THANK YOU FOR YOUR PURCHASE OF THE BTECH GMRS-20V2. THIS RADIO WILL DELIVER INSTANT RELIABLE COMMUNICATION.

PLEASE READ THIS MANUAL CAREFULLY BEFORE USE

Contents

Part I. Chapter List

Part one covers the basic setup and use of your mobile two-way transceiver.

Chapter 1. – Getting Started

BEFORE PROCEEDING INSURE:

- Qualified technicians shall service this equipment only. Do not modify the radio for any reason.
- Use only BTECH supplied or approved accessories.
- **Turn off your radio prior to entering any area with explosive and flammable materials. Do NOT USE your transceiver at a gas/fuel station**
- For vehicles with an air bag, do not mount your radio in the area over an air bag or in the air bag deployment area.
- Do not expose the radio to direct sunlight over a long time, nor place it close to a heating source.
- If the unit emits smoke or an odor, you should immediately cut off the power supply. Then send the radio to the nearest service center or dealer
- Do not operate the mobile transceiver on high power unless it is necessary. Do not transmit for long periods of time, as it may overheat the transceiver.
- Keep the unit away from dusty, damp and wet environments
- Use the correct power supply (~13.8V); do not use incorrect or higher voltage (e.g., 24V)

Exposure to Radio Frequency Energy

Your BTECH radio is designed to comply with the following national and international standards and guidelines regarding

exposure of human being to radio frequency electromagnetic energy:
- United States Federal Communications Commission, Code of Federal Regulations: 47 CFR part 95 sub-part E
- American National Standards Institute (ANSI)/Institute of Electrical & Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineer (IEEE) C95. 1-1999 Edition
- National Council on Radiation Protection and Measurements (NCRP) of the
United States, Report 86, 1986
- International Commission on Non-lionizing Radiation Protection (ICNIRP) 1998

To control your exposure and ensure compliance with the general population or uncontrolled environment exposure limits, transmit no more than 50% of the time. The radio generates measurable RF energy exposure only when transmitting.

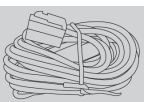
Unpacking and Inspecting

- Please check the packaging of your radio for any signs of damage.
- Carefully open the box and confirm you received the items listed below.
- If you find the radio or the included accessories are damaged or lost, immediately contact your dealer.

What's in the Box

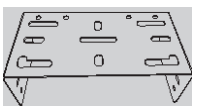
GMRS-20V2
Mobile Radio

Microphone



Power Cable (Direct Connect)

Mounting Screws and Fuse



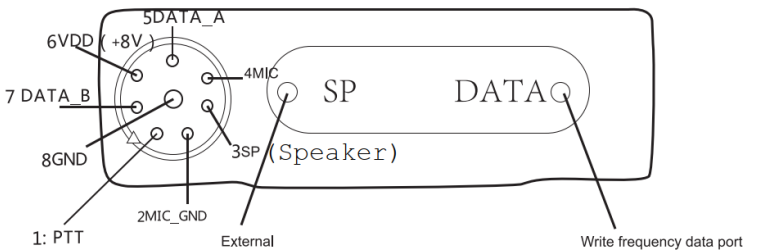
Mounting Bracket

FIND TUTORIALS, SUPPORT AND MORE

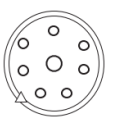
https://www.facebook.com/BaoFeng.Tech.Radio facebook

https://www.youtube.com/c/Baofengtechradio YouTube

GMRS-20V2: Overview of the Front Panel



Note: the PC port is above the power supply

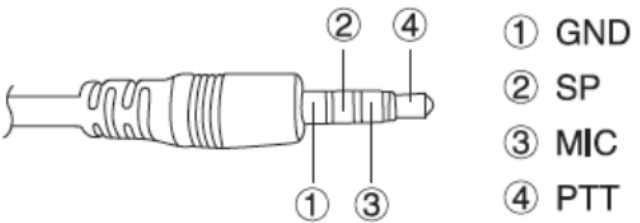


1: PTT ;
2:MIC_GND
3:SP (Speaker)
4:MIC
5:DATA_A
6: VDD (+8V)
7: DATA_B
8: GND

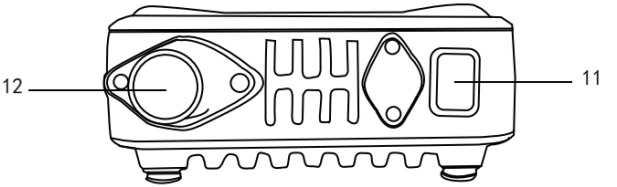
Remote Speaker Jack Info

This is the pinout of the speaker jack. It follows the TRRS wiring- you can run a cable from this jack into the AUX port on your car stereo if you desire. Then place the stereo in the AUX Input mode to hear the radio audio. *CAUTION- This is NOT a* **MONO** *speaker jack. It does require you to follow the pinout below. Use caution if plugging an external speaker directly in this jack.*

TRRS Line-Out Connector (Backward Compatible with TRS Stereo Speakers)



GMRS-20V2: Overview of the Rear Ports



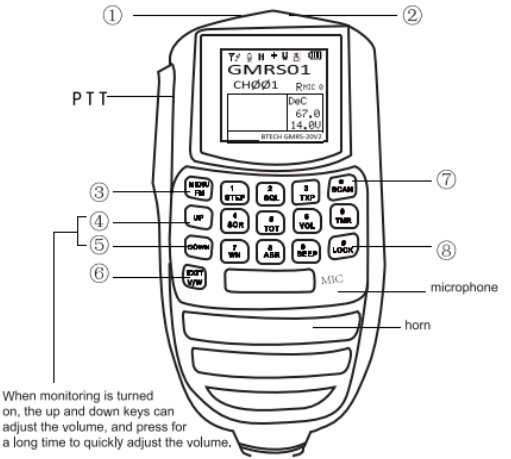
11: power cord

12：Antenna interface

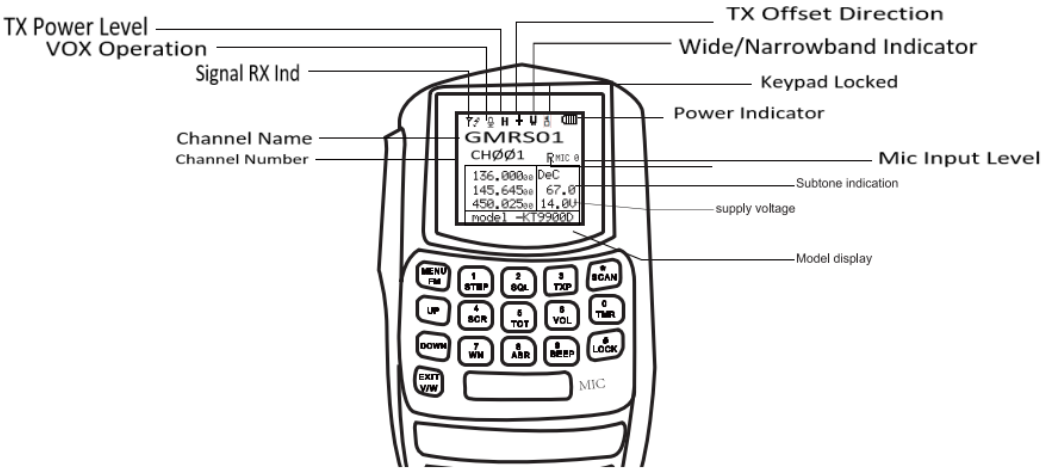
Handheld Mic Keys Explanation

■ Hand microphone description

① Short press MONI and long press power on
② Short press CALL and long press ALARM
③ "MENU" function key
④ "UP": frequency step upward
⑤ "DOWN": frequency step down
⑥ EXIT/VM exit menu, switch VFO/memory
⑦ " ★/SCAN": frequency reversal function, scan, number " ★ "
⑧ "#/LOCK": keyboard lock function, number "#"
⑨ 0 ":the number 0
⑩ 1 ":the number 1
⑪ 2 ":the number 2
⑫ 3 ":the number 3
⑬ 4 ":the number 4
⑭ 5 ":the number 5
⑮ 6 ":the number 6
⑯ 7 ":the number 7
⑰ 8":the number 8
⑱ 9":the number 9



Handheld Mic Keys ICON Explanation



Programming Cable Info

PC-04 Cable available at: www.baofengtech.com/accessories

Programming software available at: www.baofengtech.com/download

Antenna Basics

Your Mobile Radio Kit does not include an Antenna. It is VERY Important to NOT transmit without an antenna or dummy load attached to the mobile radio. Doing so, will cause harm to the internal components of your radio.

You will want to choose a suitable antenna for the bands you plan on transmitting and receiving on. If you plan on transmitting on GMRS Channels you will want to ensure you have picked an antenna that states it is capable of working with 462-467MHz. If an antenna is not properly tuned for the frequency you transmit on – it can cause damage with the reflected power going back into the radio.
Pick an antenna with SWR of less than 1.5:1 to safely transmit

Ground Plane:

Antennas require an appropriate ground plane to properly work. This can be a car body (not a fiberglass car body, but some metal), or a set of ground radials for homebrewed antennas or commercially designed antennas which do not require an external set of radials.

Magnetically Mounted Antennas:

These antennas must be grounded to a metal surface, such as a vehicle body. Magnetic base antennas do not properly operate unless they are fully magnetically grounded first. This is usually accomplished via the metal car body. Magnetic Antennas do NOT function properly on Plastic or fiberglass bodies.

NMO or PL-259 Base Antennas:

These antennas will normally require a base or mobile hardware kit. These kits are grounded either through hardware or clamp inserts on vehicles, magnetically mounted, or available as stationary base hardware kits. Some antennas may include a base station ground plane or ground radial kit.

CAUTION: **When installing base antennas, stay clear of ALL power lines- they can kill you if you come in contact with them. Keep a minimum distance of 10 feet with the antenna and yourself from the lines.**

Antenna Requirements

Antenna SWR Rating: 1.5:1 or less (on the radio frequencies in use.)
Antenna Impedance: 50 ohms (use 50 ohms rated coax and coax connectors)
Antenna Grounding: Ensure the antenna is mounted with a ground plane- either a metal base, or radial wires
Visually Inspect Coax/Connectors for any Slits or Damage – moisture should not be allowed to penetrate fittings or your coax

To maximize the life of your radio, it is important to understand antenna basics before transmitting on your radio, transmitting without an antenna, or with high SWR (Standing Wave Ratio) – can void warranty support.

An Accurate SWR Meter is a great tool to have when selecting an antenna for your needs. You can monitor and confirm that your SWR is within safe levels when setting up your radio for the first time (periodically checking SWR and your antenna set-up is advised). You will need to use an SWR meter designed for the ***UHF*** band. Other meters will *NOT* read correctly. Another option is an “Antenna Analyzer”. With those you can sweep the entire UHF band and find the “sweet spot” or resonant point of your antenna. Use this information to tune for the LOWEST SWR or lowest reflected power reading.

Chapter 2. - GMRS Information and FCC Declaration

THE BTECH GMRS-20V2 IS FCC PART 95E CERTIFIED FOR GMRS USAGE
THE GMRS-20V2 REQUIRES A GMRS LICENSE TO TRANSMIT

GMRS Repeaters

The channels that are labeled "REPT" operate through repeaters that are set up for GMRS usage. Use these channels if you have permission from those that operate your local repeater for GMRS channels.

FCC NOTICE AND DECLARATION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

The scanning receiver in this equipment is incapable of tuning, or readily altered, by the user to operate within the frequency bands allocated to the Domestic public Cellular Telecommunications Service in Part 22

FCC LICENSE REQUIRED FOR GMRS OPERATION

The GMRS-20V2 operates on GMRS (General Mobile Radio Service) frequencies, which require an FCC (Federal Communications Commission) license. You must be licensed prior to transmitting on all channels, which include GMRS channels. Serious penalties could result for unlicensed use of GMRS channels, in violation of FCC rules, as stipulated in the Communications Act's Sections 501 and 502 (amended).

You will be issued a call sign by the FCC, which should be used for station identification when operating the radio on GMRS channels. You should also cooperate by engaging in permissible transmissions only, avoiding channel interference with other GMRS users, and being prudent with the length of your transmission time.

To obtain a license or ask questions about the license application, contact the FCC at 1-888-CALL FCC or go to the FCC's website: https://www.fcc.gov/ and request form 605.
Or you can apply online direct for a GMRS license (http://wireless.fcc.gov/uls/)– a guide for this can be found at: https://baofengtech.com/step-by-step-getting-a-gmrs-license/

GMRS Frequency Chart, Channel Guide

GMRS FREQUENCY CHART

CH: Name	Ch. Freq	CH: Name	Ch. Freq	CH: Name	Ch. Freq	CH: Name	Ch. Freq	Offset
01: GMRS01*	462.56250	08: GMRS08**	467.5625	15: GMRS15	462.5500	23: REPT15	462.5500	+5MHz
02: GMRS02*	462.58750	09: GMRS09**	467.5875	16: GMRS16	462.5750	24: REPT16	462.5750	+5MHz
03: GMRS03*	462.61250	10: GMRS10**	467.6125	17: GMRS17	462.6000	25: REPT17	462.6000	+5MHz
04: GMRS04*	462.63750	11: GMRS11**	467.6375	18: GMRS18	462.6250	26: REPT18	462.6250	+5MHz
05: GMRS05*	462.66250	12: GMRS12**	467.6625	19: GMRS19	462.6500	27: REPT19	462.6500	+5MHz
06: GMRS06*	462.68750	13: GMRS13**	467.6875	20: GMRS20	462.6750	28: REPT20	462.6750	+5MHz
07: GMRS07*	462.71250	14: GMRS14**	467.7125	21: GMRS21	462.7000	29: REPT21	462.7000	+5MHz
				22: GMRS22	462.7250	30: REPT22	462.7250	+5MHz

* Per FCC GMRS Radio Guidelines; Channels 1-7 are limited to Low Power - 5watt output

**Per FCC GMRS Mobile Radio Guidelines Channels 8-14 transmitting is disabled; they can receive and monitor communications, but GMRS mobile radios cannot transmit on these channels.

Chapter 3. – Basic Shortcuts and Use

Pound # Key

Keypad Lock

A short momentary press of the 

key enables power level adjustments on the current channel.

To enable or disable the keypad lock: press, and hold the 

key for about two seconds. Repeat to unlock. The keypad lock will lock the microphone keypad. The PTT/MONI/and Power Buttons will not be locked when enabled.

Star * Key

A short momentary press of the 

key enables the reverse function (reverses the Transmit and Receive settings according to Offset settings) This allows you to hear the signals into the system (repeater), to determine if simplex or direct radio to radio communications is possible.

To enable scanning, press and hold the 

key for about two seconds. To quit scanning press the 

exit key.

Turning the unit on

To turn the unit on, simply push and hold the ORANGE top button on the microphone until it turns on. If

your radio powers on correctly there should be an audible tone after about one second and the display will show a message or flash the LCD depending on settings

Turning the unit off

To turn the unit off, simply push and hold the ORANGE top button on the microphone until it turns off. The unit is now off.

Adjusting the volume

To turn up the volume, press the ORANGE microphone button (which will put the radio into MONI mode),

then use the 

button to set desired level. Press the ORANGE button again to quiet the radio until a signal is received.

To turn the volume down, press the ORANGE microphone button then use the 

button to set desired level.
Press the ORANGE button again to quiet the radio until a signal is received.

Making a call

Press and hold the PTT button on the side of the handheld mic to transmit. DELAY speaking for a count of 2 (think 1, 2) then speak your traffic. While transmitting, speak approximately 3-5cm (1-2 inches) from the microphone. When you release the PTT, your transceiver will go back to receive mode.

Channel selection

Channel mode

The GMRS-20V2 is hard loaded with the 30 GMRS channels (see the GMRS Frequency Chart, Channel Guide in Chapter 2 for Channels and Transmitting restrictions). You can program additional analog scanning channels into memory channels 000 and 031-199.

You can use the 

and 

keys to navigate between channels.

Chapter 4. – Programming Scanning Channels

The BTECH GMRS-20V2 features 200 total memory channels and each can hold:
GMRS Channels, receive frequencies, group signaling information, bandwidth, and a seven-character alphanumeric identifier or channel name.

GMRS Channels (001-030) are the default programmed GMRS channels, you can remove and rearrange the memory locations as preferred, a radio menu reset will restore the radio to the default 30 channel lineup. Settings such as the calling (CTCSS or DCS) tone can be edited on any GMRS channels.

Channels 000 and 031-199 can be added or deleted via computer or manual programming as additional listen (receive) only channels or as GMRS channels.

Manual Programming

Adding GMRS Channels

You can add GMRS channels to the channel select list. It contains 30 channels from the factory. You can add you favorites at the end of the list to a maximum number of channels of 200 (channel 0 to 199).

1. Press the MENU key to enter the menu.
2. Enter “64” on the numeric keypad to get to GCH-AD.
3. Press the MENU key to select.
4. Use the ▲ and ▼ keys to select an empty memory channel or enter it directly on the numerical keypad.
5. Enter the Channel number you want to add select one of the channels (1 to 30) from the list below (for example if you want to add GMRS 23 which is REPT 15, type 23)
6. Press the MENU key to confirm and save.
7. Press the EXIT key to exit the menu.

GMRS Frequency Chart, Channel Guide

GMRS FREQUENCY CHART

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03: GMRS03*	462.61250	10: GMRS10**	467.6125	17: GMRS17	462.6000	25: REPT17	462.6000	+5MHz
04: GMRS04*	462.63750	11: GMRS11**	467.6375	18: GMRS18	462.6250	26: REPT18	462.6250	+5MHz
05: GMRS05*	462.66250	12: GMRS12**	467.6625	19: GMRS19	462.6500	27: REPT19	462.6500	+5MHz
06: GMRS06*	462.68750	13: GMRS13**	467.6875	20: GMRS20	462.6750	28: REPT20	462.6750	+5MHz
07: GMRS07*	462.71250	14: GMRS14**	467.7125	21: GMRS21	462.7000	29: REPT21	462.7000	+5MHz
				22: GMRS22	462.7250	30: REPT22	462.7250	+5MHz

Adding Receive/Scanner Channels

To ADD a receive-only channel

1. press the MENU key to enter the menu.
2. Enter “46” on the numerical keypad to get to RCH-AD
3. Press MENU to select.
4. Use the ▲ and ▼ keys to select an empty memory channel or enter it directly on the numerical keypad.

5. Enter the frequency desired to add as a scanner/receive only channel (136-174MHZ, 400-520MHz)
6. Press the MENU key to confirm and save.
7. Press the EXIT key to exit the menu.

Deleting Channels

To DELETE an added channel

1. Press the MENU key to enter the menu
2. Enter “47” on the numerical keypad to get to DEL-CH
3. Press MENU to select.
4. Use the ▲ and ▼ keys to select an empty memory channel or enter it directly on the numerical keypad.
5. Press the MENU key to confirm and save.
6. Press the EXIT key to exit the menu.

Computer programming

The GMRS-20V2 kit does not include a programming cable. The GMRS-20V2 uses the PC04 Programming cable. To attain a cable visit: baofengtech.com. The programming software is free at: baofengtech.com.

Chapter 5. – Other Settings

Toggle from High to Low Power

A SHORT (momentary) press of the 

key will switch from low to high power on each short press

Keypad Lock-out

Hold the microphone 

for 2 seconds at standby to turn on/off the keypad lock-out function.
(The Lock icon appears, when the radio keypad is locked out), repeat to unlock.

PTT ID Setting

1. Use PC software to change PTT-ID code.
2. Set the Menu “18” settings on the radio to select the PTT-ID signal mode (2Tone, 5Tone, or DTMF),
3. Set the Menu “20” settings to select when the PTT-ID is transmitted.
4. Set the Menu “21” settings to program the PTT-ID transmit delay time.
5. When all the settings are set, when you transmit (by pressing the PTT) the radio will transmit the PTT-ID.

DTMF RX Settings

This radio has DTMF coding and decoding. Use the PC software to set the DTMF signal settings first.

DTMF TX Settings

In two-way radio systems, DTMF is most commonly used for automation systems and remote control. A common example would be in amateur radio repeaters where some repeaters are activated by sending out a DTMF sequence (usually a simple single-digit sequence).

Table 7.1. DTMF frequencies and corresponding codes

	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A - MENU
770 Hz	4	5	6	B - ▲
852 Hz	7	8	9	C - ▼
941 Hz	*	0	#	D - EXIT

The BTECH GMRS-20V2 has a full implementation of DTMF, including the A, B, C and D codes. The numerical keys, as well as the *SCAN, and #, keys correspond to the matching DTMF codes as you would expect. The A, B, C and D codes are located in the MENU, ▲, ▼ and EXIT keys respectively.

Manually TX DTMF Tones: To manually send DTMF codes, press the key(s) while holding down the PTT key.

Automatically TX DTMF Tones:

Save it to Memory and Transmit: You can also program a DTMF tone or group to the saved calling list (requires the PC software) to the one of the 15 Memory call banks in the radio. To transmit select the Pre-set DTMF saved setting on Menu 22 and then press the call key to send the saved DTMF TX tone.

DTMF Receive Settings, Transmit Setting (Call Key)

1. Press [MENU] Key select “18” OPTSIG, press [F] Key, select DTMF function.
2. Press [MENU] Key select “22” S-INFO, press [F] Key, select pre-code signal group (1-15). (The DTMF Signal must be saved first in the PC software setting under DTMF settings.
3. If properly set up (on Menu 18 and 19), your radio will open the squelch when it receives the required DTMF signal.
4. Press [Call] Key to send the same DTMF you have selected in Menu 22.

2TONE Receive Settings, Transmit Setting (Call Key)

1. Press [MENU] Key select “18” OPTSIG, press [F] Key, select 2TONE function.
2. Press [MENU] Key select “22” S-INFO, press [F] Key, select pre-code signal group (1-15). (The 2Tone Signal must be saved first in the PC software setting under 2TONE settings)
3. If properly set up (on Menu 18 and 19), your radio will open the squelch when it receives the required 2TONE signal.
4. Press [Call] Key to send the same 2TONE you have selected in Menu 22.

5Tone Receive Settings, Transmit Setting (Call Key)

1. Press [MENU] Key select 18 OPTSIG, press [F] Key, select 5TONE function.
2. Press [MENU] Key select “22” S-INFO, press [F] Key, select pre-code signal group (1-15). (The 5Tone Signal must be saved first in the PC software setting under 5TONE settings)
3. If properly set up (on Menu 18, and 19), your radio will open the squelch when it receives the required 5TONE signal.
4. Press [Call] Key to send the same 5TONE you have selected in Menu 22.

Scanning modes

The scanner is configurable to one of three ways of operation: Time, carrier or search, each of which is explained in further details in their respective section below.

1. Press the MENU key to enter the menu.
2. Enter “17” on your numeric keypad to come to scanner mode.
3. Press the MENU key to select.
4. Use the ▲ and ▼ keys to select scanning mode.
5. Press the MENU key to confirm and save.
6. Press the EXIT key to exit the menu.

Time operation

In Time Operation (TO) mode, the scanner stops when it detects a signal, and after a factory pre-set time out, it resumes scanning.

Carrier operation

In Carrier Operation (CO) mode, the scanner stops when it detects a signal, and after a factory preset time with no signal it resumes scanning.

Search operation

In Search Operation (SE) mode, the scanner stops when it detects a signal.
To resume scanning you must press and hold the *SCAN key again.

SKIP Scanning Channels

You can configure channels to be added or removed from the scanning list on the fly.

1. Press the MENU key to enter the menu.
2. Enter Menu Item “16” on your numeric keypad to come to scanning add mode.
3. Press the MENU key to select.
4. Use the ▲ and ▼ keys to select if the channel will be added or removed from the scanning list. On will add the channel to scan, off will remove from the scan list. The change will apply to the current channel selected
5. Press the MENU key to confirm and save.
6. Press the EXIT key to exit the menu.

Tone Scanning

Scanning for CTCSS and DCS Tones/Codes

CTCSS tone and DCS code scanning mode can be accessed with or without a signal being present. The scanning process itself only occurs while a signal is being received.

Not all repeaters requiring a CTCSS tone or DCS code for access will transmit one back. In that case, the transmitter of a station that can access the repeater would need to be scanned. In other words: this would be done by listening to stations on the repeater's input frequency.

Scanning for CTCSS Tone

(ACTIVE SIGNAL REQUIRED)

1. Press the MENU key to enter the menu.
2. Enter Menu Item "11" on your numeric keypad to come to R-CTCS
3. Press the MENU key to select. **Insure you have a tone activated (and it is not off)**
4. Press the *SCAN to begin CTCSS scanning

The CTCSS frequency will change on the screen to indicate the radio is in CTCSS scanning mode. In this mode, whenever the radio is receiving an RF signal on the selected channel, the display will cycle through the CTCSS tones as they are being tested. Once the frequency of the received CTCSS tone is determined, the scan will stop and audio will be able to be heard from the repeater.
Press the MENU key to save the scanned tone into memory, then press the EXIT key to exit the menu.

Don't forget to set menu 11 back to OFF when the CTCSS tone is no longer required.

Scanning for a DCS tone

(ACTIVE SIGNAL REQUIRED)

1. Press the MENU key to enter the menu.
2. Enter on your numeric keypad to come to R-DCS
3. Press the MENU key to select. **Insure you have a tone activated (and it is not off)**
4. Press the *SCAN to begin DCS scanning

The DCS code will change on the screen to indicate the radio is in DCS scanning mode. In this mode, whenever the radio is receiving an RF signal on the selected channel, the display will cycle through the DCS codes as they are being tested. Once the bits of the received DCS code are determined, the scan will stop and audio will be heard from the repeater.
Press the MENU key to save the scanned tone into memory then press the EXIT key to exit the menu.

Don't forget to set menu 10 back to OFF when the DCS tone is no longer required.

Tri Watch (TMR)

In certain situations, the ability to monitor two, or three channels at once can be an asset.

The BTECH GMRS-20V2 features Tri Watch functionality with the ability scan between three frequencies at a fixed interval and to lock the transmit frequency to one of the three channels it monitors

1. Press the MENU key to enter the menu.
2. Enter “0” on the numeric keypad to get to TMR
3. Press MENU to select which channels are monitored (See Appendix A).
4. Use the ▲ and ▼ keys to enable or disable.
5. Press the MENU key to confirm.
6. Press the EXIT key to exit the menu.

Due to the way the BTECH GMRS-20V2 is constructed, whenever one of the A, B, or C frequencies goes active, it will default to transmit on that channel for the time you have selected on Menu 54 – this can be turned off and is explained below:

Replying on the last active channel

1. Press the MENU key to enter the menu.
2. Enter “62” on the numeric keyboard to get to TMR-TX.
3. Press the MENU key to select.
4. Select *TRACK* to reply on the channel with the last activity.
5. Press the MENU key to confirm.
6. Press the EXIT key to exit the menu.
7. The radio will now transmit on the channel which had the last activity. The amount of time before it reverts to transmitting on the primary selected channel which is set in menu 54

Locking the Default transmit channel

1. Press the MENU key to enter the menu.
2. Enter “62” on the numeric keypad to get to TMR-TX.
3. Press MENU to select.
4. Select *FIXED* to always reply on the primary selected channel
5. Press the MENU key to confirm.
6. Press the EXIT key to exit the menu.
7. The radio will now only transmit on the Main channel selected (The Main Frequency indicator arrow will be pointing at the display set as primary)

Chapter 6. - Selective calling

Sometimes when you're working with larger groups of people using the same channel, things can get very crowded, very fast. To minimize this problem, several methods of blocking out unwanted transmissions on your frequency have developed. In general, there are two forms of selective calling in two-way radio systems: Group calling, and individual calling.

Group calling, as the name suggest, is a one-to-many form of communication. Every radio in your working group is configured the same way and any radio will make contact with every other radio in the group.

Individual calling, sometimes also known as paging, is a one-to-one form of communication. Every radio is programmed with a unique ID code. And only by sending out a matching code can you get that radio to open up to your transmissions.

The BTECH GMRS-20V2 features three additional ways of group calling
(2TONE, 5TONE, AND DTMF CALLING ARE FOUND IN CHAPTER 5):

- *CTCSS*
- *DCS*
- *Tone-burst* (1000Hz, 1450Hz, 1750Hz, 2100Hz)

Using these features does NOT mean that others won't be able to listen in on your transmissions.

They only provide a method to filter out unwanted incoming transmissions. Any communications made while using these features will still be heard by anyone not employing filtering options of their own.

You can change the CTCSS or DCS settings while in memory (MR) mode.

CTCSS and 1750Hz tone-burst are also popular methods among amateur radio operators to open up repeaters.

CTCSS

CTCSS is set with menus 11 R-CTCS and 13 T-CTCS.

Procedure 8.1. CTCSS setup how-to

1. Press the MENU key to enter the menu.
2. Enter “11” on the numeric keypad to get to R-CTCS.
3. Press MENU to select.
4. Enter desired CTCSS sub-tone frequency in hertz on the numeric keypad.
5. Press MENU to confirm and save.
6. Enter “13” on the numeric keypad to go to T-CTCS.
7. Press MENU to select.
8. Enter desired CTCSS sub-tone frequency in hertz on the numeric keypad. Make sure it's the same frequency as that you entered for receiver CTCSS.
9. Press MENU to confirm and save.
10. Press EXIT to exit the menu system.

To turn CTCSS off, follow the same procedure but set it to off with the 0SQL key instead of selecting a CTCSS sub-tone frequency.

For more information see the section called “11 R-CTCS - Receiver CTCSS” and the section called “13 T-CTCS - Transmitter CTCSS” in Appendix A, Menu definitions.

DCS

DCS is set with menus 10 R-DCS and 12 T-DCS.

For a complete list of available DCS codes, see Table C.1, “DCS Codes” in Appendix C, *Technical specifications*.

Procedure 8.2. DCS setup how-to

1. Press the MENU key to enter the menu.
2. Enter “10” on the numeric keypad to get to R-DCS.
3. Press MENU to select.
4. Scroll to the desired DCS code on the numeric keypad.
5. Press MENU to confirm and save.
6. Enter “12” on the numeric keypad to go to T-DCS.
7. Press MENU to select.
8. Scroll to the desired DCS code on the numeric keypad. Make sure it's the same code as that you entered for receiver DCS.
9. Press MENU to confirm and save.
10. Press EXIT to exit the menu system.

To turn DCS off, follow the same procedure but set it to off with the 0SQL key instead of selecting a DCS code.

For more information see the section called “10 R-DCS - Receiver DCS” and the section called “12 T-DCS - Transmitter DCS” in Appendix A, *Menu definitions*.

1000Hz, 1450Hz, 1750Hz, 2100Hz Tone-burst

To send out a tone-burst; you simultaneously will press the PTT key while holding down the Call button.

To configure which Tone Burst is transmitted select the Tone Burst desired from Menu Item 52 (REP-S)

PTT + CALL = Selected Tone Burst (Selectable in Menu 52: REP-S)

Part III. How-to and setup guides.

Part three covers is a collection of how-to documents to help you set up your radio for specific working environments.

Chapter 7. - Customization

Text Display Colors

The LCD on the BTECH Mobiles are backlit multi-color LEDs, the color of which can be pre-set from the menu system into a variety of colors.

To change the colors, follow these steps:

1. Press the MENU key to enter the menu.
2. Enter one of the following on your numeric keypad:
    a. “33” to change the status icons text color
    b. “34” to change the primary selected channel/frequency display text color
    c. “35” to change the channel A text color
    d. “36” to change the channel B text color
    e. “37” to change the channel C text color
    f. “38” to change the decode tone text color
    g. “39” to change the voltage text display text color
    h. “40” to change the status (bottom) bar display color
    i. “41” to change the menu text display color
    j. “42” to change the transmitting channel foreground text color
    k. “43” to change the receiving channel foreground text color

3. Press MENU key to select.
4. Use the ▲ and ▼ keys to pick the desired color.
5. Press MENU to confirm and save.
6. Press EXIT to exit the menu.

Sync Display Channels

To sync channels on the display (simultaneously display channel name and frequency), follow these steps:

1. Press the MENU key to enter the menu.
2. Enter “32” on your numeric keypad to come to SYNC
3. Press MENU key to select.
4. Use the ▲ and ▼ keys to select:
    a. AB –To sync A/B Displays
    b. AC – To sync A/C Displays
    c. BC – To sync B/C Displays
    d. ABC- to sync ABC Displays
5. Press MENU to confirm and save.
6. Press EXIT to exit the menu.

Use SYNC in Conjunction with Menus 27,28, & 29 to coordinate what is displayed on each line (Name, Frequency, or Channel Number) –See *Appendix A Menu definitions*

Voice Operated Xmitter (VOX).

VOX or voice operated transmitter (Xmitter) is allowing just your voice to key the transmitter to send a transmission. The microphone will switch the radio from receive to transmit by hearing any sound it can detect, including your voice. This should only be used in a quiet atmosphere, and any background noise which can be picked up will switch the radio from transmit to receive. By using this you do not use the PTT button on the side of the microphone to transmit.
To use VOX, follow these steps:

1. Press the MENU key to enter the menu.
2. Enter “30” on your numeric keypad to come to VOX
3. Press MENU key to select.
4. Select from Off, or any number (which sets the sensitivity level of the microphone to detect and switch) from 1 (less sensitive) to 10 (most sensitive)
5. Press MENU to confirm and save.
6. Press EXIT to exit the menu.

Appendix A. – Menu Definitions

0	TMR	Transmit Multi Receive	OFF M+A M+B M+C M+AB M+AC M+BC M+ABC	This mode selects what displays are monitored in the background besides the primary selected channel. You can mix and match between all or partial channels to allow tri watch Selected Memory + Displays (A, B, C) M = Selected Memory A = Display A B = Display B C = Display C
1	STEP	Frequency Step Size Setup	2.5 to 25. kHz	Choose 2.5, 5, 6.25, 10, 12.5, or 25 kHz steps during tuning
2	SQL	Squelch Level	00 > 09	10 squelch levels 00 = minimum / normally open 10 = full or 'tight' squelch
3	TXP	Transmit Power	High	Full Power – 20W
			Low	Low Power – 5W
4	AUTOLK	Auto Keypad Lock	ON	Keypad Auto Lock Enabled
			OFF	Keypad Auto Lock Disabled
5	TOT	TX Time Out Timer	15 > 600 secs	Transmitter shuts off during transmission after exceeding this time limit. Set in 15 second steps. Release PTT to reset

6	APO	Auto Power Off	30 - 300 minutes	Time Set that radio will Power Off after last signal received.
			OFF	Turn off APO Option
7	WN	Bandwidth	Wideband	25.0 kHz
			Narrowband	12.5 kHz
8	ABR	Display Backlight Time	Off, 1-50 Sec	Set to backlight OFF, or time delay to shut off Display Backlight
9	BEEP	Beep Prompt	ON / OFF	Turn ON / OFF beep prompt
10	R-DCS	Receive - Digital Coded Squelch	D023N > D754I	Squelch opens when proper DCS code is detected
			OFF	Turns off Decode, all signals will be heard.
11	R-CTCS	Receive - Analog Tone Squelch	67.0 > 254.1 Hz	Squelch opens when proper CTCSS tone detected
			OFF	Turns off Decode, all signals will be heard.
12	T-DCS	Transmit - DCS Code	D023N > D754I	Transmits specified code
			OFF	No DCS code transmitted
13	T-CTCS	Transmit - CTCSS Code	67.0 > 254.1 Hz	Transmits specified tone
			OFF	No CTCSS tone transmitted
14	DTMFST	Determines if transmitted DTMF codes are heard through speaker	OFF	No DTMF tone heard
			ON	All DTMF codes are heard
15	BCL	Busy Channel Lockout	ON	Prevents transmitting if an active signal is on the channel during scan
			OFF	No lockout

16	SC-ADD	Add a Scan Channel	ON	Add channel to scan list
			OFF	Remove channel from scan list
17	SC-REV	Scan Resume Method	TO	(Time Operation) Scan stops when signal detected. The scan resumes after approximately 5 seconds (even if the channel is still active).
			CO	(Carrier Operation) Scan stops when signal detected. Scan resumes when signal disappears.
			SE	(Search Operation) Scan stops when signal detected. Scanning will not resume.
18	OPTSIG	Optional Signaling	OFF	No optional signaling
			DTMF	DTMF signaling selected
			2TONE	2TONE signaling selected
			5TONE	5TONE signaling selected
19	SPMUTE	Speaker Mute Settings	QT	Squelch opens for CTCSS/DCS tones only.
			AND	Squelch opens when CTCSS/DCS tone is recognized along with the optional signaling.
			OR	Squelch opens when either the CTCSS/DCS tone OR the optional signaling is recognized.
20	PTT-ID	PTT ID - When to send	OFF	Turns OFF PTT ID Sending
			BOT	Sends at Beginning of Transmission
			EOT	Sends at the End of Transmission
			BOTH	Sends at both Beginning and End
21	PTT-LT	PTT ID - Transmit Delay	0 > 30	Set Delay Time before transmitting PTT-ID (in msec)

22	S-INFO	Auto Group Dialing	Group Signal Code Memory	1 > 15 Can only be set with software
23	EMC-TP	Alarm Mode	ALARM	Turn on Alarm sound
			ANI	Send Alarm code and ID code on specified channel
			BOTH	Both of the above
24	EMC-CH	Alarm Channel	000 > 200	Specified Alarm Channel
25	SIG-BP	Signal Beep	OFF	Tone OFF
			ON	Pager Ring at Reception of Matching 2Tone/5Tone/DTMF code
26	CHNAME	Channel Name Edit	In Channel Mode, edits the Current Name	
27	CA-MDF	Channel A Display Mode	FREQ	In Channel Mode, display the selected format in display A
			CH	
			NAME	
28	CB-MDF	Channel B Display Mode	FREQ	In Channel Mode, display the selected format in display B
			CH	
			NAME	
29	CC-MDF	Channel C Display Mode	FREQ	In Channel Mode, display the selected format in display C
			CH	
			NAME	
30	VOX	VOX Sensitivity	Off, 1,2,3….10	When enabled it is not necessary to push the PTT button on the transceiver. Adjust the gain level to an appropriate sensitivity to allow smooth transmission. Higher numbers are more sensitive. Adjust level to allow for smooth operation.

31	VOX-T	VOX Delay	0-20 milliseconds	Delay before radio returns to receive after user stops talking/ noise disappears from background
32	SYNC	Display Sync	OFF	Separate A/B/C channel display.
			AB	Synchronizes display AB, AC, BC, or ABC
			AC	
			BC	
			ABC	
33	ST-FC	Status Icons Color Foreground Color	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
34	MF-FC	Primary Selected Channel Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
35	SFA-FC	Display Channel A Text Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
36	SFB-FC	Display Channel B Text Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY

37	SFC-FC	Display Channel C Text Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
38	SUB-FC	Decode Tone Text Color Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
39	FM-FC	Voltage Text Display Color Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
40	SIG-FC	Status (Bottom) Bar Display Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
41	MENU-FC	Menu Text Display Color	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
42	TX-FC	Transmitting Channel Color Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY

43	RX-FC	Transmitting Channel Color Foreground Color (Text)	Select Color	WHITE, RED, BLUE, GREEN, YELLOW, INDIGO, PURPLE, GRAY
44	REP-SW	OFF		Turn off relay (repeater) function.
		RX		Used as a receiver when building a relay (repeater) station (PTT key does not work)-requires 2nd radio
		TX		Used as a transmitter when building a relay (repeater) station-requires 2nd radio
45	D-SUB	Subtone Display Switch	OFF	Only display the CTCSS/DCS icon
			ON	Display the CTCSS/DCS Code
46	RCH-AD	Add RX Channel	000, 031 > 199	Indicates channel number to be stored.
47	DEL-CH	Delete Channel	000 > 199	Indicates channel number to be deleted.
48	SFT-D	Frequency Shift Direction	OFF	No Offset (TX and RX same frequency or simplex)
			+	Plus shift in transmit frequency from receive frequency
			-	Minus shift in transmit frequency from receive frequency
49	OFFSET	Frequency Shift Offset Amount	00.00 > 69.99	Set Frequency Shift Value of SFT-D
50	ANI	ANI ID Code	Can only be set with software	
51	ANI-L	ANI Length	3, 4, 5	Length of ANI ID code
52	REP-S	Repeater Activation Tone	1000Hz 1450Hz	Audible tone for repeater activation (if required by system) “Tone Burst”

			1750Hz 2100Hz	
53	REP-M	Repeater Forwarding Mode (X-Band Repeater with 2 BTECH Mobiles)	OFF	Turns Off
			CARRI	Carrier Access
			CTDCS	DCS Access (requires DCS tone)
			TONE	CTCSS Access (Requires CTCSS tone)
			DTMF	DTMF Code Access
54	TMR-MR	TMR - Return Time Delay to Primary Channel	OFF	Function OFF - Transmits always on Primary Channel
			1 > 50 seconds	This is the delay time before returning to the primary channel after secondary signal is clear. Sets the PTT to the last received transmission channel. Time delay selectable 1 to 50 seconds
55	STE	Squelch Tail Elimination	OFF	Function OFF
			ON	Eliminates squelch tail at end of transmission on receiving radio.
56	RP-STE	Repeater Squelch Tail Elimination (*Requires a repeater using this function*.)	OFF 1,2, 3…10	Delay setting to eliminate noise burst at end of a repeater transmission when receiving
57	RPT-DL	Repeater squelch tail delay.	OFF	Function OFF
			1 > 60	Delay Time
58	DTMF-G	DTMF Gain / Audio Level	0 > 60	0 = Lowest Audio Gain
				60 = Highest Gain

59	MIC-G	Microphone Gain /Audio Level	0 > 127	0 = Lowest Audio Gain 127 = Highest Gain
60	SKIPTX	Tri Frequency Operation: Randomize transmitting channels - with another corresponding mobile on the same 3 channels transmissions can be spread apart on the three channels in 2 modes.	OFF	Turns off Randomizing Transmit frequency.
			SKIP1	Randomizes in between after both transmitting and receiving, requires both a received and a transmission before going to another random frequency
			SKIP2	Alternates transmitting on A, B, C – with each PTT. When PTT is pressed the radio will transmit on the next channel in order of their display (A-B-C-Repeat) *Requires a GMRS-20V2 on both ends with identical programming to work*
61	SC-MOD	Automatic Scan Resume Method	OFF	Scan is disabled with a Radio Reboot, or by Pressing a Menu Key / PTT
			PTT-SC	Scanning will resume after transmitting (or other Menu Operations)
			MEM-SC	Scan Memory after Radio Reboot: If scanning was active when the radio was powered down, the radio will resume scanning on restart. (Scanning also resumes after transmitting or other Menu Operations)

			PON-SC	Power on Scan: The radio will start scanning upon turning on - no matter what state it was in when powering down. Also, the radio will scan after Menu operations or transmitting
62	TMR-TX	Track		TRACKED is used in conjunction with Menu 52 and will transmit in response to the active receiving channel (depending on the TMR delay time you have set on Menu 54 before returning to the primary selected channel.
		FIXED		FIXED- Will only TX on Primary Selected Channel
63	VOL	Volume Level	0,1,2,3….58	Adjust the output volume of the radio. The higher the number, the higher the volume
64	GCH-AD	Quick GMRS Channel Add	GCHxx	Quickly add GMRS channel. XX is the GMRS channel number to be added
65	SAVE	Battery Save Ratio	OFF, 1:1, 1:2, … 1:8	Selects the ratio of sleep cycles to awake cycles (1:1, 1:2…1:8). The higher number increases the RX sleep cycle, but you may miss the first few syllables before the RX opens and audio is heard.
66	RESET	Initialize to Factory Defaults	VFO	Menu Initialization
			ALL	Resets to factory default arrangement. User Menu and Channel settings are set back to Factory Settings

FCC Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: MODIFICATION OF THIS DEVICE TO RECEIVE CELLULAR RADIOTELEPHONE SERVICE SIGNALS IS PROHIBIITED UNDER FCC RULES AND FEDERRAL LAW.

Appendix B. - Technical specifications

General

Specification	Value
Frequency Range (MHz)	65-108 (Rx only)
	136-174 (Rx)
	400-520 (Rx)
	GMRS Channels (Rx/Tx) (Channels 001-007, 015-030)
	GMRS Channels (Rx Only) (Channels 008-014)
Memory channels	200
Frequency stability	2.5ppm
Frequency step (kHz)	2.5K/5.0K/6.25K/10.0K/12.5K/25.0K
Squelch Setup	CARRIER / CTCSS / DCS / 5Tone / 2TONE / DTMF
Antenna impedance	50 Ohm
Operating temperature	-20°C to +60°C
Supply voltage	13.8V DC±15%:
	7A Peak GMRS-20V2
Dimension	GMRS-20V2: 4.0(W) x 1.50 (H) x 4.0 (D)in
	14.9oz
Operating Temperature	-5°F - +140°F

Receiver

Receiver specifications

	Broadband	Narrow band
Sensitivity	≤0.25μV	≤0.35μV
Channel choice	≥70dB	≥60dB
Intermodulation	≥:65dB	≥60dB
Spurious Rejection	≥70dB	≥70dB
Audio response	+1~-3dB (0.3-3KHz)	+1~-3dB (0.3~2.55KHz)
Signal to noise ratio	≥45dB	≥40dB
Audio Distortion	≤ 5%	
Audio output power	≥2W@10%	

Transmit

	Broadband	Narrow band
Output power	20W/ 5W - GMRS-20V2	
Modulation Mode	16KΦF3E	11KΦF3E
Channel Power	≥70dB	≥60B
Signal to noise ratio	≥40dB	≥36dB
Parasitic harmonic	≥60dB	≥60dB
Audio response	+1--3dB(0.3-3KHz)	+1--3dB (0.3-2.55KHz)
Audio distortion	≤ 5%	

DCS table

Table C.1. DCS Codes

Number	Code	Number	Code	Number	Code	Number	Code
001	D023N	002	D025N	003	D026N	004	D031N
005	D032N	006	D036N	007	D043N	008	D047N
009	D051N	010	D053N	011	D054N	012	D065N
013	D071N	014	D072N	015	D073N	016	D074N
017	D114N	018	D115N	019	D116N	020	D122N
021	D125N	022	D131N	023	D132N	024	D134N
025	D143N	026	D145N	027	D152N	028	D155N
029	D156N	030	D162N	031	D165N	032	D172N
033	D174N	034	D205N	035	D212N	036	D223N
037	D225N	038	D226N	039	D243N	040	D244N
041	D245N	042	D246N	043	D251N	044	D252N
045	D255N	046	D261N	047	D263N	048	D265N
049	D266N	050	D271N	051	D274N	052	D306N
053	D311N	054	D315N	055	D325N	056	D331N
057	D332N	058	D343N	059	D346N	060	D351N
061	D356N	062	D364N	063	D365N	064	D371N
065	D411N	066	D412N	067	D413N	068	D423N
069	D431N	070	D432N	071	D445N	072	D446N

073	D452N	**074**	D454N	**075**	D455N	**076**	D462N
077	D464N	**078**	D465N	**079**	D466N	**080**	D503N
081	D506N	**082**	D516N	**083**	D523N	**084**	D526N
085	D532N	**086**	D546N	**087**	D565N	**088**	D606N
089	D612N	**090**	D624N	**091**	D627N	**092**	D631N
091	D627N	**092**	D631N	**093**	D632N	**094**	D645N
094	D645N	**095**	D654N	**096**	D662N	**094**	D645N
097	D664N	**098**	D703N	**099**	D718N	**100**	D723N
101	D731N	**102**	D732N	**103**	D734N	**104**	D743N
105	D754N	**106**	D023I	**107**	D025I	**108**	D026I
109	D031I	**110**	D032I	**111**	D036I	**112**	D043I
113	D047I	**114**	D051I	**115**	D053I	**116**	D054I
117	D065I	**118**	D071I	**119**	D072I	**120**	D073I
121	D074I	**122**	D114I	**123**	D115I	**124**	D116I
125	D122I	**126**	D125I	**127**	D131I	**128**	D132I
129	D134I	**130**	D143I	**131**	D145I	**132**	D152I
133	D155I	**134**	D156I	**135**	D162I	**136**	D165I
137	D172I	**138**	D174I	**139**	D205I	**140**	D212I
141	D223I	**142**	D225I	**143**	D226I	**144**	D243I
145	D244I	**146**	D245I	**147**	D246I	**148**	D251I
149	D252I	**150**	D255I	**151**	D261I	**152**	D263I

153	D265I	**154**	D266I	**155**	D271I	**156**	D274I
157	D306I	**158**	D311I	**159**	D315I	**160**	D325I
161	D331I	**162**	D332I	**163**	D343I	**164**	D346I
165	D351I	**166**	D356I	**167**	D364I	**168**	D365I
169	D371I	**170**	D411I	**171**	D412I	**172**	D413I
173	D423I	**174**	D431I	**175**	D432I	**176**	D445I
177	D446I	**178**	D452I	**179**	D454I	**180**	D455I
181	D462I	**182**	D464I	**183**	D465I	**184**	D466I
185	D503I	**186**	D506I	**187**	D516I	**188**	D523I
189	D526I	**190**	D532I	**191**	D546I	**192**	D565I
193	D606I	**194**	D612I	**195**	D624I	**196**	D627I
197	D631I	**198**	D632I	**199**	D645I	**200**	D654I
201	D662I	**202**	D664I	**203**	D703I	**204**	D712I
205	D723I	**206**	D731I	**207**	D732I	**208**	D734I
209	D743I	**210**	D754I				

CTCSS table

Table C.2. Default CTCSS Frequencies

Frequency	Frequency	Frequency	Frequency
67.0	69.3	71.9	74.4
77.0	79.7	82.5	85.4
88.5	91.5	94.8	97.4
100.0	103.5	107.2	110.9
114.8	118.8	123	127.3
131.8	136.5	141.3	146.2
151.4	156.7	159.8	162.2
165.5	167.9	171.3	173.8
177.8	179.9	183.5	186.2
189.9	192.8	196.6	199.5
203.5	206.5	210.7	218.1
225.7	229.1	233.6	241.8
250.3	254.1		