COLLINS BROADCAST EQUIPMENT

COLLINS

CREATIVE LEADER IN COMMUNICATION

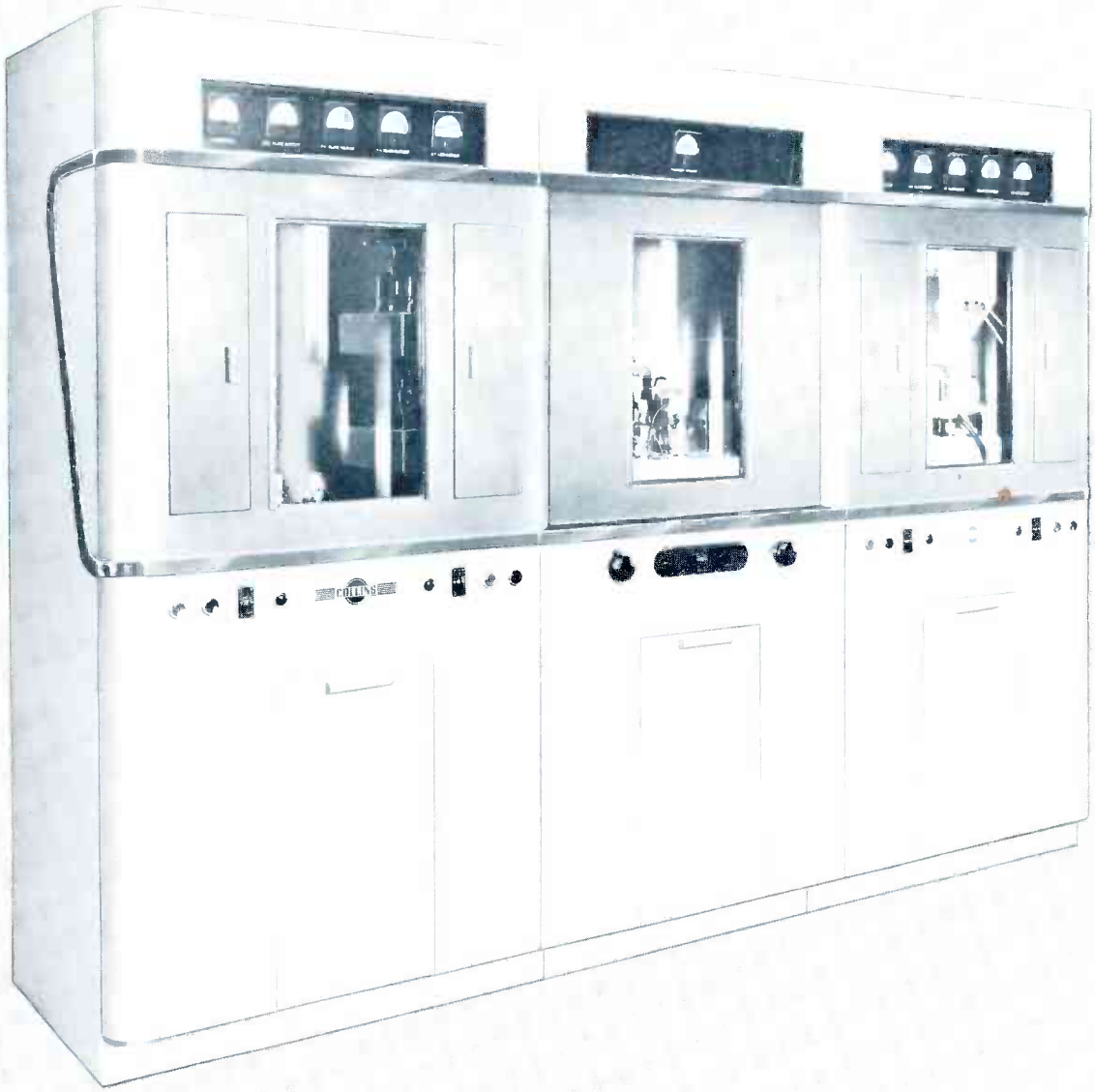
FROM MIKE TO ANTENNA

This catalog is prepared for your convenience in selecting broadcasting equipment that will best meet your requirements. The transmitting and speech equipment shown and described is engineered for reliability, high fidelity, economy and convenient operation.

Included here are the latest models of the complete broadcast line that has earned Collins its unparalleled reputation in the field. Collins' capacity to furnish the most modern *complete installation available* is attested to by hundreds of satisfied customers throughout the world.

We will be happy to work with you on the overall specifications of your individualized equipment. By obtaining your full requirements from Collins, you get not only the best individual units for your purpose, but also the assurance that you have an integrated system with superior overall performance.

AM TRANSMITTERS



COLLINS 21E/M 5/10 KW BROADCAST TRANSMITTER

The 5,000 watt 21E and 10,000 watt 21M are straight-forward electrically and mechanically designed transmitters that permit operation not only in the standard broadcast band but on short wave as well. They are supplied for any frequency from 540 kilocycles to 18 megacycles. The 21E/M occupies only 21 square feet of floor space. A convenient power increase package can convert the 5kw 21E into a 10kw 21M overnight.

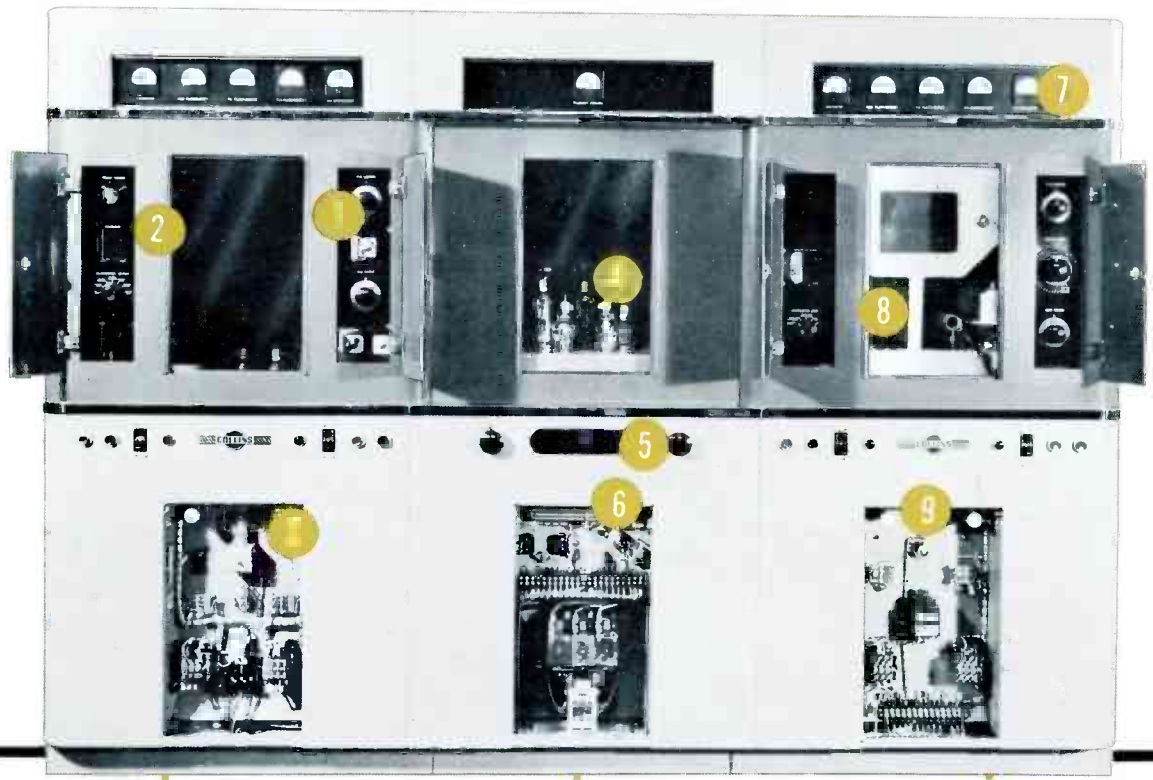
Dependability, long-life and savings in size and weight are achieved by taking advantage of the improved performance offered by modern tubes and components and the use of simplified circuitry. All transformers and reactors are of the dry type, eliminating the concrete vault required with earlier transmitters using oil-filled components.

The 21E/M is easily serviced and maintained, thus keeping lost air time to a minimum. Full view of all tubes is provided through plate glass windows and all important circuits are metered. Access to relays and contactors for inspection and adjustment may be gained while on the air by the easy removal of access covers on the front of equipment. A removable section at the top front of each cabinet exposes the meter panels for cleaning and maintenance. All other components are accessible through the rear doors or rear access panels. These doors are equipped with both ac primary interlocks and high voltage shorting switches for the protection of operating personnel.

21E/M TRANSMITTER

5/10,000 Watt AM — front view, doors off

1. Driver cabinet operating controls
2. Driver cabinet audio chassis
3. Driver cabinet relay enclosure
4. Power supply cabinet rectifier tubes
5. Power supply cabinet operating controls
6. Power supply cabinet relay enclosure
7. Power amplifier cabinet meters
8. Power amplifier modulators
9. Power amplifier relay enclosure

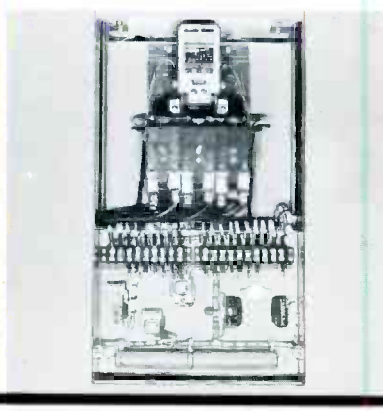


DRIVER CABINET AUDIO CHASSIS

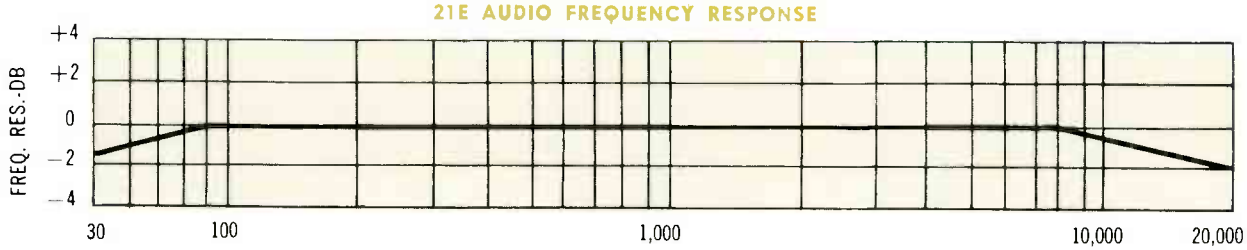
MODULATOR TUBES

POWER RECTIFIERS

RELAY ENCLOSURE



21E AUDIO FREQUENCY RESPONSE



OPERATING CONTROLS

The control circuits feature flexibility, operating convenience and optimum equipment protection. Pushbutton control of filament and plate power is provided. If desired, the pushbutton and indicating light circuits may be extended to a remote position.

Automatic sequencing is supplied; pressing the final amplifier plate "on" button causes all filament, bias and plate voltages to be applied in correct sequence and with the proper time delays. Pressing the filament "off" button instantly removes all power except that applied to the blower motor, which continues to run for a period adjustable up to 5 minutes, and then shuts off.

AUDIO

The input to the audio system consists of a terminating pad that feeds the primary of the audio input transformer. The first audio stage employs pentode-connected 6SJ7 tubes in a push-pull Class A amplifier. Type 4-125A tubes are used in the push-pull Class A audio driver. The 4-125A audio drivers are resistance coupled to the grids of a pair of 3X3000A1, push-pull, Class AB_1 modulator tubes. Approximately 12 db of feedback is provided from plates of the modulator tubes to grids of the first audio stage.

THERMAL TIME DELAY

In keeping with the modern circuitry of these transmitters, a thermal time-delay circuit is employed. The time-versus-temperature cooling curve of this circuit closely approximates the cooling characteristics of the rectifier and amplifier filaments, thereby giving the delay circuit the ability to select the proper time interval after a carrier interruption of any given length. The cold-start delay period can be adjusted for any value between 15 and 45 seconds. However, when a short carrier interruption occurs, the delay circuit allows only enough time for the filaments to reach operating temperature before the transmitter can be returned to the air. After an instantaneous power interruption the carrier can be returned to the air immediately.

METERING

Meter panels are tilted at an angle for ease of operation and observation of transmitter performance. The following circuits are metered:

RF line current, final amplifier plate voltage, final amplifier plate current, modulator plate current, final amplifier grid current, back modulator cathode current, front modulator cathode current, back final amplifier cathode current, front final amplifier cathode current, RF driver line current, RF driver plate voltage, RF driver plate current, audio driver cathode current, RF driver grid current, 807 cathode current, 807 grid current, 6SJ7 cathode current, 6SJ7 grid current, crystal oscillator cathode current, audio amplifier cathode current and ac filament primary voltage.

The top panel on the front of each cabinet can be removed by releasing two screws.

HIGH LEVEL MODULATION

Class AB_1 high level modulation is used with Eimac 3X3000A1 tubes. These tubes are physically interchangeable with the 3X2500A3 tubes used in the final amplifier but have performance characteristics ideal for audio use. With Class AB_1 operation, the audio driver transformer and its attendant problems are eliminated.

OVERLOAD RELAYS

Adjustable overload relays are furnished for the RF driver, audio driver, power amplifier and modulator stages. An overload in the RF driver or audio driver stages removes all plate voltages. An overload in the power amplifier or modulator stages causes plate power to be removed and reapplied. If the overload has cleared, the equipment then remains on the air in normal operation. However, if the overload persists or if a second overload occurs within a four-second period, the plate voltage is removed and must be reapplied manually.

POWER SUPPLIES

Plate voltage for the modulator and final amplifier is furnished by a common high voltage supply. Bias for the modulator and final amplifier is provided by a common low voltage supply. Plate voltage for the audio driver and RF driver is supplied by a common power supply. A separate low voltage supply feeds the audio driver screens as well as the plates and screens of the other RF and audio tubes. A second bias supply provides approximately 100 volts for the audio driver and RF driver bias and lesser voltage for the other biasing throughout the transmitter.

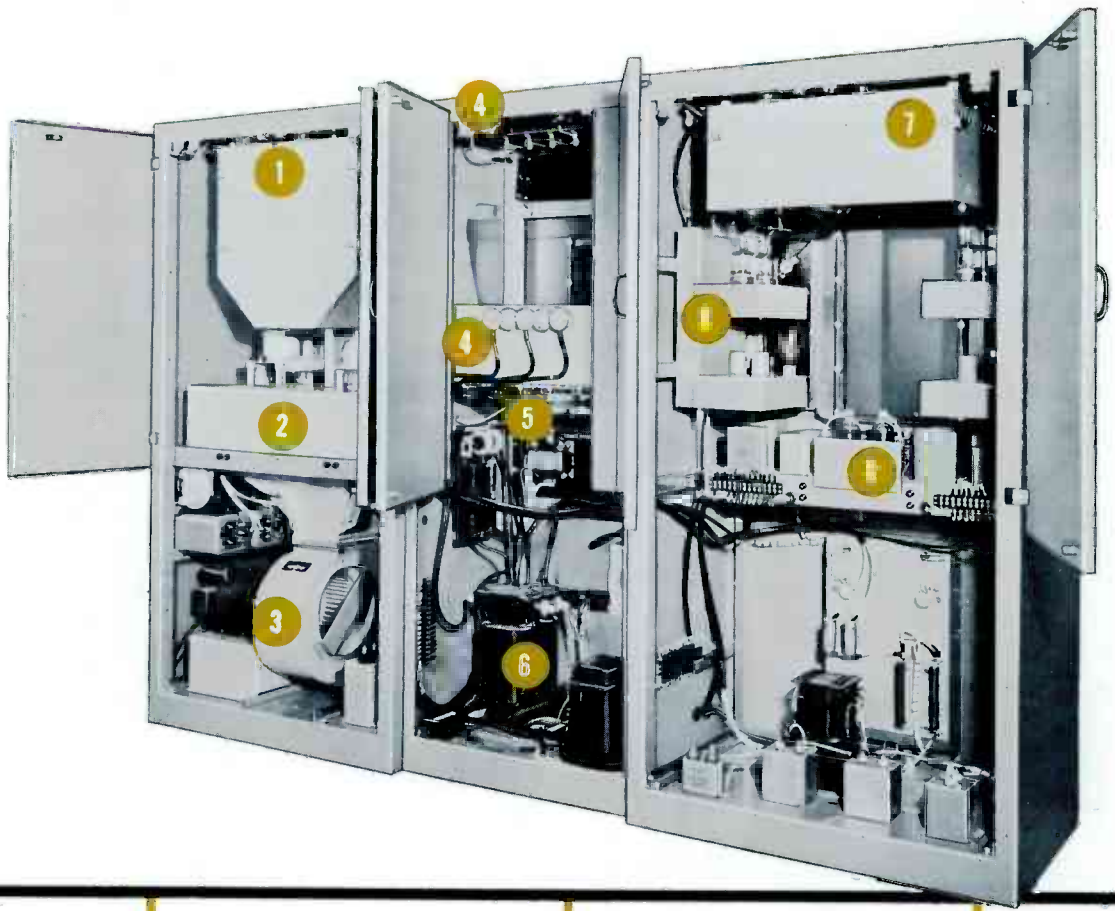
VOLTAGE CONTROL

Filament voltage adjustment control, high-low power control, and a high voltage breaker control

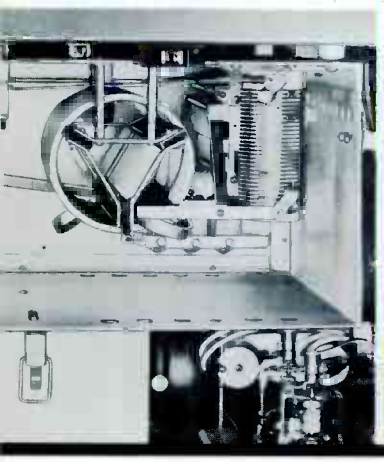
21E/M TRANSMITTER

Rear view — doors off

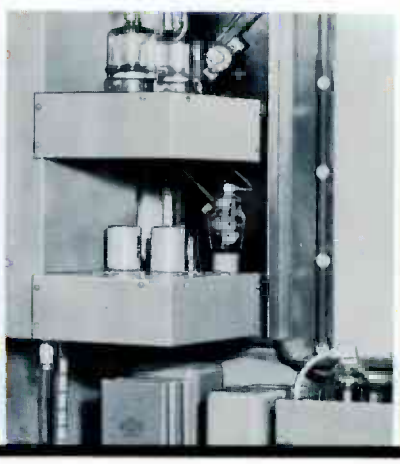
1. Power amplifier output network
2. 21M power amplifier RF chassis
3. Power amplifier cabinet blower
4. Power amplifier cabinet interlocks
5. Power supply cabinet rectifier chassis
6. Power supply cabinet modulation transformer
7. Driver cabinet output network
8. Driver cabinet RF chassis
9. Driver cabinet low voltage power supply



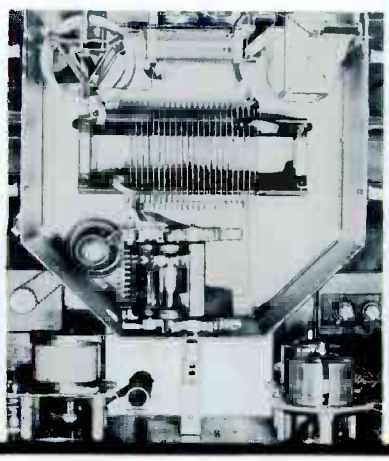
DRIVER OUTPUT NETWORK



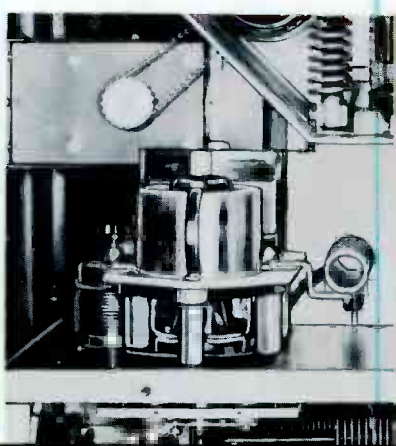
DRIVER RF CHASSIS



POWER AMPLIFIER OUTPUT NETWORK



21M POWER AMPLIFIER RF CHASSIS



are located on the front of the center cabinet just below the window. The magnetic high voltage breaker removes the primary voltage automatically upon a heavy overload in the transformer primary circuit and can be reset immediately after the overload is cleared.

RELAY ACCESSIBILITY

By removing the clip-in flush panels on the lower front of the transmitter cabinets, power circuit equipment is readily accessible. All controls are available for adjustment while the transmitter is in operation.

SHIELDING

The entire RF network is double shielded to reduce spurious radiation. RF circuits are completely independent of the cabinet proper. Quality materials and components assure long trouble-free life.

FREQUENCY CONTROL

As a result of major advances in crystal stability and oscillator design, the 21E/M Transmitter has eliminated the use of a crystal oven and its associated thermostats, relays and other controls. A highly perfected oscillator design — in conjunction with extremely stable, low temperature coefficient crystals — has resulted in exceptionally good frequency stability. There are provisions for mounting two crystals on the RF chassis, with one of the two always available in a stand-by condition. Crystals are easily selected by means of the crystal selector switch behind the right hand control panel.

All RF circuits of the 21E/M are straightforward and trouble-free. The oscillator, buffer and RF driver plate circuits are contained within shielded plug-in units located behind the right front access door of the driver cabinet. For frequencies in the AM broadcast band, the oscillator employs a resistive load. Because the 21E/M is also available for high frequency applications, provisions are included for replacing the resistor with a tuned tank circuit for frequency doubling. A frequency monitor connection is brought out from the grid circuit of the driver amplifier.

The RF output network consists of a pi section followed by an L section and is designed to feed into impedances between 50 and 72* ohms. Harmonics are greatly attenuated in this network. There is a minimum of fundamental frequency loss between the power amplifier and transmission line.

*Other impedances are available on special order.

DRIVER POWER SUPPLIES

The driver unit has separate power supplies for high voltage, low voltage and bias. The high voltage supply employs two type 872A half-wave mercury vapor rectifiers in a single-phase, full-wave circuit. It supplies dc voltage for the plates of the audio drivers and the plates and screens of the RF driver tubes.

The low voltage supply uses two type 866A half-wave mercury vapor rectifiers in a single-phase full-wave circuit to provide dc voltage for plates and screens of the low power stages and for screens of the audio driver tubes. The bias supply employs a 5U4G high vacuum rectifier in a single-phase, full-wave circuit. It supplies bias to the 807 amplifier, audio driver, and RF driver amplifier tubes, and dc voltage for the arc-suppression circuit.

OUTPUT NETWORK

In the RF output network of the 21E/M, a high degree of harmonic attenuation has been accomplished and the network loss between the final stage and the transmission line has been minimized. The entire RF network is double shielded to reduce spurious radiation and all RF circuits are completely independent of the cabinet proper.

ARC PROTECTION

Another feature is the arc-suppression circuit, which protects the final amplifier and RF driver tank circuits against arcs to ground due to lightning or other causes. Should such an arc occur, this circuit removes plate power until the arc is extinguished, then returns the equipment to normal operation.

COOLING SYSTEM

Cabinet ventilation in the final amplifier is obtained through a blower in the base of the cabinet, providing quiet, trouble-free cooling for all components and tubes. The blower produces a high capacity at a quiet, low speed and continues to run for an adjustable period of up to five minutes after power removal. Ventilation in the other two cabinets is provided by means of circulating fans.

21E/M TRANSMITTER

Specifications — Complete schematic center foldout

FREQUENCY RANGE: 540 — 1600 kc standard, frequencies to 18 mc available

POWER OUTPUT: 21E — 5500/1100 Watts
5500/550 Watts on order

21M — 10,600/5500 Watts
— 10,600/1100 Watts on order

FREQUENCY STABILITY: Better than ±5 cps (Typical — Better than ±2 cps)

AUDIO FREQUENCY RESPONSE: Within ±1.5 db from 30 to 12,000 cps (Typical — Within ±1.5 db from 30 to 15,000 cps)

DISTORTION: Less than 3% from 50 to 10,000 cps for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000)

RESIDUAL NOISE LEVEL: 60 db or more below 100% modulation

CARRIER SHIFT: Less than 3% (Typical value less than 2%)

RF OUTPUT IMPEDANCE: 40/600 ohms on order

AUDIO INPUT IMPEDANCE: 150/600 ohms

AUDIO INPUT LEVEL: +10 dbm, ±2 db, 600 ohms input with built-in input pad. With the input pad removed, −5 dbm is sufficient for 100% modulation. 150 ohm connection of input transformer is possible when desired.

AMBIENT TEMPERATURE RANGE: Up to 45° C

ALTITUDE RANGE: Sea level to 6,000 feet

POWER SOURCE: 208/230 v, 3 phase 50/60 cps; 50 cps on special order

WEIGHT: 21E — Approximately 2,700 lbs.
21M — Approximately 3,000 lbs.

DIMENSIONS: 105¼" wide, 76" high, 28" deep (Plate transformer extra)

POWER DEMAND:

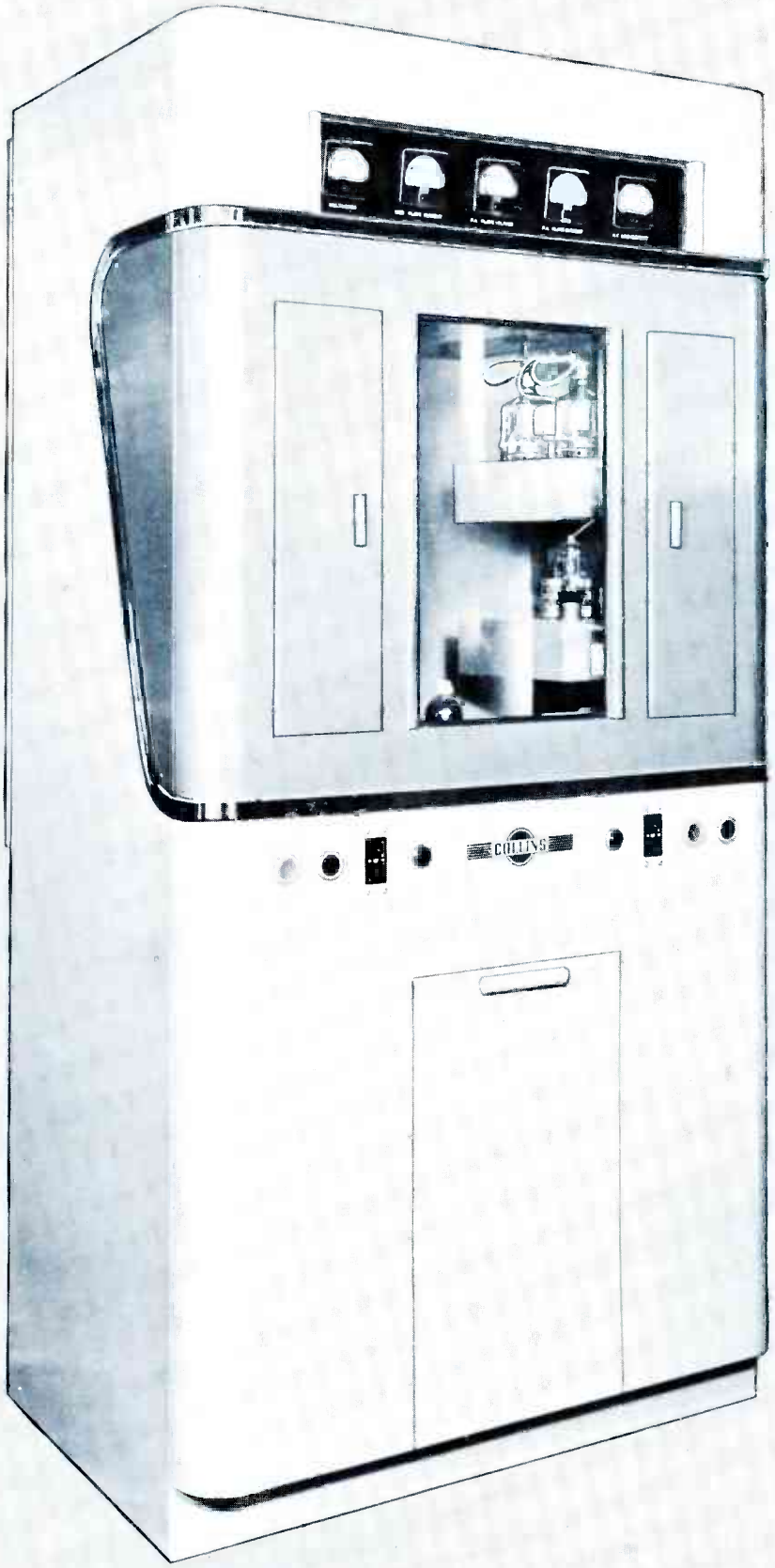
	Power (KW)	Power Factor (%)
*5,000 watts		
Output — No Modulation	12.8	90.0
— 30% Modulation	13.8	90.0
— 100% Modulation	18.5	90.0

	Power (KW)	Power Factor (%)
*10,000 watts		
Output — No Modulation	21.2	90.5
— 30% Modulation	23.6	90.1
— 100% Modulation	32.8	91.5

TUBE COMPLEMENT:

21E		21M
1 6AU6	Crystal Oscillator	1 6AU6
1 6SJ7	Buffer or Multiplier	1 6SJ7
1 807	Amplifier	1 807
2 4-125A	Driver	2 4-125A
1 3X2500A3	Final Amplifier	2 3X2500A3
2 6SJ7	Audio Amplifier	2 6SJ7
2 4-125A	Driver Amplifier	2 4-125A
2 3X3000A1	Modulator	2 3X3000A1
1 5U4G	Exciter Bias	1 5U4G
2 866A	Final Amplifier Bias	2 866A
2 866A	Low Voltage Plate	2 866A
2 872A	Intermediate Plate	2 872A
6 575A	High Voltage Plate	6 575A

*21E capable of 5,500 Watts Output, 21M capable of 10,600 watts output



COLLINS 300J-2, 550A-1, 20V-2 TRANSMITTERS

300J-2
250/100 Watt AM Transmitter

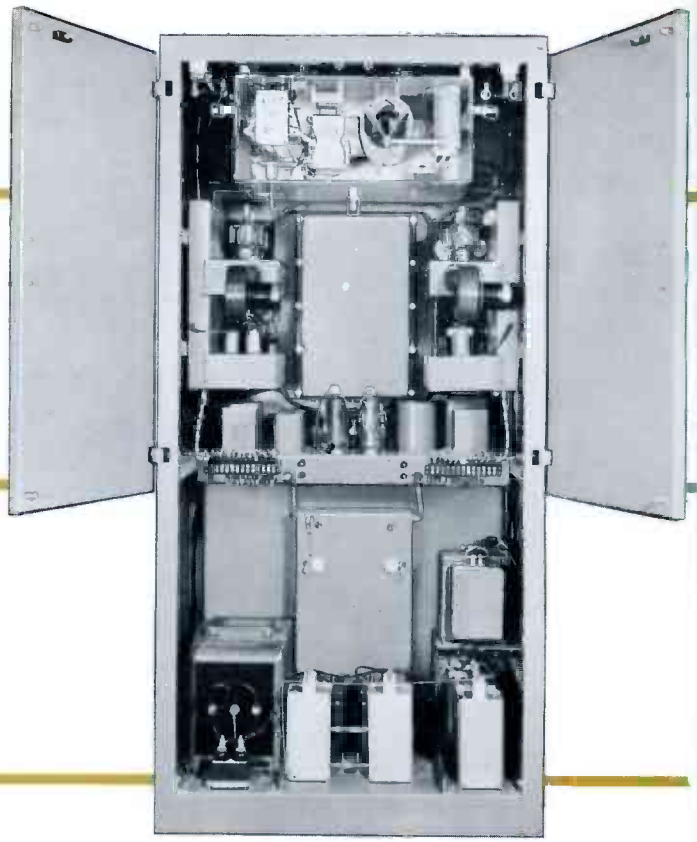
Facilities for reduction to 100 watts are standard equipment. Overnight conversion to 500/250 watts or 1,000/500 watts, with Collins power increase package.

550A-1
500/250 Watt AM Transmitter

Facilities for reduction to 250 watts are standard equipment. Overnight conversion to 1,000/500 watts, with Collins power increase package.

20V-2
1,000/500 Watt AM Transmitter

Facilities for switch-operated reduction to 500 watts are standard equipment. Reduction to 250 watts is also available on order.



Rear view, open

The 300J-2, 550A-1 and 20V-2 Transmitters are basically alike except for output power. The following text applies to all three. Differences in specifications related to power output are shown in individual specifications on page 13.

Collins 20V, 300J, 550A Transmitters give continuous high fidelity broadcast operation at any specified frequency in the band from 540 to 1600 kilocycles or in any of the high frequency broadcast bands. All materials and components are of highest quality and promote long life and trouble free operation.

OUTSTANDING FREQUENCY CONTROL

A very high percentage of transmitter frequency instability problems and oscillator failures have been directly traceable to the crystal oven, thermostat and associated equipment. Collins has, through a major advance in crystal stability and oscillator design, eliminated crystal ovens and associated thermostats, relays and circuit complexities.

Extremely stable low temperature coefficient crystals and the highly perfected oscillator produce frequency stability well within the FCC specifications of ± 20 cycles.

Two crystals are employed with one of the two always available in a standby position. A selector switch provides instant choice of either crystal while the transmitter is in operation.

HIGH EFFICIENCY TUBES — only 7 types

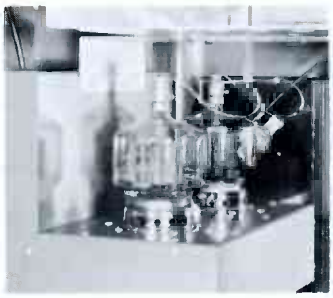
High efficiency, high gain tetrode tubes are used in both the modulator and the power amplifier. Extremely conservative operation is obtained with very low driving power, which simplifies the overall circuitry.

Oscillator Chassis

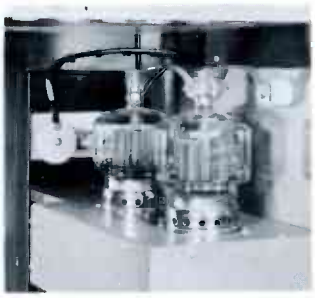
Only seven different tube types are used, resulting in fewer spares to meet FCC requirements.

4	4-400A (20V-2)	2-Final Amplifier
4	4-250A (550A-1)	2-Modulator
4	4-125A (300J-2)	
1	807	Driver Amplifier
3	6SJ7	1-Buffer Amplifier 2-Audio Amplifier
1	6AU6	Crystal Oscillator
2	872A	High Voltage Rectifier
2	866A	Low Voltage Rectifier
1	5U4G	Bias Rectifier

Cabinet ventilation is obtained through a fan on lower back panel. In addition, blowers mounted on RF and modulator chassis provide quiet, trouble-free cooling for all components and tubes.



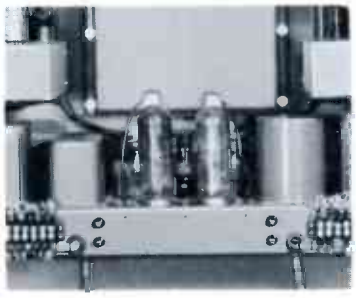
Final RF amplifier



Modulator stage

POWER SUPPLIES

One heavy duty high voltage power supply is used for the modulator and final amplifier. A separate low voltage supply feeds the modulator screen grids, as well as the plates and screen grids of the other RF and audio tubes. The bias supply provides approximately 100 volts for the modulator and power amplifier bias and lesser voltages for other biasing throughout the transmitter.



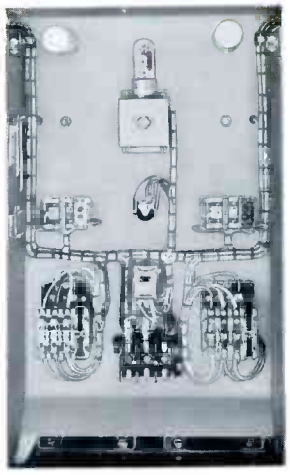
Power supply

THERMAL TIME DELAY RELAY

An instantaneous interruption of line voltage will result in no delay in returning to the air. A thermal time delay circuit automatically selects the proper delay period after short carrier interruptions. This thermal time delay relay allows return to the air at the earliest possible moment, cutting off-the-air time to a minimum number of seconds.

CONTROLS

Momentary type filament and plate power start-stop switches are located on the front of the transmitter.



Relay panel

When the filament 'On' button is pressed, the filaments, blowers, bias supply and plate time delay circuit are immediately energized. At the end of the filament warm-up cycle the filament pilot light will glow, indicating readiness for application of high and low plate voltages. Manual operation of the plate button on the front of the transmitter will energize these power supplies and the plate pilot light will glow its indication of full operating conditions.

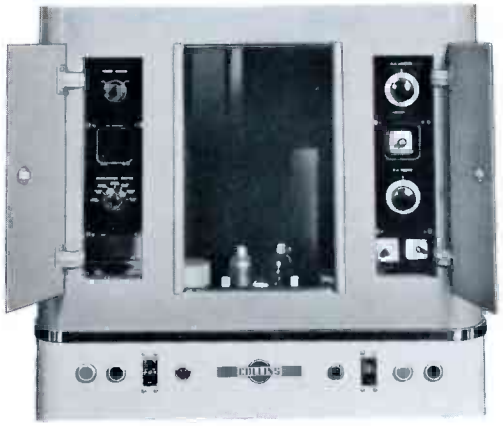
If desired, the transmitter can be started by simply pressing the plate 'On' button. Filament, bias and plate power will then be applied in correct sequence and with the proper time delay. Pressing the filament 'Off' button de-energizes all circuits.

Filament and control circuits and the high voltage plate supply are protected by toggle-type magnetically operated circuit breakers.

Individually adjustable overload relays are provided for the modulator and final amplifier stages. These relays are connected so that an overload removes plate power and the equipment must be re-energized manually.

Tuning controls on the left side of the front window: High-Low Power switch, Multimeter switch, Modulator Bias adjustments, Audio Balance control.

Tuning controls on the right side of the front window are PA Plate Tuning, PA Loading, Crystal Selector switch, Crystal Frequency Trimmers, RF Driver Audio Hum Balance and RF Final Amplifier Audio Hum Balance. All of the above controls are available for adjustment while the transmitter is in operation. AC power circuit equipment is readily accessible by removing the clip-in flush panel in the lower center of the transmitter front. No neutraliza-



Front panel controls

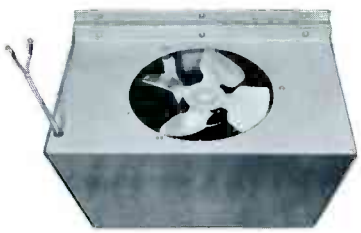
tion adjustments are necessary for operation at any frequency in the standard broadcast band.

PERSONNEL PROTECTION

Personnel protection is provided by automatic door interlocks and gravity operated shorting bars. After the interlocks have opened, the gravity bars ground the high voltage and discharge the large filter capacitors.

ARC PROTECTION

The lightning and arc-over protective kit, now supplied as standard equipment on the 20V-2, 300J-2, 550A-1 Transmitters will safeguard tubes and tank components by interrupting the high voltage and low voltage plate supply primaries in event of a short circuit or flash-over in the transmitter RF output circuit. The protective relay has one set of contacts which are normally closed. The relay coil is connected in series with the monitor coil. The end of the monitor coil that connects to the relay is isolated from ground for dc by removing the ground connection and substituting a bypass capacitor. The transmitter bias supply is used as a convenient voltage source for operation of the relay. When an arc-over occurs in the power amplifier output tuning network, due to lightning or any other cause, the ionized path produced by the RF voltage in the arc-over has a sufficiently low dc resistance to complete the relay coil circuit and energize the relay. As the relay operates, it removes high voltage from the transmitter and stops the arc-over. When the arc-over no longer exists there is no path to ground for the dc relay coil current, and the relay returns to its normal position. The relay removes arc-over conditions from the output network and returns the transmitter to normal so quickly that usually only the click of the transmitter relays will notify the operator that an arc-over has occurred.



Blower and Filter

MODULATION

A simplified modulator design and advanced circuitry has resulted in a more compact, efficient modulator. This transmitter can be safely operated at 100 per cent *sinewave* modulation without fear of breakdown. Conservative ratings, highest quality components and high efficiency cooling all contribute to the modulation capability of the transmitter. Exceptionally low audio distortion is obtained.

METERING

For ease of operation and observation of transmitter performance the following circuits are metered: RF line current, final amplifier plate current, final amplifier plate voltage, modulator cathode current, final amplifier grid current, 807 RF driver cathode current, 807 grid current, 6SJ7 buffer cathode current, 6SJ7 grid current, 6SJ7 audio driver cathode current and 6AU6 crystal oscillator cathode current. The meter panel is tilted at an angle for operating convenience.

MONITOR CONNECTIONS

Readily accessible coaxial monitor connections are provided for both modulation and frequency monitors. In addition, a direct monitor speaker connection is provided to allow on-the-air monitoring from the transmitter. A monitor amplifier system also may be fed from this termination.

OUTPUT NETWORK

A high degree of harmonic attenuation has been accomplished. The entire RF network is double shielded to reduce spurious radiation. All RF circuits are completed independent of the cabinet.

CABINET

All tubes are visible through the front window and all tuning controls are located on the front.

One vertical door, located on each side of the front window, provides access to the various controls and adjustments. The filament and plate power switches and their associated indication lights are located below these doors on the front of the transmitter.

Double doors on the rear of the cabinet provide instant access to the interior of the equipment.

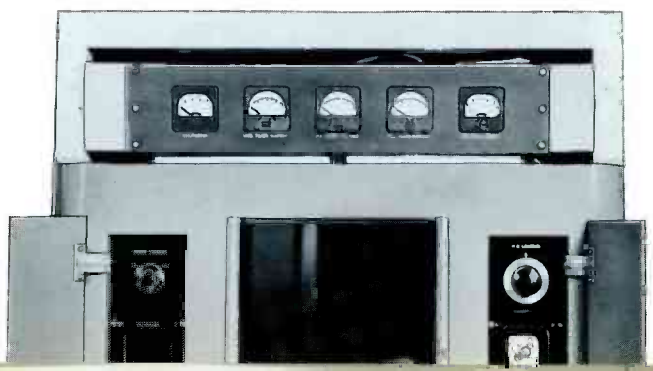
A "clip-in" panel below the window covers the compartment containing time delay circuits, plate relay and the primary terminal block.

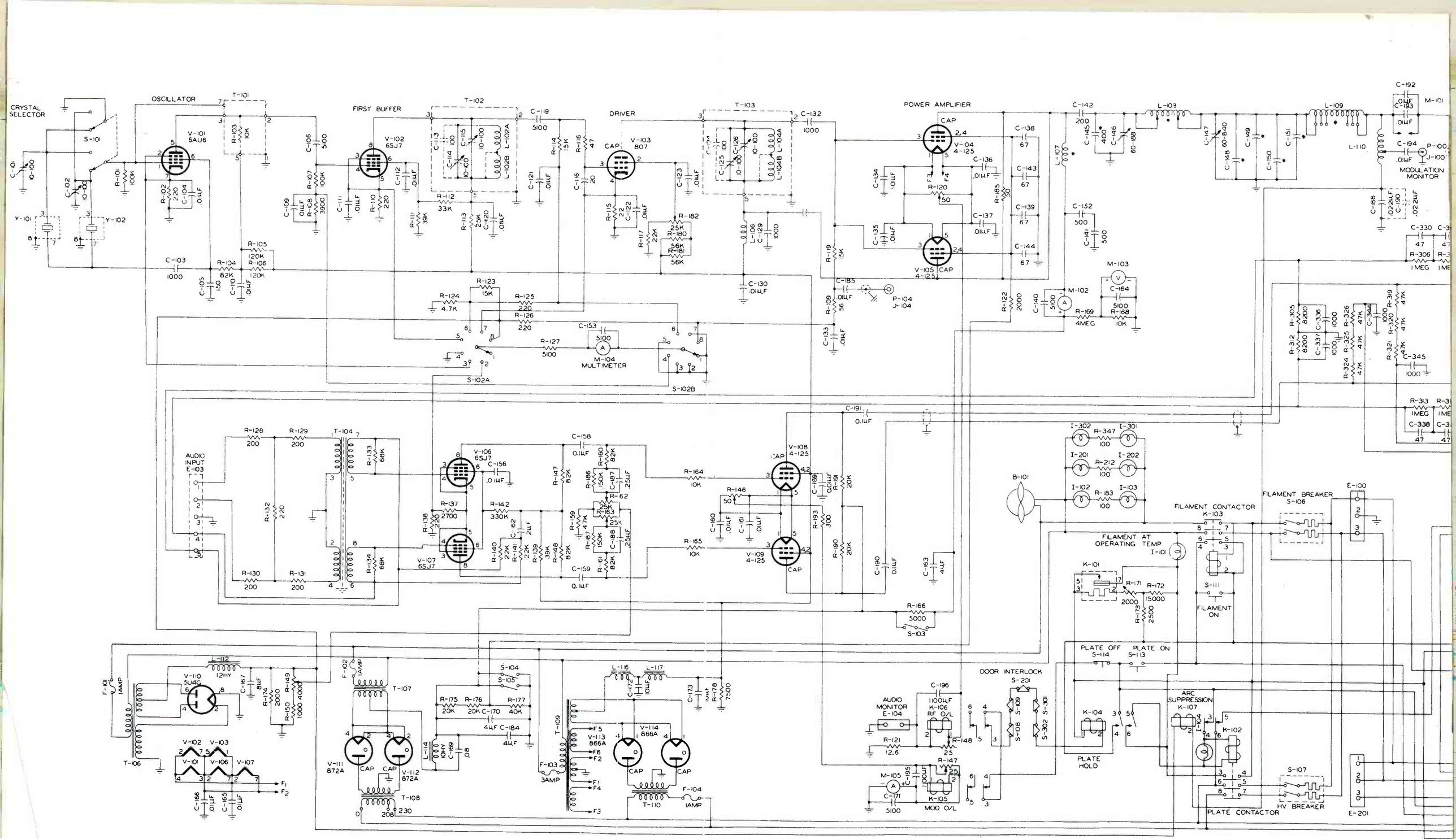
The top panel on the front of the transmitter can be removed by releasing two screws.

This ruggedly constructed cabinet is finished in an attractive high gloss two-tone grey enamel. Streamlined polished chrome styling adds to the modern appearance.

Cooling—Adequate cooling is provided by the large blower and filter assembly housed in the lower rear panel of the transmitter, plus the two auxiliary blowers shown on page 10 in the 550A-1 and 20V-2. Cooling requirements do not warrant auxiliary blowers in the 300J-2.

Accessible Meter Panel




CRYSTAL SELECTOR
S-101
Y-101
Y-102
OSCILLATOR
V-101 6AU6
FIRST BUFFER
V-102 6SJ7
DRIVER
V-103 807
POWER AMPLIFIER
V-104 4-125
V-105 4-125
M-101
MODULATION MONITOR
P-100
J-100
M-102
M-103
M-104 MULTIMETER
S-102A
S-102B
AUDIO INPUT E-103
V-106 6SJ7
V-107 6SJ7
V-108 4-125
V-109 4-125
B-101
FILAMENT CONTACTOR K-103
FILAMENT BREAKER S-106
E-100
FILAMENT AT OPERATING TEMP I-101
FILAMENT ON
S-111
K-101
S-103
PLATE OFF S-114
PLATE ON S-113
DOOR INTERLOCK S-201
AUDIO MONITOR E-104
K-106 RF O/L
K-105 MOD O/L
ARC SUPPRESSION K-107
K-104
K-102
PLATE HOLD
PLATE CONTACTOR
S-107
HV BREAKER
E-201
V-110 5U4G
V-111 872A
V-112 872A
V-113 866A
V-114 866A
T-106
T-107
T-108
T-109
T-110
F-101 1AMP
F-102 1AMP
F-103 3AMP
F-104 1AMP
L-112 12HY
F1
F2
F3
F4
F5
F6

Specifications

300J-2

COMPLETE SCHEMATIC ON PAGE 16

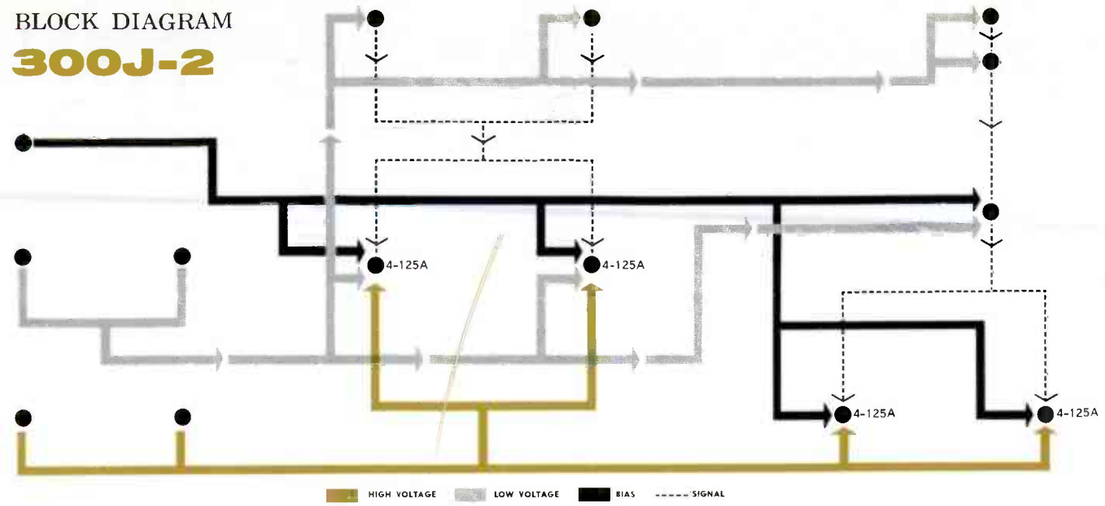
FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 24 mc available.
POWER OUTPUT: Nominal 250/100 watt. (Actual 275/110 watt).
FREQUENCY STABILITY: Better than ±5 cps (Typical — ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1½ db from 30 to 12,000 cps. (Typical ±1.5 db from 30-15,000).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 cps for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).
RESIDUAL NOISE LEVEL: 60 db or more below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 600/150 ohms.
AUDIO INPUT LEVEL: +10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230 v, single phase 50/60 cps.
POWER DEMAND:

0% modulation	1,000 watts
30% modulation	1,250 watts
100% modulation	1,400 watts
(90% Power Factor)	

WEIGHT: Approximately 900 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

300J-2



Specifications

550A-1

COMPLETE SCHEMATIC ON PAGE 17

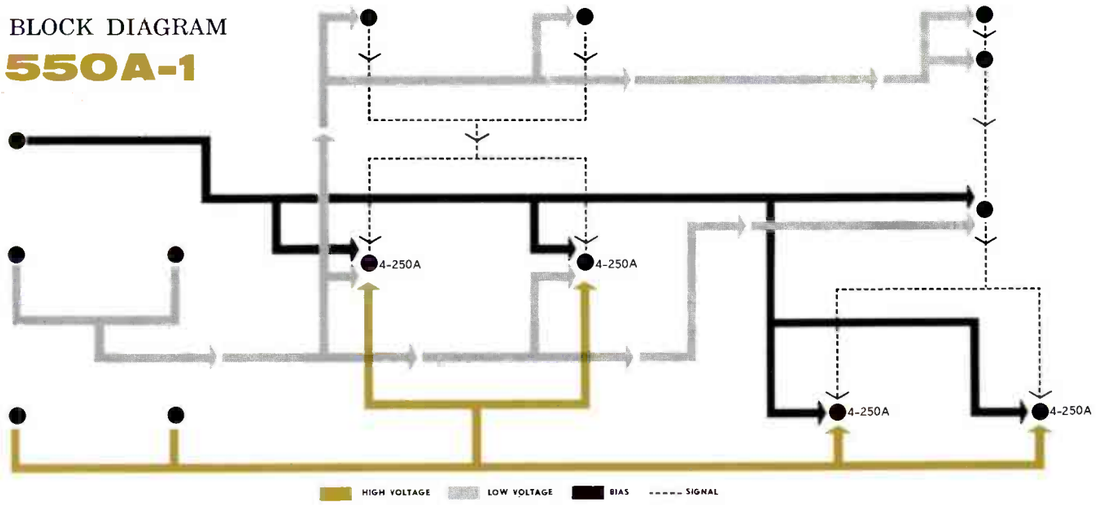
FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 18 mc available.
POWER OUTPUT: Nominal 500/250 watt. Actual 550/275 watt. (550/125 watt on order.)
FREQUENCY STABILITY: Better than ±5 cps. (Typical — Better than ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1.5 db from 30 to 12,000 cps. (Typical — ±1.5 db from 30 to 15,000 cps).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 cps for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).
RESIDUAL NOISE LEVEL: 60 db below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation. (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 150/600 ohms.
AUDIO INPUT LEVEL: +10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230 v, single phase 50/60 cps.
POWER DEMAND (at 550 watts output):

0% modulation	2300 watts
30% modulation	2370 watts
100% modulation	2840 watts
(83% Power Factor)	

WEIGHT: Approximately 1,050 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

550A-1



Specifications

20V-2

COMPLETE SCHEMATIC ON PAGE 18

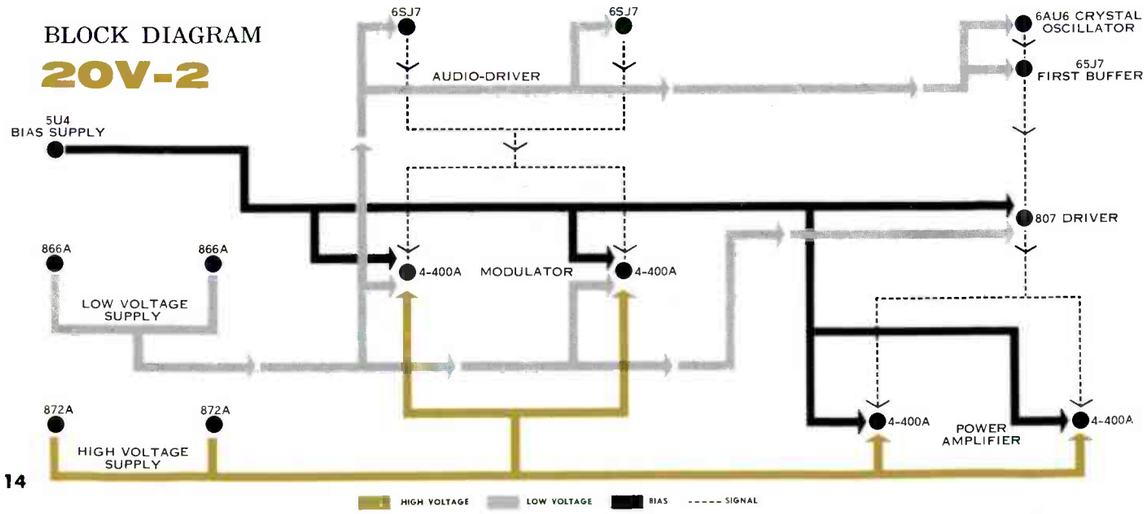
FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 18 mc available.
POWER OUTPUT: Nominal 1,000/500 watt. Actual 1100/550 watt. (1100/275 Watt on order)
FREQUENCY STABILITY: Better than ±5 cps (Typical — Better than ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1.5 db from 30 to 12,000 cps. (Typical — ±1.5db from 30 to 15,000 cps).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).
RESIDUAL NOISE LEVEL: 60 db or better below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation. (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 150/600 ohms.
AUDIO INPUT LEVEL: ±10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230v, single phase 50/60 cps.

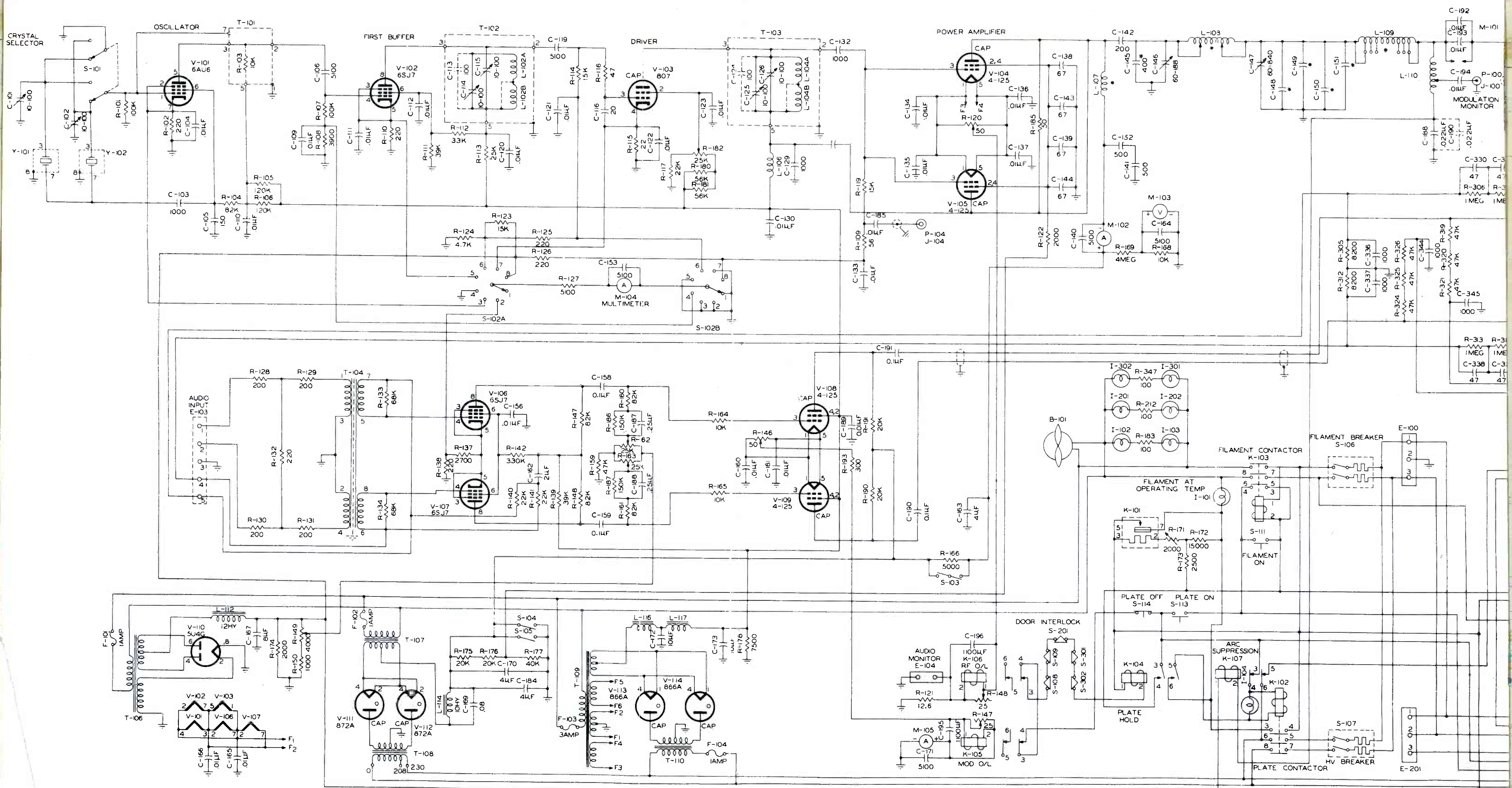
0% modulation	2950 watts
30% modulation	3250 watts
100% modulation	4150 watts

WEIGHT: Approximately 1,150 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

20V-2





CRYSTAL SELECTOR
S-101
Y-101
Y-102
OSCILLATOR
V-101 6AU6
T-101
FIRST BUFFER
V-102 6SJ7
T-102
DRIVER
V-103 807
T-103
POWER AMPLIFIER
V-104 4-125
V-105 4-125
L-108
L-109
L-110
M-101
MODULATION MONITOR
P-100
J-100
M-102
M-103
P-104
J-104
M-104 MULTIMETER
S-102A
S-102B
AUDIO INPUT E-103
T-104
V-106 6SJ7
V-107 6SJ7
V-108 4-125
V-109 4-125
B-101
FILAMENT CONTACTOR K-103
FILAMENT BREAKER S-106
E-100
FILAMENT AT OPERATING TEMP I-101
K-101
S-111 FILAMENT ON
S-103
V-110 5U4G
L-112 12HY
F-101 1AMP
T-106
F-102 1AMP
T-107
V-111 872A
V-112 872A
T-108
S-104
S-105
L-114
L-116
L-117
T-109
F-103 3AMP
V-113 866A
V-114 866A
T-110
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K-104
PLATE HOLD
ARC SUPPRESSION K-107
K-102
PLATE CONTACTOR
HV BREAKER S-107
E-201

Specifications

300J-2

COMPLETE SCHEMATIC ON PAGE 16

FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 24 mc available.
POWER OUTPUT: Nominal 250/100 watt. (Actual 275/110 watt).
FREQUENCY STABILITY: Better than ±5 cps (Typical — ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1½ db from 30 to 12,000 cps. (Typical ±1.5 db from 30-15,000).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 cps for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).

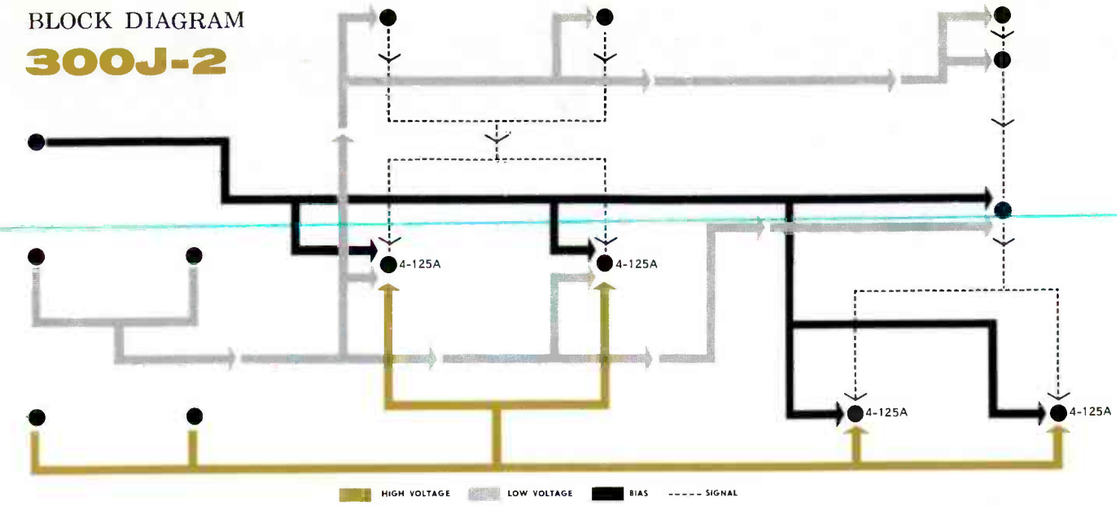
RESIDUAL NOISE LEVEL: 60 db or more below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 600/150 ohms.
AUDIO INPUT LEVEL: +10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230 v, single phase 50/60 cps.
POWER DEMAND:

0% modulation	1,000 watts
30% modulation	1,250 watts
100% modulation	1,400 watts
(90% Power Factor)	

WEIGHT: Approximately 900 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

300J-2



Specifications

550A-1

COMPLETE SCHEMATIC ON PAGE 17

FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 18 mc available.
POWER OUTPUT: Nominal 500/250 watt. Actual 550/275 watt. (550/125 watt on order.)
FREQUENCY STABILITY: Better than ±5 cps. (Typical — Better than ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1.5 db from 30 to 12,000 cps. (Typical — ±1.5 db from 30 to 15,000 cps).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 cps for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).

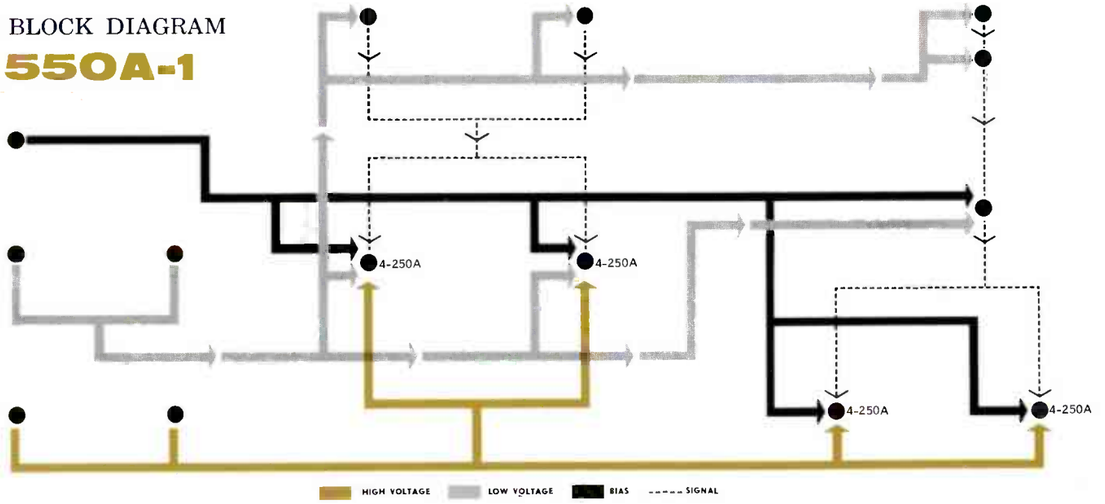
RESIDUAL NOISE LEVEL: 60 db below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation. (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 150/600 ohms.
AUDIO INPUT LEVEL: +10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230 v, single phase 50/60 cps.
POWER DEMAND (at 550 watts output):

0% modulation	2300 watts
30% modulation	2370 watts
100% modulation	2840 watts
(83% Power Factor)	

WEIGHT: Approximately 1,050 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

550A-1



Specifications

20V-2

COMPLETE SCHEMATIC ON PAGE 18

FREQUENCY RANGE: 540-1600 kc standard. Frequencies to 18 mc available.
POWER OUTPUT: Nominal 1,000/500 watt. Actual 1100/550 watt. (1100/275 Watt on order)
FREQUENCY STABILITY: Better than ±5 cps (Typical — Better than ±2 cps).
AUDIO FREQUENCY RESPONSE: Within ±1.5 db from 30 to 12,000 cps. (Typical — ±1.5db from 30 to 15,000 cps).
AUDIO FREQUENCY DISTORTION: Less than 3% from 50-10,000 for 95% modulation, including all harmonics up to 16 kc. (Typical — Less than 3% from 30-15,000).

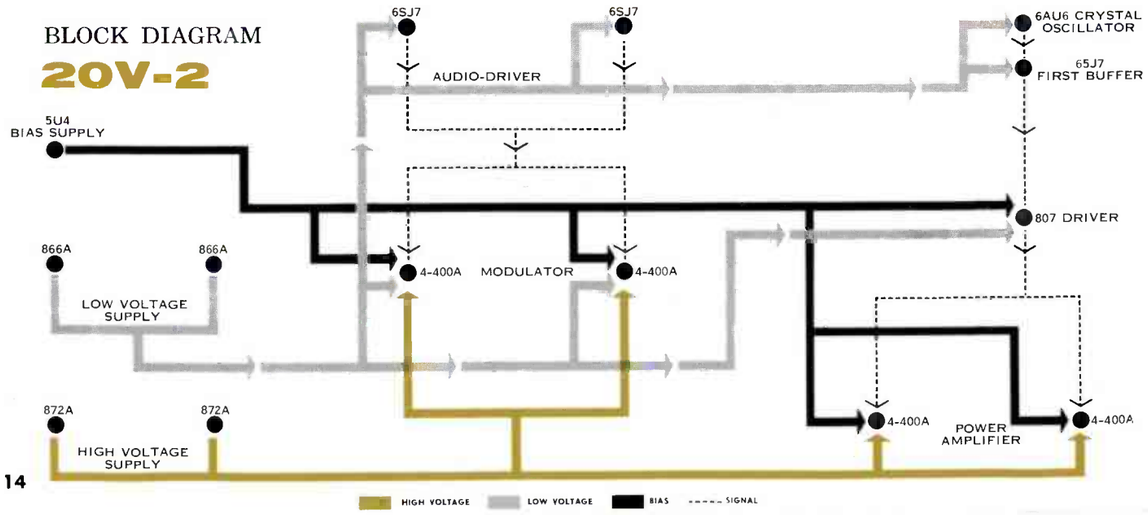
RESIDUAL NOISE LEVEL: 60 db or better below 100% modulation.
CARRIER SHIFT: Less than 3%, 0-100% modulation. (Typical — Less than 2%).
RF OUTPUT IMPEDANCE: 40/600 ohms on order.
AUDIO INPUT IMPEDANCE: 150/600 ohms.
AUDIO INPUT LEVEL: ±10 dbm ±2 db, pad input.
AMBIENT TEMPERATURE RANGE: Up to 45° C.
ALTITUDE RANGE: Sea level to 6,000 feet.
POWER SOURCE: 208/230v, single phase 50/60 cps.

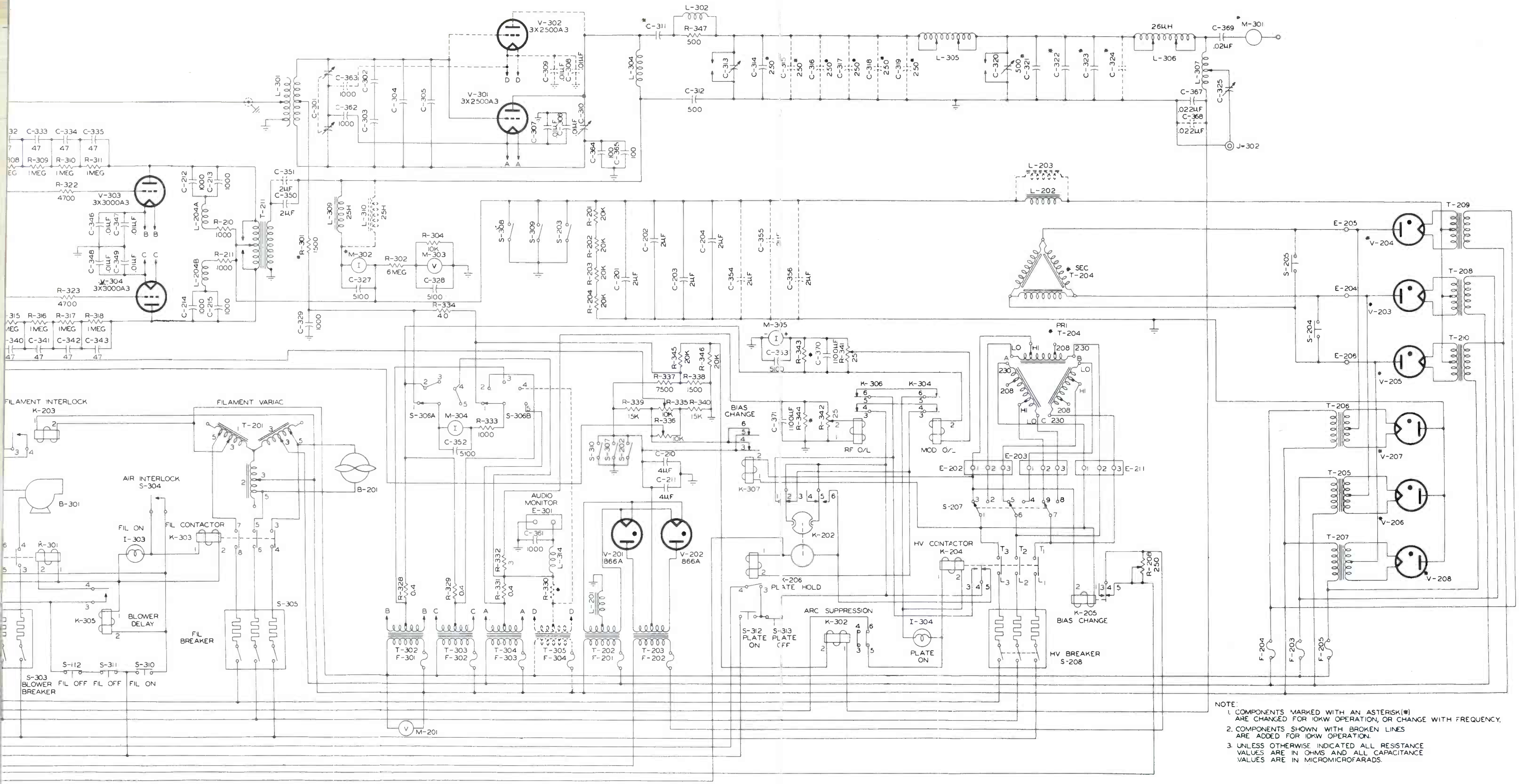
0% modulation	2950 watts
30% modulation	3250 watts
100% modulation	4150 watts

WEIGHT: Approximately 1,150 lbs.
DIMENSIONS: 38″ wide, 76″ high, 27″ deep.

BLOCK DIAGRAM

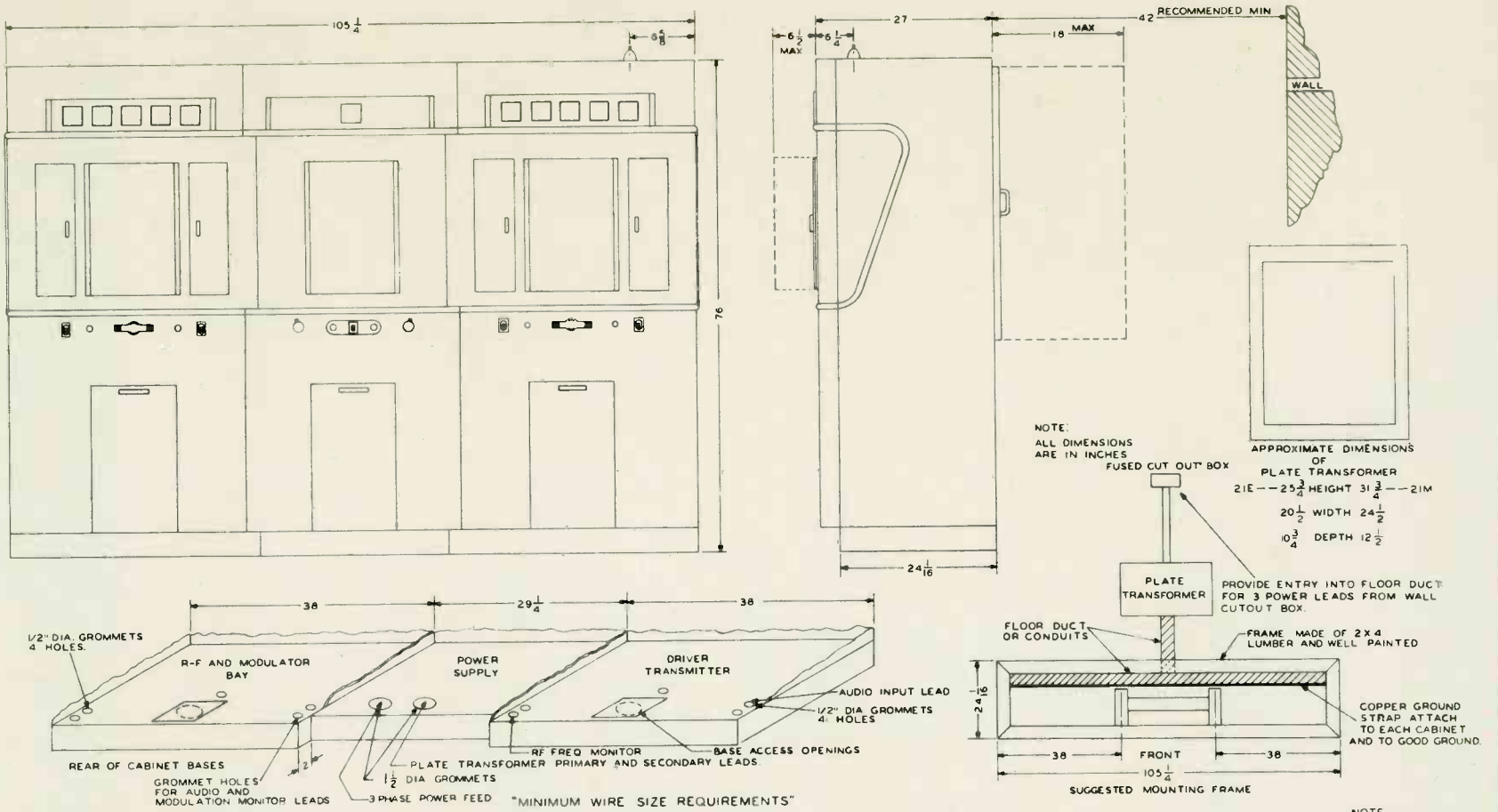
20V-2





NOTE:
1. COMPONENTS MARKED WITH AN ASTERISK(*) ARE CHANGED FOR 10KW OPERATION, OR CHANGE WITH FREQUENCY.
2. COMPONENTS SHOWN WITH BROKEN LINES ARE ADDED FOR 10KW OPERATION.
3. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.

21E/M COMPLETE SCHEMATIC



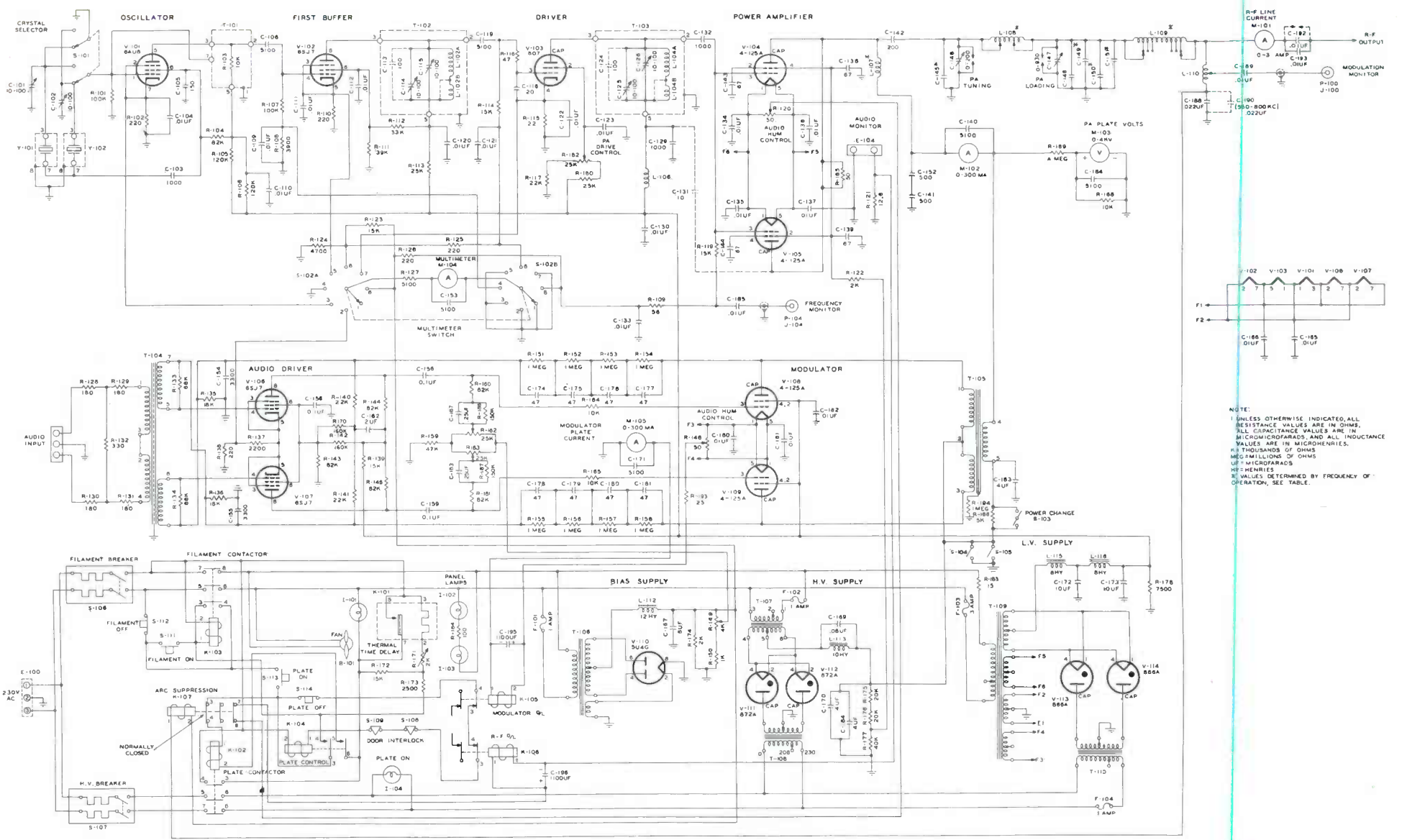
"MINIMUM WIRE SIZE REQUIREMENTS"

CONNECTION	SIZE OF WIRE
POWER LINE FEED FROM FUSED WALL CUTOUT BOX FOR 208/230 VOLT THREE PHASE 50/60 CPS POWER SOURCE	THREE NO 2 RUBBER COVERED BUILDING WIRE FOR THE 21E. THREE NO 0 RUBBER COVERED BUILDING WIRE FOR THE 21M ONE GROUND AT LEAST NO 4 WIRE FUSE THE 21M AT 125 AMPERES. THE 21E AT 100 AMPERES.
TRANSFORMER PRIMARY LEADS	SIX NO 6 RUBBER COVERED BUILDING WIRE FOR THE 21E. SIX NO 4 RUBBER COVERED BUILDING WIRE FOR THE 21M.
TRANSFORMER SECONDARY LEADS	THREE NO 12 OR 14 10,000 VOLT INSULATION
TRANSFORMER FRAME	ONE NO 4 BARE WIRE TO CABINET GROUND.

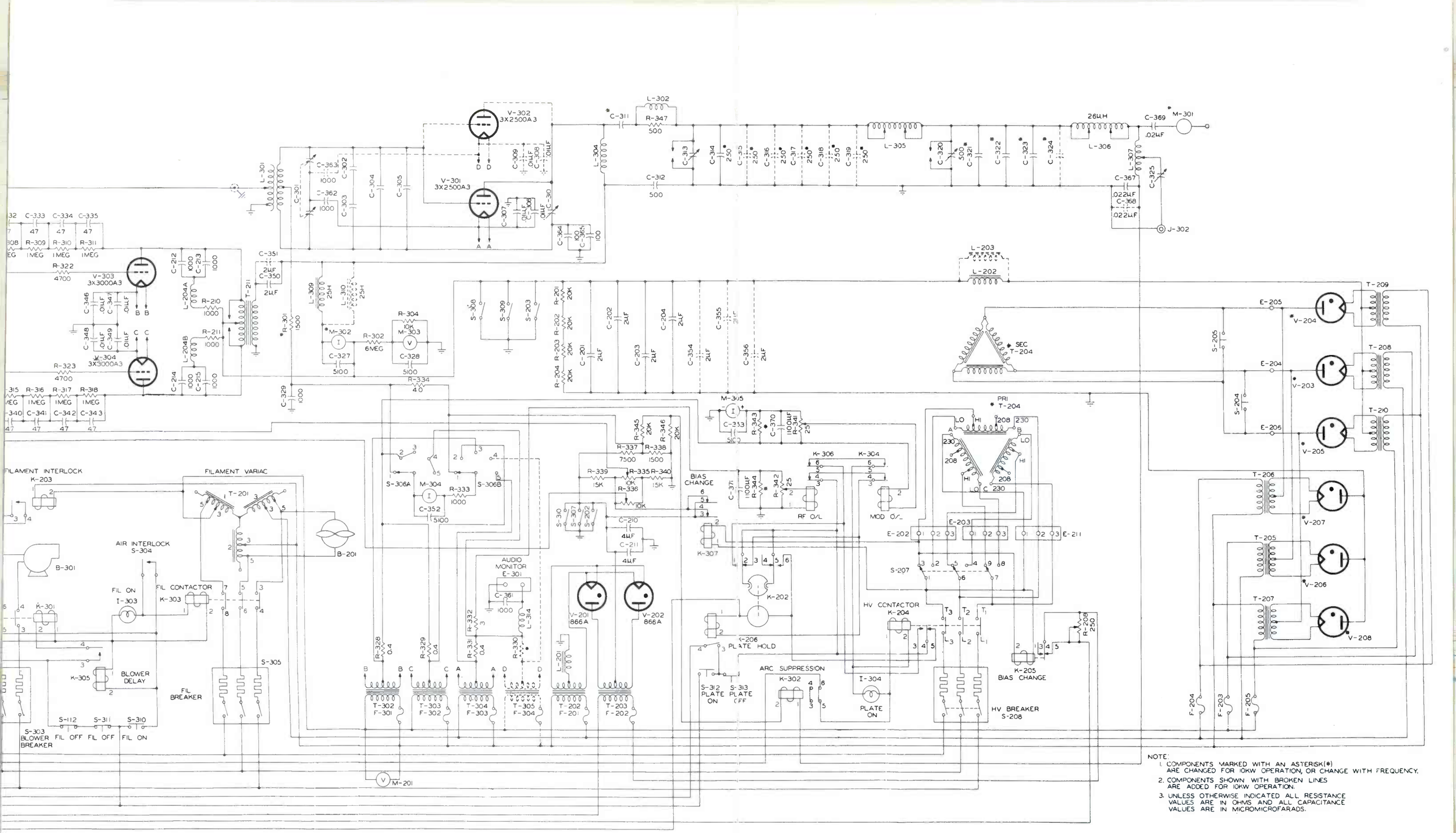
CONNECTION	SIZE OF WIRE
R-F FREQUENCY MONITOR FEED	RG/8U COAXIAL CABLE.
MODULATION MONITOR FEED	RG/8U COAXIAL CABLE.
INPUT AUDIO LEAD	SHIELDED PAIR
AUDIO MONITOR LEAD	SHIELDED PAIR
R-F TRANSMISSION LINE	7/8 OR 1-5/8 50 OR 72 OHM RIGID COAXIAL CABLE FOR THE 21E 1-5/8 50 OR 72 OHM RIGID COAXIAL CABLE FOR THE 21M.

NOTE
IF A DUCT IS USED TO REMOVE THE WARM AIR, EMPLOY AN EXHAUST BLOWER OF AT LEAST 1500 CFM CAPACITY. ALLOW NO BACK PRESSURE WITHIN ANY CABINET.

300J-2 SCHEMATIC DRAWING



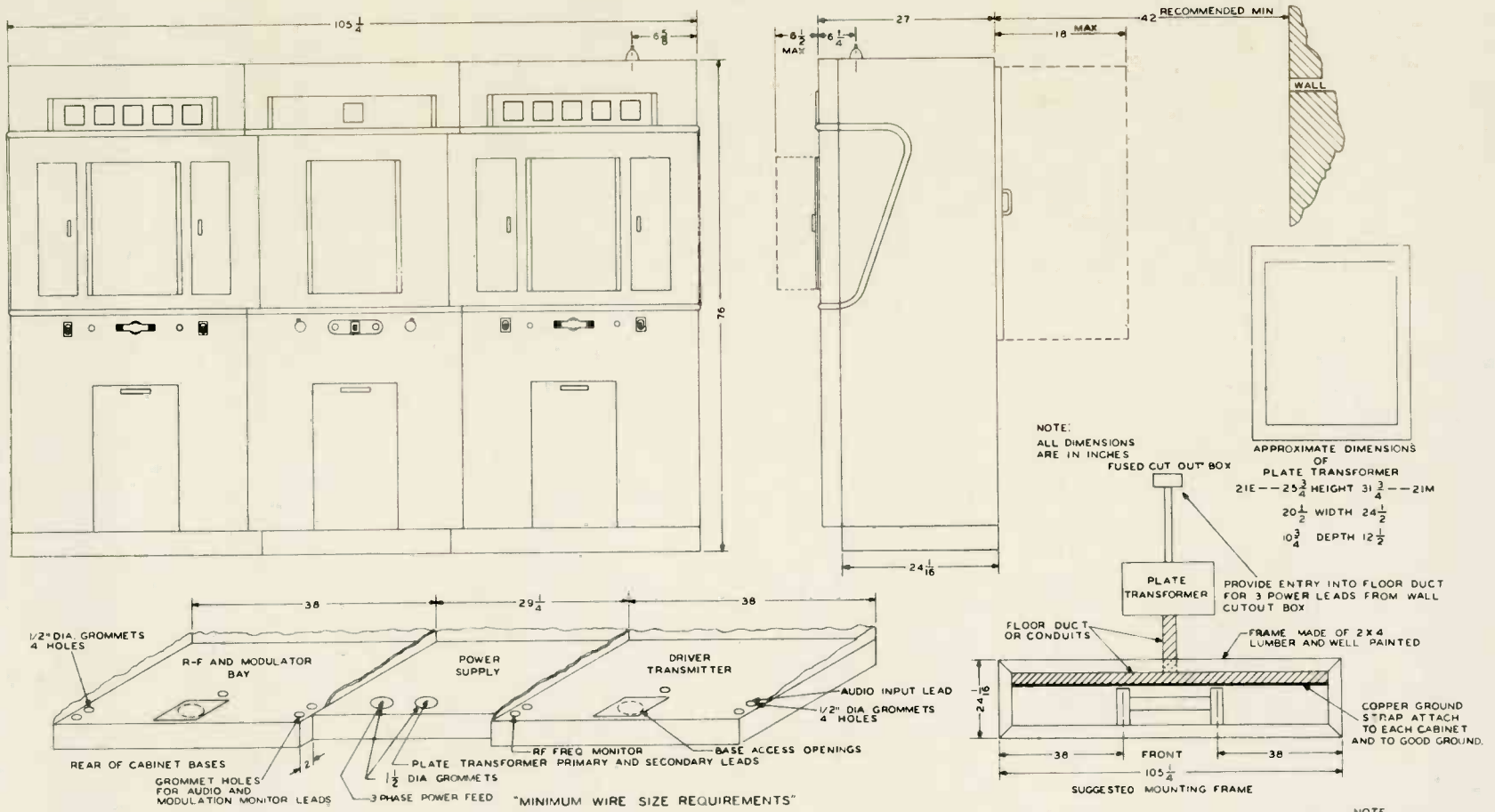
NOTE:
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
K=THOUSANDS OF OHMS
MEG=MILLIONS OF OHMS
UF=MICROFARADS
HY=HENRIES
*VALUES DETERMINED BY FREQUENCY OF OPERATION, SEE TABLE.



NOTE:

1. COMPONENTS MARKED WITH AN ASTERISK(*) ARE CHANGED FOR 10KW OPERATION, OR CHANGE WITH FREQUENCY.
2. COMPONENTS SHOWN WITH BROKEN LINES ARE ADDED FOR 10KW OPERATION.
3. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS AND ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.

21E/M COMPLETE SCHEMATIC



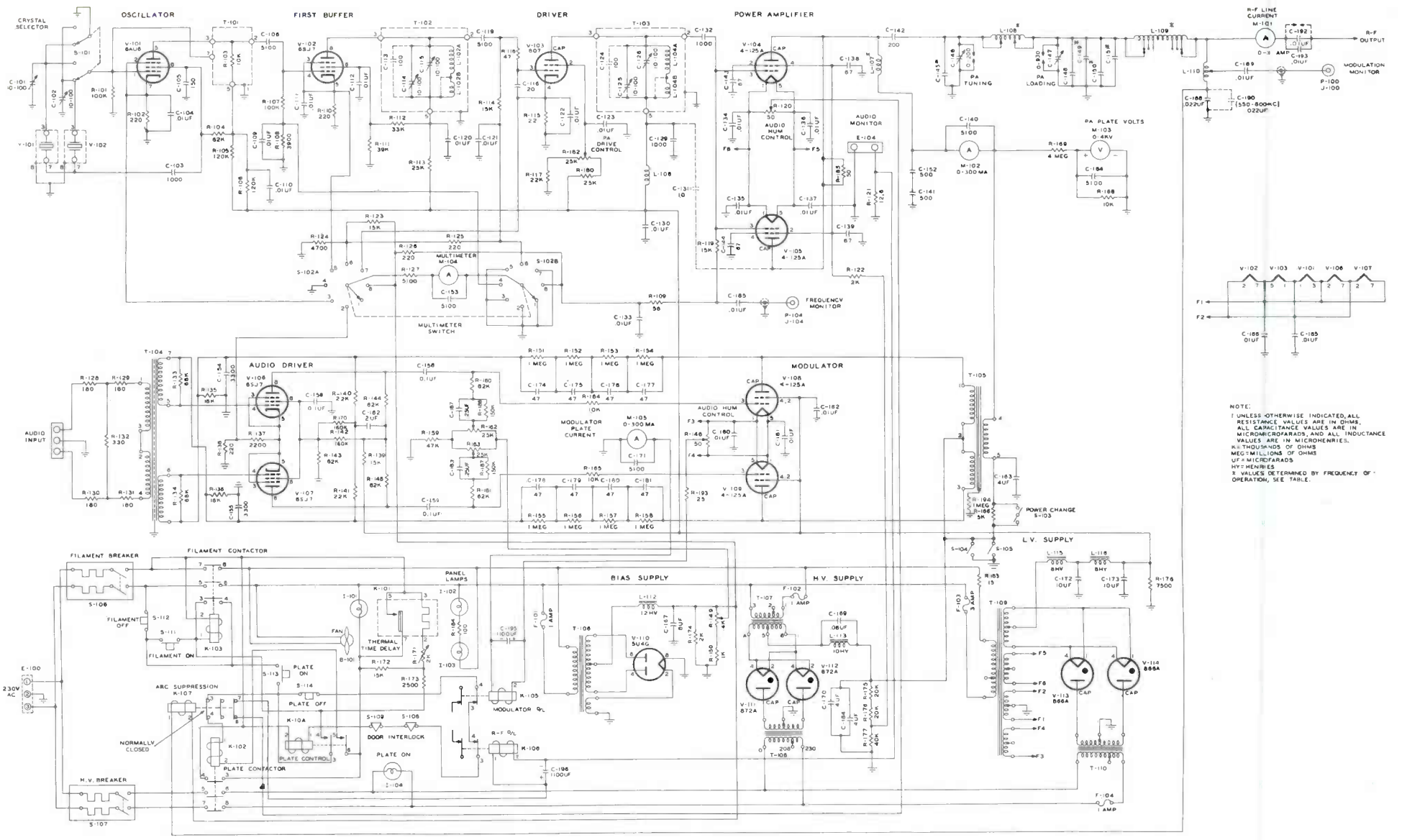
"MINIMUM WIRE SIZE REQUIREMENTS"

CONNECTION	SIZE OF WIRE
POWER LINE FEED FROM FUSED WALL CUTOUT BOX FOR 208/230 VOLT THREE PHASE 50/60 CPS POWER SOURCE	THREE NO 2 RUBBER COVERED BUILDING WIRE FOR THE 21E. THREE NO 0 RUBBER COVERED BUILDING WIRE FOR THE 21M ONE GROUND AT LEAST NO 4 WIRE FUSE THE 21M AT 125 AMPERES, THE 21E AT 100 AMPERES.
TRANSFORMER PRIMARY LEADS	SIX NO 6 RUBBER COVERED BUILDING WIRE FOR THE 21E. SIX NO 4 RUBBER COVERED BUILDING WIRE FOR THE 21M.
TRANSFORMER SECONDARY LEADS	THREE NO 12 OR 14 10,000 VOLT INSULATION
TRANSFORMER FRAME	ONE NO 4 BARE WIRE TO CABINET GROUND.

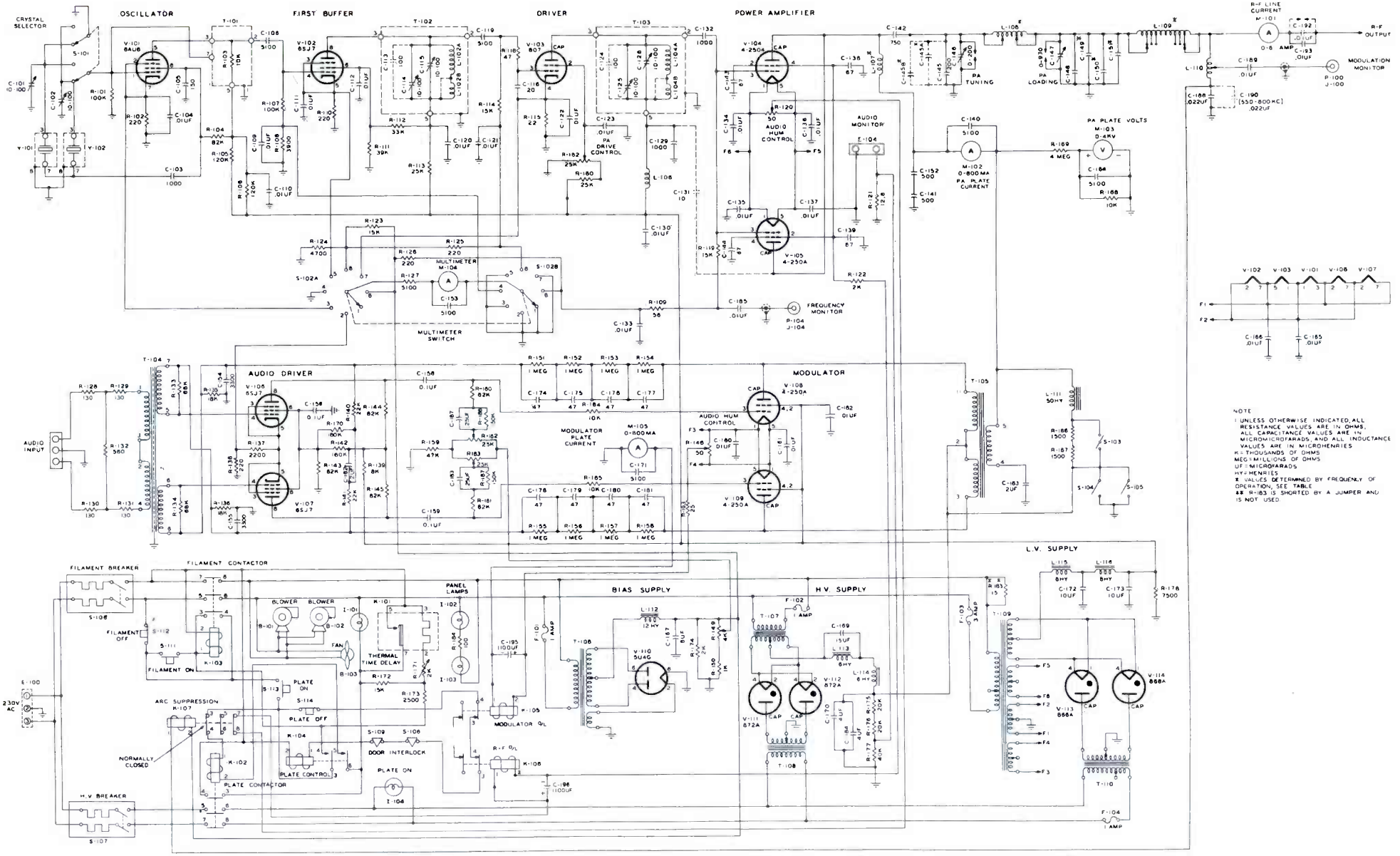
CONNECTION	SIZE OF WIRE
R-F FREQUENCY MONITOR FEED	RG/8U COAXIAL CABLE.
MODULATION MONITOR FEED	RG/8U COAXIAL CABLE.
INPUT AUDIO LEAD	SHIELDED PAIR
AUDIO MONITOR LEAD	SHIELDED PAIR
R-F TRANSMISSION LINE	7/8 OR 1-5/8 50 OR 72 OHM RIGID COAXIAL CABLE FOR THE 21E 1-5/8 50 OR 72 OHM RIGID COAXIAL CABLE FOR THE 21M.

NOTE
IF A DUCT IS USED TO REMOVE THE WARM AIR, EMPLOY AN EXHAUST BLOWER OF AT LEAST 1500 CFM CAPACITY. ALLOW NO BACK PRESSURE WITHIN ANY CABINET.

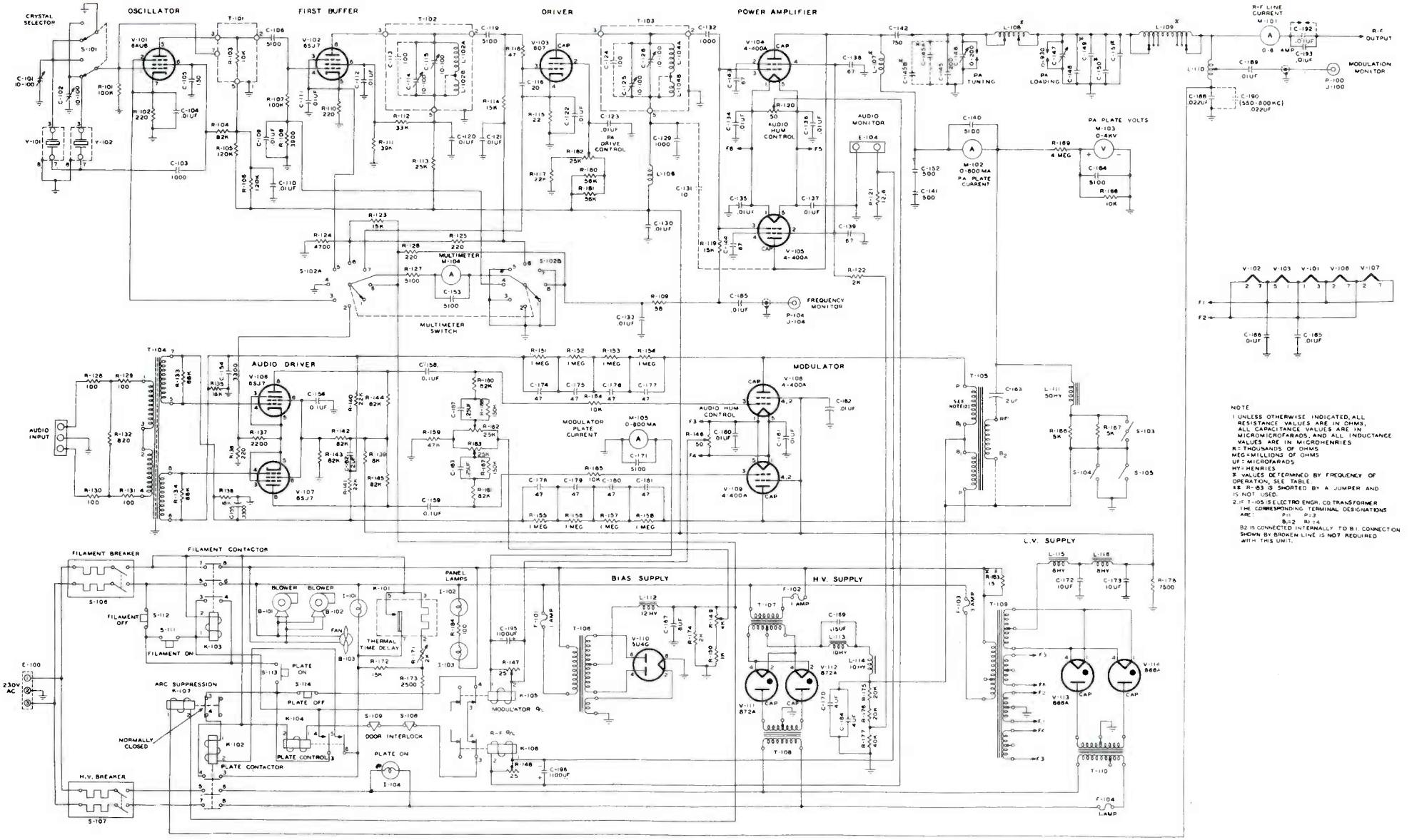
300J-2 SCHEMATIC DRAWING



550A-1 SCHEMATIC DRAWING



20V-2 SCHEMATIC DRAWING



TRANSMITTER ACCESSORIES

COLLINS 37M

FM Ring Antennas

STREAMLINED SIMPLICITY

The Collins 37M Series Ring Antenna consists of only two basic parts: (1) radiating rings and (2) connecting inter-ring transmission line. Any number of rings, either odd or even, may be employed, providing maximum flexibility in available power gains for the requirements of the particular installation.

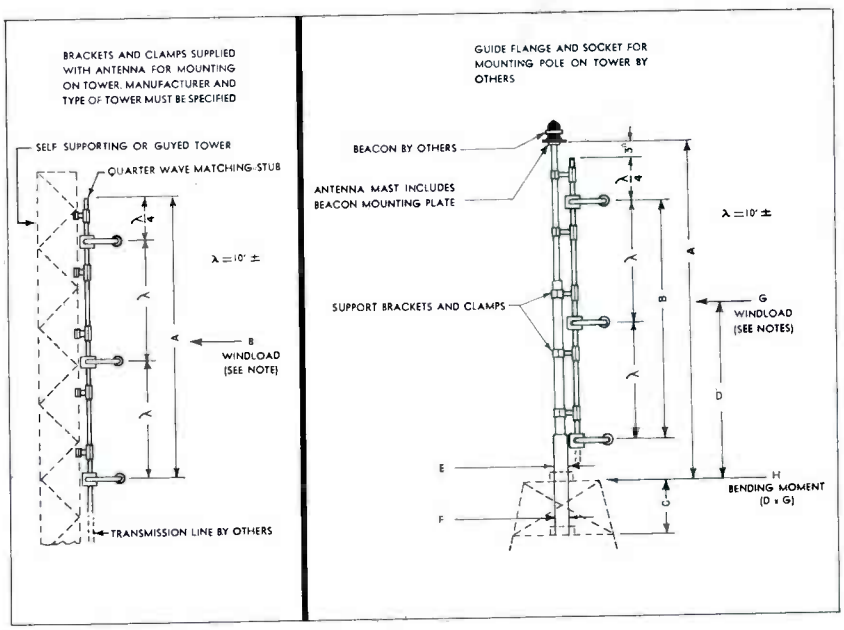
Only one inter-element transmission line is required to feed all rings in a multiple-element array. The individual radiating rings are identical mechanically and electrically. They are both shunt fed and mechanically supported by this single interconnecting feed line, which consists of modified lengths of standard EIA specification rigid coaxial transmission line of suitable size for the transmitter power being employed. The 37M terminates in a standard EIA 51.5 ohm flange connection on the bottom element of the array for coupling directly to the transmission line.

LOW WEIGHT AND WINDLOADING

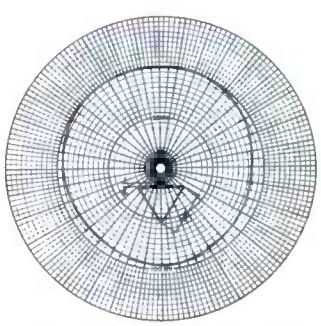
Because of the simplicity of its electrical and mechanical design, the 37M is so light and compact that the resulting dead weight and windloads are reduced to a previously unknown low for FM antennas. The 37M is unexcelled for maximum power gain at low weight and windloads.

METHOD OF MOUNTING

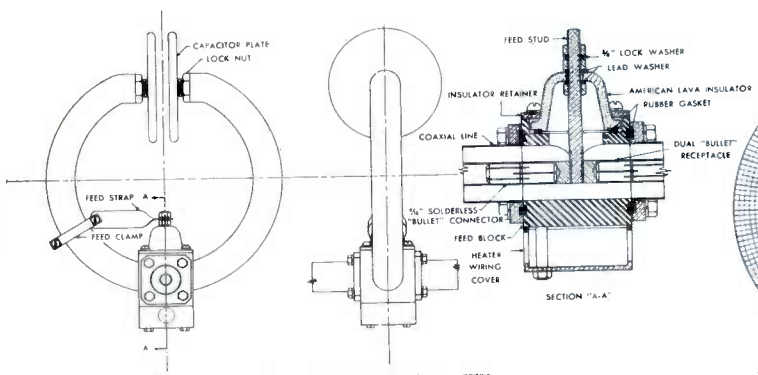
Two advantageous methods of mounting the 37M Antenna are available to the FM broadcaster: (1) Side mounting of the array on a corner leg of the tower offers definite advantages. Towers, either guyed or self-supporting, which previously have been considered incapable of supporting *any* FM antenna will in nearly all cases handle the Collins side mounting 37M. Towers which support top mounting television antenna arrays increase their usefulness with the addition of a side mounting 37M array. Any number of rings may be side mounted, obviating the necessity of modifying the top of the tower or disturbing in any way the tower lighting equipment, top mounting TV radiator or the tower proper.



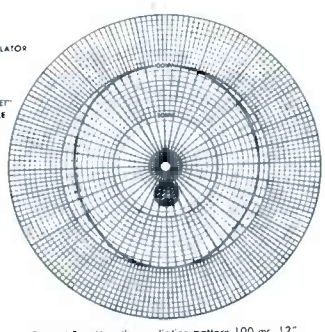
ENGINEERING DATA



Typical Side Mounting radiation pattern 100 mc, 12" diameter ring on side on Wincharger tower.



FREQUENCY RANGE VERSUS LOOP DIAMETERS
Diameter varies from 11" to 14" depending upon frequency and line size.



Typical Top Mounting radiation pattern 100 mc, 12" diameter ring on 10" diameter pole.

(2) The top or pole mounting design is available on special order for installation on towers where no TV antenna is present or planned. This style of mounting provides the maximum in height and coverage. The light weight and windloading of the top mounting array allow erection on most guyed and self-supporting towers without extensive tower modification.

INSTALLATION EASE

The unique characteristics of light weight and electrical-mechanical simplicity make the 37M easy and quick to erect. There are no extraordinarily heavy hoisting problems, and many hours of erection time may be saved. Support brackets are specially fabricated for each installation to match the tower and mounting arrangement specified by the purchaser, thus minimizing erection problems at the site.

MECHANICAL STABILITY

Another important advantage of the 37M is the inherent mechanical stability of the tower, transmission line, and antenna assembly. Undue oscillating and weaving of the tower and antenna are eliminated by the low weight and windload, which result in reduced strain on the supporting structure as well as reduction in tower maintenance costs.

CIRCULAR RADIATION PATTERN

The horizontal radiation pattern of the 37M is essentially circular for both top mounting and side mounting arrays. A maximum deviation of only 1 db is obtained in the top or pole mounted arrangement, while the circular pattern of the side mounted array will generally equal that of the top mounted antenna. The extent of deviation from a circular pattern in the side mounted antenna is normally minor and is dependent on the type and size of tower on which the antenna is mounted.

HIGH GAIN

One of the most outstanding features of the Collins FM antenna is the availability of high power gains. The flexibility of the number of rings, either odd or even, which may be used, provides a power gain to meet the requirements of each installation.

LOW VSWR

The voltage standing wave ratio of the 37M can be maintained at better than 1.1 to 1 because of the inherent high stability of the tuning system. Adequate bandwidth virtually eliminates detuning effects caused by changes in atmospheric conditions.

AMPLE POWER CAPACITY

Antenna arrays mounted on 1⅝" or 3⅛" line are available for handling transmitter powers up to 20 kw. There is a 37M to meet your particular power and gain requirements.

DE-ICING PROVISIONS

The compactness and simplicity of the 37M Antenna allow the maximum efficiency in ice and sleet removal. Each ring may be equipped with an internally mounted heating unit which consists of a cartridge type element inside each of the tuning condenser plates and an additional flexible heating element extending the full circumference of the inside of the ring. The absence of large masses of metal makes de-icing of the 37M an efficient and practical operation while the operating costs of de-icers are reduced to minimum.

SIDE MOUNTING

Collins Type	No. of Rings	Power Gain	Field Gain	A Feet	On 1⅝" Line		On 3⅛" Line	
					B	Weight	B	Weight
37M-1	1	.9	.95	2-6±	24	23	32	46
37M-2	2	2.0	1.41	12-6±	68	55	100	100
37M-3	3	3.0	1.73	22-6±	114	86	170	175
37M-4	4	4.1	2.02	32-6±	160	119	240	240
37M-5	5	5.2	2.28	42-6±	206	152	310	305
37M-6	6	6.3	2.51	52-6±	252	185	380	370
37M-7	7	7.3	2.70	62-6±	298	218	450	435
37-M-8*	8	8.4	2.90	72-6±	344	251	520	500

TOP MOUNTING

Collins Type	No. of Rings	Pwr. Gain	A Ft.	B Ft.	C Ft.	On 1⅝" Line						On 3⅛" Line					
						D Ft.	E Dia.	F Dia.	G Lbs.	H Ft.-Lbs.	Dead Wt.	D Ft.	E Dia.	F Dia.	G Lbs.	H Ft.-Lbs.	Dead Wt.
37M-1	1	.9	6		3	4-7	3⅛"	3⅛"	50	230	223	4-7	3⅛"	3⅛"	68	312	250
37M-2	2	2.0	16	10±	4	10	4½"	4½"	239	2,390	305	12-3	4½"	4½"	291	3,565	360
37M-3	3	3.0	26	20±	7	14-5	6⅝"	6⅝"	403	5,803	736	14-4	6⅝"	6⅝"	486	6,950	825
37M-4	4	4.1	36	30±	10	19	7⅝"	7⅝"	564	10,716	1169	18-9	7⅝"	7⅝"	678	12,713	1290
37M-5	5	5.2	46	40±	12	23	8⅝"	7⅝"	747	17,181	1652	22-8	9⅝"	9⅝"	919	20,769	2128
37M-6	6	6.3	56	50±	14	27-2	9⅝"	8⅝"	951	25,867	2285	26-7	10¾"	9⅝"	1173	31,260	2770
37M-7	7	7.3	66	60±	15	31	10¾"	8⅝"	1175	36,425	3218	31-3	10¾"	8⅝"	1388	43,375	3485
37M-8*	8	8.4	76	70±	16-6	34-9	11¾"	9⅝"	1417	49,241	4051	34-8	12¾"	11¾"	1696	58,682	4650

*up to 12 bays on application.

81M PHASORS

Directional Antenna Equipment

Collins entry into the complete directional antenna equipment field was the result of a desire to improve design, delivery and pricing of the equipment.

The Company maintains a research and development department which devotes its full efforts to the design and manufacture of phasing and tuning equipment that will meet critical operating parameters with a minimum of maintenance and adjustment.

By instituting its own design and construction, Collins can offer fastest possible delivery, maintain its famous standard of quality and sell at the lowest possible cost.

Whether your requirement is for a complete directional system or replacement of a control unit, your station will profit from Collins design for your individual needs. Engineered into each installation are easily adjusted networks, highest stability, adequate voltage and current safety factors and maximum economy.

A customer's requirements as specified by his consulting engineer are strictly adhered to and *designs are submitted for approval* before construction is started.

POWER DISTRIBUTION

Distribution of power to towers in a directional antenna array can be accomplished in a number of ways. The power divider in Collins 81M equipment is usually a resonant tank circuit consisting of a large fixed coil tapped with smaller variable coils for power adjustment. An alternate design uses a group of variable coils, each one feeding a tower; this group then becomes the tank coil of the circuit.

For 1 kw or lower, the capacitive arm of the tank circuit is a capacitor and variable coil connected in series. The variable coil provides tuning adjustment by varying the overall negative reactance in this branch of the tank.

In higher powers, the tank capacitance branch is fixed, the tank coil is tapped and the entire tank fed by an input 'T' network. This provides a means of trimming the tank reactance and of transforming the tank impedance to a satisfactory value.

PHASE SHIFT

Phase shifting networks are 'T' designed, with variable coils mechanically connected in tandem for the series arms and a coil and capacitor in series for a shunt arm. Wherever possible, 90° networks — capable of being adjusted ±30° from the design value — are supplied.

Wherever a phase shift network is not required, a series variable coil and capacitor are used to supply variation of + 20° around 0° setting. They are used for trimming phase shift of current in the towers with which they are used.

ABOVE, 1 kw phasor with rear doors open. AT RIGHT, 1 kw two-tower phasor installed with Collins 20V-2.

ANTENNA COUPLING

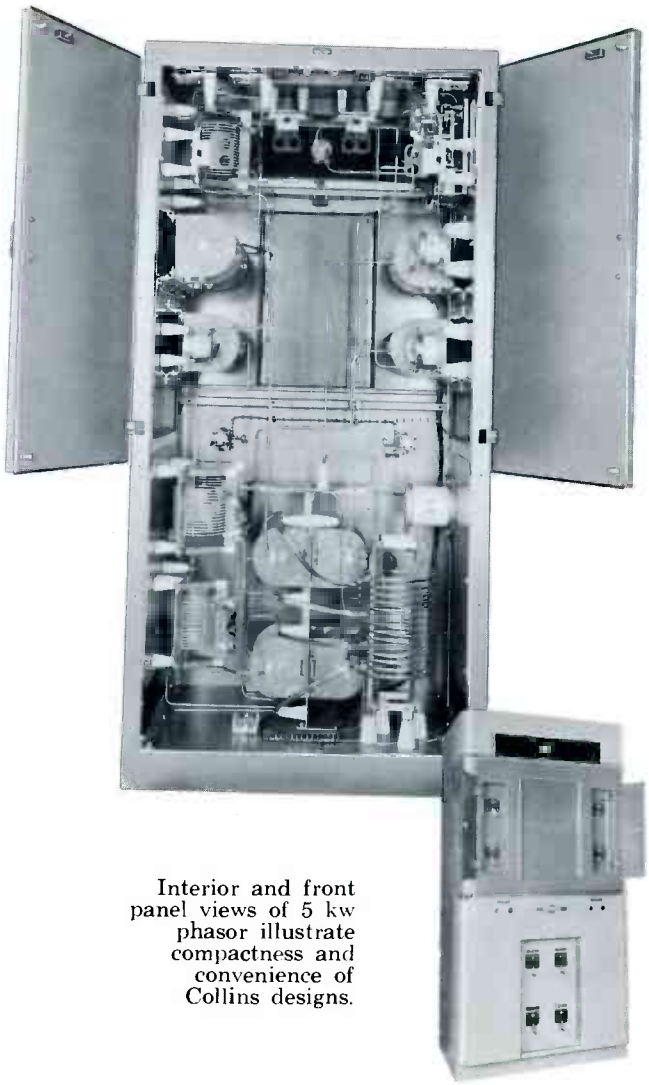
'T' networks are also used for impedance matching and phase shift. The network providing 90° of phase shift wherever possible has sufficient latitude of adjustment to match the transmission line impedance to any value within a range of impedances, including all possible values of calculated base operating impedance.

SWITCHING

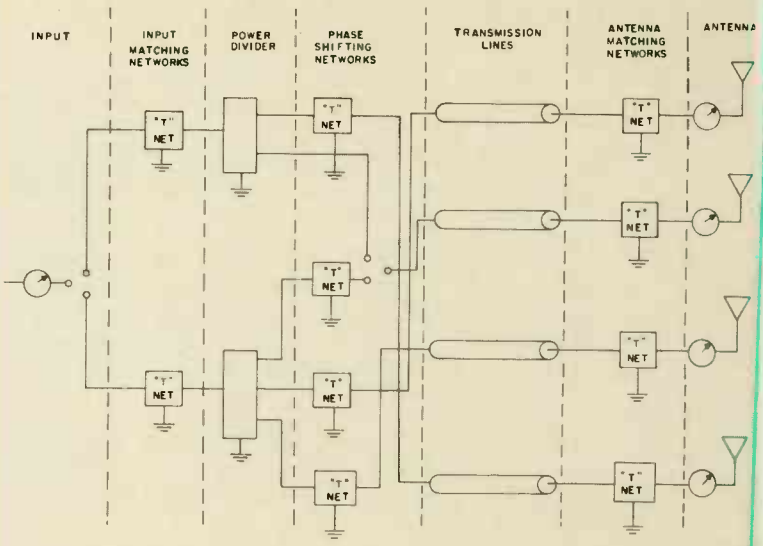
Switching of circuits for day and night operation or directional and non-directional operation is accomplished by impulse-type, toggle-operated RF relays, energized by push button switches on the front panel. The push button automatically removes the plate voltage of the transmitter before pattern switching and restores it when switching is completed. Interlocks on the cabinet doors also remove the plate voltage when doors are opened.

CONTROLS

Amplitude and phase adjustment controls are recessed counter dials which assure accurate reset-

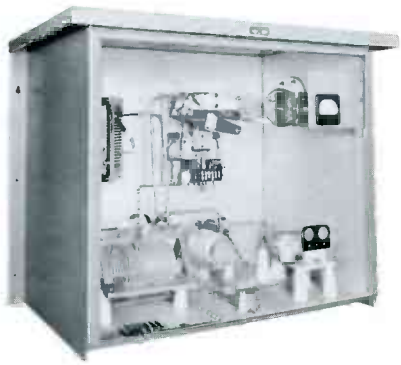


Interior and front panel views of 5 kw phasor illustrate compactness and convenience of Collins designs.



Typical block diagram of Collins directional antenna installation.

Weatherproof antenna tuner housing.



Antenna tuner for towers 1 and 3 in four-tower array of 5 kw station.

Antenna tuner for towers 2 and 4 in four-tower array of 5 kw station.

ability. In complex arrays requiring additional controls, the counter dials are recessed behind a tilt-out panel in the middle of the lower half of the cabinet.

COMPONENTS

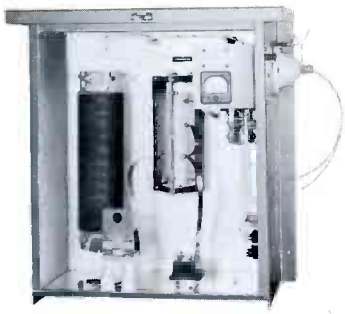
Power dividing circuits and phase shift networks utilize heavy edge-wound copper ribbon inductors and ceramic cased mica capacitors. Vacuum capacitors are used where made necessary by high circulating currents.

Plated copper tubing is used for all RF busses and insulation is steatite or Mycalex.

Input and output connections are provided at the top of the phasing cabinet unless otherwise specified. Special terminations are provided for solid dielectric cables in both the phasing cabinet and antenna coupling units. An input common point RF ammeter is supplied, along with line current meter jacks. Antenna current meters have make-before-break switches, which can be operated without opening the cabinet door on the weatherproof coupling units.

ADDITIONAL ACCESSORIES

42E-7/8 ANTENNA COUPLING UNITS



These are specially constructed units for matching a series-fed vertical radiator to an unbalanced transmission line. The electrical circuit is a low-pass T network with good harmonic attenuating properties. A three-wire or two-wire tower lighting filter choke and remote antenna current sampling transformer may be mounted in the cabinet, and an antenna current meter and line current meter jack are provided. A horn gap furnishes lightning protection. The transmission line and antenna connections are made by an insulated feed-through bushing on the side of the cabinet and the bushing has a hollow stud for the lighting circuit. Gray weatherproof aluminum housing.

42E-7 — For use with transmitters up to 1 kw. *Size:* 29″W, 28″H, 18″D. *Weight:* 64 lbs.

42E-8 — For use with 5/10 kw transmitters. *Size:* 36″W, 28″H, 22″D. *Weight:* 124 lbs. (Not shown)

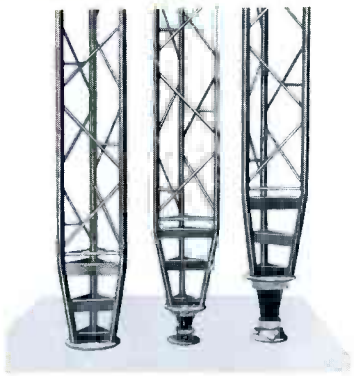
TOWER LIGHTING FILTER CHOKES

These solenoid wound 2 and 3 wire chokes provide high impedance throughout the broadcast band for isolation of the ac power lines from the antenna. Coils are wound of #10 wire and are rated at 2,000 w, 120 v ac, single phase, assemblies and provided with mounting brackets and standoff insulators for mounting in 42E-7/8 antenna coupling units. Weatherproof cabinets are available for outdoor mounting.

AUSTIN RING TRANSFORMER

These air insulated lighting transformers are designed to produce high RF impedance to ground when used to feed ac lighting energy across the base insulator of a radio tower. Transformers can be mounted either horizontally or vertically and are available in 1.75, 3, and 5 kva sizes.

AM, FM TOWERS



Collins furnishes a wide selection of both self-supporting and guyed antenna towers to meet the requirements of any AM or FM installation.

Towers are normally supplied with a protective coating of rust inhibitive paint prior to shipment, although they can be supplied with a galvanized finish at a slightly higher price. Galvanized is recommended in locations where the tower will be subjected to salt air spray, extreme humidity or other corrosive conditions. The finish coat is normally supplied by the tower erector and is in keeping with CAA requirements.

All hardware, fittings, guy insulators, anchor steel and base insulator (where required) are supplied with each tower. The applicable FCC (CAA) lightning kit and wiring also is provided.

Collins can arrange for trained installation crews who specialize in tower erection. They handle all details, including lighting, ground systems installation, etc. Since tower erection is handled by subcontractors, different erectors are employed in various areas and quotations will be supplied upon request.

Specially constructed towers, shunt-fed radiators and towers used to support FM antennas will also be quoted on request.

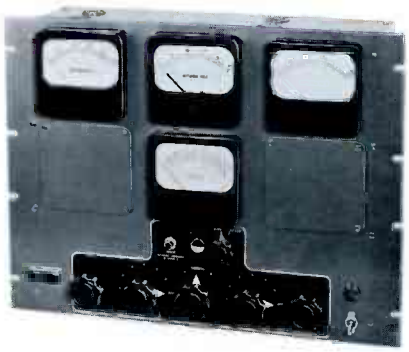
JOHNSON ROTABLE PHASE SAMPLING LOOPS

The 173-11-2 is a fully insulated sampling loop. Sensitivity adjustment is made by varying the loop position in its mounting clamps. The insulated feature permits sampling without the use of an isolation filter on simple arrays and low impedance towers. Constructed of plated steel and supplied with hardware for mounting and connection of 70 ohm line. *Size:* 73″H, 41¼″W.

The 173-10 is a shielded sampling loop which provides a sensitive and highly accurate method of sampling tower currents in directional antenna arrays. Completely shielded to eliminate electrostatic coupling, the loop responds only to the radiated magnetic field. It is unaffected by weather or ice conditions. Sensitivity is adjusted by rotating the

loop on pivot bearings, which lock in any position. The 70 ohm sampling line enters the loop through the bottom pivot. Has universal mounting brackets. *Size:* 72"H, 24"W.

CLARK 108 PHASE MONITOR



The 108 Phase Monitor provides an indication of the phase relations in directional antenna systems, and is tailored for the particular installation. It usually incorporates provision for indicating the relative amplitudes of the currents in the various antennas, as well as the phase relation. *Frequency Range:* 100 kc to 2 mc. *Phase Angle Range:* 0° to 360°. *Monitoring Accuracy:* 1 degree. *Resolution:* ½ degree. *RF Input Impedance:* 50 to 70 ohms nominal. *RF Voltage Range:* 1 to 7 v. *Tubes:* 2-6AU6, 2-OB3, 1-5Y3, 3-6AL5. *Power Requirements:* 105-125 v, 80 w. *Size:* 14"H, 19"W, 7"D. *Weight:* 20 lbs.

CLARK 120-D FIELD INTENSITY METER

The 120-D (formerly WX-2D) is a light weight instrument for the measurement of a wide range of radio signal intensities in the broadcast band. It is also effective for interference studies at low signal strengths and for close-in measurements on directional arrays. *Frequency Range:* 540 to 1600 kc. *Field Intensity Range:* 10 mv/meter to 10 v/meter. *Accuracy of Attenuators:* 2%. *Output Indicator:* direct reading panel meter. *Antenna:* Shielded, unbalanced loop. *Power Requirements:* Batteries 5-1½ v, 2-67½ v (provisions for external supply). *Size:* 9"H, 13"W, 5¾"D. *Weight:* 12½ lbs. with batteries.

CLARK 121 ACCESSORY UNIT

The 121 is designed as a companion unit to the 120D (also WX-2A, WX-2B, WX-2C and WX-2D).

The principal function is its ability to operate 1 ma recorders of the Esterline Angus type to give a permanent record of field strength. It can also be used as a general purpose recording and monitoring amplifier when a high input impedance is desired and 5 v dc is available. *Input Required:* Approximately 5 v dc. *Output:* 1 ma into loads up to 2,000 ohms. *Speaker:* 4" panel mounted. *Power Source:* 117 v 50/60 cps or 6 v dc. *Power Input:* 15 w ac or 2.5 a dc. *Size:* 12½" x 6½" x 4½". *Weight:* 10 lbs.

1181-A FREQUENCY DEVIATION MONITOR

The 1181-A gives direct indication of magnitude and direction of the frequency deviation of an AM transmitter. The monitor input is obtained from the transmitter output. Positive indication of either transmitter carrier or monitor crystal oscillator is provided. *Frequency Range:* .5 to 2.0 mc. *Crystal:* Specify frequency on purchase order. *Deviation Range:* ±30 cps. *Size:* 19"W, 15¾"H, 13"D, for rack mounting. *Power Source:* 105-125 or 210-250 v ac, 50/60 cps 125 w.

1931-A AM MODULATION MONITOR

Operating in the frequency range of 0.5 to 8 mc, the 1931-A measures percentage modulation on either positive or negative peaks, indicates overmodulation, monitors program level, measures carrier shift when modulation is applied and measures transmitter audio frequency response. *Size:* 19"W, 8¾"H, 10"D, for rack mounting. *Power Source:* 105-125 v ac, 50/60 cps, 50 w.

REMOTE ANTENNA CURRENT METERING KIT

This kit consists of a meter, thermocouple, meter mounting bracket and 15 feet of shielded pair wire. It is used to remotely read antenna current at the transmitter. A thermocouple is supplied to work in conjunction with the RF current tranformer in Col-

lins 42E tuning units. When ordering, specify type of tuner, base current of tower, base resistance or complete description of antenna system. This kit can be installed at the factory prior to transmitter shipment (at no additional charge for installation) or ordered as a kit for customer installation.

MISCELLANEOUS METERS

All popular sizes and ranges of RF and DC meters are also available.

FISHER-PIERCE 63305C BEACON LIGHT CONTROL

This photo-electric lighting control turns tower lights on at sunset and off at sunrise at predetermined levels of north sky illumination. It operates on 105-130 volts, has a contact rating of 30 amps and is supplied in a weatherproof housing. Approximate shipping weight is 10 lbs.

COPPER GROUND WIRE AND STRAP

Collins supplies No. 10 bare copper ground wire (31.8 ft. per lb.), 2" x .032" copper ground strap (4.02 ft. per lb.) and 4" x .032" copper ground strap (2.01 ft. per lb.). Also available is Truscon 8' x 24' expanded copper mesh ground screen.

RUST REMOTE CONTROL SYSTEMS

Rust remote systems consist of self-contained transmitter and control units, equipment for obtaining frequency and modulation monitor readings, and accessory units coordinated on 'building block' principles.

These are tubeless dc systems that can control normal transmitter requirements such as switching program lines, adjusting plate or filament voltage, operating a line variac, CONELRAD switching, operation of power contactors, metering of voltages and currents, loading and tuning, turning transmitter on or off, tower lights and metering of same.

If future requirements call for additional capacity, accessory units may be wired into the system. No additions or alterations to the basic units are needed, and all Collins transmitters can be equipped with remote control at the factory or in the field.

Four systems are available: the Rust C, D, F, and S Systems.

Series C

The C System is recommended for single transmitter non-directional stations as well as two- and three-tower single pattern directional operations. Provides up to 10 two-direction (20 total) control functions and 9 meter readings. Features complete accessibility, reliability and ease of installation with plug-in interconnecting cables supplied. Includes a provision for checking metering circuit calibration at the control point. *Size:* Control Unit 108-OC-19"W, 7"H, 7½"D; Transmitter Unit 108-1C-

19"W, 8¾"H, 7½"D. *Power (each unit):* 100-130 v 50/60 cps, 25 va or less. *Function Indication:* By individual numbered pilot light indicators. *Panels:* Standard RETMA rack slotting, umber gray.

Series D

The D System has a built-in reserve capacity to handle future requirements for added transmitters or directional remote operation. Features compact, accessible construction with drop-down hinged panels, low power consumption and no tubes. Can control a total of 50 functions and provide 24 meter readings. *Size:* Control Unit 108-0D-19"W, 8¾"H, 8½"D; Transmitter Unit 108-1D-19"W, 10½"H, 8½"D. *Power (each unit):* 100-130 v 50/60 cps, 25 va or less. *Function Indication:* By illuminated drum mounted on stepper. *Panels:* Standard RETMA rack slotting, umber gray.

Series F

This economy version of the C System likewise furnishes 10 two-direction control functions and 9 meter readings. Successor to popular Series E System. *Location:* 108-0F-rack mount at control point; 108-1F — rack mount adjacent to transmitter. *Size:* 108-0F — 19"W, 8¾"H, 8"D; 108-1F —

108-OF

108-1F

19"W, 8¾"H, 7¼"D. *Panel (each unit):* Umber gray, 8¾" x 19", RETMA slotting. *Power Source:* 108-0F — 100-130 v 60 cps ac, 20 w; 108-1F — 100-130 v 60 cps ac, 10 w. *Meters (on 108-0F):* Plate Voltage 0-2000/4000; Plate MA 0-500/1000; Ant. Amps 0-5/20 (also 'Twr Lts' and 'CAL'); Frequency Deviation (100-0-100 ma); Modulation Percentage (600 ma F. S.). *Panel Controls (on 108-0F):* Main transmitter and remote control power switch; push button for CAL reading; knob to set CAL reading; raise-lower switch; function selector knob.

Series S

This 108-S-1 'Space Saver' System remotely controls a transmitter from a nearby control point to which it may be connected with multi-wire cable. It provides simultaneous reading of all meters and independent operation of all control functions with a minimum of complicated equipment. *Size:* 19"W, 8¾"H, 7"D. *Power Requirements:* 115 v 60 cps, 25 w. *Controls:* Filament on-off, plate on-off, raise-lower output, 2 spare push buttons. *Meters:* 0-150/300 v ac line voltage; 0-2/4 kv dc plate volts; 0-500/1000 ma dc plate current; 0-5/20 amp ac antenna current; frequency deviation; percent modulation.

TRANSMISSION LINES

Collins can supply both open wire and coaxial transmission lines. These are available in a range of impedances and power-handling values to meet all commercial broadcast applications.

Coaxial lines are offered in flexible, semi-flexible and rigid types. The solid-dielectric, flexible or semi-flexible lines are suitable for powers up to and including five kilowatts. For higher powers, gas or air dielectric rigid lines are recommended.

Prices and detailed specifications for any broadcast application are available upon request.

B & W 200 AUDIO OSCILLATOR

The model 200 is a resistance capacitance type for making frequency response, distortion and other audio measurements. *Ranges:* 30-300, 300-3,000, 3,000-30,000 cps. *Output:* 10 v into 500 ohm load. Less than 1% rms harmonics 30-15,000 cps with 500 ohm load. *Response:* Better than ±1 db 30-15,000 cps. *Calibration Accuracy:* 3% of scale reading. *Size:* 13¾" x 7¼" x 9½". For operation from 105-125 v ac 50/60 cps. *Shipping Weight:* 17 lbs.

B & W 400 DISTORTION METER

The model 400 measures low-level audio voltages, noise and harmonic content and amplifier gain. *Ranges:* Distortion meter 30-15,000 cps on fundamentals, to 45,000 cps on harmonics; voltmeter and db meter 30-45,000 cps. *Sensitivity:* Noise and distortion — 0.3 v minimum input; voltmeter — 0.3, 0.1, 0.03, 0.01 and 0.003 v for full scale readings. *Size:* 13¼" x 7¼" x 9½"; 4½" meter. For operation from 105-125 v ac 50/60 cps. *Shipping Weight:* 17 lbs.

SPEECH EQUIPMENT

212E-1 SPEECH INPUT CONSOLE

The 212E-1 Speech Input Console offers custom-engineered flexibility in a dual channel console at a production line price. Modular-type construction assures broadcasters and recording studios of meeting a wide range of audio mixing requirements for years to come.

Starting with only the sub-units needed for single studio operation, the 212E-1 Console can be expanded by the addition of more plug-in modules to handle up to nine of 22 possible inputs simultaneously and serve two output lines. Monitoring provisions are incorporated for program, audition and remote lines, along with speaker and warning light controls.

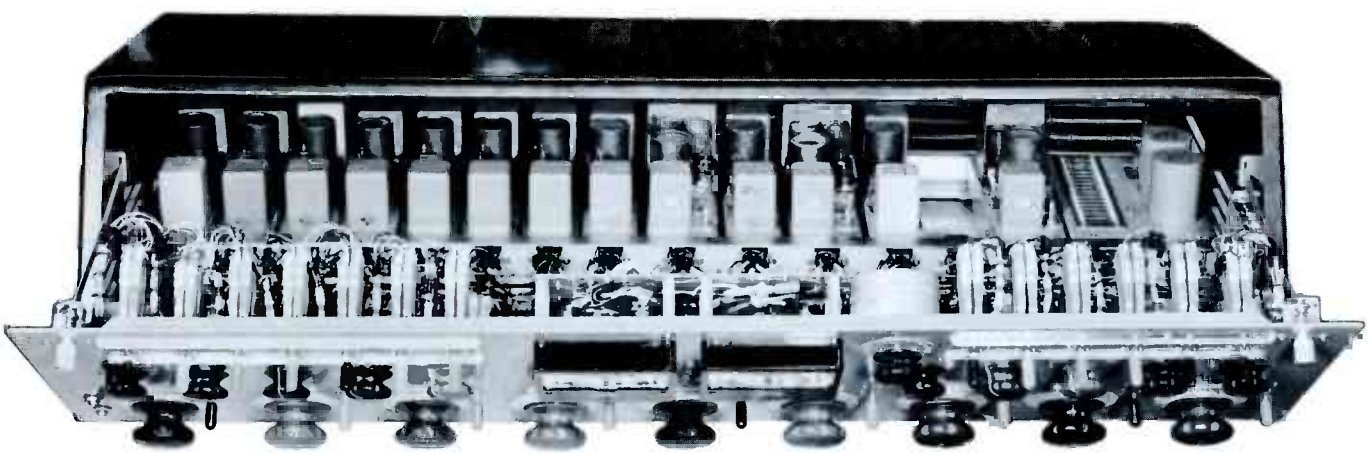
Ease of operation is assured by the use of clearly marked and color coded controls. In addition, write-in strips are provided for line switches and mixing attenuators. Even an inexperienced control operator can quickly master the 212E-1 with these aids.

Reliability of the 212E-1 has been obtained through the use of carefully engineered, highly stable circuits employing the finest quality components. Excellent frequency response is maintained, along with extremely low noise and distortion, from 50 to 15,000 cps.

Service and maintenance have been given consideration in the form of a hinged front panel which permits instantaneous inspection or removal of any amplifier. Each sub-unit has a Howard Jones connector, and an adapter cord is supplied to permit operation and service of any module while removed from the console cabinet. This can be done while the console is in normal operation.

The front accessibility provided by the hinged front panel also permits mounting the console flush against a wall. Rubber feet are furnished for desk top mounting and additional spacers and mounting holes are provided for installations where it is desirable to bolt down the console.

Space is provided in the 212E-1 Console cabinet for up to seven pre-amplifiers, plus booster amplifiers, program amplifiers, a monitor amplifier and a cueing amplifier. A rack mounting shelf is optionally available for amplifiers, power supplies and relay



units where the maximum facilities of the console are employed.

A spare lever switch has been included for any desired custom wiring.

Another outstanding feature is an external position on the second VU meter switch. This position can be terminated at a patch panel to provide VU monitoring of any external audio circuit.

Talk-back on a remote line is simplified to a single switch operation after the initial set up of two switches.

Lever switches permit the selection of two possible program sources for each low level input fader and selection of four possible program sources for each remote input fader. The mixer attenuators are of step-type design, with their outputs connected to a key switch. Thus, each input can be fed to either of the two program lines when the console is used for dual operation. The second channel can also be used for audition purposes during normal single-line program operation.

All program, audition and remote lines may be monitored both audibly and by VU meter.

An optional feature available is the Collins 356E-1 Limiter Amplifier. This plug-in module can be inserted in place of the 356B-1 Program Amplifier, allowing unattended operation. By removing the 6AL5 bias rectifier, the 356E-1 becomes a straight program amplifier for applications where the limiting action is not desired.

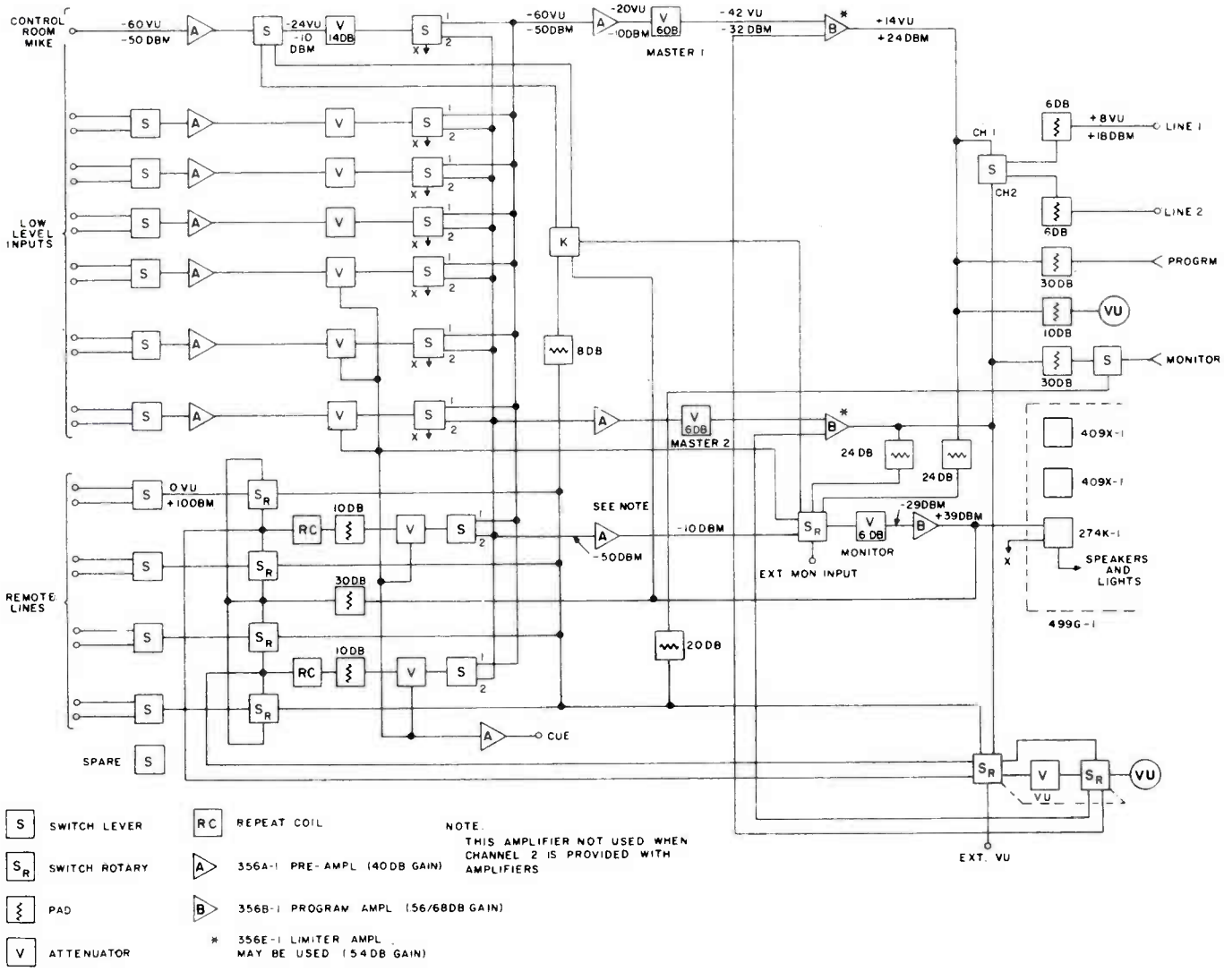
SPECIFICATIONS

Audible Noise: None.

Exterior Finish: Metalized blue-gray enamel front panel with white silk-screened lettering. Cabinet black baked enamel.

Ambient Temperature Range: +15°C to +45°C.

Power Source: 115 or 230 v ac ±10%, 50/60 cps single phase.



Ambient Humidity Range: Up to 95%.

Maximum Number of Channels: Seven low level inputs, two remote inputs, two program outputs, one monitor channel and one cue channel when provided with: ten 356A-1 Pre-amplifiers, two 356B-1 or 356E-1 Amplifiers, one 356B-1 Program/Monitor Amplifier, one 274K-1 Relay Unit, two 409X-1 Power Supplies and two 499G-1 Rack Mounting Shelves.

Input Impedance: Low level — 30/150/250/600* ohms (balanced or unbalanced). Remote lines — 150/600 ohms.*

Output Impedance: Line — 150/600* ohms. Monitor 600 ohms.

Input Level: Low Level — −50 dbm nominal (100 db gain). Remote — 0 dbm.

Gain: Low level to program line at least 100 db. Remote line to program line 54 db.

Output Level: Program — +18 dbm (50 mw). Monitor — 8 watts.

Response: ±1.5 db 50-15,000 cps at program line.

Distortion: Less than 1% at ±18 dbm at program line. Less than 3% at 8 w out of monitor amplifier.

Noise: At least 68 db below +18 dbm output with −50 dbm input. (Equivalent input noise level −118 dbm or less.)

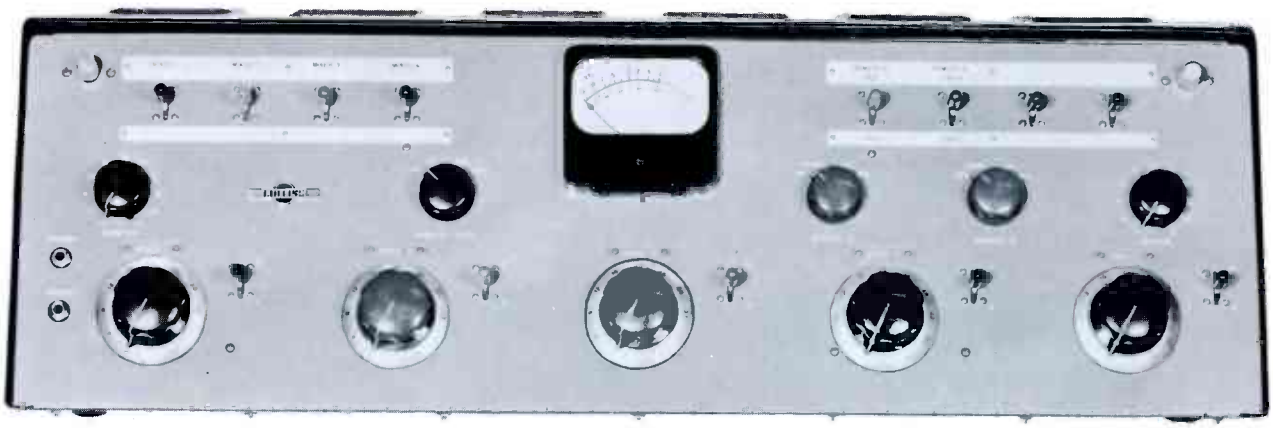
Controls: Seven low level gain controls, two remote line gain controls, one monitor gain control, two program gain controls, seven low level selector switches, four remote line function switches, four remote line selector switches, nine channel selector switches, one monitor input selector switch, VU meter range switch, VU meter input selector switch, headphone jack input selector switch, output line switch, and spare lever switch.

Indicating Devices: VU meter across program channel 1 continuously, and VU meter with adjustable range and selection of six internal inputs and an external input.

Size: 22½"D, 41⅛"W, 11"H.

Weight: 135 lbs.

*Shipped with 600 ohms output and remote line impedance, 150 ohms low level input impedance.



212F-1 SPEECH INPUT CONSOLE

The 212F-1 is a flexible packaged unit providing complete control over simultaneous broadcasting and auditioning from any combination of three of eight possible inputs, with provisions for mixing five of twelve possible inputs with the addition of two pre-amplifiers. In addition, the 212F-1 provides for monitoring of program, audition or remote lines, and control of speakers and warning lights.

Superior quality, performance and accessibility are combined in the 212F-1 to make it an outstanding contribution to high-fidelity AM, FM and TV broadcasting or program control in audio systems.

Advanced styling and construction provide an attractive appearance and quick, easy accessibility to all cabling, wiring and sub-units. Excellent ventilation is achieved by louvres in the welded steel cabinet top and sides and through the elimination of tube shields.

Use of highest quality components provides top reliability. The hinged front panel tilts forward, allowing instantaneous inspection or removal of all amplifiers, power supply and relay unit. All plug-in sub-units are provided with standard connectors and an adapter cord is provided to externally

service any unit while the console is in operation. Howard Jones barrier-type terminal strips are provided for all external leads and are readily accessible when the panel is tilted forward. For desk-top mounting, rubber feet are provided to space the cabinet above the mounting surface. The 212F-1 can be bolted to the mounting surface if desired and spacers and mounting holes are provided.

The console cabinet provides all of the space required for the amplifiers, power supply and relay unit. No additional rack cabinet space is needed and the associated interconnecting wiring is eliminated in this self-contained unit.

The 212F-1 is especially adaptable for initial installations. Space is provided for additional plug-in amplifiers as demands increase. The pre-amplifier, amplifiers, power supply and relay unit are of the plug-in type, and the 212F-1 may be obtained with the desired initial complement.

The 212F-1 uses only two types of amplifiers and three tube types, resulting in less spare tube maintenance.

As an aid to efficient operation, all mixer knobs and associated key switches are color coded. Write-in strips are provided for the input switches, remote switches and mixer attenuators.

The 212F-1 is supplied with three 356A-1 Amplifiers. Two are used as pre-amplifiers in low level inputs and the third as a booster amplifier in the program channel. Key switches at the low level input terminations allow selection of two of four possible inputs. By adding two 356A-1 Pre-amplifiers, four other low level inputs are available. The plug-in type of construction allows easy removal or relocation of the units.

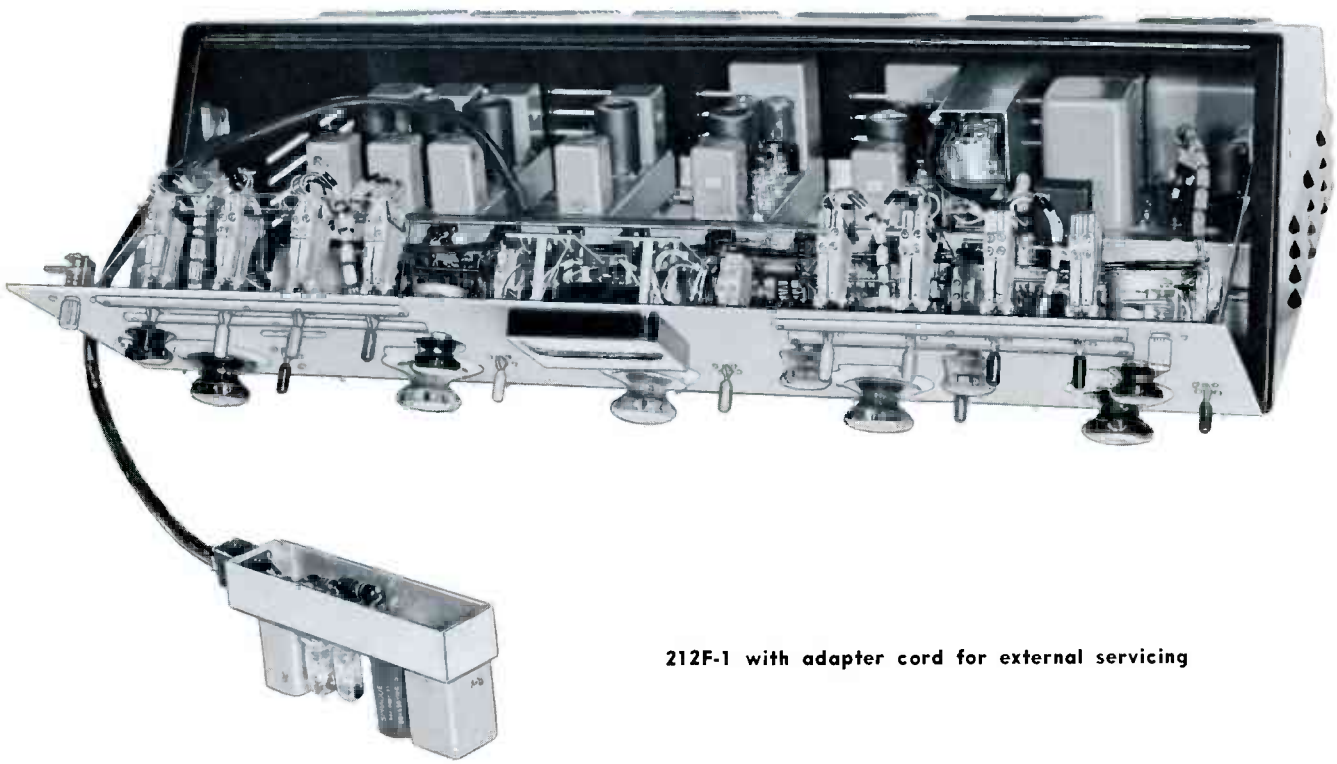
The purchase of four 356A-1 Amplifiers in addition to the basic three will provide a booster amplifier for the monitor circuit and a cueing amplifier. No rework will be required to add these additional facilities, as units are plug-in type and the necessary wiring is incorporated in all of the 212F-1 broadcast consoles. Two spare lever switches are provided for any desired custom wiring.

The block diagram on the opposite page shows the 212F-1 system. Components not supplied but provided for are shown as dotted units.

Lever switches allow selection of two possible inputs for each 356A-1 Pre-amplifier. The 212F-1 uses high level mixing following 40 db gain in the pre-amplifiers. The mixer attenuators are step-type with outputs connected to key-type lever switches. The lever switches terminate into the program bus, audition bus or resistive termination.

The program bus feeds an additional 356A-1 Pre-amplifier being used as a booster amplifier for 40 db gain. A step-type ladder attenuator for the master gain control and a fixed pad precede the program amplifier. The 356B-1 Program/Monitor Amplifier is set for a 56 db gain. The output of the program amplifier is isolated from the program line by a 6 db pad. A VU meter wired to the output of the program amplifier provides accurate measurement of the output level.

Remote line operation incorporates two lever and two rotary switches to select proper circuitry for incoming or outgoing program, audition or cue signals.



212F-1 with adapter cord for external servicing

Three of the mixer attenuators have cueing positions. The output of the cue circuit will operate headphones, or a 356A-1 Pre-amplifier may be plugged in to provide 100 milliwatts to a speaker.

Four relays in the 274K-1 Relay Unit are operated by the lever switches in the first three input channels. These relays will control the operation of the warning lights and speakers in four studios.

An optional feature available is the Collins 356E-1 Limiter Amplifier. This plug-in module, designed for use with the 212F-1, can be inserted in place of the 356B-1 Program Amplifier, allowing unattended operation. By removing the 6AL5 bias rectifier tube, the 356E-1 becomes a straight program amplifier.

SPECIFICATIONS

Audible Noise: None, relay noise damped by mounting relays on rubber.

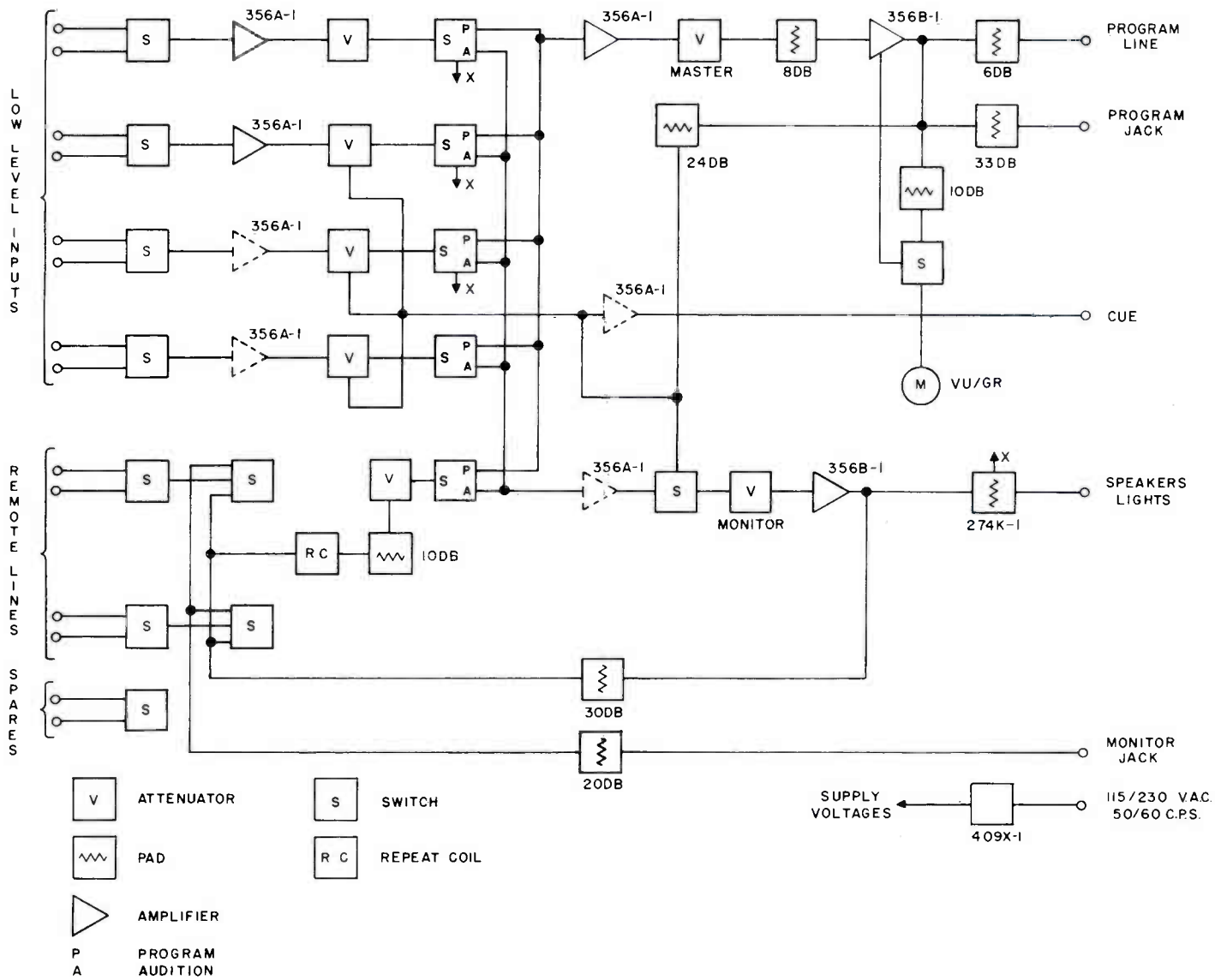
Exterior Finish: Metalized blue-gray enamel front panel with white silk-screened letters. Cabinet finished with black baked enamel.

Ambient Temperature Range: +15°C to +45°C.

Ambient Humidity Range: Up to 95%.

Number of Modules: The 212F-1 consists of the cabinet assembly and the following modules: three 356A-1 Pre-amplifiers, two 356B-1 Program/Monitor Amplifiers, one 274K-1 Relay Unit and one 409X-1 Power Supply.

Power Source: 115 or 230 v ac ±10%, 50/60 cps, single phase.



Number of Channels: Two low level inputs with provision for four low level input channels with the addition of two more 356A-1 Pre-amplifiers. One remote input, one program output and four monitor outputs. Cueing output from three of the low level mixer attenuators.

Input Impedance: Low level — 30/150/250/600 ohms balanced or unbalanced. Remote lines — 150/600 ohms.

Output Impedance: Program line—150/600 ohms.* Monitor — 150/600 ohms.*

Input Level: Low level — −60 db nominal (100 db gain). Remote — +10 dbm.

Gain: Low level to program line at least 100 db. Remote line to program line 50 db.

Output Level: Program line — +18 dbm (50 mw). Monitor — +39 dbm (8 watts).

Response: Audio ±1½ db, 50 to 15,000 cps at program line.

Distortion: Less than 1% at +18 dbm at program line. Less than 3% at 8 watts out of the monitor amplifier.

Noise: At least 68 db below +18 dbm output with −50 dbm input (less than −118 dbm at low level input).

Crosstalk: Greater than 50 db below program level, 30 to 20,000 cps.

Controls: External: Four low level gain controls, one remote line gain control, one monitor gain control, one master gain control, four low level selector switches, two remote line selector switches, five program/audition switches, two remote line off/cue/phone/mix switches, one program/audition/cue switch, two spare lever switches.

Internal: One toggle gain switch on each 356B-1 Program/Monitor Amplifier. One voltage adjust rheostat on the 409X-1 power supply.

Protective Devices: Protective fuses are provided in the primary supply voltage and dc voltage leads.

Indicating Devices: A VU meter across the program line.

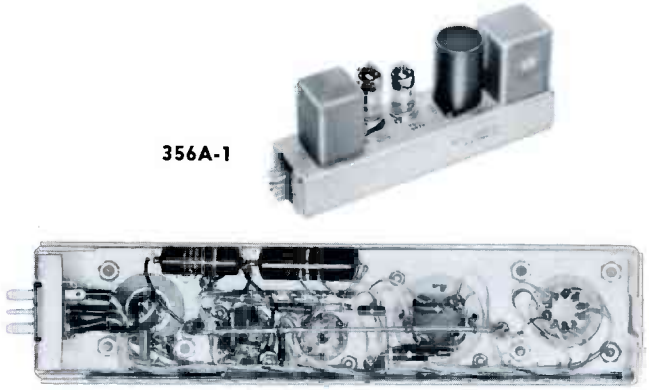
Size: 22"D, 35"W, 10¼"H.

Operational Aids: Each mixing channel has colored knobs for its switches and attenuator, reducing operational errors. Lights in the VU meter. Write-in strips for the low level and remote line switches.

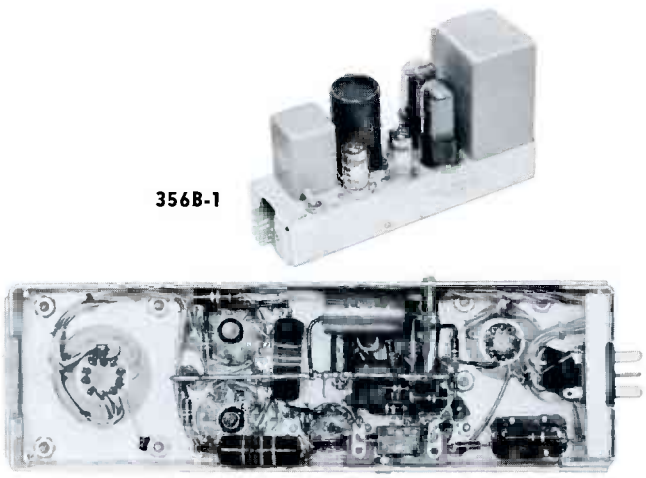
Weight: 100 lbs.

*Shipped wired for 600 ohms.

356A-1



356B-1



356A-1 PRE-AMPLIFIER

The 356A-1 is a high fidelity two-stage unit for service in AM, FM and TV applications. It is usually used to feed a line amplifier in the Collins 212F-1 and 212E-1 Speech Input Consoles. It operates from a low-level microphone or similiar source and has sufficient output to drive a program amplifier, or audition facilities. *Input Impedance:* Unloaded transformer. Source impedance 30/150/250/600 ohms (supplied wired for 150 ohms). *Input Level:* Commercial microphone; −60 db nominal. *Output Impedance:* 150 or 600 ohms balanced or unbalanced. *Output Level:* +18 dbm maximum *Gain:* 40 db. *Frequency Response:* ±1 db, 50 to 15,000 cps. *Distortion:* 0.5% maximum. *Noise:* −118 at input, or 96 db below full output. *Tubes:* 2 — 5879. *Power Requirements:* 6.3 v ac or dc at 0.3 amps. 250 v dc at 6.5 ma or 300 v dc at 7.5 ma. *Size:* 4⅝"H, 2⅛"W, 9½"D. *Weight:* 2¼ lbs.

356B-1 PROGRAM/MONITOR AMPLIFIER

The 356B-1 is a plug-in console sub-unit for pro-

gram and monitor amplifier use in 212F-1 and 212E-1. It is a three-stage amplifier with push-pull output and has a switch for high or low gain.

The unit's high-fidelity lends it to many applications in AM, FM and TV broadcasting. Followed by a high fidelity speaker, the 356B-1 is excellent for custom installation. *Input Impedance:* Unloaded transformer, source impedance 150/600 ohms. *Input Level:* −32 dbm. *Output Impedance:* 150/600 ohms. *Output Level:* +30 dbm to 8 watts (+39 dbm). *Gain:* 56 db or 68 db, selectable by switch. *Frequency Response:* ±1 db, 50 to 15,000 cps. *Distortion:* 0.5% maximum at +30 dbm, 3% maximum at 8 watts (+39 dbm). *Noise:* −116 dbm at input, or 90 db below full output of 1 watt.

Tubes: 2 — 5879, 2 — 6V6. *Power Requirements:* 6.3 v ac at 1.2 amps. 63 ma at 250 v dc at 1 watt output. 75 ma at 300 v dc at 1 watt output. 88 ma at 300 v dc at 8 watts output. *Size:* 9½"L, 2⅞"W, 5¾"H. *Weight:* 6 lbs.

274K-1

409X-1

409Y-1

356E-1

274K-1 RELAY UNIT

The 274K-1 is a plug-in relay unit for the 212F-1 and 212E-1. Four relays control studio speakers and warning lights. The unit is provided with a cover to protect relay contacts from dust and damage while handling. Each relay is provided with a series shunt circuit to minimize switching transients and arcing. Noise is held to a minimum by mounting the relays on rubber. When used with the 212F-1 and 212E-1 consoles, the 409X-1 Power Supply provides the 12 v dc at 560 milliamps and studio wiring provides power for the warning lights. *Connectors:* Howard Jones P-312-AB connector mounted on the front surface and a Howard Jones P-315-CCE connector on a 5½" pendant cable. *Size:* 5½"H, 2½"W, 9"D. *Weight:* 2½ lbs.

409X-1 POWER SUPPLY

The 409X-1 is a plug-in supply for the 212F-1 and 212E-1 Consoles. *Tubes:* 2 — 5Y3. *Output Voltages:* Up to 250 ma at 300 v dc adjustable. 6.0 amps at 6.3 v ac. 12 v dc. *Power Source:* 115 or 230 v ac, ±10%, 50/60 cps single phase. *Power Input:* 225 watts maximum. *Protection Devices:* Overload fuses in the primary supply and output voltage leads. *Size:* 9½"L, 8"W, 6"H. *Weight:* 25 lbs.

409Y-1 POWER SUPPLY

Also for use with 212E and 212F Consoles. *Output Voltages:* Up to 100 ma at 300 v dc, adjustable; 3 amps at 6.3 v ac. *Power Source:* 115 or 230 v ac, 50/60 cps, single phase (supplied wired for 115). *Size:* 5½"W, 5-9/16"H, 9½"D.

356E-1 LIMITER AMPLIFIER

The plug-in 356E-1 acts as an automatic average level or average limiting amplifier in broadcast, TV and microwave audio systems. It consists of a push-pull variable gain input stage driving a push-pull output stage. A bias rectifier provides bias to regulate gain of the input stage. A decal to convert a VU meter to a gain reduction meter is furnished with the unit.

The 356E-1 was designed for use with the 212F-1 and 212E-1, permitting unattended remote audio operation. However, it can be used to control level differences between two or more sources, as a program line compressor, expander-compressor operation or as a program amplifier.

Input Impedance: Unloaded transformer, source impedance 150 or 600 ohms.

Input Level: −54 dbm to −24 dbm with threshold control set at 0 dbm output. −34 dbm to −4 dbm with threshold control set at +20 dbm output. −24 dbm to +6 dbm with threshold control set at +30 dbm output. *Note:* 0 dbm =1 milliwatt across 600 ohms.

Output Impedance: 150 or 600 ohms, balanced or unbalanced.

Output Level: 0 dbm to +18 dbm, with threshold control set at 0 dbm output. +20 dbm to +30 dbm, with threshold control set at +20 dbm output. +30 to +36 dbm, with threshold control set at +30 dbm output.

Response: ±1 db, 50 to 15,000 cps.

Distortion: 1.5% maximum, 50 to 15,000 cps no compression. 2% maximum, 50 to 15,000 cps at any level up to 30 db gain reduction with threshold set at +20 dbm output.

Output Noise: −50 dbm or less (with threshold control set for +20 dbm output).

Compression Ratio: Adjustable 1.6/1 to 5/1, 3/1 optimum, over a 30 db range at input.

Attack Time: 11 milliseconds with switch set for dual operation. 62 milliseconds with switch set for average operation.

Release Time: 0.9 seconds for 63% recovery with switch set for dual operation. 5.2 seconds for 63% recovery with switch set for average operation.

Gain: 54 db.

Controls: Dual/average toggle switch at top near front of chassis.

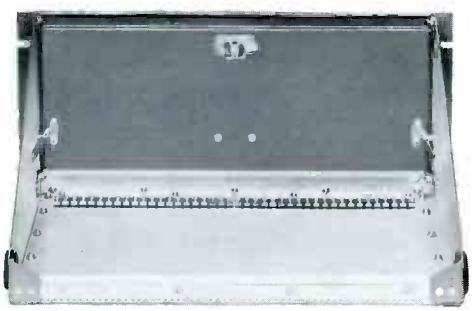
Operational Aid: 1. Test points for measuring bias voltage in adjusting threshold control.

Tubes: One GL-6386 Variable Gain Input Amplifier, two 6V6GT Output Amplifiers and one 6AL5 Bias Rectifier.

Power Source: 6.3 v ac at 1.55 amps. +300 v dc at 77 milliamps.

Size: 5-5/16"H, 3"W, 9"D, plus connector.

Weight: 5 lbs.



499G-1

Studio console test cable

Studio console jumper plug

499G-1 RACK MOUNTING SHELF

The 499G-1 is a shelf used in AM, FM and TV stations to mount amplifiers, relay units and power supplies. Because of its flexibility the amount and type of components it holds is limited only by the space available in the shelf. Associated equipment includes both the 212E and 212F consoles, and the amplifiers, relay unit and power supply listed on the following pages. *Size:* 14"D, 19"W, 8-23/32"H at front, 2"H at back. *Weight:* 11 lbs. *Type of Construction:* Fixed type rack mounting shelf with an 8-9/16" x 17⅜" panel hinged at bottom. Floor of shelf perforated sheet metal. *Type of Mounting:* Bolts to any standard 19" rack. *Finish:* Door and mounting angles Collins 4E gray enamel. Floor of shelf cadmium plated. *Connectors:* Howard Jones barrier strip mounted at front or back of unit. *Ventilation:* Convection-holes in bottom plate. *Service Conditions:* Normal studio conditions. *Flexibility:* Holes on both sides at front and back allow wiring to individual style. Perforated bottom plate allows mounting components without drilling additional holes.

PLUG-IN BRACKET ASSEMBLIES

Also available are assemblies to facilitate mounting of plug-in amplifiers in the 499G-1. They are available in 12- or 15-pin models with or without cable.

212Z-1

Left, rugged carrying case

Below, rear view showing terminals and jacks

212Z-1 REMOTE AMPLIFIER

The 212Z-1 four channel remote is a rugged transistorized unit retaining the outstanding qualities of its predecessor, the 12Z, and adding many more. Design details of the 212Z-1 were influenced by answers to a questionnaire mailed to a representative sample of broadcast stations across the country.

Among the features of the 212Z-1 are a power source of both 115 v ac and batteries, with automatic changeover both when ac power fails and when it is restored; self-contained batteries with life of approximately 75 hours; new light weight; maximum gain of 90 db; tone oscillator for line-level set up; auxiliary output for public address feed; transistors and printed wiring. Step faders rather than composition type faders are used. Four microphones can be accommodated.

The photograph above shows the 212Z-1 with carrying case open. Apparent are the convenient sloping panel and low height, the well placed and properly shaped knobs, the large illuminated VU meter and individual channel plastic write-in strips.

A distinctive finish of black and metallic blue-gray gives the 212Z-1 an attractive abrasion-resistant finish.

All terminals and jacks (except the line and program monitors) are located at the rear of the unit, insuring that the operator's movements will be unimpaired by bulky cords and cables.

One or two headsets may be plugged into the monitor jacks. Where loudspeaker monitoring or feed for local PA is desired, the PA terminals are used, and an individual gain control allows the operator to handle the program and simultaneously ride gain on the PA system.

A "multiple" jack is located on the side of the unit, permitting two 212Z-1's to be used simultaneously and controlled by one master gain control.

The 212Z-1 is housed in a compact rugged Royalite carrying case which has space to house the power cord also supplied with the unit. The 212Z-1 is fastened to the bottom of the case and all that is necessary for most remote applications is removal of the top. However, the unit can be easily removed and operated at permanent locations. The 212Z-1 weighs only 22 pounds in carrying case with batteries, a radical departure from the relatively bulky and inflexible remotes in common use.

Four Cannon XL-3-13N or Cannon P-3-13 microphone receptacles are supplied with the standard unit, and other connectors are available on special order at additional cost.

Batteries are not included as standard equipment with the 212Z-1 and should be ordered separately. In the block diagram on the next page, the four pre-amplifiers Q1 through Q4 use 2N106 hermetically sealed low noise transistors. The input faders feed the second pre-amplifier Q5 (also a 2N106) through the tone oscillator switch. The booster Q6 feeds the master gain control which is followed by the driver, Q7.

The booster and the driver both employ 2N64 transistors. The output amplifier (Q8 and Q9) has push-pull 2N44 transistors with transformer coupling on the input and output sides. Transformer T-2 feeds the program monitor, the VU meter, and the public address line and program switch. Provisions are made for two program lines and telephones through the output switch.

The power supply is a shielded, filtered full-wave supply employing germanium diodes and multisection filtering. A cutover relay connects the batteries to the amplifier whenever the ac line voltage fails.

The 400 cps tone oscillator employs a Colpitts circuit and feeds a low level signal to the second pre-amplifier through a selector switch. A power interlock switch insures that there is no battery drain when the unit is in its closed carrying case.

The four channel mixing circuit incorporated in the amplifier is designed to work with all microphones 30 to 600 ohms.

The output circuit is designed to match a 600-ohm line. To work into 150 ohms, the use of an external repeat coil 600 ohm/150 ohms is recommended. Minor rework of the unit will also provide 150 ohms.

When a telephone set is connected to the "Tel" posts, the line can be used for communication with the master control room.

Although simultaneous program feed and communication cannot take place over a single line at the same time, the output switch allows rapid interchange between the line of the telephone set for communication and the amplifier output for program transmission. This facilitates operation where only one line is available to the control point or radio transmitter.

When two lines to the master control are available, one can be used for program feed or receipt of cue preceding transmission, and the other for simultaneous communication. With this arrangement, the communication line can be substituted immediately for broadcast by simply turning the output switch and making a corresponding switch in the master control room. This rapid interchange feature between the two lines at the remote point provides a necessary safety factor, especially valuable when important programs are being broadcast.

If a telephone set is not readily available, it is possible to carry on communication by using the announcing microphone and amplifier for outgoing speech and the monitor headset for incoming speech.

SPECIFICATIONS

Input: Four channels selected by faders numbered to correspond with input plugs.

Input Impedance: 25 to 600 ohms.

Gain: 90 db minimum.

Noise Level: 55 db below normal output level (−115 dbm equivalent input noise figure).

Power Output: Normal +1 vu (+11 dbm). Emergency +6 vu (+16 dbm).

Distortion: Less than 1½% at +5 dbm.

Frequency Response: ±1.5 db 50-15,000 cps.

Output Impedance: 600 ohms (150 ohms available).

Case: Welded aluminum with removable bottom plate for access, finished in black and medium blue-gray.

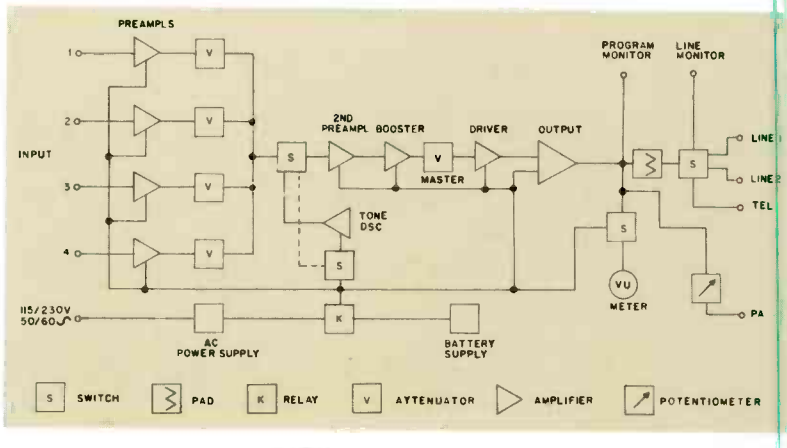
Microphone Connections: Cannon XL-3-13N or P-3-13 supplied. Hubbell 7557, Cannon UA-3-13 or UA-3-14 available at additional cost.

Power Source: 115 or 230 v ac 50/60 cps or self-contained batteries (supplied wired for 110 v ac). Batteries are low cost standard types, one 4.5 volt Burgess D-3 or Eveready 726, and two 22.5 Eveready 763. 22.5 v battery life approximately 75 hours. 4.5 volt approximately 90 hours. (Batteries not supplied with 212Z-1).

Ambient Temperature Range: 0-45°C.

Ambient Humidity Range: Up to 95%.

Weight: 22 lbs. complete with batteries in case.



Micromote with monitor earplug and mike connection. Clip on back holds units in pocket or on belt.

'MICROMOTE' TRANSISTORIZED SINGLE CHANNEL REMOTE AMPLIFIER

Only slightly larger than a package of cigarettes, this remote is ideal for one-man one-mike situations. It weighs only 10 oz. complete with ear-plug head-phone and mike connector and fits easily into a breast pocket or on belt. It is constructed of sturdy chrome-finished steel and contains 4 mercury batteries and 6 transistors. The batteries have an average life of over 200 hours and as long as the built-in battery test light operates, at least 12 hours life remains. For use with 50-250 ohm mikes. *Frequency:* ±1 db 70-15,000 cps. *Power Output:* 600 ohms ±12 dbm. *Distortion:* Less than 1%. *Gain:* 85 db. *Noise:* 80 db down below 12 dbm. *Size:* 2¼"W, 3⅝"H, ¾"D.

BOGEN LOM PRE-AMPLIFIER CONTROL

This mixer includes five independently controlled microphone inputs, one convertible to a phono cartridge input. An accurate level meter permits continuous monitoring of the combined output of all channels in use. High impedance output may be easily converted to low impedance with T-165 600-ohm transformer for remote broadcasting or recording work. *Output:* 30 milliwatts at less than 2% distortion; 6 milliwatts at less than 0.5% distortion. *Peak Output:* 45 milliwatts. *Controls:* 5 Gain, 4 Speech Filter, Microphone-Tuner-Phono, Bass, Treble, Off-On-Master Gain. *Frequency Response:* ±1 db 20-20,000 cps. *Gain:* microphone, 80 db; tuner, 45 db; crystal phono, 45 db; magnetic phono, 65 db. *Hum:* microphone and phono, −60 db below rated output. *Size:* 16¼"W, 13"D, 5⅜"H. *Weight:* 21 lbs.

26U-1 LIMITING AMPLIFIER

This unit is applicable for controlling the amplitude of audio frequency peaks in either AM or FM. In AM, by limiting loud audio passages, it prevents over-modulation and the resulting distortion and adjacent channel interference. In FM, the 26U prevents excessive transmitter swing and the distortion at the receiver caused by the inability of the average discriminator to handle frequency swings greater than 150 kc. The 26U is equally adaptable to recording equipment and quality P.A. systems. Input and output levels are adjustable and distortion and noise are low. An illuminated four-inch VU meter and variable attenuator provide a visual indication of input and output levels and amount of compression in db. The meter can also measure external audio levels and gain reduction when used with 356E-1 Limiting Amplifier. A hinged front panel gives access to internal controls and components; tubes and connections are accessible from the rear. *Frequency Range:* ±1½ db 50-15,000 cps. *Input Impedance:* 600 ohms unbalanced. *Input Level:* −20 to +20 dbm. *Output Impedance:* 600 ohms unbalanced (adjustable), 600 ohms balanced (fixed). *Compression Ratio:* 12/1 first 10 db above verge of compression. *Attack Time:* Adjustable 0.5-3.0 milliseconds. *Release Time:* Adjustable 2.2-5.2 seconds. *Distortion:* Harmonic 1½% maximum, at 25 db compression. *Power Source:* 120/130 v ac 50/60 cps. *Size:* 19"W, 10½"H, 9"D.

62E-1 VU PANEL

The 62E is designed for accurate monitoring of audio levels in broadcasting, recording studios and sound systems. A standard 4" VU meter is provided, with illuminated face and easily read figures. Over-swing is slight, and pointer action is deliberate and positive. It has a type A scale, with −20 to +3 VU on the upper side and zero to 100% on the lower side.

Three controls are provided. Any of four circuits can be monitored by the circuit selector switch. The attenuator control is calibrated at 1 mw (zero level) and in steps of 2 db up to a total of 40 db. A vernier screw adjustment allows ±0.5 db variation for co-ordinating various meters.

The 62E is designed to operate from a 600 ohm line, but other impedances may be used in conjunction with a calibration chart. *Input Impedance:* 7500 ohms constant except on the 1 mw calibration position. *Attenuator Range:* +4 dbm to +40 dbm in 2 db steps. T-type construction. *Number of Input Circuits:* Four. *Meter Scale:* Standard VU: 62E-1 — Type A Scale; 62E-2 — Type B Scale. *Frequency Range:* Constant response within 0.2 db up to 10,000 cps. *Power Requirement for Meter Illum-*

ination: 6.3 v ac or dc @ 0.3 amp. *Size:* 19"W for standard rack mounting, 5¼"H. *Finish:* Metallic gray. *Weight:* 9 lbs.

112B-1 SWITCH AND FUSE PANEL

The 112B-1 provides primary ac control over 10 different circuits. A heavy-duty circuit breaker, operated by a snap action switch, carries the total ac load, and each of the 10 circuits is individually fused. A terminal board and dust cover complete the unit. A door in the front panel furnishes convenient access to the fuses. *Size:* 5¼"H, mounts in standard 19" rack. *Finish:* Metallic gray. *Weight:* 6½ lbs.

Furnished with 9 amp link installed, and set of extra circuit breaker heaters for operation at 3, 5 or 7 amps. Replacement links in 3, 5, 7 or 9 amps available.

SHIELDED RADIO HOOKUP WIRE

Two Conductor: Two insulated conductors, twisted and covered by tinned copper braid.

Each conductor: No. 20AWG gauge, 3 amp capacity. Two solid colors, or solid color with tracers to distinguish one conductor from another.

Shielding: 96 strands No. 34AWG tinned copper wire braided in groups of 4 strands side by side.

Types Available

Solid conductor Fiberglas braid insulation.

Solid conductor Lacquered cotton braid insulation.

Same as above except cotton braid overall.

7 strands min. Fiberglas braid insulation.

7 strands min. Lacquered cotton braid insulation.

Same as above except cotton braid overall.

Two Conductor: Each conductor color coded, No. 16AWG (19 strands min.) 15 amp ac, 1,000 volts rms.

Lacquered cotton braid insulation.

Shield: 90 (min.) strands of No. 32 to No. 38AWG tinned copper wire with 5 (min.) strands running side by side.

Overall diameter: 0.32" max.

Two Conductor: Each conductor No. 12AWG (19 strands min.) 20 amp ac, 1,000 volts rms.

Lacquered cotton braid insulation color coded.

Shield: 92 strands of No. 34AWG tinned copper wire with 4 strands side by side.

Overall diameter: 0.420" max.

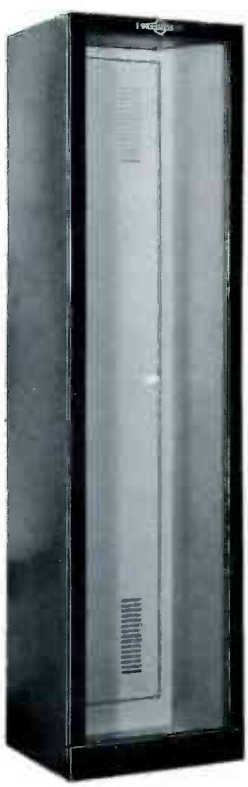
Microphone Cable (Rubber): Two insulated conductors, twisted, covered by tinned copper shielding and encased in rubber. Diam. approx. 0.285".

Each conductor: 26 strands No. 34AWG tinned soft annealed wire twisted for flexibility. Equivalent to No. 20AWG gauge 3 amp 300 volts.

Rubber covering 1/64", one white, one black.

Shield: 96 strands of No. 34AWG tinned copper wire, braided with 4 strands running side by side.

Jacket: 3/64" black rubber.



619B-½

Par-metal

RACK CABINETS

Type 619B cabinets are sturdily constructed of

sheet metal, conveniently drilled to accommodate standard 19" panels of any height. A hinged full-length rear door provides immediate access to all units mounted in the cabinet. Adequate ventilation is obtained through properly distributed louvers in the door and through an opening in the top that is protected from dust by a baffle plate. The outside depth of the cabinet is 18 inches.

These cabinets are available in metallic gray finish. Black lacquered style strips are furnished with each cabinet.

619B cabinets have 70" panel mounting space, with overall of height 76".

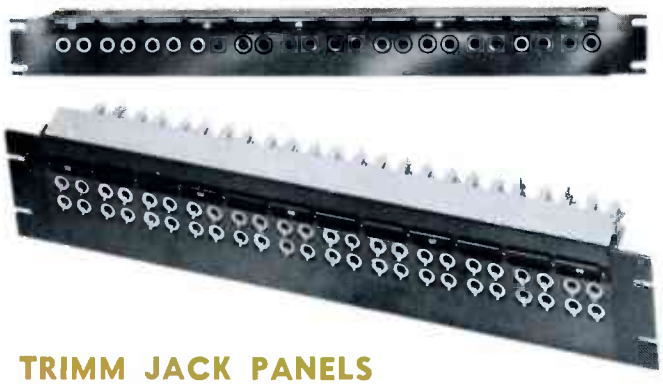
PAR-METAL PX-7718 RACK CABINET

The PX-7718 cabinet is 76⅛" high, 22" wide, and 18" deep, with 70" of panel space. The cabinet body is made of 1/16" cold rolled steel, the top is made of 5/64" steel, and the bottom of 7/64" steel. A duplex receptacle and outlet box is provided in the back under the door. Black ripple enamel finish is standard, grey ripple or "Primer Coat" only are optional at same price. Shipping weight is 190 lbs.

BLANK PANELS

Useful for filling up unused space in racks and for making special equipment, blank panels have many applications. These panels are drilled to mount in standard 19" racks. The thickness is 3/16". Standard panels are aluminum, with metallic gray finish. Other metals, colors available on special order.

Height	Weight
1¾"	10 oz.
3½"	1 lb., 4 oz.
5¼"	1 lb., 14 oz.
7"	2 lbs., 8 oz.
8¾"	3 lbs., 2 oz.
10½"	3 lbs., 12 oz.
12¼"	4 lbs., 6 oz.
14"	5 lbs.



TRIMM JACK PANELS

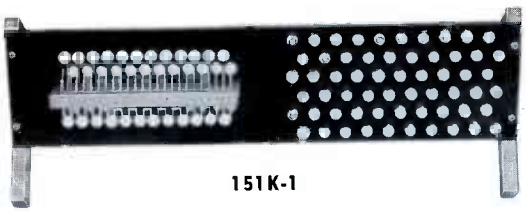
These panels, which are available in 12- and 24-jack models, fit any standard 19" rack and include such features as: solid ⅝" thick bakelite panel with steel reinforcing; heavy gauge, special spring temper nickel/silver alloy leaves; ground lugs aligned to allow single ground bus to be run full length of strip; large palladium silver contacts; connection lugs fanned out for ease of soldering.

PATCH CORDS

Patch cords for use with jack strips are available in lengths from 6" to 10'. The plugs are of the shielded type, with the sleeves tied together and grounded. The circuit is maintained through connections to the plug tips.

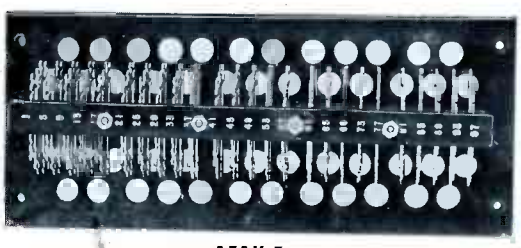
116E-4 EQUALIZER

Collins Equalizers provide complete facilities for controlling the frequency response of program and communication circuits. The circuit gives simple, smooth control of equalization. The 116E is especially suited for stations with a variety of remotes coming from different lines. It offers equalization in high frequency ranges only for two lines simultaneously. A calibrated attenuator selects the amount of equalization at required frequency, which is selected by a panel switch; this reduces line equalization time to a single run to find line characteristics and adjustment of equalizer to conjugate frequency characteristics. *Input and Output Impedances:* 600 ohms unbalanced. *Equalization Frequencies:* 5, 7, 10 and 15 kc. *Maximum Boost:* Approx. 30 db each channel. *Insertion Loss:* Approx. equal to amount of equalization used. *Frequency Range:* 30-15,000 cps. *Size:* 19"W, 3½"H, 8¼"D.



151K TERMINAL BOARDS

The 151K-1 board is employed in the base of rack mounting cabinets. It contains 96 telephone-type solder terminals for audio connections and 60 heavy duty threaded stud-type terminals for power connections.



151K-5

The 151K-5 consists of 100 telephone-type terminals, 25 in a row, 4 rows deep on a 3½" x 8" bakelite board which has 7½" x 2½" mounting centers. It weighs 1 lb.

The 151K-6 is similar to the 151K-1 except that 144 telephone-type terminals and 60 heavy duty terminals are provided. It weighs 3 lbs.

WARNING LIGHT ASSEMBLIES

Collins 209A Studio Warning lights are constructed of aluminum sheet metal with a divided compartment. Each of the two light compartments contains two 7½ w, 110 v ac bulbs and sockets to provide illumination of the lettering. Signs are made

209A-1

of boilable lucite with a black surface except for lettering. Four available signs are:

ON THE AIR	Red letters	STAND BY	Green letters
ON THE AIR	Red letters	AUDITION	Green letters
ON THE AIR	Red letters	REHEARSAL	Green letters
AM	Red letters	FM	Green letters

Special wording is available at additional cost. The 209A-1 flush type is mounted with the light box recessed in the wall and used as the junction box, or mounting it to a standard junction box recessed deeper into the wall. The cover plate mounts directly to the wall with four screws. *Size:* 4⅝"H, 7⅜"W, 2"D. *Weight:* 15 oz.

1301-A Low Distortion Oscillator

1932-A Distortion & Noise Meter

GENERAL RADIO 1301-A LOW DISTORTION OSCILLATOR

The 1301-A is used as a tone source for distortion measurements and as a power source for bridge measurements at audio frequencies. It is also satisfactory for use as a general purpose laboratory oscillator. *Frequency Range:* 27 fixed frequencies between 20 and 15,000 cps. *Frequency Calibration:* Within ±1½% +0.1 cps. *Frequency Stability:* Not greater than 0.02% per hour after 10 minutes of operation. *Output Impedances:* 600 ohms balanced to ground; 600 ohms unbalanced; 5,000 ohms unbalanced. *Power Supply:* 105-125 (or 210-250) volts, 25-60 cps (power consumption — 45 watts). *Accessories Supplied:* Power cord, multipoint connector and spare fuses. *Size:* 19" x 7" panel, 12"D. *Weight:* 13½ lbs.

GENERAL RADIO TYPE 1932-A DISTORTION AND NOISE METER

The 1932-A measures distortion, noise and hum level in audio-frequency circuits. In conjunction with the 1931-B Modulation Monitor, it can be used to measure these quantities directly in the output of transmitters. *Distortion Range:* Full scale deflections for 0.3%, 1.0%, 3%, 10% or 30% distortion. *Noise Measurement Range:* 90 db below reference calibration level, or 80 db below an AF signal of 0 dbm level at maximum sensitivity. *Audio Frequency Range:* 50-15,000 cycles (fundamental) for distortion measurements; 30-45,000 cps for noise and hum measurements. *DBM Range:* Power level range is from +20 to −60 dbm. *Residual Noise Level:* Less than −80 db. *Input Impedance:* 100,000 ohms unbalanced or 600 ohm bridging in-

TT-400/200

B-16H

T-18/68

put. *Accessories Supplied:* Line cord, cable for connecting to 1931-A, spare fuses. *Power Supply:* 105-125 (or 210-250) volts, 50/60 cps. The line input power is 65 watts. *Size:* 19" x 7" panel, 12"D. *Weight:* 37¾ lbs.

TT-400/200 TURNTABLES

These new tables, available in four models, feature simplicity with only three moving parts in the drive mechanism. Either four-pole or synchronous motors are available in 16" or 12" tables. Built of heavy cast aluminum with a blue-gray wrinkle finish, the tables have a gear shift speed selector with neutral between 33, 45 and 78 slots. The non-magnetic turntable has a unique indentation for 7" 45 rpm records with no spindle adapter required. A double-ball thrust bearing greatly reduces wow and rumble. *Models:* TT-400 (16", 4-pole); TT-400S (16", synchronous); TT-200 (12", 4-pole); TT-200S (12", synchronous). *Noise:* Better than 50 db below normal program level. *Speed Regulation:* Better than .25% overall. *Dimensions:* TT-400 — Height above table 2", height below table 6", overall base dimension 19⅝" square. TT-200 — Height above table 1½", height below table 4¼", overall base dimension 14½" x 15½". *Weight:* TT-400 53 lbs.; TT-200 22 lbs.

PRESTO T-18/T-68 CHASSIS

The T-18/T-68 turntables are 3-speed units utilizing three interchangeable idler wheels mounted on the shift plate. To select speeds, the shift is moved laterally across the panel to engage the proper idler against the motor shaft. When the knob is in either of two "off" positions located between each of the speed positions, the idlers are released from contact with the shaft to prevent flats on the rubber surface caused by extended contact.

The T-68 is furnished with a rubber mat for cueing transcriptions and a separate 45 rpm adapter disc. Both the T-18 and T-68 are available with hysteresis synchronous motors for highest possible speed accuracy. *Panel Size:* 8" x 11¾". *Turntable Diameter:* T-18 is 11⅞", T-68 is 15¾". *Turntable Weight:* T-18—4¼ lbs., T-68—7 lbs. *Noise:* Better than 40 db (50 db with hysteresis motor). *Power Required:* 115 v 60 cps, 40 w. *Available Models:* T-18 is a 12" table with 4 pole motor. T-18H is 12" and has a hysteresis motor. T-68 is 16" with a 4 pole motor. T-68H, with a hysteresis motor, is a 16" model.

REK-O-KUT B-16H TRANSCRIPTION TURNTABLE

The B-16H offers the broadcaster fine performance at a low cost. The turntable itself is precision lathe-turned, cast aluminum with an extra heavy rim for flywheel action. It is internally rim-driven by means of neoprene compound idlers. Rotates on a single-ball pivot which takes the entire thrust of

B-12

Cueing Adapter

530G

the turntable shaft. *Motor:* Self-lubricating hysteresis synchronous. *Noise Level:* −50 db. *45 RPM Hub:* Built-in, retractable. *Size:* 18¾" x 20". *Finish:* Wrinkle gray. *Weight:* 30 lbs.

REK-O-KUT B-12 TURNTABLE

This 3-speed 12" table is driven by a 4-pole induction type motor. Internal rim drive utilizes a special neoprene idler. It has a retractable hub for 45 rpm records, a ribbed rubber mat for record traction and permanently affixed strobe disc. *Noise Level:* Better than 45 db below average recording level. *Minimum Dimensions for Installation:* Left to right — 17¾"; front to back — 16"; height above deck — 3"; height below deck — 5½". *Speed Selection:* Single selector knob. Switching to speed starts motor, setting to 'off' position adjacent to speed shuts off motor. *Finish:* Silvertone aluminum. *Weight:* 19 lbs.

REK-O-KUT B-12H

Same as B-12 except has self-lubricating hysteresis synchronous motor, noise level of −55 db, and mounting height below deck of 6½".

FAIRCHILD 530G TURNTABLE

The 530 is a 16" 3-speed synchronous drive table that features fast starts and accurate timing through a direct drive design. Noise, rumble and vibration are very low. It meets the highest requirements for dubbing, broadcasting and laboratory operations. The turntable and drive are mounted in a wood cabinet finished in light gray with aluminum trim; three adjustable feet will level cabinet. *Dimensions:* 24"W, 24"D, 26½"H; turntable 28"H. *Mechanical Noise Level:* −55 db below reference level of 2½"/sec. at 1000 cycles. *Cueing Time:* ½ rev. at 33⅓; ½ rev. at 45; ¾ rev. at 78. *Power Requirements:* 110-120 v 60 cps single phase (220 v 50/60 cps and 110 v 50 cps also available).

REK-O-KUT CUEING ADAPTER

The 456 Cueing Adapter is a machined cast aluminum disc with a 45 hub built in. It will fit any turntable spindle and has 45 rpm strobe.

216/212

108C

A-160/A-120

KT-12/KT-16 Kit

GRAY 216/212 TONE ARMS

The new Gray arm utilizes dual viscous damping to assure better tracking, lower resonance and record protection. It incorporates a slide-in cartridge allowing instant change from standard groove to microgroove. These arms will accommodate all popular magnetic pickup cartridges, including Pickering, GE and Fairchild. The 216 is a 16″ model and 212 is a 12″.

GRAY 108C TONE ARM

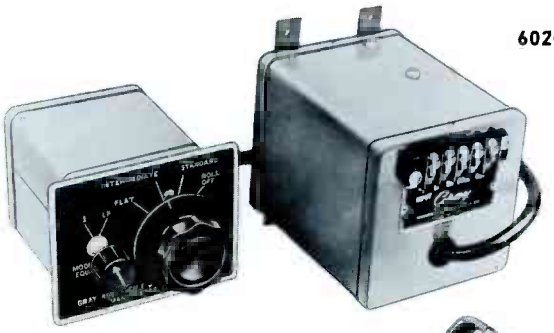
The Gray 108C lightweight arm incorporates viscous damping to provide high tracking accuracy. For records up to 16″ in diameter. Constructed of cast aluminum. Accommodates most magnetic cartridges including Pickering, GE and Fairchild.

REK-O-KUT A-160/A-120 ARMS

The A-160 (for records up to 16″) and the A-120 (for records up to 12″) have a tubular arm body with die-cast aluminum cartridge shell and counterweight. The counterweight is threaded to adjust stylus pressure. The interchangeable cartridge shell accommodates all standard cartridges and fastens to arm body with a bayonet lock. Dual ball bearing races for horizontal movement and adjustment for turntable height are also features.

AUDAX KT-12/KT-16 ARM KITS

These low-cost kits are an exact duplicate of the Audax 'compass-pivoted' transcription arm. Includes finger lift, stylus pressure adjustment, will accommodate any make cartridge. KT-12 handles up to 12″ records, KT-16 up to 16″. They weigh 2 lbs. and 2¼ lbs. respectively.



602C

G.E. Cartridges

280A/281A

202

Fairchild 225 Cartridges

GRAY 602C EQUALIZER

The 602C is normally used with standard microphone pre-amplifiers, thus making it unnecessary to purchase special audio input equipment when using magnetic cartridges. A convenient control permits instantaneous input switching from conventional records to micro-groove. *Output Impedance:* 250 ohms balanced (150 or 50 ohms available). *Insertion Loss:* 20 db. *Output Level:* −67 VU at 4.7 cm/sec. *Cable Length:* 18″.

GENERAL ELECTRIC VARIABLE RELUCTANCE CARTRIDGES

The GE VRII series cartridges have been designed in a low impedance version especially for broadcast studio use. Available in both dual and single styli

models, they feature easy and rapid clip-in replacement of styli.

Cartridges

4GS-01D has a single 1-mil diamond stylus.

4GS-02D has a single 2.5-mil diamond stylus.

4GD-01D-02D has dual 1- and 2.5-mil diamond styli.

4GD-01D-02S has dual 1-mil diamond and 2.5-mil sapphire styli.

4GS-01S has a single 1-mil sapphire stylus.

4GS-02S has a single 2.5-mil sapphire stylus.

4GD-01S-02S has dual 1- and 2.5-mil sapphire styli.

Clip-In Stylus Inserts

4G-01D — 1-mil diamond tip

4G-02D — 2.5-mil diamond tip

4G-01S — 1-mil sapphire tip

4G-02S — 2.5-mil sapphire tip

FAIRCHILD 280A/281A TRANSCRIPTION ARMS

The length and shape of these arms have been designed for highest tracking accuracy. The 280A is used for records up to 12" and the 281A for records up to 16". They accept all magnetic cartridges, and change is made by convenient plug-in slide. Adjustable springs, which make contact with cartridge terminals, short when cartridge is removed. No arm rest is required, and height, leveling and stylus pressure are adjustable. *Weight:* 6 lbs.

FAIRCHILD 202 TURRET HEAD ARM

The 202 incorporates viscous damping in the lateral plane only for proper tracking. The arm mounts up to three Fairchild cartridges, selectable by a knob on the end of the arm. This selection automatically adjusts stylus pressure for standard or microgroove. The 202 fits all transcription tables and can be adjusted for height with no effect on vertical stylus force. Length of the arm is 16" and weight is 17 oz.

FAIRCHILD 225 CARTRIDGES

The 225 series are low impedance moving coil type cartridges available in two models: 225-A, 1-mil for LP; 225-B, 2.5-mil for standard 78's and transcriptions.

COLLINS CUSTOM CONTROL DESKS

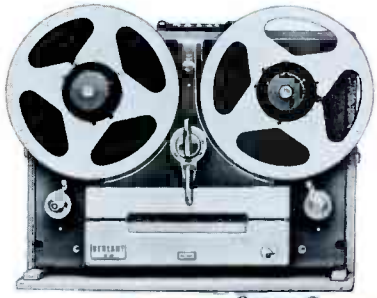
Collins now offers the most attractive control desks available at a surprisingly low cost. Custom designed to each broadcaster's requirements, the desks are sturdily constructed of wood and covered with your choice of a wide range of lasting Formica patterns.

Incorporated into previous designs have been such features as adjustable feet, built-in record compartments, hidden console cables, provisions for rack mounting, three-table designs and many others — all designed to the broadcaster's requirements with no sacrifice of attractiveness.

For a free estimate on a desk that will fill your control needs, contact the Collins representative nearest you, or write to Collins Broadcast Sales Dept., Cedar Rapids, Iowa, outlining the physical layout of your studio and the functions you wish to include in the desk.

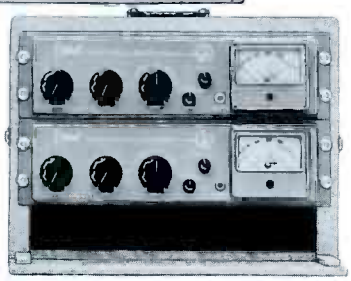
Custom Control Desk with 212E Console, TT-400 Turntables

M-90AC



PT6-6A/J Recorder/Amplifier

P-75 Recorder/Amplifier



Series 31

MAGNECORD M-90AC

A portable recorder-amplifier combination, the M-90AC has separate erase, record and playback heads. Remote control is available upon order. *Tape Speed:* 7½ and 15 i.p.s. 10½" N.A.B. reels. *Frequency Response:* 30-15,000 cps ±2 db at 15 i.p.s., 30-15,000 cps ±4 db at 7½ i.p.s.

4" VU meter for reading record, playback and bias levels. 50 or 250 ohm balanced or unbalanced input, 600 ohm balanced or unbalanced output.

P75AC RECORDER/AMPLIFIER

Editor II model in portable carrying case. Tape speeds 7½" and 15" per second. Direct drive. Hysteresis synchronous drive motor, outboard bearing on tape drive capstan. Reel size up to and including 10½" N.A.B. Push button controls and deep slot loading. Automatic tape lifter for fast forward and rewind. Instantaneous start and stop. Fail-safe brakes and tape-break control. *Frequency Response:* 40-15,000 cps ±2 db at 15 i.p.s.; 40-12,000 ±2 db at 7½ i.p.s. *Signal-to-Noise Ratio:* 55 db at 3% THD full track. *Wow and Flutter:* .2% at 15" per second. *Timing Accuracy:* ±3 sec. in 30 minutes. *Panel Size:* 10½" x 19".

Separate erase, record and playback heads allow simultaneous record and playback. Adjustable bias current. High speed cueing control.

MAGNECORD PT6-6A/J

The PT6-6A Recorder and PT6-6J Amplifier have a new 19" panel that allows rack mounting as well as portable use. Powered by 2-speed hysteresis synchronous motor for 7½ and 15 i.p.s., speed change by switch. Low impedance and high impedance inputs are provided as well as 4, 8, 16 and 500 ohm outputs. The unit includes full track erase and record/playback heads (half track heads may be specified at no additional cost). Takes 7" reels, and 10½" reel adapter arms are available. *Frequency Response:* 50-15,000 cps ±2 db at 15 i.p.s.; 50-7,500 cps ±2 db at 7½ i.p.s. *Signal-To-Noise:* 50 db. *Total Harmonic Distortion:* 10 w out, less than 2%. *Flutter:* .3% at 15 i.p.s.; .5 at 7½ i.p.s. *Size:* Amplifier — 8"D, 7"H, 19"W; in carrying case 13"D, 8"H, 20"W. Recorder — 11"D, 7"H, 19"W. *Weight:* Amplifier — 21 lbs. in case; recorder — 26 lbs. in case.

AMERICAN-CONCERTONE RECORDERS BY AMERICAN ELECTRONICS, INC.

Series 31 Recorders

Series 31 Recorder is a complete broadcast recorder consisting of separate matched amplifier and drive mechanism with two-speed direct-drive hysteresis synchronous motor. Features a two-channel input mixer (type MCM-2), Cannon connectors, tape motion regulator, single track erase and record heads, dual track playback to play both single and dual track tapes, less carrying case.

Series 31-1 is the same as Series 31 with carrying cases. *Tape Speeds:* 15 or 7.5"/i.p.s.; 3¾ and 7½"/i.p.s. on special order. *Frequency Response:* ±2 db from 40 to 15,000 cps at 15 i.p.s., ±4 db from 40 to 15,000 cps at 7.5 i.p.s. *Signal To-Noise Ratio:*

Series 60

601

620

351

55 db as measured by proposed N.A.B. standard (400 cps at 3% T. H. D.). *Total Harmonic Distortion:* 1% at zero VU. *Timing Accuracy:* Better than 99.8%. *Total Flutter and Wow:* Less than 0.1% RMS at 15 i.p.s., less than 0.2% RMS at 7.5 i.p.s., less than 0.3% RMS at 3.75 i.p.s. *Rewind and Fast Forward:* Less than 60 secs. for 2,500 ft. *Stop To 15 i.p.s.:* 0.1 second. *Input Impedance:* One megohm on high impedance microphone input. 50/250 ohms balanced or unbalanced with plug-in transformer No. T-3344. 200,000 ohms unbalanced bridging input. *Output Impedance:* Cathode follower. 600 ohms balanced output with No. T-2560 transformer. *Output Level:* 6 v from cathode follower output zero dbm across 600 ohm line. *Size:* Drive mechanism — 14" x 19" x 6½"; amplifier — 5¼" x 19" x 6". *Weight:* Drive mechanism — 35 lbs.; amplifier — 10 lbs. *Power Requirements:* 160 w — 60 cps 115 v.

Series 60 Recorders

Portability and broadcast performance are combined into one unit. Accommodates 10½" N.A.B. reels without adapter. Has hysteresis synchronous capstan drive, with separate take-up and rewind motors. The VU meter has a three-position switch to monitor level of input signal, level of taped program and bias level. Simultaneous record-playback facility for monitoring.

Model 61 — Dual track monaural record and playback. *Weight:* 38 lbs. *Speeds:* 7½, 15 i.p.s. *Frequency Response:* 15"—40-15,000 cps ±2 db; 7½" — 40-12,000 cps ±2 db. *Flutter and WOW:* 15" — .15%; 7½" — .25%. *Signal-to-Noise Ratio:* 55 db at 15". *Size:* 15½"H, 16½"W, 5¾"D. Supplied less case.

AMPEX RECORDERS

Ampex 351

Features new printed circuits and miniature tubes. Available in console cabinet, portable cases or for rack mounting. Tape speeds 7½ and 15 i.p.s. Frequency response 30 to 15,000 cps, plus or minus 2 db. Timing accuracy plus or minus 3.6 seconds in 30 minutes program time. Hysteresis synchronous drive motors. Instantaneous stop and start. Remote controls available. Separate erase, record and playback heads for full or half track recording. Hubs for 10½" N.A.B. reels.

Ampex 601

Portable recorder/pre-amplifier available for full or half track operation at 7½ i.p.s. Frequency response 40 to 10,000 plus or minus 2 db. Separate erase, record and playback heads. Synchronous motor drive. High or low impedance input available. Output 600 ohms balanced or unbalanced. Phone jack permits monitoring input or output while recording. Weight 28 lbs.

Ampex 620

Portable amplifier designed for use with Ampex 601 recorder. Power output 10 watts. Amplifier response 20 to 20,000 cps plus or minus ½ db. Built-in speaker is specially designed to handle full amplifier output. Level and equalization controls incorporated. Jack provided to operate external speaker. Weight in portable case 25 lbs.

R-16H with M-5S Overhead Lathe

Magnetic Tape Eraser

Splicer-cutter

REK-O-KUT RECORDING TURNTABLE

Ruggedly constructed and precision-machined, the R-16H 2-speed (33⅓-78) 16″ turntable has an accessory idler for 45 rpm. It is shown with the M-5S overhead lathe, which can be quickly connected to the chassis. *Size:* 18¾″ x 20″. *Turntable:* Solid cast aluminum, lathe turned. *Finish:* Gray wrinkle. *Shipping Weight:* 34 lbs.

REK-O-KUT M-5S OVERHEAD LATHE

This 16″ lathe can be readily attached to all 12″ and 16″ turntables. It includes a handcrank for run-in and run-off spiral grooves, dual clutch spiraling contol, and simple adjustment to control the depth and angle of cut. It is supplied with 120-line leadscrew. *Size:* 16″L, 6½″W, 9″H. *Weight:* 16 lbs.

RECORDING TAPE

Audiotape

Type 1251 Plastic Base (1200 ft. on 7″ reel) is the finest, professional quality tape obtainable with maximum fidelity, uniformity, frequency response and freedom from noise and distortion. Base material 1½-mil acetate.

Type 1861 "LR" (Longer Recording) tape is made on 1-mil Mylar, providing 50% more recording time per reel. Polyester film base material has exceptional strength and durability, plus longer storage life. 1800 ft. on 7″ plastic reel.

Scotch Brand

Type 111A-12 Plastic Base (1200 ft. on 7″ reel) is a high fidelity plastic tape for every recording need. Dry lubricated. Output variation within the reel at 1,000 cps is less than ±¼ db and is less than ±½ db from reel to reel.

MICROTRAN MAGNETIC TAPE ERASER

The Microtran HD-11 is a bulk tape demagnetizer that develops a high intensity magnetic field, erases signals and noise from magnetic tape without rewinding. Spindle mounting of reel permits rapid thorough coverage. *Reel Size Range:* 5″, 7″, 10½″ (spindle removable for use with other size reels). *Adapter Hub:* Available for use with 10½″ reels. *Rating:* 117 v ac, 5 amps. *Finish:* Baked enamel. *Size:* 3″ x 5″ x 8″. *Weight:* 8½ lbs.

GIBSON GIRL TAPE SPLICER-CUTTER

This unit is used for magnetic recording tape and cuts two rounded indentations in the tape slice giving the splice a "Gibson girl" shape, leaving the edges of the tape free of adhesive. The unit can be removed from its base and mounted directly on any tape recorder. It comes complete with a roll of splicing tape and tape feed. (Type No. TS4-DLX).

ALTEC-LANSING 670B CARDIOID MICROPHONE

The 670B utilizes a ribbon to provide continuously adjustable patterns to permit "tuning out" undesirable noises by shifting the null point. *Frequency Response:* 30-15,000 cps. *Power Output Level:* −58 dbm (10 dynes/sq. cm.). *Impedance:* Adjustable 30/50 or 150/250 ohms. *Size:* 7½" x 3⅜" x 2½". *Finish:* Dull gray plastic. *Weight:* 20 lbs.

ALTEC-LANSING 660A/B DYNAMIC MICROPHONE

The 660A/B Microphone is a rugged broadcast quality unit. Equipped with a swivel head with ⅝"-27 stand thread allowing a 90° vertical tilt. *Frequency Response:* 35-12,000 cps. *Power Output Level:* −57 dbm (10 dynes/cm²). *Impedance:* 660A — 30 ohms; 660B — 30, 150, 20,000 ohms. *Size:* 4" long — 1-11/16" diameter. *Finish:* Silver satin-die-cast aluminum. *Weight:* 660A — 11 oz.; 660B — 13 oz.

TURNER MODEL 57 DYNAMIC MICROPHONE

The Turner 57 is designed to meet TV and broadcast performance requirements. Matching stand with built-in shockmount available as an accessory. Black satin finish. The 57 has a built-in Cannon XL-4 connector, permitting selection of high or low impedance by making connection to proper pair of conductors. 20-foot cable furnished. *Frequency Response:* 50 to 13,000 cps. *Output Level:* 55 db below 1 volt/dyne/sq. cm. *Mounting:* Standard ⅝"-27 thread. *Size:* 8¾" x 1⅛". *Weight:* 14 oz. (less cable).

TURNER MODEL 57A DYNAMIC MICROPHONE

Same as above, except wired for quick selection of 50 or 200 ohm impedance.

TURNER MODEL 51D DYNAMIC MICROPHONE

High output and advanced circuit design for ultra wide range fidelity. Hinged coupler with ⅝"-27 thread mounting and quick disconnect. Umber gray finish, 12-foot balanced line cable. *Response:* 50-15,000 cps. *Output Level:* −55 db at high impedance. Specify high impedance or low (wired for selection of 50 or 200 ohm). Shown with matching E-6 shockmounted desk stand.

TURNER 98 CARDIOID MICROPHONE

Directional mike for broadcast, recording and P.A. functions. *Frequency Response:* 65-11,000 cps. *Output Level:* −52 db. *Impedance Specify:* 50 ohm, 200 ohm or high. *Case:* Die-cast zinc alloy, with light gray baked enamel finish or satin chrome finish. Standard ⅝"-27 thread mounting, friction swivel permits 90° swing. *Size:* 6¼" x 1½" x 1". *Weight:* 15 oz. *Cable:* Detachable 20 ft. single conductor (high imped.) or 2 conductor (50, 200 ohm) shielded, gray plastic.

TURNER 124 DYNAMIC MICROPHONE

Slender model for broadcast, recording or P.A. applications. *Response:* 50-13,000 cps. *Output Level:* −58 db. *Cable:* 12 ft. detachable. *Impedance:* Specify 50 ohm, 200 ohm or high. *Finish:* Gun metal gray.

TURNER 210A MICROPHONE

The 210A is a lightweight mike suitable for broadcast, TV, motion picture and fidelity recording uses. *Response:* 40-20,000 cps. *Output Level:* 50 ohm, −86 db; 200 ohm, −80 db. *Polar Pattern:* Omnidirectional. *Cable:* 20 ft. rubber covered 3-conductor shielded.

TURNER 220A LAVALIER MICROPHONE

Combines wide response range with small size. *Response:* 60-20,000 cps. *Output Level:* 50 ohm, −90 db; 200 ohm, −84 db. *Polar Pattern:* Omnidirectional. *Case:* Aluminum, neutral gray non-reflecting. Cable: 25 ft. attached rubber covered 3-conductor shielded.

TURNER 58A LAVALIER DYNAMIC MICROPHONE

Light and rugged, the 58A is furnished with support clip and neck cord and kink-resistant braided cable. Can be used as desk mike with matching G-4 stand. *Response:* 60-18,000 cps. *Output Level:* −57 db. *Impedance:* 50, 200 ohms, selectable. *Polar Pattern:* Essentially non-directional. *Case:* Aluminum neutral gray, non-reflecting. *Cable:* 25 ft. 3-conductor shielded. *Size:* 1″ diameter, 4″ long. *Weight:* 3½ oz. less cable.

ELECTRO-VOICE MODEL 666 SUPER CARDIOID MICROPHONE

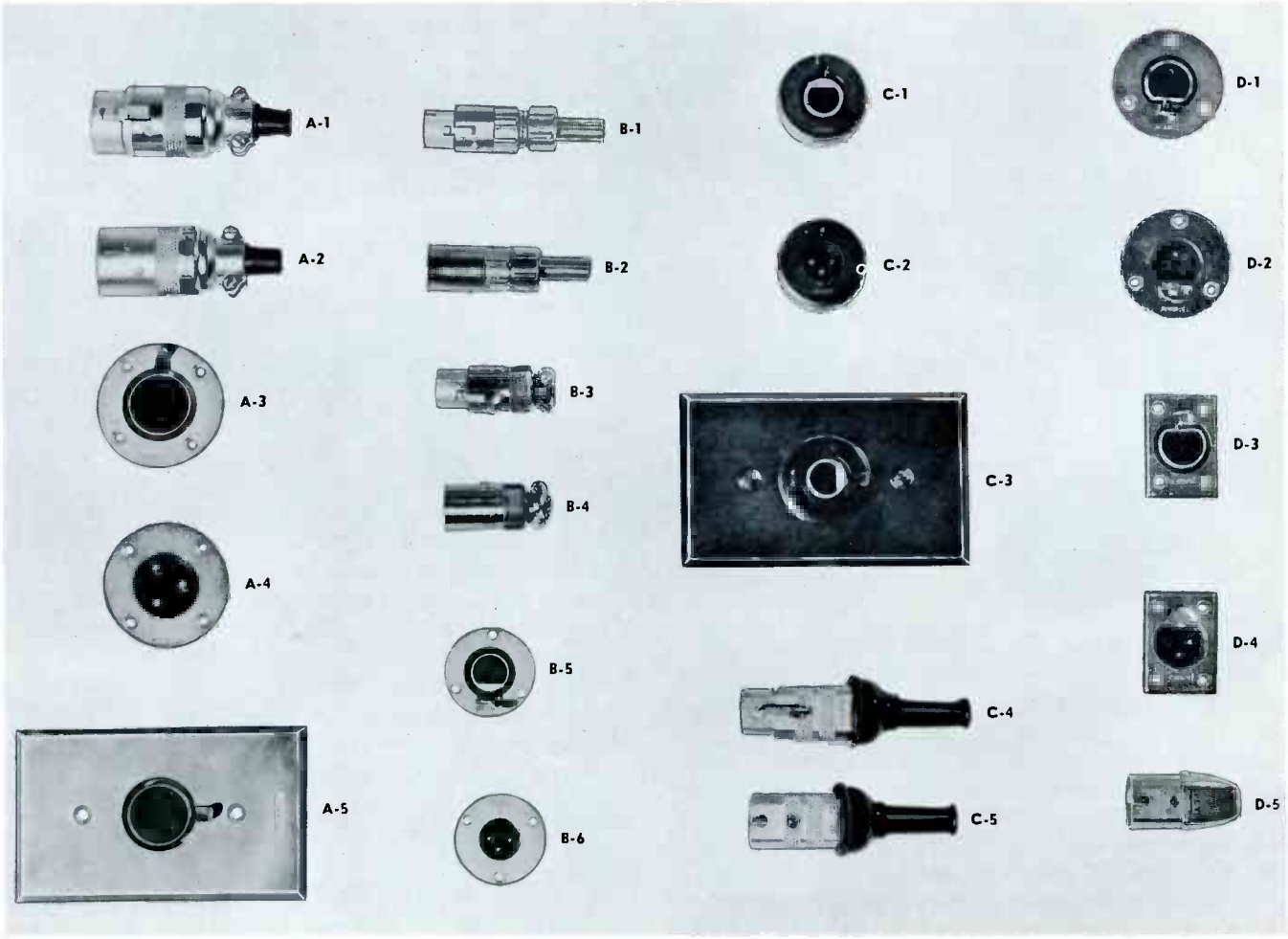
Model 666 affords another octave of uniform HF response over that found in conventional broadcast cardiods. Permits close talking with no bass accentuation. Increases working distance over pressure microphones by factor of 1.7:1 due to reverberation reduction. Uses only one moving element with exclusive, rugged Acoustalloy diaphragm. Response range: Typical 40-15,000 cps; output, −55 db. Impedance changed on internal terminal board. Wired for 50 ohms, taps at 150 and 250 ohms. Aluminum cast case finished in TV gray. Built-in Cannon UA-3 connector. Clamp-on stand mount included with ⅝″-27 thread and ½″ pipe thread adapter. 20-foot cable. *Size:* 7½″ long, 1¾″ maximum diameter. *Net Weight:* 11 oz.

ELECTRO-VOICE MODEL 665 CARDIOID

Similar in design and function to the Model 666, but for less exacting applications. Uniform response 50-14,000 cps. Pressure-cast zinc case. Non-reflecting gray finish. Dia. 1⅞″, length 7-3/16″. 18-foot cable. *Net Weight:* 1 lb., 10 oz.

ELECTRO-VOICE MODEL 655C SLIM-TRIM TV DYNAMIC

Frequency response 40-20,000 cps. Output level −55 db. Acoustalloy diaphragm. Impedance 50, 150 and 250 ohms. Impedance easily changed at internal terminal board. Cannon UA-3 connector. Clamp-on stand mount included with ⅝″-27 thread and ½″ pipe thread adapter. *Size:* 10½″ long without connector, 1″ diameter. 18-foot cable. *Net Weight:* 11 oz.



CALL LETTER PLATES

Made by Alto Metal Products, these cast aluminum call letter plates are sturdy, lightweight custom made units. Raised lettering and borders are polished to a lustrous finish, and background is black wrinkle enamel. Will fit all popular microphone types.

MICROPHONE STAND, MI-4068-D

The MI-4068-D floor stand is for use with the BK-1A, SK-45 and the 77-D. The column and telescoping tube are finished in polished chrome and the base in dark umber gray wrinkle. It has a smooth-operating clamping and release device. The stand as supplied may be used with any microphone having a $\frac{5}{8}$"-27 fixture thread. *Height of Stand:* Adjustable from 34" to 62". *Microphone Mounting:* $\frac{5}{8}$"-27 fixture thread. *Diameter of Lower Tube:* 1". *Diameter of Base:* 12". *Weight (unpacked):* 14 lbs.

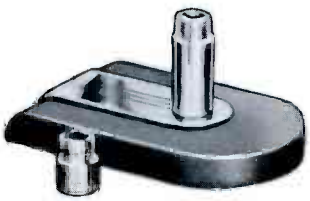
DESK STAND, MI-11008

The MI-11008 desk stand was specifically designed for use with the type BK-1A "Commentator" microphone. The BK-1A microphone fits into the center hole and is secured by a knurled thumb screw and a retaining washer. A rubber cushion around its perimeter prevents marring of any surface. *Weight (packed):* 1½ lbs. *Finish:* Dark, umber gray.

91-A

420

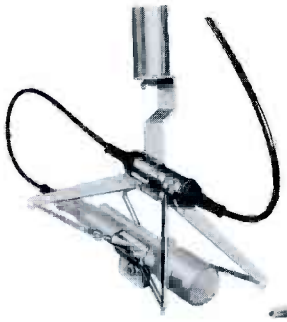
416



91-B

345

346



366

425

ANNOUNCE STAND, TYPE 91-A

The 91-A is a simple but attractive desk stand for 44-BX Microphones. It is finished in TV gray and its base rests on three felt buttons. Height of the 44-BX center above desk is 8⅜". Base diameter: 7". Use only with Type 44-BX Microphone. *Weight (unpacked):* 3½ lbs.

DESK STAND, TYPE 91-B

The 91-B is a heavy-based desk stand designed especially for studio or announce use. It can accommodate Type 77-D, BK-1A, and BK-4A microphones. The 91-B is finished in umber gray with satin chrome trim. The base is felt-covered to prevent marring the surface on which it is placed. The stand is provided with alternate mounting extensions — one ¾" and one 1¾", the choice depending on the type microphone to be mounted. *Microphone Mounting:* ½" pipe thread. *Base Dimensions:* 4½" x 6⅝" x ¾". *Weight:* 4 lbs.

ELECTRO-VOICE MODEL 345 SHOCKMOUNT

Dual-type external shockmount prevents reproduction of external shocks and stand vibrations. Permits tilting microphone head. ⅝"-27 thread Easily attached or removed. *Finish:* Satin chrome. *Size:* 1½" x 3⅞". *Net Weight:* 10 oz.

ELECTRO-VOICE MODEL 346 SHOCKMOUNT

Designed specifically for use with Model 666 microphone. Similar in every feature to Model 345 but constructed for 11-oz. microphone.

ELECTRO-VOICE MODEL 420 DESK STAND

Use with E-V 666, 655, 646 or microphone with 1" diameter. Clamp attachment for mounting 1" cylindrical microphones without tools. Heavy cast iron, gray finish. *Net Weight:* 3 lbs.

ELECTRO-VOICE MODEL 366 SUSPENSION SHOCKMOUNT

Extremely light boom suspension shockmount designed for use with 666 microphone. Combined weight of 366 and 666 is 17 oz., thus solving many problems of boom operation. No tools required for installing microphone. Pigtail cable connection with UA-3 connectors provides cable loop, isolating boom shock noises. Made for any microphone with 1" diameter (EV 666, 655, 646).

ELECTRO-VOICE MODEL 416 DESK STAND

For 646 microphone. Black rubber *Size:* 3⅛" base dia., 1" high. *Net Weight:* 2 oz.

ELECTRO-VOICE MODEL 425 DE LUXE FLOOR STAND

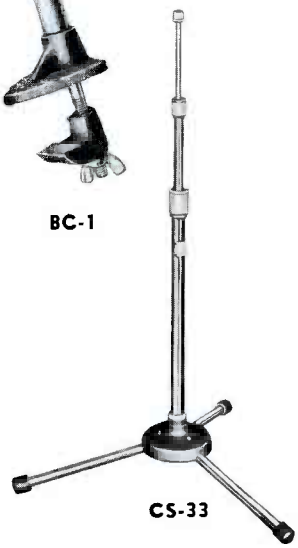
Push-button. One-hand height control from 37" to 66". Locks on release. Shaft rotates freely. Locking-type adjustable legs permit placing flush against wall or table. Easy to set up or take apart. Folds

524

BC-1

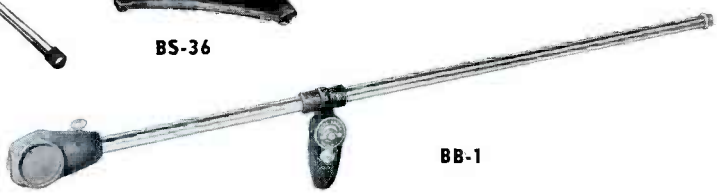
BS-36

BS-36W



CS-33

418, 419



BB-1

compactly. Die-cast base. Three-leg spread 17". Satin chrome. *Net Weight:* 7½ lbs.

ELECTRO-VOICE MODEL 524 WIND SCREEN

Designed specifically for use with Model 666 microphone. Minimizes wind effect on boom operation or when used outdoors. Made of strong black bemberg. *Net Weight:* 2 oz.

ELECTRO-VOICE MODEL 418 DESK STAND

Used with microphones using small-type stud such as Models 611, 623, 630, 635, 636, 911 and 950. Cast iron, gray finish.

ELECTRO-VOICE MODEL 419 DESK STAND

Similar to above but for use with microphones using large-type stud such as 665.

ATLAS CS-33 COLLAPSIBLE FLOOR STAND

For fixed or portable operation. Removable base legs. Can be collapsed to length of 22½". *Finish:* Full chrome. *Height Adjust:* 26"-64". *Weight:* 3 lbs.

ATLAS BC-1 BRACKET CLAMP

Can be used with a boom arm, goose neck, etc. Chrome tube 6" long. Clamp can be removed and top flange screwed or bolted into position. ⅝"-27 thread.

ATLAS GN-13 FLEXIBLE GOOSE NECK

Can be attached to any microphone stand or fixture. Ends have ⅝"-27 male and female threads. 13" long. Finished in polished chrome.

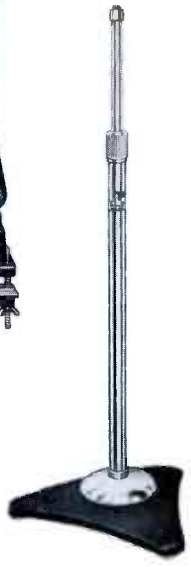
ATLAS BB-1 "BABY BOOM" ATTACHMENT

A versatile device that can be attached to any microphone stand. Can also be used with bracket clamp model BC-1. ⅝"-27 thread. *Boom Length:* 32". *Finish:* Chrome tube, gun metal castings. *Weight:* 3½ lbs.

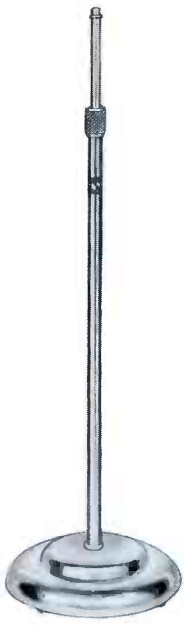
ATLAS BS-36/36W BOOM STANDS

The BS-36 features "safety air-lock cushion" built into the vertical section preventing slippage of the upright. A gyromatic swivel joint is provided at the

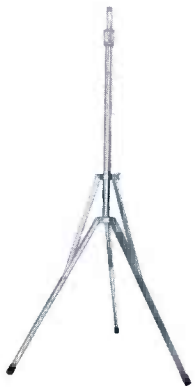
Flexo Mikester



MS-25



MS-11C



CS-1

DS-7

microphone end of the boom. Model BS-36W is identical to the BS-36 except this mobile model is supplied with a DeLuxe base having ball bearing swivel castors of hard rubber composition. "Snap-On" hangers furnished to hold mike cable to boom section. *Boom Length:* 62". *Vertical Adjust:* 48" to 72". *Base Diameter* 17". *Finish:* Chrome and gun metal shrivel. *Weight:* 33 lbs.

FLEXO MIKESTER MODEL ONE

This arm will handle any mike up to 4 lbs. It can be instantly positioned, incorporates a patented enclosed spring-controlled swivelling device, swings out 36" in any direction when fully extended. Clamps or screws to any position. Clips hold cable in place. *Weight (packed):* 4¾ lbs.

ATLAS MS-25 FLOOR STAND

Features "Safety Air-Lock Cushion" to prevent slippage of telescoping section. Uses a large diameter, oversize telescoping tube (⅞" telescoping tube — 1⅛" base tube). Terminated in ⅝"-27 thread. *Base Finish:* Chrome and gray shrivel. *Tube Finish:* Full Chrome. *Height Adjust:* 37" to 66". *Base Diameter:* 17". *Weight:* 24 lbs.

ATLAS MS-11C FLOOR STAND

Features an extended length clutch body, inner lined with a wear-proof locking collet which grips without jamming, slipping or sudden dropping. Includes self-leveling, shock absorbing base pads, plus three additional "anti-tip" points located between the base pads. Terminates in a ⅝"-27 thread. *Base Finish:* Full Chrome. *Tube Finish:* Full Chrome. *Height Adjust:* 35" to 65". *Base Diameter:* 10". *Weight:* 12 lbs.

ATLAS DS-7 DESK STAND

The model DS-7 employs a full sized clutch mechanism and ⅝"-⅞" tube combination. The base casting is 6" in diameter, finished in gun metal shrivel. Base pads included to prevent damage to desk or table tops. All tubular sections finished in chrome. *Vertical Adjust:* 8" to 13". *Weight:* 3 lbs.

ATLAS CS-1 MICROPHONE STAND

This collapsible stand is excellent for portable and remote applications. Designed specifically for broadcast use. Collapsible length of 23". *Base Finish:* Cadmium plated. *Tube Finish:* Full chrome. *Height Adjust:* 23" to 62". *Weight:* 5 lbs.

Studio Clock

Air Alert

Slanting Corner Baffles

Conalert

Wall Baffles

TELECHRON STUDIO CLOCK

The Telechron 14162 "Commerce" commercial clock has a 12" dial, rich brown case.

KAAR CONALERT

Designed expressly for CONELRAD Radio Alert. Built for 24-hour service, it gives automatic alarm with visual and aural warning; at time of Radio Alert, the speaker is automatically connected, you hear Conelrad message and red pilot lamp on panel is lighted. Provision is also made for external alarm. Available in either cabinet or rack mounting models.

MIRATEL AIR ALERT

Designed to control visible and/or audible alarm circuits on Conelrad signal from local or sky wave stations. Frequency tuneable from 550 to 1600 kc. Built-in speaker operates upon alarm. Relay circuit is voltage regulated. External bell or light control terminals and antenna terminals on rear terminal board. Available for rack or table mounting.

ARGOS WALL BAFFLES

Argos now offers a completely new look in baffles. Entire front is inset, with plastic grille cloth covering panel. Units may be covered with any color of paint or enamel (not lacquer). Constructed of plywood and hardboard for improved acoustical properties with good resonant tone. Richly grained, plastic coated leatherette covering. Extra reinforcing blocks. Four 8-32 bolts already installed for mounting speakers. Available in following styles and sizes:

Slanting Corner Baffles:

Aims sound down.

SCB-8 — Mahogany or blonde, for 8" speaker — 15⅜"W, 14"H, 7¾"D.

SCB-12—Mahogany or blonde, for 12" speaker — 21"W, 21¼"H, 10½"D.

Wall Baffles:

WB-8A—Mahogany, for 8" speakers—9⅜"W, 10½"H, 6½"D.

WB-12A — Mahogany, for 12" speakers — 13¼"W, 14¼"H, 9"D.

WB-8BA — Blonde, for 8" speakers — 9⅜"W, 10½"H, 6½"D.

WB-12BA — Blonde, for 12" speakers — 13¼"W, 14¼"H, 9"D.

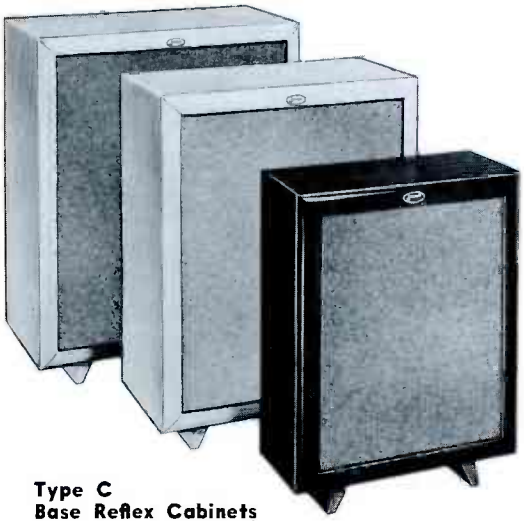
Utah Speaker/Baffle

K-310A

P12-SX

K-210

P12-T



Type C
Base Reflex Cabinets

UTAH SPEAKER/BAFFLE COMBINATION

These new all-metal units are available in black and gold (M8G) or black and silver (M8S) models. Features are use of heavy steel with baked finish and floating grille construction. *Speaker Size:* 8". *Mounting Diam.:* 7-11/16". *Overall Size:* 11"W, 11"H, 6⅞"D at top, 5-7/16"D at bottom.

JENSEN K-210 COAXIAL SPEAKER

High fidelity reproduction in a small unit. Built-in frequency-dividing system. *Power Rating:* 12 w *Impedance:* 8 ohms. *Baffle Opening:* 10½". OD, 12⅛". *Depth:* 6-5/16".

JENSEN ST-901 HF BALANCE CONTROL

Flush satin brass cup escutcheons, appropriately marked, mounting in 1-11/16" holes, and matching bar knobs. 25" leads attached. For adjusting balance of HF units. 16 ohms impedance.

JENSEN K-310A COAXIAL SPEAKER

A fine, low-cost, true two-way 15" hi-fi speaker. Integral frequency division system. *Power Rating:* 16 w. *Impedance:* 16 ohms. *Baffle Opening:* 13¼". *OD:* 15⅛". *Depth:* 8⅛".

JENSEN P12-T LOUDSPEAKER

Gap Energy Level: 1.1 million ergs. *Outside Diameter:* 12⅛". *Depth:* 6-1/16". *Baffle Opening:* 10½". *Voice Coil Impedance:* 3-4 ohms. *Power:* 9 w.

JENSEN P12-SX LOUDSPEAKER

The P12-SX direct-radiator loudspeaker is a PM speaker utilizing Alnico 5 magnets. *Gap Energy Level:* 1.5 million ergs. *Outside Diameter:* 12⅛". *Depth:* 6-1/16". *Baffle Opening:* 10½". *Voice Coil:* 6-8 ohms, 9 w.

JENSEN TYPE C "BASE REFLEX" CABINETS

These Type C enclosures combine acoustically correct performance with attractive wood cabinetry at moderate cost. Models to fit 8", 12" or 15" speakers, in choice of blonde or mahogany finishes. Two concealed cut-outs in Model C-151, one cut-out in C-121, for easy installation of flush HF and Level Controls, or Jensen tweeters.

Model C-151 for 15" speakers: 32" x 28" x 15"D.

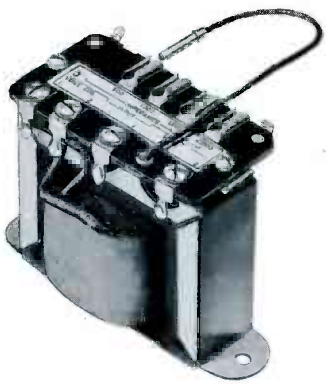
Model C-121 for 12" speakers: 29" x 25" x 13½"D.

Model C-81 for 8" speakers: 23½" x 20" x 9"D.

P8-SX

Trimm 156/157

P8-T



Impedance Matching Transformer

Model "A" Brush

JENSEN P8-SX LOUDSPEAKER

The P8-SX speaker is a PM speaker utilizing Alnico 5 magnets. *Gap Energy Level:* 1.5 million ergs. *Outside Diameter:* 8⅛". *Depth:* 3-13/16". *Baffle Opening:* 6¾". *Voice Coil:* 6-8 ohms, 7 w.

JENSEN P8-T LOUDSPEAKER

Gap Energy Level: 1.1 million ergs. *Outside Diameter:* 8⅛". *Depth:* 3⅝". *Baffle Opening:* 6¾". *Voice Coil Impedance:* 3-4 ohms. *Power:* 7 w.

JENSEN IMPEDANCE MATCHING TRANSFORMERS

Jensen speakers are all of the moving coil type and as such are low impedance. The ZY series of transformers are selected where speakers must be matched to standard 600 ohm line. They permit matching one or several speakers to such a line.

ZY-2002 Transformer for use with P8-SX, P12-SX.

Core Size: ¾" x ¾". *Power:* 10 w. *Primary:* 500, 1,000, 1,500, 2,000 ohms. *Secondary:* 6-8 ohms. *Mtg. Centers:* 2-13/16".

ZY-4002 Transformer for use with P8-T, P12-T.

Core Size: ⅝" x ⅝". *Power:* 6.5 w. *Primary:* 500, 1,000, 1,500, 2,000 ohms. *Secondary:* 3-4 ohms. *Mtg. Centers:* 2⅜".

ZY-2003 Transformer for use with K-210A.

Core Size: ⅞" x ⅞". *Power:* 16 w. *Primary:* 500, 1,000, 1,500, 2,000 ohms. *Secondary:* 6-8 ohms. *Mtg. Centers:* 3⅛".

MODEL "A" BRUSH

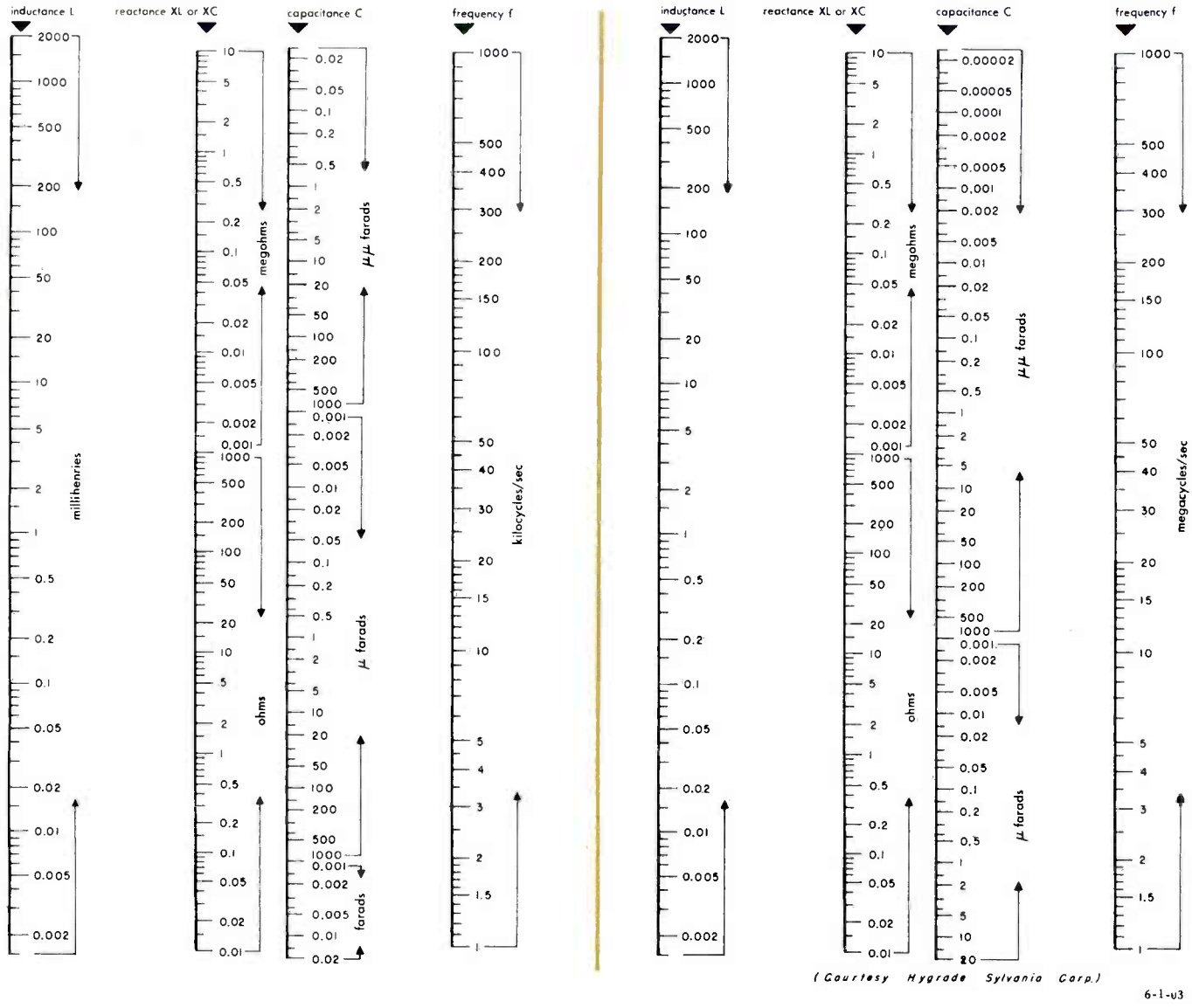
Designed for GENERAL PURPOSE applications including laboratory, studio and skilled amateur home use. The crystal drive element insures wide ranges, response 100 to 8,000 cps and high sensitivity. High impedance; ideal for multiple installations. Headset complete with 5-foot cord and adjustable headband.

TRIMM 156/157

Extremely lightweight, yet one of the most rugged headsets built by Trimm. Weight, 5 oz. Black plastic shell and cap.

CHARTS AND TABLES

REACTANCE CHART



DECIMAL EQUIVALENTS OF FRACTIONS

1/32 .03125	9/32 .28125	17/32 .53125	25/32 .78125
1/16 .0625	5/16 .3125	9/16 .5625	13/16 .8125
3/32 .09375	11/32 .34375	19/32 .59375	27/32 .84375
1/8 .125	3/8 .375	5/8 .625	7/8 .875
5/32 .15625	13/32 .40625	21/32 .65625	29/32 .90625
3/16 .1875	7/16 .4375	11/16 .6875	15/16 .9375
7/32 .21875	15/32 .46875	23/32 .71875	31/32 .96875
1/4 .25	1/2 .5	3/4 .75	1 1.0

COLOR CODES

FIXED CONDENSERS

The methods of marking "postage-stamp" mica condensers, molded paper condensers, and tubular ceramic condensers are shown in Fig. 2. Condensers made to American War Standards or Joint Army-Navy specifications are marked with the 6-dot code shown at the top. Practically all surplus condensers are in this category. The 3-dot RMA code is used for condensers having a rating of 500 volts and ±20% tolerance only; other ratings and tolerances are covered by the 6-dot RMA code.

CERAMIC CONDENSERS

Conventional markings for ceramic condensers are shown in the lower drawing of Fig. 2. The colors have the meanings indicated in Table 2. In practice, dots may be used instead of the *narrow* bands indicated in Fig. 2.

FIXED COMPOSITION RESISTORS

Composition resistors (including small wire-wound units molded in cases identical with the composition type) are color-coded as shown in Fig. 1. Colored bands are used on resistors having axial leads; on radial-lead resistors the colors are placed as shown in the drawing. When bands are used for color coding the body color has no significance.

I.F. TRANSFORMERS

Blue — plate lead.
Red — "B" + lead.
Green — grid (or diode) lead.
Black — grid (or diode) return.

NOTE: If the secondary of the i.f.t. is center-tapped, the second diode plate lead is green-and-black striped, and black is used for the center-tap lead.

LOUDSPEAKER VOICE COILS

Green — finish.
Black — start.

LOUDSPEAKER FIELD COILS

Black and Red — start.
Yellow and Red — finish.
Slate and Red — tap (if any).

POWER TRANSFORMERS

1) Primary Leads ..... *Black*
   If tapped:
   Common ..... Black
   Tap... *Black and Yellow Striped*
   Finish... *Black and Red Striped*
2) High-Voltage Plate Winding.... *Red*
   Center-Tap
   ..... *Red and Yellow Striped*
3) Rectifier Filament Winding.. *Yellow*
   Center-Tap
   ..... *Yellow and Blue Striped*
4) Filament Winding No. 1..... *Green*
   Center-Tap
   .... *Green and Yellow Striped*
5) Filament Winding No. 2..... *Brown*
   Center-Tap
   .... *Brown and Yellow Striped*
6) Filament Winding No. 3..... *Slate*
   Center-Tap
   ..... *Slate and Yellow Striped*

A.F. TRANSFORMERS

Blue — plate (finish) lead of primary.
Red — "B" + lead (this applies whether the primary is plain or center-tapped).
Brown — plate (start) lead on center-tapped primaries. (Blue may be used for this lead if polarity is not important.)
Green — grid (finish) lead to secondary.
Black—grid return (this applies whether the secondary is plain or center-tapped).
Yellow — grid (start) lead on center-tapped secondaries. (Green may be used for this lead if polarity is not important.

NOTE: These markings apply also to line-to-grid and tube-to-line transformers.

TABLE I

Resistor-Condenser Color Code

Color	Significant Figure	Decimal Multiplier	Tolerance (%)	Voltage Rating*
Orange	9	1,000,000,000	9*	2000
Black	0	1	–	—
Brown	1	10	1*	100
Red	2	100	2*	200
Orange	3	1000	3*	300
Yellow	4	10,000	4*	400
Green	5	100,000	5*	500
Blue	6	1,000,000	6*	600
Violet	7	10,000,000	7*	700
Gray	8	100,000,000	8*	800
White	9	1,000,000,000	9*	900
Gold	–	0.1	5	1000
Silver	–	0.01	10	2000
No color	–	—	20	500

*Applies to condensers only.

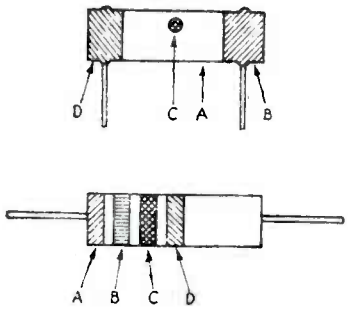


Fig. 1 — Color coding of fixed composition resistors. The color code is given in Table 1. The colored areas have the following significance:

A — First significant figure of resistance in ohms.
B — Second significant figure.
C — Decimal multiplier.
D — Resistance tolerance in per cent. If no color is shown, the tolerance is ±20%.

TABLE II

Color Code for Ceramic Condensers

Color	Significant Figure	Decimal Multiplier	Capacitance Tolerance: More than 10 µµfd. (in %)	Capacitance Tolerance: Less than 10 µµfd. (in µµfd.)	Temp. Coeff. p.p.m./deg. C.
Black	0	1	±20	2.0	0
Brown	1	10	± 1		— 30
Red	2	100	± 2		— 80
Orange	3	1000			—150
Yellow	4				—220
Green	5		± 5	0.5	—330
Blue	6				—470
Violet	7				—750
Gray	8	0.01		0.25	30
White	9	0.1	±10	1.0	500

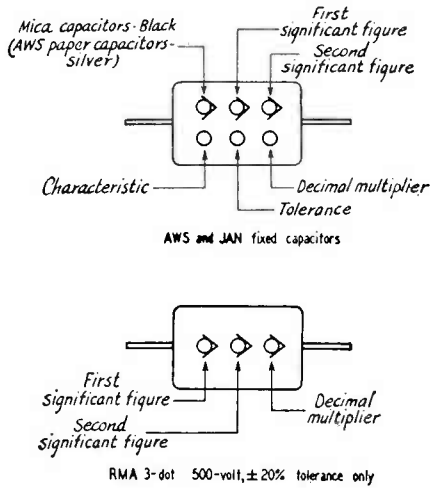


Fig. 2—Color coding of fixed mica, molded paper, and tubular ceramic condensers. The color code for mica and molded paper condensers is given in Table 1. Table 2 gives the color code for tubular ceramic condensers.

TELEPHONE CABLE COLOR CODE

Pair No.	Color	Mate	Pair No.	Color	Mate
1	Blue	White	26	Blue White	Red
2	Orange	White	27	Blue Orange	Red
3	Green	White	28	Blue Green	Red
4	Brown	White	29	Blue Brown	Red
5	Slate	White	30	Blue Slate	Red
6	Blue White	White	31	Orange White	Red
7	Blue Orange	White	32	Orange Green	Red
8	Blue Green	White	33	Orange Brown	Red
9	Blue Brown	White	34	Orange Slate	Red
10	Blue Slate	White	35	Green White	Red
11	Orange White	White	36	Green Brown	Red
12	Orange Green	White	37	Green Slate	Red
13	Orange Brown	White	38	Brown White	Red
14	Orange Slate	White	39	Brown Slate	Red
15	Green White	White	40	Slate White	Red
16	Green Brown	White	41	Blue	Black
17	Green Slate	White	42	Orange	Black
18	Brown White	White	43	Green	Black
19	Brown Slate	White	44	Brown	Black
20	Slate White	White	45	Slate	Black
21	Blue	Red	46	Blue White	Black
22	Orange	Red	47	Blue Orange	Black
23	Green	Red	48	Blue Green	Black
24	Brown	Red	49	Blue Brown	Black
25	Slate	Red	50	Blue Slate	Black

NOTE — The last pair in all cables is a Red with White mate, viz.

6-pair cable	6th pair	Red	White
11-pair cable	11th pair	Red	White
16-pair cable	16th pair	Red	White
26-pair cable	26th pair	Red	White
51-pair cable	51st pair	Red	White

CONVERSION TABLE

for units of length

CONVERSION TABLE FOR UNITS OF LENGTH

MULTIPLY NUMBER OF → / BY / TO OBTAIN NUMBER OF ↓	ANGSTROMS	MICRONS	MILS	INCHES	FEET	MILES	MILLIMETERS	CENTIMETERS	KILOMETERS
ANGSTROMS	1	10^{4}	2.540×10^{5}	2.540×10^{8}	3.048×10^{9}	1.609×10^{13}	10^{7}	10^{8}	10^{13}
MICRONS	10^{-4}	1	2.540×10	2.540×10^{4}	3.048×10^{5}	1.609×10^{9}	10^{3}	10^{4}	10^{9}
MILS	3.937×10^{-6}	3.937×10^{-2}	1	10^{3}	1.2×10^{4}	6.336×10^{7}	3.937×10	3.937×10^{2}	3.937×10^{7}
INCHES	3.937×10^{-9}	3.937×10^{-5}	10^{-3}	1	12	6.336×10^{4}	3.937×10^{-2}	3.937×10^{-1}	3.937×10^{4}
FEET	3.281×10^{-10}	3.281×10^{-6}	8.333×10^{-5}	8.333×10^{-2}	1	5.280×10^{3}	3.281×10^{-3}	3.281×10^{-2}	3.281×10^{3}
MILES	6.214×10^{-14}	6.214×10^{-10}	1.578×10^{-8}	1.578×10^{-5}	1.894×10^{-4}	1	6.214×10^{-7}	6.214×10^{-6}	6.214×10^{-1}
MILLIMETERS	10^{-7}	10^{-3}	2.540×10^{-2}	2.540×10	3.048×10^{2}	1.609×10^{6}	1	10	10^{6}
CENTIMETERS	10^{-8}	10^{-4}	2.540×10^{-3}	2.540	3.048×10	1.609×10^{5}	0.1	1	10^{5}
KILOMETERS	10^{-13}	10^{-9}	2.540×10^{-8}	2.540×10^{-5}	3.048×10^{-4}	1.609	10^{-6}	10^{5}	1

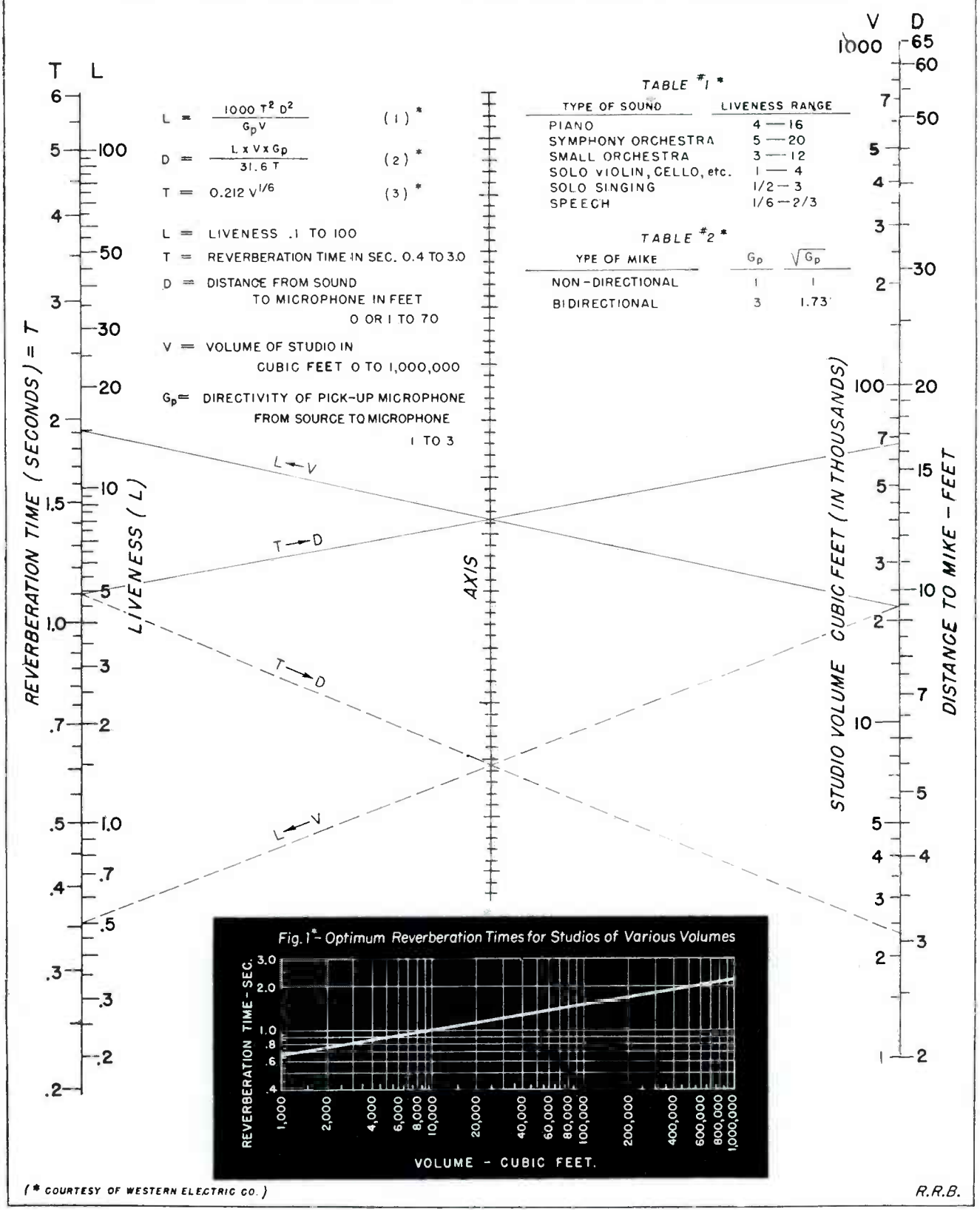
D B CHART

DECIBELS

Power Ratio	Voltage or Current Ratio	—db+	Voltage or Current Ratio	Power Ratio	Power Ratio	Voltage or Current Ratio	—db+	Voltage or Current Ratio	Power Ratio	Power Ratio	Voltage or Current Ratio	—db+	Voltage or Current Ratio	Power Ratio
10^{-1}		10		10	.251	.501	6.0	2.00	3.98	.0501	.224	13.0	4.47	19.95
10^{-2}	10^{-1}	20	10	10^{2}	.246	.496	6.1	2.02	4.07	.0490	.221	13.1	4.52	20.42
10^{-3}		30		10^{3}	.240	.490	6.2	2.04	4.17	.0479	.219	13.2	4.57	20.89
10^{-4}	10^{-2}	40	10^{2}	10^{4}	.234	.484	6.3	2.07	4.27	.0468	.216	13.3	4.62	21.38
10^{-5}		50		10^{5}	.229	.479	6.4	2.09	4.37	.0457	.214	13.4	4.68	21.88
10^{-6}	10^{-3}	60	10^{3}	10^{6}	.224	.473	6.5	2.11	4.47	.0447	.211	13.5	4.73	22.39
10^{-7}		70		10^{7}	.219	.468	6.6	2.14	4.57	.0437	.209	13.6	4.79	22.91
10^{-8}	10^{-4}	80	10^{4}	10^{8}	.214	.462	6.7	2.16	4.68	.0427	.207	13.7	4.84	23.44
10^{-9}		90		10^{9}	.209	.457	6.8	2.19	4.79	.0417	.204	13.8	4.90	23.99
10^{-10}	10^{-5}	100	10^{5}	10^{10}	.204	.452	6.9	2.21	4.90	.0407	.202	13.9	4.96	24.55
1.000	1.000	0	1.00	1.00	.200	.447	7.0	2.24	5.01	.0398	.200	14.0	5.01	25.12
.977	.989	.1	1.01	1.02	.195	.442	7.1	2.27	5.13	.0389	.197	14.1	5.07	25.70
.955	.977	.2	1.02	1.05	.191	.437	7.2	2.29	5.25	.0380	.195	14.2	5.13	26.30
.933	.966	.3	1.04	1.07	.186	.432	7.3	2.32	5.37	.0372	.193	14.3	5.19	26.92
.912	.955	.4	1.05	1.10	.182	.427	7.4	2.34	5.50	.0363	.191	14.4	5.25	27.54
.891	.944	.5	1.06	1.12	.178	.422	7.5	2.37	5.62	.0355	.188	14.5	5.31	28.18
.871	.933	.6	1.07	1.15	.174	.417	7.6	2.40	5.75	.0347	.186	14.6	5.37	28.84
.851	.923	.7	1.08	1.18	.170	.412	7.7	2.43	5.89	.0339	.184	14.7	5.43	29.51
.832	.912	.8	1.10	1.20	.166	.407	7.8	2.46	6.03	.0331	.182	14.8	5.50	30.20
.813	.902	.9	1.11	1.23	.162	.403	7.9	2.48	6.17	.0324	.180	14.9	5.56	30.90
.794	.891	1.0	1.12	1.26	.159	.398	8.0	2.51	6.31	.0316	.178	15.0	5.62	31.62
.776	.881	1.1	1.14	1.29	.155	.394	8.1	2.54	6.46	.0309	.176	15.1	5.69	32.36
.759	.871	1.2	1.15	1.32	.151	.389	8.2	2.57	6.61	.0302	.174	15.2	5.75	33.11
.741	.861	1.3	1.16	1.35	.148	.385	8.3	2.60	6.76	.0295	.172	15.3	5.82	33.88
.724	.851	1.4	1.18	1.38	.145	.380	8.4	2.63	6.92	.0288	.170	15.4	5.89	34.67
.708	.841	1.5	1.19	1.41	.141	.376	8.5	2.66	7.08	.0282	.168	15.5	5.96	35.48
.692	.832	1.6	1.20	1.45	.138	.372	8.6	2.69	7.24	.0275	.166	15.6	6.03	36.31
.676	.822	1.7	1.22	1.48	.135	.367	8.7	2.72	7.41	.0269	.164	15.7	6.10	37.15
.661	.813	1.8	1.23	1.51	.132	.363	8.8	2.75	7.59	.0263	.162	15.8	6.17	38.02
.646	.804	1.9	1.25	1.55	.129	.359	8.9	2.79	7.76	.0257	.160	15.9	6.24	38.90
.631	.794	2.0	1.26	1.59	.126	.355	9.0	2.82	7.94	.0251	.159	16.0	6.31	39.81
.617	.785	2.1	1.27	1.62	.123	.351	9.1	2.85	8.13	.0246	.157	16.1	6.38	40.74
.603	.776	2.2	1.29	1.66	.120	.347	9.2	2.88	8.32	.0240	.155	16.2	6.46	41.69
.589	.767	2.3	1.30	1.70	.118	.343	9.3	2.92	8.51	.0234	.153	16.3	6.53	42.66
.575	.759	2.4	1.32	1.74	.115	.339	9.4	2.95	8.71	.0229	.151	16.4	6.61	43.65
.562	.750	2.5	1.33	1.78	.112	.335	9.5	2.99	8.91	.0224	.150	16.5	6.68	44.67
.550	.741	2.6	1.35	1.82	.110	.331	9.6	3.02	9.12	.0219	.148	16.6	6.76	45.71
.537	.733	2.7	1.37	1.86	.107	.327	9.7	3.06	9.33	.0214	.146	16.7	6.84	46.77
.525	.724	2.8	1.38	1.91	.105	.324	9.8	3.09	9.55	.0209	.145	16.8	6.92	47.86
.513	.716	2.9	1.40	1.95	.102	.320	9.9	3.13	9.77	.0204	.143	16.9	7.00	48.98
.501	.708	3.0	1.41	2.00	.1000	.316	10.0	3.16	10.00	.0200	.141	17.0	7.08	50.12
.490	.700	3.1	1.43	2.04	.0977	.313	10.1	3.20	10.23	.0195	.140	17.1	7.16	51.29
.479	.692	3.2	1.45	2.09	.0955	.309	10.2	3.24	10.47	.0191	.138	17.2	7.24	52.48
.468	.684	3.3	1.46	2.14	.0933	.306	10.3	3.27	10.72	.0186	.137	17.3	7.33	53.70
.457	.676	3.4	1.48	2.19	.0912	.302	10.4	3.31	10.96	.0182	.135	17.4	7.41	54.95
.447	.668	3.5	1.50	2.24	.0891	.299	10.5	3.35	11.22	.0178	.133	17.5	7.50	56.23
.437	.661	3.6	1.51	2.29	.0871	.295	10.6	3.39	11.48	.0174	.132	17.6	7.59	57.54
.427	.653	3.7	1.53	2.34	.0851	.292	10.7	3.43	11.75	.0170	.130	17.7	7.67	58.88
.417	.646	3.8	1.55	2.40	.0832	.288	10.8	3.47	12.02	.0166	.129	17.8	7.76	60.26
.407	.638	3.9	1.57	2.46	.0813	.285	10.9	3.51	12.30	.0162	.127	17.9	7.85	61.66
.398	.631	4.0	1.59	2.51	.0794	.282	11.0	3.55	12.59	.0159	.126	18.0	7.94	63.10
.389	.624	4.1	1.60	2.57	.0776	.279	11.1	3.59	12.88	.0155	.125	18.1	8.04	64.57
.380	.617	4.2	1.62	2.63	.0759	.275	11.2	3.63	13.18	.0151	.123	18.2	8.13	66.07
.372	.610	4.3	1.64	2.69	.0741	.272	11.3	3.67	13.49	.0148	.122	18.3	8.22	67.61
.363	.603	4.4	1.66	2.75	.0724	.269	11.4	3.72	13.80	.0145	.120	18.4	8.32	69.18
.355	.596	4.5	1.68	2.81	.0708	.266	11.5	3.76	14.13	.0141	.119	18.5	8.41	70.79
.347	.589	4.6	1.70	2.88	.0691	.263	11.6	3.80	14.45	.0138	.118	18.6	8.51	72.44
.339	.582	4.7	1.72	2.95	.0676	.260	11.7	3.85	14.79	.0135	.116	18.7	8.61	74.13
.331	.575	4.8	1.74	3.02	.0661	.257	11.8	3.89	15.14	.0132	.115	18.8	8.71	75.86
.324	.569	4.9	1.76	3.09	.0646	.254	11.9	3.94	15.49	.0129	.114	18.9	8.81	77.62
.316	.562	5.0	1.78	3.16	.0631	.251	12.0	3.98	15.85	.0126	.112	19.0	8.91	79.43
.309	.556	5.1	1.80	3.24	.0617	.248	12.1	4.03	16.22	.0123	.111	19.1	9.02	81.28
.302	.550	5.2	1.82	3.31	.0603	.246	12.2	4.07	16.60	.0120	.110	19.2	9.12	83.18
.295	.543	5.3	1.84	3.39	.0589	.243	12.3	4.12	16.98	.0118	.108	19.3	9.23	85.11
.288	.537	5.4	1.86	3.47	.0575	.240	12.4	4.17	17.38	.0115	.107	19.4	9.33	87.10
.282	.530	5.5	1.88	3.55	.0562	.237	12.5	4.22	17.78	.0112	.106	19.5	9.44	89.13
.275	.525	5.6	1.91	3.63	.0550	.234	12.6	4.27	18.20	.0110	.105	19.6	9.55	91.20
.269	.519	5.7	1.93	3.72	.0537	.232	12.7	4.32	18.62	.0107	.104	19.7	9.66	93.33
.263	.513	5.8	1.95	3.80	.0525	.229	12.8	4.37	19.05	.0105	.102	19.8	9.77	95.50
.257	.507	5.9	1.97	3.89	.0513	.227	12.9	4.42	19.50	.0102	.101	19.9	9.89	97.72
										.0100	.100	20.0	10.00	100.00

MIKE NOMOGRAPH

NOMOGRAPH for MICROPHONE DISTANCES in LIVENESS BROADCASTING



$$L = \frac{1000\,T^2\,D^2}{G_p V} \quad (1)^*$$

$$D = \frac{L \times V \times G_p}{31.6\,T} \quad (2)^*$$

$$T = 0.212\,V^{1/6} \quad (3)^*$$

L = LIVENESS .1 TO 100

T = REVERBERATION TIME IN SEC. 0.4 TO 3.0

D = DISTANCE FROM SOUND TO MICROPHONE IN FEET 0 OR 1 TO 70

V = VOLUME OF STUDIO IN CUBIC FEET 0 TO 1,000,000

G_p = DIRECTIVITY OF PICK-UP MICROPHONE FROM SOURCE TO MICROPHONE 1 TO 3

TABLE #1 *

TYPE OF SOUND	LIVENESS RANGE
PIANO	4 — 16
SYMPHONY ORCHESTRA	5 — 20
SMALL ORCHESTRA	3 — 12
SOLO VIOLIN, CELLO, etc.	1 — 4
SOLO SINGING	1/2 — 3
SPEECH	1/6 — 2/3

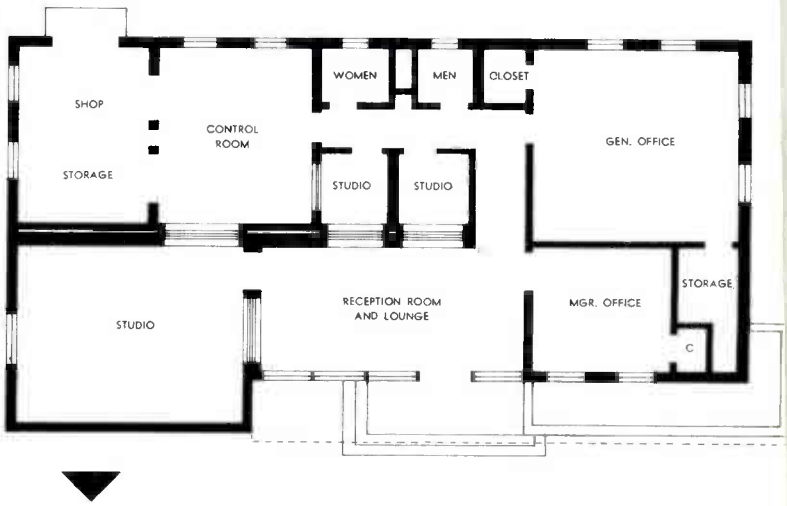
TABLE #2 *

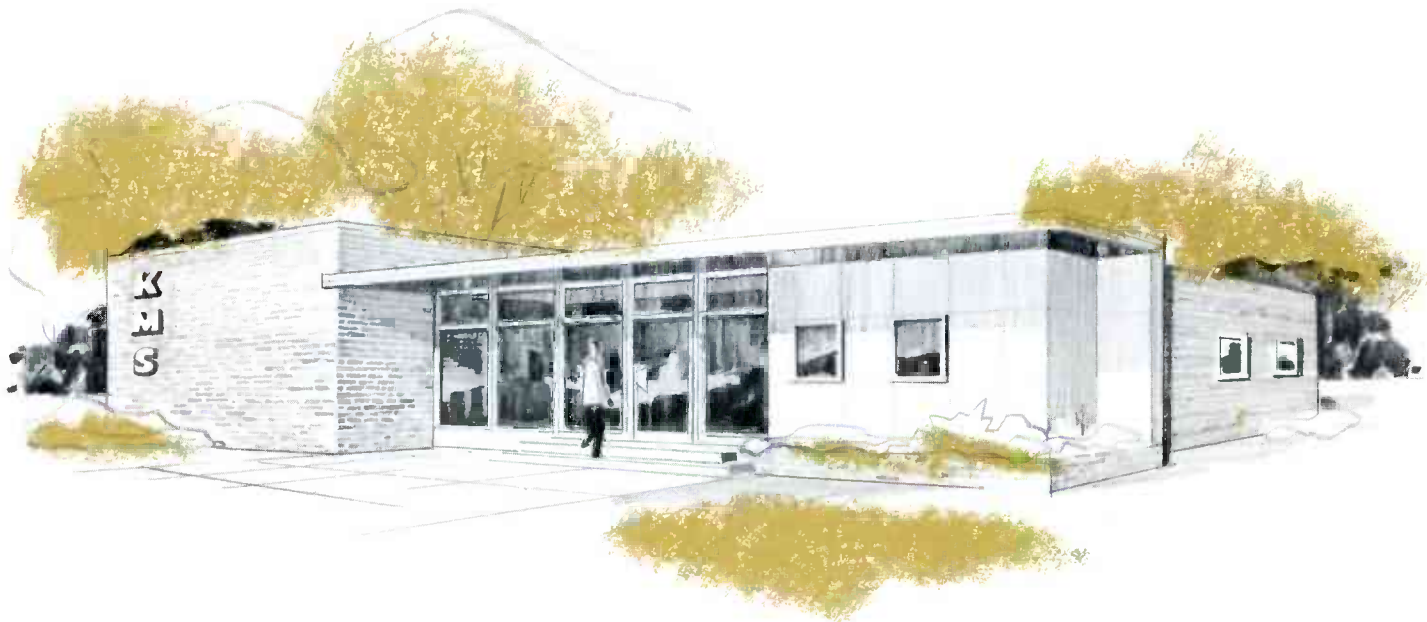
YPE OF MIKE	G_p	$\sqrt{G_p}$
NON-DIRECTIONAL	1	1
BIDIRECTIONAL	3	1.73

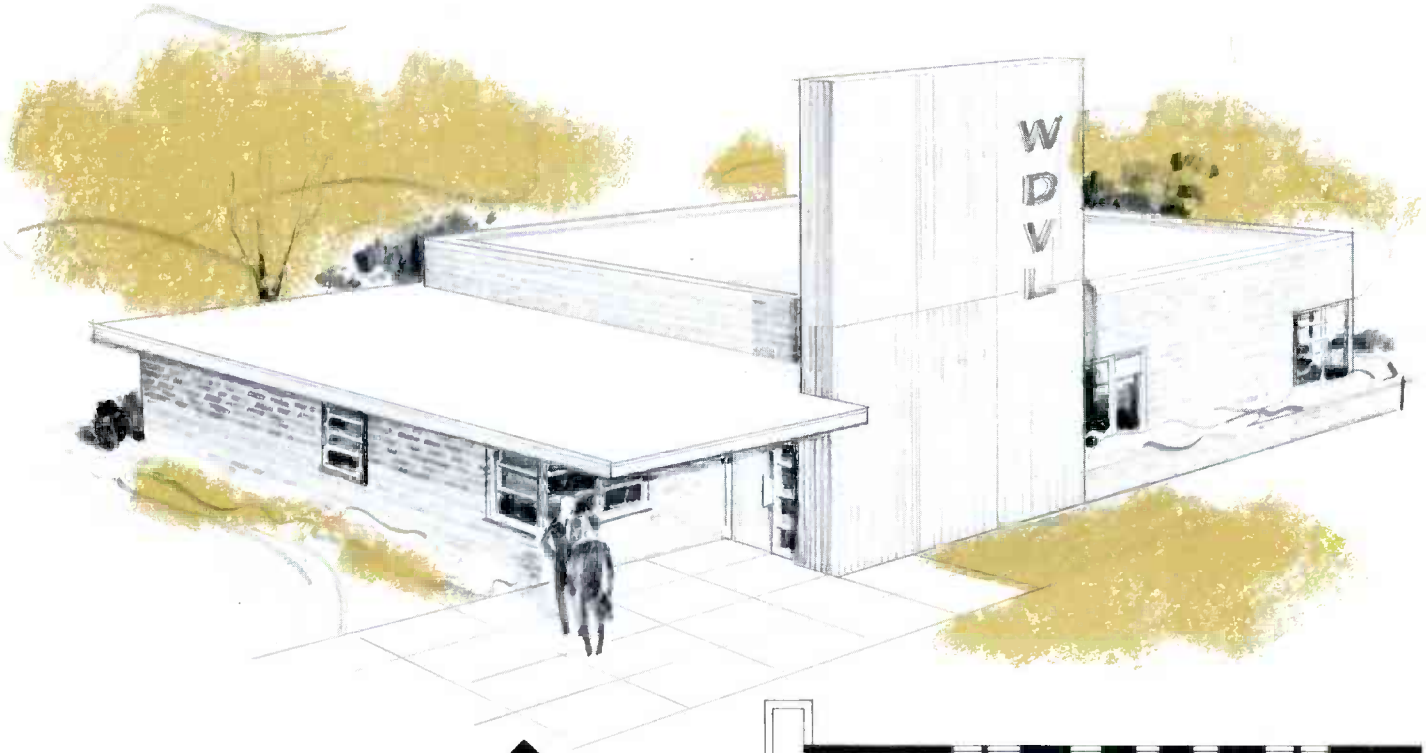
(* COURTESY OF WESTERN ELECTRIC CO.)

R.R.B.

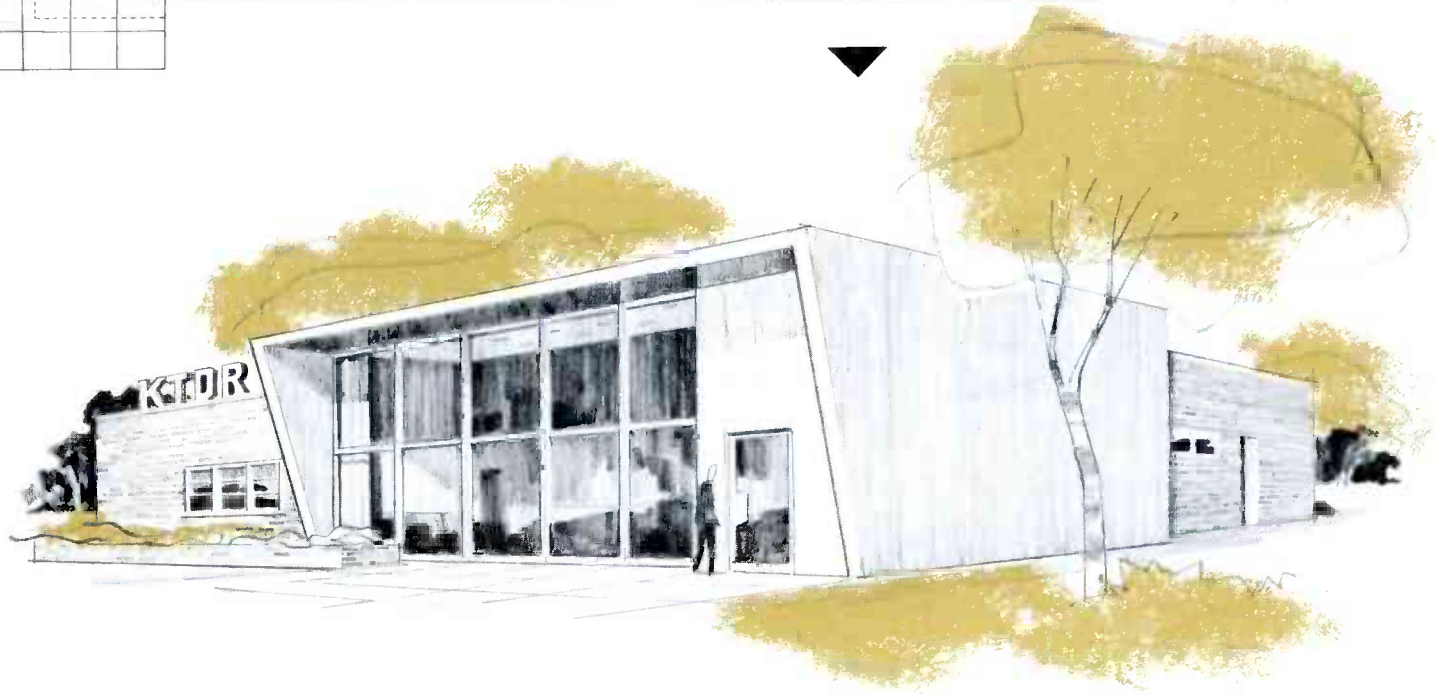
SUGGESTED STATION LAYOUTS

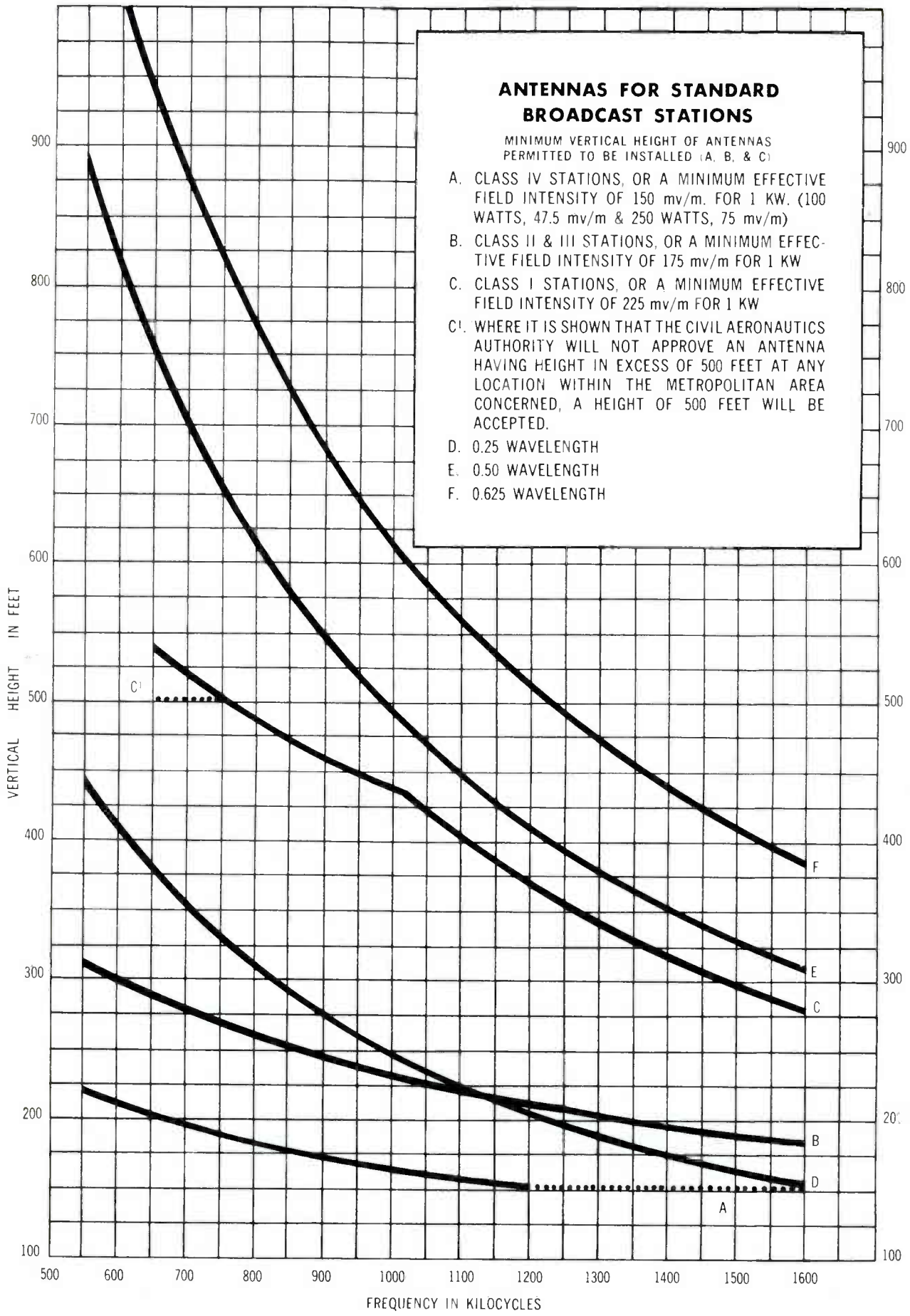





WDVL

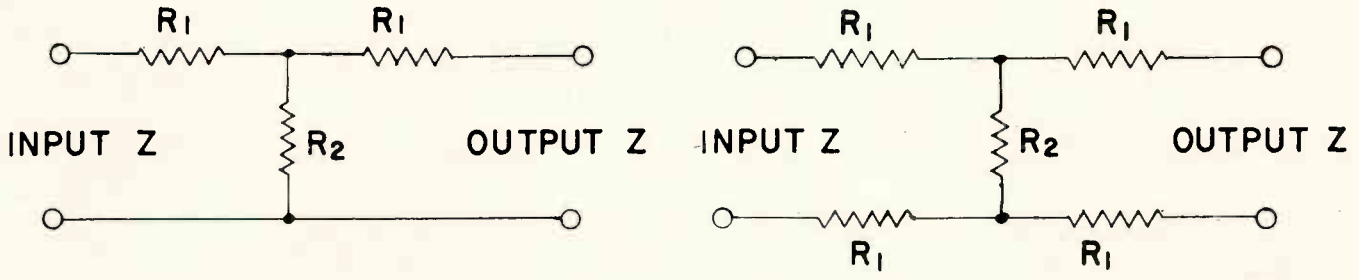

SHOP
MEN
WOMEN
OFFICE
MGR. OFFICE
STORAGE
ANNCR. BOOTH
CONTROL ROOM
STUDIO
STUDIO
RECEPTION ROOM AND LOUNGE
OFFICE
CLOSET
CLOSET
GEN. OFFICE
OFFICE
MEN
WOMEN
OFFICE
CLOSET
CLOSET
MGR. OFFICE
OFFICE
ANNCR. BOOTH
OFFICE
STUDIO
LIBRARY
RECEPTION ROOM AND LOUNGE
CONTROL ROOM
SHOP
STUDIO
STORAGE


KTDR


ANTENNAS FOR STANDARD BROADCAST STATIONS
MINIMUM VERTICAL HEIGHT OF ANTENNAS PERMITTED TO BE INSTALLED (A, B, & C)
A. CLASS IV STATIONS, OR A MINIMUM EFFECTIVE FIELD INTENSITY OF 150 mv/m. FOR 1 KW. (100 WATTS, 47.5 mv/m & 250 WATTS, 75 mv/m)
B. CLASS II & III STATIONS, OR A MINIMUM EFFECTIVE FIELD INTENSITY OF 175 mv/m FOR 1 KW
C. CLASS I STATIONS, OR A MINIMUM EFFECTIVE FIELD INTENSITY OF 225 mv/m FOR 1 KW
C1. WHERE IT IS SHOWN THAT THE CIVIL AERONAUTICS AUTHORITY WILL NOT APPROVE AN ANTENNA HAVING HEIGHT IN EXCESS OF 500 FEET AT ANY LOCATION WITHIN THE METROPOLITAN AREA CONCERNED, A HEIGHT OF 500 FEET WILL BE ACCEPTED.
D. 0.25 WAVELENGTH
E. 0.50 WAVELENGTH
F. 0.625 WAVELENGTH
VERTICAL HEIGHT IN FEET
100
200
300
400
500
600
700
800
900
FREQUENCY IN KILOCYCLES
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
C1
F
E
C
B
D
A

ATTENUATOR NETWORK

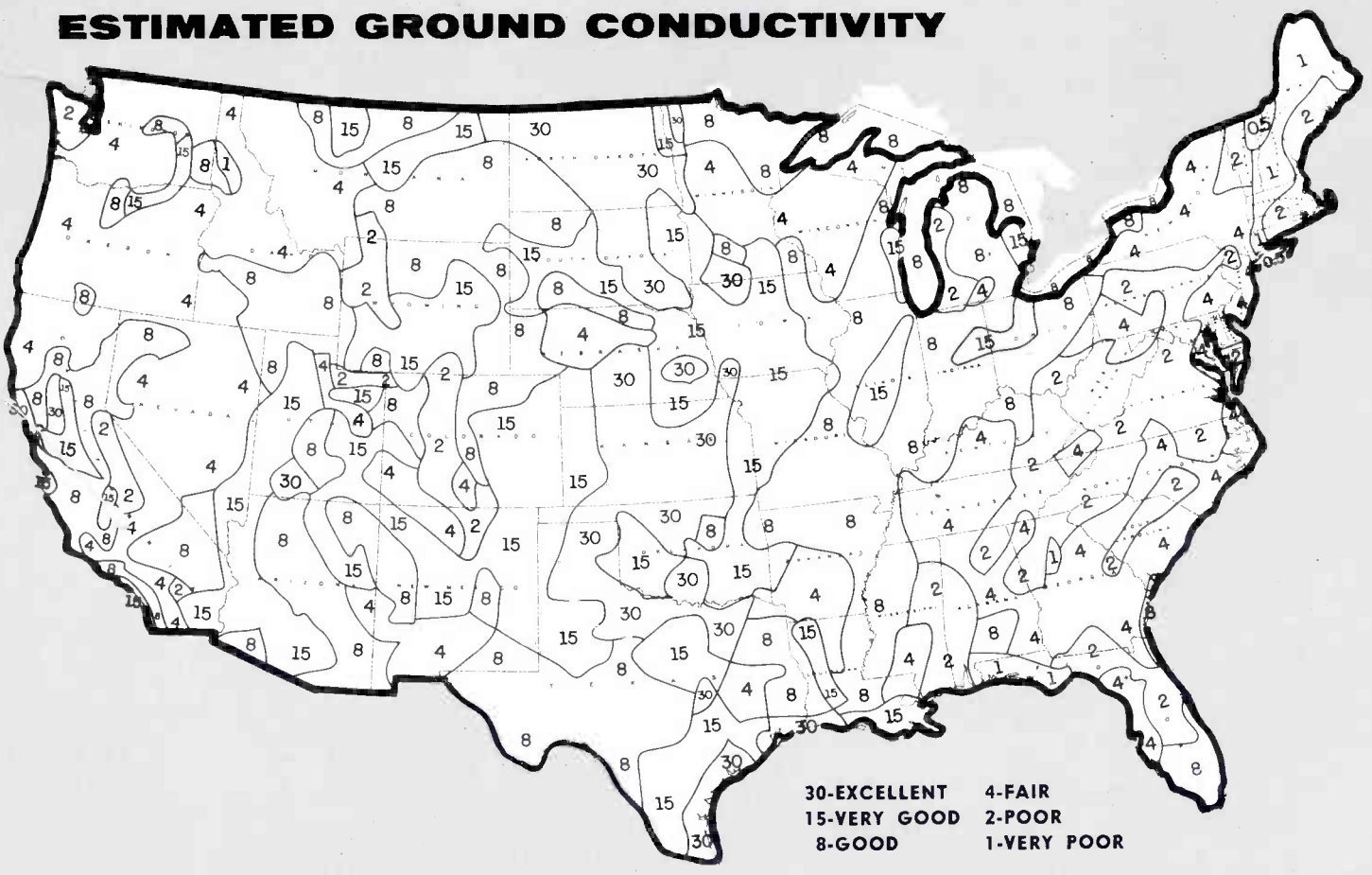
Input and Output Z=600 Ohms



DB LOSS	R_1	R_2	DB LOSS	R_1	R_2
0.5	17.2	10464	16	435.8	195.1
1	34.5	5208	17	451.5	172.9
2	68.8	2582	18	465.8	152.5
3	102.7	1703	19	479.0	136.4
4	135.8	1249	20	490.4	121.2
5	168.1	987.6	22	511.7	95.9
6	199.3	803.4	24	528.8	76.0
7	229.7	685.2	26	542.7	60.3
8	258.4	567.6	28	541.1	47.8
9	285.8	487.2	30	563.0	38.0
10	312.0	421.6	32	570.6	30.2
11	336.1	367.4	34	576.5	24.0
12	359.1	321.7	36	581.1	19.0
13	380.5	282.8	38	585.1	15.1
14	400.4	249.4	40	588.1	12.0
15	418.8	220.4			

DB LOSS	R_1	R_2	DB LOSS	R_1	R_2
0.5	8.6	10464	16	217.9	195.1
1	17.25	5208	17	225.7	172.9
2	34.4	2582	18	232.9	152.5
3	51.3	1703	19	239.5	136.4
4	67.9	1249	20	245.2	121.2
5	84.1	987.6	22	255.9	95.9
6	99.7	803.4	24	264.4	76.0
7	114.8	685.2	26	271.4	60.3
8	129.2	567.6	28	277.0	47.8
9	142.9	487.2	30	281.6	38.0
10	156.0	421.6	32	285.3	30.2
11	168.1	367.4	34	288.3	24.0
12	179.5	321.7	36	290.6	19.0
13	190.3	282.8	38	292.5	15.1
14	200.2	249.4	40	294.1	12.0
15	209.4	220.4			

ESTIMATED GROUND CONDUCTIVITY



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