

The National NC-155

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NATIONAL Radio's new receiver, the NC-155, has many features which makes this a fine instrument for the serious amateur. The 10 tube double conversion (2.215 mc, 230 kc) receiver exclusively covers the ham bands from 80 through 6 meters. An r.f. stage is included and product detection is used for c.w. and s.s.b. reception. Selectivity is controlled from 5 kc to 600 c.p.s. by a Ferrite Filter. The reviewers were pleased with the exceptionally fine bandspread and stability of the receiver. Image rejection and selectivity were judged to be good; sensitivity was 1 uv for 1 watt output. A full-wave rectifier and a voltage regulator tube make up the power supply. A complete tabulation of the receiver's specifications is given in Table I.

Circuit Description

Referring to the block diagram of fig. 1, a 6BZ6 (semi-remote cutoff pentode) serves as an r.f. amplifier. The oscillator section of the first converter, a 6BE6 pentagrid tube, operates 2.215 mc higher than the incoming signal and temperature compensating capacitors are used in its series-fed Hartley circuit.

The second converter (6BE6) converts the incoming first i.f. signal from 2.215 mc to 230 kc. Here, a series-fed Hartley is employed as a fixed frequency oscillator operating at 2.445 mc.

A 6BA6 pentode is used for each of the 230 kc i.f. stages. The output from the 2nd i.f. is fed to one diode section of the 6T8 (duo-diode, triode) which is the a.m. detector. It also furnishes delayed a.g.c. This a.g.c. voltage is returned to the 1st i.f. and r.f. amplifier stages. The other diode section of the 6T8 serves as an automatic series-gated noise limiter (a.n.l.).

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Front view of the NC-155. The controls are (bottom row) l. to r., ANTENNA, BANDSWITCH, FUNCTION, SELECTIVITY, STBY-REC. switch, AUDIO GAIN. Top row, l. to r., RF GAIN, MAIN TUNING, BFO. To the right of the S-meter, CALIBRATE Switch. Below the STANDBY-REC. switch is the phone jack.

The product detector, used for c.w. and s.s.b. reception, derives its signal from the 2nd i.f. stage. One half of a 12AX7 (high mu duo-triode) is the product detector; the other half is employed in a shunt-fed Hartley b.f.o. circuit. B.f.o. pitch control is achieved by a panel-mounted slug tuned coil, which varies the frequency ± 4 kc, centered about 230 kc.

The 1.5 watt audio power amplifier (6CW5) is driven by the triode section of the 6T8. Headphones or a 3.2 ohm external speaker may be used.

D.c. power is supplied to the receiver from a 5Y3 full-wave rectifier circuit. RC filtering is used and an 0B2 regulates the conversion oscillators, the b.f.o. and the product detector. Total power consumption from the 117 volt line is 75 watts.

The S-meter is connected between the plate decoupling resistors of the 1st and 2nd i.f. stages. The voltage drop across the decoupling resistor of the 1st i.f. varies with the a.g.c. voltage, causing the S-meter to read. The meter, which is calibrated in S1-9 units and up to 80

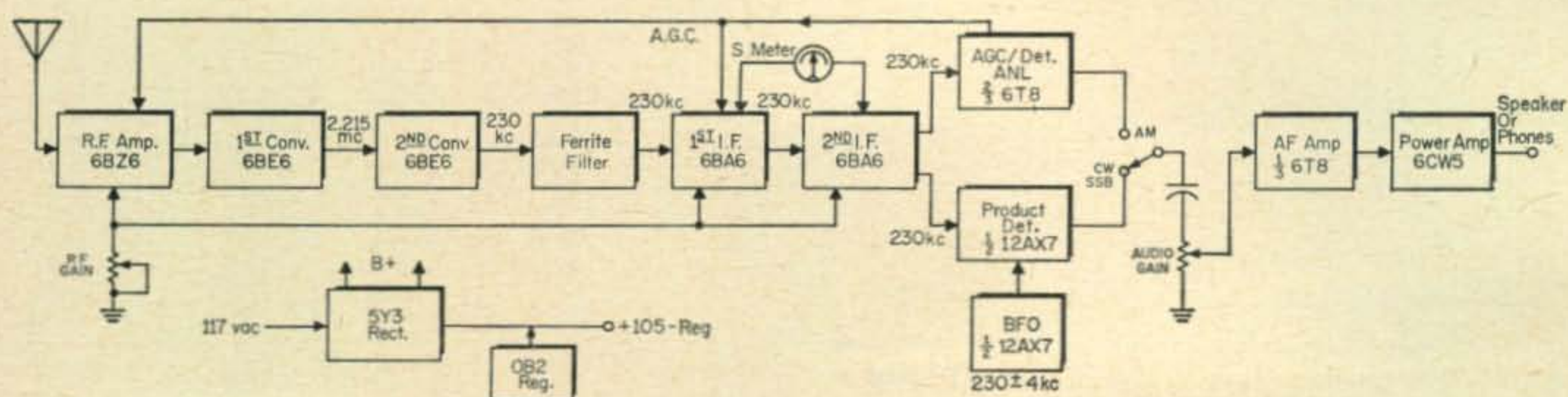
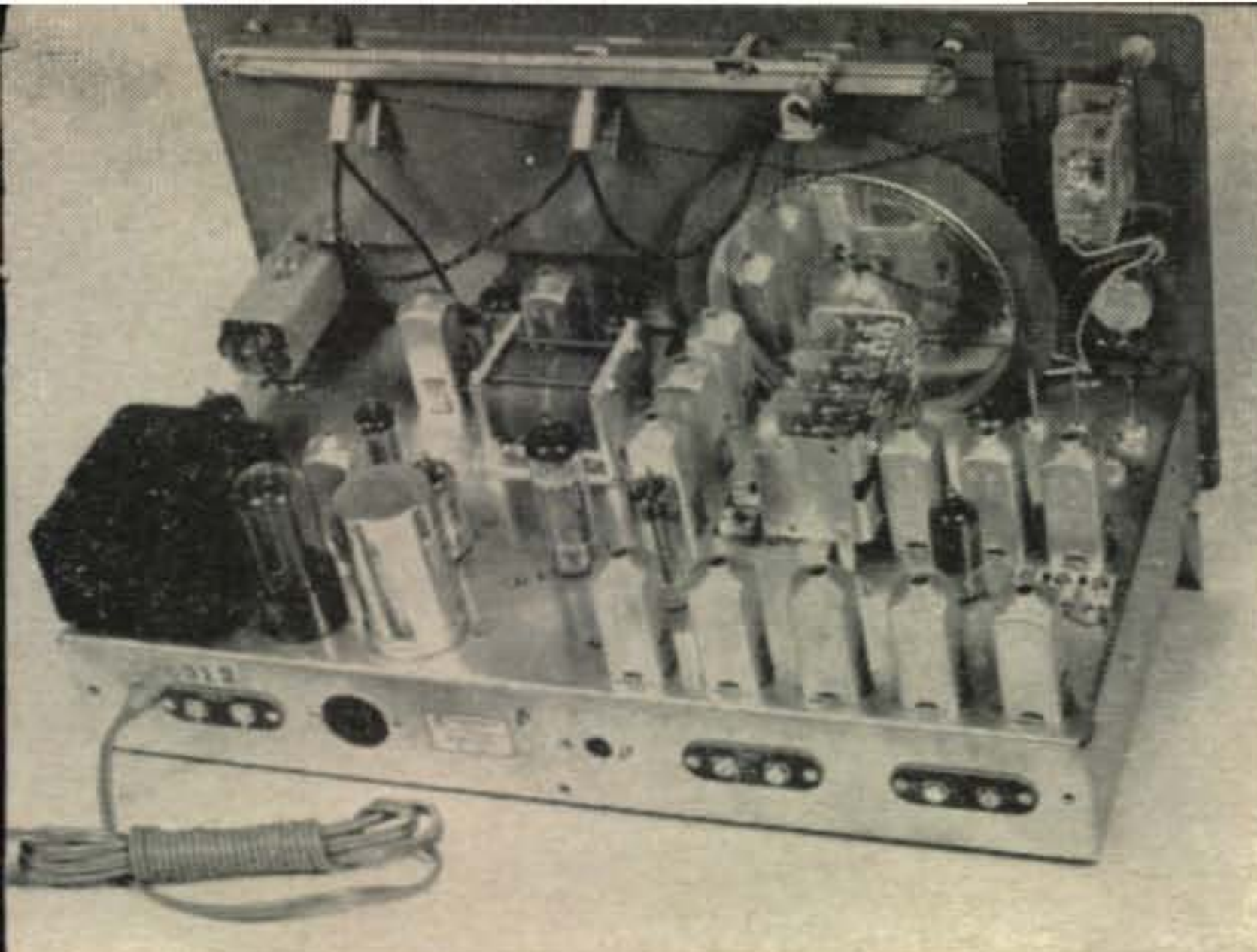


Fig. 1—Block diagram of the NC-155 receiver.



Rear view of the NC-155. Along the chassis apron, l. to r., relay terminals, accessory socket, S-meter zero-adjust control, speaker terminals, antenna terminals. The ferrite filter is left of center on top of chassis. The aluminum filter dust cover was removed for photographic purposes.

db above S9, only functions when the a.g.c. is switched on.

A pair of terminals and an accessory socket are available at the rear of the chassis for remote operation. In the standby mode, the r.f. amplifier, 1st and 2nd i.f. stages, and the audio amplifier are muted.

A 1 mc crystal calibrator is available from National as an accessory.

Mechanical Construction

The receiver is mounted in a stylish blue-gray metal cabinet 8 $\frac{5}{8}$ " high by 15 $\frac{5}{8}$ " wide by 9" deep. A *Flip-Foot* on the cabinet permits the set to be used in a tilted or flat position. The $\frac{1}{8}$ " steel panel ensures good operating stability. The receiver can be easily removed from its enclosure.

A large fiber disk, attached to the tuning capacitor shaft, is rim driven for a 12/1 tuning ratio. An additional 5/1 tuning ratio is realized by a panel vernier resulting in an overall 60/1 ratio. A drum, also attached to the tuning capacitor shaft, works the dial string system to move the pointer across the dial. No backlash was observed.

Receiver Performance

The NC-155 has a number of commendable qualities which now will be enumerated. These are:

1. The tuning is very smooth and the band-spread is excellent.
2. Drift tests were performed on all bands. A laboratory-type v.f.o. was calibrated against a 100 kc crystal and set to a frequency in the band tested. The receiver, in the c.w. mode, was then tuned and zero beat with the v.f.o. signal. At certain time intervals, the v.f.o. was varied to zero beat in the receiver, that is, made to follow the receiver drift. After 8 minutes from a cold start, a maximum drift of 1.7 kc was observed on 10 meters and it was stable thereafter. See Table II for a complete summary of results.

3. Selectivity curves for the receiver, as given by the manufacturer, were plotted between 0 and -40 db. From this data, the bandwidth at the -6 and -40 db points are listed in Table III.

4. AGC: for -80 db signal variation (100,000 μ v to 10 μ v) the change in audio output was -9.25 db. This is considered to be satisfactory.

On the negative side of the ledger, the receiver exhibited only the following fault:

The 12th harmonic (29.34 mc) of the fixed frequency 2nd conversion oscillator was heard at the upper end of the 10 meter band. In addition, two other harmonics came through on six meters.

Conclusions

Considering the price tag, the NC-155 is a real performer and should afford a great deal of pleasure to its user. The many fine qualities of the receiver: stability, smooth tuning, etc., outweigh its faults. Lack of 160 meter operation may make some of its adherents unhappy.

The instruction manual is clearly written and well illustrated. Detailed alignment instructions and a parts list are included. For some reason, however, a tube-pin voltage chart was omitted. This can make receiver troubleshooting a rough chore.

Table I: NC-155 SPECIFICATIONS

Frequency Ranges	6 meter band (50.0-54.0 mc) 10 meter band (28.0-29.7 mc) 15 meter band (21.0-21.5 mc) 20 meter band (14.0-14.4 mc) 40 meter band (7.0- 7.3 mc) 80 meter band (3.5- 4.0 mc)
Circuit	1. 10 tubes, including rectifier and v.r. tube. 2. Double conversion superhet. I.f. frequencies are: 2.215 mc and 230 kc. 3. One r.f. stage.
Sensitivity	Better than 1.0 μ v for 1 watt output.
Selectivity	600 c.p.s., 3 kc, and 5 kc.
A.G.C.	Operates in a.m., c.w. and s.s.b. positions. May be disabled for manual control.
Detector	For a.m.: diode detector; for c.w. and s.s.b.: product detector.
Audio	1. 1 $\frac{1}{2}$ watts output. 2. Speaker: external, 3.2 ohms. 3. Headphone jack mounted on front panel.
Power Requirements	75 watts, 105-125 volts, 50-60 c.p.s.
Price	\$199.95

Table II: NC-155 DRIFT CHARACTERISTICS

Band	Drift in kc
80 meters	1.1*
40 meters	4.5**
20 meters	0.54*
15 meters	0.60*
10 meters	1.7*
6 meters	30.0**

*Stabilized in 8 minutes from a cold start.

**Stabilized in 40 minutes from a cold start.

Table III: NC-155 SELECTIVITY CHARACTERISTICS

Selectivity at:	-6 db	-40 db
	5 kc	16.6 kc
	3 kc	13.5 kc
	0.6 kc	5.8 kc