



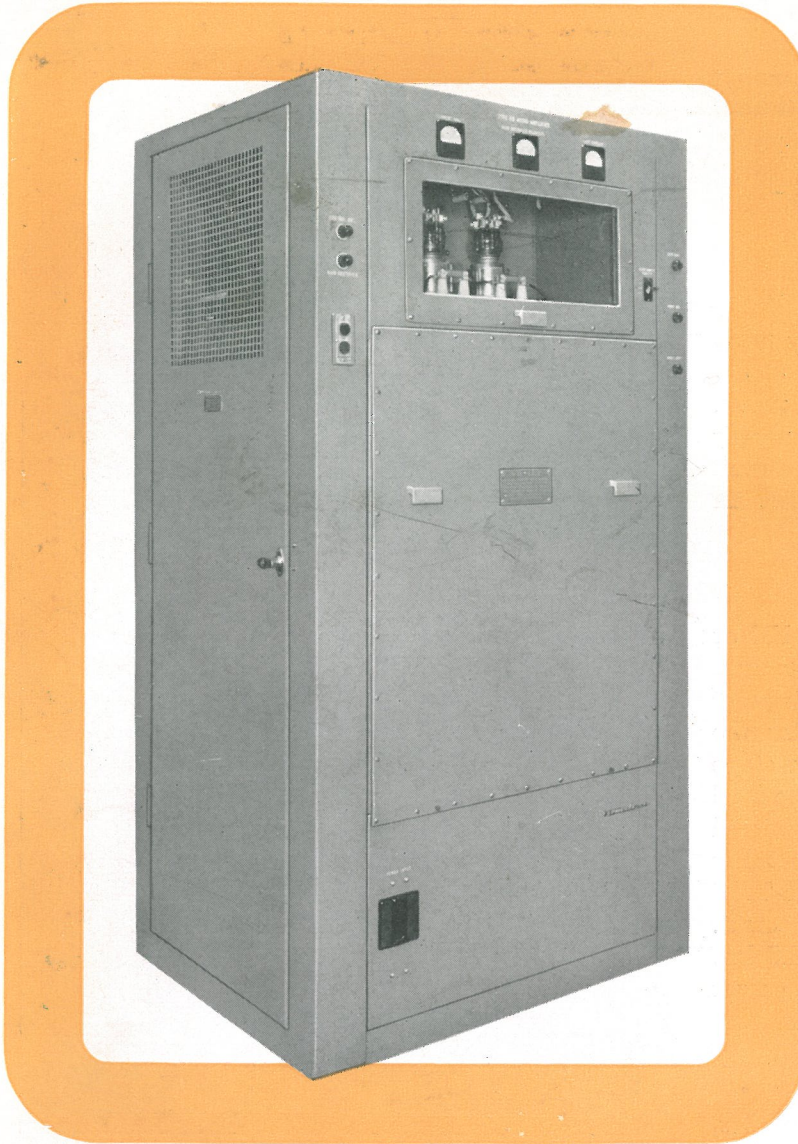
## variable-frequency audio amplifier type FG, 5/10 kw

descriptive  
bulletin

85-950

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power supply—230 or 460 volts, 50 or 60 cycles  
output 5 or 10 kw, 30-10,000 cycles



### application

The type FG variable frequency amplifier is an audio amplifier of extremely high power. It can take a signal from any conventional 30 to 10,000 cps source and amplify it with uniform response. It could, for example, start with a whisper of sound, and amplify it tremendously without distortion.

There are a number of natural applications for this equipment:

- powering vibration shakers
- powering supersonic transducers
- exploring high frequency vibration phenomena
- supplying power at audio frequencies
- powering laboratory testing equipment under controlled conditions

### design features

**wide range of frequencies** with low noise and distortion.

**completely self-contained**—unit housed in a steel and aluminum enclosure is easily installed, requires only 23 square feet floor space. All voltage or frequency conversion parts are supplied with the unit.

**remote operation** easily provided by means of duplicate 2-button control.

**completely self-protected**—air breakers protect unit against overload or incorrect operation, or against failure of single blower that provides all cooling.

**long life**—all components are conservatively rated for long, trouble-free life.

**complete safety for personnel**—there are no exposed voltages outside the enclosure. Interlocks automatically remove high voltages when either of the side doors are opened, or front panels removed.

**selenium rectifiers** provide reliable d-c voltage for power-amplifier stage. They eliminate filament transformers, time-delay relays, tube replacement, and carry a one-year guarantee.

**convenient inspection and maintenance**—access doors on both sides of unit allow back of unit to be placed against wall or other equipment.

**easy conversion**—a 5-kw unit can be converted in the field to 10-kw rating with a relatively inexpensive conversion kit.





## operation

All controls for normal operation of the amplifier are mounted on the front of the unit. When the power input breaker is closed, the blower for cooling operates and an amber light goes on. Also, if both doors are closed and the blower is working properly, the filament contactor is energized. Closing of its contacts energizes the driver amplifier, and the filament and bias voltages to the final stage.

### starting

Pressing the "start" push button (momentary type) energizes the high voltage supply contactor, at the same time lighting the red light on the front panel. Another contact operates a relay in the bias supply d-c circuit, which in turn removes a short circuit across the audio input transformer and allows an audio signal to be fed to the amplifier.

### amplification

A variable frequency audio source of either 150 or 600 ohms may be connected to the input of the unit, which is transformer coupled to the first stage of the driver amplifier. This amplifier contains the low level stages including a cathode-follower stage which drives the class B power amplifier. The final stage consists of WL-5736 triodes with thoriated tungsten filaments. For the 5-kw unit, two tubes operate in push-pull. In the 10-kw unit four WL-5736 triodes operate in a push-pull parallel arrangement. Rated plate dissipation of each WL-5736 is 2.5 kw, thus giving ample reserve to handle low power factor loads.

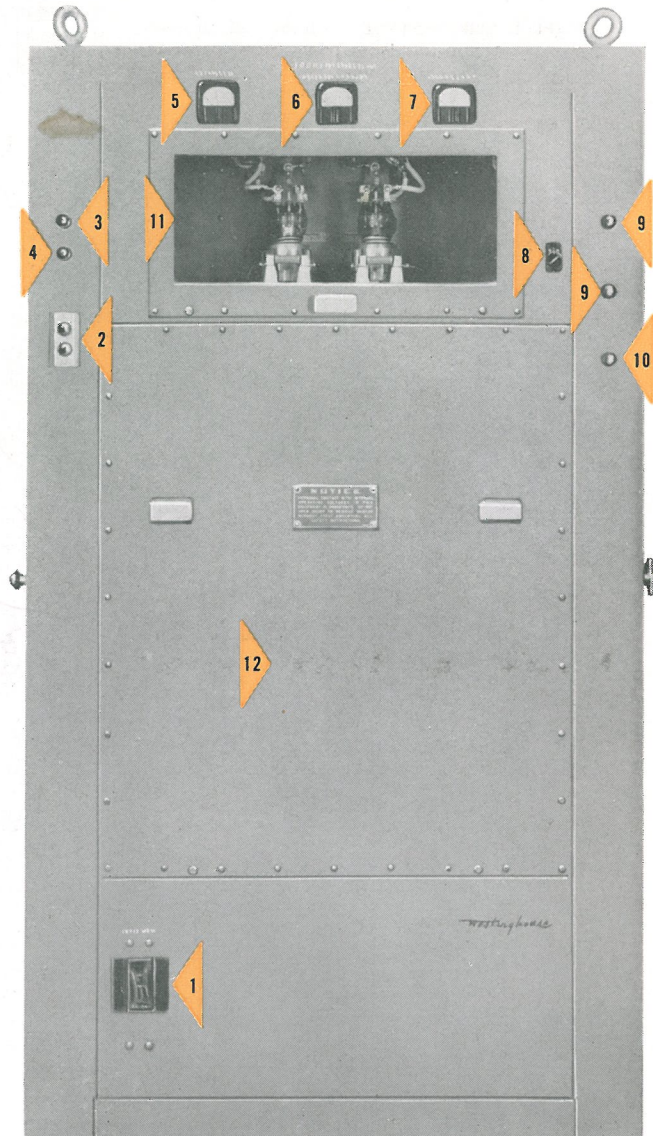
### feedback

Along with the feedback within the driver amplifier, two additional feedback circuits are employed to reduce distortion, noise and hum throughout the entire amplifier. In the 10-kw unit an additional feedback circuit may be used to increase the drive to the power amplifier tubes.

In certain applications involving low power factor loads, and loads such as shakers, in which phase and magnitude vary with frequency, it may be desirable to operate with reduced feed-back. This can be accomplished easily.

### stopping

When the "stop" button is pressed, the high voltage



front view of type FG 5/10 kw amplifier

is removed, the red light goes out, and the amplifier input is short-circuited. This is advantageous for short periods of inactivity, since it de-energizes the power output stage, but allows the unit to be placed back into operation immediately.

### remote control

The high-voltage power supply may be turned on and off at remote location by simply duplicating the main "start-stop" button and the indicators at the desired station.



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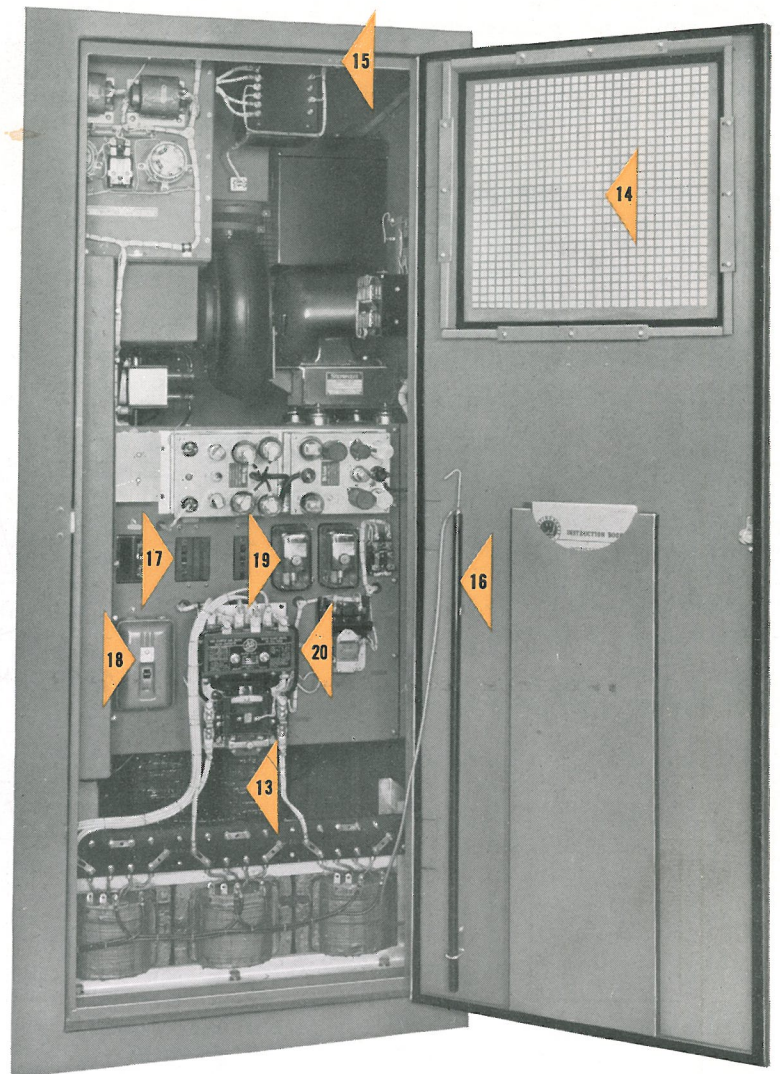
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## construction features

- 1 **power input breaker** controls and protects power supply to amplifier
- 2 **start-stop button** energizes high voltage supply contactor
- 3 **amber lamp** indicates equipment is energized and operating, except final amplifier
- 4 **red lamp** indicates final output stage of amplifier is energized
- 5 **voltmeter** for filament voltage
- 6 **voltmeter** for main rectifier
- 7 **ammeter** for plate current
- 8 **selector switch** for individual cathode currents or total current
- 9 **potentiometers** for varying bias voltage to grids of power amplifier
- 10 **potentiometer** for varying amplitude of incoming signal
- 11 **removable panel** for access to final amplifier tubes—protected by interlock switch
- 12 **removable panel** for access to rectifiers—protected by interlock switch
- 13 **output transformer** has six equal-voltage secondary windings that can be connected in series, parallel, or in series-parallel combinations. Available voltage ratings are detailed under "electrical characteristics", and other voltage ranges can be supplied on special request.
- 14 **air filters**—20" x 20" x 2"—may be used to filter intake air in dusty or dirty locations
- 15 **interlock switches** automatically remove d-c bias, plate voltage, and filament power when doors are opened
- 16 **grounding sticks** for discharging capacitors, etc.



Type FG audio amplifier with right door open

- 17 **De-ion® breakers** protect driver amplifier, power tube filaments, bias supply and control bus
- 18 **Motor Watchman®** controls power to blower
- 19 **overload relays** remove power when circuits are overloaded
- 20 **contactors and relays** assure proper sequence in applying power to amplifier circuits
- selenium rectifiers** provide bias and plate voltage for the final amplifier. A single-phase, full-wave, 300-volt rectifier supplies bias voltage, which is adjustable by means of two potentiometers. Proper output voltage is obtained by means of secondary taps on the bias transformer and an adjustable series resistor.





*Sp - 72 multy of 120  
single frequencies*

**electrical characteristics**

**operating characteristics**

response uniform  $\pm 1\frac{1}{2}$  db, 30-10,000 cps with resistance load

distortion RMS harmonic distortion 5% or less, 50-10,000 cps

hum and noise level 45 db or more below full output

audio input level 10 milliwatts maximum

input impedance 150 or 600 ohms

output voltages six equal voltage steps at 30-10,000 cycles per second, in arithmetical progression as specified: For example: 120,240,360,480,600 or 720 volts. See feature 13 on page 3.

**power supply** 220,230,240 or 440,460,480 volts, 3-phase, 50 or 60 cycles

permissible voltage deviation  $\pm 5\%$ , including regulation and variation

permissible voltage unbalance  $\pm 2\%$  average of three phases

**power input** S# 1475 827—5 kw    S# 1475 829—10 kw

no output 7.2 kw    9.7 kw

full output 15.2 kw    26.3 kw

power factor, approx. 0.9 lag    0.9 lag

■ output voltages are reduced at frequencies below 30 and above 10,000 cycles, and for pulsed operation for both 5 and 10 kw amplifiers

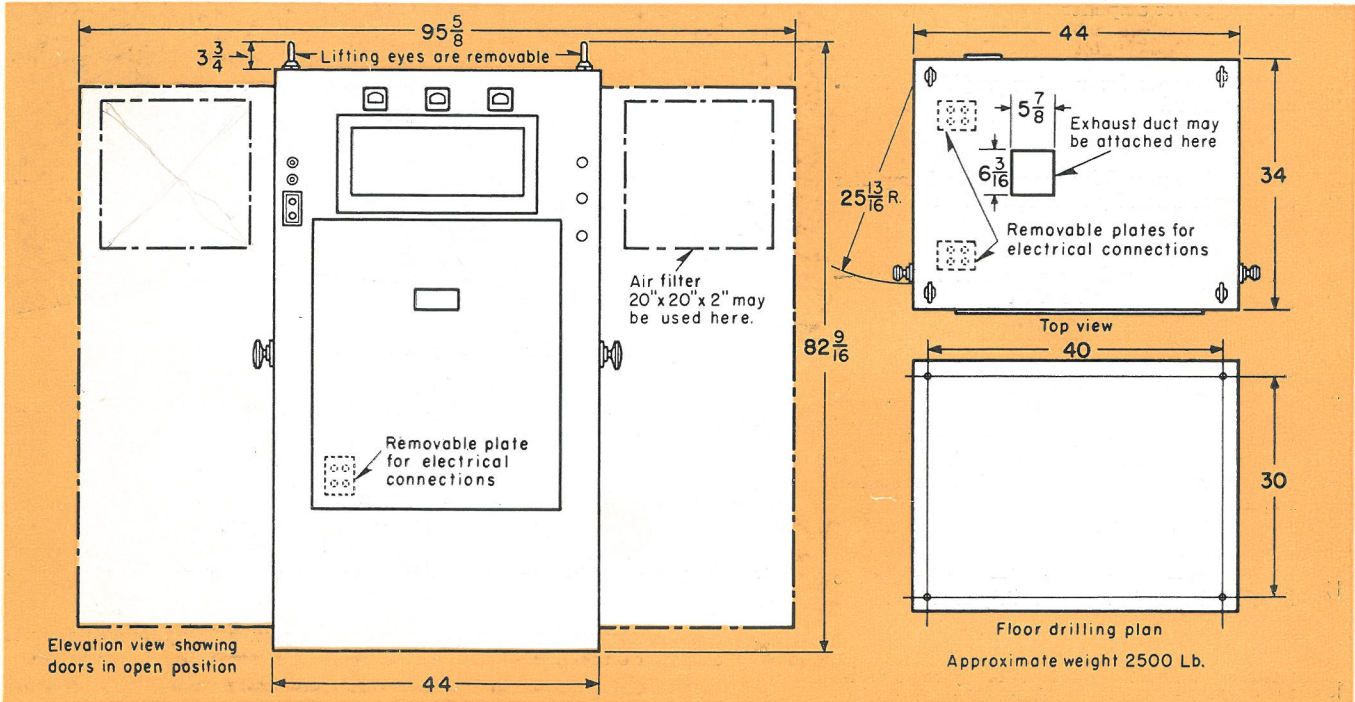
output capability	S# 1475 827—5 kw			S# 1475 829—10 kw		
	kva output	at pf		kva output	at pf	
frequency—cps	.25	.50	1.00	.25	.50	1.00
7.5	0.30	0.30	0.375	0.60	0.60	0.75
15.	1.25	1.25	1.50	2.50	2.50	3.00
30-50	2.50	3.50	5.00	5.00	7.00	10.00
50-5000	2.50	3.50	5.00	5.00	7.00	10.00
500-10000	2.50	3.50	5.00	5.00	7.00	10.00
15000	1.00	1.50	3.00	2.00	3.00	5.00
20000	1.00	1.00	2.50	1.00	1.50	2.50

**power output tubes** 2 WL-5736    4 WL-5736

**regulation**

When output voltage regulation is required, the amplifiers can be modified on special order, to provide regulation not over 10% at any frequency in the range of 60-3000 cycles into resistance loads. Regulation is defined as  $\frac{V_1 - V_2}{V_2} \times 100$ , where  $V_1$  = output voltage at no load,  $V_2$  = output voltage at full load.

**dimensions and weights**



Approximate weight 2500 Lb.

**further information**

**inquiries** refer to nearest Westinghouse office

**Westinghouse Electric Corporation**  
**electronics division** • Baltimore 3, Md.