OpenGD77

OpenGD77 / OpenGD77S / OpenDM1801 / OpenRD5R User Guide

For the latest information and discussions, please refer to the development and community forum at https://opengd77.com

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Introduction

This user guide is a work in progress as is the OpenGD77, OpenGD77S, OpenDM1801 and OpenRD5R firmware.

Due to the rapid pace of development some photos of screens are now out of date and not completely accurate.

The photos will be updated when the firmware in a particular area stabilises

The intention of the project is to create a fully featured non-commercial firmware that entirely replaces the Radioddity GD-77, and Baofeng DM-1801 factory firmware. This firmware is specifically designed for **Amateur Radio** use, and has features not available in the official firmware.

Note: The firmware is still under development and there are some key areas of functionality which are supported in the official firmware but not in this firmware

SMS message Tx and Rx are not currently supported, but may possibly be supported in the future.

Dual Watch is not supported, and may never be supported, because this functionality can almost be replicated using the Channel / Zone scan feature Scan Lists are not supported because Channel / Zone scan feature provides almost identical functionality.

Privacy and Encryption will not be supported, as its illegal for Amateur Radio use, developers in some countries (e.g. Australia) are now legally required to put a back door access into any encryption systems at the request of the government, hence effectively making it illegal or impossible to develop systems that contain encryption.

Battery saving features have not been developed, hence this firmware causes much higher battery usage in Rx when there is no signal. Some battery saving features may be developed in the future, however some advanced features like the S meter will not be possible if battery saving is implemented.

Download links and other resources

Firmware binaries:

Latest version: https://github.com/rogerclarkmelbourne/OpenGD77/releases

OpenGD77 CPS with support of new features like 80 channel zones: https://github.com/rogerclarkmelbourne/OpenGD77CPS/releases

OpenGD77Forum: https://www.opengd77.com/

Installation

The firmware can be installed onto the following radios

- Radioddity GD-77 (also known as TYT MD-760)
- Radioddity GD-77S
- Baofeng DM-1801 (also known as Baofeng DM-860)
- Baofeng RD-5R (also known as Baofeng DM-5R Tier 2)

Firmware can be installed using the FirmwareLoader.exe in the firmware release, or by using the firmware update tool provided by Radioddity, or Baofeng with their official firmware update packages. This can be downloaded from Radioddity's website radioddity.com . See Radioddity's documentation on how to use their firmware update tool.

Installation of the firmware is undertaken at the owners own risk, but the official firmware can usually be reloaded onto the radio if the user has problems with the firmware, **as long as the operator takes a full backup of their radio using the OpenGD77 CPS immediately after the firmware has been installed**

Note: The official Radioddity CPS PC software is not compatible with the firmware, and the "OpenGD77 CPS" should be used instead. This can be downloaded from the link show in section 1.1 of this guide. This CPS must also be used for the Baofeng DM-1801

Transferring data to Radio

There are two mechanisms that can be used when connecting your computer to the radio.

1. Firmware upgrade.

- Get the radio into dfu mode by:
    - Holding down the two buttons indicated below (S1,Fn) and turning the radio on.
    - The LCD screen will be blank.
    - Connection will use the HID codes and a driver is not required to be installed.
        - Radioddity GD-77 or 77s or the TYT MD-760 or 730:
            - Hold down the two small Blue and Black buttons under the PTT button.
            - Some variants have no Blue button. It will also be Black.
        - Baofeng DM-1801 or DM-860:
            - Hold down the two small Black buttons under the PTT button.
        - Baofeng RD-5R or DM-5R Tier2:
            - The Orange S1 (Call) and Black Fn (Moni or S2) buttons (either side of the PTT).
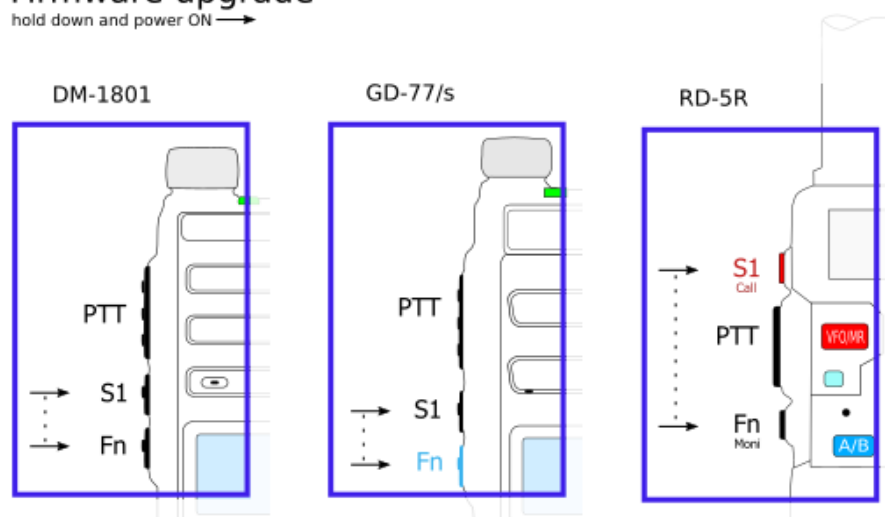
- The Firmware is easily installed from the Extras menu in the CPS.
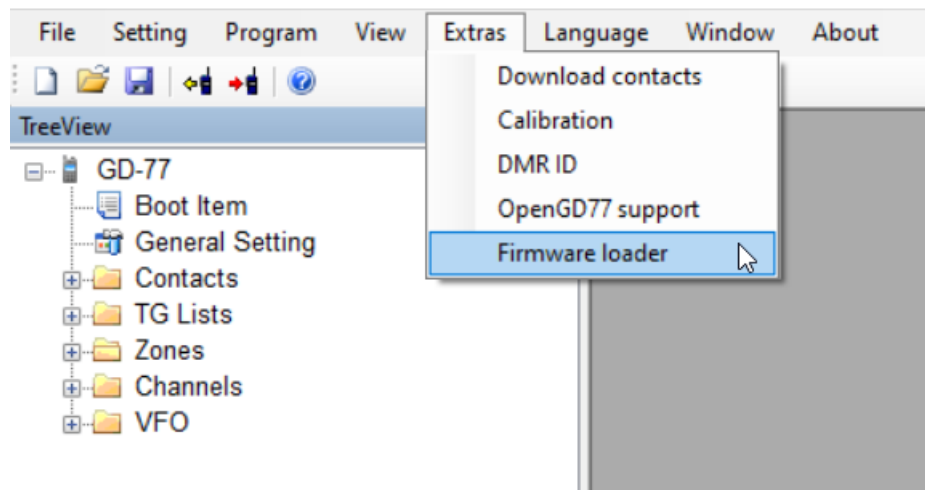
- Choose Your radio model.
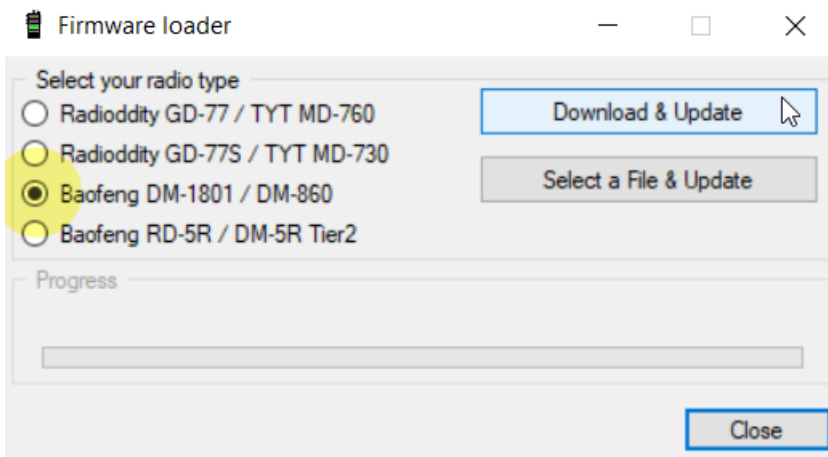
- If you choose Download and Update then you can select from the Stable or Unstable branches.
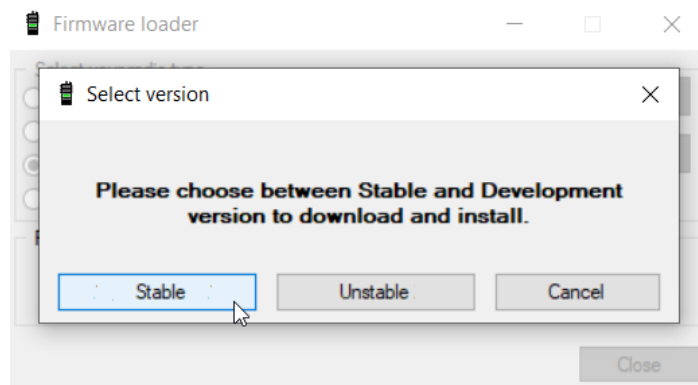
2. Updating the codeplug using OpenGD77 CPS.

- This mechanism uses serial communication while the radio is normally on with the LCD active.
    - If you have been updating the firmware then turn the radio off and turn it on normally.
    - It uses serial ports so the OpenGD77 driver must be installed. This happens as part of the installation of the CPS software.
    - Specific Detail in CPS section

Codeplug compatibility

The official firmware for each of these radios use slightly different codeplug formats.

Users radios other than the GD-77 will need to convert their codeplug using the tools written by Colin G4EML. See http://www.gb3gf.co.uk/downloads.html Specifically export their existing codeplug to CSV format, and then import those CSV files into the OpenGD77 version of Colin's tools.

The codeplug can only be uploaded to the firmware using the OpenGD77CPS.

Its also recommended that you restructure your codeplug to remove any duplicate channels which are the same frequency but use different TalkGroup. See the section 'Programming Channels and Talkgroups for use with the firmware' at the end of this User Guide

Variations between different supported radios

Not all the supported radios have the same number of buttons, or the same size screen, hence there are some differences when operating radios other than the Radioddity GD-77. Also, not all radios support all the functionality

- The Baofeng RD-5R / DM-5R USB hardware will not support USB connections while the radio is transmitting, so it is not possible to use Hotspot mode on this radio.

- The Baofeng RD-5R / DM-5R does not have left or right arrow buttons, so the **A/B** button is used to replace the left arrow and the "Band" button is used to replace the right arrow

- The Baofeng RD-5R / DM-5R does not have the **Orange** button, and its functionality has been simulated by using a Long press on the orange coloured **MR/VFO** button

- The Baofeng RD-5R / DM-5R has 2 buttons on the side, but their position is different from the GD-77 and DM-1801. The button above the PTT is used as the "Black" button on the side of the GD-77, also know as button SK1. The button below the PTT is used as the **Blue** button, also known as SK2.

- The Baofeng RD-5R / DM-5R does not work well as a Hotspot, because its RF output is impure and seems to cause RFI problems with the Raspberry Pi and possibly other host systems, causing the USB connection to fail.

- The Radioddity GD-77S does not have a keypad or screen, hence its operation is completely different from the other supported radios that have a screen.

See the appendix on GD-77S operation (#gd-77s-operation)
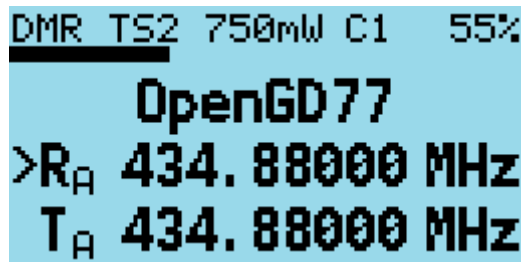
- The Baofeng DM-1801 / DM-860 has a dedicated **MR/VFO** button, which is used to change between Channel and VFO mode, in place of pressing the **Red** menu key
- The Baofeng DM-1801 / DM-860 has a dedicated **A/B** button, which is used to change between VFO A and B, in place of pressing the quick menu via the **Orange** button on the top of the radio

Main screens (VFO and Channel screens)

The firmware has 2 main screens. The VFO screen and the Channel screen. These are similar to the channel and VFO screens in the official firmware, except have additional functionality.

Initially after the firmware is installed, the VFO screen will be displayed.

VFO screen

The frequency used in the VFO for both Tx and Rx will be read from the "VFO A" settings of the codeplug.

On both the VFO and Channel screens, the mode (DMR or FM) is shown in the top left of the display, and the battery voltage percentage is shown in the top right of the display
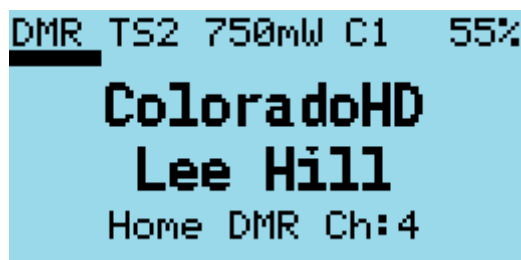
In DMR mode the current TimeSlot is shown to the right of the "DMR" text e.g TimeSlot 2 "TS2", and the Colour Code e.g. "C1" is shown to the left of the battery percentage. When TimeSlot filtering is turned off, the **TS1** or **TS2** indicator is in inverse color.

The current Tx power is shown in the middle of the top of the screen (e.g., 750mW)

On the VFO screen, the TX and RX frequency are shown, as well as the TalkGroup when in DMR mode.

The arrow to the left of the R (receive frequency) indicates that the keypad up and down arrows and number entry keys will control the RX frequency.

The channel screen displays the same information in the top row, but displays the Channel name (in this example "Lee Hill") as well as the Zone ("Home DMR"). In DMR mode the TalkGroup (in this case "ColoradoHD") will also be displayed

displayed informations

On both the VFO and Channel screens:

Press the **Red** menu button to toggle between the VFO and Channel screens

Note on radios like the Baofeng DM-1801 and RD-5R, press the MR/VFO button to toggle between Channel and VFO mode)

Press the **Green** menu key to enter the menu system

Press **Function + Green** for quick access to the Channel details screen, which can also be accessed via the menu system. *Note:* The VFO is actually a special type of channel; hence the Channel Details screen also works for the VFO.

Changing between VFO and Channel

Press the **Function + Star** key to toggle between FM and DMR mode on either the VFO or Channel screens.

Changing Timeslot in DMR mode

In DMR mode, pressing the **Star** key toggles between TimeSlot 1 and TimeSlot 2.

Controlling Tx power

Press **Function + Right** to increase the power. Press **Function + Left** to decrease the power. Power can be set to 50mW, 250mW, 500mW, 750mW, 1W, 2W, 3W, 4W, , 5W and 5W++.

The 5W++ power setting configures the PA drive to its maximum value. This power setting is designed for emergency use only, and results in around 5.5W being produced on 70cm and 7W on 2m. To access this power setting, select the 5W power setting, then press and hold **Function + Right**

Notes:

(1) The power output will only be correct after the operator has calibrated their own radio, as these radios do not seem to have very accurate power calibration applied in the factory.

(2) The High / Low power setting defined for a Channel (or VFO) is not used by the firmware, as it can only have 2 settings, whereas the firmware supports 10 power levels.

Signal strength bar graph

In both FM and DMR mode, the signal strength of the received signal is shown as a bar graph across the width of the screen. 100% bar graph is approximately S9 +40dB.

In DMR mode the signal meter will only be active when the DMR hardware detects a DMR signal.

In FM mode the signal meter should operate all the time.

signal meter

Channel screen specific functionality

The Channel screen displays the current Channel number as well as the current zone.
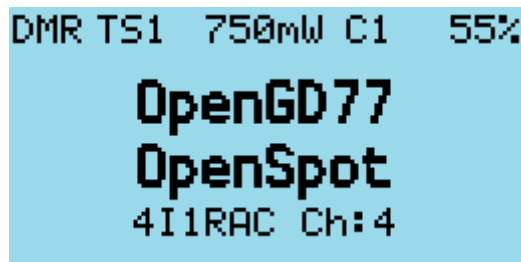
channel and zone

Changing channels within the current zone   Pressing the **Up** or **Down arrow** keys changes the channel in the current zone, and the channel number in the zone will be displayed beside the zone name.

Changing zones   Pressing **Function + Up arrow** or **Function + Down arrow** changes to the next or previous zone, respectively.

another zone

Displaying the channel Frequency

Press and hold the **Black button** to display the Rx and Tx frequency in both DMR and FM mode.

Displaying FM specific channel information

Press and hold the **Black button** to display FM specific information: CTCSS / DCS and squelch setting.

Listening on a repeater input

Pressing the **Black button** and **Blue button** enables the radio to receive on the input to a repeater. This works on both DMR and FM repeaters. This also shows the channel information as described above.

Channel screen Quick Menu   Pressing the **Orange** button on the top of the radio in Channel mode displays the Quick Menu for the Channel screen. Note that in Quick Menu, the **Orange** button has the same function as the **Green** key, which confirms your current selection.

Note. The Baofeng RD-5R does not have an Orange button. On this radio press and hold the orange coloured MR/VFO button to enter the Quick menu

Copying a channel to VFO   Press the **Orange** button or **Green** key to copy the content of the current channel to the VFO.

Read the VFO into the current channel Press the **Orange** button or **Green** key to confirm and save the updated channel to the codeplug memory. **Red** key to cancel.

Filter Filter in FM Mode

Use the **Right** or **Left** arrows to enable or disable CTCSS/DCS filtering

Filter in DMR mode

Use the **Right** or **Left** arrows to select * **None** (for no filtering, i.e. "promiscuous" mode). * **TG** (to filter by the selected Talkgroup) * **Ct** (to filter by Private Call Contacts in the codeplug) * **RxG** (to filter by Talkgroups in the TG list / Rx Group list)

When this filter is enabled the DMR mode indication at the top of the screen is displayed in inverse video.

CC Filter (DMR mode only) Controls whether the radio filters by Colour Code Use the **Right** or **Left** arrows to enable or disable

When Colour Code filtering is disabled the Colour Code number is displayed in inverse video.

TS Filter (DMR mode only) Controls whether the radio filters by Timeslot Use the **Right** or **Left** arrows to enable or disable

When Timeslot filtering is disabled the Timeslot number is displayed in inverse video.

channel quick menu

VFO Quick Menu Pressing the **Orange** button on the top of the radio in VFO mode displays the Quick menu for the VFO screen. Currently this has five options.

Note. The Baofeng RD-5R does not have an Orange button. On this radio press and hold the orange coloured MR/VFO button to enter the Quick menu

VFO selection A or B Pressing the **Orange** button twice while in VFO mode quickly toggles between VFO A and VFO B. On the Baofeng DM-1801 / DM-860, this function is controlled using the **A/B** button.

Exchange the TX and RX frequencies This function essentially reverses the TX and RX frequencies. Press **Green** key or **Orange** button to confirm.

Copy the RX frequency to the TX frequency Copies the RX frequency to the TX frequency. Press **Green** key or **Orange** button to confirm.

Copy TX frequency to the RX frequency Copies the TX frequency to the RX frequency. Press **Green** key or **Orange** button to confirm.

Filter (DMR mode only) This function is identical to the Filter described for Channel mode operation (above)

VFO to New Channel The "VFO –> New Chan" option, creates a new channel using the current VFO settings. The name of the new channel uses the format "New channel NNN", where NNN is the next available number in the All Channels zone.

This channel is not added to a Zone but is available via the "All Channels" Zone.

Tone Scan for CTCSS or DCS tone in FM This scans for any CTCSS or DCS tones, and sets the VFO to these parameters.

The default is to scan **All** tones (CTCSS and DCS). To scan for just CTCSS or just DCS, press the **right** or **left** arrow keys to select CTCSS or DCS

Press the **Orange** button or **Green** key to confirm the copy or **Red** key to cancel.

Cancelling the scan restores the Rx CTCSS/DCS to its value prior to the scan being started.

If a tone is detected; both the Rx and Tx CTCSS/DCS values are set to the tone which was detected by the scan.
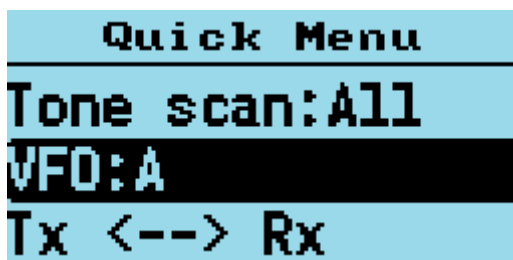
VFO quick menu

DMR specific functionality (VFO and Channel screens)

Timeslot selection The **Star** key toggles between TimeSlot 1 and TimeSlot 2

DMR ID callsign and name display When a DMR signal is received which uses the same Colour Code as selected for the VFO or Channel, the radio display will show the station's Talkgroup and DMR ID

talkgroup and DMR id

If the DMR ID is in the DMR ID database previously loaded into the radio, the callsign and name will be displayed.

DMR TS1 750mW C1 55%
TG 515
4I1RAC Angelo
OpenSpot

callsign and name

Talker Alias display   If receiving a signal from the Brandmeister network, and if the station's DMR ID is not in the radio's DMR ID database, the display will show the Talker Alias information sent by Brandmeister.

DMR TS1 750mW C1 55%
TG 91
N2XRV
DMR ID: 316205
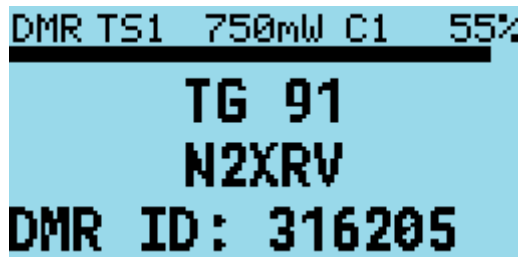
talker alias

The callsign will be displayed in the centre of the screen, and additional information will be displayed at the bottom of the screen. The additional information will default to the text "DMR ID:" followed by the stations DMR ID number.

If the station has entered any data into the APRS section of their Brandmeister "Self care" page, that text will be displayed in place of the DMR ID number.

DMR TS1 750mW C1 55%
TG 91
KD0USA
Barry
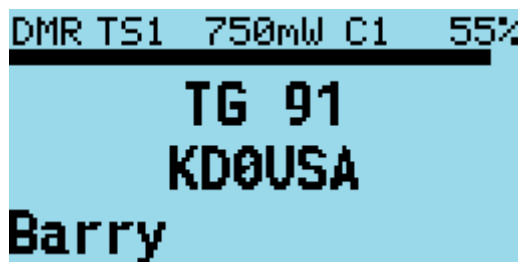
talker alias data

Note: As the Talker Alias data is sent slowly as it is embedded inside the DMR audio data frames, the callsign will appear first and about half a second later the DMR ID or other text will arrive via the DMR data and be displayed.

Talkgroup selection from the Rx Group list   Press the **Left** or **Right** Arrow keys to cycle through the TalkGroups in the TGList assigned to the VFO or Channel in the CPS. This TalkGroup will apply to both RX and TX.
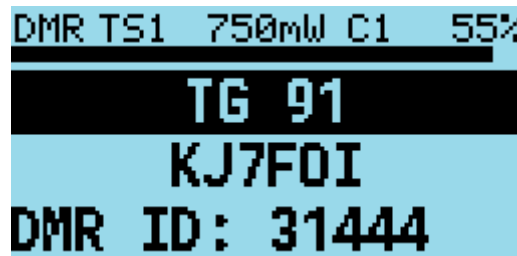
Note. The Baofeng RD-5R does not have Right and Left arrow keys. Use the A/B button as the left arrow and the Band button as the right arrow

Assignment of Timeslot to Digital Contact TalkGroup A new feature introduced to the CPS allows a default TimeSlot to be applied to each Digital Contact or TalkGroup.

By default, the Channel TS override is disabled. This means that if the **Left** or **Right** arrows are pressed to select this TG within the Rx Group list, the Timeslot assigned to the Channel (in the CPS) or manually changed using the **Star** key will not change.
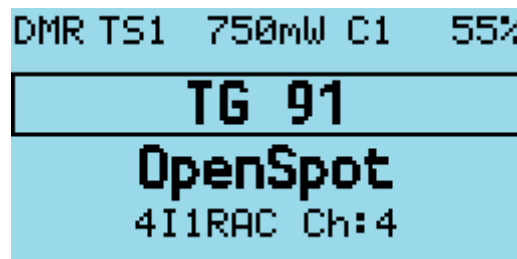
However if the Digital Contact has an override TS assigned (e.g., TS 1), when this Digital Contact TG is selected by pressing the **Right** or **Left** arrows, the Timeslot will be set to the Timeslot assigned to the Digital Contact TG.

TalkGroup displayed in inverse video If a Talkgroup is displayed in inverse video during reception of a DMR signal, this indicates that the current TX TalkGroup does not match the received TalkGroup, hence pressing the PTT would not transmit back to the station on the same TalkGroup.

talkgroup in inverse video

If you want to transmit on the same TalkGroup as the currently received signal, press the **Function** button on the side of the radio while the TalkGroup is being displayed in inverse. The TX TalkGroup will now be set to the RX TalkGroup.

talkgroup temporary set

Manual TalkGroup number entry Press the **Hash (#)** key to enter an *ad hoc* TalkGroup number, followed by the **Green** key to confirm. If the entered TG is in the Digital Contacts the name of the TG Contact will be displayed, otherwise the number will be displayed e.g. TG 98977.

To return to the previous TG prior to manually entering the TG, press either the **Left arrrow** or **Right arrow** keys.

talkgroup entry screen

When a TG has been manually entered, the display shows a 1 pixel box around the TG display area to indicate that this TG has been manually entered, even if the Contact / TG name is displayed rather than the TG number.
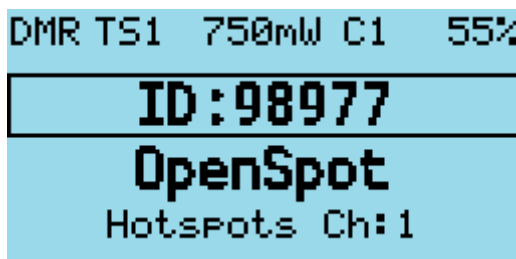
talkgroup override

Private Call number entry   Press the **Hash (#)** two times to enter a Private Call DMR ID number.

personnal DMR ID entry screen

In all numeric entry screens, pressing the Red menu key exits back to the previous screen, either the VFO or Channel screen.

Digital Contact selection   Press the **Hash (#)** three times to access the Digital contacts defined in the CPS.

contact selection screen

The contact name is shown in the middle of the screen, e.g. "TG 505 TS2" and the TalkGroup or PC number is shown in smaller text at the bottom of the screen.

Press the **Up arrow** or **Down arrow** to cycle through the list of Digital Contacts

Press **Green** to select or **Red** to cancel.

Private calls can also be selected in this manner.

private call selection

Station DMR ID number entry In Contact selection mode, press **Function + Hash (#)** key, and an alternative DMR ID can be entered for the radio (for test purposes) to temporarily override your normal DMR ID number which was loaded from the codeplug.

This DMR ID will be used for transmission *until* the radio is rebooted or you enter another DMR ID via the same screen.

To make the change permanent, so that its written back to the codeplug Press **Function + Green** instead of **Green** to confirm the number.

DMR ID entry screen

FM specific functionality (VFO and Channel screens)

FM and FM Narrow For FM with 25kHz bandwidth with the text "FM" is displayed in the top left of the screen. For narrow band with 12.5kHz bandwidth the text "FMN" is displayed.

CTCSS Tone or DCS Code These can be set for the Channel or VFO. The letters **C** or **D** and **T**, **R**, or **TR** will be displayed next to the FM indicator at the top of the screen.

C means CTCSS and **D** means DCS code. **T** means Tx tone or code only. **R** means RX tone or code only. **TR** means both Tx and Rx tones or codes are configured.
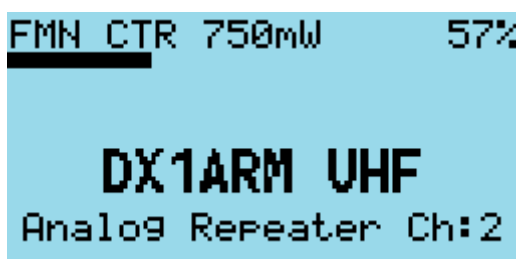
CSS status

It is possible to configure Tx and Rx tones or codes independently.

Squelch   Pressing **Left** or **Right** keys, controls the FM squelch.
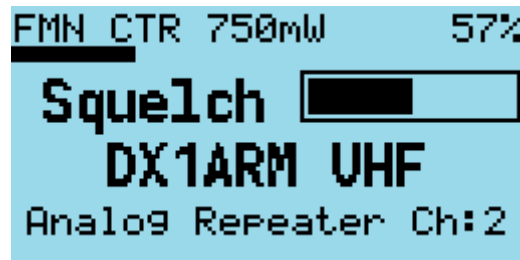
squelch level

Once in squelch control mode, pressing **Right** tightens the squelch incrementally, **Left** opens up the squelch incrementally. The VFO and each channel have individual squelch settings that can be set in this manner.

The variable squelch can be set to different values for each Channel and for the VFO using a new feature in the Community CPS, where the squelch can be set anywhere between Open and Closed in 5% steps.

In this example the squelch in the VFO is set to 20%.

If the squelch is changed in the VFO the value will be remembered even if the radio is power cycled. However if the squelch on a channel is changed, the value is only a temporary override.

To make the squelch change permanent to a Channel, press **Function + Green** to enter the Channel Details screen, and then press **Function + Green** again to save the channel data to the codeplug.

Note. If RX CTCSS is enabled, this has priority over the squelch control, and lowering the squelch threshold will not cause the squelch to be opened.

1750Hz Tone for repeater operation   Pressing the **Function** button during FM transmission, sends the 1750Hz tone required for some repeater operation.

DTMF tone transmission   Pressing any key (except the Green and Red menu keys) on the keypad during transmission will transmit the DTMF tones for that key.

The tone will also be audible through the speaker.

VFO specific functionality
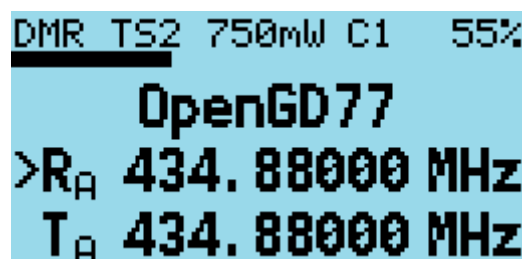
VFO screen

The VFO displays both the TX and RX frequency at all times.

When the currently selected frequency is the **RX** frequency, an arrow is displayed to the left of the "**R**", changes to the frequency will adjust both the TX and RX frequencies.

Frequency change up/down step   Pressing the **Up** or **Down** arrows will change frequency by the value defined in the frequency step value defined for the VFO in the CPS.

The step can be adjusted by pressing **Function + Green** to enter the Channel Details mode, and then adjusting the "Step" setting

Numerical frequency entry   Pressing any of the number keys allows the direct entry of the frequency.
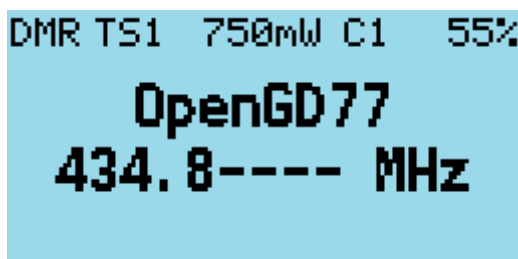
frequency entry screen

When all digits have been entered, the accept beep tones are played, and the display returns to the VFO screen.

If an invalid frequency is entered the error beep tones are played.

When entering a frequency:

Pressing the **Red** key cancels the entry

Pressing **Left** arrow deletes the digits one by one.

To adjust the TX frequency, independent of the RX frequency   Press the **Function** button on the side of the radio, and then the **Down** arrow.

This will change the currently selected frequency to the TX frequency, and the arrow will move to the left of the "**T**" instead of the "**R**"

To change the RX frequency again, press **Function + Up** arrow.

When the TX frequency is changed, the RX frequency will not be changed.

Use this method to set different TX and RX frequencies. For example, this can be useful for satellite operation as it allows Cross Band operation as well as split frequency simplex operation on the same band.

Note

If different TX and RX frequencies are set, and the currently selected input is set to RX, changing the RX frequency will also change the TX frequency, and the difference between the RX and TX frequency will be maintained if possible.

The only case where the frequency difference will not be maintained is if the TX frequency goes outside of the range of frequencies supported by the radio hardware.

Transmitting

During transmission the Talk Timer either counts up or down, depending on whether the channel has a timeout defined.

If a timeout is defined in the CPS, or adjusted in the Channel Details screen, the Talk Timer will count down and when the timeout period is reached a beep will play and the TX will stop.

In DMR Tier2 the timer will not start counting until the repeater becomes active.

During FM and DMR Tx a VU meter is displayed showing the input microphone level, in the form of a bar graph across the top of the screen.

VU meter

Timeout warning beep

A timeout warning can be configured in the Sound Options menu. The radio will beep every 5 seconds when the remaining call time is less than the timeout.

TOT

If TOT is setup for the current channel or VFO, when the timer counts down to zero the transmission will stop, a warning beep will be played and the radio will stop transmitting.
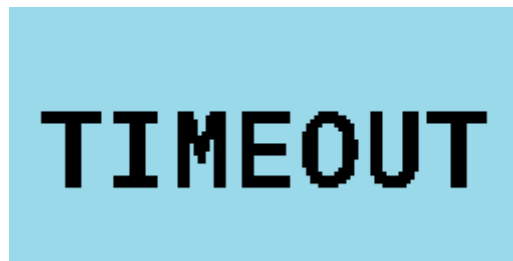
timeout screen

Scanning

Both the Channel and VFO screens support scanning, but their operation is slightly different.

Channel scanning

Press and hold (Long press) the **Up arrow** to start scanning the channels in the zone Press the **Left arrow** to reverse the direction of scan. Press the **Right arrow** to mark the channel as a 'nuisance' channel which will be removed from the current scan. Press the **Up arrow** to skip over the current channel, and continue the scan

Pressing any other button stops the scan.

Whilst scanning the mode indicator **DMR** or **FM** will flash.

VFO scanning

The VFO screen has a special scanning mode, which is entered by performing a Long Press on the **Up** arrow button. When scan mode is enabled, the display changes to show the lower and upper scan limit frequencies, instead of showing the Tx frequency.

Initially the scan limits will be set to the current VFO Rx frequency minus 1Mhz to plus 1Mhz.

Scan limits can be changed by manually entering both frequencies e.g.

1 4 4 0 0 0 1 4 8 0 0 0

To start the scan, use Long press on the **Up** arrow, until the radio beeps.

When not actively scanning, pressing the **Up** or **Down** arrows performs the normal function in the VFO of increasing or decreasing the frequency.

Press the **Left arrow** key to reverse the scan direction. Press the **Up arrow** to skip over the current frequency and continue the scan. Press the **Right arrow** arrow to mark the current frequency as a 'nuisance' frequency, which will be omitted by the scan.

Pressing any other button will stop the scan

Long press on the **Down arrow** arrow exits from scan mode.

Other screens

Lock screen

keypad lock screen

To lock the keypad.

On either the VFO or the Channel screen, press the **Green** menu key to display the Main menu, then press the **Star** key. Pressing the **Star** key from any top-level item within the Main menu locks the keypad.

To unlock the keypad, press and hold the **Function** button and press the **Star** key.

full lock screen

You can also lock the PTT button by pressing the **Green** menu key to display the Main menu and then pressing the **Hash (#)** key. The keypad *and* the PTT can both be locked at the same time by first locking the PTT and then the keypad.

Text entry

The firmware now supports alphanumeric text entry while creating a new contact or editing an existing one.

alphanumric entry

Press **Left** and **Right** to move the cursor. Press **Function-Left** to backspace, and **Function-Right** to insert a space. The keypad entry follows the same functionality as stock GD77 firmware.

The control keys and buttons

GD-77 cheatsheet

BaoFeng DM-1801

OpenGD77 Cheatsheet

On/OFF
Volume

ON + Fn = Reset Radio
ON + Fn + S1 = Firmware mode

PTT + S1 = Show Last heard list
PTT + Fn = (FM) 1750Hz tone
PTT + numeric = (FM) DTMF tone

S1 = Backlight on (if Manual
set in Display options)

PTT

S1

Fn

Fn + ◄► = Power
Fn + ∗ = DMR <-> FM on current freq
Fn + MENU = Ch details
Fn + S1 = RX <-> TX (repeater input)

MENU = Menu / Item Selection

Toggle frequencies and Ch data

DMR   FM

	DMR	FM
◄ ►	TG up/dn	Squelch
▲ ▼	Chan up/dn	Freq up/dn
Fn+▲ ▼	Zone up/dn	VFO Rx/Tx focus
S1	Show Freq	Show offsets, sq%

Scanning

(long)▲ ▼ = Scan / exit

While scanning:
◄ = reverse scan direction
► = skip nuisance channel
▲ = skip once

Shortcuts

Fn + numeric = useful shortcut
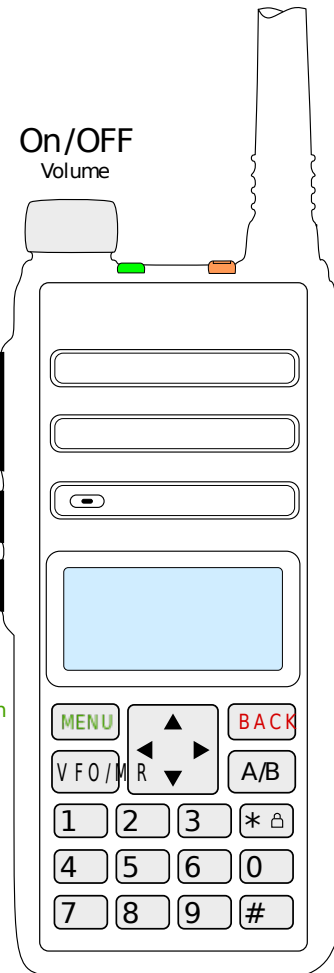
Quick Menu

- FM = VFO <-> Ch
- DMR = Filter (TS, CC, CTSS)
- VFO -> new channel
- BACK to exit
- MENU selects

Channel / Contact Editing

- Fn + ◄ = bs, Fn + ► = space
- alphanumeric keypad
- MENU saves
- Fn + MENU saves permanently

Locks

MENU, # = Lock PTT
MENU, ∗ = Lock keypad
Fn + ∗ = Unlock PTT, keypad

Back / Cancel / Exit

Swap from VFO A to VFO B

∗ = Toggle TS1, TS2 (DMR)

= Enter DMR TG ID
MENU to confirm
◄► = return to prev TG

DMR Talkgroups

Inverted display indicates receiving
on different TG to current Tx.
- Click Fn to set Tx to received TG .

Private Call

= start Private Call
(Enter DMR ID and MENU)
Fn + Back to exit.

= select Digital Contact
Use ▲▼ to scroll. MENU to call.
Back to exit.
(Override DMR id with Fn + #
until reboot or
Fn + MENU = permanent)

MENU   ▲   BACK
VFO/MR ◄ ► A/B
       ▼

1	2	3	∗🔒
4	5	6	0
7	8	9	#

DM-1801 cheapsheet

The Menu System

The Open GD77 firmware utilizes a significantly revised menu structure compared to the official firmware. Targeted at amateur use, this focuses on being more straightforward, with highlight on commonly-used features. Please refer to the menu map below.

OpenGD77 Menu Road-Map
(Based on FW Dec 09 2019 13:09:44)

Menu
Firmware info
Options
Display options
▼

Menu
Options
Display options
Channel details
▼

See page 3

Options
Squelch VHF:15%
Timeout beep:15
Fact Reset:No
▼

Options
Timeout beep:15
Fact Reset:No
Calibration:On
▼

Options
Fact Reset:No
Calibration:On
Band Limits:Off
▼

Options
Calibration:On
Band Limits:Off
Beep vol:-21dB
▼

Options
Band Limits:Off
Beep vol:-21dB
DMR mic:3dB
▼

Options
Beep vol:-21dB
DMR mic:3dB
Key long:0.4s
▼

Options
DMR mic:3dB
Key long:0.3s
Key rpt:0.2s
▼

Options
Key long:0.3s
Key rpt:0.2s
Filter time:10s
▼

Options
Key rpt:0.2s
Filter time:10s
Scan delay:5s
▼

Options
Filter time:10s
Scan delay:5s
Scan mode:Hold
▼

Options
Scan delay:5s
Scan mode:Hold
Squelch VHF:25%
▼

Options
Scan mode:Hold
Squelch VHF:25%
Squelch 220:25%
▼

Options
Squelch VHF:25%
Squelch 220:25%
Squelch VHF:15%
▼

Options
Squelch 220:25%
Squelch VHF:15%
Timeout beep:15
▼

Display options
Color:Normal
Brightness:1%
Contrast:15
▼

Display options
Brightness:1%
Contrast:15
Timeout:0
▼

Display options
Contrast:15
Timeout:0
Color:Normal
▼

Display options
Timeout:0
Color:Normal
Brightness:1%
▼

OpenGD77 Menu Road-Map
(Based on FW Dec 09 2019 13:09:44)

Menu
Display options
Channel details
Language

Channel details
Rx Grp:TG-9
Mode:DMR
Color Code:2
▼

Channel details
Mode:DMR
Color Code:2
Timeslot:2
▼

Channel details
Color Code:2
Timeslot:2
Tx CTCSS:N/A
▼

Channel details
Timeslot:2
Tx CTCSS:N/A
Rx CTCSS:N/A
▼

Channel details
Tx CTCSS:N/A
Rx CTCSS:N/A
Rx:439.47500MHz
▼

Channel details
Rx CTCSS:N/A
Rx:439.47500MHz
Tx:433.47500MHz
▼

Channel details
Rx:439.47500MHz
Tx:433.47500MHz
Bandwidth:N/A
▼

Channel details
Tx:433.47500MHz
Bandwidth:N/A
Step:2.50kHz
▼

Channel details
Bandwidth:N/A
Step:2.50kHz
TOT:165
▼

Channel details
Step:2.50kHz
TOT:165
Zone Skip:No
▼

Channel details
TOT:165
Zone Skip:No
All Skip:No
▼

Channel details
Zone Skip:No
All Skip:No
Rx Grp:TG-9
▼

Pressing the **GREEN** key enters the menu system, press again to enter a menu subsection or to exit the menu.

Press the **RED** key to step back one level or to exit the menu system.

The **UP** and **DOWN** arrow keys step up and down through the various pages of the menu system.

The **LEFT** and **RIGHT** arrow keys will change the individual items in the menu system where they are changeable.

The **BLUE** button on the side of the radio, known as SK2, is used as a "**Function**" key. Various features are accessed by holding the "function" key when pressing a button on the keypad.

Press the **ORANGE** button to access the quick menu from the standby screen.

Main Menu

main menu

Zone

This menu is used to select which groups of channels, called a Zone, is used in the Channel screen, and operates in the same way as the official Radioddity firmware, except with one addition.
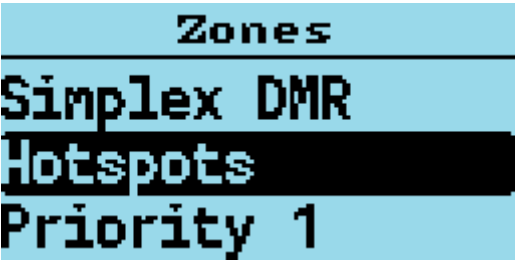
zone list

In addition to the Zones that are defined in the CPS and uploaded to the radio using the Community CPS, the firmware creates a special Zone called **All Channels**.
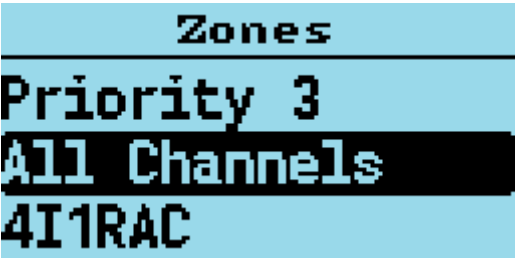
all channels zone

When the All Channels zone is selected, the Channel screen displays "**All Channels** and the channel number instead of the zone name and channel number.

all channel is selected

Pressing the **Up** and **Down** arrows will cycle through all channels in the zone.

Pressing any of the number keys on the keypad, enters 'Goto channel number' mode.

goto 12 is entered

In this mode, you can enter multiple digits and then press the **Green** key to confirm, or the **Red** key to cancel.

Note that you can quickly cycle through zones by holding the **Blue** button and pressing **Up** or **Down** in Channel mode.

RSSI

Displays a signal strength indicator showing the numerical RSSI value in dBm, along with an S-Unit bar graph.
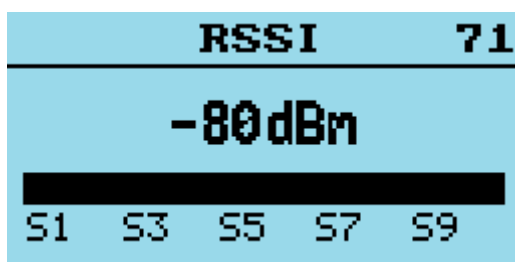
RSSI screen

Notes

Both RSSI and S meter are not calibrated and will vary somewhat between different radios in their accuracy.

DMR signals by their nature, because they are pulse transmissions, will not give accurate RSSI values.

The number in the top right of the display is for debugging purposes and is the number reported by the receiver hardware.

Battery

Displays the current battery voltage.
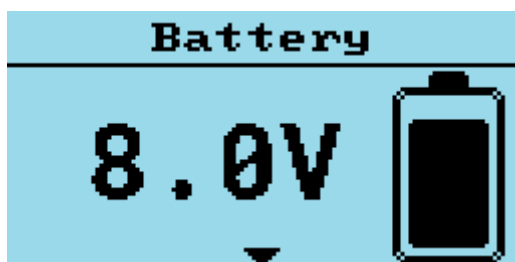
battery status screen

Press the **Down** key to display the battery usage chart. This shows the history of battery voltage on an hourly basis.
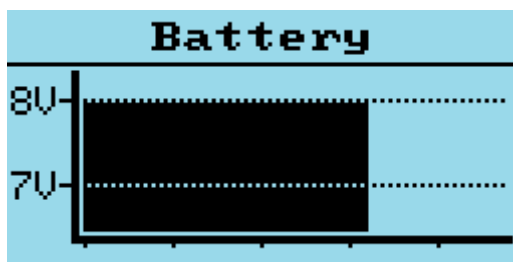
battery history graph

Last Heard

Displays a record of the last 16 DMR stations that the radio has received.

last heard screen

Pressing the **Up** or **Down** arrows cycles through the list to show stations which have been heard.

Hold **Blue** button to view details like TalkGroup and time elapsed

Firmware Info

firmware info screen

Displays the date and time the firmware was built, and also the Github commit code in brackets.

To view details on Github, append the code to https://github.com/rogerclarkmelbourne/OpenGD77/commit/

e.g. https://github.com/rogerclarkmelbourne/OpenGD77/commit/a0ebbc7

Options

main menu

This menu controls various settings specific to the firmware

options menu

Fact Reset Resets the radio to default settings, and reads the CPS VFO A values from the codeplug into the VFO screen. Power cycle the radio to apply.

The radio can also be set to the default settings by holding the Blue (Function) key while turning on the radio.

Calibration Turns ON/OFF the calibration function (default OFF).

Some radios seem to have invalid calibration data, possibly because the official firmware has corrupted the calibration parameters in the Flash memory. This requires a power cycle for the setting to apply.

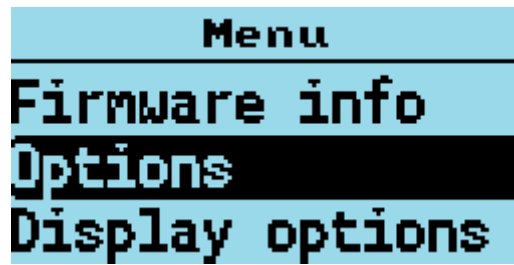If the radio does not seem to transmit or receive correctly, or if it does not work correctly (e.g., high BER) with certain hotspots, try disabling the calibration and rebooting the radio, as the nominal calibration parameters used by the firmware normally work almost as well as correct calibration data.

Band Limits Turns ON/Off the transmit band limit function that prevent transmission outside of the Amateur Radio bands. (Default ON).

Key long This setting controls the time (in seconds) after which a key is considered to be a long/repetitive press.

Key rpt This setting controls the speed of key repetitions when a key is held.

Filter time This feature works when TimeSlot filtering is turned off (**Filter: Off** in the Quick Menu). It sets the duration the radio listens in to one particular TimeSlot before resuming listening to the other TimeSlot for traffic. This prevents the radio from switching to the other TimeSlot in the event that there is a long pause or transmission gap in the current TimeSlot being heard. When TimeSlot filtering is turned on (**Filter: TS** in Quick Menu), this does not have any effect.

Scan delay   During scan mode, this controls the duration that the radio tunes in to a channel before resuming scan. This works when **Pause** is selected as the scan mode.

Scan mode   This setting controls how the receiver stops when there is a signal during scan mode. **Hold** continuously tunes in to a channel when a signal is received. **Pause** tunes in to that signal for a specified duration (Scan Delay) and then resumes scan.

Squelch UHF   This setting controls the squelch level for 70cm UHF when using an analog channel or during analog mode in VFO. Default is 45%.

Squelch 220   This setting controls the squelch level for 220MHz when using an analog channel or during analog mode in VFO. Default is 45%.

Squelch VHF   This setting controls the squelch level for 2 meter VHF when using an analog channel or during analog mode in VFO. Default is 45%.

PTT Latch   When PTT latch is enabled, the PTT switch toggles the radio to transmit or receive. In this mode the PTT does not need to be pressed continuously during an over.

Note. The PTT latch function only works if a timeout has been defined for the channel, or VFO, to prevent constant accidental transmission.

Hotspot   Hotspot mode is not supported on the Baofeng RD-5R / DM-5R because the hardware does not support reliable USB communications while the radio is transmitting

This option controls whether the firmware will enter hotspot mode when connected to MMDVMHost, including Pi-Star, or to BlueDV.

Options are **Off MMDVM** for use with Pi-Star or any other system using MMDVMHost **BlueDV** for use with BlueDV

On the GD-77S. To enable hotspot mode, Press and hold the **black button** (SK1) while turning on the radio. This will toggle hotspot mode between **MMDVM** and **BlueDV** mode.

TA Tx   Enables **transmission** of Talker Alias data

Please note. Talker Alias reception is always operational. Do not enable this feature because you are not receiving TA data, as it does not control TA Rx.

The text of "Line1" and "Line2" from the "Boot Item" screen is used for this transmission, with no space between the Line1 and Line2 data.

Note. Use of this feature will cause problems on Motorola based repeaters and networks, and should only be used for simplex and possibly on Brandmeister and other networks which correctly support Talker Alias

Allow PC   Allows Private Calls to be received

Display Options
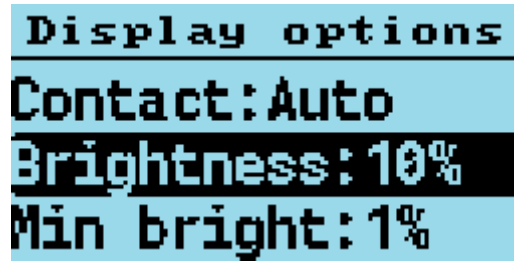
display options menu

Brightness The firmware allows the display backlight brightness to be controlled from 100% to 0%, in 10% steps between 10% and 100% and below 10% the brightness is controlled in 1% steps. The default backlight brightness (default 100%). Use the **Right** and **Left** arrow keys to adjust the brightness.

Min Bright Controls the display backlight brightness in its "Off" state. The default value is "0%", so that when the display is in its "Off" state there will be no backlight.

Contrast The firmware allows the display contrast to be set. Lower values result in dark text, higher values result in darker text but the background also starts to become dark at higher settings.

Display mode Controls the display backlight operation

Auto Display backlight will turn on automatically when triggered by various events e.g. Rx of signal, or pressing a key or button.

Squelch Display backlight remains illuminated while the FM squelch is open or there is a valid DMR signal, and also remains illuminated for the specified backlight timeout after the squelch has closed. The minimum timeout period in this mode is 5 seconds.

Manual Display backlight is toggled on and off by pressing the **Black** button (SK1)

None Display backlight will not illuminate under any condition

Timeout Sets the time before the display backlight is extinguished (default No timeout). Setting this value to "No" prevents the backlight from turning off at all.

Colour mode This option allows for Normal or inverse colour display. Normal is white background with black pixels; Inverse is black background with white pixels. *Note.* This does not completely replicate the GD-77 "Black" display hardware version, because that radio uses a different LCD panel which physically has a black background, whereas the normal GD-77 has an LCD panel with a white background

Order Controls where the DMR Contact display data is sourced from Cc = Digital Contacts (in the codeplug) Db = DMR ID database TA = Talker Alias

The default is Cc/Db/TA, which means the received DMR ID is first checked in the Digital Contacts, and if not found the internal DMR ID database is searched, and if not found and the DMR transmission includes Talker Alias, then Talker Alias will be used.

Contact   Controls the position on the screen where the DMR Callsign and Name etc, is displayed. Options are 1 Line, 2 Lines or Auto

1 Line - This only uses the middle line of the display to show the callsign and name. When using Talker Alias which contains more characters than the 16 character width of the screen, the text will be cropped, so you will not see the end of the TA text.

2 Lines - The Callsign is displayed on the middle line of the display, and the name and other information will be displayed on the bottom line of the display. i.e the firmware automatically breaks up the "CALLSIGN NAME" format text at the space separating the callsign from the name.

Auto - When the Callsign and name will fit on the middle line of the display, only the middle line will be used (this is equivalent to the "1 Line" option.) If the caller information e.g. from TA is longer than 16 characters and won't fit on the middle line, the display will be split onto both lines and is equivalent to the "2 Lines" option.

The default is 1 Line.

Sound Options
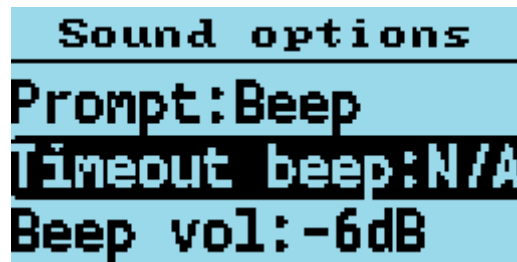
sound options menu

Timeout beep This setting controls whether the radio emits timeout warning beeps during transmission when the timeout is about to expire and transmission will be terminated.

Beep volume This controls the volume of the beep and other tones, and can be set from 100% to 10% in these increments: (-24dB, -21dB, -18dB, -15dB, -12dB, -9dB, -6dB, -3dB, 0dB, 3dB, 6dB).

DMR Beep This setting controls the beeps which are played at the start or end, or both start and end of DMR transmissions The beep at the start of transmissions is used to confirm connection to a repeater, because it is only played when the radio enters the main transmission phase to a repeater, and not when its 'waking' the repeater These beeps are only played through the radio's speaker, they are not transmitted via the DMR audio signal

Options are "Start", "Stop", "None" or "Both"

DMR mic This controls the audio gain of the DMR microphone input system, relative to the default value.

This only adjusts the gain on DMR, and does not affect the FM mic gain. Settings are in 3dB steps, with 0dB being the normal default setting, which is the same as the official firmware.

FM mic This controls the audio gain of the FM microphone input system, relative to the default value. Positive values result in more gain than default, Negative values result in less gain than default. The units of this control in the baseband IC (AT1846S) are not known.

VOX threshold Threshold value which controls the mic level which triggers the radio to transmit when VOX is enabled.

VOX Tail Controls the length of time after the operator stops speaking, before the transmission is ended.

Prompt This setting controls the audible feedback to button and key presses etc and has the following options

Silent. The radio does not provide any audio feedback to button Beep. The radio emits a beep when keys or buttons are pressed. There are 2 different pitches of beep. When navigating through Channels or Talkgroups or menu items, when the first item in the list is reached the higher pitch beep is emitted. Also when switching between Timeslots, the higher pitch beep is emitted on TS1 When switching between FM and DMR mode the higher pitch beep is emitted when the mode is DMR When changeing power, the higher pitch beep is emitted when the lowest power level is selected.

In addition to the beep, the firmware also supports voice prompts if an voice prompt file is loaded via the CPS. There are 3 levels of voice prompt, "Voice", "Voice L2" and "Voice L3", in the latter two cases the L indicates the "Level"

The voice level is used to control whether the voice prompt is played immediatly, or whether the operator needs to press button SK1 to play the which describes the last change made to the radio.

For example. On "Voice mode", which is level 1, the things which are voiced immediatly voiced are: Number key, and # key buttons being pressed. Changes to squelch level. Menu options are announced as you arrow through the menu system, as well as the "Quick" menu accessed via the Orange button on the top of the radio Option values are announced as you change menu settings;

Voice level 2 has almost identical operation to Voice level 1, except that if a key or button is pressed while a prompt is already being played, there will be a slight reduction in the verbosity of the next response.

Voice level 3, all items voice immediatly, including Channel names are announced as you arrow through channels in channel mode; Talkgroup names are announced as you arrow through them in DMR mode;

Voice prompts can be re-announced by pressing the SK1 button. For example, if the last voice prompt was the Talkgroup name, then pressing SK1 will play the Talkgroup name again.

Pressing SK1 whilst a voice prompt is playing, terminates the voice prompt playback.

Channel Details

channel details screen

Mode   FM or DMR

Color Code   Sets the color code when the VFO/Channel is set to DMR

Timeslot   Selects DMR Timeslot 1 or 2 when the VFO/Channel is set to DMR.

Tx/RX Grp   Selects which Tx/Rx group is assigned to the current channel (DMR only).

Tx CTCSS or DCS   Sets the transmit CTCSS tone or DCS code when the VFO/Channel is set to FM.

Rx CTCSS or DCS   Sets the receive CTCSS tone or DCS code when the VFO/Channel is set to FM.

For both Tx and Rx CTCSS / DCS. **Long press** of **Right arrow** or **Left arrow**, skips forward, or back by 5 entries in the list of possible CTCSS / DCS settings.

Pressing **Function + Right** or **Function + Left** skips to the end or beginning of the current CTCSS / DCS items.

Bandwidth   Sets the Rx and Tx bandwidth in FM mode to either 25Khz or 12.5Khz

RX   Rx frequency. Enter the frequency via the keypad

TX   Tx frequency Enter the frequency via the keypad

Step   Selects the VFO/Channel frequency step size.

TOT   Sets the time out timer to OFF or ON.

Zone Skip   Set to skip the channel when scanning within the zone.

All Skip   Set to skip the channel when scanning within the All Channels list.

VOX   Controls whether VOX (Voice Operated Switch) is enabled or disabled.

Accepting and saving the changes to the channel   Pressing the **Green** menu key confirms the changes.

Pressing **Function + Green** saves the settings to the codeplug, or in the case of the VFO the changes are saved to the non-volatile settings. Pressing the **Red** menu key closes the menu without making any changes to the channel.

Credits Screen
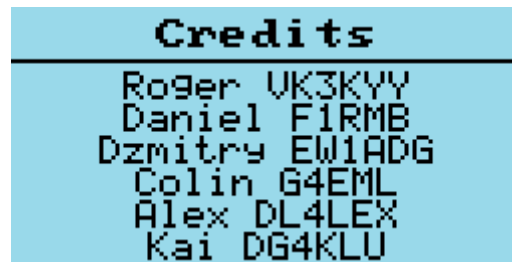
credits screen

Details of the creators of firmware.

If other developers contribute to the development effort they will be added to this screen, and the addition details will be viewed by pressing the **Down Arrow** to scroll the text

Making and receiving DMR Private Calls

To make a Private Call

In DMR mode, either in the VFO or the Channel screen. . .

- Press the # key twice to enter the Private Call DMR ID

- The top of the screen will now show "PC entry"

- Enter the station's DMR ID e.g. 5053238

- Press the Green menu key to confirm, or the Red menu key to exit.

Note. If you make a mistake when entering the number, press the **Left** arrow key to erase the digits one by one.

If the PC ID you entered is in the DMR ID database you had previously uploaded to the radio, the stations Callsign and name will now be displayed on the screen.

If the ID is not in the DMR ID database, the text, "ID: " followed by the number, will be displayed

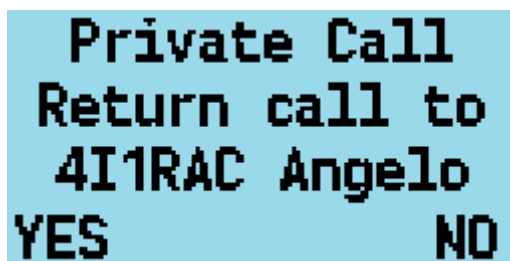**The radio is now in Private call mode.**

To return to normal Talkgroup operation, there are 3 methods

1. Press **Function + Red** menu key

2. Press the **Left** or **Right** arrow key which will load the next TG in the Rx Group list assigned to the VFO or the Channel

3. Press the **Hash (#)** key, then enter a TG number and press the **Green** menu key.

Note. When in Private Call mode, changing between VFO mode and Channel mode or vice versa, via the **Red** menu key will not change back to TalkGroup mode

To Receive a Private Call

On receipt of a private call, the radio will display this screen

accept screen

With the callers Callsign and Name (or ID) displayed.

To Accept the call, and configure the radio to return the Private call back to the calling station, Press the **Green** menu key, for YES. Otherwise either press the **Red** menu key for No, or ignore the prompt and continue using the radio as normal.

If you accept the Private Call, the radio will be switched into Private Call mode, ready for transmission. The callers' ID or name is shown e.g.

private call screen

Once the private call is complete, you can return to the Talkgroup you were on prior to accepting the Private Call, by pressing **Function + Red** menu key. (or by any of the methods described in the section on making a Private Call)

Hotspot mode

IMPORTANT INFORMATION

Hotspot mode is not supported on the Baofeng RD-5R / DM-5R because the hardware does not support reliable USB communications while the radio is transmitting

- The USB connection between the radio and the host system e.g. Pi-Star needs to be protected from RF injection, otherwise the USB connection will occasionally be reset when the radio is transmitting, which will cause the hotspot to stop working.
- Do not use the antenna on top of the radio when in hotspot mode, this usually causes RF injection problems which can't be resolved by screening or ferrite chokes.
- Connect the radio to an external antenna.
- Use ferrite RFI protection on the USB cable.
- When using a Raspberry Pi as the host system, use a metal enclosure for the Raspberry Pi

The firmware can operate as a DMR (*voice only*) hotspot when connected via its USB programming cable to a Raspberry Pi running Pi-Star or any other device that is running MMDVMHost.

Note. Hotspot mode may be compatible with software like BlueDV, but your mileage may vary.

First, connect the radio to a Raspberry Pi via its programming cable.

a hotspot hardware

Hotspot mode works with the Raspberry Pi Zero, but an adaptor cable is needed to convert from the micro USB port on the RPi Zero to the full size USB plug on the radio's programming cable.

In the Pi-Star Configuration screen, select "OpenGD77 DMR hotspot (USB)" as the modem type.

Pi-Star configuration page

If your version of Pi-Star does not contain the OpenGD77 DMR Hotspot as an option, please update your version of Pi-Star.

After connecting the radio to the raspberry pi, hold down the black side key while powering on the radio. Assuming the modem type has been set properly in Pi-Star, the display will change on the radio to show it is in Hotspot Mode, and will show the Colour Code, Receive frequency and approximate TX power in mW.

hotspot screen

If the radio does not enter Hotspot mode, power cycle the radio and power cycle Pi-Star

If the radio still fails to enter hotspot mode, check your USB connections.

Note. By default Pi-Star configures the "modem" to have a power setting of "100" in the Expert -> MMDVMHost settings.

This is 100% of the maximum power of the modem, and in the case of the radio the maximum power output is 5W, but the radio is not designed to operate as a hotspot, where it may be continuously transmitting.

The maximum power setting that the radio can support for continuous transmission will vary depending on the operating environment, including the ambient temperature and antenna SWR, etc.

It is the responsibility of the user to set an appropriate power level that will not overheat and damage the PA.

In Hotspot mode, if Pi-Star (MMDVMHost) sends a power setting of 100%, the assumption is that that Pi-Star has not been correctly configured for the OpenGD77 and this value is disregarded.

Instead the firmware will use the power setting specified by the user in the Utilities menu, which will default to 1W.

If the power setting in the Pi-Star MMDVMHost Expert settings is any other value e.g. 50%, the hotspot will use that power setting closest to the chosen value. So 50% of 5W is 2.5W, and the closest power setting to this is 2W.

Power	Pi-Star RFLevel
50mW	1
250mW	5
500mW	10
750mW	15
1W	20
2W	40
4W	80
5W	99
5W++	N/A

The receive frequency specified by Pi-Star will be displayed at the bottom of the screen.

Note. Offsets should not be applied to the TX or RX frequencies in Pi-Star, because the radio should not need any offsets, and any offset will be reflected in the frequency displayed on the radio, because Pi-Star actually sends the master frequency +/- the offset to the hotspot.

When the radio receives an RF DMR signal, the green LED on the top of the radio will illuminate as normal, and the name and callsign are displayed if the DMR ID database contains that ID. If the ID is not in the DMR ID database, the ID number will be shown.

hotspot RX screen

When Pi-Star receives traffic from the Internet and sends it to the hotspot for transmission, the hotspot displays the Callsign and name or the DMR ID, and the TX frequency is shown.

The LED on the top of the radio also turns red to indicate the radio is transmitting

Resetting the Settings

The radio can also be set to the default settings by holding the **Blue (SK2)** key while turning on the radio.

Additionally holding the **Blue (SK2)** button as well as the **Up arrow** and **Down arrow** keys , resets any custom boot melody and custom boot image that has been uploaded using the OpenGD77 CPS.

On the GD-77S, which does not have a keypad, holding **Blue (SK2)** and **Orange** resets any custom boot melody.

GD-77S operation

To use the firmware with the GD-77S you **must** load voice prompt files using the OpenGD77 CPS. If you do not load voice files the radio will not announce anything, and it will be virtually unusable.

See the section relating to voice prompts and how to install them.

The GD-77S has a 16 position rotary switch on the top of the radio, next to the volume control. This control is used to select the channel in the current zone. Note. Although the OpenGD77 CPS and codeplug format allows up to 80 channels per Zone, the GD-77S can only access the first 16 channels in each Zone, so codeplugs designed for the GD-77 containing more than 16 channels will need to be modified so that each zone only contains a maximum of 16 channels.

The GD-77S has 2 buttons on the side of the radio below the PTT button. A black button known as SK1 and a blue button known as SK2. It also has an orange coloured button at the top, next to the channel selector switch.

The firmware uses the concepts of different Control modes. In each mode buttons SK1 and SK2 perform a different function, the operator cycles through the Control modes by pressing the Orange button.

The Control modes, and the function of buttons SK1 and SK2 in each mode is as follows

GD77S Channel / TG mode

This mode is announced as "Channel mode". In this mode, button SK1 and SK2 are used to cycle through the Talkgroups / Contacts assigned to the current channels

GD77S Scan mode

This mode is similar to the Channel scan mode in the normal firmware. Pressing SK1 toggles scanning to start or stop, in the same way that holding the Up and Down arrows controls the Zone scan function in the normal firmware.

GD77S Timeslot mode

In this mode, pressing either button (SK1 or SK2) toggles from Timeslot 1 to Timeslot 2

GD77S Colourcode mode

In this mode, pressing SK1 increases the colourcode number, and pressing SK2 decreases the colourcode number

GD77S DMR Filter mode

In this mode, pressing SK1 increases the DMR filter level and pressing SK2 reduces the filter level. See information in the normal firmware, in the VFO or Channel screen quick menu, for details for DMR filter levels

GD77S Zone mode

In this mode pressing SK1 or SK2 cycles through the Zones, pressing SK1 selects the next zone and pressing SK2 selects the previous Zone. Zone selection wraps around, so pressing SK2 on the first Zone, selects the last Zone, and pressing SK1 on the last Zone selects the first zone

GD77S Power mode

In this mode, pressing SK1 increases the power by one step, and pressing SK2 decreases the power by one step. See details of available power step levels in the normal firmware.

Note. Like in the normal firmware, the power output will only be accurate if the operator has calibrated the power of the radio, as the factory power level calibration is likely to be highly inaccurate.

CPS software

NOTE: You cannot use the standard Radioddity CPS, or Baofeng CPS, to write to a radio flashed with the firmware. If you wish to use the Radioddity CPS the radio will need to run the official Radioddity firmware. Once the codeplug has been written to the radio with your ID and callsign, you can then flash the firmware to the radio and it will then read and operate with the code plug written to it with the standard firmware and CPS software.

Please download the latest OpenGD77 CPS from here: https://github.com/rogerclarkmelbourne/OpenGD77CPS/releases

Please see the next section for information specific to the OpenGD77 CPS. The information in the rest of this section is applicable to both the standard Radioddity CPS and the Community CPS.

Overview

The firmware simplifies the concept of TalkGroups, for maximum convenience for radio amateurs. Unlike most commercial DMR radios it is not necessary to create multiple channels to use the same frequency with many different transmit TalkGroups. Changing is as simple as scrolling **Left** and **Right** across your TalkGroup list or entering an *ad hoc* TalkGroup by pressing the **hash** key.

In DMR mode when using either the VFO or the Zones and Channels, you can use the LEFT/RIGHT arrow keys to scroll through and select any of the TalkGroups in the Rx Group list assigned to the current channel, or to VFO A.
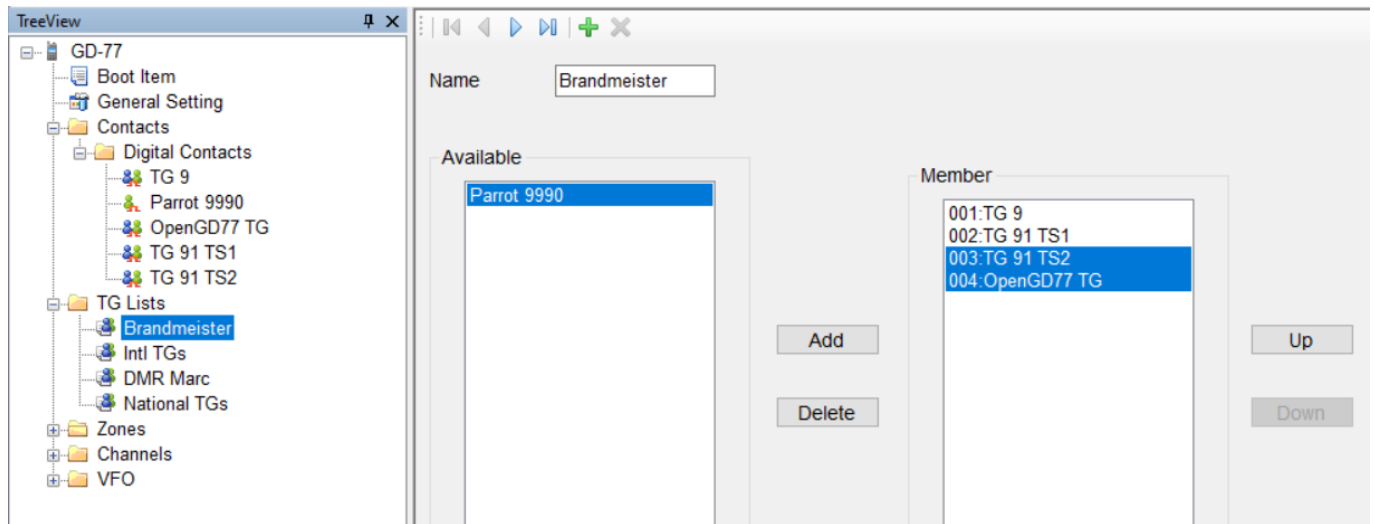
When programming the radio using the CPS, first add all the TalkGroups that you think you may wish to use into the Digital Contacts list.
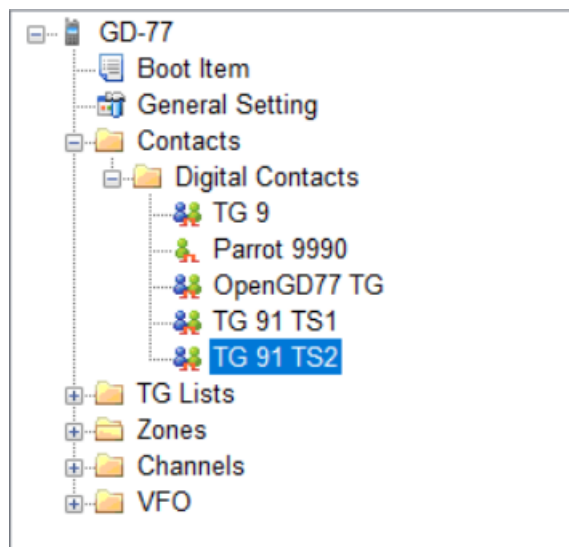
CPS TG contact lists

Next create one or more "TG Lists" and populate each with the sets of the Talkgroups that you will want to use with different channels. You can have the same Talkgroups in many TG Lists.

TG list window

Now setup the channels. Enter the frequencies, slot and colour code as normal for a DMR channel.

Note. Currently the firmware does not use the "Contact" e.g., shown as TG9 below. Instead it uses the TG's in the TG list. However we advise all users to set the "Contact" to the first channel in the TG list assigned to the channel.

Next select the TG List that you wish to use for the channel.

The firmware can use the TG list to filter the incoming DMR signal, or it can operate in "Digital Monitor Mode" (aka promiscuous mode) all the time. This can be set in the radio quick menu setting for **Filter** and **DMR filter**
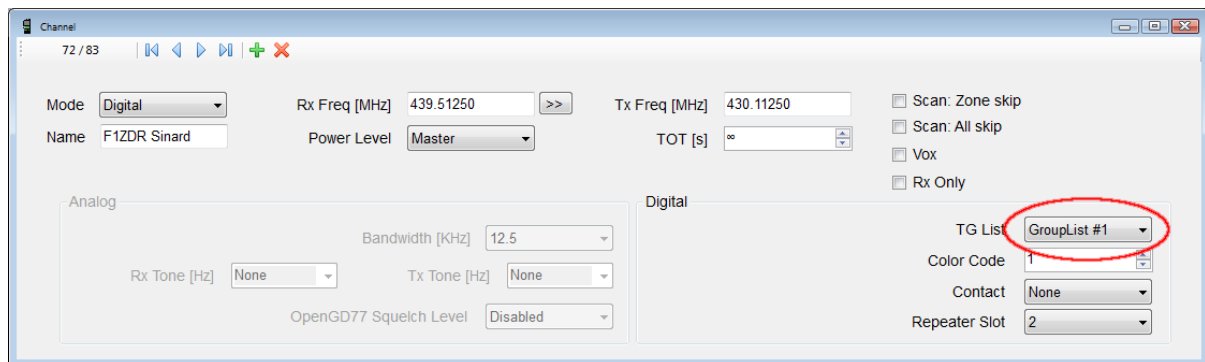

channel TG list selection

Note. The "Contact" is not used by the firmware. You must use the TG list to define the TG's you want to use with each channel. Hence you must have at least 1 TG list and it must contain at least 1 Digital Contact which is a TalkGroup.

Finally save your codeplug to your computer before writing the code plug to the radio using either the standard Radioddity CPS to programme the radio before flashing it to OpenGD77 or if you are using the special OpenGD77 compatible version of the "Community CPS", (as detailed in the next section) you can write the code plug directly to an already flashed OpenGD77 radio.

New Driver Installation The CPS installer now also installs the comm port driver, however the comm port driver can be installed manually by downloading the files from https://github.com/rogerclarkmelbourne/OpenGD77/tree/master/OpenGD77CommDriver
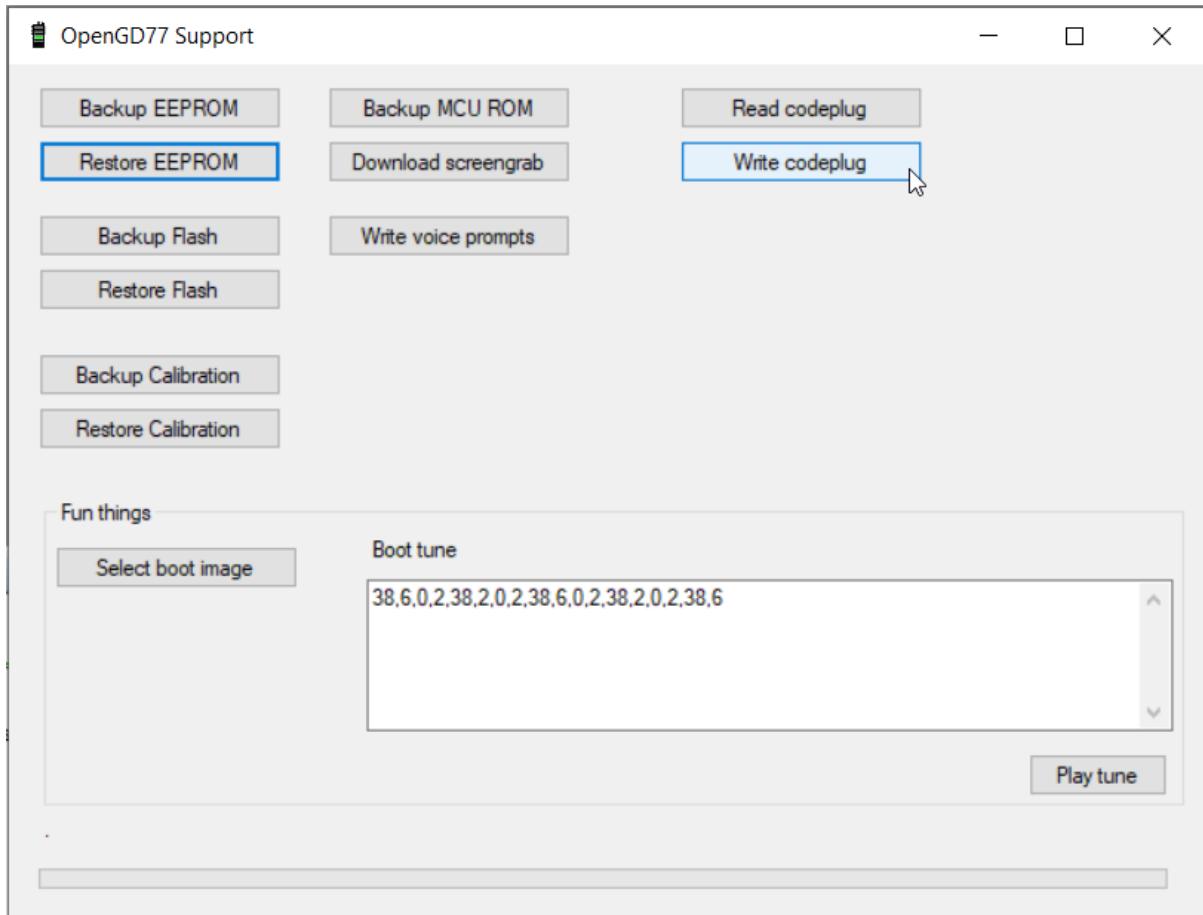
To install the driver, download and unzip the zip file, and run the .bat file

Once the driver is installed, the Windows device manager should show the "OpenGD77" in the "ports" section of the Windows device manager
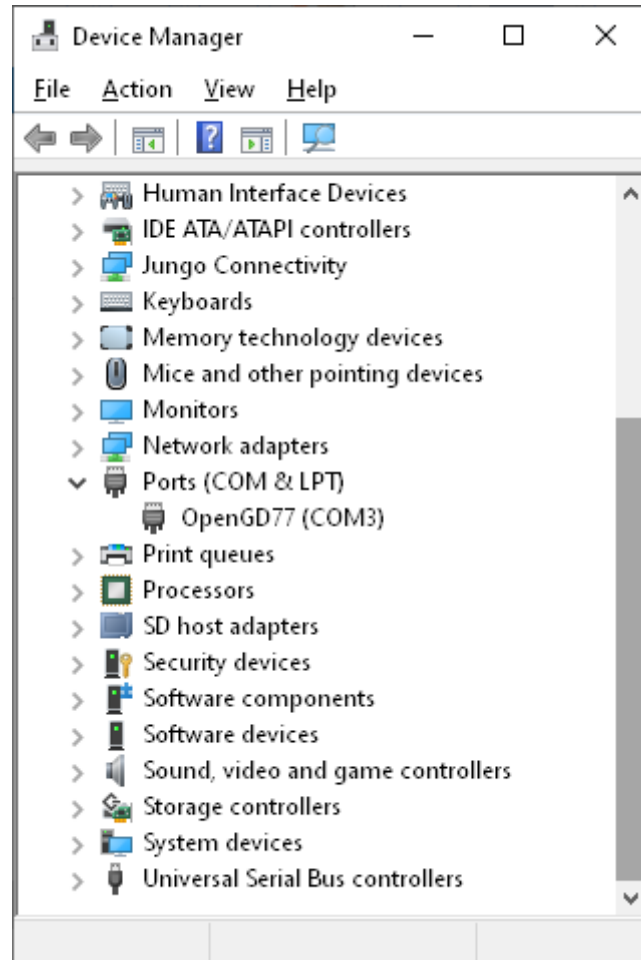
Device manager window

OpenGD77 Menu In the CPS there is a new menu item under the Extras menu for OpenGD77 Support, which opens this window.
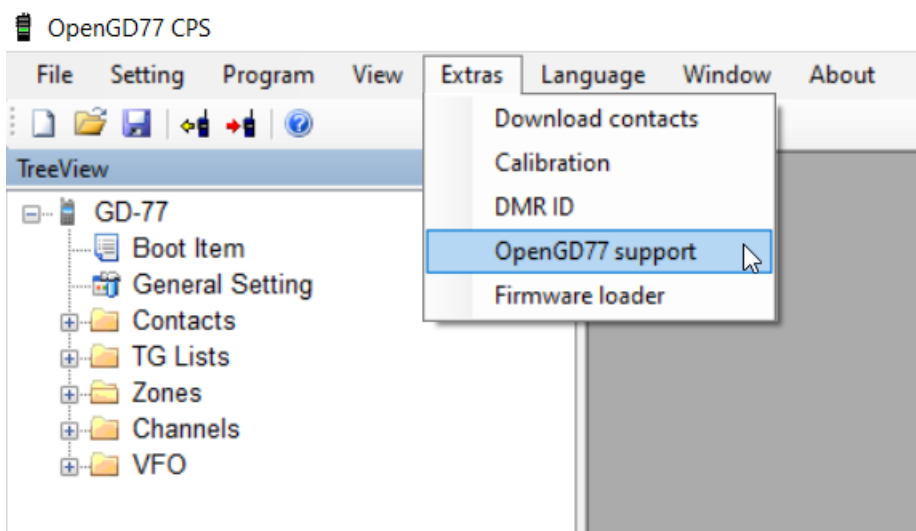

OpenGD77 support window

From here you can backup the internal 64k EEPROM and the 1 mega byte Flash chip, as well as Reading and Writing the codeplug. The calibration data stored in the Flash chip (At address 0x8f000) can be backed up and restored without backing up the whole of the Flash.

Note. If you restore the Flash you will also overwrite the calibration data as it's stored in the 1Mb Flash chip.

You can also use this window to grab a screenshot from the radio's current display. Screenshots are saved in PNG format.

Backup Before You Do Anything Else Before writing a codeplug to the radio the first time, you should backup both the EEPROM and Flash chip, and save the files in a safe place, in case something goes wrong in the future and you need to restore the data.

menu entry to access the OpenGD77 support window

Backup the EEPROM, Flash memory, Calibration data, MCU ROM and the Codeplug.
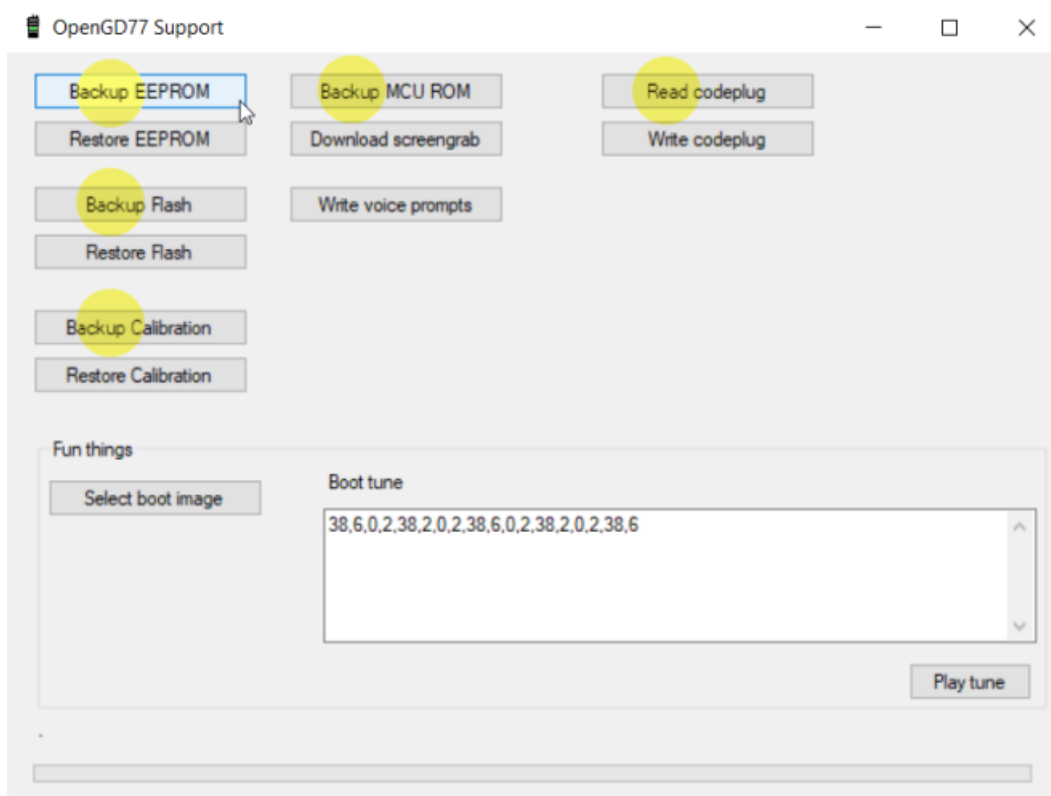
buttons that create various backups

Reading and Writing Your Codeplug To read the codeplug, press the "Read codeplug" button, wait for all 3 data sections to download, and then close the OpenGD77 Support window. To write a codeplug press the "Write codeplug" button.

Writing DMR IDs – the User Database   The firmware supports extended DMR ID information, with up to 16 characters for Callsign and name, as well as doubling the memory capacity for DMR IDs.

Please change the Number of characters menu to the desired DMR callsign and name length.

Then, you can add in DMR IDs into the database by selecting an ID prefix. You can continue adding DMR IDs based on your commonly heard prefixes until you fill up the allocation.

DMR IDs downloader window

Note. Because the memory size used for the DMR ID is limited, you can store more DMR IDs if you assign fewer characters per ID. Depending on actual information, the firmware can store approximately 13,000-26,000 IDs in its user database.

As the firmware supports Talker Alias, you might find this sufficient – the firmware will display callsign and name data retrieved from the DMR stream, for user IDs not stored in your radio's User Database.

Boot tune   The tones are in pitch, delay pairs. So 38,6 means play tone 38 (932Hz F#) for 6 time periods.

Boot Tune in Morse code   You can create your callsign in Morse code when turning on the radio. ITU Morse standards have the following ratios: * 38,6 = dash * 0,2 = internal pause * 38,2 = dot * 0,6 = interchar pause * 0,7 = interword pause (unused in a callsign)

Or perhaps more usefully: * Dah = 38,6,0,2, * Dit = 38,2,0,2, and change the terminating "2" to a 6 between letters. (No comma on the very end.)
So KI4 (for example) would become: * 38,6,0,2, 38,2,0,2, 38,6,0,6, * 38,2,0,2, 38,2,0,6, * 38,2,0,2, 38,2,0,2, 38,2,0,2, 38,2,0,2, 38,6,0,6 * Remove the spaces and carriage returns once you've got it all worked out and paste into the Boot Tune section under Extras/OpenGD77 support

Melodies and Notes   For reference, the tone values in OpenGD77 are:

Value	Note	Freq	(info)			(Hz)									
1	A	110	(A2)	13	A	220		25	A	440		37	A	880	
2	A#	116.5		14	A#	223		26	A#	466		38	A#	932.3	
3	B	123.5		15	B	247		27	B	494		39	B	987.8	
4	C	130.8	(C3)	16	C	261	(C4 mid c)	28	C	587.3	(C5)	40	C	1046.5(C6)	
5	C#	138.5		17	C#	277		29	C#	554.3		41	C#	1108.7	
6	D	146.8		18	D	294		30	D	587.3		42	D	1174.7	
7	D#	155.5		19	D#	311		31	D#	622.3		43	D#	1244.5	
8	E	164.8		20	E	329.6		32	E	659.3		44	E	1318.5	
9	F	174.6		21	F	349		33	F	698.5		45	F	1397	
10	F#	185		22	F#	370		34	F#	740					
11	G	196		23	G	392		35	G	784					
12	G#	207.6		24	G#	415.3		36	G#	830.6					

Boot Image   The Boot image needs to be 128 wide x 64 pixels high. It needs to be in 1-bit png format. (An indexed image format that is not supported by some modern paint programs.)