

**AUDIO
DATA
BOOK**

GENERAL  ELECTRIC

BROADCAST EQUIPMENT



AUDIO

DATA BOOK

This book is recorded in your name as follows:

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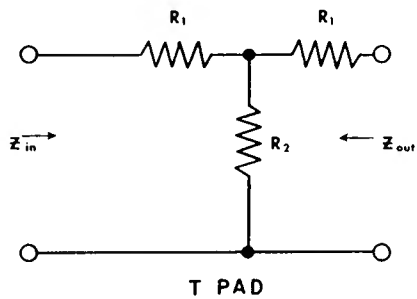
GENERAL  ELECTRIC

SYRACUSE 1, NEW YORK

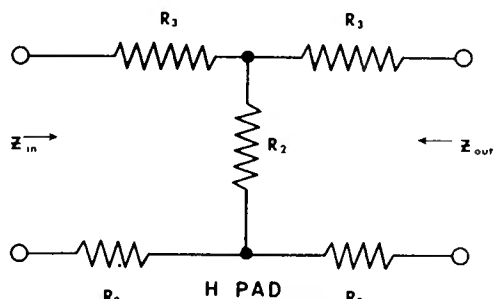
VOLUME LEVEL TO POWER AND VOLTAGE CONVERSION TABLE

Reference Level
0 dbm = 1 milliwatt, 600 ohms

Milliwatts	Volts	DBM
.000001	.0007746	-60
.000010	.002449	-50
.000100	.007746	-40
.001	.02449	-30
.010	.07746	-20
0.100	.2449	-10
1.000	.7746	0
Watts	Volts	DBM
.001000	.7746	0
.002512	1.228	+ 4
.006310	1.946	+ 8
.01000	2.449	+10
.1000	7.746	+20
1.000	24.49	+30
10.00	77.46	+40



For impedances
other than 600 ohms,
multiply all resistors
by Factor $\frac{Z_x}{600}$

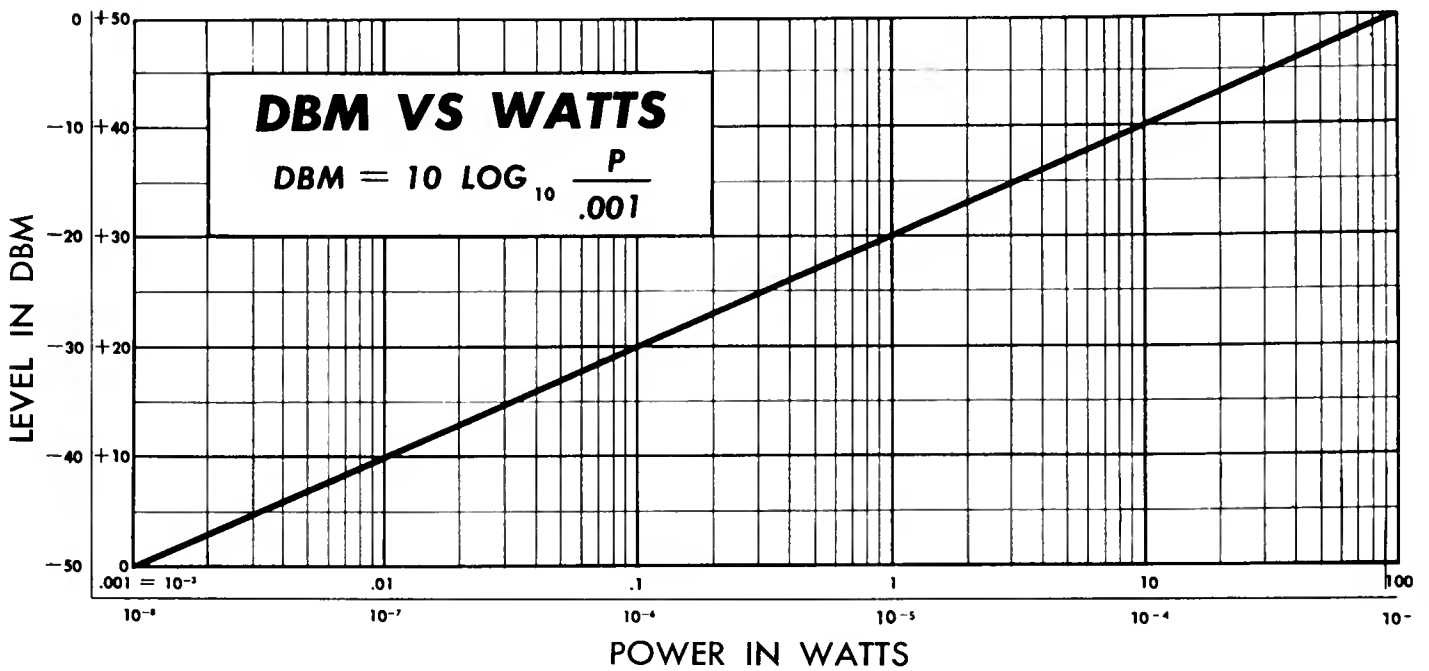
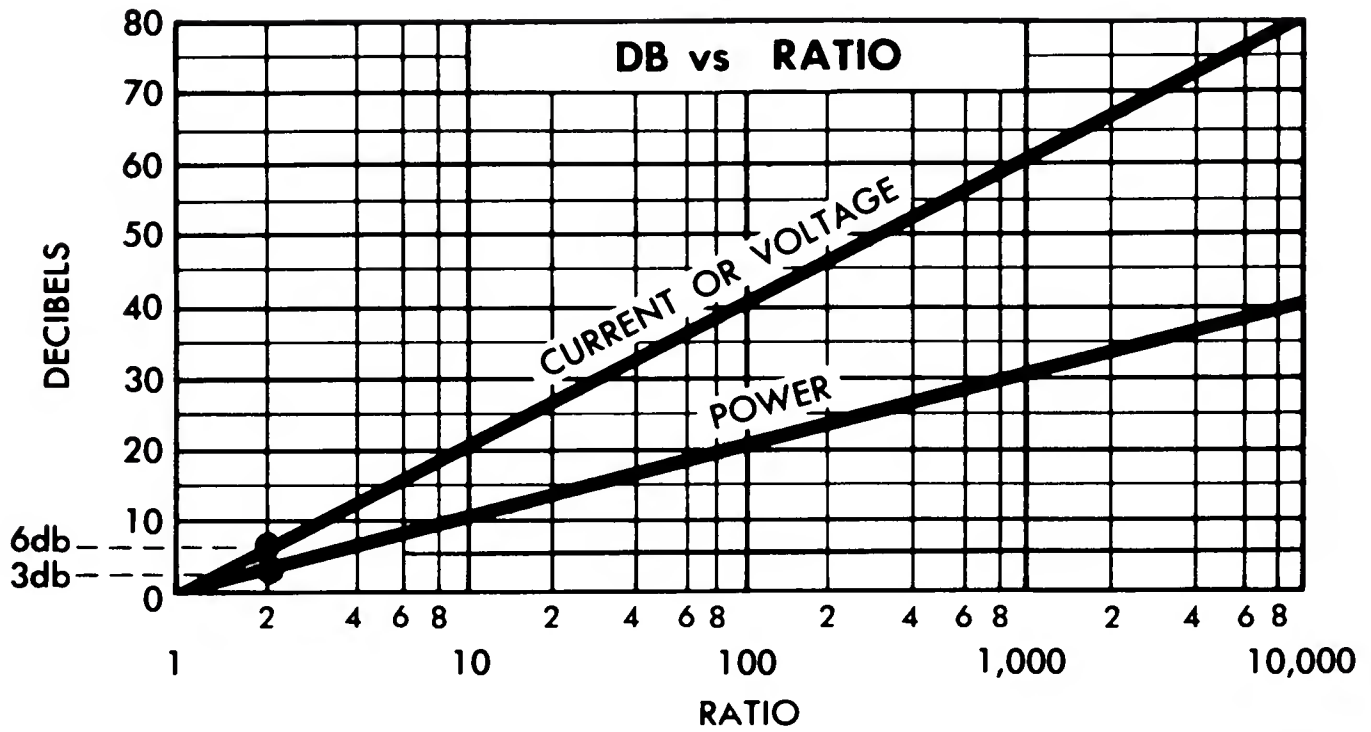


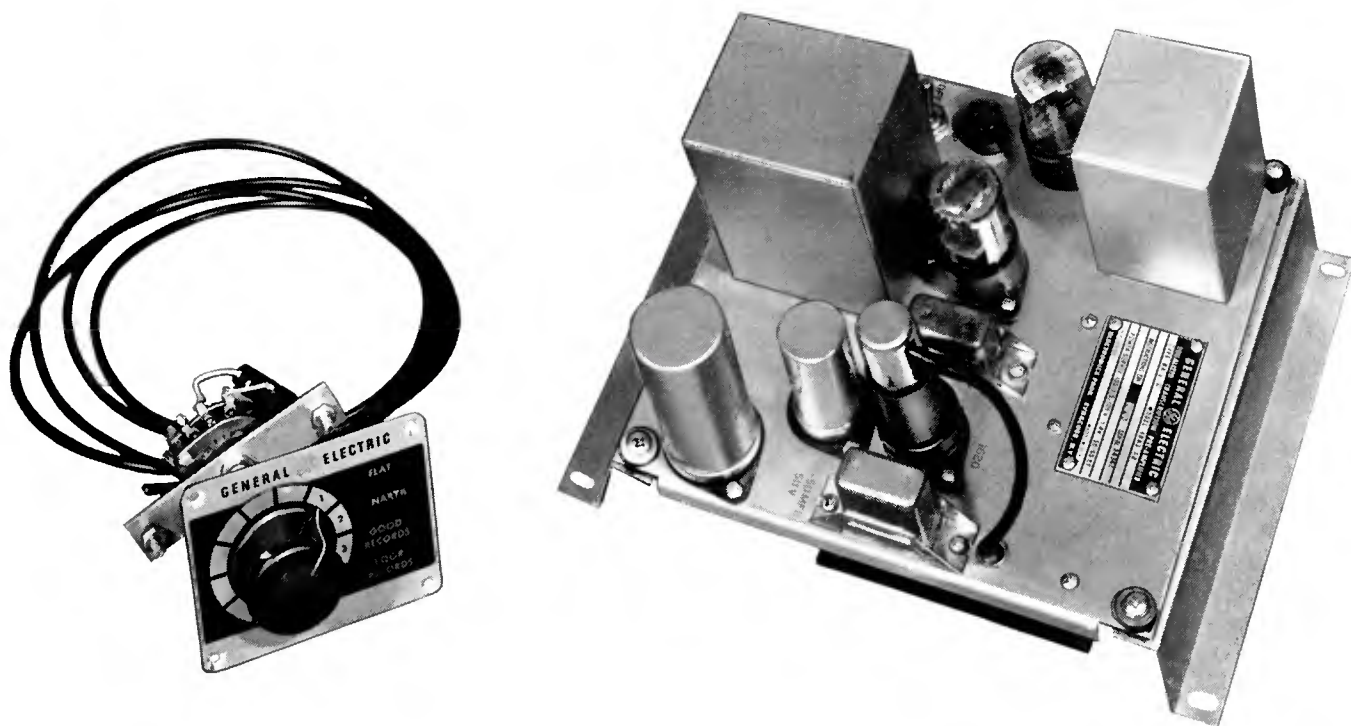
$Z_{in} = Z_{out} = 600 \text{ ohms}$

Loss in DB	EIA Resistor Values*			Loss in DB	EIA Resistor Values*		
	R ₁	R ₂	R ₃		R ₁	R ₂	R ₃
1/2	18	10,000	8.2	16	430	200	220
1	36	5,100	18	17	470	180	220
2	68	2,700	36	18	470	150	240
3	100	1,800	51	19	470	130	240
4	130	1,200	68	20	510	120	240
5	160	1,000	82	22	510	100	270
6	200	820	100	24	510	75	270
7	220	680	110	26	560	62	270
8	270	560	130	28	560	47	270
9	300	470	150	30	560	39	270
10	300	430	160	32	560	30	300
11	330	360	160	34	560	24	300
12	360	330	180	36	560	18	300
13	390	270	200	38	560	15	300
14	390	240	200	40	560	12	300
15	430	220	200				

* EIA resistor values nearest to the exact values are given

RESISTIVE PADS





BA-3-A Equalized Transcription Pre-Amplifier

APPLICATION

The Type BA-3-A Equalized Transcription Pre-Amplifier is a high-quality, AC operated, equalized audio amplifier. It is designed to enable broadcasters to fully realize the superior play-back performance possible with G-E Variable Reluctance Pickups. A four-position switch allows control of high-frequency response. Approximately -15 VU audio output is available for feeding console mixer systems. For the convenience of the operator, the Type BA-3-A provides a cueing circuit which will feed headphones independent of the program circuit.

FEATURES

1. Full "NARTB" low-frequency response.
2. Adjustable high-frequency response including "NARTB" position.
3. Sufficient level to feed directly into conventional mixer systems.
4. Low-noise type 1620 input tube.
5. Tubes and chassis shock mounted.
6. Magnetically shielded output and power transformers.
7. Provision for tube current checks.
8. Output circuits are 600/150 ohms and may be run either balanced or unbalanced.
9. Low distortion.
10. Cueing circuit for headphones.

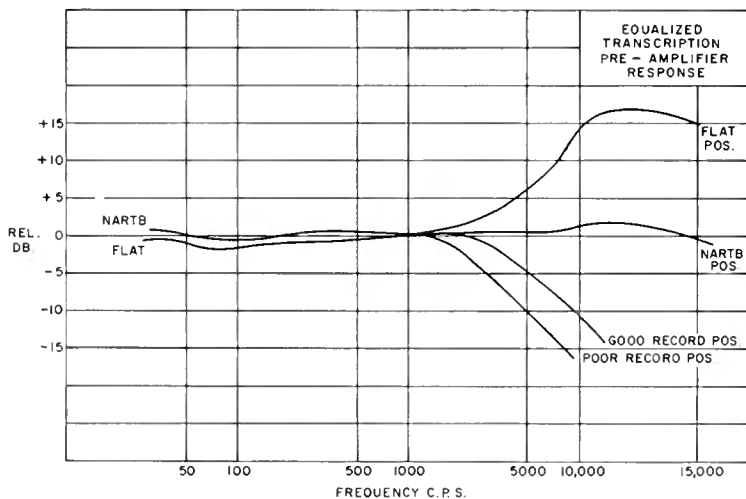
DESCRIPTION

The amplifier is built on a flat-plate chassis which mounts inside the turntable cabinet. The four-position switch which allows control of the high-frequency response mounts on the turntable either at the top or the side. Included with the switch is an escutcheon plate and knob which mounts on the top of the turntable.

The four positions of the switch are "Flat", "NARTB", "Good Records", and "Poor Records". The "Flat" position provides essentially flat high-frequency response from material recorded at constant velocity. The "NARTB" position provides essentially flat high-frequency response from material recorded in accordance with the "NARTB" lateral curve. The "Good Records" position provides a high-frequency response somewhat more attenuated than that given by the "NARTB" position. The fourth position, "Poor Records", provides a high-frequency response considerably more attenuated than that given by the "NARTB" position. All switch positions provide low-frequency response essentially the complement of the "NARTB" curve.

Shielded leads are provided which connect the amplifier to the pickup and to the equalizer switch. If it is desirable, leads can be connected from the amplifier to a headphone cueing jack. These are not furnished as part of the equipment.

The usual power and audio output leads interconnect with the station facilities. Terminals are provided for metering of tube cathode voltages.



Average Performance Characteristics of the Transcription Equalizer with the "New Orthophonic" Test Record G-E 4GS-01D or 4GD-01D-02D Cartridge using the 1-mil Diamond Stylus.

MECHANICAL SPECIFICATIONS

Dimensions:

- Height 7 inches (over-all)
- Width $8\frac{3}{4}$ inches
- Depth $8\frac{3}{4}$ inches
- Weight: Approx. 6 lbs. 3 oz. (unpacked)

Mounting: The amplifier mounts inside the turntable cabinet and the switch is designed to mount on the turntable, either at the top or the side.

ELECTRICAL SPECIFICATIONS

Power Input:

- 110/117/125 volts, 50/60 cycles
- 20 watts

Tube Complement:

- 1 G-E Type 1620*
- 1 G-E Type 6SN7-GT
- 1 G-E Type 6X5

*Type 6J7 may be used where a minimum of microphonics and hum is not required.

Output Level: When used with the G-E Variable Reluctance Broadcast Cartridges, 4GS-01D, 4GS-02D or 4GD-01L-02D, the output will be approximately -15 VU maximum from 78 rpm records; -20 VU maximum from microgroove records.

Noise Level: 65 db below output level of -5 dbm.

Cueing: Approximately $1\frac{1}{2}$ volts program peak, one side grounded, for use with high impedance headphones. Output isolated from program circuit.

Output Circuits

- Load Impedance: 600/150 ohms.
- Output Connections: 600 or 150 ohms—balanced, or either side may be grounded.

Distortion: 1% or less, 50 to 15,000 cycles with up to -5 dbm output. This includes equalizing circuits.

Metering: Cathode resistors tapped at 1 volt for connection to an external 5000 ohms-per-volt 2-volt meter.

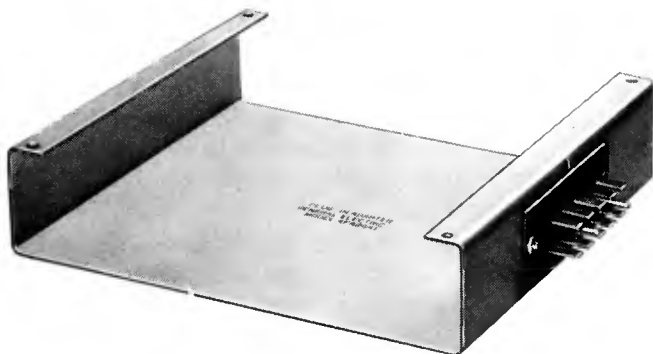
ORDERING INFORMATION

When ordering, please specify:

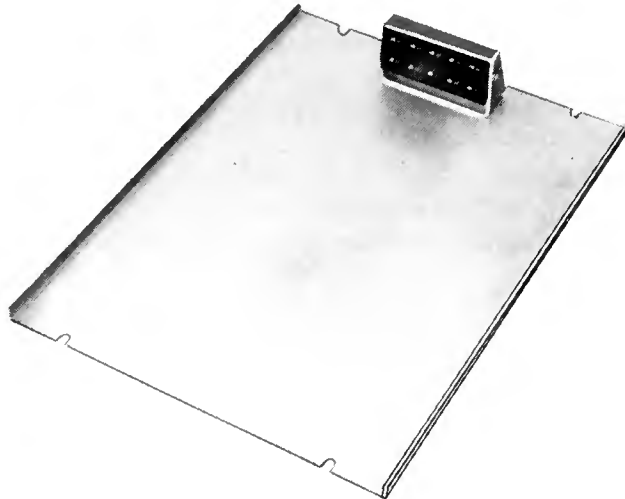
- Type BA-3-A Equalized Transcription Pre-Amplifier.
- Type number includes amplifier, one set of operating tubes, instruction book and AC power plug.

ACCESSORIES

- Type FA-26-A Plug-in Adapter for converting unit to a plug-in chassis.
- Type FA-22-F Tray to provide a plug-in base for the FA-26-A Adapter.



FA-26-A Plug-in Adapter



FA-22-F Tray



Type BA-1-H Plug-In Pre-Amplifier, Type FA-22-D Tray

APPLICATION

Type BA-1-H Plug-In Pre-Amplifier is designed for use as a microphone pre-amplifier or as a booster amplifier between mixer bus and the program amplifier of a studio audio system. It can also be used as an isolation amplifier when provided with a suitable bridging resistance, such as Type FA-35-G Bridging Volume Control.

This pre-amplifier, when used in conjunction with Type BA-12-C Plug-in Program/Monitor Amplifier, makes it possible to assemble a complete studio audio system employing only two basic amplifier types.

FEATURES

- 1— Plug-in construction permits easy removal for servicing.
- 2— Small, compact design. Six of these amplifiers can be mounted in 7" of rack space.
- 3— Simple two-stage circuit using printed-wire board makes parts easy to locate for maintenance.
- 4— Excellent plug-in contact efficiency. Unit uses Cinch-Jones "2400" series plugs.
- 5— Tubes are shielded by easily removed tube shields.
- 6— Transformers are of hum-bucking coil construction with magnetically shielded cases.

- 7—Chassis provides mounting hole to accommodate Type FA-35-G Bridging Volume Control.
 8—Uniformity of performance assured by use of printed wireboard.

INTERCHANGEABILITY

Electrically and mechanically interchangeable with previous Type BA-1-F Plug-In Pre-Amplifier.

COMPLIANCE

Complies with all applicable FCC and RETMA specifications.

DESCRIPTION

Type BA-1-H Plug-in Pre-Amplifier consists of a single plug-in unit that utilizes a printed-wire board on which are assembled all the amplifier components. This assembly is mounted in a wrap-around frame incorporating a ten-pin Cinch-Jones "2400" series plug.

Electrically, the BA-1-H consists of two resistance coupled stages using Type 5879 tubes. A feedback loop is used around the two stages. Specially designed input and output transformers with hum-bucking coil construction and alloy shields are used.

An unloaded transformer input is employed to give maximum gain and optimum signal-to-noise ratio from high-quality broadcast microphones.

A Type FA-35-G Bridging Volume Control is available as an accessory. This control may be mounted in a hole which is available for this purpose on the BA-1-H. When so mounted, this control provides a 10,000 ohm input impedance for use as a bridging or continuously variable-input volume control.

MECHANICAL SPECIFICATIONS

Units: Type number covers single plug-in assembly.

Dimensions:	Height	Length	Width	Weight
BA-1-H	4 $\frac{5}{8}$ "	10 $\frac{1}{4}$ "	2 $\frac{7}{16}$ "	2 $\frac{1}{2}$ lbs

Mounting: Plug-in mounting. A single pre-amplifier chassis can be mounted on a Type FA-22-D Tray (accessory) whereas six of these pre-amplifiers or three pre-amplifiers and one Type BP-10-B Plug-in Power Supply can be mounted on a Type FA-23-B Shelf (accessory) for rack mounting. Up to seven pre-amplifiers can be mounted in a Type BC-11-A Audio Console.

Operating Conditions:

Maximum cabinet ambient temperature: 130°F (55°C)
 Maximum relative humidity: 95%

Electrical Connections: All connections are made via a 10 pin "2400" series Cinch-Jones plug, which is the standard plug used on all our plug-in units.

Safety Provisions: No B+ power is applied to the unit unless it is plugged into its mating connector. The exposed soldered eyelet points on the top side of the board are protected with an insulating coating of resin varnish.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response: ± 1 db 50-15,000 cps.
 Gain: 40 db

Harmonic Distortion: .5% or less at +18 dbm, 50-15,000 cps.
 Noise -80 dbm or less.

Power Requirements:

0.3 ma at 6.3 volts AC (Filament Power)
 Filaments biased at +20 to +50 volts DC (supplied by BP-10-B Power Supply).

Signal Inputs:

Input Impedance: Unloaded transformer.
 Source Impedance: 30/150/250/600 ohms connections (150 ohms as shipped.)

Signal Outputs: Rated output, +18 dbm; output impedance, 600/150 ohms; 600 ohms as shipped.

TUBE COMPLEMENT

2 Type 5879

ORDERING INFORMATION

When ordering, please specify: Type BA-1-H Plug-In Pre-Amplifier (requires an external power supply).

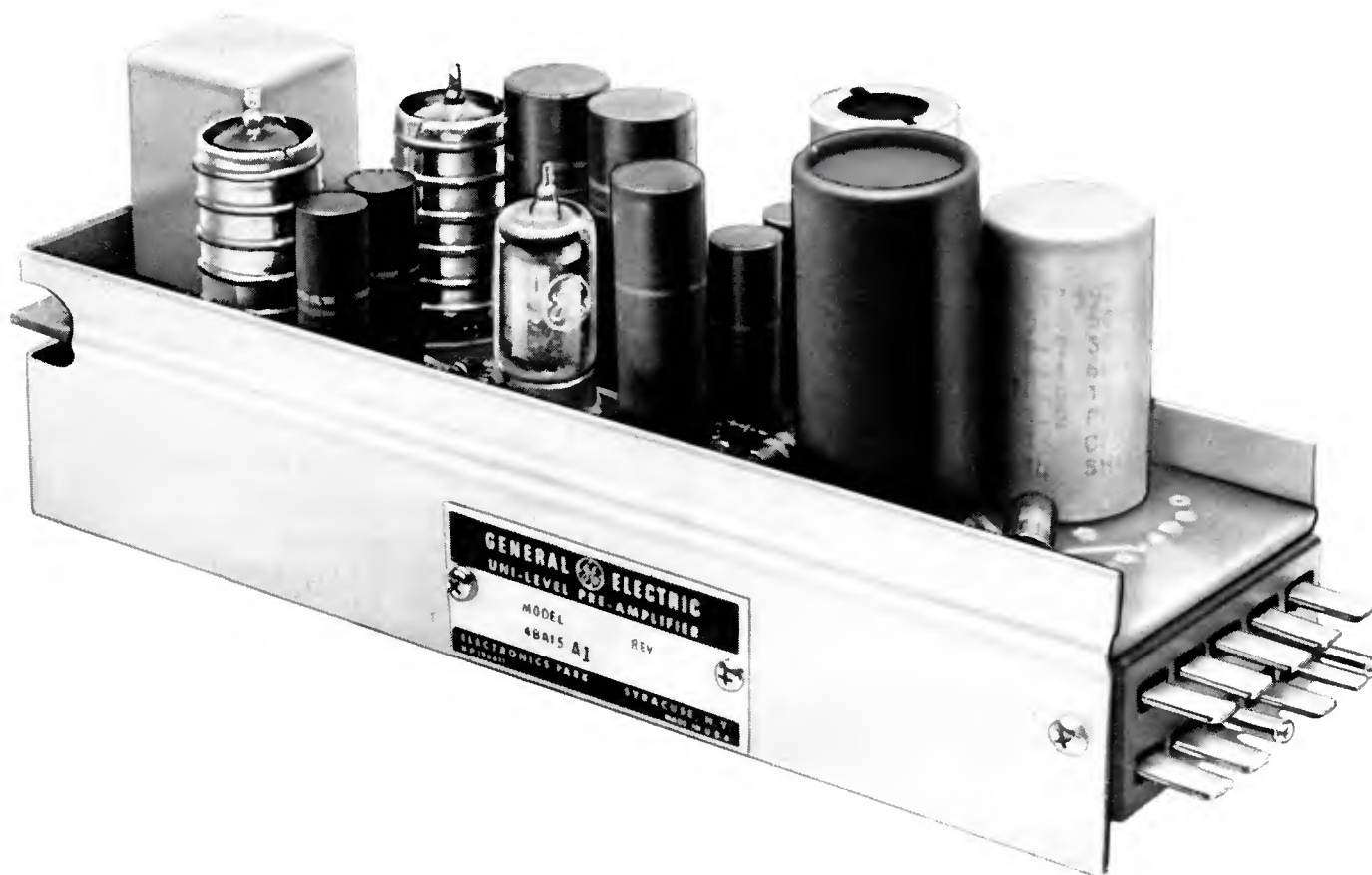
ACCESSORIES

Type FA-22-D Tray, for mounting BA-1-H. (Required only for older FA-22-A Shelves or external mounting.)

Type BP-10-B Plug-in Power Supply, for BA-1-H's and/or BA-12-C's. (Type BP-10-B uses 200 watts at 110 volts AC and will supply power for 25 Type BA-1-H Pre-Amplifiers or 3 Type BA-12-C Program/Monitoring Amplifiers.)

Type FA-23-B Shelf, for mounting various plug-in amplifiers. The FA-23-B Shelf requires 7" of vertical rack space, and will accommodate 6 BA-1-H Pre-Amplifiers, or 4 BA-12-C Program/Monitoring Amplifiers, or BA-9-A Uni-Level Amplifiers; or 2 BP-10-B power supplies or combinations of these plug-in units.

Type FA-35-G Bridging Volume Control, for use with BA-1-H and BA-12-C Amplifiers. It is designed to convert a 600 ohm amplifier input to a 10,000 ohm balanced-bridging service and may be used on line levels up to +40 dbm. When used with the BA-1-F it is connected ahead of the input transformer.



APPLICATION

The General Electric Type BA-15-A Plug-In Uni-Level Pre-Amplifier is a high gain microphone pre-amplifier incorporating automatic level control. This device is designed to automatically control variation in microphone signal levels. This compact plug-in unit may be used in place of the BA-1-F or BA-1-H Pre-Amplifiers.

Input level variations of up to 30 db may be successfully controlled by this pre-amplifier with only a 10 db change in the output signal level. Such variations are often encountered in boom microphone operation or in other cases where the relationship between the talent and the microphone is continuously changing. In addition, the Uni-Level Pre-Amplifier is a high gain unit having 60 db of gain as compared to a conventional pre-amplifier having 40 db of gain.

FEATURES

1. **Extremely versatile.**
 - a. *Relieves operators* by permitting automatic level control in any microphone channel.
 - b. *May be used in variety of applications* in AM-FM-TV-Recording studios, such as announce booths, boom mikes and public address systems.
 - c. *Controls level difference* between two or more microphone signals.

- d. *Automatic Gain Control is applied* when the microphone signal to the amplifier is -70 dbm or higher. Signals below -70 dbm are linearly amplified.

2. **High gain**—60 db vs. 40 db gain for standard pre-amplifiers.
3. **Plug-in construction** allows easy removal of pre-amplifiers for servicing.
4. **Small compact design.** Six of these units can be mounted in 7" of rack space.
5. **Tubes** are shielded by easily removed tube shields.
6. **Transformers** are of hum-bucking coil construction with magnetically shielded cases.
7. **Prevents blasting** when two or more people are using same microphone.
8. **Automatically adjusts** audio level from close-in to 6 or 8 feet from microphone.

DESCRIPTION

Type BA-15-A Plug-In Uni-Level Pre-Amplifier is a single plug-in chassis which consists of a push-pull input stage (12AX7) supplying signal to a variable gain output stage (GL6386). Signal for the bias generator is supplied from the plates of the output stage (GL6386) to a voltage amplifier stage (GL5670) connected in push-pull. The voltage amplifier supplies a signal to a full wave bias

rectifier stage (6AL5) whose output applies a bias voltage to the control grids of the variable gain stage.

MECHANICAL SPECIFICATIONS

Units: The type number covers the amplifier, one set of operating tubes, and installation and operating instructions.

Dimensions: Height $4\frac{3}{4}$ "
Width $2\frac{1}{2}$ "
Length $10\frac{1}{2}$ "
Weight $1\frac{1}{2}$ lbs.

Mechanical: The size of this unit permits it to be used with our present line of plug-in amplifiers. The chassis size is that of the BA-1-H. It may be used to replace a BA-1-F or H, or any similar amplifier used as a microphone pre-amplifier of any studio audio system.

Mounting: 6 Uni-Level Pre-Amplifiers can be mounted in 7" of rack space using a Type FA-23-B shelf. Plug-in construction using a Jones 2400 series plug allows easy removal for servicing.

Operating Conditions:

Up to an external ambient of 45°C .
Up to 95% relative humidity.
Will withstand normal shipping.

Open-type construction allows natural ventilation.

Electrical Connections: All connections are made to one 2400 series Jones connector mounted at end of chassis. The electrical connections to the BA-15-A Jones connector except for one connection are the same as our present line of plug-in amplifiers.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response: ± 1 db 50-12,000 and $+1-1.5$ @ 15,000 cycles under any gain condition up to 30 db gain reduction.

Gain: 60 db unloaded transformer input.

Harmonic Distortion: Below and up to threshold of gain reduction .5%—50 to 15,000 cps. With 30 db gain reduction 50 to 15,000 cps 1%.

Output Noise: -60 dbm.

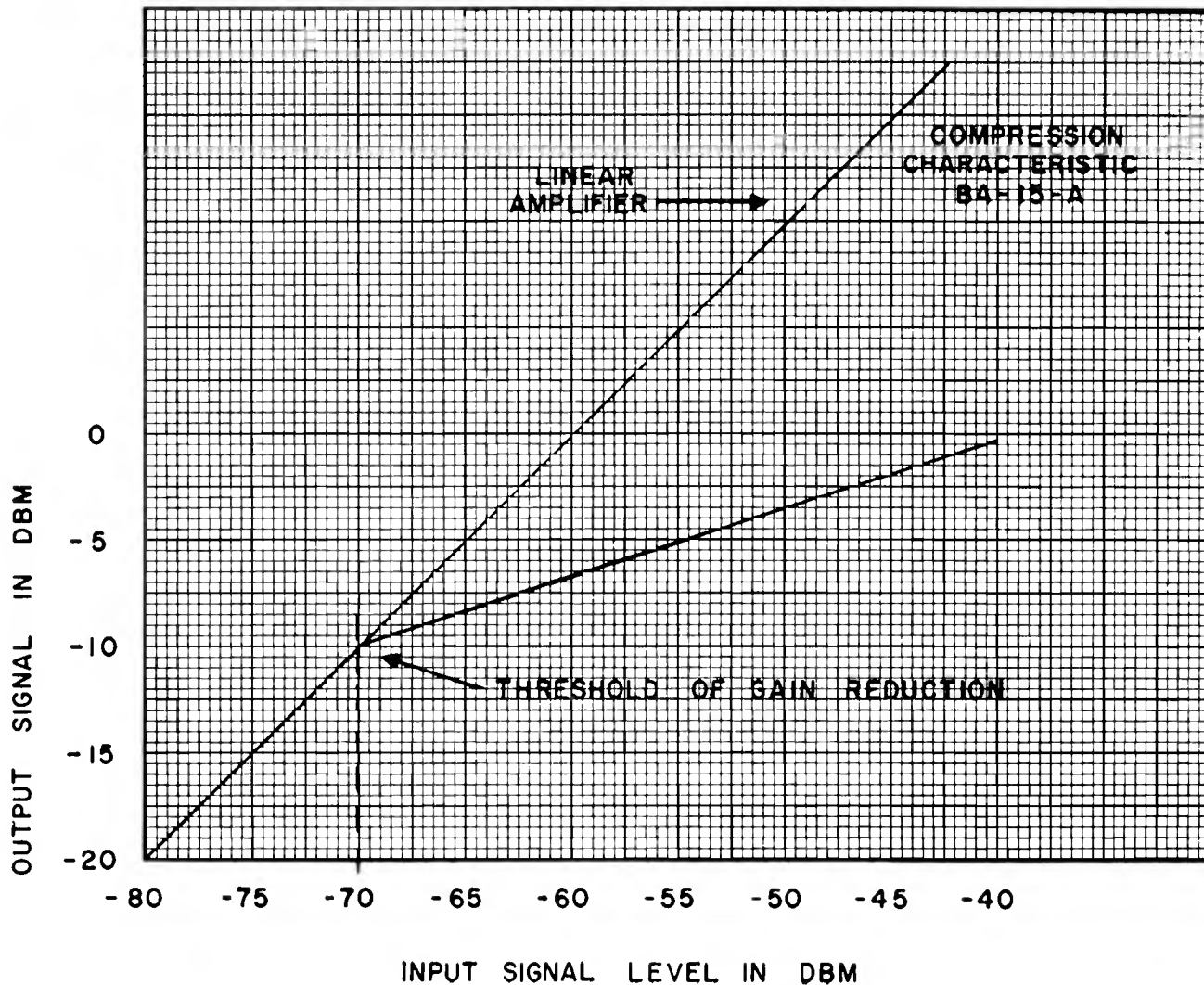
Attack Time: 1 millisecond

Recovery Time: .9 seconds for 63% recovery.

Power Requirements:

300 V DC 25 ma approximately.

6.3 V AC @ 1.30 amps +20 to +50 V DC bias on filaments. 15.7 watts. (The BA-15-A uses an external power supply—suggested Type BP-10-B Power Supply.)



Signal Inputs: Microphone level and up to -40 dbm with 30 db gain reduction.

Source Impedance: 30/150/250/600 ohms.

Impedance: 150 ohms as shipped. Balanced or unbalanced.

Input Impedance: Unloaded transformer.

Signal Outputs: Threshold—10 dbm output 0 dbm at 30 db gain reduction. 150/600 ohms out. 600 ohms as shipped. Balanced or unbalanced.

TUBE COMPLEMENT

1—12AX7

1—GL6386

1—6AL5

1—GL5670

ORDERING INFORMATION

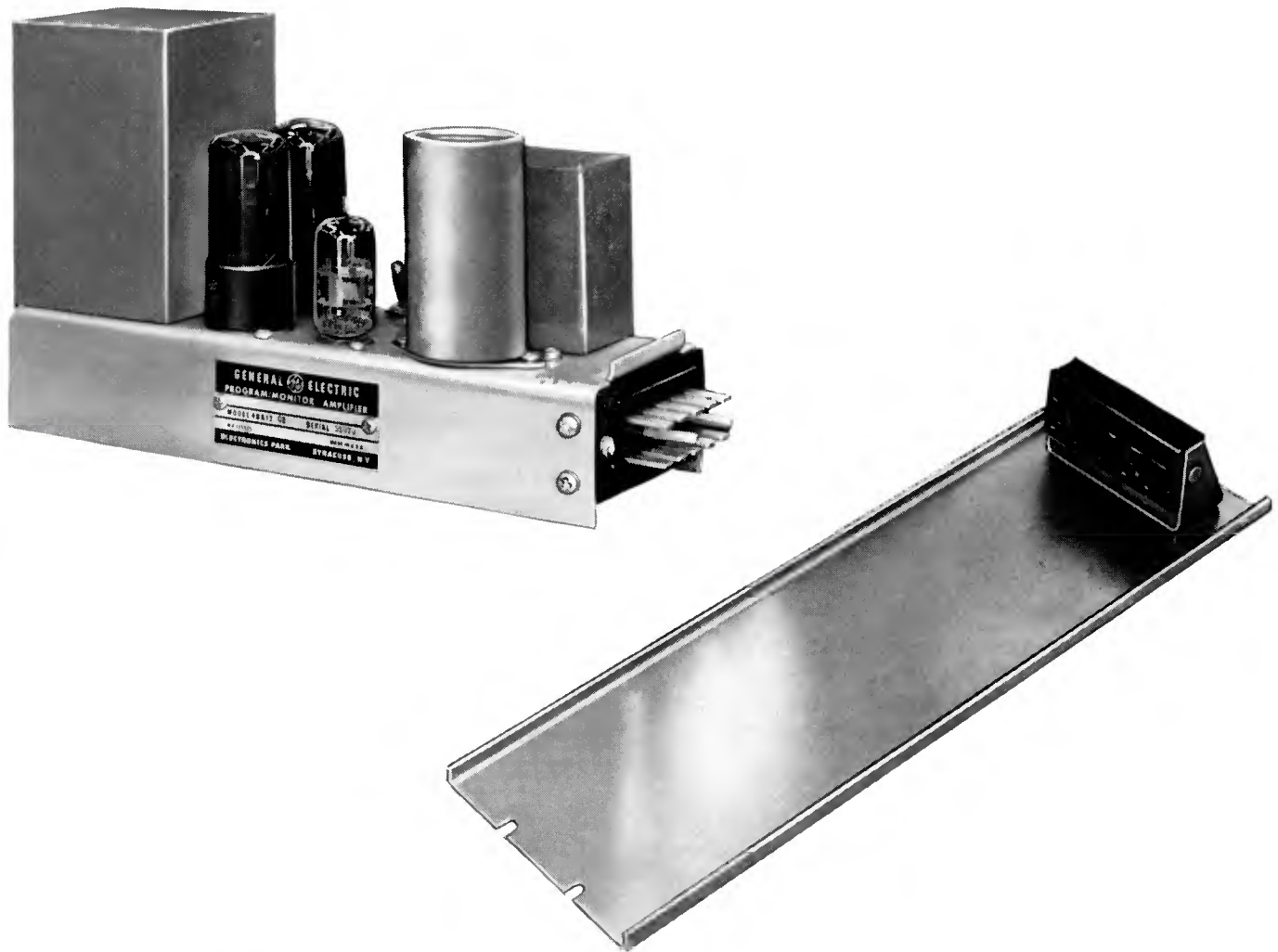
When ordering specify:

Type BA-15-A Plug-In Uni-Level Pre-Amplifier to consist of one amplifier; one set of operating tubes and installation and operating instructions.

ACCESSORIES

1—FA-23-B Shelf (Mounts 6 BA-15-A Amplifiers)

1—BP-10-B Power Supply will supply 5 BA-15-A amplifiers.



Plug-In Program/Monitoring Amplifier, Type BA-12-C and Tray, Type FA-22-E

APPLICATION

The Type BA-12-C, Plug-In Program/Monitoring Amplifier is a high fidelity, compact, fixed gain, plug-in audio unit, recommended for use as a program, line, monitoring or isolation amplifier.

FEATURES

1. Small, compact design. Four of these amplifiers can be mounted in 7 inches of rack space.
2. Plug-in construction with point-to-point wiring makes maintenance extremely easy.
3. Only two tube-types used.
4. Easy removal for servicing. Uses Jones "2400" series plug.
5. Chassis punched for addition of bridging controls and metering switches.
6. No shock hazard. Voltage is applied to the unit only when plugged into a mating source and when so plugged in, no voltage is exposed.
7. Versatile: fulfills all medium and high-level audio system requirements. Toggle switch allows selection of 56- or 71-db gain.

DESCRIPTION

The General Electric Type BA-12-C Plug-In Program/Monitor Amplifier is a dual purpose amplifier. By means of a switch, located on the chassis top, this amplifier may be instantly changed from a line amplifier to an 8 watt monitor amplifier.

With the switch set in low position, the amplifier serves as a program or line amplifier. In this position the amplifier has a gain of 56 db. With an output level of +30 dbm, the distortion is less than one-half of one percent with a maximum input of -26 dbm.

When the switch is in the high position, the amplifier may be used as a monitor amplifier with a gain of 71 db. In this application an output level of +39 dbm (8 watts) is possible with a distortion figure of less than 3% at maximum input level of -32 dbm.

Electrically the BA-12-C Amplifier consists of a 5879 pentode input stage plus a triode-connected 5879 used as a split load phase inverter and two 6V6 tubes in the push-pull output stage. Feedback from a tertiary winding on the output transformer is fed to the cathode of the first stage. For high gain applications, the "HI"

position of the above mentioned switch decreases the feedback by 15 db.

Holes are provided on the chassis for installation of an accessory FA-35-G Bridging Volume Control and two tube metering switches if such are desired.

The BA-12-C Amplifier is equipped with a male, 10-pin "2400" series Jones plug for mating use in the G-E BC-11-A Console. It may also be mounted on an accessory FA-22-E Tray with mating receptacle for rack use. When so mounted, the tray and amplifier combination is usually mounted on an FA-23-A standard cabinet-rack mounting shelf (Accessory). Power can then be obtained from a rack-mounted BP-10-B Power Supply.

MECHANICAL SPECIFICATIONS

Dimensions:

Height	5 $\frac{3}{4}$ "
Width	3 $\frac{1}{2}$ "
Depth	10 $\frac{3}{4}$ "
Weight:	6 lbs.

Mounting: Each BA-12-C Amplifier mounts on a Type FA-22-E Tray. Four of these Trays mount on one Type FA-23-A Shelf, occupying 7 inches (4 rack units) of cabinet space.

Operating Conditions:

Maximum ambient temperature:	113°F (45°C)
Maximum relative humidity:	95%

Safety Provisions: Voltage is applied to the unit only when it is plugged into a mating source and when so plugged, no voltage is exposed.

ELECTRICAL SPECIFICATIONS

Type of Circuit: Consists of a 5879 pentode input stage plus a triode connected 5879 used as a split load phase inverter and two Type 6V6 tubes as the push-pull output. Feedback is used from a tertiary winding on the output transformer to the cathode of the input stage. For high gain applications, a switch is provided to decrease the feedback by 15 db.

Performance:

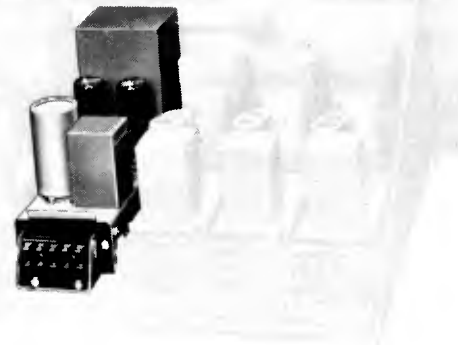
Program Amplifier (*low gain position*):

Frequency Range:	50-15,000 cps. \pm 1 db.
Gain:	56 db.
Output Level and Distortion:	+30 dbm (1 watt) $\frac{1}{2}$ % or less distortion (maximum input -26 dbm).
	+39 dbm (8 watts) 1% or less distortion (maximum input -17 dbm).
Output Noise:	Less than -60 dbm.

Monitoring Amplifier (*high gain position*):

Frequency Range:	50-15,000 cps. \pm 1 $\frac{1}{2}$ db.
Gain:	71 db.
Output Level and Distortion:	+39 dbm (8 watts) 3% or less distortion (maximum input -32 dbm).

For high level loudspeaker applications, the BA-12-C can be modified to give 15 watts output by using Type



Plug-In Program/Monitoring Amplifiers, Type BA-12-C and Trays, Type FA-22-E; plus Plug-In Pre-Amplifiers, Type BA-1-F mounted in Broadcast Shelf, Type FA-23-A.

6L6 or 5881 tubes, and increasing the B+ supply voltage.

Signal Inputs:

Input Impedance:	Unloaded transformer.
Source Impedance:	600/150 ohms; 600 ohms as shipped.

Power Inputs:

Filaments:	1.2 amps at 6.3 volts AC.
Bias:	Biased at +20 to +50 volts DC.
B+ Requirement:	88 ma at 300 volts DC (at 8 watts output).

Outputs: Output impedance, 600/150 ohms; 600 ohms as shipped.

Tube Complement:

- 2 Type 5879 (input and phase inverter)
- 2 Type 6V6 (push-pull output)
- (Type 6L6 or Type 5881 tubes may be used to obtain higher power output when desired)

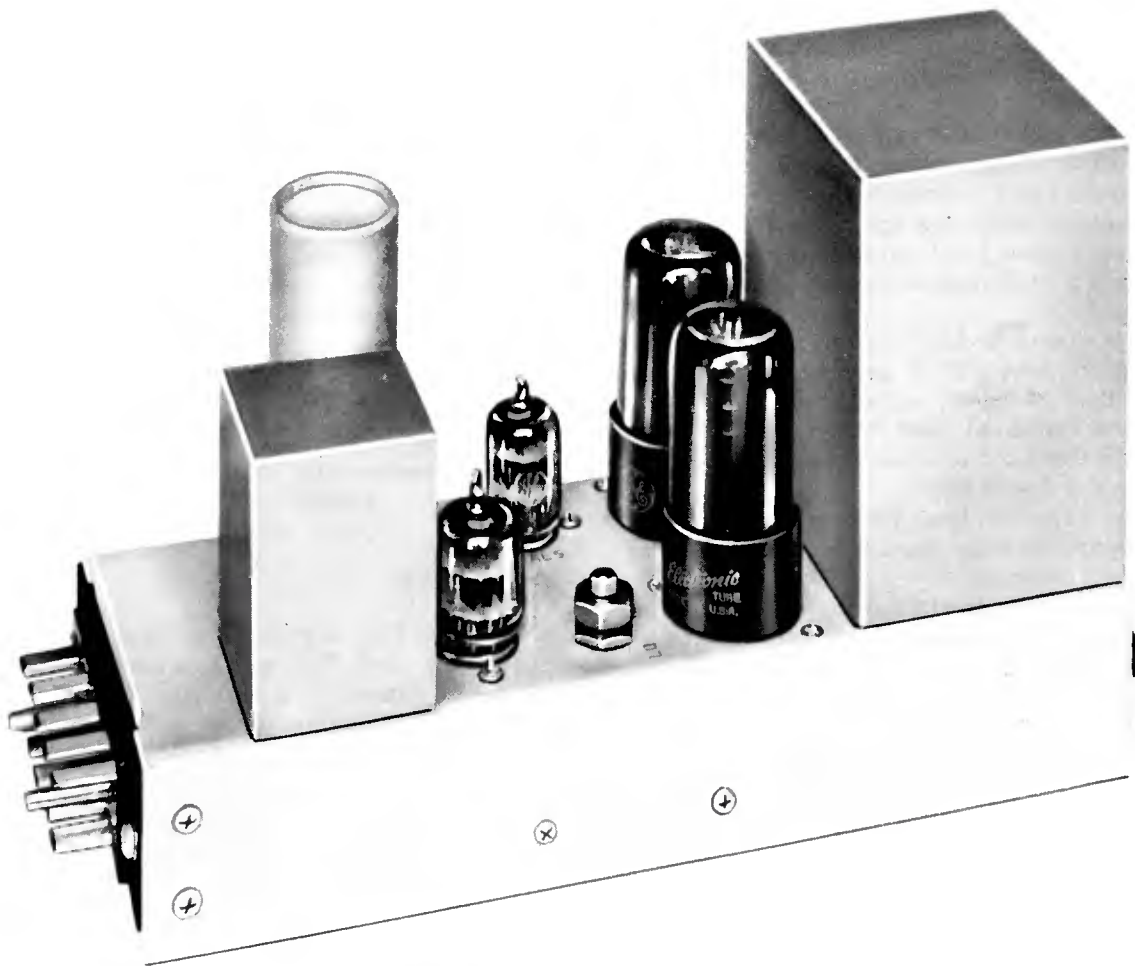
ORDERING INFORMATION

When ordering, please specify:

Type BA-12-C Plug-In Program/Monitoring Amplifier (requires an external power supply).

ACCESSORIES

Type FA-22-E Tray, for mounting BA-12-C.
Type BP-10-B Plug-In Power Supply, for BA-1-F's and/or BA-12-C's. (Type BP-10-B uses 200 watts at 110 volts AC and will supply power for 25 Type BA-1-F Pre-Amplifiers or 3 Type BA-12-C Program/Monitoring Amplifiers.)
Type FA-23-A Shelf, for mounting Plug-in units with trays. (Type FA-23-A occupies 7 inches (4 units of rack height) in a Type PR-1-A Cabinet Rack and will accommodate 6 Pre-Amps, Type BA-1-F, with trays, 4 Type BA-12-C Program/Monitoring Amplifiers, with trays or 2 Type BP-10-B Power Supplies, with trays.)
Type FA-35-G, Bridging Volume Control. (Bridging Volume Control for use with BA-1-F and BA-12-C Amplifiers. It is designed to convert a 600-ohm amplifier input to a 10,000-ohm balanced-bridging service and may be used in line levels up to +40 dbm.)



Plug-In Uni-Level Amplifier, Type BA-9-A.

APPLICATION

The General Electric Type BA-9-A Plug-In Uni-Level Amplifier is an automatic level control unit designed to automatically control variations in audio program level. This compact, plug-in unit replaces or may be used in addition to the BA-12-C Plug-In Program/Monitoring Amplifier when the latter is used as a program amplifier.

The BA-9-A Uni-Level Amplifier may be used as an average level control device or as a peak level control amplifier.

Maximums of up to 30 db in program variations may be successfully controlled by this amplifier. Such variations are sometimes encountered when switching between the outputs of turntable pre-amps, projectors, or other sources. This amplifier may be used in any audio system where -34 dbm is available to its input.

FEATURES

1 Extremely versatile.

- a. Permits unattended remote audio operation. This amplifier used on an incoming remote line automatically controls level variations from an

unattended remote amplifier. (See Fig. 3—Typical Applications.)

- b. Controls level differences between two or more program sources. Level differences automatically controlled between:
 - (a) Turntables and/or projector outputs.
 - (b) Network incoming signal (when properly padded) and projectors, turntables, or announce mike pre-amps.
- c. May be used as a program line compressor.
- d. May be used as an automatic master gain control for program line. (See Fig. 1—Typical Applications.)
- e. May be used as a microwave input audio control. (See Fig. 4—Typical Applications.)
- f. May be used as an Expander-Compressor Amplifier. With average program material set for 15 db of gain reduction, output will be compressed for incoming signals exceeding 15 db and expanded for signals below 15 db.
- g. May be used as an automatic fader control. (See Fig. 2—Typical Applications.)
- h. May be used as a straight program amplifier,

with or without level control. Removal of one tube disables automatic level control and permits use as a normal program amplifier.

- 2 **Physically and functionally interchangeable with Type BA-12-C Plug-In Program/Monitor Amplifier** when used for program purposes. Can be used in BC-11-A Audio Console in place of the program amplifier to provide automatic master gain control for this console.
- 3 **Small, compact, plug-in construction.**
 - a Compact design permits four units to be mounted in 7 inches of rack space.
 - b Plug-in construction speeds maintenance.
- 4 **Used as a peak level control**, amplifier will operate over a 30 db range with only a 10 db change in output.
- 5 **Used as an average level control device**, amplifier will operate over a 30 db range of input level with only a 10 db change in output level.
- 6 **Variable threshold level.** Amplifier will operate with the threshold level set at any output between +10 dbm and +30 dbm.
- 7 **Average Program/Dual Recovery Switch** permits use of amplifier as an average level control or as a peak level control.
- 8 **Dual time constant eliminates program "pumping."** Recovery time is an automatic function of program material.

DESCRIPTION

The BA-9-A Plug-In Uni-Level Amplifier is an automatic level control device designed to replace the Type BA-12-C Plug-In Program/Monitor Amplifier when used as a program amplifier, and when features of automatic level control are desired.

The Type BA-9-A Amplifier, when operated at an output level of +20 dbm, supplies gain control characteristics over a range of 30 db with a rise in output level of only 10 db. This is a 3:1 compression ratio. At +30 dbm output, the BA-9-A has a compression ratio over a 30 db range of 5:1.

The threshold control may be set for a range varying from 0 dbm at a compression ratio of 1.6:1, to +30 dbm at a compression ratio of 5:1. Recommended threshold level is +20 dbm with a resultant compression ratio of 3:1.

A switch is incorporated on the front of the amplifier which permits changes in attack and recovery time.

In the "down" position of the switch, the amplifier has a dual recovery time—wherein the recovery time is an automatic function of the nature of the program material. For short, single peaks, approximately 0.9 seconds is required for 63% recovery of gain after the signal has dropped below the gain reducing level. For sustained or rapidly reoccurring peaks, approximately 0.9 seconds is required for 40% of gain recovery, increasing automatically up to about 34 seconds for 90% of gain recovery. The typical attack time is approximately 11 milliseconds.

In the "up" position of the switch, the amplifier is an average level control device which will work on average levels of program material changes. In essence, single short peaks will not cause gain reduction, but sustained increases in over-all program level or rapidly reoccurring short peaks will cause automatic gain reduction de-

pending upon the over-all amplitude of the incoming signals. The typical attack time is approximately 62 milliseconds. The average recovery time is 13 seconds for 90% recovery.

These effects are accomplished by the use of a bias generator which in turn is composed of a full wave rectifier circuit charging simple RC networks. The output of the bias generator supplies a variable DC bias to the control grids of a G-E Type GL-6386 tube (a dual remote cutoff triode).

Gain reduction may be read on any standard VU meter. A third scale, in the form of a decal supplied with the amplifier, may be applied to the VU meter's face. By the use of a suitable switch connected between the VU meter multiplier and meter movement, gain reduction will be indicated over a 30 db range.

MECHANICAL SPECIFICATIONS

Units: One BA-9-A Plug-In Uni-Level Amplifier.

Dimensions: Height: 5 $\frac{3}{4}$ inches
Width: 3 $\frac{1}{2}$ inches
Depth: 10 $\frac{3}{4}$ inches

Weight: 6 lbs.

Mounting: Four amplifiers may be mounted in one FA-23-B Shelf which in turn mounts flush in the front of a standard EIA Cabinet Rack. Mounting height of the FA-23-B Shelf (accessory) is 7 in. (4 rack units).

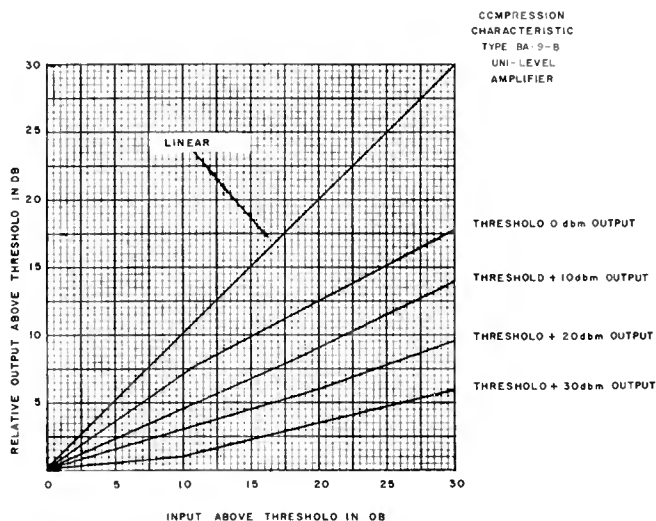
Operating Conditions: Maximum ambient temperature: 113°F (45°C).
Maximum relative humidity: 95%.

Electrical Connections:

Power and Signal: Through Cinch-Jones 2400 series plug, plugging into female mate on FA-23-B Shelf. Connections on plugs are solder terminal.

Threshold bias voltage: Tip jacks.

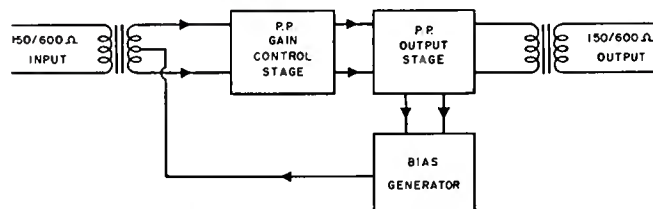
Safety Provisions: No voltage applied to unit until plugged into mating source. No exposed voltages.



ELECTRICAL SPECIFICATIONS

Section E211 Page 14-2
Broadcast Equipment Data Book
February 15, 1958
Supersedes E211 Page 14-2—2/15/57

Circuit Operation: Consists of a G-E Type GL-6386 push-pull triode variable gain input stage supplying signal to a push-pull output stage utilizing two Type 6V6 GT power tubes. The signal for the bias generator rectifier is supplied from the plates of the output stage. The bias generator uses a full wave rectifier Type 6AL5 whose output supplies a bias voltage to the control grids of the GL-6386 tube. A switch selects time constants so that either an average control of program material or a peak compression of program material is obtained.



Simplified Block Diagram, Plug-In Uni-Level Amplifier, Type BA-9-A.

Performance:

Frequency response: + or -1 db, 50-15,000 cycles under any condition of gain reduction up to 30 db.

Gain: 54 db.

Harmonic distortion: (Threshold control set for +20 dbm output.) At any level up to 30 db of gain reduction, the total harmonic distortion between 100 and 15,000 cycles is 1½% or less; from 50 to 100 cycles the distortion rating is 2% or less.

Output noise:—Less than -55 dbm.

Attack time:

Dual	Average
11 milliseconds	62 milliseconds

Recovery time: (Dual)

Single short peaks: 0.9 seconds for 63% recovery.

Sustained peaks: 0.9 seconds for 40% recovery.

34 seconds for 90% recovery.

(Average)

13 seconds for 90% recovery.

Inputs: Power

Plate—300 volts DC @ 77 milliamperes.

Heater—6.3 volts AC @ 1.55 amperes.

Signals

Threshold control @ 0 dbm output:
—54 dbm to -24 dbm input.

Threshold control @ 20 dbm output:
—34 dbm to -4 dbm input.

Threshold control @ 30 dbm output:
—24 dbm to +6 dbm input.

Input impedance: Unloaded transformer.

Source impedance: 150/600 ohms, shipped wired for 600 ohms. Balanced input.

Outputs: Signal—150/600 ohms impedance, shipped wired for 600 ohms. Balanced output.

Threshold control @ 0 dbm:

0 dbm to +18 dbm output.

Threshold control @ 20 dbm:

+20 dbm to +30 dbm output.

Threshold control @ 30 dbm:

+30 dbm to +36 dbm output.

(All signals below and up to threshold level, linearly amplified.)

Test: Two tip jacks for threshold bias setting.

External VU Meter (as Compressor meter):

Pins 8 and 9 on Cinch-Jones 2400 series plug.

External Power Supply: BP-10-B (Accessory).

Controls: Threshold setting control.

Average Program/Dual Recovery Switch.

Tube Complement: 1—GL-6386

1—6AL5

2—6V6GT



Tip Jacks and Switch, Plug-In Uni-Level Amplifier, Type BA-9-A.

ORDERING INFORMATION

When ordering please specify:

. . . . BA-9-A Plug-In Uni-Level Amplifier. (The type number includes the amplifier; one set of operating tubes; one gain reduction scale (decal) for applying to a standard 4-in. VU meter; and installation and operating instructions.)

ACCESSORIES

1—FA-23-B Shelf—for rack mounting four Type BA-9-A Amplifiers.

1—BP-10-B Power Supply.

1—FA-22-F Tray (for mounting BP-10-B).

1—FA-46-A2 Shelf for mounting four Type BA-9-A Amplifiers in base cabinet.

1—FA-22-E Tray (for mounting single BA-9-A).

1—7774619P1 VU Meter (for steel panels).

1—7774619P2 VU Meter (for aluminum or non-magnetic panels).

Typical Applications, BA-9-A Uni-Level Amplifier

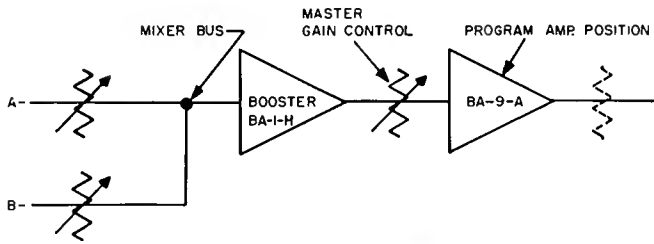


Fig. 1. The BA-9-A Uni-Level Amplifier as an Automatic Level Control Amplifier

The application of automatic level control to a studio system is outlined in Figure 1.

The Uni-Level Amplifier can be used to control level differences between two or more program sources, as a program line compressor, automatic master gain control, expander-compressor operation, or as a straight program amplifier.

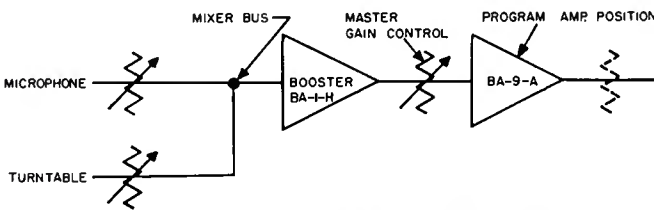


Fig. 2. Using the BA-9-A Uni-Level Amplifier as an Automatic Fader Control

The use of the "Uni-Level" Amplifier as an automatic fader control is outlined in Figure 2. In this application, the turntable signal level should be set so that it results in a GR scale reading of about 2 to 3 db of gain reduction. The microphone level at the mixer bus is set about 20 db higher than the turntable signal at the same point.

The microphone and turntable inputs can now be used together with no manual fading required. Whenever it is desired to use the microphone channel to make an announcement, it is only necessary to talk into the microphone. The turntable will fade into the background

and will be separated from the microphone announcement by 20 db.

The resultant increase in output signal level will be less than 7 db, which can be easily handled by the transmitter limiting amplifier. Depending upon which position the AVER/DUAL switch is in will determine the speed with which the turntable level will return to normal.

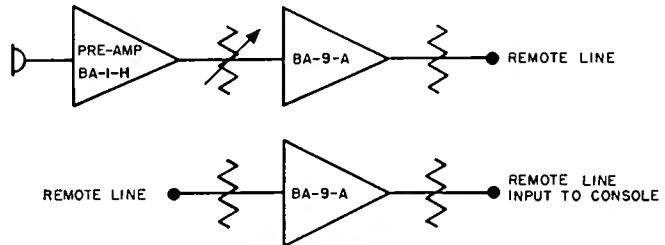


Fig. 3. Unattended Remote Operation

When it is desirable to operate the Uni-Level Amplifier on unattended remote operations, either of the above single-line diagrams can be used. A typical setup would be to set levels so that what is considered a normal signal level causes about 15 db gain reduction. For a signal increase of ± 15 db line variations will be only 5 db.

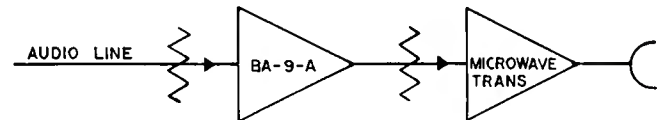
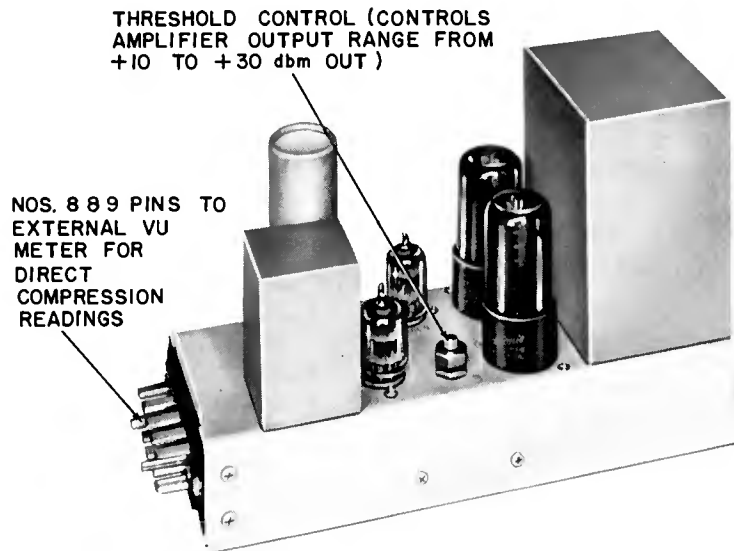


Fig. 4. Microwave Relay Application of the Uni-Level

The Uni-Level Amplifier can be used to prevent excessive audio variations in an audio line feeding the audio input of a microwave system. Such an application is shown in Figure 4.



Plug-Pins and Control, Plug-In Uni-Level Amplifier, Type BA-9-A.



Uni-Level Amplifier, Type BA-9-B

APPLICATION:

The General Electric Type BA-9-B Uni-Level Amplifier is a rack mounted, AC powered version of the familiar and popular Type BA-9-A Plug-in Uni-Level Amplifier. It is intended for automatic level control applications in radio and TV stations, sound recording studios, and industrial and public address systems.

In radio and TV stations it may be used to control level differences between two or more medium level program sources, as a program line compressor, as an automatic master gain control for program or remote line, for expander-compressor operation (including automatic fading of music for voice-over-music announcements) or as a straight program amplifier.

In sound recording studios it may be used to control level differences between various voice or music signals, or as a compressor to be used prior to the recording amplifier.

In industrial or public address systems, the Uni-Level Amplifier may be used to eliminate "blasting" due to varying intensities of sound sources with consequent overloading of line or power amplifiers, as a compressor-expander to control and amplify weak or compress excessively strong input signals, or as a micro-wave audio input control.

Due to the unique design of the Type BA-9-B, this amplifier may be used as either an average level control device or as a peak level control amplifier.

Maximums of up to 30 db in program variations may be successfully controlled by this amplifier. It may be used in any audio system where -34 dbm is available to its input.

(See Typical Application section for detailed suggested use.)

FEATURES:

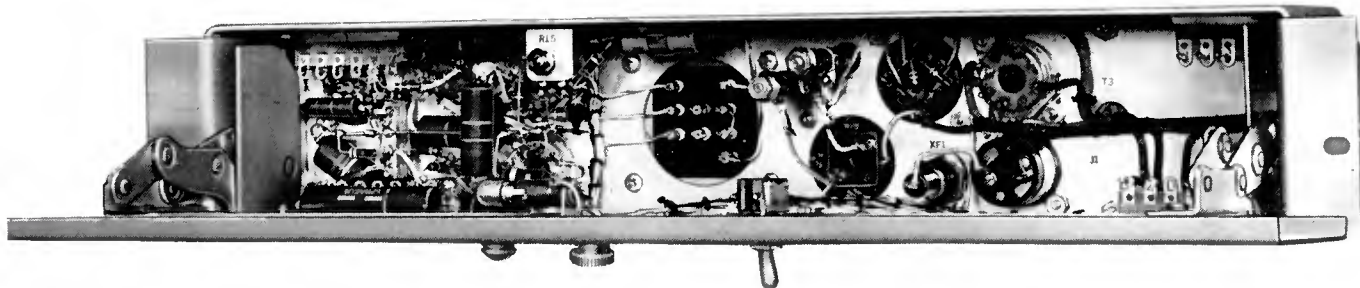
1. **AC Powered.** Requires only 110-125 volt AC power for operation.
2. **Conserves Rack Space.** Will mount in any standard rack, utilizing only 3½ in. (2 RU) of vertical height.
3. **Extremely versatile.**
 - a. **Permits unattended remote audio operation.** This amplifier used on an incoming remote line automatically controls level variations from an unattended remote amplifier. (See Fig. 3—Typical Applications.)
 - b. **Controls level differences between two or more program sources.** Level differences automatically controlled between:
 - Turntables and/or projector outputs.
 - Network incoming signal (when properly padded) and projectors, turntables, or announce mike pre-amps.
 - c. **May be used as a program line compressor.**
 - d. **May be used as an automatic master gain control for program line.** (See Fig. 1—Typical Applications.)
 - e. **May be used as a microwave input audio control.** (See Fig. 4—Typical Applications.)
 - f. **May be used as an Expander-Compressor Amplifier.** With average program material set for 15 db of gain reduction, output will be compressed for incoming signals exceeding 15 db and expanded for signals below 15 db.
 - g. **May be used as an automatic fader control.** (See Fig. 2—Typical Applications.)
 - h. **May be used as a straight program amplifier,** with or without level control. Removal of one tube disables automatic level control and permits use as a normal program amplifier.

4. **Functionally interchangeable** with G-E Type BA-12-C Plug-In Program/Monitor Amplifier when used for program purposes.
5. **Used as a peak level control**, amplifier will operate over a 30 db range with only a 10 db change in output.
6. **Used as an average level control device**, amplifier will operate over a 30 db range of input level with only a 10 db change in output level.
7. **Variable threshold level.** Amplifier will operate with the threshold level set at any output between +10 dbm and +30 dbm.
8. **Average Program/Dual Recovery connection** permits use of amplifier as an average level control or as a peak level control.
9. **Dual time constant eliminates program "pumping."** Recovery time is an automatic function of program material.
10. **Easily Serviced.** All components exposed for easy service when hinged front panel is opened.

recurring peaks, approximately 0.9 second is required for 40 per cent of gain recovery, increasing automatically up to about 34 seconds for 90 per cent of gain recovery. The typical attack time is approximately 11 milliseconds.

By strapping an adjacent terminal connection, the amplifier may be changed to an average level control device which will work on average levels of program material changes. In essence, single short peaks will not cause gain reduction, but sustained increases in over-all program level or rapidly recurring short peaks will cause automatic gain reduction depending upon the over-all amplitude of the incoming signals. The typical attack time is approximately 62 milliseconds. The average recovery time is 13 seconds for 90 per cent recovery.

These effects are accomplished by the use of a bias generator which in turn is composed of a full wave rectifier circuit charging simple RC networks. The output of the bias generator supplies a variable DC bias to the control grids of a G-E Type GL-6386 tube (a dual remote cutoff triode).



Type BA-9-B Uni-Level Amplifier (Front View, Panel Open)

DESCRIPTION:

Essentially, the Type BA-9-B Uni-Level Amplifier is the AC powered, rack-mounted version of its plug-in counterpart, the Type BA-9-A Uni-Level Amplifier. Other than its mounting and power supply, it is identical in performance and specification with the Type BA-9-A Uni-Level Amplifier.

The Type BA-9-B Uni-Level Amplifier is an automatic level control device designed to functionally replace or supplement the Type BA-12-C Program/Monitor Amplifier, when used as a program amplifier, or when features of automatic level control are desired.

The Type BA-9-B Amplifier, when operated at an output level of +20 dbm, supplies gain control characteristics over a range of 30 db with a rise in output level of only 10 db. This is a 3:1 compression ratio. At +30 dbm output, the Type BA-9-B has a compression ratio over a 30 db range of 5:1.

The threshold control may be set for a range varying from 0 dbm at a compression ratio of 1.6:1, to +30 dbm at a compression ratio of 5:1. Recommended threshold level is +20 dbm with a resultant compression ratio of 3:1.

A connection may be made in the amplifier which permits changes in attack and recovery time.

The unit as shipped is connected for dual recovery time—wherein the recovery time is an automatic function of the nature of the program material. For short, single peaks, approximately 0.9 second is required for 63 per cent recovery of gain after the signal has dropped below the gain reducing level. For sustained or rapidly

Gain reduction may be read on any standard VU meter. A third scale, in the form of a decal supplied with the amplifier, may be applied to the VU meter's face. By the use of a suitable switch connected between the VU meter multiplier and meter movement, gain reduction will be indicated over a 30 db range.

Space is provided behind the hinged front panel for mounting an input and an output attenuator. These attenuators may be mounted on the hinged panel by the broadcaster to handle input or output levels of higher or lower values than those specified for Uni-Level operation.

A pilot light and an "OFF-ON" switch is located on the front panel for convenience. Total dimensions of the chassis (over-all) are height 3½ in., width 19 in., and depth 7½ in. Weight is approximately 12 lbs.

MECHANICAL SPECIFICATIONS:

Units:

One Type BA-9-B Uni-Level Amplifier.
One miniature motor base plug for AC power.

Dimensions: (Over-all).

Height: 3½ in. (2 R.U.)
Width: 19 in.
Depth: 7½ in.
Weight: 12 lbs.

Mounting:

Standard RETMA 19 in. Cabinet rack mounting.

Operating Conditions:

Maximum ambient temperature: 113° F (45° C).
Maximum relative humidity: 95 per cent.

Electrical Connections:

AC power: Recessed miniature motor base receptacle and plug.
 Signal: Solder lug terminal strips.
 Gain Reduction: Solder lug terminal strips.
 Average Program/Dual Recovery: Strap on adjacent terminal.

Safety Provisions:

No exposed voltages when hinged front panel is closed. AC switch provided on panel for independent operation of unit. Pilot, light on front panel indicated amplifier operation. AC power-fused.

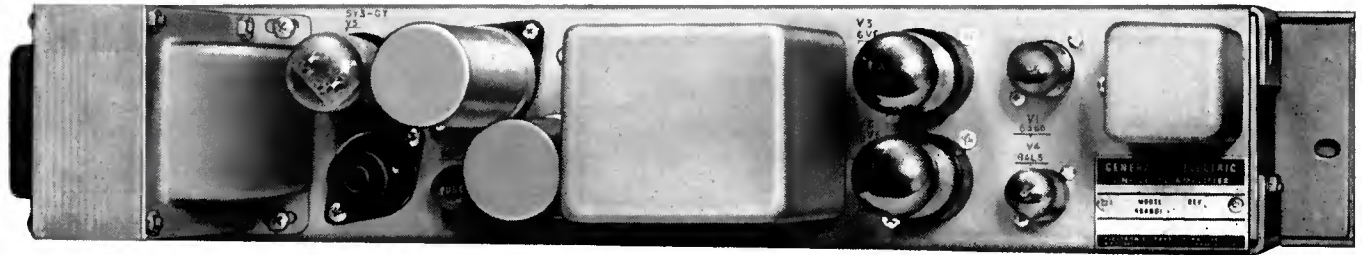
Output noise: Less than -50 dbm. (With 6V6GT)
 -55 dbm. (With 5881)

Attack time:

Dual Average
 11 milliseconds 62 milliseconds

Recovery time: (Dual)

Single short peaks: 0.9 second for 63 per cent of recovery.
 Sustained peaks: 0.9 second for 40 per cent recovery.
 34 seconds for 90 per cent recovery. (Average)
 13 seconds for 90 per cent recovery.

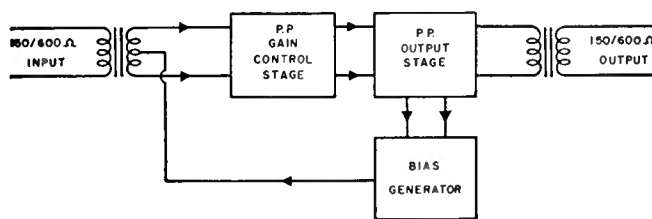


Type BA-9-B Uni-Level Amplifier (Rear View)

ELECTRICAL SPECIFICATIONS:

Circuit Operation:

Consists of a G-E Type GL-6386 push-pull triode variable gain input stage supplying signal to a push-pull output stage utilizing two Type 6V6GT power tubes. The signal for the bias generator rectifier is supplied from the plates of the output stage. The bias generator uses a full wave rectifier Type 6AL5 whose output supplies a bias voltage to the control grids of the GL-6386 tube. A strap to an adjacent terminal will select the correct time constants to obtain the average control of program material. As shipped, the amplifier is connected for peak compression of program material.



Simplified Block Diagram, BA-9-B Uni-Level Amplifier

Performance:

Frequency response: + or -1 db, 50-15,000 cycles under any condition of gain reduction up to 30 db.

Gain: 54 db.

Harmonic distortion: (Threshold control set for +20 dbm output.) At any level up to 30 db of gain reduction, the total harmonic distortion between 100 and 15,000 cycles is 1½ per cent or less; from 50 to 100 cycles the distortion rating is 2 per cent or less.

Inputs:

Power: 117 volts AC 50/60 cycle, 65 watts. (Note: B+ voltage is adjustable to 300 volts DC for AC inputs varying between 110-125 volts.)

Signals:

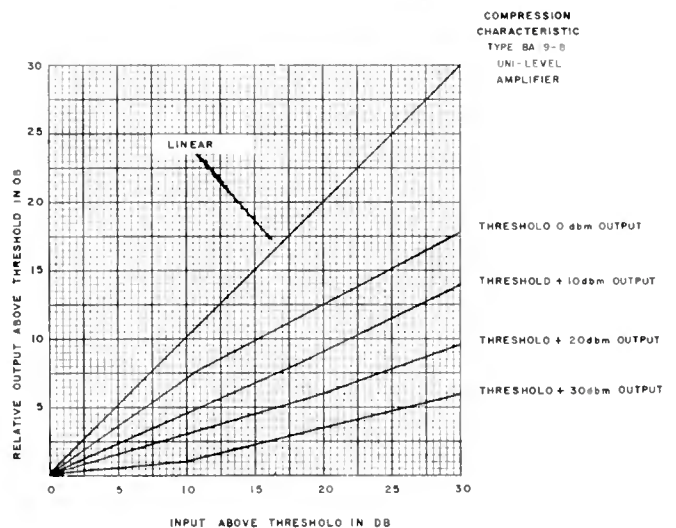
Threshold control @ 0 dbm output: -54 dbm to -24 dbm input.
 Threshold control @ 20 dbm output: -34 dbm to -4 dbm input.
 Threshold control @ 30 dbm output: -24 dbm to +6 dbm input.

Input impedance: Unloaded transformer.

Source impedance: 150/600 ohms, shipped wired for 600 ohms. Balanced input.

Outputs:

Signal: 150/600 ohms impedance, shipped wired for 600 ohms. Balanced output.



Threshold control @ 0 dbm: 0 dbm to +18 dbm output.

Threshold control @ 20 dbm: +20 dbm to +30 dbm output.

Threshold control @ 30 dbm: +30 dbm to +36 dbm output.

(All signals below and up to threshold level, linearly amplified.)

External VU Meter:

Solder lugs on terminal strip.

Controls: Threshold setting.

TUBE COMPLEMENT

1—GL-6386

1—6AL5

2—6V6GT

1—5Y3GT

ORDERING INFORMATION

When ordering, please specify:

.....General Electric Type BA-9-B Uni-Level Amplifier (for rack mounting). (The Type Number includes the amplifier, one set of operating tubes, one gain reduction scale (decal) for applying to standard 4-in. VU meter, one miniature motor base plug, and Installation and Operating Instructions.)

ACCESSORIES:

1—7774619P1 VU Meter (for steel panels).

1—7774619P2 VU Meter (for aluminum or non-magnetic panels).

Typical Applications, BA-9-B Uni-Level Amplifier

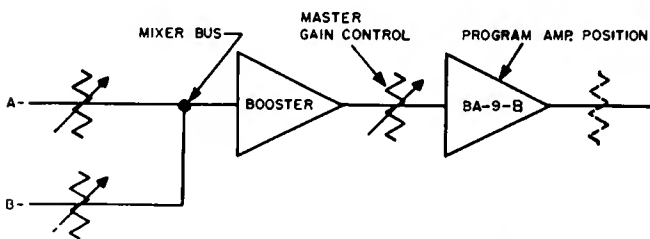


Fig. 1. The BA-9-B Uni-Level Amplifier as an Automatic Level Control Amplifier

The application of automatic level control to a studio system is outlined in Figure 1.

The Uni-Level Amplifier can be used to control level differences between two or more program sources, as a program line compressor, automatic master gain control, expander-compressor operation, or as a straight program amplifier.

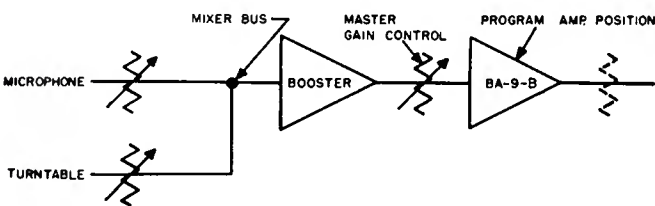


Fig. 2. Using the BA-9-B Uni-Level Amplifier as an Automatic Fader Control

The use of the "Uni-Level" Amplifier as an automatic fader control is outlined in Figure 2. In this application, the turntable signal level should be set so that it results in a GR scale reading of about 2 to 3 db of gain reduction. The microphone level at the mixer bus is set about 20 db higher than the turntable signal at the same point.

The microphone and turntable inputs can now be used together with no manual fading required. Whenever it is desired to use the microphone channel to make an announcement, it is only necessary to talk into the microphone. The turntable will fade into the background

and will be separated from the microphone announcement by 20 db.

The resultant increase in output signal level will be less than 7 db, which can be easily handled by the transmitter limiting amplifier. The speed with which the turntable will return to normal is determined by the operation of the Uni-Level recovery circuits. It may be used either in the Dual or Average conditions for attack and recovery. The speed with which the turntable level will return to normal is determined by the average or peak condition of attack and recovery of the amplifier.

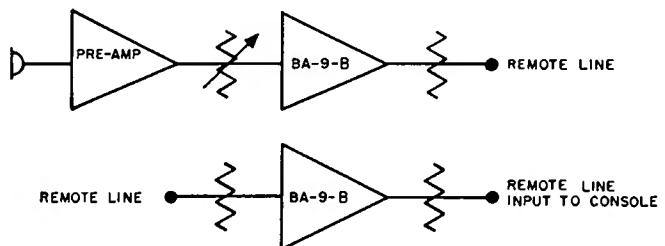


Fig. 3. Unattended Remote Operation

When it is desirable to operate the Uni-Level Amplifier on unattended remote operations, either of the above single-line diagrams can be used. A typical setup would be to set levels so that what is considered a normal signal level causes about 15 db gain reduction. For a signal increase of ≈ 15 db line variations will be only 5 db.

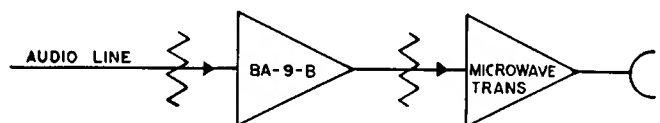


Fig. 4. Microwave Relay Application of the Uni-Level

The Uni-Level Amplifier can be used to prevent excessive audio variations in an audio line feeding the audio input of a microwave system. Such an application is shown in Figure 4.

AC Powered Program/Monitor Amplifier Type BA-14-A

Section E211 Page 110
Broadcast Equipment Data Book
September 1, 1957
Supersedes E211-110 Dated 2/15/57



BA-14-A AC Powered Program/Monitor Amplifier.

APPLICATION:

The General Electric Type BA-14-A Program/Monitoring Amplifier is a versatile, dual-purpose audio amplifier designed to serve as a program or line amplifier, or as a general purpose monitoring amplifier in Radio and Television Stations, in Recording Studios, and in Motion Picture Studios.

When connected as a program amplifier it may be used as a program or main amplifier, an isolation or bridging amplifier, a line amplifier, for medium power monitoring or as a cueing or audition amplifier.

When connected for monitoring service, it may be used as a monitor amplifier, bridging program or other lines to furnish power for studio speakers; a control-to-studio talkback amplifier, where the talkback microphone is fed into the BA-14-A without preamplification; a transcription cueing or audition amplifier (again without preamplification); or an emergency program

amplifier in the program channel of speech input systems.

This unit contains its own built-in power supply and is intended for shelf mounting in an audio rack. Simple, easily made internal connections and interchangeable tubes permit this amplifier to be quickly converted from program to monitor service, or vice-versa.

FEATURES:

- 1—Extremely versatile.
 - a) Maybe connected for matching or bridging input.
 - b) Provides both line and voice-coil outputs.
 - c) Can be connected for either program or monitor service.
 - d) Has multi-impedance inputs and outputs.
 - e) Will operate direct from a microphone or a line.
- 2—High Gain Program or Monitor amplifier.
 - a) 60 db of program matching gain; 36 db of program bridging gain.

- b) 105 db of monitor gain (unloaded input); 75 db of monitor bridging gain.
- 3—Compact. 6 $\frac{3}{8}$ " height and 7" width permit two amplifiers to be mounted side by side on one shelf in 7" of vertical rack space.
 - 4—Plug-in construction and small height permit easy removal for maintenance or service type change. All external connections are made on two 10-pin Jones plugs and sockets. Input connections (including fixed bridging pad) are made on one "2400" series plug, while AC power and output connections are made on second "2400" series Jones plug. Mating sockets are mounted on accessory shelf.
 - 5—Contains built-in power supply. Only 105 to 125 volts, 60 cycle, AC needed to power this amplifier.
 - 6—Uses readily available low cost, low noise tubes. Amplifier uses three 5879s, either two 6V6s or two 5881s, and a 5U4GA. 6V6s are used in program service, 5881s may be used for increased power in monitor service.
 - 7—Rated at 10-watt output in monitor use; 4-watt output in program use.
 - 8—Magnetically and electrostatically shielded transformers effectively prevent hum pickup in this and adjacent medium or high level equipment.
 - 9—Stability improved through use of negative feedback. Tertiary winding of output transformer supplies negative feedback to cathode of second stage.
 - 10—Excellent frequency response with low distortion. Program amplifier: ± 1 db 30-15,000 cps. + 30 dbm output less than 0.5% harmonic distortion (50-15,000 cps).
Monitor amplifier: ± 1 db 30-15,000 cps. + 40 dbm output 1 $\frac{1}{2}$ % harmonic distortion.
 - 11—Continuous log taper volume control with db markings furnished and mounted on amplifier. Precision step attenuator may be substituted by broadcaster, if desired. (See Electrical Specifications —Gain Control.)



Rear view of BA-14-A Amplifier, showing plug-in construction.

12—Variable frequency response made by internal adjustment, if desired.

DESCRIPTION:

The BA-14-A Program/Monitor Amplifier is a four-stage, AC powered unit designed to operate from either microphone or line level signals and to furnish power to drive either program lines or one or more speakers.

Either matching inputs of 600/250/150/30 ohms or a 10,000-ohm bridging input are available for matching or bridging any standard broadcast source impedance.

The output of the amplifier may be used to drive a 600/150 line and/or an 8/2 ohm voice-coil loudspeaker. Separate windings are used for the program and voice-coil sections of the output transformer, thus it is possible to use both speaker and line feed simultaneously (for low or medium level monitoring) if required. Negative feedback is supplied from a tertiary winding of the output transformer back to the cathode of the second stage.



BA-14-A Amplifiers mounted in FA-23-C Shelf.

The complete amplifier includes only four stages.* The first and second stages are conventionally connected 5879 pentode tubes. The third stage, also using a 5879 type tube, serves as a phase-splitter driving the push-pull output stage. When connected for program service, two 6V6 tubes are used in the output stage. However, when connected for monitoring service, additional power may be gained if 5881 type tubes are substituted for the two 6V6 tubes. A 5U4GA is used as a rectifier.

Changes from program to monitor service or vice-versa are easily made by changing five jumper straps located on easily accessible terminal boards under the chassis. These connections cut in or by-pass the first stage and change the voltages supplied to the tubes.

Impedance changes are made in the customary manner on the transformer terminals. As shipped, the amplifier

* In program service, the first stage is by-passed and the tube omitted from the socket.

is connected for program service with a 600-ohm input, an output of 600 ohms and 8 ohms, and minus the first-stage tube which is by-passed. For monitor purposes a tube kit (7145567), consisting of the first-stage 5879 and two 5881 output tubes, is available as an accessory item.

Frequency response and noise and distortion measurements for program and monitor services may be found under Electrical Specifications.

MECHANICAL SPECIFICATIONS:

Units: One BA-14-A Program/Monitor Amplifier, equipped with an Allen-Bradley potentiometer.

Dimensions: Height: 6³/₈"
 Depth: 13"
 Width: 7¹/₂"
 Weight: 20 lbs.

Mounting: Each amplifier mounts in an FA-23-C shelf (Accessory). Two amplifiers may be mounted in this shelf which, in turn, may be mounted in a PR-1-A or other standard RETMA Cabinet Rack. When so mounted, the rear of the amplifier plugs into two Jones "2400" series mating sockets on the FA-23-C shelf. These two plugs handle all input, output and power connections to this unit. The FA-23-C shelf includes four Jones sockets, spacer bar, and two knobs and shaft extensions.

Operating Conditions:

Maximum room ambient temperature—continuous operation 113°F (45°C).
 Maximum room ambient temperature—5% of annual operating hours . . . 122°F (50°C).
 Maximum cabinet ambient temperature—continuous operation 122°F (50°C).
 Maximum cabinet ambient temperature—5% of annual operating hours, 140°F (60°C).
 Maximum relative humidity 95%.

Electrical Connections:

Power and Signal:

Two 10-pin, "2400" series Jones plugs (furnished on amplifier) mating to two 10-pin, "2400" series Jones sockets mounted on FA-23-C shelf (Accessory).

Safety Provisions:

No voltage applied until amplifier is plugged into mating source. Amplifier is equipped with ON-OFF switch and red jewel indicator light. Power transformer primary is fused. No exposed voltages.

ELECTRICAL SPECIFICATIONS:

Type of Circuit:

Program Service:

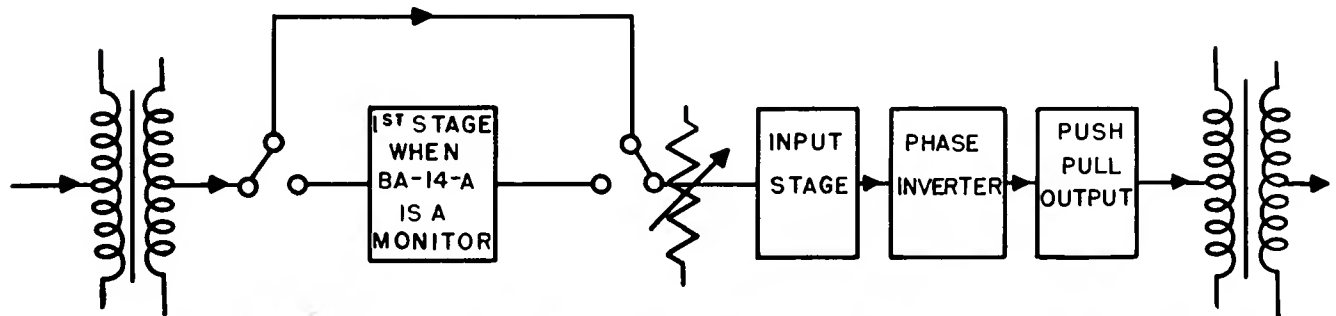
Amplifier consists of a four-stage amplifier with the first stage by-passed. The input transformer is connected to the grid volume control of the second stage; said stage using a type 5879 tube, pentode connected. The third stage, also a type 5879, serves as a phase-splitter which, in turn, drives the two 6V6 tubes in the push-pull output stage. 15 db of negative feedback is supplied from the tertiary winding of the output transformer back to the second-stage cathode. A 5U4GA is used as a rectifier.

Monitor Service:

In monitor service, the four stages of the amplifier are used to develop additional gain. Power output is increased by the change in plate voltage and substitution of higher power output tubes. The first two stages are conventionally connected pentode tubes of the 5879 type. The third stage, utilizing a 5879, serves as a phase-splitter which, in turn, drives two type 5881 tubes in the push-pull output stage. Type 6V6 tubes may be used in place of the type 5881 tubes with a slight reduction in power output. A type 5U4GA tube serves as the rectifier. 10 db of negative feedback from the output transformer tertiary winding is supplied to the cathode of the second stage.

Performance: Program Service Monitor Service

	Program Service	Monitor Service
Frequency	+30 dbm out,	+40 dbm out (10
Response:	±1 db 30 to 15,000 cycles per second.	watts), 1 db 30 to 15,000 cycles per second.



Block diagram of BA-14-A Program/Monitor Amplifier, shown connected as a program amplifier.

Performance: (cont'd)	<u>Program Service</u>	<u>Monitor Service</u>
Gain:	Matching: 60 db Bridging: 36 db (for 600-ohm terminated source).	Unloaded transformer input: 105 db. Bridging input: 75 db (supplied with fixed bridging resistor on Jones Plug). Input stage bypassed: +40 dbm out Unloaded input: 66 db Loaded input: 60 db Bridging input: 36 db
Output:	4 watts	10 watts
Harmonic Distortion:	+30 dbm out 50-15,000 cps less than 0.5%. 30 cycles—0.75%. +36 dbm out 30-15,000 cps less than 1%.	+36 dbm out 30-15,000 cps—1% +40 dbm out 30-15,000 cps—1½%.
Noise:	+30 dbm out, signal to noise ratio is 83 db. -53 dbm or less, unweighted. Noise remains constant regardless of position of gain control.	-18 dbm at maximum gain. Volume control set for 20 db loss, noise level will be -30 dbm. Low gain monitor -30 dbm.
Maximum input level:		
Matching input:	0 dbm.	-35 dbm as high gain monitor. 0 dbm as low gain monitor.
Bridging input:	+24 dbm.	-5 dbm as high gain monitor. +30 dbm as low gain monitor with fixed resistors. +40 dbm as low gain monitor with FA-35-G Bridging Volume control.

Input Impedances:

Source impedances:

Matching:	600/250/150/30 ohms, balanced or unbalanced.	600/250/150/30 ohms, balanced or unbalanced.
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Performance: (cont'd)	<u>Program Service</u>	<u>Monitor Service</u>
Bridging:	0 to 1000 ohms, terminated resistive circuits, balanced or unbalanced.	0 to 1000 ohms, terminated resistive circuits, balanced or unbalanced.
Input impedances:		
Matching:	600/250/150/30 ohms, balanced or unbalanced.	600/250/150/30 ohms or unloaded transformer, balanced or unbalanced.
Bridging:	10,000 ohms, balanced or unbalanced.	10,000 ohms, balanced or unbalanced.
Output Impedances:		
Line:	600/150 ohms.	600/150 ohms.
Speaker:	8/2 ohms.	8/2 ohms.

Gain Control:* Log taper potentiometer continuously variable attenuation from 0 to infinity. Log taper potentiometer continuously variable attenuation from 0 to infinity.

* *The broadcaster may substitute 500,000-ohm Daven attenuator CP-130-Y, 2 db/step-30 step, for the gain control furnished, if desired.*

Input Power: 105/115/125 volts, AC, 50/60 cycles, single phase, 85 watts.

Tube Complement: Amplifier is shipped connected for program service and is equipped with tubes for this type service. For monitor service, see Accessory listing for monitor service tube kit.

Program service:	2—5879 2—6V6 1—5U4GA
Monitor service:	3—5879 2—5881 1—5U4GA

ORDERING INFORMATION:

When ordering please specify:

_____ General Electric Type BA-14-A PROGRAM/MONITOR AMPLIFIER. (The type number includes the amplifier connected for program service, a set of operating tubes for program service, and an Installation and Instruction book.)

ACCESSORIES:

7145567 —Monitor tube kit (consisting of 1—5879 tub: and 2—5881 tubes).

FA-23-C —Shelf with four mating Jones sockets, two knobs, and two extension shafts. Shelf will mount two BA-14-A amplifiers.



Type BA-7-A Audiomatic Limiting Amplifier

APPLICATION

The General Electric BA-7-A Audiomatic Limiting Amplifier is a peak-limiting device designed to permit a substantial increase in the average program level without danger of any audio peaks exceeding a predetermined level.

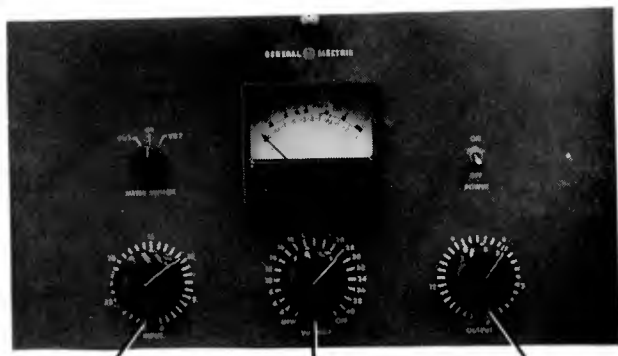
The output of the BA-7-A Audiomatic Limiting Amplifier is sufficient to drive any RETMA AM, FM, or TV audio transmitter to 100% modulation. It is readily adaptable for use in recording systems in the tape, disc, and motion picture sound recording industries. As such, it may be used either before or after pre-emphasis.

FEATURES

1. "Thumping" virtually eliminated. New design uses a new method for eliminating the "thump" component common to limiter actions.
2. Greater limiting range. The new Audiomatic Limiter incorporates a limiting range of 20 db, an increase of 8 db in limiting range over the popular G-E BA-5-A Limiter.

3. Higher output level. The new Audiomatic Limiter has an output level of +27 dbm, an increase of 15 dbm in output level as compared to the G-E BA-5-A Limiter.
4. New program controlled recovery circuit utilized. This circuit permits large amounts of gain reduction with a negligible pumping effect.
5. Two different types of recovery circuits offered. The conventional dual RC type may be used, or the new program controlled recovery circuit may be used.
6. Attack time effectively zero. 70 microsecond attack time is obtained by means of a high speed bias generator.
7. Extremely low transient waveform distortion.
8. Very high compression above threshold of gain reduction action.
9. "Motor-boating" can not occur since automatic control voltage is not a function of the output voltage of the controlled amplifier.
10. Very low steady state distortion and noise level due to inverse feedback circuits.

11. **Instant accessibility.** Vertical rack mounting chassis utilizes single hinged front-cover panel.
12. **Compact.** Entire unit measures only 10½" high by 9" deep, by 19" wide.
13. **Single unit.** All amplifiers and power supply are mounted on the one small chassis.
14. **One VU meter supplies all required readings.** Single VU meter is used to read input level to control amplifiers, gain reduction, output level of limiter, and for balancing of modulator.
15. **No matched tubes required.** The BA-7-A Audiomatic Limiting Amplifier uses only 18 tubes—none of which require matching.
16. **Plug-in connections.** All external connections are made on plugs. It is not necessary to solder or unsolder connections when installing or removing amplifier.
17. **Thoroughly shielded.** All transformers, oscillator, and R.F. power amplifier sections, plus tubes in R.F. section, are thoroughly shielded to prevent radiation and interaction.
18. **Excellent frequency response with low distortion up to practical limit of gain reduction.** (See Electrical Specifications.)



Input Level Control VU Meter Attenuator Output Level Control

Front panel of BA-7-A Amplifier

DESCRIPTION

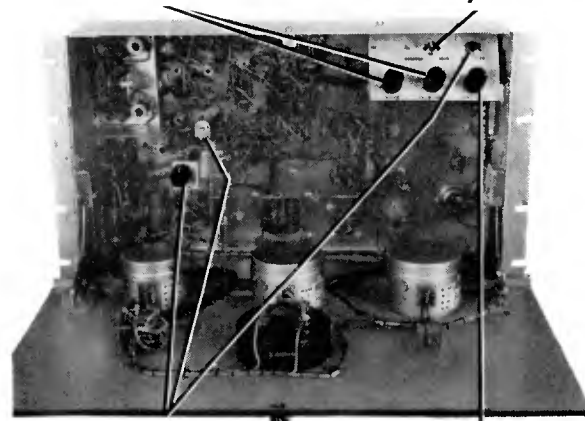
The General Electric Type BA-7-A Audiomatic Limiting Amplifier is designed as a fast-acting, thumpless, peak-limiting audio amplifier. As such it incorporates, among others, two new outstanding features, the first being a new and effective method of eliminating the "thump" component common to all limiter actions. The second outstanding feature is the incorporation of the new program controlled recovery circuit which permits the use of larger amounts of gain reduction with negligible pumping effect. These features are made possible by the use of a new method of limiting, namely the audio modulation of an RF carrier, the imposition of limiting action on this signal, and the demodulation of the RF to render a virtually thumpfree, peak-limited audio signal.

The use of this new design permits an 8 db increase in limiting range, a 15 db increase in output level, and a reduction in physical size as compared to the popular General Electric BA-5-A Limiting Amplifier. Attack

time is effectively zero—being limited to approximately 70 microseconds by means of a high speed generator. A switch is provided which will allow the amplifier to operate either on the new program controlled recovery circuit where large amounts of gain reduction are expected, or on the conventional dual RC recovery circuit. Should conditions require it, this amplifier may be used in a backward acting mode of operation.

Mechanically, the Audiomatic Limiting Amplifier is complete with power supply on one chassis. As such it requires only 10½" of vertical rack space, and 9" of rack depth. This vertical rack-mounted unit is equipped with a hinged front panel allowing instant accessibility to the internal controls and components. Only 110 watts of 110-125 volts AC power are required for its operation.

Adjustments for Proper Compression Characteristics Selects Dual R.C. or Program Control Recovery Circuit



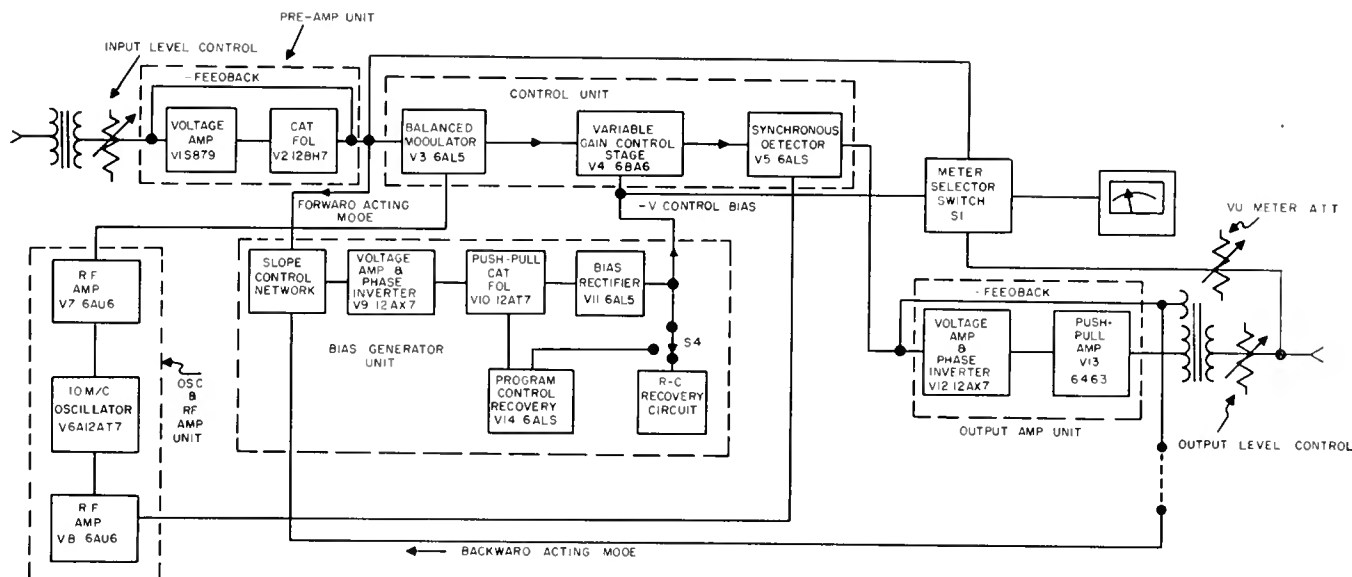
Controls for Adjusting Balance of Modulator Meter Zero Set for Gain Reduction Position

Front view of BA-7-A Amplifier with front panel open to show interior controls

All connections are made by means of a single 10-pin Cinch-Jones plug and a standard AC plug and receptacles, located on the rear of the amplifier chassis. A VU meter is used to measure signal levels and gain reduction.

Electrically, the Audiomatic Limiting Amplifier consists of an amplifier and power supply mounted on one chassis. The amplifier incorporates five sections: a preamplifier, an oscillator and RF section, a bias generator, a control section and an output stage.

The operation of the limiting amplifier on the audio signal is as follows: The incoming audio signal is fed into the loaded input of the preamp stage. From here the signal is split in two paths, the first going to the balanced modulator in the control section, and the second to the bias generator. The balanced modulator receives, in addition to the audio signal, a constant amplitude 10-megacycle carrier from the oscillator and RF amplifier section. This carrier is then amplitude modulated by the audio signal, the main carrier is suppressed, and the resulting output signal, consisting of modulated sidebands only, is fed to the variable gain RF stage in the control section. Simultaneously the audio fed to the bias generator section is first passed through a voltage correction network, through a slope control, then to a



Simplified block diagram of BA-7-A Amplifier

voltage amplifier, a phase splitter and then a push-pull cathode follower. The output of the cathode follower is split in two parts, the first being fed to the program control recovery circuit, the second being fed to a full wave rectifier diode. The variable DC voltage resulting from this latter diode's action is then applied to the grid of the variable gain RF stage in the control section. This variable DC voltage has the effect of controlling the amplitude of the audio modulated sidebands. Since there is no carrier present at the grid of this control stage, the low frequency or thump component, created by varying the control voltage, is not passed through the RF circuit and thus is not detected later. These controlled sidebands are then passed to a synchronous detector which also receives a 10-megacycle constant amplitude carrier from the oscillator and RF section. The carrier and controlled sidebands are recombined and the resultant audio is detected. The audio signal is then fed to a voltage amplifier, a phase splitter and then the push-pull output stage of the limiting amplifier. From a tertiary winding on the output transformer, voltage is fed back around the output unit. The secondary of the output transformer feeds the line through an output attenuator which is bridged by a VU multiplier attenuator. The VU meter is switched to read the output level, the amount of gain reduction, the input level to the balanced modulator, and can be used to check modulator balance.

Recovery of the amplifier is controlled by two different types of circuits, both located in the bias generator section. The first circuit is the conventional dual RC circuit. The second circuit is the new program controlled recovery circuit. This latter recovery control is obtained

by placing a diode in the discharge path of a capacitor in the recovery circuit. The diode is biased to an equivalent voltage of 15 db of gain reduction. The amplitude of the audio trigger voltage from the cathode-follower (bias generator) output is adjusted to produce an artificial verge of 3 db. Thus, below 3 db of gain reduction the diode will not conduct, resulting in a very slow discharge rate and consequent slow recovery time of the amplifier. Between 3 db and 20 db of gain reduction the audio trigger voltage will cause the diode to conduct. This results in a voltage discharge of the capacitor which produces a normal amplifier recovery rate. However, during the absence of program material the diode will cease to conduct and recovery of the amplifier will be appreciably slowed down. Hence, the audio gain recovery is controlled by the variances in peak audio amplitudes, with the resulting advantage that large amounts of gain reduction may be used with negligible pumping effect. Where only small amounts of gain reduction from threshold to 6 db are required, the dual RC circuit should be used.

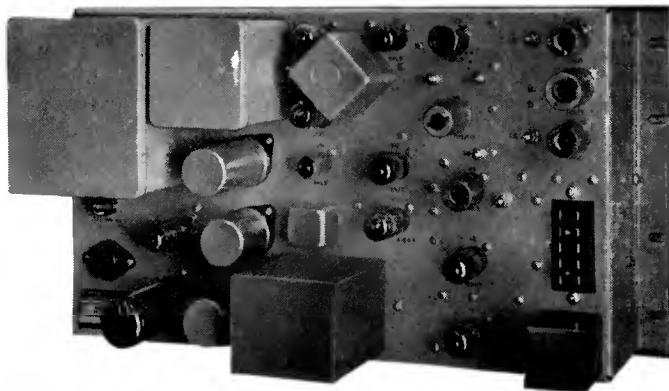
The recommended compression ratio for this amplifier operation is 20:1 when used in either the dual RC or program controlled recovery operational mode. If used as a backward acting amplifier, the recommended compression ratio is 2:1.

Balanced tubes are not required in this unit. Only a simple adjustment of the modulator balance controls is necessary to balance the modulator. A push-button balance check switch provides an easy, rapid and convenient means of checking the modulator balance.

Performance, distortion ratings, etc., may be found in the *Electrical Specifications* section.

MECHANICAL SPECIFICATIONS

Units:	1—BA-7-A Audiomatic Limiting Amplifier.
Dimensions:	Height: 10½" (6 Rack Units) Width: 19" Depth: 9" Weight: 42 lbs.
Mounting:	Standard RETMA 19" rack mounting with hinged front panel.
Operating Conditions:	Maximum ambient temperature: 113° F (45 °C). Maximum relative humidity: 95%
Electrical Connections:	Input and output audio signals made through a 10-pin Cinch-Jones plug and receptacle. AC power made through standard AC plug and receptacle.
Safety Provisions:	Power supply primary fused. All exposed wiring normally covered by hinged front panel.
Ventilation:	Normal rack ventilation. No blowers required.



Rear view of BA-7-A Amplifier

ELECTRICAL SPECIFICATIONS

Type of Circuit: (See block diagram of circuitry.) Audio signal is fed into preamplifier through an input transformer with terminated secondary into a 5879 voltage amplifier and 12BH7 cathode-follower output. The preamplifier incorporates inverse voltage feedback. The audio signal is then split into two paths, one into the balanced modulator using a 6AL5, the other into the bias generator circuit. A 10 M/C constant amplitude carrier is generated by an oscillator consisting of one-half of a 12AT7 and amplified by a 6AU6 power amplifier. This carrier signal is fed to the balanced modulator and is modulated by the audio signal. The output of the modulator consists of sidebands only with the carrier suppressed. The sidebands are then fed to a variable gain RF stage using a 6BA6. The audio signal which is fed to the bias generator is passed through a voltage correction network; it is then fed into a 12AX7 voltage amplifier and phase splitter, which drives a 12AT7 push-pull cathode-follower. Full wave rectification is then achieved by using a 6AL5 dual diode. This variable DC voltage is then applied to the grid of the variable gain RF stage (6BA6) to control the amplitude of the

sidebands. The controlled sidebands are passed to a synchronous demodulator using a 6AL5. The demodulator receives a 10 M/C constant amplitude carrier from the same source as the balanced modulator for the detection process. The audio signal is then fed into a 12AX7 voltage amplifier and phase splitter which drives the push-pull 6463 amplifier output stage. Two different types of recovery circuits can be used, the conventional dual RC type or the new program recovery circuit.

Performance:

Output Level:	Variation of ± 0.5 db from verge to 20 db of limiting
Frequency Response:	± 1 db from 50 to 15,000 cycles (from verge to 20 db of limiting)
Distortion:	From verge to 12 db of gain reduction: 1% or less, 50 to 15,000 cycles From 12 db to 20 db of gain reduction: 1.5% or less, 100 to 15,000 cycles 2.5% or less, 50 to 100 cycles
Attack Time:	Approximately 70 microseconds
Compression Ratio:	Forward acting: 20:1 Backward acting: 2:1

Recovery Time:

Dual RC:

Approximately 0.5 seconds for short peaks for 63% gain recovery. For sustained or rapidly recurring peaks, the recovery time is approximately the same for 50% recovery and increases to 10 seconds for 90% gain recovery.

Program controlled recovery:

Determined by type of program material

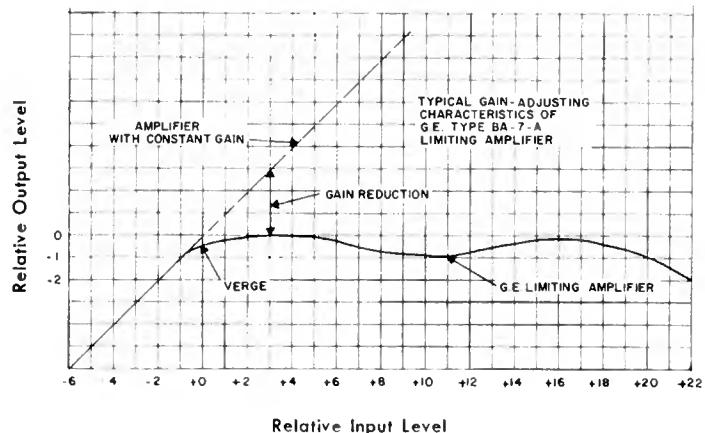
Signal to

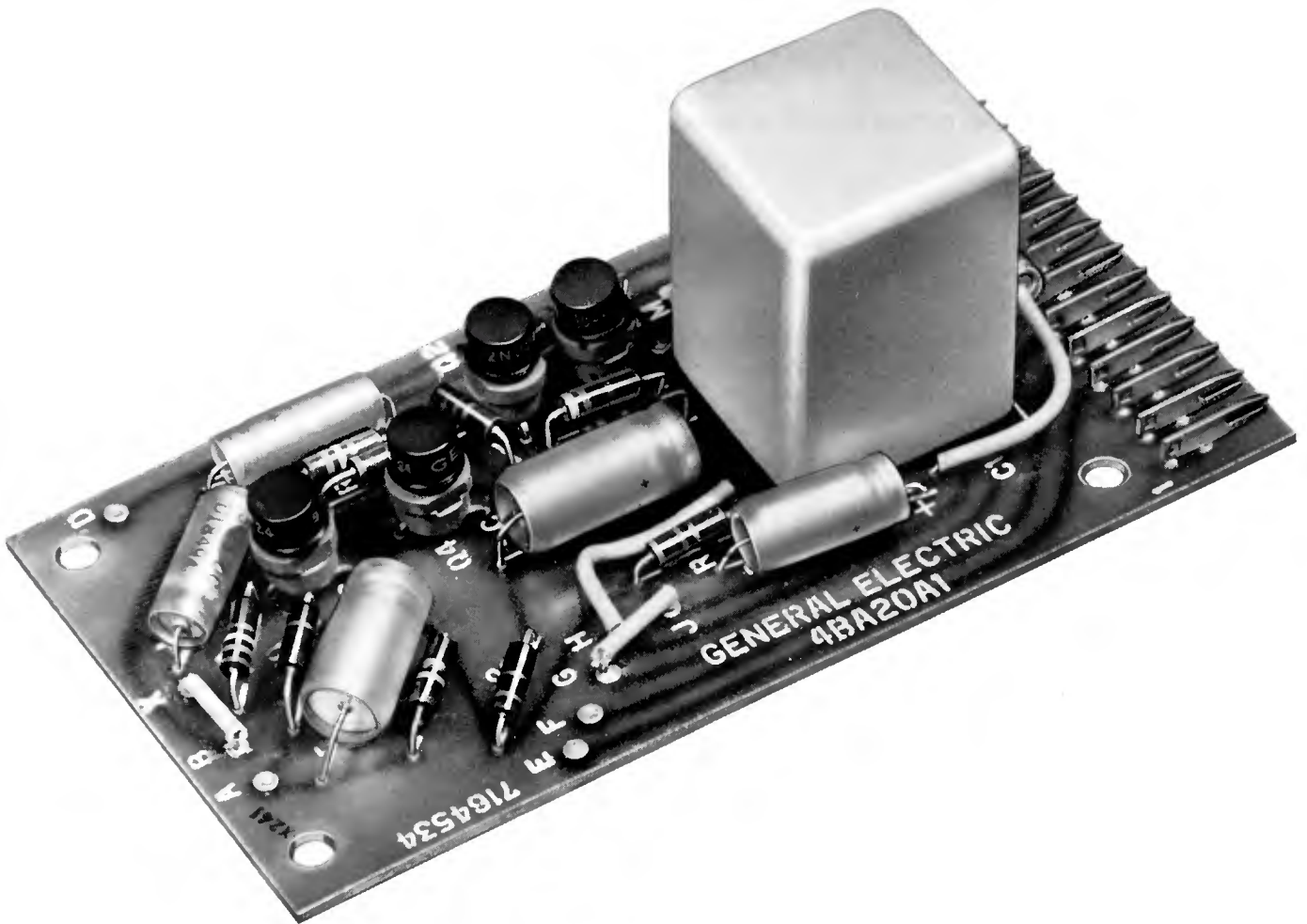
Noise ratio: 65 dbm below ≈ 27 dbm output at threshold or below

Signal to

Thump Ratio: -45 db or better

Total Gain (amplifier set at verge of limiting: 57 dbm, ± 2 db.



*Pre-Amplifier, Type BA-20-A*

APPLICATION

The General Electric Type BA-20-A Pre-Amplifier is a high-fidelity, plug-in pre-amplifier assembly designed to raise the level of microphone outputs to mixer level for broadcast applications. The use of printed wiring and complete transistorization makes the unit compact and easy to install and maintain.

The Type BA-20-A Pre-Amplifier is designed for use in custom console or audio systems using Transistor Amplifiers Types BA-22-A, BA-24-A, or BA-28-A.

Power for the operation of these Pre-Amplifiers may be obtained from the Type BP-20-A Transistor Power Supply or from any other well filtered 25-volt d-c supply.

FEATURES

- Small and compact.
- Eight units plus eight Type FA-47-A line-to-line coils can be mounted in one $3\frac{1}{4}$ inch high rack mounted shelf.
- 50 or 40 db gain.

DESCRIPTION

The General Electric Type BA-20-A Pre-Amplifier is a complete, plug-in, transistor pre-amplifier assembly.

The Pre-Amplifier is constructed on a fiberglass printed wire board. The input, output, and power connections are made by means of a 13-pin connector assembly which is staked and soldered to the circuit board.

MECHANICAL SPECIFICATIONS

Dimensions:

Length:	5 $\frac{1}{2}$ inches
Width:	2 $\frac{3}{4}$ inches
Height:	2 inches
Weight:	6 ounces

Mounting:

The 13-pin connector of the Pre-Amplifier is inserted into a receptacle of the Type FA-49-A Shelf. The Accessory Connector, G-E Drawing C-7777466-P1, is required if the Pre-Amplifier is to be mounted in any other type of installation.

Operating Conditions:

Maximum room ambient temperature continuous, 95°F (35°C).

Maximum cabinet ambient temperature continuous 122°F (50°C).

Maximum room ambient temperature 5% of time, 122°F (45°C).

Maximum cabinet ambient temperature 5% of time, 131°F (55°C).

Maximum relative humidity95%

Electrical Connections:

All electrical connections are made through a 13 pin mounted at one end of the printed wire board.

Safety Provisions:

No power is applied to the unit unless it is plugged into its mating socket. The maximum voltage applied to the unit is 25 volts D. C.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response— ± 1 db 50-15,000 C.P.S.

Gain—50 db as shipped. May be set for 40 db gain by modification.

Distortion—Less than .5% at rated output levels.

Noise—Equivalent to -120 dbm at the input, i.e. a 60 db S/N ratio with -60 dbm from a microphone. Measures 60 db below a -10 dbm output level.

Signal Inputs:

Source Impedance—50/150/250/600 ohms balanced or unbalanced.

Input Impedance—unloaded transformer.

Signal Output:

Between 300 and 1,000 ohms unbalanced. A balanced output may be obtained by use of accessory FA-47-A line-to-line coil.

Power Input:

25 volts D. C. at 8 m.a.

Controls:

Accessory—carbon potentiometer.

INTERCHANGEABILITY

This amplifier is not interchangeable with any existing unit.

TRANSISTOR COMPLEMENT

3 GE 2N324 Transistors

1 GE 2N320 Transistors

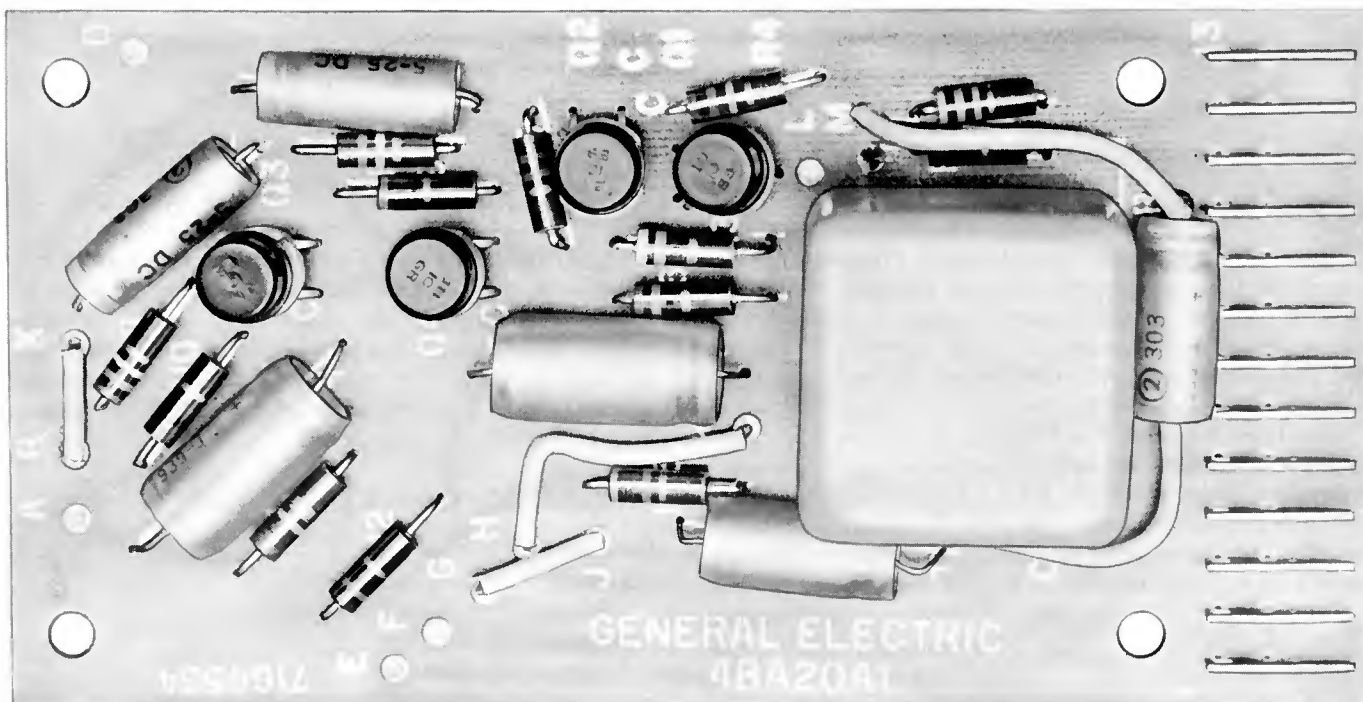
ACCESSORIES

Type FA-49-A Shelf

Type FA-47-A Line to Line Coil

7777466P1 Receptacle

2R74P25 Potentiometer



Pre-Amplifier, Type BA-20-A (Top View)



Type BA-21-A Preamplifier Module

APPLICATION

The General Electric Type BA-21-A Transistor Preamplifier Module provides the gain necessary to raise the audio signal from a microphone to a level high enough to feed a mixer bus. This preamplifier is designed for use in the Type BC-21-A Audio Console or other custom console systems employing transistor amplifiers.

FEATURES

- All transistor—no tubes in the circuitry.
- Plug-in construction for ease in maintenance.
- Space saving—small, compact, light weight.
- Low voltage—low power drain.
- Modular construction—amplifier, Daven fader, mixer key and front panel make up complete plug-in unit.

DESCRIPTION

Type BA-21-A Transistor Preamplifier consists of

a plug-in audio unit of excellent broadcast quality which includes the amplifier chassis, etched front panel, Daven step attenuator, three-position output lever switch and a mounting frame.

This amplifier is composed of four transistor stages. The first and second stages are directly coupled in a configuration known as the Darlington compound connection. The second stage is then capacitively coupled to the third stage which, in turn, is directly coupled to the emitter-follower output stage. An inter-stage gain control is located between the second and third stages. The unbalanced 600 ohm output of the amplifier drives a mixer bus.

MECHANICAL SPECIFICATIONS

Units:

Type number covers the amplifier assembly, a set of transistors and a set of installation and operating instructions.

Dimensions:

Length	Width	Height	Weight	Front Panel Slope
9½ in.	3 in.	4 $\frac{7}{16}$ in.	1¾ lbs.	45°

Mounting:

Unit plugs into Type BC-21-A Audio Console or a similar mounting arrangement using a 13-pin Elco receptacle.

Operating Conditions:

Max. Room Ambient Temperature, Cont. 95°F (35°C)

Max. Cabinet Ambient Temperature, Cont. 122°F (50°C)

Max. Room Ambient Temperature, 5% of time, 113°F (45°C)

Max. Cabinet Ambient Temperature, 5% of time, 131°F (55°C)

Max. Relative Humidity, 95%

Electrical Connections:

All electrical connections are made through a 13-pin plug mounted at one end of the printed wire board.

Safety Provisions:

No power is applied to the unit unless it is plugged into its mating socket. When the unit is plugged in and console closed there is no exposed voltage. The maximum voltage applied to the unit is 25 volts DC.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response: ± 1 db 50–15,000 cps.

Gain: 50 db (may be modified for 40 db if desired).

Distortion: ½% or less at rated output level.

Noise: -70 dbm

Power Requirements:

25 volts DC at 8 ma

Signal Inputs:

Levels (Max.):

-35 db with amplifier connected for 50 db of gain.

-20 db with amplifier connected for 40 db of gain.

Impedances:

Input: Unloaded transformer

Source: 50/150/250/600 ohms balanced or unbalanced.

Signal Output:

-10 dbm; impedance between 300 and 1000 ohms (nominally 600 ohms) unbalanced.

Controls:

Daven type, adjustable in 2 db steps, no detents.

TRANSISTOR COMPLEMENT

3—2N324 G.E.

1—2N320 G.E.

COMPLIANCE

Complies with all applicable FCC and EIA specifications.

ORDERING INFORMATION

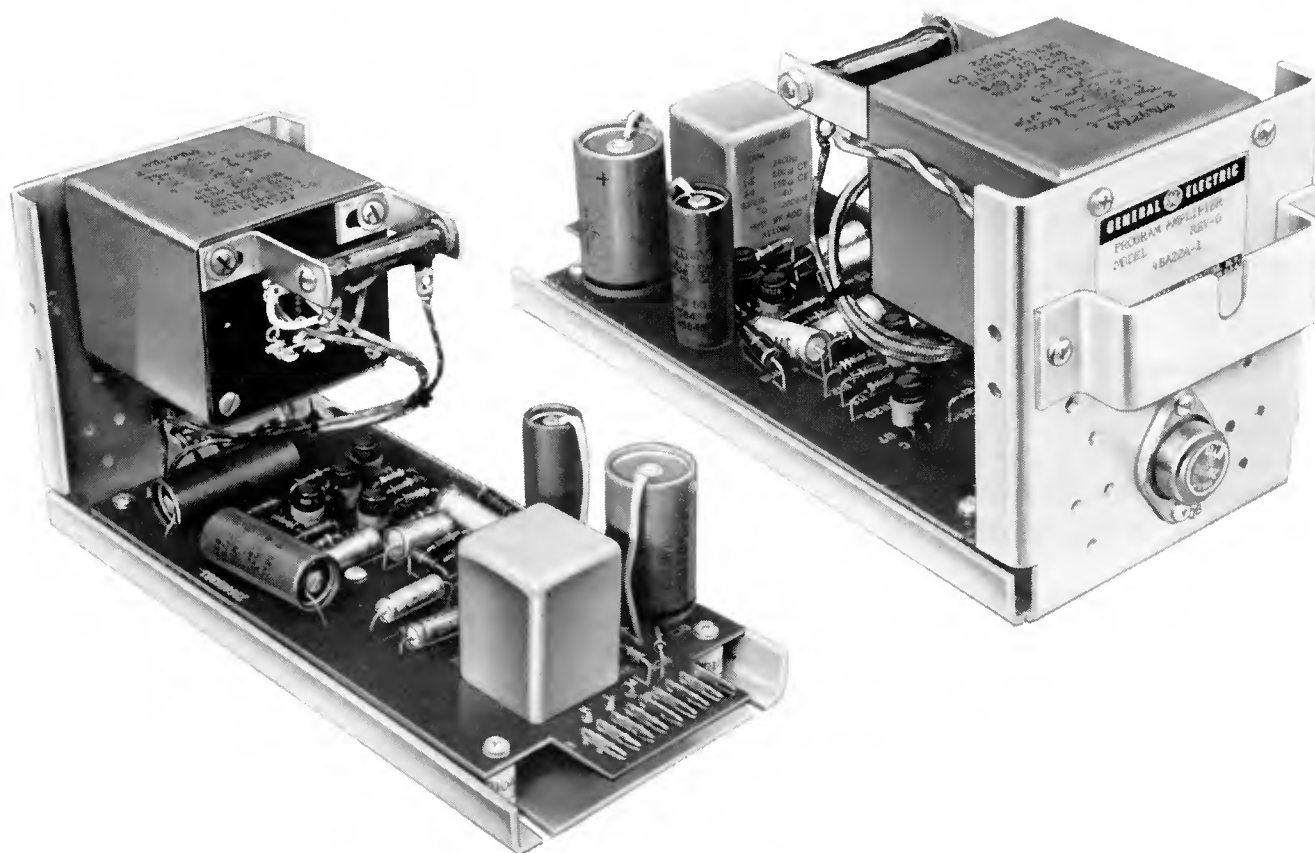
When ordering please specify: Type BA-21-A Transistor Preamplifier (requires external power supply).

ACCESSORIES

Type FA-47-A Line-to-line Transformer will provide a balanced 150 or 600 output from Type BA-21-A Preamplifier Module.

Type BP-20-A 25-volt Transistor Power Supply (Regulated).

7777466P4 Elco 13-pin receptacle.



Type BA-22-A Program Amplifier

APPLICATION

The General Electric Type BA-22-A Transistor Program Amplifier provides the gain necessary to raise an audio signal from mixer bus level to line output level of +24 dbm (+18 dbm and a 6 db pad).

This amplifier is designed for use in the Type BC-21-A Audio Console or any custom console employing transistor amplifiers.

FEATURES

- All transistors—no tubes in the circuitry.
- Low voltage—low power drain.
- Plug-in construction for ease in maintenance.
- Space saving—small, compact, lightweight.

DESCRIPTION

Type BA-22-A Transistor Program Amplifier is a compact plug-in audio unit constructed on a printed wire board and mounted on an "L" shaped aluminum frame.

This fine broadcast quality high fidelity amplifier contains eight separate transistor stages. The first two stages are coupled directly in a Darlington compound connection. The second stage is capacitively coupled to the third stage which is directly coupled to the fourth stage. The fourth stage is a common emitter directly coupled to an emitter follower which is then directly coupled to another common emitter. The latter stage is directly coupled to a common collector Darlington compound connected output stage. The master gain control is connected between stages two and three.

MECHANICAL SPECIFICATIONS

Units:

Type number includes amplifier assembly, a set of transistors and a set of installation and operating instructions.

Dimensions:

Length	Width	Height	Weight
9 $\frac{5}{8}$ "	4 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "	2 $\frac{3}{4}$ Lbs

Mounting:

This amplifier plugs into the Type BC-21-A Audio Console or, by utilizing a Type FA-48-A Shelf, up to four of these units may be rack mounted in any standard EIA rack such as the Type PR-1-A Equipment Rack.

Operating Conditions:

- Max. Room Ambient Temperature, Cont. 95°F (35°C)
- Max. Cabinet Ambient Temperature, Cont. 122°F (50°C)
- Max. Room Ambient Temperature, 5% of time, 113°F (45°C)
- Max. Cabinet Ambient Temperature, 5% of time, 131°F (55°C)
- Max. Relative Humidity, 95%

Electrical Connections:

All connections are made by a 9-pin plug which is attached to printed wire board.

Safety Provisions:

No power is applied to the unit unless it is plugged into its mating socket. When the unit is plugged in and console closed there is no exposed voltage. The maximum voltage applied to the unit is 50 volts DC.

ELECTRICAL SPECIFICATIONS

Performance:

- Frequency Response: ± 1 db 50-15,000 cps.
- Gain: 75 db matching input.
- Distortion: $\frac{1}{2}\%$ or less at +24 db (or rated output level).
- Noise: S/N ratio of 60 db.

Power Requirements:

50 volts DC at 160 ma.

Signal Input:

Transformer matching—maximum input level —20 dbm.

Signal Output:

150/600 ohms balanced or unbalanced—connected for 600 ohms at +24 dbm output level.

Controls:

Provisions are made for mounting an interstage control on the amplifier front when required. A 750K Carbon potentiometer is recommended. When used in Type BC-21-A Audio Console, a Daven, step-type control is used.

TRANSISTOR COMPLEMENT

- 3—2N324 G.E.
- 4—2N320 G.E.
- 1—2N553 Delco

COMPLIANCE

Complies with all applicable FCC and EIA specifications.

ORDERING INFORMATION

When ordering please specify: Type BA-22-A Transistor Program Amplifier (requires external power supply).

ACCESSORIES

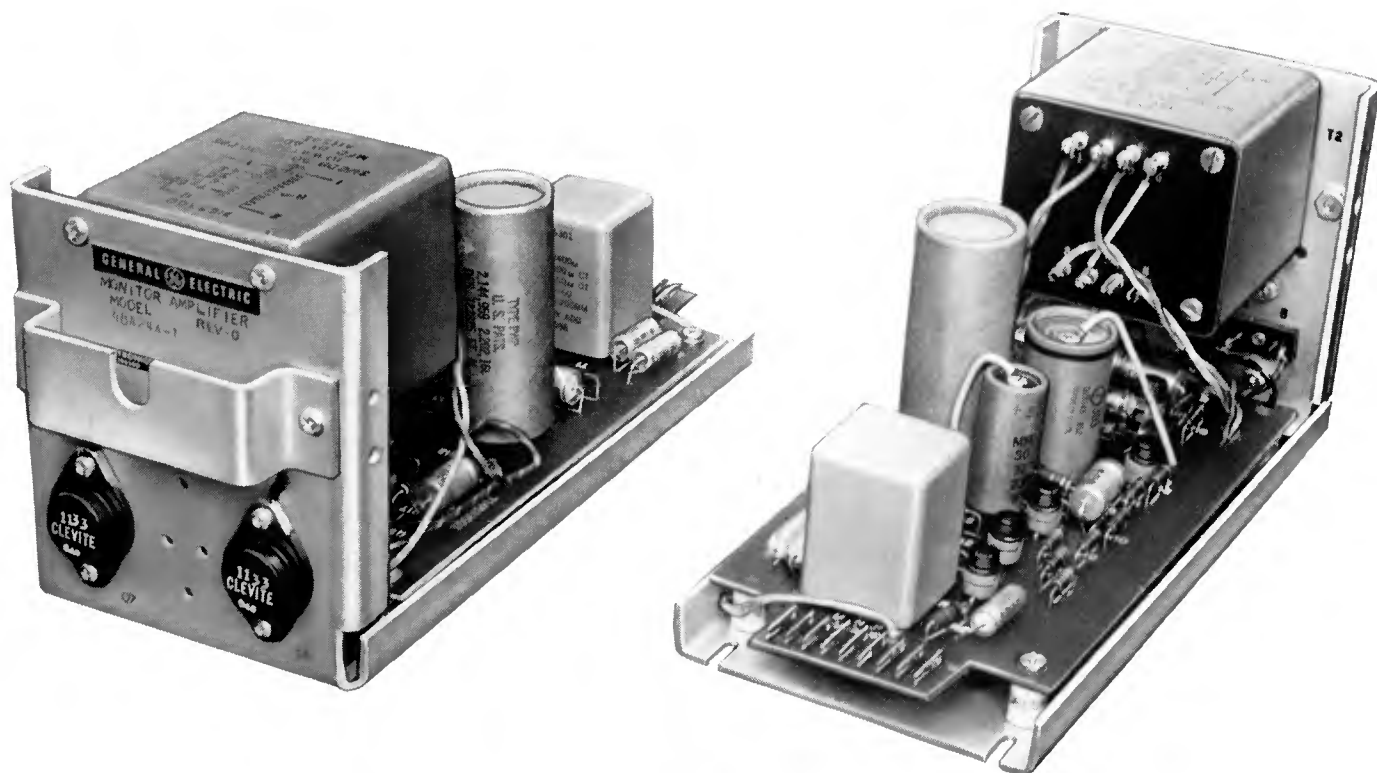
- Type FA-48-A Equipment Shelf.
- Type BP-21-A 50/25 V Power Supply.
- 2R74P25 Interstage Control.



Type BA-22-A Program Amplifier installed in a Type FA-48-A Equipment Shelf.

Transistor Monitor Amplifier, Type BA-24-A (Plug-In)

Section E211 Page 17
Broadcast Equipment Data Book
March 1, 1959



Type BA-24-A Monitor Amplifier

APPLICATION

The General Electric Type BA-24-A Transistor Monitor Amplifier is capable of bridging a number of different circuits and providing the gain necessary to raise an audio signal to loudspeaker level for aural evaluation of the program line, incoming remote lines and other sources.

FEATURES

- All transistors—no tubes in the circuitry.
- Plug-in amplifier construction for ease in maintenance.
- Space saving—small, compact, lightweight.
- Low voltage—low power drain.

DESCRIPTION

The Type BA-24-A Transistor Monitor Amplifier is a compact, plug-in audio amplifier constructed on a printed wire board and mounted on an "L" shaped aluminum frame.

This broadcast amplifier consists of unloaded input transformer which feeds a Darlington compound connected stage. The third stage is an emitter follower which drives the common emitter fourth stage which in turn drives another common emitter stage.

MECHANICAL SPECIFICATIONS

Units:

The type number covers the amplifiers, a set of transistors and a set of installation and operating instructions.

Dimensions:

Height	Width	Length	Weight
4½"	4¼"	9⅝"	2½ Lbs

Mounting:

This amplifier plugs into the Type BC-21-A Audio Console or, by utilizing a Type FA-48-A Shelf, up to four of these units may be rack mounted in any standard EIA rack such as the Type PR-1-A Equipment Rack.

Operating Conditions:

- Max. Room Ambient Temperature, Cont. 95°F (35°C)
- Max. Cabinet Ambient Temperature, Cont. 122°F (50°C)
- Max. Room Ambient Temperature, 5% of time, 113°F (45°C)
- Max. Cabinet Ambient Temperature, 5% of time, 131°F (55°C)
- Max. Relative Humidity, 95%.

Electrical Connections:

All electrical connections are made by a 9-pin plug which is attached to the amplifier wire board.

ELECTRICAL SPECIFICATIONS

Performance:

- Frequency Response: ±2 db, 50-15,000 cps.
- Gain: 80 db matching input.
- Distortion: 1½% or less at +33 dbm.
- Noise: S/N ratio, 60 db at +33 dbm output.

Power Requirements:

25 volts DC at up to 400 ma.

Signal Input:

Matching input, maximum input level -25 dbm.

Signal Output:

8/150/600 ohms at +33 dbm (2 watts)

Controls:

Not part of amplifier. Terminals provided for mounting a 750K ohm potentiometer inter-stage gain control.

TRANSISTOR COMPLEMENT

- 5—2N324 G.E.
- 1—2N320 G.E.
- 2—CTP-1123-Clevite.
- 1—2N169A G.E.

COMPLIANCE

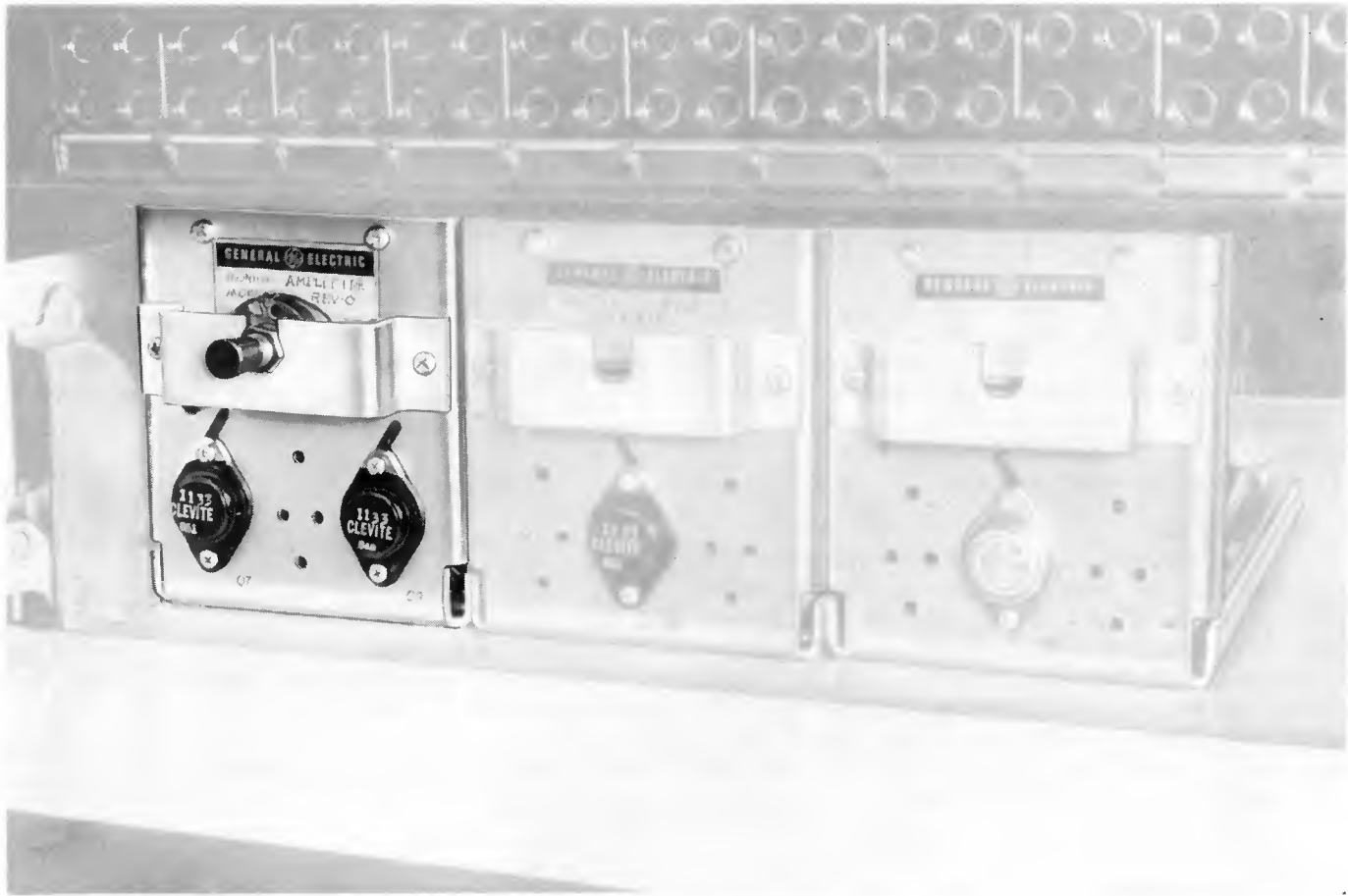
Complies with all applicable FCC and EIA specifications.

ORDERING INFORMATION

When ordering, please specify Type BA-24-A Transistor Monitor Amplifier (requires external power supply).

ACCESSORIES

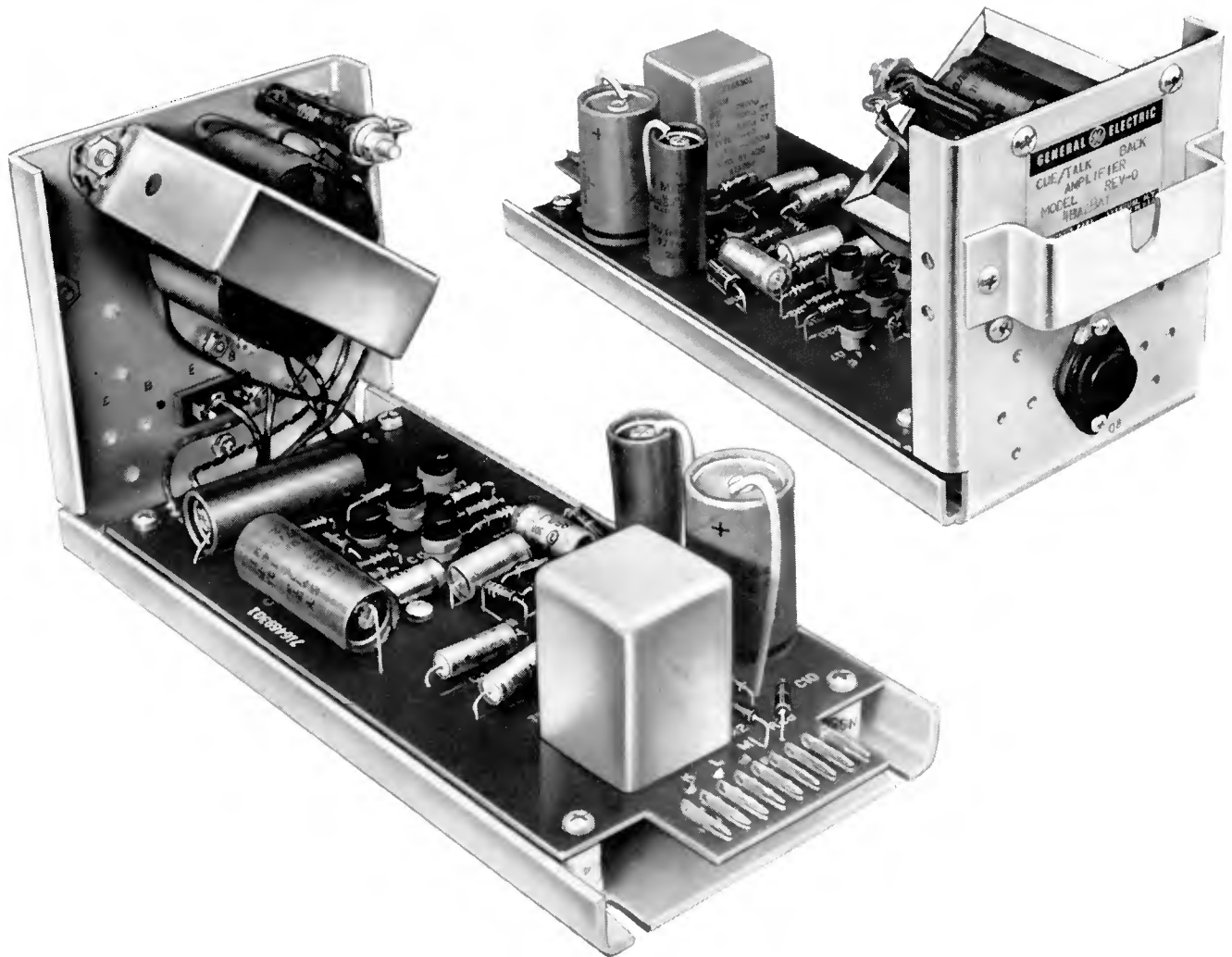
- Type FA-48-A Equipment Shelf.
- Type BP-20-A 25 v Power Supply.
- 2R74P25 750K Carbon Potentiometer.



Type BA-24-A Monitor Amplifier, with interstage gain control, installed in Type FA-48-A Equipment Shelf

Transistor Cue/Talkback Amplifier, Type BA-28-A (Plug-in)

Section E211 Page 18
Broadcast Equipment Data Book
March 1, 1959



Type BA-28-A Cue/Talkback Amplifier

APPLICATION

The General Electric Type BA-28-A Transistor Cue/Talkback Amplifier provides the gain necessary to raise an audio signal from mixer bus level to a level (+27 dbm) sufficient for cuing and studio talkback service.

This amplifier is designed for use in the Type BC-21-A Audio Console or any custom console employing transistor amplifiers.

FEATURES

- All transistors—no tubes in the circuitry.
- Space saving—small, compact, light weight.
- Low voltage—low power drain.
- Plug-in construction for ease in maintenance.

DESCRIPTION

Type BA-28-A Transistor Cue/Talkback Amplifier is a

compact plug-in audio unit constructed on a printed wire board and mounted on an "L" shaped aluminum frame.

This amplifier contains eight separate transistor stages. The first two stages are coupled directly in a Darlington compound connection. The second stage is capacitively coupled to the third stage which is directly coupled to the fourth stage. The fourth stage is a common emitter directly coupled to an emitter follower which is then directly coupled to another common emitter. The latter stage is directly coupled to a common collector Darlington compound connected output stage. This amplifier differs from the Type BA-22-A Transistor Program Amplifier only in the quality of the output. In this unit, an open core and coil type output transformer produces a lower quality output.

MECHANICAL SPECIFICATIONS

Units:

Type number includes amplifier assembly, a set of transistors and a set of installation and operating instructions.

Dimensions:

Length	Width	Height	Weight
9 $\frac{5}{8}$ "	4 $\frac{1}{4}$ "	4 $\frac{1}{2}$ "	2 $\frac{1}{2}$ Lbs

Mounting:

Unit plugs into Type BC-21-A Audio Console or, by utilizing a Type FA-48-A Equipment shelf, up to four of these units can be rack mounted in any standard EIA rack such as the Type PR-1-A Equipment Rack.

Operation Conditions:

Max. Room Ambient Temperature, Cont. 95°F (35°C)

Max. Cabinet Ambient Temperature, Cont. 122°F (50°C)

Max. Room Ambient Temperature, 5% of time, 113°F (45°C)

Max. Cabinet Ambient Temperature, 5% of time, 131°F (55°C)

Max. Relative Humidity, 95%

Electrical Connections:

All connections are made by a 9 pin plug which is attached to printed wire board.

Safety Provisions:

No power is applied to the unit unless it is plugged into its mating socket. When the unit is plugged in and console closed there is no exposed voltage. The maximum voltage applied to the unit is 25 volts DC.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response: ± 2 db 100-10,000 cps.

Gain: 75 db matching input.

Distortion: 3% or less at +24 db (or rated output level).

Noise: S/N ratio of 60 db.

Power Requirements:

50 volts DC at 160 ma.

Signal Input:

Transformer matching—maximum input level—20dbm.

Signal Output:

600 ohms balanced or unbalanced—connected for 600 ohms balanced at +27 dbm output level.

TRANSISTOR COMPLEMENT

3—2N324 G.E.

4—2N320 G.E.

1—2N553 Delco.

COMPLIANCE

Complies with all applicable FCC and EIA specifications.

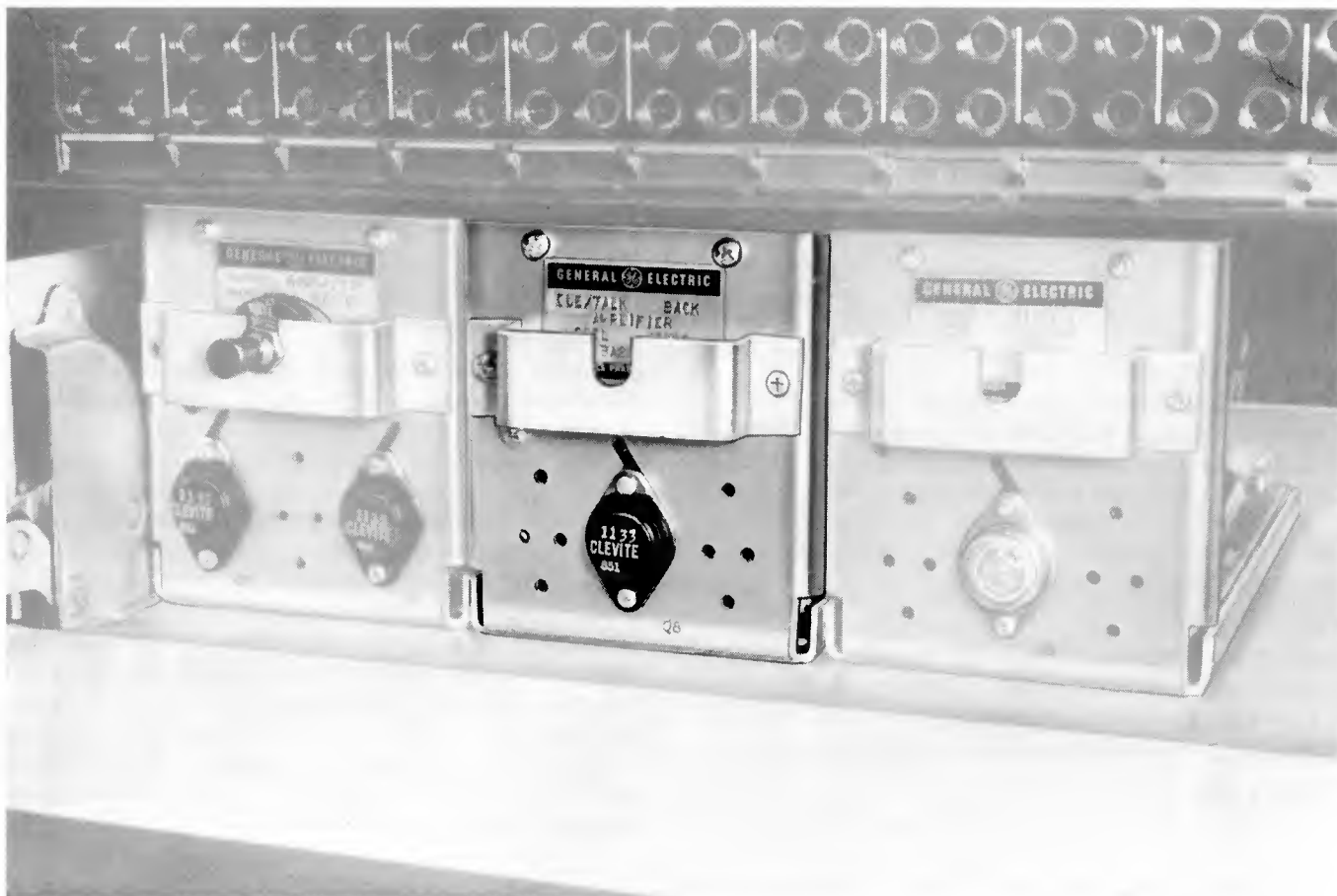
ORDERING INFORMATION

When ordering please specify: Type BA-28-A Cue/Talkback Amplifier (requires external power supply).

ACCESSORIES

Type FA-48-A Equipment Shelf.

Type BP-21-A 50/25-volt Transistor Power Supply (Regulated).



Type BA-28-A Cue/Talkback Amplifier installed in Type FA-48-A Equipment Shelf



Transistorized Portable Amplifier, Type BA-26-A

APPLICATION

The General Electric Type BA-26-A Transistorized Portable Amplifier is designed for all remote or auxiliary (emergency) studio audio mixing applications in AM-FM-TV or recording work.

Standard input and output impedances will make it possible to operate this Transistorized Portable Amplifier in conjunction with other makes and models of broadcast audio equipment.

FEATURES

- Completely transistorized. Not a tube in the circuitry.
- Four microphone inputs, plus a high level input. All 5 inputs equipped with transformers.
- Regulated, self-contained 95-135 volt 50/60 cycle a-c power supply.
- Provisions for operating from self-contained batteries.
- Built-in tone generator.
- Provisions for paralleling portable amplifiers.
- Amplified cue.
- Small, lightweight design, weighs only 19½ lbs.
- All transistors plug in.

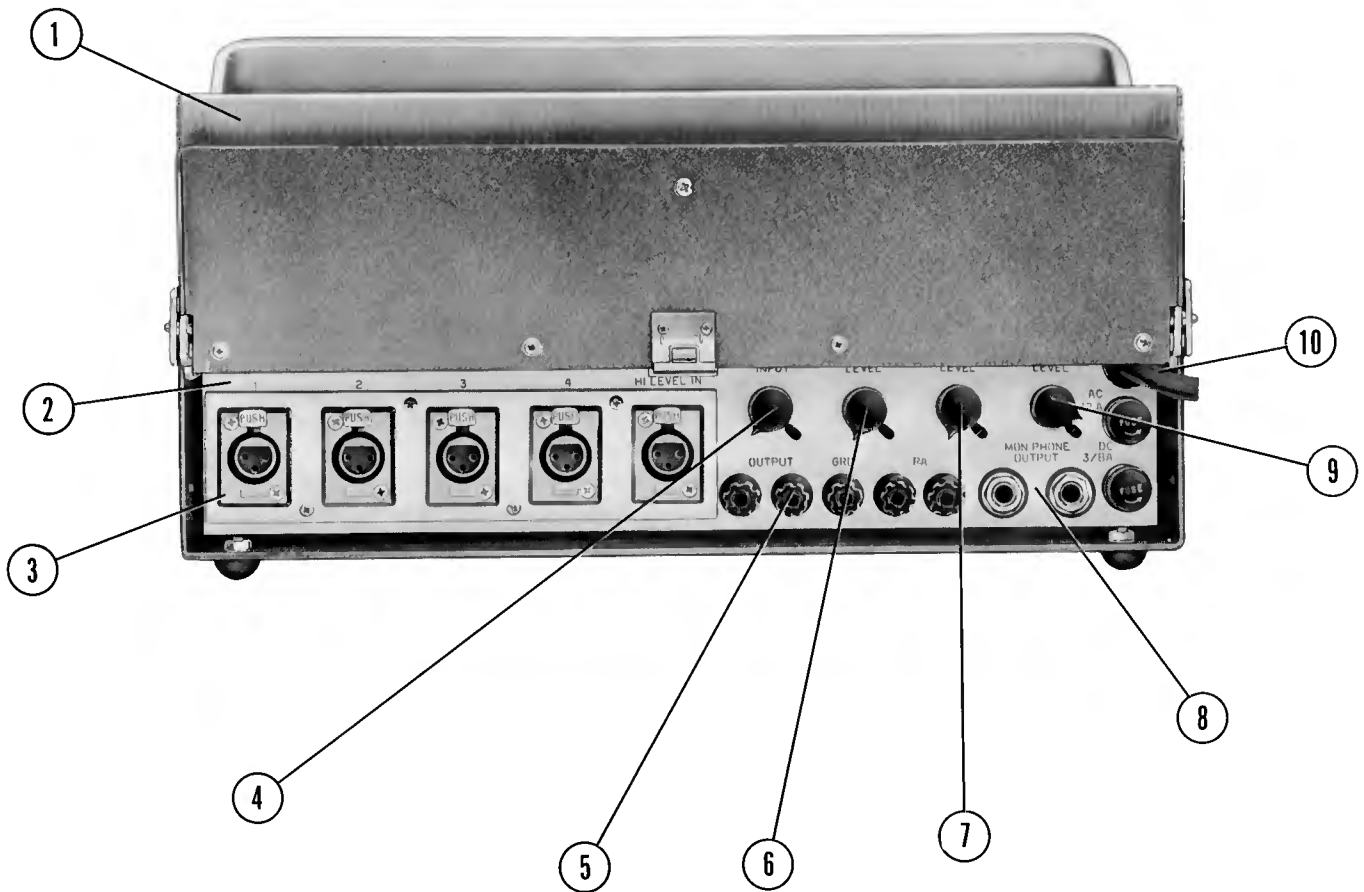
- New laminated plastic front panel for ease of write-in and erase.
- Built-in studio quality—designed for use on AM-FM-TV broadcast and recording audio applications.
- Carrying handle functions as a base to set unit at a convenient operating angle.

DESCRIPTION

The Type BA-26-A Transistorized Portable Amplifier is suitable for use as a remote audio mixer and amplifier, capable of amplifying and mixing four microphones and one high level source and feeding the output to a line at a +18 dbm level. The frequency response and distortion characteristics will be such that it will be suitable for use on AM-FM-TV and recording applications.

In addition to providing facilities for mixing five sources, this Transistorized Portable Amplifier has a self-contained power supply and provisions for installing batteries. This will permit the operation of the Transistorized Portable Amplifier from either a power line or its batteries.

A new feature will include a high-level input which may be used for mixing in a music source or as a means of coupling two or more Type BA-26-A Transistorized Portable Amplifiers together to get additional mixing facilities.



Transistorized Portable Amplifier, Type BA-26-A (Rear cover opened)

- | | |
|--|-----------------------|
| 1. Hinged Cover | 6. Cue Gain Control |
| 2. Removable Plate for Mounting Cannon P3 Type Receptacles | 7. P.A. Feed Control |
| 3. XLR Type Input Connectors | 8. Dual Phone Jacks |
| 4. High Level Gain Control | 9. Head Phone Control |
| 5. Spring Type Binding Posts for Output & P.A. Connections (5) | 10. 8' Power Cord |

MECHANICAL SPECIFICATIONS

Dimensions:

Height 7 in.
 Width 15 in.
 Depth 12 in.
 Weight 19½ lbs. with batteries (18½ lbs. less batteries)

Mounting:

Self-contained portable unit. Sets in position on four rubber feet or may be tilted at an angle by positioning handle under unit. Four rubber feet on the cover allow unit to sit on any surface in the carrying position.

Electrical Connections:

All connections are accessible through a spring-loaded hinged rear cover. The connections include:

- 4 Microphone Receptacles—Cannon XLR-31 receptacle. (Cannon P3-13 may be substituted by removal of XLR-31 mounting plate.)
- 1 High-Level Input Receptacle—Cannon XLR-31. (Cannon P3-13 may be substituted by removal of XLR-31 mounting plate.)
- 1 Pair of spring-loaded binding posts for output line connections.
- 1 Spring-loaded binding post for ground terminal.
- 1 Pair of spring-loaded binding posts for P.A. output.
- 2 Monitor phone output jacks.
- 1 AC cord (grounded-safety type)—adapter provided for two-wire plug.

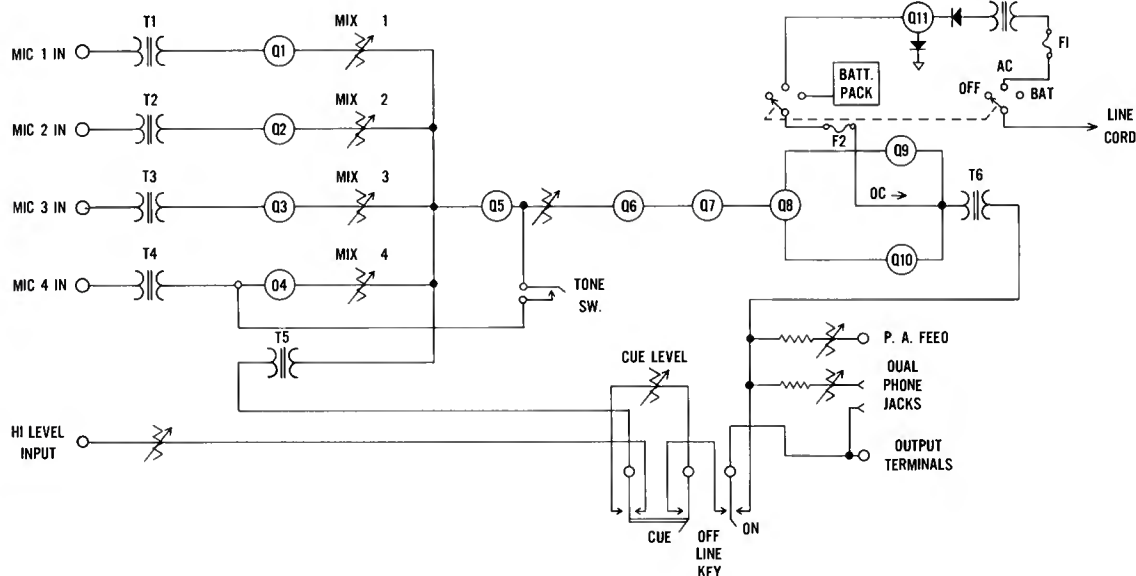
Safety Provisions:

Grounded AC power plug provided.
 Completely enclosed.
 117 AC max. voltage.
 Binding post for grounding chassis.

ELECTRICAL SPECIFICATIONS

Performance:

Program Circuits



Frequency Response ± 1 db 50 to 15,000 CPS.

Over-all Gain 90 db ± 2 db.

Noise 65 db below +18 dbm output level.

Distortion 1% or less at a +18 dbm out after a 4 db pad from 50 to 15,000.

Battery operation in hours Approximately 25 hours.

Operating Temperature Range Up to 55° 5% of the time, 45° continuous.

Power Requirements:

Power Inputs:

A. C. Supply 95-135V, 50/60 cycle, 225 watts (approx.).

Batteries 4-6½ volt cells.

2-1½ volt flashlight cells.

Signal Inputs:

Impedances

50/150/600 ohms balanced or unbalanced

Levels

MIC level to -25 dbm (maximum)

High Level 0 to -20 dbm

Signal Outputs:

Impedance Line

Output—150/600 ohm balanced or unbalanced.

Mon. Phone Output—High Impedance output balanced.

PA Output—150 ohms, balanced.

Levels

Line—+18 dbm (after 4 db pad).

Mon. Phones—0 dbm (maximum adjustable).

PA Feed—-50 dbm.

TRANSISTOR COMPLEMENT

8—2N527 GE

3—2N553 Delco

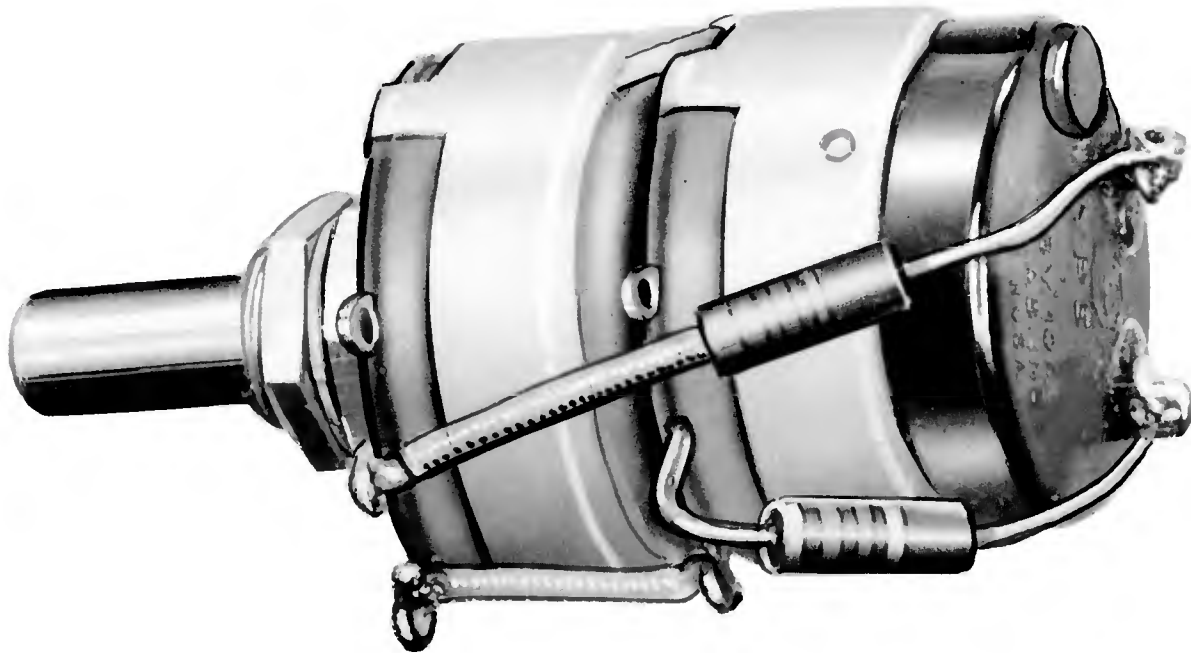
2—1N537 GE Silicon Diodes

1—1N517 International Zenner Diode

2—1N91 GE Germanium Diodes

ORDERING INFORMATION

When ordering please specify Type BA-26-A Transistorized Portable Amplifier.



G-E Bridging Volume Control, Type FA-35-G

APPLICATION

The FA-35-G Bridging Volume Control is designed to convert a 600-ohm input of an amplifier to 10,000 ohms balanced bridging service. It may be used on line levels up to +40 dbm.

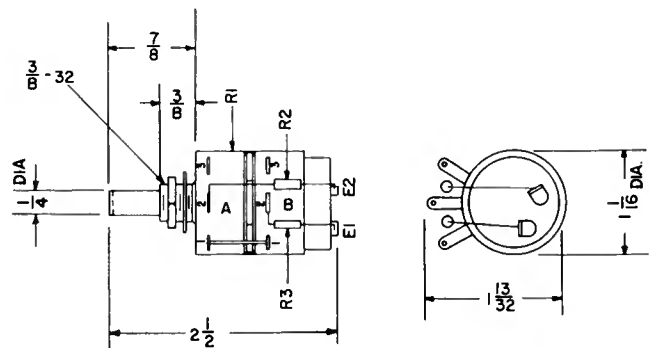
DESCRIPTION

The FA-35-G consists essentially of a continuously variable dual potentiometer, a screwdriver control (a knob may be used) and a dummy switch section tandem-mounted to provide terminals for mounting two resistors and input connections to the control.

MECHANICAL SPECIFICATIONS

Dimensions:

Height $2\frac{1}{2}$ "
 Diameter $1\frac{1}{8}$ "



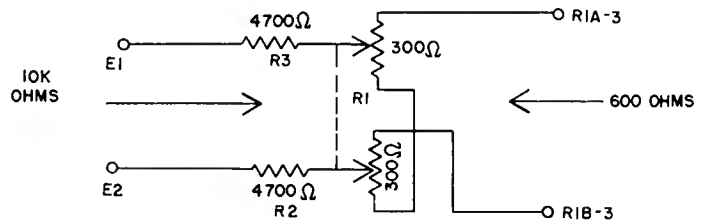
Weight: 2 ounces

Mounting:

The FA-35-G is designed to fit holes provided in the ends of the BA-1-F Pre-Amplifier and the BA-12-C Program/Monitor Amplifier chassis. It may also be mounted on the BA-4-E Monitoring Amplifier or used in similar applications where a bridging gain control is required. A $\frac{3}{8}$ " hole is required for mounting in applications other than outlined above. (See outline diagram for internal chassis clearance dimensions.)

ORDERING INFORMATION

When ordering, please specify:
 Type FA-35-G Bridging Volume Control.



Outline and Elementary Diagrams, FA-35-G Bridging Volume Control



Type BC-21-A Transistorized Audio Console

APPLICATION

The General Electric Type BC-21-A Transistorized Audio Console is designed for studio and/or master audio control of radio and television stations.

This console provides all the facilities required for switching, mixing and amplifying the outputs of microphones, turntables, tape mechanisms, projectors, remote and network lines and other audio sources. It also supplies facilities for auditioning, cuing, monitoring remote lines and cue/talkback circuits to studio and remote lines.

Completely transistorized, this all plug-in audio console may be used for single-channel operation or easily, quickly and inexpensively modified for two-channel operation.

FEATURES

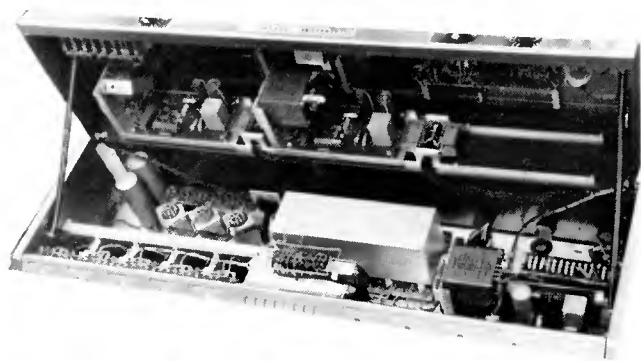
- Completely transistorized—not a tube in the circuitry.
- Use of transistors eliminates need for special cooling provision.
- Complete plug-in facilities for all amplifiers, and relay modules. Amplifiers may be quickly and easily removed or replaced during service operations.
- Buy as you need. Console can be operated with less than full complement of preamplifiers. Buy the basic package, add more later as you expand operations.
- Clean, “crackle-free” switching. Springleaf, telephone type lever keys used.
- Noiseless fading and mixing. Program controls are high quality Daven step-type attenuators.

- Improved operational efficiency with color-coded controls. Selector switches and associated lever key handles are color coded for instant recognition and prevention of operational error.
- Dual channel operation provided in console design. Addition of second program amplifier, second master gain module, and VU meter, plus minor terminal board changes, will permit simultaneous two-channel operation. Second VU meter mounting space is included in console for this purpose. No interaction between two program channels when so used.
- Built-in cue/TB amplifier—Console includes complete cue and talkback facilities with push-button selector switch and speaker.
- Records, tapes and transcriptions easily cued. The OFF position of hi-level attenuators equipped with cue switch to feed input to cue amplifier.

DESCRIPTION

The Type BC-21-A Transistorized Audio Console consists of a desk unit containing four Type BA-21-A Pre-amplifiers, a Type BA-22-A Program Amplifier, a Type BA-24-A Monitor Amplifier and a Type BA-28-A Cue/Talkback Amplifier and associated mixer, gain control and relay equipment. The Type BP-20-A 25v Power Supply and the Type BP-21-A 50/25v Power Supply are included in the basic package but they are rack mounted outside of the console.

The preamplifiers, high level mixer controls and master gain control are plug-in modules which make up most of the lower front section of the console. These

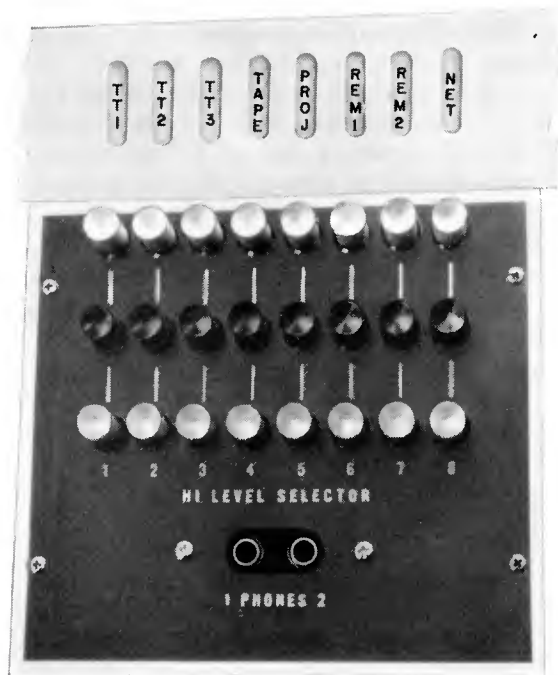


Console open showing Cue/Talkback and Program Amplifiers mounted in swing-up top and Monitor Amplifier in bottom of console at right. (Note: Mounting space for additional Program Amplifier in top at right.)

units are inserted from the front and become part of the control panel of the console. The cue/talkback and program amplifiers mount in the hinged top section of the console; while the monitor amplifier and plug-in relay modules are located in the console base.

This basic console handles up to 8 low level microphone inputs which are selected by means of microphone keys into the four preamplifiers. Up to ten inputs can be handled by addition of another preamplifier module (accessory).

Eight high level program sources such as turntables, tape and remotes or network are connected by means of three eight-position spring leaf push-button switch assemblies into three high level mixers.



High Level Input Selector Panel

All audio sources feed into mixer bus keys which provide the means of selecting either the program bus or the audition bus. In the case of two-channel operation, the audition bus becomes program bus number two.

This console includes a master gain control module and provisions for mounting the second channel master gain control module. Space and connections are provided

for the installation of a second program amplifier for dual channel operation.

By means of a 5-position monitor selector switch, it is possible to connect the monitoring amplifier input to the program lines, the audition bus, or three external lines.

Two output line keys are incorporated making it possible to switch the program output to either of two lines when the console is used as a single-channel unit. In two channel applications, the line keys will connect either output line to either channel. In single channel operation, the keys control normal program output in one position and in the other position provide emergency program output from the monitoring amplifier.

A single VU meter with associated selector switch and pad is provided. By means of extra meter hole and dual overlay panel a second VU meter may be mounted if desired.

This design incorporates a cue/talkback amplifier which with a push-button selector switch makes it possible to communicate with either of two studios, an announce booth or NEMO lines without affecting monitor facilities. A 4-inch speaker is mounted on the console and serves as both TB mike and cue speaker. An eight-position push-button switch assembly provides for selection of six intercommunication positions, a cue position and a LISTEN/TALK operate button. The listen/talk button is red versus black for other positions.



Cue/Talkback Selector and Gain Control Panel

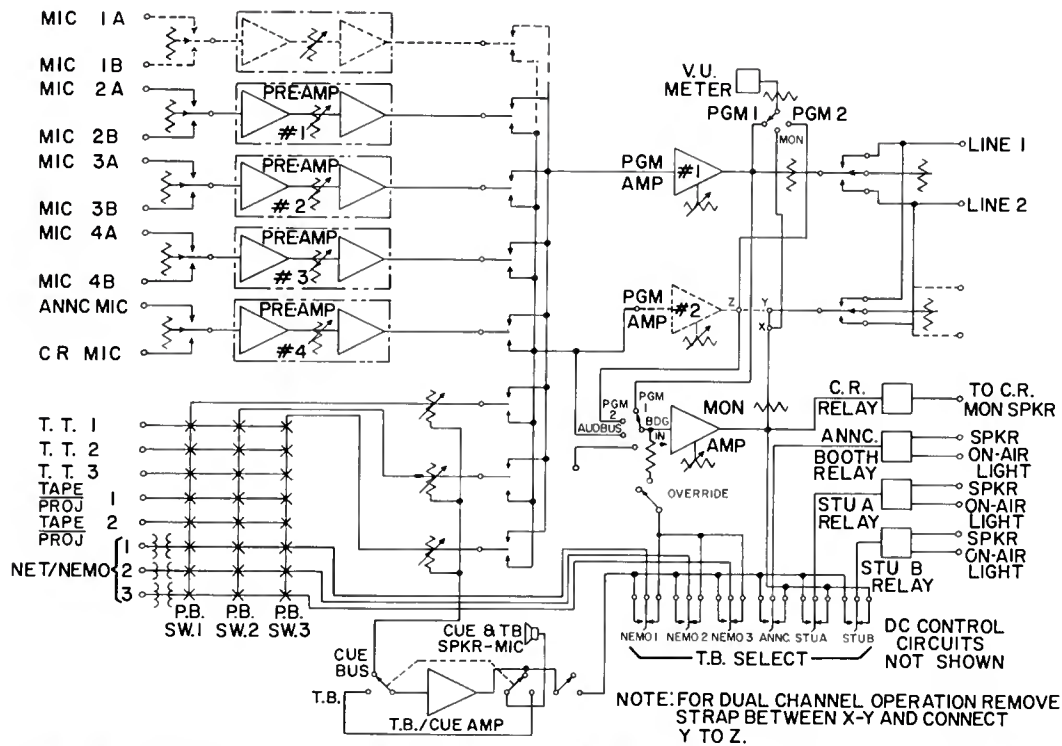
For cue purposes, the talkback amplifier doubles as the cue amplifier. Cue faders are used in the three high level mixer positions. The cue output of these faders is connected to a common bus brought up to a position on the cue/talkback selector switch.

This console design includes speaker and warning light cut-off relays and associated circuitry. Provisions are made for operation of both audition and on-air warning lights. Relay control circuits provide for operation of two studios, an announce booth and the control room speaker. Four printed wire board relay assemblies are supplied. These relay modules plug into the console proper.

This console provides a pair of phone jacks for monitoring each channel via a headset.

A spare key is provided (mounted adjacent to the two line keys) which may be wired by the customer for such purposes as feeding recorders, studio amplifiers, etc.

An OVER-RIDE switch is included in the console design. This OFF/ON switch connects the three remote lines



Line Diagram of Type BC-21-A Transistorized Audio Console. Note how easily it can be modified for Dual Channel operation

to the monitor speaker input. The only exception being that if a remote line is being fed program material for cue purposes that line is automatically disconnected from the over-ride bus.

A four-position switch makes it possible to selectively feed program material for remote cue purposes to any one of three remote lines. When a remote line is being fed cue, it is removed from the over-ride circuit.

A single VU meter is mounted in the console together with a four-position meter selector switch which provides the following selections:

- (a) OFF
- (b) CHAN 1 (Connects meter to Chan 1 output line.)
- (c) CHAN 2 (Connects meter to the monitor output. In a two-channel conversion, this position is reconnected to the No. 2 output line.)
- (d) EXT (This position connects the meter to a pair of terminals which may be used to meter some external audio circuit.)

Circuits associated with the monitor amplifier include a gain control and an input selector switch. Both these controls are mounted on the upper right hand side of the console. The selector switch makes it possible to switch several lines to the monitor input. The positions in detail are:

- (a) OFF
- (b) CHAN 1 (Bridges monitor input to program channel No. 1 output.)
- (c) CHAN 2 (Connects Chan 2 (audition) mixer bus to the monitor input. In a two-channel conversion this position is reconnected so that

it bridges Chan 2 program output).

- (d) EXT 1 Bridges monitor input to three sets of
- (e) EXT 2 terminals for connection to 3 remote
- (f) EXT 3 audio circuits.

MECHANICAL SPECIFICATIONS

Units: Type number covers the console assembly, 4 Type BA-21-A Preamplifier Modules, a Type BA-22-A Program Amplifier, a Type BA-24-A Monitor Amplifier, a Type BA-28-A Cue/Talkback Amplifier, a Type BP-20-A 25-volt Power Supply, a Type BP-21-A 50/25-volt Power Supply and associated equipment.

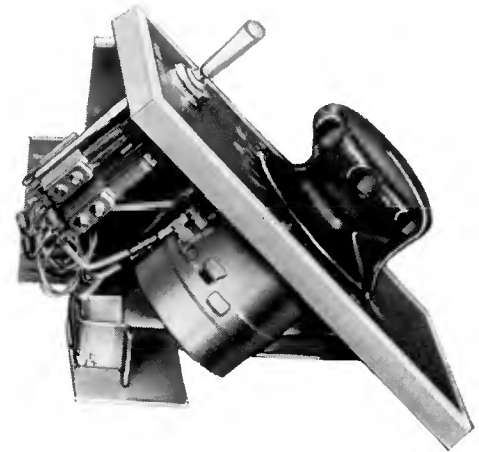
Dimensions: (Exterior console dimensions)

Height	Length	Depth	Weight
11 in.	38 in.	17 in.	75 lbs.

Mounting: All amplifier chassis are plug in and mount in console. The console cabinet may be mounted on two Type PR-16-B/C Base Cabinets or any available desk of sufficient size. The power supplies mount in one of the



Monitor, VU Meter and Line Output Control Panel



High Level Plug-in Module

base cabinets or any standard EIA cabinet rack, such as the Type PR-1-A Cabinet Rack (accessory).

Controls and Adjustments:

- 5—Microphone Selector Keys
- 4—Mixer and Mixer Keys (part of preamplifier module)
- 3—8-Position Push-button Selector Switches for high level sources
- 3—High Level Mixers and Mixer Keys
- 1—Master Gain Control
- 1—Monitor Selector Switch
- 1—Monitor Gain Control
- 1—V.U. Meter Selector Switch
- 2—Output Keys
- 1—8-Position Push-button Cue/Talkback Selector Switch
- 1—Over-ride Switch
- 1—Cue/TB Gain Control
- 1—Spare Key (utility)
- 1—Remote PGM Cue Selector Switch
- 3—Line Isolation Transformers

ELECTRICAL SPECIFICATIONS

Performance:

Program Circuits

Frequency Response: ± 2 db, 50 to 15,000 cps.

Gain: 105 db ± 2 db.

Noise: 65 db below +18 dbm out (with controls set for 68 db of gain).

Crosstalk (Nominal):

At least 50 db down, 50-15,000 cps.

At least 80 db down, at 1000 cps.

Distortion: 1% or less at +18 dbm (after 6 db pad).

Monitor Circuits

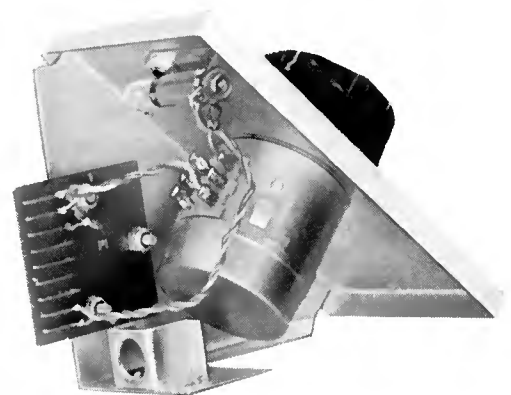
Frequency Response: ± 1 db, 50 to 15,000 cycles.

Distortion: $1\frac{1}{2}\%$ or less at +33 dbm.

Power Requirements: 110/117/125 volts, 50/60 cycle, single phase, AC, 90 watts (45 watts each power supply).

25 volts, DC at 1 amp for the monitor amplifier and control relays, from the Type BP-20-A Power Supply.

50 volts, DC at 500 ma for program amplifier and cue/talkback amplifier as well as 25 volts, DC at 40



Master Gain Control Module

ma for the preamplifiers from the Type BP-21-A Power Supply.

Signal Inputs:

Impedances

Microphones: 10—30/150/250/600 ohms, balanced or unbalanced.

Turntables: 3—600 ohms, balanced or unbalanced.

Network or Remote Lines: 3—600/150 ohms, balanced or unbalanced.

Tape/Projectors: 2—600 ohms, balanced or unbalanced.

External Monitor: 3—20,000 ohms, balanced, bridging.

External VU: 1—7500 ohms, balanced, bridging.

Levels

Low Level Inputs—Microphone level to -25 dbm.

High Level Inputs— -10 to +18 dbm

Signal Outputs:

Impedances

Program Lines (Regular): 2—600 ohms, balanced.

Monitor Channel: 1—600/150/8 ohms, balanced.

Remote Cue (into NEMO line): 3—Bridging, balanced.

Levels

Program Output Level—+18 dbm

Monitor Output Level—+33 dbm (2 watts)

TRANSISTOR COMPLEMENT

1—2N277 Delco

1—2N173 Delco

1—2N169A G.E.

3—2N441 Delco

25—2N324 G.E.

6—1N538 G-E Silicon Diode

10—2N320 G.E.

2—CTP 1133 Clevite

2—2N553 Delco

ORDERING INFORMATION

When ordering please specify Type BC-21-A Transistorized Audio Console which includes:

1—Console Cabinet

4—Type BA-21-A Preamplifier Modules

1—Type BA-22-A Program Amplifier

1—Type BA-24-A Monitor Amplifier

1—Type BA-28-A Cue/Talkback Amplifier

1—Type BP-20-A 25-volt Power Supply

1—Type BP-21-A 50/25-volt Power Supply

ACCESSORIES

Type BA-22-A Program Amplifier for two-channel operations

Type BA-21-A Preamplifier Module for fifth position on console

Type BA-24-A Monitor Amplifier for auxiliary speaker operation

Type BP-20-A 25-volt Power Supply for extra monitor amplifiers (one BP-20-A will provide adequate power for two monitor amplifiers)

or

Dual Channel Kit 7168290 consisting of:

1—Type BA-22-A Program Amplifier for two channel operation

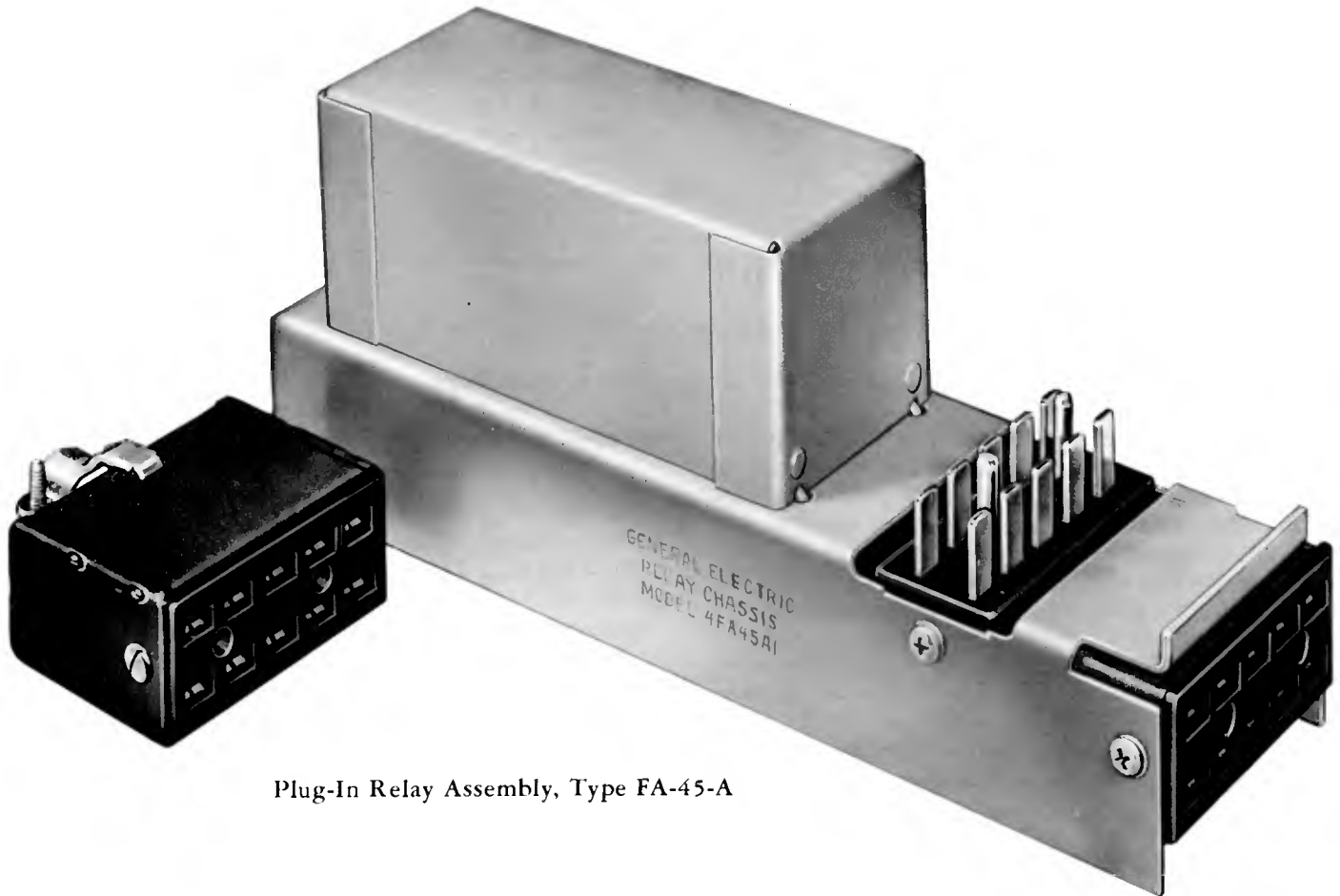
1—7164636 Master Gain Module

1—7477541-4 Meter Attenuator

1—7492839-1 VU Meter



Type BC-21-A Transistorized Audio Console for Dual Channel Operation



Plug-In Relay Assembly, Type FA-45-A

APPLICATION

The General Electric Type FA-45-A Plug-In Relay Assembly is designed to control speaker and air warning lights in an announce booth and one studio. While primarily designed to plug into a BC-11-A Console, this unit may be mounted and power supplied externally for other applications.

The relay assembly may be operated from either 117 volts AC or 24 volts DC without a wiring change. In external applications, by easily made wiring changes on the plugs, this relay assembly may be used for relay operation of TV motion picture audio change-over and other applications where two relays with two form C contacts each can be used.

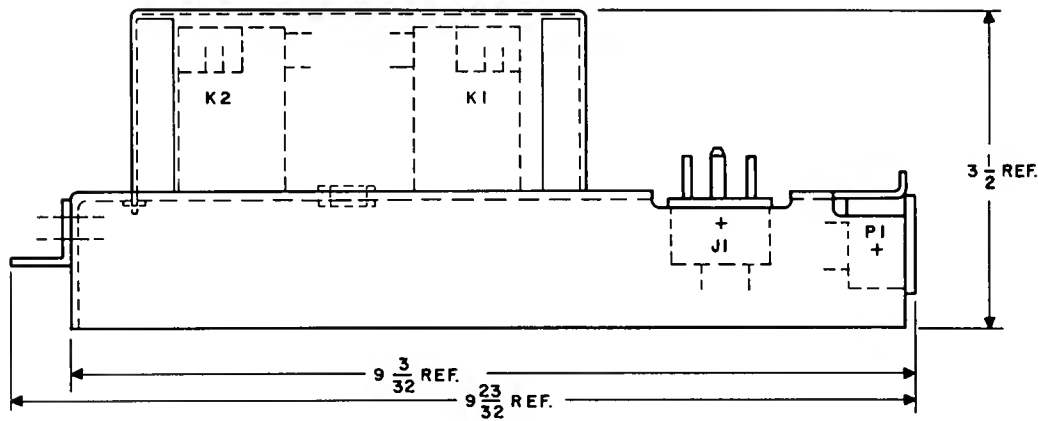
FEATURES

1. **Plug-in, pre-wired construction.** Assembly is pre-wired to plug in and operate in BC-11-A Console.
2. **Operates on either 24 volt DC or 117 volt AC without wiring change.** Unique coil construction permits operation on either voltage.
3. **Relays are case protected.** Relays are protected from dust or damage due to accidental impact by aluminum case. Case may be readily removed during routine maintenance.
4. **Impossible to make wrong connection in console.** Relay chassis employs female plug while other chassis in console employ male plugs, in same position.
5. **May be used in other applications.** Relay chassis wiring may be changed easily for use in other applications. Two 10-terminal Jones plugs permit wide variety of control and use. Unit may be externally mounted and operated. Relay contacts rated at 5 amperes at 115 v AC.

DESCRIPTION

The General Electric Type FA-45-A Plug-In Relay Assembly consists of two relays mounted and wired with associated components on a plug-in chassis. Each relay has two form C contacts.

When plugged into the BC-11-A Audio Console, connections are made through P-1 (see outline diagram) to the existing wiring of the BC-11-A mixer switches. In this application, K-1 (see circuit diagram) is controlled by any one of the first four microphone mixer switches, while K-2 is controlled by the announce-booth mixer switch. Another plug, mating with J-1 (see outline diagram) on top of the assembly should be wired with the relay voltage and external circuits associated with



Outline Drawing, Plug-In Relay Assembly, Type FA-45-A

the announce-booth and studio loudspeakers and air warning lights.

Each relay is provided with two sets of contacts, one of which is used to break the loudspeaker circuit and the other for the air warning light control. Both relays are protected by a cover which may be easily removed during routine maintenance.

The Relay Assembly requires 24 volts DC at 110 ma, or 117 volts AC at 110 ma. Low voltage operation down to 19 volts DC or 95 volts AC is possible. It is recommended that 24 volts DC be used for the relay operation to eliminate the possibility of hum pickup in the audio circuits.

The bases of the plugs on the chassis are readily available for rewiring if other control circuits or other applications are contemplated.

MECHANICAL SPECIFICATIONS

- Units:** 1—FA-45-A Plug-In Relay Assembly with J-1 mating plug.
- Dimensions:**
 Over-all height— $3\frac{1}{2}$ "
 Over-all length— $9\frac{23}{32}$ "
 Over-all width— $2\frac{7}{16}$ "
- Weight:** 1 lb., 9 oz.
- Connectors (on Chassis):** J-1—10-pin, male, Jones # P-2410
 P-1—10-pin, female, Jones # S-2410
 A 10-pin, female plug, Jones # S-2410-CCT is supplied to mate with J-1.
- Finish:** Grey.

ELECTRICAL SPECIFICATIONS

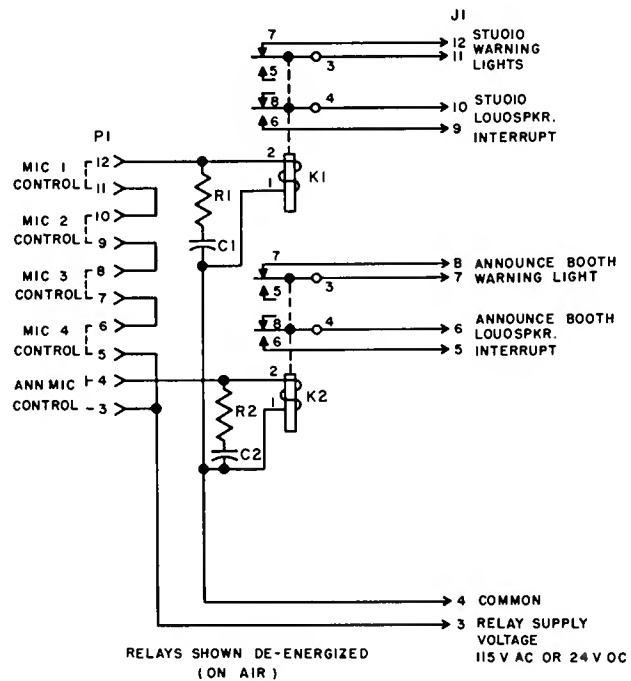
- Relay Coil Requirements:** 24 volts DC @ 110 ma, or 117 volts AC @ 110 ma.
- Relay Contact Capacity:** 5 amperes @ 117 volts AC, each contact.

- Relay Contact Type:** Two form C contact assemblies on each relay.
- Number of Relays:** Two.

ORDERING INFORMATION

When ordering, please specify:

FA-45-A Plug-In Relay Assembly. (Type number includes one Relay chassis, one Jones # S-2410-CCT plug, and Installation and Operating Instructions.)



Elementary Diagram, Plug-In Relay Assembly, Type FA-45-A



Transcription Equalizer, Type FA-12-B

APPLICATION

The General Electric Transcription Equalizer, Type FA-12-B, is an adjustable network for use with professional-type G-E cartridges, 4GS-01D, 4GS-02D and 4GD-01D-02D, for broadcast reproduction of lateral transcriptions and records.

FEATURES

1. **Pleasing record reproduction**—full low-frequency response and adjustable high-frequency response.
2. **Easy to install**—single unit construction.
3. **Low hum pickup** because of adequate magnetic shielding.
4. **Connections simplified**—outputs may be run balanced or unbalanced.
5. **Convenient to use**—connects to any microphone pre-amplifier.

DESCRIPTION

The FA-12-B Transcription Equalizer is a single unit housed in a rectangular steel case. It has a low-impedance

output which will work into the unloaded input of any microphone pre-amplifier. It includes a four-position switch which provides control of high-frequency response.

The "FLAT" position provides essentially flat high-frequency response from material recorded at constant velocity above 700 cps. The "NARTB" position provides an essentially flat reproduction of material recorded in accordance with the "NARTB" lateral curve. This position may also be used for reproduction of 78 rpm vinylite base and "hi-fi" records. The "GOOD RECORDS" position provides a high-frequency response somewhat more attenuated than that given by the "NARTB" position. The fourth position, marked "POOR RECORDS", provides a high-frequency response considerably more attenuated than that given by the "NARTB" position. (See Average Performance Characteristic Curves, Fig. 1.)

All switch positions provide low-frequency response essentially the complement of the "NARTB" curve.

Experience has shown that the "NARTB" position is ideal for high-quality transcriptions and both wide-groove (.003 in.) and micro-groove (.001 in.) types of records. For worn transcriptions and average good records, the "GOOD RECORDS" position provides the most pleasing response. Noisy and distorted records require the "POOR RECORDS" position. The "FLAT" position is useful for the reproduction of instantaneous recordings and other special records cut with a "FLAT" recording characteristic.

MECHANICAL SPECIFICATIONS

Dimensions:	Can	Dial Plate
Depth	4 1/16 in.	_____
Length	3 3/8 in.	3 5/8 in.
Width	3 1/4 in.	3 in.
Weight:	2 lbs.	_____

Mounting: Tapped mounting holes are provided at the top (switch end) of the case to enable mounting the FA-12-B to the under side of the top panel of a transcription turntable with its switch shaft passing vertically through a clearance hole drilled in the top panel. The switch shaft is made extra long so as to accommodate various thicknesses of transcription turntable top panels. A knob and escutcheon plate are supplied for mounting above the Transcription Equalizer on the control surface of the transcription turntable. External connections to the pickup and to the amplifier are made on a terminal board located at the bottom of the Equalizer case. Although the Equalizer components are completely enclosed in a protective metal case containing inner mu-metal shields, the removal of two case screws enables rapid access to the components should servicing be necessary.

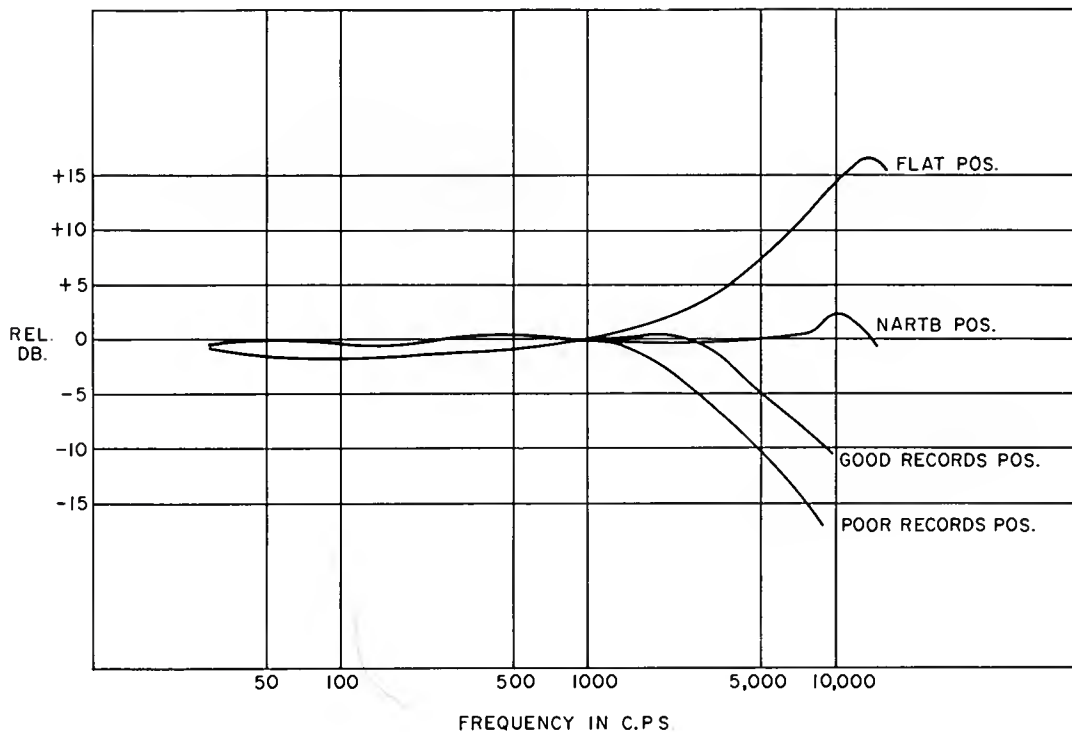


Fig. 1. Average Performance Characteristics of the Transcription Equalizer with the "New Orthophonic" Test Record and G-E 4GS-01D or 4GD-01D-02D Cartridge using the 1-Mil Diamond Stylus

ELECTRICAL SPECIFICATIONS

Output Circuits:

Load Impedance: Designed to work into either a 150/250- or 30/50-ohm unloaded input.

Output Connections: Balanced, or either side may be grounded.

Output Level: An output level of approximately -55 VU maximum is

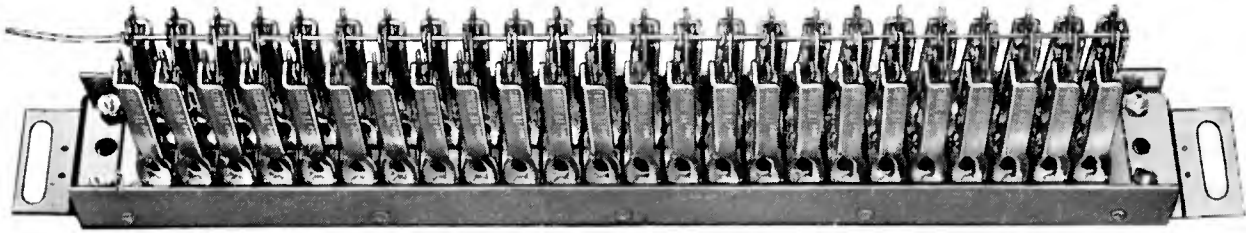
obtained when reproducing 78 rpm shellac records; -60 VU maximum from micro-groove records.

Typical Reproduction Response: See Fig. 1

ORDERING INFORMATION

When ordering, please specify:

Type FA-12-B Transcription Equalizer



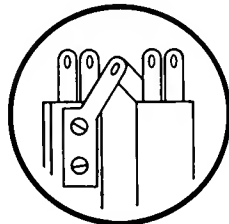
Type FA-2-A Jack Strip showing common ground

APPLICATION

G-E Type FA-2-A Jack Strips are used in amplifier racks to permit rapid isolation, selection, and monitoring of individual amplifiers by means of patch cords. They are also used in studio and master control room consoles and racks to permit "patching" of the various remote, local, and audition programs into the desired transmitter, remote, and monitoring channels.

FEATURES

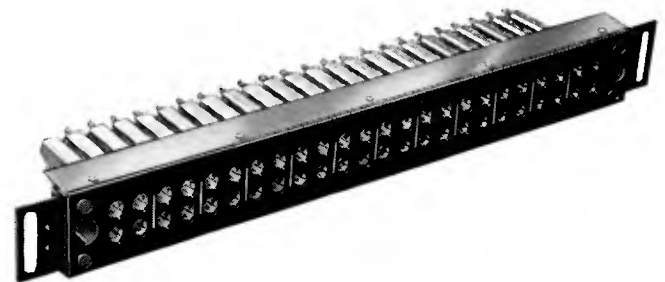
1. **Easily wired ground terminals.** The jacks used on these Jack Strip assemblies are provided with *special off-set sleeve (or grounding) terminals*, so designed that the sleeve terminals fall in a line down the center of the assembly when two rows of jacks are mounted on the strip. This makes it possible to ground all sleeves by simply passing a single straight length of bus wire through all sleeve terminals, thus effecting a saving in labor, time and wiring space.



2. **Increased strength.** The two-sided construction of this jack adds rigidity, lessening the possibility of wire breakage, and makes a smoother operating Jack-Strip assembly.
3. **Easily mounted.** The vertically slotted end mounting brackets permit some vertical movement of the jack strip. This facilitates the mounting of the strip when used in conjunction with odd sized rack mounted equipment.
4. The PV-14-A Card Holder Kit is available for labeling of the Jack Strips where the strips are to be mounted within the rack instead of front flush mount.

DESCRIPTION

The FA-2-A Jack Strip consists of 48 jacks, mounted in two rows on heavy black Textolite board. All jacks



Type FA-2-A Jack Strip

are of the tip and sleeve type with an additional normally closed contact making the jack suitable for use on "normalled through" circuits.

Jacks are mounted on $\frac{5}{8}$ -inch horizontal centers so as to mate properly with G-E Patch Cords (Types FA-7-A, B & C) and other manufacturers' standard, double-plug patch cords.

MECHANICAL SPECIFICATIONS

Dimensions:

Height	2 $\frac{1}{8}$ in.
Width	18 $\frac{3}{16}$ in.
Depth	3 $\frac{5}{8}$ in. approx.

Weight: 5 $\frac{1}{2}$ lbs.

Mounting: Mounting brackets at the end of the strip are vertically slotted to fit a standard 19-inch RETMA cabinet or relay rack. Two No. 12-24 screws are supplied to mount each Jack Strip. Jack Panels, Type FA-3-A, -B, and -C, may be used with the FA-2-A to provide designation cards above and below each jack pair.

ELECTRICAL SPECIFICATIONS

Number of Jack Pairs:	24
Type of Jack:	Tip and sleeve with normalled-through contact

ORDERING INFORMATION

When ordering, please specify:
Type FA-2-A Jack Strip.

ACCESSORIES

- PV-14-A Card Holder Kit
- FA-7-A B/C 2, 4 or 6 foot Patch Cords
- FA-3-A, B/C Single, Double or Triple Jack Panels



Equalizer Panel, Type FA-14-A

APPLICATION

The Type FA-14-A Equalizer Panel is designed to equalize the non-linear characteristics of one or two non-loaded telephone lines for substantially flat frequency response to 10,000 or 15,000 cycles per second, depending on line characteristics and termination. The FA-14-A would normally be used on lines which are not continuously operating and thus do not require the permanent installation of a fixed equalizer.

FEATURES

1. Provides equalization for two lines.
2. Front-panel adjustment in steps of 3 db.
3. Equalizes short lines up to 15,000 cycles—longer lines up to 10,000 cycles.
4. Simple clamp-type mount permits flexibility of mounting on any standard rack.

MECHANICAL SPECIFICATIONS

Dimensions:

Height	3 ¹⁵ / ₃₂ "
Width	19"
Depth	4 ¹⁵ / ₁₆ "
Weight:	5 lbs.

Mounting: The Equalizer Panel is designed for vertical mounting on a standard 19-inch RETMA relay or cabinet rack. A clamp-type mounting, not visible from the front, is provided to mount the panel in any desired location on a rack.

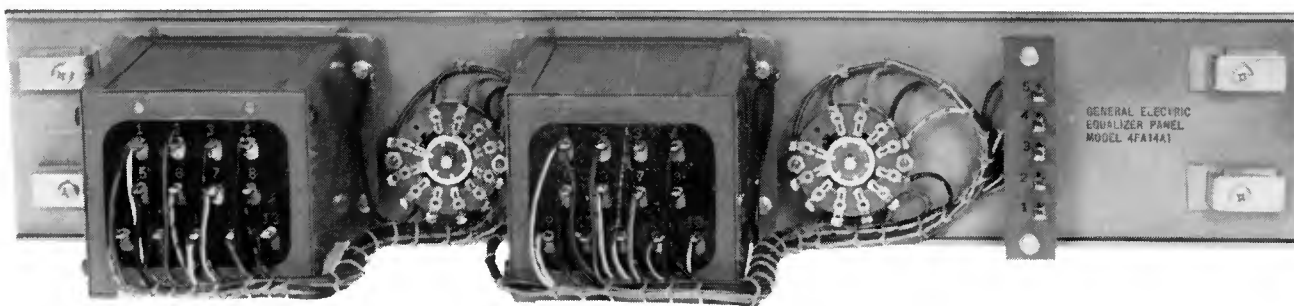
ELECTRICAL SPECIFICATIONS

Type of Circuit: The FA-14-A consists of two separate and complete FA-14-B Equalizers mounted on a single panel. Parallel-resonant circuits consisting of a capacitor, a reactor, and logarithmically tapered resistances are used in each equalizer unit. These resistances are selected by a rotary switch located on the front panel. Input and output connections of the FA-14-A are available on terminal boards.

The electrical specifications for each of the sections of the Equalizer Panel are the same as the specifications for the Equalizer Unit, Type FA-14-B.

ORDERING INFORMATION

When ordering, please specify:
Type FA-14-A Equalizer Panel.



Equalizer Panel, Type FA-14-A, rear view

Equalizer Unit, Type FA-14-B

APPLICATION

The Type FA-14-B Equalizer Unit is a semi-fixed unit recommended for use on lines which are permanently

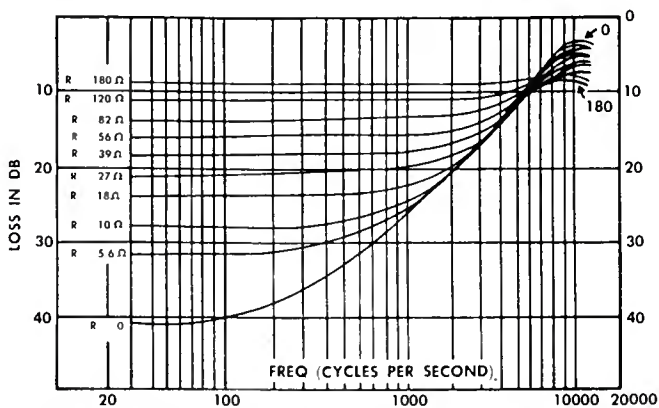
installed and continuously used, such as studio-to-transmitter lines and remote or "nemo" lines. It is designed to equalize non-linear characteristics of non-loaded telephone lines for substantially flat frequency response up to 10,000 or 15,000 cycles per second, depending on line characteristics and terminations.



Equalizer Unit, Type FA-14-B

FEATURES

1. Equalizes up to 10,000 or 15,000 cycles depending on line length and termination.
2. Easily connected for equalization in steps of 3 db or less.
3. Small size allows flexibility of mounting.



Frequency Characteristics, 600 Ohm Source and Load

MECHANICAL SPECIFICATIONS

Dimensions:

Height	3 $\frac{3}{8}$ " (2 Rack Units)
Width (including mounting)	3 $\frac{7}{8}$ "
Depth	3"
Weight:	1 $\frac{1}{2}$ lbs.

Mounting: Mounting flanges on the bottom of the case make it adaptable for mounting on any flat surface.

ELECTRICAL SPECIFICATIONS

Type of Circuit: The FA-14-B consists of a reactor, a capacitor, and associated resistors mounted in a rectangular metal case. A solder-lug terminal board is provided on one end of this case for adjusting the resistance and for connecting the unit to the line.

Line Impedance: 600 or 150 ohms

Equalization Ability (dependent on line length):

Line Termination 150 ohms:	30 to 15,000 cps.
Line Termination 600 ohms:	30 to 10,000 cps.

Insertion Loss (600-ohm source and load):

(See Frequency Characteristics curve.)

R = 0 ohms:	41-db max at 30 cycles, 2.5-db min at 11,000 cycles
R = 180 ohms:	8-db max at 30 cycles, 7-db min at 11,000 cycles

Equalization Range: Refer to Frequency Characteristics curve.

ORDERING INFORMATION

When ordering, please specify:
Type FA-14-B Equalizer Unit.



APPLICATION

The Type FA-18-A Sound Effects Filter Panel provides control of program bandwidth, thus enabling the user to obtain unusual dramatic sound effects. Speech and music may be made "bassy" or "tinny" and "telephone-quality" effects may be simulated.

FEATURES

1. Simple control of desired bandwidth.
2. Gives variety of "bassy" or "tinny" effects.
3. Telephone conversation effect may be created.
4. Helps to eliminate static from overseas or short-wave pickups and rebroadcasts. Clarifies speech intelligence.
5. Easy installation and operation.
6. Telephone-type key permits instant switching in or out of audio circuit.

DESCRIPTION

The FA-18-A consists of adjustable high- and low-pass filter sections mounted on a panel. Each of the filters are connected to a variable cutoff frequency-selector switch controlled by a front-panel knob. Each switch has eight cutoff positions (100, 250, 1000, 2000, 3000, 4000 and 5000 cycles) and an OFF position. A key switch is provided to connect or disconnect the filter

circuit so that the filter may be preset at any time for desired characteristics and inserted in the circuit when required.

MECHANICAL SPECIFICATIONS

Dimensions:

- Height 5 ⁷/₃₂" (3 Rack Units)
- Width 19"
- Depth (including front panel control) 8 ⁵/₃₂"

Weight:

9 lbs.

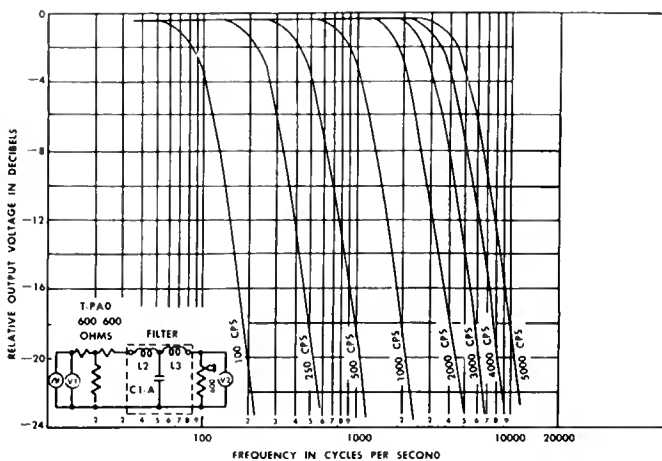
Mounting: The Sound Effects Filter Panel is designed for vertical mounting on a standard 19-inch relay or cabinet rack. A clamp-type mounting, not visible from the front, is provided to mount the panel in any desired location on a rack.

ELECTRICAL SPECIFICATIONS

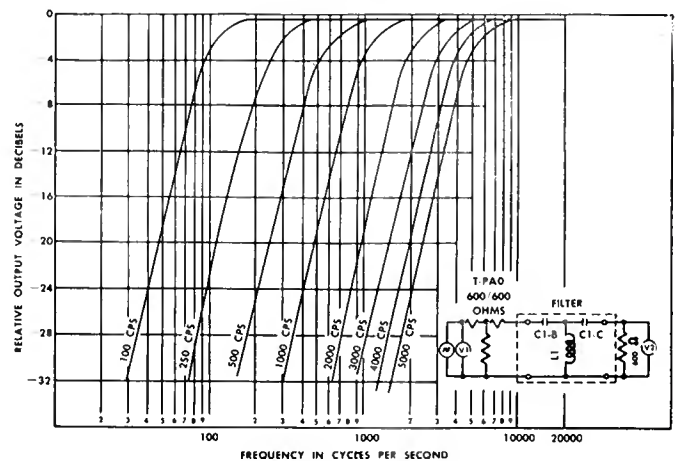
- Source Impedance: 600 ohms (unbalanced)
- Operating Level: -40 to +20 dbm
- Load Impedance: 600 ohms (unbalanced)
- Insertion Loss: 1 db or less at passed frequencies.

ORDERING INFORMATION

When ordering, please specify:
Type FA-18-A Sound Effects Filter Panel.



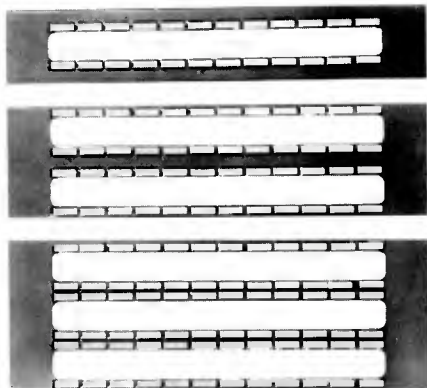
Typical Attenuation Characteristics of High-frequency Cut-off Section of FA-18-A



Typical Attenuation Characteristics of Low-frequency Cut-off Section of FA-18-A

Jack Panels, Types FA-3-A (Single), FA-3-B (Double),
 FA-3-C (Triple)
 Patch Cords, Types FA-7-A (2'), FA-7-B (4'), FA-7-C (6')

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 August 1, 1955



From top, FA-3-A, FA-3-B and FA-3-C Jack Panels



Patch Cords, Types FA-7-A, B and C

DESCRIPTION

Jack Panels are available for covering one, two or three G-E Type FA-2-A Jack Strips.

Designation cards inserted behind clear plastic strips are mounted in card holders on each panel above and below each pair of jack openings.

SPECIFICATIONS

Type No.	Description	Height	Weight
FA-3-A	Single Jack Panel	3 1/2"	1 1/4 lbs.
FA-3-B	Double Jack Panel	5 7/8"	1 3/4 lbs.
FA-3-C	Triple Jack Panel	6 3/4"	2 lbs.

Mounting: A mounting is furnished with each panel to secure it to the Jack Strip so that no mounting screws will be exposed.

ORDERING INFORMATION

When ordering, please specify:
 Type FA-3... Jack Panel.

DESCRIPTION

General Electric Patch Cords consist of two insulated copper conductors shielded with tinned copper braid and covered with heavy black cotton braid. A six-inch length at either end is reinforced so that the two-conductor double plug may be securely mounted. The plug at either end is interchangeable with the W. E. Type 241-A double plug. The shield of the cord is connected to the sleeves of both plugs.

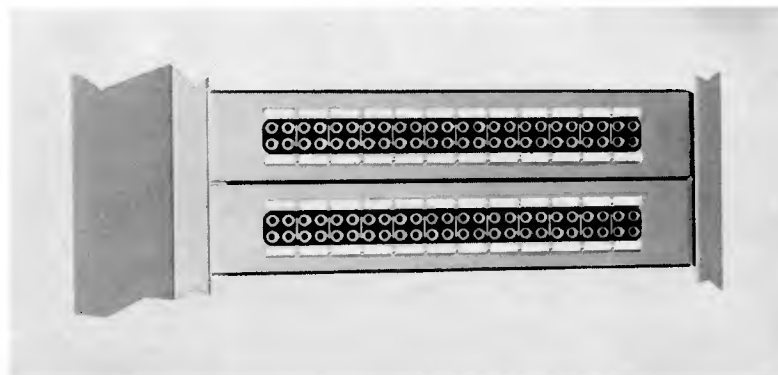
SPECIFICATIONS

General Electric Patch Cords are available in three sizes:

Type No.	Cord Length
FA-7-A	2 feet
FA-7-B	4 feet
FA-7-C	6 feet

ORDERING INFORMATION

When ordering, please specify:
 Type FA-7... Patch Cord.



Use of Jack Panel Provides a Neat Flush Mounting of Jack Strips in a Rack

Line-To-Line Transformer, Type FA-40-B
 Bridging-To-Line Transformer, Type FA-41-C
 Line-To-Voice Coil Transformer, Type FA-42-A

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 August 1, 1958
 Supersedes E211.74—8/1/55



MECHANICAL SPECIFICATIONS

Dimensions: (Over-all):
 Height 3 1/8" maximum
 Width 2 1/16" maximum
 Depth 2 5/8" maximum
 Weight: Approx. 1 3/4 lbs.
 Mounting: # 6-32-8 tapped inserts.

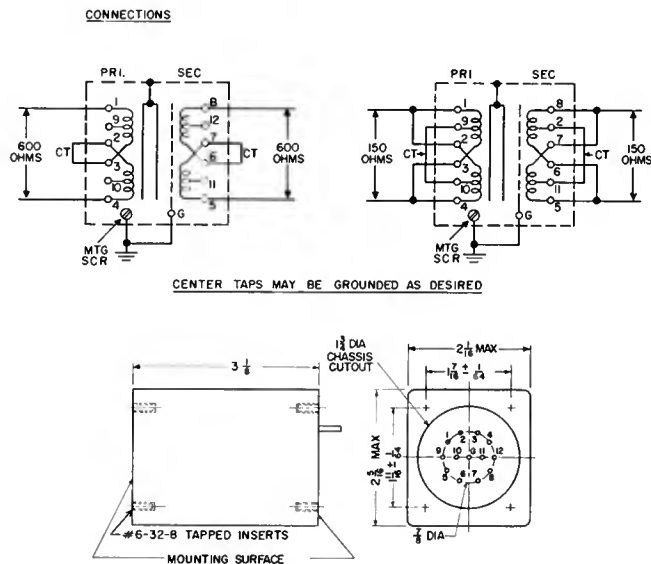
G-E Line-To-Line Transformer, Type FA-40-B

APPLICATION

The FA-40-B Line-To-Line Transformer is designed for use as a high quality repeat coil in telephone lines, or for isolation and impedance-matching in output circuits of low- and medium-level amplifiers.

ORDERING INFORMATION

When ordering, please specify:
 Type FA-40-B Line-To-Line Transformer.



Installation Drawing for FA-40-B Transformer

APPLICATION

The FA-41-C Bridging-To-Line Transformer is designed for use in connecting a 600- or 150-ohm device across a low-impedance program circuit without appreciably affecting the performance of that circuit.

MECHANICAL SPECIFICATIONS

Dimensions: (Over-all):

Height $3\frac{1}{4}$ "
 Width $2\frac{1}{16}$ "
 Depth $2\frac{5}{16}$ "
 Weight: Approx. $\frac{3}{4}$ lb.
 Mounting: $\frac{1}{4}$ "—#6-32 tapped inserts.

ELECTRICAL SPECIFICATIONS

Frequency Range: In excess of 50 to 15,000 cycles, $\pm 1\frac{1}{2}$ db.
 Impedances: 20,000 ohms to 600 ohms.
 5,000 ohms to 150 ohms.
 Maximum Operating Level: +15 dbm at 50 cycles on secondary (corresponds to approx. 38 volts on 20,000-ohm primary).
 Bridging Loss: 19 db. (See drawing below.)
 Connections: See drawing below.

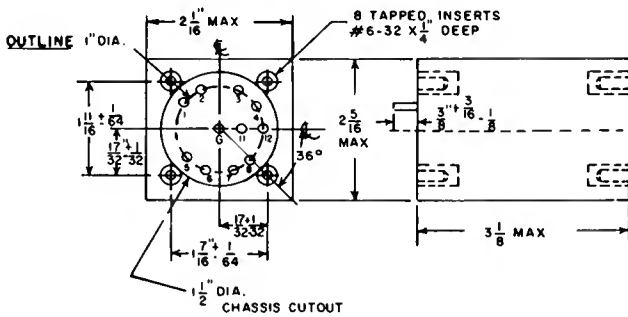
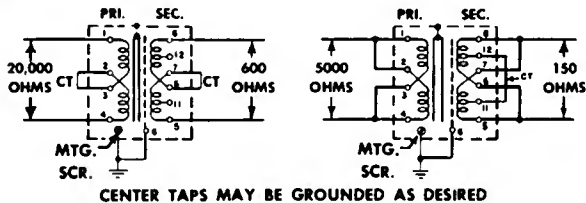


G-E Bridging-To-Line Transformer, Type FA-41-C

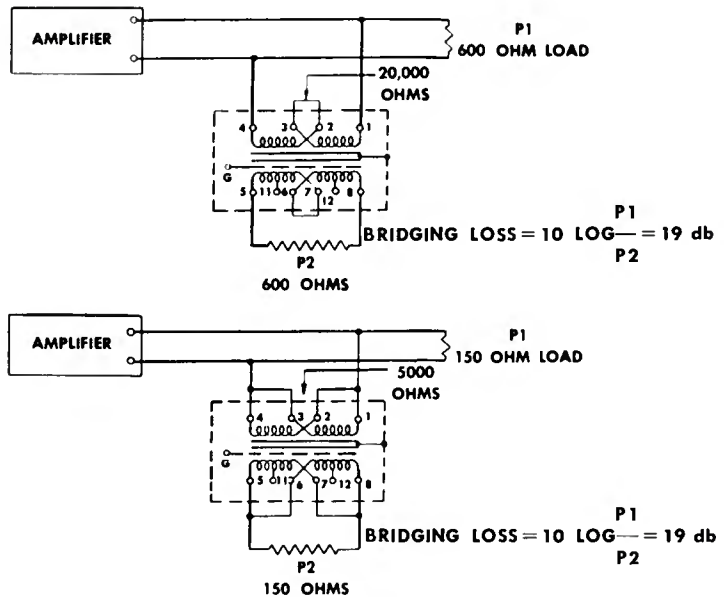
ORDERING INFORMATION

When ordering, please specify:
 Type FA-41-C Bridging-To-Line Transformer.

CONNECTIONS



BRIDGING LOSS:



Installation Drawing for FA-41-C Transformer

APPLICATION

The General Electric Type FA-42-A Line-to-Voice Coil Transformer is designed to match a 600 ohm amplifier output to single or multiple speaker voice coils. It is provided, for this purpose, with multiple primary and secondary taps.

FEATURES

1. **Multiple primary taps.** Permits paralleling of speakers across a single output.
2. **Multiple secondary taps.** Permits use of transformer with all common voice coil impedances.
3. **Terminal impedances clearly marked.** All terminal impedances are clearly marked on the coil adjacent to the terminal.
4. **Frame bright plated to resist corrosion.**

DESCRIPTION

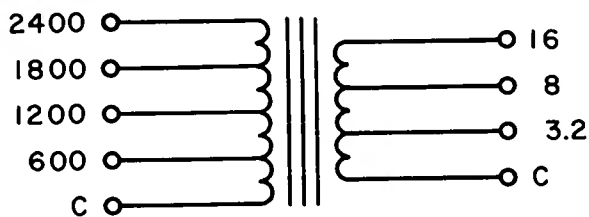
The General Electric Type FA-42-A Line-to-Voice Coil Transformer utilizes core and coil construction with solder lug type terminals.

Multiple primary terminals permit the use of from one to four speakers across the output of any 600 ohm amplifier.

Multiple secondary terminals permit the proper matching of any speaker with a voice coil impedance range of from 3.2 ohms to 16 ohms. Three taps are provided for this purpose.

All terminals are situated on the coils and are clearly marked for ready identification of their impedances.

TRANSFORMER CIRCUIT



Line-To-Voice Coil Transformer, Type FA-42-A

MECHANICAL SPECIFICATIONS

Units: 1—FA-42-A Line-to-Voice Coil Transformer.

Dimensions:

Over-all Height 2"
 Over-all Width $2\frac{3}{8}$ "
 Over-all Length $3\frac{1}{4}$ "

Weight: 14 oz.

Mounting Holes: Two— $\frac{3}{16}$ " diameter on $2\frac{1}{16}$ " centers.

Connections: Solder type terminals, protruding from coil.

Markings: Terminal impedances marked adjacent to them on coil surface.

Construction: Open frame, core and coil construction.

ELECTRICAL SPECIFICATIONS

Performance:

Frequency Response: ± 2 db, 60-8000 cps.

Power Handling Capacity: 5 watts with less than 3% distortion.

Primary Impedances: 600/1200/1800/2400 ohms.

Secondary Impedances: 3.2/8/16 ohms.

ORDERING INFORMATION

When ordering, please specify:

FA-42-A Line-to-Voice Coil Transformer.

**Broadcast Shelves,
Types FA-23-B, FA-23-C and FA-46-A**

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August 15, 1958
Supersedes E211.75-4/1/56



Front view of FA-23-B Shelf.

APPLICATION:

FA-23-B and FA-46-A

The General Electric Type FA-23-B Broadcast Shelf is designed to mount in a standard EIA 19" cabinet or relay rack. This shelf, occupying only seven inches of vertical rack space, provides mounting space for General Electric plug-in audio amplifiers in any of the following combinations:

- Six BA-1-F Pre-Amplifiers, or
- Four BA-9-A Uni-Level Amplifiers, or
- Four BA-12-C Program/Monitor Amplifiers, or
- Two BA-3-A Equalized Transcription Pre-Amplifiers, or
- Two BP-10-B Power Supplies.

Combinations of the various units are possible such as mounting three BA-1-F Pre-Amplifiers and two BA-12-C Program/Monitor Amplifiers or two BA-9-A Uni-Level Amplifiers on a single FA-23-B Shelf.

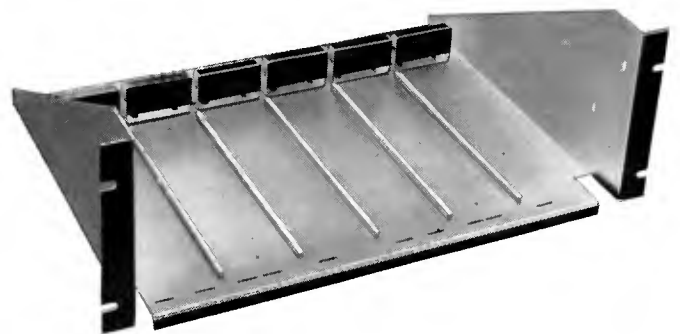
The plug-in audio equipment may be easily inserted in or withdrawn from the mating receptacles mounted on the shelf. An extractor tool, clipped to the shelf door, aids in quick removal of amplifiers through the front of the rack.

The General Electric Type FA-46-A Broadcast Shelf is identical to the unit just described less the front panel and hinges.

FA-23-C

The General Electric Type FA-23-C Broadcast Shelf is designed to permit rack mounting of the General Electric Type BA-14-A Program/Monitor Amplifiers. This shelf, similar in appearance, size, and function to

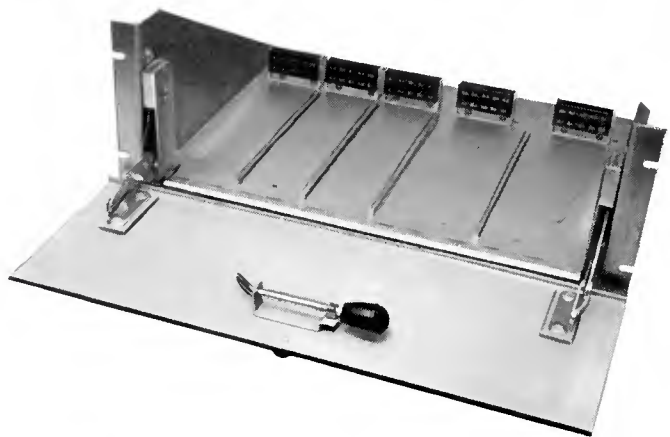
the FA-23-B Broadcast Shelf, differs in that the front panel of the FA-23-C Shelf contains four holes with plug buttons, control decals for the operating controls, and the indicating light jewels of the BA-14-A Program/Monitor Amplifier. If a front panel volume control is not required, the BA-14-A can be mounted in a FA-23-B Shelf. Both shelves are furnished with the same number of mating Jones receptacles and spacer bars.



Front view of FA-46-A Shelf.

FEATURES:

1. **Easy to service and maintain.** Hinged front panels permit easy, quick replacement of amplifiers, or power supplies.
2. **Space saving.** Construction of shelf, occupying only seven inches of vertical rack space, permits many ampli-



Front view of FA-23-B Shelf, with front panel open.

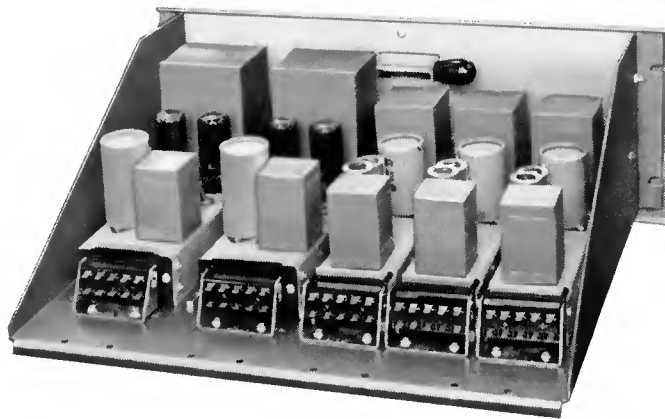
fier combinations to be compactly mounted in a small area.

3. **Improved rack appearance.** Door, when closed, covers all shelf mounting hardware. Shelf panel matches other General Electric rack mounted audio panels.

4. **Easy amplifier replacement.** Extractor tool, clipped to inside of front panel, permits rapid and easy withdrawal of amplifiers for maintenance or service.

5. **FA-23-C panel adapted for mounting of controls and indicating light jewels.** FA-23-C Shelf is equipped with shaft extensions for BA-14-A controls. Front panel is equipped with two control scales and plug buttons for both the controls and indicator light jewels.

6. **Mounts many amplifier combinations.** Spacer bars and mating receptacles may be mounted in any desired manner to permit use of different types of General Electric audio amplifiers. Shelf base is drilled to mount spacer bars and receptacles.



Rear view of FA-23-B Shelf, showing mounted BA-1-F and BA-12-C Amplifiers.

DESCRIPTION:

The General Electric Type FA-23-B, FA-23-C and FA-46-A Broadcast Shelves are designed to mount the General Electric line of plug-in audio amplifiers and power supplies in standard 19" EIA cabinet or relay racks. Through the use of these shelves, from two to six amplifiers or power supplies (depending upon the type) may be mounted in only seven inches of rack space.

These shelves are identical in construction, size and appearance except for the addition of four holes (with plug buttons furnished) and two scales on the front panel of the FA-23-C Shelf and the lack of front panel and hinges on the FA-46-A.

All models are equipped with five spacer bars, six 10-pin Cinch-Jones 2400 series receptacles, and special brackets. The bases of the shelves are drilled to permit mounting the spacer bars and receptacles in different configurations. Both the spacer bars and receptacle brackets are drilled and tapped for this purpose.

Essentially the shelves consist of a drilled, horizontal plate, two mounting flanges, and a spring loaded, hinged front panel. The mounting flanges, an integral part of the horizontal base, are folded up vertically and are notched with standard EIA slots for rack mounting in a 19" cabinet or rack. A clip mounted on the inside of the front panel of the FA-23-B and FA-23-C holds the extractor tool for ready use whenever it becomes necessary to remove or insert an amplifier or power supply.

All steel parts are given a rust-proof plating of cadmium.

The front panel of the FA-23-B Shelf is painted a Dark Metalustre Blue and is devoid of holes or control designations.



Front view of FA-23-C Shelf, showing front panel control of mounted BA-14-A Amplifiers.

The front panel of the FA-23-C Shelf is painted a Dark Metalustre Blue, and in addition, is provided with four holes and two calibrated scales. These holes and scales are used for mounting the two indicator light jewels and for passage of the extension shafts of volume controls in the BA-14-A Program/Monitor Amplifiers. The knobs furnished are the push-on type permitting ready insertion or removal of the knobs whenever it becomes necessary to open the front panel.

A shelf utilizes fourteen inches of space between the rear of the front mounting surface and the rear of the shelf. When these shelves are mounted in a General Electric Type PR-1-A cabinet rack, the #12-24 mounting screws (furnished) are hidden from sight by the exclusive General Electric rolled front panel and cabinet design, an important contribution to the neat appearance of your control or equipment room.

MECHANICAL SPECIFICATIONS:

Units:

FA-23-B

- 1—FA-23-B Shelf.
- 5—Drilled and tapped spacer bars, with screws.
- 6—Cinch-Jones S-2410 10-pin female connectors with special shelf mounting brackets.
- 1—Extractor tool.
- Mounting screws.

FA-46-A2

As above less extractor tool, front panel and hinges.

FA-23-C

- 1—Shelf with panel plug buttons and two calibrated scales.
- 2—Extension shafts.
- 2—Control knobs and springs.



Rear view of FA-23-C Shelf, showing mounted BA-14-A Amplifiers.

- 5—Drilled and tapped spacer bars, with screws.
- 6—Cinch-Jones S-2410 10-pin female connectors with special shelf mounting brackets.
- 1—Extractor tool.
- Mounting screws.

Dimensions:

- Height: $6\frac{5}{16}$ " (4 Rack units)
- Width: 19"
- Depth: $13\frac{9}{16}$ "
- Weight: 9 lbs.

Mounting:

FA-23-B, FA-23-C and FA-46-A Shelves bolt to the front of the cabinet or relay rack with #12-14 round head screws (furnished). They may be mounted in any standard 19" width cabinet or relay rack with at least 14" clearance between the front panel and the rear door.

Finish:

Front panel—G-E Dark Metalustre Blue.
Shelf base and hardware—cadmium plated for rust prevention.

ORDERING INFORMATION:

When ordering please specify:
_____General Electric Type FA-23-B Broadcast Shelf. (Type number includes shelf, panel, spacers, connectors and brackets, extractor tool, mounting screws and Installation Instructions.)

OR

_____General Electric Type FA-23-C Broadcast Shelf. (Type number includes shelf, panel with scale and plug buttons, spacers, connectors and brackets, extractor tool, extension shafts, push-on knobs, and Installation Instructions.)

OR

_____General Electric Type FA-46-A Broadcast Shelf. (Type number includes shelf, spacers, connectors and brackets, mounting screws and Installation Instructions.)

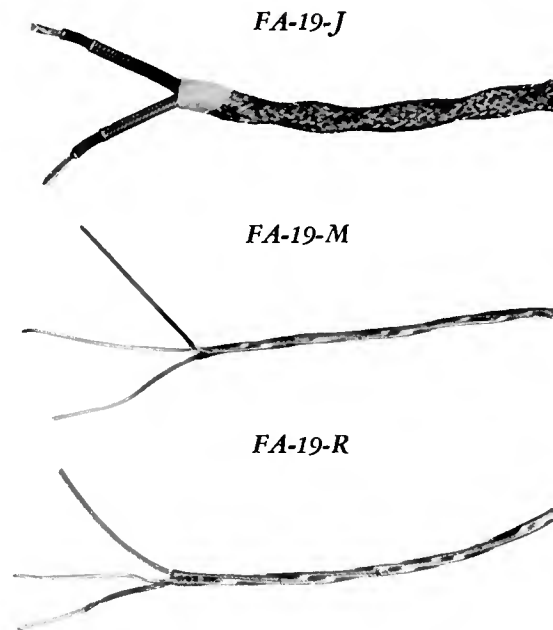
INTERCONNECTING CABLES

Twin #16 Stranded, Type FA-19-J

Twin #22 Solid, Type FA-19-M

Twin #22 Stranded, Type FA-19-R

Section E211 Page 76
Broadcast Equipment Data Book
February 15, 1958
Supersedes E211.76-4/1/55



APPLICATION

Interconnecting Cables, Types FA-19-J, FA-19-M, and FA-19-R are used for power, audio, or circuit control connections. Each of the three types has special characteristics and recommended uses. All of the three cables are designed and manufactured to give long, efficient, trouble-free service. The FA-19-M and FA-19-R Cables have been made with very small outside diameters to permit their use in large numbers in small conduits or other small-diameter wiring channels.

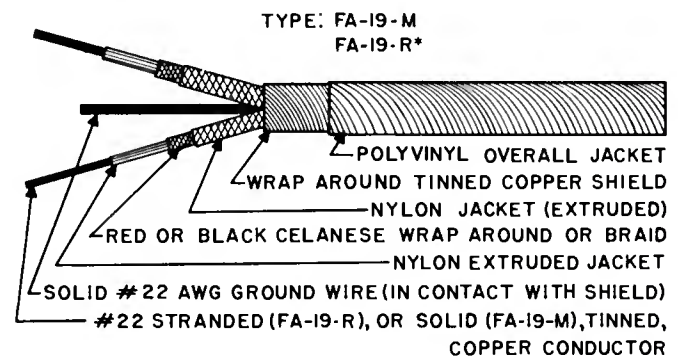
FEATURES

1. Small outside diameter of FA-19-M and FA-19-R enables use of greater number of cables in a small conduit. Outside diameter only 0.152 inches.
2. Easily stripped and prepared for soldering.
3. Third bare conductor in full length contact with shield provides excellent grounding in audio cables (FA-19-M and FA-19-R). No need to solder ground to shield.
4. Wrap-around shield in audio cables easily removed during making of connection. No need to fray out shield as with braided type.
5. Audio cables insulated from each other by over-all polyvinyl jackets on each cable. Permits common grounding at one point.
6. Sold in 500-foot, non-returnable spool lots.

DESCRIPTION

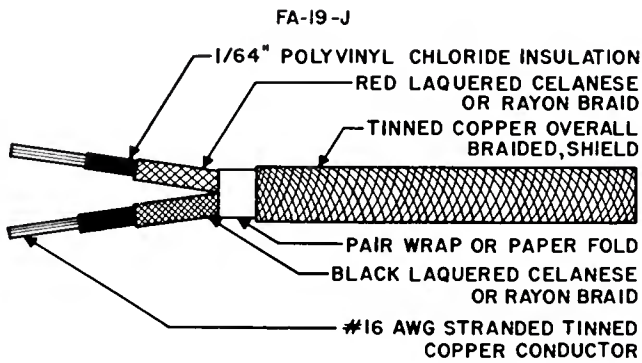
Types FA-19-M and FA-19-R Interconnecting Cables are small-diameter, two-conductor, shielded cables de-

signed for use in low or intermediate level audio circuits. Both cables are No. 22 AWG two-conductor, shielded with over-all nylon jackets. The FA-19-M employs solid conductors, while the FA-19-R uses stranded conductors. A unique feature of these two cables is the third, bare ground wire included under the shielding and in contact with it for the entire length of the cable.



*Utilizes stranded bare ground wire.

The FA-19-M is recommended for general-purpose audio wiring within ducts, conduits, and cabinets, where vibration is at a minimum. The FA-19-R is recommended for use inside cabinet racks where some vibration or occasional wire movement can be expected. Both cables afford ground control by permitting the shield to be grounded only at those points desired. Both are capable of carrying 1.8 amperes at 400 volts DC.



The FA-19-J Interconnecting Cable is a medium-diameter, two-conductor shielded cable designed for use in power and high-level audio circuits. Primarily intended for handling power, this cable is composed of two No. 16 AWG stranded conductors with heavy insulation and an over-all braided, tinned copper shield. This cable is recommended for power use up to 8.0 amperes at 600 volts and for use in high-level audio circuits where shielding is desired, as in ducts, conduit, and cabinets.

SPECIFICATIONS—MECHANICAL AND ELECTRICAL

FA-19-J: 2 No. 16 AWG, stranded, tinned copper conductors with $\frac{1}{64}$ -inch, black polyvinyl chloride insulation on each conductor. One conductor covered with black lacquered celanese or rayon braid; second conductor

covered with red lacquered celanese or rayon braid. The two conductors are twisted and given a pair wrap or paper fold, with a tinned copper, braided over-all shield. Length per spool, 500 feet. Rated voltage: 600 volts DC at 8 amperes. Outside diameter: 0.245 inches.

FA-19-M: 2 No. 22 AWG, solid, tinned copper conductors with nylon extruded insulation. One conductor has a black celanese wrap; second conductor has red celanese wrap. A nylon jacket is extruded over the celanese wrap of each conductor. One No. 22 solid, tinned copper ground wire is twisted with the two identified conductors and the whole included in a wrapped, tinned copper shield. A polyvinyl jacket covers over-all. Cable is furnished on 500-foot spools. Rated voltage: 400 volts DC at 1.8 amperes. Outside diameter: 0.152 inches.

FA-19-R: 2 No. 22 AWG, stranded, tinned copper conductors with nylon extruded insulation. One conductor covered with black celanese wrap; second conductor covered with red celanese wrap. Over the celanese wraps on each conductor is extruded a nylon jacket. One No. 22, stranded, tinned copper ground wire is twisted with the two identified conductors and the whole included in a wrapped, tinned copper shield. A polyvinyl jacket covers over-all. Cable is furnished on 500-foot spools. Rated voltage: 400 volts DC at 1.8 amperes. Outside diameter: 0.52 inches.

ORDERING INFORMATION

When ordering, please specify:

Type No. FA-19..... Interconnecting Cable;
.....feet;spools.

RECOMMENDED NUMBER OF CABLES IN ONE CONDUIT

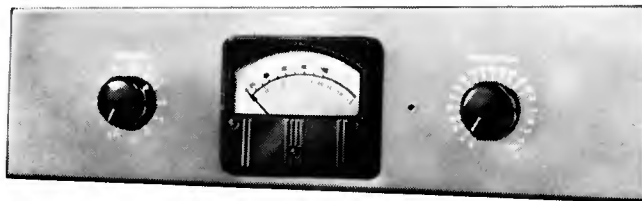
Conduit Size (Nominal)

Cable Type	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/4"
FA-19-J	2	4	7	13	17	28	40	62	83	107	135
FA-19-M	6	10	17	28	38	63	88	138	185	238	300
FA-19-R	6	10	17	28	38	63	88	138	185	238	300

Program Level Indicator Panel, Type FA-1-A Switch and Fuse Panel, Type FA-4-A

Section E211.77
Broadcast Equipment Data Book
April 1, 1955

1. Program Level Indicator Panel, Type FA-1-A



PROGRAM LEVEL INDICATOR PANEL,
TYPE FA-1-A

APPLICATION

The Type FA-1-A Program Level Indicator Panel provides a means of measuring accurately the program level of up to ten 600-ohm audio lines. The level of lines having other impedances may be measured by applying suitable correction factors. Program-level readings obtained with this unit are in "volume units" (VU). When used to make steady-state, single-frequency measurements, the readings obtained are in dbm.

FEATURES

1. Measures levels from +4 to +42 VU.
2. May be switched to any of ten program lines.
3. Uses large size, illuminated standard VU meter.
4. Clamp-type mounting for easy installation.

DESCRIPTION

The unit includes a two-circuit, ten-point selector switch (plus an OFF position), a variable step-type attenuator which provides readings of from +4 to +42 VU (or dbm) in 2-db steps, a VU meter, and a calibrating potentiometer for making a fine adjustment of the level reading over a range of $\pm 1/2$ dbm. The illuminated VU meter has two scales: the upper scale is calibrated in percent, ranging from 0 to 100; the lower scale is calibrated in VU, ranging from -20 to +3. A source of 6.3 volts at 0.3 amp is required for illumination.

MECHANICAL SPECIFICATIONS

Dimensions

Height	5 $\frac{7}{8}$ in. (3 RU)
Width	19 in.
Depth	3 $\frac{3}{8}$ in.
Weight	4 $\frac{1}{2}$ lbs.

Mounting: The unit mounts on a standard 19-inch RETMA relay or cabinet rack. A clamp-type mounting, which is not visible from the front, is provided to mount the panel in any desired location on the rack.

VU Scale: "B" Scale

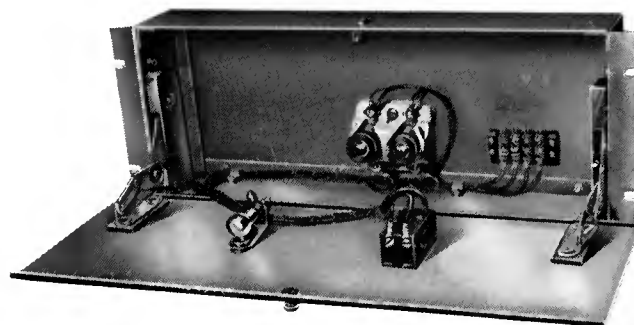
ELECTRICAL SPECIFICATIONS

Input Impedance	7500 ohms
Measurement Range (600-ohm lines)	+4 to +42 VU (or dbm) in 2-db steps
Number of Lines That May Be Measured	1 to 10, inclusive

ORDERING INFORMATION

When ordering, please specify:
Type FA-1-A Program Level Indicator Panel.

2. Switch and Fuse Panel, Type FA-4-A



SWITCH AND FUSE PANEL, TYPE FA-4-A
(FRONT PANEL OPEN)

APPLICATION

The Type FA-4-A Switch and Fuse Panel provides a master power switch, indicator lamp and fuse protection for an entire cabinet or relay rack.

FEATURES

1. Easy access to fuse block through hinged-front panel.
2. Unused surface on removable back plate readily fitted with additional equipment.
3. Attractively styled for any cabinet mounting.

DESCRIPTION

Power circuits running through the FA-4-A are activated by the switch. Dual fuses protect equipment from surges and shorts in the power line. The panel light indicates that the line is in use, or, with switch on and light out, indicates circuit trouble. The hinged-front panel allows easy access to the fuse block on the inside back plate for inspection or replacement of fuses. Two fuses of the screw-plug type are required, but are not furnished since their rating depends upon the load to be protected. On the removable back plate are approximately 100 square inches of unused surface which may be used to mount additional terminal distribution blocks, filament or line transformers, line pads, equalizers, relays, and so forth. A $\frac{1}{8}$ -inch diameter hole is provided at each end of the chassis for connecting external wires.

MECHANICAL SPECIFICATIONS

Dimensions

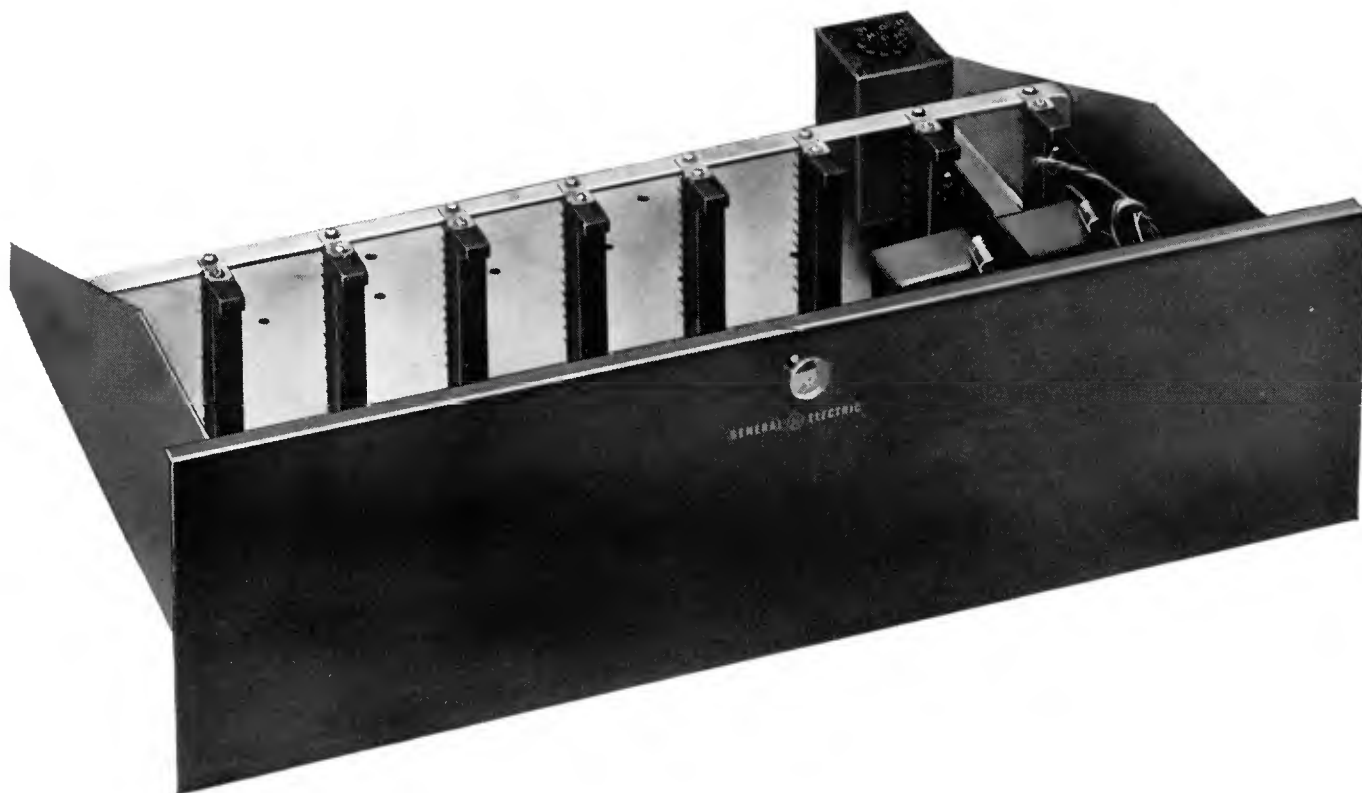
Height	6 $\frac{31}{32}$ in. (4 RU)
Width	19 in.
Depth (behind panel)	3 $\frac{1}{4}$ in.
(over-all)	4 $\frac{5}{16}$ in.
Weight:	5 $\frac{1}{2}$ lbs.

ELECTRICAL SPECIFICATIONS

Switch	DPST, 20 amps, 125 v
Fuses (not furnished)	Plug type; rating dependent on equipment to be protected; 20 amps maximum
Lamp	Mazda # 6S6, 120 v, 6 watts

ORDERING INFORMATION

When ordering, please specify:
Type FA-4-A Switch and Fuse Panel.



Broadcast Shelf, Type FA-49-A1

APPLICATION

The General Electric Shelf, Type FA-49-A1 is designed for mounting the General Electric transistorized, plug-in Pre-Amplifiers, Type 4BA-20-A1, and the Line-to-Line Transformers, Type 4FA-47-A1. This shelf occupies five and one quarter inches of vertical rack space and is equipped with receptacles and mounting slots to accommodate the mounting of eight Pre-Amplifiers and mounting holes for the eight Line-to-Line Transformers.

FEATURES

- Fits any standard rack. The Type FA-49-A1 Broadcast Shelf is designed to fit 19" EIA cabinet rack.
- Easy to maintain and service. Hinged front panels permit easy, quick replacement of amplifiers.
- Space saving. Shelf occupies only 5¼ inches of rack space.

DESCRIPTION

The General Electric Type FA-49-A1 Broadcast Shelf is designed to mount the General Electric line of transistorized, plug-in Pre-Amplifiers, and Line-to-Line Transformers. This Shelf consists of a horizontal plate equipped with two vertical end-mounting brackets, a hinged front panel, eight plug-in connectors and two adhesive backed write-in strips. The end brackets are provided with mounting slots and screws for fastening

the Shelf in a standard 19-inch cabinet or rack. The hinged front panel covers the front of the Shelf and conceals the mounting screws. The Shelf must have at least 13½ inches clear depth between the front mounting surface and the rear door of a rack cabinet.

MECHANICAL SPECIFICATIONS

Dimensions:	Height	5¼"
	Width	19"
	Depth	13½"
	Weight	6 lbs.

Mounting: The Type FA-49-A1 Shelf bolts to the front of the cabinet or rack with #12-24 mounting screws (furnished). They may be mounted in any 19" wide cabinet or rack with at least 13½" clearance between the front panel and the rear door.

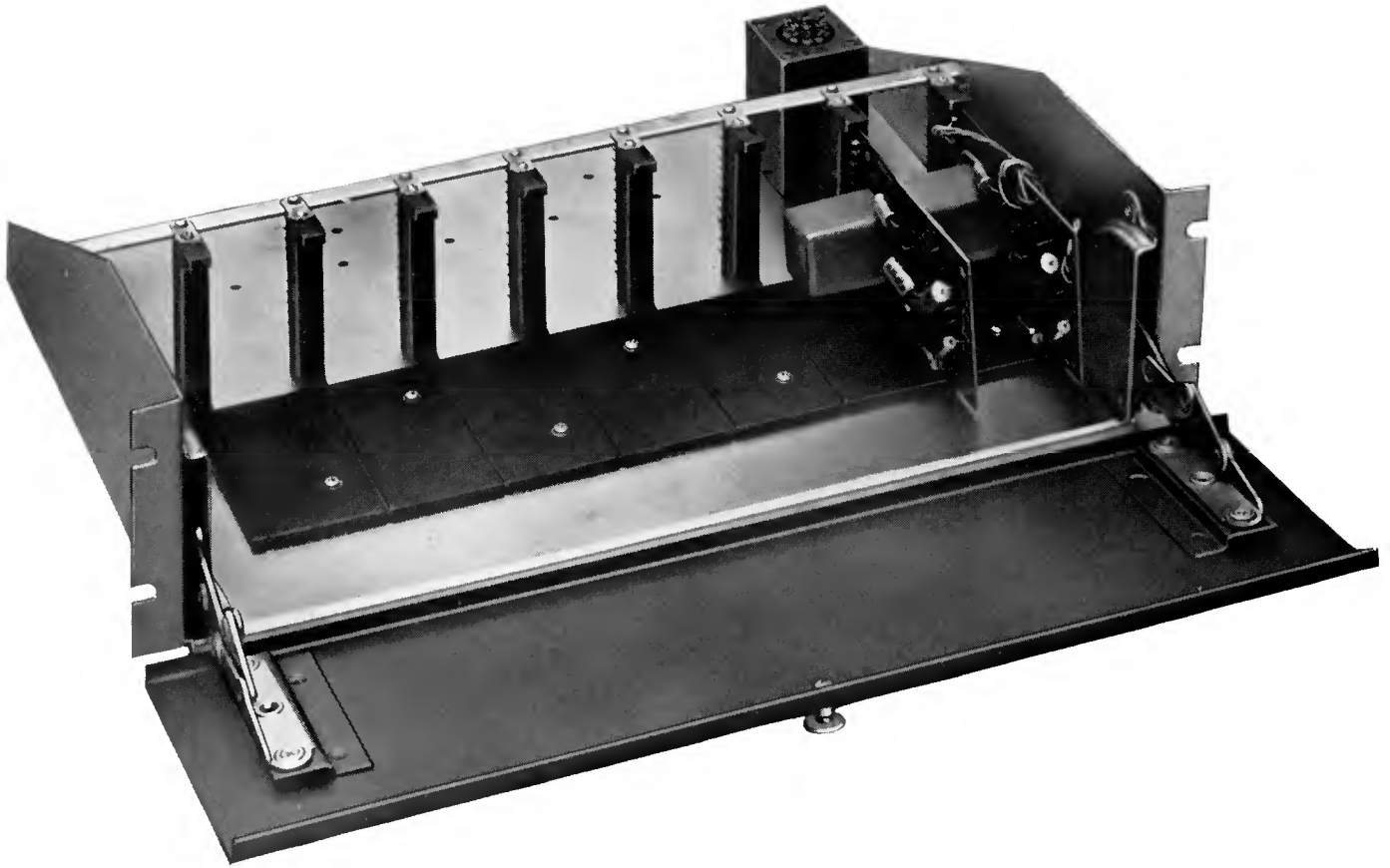
Finish: Front panel—G-E Dark Metalustre Blue outside and inside. Chassis—Cadmium plated.

ORDERING INFORMATION

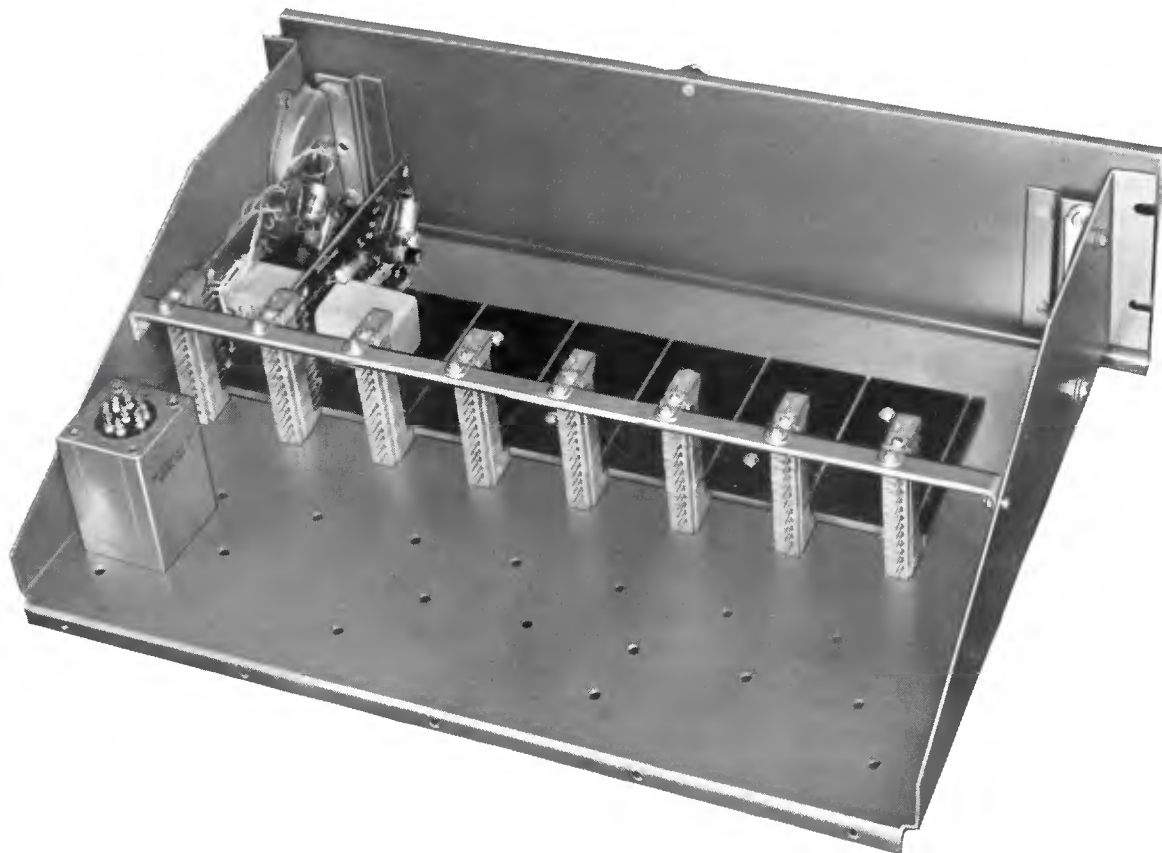
When ordering please specify: General Electric Type FA-49-A1 Broadcast Shelf.

ACCESSORIES

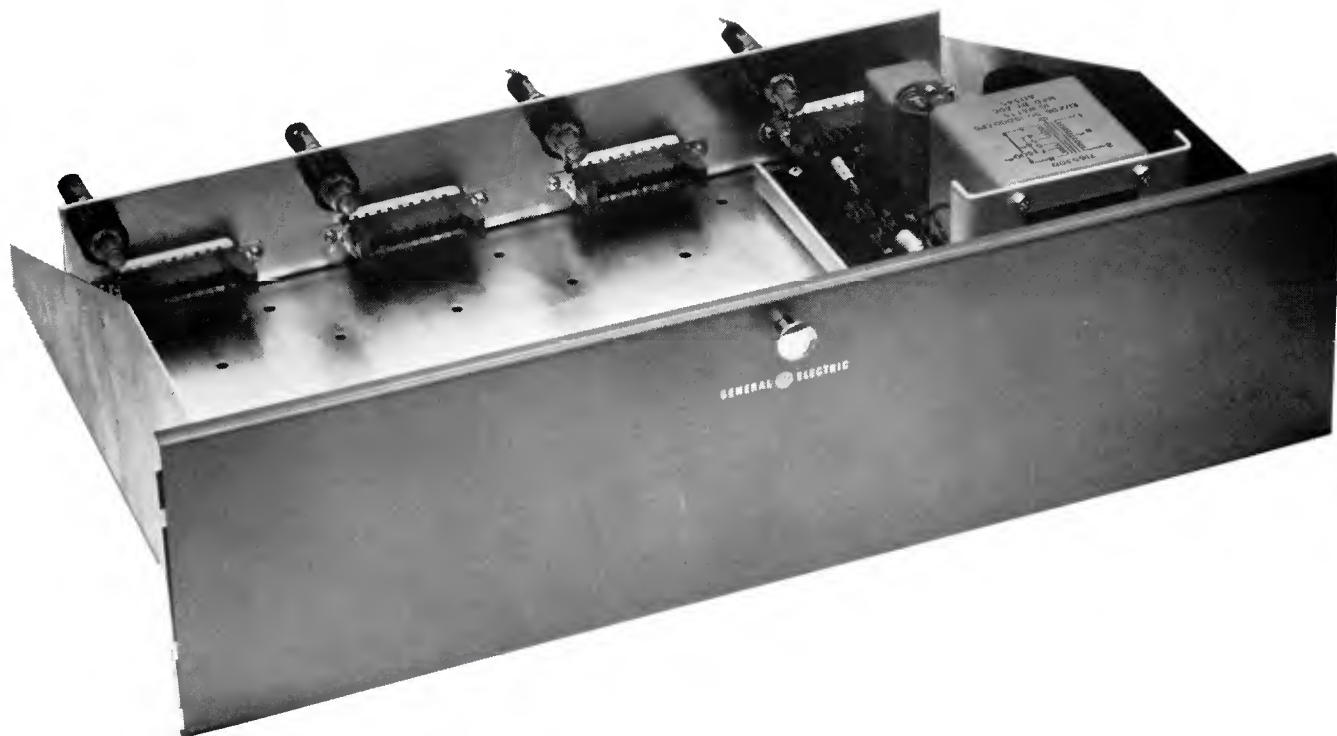
- 8—Type BA-20-A1 Pre-Amplifiers.
- 8—Type FA-47-A1 Line-to-Line Transformers.



Broadcast Shelf, Type FA-49-A1 (Open Panel View)



Broadcast Shelf, Type FA-49-A1 (Rear View)



Broadcast Shelf, Type FA-48-A1

APPLICATION

The General Electric Shelf, Type FA-48-A1 is designed for mounting the General Electric line of plug-in, transistorized audio amplifiers. This shelf occupies five and one quarter inches of vertical rack space and is equipped to accommodate four of the following plug-in amplifier types:

- Type BA-22-A Program Amplifier
- Type BA-24-A Monitor Amplifier
- Type BA-28-A Cue/Talkback Amplifier

FEATURES

- Fits any standard rack. The Type FA-48-A1 Broadcast Shelf is designed to fit 19-inch EIA cabinet rack.
- Easy to maintain and service. Hinged front panels permit easy, quick replacement of amplifiers.
- Space saving. Shelf occupies only $5\frac{1}{4}$ inches of rack space.

DESCRIPTION

The General Electric Type FA-48-A1 Broadcast Shelf is designed to mount the General Electric line of plug-in amplifiers. This Shelf consists of a horizontal plate equipped with two vertical end-mounting brackets, a hinged front panel, four plug-in connectors, four fuse-holders with indicator lights, and four adhesive backed write-in strips. The end brackets are provided with mounting slots and screws for fastening the Shelf in a standard 19-inch cabinet or rack. The hinged front panel

covers the front of the Shelf and conceals the mounting screws. The Shelf must have at least $13\frac{1}{2}$ inches clear depth between the front mounting surface and the rear door of a rack cabinet.

MECHANICAL SPECIFICATIONS

Dimensions: Height $5\frac{1}{4}$ inches
Width 19 inches
Depth $13\frac{5}{8}$ inches
Weight 6 lbs.

Mounting: The Type FA-48-A1 Shelf bolts to the front of the cabinet or rack with No. 12-24 mounting screws (furnished). They may be mounted in any 19-inch-wide cabinet or rack with at least $13\frac{1}{2}$ -inch clearance between the front panel and the rear door.

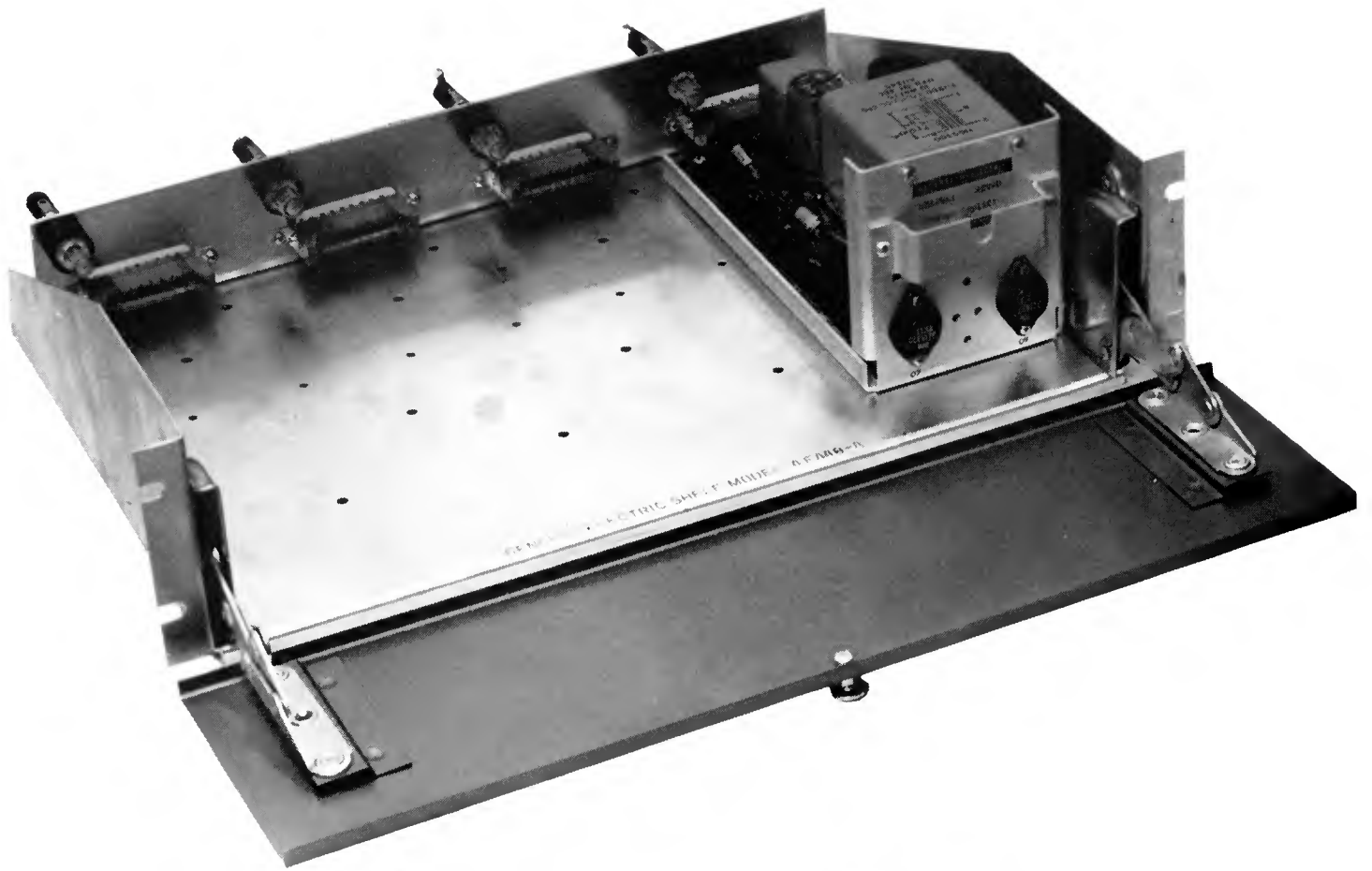
Finish: Front panel—G-E Dark Metalustre Blue outside and inside. Chassis—Cadmium plated.

ORDERING INFORMATION

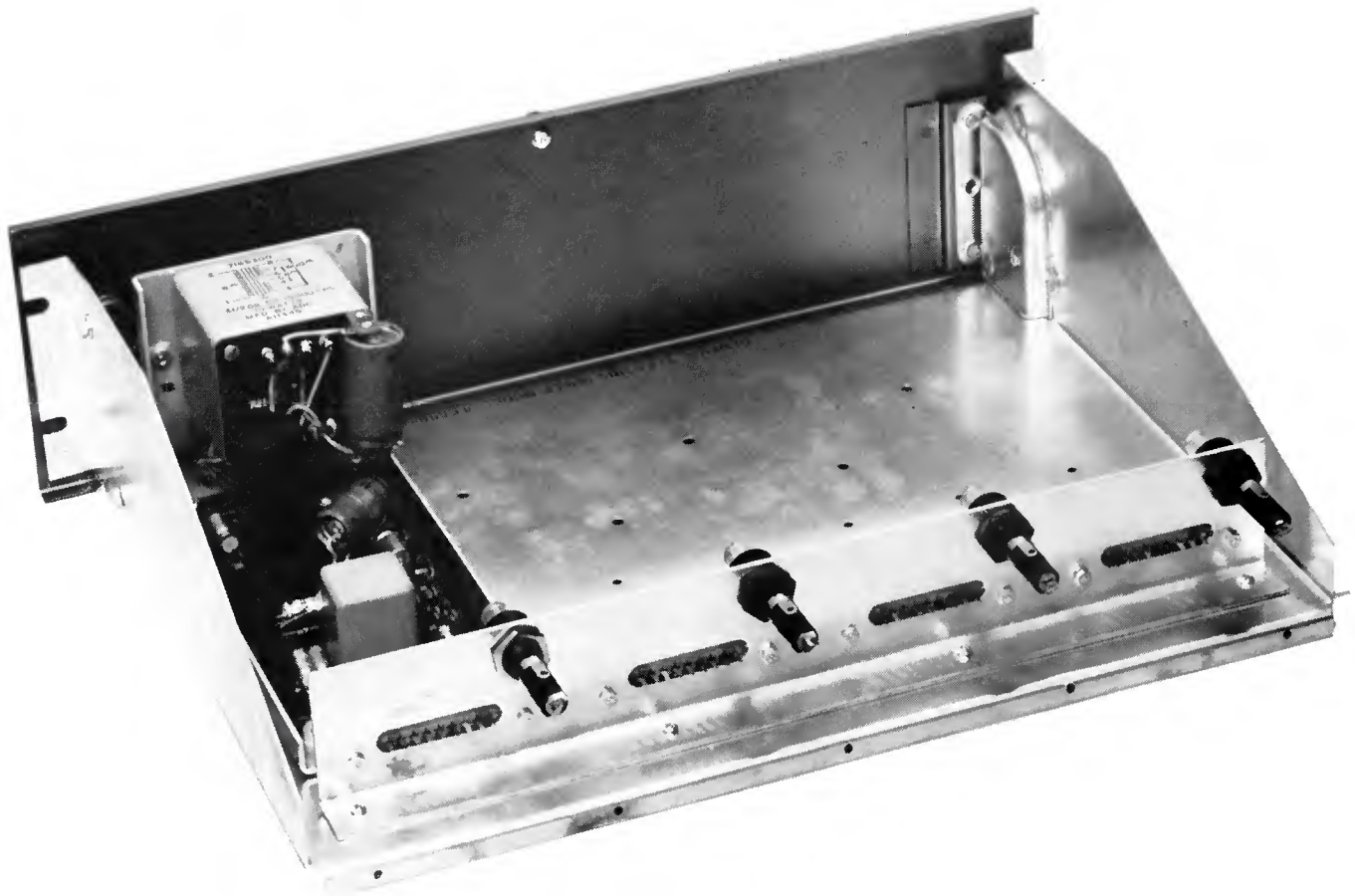
When ordering please specify: General Electric Type FA-48-A1 Broadcast Shelf.

ACCESSORIES

- Type BA-22-A1 Program Amplifier
- Type BA-24-A1 Monitor Amplifier
- Type BA-28-A1 Cue/Talkback Amplifier



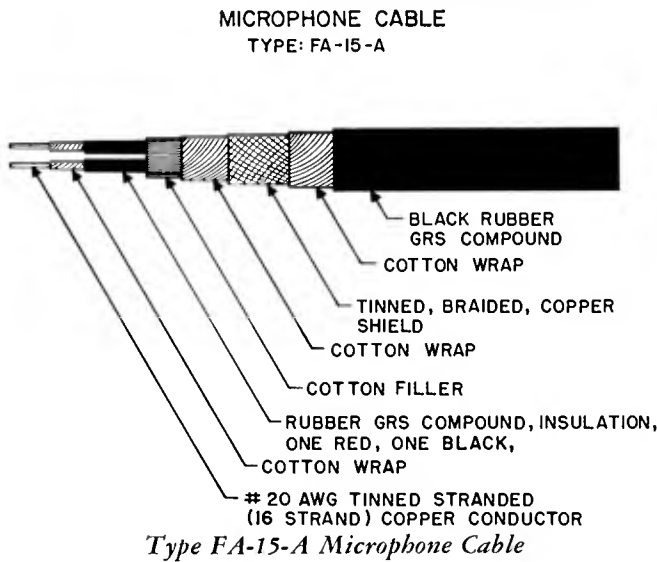
Broadcast Shelf, Type FA-48-A1 (Open Panel View)



Broadcast Shelf, Type FA-48-A1 (Rear View)

Microphone Cable, Plugs and Receptacle
 Type FA-15-A Microphone Cable
 Type FA-16-A Male Microphone Plug
 Type FA-16-B Female Microphone Plug
 Type FA-16-C Microphone Wall Receptacle

Section E211.20
 Broadcast Equipment Data Book
 February 1, 1955



Type FA-16-A Male Microphone Plug, Type FA-16-B Female Microphone Plug, and Type FA-16-C Microphone Wall Receptacle

APPLICATION

General Electric FA-15-A Microphone Cable is a two-conductor, shielded, rubber-covered, flexible, waterproof cable designed primarily for use with low impedance microphones in television and broadcast studios. It may be used also for the make-up of extension cables and as replacement for old cables.

FEATURES

1. Lies straight in use, but high flexibility permits easy coiling for storage purposes.
2. Ruggedly constructed for long, efficient service.
3. Tough outer GRS compound jacket resists abrasion and abuse, giving thorough protection to shielding and conductors within.

MECHANICAL AND ELECTRICAL SPECIFICATIONS

Lot Length: 250' per spool

Voltage Rating: 600 volts AC

Outside Diameter: 0.320"

This cable consists of two #20 AWG (16 strands per conductor), stranded, tinned copper conductors with a cotton wrap over each conductor. Rubber GRS compound insulation is placed over the cotton wrap; insulation colored white on one conductor, black on the other. The two conductors are then twisted with cotton fillers and a cotton wrap is placed over them. A tinned copper braided shield is placed over this assembly. This, in turn, is covered with another cotton wrap. The entire assembly is enclosed within a black rubber GRS compound jacket.

ORDERING INFORMATION

When ordering, please specify:

.....spools (250' each) of Type FA-15-A Microphone Cable.

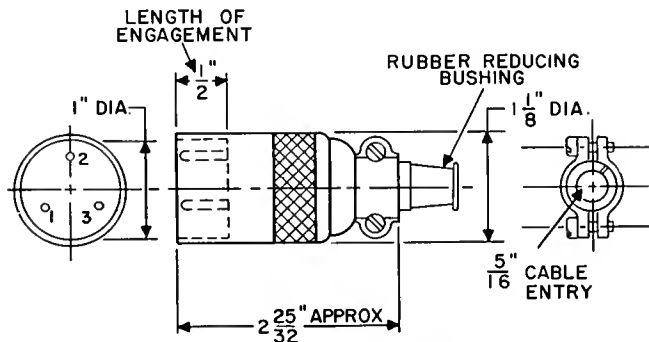
APPLICATION

General Electric microphone plugs and wall receptacle are ruggedly designed units patterned after a trouble-free type of self-locking, quick disconnect plug and receptacle. They are furnished with three standard contacts and have either a satin chrome or zinc plate finish.

FEATURES

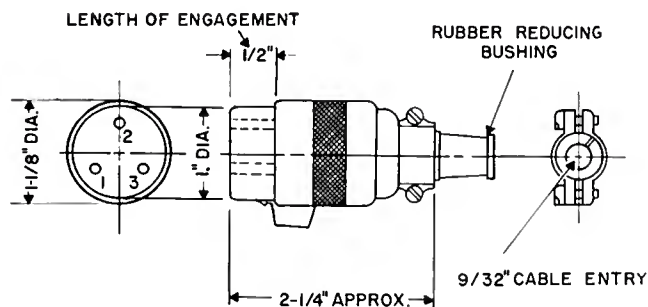
1. Easily installed. Large solder pots on pin ends permit easy installation with excellent electrical and mechanical connection of wires.
2. Positive locking device. A push of the male plug into the wall receptacle or mating plug automatically locks the two together.
3. Quick, easy disconnect. Thumb latch allows immediate disconnect of lock and easy withdrawal of plug.
4. Rugged construction. Steel shell with phenolic mounted contacts assures long, dependable life.
5. Rubber bushed cable clamp takes strain from connections and aids in prolonging cable life. Clamp is integral part of plug shell.
6. Large pin-type male contacts assure good connections with mating plug or receptacle.

MECHANICAL AND ELECTRICAL SPECIFICATIONS:



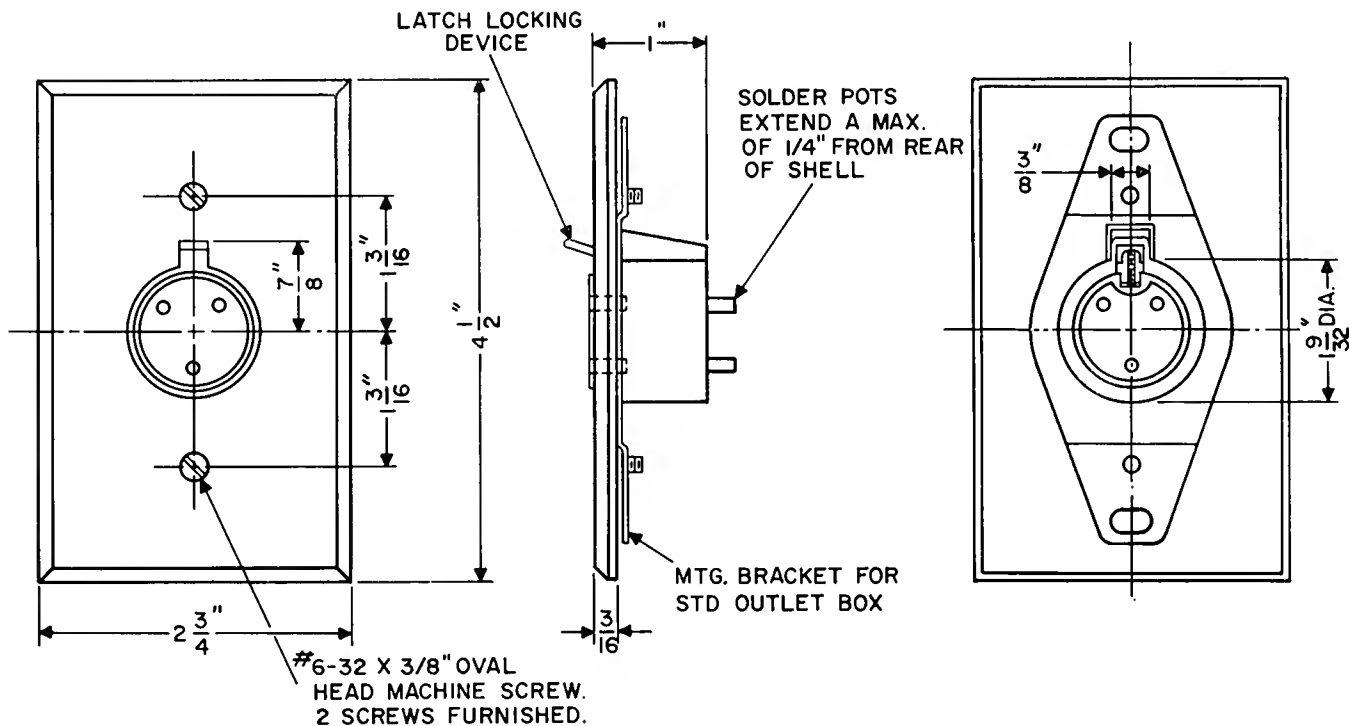
FA-16-A Male Microphone Plug

The steel shell and zinc cable clamp are finished in satin chrome. Phenolic insulation is used to mount the contact pins. Cable entry is $\frac{5}{16}$ " through rubber reducing bushing. Shell has circular groove in interior to accept latch of female connector or wall receptacle. The three male contacts are so spaced that they cannot be inserted in a receptacle in the wrong position. The contacts terminate in tinned solder pots for wire connections. Dimensions shown on above drawing.



FA-16-B Female Microphone Plug

The die-cast zinc shell is finished in satin chrome. Insulation is black phenolic compound with contacts anchored within. Cable entry is $\frac{9}{32}$ " through a rubber reducing bushing. A thumb-operated locking latch locks on inside rim of mating male plug shell when the units are pushed together. Encasements of the three female contacts are so located that the male plug cannot be wrongly positioned on insertion. The contact encasements terminate in solder pots for wire connections. See above drawing for dimensions.



FA-16-C Microphone Wall Receptacle

This unit is a single-gang, flush-mounting, wall receptacle with female latch-locking unit. It has a die-cast zinc shell and is finished in zinc plate. Insulation is black phenolic compound. Encasements of the three female contacts terminate in solder pots. A male plug is automatically locked into this receptacle by the locking latch engaging in a groove on the inside rim of the plug shell when the plug is inserted. The thumb-operated latch releases the lock. This receptacle fits all standard

wall outlet boxes similar to G-E Outlet Box SP-5800. See drawing above for dimensions.

ORDERING INFORMATION

When ordering, please specify:

- Microphone Plug, Male, Type FA-16-A.
- Microphone Plug, Female, Type FA-16-B.
- Microphone Wall Receptacle, Female, Type FA-16-C.

Monitoring Speaker, Type FS-1-B
Studio Wall Speaker, Type FS-2-B
Housing for FS-1-B Speaker, Type FS-4-A
Cabinet for FS-2-B Speaker, Type FS-3-A

Section E211 Page 40
Broadcast Equipment Data Book
June 15, 1957
Supersedes E211 40, 8/1/55



FS-1-B Monitoring Speaker (FS-4-A Cabinet)

APPLICATION

The FS-1-B Monitoring Speaker is designed for critical high-quality monitoring of broadcast program material in AM-FM and TV broadcast studios. It is ideally suited for every application requiring a pleasing, wide range response coupled with an attractive appearance. The FS-1-B Monitoring Speaker will provide unexcelled reproduction of music and speech in clients' rooms, control rooms, and studios. Its range extends from 50 to 13,000 cps.

The FS-2-A Studio Wall Speaker is a low cost speaker and housing combination for general purpose use in studios, offices, and recording rooms of broadcast studios.

FEATURES

FS-1-B MONITORING SPEAKER

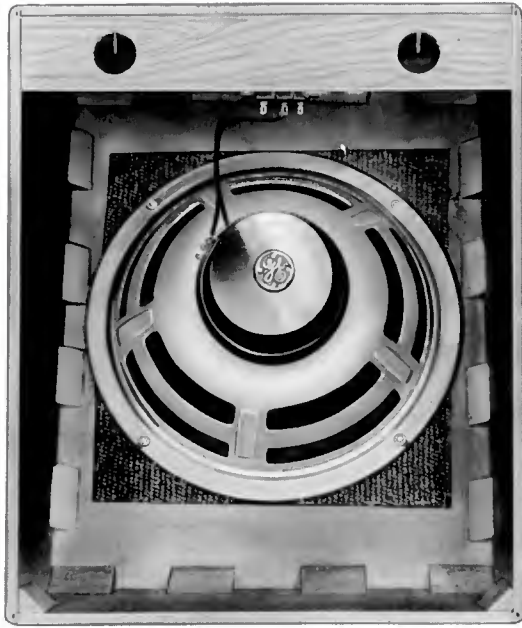
1. Rich full bass. Assured by use of ample cabinet volume and bass-reflex design.
2. Wide range response. Use of famous G-E speaker Type 1201A provides a uniform response, free from objectionable peaks, over the useful range of 50 to 13,000 cycles per second.
3. High wattage capacity. Non-warping aluminum foil base voice coil is unaffected by changes in moisture or temperature.
4. Low driving power required. Speaker is highly efficient.
5. Contemporary styling of cabinet. Carefully selected woods and contemporary cabinet styling complement the appearance of any studio.
6. Line-to-voice-coil transformer included.

FS-2-B STUDIO WALL SPEAKER

1. Good sound distribution. Cabinet front sloped for best sound distribution.
2. Good frequency reproduction. Uses General Electric 1201A speaker.



FS-2-B Studio Wall Speaker (FS-3-A Housing)



FS-2-B Studio Wall Speaker, rear, Showing Voice Coil Transformer

3. Attractively styled cabinet. Attractive walnut-finish wood used in cabinet construction.
4. Line-to-voice-coil transformer included.
5. Economical. Speaker and cabinet combination low in price.

DESCRIPTION

The FS-1-B Monitoring Speaker is composed of the FS-4-A Monitoring Speaker Cabinet, a 1201A Loudspeaker, and an FA-42-A Line-to-Voice-Coil Transformer.

The speaker used in the cabinet employs a curvilinear molded cone for efficient dispersion of its wide range reproduction. The heavy Alnico V permanent magnet provides a high sensitivity with reliable, quiet operation.

The interior surfaces of the cabinet are treated with special sound-absorptive material.

While the cabinet is designed for floor mounting, it may be readily wall mounted, if required.

The FS-2-B Studio Wall Speaker consists of an FS-3-A Wall Speaker Housing, a 1201A Speaker and an FA-42-A Line-to-Voice-Coil Transformer.

The cabinet is especially constructed and braced for wall mounting. Its sloping front panel assures good distribution of sound when the speaker is located out of the way at or near ceiling level. Its external walnut finish harmonizes pleasingly with other studio fixtures.

A line-to-voice-coil transformer, included with this model, will provide correct matching to several line impedances or parallel speaker operation.

MECHANICAL SPECIFICATIONS

- Units: FS-1-B Monitoring Speaker including floor cabinet, speaker, and line-to-voice-coil transformer.
- FS-2-B Studio Wall Speaker, including wall mounting cabinet, speaker, and line-to-voice-coil transformer.
- FS-3-A Wall Speaker Housing only.
- FS-4-A Monitoring Speaker Cabinet only.

Dimensions:	FS-1-B	FS-2-B
	Speaker: 12"	12"
	Cabinet: Width: 25"	14 ⁵ / ₈ "
	Depth: 14 ¹ / ₂ "	9 ³ / ₄ "
	Height: 26"	18"
Weight:	70 lbs approx.	10 lbs approx.

- Mounting: FS-1-B. Floor mounting.
- FS-2-B. Wall mounting with drilled holes to facilitate easy mounting or take-down.

Finish: Walnut.

Connections: FS-1-B and FS-2-B—solder terminals on transformer taps.

ELECTRICAL SPECIFICATIONS

Performance:

FS-1-B and FS-2-B: Frequency response: 50-13,000 cps.
Power Handling capacity: 25 watts, music and speech.

Field: Alnico V permanent magnet, 14.5 ounces.

Transformer Input Impedance: 600/1200/1800/2400 ohms.

ORDERING INFORMATION

When ordering, please specify:

FS-1-B Monitoring Speaker. (The type number includes one FS-4-A Cabinet, one 1201A speaker, one FA-42-A Line-to-Voice-Coil Transformer, and Installation and Operating Instructions.)

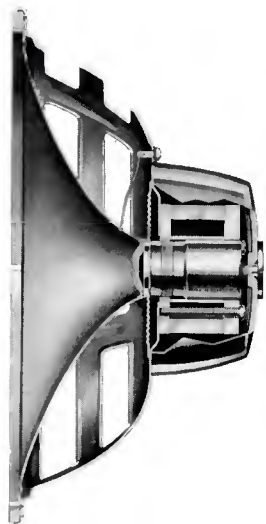
FS-2-B Studio Wall Speaker. (The Type number includes one FS-3-A Wall Housing, one 1201A speaker, one FA-42-A Line-to-Voice-Coil Transformer, and Installation and Operating Instructions.)

FS-3-A Wall Speaker Housing.

FS-4-A Monitoring Speaker Cabinet.

ACCESSORIES

FA-19-J Interconnecting Cable.



Cut-Away View, 1201A Speaker



G-E 1201A Speaker

APPLICATION

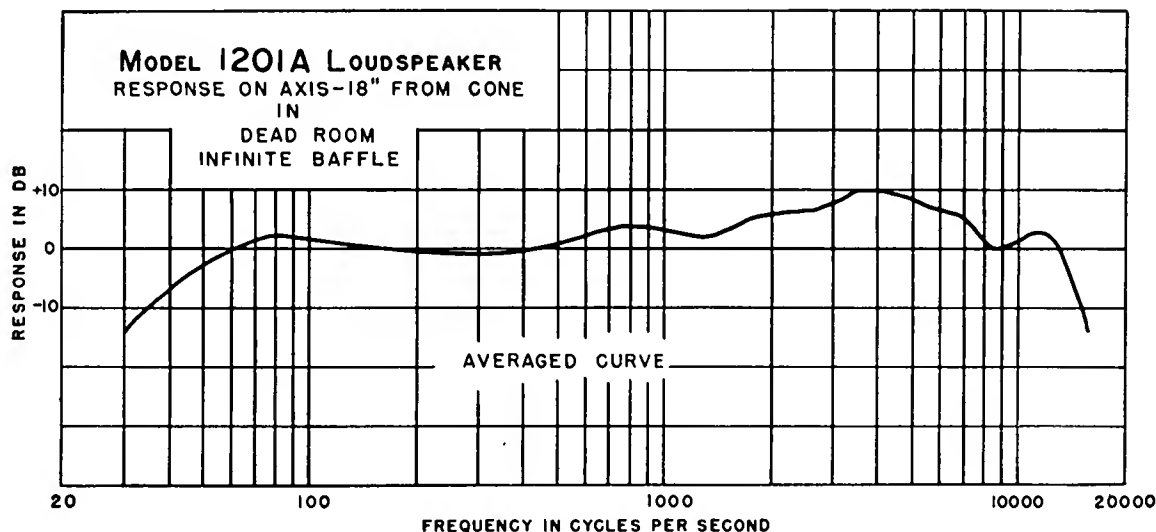
General Electric Loudspeakers are designed for critical high quality monitoring of broadcast program material in AM-FM and TV broadcast studios. They may be depended upon to provide excellent reproduction of music and speech in recording, control, and studio monitoring applications.

The Types 850, 1201A and 1203A Speakers are wide range speakers for use in broadcast control and studio monitoring.

FEATURES

1. High wattage handling capacity made possible by

- 2. **Faithful reproduction** assured by molded, scientifically designed General Electric cones.
- 3. **High efficiency** due to liberal use of Alnico V magnet material.
- 4. **Rigidly constructed.** All-welded construction insures rigidity and provides optimum controlled flux density.
- 5. **Attractive appearance.** Lustrous finish is specially protected to preserve beauty and effectiveness.
- 6. **Wide range.** The 1201A and 1203A Speakers uniformly cover the frequency range from 50 to 13,000 cycles per second.



DESCRIPTION

General Electric Loudspeakers are designed by audio engineers and produced under exacting conditions of quality control.

The Type 850 Speaker is a wide range unit, 8-in. in diameter with a 15-watt handling capacity.

The Type 1201A and 1203A Speakers are wide range units, 12" in diameter and with 25-watt handling capacities. They differ only in their Alnico V magnet weight; the 1201A having a 14.5-ounce magnet compared to a 9-ounce magnet in the 1203A, with a consequent increase in efficiency in the 1201A.

All speakers employ non-warping aluminum foil base voice coils with molded, scientifically designed circular cones. All-welded frame construction is employed to insure rigidity and controlled flux density. Alnico V magnet material is used for increased efficiency.

Due to careful design and quality control in manufacture, these speakers offer a uniform response, with freedom from objectionable peaks over their useful response ranges.



G-E 850 Speaker

MECHANICAL AND ELECTRICAL SPECIFICATIONS

Units: Wide Range Speakers: 850, 1201A, 1203A.

Mounting: All speakers are equipped with four mounting holes on the circumference of the frame designed to accept No. 8 machine screws.

Dimensions and Weights:

	Diameter Over-all Size	Mtg. Hole Centers	Depth Gasket to Yoke or Cover	Shipping Weight
850	7 $\frac{1}{2}$ "	7 $\frac{5}{8}$ "	3 $\frac{3}{4}$ "	2 lbs 10 oz
1201A	12 $\frac{7}{8}$ "	11 $\frac{9}{16}$ "	5 $\frac{7}{8}$ "	6 lbs 8 oz
1203A	12 $\frac{7}{8}$ "	11 $\frac{9}{16}$ "	5 $\frac{7}{8}$ "	5 lbs 2 oz

Type*	Size*	Shape* Cone	Alnico V		V.C.		
			Mag. Wt.	Power Rating	V.C. Diam.	Imp. Ohms	Baffle Open.
** 850	8"	Round	6.8 oz.	15w	1"	8.0	6 $\frac{7}{8}$ "
**1201A	12"	Round	14.5 oz.	25w	1 $\frac{1}{4}$ "	8.0	10 $\frac{3}{4}$ "
**1203A	12"	Round	9.0 oz.	25w	1 $\frac{1}{4}$ "	8.0	10 $\frac{3}{4}$ "

* The General Electric Company manufactures a complete line of original and replacement speakers in a variety of shapes, sizes, and ratings not shown here. For information concerning these latter speakers, please consult your local General Electric distributor.

**Wide range speakers recommended for broadcast studio and monitoring applications.

Connections: 1201A, 850 and 1203A—Screw terminals.

ORDERING INFORMATION

When ordering, please specify:

Type....., Wide Range Speaker

ACCESSORIES

FS-4-A Monitoring Speaker Cabinet (for 12" speaker).

FS-3-A Wall Speaker Cabinet (for 12" speaker).

FA-42-A Line-to-Voice-Coil Transformer.

FA-19-J Interconnecting Cable.

**RESISTORS
FIXED COMPOSITION
RETMA STANDARD REC-116
MILITARY STANDARD MIL-R-11A**

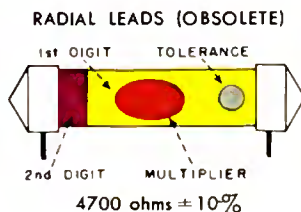
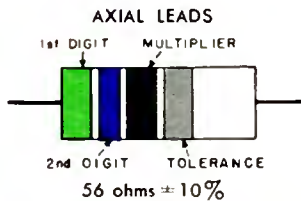
Color	Digits of Resistance (ohms)	Multiplier	Tolerance (%)
Black	0	1	—
Brown	1	10	—
Red	2	100	—
Orange	3	1000	—
Yellow	4	10,000	—
Green	5	100,000	—
Blue	6	1,000,000	—
Violet	7	10,000,000	—
Gray	8	100,000,000	—
White	9	—	—
Gold	—	0.1	±5
Silver	—	0.01	±10
No color	—	—	±20

INSULATION CODING

RETMA: Insulated fixed composition resistors with axial leads are designated by a background of any color except black. The usual color is natural tan. Noninsulated fixed composition resistors with axial leads are designated by a black background color.

MILITARY (MIL): Insulated resistors are designated by a background of any color except black. The usual color is natural tan. Noninsulated resistors with axial leads are designated by a black background color. Noninsulated resistors with radial leads are designated by a black background color or by a background the same color as the first significant figure of the resistance value.

EXAMPLES



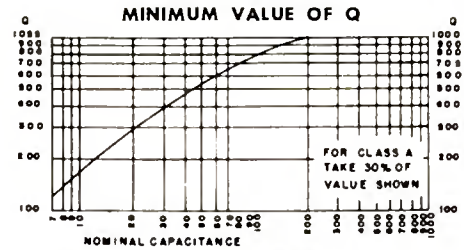
**CAPACITORS
MICA DIELECTRIC**

**RETMA STANDARD REC-115A
(See example under MIL-C-5A)**

Color	Digits of Capacitance (μμf)	Class	Multiplier	Tolerance (%)
Black	0	A	1	±20
Brown	1	B	10	—
Red	2	C	100	±2
Orange	3	D	1000	±3
Yellow	4	E	10,000	—
Green	5	—	—	±5
Blue	6	—	—	—
Violet	7	—	—	—
Gray	8	I	—	—
White	9	J	—	—
Gold	—	—	0.1	—
Silver	—	—	0.01	±10

DESCRIPTION OF CLASS

Class	Temperature Coefficient (parts per million per °C)	Maximum Capacitance Drift	Minimum Insulation Resistance (megohms)
A	±1000	±(5% + 1 μμf)	3000
B	±500	±(3% + 1 μμf)	6000
C	±200	±(0.5% + 0.5 μμf)	6000
D	±100	±(0.3% + 0.1 μμf)	6000
E	+100 -20	±(0.1% + 0.1 μμf)	6000
I	+150 -50	±(0.3% + 0.2 μμf)	6000
J	+100 -50	±(0.2% + 0.2 μμf)	6000



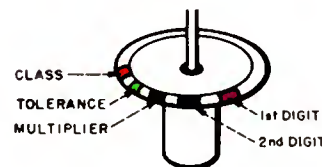
VOLTAGE RATING

(Indicated by dimensions rather than color coding)

Maximum Dimensions (inches)			Style	Capacitance (μμf)	Voltage Rating (v d-c)
Length	Width	Thickness			
5 ₁₆	15 ₃₂	7 ₃₂	20	5-510 560-1000	500 300
17 ₆₄	15 ₃₂	7 ₃₂	25	5-1000 1100-1500	500 300
53 ₆₄	53 ₆₄	9 ₃₂	30	470-6200 Over 6200	500 300
53 ₆₄	53 ₆₄	3 ₈	35	3300-6200 Over 6200	500 300
11 ₃₂	41 ₆₄	11 ₃₂	40	100-2400 2700-7500 Over 7500	1000 500 300

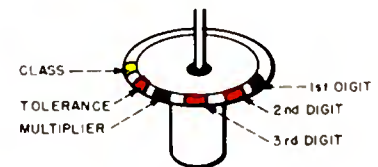
EXAMPLES

SILVER MICA BUTTON CAPACITORS (5-DOT)



700 μμf ± 5%, Class C

SILVER MICA BUTTON CAPACITORS (6-DOT)



1320 μμf ± 2%, Class E

CAPACITOR AND RESISTOR COLOR CODE CHART

CAPACITORS MICA DIELECTRIC

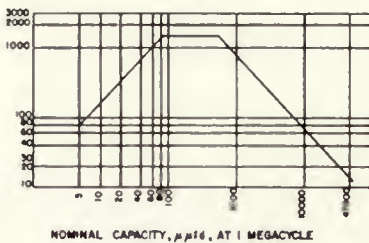
MILITARY STANDARD MIL-C-5A

Color	Digits of Capacitance (μf)	Characteristic	Multiplier	Tolerance (%)
Black	0	A	1	± 20
Brown	1	B	10	—
Red	2	C	100	± 2
Orange	3	D	1000	—
Yellow	4	E	—	—
Green	5	F	—	—
Blue	6	G	—	—
Violet	7	—	—	—
Gray	8	—	—	—
White	9	—	—	—
Gold	—	—	0.1	± 5
Silver	—	—	0.01	± 10

DESCRIPTION OF CHARACTERISTIC

Characteristic	Temperature Coefficient (parts per million per $^{\circ}\text{C}$)	Maximum Capacitance Drift	Minimum Insulation Resistance (megohms)
B	Not specified	Not specified	7500
C	± 200	$\pm 0.5\%$	7500
D	± 100	$\pm 0.3\%$	7500
E	+100 -20	$\pm (0.1\% + 0.1 \mu\text{f})$	7500
F	+70	$\pm (0.05\% + 0.1 \mu\text{f})$	7500

Q MINIMUM VALUE OF Q



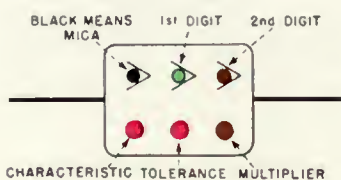
VOLTAGE RATING

(Indicated by dimensions rather than color coding)

Maximum Dimensions (inches)			Style CM	Capacitance (μf)	Voltage Rating (v d-c)
Length	Width	Thickness			
$3\frac{5}{64}$	$5\frac{1}{64}$	$7\frac{3}{32}$	15	5-510	300
$5\frac{1}{64}$	$1\frac{5}{32}$	$7\frac{3}{32}$	20	5-510 560-1000	500 300
$1\frac{7}{64}$	$1\frac{5}{32}$	$7\frac{3}{32}$	25	51-1000	500
$5\frac{3}{64}$	$5\frac{3}{64}$	$9\frac{3}{32}$	30	560-3300	500
$5\frac{3}{64}$	$5\frac{3}{64}$	$11\frac{3}{32}$	35	3600-6200 6800-10,000	500 300
$1\frac{1}{32}$	$4\frac{1}{64}$	$11\frac{3}{32}$	40	3300-8200 9100-10,000	500 300

EXAMPLE

6-DOT CODE



510 μf $\pm 2\%$, Characteristic C, 500 v (Style 20)

The arrangement of dots under RETMA Standard REC-115A is the same as in the example above. The only difference is that the first dot is white instead of black.

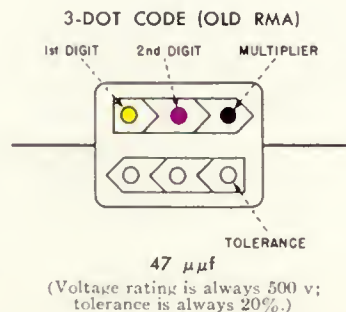
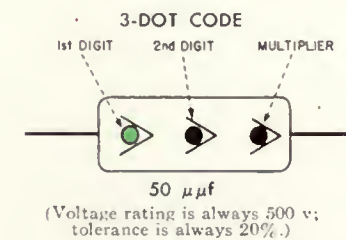
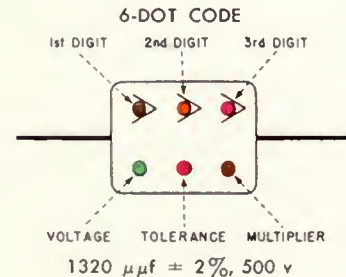
CAPACITORS MICA DIELECTRIC

OBSOLETE STYLES

Color	Digits of Capacitance (μf)	Multiplier	Tolerance (%)	Voltage Rating (v d-c)
Black	0	1	± 20	—
Brown	1	10	± 1	100
Red	2	100	± 2	200
Orange	3	1000	± 3	300
Yellow	4	10,000	± 4	400
Green	5	—	± 5	500
Blue	6	—	± 6	600
Violet	7	—	± 7	700
Gray	8	—	± 8	800
White	9	—	± 9	900
Gold	—	0.1	$\pm 5^*$	1000
Silver	—	0.01	± 10	2000
No color	—	—	$\pm 20^*$	500*

*Old 3-dot only.

EXAMPLES



GENERAL ELECTRIC

SCHENECTADY, NEW YORK

COMPLIMENTS OF BROADCAST EQUIPMENT

www.americanradiohistory.com

CAPACITORS

CERAMIC DIELECTRIC

RETMA STANDARD REC-107A

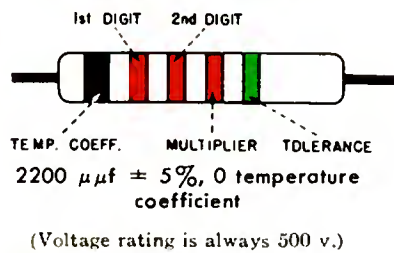
MILITARY STANDARD MIL-C-20A

Color	Digits of Capacitance ($\mu\mu\text{f}$)	Multiplier	Tolerance		Temperature Coefficient (parts per million per $^{\circ}\text{C}$)	
			10 $\mu\mu\text{f}$ or Less ($\mu\mu\text{f}$)	Over 10 $\mu\mu\text{f}$ ($^{\circ}\text{C}$)	RETMA	MIL
Black	0	1	± 2.0	± 20	0	0
Brown	1	10	$\pm 0.1^{\dagger}$	± 1	-33	-30
Red	2	100	—	± 2	-75	-80
Orange	3	1000	—	$\pm 2.5^{\dagger}$	-150	-150
Yellow	4	10,000 †	—	—	-220	-220
Green	5	—	± 0.5	± 5	-330	-330
Blue	6	—	—	—	-470	-470
Violet	7	—	—	—	-750	-750
Gray	8	0.01	± 0.25	—	+150 to -1500	+30
White	9	0.1	± 1.0	± 10	+100 to -750	-330
Gold	—	—	—	—	—	+100

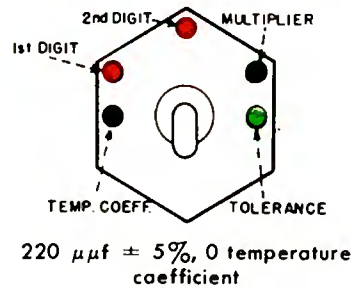
† RETMA only.

EXAMPLES

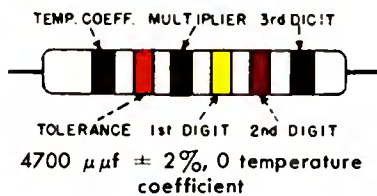
TUBULAR CAPACITORS



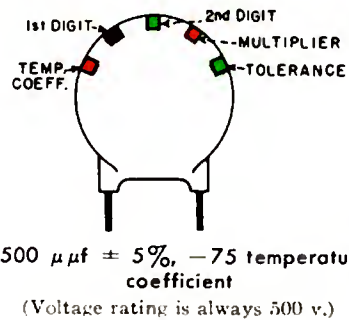
FEED-THROUGH CAPACITORS (RETMA ONLY)



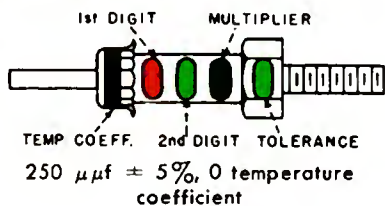
TUBULAR CAPACITORS (OLD RMA)



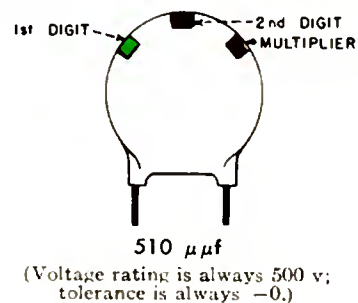
5-DOT DISC CAPACITORS (RETMA ONLY)



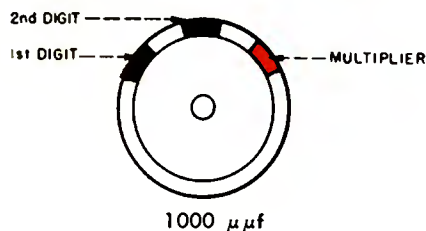
STAND-OFF CAPACITORS (RETMA ONLY)



3-DOT DISC CAPACITORS (RETMA ONLY)



3-DOT BUTTON CAPACITORS (RETMA ONLY)



CAPACITORS PAPER DIELECTRIC

MILITARY STANDARD MIL-C-91A

(Commercial codes are same except as noted)

Color	Digits of Capacitance (μmf)	Multiplier	Tolerance (%)	Voltage Rating* (v d-c)	Characteristic	Temperature Rating ($^{\circ}\text{C}$)
Black	0	1	± 20	—	A	85
Brown	1	10	—	100	E	85
Red	2	100	—	200	—	—
Orange	3	1000	± 30	300	—	—
Yellow	4	10,000	—	400	—	—
Green	5	—	—	500	—	—
Blue	6	—	—	600	—	—
Violet	7	—	—	700	—	—
Gray	8	—	—	800	—	—
White	9	—	—	900	—	—
Gold	—	—	—	1000	—	—
Silver	—	—	± 10	—	—	—

*Tubular capacitors only; for rectangular capacitors see table below.

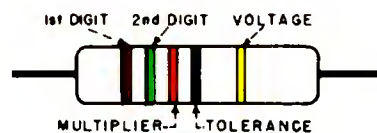
VOLTAGE RATING FOR RECTANGULAR CAPACITORS

(Indicated by dimensions rather than color coding)

Maximum Dimensions (inches)			Style CM	Capacitance (μmf)	Voltage Rating (v d-c)
Length	Width	Thickness			
$5\frac{1}{64}$	$1\frac{1}{32}$	$\frac{7}{32}$	20	1000 2000-6000 10,000	400 200 120
$5\frac{1}{64}$	$3\frac{1}{64}$	$1\frac{1}{64}$	22	2000-3000 6000-10,000 20,000	400 300 120
$5\frac{3}{64}$	$5\frac{3}{64}$	$9\frac{1}{32}$	30	1000-2000 3000 6000-10,000 20,000	800 600 400 120
$5\frac{3}{64}$	$5\frac{3}{64}$	$11\frac{1}{32}$	35	3000 6000-10,000 20,000	800 600 300
$1\frac{1}{4}$	$4\frac{1}{64}$	$9\frac{1}{32}$	41	3000-6000 10,000 20,000 30,000	600 400 300 120
$1\frac{15}{32}$	$4\frac{9}{64}$	$11\frac{1}{32}$	42	1000-6000 10,000-20,000 30,000 50,000 100,000	1000 600 400 300 120
$1\frac{15}{32}$	$4\frac{9}{64}$	$13\frac{1}{32}$	43	10,000 20,000-30,000 50,000-100,000 200,000	1000 600 400 120

EXAMPLES

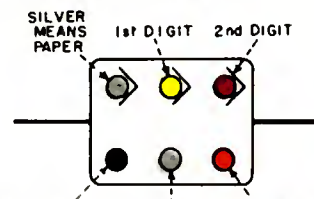
TUBULAR CAPACITORS (COMMERCIAL ONLY)



$15,000 \mu\text{mf} \pm 20\%$, 400 v

(No characteristic or temperature rating)

RECTANGULAR CAPACITORS



CHARACTERISTIC TOLERANCE MULTIPLIER
 $4700 \mu\text{mf} \pm 10\%$, Characteristic A