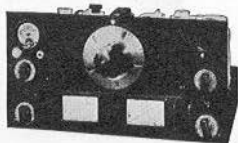


The COMMUNICATION RECEIVER

Editor: Bill Fizette, K3ZJW

R.D. 1, Box 55, Henryville, Pennsylvania 18332

All correspondence requires SASE for reply



THE NATIONAL SLIDING COIL TRAY RECEIVERS

INTRODUCTION

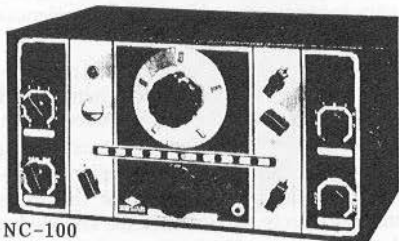
October, 1935: The National Company under the engineering direction of Jim Millen has had the HRO communications receiver on the market for ten months, and it is already a resounding success, with wide acceptance by various government and professional interests and the more affluent amateur circles. However, Millen is fully aware of the market and design factors which significantly influence sales, and he sets out to design a different receiver for a different market, a receiver which will be not only lower in price than the HRO, but will also appeal to the mass market for a quality short-wave-listener communications type receiver. His answer is the NC-100, first announced in Catalog 250 and referred to in QST for October, 1935.

No survey of the communications receivers of the 1930's would be complete without a review of these "sliding-coil receivers" conceived by Millen's engineering group. The predominant design feature of the new receiver was the sliding coil catacomb, a massive aluminum casting with a separate compartment for each of the 15 RF coils. This mechanical design was so successful that the National Company built a long series of receivers around it, continuing into the 1950's. This column reviews some of the details surrounding this unique and historically significant innovation.

The world, and especially the great American consuming public, was awakening to the wonders of radio and especially to the new experience of international short wave. Unfortunately, the Great Depression was still heavy on the pocketbooks of the purchasers, and the price of the HRO, \$200 with coils, speaker, and power supply, was simply too much for most people. Then too, the HRO appeared needlessly complex with separate coil sets and power supply; furthermore, it did not tune the broadcast band without buying two special coils, and for the music listener the audio quality left much to be desired.

Millen was aware of this opposition to some of the design features of the HRO, but he was adamant

that plug-in coils were state-of-the art technology. At the same time he was cognizant of the emerging interest of the general public in short wave and the trends in the radio industry to turn out lower-priced consumer products with some short wave bands and booming push-pull audio circuits. The NC-100, a hybrid short-wave/communications/BC band receiver, neatly answered the problems.

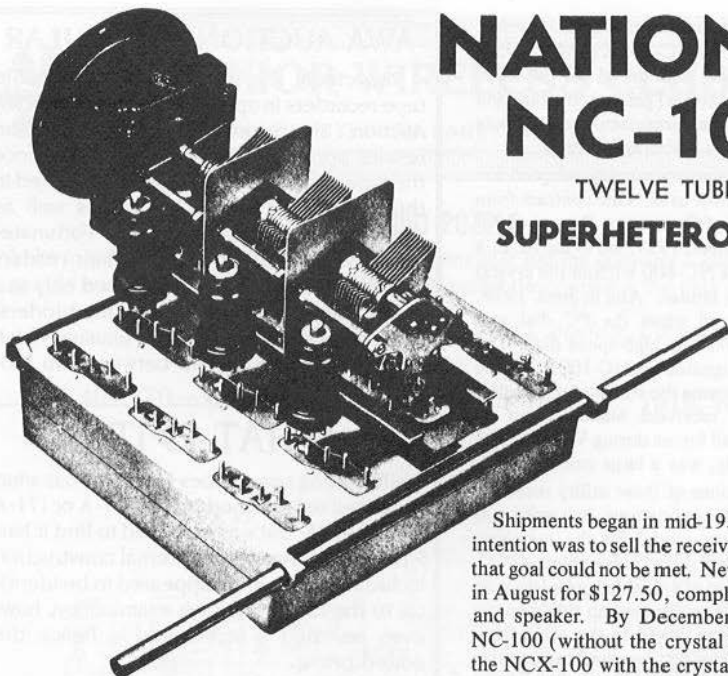


Being mechanical engineers first and foremost, the National design group produced another mechanical wonder. The coil catacomb moved back and forth across the bottom of the chassis on a 1/2" polished steel rod, actuated by a knob on the front panel through a rack and pinion arrangement, bringing each of the coil sets in turn into positive contact with phosphor-bronze fingers protruding down from the bottom of the tuning capacitor. There were no long leads or filmy switches, and each coil remained shielded, with no troublesome interactions or dead spots resulting from idle coils. As each set of coils was moved into position, they would snap into place with a positive detent action, insuring that they could return to the same position each time. This feature contributed measurably to calibration accuracy. To prevent unnecessary noise and crashes during band changing, the coil tray slid on fiber rings, the pinion gear was insulated from the chassis, and the screen voltage was removed by an automatic switch in the oscillator coil.

Once the band-switching mechanism was a reality, the rest of the receiver followed a logical design sequence, with much of the technology borrowed from the HRO. The 500-division PW dial with its twelve-foot effective scale length was retained, as

NATIONAL NC-100

TWELVE TUBE
SUPERHETERODYNE



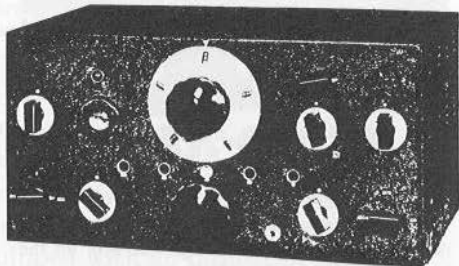
was the crystal filter and IF system. One RF stage was deemed adequate, and the capacitor gang and the 20:1 ratio gear box were modified to a three section in-line version. Coils were of the well-known R-39 material, with construction similar to those of the HRO, with the exception that pins were used instead of button contacts. The new metal tubes were used in all circuits except the power supply and the tuning indicator.

The push-pull audio circuit produced a very respectable 10 watts, with the audio response shaped by the tone control and a ten-inch separate speaker mounted in a metal-clad wood cabinet. Millen, who considered that all serious communications receivers should have external power supplies, rationalized the use of the built-in power supply on the basis of the audio power requirements. Otherwise he said very little about it, and the purchasers didn't really seem to care.

The front panel was a thin aluminum plate finished in contrasting red, white, and black enamel, a departure from the severely conservative black crackle finish then in vogue for communications gear. The eye tube, a 6E5, acted as a tuning indicator and, other than being a popular sales gimmick, contributed very little. Without the speaker the receiver weighed 50 pounds, and it was obviously a quality piece of gear. Of equal importance, it tuned the complete spectrum from 540 kc to 30 mc, not just some of the short wave bands. Advertising emphasized the neatness of the layout and the accessibility for repairs.

Shipments began in mid-1936; while the original intention was to sell the receiver for less than \$100, that goal could not be met. Newark Electric listed it in August for \$127.50, complete with crystal filter and speaker. By December, Newark listed the NC-100 (without the crystal filter) for \$118, and the NCX-100 with the crystal for \$141. By comparison, the HRO w/power pack was \$168, the RME-69 was \$135, and the Hammarlund Super Pro a whopping \$241.

Whether the NC-100 as originally conceived was a market success is unknown, but it was a simple matter to convert it to the amateur version, the NC-101X; the only change required was in the tuning condenser plates, easy for the National Company. The five amateur bands, 160-10 meters, were now readily available in a quality communications receiver, complete with speaker and crystal filter, for \$125.00. Each band was spread over 80 per cent of the twelve-foot tuning range, and the calibration was advertised as "permanent".



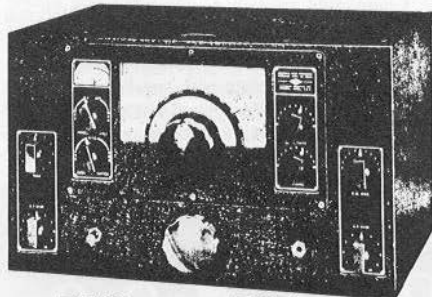
NATIONAL NC-101X

(Continued on next page.)

The family began to grow with the announcement of a battery version of the NC-101 X in May, 1937. In September, National announced the NC-80X and 81 X, economy receivers (general coverage and amateur versions) with no preselector and two sets of coils in each band in a sliding coil tray.

The commercial interests quickly adapted the basic design to their own uses. One contract from the U.S. Department of Commerce, Bureau of Air Commerce, in November, 1937, led to the RCE, a receiver similar to the NC-100 without the crystal filter but with a noise limiter. And in June, 1938, the inevitable occurred when the PC dial was changed to a direct reading high-speed dial. The new models were designated the NC-100A and the NC-100-XA, and became the standard designs for many thousands of receivers manufactured by National for the armed forces during WW II. The U.S. Navy, especially, was a large customer.

Various other versions of these utility receivers were made for special applications; one worthy of mention was a unique model for the merchant marine. The National 156-1 resembled a NC-100A, with the addition of a shielded preselector on the back, with a single coil catacomb riding on the usual polished rod and linked to the main band switch. (The preselector was required to minimize radiation from the receiver, by means of which the Axis subs were able to locate the Allied ships.) Other listed versions included the NC-100ASD and the NC-100-AX (which may or may not be the same as the XA). Many of these hit the surplus markets after the war and became the basis of new amateur stations.



NC 100-XA

In September, 1940, the NC-240 was announced. This was a 12-tube, 10-band receiver of the NC-100 mechanical design but with all the latest circuit refinements. In December it was officially designated the "Silver Anniversary Receiver", complete with a special NC Silver Anniversary emblem on the top, an attempt to capitalize on the convenient coincidence of the 25 years of both ARRL and National. With the intervention of the war, all design work was more-or-less frozen and National concentrated on defense production. In

AWA AUCTION IS POPULAR

Reportedly, there were at least 8 portable tape recorders in operation at the recent AWA Auction. The recorded information (auction results) appears to be of great interest since the same recorded information was printed in three national collector papers as well as several regional club newsletters. Fortunately, the various editors warned their readers that the sale prices were to be used only as a guide—meaning some were low (few bidders) while other dollar values were unusually high (strong desire to acquire between two bidders).

WHAT IS IT?

While sorting some tubes I came across what appeared to be a modern UX-201-A or 171-A (circa 1934-38) but was surprised to find it had 5 prongs (UY base). The internal construction including the filament appeared to be identical to the 201-A. A closer examination, however, revealed a screen-grid—hence the added prong.

The tube had no markings other than "Philco" on the base. Some time ago I read about this screen-grid tube which did not have the grid connection at top (such as the UX-222), but I have misplaced the information. Can someone bring me up to date?

— BK

1946, the NC-200 was revived as the NC-240, which was soon followed by the -C, the -CS, and the -D models. The coil tray on the 200 and 240 receivers included 18 compartments, with six basic bands and four amateur bands, the latter switched in by capacitor changes.

The writer has a certain fondness for the NC-101 X, as it was the first manufactured ham receiver purchased, second-hand of course, in Columbus, Ohio, in 1955. (The call W8VP was scratched into the coil tray.) After many changes, it has now been restored to its original condition. Restoration, incidentally, requires somewhat more mechanical skill than does the HRO. And if you do one, be sure that you have the correct circuit. A future column will describe the procedure in detail.

Credit must be given to Millen and his engineers for the sliding-coil-tray concept and their design of a practical means of making it work. While National had many other receivers over the years, it is probably safe to say that in sheer numbers of units manufactured, the HRO and the various sliding-coil-tray receivers led the list.

— K3ZJW