

Specifically
designed for the
low-power station



TYPE 100-E

HIGH-FIDELITY 100 WATT

BROADCAST TRANSMITTER

BY



THE TYPE **100-E** BROADCAST TRANSMITTER

An RCA High-Fidelity Transmitter For Low-Power Stations

SIMPLIFIED DESIGN

The Type 100-E Transmitter is designed to solve, for low-power stations, the pressing problem of accomplishing high-fidelity transmission on a limited budget. This cost-vs.-quality problem is particularly acute in these stations because equipment costs—both initial and upkeep—tend to be disproportionately high. Recognizing this—and realizing that performance is preferable to gadgets—RCA engineers set out to develop a low-power quality transmitter of entirely new and markedly simplified design. They decided that by introducing obviously desirable simplifications, using inexpensive type tubes, taking advantage of new engineering developments, and finally, adopting a mechanical assembly honestly proportional to 100 watt needs, they could produce a quality transmitter that small stations could really afford. The Type 100-E Transmitter is the embodiment of that idea. While it is startlingly simplified in design, low in first cost and extremely economical to operate, it does not yield an inch, either in convenience, or in reliability, or in performance to the finest high-powered transmitters. As the following brief survey of the features of this transmitter will reveal, it literally “has everything” that the low-power station needs.



HIGH-FIDELITY PERFORMANCE

While simplicity and economy were prerequisites, high-fidelity transmission was, of course, the motivating factor in the development of this new transmitter. In order to insure transmission quality which can be truly termed “high-fidelity” it is necessary to take into account not just one or two, but all of the factors determining reproduction fidelity. In the design of the Type 100-E Transmitter, each of these factors—viz., frequency response, audio distortion and background noise-level—has been given the most careful consideration. As a result, the measured characteristics are in each instance well within the limits of the critical standards set for RCA de luxe high-power transmitters.



FLAT FREQUENCY CHARACTERISTIC

The frequency characteristic of the Type 100-E Transmitter is flat within ± 1 db. from 30 to 10,000 cycles. This response, including as it does the whole usable audio range, provides for all present and future requirements in frequency range. The very small (± 1 db.) deviation—which is far less than the ear can detect—is of added value because it means that other units—as, for instance, the microphone amplifier—can be allowed larger deviations from uniformity without causing the overall frequency response of the station to exceed allowable limits.



MINIMUM AUDIO DISTORTION

The audio harmonic distortion in the Type 100-E Transmitter is very low. At 100% modulation the audio harmonic content is less than 6% with all harmonics arithmetically added—while for lower percentages of modulation it is somewhat less. These figures, as noted, are for the arithmetical sum of the components. As measured in terms of the RMS sum of the components—a less critical method—the harmonic content is less than 4% at the most. This represents distortion less than would



**Front view of the
TYPE 100-E 100 WATT
Broadcast Transmitter,
showing meters and
controls. Compact
in construction.**

be noted by ear even with the new high-fidelity receivers. The advance which it represents can be judged by the fact that the distortion in transmitters not specifically built for high-fidelity is from two to four times this amount.



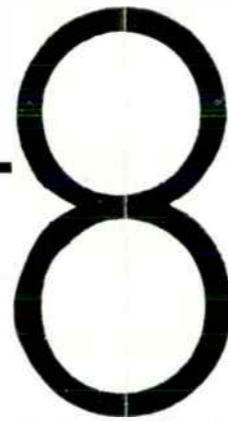
VERY LOW NOISE LEVEL

The background noise-level in the Type 100-E Transmitter is 55 db. below the level of 100% modulation. This background level is that of all the hum and noises measured together and without weighting. The actual level in the middle frequency band (150 to 5000 cycles)—or as measured with a weighted filter—is very much lower. A noise-level of 55 db. down means, of course, that a volume range of 55 db. is available without losing the very low sounds in the background. This is the volume range which RCA engineers believe is the maximum usable range, since it extends from the minimum usable output, represented by the average noise-level in a quiet residence, to the maximum desired output, represented by the loudest sounds of a symphony orchestra.



REDUCED DEPRE- CIATION RATE

The performance characteristics of the Type 100-E Transmitter equal, as pointed out, the maximum likely requirements in every respect. This is not only positive assurance of continuing favorable listener reaction, but also a very real item of econ-



POINTS OF VITAL IMPORTANCE

- 1 The Type 100-E is a New, Simplified Transmitter Designed Specifically for Low-Power Stations.** An entirely new type of transmitter built to the exact needs of 100-watt stations. It emphasizes performance rather than non-essential features, discards items not needed on low-power transmitters, and introduces simplifications which not only provide economy but also increase reliability.
- 2 It Provides High-Fidelity Performance Equal to that of the Finest Transmitters.** Its performance characteristics—equal in every respect to those of the deluxe high-powered RCA transmitters—assure unsurpassed “high-fidelity.” Moreover, this performance not only meets the most critical of present standards, but is equal to any likely future standards—thus effectively minimizing the possibility of early obsolescence on this account.
- 3 It Incorporates the Latest Engineering Advances—Forestalling Rapid Depreciation.** It includes such new developments as zero-coefficient crystals, Class B modulation and others, which increase the quality and reliability of the transmitter. These are important assets since they greatly increase the life of the transmitter and thus allow the cost to be liquidated over a greater period of useful life.
- 4 It is a Self-Contained, All AC-Operated Unit, Complete in Itself.** It is almost as easily installed as a receiver. It has no rotating machinery, starters or parts to get out of order; can be easily moved. It operates from a single-phase 110-volt supply and hence does not require special

power lines. It has its own speech-amplifier so that it may be placed at some distance from the studio.

- 5 It Uses Inexpensive Tubes Throughout—Reducing Tube Costs to a New Low.** It employs a new and entirely different arrangement of tubes developed especially for this transmitter by RCA engineers. All of these tubes are inexpensive types noted for their long life. As a result, tube costs with this transmitter are approximately half those of any comparable 100 watt transmitter.
- 6 It is the Most Economical-to-Operate Transmitter Ever Developed.** It is inexpensive to operate because of the simplified design and reduced number of components. In addition, the power consumption is extremely low. The guarantee against defective materials reduces replacements other than tubes. And the unit chassis assembly reduces the necessary servicing to a minimum.
- 7 It Carries All Standard RCA Guarantees and Patent Protection.** It is fully guaranteed against defective workmanship and materials, exactly as are the larger RCA transmitters—a complete insurance against unexpected replacement costs. Moreover—the user is adequately protected against damages resulting from claims of patent infringement.
- 8 A Standard Transmitter Reasonably Priced.** It offers small stations “high-fidelity” and RCA quality at a price they can really afford. It puts within reach of these stations the guarantees of quality, reliability and protection previously available to larger stations only.

MODERN APPEARANCE

The Type 100-E Transmitter is designed for installation either at a remote point or—as is often desirable for transmitters of this power—in or adjacent to the studio control room. Thus, while it is complete with high-gain speech amplifier and necessary equipment for remote operation, it is, nevertheless, relatively small in size, so that when installed at the studio location it will require a minimum of space. The attractive exterior, to which the photographs shown hardly do justice, is definitely modern in design—but radicalism has been avoided so that the unit will blend attractively with the usual control room surroundings. The use of rounded corner moldings, particularly effective in setting off a unit of this size, is a pleasing feature. The two-tone lacquer finish—light grey for the panel, darker grey for the trimming—is another. Tuning and power controls, similarly emphasizing the idea of trimness and modernity, add the completing touch.



RUGGED CONSTRUCTION

The mechanical construction of this transmitter is particularly rugged. This feature—one often given insufficient attention in small transmitters—insures that the unit may be moved without danger of warping the frame or otherwise endangering the equipment. The frame of the unit is of copper-plated welded-steel construction. The

side doors, back and top are of perforated sheet steel, copper-plated and lacquered. The doors, which are secured with instantly released catches, provide complete access to all parts of the transmitter. If desired, the top and back are also easily removed.

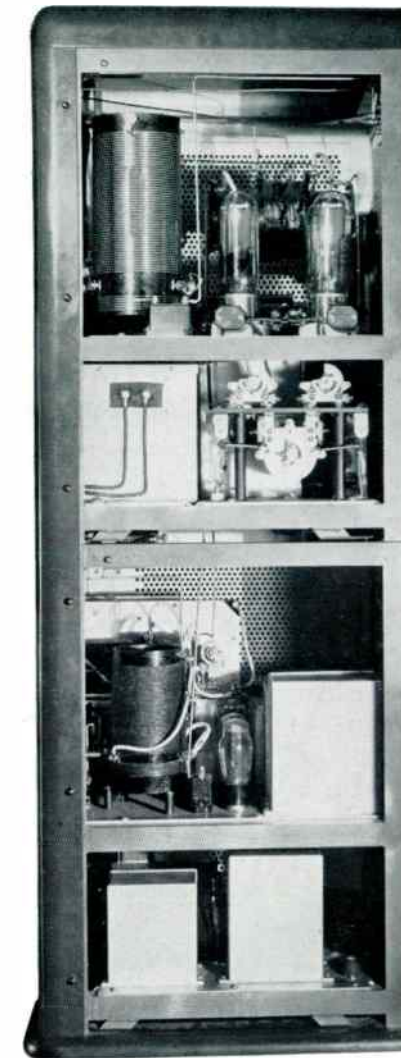


One of the several interesting features of this transmitter which are rather new to broadcast practice, is the use of a modified unit-chassis design. Thus, referring to the side views of this equipment, the bottom shelf constitutes the speech-amplifier and modulator unit, the next higher shelf the exciter unit, and the two top shelves the power amplifier unit. Each of these three units is complete in itself, and each has its own power supply. This simplified method of assembly affects material reduction in manufacturing costs—while at the same time facilitating adjustment and servicing of the equipment in the field. Moreover, since various combinations of these same units are used in other RCA transmitters, the benefits of quantity production, and of reduced development costs, are thereby obtained. It is through such savings, and by taking advantage of new engineering developments, that it has been possible to produce an RCA quality transmitter at a price within the reach of small stations.

UNIT-CHASSIS ASSEMBLY



An interior view of the left side of the transmitter. Easy accessibility to all parts featured throughout.



Looking into the right-hand side of the 100-E Transmitter, showing easy accessibility to all parts.

LOW COEFFICIENT CRYSTALS

Most prominent of the advanced engineering developments incorporated in the Type 100-E Transmitter is the use of the new low-temperature-coefficient crystals. These V-cut crystals are an exclusive RCA development and should not be confused with other low-coefficient crystals for, unlike most of the latter, they are cut-down neither in size nor in thickness. On the contrary, they have lateral dimensions the same as those of older type crystals, while their thickness is greater than that of Y-cut, and very nearly equal to that of X-cut crystals. They are "single-frequency" and, moreover, provide greater output than either X-cut or Y-cut crystals. And, finally, they have a temperature coefficient which is almost negligible—the maximum variation being about one cycle per degree (as compared to an average of about fifty cycles per degree for formerly used types).

★ SIMPLIFIED TEMPERATURE CONTROL

Use of these V-cut crystals has several important advantages. In addition to the improvement in frequency stability, the necessary temperature control devices are markedly simplified. The old unwieldy heater-oven with its complicated structure and delicately adjusted thermostats is completely done away with. In its place is a small unit (approximately 2" square by 4" deep) which is mounted on a tube-base. This unit, complete in itself, contains the crystal, mounted in recessed plates, a simple bi-metallic thermostat, and a small heater-winding. Such heat insulation

omy, since it effectively minimizes the possibility of early obsolescence on account of increasing quality standards. The new engineering developments incorporated in this transmitter have a similar effect. The zero-coefficient crystals, for instance, by providing frequency stability some ten times better than present requirements, fully allow for likely future requirements as to stability. By thus insuring against obsolescence, rapid depreciation is prevented and the cost of the transmitter may be liquidated over a much greater number of years of useful life.

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To the low first cost and low depreciation cost of this transmitter may be added a third distinct economy—namely, low operating cost. In this respect, in fact, the Type 100-E Transmitter is in a class by itself—for its operating cost is only a fraction of that of any comparable transmitter. Several factors contribute to this: first, the power consumption—approximately 1125 watts—is extremely low; second, the inexpensive tubes used greatly reduce tube costs; third, the RCA guarantee against defective parts and workmanship greatly reduces replacements; and fourth, the simplified construction makes all servicing easy. The result is an equipment simple, reliable, and economical to operate.

★ ECONOMICAL OPERATION

as is necessary is provided by the double metal walls of the unit. The thermostat, which is enclosed in a gas-filled glass tube, is foolproof and requires no adjusting. It maintains a box temperature of 60° C, to within one degree. Thus, frequency deviations are held to a maximum of a few cycles, tedious thermostat adjustments are completely eliminated, and reliability is greatly increased. Worthy of note, and of importance as assurance of the quality and trustworthiness of this new crystal unit, is the fact that it has been adopted as standard for all RCA Broadcast Transmitters from 100 watts to 500,000 watts.



EXCITER UNIT

In addition to the crystal-controlled oscillator—an RCA-10 Radiotron in a Hartley circuit—the exciter unit includes the intermediate and modulated amplifier stages. A screen-grid type RCA-865 Radiotron is employed in the former, and in the latter, one of the new-type RCA-800 Radiotrons—another of the new features of this transmitter. Tuning controls are conveniently located on the front panel just beneath the corresponding plate meters. The fourth control (see front view of the transmitter) is that of the inductive coupling to the power amplifier. All three stages are self-biased while plate voltages are supplied by a rectifier which employs two RCA-83 full-wave rectifier tubes. This rectifier, as noted before, is an integral part of the exciter unit.



BUILT-IN SPEECH AMPLIFIER

The modulator unit contains, in addition to the modulator stage proper, an input audio stage and a driver audio stage. This built-in two-stage speech amplifier, a feature not provided in many small transmitters, makes it possible to operate the transmitter from a relatively low-level input—only minus 6 db. being required for 100% modulation. The input transformer is designed to couple a 500-ohm line to the grid of the RCA-56 Radiotron employed in the first audio stage. The output of this stage is transformer-coupled to a pair of RCA-45 Radiotrons operating as a push-pull Class A driver stage. Operation of this stage Class A insures the well-regulated excitation necessary to correctly drive the Class B modulators.



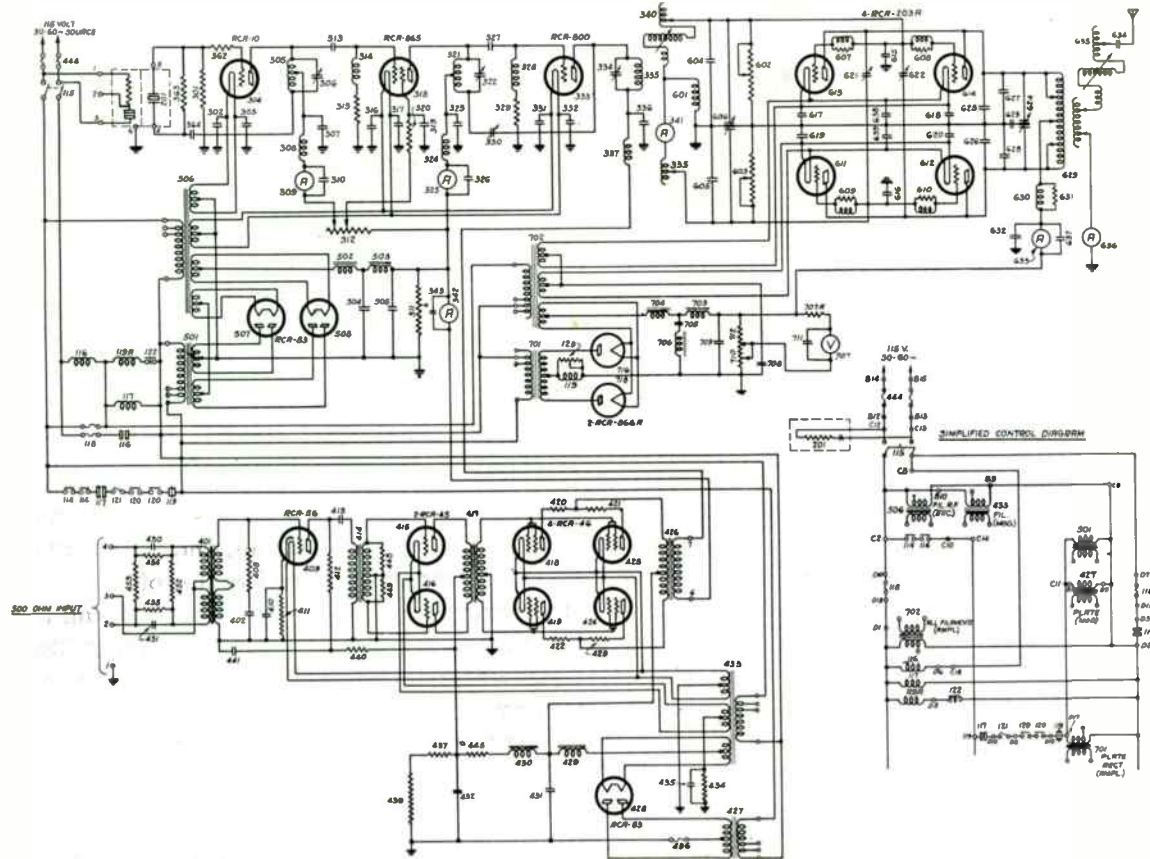
CLASS B MODULATING SYSTEM

The modulator stage employs four RCA-46 Radiotrons operating as a Class B modulator. They furnish the necessary power to completely modulate the output of the RCA-800 stage of the exciter unit. This arrangement is identical to the Class B modulating systems used in all of the new high-power RCA broadcast transmitters, including the 500,000-watt transmitter recently installed at WLW. The high efficiency, low distortion and general satisfactoriness of this type of modulation are now well known to all broadcast engineers. Its use in the Type 100-E Transmitter—in contrast to the cheaper modulating arrangements generally used in low-power transmitters—is another evidence of the quality design emphasized throughout this transmitter. Plate and bias voltages for the audio and modulator stages are supplied by a full-wave rectifier employing an RCA-83 Radiotron. This rectifier is an integral part of the modulator-unit chassis.



CONSERVATIVELY- RATED POWER AMPLIFIER

The modulated output of the RCA-800 stage is inductively coupled to the grids of the linear power-amplifier stage. This latter consists of four RCA-203-A Radiotrons in a balanced push-pull circuit. The conservative rating of the tubes used is noteworthy—first, because it insures the 400 watts of instantaneous power required on peaks of 100% modulation, and second, because such operation insures long life for these tubes, which, except for the very small tubes, complete the transmitter's tube complement. As a matter of fact, the RCA-203-A is noted among engineers for its sturdiness and long life—an important factor in cutting operating costs. These tubes are self-biased while plate voltage is supplied by a full-wave rectifier employing two RCA-866-A Radiotrons.



SPECIFICATIONS OF THE TYPE 100-E BROADCAST TRANSMITTER

Output power 100 watts
 Modulation capability 100%
 Radio frequency range 550 - 1500 KC.
 Radio frequency stability ± 10 cycles
 Audio frequency response
 (± 1 db.) 30 - 10,000 cycles
 Audio harmonic distortion (at 100% mod.) 4% RMS

Background noise-level (unweighted).....55 db.
 Radio frequency harmonics05%
 Power supply 105/125 volts, 50/60 cycles
 Power consumption 1125 watts
 Dimensions (over all) 55" x 24" x 20"
 Weight (unpacked) 450 lbs.
 Audio input for 100% modulation -6 db.

FLEXIBLE ANTENNA COUPLING

The power amplifier is intended to be inductively coupled to the antenna through the proper loading coil or series condenser. Sufficient inductive or capacitive reactance is provided to allow use of an antenna of from 45 to 140 electrical degrees in length. Or if desired, the transmitter may be coupled to a 500 ohm transmission-line, although the equipment is primarily designed for direct coupling to the antenna.

AUTOMATIC CONTROL CIRCUITS

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 The Type 100-E Transmitter is designed to operate from a 105-125 volt—single phase—50-60-cycle power supply. Plate and filament switches control power supply to the modulator and exciter units and to the power amplifier. Time delay and overload relays are provided in these control circuits so that the equipment is fully protected against failures during operation and against improper sequence of starting. The sequencing relays are automatic in operation so that operation may be either manual or automatic. In a similar manner, the station personnel is protected by automatic interlocks which, placed on each door, remove all high voltages whenever the doors are opened.

-5-
160 70
140 70
180/720
-400

230
200
1

THESE 25 FEATURES OF THE TYPE **100-E**

TRANSMITTER

Make it the best value ever offered to small stations

- Uniform (± 1 db.) response 30 to 10,000 cycles
- + Audio distortion less than 4% at 100% modulation
- + Background noise-level 55 db. down (unweighted)
- + Frequency stability better than ± 10 cycles
- + R-F harmonics less than .05% of fundamental

= Unsurpassed "high-fidelity" performance

- Zero-temperature-coefficient crystals
- + Class B modulation system
- + Automatic time-delay relays for starting
- + New unit-chassis type assembly
- + Other new engineering developments

= Most up-to-date transmitter available

- Lowest initial transmitter cost
- + Absolutely minimum installation cost
- + Completeness of the self-contained unit
- + Performance insuring against early obsolescence
- + Engineering which forestalls rapid depreciation

= Least expensive transmitter, first and last

- Inexpensive type tubes throughout
- + Simplified design, fewer components
- + Extremely low power-consumption
- + Guarantee against defective material
- + New minimum of servicing

= Lowest operating cost of any transmitter

- Assurance of continuing dependability
- + Modern appearance of equipment
- + Highly favorable audience reaction
- + Adequate patent protection
- + Prestige of an RCA quality transmitter

= Complete and lasting satisfaction

180 $\sqrt{1100}$ 7

2800
600

2200
180

176000

239000

8 / 396000

32
76
72
40





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