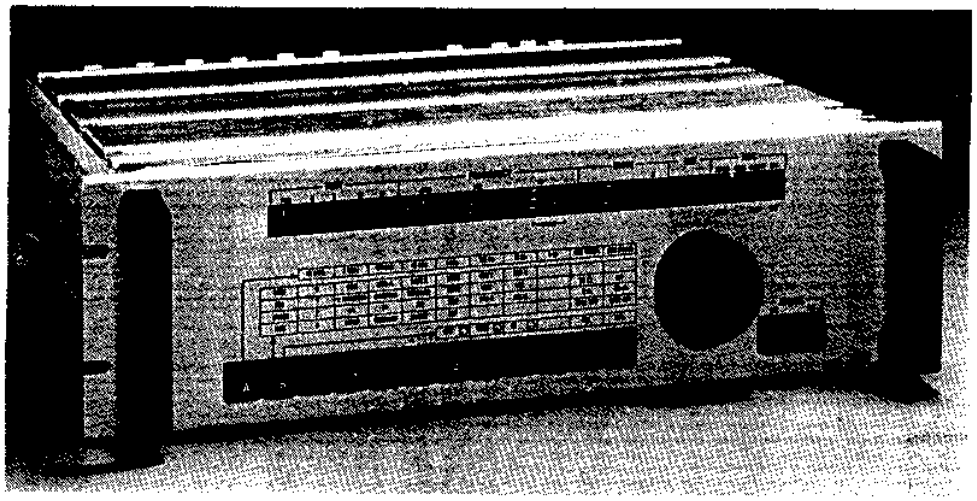
COMMUNICATIONS RECEIVER CR90

Technical Description



CONTENTS

REMARK: DO NOT REMOVE OR REPLACE A PC BOARD WITH POWER ON

Description No: B10850 1100 00

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1. INTRODUCTION

CONTENTS

1. INTRODUCTION

1.1 GENERAL

This technical manual describes the Communications Receiver CR90. Information is provided for installation, operation, maintenance, repair and trouble-shooting.

1.2 GENERAL DESCRIPTION

The Communications Receiver CR90 (figure 1:1) is intended for radio communication in the frequency range 10 kHz to 30 MHz. The receiver can be used for reception in modes A1, F1 and A3 with four different bandwidths and with single sideband (SSB) and independent sidebands (ISB).

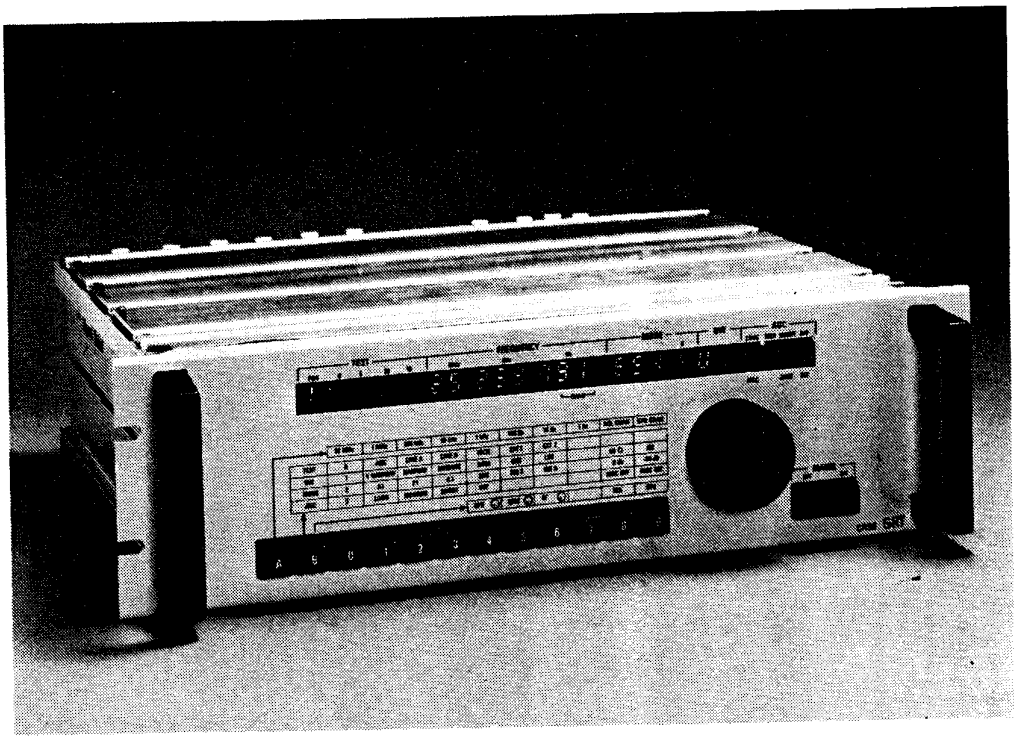


Figure 1:1 Communications Receiver CR90

All settings (frequency, mode, bandwidth, etc) are executed with an easily handled keyboard. Beside the keyboard is a knob which can be used for frequency setting instead of the keyboard, for instance when searching for a station. The knob can also be used for setting of MGC level, BFO frequency and AF level.

All traffic parameters can be stored in a memory from which they can be recalled quickly when needed. This means that communication with a regular station can be achieved instantly.

Traffic parameters for nine different stations can be stored in the standard memory, and with an optional plug-in channel board another 100 can be stored.

All parameters are displayed by digits and LEDs on a display on the front panel.

The receiver can be remotely controlled if equipped with an optional remote control board.

The power supply can be either 220V AC or 21-32V DC. The memory circuits are supplied from a battery-supported +5V source which means that the information will not be lost due to mains failures.

1.3 SPECIFICATIONS

Frequency range	10 kHz - 30 MHz
Frequency setting	Digitally by pushbuttons or continuously by a single knob in 1 Hz, 10 Hz, 100 Hz or 1 kHz steps over the entire frequency range
Frequency accuracy	1×10^{-7}
Modes of operation	A1, A2, A2H, A3, A3H, A3A, A3J, A3B, F1
Input impedance	50 ohm SWR < 3:1 or high impedance selectable
Input protection	30V EMF behind 50 ohm continuously or 60V EMF behind 50 ohm for up to 15 minutes
Sensitivity	A3J (bandwidth = 3 kHz) : 0.6 µV EMF for 12 dB SINAD. A3 (bandwidth = 6.8 kHz m = 30%: 3 µV EMF for 12 dB SINAD

IF selectivity (standard version)	VERY NARROW: -3dB at ± 150 Hz -60 dB at ± 500 Hz
	NARROW: -3 dB at ± 300 Hz -60 dB at ± 850 Hz
	INTERMEDIATE: -3 dB at ± 750 Hz -60 dB at ± 1250 Hz
	WIDE: -3 dB at ± 3400 Hz -60 dB at ± 4500 Hz
	USB: -3 dB at + 250 and + 3000 Hz -60 dB at -250 and +3500 Hz
	LSB: -3 dB at -250 and -3000 Hz -60 dB at +250 and -3500 Hz
Cross modulation	Wanted signal 300/uV EMF. Unwanted signal more than 1 V EMF 30% modulation, to produce an output of 20 dB below the wanted signal output
Reciprocal mixing	Wanted signal 100 /uV EMF. Unwanted signal 20 kHz removed, must be more than 75 dB and typically 80 dB above the wanted signal to produce a noise level of 20 dB below the wanted output
Intermodulation	Two 30 mV EMF signals separated and removed 20 kHz from the tuned frequency will produce less than -90 dB third order intermodulation
IF attenuation	More than 100 dB
Image rejection	More than 100 dB
Spurious responses external(1.6-30 MHz):	Unwanted signals more than 20 kHz removed from the tuned frequency must be more than 100 dB above the wanted signal to produce an equivalent output

Spurious response internal	10 kHz-1.6 MHz: Not exceeding an equivalent aerial input of 0.5 /uV EMF. 1.6-30 MHz: Not exceeding an equivalent aerial input of 0.2 /uV EMF and max 2 spurious responses not exceeding an equivalent aerial input of 0.9 /uV EMF
AGC range	An increase of 120 dB from 2 /uV EMF will produce an output change of less than 3 dB
AGC time constants	Attack: Less than 2 ms Decay: 0.1, 1 and 5 seconds selectable
BFO	Synthesized from the Master Oscillator
	A1: Tunable in 100 Hz steps 300 Hz to 1800 Hz rel f_o
	F1: Selectable in 100 Hz steps 300 Hz to 2800 Hz rel f_o
	SSB/ISB: fixed at f_o
Line output (600 ohm balanced)	Adjustable up to +10 dBm, distortion less than 0.5%
Loudspeaker (4-8 ohm)	2 W max at less than 5% distortion
Channel memory	9 channels as standard. Additional 100 channels with optional plug-in board
Remote control (V.28 interface)	All front panel functions can be remotely controlled with an optional
Power supply	AC: 220 V +20% to - 10%, 45-400 Hz DC: 21-32 V floating
Power consumption	AC: 50 VA DC: 30 W
Temperature range	Operational: -30 to +55°C Storing: -40 to +70°C

Relative humidity	Max 95% according to IEC 68-2-30	
Vibration	5-150 Hz, 2 g according to IEC 68-2-6	
Bumps	4000 bumps, 25 g in main direction according to IEC 68-2-29	
Dimensions	Panel width:	482 mm (19")
	Height:	133 mm
	Depth:	320 mm
Weight	12 kg	

2. INSTALLATION

CONTENTS

APPENDICES

2. INSTALLATION

2.1 GENERAL

The Communications Receiver CR90 is designed for installation in a 19 inch standard rack. The rear of the unit is open which gives easy access to all inputs and outputs on the rear edges of the boards.

Refer to appendix 2:1 for outline dimensions of the receiver.

2.2 EXTERNAL CONNECTIONS (figure 2:1)

All connections are to be made on the rear of the unit. Position numbers given in brackets refer to the positions of the boards.

1. If the internal 5 MHz oscillator is to be used, set the switch on the Reference Board (position 20) in the lower position. If an external master oscillator is to be used, set the switch to the upper position and connect the external oscillator to the BNC coaxial connector on the Reference Board.

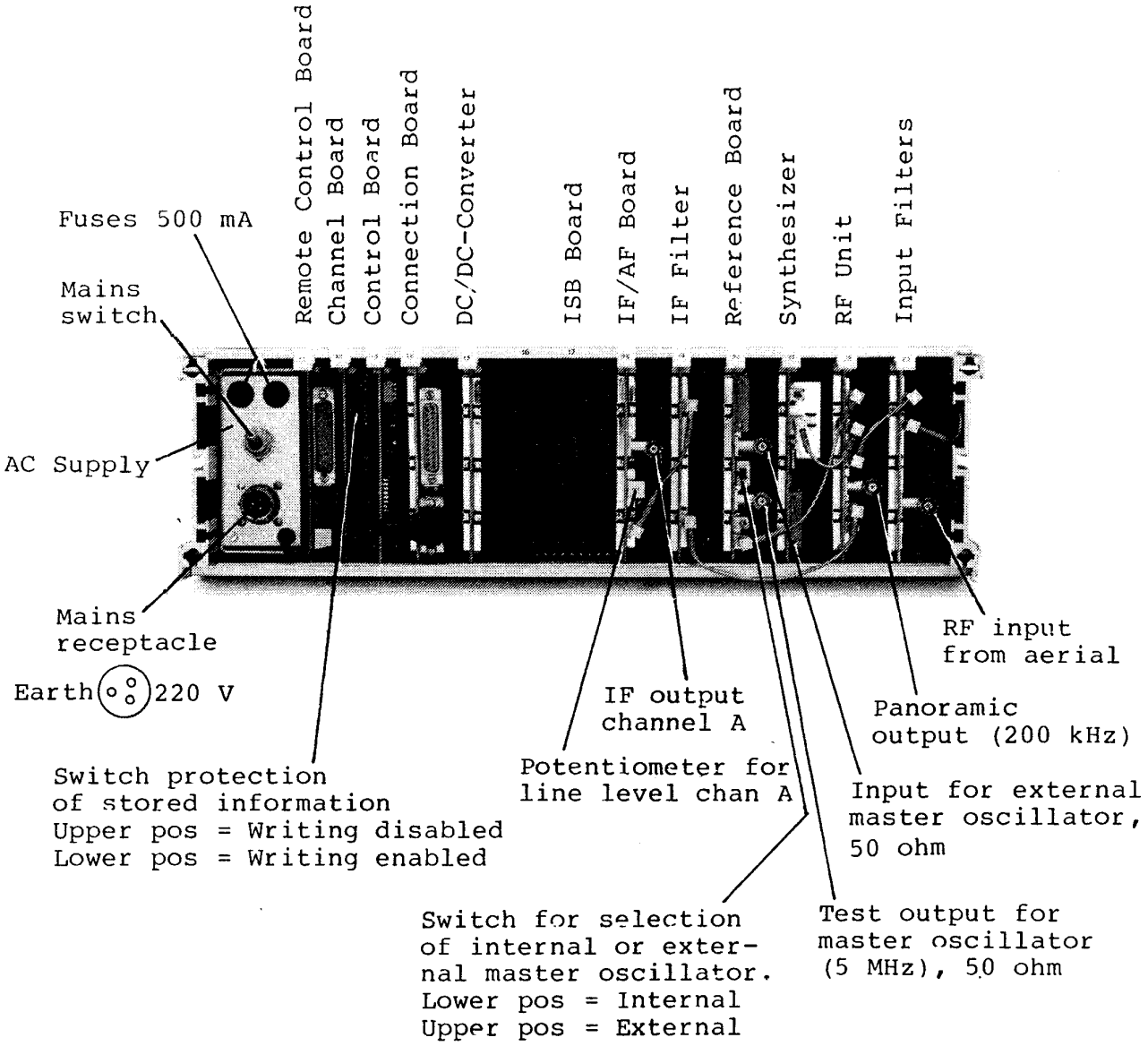
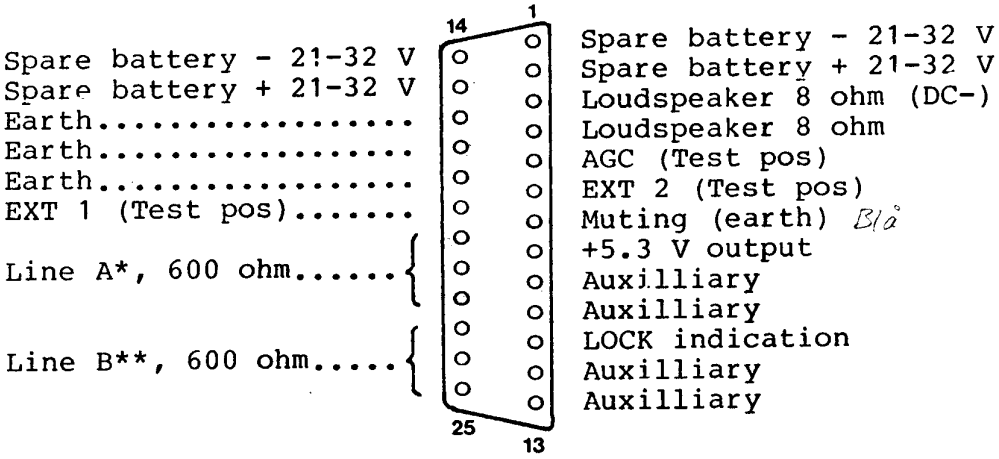


Figure 2:1 Rear of CR90

2. Connect AC mains to the receptacle on the rear of the AC Supply.

   If DC power is to be used, it can be connected in two different ways:

   * Normally the DC input is to X2 on the Connection Board (for pin numbers, see figure 2:2). This configuration allows uninterrupted service if both AC mains and a 24V battery is connected.



*600 ohm between pins 20 and 22

**600 ohm between pins 23 and 25

Figure 2:2 Connector X2 on Connection Board

* If AC mains is not used, the cable from the AC Supply can be disconnected (and the AC Supply can be removed altogether if desired) and DC power is applied to the 9-pole connector at the Connection Board (pin numbers, see figure 2:3).

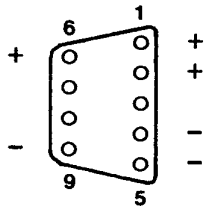


Figure 2:3 Connector X3 on Connection Board

3. Connect loudspeaker, AF lines, etc, to the upper connector on the Connection Board (position 14).

   Note that this connector has a muting input which should be connected to the transmit/receive switching circuits when the receiver is used in a simplex traffic system (see figure 2:2).

4. Connect the antenna cable to the RF input connector on the Input Filters (position 23).

5. If remote control is used, connect the remote control lines to the connector on the Remote Control Board according to figure 2:4.

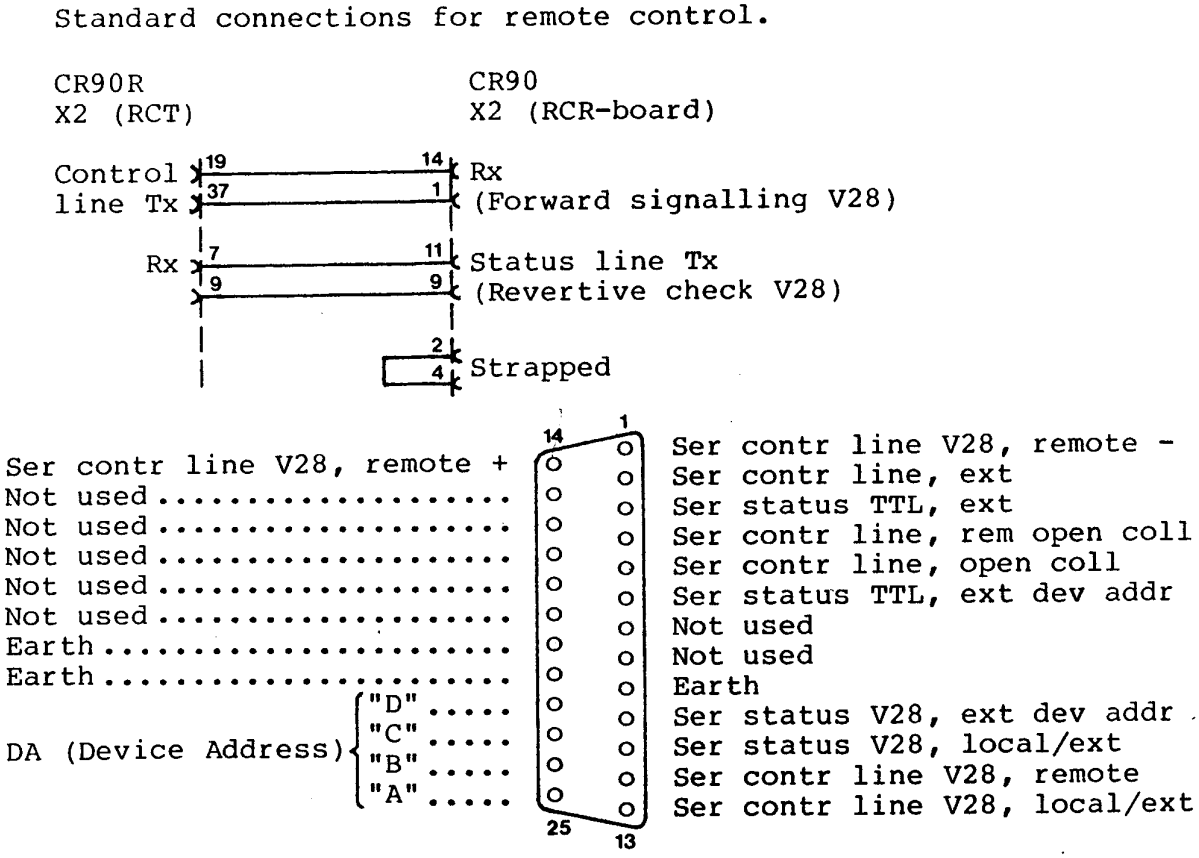


Figure 2:4 Connector X2 on Remote Control Board

On the rear of the unit there are also a panoramic output for IF (on the RF Unit, position 22) and two IF outputs, one for channel A and one for channel B (on the IF/AF Board, position 18 and on the ISB Board, position 17). All these outputs give IF 200 kHz and are intended for measuring and monitoring purposes.

2.3 ADJUSTMENTS

In this section, switches and potentiometers which may require adjustment are discussed.

2.3.1 Panel Board

Switch S15 for device address (DA).

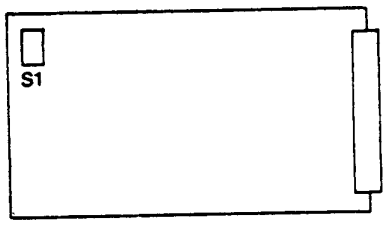
Normally set to 0000 (all switches closed)

2.3.2 Channel Board

Switch S1 for protection of stored information (see figure 2:1)

2.3.3 Control Board

Switch S1 for device address (DA). Must be set to the same code as controlling device, normally 0000



2.3.4 ISB Board

The trim potentiometer located at the rear of the ISB Board is used to adjust the AF level delivered to the 600 ohm line for channel B. Select B with the test meter and adjust to the wanted level. 0 dBm corresponds to about 9 divisions on the LED bar. **Note! Do not adjust potentiometer R249.**

2.3.5 Reference Board

Switch S1 for selection of internal or external master frequency (see figure 2:1)

Center frequency	1	2	3	4	5
300	1	0	0	0	0
400	1	0	0	0	1
500	1	0	0	1	0
600	1	0	0	1	1
700	1	0	1	0	0
800	1	0	1	0	1
900	1	0	1	1	0
1000	1	0	1	1	1
1100	1	1	0	0	0
1200	1	1	0	0	1
1300	1	1	0	1	0
1400	1	1	0	1	1
1500	1	1	1	0	0
1600	1	1	1	0	1
1700	1	1	1	1	0
1800	1	1	1	1	1
1900	0	0	0	0	0
2000	0	0	0	0	1
2100	0	0	0	1	0
2200	0	0	0	1	1

(S269)

← PRESS FOR 0

← PRESS FOR 1

↑ 1 ↑ 5

2300	0	0	1	0	0
2400	0	0	1	0	1
2500	0	0	1	1	0
2600	0	0	1	1	1
2700	0	1	0	0	0
2800	0	1	0	0	1
2900	0	1	0	1	0
3000	0	1	0	1	1
3100	0	1	1	0	0
3200	0	1	1	0	1
3300	0	1	1	1	0
3400	0	1	1	1	1

Figure 2:5 Selection of center frequency

2.3.6 IF/AF Board

The trim potentiometer R214 located at the rear of the IF/AF Board is used to adjust the AF level delivered to the 600 ohm line for channel A. Select A with the test meter and adjust to the wanted level. 0 dBm corresponds to about 9 divisions on the LED bar.

Use switch S269 to select the desired center frequency for the AF output in mode FSK and AFSK according to figure 2:5 below.

Note! Do not adjust potentiometer R249.

3. OPERATION

CONTENTS

3. OPERATION

3.1 CONTROLS (figure 3:1)

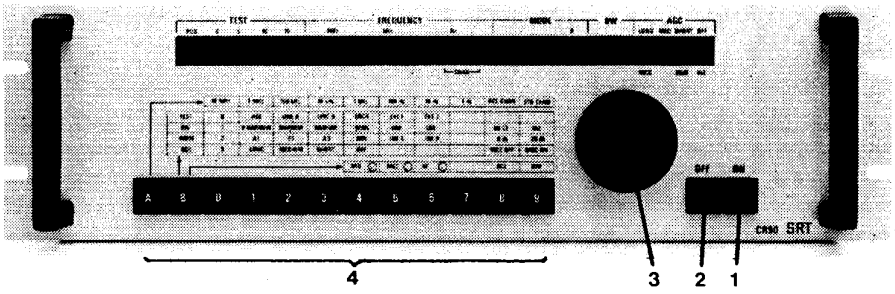


Figure 3:1 Front Panel CR90

1. ON — For DC voltage switch-on. The display is lit when the button is depressed.

   NOTE that this button does not affect the mains input, which is switched on and off with a switch on the rear of the AC Supply. (Normally this switch should be in position ON).

2. OFF — For DC voltage switch-off.

3. Tuning knob — This knob can be used for frequency tuning and adjustments of BFO, MGC and AF level if appropriate commands have been entered from the keyboard.

4. Keyboard — Push-buttons for frequency setting, test meter control, bandwidth selection, input impedance selection, mode selection, attenuation selection, AGC selection, MGC on or off, and storing and recall of setting parameters. The keyboard is also used to connect the tuning knob for various functions. (For details, see 3.3 OPERATION)

3.2 DISPLAY (figure 3:1)

The display has the following indicators from left to right:

Test	A one digit display indicating the test position and a LED-bar indicating the deflection.
Frequency	An eight digit display indicating the frequency. The two last digits are also used to indicate the channel used in the 100 channels memory.
Mode	A three digit display indicating the selected mode and a LED indicating, if channel B is connected to the loudspeaker output, when operating with ISB.
BW	A two digit display indicating the selected bandwidth
AGC	Four LEDs indicating: *AGC LONG selected *AGC MED selected *AGC SHORT selected *AGC off
MGC	MGC on
-20 dB	- 20 dB attenuation inserted
HiZ	High impedance input selected

3.3 OPERATION

All settings of the Receiver CR90 can be executed by means of SRT's Sequential Input Keyboard System.

The keyboard has two code start buttons (A and B) and ten numeric buttons (0-9). With these buttons a specific function is first selected and then the actual setting is carried out.

The specific function is selected by only two keystrokes (e.g. B and 3) and all subsequent numeric keystrokes are interpreted as setting data for the function selected.

Detailed information for various settings are given below:

3.3.1 Frequency Setting

1. Depress in sequence buttons A and 0. This gives access to the frequency parameters starting with the 10 MHz figure. Buttons A and 1 would give access to the frequency parameters starting with the 1 MHz figure (A2 = 100 kHz, A3 = 10 kHz etc). The selected position is indicated by a point immediately to the right of the figure.

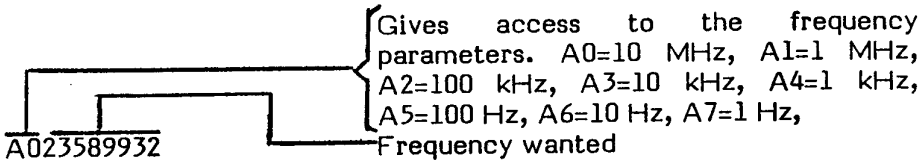
2. Enter the sequence of figures you want to set with the buttons 0-9. During this operation the point in the display indicates the next figure to be changed.

3. Instead of using the buttons, the tuning knob may be used. The knob will, however, only affect the figure selected in item 1 and more significant figures.

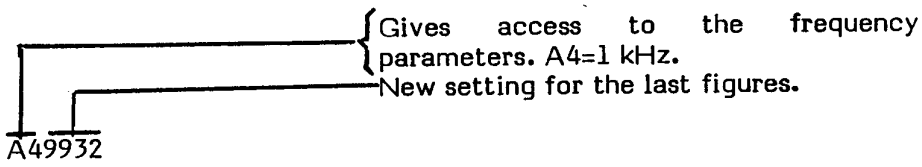
   NOTE that the knob is disabled, if other choices than A4, A5, A6 and A7 are made in item 1.

Examples

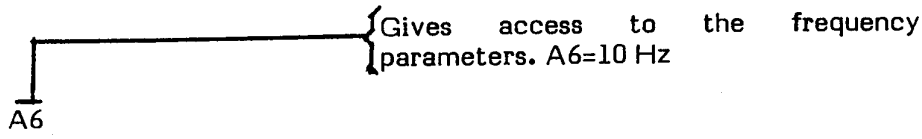
* If you want to set the frequency 23.589932 MHz, dial code:



* If you want to set the frequency 23.589932 MHz, when you already have 23.580000 MHz, dial code:



* If you want to search for a station with the tuning knob in 10 Hz steps, dial code:



3.3.2 Check of Test Positions

1. Depress in sequence buttons B and 0 which correspond to test position check.

2. Depress one of the buttons 1-6 that corresponds to the test position you want to check. The selected position and the deflection are indicated on the display.

Each test position corresponds to a specific key code as follows:

Test position	Code to be dialled	Deflection
AGC	B01	Corresponds to RF input level
Line A	B02	9 divisions corresponds to approx 0 dBm
Line B	B03	9 divisions corresponds to approx 0 dBm
Lock	B04	Normally 15 divisions
EXT 1	B05	For external measuring point connected to connector on the Connection Board (pos 14)
EXT 2	B06	Same as EXT 1

3.3.3 Bandwidth and Impedance Selection

Bandwidth

1. Depress in sequence buttons B and 1 which correspond to bandwidth selection.

2. Depress one of the buttons 1-6 that corresponds to the wanted filter. Six filters are available and the selected filter bandwidth is displayed (for USB and LSB a U and an L respectively is displayed).

Each filter corresponds to a specific key code as follows:

Filter	Code to be dialled
Very narrow(0.3 kHz standard)	B11
Narrow (0.6 kHz standard)	B12
Medium (1.5 kHz standard)	B13
Wide (6.8 kHz standard)	B14
USB (+0.25 - +3.0 kHz standard)	B15
LSB (-0.25 - -3.0 kHz standard)	B16

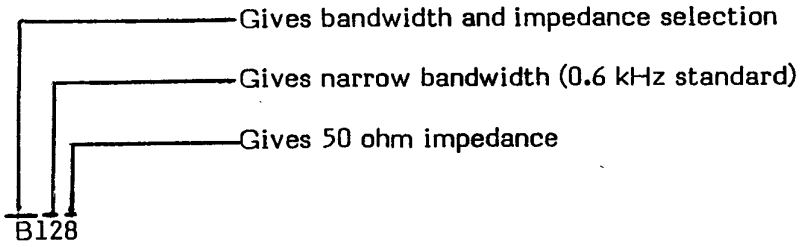
Impedance

1. Depress in sequence buttons B and 1.

2. Depress button 8 or 9 (50 ohm or high impedance) depending on the impedance wanted. High impedance is indicated by a LED on the display.

Example:

If you want to select narrow bandwidth and 50 ohm impedance, dial code



3.3.4 Mode and Attenuation Selection

Mode

1. Depress in sequence buttons B and 2 which correspond to mode selection

2. Depress one of the buttons 1-6 that corresponds to the mode wanted. The available modes are A1, F1, A3, SSB, ISB A and ISB B. The selected mode is indicated on the display, and if ISB B is selected a LED is lit.

Each mode selection corresponds to a specific key code as follows:

Mode type	Code to be dialled
A1	B21
F1	B22
A3	B23
SSB	B24
ISB A	B25
ISB B	B26

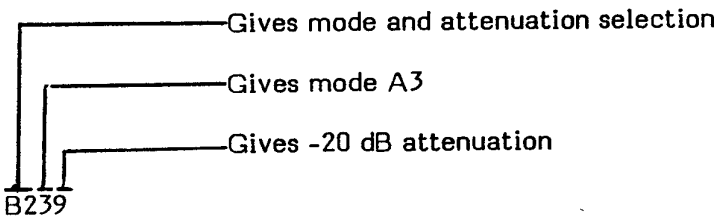
Attenuation

1. Depress in sequence buttons B and 2

2. Depress button 8 or 9 (0 dB or -20 dB) depending on the attenuation wanted. If -20 dB is selected, a LED on the display is lit.

Example:

If you want to select mode A3 and -20 dB attenuation, dial code:



3.3.5 AGC and MGC Selection

AGC

1. Depress in sequence buttons B and 3 which correspond to AGC selection.

2. Depress one of the buttons 1-4 that corresponds to the AGC function wanted. Three different decay times are available: long, medium and short, which are 5.0, 1.0 and 0.1 second respectively (the fourth selection is AGC off). The selected function is indicated by a LED in the display.

Each AGC function corresponds to a specific key code as follows:

AGC function	Code to be dialled
Long (5.0 s decay time)	B31
Medium (1.0 s decay time)	B32
Short (0.1 s decay time)	B33
Off	~~B24~~ 834

MGC
---

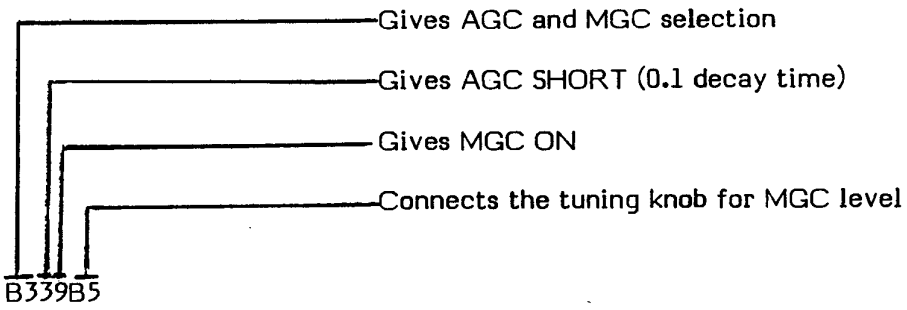
1. Depress in sequence buttons B and 3

2. Depress button 8 or 9 (MGC OFF or ON) depending on the function wanted. MGC ON is indicated by a LED in the display.

3. If MGC ON is selected, code B5 makes it possible to adjust the MGC level with the tuning knob.

Example

If you want to select AGC short and adjust the MGC level, dial code



3.3.6 BFO Adjustment

1. Depress in sequence buttons B and 4 which connects the tuning knob for adjustment of the BFO frequency.

3.3.7 AF Level Adjustment

1. Depress in sequence buttons B and 6 which connect the tuning knob for adjustment of the AF level.

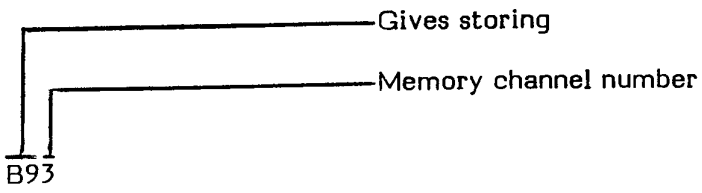
3.3.8 Use of 9 Channels Memory

Storing

1. Depress in sequence buttons B and 9.
2. Depress one of the buttons 1-9 that corresponds to the desired memory channel. All setting parameters will be stored in the selected channel.

Example

If you want to store the settings in memory channel 3, dial code:

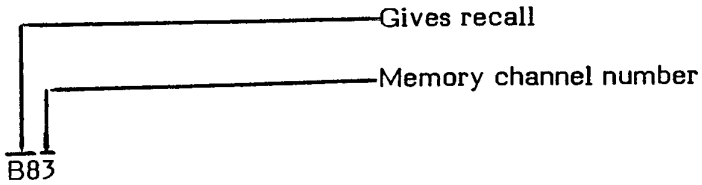


Recall

1. Depress in sequence buttons B and 8
2. Depress one of the buttons 1-9 that corresponds to the desired memory channel. All setting parameters stored in that channel are then recalled

Example

If you want to recall the setting parameters from memory channel 3, dial code:



3.3.9 Use of 100 Channels Memory

Storing is only possible when the switch on the Channel Board is set to the lower position (see figre 2:1)

Storing
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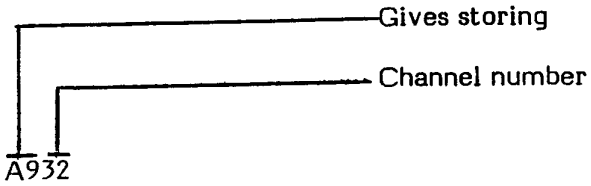
1. Depress in sequence buttons A and 9

2. Give the desired channel number 00-99 with the buttons 0-9. The selected channel number is indicated on the display, and all setting parameters are stored in the selected channel.

Example:

If you want to store the settings in optional memory channel 32, dial code:



Recall
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1. Depress in sequence buttons A and 8

2. Give the desired channel number 00-99 with the buttons 0-9. The selected channel is indicated on the display, and all setting parameters are recalled.

Example:

If you want to recall the setting parameters from the optional memory channel 63, dial code: