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## 1 INTRODUCTION TO THE HT50 VHF HANDHELD RADIO TELEPHONE

The HT50 transceiver offers high performance, low power consumption, robust construction and dependable reliability in a small and easy to handle package. The shockproof casing with push button keys, for ease of operation, is fully waterproofed to a depth of 1 metre and will withstand the shock of being dropped onto a hard surface from a height of 1 metre.

The HT50 embraces the following features:

- **54 International Channels** – plus special national channels
- **Dual Watch** – on Channel 16 and current working channel
- **Tri-Watch** – including user selected working channel
- **Memory Scan** – scans commonly used channels
- **All Channel Scan** – automatically searches for all incoming signals
- **Full Keypad Operation** – of all functions including volume and squelch
- **Powersave** – automatically switches to standby when no signal is being received
- **Rechargeable** – 700mAh Nicad Battery with 1200 mAh NimH option
- **Battery Charger** – for on board charging

The main components of the HT50 are:

### 1.1 Electronics PCBs

- a. Radio Frequency PCB
- b. Control PCB

### 1.2 Mechanical Components

Not yet available

## 2 OPERATING THE HT50 VHF HANDHELD RT

**2.1** This Service Manual only contains operating instructions for those features of the HT50 that are not normally available to the end user. For details of normal operation please refer to the HT50 Operation Manual, E0XXXX.

**2.2 Power ON Combination Functions.** There are several functions available which can only be accessed by pressing and holding down certain key combinations and switching the radio on. These functions and their method of activation are described below.

**Second Mode.** Second Mode (alternative country) – hold down Volume key and press On.

**First Key Beep.** When a key is first pressed a beep can be generated. This function can be toggled on and off by holding down the Squelch key and pressing the On button. NB. This function can be disabled by reprogramming the NVM, Section 7 refers.

**Programme Mode.** The radio is placed in Programme Mode for programming and reconfiguration utilising a programming kit and a PC. Hold down SCAN, UP and DW keys and press On. NB. This mode can only be exited by switching the radio off and whilst in programming mode the radio will not transmit or receive.

**LCD Test Mode.** Tests all legends – hold down Volume, Squelch, 16 and Lights keys and switch On. As each key is operated the appropriate legend appears. The radio will not transmit or receive in this mode and must be switched off to exit the mode.

**ATIS / DSC Test Mode (only available on special radios).** Tone test mode is activated by holding down the Volume and Scan keys and switching on. Whilst in this mode the radio receives and transmits on channel 16. Tests are initiated by pressing keys as follows:

|       |                                                |                    |
|-------|------------------------------------------------|--------------------|
| SCAN  | Radio transmits a continuous '0' tone (2100Hz) | Display shows '00' |
| D/W   | Radio transmits a continuous '1' tone (1300Hz) | Display shows '11' |
| LITES | Radio transmits alternating '010101' tones     | Display shows '10' |
| 16    | Radio receives on channel 16                   | Display shows '16' |

**Battery Cycle Test Mode (only available on special radios).**

The radio can be placed in this mode by holding down the **UP** & **DOWN** keys. While in this mode the radio operates on channel 16 and performs as follows

- 6 seconds receive at full volume unmuted

- 48 seconds receive with audio muted
- 6 seconds transmit at high power

Exit from this mode can only be achieved by turning the radio off.

**Tx / Rx Cycle Test Mode (only available on special radios)**

The radio can be placed in this mode by holding down the **SQUELCH** & **D/W** keys. While in this mode the radio operates on channel 16 and performs as follows

- 5 minutes receive at full volume unmuted
- 5 minutes transmit at high power

Exit from this mode can only be achieved by turning the radio off.

### **3 ASSEMBLY INSTRUCTIONS**

Not yet available

## **4 MECHANICAL ASSEMBLY DRAWINGS**

**4.1** Not yet available

## 5 CIRCUIT DESCRIPTIONS

### Introduction

The HT50 consists of 2 PCB assemblies. The RF PCB assembly, Navico Part No. E03466, contains all the transmitter and receiver circuitry including the synthesiser and Voltage Controlled Oscillator (VCO). The control PCB assembly, Navico Part No. E03463, houses the microprocessor, user controls, audio and supply regulation circuitry and the LCD drivers. The RF and Control PCBs are interconnected via a 20 way multi-connector.

#### 5.1 Radio Frequency PCB. Refer to Drawing No. E03464.

**VCO and Frequency Synthesis.** A crystal controlled oscillator operating at 21.85 MHz comprising transistor TR10, Crystal Xtal 3 and associated components provides the reference frequency for the synthesiser and acts as the second Local Oscillator in the receiver. The synthesiser IC3 is loaded with data from the Control PCB to select the frequency divide ratios appropriate to the channel selected. The Voltage Controlled Oscillator (VCO) is tuned by applying the output of the synthesiser to varactor diode CV2 via the filter C69, R43 and C71. The VCO operates at the fundamental frequency in transmit mode and at 21.4MHz below the receive frequency in receive mode. Modulation is achieved by applying the modulating signal, provided from the Control Board, IC7, to Varactor Diode CV1 and hence to the VCO. The VCO output is fed to buffer amplifiers TR4 and TR5 via R24 and C47 and the output of the buffer is tuned by L11 and L12 with appropriate capacitors selected, for receive or transmit, by Pin Diodes PD5 and PD6.

**Transmitter.** The output from the VCO buffer is fed via Pin Diode PD4 and C35 to the PA Driver stage TR3 which provides about 15 mW drive to the RF Power Module IC1. Synthesiser IC3 (pin 16) generates an "In Lock" signal, to indicate that the VCO is in lock, which is applied to transistor TR9. When the VCO is out of lock, Transistor TR9 inhibits Transistor TR8 and isolates the supply to the PA stage. Power control is achieved by monitoring the RF output and comparing the rectified sample with a predetermined level in IC2. Power levels are adjustable through variable resistor VR1, for low power, and VR2 for high power. The rectified signal sample is also fed to the Control Board via Transistor TR11 to provide confirmation that power is being radiated.

The output from the power module is fed via pin diode PD1 to the input/output filter L1, L2, L3 and associated capacitors. This limits the necessary frequency response to avoid unwanted harmonic emissions. Pin diode PD2 is enabled when transmitting to inhibit the signal to the receiver and avoid damage to TR1.

**Receiver.** The received RF signal from the antenna is applied to a low pass filter L1, L2, L3, L4 and associated components and to bandpass filter L5 and L6 with associated capacitors. The signal is amplified by Transistor TR1 and further filtered by L7 and L8 and associated capacitors.

The signal is then applied to mixer TR2 where it is mixed with the VCO output, 21.4 MHz below the signal frequency. The output of the mixer, first Intermediate Frequency (IF) at 21.4MHz, is matched into the crystal filter network Xtal 1 and Xtal 2 by CH3, C26 and R8. The crystal filter provides isolation from adjacent channel interference. The crystal filter output is matched to the second IF stage IC4 by CH4 and associated capacitors.

IC4 houses a second mixer amplifier and demodulator. The second mixer mixes the output of the crystal filter with the output of a crystal controlled oscillator, operating at 21.85MHz, TR10. The output of the second mixer produces the second IF, 450KHz, which is filtered by a ceramic filter CF1 to provide further isolation from adjacent channel interference. The signal is then demodulated in IC4 and the audio is fed to the control PCB via R61 and C93. The combination of values of R61, C92 and C96 provide signal de-emphasis.

The audio from pin 9 is also amplified by a high gain amplifier within IC4 to detector SD2 to provide a voltage proportional to the received signal strength to provide a noise squelch signal. The squelch signal is fed to an A-D converter on the microcontroller for comparison with the selected squelch level.



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**5.2 Control PCB.** All the functions of the radio are controlled from this assembly by the microprocessor IC10. Refer to Drawing No. E03461.

**Power Supply.** When the ON / OFF key S1 is pressed TR2 is momentarily turned on which provides power to the voltage regulators. This in turn powers up the microcontroller circuit which grounds the base of TR1 and holds TR2 ON.

Voltage regulation is provided by two separate 5 volt regulators, REG1 and REG2 which provide 5 volt supplies to digital and RF circuitry. TR3 and TR4 respectively route the 5 volts to receive and transmit for the RF and other analogue circuitry.

To turn the radio off switch S1 is again pressed and held for about 2 seconds. The continued key depression is sensed by the microcontroller and the base of TR1 goes high causing loss of supply voltage on release of the key.

**Microprocessor.** The microprocessor has its own clock controlled by XTAL1 running at 4.096MHz. Reset generator IC8 ensures that the microprocessor starts up correctly, and resets under low voltage conditions. The microprocessor has an integral LCD interface driving the front panel display, LCD1. Voltage drive levels for the LCD driver are produced by the resistor network R65 – R68. External controls consist of 12 push buttons, S1 to S12 and backlighting is provided by 3 LEDs driven by TR11. The level of illumination is controlled by the duty cycle applied to the base of TR11.

Configuration data and channel information is stored in the non volatile memory IC5 which interfaces to IC10 via a 4 wire serial interface.

**ATIS Generation and Processing.** The ATIS signal is generated by the microprocessor, IC10, which produces a 2 bit (3 level) approximation of a sine wave at the correct frequency and baud rate. The two outputs are summed by R21 – R23 before filtering by IC3b which forms a second order low pass filter. The output is then attenuated by R100 and R25 before summing into the microphone audio. Note that the microphone is muted by TR10 during transmission of the ATIS signal. The MMSI is held in the non volatile memory IC5 together with a control flag to enable ATIS generation.

The microprocessor also includes software code to enable recognition of ATIS tones to mute the receiver during reception. The received audio is filtered by IC9c and IC9d followed by a zero crossing detector formed by IC9a, IC9b, D4 and TR12. This signal is fed to the microprocessor which measures the period of each half cycle of the incoming signal. By counting the number of periods which might be an ATIS signal the micro can decide that ATIS is being received. When this decision is made, after about 10ms, the microprocessor sets an output to mute the audio for 300ms.

**Receive Audio.** Audio from the demodulator (on RF PCB) is supplied, via VR1 to preset the maximum audio level, to amplifier IC1a and filter IC1b to provide rejection of frequencies below 300 Hz. The audio is then fed to the audio power amplifier stage IC2. The supply to IC2 is controlled by the microprocessor

through TR6 which is turned on only when the radio is in the receive mode and not squelched.

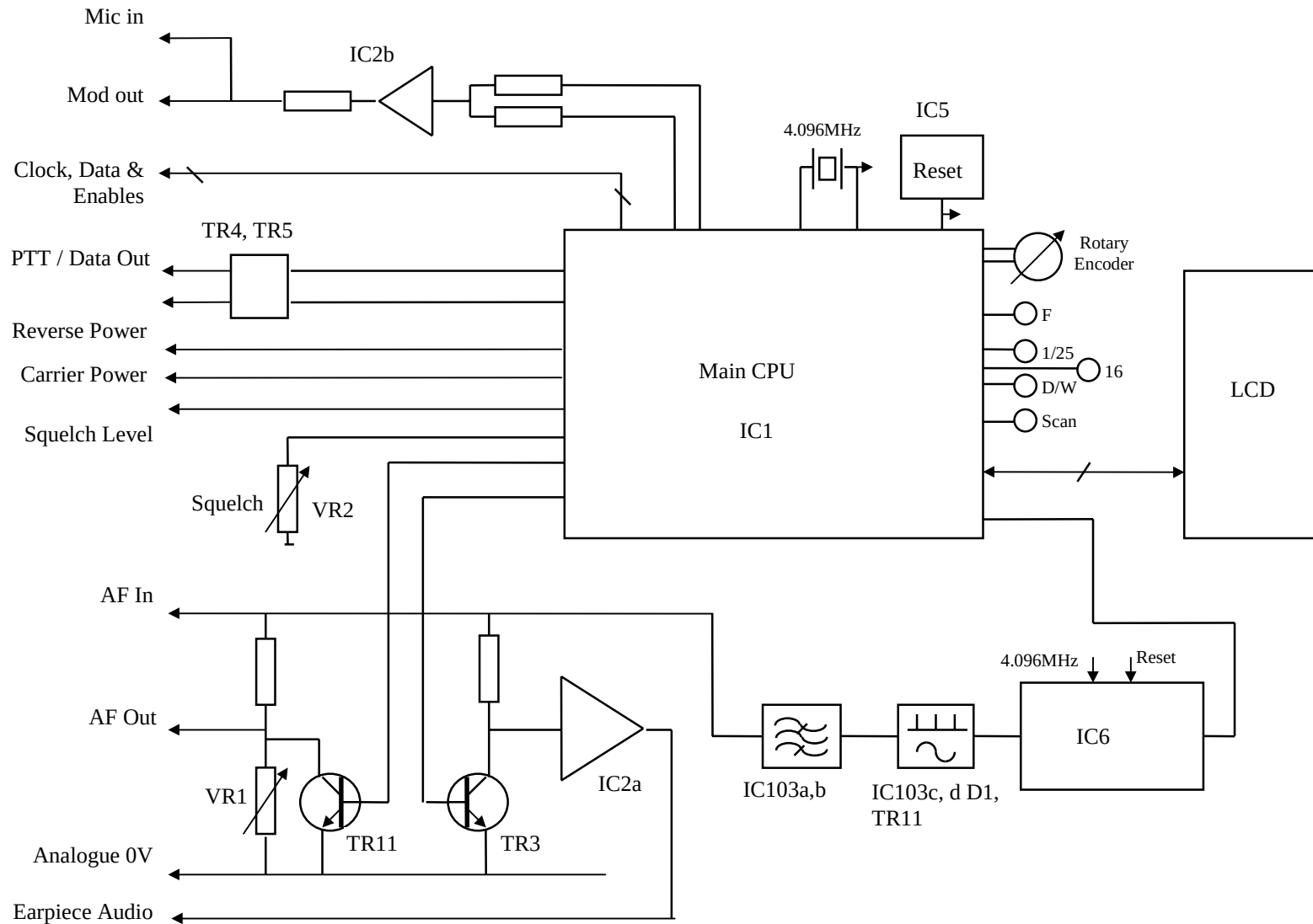
Volume control is provided by a d.c. level, generated by IC6 and IC11, supplied to the volume control pin on IC2. IC6 is a shift register which is connected to the microcontroller and the appropriate volume level is set from information generated by the raise and lower keys on the front panel when **Volume** is selected. This provides a 32 level control of audio.

When any key is pressed a beep is created by the microcontroller generating a tone, IC10 pin 12, which is filtered by R94, C106, C105 and R93 and fed to the audio amplifier IC2. TR13 provides momentary muting of the received audio to increase the clarity of key beeps. If a key beep is required when the radio is squelched TR16 is turned on to mute the audio whilst the audio amplifier is turned on via TR6. This is to prevent any clicking from the loudspeaker. As soon as the key beep has finished, power to the audio amplifier is turned off.

**Transmit Audio.** DC bias to the microphone is provided by R63 and R64. When the microphone is not required muting is enabled by the microcontroller turning on transistor TR10. IC7 and associated components provide amplification and audio frequency filtering. The circuit also acts as a limiter using feedback provided by TR8 and TR9. The output from the final amplifier stage, IC7a is fed via a resistive divider R41, VR3 and R42 to the modulator diode of the VCO located on the RF PCB.

**Communications.** To enable programming of the radio a simple serial bi-directional data link is provided via connection to the antenna socket; isolated by a network on the RF PCB. This signal is buffered by IC4a and IC4b, for receive and transmit respectively, and connected to the RxD/TxD lines of the UART on the microcontroller. When communications are not required the circuitry is isolated by TR7.

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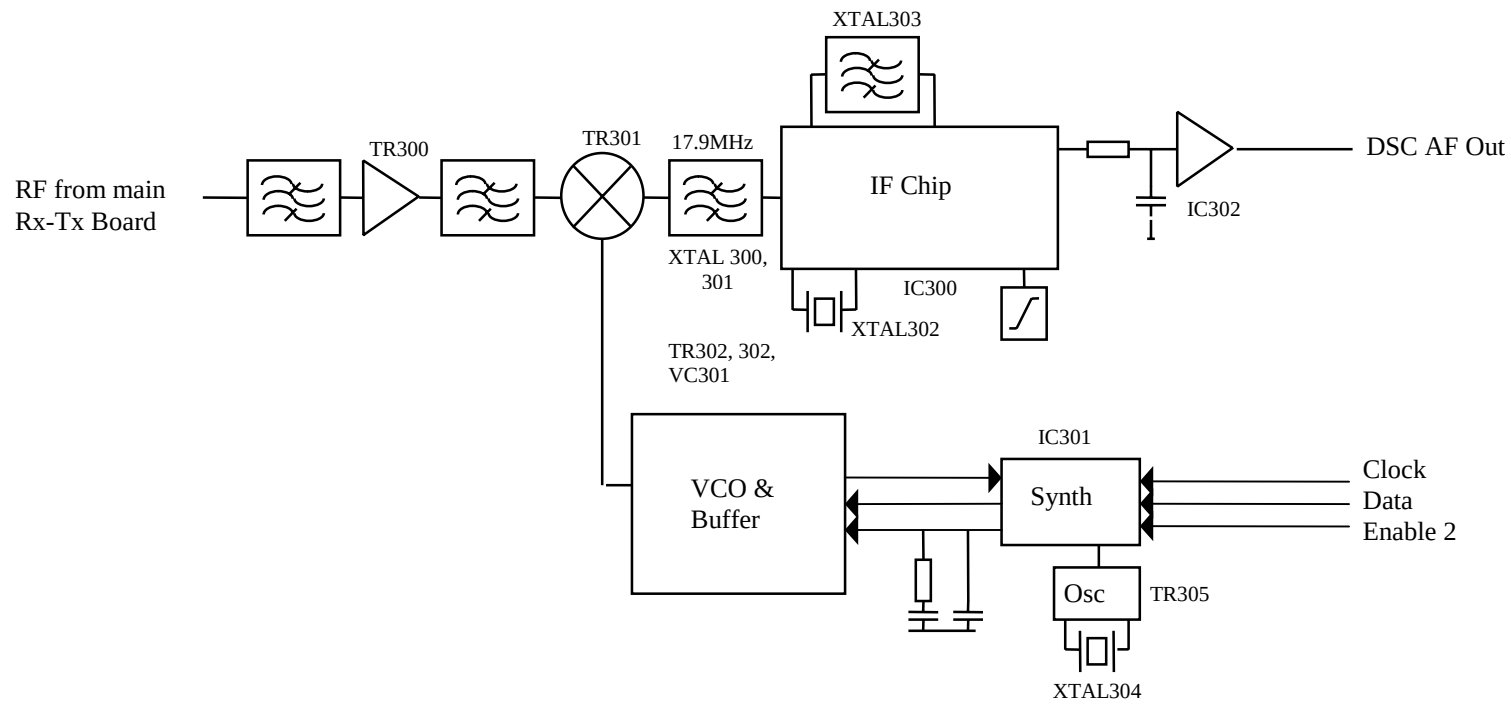


## E02958 Circuit Block Diagram

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## E03209 Block Diagram

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## **6      CIRCUIT DIAGRAMS**

### **6.1    Circuit Schematics**

Radio Frequency PCB  
Control PCB

E03464  
E03461

**Component Lists and Layouts**

|                                     |        |
|-------------------------------------|--------|
| Radio Frequency PCB Assembly Detail | E03466 |
| Control PCB Assembly Detail         | E03463 |

Not yet complete



## 7 PROGRAMMING AND CONFIGURATION

### Introduction

All Transmitting / Receiving characteristics of the H2 Series radio telephones are stored in Non Volatile Memory (NVM). The NVM of any H2 Series radio can be programmed with new characteristics using the programming kit, Part Number XXXXX.

#### 7.1 Configuration Settings. The following features are available:

|                               |                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| COUNTRY                       | Selects primary mode. NVMs with INT (International) selected for the FIRST COUNTRY flag will receive on the INT Rx frequencies. The radio can be switched to USA with weather channels if the VOL key is depressed on power up unless the SELECTED MODE ONLY flag is set. (SECOND MODE – YES). |
| SECOND MODE                   | Enables or disables switch to USA with weather channels.                                                                                                                                                                                                                                       |
| SCANNING                      | Enables and disables SCAN and MEMORY SCAN functions.                                                                                                                                                                                                                                           |
| CHANNEL 10 SCAN               | Enables or disables Channel 10 from SCAN facility, (Scanning Channel 10 is not permitted in some countries).                                                                                                                                                                                   |
| DUAL WATCH                    | Enables or disables DUAL WATCH                                                                                                                                                                                                                                                                 |
| TRI WATCH                     | Enables or disables TRI WATCH                                                                                                                                                                                                                                                                  |
| PRIORITY CHANNEL              | Selects alternate channel to be monitored when DUAL WATCH selected.                                                                                                                                                                                                                            |
| FIRST KEY BEEP                | Enables or disables KEY BEEP                                                                                                                                                                                                                                                                   |
| STARTUP CHANNEL (SC)          | Selects channel to be displayed on power up, usually Channel 16                                                                                                                                                                                                                                |
| WATCH CHANNEL (WC)            | Selects third channel to be monitored when TRI WATCH selected.                                                                                                                                                                                                                                 |
| USA / CANADA WEATHER CHANNELS | Enables or disables USA weather channels.                                                                                                                                                                                                                                                      |

|                 |                                                            |
|-----------------|------------------------------------------------------------|
| ATIS IDENTIFIER | Stores Automatic Transmission Identification System (ATIS) |
| DSC IDENTIFIER  | Maritime Mobile Service Identity (MMSI) number.            |

## **7.2 Programming.**

### **INITIAL SET UP**

The XXXXX programming kit operates in conjunction with an IBM compatible PC. The programme should be copied to the 'C' drive on the PC hard disc into a directory entitled H2setup.exe

#### **C:\H2setup.exe**

If using a monochrome monitor type **MODE BW80**. Connection between the radio and PC is by means of the programming lead supplied with the kit from the Antenna Socket on the radio to a 9 pin serial port on the PC.

Enter the programming set up software by typing "H2setup". Programming is entirely menu driven and self explanatory. (NB. Programme may not run under WINDOWS 95 / 97 / 98 but operates satisfactorily under 3.1 or 3.11).

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>H2 RADIO SETUP PROGRAM</p> <p>-----</p> <p>Version 1.0</p> <p>Copyright (C) Simrad-Navico Ltd 1998</p> <p>This program allows the dealer to configure the H2 series Radios to any mode including the programming of private channels.</p> <p>WARNING</p> <p>-----</p> <p>Incorrect use of this program could enable the radios to be used in contravention of local regulations.</p> <p>Which COM port is to be used? (1 or 2)</p> <p>Type 1, 2 or [ESC] to exit program</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**In order to adjust characteristics, radio must be switched to "Programming Mode"**  
**by:**  
**simultaneously holding down SHIFT, UP and DW keys whilst pressing ON key**

## H2 RADIO SETUP PROGRAM

---

Using COM1 port on computer

NVM Data: NOT LOADED

Select option:-

- 1 - Load NVM data from Radio (Copy data from radio to PC)
- 2 - Load NVM data from File (Load data from programme file)
- 3 - View/Modify NVM data (View/change displayed data)
- 4 - Save NVM data to Radio (Save displayed data to radio)
- 5 - Save NVM data to File (Save data to new PC file)
- 6 - CLONE from existing Radio (Copy existing data from radio to radio)
- 7 - Exit Program (Exit programme)

Use ↑↓ [Enter] or type option number, type [ESC] to exit program

**\*\*Text in brackets is for information only and does not appear on screen\*\***

### Load NVM data from Radio

Connect Radio, press any key when ready

—————NVM data—————

|     |     |     |     |
|-----|-----|-----|-----|
| 00: | 10: | 20: | 30: |
| 01: | 11: | 21: | 31: |
| 02: | 12: | 22: | 32: |
| 03: | 13: | 23: | 33: |
| 04: | 14: | 24: | 34: |
| 05: | 15: | 25: | 35: |
| 06: | 16: | 26: | 36: |
| 07: | 17: | 27: | 37: |
| 08: | 18: | 28: | 38: |
| 09: | 19: | 29: | 39: |
| 0A: | 1A: | 2A: | 3A: |
| 0B: | 1B: | 2B: | 3B: |
| 0C: | 1C: | 2C: | 3C: |
| 0D: | 1D: | 2D: | 3D: |
| 0E: | 1E: | 2E: | 3E: |
| 0F: | 1F: | 2F: | 3F: |

Any key to continue, [ESC] to exit

## Load NVM data from Radio

Connect Radio, press any key when ready  
 Failed - check connections, is radio turned on?

| NVM data |     |     |     |
|----------|-----|-----|-----|
| 00:      | 10: | 20: | 30: |
| 01:      | 11: | 21: | 31: |
| 02:      | 12: | 22: | 32: |
| 03:      | 13: | 23: | 33: |
| 04:      | 14: | 24: | 34: |
| 05:      | 15: | 25: | 35: |
| 06:      | 16: | 26: | 36: |
| 07:      | 17: | 27: | 37: |
| 08:      | 18: | 28: | 38: |
| 09:      | 19: | 29: | 39: |
| 0A:      | 1A: | 2A: | 3A: |
| 0B:      | 1B: | 2B: | 3B: |
| 0C:      | 1C: | 2C: | 3C: |
| 0D:      | 1D: | 2D: | 3D: |
| 0E:      | 1E: | 2E: | 3E: |
| 0F:      | 1F: | 2F: | 3F: |

Any key to continue, [ESC] to exit

## Load NVM data from Radio

Connect Radio, press any key when ready  
 NVM data loaded successfully

| NVM data |          |          |          |
|----------|----------|----------|----------|
| 00: 0010 | 10: 0003 | 20: 0000 | 30: 0000 |
| 01: 0000 | 11: 3011 | 21: 0000 | 31: 0000 |
| 02: 2020 | 12: 1111 | 22: 0000 | 32: 0000 |
| 03: 8008 | 13: 1111 | 23: 0000 | 33: 0000 |
| 04: 1010 | 14: 1333 | 24: 0000 | 34: 0000 |
| 05: 3111 | 15: 3333 | 25: 0000 | 35: 0000 |
| 06: 1101 | 16: 3333 | 26: 0000 | 36: 0000 |
| 07: 0000 | 17: 3300 | 27: 0000 | 37: 0000 |
| 08: 0004 | 18: 3333 | 28: 0000 | 38: 0000 |
| 09: 0411 | 19: 3333 | 29: 0000 | 39: 0000 |
| 0A: 1111 | 1A: 3333 | 2A: 0000 | 3A: 0000 |
| 0B: 1111 | 1B: 33FF | 2B: 0000 | 3B: 0000 |
| 0C: 1333 | 1C: 3098 | 2C: A1A2 | 3C: 0000 |
| 0D: 1111 | 1D: 309A | 2D: FFFF | 3D: 0010 |
| 0E: 1110 | 1E: 0000 | 2E: 0000 | 3E: 1010 |
| 0F: 0030 | 1F: 0000 | 2F: 0000 | 3F: 016A |

Any key to continue, [ESC] to exit

**H2 RADIO SETUP PROGRAM**

-----

Using COM1 port on computer

NVM Data: LOADED  
Software: 001

Select option:-

- 1 - Load NVM data from Radio
- 2 - Load NVM data from File
- 3 - View/Modify NVM data
- 4 - Save NVM data to Radio
- 5 - Save NVM data to File
- 6 - CLONE from existing Radio
- 7 - Exit Program

Use ↑↓ [Enter] or type option number, type [ESC] to exit program

**Load NVM data from File**

Enter NVM Data File Name:

-----NVM data-----

|     |     |     |     |
|-----|-----|-----|-----|
| 00: | 10: | 20: | 30: |
| 01: | 11: | 21: | 31: |
| 02: | 12: | 22: | 32: |
| 03: | 13: | 23: | 33: |
| 04: | 14: | 24: | 34: |
| 05: | 15: | 25: | 35: |
| 06: | 16: | 26: | 36: |
| 07: | 17: | 27: | 37: |
| 08: | 18: | 28: | 38: |
| 09: | 19: | 29: | 39: |
| 0A: | 1A: | 2A: | 3A: |
| 0B: | 1B: | 2B: | 3B: |
| 0C: | 1C: | 2C: | 3C: |
| 0D: | 1D: | 2D: | 3D: |
| 0E: | 1E: | 2E: | 3E: |
| 0F: | 1F: | 2F: | 3F: |

Enter file name (and path if required) or [ESC] to exit

Load NVM data from File

Enter NVM Data File Name:

File cannot be found or cannot be opened

NVM data

|     |     |     |     |
|-----|-----|-----|-----|
| 00: | 10: | 20: | 30: |
| 01: | 11: | 21: | 31: |
| 02: | 12: | 22: | 32: |
| 03: | 13: | 23: | 33: |
| 04: | 14: | 24: | 34: |
| 05: | 15: | 25: | 35: |
| 06: | 16: | 26: | 36: |
| 07: | 17: | 27: | 37: |
| 08: | 18: | 28: | 38: |
| 09: | 19: | 29: | 39: |
| 0A: | 1A: | 2A: | 3A: |
| 0B: | 1B: | 2B: | 3B: |
| 0C: | 1C: | 2C: | 3C: |
| 0D: | 1D: | 2D: | 3D: |
| 0E: | 1E: | 2E: | 3E: |
| 0F: | 1F: | 2F: | 3F: |

Enter file name (and path if required) or [ESC] to exit

Load NVM data from File

Enter NVM Data File Name: D8.DAT

File loaded successfully

NVM data

|          |          |          |          |
|----------|----------|----------|----------|
| 00: 0010 | 10: 0003 | 20: 0000 | 30: 0000 |
| 01: 0000 | 11: 3011 | 21: 0000 | 31: 0000 |
| 02: 2020 | 12: 1111 | 22: 0000 | 32: 0000 |
| 03: 8008 | 13: 1111 | 23: 0000 | 33: 0000 |
| 04: 1010 | 14: 1333 | 24: 0000 | 34: 0000 |
| 05: 3111 | 15: 3333 | 25: 0000 | 35: 0000 |
| 06: 1101 | 16: 3333 | 26: 0000 | 36: 0000 |
| 07: 0000 | 17: 3300 | 27: 0000 | 37: 0000 |
| 08: 0004 | 18: 3333 | 28: 0000 | 38: 0000 |
| 09: 0411 | 19: 3333 | 29: 0000 | 39: 0000 |
| 0A: 1111 | 1A: 3333 | 2A: 0000 | 3A: 0000 |
| 0B: 1111 | 1B: 33FF | 2B: 0000 | 3B: 0000 |
| 0C: 1333 | 1C: 3098 | 2C: A1A2 | 3C: 0000 |
| 0D: 1111 | 1D: 309A | 2D: FFFF | 3D: 0010 |
| 0E: 1110 | 1E: 0000 | 2E: 0000 | 3E: 1010 |
| 0F: 0030 | 1F: 0000 | 2F: 0000 | 3F: 016A |

Enter file name (and path if required) or [ESC] to exit

View / Modify NVM data

This option is not available  
NVM data has not been loaded

Use options 1 or 2 to load data

Press any key to exit

View / Modify NVM data

Configuration Settings

Country : INT  
Second Mode Enabled : YES  
Scanning Enabled : YES  
Channel 10 Scan Enabled : NO  
Dual Watch Enabled : YES  
Tri Watch Enabled : YES  
Priority Chan (PC) Enabled : YES  
User can disable first key beep : YES  
Startup Channel (SC) : 16  
Watch Channel (WC) : 16  
USA / Canada Weather Channels : NO  
ATIS Identifier : -----  
DSC Identifier (MMSI) : -----

←↑↓→ select    [space] modify    [Pg Dn] next screen    [ESC] exit

**Select setting to be changed, use Space Bar to scroll through  
available options**

| View / Modify NVM data  |                  |                     |            |
|-------------------------|------------------|---------------------|------------|
| Normal Channel Settings |                  |                     |            |
| 0 : - - -               | 16 : - - S       | 60 : - - D          | 76 : - - - |
| 01 : - - D              | 17 : - L S       | 61 : - - D          | 77 : - - S |
| 02 : - - D              | 18 : - - D       | 62 : - - D          | 78 : - - D |
| 03 : - - D              | 19 : - - D       | 63 : - - D          | 79 : - - D |
| 04 : - - D              | 20 : - - D       | 64 : - - D          | 80 : - - D |
| 05 : - - D              | 21 : - - D       | 65 : - - D          | 81 : - - D |
| 06 : - - S              | 22 : - - D       | 66 : - - D          | 82 : - - D |
| 07 : - - D              | 23 : - - D       | 67 : - - S          | 83 : - - D |
| 08 : - - S              | 24 : - - D       | 68 : - - S          | 84 : - - D |
| 09 : - - D              | 25 : - - D       | 69 : - - S          | 85 : - - D |
| 10 : - - D              | 26 : - - D       | 70 : - - -          | 86 : - - D |
| 11 : - - D              | 27 : - - D       | 71 : - - S          | 87 : - - D |
| 12 : - - D              | 28 : - - D       | 72 : - - S          | 88 : - - D |
| 13 : - - D              | 29 : - - -       | 73 : - - S          | 89 : - - - |
| 14 : - - D              | 31 : - - -       | 74 : - - S          | 90 : - - - |
| 15 : - L S              | 37 : - - -       | 75 : - - -          | 99 : - - - |
| (- - -) disabled        | (T) Receive only | (L) Low power only  |            |
| (S) Simplex             | (D) semi-Duplex  | (R) Reverse duplex  |            |
| ←↑↓→ select             | [space] modify   | [Pg Dn] next screen | [ESC] exit |

**Attributes Setting.** Select required channel (highlighted), press space bar and select required attribute (flashing cursor), scroll through options using Space Bar, select next attribute, press enter when changes complete and use select key to move to next channel.

| View / Modify NVM data |                  |                     |                 |
|------------------------|------------------|---------------------|-----------------|
| Aux Channel Settings   |                  |                     |                 |
| Channel                | Attributes       | Display             | Frequency (MHz) |
| A1                     | - - -            |                     | 0.000           |
| A2                     | - - -            |                     | 0.000           |
| A3                     | - - -            |                     | 0.000           |
| A4                     | - - -            |                     | 0.000           |
| A5                     | - - -            |                     | 0.000           |
| A6                     | - - -            |                     | 0.000           |
| (- - -) disabled       | (T) Receive only | (L) Low power only  |                 |
| (S) Simplex            | (D) semi-Duplex  | (R) Reverse duplex  |                 |
| ←↑↓→ select            | [space] modify   | [Pg Dn] next screen | [ESC] exit      |

**Attributes Setting.** As above.

**Display Setting.** Select display, press Space Bar to scroll through options, select key for next character, scroll using Space Bar, Return to set characters, select to move to Frequency.



**Frequency Setting.** Operate Space Bar, following screen appears:

A1 Frequency

Enter Required Frequency in MHz

[Enter] accept [ESC] exit

Enter frequency then press Enter to accept. Select next channel.

Save NVM data to Radio

Verifying NVM data in radio \*

Verify successful, radio is programmed \*

NVM data

|          |          |          |          |
|----------|----------|----------|----------|
| 00: 0010 | 10: 0003 | 20: 0000 | 30: 0000 |
| 01: 0000 | 11: 3011 | 21: 0000 | 31: 0000 |
| 02: 2020 | 12: 1111 | 22: 0000 | 32: 0000 |
| 03: 8008 | 13: 1111 | 23: 0000 | 33: 0000 |
| 04: 1010 | 14: 1333 | 24: 0000 | 34: 0000 |
| 05: 3111 | 15: 3333 | 25: 0000 | 35: 0000 |
| 06: 1101 | 16: 3333 | 26: 0000 | 36: 0000 |
| 07: 0000 | 17: 3300 | 27: 0000 | 37: 0000 |
| 08: 0004 | 18: 3333 | 28: 0000 | 38: 0000 |
| 09: 0411 | 19: 3333 | 29: 0000 | 39: 0000 |
| 0A: 1111 | 1A: 3333 | 2A: 0000 | 3A: 0000 |
| 0B: 1111 | 1B: 33FF | 2B: 0000 | 3B: 0000 |
| 0C: 1333 | 1C: 3098 | 2C: A1A2 | 3C: 0000 |
| 0D: 1111 | 1D: 309A | 2D: FFFF | 3D: 0010 |
| 0E: 1110 | 1E: 0000 | 2E: 0000 | 3E: 1010 |
| 0F: 0030 | 1F: 0000 | 2F: 0000 | 3F: 016A |

Any key to continue, [ESC] to exit

- Final legend.
- Following legends will be displayed briefly in turn:
  - Reading existing data from radio
  - Writing NVM data to radio

Clone Radio

Connect SOURCE radio, press any key when ready

Any key to continue, [ESC] to exit

Clone Radio

Loading data from radio  
Connect TARGET radio, press any key when ready

Any key to continue, [ESC] to exit

Clone Radio

Writing NVM data to radio  
Verifying data in radio  
NVM data verified successfully

[ESC] to exit      Any other key to repeat

## **8 FAULT FINDING**

### **8.1 Common User Faults**

Not Yet Available.

### **8.2 Common Technical Faults**

Not Yet Available

## **9 SPARE PARTS DETAIL**

### **9.1 Spares**

### **9.2 Service Aids**

## 10 TECHNICAL NOTES