RA 3790 Series

HF Receiver

Operator's Manual

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RACAL

The Electronics Group

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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.

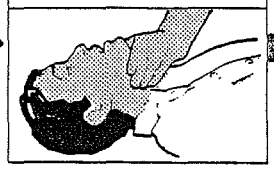
2 REMOVE FROM DANGER: WATER, GAS, ELECTRICITY, FUMES, ETC.

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

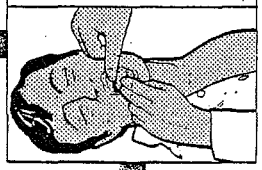
If casualty is not breathing start ventilation at once.

LOOSEN NECKWEAR
TILT HEAD BACKWARDS
AND PUSH CHIN UPWARDS

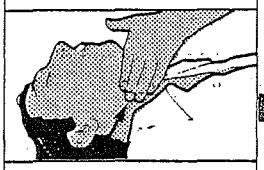


PINCH THE NOSE
COMMENCE VENTILATION
FOUR GOOD INFLATIONS
MOUTH-TO-MOUTH

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



CHECK PULSE



POSITION OF PULSE

PULSE PRESENT

PULSE ABSENT

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

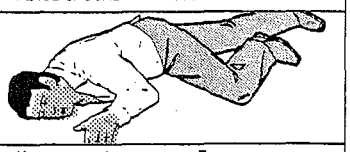
TWO FIRST AIDERS
One conducts chest compressions, without pause at 60 per minute. The other administers mouth-to-mouth ventilation – after each 5th compression.

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

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	

WARNINGS

ANY SPECIAL SAFETY WARNINGS OR INSTRUCTIONS WHICH APPEAR IN THIS MANUAL MUST BE STRICTLY OBSERVED.

HIGH VOLTAGE

LETHAL VOLTAGES EXIST IN THE EQUIPMENT. GREAT CARE MUST BE TAKEN WHEN CARRYING OUT ADJUSTMENTS OR WHEN FAULT FINDING.

ENSURE THAT A RELIABLE SAFETY EARTH IS CONNECTED TO THE EQUIPMENT BEFORE POWER IS APPLIED.

ALL POWER SOURCES MUST BE ISOLATED AND ALL HIGH VOLTAGE POINTS DISCHARGED TO EARTH BEFORE ANY FAULT RECTIFICATION WORK IS UNDERTAKEN.

HIGH CURRENT

HIGH CURRENTS EXIST IN THE EQUIPMENT. CARE MUST BE TAKEN WHEN CARRYING OUT ADJUSTMENTS OR WHEN FAULT FINDING.

STATIC SENSITIVE DEVICES

THE EQUIPMENT CONTAINS COMPONENTS WHICH ARE SUSCEPTIBLE TO DAMAGE BY STATIC ELECTRICAL CHARGES. APPROPRIATE PRECAUTIONS SHOULD BE OBSERVED WHEN HANDLING SUCH COMPONENTS OR SUB-ASSEMBLIES CONTAINING THEM, OR WHEN MAKING DIAGNOSTIC TESTS.

CAUTION

'POZIDRIV' SCREWDRIVERS

METRIC THREAD CROSS-HEAD SCREWS FITTED TO RACAL EQUIPMENT ARE OF THE 'POZIDRIV' TYPE. PHILLIPS TYPE AND 'POZIDRIV' TYPE SCREWDRIVERS ARE NOT INTERCHANGEABLE, AND THE USE OF THE WRONG SCREWDRIVER WILL CAUSE DAMAGE. POZIDRIV IS A REGISTERED TRADE MARK OF G.K.N. SCREWS AND FASTENERS LIMITED. THE 'POZIDRIV' SCREWDRIVERS ARE MANUFACTURED BY STANLEY TOOLS LIMITED.

RA3790 SERIES HF RECEIVER

OPERATORS MANUAL

CONTENTS

PREFACE

SCOPE OF MANUAL

This manual is for use with all receivers in the RA3790 Series. The manual contains receiver operating information at basic and advanced levels, and is aimed at operators with experience in the use of communications receivers. Detailed information regarding remote control is included in the RA3790 Series Receiver Interface Manual.

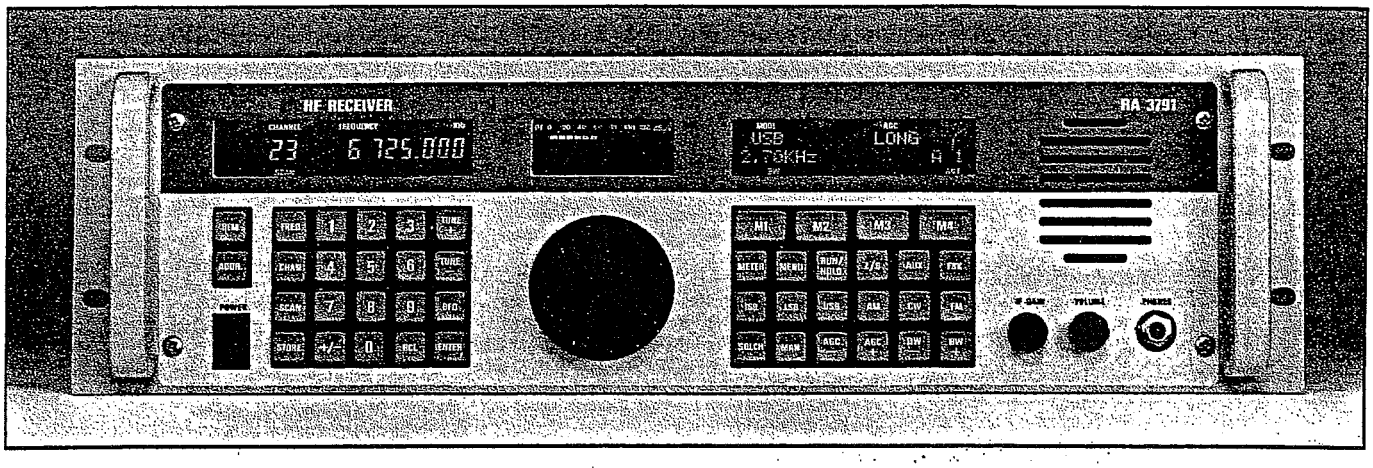
ASSOCIATED DOCUMENTS

RA3790 Series Receiver Interface Manual (Ref. A5257)

RA3790 Series Receiver Maintenance Manual (Ref. A5258)

RA3791 RA3792
RA3793 RA3794

DIGITAL HF RECEIVERS



KEY FEATURES

- *Frequency Range 10kHz to 30MHz*
- *High performance RF circuits*
- *Digital Signal Processing*
- *User programmable digital IF filters providing up to 100 bandwidths*
- *Tunable IF notch plus passband tuning*
- *Simple to operate*
- *Automatic scanning of channels and frequency*
- *Remote control*
- *Controller of slave equipments*
- *Wide range of options*
- *Modular construction*
- *Comprehensive Built In Test Equipment (BITE)*

DESCRIPTION

This family of high performance HF receivers covers the frequency range 10kHz to 30MHz with functions such as IF filtering, AGC and demodulation being implemented using digital signal processing techniques. The receivers use a modular design and a number of configurations are available:

RA3791	Single receiver with operator's front panel
RA3792	Dual receiver with operator's front panel
RA3793	Single receiver for remote control
RA3794	Dual receiver for remote control
MA3790	Receiver remote control unit

The receivers provide the high level of RF performance required from a receiver operating in the crowded HF spectrum.

Particular attention has been given to sensitivity, intermodulation, reciprocal mixing and spurious responses. The front panel of the receiver has been designed to provide a comprehensive range of facilities while also being easy to use. Single function push buttons select the most commonly used functions and a menu system is provided to control the receiver's many special features.

The receivers include, as standard, a serial ASCII remote control interface with a built-in multi-addressing capability of up to 100 receivers. Alternatively, an IEEE-488 interface may be fitted. Slave receivers may be controlled in a number of ways: by computer; using the MA3790 dedicated receiver control unit which has the same front panel as the RA3791; or by the RA3791 or RA3792 receivers which have built-in controller facilities. All receiver functions may be remotely controlled. The remote control protocol is compatible with that used in the well established RA3701/RA3702 thereby allowing RA3790 and RA3700 Series receivers to be used together in a system.

RA3791 RA3792 RA3793 RA3794

DIGITAL HF RECEIVERS

TECHNICAL SPECIFICATION

Frequency Range
10kHz to 30MHz in 1Hz steps

Tuning
By numeric keypad, single spinwheel tuning knob with selected tune rate

Modes of operation

CW	A1A, A1B
MCW	A2A, A2B
AM	A3E
FM	F3E
FSK	F1B
USB/LSB	H2A, H2B, H3E, J2A, J2B, J3E R2A, R2B, R3E
Option:	
ISB	B7B, B8E, B9W

BFO
Tunable ±8kHz in 10Hz steps using the main tuning knob or by keypad entry

Channel store
100 frequencies in non-volatile EEPROM memory with associated mode, bandwidth, AGC and BFO settings. Bulk erasure of 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 over a number of ranges defined by the user. Skip ranges or frequencies may be programmed. Step size 100Hz to 999.9kHz. Sweep rate 10Hz/s to 999.99kHz/s

In either mode scanning may be halted on detection of a signal above a threshold set by the operator

Frequency stability
One of the following optional frequency standards may be fitted:–
(a) **TCXO**
±7 parts in 10^7 over the range –10°C to +55°C
(b) **Ovened oscillator**
±1 part of 10^7 over the range –10°C to +55°C. Ageing ±2 in 10^8 per day after 24 hours continuous operation
(c) **High stability ovened oscillator**
±3 parts in 10^8 over the range –10°C to +55°C. Ageing ±5 in 10^{10} per day after 3 months continuous operation

Sensitivity
For the frequency range 0.5–30MHz

SSB/CW: A signal of –113dBm (1µV emf) in a 2.7kHz bandwidth gives an S+N/N of:–
16dB [19dB], RF amplifier on,
10dB [13dB], RF amplifier off

AM: A signal of –103dBm (3µV emf) 70% modulated at 1kHz, in a 6kHz bandwidth, gives an S+N/N of:–
16dB [19dB], RF amplifier on,
10dB [13dB], RF amplifier off

Selectivity
The receiver has digital filters with the following bandwidths:

USB	2.7kHz (300Hz to 3kHz)
LSB	2.7kHz (300Hz to 3kHz)
Symmetrical	300Hz, 1kHz, 3kHz, 6kHz, 12kHz

The user may program the receiver from the front panel or via the remote interface to configure additional filters by entering the bandwidths required. Up to 100 different filters may be configured. Once configured, the filters are selected from the front panel or by filter number via the remote interface. All filters have very low ripple and differential group delay and a stopband exceeding 100dB

The software allows the bandwidth and position of a configured filter to be finely adjusted. It also provides a variable width, tunable IF notch filter

Reciprocal mixing
With a wanted signal of –113dBm (1µV emf) in a 2.7kHz bandwidth, an unwanted signal 20kHz removed must be greater than 96dB [102dB] above the wanted signal in order 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
With two –13dBm (100mV emf) signals separated and removed from the wanted signal by 20kHz, the third order intermodulation products, relative to either of the interfering signals, will be not less than:–
86dB [90dB], RF amplifier off,
70dB [76dB], RF amplifier on

Third order intercept point is not less than:–
+30dBm [+32dBm], RF amplifier off,
+22dBm [+25dBm], RF amplifier on

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

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]

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 (10µV pd)
30-100MHz: Not greater than –67dBm [–87dBm]

AGC
An increase in input of 120dB above –107dBm (2µV 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. Decay time constants are programmable by the user

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

AF outputs
(a) Internal loudspeaker. Level adjustable using the front panel volume control. May be switched off from the front panel
(b) Rear panel connection for external loudspeaker. Level adjustable using 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 from front panel or via remote control

IF output
Centre frequency may be selected by the user as follows:
(a) 1.4MHz
(b) Programmable by the user in the range 10kHz to 455kHz in 5kHz steps

Bandwidth may be selected by the user as follows:
(a) Narrowband: Bandwidth equal to selected IF bandwidth. Level nominally –7dBm
(b) Wideband: Bandwidth 12kHz Level nominally 50dB above antenna input or –7dBm, whichever is the smaller

Digital signal output (option)
The serial digital interface can be programmed to provide either:
(a) Digital IF output: Bandwidth either equal to selected IF bandwidth or fixed at 12kHz
(b) Digital audio output

Metering
The front panel bar-graph meter may be switched to meter:
(a) RF signal level
(b) AF line level
(c) Tune indication for FSK

Remote control
Serial ASCII complying with CCITT recommendation V10 and EIA standard RS423-A. Compatible with V28/RS232-C. Maximum data rate 9600 baud

An optional IEEE-488 interface complying with ANS/IEEE Std 488-1987 is also available

Power Supply
90V to 132V and 175V to 264V AC with automatic range selection 47 to 63Hz

Environmental

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

Dimensions

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

Note: Figures in [ ] are typical values

RACAL

RACAL COMMUNICATIONS

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CHAPTER 1

GENERAL DESCRIPTION

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CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1. The RA3790 family of high performance HF receivers covers the frequency range 10 kHz to 30 MHz in 1 Hz steps. Reception facilities for USB, LSB, AM, CW, MCW, FSK and FM are provided as standard, with ISB available as a software option.

2. Using a modular design, the receiver can be configured to meet a variety of different applications. For example, the RA3791 is a single receiver comprising a Chassis Assembly, Front Panel and Power Supply, with one Analogue Board and one Digital Board (Fig. 1.1). By the addition of a further Analogue Board and Digital Board, the RA3792 Dual Receiver is produced (Fig. 1.2).

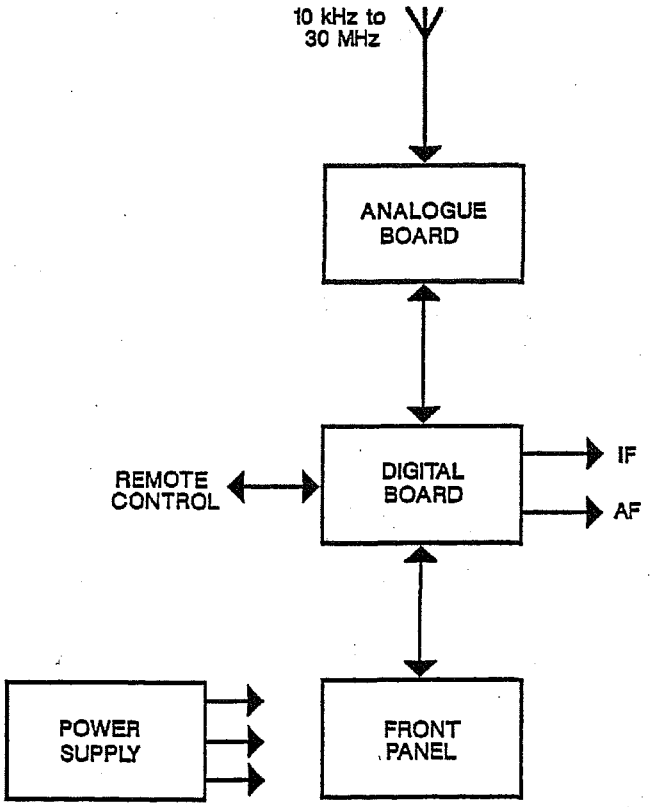


Fig. 1.1 RA3791 Single Receiver

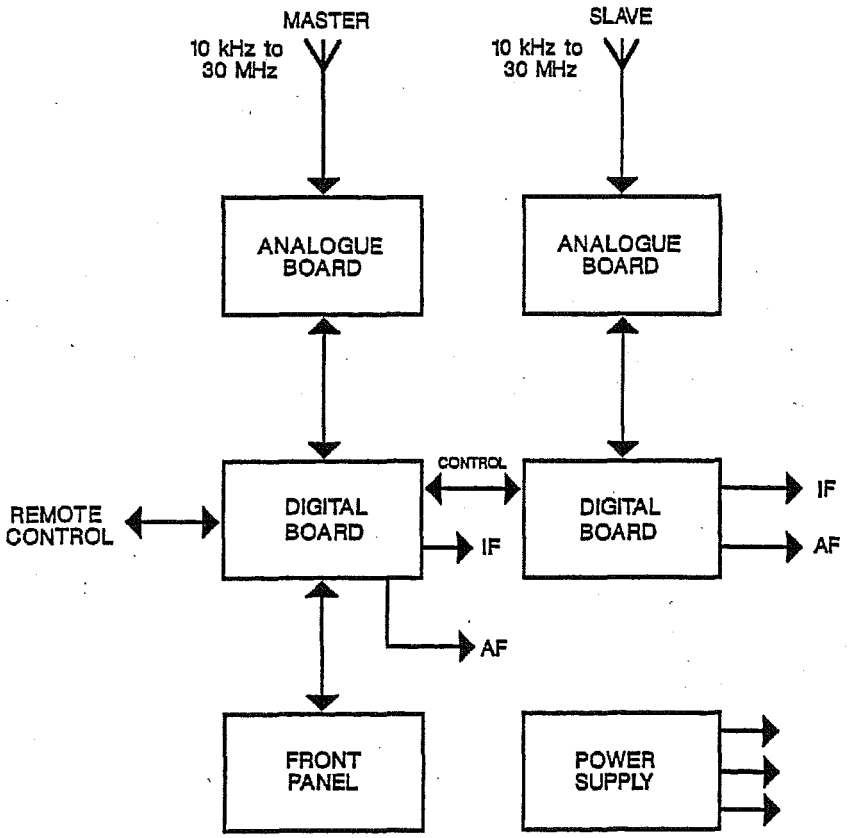


Fig. 1.2 RA3792 Dual Receiver

3. For remote control unmanned operation, blank front panel versions are available, the RA3793 Single Receiver and the RA3794 Dual Receiver. Either the RA3791 or RA3792 can be made to function as a receiver controller, or the MA3790 Controller can be used.

4. All receivers include, as standard, a serial ASCII remote control interface with a built-in multi-addressing capability of up to 100 receivers. Alternatively, an IEEE-488 interface can be provided. All front panel operating functions except power on/off switching and audio monitor level can be controlled remotely.

5. Single function pushbuttons control the most commonly used operations and a menu system is used to control many other receiver facilities. Frequency selection is achieved using a spinwheel tuning knob with selectable tune rates or by numeric pushbutton entry. A 100-channel non-volatile memory provides instant recall of 100 frequencies and associated operating settings. Facilities for the automatic scanning of preset channels and the sweeping of a pre-programmed frequency range are also provided.

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

OPERATING MODES

7. The receiver has six basic modes of operation, as listed below. These basic modes are described briefly in the following paragraphs. Refer to the RA3790 Series Interface Manual for further information on modes (2) to (6).

(1) Locally operated receiver

(2) Remotely controlled receiver

(3) Receiver operating as a controller

(4) Receiver operating as a local diversity master

(5) Receiver operating as a remote diversity master

(6) Receiver operating as a controller of a remote diversity pair

Locally Operated Receiver

8. The receiver is controlled by an operator using the front panel pushbutton switches plus rotary knobs in conjunction with the liquid crystal displays (7-segment digits, dot matrix characters, a bargraph meter and special-purpose legends).

9. In a dual receiver the front panel is used to control the currently selected receiver only. The front panel is connected to the digital board of the 'main' receiver. The 'slave' receiver is controlled via its auxiliary serial port which is internally connected to the master serial port of the main receiver. This link operates unaddressed on fixed settings.

Remotely Controlled Receiver

10. The receiver is controlled via either the serial ASCII or optional IEEE-488 remote control ports (only one is available externally). Between the two halves of a dual receiver, a serial link is used on fixed settings. All the facilities available on the front panel, except power on/off, local monitoring and some equipment configuration functions may be controlled remotely. Receivers intended for remote only operation (RA3793, RA3794) are fitted with a blank front panel with no controls or displays (except for fault indicators and a phones socket).

11. In a dual receiver, each half has an independent address for external control, thus allowing control of both receivers. However, the front panel displays reflect the settings of the currently selected receiver only.

Receiver Operating as a Controller of Remote Receiver(s)

12. The receiver sends control data via the remote control port to remote receivers to either interrogate them or change the operational settings. When a receiver is acting as a controller, its own operational settings are unchanged.

13. A dual receiver can be configured to control the slave receiver(s) in two ways:-

(1) Using its internal link between the two halves, ie 'Master' port on the main receiver to the 'Auxiliary' port on other receiver. In this mode, the settings (excluding address) of any external slave receivers 'Tributary' port must be the same as the 'Auxiliary' port.

(2) By removing the internal link between the two halves of the dual receiver and controlling the second half of the dual via its 'Tributary' port, any suitable settings can be used. All slave receivers, including the second half of the dual receiver, must be set to different addresses on their 'Tributary' ports. There are no restrictions on the format of the remote link for control of a slave receiver(s) from a single receiver.

Receiver Operating as a Local Diversity Master

14. The receiver is controlled by an operator using the front panel and sends its own operational settings to another receiver, thus ensuring that both receivers track each other. The remote receiver is termed a diversity slave. Each receiver indicates its own metering level.

15. When a single receiver acts as a diversity master and controls a single diversity slave, the mode of operation is termed as External Diversity Operation. When one half of dual receiver acts as a diversity master and controls the other half of the same receiver, the mode of operation is termed as Internal Diversity Operation.

Receiver Operating as a Remote Diversity Master

16. The receiver acting as a diversity master is controlled via either the serial ASCII or IEEE-488 remote control ports. All facilities available on the front panel for a local diversity master, except power on/off, local monitoring and some equipment configuration functions may be controlled remotely. The receivers own operational settings are sent to the diversity slave thus ensuring that both receivers track each other.

17. Remote operation of a diversity pair is not available if the diversity pair is an external diversity pair fitted with the IEEE-488 option.

Receiver Operating as a Controller of Remote Diversity Pair

18. The receiver sends control data via the remote port to the remote diversity pair to either interrogate them or to change their operational settings. When a receiver is acting as a diversity controller, its own operational settings are unchanged.

19. Controller operation of a diversity pair is not available if the diversity pair is an external diversity pair fitted with the IEEE-488 option.

Note: The restrictions for IEEE-488 type receivers are due to the fact that only one port is provided for the IEEE-488 option, whereas two ASCII ports are provided for the standard serial receiver.

PHYSICAL CHARACTERISTICS

20. The RA3790 series of receivers use a common chassis assembly which houses the power supply unit and the front panel assembly. The equipment is 19 inch rack-mounting and occupies 5.25 inches (3RU) of rack height.

21. An AC Power Supply is fitted, which operates from 90 V to 132 V and 175 V to 264 V, 47 to 63 Hz, with automatic voltage range selection.

FRONT PANEL AND DISPLAY

22. The normal front panel has 44 pushbuttons and a shaft encoder where the steps per revolution can be configured under menu control.

23. All front panel control functions are under software control except for the following:-

(1) The Volume control, used to set the audio level applied to the loudspeaker and to the headphones connected to the PHONES socket

(2) The Power switch, used to switch the AC power supply on and off.

24. The front panel pushbutton switches are arranged in three groups with the following basic functions:-

(1) Remote control and addressing

(2) Numeric entry and main knob function

(3) Receiver operating mode and M1 to M4 menu (soft) pushbuttons

(4) There are three back-lit liquid crystal display areas on the front panel:

Left Hand: Receiver address, channel number and frequency setting (all 7-segment digits) plus receiver status legends.

Centre: Meter with RF, AF and tuning scales plus main knob function, COR and MUTE legends.

Right Hand: Two-row by 20-character alpha-numeric display. This normally displays Mode, Bandwidth, AGC, Squelch, BFO, FSK Polarity and FSK HOLD, antenna number and RF amplifier status settings. It is also used in conjunction with the four menu pushbuttons to select menu-driven functions. Messages to the operator are also displayed here.

BRIEF TECHNICAL DESCRIPTION

25. The following brief technical description should be read in conjunction with the RA3791 block diagram given in Fig. 1.3.

ANALOGUE BOARD

RF Input

26. The signal from the antenna is routed via a protection and muting circuit and a 30 MHz low pass filter to a wideband RF amplifier. When the receiver is connected to an efficient HF antenna system the received signal will usually be externally noise limited and the operator may switch off the RF amplifier in order to optimise intermodulation performance rather than sensitivity.

27. The protection circuit contains a relay to open automatically the RF path for signals at the antenna greater than approximately +18 dBm, or when a mute signal is applied to the receiver, either via a rear panel connection or via the remote control interface.

28. The low pass filter protects the receiver from image frequency signals and also attenuates first local oscillator re-radiation from the antenna connection.

First Mixer and IF Amplifier

29. After amplification, the 40.032 MHz to 70.032 MHz first local oscillator output from the Synthesiser is mixed with the received signal in the first mixer stage. The resulting difference frequency of 40.032 MHz is filtered (12 kHz bandwidth) and amplified.

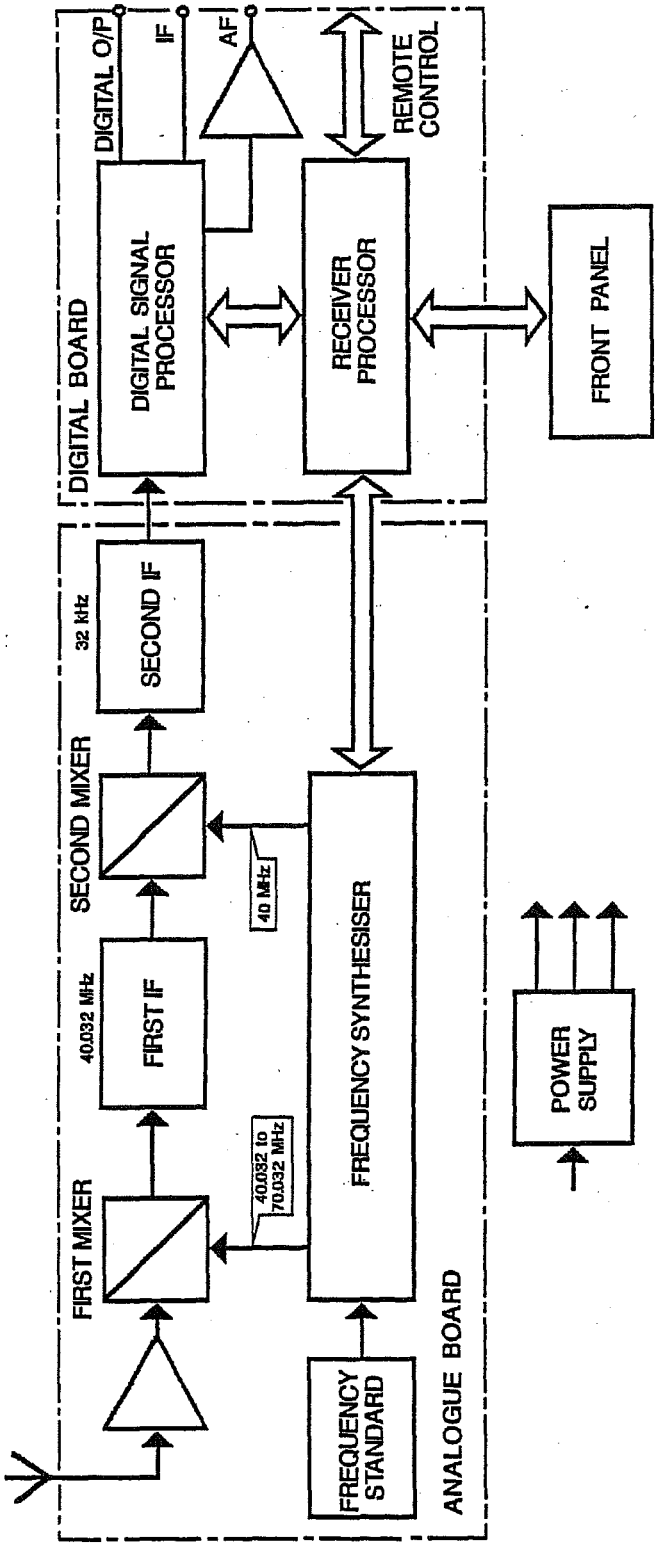


Fig. 1.3 Basic RA3791 Receiver Block Diagram

Second Mixer and IF Amplifier

30. The second mixer mixes the 40.032 MHz first IF output with a 40 MHz second local oscillator signal from the synthesiser. The resulting second IF output at 32 kHz is passed via a low pass filter to an amplifier prior to application to the Digital Signal Processor IF/AF circuitry.

First Local Oscillator

31. The first local oscillator signal is produced by a fractional-N single-loop synthesiser and is phased locked to a 20 MHz reference signal. A voltage controlled oscillator (VCO) generates the first LO frequency of between 40.032 MHz and 70.032 MHz. The frequency is controlled by a phase locked loop in which the VCO frequency is divided by the programmable divider and then phase compared with a 1 MHz reference frequency. The output of the phase comparator is filtered by the loop filter and fed back to the VCO to lock the loop.

32. The division ratio of the signal fed back to the phase comparator is determined by a programmable divider. This is controlled by a synthesiser control device which is loaded with frequency setting data from the receiver processor, and processes this information to obtain a frequency resolution down to 1 Hz.

Second Local Oscillator

33. The second LO output is produced by a 40 MHz voltage controlled crystal oscillator (VCXO) phase locked to the 1 MHz reference signal. This 1 MHz may be derived from either an internal or an external source.

34. The operator may select an internal or external reference source. With 'internal' selected and an internal 10 MHz Frequency Standard fitted, the frequency standard output is divided to produce a 1 MHz reference for the phase comparator. In this mode a reference output is made available at the rear panel for connection to external equipment. This external reference frequency output may be selected from 1 MHz, 5 MHz or 10 MHz, derived from the loop divider.

35. With 'external' selected, an external frequency standard of 1 MHz, 5 MHz or 10 MHz may be used.

DIGITAL BOARD

Analogue-to-Digital Conversion

36. The 32 kHz second IF signal is amplified prior to the analogue-to-digital conversion (ADC). The ADC is a linear 16-bit, 64-times oversampling converter. It employs third order noise shaping sigma-delta technology, yielding 16-bit dynamic performance at a 96 kHz sample rate. The sigma-delta converter has inherent linear phase, negligible ripple and excellent linearity while requiring minimal anti-alias filtering.

37. A second high speed ADC is used to measure the signal level and reduce the gain of the first IF stages in order to avoid overloading the main ADC.

Digital Signal Processing

38. The 16-bit 96 ksample per second signal from the ADC is passed to an array of digital signal processors. These processors perform a complex mix to zero IF, represented by in-phase and quadrature components. This is followed by decimation filtering to a sample rate of 16 kHz. Further selectivity filtering is then performed followed by back-end AGC and demodulation. All filtering utilises finite impulse response filters (FIRs) to maintain linear phase and zero differential group delay.

Analogue Outputs

39. The demodulated audio output is converted to analogue form using a 14-bit linear CODEC. The analogue output drives a line amplifier which provides a 600 ohm balanced output at the rear panel. An independent amplifier provides outputs for loudspeaker and headphones.

40. The digital IF signal, after filtering and AGC, is digitally converted back to an IF of 1.4 MHz. A digital-to-analogue converter then converts it to analogue form to provide a rear panel IF output at a frequency of 1.4 MHz.

41. An IF frequency converter is also provided which allows the frequency of the IF output to be programmed by the user within the range 10 kHz to 455 kHz in 5 kHz steps.

Digital Outputs

42. In addition to the analogue audio and IF outputs, an optional digital signal output is also available. This can be programmed to provide either a digital IF output or a digital audio output. It can be used to provide an input to an external unit which performs further digital signal processing or for recording on a digital tape recorder.

Receiver Processor

43. This microprocessor is supported by 256 Kbytes of EPROM for program storage, 64 Kbytes of RAM for use as a working memory and 8 Kbytes of EEPROM. The latter is used for channel storage and for configuring the receiver.

44. The remote control interface allows connection to control equipment using serial ASCII to exchange data using the RS-423 standard. It consists of Master and Tributary ports to allow different system configurations in which the receiver may act as either a controller or as a slave. The receivers include a built-in, multi-addressing capability with an address range of up to 100 receivers. An IEEE-488 remote control interface is also available as an option.

FRONT PANEL

45. The Front Panel provides the controls and displays necessary to operate the receiver. These are interfaced via the receiver processor which processes front panel commands as well as those received via the remote control ports. The control of all boards in the receiver is completely digital.

46. Single function pushbuttons control the most commonly used operations and four menu pushbuttons control the facilities offered by the menu system.

47. Three liquid crystal displays (LCDs) indicate the current selections and operating settings of the receiver. Back lighting is provided, the intensity being controlled by the operator.

FSK DEMODULATOR SOFTWARE

48. This software demodulates two-tone FSK signals and produces a low level telegraph output to drive a teleprinter. In the FSK mode, the front panel bargraph meter may be switched to provide a centre-zero tuning meter to allow accurate tuning of FSK signals.

49. For use in diversity systems it includes a diversity combiner which automatically selects the largest signal to drive the printer.

ENHANCED FILTER SOFTWARE

50. The receiver is supplied with digital filters with the following bandwidths:

300 Hz, 1 kHz, 3 kHz, 6 kHz, 12 kHz symmetrical
300 - 3000 Hz USB
300 - 3000 Hz LSB

51. The operator also has the flexibility to define filter bandwidths. Using a configuration menu, the bandwidths required are simply entered and software in the receiver computes the coefficients necessary for a digital filter of the appropriate bandwidth. Filters defined using this configuration process may subsequently be selected by the operator using the BW+ and BW- buttons on the front panel. A total of up to 100 filters may be programmed into the receiver. All filters are finite impulse response designs with low ripple and zero group delay. IF notch and passband tuning facilities are also available.

ENHANCED SIGNAL DETECTOR SOFTWARE

52. The receiver includes two types of signal detector. The first operates by measuring the signal level and can be used to stop a channel scan or frequency sweep when the received signal level exceeds a user defined threshold.

53. The second type of signal detector has enhanced software to provide a reliable and effective method of signal detection which measures the signal plus noise to noise ratio (SNR) in the receiver IF filter bandwidth, using DSP spectral analysis techniques. A signal is detected when its measured SNR exceeds a selected threshold which can be set from the receiver front panel or via remote control. Since SNR is measured, this detection method is unaffected by variable external noise levels which defeat simple RF signal level type detectors.

54. A common use of the signal detector function is to stop an automatic frequency sweep or channel scan when the selected SNR threshold has been exceeded. In this mode of operation the signal detection function is interlocked with the frequency sweep or channel scan to ensure optimum reliability.

OPTIONS

DSP Software Options

55. The following DSP software options can be provided to enhance the facilities available in the receiver.

ISB Demodulator Software

56. This software implements a second IF channel with filtering, AGC and demodulation for use during independent sideband reception.

Digital Signal Output Software

57. This output can be programmed to provide either a digital IF output or a digital audio output. It can be used to provide an input to an external unit which performs further digital signal processing or for recording on a digital tape recorder.

Hardware Option

58. The following hardware option can be provided to enhance the facilities available in the receiver.

Front End Filter

59. The front end filter provides front end selectivity to reduce second order inter-modulation products.

CHAPTER 2

GENERAL INSTALLATION PROCEDURES

CONTENTS

Illustrations

CHAPTER 2

GENERAL INSTALLATION PROCEDURES

INTRODUCTION

1. This chapter provides general installation information and interface wiring details. Where the receiver forms part of a larger system, additional installation information may be found in the system documentation provided. Receiver rear panel views are given in Figs. 2.1 and 2.2 at the end of the chapter.

2. Refer to Chapter 5 for additional information relating to remote control operation and to Chapter 7 for a list of the available installation accessories. For detailed remote control information refer to the RA3790 Series Receiver Interface Manual.

GENERAL

3. All interface connections are made at the rear of the receiver with the exception of the headphones which are connected to the front-panel PHONES socket. All interface connections are specified as Safety Extra Low Voltage (SELV) connections.

4. The receiver is designed to be housed in any standard 19-inch (483 mm) rack or cabinet, and is supported on suitable runners by means of bollards attached to the receiver side panels. Four mounting screws are required, two at each edge of the front panel, to secure the receiver to the rack or cabinet. To assist in the circulation of cooling air, a one-rack-unit vent panel should be fitted above the receiver.

5. On receipt of the receiver, inspect for any physical damage that may have occurred during transit. Prior to installation, check that all boards are firmly in place and that all visible connectors are mated correctly.

AC POWER CONNECTION

6. The receiver power supply lead is fitted with a three-way IEC socket for connection to PL1 on the receiver rear panel. The power connection wiring is as follows:

SIGNAL	BRITISH STANDARD WIRE COLOUR	CONNECTOR PIN
LIVE (Phase)	Brown	L
NEUTRAL (Common)	Blue	N
EARTH (Ground)	Green/Yellow	⏚

NOTE: For safety reasons, the pin marked ⏚ must always be connected to the power supply (mains) earth, which does not necessarily constitute an RF earth.

AC FUSE RATING

7. The AC supply connector PL1 has two integral 20 mm by 5 mm fuse holders FS1 and FS2, each fitted with a 2 Ampere anti-surge fuse (Racal part No. 922457). These fuses are rated at 2 Amperes regardless of the operating voltage (in the range 100 volts to 240 volts) and no voltage selector is required.

EARTH TERMINAL

8. The chassis earth terminal, located beneath the supply input connector PL1, may be connected to the rack or cabinet RF earth, separate from the supply (mains) earth.

ANTENNA CONNECTION

9. The antenna connection is made to the rear panel (Fig. 2.1) using a 50 Ohm BNC coaxial socket (SK1). For the RA3792 Dual Receiver, two antenna connections are required, one for each receiver (Fig. 2.2).

10. To facilitate remote antenna selection, using an external antenna selection unit, four antenna select lines are provided on the Master/Auxiliary Port Connector (see below). These lines may be used simply to select one of four antennas, or BCD-coding may be used where more than four antennas are required. The output signal requirements conform to Racal Specification DS147, as described in the RA3790 Interface Manual, and the menu-driven operating procedures are detailed in Chapter 5 of this manual.

IF OUTPUT

11. A 50 Ohm BNC coaxial socket (SK3) is mounted on the rear panel (Fig. 2.1) for a 1.4 MHz or programmable frequency IF output, for external use.

REFERENCE IN/OUT CONNECTOR

12. The reference signal required by the receiver synthesiser is provided either by an internal 10 MHz Frequency Standard or by an external source connected to a 50 Ohm BNC coaxial connector, SK2, on the rear panel. When the reference signal is provided internally, a 1 MHz, 5 MHz or 10 MHz reference signal, as

selected, is available at SK1 for external use. Further details are given in Chapter 6 of the Maintenance Manual (A5258) and in Chapter 1 of the Interface Manual (A5256).

DSP/AUDIO CONNECTIONS

13. A 25-way DSP/Audio connections socket SK4, from the Digital Board (two for the RA3792 Dual Receiver), is mounted on the rear panel (Figs. 2.1 & 2.2). The mating 25-way plug is a Cannon D-type, and the pin connections are listed below.

Pin	Signal
1	Line 1 output
2	Line 1 ground
3	Line 2 ground
4	Loudspeaker output
5	Audio ground
6	External audio input
7	Diversity AGC (gain control) input
8	FSK 2 (not used)
9	Digital ground
10	Differential strobe+
11	Differential data input+
12	Differential data ouput+
13	Differential clock+
14	Line 1 output
15	Line 2 output
16	Line 2 output
17	Loudspeaker ground
18	COR output
19	Diversity AGC (gain control) output
20	FSK 1 (output)
21	Digital ground (output)
22	Differential strobe-
23	Differential data input-
24	Differential data output-
25	Differential clock-

MASTER/AUXILIARY PORT CONNECTOR

14. This is a 15-way plug with mating Cannon D-type 15-way socket. The pin connections are listed below.

Pin	Signal
1	Logic ground
2	Transmit data
3	Receive data
4	Request to send (RTS) or clear to receive (CTR)
5	Clear to send (CTS)
6	Receive common
7	Transmit common (signal ground)
8	Monitor audio output
9	Monitor audio input
10	Audio ground
11	Fault input/output
12	Antenna 0 output
13	Antenna 1 output
14	Antenna 2 output
15	Antenna 3 output

TRIBUTARY PORT CONNECTOR

15. This is a 15-way plug with Cannon D-type mating 15-way socket. The pin connections are listed below.

Pin	Signal
1	Logic ground
2	Transmit data
3	Receive data
4	Request to send (RTS) or Clear to receive (CTR)
5	Clear to send (CTS)
6	Receive common
7	Transmit common (signal ground)
8	Not used
9	Not used
10	Not used
11	IF Valid output
12	Not used
13	Scan inhibit input
14	Mute input
15	Dump input

OPTIONAL IEEE-488 PORT CONNECTOR

16. The optional IEEE-488 port can be configured as a 'master' or a 'tributary'. The electrical interface complies with IEEE-488.1-1987 (IEC-625). The protocol conforms to the Racal DS145 External Control Protocols document. For further information, refer to the RA3790 Interface Manual.

17. Connections are made to a 25-way D-type socket on the rear panel; the pin connections for the mating socket are given below:

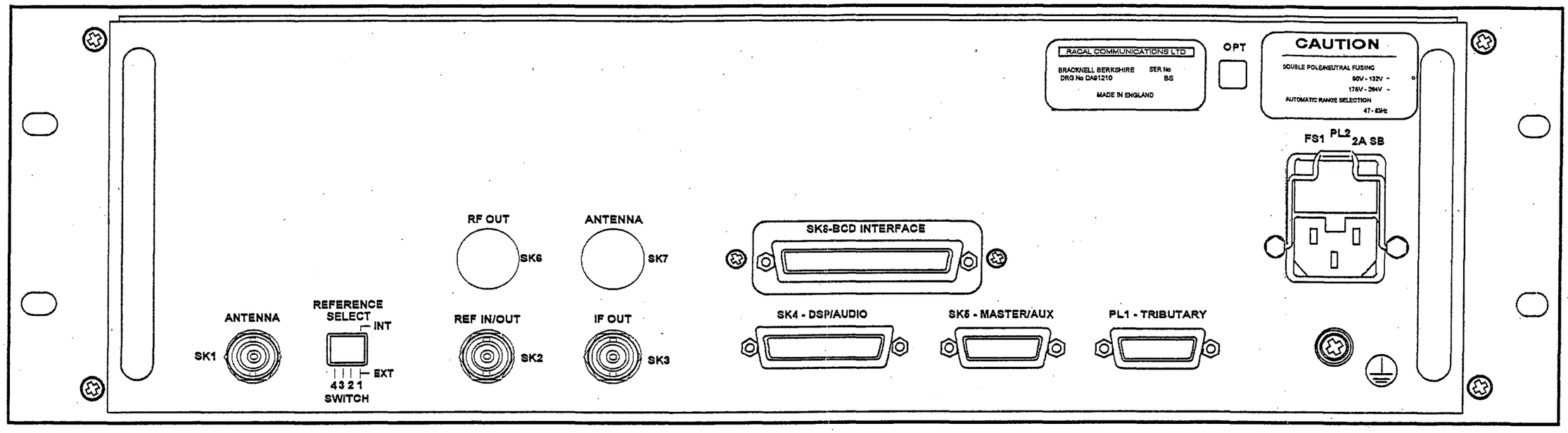
Pin	Signal	Pin	Signal
1	DIO1	13	DIO5
2	DIO2	14	DIO6
3	DIO3	15	DIO7
4	DIO4	16	DIO8
5	EO1	17	REN
6	DAV	18	Gnd. (6)
7	NRFD	19	Gnd. (7)
8	NDAC	20	Gnd. (8)
9	IFC	21	Gnd. (9)
10	SRQ	22	Gnd. (10)
11	ATN	23	Gnd. (11)
12	Shield	24	Logic Ground

NOTE: Gnd.(n) refers to the signal ground return of the referenced contact.

REMOTE CONNECTOR (RA3793, RA3794 only)

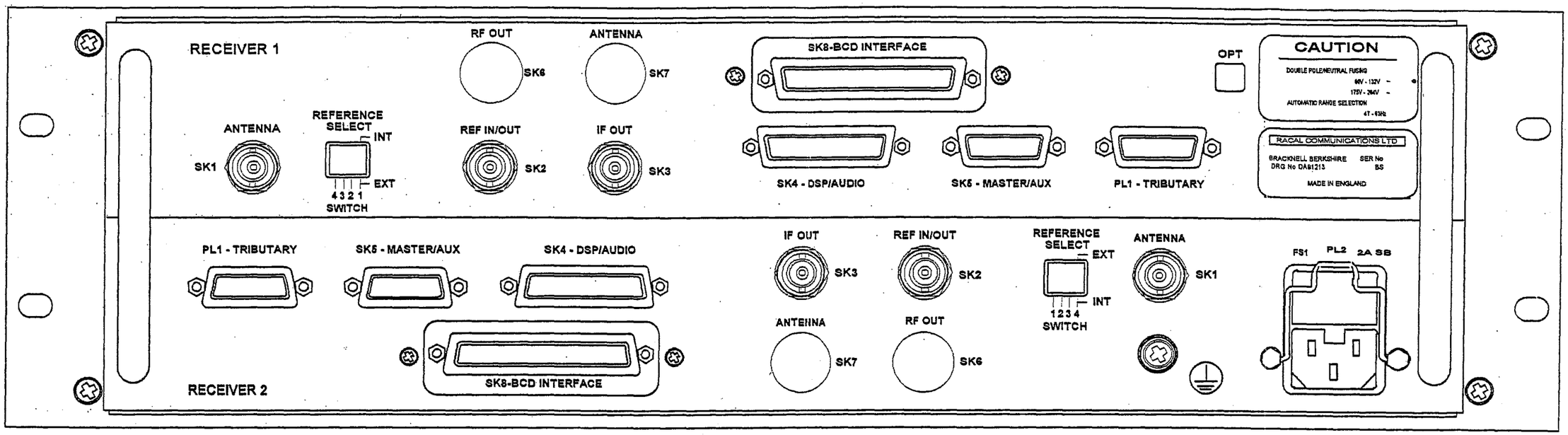
18. The REMOTE connector on the front panel of the RA3793 (two connectors on the RA3794) receiver is connected in parallel with the rear panel Master Port connector (SK5). The pin connections are given below:

Pin	Signal
1	Logic ground
2	Transmit data
3	Receive data
4	Not used
5	Not used
6	Receive common
7	Transmit common (signal ground)
8	Monitor audio output
9	Monitor audio input
10	Audio ground
11	Fault input/output
12	Not used
13	Not used
14	Not used
15	Not used



Rear Panel Layout: RA3791 Single Receiver

Fig. 2.1



Rear Panel Layout: RA3792 Dual Receiver Fig. 2.2

CHAPTER 3

INTRODUCTION TO RECEIVER OPERATION

CONTENTS

Illustrations

CHAPTER 3

INTRODUCTION TO RECEIVER OPERATION

INTRODUCTION

1. This chapter describes the receiver front panel displays, the menu system and the front panel controls. Read this chapter first before moving on to Chapter 4, which covers local control operation, and to Chapter 5, which covers remote control operation.

FRONT PANEL

2. The front panel of the RA3791 and RA3792 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 the built-in, multi-addressing facility.

3. For ease of operation the pushbutton controls have dedicated functions and are arranged in the following basic groups:

   (1) Remote control and addressing

   (2) Numeric keypad and main knob function

   (3) Receiver operating mode and menu facility

4. The receiver operating conditions are indicated on three back-lit liquid crystal displays (LCDs) which provide the following information:

   (1) Frequency, channel number, remote receiver address and receiver status, indicated on the left-hand display.

   (2) Main knob function and bar graph meter giving RF or AF signal level, indicated on the centre display.

   (3) Operating mode, bandwidth, AGC, BFO and antenna settings, indicated on the right-hand display. Using the two row x 20 character alpha-numeric matrix, this display is also used in conjunction with the menu pushbuttons to control menu facilities, such as the setting up of scan parameters and the running of the BITE routines. Messages to the operator are also displayed here.

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

6. Since the RA3793 and RA3794 Receivers are for remote operation only, as slave receivers, the 'blank' front panels (Fig 3.2) are fitted with the following facilities only:

   (1) A FAULT indicator for each receiver in a dual receiver. For a single receiver, only the FAULT 1 indicator is used.

   (2) A single PHONE socket and VOLUME control, switchable between receiver 1 and receiver 2 in a dual receiver.

THE MENU SYSTEM

7. The menu system is provided for additional facilities which are not controlled directly by the normal front panel pushbuttons. Generally these include less commonly used or complex operations, such as the setting up of scan parameters and the running of the BITE routines. 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 one by pressing the MENU pushbutton, with further presses advancing the menu to successive levels.

8. Once the deepest menu level has been reached, a further press of the MENU pushbutton returns the menu to level one. At each menu level, one of up to four options may be selected using the four menu pushbuttons (M1, M2, M3, M4). The menu levels and options available on pressing the corresponding menu pushbuttons are tabulated below.

LEVEL	OPTIONS			
	M1	M2	M3	M4
1	Frequency Sweep	Channel Scan	Antenna Select	Passband/ Notch
2	FSK	Amplifier/Atten-uator	COR Select	
3	Unit Test	Select Test	Show Fault	
4	Audio Level	Channel Functions		
5	Display	Tune Rates	Set Modes	Software ID
6*	Diversity/Master	Remote Port	Bandwidth	AGC
7*	IF output		Serial Number	

* Menu Level 6 and 7 will only be available if SW1/1 on the Digital Board is 'ON'.

9. Once an option has been selected, messages giving instructions on how to proceed are provided on the right-hand display. These will normally invite further selections using the menu pushbuttons or a string of digits using the numeric pushbuttons. On the completion of data entry, pressing ENTER actions the data and the next message is displayed.

10. 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.

FRONT PANEL CONTROLS

11. The function of each front panel control is described below and should be read in conjunction with the front panel layout diagram given in Fig. 3.1. For description purposes only, this diagram shows all indicators displayed, a situation not encountered during normal receiver operation.

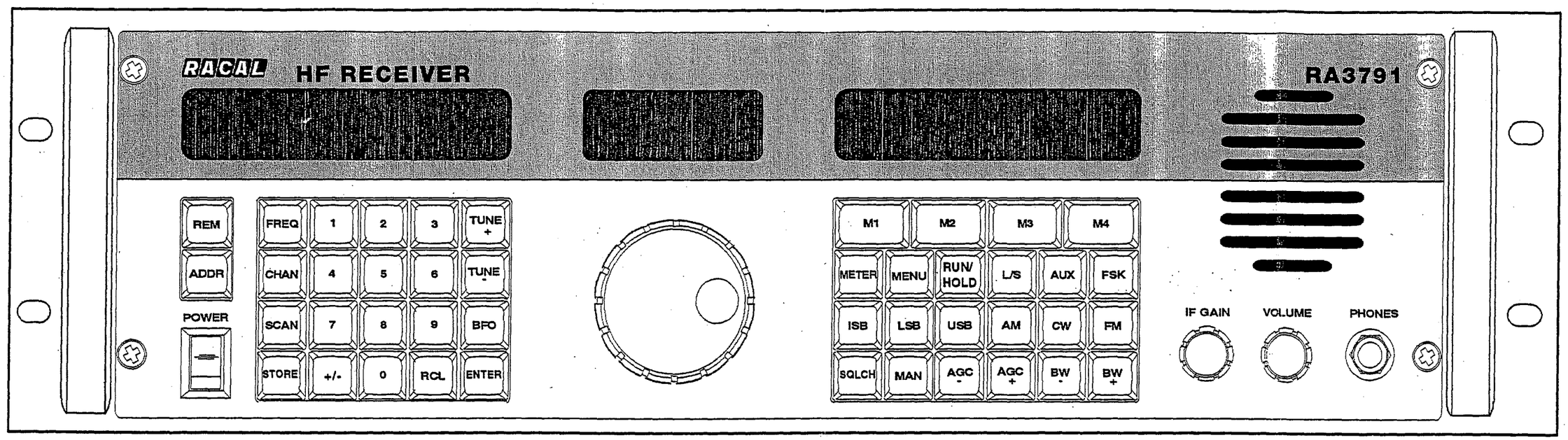
12. When ⚠ appears on the left-hand display, for example, during frequency or channel entry, it informs the operator that the currently displayed parameters may not be those applicable to the receiver under control.

CONTROL	FUNCTION
POWER	Switches the power supply on and off. Press the top of the rocker switch for on. Adjacent power-on indicator provided.
VOLUME	Controls the audio signal level applied to the internal loudspeaker and to headphones connected to the front panel PHONES socket.
IF GAIN	Controls the receiver gain. Sets the AGC threshold when MAN is selected. Sets the squelch/COR level when SQLCH is selected.
TUNING KNOB	Sets either the receiver frequency, BFO frequency or channel number, according to the selected function.
REM	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.
ADDR	Allows entry of a remote receiver address. ADDRESS, ⚠ and a cursor are shown on the left-hand display. RA3792 Dual Receiver: allows selection of either receiver.

CONTROL	FUNCTION
FREQ	Permits frequency entry using the numeric pushbuttons. ⚠ appears and a cursor indicates the position of the digit to be entered.
CHAN	Enables selection of a channel number between 00 and 99. ⚠ appears on the left-hand display, together with the last selected channel number.
SCAN	Stops or restarts either frequency sweeping or channel scanning. When ⚠ is displayed also used to set or clear individual channel scan flags.
STORE	Enables frequency and mode parameters to be stored in a channel.
0 to 9	Numeric pushbuttons for entering frequency, channel number, BFO frequency, etc.
+/-	Controls the direction of channel scan or frequency sweep. Also controls the sign of the BFO frequency and toggles FSK output polarity (if FSK option fitted).
RCL	Returns the front panel displays to the current receiver operating conditions at any time except when set for REMOTE operation.
TUNE +	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.
TUNE −	Each press changes the tuning rate through the sequence of VARIABLE, FAST, MEDIUM, SLOW and LOCK.

CONTROL	FUNCTION
BFO	Receiver mode CW: Allows the BFO frequency to be set using the tuning knob or the numeric pushbuttons. BFO appears on the centre display and the right-hand display shows the current BFO frequency. Receiver mode USB, LSB: Activates the passband tuning system (see Chapter 4, page 4-35). If the notch filter has been activated via the MENU key, this pushbutton cycles the notch filter bandwidth through the available widths of 300 Hz, 180 Hz, 100 Hz, 60 Hz and automatic (see Chapter 4, page 4-36).
ENTER	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.
METER	Selects AF line or RF level monitoring on the centre display. In FSK mode an FSK tuning meter may also be selected.
L/S	Switches the internal loudspeaker on and off.
RUN/ HOLD	Used to toggle the printer on or off in FSK operation.
FSK AUX FM CW AM USB LSB ISB	Selects the required operating mode, which is then indicated on the right-hand display. ISB is inoperative unless the option is fitted.
SQLCH	Activates the squelch facility and SQ appears on the right-hand display. The squelch threshold is then set using the IF GAIN control.
MAN	Determines the use of the IF GAIN control, allowing it to set the receiver gain, the AGC threshold or the squelch level.

CONTROL	FUNCTION
AGC − AGC +	Used to increase or decrease the AGC decay time constant.
BW − BW +	Used to select a wider or narrower receiver bandwidth.
MENU	Accesses the menu system at level one with subsequent presses selecting the next level, and so on, to level seven. The sequence is then repeated. Used in conjunction with the four menu pushbuttons M1 to M4.
M1 TO M4	Permit selection of various options at each menu level and then used to implement any subsequent instructions given on the right-hand display.



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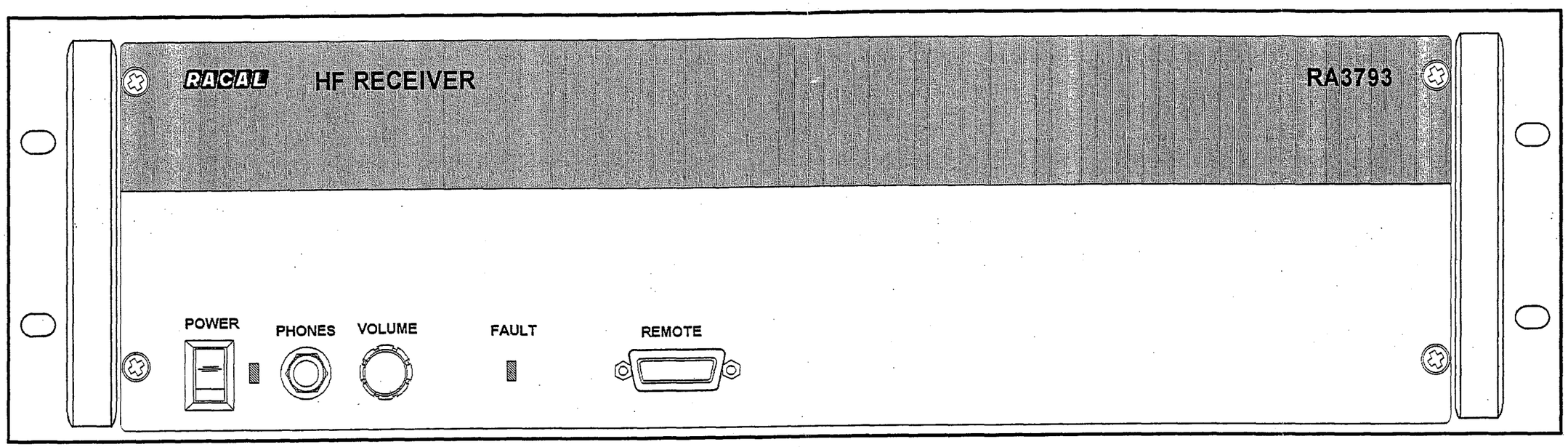
RACAL

Front Panel Layout: RA3791 and RA3792 Receivers Fig. 3.1



Front Panel Layout: RA3793 and RA3794 Receivers Fig. 3.2

CHAPTER 4

LOCAL CONTROL OPERATION

CONTENTS

CONTENTS (cont.)

CHAPTER 4

LOCAL CONTROL OPERATION

INTRODUCTION

1. This chapter gives local control operating procedures for RA3790 series receivers fitted with front panel controls. It describes how to set the receiver to the required operating frequency, how to select the operating mode, bandwidth, manual gain and the AGC time constant. Other procedures covered include BFO operation, squelch operation, channel storage and selection, channel scanning, frequency sweeping, antenna selection and RF amplifier selection.

2. It is assumed that the receiver has been installed correctly in accordance with the information given in Chapter 2, that the receiver is connected to a suitable source of supply, and that a suitable antenna is connected to the receiver antenna socket.

3. Before attempting to operate the receiver, particularly for the first time, the operator is advised to initially read Chapter 3, Introduction to Receiver Operation. This describes the front panel displays, the front panel controls and the menu system.

INITIAL SWITCH-ON

4. The receiver is switched on and off via the front-panel POWER rocker switch (press the top of the rocker switch for ON). When power is applied check that the display panels illuminate.

5. Check that FAULT is not displayed on the front panel left-hand display, denoting a BITE routine failure (either a power-up BITE routine failure or subsequently a continuous BITE routine failure). If FAULT is displayed, refer to Chapter 6, Operator Servicing.

DUAL RECEIVER SELECTION

6. In the RA3792 dual receiver, either receiver may be operated locally from the front panel, where the address of the receiver currently under control is indicated on the left-hand display panel. The loudspeaker and phones jack are connected to the currently controlled receiver.

7. Press 

and then 

to transfer front panel control to the other receiver.

8. To hand-off the operating conditions from the current receiver to the other receiver and then to control the other receiver:

Press [ADDR] and then [ENTER]

Example:

(1) The RA3792 is configured with addresses 3 and 4, and the front panel is currently controlling and displaying the operating conditions of receiver 3.

(2) The operator may either:

(a) Press [ADDR] then [RCL] to display the settings of receiver 4 and transfer front panel control to receiver 4. Both receivers continue to operate on their original settings.

or:

(b) Press [ADDR] then [ENTER] to transfer the settings of receiver 3 to receiver 4 and to 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.

FREQUENCY SETTING

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

Pushbutton Selection

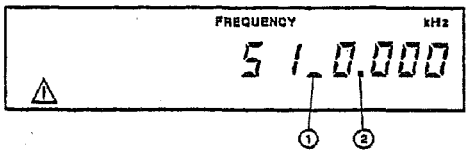
10. Press [FREQ] to enable a new frequency to be entered. Select the desired frequency using the numeric pushbuttons. Press [ENTER] to set the receiver to the new frequency.

Example:

To set the receiver to a frequency of 5123.4 kHz:

Press [FREQ] [0] [5] [1] [2] [3] [4] [ENTER]

11. The display now indicates the selected frequency in kHz with the leading zero suppressed. The receiver operates on the present frequency until [ENTER] is pressed to change to the new frequency. If [RCL] is pressed instead of [ENTER] then the receiver reverts to the present operating frequency.



12. 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 decimal point ② must be entered. Attempted entry of a frequency above 30.000000 MHz is disregarded. A mode, bandwidth, AGC, MAN or BFO pushbutton may be pressed to terminate frequency entry.

Tuning Knob Selection

13. Press [TUNE +] or [TUNE −] to enable the tuning knob and to select the desired tune rate. The tune rate is indicated on the centre display.

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

15. Lock the selected frequency by pressing [TUNE −] repeatedly until LOCK appears on the centre display.

Example:

To select a slow tune rate:

Press [TUNE −] or [TUNE +] repeatedly until the SLOW appears on the centre display.

When LOCK is displayed, the tuning knob is disabled for tuning and pressing either [TUNE −] or [TUNE +] selects the last used tune rate.

Subsequent presses of TUNE − or TUNE + decrease or increase respectively the tune rate. Any of these rates can be 'locked out', the size of the steps for SLOW, MEDIUM and FAST tune rates can be configured and the number of tune steps per revolution can be configured, using the front panel menu system (TUNE RATES menu), as follows.

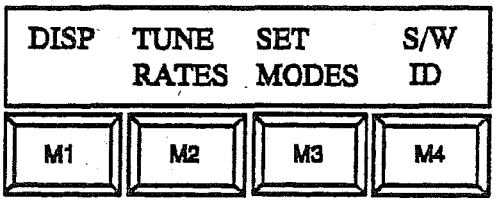
Tune Rates Selection

16. This menu facility is used to select which tune rates are to be made available for selection by the TUNE + or TUNE − pushbuttons. Any unwanted tune rates can be 'locked out'.

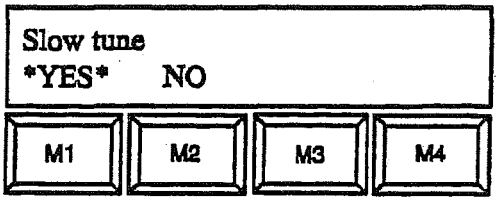
Example:

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

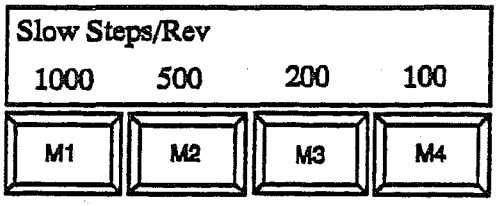
Press MENU several times until these menu options are displayed. Select TUNE RATES by pressing M2

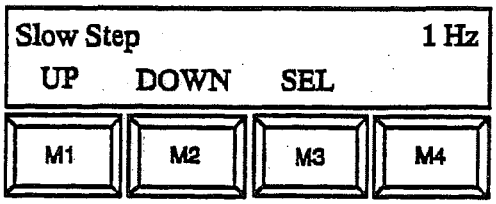


Press M1 to retain slow tune. The currentselectionisindicated*—*.Press M2 to 'lock out' slow tune.



If YES is selected, then the Steps/Rev menu is displayed, followed by the step size menu. The frequency step size for SLOW, MEDIUM and FAST tune rates is selected from 1 Hz, 2 Hz, 5 Hz, 10 Hz, 20 Hz, 50 Hz, 100 Hz, 200 Hz, 500 Hz and 1000 Hz, by pressing M1 or M2 until the required step size is displayed and then pressing M3 to select.





Note 1: Once selected the tune rate menu configurations are the same for both receivers of the RA3792 dual receiver.

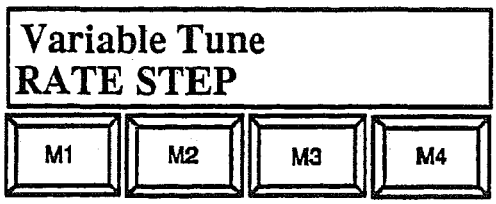
Note 2: The operation of the VARIABLE tune rate is dependent upon the issue of software (P90550) fitted in the receiver as follows:

P90550 Issue 1 and 2
For the VARIABLE tune 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.

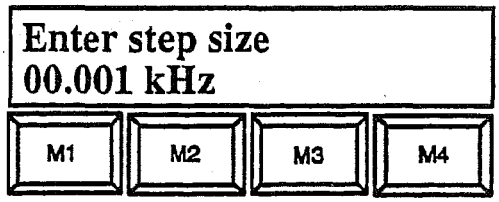
P90550 Issue 3 and above
The VARIABLE tune rate can be operated in one of two modes. On selecting VARIABLE tune in the TUNE RATES menu the following selection is presented:

The current selection of RATE or STEP is indicated by *----*.



When RATE is selected by pressing [M1] the VARIABLE tune rate operates as for Issue 1 and 2 software.

When STEP is selected by pressing [M2] the following menu is presented to allow a step size of between 1 Hz and 99.999 kHz to be selected.



When the tuning knob is then set to VARIABLE tune by pressing [TUNE +] or [TUNE −], the receiver frequency will be changed by this step size. The SLOW, MEDIUM and FAST tune rates continue to operate as before.

MODE SELECTION

17. A new demodulation mode is selected simply by pressing the appropriate mode pushbutton. The relevant software option must be fitted for the ISB button to be effective.

Mode Pushbuttons

18. Press any one of [LSB] [USB] [AM] [CW] [FM] [AUX] [ISB] [FSK]
On pressing the required pushbutton, the receiver adopts the new mode, which is indicated below the MODE legend on the right-hand display (except AUX, which may be programmed with any of the other modes).

19. If required, new operating parameters (bandwidth etc) for each mode can now be selected as required.

Example:

To change the mode from CW to AM:

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

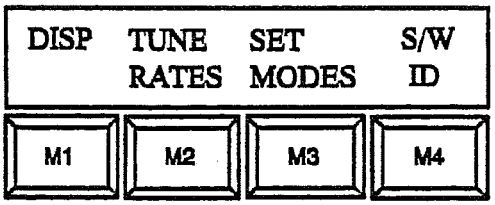
When a mode is selected, the bandwidth, AGC and BFO frequency (where appropriate) are recalled automatically. The receiver may be set up to recall either the settings last used in that particular mode or to recall programmed settings (see 'Preset Parameters' below). A new mode may also be selected when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

Preset Parameters

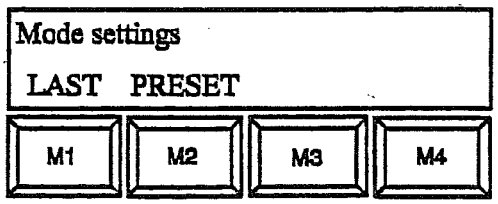
20. This menu facility is used to set the receiver so that either the last used parameters or preset parameters are recalled automatically when the mode is changed. In the latter case, the menu is also used to preset the required parameters.

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 [M3]



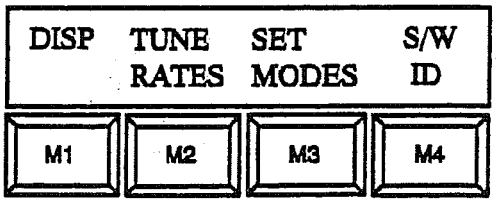
Press [M1] to select LAST. The display then returns to the menu options.



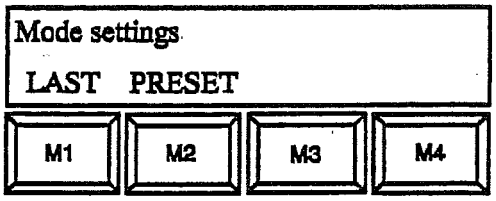
Press [RCL] to exit the menu system and to return the displays to the current receiver operating conditions. When a new mode is selected, the bandwidth, AGC and BFO settings last used in that mode are recalled.

Example 2:

To store new preset parameters for the CW mode:

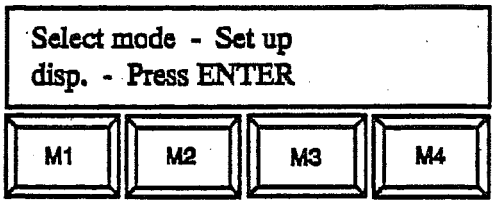


Press [MENU] repeatedly until these menu options are displayed. Select SET MODES by pressing [M3]



Press [M2] to select PRESET.

Press [CW] to select the 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.

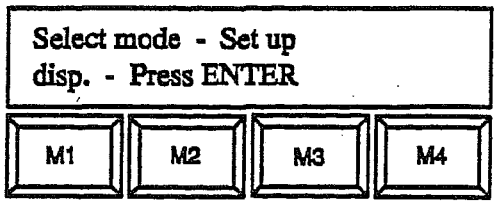


Press ENTER to memorise the parameter settings. The display returns to the select mode message so that another mode may be set up. When all the required modes have been set up, press RCL to exit the menu system. The display then reverts to the previous receiver operating conditions.

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

Example 3:

22. To store new preset parameters for the AUX mode, proceed as in the previous example until this message is displayed. Press AUX to select the 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 must be defined by pressing the desired mode pushbutton. The remainder of the procedure is as before.

BANDWIDTH SELECTION

23. The basic receiver has digital filters with the following bandwidths:

USB:	300 Hz to 3 kHz
LSB:	300 Hz to 3 kHz
Symmetrical:	300 Hz
	1 kHz
	3 kHz
	6 kHz
	12 kHz

24. Using the Enhanced Filter facility, up to 100 filters (25 for USB, 25 for LSB and 50 symmetrical) can be programmed into the receiver by the operator, using the BW menu (para. 27). This enhanced software also includes an IF notch and passband tuning facility.

25. The receiver bandwidth is increased or decreased using the BW + and BW − pushbuttons, where successive button presses will step through all the filters available.

Example:

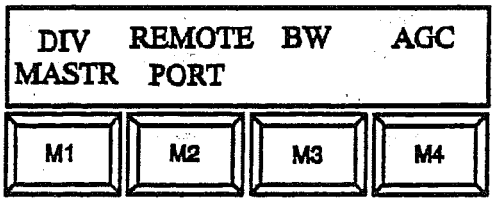
26. To increase the bandwidth on AM from 2.7 kHz to 12 kHz press BW + the required number of times until the right-hand display indicates 12 kHz.

BW Menu

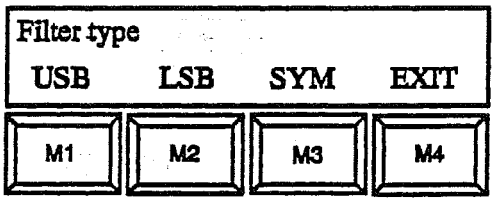
27. This menu is used to programme into the receiver up to 100 digital filters.

Example:

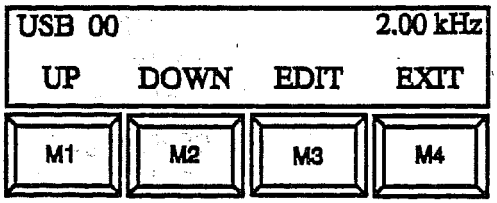
To enter details for USB filter 00:
Press MENU several times until these menu options are displayed. Select BW by pressing M3



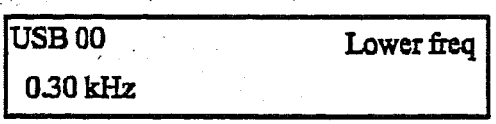
Press M1 to select USB.



Where applicable, UP and DOWN are used to step up or step down through the available filters. Press M3 to edit the filter bandwidth.



Use the numeric pushbuttons to enter the filter lower frequency, including any leading zero, and press ENTER



Use the numeric pushbuttons to enter the filter upper frequency, and press [ENTER]

USB 00	Upper freq
2.70 kHz	

The display reverts to the BW menu so that additional filter details can be entered. Press [M4] to exit.

AGC SELECTION

28. The AGC time constant can be selected from pre-determined settings under pushbutton control. The time constants include SHORT, MEDIUM , LONG and LINK 11 to cope with different types of signals, where the hang and decay times can be set individually.

The AGC time constant is selected by pressing [AGC +] to increase the time constant or [AGC -] to decrease the time constant. The [MAN] pushbutton is pressed 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.

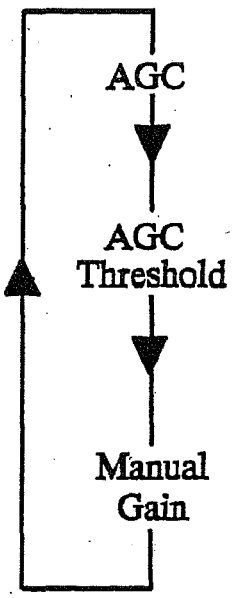
Gain Control Modes

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

(1) **AGC:**
- (a) Receiver gain is controlled automatically.
- (b) AGC time constant is displayed on the right-hand display.
- (c) IF GAIN control is disabled unless squelch is selected.

(2) **AGC Threshold:**
- (a) Receiver gain is constant for signals below the threshold set by the IF GAIN control, and is controlled automatically for signals above the set threshold.
- (b) AGC time constant plus MAN is displayed on the right-hand display.

(3) **Manual Gain:**
- (a) Receiver gain is constant at the level set by the IF GAIN control.
- (b) MAN is displayed on the right-hand display.



Example 1:

29. To select AGC threshold operation from normal MEDIUM AGC mode:

Press MAN and if required AGC + or AGC − to change the AGC setting.

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

Example 2:

30. To select manual gain operation from AGC threshold mode:

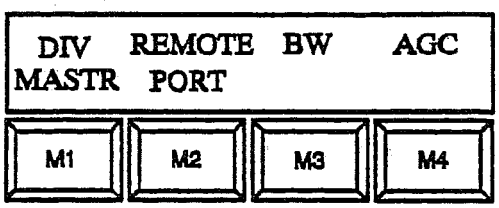
Press MAN and adjust the IF GAIN control to set the receiver gain.

AGC Menu Operation

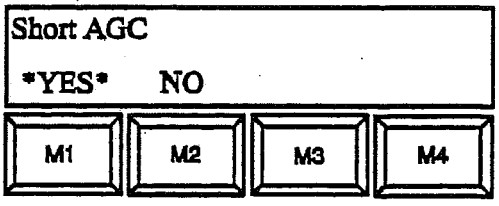
31. The AGC time constants available for selection by the two AGC pushbuttons may be altered to suit requirements via the AGC menu. This menu is also used to set the hang and decay times for each AGC mode. The AGC time constants are presented in turn and unwanted ones may be 'locked out' by selecting NO.

Example

32. To retain medium and long AGC time constants, and 'lock out' all others:



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



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

Press [M1] to include the medium AGC time constant.

Use the numeric pushbuttons to enter the desired hang time, in seconds, including leading zeros where necessary.

Use the numeric pushbuttons to enter the desired decay time, in seconds, including leading zeros where necessary.

AGC hang time
0.000s

Repeat the above procedure to include the long AGC time constant and 'lock out' the LINK 11 normal and data AGC time constants.

AGC decay time
1.234s

Note: The AGC menu settings apply to both receivers of the RA3792 dual receiver.

BFO SETTING

33. For the CW mode the BFO tuning facility is selected by pressing the BFO pushbutton; the BFO frequency is then set either by using the numeric pushbuttons or the tuning knob. The BFO frequency is displayed above the BFO legend on the right-hand display.

BFO Tuning Selection

34. Press [CW] if not already selected. The CW mode legend and parameters are displayed on the right-hand display. Press [BFO] to enable the BFO tuning facility, indicated by the BFO legend appearing on the centre display.

Tuning Knob

The BFO frequency can now be set using the tuning knob, over the range plus and minus 8.00 kHz in 10 Hz steps. To lock the BFO frequency, press [TUNE −] repeatedly until LOCK appears on the centre display. The tuning knob is now disabled and the BFO frequency setting is locked.

Pushbutton Selection

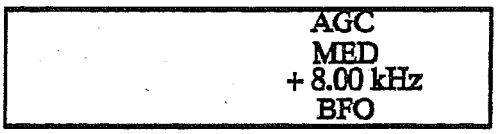
35. After pressing [BFO] press [+/-] as necessary to change the sign of the BFO frequency. Use the numeric pushbuttons to enter the required BFO frequency, in the range plus and minus 8.00 kHz in 10 Hz steps, and then press [ENTER].

The BFO frequency is displayed on the right-hand display.

Example:

36. To set the BFO frequency to 1.00 kHz when in the 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] then [ENTER] to obtain the desired BFO frequency of 1.00 kHz.

The receiver continues to operate on the 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 parameters. If RCL is pressed instead of ENTER, the display reverts to the current BFO frequency.

When the sign of first numeric pushbutton is pressed, the rest of the BFO frequency display is reset to zero. The position of the next digit to be entered is indicated by the cursor. Trailing zeros after the fixed decimal point need not be entered. After setting the BFO frequency using the numeric pushbuttons the tuning knob is enabled to allow further adjustment as necessary. Movement of the tuning knob disables the numeric pushbuttons.

SQUELCH AND COR OPERATION

37. The receiver is provided with a squelch facility which is used to mute the audio outputs when the received signal level falls below a threshold set using either the IF GAIN control or the optional Signal Detector menu. There is also a COR (Carrier Operated Relay) output at a rear panel connector which can be used, for example, to start a tape recorder when a signal is present and stop it when the signal level drops below the squelch threshold.

Squelch Operation

38. Press SQLCH to enable squelch operation. Set the squelch threshold using the IF GAIN control. Adjustment of the squelch threshold is made easier if a short COR hang time is selected (see COR Output).

39. 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 control is used to adjust the AGC threshold level and the squelch level is set automatically to be 3 dB higher. Squelch can be selected with manual gain. SQ appears on the right-hand display to indicate the selection of the squelch facility.

COR Output

40. The COR Select menu is used to control the COR output signal available via a rear panel connector, such that the COR output is active only when the signal is above the set threshold or off permanently. When active, the COR output is switched on when the signal level exceeds the threshold set either by the IF GAIN control or the Signal Detector menu. The COR legend appears on the centre display when the threshold level is achieved.

41. 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 can only be used when the COR output is enabled.

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

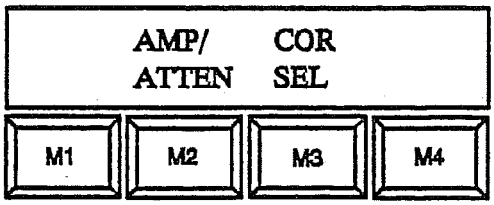
43. If during the hang time, the ENTER pushbutton is pressed (or the ENTR remote command is actioned), the hang time is dumped (i.e. the COR output is set to the inactive state and the audio output is muted). If the received signal is then still above the threshold, the COR acts as if a new signal has been detected.

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

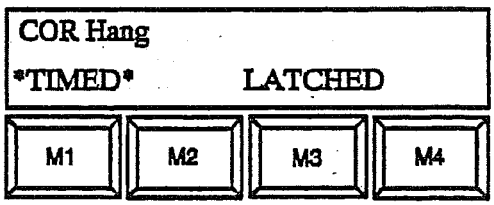
Example:

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

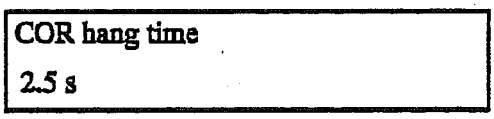
Press [MENU] repeatedly until these menu options are displayed. Select COR SEL by pressing [M3]



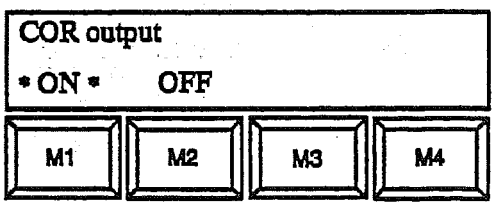
46. Press [M1] to select timed COR hang operation.



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



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



Press [RCL] to exit the menu system.

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

CHANNEL STORAGE AND SELECTION

47. The programmable channel memory can store up to 100 operating frequencies together with associated mode, bandwidth, AGC and BFO settings. Each channel is allocated a channel number from 00 to 99, which is subsequently selected to provide instant recall. The stored channel data is not lost when power is removed from the receiver.

Channel Storage

48. To store the currently displayed frequency and mode parameters:

Press and hold depressed the STORE pushbutton while entering the required two-digit channel number, using the numeric pushbuttons. Release the STORE pushbutton to memorise the channel data.

49. 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 indicated by the cursor. The SCAN legend can be removed from individual channels (see para. 54).

Channel Selection

50. Channel selection is carried using either the numeric pushbuttons or the tuning knob, as follows:

Press CHAN to initiate channel selection. The last selected channel number is indicated; this channel can be retained, or another channel can be selected using the numeric pushbuttons or the tuning knob. When the required channel is displayed, press ENTER to set the receiver to the chosen channel number.

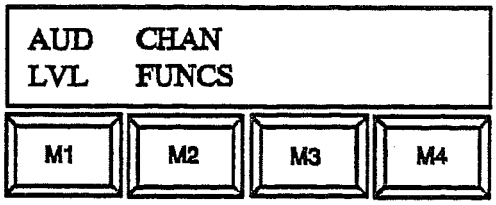
During channel selection, ⚠ is displayed to indicate that the displays do not represent the current receiver operating conditions. Leading zeros must be entered for single figure channel numbers. Once the tuning knob is rotated, the numeric pushbuttons are disabled.

The memory contents can be checked at any time without affecting receiver operation by pressing CHAN and selecting the required channel number. The contents of one channel can be transferred to another channel by first selecting the source channel but without pressing ENTER, and then performing the channel storage procedure for the recipient channel.

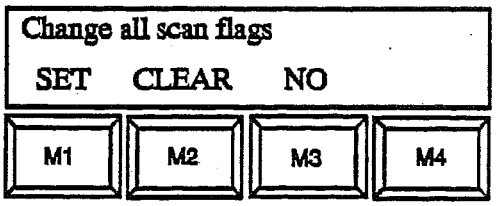
IF Gain/COR Threshold Storage

51. The receiver can be set up to store additionally either the IF gain setting (in manual AGC) or the COR threshold (in AUTO AGC) in a channel. This allows each channel to have a different COR or IF gain setting associated with it. The stored setting is then used when a channel is recalled. This facility is controlled from the menu as follows:

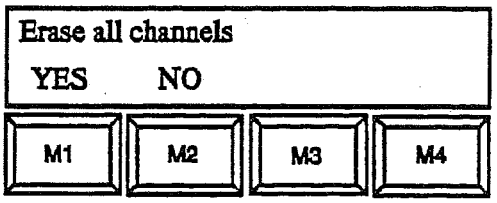
Press MENU repeatedly until these menu options are displayed. Select CHAN FUNCS by pressing M2



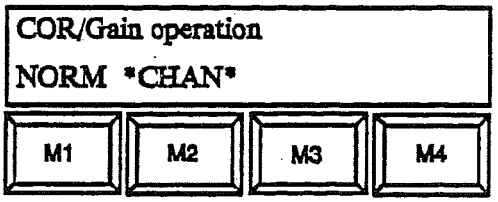
Press M3 to retain the original scan flag settings.



Press M2 to retain all channels.



Press M1 if the current COR or IF gain setting is to be used when a channel is recalled. Press M2 if the stored COR or IF gain setting is to be used when a channel is recalled. The current selection is indicated by *----*.



52. When CHAN is selected, the COR or IF gain setting is displayed, in place of the antenna number and RF amplifier status, in the following cases :

(1) When the gain knob is moved the current setting is displayed for 2 seconds.

(2) When ⚠ is displayed, the current setting is displayed continuously.

(3) When ⚠ is displayed and a channel is recalled, the stored setting is displayed continuously.

CHANNEL SCANNING

53. 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 can 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 can be stopped at any time by using a front panel pushbutton or by means of an external input to a rear panel connector ('scan inhibit' line). Alternatively, the scan can be halted on detection of a signal which exceeds a threshold set using either the IF GAIN control or the Signal Detector menu. Channel scanning is initiated on completion of the scanning setting up procedure.

Scan Flag Selection and Deletion

54. 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 pushbuttons or the tuning knob.

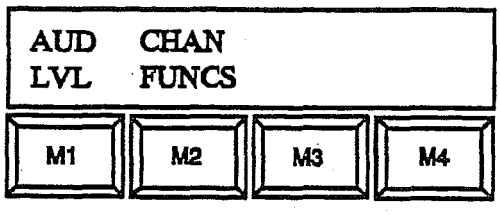
Press [SCAN] to toggle the scan flag. The SCAN legend appears below the channel number on the left-hand display when the scan flag is set.

Press [RCL] to return to normal front panel operation.

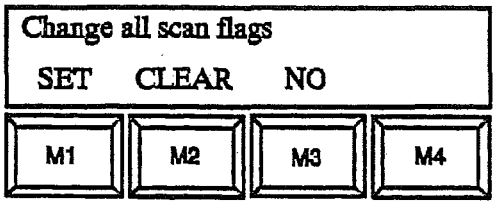
When setting the scan flags, ⚠ is displayed to indicate that the displays do not represent the current receiver operating parameters. When data is stored in a channel, the scan flag for that channel is set automatically.

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

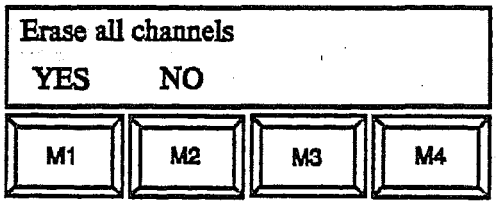
Press [MENU] repeatedly until these menu options are displayed. Select CHAN FUNCS by pressing [M2]



Press M1 or M2 to set or clear all scan flags, as required, or press M3 for NO.



Press M2 to retain all channels, or press M1 to erase all channels.



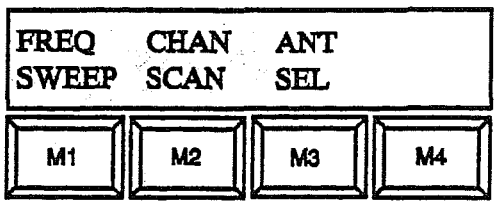
Setting the Channel Scan

55. Before commencing with 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.

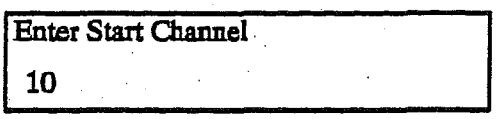
Example:

56. To set a range of channels to be scanned from number 10 to number 20, with a dwell time of 0.5 seconds and without the use of the stop on COR facility:

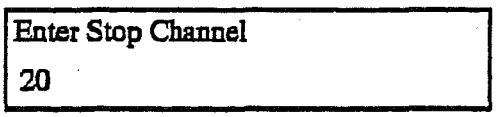
Press MENU until these menu options are displayed. Select CHAN SCAN by pressing M2



Enter the start channel number by pressing 0 and ENTER

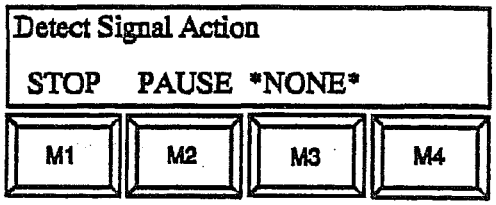


Enter the stop channel number by pressing 2 0 and ENTER



Enter the required dwell time by pressing [0] [5] and [ENTER]

If necessary Press [M3] to select NONE. The current selection is indicated by *----*.



The display 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 the scan, if required.

Only those channels with the 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 pushbuttons are disabled except for:

[REM] [TUNE +] [TUNE −] [ADDR] [SCAN] [METER] [+/-] [RCL] [SQLCH] [L/S]

Changing the Dwell Time

57. While the receiver is channel scanning, the dwell time can be changed using the teu TUNE pushbuttons, from the initial value chosen via the menu system.

Press [TUNE +] or [TUNE −] repeatedly to increase or decrease the dwell time in steps of 0.1 second over the range 0.1 to 9.9 seconds

Scan Stop and Start

58. Press [SCAN] to stop channel scanning. The SCANNING legend changes to SCAN.

Press [SCAN] again to restart channel scanning. The SCAN legend changes back to SCANNING.

COR Action

59. If it is required for the scan to stop automatically when a signal is detected, then either STOP or PAUSE operation must be selected. (See also SQUELCH and COR operation). The scanning cycle will then stop or pause (as required) on any channel where a signal is above the COR/Squelch threshold.

60. Scanning is resumed, and the next channel selected when:-

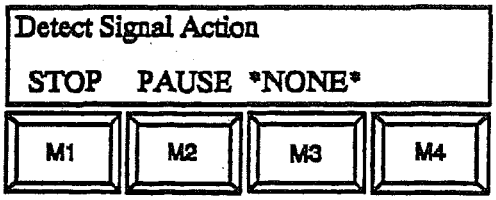
(1) The signal drops below the threshold, for the duration of the COR hang time (STOP selected).

(2) The pause time has expired (PAUSE selected). The pause time is equal to the COR hang time.

(3) The [ENTER] button is pressed.

61. To set the receiver to stop or pause the scan automatically when a signal is detected, proceed with setting up the channel scanning, using the menu system as previously described, until the following menu is displayed:

Press [M1] [M2] or [M3] as required. The current selection is indicated *----*.



62. Selecting STOP will cause the scan to halt, when a signal is detected, until the signal remains undetected for the duration of the COR hang time (set up by the COR menu, see COR AND SQUELCH OPERATION).

63. Selecting PAUSE will cause the scan to halt, when a signal is detected, for a duration determined by the COR hang time (the pause time is the same as the COR hang time above, set up by the COR menu, see COR AND SQUELCH OPERATION).

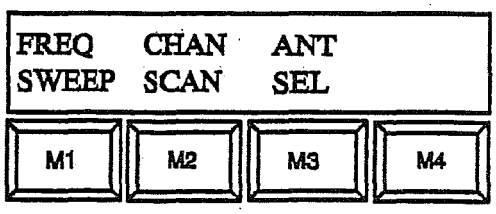
64. The SCANNING legend flashes when channel scanning is halted due to the STOP or PAUSE function being triggered, or the 'scan inhibit' line being activated. In the former case the COR legend also appears on the centre display.

FREQUENCY SWEEPING

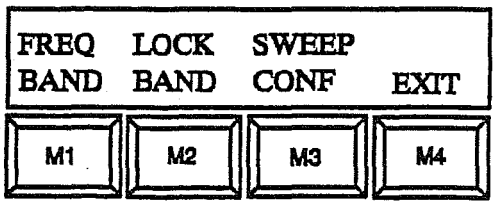
65. The receiver can be set up to sweep automatically over multiple ranges of frequency within its complete frequency coverage, and can be set to exclude spot frequencies or defined frequency ranges. The maximum total number of sweep and exclusions ranges is 100. The range start and stop frequencies, the step size and sweep rate (or dwell time) can all be configured via the menu system. The sweep may be stopped at any time by using a front panel pushbutton or by means of an external input to a rear panel 'scan inhibit' line. Alternatively the 'COR action menu' allows the sweep to be stopped or paused on detection of a signal whose level exceeds a threshold set using either the IF GAIN control or Signal Detector menu.

Setting the Frequency Sweep

66. Press MENU until these menu options are displayed. Select FREQ SWEEP by pressing M1



This menu provides the following functions:-



(1) M1: To configure one or more frequency sweep ranges.

(2) M2: To configure one or more frequency lockout ranges.

(3) M3: To configure general sweep parameters:-

(a) Step size - Manual sweep only.

(b) Sweep rate - Manual sweep only.

(c) Dwell time - Auto sweep only.

(d) COR action

(e) Quick erasure of all sweep and exclude ranges.

(4) M4: Starts a frequency sweep from the current receiver frequency if in range.

Sweep and Exclude Range Configuration

67. Menus are provided to allow all configured ranges to be reviewed and modified; examples of these are shown later in this section.

The following points should be noted:-

(1) When a new or spare range is being configured, the start frequency will default to the current receiver frequency.

(2) When a new start frequency has been entered, the stop frequency will default to the start frequency to allow quick entry of a spot frequency.

(3) If both the start and stop frequencies are set to 0 Hz, the range will be set to the unused state.

(4) If a start frequency is entered which is higher than the stop frequency, the message 'STOP < START FREQ PRESS MENU TO CONT' is displayed.

(5) Trailing zeros need not be entered.

(6) When selecting either the FREQ BAND or LOCK BAND menus, the first range to be displayed will be the highest configured range in the list.

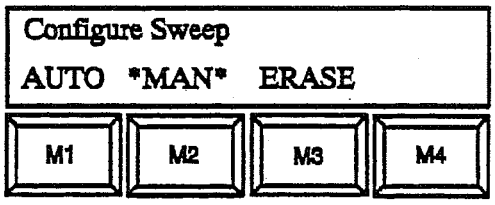
(7) When the end of the range list is reached the next available range is indicated by the 'New Range' message.

(8) An unused or de-configured range (that is not at the end of the list) is indicated by the 'Spare Range' message.

(9) When no more ranges are available at the end of the list, the 'No More Ranges' message is displayed.

General Sweep Configuration

After selecting the Sweep configuration menu, the menu shown is presented. This menu provides the following functions:



M1: To configure Auto sweep operation. In this mode the step size is always set to set to half the receiver bandwidth (i.e. changes when the bandwidth does), and the subsequent menus allow the average sweep dwell time and COR action to be set up.

Note: The dwell time must be in the range of 0.008 to 99.999 seconds.

M2: To configure Manual Sweep operation. In this mode the subsequent menus allow the operator to configure the step size, sweep rate and COR action.

Note: 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 125 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.

M3: To allow quick clearance of all currently configured sweep and lockout ranges.

Note: The current selection of AUTO or MAN sweep operation is indicated by *----*.

COR Action

68. If it is required to stop the sweep automatically when a signal is detected, then either Stop or PAUSE operation must be selected. (See also SQUELCH and COR operation). The sweep is then stopped or paused (as required) on any signal that is above the COR/Squelch threshold selected.

The sweep is resumed when:

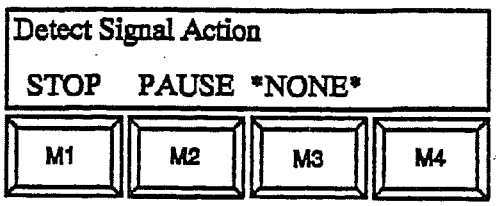
(1) The signal drops below the threshold, for the duration of the COR hang time (Stop selected).

(2) The pause time has expired (Pause selected).

(3) The ENTER pushbutton is pressed, in which case the sweep will advance by the number of sweep steps that is greater than or equal to the current bandwidth.

69. To set the receiver to stop or pause the sweep automatically when a signal is detected, proceed with setting up the Sweep configuration sweep, using the menu system as described above (The AUTO or MAN selections), until the following menu is displayed:

Press M1 M2 or M3 as required. The current selection is indicated *----*.



70. Selecting STOP causes the sweep to halt, when a signal is detected, until the signal remains undetected for the duration of the COR hang time (set up by the COR menu, see COR AND SQUELCH OPERATION).

71. Selecting PAUSE causes the sweep to halt, when a signal is detected, for a duration determined by the COR hang time. (The Pause time is the same as the COR hang time above, set up by the COR menu (see COR AND SQUELCH OPERATION).

72. The SCANNING legend flashes when frequency sweeping is halted due to the Stop or Pause function being triggered, or the 'scan inhibit' line being activated. In the former case, the COR legend also appears on the centre display.

Derived Frequency Ranges

73. After all the ranges have been entered, the receiver calculates the final ranges to be swept. The lockout ranges and spot lockout frequencies are widened to ensure that signals at the edges of lockout ranges are not detected. If, when a sweep is initiated, the receiver cannot derive any ranges to sweep (i.e. no sweep ranges are configured or the lockout ranges completely overlap the sweep ranges) the message 'NO RANGES TO SWEEP' appears on the right-hand display.

Changing the Sweep Direction

74. During a frequency sweep, the direction of the sweep can be changed. Press [+/-] to reverse the direction of the sweep.

Changing the Sweep Rate

75. During a frequency sweep, the sweep rate can be changed, using the two TUNE pushbuttons. Press [TUNE +] or [TUNE −] repeatedly to increase or decrease the sweep rate in steps of approximately 10% of the current rate.

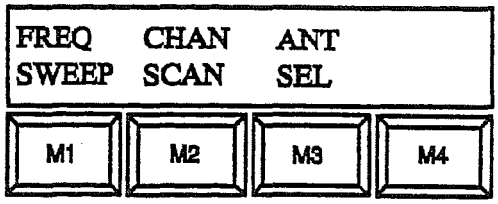
Stopping and Restarting the Sweep

76. Press [SCAN] to stop the frequency sweep. The SCANNING legend now disappears.

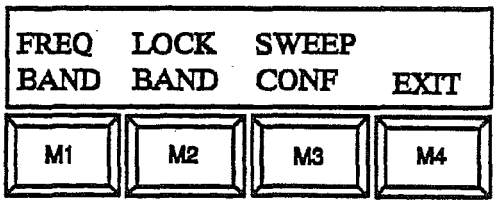
Press [SCAN] to restart the frequency sweep. The SCANNING legend now reappears.

Example 1: Erase all Existing Ranges

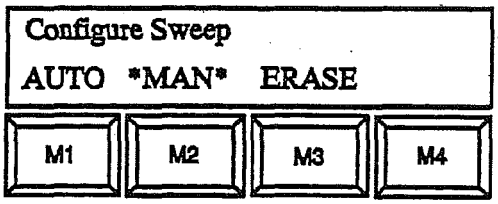
77. Press MENU until these menu options are displayed. Select FREQ SWEEP by pressing M1



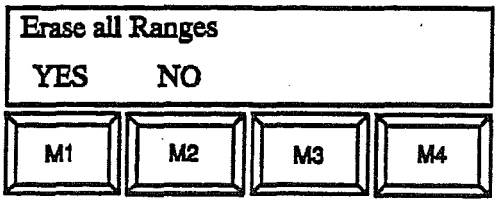
Select the option to configure the sweep by pressing M3



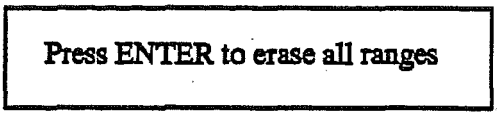
Press M3 to select range erasure.



Press M1 to confirm range erasure.



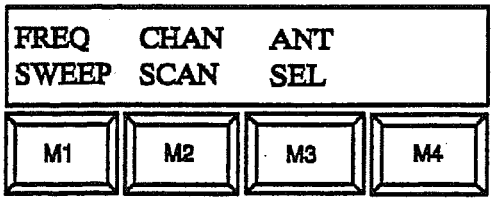
Press ENTER to erase all sweep and lockout ranges.



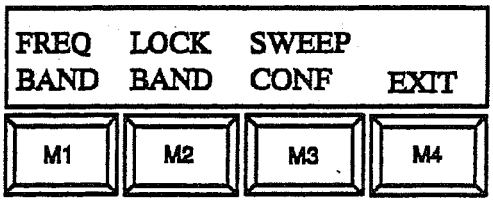
Example 2: Set up a Single MANUAL Frequency Sweep

Sweep from: 10 MHz - 20 MHz (no lockout ranges)
Step size: 3 kHz
Sweep rate: 6 kHz/second
COR action: None

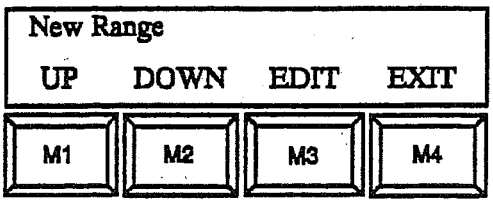
Press MENU until these menu options are displayed. Select FREQ SWEEP by pressing M1



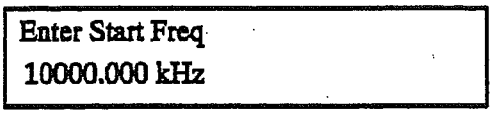
Select the option to set up frequency ranges by pressing M1



The first free range is indicated. Select the edit function by pressing M3

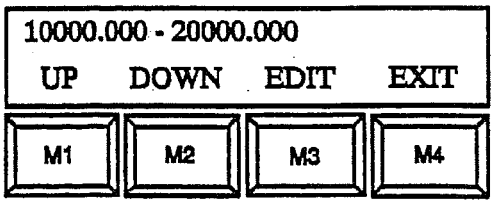


Enter the start frequency in kHz by pressing 1 0 ENTER

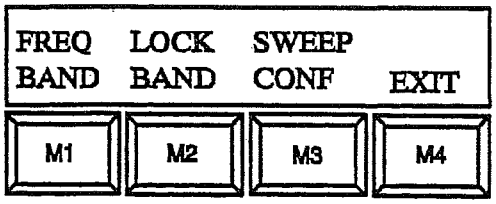


Enter the stop frequency in kHz by pressing 2 0 ENTER

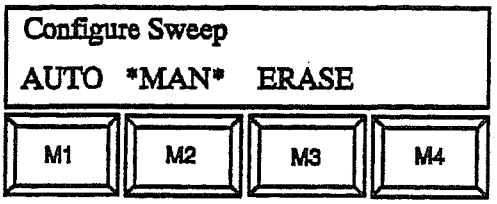
The newly configured range is displayed. Exit the sweep range by pressing M4



Select the option to set up step size, sweep rate and COR action by pressing M3



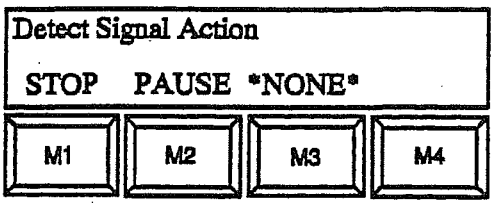
Select the option to set up Manual Sweep operation by pressing M2



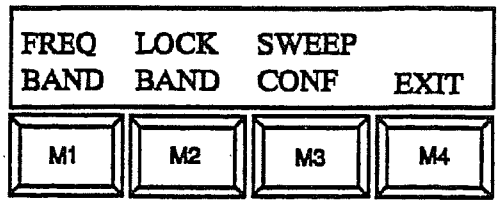
Enter the step size in kHz by pressing 0 0 3 ENTER

Enter the sweep rate in kHz by pressing 0 0 6 ENTER

Press M3 to allow continuous sweeping over the selected frequency range.



Select the option to exit and to start the sweep by pressing M4



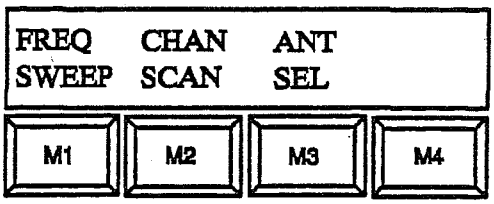
The display will then revert to the current receiver operating parameters and the frequency sweep commences from the current frequency.

Note: If the current frequency is not in the sweep range, the sweep will start at either 10 MHz (if sweeping up) or 20 MHz (if sweeping down).

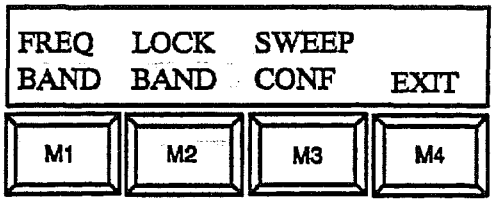
Example 3: Change Single MANUAL Sweep to Multiple AUTO Sweep

Sweep from:	11 MHz to 12 MHz
Avoiding:	11.3 MHz (spot frequency)
	11.6 MHz to 11.7 MHz
Dwell time:	200 ms
COR action:	Stop

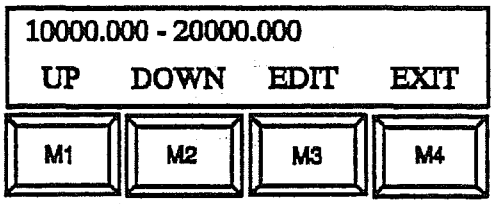
78. Press [RCL] to stop the current sweep, then press [MENU] until these menu options are displayed. Select FREQ SWEEP by pressing [M1]



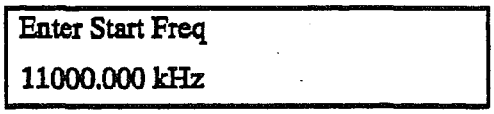
Select the option to set up sweep ranges by pressing [M1]



The previously configured range is displayed. Select the edit function by pressing [M3]

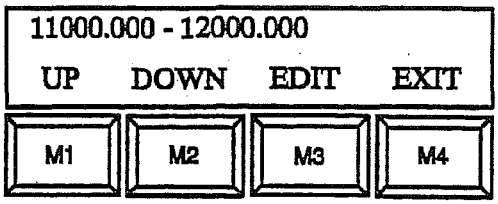


Enter the start frequency in kHz by pressing [1] [1] [ENTER]

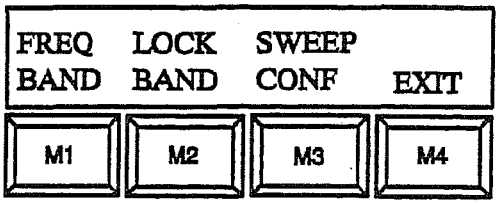


Enter the stop frequency in kHz by pressing [1] [2] [ENTER]

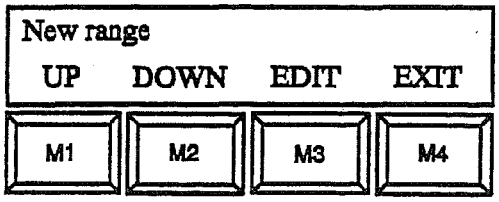
The newly configured range is displayed. Exit the sweep range set up by pressing M4



Select the option to set up lockout ranges by pressing M2

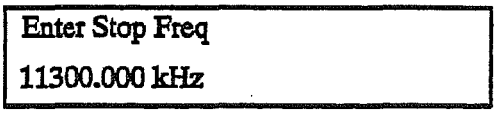


The first free lockout range is indicated. Select the edit function by pressing M3



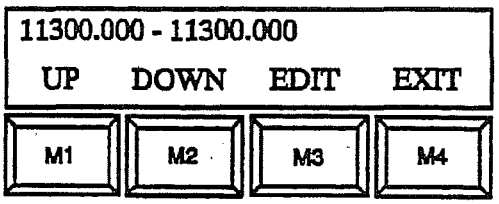
Enter the start frequency in kHz by pressing 1 1 3 ENTER

Note: The stop frequency will default to the start frequency, to allow quick entry of a stop frequency.

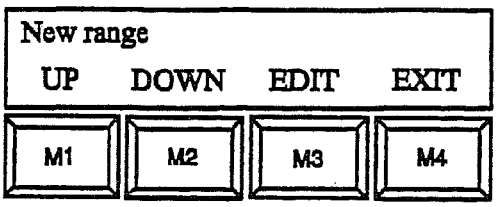


Press ENTER

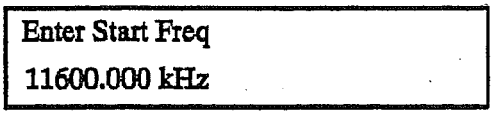
The newly configured range is displayed. Select the next range by pressing M1



The next unused range is displayed. Select the edit function by pressing M3

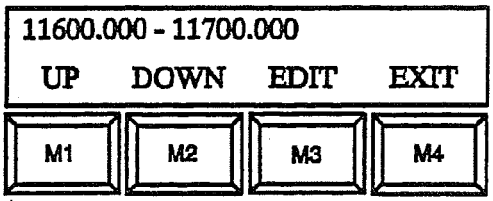


Enter the start frequency in kHz by pressing [1] [1] [6] [ENTER]

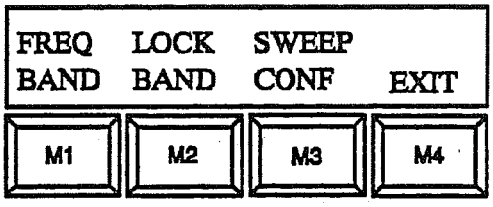


Enter the stop frequency in kHz by pressing [1] [1] [7] [ENTER]

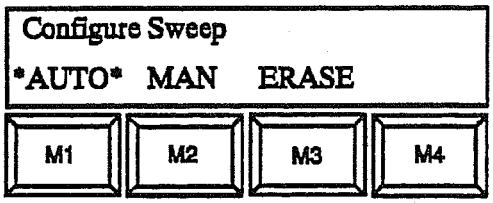
The newly configured range is displayed. Exit the lockout range set up by pressing [M4]



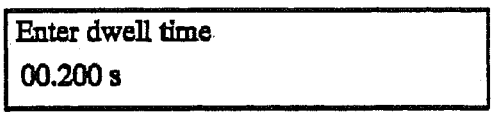
Select the option to set up step size, sweep rate and COR action by pressing [M3]



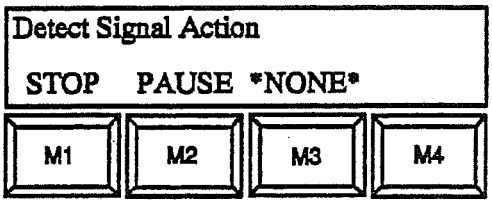
Select the option to set up Automatic sweep operation by pressing [M1]



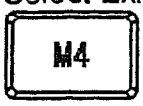
Enter the dwell time in seconds by pressing [0] [0] [2] [ENTER]

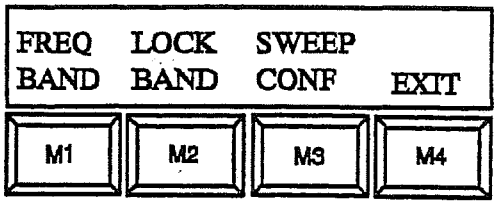


Press [M1] to select STOP COR action over the selected sweep frequency ranges.



Select Exit and start the sweep by pressing





Assuming a receiver bandwidth of 1 kHz, the following derived ranges will be calculated.

(1) 11000000 to 11299000 Hz (11.3 MHz -1 kHz)

(2) 11301000 to 11599000 Hz (11.3 MHz +1 kHz to 11.6 MHz -1 kHz)

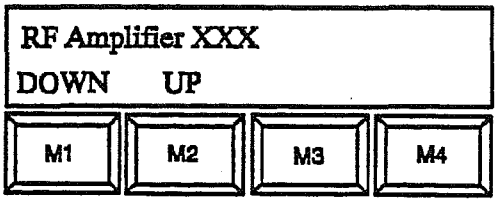
(3) 11701000 to 12000000 Hz (11.7 MHz +1 kHz)

The display then reverts to the current receiver operating parameters, and frequency sweeping commences. Each of the derived ranges are used in ascending order.

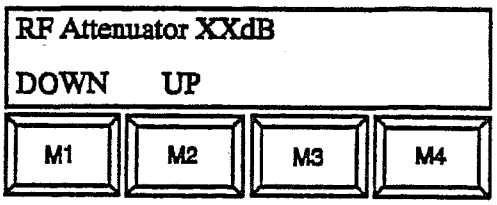
RF AMPLIFIER/ATTENUATION

79. The RF AMP menu allows the user to control the switching of the RF Amplifier and 10 dB attenuator and, if the optional Sub-octave Filter Module is fitted, the additional RF attenuators. Either of the two following menus will be displayed, depending on whether the amplifier or attenuator is currently selected:

Where 'XXX' is the current amplifier selection of OFF, ON or AUTO.



Where 'XX' is the current attenuation setting of 0 or 10 dB. If the sub-octave filter option is fitted, then 20 or 30 dB may also be displayed.



The selection of DOWN or UP will move one step round the following loop of amplifier/attenuator selection in the required direction.

Amp ON > Amp AUTO > Amp OFF > Attenuator, where if ON is selected then the RF amplifier is switched on and 0 dB attenuation is selected.

If AUTO is selected, then the RF amplifier is switched on at frequencies above 480 kHz. When the receiver is being tuned, hysteresis is provided, the switching frequencies being 470 kHz and 490 kHz. The attenuation is set to 0 dB.

The receiver display indicates that the RF amplifier is set to on or AUTO by displaying an upper-case letter 'A' next to the antenna number.

If OFF is selected, then the RF amplifier is switched off and the attenuation set to 0 dB.

If ATTENUATOR is selected, then the required attenuation is selected (10 dB, or if the sub-octave option is fitted, 20 dB or 30 dB, as required).

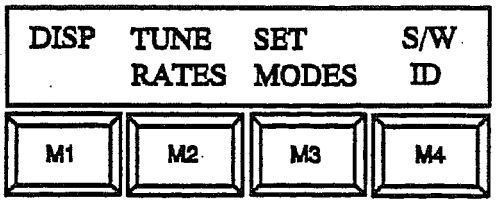
The receiver display indicates that the ATTENUATOR is set to 10 dB (10, 20 or 30 dB if the sub-octave option if fitted) by displaying a lower-case letter 'a' next to the antenna number.

Pressing [RCL] at any time will return the receiver to the normal operating conditions with the amplifier/attenuator selected, as required.

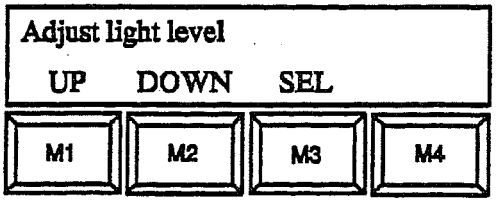
DISPLAY ILLUMINATION AND VIEWING ANGLE

80. The back-lighting intensity of all three front panel displays can be set to suit operating conditions, using the menu system. This facility also allows the viewing angle for the right-hand display to be set.

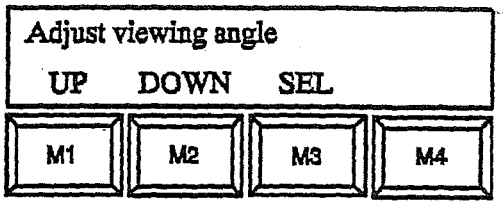
Press [MENU] repeatedly until these menu options are displayed. Select DISP by pressing [M1]



Press [M1] or [M2] repeatedly to increase or decrease the back-lighting intensity. Select the chosen intensity by pressing [M3]



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



Press RCL to exit from the menu system.

Note: Both receivers in the RA3792 operate at the same settings.

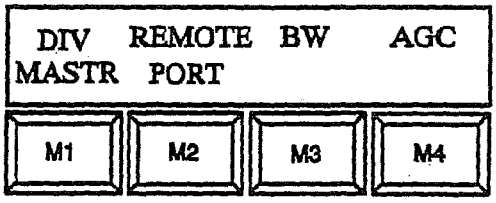
DIVERSITY OPERATION

81. 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. The master receiver then sends out control commands via a 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 can be used as the master.

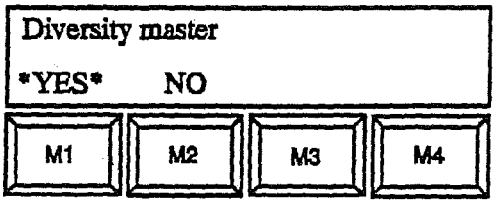
Example:

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

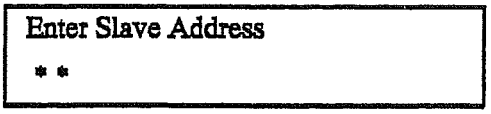
Press MENU repeatedly until these menu options are displayed. Select DIV MASTR by pressing M1



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 reverts to the current receiver operating parameters and the MASTER legend appears on the left-hand display.



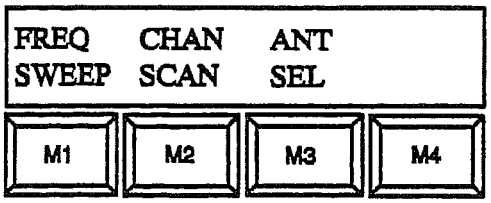
ANTENNA SELECTION

82. The menu system allows for the selection of the antenna to be connected to the receiver (via an external antenna selection unit). One of up to 16 antennas can be selected (four antennas are available for each receiver in the RA3792 dual receiver). A binary coded output is available at rear panel connections to drive the external antenna switch. Details of interface wiring are given in Chapter 2 and further information is given in the RA3790 Interface Manual.

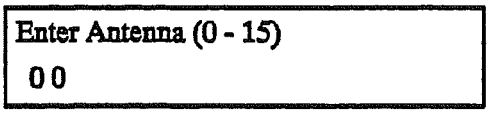
Example:

To select antenna number 5:

Press [MENU] until these menu options are displayed. Select ANT SEL by pressing [M3]



Press [0] [5] [ENTER] to select antenna number 5.

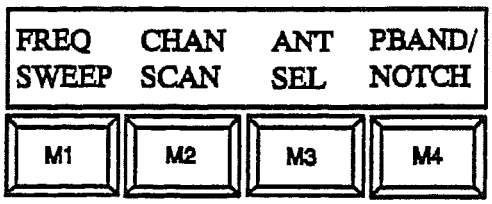


The receiver continues to operate on the previous parameters with the selected antenna number displayed on the right-hand display.

If an attempt is made to enter an antenna number greater than 15, the message 'VALUE OUT OF RANGE PRESS MENU TO CONT.' appears on the right-hand display.

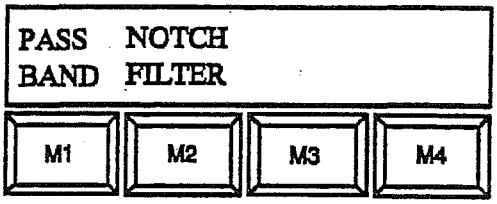
PASSBAND TUNING

83. With the receiver set to USB or LSB, passband tuning can be selected to tune the position of the passband relative to the carrier to help reduce unwanted inband signals.



Press [MENU] repeatedly until these menu options are displayed. Press [M4] to select the following menu.

Press [M1] to select passband tuning. The receiver display will indicate the previous mode with the following modifications.



USB-PB shows the receiver is set to passband tuning. 1.65 kHz is the position of the filter centre frequency relative to the carrier frequency.

The position of the filter centre frequency can be changed using the tuning knob. The width of the IF filter can be increased or decreased using the [BW +] and [BW -] push- buttons. Pressing [RCL] will take the receiver out of passband tuning.

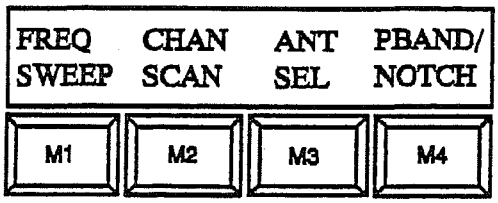
Alternatively, pressing [BFO] when the receiver is set to USB or LSB will cause the receiver to enter passband tuning mode without using the menu system.

This "shortcut" is only available when the receiver is fitted with P90550 Issue 7 or later software.

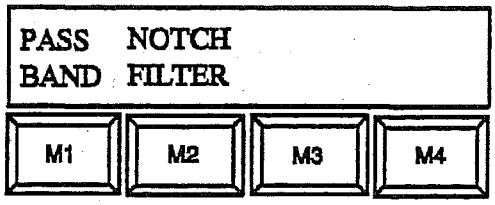
NOTCH FILTER

84. With this facility a notch filter of variable bandwidth can be tuned around the receiver frequency to minimize unwanted inband signals.

Press [MENU] repeatedly until these menu options are displayed. Press [M4] to select the following menu (see paragraph 87 for menu details with P90550 Issue 7 or later software).



Press [M2] to select notch filter tuning. The receiver display will indicate the previous mode with the following modifications.



USB-300 is the 3 dB bandwidth of the notch (300 Hz). The width can be changed by pressing repeatedly the [BFO] button.

Four notch width values are available; 60, 100, 180 and 300 Hz.

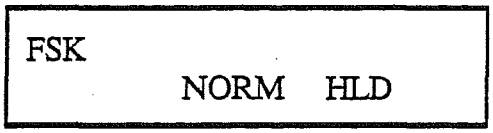
1.65 kHz is the position of the notch filter centre frequency relative to the carrier frequency. The position of the filter centre frequency can be changed using the tuning knob. The width of the IF filter can be increased or decreased using the [BW +] and [BW -] pushbuttons. Pressing [RCL] will take the receiver out of notch filter tuning.

From Issue 7 of P90550 68k software and Issue 6 of P90553 DSP software, an automatic notch is available (see **Note** below). This is selected by the [BFO] button in the follwing sequence: 300, 180, 100, 60, AN (Automatic Notch). The automatic notch filter will tune to any steady carrier signal within the IF passband and reduce that signal's amplitude.

Note: The automatic notch facility is only available if the Digital IF/AF hardware option (DSP3) is fitted to the receiver.

FSK OPERATION

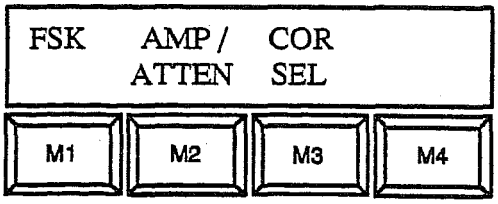
85. Press [FSK] to select the FSK mode. The display will now indicate that the receiver is set to FSK mode.



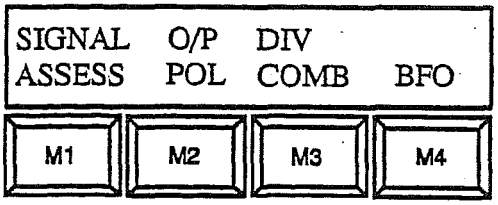
When FSK mode is first selected HLD will be displayed. This indicates that the FSK data output on the rear panel of the receiver (RS-423 output on SK4 pin 20 and pin 21) is disabled. To enable the FSK data output press [RUN/HOLD]. HLD on the display will change to RUN. This indicates that the FSK data output has been enabled.

NORM indicates that the receiver will demodulate an FSK tone at a frequency that is above the carrier frequency as a '1' at the FSK data output. An FSK tone at a frequency lower than the carrier frequency will be demodulated as a '0' at the FSK data output. To invert the sense of the demodulation, press [+/-]. INV will be displayed in place of NORM.

To select the FSK menu press [MENU] repeatedly until these menu options are displayed. Press [M1] to select the following menu.



This menu enables the user to control the following facilities:



SIGNAL ASSESS: Enables or disables the SIGNAL ASSESSOR function. If the SIGNAL ASSESSOR function is enabled, the receiver will attempt to continue to demodulate an FSK signal even if one of the tones has been lost due to fading.

O/P POL: Sets the output polarity of the FSK data output. When NORM is selected and the receiver is set to HLD with the [RUN/HOLD] key, the FSK data output will be set to a 'o'. When INV is selected and the receiver is set to HLD, the FSK data output will be set to '1'. The output polarity of the receiver should be set so that the FSK data terminal does not print spurious characters when the receiver is in FSK HLD mode. Note that if INV polarity is selected, the demodulation sense of the FSK signal is reversed. This means that an FSK tone higher than the carrier frequency will be demodulated as a '0' not a '1'.

DIV COMB: Used for diversity FSK operation with two receivers.

BFO: Sets the frequency of the BFO in FSK mode. The BFO may be varied between -8.00 kHz and +8.00 kHz. The default value for the FSK BFO (after receiver initialisation) is +2.00 kHz. If the FSK BFO frequency is between -8.00 kHz and -0.01 kHz the sense of the demodulated FSK output will be inverted. This means that with the FSK

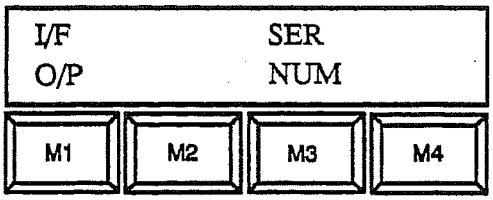
polarity set to 'NORM' the receiver will demodulate an FSK tone at a frequency that is above the carrier frequency as a '0' at the FSK data output. An FSK tone at a frequency lower than the carrier frequency will be demodulated as a '1' at the FSK data output.

The FSK demodulator automatically adjusts to the current receiver bandwidth. Thus for any bandwidth, an optimum FSK detector is always available. The bandwidth should be set to no less than [tone separation+{2 x baud rate}]. For example, if an FSK signal has a shift of 400 Hz and data is being transmitted at 100 baud, the bandwidth should be set to 600 Hz.

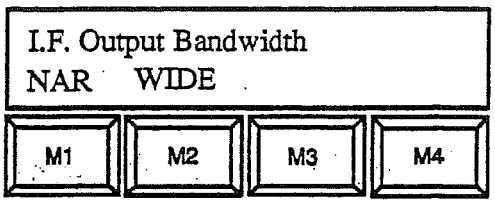
Note: When an external FSK demodulation unit is connected to the receiver's audio line output, the FSK BFO should be adjusted to give the audio tones required by the external FSK demodulation unit. The polarity of the audio tones may be reversed by inverting the sign of the FSK BFO frequency.

IF OUTPUT MENU

86. Press MENU repeatedly until these menu options are displayed. Note that this menu will only be accessible if the 'Configuration menus' option has been enabled. See chapter 3, page 3-2, paragraph 8 for further details.



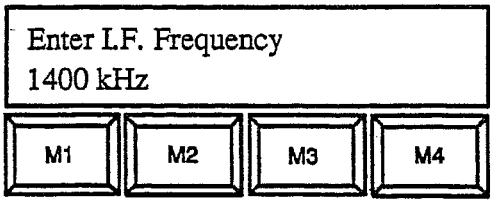
Press M1 to select the IF output menu. The display will change to:



Press M1 to select narrow band mode for the IF output. In narrow band mode the bandwidth of the IF output is set by the currently selected receiver bandwidth.

Press M2 to select wide band mode for the IF output. In wide band IF output mode the bandwidth of the IF output is set to 12 kHz and is not changed if the operating bandwidth of the receiver is adjusted.

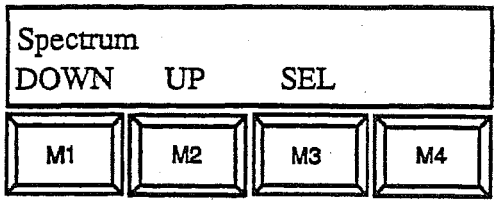
After the IF output bandwidth has been selected the centre frequency of the IF output will be requested. Enter the IF



frequency (in kHz) using the numeric keypad in the range 10 kHz to 455 kHz in 5 kHz steps or 1400 kHz. Press ENTER to enter the frequency. If a frequency between 10 kHz and 455 kHz is selected, change LK4 and LK5 on the Digital Board from position A to position B. If 1.4 MHz is selected LK4 and LK5 must be in position A.

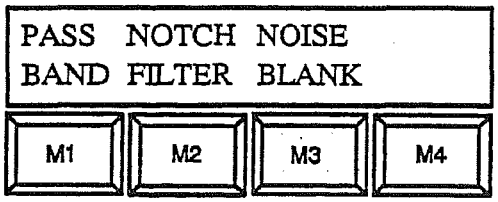
The final display in the IF output menu will now be displayed if the optional Digital IF/AF interface is installed in the receiver.

Press M1 or M2 to scroll through the available Digital IF/AF output format options. These options are listed in the RA3790 Interface Manual (Ref A5257) Chapter 1 under the heading "Digital IF/AF Interface". When the correct format is displayed on the receiver, press M3 to select that format and to exit the IF output menu.



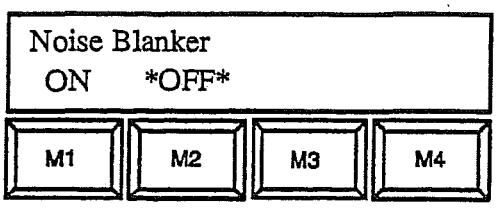
NOISE BLANKER

87. Press MENU repeatedly until these menu options are displayed.

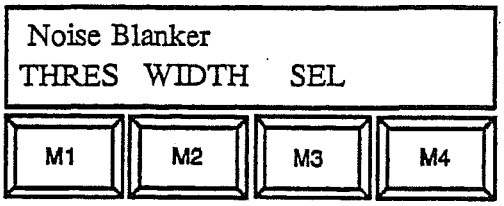


Note: This facility is only available with P90550 Issue 7 or later 68k software and P90553 Issue 5 or later DSP software.

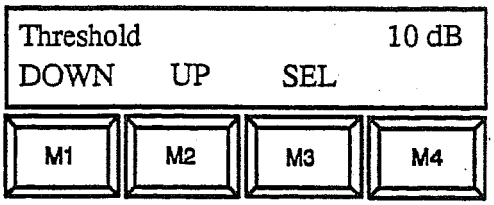
Press M3 to select the Noise Blanker. The current selection is indicated by *----*. Press M2 to turn the noise blanker off or press M1 to turn the noise blanker on and to select the following menu.



Select THRES by pressing M1.

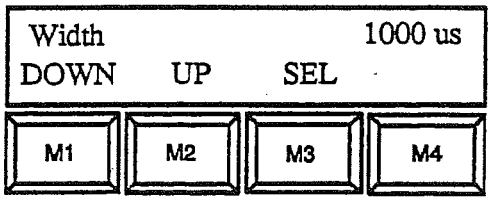


The following menu is displayed.



The noise blanker threshold is adjusted by pressing M1 to decrease the threshold and M2 to increase the threshold. Press M3 to select the setting and to return to the Noise Blanker menu. The noise blanker threshold is the level which the noise blanker becomes active (1 dB to 30 dB). This value is the change in peak signal level between the wanted signal level and the interfering signal level that is required before the noise blanker is activated. Care should be taken to adjust the threshold so that rapid changes in the level of the wanted signal does not activate the noise blanker. If the noise blanker is activated by the wanted signal, part of the wanted signal will be eliminated.

Select WIDTH by pressing M2. The following menu is displayed.

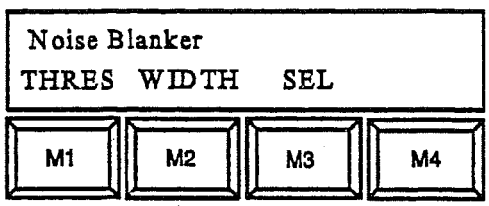


The width of the blanking pulse is adjusted by pressing M1 to decrease the width and M2 to increase the width.

Press M3 to select the setting and to return to the Noise Blanker menu.

The noise blanker width is the width of the blanking pulse applied to the receiver signal path in order to mask the effects of the interfering signal (100 μseconds to 100,000 μseconds). The width of the blanking pulse should be adjusted so that the effects of the unwanted signal are masked. Short duration repetitive interfering signals only require a narrow blanking pulse to be applied to mask the unwanted signal, longer duration signals require a wider blanking pulse. Care should be taken to adjust the width of the blanking pulse so that the wanted signal is not eliminated along with the unwanted signal (interference).

Press M3 to select the settings and return to the main receiver display.



The receiver display indicates that the noise blanker is 'on' displaying an upper-case letter 'N' near the antenna number.

If the Digital IF/AF hardware option (DSP3) is fitted to the receiver, a noise reduction system is automatically activated when the noise blanker is activated.

CHAPTER 5

REMOTE CONTROL OPERATION

CONTENTS

CHAPTER 5

REMOTE CONTROL OPERATION

INTRODUCTION

1. A number of RA3790-series receivers can be interconnected to form a network, which can incorporate additional items of equipment, such as antenna selection units, tape recorders and control computers. Refer to the RA3790 Interface Manual for remote control configuration information, and for further information regarding the use of the receiver in remote control systems.

2. A receiver may be fitted with either a dual serial ASCII (RS-423) interface or a single IEEE-488 (GPIB) interface, where each type of interface can be used to control the RA3790 series receivers and associated equipment. Each interface is described in detail in the RA3790 Interface Manual.

3. 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 this chapter. Alternatively they may be programmed remotely using an external computer or dumb terminal (see RA3790 Interface Manual).

4. Using the remote control facilities built into every receiver, a network could be used to interlink two or several receivers, each with or without an operator, at a single site or within a single building. Using suitable modem units, telephone lines and/or microwave links, this network could be extended to interlink a number of remote sites, each of which could be fixed, mobile, manned or un-manned.

5. A receiver is switched to remote (slave) operation either by pressing the front-panel REM pushbutton (serial ASCII interface options only) or via a command signal sent from a controller connected to the remote interface. In both cases, REMOTE is indicated on the left-hand display and the front panel controls, apart from local monitoring functions, are disabled.

6. To use a receiver as a controller (master), the address of the slave receiver to be controlled is simply entered using front-panel pushbuttons. Operating settings may be handed off from the master to the slave, or vice-versa, and the

front panel of the master receiver may then be used to control the slave receiver. In a remote system there is only one master equipment, and up to 100 (serial ASCII interface) or 30 (IEEE-488 interface) slave equipments.

OPERATION AS A MASTER

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

8. Press [ADDR] to set the receiver to act as a master.

Enter the required slave address using the numeric pushbuttons, as indicated by the cursor in the address display.

9. Press [ENTER] to hand off the current master settings to the slave, or press [RCL] to recall the current slave settings to the master. The MASTER legend is displayed on the left-hand display. The slave receiver can now be controlled using the front panel controls of the master equipment.

10. When the RA3790 series receiver is being used as the master to control a slave receiver, the receiver in the master is effectively disconnected from its front panel controls and continues to operate on its current settings. To reconnect the front panel to the receiver in the master, press [ADDR] followed by [RCL] to recall the current settings of the master or [ENTER] to hand off the current settings of the slave to the master.

11. During address entry, the cursor indicates the required number of digits to be entered. The availability of single or double-figure address numbers is determined when the serial ports are 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 a receiver using the IEEE-488 interface), no numeric keys are pressed to select master operation.

OPERATION AS A SLAVE

12. It is not necessary to set a slave 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 pushbutton on the front panel of the slave receiver, assuming 'local control lock-out' has not been set at the controller.

13. Press [REM] to return the slave to local operation. The REMOTE legend on the left-hand display is extinguished.

    For a serial (ASCII) controlled receiver, press [REM] again to reselect remote operation. The REMOTE legend appears on the left-hand display and remote operation is resumed.

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

14. 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 apart from the following:

    (1) POWER ON/OFF switch

    (2) VOLUME (audio level control)

    (3) METER

    (4) L/S pushbutton (switches the loudspeaker on/off)

    (5) ADDR and RCL pushbuttons (enables front panel selection of either receiver in a dual receiver). A dual receiver has two addresses, and each receiver may be controlled independently (unless diversity operation has been selected).

REMOTE BITE MONITORING

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

16. Fault interrogation can be carried out from the front panel of the master to determine which equipment is faulty.

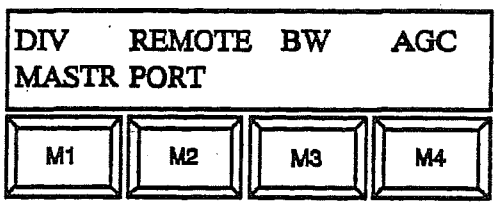
LOCAL SETTING UP OF ASCII PORTS

17. On RA3791 and RA3792 receivers, the ASCII master port interface parameters can be set up locally using the front panel menu system, thus allowing the receiver to function either as a master or a slave in a remote control system. The ASCII auxiliary and tributary port interface parameters are set up locally using switches provided on the digital board, as described in the RA3790 Series Receiver Interface Manual.

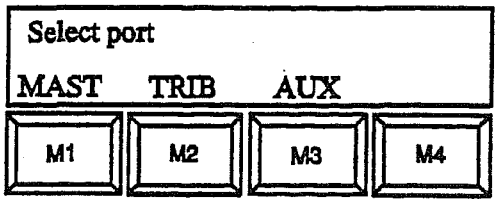
Example: (RA3791/RA3792 receivers master port)

18. To set up one master port of the receiver for operation on a serial ASCII link with a baud rate of 2400, even parity, including a link control character, a cyclic redundancy code (CRC) and no free tune facility and a two-character address capability, proceed as follows:

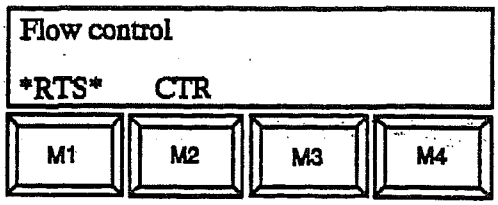
Press [MENU] repeatedly until these options are displayed. Select REMOTE PORT by pressing [M2]



Press [M1] to select local Master port for parameter changes.

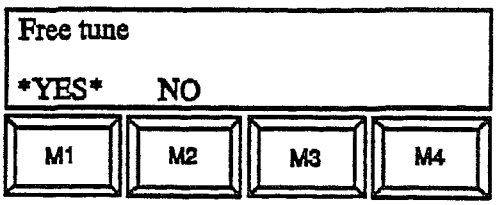


Press [M1] to select RTS if the port is connected to a data communications equipment such as a modem.

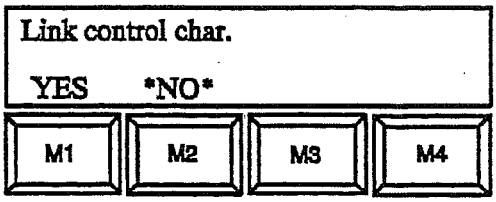


Press [M2] to select CTR if the port is connected to a data terminal such as a computer or another receiver.

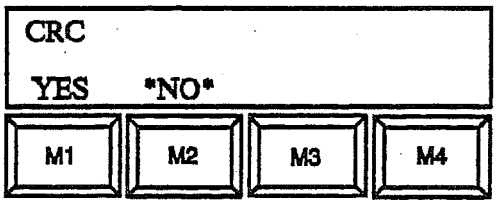
19. Press [M2] to omit the free tune facility. Tuning of a controlled equipment will now be by discrete frequency updates. The current selection is indicated by *----*.



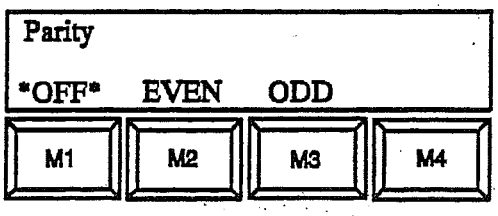
Press [M2] to include the link control character for link management.



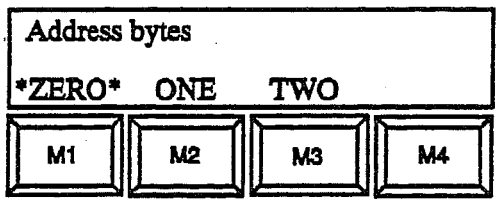
Press [M1] to include CRC to detect corruption of remote link input and output data.



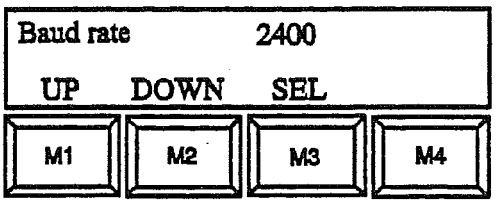
Press [M2] to select even parity.



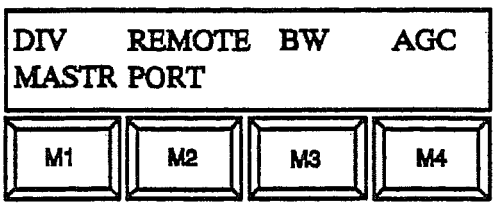
Press [M3] to provide a two-character address capability, allowing up to 99 tributaries to be addressed when in the controller mode.



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



Press [M2] to select REMOTE PORT



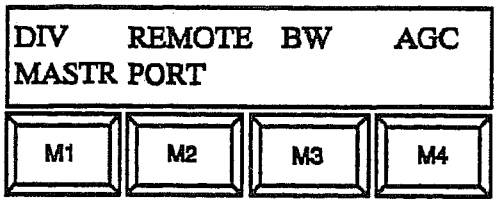
LOCAL SETTING UP OF IEEE-488 PORT

20. This information is currently not available and will be issued later.

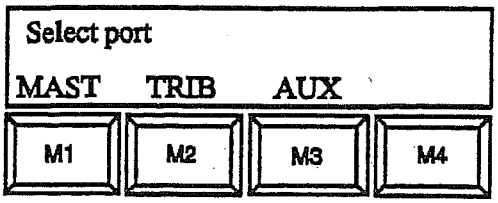
MENU CONFIRMATION OF SETTINGS

21. A menu facility is provided to allow the settings for either the tributary or auxiliary ports to be viewed, as follows.

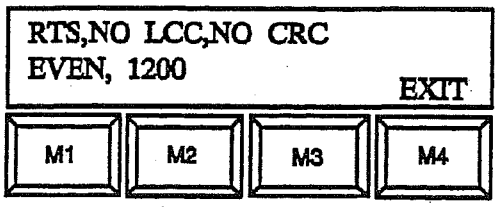
Press [MENU] repeatedly until these options are displayed. Select REMOTE PORT by pressing [M2]



Press [M3] to select AUX port



The display shows the auxiliary port settings. Press [M4] to exit.



CHAPTER 6

OPERATOR SERVICING

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Tables

CHAPTER 6

OPERATOR SERVICING

INTRODUCTION

1. The receiver incorporates comprehensive built-in test equipment (BITE) facilities to indicate a fault condition and to enable fault location to board level to be performed by the operator.

2. Important operational functions are checked automatically on initial power-up and are then monitored continuously during receiver operation without operator intervention. Any detected failures cause FAULT to be displayed on the front panel, indicating that a fault exists within the receiver. When a receiver or a receiver controller is controlling another receiver, a fault in either equipment will cause FAULT to be displayed. Similarly, in a dual receiver the FAULT display may refer to either receiver.

3. Fault location to a section of the receiver is 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 using the menu system. LED indicators on the digital board provide additional fault location information and may prove helpful where a failure prevents fault interpretation from the front panel.

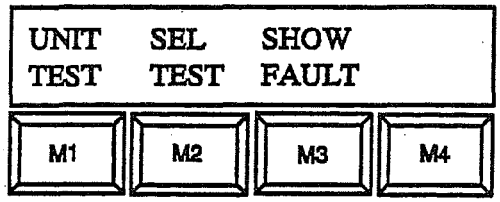
4. Failures may occur which are not detected by the continuous monitoring BITE tests. In these cases, more detailed unit confidence BITE tests can be initiated using the menu system.

5. Using the fault location facility provided by the BITE routines, a faulty board may be identified and then replaced by a service technician so that the receiver is returned quickly to operational use. Board replacement instructions are given in Chapter 2, Receiver Servicing, of the RA3790 Maintenance Manual.

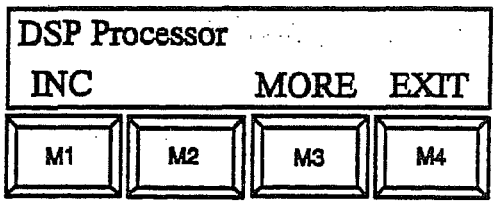
FAULT INTERPRETATION

6. Details of a failure which causes FAULT to be displayed can be viewed 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. Select the second receiver and then repeat the procedure.

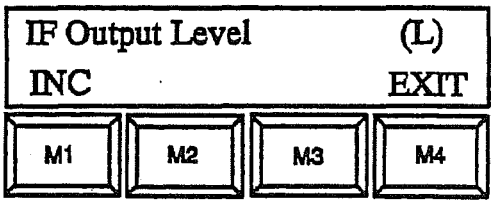
Press [MENU] repeatedly until these menu options are displayed. Press [M3] to select SHOW FAULT.



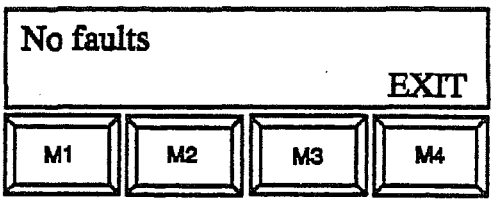
The display indicates the section at fault. Press [M3] for further information.



More detailed fault information is then displayed. Press [M1] to increment and display any further BITE test failures.



If no further faults are detected, press [M4] to exit. The display reverts to the BITE menu options.



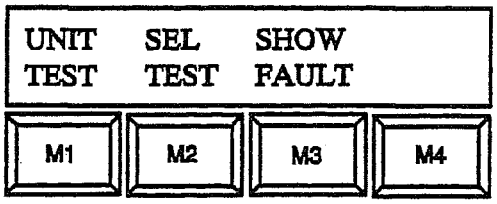
Each time INC is selected, the display increments to show the name of the section in which the next test failure has been identified. This may be the same section as for the previous fault or it may be a different section. When detailed fault information is being requested using MORE, either (F), (H) 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. intermittent), FAULT remains illuminated until cleared by using the SHOW FAULT facility to examine the recorded fault(s). For the RA3792 dual receiver, r1 or r2 is shown in the address display to indicate which receiver is faulty.

UNIT CONFIDENCE TEST

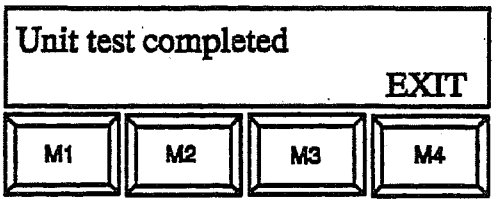
7. When called up by the menu system the unit confidence test is performed under program control to provide a comprehensive self-test facility. This includes tests such as a performance check of the receiver signal path using a noise source as a test signal. Normal reception in this mode is interrupted.

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.

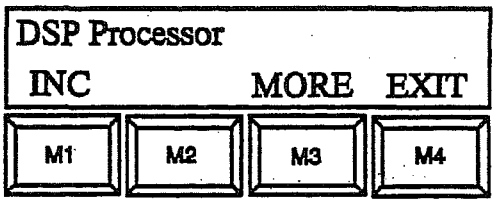
Press MENU repeatedly until these menu options are displayed. Press M1 to select UNIT TEST.



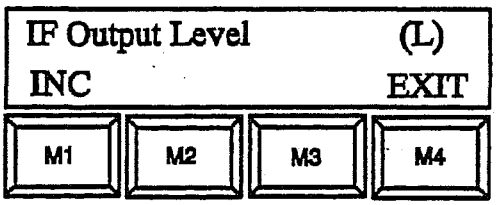
The unit confidence test now runs through the test routines automatically. If no faults are detected, a test complete message is displayed. Press M4 to exit.



If faults are present, the test sequence stops on the first detected failure and the display shows the faulty section. Press M3 to display further details.



The display then gives detailed fault information, as shown in the example given opposite. Press M1 to increment past the failed test and to continue the confidence test. Press M4 to exit and return to the BITE menu.



On the successful completion of each group of section tests, the display shows (P) adjacent to the appropriate main test heading to indicate a pass. When

more detailed information is requested via the menu system, (F), (H) or (L) is shown to indicate test failure, signal level too high or signal level too low.

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 may be useful to produce a fault report listing all failed tests.

BITE TEST SUMMARY

8. Table 6.1 provides a summary of the tests performed during power-up, continuous monitoring and unit confidence BITE tests. The functions tested are listed under the respective section or facility heading.

Table 6.1: BITE Test Summary

Test No.	Test Name	Power up	Continuous Monitoring	Unit Confidence	Select Test
001	Control Processor EPROM Checksum	YES	NO	NO	NO
002	Control Processor RAM Even Bytes	YES	NO	YES	YES
003	Control Processor RAM Odd Bytes	YES	NO	YES	YES
004	EEROM Test	NO	YES	NO	NO
005	+5 V Digital Rail	NO	YES	YES	YES
006	+15 V Rail	NO	YES	YES	YES
007	-15 V Rail	NO	YES	YES	YES
008	-5 V Rail	NO	YES	YES	YES
009	Digital Board I/O	NO	NO	NO	YES
010	Parallel I/O	NO	NO	NO	YES
051	Master/Auxiliary Port Internal	NO	NO	NO	YES
052	Master/Auxiliary Port External	NO	NO	NO	YES
053	Tributary Port Internal	NO	NO	NO	YES
054	Tributary Port External	NO	NO	NO	YES
055	Diversity Master Link	NO	YES	NO	NO
101	RX Data Bus	YES	NO	YES	YES
102	RX Address Bus	YES	NO	YES	YES
103	RX Bus Control	YES	NO	YES	YES
104	RX BITE Bus	YES	NO	YES	YES
151	Front Panel Display	NO	NO	NO	YES
152	Front Panel Keyboard	NO	NO	NO	YES

Test No.	Test Name	Power up	Continuous Monitoring	Unit Confidence	Select Test
201	+5 V Analogue Rail	NO	YES	YES	YES
202	Reference Input Level	NO	YES	YES	YES
203	Reference Lock 1	NO	YES	YES	YES
204	Reference Lock 2	NO	YES	YES	YES
205	Board Interface	NO	YES	YES	YES
206	DSP EPROM Checksum	NO	NO	YES	YES
207	DSP RAM Test High	NO	NO	YES	YES
208	DSP RAM Test Mid	NO	NO	YES	YES
209	DSP RAM Test Low	NO	NO	YES	YES
210	DSP Reset	NO	NO	YES	YES
211	DPRX ASIC Test	NO	NO	YES	YES
212	Sample Rate Clock Test	NO	NO	YES	YES
213	Peak Detector Level Test	NO	NO	YES	YES
214	Input level/Peak Detector Test	NO	NO	YES	YES
215	IF SNR Test	NO	NO	YES	YES
216	ADC Sampling Clock Lock Test	NO	NO	YES	YES
217	AGC Voltage Test	NO	NO	YES	YES
218	DSP1 IRQA Test	NO	NO	YES	YES
219	Data Bus Parallel I/O Test	NO	NO	YES	YES
220	CODEC 1 Control Test	NO	NO	YES	YES
221	CODEC/Mult.DAC1 Level Test	NO	NO	YES	YES
222	CODEC/Mult.DAC1 SINAD Test	NO	NO	YES	YES
223	Internal Audio Level Test	NO	NO	YES	YES
224	Int. Audio Output SINAD Test	NO	NO	YES	YES
225	Multiplying DAC2 Level Test	NO	NO	YES	YES
226	Multiplying DAC2 SINAD Test	NO	NO	YES	YES
227	IF Valid Line Loopback Test	NO	NO	NO	YES
228	External AGC Loopback Test	NO	NO	NO	YES
229	Audio Line 1 Level Test	NO	NO	NO	YES
230	Audio Line 1 IMD Test	NO	NO	NO	YES
231	Audio Line 2 Level Test	NO	NO	NO	YES

Test No.	Test Name	Power up	Continuous Monitoring	Unit Confidence	Select Test
232	Audio Line 2 IMD Test	NO	NO	NO	YES
233	IF Output Level Detector Test	NO	NO	YES	YES
234	IF Output IMD Test	NO	NO	NO	YES
251	Frequency Standard Level	NO	YES	YES	YES
252	40 MHz Lock Detector	NO	YES	YES	YES
253	Second LO Drive Level	NO	YES	YES	YES
254	VCO Lock Detector	NO	YES	YES	YES
255	First LO Drive Level	NO	YES	YES	YES
256	First LO Sweep	NO	YES	YES	YES
257	First Mixer Sweep	NO	NO	YES	YES
258	Analogue Board Gain	NO	NO	YES	YES
259	RF Amplifier Gain	NO	NO	YES	YES
260	RF Attenuator	NO	NO	YES	YES
261	First IF AGC	NO	NO	YES	YES
262	Receiver Gain	NO	NO	YES	YES
301	CODEC2 Control	NO	NO	YES	YES
302	CODEC2 SINAD	NO	NO	YES	YES
351	FSK Loopback	NO	NO	NO	YES
401	SSI Data Line	NO	NO	NO	YES
402	SSI Sync line	NO	NO	NO	YES

CHAPTER 7

ACCESSORIES

CONTENTS

CHAPTER 7

ACCESSORIES

INTRODUCTION

1. The range of accessories available for the RA3790 Series Receivers is as listed below.

INSTALLATION ACCESSORIES

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

3. **Mating Connector Kit - ASCII Remote Control** (Part No. 91311-01)

Items List (Issue 01)

1	A01469	Connector, 15-way, D-type Plug, qty 1
2	A01470	Connector, 25-way, D-type Plug, qty 1
3	A01471	Connector, 15-way, D-type Socket, qty 1
4	993040/EQ	Connector Cover, 15-way, qty 2
5	993041/EQ	Connector Cover, 25-way, qty 1
6	923205	Connector, 50 Ohm, BNC, qty 3

4. **Extension Kit - ASCII Remote Control** (Part No. 91311-01)
(Supplements Mating Connector Kit for Dual Receiver)

Items List (Issue 01)

1	A01469	Connector, 15-way, D-type Plug, qty 1
2	A01470	Connector, 25-way, D-type Plug, qty 1
3	A01471	Connector, 15-way, D-type Socket, qty 1
4	993040/EQ	Connector Cover, 15-way, qty 2
5	993041/EQ	Connector Cover, 25-way, qty 1
6	923205	Connector, 50 Ohm, BNC, qty 3

5. **Audio Monitoring Accessories:**

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

SERVICING ACCESSORIES

6. Maintenance Kit, Part Number 91300-01

Items List (Issue 01)

1	91813-01	Assy-Connector Loopback 1, qty 1
2	91814-01	Assy-Connector Loopback 2, qty 1
3	91815-01	Assy-Cable 40-way Extender, qty 1
4	91816-01	Assy-Cable 50-way Extender, qty 1
5	91817-01	Assy-Cable 6-way Extender, qty 1
6	934397	Connector, 50 Ohm, BNC, qty 1