

CHINESE DUAL-BAND HT TRANSCEIVER EVALUATION

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UV-3R 2 Watt



UV-5R+ 5 Watt

Recently at the Boulder Friday ham breakfast, Gary, W0QN, showed up with a new, dual-band, transceiver from China which he had just purchased for a ridiculously low price of less than \$40. Gary's radio was the Baofeng UV-3R. It was a 2 Watt, 2m/70cm radio. It had no key pad, and was intended for use strictly on pre-programmed memory channels. It is programmed from a PC via a USB cable. Gary also said there was another version, model UV-5R, which had a key pad and 5 W output for only \$10 more.

I was impressed enough to go home and research the internet and buy myself one of these radios. I found that the UV-5R was in fact typically going for about \$50 on Amazon.com. However, the most recent, improved version is the UV-5R+Plus, which I ordered for \$59. The radio comes with the following standard accessories: Li-Ion battery (7.4V, 1.8 Amp-hr), battery charger, 5" antenna, belt clip and an ear bud / microphone with PTT button, plus a manual (marginal !). I also purchased an additional battery (\$16), Programming USB cable and software (\$12) and a higher gain, 15" antenna (\$11). Total came to \$98 with free shipping. Such a deal !

KEY TECHNICAL SPECS Frequency Coverage VHF 136 to 174 MHz and UHF 400 to 480 MHz, RF Power = 5 Watt or 1 Watt, Spurious Emissions < -60 dBc, FM Modulation, Deviation = 5 kHz or 2.5 kHz (wide band or narrow band), Receiver Sensitivity = 0.2 μ V, Modes = VFO or Memory, 128 Memories, Programming PC via USB

BENCH TESTS I have performed bench tests on the UV-5R+ using professional test equipment, including an HP RF power meter, HP spectrum analyzer and Fluke signal generator. I found the UV-5R+ to in general meet most specs. It operates both receive and transmit over the entire frequency ranges as specified. The max. output power was 5 Watts (+37dBm) on both bands. It varied less than -0.6 dB and +0.2 dB from 5 Watts. On the low power setting, I measured +32.2 dBm on 2 meters and +31.1 dBm on 70 cm, thus a bit higher than the specified 1 Watt (+30 dBm).

The UV-5R+ did not meet the < -60dBc spec. for spurious and harmonic emissions. My measurements were not over the air measurements, but done with a direct coax connection from the antenna connector to a 50 Ω , 30dB, high-power attenuator and then directly into my HP spectrum analyzer. On VHF, the third harmonic was -45 dBc, with all other emissions being < -60 dBc. On UHF, the second harmonic was -56 dBc and the third harmonic was -38 dBc. Using an antenna on the HT and also an antenna on the spectrum analyzer, I also noted undesirable spurious emissions occurred on VHF upon key-up. Several spurs, as strong as -30 dBc, extending \pm 30 MHz from the carrier would appear upon hitting the PTT button and then would die out within a couple of seconds. These only occurred when transmitting into the supplied, 5" antenna. They did not occur when using the longer 15" whip antenna, nor when the transmitter was connected to a 50 Ω dummy load. They also did not occur when operating on the UHF band.

The receiver sensitivity is specified as < 0.2 μ V for 12 dB SINAD. With my calibrated Fluke signal generator connected directly to the HT's antenna connector, I found at the recommended squelch setting (3), that the squelch would open at -128 dBm (0.09 μ V) on both VHF and UHF. At 0.2 μ V, very clear audio resulted.

ANTENNAS The antenna connector on the UV-5R+ is an SMA male. Thus, the antenna has a mating SMA jack (female). This is the opposite of most ham HTs. Thus, take caution when purchasing extra antennas. Both Comet and Diamond do make longer (15") gain, whip antennas with the correct connector. They sell in the \$20-\$30 range. The antenna I purchased from Amazon.com for \$11 was a Nagoya model NA-771. It is specified to have 2.1 dBi gain on 2 meters and 3 dBi on 70 cm. The supplied, 5" antenna is specified to have 1 dBi gain.

MANUAL The English/German/French instruction manual leaves a lot to be desired, because it is intended for the FCC part 90 users and not hams. This radio has a tremendous number of features which are not adequately described in the manual. Plus the manual gives zero information on how to program the radio. It is easy to enter from the keypad a temporary frequency using the VFO mode. However, it is quite difficult to program a memory from the keypad. The best way to use this radio is to pre-program all your desired frequencies into it using your computer and an accessory USB cable. The programming software which I purchased had no instruction manual, nor "Help" menu. As a result, my learning curve on bringing this radio on line and being able to program it from my computer took me about five hours. To make things easier for you, I am attaching an Appendix giving you all the gory details on how to program this HT.

CONCLUSION The Baofeng UV-5R+ is a great buy for the money. As with every other ham radio I have purchased in the past, there are always a few "got-chas". This one is no different. My main complaint is relative to its scanning feature. It is not possible to select or lock-out a particular channel from the keypad. The selection of which channels are scanned is only done via the PC programming with the USB cable.

FCC PART 90 CONCERNS The UV-5R+ is type accepted for FCC part 90, Land Mobile Radio service. **CAUTION -- This radio is capable of transmitting**

in the Public Safety frequency bands. Amateurs are reminded that it is illegal for you to transmit in these land mobile frequency bands. Thus, when in the VFO mode, you should never enter any frequency outside of our own 2 meter (144-148 MHz) or 70 cm (420-450 MHz) bands. If you want to use the UV-5R+ to monitor other frequencies, this is legal. However, these frequencies must be entered into the radio as a stored memory channel, in which the transmitter is disabled. I foresee future RFI problems for our police and fire agencies if a lot of these radios are put into service by the general public. With their extremely low price and Amazon.com availability, we hams will also potentially be faced with RFI problems from unlicensed users.



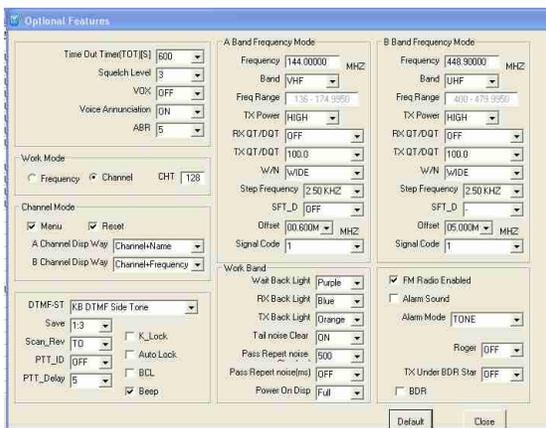
APPENDIX I ---- PROGRAMMING To be really functional, this radio should have all the frequencies you expect to use, pre-programmed into its memories. A special USB cable is required. It plugs into the side of the radio, into both the speaker and mike jacks. Be sure to push it in firmly, beyond the point where you think it should stop. If not seated properly, the computer can't talk to the radio. The software can be downloaded from the internet. In my case I purchased the package of USB cable and software (\$12). The software came on a mini, 3" CD. This caused a problem as my Apple MacBook Pro laptop computer will not accept mini discs. Thus I needed to blow the dust off of my ancient Dell Windows computer to read the CD and transfer the software to a USB thumb drive, memory stick. I have my Apple configured to also run simultaneously Windows XP programs. Thus, my following comments are really about using a Windows computer to program the UV-5R+, not an Apple.

The first step is to install the UV-5R+ software, including the driver for the Prolific USP-to-Serial cable. Next connect the USB cable to the computer. Windows should now recognize it as "New Hardware Found". I then found it necessary to configure the serial port settings. To do this click on Control Panel --> System --> Hardware --> Device

Manager --> Ports (COM & LPT) --> to finally "Prolific USB-to-Serial Comm Port". In my case, it found the USB cable at COM4. I then opened up the Prolific USB cable menu and made the following port settings: 9600 bits/sec, 8 data bits, Parity = none, Stop Bits = 1, flow control = none. Next click on "Advanced" and select FIFO buffers and set both Transmit and Receive Buffers to LOW(1).

At this point, the program BF5R (BF5R_CPS.exe) should be in your list of available Windows programs. Click on it to run. It will come up labeled as "UV-5R Series Program Software". A weird little box will appear with a yellow warning triangle and a bunch of ????. Just click on OK to make it disappear. The program will now run and give you a blank memory table. For starters, you can simply click on "Default" and the program will load a few frequencies which the factory used for testing the radio. This will give you an example of how the memory data table is organized. Now "Clear" this table

The next step is to determine if you can establish communications with your radio. Turn on the radio. Plug the USB cable into the radio speaker/mike jacks firmly. On the UV-5R program task bar, click on "Communication" and set the Comm Port to the correct port. Next click on the task bar "Program" and then click on "Read from Radio". If you have a successful USB connection to your radio, you should now have a memory table with whatever has been previously programmed into the radio. I suggest you save this for future reference. Now go back to the task bar and click on "Edit", then on the sub-menu, select "Optional Features". This shows you all of the other settings for the radio. I suggest you do a screen save of this also for future reference.



At this point, you are now ready to start programming your radio. First make all the necessary choices on the Optional Features and then click on "Close".

Channel Information												
Channel	Band	RX Frequency	TX Frequency	CTCSS/DCS Dec	CTCSS/DCS Enc	TX Power	W/N	PTT-ID	BusyLock	Scan_Add	SigCode	CH-Name
0												
1	HF/UH	146.70000	146.10000	OFF	100.0	HIGH	W	OFF	OFF	ON	1	BARC
2	HF/UH	448.90000	443.90000	OFF	100.0	HIGH	W	OFF	OFF	ON	1	BARC70
3	HF/UH	146.76000	146.10000	100.0	100.0	HIGH	W	OFF	OFF	ON	1	BCARES
4	HF/UH	146.52000	146.52000	OFF	OFF	HIGH	W	OFF	OFF	ON	1	2MCALL
5												
6	HF/UH	155.14500		OFF	OFF	LOW	N	OFF	OFF	ON	1	GREEN
7												
8	HF/UH	162.55000		OFF	OFF	LOW	W	OFF	OFF	OFF	1	NWSDEN
9												
10	HF/UH	148.00000		OFF	OFF	LOW	W	OFF	OFF	OFF	1	OFF
11												

Now you may start entering your desired frequencies into the Channel table. See the above example. The first four channel entries are for three local repeaters and the national 2m simplex calling frequency. Memory channel 6 is the local Sheriff/Fire dispatch channel. Memory channel 8 is the National Weather Service in Denver. Every column must have an entry, except for TX Frequency. Leave TX frequency blank to disable the transmitter on that particular channel. The CTCSS Decode & Encode columns are for entering sub-audible PL tone frequencies. Note that the BCARES 146.76 repeater requires a 100 Hz PL tone and it also transmits a 100 Hz PL tone. Thus tone squelch can be used on the 76 repeater. You can also enter Digital Coded Squelch addresses (DCS). Select W or N for wide band (5kHz) or narrow band (2.5kHz). Hams use W. Public Safety uses N. Set PTT-ID and BusyLock to OFF. If when the UV-5R+ is in the scan mode, and you want to scan a particular memory, you must set the Scan_Add to ON. This can not be done later on the keypad. Note, I set the NWS to OFF, because they are transmitting continuously weather bulletins. Set SIGCODE = 1. In the last column CH-Name, you can give an easily remembered name to your channel, such as BARC for BARC's 2 meter repeater. On the UV-5R+, you can elect to either have the frequency (146.700) displayed or the channel name BARC. The max. number of characters allowed for a name is six.