



On the care and feeding of MD-380 handhelds

Introduction

The MD-380 is a 70cm band handheld that supports traditional analog FM and the new digital ETSI DMR standard available from more than a half dozen manufacturers. DMR is sometimes called MotoTRBO by Motorola users.

MD-380 Operation

Turning on / off

The on / off and volume control is the knob on the top of the right hand side of the radio. Turn it clockwise to turn on and adjust the speaker volume, counter clockwise until it clicks to turn off.

Transmitting

Press the orange PTT switch on the side of the radio, if you hear an access permit tone – two short musical notes, you are successfully accessing the repeater and the timeslot/talk group you need is available. If you hear no tone or a long steady single tone, either you are out of range of the repeater or it is busy. Before transmitting check the display – this will show the repeater and talk group you will transmit to.

LED

There is an LED in front of the volume control knob. It goes green if one or more talk groups on the repeater is active, although you will hear no audio if the active talk group is not the one you currently have selected. It goes red when you transmit.

Changing channels

The channel selector is the centre knob on the top of the radio. It has 16 positions. The currently selected channel is displayed on the LCD screen. The channels are a combination of repeater, timeslot and talk group. Each repeater supports two timeslots (two independent conversations) and multiple talk groups.

Changing Zone

Channels are organised in to zones (banks) of channels. The zone is changed via the keypad.

- Press the green “**menu**” key, use the ↓ key to scroll to zone
- Press green key to confirm
- Press the up or down arrow keys to select the desired zone
- Press green key again to confirm

Note – there is a 'feature' in the MD-380 in that it will ignore the keypad if the currently selected timeslot is active, in other words you can't change zone while a QSO is in progress. One way to work around this is to change channel with the selector knob to an idle channel, then you will be able to

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access the menus.

Other Buttons

There are two smaller buttons on the side, one above and one below the orange **PTT**. They have different functions for short press – half second or less, or long press – 1 second or longer.

Lower side button – a short press toggles between low and high power – look for an H or L in a box on the top of the screen. A long press enables 'talkaround' mode, essentially you are transmitting on the repeater output, useful for making simplex contact when out of range of the repeater.

Upper side button - short press toggles channel scanning on or off while a long press toggles between normal and tight squelch:

- When scanning you will see a symbol with an arrow head inside a circle in the centre of the upper row of the display
- Tight squelch helps in noisy environments

Display

The upper line has a signal strength indicator on the left hand side, TX power and scan symbols and a strange red/blue shield and a battery level indicator on the right hand side. The shield indicates that the currently selected channel is a DMR mode channel as opposed to an analog channel.

The first line in the light blue region shows the talk group or analog channel name. The talk group has a 'two persons' graphic symbol in front of it, while an analog channel has a speaker symbol graphic. The purpose of the graphics appears to be to waste screen space.

The lower line of the light blue region displays the zone that is currently selected and the channel number. Again there is a meaningless graphic symbol to waste screen space.

When the receiver is un-muted either the name and call sign of the active station is displayed on the upper line, or their ID code is displayed. The radio contains a table of known IDs and names/calls but there is not space in the table for all known IDs – there are over 40 000 registered IDs. The radios do have all known ZL IDs as of the date when the code plug was created, but the table needs to be periodically updated to add newly registered users. If an ID is not in the table then the ID number is displayed instead of the name and call sign.

Charging

Charge in the supplied charger stand using the supplied adapter. The standard charger base is quite slow to charge and if the hand held is left turned on, the charge cycle may never complete. The recommendation is to switch the radio off while charging, even then a charge cycle may take five or six hours.

Front Panel Programming

The MD-380 offers limited front panel programming capability.

For DMR channels the main use is to access a repeater not yet in the code plug.

Select the “**FPP**” zone and then use the channel select knob to select the talk group you want to use.

The “Program Radio” option is hidden in the “Utilities” menu.

- Press the green “**menu**” key, use the ↓ key to scroll to “**Utilities**”
- Press the green “**confirm**” key, then use the ↓ key to scroll to “**Program Radio**”
- Press the green “**confirm**” key, then enter the string “**99999999**” and press the green “**confirm**” key

You can then change the TX and RX frequency of the channel you currently have selected.

Finally press the red back key several times until you are back at the main menu.

You can do the same for an analog channel to modify an existing channel to a new frequency if necessary.

Programming Software

Programming software for the MD-380 can be found on the <http://arec.info/downloads/> web site as can an example programming file - MD380-Zlmaster-latest.zip. You will also need the appropriate programming cable from Tytera.

Once the programming software has been installed and launched, you can open the example programming file by clicking on “File” then “Open” and browsing to where you unzipped the programming file.

You will need to customise the file to your identity. Select the 'General Setting' tab and enter your DMR ID in the 'Radio ID' box. You can also enter your call or name in the 'Radio Name' box. This is the minimum you need to change.

To write the program file, a.k.a code plug, to the radio first connect the programming cable to the radio, the recommendation is to do this with the radio powered off. Then power up the radio. In the programming software, select “Program” “Write Data”. A box titled 'Write data to radio' will pop up. Click OK to start. The bar graph should slowly fill, while the radio display shows “PC Programming USB mode”. A box will eventually pop up with a “Write data succ!” message, click OK to close it.

I have seen programming occasionally fail. Check that the programming cable is fully seated and repeat.

If you want to customise the radio's programming further then -

“Menu Items” tab defines which items will appear in the radio's configuration menus. I have most

options checked except remote monitor, radio enable, radio disable and vox.

“Buttons Definitions” defines the functions of the two side buttons and allows you to configure the keypad buttons to select frequently used contacts, a feature I've not explored.

“Text Message” allows you to define a number of pre canned short messages.

“Privacy Setting” allows encryption keys to be defined. Encrypted transmissions are not permitted on the DMR-MARC network.

“Digital Emergency System” is a carry over from the commercial world. It is not used in amateur radio.

“Contacts” tab defines contacts and user IDs. There are two types of contact, group which defines talk groups, and private call which defines individual users. It is the private call entries that are used to translate the call ID value and display the corresponding contact name on the display during a QSO. There is no easy import option, new private call contacts have to be added manually. New contacts are added to the end of the list and the list cannot be sorted or re-ordered.

“Digital RX Group Lists” define a series of RX groups – these have a one to one correspondence with the group contacts and are required in the channel definition page. It is also possible to create super groups by having more than one group contact in the RX group. This will cause the receiver to unmute on activity in any of the talk groups contained in that super group – with the restriction that all the talk groups have to be in the same time slot.

“Zone Information” tab allows you to create zones and associate particular channels with a given zone. A maximum of sixteen channels can be assigned to a zone.

“Scan List” tab allows you to define a series of scan lists. These define which channels will be scanned when you are listening to a particular channel.

“Channels Information” tab defines all the channels and the parameters for each channel.

- “Channel Mode” is digital for a DMR channel or analog for a conventional FM channel

- “Bandwidth” 12.5kHz for digital, select 25kHz for analog

- “Scan List” selects which scan list to use for this channel

- “squellch” selects sensitivity, normal or tight – use tight only if necessary in a noisy environment

- “RX and TX Ref Frequency” – leave as default, medium

- “TOT” selects the time out duration, set to 3 minutes by default

- “TOT Rekey Delay” set to 0

- “Power” sets TX power, set to high by default

- “Channel Name” The display format limits this to 10 characters.

As the radio displays the zone name on a second line, I have limited the channel name to an abbreviated talk group name, with a suffix to make the name unique per repeater. This is needed so you can find the right channel in the channels list when creating zones. I.E. you don't want 16 channels, all called VK/ZL, all with different frequencies.

- “RX and TX Frequency” self explanatory

- “Admit Criteria” determines when you are allowed to transmit. Color Code is the polite option and will only allow you to transmit if the channel is not already in use.

Untick all options boxes except allow talk around.

“Emergency System” select none

“Contact Name” determines the talk group that will be transmitted

“Group List” determines which talk group(s) will be received

“Color Code” is like a digital CTCSS, all amateur DMR systems use a value of 1

“Repeater Slot” determines the timeslot that will be used

“Privacy” select none

If the channel is an analog one, CTCSS parameters can be set in the analog data window. Just set the required CTCSS tone frequency in the Enc box.

New channels can be added by clicking the add button at the bottom of the panel. The new channel will be appended to the end of the list. The list cannot be sorted or re-ordered.

Prior to adding new channels, you will first need to add any new group contacts that the new channels might require, define matching RX groups if necessary, and at least set up a scan group for the new channels. This scan group doesn't need to have any members at this stage, but the name needs to exist so you can use it in setting up the channels.

You can then add channels as needed, setting up the necessary parameters.

Once the new channels are added you have the choice of adding them to an existing zone or creating a new zone and adding them there. The new channels will not be accessible until they are added to a zone.

To add to an existing zone, select the “Zone Information” tab and left click the desired zone name to select it. A box will open with a list of available channels on the left and current members of the zone on the right. Scroll down the list of available channels until you find the new channel you have created and click the add button to move it to the zone members list. You can have a maximum of 16 channels in a zone, so may need to delete an existing zone member to make space.

To create a new zone, left click the “Zone Information” icon so that it highlights, then right click to get the add option. Click that and a new zone will appear at the end of the list. Select it as above and you can then add channels as described above and give it a useful name.

Finally, if you did create a new scan group, you need to select it and add the desired channels to it. The mechanism is the same as adding channels to a zone, but you select the desired scan list in the “Scan List” tab.

DMR Concepts

Zones

Zones are banks of channels and currently are set up and named by the repeater location that they support. There is generally one repeater per zone for the DMR repeaters.

Colonial was the DMR repeater on Colonial Knob. It has been replaced by Porirua.

Porirua is the ZL2DMR repeater on Colonial Knob.

Wairarapa is the Masterton DMR repeater, currently at the Masterton branch clubrooms at Hood aerodrome.

Kapiti is the Kapiti DMR repeater on Mt Field. Covers the Kapiti Coast south to Pukerua Bay and north along SH1 to Bulls.

Wellington is not yet on the air but will go on Hawkins or Wrights Hill to provide better coverage in to Wellington CBD and the Hutt Valley

Wellington STSP is a DMR STSP repeater run by the Wellington VHF Group.

Waikato is the DMR repeater in the centre of Hamilton.

Dunedin is the Highcliff repeater

Tasman is located on the Takaka Hill.

Manawatu is on the Pahiatua Track Road above Palmerston North

Auckland is on Quinns Rd in the Waitakeries

Christchurch is on the gondola building on the Summit Rd .

Tauranga is ??

Marlborough not yet on the air, site still tbd, looking to cover Blenheim and SH1 south towards Kaikoura

Taranaki not yet on the air, site on Mt Taranaki tbd

Whangarei not yet on the air, coverage of Warkworth to Whangarei along SH1

FPP is a generic DMR zone that will allow a user to re-program the TX and RX frequencies to a new repeater not yet in the code plug. This will allow the radios to access the new repeater without having the code plug updated.

Analog Upper North, Analog Lower North and Analog South Island contain the regular analog FM 70cm repeaters for the whole country, split in to 3 groups

National System has the analog National System frequencies - however as the number of NS repeaters exceeds the number of channels that fit in a single zone, the channels are identified by frequency only eg NS 9925 would be used for Kapiti, Whangarei, Rangitoto, Rotorua, Nelson and Dunedin NS nodes.

STSP DMR has the national AREC STSP repeater frequencies. Only VK/ZL, ZK and ZL talk groups are supported.

STSP Analog has the same set of frequencies but programmed for analog operation

Talk Groups

In each DMR repeater zone, the first eleven channels are the eleven talk groups that are carried on that repeater. These are

VK/ZL (TG5) used to be carried on all repeaters in NZ and Australia but has been phased out as the system becomes more heavily used. The channels are still in the channel list but are not populated in the default zones

ZL (TG530) is a nationwide talk group carried on all ZL repeaters but does not go to VK This is the preferred talk group for New Zealand wide operation.

ZK (TG8) is a second nationwide talk group carried on all ZL repeaters. It differs from ZL in that it is carried in timeslot 1 rather than timeslot 2, thus ZL and ZK can be in use simultaneously. It is intended primarily for national AREC use but is available for general use if TS1 is not busy.

LCL which is carried only on the NZ repeaters and is local to a master repeater and its peers but is not connected between ZL masters.

WW is the original World Wide talk group (TG1), primary language is English but you will hear QSOs in other languages. It should only be used as a calling channel. QSOs should be kept short or QSY to one of the **UA** channels

WWE (TG13) is the World Wide English language talk group. This is the preferred talk group for international contacts. Again it should be primarily used as a calling channel.

UAE1 and **UAE2** are the so called 'user access' groups. These are intended as overflow groups for **WWE**. They differ in that use of **WWE** keys up over a thousand repeaters world wide and ties up the timeslot that it is carried in for the duration of the QSO on *all* those repeaters. **UAE1** and **UAE2** only key up the local repeaters at each end of the QSO and free up the timeslot on the rest of the network. The idea is that you would make contact on **WWE** then QSY to **UAE1** or **UAE2** if you are going to have a long QSO. **UAE1** and **UAE2** are intended for English language contacts.

UAA1 and **UAA2** are the equivalent user access groups for **WW**, QSOs in any language can occur in these groups. These exist in the channel list but are not populated in the default zones due to the restriction of 16 channels per zone.

AT is the Audio Test talk group. It is used in conjunction with the CAL DMR website <http://norcaldmr.org/listen-now/> A transmission in AT will be heard on that web site and a VU meter will display audio levels. *Note the web site only works with the Chrome browser* and also note that it takes around 25 seconds for the audio to be processed and output.

DMRplus SP This links to the DMRplus network South Pacific talk group. It is a "PTT mode" talk group. That is, the audio from this source is muted until your local repeater is keyed using this talk group. At that point audio from **WW** and **WWE** is muted and audio from **DMRplus SP** is enabled, and will remain enabled for 10 minutes after the last time the TG is keyed locally.

DMRplus US This links to the DMRplus network North American talk group. It is a "PTT mode" talk group. That is, the audio from this source is muted until your local repeater is keyed using this talk group. At that point audio from **WW** and **WWE** is muted and audio from **DMRplus US** is enabled, and will remain enabled for 10 minutes after the last time the TG is keyed locally.

DMRplus UK This links to the DMRplus network UK talk group. It is a "PTT mode" talk group. That is,

the audio from this source is muted until your local repeater is keyed using this talk group. At that point audio from **WW** and **WWE** is muted and audio from **DMRplus UK** is enabled, and will remain enabled for 10 minutes after the last time the TG is keyed locally.

Basic DMR Concepts

The DMR system is based around the idea of 'talkgroups'. These can be thought of as virtual channels. Some are regionally based, others are carried worldwide. Only a limited number are carried on a given repeater.

All ZL repeaters currently carry

- TG1 **WW** (worldwide) as its name suggests, for short worldwide contacts, primarily in the English language - please avoid long QSOs on this busy channel
- TG9 **LCL** (local) only carried on the local cluster of repeaters, does not go to Australia or rest of world – not used very much at the moment
- TG530 **ZL** uses TS2, linked across all ZL repeaters, is not linked to VK or DMR-MARC core
- TG8 **ZK** uses TS1, linked across all ZL repeaters, is not linked to VK or DMR-MARC core
- TG13 **WWE** (worldwide English) primary talk group for worldwide contacts between regions – use this in preference to WW.
- TG113 and TG123 **UAE1** and **UAE2** – PTT activated overflow groups for WWE
- TG119 and TG129 **UAA1** and **UAA2**, additional PPT activated overflow groups
- TG9999 **AT** Audio Test
- TG133 **DMRplus US** – PTT activated connection to DMRplus network North American talk group
- TG143 **DMRplus UK** – PTT activated connection to DMRplus network United Kingdom talk group
- TG153 **DMRplus SP** – PTT activated connection to DMRplus network South Pacific talk group

Each repeater has two timeslots.

All NZ repeaters use timeslot 1 to carry **WW**, **WWE**, **UAE1**, **UAE2**, **DMRplus US**, **DMRplus UK**, **DMRplus SP**, **UAA1**, **UAA2** and **AT** (the international talk groups) as well as **ZK** while timeslot 2 carries **LCL** and **ZL** (the local / regional talk groups).

Both timeslots can be used at the same time, so one ZL station could be working an international contact while a second ZL station is talking locally.

In a given timeslot, only one talk group can be active at a time, so if **WWE** is active you cannot make a call in **WW** at the same time.

Etiquette

Check the busy LED on the radio before transmitting for the first time. If it is green, the repeater is currently active on one or more talk groups and your call might interrupt another local user in a different talk group to the one you have selected. Step around the channel selector switch to find out where the activity is, or check the netwatch page if handy, to make sure you don't interrupt a QSO already in progress.

When making a call you do not need to call CQ, just announce yourself and it is normal on the initial call to say which talk group you are calling in – this helps someone who is scanning channels to go back to the correct channel to reply your call. Eg “ZL2XYZ listening worldwide english” or “ZL2XYZ listening TG13”. Most people reference the talk groups by name not number.

Keep contacts in **WW and WWE** short, they are intended primarily as calling channels, and QSY to **UAE1/2** if it is going to be a long QSO. This is due to the number of repeaters that are tied up world wide by a contact in **WW** or **WWE**. Using one of the **UA** channels only ties up the local repeaters at each end of the QSO.

The **UA and DMRplus** groups are set up in "press to talk" mode. That is to say that the audio from those groups is not connected to your local repeater until you trigger your local repeater using that talk group ID, so you must trigger your repeater with the correct talk group ID set at least once to hear the overseas station, and he needs to do the same at his end. When changing from **WW** or **WWE** English to one of the **UA** groups, I find it best to "kerchunk" the repeater once on the **UA** group channel to activate the connection, then put out a call for the other station.

Once activated, the **UA or DMRplus** group has exclusive use of time slot 1 for the next 10 minutes and audio feeds from all other TGs that use time slot 1 are muted for that duration. Each time you transmit locally you re-start the 10 minute timer so you retain use of the group for the duration of your QSO.

In addition to the access permit tones at the start of an over, you will hear a channel free tone at the end of each over. As DMR repeaters have no audible 'tail' this is the indication that you can transmit now but please remember to leave a few seconds gap so other stations can break in if necessary.

Useful Links

<http://trbo.arec.info:42420/MinimalNetwatch> this is the ZL-TRBO C-Bridge site that controls operation of the NZ DMR repeaters and allows you to see the activity going on in real time:



Control Center ZL-TRBO

22:17:50 November 29, 2014 UTC

start time	duration	source peer alias	source radio alias	Bridge Group	RSSI (dBm)	Site name	Loss rate
22:17:47.201 Nov 29	2.4	N2JTI - Harriman New York USA -- 313607	N2OKB - Francisco - Menros New York USA -- 3136168	North America	0.000	DMR-MARC	0.0%
22:09:21.056 Nov 29	0.5	WAZVNV - Selden New York USA -- 313612	K2HPS - Henry - Yorktown Hts New York USA -- 3136296	Worldwide	-127.9	DMR-MARC	10.0%
22:09:05.509 Nov 29	0.1	AE5DN - Stillwater Oklahoma USA -- 314007	KC5DPV - Joe - Stillwater Oklahoma USA -- 3140048	Worldwide	-108.3	DMR-MARC	0.0%
22:08:38.519 Nov 29	0.5	WAZVNV - Selden New York USA -- 313612	K2HPS - Henry - Yorktown Hts New York USA -- 3136296	Worldwide	-126.9	DMR-MARC	0.0%
22:02:35.716 Nov 29	1.3	ZL2DMR - Wellington North Island NZL -- 530200	ZL2BEZ - Paul - Wellington North Island NZL -- 5301034	WW English	-103.2	ZL-TRBO	0.0%
21:58:16.605 Nov 29	3.7	WR3FHR - Thoroford New Jersey USA -- 313401	WR3FHR - Clint - Vineland New Jersey USA -- 3134077	North America	-60.1	DMR-MARC	0.0%

- 'source radio alias' is the ID and name of the user, if known.
- 'source peer alias' is the repeater they are coming in on.
- 'RSSI' is the received signal strength at the repeater, the less negative the number, the stronger you are. Levels -90 to -120 dBm are fairly weak, -80 to -60s getting stronger, above -60dBm is fairly strong.
- 'loss rate' is the packet loss rate, ie packets which contained uncorrectable errors and hence are likely to carry distorted audio. At signal levels -95dBm or better, the loss rate should be zero. High loss rates at reasonable RSSI levels are a sign of either interference on the repeater input or internet issues.

<http://arec.info/downloads/> has programming software and files for a number of different model radios

<http://dmr.darc.de/> German 'last heard' site, more colourful than the cBridge site

<http://www.dmr-marc.net/> Motorola Amateur Radio Club web site, many useful links

<https://groups.yahoo.com/neo/groups/TYT-TYTERA/info> Yahoo forum for Tytera MD-380 radio

Finally for more information this handy guide to amateur radio use of DMR is available free to download in PDF form:

[http://www.dmr-marc.net/Amateur %20Radio Guide%20to DMR.pdf](http://www.dmr-marc.net/Amateur%20Radio%20Guide%20to%20DMR.pdf)