The Angrynine – a voyage of discovery – Part 1.

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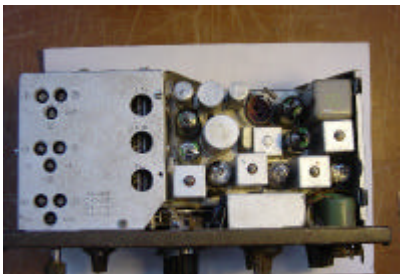
I acquired my GRC-9 about 9 months ago along with the Hallicrafters SX-16 mentioned in my article in Radio Bygones Issue 83 (June / July 03). I had heard about this radio from a number of sources but knew very little about it until now. As the details show this is a very versatile radio and has a good reputation in military radio circles especially in the US. It does appear to have had a long history from immediately post war replacing the BC1306 (3.8 to 6.6 Mc/s but uses exactly the same supplies), through to Korea, Vietnam, Congo (Belgian Army) and apparently the Contra rebels in Nicaragua! It is an excellent set as an entry - level introduction to our part of Amateur Radio and is very affordable, almost brand new ones are around £250 but good, tested used ones are in the region of £100 - £150 from a couple of good suppliers – see web addresses at the end). Mine is a little tatty but I don't mind that as it shows it has been used.

Technically the set is a traditional design using directly heated valves (1.4, 3, 6.3VDC). The PA valve is a 2E22 with approximately 500V on the anode and 6.3VDC @ 2.0A LT. Although it operates as a transceiver with full QSK it is in fact a receiver (RT-77) and transmitter and could be used / worked on separately. There is a variant that uses a transistor PSU / inverter for powering the receiver as a separate unit.



Receiver top view

Initially my set didn't work but was pretty much complete. Aided by some Jimi Hendrix playing in the background (well, it is a Vietnam era set!) I removed the units from their case and after a few false starts removed the connecting cable from the TX to the RX. This is quite simple if you know how. There are NO screws to remove and all it takes is a little gentle leverage with a screw driver and then pulling on the lugs. Do not yank (no pun intended) on the cable, as you WILL pull out one or more wires.

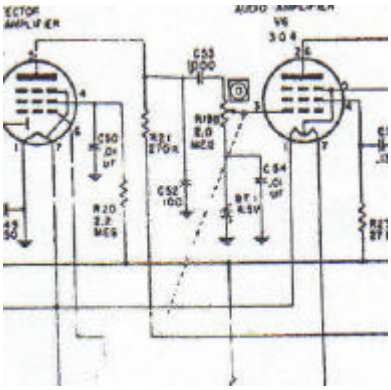
With the Receiver on the bench, the right way up, the valves can be accessed after removing the clipped in plate and valve shields - though a word of caution is needed. In the Spares Kit (Part number BX-53) there is a valve removing tool (type Metox no. 16183) and it, or something similar, is needed as the valves are very close to the screened cans and unless you have very thin fingers it is almost impossible to get them out. The valve tool is like a large spring or coil with a looped handle (see picture) and the theory is that you push this onto the valve and the action of pulling upwards forces the coil to tighten on the bulb. It sounds dangerous but it does work. Once the valve is out the fun starts as the coil is tight on the valve and the more you pull the tighter it gets. The technique seems to be to gently push the coil from underneath and ease it off that way but it takes practice. I had loads of practice as my example had been 'got at' by the 'Phantom Valve Swapper of Old London Town' and they were all in the wrong position or wrong type!! When replacing the valves I found it better to use my fingers rather than the tool as once the valve is in it is the devil's own job to pull the tool out without removing the valve again!! Also be very aware that the lettering on the valves comes off with the slightest touch so I would advise using a permanent marker pen with a fine point and write on what they are.

As you can see the boiler plate was missing, which is a shame (my thanks to Roy at MilRadio for supplying spares) but it clearly shows the date stamp of 7th September 1960 and is manufactured in France by TRT, Paris.

With my example, once I had put the valves in the right position, the set burst into life. The 3Q4 delivers quite a punch for a battery valve, certainly enough to drive a high impedance speaker to levels that allowed the set to be heard when used outside at Blandford!! Actually, the audio quality is quite good and listening to AM Broadcast stations was pleasant enough. BFO injection is at a high level and allows CW/ SSB to be resolved although there is no variable control and by backing off the RF gain control the quality improved dramatically. The tuning rate is too high for modern band conditions, especially on 40M, and it would be possible to fit an external slow motion drive but the risk would be that the set's appearance would be spoiled and that is something that should, in my opinion, be avoided. However, it may be possible to do a temporary modification without touching the case and I am working on that.

Metox tube puller

GRC-9 mounted in a jeep (French Army?)



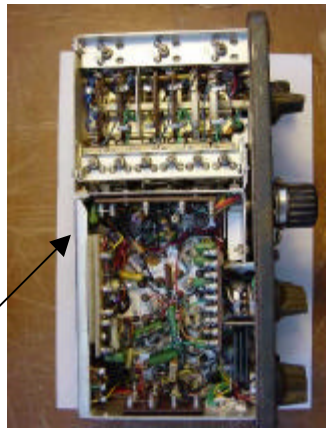
As you can see from the circuit there is a GB battery providing –4.5V to the grid of the Audio Amplifier and the one in the set was manufactured in Crawley, Surrey in 1964. It goes without saying that it was dead but in practice it didn't prevent the set from working. I would be interested to know what function this provides. In the end I removed the case to reveal a number of 'hearing aid' sized cells and these were discarded. I then left the battery open circuit and short circuit as an experiment but there seemed to be no detectable impact? The battery pushes into a socket and is held in place by a screw clip. The battery will come apart quite easily by cutting the case around the bottom join and gently pulling apart. Once apart you can then either insert enough 'hearing aid' batteries to make up the 4.5V or AAA cells (though they are difficult to fit) or something similar but as I said earlier it doesn't seem to make any difference. The case can be reassembled and sealed using plastic model glue.

[*Without the bias battery, the valve would draw an increased amount of anode current, both to its detriment and that of the HT battery, if running on batteries. I'd also expect some audio distortion to be evident – Ed.]*

Power Supplies

The set is designed for battery use on receive and as a consequence it is looking for a well smoothed LT and HT (though arguably the LT is more important as the valves are directly heated) and if using a mains unit it is worth spending time on getting the ripple down to miniscule levels. I found that using a variable circuit with a LM317T (1A) was quite acceptable either at the 1.2V reference level (i.e. Vadj. tied to ground) or adjusting up to 1.4V as per the specification worked well care should be taken to make sure that the output voltage is clamped to avoid more than 2V being presented as this could blow the valves. There is a VR105 voltage stabiliser in the transmitter section so if testing the receiver as a stand-alone unit you will need to provide additional stabilisation. It is possible to use the DY-88 dynamotor unit of course but this is bulky. If you want to test just the receiver the following socket information should be useful. Note that the pins are numbered on the inside of the receiver so to make sure you will have to take the base plate off. Remember the set will not work without a speaker or phones inserted in to the socket – you could just put a plug in if you didn't want audio.

Receiver pin connections	
1	Sidetone from Tx
2	Net +105V
3	Receiver +105V
4	+105V
5	Ground
6	Receiver 1.4 V
7	Mod Tube control
8	Receiver aerial
9	Receiver aerial



Receiver Socket. (*note, the pins are numbered inside the receiver*)

AN/GRC-9 HF AM/CW/MCW Transmitter-Receiver Specification

Source: TM 11-263/TO 31R2-2GRC9-1/June 1956 (thanks to WB6FZH web page)

Transmitter

Frequency Range:
- Band 1 --- 6.6 to 12.0 Mc/s
- Band 2 --- 3.6 to 6.6 Mc/s
- Band 3 --- 2.0 to 3.6 Mc/s

Transmitter Type: Crystal or Master-Oscillator power amplifier.
Crystal Channels: Two per band
Types of Signals Transmitted
- CW, MCW, and Phone (AM)

Distance range
- CW (Continuous Wave- Keying carrier)
  - Ground Operation: 30 miles
  - Vehicular Operation: 20 miles
- MCW (AM modulated CW- Keying tone)
  - Ground Operation: 20 miles
  - Vehicular Operation: 10 miles
- Voice (AM modulated- Microphone)
  - Ground Operation: 10 miles
  - Vehicular Operation: 10 miles
- Antennas
  - Ground Operation: Whip or Long-Wire
  - Vehicular Operation: Whip
- Type of Modulation: Amplitude
- Number of Valves: 5
- Weight: 29 lbs
- Power Output- PE-237/DY-88/DY-105/PP-327 power supplies {GN-58 PS}
  - In "HI" position
    - Phone/MCW: 7 Watts {3.6 Watts}
    - CW: 15 Watts {10 Watts}
  - In "LO" position
    - Phone/MCW: 1 Watt {1.2 Watts}
    - CW: 5 Watts {5 Watts}
  - Power Requirements: Early/Late Model
    - Transmitter Plate Voltage- 475 @ 90 mA/580 @ 100 mA
    - Transmitter Filaments- 6.5 @ 2 amperes
    - Keying Relay- 6.o @ .5/6.9 @ .575 ampere

Receiver

Frequency Range
- Band 1 --- 6.6 to 12.0 Mc/s
- Band 2 --- 3.6 to 6.6 Mc/s
- Band 3 --- 2.0 to 3.6 Mc/s
  - Receiver Type: Superheterodyne
  - Types of Signals Received: CW, MCW, and AM Phone
  - Number of Valves: 7
  - Weight: 8 lbs
  - Intermediate Frequency: 456 Kc/s
  - Method of Calibration: Built-In crystal oscillator
  - Calibration points: 200 kc intervals
  - Power Required
    - A- Power 1.4 volts at 450mA (Heater Voltage)
    - B- Power 105 volts at 20mA (Stdby: 17mA) (Rx HT)

Antenna: Same as AN/GRC-9 Transmitter

To test the basic functions of the receiver you need to apply 105VDC to pins 3 + 4 and 1.4VDC to pin 6. The aerial goes to pins 8 and / or 9 and ground / 0V on pin 5. Note that Pin 5 is offset.

Although I had tested the unit on the bench into a dummy load and with 500V on the anode the set would give around 18 – 20W RF into a dummy load or on the main aerial I hadn't had any QSO's from my home QTH. The target was to get the set working in time for the Royal Signals Association event in Blandford. I had built a mains PSU as had Simon 'GFN but for whatever reason neither of these liked the Inverter unit that we needed to use as /P operation would be needed.

Accordingly I fired up the DY88 dynamotor unit and it all seemed to work but is noisy when the dynamotor kicks in – plus the initial drain on the 12V battery is enormous.

However, on receive it uses a couple of Vibrator packs so at least we would be able to demonstrate the set. Thank goodness I stopped using it on transmit just before the Land Rover battery completely died.

At Blandford we had rigged up a Doublet aerial (30' twin feeder down lead and 55' in each leg) to a mast on the Land Rover. As you can imagine the Royal Signals camp is awash with RF of varying types so operation on 80M was out of the question during the day. I tuned the set to 40M however and it was very lively. Using the original key (J37) I sent a couple of CQ's and the first station that came back was a DL4, he gave me 559 , along came a F6 and another DL in fairly rapid succession and that was with 15W. The receiver audio bandwidth is too wide for general use on a band like 40M and if serious operation was envisaged you would need a CW filter of some sort (external, unless you want to modify the set internally). The CW note is chirpy and that needs to be looked at and there may be modifications needed if it is to be used seriously.

There are far to many accessories and variants to mention here but I recommend that you look at Mark Roubos web site (see below) where a comprehensive catalogue of variants and special sets are located.

Since beginning to write this article I have acquired a second set and that had a nasty little fault in that the 500V HT line measured 120Ω to ground! The fault lay in a decoupling 0.01μF capacitor but more on that in Part 2…

Useful web sites / addresses

www.milradio.com - stocks of GRC-9 and spares

www.Armyradio.com - stocks of GRC-9 and spares

http://members.aol.com/tcsopr/index.htm - Pictures of GRC-9 and other good vintage stuff

www.angrynine.nl - Mark Roubos page with lots of special sets and information

www.fairradio.com - USA stock of parts and manuals