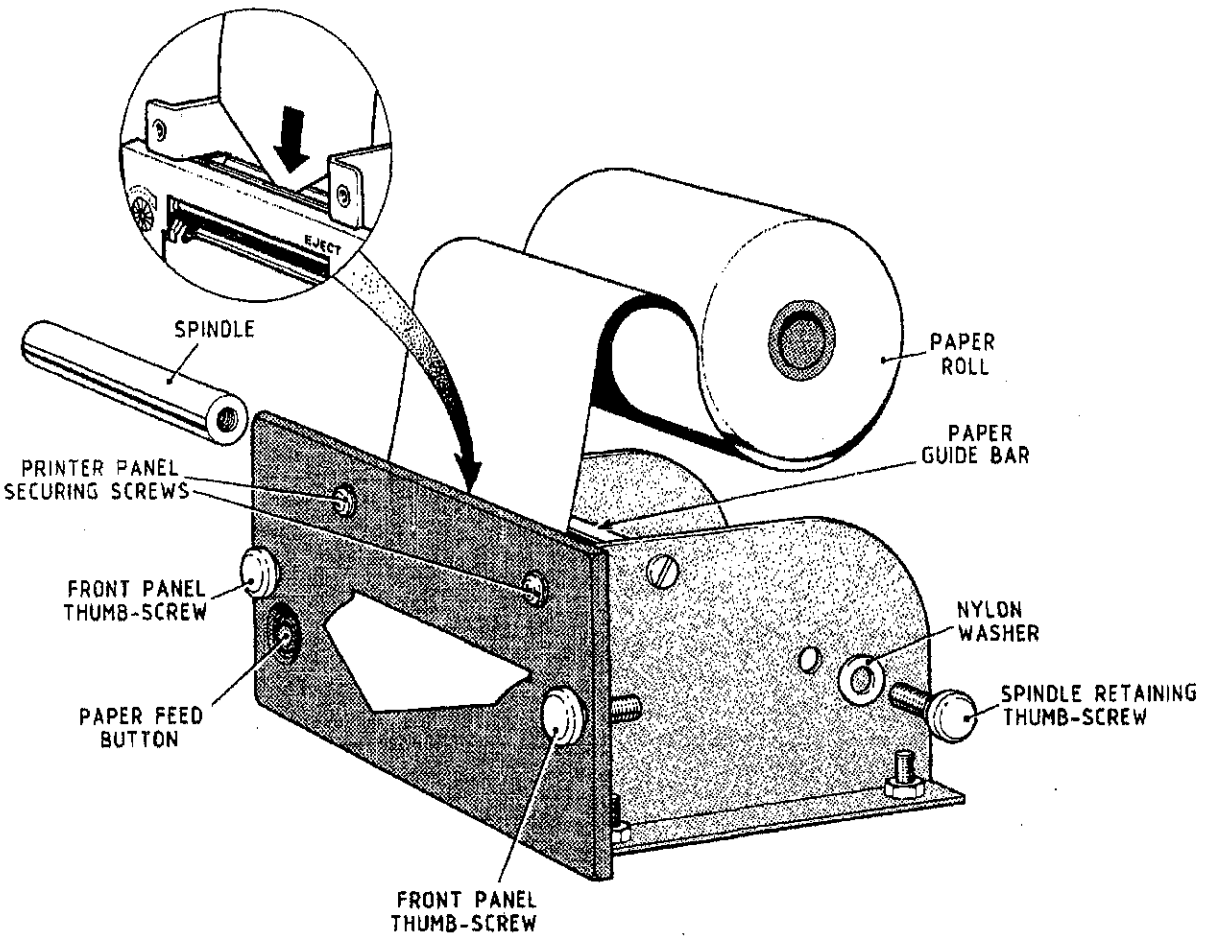


Fig 1 Paper Roll Replacement

Ribbon Cartridge Replacement

12 To replace the ticket printer ribbon cartridge, proceed as follows:

12.1 Power down the system, as detailed in Chapter 3 (OPERATING INSTRUCTIONS), and disconnect the RIU from the mains supply.

12.2 Release the ticket printer from the RIU by unscrewing the two front panel knurled thumb-screws (Fig 1).

12.3 Carefully withdraw the printer assembly from the RIU front panel.

Note ...

There is no need to remove the paper roll.

12.4 Remove the two printer panel securing screws (posidrive) and washers from the printer front panel (Fig 1).

12.5 Separate the front panel from the printer assembly to reveal the printer mechanism and ribbon cartridge. Take note of the ribbon and paper arrangement.

12.6 Press on the ribbon cartridge area marked PUSH (Fig 2) until it tilts outwards. The cartridge may then be removed and discarded.

12.7 Insert the replacement ribbon cartridge, passing the ribbon through the slot, and if necessary, tension the ribbon by turning the knurled cartridge wheel in the direction indicated.

12.8 Secure the printer front panel to the printer assembly using the posidrive screws and washers previously removed.

12.9 Refit the ticket printer to the RIU by tightening the two knurled thumb-screws.

12.10 Reconnect the mains supply to the RIU and power up the system, as detailed in Chapter 3 (OPERATING INSTRUCTIONS).

12.11 Press the paper feed button and check that paper is fed from the paper exit slot.

12.12 The printer is now ready for use.

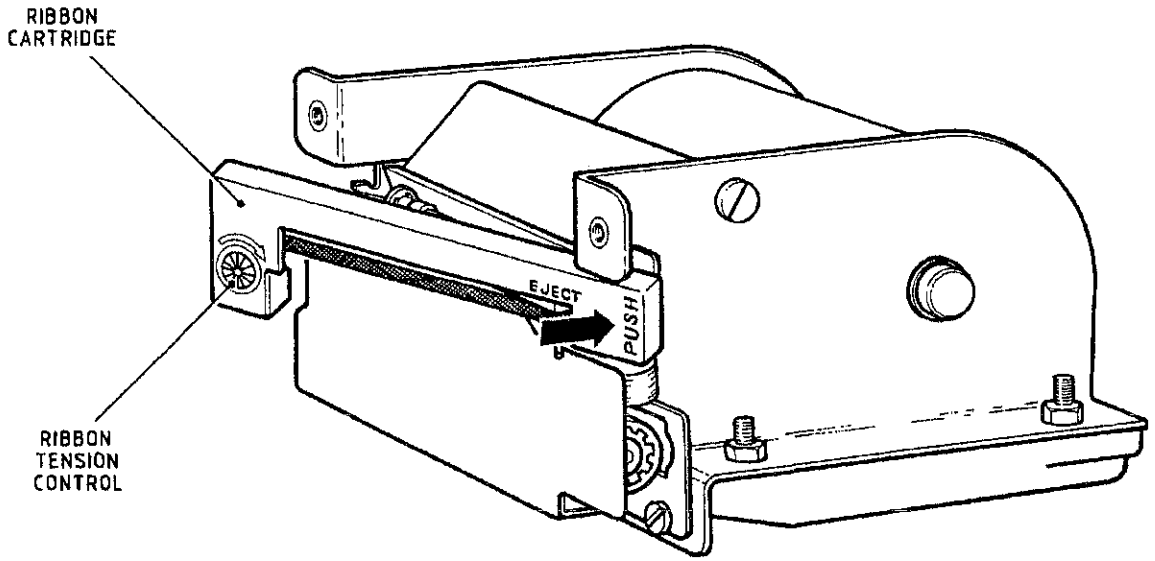


Fig 2 Ribbon Cartridge Replacement

SYSTEM EQUIPMENT CALIBRATION/CHARACTERISATION

13 The 8920C Radio Test System equipment is supplied ready for use and does not require initial calibration or alignment. Parameters which vary between certain radio tests are configured by the system software. However, the equipment calibration should be checked on a yearly basis (refer to Category 101 of this AESP for information on initiating calibration/repair activities).

14 If, at anytime, the operation/accuracy of the RIU or 2955B or AP60-50 Power Supply is suspect, the offending equipment should be removed from service.

POWER ON SELF TEST (POST) - ERROR INDICATIONS

15 At system power on, a system self test is invoked. If no errors are found during the power on self test, a message is displayed stating that the system self test has completed successfully. If errors are found, they are indicated in the form of displayed or printed error messages, or the PC buzzer in the RIU will sound. The form in which error indications are presented depends on which piece(s) of equipment is (are) faulty.

PC Buzzer Sounds Continuously

16 When the PC buzzer in the RIU sounds continuously, the fault is related to the 2955B and printer. To restart after the fault has been rectified, switch the RIU off and then back to on.

Printed Error Messages

17 For printed error messages, the fault is related to the 2955B and possibly the AP60-50 Power Supply or the RIU. To restart after the fault has been rectified, switch the RIU off and then back to on.

Displayed Error Messages

18 If power on self test (POST) errors are not related to the 2955B, then the error messages are displayed on the 2955B screen. When the printer is used to display error information, the same information is displayed on the 2955B. There are two error categories; RIU PC errors and instrument (RIU and AP60-50 power supply) check errors.

PC POST Errors

19 A display on the 2955B screen, entitled 'PC Power On Self Test', gives the reference numbers for the errors found. The error codes, in hexadecimal, and the error locations are listed below:

0001 - Channel 2 Timer
0008 - Parallel Port
0010 - Serial Port
0020 - Real Time Clock
0040 - Video
0080 - Real Time Clock Checksum
0100 - Lower Memory
0200 - Floppy Disc Controller
0400 - Hard Disc Controller
0800 - Hard Disc Controller

20 If more than one error occurs, the numbers are summed. All errors, except those associated with the real time clock, must be referred to the manufacturer. The real time clock errors could indicate that the back-up battery has expired (Para 30).

Instrument Check Errors

21 A display on the 2955B screen, entitled 'instrument checks', indicates any pieces of equipment which do not respond. Where applicable, the equipment GPIB address is also detailed.

22 The operator is given the option to continue or not. If the response is not to continue, the system halts. If the response is to continue, the operator is prompted to rectify the error. Before pressing the key to continue, the operator should check that the offending equipment is:

22.1 Powered up.

22.2 The Bus connection and GPIB address selection are correct.

22.3 Selected for use (printer only).

23 If the printer is at fault, the operator is given the option to run without the printer. If this is chosen, no printer is required during operation, no matter what print option has been selected.

24 This sequence is repeated until the checks pass, then the first screen "Self Test Successfully Completed" is displayed on the 2955B.

CHARACTERISATION DATA LOSS

25 Should the RAM disc fail and the characterisation data be lost, a message is displayed between the first and second screens to indicate this. Operation is still possible as the data is updated from PROM, using default values.

26 This failure is normally caused by loss of power in the RAM disc power back-up battery (see Para 30).

RUN TIME ERROR INDICATION

27 Any errors occurring during normal operation are indicated on the 2955B screen. If this is not possible, error messages are printed. Should printing not be possible, the PC buzzer is sounded continuously.

28 The 2955B error display is entitled 'system error' which is followed with details of the error and the application line number.

29 If the error is a GPIB or printer error, the system bus and equipment should be checked before restarting. For all other errors, the radio under test, the test number error message and line number should be recorded to enable the error to be analysed.

RIU COMPUTER BATTERIES REPLACEMENT

30 The RIU computer sub-assembly incorporates two back-up batteries, one for the real-time clock (RTC) and one for the RAM disc (Dallas smart socket).

31 RAM disc battery failure causes the characterisation and printer configuration data to be lost. This is indicated by a warning message which appears on the 2955B screen at system power up.

32 RTC battery failure is indicated by an error message which appears on the 2955B screen during system power up.

33 When either battery fails, the RIU must be removed from the system for battery replacement and RAM disc re-characterisation (refer to Category 101 for information on initiating maintenance/repair activities).

ATP EPROM DEVICE REPLACEMENT

CAUTION

STATIC SENSITIVE COMPONENTS. The test program EPROM devices are static sensitive components and the appropriate handling precautions must be observed to prevent these components being permanently damaged by static charges.

34 To replace the application test program (ATP) EPROM devices (ICs 5, 6, 9 and 10) in the RIU, proceed as follows:

34.1 Switch off the 8920C Radio Test System equipment and disconnect the mains cables from the a.c. source.

34.2 Disconnect all signal cables from the RIU.

34.3 Remove the RIU from the racking (if applicable).

34.4 Place the RIU upside down on a suitable work surface.

34.5 Remove the RIU bottom cover by removing the four retaining screws (Fig 3).

34.6 Remove the metal screen from the RIU chassis by removing the 11 retaining screws (Fig 3).

34.7 Remove ICs 5, 6, 9, and 10 from the PC Expansion Board IC sockets (Fig 3).

34.8 Fit the replacement ICs, reassemble the RIU, and refit the RIU to the system.

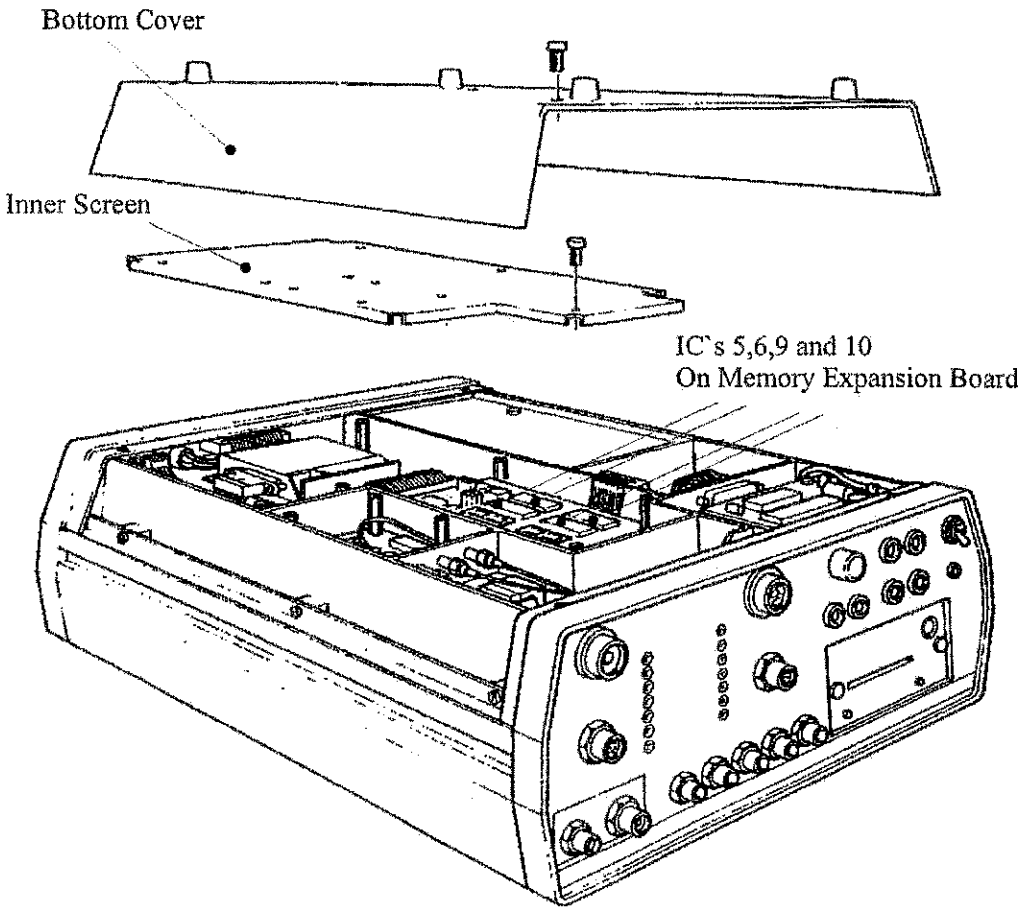


Fig 3 ATP EPROM Device Replacement

SYSTEM SELF-TEST

35 The system self-test procedure enables system performance to be checked. A system self-test should be carried out on initial installation of the equipment and then periodically as part of the system maintenance schedule. These checks may also be used as an aid to fault diagnosis.

Test Equipment

36 In addition to the 8920C equipment, an RF Probe (NSN Z4/6625-01-131-3883) is required for carrying out the self-test procedure.

Test Set-Up

37 System connections are as per Table 1 (front panels) and Table 2 (rear panels) in Chapter 2 (SYSTEM INSTALLATION) of this manual.

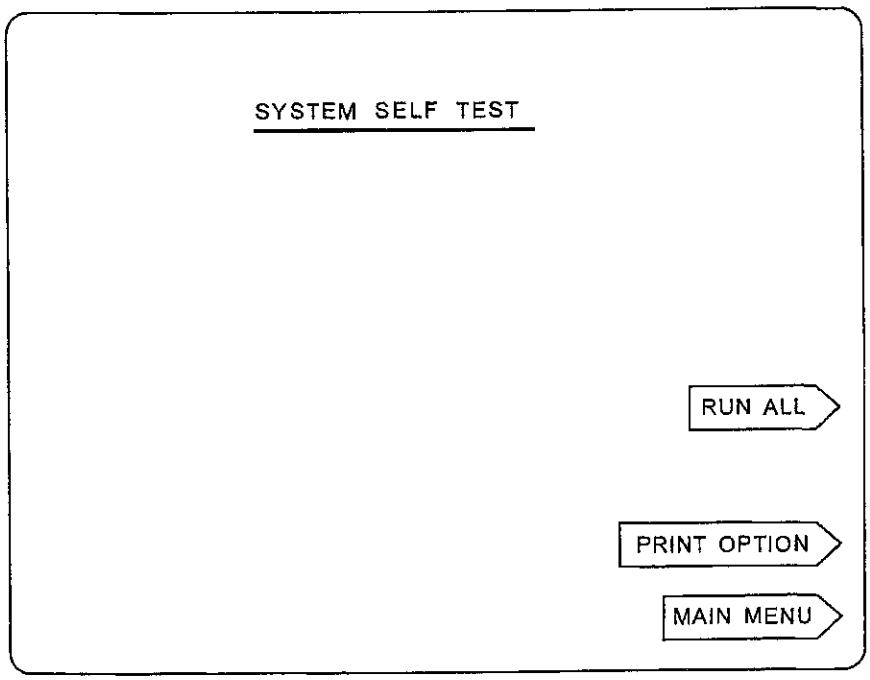
38 Check that the system equipment mains leads are connected to the mains supply.

39 Switch on the 2955B, RIU, DMM and AP60-50 Power Supply.

Accessing the Self Test Program

40 The system self test program is accessed by selecting the SELF TEST option on the main menu (see Chapter 3). A 'System Self Test' menu is displayed which enables the print option to be changed or the self test sequence to be started. The default print mode is print-on-fail. Once started, the self test can not be aborted, but will stop when any one unit is deemed to have failed.

41 The 8920C self test program provides dedicated self tests for the printer, 2955B, RIU and AP60-50 Power Supply and are performed in the order given. The 2955B self test is performed before the RIU and AP60-50 Power Supply to ensure that the unit is operational and that any failures during the RIU tests are not due to 2955B problems. The AP60-50 Power Supply self test checks that the voltage levels used in the radio applications can be set up over the GPIB under automatic control. Printer tests cannot be repeated manually.



System Self-Test Procedure

42 The individual tests of the self test procedure are contained in the following tables, which describe how to manually set them up. These tables also provide suggested alternative tests/actions to isolate the faulty circuitry if a failure occurs. All the measurement readings are confidence level only, and do not give an accurate representation of path losses/levels, but indicate that paths are present within the RIU. Individual manual tests should only be attempted after the RIU has been reset, to avoid undefined conditions being set up within the RIU.

Note ...

> The self test procedure is designed to be a comprehensive test of the status. However, in a few instances not all functionality is checked. Therefore if a fault is suspected, it may be necessary to utilise external equipment to confirm the system status.

Printer Test

43 This test checks the RIU printing function.

TEST

A text string is output to the printer. If it is not printed then either the printer has been disconnected inside the RIU or there is an internal problem, in which case the RIU should be returned.
RESULT: Printer should print: "ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890" "abcdefghijklmnopqrstuvwxyz"
Diagnostics If no print, check printer is connected, has paper and form feeds. If it is still not functioning, the RIU is faulty and should be returned. If the printer prints a message other than the above, check the printer configuration to determine whether the correct printer type has been selected.

2955B Test

44 The 2955B self test is called from the system self test program and runs automatically. When the 2955B self test is complete, the PAUSE option changes to ALL TESTS and the operator must then select RETURN. The operator is then asked whether the test has passed or failed. If any failures were noted, the operator should refer to the appropriate 2955B manufacturer's publication.

RIU - RF Path Tests

45 Tests 1 to 4 test the system RF paths. The RF paths, NORMAL, HI SENS, RF AMP, and INTERMOD are checked using an external DMM and the RF probe to prove that the RF and signal paths through the RIU are functional. The initial set-up conditions require that cables are connected as per Chapter 2, under 'SYSTEM CONNECTIONS'.

Note ...

In manual mode, calibration data must be taken into account to produce the results shown.

TEST 1

An RF signal is set up at the 2955B 'N' type output and the probe is used to measure the RF signal at the ANT IN connector of the RIU. This test checks the RF NORMAL path		
Test Set-Up		
2955B settings	RIU settings	External Connections
RF GEN 380 MHz -19 dBm, N o/p selected RF GEN ON	RF PROBE ON RF SELECT NORMAL	RF probe to ANT IN and RF probe sockets, DMM set to Volts.
RESULT: DMM reading to be between 15 and 35 mV.		
Diagnostics		
FAULT: Low DMM reading		
Possible Cause	Action	
a) Faulty cable between 2955B (N) and RIU (N).	Check serviceability of cable/ connections. Replace if necessary.	
b) 2955B N port not selected.	Check if led indicator is On above connector.	
c) Open circuit between DMM and probe connections.	If open circuit condition, return unit.	

TEST 2

An RF signal from the 2955B 'BNC' output port is routed to the RIU 'BNC' input. The RIU path is now via the RF amp to the ANT IN connector. The RF is again measured by the RF probe at the ANT IN connector. This test checks the RF AMP path.

Test Set-Up

2955B settings	RIU settings	External Connections
RF GEN 380 MHz -4 dBm, BNC o/p selected	RF PROBE ON RF SELECT RF AMP	RF probe to ANT IN and RF probe sockets, DMM set to Volts.

RESULT: DMM reading to be greater than 0.6 V

Diagnostics

FAULT: Low DMM reading

Possible Cause	Action
a) Faulty cable between 2955B (BNC) and RIU (BNC).	Check serviceability of cable/ connections. Replace if necessary.
b) 2955B BNC port not selected.	Check if led indicator is On above connector.
c) RF amplifier faulty.	Continue with test 4. If test 4 is successful, return unit.
d) RF switch or internal cabling faulty.	

TEST 3

As Test 2 but the RF amp output is routed via the 6dB combiner to the ANT IN connector. This checks the INTERMOD path

Test Set-Up

2955B settings	RIU settings	External Connections
RF GEN 380 MHz -4 dBm, BNC o/p selected	RF PROBE ON RF path INTERMOD	RF probe to ANT IN and RF probe sockets, DMM set to Volts.

RESULT: DMM reading to be greater than 0.3 V

Diagnostics

FAULT: Low DMM reading

Possible Cause	Action
a) Faulty RF Stripline PEC Combining circuitry not functioning.	Return unit.

TEST 4

The RF signal is now routed via the HI SENS path through the RIU to the ANT IN connector. The RF level is again measured using the RF probe and the DMM. This checks the HI SENS path

Test Set-Up

2955B settings	RIU settings	External Connections
RF GEN 380 MHz -15 dBm, BNC o/p selected	RF PROBE ON RF path HI SENS	RF probe to ANT IN and RF probe sockets, DMM set to Volts.

RESULT: DMM reading to be between 40 and 80 mV

Diagnostics

FAULT: No level measured

Possible Cause	Action
a) Faulty RF Stripline PEC.	Return unit.

RIU - DDG Tests

46 Tests 5 to 8 test the system DDG functions.

Note ...

Tests 5 to 8 cannot be performed manually.

TEST 5

This test checks the operation of the DDG board and the routing of digital signals to the EXT MOD connector of the RIU. A 2 kHz square wave is generated by the DDG and is routed to the EXT MOD connector of the RIU which is linked to the AF input on the 2955B. The 2955B is used to measure the amplitude of the waveform.

Test Set-Up

2955B settings	RIU settings	External Connections
Dist Off, AF Level meter selected 50kHz LPF	REMOTE PATH AUDIO, AF GENERATOR REMOTE, REMOTE XFORMER MEASURE	EXT MOD RIU to 2955B AF Input

RESULT: 2955B reads level between 507 and 907 mV

Diagnostics

FAULT: No level measured

Possible Cause	Action
a) Faulty connection between RIU EXT MOD and 2955B AF IN.	Check serviceability of cable/connections. Replace if necessary. If cable is functional, return unit.

TEST 6

All set-ups are as shown in Test 5. The 2955B now measures the frequency of the square wave generated in the above test.

Test Set-Up

2955B settings	RIU settings	External Connections
	As Test 5	

RESULT: 2955B reads a frequency between 1.82 and 2.02 kHz

Diagnostics

FAULT: No frequency measured.

Possible Cause	Action
a) Faulty connection between RIU EXT MOD and 2955B AF IN.	Check serviceability of cable/connections. Replace if necessary. If cable is functional, return unit.

TEST 7

Set-up as Test 5. This is the DDG BER test and cannot be set up manually

Test Set-Up

2955B settings	RIU settings	External Connections
	As Test 5	

RESULT: 2955B BER indication must be less than 1%

Diagnostics

FAULT: BER measurements greater than 1%

Possible Cause	Action
a) DDG board in RIU faulty.	Return RIU to manufacturer.

TEST 8

Set CIP AUDIO/HARNESS switch to SELF TEST. The square wave generated at Test 5 is switched within the RIU and the level measured

Test Set-Up

2955B settings	RIU settings	External Connections
x Mode Dist Off AF Level meter selected DC coupled 50kHz LPF	REMOTE PATH AUDIO, AF GENERATOR REMOTE, REMOTE XFORMER MEASURE, DATA Tx, SIGNAL DATA, AF LOAD 300R	(standard configuration) + CIP Power Switch to OFF

RESULT: Reading LL 500 mV UL 900 mV

Diagnostics

FAULT: No level measured

Possible Cause	Action
a) Faulty connection between RIU EXT MOD and 2955B AF IN.	Check serviceability of cable/ connections. Replace if necessary. If cable is functional, return unit.

RIU - 18 V and Attenuator Tests

47 Tests 9 to 13 test the 18 V and Audio attenuation paths.

TEST 9

Set CIP AUDIO/HARNESS switch to SELF TEST. The RIU +18V is routed from Control pin O to Audio pin C and then via RIU AF VOLT 1 path to the 2955B AF input to measured. NOTE: the RIU must be set up in the precise sequence shown for the test to work correctly.

Test Set-Up

2955B settings	RIU settings	External Connections
AF GEN DC coupled	HARNESS LOAD NONE AUDIO LOAD NONE, AF INPUT AUDIO, PIN O DMM REMOTE PATH REBRO SLAVE, DC MEASURE ON	(standard configuration)

RESULT: 2955B reads level between 17 and 19 V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) No 18 V d.c.	Check if 18V d.c. is present at RIU Control pin O. If not, return unit. If yes see b).
b) Faulty cable between RIU AF IN and 2955B AF IN.	Check serviceability of cable/connections. Replace if necessary. If cable not faulty, see c).
c) Audio pin C circuitry faulty.	Return unit.

TEST 10

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 9 but the +18V is routed via Harness pin D and the RIU AF VOLT 2 path to the 2955B for measurement

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter DC coupled	AF INPUT HRNS/REM, REMOTE XFORMER STIM, PIN O DMM, REMOTE PATH REBRO SLAVE, AUDIO LOAD NONE	(standard configuration)

RESULT: 2955B reads level between 17 and 19 V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) No 18 V d.c.	Check if 18V d.c. is present at RIU Control pin O. If not, return unit. If yes see b).
b) Faulty cable between RIU AF IN and 2955B AF IN.	Check serviceability of cable/connections. Replace if necessary. If cable not faulty, see c).
c) Harness pin D circuitry faulty.	Return unit.

TEST 11

Set CIP AUDIO/HARNESS switch to SELF TEST. A 4V rms AF output from the 2955B is routed via the AF GENERATOR AUDIO path in the RIU to Audio pins A and B. Audio pins A and B are then routed via the CIP to the REMOTE terminals (Remote High and Low). This is then routed via AF Volt 2 to the 2955B for measurement. No Audio attenuation in the Audio path is selected.

Test Set-Up

2955B settings	RIU settings	External Connections
50kHz LPF Rx Mode AF level meter AF GEN 1 kHz, 4V	REMOTE PATH AUDIO, AF GENERATOR AUDIO, AF INPUT HRNS/REM REMOTE XFORMER MEASURE, AF ATTENUATION 0DB	(standard configuration)

RESULT: 2955B reads level between 120 and 150 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty cable/connection between2955B AF GEN and RIU AF GEN	Check serviceability of cable/connections. Replace cable if necessary.
b) No a.c. volts.	Check if a.c. voltage is present at Audio pin A wrt B. If no, return RIU unit. If yes, see c).
c) Faulty cable between 2955B AF IN and RIU AF IN.	Check if a.c. voltage is present at Remote terminal. If no, check cable/connections between 2955B AF IN and RIU AF IN and replace if necessary. If yes, see d).
d) RIU Remote circuitry faulty.	Return RIU.

TEST 12

As in Test 11 but with 20dB attenuation selected in the Audio path.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	REMOTE PATH AUDIO, AF GENERATOR AUDIO, AF INPUT HRNS/REM REMOTE XFORMER MEASURE, AF ATTENUATION 20DB	(standard configuration)

RESULT: 2955B reads level between 12 and 15 mV

Diagnostics

As Test 11.

TEST 13

As in Test 11 but with 40dB attenuation selected in the Audio path.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	REMOTE PATH AUDIO, AF GENERATOR AUDIO, AF INPUT HRNS/REM REMOTE XFORMER MEASURE, AF ATTENUATION 40DB	(standard configuration)

RESULT: 2955B reads level between 0.5 and 4.0 mV

Diagnostics

As Test 11.

RIU - Harness Path Tests

48 Tests 14 and 15 test the system Harness paths.

TEST 14

Set CIP AUDIO/HARNESS switch to SELF TEST. An AF output from the 2955B is routed via AF GENERATOR REMOTE path to Harness pin A. This is linked to Audio pin D input and via AF Volt 1 to the 2955B AF Input for measurement.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	REMOTE PATH OFF, AF GENERATOR AUDIO, AF INPUT HRNS/REM, HARNESS LOAD NONE, AF LOAD NONE, REMOTE XFORMER STIM	(standard configuration)

RESULT: 2955B reads level between 3.2 and 3.9 V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) No a.c. volts.	Check if a.c. voltage is present at Harness pin A wrt B. If not, return RIU unit.

TEST 15

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 14 but Harness pin A routed via Harness pin D (Audio pin C) and AF Volt 2 path to 2955B.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM	(standard configuration)

RESULT: 2955B reads level between 3.2 and 3.9 V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) RIU Harness circuitry faulty.	Check if a.c. voltage is present at Harness pin A wrt B. If not, return RIU unit.

RIU - Audio Load Tests

49 Test 16 to 20 test the Audio load functions.

TEST 16

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 14 but Harness pin A to Audio pin D with 300 Ohms Audio load selected at Audio pin D. AF voltage measured on the 2955B.		
Test Set-Up		
2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD 300R	(standard configuration)
RESULT: 2955B reads level between 2.8 and 3.4 V		
Diagnostics		
FAULT: As test 14 plus 2955B reading high		
Possible Cause	Action	
a) 300 ohm load not switched in.	RIU circuitry faulty, return unit.	

TEST 17

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 16, but 150 Ohm Audio load selected.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD 150R	(standard configuration)

RESULT: 2955B reads level between 2.5 and 3.1 V

Diagnostics

FAULT: As test 14 plus 2955B reading high

Possible Cause	Action
a) 150 ohm load not switched in	RIU circuitry faulty, return unit.

TEST 18

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 16, but 100 Ohm Audio load selected.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD 100R	(standard configuration)

RESULT: 2955B reads level between 2.2 and 2.8 V

Diagnostics

FAULT: As test 14 plus 2955B reading high

Possible Cause	Action
a) 100 ohm load not switched in.	RIU circuitry faulty, return unit.

TEST 19

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 16, but 51 Ohm Audio load selected.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 4V	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD 51R	(standard configuration)

RESULT: 2955B reads level between 1.7 and 2.3 V

Diagnostics

FAULT: As test 14 plus 2955B reading high

Possible Cause	Action
a) 51 ohm load not switched in.	RIU circuitry faulty, return unit.

TEST 20

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 16, but 1 Ohm Audio load selected.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 200mV	DC MEASURE OFF, AF INPUT HRNS/REM, AF GENERATOR AUDIO, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD 1R	(standard configuration)

RESULT: 2955B reads level between 1 and 5 mV

Diagnostics

FAULT: As test 14 plus 2955B reading high

Possible Cause	Action
a) 1 ohm load not switched in.	RIU circuitry faulty, return unit.

RIU - Harness Load Tests

50 Tests 21 to 29 test the Harness load functions.

TEST 21

Set CIP AUDIO/HARNESS switch to SELF TEST. An audio signal is passed through the 30 ohms harness load and via the CIP is measured through the AF INPUT AUDIO path.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 200mV	REMOTE PATH OFF, AF INPUT AUDIO, AF GENERATOR REMOTE, HARNESS LOAD 30R, REMOTE XFORMER STIM, AF LOAD NONE	(standard configuration)

RESULT: 2955B level between 50 and 100 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty RIU path.	Check if a.c. voltage is present at Audio pin A wrt B. If not, return unit. If yes, see b).
b) RIU faulty.	Check if a.c. voltage is present at Harness pin D. If not, return RIU unit.

TEST 22

Set CIP AUDIO/HARNESS switch to SELF TEST. An audio signal is passed through the 300 Ohm harness load and via the CIP measured through the AF INPUT AUDIO path.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 200mV	REMOTE PATH OFF, AF INPUT AUDIO, AF GENERATOR REMOTE, HARNESS LOAD 300R, REMOTE XFORMER STIM, AF LOAD NONE	(standard configuration)

RESULT: 2955B reads level between 140 and 165 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty RIU path.	Check if a.c. voltage is present at Audio pin A wrt B. If not, return unit. If yes, see b).
b) RIU faulty.	Check if a.c. voltage is present at Harness pin D. If not, return RIU unit.

TEST 23

Set CIP AUDIO/HARNESS switch to SELF TEST. An audio signal is passed through the harness unloaded path and via the CIP measured through the AF INPUT AUDIO path.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AF GEN 1 kHz, 200mV	REMOTE PATH OFF AF INPUT AUDIO, AF GENERATOR REMOTE, HARNESS LOAD NONE, REMOTE XFORMER STIM, AF LOAD NONE	(standard configuration)

RESULT: 2955B reads level between 165 and 200 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty RIU path.	Check if a.c. voltage is present at Audio pin A wrt B. If not, return unit. If yes, see b).
b) RIU faulty.	Check if a.c. voltage is present at Harness pin D. If not, return RIU unit.

TEST 24

Set CIP AUDIO/HARNESS switch to SELF TEST. This test routes the PRESSEL line from Audio pin F to Harness pin E (via CIP) and measures the PRESSEL line voltage in the OFF condition.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test AF level meter DC coupled	TRANSMIT DATA ON AF INPUT HRNS/REM, PIN E MEASURE, REMOTE XFORMER STIM	(standard configuration

RESULT: 2955B reads level between 4 and 5.4 V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty RIU.	If 5 V d.c. is present at Audio pin F, return RIU.

TEST 25

Set CIP AUDIO/HARNESS switch to SELF TEST. The PRESSEL line is selected ON and the voltage measured.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test AF level meter DC coupled	TRANSMIT ON AF INPUT HRNS/REM, PIN E MEASURE, REMOTE XFORMER STIM, TRANSMIT DATA ON	(standard configuration)

RESULT: 2955B reads level between 1 and 200 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty RIU.	If 5 V d.c. is present at Audio pin F, return RIU.

TEST 26

Set CIP AUDIO/HARNESS switch to SELF TEST. A 4:4 keying rate has been set up on Audio pin F and the amplitude of the signal measured. The RIU set up must be followed precisely.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test Read AF frequency AF GEN 1kHz, 4V	KEYING 4:4, AF GENERATOR REMOTE, AF INPUT AUDIO, REMOTE PATH OFF, REMOTE XFORMER MEASURE, TRANSMIT DATA ON, HARNESS LOAD 30R, PIN E MEASURE	(standard configuration)

RESULT: 2955B reads level between 2.5 and 4.5 V

Diagnostics

Possible Cause	Action
a) Faulty RIU.	Check if a square wave of frequency 1 kHz and level 3 V present at Audio pin F. If not, return RIU.

TEST 27

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 26 but measure the frequency of the signal.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test Read AF frequency AF GEN 1kHz, 4V	KEYING 4:4, AF GENERATOR REMOTE, AF INPUT AUDIO, REMOTE PATH OFF, REMOTE XFORMER MEASURE, TRANSMIT DATA ON, HARNESS LOAD 30R, PIN E MEASURE	(standard configuration)

RESULT: 2955B reads frequency between 0.9 and 1.1 kHz

Diagnostics

Possible Cause	Action
a) Faulty RIU.	Check if a square wave of frequency 1 kHz and level 3 V present at Audio pin F. If not, return RIU.

TEST 28

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 26 but with keying rate set to 27:54.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test AF level meter AF GEN 1kHz, 4V	KEYING 27:54, AF GENERATOR REMOTE, AF INPUT AUDIO, REMOTE PATH OFF, REMOTE XFORMER MEASURE, TRANSMIT DATA ON, HARNESS LOAD 30R, PIN E MEASURE	(standard configuration)

RESULT: 2955B reads level between 2.5 and 4.5 V

Diagnostics

Possible Cause	Action
a) Faulty RIU.	Check if a square wave of frequency 333 Hz and level 3.8 V is present at Audio pin F. If not, return RIU.

TEST 29

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 26 but measure the frequency of the signal.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test Read AF frequency AF GEN 1kHz, 4V	KEYING 27:54, AF GENERATOR REMOTE, REMOTE PATH OFF, REMOTE XFORMER MEASURE, TRANSMIT DATA ON, HARNESS LOAD 30R, PIN E MEASURE	(standard configuration)

RESULT: 2955B reads level between 0.3 and 0.36 kHz

Diagnostics

Possible Cause	Action
a) Faulty RIU.	Check if a square wave of frequency 333 Hz and level 3.8 V is present at Audio pin F. If not, return RIU.

RIU - Control Relay Tests

51 Tests 30 to 49 test the RIU control relays.

TEST 30

Set CIP AUDIO/HARNESS switch to SELF TEST and the CIP LINE RESISTANCE switch to Tx 1400. This test checks the LINE RESISTANCE switch function. A path is set up within the RIU to allow a resistance measurement of the path to be made. The RIU must be set up in the sequence shown.
Test Set-Up 2955B settings: — RIU settings: REMOTE PATH AUDIO External Connections: Set DMM to Ohms.
RESULT: DMM reading to be between 1.35 and 1.99 kohms
Diagnostics Verify resistance is within these limits. If not, faulty CIP.

TEST 31

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin F. For this test the RIU must be set up in the sequence shown.
Test Set-Up 2955B settings: — RIU settings: PIN C To DMM, PIN F 150Hz External Connections: Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 47 and 50 kohm
Diagnostics Verify resistance is within these limits. If not, return RIU.

TEST 32

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin A. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN A,B,C,D O/C PIN C To DMM	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 47 and 50 kohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 33

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 31 but Relays closed. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN C to DMM, PIN F CLR SPEECH PIN E MEASURE	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 0 and 10 ohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 34

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open, use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin K. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN D to DMM, PIN K to O/C	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 47 and 50 kohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 35

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 34 but Relays closed. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN D to DMM, PIN K to 0V	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 0 and 10 ohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 36

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin L. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN D to DMM, PIN L to O/C	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 47 and 50 kohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 37

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 36 but Relays closed. For this test the RIU must be set up in the sequence shown.		
Test Set-Up		
2955B settings	RIU settings	External Connections
	PIN D to DMM, PIN L to 0V	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.
RESULT: DMM reading to be between 0 and 10 ohm		
Diagnostics		
Verify resistance is within these limits. If not, return RIU.		

TEST 38

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open, use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin M. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN D To DMM, PIN M O/C	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.

RESULT: DMM reading to be between 47 and 50 kohm

Diagnostics

Verify resistance is within these limits. If not, return RIU.

TEST 39

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 38 but Relays closed. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN D To DMM, PIN M 0V	Disconnect CIP Audio cable from RIU. Set DMM to Ohms.

RESULT: DMM reading to be between 0 and 10 ohm

Diagnostics

Verify resistance is within these limits. If not, return RIU.

Possible Cause	Action
a) If all the above tests fail, check the DMM and cables, normalising if necessary.	

TEST 40

Set CIP AUDIO/HARNESS switch to SELF TEST. Use the radio cables to route the RIU +18V from Control pin O to Audio pin C and then via RIU AF VOLT 1 path to the 2955B AF input to be measured. NOTE: the RIU must be set up in the precise sequence shown for the test to work correctly.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter DC coupled	HARNESS LOAD NONE, AF LOAD NONE, AF INPUT AUDIO, PIN O DMM, RIU REMOTE PATH REBRO SLAVE, DC MEASURE ON	Remove the Audio, Control, and Harness cables only from the RIU. Do **not** remove the remote leads. Connect radio Harness, Control and Audio cables between CIP and RIU.

RESULT: 2955B reads level between 17 and 19V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty radio cable (assuming the system has passed Test 9).	Check radio cables for continuity.

TEST 41

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 40 but the +18V is routed via Harness pin D and the RIU AF VOLT 2 path to the 2955B for measurement.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter DC coupled	AF INPUT HRNS/REM, REMOTE XFORMER STIM, PIN O DMM, REMOTE PATH REBRO SLAVE	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU.

RESULT: 2955B reads level between 17 and 19V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty radio cable (assuming the system has passed Test 10).	Check radio cables for continuity.

TEST 42

Set CIP AUDIO/HARNESS switch to SELF TEST. A 4V rms AF output from the 2955B is routed via the AF GEN 1 path in the RIU to Audio pins A and B. Audio pins A and B are then routed via the CIP to the REMOTE terminals (Remote High and Low). This is then routed via AF Volt 2 to the 2955B for measurement. No Audio attenuation in the Audio path is selected.

Test Set-Up

2955B settings	RIU settings	External Connections
50kHz LPF Rx mode AF level meter AF GEN 1 kHz, 4V	REMOTE PATH AUDIO, AF GENERATOR AUDIO, AF INPUT HRNS/REM, REMOTE XFORMER MEASURE, AF ATTENUATION 0DB	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU.

RESULT: 2955B reads level between 120 and 150 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty radio cable (assuming the system has passed Test 11).	Check radio cables for continuity.

TEST 43

Set CIP AUDIO/HARNESS switch to SELF TEST. An AF output from the 2955B is routed via AF Generator Remote path to Harness pin A. This is linked to Audio pin D input and via AF Volt 1 to the 2955B AF Input for measurement.

Test Set-Up

2955B settings	RIU settings	External Connections
Rx Mode AF level meter AFGEN 1kHz, 4 V	REMOTE PATH OFF, AF INPUT AUDIO, AF GENERATOR REMOTE, HARNESS LOAD NONE, AF LOAD NONE, REMOTE XFORMER STIM	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU.

RESULT: 2955B reads level between 3.2 and 3.9V

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty radio cable (assuming the system has passed Test 14).	Check radio cables for continuity.

TEST 44

Set CIP AUDIO/HARNESS switch to SELF TEST. The PRESSEL line is selected ON and the voltage measured.

Test Set-Up

2955B settings	RIU settings	External Connections
Audio test AF level meter DC coupled	TRANSMIT ON, AF INPUT HRNS/REM, PIN E MEASURE, REMOTE XFORMER STIM, DATA TRANSMIT ON	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU.

RESULT: 2955B reads level between 1 and 200 mV

Diagnostics

FAULT: No reading on 2955B

Possible Cause	Action
a) Faulty radio cable (assuming the system has passed Test 25).	Check radio cables for continuity.

TEST 45

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 33 but Relays closed. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN F CLR SPEECH, PIN C DMM, PIN E MEASURE	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU. DMM set to Ohms.

RESULT: DMM reading to be between 47 and 50 kohm

Diagnostics

Verify resistance is within these limits. If not, check radio cables for continuity.

TEST 46

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 35 but Relays closed. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN D DMM, PIN K 0V	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU. DMM set to Ohms.

RESULT: DMM reading to be between 0 and 10 ohm

Diagnostics

Verify resistance is within these limits. If not, check radio cables for continuity.

TEST 47

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin A. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN A,B,C,D O/C, PIN C DMM	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU. DMM set to Ohms.

RESULT: DMM reading to be between 47 and 50 kohm

Diagnostics

Verify resistance is within these limits. If not, check radio cables for continuity.

TEST 48

Set CIP AUDIO/HARNESS switch to SELF TEST. As Test 38 but Relays closed. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN D DMM, PIN M 0V	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control and Audio cables between CIP and RIU. DMM set to Ohms.

RESULT: DMM reading to be between 0 and 10 ohm

Diagnostics

Verify resistance is within these limits. If not, check radio cables for continuity.

TEST 49

Set CIP AUDIO/HARNESS switch to SELF TEST. With relays open use an external DMM set to Ohms to verify the operation of the relays by providing a ground connection to Control pin L. For this test the RIU must be set up in the sequence shown.

Test Set-Up

2955B settings	RIU settings	External Connections
	PIN D DMM PIN L O/C	Remove the Audio, Control, and Harness cables only from the RIU. Connect radio Harness, Control, and Audio between CIP and RIU. DMM set to Ohms.

RESULT: DMM reading to be between 47 and 50 kohm

Diagnostics

Verify resistance is within these limits. If not, check radio cables for continuity.

AP60-50 Power Supply Tests

52 These tests enable the operator to check the presence and accuracy of the PSU output voltage levels, and operation of the PSU ENABLE control function.

Initial Settings

53 Set up the 8920C system, as follows:

53.1 Ensure the system connections are as detailed in Para 37.

53.2 Set the CIP controls, as follows:

53.2.1	AUDIO/HARNESS	- RADIO
53.2.2	LINE RESISTANCE	- OC
53.2.3	POWER	- AUDIO PIN C - 1

Test Method

54 To carry out the PSU tests, proceed as follows:

54.1 Select the Current Consumption skeleton test set-up from the Skeleton Test Menu.

54.2 Set the PSU output voltage to 12 V.

54.3 Select the Voltage Pin C - Audio Socket skeleton test set-up from the Skeleton Test Menu.

54.4 Note the 2955B d.c. voltage indication, which shall be 12 V ±0.5 V.

54.5 Set the PSU output voltage to 28 V.

54.6 Note the 2955B d.c. voltage indication, which shall be 28 V ±0.5 V.

Failure Diagnosis

55 If power is not indicated, make the following checks:

Possible Fault	**Action**
PSU output not enabled	Check that PSU 'enabled' LED (green) is illuminated
PSU faulty	Check power output at PSU output terminals
CIP faulty	Check power output at DC SUPPLY connector on CIP

CIP TESTS

56 If a system failure investigation results in the performance of the CIP being suspect, verify the fault by carrying out the CIP functional tests provided in Chapter 6 of this manual.

CHAPTER 5

RADIO INTERFACE UNIT

CONTENTS

CONTENTS (continued)

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CONTENTS (continued)

CONTENTS (continued)

INTRODUCTION

1 This chapter provides the support documentation for the Radio Interface Unit (RIU), which can be configured for use in the testing of various types of radio communications transceiver. However, the information covered in this chapter is applicable to the RIU configuration for testing Clansman type transceiver radios.

Warnings and Cautions

2 The warnings and cautions given in the preliminary information at the front of this manual are also applicable to the RIU equipment.

UNIT OVERVIEW

Introduction

3 The GEC-Marconi Avionics Radio Interface Unit (RIU) combines the interfacing and control functions required for testing all Clansman type radio transceivers and ancillary equipment, and suitable for static or mobile use. It is configured to operate as part of the GEC-Marconi Avionics 8920C Radio Test System, which uses the 2955B Radio Communications Test Set to provide the majority of the instruments necessary for radio test evaluation. A computer within the RIU provides system control via a GPIB (General Purpose Interface Bus) link. Application test programs (ATPs) reside in EPROM (Erasable, Programmable, Read-Only Memory) within the RIU.

Construction

4 Components which make up the RIU are housed in a 4U high chassis, with connectors and controls mounted on the front and rear panels. Panel views are shown in Fig 1.

5 The RIU is made up by the following main items:

5.1 Radio Interface Control board.

5.2 Digital Data Generator board.

5.3 RF Stripline board.

5.4 Computer (IBM PC compatible) sub-assembly.

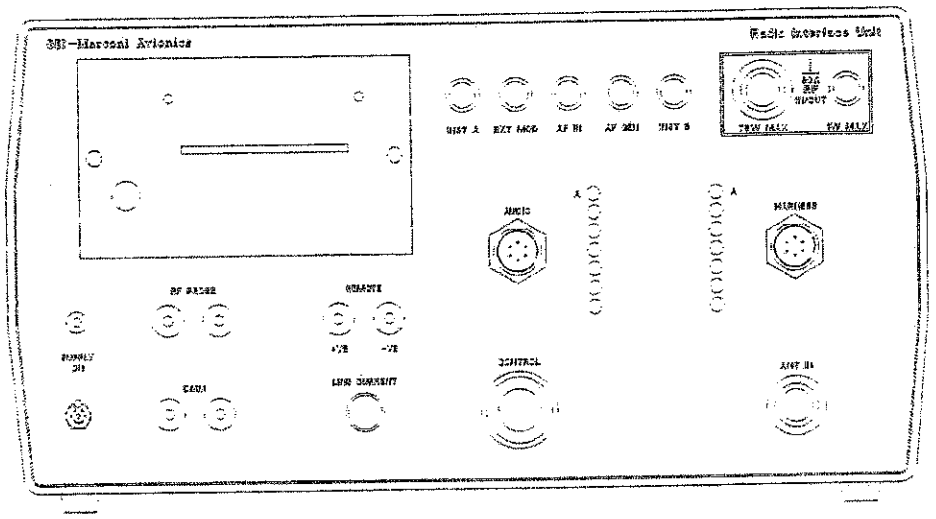
5.5 GPIB Control board.

5.6 GPIB Interface board.

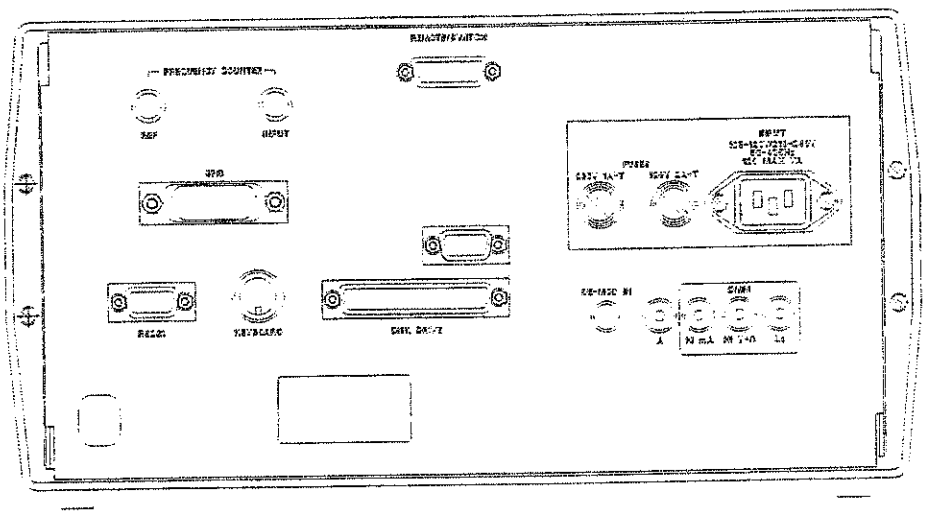
5.7 Ticket Printer.

5.8 Power supply unit.

6 The RIU may be free standing or mounted in a standard 19-inch system when fitted with brackets supplied with the rack mounting kit.



FRONT



REAR

Fig 1 RIU Panel Views

Brief Functional Description

7 The following functional description is supported by the simplified block diagram shown in Fig 2.

Radio Interfacing

8 The Radio Interface Control board contains circuit functions for switching and routeing signals between the radio under test and the 2955B under the control of the RIU computer (via the GPIB) and Digital Data Generator board. It also provides facilities for measuring the d.c. power consumption of the radio under test.

Radio Test Control

9 Radio test control functions are provided by the Digital Data Generator board. This board controls the various routeing and switching processes within the Radio Interface Control board.

10 The Digital Data Generator board also provides the following facilities:

10.1 System delay and bit error rate measurement for signals propagated through the radio circuitry.

10.2 Frequency counting.

10.3 Remote switch and Pressel lamp control.

10.4 Line routeing for the LINE RESISTANCE switch.

RF Signal Routeing

11 Radio frequency (RF) signal routeing is achieved using a coaxial RF relay/combiner network. The RF Stripline board contains most of the RF routeing components, which include an RF amplifier (400 kHz to 500 MHz).

12 The signal combining facility enables signals to be mixed to evaluate receiver performance. For this purpose, an additional signal generator may be connected to the INST B connector on the front panel.

13 A spectrum analyser may be connected to the system at the INST A connector on the front panel to perform signal purity tests.

RIU/System Control

14 RIU functions and system peripheral equipment (i.e. the 2955B and external power supply) are controlled by the computer within the RIU. Data is passed between the computer and system equipment via a GPIB (General Purpose Interface Bus) link.

15 The computer sub-assembly is made up by two boards, as follows:

15.1 A mother board containing the IBM PC compatible computer.

15.2 A daughter board containing the EPROMs, which hold the application test programs (ATPs) for each Clansman radio.

GPIB Control

16 Test control data from the RIU computer sub-assembly is converted to GPIB format by the GPIB Control board. The GPIB Interface board is used as a connection interface, for signals and d.c. power, between the computer sub-assembly and the GPIB Control board.

Printer (Ticket or Centronics)

17 A print out of the test results may be obtained by selecting the printer option on the main menu before tests commence.

Power Supply Unit

18 A switch-mode power supply unit provides the +5 V d.c. and +12 V d.c. supplies required by the RIU circuit functions. The wide ranging a.c. input requirements of the power supply removes the need for a 115 V/220 V selection switch.

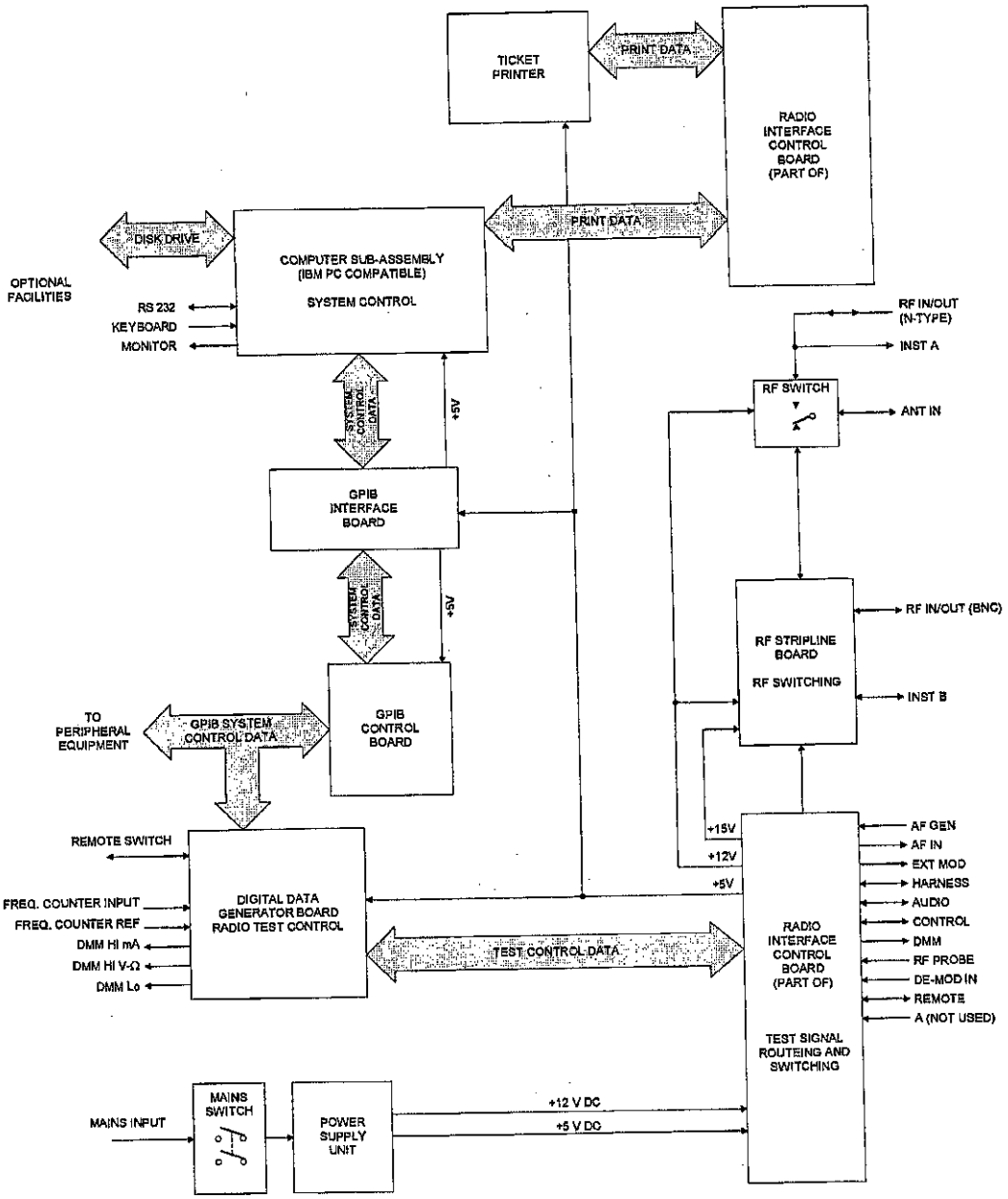


Fig 2 RIU Simplified Block Diagram

Modules/Accessories

19 The part number identifications for the main modules (e.g. PCBs) and accessories are listed in Table 1.

TABLE 1 MODULES AND ACCESSORIES

Item (1)	Part Number (2)	Quantity (3)
Radio Interface Control board	4215-18857-02-T	1
Digital Data Generator board	4215-18905-02-T	1
RF Stripline board	4215-18858-02-T	1
Computer Sub-assembly	4215-10117-02-T	1
GPIB Control board	4215-00335-02-T	1
GPIB Interface board	4215-18865-02-T	1
Power Supply Unit	4215-00355-40-4-T	1
Ticket Printer	4531-5541	1
Mains input cable	4555-1009	1
Rack mounting bracket	4215-00070-20-1-T	2
Locating bar	4215-00072-20-1-T	2

RACK MOUNTING

20 The RIU may be mounted in a standard 19-inch rack using the available rack mounting kit. To install the RIU into the rack, proceed as follows:

20.1 Disconnect all external cabling from the front and rear panels.

20.2 If the four feet are required to be removed, ease the centre bungs from the feet to expose the retaining screws. The feet retaining screws are held by captive nuts in the RIU bottom cover.

20.3 Fit a locating bar to each rack mounting bracket (Chap 2), using the M5x12 counter-sunk screws provided.

20.4 Fit a rack mounting bracket/locating bar assembly to each side the unit, using a M5x12 pan head screw at the handle fixing hole locations.

TECHNICAL SPECIFICATION

Physical Details

21 The physical details for the RIU are as follows:

21.1	Width	: 345 mm
21.2	Depth	: 445 mm
21.3	Height	: 176 mm
21.4	Rack Height	: 4U
21.5	Weight	: 15 kg

Power Requirements

22 The RIU power requirements are as follows:

22.1	Voltage	: 195 - 260 V a.c. (can also be configured for 110 V a.c. operation)
22.2	Frequency	: 45 - 400 Hz
22.3	Input Power	: 120 VA Maximum

Inputs and Outputs

Front Panel

23 Table 2 provides details on the front panel inputs and outputs. A front panel view of the RIU is shown in Fig 3.

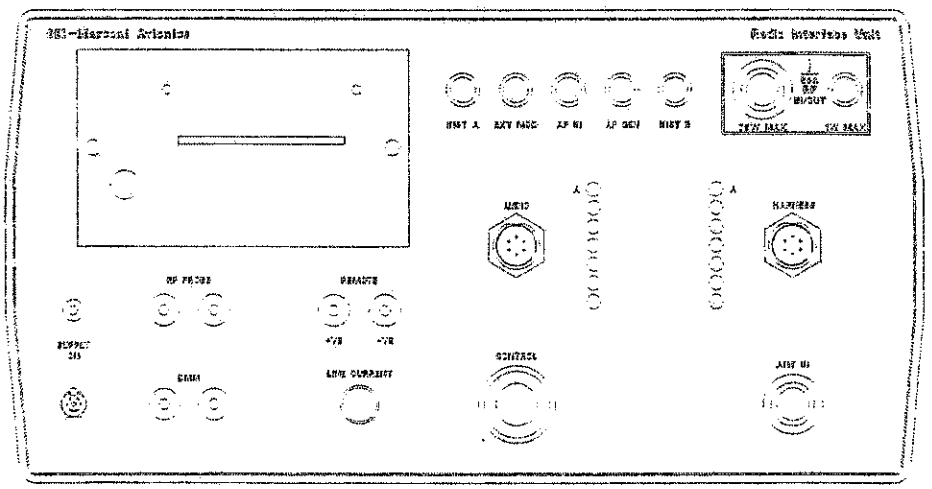


Fig 3 RIU Front Panel

TABLE 2 FRONT PANEL INPUTS AND OUTPUTS

Name (1)	Description (2)	Type (3)
INST A	Impedance : 50 Ohms	Output
EXT. MOD	Impedance : 50 Ohms	Output
AF IN	AF path to 2955B	Output
AF GEN	AF path to radio from 2955B	Input
INST B	Impedance : 50 Ohms	Input
RF IN/OUT	BNC Impedance : 50 Ohms "N" Type Impedance : 50 Ohms	Bidirectional
ANT IN	Impedance : 50 Ohms Power : 100 W peak Max.	Bidirectional
HARNESS	Multi-signal connection to radio. Signals vary between radios. The HARNESS signals are also available via a row of test point (fanout) pins on the front panel.	Bidirectional
AUDIO	Multi-signal connection to radio. Signals vary between radios. The AUDIO signals are also available via a row of test point (fanout) pins on the front panel.	Bidirectional
DMM	+ve and -ve connections to digital multimeter.	Output
CONTROL	Multi-signal connection radio. Signals vary between radios.	Bidirectional
RF PROBE	+ve and -ve connections for RF probe.	Input
REMOTE	+ve and -ve connections carrying audio to/from radio, and d.c. control to radio.	Bidirectional

Rear Panel

24 Table 3 provides details on the rear panel inputs and outputs. A rear panel view of the RIU is shown in Fig 4.

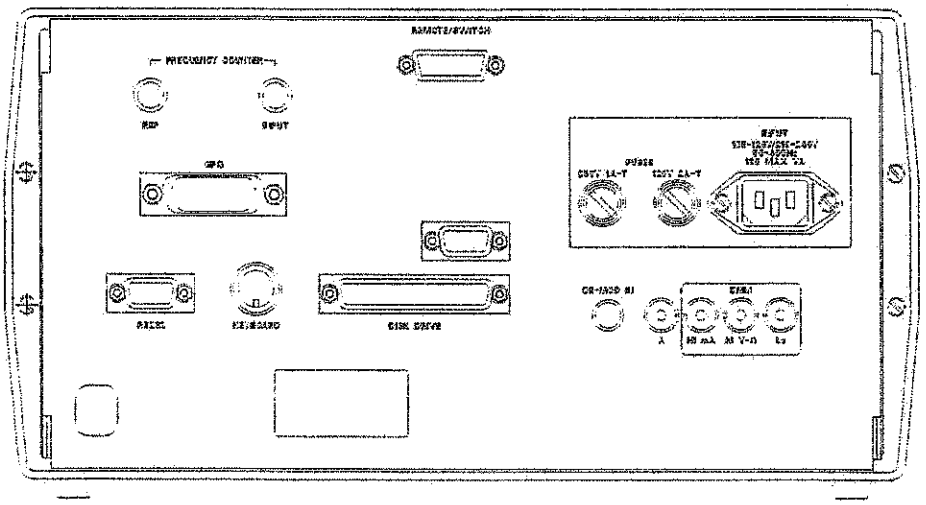


Fig 4 RIU Rear Panel

TABLE 3 REAR PANEL INPUTS AND OUTPUTS

Name (1)	Description (2)	Type (3)
GPIB	General Purpose Interface Bus. Complies with the following subsets as defined in IEEE 488-1978: SH1, AH1, T5, L4, SR1, RL1, PPO, DC1, DT1, E1.	Bidirectional
DMM HI V-Ω/Lo/ HI mA	Three connections to Digital Multimeter: Volts/Resistance, Current and Common	Outputs
A	Not used	
REMOTE/SWITCH	LINE RESISTANCE switch lines	Bidirectional
	REMOTE SWITCH lines (for Pressel operation and 'continue')	Outputs
	Tx lamp operation lines	Inputs
	HARNESS Pin B - Level = +5 V <0.1 mA	Outputs
	AUDIO Pin F - Level = <0.5 V (10 mA) to 16 V (<0.1 mA)	Outputs
DE-MOD IN	Demodulated signal (from 2955B). Load : 10 k ohm minimum Level : 400 mV p-p for 1 kHz deviation ±10% Bandwidth : 0.3 to 3.4 kHz band-pass 300 Hz low-pass or 15 kHz low-pass selected by 2955B filter switch.	Input
RS232	RIU computer serial data interface connection - (not implemented)	Bidirectional
DISK DRIVE	RIU computer disk drive interface connection - (not implemented)	Bidirectional
MONITOR	RIU computer monitor interface connection - (not implemented)	Outputs
KEYBOARD	RIU computer keyboard interface connection - (not implemented)	Inputs

(continued)

TABLE 3 REAR PANEL INPUTS AND OUTPUTS (continued)

Name (1)	Description (2)	Type (3)
FREQUENCY COUNTER:		
REF	Frequency: 1 MHz ±ppm Load: 50 ohms Level: 3 V pk-pk	Input
INPUT	Frequency: 100 kHz to 999 kHz Load: 50 ohms Level: 100 mV to 5 V pk-pk	Input

Performance

Frequency Range

25 Frequency range of the Clansman series radios tested is 1.5 MHz to 500 MHz.

Frequency Counter

Reference Signal

26 An external reference clock for the frequency counter circuit:

26.1 Signal Type : Sine wave

26.2 Input Voltage : 0.5 V to 5 V sine wave

26.3 Drive Capability : 50 ohm load

26.4 Frequency : 1 MHz

26.5 Accuracy : ±1 ppm

Measurement Signal

27 The signals measured by the frequency counter:

27.1 Signal Type : Sine wave or square wave

27.2 Frequency Range : 100 kHz to 999 kHz

27.3 Input Voltage Range : 100 mV to 5 V pk-pk

27.4 Measurement Accuracy : ±0.1 Hz @ gate time of 5s, 7 digit output
±1 Hz @ gate time of 0.5s, 6 digit output

Delay Measurement

28 The delay measurement parameters are as follows:

28.1	Data Type	: TTL
28.2	Data Out	: Preamble followed by 2 kHz square wave Measurement accuracy - one hundredth of a bit (0.625 micro seconds) Maximum delay permissable - 3.99 bits.
28.3	Preamble	: 8 kHz square wave for approximately 0.5 s

BER Measurement

29 29 The BER measurement parameters are as follows:

29.1	Data Type	: TTL
29.2	Data Out	: Preamble followed by PRBS
29.3	Measurement	: Percentage of BER second
29.4	PRBS POLYNOMIAL	: $1 + X^2 + X^{10} + X^{11} + X^{12}$
29.5	Preamble	: 8 kHz square wave for approximately 0.5 s

Radio Frequency Interference

30 Radio frequency interference suppression is designed in accordance with BS 6527 Class B for conducted and radiated emissions.

RF Amplifier

31 Characteristics of the RF amplifier used in the RIU are as follows:

31.1	Frequency Range	: 400 kHz to 500 MHz
31.2	Impedance	: 50 Ohms nominal
31.3	Flatness	: ±0.5 dBm
31.4	Maximum Output	: +13.2 dBm

Safety

32 The RIU is protected in accordance with IEC Safety Class 1 and designed according to IEC Publication 348.

Environmental Conditions

33 The environmental conditions under which the RIU may be operated are as follows:

33.1	Temperature Range	: -5° C to +55° C
33.2	Humidity	: < 70%

Conditions of Storage and Transport

34 Conditions under which the RIU may be stored and transported are as follows:

34.1	Temperature Range	: -40° C to +70° C
34.2	Humidity	: Up to 95% RH at 40° C
34.3	Altitude	: Up to 2500 metres (pressurised freight at 27 kpa differential, 3.9 lbf/sq in).

OPERATION

Introduction

35 The Radio Interface Unit (RIU) is designed to operate as part of a radio test system. Application software within the unit enables radio tests to be performed automatically or manually. RIU manual controls are limited to a power on/off switch, a printer paper-feed button and a line current setting control, but the software enables RIU function parameters/conditions to be set manually by utilising the 2955B keyboard and screen. For details on how to operate the RIU within the system, refer to Chapter 3 (OPERATING INSTRUCTIONS) of this manual.

36 Before using the RIU, it is first necessary to become familiar with the location and function of all controls and connectors.

Controls and Indicator

37 Panel views of the RIU are shown in Fig 5.

SUPPLY Switch

38 Mains power is applied to the RIU by setting the SUPPLY switch to the ON position. The front panel green LED indicator is lit when the SUPPLY switch is in the ON position.

Printer Paper-Feed Button

39 Paper can be advanced from the printer by pressing the paper-feed button on the ticket printer front panel.

LINE CURRENT Control

40 This control sets the line current of the radio under test, via the REMOTE lines. Different line current values set different radio operating modes. The application test program displays instructions on the setting of this control, which should be set to its most counter-clockwise position before tests commence.

Front Panel Connectors

41 Panel views of the RIU are shown in Fig 5.

INST A

42 Instrument A - coaxial RF output coupled and attenuated to the RF IN/OUT path on the front panel. Used typically for connection to auxiliary spectrum analyser for signal purity tests.

EXT MOD

43 Digital signal output - connected to the 2955B EXT MOD INPUT to create a modulated RF signal used for BER and system delay measurement.

AF IN

44 Audio output - provided for general AF parameter measurement (e.g. audio level, distortion factor, etc.).

AF GEN

45 Audio input - provides a connection for audio generators and sequential tone encoders used for radio audio tests.

INST B

46 Instrument B - coaxial RF input routed (via 6 dB combiner) to the RF IN/OUT connector on the front panel. Used typically for connection to secondary signal generator for intermodulation tests or carrier suppression during SSB measurements.

RF IN/OUT

47 RF input/output - provides connection to the RF test instrumentation.

ANT IN

48 Antenna input/output - provides a system RF routeing connection for the radio antenna signals.

HARNESS

49 Harness input/output - provides a connection to the system from the radio Harness connector. Each pin of the RIU HARNESS connector is brought out to test points on the front panel. These test points are in pin order, A to G, starting from the top.

AUDIO

50 Audio input/output - provides a system AF routeing connection for the radio Audio signals. Each pin of the RIU AUDIO connector is brought out to test points on the front panel. These test points are in pin order, A to G, starting from the top.

DMM

51 Digital multimeter outputs - connection facility for DMM. Application test programs instruct when to use a DMM for tests.

CONTROL

52 Control signal inputs/outputs - provides a system connection for the radio Control signals.

RF PROBE

53 RF test probe inputs - provides a system connection for an RF probe.

REMOTE

54 Remote lines inputs/outputs - provides a system connection for the audio and d.c. control signal connections to/from the radio Remote lines.

Rear Panel Connectors

55 Panel views of the RIU are shown in Fig 5.

GPIB

56 General Purpose Interface Bus - The GPIB is used internally to control the RIU and is brought out to the rear panel for connection to the peripheral equipment.

DMM HI V-Ω/Lo/HI mA

57 Outputs to Digital Multimeter (DMM) - Provides DMM connection facilities for measuring volts, current and resistance during automatic tests. Application test programs instruct when to use the DMM for tests.

DE-MOD IN

58 Demodulated input - a demodulated signal from the modulation meter within the 2955B.

RS232

59 RS232 data and control connection to the RIU computer - not implemented.

KEYBOARD

60 Keyboard connection to RIU computer - not implemented.

DISK DRIVE

61 Disk drive connection to the RIU computer - not implemented.

MONITOR

62 Monitor connection to RIU computer - not implemented.

FREQUENCY COUNTER - REF

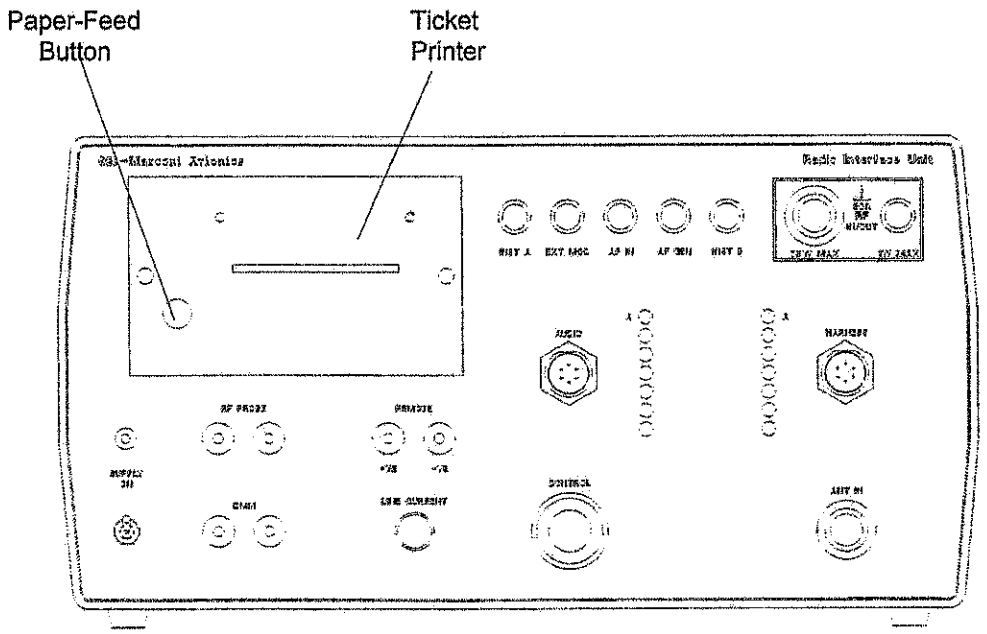
63 A 1 MHz reference frequency input from a secondary signal generator. Used in association with frequency measurements.

FREQUENCY COUNTER - INPUT

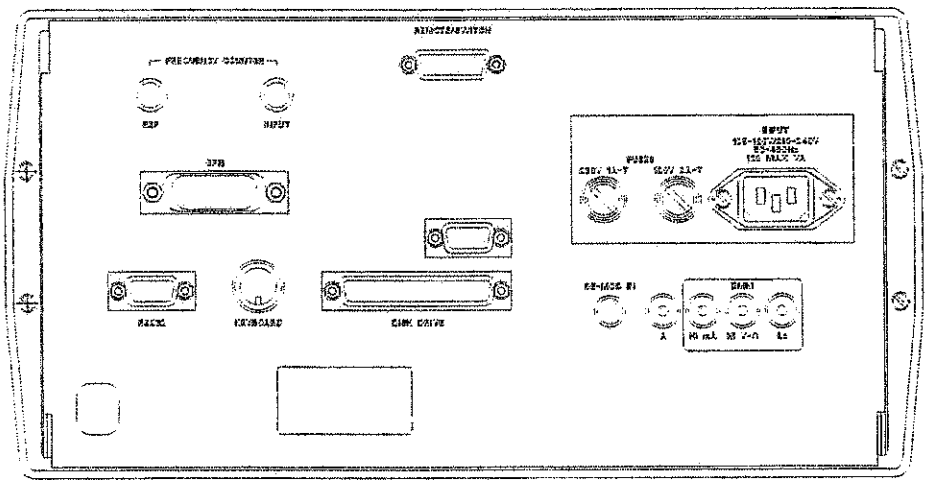
64 RF input connection for signals to be measured by the internal frequency counter.

REMOTE/SWITCH

65 Multipurpose connection from CIP - carries control signal lines from Remote Switch, HARNESS Pin B, AUDIO Pin F, Tx lamp and the CIP LINE RESISTANCE switch.



FRONT



REAR

Fig 5 RIU Panel Views

TECHNICAL DESCRIPTION

66 The following technical description covers functional descriptions for the Radio Interface Control board, Digital Data Generator board and RF Stripline board. For full functional details on the Computer Sub-assembly, GPIB Control board, Ticket Printer and Power Supply Unit proprietary items, refer to the associated manufacturer's publication.

Radio Interface Control Board - Functional Description

General

67 The Radio Interface Control (RIC) board of the RIU provides conditioning and the routeing paths for the various stimuli and measurement signals passed to/from the radio under test. Signal routeing is performed by relays mounted on the RIC board and routeing (relay) control is provided by the DDG board.

68 Test signal routeing is performed automatically by the ATP for the radio under test or manually, using the 2955B keypad (Chap 3).

69 Functionally, the RIC board provides:

69.1 Audio, Harness, Control, Keying Rate and PTT (Press to Transmit) functions.

69.2 AF and DC measurement paths.

69.3 Tx and Rx signal conditioning for bit error rate and propagation time delay measurements.

69.4 Signal routeing relay control.

69.5 Centronics connection interface for the ticket printer.

69.6 Power regulation and distribution to other parts of the RIU.

70 A functional block diagram for the RIC board is shown in Fig 6a and 6b.

Audio Attenuation - Microphone

71 The function of the audio attenuation circuit (Fig 6a) is to attenuate the AF GEN input test signal from the 2955B and route it to pins A and B of the AUDIO connector of the radio under test. The AF GEN signal, supplied to the RIC board at PL2-28/29, is routed to the attenuation circuit which provides selectable attenuation levels of 0 dB, 20 dB and 40 dB. After attenuation, the resultant signal is passed through a source/radio-matching audio transformer and resistor network and out to the radio via the RIU front panel AUDIO connector.

Harness/Remote In/Out

72 The Harness/Remote In/Out circuit (Fig 6a) provides the audio paths for various audio signals and Tx data:

72.1 Remote Lines. Audio signals from the radio at the REMOTE +VE and REMOTE -VE connectors are routed, via the remote transformer, to the AF IN front panel connector and out to the 2955B for measurement. Audio signals from the 2955B at the AF GEN connector are passed through the circuit in the opposite direction to be routed out to the REMOTE lines of radio under test.

72.2 Line Current Pot-3. A connection between the LINE CURRENT potentiometer on the front panel and the remote transformer enables the current in the REMOTE lines to be set for controlling radio operation.

72.3 Harness A and B. Audio signals generated by the 2955B at the AF GEN input to the RIU are input to the RIC board at PL2-28/29 and are routed through the remote transformer and out to the radio at pins A and B of the HARNESS connector. At another stage of the test sequence, Tx data from the DDG board is connected to the HARNESS A line and routed out to the radio. Also, +5 V is switched to the HARNESS B line to provide the Tx command for the radio.

72.4 DMM -VE and PROBE -VE. When "RF Probe On" is selected, DMM -VE and PROBE -VE are connected together.

PTT and Keying Control

73 A low frequency audio test signal supplied by the 2955B to the AF GEN connector is routed through the Harness/Remote In/Out circuit to the PTT and Keying Control circuit (Fig 6a). This circuit produces a square wave keying test signal with selectable duty cycles of 1:1 and 2:1. Signal switching relay contacts select the PTT mode and the required duty cycle. The keying signal is routed to the radio via pin F of the front panel AUDIO connector.

AF Measurement

Audio Loads

74 Audio signals from the radio on pin D of the AUDIO connector are supplied, via PL2-39, to the Audio Loads and Selection Switching circuit (Fig 6b), which selects the required radio load. The audio signal is then routed, via PL2-26/27 and the AF IN connector, to the 2955B for measurement.

Harness Loads

75 Audio signals from the radio on pins D and E of the HARNESS connector are supplied, via PL2-53 and 55, to the Harness Signals and Load Selection Switching circuit (Fig 6a). This circuit selects the required load and routes the selected signal to the 2955B for measurement via PL2-26/27 and the AF IN connector. The HARNESS D signal (unloaded) is also routed to the TTL Restoration circuit (Para 83).

+28 V Radio Supply

76 The +28 V radio supply from the radio on pin C of the AUDIO connector is supplied to the RIC board at PL2-15/37. It is then routed to the 2955B for measurement via PL2-26/27 and the AF IN connector. The +28 V radio supply is also routed to the 321 Radio Control circuit (Para 78).

Radio Supply Line Current

77 The voltage produced by the line current sensing resistor chain in the RIU is supplied to the RIC board at PL7-6 and routed, via the AF IN connector, to the 2955B for measurement.

321 Radio Control - Lines B, C, D

78 The +28 V radio supply at PL2-15/37 of the RIC board is routed to the 321 Radio Control Circuit (Fig 6a) where it is used to generate +5 V and +10 V supplies. A voltage select switching circuit routes the appropriate voltage supply to pins B, C and D of the CONTROL connector, via PL2-19/20/21 respectively.

321/353 Radio Control Switching

79 The function of the 321/353 Radio Control Switching circuit (Fig 6a) is to apply either an open circuit condition or a 0 V (ground) connection to the following control lines of the radio under test:

79.1 321 radio - Control line A.

79.2 353 radio - Control lines M, K, L, and P and Harness line F.

DC Measurement and Silent Tune Control

DC Measurement

80 The DC Measurement and Silent Tune Control circuit (Fig 6a) selects the following d.c. sources for measurement by the DMM:

80.1 321 radio control +5 V and +10 V supplies.

80.2 +28 V radio supply.

80.3 +18 V generator output for silent tune control.

80.4 Voltage across LINE CURRENT front panel control.

80.5 RF probe input.

Silent Tune Control

81 The route switching part of the DC Measurement and Silent Tune Control circuit connects the +18 V generator output to pin O of the CONTROL connector.

Data Level Changing and TTL Restoration

Data Level Changing

82 TTL digital data trains (Tx DATA) generated by the DDG board are routed to the Data Level Changing and Routeing circuit (Fig 6a) of the RIC board via PL1-9. This circuit allows digital data checks on the RT-353 radio by reducing the incoming data level to the Clansman level. The resultant signal is routed out to either the radio via HARNESS line A to modulate the radio RF as simulated transmit data, or to the 2955B, via the EXT MOD connector, to modulate the 2955B RF for transmission to the radio.

TTL Restoration

83 Simulated transmit data from the radio (Para 82) is demodulated by the 955B and passed back to the RIU at the DE-MOD IN connector. This signal is fed, via PL8-1/2, to the TTL Restoration circuit (Fig 6a) on the RIC board where TTL levels are restored. The resultant signal (Rx DATA) is routed, via PL1-25, to the DDG board for bit error rate and delay measurements. When the system is transmitting data to the radio via the 2955B (Para 82) and monitoring via the HARNESS connector, the signal is fed into the RIC board at PL2-53 and routed to the TTL Restoration circuit. Again, the resultant signal (Rx DATA) is routed back to the DDG board for bit error rate and delay measurements.

Relay Control

84 Operation of the test signal routeing relay is controlled by three control lines and an 8-bit data bus (Fig 6b) supplied by the DDG board. The three control signals (PL1-14 to 16) multiplex the 8-bit data bus (PL1-1 to 8) enabling 56 switching activities.

85 The three control lines are decoded and the selected decoder output line selects one of eight data latches, to which the data bus is connected. The data latch outputs control the relay drivers, which operate the selected signal routeing relays.

86 The Relay Control circuit provides control for all test signal routeing relays on the RIC board and the RF signal routeing relays on the RF Stripline board. Drive signals for the RF Stripline board relays are routed via RIC board connector PL7-3/5/7/8/10.

Printer Interface

87 The Printer Interface (Fig 6b) reconfigures the Centronics-type 25-way connection at PL3 of the RIC board to a 16-way connection at PL4 of the RIC board to comply with the connection requirements of the RIU ticket printer.

Power Up Reset

88 A power up reset circuit (Fig 6b) ensures that the data latches in the Relay Control circuit and the relevant components in the PTT and Keying Control circuit are in the required state after the RIC board has powered up.

DDG Board Enable Control

89 A 0 V (ground) signal (AUTO EXT ENABLE) connection at PL1-12 of the RIC board (Fig 6a) is passed to the DDG board to enable the 8 MHz clock circuit. If this connection were not made, the DDG board would be functionally inoperable.

DC Power Inputs

90 Power supply inputs of +12 V, +5 V and O V, provided by the RIU power supply unit, are applied to the RIC board (Fig 6b) at PL6-3 (+12 V), PL6-4 (+5 V) and PL6-1/5/6 (0 V).

91 +5 V supply distribution:

91.1 Vcc supply for RIC board.

91.2 To DDG board via PL1-13/26.

91.3 To PC/GPIB boards and ticket printer via PL2-1 to 9.

91.4 To "power on" led on front panel via PL2-1/2.

92 +12 V supply distribution:

92.1 To all test signal routeing relays on RIC board.

92.2 To +18 V generator on RIC board.

92.3 To +5 V reference generator on RIC board.

92.4 To +15 V generator on RIC board.

92.5 To RF Stripline board and RF Switch via PL7-9/4.

93 +5 V reference distribution:

93.1 To the Data Level Changing and Routing circuit on the RIC board.

94 +15 V distribution:

94.1 To a relay driver component in the RIC board Relay Control circuit to provide the drive for the RF Stripline board relays.

94.2 To RF Stripline board via PL7-1/4.

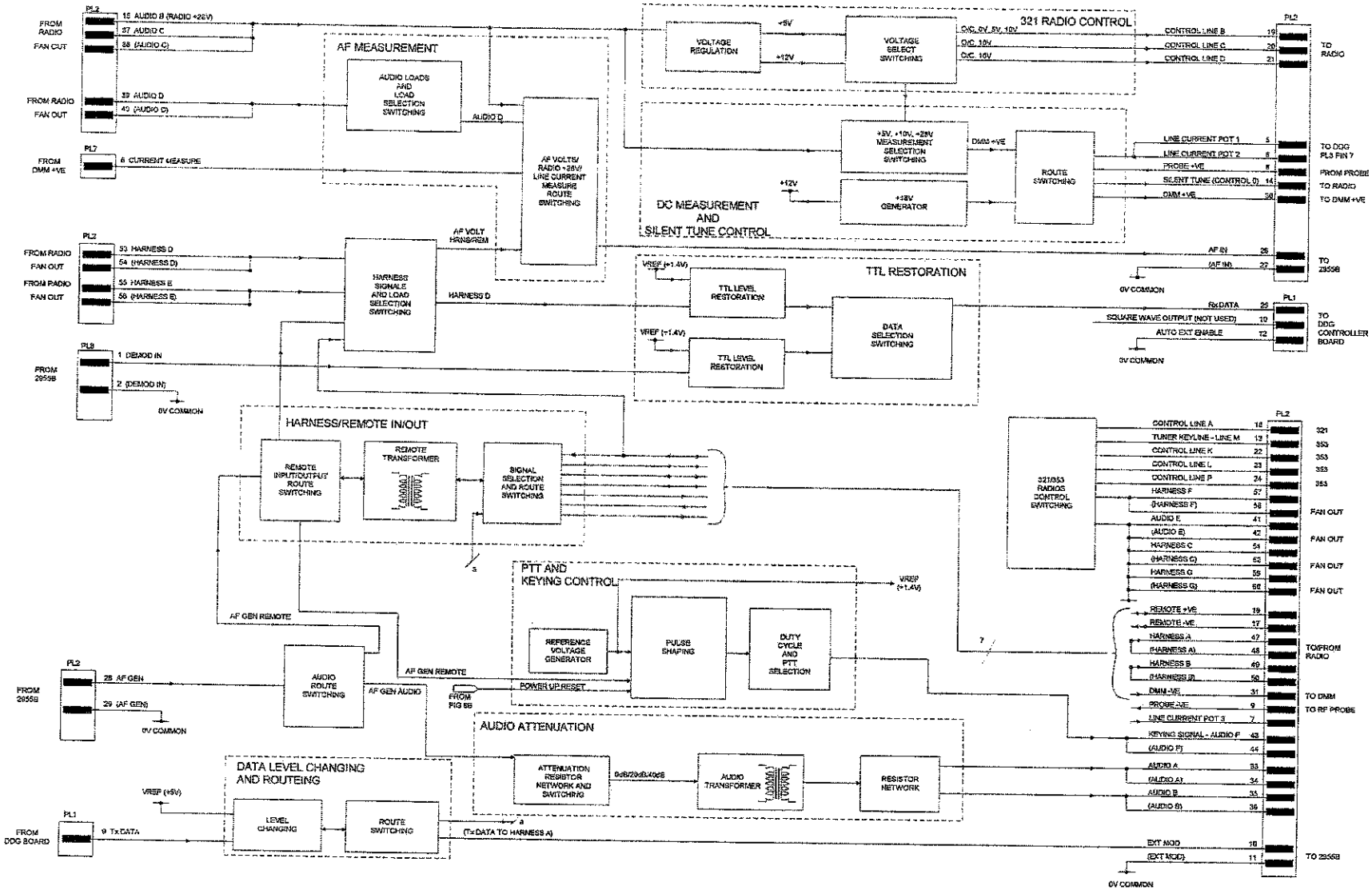


Fig 6a Radio Interface Control Board – Functional Block Diagram

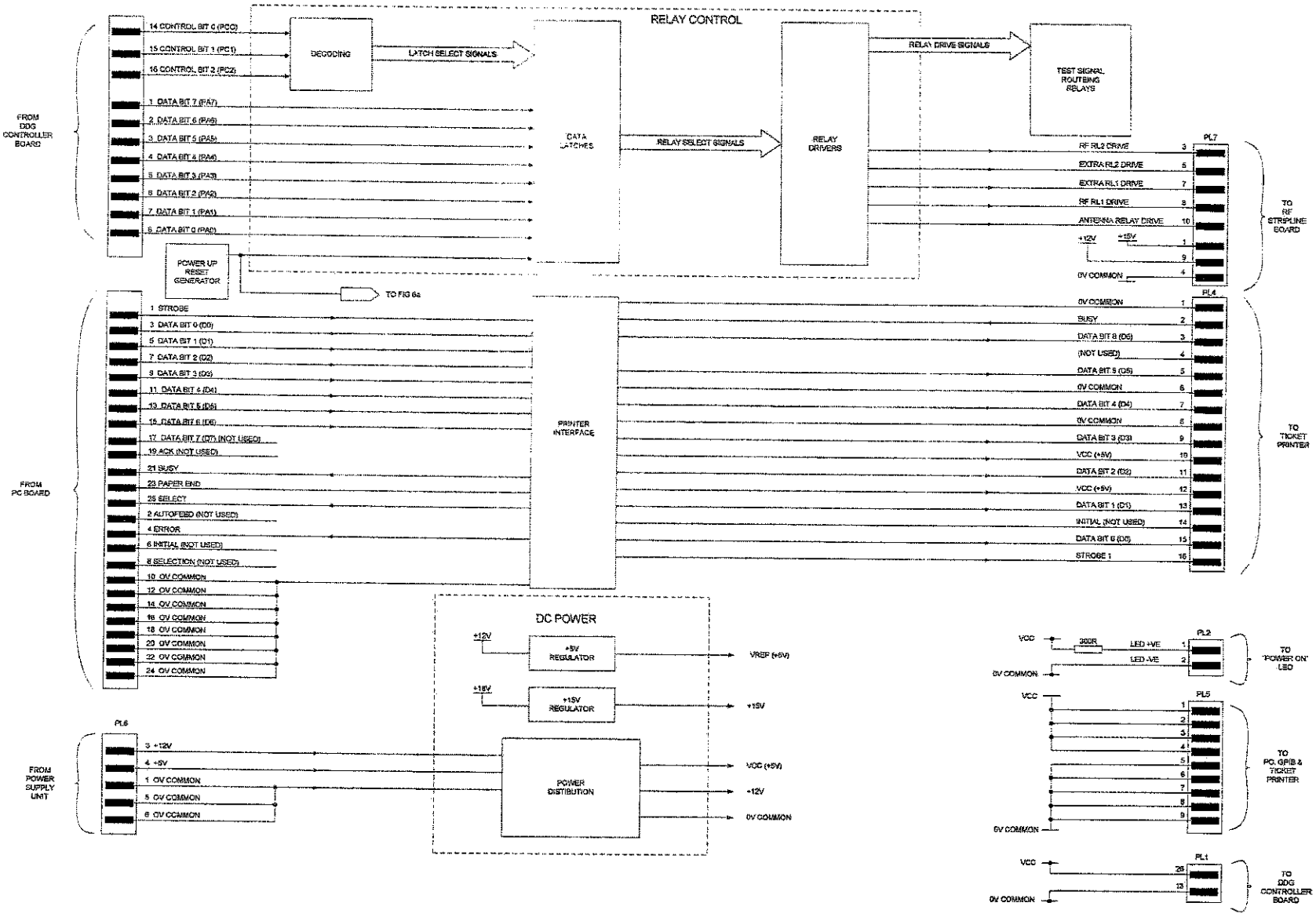


Fig 6b Radio Interface Control Board – Functional Block Diagram

Digital Data Generator Board - Functional Description

General

95 The DDG MKIV is a double Eurocard PCB located in the RIU of the 8920C Clansman Radio Test Set. The board has seven main functions:

95.1 Radio Interface Card (RIC) switching control.

95.2 Delay measurement.

95.3 Bit error rate (BER) testing.

95.4 Frequency counting.

95.5 Transmit LED control.

95.6 Audio indicator control.

95.7 GPIB interface.

96 The DDG board is controlled by commands received via the GPIB from the internal PC test program (TPG). The on-board CPU decodes the commands and executes the various board functions. A functional block diagram for the DDG board is shown on Fig 7.

RIC Control

97 The DDG board controls RIC board switching, using two external ports. Port A provides 8 output data bits for the peripherals internal to the RIC board. The lower 3 bits of Port B provides the address for these internal peripherals. Firmware on the DDG board controls the timing of the address lines and data lines.

Delay Measurements

98 Delay measurements measure the propagation delay of data through the radio. The DDG board produces a preamble output of one zero reversal patterns, which allows the radio to gain synchronisation. A 2 kHz square wave is then transmitted to the radio, and the time difference between transmitted and received data is measured.

BER Measurement

99 The most commonly used performance indicator in the testing of digital transmission systems is bit error rate (BER). The test is performed by transmitting a psuedo-random data stream over the transmission system and comparing the transmitted data with received data in order to identify bit errors. The number of errors are counted over a 1 second period and are expressed as a percentage error of the number of data bits transmitted in the 1 second period. Prior to BER testing, the transmitted and received data must be aligned with the necessary propagation delay calculated previously. Again, a preamble of one zero reversals are transmitted in order to synchronise the radio.

Frequency Counter

100 The frequency counter is designed to measure frequencies from 100 kHz to 999 kHz. In order to measure frequency, a 1 MHz reference clock must be applied at the DDG board reference input. To obtain the accuracy specified, it is suggested that a MI 2024 signal generator, or equivalent, be used for supplying the reference signal. There are two gate times available, 0.5 seconds and 5 seconds. The 0.5 seconds gate gives 6-digit performance and 2 Hz accuracy over a 1-year period, while the 5-second gate gives 7-digit performance and 1 Hz accuracy over a 1-year period.

Tx Pressel LED

101 The Pressel LED may be illuminated by the AUDIOF, HARNESSB or PRESSEL SWITCH input lines at various points in the test program. The DDG MKIV board controls the various scenarios under which the LED will be illuminated.

Audio Indicator

102 The DDG MKIV board controls the function of the audio indicator. The audio indicator becomes audible when a 'continue' function appears on the menu options for the automatic test programs. On hearing the tone, the operator responds by performing a 'continue' action.

DMM Signal Routing

103 A DMM measurement signal routing facility enables test signals from the RIC board to be routed automatically to the voltage/resistance or current measuring inputs of the DMM during automatic testing. The measurement route is selected by relay RL1, which is controlled by the application test program during automatic testing. For manual tests, the RIC board signals are routed directly to the DMM via the RIU front panel DMM connectors.

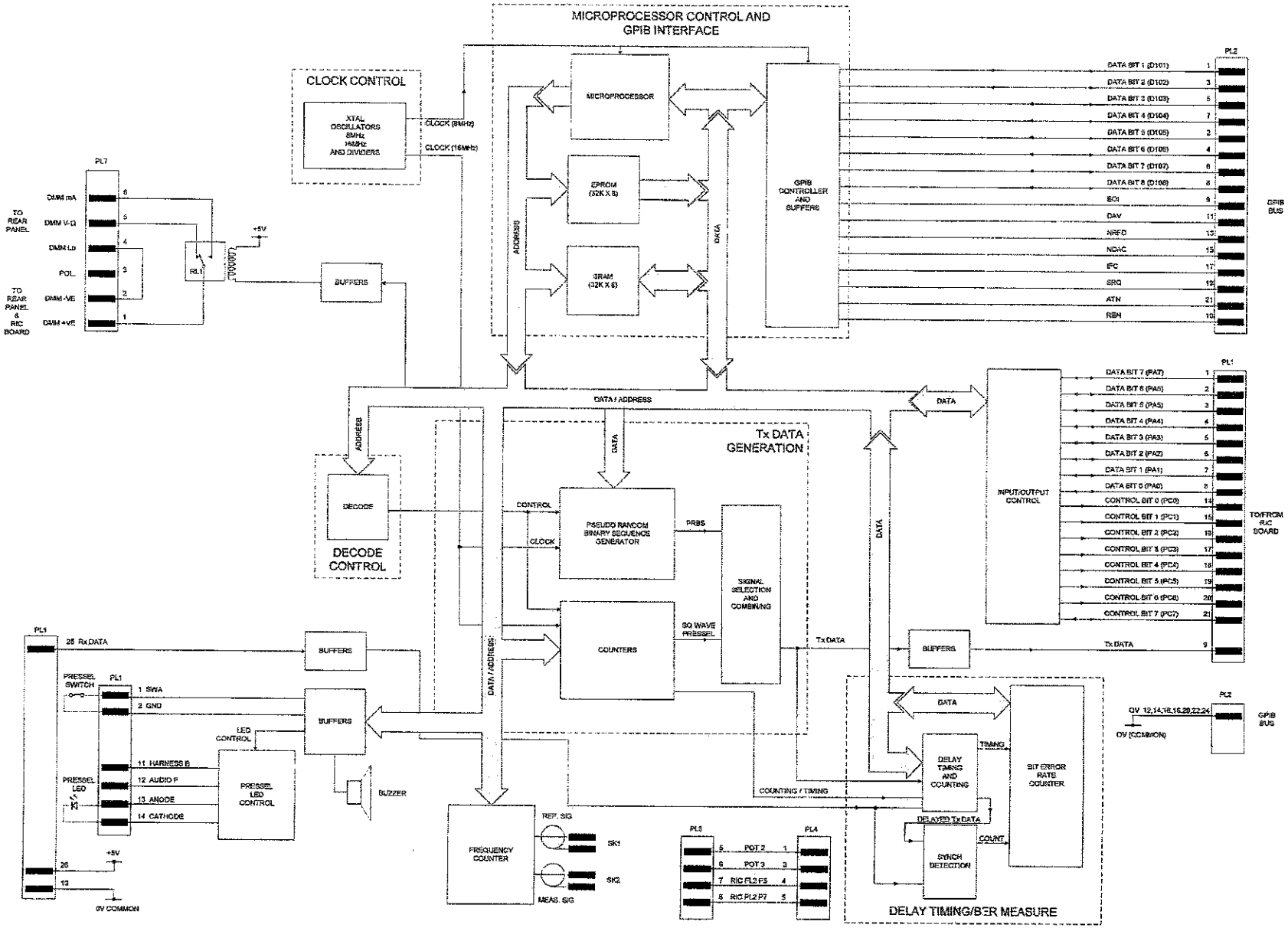


Fig 7 Digital Data Generator Board – Functional Block Diagram

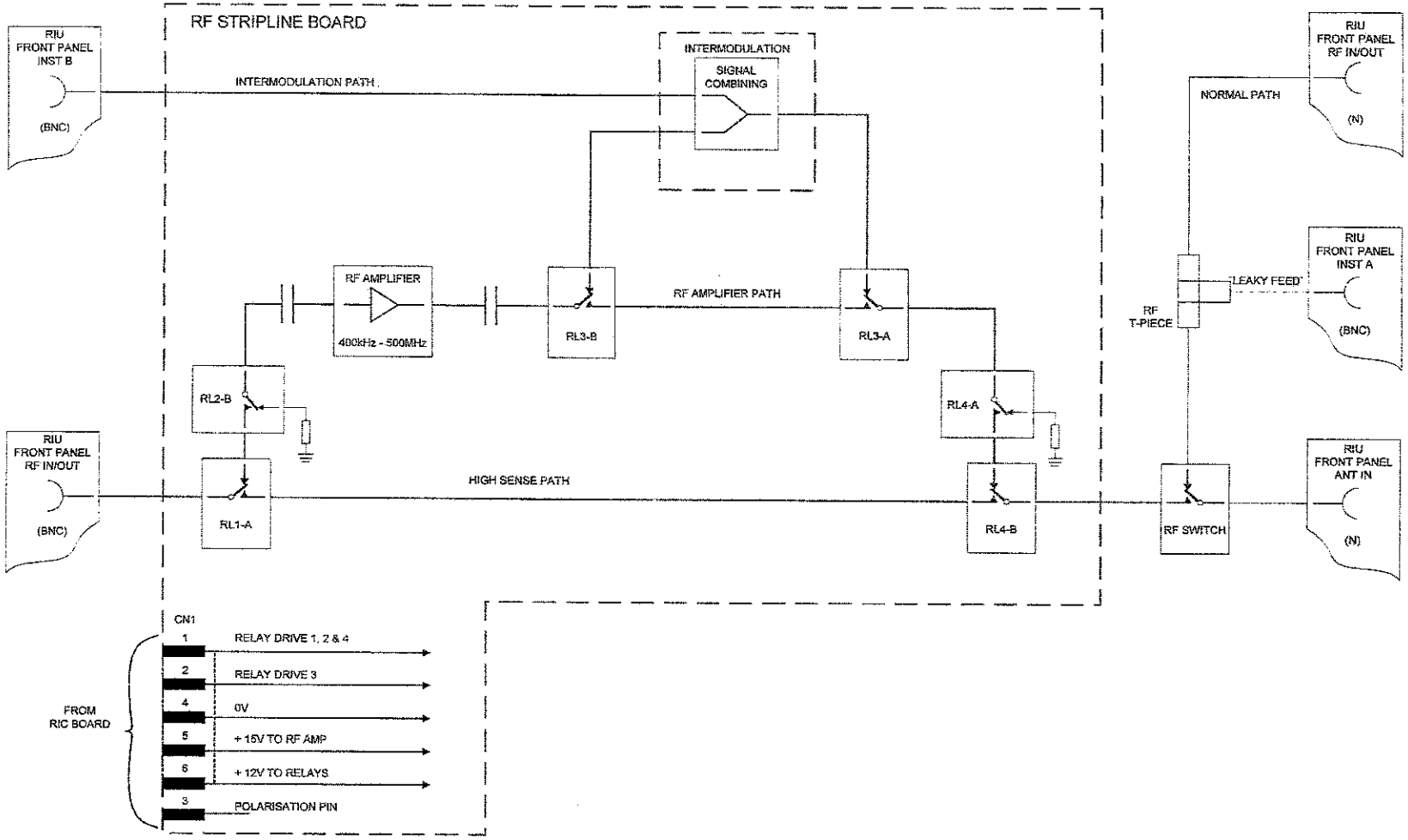


Fig 8 RF Stripline Board – Functional Block Diagram

RF Stripline Board - Functional Description

General

104 The RF Stripline board provides the RF test signal interface between the radio under test and the 2955B Radio Communications Test Set. RF signal routeing on this board is performed by relays controlled by the RIC board.

Modes of Operation

105 Functionally, the RF Stripline board has three modes of operation:

105.1 High sensitivity.

105.2 Amplification.

105.3 Intermodulation.

106 A functional block diagram of for the RF Stripline board is shown on Fig 8.

High Sensitivity Mode

107 This mode is used for low level measurements on the radio under test and provides a direct (high sense) path between the RIU ANT IN and RF IN/OUT (BNC) front panel connectors.

Amplification Mode

108 Amplifies the 2955B output at the RIU RF IN/OUT (BNC) front panel connector during receiver testing. The amplified signal is routed, via the RF Switch, to the RIU ANT IN front panel connector.

Intermodulation Mode

109 This mode is used for "adjacent channel" receiver testing of the radio under test. Relay RL2 is switched to select the signal combining circuit, which combines the amplified signal with the input signal present at the RIU INST B front panel connector. The resultant intermodulated signal is routed, via the RF Switch, to the RIU ANT IN front panel connector.

RIU Computer Sub-assembly

110 The RIU Computer Sub-assembly (IBM PC compatible) is a proprietary item and is of two-board construction. One board contains the PC computer components and the second is an expansion board containing EPROM devices, which hold the radio application test programs (ATPs).

111 As well as controlling the radio test system the PC board provides optional facilities for the connection of a disc drive, keyboard, monitor, a Centronics interface and an RS232 interface. Two batteries on the PC board are used to maintain power to the real-time clock and the RAM disc when the RIU is not powered up. When either battery fails, a warning message appears on the 2955B screen (see the ROUTINE MAINTENANCE section of this chapter).

112 For full details on the Computer Sub-assembly, refer to the manufacturer's publication (not supplied by GMAV).

GPIB Control Board

113 The GPIB Control Board is a proprietary item which converts system control data from the Computer Sub-assembly to GPIB format and vice versa. For full details on the GPIB Control Board, refer to the manufacturer's publication (not supplied by GMAV).

Ticket Printer

114 The RIU Ticket Printer is a proprietary item and is controlled by the RIU PC computer via a Centronics/ticket printer interface on the RIC board. For full details on the RIU ticket printer, refer to the manufacturer's publication (not supplied by GMAV).

Power Supply Unit

115 The RIU Power Supply Unit is a proprietary item and provides the necessary d.c. power required for RIU operation. Mains input voltage and frequency requirements are wide ranging (between 85 V a.c. to 264 V a.c. at frequencies between 47 Hz and 440 Hz) obviating the need for a 115 V/240 V selection facility.

116 The power supply outputs are:

116.1 +5.1 V @ 5 A.

116.2 +12 V @ 2 A.

116.3 -12 V @ 0.5 A.

Note ...

The -12 V output is not used by the RIU.

117 For full details on the RIU power supply unit, refer to the manufacturer's publication (not supplied by GMAV).

ROUTINE MAINTENANCE

Introduction

118 1If the Radio Interface Unit is operated within the specified environmental limits, it will give reliable service and require minimal maintenance. The following maintenance activities can be performed by the operator. A faulty unit must be returned to GEC-Marconi Avionics for repair.

Safety Precautions

119 Although this equipment has been designed and constructed in accordance with international safety standards, it is important that the safety notices in the preliminary pages of this manual are read and understood.

Replacement of Parts

120 Do not substitute parts or perform unauthorised modifications upon the equipment.

Cleaning

121 External surfaces of the equipment should be kept clean and dust free using proprietary computer cleaning products.

Mains Cable Inspection

122 Once every three months, disconnect the a.c. supply cable from the RIU rear panel mains socket and examine the cable assembly for signs of damage. Pay particular attention to the cable exits from the connectors at each end. Inspect the connectors internally for damage, tightness of electrical connection, overheating and effectiveness of the cable grip.

123 Renew the cable assembly if it is defective. Reconnect the mains cable to the a.c. supply and switch the RIU on to verify soundness of the cable connections.

Earth Continuity Testing

124 Once every twelve months, perform earth continuity tests on the RIU, as follows:

124.1 Remove the mains plug from the wall socket.

124.2 At the Robin KMP 3075 DL:

124.2.1 Set the TRAC/LOC switch to TRAC.

124.2.2 Set the right-hand selector switch to CONTINUITY (20 Ω range).

124.2.3 Set the left-hand selector switch to AUTO NULL position.

124.2.4 Short together the red and black test leads.

124.2.5 Press and release the PRESS TO TEST button (this will measure the resistance of the lead set, and store the result in memory).

124.2.6 Set the left-hand selector switch to Ω.

124.3 At the RIU, connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the chassis.

124.4 Press the PRESS TO TEST button. The true continuity measurement is displayed, with the resistance of the test leads deducted. Confirm that the measured resistance is less than 0.1 Ohms

124.5 If this test should fail, the equipment must not be operated until the fault has been cleared.

124.6 Disconnect the Robin KMP 3075 DL.

Insulation Resistance Testing

125 Once every twelve months, perform an insulation resistance test on the RIU; as follows:

125.1 Earth continuity must be verified before proceeding with the insulation resistance test.

125.2 At the RIU:

125.2.1 Remove the mains plug from the wall socket and link together the L and N pins.

125.2.2 Connect one test lead of the Robin KMP 3075 DL to the earth pin on the mains plug, and the other to the linked L and N pins.

125.2.3 Set the mains power switches to ON.

125.3 At the Robin KMP 3075 DL:

125.3.1 Set the left-hand selector switch to 500 V range.

125.3.2 Set the right-hand selector switch to INSULATION (20 MΩ range).

125.3.3 Press and hold the PRESS TO TEST button until the tester beeps. The tester should show the over range indicator.

125.4 Repeat the test, using higher insulation ranges as appropriate to take the measurement.

125.5 Verify that the measured insulation resistance is greater than 20 MΩ.

125.6 If this test should fail, the equipment must not be operated until the fault has been cleared.

125.7 Disconnect the Robin KMP 3075 DL and remove the link from the live and neutral pins.

Ticket Printer

Paper Roll Replacement

126 When replacing a paper roll, use only 57-58 mm (2.5 inch), wood free, high quality paper. Paper roll diameter must not exceed 50 mm.

127 To load a new paper roll (Fig 9), proceed as follows:

127.1 Switch off the RIU and disconnect the RIU from the mains supply.

127.2 Release the ticket printer from the RIU front panel by unscrewing the two knurled thumb-screws.

127.3 Carefully withdraw the printer assembly from the RIU front panel.

127.4 Release the paper roll spindle by removing the spindle retaining thumb-screw. Take care not to lose the nylon washer.

127.5 Withdraw the paper roll spindle and discard the old paper roll core.

127.6 Prepare the new paper roll by cutting a shallow 'arrowhead' at the leading edge as shown in Fig 9.

127.7 Install the new paper roll so that the leading edge is fed from the bottom of the roll. Place the spindle in position and secure it with the thumb-screw and nylon washer.

127.8 Straighten the first 20 mm (1 inch) of the leading edge.

127.9 Feed the paper over the paper guide bar and then, ensuring the paper is correctly centred, into the printer paper slot as far as it will go.

127.10 Refit the ticket printer to the RIU by tightening the two knurled thumb-screws.

127.11 Reconnect the mains supply and switch on the RIU.

127.12 Press the paper feed button and check that paper is fed from the paper exit slot.

127.13 The printer is now ready for use.

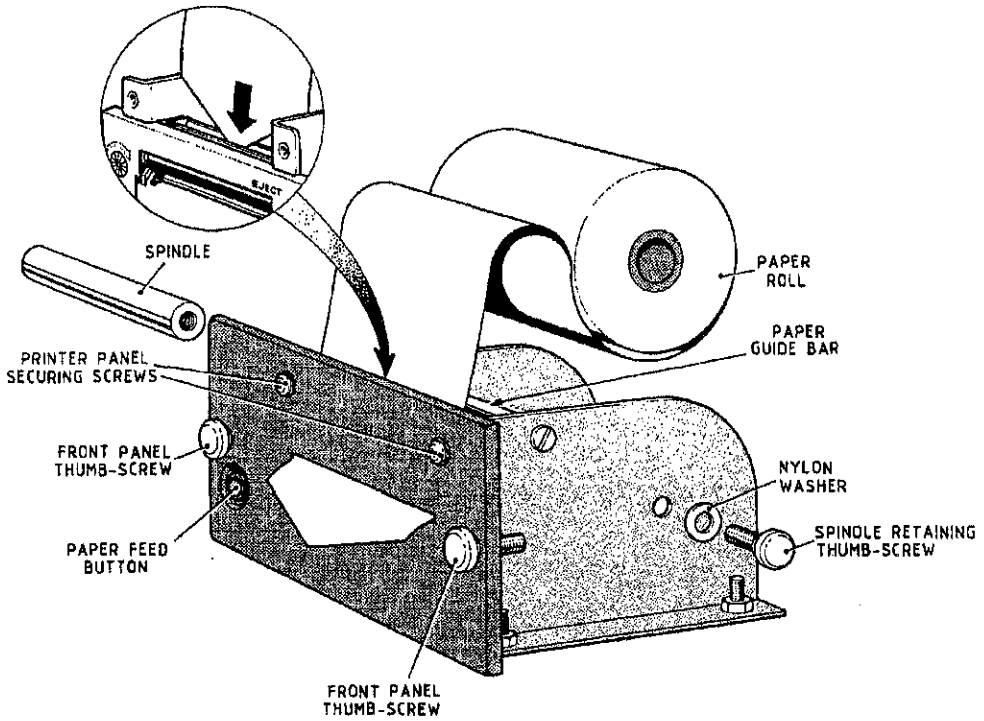


Fig 9 Paper Roll Replacement

Ribbon Cartridge Replacement

128 To replace the ticket printer ribbon cartridge (Fig 10), proceed as follows:

128.1 Switch off the RIU and disconnect the RIU from the mains supply.

128.2 Release the ticket printer from the RIU by unscrewing the two front panel knurled thumb-screws (Fig 9).

128.3 Carefully withdraw the printer assembly from the RIU front panel.

Note ...

There is no need to remove the paper roll.

128.4 Remove the two printer panel securing screws (posidrive) and washers from the printer front panel (Fig 9).

128.5 Separate the front panel from the printer assembly to reveal the printer mechanism and ribbon cartridge. Take note of the ribbon and paper arrangement.

128.6 Press on the ribbon cartridge area marked PUSH (Fig 10) until it tilts outwards. The cartridge may then be removed and discarded.

128.7 Insert the replacement ribbon cartridge, passing the ribbon through the slot, and if necessary, tension the ribbon by turning the knurled cartridge wheel in the direction indicated.

128.8 Secure the printer front panel to the printer assembly using the posidrive screws and washers previously removed.

128.9 Refit the ticket printer to the RIU by tightening the two knurled thumb-screws.

128.10 Reconnect the mains supply and switch on the RIU.

128.11 Press the paper feed button and check that paper is fed from the paper exit slot.

128.12 The printer is now ready for use.

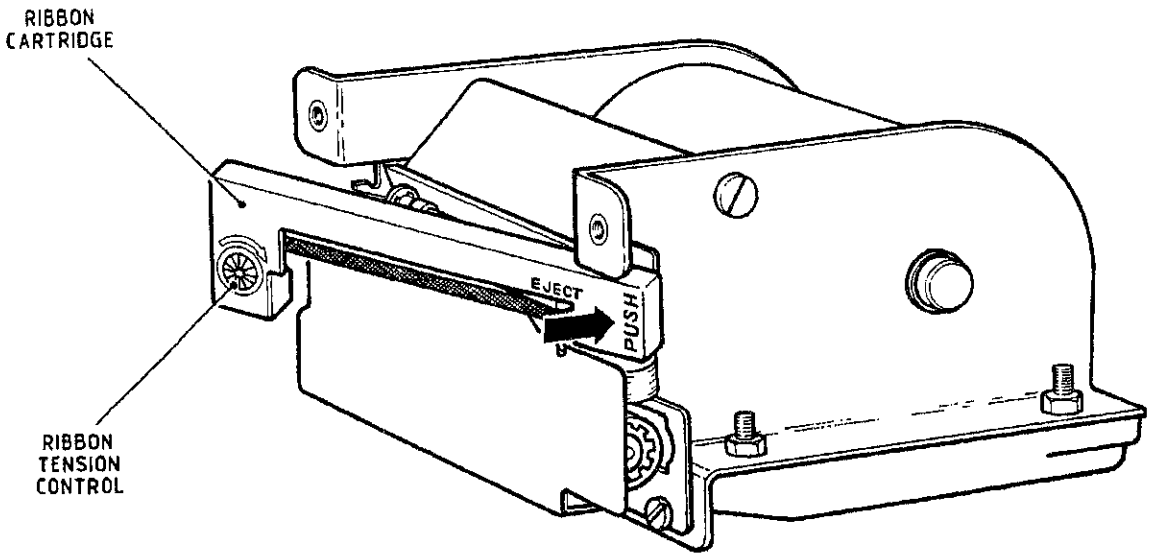


Fig 10 Ribbon Cartridge Replacement

Connecting a Centronics Printer

129 If required, the RIU can be configured for the connection of a Centronics type printer by selecting the 'Printer Type' option on the Clansman Main Menu. For details on how to do this, refer to Chapter 3, under 'Using the Printer Type Option'.

RIU Computer Batteries Replacement

130 The RIU computer sub-assembly incorporates two back-up batteries, one for the real-time clock (RTC) and one for the RAM disc (Dallas smart socket).

131 RAM disc battery failure causes the characterisation and printer configuration data to be lost. This is indicated by a warning message which appears on the 2955B screen at system power up.

132 RTC battery failure is indicated by an error message which appears on the 2955B screen during system power up

133 When either battery fails, the RIU must be sent to GEC-Marconi Avionics for battery replacement and RAM disc re-characterisation.

RIU Performance Checks

System Characterisation

134 The RIU is supplied system characterised and does not require further calibration or alignment. Parameters which vary between certain radio tests are configured by the system software.

Functional Testing

135 When installed as part of the 8920C Radio Test System, RIU operation is checked during the system self-test procedure, which is contained in Chapter 4 (SYSTEM MAINTENANCE) of this manual. A system self-test should be carried out on initial installation of the equipment and then periodically as part of the system maintenance schedule. These checks may also be used as an aid to fault diagnosis.

CHAPTER 6

CONNECTOR INTERFACE PANEL

CONTENTS

(continued)

CONTENTS (CONTINUED)

Table

Fig

INTRODUCTION

1 This chapter provides the support documentation for the GMAV Connector Interface Panel (CIP), which is designed specifically for use with the GMAV 8920C Radio Communications Test Set.

2 The CIP is used to route d.c., control and radio test signals between the 8920C test equipment and the equipment under test (EUT). Controls on the CIP enable the routes of certain test signals to be selected and to set circuit conditions for particular tests.

Construction

3 The CIP consists of a 4U high metal panel on which is mounted various types of connector and switch controls. A number of flying leads are hard-wired to some of the panel mounted components. The free ends of these leads are terminated with the appropriate connectors for connection to other equipments in the system. A metal cover is attached to the rear side of the panel to protect the panel mounted components from physical damage. The CIP is constructed such that it can be fitted directly into a 19-inch rack system. Front and plan views of the CIP are shown in Figs 1 and 2 respectively.

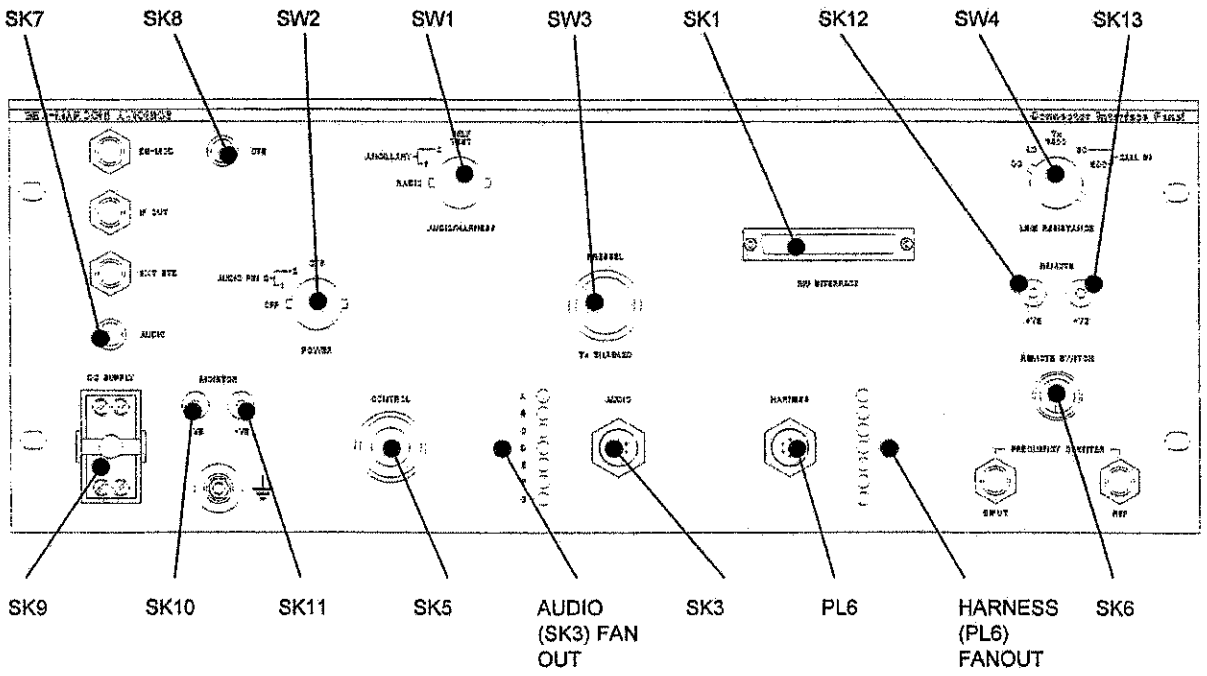


Fig 1 Connector Interface Panel - Front View

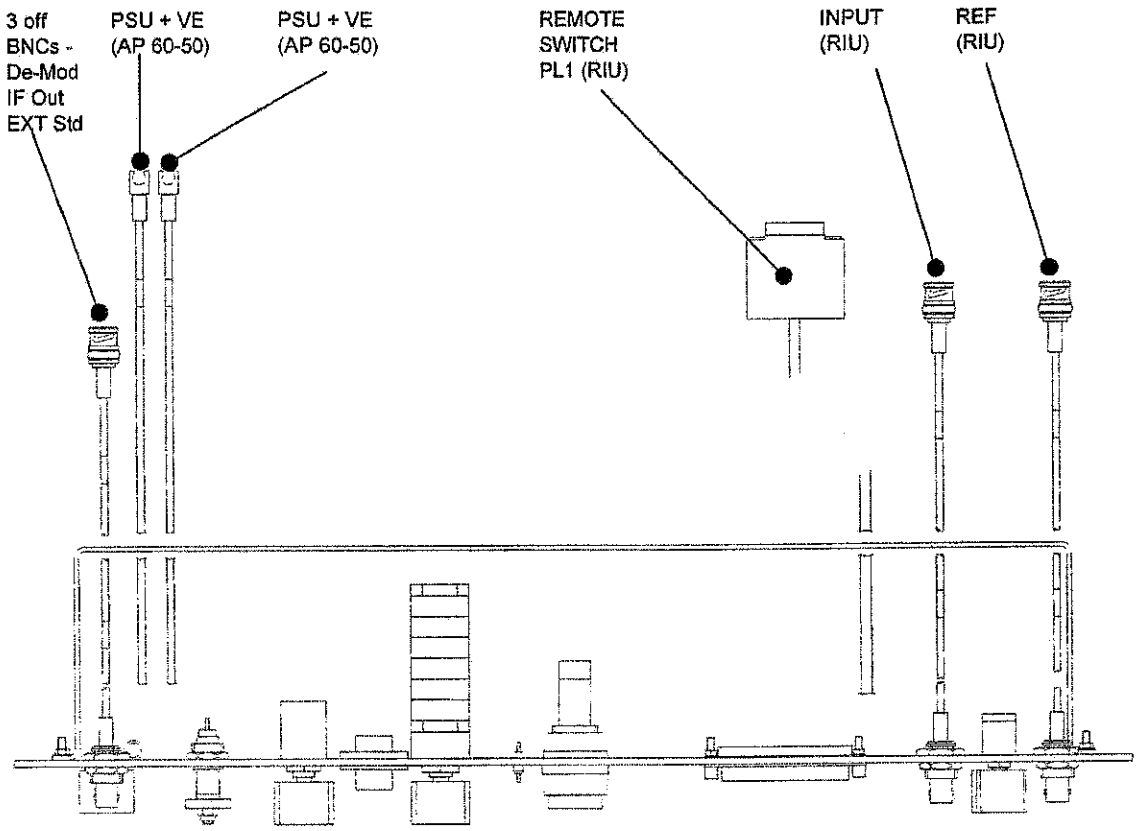


Fig 2 Connector Interface Panel - Plan View

Specification

Physical Details

4 The physical details for the CIP are as follows:

4.1	Width	: 483 mm
4.2	Height	: 177 mm
4.3	Rack Height	: 4U

Operating Environmental Conditions

5 The CIP operational conditions are as follows:

5.1	Temperature Range	: 0° C to +40° C
5.2	Relative Humidity	: 20% to 95% non-condensing

INSTALLATION

6 The CIP can be mounted in a standard 19-inch rack system (see Chapter 2), or can be used free standing.

Note ...

If the CIP is to be used free standing, it must be supported in some way (e.g. framework, angle brackets, etc.).

OPERATION

7 This section provides descriptions of the functions of the CIP controls and connectors and does not include specific operating procedures. This is because the operation of the CIP is system mode dependent, which means that the CIP can be set up in many different ways according to which test is being carried out. Test instructions for each EUT are provided in separate documents and detail the way the CIP is set up for the applicable tests.

Controls and Connectors

8 The Connector Interface Panel contains a number of system connectors and controls. The location of CIP controls and connectors are shown in Figs 1 and 2.

Controls

9 The type and function of the CIP controls are described next.

PRESSEL - Tx ENABLED Switch

10 A pushbutton switch which enables the transmit mode when operated. Illuminates (red) when operated.

Note ...

If the transmit mode is enabled with either the RF AMP or INTERMOD RF path selected, then the RF path will revert to 'normal'.

11 When this switch is pressed and held, the system activates the Tx line (Audio-F) such that the EUT sets the Tx command. Once the line goes low, the system responds by illuminating the Tx ENABLED lamp. This is achieved by monitoring both Audio-F and Harness-B. The software decides if the system configuration is safe for the EUT to enter the Tx state,

LINE RESISTANCE Switch

12 A 5-position rotary switch used during 'remote line' tests.

13 Descriptions of the function of each switch setting are as follows:

13.1 OC (Open Circuit) - Remote line d.c. condition open circuit. Audio path through remote lines still exists. Normal setting for most radio tests.

13.2 LC (Line Current) - Connects the remote line to the variable LINE CURRENT control on the RIU front panel. This allows a resistance of between 30 ohms and 500 ohms to be applied.

13.3 Tx 1400 - Connects a 1400-ohm load across the REMOTE terminals.

13.4 CALL IN - SC - Applies a short circuit condition across the REMOTE terminals.

13.5 13.5 CALL IN - 500 - Connects a 500-ohm load across the REMOTE terminals.

Note ...

To enable remote line current measurements to be carried out (switch positions LC, Tx1400, CALL IN SC and 500), the DMM must be connected to the RIU DMM sockets to complete the circuit.

POWER Switch

14 A 4-position rotary switch, used in association with ancillary equipment tests.

15 Descriptions of the function of each switch setting are as follows:

15.1 OFF - Normal setting for radio testing. Enables the EUT supply current to be monitored on the DMM via the CIP MONITOR banana sockets. Supply current is measured by measuring the voltage across a current sensing resistor located inside the radio power cable connector.

15.2 AUDIO PIN C-1 - Connects d.c. power from the DC SUPPLY connector to pin C of the CIP AUDIO connector. Also, the REMOTE +VE and -VE sockets are connected to Harness-A and Harness-B respectively, in conjunction with the AUDIO/HARNESS switch. For certain ancillaries, a low impedance audio drive is required and is applied directly from the 2955B to the BNC AUDIO connector, via the POWER switch, and then to Harness-A. The AUDIO/HARNESS switch is also used to create this path.

15.3 AUDIO PIN C-2 - Connects d.c. power from the DC SUPPLY connector to pin C of the CIP AUDIO connector. For certain ancillaries, a low impedance audio drive is required and is applied directly from the 2955B to the BNC AUDIO connector, via the POWER switch, and then to Harness-A. The AUDIO/HARNESS switch is also used to create this path.

15.4 CTS - Connects d.c. power from the DC SUPPLY connector to the CTS socket. Provides a d.c. stimulus required by the Condition Test Set ancillary equipment.

AUDIO/HARNESS Switch

16 A 4-position rotary switch, used in association with radio and ancillary equipment tests.

17 Descriptions of the function of each switch setting are as follows:

17.1 RADIO - Normal setting for radio testing. All EUT connections from the RIU front panel are duplicated on the CIP. This allows for the seven radio types to be tested either automatically or manually.

17.2 ANCILLARY-1 - Signals from the RIU are switched to allow for testing of ancillary equipment. All EUT connections from the RIU front panel are duplicated on the CIP, apart from Audio-A and Audio-B which are reversed with Audio-D and Audio-E, and Harness-A and Harness-B which are reversed with Harness-D and Harness-E. This is because the audio paths are reversed for ancillary items (i.e. A-A to A-D, A-B to A-E, and H-A to H-D, H-B to H-E).

17.3 ANCILLARY-2 - As per ANCILLARY-1 (Para 17.2), but with the addition of the REMOTE +VE and -VE sockets being connected to Harness-A and Harness-B respectively. See also AUDIO PIN C-2 (Para 15.3).

17.4 SELF TEST - Configures the CIP wiring connections such that the signal paths are 'wrapped back' to allow the self test to be carried out.

Connectors

18 Descriptions of the CIP connectors and the signals they carry are given below.

DC SUPPLY Socket

19 An 8-way polarised socket providing d.c. power from the PSU to the EUT.

Earth (⏚) Terminal

20 A common earthing point, provided to minimise earth loop problems.

MONITOR +VE and -VE Sockets

21 These sockets connect the DMM to the current-sense resistors contained either within the CIP (1 ohm) or the EUT d.c. power cables.

DE-MOD Socket

22 This BNC connector provides access to the demodulated output from the modulation meter within the 2955B.

IF OUT Socket

23 A 110 kHz ±10 kHz IF signal (internally supplied from the 2955B) for external use.

EXT STD Socket

24 Provision for the connection of a 1 MHz frequency standard (routed to the 2955B). This signal is automatically phase-locked to the 2955B internal standard.

AUDIO Socket (BNC)

25 Used to supply AF from the 2955B AF GEN OUTPUT (< 5 ohms impedance) socket to the CIP AUDIO and HARNESS lines.

CTS Socket

26 Provides d.c. power for use by the Condition Test Set ancillary equipment. The d.c. power is available only when the CIP POWER switch is in the CTS position.

CONTROL, AUDIO and HARNESS Sockets

27 Provides system connections for the EUT CONTROL, AUDIO, and HARNESS signals. These lines are passed through the CIP to the RIU connectors of the same name via the CIP RIU INTERFACE connector. The lines are configured for radios, ancillaries, and self-test operations by the CIP POWER and AUDIO/HARNESS switches.

FREQUENCY COUNTER - INPUT and REF Sockets

28 The FREQUENCY COUNTER sockets are used for connection to the 8920C frequency counting facility.

28.1 INPUT socket - Signal input connection for frequency measurement.

28.2 REF socket - For connection of a reference signal input (1 MHz, +7 dBm from GFE signal generator).

REMOTE +VE and -VE Sockets

29 Provides a system connection for the EUT remote line signals. The remote lines are routed to the RIU REMOTE +VE & -VE sockets via the CIP LINE RESISTANCE switch (Para 12) and the RIU INTERFACE connector.

REMOTE SWITCH Socket

30 For connection of a remote pushbutton switch. In automatic test mode, this switch may be selected for use to remotely 'continue' the test program. In manual mode this switch may be used as a remote Pressel switch.

RIU INTERFACE Socket

31 Routes the CONTROL, AUDIO, HARNESS, and REMOTE signal lines to the RIU front panel connectors of the same name.

FUNCTIONAL TESTS

32 The following functional tests may be carried out periodically as a general performance check, and should be carried out if CIP operation is suspect.

33 The CIP functional tests consist of continuity/resistance measurements of this signal connection paths through the CIP circuitry and an operational test of the PRESSEL switch Tx ENABLED l.e.d.

34 Pinout functions for the CIP connectors and a CIP wiring diagram (Fig 3, Sheets 1 to 4) are provided in this section to aid functional testing and general wiring repairs.

Test Equipment

35 The test equipment required for carrying out the functional tests is listed in Table 1.

TABLE 1 TEST EQUIPMENT

Item	Description	Use
1	Digital Multimeter - Resistance measurement capability of 0 ohms to 10 M ohms D.C.	Continuity/Resistance tests
2	Power Supply +5 V ±5%, 1 A	Tx ENABLED l.e.d. tests

Continuity/Resistance Tests

Definition of Terms

36 The definition of terms for continuity/resistance measurements are as follows:

36.1 Short Circuit = <5 ohms.

36.2 Open Circuit = >1 M ohm.

AUDIO/HARNESS Switch - AUDIO Routeing Paths

37 Verify that a short circuit condition exists between AUDIO connector SK3 and the following for the AUDIO/HARNESS switch positions given.

TABLE 2 AUDIO/HARNESS SWITCH - AUDIO ROUTEING PATHS

Signal	Source	Destination for Switch Position			
		RADIO	ANCILLARY 1	ANCILLARY 2	SELF TEST
AUDIO A	SK3-A	SK1-4	SK1-7	-	SK1-2 SK1-4 SK1-31 SK13
AUDIO B	SK3-B	SK1-5	SK1-8	-	SK1-1 SK1-5 SK1-30 SK1-12
AUDIO C	SK3-C	SK1-6	SK1-6	SK1-21 SK1-25 SK5-B SK5-L	SK1-6 SK1-17 SK1-27
AUDIO D	SK3-D	SK1-7	SK1-4	SK7 when SW2 set to AUDIO PIN C-1	SK1-7 SK1-14 SK1-29
AUDIO E	SK3-E	SK1-8	SK1-5	-	SK1-8
AUDIO F	SK3-F	SK1-9	-	-	SK1-9 SK1-18
AUDIO G	SK3-G	SK3-D	SK3-D	SK3-D	SK3-D

AUDIO/HARNESS Switch - HARNESS Routeing Paths

38 Verify that a short circuit condition exists between HARNESS connector PL6 and the following for the AUDIO/HARNESS switch positions given.

TABLE 3 AUDIO/HARNESS SWITCH - HARNESS ROUTEING PATHS

Signal	Source	Destination for Switch Position			
		RADIO	ANCILLARY 1	ANCILLARY 2	SELF TEST
HARNESS A	PL6-A	SK1-4	SK7 when SW2 set to AUDIO PIN C-2	SK12 when SW2 set to AUDIO PIN C-1	SK1-7
HARNESS B	PL6-B	SK1-15	SK1-18	SK13 when SW2 set to AUDIO PIN C-1	SK1-15 (10 kΩ ±10%) to SK1-18
HARNESS C	PL6-C	SK1-16	SK1-16	SK1-16	SK1-16
HARNESS D	PL6-D	SK1-17	SK1-14	SK1-7	SK1-27
HARNESS E	PL6-E	SK1-18	SK1-15	-	SK1-18
HARNESS F	PL6-F	SK1-19	SK1-19	-	SK1-19 SK1-20 SK1-22
HARNESS G	PL6-G	-	-	-	-

AUDIO/HARNESS Switch - CONTROL Routeing Paths

39 Verify that a short circuit condition exists between CONTROL connector SK5 and the following for the AUDIO/HARNESS switch positions given.

TABLE 4 AUDIO/HARNESS SWITCH - CONTROL ROUTEING PATHS

Signal	Source	Destination for Switch Position			
		RADIO	ANCILLARY 1	ANCILLARY 2	SELF TEST
CONTROL B	SK5-B	-	-	PL1-11 when SW2 set to CTS	-
CONTROL D	SK5-D	-	-	-	SK1-24 SK1-25 SK1-26

POWER Switch - DC SUPPLY, REMOTE, MONITOR Routeing Paths

40 Verify that a short circuit condition exists between DC SUPPLY connector SK9, REMOTE connectors SK12 and SK13, MONITOR connectors SK10 and SK11 and the following for the POWER switch positions given.

TABLE 5 POWER SWITCH - DC SUPPLY, REMOTE, MONITOR ROUTEING PATHS

Signal	Source	Destination for Switch Position			
		OFF	AUDIO PIN C-1	AUDIO PIN C-2	CTS
PSU +VE	SK9-4	-	SK3-C (via 1Ω)	SK3-C (via 1Ω)	SK8 (inner)
PSU -VE	SK9-1	-	SK3-E, SK7 (outer)	SK3-E, SK7 (outer)	SK3-E, SK7 (outer)
REMOTE +VE	SK12	-	-	-	SK5-K
REMOTE -VE	SK13	-	-	-	SK5-H
MONITOR +VE	SK10	SK9-5	SK9-4*	SK9-4*	-
MONITOR -VE	SK11	SK9-1	SK3-C*	SK3-C*	-

* = 1 Ω between SK9-4 and SK3-C in this position.

LINE RESISTANCE Switch - REMOTE/SWITCH Routeing Paths

41 Verify that the following resistances exist between pins 4 and 12 of REMOTE/SWITCH connector PL1 (flying lead) for the LINE RESISTANCE switch positions given.

Note ...

With the switch set at LC, PL1-4 connects to PL1-3, and PL1-12 connects to PL1-11.

TABLE 6 LINE RESISTANCE SWITCH - REMOTE/SWITCH ROUTEING PATHS

Socket	Destination for Switch Position				
	OC	LC	Tx 1400	CALL IN - SC	CALL IN - 500
PL1-4	Open Circuit	PL1-3	1500 Ω ±10%	Short Circuit	470 Ω ±10%
PL1-12	Open Circuit	PL1-11	1500 Ω ±10%	Short Circuit	470 Ω ±10%

CONTROL Links

42 Verify that a short circuit condition exists between the following:

SK5-A	to	SK1-20
SK5-B	to	SK1-21
SK5-C	to	SK1-22
SK5-D	to	SK1-23
SK5-K	to	SK1-24
SK5-L	to	SK1-25
SK5-M	to	SK1-26
SK5-O	to	SK1-27
SK5-P	to	SK1-28
SK5-S	to	SK1-29
SK5-E	to	SK1-30
SK5-H	to	SK1-31

AUDIO and HARNESS Links

43 Verify that a short circuit condition exists between the following:

PL1-6	to	PL6-B
PL1-14	to	SK3-F

AUDIO/HARNESS Fanout

44 Verify that a short circuit condition exists between AUDIO connector SK3 and the AUDIO fanouts, and similarly for HARNESS connector PL6 and the HARNESS fanouts.

PSU Links

45 Verify that a short circuit condition exists between the following:

SK9-1	to	SK9-2
SK9-3	to	SK9-4
SK9-5	to	SK9-6 to SK9-7 to SK9-8
SK9-4	to	PL4 (flying lead)
SK9-1	to	PL5 (flying lead)

PRESSEL Switch

46 Verify that when the PRESSEL switch (SW4) is pressed and held, a short circuit exists between the following, and that an open circuit condition exists when the switch is released:

SK6-1	to	SK6-4
PL1-1	to	PL1-9

PRESSEL Switch Tx ENABLED Indicator Test

47 Connect a +5 V d.c. supply (Table 1, Item 2) to PLI-7 with respect to PL1-15. The Tx ENABLED indicator should be illuminated.

MAINTENANCE

Introduction

48 The CIP requires no maintenance of a routine kind, apart from periodic cleaning of the front of the panel with proprietary cleaning products.

49 The repair policy for the CIP is defined as; all repairs involving general wiring, connector replacement (pins broken or pushed back, etc) and flying leads may be carried out locally. However, for any repairs which involve the replacement of a rotary switch assembly (due to an open circuit path), the CIP should be returned to the manufacturer for repair.

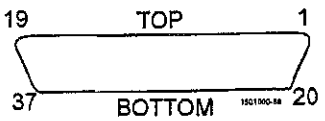
50 Pinout functions for the CIP connectors and a CIP wiring diagram (Fig 3, Sheets 1 to 4) are provided in this section to aid functional testing (Para 32) and general wiring repairs.

Connector Pinout Functions

51 The connector pinout diagrams are viewed from the front of the CIP panel.

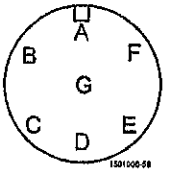
SK1 - RIU INTERFACE

PIN	FUNCTION
SK1-1	REMOTE +VE
SK1-2	REMOTE -VE
SK1-4	AUDIO A
SK1-5	AUDIO B
SK1-6	AUDIO C
SK1-7	AUDIO D
SK1-8	AUDIO E
SK1-9	AUDIO F
SK1-14	HARNESS A
SK1-15	HARNESS B
SK1-16	HARNESS C
SK1-17	HARNESS D
SK1-18	HARNESS E
SK1-19	HARNESS F
SK1-20	CONTROL A
SK1-21	CONTROL B
SK1-22	CONTROL C
SK1-23	CONTROL D
SK1-24	CONTROL K
SK1-25	CONTROL L
SK1-26	CONTROL M
SK1-27	CONTROL O
SK1-28	CONTROL P
SK1-29	CONTROL S
SK1-30	CONTROL E
SK1-31	CONTROL H



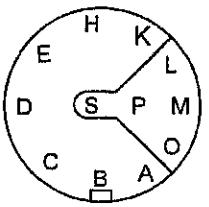
SK3 - AUDIO

PIN	FUNCTION
SK3-A	AUDIO A
SK3-B	AUDIO B
SK3-C	AUDIO C
SK3-D	AUDIO D
SK3-E	AUDIO E
SK3-F	AUDIO F



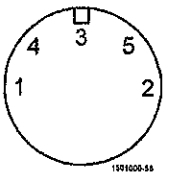
SK5 - CONTROL

PIN	FUNCTION
SK5-A	CONTROL A
SK5-B	CONTROL B
SK5-C	CONTROL C
SK5-D	CONTROL D
SK5-K	CONTROL K
SK5-L	CONTROL L
SK5-M	CONTROL M
SK5-O	CONTROL O
SK5-P	CONTROL P
SK5-S	CONTROL S
SK5-E	CONTROL E
SK5-H	CONTROL H



SK6 - REMOTE SWITCH

PIN	FUNCTION
SK6-1	SWITCH (A)
SK6-2	(Spare)
SK6-3	(Spare)
SK6-4	SWITCH (GND)
SK6-5	(Spare)



SK7 - AUDIO (BNC)

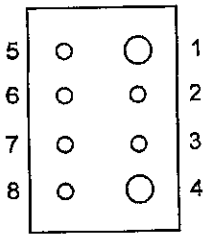
PIN	FUNCTION
SK7	2955B AF OUT

SK8 - CTS (BNC)

PIN	FUNCTION
SK7	PSU +VE

SK9 - DC SUPPLY

PIN	FUNCTION
SK9-1	PSU -VE
SK9-2	PSU -VE
SK9-3	PSU +VE
SK9-4	PSU +VE
SK9-5	I SENSE
SK9-6	I SENSE
SK9-7	I SENSE
SK9-8	I SENSE



SK10 - MONITOR +VE

PIN	FUNCTION
SK10	MONITOR +VE

SK11 - MONITOR -VE

PIN	FUNCTION
SK11	MONITOR -VE

SK12 - REMOTE +VE

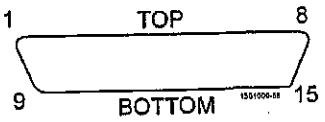
PIN	FUNCTION
SK12	REMOTE +VE

SK13 - REMOTE -VE

PIN	FUNCTION
SK13	REMOTE -VE

PL1 - REMOTE/SWITCH (FLYING LEAD)

PIN	FUNCTION
PL1-1	SWITCH (A)
PL1-2	(Spare)
PL1-3	POT 2
PL1-4	RIC PL2-5
PL1-5	(Spare)
PL1-6	HARNESS B
PL1-7	LED ANODE
PL1-8	(Spare)
PL1-9	SWITCH (GND)
PL1-10	(Spare)
PL1-11	POT 3
PL1-12	RIC PL2-7
PL1-13	(Spare)
PL1-14	AUDIO F
PL1-15	LED CATHODE



PL4 - PSU +VE (FLYING LEAD)

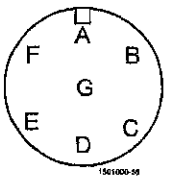
PIN	FUNCTION
PL4	PSU +VE

PL5 - PSU -VE (FLYING LEAD)

PIN	FUNCTION
PL5	PSU -VE

PL6 - HARNESS

PIN	FUNCTION
PL6-A	HARNESS A
PL6-B	HARNESS B
PL6-C	HARNESS C
PL6-D	HARNESS D
PL6-E	HARNESS E
PL6-F	HARNESS F
PL6-G	NOT USED



CIP Wiring Information

52 Interconnection wiring information for the CIP is provided in Fig 3, sheets 1 to 4.

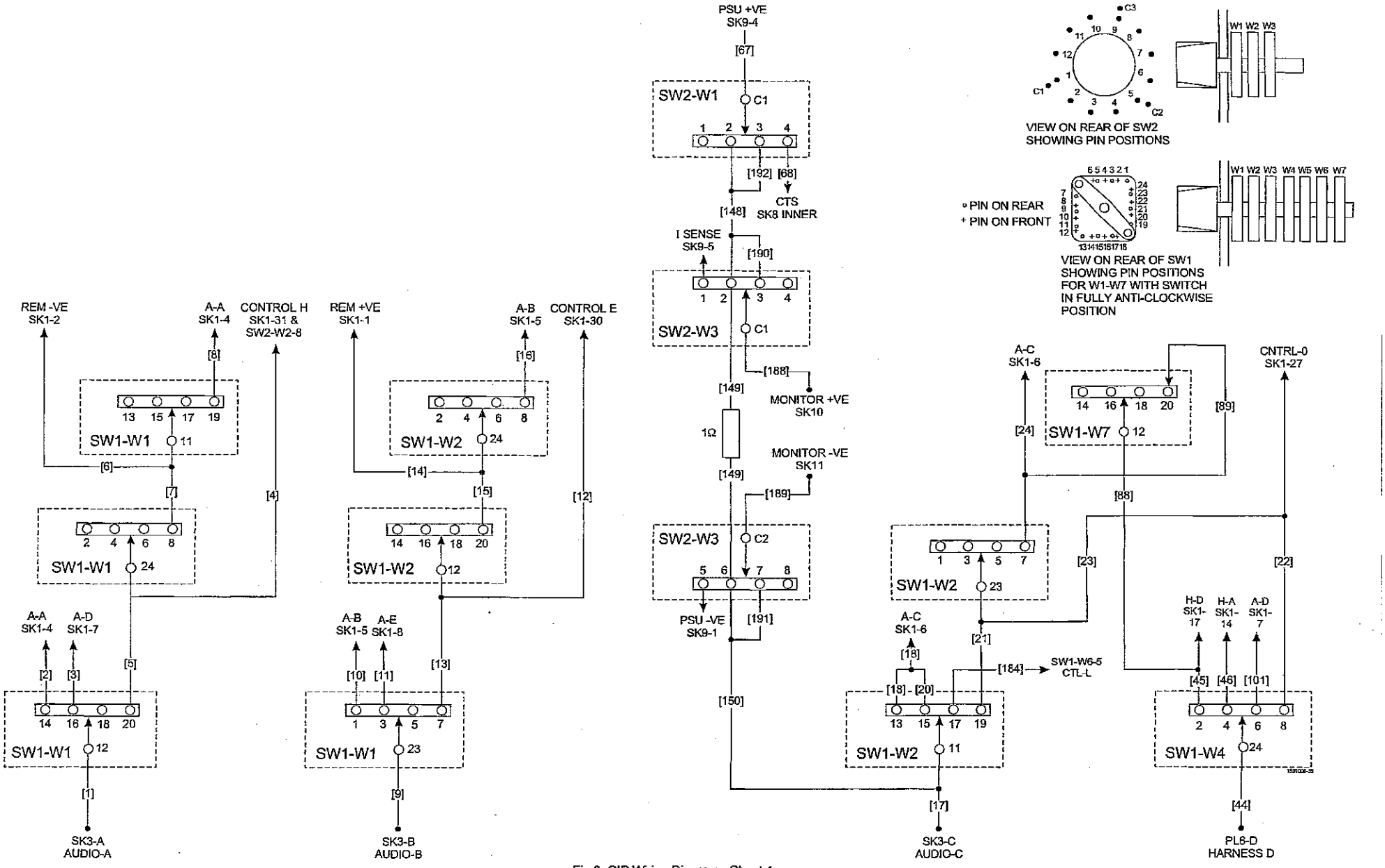


Fig 3 CIP Wiring Diagram - Sheet 1

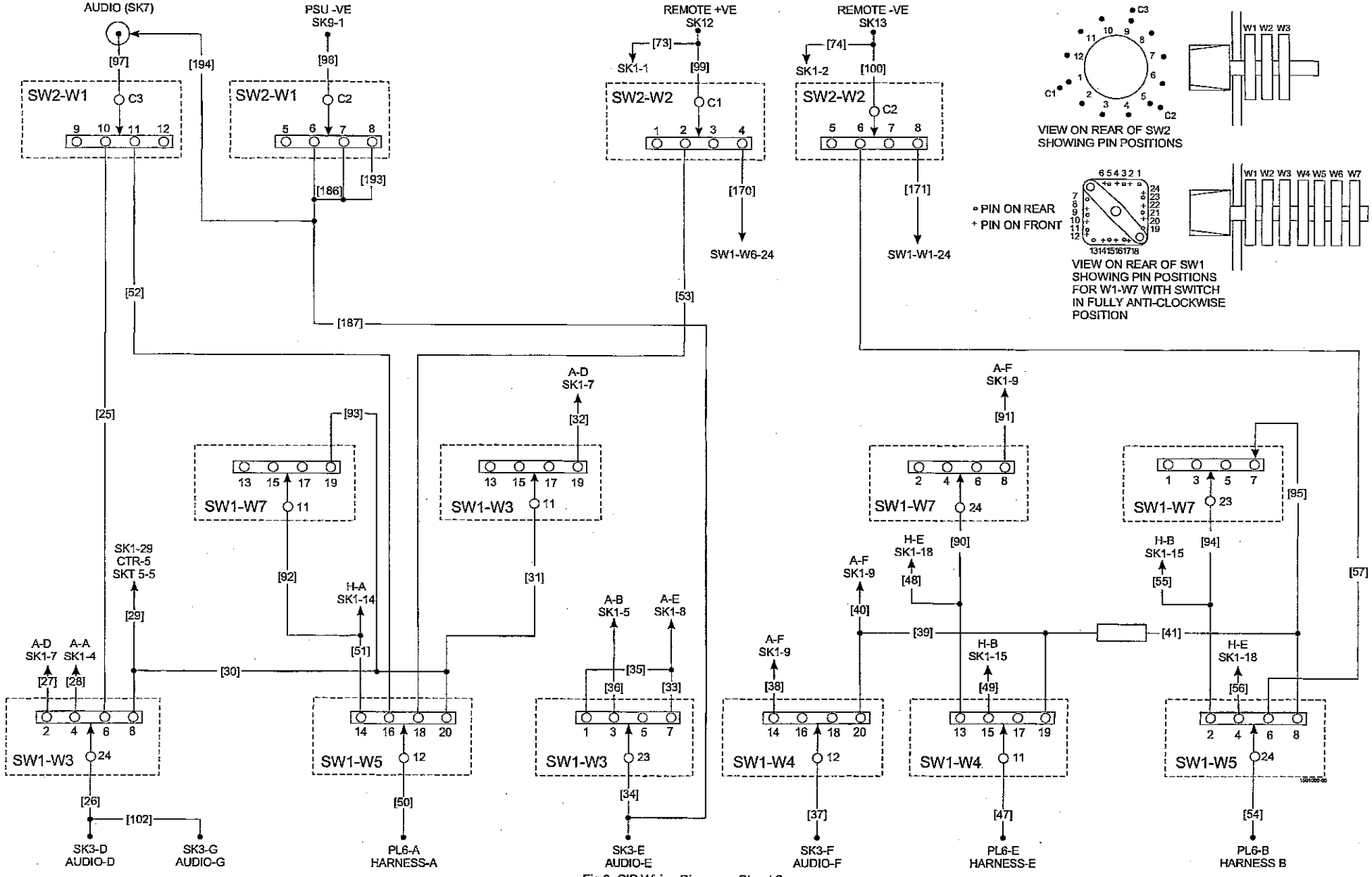
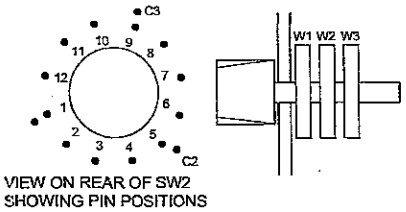
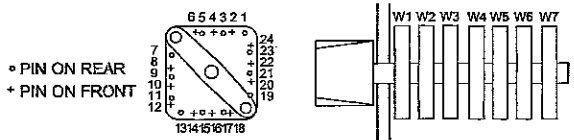


Fig 3 CIP Wiring Diagram - Sheet 2



VIEW ON REAR OF SW2
SHOWING PIN POSITIONS



VIEW ON REAR OF SW1
SHOWING PIN POSITIONS
FOR W1-W7 WITH SWITCH
IN FULLY ANTI-CLOCKWISE
POSITION

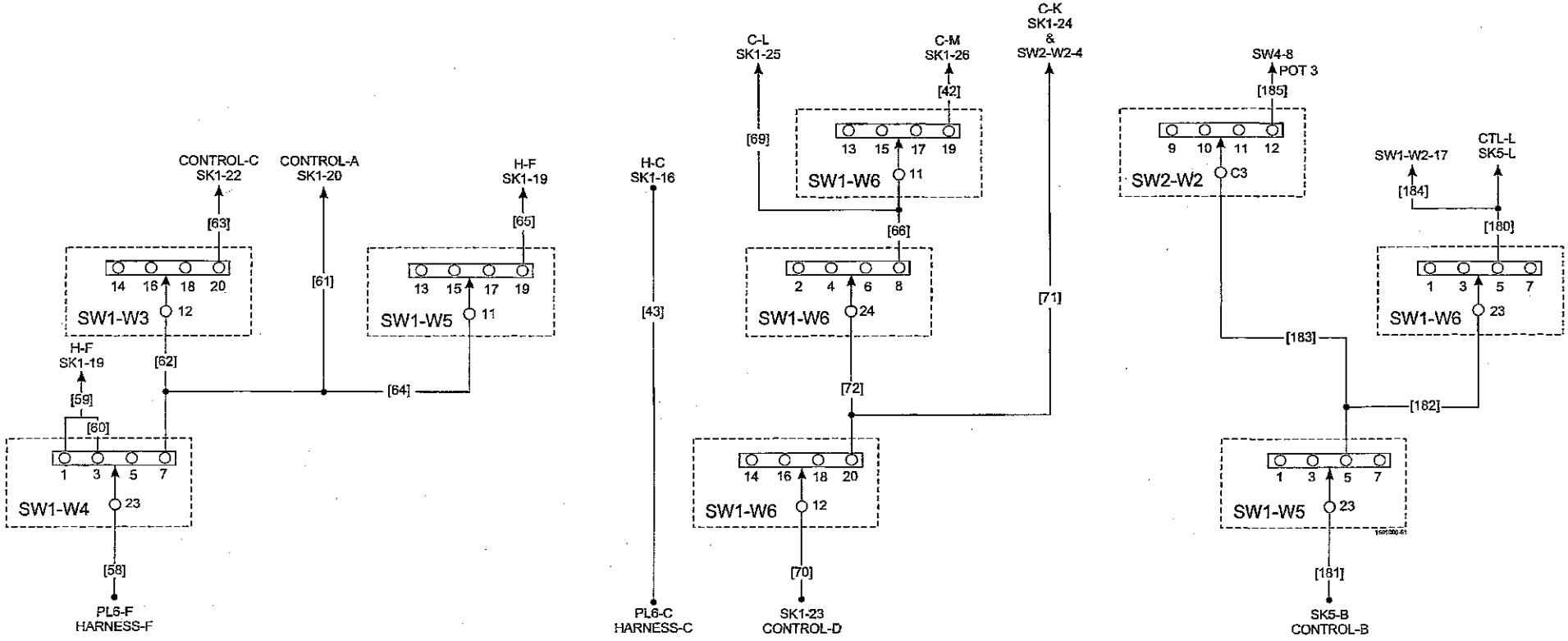
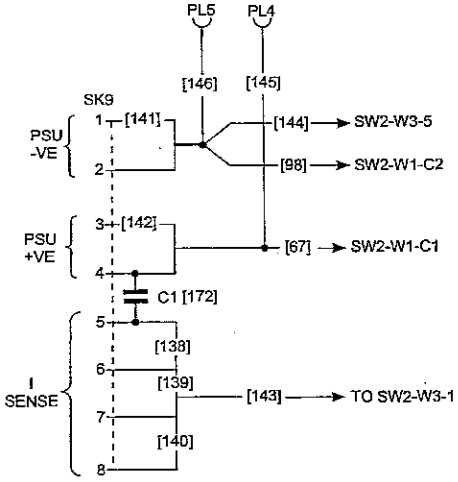
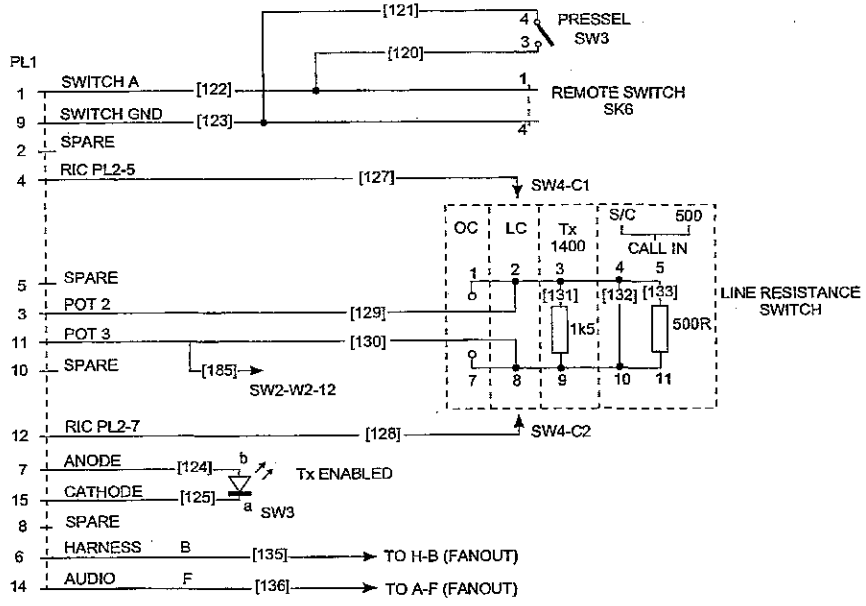
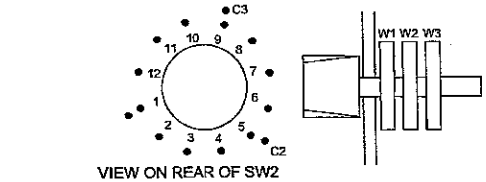
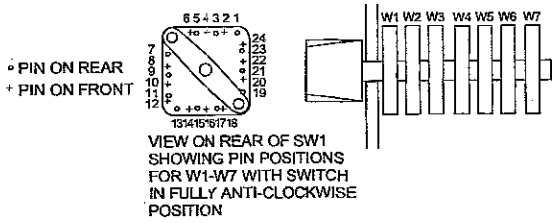


Fig 3 CIP Wiring Diagram - Sheet 3









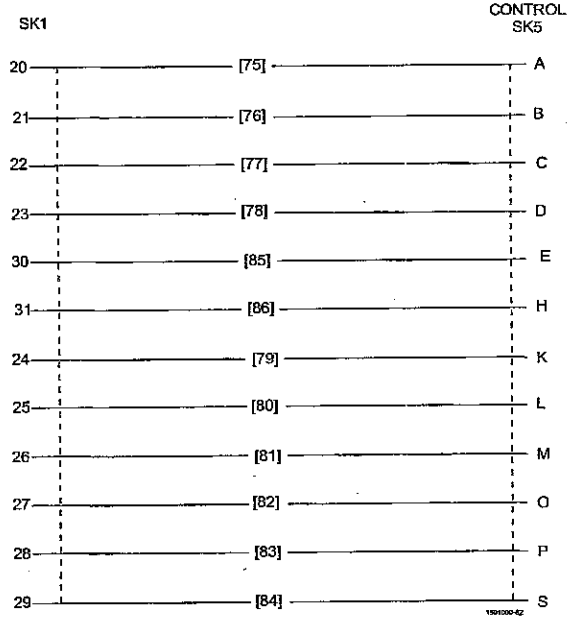


Fig 3 CIP Wiring Diagram - Sheet 4