

# How to Program Your Software Defined Radio

## What is SDR?

- What is a Software Defined Radio?
  - The newer radios use a computer chip, Analog To Digital converters, Digital To Analog converters , memory chip and Digital Signal processors to make the transmitter-receiver circuits in a Software Defined Radio (SDR).
- So what does this technical gibberish mean?
  - Digital code that is “1”s and “Zero”s make up the information to make the SDR radios work.
- Most SD radios have a means by which we can store information such as frequencies, modes of operation, radio settings and other details. This is called memory management.
- What do you need to have to do this?
  - You will need a computer with Windows Based operating system such a Windows 10.
  - You need an interface cable. Some of the cable have electronics in them although they will look like a usb cable. You must have the correct cable for your radio. Some radios come with the correct cable, other you will have to order the cable separately.
  - You will need software installed on the computer that is used to program your specific radio.

# How to Program Your Software Defined Radio

What software do I need?

- There is free software available that you can download. One common piece of software is called “Chirp”. Chirp is for placing frequencies and tones in the radio.
- The Chirp website is found here :  
<https://chirp.danplanet.com/projects/chirp/wiki/Home>
- See the handout for details of the radios it can be used to program.
- A lot of the radios listed are the Chinese Handy-Talkies. However there are some listed that are mobile/desktop rigs.
- Some vendors may have software you can download from the internet for your specific radio.
- If you have to purchase software, one company called RTsystems has programming software for many different vendors radios such as Kenwood, Yaesu, Icom, Elantec and other.

# How to Program Your Software Defined Radio

How do I install the software?

- Most of the software uses the Universal Serial Bus or USB port on the computer. The USB port may require some code called a “driver” to work with the programming software.
- The “driver” code is also software. This piece of code allows the computer to understand how utilize the electronics in the programming cable if there is one. Also some radios have a usb port built in to them which may also require a “driver” for programming.
- Order of software installation:
  - Install the radio programming software first.
  - install the software driver second.

# How to Program Your Software Defined Radio

How do I connect to the radio?

- You will need to read the manual to determine how to get the radio into a mode for programming.
- The may require using multiple simultaneous keystrokes to prepare the radio for using the programming cable.
- Turn on the computer and after it is booted up, start the software to program the radio.
- With the radio turned off, connect the programming cable to the radio.
- Turn on the radio and use the keystrokes defines by the manufacture to place the radio in programming mode.

# How to Program Your Software Defined Radio

What do I do with what I see on the computer? (Baofeng BF-F8)

Opening screen

The screenshot displays the CHIRP software interface. The main window shows a table of radio memories. The table has the following columns: Loc, Frequency, Name, Tone Mode, Tone, ToneSql, DTCSC Code, DTCSC Pol, Duplex, Offset, Mode, Tune Step, Skip, Comment, URCALL, RPT1CALL, RPT2CALL, and Digital Code. The data in the table is as follows:

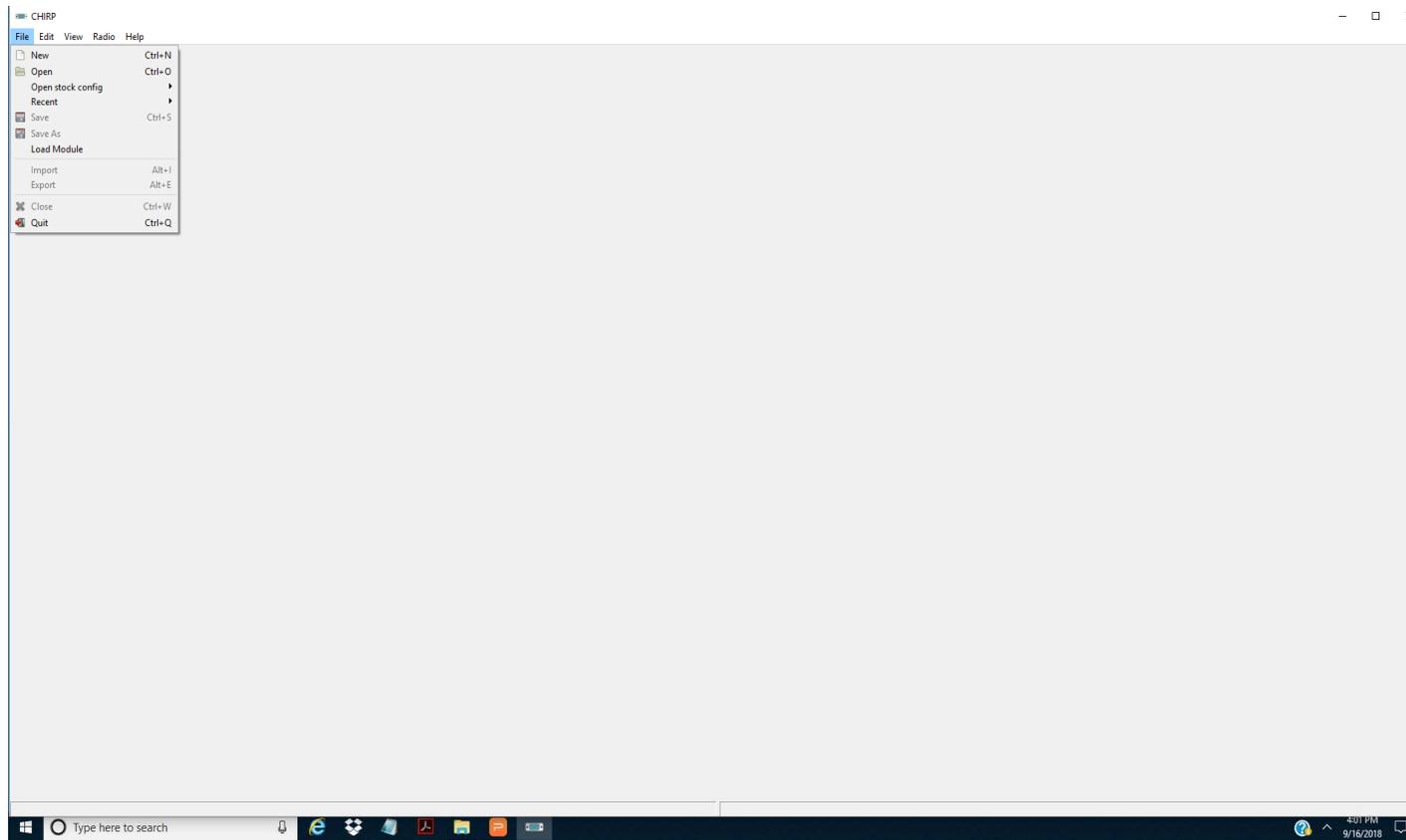
Loc	Frequency	Name	Tone Mode	Tone	ToneSql	DTCSC Code	DTCSC Pol	Duplex	Offset	Mode	Tune Step	Skip	Comment	URCALL	RPT1CALL	RPT2CALL	Digital Code
0	146.010000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
1	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
2	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
3	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
4	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
5	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
6	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
7	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
8	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
9	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
10	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
11	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
12	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
13	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
14	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
15	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
16	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
17	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
18	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
19	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
20	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
21	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
22	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
23	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
24	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
25	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
26	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
27	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
28	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
29	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
30	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
31	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
32	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
33	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
34	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
35	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
36	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0
37	0.000000		(None)	88.5	88.5	023	NN	(None)	0.600000	FM	5.0						0

The interface also shows a taskbar at the bottom with the Windows logo, a search bar, and system tray icons including the date and time (11:05 AM 9/16/2018). A status bar at the bottom of the window indicates "[0] Completed Downloading MYCALL list (idle)".

# How to Program Your Software Defined Radio

What do I do with what I see on the computer? (Baofeng BF-F8)

Get the file for the radio



# How to Program Your Software Defined Radio

What do I do with what I see on the computer? (Baofeng BF-F8)

Prevent out of band transmissions

CHIRP  
File Edit View Radio Help

Baofeng BF-F8HP; Baofeng\_BF-F8HP\_20180507.img

Memories Memory Range: 0 - 127 Refresh Special Channels Show Empty Properties

Settings	Loc	Frequency	Name	Tone Mode	Tone	ToneSql	DTCSS Code	DTCSS Rx Code	DTCSS Pol	Cross Mode	Duplex	Offset	Mode	Power	Skip
Browser	0	147.015000	W9OU	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	1	146.880000	W9INX	(None)	88.5	88.5	023	023	NN	Tone->Tone	-	0.600000	FM	High	
	2	146.910000	W9TE	TSQL	141.3	141.3	023	023	NN	Tone->Tone	-	0.600000	FM	High	
	3	146.940000	W9TE	TSQL	141.3	141.3	023	023	NN	Tone->Tone	-	0.600000	FM	High	
	4	147.105000	W9LKI	TSQL	131.8	131.8	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	5	147.180000	W9LKI	TSQL	131.8	131.8	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	6	147.210000	K9HD	TSQL	97.4	97.4	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	7	147.255000	W9INX	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	8	147.360000	W9RQ	Tone	141.3	88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
	9	442.875000	KC9QDO	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	10	443.525000	KC9LUT	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	11	444.350000	KC9QDO	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	12	442.450000	KASLCF	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	13	443.275000	K9MMQ	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	14	443.800000	W9INX	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	15	444.250000	W9AVW	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	16	444.800000	W9FEZ	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	17	444.875000	W9TE	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
	8	154.355000	FIRE	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
	9	154.220000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
	0	154.450000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
	1	145.530000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.000000	FM	High	
	22	160.230000	RAIL RO	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
	23	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	24	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	25	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	26	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	27	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	28	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	29	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	30	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	31	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	32	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	33	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	34	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	35	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	36	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
	37	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		

[0] Completed Getting memory 127 (idle)

Type here to search

11:15 AM  
9/16/2018

# How to Program Your Software Defined Radio

What do I do with what I see on the computer? (Baofeng BF-F8)

Upload changes to the radio

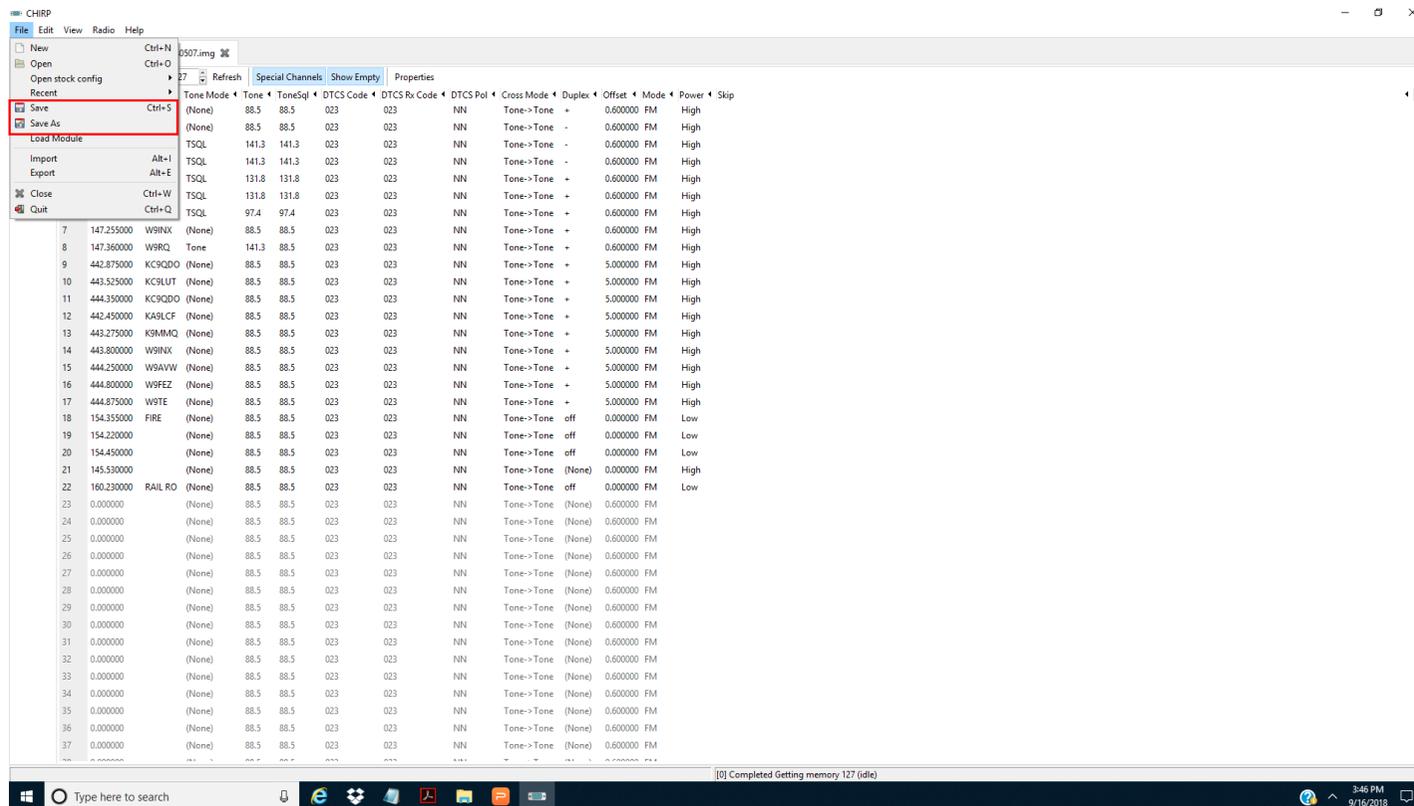
The screenshot shows the CHIRP software interface. The 'Radio' menu is open, and 'Upload To Radio' is highlighted. The main window displays a table of radio channels. The table has the following columns: Loc, Name, Mode, Power, Skip, Frequency, Name, Mode, Power, Skip, Frequency, Name, Mode, Power, Skip. The data is as follows:

Loc	Name	Mode	Power	Skip	Freq	Name	Mode	Power	Skip	Freq	Name	Mode	Power	Skip
0					88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
1					88.5	023	023	NN	Tone->Tone	-	0.600000	FM	High	
2					41.3	023	023	NN	Tone->Tone	-	0.600000	FM	High	
3	146.940000	W9TE	TSQL	141.3	141.3	023	023	NN	Tone->Tone	-	0.600000	FM	High	
4	147.105000	W9LKI	TSQL	131.8	131.8	023	023	NN	Tone->Tone	+	0.600000	FM	High	
5	147.180000	W9LKI	TSQL	131.8	131.8	023	023	NN	Tone->Tone	+	0.600000	FM	High	
6	147.210000	K9HD	TSQL	97.4	97.4	023	023	NN	Tone->Tone	+	0.600000	FM	High	
7	147.255000	W9INX	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
8	147.360000	W9RQ	Tone	141.3	88.5	023	023	NN	Tone->Tone	+	0.600000	FM	High	
9	442.875000	KCSQDO	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
10	443.525000	KCSLUT	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
11	444.350000	KCSQDO	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
12	442.450000	KA9LCF	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
13	443.275000	K9MMQ	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
14	443.800000	W9INX	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
15	444.250000	W9AVW	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
16	444.800000	W9FEZ	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
17	444.875000	W9TE	(None)	88.5	88.5	023	023	NN	Tone->Tone	+	5.000000	FM	High	
18	154.355000	FIRE	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
19	154.220000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
20	154.450000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
21	145.530000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.000000	FM	High	
22	160.230000	RAIL RO	(None)	88.5	88.5	023	023	NN	Tone->Tone	off	0.000000	FM	Low	
23	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
24	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
25	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
26	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
27	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
28	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
29	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
30	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
31	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
32	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
33	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
34	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
35	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
36	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		
37	0.000000	(None)	(None)	88.5	88.5	023	023	NN	Tone->Tone	(None)	0.600000	FM		

# How to Program Your Software Defined Radio

What do I do with what I see on the computer? (Baofeng BF-F8)

Save the radio setting to the disc drive.



# How to Program Your Software Defined Radio

What is firmware and how is it updated?

- The new HF radios and Handy-Talkies have firmware that may be needed to be updated.
- Firmware is actually the operating system used by your radio. It is similar to the operating system used by your computers.
- There may arise the requirement to update the firmware. This can be concerning since if it is done wrong could make your radio unusable.
- The firmware update requires an installer program which is different from the software to update frequencies and tones.
- The installer program may use the same cable as previously discussed.

# How to Program Your Software Defined Radio

What is firmware and how is it updated?

- Read the direction from the manufacturer of the radio very carefully!!
- Some radio have a switch internal to the radio to allow it to have a firmware update. The direction are specific as to when to power up, install the firmware and power down the radio. The internal switch then has to be changed to a non-programming mode. This is the case with the Yeasu FTM-400.
- To show how this is done, I will place an update into a DMR GD-77 radio.

# How to Program Your Software Defined Radio

What is firmware and how is it updated?

- First : Install the software on the computer for the firmware upgrade.
- Second : If drivers are required for the computer, install them as well.  
Also any settings for the USB cable must be updated or changed.
- Third : Check the radio setting for the USB interface settings.
- Fourth : Read the direction thoroughly before doing the upgrade to ensure the radio is ready to be programmed.
- Observe the process that the manufacturer has described for the upgrade.