

Mini-Kits

HF RADIO v1.0

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 x.x0 If no DDS is found.
version x.x1 If an AD9851 is found.
version x.x2 If an AD9954 is found.
version x.x3 If an AD9958 is found. (note:- disabled in this version until fully tested with the AD9958)

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 3.3 seconds 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

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

A long press, copies the active VFO to the non-active VFO. ie, 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

memory. 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 DDS 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 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 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.

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.

Encoder

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.

the encoder.

1) You can change the cursor position by holding down button 3 and rotating

a character by

2) To change the character at the cursor position, release button 3, select rotating the encoder.

display chip.

The characters available are, characters 32 to 127 of the HD44780 LCD

```
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.

displays SAVING

4) A long press of the MEM button saves the changes to the memory and

edit mode.

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

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.

flashing.

when the select memory group mode is on, the group character will start

o.

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,

displays SAVING

A long press of the MEM button saves the changes to the memory group and

mode.

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

7 Skip this memory when scanning / Delete this memory.

A quick press changes the scan skip state.

character. i.e. M•001
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

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.

displayed on the

If you select YES, the memory will be deleted. MEMORY IS EMPTY will be

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.

for 1.6 second.
The station S meter level will be displayed on the upper line of the LCD

station,
A receive S meter level at or above this level will be considered on

all non memories.

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 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)

for 1.6 second.
station,
all non
restarted.
memories.
the scan

A quick press will start a memory group scan.
The station S meter level will be displayed on the upper line of the LCD
A receive S meter level at or above this level will be considered on 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 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.

Encoder

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 10 options, then press the MENU button (#) to go to the selected 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	IPO	(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	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

IPO screen.

Use the rotary encoder to turn the Intercept Point Optimization ON or OFF.

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 3

NOISE BLANKER screen.

Use the rotary encoder to turn the noise blanker 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 VFOs)

FUNCTION MENU 4

ATTENUATOR screen.

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

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 VFOs)

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 VFOs)

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 VFOs)

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 VFOs)

FUNCTION MENU 10

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 6 options, then press the MENU button (#) to go to the selected screen(s).

SETUP MENU 1	EXIT
SETUP MENU 2	SWEEP SETUP
SETUP MENU 3	BAUD RATE
SETUP MENU 4	OPTIONAL FILTERS
SETUP MENU 5	I/O BOARD SETUP
SETUP MENU 6	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 screen.

SETUP MENU 2

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 3

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 4

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 5

I/O BOARD SETUP

This screen allows you to select what is output on the 48 pins of the I/O board.
(96 pins if using two I/O boards)

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 6

LOAD DEFAULTS

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, then 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 8 options, then press the MENU button (#) to go to the selected screen(s).

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	MISCELLANEOUS
CAL MENU 7	BACKUP CAL INFO
CAL MENU 8	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 AD9851, AD9954, AD9958. 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.
AD9851 Range = 1 MHz to 180 MHz.
AD9954 Range = 10 MHz to 400 MHz. (500 MHz max if overclocking)
AD9958 Range = 1 MHz to 500 MHz. (600 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.

AD9951 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)

AD9954 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)

AD9958 Range = 1 x REFCLK, 4 x REFCLK to 20 x REFCLK.
(CLK range 1 - 500 MHz, with 1 x refclk)
(VCO range 100 - 160 MHz or 255 - 500 MHz, with 4-20 x refclk)
(600 MHz max if overclocking)

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

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

The following screens allow 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 specify 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

The following screens allow you calibrate the S meter.
There are no timeouts on these screens.

S METER CAL screen 1. 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 2. 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 3 to 15.

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

MISCELLANEOUS screen 1. SSB offset frequency.

This first screen allows you to set the SSB offset frequency within the range of -30 KHz. to 30 KHz.
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.

MISCELLANEOUS screen 2. CW offset frequency.

This screen allows you to set the CW offset frequency within the range of -30 KHz. to 30 KHz.
You can use the keypad or rotary encoder to enter the frequency.
Press the MENU button (#) to save the setting to EEPROM and return to the calibration menu.

CAL MENU 7

BACKUP CAL INFO

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, then 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 8

RESTORE BACKUP

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, then 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.

I/O BOARD default layout.

O/P PIN	FUNCTION NUMBER	
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
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)
;
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;
; O/P functions 0 to 255. (only 0 to 87 currently used)
;
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;
; 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 = (Unused. Reserved for future use)
; 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.                     On = DIG.
; 048 = PKT mode.                     On = PKT.
;
;
; 049 = Band 0 \                       Off,Off,Off,Off = 160m,   Off,Off,Off, On = 80m,
; 050 = Band 1 |                       Off,Off, On,Off = 40m,   Off,Off, On, On = 30m,
; 051 = Band 2 |                       Off, On,Off,Off = 20m,   Off, On,Off, On = 17m,
; 052 = Band 3 /                       Off, On, On,Off = 15m,   Off, On, On, On = 12m,
;                                     On,Off,Off,Off = 10m,   On,Off,Off, On = 6m,
;                                     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.
;
; 065 = FILTER 0 \                     off,off,off = SSB/CW     off,off, On = SSB narrow,
; 066 = FILTER 1 >                     off, On,off = AM,       off, On, On = CW narrow,
; 067 = FILTER 2 /                     on,off,off = FM,       on,off, On = FM narrow,
;                                     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.
;
-----

```