

Courtesy HB9DON and W2HX

**H F Radio**

**BCC 39B**

**USER HANDBOOK**

**RACAL**

*The Electronics Group*

Courtesy HB9DON and W2HX

**USER HANDBOOK**

**FOR**

**H F RADIO**

**BCC 39B**

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BCC39B USER

HF Manpack Radio BCC 39B

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HB9DON and W2HX

Courtesy HB9DON and W2HX

**HF RADIO BCC 39B**

**USER HANDBOOK**

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CHAPTER 1  
**GENERAL INFORMATION**

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CHAPTER 1  
GENERAL INFORMATION

ROLE

- 1 The BCC39B is a high power HF manpack radio oriented towards long range patrol operation using short burst transmissions (CW or data using FSK keying from an ancillary unit). The unwanted radiation from the receiver is kept at a very low level and when using the associated ATU, the BCC 565 (see Fig. 3), the tuning times are very short. Operation can take place using single frequency simplex and two frequency simplex (half duplex). The controls (except on/off) are on a removable unit which may be extended, using a special cable, for use by an operator on the move. The radio, the control panel and the connector are separately sealed.

NOTE: A summary of the features and options available are summarised in para 10.

PARAMETERS

- 2 The main parameters of the radio are:

Frequency range:	1.5 - 29.9999 MHz in 100Hz steps. Single frequency simplex or two frequency simplex.
Operating modes	SSB (USB and LSB), CW, FSK data.
Preset Channels	10. In two frequency simplex operation 0 - 4 are allocated to the transmit frequency and 5-9 to the receive frequency.
Transmitter Power	50W High Power 5 W Low Power
Supply Voltage	20V - 32V
Battery Life (50W) (5W)	18 hours with 4Ah NiCd at 1:99 Tx/Rx 19 hours with 4Ah NiCd at 1:9 Tx/Rx
Antenna without ATU	Dipole adjusted for frequency
Operating temperature	-40°C to +70°C
Duty cycle	High power switches to low power if PA temperature becomes excessive. Duty cycle continuous HP below 20°C reducing to about 1 minute at 70°C. Low power duty cycle is continuous.
Width	207 mm
Height	77 mm

Depth	155 mm less battery 290 mm with NiCd battery 225 mm with Lithium battery
Weight	2.5 kg less battery 6.1 kg with NiCd battery 3.8 kg with Lithium battery
3 ATU Parameters	
Frequency	1.5 to 30MHz
Tuning Time	200ms for an active tune. Once tuned, the built in memory resets without radiation.
Antenna	2.4 m whip or wire antenna between 1/12 and 3/8 wavelength.
Width	207 mm
Depth	32.5 mm
Height	175 mm
Weight	1.25 kg

**CONTROLS**

4 On/Off switch	Z      Zeroise radio memory. OFF    All power off (radio memory retained) AUX    Radio power off, power to ATU and auxilliaries on. ON 1F Normal operation, single frequency simplex ON 2F Normal operation, two frequency simplex.
-----------------	---

A mechanical stop is placed between Z and OFF, released by pressing a button at the side, to avoid zeroising the memory unintentionally.

NOTE: Zeroise can only take place if a battery is connected.

**5 Keyboard (on removable panel)**

Digits 0-9 are used to :-

- Set frequency
- Set channel number

Arrow keys are used to:

▲ Increase volume in 7 steps (6dB per step)

▼ Decrease volume in 7 steps

NOTE: They are also used to increase or decrease frequency when in "search" mode.

On switch on volume is set to a mid value.

MODE	Using toggle action selects in sequence USB/Voice, display USB USB/CW, display USB CW LSB/Voice, display LSB LSB/CW, display LSB CW Display indicates the selection.
	NOTE: For Voice mode position 4 of display (normally CW) is blank.
PWR	Using toggle action selects in sequence:- High power (50W) display - HP Low power (5W) display - LP
TUNE	Initiates an active tune on selected frequency NOTE: Changing to a new frequency or untuned channel automatically initiates an active tune when PTT is next operated. In two frequency simplex the TUNE key initiates an active tune on the "receive" frequency, the "transmit" frequency is automatically tuned when the PTT is next operated.
SET	Sets (stores) the following digits into memory as frequency.
CH	Single frequency simplex:- Sets the working channel when followed by a digit (0 to 9).  Two frequency simplex:- Changes the display to show the Rx or Tx channels and frequency when toggled. When followed by a digit it sets the working channel (Tx 0-4, Rx 5-9)
T	Test key. An active test sequence is initiated when the Test key is operated. Also used to illuminate the display.

**DISPLAY (see Fig. 2)**

6 The display is divided into 16 areas as follows:-

- 1      USB    Upper sideband
- 2      LSB    Lower sideband
- 3      ◀▶    Search mode
- 4      CW     CW mode or Voice/data mode

NOTE:- Voice/data mode has no display

- 5 HP High power output  
6 LP Lower power output  
7 Tx) Used when in two frequency simplex mode to show whether  
8 Rx) the channel and frequency displayed is for Tx or Rx.  
Both Tx and Rx are displayed in the single frequency  
simplex mode.  
NOTE: Tx or Rx does not indicate that the radio is  
transmitting or receiving.  
9 0-9 Channel number  
10 Bars 5 Horizontal bars. Shows 0 to 5 bars to indicate the  
received signal level (the more bars the stronger the  
signal). When transmitting the bars display the power  
output relative to that selected. During a Test sequence  
the bars show the battery voltage.  
11-16 0-9 Frequency of the selected channel (with a fixed decimal  
point after the first two digits) in MHz.

#### CONNECTORS

7 Coaxial socket 50ohm Antenna connector (50ohm) BNC

Audio socket (x2) AUDIO Two types are available:

##### Pattern 105

- Audio socket 7 pin Patt 105 (F)  
A Microphone  
B Microphone return  
C +24V for auxilliaries  
D Phones  
E Earth return  
F PTT  
G Phones

##### US Audio Socket

- Audio socket 5 pin, US type to MIL-C-55116  
A Earth return  
B Phones  
C PTT  
D Microphone  
E +24V for auxilliaries

Control panel connector Three way special

- A Earth  
B Supply, +5V  
C Data, 5V logic

Supply terminals (x2)  
(rear panel) Battery connector special  
+24V  
-24V

### BATTERY

- 8 Two types are available:

24V 4Ah NiCd rechargeable to "Clansman" interface  
or

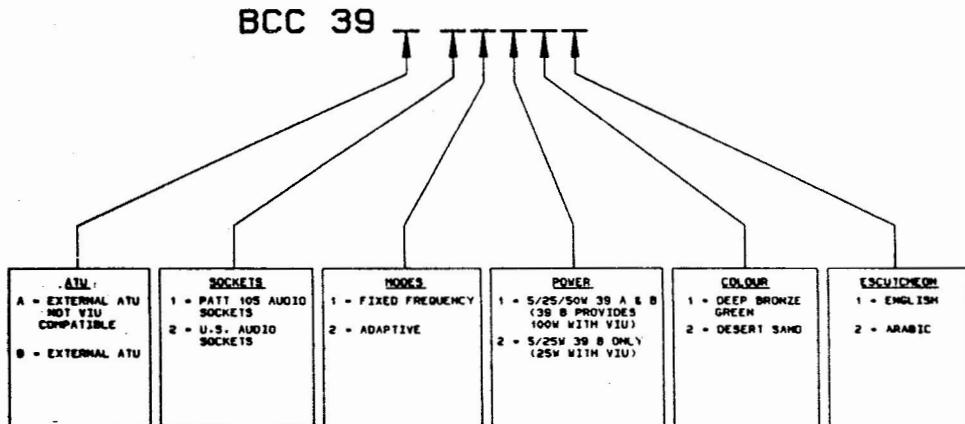
24V 15Ah Lithium primary to "Clansman" interface.

### FUSES

- 9 A special wired in fuse link is fitted to the rear panel of the BCC 39B. This fuse is rated at 15A.

### OPTIONAL FACILITIES

- 10 The BCC 39B can be tailored to meet customer and installation requirements. Various options are available which are summarised by a letter and five figure code.



NOTE: This chart includes the BCC 39A version.

- 11 The Adaptive mode, which is an optional facility, offers alternative methods of 'Best Frequency' selection during adverse communication conditions. Information on the Adaptive mode is in Chapter 5.

CHAPTER 2

**ASSEMBLY**

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CHAPTER 2

ASSEMBLY

**STATION ITEMS**

- 1 The following items make up a BCC 39B station.

BCC39B  
Battery 24V  
Dipole antenna (if BCC 565 is not used)  
Carrying pouch or frame (optional)  
Handset/Headset  
Morse key  
BCC 565 ATU (optional)  
2.4 m whip antenna (if BCC 565 is used)  
Long wire antenna (if BCC 565 is used)  
Coaxial connector for ATU (short) (if BCC 565 is used)  
Coaxial connector for ATU (long) (if BCC 565 is used remotely)  
Ground Spike (if used with BCC 565 and long wire antenna)  
Control panel connector (if remote control is needed)

NOTE: For typical installation see Fig. 5.

**FITTING THE BATTERY**

- 2 The battery is clipped to the rear of the radio using two over-centre sprung clips. It cannot be fitted incorrectly as the contact area is offset and is mechanically protected. Ensure that the radio and battery contacts are clean before fitting. If there is a likelihood of immersion in water smear both sets of contacts with petroleum jelly.

**ANTENNAS**

- 3 Without BCC565 ATU.

A dipole antenna adjusted to the frequency in use may be connected directly to the 50ohm socket on the BCC 39B. The MA654 dipole antenna kit is suitable for operation from 3-30MHz and has markers at 0.5MHz intervals

With BCC 565 ATU

The BCC 565 may be clipped directly onto the BCC 39B using two over-centre clips. A "short" coaxial connector is fitted between the 50ohm socket on the radio and the one on the ATU. Alternatively the BCC 565 may be operated remotely from the BCC 39B using the "long" coaxial connector. The maximum length of coaxial connector is 50m.

Antennas for use with the BCC565:-

2.4m whip. Erect by laying out on the ground and pulling the inner wire at the top end until all sections are fully located. Fit to the hexagonal socket on the ATU and lock with the securing flange. If operating with the radio on the ground, an earth connection should be made between the Earth terminal on the ATU and a ground spike.

Wire antennas. These should be set to be between 1/12 and 3/8 of a wavelength. The dipole wires of MA654 may be used as single wire antennas, the markings will give  $\frac{1}{2}$  wavelength but need not be adhered to. Connect the antenna wire to the hexagonal socket using the special "wire adaptor" supplied with the ATU. An earth connection should be made between the Earth terminal on the ATU and a ground spike when using single wire antennas.

#### HANDSET/HEADSET

- 4 The BCC 39B is normally fitted with British type (pattern 105) audio sockets which can be used with any headset/handset using "Clansman" style connectors with 7 pins. The handset/headset is fitted to either of the sockets marked "Audio".

NOTE: An alternative to the British sockets is the US type audio sockets which are intended for use with US style handsets, see Fig. 4.

#### MORSE KEY

- 5 The Morse key, fitted with US or British style connector as appropriate should be plugged into the audio socket not in use by the handset/headset.

#### MEANS OF CARRIAGE

- 6 The BCC 39B may be carried loose in the operators rucksack, in a carrying pouch or on a carrying frame. There are three carrying frames available:

- (a) Jaguar Radio Carrying Frame with Plate Adapter 49270-020-10.
- (b) Carrying Frame Lightweight 49270-024-10 (see Fig. 6).
- (c) Carrying Frame Shock Protected 49270-022-10 (see Fig. 5).

**CONTROL PANEL DETACHED FROM RADIO (Fig. 1)**

- 7 The BCC 398 may be operated with the control panel on an extension cable. Turn the locking lever anticlockwise through 90° and carefully remove the control panel. Fit the extension cable (button end) to the radio and the other (spring contact) end to the control panel, rotating the locking lever clockwise. To replace, carefully insert the right hand end of the control panel onto the lug on the radio before closing the contacts and rotating the locking lever. The part number for the extension cable is 49270-010-10.

CHAPTER 3  
OPERATING INSTRUCTIONS

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CHAPTER 3  
**OPERATING INSTRUCTIONS**

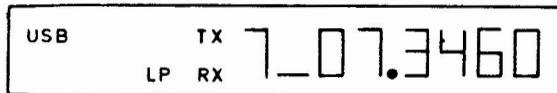
NOTE: The BCC 39B front panel controls are shown in Fig. 2.

**PRELIMINARY**

- 1 Connect a battery in charged condition to the rear panel as described in Chapter 2.
- 2 Connect the headset/handset to either of the audio sockets.
- 3 For morse key operation connect the key to the other audio socket.
- 4 Connect an antenna as described in Chapter 2 using the ATU if required.

**OPERATION IN SINGLE FREQUENCY SIMPLEX MODE**

- 5 Turn the on/off switch to ON-1F. The display will show the mode, power, channel and frequency in which the radio was last operated. The volume is reset to a medium level at switch on.
- 6 If the channels have already been set with the required frequencies press CH and the required channel number. The display will show the channel number and its frequency:-

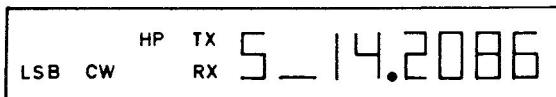


For USB, Voice, low power, channel 7 on 7.3460 MHz.

NOTE: If position 4 of display is blank it indicates Voice operation, see Chapter 1, para 6.

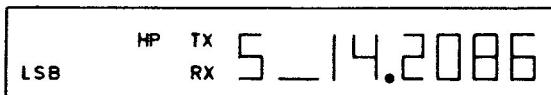
If the channel frequencies need re-setting see paragraph 14 for frequency setting.

To change to channel 5 - press CH - 5.

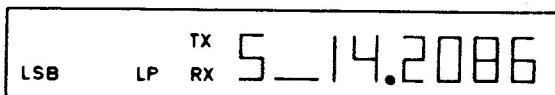


For LSB, CW, High Power channel 5 on 14.2086 MHz.

- 7 To change the mode, toggle the MODE key until the display shows the required modes. The BCC 39B toggles in the sequence USB/Voice, USB/CW, LSB/Voice, LSB/CW. To change the mode from that given above to LSB/Voice press the MODE key three times giving the display:



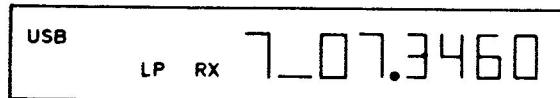
- 8 To change the power output toggle the PWR key, the radio will change from high to low power and then back at each press of the key. To change the power from that given above to Low Power press the PWR key once giving the display:



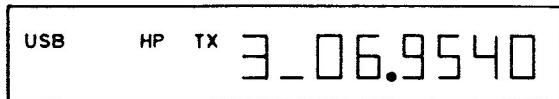
- 9 If there has been a change to a new frequency the radio will automatically re-tune the ATU (if used) when the PTT is next operated. If the radio is to receive before transmitting it will be necessary to press the TUNE key to initiate an active tune sequence. Also if the antenna has been changed or moved without changing frequency it will be necessary to press the TUNE key. The active tune sequence is very short (1/5 second). Once the ATU has been tuned on a frequency it will store the setting and come back to it when ever that channel and frequency is next called up. There will thus be no further active tune sequence and power will not be radiated.
- 10 The audio level (volume) is controlled in seven 6dB steps by pressing the ▲ key to increase the level and the ▼ key to reduce the level. At switch on the volume is always set to the mid level.

**OPERATION IN TWO FREQUENCY SIMPLEX MODE**

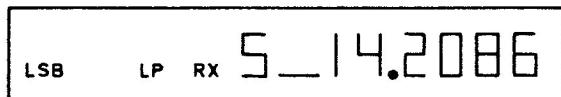
- 11 Turn the on/off switch to ON-2F. The display will show the mode, power, channel and frequency as before but in addition it will show which of the two preset channels is used for Transmit (Tx) and which for Receive (Rx). Channels numbered 0-4 are allocated to the Tx frequencies and channels 5-9 are allocated to the Rx frequencies. If the channels are already set with the correct frequencies the display may show



indicating USB, Voice, Low Power, Receive channel No 7 with frequency 7.3460 MHz. To display the Tx channel and frequency press CH once giving



for USB, Voice, High Power, Tx channel 3 on 6.9540 MHz. To change a Tx or Rx channel press CH and a digit key (0-4 for Tx and 5-9 for Rx). Thus to change the above setting to give Rx channel 5 press CH-5 the display will show



for LSB, Voice, Low Power, Rx channel 5 on 14.2086 MHz. Note that the channel frequencies and modes stay the same whether operation in single or two frequency simplex is required.

- 12 There is no change in operation of modes and power for two frequency simplex which are as stated in paragraphs 7 and 8.
- 13 Tuning the ATU is also similar except that now there are two frequencies for the ATU to select. After selection of a new frequency always press TUNE to initiate an active tune on the Rx frequency. Then the next PTT operation will cause an active tune on the Tx frequency. After this the ATU will store both settings and will select the Tx or Rx channel settings automatically.

### CHANGING CHANNEL FREQUENCIES

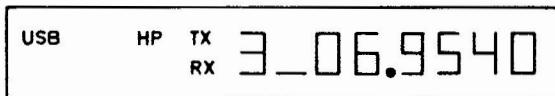
- 14 To change the frequency of a channel, first set the radio to operate on that channel by pressing CH-3 for example. Then press SET and the digits of the new frequency. The display will blank the frequency digits as soon as the SET key is pressed and will show each digit as it is keyed. Once each digit is shown correctly the frequency is stored. If an error is made at any moment, press SET and key in the frequency again.

Note it is always necessary to key in the initial "0" of frequencies below 10 MHz.

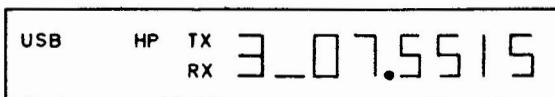
Example:-

Change channel 3 to 07.5515 MHz.

Key CH - 3



Key SET - 075515



This operation is the same for single and two frequency simplex operation. Remember the display must show the channel to be changed before pressing SET. With two frequency simplex it may be necessary to toggle the CH key to display the required channel.

### SWITCHING FROM TWO TO SINGLE FREQUENCY SIMPLEX

- 15 The frequencies set into each channel do not change when switching between two and single frequency simplex. Thus it is possible to receive temporarily on a Tx channel by switching to the single frequency simplex (ON - 1F) mode to see if that channel is clear of interference.

### SPEECH OPERATION

- 16 The maximum microphone sensitivity automatically changes with the volume control setting such that it is most sensitive when the volume control is set at a low level, i.e. in quiet conditions. An automatic modulation control circuit is also provided so that even at low volume control settings loud speech will not overload the transmitter.

### CW OPERATION

- 17 When operating in the CW mode the radio transmits a signal 1kHz offset from the displayed frequency (above it for USB and below it for LSB). This signal then is heard as a 1kHz tone in the operators earphones when the receivers displayed frequency is the same as that of the transmitter. This tone will be heard in both voice and CW modes but an additional narrow filter at 1kHz is added when in the CW mode to improve the signal to noise ratio and to reject interference. Operation of the key puts the radio immediately into the transmit mode and the radio remains on the transmit mode whether actually transmitting (key down) or not transmitting (key up) until about 0.5 second after the last key down of a transmission. The radio then reverts to the receive mode.

### OPERATION WITH MESSAGE TERMINAL UNIT

(Merod or similar)

- 18 When operating with any Message Terminal Unit for sending data over the BCC 39B the radio should be set to the "Voice" mode. The input and output levels of suitable units are compatible with the audio levels and the connection to the radio is to either of the normal audio sockets. As the data is sent as a continuous signal the transmitter temperature will rise more quickly than with Voice or CW operation and so care should be taken when using High Power at high ambient temperatures ( $30^{\circ}\text{C}$  and above) to limit the message times to 30 seconds or less. If the transmitter temperature becomes excessive the radio will automatically switch to Low Power indicated by a low reading on the 5 bar display. There is no message time limit when operating on low power.

### TEST AND MEASUREMENT

- 19 At all times while receiving, the 5 bar display gives an indication of the received signal strength, the more bars the stronger the signal. When transmitting the 5 bars indicate the transmitter power such that 3 bars indicates that the nominal power (5W or 50W) is being delivered to the ATU. A poor VSWR can affect the power output so that a low indication does not necessarily mean a faulty transmitter. The power shown may also be low due to a discharged battery. Operating the T (Test) key initiates a test sequence and while it is held down the bars indicate the battery voltage with 5 bars for a fully charged battery with a receive load. The voltage will drop when transmitting. A good test of the battery is to press T while transmitting on high power, two or three bars indicates a good battery, no bars indicates that the battery is discharged and should be changed. The test sequence mentioned above carries out a simple test on the functions of the radio. If a fault is detected the frequency part of the display is blanked and replaced by a digit indicating the type of fault.

#### DISPLAY ILLUMINATION

- 20 The display can be illuminated for use at night by operating the T key. To save battery drain the light goes out after 15 seconds. It will stay on while other keys are being pressed (but not initiated by other than the T key) and go out 15 seconds after the last key has been pressed.

#### SEARCH MODE

- 21 If small changes in frequency are required either to adjust to another radio which has drifted off frequency or to search for a clear channel a "Search" mode can be initiated as follows:

Press the CH key twice rapidly (within  $\frac{1}{2}$  second). The  symbol in the display will show that the radio is operating in the "search" mode.

Press the ▲ key to increase frequency by 100Hz or the ▼ key to decrease frequency by 100Hz. Repeated operation of these keys progressively steps the operating frequency. For more rapid frequency changes, hold either of these keys down for more than a second when the frequency will change rapidly in 100Hz steps until the key is released.

To return to the normal mode of operation either:-

Press CH once when the original channel frequency will be re-set or

Press SET when the new frequency, as displayed, will be set into the channel and be stored.

In single frequency simplex, any transmissions made while in the "search" mode will be at the new frequency found by searching.

In two frequency simplex mode "search" is only effective while an "Rx" channel is being displayed and any transmission will take place on the normal Tx channel frequency. It is however possible to change the Tx channel frequency by temporarily switching to ON-1F while "searching" then reverting to ON-2F.

While in "search", "power" and "mode" changes can be made in the normal way but it is not possible to alter the volume setting.

**ERROR TONE**

- 22 A two note error tone is initiated under certain conditions:-

Low battery (less than 20 V) while transmitting.  
While Zeroising the frequencies (switch set to Z).  
Operation with no frequency programmed (after zeroising).

The error tone ceases when the condition is corrected.

**WARNING**

- 23 The BCC 39B is a high power radio and if it is operated at high power into a short antenna at low frequencies very high RF voltages will be generated at the antenna. These can cause unpleasant "RF burns". If the radio is not earthed through a short braid to an earth spike, the radio itself, handset and key can rise to high voltages and also cause a burn.

Therefore:-      1) Always earth the radio when it is static and especially when using High Power.

                      2) When operating mobile (man carried) use Low Power only. The RF voltages will be lessened if the radio is mounted for carriage on a substantial metal frame to which it is connected electrically.

## CHAPTER 4

### USER MAINTENANCE

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## CHAPTER 4

### USER MAINTENANCE

#### INTRODUCTION

1. User maintenance of the BCC 39B is restricted to the periodic performance of the cleaning, lubrication and inspection procedures set out in this Chapter.
2. The frequency with which each of the user maintenance procedures is applied, and whether or not every operation of a particular procedure is required at every maintenance period, depends upon local circumstances. However, it is recommended that all the procedures are conducted in full before returning the radio to stores following its use in the field.

#### TOOLS AND MATERIALS REQUIRED

3. (1) Small, clean, dusting brush.  
(2) Clean, soft, lint-free cloth.  
(3) Clean water.  
(4) Petroleum jelly.

#### CLEANING

##### WARNING

UNDER NO CIRCUMSTANCES ATTEMPT TO CLEAN THE RADIO USING SOLVENTS, DETERGENTS OR ABRASIVE SUBSTANCES. TO DO SO CAN RESULT IN DAMAGE TO THE DISPLAY WINDOW AND/OR THE UNIT SEALS, THUS IMPAIRING THE OPERATIONAL EFFICIENCY OF THE UNIT.

DO NOT ZEROISE (Z ON THE ON/OFF SWITCH) THE BCC 39B UNLESS THIS IS A REQUIREMENT AND IN ANY CASE DO NOT LEAVE IN THE ZEROISE POSITION FOR EXTENDED PERIODS.

4. Proceed as follows:

- (1) Taking care not to scratch or otherwise damage the window protecting the display, remove all loose dirt, grit, etc. from the exterior of the radio. A dusting brush should be used to clean out corners and recesses, around the keypad pushbuttons, etc.

- (2) Moisten a piece of clean, lint-free cloth in clean water (warm water may be used, if available).
- (3) Using the moist cloth, thoroughly wipe over the exterior surfaces to remove any remaining dirt and stains. Caked dirt should be 'soaked' off.
- (4) Using a dry, clean, lint-free cloth, dry the exterior of the radio. Ensure that all moisture is removed from within recesses, connector sockets, etc.

#### **ANTI-CORROSION**

5. Immediately following cleaning, the battery input terminals on the BCC 39B (i.e. the pair of stud contacts contained on the rear panel) must be coated with petroleum jelly to protect them against corrosion.
6. It is important that this protection is maintained while the radio is in use, especially if there is a possibility that it will be subjected to immersion in salt water or exposed to salt spray.

#### **INSPECTION**

7. Should a defect be found during any stage of the procedure which follows, the first-line repair authority must be notified. Under no circumstances should user personnel attempt any repair.
8. Proceed as follows:
  - (1) Examine the exterior of the radio for indications of mechanical damage, paying particular attention on the BCC 39B to the seals fitted between the front and rear panel assemblies and the centre sleeve section of the case.
  - (2) Confirm that all the screws fixing the panel assemblies are present and securely tightened.
  - (3) Inspect the display window for scratches and other marking. In particular, check that there is no blemish which could obscure or distort any part of the display.

- (4) At the ON/OFF switch:
  - (i) Check that the control knob is correctly orientated and securely fastened.
  - (ii) Check that the mechanical lock operates and releases correctly.
  - (iii) Check for the correct mechanical operation of the switch over its complete range of movement.  
(N.B. do not put the CHAN switch to Z (zeroise) unless this is required to be done).
- (5) Depress and release each of the keypad pushbuttons in turn, checking that the pushbutton operates and releases correctly (a slight click should be heard).
- (6) Check that each of the multi-way and coaxial connectors on the front panel is undamaged and securely fitted. Also check that the connector interior and pins are clean and dry.
- (7) Check that all plugs and sockets on the front panel are provided with a protective cap. Confirm that each of these caps is clean and undamaged and that the cap retaining strap is intact.
- (8) At the rear panel, check that the battery terminals are clean and are protected against corrosion by a film of petroleum jelly.
- (9) Check all headsets and handsets for external damage and cleanliness.
- (10) Check the whip or wire antenna for damage and correct function.

**CHAPTER 5**  
**ADAPTIVE MODE**

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## CHAPTER 5

### ADAPTIVE MODE (OPTIONAL FACILITY)

#### INTRODUCTION

- 1 During adverse communications conditions in the HF spectrum the adaptive mode of the BCC 39B offers an alternative method of "Best Frequency" selection. This automatic selection occurs when "Point to Point", (Mode 5) or "Net" (Mode 4) is selected on the keyboard. Point to Point, mode 5, is used for two radio operation in the adaptive mode. Net, mode 4, is used when three or more radios wish to operate in the adaptive mode. The adaptive mode is an optional facility.

#### FREQUENCIES

- 2 The frequencies used in the Adaptive mode are whole numbers of kHz. They will be the "Channel Frequency" with the 100 Hz digit omitted and the 7 higher and 7 lower frequencies with channel spacing set according to the centre frequency:

<u>Frequency MHz</u>	<u>Channel Spacing kHz</u>
1.5 - 5.0	2.0
5.0 - 10.0	4.0
10.0 - 15.0	8.0
15.0 - 30.0	16.0

This ensures that all the 15 frequencies are within the ATU pass band.

- 3 If for some reason the chosen frequency is found to be unsatisfactory, it can be relegated to the bottom of the priority list by pressing SET and then ▼. Similarly, if a frequency is found to be good it can be upgraded by pressing SET and ▲. It will then be the most likely frequency to be selected following radio silence of 45 seconds.
- 4 Operation in the Adaptive mode is always in the Voice/USB mode. This allows Voice to be transmitted but not C.W.
- 5 The code sequence changes with the pre-programed frequency, and is arranged so that two BCC 39B nets on nearby frequencies cannot recognise each others codes, therefore avoiding mutual interference.
- 6 If the channel number or frequency is changed while in the Adaptive mode, the radio reverts to the initial state and 5 seconds of channel search are allowed to build up the new channel quality list.

**CONTROLS**

- 7 To enter the Adaptive mode, ensure that the radio is switched to the IF position. Press the "MODE" key until the final digit of the frequency display changes to "n" (Net mode) or "P" (Point to Point mode) as required.
- 8 The sequence of modes selected when the "Mode" key is sequentially depressed is as follows:

MODE 0	USB/VOICE	display - USB
MODE 1	LSB/VOICE	display - LSB
MODE 2	USB/CW	display - USB/CW
MODE 3	LSB/CW	display - LSB/CW
MODE 4	ADAPTIVE NET	display - USB with last digit of frequency changed to "n".
MODE 5	ADAPTIVE POINT TO POINT	display - USB with last digit of frequency changed to "P".

- 9 An alternative method of selecting the required mode is to select the pre-allocated digit for any particular mode. By keying "MODE" - and the digit number in sequence the following selections are made:

<u>Key</u>	<u>Digit</u>	<u>Selected Mode</u>
MODE	0	USB/VOICE
MODE	1	LSB/VOICE
MODE	2	USB/CW
MODE	3	LSB/CW
MODE	4	ADAPTIVE NET
MODE	5	ADAPTIVE POINT TO POINT

The display will be as indicated in 8.

**OPERATING IN POINT TO POINT ADAPTIVE MODE**

- | 10 | <u>Action</u>   | <u>Effect</u>   |
|----|---|---|
|    | (a) Both stations must commence on a common frequency | -   |
|    | (b) Both stations select MODE 5                       | A tune operation will be carried out automatically on entering this mode. The receivers are muted by squelch operation. The last frequency digit changes to a flashing "P". |

- (c) When the "P" becomes static the controlling station holds down the PTT switch.  
(The PTT line is inhibited while the "P" is flashing).

A series of rapid pips are heard as sidetone alerts operators that a link set-up is in progress. When the pips cease and the receiver squelch lifts the operator can speak. Provided there is a response within approximately 30 seconds the radios will remain on their selected frequencies.

#### **Station Time Out**

- 11 Should the called station time out for any reason and automatically revert to channel frequency assessment the CONTROLLER can re-establish the link by pressing the PTT switch 3 times within 1 second and holding it down on the third press.

#### **Receipt of Alert Indicator**

- 12 The alert indicator can be received when the receiver is in USB mode. The display will show "P-P" or "Net" and sidetone pips will be heard. This alerts the operator that a Point to Point or Net link-up is in progress based on the receivers centre frequency, and dependent on the operational plan, may mean that the receiving station should change to Point to Point or Net operation (or) is being alerted that the Point to Point or Net mode is in use.

#### **Operator Initiation of Channel Assessment**

- 13 The squelch will close and the receiver will AUTOMATICALLY revert to channel frequency assessment if no transmissions are received in the Point to Point mode for approximately 45 seconds. The operator may override this time period by pressing keys "T" and "3" in sequence causing the squelch to close immediately and the receiver will automatically revert to channel frequency assessment.

#### **OPERATING IN NET ADAPTIVE MODE**

14	<u>Action</u>	<u>Effect</u>
	(a) All stations must commence on a common frequency	-
	(b) All stations select MODE 4	A tune operation will be carried out on entering this mode. The receivers are muted by squelch operation. The last frequency digit changes to a flashing "n".

- (c) When the "n" becomes static the controlling station holds down the PTT switch.  
(The PTT line is inhibited while the "n" is flashing).

A series of rapid pips are heard as sidetone alerts operators that a link set-up is in progress. When the pips cease and the receiver squelch lifts, the operator can speak. Provided there is a response within approximately 30 seconds the radios will remain on the selected frequency.

#### **Station Time Out**

- 15 Should the called station time out for any reason and automatically revert to channel frequency assessment the CONTROLLER only should re-establish the link by pressing the PTT switch 3 times within 1 second and holding it down on the third press. In the event that the CONTROLLER station times out, all stations should remain in NET mode 4 until the link-up is re-established by the CONTROLLER, or as directed by local procedures.

#### **Receipt of Alert Indicator**

- 16 The alert indicator can be received when the receiver is in USB mode. The display will show "P-P" or "Net" and sidetone pips will be heard. This alerts the operator that a Point to Point or Net link-up is in progress based on the receivers centre frequency, and dependent on the operational plan, may mean that the receiving station should change to Point to Point or Net operation (or) is being alerted that the Point to Point or Net mode is in use.

#### **Operator Initiation of Channel Assessment**

- 17 The squelch will close and the receiver will AUTOMATICALLY revert to channel frequency assessment if no transmissions are received in the NET mode for approximately 45 seconds. The operator may override this time period by pressing keys "T" and "3" causing the squelch to close immediately and the receiver will automatically revert to channel frequency assessment.

#### **INTRODUCTION USER MENU**

- 18 This user menu is a feature specific to the BCC 39B Adaptive radio. To allow the user to set the adaptive squelch times or cause the radio to execute its BITE program, a small menu system has been provided on the radio keyboard.

- 19 Setting the squelch times, will enable the user to define the length of time the squelch remains open after the last transmission on an adaptive link. The default value for both Net and Point to Point modes is 45 seconds; this is set if the radio is zeroised. The squelch (dwell time) of each mode can be set independently to any whole number value between 30 and 599 seconds.
- 20 BITE - Built In Test Equipment - can be used as part of a functional test for the BCC 39B Adaptive radio. No extra equipment is needed except for a handset or headset. It aids in the fault finding and fault diagnosis of the radio. Using inputs from the user, BITE can carry out various tests at unit, board and component level. This means that a large number of faults can be traced to board level without the need for the radio to be removed from its carrying frame or vehicle installation.

#### INITIAL INSTRUCTIONS

- 21 The function menu for the BCC 39B Adaptive radio can be accessed by pressing the TEST key followed by the Mode key within 1 second of each other.

The display will then show - " t.SEt ?"

- 22 This is the first option in the menu, and if selected will allow the setting of the squelch for the adaptive modes. To select this facility press the up arrow key ▲, if it is not required, press the down arrow key ▼. If any other key is pressed, or after the 25 second time out, the radio will leave the menu and resume operation in the previous mode and frequency.

- 23 If this option is not required, and the operator presses the down arrow key ▼, the display will show:

" bItE ?"

- 24 This is the second option in the menu, and if selected will execute the radio's BITE program. As stated previously to select this facility press the up arrow key ▲, if it is not required press the down arrow key ▼.

#### SQUELCH OPTION

- 25 If this option is selected as described the display will show:

" P 045 " - where ' P ' indicates that the time out is for the point to point mode and the ' 045 ' shows the relevant squelch time in seconds. As stated before the default value will be ' 045 ' i.e. 45 seconds. If the value is as desired, pressing the up arrow key ▲ will change the display to the net squelch time:

" N 045 "

- 26 If the squelch time indicated of either mode is not as required, it can easily be changed. By pressing the SET key the squelch value clears and a flashing cursor indicates that an input is required:

" P - " - at this point the new value for the squelch may be inputted as a three digit number between 030 and 599. For times less than 100 seconds the leading 0 must be entered. The new squelch time will only be accepted if it lies between the permitted values.

- 27 The squelch option can be left by pressing the down arrow key ▼. The radio will revert to the mode and frequency selected before entering the menu.

#### BITE OPTION

- 28 The BCC 39B Adaptive radio is modular in design, with the modules linked by a bus interconnect system. BITE monitors this interconnect system, measuring signals and voltages from the various modules. The signals are passed through the Analogue to Digital convertor on the Central Control Unit (CCU) to the processor. Here the readings are checked against the test limits, depending on the outcome a pass or fail is shown on the keyboard display. If the test is a failure, the test measurement and the failed unit are displayed.

- 29 BITE can also be used to indicate a system problem as it can test inputs and signals received by the radio. External problems such as a low voltage power supply can be highlighted. The handset, headset and keyboard can be tested, by the user relaying back to the radio information, such as audible tones and keyboard displays.

- 30 This version of the BITE software contains ten tests, and they are carried out in the following order:

- 1 - Key pad test
- 2 - Socket test
- 3 - Battery test
- 4 - Five volt test
- 5 - Twenty volt test
- 6 - Transmit audio CW test
- 7 - Transmit audio FSK test
- 8 - Antenna Tuning Unit voltage and control test
- 9 - Forward and Reverse Power Detectors test

#### Key Pad Test

- 31 The function and numerical keys of the key pad are each tested in turn by prompting the operator to press a specific key; this is to ensure that the processor receives the correct key code when each key is pressed.

- 32 After BITE has been selected, a prompt is displayed:

" ◊ t Pr UPA " - this indicates that the radio is in BITE mode and that it is waiting for a key press (indicated by the diamond symbol), in this case the up arrow key ▲ . Pressing the correct key ensures a PASS and the test continues; if the correct key code is not obtained within the time period allowed (8 seconds approximately) a FAIL is displayed and the test continues.

### Socket Test

- 33 With a handset connected, each audio socket has its pressel line tested and the receive signal to earpiece checked. The microphone and the volume control along with the switched warning tone are also checked. The operator is prompted to confirm that these tones are present.

- 34 The prompts during the test are as follows:

" H-Set 1? " - connect the hand/head set to the socket indicated  
" Er tne ? " - can the Error tone be heard  
" Vol? " - can the variation in volume be heard  
" Ptt " - key PTT

- and  
35 To answer yes to any of these questions (except the Ptt prompt) use the up arrow key ▲ , a PASS will be displayed and the test will continue. If the test is a failure the down arrow key ▼ should be pressed and a FAIL will be displayed. A FAIL will also be displayed if no response is received within the allocated time period (8 seconds approximately).

- 36 When the Ptt prompt is displayed the operator should press the PTT. A PASS will be displayed if this can be detected by the control unit, and the test will continue. FAIL is displayed if the PTT is not detected within the timeout period (5 seconds approximately).

### Battery Test

- 37 The voltage on the Battery Switched line is tested and checked against its test limits, thus indicating if the external power supply is sufficiently high. If it passes, the test number and PASS are displayed, the software then proceeds to the next test. If it fails, the test number and FAIL are displayed:

" t 03.FAIL " - any key will change the display to show the measured voltage, in volts, and the failed unit.

" F 19.5 UE " - in this case the 'E' indicates an external error. If the failed unit is internal then the unit number will be shown.

- 38 At this point there are two options, to either continue with BITE by pressing the up arrow key ▲, or to exit from BITE by pressing the down arrow key ▼. If the up arrow key ▲ is pressed the next test is run, if the down arrow key ▼ is pressed the radio exits BITE and is re-initialised.

#### **Five Volt Test**

- 39 The five volt rail, as for Battery Test, is measured and checked against its test limits. In this case the voltage must lie between 5.4 and 5.1 volts.

#### **Twenty Volt Test**

- 40 The twenty volt rail is measured and checked against its test limits. The maximum and minimum values permitted are 21.1 and 18.8 volts respectively.

#### **Transmit Audio Tests (CW and FSK)**

- 41 The Transmit audio (AFT) signal is sampled in CW mode and its peak to peak value calculated and checked against its test limits to ensure correct modulation level. Instead of a simple voltage measurement and comparison, the test takes 32 samples of the AFT signal in CW mode. The maximum peak to peak variation of these samples is calculated and this is then compared to the test limits to ensure correct modulation level. The test then proceeds as before with PASS or FAIL being displayed depending on the outcome of the test. The limits on the peak to peak variation are 1.85 and 1.17 volts.
- 42 Similarly the Frequency Shift Key (FSK) modulating tones are checked and compared with the same test limits.

#### **Antenna Tuning Unit Voltage and Control Test**

- 43 On entering this test the following prompt is displayed:

" ◇ No Atu " - this requires the ATU (if it is connected) to be disconnected. The diamond symbol indicates that the radio is waiting for a key to be pressed before continuing, in this case the up arrow key ▲ to confirm that the ATU has in fact been removed. The voltage present at the 50 ohm socket is measured and compared against test limits to ensure that sufficient voltage is available to allow correct ATU operation. The maximum permitted difference between the ATU line (TUS) and Battery Switched (BSW) is 0.8 volts.

- 44 TUS is then taken low and measured to check the control signalling circuit of the CCU; this confirms that the radio is capable of signalling to the ATU, again the result is checked against test limits. The PASS/FAIL routine is as before. When driven low the TUS line is checked to see it does not exceed 0.5 volts.

**Forward and Reverse Power Detectors Test**

- 45 As with the ATU test the " No Atu " prompt is displayed; this is a requirement for the power tests. The radio is set to TX and the Forward Power line (PMF) monitored whilst the Gain Control Line (GCF) is slowly increased until the PMF reaches 1 V. The Reverse Power line (PMR) is then measured and the difference between the two is calculated. If PMR is greater than PMF or if the difference is too great a FAIL is displayed and the test continues as before. The maximum permitted difference in PMF and PMR is 100 millivolts.
- 46 If it passes the test the radio displays PASS and then ' End '. The radio then exits BITE and is re-initialised.

Courtesy HB9DON and W2HX



**RACAL**

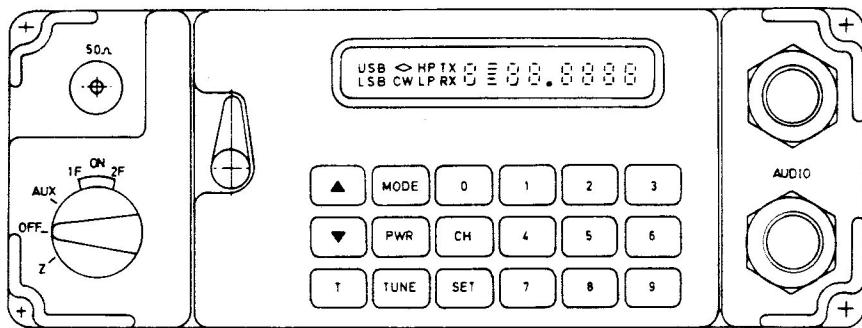
TH7081

BCC 39B USER

Control Panel Removed

Fig 1

Courtesy HB9DON and W2HX

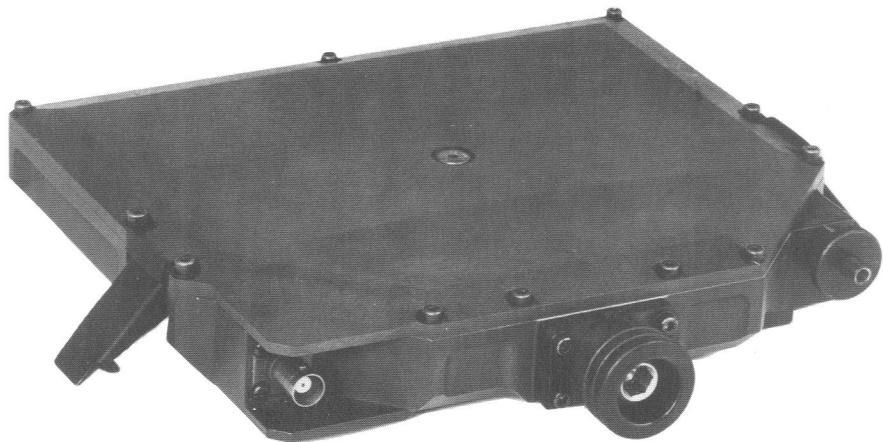


**RACAL**  
TH7081  
BCC39B USER

Front Panel

Fig 2

Courtesy HB9DON and W2HX



**RACAL**

TH7081

BCC39B USER

Antenna Matching Unit BCC 565

Fig 3

Courtesy HB9DON and W2HX



**RACAL**

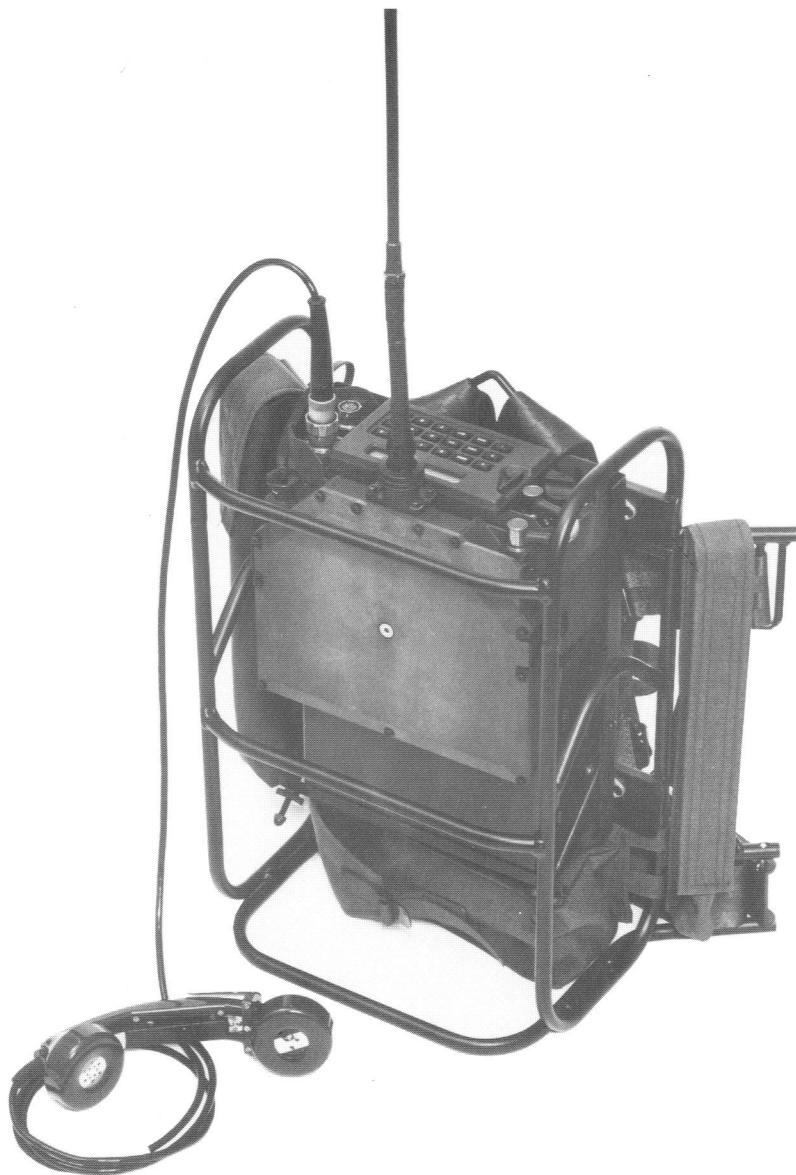
TH7081

BCC 39B USER

BCC39B with American  
Audio Connectors

Fig 4

Courtesy HB9DON and W2HX



**RACAL**

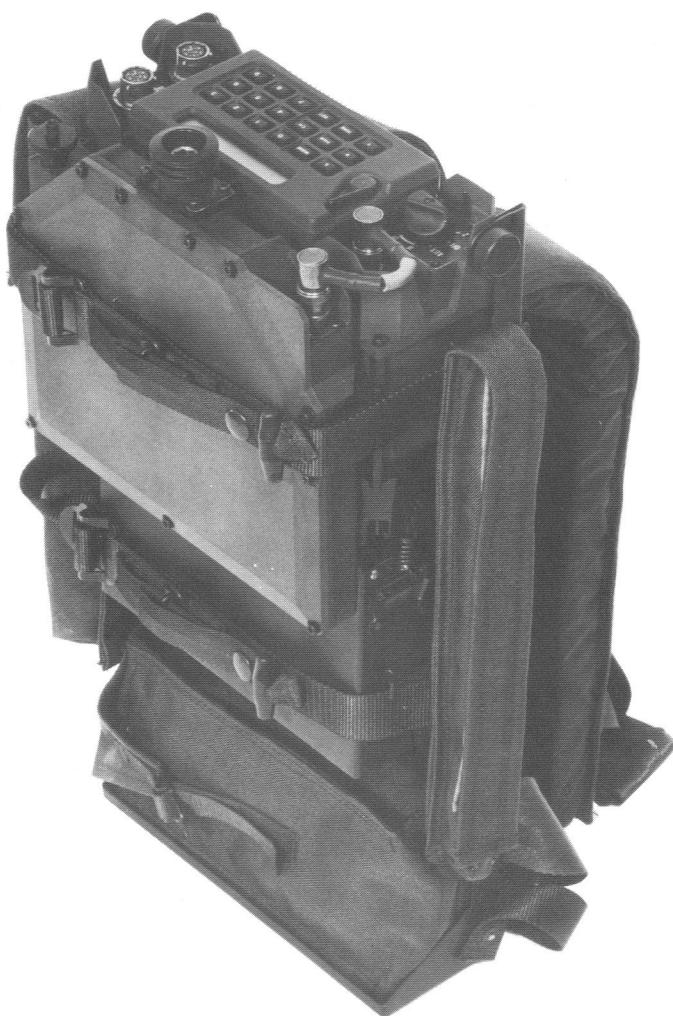
TH 7081

BCC 39B USER

Manpack Installation

Fig 5

Courtesy HB9DON and W2HX



**RACAL**

TH7081

BCC 39B USER

Lightweight Manpack Installation

Fig 6