SPECIFICATIONS

GAIN: 120 db at 400 cycles.
INPUT IMPEDANCE: 500 C.T.; 200 C.T., or 50 ohms.
OUTPUT IMPEDANCE: 500 ohms C.T.
OUTPUT RATING: 15 watts at 2½% total harmonic distortion. 20 watts at 4½% total harmonic distortion.
TUBES: 2-6K5G; 1-6C5G; 1-6P6G; 2-6B4G; 1-5X4G; 1-5Y4G.
POWER CONSUMPTION: 150 watts.
VOLTAGE: 105-125 Volts, 50/60 cycles
DIMENSIONS: 15"L x 9"D x 8"H
SHIPPING WEIGHT: 36 Lbs.
FINISH: Cadmium plated chassis.

The power output section is provided with facilities for connecting from one to three additional model P015 power amplifiers similar in design to the power section embodied in the PA-15 amplifier.

THE EQUALIZING OR COMPENSATING CIRCUIT is inserted in the final stage of the voltage amplifier section and consists of specially designed non-resonant circuits. This compensating network has been arranged to give five positions of frequency equalization as follows: Two steps of attenuation at 30 cycles of 10 db. per step and two steps of attenuation at 10,000 cycles of 15 db. per step. This attenuation curve does not affect the response at 400 cycles in any of the four positions and will give a gradual attenuation both sides of this point to the selected equalization.

THE POWER OUTPUT amplifier section of this unit contains the power supply for all filament, bias and plate voltages of both the voltage and power amplifiers. Provisions have been made in this section for supplying filament and plate voltages, when required, through a receptacle on the rear of the chassis.

THE INPUT to the power amplifier is connected to a receptacle located on the rear of the chassis for paralleling one to three additional model P015 power amplifiers when increased power output is desired. This input circuit is connected to a driver stage of amplification transformer coupled to a push-pull stage of amplification which employs two triode power tubes operating at fixed bias.

The care in design of circuit components and layout of the PA-15 amplifier results in an output having a flat frequency response, but of more importance an output in which all of the harmonics arithmetically added result in a distortion factor not greater than 2.5% under any load condition up to the rated output.
CONNECTIONS: A shielded input cable fitted with lock type connector at one end should be used between control box and amplifier. Connect microphone plug of this input cable to #1 microphone connector on amplifier and other end of input cable to input strip of control box. See diagram. Connect shield of input cable to correct terminal on control box. Connect terminals 1 and 6 of amplifier to output terminal strips of control box. #1 terminal of amplifier connects to bottom terminal on control box and #6 to top terminal. Connect each speaker to terminals on control box as shown—speaker #1 to terminals #1, speaker #2 to terminals #2, etc. Ground side of speaker is bottom terminal. Shielded wire must be used for all speakers. Single wire shielded is satisfactory in which case shield is ground. If two wire shielded is used, the shield and ground wire must be tied together.

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The Bogen Model PH10 is a 10 watt amplifier for radio and phonograph reproduction. It is provided with a special multi-range tone control switch. Four tone control positions are provided, corresponding to four different frequency response curves for different types of operation.

POWER RATING: 117 V - 60 Cycles: Power consumption - 60 Watts

TUBES: Total 4:2-6V6, 1-6SL7, 1-5Y3.

CONNECTIONS:

Input: The amplifier has a high impedance input. Connection is made from the radio output or phonograph pickup to the INPUT terminal by a single shielded wire using the single prong connector provided. For full output of the amplifier the input device must be capable of delivering approximately one volt across 500,000 ohms. Most crystal pickups, high output type magnetic pickups and most radio tuners can provide this voltage.

Output: Two voice coil output impedances, of 3.2 ohms and 8 ohms, respectively, are provided. Connections are made from COM and the proper impedance tap directly to the speaker voice coil. Either FM speakers or speakers having their own field supply should be used. An A.C. power receptacle is provided for power supply to the accompanying radio or phono turntable.

TONAL CONTROL:

Position 1 provides an accentuated bass response with a lowered treble response. It is best for phonographic reproduction of popular type recordings and is designed to accentuate the orchestral rhythm effects. Position 2 provides the same bass response as in position 1, but the treble response does not drop off as fast. This type response is best for phonographic reproduction of symphonic and other classical type recordings. Position 3 provides a level response of the bass and mellow ranges and a gradually decreasing response in the treble range. This response is good for reproduction of standard AM broadcast programs. Position 4 provides equal response at all frequencies and is ideal for reproduction of FM broadcast programs.
There are 2 basic kits as follows:

Kit PK-1 consists of a PH10 Amplifier, reproducer combination (a 12" speaker and a tweeter with cross-over network), and an automatic record changer with (built-in switch to automatically disconnect the phonograph during the change cycle).

Kit PK-2 is the same as the PK-1 except that a PH10C amplifier is substituted for the PH10: (the PH10C is identical to the PH10 except that the controls are brought out on extended leads for external mounting).

**INTERCONNECTION OF UNITS:**

The reproducer unit, which is common to both kits is connected to the output of the PH10 or PH10C amplifier. The reproducer unit terminates in a three conductor cable which is connected to the output strip of the amplifier. (See interconnection diagram). This strip is marked "COM -3.2-8" to which are connected respectively the blue, white and red leads of the reproducer cable.

The output of the automatic record changer is connected to the input of the amplifier by plugging the single conductor shielded lead (terminated in a single prong plug) into the corresponding input receptacle on the amplifier. Phonograph turntable power is obtained by plugging the power cord into the power receptacle on the amplifier (which, in turn, has its power cord plugged into any convenient 117V, 60 cycle outlet).

**SCAN**

**LINE CORD**
**PLUG INTO ANY CONVENIENT**
**117 V, 60 CYCLE OUTPUT.**

**RECORD CHANGER:** Webster Model 148

**AUTOMATIC CHANGER**
**POWER CORD**
**OUTPUT**

**PHIO OR PHIOC**

**REPRODUCER**

**CABLE**

Connect male plug (not supplied) to end of changer power leads and plug into receptacle on amplifier.

**Plug small connector on changer pickup lead into receptacle on amplifier.**
The Model PM4-AC-2 is identical to the PM4-AC except that there is no longer provision for voltage type velotron microphone.

The Model PM4-AC-2 is a four position Mixer and Pre-amplifier, self powered. It can be attached to the input of any amplifier so that any combination up to four high impedance microphones, phonographs or a radio may be blended by the operator.

Power Rating: - 105-125 volts A.C., Consumption 35 watts.

Tubes Used: - Total 5: 4-6F5G; 1-2526, Balast type BK-67-B.

Connections: - Shielded microphone receptacles are available on the chassis to connect any high impedance microphone such as velotron (no voltage,) velocity dynamic or crystal. A shielded wire cable is necessary for each of the 4 circuits to minimize hum. The female cable connectors supplied with each of the 4 input connectors should be fitted to the cables from microphones or other source of sound by the following method.

1. Skin off about 1 inch of outer rubber covering, exposing shielding.
2. Cut shielding back so that only 3/8 inch is exposed.
3. Clinch sheet metal sleeve around shielding and trim off any whiskers, clinch small ends around inner rubber insulation only.
4. Remove inner rubber insulation from wire, within 1/8 inch of metal sleeve.
5. Tin wire with solder and cut to about 1/8 inch.
6. Slip cable through connector body and solder wire into hollow end of center contact.
7. Draw cable back into connector body. Force bakelite washer into recessed seat. Tighten set screw into metal sleeve.
8. Never use soldering paste on any microphone connection. Use Rosin core solder.

The Input circuits are all of high impedance and are, therefore, suitable for high impedance microphones, phono-pick-ups, etc. If a low impedance device is used, it is necessary to use a matching transformer, designed for use with that device and having a high impedance secondary (to tube grid). This transformer should be kept one or two feet away from all power transformers to prevent hum pick-up. The strength of signal from radios and phonographs should be kept down by their own volume control so as to prevent overloading the tubes in the pre-amplifier.

Output: - The output circuit of this pre-amplifier is of high impedance and therefore matches the input to other Bogen amplifiers. A shielded cable is necessary in connecting to the input of the power amplifier. It should be kept short to reduce the chance of picking up noise and loss of high tones. A shielded output connector is on the left end of the chassis. Because of the "gain" obtained in this pre-amplifier it is generally advisable to connect it to the "phono input" terminals of the power amplifier rather than to the "microphone input" terminals.

NOTES: - The PM4-AC-2 or any associated amplifier or device should not be grounded excepting through a paper condenser of not over .25 mfd. Hum may be caused by faulty tubes or by a ground. In some locations hum may be reduced by reversing the 110 volt power plug in the electrical outlet.
The Model 3LX is a Volume Expander unit, self-powered, for use with any public address system or amplifier. It restores the full dynamic range of volume an originally played at the radio or recording studio.

**POWER RATING:** - 117 volts AC, power consumption 28 watts.

**TURNS:** - Total 3: 1-CSA7; 1-6CA6; 1-5#4.

**CONNECTIONS:**

Input: The phono pickup is connected to the terminals on the left side of the volume Expander. "GND" or "1" is for the grounded or shielded side. "M" or "2" is for the live wire of a magnetic pickup. "L.C." or "3" is for the live wire of a low output crystal pickup. "H.C." or "4" is for the live wire of a high output crystal pickup. If a low impedance pickup is to be used, a matching transformer should be connected between the phono-head and the input terminals.

Output: The two output terminals on the right side of the Volume Expander should be connected to the "Phono-Input" terminal of the amplifier. Using a shielded wire, connect #1 on the Expander to the grounded input terminal on the amplifier by means of the shield itself. Then connect the wire from #2 on the Expander to the live or grid terminal on the phonograph input on the amplifier.

Plug the power cord into a 117 volt AC output and turn on the switch mounted on the front panel. If there is a noticeable hum, remove the power plug, rotate it one-half turn to reverse the polarity and re-insert it in the power outlet.

**Volume Expansion:** The knob marked "Expansion" controls the amount of expansion. It is not a volume control. Zero on the dial indicates normal reproduction and as the knob is turned towards 10, expansion is increased.

**To Set Expander:** Set the expander control to zero. Turn up the amplifier volume control to a point near the desired volume. On a loud passage of the record, turn the expansion control to the right until the volume level of these passages reach the desired expanded point. Now regulate amplifier volume control to obtain the overall volume required. The expander does not affect the softer portions of the record but only increases the volume of loud passages. With the expander in operation, needle scratch will be reduced, as the expanded loud passages will now constitute loudest listening volume and the soft passages will consequently be lower.

The Volume Expander may be used with a radio or tuner. Connect voice coil or detector output leads to the "Phono Input" lugs, varying the live lead between Terminals "M" or "2", "L.C." or "3", and "H.C." or "4", for best results.

To use the Volume Expander with a complete radio, break the grid lead in the first audio stage and connect the grid lead to the input terminals according to best results. Connect the grid of the audio tube to #2 on the output strip. Use shielded wire, connecting the shield to "GND" or "1" of Expander input #1 of expander output, and to radio chassis. Operate as outlined above. The Volume Expander should be used only for music. Set the Expander control to zero to cut out all expansion.

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The Bogen Model PV-10 is a 10 watt phonograph amplifier. It is provided with a Volume Expander which restores the full dynamic range of volume as originally played at the recording studio.

POWER RATING: 117 volts, AC, 60 cycles, power consumption 75 Watts.

TUBES: Total 6; 2-6SL7, 1-6SA7, 2-6V6G, 1-5Y4G.

CONNECTIONS:

Input: The pickup is connected to the terminals marked "PHONO INPUT" on the rear of the chassis. "GND" is for the grounded or shield side of the pickup. Connect the live wire of a magnetic pickup to "M". Crystal pickups may be connected to either "LC" (Low Output Crystal) or "HC" (High Output Crystal). A radio tuner may be connected to the Model PV-10. The radio output can be taken from the detector output or voice coil leads. Connect the radio ground to the terminal marked "GND". If both radio and phonograph are to be used, connect a single pole double throw switch to the amplifier to select between radio and phonograph.

Output: The amplifier output is terminated in various impedances on the strip marked "Output". Either PM speakers or speakers having their own field supply should be used. Plug the power cord into a 117 volt AC outlet and lift power switch up to the "ON" position. If there is a noticeable hum, remove the power plug, rotate it one-half turn to reverse the polarity and re-insert it in the power outlet.

TONE CONTROL: is adjusted to obtain the most satisfactory quality and pitch.

VOLUME EXPANSION:

The knob marked "Expansion" controls the amount of expansion. IT IS NOT A VOLUME CONTROL. Zero on the dial indicates normal reproduction, and as the knob is turned towards 10, expansion is increased.

TO SET EXPANDER:

Set the expander control to zero. Turn up the amplifier volume control to a point near the desired volume. On a loud passage of the record, turn the expansion control to the right until the volume level of this passage reaches the desired expanded point. Now regulate amplifier volume control to obtain the overall volume required. The expander does not affect the softer portions of the record, but only increases the volume of loud passages. With the expander in operation, needle scratch will be reduced, as the expanded loud passages will now constitute loudest listening volume and the soft passages will consequently be lower.

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The Bogen Model PV15 is a 15 watt phonograph amplifier. The distortion is under 2% for its 15 watts rated output, with a peak output of 25 watts. It is provided with separate Bass and Treble controls and input facilities for any type of phonograph pickup. A Volume Expander is incorporated which restores the full dynamic range of volume as originally played at recording studio.

POWER RATING: - 117 Volts AC, 60 cycles; Power Consumption: 130 watts.

TUBES: - Total 9: 2-6SJ7; 1-6SK7; 2-6SL7GT; 1-6SF5; 2-6L6G; 1-5Y3G.

CONNECTIONS: Input:

The pickup is connected to the terminals marked "Phono Input" on the rear of the chassis. "GND" is for the ground or shield side of the pickup. Connect the live wire of a magnetic pickup to "M". Crystal pickups may be connected to either "LC" (Low Output Crystal) or "HC" (High Output Crystal). If in doubt as to type of crystal pickup used, try both terminals for best results. Additional input receptacles are provided for low output pickups such as the GE variable reluctance (REL) and for the dynamic type cartridge made by American Microphone Co. (DYN) in conjunction with the matching transformer supplied with it. The DYX input terminal is also used for connection of the Pickering Model 122M cartridge. A radio tuner may be connected to the Model PV15. The radio output can be taken from the detector output or voice coil leads. Connect the radio ground to the terminal marked "GND". Connect the live lead to the HC terminal. If both radio and phonograph are to be used, connect a single pole double throw switch to the amplifier to select between radio and phonograph.

OUTPUT:

The amplifier output is terminated in various impedances on the strip marked "Output". Either FM speakers or speakers having their own field supply should be used. Plug the power cord into a 117 volt AC outlet and lift power switch up to the "ON" position. If there is a noticeable hum, reverse the polarity of the power plug.

VOLUME EXPANSION:

The knob marked "Expansion" controls the amount of expansion. It is not a volume control. Zero on the dial indicates normal reproduction and as the knob is turned towards 100, expansion is increased.

TO SET EXPANDER:

Set the expander control to zero. Turn up the amplifier volume control to a point near the desired volume. On a loud passage of the record, turn the expander control to the right until the volume level of this passage reaches the desired expanded point. Now regulate the amplifier volume control to obtain the overall volume required. The expander does not affect the softer portions of the record but only increases the volume of the loud passages. With the expander in operation, needle scratch will be reduced, as the expanded loud passages will not constitute the loudest listening volume and the soft passages will consequently be lower.

PV15M:

The model PV15M incorporates a separate input for microphone use. The volume for this channel is controlled independently by the control marked "MIC". TUBES: Add 1 - 6SJ7 to above.
The Bogen Model PV20A is a 20 watt phonograph amplifier. Rated output of 20 watts is attained with less than 2% distortion. Peak output is 30 watts. Separate Bass and Treble controls, constituting a Triple Range Electronic Tone Corrector, are provided. A volume expander is incorporated which restores the full dynamic range of volume as originally played at the recording studio. A 70 volt constant voltage output tap is provided for ease in selecting speaker matching transformers.

POWER RATING: - 117 volts, AC, 60 cycles, 120 watts.

TUBES: - Total 3: 2-7F7, 2-6L6G, 1-6SJ7, 1-6SN7, 1-6SA7, 1-5U4G.

CONNECTIONS: Input: - The pickup is connected to the terminals marked "Phono Input" on the rear of the chassis. "GND" is for the grounded or shield side of the pickup. Connect the live wire of a magnetic pickup to "M". Crystal pickups may be connected to either "LC" (Low Output Crystal) or "HC" (High Output Crystal). If in doubt as to type of crystal pickup used, try both terminals for best results. A radio tuner may be connected to the Model PV20A. The radio output can be taken from the detector output or voice coil leads. Connect the radio ground to the terminal marked "GND". Connect the live lead to the terminal which gives best results. If both radio and phonograph are to be used, connect a single pole double throw switch to the amplifier to select between radio and phonograph.

OUTPUT: - The amplifier output is terminated at a strip marked OUTPUT, in standard output impedances of 4, 8, 15 and 500 ohms. In addition, a 70 volt constant voltage tap is provided. Speakers may also be connected to the two built-in speaker sockets. The impedance, or voltage at the sockets may be selected by connecting the lug on the flexible lead to the desired terminal on the output strip. Speaker lines may also be connected directly to the output strip. Connect the lines to common, or terminal #1, and to the tap required. Speakers may be readily connected in parallel to the constant voltage tap, calculating the matching transformer impedances by means of the following formula:

\[ Z = \frac{E^2}{P} \]

Example: For a 2 watt output,

\[ Z = \frac{5000}{2} = 2500 \text{ ohms.} \]

SPEAKER INSTALLATION: - To assure correct power distribution, it is essential that the correct line matching transformer be used in conjunction with each speaker. The recommended Bogen transformer and proper impedance tap for the most commonly used powers are tabulated below. The impedances listed are based on a nominal 8 ohm voice coil impedance. If a 15 ohm voice coil speaker is employed, use a transformer incorporating a tap marked at 1/2 the value shown on the table. For example, to obtain 1 watt on a 70 volt line with an 8 ohm voice coil speaker, the table indicates use of a transformer tapped at 5000 ohms. If a 15 ohm voice coil speaker is used, a tap marked 2500 ohms should be employed.

<table>
<thead>
<tr>
<th>Required Power</th>
<th>70V Tap</th>
<th>Transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 watt</td>
<td>10,000 ohms</td>
<td>T45C</td>
</tr>
<tr>
<td>1 &quot;</td>
<td>5,000 &quot;</td>
<td>T45C</td>
</tr>
<tr>
<td>2 &quot;</td>
<td>2,500 &quot;</td>
<td>T25C</td>
</tr>
<tr>
<td>5 &quot;</td>
<td>1,000 &quot;</td>
<td>T5B</td>
</tr>
<tr>
<td>10 &quot;</td>
<td>500 &quot;</td>
<td>T5B</td>
</tr>
<tr>
<td>20 &quot;</td>
<td>250 &quot;</td>
<td>T5B</td>
</tr>
</tbody>
</table>

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NOTE: The sum of the wattages drawn by all speakers must not exceed 20 watts, the rated output of the amplifier.

Either PM speakers or speakers having their own field supply should be used. Plug the power cord into a 117 volt AC outlet and lift power switch up to the ON position. If there is a noticeable hum, remove the power plug, rotate it one-half turn to reverse the polarity and re-insert it into the power outlet. When operating speakers on voice coil impedance (without transformers) use as heavy a wire as possible. Speaker cable runs of 100 feet or over should be at least #16 wire.

VOLUME EXPANSION: The knob marked "EXPANSION" controls the amount of expansion. It is not a volume control. Zero on the dial indicates normal reproduction and as the knob is turned towards 100, expansion is increased.

EXPANDER CIRCUIT: The expander circuit consists of a 6SA7 control tube, a 7F7 expander amplifier and rectifier tube, with associated components. Simplified, the action of the expander is as follows:

Output of the first triode section of the 7F7 input tube is applied to the grid of the second triode through a voltage divider network. The upper leg of the divider is a fixed .22 megohm resistor. The other leg consists of the expander circuit proper. This leg can act as a constant or variable resistor, depending on the position of the EXPANSION control. With this control in the 0 or extreme counter clockwise position, the expander is off, the lower leg of the divider is fixed, and a fixed percentage of the signal is fed to the second triode grid. With the EXPANSION control on, the lower leg of the voltage divider varies, increasing in value as the signal increases, decreasing in value as the signal decreases, with a resultant increase or decrease of the percentage of the signal fed to the second grid. Rotation of the control in a clockwise direction - contact moves away from the ground end of the expansion control - increases the amount of expansion for a given increase in signal.
DESIGNED TO PROVIDE MULTI-BAND RECEPTION WITH ANY BOGEN SOUND OR SCHOOL SYSTEM

SPECIFICATIONS

Input Voltage: 117 Volts  Power Consumption: 40 W.

Range:
- Broadcast Band: 550 to 1700 K.C.
- Intermediate Band: 1.5 to 5.5 M.C.
- Short Wave Band: 5.5 M.C. to 18.5 M.C.

Tubos Used:
- 7H7 - R.F. Amplifying stage (pentode)
- 7Q7 - Converter Stage (pentagrid converter)
- 7H7 - I.F. Amplifying stage (pentode)
- 7A6 - Second Detector and A.V.C. (twin diode)
- 5Y4 - Rectifier (full wave, high vacuum)
- 6U5 - Tuning Indicator (Electron ray triode)

The output matches a 200 Ohm microphone line or High impedance phonograph line.

ALIGNING INSTRUCTIONS

1. I.F. Alignment
   a. Connect the test oscillator output to center section of variable condenser.
   b. Tune oscillator to 456 K.C. and adjust its output so that the tuning indicator tube is half closed.
   c. Adjust the I.F. trimmers for the narrowest shadow in the tuning eye, readjusting the oscillator output as necessary.

2. Broadcast Band
   a. Connect the test oscillator to the antenna terminal of the tuner and set both to 550 K.C.
   b. Set the tuner bandswitch to "Broadcast" and adjust the broadcast padder for the narrowest shadow in the tuning eye.
   c. Set both the oscillator and tuner to 1500 K.C. and adjust the broadcast oscillator trimmer, R.F. trimmer and antenna trimmer for narrowest shadow.
   d. Re-check the 550 K.C. Calibration.

3. Intermediate Band
   a. Connect the test oscillator to the antenna terminal of the tuner and set both the oscillator and tuner to 1.5 M.C.
   b. Set the tuner bandswitch to "Intermediate" and adjust the intermediate padder for the narrowest shadow in the tuning eye.
   c. Set both the oscillator and tuner to 3.4 M.C. and adjust the intermediate oscillator trimmer, R.F. trimmer and antenna trimmer for narrowest shadow.
   d. Re-check the 1.5 K.C. calibration

4. Short Wave Band
   a. Connect the test oscillator to the antenna terminal of the tuner and set both the oscillator and tuner to 5.5 M.C.
   b. Set the tuner bandswitch to "Short Wave" and adjust the short wave padder for the narrowest shadow in the tuning eye.
   c. Set both the oscillator and tuner to 1.5 and adjust the short wave oscillator trimmer, R.F. trimmer, and antenna trimmer for narrowest shadow in the tuning eye.
   d. Re-check the 5.5 M.C. calibration.

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The Bogen Model S-32 Centralized Sound System operates from 110 - 125 volts, 50 - 60 cycles.

**POWER CONSUMPTION:** 175 Watts.

**TUBES USED:**
- Tuner: 6X47, 6DQ6, 6AS7, 6G8, 6656, 6V6.
- Amplifier: 6X47, 6GH5, 6G8, 6656, 6NO4.

It is recommended that a noise reducing antenna system be installed for use with the S-32 tuner to assure best reception. Connect the antenna to the red wire on the radio tuner and a ground wire to the black wire of the tuner.

For connecting speakers, two wire shielded cable should be used. The speaker connection terminals are mounted inside the rear of the cabinet. These terminals are mounted in sections, each containing ten pairs of terminals, but only eight pairs on each section are used. These correspond to the number of switches in each row on the speaker-switching panels. Each speaker should have a separate two-conductor shielded cable connecting to the pair of terminals corresponding to a given speaker switch.

Starting with switch #1 on the first row, its terminals will be 1 and 2. Switch #2 will have terminals 3 and 4, and so on to switch #9, with terminals 10 and 11. If the cabinet contains more than one row of switches, #1 switch of the second row will again control terminals 1 and 2 of the second terminal section. Switch 1 of the second row may also be designated as Switch #9.

In connecting the speakers, one wire of the two-wire shielded cable should be connected to the inside or odd numbered terminal. The other wire and shield should be connected to the outside or even numbered terminal. A convenient method of connecting wires and shielding together is to skin the wire back, wrap it around the shield several times, then fasten the wire under the even numbered screw terminal.

The two wires of the cable should be connected to the two black wires of the transformer mounted on each speaker. The shield should not be connected to either wire at the speaker end, but should be secured to the speaker chassis under the clamp provided.

All speakers provided with Bogen Centralized Systems are equipped with variable line transformers. Normally, these speakers leave the factory connected for 15,000 ohms impedance. This means that the speakers will draw one-half watt of power, which has been proven by experience to be sufficient power for classroom speakers. If a variation of this power is desired, Table #1 is provided which gives the impedance and power the speaker will draw. The "Connect V.O." column shows the number of the transformer to which the voice coil of the speaker must be connected in order to give the desired impedance.

<table>
<thead>
<tr>
<th>OHMS IMPEDANCE</th>
<th>CONNECT V.O. FORM TO SPR LUGS</th>
<th>SPEAKER POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>15,000</td>
<td>1-3</td>
<td>6/8 watt</td>
</tr>
<tr>
<td>10,000</td>
<td>2-5</td>
<td>5/8 watt</td>
</tr>
<tr>
<td>7,000</td>
<td>1-4</td>
<td>3/8 watt</td>
</tr>
<tr>
<td>4,000</td>
<td>1-5</td>
<td>2/8 watt</td>
</tr>
<tr>
<td>2,500</td>
<td>5-6</td>
<td>1/8 watt</td>
</tr>
<tr>
<td>1,500</td>
<td>7-8</td>
<td>5/16 watt</td>
</tr>
<tr>
<td>1,000</td>
<td>9-10</td>
<td>7/16 watt</td>
</tr>
<tr>
<td>500</td>
<td>11-12</td>
<td>1 watt</td>
</tr>
</tbody>
</table>
When speakers are required in auditoriums or gymnasiums, they must supply considerably more power. This power may range anywhere from 1 to 15 watts, therefore, speakers for auditoriums must be larger in size than is ordinarily supplied for classrooms. These larger speakers must be equipped with special adjustable line transformers to permit the proper power adjustment. The impedance of the transformer will determine the power that any speaker will draw from the system. Table #2 shows the relationship between impedance and power.

MICROPHONE:

An external high impedance microphone may be connected to the connector provided on the rear of the amplifier chassis. Provision is made for connecting two external phonographs. A three point terminal strip is mounted on the rear of the amplifier chassis adjacent to the microphone connector. Terminal 1 is ground or common for both phonographs. Connect first phono between terminals 1 and 2. Connect second phono or other input device between terminals 1 and 3.

EXPANSION:

The Model S-32 has provision for from 8 to 32 speaker control switches. If the S-32 is originally purchased with any number less than 32, control switches may be added at any time until the maximum number is reached. As figure #1 shows, the switches are arranged in rows of 8 each. Each row is connected to its own terminal section. The rows of switches, as well as the terminal sections, are numbered from the bottom up.

Row 1 is supplied with the Standard S-32-3, rows 1 and 2 with the S-32-16, rows 1, 2, and 3 with the S-32-24 and rows 1, 2, 3, and 4 with the S-32-32.

Standard panels completely wired at the factory, are available for expansion of any Model S-32 originally purchased with less than 32 switches. When ordering switching panels for expansion, the number of switches already present should be specified. Expansion should be done with additional panels as follows:

- S-32-3 to S-32-16: Order P58 and insert in place of upper blank switching panel.
- S-32-24 to S-32-32: Order P516, remove upper panel with Row #3 and insert.

When adding switch panels, mount terminal strips in mounting holes on side of cabinet, using screws and bushings provided. The cable should be placed as shown on figure #1.

The extreme right hand switch, looking at rear of panel, is then wired to the switch mounted on panel directly below it as shown on figure #2.
REMOTE STATIONS SCHEMATIC

CONNECTIONS AT SPEAKER

HOOK-UP DIAGRAM

See Schematic Diagram for color code of wires in Master, Station Cable. See instruction sheet for hook-up of any combination of Master and Remote Stations. Each split line, ~, represents a two wire shielded cable. The Interconnecting Cable should not be grounded at any point. Use covered cable throughout. See Remote Station Schematic for color code of wires in Break-in Boxes.
The Bogen Model S115 Industrial Paging and Communicating System provides selective communication between various master stations and various remote stations. The combined total of master and remote stations are 11, 21, 31 and 41, for Models S115, S215, S316 and S415, respectively.

**POWER RATING:**
- Master Units - 117 volts AC - Power Consumption - 88 watts
- Remote Units - No power required.

**TUBES USED:**
- Total 5 - 2-T77; 2-T75; 1-T74

**CONNECTIONS:**
- All wiring in this system must be done with two conductor shielded cable. Either a multiple cable with the required number of pairs of wires may be used, or the entire installation wired with two conductor shielded.

**NO BREAK-IN REMOTE**

Connect Pair R of remote to the next available master cable pair, as explained above. Interconnect to every master, using the same "Pair Number" on each master. It is obvious that should it be necessary that the remote communicate with a particular master, the connections to that pair on the master cable is omitted. Ground the shield of the cable to the lug provided at the transformer mounting.

**REMOTE WITH BREAK-IN**

Connect pair R of cable on break-in box to the next available master cable pair, as explained above, and interconnect to each master the BR-1 of remote to Pair Br of master, for Model CS break-in box where break-in to one master is possible. For Model CS3 where break-in to three masters is possible, connect Pair S and R as above. Connect Pair BR-1 of remote to Pair Br of first master. Pair Br-2 of remote to Pair Br of second master, and Pair Br-3 of remote to Pair Br of third master. If break-in to more than three masters is desired, use CS12 break-in box. Hookup as above, connecting Br-4 of remote to Pair Br on fourth master, etc. Any unused pairs on the CS12 should be cut off at the serving. For cable colors of the pairs, see the schematic diagram. Names of stations can be placed on push-buttons on the paper and celluloid inserts provided.

**SERVICE:**

If the device, when first connected to the power line, hums, the power plug should be reversed - this is done to correct the polarity.

To prevent interference between stations, after the system is completely installed, the "On Bus" must be cut to separate the Master portion of the "On Bus" from the Remote portion of the "On Bus". The "On Bus" consists of two bare wires running the length of the pushbutton switches. These wires should be cut between the last button being used to control a master and the first button being used to control a remote. If there is only one master in the system the red and black shielded pair connected to the "On Bus" must be cut. The "On Bus" is shown in the schematic diagram labeled "On" and is also shown in the pictorial diagram. In the example of a system consisting of five masters, the bus is cut between buttons numbered four and five.
S-115 OPERATING NOTES:

There are two types of busy signals, one being a steady tone, or whistle, and the other a buzz, depending upon whether a master or remote station is being called.

In calling several master stations at once, after pressing the buttons of the stations to be called, place the "Talk-Listen" switch in the "Listen" position. If a whistle is heard, it means that the stations are conducting a conversation which would be interrupted if they were called.

In conducting a conference, any number of master stations may listen, but only one may talk at any time. If more than one station talk at once, the whistle will interfere with the conversation.

In calling a remote station, after pressing the button of the station to be called, place the "Talk-Listen" switch in the "Listen" position. If a buzz is heard, it means that the station is in use and would be interrupted if called.

<table>
<thead>
<tr>
<th>STATION</th>
<th>Bm 1 2 3 4 5 6 7 8 9 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1 Bm 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>3</td>
<td>1 2 Bm 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>4</td>
<td>1 2 3 Bm 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td>5</td>
<td>1 2 3 4 Bm 5 6 7 8 9 10</td>
</tr>
<tr>
<td>6</td>
<td>1 2 3 4 5 Bm 6 7 8 9 10</td>
</tr>
<tr>
<td>7</td>
<td>1 2 3 4 5 6 Bm 7 8 9 10</td>
</tr>
<tr>
<td>8</td>
<td>1 2 3 4 5 6 7 Bm 8 9 10</td>
</tr>
<tr>
<td>9</td>
<td>1 2 3 4 5 6 7 8 Bm 9 10</td>
</tr>
<tr>
<td>10</td>
<td>1 2 3 4 5 6 7 8 9 Bm 10</td>
</tr>
<tr>
<td>11</td>
<td>1 2 3 4 5 6 7 8 9 10 Bm</td>
</tr>
</tbody>
</table>

MASTER STATION CROSS CONNECTION CHART

Each horizontal row represents a station cable; a vertical row the interconnected pairs. Numbers correspond to pair colors.
The Bogen Model SA system provides selective communication between the master station and any one of a number of remote stations, acts as a public address or call system, and, when connected to radio and/or phonograph pickup, provides a program distribution system.

**POWER SOURCE:** 117 volts AC, 50-60 cycles

**POWER RATING:** Master Unit-75 watts at 117 volts AC. Remote Stations - No power required.

**POWER OUTPUT:** 15 watts

**TUBES USED:** Total 4 - 2-6SJ7; 1-6L6GA; 1-5Y3

**SPEAKER INSTALLATION:**

Speakers used with the Model SA system are equipped with line matching transformers. The proper impedance to use for any desired power is indicated in the following table:

<table>
<thead>
<tr>
<th>Impedance</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3/8 watt</td>
</tr>
<tr>
<td>1500</td>
<td>1/2 watt</td>
</tr>
<tr>
<td>1000</td>
<td>3/4 watt</td>
</tr>
<tr>
<td>500</td>
<td>1-1/2 watt</td>
</tr>
<tr>
<td>250</td>
<td>3 watt</td>
</tr>
<tr>
<td>125</td>
<td>6 watt</td>
</tr>
<tr>
<td>75</td>
<td>10 watt</td>
</tr>
<tr>
<td>50</td>
<td>Full Output</td>
</tr>
</tbody>
</table>

**NOTE:** The sum of the wattages drawn by all speakers must not exceed the full output of the amplifier.

The speakers are connected to the master cable by means of two-wire cable. Each speaker is connected to a numbered pair on the master cable, to correspond with the number of a pushbutton. See Schematic Diagram. The break-in leads from the remote stations shall be connected to the master station by means of two-wire shielded cable. It is recommended that a junction box be used for making connections. Connect the ground lead in the master cable to the shield of the break-in leads and to a good external ground.

**CONNECTIONS AT SPEAKER**

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The Model 3M6 is a 6 watt AC operated amplifier useful especially for small installations and as a driver for the 100 watt booster amplifier or speech amplifier and modulator for transmitters.

POWER RATING: 105-125 Volts, AC 60 cycles, consumption 50 watts.

TUBES USED: Total 4: 2-6C8G; 1-6L6, and 1-5X4G. The tube shields provided should be used on the two 6C8G tubes on the extreme left.

CONNECTIONS: Phonograph: The two post terminal strip on the upper left corner of the front panel is for high impedance type of phonograph pickup. A shielded wire should be used to reduce hum pickup. Connect the shield to terminal #1 which is grounded. Connect the wire itself to terminal #3 which is the grid lead.

Microphone: High impedance type of microphones, such as Velotron, Velocity or Crystal may be connected to the connector on the front panel. Be sure to use shielded microphone cable and ground the shield to the metal cap of plug.

OUTPUT:

Speakers may be connected to the terminal strip marked "output". Terminal 1 is common, terminal 2 is 2 ohms, terminal 3 is 4 ohms, terminal 4 is 9 ohms, terminal 5 is 15 ohms, terminal 6 is 500 ohms. Use the 500 ohm tap as a modulator or driver.

REMARKS: If any hum is noticed when using the microphone, reverse the line polarity by pulling out the AC line plug, giving it a half turn, and reinserting. Hum may be caused by faulty tubes. If hum is noticed, with correct line polarity, check all tubes carefully. In some cases, an external ground may be necessary. Terminal #1 of phono input may be used to ground the system.

FITTING MICROPHONE CABLE CONNECTOR:

1. Skin off about 1/2 inch of outer rubber covering, exposing shielding.
2. Cut shielding back so that only 1/4 inch is exposed.
3. Clinch sheet metal sleeve around whole cable so that small ends clinch upon shielding. Trim off any whiskers which might cause short.
4. Remove inner rubber insulation from wire, within 1/8 inch of metal sleeve.
5. Tin wire with solder and cut to about 1/8 inch.
6. Slip cable through connector body and solder wire into hollow end of center contact.
7. Draw cable back into connector body. Force bakelite washer into recessed seat. Tighten set screw into metal sleeve.
8. Never use soldering paste or acid on any microphone connection. Use Rosin core solder.

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The model "VE6-AD" is a Volume Expander Unit, self powered for use with any public address system or amplifier. It restores the full range of volume as originally played at the radio or recording studio. It also reduces needle scratch to a minimum as explained in paragraphs below.

**Power Rating:** 105-125 volts, A.C. or D.C., Consumption 32 watts.

**Tubes:** Total 5, 1-6F5, 1-6L7, 1-6H6, 1-25Z6, 1-BK76B ballast, 1-25 watt indicator bulb. Note that metal tubes are recommended in place of "G" tubes.

**Connections:** Input The high impedance phono-pickup is connected to the "Input" terminals mounted on the left side of the Volume Expander. #1 is for the grounded or shielded side. #2 is for the live side. If a low impedance pickup is to be used, a matching transformer should be connected between the phono-head and the input terminals.

**Output:** The two output terminals on the rear of the Expander should be connected to the "Phono-Input" terminals of the amplifier. (Do not use the "Microphone-Input" terminals for this purpose as there would be too much amplification and quality would suffer). Using a shielded wire, connect #1 on the Expander to the grounded input terminal on the amplifier by means of the shield itself. Then connect the wire from #2 on the Expander to the live or grid terminal on the phonograph input on amplifier.

**Protective Lamp:** If the lamp mounted with the tubes lights up, it is a warning, indicating that some part of the equipment is "Grounded". This should be corrected before attempting to operate further.

**Volume Expansion:** The knob marked "Volume" controls the amount of expansion, it is not a volume control. 100 on the dial indicates normal reproduction and as knob is turned towards zero, expansion is increased. In practical use the setting is likely to vary between 20 and 70. As a trial start with the control at 100 and using a phonograph record, place the pickup at the finish end of the record so that the needle rides in the blank groove. The needle scratch should be observed as this is the normal scratch without expansion. Slowly rotate the control toward zero until a marked decrease in needle scratch is noticed. There is an abrupt change at this point which is easily distinguished. A place just beyond this point will generally be found to be the best adjustment.
Models WP and WM are wireless phonographs which can be used with any radio. Model WP consists of a phonograph only, while Model WM includes provision for microphone input.

Tubes Used:
- Model WP: 1-6C8G
- Model WM: 1-6C8G, 1-6J7

Power Consumption:
- Motor Off: 37 watts
- Motor On: 50 watts
- 110 - 120 volts AC Only

The signal from the phonograph will be found at approximately 550 kilocycles, or the upper end of the dial. If the signal cannot be found, or there is too much static, the short wire protruding from the line and near the plug should be wrapped around the aerial wire near the set. In extremely noisy locations, this wire may be connected directly to the aerial connection of the radio.

If interference between the phono and a radio station is encountered, phono reception may be shifted to a different part of the dial, as follows: - Near the tone arm rest will be found a small hole, insert a screw driver thru this hole into the adjustment screw. Rotating clockwise will shift the phono toward the upper end of the dial, and rotating counter-clockwise will shift it toward the lower end.

Once adjusted, the phono will always be found at the same point on the dial.
The WR Remote Control is made up of a transmitter and receiver. The transmitter only uses power from the supply line.

Tubes Used:  
- Transmitter - 1-6G8  
- Receiver - 2-6B6, 1-6X5  
- Power Consumption: Transmitter - 35 watts  
- 110 volts AC-DC.

The transmitter may be operated from any point in the same building. It is only necessary to plug into a 110 volt AC or DC receptacle and connect the ground wire to a good ground. This may be done by inserting the ground lug under the screw that holds the outlet plate. If the outlet being used has a bakelite plate, then it must be removed and the ground lug fastened to the wall box. This ground connection is extremely important. A good ground may also be obtained by using the water, gas or steam pipes in the building.

With the receiver connected to the amplifier, the amplifier is inoperative unless the remote unit is turned on by means of its toggle switch. When this switch has been turned on and the unit allowed to heat up the Remote Control is ready for operation.

If units fail to operate check tubes first. The transmitter and receiver are aligned perfectly at the factory, but if unit becomes weak or there is interference between channels, they may be re-aligned. Equipment needed is an R.F. oscillator and a 10 volt D.C. 1000 ohm per volt meter.

On the side of the receiver are three terminals which are normally connected together. Remove the jumper from terminal 2, leaving 1 and 3 connected. Place meter across 1 and 2. Connect oscillator to the ground wire of the receiver and the oscillator chassis to receiver chassis. Set oscillator to 100 K.C. and adjust trimmer A shown in Fig. 1 for maximum reading on the meter. After trimmer A is adjusted, connect jumper wire to terminals 1 and 2, and place meter across 1 and 3. Set oscillator to 150 K.C. and adjust trimmer B shown on Fig. 1 to maximum reading on the meter.

Disconnect the oscillator and connect the ground wire of the receiver to the BX or ground in the manner normally used. Connect the remote unit to the ground normally used and turn the switch on. Turn Volume Control #1 off and #2 full on. Adjust trimmer B of the transmitter shown in Fig. 2 until meter connected to terminals 1 and 3 indicates maximum. Do not touch receiver trimmers. Again reconnect jumper wire to terminals 1 and 3, and meter to 1 and 2. Turn Volume Control #2 off and #1 full on. Adjust trimmer A shown in Fig. 2 for maximum meter reading.

When receiver and transmitter have been aligned as described, reconnect the jumper on the three terminals of the receiver.
on. Turn Volume Control #1 off and #2 full on. Adjust trimmer B of the transmitter shown in Fig. 2 until meter connected to terminals 1 and 3 indicate maximum. Do not touch receiver trimmers. Again reconnect jumper wire to terminals 1 and 3, and meter to 1 and 2. Turn volume Control #2 off and #1 full on. Adjust trimmer A shown in Fig. 2 for maximum meter reading. When receiver and transmitter have been aligned as described, reconnect the jumper on the three terminals of the receiver.
The Model WR is a wireless remote control which may be used on any Bogen amplifier provided with remote control facilities. This is standard equipment on some Bogen models but may be had on any Bogen amplifier. The WR Remote Control makes it possible to control the two inputs of the amplifier at any remote point in the building.

The WR Remote Control is made up of a transmitter and receiver. The transmitter only uses power from the supply line.

**Tubes Used:**
- Transmitter - 1-608G
- Receiver - 2-6P7G - 1-6B8G

**Power Consumption:**
- Transmitter - 35 watts - 110 volts AC-DC.

With the receiver connected to the amplifier, the amplifier is inoperative unless the remote unit is turned on by means of its toggle switch. When this switch has been turned on and the unit allowed to heat up the Remote Control is ready for operation.

When the remote control is used for mixing or fading between the two channels, a slight cancellation effect may be noticed. This may be evidenced by a slight variation in volume between the two channel controls. This condition is perfectly normal and can easily be compensated by merely advancing either control, until the volume level is equalized. For example, Control #1 is at 70 and it is necessary to increase the volume on control #2. When control #2 is advanced if it seems to effect a variation in the volume of control #1, then merely advance control #1 a little further to bring up its volume thereby compensating for the cancellation effect created by control #2. A slight time lag may also be noticed when operating the remote control. This condition is also normal and is due to the fraction of a second difference in time between the rotation of the control and the result at the amplifier. It is recommended that the remote control be moved slowly, not abruptly, to increase or decrease volume, then there will be no noticeable time lag.

If units fail to operate check tubes first. The transmitter and receiver are aligned perfectly at the factory, but if unit becomes weak or there is interference between channels, they may be re-aligned. Equipment needed is an R.F. oscillator and a 10 volt D.C. 1000 ohm per volt meter.

On the side of the receiver are three terminals which are normally connected together. Remove the jumper from terminal 2, leaving 1 and 3 connected. Place meter across 1 and 2. Connect oscillator to the ground wire of the receiver and the oscillator chassis to receiver chassis. Set oscillator to 100 K.C. and adjust trimmers A shown in Fig. 1 for maximum reading on the meter. After trimmers A are adjusted, connect jumper wire to terminals 1 and 2, and place meter across 1 and 3. Set oscillator to 70 K.C. and adjust trimmer B shown on Fig. 1 to maximum reading on the meter.

Disconnect the oscillator and connect the ground wire of the receiver to the EX or ground in the manner normally used. Connect the remote unit to the ground normally used and turn the switch.
The models 2AR and 2RS Communo-Phones consist of 1 master and 1 remote station to provide intercommunication between two points only. In the 2AR system, any conversation originating at or near the remote will be heard automatically at the master. In the 2RS system, both stations incorporate press-to-talk switches.

**POWER RATING:**  
Master unit only: 25 watts, 117 volts AC or DC.  
Remote Units: no power connection.

**TUBES USED:** (IN MASTER): Total (2): 1-12SL7GT, 1-50L6.
INTERCONNECTIONS DIAGRAM

2AR SYSTEM
(BACK VIEWS)

MASTER

AR REMOTE

JUMPER IN PLACE
WHEN USING AR
REMOTE.

A

2RS SYSTEM
(BACK VIEWS)

MASTER

RS REMOTE

JUMPER REMOVED
WHEN USING RS
REMOTE.

B

CONNECTIONS:

Model 2AR:

A 50 ft roll of two conductor cable is supplied with each system. Remove approximately 1/2" of insulation from the wires at one end of the roll and connect to terminal "G" and the center terminal of the master unit. Cut the roll of wire to the required length, remove insulation, and observing cable colors, connect to similar terminals of the AR remote station. Make certain that the link between the center and "B" terminal of the master unit is firmly screwed in place. Refer to drawing A.

Model 2RS: — A 50 ft roll of three conductor cable is supplied with each system. Follow same procedure as outlined above, but connect the three wires as indicated in drawing B. Remove the link between the center and "B" terminal of the master unit. In the event that operation similar to the 2AR system is required with a 2RS system, connect as indicated in drawing A.
The 53C Communo-Phone is a self-powered combination microphone loud speaker system. It operates on either AC or DC current, 105-125 volts. Each unit draws 35 watts and is designed for continuous service. The tubes used are: 1-25Z6; 1-6J7; 1-6C5; 1-25A6; 1-25 watt, 120 volt bulb and 1-Ballast BK55B.

Connections:

These units are connected together by means of the 53C communicator connector box. Cables are supplied in any length to meet requirements and come equipped with a six prong male plug on each end. The connector box is supplied with a five foot length of cable and a six prong male plug. The cable from the connector box is plugged into the socket marked "Pwr" ("A" Fig. #1) located on the rear of the first station. To connect the other stations insert one plug of the cable into the socket on the rear of the station, and insert the other plug into a socket on the connector box (see-Fig. #2). When less than five stations are used the cables should be plugged into consecutive sockets on the connector box.

Insert the plugs of the line cords into any source of 110 volt AC or DC. Snap the line switches on and observe the 25 watt lamp. If the lamp is brilliant, reverse the line plug which will give the correct operating polarity. With each unit at correct polarity, the system should be operating. If you desire to connect your own connector box and cables, refer to figure #3.

When Using These Units on DC:

When all units are plugged in as outlined above, inter-communication may be started among the various stations, making sure that the volume control is turned up. If no sound is heard, the polarity of the units is incorrect and all the plugs must be reversed at the same time. This applies to DC only.

NOTE:  CAUTION !!!!!! Do not under any circumstances connect a ground to this chassis.
The Model 6C Communo-Phone is an intercommunicating loud-speaking system, in which all stations are masters and each can call any other station.

**POWER RATING:** 105 to 125 volts, either AC or DC

**CONNECTIONS:**

All stations are joined into a single system with a cable having anumber of wires. This number is one greater than the total number of stations in use (i.e., for six stations a cable of seven conductors is needed). To connect system, first assign a number to each station for identification and follow indicated wiring chart. Plug line cord into the usual power outlet. If the device is silent when first connected to Direct Current, the power line plug should be removed and rotated so that its prongs are reversed - this is done to correct the polarity. If the unit hums on AC, reverse line plug.

**OPERATION:**

To call a station turn the selector switch to the position marked for the station you wish to call. Then press the right hand knob down which is the "talk-listen" switch and talk.

**CABLE LENGTH:**

For best results use heavy wire for long distances between units. For distances not over 100 feet, use copper wire size #20 or larger, for greater distances #18 or heavier should be used.
NOTES - ALL CAPACITANCE VALUES IN MFD.
ALL VOLTAGE READINGS TAKEN WITH A 20,000 OHMS PER VOLT VOLTOMETER.

FRONT SECTION REAR VIEW OF SWITCH (IN "ALL" POSITION)

REAR SECTION
Important: It is essential to the best operation of the 7W system that a good common ground be obtained at each unit. If the electrical ground at the wall socket does not give satisfactory operation, try several other grounds until best results are obtained. A steam pipe, gas pipe, cold water pipe, radiator or ventilator system can be used to establish good common grounds. It is possible, in some cases, that dissimilar grounds give better transmission than similar grounds. If trouble is experienced in transmission of any unit with another, try other grounding media, one at a time, at each unit, until best transmission is obtained. Thus the same grounding medium is not essential for all units, if dissimilar grounds give best and most efficient transmission.

If it is impossible to obtain efficient transmission because of utter lack of a good grounding system, the ground leads of the units may be interconnected by a single wire to act as the transmitting ground.
The Bogen Model 7W is a wireless communicating system that may be operated from any electric outlet supplying 105 to 125 volts, wither AC or DC. Each station draws 40 watts and is designed for continuous service. Tubes used in each station are: 2-6K7, 1-6Q7, 1-6J7G, 1-25A7G, 1-25A6G, 1-BX40B.

Each station must be connected to a good ground.

Silent Watchman: The Silent Watchman is an adjustable control device for the automatic suppression of line noises. This adjustment should be set to the correct value when the system is first put into operation. However, before making Silent Watchman adjustments, all stations should be installed and efficient communication established.

To adjust the Silent Watchman turn the station "ON" and advance the volume control at least half way. Turn the adjuster shaft with a small screw driver slowly to the right until the point is reached where the line noise becomes inaudible. Do not turn adjustment beyond the point where line noise becomes inaudible. Make this adjustment carefully. The Silent Watchman is then left in this position, no further adjustments being necessary.

NOTE: The other 7W stations should not be in the "talk" position when this adjusting is being done.

FREQUENCY SELECTOR: The 7W Wireless System consists of 7 units; 7WA, 7WB, 7WC, 7WD, 7WE, 7WF, 7WG. The letter after 7W denotes the receiving frequency of each master unit. The units are tuned and set at the factory to the following frequencies: 7WA-100Kc., 7WB-120Kc., 7WC-140Kc., 7WD-160Kc., 7WE-180Kc., 7WF-220Kc., 7WG-260Kc. Each unit has six push buttons, one for each transmitting frequency except its own. If a unit is marked 7WA, its receiver is tuned to 100Kc., and the 100 Kc. transmitting frequency is omitted in this unit. Obviously, as a station cannot call itself, number one selector button is set to the next transmitting frequency, which would be the following letter in the alphabet. For example 7WA, push button number one would transmit to 7WB, etc. In order to communicate between 7WA and 7WB, 7WA would press #1 button to talk to 7WB and 7WB would press #1 to talk to 7WA.

Addition of stations: When a complete 7W system is installed there should be no two units with the same last letter. System should comprise seven units with letters A to G. If less than seven stations are installed, start with letter A and when ordering additional stations for an existing system of less than seven units specify the letters of the units already installed, or order units with letters not already in the existing system. For example, if a system has been installed using three units marked 7WA, 7WB, and 7WC, and two stations are to be added, order the next two consecutive letters, namely 7WD and 7WE.
CABLE LENGTH: For best results use heavy wire for long distances between units. For distances up to 100 feet, use #20 wire. For greater distances, use #18 or heavier.

POWER: 32 watts
For master only.
Remote requires no power.

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MODELS 12AH, 12AEH, 12AP, DAVID BOGEN CO., INC.
12APH, 219AH, 219AEH

POWER RATING: Master Unit only, 110 volts AC or DC; consumption, 25 watts.
Remote Units, no power connection.

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SELECTOR SWITCH
For Model 12C an 11-contact switch is used. Follow same color code up to 11

VOLTAGES MEASURED ON A.C.
VOLTAGE: 105–125 volts, a.c. or d.c. POWER: 32 watts per unit.

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POWER RATING: 117 Volts AC or DC; consumption 25 watts per unit

TUBES USED: 1-14F7; 1-50L6GT Pilot Lamp - NE51 Neon

CONNECTIONS: All stations are connected to form a single system with a multi-wire cable. The number of wires in the cable is one more than the number of stations in use. (that is, for five stations a cable of six conductors is needed.)

CABLE LENGTHS: For best results use heavy wire for long distances between units. For distances not over 100 feet, use copper wire size 20 or larger. For greater distances, number 20 or heavier should be used.
The Models 12N and 219N Communie-Phones are intercommunicating loudspeaking systems, in which all stations are master units and can call any other station.

POWER RATING: 105-125 Volts, AC-DC, 32 watts power per unit.

TUBES: 1-14F7; 1-50L6GT; 1-35Z5GT; Pilot light 117 volts, 6 watts.

CONNECTIONS:

All stations are joined into a single system with a cable having a number of wires. This number is one greater than the total number of stations in use (i.e., for 5 stations a cable of 6 conductors is needed). Larger cable may be used, with spare conductors for possible future expansion of number of stations. For small systems of 5 stations or less, a 6 conductor cable will be found convenient. Then, when necessary, an additional station may be installed.

EARPHONE:

On units having an earphone and hookswitch, either the loudspeaker or the earphone may be used for listening. When the phone is removed from the hook, it automatically cuts off the loudspeaker. The phone is then used for listening, but the loudspeaker is still used as a microphone. This is used principally to prevent others in the same room from hearing replies which may be confidential.

CABLE LENGTHS:

For best results use heavy wire for long distances between units. For distances not over 100 feet, use copper wire size #20 or larger, for greater distances #18 or heavier should be used.

SELECTOR SWITCH TABLE

<table>
<thead>
<tr>
<th>STATIONS NO.</th>
<th>SELECTOR SWITCH POSITION</th>
<th>STATION 1 SMITH</th>
<th>STATION 2 HENRY</th>
<th>STATION 3 JONES</th>
<th>STATION 4 SHIPPING</th>
<th>STATION 5 STENO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Henry</td>
<td>Smith</td>
<td>Smith</td>
<td>Smith</td>
<td>Smith</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Jones</td>
<td>Jones</td>
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<tr>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Steno</td>
</tr>
</tbody>
</table>

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CONNECTIONS:
All wiring in this system must be done with two conductor shielded cable. Either a multiple number of pairs of wire or the entire installation wired with two conductor shielded. Bond all shields at every junction.

POWER RATING:
Master units: 32 watts. Remote units: no power required.
Total: 3 lbs. 14 oz. 7 lbs. 15 oz.
117 volts, 6 watts.
See Schematic Diagram for color code of wires in Master Station Cable. Hook-up above shows connections for various Master and Remote Stations. For different combinations, see instruction sheet. Each split line, —, represents a two wire shielded cable.

Bond shields at all junctions. For color code of wires in Remote Station Cable, see Schematics of Remote Stations. A Junction Box is available for connecting Master and Remote Stations to the interconnecting cable. See Schematic Diagram for connections at Junction Box. The Inter-connecting Cable should not be grounded at any point. Use covered cable throughout.

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MODELS 112SH & 112SEH

MODEL 112S

See Schematic Diagram for color code of wires in Master Station Cable. Hook-up above shows connections for various Master and Remote Stations. For different combinations, see instruction sheet. Each split line (---) represents a two conductor twisted pair.

for color code of wires in Remote Station Cable, see Schematics of Remote Stations. A Junction Box is available for connecting Master and Remote Stations to the Interconnecting Cable. See Schematic Diagram for connections at Junction Box. The Interconnecting Cable should not be grounded at any point.
SPECIFICATIONS:

Master Units: 117 volts, AC or DC. Power Consumption 25 watts.
Remote Units: No power required.
Tubes Used: Total 2: 1-14F7, 1-50L6GT
Pilot Light: NE51 Neon

REMOTE MODELS: There are four types of remotes which may be used in this system:

Model 1SARH (no break-in)
Model 1SRSH (one master break-in)
Model 1RS3H (three master break-in)
Model 1RS12H (eleven master break-in)

All wiring in this system must be done with two conductor twisted pairs of wire. Either a multiple cable with the required number of pairs of wires may be used, or the entire installation may be done with two conductor twisted wire.

IMPORTANT:

To prevent interference between stations in the 112SH system after the system is completely installed, the "ON BUS" must be cut to separate the master portion of the "ON BUS" from the remote portion of the "ON BUS". The "ON BUS" consists of two bare wires connecting all contacts of the two rear wafers of the selector switch. (See Figure below). These wires should be cut between the last switch position being used for a master and the first position being used for a remote; i.e., for a system of 5 masters they should be cut between the 4th and 5th contacts on the two rear wafers. If there is only one master in the system, it is unnecessary to cut these wires.

If the system, when first connected to the power line is silent on D.C. or hums on A.C., the power plug should be reversed in the outlet to correct polarity.