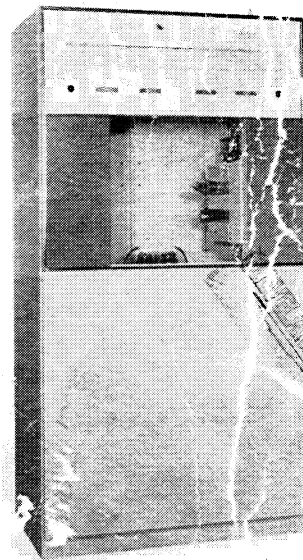
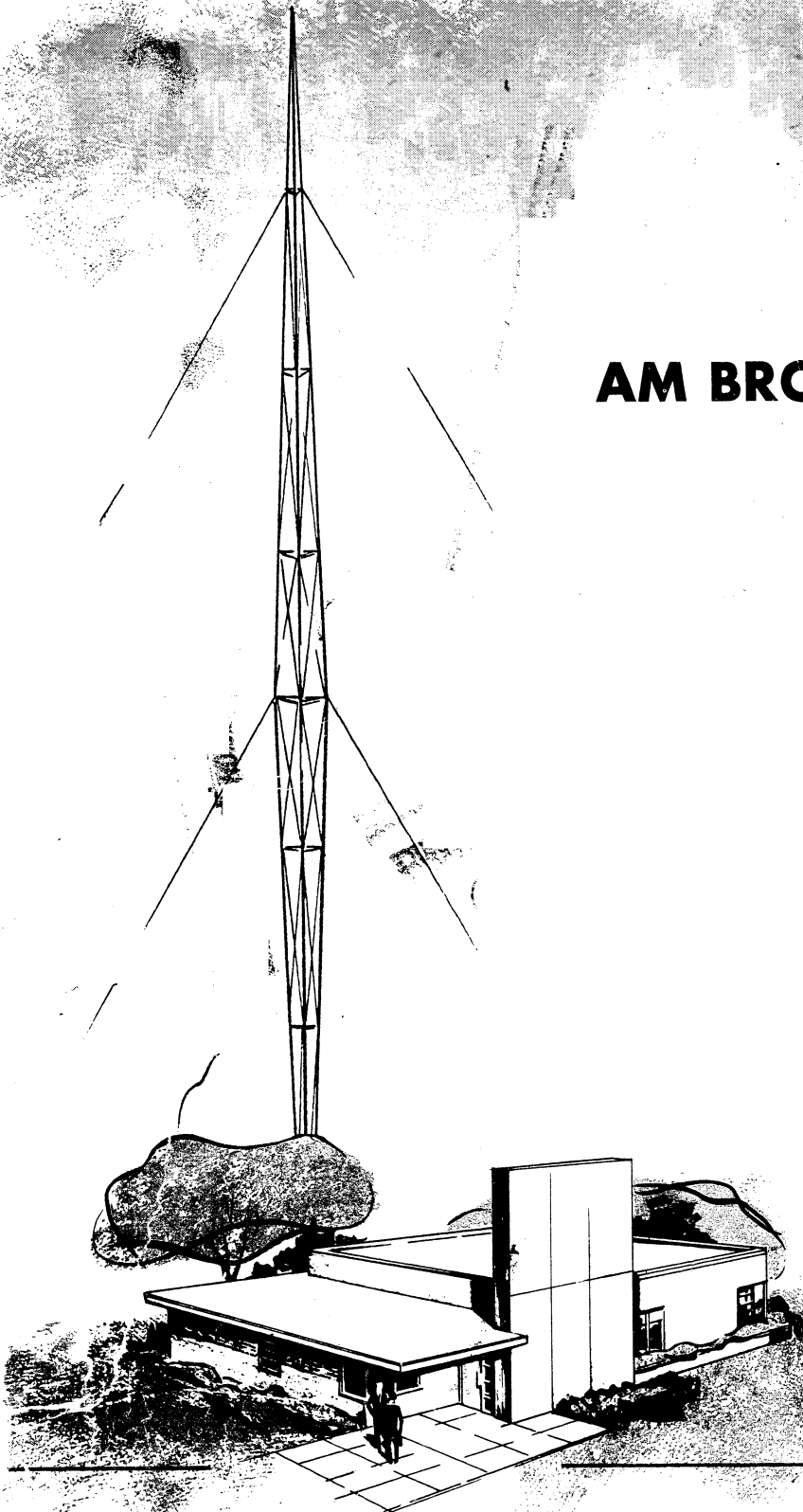


Collins

INSTRUCTION BOOK

AM BROADCAST TRANSMITTER

20V-3



— COLLINS RADIO COMPANY —

GUARANTEE

The equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins instructions.
- (b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

No other warranties, expressed or implied, shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause.

HOW TO RETURN MATERIAL OR EQUIPMENT. If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in the handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Service Division
Cedar Rapids, Iowa

INFORMATION NEEDED:

- (A) Type number, name and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins number (and name) of unit subassemblies involved in trouble,
- (J) Remarks

HOW TO ORDER REPLACEMENT PARTS. When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

ADDRESS:

Collins Radio Company
Service Division
Cedar Rapids, Iowa

INFORMATION NEEDED:

- (A) Quantity required
- (B) Collins part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins type number, name and serial number of principal equipment
- (E) Unit subassembly number (where applicable)

AM BROADCAST TRANSMITTER 20V-3

INSTRUCTION BOOK

1 SEPTEMBER 1961

523-0146-00

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1961

CEDAR RAPIDS, IOWA, U.S.A.

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SECTION I
General Description

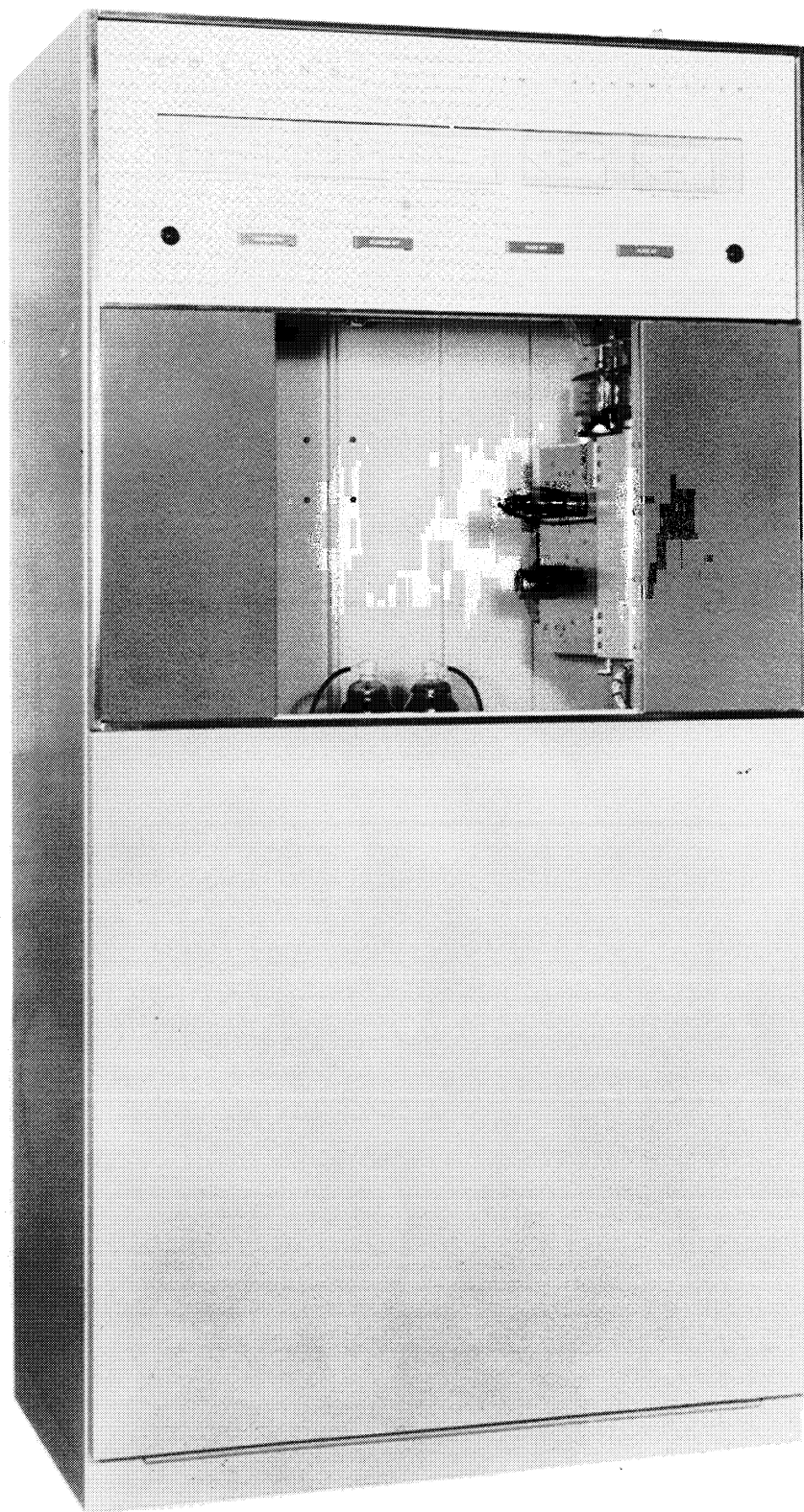


Figure 1-1. AM Broadcast Transmitter 20V-3

SECTION I

GENERAL DESCRIPTION

1.1 PURPOSE OF INSTRUCTION BOOK.

This instruction book is a guide for installing, operating, and maintaining Collins AM Broadcast Transmitter 20V-3.

1.2 PURPOSE OF EQUIPMENT.

Collins AM Broadcast Transmitter 20V-3 is used for standard or high-frequency AM broadcast service on a single frequency in the range from 550 kilocycles to 12 megacycles with an output power of 250, 500, or 1000 watts.

1.3 DESCRIPTION OF EQUIPMENT.

1.3.1 PHYSICAL DESCRIPTION.

AM Broadcast Transmitter 20V-3, shown in figure 1-1, weighs about 1160 pounds and is 38 inches wide, 76 inches high, and 27-1/2 inches deep. It uses 14 tubes, all of which are visible through a large window in the front of the cabinet. All transmitter operating controls are located under two access doors, one on each side of the front window. The on-off controls and five monitoring meters are located near the top of the transmitter front panel. The meters may be observed easily while operating the tuning controls. The bottom front of the transmitter cabinet is removable to allow access to the power input terminals, power input circuit breakers, and control relays.

Two large doors at the upper rear of the cabinet (see figure 1-2) allow access to the upper part of the transmitter for servicing and maintenance. The lower half of the transmitter is covered by a removable panel that contains a ventilating fan and a permanent-type air filter. There are both electrical and mechanical interlocks on each of the rear doors to protect personnel. Electrical interlocks of the split V-type open the primary circuits of the high- and low-voltage transformers whenever the rear doors or lower rear panel are opened. The mechanical interlocks close, grounding the high-voltage circuits, after the electrical interlocks have opened the primary circuits.

Inside the transmitter cabinet, transformers and other heavy components are mounted at the bottom of the cabinet. Audio and r-f circuits are in separate chassis on opposite sides of the cabinet. These two chassis swing out toward the center of the cabinet so that all components in the chassis may be reached for easy maintenance. The power amplifier plate circuit and r-f output network are housed in a single, shielded compartment that is suspended from the top of the

cabinet. The entire back panel of this r-f compartment is removable, providing access to all components in the compartment.

The power supplies are mounted on a shelf that is about midway between the top and bottom of the cabinet. This entire shelf tilts forward to expose all components on the bottom of the power supply chassis.

Ventilating air for the transmitter is drawn through a cleanable air filter at the rear of the cabinet by a low-speed, high-volume fan. The cooling air is exhausted through a shielded opening in the top of the cabinet. Individual high-speed blowers supply cooling air directly to the power amplifier and modulator tubes.

1.3.2 ELECTRICAL DESCRIPTION.

The power amplifier tubes in the 20V-3 are two 4-400A tetrodes connected in parallel. The transmitter uses high-level plate modulation of the power amplifier. The modulator tubes also are two 4-400A tetrodes connected in a push-pull class AB₁ modulator circuit.

The r-f carrier frequency is generated by a crystal oscillator that uses a low-temperature coefficient crystal. This type of crystal eliminates the need for a crystal oven and its associated thermostats and control relays. Two crystals may be mounted on the r-f chassis, so that one will always be available as a standby. Either of the two crystals may be selected by a switch on the front panel of the transmitter.

The r-f output network is a pi-section followed by an L-section. This network will feed into impedances between 50 and 72 ohms. (Other output impedance values are available on special order.) The tubes and r-f output circuit components are safeguarded against short circuits or flashover in the transmitter f-f output circuit by an arc-suppression circuit. This circuit interrupts all plate voltages in the event of arc-over in the output circuit, and returns the transmitter to the air when the arc is extinguished.

The transmitter output power may be switched from high to low level, or vice versa, while the transmitter is on the air by a power change switch under the front panel access doors.

Provisions are made in the transmitter for connection of remote on-off controls, on-off indicators, plate current and plate voltage indicators, and monitor meters. Outputs are provided also for frequency, modulation, and audio monitoring.

SECTION I
General Description

There are three separate power supplies in AM Broadcast Transmitter 20V-3 for high voltage, low voltage, and bias. Overload protection is provided by magnetically operated circuit breakers, by fuses in the primaries of the filament, low-voltage, and bias transformers, and by individual overload relays in the cathode circuits of the power amplifier and modulator. A thermal time delay circuit in the transmitter prevents application of plate voltage before the filaments reach operating temperature.

A more detailed description of the operation of the 20V-3 is contained in section IV of this instruction book.

1.4 EQUIPMENT SUPPLIED.

Table 1-1 lists equipment supplied as part of AM Broadcast Transmitter 20V-3. This basic transmitter is stocked with r-f output circuit components for operation in the frequency range from 1.05 to 1.5 megacycles. Transmitters that are to operate outside this range are specially reworked at the factory. Refer to section II for the Collins part numbers of circuit components for use at other frequencies in the standard broadcast band.

TABLE 1-1
EQUIPMENT SUPPLIED

EQUIPMENT	COLLINS PART NUMBER
AM Broadcast Transmitter 20V-3	522-2480-00

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED.

Table 1-2 lists equipment required for the operation of AM Broadcast Transmitter 20V-3, but not supplied as part of the transmitter.

TABLE 1-2
EQUIPMENT REQUIRED BUT NOT SUPPLIED

EQUIPMENT	COLLINS PART NUMBER
Tube kit	540-1215-001
Crystals	See table 2-2, section II.

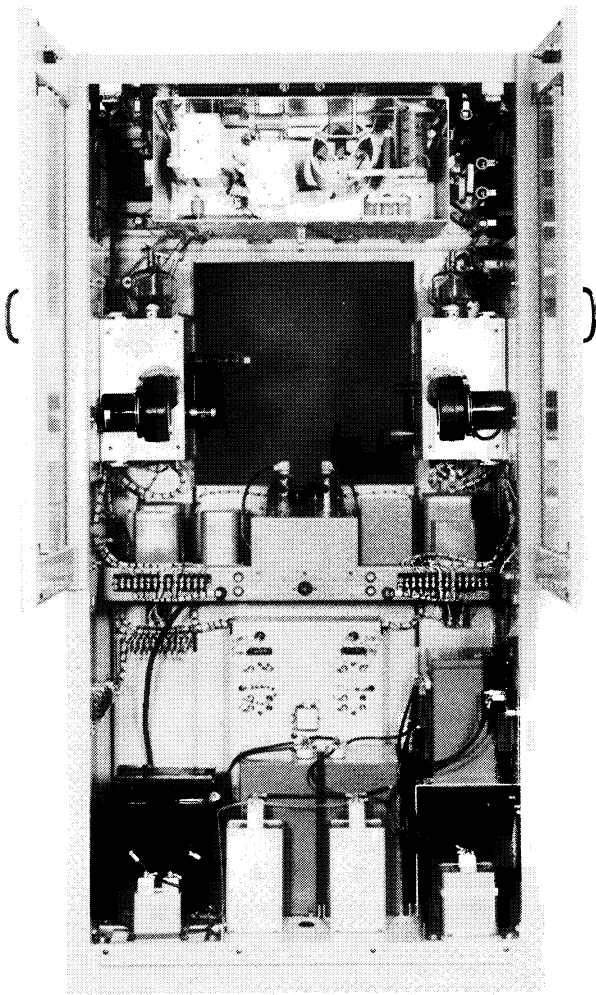


Figure 1-2. AM Broadcast Transmitter 20V-3,
Rear View with Lower Panel Removed

1.6 ACCESSORY EQUIPMENT.

Table 1-3 lists accessory equipment that may be used with the 20V-3.

TABLE 1-3
ACCESSORY EQUIPMENT

EQUIPMENT	COLLINS PART NUMBER
Type 512B-2 Impedance Matching Unit (For con- verting 50- or 75-ohm unbalanced output to 300- or 2600-ohm balanced output, 2 to 12 megacycles)	522-0113-005

1.7 EQUIPMENT SPECIFICATIONS.

1.7.1 MECHANICAL.

Weight	1160 pounds maximum.
Size	38 inches wide, 76 inches high, 27-1/2 inches deep.
Ventilation	One ventilating fan, two blowers.
Ambient temperature range.	+15°C (59°F) to +45°C (113°F).
Ambient humidity range	0- to 95-percent relative humidity.
Altitude	0 to 6000 feet.

1.7.2 ELECTRICAL.

Power source	200 to 250 volts, 50 to 60 cycle, single-phase.
Maximum power requirements	4.15 kw at 83-percent power factor for 1000-watt output power with 100-percent modulation.
Power output	250, 500, or 1000 watts.
Output impedance	50 to 72 ohms, unbalanced. Other output impedances available on special order. Accessory units available for conversion to balanced output.
Frequency range	0.55 to 12 megacycles.
Oscillator	Crystal-controlled, high-stability type using a plated, AT cut, nontemperature-controlled crystal.
Broadcast band (0.55 to 1.6 megacycles) frequency stability.	Better than ±10 cps over an ambient temperature range from +15°C (59°F) to +45°C (113°F) and line-voltage variations of ±15 percent.
High-frequency band (1.6 to 12 megacycles) frequency stability.	Better than ±0.005 percent over an ambient temperature range from +15°C (59°F) to +45°C (113°F) and line-voltage variations of ±15 percent.
Harmonic and spurious radiation	All harmonic and spurious frequencies at least 45 db below carrier level. Additional attenuation furnished by external antenna-matching network or harmonic filter.
Audio input impedance	600 or 150 ohms, balanced.
Audio input level	+10 dbm ±2 db.
Audio frequency response	±2 db from 50 to 10,000 cps, measured at 75-percent modulation.
Audio frequency distortion	Less than 3 percent over range from 50 to 7500 cps at any modulation level up to 95 percent.
Carrier shift	Less than 3 percent from 0- to 100-percent modulation.
Noise level	At least 60 db below 100-percent modulation at all frequencies to 30,000 cps.

SECTION I
General Description

1.8 TUBE COMPLEMENT.

Table 1-4 lists type and function of all tubes used in AM Broadcast Transmitter 20V-3.

TABLE 1-4
TUBE COMPLEMENT

QUANTITY	TYPE	FUNCTION
1	6AU6	Crystal oscillator
1	6SJ7	Buffer amplifier

TABLE 1-4
TUBE COMPLEMENT (Cont)

QUANTITY	TYPE	FUNCTION
1	807	R-f driver
2	4-400A	Power amplifier
2	6SJ7	Audio driver
2	4-400A	Modulator
1	5U4G	Bias rectifier
2	866A	Low-voltage rectifier
2	575A	High-voltage rectifier