# RA 3700 Series

# Modular HF Receivers

# Operators Manual


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RACAL

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## LETHAL VOLTAGE WARNING

VOLTAGES WITHIN THIS EQUIPMENT ARE SUFFICIENTLY HIGH TO ENDANGER LIFE.

COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORISED TO DO SO AND THESE PERSONS SHOULD ALWAYS TAKE EXTREME CARE ONCE THE COVERS HAVE BEEN REMOVED.

# RESUSCITATION

## TREATMENT OF THE NON-BREATHING CASUALTY

**1** SHOUT FOR HELP. TURN OFF WATER, GAS OR SWITCH OFF ELECTRICITY IF POSSIBLE

Do this immediately. If not possible don't waste time searching for a tap or switch.

**2** REMOVE FROM DANGER: WATER, GAS, ELECTRICITY, FUMES, ETC.

Safeguard yourself when removing casualty from hazard.
If casualty still in contact with electricity, and the supply cannot be isolated, stand on dry non-conducting material (rubber mat, wood, linoleum).
Use rubber gloves, dry clothing, length of dry rope or wood to pull or push casualty away from the hazard.

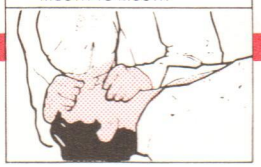
**3** REMOVE OBVIOUS OBSTRUCTION TO BREATHING

If casualty is not breathing start ventilation at once.

---

LOOSEN NECKWEAR
TILT HEAD BACKWARDS
AND PUSH CHIN UPWARDS

PINCH THE NOSE
COMMENCE VENTILATION
FOUR GOOD INFLATIONS
MOUTH-TO-MOUTH



IF CHEST DOES NOT RISE
RE-CHECK AIRWAY, REMOVE
OBSTRUCTION AND RE-INFLATE

CHECK PULSE

POSITION OF PULSE

PULSE PRESENT

PULSE ABSENT

CONTINUE INFLATIONS
UNTIL RECOVERY OF
NORMAL BREATHING

HEART HAS STOPPED BEATING
LAY ON BACK ON FIRM SURFACE
(eg FLOOR).
COMMENCE EXTERNAL CHEST
COMPRESSION AND CONTINUE
MOUTH-TO-MOUTH VENTILATION

ONE FIRST AIDER
15 Compressions at 80 per minute followed by 2 Inflations

TWO FIRST AIDERS
One conducts chest compressions, without pause at 60 per minute. The other administers mouth-to-mouth ventilation – after each 5th compression.

Check heart beat after first minute and then after every three minutes. Continue external chest compression and mouth-to-mouth ventilation until a normal pulse is felt and colour improves.

CONTINUE INFLATIONS
UNTIL RECOVERY OF
NORMAL BREATHING

WHEN NORMAL BREATHING COMMENCES
PLACE CASUALTY IN RECOVERY POSITION

Keep casualty at rest. Remove on a stretcher. Watch closely, particularly for difficulty in breathing. Lightly cover with blankets or other materials.

SEND FOR DOCTOR AND AMBULANCE

| DOCTOR | AMBULANCE | HOSPITAL | Nearest First Aid Post |
|---|---|---|---|
| TELEPHONE | TELEPHONE | TELEPHONE | |
| | | | |

# PREFACE

## SCOPE OF MANUAL

This manual is for use with receivers and receiver control units in the RA3700 Series, including options, and is intended for both first-time and experienced users. It contains sufficient information to enable basic installation and initial setting up of a receiver. Full operating instructions for both local and remote operation are included as well as information on using the built-in test equipment (BITE) facility to locate faulty modules.

These instructions cover all versions of the receiver. The operation of the MA3700 receiver control unit is identical to that of the RA3701 receiver unless otherwise stated.

## ASSOCIATED DOCUMENTS

RA3700 Series Modular HF Receivers Maintenance Manual (Ref TH9359)

# CONTENTS (continued)

# CONTENTS (continued)

# CONTENTS (continued)

# CONTENTS (continued)

## TABLES



## ILLUSTRATIONS

# CHAPTER 1

# GENERAL DESCRIPTION

## 1.1 RACAL RA3700 SERIES MODULAR RECEIVERS

This family of high performance HF receivers covers the frequency range 15 kHz to 30 MHz in 1 Hz steps. Reception of USB, LSB, AM, CW and FM is provided as standard, with ISB and FSK available as options.

Using a highly modular design, the same frame and modules can be configured to assemble receivers to meet a variety of different applications.

The family includes single and dual receivers and a range of optional modules may be fitted to enhance the receiver facilities.

The receivers include, as standard, a serial ASCII remote control interface with a built-in multi-addressing capability of up to 100 receivers. Slave receivers may be controlled in a number of ways: by computer; by using the MA3700 receiver control unit; or by the RA3701 and RA3702 receivers, which have built-in controller facilities. Alternatively, an IEEE-488 control interface can be provided. All front panel operating functions except power on/off switching can be controlled remotely.

Single function buttons control the most commonly used operations and four keys control the receivers' many special facilities by means of a menu system.

Frequency selection is achieved using either a spinwheel tuning knob with selectable tune rates or by numeric keypad entry. A 100-channel non-volatile memory provides instant recall of 100 frequencies and their associated operating settings. Facilities for automatic scanning of these preset channels and sweeping of a pre-programmed frequency range are also provided.

Comprehensive built-in test equipment (BITE) locates faults to module level and may be controlled remotely as well as locally from the front panel.

The RA3700 Series includes the following list of equipments:

| | |
|---|---|
| RA3701 HF Receiver: | An HF receiver with front panel controls plus local and remote control facilities. |
| RA3702 Dual HF Receiver: | Effectively two RA3701 receivers in one chassis sharing a common front panel, which may be switched to control one receiver at a time. |
| RA3703 HF Receiver: | Remote control only version of the RA3701. Intended for operation as a slave receiver. |
| RA3704 Dual HF Receiver: | Remote control only version of the RA3702. Intended for operation as two independent slave receivers. |
| RA3705 Dual HF Receiver: | Two receivers in one chassis with common synthesiser modules. The receiver is intended for remote control only and is used in DF systems. |
| RA3706 Dual HF Receiver: | Same as RA3705 but with front panel controls. |
| MA3700 Receiver Control Unit: | This unit has a receiver front panel and may be used as a controller for receivers in the RA3700 Series. |

# CHAPTER 2

# GETTING STARTED

## 2.1 GENERAL

This chapter contains general installation data, interface wiring information and a brief initial check-out procedure at a level sufficient to enable the receiver to be connected for local operation. Details of configuring for remote control operation are given in Chapter 6. All interface connections are made at the rear of the receiver, the only front panel connection being the headphones. Details of a range of installation accessories are provided in Chapter 8. Figs 2.1 and 2.3 illustrate the rear panel connections.

The receiver is designed to be housed in any standard 19-inch rack and is supported on the rack runners by means of bollards attached to the receiver. Four mounting screws are required to secure the receiver front panel to the rack. No special cooling considerations are required for the receiver.

On receipt, inspect the receiver for any physical damage which may have occurred during transit. Prior to installation ensure that all modules are firmly in place and check all rear connectors are correctly mated.

## 2.2 POWER CONNECTIONS

**IMPORTANT:**

Before making power connections ensure that the voltage selector at the rear of the power supply module is set to the correct AC supply voltage. The receiver is designed to operate with AC line voltages of 100, 120, 220 or 240 volts.

### Voltage Selection

To change the voltage setting, first open the cover of the voltage selector unit, which also incorporates the mains input plug (PL1). This exposes a compartment containing a voltage selector drum, which may be fitted in four different ways (to select 100 V, 120 V, 220 V or 240 V). Remove the drum and re-insert so that the required voltage setting is visible through the cover window when closed.

### Power Fuse

The receiver is supplied with a 2A anti-surge fuse for use with all voltage selections. This fuse and a spare 2A fuse (Racal Part No. 922457H) are contained in removable holders located in the compartment of the voltage selector unit. When replacing ensure that only a correctly rated fuse is fitted and that the holder is re-inserted with the arrow pointing in the direction shown on the inside of the cover.

### Power Connector Wiring

The power supply cable from the rack should be terminated with a 3-way IEC socket for connection to PL1 on the voltage selector unit. The power connector wiring is detailed in Table 2.1.

## TABLE 2.1

### Power Input Connections

| Signal | (British Standard) Wire Colour | Connector Pin Identity |
|---|---|---|
| Live (Phase) | Brown | L |
| Neutral (Common) | Blue | N |
| Earth (Ground) | Green/Yellow | ⏚ |

NOTE:
For safety purposes Pin ⏚ must always be connected to the mains earth and does not necessarily form an RF earth.

### Ground Terminal

The chassis earth terminal situated above the mains input plug may be connected to an RF earth separate to the mains earth.

## 2.3 INTERFACE WIRING

### Antenna

The ANTENNA socket (SK2) on the Front End Module rear panel will accept a wideband receiving antenna of 50 ohms impedance, using a BNC type connector.

### IF Output

If the installation requires a 1.4 MHz output from the receiver, taken either before or after the IF filters, then this is available from SK1 on the rear panels of both Front End and IF/AF Modules, giving wide (WIDEBAND IF OUT) and narrow (MAIN IF OUT) IF outputs respectively.

### Local Oscillator (LO) Output

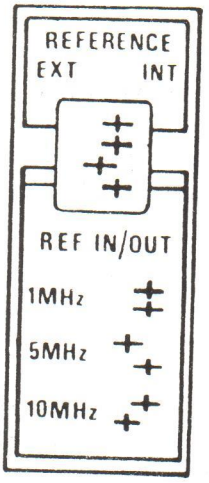
The 41.4 to 71.4 MHz first local oscillator output signal from the synthesiser is available at a rear panel BNC connector (SK1) on the 1st LO Synthesiser Module.

### Reference Input/Output

The reference signal required by the synthesiser section of the receiver is provided either by an internal 5 MHz frequency standard module or by an external source connected to SK1 (REF IN/OUT) on the Reference BFO Module rear panel.

If fitted with an internal frequency standard the receiver is set for internal operation with the REFERENCE switch on top of the Reference BFO Module set to the INT position as marked. In this mode a reference frequency output is made available at the REF IN/OUT BNC socket with a choice of 1 MHz, 5 MHz or 10 MHz, as selected by REF IN/OUT switches on the same switch panel according to the settings shown on the switch label.

If operation with an externally derived reference signal of 1 MHz, 5 MHz or 10 MHz is required, the REFERENCE switch is first set to EXT and the REF IN/OUT switches are then set to the frequency of the reference input.




### AF Output Connections

A number of AF and AGC input and output connections are provided on a 15-way D type plug (PL6) at the rear of the IF/AF Module, as listed in Table 2.2.

## TABLE 2.2

## AF Output Connections

| Signal Description | Connector Pin No. |
|---|---|
| Line 1, Output 1 | 1 |
| Line 1, Centre Tap | 2 |
| Line 1, Output 2 | 9 |
| Diversity AGC | 3 |
| Diversity AGC 0V | 10 |
| D.F. Gain Control | 4 |
| D.F. Gain Control 0V | 11 |
| External Audio Input | 7 |
| External Audio Input Ground | 14 |
| Loudspeaker Output | 8 |
| Loudspeaker Ground | 15 |
| Audio Ground | 12 |
| Audio Ground | 13 |

### Line Output Adjustment

The audio line output on the receiver rear panel is normally set for a level of 0 dBm. If the installation requires a different setting, the line level may be adjusted by means of a control located on top of the IF/AF module. The front panel meter may be set to monitor the AF level at the line output.

### Parallel I/O Connections

External input/output control lines may be connected to a 25-way rear panel D type connector (SK1) on the Processor Module. The pin connections are listed in Table 2.3 followed by an explanation of their use.

## TABLE 2.3

## Parallel I/O Connections

| Signal Description | Connector Pin No. |
|---|---|
| Ground | 1 |
| Antenna 0 | 3 |
| Antenna 1 | 4 |
| Antenna 2 | 5 |
| Antenna 3 | 6 |
| Ground | 7 |
| COR 1 | 14 |
| COR 2 | 8 |
| Mute 1 | 15 |
| Mute 2 | 9 |
| Dump 1 | 16 |
| Dump 2 | 10 |
| Scan Inhibit 1 | 17 |
| Scan Inhibit 2 | 23 |
| Auxiliary 0 | 18 |
| Auxiliary 1 | 19 |
| Auxiliary 2 | 20 |
| Auxiliary 3 | 21 |

**Antenna 0 to Antenna 3** are logic outputs to control an external antenna switch. The outputs are binary coded allowing selection of up to 16 antennas (binary codes 0000 to 1111) in a single receiver. Antenna 0 is the least significant bit (LSB) and Antenna 3 is the most significant bit (MSB). In a dual receiver Antenna 0 and Antenna 1 are allocated to receiver 1, and Antenna 2 and Antenna 3 are allocated to receiver 2. This allows selection of up to 4 antennas (binary codes 00 to 11) per receiver. Antenna 0 and Antenna 2 are the LSBs.

**COR 1 and COR 2** are "carrier operated relay" logic outputs which may be used to indicate whether the signal exceeds the COR threshold (see Chapter 4). Logic 1 indicates that the signal exceeds the COR threshold. In a dual receiver COR 1 refers to receiver 1 and COR 2 refers to receiver 2. In a single receiver only COR 1 is used.

**Mute 1 and Mute 2** are logic inputs which allow the receiver(s) to be muted by an external logic signal. A logic 1 is required to mute the receiver(s). In a dual receiver Mute 1 refers to receiver 1 and Mute 2 refers to receiver 2. In a single receiver only Mute 1 is used.

**Dump 1 and Dump 2** are logic inputs which allow the receiver(s) AGC to be dumped by an external logic signal. A transition from logic 0 to logic 1 is required to dump the AGC. In a dual receiver Dump 1 refers to receiver 1 and Dump 2 refers to receiver 2. In a single receiver only Dump 1 is used.

**Scan Inhibit 1 and Scan Inhibit 2** are logic inputs which allow the receiver(s) channel scan or frequency sweeping to be stopped by an external logic signal and then resumed when the signal is removed. A logic 1 is required to inhibit the scan. In a dual receiver Scan Inhibit 1 refers to receiver 1 and Scan Inhibit 2 refers to receiver 2. In a single receiver only Scan Inhibit 1 is used.

**Auxiliary 0 to Auxiliary 3** are logic inputs which are not used in standard receivers.

For all logic inputs and outputs:

Logic 1 = short circuit to 0 volts
Logic 0 = open circuit.

## 2.4 INITIAL CHECK-OUT PROCEDURE

The following procedure may be used to ensure that the receiver is operating properly after installation. Using a known local AM broadcast, it is intended only as a basic operational check; refer to Chapter 4 for more detailed operating instructions including display information.

Before powering up the receiver for the first time, ensure that the DIL switches on top of the Processor Module are set for normal operation as follows:

Switches 1 to 4 set to all OFF
Switches 5 to 8 set to all ON (NORMAL).

The Processor Module is initially delivered with these switch settings.

Press the POWER rocker switch to turn on the receiver. The two outside displays should exhibit operational parameters, which may be random, after a delay of approximately 2 seconds.

If FAULT is displayed on the left-hand display, refer to Chapter 7 for operator servicing information. This chapter also contains operating instructions for using the built-in test equipment (BITE) to carry out a more in-depth automatic check of the receiver's operation.

To select a known local station using the numeric keypad:

Press 

then key in the station frequency in kHz, as indicated on the left-hand display (enter any leading zeros).

Press 

to set the receiver to this frequency.

Press 

to select AM mode, as indicated on the right-hand display. Also observe the bandwidth setting on this display.

Press 

repeatedly until the widest bandwidth is selected.

Press 

if the loudspeaker is muted to allow the received signal to be audible.

Press 

to allow either the RF or AF signal level to be displayed on the centre display.

To change the receiver frequency using the tuning knob:

Press 

or 

to enable the tuning knob and to select the desired tuning rate, as indicated on the centre display.

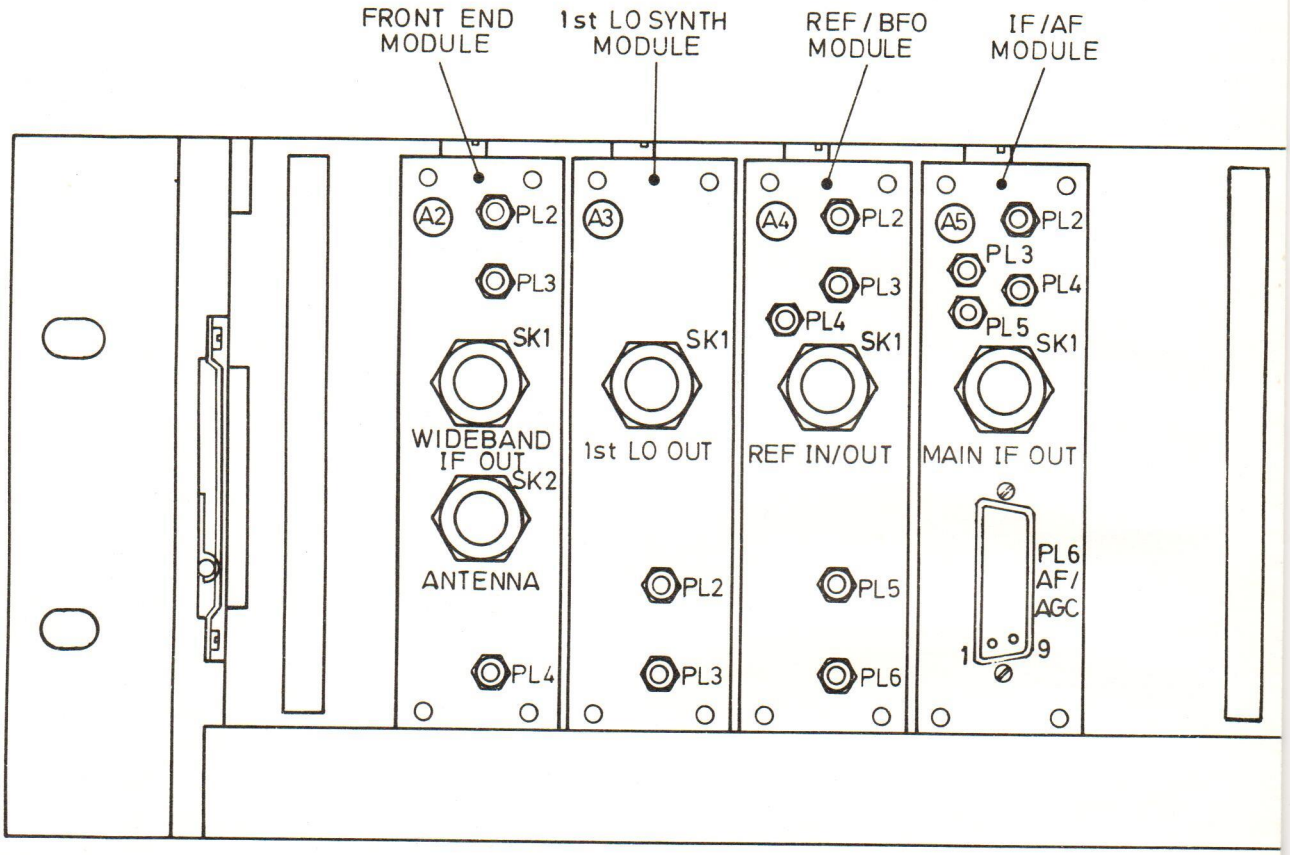
Rotate the tuning knob in either direction until the desired frequency is shown on the left-hand display.

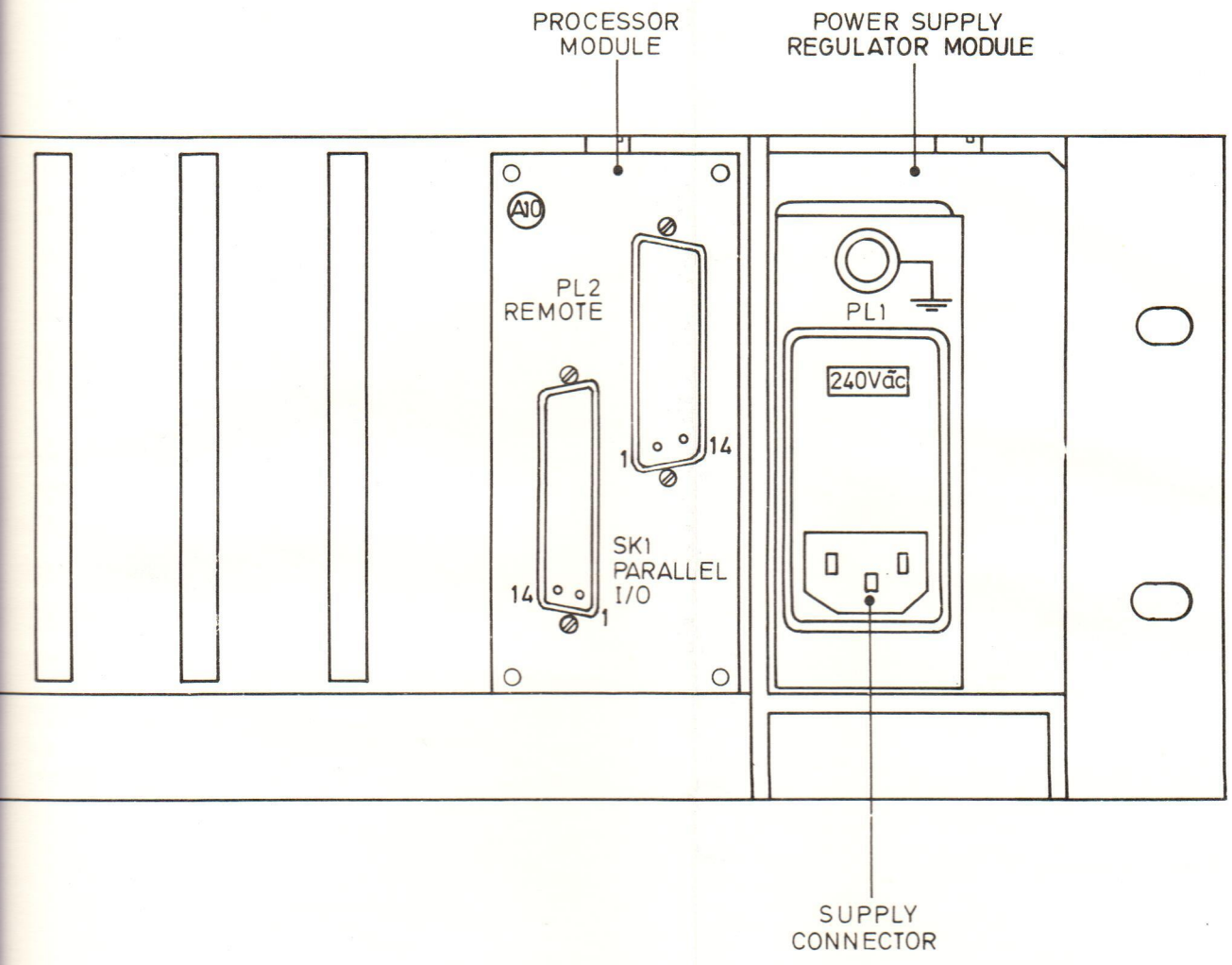
Mode and bandwidth can then be selected as described previously.

This completes the basic check-out procedure.

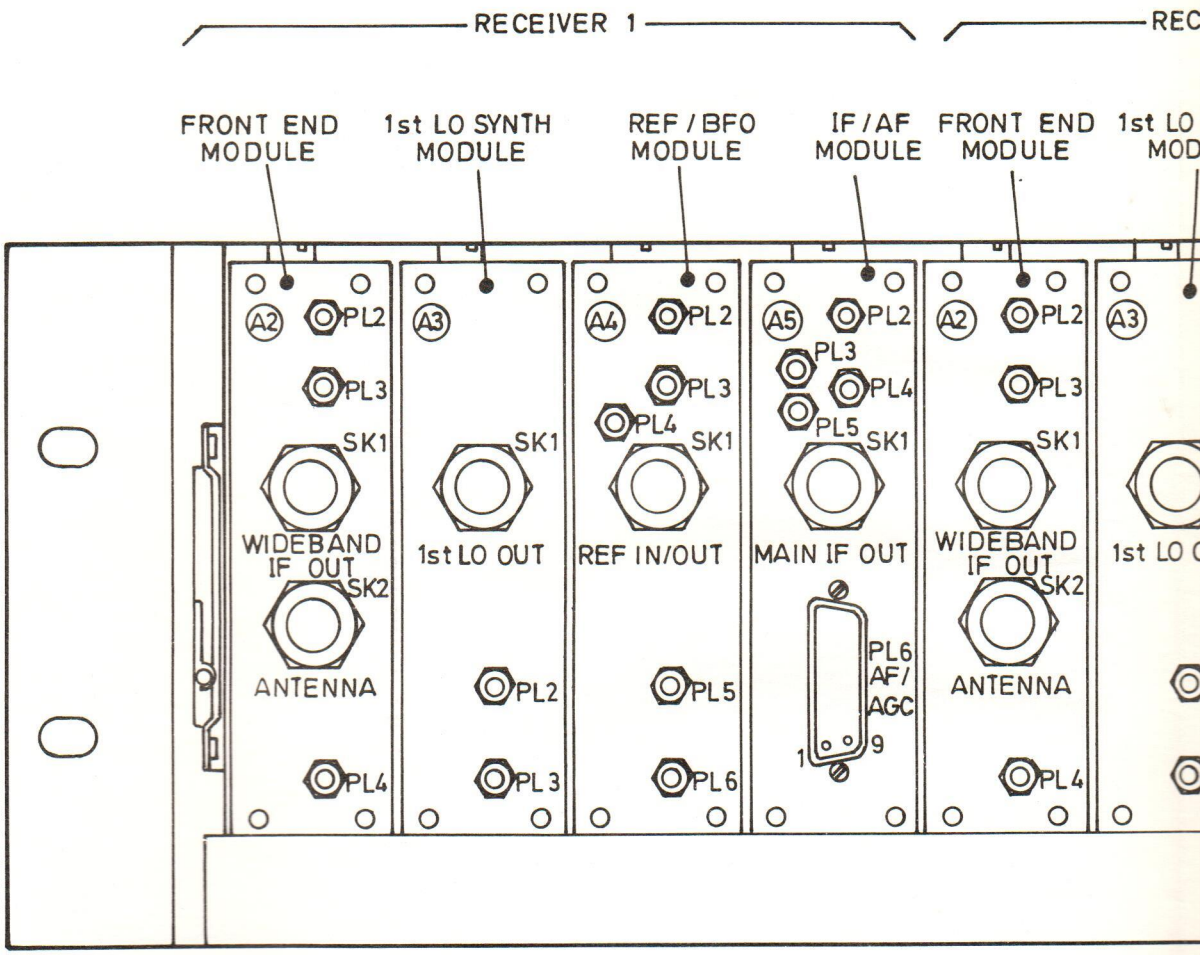
## 2.5 TUNING KNOB FRICTION ADJUSTMENT

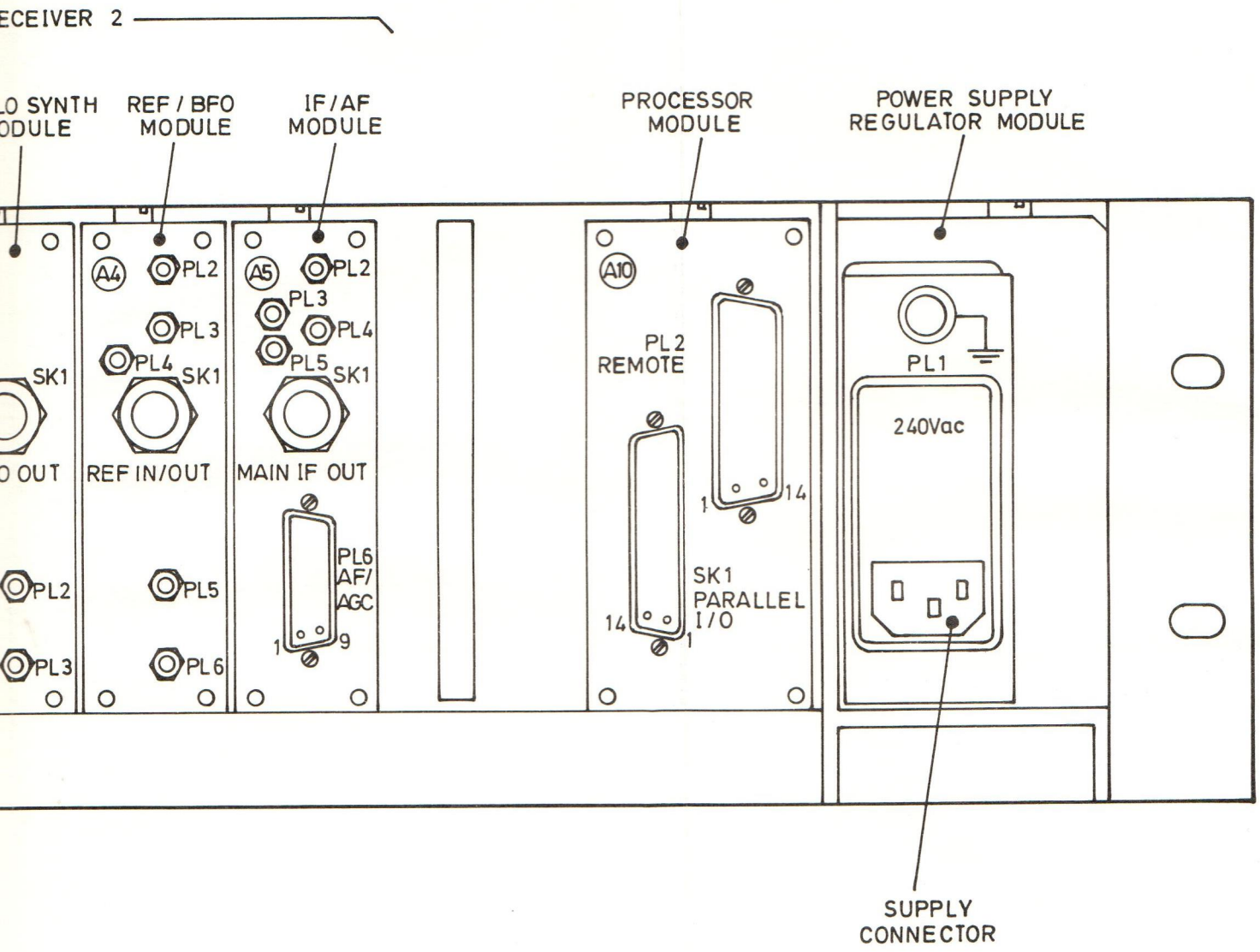
The tuning knob friction may be adjusted by removing the knob and adjusting the preset screw located behind it.


FRONT END MODULE
1st LO SYNTH MODULE
REF / BFO MODULE
IF / AF MODULE
A2
PL2
PL3
SK1
WIDEBAND IF OUT
SK2
ANTENNA
PL4
A3
SK1
1st LO OUT
PL2
PL3
A4
PL2
PL3
PL4
SK1
REF IN/OUT
PL5
PL6
A5
PL2
PL3
PL4
PL5
SK1
MAIN IF OUT
PL6
AF/
AGC
1
9



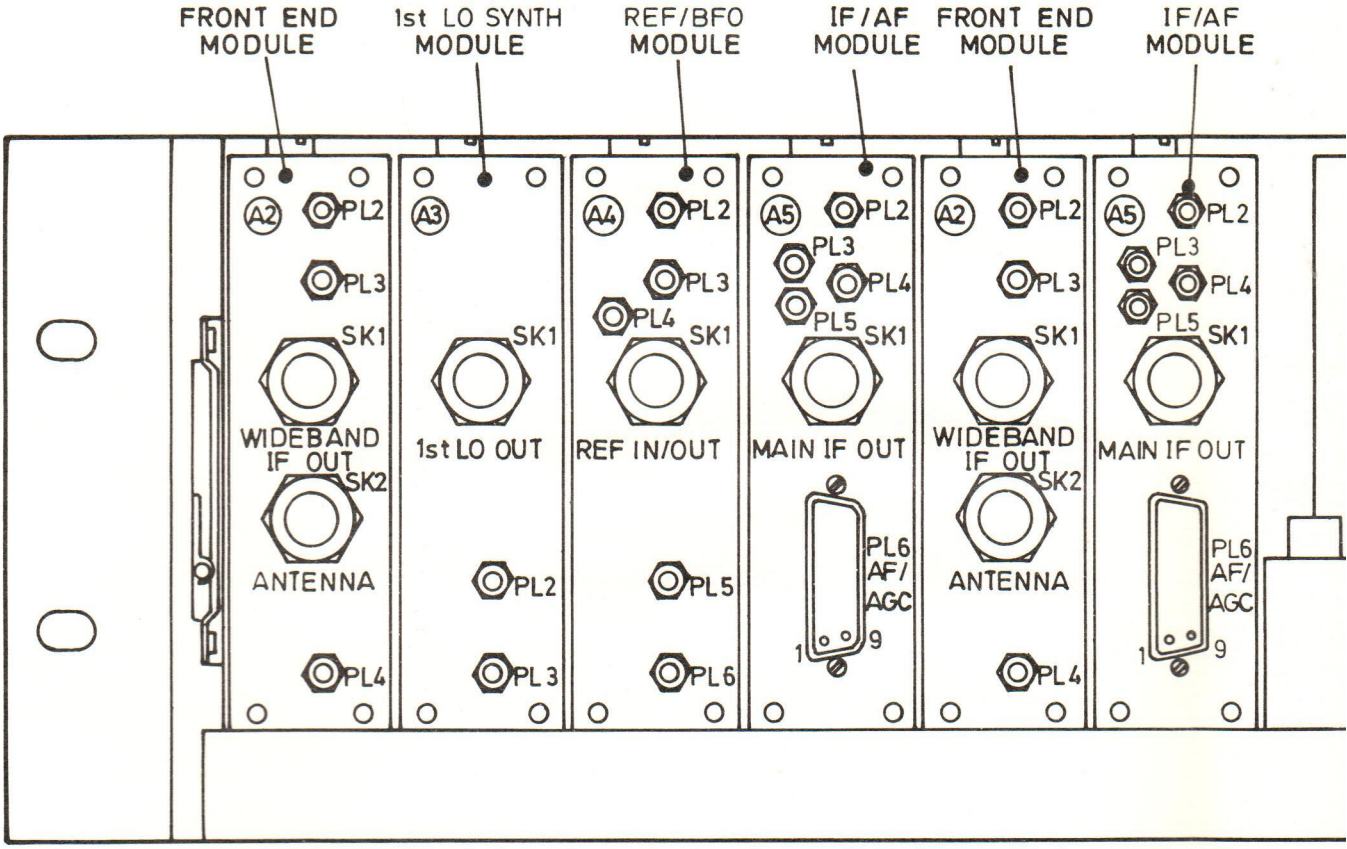

**RA3701/RA3703**
Rear Panel View Fig. 2·1


RECEIVER 1
REC
FRONT END MODULE
1st LO SYNTH MODULE
REF / BFO MODULE
IF / AF MODULE
FRONT END MODULE
1st LO MOD
A2
PL2
PL3
SK1
WIDEBAND IF OUT
SK2
ANTENNA
PL4
A3
SK1
1st LO OUT
PL2
PL3
A4
PL2
PL3
PL4
SK1
REF IN/OUT
PL5
PL6
A5
PL2
PL3
PL4
PL5
SK1
MAIN IF OUT
PL6
AF/
AGC
1
9
A2
PL2
PL3
SK1
WIDEBAND IF OUT
SK2
ANTENNA
PL4
A3
SK1
1st LO




RA3702/RA3704:
Rear Panel View

Fig. 2.2


FRONT END MODULE
1st LO SYNTH MODULE
REF/BFO MODULE
IF/AF MODULE
FRONT END MODULE
IF/AF MODULE
A2
PL2
PL3
SK1
WIDEBAND IF OUT
SK2
ANTENNA
PL4
A3
SK1
1st LO OUT
PL2
PL3
A4
PL2
PL3
PL4
SK1
REF IN/OUT
PL5
PL6
A5
PL2
PL3
PL4
PL5
SK1
MAIN IF OUT
PL6 AF/AGC
1
9
A2
PL2
PL3
SK1
WIDEBAND IF OUT
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SK1
MAIN IF OUT
PL6 AF/AGC
1
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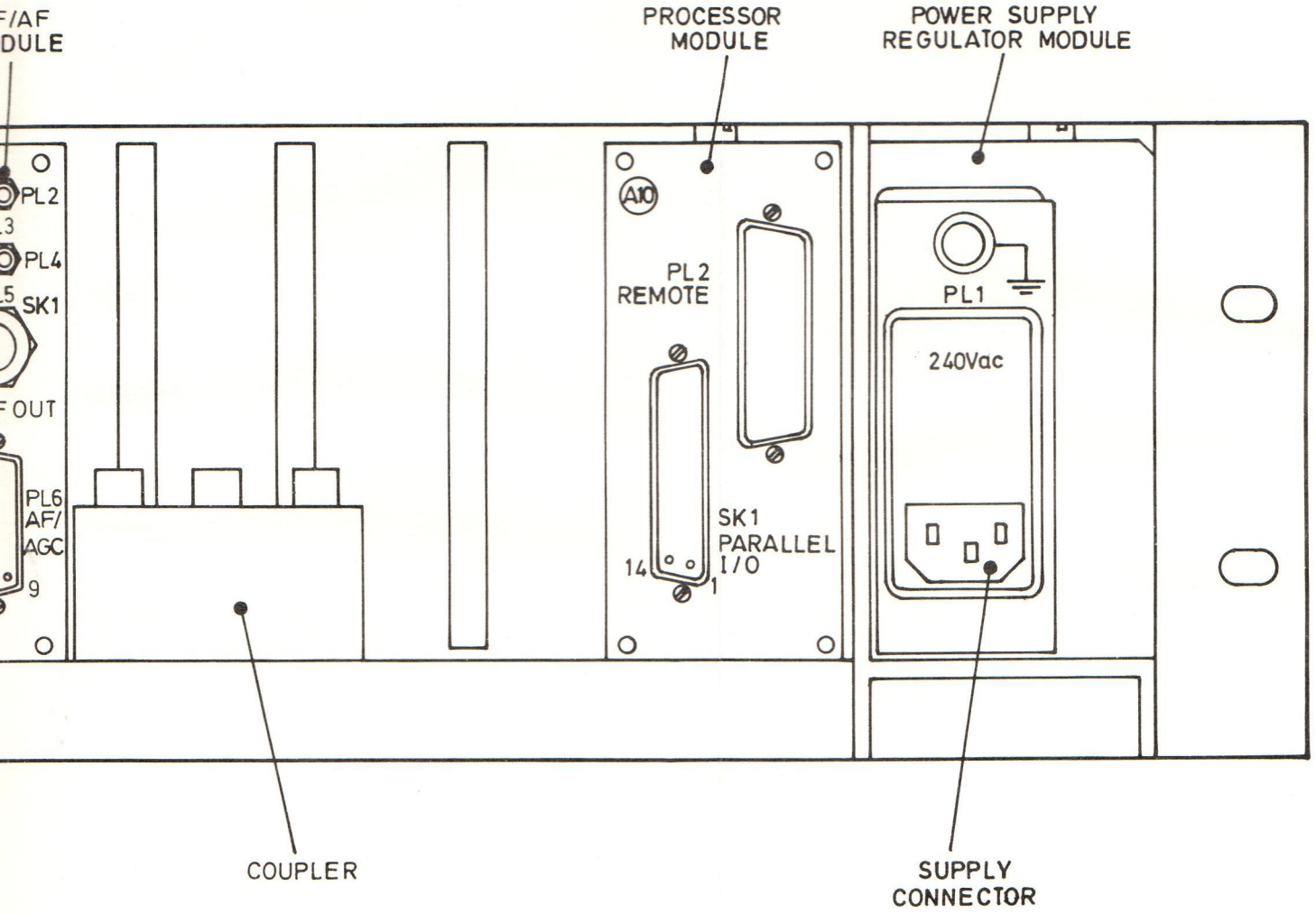



RA3705/RA3706
Rear Panel View

Fig. 2.3

# CHAPTER 3

# INTRODUCTION TO RECEIVER OPERATION

## 3.1 THE FRONT PANEL

The front panel of the RA3701, RA3702 and RA3706 receivers is illustrated in Fig 3.1. In addition to providing the controls and displays necessary to operate the receiver, the front panel may be used to control remote slave receivers using a built-in, multi-addressing facility.

For ease of operation the push button controls have dedicated functions and are arranged in the following basic groups:

- Remote control and addressing.
- Numeric keypad and main knob function.
- Receiver operating mode and softkey menu facility.

The receiver operating conditions are indicated on three back-lit liquid crystal displays (LCD) providing the following information:

- Frequency, channel number, remote receiver address and receiver status indicated on the left-hand display.
- Main knob function and bar graph meter giving RF or AF signal level on the centre display.
- Operating mode, bandwidth, AGC, BFO and antenna settings indicated on the right-hand display. Using its 2 row x 20 character alpha-numeric display capability, this display is also used in conjunction with the menu softkeys to control menu facilities such as setting up scan parameters and running BITE. Messages to the operator are also displayed here.

Audio monitoring from the front panel is provided by either a loudspeaker or a phones outlet which mutes the loudspeaker when in use.

Since the RA3703, RA3704 and RA3705 are intended for remote operation as slave receivers their front panels (Fig 3.2) are only provided with the following facilities:

- A FAULT indicator for each receiver in a dual receiver. In a single receiver only the FAULT 1 indicator is lit to signify a fault condition.
- Separate PHONE sockets and VOLUME controls for each receiver in a dual receiver. In a single receiver only the PHONES 1 socket is fed with the audio output and controlled by the VOLUME 1 control.
- Controls for setting the address and parameters for the remote interface on single and dual receivers (see Chapter 6).

## 3.2 THE MENU SYSTEM

A menu system is provided for additional facilities which cannot be controlled directly by the normal front panel push buttons. Generally these include less commonly used or complex operations such as setting up scan parameters and running BITE. The menu system is split into several levels with a number of menu options being presented at each level for the control of different facilities. The menu system is entered at level 1 by pressing the MENU button, with further presses advancing the menu to the next level.

Once the deepest level has been reached, a further press of the MENU button returns the menu options to level 1. At each level of the menu, one of up to four options may be selected using four softkeys (M1, M2, M3, M4). The menu levels and options available, along with the corresponding softkey selection, are listed in Table 3.1.

## TABLE 3.1

### Menu System

| Level | Options | | | |
|---|---|---|---|---|
| | M1 | M2 | M3 | M4 |
| 1 (Operation) | Frequency Sweep | Channel Scan | Antenna Select | Passband Tuning |
| 2 (Operation) | Erase Channels | Set Modes | Set FSK ** | Sub-Octave Filter ** |
| 3 (BITE) | Unit Confidence Test | Select Test | Factory Test | Show Fault |
| 4 (Store List) | Tune List | Bandwidth List | AGC List | — |
| 5 (System) | Diversity Master | RF Amplifier | COR Select | Display |
| 6 (Configuration) | Bandwidth * | Serial Ports IEEE Port * | Tune Rates * | Equipment and software ident. * |

NOTE:

* Indicates options not normally required in general use by the operator but used for configuring the receiver or system. For the bandwidth configuration procedure refer to the RA3700 Series Technical Manual. A security code is required to be entered to gain access to the configuration options.

** Indicates that these options are configuration dependant.

Once an option has been selected, messages giving instructions on how to proceed are provided on the right-hand display. These will normally require further selections to be made using the softkeys or a string of digits to be entered via the numeric keypad. On completion of data entry, such as defining the start channel number, pressing ENTER actions the data and the next message is displayed.

When a request for numeric data is made by the menu system the present data setting is initially displayed with the most significant digit flashing. This flashing cursor indicates the position of the first digit to be entered and moves to the next digit after each entry. On entering the first digit the rest of the digits are set to zero. Previous data entries can be retained simply by pressing ENTER.

Errors in data entry can be corrected by pressing MENU before ENTER is pressed. This deletes the incorrect entry and allows the parameter to be re-entered from the first digit. Once ENTER is pressed, mistakes can only be corrected by starting the procedure from the beginning. When a message such as "VALUE OUT OF RANGE PRESS MENU TO CONT." appears, pressing MENU reverts the display to the previous correct entry and a new value can then be entered. Exit from the menu system back to normal front panel operation can be achieved at any time by pressing the recall (RCL) push button.

## 3.3 RECEIVER CONTROL

The RA3701 and RA3702 receivers can function in four basic operational modes:

- **Stand-Alone**
  The front panel is used to control the receiver in local stand-alone mode.

- **Slave**
  In remote configuration the receiver acts as a slave controlled via its remote control port. The front panel displays indicate the settings set by the controller except for RF/AF metering. All front panel keys are disabled with the exception of REM, L/S and METER. The ADDR and RCL keys are also available on a RA3702 receiver. The controller may be a computer, an MA3700 receiver control unit or another RA3700 Series receiver.

- **Master**
  In master configuration the front panel may be used to control other receivers in the RA3700 Series without disturbing the settings of its own receiver, which continues to operate on its present settings. The receivers have a multi-addressing system which allows up to 99 (30 if IEEE processor fitted) receivers to be controlled or interrogated for their current settings or BITE status.

- **Diversity**
  Single receivers may be used in an external diversity pair configuration where the master receiver settings are sent to the slave receiver via the receivers' remote control ports. The front panel of the master can then be used to control both receivers simultaneously for diversity reception. Remote control of two single receivers configured for diversity operation is also available.

  Dual receivers may be used in an internal diversity pair mode whereby both receivers operate on the same settings. Remote control of a dual receiver configured for diversity operation is available.

## 3.4 SUMMARY OF FRONT PANEL CONTROLS

The function of each front panel control and, where applicable, its associated display presentation is summarised in Table 3.2. This should be read in conjunction with the front panel view in Fig 3.1, which shows all indicators displayed. In normal operation, however, all the indicators would not be illuminated at the same time. When ⚠ appears on the left-hand display this indicates that the displays may not reflect the receiver's operating conditions, as occurs, for instance, during frequency or channel entry.

## TABLE 3.2

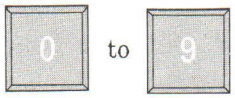
## Function of Controls

| Control | Function |
|---|---|
| POWER | Switches the power supply on/off. Press the top of the rocker switch for ON. |
| VOLUME | Controls the AF level to the loudspeaker or headphones. |
| IF GAIN | Controls either the receiver gain or sets the AGC threshold or squelch/COR levels, as selected by MAN or SQLCH. |
| TUNING KNOB | Sets either the receiver frequency, BFO frequency, channel number or passband position according to the selected function. |
| REM (Remote) | Puts the receiver under remote control, as indicated by REMOTE appearing on the left-hand display. A second press reverts the receiver to local operation. For IEEE-488 receivers this only sets the receiver back to local. |
| ADDR (Address) | Allows entry of a remote receiver address. ADDRESS, ⚠ and a cursor are shown on the left-hand display. Also allows selection of either receiver in an RA3702. |
| FREQ (Frequency) | Permits frequency entry via the numeric keypad. ⚠ appears and a cursor indicates the position of the digit to be entered. |
| CHAN (Channel) | Enables selection of a channel number between 00 and 99. The left-hand display indicates the last selected channel number and ⚠ appears. |
| SCAN | Stops or restarts either frequency sweeping or channel scanning. Also used to set or clear individual channel scan flags when ⚠ is displayed. |
| STORE | Enables frequency and mode parameters to be stored in a channel. |

(continued)

## TABLE 3.2 (Continued)

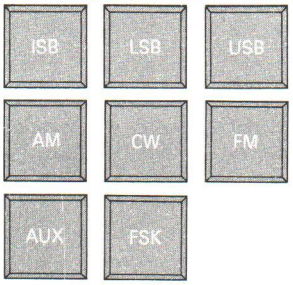
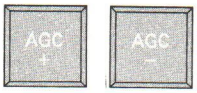
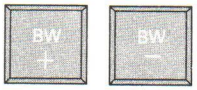
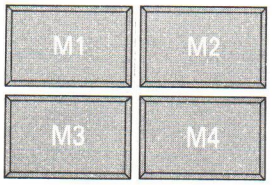
## Function of Controls

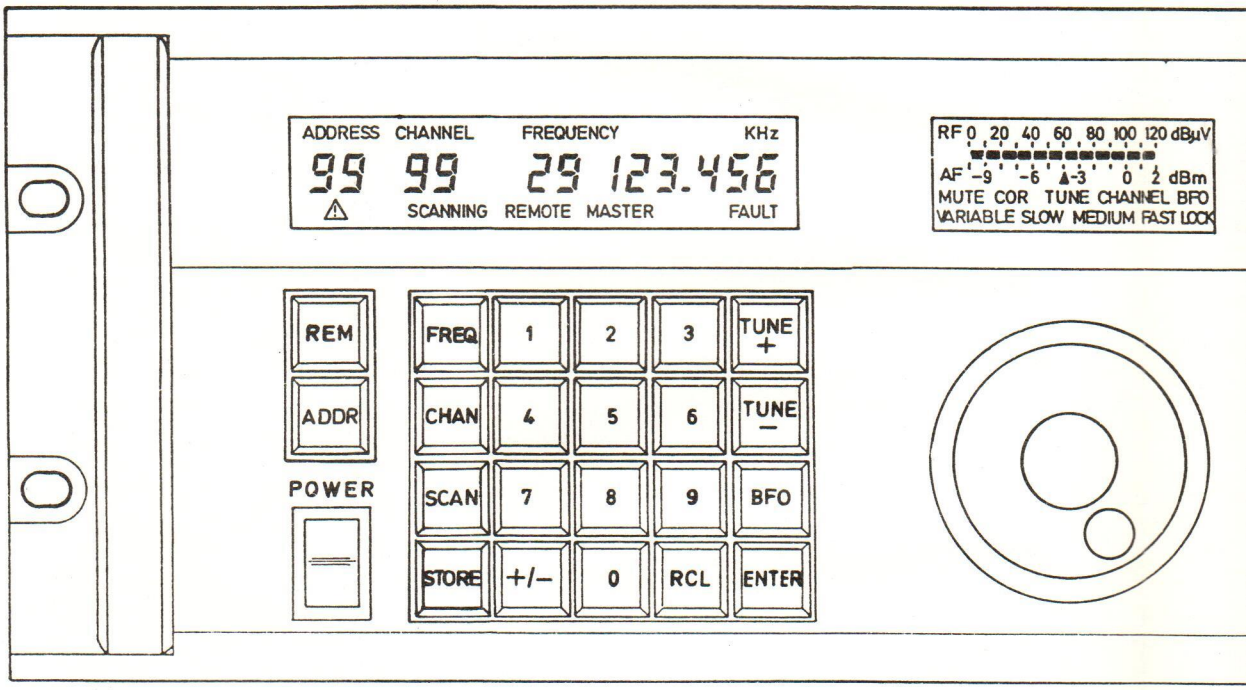
| Control | Function |
|---|---|
|   | Keypad used for numeric values when entering frequency, channel numbers, BFO frequency, etc. |
|   | Controls the direction of channel scan or frequency sweep. Also controls the sign of BFO frequency entry and toggles FSK output polarity (if option fitted). |
|   (Recall) | Returns the front panel displays to the current receiver operating conditions at any time except in REMOTE mode. |
|   | Each press changes the tuning rate through the sequence of LOCK, SLOW, MEDIUM, FAST and VARIABLE. Also used to adjust the scan dwell time and sweep rate. |
|   | Each press changes the tuning rate through the sequence of VARIABLE, FAST, MEDIUM, SLOW and LOCK. |
|   | Allows the BFO frequency to be set by the tuning knob or numeric keypad when in CW mode. BFO appears on the centre display and the right-hand display shows the current BFO frequency. |
|   | Used to terminate frequency, channel or BFO frequency entries, causing the receiver to operate on the new settings. Also used with menu options when instructed by messages on the right-hand display. |
|   | Selects AF line or RF level monitoring on the centre display. |
|   (Loudspeaker) | Switches the internal loudspeaker on/off. |
|   | Used to toggle the printer on/off in FSK operation. |

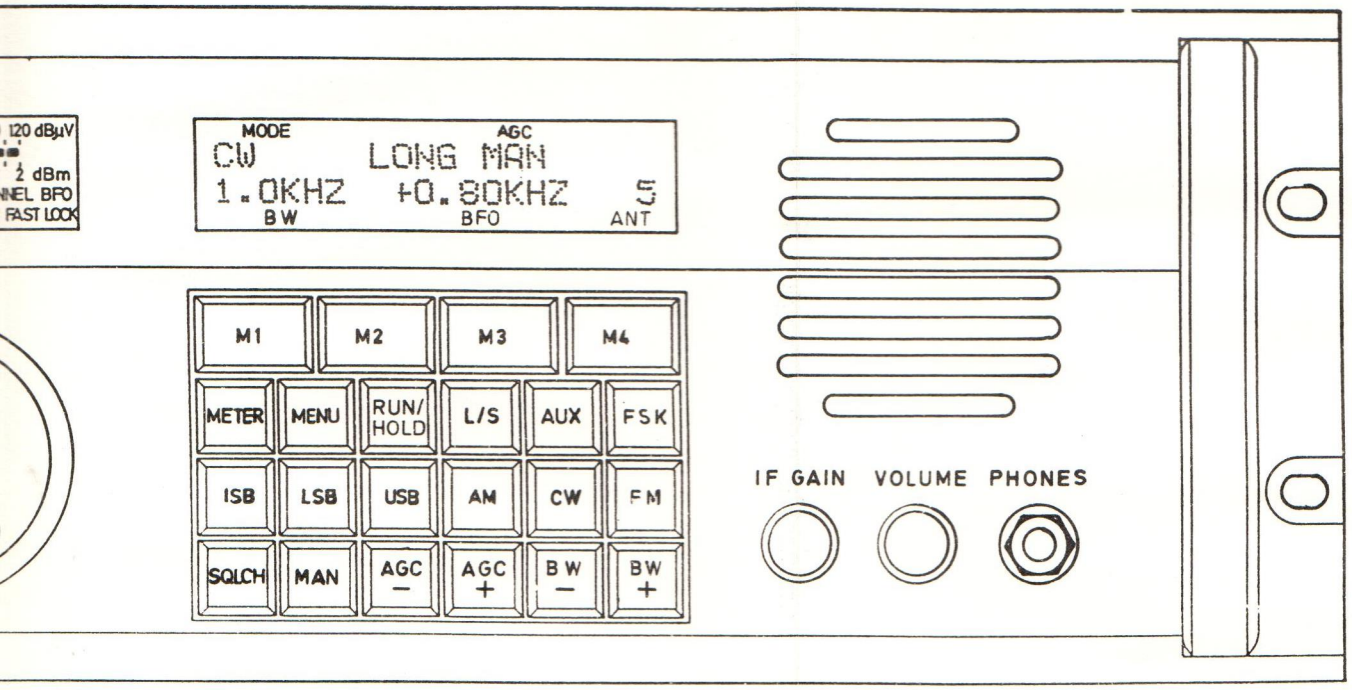
(continued)

## TABLE 3.2 (Continued)

## Function of Controls

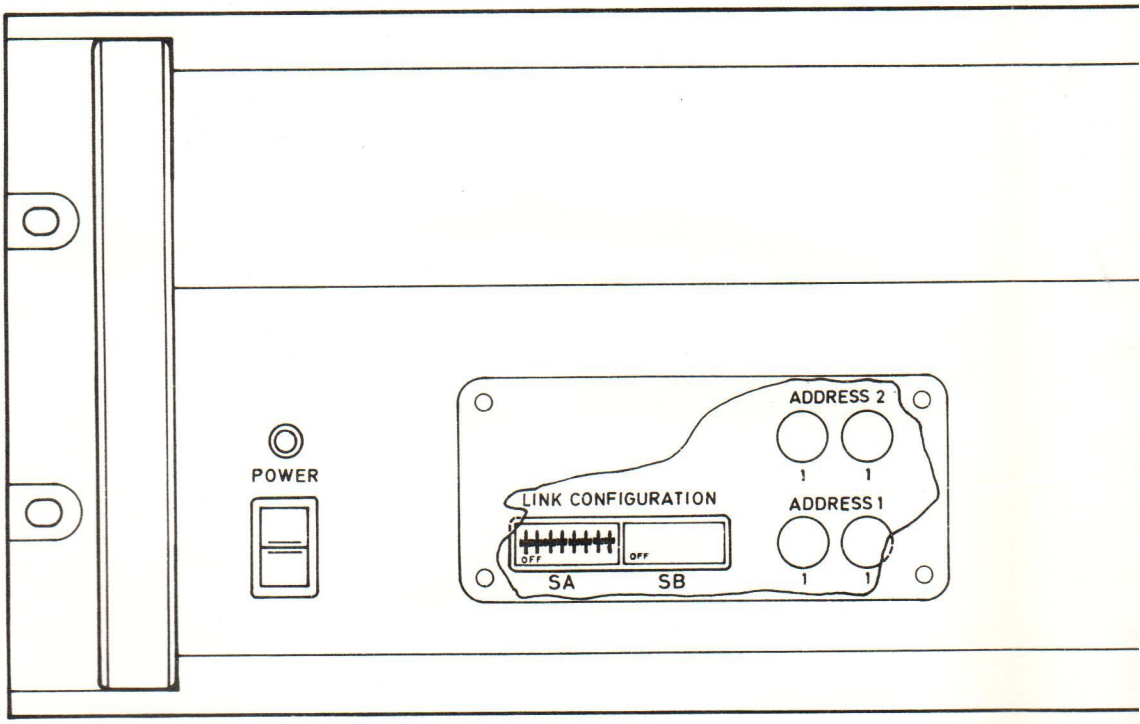
| Control | Function |
|---|---|
|  | Selects the required operating mode, which is then indicated on the right-hand display.<br>  are inoperative unless the appropriate module options are fitted (see Chapter 9). |
|  <br>(Squelch) | Activates the squelch facility, as indicated by SQ appearing on the right-hand display. The squelch threshold is then set using the IF GAIN control. |
|  <br>(Manual) | Determines the use of the IF GAIN control, allowing it to set either the receiver gain or AGC threshold or squelch levels. |
|  | Used to increase or decrease the AGC decay time constant. |
|  | Used to select a wider or narrower receiver bandwidth. |
|  | Accesses the menu system at level 1 with subsequent presses selecting the next level, and so on, to level 6, the sequence then being repeated. Used in conjunction with the four softkeys. |
|  | Permit softkey selection of various options at each menu level and then used to implement any subsequent instructions on the right-hand display. |


ADDRESS CHANNEL FREQUENCY KHz
99 99 29 123.456
SCANNING REMOTE MASTER FAULT
RF 0 20 40 60 80 100 120 dBµV
AF -9 -6 -3 0 2 dBm
MUTE COR TUNE CHANNEL BFO
VARIABLE SLOW MEDIUM FAST LOCK
REM
ADDR
POWER
FREQ
CHAN
SCAN
STORE
1
2
3
4
5
6
7
8
9
+/-
0
RCL
ENTER
TUNE +
TUNE -
BFO

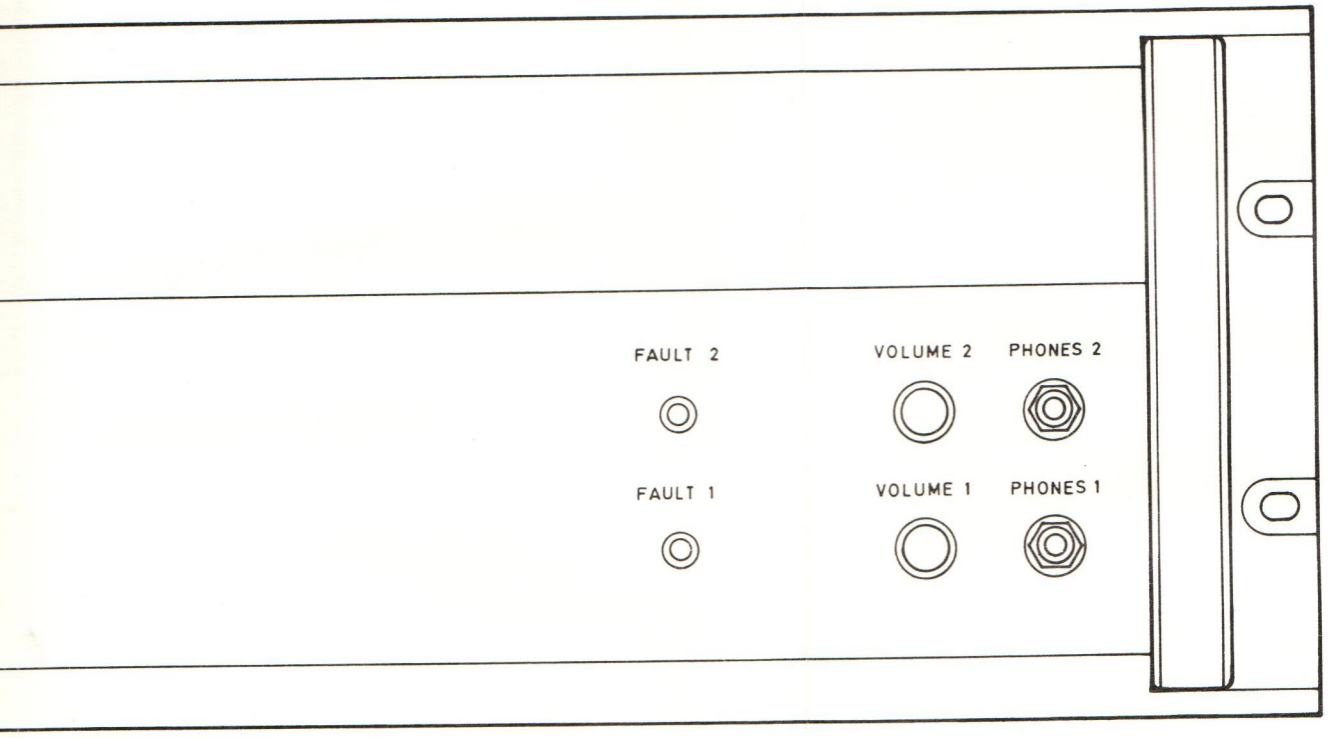



RA3701/RA3702/RA3706
Front Panel View

Fig 3.1


POWER
ADDRESS 2
1
1
LINK CONFIGURATION
ADDRESS 1
ON
OFF
OFF
SA
SB
1
1

TH9041




RA3703/RA3704/RA3705
Front Panel View Fig. 3.2

# CHAPTER 4

# LOCAL OPERATION OF THE RECEIVER

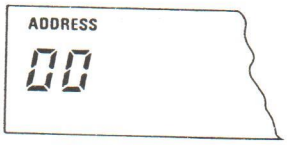
## 4.1 INTRODUCTION

This chapter contains local operating instructions for equipments in the RA3700 Series with front panel controls. Users of RA3701 single receivers should omit the following dual receiver selection instructions. If the FAULT legend appears on the left-hand display at any time during receiver operation, refer to Chapter 7 for operator servicing information.

## 4.2 DUAL RECEIVER SELECTION

In an RA3702 equipment either receiver may be locally operated from the front panel.

Indication of which receiver is being currently controlled from the front panel is provided by its address appearing on the left-hand display. The loudspeaker and headphone jack socket are connected to the currently controlled receiver.




Press ADDR then RCL to transfer front panel control to the other receiver.

To hand off operating settings between receivers and transfer front panel control to the other receiver:

Press ADDR then ENTER

**Examples**

The RA3702 is configured to have receivers with addresses 3 and 4 and its front panel is currently controlling and displaying the operating settings of receiver 3.

The operator may either:

Press ADDR then RCL to display the settings of receiver 4 and transfer front panel control to receiver 4. Both receivers still operate on the same settings as before.

or:

Press ADDR then ENTER to transfer the settings of receiver 3 to receiver 4 and take control of receiver 4.

Receiver 3 continues to operate on the same settings as before and the previous settings of receiver 4 are lost.

## 4.3 FREQUENCY SETTING

The receiver frequency can be set either by push button entry or by using the tuning knob. Frequency is displayed on the left-hand display.

### Push Button Selection

Press FREQ to enable a new frequency to be entered.

Select the desired frequency using the numeric keypad.

Press ENTER : the receiver now operates on the entered frequency.

### Example

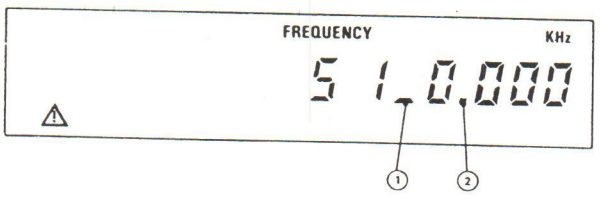
To set the receiver to a frequency of 5123.4 kHz:

Press FREQ 0 5 1 2 3 4 ENTER

The display now indicates the selected frequency in kHz with the leading zero suppressed.

The receiver continues to operate on its present frequency until ENTER is pressed to change to the new frequency. If RCL (RECALL) is pressed instead of ENTER then the display reverts to the present operating frequency.

*During frequency entry* ⚠ *is displayed to indicate that the displays do not represent the current receiver operating frequency and the cursor* (1) *indicates the position of the next digit to be entered. The frequency is entered in kHz starting with the left-hand digit. Leading zeros to the left of the fixed decimal point* (2) *must be entered but trailing zeros need not be entered.*




*Attempted entry of a frequency above 29.999999 MHz is disregarded. A mode key, bandwidth, AGC, MAN or BFO key may be used to terminate frequency entry.*

### Tuning Knob

Press 

or 

to enable the tuning knob and to select the desired tune rate. The tune rate is indicated on the centre display.

Turn the tuning knob until the desired frequency is displayed. A clockwise rotation increases the frequency, anti-clockwise rotation decreases the frequency.

Lock the selected frequency by pressing 

repeatedly until LOCK appears on the centre display.

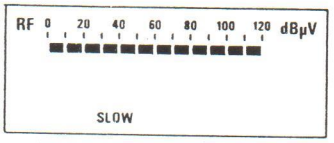
### Example

To select a slow tune rate:

Press 

or 

repeatedly until the centre display indicates SLOW.




*When LOCK is displayed the tuning knob is disabled for tuning and pressing* 

*or* 

*selects the last used tune rate.*

*Subsequent presses of* 

*or* 

*decrease or increase the tune rate respectively. Any of these rates can be "locked out" using the front panel menu system (see "Tune Rate List"). The size of the tune steps for SLOW, MEDIUM and FAST tune rates can be configured using the front panel menu system (see "Tune Rates"). For receivers fitted with front panel type ST90122, the number of tune steps per revolution can also be configured using the front panel menu system (see "Tune Rates").*

### Tune Rate List

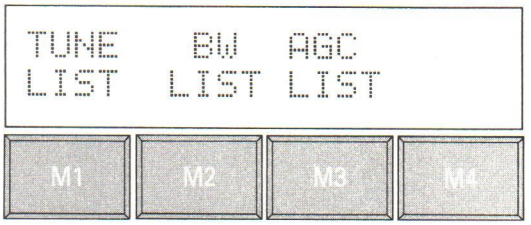
This menu system facility may be used to select which tune rates are to be made available for selection by the TUNE + or TUNE − buttons.

Any unwanted tune rates may be "locked out".

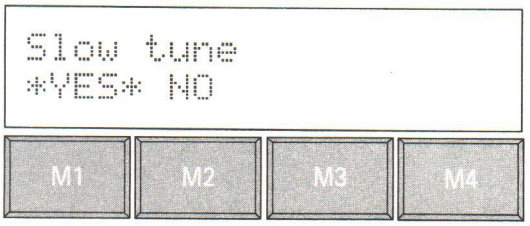
### Example

To select slow and fast tune rates but to "lock out" medium and variable:

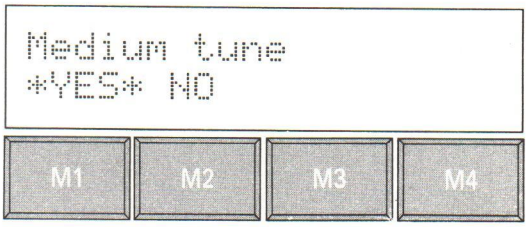
Press MENU several times until these menu options are displayed. Select TUNE LIST by pressing M1




Press M1 to retain slow tune. The current selection is indicated by *---*.




Press M2 to "lock out" medium tune.




Repeat the above procedure to retain fast tune and "lock out" variable tune. The display then returns to the menu options.

*Only one tune list is available for both receivers in an RA3702.*

### Tune Rates

The frequency step for the SLOW, MEDIUM and FAST tune rates may be selected from one of the following:

1 Hz, 2 Hz, 5 Hz, 10 Hz, 20 Hz, 50 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz.

If the receiver is fitted with an ST90122 type front panel, the number of tune steps per revolution for the SLOW, MEDIUM and FAST tune rates may be selected from one of the following:

1000, 500, 200 and 100.

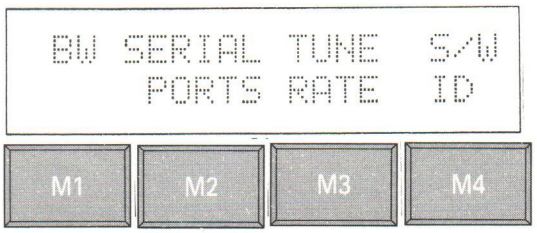
**Example**

To configure the following tune rates:

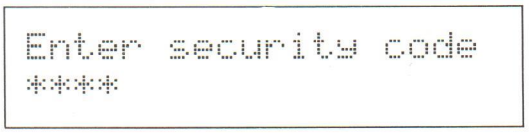
| Rate | Step Size | Steps Per Rev. |
|---|---|---|
| SLOW | 1 Hz | 500 * |
| MEDIUM | 20 Hz | 200 * |
| FAST | 500 Hz | 100 * |

*NOTE: Steps per revolution can only be configured on receivers fitted with an ST90122 type front panel.

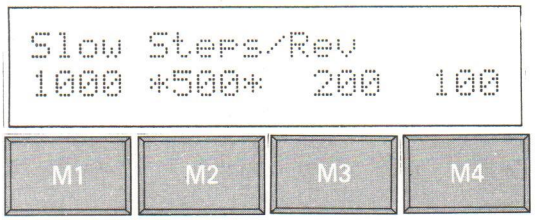
Press MENU repeatedly until these menu options are displayed.
Select TUNE RATE by pressing M3



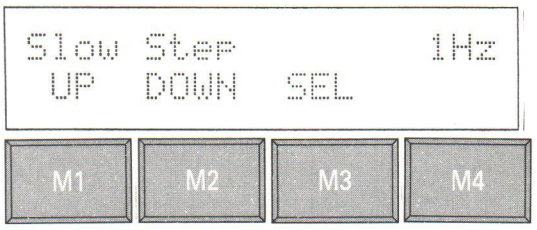

Key in the security code on the numeric keypad and press ENTER . A flashing cursor indicates the next digit to be entered.



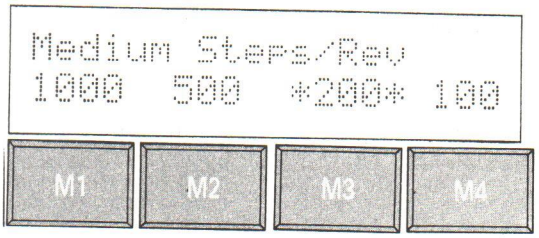

If front panel ST90122 is fitted, press M2 to select 500 steps per rev.



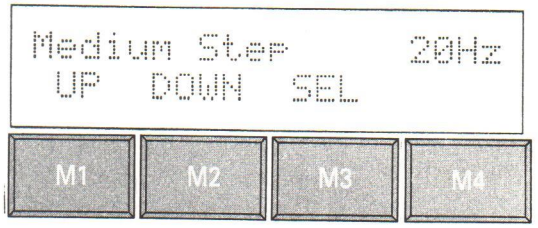

Press M1 or M2 until a step size of 1 Hz is displayed. Press M3



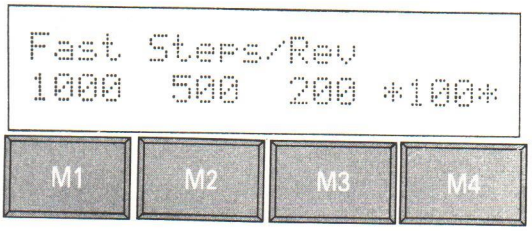
If front panel ST90122 is fitted, press M3 to select 200 steps per rev.



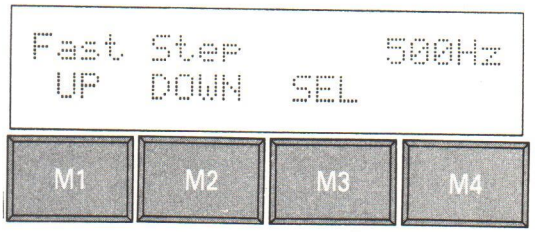

Press M1 or M2 until a step size of 20 Hz is displayed. Press M3




If front panel ST90122 is fitted, press M4 to select 100 steps per rev.




Press M1 or M2 until a step size of 500 Hz is displayed. Press M3




NOTE: For the VARIABLE rate the step size or steps per revolution are not provided. The step size is determined from the SLOW, MEDIUM and FAST step sizes as follows:

SLOW step sizes up to approximately 2 revs/second
MEDIUM step sizes between approximately 2 and 4 revs/second
FAST step sizes above approximately 4 revs/second.

If the receiver is fitted with an ST90122 front panel, the steps/rev used for the VARIABLE tune rate is the same as for SLOW tune rate.

*Both receivers in an RA3702 operate on the same Tune Rate configuration settings.*

## 4.4 MODE SELECTION

A new reception mode can be selected simply by pressing the appropriate push button. The relevant option must be fitted for the ISB and FSK buttons to be effective.

**Mode Buttons**

Press any one of LSB USB AM CW FM AUX ISB FSK

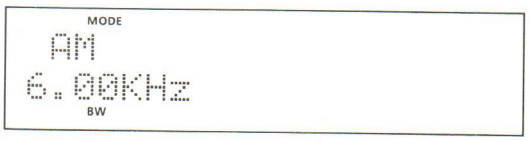
The receiver now adopts the new mode, which is indicated below the MODE legend on the right-hand display (except AUX, which may be programmed with any one of the other modes).

If required, new operating parameters (bandwidth etc) for each mode can now be selected by performing the relevant setting-up procedure.

**Example**

To change the mode from CW to AM:

Press [AM] to select AM mode. The display now indicates the chosen mode.




*When a mode is selected the bandwidth, AGC and BFO frequency are automatically recalled. The receiver may be set up to recall either the settings last used in that mode or to recall programmed settings (see "Preset Parameters"). A new mode may also be selected when ⚠ is displayed.*

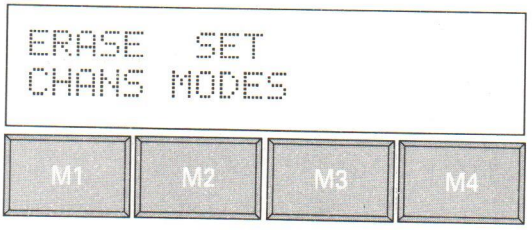
**Preset Parameters**

This facility uses the menu system to set the receiver so that either the last used bandwidth, AGC and BFO settings or preset settings are automatically recalled when the mode is changed. In the latter case it allows the settings to be programmed.

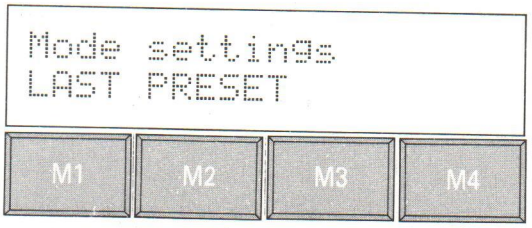
**Example (1)**

To set the receiver so that the last used settings are recalled when the mode is changed:

Press [MENU] repeatedly until these menu options are displayed.
Select SET MODES by pressing [M2]




Press [M1] to select LAST. The display then returns to the menu options.




Press [RCL] to exit the menu system and return the displays to the current receiver operating conditions.

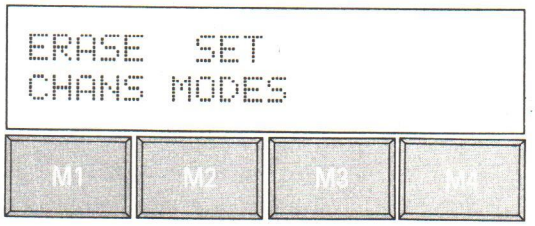
*When a new mode is selected the bandwdth, AGC and BFO settings last used in that mode are recalled.*

**Example (2)**

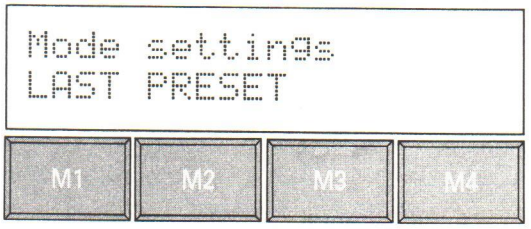
To store new preset parameters for CW mode:

Press MENU repeatedly until these menu options are displayed.

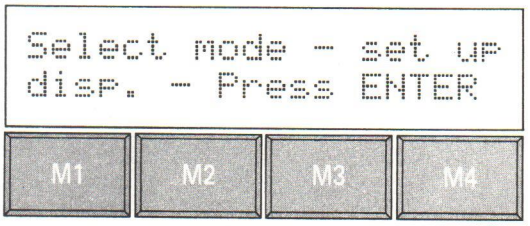
Select SET MODES by pressing M2




Press M2 to select PRESET.




Press CW to select CW mode for preset parameter changes.




The display then returns to the mode/bandwidth/AGC/BFO display to enable the desired preset parameters to be entered; refer to the appropriate setting-up procedure.

Press ENTER to memorise the parameter settings.

The display then returns to the select mode message so that another mode may be set up.

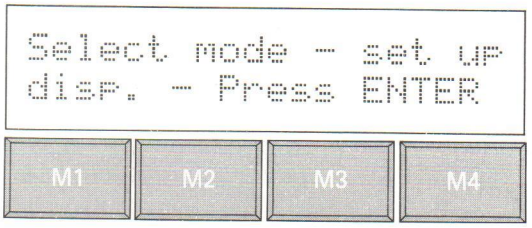
When all the required modes have been set up, press RCL to exit the menu system. The display then reverts to the previous receiver operating conditions.

*Any combination of mode, bandwidth, AGC setting and BFO offset may be pre-programmed for selection by the AUX button. This facility may be used, for example, to set the operating parameters required for use with an external demodulator.*

**Example (3)**

To store new preset parameters for the AUX mode proceed as in the previous example until the following message is displayed:

Press AUX to select AUX mode for preset parameter changes.




The display then returns to the mode/bandwidth/AGC/BFO display to enable the desired preset parameters to be entered. This time, however, the mode needs to be defined by pressing the desired mode button. The rest of the procedure is as before.

## 4.5 BANDWIDTH SELECTION

The receiver bandwidth can be increased or decreased by means of push button controls. The selected bandwidth is shown above the BW legend on the right-hand display.

**Bandwidth Buttons**

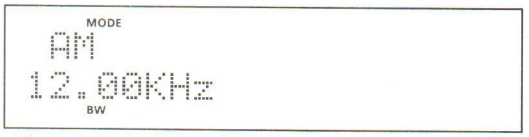
Press BW + repeatedly until the desired wider bandwidth is displayed.

Press BW − repeatedly until the desired narrower bandwidth is displayed.

**Example**

To increase the bandwidth on AM from 2.7 kHz to 12 kHz:

Press BW + until the right-hand display indicates 12.00 kHz.




*A wide selection of bandwidths may be fitted to the receiver. Individual bandwidths may be "locked out" so that they are not made available for selection by the* BW + *and* BW − *buttons. This is done using the "Bandwidth List" facility. If only one filter is fitted for each sideband in LSB, USB and optional ISB modes, then the bandwidth selection facility is ineffective in these modes.*

### Bandwidth List

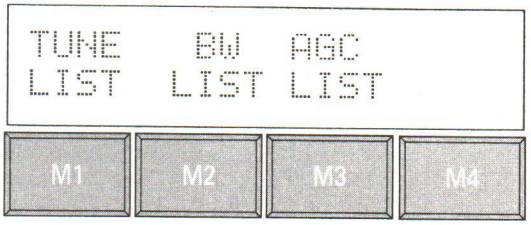
This facility uses the menu system to determine which bandwidths are to be made available for selection when using the BW + and BW − buttons. The system allows all bandwidths fitted to the receiver for use in USB, LSB and symmetrical modes to be presented in turn so that any unwanted ones can be "locked out".

### Example

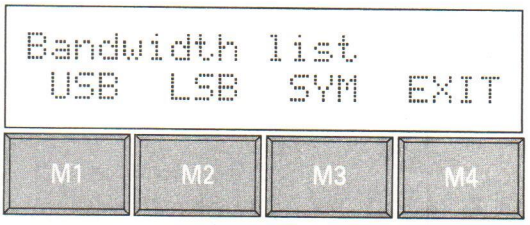
To enable the 0.30 kHz, 6.00 kHz and 12.00 kHz bandwidths to be made available for selection, but not the 1.00 kHz and 2.70 kHz bandwidths, proceed as follows:

Press MENU repeatedly until these menu options are displayed.

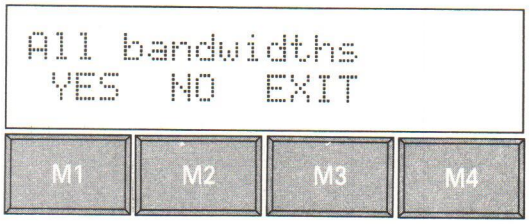
Select BW LIST by pressing M2




Press M3 to select the symmetrical bandwidth list for alteration.

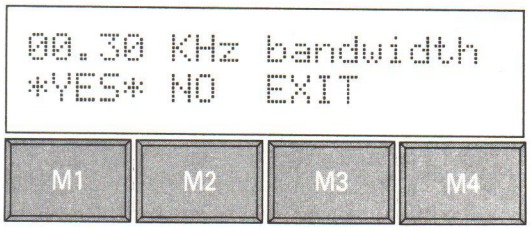



Press M2 to specify that all bandwidths are not required.




Press M1 to select the 0.30 kHz bandwidth.

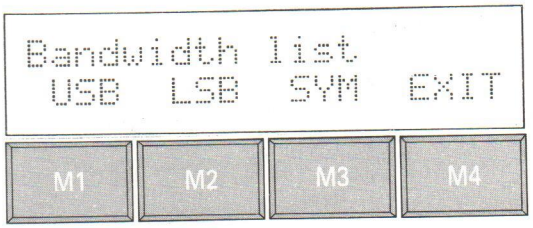
The current selection is indicated by * - - - *.



For the remaining bandwidths, select YES or NO by pressing M1 or M2 as directed to include the 6.00 kHz and 12.00 kHz bandwidths and "lock out" the 1.00 kHz and 2.70 kHz bandwidths. After each selection, the next bandwidth is displayed until the list is completed.

Press M4 to exit the Bandwidth list.

The display then returns to the current receiver operating conditions.




### Bandwidth Configuration

Before leaving the factory the control system of the receiver is programmed with information defining the IF crystal filters fitted to the receiver. This information may change, and re-programming required, due to:

- A different filter being subsequently fitted.
- The Processor Module being replaced with another which is not programmed with the required bandwidth configuration.
- A requirement to offset a filter in frequency for use in special applications such as FSK reception.

Instructions for programming new bandwidth configuration information, using the menu system, are contained in the IF/AF Module chapter in the RA3700 Series Maintenance Manual.

## 4.6 AGC SELECTION

The AGC decay time constant can be selected from up to five predetermined settings under push button control. The time constants include SHORT, MEDIUM and LONG to cope with different types of signals plus special time constants for use with certain types of data transmission. The selected time constant is displayed below the AGC legend on the right-hand display. A further (MAN) button is used to select the desired gain control mode, giving either full AGC, variable AGC threshold or manual gain. In the latter two modes the IF GAIN control is used to set the AGC threshold or receiver gain respectively.

### AGC Time Constant

Press AGC + to increase the AGC decay time constant;

e.g. from MEDIUM to LONG.

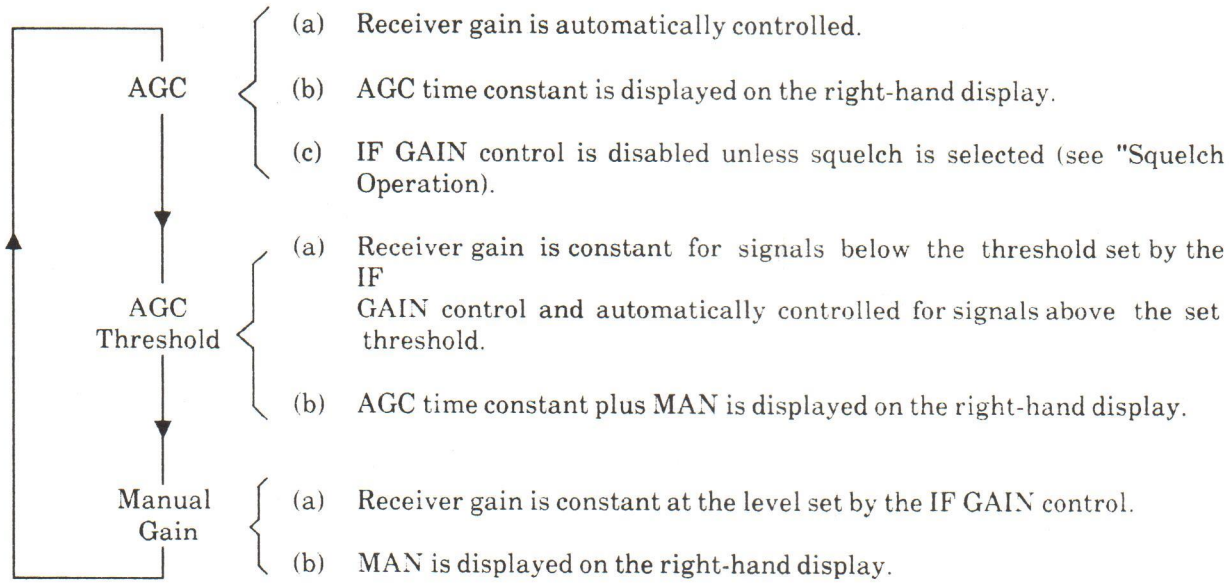
Press AGC − to decrease the AGC decay time constant;

e.g. from MEDIUM to SHORT.

*Individual time constants may be "locked out" so that they are not made available for selection by the* AGC + *and* AGC − *buttons. This is done using the "AGC List" facility.*

**Gain Control Modes**

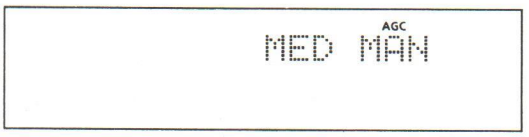
Each time MAN is pressed the gain control modes are selected in the following sequential loop:




**Example (1)**

To select AGC threshold operation from normal MEDIUM AGC mode:

Press MAN . If required press AGC + or AGC − to change the AGC setting.

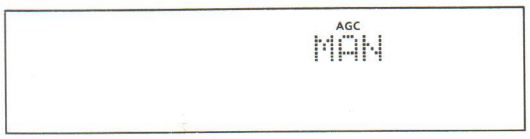



Adjust the IF GAIN control for the desired AGC threshold setting.

**Example (2)**

To select manual gain operation from AGC threshold mode.

Press MAN




Adjust the IF GAIN control to set the receiver gain.

*Further presses of* MAN *cause normal AGC mode to be re-entered and the sequence repeated.*

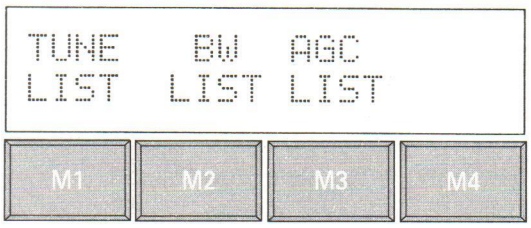
**AGC List**

The AGC time constants made available for selection by the two AGC buttons may be altered to suit operational requirements via the menu system. The AGC time constants are presented in turn and unwanted ones may be "locked out".

**Example**

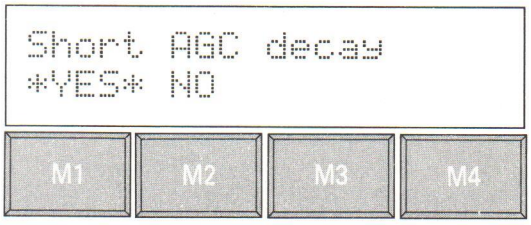
To retain medium and long AGC time constants and "lock-out" all others:

Press MENU repeatedly until these menu options are displayed.

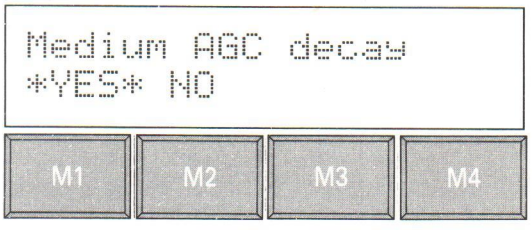



Select AGC LIST by pressing M3

Press M2 to exclude the short AGC decay time constant. The current selection is indicated by *---*.




Press M1 to include the medium AGC decay time constant.



Repeat the above procedure to include the long AGC decay time constant and "lock-out" the LINK 11 normal and data AGC decay time constants. The display then reverts back to the receiver operating conditions.

*Only one AGC list is available for both receivers in an RA3702.*

## 4.7 BFO SETTING

In CW mode the BFO tuning facility is selected using the BFO button and the BFO frequency set by either using the tuning knob or the numeric keypad. The BFO frequency is displayed above the BFO legend on the right-hand display.

### BFO Tuning Selection

Press 

if not already selected and the CW mode legend and parameters are displayed on the right-hand display.

Press 

to enable the BFO tuning facility, indicated by the BFO legend appearing on the centre display.

### Tuning Knob

Adjustment of the BFO frequency by means of the tuning knob is possible once the BFO tuning facility has been selected.

Turn the tuning knob clockwise to increase the BFO frequency or anti-clockwise to decrease the BFO frequency until the desired setting is displayed on the right-hand display.

Press 

repeatedly until LOCK appears on the centre display.

The tuning knob is now disabled and the BFO frequency setting locked.

### Push Button Selection

After pressing 

press 

to change the BFO frequency sign as required.

Select the desired frequency using the numeric keypad.

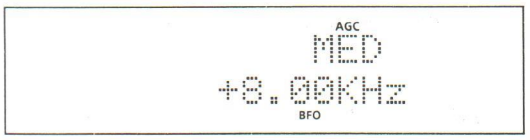
Press 

and the entered BFO frequency is displayed on the right-hand display.

**Example**

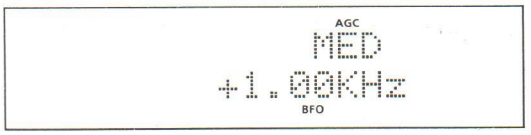
To set the BFO frequency to 1.00 kHz when in CW mode:

Press [BFO] to enable the BFO tuning facility.




The BFO legend appears on the centre display and the previous BFO frequency setting is displayed on the right-hand display.

Press [+/-] if necessary to change the displayed BFO frequency sign.




Press [1] [ENTER] to obtain the desired BFO frequency of 1.00 kHz.

*The receiver continues to operate on its current BFO frequency until* [ENTER] *is pressed to change to the new frequency.* ⚠ *is displayed to indicate that the displays do not represent the current operating frequency of the receiver. If* [RCL] *is pressed instead of* [ENTER] *the display reverts to the current BFO frequency.*

*When the sign or first numeric key is pressed the rest of the displayed BFO frequency is reset to zero. The position of the next digit to be entered is signified by a cursor. Trailing zeros after the fixed decimal point need not be entered. After setting the BFO frequency using the keypad the tuning knob is enabled to allow further adjustment as necessary. Movement of the tuning knob disables the numeric keypad. An offset frequency of up to three digits is permissible giving a BFO frequency range of +9.99 kHz to -9.99 kHz.*

## 4.8 SQUELCH AND COR OPERATION

The receiver is provided with a squelch facility which may be used to mute the audio outputs when the signal level falls below a threshold set using either the IF GAIN control or Signal Detector menu, if fitted. There is also a COR ("carrier operated relay") output on the rear panel which may be used, for instance, to start a tape recorder when a signal is present and stop it when the signal drops below the squelch threshold.

**Squelch Operation**

Press [SQLCH] to enable squelch operation. Set the squelch threshold, using either the IF GAIN control or Signal Detector menu, if fitted.

Adjustment of the squelch threshold is made easier if a short COR hang time is selected (see COR Output).

*When full AGC is selected the IF GAIN control is used to set the squelch threshold. When squelch is selected with threshold AGC the IF GAIN is used to adjust the AGC threshold level and the squelch level is automatically set to be 3 dB higher. Squelch cannot be selected with manual gain. 'SQ' appears on the right-hand display to indicate selection of squelch. If 10 kHz/Signal Detector module is fitted then refer to Chapter 9 for further details of squelch operation.*

### COR Output

Using the menu system the rear panel COR output may be set to be permanently active, active only when squelch is selected or permanently off. When active the COR output is switched on when the signal level exceeds the threshold set by either the IF GAIN control or Signal Detector menu (see Chapter 9) if fitted. The COR legend then appears on the centre display when the threshold level is achieved.

The COR facility may also be used to halt a frequency sweep or channel scan automatically when a signal above the threshold is present. This "Stop on COR" facility may only be used when the COR output is enabled.

A COR hang time may be programmed to hold the COR output on for a certain time after the signal has dropped below the threshold. This hang time also applies to the audio mute provided by the squelch facility.

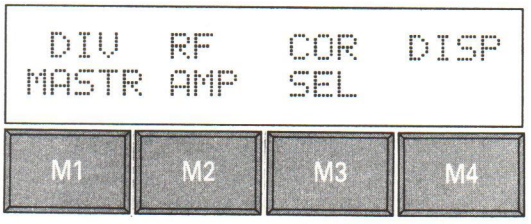
If during the hang time, the ENTER key is pressed (or the ENTR remote command actioned), the hang will be dumped (ie. COR output will be set to the in-active state and the audio will be muted). If the signal is then still above the threshold the COR will act as if a new signal has been detected.

A latched COR hang can be configured in which case the hang is only terminated when dumped by the use of the ENTER key or remote ENTR command.

### Example (Receivers without 10 kHz/Signal Detector)

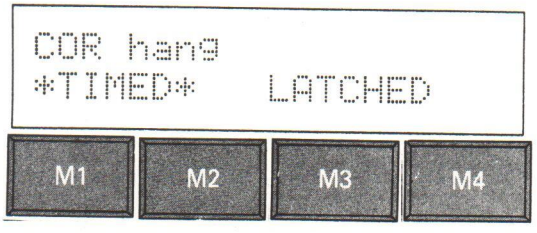
To provide a COR hang time of 2.5 seconds for the COR output and set the COR facility to be active only when squelch is selected, proceed as follows:

Press MENU repeatedly until these menu options are displayed.

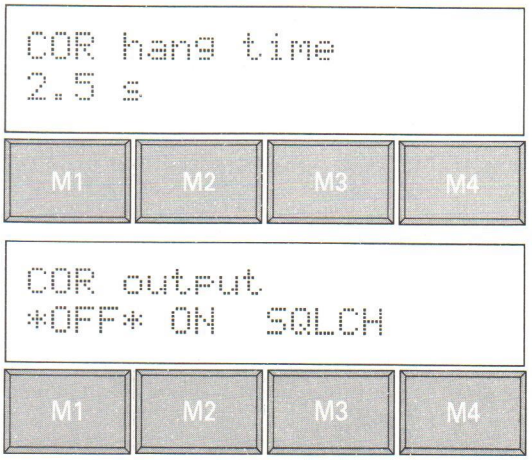



Select COR SEL by pressing M3

Press M1 to select timed COR hang operation.



Press [2] [5] [ENTER] to enter the desired COR hang time of 2.5 seconds.




Press [SQLCH] to select squelch. The current selection is indicated by *- - -*. The display then reverts to the menu optons.




Press [RCL] to exit the menu system.

*The COR hang time is a delay controlled by software. There will be an additional delay after the signal has dropped below the threshold and before the software delay commences. This additional delay is dependent on the signal level and the AGC time constant selected.*

## 4.9 CHANNEL STORAGE AND SELECTION

The programmable channel memory facility has the capacity to store data on 100 operating frequencies together with their associated mode, bandwidth, AGC and BFO settings. The data is allocated a channel number from 00 to 99 which is subsequently selected to provide instant recall. The stored data is not lost if the power is interrupted.

### Channel Storage

To store the current displayed frequency and mode parameters, proceed as follows:

Hold [STORE] in while entering a two figure channel number on the numeric keypad.

Release [STORE] to memorise the channel data.

*The SCAN legend appears on the left-hand display to signify that the SCAN flag has also been set. Leading zeros must be entered for single figure channel numbers. The position of the next digit to be entered is signified by a cursor. Failure to store channel data causes the FAULT legend to flash. Channels not programmed with an operating frequency and mode parameters are allocated a set of default parameters.*

### Channel Selection

Channel selection can be carried out by using either the numeric keypad or the tuning knob.

Press [CHAN] to initiate channel selection. The last channel number selected with its settings are then indicated.


Either retain the last channel or select a new channel, as required, by keypad entry or rotating the tuning knob in either direction until the desired channel is displayed on the left-hand display.

Press [ENTER] : the receiver now operates on the settings stored for the chosen channel number.

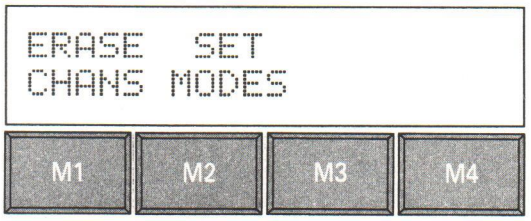
*During channel selection, ⚠ is displayed to indicate that the displays do not represent the current receiver operating conditions. Leading zeros must be entered for single figure channel numbers. Once the tuning knob is rotated the numeric keypad is disabled.*

*The memory contents may be checked at any time without affecting receiver operation by pressing* [CHAN] *and selecting to the desired channel. The contents of one channel may be transferred to another by first carrying out the channel selection procedure for the source channel, but without pressing* [ENTER] *, and then performing the channel storage procedure for the recipient channel.*

### Erasure of Channels

All channels can be erased by using a menu system facility.

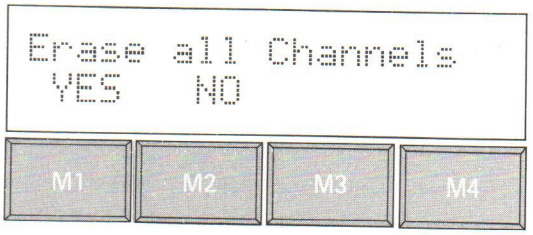
Press [MENU] repeatedly until these menu options are displayed.



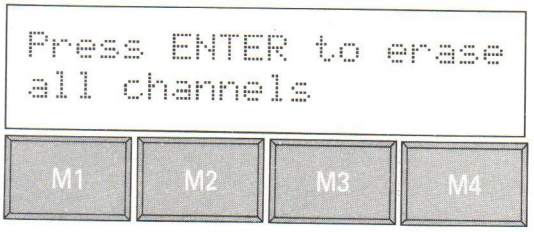

Select ERASE CHANS by pressing [M1]

Press [M3] to retain scan flags.

Press M1 to select channel erasure.




Press ENTER to implement bulk channel erasure. The display then reverts to the menu options.




Press RCL to exit the menu system.

*Protection against unintentional channel erasure is provided by requesting that two keys be pressed sequentially in response to the "Erase all channels" message.*

## 4.10 CHANNEL SCANNING

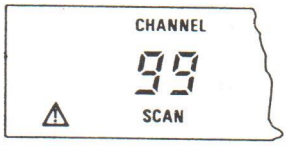
The receiver can be set up to scan automatically any range of channels within the 100 channel memory. The start channel, stop channel and dwell time on each channel may be programmed via the menu system. Individual channels within the scan range which are not to be scanned may be "locked out" by deleting the scan flags for these channels. The scan may be stopped at any time by using a front panel button or by means of an external input to a rear panel "scan inhibit" line. Alternatively the scan may be halted on detection of a signal whose level exceeds a threshold set using either the IF GAIN control or Signal Detector menu, if fitted. (Stop on COR operation). Channel scanning is initiated on completion of the scanning setting up procedure.

### Scan Flag Selection and Deletion

Press CHAN to enable the selection of channels on which the scan flag is to be set or erased.

Select the desired channel using the numeric keypad or tuning knob.

Press SCAN to toggle the scan flag. The SCAN legend appears below the channel number on the left-hand display when the scan flag is set.

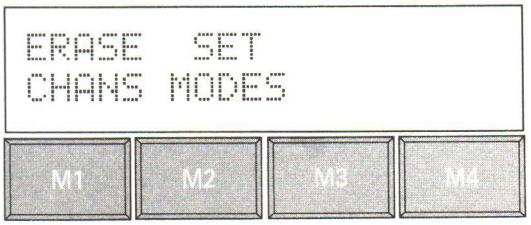


Press RCL to exit to normal front panel operation.

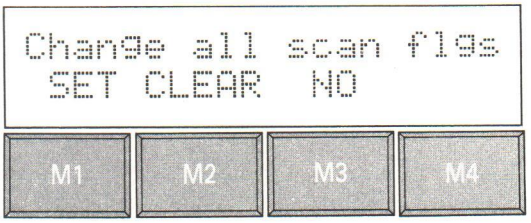
*When setting the scan flags, ⚠ is displayed to indicate that the displays do not represent the current operating frequency of the receiver. When data is stored in a channel the scan flag for that channel is automatically set.*

All channel flags may be simultaneously set or erased as required via the menu system as follows:

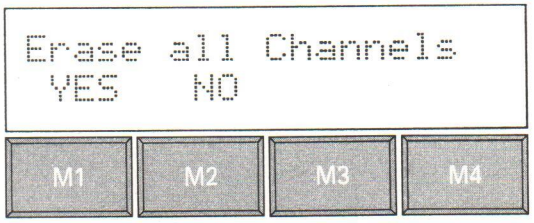
Press MENU repeatedly until these menu options are displayed.
Select ERASE CHANS by pressing M1




Press M1 or M2 to set or clear all scan flags as required.




Press M2 to retain all channels. The display then reverts to the menu options.



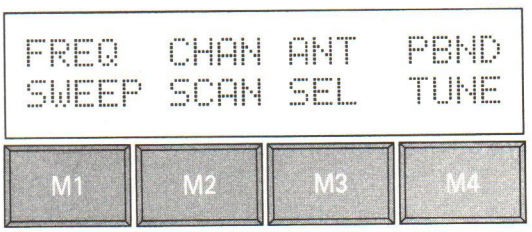

**Setting the Channel Scan**

Before commencing channel scanning, the range of channels to be scanned, the dwell time and whether the stop on COR facility is needed, must all be set up via the menu system. Further details of the dwell time and stop on COR operation are given later.

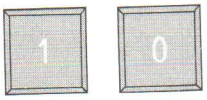
**Example**

To set a range of channels from numbers 10 to 20 for scanning, with a dwell time of 0.5 seconds and without the use of the stop on COR facility:

Press MENU until these menu options are displayed.
Select CHAN SCAN by pressing M2



Enter the start channel number by pressing

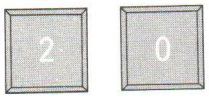



on the numeric keypad.

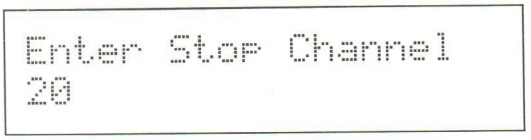

Press 


to store channel 10 in the memory.

Enter the stop channel number by pressing



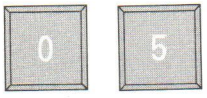

on the numeric keypad.



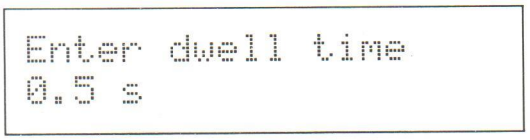

Press 


to store channel 20 in the memory.

Enter the dwell time by pressing




on the numeric keypad.




Press 

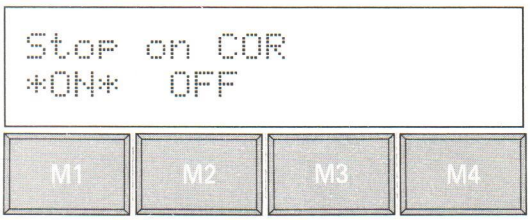

to store a 0.5 sec dwell time in

the memory.

Press 


to omit the stop on COR

facility and initiate continuous scanning of all channels within the designated range of channels. The current selection is indicated by *--*.

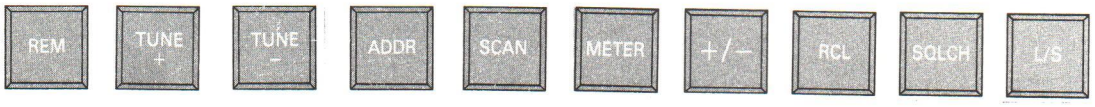



The display then reverts to the current receiver operating parameters and channel scanning commences from the lowest channel number within the allocated range of channels.

Press 

to reverse the direction of scan if required.

*Only those channels with their SCAN flag set are scanned. The SCAN legend changes to SCANNING and the channel numbers cycle through the selected range. If channel scanning is attempted with no scan flags set then the message "NO CHANNELS TO SCAN" appears on the right-hand display. While channel scanning is taking place, all push buttons are disabled except for:*




### Changing the Dwell Time

While the receiver is channel scanning, the dwell time may be changed, by means of the two tune buttons, from the initial value chosen via the menu system.

Press 

or 

repeatedly to increase or decrease the dwell time in steps of 0.1 sec over the range 0.1 to 9.9 sec.

### Stopping and Restarting the Scan

Press 

to stop channel scannng.

The SCANNING legend changes to SCAN .

Press 

again to restart channel scanning.

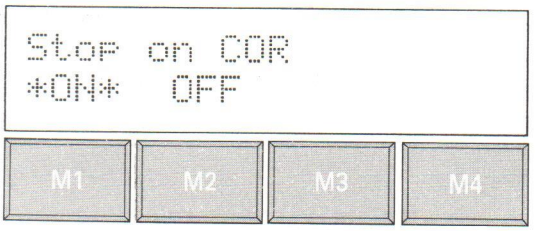
The SCAN legend changes back to SCANNING .

**Stop on COR**

If it is required to stop the scan automatically when a signal is detected then Stop on COR operation must be selected (see also "SQUELCH AND COR OPERATION"). The scanning cycle stops on any channel which receives a signal exceeding a preset threshold. Scanning resumes when the signal falls below the threshold or if ENTER is pressed.

To set the receiver to stop the scan automatically when a signal is detected:

Proceed with setting up the channel scanning, using the menu system as previously described, until this message is displayed. Press M1 to include the Stop on COR facility and initiate channel scanning as before.




Set the desired signal threshold, using either the IF GAIN control or Signal Detector menu (see Chapter 9) if fitted.

*The SCANNING legend flashes when channel scanning is halted due to the Stop on COR threshold being achieved, or the "scan inhibit" line being activated. In the former case the COR legend also appears on the centre display. The Stop on COR facility cannot be used on channels with manual gain control in operation or if the COR output is set to OFF.*

## 4.11 FREQUENCY SWEEPING

The receiver can be set up to sweep automatically over any range of frequencies within its complete frequency coverage. The start frequency, stop frequency, sweep rate and frequency step size may be programmed via the menu system. The sweep may be stopped at any time by using a front panel button or by means of an external input to a rear panel "scan inhibit" line. Alternatively the sweep may be halted on detection of a signal whose level exceeds a threshold set using either the IF GAIN control or Signal Detector menu, if fitted. (Stop on COR operation). Frequency sweeping is initiated on completion of the sweep setting-up procedure.

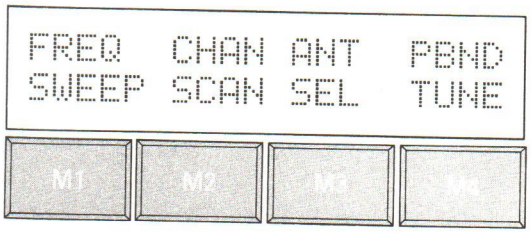
**Setting the Frequency Sweep**

The menu system is used to set up the sweep start and stop frequencies, step size, initial sweep rate and whether Stop on COR is required. On completion of data entry, frequency sweeping is automatically started. Further information on how to alter the preset dwell time during sweeping, or use of the Stop on COR facility is given later.

**Example**

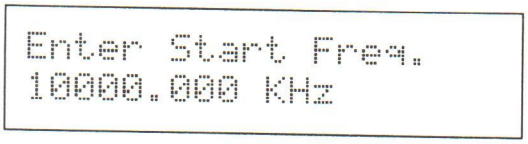
To sweep a range of frequencies from 10 MHz to 20 MHz with a step size of 3.0 kHz at a rate of 6 kHz/second and without using the Stop on COR facility:

Press MENU until these menu options are displayed.



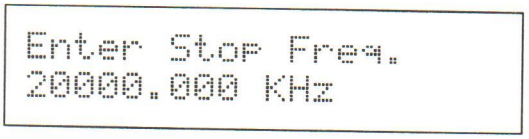

Select FREQ SWEEP by pressing M1

Enter the start frequency in kHz by pressing 1



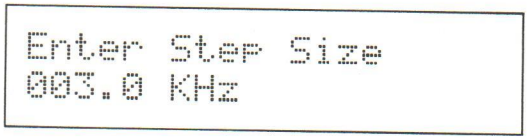

Press ENTER to store 10 MHz in the memory.

Enter the stop frequency in kHz by pressing 2




Press ENTER to store 2 MHz in the memory.

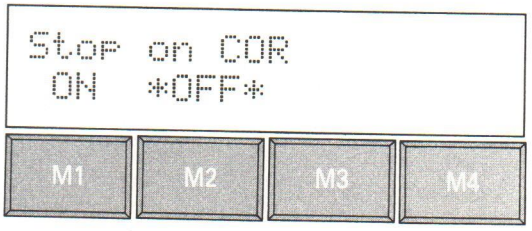
Enter the step size in kHz by pressing 0 0 3




Press ENTER to store 3.0 kHz in the memory.

Enter the initial sweep rate in kHz/second by pressing 0 0 6. Press ENTER to store 6 kHz/second in the memory.


Press M2 to omit the Stop on COR facility and initiate continuous sweeping over the selected frequency range. The current selection is indicated by *- - -*



The display then reverts to the current receiver operating parameters and frequency sweeping commences from the lowest frequency in the selected range.

Press 

to reverse the direction of sweep if required.

*Trailing zeros need not be entered. The step size must be in the range 0.1 to 999.9 kHz and a sweep rate in the range 0.01 to 999.9 kHz/second is allowed. In addition the sweep rate is limited to a maximum of 100 times the value of the step size per second. If these parameters are exceeded the message "STEP OR RATE ERROR PRESS MENU TO CONT." appears on the right-hand display. If a start frequency is entered which is higher than the stop frequency the message "STOP < START FREQ PRESS MENU TO CONT." is displayed.*

### Changing the Sweep Rate

While the receiver is frequency sweeping, the sweep rate can be changed, by using the two tune buttons, from the initial sweep rate value chosen via the menu system.

Press 

or 

repeatedly to increase or decrease the sweep rate in steps of about 10% of the current rate.

### Stopping and Restarting the Sweep

Press 

to stop the frequency sweep.

The SCANNING legend now disappears.

Press 

again to restart the frequency sweep.

The SCANNING legend now reappears.

### Stop on COR

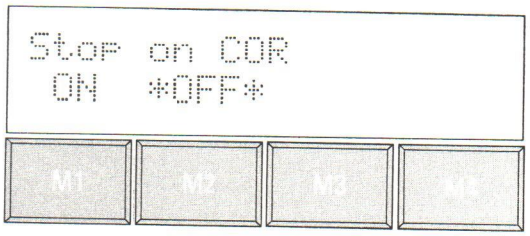
If it is required to stop the sweep automatically when a signal is detected then Stop on COR operation must be selected (see also "SQUELCH AND COR OPERATION"). The sweep action will then stop on any frequency for which a signal exceeds the squelch threshold selected.

Frequency sweeping is resumed when the signal drops below the threshold or if 

is pressed.

NOTE: When the ENTER key is pressed, the sweep will advance by the number of sweep steps that is greater or equal to the current bandwidth.

To set the receiver to stop the sweep automatically when a signal is detected, proceed with setting up the frequency sweep, using the menu system as previously described, until this message is displayed.




Press M1 to include Stop on COR and initiate frequency sweeping as before.

Set the desired signal threshold, using either the IF GAIN control or Signal Detector menu (see Chapter 9) if fitted.

*The SCANNING legend flashes when frequency sweeping is halted due to the Stop on COR level being achieved or the "scan inhibit" line being activated. In the former case the COR legend also appears on the centre display. The Stop on COR facility cannot be used on channels with manual gain control in operation or if the COR output is set to OFF.*

## 4.12 RF AMPLIFIER

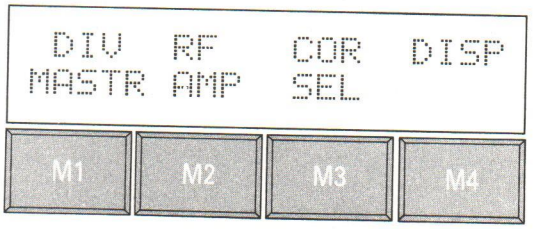
The receiver is fitted with an RF amplifier which may be switched on or off from the front panel. With the amplifier switched on the receiver sensitivity is optimised. However, when receiving small signals in the presence of much larger signals, as may be the case when connected to an efficient antenna, it may be advantageous to switch off the RF amplifier to reduce interference from the larger signals.

The receiver may be set up via the menu system so that the RF amplifier is switched on at all frequencies, switched off at all frequencies or switched off below 480 kHz where its gain starts to fall. When the RF amplifier is switched on the letter A is shown next to the Antenna number on the right-hand display.

**Example**

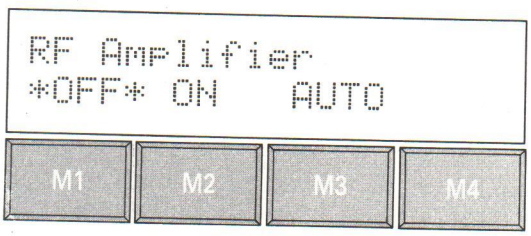
To switch on the RF amplifier for all frequencies above 480 kHz:

Press MENU repeatedly until these menu options are displayed.




Select RF AMP by pressing M2

Press M3 to enable the rf amplifier to be automatically switched on and off above and below 480 kHz. The current selection is indicated by *- - -*. The display then reverts to the menu options.




Press RCL to exit the menu system.

*If the receiver tuning knob is being used with AUTO selected then the switching on and off frequencies become 490 kHz and 470 kHz respectively.*

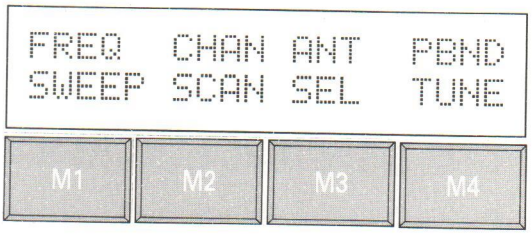
## 4.13 PASSBAND TUNING

Passband tuning is available in USB and LSB modes only. Signal interference within the passband may be tuned out by selecting a filter narrower than the current SSB bandwidth and using the tuning knob to position it within the SSB passband for best intelligibility. This facility is accessed through the menu system.

**Example**

To select a 1 kHz passband filter for use in USB mode with a passband of 2.7 kHz:

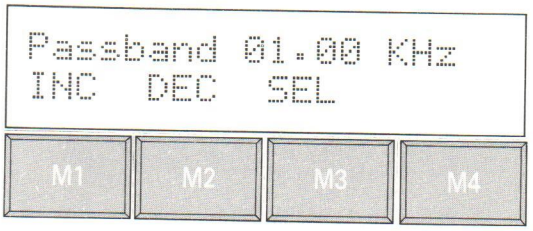
Press MENU to display these menu options.




Select PBND TUNE by pressing M4

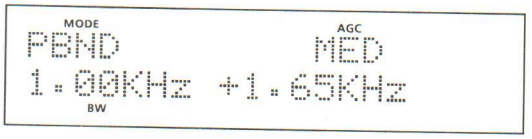
The last selected passband filter is then displayed.

Press M1 or M2 as necessary




to increase or decrease the passband until the desired frequency of 1 kHz is displayed. Select this frequency by pressing M3

The passband filter frequency of 1 kHz is then displayed below the PBND legend, along with +1.65 kHz to indicate that the selected passband filter has been automatically centred within the SSB passband.




Rotate the tuning knob in either direction to position the centre frequency of the filter to the required setting within the SSB filter passband. Observe that the 1.65 kHz digits change to indicate the filter position.

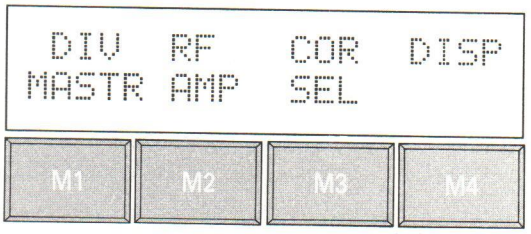
Press RCL (or a mode button) to exit the passband tuning facility and revert back to normal operation.

*Only symmetrical filters with a bandwidth of equal to or less than the current SSB bandwidth are made available for selection by* M1 *or* M2 *. If none are available then the message 'NO BWs AVAILABLE. PRESS RCL TO CONT.' appears. Exit the menu system by pressing* RCL *and continue by carrying out the bandwidth list procedure (see "BANDWIDTH SELECTION") to establish bandwidth availability. Attempted passband tuning operation in non-SSB modes results in the message 'USB & LSB MODES ONLY PRESS RCL TO CONT.' being displayed as a reminder first to select either LSB or USB modes.*

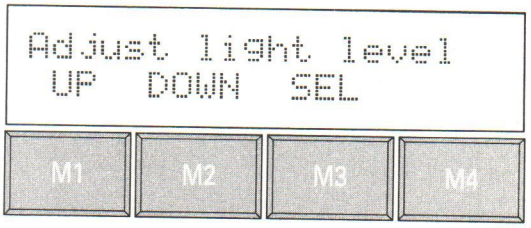
## 4.14 FRONT PANEL DISPLAY ILLUMINATION AND VIEWING ANGLE

The back-lighting intensity of all three displays can be set to suit operating conditions by means of the menu system. This facility also enables an optimum viewing angle to be set for the right-hand display.

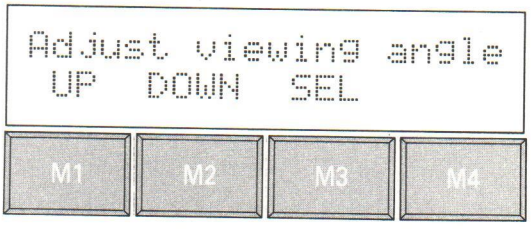
Press MENU several times until these menu options are displayed.
Select DISP by pressing M4




Press M1 or M2 repeatedly to increase or decrease the back-lighting intensity until the required setting is achieved.
Select the chosen intensity setting by pressing M3




Press M1 or M2 as before to achieve the required viewing angle and select by pressing M3 . The display then reverts to the menu options.




Press RCL to exit the menu system.

*Both receivers in an RA3702 operate at the same settings.*

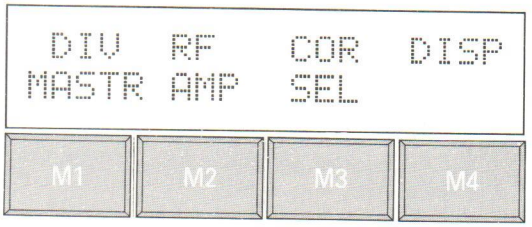
## 4.15 DIVERSITY OPERATION

For diversity operation using single receivers the menu system is used to designate a receiver as the master of an external diversity pair. Prior to operation, the remote control interface ports of the receiver pair must be set up for diversity operation (see Chapter 6). The master receiver then sends out control commands via its serial port in order to set the slave receiver to the same settings. If a dual receiver is set up for internal diversity operation, one receiver becomes the master and the other receiver the slave; either receiver may be used as the master.

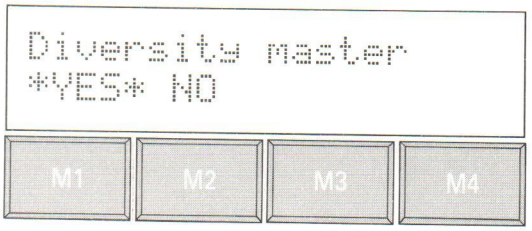
**Example**

Selecting receiver as diversity master of a slave address '15'. Note the 'Master' remote port must be set up for 'TWO' address bytes.

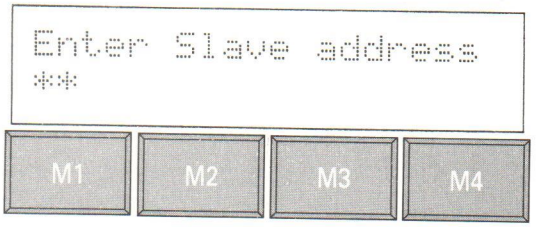
Press MENU several times until these menu options are displayed.
Select DIV MASTER by pressing M1




Press M1 to nominate this receiver as the diversity master and the remote receiver as the diversity slave. The current selection is indicated by *---*. The display then reverts to the menu options and the MASTER legend appears on the right-hand display.




Press 1 5 ENTER to nominate receiver address 15 as the diversity slave. The display then reverts to the current receiver operating parameters, and the MASTER legend appears on the left hand display.



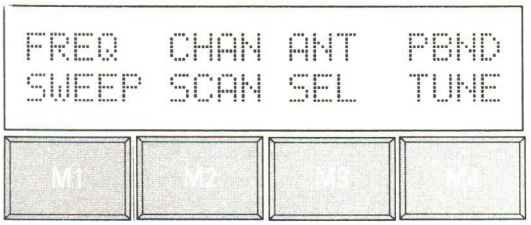

## 4.16 ANTENNA SELECTION

Facilities are provided in the menu system to allow selection of the antenna which is connected to the receiver. One of up to 16 antennas may be selected (4 antennas are available for each receiver in a dual receiver). A binary coded output is available at the rear panel to drive an external antenna switch. Details of interface wiring to the Parallel I/O connector are provided in Chapter 2.

**Example**

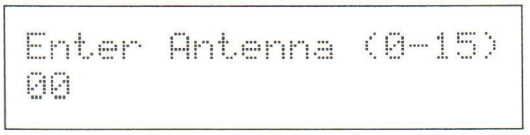
To select antenna number 5:

Press MENU until these menu options




are displayed.
Select ANT SEL by pressing M3

Enter the antenna number by pressing 0

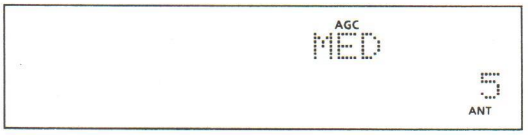



5 on the numeric keypad. Press

ENTER to execute the selection and storage of

antenna number 5.

The receiver then continues operating on the previous parameters with the selected antenna number displayed on the right-hand display.




*If an attempt is made to enter an antenna number greater than 15 then the message "VALUE OUT OF RANGE PRESS MENU TO CONT." appears on the right-hand display. The antenna numbers available for selection for each receiver in a dual receiver are in the range 0 - 3.*

# CHAPTER 5

# REMOTE OPERATION OF THE RECEIVER

## 5.1 INTRODUCTION

The RA3700 Series of receivers incorporates full remote control capabilities, including built-in, multi-addressing which allows up to 99 receivers (30 if IEEE-488 controlled receivers are used) to be controlled by one controller. The controller may be a computer, an MA3700 receiver control unit or an RA3700 Series receiver. This chapter describes the operation of the receivers in a remote control system. For details of how to install and set up receivers in such a system, refer to Chapter 6.

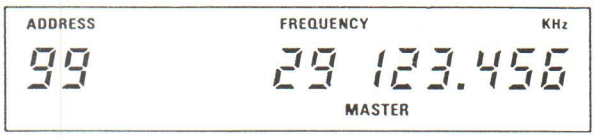
A receiver may be switched to remote operation, in which it acts as a slave, either by a command signal sent from the controller or (if it is a serial controlled receiver), by means of the REM (remote) button on the receiver front panel. In both cases the remote condition is indicated on the left-hand display and the front panel controls are disabled except for local monitoring functions.

In order to use an RA3700 Series equipment as a controller (master), the address of the slave receiver to be controlled is simply entered using the front panel buttons. Operating settings may be handed off from the master to the slave, or vice versa, and the front panel of the master may then be used to control the slave. In a remote system there is only one master equipment.

## 5.2 OPERATION AS A MASTER

The operating parameters of any slave receiver in the system may be controlled remotely from the master equipment front panel. On taking control the current settings displayed on the front panel of the master may be handed off to the slave or, alternatively, the current operating settings of the slave may be recalled by the master. Subsequently the operating settings of the slave may be changed as required using the front panel of the master by following the procedures described in Chapter 4

Press ADDR to set the equipment to act as a master. Enter the slave address on the numeric keypad as indicated by the cursor in the address display.




Press ENTER to hand off the current master settings to the slave or RCL to recall the current slave settings to the master; the MASTER legend is displayed on the left-hand display. The slave receiver may now be controlled using the front panel of the master equipment.

*When an RA3700 Series receiver is being used as the master of a slave equipment the receiver in the master is effectively disconnected from its front panel and continues to operate on its current settings.*

*During an address entry a cursor indicates the required number of digits. The availability of single or double figure address numbers is determined when the serial ports are initially configured for remote control operation (see Chapter 6). An incorrect address entry can be corrected by overwriting the displayed number. If zero address characters are configured (or fixed slave addressing for an IEEE-488 controlled receiver), no numeric keys are pressed to select master operation.*

## 5.3 OPERATION AS A SLAVE

It is not necessary to set a receiver to remote operation manually, as this occurs automatically when the receiver is addressed by the master. If required the slave receiver can be manually returned to local operation at any time by pressing the REM button on the front panel of the slave. Note that an exception to this is if the controller has set "local control lock-out" on the slave in order to prevent it from being returned to local control.

Press 

to return the slave to local operation. The REMOTE legend now disappears.

For a Serial controlled receiver:

Press 

again to reselect remote operation. The REMOTE legend now re-appears and remote operation is resumed.

NOTE: For IEEE-488 controlled receivers, the REM key can only be used to set the receiver back to local.

*On a slave receiver the front panel displays indicate the actual operating conditions set by the master and the REMOTE legend appears on the left-hand display along with the slave address. All front panel controls are disabled except for the following:*

- *POWER ON/OFF.*
- *VOLUME (audio level control).*
- *METER (RF and AF metering).*
- *L/S (switches loudspeaker on/off).*
- *ADDR, RCL (enables front panel selection of either receiver in a dual receiver).*

*A dual receiver has two addresses; each receiver may be controlled independently (unless diversity operation has been selected.*

## 5.4 REMOTE BITE MONITORING

When a master equipment is being used to control a slave, faults on either the master or slave will be indicated by the FAULT legend on the front panel of the master.

Fault interrogation may be carried out from the front panel of the master to determine which equipment, and which module, is faulty. This procedure is described in Chapter 7.

# CHAPTER 6

# SETTING UP THE REMOTE CONTROL INTERFACE

## 6.1 INTRODUCTION

The equipment is fitted with either a dual Serial ASCII (RS423) or a single General Purpose Interface Bus (IEEE-488) interface.

### Serial ASCII Interface

This interface complies with CCITT recommendation V10 and EIA standard RS423-A. It is also compatible with CCITT recommendation V24/V28 and EIA standard RS232-C.

The remote control protocol is based on ASCII characters so that the equipment can easily be used in computer controlled systems. Alternatively the MA3700 receiver control unit or an RA3700 Series receiver can be used as the system controller. Details of the remote control command format are contained in the RA3700 Series Maintenance Manual.

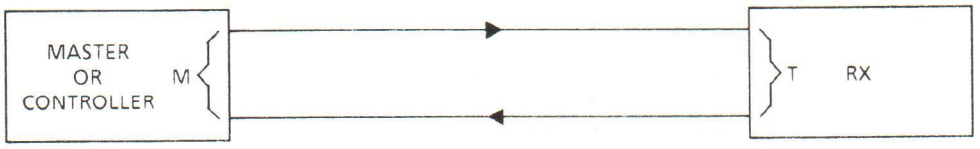
The equipment is fitted with two serial control ports (Master and Tributary). Each port has separate lines for transmitting and receiving serial data. The Master port is used on an equipment which is acting as a controller (master). The Tributary port is used when an equipment is acting as a slave unit. In some systems both ports on an equipment may be used (e.g. in a remotely controlled diversity pair). Typical system configurations are shown in Fig. 6.1. Connection details are given in Section 6.5.

Before an equipment can be used in a remote control system, various parameters must be preset so that all the equipments in the system are compatible. For example, they must all be set to send and receive data at the same speed. Also, each equipment in the system must be allocated a unique address. These parameters may be set up locally as described in Section 6.2. Alternatively they may be programmed remotely using an external control unit. This may be either a computer or another RA3700 Series equipment with full front panel controls; details of the latter are contained in Section 6.3.

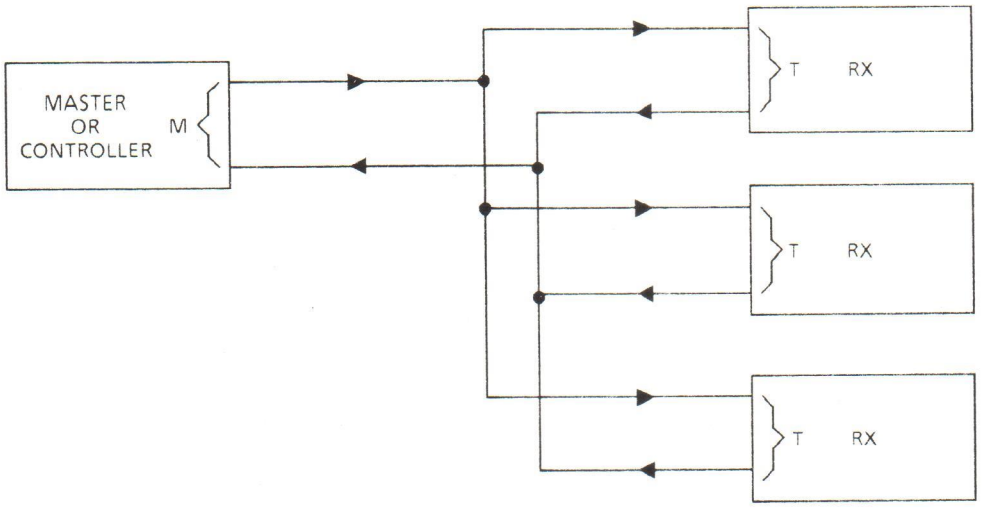
### IEEE-488 Interface

This interface complies with ANSI/IEEE std. 488.1 1987. The system controller may be a computer, an MA3700 receiver control unit or an RA3700 Series receiver. Details of the remote control command format are contained in the RA3700 Series Maintenance Manual. The receiver is connected into the system via a standard IEEE-488 cable.

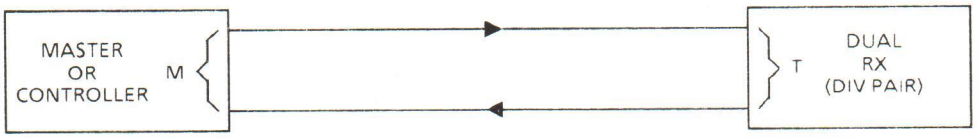
Before an equipment can be used in a remote control system, various parameters must be preset so that all the equipments in the system are compatible. For example, the termination of strings of data words (packets) must be defined. Also, each equipment in the system must be allocated a unique address. These parameters may be set up as described in Section 6.4.




(a) ONE – TO – ONE




(b) MULTI – DROP SYSTEM




(c) REMOTE CONTROLLED DIVERSITY PAIR

M = MASTER PORT
T = TRIBUTARY PORT

**Typical Serial Remote Control Configurations** **Fig. 6.1**

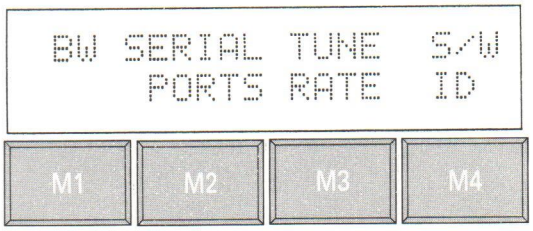
## 6.2 LOCAL SETTING UP OF SERIAL PORTS

On RA3701/RA3702 receivers the serial link parameters of the Master and Tributary ports can be set up locally via its own front panel menu system, thus allowing it to function either as a master or slave in a remote control system. For RA3703/RA3704 receivers the serial link parameters can be set up locally using the switches provided on the front panel as described later in this section.

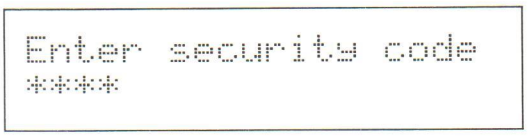
**Example** (RA3701/RA3702 receivers)

To set up both ports of the receiver for operation on a serial link which has a baud rate of 2400, even parity, includes a link control character, a cyclic redundancy code (CRC) and no free tune facility; and provide the master with a two character slave address capability with address 99 being allocated as its slave address, proceed as follows:

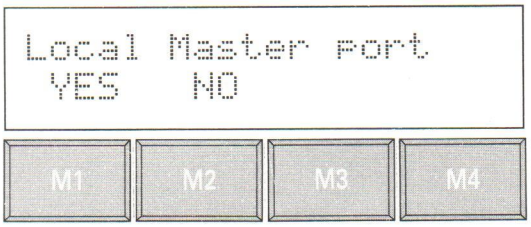
Press MENU repeatedly until these menu options are displayed.
Select SERIAL PORTS by pressing M2




Key in the security code on the numeric keypad and then press ENTER . This operation prevents unintentional changes to the link parameters. A flashing cursor indicates the next digit to be entered.

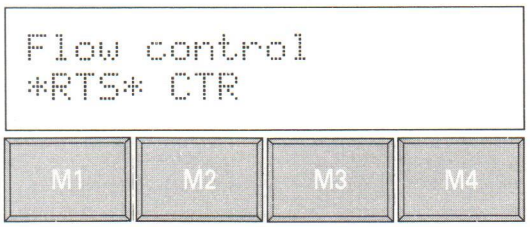



Press M1 to select the local Master port for parameter changes.



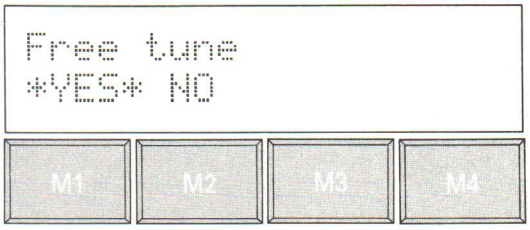

Press M1 to select RTS if the port is connected to a data communications equipment such as a modem.

Press M2 to select CTR if the port is connected to a data terminal equipment such as a computer or another receiver.

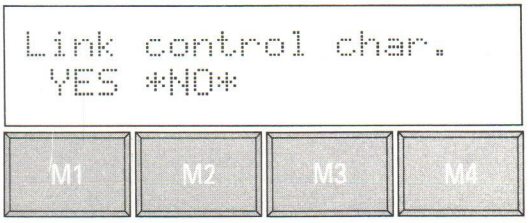


Press M2 to omit the free tune facility.

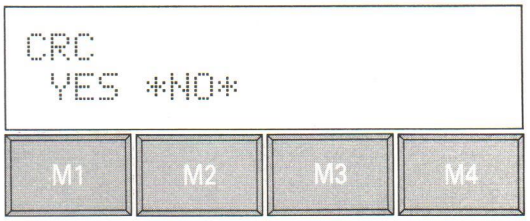
Tuning of a controlled equipment will now be by discrete frequency updates. The current selection is indicated by *---*.



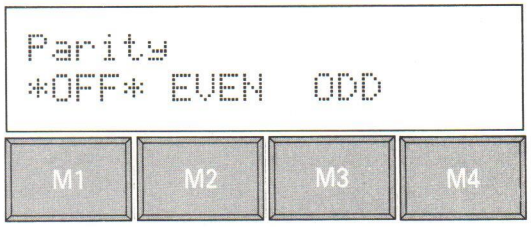

Press M1 to include the link control character for link management.



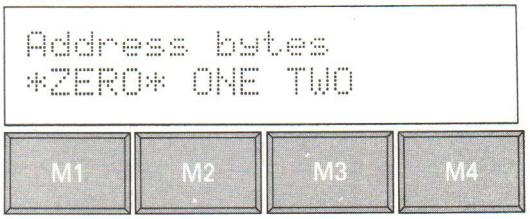

Press M1 to include CRC to detect corruption of remote link input and output data.



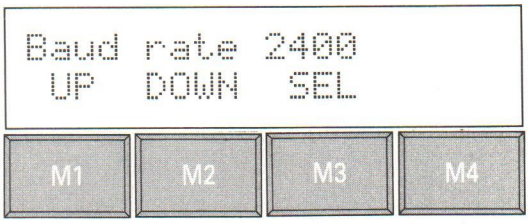

Press M2 to select even parity.



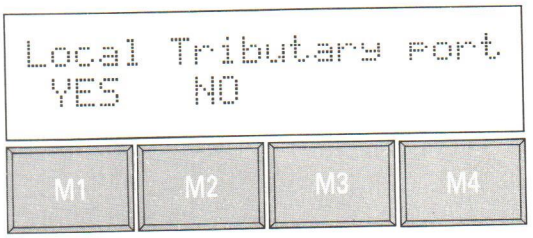

Press M3 to provide a two character address capability, allowing up to 99 Tributaries to be addressed when in the controller mode.




Press M1 or M2 until a baud baud rate of 2400 is displayed. Press M3 to select the displayed baud rate.

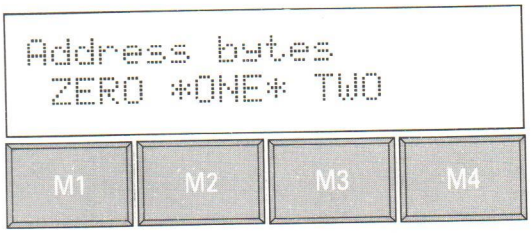


Press M1 to select the local Tributary port for parameter changes.

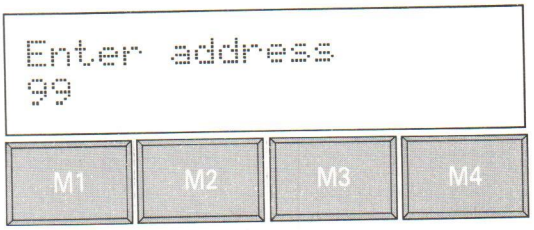



Set up CTR/RTS, the link control character, CRC and parity as previously described for the Master port.

Press M3 to enable a two character slave address to be entered. .

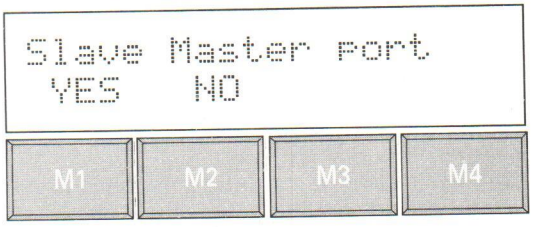



Press 9 9 on the numeric keypad, then ENTER to enter address 99.




For a dual receiver this enters the address for receiver 1. The message is repeated to allow the address for receiver 2 to be entered. Note that the same address cannot be used twice.

Press RCL to return the receiver to the current local operating conditions.




**Example** (RA3703/RA3704 receivers)

To set up both ports of the receiver for operation on a serial link, proceed as follows:

Ensure that the receiver is powered down and that the cover protecting the front panel switches is removed.

Set the right-hand DIL switch (SB8) to OFF to allow local setting up of the ports. With the switch in the ON position the ports are set up remotely.

Set the rotary ADDRESS switches to the desired receiver address and the DIL switches to the desired link parameters as shown in Table 6.1. The receiver is configured with the selected parameters at power-up, after which any alterations have no effect.

## TABLE 6.1

### DIL Switch Settings (Serial ASCII)

| Function | Switch Settings | |
|---|---|---|
| Address characters: | **SA1** | **SA2** |
| Zero | OFF | OFF |
| One | ON | OFF |
| Two | OFF | ON |
| Link control: | **SA3** | |
| Off | OFF | |
| On | ON | |
| CRC: | **SA4** | |
| Off | OFF | |
| On | ON | |
| Parity: | **SA5** | **SA6** |
| Off | OFF | OFF |
| Odd | ON | OFF |
| Even | OFF | ON |
| Free tune: | **SA7** | |
| Off | OFF | |
| On | ON | |
| Flow control: | **SA8** | |
| RTS | OFF | |
| CTR | ON | |

| Function | Switch Settings | | | |
|---|---|---|---|---|
| Baud Rate: | **SB1** | **SB2** | **SB3** | **SB4** |
| 50 | OFF | OFF | OFF | OFF |
| 75 | ON | OFF | OFF | OFF |
| 110 | OFF | ON | OFF | OFF |
| 150 | ON | ON | OFF | OFF |
| 300 | OFF | OFF | ON | OFF |
| 600 | ON | OFF | ON | OFF |
| 1200 | OFF | ON | ON | OFF |
| 1800 | ON | ON | ON | OFF |
| 2000 | OFF | OFF | OFF | ON |
| 2400 | ON | OFF | OFF | ON |
| 4800 | OFF | ON | OFF | ON |
| 9600 | ON | ON | OFF | ON |
| Override: | **SB8** | | | |
| Off | OFF | | | |
| On | ON | | | |

## 6.3 EXTERNAL SETTING UP OF SERIAL PORTS

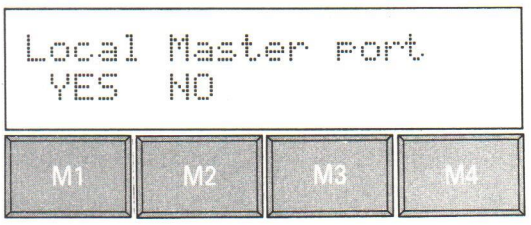
The serial link parameters for both ports of a receiver can be set up externally via its serial ASCII remote interface. If a controller is used to set up a slave then the procedure is similar to that used in the previous section. To enable the slave to accept the required interface parameters the configure input on slave's serial interface connector (see Table 6.3) must be linked to 0 V when instructed by the menu system. The slave commences remote operation in the programmed parameters when the configure line is released.

### Example

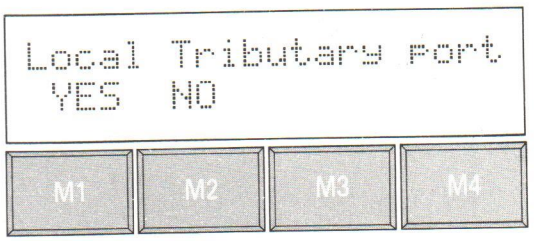
To set up both ports of a slave receiver with the same parameters locally set up in the previous section, using the menu system, proceed as follows:

Carry out the initial part of the previous procedure until this message is displayed. Press

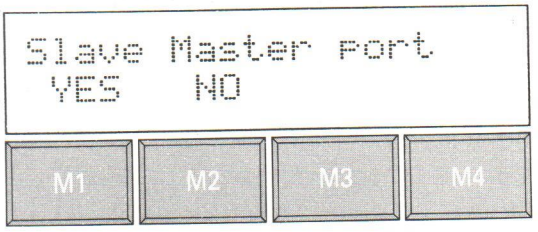

to reject the local Master port.



Press M2 to reject the local Tributary port.

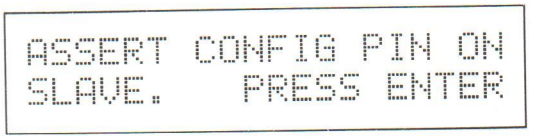



Press M1 to select the slave Master port for parameter changes.

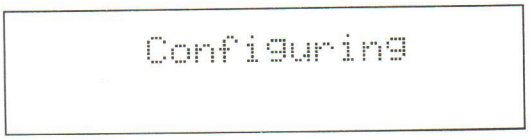



Repeat the previous local setting up procedure to program the slave with the same serial link parameter as the master until this message is displayed.

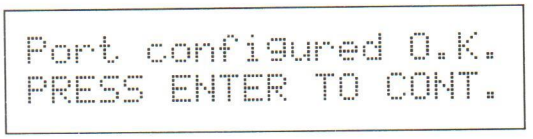
Connect the slave configure pin to 0 V and press ENTER



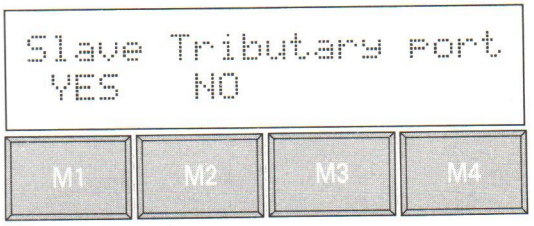

Configuration of the slave Master port then commences.




Press ENTER to continue to the next port.



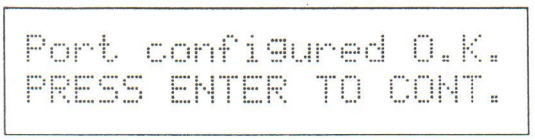

Press M1 to select the slave Tributary port for parameter changes.



Continue the previous setting up procedure until the slave Tributary port is successfully programmed.

Remove the 0 V connection and press 

to return the master receiver to local operation.




*Unsuccessful external programming of a slave is notified by either of these two messages appearing on the master: "Configuration error PRESS ENTER TO CONT."; "REMOTE LINK FAILED PRESS RCL TO CONT.".*

## 6.4 SETTING UP THE IEEE-488 INTERFACE

According to the receiver version the IEEE-488 interface may be set up using either the menu system or DIL switches in the same manner as described for locally setting up the serial ports (Section 6.2).

The following parameters need to be defined for the IEEE port:

### CRC Selection

This allows selection of a cyclic redundancy check to be added to the end of remote data packets.

### Terminator Selection

This allows the data packet terminator to be either a < CR > or < CR >< LF >.

### Address Selection

This allows the receivers remote control address to be configured.

### System Controller

This allows the receiver to be configured as a 'System Controller'. This provides the receiver with the capability to control other receivers either as a Master or a Diversity Master. For any given system connected to an IEEE-488 bus, only one equipment can have the 'system controller' function. If a receiver is configured as a system controller, it cannot be controlled as a slave by any other equipment.

### Slave Addressing

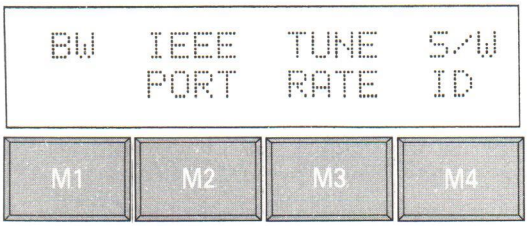
This allows the method of slave addressing to be selected. If variable slave addressing is selected, the address of the slave is entered during the ADDRESS RCL or ENTER key press sequence or in the Diversity Master menu.

If fixed slave addressing is selected the fixed slave address is entered in the subsequent menu, and is the only address the receiver can control either as a Master or Diversity Master.

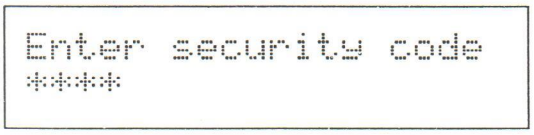
**Example** (RA3701/RA3702 receivers)

To set up the remote interface of the receiver for operation as a slave on an IEEE-488 link which requires a CRC, a packet terminator with carriage return and line feed (CR/LF) ASCII characters; and with address 12 being allocated as its slave address, proceed as follows:

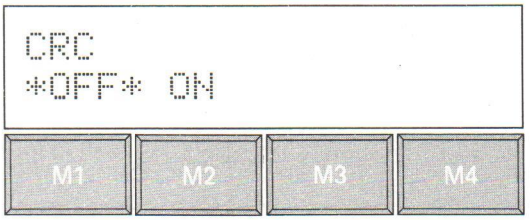
Press MENU repeatedly until these menu options are displayed.
Select IEEE PORT by pressing M2



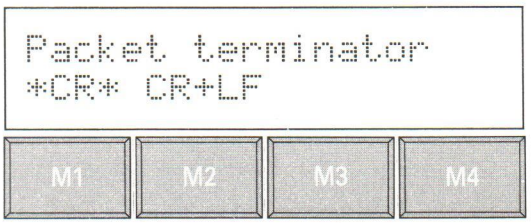

Key in the security code on the numeric keypad and then press ENTER . This operation prevents unintentional changes to the link parameters. A flashing cursor indicates the next digit to be entered.



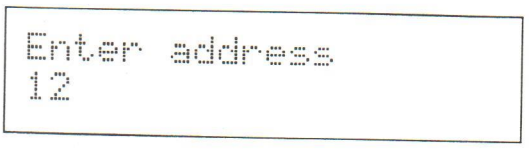

Press M2 to include CRC to detect corruption of remote link input and output data. The current selection is indicated by *---*.



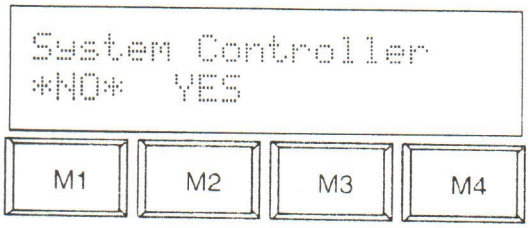

Press M2 to select the required type of packet terminator.



Press 1 2 on the numeric keypad, then ENTER to enter address 12 for the receiver's slave address.




Press M1 to select non system controller operation.




The display then reverts to the menu options.

*On a dual receiver an even address must be entered for receiver 1. The address for receiver 2 then becomes the address of receiver 1 plus 1.*

**Example** (RA3703/RA3704 receivers)

Set the rotary ADDRESS switches to the desired receiver address and the DIL switches to the desired link parameters as shown in Table 6.2.

## TABLE 6.2

### DIL Switch Settings (IEEE-488)

| Function | Switch Settings |
|---|---|
| CRC: | **SA4** |
| Off | OFF |
| On | ON |
| Terminator: | **SB5** |
| CR | OFF |
| CR + LF | ON |

## 6.5 REMOTE CONNECTIONS

This section contains details of the remote control interface connector provided on the receiver rear panel.

### Serial ASCII Interface

The serial ASCII interface is designed to operate with RS423-A remote control systems, but may also be operated with RS232-C systems simply by altering the signal return arrangements (see later). RS423-A is designed for longer lines with each of the two ASCII data lines for each port having their own return line, this being twisted together with the data line. RS232-C systems utilize a common return line.

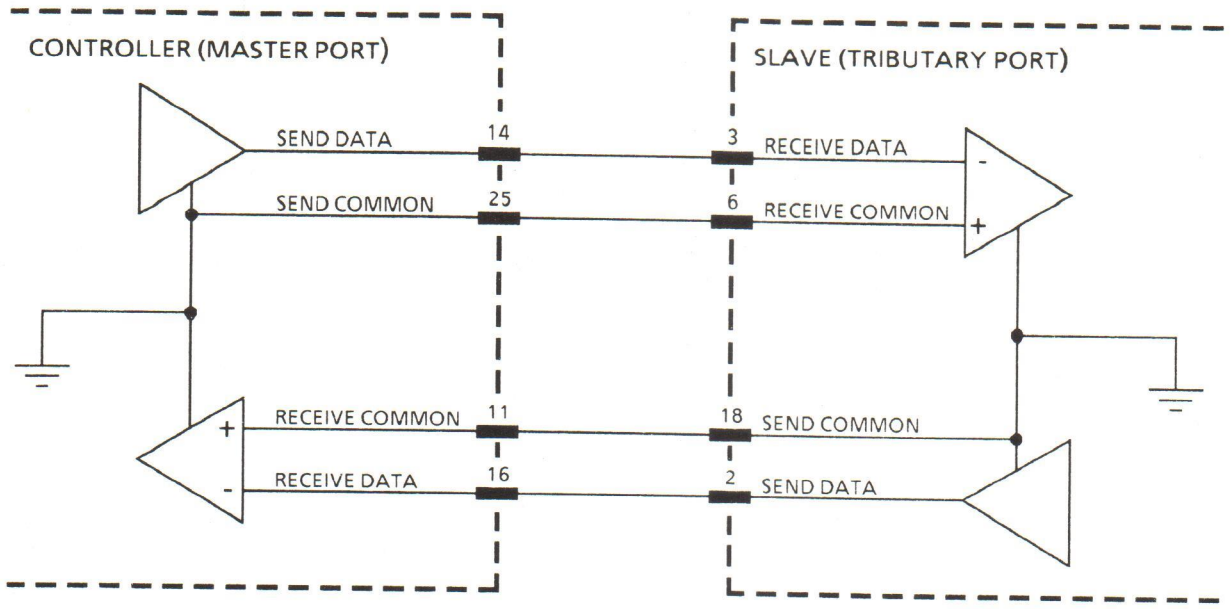
For an equipment fitted with a serial ASCII remote control interface, the Processor Module is provided with a 25-way D-type connector (PL2) with male pins for connecting with external equipment employing interfaces according to the above standards. The pin connections are listed in Table 6.3. Typical configurations using these connections are shown in Fig. 6.2.

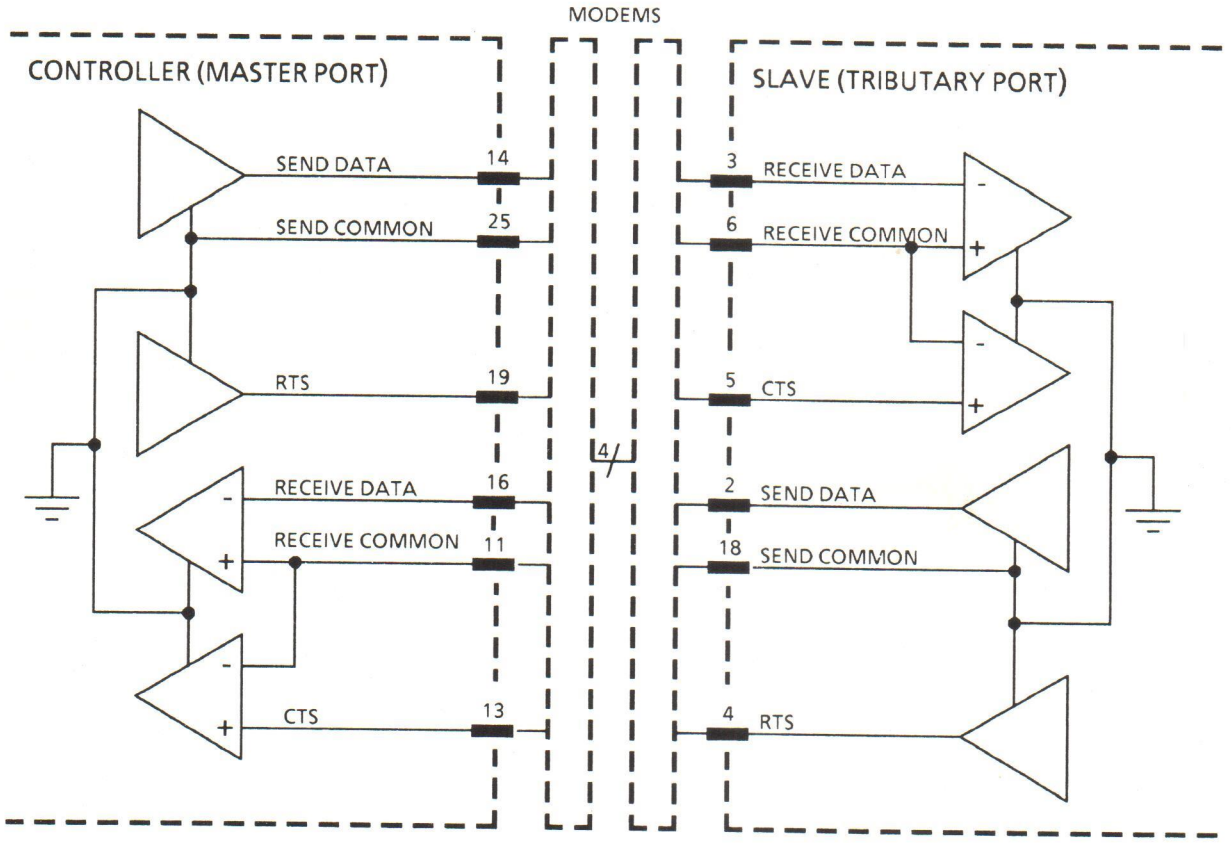
### TABLE 6.3

### Serial ASCII Interface Connections

| Signal Description | | Connector Pin No. |
|---|---|---|
| Send Data(M) | 14 | |
| Send Common | (M) | 25 |
| Receive Data | (M) | 16 |
| Receive Common | (M) | 11 |
| Send Data(T) | 2 | |
| Send Common | (T) | 18 |
| Receive Data | (T) | 3 |
| Receive Common | (T) | 6 |
| Request to Send | (RTS) * (M) | 19 |
| Clear to Send | (CTS) (M) | 13 |
| Request to Send | (RTS) * (T) | 4 |
| Clear to Send | (CTS) (T) | 5 |
| Protective Ground | | 1 |
| Signal Ground | | 7 |
| Configure | | 12 |
| Logic '1' | | 9 |

NOTE: M = Master Port
T = Tributary Port
* = Clear to Receive (CTR) when computer controlled.



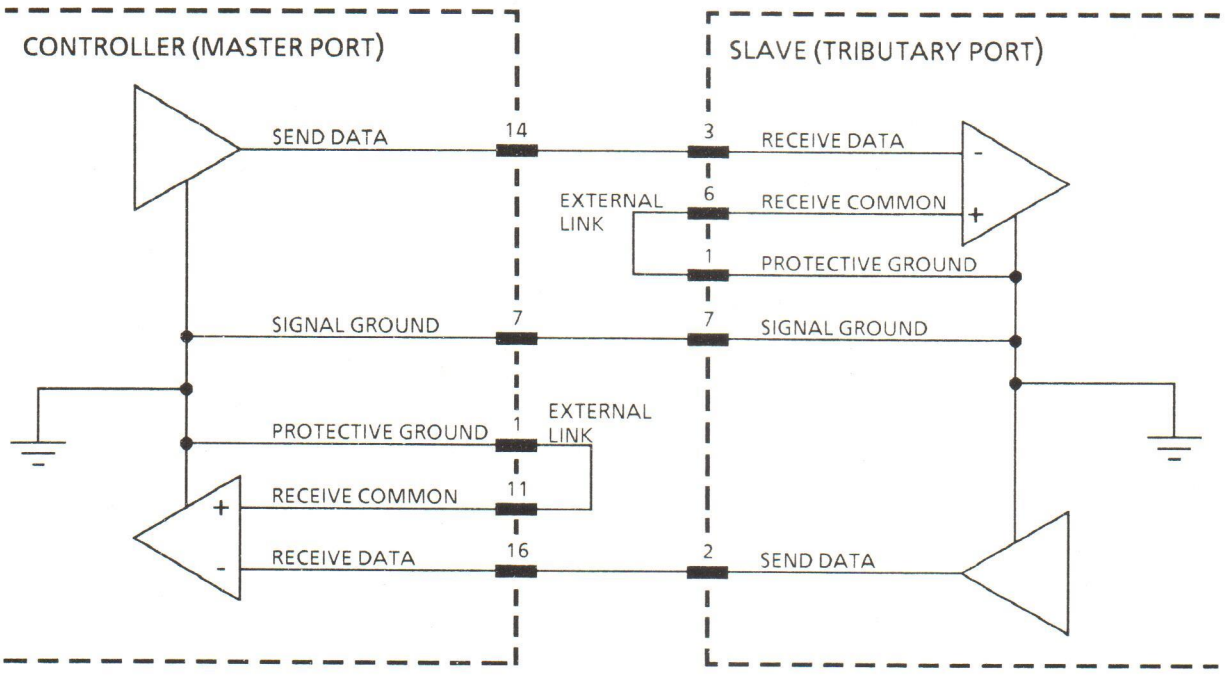

**Typical RS423 Interface Connections** **Fig.6.2**

Signal Earthing

To accommodate either type of serial interface the signal return arrangements are connected as follows:

**RS423**: The 'send common' of the sending ends and 'receive common' of the receiving ends are connected together and earthed at the 'send common' ends only (see Fig. 6.2).

**RS232**: The signal grounds of both ends are connected together. Also the 'receive common' is linked to earth at the receiving ends by means of an external link (see Fig. 6.3).




**RS232 Ground Connections** **Fig. 6.3**

**IEEE-488 Interface**

If the interface bus system used for remote control operation is of the IEEE-488 type, the Processor Module is provided with a 24-way connector whose type and pin connections are in accordance with the IEEE-488 specification.

In this system, two or more units are linked together by means of ready-made, standard cables. Their connectors have a socket at the rear for the insertion of an additional connector. In this way several equipments can be connected to the same bus, up to a maximum of 32 units.

# CHAPTER 7

# OPERATOR SERVICING

## 7.1 INTRODUCTION TO BITE

The receiver incorporates comprehensive built-in test equipment (BITE) facilities to indicate a fault condition and enable subsequent fault finding down to module level to be performed by the operator.

Important operational functions are automatically checked on initial power-up and then monitored continuously during receiver operation without operator intervention. Any detected failures cause the front panel FAULT legend to appear, indicating that a fault exists in the unit. When a master or diversity (master) receiver is controlling a slave, faults in either equipment cause the FAULT legend to be displayed. Similarly, in a dual receiver the FAULT legend may refer to either receiver.

Fault finding to a section of the receiver can then be carried out using the menu system. In addition to naming the faulty section, further information isolating the area at fault within the section can be accessed through the menu system. Internal indicators provide back-up fault information in the event of a failure preventing fault interpretation from the front panel.

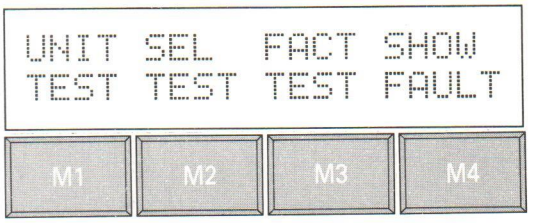
Failures may occur which are not recognised by the continuous monitoring BITE tests. In this case a more detailed BITE test can be initiated via the menu system in the form of a unit confidence test with the same diagnostic facilities as the continuous BITE.

Using the fault information provided by the BITE facilities, a faulty module may be identified and replaced so that the receiver is quickly returned to service. Module replacement instructions are included in Section 7.5. The information provided by BITE can also be of assistance in the subsequent repair of the faulty module.

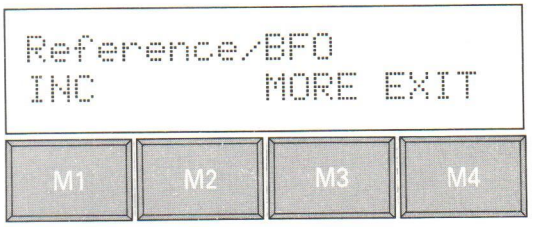
## 7.2 INTERPRETATION OF THE FAULT LEGEND

Details of any failure which causes the FAULT legend to appear on the left-hand display can be displayed using the menu system SHOW FAULT option. In a dual receiver, if this facility does not show a failure in the receiver under front panel control, then a fault in the background receiver is indicated. This receiver should be selected (see Section 4.2) and the procedure repeated.

Press MENU repeatedly until these menu options are displayed.
Select SHOW FAULT by pressing M4

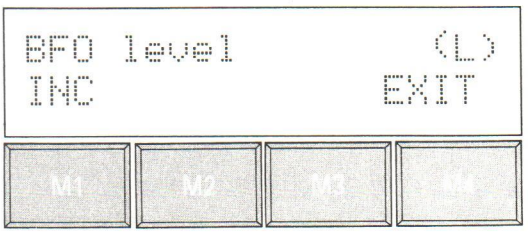



The display indicates the section at fault. Press M3 for more detailed information.

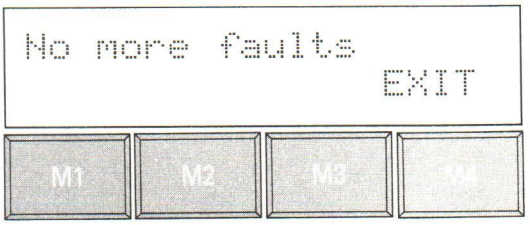


More detailed fault information is then displayed.

Press M1 to increment the display to any further BITE test failures.




If no more faults are present, press M4 and the display reverts to the BITE menu options.



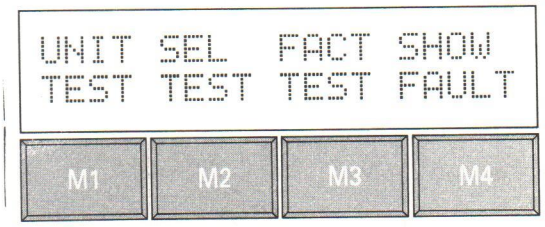

*Each time INC is selected the display increments to show the name of the section in which the next test failure has been identified. This may be the same section as for the previous fault or it may be a different section. When detailed fault information is being requested using MORE, either (F), (H) or (L) is displayed to confirm that the function has either failed or that the result is too high or too low. If the fault disappears (i.e. intermittant) the FAULT legend remains lit until cleared by using the SHOW FAULT facility to examine the recorded fault(s). On an RA3702, r1 or r2 is shown in the address display to indicate which receiver is faulty.*

## 7.3 UNIT CONFIDENCE TEST

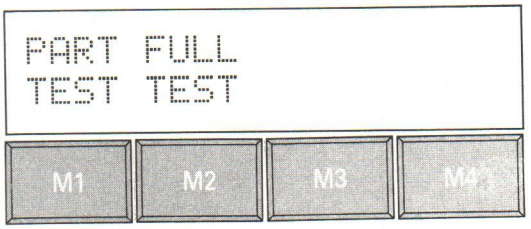
When called up by the menu system the unit confidence test is performed under program control to provide a comprehensive self test of all modules. This includes tests such as a performance check of the receiver signal path using a noise source as a test signal. Normal reception in this mode is interrupted.

When a fault is detected the program stops and the name of the suspect section is displayed. Further fault information can then be obtained or the test sequence continued as required.

Press MENU repeatedly until these menu options are displayed.
Select UNIT TEST by pressing M1



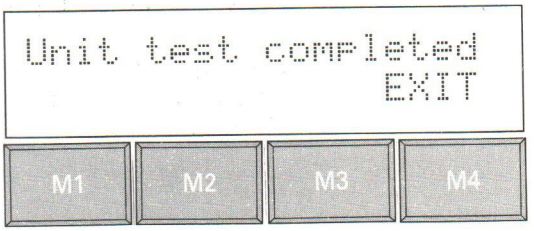

On a dual receiver only, the following menu options are displayed.



Press M1 to run a partial unit confidence test on the current receiver which does not interfere with the operation of the background receiver.

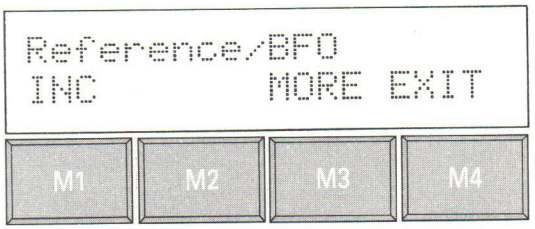
Press M2 to run the full unit confidence test on the current receiver which also interrupts the normal operation of the background receiver.

The unit confidence test now runs through its test sequence auto-matically. If no faults are detected a test complete message is displayed.

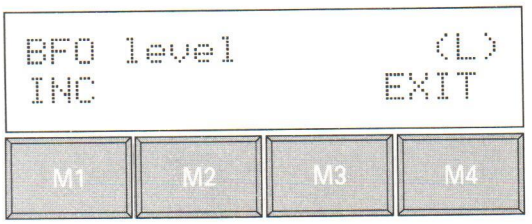



Press M4 to exit the menu system.

If faults are present then the test sequence stops on the first detected failure and the display shows the faulty section. Press M3 to display more detailed fault information.




The display then gives detailed fault information as shown in the example opposite.




Press M1 to increment past the failed test for both the previous displays and causes the unit confidence test to continue.

Press M4 to return the unit to normal operation and display to the BITE menu.

*On successful completion of each group of section tests the right-hand display exhibits a (P) for pass alongside the appropriate main test heading as listed in the summary of BITE tests. When more detailed information concerning a fault is requested via the menu system, a failure classification letter is given with the faulty function. According to the type of test and nature of the fault this can be either (F), (H) or (L) to signify fail, high or low parameters respectively.*

*Some faults may cause more than one BITE test to fail. In these cases the location of the fault is normally indicated by the first fault that is displayed. To assist in the repair of the fault it is useful to produce a fault report listing all the failed tests.*

*Before running the unit confidence test ensure that the receiver is not muted.*

## 7.4 INTERNAL STATUS INDICATORS

For most failures the suspect section of the receiver can be diagnosed from the front panel using the BITE interrogation facility provided by the menu system. If a fault causes this facility to become unavailable, diagnosis to module level can be assisted by interpretation of internal status indicators mounted on top of the Power Supply Regulator and Processor Modules as follows.

On the Power Supply Regulator Module four supply indicators are provided (+20 V, +15 V, +5 V, -15 V). If all are unlit, first check the mains fuse. If the fault persists, replace the Power Supply Regulator Module. If replacing this module fails to cure the fault then the major power supply components mounted on the chassis behind the front panel are suspect.

In the event of only one supply indicator being unlit either the Power Supply Regulator Module is faulty or one of the modules is consuming excessive current from the supply rail (unplug one at a time until the fault disappears). However, the +5 V and +15 V supplies are provided with fuses which should first be checked as required. Note also that as the BITE facility is powered from the +5 V supply, faults on the other supplies can be diagnosed from the front panel using the menu system.

If a fault condition exists in the receiver an indication that the Processor Module is functioning in basic terms can be obtained by observing that a flashing BITE code number is being displayed on its three status indicators. In a fully functioning receiver a flashing P is exhibited on one of these indicators during normal operation. During unit confidence test the current test number is shown on these indicators. If a fault is detected, either during unit confidence test or continuous BITE, the failed test number is indicated flashing. On successful completion of unit confidence test the number 999 is displayed. In a dual receiver, test numbers for receiver 2 are distinguished by means of decimal points (e.g. 123 for receiver 1 and 1.2.3. for receiver 2). Also in a dual receiver, the displays switch between the BITE status of receiver 1 and the BITE status of receiver 2 approximately every five seconds.

Satisfactory status indications from the Power Supply Regulator and Processor Modules, and a non-functioning front panel, point to the fault being in the Front Panel Assembly itself.

## 7.5 REPLACEMENT INSTRUCTIONS

### Fuse Replacement

The receiver is fitted with three supply fuses: a mains fuse in the voltage selector unit and two additional fuses (+5 V, +15 V) mounted on the board within the Power Supply Regulator Module.

To change the mains fuse proceed as follows:

(a) Remove the mains lead.

(b) Open the cover of the voltage selector unit.

(c) Withdraw the right-hand fuse holder and replace the 2 A slow-blow fuse (Racal Part No. 922457H). A spare fuse is normally contained in the adjacent fuse holder.

(d) Insert the fuse holder with the arrow pointing in the direction shown on the inside of the cover.

(e) Close the cover of the voltage selector unit.

(f) Refit the mains lead.

To change either the +5 V or +15 V fuses proceed as follows:

(a) Remove the mains lead.

(b) Detach the Power Supply Regulator Module from the chassis by unscrewing the four securing bolts.

(c) Identify the appropriate 5 A fuse on the board (FS1: +5 V, FS2: +15 V) and replace (Racal Part No. 922453L).

(d) Refit the Power Supply Regulator Module to the chassis.

(e) Refit the mains lead.

### Module Replacement

The modular construction employed by the receiver enables the plug-in modules and front panel assembly to be quickly replaced when diagnosed as being faulty by the BITE system. An exploded view of the basic receiver is shown in Fig 7.1. Module interconnection details for the various receiver versions are given in Fig 7.2 to Fig 7.4.

The plug-in modules are easily removed by first disconnecting any connections at the rear of the suspect module and then unscrewing two captive bolts securing the module to the chassis cross-rails. The module may then be unplugged. Reverse the above procedure to refit a module.

The Front Panel Assembly is held in place by four bolts securing it to the sides of the Chassis Assembly. After unscrewing these bolts, carefully remove the assembly until the two ribbon connectors and power cable are accessible. Unplug these connections to allow complete removal of the Front Panel Assembly. To re-assemble, reverse the above procedure.

The Frequency Standard Module is accessible after the Front Panel Assembly has been removed. After removing PL1 the module can be released by removing the four securing screws.

If a fault still exists after replacing a suspect module, ensure that another module is not faulty before the Chassis Assembly itself is suspect. This can be replaced after first removing all the modules using the procedures described above.

## 7.6 SUMMARY OF BITE TESTS

Table 7.1 provides a summary of tests performed during the power-up, continuous monitoring and unit confidence BITE tests. The functions tested are listed under their respective module or major facility heading. Note that the partial unit confidence tests are available only on RA3702/RA3704 dual receivers.

### TABLE 7.1

### BITE Tests

| Function Tested | Power Up | Continuous Monitoring | Unit Confidence | |
|---|---|---|---|---|
| | | | Full | Partial |
| Processor | | | | |
| Memory | YES | NO | YES | YES |
| Measurement system | NO | NO | YES | NO |
| Power supplies | NO | YES | YES | YES |
| RX Bus (motherboard) | YES | NO | YES | NO |
| Front Panel | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| Reference | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| BFO Ref level | NO | YES | YES | YES |
| BFO Ref lock | NO | YES | YES | YES |
| Ref Osc. varac. V | NO | YES | YES | YES |
| Ref o/p level | NO | YES | YES | YES |
| BFO lock | NO | YES | YES | YES |
| BFO Osc.varac. V | NO | YES | NO | NO |
| BFO sweep | NO | NO | YES | NO |
| BFO o/p level | NO | YES | YES | YES |
| Synthesiser | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| Synth. varac. V | NO | YES | NO | YES |
| Synth. range | NO | NO | YES | YES |
| Synth. sweep | NO | NO | YES | YES |
| Synth. o/p level | NO | NO | YES | YES |
| Synth. lock | NO | YES | YES | YES |

(continued)

**TABLE 7.1 (Continued)**

**BITE Tests**

| Function Tested | Power Up | Continuous Monitoring | Unit Confidence | |
|---|---|---|---|---|
| | | | Full | Partial |
| IF/AF | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| IF amplifier (gain) | NO | NO | YES | NO |
| IF filter (passbands) | NO | NO | YES | NO |
| 2nd IF AGC | NO | NO | YES | NO |
| AGC characteristics | NO | NO | YES | NO |
| Modulation detectors | NO | NO | YES | NO |
| Front End | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| 1st mix drive level (operating frequency) | NO | YES | YES | NO |
| 1st mix drive level (full range) | NO | NO | YES | NO |
| 1st mix drive swp | NO | NO | YES | YES |
| 2nd mix drive level (operating frequency) | NO | YES | YES | YES |
| RX gain (overall) | NO | NO | YES | NO |
| 1st IF gain (control) | NO | NO | YES | NO |
| 100 kHz Module | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| 5 MHz level | NO | YES | YES | YES |
| 1.4 MHz level | NO | NO | YES | NO |
| 100 kHz level | NO | NO | YES | NO |
| 1.4 MHz ISB level (ISB RX only) | NO | NO | YES | NO |
| 100 kHz ISB level (ISB RX only) | NO | NO | YES | NO |
| FSK Module | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| FSK discriminator sweep | NO | NO | YES | NO |
| FSK meter sweep | NO | NO | YES | NO |
| FSK slicer sweep | NO | NO | YES | NO |

(continued)

**TABLE 7.1 (Continued)**

**BITE Tests**

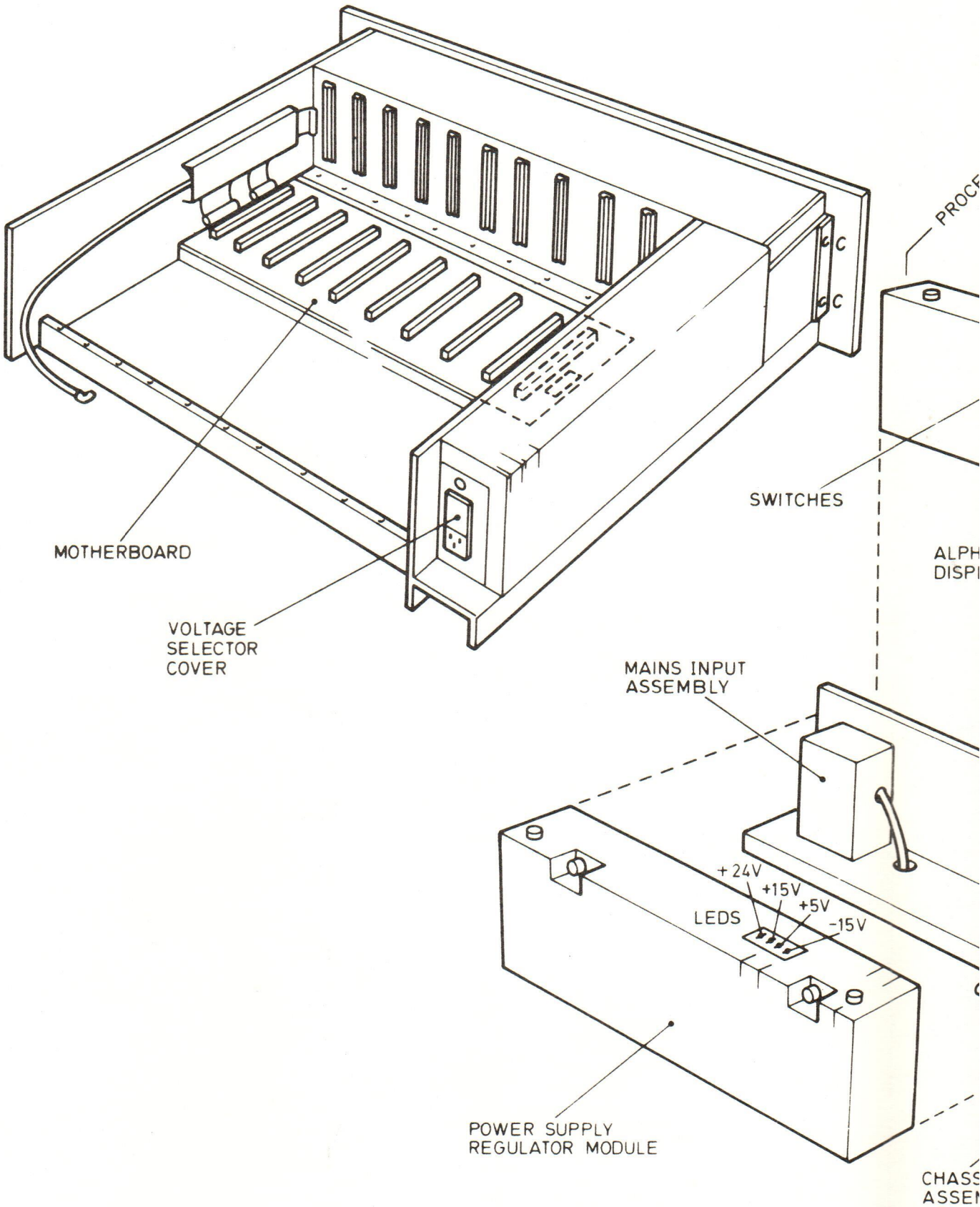
| Function Tested | Power Up | Continuous Monitoring | Unit Confidence | |
|---|---|---|---|---|
| | | | Full | Partial |
| ISB Module | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| IF amplifier (gain) | NO | NO | YES | NO |
| 2nd IF AGC | NO | NO | YES | NO |
| AGC characteristics | NO | NO | YES | NO |
| Product detector (modulation) | NO | NO | YES | NO |
| IF Filter | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| IF level | NO | NO | YES | NO |
| IF filter (passbands) | NO | NO | YES | NO |
| 10 kHz/Signal Detector | | | | |
| BITE hardware | NO | YES | YES | YES |
| Supply rails | NO | YES | YES | YES |
| Reference level | NO | YES | YES | YES |
| 1.41 MHz lock | NO | YES | YES | YES |
| 1.4 MHz level | NO | NO | YES | YES |
| 10 kHz level | NO | NO | YES | YES |
| ISB 1.4 MHz level (ISB Rx only) | NO | NO | YES | YES |
| ISB 10 kHz level (ISB Rx only) | NO | NO | YES | YES |
| Memory | YES | NO | YES | NO |
| Sample Clock | NO | NO | YES | YES |
| A to D Convertor | NO | NO | YES | YES |
| Local Oscillator Lock | NO | NO | YES | YES |
| I.F. Signal/Noise | NO | NO | YES | YES |
| ISB Sample Clock (ISB Rx only) | NO | NO | YES | YES |
| ISB A to D Convertor (ISB Rx only) | NO | NO | YES | YES |
| ISB I.F. Signal/Noise (ISB Rx only) | NO | NO | YES | YES |

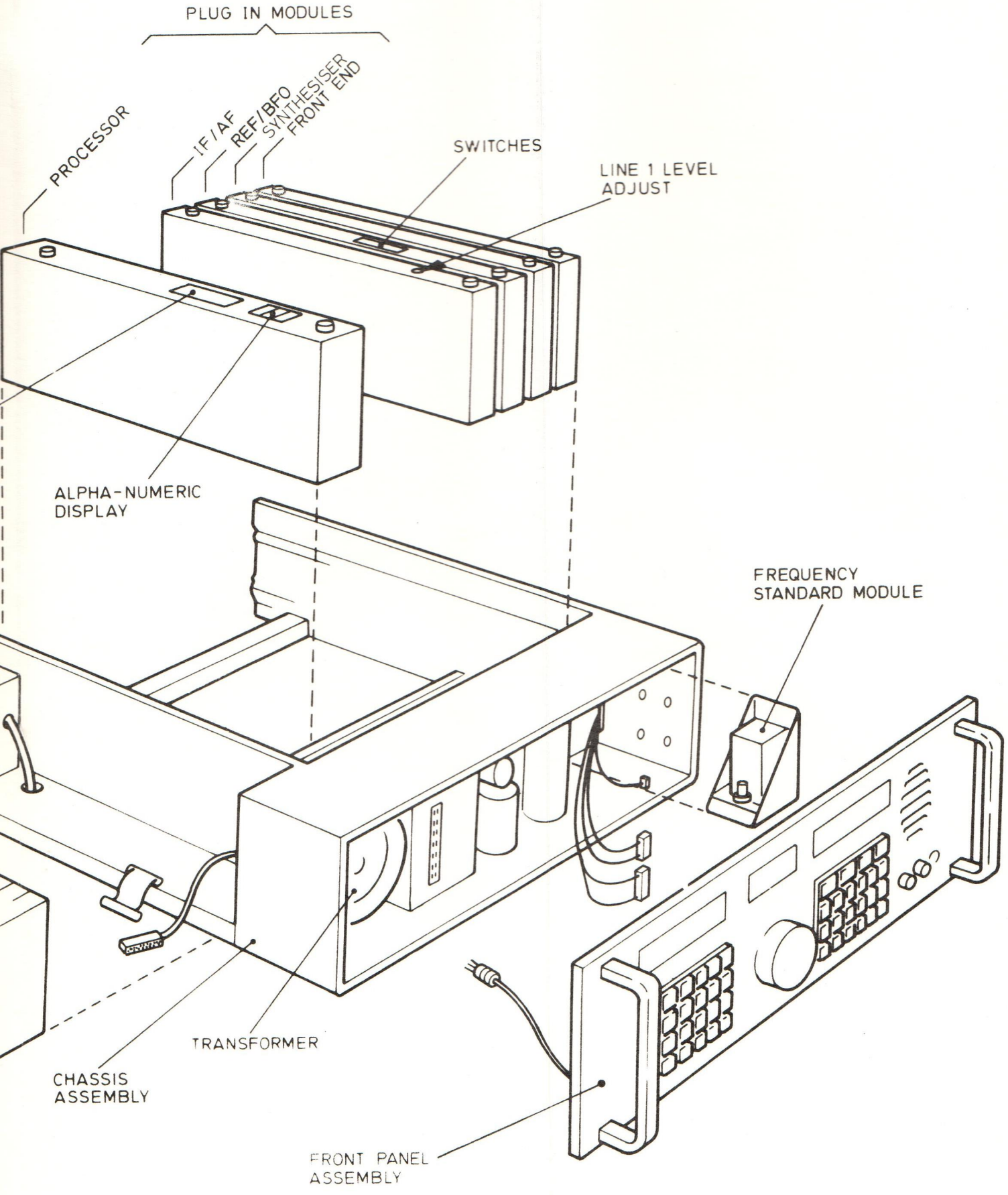
**TABLE 7.1 (Continued)**

**BITE Tests**

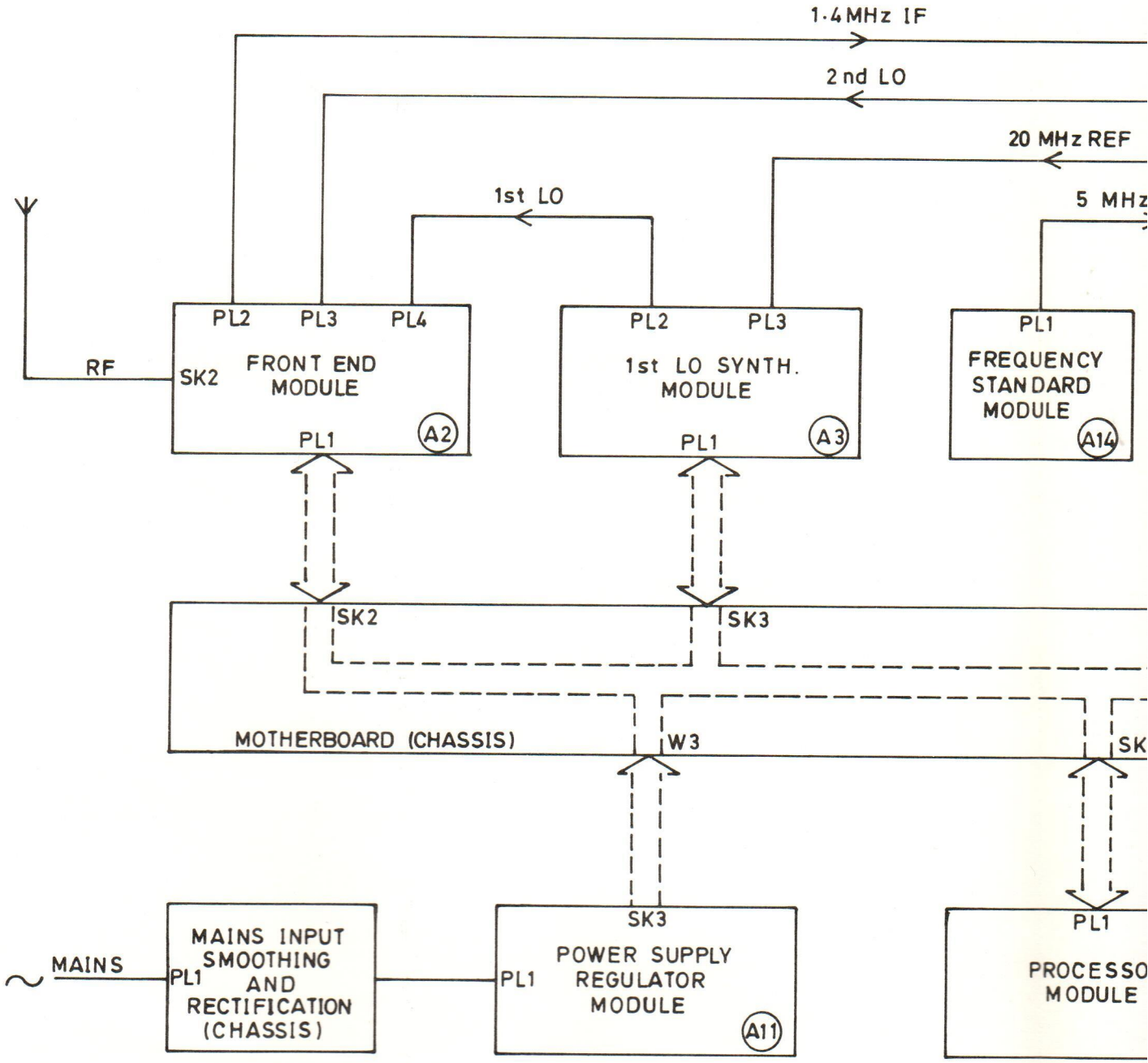
| Function Tested | Power Up | Continuous Monitoring | Unit Confidence | |
|---|---|---|---|---|
| | | | Full | Partial |
| Sub-Octave Filter Module | | | | |
| BITE hardware | NO | YES | YES | YES |
| +5V rail | NO | YES | YES | YES |
| +15V rail | NO | YES | YES | YES |
| 10dB Attenuator | NO | NO | YES | YES |
| 20dB Attenuator | NO | NO | YES | YES |
| 30dB Attenuator | NO | NO | YES | YES |
| Bypass Filter Position | NO | NO | YES | YES |
| FL1 Filter Position | NO | NO | YES | YES |
| FL2 Filter Position | NO | NO | YES | YES |
| FL3 Filter Position | NO | NO | YES | YES |
| FL4 Filter Position | NO | NO | YES | YES |
| FL5 Filter Position | NO | NO | YES | YES |
| FL6 Filter Position | NO | NO | YES | YES |
| FL7 Filter Position | NO | NO | YES | YES |
| FL8 Filter Position | NO | NO | YES | YES |
| FL9 Filter Position | NO | NO | YES | YES |
| FL10 Filter Position | NO | NO | YES | YES |
| FL11 Filter Position | NO | NO | YES | YES |
| FL12 Filter Position | NO | NO | YES | YES |

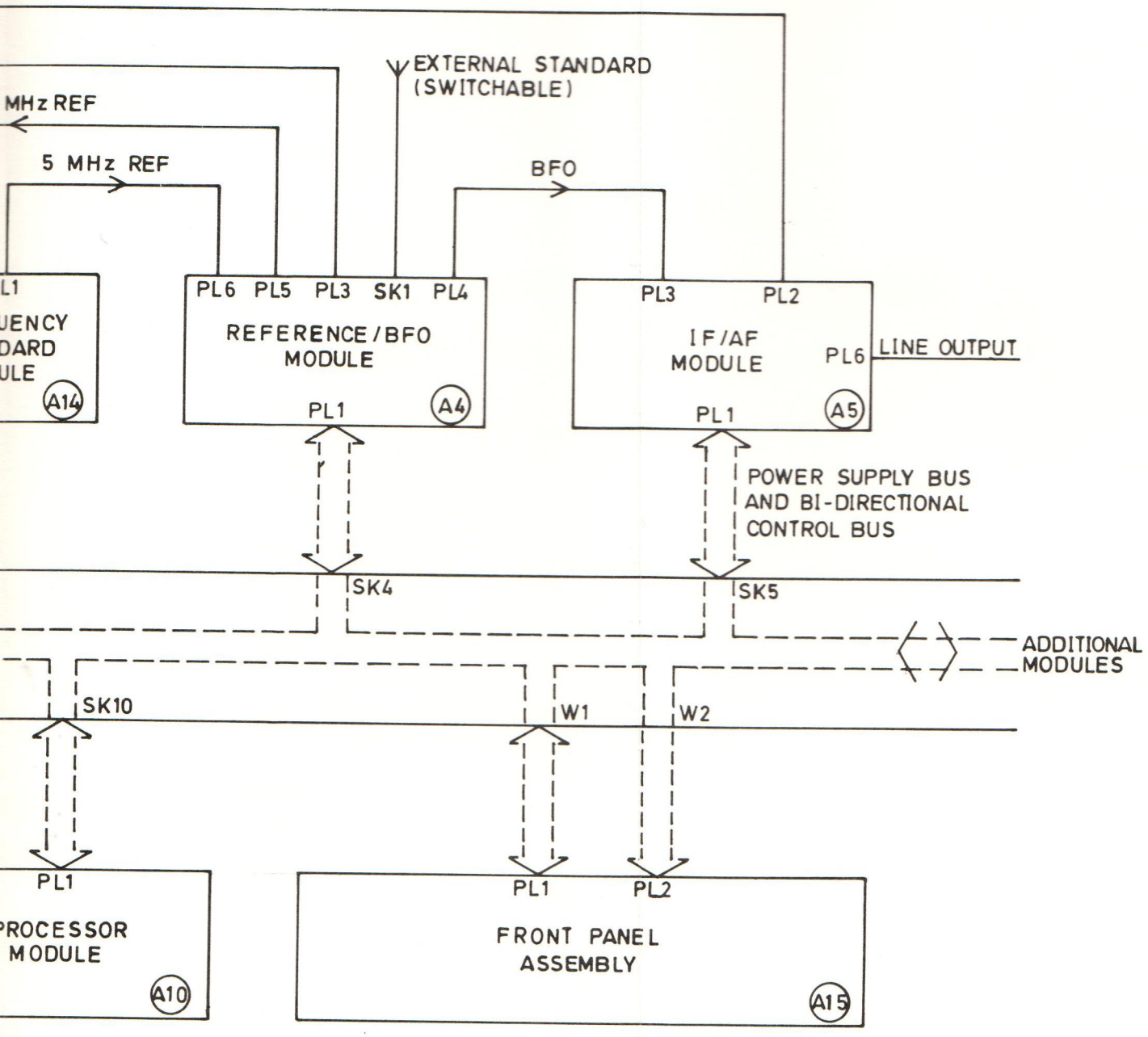
Note that the tests are not all performed in the order shown in the table.


PROCE
SWITCHES
ALPH
DISPL
MOTHERBOARD
VOLTAGE
SELECTOR
COVER
MAINS INPUT
ASSEMBLY
+24V
+15V
+5V
-15V
LEDS
POWER SUPPLY
REGULATOR MODULE
CHASS
ASSEN

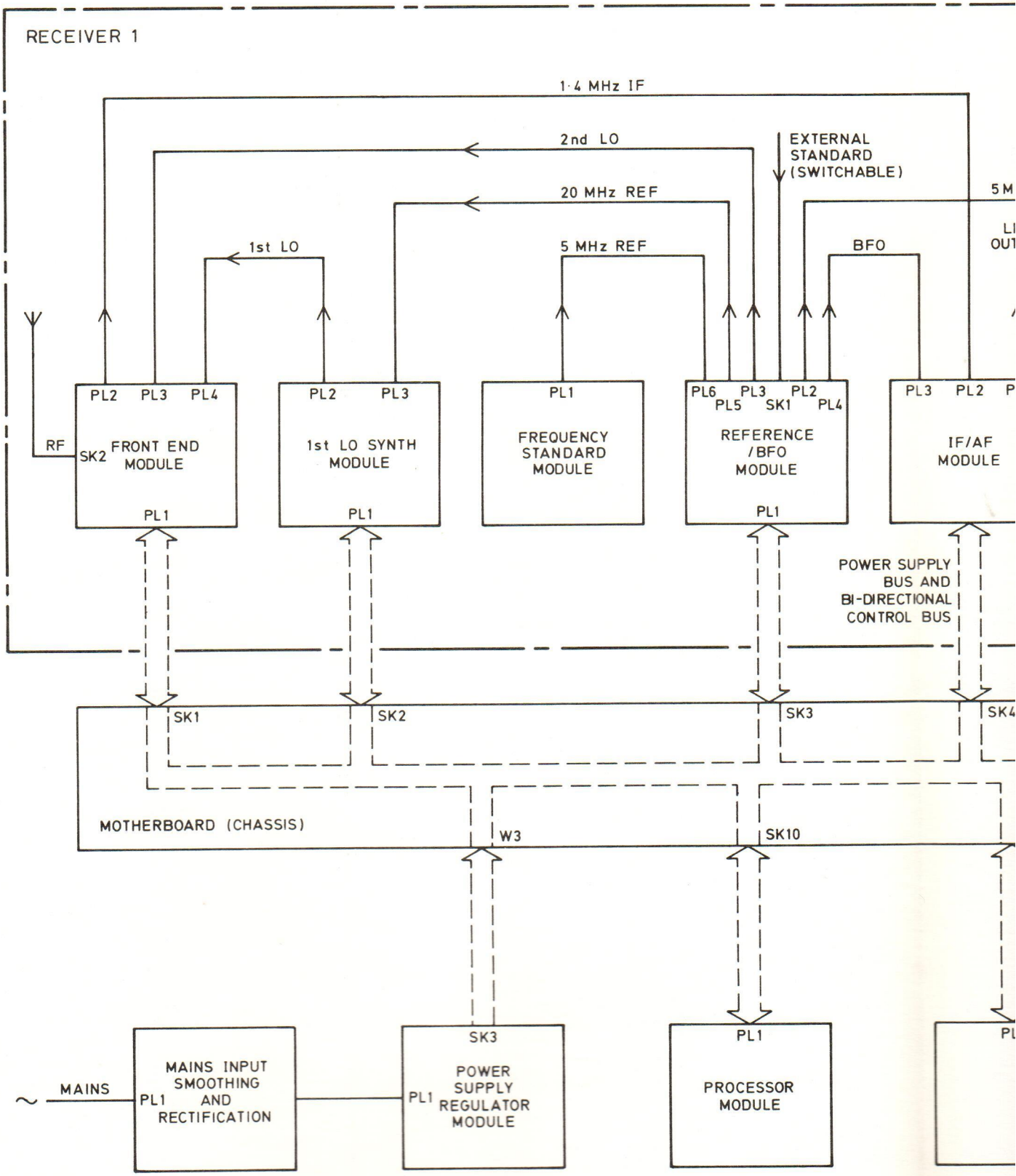


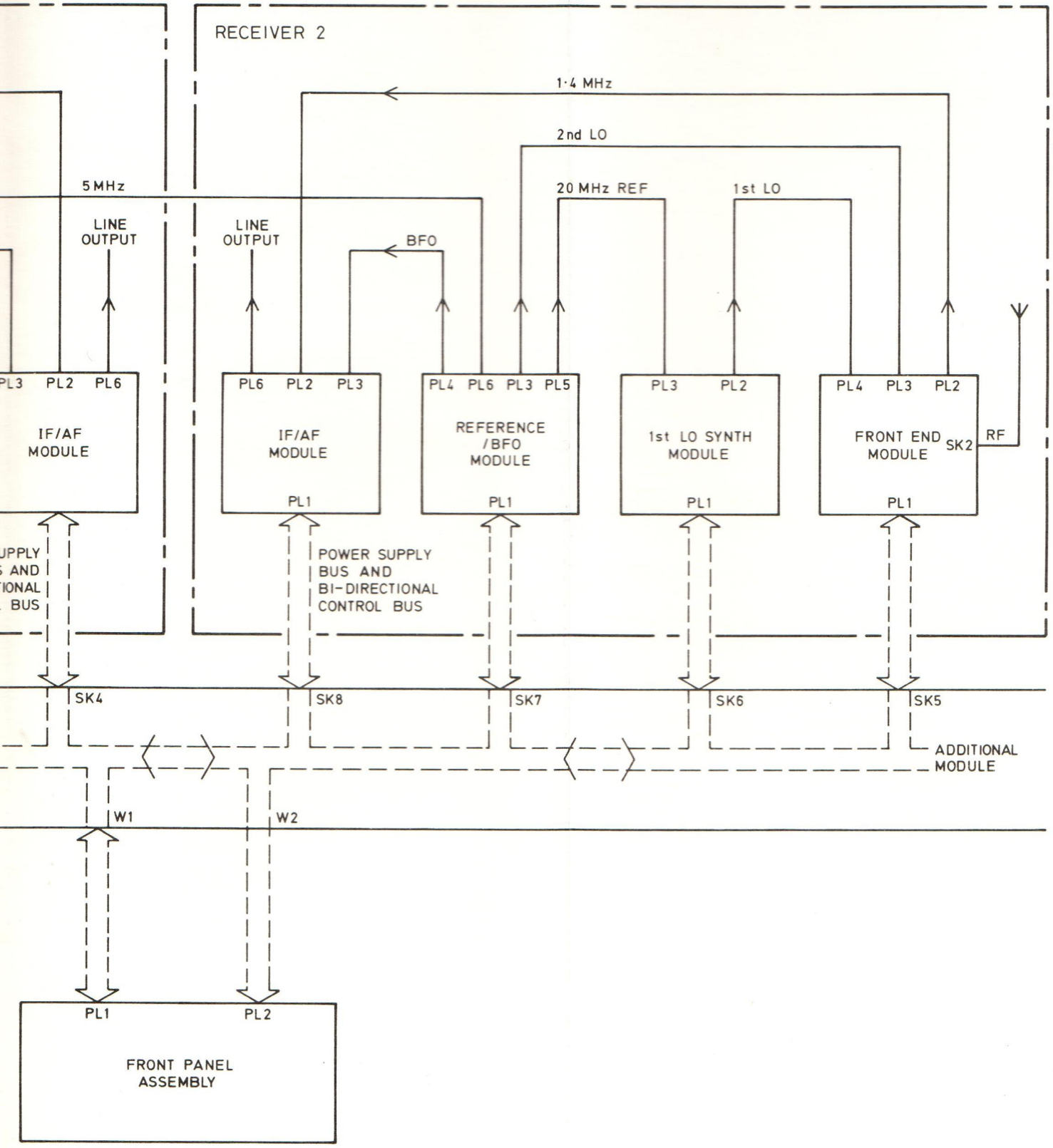

**RA 3701 :**
**Exploded View** **Fig. 7.1**


1·4MHz IF
2nd LO
20 MHz REF
1st LO
5 MHz
RF
SK2
PL2
PL3
PL4
FRONT END MODULE
A2
PL1
PL2
PL3
1st LO SYNTH. MODULE
A3
PL1
PL1
FREQUENCY STANDARD MODULE
A14
SK2
SK3
MOTHERBOARD (CHASSIS)
W3
SK
MAINS
PL1
MAINS INPUT SMOOTHING AND RECTIFICATION (CHASSIS)
SK3
PL1
POWER SUPPLY REGULATOR MODULE
A11
PL1
PROCESSO
MODULE



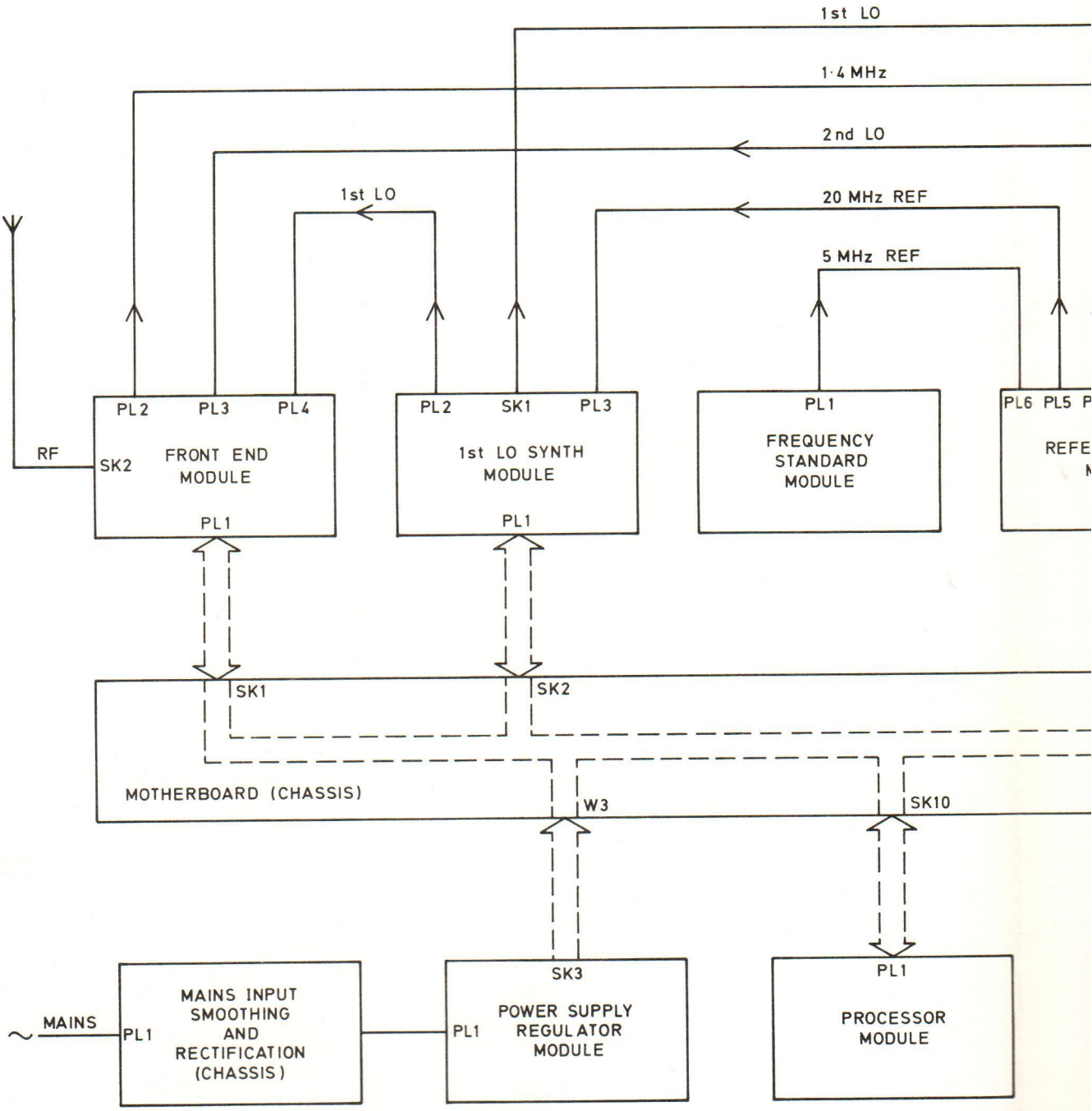

RA3701/RA3703
Receiver Block Diagram Fig.7.2

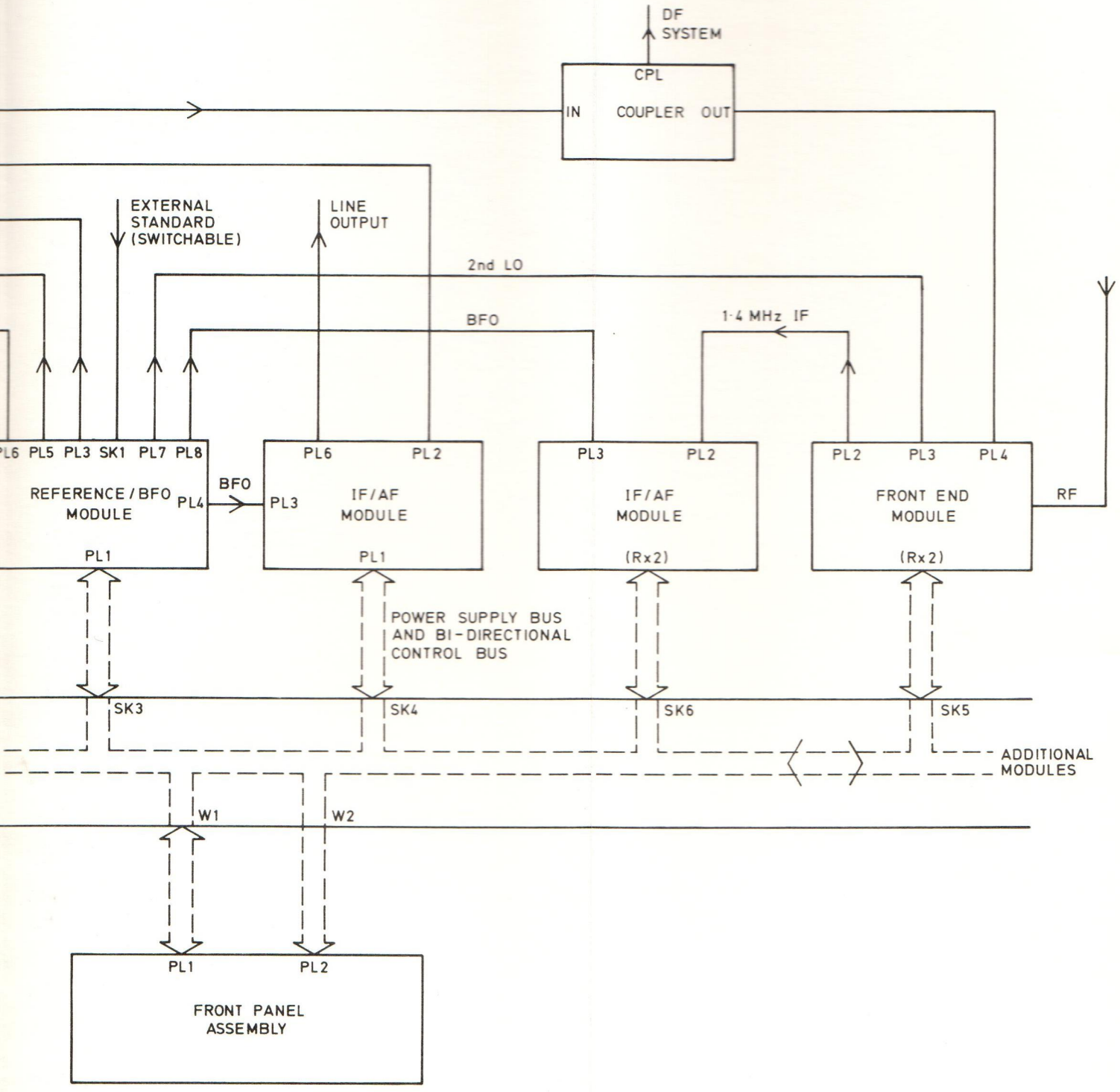

RECEIVER 1
1·4 MHz IF
2nd LO
EXTERNAL STANDARD (SWITCHABLE)
20 MHz REF
1st LO
5 MHz REF
BFO
RF
SK2
PL2 PL3 PL4
FRONT END MODULE
PL1
PL2 PL3
1st LO SYNTH MODULE
PL1
PL1
FREQUENCY STANDARD MODULE
PL6 PL5 PL3 SK1 PL2 PL4
REFERENCE /BFO MODULE
PL1
PL3 PL2
IF/AF MODULE
POWER SUPPLY BUS AND BI-DIRECTIONAL CONTROL BUS
SK1
SK2
SK3
MOTHERBOARD (CHASSIS)
W3
SK10
MAINS
PL1
MAINS INPUT SMOOTHING AND RECTIFICATION
SK3
PL1
POWER SUPPLY REGULATOR MODULE
PL1
PROCESSOR MODULE




RA 3702 / RA 3704 :
Block Diagram

Fig. 7.3


1st LO
1·4 MHz
2nd LO
1st LO
20 MHz REF
5 MHz REF
RF
SK2
PL2
PL3
PL4
FRONT END MODULE
PL1
PL2
SK1
PL3
1st LO SYNTH MODULE
PL1
PL1
FREQUENCY STANDARD MODULE
PL6 PL5
REFE
SK1
SK2
MOTHERBOARD (CHASSIS)
W3
SK10
MAINS
PL1
MAINS INPUT SMOOTHING AND RECTIFICATION (CHASSIS)
SK3
PL1
POWER SUPPLY REGULATOR MODULE
PL1
PROCESSOR MODULE




RA3705/RA3706
Block Diagram

Fig. 7.4

# CHAPTER 8

# ACCESSORIES

## 8.1 INTRODUCTION

A range of accessories are available for the RA3700 Series, as listed below.

## 8.2 INSTALLATION ACCESSORIES

The following items are available to facilitate installation and operation of the receiver:

**Mating Connector Kit** (Order No. ST88116)

(Serial ASCII remote control), connectors supplied:

- RF plugs, BNC 50 ohms (Qty. 5).
- Connector socket, 15-way D type (for PL6 on IF/AF Module).
- Connector socket, 25-way D type (for PL2 on Processor Module).
- Connector plug, 25-way D type (for SK1 on Processor Module).

**Mating Connector Kit** (Order No. ST88117)

(IEEE-488 remote control), connectors supplied:

- All connectors in previous kit except that connector socket,25-way D type is replaced with an IEEE-488 Connector Kit.

**IEEE-488 Cable Assemblies**

- 1 m (Order No. 945913)
- 2 m (Order No. 945783)
- 3 m (Order No. 945798)

**Extension Kit** (Order No. ST88234)

(Supplements either Mating Connector Kit for dual receiver), connectors supplied:

- RF plugs, BNC 50 ohms (Qty. 5).
- Connector socket, 15-way D type

**Audio Monitoring Accessories**

- Headphones (Order No. AA660/A), 600 ohms with ventilated ear cushions, lead and plug.

## 8.3 SERVICING ACCESSORIES

The following BITE Kits are available for use during receiver servicing:

**BITE Kit** (Order No. ST88233)

(Serial ASCII remote control), items supplied:

- Parallel loopback test connectors 1 and 2 (for SK1 on Processor Module).
- Serial loopback test connector (for PL2 on Processor Module).
- Extender assembly (allows access to modules and provides test points).
- Coaxial leads, moulded SMB (Qty. 6) (for use with extender assembly).
- 50 ohms load (BNC).

# CHAPTER 9

# OPTIONS

## 9.1 INTRODUCTION

This chapter contains additional installation and operation instructions which apply to receivers fitted with optional modules.

## 9.2 100 kHz IF MODULE

### Introduction

The 100 kHz IF Module provides a 100 kHz IF output for use with peripheral equipment which requires an IF signal at this frequency. The module includes two channels for use in dual receivers and ISB receivers. The standard 1.4 MHz IF output is no longer available when the 100 kHz IF Module is fitted.

### Interface Wiring

The 100 kHz IF outputs are available from SK1 and SK2 on the rear panel of the module. Table 9.1 indicates the function of each connector.

### TABLE 9.1

### IF Output Connections

| Receiver | SK1 | SK2 |
|---|---|---|
| Single SSB | IF output | Not used |
| Single ISB | USB IF output | LSB IF output |
| Dual SSB | Rx1 IF output | Rx2 IF output |

### Operation

Operation of the receiver is not affected by the addition of the 100 kHz IF Module.

## 9.3 IF FILTER MODULE

### Introduction

The IF Filter Module may contain up to seven IF crystal filters supplementing those fitted in the basic receiver. The module is configured in the factory for use in either a single or a dual receiver. It may also be fitted with ISB filters and used in conjunction with the ISB Module.

### Operation

The filters in the IF Filter Module may be selected using the  and  buttons in exactly the same way as the standard filters as described in Chapter 4. Bandwidth List and Bandwidth Configuration facilities described in Chapter 4 also apply to the IF Filter Module.

## 9.4 ISB MODULE

### Introduction

The addition of the ISB Module allows independent sideband signals to be demodulated. The ISB Module demodulates the LSB channel and the IF/AF Module demodulates the USB channel. Separate line and IF outputs are provided for each sideband. This module may be fitted to the RA3701 or the RA3703.

### Interface Wiring

IF Output
A 1.4 MHz IF output is available from SK1 on the rear panel of the ISB Module.

AF Output Connections
A number of AF and AGC input and output connections are provided on a 15-way D type plug (PL5) at the rear of the ISB Module, as listed in Table 9.2

**TABLE 9.2**

**AF Output Connections**

| Signal Description | Connector Pin No. |
|---|---|
| Line 2, Output 1 | 1 |
| LIne 2, Centre Tap | 2 |
| Line 2, Output 2 | 9 |
| Diversity AGC | 3 |
| Diversity AGC 0 V | 10 |
| D.F. Gain Control | 4 |
| D.F. Gain Control 0 V | 11 |
| Ground | 12 |
| Ground | 13 |

### Line Output Adjustment

The line level may be adjusted by means of a control located on top of the ISB Module. The front panel meter may be set to monitor the AF level at the line 2 output.

### Operation

ISB operation may be selected by pressing the 

button. In ISB operation the front panel loudspeaker, headphone output and meter monitor one sideband, the monitored sideband being indicated on the right-hand display. Pressing the 

button toggles the sideband monitored on the front panel

Different AGC time constants may be selected for each sideband; the AGC buttons control the time constant for the monitored sideband. If the receiver is fitted with more than one pair of SSB filters, the bandwidth buttons may be used to select the bandwidth for the monitored sideband.

## 9.5 FSK MODULE

### Introduction

The FSK Module demodulates FSK signals and provides an output to drive a printer. Using the front panel bar graph meter, a tuning meter is provided to allow accurate tuning of the FSK signal. The module is capable of processing two FSK channels allowing it to be used in dual receiver applications. It includes a built-in diversity combiner which automatically selects the largest signal to feed the printer in diversity systems. These operating instructions cover both the standard and wideband FSK Modules. Information applicable to only one version of the FSK Module is indicated as such in the text.

### Interface Wiring

Fitted on the rear of the standard FSK Module is a 15-way D type socket (SK1) for connecting the printers. For the Wideband FSK Module an additional 9-way D type socket (SK2) is provided for the high voltage output. The pin connections for both sockets are shown in Table 9.3.

**TABLE 9.3**

**FSK Module Connections**

| Signal Description | Connector Pin No. |
|---|---|
| Main Output | 8 |
| Secondary output | 6 |
| Ground | 2, 5, 10, 11, 12, 13, 14, 15 |
| External demod. input | 1 |
| External demod. return | 9 |
| Diversity AGC A | 4 |
| Diversity AGC B | 3 |
| Do not connect | 7 |
| High voltage output (SK2 Wideband FSK Module only) | 1 |
| Ground (SK2) | 6, 7, 8, 9 |

Printer

The receiver may be connected directly to a printer with a V10/RS423 or a V28/RS232 interface.

With a Wideband FSK Module fitted the receiver may also drive a printer with a 20 mA double current interface using the high voltage output, but only from the main output channel.

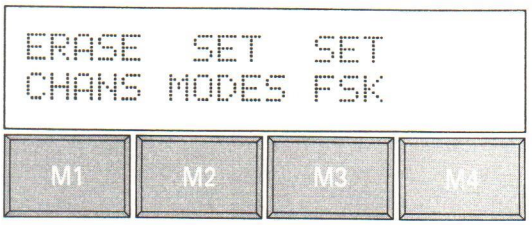
The printer should also be capable of decoding the relevant FSK transmission eg: ITA 2 or 5.

**System Configurations and Setting Up the Receiver**

This section illustrates several different system configurations and describes how the receivers should be set up.

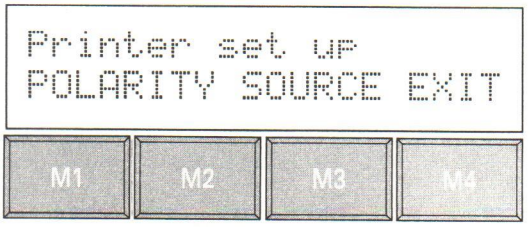
The receiver menu is used to set up the receiver for the system configuration required.

Press MENU repeatedly until these menu options are displayed.




Select SET FSK by pressing M3

Printer POLARITY is used to set up the output polarity to suit the requirements of the printer or other output device (see "Printer Polarity").



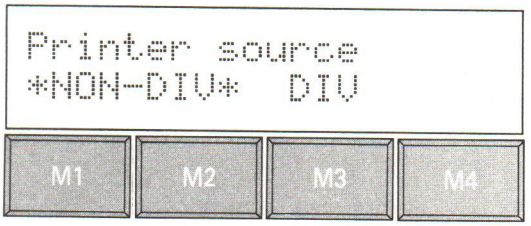

Selecting SOURCE allows the user to define the printer configuration. The operation differs according to the type of receiver and system as described below:

Single Receiver

Non-diversity systems containing single receivers should be connected as shown in Figure 9.1 (a).

To set up the receiver, select SOURCE as described above.

This menu is then presented and NON-DIV operation should be selected. The signal from the FSK demodulator is fed to the main printer output on the FSK Module. The printer should be connected to this output.



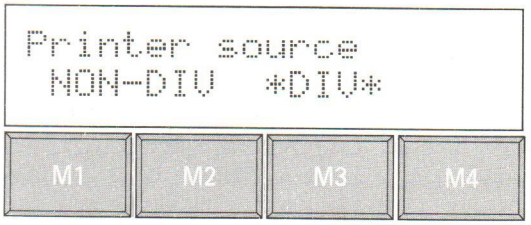
Single Receivers connected for Diversity Operation

Diversity systems containing single receivers should be connected as shown in Figure 9.1 (b).

One receiver of the diversity pair must be designated as the diversity master as described in section 4.15 of this manual.

To set up the diversity master receiver, select SOURCE as described above.

Select DIV. The signals from the FSK demodulators in the two receivers are compared by the diversity combiner in the master receiver and the stronger is selected to drive the main printer output.



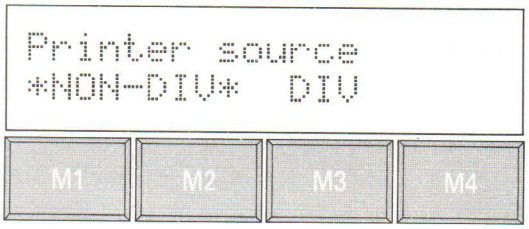

The diversity master will automatically set up the slave.

Dual Receiver connected for Non-Diversity Operation

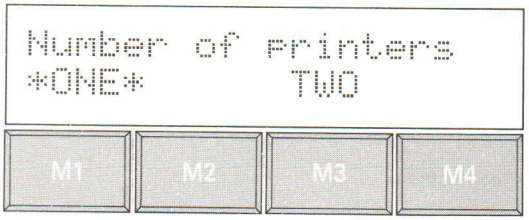
Non-diversity systems containing dual receivers should be connected as shown in Figure 9.1 (c).

To set up the receiver, select SOURCE as described above. This procedure may be performed with the front panel set to control either receiver in the equipment. It need not be repeated for each receiver.

Select NON-DIV operation.




Two printers may be connected so that FSK signals from the two receivers may be printed independently. The output from receiver 1 is fed to the main printer output and the output from receiver 2 to the secondary printer output. TWO should be selected to indicate that two printers are connected. Note that only one printer with a 20 mA double current interface may be connected to a Wideband FSK Module.




If only one printer is available this should be connected to the main printer output and ONE should be selected. This output is fed with the output from the receiver currently being controlled and monitored on the front panel. Note that if the front panel is switched to control the other receiver, the printer output is not changed over until an FSK mode is selected and the printer output set to "run". This means that the printer will continue to print an FSK signal from the first receiver.

Dual Receiver connected for Diversity Operation

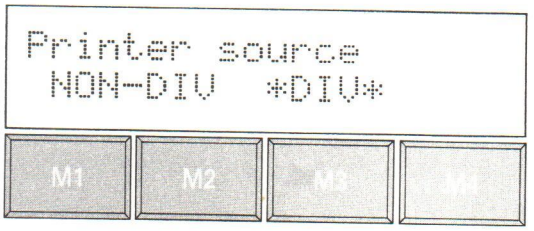
Diversity systems containing dual receivers should be connected as shown in Figure 9.1(c).

One receiver in the equipment must be designated as the diversity master as described in section 4.15 of this manual. The following setting-up procedure should then be performed on the master receiver.

To set up the receiver, select PRINTER SOURCE as described above.

Select DIV operation.

The FSK signals received by both receivers in the dual equipment are combined and the stronger is selected to feed the main printer output. The secondary printer output is not used.



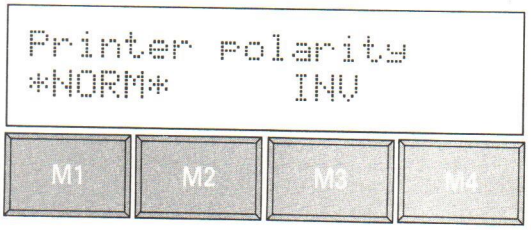

Printer Polarity

Selecting POLARITY presents this menu. The polarity may be:

NORM - Normal polarity. Mark = "Low".

INV - Inverted polarity. Mark = "High".

NOTE: This setting need only be changed if the output device is changed to one with the opposite polarity. The +/- button is used to switch the signal polarity (see "Operation").

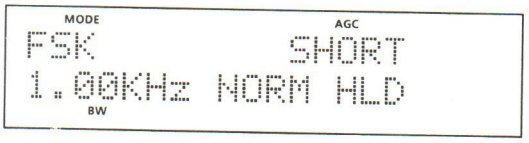



**Operation**

Mode Selection

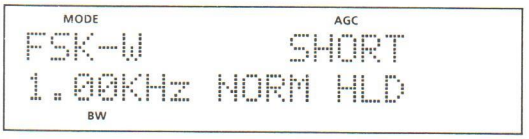
FSK operation may be selected by pressing the FSK button.

For a standard FSK Module the currently displayed mode changes to FSK. The previous FSK operating settings are also shown (explained later).



With a Wideband FSK Module, three FSK symmetrical modes are available which are selected in rotation on each press of the FSK button.

The selected FSK mode is shown on the display as in this typical example. The modes are:




FSK - N - indicates narrow width FSK of +/- 42.5 to 100 Hz
FSK - M - indicates medium width FSK of +/- 100 to 400 Hz
FSK - W - indicates wide width FSK of +/- 400 to 1000 Hz.

*On initial selection of a wideband FSK mode the receiver operates on the last selected FSK symmetrical mode option. When changing between these modes the selected FSK polarity and AGC setting remain the same.*

Printer On/Off

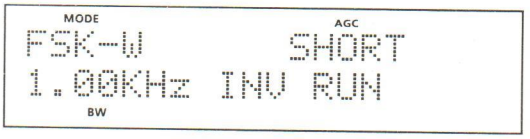
Once FSK operation has been selected the RUN/HOLD button may be used to toggle the output between the "hold" state in which the output is disabled and the "run" state in which data is sent to the terminal device. The current state is indicated on the right-hand display (see below).

In non-diversity mode this controls the output for the channel which is currently being monitored on the front panel. In diversity mode the combined output is controlled.

When a non-FSK mode is selected or the signal is muted, the printer output is automatically set to "hold".

FSK Polarity

The FSK polarity may be switched between "normal" and "inverted" using the +/- button.

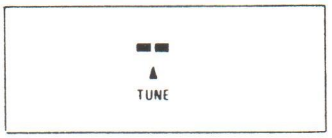



This controls the polarity for the channel which is currently being monitored on the front panel (or both channels if in diversity mode).

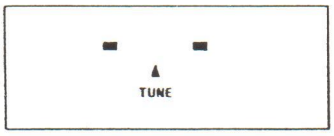
### FSK Tuning Meter

The METER button may be used to set the front panel bar graph meter to monitor either AF level, RF level or FSK tuning. The function is indicated by a legend in the centre display. In the FSK tuning mode the meter acts as a centre-zero tuning meter. The receiver should be tuned so that the illuminated meter segments are symmetrically displaced on either side of the centre marker.

Standard : bars represent mean frequency of the 2 FSK tones.




Wideband : bars represent each of the 2 FSK tones.




If the 2 FSK tones are not displayed when using a receiver fitted with a Wideband FSK Module then the other available FSK symmetrical modes should be selected as described in the FSK mode selection operating instructions. In this way the optimum bandwidth for the FSK signal can be obtained.

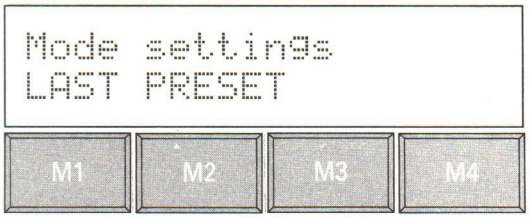
### Preset Parameters

The bandwidth and AGC settings recalled when an FSK mode is selected can be preset using the SET MODES menu option as described in Section 4.4 of this manual.

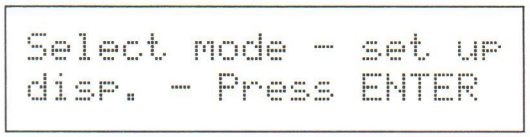
### Example

To store settings for the symmetrical FSK mode:

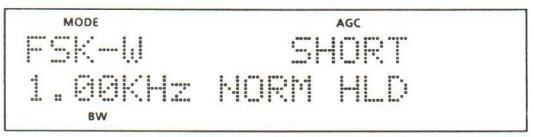
Press M2 to select PRESET.



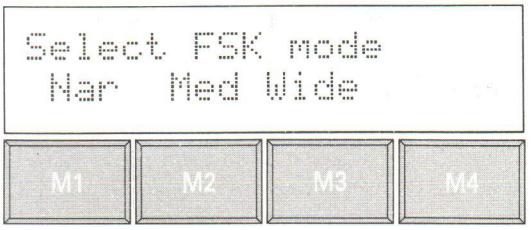

Press FSK to select the FSK mode.




For a standard FSK Module, the display returns to the normal mode display to allow setting of the bandwidth, AGC time constants and FSK polarity. These are recalled when the FSK mode is selected, as described in Section 4.4 of this manual.

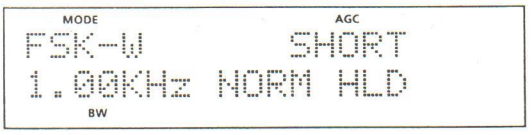


For a Wideband FSK Module this menu is presented when the FSK button is pressed.




Press M1 to M3 as required to select the desired symmetrical FSK mode.

The display returns to the normal mode display to allow the AGC , BW and FSK polarity to be set up as with the standard FSK module.




## 9.6 AUDIO MODULE

### Introduction

The Audio Module contains an isolation transformer and an audio crosstalk suppressor and is designed to be connected to telephone lines. The audio signal is routed to the MA3700 front panel for monitoring.

### Interface Wiring

The audio monitor input to the Audio Module is connected as shown in Table 9.4 to SK1 on the rear panel of the module.

**TABLE 9.4**

**Audio Module Connections**

| Signal Description | Connector Pin No. |
|---|---|
| Audio Monitor Input | 1 |
| Audio Monitor Input | 2 |
| Audio Ground | 9 |

### Audio Level Adjustment

The audio level may be adjusted by means of two potentiometers inside the module. The controls are set for a nominal -19 dBm signal at the audio monitor input. For signals greater than -13 dBm, R3 may require adjustment to reduce the crossover distortion.

### Operation

Operation of the MA3700 is not affected by the addition of the Audio Module.

## 9.7 SUB OCTAVE FILTER MODULE

### Introduction

The Sub Octave Filter Module is fitted to single receivers and provides filtering at the antenna input to reduce second order out of band intermodulation products.

### Installation

The Sub Octave Filter Module is plugged into SK1 on the motherboard and connected to the other modules as follows:

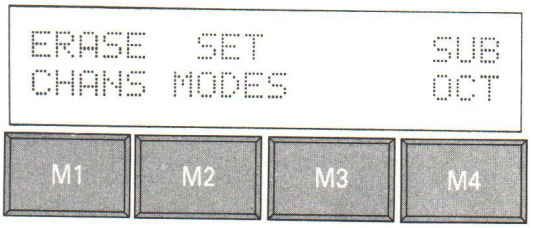
PL2 (Sub Octave Filter) to SK2 (Front End)

### Operation

The receiver menu is used to set up the receiver for the configuration required.

### RF Filtering Selection

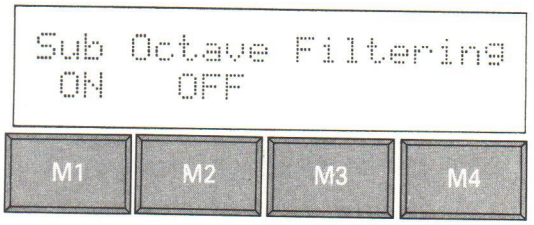
Press MENU repeatedly until these menu options are displayed.




Select SUB OCT by pressing M4

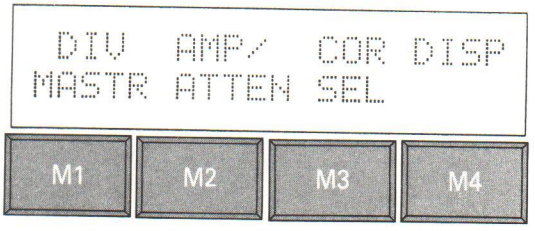
Press M1 to turn the filters on.

Press M2 to select the filter bypass position.



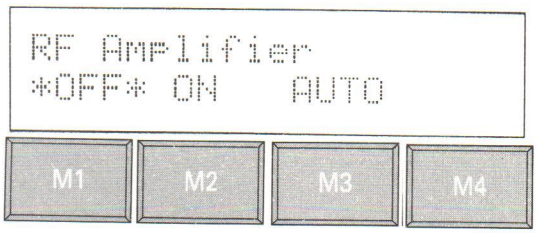

### RF Attenuation Selection

Press MENU repeatedly until these menu options are displayed.

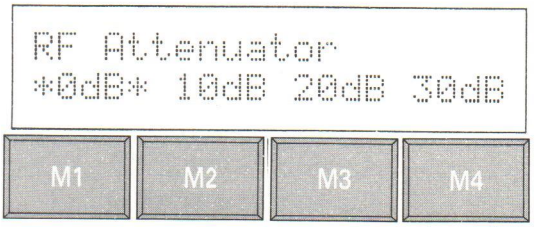



Select RF AMP/RF ATTENuation by pressing M2

Selecting ON or AUTO performs the function described in Section 4.12. The RF attenuator in the Sub Octave Filter Module is set to 0 dB and 'A' is displayed. Selecting OFF presents the following menu.




This menu allows the RF attenuator to be selected with one of the preset attenuation levels. If an attenuator of 10 dB, 20 dB or 30 dB is selected, an 'a' will be displayed.




## 9.8 10 kHz/SIGNAL DETECTOR MODULE

### Introduction

The 10 kHz/Signal Detector Module provides an alternative detector to the IF/AF module detector for COR/SQUELCH operation. It allows the detection threshold to be set to a particular signal to noise ratio (SNR). Once selected as the COR detector all functions which previously used the IF/AF module COR detector will use the 10 kHz/Signal Detector module detector. The module is capable of processing two channels allowing it to be used in ISB or dual receiver applications.

### Interface Wiring

IF Input/Output

A 1.4 MHz IF input/output is available from PL3 on the rear panel of the Signal Detector module. This may be configured as an output in single channel operation by a link internal to the 10 kHz/Signal Detector module, and is after the final IF filters and AGC. In dual channel operation this is configured as the second IF input.

IF/AF/Signal Detect Connections

A number of user connections are provided on a 25-way D type socket (SK1) at the rear of the 10 kHz/Signal Detector module as listed in Table 9.5.

## TABLE 9.5

## 10 kHz/Signal Detector Module Connections

| Signal Description | Connector Pin No. |
|---|---|
| 0 V (Digital) | 1 |
| 0 V (Digital) | 7 |
| Signal Detected Channel A | 10 |
| Signal Detected Channel B | 11 |
| Audio Output 1 | 18 |
| Audio Centre Tap | 19 |
| Audio Output 2 | 20 |
| 0 V (Analogue) | 21 |
| 10 kHz IF Output Channel A | 22 |
| 0 V (Analogue) | 23 |
| 10 kHz IF Output Channel B | 24 |

The audio output is a 600 ohm balanced output. Its level may be adjusted by means of a control located on top of the 10 kHz/Signal Detector module.

The signal detected outputs for each channel are asserted when the signal to noise ratio of the signal in the channel is better than the selected detection threshold. The output will be de-asserted when the signal falls below the detection threshold.

For all logic inputs and outputs:

Asserted = short circuit to 0 volts. De-asserted = open circuit.

The 10 kHz IF outputs are 600 ohms unbalanced with a bandwidth determined by the IF filter selected

**Operation**

The functions available in the COR/SQUELCH facility are extended by the selection of either the existing IF/AF module COR detector or the 10 kHz/Signal Detector module detector. When the 10 kHz/Signal Detector module is enabled as the detector for COR operation the IF GAIN control is no longer used to set the COR detector threshold. In threshold AGC the IF GAIN control sets the AGC threshold only.

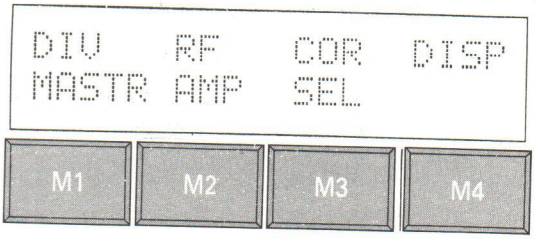
In frequency or channel scan the detection threshold for the 10 kHz/Signal Detector module should be set prior to starting scan as the detection level cannot be set when the scan is in progress. On narow bandwidths the scan rate may be slower than the rate selected since the signal detection is interlocked with the scan to allow reliable operation.

Selection of the 10 kHz/Signal Detector module as the detector for COR/SQUELCH operation and the setting of then detection threshold is via the COR selection menu.

**Example**

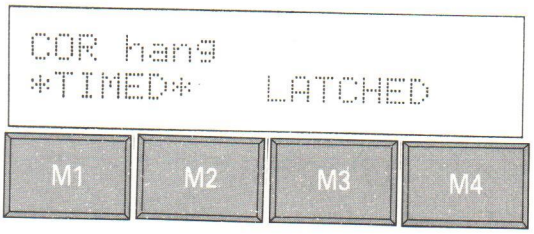
To provide a COR hang time of 2.5 seconds for the COR output and set the COR output to be active when a signal exceeds the signal to noise threshold of 10 dB from the signal detector, proceed as follows:

Press MENU repeatedly until these menu options are displayed.

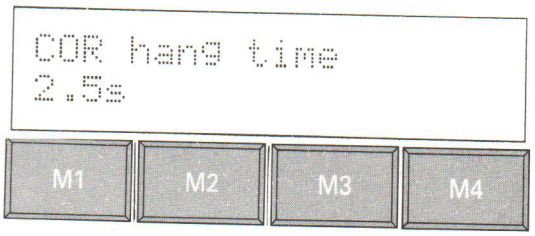



Select COR SEL by pressing M3

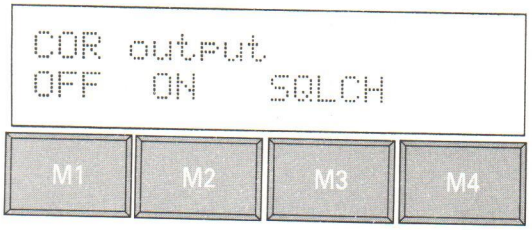
Press M1 to select TIMED COR hang time. The current selection is indicated by *---*.




Press 2 5 ENTER to enter the desired COR hang time of 2.5 seconds.

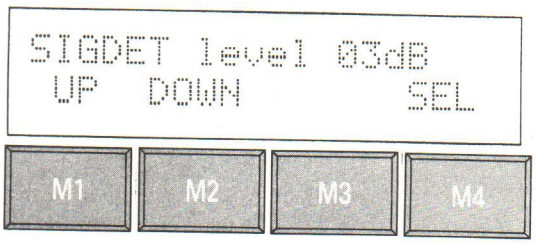



Press M2 to select COR output active when signal is above threshold. The current selection is indicated by *---*.




Press M1 to select Signal Detector for COR detector. The current selection is indicated by *---*

Press M1 repeatedly until the display shows 10 dB as detection level. The current detection level is indicated on the display.




During the setting of the detection threshold the COR legend will be illuminated if the signal is above the detection threshold, any COR hang time is temporarily disabled.

Press M4 to select required COR functions. The display then reverts to menu options.

Press RCL to exit menu system.

If at any time during the selection of COR detector or setting of Signal Detector detection level it is necessary to return to the original settings, then the RCL key can be pressed which exits the menu and restores the original settings

## 9.9 PAN FRONT END MODULE

### Introduction

The Pan Front End module is a standard front end module modified to provide a 41.4 MHz IF output for driving pan display units. The module is used with a 100 kHz filter assembly which limits the bandwidth and provides first LO rejection.

### Interface Wiring

The 100 kHz pan output is taken from the BNC socket SK1 on the filter assembly.

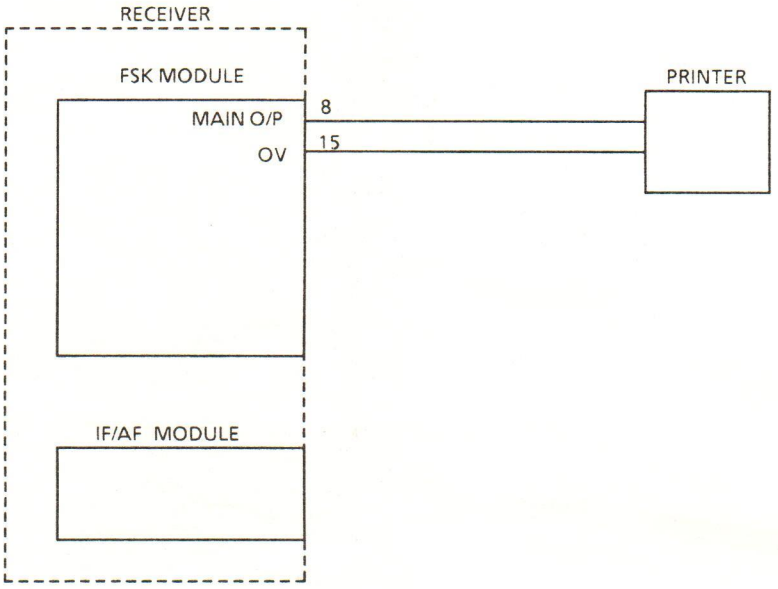
### Pan Output Level

The gain is calibrated to be a nominal 0 dB relative to the antenna when used with the sub octave filter module and the receiver set as follows:

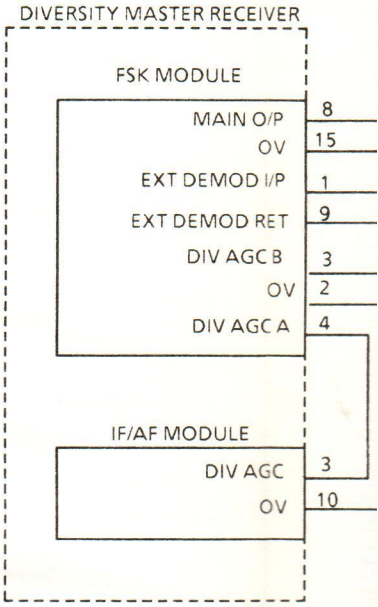
| | |
|---|---|
| RF AMP:- | OFF |
| SUB OCTAVE:- | ON |

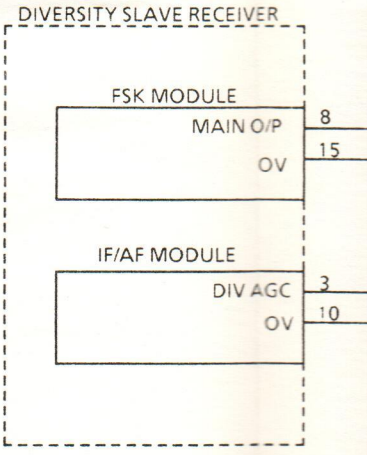
### Operation

The operation of the RA3701 is not affected by the addition of the Pan Front End module.



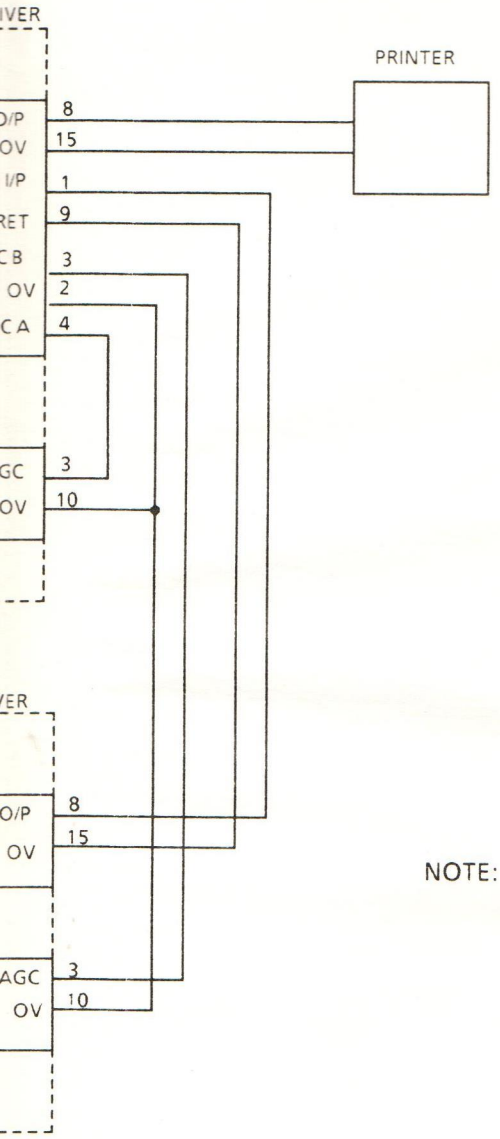

SINGLE RECEIVER
(a)

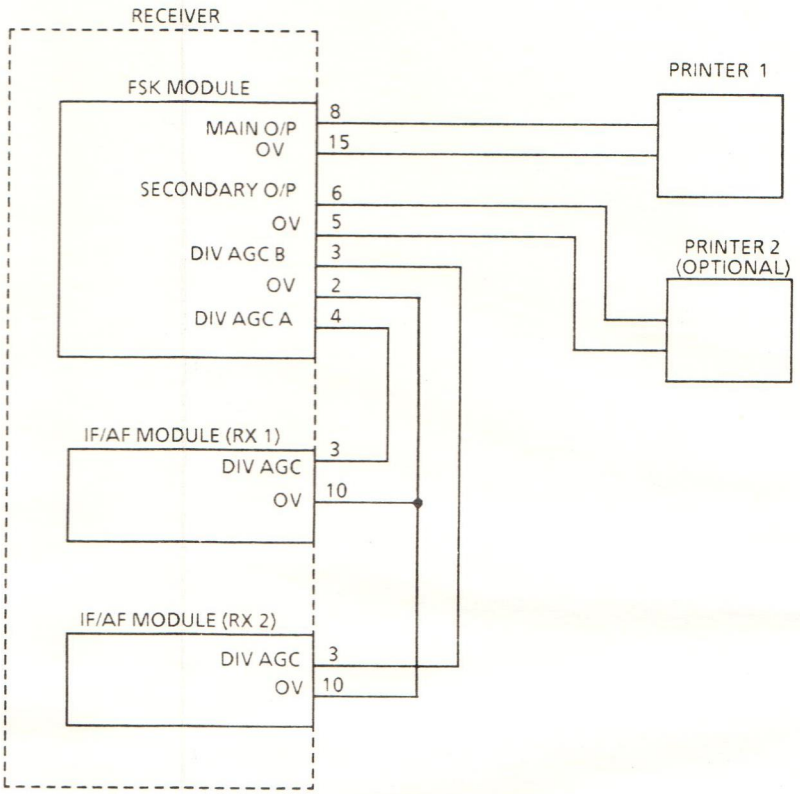



TWO SINGLE RECEIVERS CONNECTED FOR D

(b)




NOTE: FOR NON-DIVERSITY OPERATION, THE DIVERSITY AGC CONNECTIONS ARE NOT REQUIRED AND PRINTER 2 MAY BE USED

DUAL RECEIVER
(c)

TED FOR DIVERSITY OPERATION

)

**FSK System Configurations** **Fig 9.1**

# RA3701 RA3702
# RA3703 RA3704

## TECHNICAL SPECIFICATION

***Frequency range***
15kHz to 30MHz in 1Hz or 10Hz steps.

***Tuning***
By numeric keypad or single spinwheel tuning knob with selectable tune rate.

***Modes of operation***

| | |
|---|---|
| CW | A1A |
| MCW | A2A |
| AM | A3E |
| FM | F3E |
| USB/LSB | R2A, H2A, J2A, R3E, H3E, J3E |
| *Options:* | |
| ISB | B7E, B8E, B9E (RA3701, RA3703) |
| FSK | F1B |

***BFO***
Tunable +/–9.99kHz in 10Hz steps using the main tuning knob or by keypad entry.

***Channel Store***
100 frequencies in non-volatile EEROM memory with associated mode, bandwidth, AGC and BFO settings. Bulk erasure of the memory is possible from the front panel or remotely.

***Scan modes***
**(a)** Channel scan between designated channels with selected dwell time on each channel (0.1s to 9.99s).
**(b)** Frequency sweep between any two frequencies with selected step size (from 0.1kHz to 999.9kHz) and sweep rate (from 10Hz/s to 999.99kHz/s).

In either mode scanning may be halted on detection of a signal above a threshold set at the front panel with the IF gain control.

***Frequency stability***
One of the following optional frequency standards may be fitted:–
**(a) TCXO**
Accuracy $\pm 1.5$ in $10^6$
**(b) 9442 ovened oscillator***
Temperature stability $\pm 3$ in $10^9$ per °C.
Ageing
$\pm 3$ in $10^9$ per day after 3 months continuous operation.
**(c) 9420 ovened oscillator***
Temperature stability $\pm 6$ in $10^{10}$ per °C.
Ageing
$\pm 5$ in $10^{10}$ per day after 3 months continuous operation.

**Full details in Racal Dana Publications 825-2 and 827-2.*

***Sensitivity***
For the frequency range 0.5 – 30MHz.
SSB/CW: A signal of –113dBm (1$\mu$V emf) in a 2.7kHz bandwidth gives an S+N/N of 16dB [19dB] with the RF amplifier on and 10dB [13dB] with the RF amplifier off.
AM: A signal of –103dBm (3$\mu$V emf) 70% modulated at 1kHz, in a 6kHz bandwidth, gives an S+N/N of 16dB [19dB] with the RF amplifier on and 10dB [13dB] with the RF amplifier off.

***Selectivity***
The following bandwidths are standard:

| | |
|---|---|
| USB | 2.7kHz |
| LSB | 2.7kHz |
| Symmetrical | 300Hz |
| | 1kHz |
| | 2.7kHz |
| | 6kHz |
| | 12kHz |

Other filters are available as options. A total of 5 filters (giving 7 bandwidths) are fitted in the basic receiver. The optional IF Filter Module allows a further 7 filters to be added.

***Reciprocal mixing***
With a wanted signal of –113dBm (1$\mu$V emf) in a 2.7kHz bandwidth, an unwanted signal 20kHz removed must be greater than 96dB [102dB] above the wanted signal to give a noise level equal to the output produced by the wanted signal.
At 80kHz removed the difference in level must be greater than 106dB [115dB].

***Out of band intermodulation products***
RF amplifier on:
With two –13dBm (100mV emf) signals separated and removed from the wanted signal by 25kHz, the third order intermodulation products will be not less than 70dB [76dB] below either of the interfering signals. Third order intercept point not less than +22dBm [+25dBm].
RF amplifier off:
Third order intercept point typically not less than +32dBm.

***In band intermodulation products***
Two in band signals of –13dBm (100mV emf) with 600Hz spacing produce third order intermodulation products not greater than –50dB [–55dB] at the IF output and line output.

***Blocking***
With a wanted signal of –53dBm (1mV emf), an unwanted signal more than 20kHz removed must be greater than +7dBm [+13dBm] to reduce the output by 3dB.

***Cross modulation***
With a wanted signal of –53dBm (1mV emf) in a 2.7kHz bandwidth, an unwanted signal 30% modulated, more than 20kHz removed must be greater than +1dBm [+7dBm] to produce an output 20dB below the output produced by the wanted signal.

***External spurious responses***
Spurious response rejection not less than 80dB [90dB].

***Image and IF rejection***
Image and IF rejection not less than 90dB [100dB].

***Internal spurious responses***
Typically fewer than 5 internal spurious responses give an output more than 3dB above the receiver noise level in a 2.7kHz bandwidth. None give an output more than 6dB above the receiver noise level in a 2.7kHz bandwidth.

***Antenna input***
**(a)** Input impedance 50 ohms nominal.
**(b)** The receiver will withstand, without damage, input signals of up to 50V emf continuously.
**(c)** Re-radiation from antenna input:
0–30MHz: Not greater than –87dBm (10$\mu$V pd).
30–100MHz: Not greater than –67dBm [–87dBm].

***AGC***
An increase in input of 120dB above –107dBm (2$\mu$V emf) produces an output change of less than 2dB.
Short, medium and long decay times may be selected from the front panel. When the mode is changed the receiver automatically selects the last time constant used in that mode.

***IF gain control***
The IF gain control may be used to set:
**(a)** Receiver gain
**(b)** AGC threshold
**(c)** Squelch threshold
The control range is 120dB.

***Note***
Figures in [ ] are typical values.

***AF outputs***
**(a)** 200mW into the internal loudspeaker (RA3701, RA3702).
Adjustable using the front panel volume control. May be switched off from the front panel.
**(b)** Rear panel connection for external loudspeaker (RA3701, RA3702). Level adjustable using the front panel volume control. Maximum output 1W into 8 ohms or 200mW into 16 ohms.
**(c)** Front panel headphone output.
Adjustable using front panel volume control. Maximum output 200mW into 16 ohms or 1mW into 600 ohms. Plugging in headphones disables the internal loudspeaker.
**(d)** Rear panel line output –20dBm to +10dBm into 600 ohms balanced. Level adjustable by means of a preset control mounted on top of the receiver.

***IF outputs***
**(a) Narrow**
Centre frequency 1.4MHz.
Bandwidth determined by IF filter selected.
Level –7dBm into 50 ohms.
(Optional modules provide 100kHz or 455kHz IF outputs).
**(b) Wide**
Centre frequency 1.4MHz.
–3dB bandwidth not less than 12kHz.

***Metering***
The front panel bar-graph meter may be switched to meter either RF signal level or AF line level (RA3701, RA3702).

***Remote Control***
One of the following interfaces is fitted:-
**(a)** Serial ASCII complying with CCITT recommendation V10 and EIA Standard RS423-A. Compatible with V28/RS232-C. Data rate may be preset in the range 50 baud to 9600 baud.
**(b)** IEEE 488 complying with ANSI/IEEE Std 488-1978.

***Power supply***
100, 120, 220, 240V. 45-65Hz.
Operates to full specification over the range –15% to +10% relative to taps. Withstands a mains surge of $\pm 50\%$ for up to 1 second without damage. Power consumption approximately 60W for the basic RA3701 and RA3703 receivers. Power consumption approximately 90W for the RA3702 and RA3704 receivers.

***Environmental***
The full Environmental Specification is given in Racal Document ES20 (Issue 5.1) available on request. The equipment is suitable for operation in fixed or transportable installations.

| | |
|---|---|
| Operating temperature | –10°C to +55°C. |
| Storage temperature | –40°C to +70°C. |
| Relative humidity | 95% at 40°C. |

***Dimensions***
Height 133mm (5.25 in)
Width 483mm (19 in)
Depth 450mm (17.7 in) behind front panel

***Weight***
Approximately 14 kg (31 lb) for the basic RA3701 and RA3703 receivers.
Approximately 20 kg (44 lb) for the RA3702 and RA3704 receivers.

***Optional modules***
The RA3701 and RA3703 may be fitted with up to 5 plug-in optional modules. One plug-in optional module may be fitted to the RA3702 and RA3704. Please consult Racal for details of optional modules.

RACAL

**RACAL COMMUNICATIONS**

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