

Western Electric

106-A AMPLIFIER



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106-A AMPLIFIER

Type

Two-stage line or main Amplifier with bridging or matching input. A complete self-contained rack mounting unit incorporating gain control and power supply equipment for operation from AC power source.

Typical Electrical Characteristics

Gain:

- 45 db max (600 ohm matching connection)
- 20 db max (10,000 ohm bridging connection)

Gain Control:

38 db in 20 steps (2 db each plus "off" position)

Operates From:

600 ohms (matching or bridging connection)

Operates Into:

- Main Output 600 ohms
- Monitor Output 40 ohms (approx.)

Output Power:

Main output + 28 dbm* (600 milliwatts) with less than 1% harmonic distortion.

Monitor Output 20 db less than Main Output (Isolation between Main and Monitor Output is 20 db)

Output Noise:

Main Output max gain setting -52 dbm* unweighted -68 dbm* weighted (ear sensitivity curve)

Signal to noise ratio 70 db with normal + 18 dbm* signal output

Frequency Characteristics:

Flat within 1 db over range 30 to 15,000 cycles

Power Supply:

105-125 volts, 50-60 cycle AC, 0.4 amperes, 48 watts maximum.

*Reference 1 milliwatt

Apparatus Description

Dimensions:

19 $\frac{1}{8}$ inches wide, 7 inches high (panel space), 8 inches deep behind panel.

Weight:

22 pounds.

Finish:

Chassis, bright aluminum lacquer. Mat, Dark aluminum gray coded 106A-15, Black Japan, coded 106A-3.

Description

The 106-A Amplifier is designed to operate between impedances of 600 ohms, although it may equally well be used in conjunction with 500 ohm circuits, and has a gain of approximately 45 db. It also has a high impedance input of 10,000 ohms for bridging across a 600 ohm circuit and under this condition the gain is approximately 20 db. An additional winding, delivering a voltage approximately 20 db below the main output of the amplifier, is provided on the output transformer for monitoring with a suitable monitoring amplifier. The operation of this winding (impedance approximately 40 ohms) has no effect on the main output of the amplifier. The amplifier is equipped with a gain control which has nineteen 2 db steps of attenuation and an "off" position.

The 106-A Amplifier operates from a 105 to 125 volt, 50 or 60 cycle AC supply. As supplied from the factory the power transformer is connected for operation from an AC supply of 120 volts nominal voltage. The power consumption is 41 watts at 115 volts, 44.5 watts at 120 volts and 48 watts at 125 volts.

The schematic circuit diagram of the 106-A Amplifier is shown on Figure 1 and the wiring diagram on Figure 2.

Mounting:

The component parts of the 106-A Amplifier are assembled on a recessed metal panel 19 inches wide and 7 inches high designed for mounting on a standard relay rack or equipment cabinet. This panel is equipped with a front mat which is fastened in place by four screws from the rear and is removable to allow access to the wiring and terminals. Projecting through the front mat are the gain control Knob, two push type keys for plate current measurement and the power supply switch. A pilot lamp mounted behind the mat illumi-

nates a plastic lens to indicate when the amplifier is energized.

Power Supply:

The 106-A Amplifier is completely AC operated; the filaments of the vacuum tubes are operated directly from a 10-volt winding on the self-contained power transformer and the plates are supplied from a self-contained rectifier and filter. In addition, the power transformer and rectifier have extra capacity to supply filament and plate power to other amplifiers. Terminals are provided on the amplifier for this purpose. Extra plate supply of 4 milliamperes at 275 volts unfiltered is available. An external filter section consisting of a Western Electric 221-A Retardation Coil or equivalent and an 8 microfarad condenser is required. The extra filament supply is 2 amperes at 10 volts AC.

Installation

Care should be taken when installing the 106-A Amplifier to guard against exposure to strong magnetic fields. Although special shielding precautions have been taken in the design of the amplifier and noise from electromagnetic coupling has been practically eliminated in the amplifier itself, objectionable hum from other sources may be experienced if this precaution is not taken.

External Connections:

Two terminal strips are provided on the amplifier. The terminal strip at the left-side of the amplifier (viewed from the front) contains the terminals, numbered from 1 to 20, for the audio frequency circuits, plate current meter and plate supply for external amplifiers. The terminal strip at the right side of the amplifier contains the terminals, numbered from 21 to 25, for the AC circuits. The following table gives the terminal numbers and the connections for each terminal.

<i>Terminal Numbers</i>	<i>External Connections</i>
1 and 2	Input (600 ohms)
3 and 4	Center tap of input coil (strapped)
5	Center tap of input terminating resistance
6	Spare
7 and 8	Bridging Input
9 and 10	Plate current Meter (10 Positive)
11 and 12	Main Output (600 ohms)
13 and 14	Monitor Output (40 ohms)
15	Ground
16, 17 & 18	Spare
19 and 20	Plate supply for external Amplifiers (20 Positive)
21	Ground
22 and 23	Filament supply for external Amplifiers
24 and 25	105-125 volt, 50-60 cycle, AC Power Supply

The AC Power connections to the amplifier should be made with No. 14 Gauge twisted pair copper wire soldered to terminals 24 and 25. These leads may be in conduit or lead sheath. The holes in the amplifier chassis are of the proper size for one-half inch conduit fittings. The amplifier is wired normally for line voltages between 115 and 125 volts. If the line voltage is between 105 and 115 volts, the connection on terminal No. 3 of the power transformer should be transferred to terminal No. 2.

When external amplifiers are supplied with filament power from the 106-A Amplifier, the connections for the 10 volt AC filament supply should be made to terminals 22 and 23 with shielded twisted pair copper wire not smaller than number 16 gauge. Terminal number 21 is provided for grounding the shields of the AC leads.

All other external connections to the amplifier should be made with shielded twisted pair copper wire and all joints should be securely soldered. The shields should be electrically continuous and should be grounded by connecting to the ground lug of the amplifier. The ground lug should be connected to a good ground. The negative side of the amplifier plate supply should normally be grounded by

strapping terminals 15 and 19. However, when external amplifiers obtain their plate supply from the 106-A Amplifier, it may be found desirable to make this ground connection at the terminal strip of one of the external amplifiers in order to obtain the lowest noise level.

Plate Current Measuring Circuits:

Two push type keys are provided on the front of the panel for connecting an external meter to indicate the plate currents of the vacuum tubes. The KS-10003 Meter may be used for this purpose. The lower scale (0-2 milliamperes) of this meter indicates the plate current of the first stage vacuum tube when the first stage key is operated. The upper scale (0-40 milliamperes) indicates the plate current of the second stage when the second stage key is operated. If this meter is not available, a 200 microampere scale meter with a series multiplier of such resistance to make the total value of multiplier and meter resistance 1000 ohms may be used. If a meter and multiplier are used, the readings in microamperes must be multiplied by 10 to obtain the actual plate current of the first stage vacuum tube and by 200 to obtain the actual plate current of the second stage vacuum tube.

After the connections have been made to the amplifier as outlined above, a Western Electric 310-B Vacuum Tube should be inserted in vacuum tube socket VS1. The flexible grid lead should be attached to the cap on the top of the vacuum tube and the tube shield should be placed over the tube. A Western Electric 336-A Vacuum Tube should be inserted in vacuum tube socket VS2 and a Western Electric 274-A Vacuum Tube should be inserted in vacuum tube socket VS3.

Operation

After the amplifier has been installed as described in the preceding section, it is ready for operation. The power switch on the front of the panel should be operated to its "on" position. After the power has been on for a period of two minutes, the plate current of each vacuum tube should be measured to ascertain that the tubes are operating. With the proper me-

ter connected to the meter terminals of the amplifier, the plate current measurements are made by successively depressing the plate current keys on the front of the amplifier. The plate current of the first stage, associated with Key No. 1, should be 1.0 ± 0.2 milliamperes. The plate current of the second stage, associated with Key No. 2, should be 34 ± 4 milliamperes.

While the 106-A Amplifier is designed to operate between impedances of 600 ohms, it may also be operated between impedances of 500 ohms. The high impedance input may be used for bridging the amplifier on a 500 or a 600 ohm circuit when it is desired to supply additional program lines without the use of special dividing networks. The net gain of the amplifier when the high impedance input is used, is approximately 20 db which is sufficient for this service under all normal conditions.

The monitoring winding on the output transformer delivers a voltage approximately 20 db below the main output of the amplifier. While this winding is designed to operate into a Western Electric 124 or 133 Type Amplifier, it may be used with any amplifier having sufficient gain which will operate satisfactorily from the low impedance (approximately 40 ohms) presented by this winding. Suitable im-

pedance matching or volume control elements should be provided as required depending upon the type of amplifier.

Maintenance

The vacuum tubes used in this amplifier have a long life but will require occasional replacement. The electrolytic condensers also have a finite life. Deterioration is indicated by a gradual increase in the hum level of the amplifier. If this reaches an unsatisfactory value, it is suggested that the entire set of electrolytic condensers be replaced.

Vacuum Tubes:

The following tubes are required for the operation of this amplifier. *They are not supplied with the amplifier, but must be ordered separately.*

- 1 Western Electric 310-B Vacuum Tube (first stage)
- 1 Western Electric 336-A Vacuum Tube (second stage)
- 1 Western Electric 274-A Vacuum Tube (rectifier)

Replacement Parts:

In case replacements or additional parts are required they should be ordered from the nearest distributor.

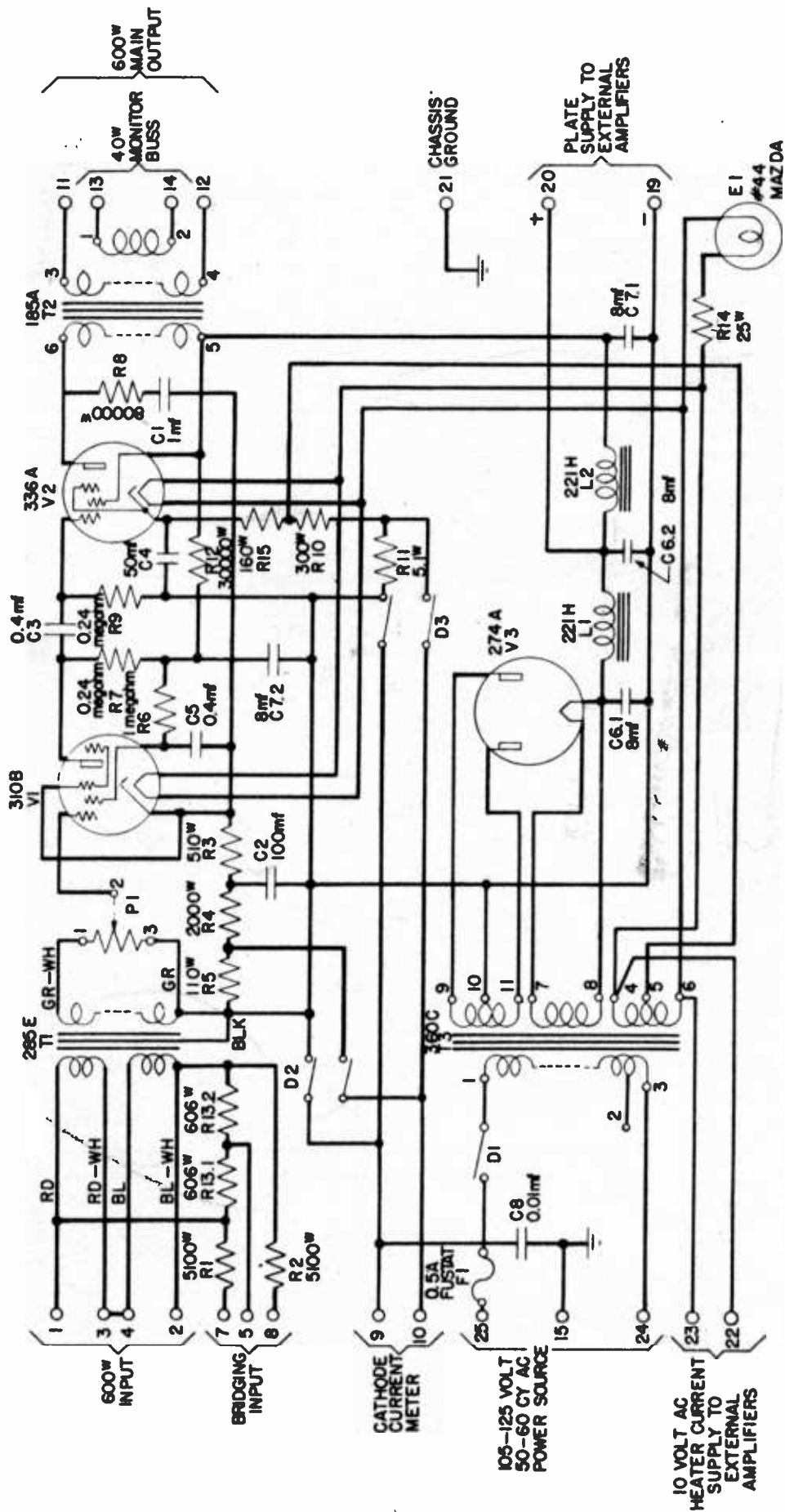


Figure 1—Schematic

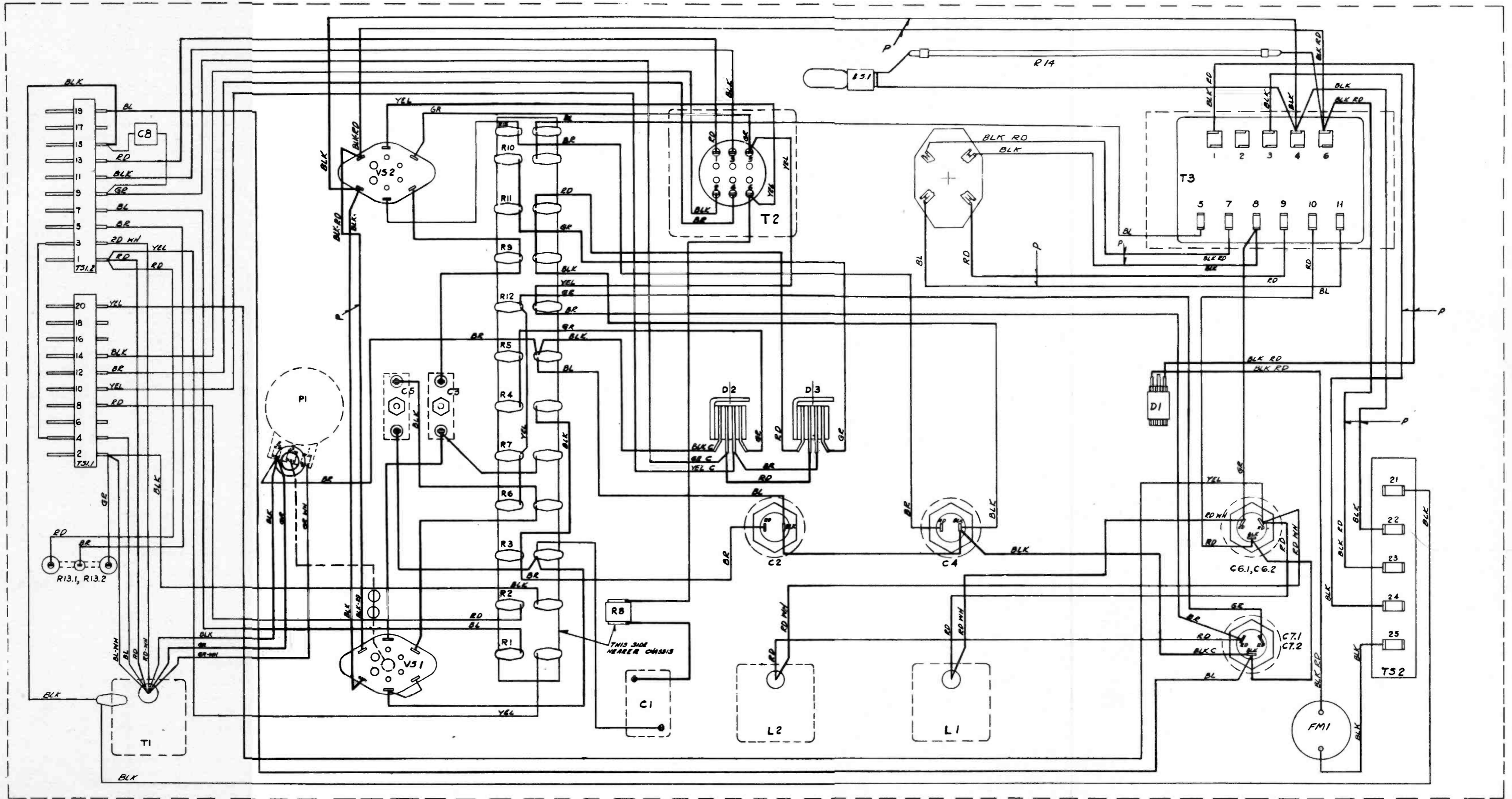


Figure 2—Wiring Diagram



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