

BC-224 AND BC-348 AIRCRAFT RADIO RECEIVERS

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BY

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[Background:](#)

Installed in almost all USAAF (and many USN, British and Canadian) multi-engined transports and bombers used during the fifteen year period from before WWII through the Korean War, BC-224 and BC-348 radio receivers were easy to operate and reliable. They were the receiving component of the following long-range liaison radio sets:

<i>Signal Corps Radio</i>	<i>Receiver</i>	<i>Transmitter</i>
<i>SCR-187</i>	BC-224	BC-191
<i>SCR-238</i>	BC-224	BC-307
<i>SCR-260</i>	BC-348	BC-349
<i>SCR-287</i>	BC-348	BC-375

<i>Aircraft Radio Communication Set</i>	<i>Receiver</i>	<i>Transmitter</i>
<i>AN/ARC-8</i>	<i>BC-348</i>	<i>ATC or AN/ART-13</i>

These receivers were also used on the ground in Mobile Radio Communication sets, e.g., the AN/MRC-35. A complete BC-348 with dynamotor, its mounting, and its plugs, later became units of, and comprised, Aircraft Radio Receiving set AN/ARR-11.

The basic design of these receivers is such that all cabinets, mountings, power plugs and sockets, dynamotors (within primary voltage ratings), dial mechanisms, handles, dial light covers, knobs and switch levers are directly interchangeable between all -B model and later receivers produced by all manufacturers. The ability of the Signal Corps to supply and maintain these receivers was thus greatly enhanced.

The BC-224-A receiver, with its BD-94-A dynamotor and FT-154 mount, is unbelievably different in physical appearance both inside and outside from the BC-224-B, and later models, and yet are remarkably similar electrically. (As a matter of fact, the external appearance of the BC-224-A is closer to that of the BC-312 than to anything else.) The only non-electronic parts interchangeable between the BC-224-A and later models appear to be the connector plug, the main tuning dial spinner knob, and the knobs for the dial light dimmer, volume control, crystal switch, and CW beat frequency oscillator.

All the other receivers from the -B series forward were physically similar. All models produced by Belmont Radio and Wells Gardner substituted an electrically identical octal-based 6K6GT output tube for the older six-pin-based 41 but, except for BC-348s -J, -N, and -Q produced by Wells Gardner, little else changed. The Wells Gardner receivers are a single-ended tube design manufactured using point-to-point wiring--a standard commercial practice. Their front panel differs from those of all other models by the location and use of a rotary (instead of toggle) CW OSC switch above and to the left of the CRYSTAL switch and by the absence of an antenna trimmer control.

Note that very large orders were placed simultaneously in 1943 with Belmont Radio (for the BC-348-R) and with Wells Gardner (for the BC-348-Q). While BC-348s -J, -N, and -Q are of a more modern design, the performance specification for all BC-348 models is identical. Therefore, it does not necessarily follow that the -J, -N, and -Q models are better performers than the -R model, and its predecessors. What it does indicate, however, is that similar performance was obtained in a slightly different and, probably, less expensive manner.

A Brief History:

Designed by RCA in the mid-1930s to U.S. Army Signal Corps specifications for a 14-volt DC powered aircraft receiver (in all likelihood to be used with the BC-191 transmitter it already had), the first production BC-224 by RCA was the BC-224-A. Based on Air Corps experience with the BC-224-A, RCA redesigned the receiver to include four separate removable bandswitching coil modules, a redesigned dial and mask assembly, and an improved dynamotor assembly. The newly redesigned receiver became the BC-224-B. Satisfied with the BC-224-B, the Signal Corps had RCA make a 28-volt DC version and called it the BC-348-B. There was no BC-348-A.

The BC-224-A, -B, -C, and -D; and the BC-348-B, and -C, tuned 1.5-18 mc in six bands. The Signal Corps had the receiver design modified to add a 200-500 kc band and compress the 1.5-18 mc coverage into the remaining five bands. This modified design became the BC-224-E and the BC-348-E. The 200-500 kc and 1.5-18 mc tuning range remained constant for subsequent production of all models. In 1943, the Signal Corps (or RCA) had Belmont Radio remanufacture some of the RCA-manufactured BC-348-Cs to include the 200-500 kc band. This remanufactured

receiver became the BC-348-S. While the BC-224-A used a BD-94-A (14-V) dynamotor and an FT-154 mounting, all the BC-224-B/BC-348-B and later receivers used DM-24 (14-V) and DM-28 (28-V) dynamotors, FT-154 (lettered series) and FT-167 mountings, PL-P103, PL-Q103, and PL-Q103-A plugs.

More than 100,000 of these receivers were produced: 80 percent of them by Belmont Radio and Wells Gardner in Chicago; the balance by RCA and Stromberg-Carlson, in the New York/New Jersey area. Except for the General Electric dynamotor in the BC-224-A, Eicor, Inc., Russell Electric Co., and Webster-Chicago Corp., all of Chicago, appear to have manufactured all the dynamotors used with these receivers. In 1943, the approximate cost of a complete BC-348-Q was \$368--almost 18 times the \$21 monthly base pay of an Army private.

It has been suggested that BC-348 receivers were copied and manufactured by the U.S.S.R. during War II by the Russian Vefon Works. If anyone has a BC-348 with a Russian nameplate, or with any other indication that it was not manufactured in the U.S., please sound off. Confirmation of this circumstance would indeed be a unique revelation.

It has also been suggested that Hallicrafters produced an "EM-86" AC power supply for these receivers that could be mounted internally in place of the DM-24/28 dynamotor. It is not known whether this AC power supply was produced for the Military or commercially as a conversion component after WWII. Proof of its existence, however, would also be helpful.

In the Discovery Channel's "Wings of the Luftwaffe" TV series, during the story of the Ju-52 (the Germans called their Gooney Bird "Iron Annie" or Tante Ju--"Auntie Junkers"), you'll see a completely restored Ju-52 (the one with the yellow engine cowls) sporting a BC-348 (or a BC-224) on the forward right hand side of the passenger/cargo compartment bulkhead--a symbolic act of deference by one fine old lady to another.

History by Model Number:

The following chart provides a concise picture of the lineage of these receivers. The serial numbers shown are the high numbers reported by members of Boatanchors. Unless otherwise specified, missing data does not mean the receiver didn't exist, only that specific information about it has not yet turned up. Please contact me if you are able to provide any corrections, additions, serial numbers, order numbers, or any other information relevant to this file. Thanks, Ken Corwin, KF6NUR (kenc2@pacbell.net).

MODEL	MFR	ORDER	HI SN	TLU	T	NOTES
BC-224-A	CRV	SC-132373	591	AAA	A	1st prod -224 (650 '36/37)
BC-224-B	CRV	17840-NY-39 (1-5-39)	102	BBB	A	Redesign of -A (1938)
BC-224-B	CRV	65-NY-40 (8-8-39)	199	BBB	A	
BC-224-B	CRV	65-NY-40 (8-18-39)	632	BBB	A	
BC-224-C	CRV	1780-NY-41	228	BBB	A	
BC-224-D	CRV	64-PHILA-42	289	BBB	A	
BC-224-D	CRV	94-PHILA-42	151	BBB	A	
BC-224-E	CRV			BBB	B	200-500 kc band added

BC-224-F	CDL	634-WFSCPD-42	577	CCC	B	Output tube changed to 6K6
BC-224-G	CRV			BBB	B	Same as -E
BC-224-H	CRV	824-WF-42*	1033	BBB	B	Same as -E
BC-224-K	CDL			CCC	B	Same as -F
BC-224-L	CRV			BBB	B	Same as -E
BC-348-A						Does not exist.
BC-348-B	CRV			BBB	A	28V version of BC-224-B
BC-348-C	CRV	1780-NY-41	3193	BBB	A	(See BC-348-S)
BC-348-D						Does not exist--reference 12
BC-348-E	CCT			BBB	B	200-500 kc band added
BC-348-F						Does not exist--reference 12
BC-348-G						Reference 12
BC-348-H	CDL	2356-CHI-41	2717	CCC	B	Output tube changed to 6K6
BC-348-I						Does not exist--reference 12
BC-348-J	CWQ	832-CHI-42	3983	DDD	B	Sgl-end dsgn; pt-pt wirng
BC-348-K	CDL	78-WFSCPD-42	1665	CCC	B	Same as -H
BC-348-L	CDL	146-WFSCPD-42	7859	CCC	B	Same as -H
BC-348-M	CCT	147-WF-42	3738	BBB	B	Same as -E
BC-348-N	CWQ	144-WF-42 *	10036	DDD	B	Same as -J
BC-348-O	CRV	145-WF-42 *	6125	BBB	B	Sim. to -E, +adj osc ser pad
BC-348-P	CCT	2542-WF-42	5487	BBB	B	Same as -E, +caps 66-1 & -2
BC-348-Q	CWQ	2541-WF-42	5262	DDD	B	Same as -J, +R 87-6, -R 104
BC-348-Q	CWQ	11415-WF-43	19209	DDD	B	Same as -J, +R 87-6, -R 104
BC-348-Q	CWQ	928-DAY-DE	A122	DDD	B	Same as -J, +R 87-6, -R 104
BC-348-R	CDL	2540-WF-42	11996	CCC	B	Same as -H, +ceram HFO soc
BC-348-R	CDL	11414-WF-43 **	18699	CCC	B	Same as -H, +ceram HFO soc

BC-348-S	CDL	8980-WF-43 ***	1484	BBB	B	Same as -O, Remfd -C
BC-348-AL	?	?		CCC	B	Same as -R, AFM 100-5, p 81

* This information appears only on a piece of paper glued to the inside of the cabinet, not on the nameplate.

** BC-348-R's manufactured against this order have a plastic nameplate

*** BC-348-C receivers remanufactured to add the LF band have two nameplates: The original 3" x 2" BC-348-C nameplate, applied by RCA at the time of manufacture, and a 2" x 1-1/2" BC-348-S nameplate, applied in the upper right hand corner of the front panel by Belmont Radio at the time of remanufacture. The serial numbers on the two nameplates are usually different.

MFR--Manufacturer codes:

CCT = Stromberg-Carlson Telephone Mfg. Co., Inc., Rochester, NY

CDL = Belmont Radio Corp., Chicago, IL

CRV = RCA Mfg. Co., Inc., Camden, NJ

CWQ = Wells Gardner & Co., Chicago, IL

TLU--Tube Lineup codes:

AAA = 6B7, 6D6(4), 6F7, 41, 76

BBB = 6B8, 6C5, 6F7, 6J7, 6K7(3), 991, 41

CCC = 6B8, 6C5, 6F7, 6J7, 6K7(3), 991, 6K6GT

DDD = 6K6GT, 6SA7, 6SJ7, 6SK7(4), 6SR7

T--Tuning Range codes (megacycles):

CODE	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6
A	1.5-3.0	3.0-5.0	5.0-7.5	7.5-10.5	10.5-14.0	14.0-18.0
B	0.2-0.5	1.5-3.5	3.5-6.0	6.0-9.5	9.5-13.5	13.5-18.0

Tube functions:

AAA = 1RF(6D6), 2RF(6D6), 1DET(6D6), HFO(76), 1IF(6D6), 2IF/CWO(6F7), 3IF/2DET/AVC(6B7), OUTPUT(41)

BBB = 1RF(6K7), 2RF(6K7), 1DET(6J7), HFO(6C5), VR(991), 1IF(6K7), 2IF/CWO(6F7), 3IF/2DET/AVC(6B8), OUTPUT(41)

CCC = 1RF(6K7), 2RF(6K7), 1DET(6J7), HFO(6C5), VR(991), 1IF(6K7), 2IF/CWO(6F7), 3IF/2DET/AVC(6B8), OUTPUT(6K6GT)

DDD = 1RF(6SK7), 2RF(6SK7), 1DET/HFO(6SA7), 1IF(6SK7), 2IF(6SK7), 3IF(6SJ7), 2DET/AVC/CWO(6SR7), OUTPUT(6K6GT)

Commercial equivalent to VT number:

VT-48 = 41	VT-70 = 6F7	VT-93 = 6B8	VT-152 = 6K6GT
VT-65 = 6C5	VT-76 = 76	VT-118 = 6SJ7	VT-233 = 6SR7
VT-68 = 6B7	VT-86 = 6K7	VT-117 = 6SK7	RCA 991 = NE-48 (ANSI B9A)
VT-69 = 6D6	VT-91 = 6J7	VT-150 = 6SA7	

Mountings:

Following is a list of FT-154 Mountings and the receivers for which they are listed as components. With the exception of the FT-154 (without letter suffix), they are interchangeable.

Mounting	Listed as a component in the manual for Receivers:
FT-154	BC-224-A
FT-154-C	BC-224-C, BC-348-C
FT-154-E	BC-224-E, BC-224-G, BC-224-H, BC-224-L, BC-348-E, BC-348-M, BC-348-O, BC-348-P, BC-348-S
FT-154-H	BC-224-F, BC-224-K, BC-348-H, BC-348-K, BC-348-L, BC-348-R
FT-154-J	BC-348-J, BC-348-N, BC-348-Q
FT-154-K	BC-224-F, BC-224-K, BC-348-H, BC-348-K, BC-348-L, BC-348-R
FT-154-L	BC-224-E, BC-224-F, BC-224-G, BC-224-H, BC-224-K, BC-224-L, BC-348-E, BC-348-H, BC-348-K, BC-348-L, BC-348-M, BC-348-O, BC-348-P, BC-348-R, BC-348-S
FT-154-P	BC-224-E, BC-224-G, BC-224-H, BC-224-L, BC-348-E, BC-348-M, BC-348-O, BC-348-P, BC-348-S
FT-154-Q	BC-348-J, BC-348-N, BC-348-Q
FT-154-T	BC-224-E, BC-224-F, BC-224-G, BC-224-H, BC-224-K, BC-224-L, BC-348-E, BC-348-H, BC-348-K, BC-348-L, BC-348-M, BC-348-O, BC-348-P, BC-348-R, BC-348-S
FT-154-W	BC-224-E, BC-224-G, BC-224-H, BC-224-L, BC-348-E, BC-348-M, BC-348-O, BC-348-P, BC-348-S
FT-154-AA	BC-348-J, BC-348-N, BC-348-Q
FT-154-AC	BC-348-R (from order number on nameplate)

Special Note on Receiver Alignment:

In manuals other than NAVAER 16-30ARR11-501 (see Reference 5., below), instructions for the alignment of these receivers dictate that the i.f. amplifiers be aligned at 915 kcs, followed by alignment of the crystal filter and beat frequency oscillator.

NAVAER 16-30ARR11-501 states, in SECTION III, ALIGNMENT PROCEDURE, paragraph 3-2: "The intermediate frequency amplifiers and the beat frequency oscillator must be aligned to the crystal filter frequency. In the following procedure, the signal generator's output frequency will be the crystal filter frequency unless otherwise stated. The crystal filter frequency should be not more than 1.3 kc above or below 915 kcs." The procedure then describes a method of i.f. amplifier alignment, followed by beat frequency oscillator alignment, alignment of the crystal filter and adjustment of its bandwidth, all centered on the actual frequency of the crystal.

Description:**1. General**

Radio Receivers BC-224 and BC-348 are locally controlled, eight-tube, six-band superheterodyne receivers designed for use in U.S. Army aircraft. The BC-224-A, -B, -C, and -D; and BC-348-B, and -C receivers tune 1.5 to 18 mc; all others tune 200 to 500 kc and 1.5 to 18 mc. BC-224 receivers are designed for operation from a 14-volt DC power source; BC-348 receivers from a 28-volt DC power source. Their normal power consumption is 56 watts; or 60 watts when supplying power to accessory equipment such as a BC-221 or LM frequency meter. All controls are located on the front panel where they may be operated easily by the aircraft radio operator. Antenna, ground and headphone connections are made on the front panel. Power and interphone connections are made through a connector plug at the back of the receiver.

Each receiver is capable of am, mcw and c-w reception. Either manual or automatic volume control may be selected by a switch on the front panel; likewise normal or extreme selectivity is provided by means of an i-f crystal filter that may be switched in or out of the circuit as desired. A beat frequency oscillator is employed for c-w reception. (Note that SSB reception is possible in the MVC mode by using the BFO as the reinserted carrier and riding the volume control as necessary to make the audio output more or less uniform.) The audio output impedance may be preset either high or low, according to requirements. The receivers are not intended for remote control and no provision has been made for this operation.

2. Weight and Dimensions

Radio Receiver BC-224-A, complete with all tubes and with Dynamotor BD-94-A mounted, assembled with Mounting FT-154 with plug mounted, is 18" wide, 10-1/16 high, 8" deep (including the handle on the tuning knob), and weighs about 42 pounds.

Radio Receiver BC-224-B, and later, and BC-348s, complete with all tubes and with Dynamotor DM-24 or DM-28 mounted, assembled with Mounting FT-154-(lettered suffix) with Plug PL-P103, Plug PL-Q103, or Plug PL-Q103-A mounted, are 18" wide, 9-1/2" high, 10-1/2" deep (including the handle on the tuning knob), and weigh about 40 pounds.

3. Cabinet

Radio Receiver BC-224-A is housed in a welded aluminum cabinet 18" long, 9-1/8" high, and 6-1/2" deep, which is provided with louvers in the rear and four large holes in the bottom for dynamotor ventilation. An opening is provided at the bottom rear of the cabinet for the connector plug. The exterior of the cabinet has a black wrinkle finish; the inside is flat black. Four mounting studs are riveted to the bottom of the cabinet. Two snap-slides,

mounted at the extreme edges of a flange on the lower front edge of the cabinet, are used to lock the cabinet to Mounting FT-154.

Radio Receiver BC-224-B, and later, and BC-348s are housed in a spot welded aluminum cabinet 18" long, 8-5/8" high and 8-15/16" deep. There are no louvers or ventilation holes in the cabinet. The top and back of the cabinet are strengthened by embossed grooves that run nearly the length of the cabinet. An opening is provided at the bottom rear of the cabinet for the connector plug. An aluminum casting is mounted over this opening and acts as a seal between the cabinet and the chassis. The exterior of the cabinet has a black wrinkle finish; the inside is flat black. The bottom of the cabinet is reinforced by a stainless steel plate, to which are attached four mounting studs. A flange on the front of the plate mounts two snap-slides which are used to lock the cabinet to Mounting FT-154- (lettered suffix).

4. Chassis

The chassis of Radio Receivers BC-224-A is formed from a heavy aluminum plate.

The chassis of Radio Receiver BC-224-B, and later, and BC-348s, is a machined aluminum casting with an aluminum plate mounted on each end. These plates have cutouts to facilitate servicing and serve as mountings for parts and as runners for the chassis when it is installed or removed.

5. Dial and Mask

The tuning dial of Radio Receiver BC-224-A is calibrated in six frequency ranges and driven at its outer edge by a split gear. This anti-backlash gear is driven by a pinion on the countershaft of the tuning condenser. Dial travel is limited by stops mounted on the tuning condenser. A dial mask with windows is driven by a system of cables and pulleys attached to the band switch shaft and detent wheel mechanism.

The dial and mask assembly of Radio Receiver BC-224-B, and later, and BC-348s, is a casting which mounts a dial scale calibrated in six frequency ranges, a dial mask with windows, a band switch shaft, a detent wheel and mechanism, and drive gears. A stop arm provides a positive stop at each end of the frequency range. The use of split gear tuning minimizes backlash. The drive ratio is such that approximately 100 revolutions of the tuning control knob are required to turn the ganged tuning capacitors through the frequency range. The assembly is mounted on the front panel, and indicates the range and frequency to which the receiver is tuned.

6. Dynamotor

The Dynamotor Unit BD-94-A of Radio Receiver BC-224-A is located at the lower right corner of the chassis. The Dynamotor Unit consists of a dynamotor machine and low voltage rf filter components enclosed in a ventilated aluminum enclosure. The high voltage filters are enclosed in a separate aluminum enclosure, called the Reactor Pack, which is attached to the dynamotor enclosure. In addition to the power supplied by the Dynamotor Unit to the receiver, there is available at the connector plug 15 milliamperes at about 200 volts for the operation, if necessary, of accessory equipment.

The dynamotor assembly of Radio Receiver BC-224-B, and later, and BC-348s, is mounted at the upper left rear corner of the chassis. It consists of Dynamotor DM-24 or Dynamotor DM-28 and an r-f filter unit that supplies all the high voltage direct current for the operation of Radio Receiver BC-224 (DM-24) or Radio Receiver BC-348 (DM-28). In addition to the power supplied by the dynamotor to the receiver, there is available at the connector plug 20 milliamperes at approximately 200 volts for the operation, when necessary, of accessory equipment. To remove the unit for servicing or replacement, disconnect the spade lugs at the 5-screw terminal board and loosen the mounting bolt at each corner of the mounting plate. There is a hole in the dynamotor mounting flange, above the 5-screw terminal board, which is designed to pass a dowel pin mounted on the receiver chassis of all BC-348s if a

dynamotor of correct primary voltage is being installed in the receiver.

The nominal ratings of these dynamotors are as follows:

<i>Dynamotor</i>	<i>Input</i>		<i>Output</i>		<i>Regulation Percent</i>
	Amps	Volts	Mas	Volts	
<i>BD-94-A</i>	1.75	13.8	50	225	15
<i>DM-24-(*)</i>	2.45	13.8	70	220	12
<i>DM-28-(*)</i>	1.23	27.9	70	220	12

(*) Any letter.

7. I-F Transformers, Crystal Filter, C-W Oscillator

The i-f transformers, crystal filter, and c-w oscillator assemblies of BC-224-A receivers are mounted horizontally in a row along the upper right hand edge of the chassis and above the row of i-f tubes, which are also mounted horizontally; these items on all BC-224-B, and later, and BC-348 models except the BC-348-J, -N, and -Q, are mounted vertically on the left front section of the chassis near the i-f tubes which are also mounted vertically. The crystal filter of the BC-348-J, -N, and -Q, is mounted on the crystal filter switch; its neutralizing coil and the c-w oscillator are mounted on the under side of the chassis. Because fixed capacitors are used across their primaries and secondaries, the i-f transformers are tuned by adjusting their cores. With the crystal filter switch on the panel in the ON position, sharp selectivity is obtained on all bands. The c-w oscillator can be turned on with a switch on the panel and its frequency adjusted by a tuning knob, also on the panel.

8. R-F and Oscillator Units

The r-f amplifier and 1st detector tubes of the BC-224-A are mounted horizontally on the top left hand edge of the chassis. The antenna, r-f, detector, and band switch units are not individual sub-assemblies but are assembled together above and below the tuning capacitor which is located on the lower left just behind the front panel. The individual sections are separated by covers and vertical separators. The HFO tube is mounted vertically in an enclosure at the rear of the chassis above a temperature controlled compartment containing the oscillator coils.

In Radio Receiver BC-224-B, and later, and BC-348s, the antenna, r-f, 1st detector and oscillator units are sub-assemblies consisting of a shield can, coils, trimmer capacitors, band switch section, resistors, fixed capacitors and, in the oscillator unit, a 6C5 oscillator tube, VT-65. BC-348-J, -N, and -Q receivers combine the oscillator and 1st detector function in a 6SA7, VT-150, which is located in the oscillator unit in those receivers. The four units are mounted at the right rear of the chassis and are bonded together by common ground straps. All tubes are mounted vertically. The band switch sections are ganged by the band switch drive shaft. On BC-348-J, -N, and -Q receivers, band switch sections are ganged by the use of slotted bars and tension springs.

9. Audio Output

Audio output of up to 830 milliwatts is provided by either a 41 or a 6K6GT, which are electrically identical. A match to either a high or low load impedance may be made by soldering the audio output line to the appropriate terminal on Resistor Rack #2 (BC-224-A), or on the output transformer (all other receivers). The high and low matching impedances available on Radio Receiver BC-224-A are approximately 3500 and 500 ohms, respectively.

For all other receivers, these matching impedances are approximately 4000 and 300 ohms.

10. Front Panel

The front panel of Radio Receiver BC-224-A is attached to the chassis with five bright nickel-plated machine screws. Two handles are mounted on the panel. The front panel and chassis assembly is attached to the cabinet with five captive thumbscrews. The panel has a black wrinkle finish. Controls and switches are each identified by metal nameplates attached with screws to the panel.

The front panel of Radio Receiver BC-224-B, and later, and BC-348s, is attached to the chassis and to the end plates by machine screws. Two handles are mounted on the panel. Thumbscrew rods pass through the lower part of these handles and fasten the chassis to the cabinet. On the right side of the panel is a small metal plate held in place by six screws and covering an opening that gives access for servicing to the underside of the r-f tube shelf. Both the front panel and the r-f tube shelf plate have a black wrinkle finish. White lettering identifies each control and indicates the switch positions.

The following items are mounted on the front of the panel: antenna and ground binding posts, marked A and G (some panels, instead, are marked ANT. and GND., or just A and G); antenna alignment control, marked ANT. ALIGN (ANTENNA ALIGNMENT on BC-224-A receivers; not on BC-348-J, -N, or -Q receivers); dial lights rheostat control, marked DIAL LIGHTS; tuning control, marked TUNING; band switch control, marked BAND SWITCH; window frame assembly which covers the dial lights; beat frequency control, marked BEAT FREQ. (BEAT FREQUENCY on BC-224-A); crystal filter control, marked CRYSTAL OUT IN; volume control, marked INCREASE VOL. (INCREASE OUTPUT on BC-224-A); power control, marked AVC OFF MVC; c-w oscillator control, marked C.W. OSC. ON OFF; two telephone jacks, each with a cover assembly, marked TEL (one telephone jack without cover, marked PHONES on BC-224-A); a toggle switch controlling the heaters (not the tube filament) in the HFO compartment, marked HEATER OFF ON (BC-224-A only); and a 2" x 3" nameplate, identifying the receiver's model, order and serial numbers, and its manufacturer. Some of the order numbers (RCA and Wells Gardner), instead of being shown on this nameplate, were printed on a small piece of paper and glued to the rear vertical surface on the inside of the cabinet. The reason for this is unknown.

11. Mounting

Mounting FT-154 is comprised of a metal plate upon which four shock absorbers are mounted. A second metal plate, with grooves and cutouts to fit the mounting studs on the bottom of the cabinet and studs to fit the snap-slides, is attached to the top of the shock absorbers. A metal stiffener is attached to the bottom of this plate to strengthen the assembly, and provision is made at the rear of the plate for mounting the connector plug. Mounting FT-154, used with the BC-224-A, is not interchangeable with later Mounting FT-154-(lettered suffix), because of its unique physical characteristics.

12. Connector Plug

The eight-contact connector plug which enables power connections at the rear of the receiver is mounted by screws on Mounting FT-154. The wiring terminals are accessible by removing the rear cover on the plug housing. The connector plug, when provided with a straight fitting, is identified as Plug PL-P103. When it is provided with a right angle fitting, it becomes Plug PL-Q103, whether the fitting is mounted toward the right, left, or back of the receiver. If the right angle fitting is supplied with a cable clamp, the connector becomes Plug PL-Q103-A.

13. Performance Characteristics for Receivers

(see Paragraph 14 for the explanation of each note).

<i>Note</i>	<i>Test</i>	<i>Specification Performance</i>	<i>Average Performance</i>
1	Sensitivity	Less than 7 microvolts.	1.2 microvolts
	Receiver sensitivity shall be better than 20 microvolts at 20 volts d-c primary input to the receiver (BC-348s).		
2	Audio Power Output		
	MVC	400 milliwatts	500 milliwatts
	AVC	200 milliwatts	830 milliwatts
3	Receiver Noise	Less than 15 milliwatts	0.8 milliwatts
4	Audio Hum	Less than 50 microwatts	-----
5	Selectivity		
	Input Ratio	Bandwidth (kc)	Bandwidth (kc)
	2:1	2.1 min, 10 max .2-.5 mc	3.0
		5 min, 10 max 1.5-18.0 mc	7.6
	10:1	18 max	13.8
	100:1	30 max	19.1
	1,000:1	40 max	26.2
	10,000:1	52 max	32.4

14. Reference Notes for Performance Characteristics.

Note 1--Sensitivity shall be measured as follows: The radio receiver is to be operated at (*) volts with a 4000 ohm non-inductive output load. The calibrated signal generator output is to be fed to the receiver through a 100 mmf mica capacitor. Antenna trimmer alignment is to be made at 3.4 mc only, and before sensitivity measurements are taken.

a. For MCW measurements turn C-W OSC. switch OFF and CRYSTAL switch OUT. Adjust the standard signal generator to give approximately 10 milliwatts receiver output at the resonant frequency. Alternately adjust the receiver INCREASE VOL. control and the signal generator attenuator to obtain 10 milliwatts receiver output with a 400 cycle 30% modulated signal and 2.5 milliwatts noise output with the unmodulated carrier applied to the receiver. Read microvolts sensitivity on the signal generator attenuator. If noise adjustment is not necessary set receiver INCREASE VOL. control at maximum.

b. For C-W measurements turn C-W OSC. switch ON and CRYSTAL switch OUT. Adjust the receiver INCREASE VOL. control to give 0.3 milliwatt noise output, if possible, with no signal input. With an unmodulated carrier input and the receiver BEAT FREQ. control adjusted for approximately 800 cycles the signal generator attenuator shall be adjusted to obtain a receiver output of 10 milliwatts. Read microvolts sensitivity on the signal generator attenuator.

Note 2--Audio power output shall be measured into a 4000 ohm non-inductive load and with a 400 cycle 30% modulated signal input. Receiver input voltage shall be held at (*) volts.

Note 3--Receiver noise shall be measured with a 4000 ohm load, with a (*) volt primary power input, and with the INCREASE VOL. control at maximum. A 100 mmf mica capacitor shall be connected between antenna and ground terminals of the receiver.

Note 4--Audio hum is to be measured using a 4000 ohm load, with a (*) volt primary power input, and with the INCREASE VOL. control at minimum.

Note 5--The selectivity of the receiver on MVC with the CRYSTAL switch OUT shall comply with the values given in the table when measured at normal sensitivity by the single standard signal generator method.

* 14 for the BC-224; 28 for the BC-348.

References:

1. U. S. Army Signal Corps Technical Order No. 08-10-24, 12 June 1936, "Instruction Book for Radio Receiver BC-224-A manufactured by RCA Manufacturing Co., Inc., Camden, N.J., U.S.A., Order No. SC-132373"
2. Army Air Forces Technical Order No. 08-10-119, December 15, 1942; "Instruction Book for Operation and Maintenance of Radio Receiver BC-348-E Radio Receiver BC-348-M Radio Receiver BC-348-P"
3. U.S. Air Force Technical Order 12R2-3BC348-2, revised 15 April 1957; was AN 16-40BC-348-3, 21 June 1948; was AN 08-10-112, 17 July 1943, revised 18 December 1943, revised 30 July 1945; "Handbook Maintenance Instructions Radio Receivers BC-348-J BC-348-N BC-348-Q"
4. U.S. Air Force Technical Order 12R2-3BC-112, revised 15 April 1957; was AN 16-40BC224-2, 20 July 1945, revised 11 May 1948; "Handbook Maintenance Instructions Radio Receivers BC-224-F BC-224-K BC-348-H BC-348-K BC-348-L BC-348-R"
5. NAVAER 16-30ARR11-501, 1 September 1949, "Handbook of Bench Test and Alignment Procedure for Radio Receiver AN/ARR-11"
6. Air Force Manual 100-5, Radio Receivers, 14 December 1956, pages 77 through 817. Antique Wireless Association, Inc., "The Old Timer's Bulletin," Volume 27, Number 2, August, 1986, page 14; The Communication Receiver column; "The BC-348 High Frequency Aircraft Receiver" by Bill Fizette, K3ZJW; "Radio Receiver BC-224/348," by H. A. Robinson, W3LW
8. Department of Defense, Defense Supply Agency, Invitation For Bid, Sale No. 41-5413, Item 223, Bid Opening: 29 April 1975
9. Electric Radio, Number 31, November, 1991, Electric Radio in Uniform, "The BC-348 Receiver," by Walt Hutchens, KJ4KV
10. Electric Radio, Number 85, May, 1996, "The 'Pile,'" by Michael D. Runyan, KK7F
11. U. S. Army Signal Corps "Instruction Book for Radio Receivers BC-224-C and BC-348-C manufactured by RCA Manufacturing Co., Inc., Camden, N. J., U. S. A. Order No. 1780-NY-41, November 14, 1940, IB-38005-2"

12. "Airborne Radio Equipment Handbook," published by the Signal Section of the Air Service Command, April, 1943
13. AN 08-10-209, 13 November 1943, Revised 1 March 1944, "Handbook of Maintenance Instructions for Radio Receivers BC-348-E, BC-348-M, BC-348-O, BC-348-P, BC-348-S, BC-224-E, BC-224-G, BC-224-H, BC-224-L." (The latest version of this manual is believed to be NAVWEPS or T.O. 16-40BC224-3, revision date unknown.)
14. Electric Radio, Number 90, October, 1996, "My Dream Receiver," by Horst Geipel, WA0NUH

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