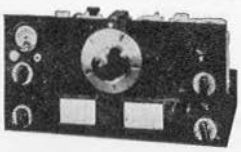
The COMMUNICATION RECEIVER

Editor: Bill Fizette, K3ZJW
R.D. 1, Box 55, Henryville, Pennsylvania 18332
All correspondence requires SASE for reply



THE WORLD WAR II BC-312 FAMILY OF SIGNAL CORPS RECEIVERS

Another of the group of military communications receivers developed during the 1930's and used as a work horse by the U.S. Army during World War II and the Korean War was the BC-312 and its variants, the BC-342 and the BC-314. While there were circuit similarities to the Army Air Corps BC-348 and they were designed at about the same time, they were entirely different receivers. The 312 was originated by the U.S. Army Signal Corps Laboratories at Fort Monmouth, NJ for Army use to replace the earlier BC-189 superhet receiver, a cumbersome design with 12 plug-in coil drawers.

There were several versions of this receiver, and a series of models of each version, all of similar appearance. "Roby" Robinson, W3LW, who told us the story of the BC-348, continues with the BC-314.

RADIO RECEIVERS BC-312/314/342

by Harris A. Robinson, W3LW

The Signal Corps Laboratory at Fort Monmouth, New Jersey, observed the 1934 Washington Conference (*OTB*, August 1986, p. 15), the resulting technical specification on HF receivers, and the performance testing of the original BC-224A prototype. SCL then proceeded with their own design of a 1.5 to 18 mc six-band receiver sufficiently rugged for usage in armoured vehicles, tanks, communication vans, etc.

Their design included four 6-band coil assemblies. The oscillator was temperature stabilized with thermostatically controlled heaters.

The SCL drawings were put out for bid and GE received the first production contract for 150 of the BC-312A receivers. Because of problems which arose, before a second production RCA proposed a modified design to facilitate manufacturing in the light of the experience with the BC-224B. These modifications included access covers on the coil modules, deletion of the thermostats and oscillator temperature controls, and RF inductance adjustment loops, among others. RCA proceeded with production which was designated with BC-312B and subsequent suffix letters.

The revised SCL-RCA production drawings were made available for manufacture by other qualified companies – Farnsworth, Crosley, etc. These receivers were all powered by 12/14 VDC vehicle supplies. For some applications with 115 VAC sources, the dynamotor was replaced by a 115 VAC transformer-rectifier power unit and these production receivers were designated the BC-342.

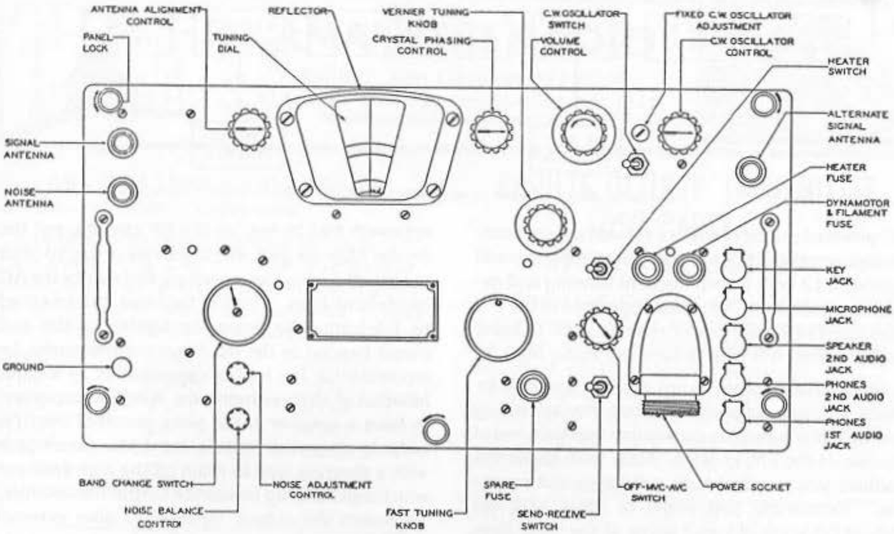
A dynamotor powered 12/14 VDC lower frequency version – 150 to 1500 kc – went into a somewhat limited production. Case size and general design followed those of the HF receivers; these LF units were designated the BC-314.

ADDITIONAL INFORMATION ON THE BC-312 RECEIVERS

Sooner or later many of the military receivers ended up in active use by amateurs, especially in the two year period after WWII when commercial short wave receivers were in such short supply. For some reason this receiver never attained the widespread popularity of the BC-348, probably because it was relatively scarce and there were some problems in converting it to amateur use. The BC-312 was in turn more readily available than the AC powered version, the 342.

The family included the following:

BC-312: Basic receiver of the series; 1500 kc to 18 mc. If you have an A model, it is rare. According to one manual, no B receivers were in service. The noise balancing system and the oscillator heaters were in only the very early letters; if you have an A, B, or C, it is probably a scarce, early model.



The BC-312 showing panel controls, jacks and power socket.

BC-342: The AC version; again, only the early letters have the heaters and noise systems. No A and B models were in service, so if you find one, it is unusual.

BC-314: Low frequency model, covering 150 to 1500 kc. No A or B models in service.

BC-344: The AC model of the BC-314.

You may run across a model which has no letter designation. They are from the very first production runs, and are scarce.

The receiver was mostly used as part of a complete radio set, one example being in the SCR-245 for use in small to medium size vehicles. It was interconnected with the BC-223 transmitter, a separate junction box, a terminal box, and a control box with a T-17 microphone and a headset. Another microphone and headset and a J-45 key were plugged into the receiver. (Former surplus hounds will recognize many of these familiar designations.) This allowed the radio set to be controlled either from the receiver or the control head. All units were interconnected with a series of cables and a single whip antenna served both receiver and transmitter. The power source was the vehicle storage battery and a PE-55 dynamotor. Another common installation had the 314 paired with the BC-191 transmitter, more commonly known as the Air Corps BC-375.

Mechanically, the 314 is not very large in comparison to the commercial equivalents of the day, but it is heavy. With the shock mount it weighed in at 46 lbs. Construction is of the highest quality, one example being in the tuning dial mechanism. A 45 division logging scale on the main dial could be subdivided into 100 segments per division by the vernier tuning control, resulting in very accurate logging. Both fast and slow tuning controls were provided. The power supply could be readily removed and exchanged.

An interesting feature is the row of jacks along the right side of the panel. Early sets had outputs from both the 1 st and 2nd audio stages, as well as jacks for "*Mic*" and "*Key*". Leads from the latter went to the large plug on the panel for remote control applications. In a similar manner, the Send-Receive switch is in series with an internal antenna-switching relay and pins in the power plug. A 12 VDC power source is needed to make the relay operate.

In the models with the internal heaters, the oscillator compartment was maintained at a constant 110° F. However, this refinement required an additional 25 watts of power. Another nicety of the early sets was the antenna noise balancing network. The two controls were located behind covers under the band switch. Designed to minimize vehicle ignition noise, it was unduly complicated and was omitted after the first models.

Most of the 312s operated on 12-14 VDC at approximately 7 amps, although some models after the G were designed for 24-28 VDC and were designated by the letter "X".

MAKING THE RECEIVERS OPERABLE:

If you have the BC-312, it can be powered with the dynamotor, which will require 10 amps at 12-14 VDC, or 6 amps if the heaters are not present. Observe the precautions with the old dynamotors as detailed in the BC-348 articles. If you have the

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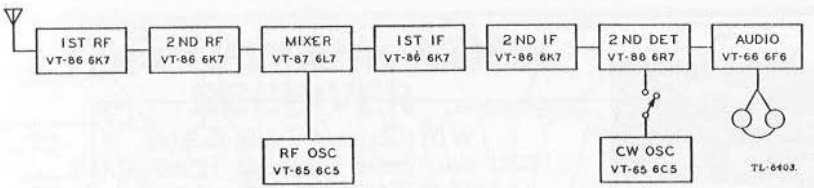
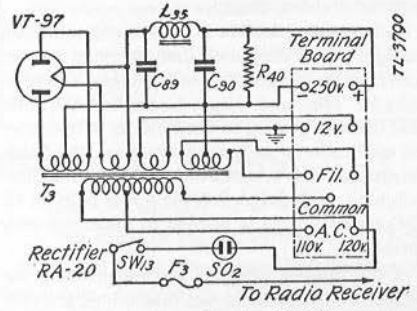


FIGURE 2.—Block diagram of radio receiver BC-312-(*).

AC powered model or wish to convert a dynamotor model, acquire or fabricate a power supply that will provide a 12 volt, 2 amp filament winding and deliver approximately 250 volts under load to the B+ circuits. The RA-20 power supply used 8 uf caps; higher values will help reduce the audio hum.

Unfortunately there is not enough space to include a circuit diagram here, but they are widely available in the surplus conversion manuals and of course, in the TM 11-850. Also, look inside the cabinet; you may find both a diagram and a parts list. Remember that some of these sets are almost 60 years old, and some of the capacitors may be bad. Suspect all high-voltage by-passes, and if you find a bad one, snip the lead and replace with a modern high reliability equivalent under the chassis out of sight. The socket on the front of the set is hot with B+ . . . be careful!



C89 C90—8-microfarad capacitor, type CA-329.
F3 —2 ampere fuse, type FU-27.
I 35 —14-henry choke coil, type C-227.
R40 —65,000-ohm bleeder resistor, type RS-220.
SO2 —A-c power socket.
SW 13 —Line switch, type SW-105.
T3 —Power transformer, type C-228.

Power supply RA-20

To align the set, the manual is helpful. Briefly, the IF in the 312 and the 342 is 470 kc, while that of the low frequency models is 92.5 kc. With the former the oscillator operates 470 kc above the RF on bands A, B, and C, and 470 kc below on the other bands. The BC-314 receiver has the oscillator at 92.5 kc above the RF signal on all bands.

For those readers who want to do more than just get the receiver going or look at it, an excellent overview by George Grammar is in the September 1946 issue of *QST*. Most of the changes are such that the outward appearance is not altered. His approach was to hop up the RF circuits, put the crystal filter on frequency, provide a way to shut the set off during transmission, and reduce the AC headphone hum. The bad backlash can be cured by lubricating all gears, by tightening the end thrust bearing in the oscillator compartment, by repositioning the tuning capacitor, or by a combination of all three methods. It is also important to have a speaker in the plate circuit of the 6F6 output; otherwise replace the open circuit jack with a shorting type to drain off the high voltages which can build up inside the output transformer. To match the output, try a 4000 ohm external transformer.

Besides the above references, information can be found in the *Radio Handbook, 11th Edition*, 1947 and in QST H&K of the period (See also *Hints and Kinks*, Vol. 5, 1954). This is also a good time to reemphasize my point about not making changes in mint units. (The November '86 *QST* contains an ad seeking WWII communications gear in original crates.)

Making these old sets work again can be very enjoyable. Most are still available for reasonable prices, and while the BC-312/342 can hardly be made into a modern communications receiver, it will turn in a very credible performance.

– *K3ZJW*

The Ralph Batcher Memorial Award

The Radio Club of America (New York City) presents an annual award to a member who has done outstanding service in preserving or documenting historical radio. To date, 9 of the 11 Awards have been given to AWA members. Ralph Batcher was also an AWA member and was recognized as a leading radio historian.

* Morgan E. McMahon	1976
John F. Rider	1977
* Bruce L. Kelley	1978
* Robert W. Merriam	1979
* Edward G. Raser	1980
* Ernest A. DeCoste	1981
* Louise Ramsey Moreau	1982
* Joseph R. Pavek	1983
* William A. Breniman	1984
Donald G. Fink	1985
* Donald K. deNeuf	1986