Mini-Kits

HF RADIO v1.M & M1 RADIO v1.M

Update History.

V1.J	Original release.	April 2009,	HF RADIO version for EME150.
V1.K	Second release.	January 2015,	HF RADIO and M1 RADIO versions.
V1.L	Third release.	December 2015,	HF RADIO and M1 RADIO versions.
V1.M	This release.	April 2016,	HF RADIO and M1 RADIO versions.

Improvements

1) The delay before frequency changes made with the rotary encoder are saved to EEPROM, has been reduced from 3.3 seconds to 1 second.

Bug Fixes

1) Fixed a bug causing VFO bands selected via keypad functions 1 and 4, (VFO band up and down) under some conditions not to be saved to EEPROM. Meaning on power-up, the incorrect band was reloaded.
2) Fixed incorrect VFO band up and down stepping. (some bands were skipped)

Notes

1) **Users updating from HF ver1.J** should follow the document "Updating from version 1.J" This describes a workaround that protects your DDS calibration information during the update.
   This is required due to a bug in the v1.J BACKUP CAL INFO screen.
2) Users updating from HF ver1.J should check the modulation mode offsets in SETUP MENU 2, as the original SSB and CW offsets setup in the CAL MENU, are no longer used.
3) Users updating from HF ver1.J will notice that FUNCTION MENU 2, IPO has been changed to display PREAMP. PREAMP is just the inverse of IPO.
   i.e. if IPO is turned on in HRD, PREAMP will be turned off.
4) The only difference between the HF and M1 versions are,
   A) The DIG mod mode text has been changed to AMs, to suit the M1 hardware.
   B) The M1 default settings have been changed to suit the M1 hardware.

When first turned on, the software name and version number is displayed on line 1 and 2 of the LCD.

During power-up the PIC checks to see which DDS board is fitted.
The last digit of the version number indicates the DDS chip type found i.e.

Version 1.M0 If no DDS is found.
Version 1.M1 If an AD9850 or AD9851 is found.
Version 1.M2 If an AD9951 or AD9954 is found.

If no DDS board is connected to the PIC board, or the DDS chip type does not match the calibration settings saved in the PIC's EEPROM you will be taken to the DDS CALIBRATION screens. See below.

After 2.5 second the VFO or memory screen is displayed.
The memory or frequency displayed is the same as that displayed before the power was turned off.
Any changes are saved to EEPROM 1 second after the rotary encoder stops moving.

More descriptions to be added here. VFO's, DDS ranges, Bootloader, HRD control, etc

Button functions.

A A/B

A quick press changes from the active VFO to the non-active VFO. i.e., VFO-A to VFO-B, or VFO-B to VFO-A.

A long press, copies the active VFO to the non-active VFO. i.e., VFO-A to VFO-B, or VFO-B to VFO-A.

B RIT / SPLIT

A quick press turns the RIT function on or off.

A long press, turns the split VFO function on or off.

C RPT

A quick press turns on the -RPT function, the next press turns on the +RPT function, the next press turns off the RPT function.

Holding the RPT button down, allows you to adjust the RPT offset for the current VFO.
Each of the 30 VFO's has its own RPT offset.

The default RPT offset for the 10M VFO's is 100KHz.
" 6M VFO's is 1MHz.
" 2M VFO's is 600KHz.
" 70CM VFO's is 5MHz.
The default RPT offset for all other VFO's is 0.0KHz.

D MEM

A quick press turns the MEM function on, use the encoder to select a used memory.
You can use any of the MEMORY mode keypad functions.
See "Button functions while in MEMORY mode" below.
Another quick press turns the MEM function off.

A long press, saves the current VFO to a memory, use the encoder to select a memory to save to.
There are 202 memories to choose from. Memory 1 to 200 and M-PL and M-PU.

A quick press will cancel the memory save, and return you to the VFO screen.
Or another long press will save to the selected memory. SAVING will be displayed for 1.6 sec, then you will be returned to the MEMORY mode screen. You can then use any of the MEMORY mode keypad functions. See "Button functions while in MEMORY mode" below.

Note:- M-PL and M-PU memories can be used to set the frequency limits for a VFO scan.
M-PL = lower limit, M-PU = upper limit.

* STEP SIZE

Hold this button down to select the mechanical rotary encoder, DDS frequency step size.

The cursor will be turned on under one digit of the frequency display, allowing you to select a step size of 10Hz to 100MHz using the mechanical rotary encoder, further anti-clockwise rotation of the encoder allows you to select one of the preset step sizes shown below.

6MHz, 200KHz, 100KHz, 50KHz, 30KHz, 25KHz, 20KHz, 15KHz, 12.5KHz, 10KHz, 9KHz, 6.25KHz, 6KHz, 5KHz, 3KHz, 2.5KHz, 1KHz.

While holding down the * (STEP SIZE) button, if you press the # button you can enable or disable the RND (rounding) function. If rounding is enabled RND will be displayed on the LCD. When the * (STEP SIZE) button is released, the mechanical rotary encoder will step the DDS frequency by the step size. If rounding is enabled the frequency will be rounded to the nearest whole multiple of the step size.
Each of the VFO's has its own step size.

The default step size is 1KHz rounded, for all VFO's.

(note :- the STEP SIZE is only used by the mechanical rotary encoder,)
(the optical encoder always changes the frequency by 10Hz steps)

0 Start entering a frequency.

0 must be the first digit entered to start keypad frequency entry.
Any subsequent digits will be entered in front of the MHz decimal point.
If the * is entered, any subsequent digits will be entered after the MHz decimal point.
The # is then used to accept the number entered.
i.e. to set a frequency of 21.25 MHz, enter 021*25#

MENU

A quick press while in the VFO or MEM screen, turns on the FUNCTION MENU screens.
See the FUNCTION MENU description below.

A long press while in RX on the VFO or MEM screen, turns on the SETUP MENU screens.
See the SETUP MENU description below.

A continuous press while turning on the power, selects the CAL MENU screens.
See the CAL MENU description below.

Button functions while in VFO mode.

1 VFO band up.

The first press turns on the band display. Further presses increase the band.
i.e. 160m, 80m, 40m, 30m, 20m, 17m, 15m, 12m, 10m, 6m, FM, AIR, 2m,
70cm, PHANTOM, ... 160m, 80m, 40m etc.
The band will be displayed for 3 seconds.

Note:- the PHANTOM band covers any frequency between the HF bands.
i.e. 100KHz to 33MHz not covered by the 160m to 10m bands.

2 Modulation mode up.

Each press increases the mode.
i.e. LSB, USB, CW, CWR, AM, FM, DIG, PKT ... LSB, USB, CW etc.

4 VFO band down.

The first press turns on the band display. Further presses decrease the band.
i.e. PHANTOM, 70cm, 2m, AIR, FM, 6m, 10m, 12m, 15m, 17m, 20m, 30m, 40m,
80m, 160m ... PHANTOM, 70cm, 2m etc.
The band will be displayed for 3 seconds.

Note:- the PHANTOM band covers any frequency in the HF range
not covered by the 160m to 10m bands.

5 Modulation mode down.

Each press decreases the mode.
i.e. PKT, DIG, FM, AM, CWR, CW, USB, LSB ... PKT, DIG, FM etc.

7 Change VFO band display mode.

The first press displays the current band display mode. Further
presses change the band display mode. i.e. wavelength or frequency.
The band will be displayed for 3 seconds.

8 Start a VFO scan. (VFO band limits)

A quick press will start a VFO scan.
The station S meter level will be displayed on the upper line of the LCD for 1.6 second.
A receive S meter level at or above this level will be considered on station,
this will slow or halt the scan. See the SCAN setup screens.
After the 1.6 seconds, scanning will be started, the step size will be the same as the
current VFO step size, the scan rate is set in the SCAN setup screens.
The DDS frequency will be limited to the VFO band limits.
The scan direction character will be displayed, i.e. ↑
When a band limit is reached, the scan will be restarted.

9 Start a VFO scan. (M-PL to M-PU limits)

A quick press will start a VFO scan.
The station S meter level will be displayed on the upper line of the LCD for 1.6 second.
A receive S meter level at or above this level will be considered on station,
this will slow or halt the scan. See the SCAN setup screens.
After the 1.6 seconds, scanning will be started between the frequency limits
set by memory M-PL (lower limit) and M-PU. (upper limit)
The scan direction character will be displayed in brackets i.e. <↑>
When an upper or lower limit is reached, the scan will be restarted.
This button will have no effect if M-PL or M-PU are empty.

Button functions while in VFO SCAN mode.

1 Set the scan direction to up.

The scan direction character ↑ will be displayed on the top line of the LCD.

2 Modulation mode up.

Each press increases the mode.
i.e. LSB, USB, CW, CWR, AM, FM, DIG, PKT ... LSB, USB, CW etc.

4 Set the scan direction to down.

The scan direction character ↓ will be displayed on the top line of the LCD.

5 Modulation mode down.

Each press decreases the mode.
i.e. PKT, DIG, FM, AM, CWR, CW, USB, LSB ... PKT, DIG, FM etc.

7 Halt/Resume the VFO scan.

A quick press halts the scan, another press resumes scanning.
The scan halt character = will be displayed on the top line of the LCD when scanning is halted.

8 Change to VFO frequency limits.

A quick press changes the scan frequency limits to the frequency limits of the active VFO.
The scan direction character will be displayed i.e. ↑
This button will have no effect if this was already the scan mode.

9 Change to M-PL, M-PU limits.

A quick press changes the scan frequency limits to the frequency limits set by memory M-PL (lower limit) and M-PU. (upper limit)
The scan direction character will be displayed in brackets i.e. <↑>
This button will have no effect if this was already the scan mode, or if M-PL or M-PU are empty.

0 Exit the VFO scan mode.

A quick press, copies the current frequency into the active VFO, then exits the scan mode.

A long press exits the VFO scan mode, returning to the pre-scan frequency.

Mechanical and Optical Rotary Encoders.

CW rotation changes the scan direction to up.
The scan direction character ↑ will be displayed on the top line of the LCD.

CCW rotation changes the scan direction to down.
The scan direction character ↓ will be displayed on the top line of the LCD.

Button functions while in MEMORY mode.

2 Modulation mode up.

Each press increases the mode.
i.e. LSB, USB, CW, CWR, AM, FM, DIG, PKT ... LSB, USB, CW etc.
Changes made are not saved to the memory.

3 Memory text label.

A quick press turns the memory text label on or off.

A long press, allows you to edit the text label. The memory text label is turned on, and the 8 character label is displayed.
To show that the edit mode is active the label is displayed in quotes. i.e. "FAVORITE"
If this is a new memory, the default text label "MEM--TAG" will be displayed.
The cursor is turned on under the first character of the label.

1) You can change the cursor position by holding down button 3 and rotating the encoder.
2) To change the character at the cursor position, release button 3, select a character by rotating the encoder.
   The characters available are, characters 32 to 127 of the HD44780 LCD display chip.

   Space ! " # $ % & ' ( ) * + , - . /
   0 1 2 3 4 5 6 7 8 9
   : ; < = > ? @
   A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
   ¥] ^ _ '
   a b c d e f g h i j k l m n o p q r s t u v w x y z
   { | } → ←

3) Repeat step 1 and 2 to edit all the characters in the label.

4) A long press of the MEM button saves the changes to the memory and displays SAVING on the LCD for 1.6 sec before exiting the edit mode.
   Or a quick press of the MEM button cancels any changes and exits the edit mode.

5 Modulation mode down.

Each press decreases the mode.
i.e. PKT, DIG, FM, AM, CWR, CW, USB, LSB ... PKT, DIG, FM etc.
Changes made are not saved to the memory.

6 Select a memory group.

A quick press turns the select memory group mode on.
When doing memory scanning, you can limit the scan to use only memories in a selected group.
When a memory is created, it assigned to the default group M. i.e. M-001.
When the select memory group mode is on, the group character will start flashing.
Use the encoder to assign the memory to one of the groups.
There are 16 groups available. M, a, b, c, d, e, f, g, h, i, j, k, l, m, n, o.

A long press of the MEM button saves the changes to the memory group and displays SAVING on the LCD for 1.6 sec before exiting the select mode.
Or a quick press of the MEM button cancels any changes and exits the select mode.

7 Skip this memory when scanning / Delete this memory.

A quick press changes the scan skip state.
A memory that will be skipped during scanning has a • after the group character. i.e. M•001
A memory that will be included when scanning has a - after the group character. i.e. M-001
The default state is - (include the memory when scanning)

A long press enables you to delete the current memory.
You will be prompted to confirm that you want to delete the memory.
Use the rotary encoder to make your selection, then press the MENU button (#).
If you select NO, the memory will not be deleted.
If you select YES, the memory will be deleted. MEMORY IS EMPTY will be displayed on the LCD, you will have to select a new memory to use with the rotary encoder.

8 Start a MEM scan. (all non-skipped memories)

A quick press will start a memory scan.
The station S meter level will be displayed on the upper line of the LCD for 1.6 second.
A receive S meter level at or above this level will be considered on station,
this will slow or halt the memory scan. See the SCAN setup screens.
After the 1.6 seconds, scanning will be started, the DDS will step through all non skipped memories.
The memory scan rate is set in the SCAN setup screens.
The scan direction character will be displayed i.e. ↑
When all memories have been scanned, the scan will be restarted.
This button will have no effect if there are less than 2 non-skipped memories.

9 Start a MEM scan. (memory group mode)

A quick press will start a memory group scan.
The station S meter level will be displayed on the upper line of the LCD for 1.6 second.
A receive S meter level at or above this level will be considered on station,
this will slow or halt the memory scan. See the SCAN setup screens.
After the 1.6 seconds, scanning will be started, the DDS will step through all non skipped memories in the current group.
The memory scan rate is set in the SCAN setup screens.
The scan direction character will be displayed in brackets i.e. <↑>
When all memories in the group have been scanned, the scan will be restarted.
This button will have no effect if there are less than 2 non-skipped memories.
If there are less than 2 non-skipped memories in the current memory group the scan direction character will be changed to *. (unable to scan)

Button functions while in MEMORY SCAN mode.

1 Set the scan direction to up.

The scan direction character ↑ will be displayed on the top line of the LCD.

2 Modulation mode up.

Each press increases the mode.
i.e. LSB, USB, CW, CWR, AM, FM, DIG, PKT ... LSB, USB, CW etc.
Changes made are not saved to the memory.
This function is only useful when a scan is halted.

3 Select the memory group to scan.

A quick press displays a screen that allows you to select a group to scan.
If you are not in group scanning mode, this button has no effect.
Use the rotary encoder to select one of the 16 groups, M, a, b ... n, o.
The bottom line of the LCD will display NOT ENOUGH MEM'S if there are less than 2 memories in the group. (cannot scan with 0 or 1 memory)
The unable to scan character <*> will be displayed on the top line of the LCD if there are not enough memories to allow scanning.
A long press of the MEM button saves the changes to the memory group and displays SAVING on the LCD for 1.6 sec before exiting the select mode.
Or a quick press of the MEM button cancels any changes and exits the select mode.

4 Set the scan direction to down.

The scan direction character ↓ will be displayed on the top line of the LCD.

5 Modulation mode down.

Each press decreases the mode.
i.e. PKT, DIG, FM, AM, CWR, CW, USB, LSB ... PKT, DIG, FM etc.
Changes made are not saved to the memory.
This function is only useful when a scan is halted.

7 Halt/Resume the MEM scan.

A quick press halts the scan, another press resumes scanning.
The scan halt character = will be displayed on the top line of the LCD when scanning is halted.

8 Change to all non-skipped memory scanning.

A quick press changes the memory scan to all non-skipped memories.
The scan direction character will be displayed, i.e. ↑
This button will have no effect if this was already the scan mode.

9 Change to memory group scanning.

A quick press changes to scanning only memories in one of the memory groups, M, a, b ... n, o.
See memory scan button 3 above, to select a memory group to scan.
The scan direction character will be displayed in brackets i.e. <↑>
The unable to scan character <*> will be displayed on the top line of the LCD if there are not enough memories to allow scanning.
This button will have no effect if this was already the scan mode.

0 Exit the MEM scan mode.

A quick press exits the MEM scan mode, and returns to the current memory.

A long press exits the MEM scan mode, and returns to the pre-scan memory.

Mechanical and Optical Rotary Encoders.

CW rotation changes the scan direction to up.
The scan direction character ↑ will be displayed on the top line of the LCD.

CCW rotation changes the scan direction to down.
The scan direction character ↓ will be displayed on the top line of the LCD.

FUNCTION MENU's

To enter the function screens, press the MENU button briefly while in the VFO or MEMORY screen.
Use the rotary encoder to select 1 of the 11 options, then press the MENU button (#) to go to that screen.
The TX input (PTT) is functional while in this menu, but other functions, i.e. RIT, RPT, Band, Mode etc
are not available.

This menu remembers the function you selected last time, so you can quickly return to that function
without having to use the encoder to select it again.
i.e. If you had been setting the OUTPUT POWER, press the MENU button (#) twice to return to that function.

FUNCTION MENU 1	EXIT	
FUNCTION MENU 2	PREAMP	(effects current VFO only)
FUNCTION MENU 3	NOISE BLANKER	(effects all VFO's)
FUNCTION MENU 4	ATTENUATOR	(effects current VFO only)
FUNCTION MENU 5	AGC	(effects all VFO's)
FUNCTION MENU 6	NARROW FILTER	(effects current VFO only)
FUNCTION MENU 7	OUTPUT POWER	(effects all VFO's)
FUNCTION MENU 8	SPEECH PROCESSOR	(effects all VFO's)
FUNCTION MENU 9	VOX	(effects all VFO's)
FUNCTION MENU 10	ANTENNA	(effects current DDS range only)
FUNCTION MENU 11	LCD BACKLIGHT	

Note:- All the FUNCTION MENU settings are saved in the 24LC256 EEPROM.

FUNCTION MENU 1

EXIT screen.

Press the MENU button (#) to return to the VFO/MEMORY screen.

FUNCTION MENU 2

PREAMP screen.

Use the rotary encoder to turn the PREAMP ON or OFF.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

Note:- PREAMP is the inverse of IPO, (Intercept Point Optimization) Turning PREAMP on will turn IPO off.

(this setting effects the current VFO only)

FUNCTION MENU 3

NOISE BLANKER screen.

This screen is used to control one of the 2 noise blanker functions.

SETUP MENU 5 controls which noise blanker O/P's are to be used.
The single FT-817 NB. O/P function 019.
Or the new M1, NB1 and NB2 O/P functions 254 and 255.
(See SETUP MENU 5 below for more information.)

If SETUP MENU 5. NB1, NB2 BLANKING is set to disabled,

The rotary encoder is used to turn the output NB ON or OFF.

If SETUP MENU 5. NB1, NB2 BLANKING is set to enabled,

The rotary encoder is used to turn the outputs NB1 and NB2 to OFF, NB1, or NB2.

Note:- Ham Radio Deluxe can only turn 1 noise blanker OFF or ON, so when using the new M1 hardware,
Ham Radio Deluxe will only switch the last used noise blanker setting OFF or ON,
it cannot change which noise blanker setting to use.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects all VFO's)

FUNCTION MENU 4

ATTENUATOR screen.

This screen is used to control one of the 2 attenuator functions.

SETUP MENU 5 controls which attenuator O/P's are to be used.
The single FT-817 ATT. O/P function 018.
Or the new M1, 6,12,18dB ATTEN. O/P functions 252 and 253.
(See SETUP MENU 5 below for more information.)

If SETUP MENU 5. 6,12,18dB ATTEN is set to disabled,

The rotary encoder is used to turn the outputs ATT ON or OFF.

If SETUP MENU 5. 6,12,18dB ATTEN is set to enabled,

The rotary encoder is used to turn the outputs ATTEN 0 and ATTEN 1 to OFF, 6dB, 12dB or 18dB.

Note:- Ham Radio Deluxe can only turn 1 attenuator OFF or ON, so when using the new M1 hardware,
Ham Radio Deluxe will only switch the last used attenuator setting OFF or ON,
it cannot change the attenuator value.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects the current VFO only)

FUNCTION MENU 5

AGC screen.

Use the rotary encoder to change the Automatic Gain Control.
The options are, OFF, SLOW, FAST, AUTO.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects all VFO's)

FUNCTION MENU 6

NARROW FILTER screen.

Use the rotary encoder to turn the narrow filter ON or OFF.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

A narrow filter is available in FM mode and optional SSB and CW narrow filters can be installed.
See SETUP MENU 4, OPTIONAL FILTERS, to enable the optional SSB and CW narrow filters.

If a narrow filter is not installed, you will be unable to turn the filter ON.
i.e. if no SSB narrow filter is installed, you will not be able to turn on the narrow filter in USB or LSB mode.

(this setting effects the current VFO only)

FUNCTION MENU 7

OUTPUT POWER screen.

Use the rotary encoder to change the output power.
The options are, LOW 1, LOW 2, LOW 3, HIGH.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects all VFO's)

FUNCTION MENU 8

SPEECH PROCESSOR screen.

Use the rotary encoder to turn the speech processor ON or OFF.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects all VFO's)

FUNCTION MENU 9

VOX screen.

Use the rotary encoder to turn the VOX function ON or OFF.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects all VFO's)

FUNCTION MENU 10

ANTENNA screen.

Use the rotary encoder to change the ANTENNA setting.
The options are, ANT 1 (Rear), ANT 2 (Front).

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

(this setting effects the current DDS range only, i.e. HF, 6m, FM, AIR, 2m or 70cm)

FUNCTION MENU 11

LCD BACKLIGHT screen.

Use the rotary encoder to change the LCD BACKLIGHT setting.
The options are, OFF, LOW, MED, HIGH.

Then press the MENU button (#) to save the setting to EEPROM and return to the VFO/MEMORY screen.

SETUP MENU's

To enter the setup screens, press the MENU button for 2 seconds while in RX on the VFO or MEMORY screen.
Use the rotary encoder to select 1 of the 12 options, then press the MENU button (#) to go to that screen.

SETUP MENU 1	EXIT
SETUP MENU 2	MOD MODE OFFSETS
SETUP MENU 3	HIDE MOD MODES
SETUP MENU 4	HIDE BANDS
SETUP MENU 5	M1 I/O EXPANSION
SETUP MENU 6	I/O BOARD SETUP
SETUP MENU 7	MECH ROTARY ENC
SETUP MENU 8	OPTO ROTARY ENC
SETUP MENU 9	SWEEP SETUP
SETUP MENU 10	BAUD RATE
SETUP MENU 11	OPTIONAL FILTERS
SETUP MENU 12	LOAD DEFAULTS

Note:- All the SETUP MENU settings are saved in the 24LC256 EEPROM.

SETUP MENU 1

EXIT screen.

Press the MENU button (#) to return to the VFO or MEMORY screen.

SETUP MENU 2

MOD MODE OFFSETS screens.

The following screens allow you to set an RX and TX offset frequency for each of the 8 modulation modes.
The offset is added to the LCD display frequency to produce the actual DDS chips O/P frequency when using the selected modulation mode.

The DDS and I/O expansion board are updated to allow you to check the offset frequency with a frequency counter or the frequency could be adjusted to zero beat on a receiver.
The Frequency and band are the same as those in use before entering the SETUP MENUs.

Before using these screens, the current band in use should be one that allows you to use TX, i.e. Not the PHANTOM or FM bands.

(There are no timeouts on these screens)

MOD MODE OFFSETS screen 1. LSB OFFSET

This first screen allows you to set the LSB RX and TX offsets.
They have a range of +50KHz to -50KHz.

With the PTT button released, you can adjust the LSB RX offset.
With the PTT button pressed, you can adjust the LSB TX offset.

You can use the keypad or rotary encoder to enter the frequencies.
Press the MENU button (#) to save the setting and step to the next setup screen.

MOD MODE OFFSETS screens 2 to 8.

These screens allows you to set the RX and TX offset, for the other 7 modulation modes. (USB, CW, ,,, PKT)
They all have a range of +50KHz to -50KHz.

You can use the keypad or rotary encoder to enter the frequencies.
After making selections for all 16 offsets, the settings are saved to EEPROM.
You will then be returned to the setup menu.

SETUP MENU 3

HIDE MOD MODES screen 1. LSB MOD MODE

This screen allows you to hide the display of the LSB modulation mode.
If hidden, the modulation mode will not be selectable on the keypad or by Ham Radio Deluxe.

The range is ENABLE SELECTION or HIDE SELECTION.

You can use the rotary encoder to make this selection.
Press the MENU button (#) to save the setting and step to the next setup screen.

HIDE MOD MODES screen 2 to 8.

The following screens allow you to hide the display of the other 7 modulation modes. (USB, CW, ,,, PKT)

The range is ENABLE SELECTION or HIDE SELECTION.

You can use the rotary encoder to make the selection.
After making selections for all modes, the settings are saved to EEPROM.
You will then be returned to the setup menu.

Note:- if you have the FM band enabled (not hidden), the FM modulation mode will also be enabled.

SETUP MENU 4

HIDE BANDS screen 1. 160m BAND

This screen allows you to hide the display of the 160m band.
If hidden, the band will not be selectable on the keypad or by Ham Radio Deluxe.

The range is ENABLE SELECTION or HIDE SELECTION.

You can use the rotary encoder to make this selection.
Press the MENU button (#) to save the setting and step to the next setup screen.

HIDE BANDS screens 2 to 14.

The following screens allow you to hide the display of the other 13 bands. (80m, 40m, ,,, 2m, 70cm)

The range is ENABLE SELECTION or HIDE SELECTION.

You can use the rotary encoder to make this selection.
After making selections for all bands, the settings are saved to EEPROM.
You will then be returned to the setup menu.

Note:- if you hide all of the HF bands (160m - 10m) the PHANTOM band will also be hidden.

SETUP MENU 5

M1 I/O EXPANSION screens.

The original software copied the FT-817 functionality, 1 attenuator and 1 noise blanker output.
The new M1 hardware has expanded this functionality to 3 attenuator and 2 noise blanking settings.

The following two screens allow you change the output pins that are used to operate the attenuator and noise blanker circuits, to suit the new M1 hardware.

M1 I/O EXPANSION screen 1. 6,12,18dB ATTEN

The range is 6,12,18dB ATTEN ENABLED (for new M1 hardware)
          or 6,12,18dB ATTEN DISABLED. (for FT-817 functionality)

You can use the rotary encoder to make this selection.
Press the MENU button (#) to save the setting and step to the next setup screen.

M1 I/O EXPANSION screen 2. NB1,NB2 BLANKING

The range is NB1,NB2 BLANKING ENABLED (for new M1 hardware)
          or NB1,NB2 BLANKING DISABLED. (for FT-817 functionality)

You can use the rotary encoder to make this selection.
Press the MENU button (#) to save the setting and returned to the setup menu.

SETUP MENU 6

I/O BOARD SETUP screens.

This screen allows you to select what is output on the pins of the I/O board.
(the number of output pins available depends on the I/O board(s) you are using)

On this screen you first select which O/P pin you want to edit, then you select the function you want to assign to that pin. See steps 1 to 4 below. (There is no timeout on this screen)

(1) First press the A button to allow you to select which O/P pin to edit.
The cursor is placed under the O/P pin number to indicate you are in the select pin mode.
You can use the rotary encoder to select one of the 96 O/P pins.
Or key in the two digit pin number using the keypad.

(2) Next press the B button to allow you to select which O/P function you want assigned to the pin.
The cursor is placed under the O/P function number to indicate you are in the select function mode.
You can use the rotary encoder to select one of the 256 O/P functions.
Or key in the three digit function number using the keypad.
Not all 256 functions are currently used, see the function table at the end of this document.

(3) Next briefly press the MENU button (#) to enter your selection, you will be returned to step (1) with the cursor placed under the O/P pin number, ready to select the next pin to edit.

(4) Finally press the MENU button (#) for 2 seconds to save all the changes to EEPROM.
You will be prompted to confirm that you want to save the changes.
If you select YES using the rotary encoder, all the changes made in the I/O BOARD SETUP screens will be saved to the 24LC256 EEPROM.
If you select NO the changes will not be saved.
You will then be returned to the setup menu.

SETUP MENU 7

MECH ROTARY ENC screen 1. Type selection

This screen allows you to select the encoder software to use,
You have 2 choices, LEGACY (the original HF version) and USER TUNABLE (the new improved version)

Use the rotary encoder to make your selection.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

MECH ROTARY ENC screen 2. Encoder tuning

If USER TUNABLE was selected, this second screen allows you to tune the encoder acceleration and sensitivity.

The acceleration (ACC.) can be adjusted from 1 (no ACC.) to 16 (max ACC.)
The sensitivity (SENS.) can be adjusted from 1 (min SENS.) to 255 (max SENS.)

The default settings are ACC.06 and SENS.032, this gives a similar response to the LEGACY setup.

To adjust the ACC. press the A button then enter the 2 digit ACC. on the keypad.
To adjust the SENS. press the B button then enter the 3 digit SENS. on the keypad.

On the second line of the LCD there is a test frequency display, to allow you to test the encoder operation.

If you have the sensitivity to high, you will find that at even quite slow rotation, the frequency changes by more than 1 step. (10Hz)

If you use high ACC. i.e. 16 you need to keep the SENS. quite low.
With low ACC. the SENS. can be increased before the slow rotation starts stepping by more than 1.

It's useful to try using the encoder with no acceleration, i.e. ACC.01 SENS.001 to see what improvement higher acceleration makes.

There is no time-out on this screen. (Allows you to fine tune your settings)
When happy with the settings, press # to save them to EEPROM.

You will then be returned to the setup menu.

SETUP MENU 8

OPTO ROTARY ENC

This screen allows you to enable the use of a high pulse per revolution (PPR) optical rotary encoder in addition to the original mechanical rotary encoder.
If you wish, you can remove the mechanical encoder, and only use the optical encoder.

The range is DISABLED or ENABLED.

Use the rotary encoder to make your selection.
Press the MENU button (#) to save the setting to EEPROM and step to the next opto setup screen.

See the Optical Rotary Encoder section at the end of this document for a full description of setting up the optical rotary encoder.

SETUP MENU 9

SWEEP SETUP screen 1. VFO SWEEP TIME

This first screen allows you to set the VFO sweep time. (the time between frequency steps)
It has a range of 0.2 - 10.0 sec, in 0.1 sec steps.

You can use the rotary encoder to enter this number.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

SWEEP SETUP screen 2. VFO PAUSE TIME

This screen allows you to set the VFO pause time. (the time to pause when a station is found)
It has a range of 0.5 - 25.0 sec, in 0.5 sec steps, a setting of over 25.0 sec will select HALT,
(scanning will be stopped when a station is found)

You can use the rotary encoder to enter this number.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

SWEEP SETUP screen 3. MEM SWEEP TIME

This first screen allows you to set the MEMORY sweep time. (the time between memory changes)
It has a range of 0.2 - 10.0 sec, in 0.1 sec steps.

You can use the rotary encoder to enter this number.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

SWEEP SETUP screen 4. MEM PAUSE TIME

This screen allows you to set the MEMORY pause time. (the time to pause when a station is found)
It has a range of 0.5 - 25.0 sec, in 0.5 sec steps, a setting of over 25.0 sec will select HALT,
(scanning will be stopped when a station is found)

You can use the rotary encoder to enter this number.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

SWEEP SETUP screen 5. STATION LEVEL

This screen allows you to set the station S level.
A receive S meter level at or above this level will be considered on station, this will slow or halt the scan.

The S level range is S0 to 60. (60 = S9 +60)

You can use the rotary encoder to enter this setting.
Press the MENU button (#) to save the setting to EEPROM and return to the setup menu.

SETUP MENU 10

BAUD RATE screen.

This screen allows you to set the baud rate for the CAT interface, this is used to control the DDS board via the serial port. i.e. Ham Radio Deluxe.

The default baud rate is 34800 BAUD.
(the bootloader does not use this setting, it has an auto baud rate function)

The range is 4800, 9600, 34800 BAUD.

You can use the rotary encoder to select this setting.
Press the MENU button (#) to save the setting to EEPROM and return to the setup menu.

SETUP MENU 11

OPTIONAL FILTERS screen 1. SSB NARROW

This screen allows you to enable the optional SSB narrow filter.

The range is NOT INSTALLED or INSTALLED.

You can use the rotary encoder to select this setting.
Press the MENU button (#) to save the setting to EEPROM and step to the next setup screen.

OPTIONAL FILTERS screen 2. CW NARROW

This screen allows you to enable the optional CW narrow filter.

The range is NOT INSTALLED or INSTALLED.

You can use the rotary encoder to select this setting.
Press the MENU button (#) to save the setting to EEPROM and return to the setup menu.

SETUP MENU 12

LOAD DEFAULTS screen.

This screen allows you to load default settings for all of the SETUP and FUNCTION menus and the FT-817 VFO's and MEMORIES etc.
The only settings not changed are the DDS MENU settings and BACKUP CAL INFO.

You will be prompted to confirm that you want to proceed with loading the defaults.
Use the rotary encoder to select YES or NO, the press the MENU button (#).

If you select YES, the 24LC256 EEPROM will be loaded with default settings.
Then the PIC will be reset so that the new settings will take effect.

If you select NO the defaults will not be loaded and you will be returned to the setup menu.

CAL MENU's

To enter the calibration screens, press the MENU button (#), while turning on the power.
After the version numbers are displayed the calibration menu will be displayed.
Use the rotary encoder to select 1 of the 7 options, then press the MENU button (#) to go to that screen.

CAL MENU 1	EXIT
CAL MENU 2	DDS CALIBRATION
CAL MENU 3	BAND FREQ LIMITS
CAL MENU 4	DDS RANGE LIMITS
CAL MENU 5	S METER CAL
CAL MENU 6	BACKUP CAL INFO
CAL MENU 7	RESTORE BACKUP

Note:- All the CAL MENU settings are saved in the PIC's internal EEPROM.

CAL MENU 1

EXIT screen.

Press the MENU button (#) to return to the VFO screen.

CAL MENU 2

DDS CALIBRATION screen 1. DDS CHIP TYPE

This first screen shows the DDS chip type found at power-up.
If no DDS board is fitted, you can select the chip type using the rotary encoder.
The options available are AD9850/51 or AD9951/54.
If a DDS was found at power-up, you cannot change the chip type.
Press the MENU button (#) to step to the next cal screen.

DDS CALIBRATION screen 2. DDS O/P DIVIDER

This screen allows the software to produce the correct output frequency when there is a divider circuit connected to the DDS O/P.
This divider may be used to produce 90 degree outputs if you are using an I/Q mixer.

The range is NONE, DIVIDE BY 2 or DIVIDE BY 4.
You can use the rotary encoder to enter this setting.
Press the MENU button (#) to step to the next cal screen.

DDS CALIBRATION screen 3. OVER-CLOCK DDS ?

This screen will be displayed if you are using the AD9954 or AD9958, the screen allows you to overclock the DDS reference frequency.
The maximum DDS reference frequency limits of the next two screens are set higher if you enable DDS overclocking.

The range is NO or YES.
You can use the rotary encoder to enter this setting. Then press the MENU button (#).
If you select YES, a warning screen will be displayed briefly and you will be asked to confirm your selection.
The warning is a reminder that you are using the DDS outside its data sheets electrical specifications and that you are overclocking at your own risk.
If the overclock frequency is too high, the DDS may get hotter than normal and not function reliably.
Press the MENU button (#) to step to the next cal screen.

DDS CALIBRATION screen 4. DDS REF FREQ

This screen is for entering the frequency of the DDS reference frequency (crystal oscillator frequency) connected to the DDS.

AD9850/51 Range = 1 MHz to 180 MHz. (don't go above 125MHz if using the AD9850)
AD9951/54 Range = 10 MHz to 400 MHz. (500 MHz max if overclocking)

You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to step to the next cal screen.

DDS CALIBRATION screen 5. DDS REF MULT

This screen is for entering the DDS reference multiplier.
If you select a 1 x REFCLK the DDS REF FREQ (crystal) is used as the DDS SYSTEM CLK.
Otherwise, the DDS multiplies the DDS REF FREQ by the REFCLK number using an internal VCO to produce the DDS SYSTEM CLK.

AD9851 Range = 1 x REFCLK or 6 x DDS SYSTEM CLK.
(CLK range 1 - 180 MHz, with 1 x refclk)
(VCO range 30 - 180 MHz, with 6 x refclk)

AD9951/54 Range = 1 x REFCLK, 4 x REFCLK to 20 x REFCLK.
(CLK range 10 - 400 MHz, with 1 x refclk)
(VCO range 80 - 400 MHz, with 4-20 x refclk)
(500 MHz max if overclocking)

Note:- If using the AD9850, do not try selecting 6 x DDS SYSTEM CLK as it may damage the DDS chip.

You can use the rotary encoder to enter this setting.
Press the MENU button (#) to step to the next cal screen.

DDS CALIBRATION screen 6. DDS SYSTEM CLK

This screen is for calibrating the DDS output frequency.
The DDS is set to produce 10MHz, You can change the DDS clock frequency over a 1% range (10,000 ppm) to set the DDS output frequency to exactly 10MHz, using a calibrated frequency counter.
You can use the rotary encoder to set the frequency.
This screen will continue to be displayed until the MENU button (#) is pressed briefly. (There is no timeout on this screen)

DDS CALIBRATION screen 7. MAX DDS FREQ

This screen is for setting the Maximum DDS frequency that can be produced by the DDS circuit board. It is usually set to the DDS LP filter cutoff frequency.

After pressing the MENU button (#) you will be prompted to save all of the DDS changes made in DDS CALIBRATION screen 1 to 7. If you select YES using the rotary encoder, the changes will be saved to the PIC's internal EEPROM. If you select NO the changes will not be saved to EEPROM.

You will then be returned to the calibration menu.

CAL MENU 3

BAND FREQ LIMITS screens.

The following screens allow you to set the MIN/MAX band limits for 14 VFO bands.
160m, 80m, 40m, 30m, 20m, 17m, 15m, 12m, 10m, 6m, FM, AIR, 2m, 70cm

BAND FREQ LIMITS screen 1. 160m BAND MIN

This first screen allows you to set the minimum frequency of the 160m band.
If you briefly press the 7 button, you change the wavelength/frequency state, this is only an aid to help you identify the band that you are adjusting.
i.e. 160m BAND MIN or 1.80MHZ BAND MIN
You can use the keypad or rotary encoder to enter the frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

BAND FREQ LIMITS screen 2. 160m BAND MAX

This screen allows you to set the maximum frequency of the 160m band.
You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

BAND FREQ LIMITS screen 3. 80m BAND MIN

This screen allows you to set the minimum frequency of the 80m band.
You can use the keypad or rotary encoder to enter the frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

BAND FREQ LIMITS screen 4. 80m BAND MAX

This screen allows you to set the maximum frequency of the 80m band.
You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

BAND FREQ LIMITS screen 5 to 30.

The following screens allow you to set the MIN/MAX limits for the 12
remaining bands.

After setting all frequencies you will be returned to the calibration menu.

CAL MENU 4

DDS RANGE LIMITS screens.

The following screens allows you to set the MIN/MAX limits, DDS OFFSET and TX offset for the
6 DDS ranges.
The MIN screens set the minimum frequency that the DDS will be able to produce.
The MAX screens set the maximum frequency that the DDS will be able to produce.
The DDS OFFSET screens specifies the frequency that is added to the DDS O/P to produce the
RX display frequency.
The TX offset screen is useful if the TX I/F frequency is different to the RX I/F.
(For example on HF, if using an I/Q mixer on RX the circuit may have no offset between the)
(RX display freq and the DDS. but you may have an I/F offset when using TX)

The 6 DDS ranges are shown below.

HF	Covers the 160m to 10m bands.	(1.8MHz to 28MHz bands)
6m	Covers the 6m band.	(50MHz band)
FM	Covers the FM band.	(88MHz band)
AIR	Covers the AIR band.	(108MHz band)
2m	Covers the 2m band.	(144MHz band)
70cm	Covers the 70cm band.	(430MHz band)

Note:- the PHANTOM band covers any frequency in the HF range
not covered by the 160m to 10m bands.

DDS RANGE LIMITS screen 1. HF DDS MIN

This first screen allows you to set the minimum frequency of the HF range.
You can use the keypad or rotary encoder to enter the frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

DDS RANGE LIMITS screen 2. HF DDS MAX

This screen allows you to set the maximum frequency of the HF range.
You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

DDS RANGE LIMITS screen 3. HF DDS OFFSET

This screen allows you to specify what offset is added to the RX LCD display frequency
to produce the actual DDS chips O/P frequency when on the HF band.

The range is -700MHz to 700MHz.

You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

The RX DDS O/P frequency = ABS(LCD display frequency + DDS OFFSET)

ABS = absolute, i.e. convert a negative number to a positive number.
DDS OFFSET can be a positive or negative value.

3 examples,

1) With DDS OFFSET = 0MHz.
With a LCD display frequency of 1MHz.
DDS frequency = ABS(1MHz + 0MHz) = 1MHz

With a LCD display frequency of 30MHz.
DDS frequency = ABS(30MHz + 0MHz) = 30MHz

2) With DDS OFFSET = 70MHz.
With a LCD display frequency of 1MHz.
DDS frequency = ABS(1MHz + 70MHz) = 71MHz

With a LCD display frequency of 30MHz.
DDS frequency = ABS(30MHz + 70MHz) = 100MHz

3) With DDS OFFSET = -70MHz.
With a LCD display frequency of 1MHz.
DDS frequency = ABS(1MHz + -70MHz) = 69MHz

With a LCD display frequency of 30MHz.
DDS frequency = ABS(30MHz + -70MHz) = 40MHz

Note :- The software will limit the DDS output frequency so that it is not greater than
MAX DDS FREQ set in DDS CALIBRATION screen 7.

When using the keypad to enter a negative offset. 0 must be the first digit entered, then press # to signal that the frequency is negative.
Any subsequent digits will be entered in front of the MHz decimal point.
If the * is entered, any subsequent digits will be entered after the MHz decimal point.
The # is then used to accept the number entered.
i.e. to set a frequency of -21.25 MHz, enter 0#21*25#
to set a frequency of 32.15 MHz, enter 032*15#

DDS RANGE LIMITS screen 4. HF DDS TX OFFSET

This screen allows you to specify what offset there should be between the RX DDS frequency and the TX DDS frequency when on the HF band.
(The default offset for all bands is 0.0 MHz.) (RX and TX are the same freq.)

The range is -83MHz to 83MHz.

You can use the keypad or rotary encoder to enter this frequency.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

The TX DDS O/P frequency = ABS(LCD display frequency + DDS OFFSET + TX offset)

ABS = absolute, i.e. convert a negative number to a positive number.
DDS OFFSET and TX offset can be a positive or negative values.

DDS RANGE LIMITS screen 5 to 24.

The following screens allows you to set the MIN, MAX, DDS OFFSET and TX OFFSET for the 5 remaining DDS ranges.

After setting all frequencies you will be returned to the calibration menu.

CAL MENU 5

S METER CAL screens.

The following screens allow you calibrate the S meter.
There are no timeouts on these screens.
The DDS and I/O expansion board are enabled to allow the receiver circuit to feed the S meter DC voltage to the PIC.
The Frequency, band and modulation mode are the same as those in use before the power was last turned off.

S METER CAL screen 1. S-METER DISPLAY

The first screen allows you to disable the LCD S-Meter display.
You may want to do this for example if you have an external analogue S_Meter.

The PIC continues to read the S-Meter I/P signal, so that it can determine when it is “on station” during VFO and MEM scanning, but it does not display the level on the main VFO and MEM screens.

The range is DISABLED or ENABLED.

Use the rotary encoder to make your selection.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

S METER CAL screen 2. MIN S1 LEVEL

Feed a signal generator into the receive section at a level that corresponds to the minimum level that should be displayed as a level of S1.

Then hold down the MENU button (#) for over 2 seconds.
(After 1 second the bottom line of the LCD will be cleared, after 2 seconds the)
(current analog to digital converter results will be entered onto the display.)
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

S METER CAL screen 3. MIN S2 LEVEL

Set the signal generator to the level that corresponds to the minimum level that should be displayed as a level of S2.
Then hold down the MENU button (#) for over 2 seconds.
Press the MENU button (#) to save the setting to EEPROM and step to the next screen.

S METER CAL screen 4 to 16.

Repeat the procedure above for the 13 remaining S meter levels.
There are a total of 15 screens to calibrate the S meter,
S1, S2, S3, S4, S5, S6, S7, S8, S9, 10 (= S9+10), 20 (= S9+20), 30 (= S9+30), 40 (= S9+40), 50 (= S9+50), 60 (= S9+60).

After setting all S levels you will be returned to the calibration menu.

CAL MENU 6

BACKUP CAL INFO screen.

This screen allows you to copy the 256 bytes of calibration information that is stored in the PIC's internal EEPROM, to the 24LC256 EEPROM.
This should be used before using the bootloader. The bootloader will overwrite the calibration info with default settings, so use this screen to save a copy of all the calibration settings you have made.
After using the bootloader you can use CAL MENU 8, RESTORE BACKUP to restore the settings you saved.

You will be prompted to confirm that you want to proceed with the backup.
Use the rotary encoder to select YES or NO, the press the MENU button (#).

If you select YES, the calibration info will be saved to the 24LC256 EEPROM.

If you select NO the calibration info will not be saved to EEPROM.

You will then be returned to the calibration menu.

CAL MENU 7

RESTORE BACKUP screen.

This screen allows you to restore the calibration info from the 24LC256 EEPROM.

You will be prompted to confirm that you want to proceed with the restore.
Use the rotary encoder to select YES or NO, the press the MENU button (#).

If you select YES, the calibration info will be restored from the 24LC256 EEPROM,
then the PIC will be reset so that the new settings will take effect.

If you select NO the restore will be cancelled and you will be returned to the calibration menu.

Optical Rotary Encoder.

Version 1.L introduces the option to use a high pulse per revolution (PPR) optical rotary encoder in addition to the original mechanical rotary encoder.
If you wish, you can remove the mechanical encoder, and only use the optical encoder.

The software should work well with encoders with a PPR of between 100 and 600.
A 360 PPR encoder with open collector outputs is recommended.
These encoders typically require a power supply of between 5V and 24V.
The PCB's 12V supply is ideal to power the encoder.

The encoder's open collector O/P's are connected to the unused PIC pins E1 and E2.
The default state of these pins is analog I/P's, in this state they do not require any pull-ups, it is quite OK to leave them unconnected. (floating)

When the opto encoder is enabled, these 2 pins are configured as digital I/P's, and should not be left "floating", as this can cause the I/P pins to draw excessive current.
10K pull-ups to +5V are required to make sure that they remain at valid digital logic levels.

The ENC A lead is connected to port E1.
The ENC B lead is connected to port E2.

Normally a high PPR encoder would not be suitable for fine control, for example, selecting options in a menu, as a very small encoder movement would produce too many output pulses.
The software cures this problem by dividing the encoder pulses to give a more usable range.

For maximum flexibility when using different PPR encoders, the software can use the following dividers and multipliers, /64, /32, /16, /8, /4, /2, x1, x2, or x4,
These are referred to as the sensitivity range (SR).

For use in the menu's, a divider is selected so that the encoder would produce about 20 pulses per rev.

When using the encoder to adjust the output frequency, you would typically select a divider to give about 400 pulses per rev.
To reduce the sensitivity at low speeds, you can select a larger division ratio at low encoder speeds, this makes small frequency changes easier.

The software allows you to select a speed/sensitivity profile with these divider settings.
There are 8 sets of these divider profiles, 7 pre-configured profiles and 1 user tunable profile.

********** **IMPORTANT** **********

If you have built the M1 system using an optical rotary encoder and you don't want to use the mechanical rotary encoder, you will need to use a special procedure to enable the opto encoder.
This is because the opto encoder is disabled by default so you cannot use it to navigate to setup menu 8 to enable it.

Use this procedure.

Hold down the * button during power-up.
If the opto encoder is already enabled, a brief message is displayed stating that the encoder is enabled.
If the opto encoder is currently disabled, a selection screen is displayed.
Select YES using the mechanical encoder, or a brief press of the * button can be used to toggle the NO/YES state.
Then press the menu button to save your selection.

****

SETUP MENUS

SETUP MENU 8 allows you to enable or disable the use of the opto rotary encoder.

If the encoder is enabled, the next screen allows you to select a speed/sensitivity profile.

There is 1 user tunable profile, and 7 pre-configured profiles.

Profile 1, is most suited for 100 PPR optical encoders.
Profiles 2 to 7 are suited for higher PPR encoders.
Profile 4, is most suited for 360 PPR optical encoders.
Profile 6, is most suited for 600 PPR optical encoders.

You can use any of the profiles with any PPR encoder,

i.e. if using a 360 PPR encoder, selecting profile 1 will result in very fast/sensitive operation.
i.e. if using a 360 PPR encoder, selecting profile 7 will result in a slower, less sensitive operation.

To exit the profile selection screen, another 2 second press of the menu button returns you to the setup EXIT screen.

PROFILE TESTING

To aid in selecting a profile, two test screens are provided to check the encoder operation using the selected profile.
(The following descriptions assume you are using a 360 PPR encoder)

Each profile is composed of 2 sub-profiles.

1) A FIXED RATE sub-profile, used in the setup menus, and anywhere that only small changes are required.

2) A VARIABLE RATE sub-profile, used when tuning the frequency.

1) The FIXED RATE sub-profile.

This profile simply divides the encoder output pulsed by a fixed amount.
i.e. PROFILE 4 divides the encoder pulses by 16. Resulting in 360/16 = 22.5 Pulse Per Revolution.

2) The VARIABLE RATE sub-profile.

At slow encoder speeds, this profile can divide the encoder pulses by up to 64, as you speed up rotation, the program divides by smaller and smaller amounts, and at high speeds it can start multiplying the encoder pulses.

I.e. PROFILE 4 uses a variable profile that divides the encoder pulses by 16 at slow speeds then /8 at higher speed, then /4, /2, then x1 at fast rotation.
Resulting in 360/16 = 22.5 Pulse Per Revolution at very slow speed up to 360 x 1 = 360 Pulse Per Revolution at fast rotation.

While on the second rotary encoder screen where you select one of the 8 speed/sensitivity profiles, pressing the D button (D for display) opens a test screen allowing you to check the operation of the selected profile.

The first test screen displays the FIXED RATE sub-profile performance.
The LHS of the LCD top line displays the encoder speed. (Pulses per second), followed by the divider used,
The RHS displays the resulting output count rate. (Counts per second)
The LCD second line, displays a test number that is controlled by the encoder rotation.

Pressing the D button again switches to the VARIABLE RATE test screen.
The top line of the LCD again displays the speed, divider, and output count rate.
But with the variable rate tuning, you can see how the speeds selects the different dividers and multipliers.
The LCD second line, displays a test frequency that is controlled by the encoder rotation.

Pressing the D button switches between the FIXED the VARIABLE RATE test screens.

There are no time-outs on the test screens.

A 2 second press of the menu button (#) exits the test screen and returns you to the profile selection screen.

To exit the profile selection screen, another 2 second press of the menu button returns you to the setup EXIT screen.

USER TUNABLE PROFILE.

The USER TUNABLE PROFILE operates the same as the other 7 profiles, except you can adjust the profile settings to give the sensitivity/speed/acceleration rate, you prefer.

USER TUNABLE, FIXED RATE sub-profile.

While in the USER PROFILE, FIXED RATE test screen, pressing the A button (A for adjust) opens a screen allowing you to adjust the settings of the USER TUNABLE, FIXED RATE sub-profile.

Here you can set the Sensitivity Range (SR) divider and the speed that is considered as moving.
Pressing the A button puts a cursor under the sensitivity range (SR), use the encoder to select the divider required.
Pressing the B button puts a cursor under the speed, use the encoder to select the encoder speed that should be considered as a valid encoder rotation. (not stopped)
Typically you would use a speed setting of 1, if you set a higher speed, slow rotation or knocking the encoder will be ignored. (considered as stopped)

A brief press of the menu button (#) exits the tuning screen and returns you to the test screen, so you can test the setting changes.

Press the A button again to re-enter the tuning screen and make any required changes, until you are satisfied with the result.

While in the test screen, press the D button to switch to the VARIABLE RATE test screen.

USER TUNABLE, VARIABLE RATE sub-profile.

While in the USER PROFILE, VARIABLE RATE test screen, pressing the A button (A for adjust) opens the first of 9 screen allowing you to set the speed that the sensitivity range (SR) dividers will start to be used.

The first screen is for the /64 divider. Use the encoder to set the speed that is needed before this divider will be used, i.e. a speed setting of 20 means that when the encoder speed is >= 20 PPS, divide the encoder pulses by 64.
If you do not want to use this divider, pressing the * button sets the divider to "UNUSED"

A brief press of the menu button (#) steps to the next lower divider.

Repeat for each of the remaining dividers/multipliers.

Remember, speeds below the setting of the first USED divider will be considered as STOPPED.
Typically you would start with a speed setting of 1, if you set a higher speed, slow rotation or knocking the encoder will be ignored. (considered as stopped)

A brief press of the menu button (#) exits the tuning screen and returns you to the test screen, so you can test the setting changes.

Press the A button again to re-enter the tuning screen and make any required changes, until you are satisfied with the result.

A 2 second press of the menu button (#) exits the test screen and returns you to the profile selection Screen.

To exit the profile selection screen, another 2 second press of the menu button returns you to the setup EXIT screen.

When setting up the user tunable profile, you can use the settings of the pre-configured profile that most closely matches your requirements as a starting point for your profile.

The profile settings for the 7 pre-configured profiles are shown below.

Pre-configured Opto Encoder Profiles

PROFILE 1.	Most suited to 100 PPR optical encoders.	
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.5 /4	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	Unused
	SR.3 /16	Unused
	SR.4 /8	Unused
	SR.5 /4	1
	SR.6 /2	2
	SR.7 x1	3
	SR.8 x2	4
	SR.9 x4	9

PROFILE 2.		
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.4 /8	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	Unused
	SR.3 /16	Unused
	SR.4 /8	1
	SR.5 /4	2
	SR.6 /2	4
	SR.7 x1	19
	SR.8 x2	38
	SR.9 x4	Unused

PROFILE 3.		
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.4 /8	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	Unused
	SR.3 /16	Unused
	SR.4 /8	1
	SR.5 /4	3
	SR.6 /2	7
	SR.7 x1	13
	SR.8 x2	27
	SR.9 x4	Unused

PROFILE 4.	Most suited to 360 PPR optical encoders.	
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.3 /16	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	Unused
	SR.3 /16	1
	SR.4 /8	4
	SR.5 /4	8
	SR.6 /2	16
	SR.7 x1	32
	SR.8 x2	Unused
	SR.9 x4	Unused

PROFILE 5.		
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.3 /16	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	Unused
	SR.3 /16	1
	SR.4 /8	6
	SR.5 /4	11
	SR.6 /2	22
	SR.7 x1	44
	SR.8 x2	Unused
	SR.9 x4	Unused

PROFILE 6.	Most suited to 600 PPR optical encoders.	
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.2 /32	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	1
	SR.3 /16	7
	SR.4 /8	13
	SR.5 /4	27
	SR.6 /2	53
	SR.7 x1	Unused
	SR.8 x2	Unused
	SR.9 x4	Unused

PROFILE 7.		
	Sensitivity	Speed threshold
Fixed rate sub-profile.	SR.2 /32	1
Variable rate sub-profile.	SR.1 /64	Unused
	SR.2 /32	1
	SR.3 /16	8
	SR.4 /8	16
	SR.5 /4	31
	SR.6 /2	62
	SR.7 x1	Unused
	SR.8 x2	Unused
	SR.9 x4	Unused

Default O/P pin functions.

```
;-------------------------------------------------------------------------------------------
;              HF default O/P pin functions.
;-------------------------------------------------------------------------------------------
;
;  O/P   | FUNCTION
;  PIN   |  NUBMER
;
; O/P 01,   001 = 1.8 MHz, 160m band.                                    On = 160m.
; O/P 02,   002 = 3.5 MHz,  80m band.                                    On = 80m.
; O/P 03,   003 = 7.0 MHz,  40m band.                                    On = 40m.
; O/P 04,   004 =  10 MHz,  30m band.                                    On = 30m.
; O/P 05,   005 =  14 MHz,  20m band.                                    On = 20m.
; O/P 06,   006 =  18 MHz,  17m band.                                    On = 17m.
; O/P 07,   007 =  21 MHz,  15m band.                                    On = 15m.
; O/P 08,   008 =  24 MHz,  12m band.                                    On = 12m.
;
; O/P 09,   009 =  28 MHz,  10m band.                                    On = 10m.
; O/P 10,   010 =  50 MHz,   6m band.                                    On = 6m.
; O/P 11,   011 =  88 MHz,   FM band.                                    On = FM.
; O/P 12,   012 = 108 MHz,  AIR band.                                    On = AIR.
; O/P 13,   013 = 144 MHz,   2m band.                                    On = 2m.
; O/P 14,   014 = 430 MHz, 70cm band.                                    On = 70cm.
; O/P 15,   015 = Phantom, (out of band, 160m-10m)                       On = PHANTOM.
; O/P 16,   016 = Out of band, 6m-70cm.                                  On = OUT OF BAND.
;
; O/P 17,   017 = IPO  (RF Preamp)                                       On = IPO ON.
; O/P 18,   018 = ATT  (Attenuator)                                      On = ATT ON.
; O/P 19,   019 = NB   (Noise blanker)                                   On = NB ON.
; O/P 20,   020 = AGC 0 \ (Auto Gain Control) Off,Off = AGC OFF,  Off, On = AGC SLOW,
; O/P 21,   021 = AGC 1 /                      On,Off = AGC FAST,  On, On = AGC AUTO.
; O/P 22,   082 = ANT2  (Antenna 2, front)        Off = ANT 1 (rear),  On = ANT 2 (front).
; O/P 23,   000 = Output not in use. (always off)
; O/P 24,   083 = TX                               Off = RX,           On = TX.
;
; O/P 25,   025 = Filter SSB/CW                                          On = SSB/CW.
; O/P 26,   026 = Filter SSB narrow                                      On = SSB narrow.
; O/P 27,   027 = Filter AM                                              On = AM.
; O/P 28,   028 = Filter CW narrow                                       On = CW narrow.
; O/P 29,   029 = Filter FM                                              On = FM.
; O/P 30,   030 = Filter FM narrow                                       On = FM narrow.
; O/P 31,   031 = Filter FM wide                                         On = FM wide.
; O/P 32,   000 = Output not in use. (always off)
;
; O/P 33,   033 = BK 0  \ (LCD Backlight)      Off,Off = OFF,     Off, On = LOW,
; O/P 34,   034 = BK 1  /                       On,Off = MED,      On, On = HIGH.
; O/P 35,   035 = PWR 0 \ (O/P Power)          Off,Off = LOW 1,   Off, On = LOW 2,
; O/P 36,   036 = PWR 1 /                       On,Off = LOW 3,    On, On = HIGH.
; O/P 37,   037 = PROC (speech processor)                                On = PROC.
; O/P 38,   038 = VOX                                                    On = VOX.
; O/P 39,   000 = Output not in use. (always off)
; O/P 40,   083 = TX                               Off = RX,           On = TX.
;
; O/P 41,   041 = LSB mode.                                              On = LSB.
; O/P 42,   042 = USB mode.                                              On = USB.
; O/P 43,   043 =  CW mode.                                              On = CW.
; O/P 44,   044 = CWR mode.                                              On = CWR.
; O/P 45,   045 =  AM mode.                                              On = AM.
; O/P 46,   046 =  FM mode.                                              On = FM.
; O/P 47,   047 = DIG mode.                                              On = DIG.
; O/P 48,   048 = PKT mode.                                              On = PKT.
;
; O/P's 49 to 96,   000 = Outputs not in use. (always off)
;
;-------------------------------------------------------------------------------------------
```

```
;-------------------------------------------------------------------------------------------
;       M1 default O/P pin functions.
;-------------------------------------------------------------------------------------------
;
; CONNECTOR J4 ( Pre-selector and Low Pass Filters )
;
; O/P 01,   007 =  21 MHz,  15m band.                                       On = 15m.
; O/P 02,   006 =  18 MHz,  17m band.                                       On = 17m.
; O/P 03,   008 =  24 MHz,  12m band.                                       On = 12m.
; O/P 04,   005 =  14 MHz,  20m band.                                       On = 20m.
; O/P 05,   004 =  10 MHz,  30m band.                                       On = 30m.
; O/P 06,   003 = 7.0 MHz,  40m band.                                       On = 40m.
; O/P 07,   002 = 3.5 MHz,  80m band.                                       On = 80m.
; O/P 08,   001 = 1.8 MHz, 160m band.                                       On = 160m.
; O/P 09,   009 =  28 MHz,  10m band.                                       On = 10m.
; O/P 10,   010 =  50 MHz,   6m band.                                       On = 6m.
; O/P 11,   015 = Phantom, (out of band, 160m-10m)                          On = PHANTOM.
;
;
; CONNECTOR J3 ( Mode Selection and Crystal Filters )
;
; O/P 12,   046 =  FM mode.                                                 On = FM.
; O/P 13,   047 = AMs mode.                                                 On = AMS.
; O/P 14,   043 =  CW mode.                                                 On = CW.
; O/P 15,   041 = LSB mode.                                                 On = LSB.
; O/P 16,   042 = USB mode.                                                 On = USB.
; O/P 17,   045 =  AM mode.                                                 On = AM.
; O/P 18,   022 = PREAMP                                                    On = PREAMP ON.
; O/P 19,   083 = TX Enable  (TX)                     Off = RX,             On = TX Enable.  (TX)
;
;
; CONNECTOR J5 (Various Functions )
;
; O/P 20,   018 = ATT  (Attenuator)                                         On = ATT ON.
; O/P 21,   053 = AGC Off                                                   On = AGC Off.
; O/P 22,   055 = AGC Fast                                                  On = AGC Fast.
; O/P 23,   019 = NB   (Noise blanker)                                      On = NB ON.
; O/P 24,   037 = PROC (speech processor)                                   On = PROC.
; O/P 25,   038 = VOX                                                       On = VOX.
; O/P 26,   082 = ANT2  (Antenna 2, front)            Off = ANT 1 (rear)    On = ANT 2 (front)
; O/P 27,   035 = PWR 0 \ (O/P Power)              Off, Off = LOW 1,   Off, On = LOW 2,
; O/P 28,   036 = PWR 1 /                           On, Off = LOW 3,    On, On = HIGH.
; O/P 29,   252 = ATTEN 0 ( 6dB Attenuator)   \    Off, Off = 0dB,     Off, On = 6dB.
; O/P 30,   253 = ATTEN 1 (12dB Attenuator)   /     On, Off = 12dB,     On, On = 18dB.
; O/P 31,   254 = NB1  (Noise blanker 1)                                    On = NB1 ON.
; O/P 32,   255 = NB2  (Noise blanker 2)                                    On = NB2 ON.
;
; O/P's 33 to 96,   000 = Outputs not in use. (always off)
;
;-------------------------------------------------------------------------------------------
```

```
;-------------------------------------------------------------------------------
;       List of all the available O/P functions 0 to 255.
;       (only 0 to 87 and 252 to 255 currently used)
;-------------------------------------------------------------------------------
;
;       000 = Output not in use. (always off)
;
;       001 = 1.8 MHz, 160m band.                                       On = 160m.
;       002 = 3.5 MHz,  80m band.                                       On = 80m.
;       003 = 7.0 MHz,  40m band.                                       On = 40m.
;       004 =  10 MHz,  30m band.                                       On = 30m.
;       005 =  14 MHz,  20m band.                                       On = 20m.
;       006 =  18 MHz,  17m band.                                       On = 17m.
;       007 =  21 MHz,  15m band.                                       On = 15m.
;       008 =  24 MHz,  12m band.                                       On = 12m.
;       009 =  28 MHz,  10m band.                                       On = 10m.
;       010 =  50 MHz,   6m band.                                       On = 6m.
;       011 =  88 MHz,   FM band.                                       On = FM.
;       012 = 108 MHz,  AIR band.                                       On = AIR.
;       013 = 144 MHz,   2m band.                                       On = 2m.
;       014 = 430 MHz, 70cm band.                                       On = 70cm.
;       015 = Phantom, (out of band, 160m-10m)                          On = PHANTOM.
;       016 = Out of band, 6m-70cm.                                     On = OUT OF BAND.
;
;       017 = IPO  (RF Preamp)                                          On = IPO ON.
;       018 = ATT  (Attenuator)                                         On = ATT ON.
;       019 = NB   (Noise blanker)                                      On = NB ON.
;
;       020 = AGC 0 \ (Auto Gain Control)    Off,Off = AGC OFF,   Off, On = AGC SLOW,
;       021 = AGC 1 /                         On,Off = AGC FAST,   On, On = AGC AUTO.
;
;       022 = PREAMP  (inverse of function 017)                          On = PREAMP ON.
;                                                                       (On = IPO OFF)
;
;       023 = (Unused. Reserved for future use)
;       024 = (Unused. Reserved for future use)
;
;       025 = Filter SSB/CW                                             On = SSB/CW.
;       026 = Filter SSB narrow                                         On = SSB narrow.
;       027 = Filter AM                                                 On = AM.
;       028 = Filter CW narrow                                          On = CW narrow.
;       029 = Filter FM                                                 On = FM.
;       030 = Filter FM narrow                                          On = FM narrow.
;       031 = Filter FM wide                                            On = FM wide.
;
;       032 = (Unused. Reserved for future use)
;
;       033 = BK 0  \ (LCD Backlight)          Off,Off = OFF,     Off, On = LOW,
;       034 = BK 1  /                           On,Off = MED,      On, On = HIGH.
;
;       035 = PWR 0 \ (O/P Power)              Off,Off = LOW 1,   Off, On = LOW 2,
;       036 = PWR 1 /                           On,Off = LOW 3,    On, On = HIGH.
;
;       037 = PROC (speech processor)                                   On = PROC.
;       038 = VOX                                                       On = VOX.
;
;       039 = (Unused. Reserved for future use)
;       040 = (Unused. Reserved for future use)
;
;       041 = LSB mode.                                                 On = LSB.
;       042 = USB mode.                                                 On = USB.
;       043 =  CW mode.                                                 On = CW.
;       044 = CWR mode.                                                 On = CWR.
;       045 =  AM mode.                                                 On = AM.
;       046 =  FM mode.                                                 On = FM.
;       047 = DIG mode. (AMs mode, on M1 version software)              On = DIG / AMs
;       048 = PKT mode.                                                 On = PKT.
;
;                           Off,Off,Off,Off = 160m,      Off,Off,Off, On = 80m,
;                           Off,Off, On,Off = 40m,       Off,Off, On, On = 30m,
;       049 = Band 0 \      Off, On,Off,Off = 20m,       Off, On,Off, On = 17m,
;       050 = Band 1  |     Off, On, On,Off = 15m,       Off, On, On, On = 12m,
;       051 = Band 2  |      On,Off,Off,Off = 10m,        On,Off,Off, On = 6m,
;       052 = Band 3 /       On,Off, On,Off = FM,         On,Off, On, On = AIR,
;                            On, On,Off,Off = 2m,         On, On,Off, On = 70cm,
;                            On, On, On,Off = PHANTOM,    On, On, On, On = OUT OF BAND.
;
```

```
;       053 = AGC Off                                                       On = AGC Off.
;       054 = AGC Slow                                                      On = AGC Slow.
;       055 = AGC Fast                                                      On = AGC Fast.
;       056 = AGC Auto                                                      On = AGC Auto.
;       057 = LCD Backlight Off                                             On = BK-light Off.
;       058 = LCD Backlight Low                                             On = BK-light Low.
;       059 = LCD Backlight Med                                             On = BK-light Med.
;       060 = LCD Backlight High                                            On = BK-light High.
;       061 = O/P Power Low 1                                               On = O/P PWR Low 1.
;       062 = O/P Power Low 2                                               On = O/P PWR Low 2.
;       063 = O/P Power Low 3                                               On = O/P PWR Low 3.
;       064 = O/P Power High                                                On = O/P PWR High.
;
;                             Off,Off,Off = SSB/CW          Off,Off, On = SSB narrow,
;       065 = FILTER 0 \      Off, On,Off = AM,             Off, On, On = CW narrow,
;       066 = FILTER 1  >       On,Off,Off = FM,             On,Off, On = FM narrow,
;       067 = FILTER 2 /        On, On,Off = FM wide.
;
;       068 = (Unused. Reserved for future use)
;
;       069 = DDS RNG 0 \     Off,Off,Off = HF (1.8-28MHz),  Off,Off, On =   6m (50MHz),
;       070 = DDS RNG 1  >    Off, On,Off = FM (88MHz),      Off, On, On =  AIR (108MHz),
;       071 = DDS RNG 2 /      On,Off,Off = 2m (144MHz),      On,Off, On = 70cm (430MHz).
;
;       072 = (Unused. Reserved for future use)
;
;       073 = DDS Range HF   (1.8-28MHz)                                    On = DDS RNG HF.
;       074 = DDS Range 6m   ( 50MHz)                                       On = DDS RNG 6m.
;       075 = DDS Range FM   ( 88MHz)                                       On = DDS RNG FM.
;       076 = DDS Range AIR  (108MHz)                                       On = DDS RNG AIR.
;       077 = DDS Range 2m   (144MHz)                                       On = DDS RNG 2m.
;       078 = DDS Range 70cm (430MHz)                                       On = DDS RNG 70cm.
;
;       079 = (Unused. Reserved for future use)
;       080 = (Unused. Reserved for future use)
;
;       081 = ANT1  (Antenna 1, rear)             Off = ANT 2 (front) On = ANT 1 (rear)
;       082 = ANT2  (Antenna 2, front)            Off = ANT 1 (rear)  On = ANT 2 (front)
;       083 = TX                                  Off = RX,           On = TX.
;       084 = RX                                  Off = TX,           On = RX.
;       085 = VFOA                                                    On = VFOA.
;       086 = VFOB                                                    On = VFOB.
;       087 = MEM                                                     On = MEM.
;
;       252 = ATTEN 0 ( 6dB Attenuator)   \   Off, Off = 0dB,     Off, On = 6dB.
;       253 = ATTEN 1 (12dB Attenuator)   /    On, Off = 12dB,     On, On = 18dB.
;       254 = NB1  (Noise blanker 1)                                  On = NB1 ON.
;       255 = NB2  (Noise blanker 2)                                  On = NB2 ON.
;
;-------------------------------------------------------------------------------------
```