



# South County ARES

Radio Programming

# AGENDA

- **Memory Channels vs Variable Frequency Oscillator (VFO)**
- **Simplex**
- **Repeater**
  - Input Frequency
  - Output Frequency
- **PL, CTCSS, DCS, WTF?**
- **Manual vs Computer Programming**
- **Exercise**

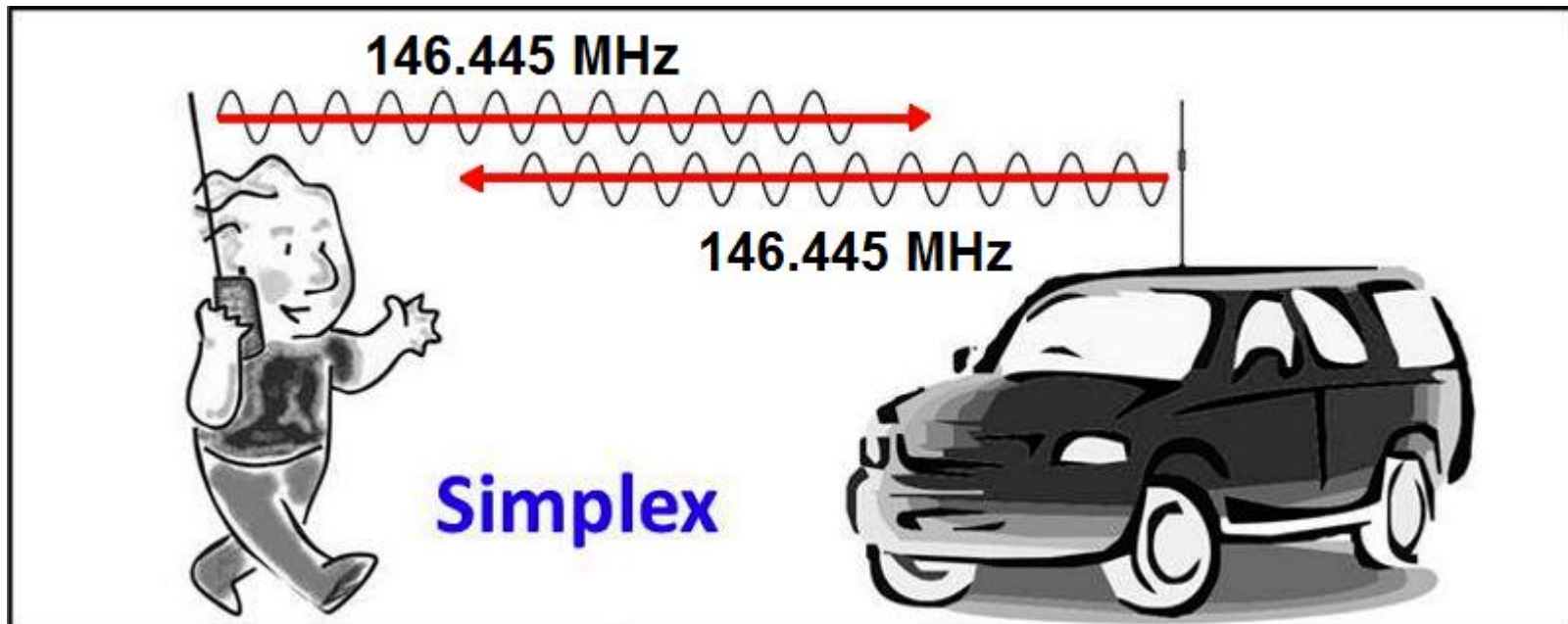
# MEMORY CHANNELS VS VFO MODE

- Memory Channels are like radio stations you program on your car radio
- VFO (variable frequency oscillator) mode is like turning the tuning knob on your car radio



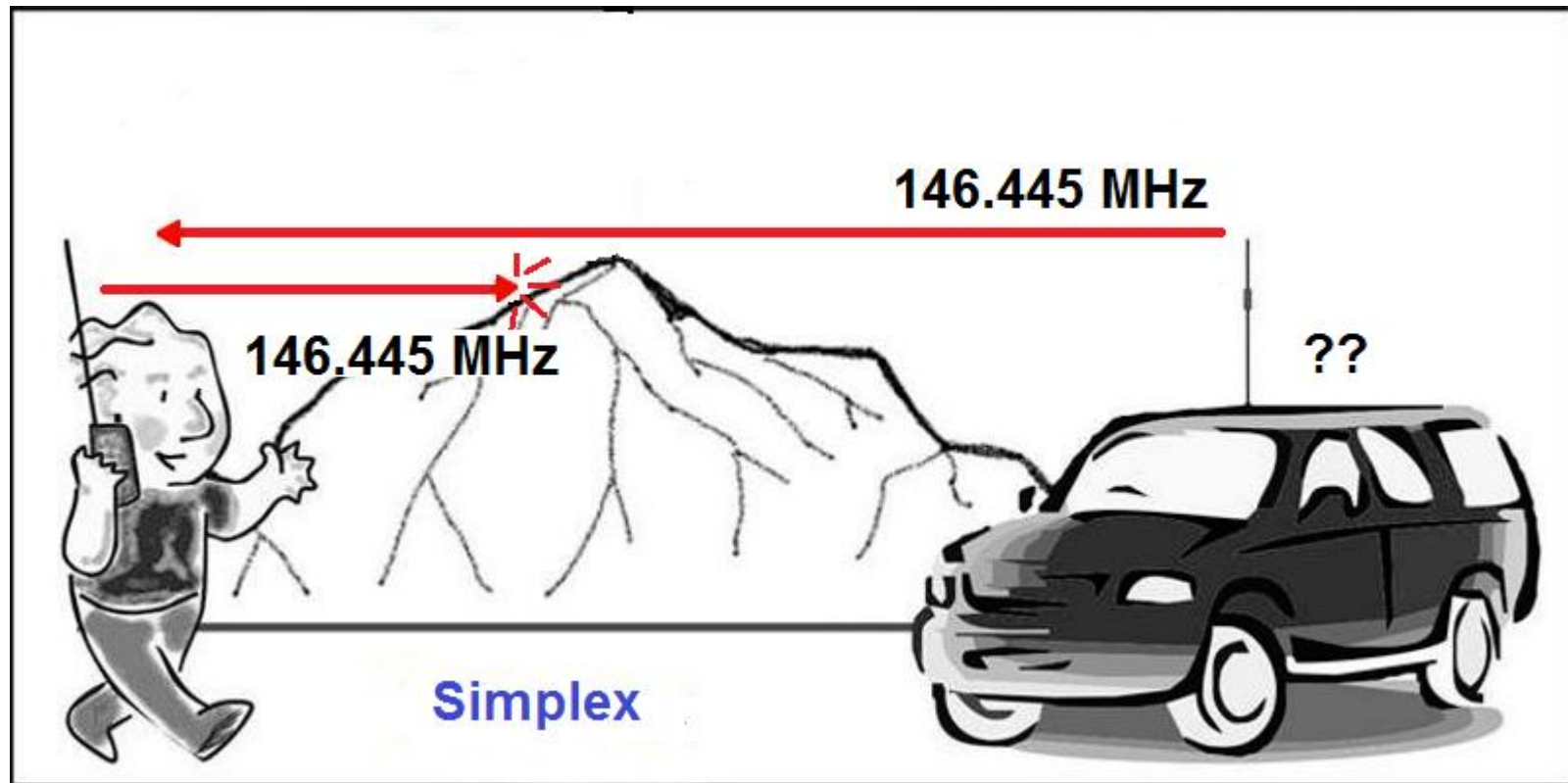
# SIMPLEX

- Transmit and Receive on the same frequency
- Fine for short range and when there are no obstructions
- Handheld radios suffer from lower power and smaller antennas



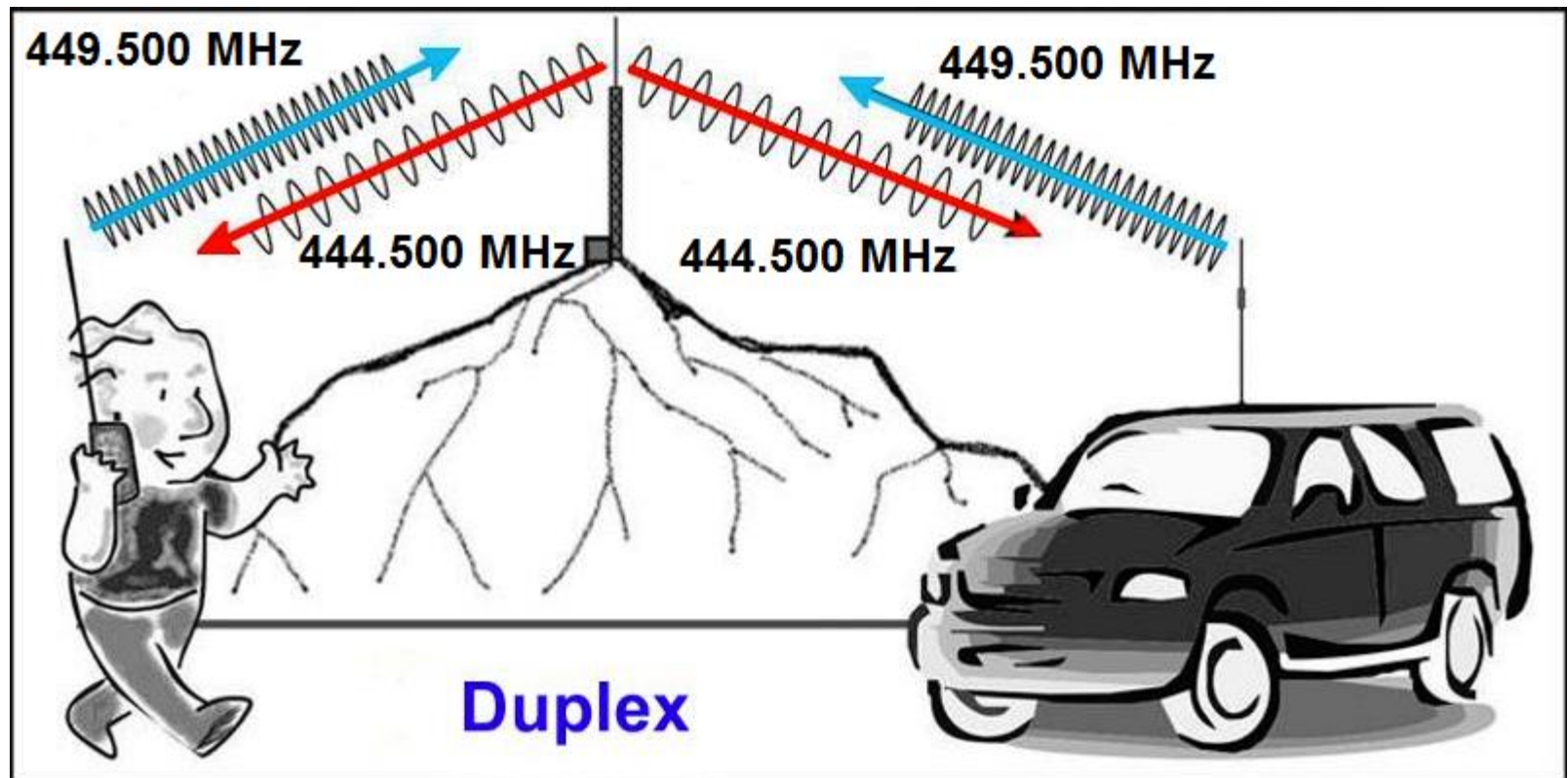
# SIMPLEX

- Transmit and Receive on the same frequency
- Limited range and can be impacted by obstructions
- A higher powered mobile or base station radio with a longer and elevated antenna may be necessary



# REPEATER

- **Input Frequency** – The frequency we transmit on
- **Output Frequency** – The frequency we listen on
- We identify the repeater using the output frequency
- Repeater can extend range

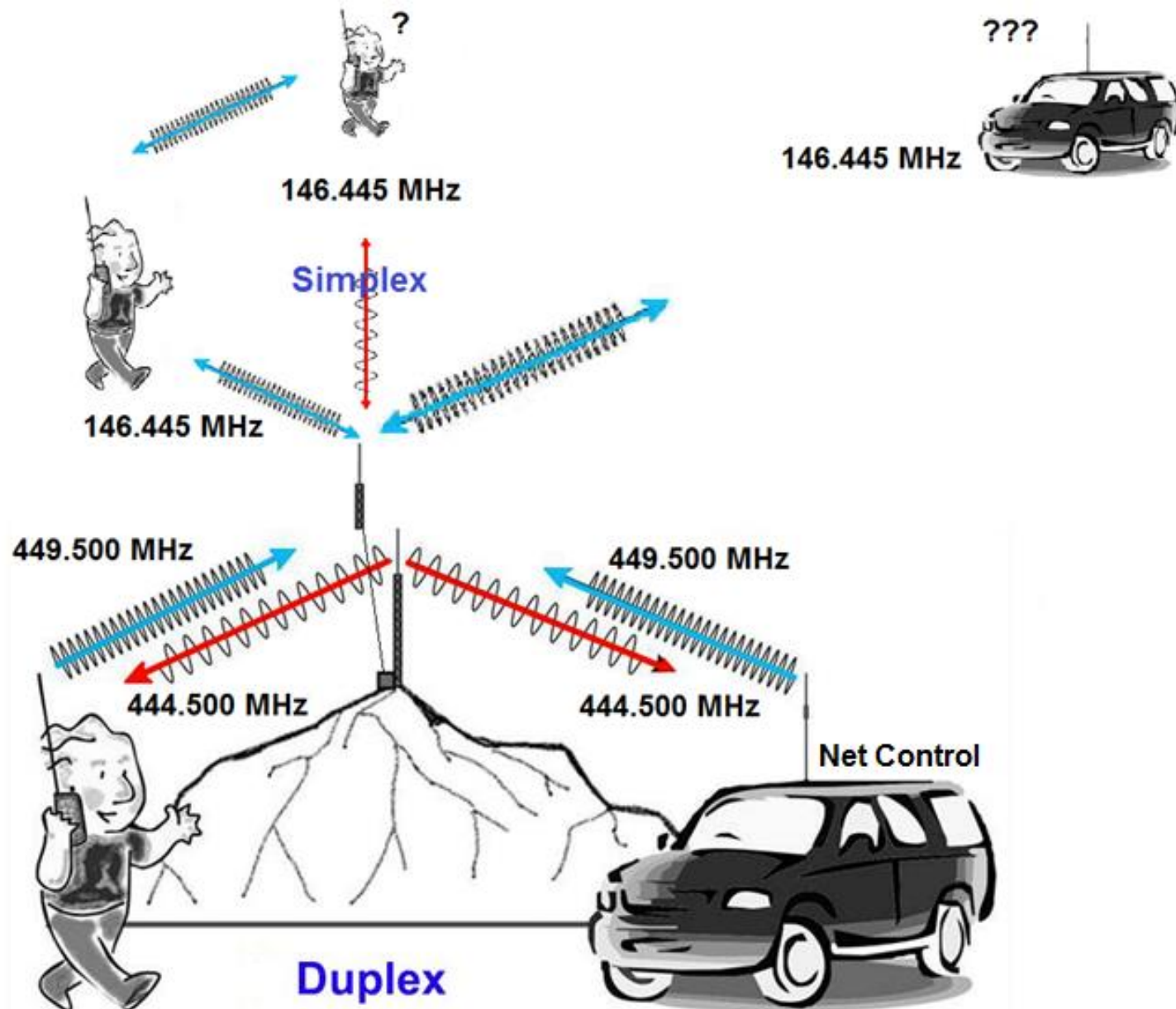


# REPEATER

- There are standard offsets between the input and output frequencies
- Offsets vary by band
- Just to make things more complicated, on 2m, the offsets can be plus or minus depending on what part of the band the repeater is on

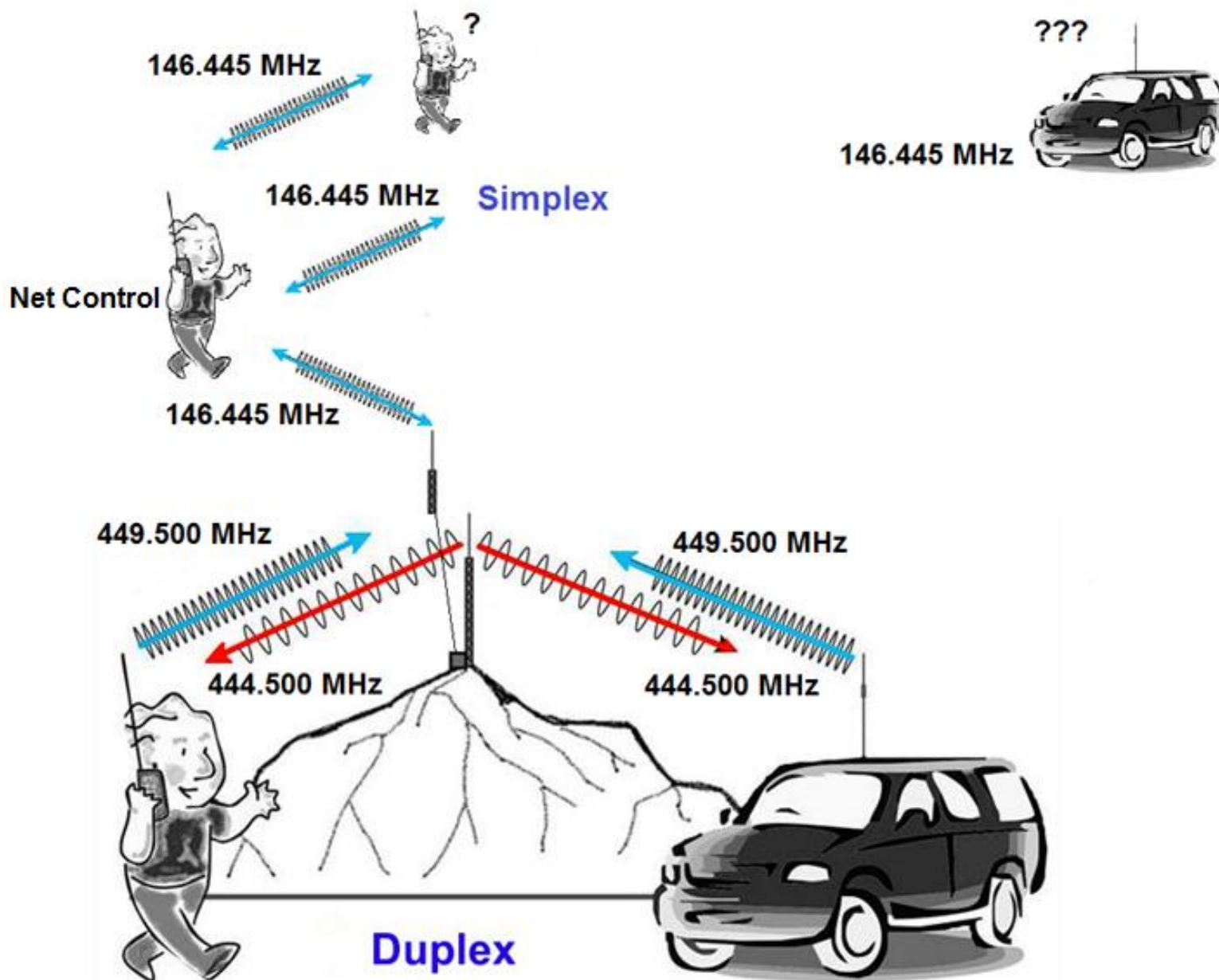
Repeater Output Frequency	Standard Input Frequency Offset
145.1 MHz - 145.5 MHz	-600 kHz
146.0 MHz - 146.4 MHz	+600 kHz
146.6 MHz - 147.0 MHz	-600 kHz
147.0 MHz - 147.4 MHz	+600 kHz
147.6 MHz - 148.0 MHz	-600 kHz
222.0 MHz - 225.0 MHz	-1.6 MHz
440.0 MHz - 450.0 MHz	+5 MHz

# REPEATER LINKED TO SIMPLEX





# REPEATER LINKED TO SIMPLEX



# TONES

- **Prevent repeaters and radios from responding to unwanted signals or interference**
- **Repeaters use tones (67.0 to 254.1 Hz) to prevent interference from other repeaters on the same frequency or causing interference**
- **Radios transmit these tones while the PTT button is being pressed**
- **If there are other repeaters in the area using the same frequency, you will want you radio set to receive tone as well**

# TONES

- **CTCSS = Continuous Tone Coded Squelch System**
  - PL = Private Line
  - QC = Quiet Channel
  - CG = Channel Guard
- **DCS = Digital Coded Squelch**
  - DPL = Digital Private Line
  - DCG = Digital Channel Guard
- **Transmit Tone**
  - Yaesu – Tone
  - Kenwood – Tone
  - ICOM – Tone
  - Baofeng – T-CTS (Menu 13)
- **Receive Tone**
  - Yaesu - TSQL
  - Kenwood – CT or CTCSS
  - ICOM - TSQL
  - Baofeng – R-CTS (Menu 11)

# CHIRP

- Free download (<http://chirp.danplanet.com/projects/chirp/wiki/Home>)
- Supports most radios
- Runs under Windows, MacOS and Linux
- Software only, programming cable must be purchased separately

CHIRP

File Edit View Radio Help

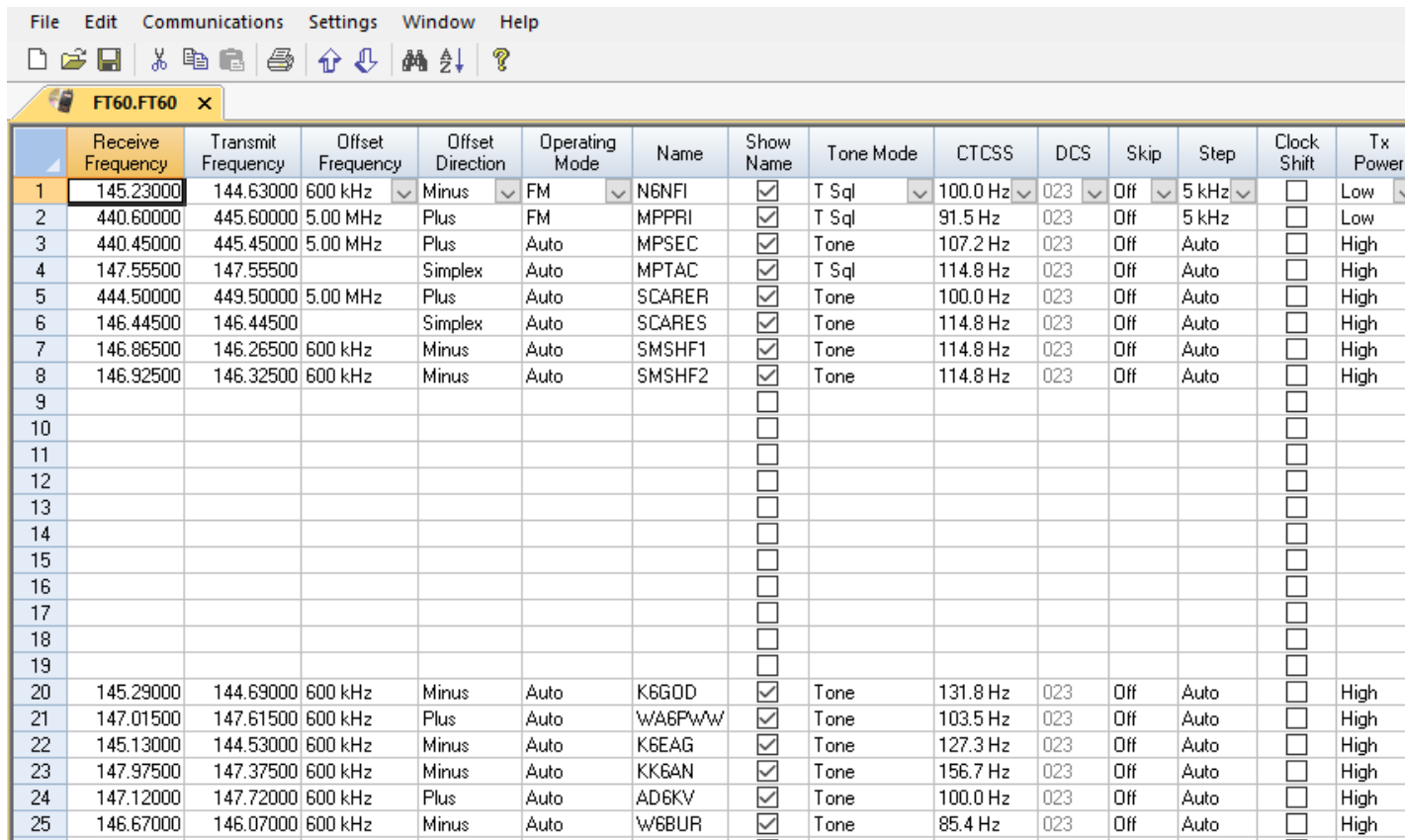
Baofeng BF-F8HP: BF-F8HP.img

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

Settings	Loc	Frequency	Name	Tone Mode	Tone	ToneSql	DTCS Code	DTCS Rx Code	DTCS Pol	Cross Mode	Duplex	Offset	Mode	Power	Skip
	0	0.000000		(None)							(None)		FM		
	1	145.230000	N6NFI	Tone	100.0						-	0.600000	FM	High	
	2	147.555000	MPCERT	Tone	114.8						(None)		FM	High	
	3	440.450000	MPCERT	Tone	107.2						+	5.000000	FM	High	
	4	444.500000	SCARES	Tone	100.0						+	5.000000	FM	High	
	5	146.445000	SCARES	Tone	114.8						(None)		FM	High	
	6	146.865000	SMSHRF	Tone	114.8						-	0.600000	FM	High	
	7	146.925000	SMSHRF	Tone	114.8						-	0.600000	FM	High	
	8	145.290000	K6GOD	Tone	131.8						-	0.600000	FM	High	
	9	147.015000	WA6PWW	Tone	103.5						+	0.600000	FM	High	
	10	145.130000	K6EAG	Tone	127.3						-	0.600000	FM	High	
	11	147.975000	KK6AN	Tone	156.7						-	0.600000	FM	High	
	12	147.120000	AD6KV	Tone	100.0						+	0.600000	FM	High	
	13	146.670000	W6BUR	Tone	85.4						-	0.600000	FM	High	
	14	146.880000	WB6NDJ	Tone	77.0						-	0.600000	FM	High	

# RT SYSTEMS

- Commercial software, available to Ham Radio Outlet (<https://www.rtsystemsinc.com/>)
- Supports most radios
- Windows only (surveying users about MacOS support)
- Available as software only or with programming cable



The screenshot shows the RT Systems software interface. The menu bar includes File, Edit, Communications, Settings, Window, and Help. The toolbar contains icons for file operations and settings. The main window displays a list of radio frequencies and settings for the FT60. The table below represents the data shown in the screenshot.

	Receive Frequency	Transmit Frequency	Offset Frequency	Offset Direction	Operating Mode	Name	Show Name	Tone Mode	CTCSS	DCS	Skip	Step	Clock Shift	Tx Power
1	145.23000	144.63000	600 kHz	Minus	FM	N6NFI	<input checked="" type="checkbox"/>	T Sqr	100.0 Hz	023	Off	5 kHz	<input type="checkbox"/>	Low
2	440.60000	445.60000	5.00 MHz	Plus	FM	MPPRI	<input checked="" type="checkbox"/>	T Sqr	91.5 Hz	023	Off	5 kHz	<input type="checkbox"/>	Low
3	440.45000	445.45000	5.00 MHz	Plus	Auto	MPSEC	<input checked="" type="checkbox"/>	Tone	107.2 Hz	023	Off	Auto	<input type="checkbox"/>	High
4	147.55500	147.55500		Simplex	Auto	MPTAC	<input checked="" type="checkbox"/>	T Sqr	114.8 Hz	023	Off	Auto	<input type="checkbox"/>	High
5	444.50000	449.50000	5.00 MHz	Plus	Auto	SCARER	<input checked="" type="checkbox"/>	Tone	100.0 Hz	023	Off	Auto	<input type="checkbox"/>	High
6	146.44500	146.44500		Simplex	Auto	SCARES	<input checked="" type="checkbox"/>	Tone	114.8 Hz	023	Off	Auto	<input type="checkbox"/>	High
7	146.86500	146.26500	600 kHz	Minus	Auto	SMSHF1	<input checked="" type="checkbox"/>	Tone	114.8 Hz	023	Off	Auto	<input type="checkbox"/>	High
8	146.92500	146.32500	600 kHz	Minus	Auto	SMSHF2	<input checked="" type="checkbox"/>	Tone	114.8 Hz	023	Off	Auto	<input type="checkbox"/>	High
9							<input type="checkbox"/>						<input type="checkbox"/>	
10							<input type="checkbox"/>						<input type="checkbox"/>	
11							<input type="checkbox"/>						<input type="checkbox"/>	
12							<input type="checkbox"/>						<input type="checkbox"/>	
13							<input type="checkbox"/>						<input type="checkbox"/>	
14							<input type="checkbox"/>						<input type="checkbox"/>	
15							<input type="checkbox"/>						<input type="checkbox"/>	
16							<input type="checkbox"/>						<input type="checkbox"/>	
17							<input type="checkbox"/>						<input type="checkbox"/>	
18							<input type="checkbox"/>						<input type="checkbox"/>	
19							<input type="checkbox"/>						<input type="checkbox"/>	
20	145.29000	144.69000	600 kHz	Minus	Auto	K6G0D	<input checked="" type="checkbox"/>	Tone	131.8 Hz	023	Off	Auto	<input type="checkbox"/>	High
21	147.01500	147.61500	600 kHz	Plus	Auto	W46PWW	<input checked="" type="checkbox"/>	Tone	103.5 Hz	023	Off	Auto	<input type="checkbox"/>	High
22	145.13000	144.53000	600 kHz	Minus	Auto	K6EAG	<input checked="" type="checkbox"/>	Tone	127.3 Hz	023	Off	Auto	<input type="checkbox"/>	High
23	147.97500	147.37500	600 kHz	Minus	Auto	KK6AN	<input checked="" type="checkbox"/>	Tone	156.7 Hz	023	Off	Auto	<input type="checkbox"/>	High
24	147.12000	147.72000	600 kHz	Plus	Auto	AD6KV	<input checked="" type="checkbox"/>	Tone	100.0 Hz	023	Off	Auto	<input type="checkbox"/>	High
25	146.67000	146.07000	600 kHz	Minus	Auto	W6BUR	<input checked="" type="checkbox"/>	Tone	85.4 Hz	023	Off	Auto	<input type="checkbox"/>	High
26	146.60000	146.00000	600 kHz	Minus	Auto	W6BUR	<input checked="" type="checkbox"/>	Tone	85.4 Hz	023	Off	Auto	<input type="checkbox"/>	High

# MANUAL PROGRAMMING

- Different for each type of radio
- Need to be in VFO mode
- If your radio has an A and a B side, switch to A
- **Automatic Repeater Offset**
  - Yaesu - Automatic Repeater Shift (ARS)
  - Kenwood - Automatic Repeater Offset
  - ICOM - Auto Repeater Function
  - Baofeng - No automatic setting

Repeater Output Frequency	Standard Input Frequency Offset
145.1 MHz - 145.5 MHz	-600 kHz
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147.0 MHz - 147.4 MHz	+600 kHz
147.6 MHz - 148.0 MHz	-600 kHz
222.0 MHz - 225.0 MHz	-1.6 MHz
440.0 MHz - 450.0 MHz	+5 MHz

# MANUAL PROGRAMMING

- **Set the Tone Frequency**
- **Enable/Disable Transmit Tone as needed**
- **Enable/Disable Receive Tone as needed**
- **Save in a memory channel**

# HELP, THE REPEATER'S DOWN

**“If repeater is down, use output frequency in simplex mode” –  
SCARES Handbook, Rev: April 2012, Page 6**

- 1. Switch to VFO mode**
- 2. Switch to the “A” side**
- 3. Enter 444.500**
  - Note: On Kenwood's hit the [ENT] button to enter from keypad
- 4. Set the offset to Off, None, Simplex or whatever your radio uses**
- 5. Set the Tone Frequency**
- 6. Enable Transmit Tone**
- 7. Disable Receive Tone**



# HELP, THE REPEATER'S DOWN

## 1. Set the offset to none, off or simplex

- **Baofeng** : [MENU], [2] [5] (SFT-D), [MENU], ▲ ▼ to select OFF, [MENU], [EXIT]
- **Wouxon** : [MENU], [2] [4] (SFT-D), [MENU], ▲ ▼ to select OFF, [MENU], [EXIT]
- **Yaesu FT-60** : [FW], [0], rotate dial to “38: RPT.MOD”, [FW], rotate dial to “RPT.OFF”, PTT to save
- **Yaesu VX-7** : [MONF], 0, rotate dial to “Basic Setup : 7 RPT SHIFT”, [MAIN][SUB] to select “SIMP”, PTT to save
- **Yaesu FT-1dr** : Hold [DISP] for 1 sec, rotate dial to “7 CONFIG”, [DISP], rotate dial to “15 RPT SHIFT”, [DISP], rotate dial to SIMPLEX, [DISP] for 1 sec , [DISP] for 1 sec
- **Yaesu FT-2dr** : Hold [DISP] for 1 sec, rotate the dial, then touch “CONFIG”, rotate dial and touch “15 RPT SHIFT”, rotate dial to select SIMPLEX, [BACK], [BACK], [BACK]
- **Kenwood TH-F6** : [F], [REV] until neither + nor – appear
- **Kenwood TH-D72** : [F], [MHz] until neither + nor – appear
- **Kenwood TH-D74** : [F], [REV] until neither + nor – appear

# HELP, THE REPEATER'S DOWN

## 1. Set Tone to 100.0

- **Baofeng** : [MENU], [1] [3] (T-CTCS), [MENU], ▲ ▼ to select 100.0, [MENU], [EXIT]
- **Wouxon** : [MENU], [1] [6] (T-CTCS), [MENU], ▲ ▼ to select 100.0, [MENU], [EXIT]
- **Yaesu FT-60** : [FW], [2], rotate dial to 100.0, [FW]
- **Yaesu VX-7** : [MONF], 8, rotate dial to TONE SET, [BAND], then [MAIN][SUB] to select 100.0
- **Yaesu FT-1dr** : Hold [DISP] for 1 sec, rotate dial to 4 “SIGNALING”, [DISP], rotate dial to “12 TONE SQL FREQ”, [DISP], rotate dial to 100.0, [DISP]
- **Yaesu FT-2dr** : Hold [DISP] for 1 sec, then touch “SIGNALING”, rotate dial and touch “12 TONE SQL FREQ”, rotate dial to 100.0, [BACK] [BACK] [BACK]
- **Kenwood TH-F6** : [F], [TONE], rotate dial to select 100.0, [OK]
- **Kenwood TH-D72** : [F], [TONE], rotate dial to select 100.0 , [OK]
- **Kenwood TH-D74** : [F], [TONE], rotate dial to select 100.0 , [ENT]

# HELP, THE REPEATER'S DOWN

## 1. Set transmit tone on

## 2. Set receive tone off

- **Baofeng** : [MENU], [1] [1] (R-CTCS), [MENU], ▲ ▼ to select OFF, [MENU], [EXIT]
- **Wouxon** : [MENU], [1] [5] (R-CTCS), [MENU], ▲ ▼ to select OFF, [MENU], [EXIT]
- **Yaesu FT-60** : [FW], [1], rotate dial to TONE, PTT to save
- **Yaesu VX-7** : [MONF], 8, SQL TYPE, [MAIN][SUB] to select TONE, [BAND], PTT
- **Yaesu FT-1dr** : Hold [DISP] for 1 sec, rotate dial to 4 “SIGNALING”, [DISP], rotate dial to “11 SQL TYPE”, [DISP], rotate dial to TN, [DISP] for 1 sec , [DISP] for 1 sec
- **Yaesu FT-2dr** : Hold [DISP] for 1 sec, then touch “SIGNALING”, rotate dial and touch “11 SQL TYPE”, rotate dial to select TN, [BACK]
- **Kenwood TH-F6** : [TONE] until “T” appears
- **Kenwood TH-D72** : [TONE] until “T” appears
- **Kenwood TH-D74** : [TONE] until “T” appears

# EXERCISE

- **SCARES 440 Simplex**
  - 444.500 MHz Simplex
  - 100.0 Hz Tone
  - Test with the simplex repeater
  - Save in memory
- **Burlingame Repeater (KC6ULT)**
  - 146.8050 MHz
  - Minus 600 Hz offset
  - 192.8 Hz Tone
  - Save in memory

# EXERCISE

## Extra Credit

- **SMC Office of Emergency Services 2m Simplex**
  - 146.865 MHz Simplex
  - 114.8 Hz Tone
  - Save in memory

Optional (being phased out?)

- 146.925 MHz Simplex
- 114.8 Hz Tone
- Save in memory

# EXERCISE

- **SCARES 440 Simplex**
  - 444.500 MHz Simplex
  - 100.0 Hz Tone
  - Test with the simplex repeater
  - Save in memory
- **Burlingame Repeater (KC6ULT)**
  - 146.8050 MHz
  - Minus 600 Hz offset
  - 192.8 Hz Tone
  - Save in memory
- **SMC Office of Emergency Services 2m Simplex**
  - 146.865 MHz Simplex
  - 114.8 Hz Tone
  - Save in memory

Optional (being phased out?)

  - 146.925 MHz Simplex
  - 114.8 Hz Tone
  - Save in memory