

Western Electric

131A AMPLIFIER



Instruction Bulletin No. 1099, Issue 2

Western Electric

131A AMPLIFIER

Description

Type:

The 131A Amplifier is a special purpose two-stage push-pull 5 watt amplifier for booth and studio loud speaker monitoring in high quality Speech Input or Sound Systems. It incorporates three loud speaker cut-off relays and an output network for serving a booth and two studio loud speakers and a cue feed circuit. The amplifier is designed for operation from an external power supply source.

Typical Electrical Characteristics:

Frequency Characteristic—Flat within 1 db over the range 50 to 15,000 cycles.

Output Power—Approximately 5 watts (+37 dbm) with 5% harmonic distortion; approximately 3.2 watts (+35 dbm) with 1% harmonic distortion.

Output Noise— -55 dbm, unweighted, with maximum gain. Signal to noise ratio over 90 db under conditions of normal gain and output level.

Gain—Approximately 50 db Maximum.

Operates from—600 ohms.

Operates into—Tapped output transformer provides for operation into any impedance from 1 ohm to 1200 ohms. (See output circuit description.)

Power Supply—Filament 6.3 volts, 3 amperes a-c or d-c. Plate 275 volts, 75 milliamperes, d-c. (Filament and plate supply may be obtained from 18 or 20 type Rectifiers.)

Equipment Characteristics:

Panel size—Approximately 6 $\frac{3}{8}$ " x 10-5/16". The apparatus extends approximately 5" from the front and 2 $\frac{1}{4}$ " from the rear of panel.

Weight—Approximately 7 $\frac{3}{4}$ lbs.

Mounting—Designed for mounting in the 25B type Speech Input Console Unit. The 190 type Mounting Plate may also be used for mounting two 131A Amplifiers on standard 19" relay rack type frames.

Installation

Mounting:

The 131A Amplifier is designed primarily for mounting in the 25A or B Speech Input Equipment. Figure 3 shows the outline dimensions of the panel on which the amplifier apparatus is mounted. Apparatus and vacuum tubes mounted on the panel extend about 5" from the outside surface, with the wiring

on the other side, or bottom of the panel; apparatus on this side of the panel extends about 2 $\frac{1}{4}$ " from the panel.

As mounted in the 25 type Speech Input Equipment, the Amplifier chassis is mounted on 8 rubber vibration mounts (U. S. Rubber Company A-301 Cylindrical Mount). In addition to providing isolation from shock and

vibration the rubber mounts insulate the chassis electrically from the cabinet or framework. This permits this and other associated amplifiers and circuits all to be grounded at a single point in the system which is desirable to control noise and crosstalk. Care should be used to see that this insulation is not rendered ineffective by contact between the chassis and the cabinet or other mounting.

Suitable mounting brackets are necessary for other applications of the 131A Amplifier, or the 190 type Mounting plate may be used. Mounting precautions as indicated above should be observed. Other precautions include the following:

Mounting Precautions:

Avoid exposure to magnetic fields which might induce noise in the equipment. When equipment such as 18 or 20 type Rectifiers, or amplifiers with self-contained a-c power supplies are mounted near 131A Amplifiers it is desirable to have maximum separation (10 inch minimum) between the input transformer of the 131A Amplifier and the power transformer of the a-c operated equipment.

Hum caused by pick-up in the input trans-

former can often be reduced by loosening the clamping ring and rotating the transformers to the position of minimum hum. To avoid damaging the leads the transformer should not be rotated more than 180 degrees in either direction from its original position.

Power Supply Considerations:

Both filament and plate power supply can be obtained from either the Western Electric 18A or B Rectifiers (one rectifier for each amplifier). When the 18 type Rectifier is used, a 4 or 5 db improvement in signal to noise ratio can usually be obtained, if required, by equipping the rectifier with an extra filter section as described in the Instruction Bulletin for that rectifier.

External Connections:

Locations:

Terminals 1 to 8 inclusive located on Terminal Strip TS1.

Terminals 9 to 16 inclusive located on Terminal Strip TS2

Terminals 17 to 19 inclusive located on Terminal Strip TS3.

Terminal Numbers	External Connections
1 and 2	600 ohm input.
3	Common lead (ground)—to key contacts for loud speaker cut-off.
4	Booth Microphone Key—to key contacts for booth loud speaker cut-off.
5	Studio A Microphone Keys—to key contacts for Studio A loud speaker cut-off.
6	Studio B Microphone Keys—to key contacts for Studio B loud speaker cut-off.
7	—275 Volts d-c plate supply.
8	+275 Volts d-c plate supply.
9 and 10	Cue feed circuit to remote lines through repeating coil (10 ground side).
11 and 12	Booth Loud Speaker (12 ground Side).
13 and 14	Studio A Loud Speaker (14 ground Side).
15 and 16	Studio B Loud Speaker (16 ground Side).
17 and 18	6.3 Volts a-c or d-c filament supply.
19	Ground (See System Grounding).

All electrical connections to the Amplifier should be made with shielded, twisted-pair copper wire with insulation over the shields, and all joints should be securely soldered with rosin flux solder. The shields should be electrically continuous and should be grounded at the amplifier end only. This grounding should be by connection to the amplifier chassis or to Terminal 19. The shield enclosing the output leads to the cue circuit should not be grounded at the Amplifier but should be grounded only at the input of the succeeding repeating coil.

The Amplifier chassis is insulated from its mounting and hence from the cabinet or rack by the flexible rubber supports, and care should be used in all wiring to avoid shorting out this insulation by uninsulated shields or other connections. Ground to the Audio Ground for each circuit group supplied from a common power supply source should be made at a single point as covered under System Grounding.

System and Power Source Grounding:

The chassis, the shielding, and the negative side of the plate supply should be grounded by connecting Terminal 19 to the Audio Ground lug on the rack or cabinet. When several Amplifiers obtain plate power from a common source, the ground should be applied at only one point in each system supplied from each source. The center tap of the transformer filament winding should also be grounded to the Audio Ground.

Output Circuit Considerations:

The output circuit of this Amplifier consists of an output transformer T2, which feeds four branch circuits. Three of these branch circuits are for connection to the voice coils of three separate loud speakers, while the fourth branch is for connection through an external repeating coil to feed cue program transmission to remote lines or other similar destinations.

The number of loud speakers and their voice coil impedances are likely to differ for different locations so that it is necessary during installation to adjust this output circuit to operate properly with the conditions encountered.

As furnished, the tapped secondary winding of Transformer T2 is connected for the impedance range 1 to 3 ohms, which will satisfactorily feed the four parallel branch circuits when a 3 to 10 ohm loud speaker or equivalent resistance is connected to each of the three loud speaker branches, and the fourth (cue feed) branch is terminated in approximately 600 ohms.

NOTE: To maintain proper network balance, loud speaker branch circuits not equipped with a loud speaker must be terminated instead by connecting in place of the speaker a 2 watt resistance equal in value to the speaker impedance.

Where speakers having other impedances are used the secondary of transformer T2 should be restrapped in accordance with Table I to the proper range to match the combined impedance of the three speaker branches.

TABLE I

Rated Load Impedance	Working Range of Load Impedance	Strap Terminals Connected by Dash	Output Connections
600 ohms	300 ohms to 1200 ohms	7-8, 9-10, 11-12	5 & 14
150 ohms	70 ohms to 300 ohms	7-8, 9-14, 11-12, 5-10	5 & 14
30 ohms	20 ohms to 70 ohms	7-8, 9-10, 11-12	6 & 13
16 ohms	10 ohms to 20 ohms	7-8-10, 9-11-12	6 & 13
7.5 ohms	3 ohms to 10 ohms	7-9-10-12, 6-8, 11-13	6 & 13
*1.75 ohms	1 ohm to 3 ohms	6-8-10-12, 7-9-11-13	6 & 13

*Amplifier as supplied is wired for this load.

Although it is not necessary that the speakers connected to the speaker branches have identical impedances, it can be expected that more energy and consequently higher program level will be fed to the speaker or speakers having the lower impedance. This may be altered by connecting a resistance in series with the low impedance speaker. In some cases, however, this may result in an appreciable lowering of the level available from the system.

The cue feed branch normally has an impedance so much greater than the combined impedance of the three loud speaker branches, that it usually meets all impedance conditions without modification. For some applications a change in the cue feed circuit resistances may become desirable to obtain either a higher or lower average program level. As long as a high ratio is maintained between the impedance of the cue feed branch and the combined impedance of the loud speaker branches, such adjustment can usually be carried out by a cut and try method until a satisfactory cue feed level is obtained without affecting the loud speaker branches.

Loud Speaker Cut-Off Feature:

Each loud speaker branch circuit is equipped with a cutoff relay which may be connected to operate from a pair of contacts on external keys such as microphone keys or talk back keys so that operation of the key to turn the microphone on will, at the same time automatically silence the loud speaker located in the same room with the microphone. This prevents acoustic feed back, (or singing) caused by a microphone picking up sound from a loud speaker connected to the same amplifier channel.

Power for operating these cut-off relays is obtained from the power stage cathode circuit which in turn obtains energy from the

plate supply source. Because of this feature, it is unnecessary to obtain this power from a special signal power supply source. To operate these relays therefore, it is only necessary to connect terminal No. 3 (common terminal) to terminal No. 4 to silence the booth speaker; to terminal No. 5 to silence Studio A Speaker, and to terminal No. 6 to silence Studio B Speaker. Each of these connections should be made through a "make" contact pair on the key or keys assigned to control the associated speaker.

In operation, each cut-off relay substitutes for its speaker load a compensating resistance load, which should have approximately the same number of ohms as the impedance of the associated speaker. This tends to hold the level constant on the speaker or speakers remaining in operation. Resistances R12, R13 and R14 are these compensating resistance loads associated respectively with the Booth Speaker, Studio A Speaker and Studio B Speaker cut-off relays. As shipped, each of these resistances has a value of 10 ohms $\pm 5\%$. If other than 10 ohm speakers are used these resistances should be replaced by other 2 watt resistances having approximately the same value as the impedance of the associated speaker.

Vacuum Tubes:

Two Western Electric 348A Vacuum Tubes should be inserted in the first stage sockets. The flexible grid leads should be attached to the tube caps and the tube shields should be placed over the tubes. Two Western Electric 349A Vacuum Tubes should be inserted in the second stage sockets.

Warning: The tube shields are locked to the bases (which are fastened to the panel) by screw threads at the bottom of the shield and can only be removed without damage by rotating the shield counter-clockwise.

Operation

A period of approximately one minute should be allowed for the vacuum tube cathodes to reach their operating temperature after pow-

er is applied. As this amplifier is of the push-pull type throughout, it is desirable for best operation to pair off tubes on opposite sides

of the same stage so that they have as nearly identical characteristics as possible. This test is not critical and the trial of several pairs of tubes will usually indicate which pair gives the best performance.

No special plate current measuring facilities are provided in this amplifier. However, operation may be checked by measuring the voltages as indicated on the schematic, Figure 1.

Associated Parts:

The following vacuum tubes are required for the operation of this Amplifier and must be specified separately on the order.

2—Western Electric 348A Vacuum Tubes

2—Western Electric 349A Vacuum Tubes

In an emergency, if the above tubes are

not available, the following tubes may be substituted:

First Stage—6J7 or RCA 1620 for 348A

Second Stage—6F6 for 349A

(For best results the same make of tube should be used in both sides of each push-pull stage.)

The following accessory equipment is recommended for use with this Amplifier.

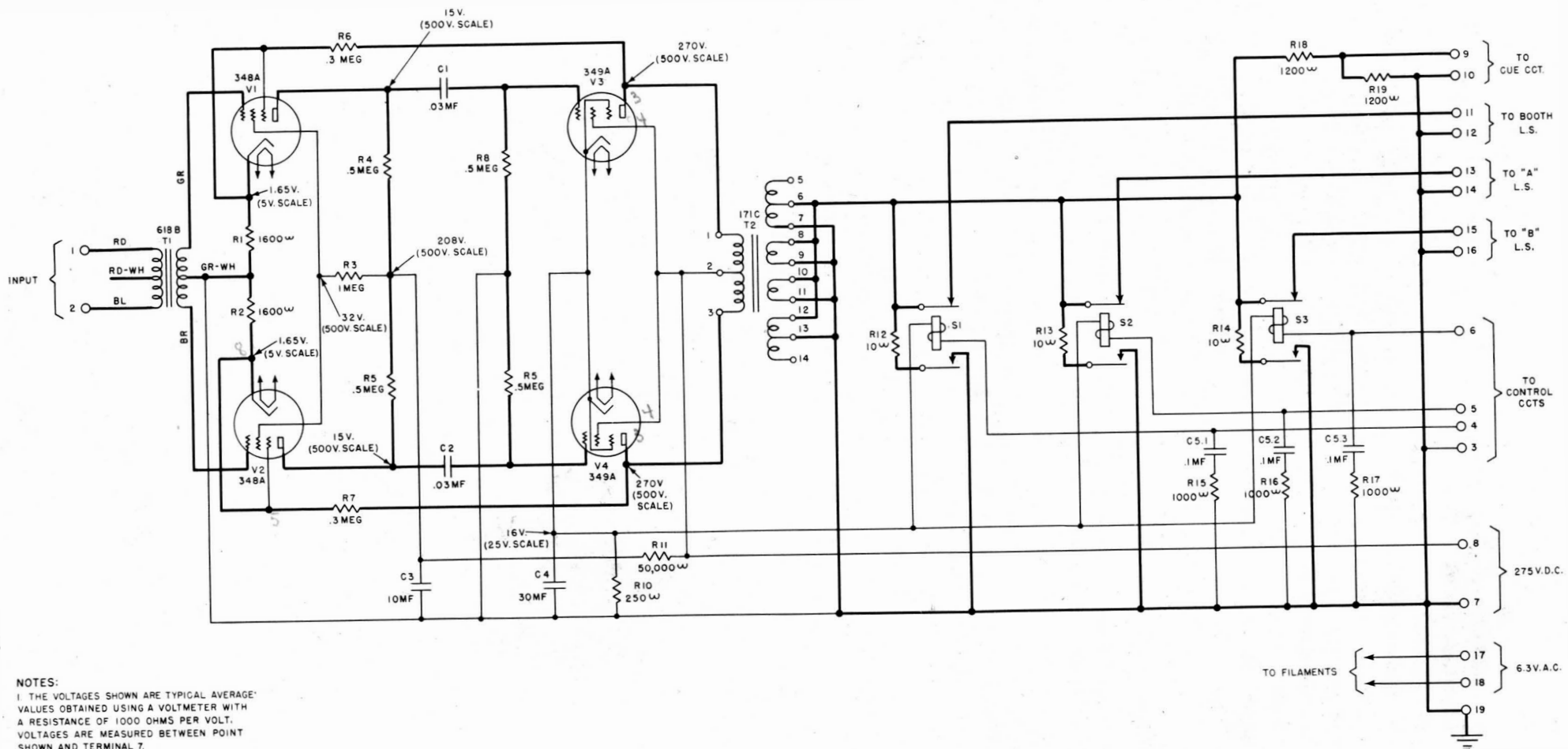
190 type Mounting Plate

Western Electric 18A, 18B or 20B

Rectifier

Maintenance Parts:

If replacement parts are required for the 131A Amplifier they may be procured through the nearest distributor. Lists of replaceable parts of the amplifier are packed with each amplifier.



NOTES:
 1. THE VOLTAGES SHOWN ARE TYPICAL AVERAGE VALUES OBTAINED USING A VOLTMETER WITH A RESISTANCE OF 1000 OHMS PER VOLT. VOLTAGES ARE MEASURED BETWEEN POINT SHOWN AND TERMINAL 7.

FIG. 1 — Schematic

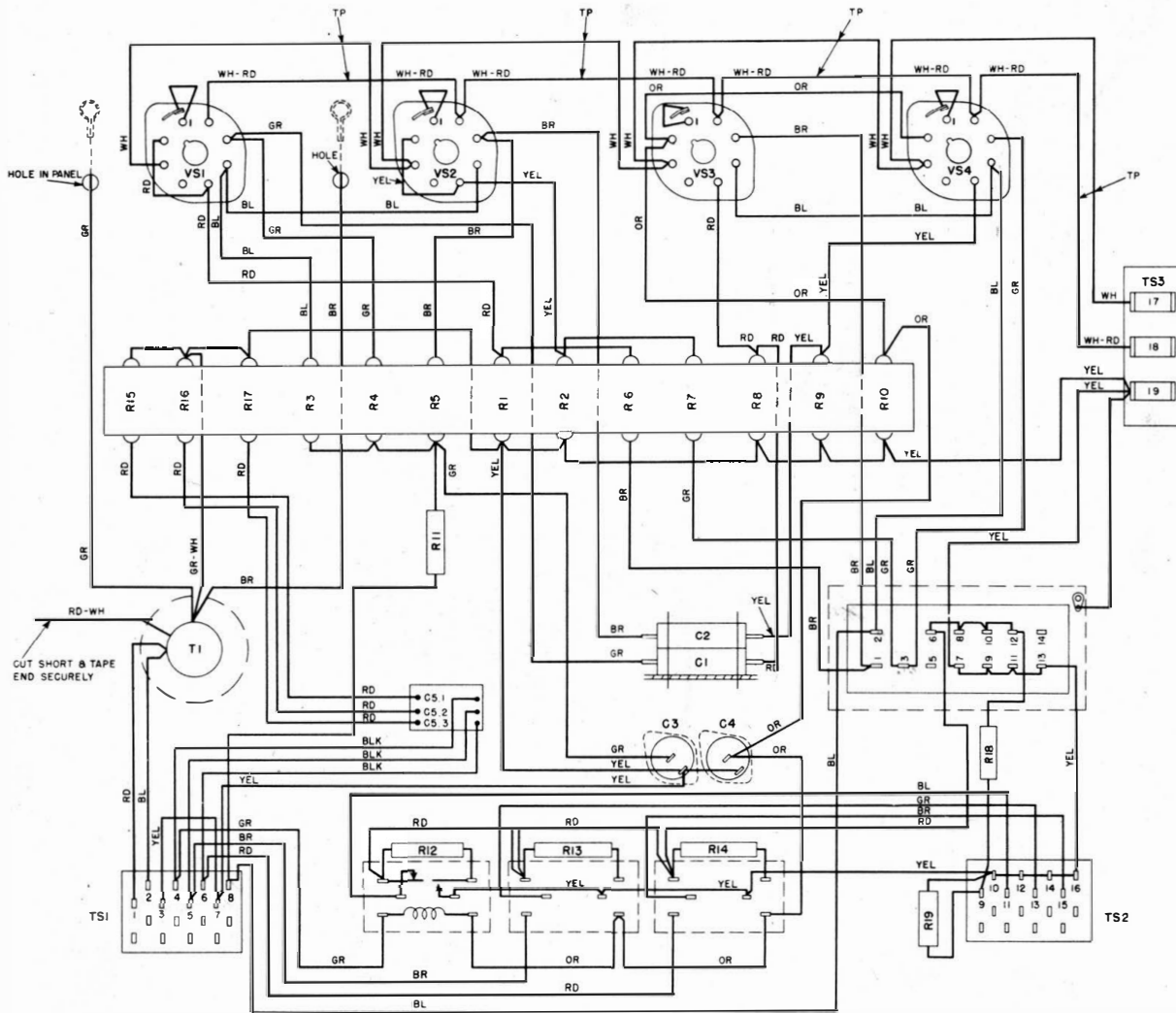


FIG. 2 — Wiring Diagram

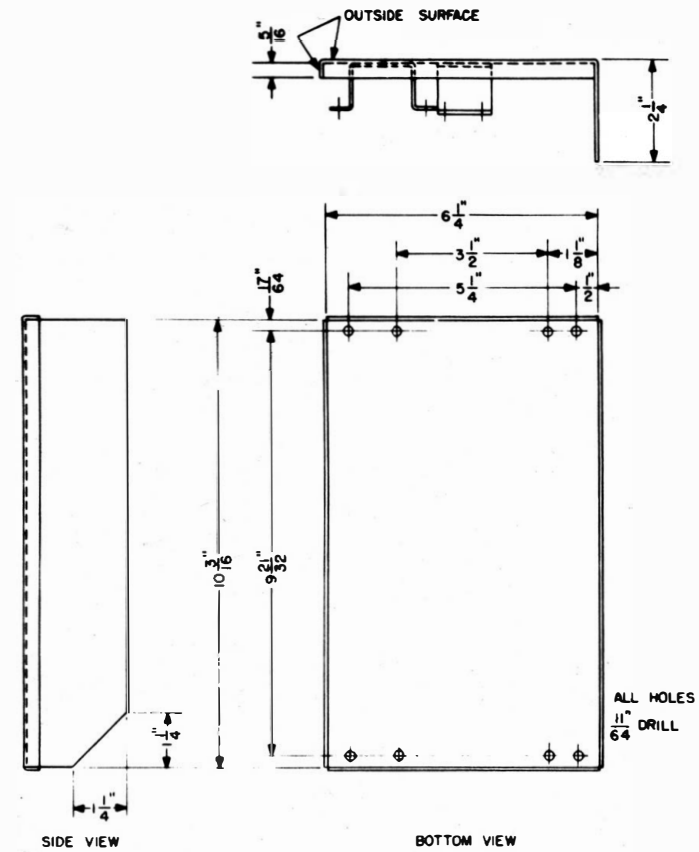


FIG. 3 — Chassis Detail

DISTRIBUTOR IN THE UNITED STATES

Graybar

ELECTRIC COMPANY

Executive Offices: 420 Lexington Avenue, New York 17, N. Y.

ALABAMA
Birmingham

ARIZONA
Phoenix

ARKANSAS
Little Rock

CALIFORNIA
Los Angeles
Oakland
Sacramento
San Diego
San Francisco

COLORADO
Denver

CONNECTICUT
Hartford
New Haven

DELAWARE
Wilmington

DIST. OF COLUMBIA
Washington

FLORIDA
Jacksonville
Miami
Orlando
Tampa

GEORGIA
Atlanta
Savannah

IDAHO
Boise

ILLINOIS
Chicago
Peoria

INDIANA
Evansville
Hammond
Indianapolis

IOWA
Davenport
Des Moines

KANSAS
Wichita

KENTUCKY
Louisville

LOUISIANA
New Orleans

MAINE
Portland

MARYLAND
Baltimore

MASSACHUSETTS
Boston

Springfield
Worcester

MICHIGAN
Detroit
Flint
Grand Rapids
Lansing

MINNESOTA
Duluth
Minneapolis
St. Paul

MISSISSIPPI
Jackson

MISSOURI
Kansas City
St. Louis

NEBRASKA
Omaha

NEW HAMPSHIRE
Manchester

NEW JERSEY
Newark

NEW YORK
Albany
Buffalo

New York
Rochester
Syracuse

NO. CAROLINA
Asheville
Charlotte
Durham
Winston-Salem

OHIO
Akron
Cincinnati
Cleveland
Columbus
Dayton
Toledo
Youngstown

OKLAHOMA
Oklahoma City
Tulsa*

OREGON
Portland

PENNSYLVANIA
Allentown
Harrisburg
Philadelphia
Pittsburgh
Reading

RHODE ISLAND
Providence

SO. CAROLINA
Columbia

TENNESSEE
Chattanooga
Knoxville
Memphis
Nashville

TEXAS
Amarillo
Beaumont
Corpus Christi
Dallas
Fort Worth
Houston
San Antonio

UTAH
Salt Lake City

VIRGINIA
Richmond
Roanoke
Norfolk

WASHINGTON
Seattle
Spokane
Tacoma

WISCONSIN
Milwaukee

*Sales Office

A NATIONAL ELECTRIC SERVICE

DISTRIBUTOR FOR CANADA AND NEWFOUNDLAND

Northern Electric

COMPANY LIMITED

General Offices: 1620 Notre Dame Street, W.

Plant: 1261 Shearer Street,
Montreal, P. Q., Canada

TWENTY-FIVE BRANCHES FROM COAST TO COAST

Western Electric