

CHAPTER 5

FAULT FINDING PROCEDURES

INTRODUCTION

- 1 This chapter contains a set of fault finding procedures for the RA1792 HF Communications Receiver. Tests have been provided for the major receiver unit and for module/board replacement. All procedures should be performed by a qualified technician with adequate training in electronic theory and practise including digital and RF circuitry. The technician should also be thoroughly familiar with and skilful in the use of handtools and electronic test equipment.
- 2 Figure 5-1 is a signal flow diagram for the receiver; Figure 5-2 is a fault finding chart to aid in module troubleshooting; and Figure 5-3 is an RF level diagram for RF checks.
- 3 Paragraphs 8 - 9 describes the turn-on procedures and operator checks. Paragraphs 10 - 18 describes test procedures to isolate faults to a replaceable module, and to perform any correction maintenance required.
- 4 If specified performance cannot be obtained, then a fault must be suspected. Refer to Chapter 8 for the electrical circuit diagram of the particular module under test. When a module has been determined to be defective or suspected, it may be removed and replaced with one known to be of good operating condition. In any cases where alignment procedures are required, refer to Chapter 6, Alignment.

For operating instructions, refer to Chapter 3 of this manual.

SAFETY PRECAUTIONS

- 5 Observe all safety regulations. Do not replace modules or make adjustments (except when aligning trimmers or other adjustable components) with the a.c. line cord plugged in or external power supplies turned on.

WARNING

The power line voltages used in this equipment may be dangerous to personnel. Use caution when servicing the power supplies or their load components.

EQUIPMENT REQUIRED

List of Test Equipment

- 6 Table 5-1 is a list of test equipment recommended for conducting fault finding and maintenance procedures. Although not all of these instruments are specifically mentioned in the procedures of this chapter, they are nevertheless recommended in order to properly probe the RA1792 for faulty conditions.

| Item | Description | Recommended Instrument or Equal |
|------|---------------------------|---------------------------------|
| 1 | 1 ea. HF Signal Generator | Racal 9084 |
| 2 | 1 ea. Frequency Counter | Racal 9911 |
| 3 | 1 ea. Oscilloscope | Tektronics 465 |
| 4 | 1 ea. RF Voltmeter | Racal 9301A |
| 5 | 1 ea. Digital Multimeter | Racal 9077A |
| 6 | 1 ea. AF Power Meter | Marconi TF893A |

Special Tools

- 7 No special tools other than normal hand tools are required for the replacement of any module in the RA1792 receiver.

TURN-ON PROCEDURE AND OPERATOR CHECKS

- 8 The following procedure should be followed by an operator to turn on the RA1792 Receiver while observing certain indications. The procedure is useful as a first step to fault finding by identifying possible faulty operation of the receiver.

Procedure

- 9 (1) Inspect the equipment for signs of physical damage.
- (2) Check all controls for correct mechanical action, i.e., freedom from binding, scraping of general interference of parts. Leave REF INT/EXT switch (S2) to INT.

- (3) Connect the power cord from A10J1 to a suitable AC power source.
- (4) Connect a set of headphones to the front panel PHONES jack.
- (5) Turn the receiver SUPPLY switch to on.
- (6) Select each control function in turn by pressing the appropriate key switches. Observe that the LCD displays indicate that the proper function has been selected and that the tuned and BFO frequencies are properly displayed.
- (7) While listening to the noise output from the receiver, select 16 kHz bandwidth, AM detector, Man gain (IF GAIN control set to max) Tuned Frequency, and above 500 kHz.
- (8) Observe that the noise level varies in accordance with the setting of the IF GAIN and VOLUME controls.
- (9) With the IF GAIN and VOLUME controls set for maximum, select each bandwidth in turn and observe that the receiver noise level falls as the bandwidth is reduced. Select the 16 kHz bandwidth.
- (10) Select FM then CW and observe that the character of the noise output changes for each demodulator.
- (11) Select AGC MED, set the tuned frequency to all zero's, select BFO/Variable and tune the BFO from zero through the range ± 8 kHz. Observe that a beat note corresponding to the BFO offset is audible.
- (12) Tune the BFO to indicate + 1.00 kHz, observe that the RF and AF levels are indicated as appropriate on the LCD meter scales.
- (13) Select the AF meter scale and observe that the AF level indication varies in accordance with the setting of the VOLUME control. Leave this control set to indicate 0 dB output level on the AF meter scale.
- (14) Connect an antenna to A1J1 and tune the receiver to a known transmission, observe that all controls function normally.
- (15) Turn the SUPPLY switch off. Disconnect all equipment.

Corrective Maintenance

- 10 If all normal indications as described above were not obtained, faulty conditions can be suspected. A list of possible symptoms has been provided on the fault finding chart, Figure 5-2, to aid in isolating a faulty module/board assembly.

RECEIVER DISASSEMBLY AND REASSEMBLY

- 11 Refer to Chapter 6, Alignment, paragraph 6 - 14 for receiver disassembly and reassembly.

FAULT FINDING PROCEDURES

- 12 The following procedure is to be followed to isolate a fault to a module within the receiver. Before proceeding with fault finding, check the fault finding chart, Figure 5-2, to determine the approximate location of the fault.

13 POWER SUPPLIES

Preliminary

- (1) Plug in power cord A10J1 and connect to main power source.
- (2) Connect a headset to the PHONES jack.
- (3) Turn SUPPLY switch to ON, and observe that the front panel displays are active. If not, check power fuse on A10 assembly. Replace as required.

Tests

- 14 Check for the following voltages with respect to ground at power supply module A10, using the digital multimeter, item 5 of Table 5-1. A10 is located inside the chassis near the rear panel.

| A10A1J1 Pin No. | Voltage |
|-----------------|-------------------------|
| 1, 14 | +20V \pm 1 volt |
| 10, 11, 24 | +15V \pm 0.75 volt |
| 3, 16 | 20V nominal unregulated |
| 22, 23 | -15V \pm 0.75 volt |
| 7, 8 | +12V \pm 0.5 volt |
| 4, 17 | +5V, +0.5 to -0.2 volt |
| 5, 18 | 10V nominal unregulated |
| 13, 19, 20 | Ground, 0 volts |

NOTE: Ripple on all regulated supplies should be less than 5 mV P-P.

Corrective Action

- 15 If any of the above voltages are not present or are outside the permitted tolerance check for short circuit conditions on the appropriate power bus. If no receiver fault condition is apparent replace the A10 module.

RF Section

- 16 Refer to the signal level diagram, Figure 5-3, for the following tests.

Preliminary

- 17
- (1) Remove receiver from rack and disassemble as described in the alignment procedures of Section 6.2.
 - (2) Connect the RF voltmeter, Item 4 of Table 5-1 to the IF OUT connector on the receiver rear panel using the 50 ohm termination.
 - (3) Using the HF Signal Generator, Item 1 of Table 5-1, inject the test signal levels shown in Figure 5-3 as appropriate to verify the performance of the individual signal path modules and/or the entire signal path as necessary.
 - (4) Verify the LO and BFO frequencies and levels as required, using the frequency counter, Item 2 and RF Voltmeter, Item 4 of Table 5-1.
 - (a) 1st LO frequency equals indicated tuned frequency plus 40.455 MHz (A2J1).
 - (b) 2nd LO frequency equals 40 MHz (A3J2).
 - (c) BFO frequency equals 455 ± 8 kHz (A4J5).

NOTE: It should be determined if the optional Internal Frequency Standard is installed. An external reference standard should be used where necessary for the above checks.

Control Malfunction

- 18
- (1) Local control of RA1792 is affected via the A6 microcomputer and A9 Receiver Control modules with the associated keyswitch and tuning encoder controls. Before replacing these modules ensure that all ribbon cable connectors and the EPROM's A6U5, U6 and U7 are properly seated in their respective sockets.
 - (2) Remote control malfunctions are likely to be confined to fault conditions existing in the optional A6A1 Digital Interface module or the associated control connections.

NOTE: Since the above modules are interactive it may be necessary to substitute known working modules in turn to effect a repair. Start by disconnecting A6A1, then replace A6A2, then A9A2, then A9A1 as needed.

0.5 - 30 MHz
RF IN A1J1

A1 RF
LOW

MANUAL
INPUTS

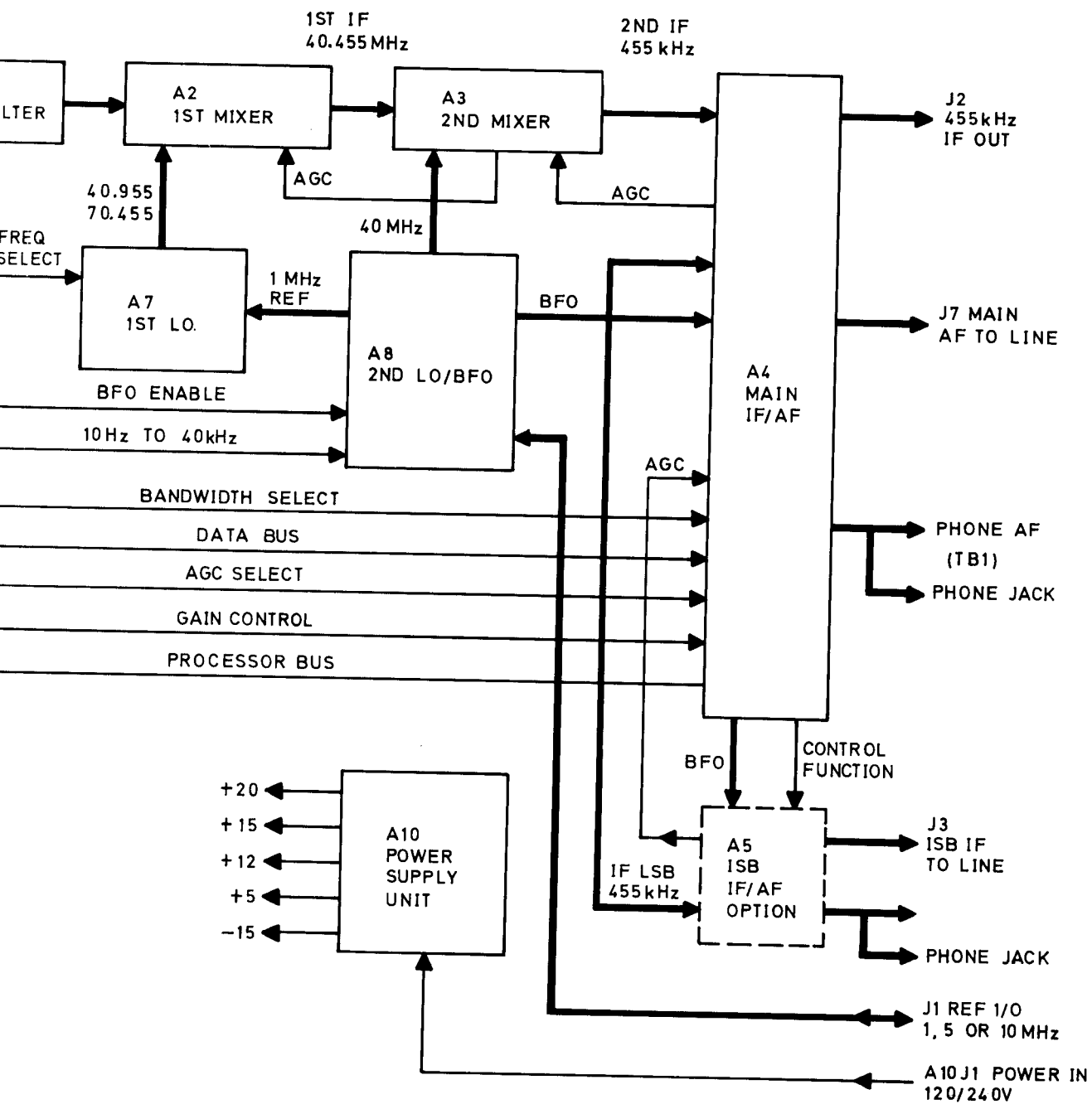
DISPLAY
OUTPUTS

FRONT
PANEL
CONTROL
AND
DISPLAY
A9A
AND
A9A

A6A1J1

A6A1
DIGITAL
I/O
OPTION

A6
MI
PR

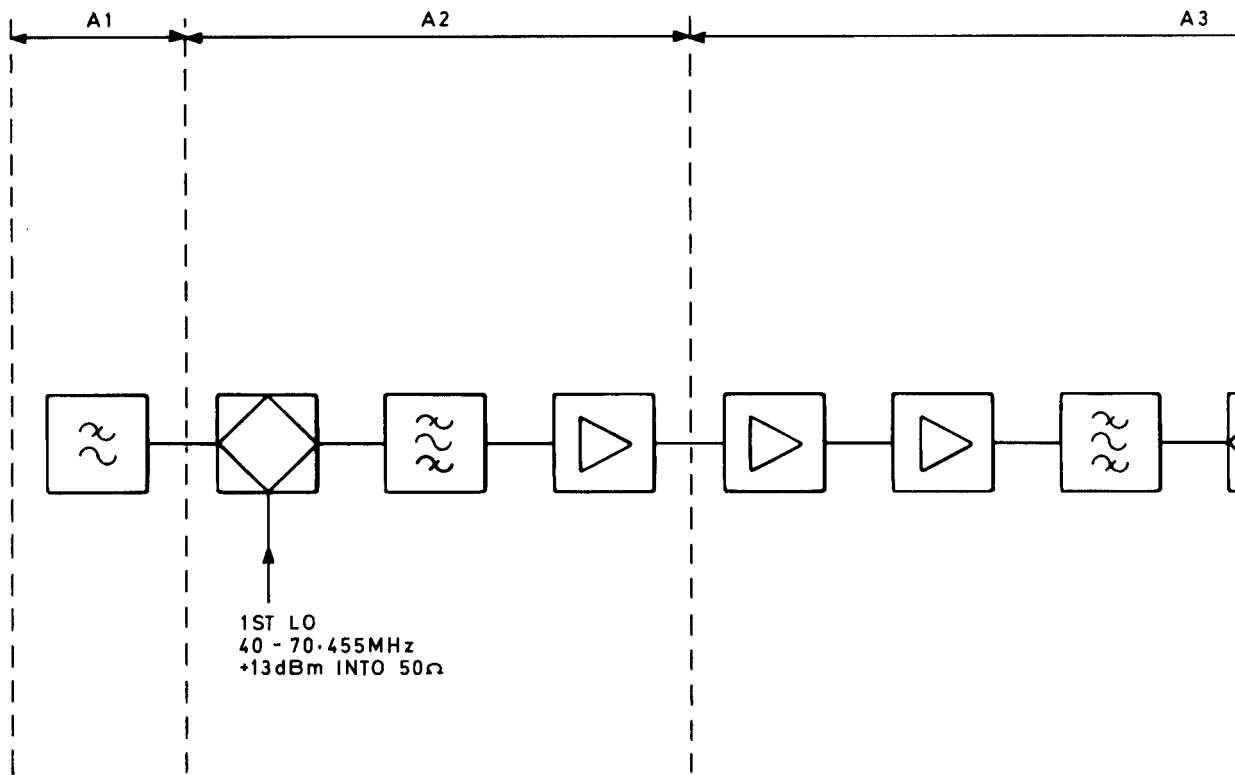


Signal Flow Diagram
RA.1792

Fig. 5.1

| FAULT SYMPTONS | BOARD/MODULE PROBABLE FAULT | | | | | | | | | | | COMMENTS & NOTES | |
|-----------------------------------|--|----|----|----|----|------|------|----|----|----|-----|------------------|--|
| | A1 | A2 | A3 | A4 | A5 | A6A2 | A6A1 | A7 | A8 | A9 | A10 | | |
| | Check Module Board According To Number Order | | | | | | | | | | | | |
| All voltages low | | | | | | | | | | | | 1 | Check A10T1 primary tap selection |
| One or more d.c. bus voltages low | | | | | | | | | | | | 1 | Check for short circuit conditions at A10A1J1 |
| Sensitivity low | 4 | 3 | 2 | 1 | | | | 6 | 5 | | | | Ref. Figure 5-3 |
| BFO wrong frequency | | | | | | 2 | | | 1 | 3 | | | Check A8J (Control) |
| 2nd LO wrong frequency | | | | | | | | | 1 | | | | Check setting of S2 |
| 1st LO wrong frequency | | | | | | 3 | | 2 | 1 | 4 | | | Check Ref. 1 MHz at A7J2. Check TP11 (Control) |
| Poor bandpass response | | 3 | 2 | 1 | | | | | | | | | |
| Low AF output | | | | 1 | | | | | 2 | | | | Check VOLUME control R2 |
| Low IF output | | | | 1 | | | | | | | | | Check cable to J2 |
| Poor AGC range | | 3 | 2 | 1 | | | | | | | | | Check AGC cabling |
| ISB Fault | | | | 2 | 1 | | | | | | | | |
| Control malfunction | | | | | | 1 | | | | | 2 | | Check all control cabling |
| Low Remote Control | | | | | | | 1 | | | | | | Check cable to A6A1J1 |
| No/Wrong REF FREQ. Output | | | | | | | | | 1 | | | | Check A8 links LK1 and LK2 |
| Meter malfunction | | | | 1 | | 3 | | | | | 2 | | |

Figure 5-2. Fault Finding Chart



TEST POINT

- A1J1

J5

E9

A3E1

TP1

TP2

RELATIVE SIGNAL LEVEL

- 0dB

-1dB

-10dB

+4dB

+18dB

+24dB

SIGNAL LEVEL (rms)

- 0.5μV

0.46μV

0.16μV

0.8μV

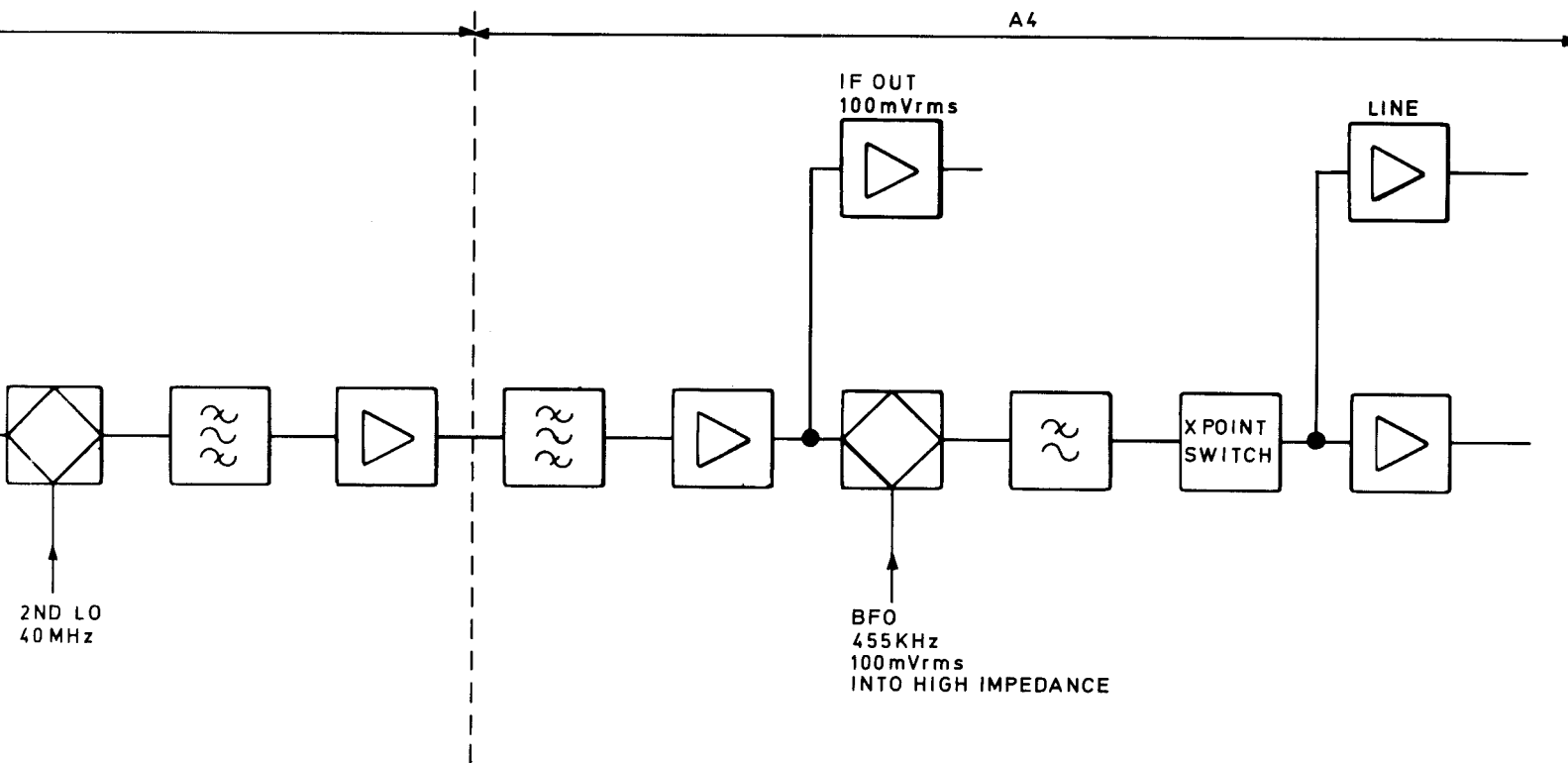
4.0μV

7.9μV

FREQUENCY

40.455MHz

ALL SIGNAL LEVELS ARE RELATIVE TO ANTENNA INPUT AND ARE MEASURED USING AN RF OR AF VOLTMETER WITH HIGH IMPEDANCE PROBE. MEASUREMENTS MADE WITH AGC OFF AND IF GAIN SET TO MAXIMUM.



| | | | | | |
|-------|-----------|-------|-------|--------|-----------|
| TP3 | U4 PIN 14 | A3E3 | TP1 | TP7 | U28 PIN 7 |
| +37dB | +34dB | +55dB | +42dB | +116dB | |
| 35μV | 25μV | 280μV | 63μV | 300mV | 350mV |



Signal Level Diagram

Fig 5.3