in the breaker, one of its auxiliary normally closed (NC) contacts will close and energize the reset coil of the latch relay 6K14. Note that the normal position of 6K14 is the "latched in" position and also that its reset coil can be energized only when 6K5 is latched in and when the normally open (NO) time-closing contact of 6K7 is closed. Energizing the reset coil of 6K14 allows it to fall out, energizing the lockout supervisory light (LOCK OUT) 7I13 and the reclosure coil of the reclosure relay 6K15 and de-energizing the restart auxiliary relay 6K6 and the lockout relay 6K7. When the reclosure coil of 6K15 is energized through the reclosure switch 7S5 (AUTO RECLOSER SWITCH) and one of the contacts of 6K15, a ratchet-cam mechanism moves to the second position. The OCCO* contact of 6K15 is then closed, the CCCO† contact remaining closed. The third or instantaneous contact of 6K15, which closes each time the reclosure coil of 6K15 is energized, energizes the latch coil of 6K14 through the OCCO contact and one section of 7S5. Energizing the latch coil of 6K14 latches it in, removing power from 7I13 and from the reclosure coil of 6K15 and re-applying power to the restart auxiliary relay 6K6. When power is removed from the reclosure coil of 6K15, the instantaneous contact opens, de-energizing the latch coil of 6K14.

Approximately one second after the coil of 6K6 is energized, its normally open (NO) time-closing contact closes, energizing the auxiliary close circuit of 5K1. Breaker 5K1 then closes as during a normal Rectifier-on operation, re-applying plate power.

If a second drop-out of 5K1 occurs, the operation described above will be repeated, and the reclosure relay 6K15 will move to the third position and power will be re-applied a second time.

A third drop-out will cause 6K15 to move to the fourth and last position. The OCCO contact is then in the open position, preventing the latch coil of 6K14 from being energized. 6K14 then remains in the reset position, preventing the re-application of plate power. Note that in this position the LOCK OUT supervisory light 7I13 is energized, indicating that the reclosure circuit is in the lockout position.

After the first and second drop-outs, when the OCCO contact of 6K15 is closed, the coil of the automatic reset relay 6K17 is energized. This time-delay relay energizes the reset coil of 6K15 approximately 10 seconds after being energized. Operating the reset coil of 6K15 allows the sequence mechanism to move back to the starting position. Thus, if not more than two drop-outs have occurred in any 10-second interval, the automatic reclosure circuit is automatically reset. Depressing either RECTIFIER ON push button (7IS3 or 8IS1) or the RECT ON push button (6IS1) energizes the reset relay 6K16. The reset relay 6K16 energizes the reset coil of 6K15 and the latch coil of 6K14. Thus, the reclosure circuit is manually reset each time a RECTIFIER ON or RECT ON push button is operated.

If it is desired that there be no reclosure of 5K1, the reclosure switch 7S5 (AUTO RECLOSER SWITCH) may be placed in the OFF position. This prevents energizing of the reclosure and latch coils of 6K15 and energizes the reclosure switch supervisory light 7I14 to indicate visually that the switch is in the off position.

Two-Second Power Failure Restart

Using the mechanical latch relays permits the transmitter to return automatically to whatever operating condition preceded a failure of the main power supply. For momentary power failures of less than two seconds, the bypass time-delay relays 7K3 and 8K3 permit instantaneous re-application of plate power. A mechanical time-delay device delays the bypass time-delay relay contacts from opening for two seconds after their coils are de-energized. These contacts are in shunt with the contacts of the filament time-delay relays and maintain the circuits during the two-second delay. If power is re-applied during this time, the circuits remain sealed in, and plate power is immediately re-established. Otherwise, the filament time-delay relays 7K2 and 8K2 will fall out and will reclose only after a one-minute time delay.

EMERGENCY STARTING

The EMERGENCY START push buttons 7S3 and 8S2 permit bypassing of the one-minute time-delay relays 7K2 and 8K2 when starting under emergency conditions. For example, assume that a power failure of sufficiently long duration occurs such that the automatic power failure restart circuit will not automatically re-apply plate power. Under this condition the rectifier tubes are still moderately hot and do not need the full one-minute time delay. A good rule to follow in this instance is to allow for as much heating time before operating the EMERGENCY START switch as the time-off interval in order to avoid long program delay.

This circuit should not be used in normal operation since severe damage may result to the rectifier tubes if plate power is applied without proper filament heating time delay when the tubes are cold.

It should be noted that a spare socket, 6XV7, for a Type GL-869-B rectifier tube is provided in the Rectifier and Control cubicle. By maintaining a spare rectifier tube with heated filament, replacement can be made with a minimum of lost time in the event of failure of one of the operating tubes.

*Open closed closed open
†Closed closed closed open

INDEPENDENT OPERATION OF AURAL AND VISUAL AMPLIFIERS

Although plate power for both the Aural and Visual Amplifiers is supplied by a single high-voltage Rectifier, it is possible to operate either Amplifier independently while most necessary servicing, such as tube changing, is being done in the other. This is accomplished by use of the VISUAL-BOTH-AURAL multicontact DC SWITCH 7S8 and the d-c high-voltage contactors 6K12 and 6K13. When operated to any one of its three positions, switch 7S8 performs all the necessary control circuit switching as described in the CONTROL CIRCUIT COMPONENTS AND THEIR FUNCTIONS division of this section to allow independent and simultaneous operation. Contactors 6K12 and 6K13 properly connect the output of the high-voltage Rectifier.

If 7S8 is operated when the plate power is off, the proper solenoids of 6K12 and 6K13 will be energized to accomplish the desired switching. As soon as the switching is properly accomplished, the DC SWITCH STATUS light 7I16 (and the transfer relay 6K11) will be energized through a combination of contacts on 7S8 and interlocks on 6K12 and 6K13 to indicate this.

It will be noted that a normally open (NO) auxiliary contact on plate breaker 5K1 prevents the d-c contactors 6K12 and 6K13 from being energized when 5K1 is closed. Also, a contact of 7S8 (contact number 9) in the undervoltage solenoid circuit of 5K1 opens at positions of 7S8 midway between the three main operating positions. Thus, if 7S8 is operated when plate power is on, Rectifier breaker 5K1 first drops out because of the interruption of power in its undervoltage circuit, d-c contactor 6K12 or 6K13 transfers, and transfer relay 6K11 is again energized. Now, since the breaker drop-out was not due to a normal Rectifier-off operation (which would have reset latch relay 6K5), the automatic plate reclosure circuit will operate (if 7S5 is in the automatic position, that is, AUTO RECLOSER ON) and plate power will be re-applied automatically. Plate power is therefore interrupted only during the transfer of the d-c contactors.

FILAMENT TIME-DELAY STATUS LIGHTS

The lights in the green RECTIFIER ON (7IS3 and 8IS1) and RECT ON (6IS1) push buttons are energized during a start operation only after the proper filament time-delay relay has timed out. If switch 7S8 is in the BOTH position, these lights are energized only when both the Aural and Visual filament time-delay relays have timed out (and bias voltage has been established on both Amplifiers). If, however, 7S8 is in the AURAL or VISUAL position, 6IS1, 7IS3, and 8IS1 will be energized after the corresponding time-delay relay has timed out. Now, if one of the Amplifiers is in operation and the other has been off (for example, for a tube change), the RECTIFIER ON and RECT ON green push buttons cannot be used as an indication of the status of the time-delay relay for the Amplifier which is not in use. For this reason, the separate filament time-delay status lights (FIL TD STATUS) 7I16 and 8I7 have been provided to give a positive indication of the filament time-delay status for each Amplifier, regardless of whether or not the other Amplifier is being operated.

SUPERVISORY LIGHT CIRCUITS

The AIR, WATER, DOOR, BIAS, AUTO RECLOSER SWITCH, and LOCK OUT supervisory lights illuminate only as long as the particular circuit condition which they indicate exists. All remaining supervisory lights indicate momentary overload conditions and remain illuminated until the RESET push button 7IS5 is depressed to break the seal on the corresponding light relay (except for the ARC BACK supervisory light 7I12 on the Aural Amplifier cubicle front panel which is reset by the ARC BACK RESET push button 6IS3 on the front panel of the Rectifier and Control cubicle). When any of the overload indicating lights is energized, the lamp in the corresponding red RESET push button is also energized. Thus, if the red push button alone is illuminated, it is an indication that one of the overload supervisory lights is burned out and requires replacement.

VISUAL AMPLIFIER

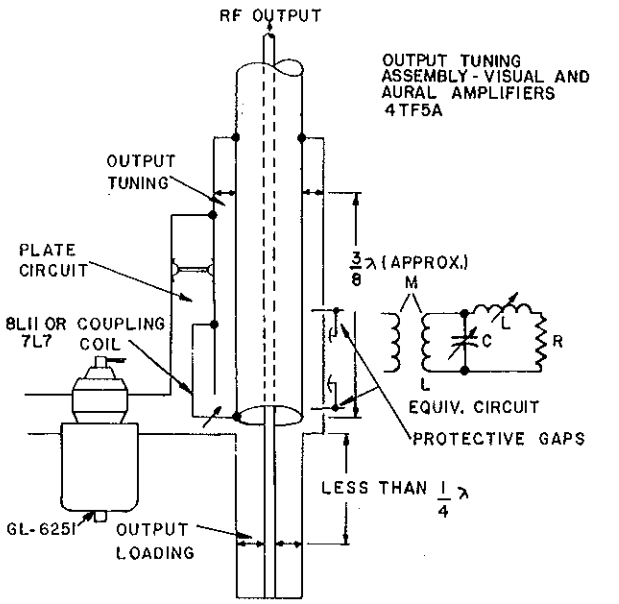
POWER AMPLIFIER

The Visual Amplifier fundamentally consists of two Type GL-6251 tetrode tubes operating in parallel in a grounded-grid or grid-separation circuit. In this circuit both the screen grid and the control grid are maintained as nearly as possible to RF ground potential, the plate or load circuit being connected between the anode and screen grid and the excitation voltage being applied between the filament and control grid.

Not shown on the Elementary Diagram is a neutralizing loop (see Fig. 50) which is coupled magnetically to the anode circuit and is connected to the junction between the filaments of the two tubes. By this means a voltage is introduced to the filaments from the anodes of a proper phase and amplitude to neutralize the effect of anode-to-filament feedback through the very small anode-to-filament capacitance.

Another part of the circuit not shown on the Elementary Diagram is a resistive element necessary to prevent spurious oscillations in the amplifier tubes. With tetrode tubes such as the Type GL-6251, a spurious

Colpitts-type oscillation can take place between the filament, the control grid, and the screen grid, with the screen grid acting as the anode in the production of the oscillations. The frequency-determining circuit in the production of these oscillations is the unavoidable circuit between the control and screen grids. It is necessary to the proper operation of the tube that this circuit does not resonate within the band of frequencies over which the Amplifier operates. Fortunately, in this Amplifier the resonant frequency of this circuit is well above the operating range. Since the circuit between screen and control grids is all within the tubes, with the exception of the bypass capacitors 8C40, 8C41, 8C42, and 8C43, and the ground connections between these capacitors, it is obvious that the only way to prevent these oscillations is to introduce a damping or loading resistance in this external ground connection sufficient to prevent the oscillations from starting. This has been accomplished by placing a group of small low-value resistors in a circle around each tube shunted by low-inductance leads in the form of short pieces of bus bar. These resistors are all in shunt with the ground connections between the bypass capacitors. By this means sufficient circuit loading has been obtained to eliminate the spurious oscillations under normal operating conditions.



(A-7991254, Sheet 1)

Fig. 56 Visual and Aural Amplifier Output Tuning Assembly Mechanical-Elementary Diagram

OUTPUT CIRCUIT

See Figs. 22 and 56.

The plate circuit, 8L6, is a quarter-wave cavity having a motor-driven sliding short for tuning and which is shortened by the output capacitance of the tube. The output coupling circuit consists of an inductive loop, 8L11, which is resonated by means of a concentric transmission line approximately three-eighths wavelength long having a motor-driven sliding short. The input impedance of a shorted transmission line is capacitive when the length is between a quarter and three-eighths of a wave long. The output load or transmission line is coupled to the output circuit through a shorted section of concentric line which is shorter than a quarter wave. The input impedance of a shorted line less than a quarter wave long is inductive (see Fig. 56). Two protective gaps are installed on the output circuit assembly. One is placed at the point of minimum spacing and the other approximately at the point of maximum voltage gradient. These gaps will break down in the event of a high VSWR on the RF load for this Amplifier and will operate 8K19 which will remove plate voltage from the Amplifier and cause the RF OUTPUT supervisory light to be illuminated.

The output circuit is coupled and loaded to the plate circuit in normal operation to make the bandwidth of the plate and output circuits sufficiently broad. In order to assure sufficient lower-sideband attenuation the Vestigial-Sideband Filter (supplied with the Model 4TF5A1 Amplifier) is required in the output transmission line to the antenna.

Adjustment of the bandpass characteristic is effected by means of a sweep generator and an oscilloscope. The sweep generator output voltage which is developed across terminating resistors 8R48 and 8R78 is loosely coupled to the plate circuit by means of a capacitance probe. (Relay 8K18 is energized when the SWEEP-OPERATE switch is in the SWEEP position.) The oscilloscope is connected to the output of one of the two sweep detector circuits. Sweep detector No. 1 consists of capacitor 5C1, germanium diode 5CR1, resistor 5R1, compensating coil 5L4, and the RF decoupling circuit 5C2, 5R1, 5R3, and 5L5. Sweep detector No. 2 is the same as sweep detector No. 1 except for the symbol numbers.

Sweep detector No. 1 is mounted on the output transmission line preceding the Vestigial-Sideband Filter, and sweep detector No. 2 is mounted on the output transmission line following the Vestigial-Sideband Filter. Thus, by means of the oscilloscope trace the bandpass characteristic may be observed and adjusted before and after the Vestigial-Sideband Filter. By observing the oscilloscope trace when connected to sweep detector No. 2, the Lower-Sideband Filter may be checked.

A reflectometer and a peak reading RF voltmeter are located on the output transmission line. Crystal recti-

fiers in the reflectometer 5E1 provide two d-c voltages, one proportional to the forward-traveling wave in the transmission line and the second proportional to the reverse-traveling or reflected wave. These voltages are proportional to the average value of RF voltage and are therefore proportional to average RF power.

The peak reading RF voltmeter produces a d-c voltage which is proportional to the RF transmission-line voltage during the synchronizing pulse intervals. This is accomplished by operating the RF rectifier tube 5V1 into the time-constant circuit 5C5 and 5R4-8R96. The time constant of this circuit is long enough so that the capacitor 5C5 does not discharge appreciably between sync pulses. Tube 5V1, therefore, conducts only during the sync pulse interval and the d-c voltage produced is proportional to the amplitude of the sync pulses.

INPUT CIRCUIT

Refer to Figs. 57 and 58.

Fundamentally, the input circuit of the Amplifier, which is not shown on the Elementary Diagram, transforms the impedance seen between the filaments and the control grids to approximately 50 ohms resistance at the midband of the television channel used which will provide a satisfactory load for the driving transmitter.

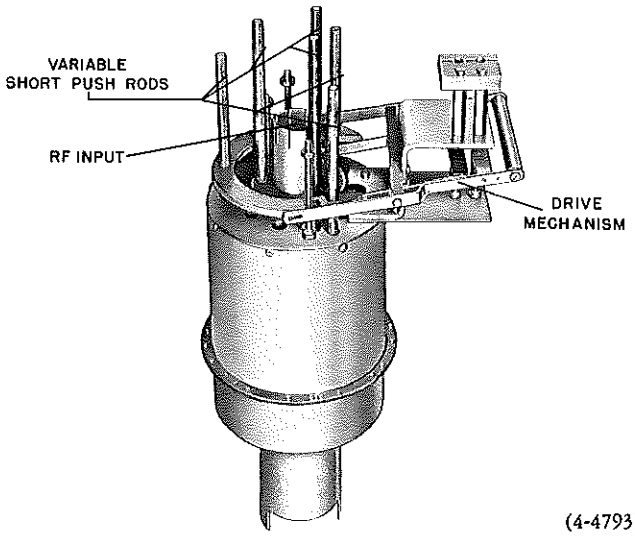


Fig. 57 Input Matcher Assembly, Visual and Aural Amplifier Cavities, PL&C-7775419-G1

Progressing from the filaments of the amplifier tubes back toward the input terminal, the circuit required to do this consists of a capacitance C (22 mmfd ± 1.5 mmfd), an inductance L1 which is a manually adjustable length of concentric line 1/16 wavelength or less, a fixed 20-ohm concentric-line matching section, inductance L2 which is a manually adjustable length of concentric line 0.2 wavelength or less.

SWEEP GENERATOR

Circuit Analysis

The sweep generator is a device for generating a constant voltage swept over a band of frequencies approximately 8 megacycles wide and centered on the television channel for which the wide-band, Class B, linear radio-frequency amplifier is to be aligned. The sweep voltage is delivered at the RF OUTPUT jack 8J101. The output is then connected to a termination which is coupled by means of a small capacitance probe to the plate circuit of the Amplifier. Thus, this voltage drives the circuit to be adjusted. By placing a suitable detector on the output transmission line the frequency response of the Amplifier output circuit can be displayed on an oscilloscope.

The sweep generator consists of a 6BK7 oscillator 8V101, a GL-832-A wide-band amplifier 8V102, and two marker oscillators 8V103 and 8V104 (Type 6U8). The frequency of the 6BK7 oscillator is swept by capacitor 8C106 which is driven by the synchronous motor 8B101. Energy from the oscillator circuit is inductively coupled to the grid of the GL-832-A amplifier by the untuned coupling 8L102. The plate circuit of the amplifier is a double-tuned circuit, loaded and coupled to give a flat response over a large part of the range of frequencies generated by the oscillator.

Switch 8S103 connects the SCOPE INPUT jack 8J104

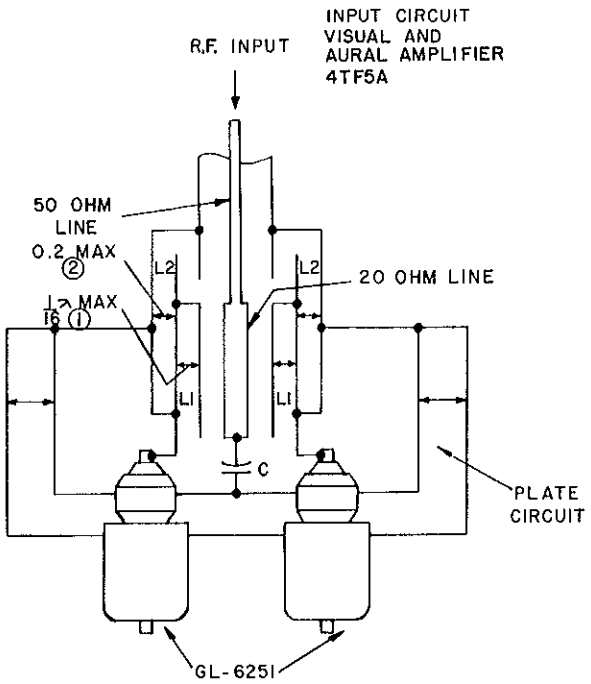


Fig. 58 Visual and Aural Amplifier Input Circuit Mechanical-Elementary Diagram

to either the RF output termination detector or any of the three detector input jacks, 8J102, 8K103 or 8J105.

RF energy from the two marker crystals is coupled to the marker mixer diode 8CR101 through coupling capacitance 8C138A and 8C138B. Energy from the Amplifier output circuit is also coupled to 8CR101 through 8C124. Thus a "beat note" is produced across 8CR101 whenever the sweep frequency coincides with one of the marker oscillator frequencies. The "beat" or "marker" is coupled to the oscilloscope input jack through coupling capacitor 8C123. The marker beats are therefore superimposed on the oscilloscope trace to show the band extremities.

The markers are crystal-controlled by high-frequency crystals of the overtone type. Refer to the Marker Oscillator No. 1. The anode of the triode section of 8V103 is coupled by 8C133 to the control grid of the pentode section. The control grid of the triode section is grounded and the cathode of that section is coupled to the cathode of the pentode section by the crystal 8Y101. It is seen that oscillation will occur if the series impedance of the crystal becomes low (as at its resonant frequency or overtone), and at the same time, there is appreciable load impedance in the plate circuit of the triode section (8L113 and output capacitance of the triode section at parallel resonance). The pentode section performs an additional function as a tripler of the oscillation frequency, since the circuit 8L112 and 8C131 is tuned to three times the oscillation frequency.

An 1800-rpm, 60-cycle, synchronous motor is used to turn the rotor of the oscillator tank capacitor 8C106. This means that the sweep moves from one end of its range to the other and returns during one-half revolution. It is the purpose of blanking to reduce the RF output of the sweep generator to zero during at least a part of the return trace (less than one-half revolution of the motor). This is accomplished by impressing a 60-cycle voltage across the divider 8R138, 8R139, and 8R140. A part of this voltage is impressed on the selenium rectifier 8CR102 which passes current only during one-half of the cycle. Half-cycle pulses of voltage therefore appear across 8R141. The low potential end of grid resistors 8CR101 and 8R102 is connected to the junction of 8CR102 and 8R141. The pulses of voltage (negative in polarity) are therefore impressed on the oscillator tube 8V101 grids, causing it to stop oscillating during the desired interval of time.

Switch 8S102 permits monitoring the plate currents of the oscillator, the amplifier, the marker oscillator pentode sections, and the grid voltage of the marke oscillator triode sections.

Sweep Alignment

To align the sweep, connect a high-gain oscilloscope such as a General Electric Type ST-2-A to the SCOPE INPUT jack 8J104 and set the switch 8S103 to the TERMINATION position.

Assuming that the Amplifier cubicle filaments and the sweep generator power supply are on, place the OPERATE-SWEEP switch in the SWEEP position. Place the MARKERS, FILAMENT, and MOTOR switches in the ON position, thus energizing the sweep generator tubes and the sweep motor.

With the marker crystals in their sockets and meter switch 8S103 in the XTAL 1 position, start adjusting 8L113 clockwise from its full counterclockwise position while observing the tuning meter 8M101. When the oscillator starts oscillating, the meter reading will suddenly increase. Adjust 8L113 for maximum reading on the meter. Repeat this process for the XTAL 2 position, adjusting 8L116.

The sweep oscillator must now be adjusted to the proper frequency range and the output circuit of the amplifier adjusted to produce a constant RF voltage over the desired frequency band at the terminations. The frequency of the oscillator may be adjusted by means of a shorting bar on the plate circuit transmission line 8L101. The section of this line near the shorted end has much wider spacing than the rest of the line. Moving the sliding short the length of this expanded section will change the oscillator tuning sufficiently to cover all channels from 7 through 13. At channel 7 the sliding short will be almost at the end of the line. At channel 13 the sliding short will be almost at the opposite end of the expanded section. Other channels between 7 and 13 will fall proportionately between these limits.

The input circuit of the amplifier consists of the shorted transmission line 8L102 which is inductively coupled to the oscillator plate line 8L101. This circuit operates untuned. At channel 7 the sliding short on 8L102 should be near the end of the transmission line. At channel 13 the short should be moved from the end to within about one-half inch of the beginning of the expanded section of 8L101. If line 8L102 is too short at any particular frequency, it may be too near resonance and the amplifier may be unstable and tend to oscillate.

Now with the oscilloscope sweep set for approximately 60 cycles, a pattern of four sweep traces, two of which are mirror images, can be synchronized. If there is little or no oscilloscope deflection, tune the primary of the output circuit by means of 8C117 until a single-humped response is obtained. It may be neces- to move the shorting bar on 8L106 to obtain full resonance.

At this point the BLANKING switch may be placed in the ON position. This will cause the major portion

of the mirror traces to disappear, since the oscillator is prevented from oscillating during this time. The base line during this time is the reference or zero-voltage line. It will be noted that there are two positions at which the synchronous sweep motor 8B101 may "lock in" with respect to the blanking voltage. For this reason it may be necessary when starting the sweep generator to snap the MOTOR switch off and on a time or two until the motor "locks in" on the desired trace. In this way the sweep frequency can always be increasing or decreasing as the oscilloscope trace moves from left to right as desired.

The secondary of the output circuit should then be tuned to resonance by means of capacitor 8C121 and the sliding short on 8L107. When properly tuned, the response should be a double-coupled response just slightly over critical coupling. This results in a response essentially flat over the desired range of frequencies. In order to obtain the desired flatness, it will be necessary to adjust the coupling between 8L106 and 8L107 and the secondary loading by means of loading capacitors 8C120 and 8C129. The capacitors should be adjusted together in order to maintain approximately the same capacitance in each. When adjustment is made to adjust the loading, there must be a compensating change in the secondary tuning capacitor 8C121.

Adjust 8C131 and 8C140 to obtain a maximum height of the marker beat seen on the oscilloscope trace. Adjust 8L113 and watch the marker beat it controls. Set 8L113 for a point where small adjustments do not move the marker. This indicates that the marker is oscillating at a frequency controlled by its crystal. Repeat this procedure for the other marker, adjusting 8L116. When this procedure has been followed, the oscilloscope trace will be like that shown in Figs. 59 and 60.

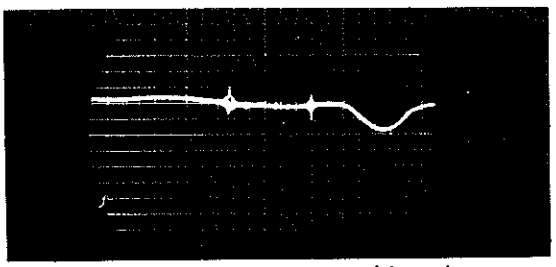


Fig. 59 Sweep Response with Markers

POWER SUPPLIES

Screen grid power for the Visual Amplifier is obtained through high-voltage rectifier tubes 6V16 and 6V17. This power is regulated electronically as follows: a bridge circuit consisting of 8V21, 8V22, 8V23, 8R62, 8R69, 8R61, 8R57, 8R56, and 8R68 is connected across the output of the regulator. An error voltage is obtained between the arm of 8R57 and the junction of 8R62 to 8V21 and is applied between grid and cathode of 8V13. The amplified error voltage at the anode of 8V13 is applied to the grid of the amplifier tube 8V14. The amplified signal at the anode of 8V14 is applied to the grids of the series regulating tubes 8V15, 8V16, 8V17, and 8V20, which operate in series with the load to maintain the voltage essentially constant across the bridge circuit from which the error voltage was originally obtained. Screen voltage is adjusted by means of the variable transformer 8T8. The screen regulator is loaded by 8R58 to maintain proper operation when the screen current of the GL-6251 runs negative.

Control grid voltage is obtained from a three-phase, full-wave rectifier utilizing selenium rectifiers.

Individual bias voltages are controlled by rheostats 8R38 and 8R39.

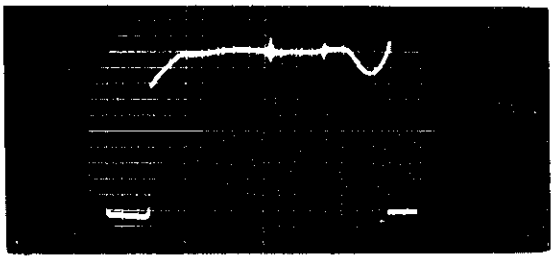


Fig. 60 Sweep Response with Markers and Blanking

VESTIGIAL-SIDEBAND FILTER AND HARMONIC FILTERS

Refer to the instruction books included as inserts in this book for information pertaining to these units: EBI-3326, Vestigial-Sideband Filter, PL-7775490, and EBI-3310, Harmonic Filter, Model 4PY25F1.

AURAL AMPLIFIER

POWER AMPLIFIER

The Aural Amplifier is essentially identical to the Visual Amplifier with the few exceptions which are described in the following.

OUTPUT CIRCUIT

See Fig. 56.

The output circuit of the Aural Amplifier is identical to that of the Visual Amplifier except that no peak power reading diode is required. Instead, the forward-wave indication of reflectometer 7E1 is used as a relative power output indication. The reverse-wave voltage of this reflectometer is amplified by reflectometer amplifier 7V10 to operate relay 7K17 whenever its magnitude becomes greater than a predetermined value such as would occur in the case of a transmission-line

or antenna fault. When 7K17 is operated, it causes plate power to be removed from the Amplifier, thus protecting the equipment.

INPUT CIRCUIT

See Fig. 58.

The Aural input circuit accomplishes the necessary impedance transformation in the same manner as the Visual Amplifier input circuit.

The input presents a corrected impedance which terminates the input transmission line so that it has a VSWR of 1.25 to 1 or better at the aural carrier frequency.

SWEEP GENERATOR

The sweep generator of the Aural Amplifier is identical to that of the Visual Amplifier.

AURAL RECTIFIER CIRCUITS

Screen power is obtained from a conventional single-phase, full-wave rectifier circuit using rectifier tubes 6V18 and 6V19. Screen voltage is adjusted by means of the variable transformer 7T17.

Protective bias voltage to prevent excessive plate current and excessive plate dissipation when RF drive power is reduced or not present is obtained from an unfiltered three-phase, full-wave rectifier consisting of selenium rectifiers 7CR5 through 7CR10. During normal operation, self bias is produced by the grid current flowing through the grid resistor 7R1. This voltage is greater than the protective bias rectifier voltage; therefore, the bias rectifier does not conduct during normal operation of the Amplifier.

HIGH-VOLTAGE RECTIFIER

The Rectifier and Control Cubicle contains the high-voltage Rectifier, high-voltage filter capacitors, and the associated control equipment. The high-voltage Rectifier is a three-phase, full-wave circuit utilizing Type GL-869-B tubes, 6V1 through 6V6. The output of the Rectifier divides through two paths, one for the Aural Amplifier and the other for the Visual Amplifier. DC isolation switches 6K12 and 6K13 make it possible to isolate either Amplifier. Reactor 5L7 and capacitor 6C4 form the high-voltage filter for the Aural section. Reactor 5L8 and capacitors 6C1, 6C2, and 6C3 form the high-voltage filter for the Visual section.

A capacitor-resistance type of rectifier step-start is used to prevent high initial inrush of current through rectifier tubes upon the application of power. This consists of resistors 6R12 and 6R13 for the Aural and 6R10 and 6R11 for the Visual in conjunction with step-start contactor 6K10. Contactor 6K10 is delayed in closing upon the application of rectifier power. Thus, the filter capacitors charge up slowly through the resistors. When almost fully charged, after approximately one second, contactor 6K10 closes, shorting out the resistors and thereafter allowing the filter to operate in the normal manner.

Since the arc-back indicator circuit of all the rectifier tubes is identical, it is necessary to describe the operation of only one. In normal operation, current in rectifier tube 6V1 flows from anode to cathode and through resistor 6R2. Selenium rectifier 6CR5 is so poled that the voltage drop across 6R2 will not cause current to flow through 6CR5 and 6K26. However, when an arc back occurs, reverse current flows through the tube; the voltage across 6R2 reverses and current will flow in the coil of the fast-acting relay 6K26, causing it to operate.

The arc-back indicator tubes 6V10 through 6V15 are cold-cathode, glow-discharge triodes. In normal operation the glow discharge between main anode and cathode will not start until a certain minimum voltage is impressed upon the "starter" or auxiliary anode. After the discharge starts, it continues regardless of whether or not the initiating voltage remains in the starter anode. The glow discharge is visible, providing a means of determining its presence.

Suppose that arc-back relay 6K26 is actuated by an arc back through 6V1. One contact closes and actuates a trip coil in the main circuit breaker to remove high-voltage power as soon as possible. A second contact closes and puts a positive voltage from the supply consisting of 6T4, rectifiers 6CR1 through 6CR4, and filter capacitor 6C5 across the series resistors 6R31 and 6R32. Since the junction of these resistors is connected to the starter anode of 6V10, a part of this voltage is applied to it sufficient enough to start the glow discharge in 6V10, indicating that 6V1 has had an arc back. The glow-discharge current through resistor 6R30 immediately causes the voltage to drop sufficiently so that if there are subsequent arc backs in any of the rectifier tubes, the starter anodes of the corresponding glow-discharge tubes will not have enough voltage impressed on them to ignite those tubes. Thus, only one glow-discharge tube can ignite and it will indicate which rectifier tube arced back first.

The arc-back indicator can be reset by depressing push button switch 6IS3, which removes voltage from the anode of all the glow-discharge tubes, causing the glow discharge to be extinguished.

PARTS LIST

ELECTRICAL

Symbol	Description	G-E Drawing
	MOTORS	
5B1 and 5B2	Heat exchanger motors. 200 v, 3 phase, 50/60 cycles, 1800 rpm, 3 hp, 1800 rpm, open, ball bearings. G-E Motor Type K, frame 225.	
5B3	Ingersoll-Rand Cat. #RVNL-5HP motorpump, Model D, 220/440 v, 3 phase, 50/60 cycles, includes G-E standard open motor.	B-7487967-P1
7B1	Gear motor: 115 v, 1 phase, 50/60 cycles, 45/55 rpm, full load current 0.5 amp approx, 240 in-oz torque, includes 3.75 mfd Pyranol* capacitor 7C46. Holtzer-Cabot Type RBC-3712.	B-7486142-P1
7B2 and 7B3	Gear motors, reversible: input 115 v, 60 cycles; output 47.5 rpm, torque 100 oz-in, 30/1 gear ratio; includes 3.75 mfd Pyranol capacitors 7C47 and 7C48. Holtzer-Cabot Cat. # RBC-2510.	B-7484282-P2
8B1	Gear motor: 115 v, 1 phase, 50/60 cycles, 45/55 rpm, full load current 0.5 amp approx, 240 in-oz torque, includes 3.75 mfd Pyranol capacitor 8C50. Holtzer-Cabot Type RBC-3712.	B-7486142-P1
8B2 and 8B3	Gear motors, reversible: input 115 v, 60 cycles; output 47.5 rpm; torque 100 oz-in, 30/1 gear ratio, includes 3.75 mfd Pyranol capacitors 8C48 and 8C49. Holtzer-Cabot #RBC-2510.	B-7484282-P2
8B101	Synchronous, split phase motor, Bodine Cat. #2246, frame size NSY-12, 115 v, 60 cycles, sleeve bearings, 1/75 hp, 1800 rpm.	B-7485982-P1
6BM1 and 6BM2	Rotron Model C Type 3L blower motors. Includes FA Smith motor, frame 6H, shaded pole, 4 pole, totally enclosed, ball bearings, 220 v, 1 phase, 50/60 cycles, 1600 rpm.	M-7483607-P3
6BM3	American Blower Corp. Type 00, Sirocco utility set Size 30. Includes G-E open, shaded pole motor Cat. #5KSP11DG71, 230 v, 0.025 hp, 50/60 cycles, sleeve bearings lubricated for life, discharge may be adjusted to any angle. G-E Dwg. No. for motor only is B-7409263-P2.	C-7707201-P2
6BM4	American Blower Corp. Type 00, Sirocco utility set Size 30. Includes G-E open, shaded pole motor Cat. #5KSP11DG69, 230 v, 0.025 hp, 50/60 cycles, sleeve bearings lubricated for life, LH discharge. G-E Dwg. No. for motor only is B-7409263-P4.	C-7707201-P4
6BM5	Blower motor, Rotron Model C, Type 3L; includes FA Smith motor frame 6H, shaded pole, 4 pole, totally enclosed, ball bearings, 220 v, 1 phase, 50/60 cycles, 1600 rpm.	M-7483607-P3
7BM1 and 8BM1	Blower and motor assemblies. Includes: Blower: 3110 rpm, 600 cfm at 3.5 sp. American Blower Corp. Cat. #75 SISW Sirocco fan Series 81. Ball bearings: 11/16" dia Fafnir "LAK". Ball bearings: 11/16" dia Fafnir "LCJ". Motor: G-E Model 5K45MG7, Form G, Type K, 1 hp, 3 phase, 208-220/440 v, 60/50 cycle, 3450/2850 rpm, with 3/16" x 3/16" key and shaft keyway. Belt: matched pair. Browing Mfg. Co. Cat. #4L350, "A" section.	PL-7775116-G1
	CAPACITORS	
5C1 and 5C2	Silver mica, 27 mmfd, ±10%, 500 v d-c w.	P-3R122-P11
5C4	Ceramic high K disk, 0.005 mfd +100% -0%, 500 v d-c w.	C-7774750-P11
5C5	Pyranol, 2.0 mfd ±10%, 600 v d-c w. G-E Cat. # 22F419.	C-3R143-P36
5C6	Consists of probe A-7138547-G1 and 3-1/8 inner line.	
5C10 and 5C12	Silver mica, 27 mmfd ±10%, 500 v d-c w.	P-3R122-P11
5C13 and 5C15	Silver mica, 27 mmfd, ±10%, 500 v d-c w.	P-3R122-P11

* Registered U. S. Patent Office

Symbol	Description	G-E Drawing
	CAPACITORS (CONT'D)	
5C16 thru 5C18	Part of basic construction.	
6C1 thru 6C4	Pyranol, 9.0 mfd ±10%, 7500 v d-c w. G-E Cat. #14F422.	P-7770283-P14
6C5	Pyranol, 10.0 mfd ±10%, 600 v d-c w. G-E Cat. #23F876.	P-3R88-P19
6C6 thru 6C8	Pyranol, 10.0 mfd ±10%, 2000 v d-c w. G-E Cat. #23F386.	P-3R87-P4
6C9 thru 6C11	Pyranol, 9.0 mfd ±10%, 7500 v d-c w. G-E Cat. #14F422.	P-7770283-P14
7C2 thru 7C10	Mica, 220 mmfd ±10%, 2500 v d-c w. RETMA Type RCM55B221K.	P-3R32-P7
7C13	Pyranol, 10.0 mfd ±10%, 600 v d-c w. G-E Cat. #23F876.	P-3R88-P19
7C14 thru 7C17	Ceramic high K disk, 0.01 mfd +100% -0%, 500 v d-c w.	C-7774750-P13
7C18 thru 7C21	Ceramic, double cup, 500 mmfd min, 10,000 peak v d-c w. Erie Type 401-02, Hi-K.	K-7119854-P1
7C22 thru 7C29	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
7C30 thru 7C33	Ceramic, double cup, 500 mmfd min, 10,000 peak v d-c w. Erie Type 401-02, Hi-K.	K-7119854-P1
7C34 thru 7C39	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
7C43	Ceramic, double cup, 390 mmfd ±10%, 8000 peak v d-c w, -750 temp coef. Erie Type 742B.	K-7119383-P6
7C44 and 7C45	Pyranol, 10.0 mfd ±10%, 600 v d-c w. G-E Cat. #23F876.	P-3R88-P19
7C46	Pyranol, 3.75 mfd ±10%, 330 v a-c w at 60 cycles. G-E Cat. #21F403-G2. Part of 7B1.	P-7770037-P4
7C47 and 7C48	Pyranol, 3.75 mfd ±10%, 330 v a-c w at 60 cycles. G-E Cat. #21F403-G2. Part of 7B2 and 7B3.	P-7770037-P4
8C1	Pyranol, 50 mfd ±10%, 330 v a-c w, 600 v d-c w. G-E Cat. #23F710.	P-7769244-P2
8C2	Paper, molded plastic; 0.0068 mfd ±20%, 600 v d-c w. Sprague Cat. #109P68206.	B-7491096-P46
8C3	Mica, 220 mmfd ±10%, 2500 v d-c w. RETMA Type RCM55B221K.	P-3R32-P7
8C4	Pyranol, 1.0 mfd ±10%, 1000 v d-c w. G-E Cat. #23F359.	P-3R88-P6
8C5 thru 8C8	Mica, 220 mmfd ±10%, 2500 v d-c w. RETMA Type RCM55B221K.	P-3R32-P7
8C9 and 8C10	Paper, molded plastic; 0.01 mfd ±20%, 600 v d-c w. Sprague Cat. #109P10306.	B-7491096-P47
8C11 and 8C12	Mica, 220 mmfd ±10%, 2500 v d-c w. RETMA Type RCM55B221K.	P-3R32-P7
8C13 and 8C14	Pyranol, 10.0 mfd ±10%, 600 v d-c w. G-E Cat. #23F876.	P-3R88-P19
8C15 and 8C16	Mica, 220 mmfd ±10%, 2500 v d-c w. RETMA Type RCM55B221K.	P-3R32-P7
8C17	Pyranol, 1.0 mfd ±10%, 7500 v d-c w. G-E Cat. #23F428.	P-3R87-P20
8C20 and 8C21	Pyranol, 2.0 mfd ±10%, 1500 v d-c w. G-E Cat. #23F371.	P-3R88-P11
8C22	Pyranol, 2.0 mfd ±10%, 600 v d-c w. G-E Cat. #22F419.	P-3R143-P36
8C23 thru 8C26	Ceramic, double cup, 500 mmfd min, 10,000 peak v d-c w. Erie Type 401-02, Hi-K.	K-7119854-P1
8C27	Pyranol, 2.0 mfd ±10%, 600 v d-c w. G-E Cat. #22F419.	P-3R143-P36
8C28 thru 8C35	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
8C36 thru 8C39	Ceramic, double cup, 500 mmfd min, 10,000 peak v d-c w. Erie Type 401-02, Hi-K.	K-7119854-P1
8C40 thru 8C44	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
8C45	Ceramic, double cup, 390 mmfd ±10%, 8000 peak v d-c w, -750 temp coef. Erie Type 742B.	K-7119383-P6
8C48 and 8C49	Pyranol, 3.75 mfd ±10%, 330 v a-c w at 60 cycles. G-E Cat. #21F403-G2. Part of 8B2 and 8B3.	P-7770037-P4
8C50	Pyranol, 3.75 mfd ±10%, 330 v a-c w at 60 cycles. G-E Cat. #21F403-G2. Part of 8B1.	P-7770037-P4
8C51	Mica, 220 mmfd ±10%, v d-c w. RETMA Type RCM55B221K.	P-3R32-P7

Symbol	Description	G-E Drawing
	CAPACITORS (CONT'D)	
8C52	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
8C53 thru 8C54	Paper, dielectric, hermetically sealed, tubular, mineral oil impregnated, 0.5 mfd +30% - 10%, 600 v d-c w. Sprague Cat. #PPX24B22.	P-7768969-P38
8C101	Ceramic high K disk, 0.005 mfd +100% -0%, 500 v d-c w.	C-7774750-P11
8C102 and 8C103	Ceramic, temp compensating, 10 mmfd ±1.0 mmfd, 500 v d-c w.	P-3R93-P7
8C104 and 8C105	Ceramic, temp compensating, 8 mmfd ±1.0 mmfd, 500 v d-c w.	P-3R93-P5
8C106	Variable, air, 4.4 to 15.5 mmfd. Hammarlund Type BFC Special.	K-7121107-P1
8C107 and 8C108.	Ceramic high K disk, 0.01 mfd +100% -0%, 500 v d-c w.	C-7774750-P13
8C110 and 8C111	Ceramic, standoff type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 326.	A-7138472-P9
8C112	Mica, Class C; 100 mmfd ±10%, 500 v d-c w. RETMA Type RCM20C101K.	P-3R141-P44
8C113 thru 8C115	Ceramic high K disk, 0.005 mfd +100% -0%, 500 v d-c w.	C-7774750-P11
8C116	Ceramic, standoff type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 326.	A-7138472-P9
8C117	Variable, air, miniature dual butterfly type, 2.7 to 10.8 mmfd. Johnson Cat. #160-211-43.	M-7481115-P8
8C118	Ceramic, temp compensating tube type; 47 mmfd ±10%, 500 v d-c w.	P-7770468-P17
8C120	Variable, ceramic, 5 to 20 mmfd, 500 v d-c w. Erie Type TS2A-N300.	M-7484389-P4
8C121	Variable, ceramic, 3 to 12 mmfd, 500 v d-c w. Erie Type TS2A-NPO.	M-7484389-P2
8C122	Ceramic, feed thru type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 327.	B-7485975-P19
8C123	Ceramic, 100 mmfd ±20%, 500 v d-c w. Erie Style 331 Hi-K.	M-7483722-P1
8C125 thru 8C127	Ceramic, feed thru type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 327.	B-7485975-P19
8C128	Ceramic, 470 mmfd ±20%, 500 v d-c w. Erie Style 331 Hi-K.	M-7483722-P5
8C129	Variable, ceramic, 5 to 20 mmfd, 500 v d-c w. Erie Type TS2A-N300.	M-7484389-P4
8C130	Ceramic, 1000 mmfd ±20%, 500 v d-c w. Erie Style 332 Hi-K.	M-7483722-P7
8C131	Variable, air, miniature, 1.8 to 8.7 mmfd. Johnson Cat. #160-104-43.	M-7481115-P2
8C132	Ceramic, 1000 mmfd ±20%, 500 v d-c w. Erie Style 332 Hi-K.	M-7483722-P7
8C133	Ceramic, temp compensating tube type; 47 mmfd ±10%, 500 v d-c w.	P-7770468-P17
8C134 thru 8C136	Ceramic, 470 mmfd ±20%, 500 v d-c w. Erie Style 331 Hi-K.	M-7483722-P5
8C137	Ceramic, 1000 mmfd ±20%, 500 v d-c w. Erie Style 332 Hi-K.	M-7483722-P7
8C138A	Includes RG-59/U cable and 8L112.	
8C138B	Includes RG-59/U cable and L115.	
8C139	Ceramic, feed thru type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 327.	B-7485975-P19
8C140	Variable, air, miniature, 1.8 to 8.7 mmfd. Johnson Cat. #160-104-43.	M-7481115-P2
8C141	Ceramic, 1000 mmfd ±20%, 500 v d-c w. Erie Style 332 Hi-K.	M-7483722-P7
8C142	Ceramic, temp compensating tube type; 47 mmfd ±10%, 500 v d-c w.	P-7770468-P17
8C143 and 8C144	Ceramic, 470 mmfd ±10%, 500 v d-c w. Erie Style 331 Hi-K.	M-7483722-P5
8C145 and 8C146	Ceramic, feed thru type, 1000 mmfd ±20%, 500 v d-c w. Erie Style 327.	B-7485975-P19
8C147	Ceramic, 470 mmfd ±20%, 500 v d-c w. Erie Style 331 Hi-K.	M-7483722-P5
8C150	Ceramic high K disk, 0.01 mfd +100% -0%, 500 v d-c w.	C-7774750-P13
	RECTIFIERS	
5CR1 thru 5CR3	Germanium diodes. RETMA Type 1N63.	
6CR1 thru 6CR4	Selenium, peak current 2000 ma, max d-c current 200 ma. Federal Tel. and Radio Type 1006.	M-7480225-P4
6CR5 thru 6CR10	Selenium, half wave, rating at 35° C new 31 v, max 36 v, d-c output 12 v, current 0.25 amp. G-E Model 6RS12A1.	A-7136264-P1
7CR1 thru 7CR10	Selenium, 300 v max, peak current 750 ma, max d-c output 200 ma. Federal Tel. and Radio Type 1006.	M-7480225-P4

Symbol	Description	G-E Drawing
	RECTIFIERS (CONT'D)	
7CR13	Germanium diode. RETMA Type 1N63.	
8CR1	Selenium, input when new 50 v, aged 52 v; d-c output 62 v at 7.05 amp, 3 phase full wave budge connection, 2 cells per arm. G-E Cat. #6RS5JH53.	B-7488234-P1
8CR2	Diode, germanium. RETMA Type 1N63.	
8CR101	Diode, germanium. G-E Type G7A.	
8CR102	Selenium, peak current 900 ma, max d-c output 75 ma. Federal Tel. and Radio Type 1003.	M-7480225-P1
	MISCELLANEOUS ELECTRICAL PARTS	
5E1 and 5E2	Coupler unit: Similar to M.C. Jones Model 442A10. 0 - 40 kw power rating for operation over freq range 50 to 216 mc, includes silicon crystal Type 1N21. (For replacement use 1N21B.)	B-7488365-P1
	FUSES	
7F1 thru 7F3	3 amp, 250 v. G-E Cat. #3167.	K-1R11-P1
	LAMPS	
6I2	6 - 8 v, 0.15 amp. G-E Cat. #47.	
7I1 thru 7I17	6 - 8 v, 0.15 amp. G-E Cat. #47.	
8I1 thru 8I10	6 - 8 v, 0.15 amp. G-E lamp #47.	
	PUSH-BUTTON SWITCHES AND INDICATING LIGHTS	
6IS1	Green cap, includes G-E lamp #46.	A-7135306-G2
6IS2 and 6IS3	Red cap, includes G-E lamp #46.	A-7135306-G1
7IS1	Red cap, includes G-E lamp #46.	A-7135306-G1
7IS2 and 7IS3	Green cap, includes G-E lamp #46.	A-7135306-G2
7IS4 and 7IS5	Red cap, includes G-E lamp #46.	A-7135306-G1

Symbol	Description	G-E Drawing
	PUSH-BUTTON SWITCHES AND INDICATING LIGHTS (CONT'D)	
8IS1	Green cap, includes G-E lamp #46.	A-7135306-G2
8IS2	Red cap, includes G-E lamp #46.	A-7135306-G1
	JACKS AND RECEPTACLES	
5J1	Series BNC receptacle, Type UG-290/U.	M-7468506-P1
5J2 and 5J3	Jacks. Included in Probe Assembly, PL-7141294-G2 as Part 4.	
5J4 and 5J5	Series BNC, receptacles Type UG-290/U. Included in Connector Bracket Assem. A-7145074-G1 as Part 4.	M-7468506-P1
5J10	Series BNC receptacle Type UG-290/U.	M-7468506-P1
5J11 and 5J12	Series BNC receptacles Type UG-290/U. Included in Connector Bracket Assem. A-7145074-G1 as Part 4.	M-7468506-P1
5J13	Jack. Included in Probe Assembly PL-7141294-G2 as Part 4.	
5J14	Series BNC receptacle Type UG-290/U.	M-7468506-P1
5J15	Jack. Included in Probe Assembly PL-7141294-G2 as Part 4.	
6J1	Twin outlet: G-E Cat. #GE4060-1. Harvey Hubbell Cat. #5252.	B-7488131-P1
7J2 thru 7J4	Receptacles: BNC series panel jacks, Type UG-624/U.	A-7010955-P1
7J5	Receptacle, Type UG-704/U.	M-7403898-P1
7J6 and 7J7	Twin outlets. G-E Cat. #GE4060-1. Harvey Hubbell Cat. #5252.	B-7488131-P1
7J11	BNC series panel jack, Type UG-291/U.	B-7411435-P1
8J9 thru 8J11	BNC series panel jacks, Type UG-624/U.	A-7010955-P1
8J12 and 8J13	Twin outlets. G-E Cat. #GE4060-1. Harvey Hubbell Cat. #5252.	B-7488131-P1
8J14	BNC series panel jack, Type UG-191/U	B-7411435-P1
8J16	Receptacle, Type UG-604/U.	M-7403898-P1
8J17	BNC series panel jacks, Type UG-624/U.	A-7010955-P1
8J101 thru 8J105	Receptacles: BNC panel jacks Type UG-624/U.	A-7010955-P1
8J106	Receptacle: BNC keyed, Type UG-625/U.	A-7010954-P1

Symbol	Description	G-E Drawing
	RELAYS	
5K1	Circuit breaker, G-E Type AK1-25, rated 400 amp, 600 v, 60 cycles. Electrically operated with: 1. Closing solenoid rated 230 v, 60 cycles; 2. Aux closing relay rated 115 v, 60 cycles; Breakers are furnished with EC-1 trip containing: 1. Instantaneous trip 5000 amp; 2. Short time trip rated 800 amp, trip in 0.133 sec with 250% of load; 3. Long time delay trip rated 400 amp, adjustable from 80 to 160% of rating, trips in 5 sec at 600% of rating. Additional trips: 1. Mechanical trip; 2. Under-voltage trip, 115 v, 60 cycles, instantaneous; 3. Shunt trip, 115 v, 60 cycles, instantaneous Aux. switches, 5 NO. and 5 NC.	C-7773783-P2
5K2 thru 5K4	Solenoids: 117 v a-c + 10% −20%, 60 cycles; resistance 25 ohms ±10% at 25° C; seated 0.32 amp at 25° C, extended 1" 3.5 amp at 25° C; pull 7 lbs. Dormeyer Cat. #230 Special.	A-7144707-P1
6K1	115 v ± 10%, 50/60 cycle operating and reset coils; 2pst NO. and 2pst NC contacts. Struthers Dunn Type 51BXB102.	M-7484875-P2
6K2	Contactor: 110 v ±10%, 60 cycle coil reference 22D156-G2; 3 main poles, 1 NO. and 1 NC left interlock. G-E Model CR-2810-D11AB1H2.	P-7773535-P3
6K3	Time delay relay: 115 v, 60 cycle coil; 3 min ±12 sec time delay. Price Brothers Type 4052.	M-7478040-P5
6K4	Contactor: 110 v ±10%, 60 cycle coil; 3 pole. G-E Type CR-2810-C11AB1A2.	P-7773089-P2
6K5	115 v ± 10%, 50/60 cycle operating and reset coils; 2pst NO. and 2pst NC contacts; Struthers Dunn Type 51BXB102.	M-7484875-P2
6K6	Time delay relay: 115 v ± 10%, 60 cycle coil; "on delay"-time delay after coil is energized, 1 NO. and 1 NC time delay. Allen Bradley Bulletin # 849 Style A.	B-7485292-P1
6K7	Time delay relay: 115 v ± 10%, 60 cycle coil; "on delay"-time delay after coil is energized; 1 NO. and 1 NC time delay contact plus 1 NO. and 1 NC instantaneous contact. Allen Bradley Bulletin # 849-Style AX.	B-7485292-P3
	RELAYS (CONT'D)	
6K9	115 v ±10%, 60 cycle coil; dpst NO. contacts. Similar to Ward Leonard Type 81-6520 except mounted on larger base.	M-7484759-P1
6K10	Contactor, RF: dpst, NO. cold break contactor rated 15 amp, 5000 v; 115 v ± 10%, 60 cycle coil, front connected for mtg on 1/8" panel. Similar to Monitor Controller Type SP2001.	A-7136262-P1
6K11	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
6K12 and 6K13	Contactors, RF: spst with 4 microswitches; 110 v, 60 cycle operation, 2 solenoids. EF Johnson Type 145-101.	B-7485962-P1
6K14	115 v ±10%, 60 cycle operating and reset coils; 2pst NO. and 2pst NC contacts. Struthers Dunn Type 51BXB102.	M-7484875-P2
6K15	Reclosure relay, elec. reset, both coils rated 115 v ± 10%, 60 cycles, one OCCO, one CCCO, and one NO. auxiliary contact which closes when operating coil is energized. Struthers Dunn Type 99AXA115.	M-7474991-P3
6K16	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
6K17	Time delay relay: 115 v ± 10%, 60 cycle coil; "on delay" - time delay after coil is energized, 1 NO. and 1 NC time delay contact. Allen Bradley Bulletin # 849-Style A.	B-7485292-P1
6K20	Pull in 10 ma ±2 ma, 1 form A contact.	C-7773760-P19
6K21 thru 6K26	Pickup 0.5 to 1.5 amp, 2 form A contacts, 10,000 v d-c working coil to contacts. Approx resistance 0.4 ohm, CP Clare Type E.	C-7773776-P1
6K27	40 amp continuous, 20 - 80 range. G-E Model 12PJC11A6.	B-7487929-P6
6K30	Coil rated 230 v a-c ± 10%, 50/60 cycles, or 5 - 6 v amp d-c; dpst NO. contacts. Struthers Dunn Type SD-BIBXX.	M-7484872-P1
6K31 and 6K32	208/230 v, 50/60 cycle coil; 2 form A contacts.	C-7773750-P11
7K1	Contactor: 110 v ±10%, 60 cycle coil; 3 pole, 1 NC left external interlock. G-E Type CR-2810-C11AB1D2.	P-7773089-P9
7K2	Time delay relay: 115 v, 60 cycle coil; 63 sec ±3 sec time delay. Price Brothers Type 4052.	M-7478040-P4

Symbol	Description	G-E Drawing
	RELAYS (CONT'D)	
7K3	Time delay relay, adjustable: 115 v ±10%, 60 cycle coil; off delay-time delay after coil is de-energized, 1 NO. and 1 NC time delay contact. Allen Bradley Bulletin # 849 Style B.	B-7485292-P2
7K4	Contactor, size 00, 4 poles, 3 NO. and 1 NC; 110 v ±10%, 60 cycle coil reference F22D135G2. G-E Type CR-2810-A11AK2.	P-7772368-P2
7K5 thru 7K7	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
7K8 and 7K9	115 v a-c ±10%, 60 cycle, dpdt. Struthers Dunn Type BIXBX or Ward Leonard Type 110-6522.	M-7484872-P4
7K10 and 7K11	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
7K12	Telephone type, pickup less than 20 v, dropout more than 15 v, 2 form A, 1 form B contacts.	P-7769664-P51
7K13	230 v ±10%, 60 cycle coil, 3pdt, Struthers Dunn Type BIXCX.	M-7484871-P3
7K14	5 amp continuous, 0.5 - 2 range. G-E Model 12PJC11A1.	B-7487929-P1
7K15 and 7K16	12 amp continuous, 4 - 16 range. G-E Model 12PJC11A4.	B-7487929-P4
7K17	Pull-in 4 ma or less, dropout 2 ma or more, resistance 5000 ohms or less, twin 2 form A, 1 form B contacts.	P-7773402-P19
7K18	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
7K19	115 v, 50/60 cycle coil, 2 form A, 1 form B contacts.	P-7770291-P6
7K20	110 v ±10%, 50 - 60 cycles; spst double break, NO. contacts. Leach Type 1521.	M-7485293-P3
7K21	Telephone type, pickup less than 20 v, dropout more than 15 v, 2 form A, 1 form B contacts.	P-7769664-P51
7K22	Double wound coil, 2 similar electrically separate coils, each to carry continuously up to 6 amp d-c simultaneously, coils are wound differentially, relay picks up on an unbalance of currents of less than 2.0 amp and more than 1.25 amp, 2 form A, 2 form B contacts.	P-7773421-P7
7K23	Contactor: 110 v ±10%, 60 cycle coil; 3 pole, 1 NC left external interlock. G-E Type CR-2810-C11AB1D2.	P-7773089-P9

Symbol	Description	G-E Drawing
	RELAYS (CONT'D)	
8K1	Contactor: 110 v ±10%, 60 cycle coil; 3 pole, 1 NC left external interlock. G-E Type CR-2810-C11AB1D2.	P-7773089-P9
8K2	Time delay relay: 115 v, 60 cycle coil; 63 sec ±3 sec time delay. Price Brothers Type 4052.	M-7478040-P4
8K3	Time delay relay, adjustable: 115 v ±10%, 60 cycle coil; off delay - time delay after coil is de-energized, 1 NO. and 1 NC time delay contact. Allen Bradley Bulletin # 849 Style B.	B-7485292-P2
8K4	Contactor, size 00, 4 poles, 3 NO. and 1 NC; 110 v ±10%, 60 cycle coil, reference F22D135G2. G-E Type CR-2810-A11AK2.	P-7772368-P2
8K5 thru 8K7	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
8K8 and 8K9	115 v a-c ±10%, 60 cycle, dpdt. Struthers Dunn Type BIXBX or Ward Leonard Type 110-6522.	M-7484872-P4
8K10	230 v ±10%, 50/60 cycle coil, 3pdt. Struthers Dunn Type BIXCX.	M-7484871-P3
8K11	5 amp continuous. 0.5 - 2 range. G-E Model 12PJC11A1.	B-7487929-P1
8K12	Telephone type, pickup less than 20 v, dropout more than 15 v, 2 form A, 1 form B contacts.	P-7769664-P51
8K13	Double wound coil, 2 similar, electrically separate coils, each to carry continuously up to 6 amp d-c simultaneously, coils are wound differentially, relay picks up on an unbalance of currents of less than 2.0 amp and more than 1.25 amp; 2 form A, 2 form B contacts.	P-7773421-P7
8K14 and 8K15	12 amp continuous, 4 - 16 range. G-E Model 12PJC11A4.	B-7487929-P4
8K16	115 v, 50/60 cycle coil, 3 form A contacts.	P-7770291-P3
8K17	Telephone type, pickup 550 ma or less, dropout 350 ma or more, resistance less than 0.75 ohm, 2 form A, 1 form B contacts.	P-7769664-P47
8K18	110 v ±10%, 50 - 60 cycles; spst double break, NO. contacts. Leach Type 1521.	M-7485293-P3
8K19	Telephone type, pickup less than 20 v, dropout more than 15 v, 2 form A, 1 form B contacts.	P-7769664-P51
8K20	115 v a-c ±10%, 60 cycle, dpdt. Struthers Dunn Type BIXBX or Ward Leonard Type 110-6522.	M-7484872-P4

Symbol	Description	G-E Drawing
	INDUCTORS	
5L1 and 5L2	Coils. Included in Probe Assembly A-7141294-G2 as Part 5.	
5L3	RF choke coil; inductance 0.84 uh, current 1000 ma, freq range 160 - 350 mc. Ohmite Cat. # Z-235.	P-7772834-P6
5L4	Coil: (Channels 7 thru 10 only) 6-1/4 turns, 0.30" ID at 0.11" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P1
5L4	Coil: (Channels 11 thru 13 only) 4-1/4 turns, 0.30" ID at 0.18" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P2
5L5	RF choke coil: inductance 0.84 uh, current 1000 ma, freq range 160 - 350 mc. Ohmite Cat. # Z-235.	P-7772834-P6
5L7	Reactor: min inductance 1.5 h at 9.0 amp d-c, less than 10 ohms d-c resistance at 25° C.	B-7487259-P1
5L8	Reactor: min inductance 1.0 h at 12.0 amp d-c, less than 4 ohms d-c resistance at 25° C.	B-7487258-P1
5L10	Coil: (Channels 7 thru 10 only) 6-1/4 turns, 0.30" ID at 0.11" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P1
5L10	Coil: (Channels 11 thru 13 only) 4-1/4 turns, 0.30" ID at 0.18" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P2
5L11	RF choke coil: inductance 0.84 uh, current 1000 ma, freq range 160 - 350 mc. Ohmite Cat. # Z-235.	P-7772834-P6
5L12	Coil. Included in Probe Assembly A-7141294-G2 as Part 5.	
5L13	Coil: (Channels 7 thru 10 only) 6-1/4 turns, 0.30" ID at 0.11" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P1
5L13	Coil: (Channels 11 thru 13 only) 4-1/4 turns, 0.30" ID at 0.18" pitch, of 0.064" dia B11B10A5 wire.	A-7145557-P2
5L14	RF choke coil: inductance 0.84 uh, current 1000 ma, freq range 160 - 350 mc. Ohmite Cat. # Z-235.	P-7772834-P6
5L15	Coil. Included in Probe Assembly A-7141294-G2 as Part 5.	
6L1 thru 6L3	Reactor: inductance 10 h at 0.65 amp d-c, 50 ohms d-c resistance.	M-7475694-P1
7L1	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
	INDUCTORS (CONT'D)	
7L2 thru 7L5	Inductances consisting of cable assemblies each of which includes: 7.0" ±0.02" of round, extra flexible bare tinned copper 7/7/95/0.005 wire, G-E Spec B11Y3C21; 2 cable connectors Ilsoco Cat. No. SLU-225, G-E Dwg. No. A-7143465-P1. (Part of Cavity Assembly PL-7668731-G1.)	A-7141619-G1
7L6	Coil assembly. Includes 5 full turns equally spaced, 13/16" O.D., of 0.080" dia wire G-E Spec # B11B10A5. (Part of Cavity Assembly PL-7668731-G1.)	A-7139494-G1
7L7	Coupling loop, part of cavity construction. When reordering specify channel of operation.	
7L13 and 7L14	Reactors: inductance 10 h min at 0.175 amp, d-c resistance 132 ohms.	M-7475693-P1
7L16 and 7L17	Coils: include 11 turns, equally spaced right-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P2
7L18 and 7L19	Coils: include 11 turns, equally spaced left-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P1
8L1	Reactor: inductance 0.6 h min at 7.0 amp, d-c resistance less than 1.5 ohm.	B-7487242-P1
8L2 thru 8L5	Inductances consisting of cable assemblies each of which includes: 7.0" ± 0.02" of round, extra flexible bare tinned copper 7/7/95/0.005 wire, G-E Spec B11YSC21; 2 cable connectors Ilsoco Cat. No. SLU-225, G-E Dwg. No. A-7143465-P1. (Part of Cavity Assembly PL-7668731-G1.)	A-7141619-G1
8L6	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
8L7	Coil: includes 11 turns, equally spaced right-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P2
8L8	Coil: includes 11 turns, equally spaced left-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P1
8L9	Coil: includes 11 turns, equally spaced right-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P2

Symbol	Description	G-E Drawing
	INDUCTORS (CONT'D)	
8L10	Coil: includes 11 turns, equally spaced left-hand wound, 0.38" ID, of 0.064" dia B11B10A5 bus wire.	A-7143897-P1
8L11	Coupling loop, part of cavity construction. When reordering specify channel of operation.	
8L12	Coil assembly. Includes 5 full turns equally spaced, 13/16" ID, of 0.080" dia wire G-E Spec # B11B10A5. (Part of Cavity Assembly PL-7668731-G1.)	A-7139494-G1
8L101	Inductor.	A-7137816-G1
8L102	Inductor.	A-7137864-G1
8L103 thru 8L105	RF choke coils: inductance 0.84 uh, current 1000 ma, freq range 160-350 mc. Ohmite Cat. #Z-235.	P-7772834-P6
8L106	Inductor.	A-7137852-G1
8L107	Inductor.	A-7137596-G1
8L108	RF choke: inductance 1.8 uh, current 1000 ma, freq range 75 - 190 mc. Ohmite Cat. # Z-144.	P-7772834-P5
8L110 and 8L111	RF choke coils: inductance 0.84 uh, current 1000 ma, freq range 160-350 mc. Ohmite Cat. #Z-235.	P-7772834-P6
8L112	Coil: 1-1/2 turns, 1/2" ID, right-hand wound, of 0.064" dia copper wire.	A-7137883-P2
8L113	Variable coil.	A-7137895-G1
8L114	RF choke: inductance 3.0 uh ±20%.	M-7475057-P4
8L115	Coil: 1-1/2 turns, 1/2" ID, left-hand wound, of 0.064" dia copper wire.	A-7137883-P1
8L116	Coil.	A-7137895-G1
8L117	RF choke: inductance 3.0 uh ± 20%.	M-7475057-P4
	METERS	
6M1 and 6M2	Hour meters: 230 v, 60 cycles.	P-3R142-P2
7M1	1.5 amp, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P15
7M2 and 7M3	8 amp d-c, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R126-P6
7M4	15 amp d-c, approx terminal resistance 0.0033 ohm, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P29
7M5	200-0-600 ma d-c, terminal resistance 0.063 ohm approx, calibrated for use on nonmagnetic panel. G-E Type DO-71.	B-7488225-P3
7M6	1.5 kv, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R124-P21
7M7	10 ma d-c, nom resistance 3.0 ohms ±20%, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R128-P26
7M8	300 v a-c. G-E Type AO-72.	P-3R136-P15
7M9	200-0-600 ma d-c, terminal resistance 0.063 ohm approx, calibrated for use on nonmagnetic panel. G-E Type DO-71.	B-7488225-P3
7M10	200 microamp, approx terminal resistance 300 ohms, linear scale, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P12
7M11	8 kv, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P22
7M12	8 v a-c. G-E Type AO-72.	P-3R136-P5
8M1	200-0-600 ma d-c, terminal resistance 0.063 ohm approx, calibrated for use on nonmagnetic panel. G-E Type DO-71.	B-7488225-P3
8M2	1.5 amp, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P15
8M3	80 v d-c, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R124-P11
8M4	20 amp d-c, approx terminal resistance 0.0025 ohm, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P30
8M5 and 8M6	10 amp d-c, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R126-P7
8M7	1.0 ma d-c, internal resistance 100 ohms ± 1%, dual scale 0 - 500 v d-c and 0 - 500 ma d-c, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-7769632-P9
8M8	200-0-600 ma d-c, terminal resistance 0.063 ohm approx, calibrated for use on nonmagnetic panel. G-E Type DO-71.	B-7488225-P3
8M9	8 v a-c. G-E Type AO-72.	P-3R136-P5
8M10	8 kv, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P22
8M11	1.5 kv, calibrated for use on nonmagnetic panel. G-E Type DO-71.	P-3R124-P21
8M12	200 microamp, approx terminal resistance 300 ohms, linear scale, calibrated for use on magnetic panel. G-E Type DO-78.	P-3R91-P12

Symbol	Description	G-E Drawing
	METERS (CONT'D)	
8M14	30 ma d-c, nom resistance 1.66 ohms ±20%, calibrated for use on magnetic panel. G-E Type DO-71.	P-3R127-P29
8M101	1 ma d-c movement, nom resistance 67.7 ohms ±20%, calibrated for use on nonmagnetic panels. G-E Type DO-71.	P-3R128-P20
	PLUGS	
5P1	BNC series, Type UG-260/U.	M-7468567-P1
5P2 and 5P3	N series, Type UG-21B/U.	B-7404649-P1
5P4 and 5P5	BNC series, Type UG-260/U.	M-7468567-P1
5P10 thru 5P12	BNC series, Type UG-260/U.	M-7468567-P1
5P13	N series, Type UG-21B/U.	B-7404649-P1
5P14	BNC series, Type UG-260/U.	M-7468567-P1
5P15	N series, Type UG-21B/U.	B-7404649-P1
7P2 thru 7P4	BNC series, Type UG-260/U.	M-7468567-P1
7P7	BNC series, Type UG-260/U.	M-7468567-P1
7P10	BNC series, Type UG-88/U.	M-7476889-P1
8P12 and 8P13	BNC series, Type UG-260/U.	M-7468567-P1
8P14	BNC series, Type UG-88/U.	M-7476889-P1
8P15 thru 8P18	BNC series, Type UG-260/U.	M-7468567-P1
	RESISTORS	
5R1	Composition, 0.10 megohm ±10%, 1 w.	C-3R78-P104K
5R3	Composition, 1000 ohms ±10%, 1/2 w.	C-3R77-P102K
5R4	Composition, 0.10 megohm ±5%, 2 w.	C-3R79-P104J
5R5 and 5R6	Composition, 1000 ohms ±10%, 1/2 w.	C-3R77-P102K
5R9	Resistor box assembly. Includes: Resistor box. Industrial Control Type CR-9143-SG, Schenectady Wks Dwg. No. 283A332 or G-E Syracuse Dwg. No. B-7488220-P1; 2 side covers, G-E Cat. # 194800 1 top cover, G-E Cat. # 194799.	A-7143544-G1

Symbol	Description	G-E Drawing
	RESISTORS (CONT'D)	
5R10	Composition, 0.10 megohm ±10%, 1 w.	C-3R78-P104K
5R11 thru 5R15	Composition, 1000 ohms ±10%, 1/2 w.	C-3R77-P102K
6R1	Wirewound, 1.0 ohm ±10%, 375 w. Ward Leonard Type # 10-1/2 D.	M-7484196-P4
6R2 thru 6R7	Wirewound, 0.06 ohms ±10%, 110 w. Ward Leonard Type # 4-1/2 B.	M-7484196-P2
6R8	Wirewound, 50 ohms ±5%, 25 w. Ward Leonard Cat. # 25F50.	M-2R14-P18
6R10 thru 6R13	Wirewound, ferrule type, 1000 ohms ±5%, 200 w.	M-2R71-P31
6R14 thru 6R16	Wirewound, ferrule type, 50,000 ohms ±5%, 200 w.	M-2R71-P48
6R17	Wirewound, ferrule type, 50 ohms ±5%, 200 w.	M-2R71-P18
6R18 and 6R19	Wirewound, ferrule type, 3.15 ohms ±5%, 200 w.	M-2R71-P6
6R20 thru 6R22	Wirewound, ferrule type, 50,000 ohms ±5%, 200 w.	M-2R71-P48
6R23	Wirewound, ferrule type, 63 ohms ±5%, 60 w.	M-7464827-P19
6R24	Wirewound, ferrule type, 20,000 ohms ±5%, 115 w.	M-7464826-P44
6R25	Wirewound, ferrule type, 1000 ohms ±5%, 60 w.	M-7464827-P31
6R26	Wirewound, ferrule type, 40,000 ohms ±5%, 115 w.	M-7464826-P47
6R27	Wirewound, ferrule type, 1000 ohms ±5%, 60 w.	M-7464827-P31
6R29	Composition, 2700 ohms, ±10%, 2 w.	C-3R79-P272K
6R30	Wirewound, 5000 ohms ±5%, 5 w. Sprague Type 5 KT with pigtail leads and Style C mtg.	M-7478711-P98
6R31	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R32	Composition, 47,000 ohms, ±5%, 1 w.	C-3R78-P473J
6R33	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R34	Composition, 47,000 ohms ±5%, 1 w.	C-3R78-P473J
6R35	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R36	Composition, 47,000 ohms ±5%, 1 w.	C-3R78-P473J

Symbol	Description	G-E Drawing
	RESISTORS (CONT'D)	
6R37	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R40	Composition, 47,000 ohms ±5%, 1 w.	C-3R78-P473J
6R41	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R42	Composition, 47,000 ohms ±5%, 1 w.	C-3R78-P473J
6R43	Composition, 0.12 megohm ±5%, 1 w.	C-3R78-P124J
6R44	Composition, 47,000 ohms ±5%, 1 w.	C-3R78-P473J
6R45	Wirewound, 5000 ohms ±5%, 25 w. Ward Leonard Cat. #25F5000.	M-2R14-P38
6R46	Rheostat, wirewound: 1000 ohms ±10%, 25 w, linear taper. Ohmite Model H, Cat. #0158.	M-2R33-P42
6R47	Wirewound, 5.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F5.	M-2R14-P8
6R50 thru 6R55	Wirewound, 20.0 ohms ±10%, 375 w. Ward Leonard Type #10-1/2 D.	M-7484196-P6
6R56 thru 6R61	Wirewound, 31.5 ohms ±10%, 375 w. Ward Leonard Type #10-1/2 D.	M-7484196-P5
7R1	Wirewound, ferrule type, 160 ohms, 9 taps ±10%, 160 w.	M-2R54-P23
7R2	Wirewound, 5.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F5.	M-2R14-P8
7R3 and 7R4	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
7R5	Wirewound, ferrule type, 1.0 ohm ±5%, 60 w.	M-7464827-P1
7R6	Multiplier, precision, 1.5 megohm ±0.5%, 1500 v. Jan Type MFB155.	M-7470483-P5
7R7	Wirewound, ferrule type, 1.0 ohm ±5%, 60 w.	M-7464827-P1
7R8	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
7R9	Rheostat, wirewound, dual: each section rated 5.0 ohms ±10%, 225 w. Ohmite Type 6605.	P-7769823-P5
7R10	Wirewound, 3.15 ohms ±10%, 375 w. Ward Leonard Type 10-1/2 D.	M-7484196-P7
7R11 and 7R12	Wirewound, ferrule type, 1.0 ohm ±5%, 60 w.	M-7464827-P1
7R13 and 7R14	Wirewound, 1.0 ohm ±5%, 25 w. Ward Leonard Cat. #25F1.	M-2R14-P1
7R15 and 7R16	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
7R17	Composition, 0.10 megohm ±10%. 2 w.	C-3R79-P104K
7R18	Wirewound, ferrule type, 4000 ohms ±5%, 200 w, 9 taps equally spaced.	B-7491515-P1
7R20A and 7R20B	Multiplier, precision, 4.0 megohm ±0.5%, 4000 v. Jan Type MFA405.	M-7470483-P11
7R23	Composition, 5100 ohms ±5%, 2 w.	C-3R79-P512J
7R24	Potentiometer, composition: 7500 ohms ±20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P53
7R30	Composition, 10,000 ohms ±10%, 1 w.	C-3R78-P103K
7R31	Composition, 0.10 megohm ±10%, 1 w.	C-3R78-P104K
7R32	Composition, 27 ohms ±10%, 1 w.	C-3R78-P270K
7R33	Composition, 470 ohms ±10%, 1 w.	C-3R78-P471K
7R34	Potentiometer, composition: 1500 ohms ±20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P9
7R35 and 7R36	Wirewound, 6300 ohms ±5%, 10 w. Sprague Type 10 KT with tab terminals and Style C mtg.	M-7478633-P99
7R37	Composition, 0.27 megohm ±10%, 1 w.	C-3R78-P274K
7R38	Composition, 220 ohms ±5%, 2 w.	C-3R79-P221J
7R39	Composition, 180 ohms ±5%, 1/2 w.	C-3R77-P181J
7R40	Wirewound, 5.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F5.	M-2R14-P8
7R41	Wirewound, 10,000 ohms ±5%, 25 w. Ward Leonard Cat. #25F10000.	M-2R14-P41
7R45 and 7R46	Composition, 130 ohms ±5%, 1 w.	C-3R78-P131J
7R47	Rheostat, wirewound; 750 ohms ±10%, 75 w, linear taper. Ohmite Model "G", Cat. #1116.	M-2R35-P17
8R1	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
8R3	Rheostat, wirewound: 6 ohms ±10%, linear taper, 25 w. Ohmite Model H, Cat. #0143.	M-2R33-P50
8R31 thru 8R34	Wirewound, noninductive, ferrule type, 4.0 ohms ±5%, 160 w.	M-7472341-P7
8R36 and 8R37	Wirewound, ferrule type, 1.0 ohm ±5%, 60 w.	M-7464827-P1
8R38 and 8R39	Rheostat, wirewound: 10 ohms ±10%, linear taper, 225 w. Ohmite Model P, Cat. #1256.	M-2R38-P7
8R40 and 8R41	Wirewound, ferrule type, 4.0 ohms ±5%, 115 w.	M-7464826-P7

Symbol	Description	G-E Drawing
	RESISTORS (CONT'D)	
8R42	Wirewound, 5.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F5.	M-2R14-P8
8R43	Wirewound, 3.15 ohms ±10%, 375 w. Ward Leonard Type 10-1/2 D.	M-7484196-P7
8R44 and 8R45	Wirewound, ferrule type, 1.0 ohm ±5%, 60 w.	M-7464827-P1
8R46 and 8R47	Wirewound, 1.0 ohm ±5%, 25 w. Ward Leonard Cat. #25F1.	M-2R14-P1
8R48	Composition, 130 ohms ±5%, 1 w.	C-3R78-P131J
8R49	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
8R50 thru 8R53	Wirewound, noninductive, ferrule type, 1.0 ohm ±5%, 60 w.	M-7472343-P1
8R55	Composition, 30,000 ohms ±5%, 2 w.	C-3R79-P303J
8R56	Composition, 10,000 ohms ±5%, 2 w.	C-3R79-P103J
8R57	Potentiometer, composition: 100,000 ohms ±20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P20
8R58	Wirewound, 4000 ohms ±5%, 200 w, 9 taps equally spaced.	B-7491515-P1
8R59	Wirewound, ferrule type, 40,000 ohms ±5%, 115 w.	M-7464826-P47
8R60	Wirewound, 10.0 ohms ±5%, 25 w. Ward Leonard Cat. #25F10.	M-2R14-P11
8R61	Composition, 56,000 ohms ±5%, 2 w.	C-3R79-P563J
8R62	Wirewound, ferrule type, 20,000 ohms ±5%, 60 w.	M-7464827-P44
8R63 thru 8R65	Composition, 0.10 megohm ±5%, 2 w.	C-3R79-P104J
8R66	Composition, 0.33 megohm ±5%, 2 w.	C-3R79-P334J
8R67	Composition, 0.22 megohm ±5%, 2 w.	C-3R79-P224J
8R68	Composition, 0.10 megohm ±5%, 2 w.	C-3R79-P104J
8R69	Composition, 56,000 ohms ±5%, 2 w.	C-3R79-P563J
8R70 thru 8R77	Composition, 1000 ohms ±5%, 1 w.	C-3R78-P102J
8R78	Composition, 130 ohms ±5%, 1 w.	C-3R78-P131J
8R79	Composition, 180 ohms ±5%, 1/2 w.	C-3R77-P181J
8R80 thru 8R87	Wirewound, 200 ohms ±5%, 5 w. Sprague Type 5 KT with pigtail leads.	M-7478711-P24
8R88	Composition, 220 ohms ±5%, 2 w.	C-3R79-P221J
8R89	Composition, 0.22 megohm ±5%, 2 w.	C-3R79-P224J
8R90	Composition, 0.39 megohm ±5%, 2 w.	C-3R79-P394J
8R91 and 8R92	Composition, 0.10 megohm ±5%, 2 w.	C-3R79-P104J
8R93A and 8R93B	Multiplier, precision, 4.0 megohm ±0.5%, 400 v. Jan Type MFA405.	M-7470483-P11
8R94	Multiplier, precision, 1.5 megohm ±0.5%, 1500 v. Jan Type MFB155.	M-7470483-P5
8R96	Potentiometer, composition: 250,000 ohms ±20%, 2.25 w, linear taper. Allen Bradley Type J.	M-2R73-P62
8R97	Composition, 11,000 ohms ±5%, 2 w.	C-3R79-P113J
8R98	Composition, 10,000 ohms ±5%, 2 w.	C-3R79-P103J
8R101 and 8R102	Composition, 22,000 ohms ±10%, 1/2 w.	C-3R77-P223K
8R103	Composition, 5600 ohms ±10%, 2 w.	C-3R79-P562K
8R104 and 8R105	Composition, 560 ohms ±5%, 2 w.	C-3R79-P561J
8R104	Composition, 22,000 ohms ±10%, 2 w.	C-3R79-P223K
8R107 and 8R108	Composition, 75,000 ohms ±5%, 1 w.	C-3R78-P753J
8R109	Composition 5600 ohms ±10%, 2 w.	C-3R79-P562K
8R110	Composition, 56,000 ohms ±10%, 1/2 w.	C-3R77-P563K
8R111	Composition, 1000 ohms ±10%, 1/2 w.	C-3R77-P102K
8R112	Composition, 56,000 ohms ±10%, 1/2 w.	C-3R77-P563K
8R113	Composition, 0.12 ohms ±10%, 1 w.	C-3R78-P124K
8R114	Composition, 820 ohms ±10%, 1/2 w.	C-3R77-P821K
8R115	Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
8R116	Composition, 620 ohms ±5%, 1/2 w.	C-3R77-P621J
8R117	Composition, 820 ohms ±5%, 1/2 w.	C-3R77-P821J
8R118	Composition, 51,000 ohms ±5%, 1/2 w.	C-3R77-P513J
8R119	Composition, 1000 ohms ±5%, 1/2 w.	C-3R77-P102J

Symbol	Description	G-E Drawing
	RESISTORS (CONT'D)	
8R120	Composition, 10,000 ohms ± 10%, 1 w.	C-3R78-P103K
8R121	Composition, 0.12 megohm ± 10%, 1 w.	C-3R78-P124K
8R122	Composition, 820 ohms ± 10%, 1/2 w.	C-3R77-P821K
8R123	Composition, 0.10 megohm ± 10%, 1/2 w.	C-3R77-P104K
8R124	Composition, 620 ohms ± 5%, 1/2 w.	C-3R77-P621J
8R125	Composition, 820 ohms ± 5%, 1/2 w.	C-3R77-P821J
8R126	Composition, 10,000 ohms ± 10%, 1 w.	C-3R78-P103K
8R127 thru 8R129	Composition, 56,000 ohms ± 10%, 1/2 w.	C-3R77-P563K
8R130 and 8R131	Composition, 100 ohms ± 5%, 1 w.	C-3R78-P101J
8R132 and 8R133	Composition, 5100 ohms ± 5%, 1/2 w.	C-3R77-P512J
8R134	Composition, 100 ohms ± 5%, 1 w.	C-3R78-P101J
8R135	Composition, 5100 ohms ± 5%, 1/2 w.	C-3R77-P512J
8R136	Composition, 100 ohms ± 5%, 2 w.	C-3R79-P101J
8R137	Composition, 15,000 ohms ± 5%, 1/2 w.	C-3R77-P153J
8R138 and 8R139	Composition, 6800 ohms ± 10%, 2 w.	C-3R79-P682K
8R140	Composition, 1800 ohms ± 10%, 2 w.	C-3R79-P182K
8R141	Composition, 4700 ohms ± 10%, 1 w.	C-3R78-P472K
	SWITCHES	
5S1	Circuit breaker: 3 pole, normal current 100 amp, a-c voltage 600 v, instant trip 500 amp. Trumbull Type AT225 amp J frame, Cat. # AT39100G.	C-7775284-P1
5S2	Safety switch: 3pdt, 230 v a-c, 400 amp. Trumbull Elec. Cat. #35325.	B-7485967-P1
5S3 and 5S4	Sensitive switch: dpdt, an assembly of Micro Switch Co. actuator Cat. #ADD3721R and switch Cat. # DT-2R-A7.	M-7405603-P1
6S1	Circuit breaker: 5 amp, 3 pole, time overload curve # 3. Heinemann Cat. # 3363S-5.	P-7768830-P15
6S3 and 6S4	Circuit breakers: 5 amp, 3 pole, time overload curve # 1. Heinemann Cat. # 3363S-5.	P-7768830-P1
6S5	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
6S6	Door interlock, with actuator: max current 10 amp, 125 v a-c. Similar to Micro Switch actuator # MCD2711 with microswitch # DT-2R-A7 installed.	B-7487976-P1
6S7	Grounding switch.	ML-7487877-G1
6S8 thru 6S10	Door interlocks.	ML-7460330-G4
6S11	Door interlock, with actuator: max current 10 amp, 125 v a-c. Similar to Micro Switch actuator #MCD2711 with dpdt microswitch #DT-2R-A7 installed; operating force 2.5 lbs, release force 0.25 lb.	B-7487976-P1
6S12	Circuit breaker: 3 amp, 2 pole, time overload curve # 1. Heinemann Cat. # 2263S-3.	P-7768829-P23
6S13 and 6S14	Circuit breakers: 15 amp, 3 pole, time overload curve # 1. Heinemann Cat. # 3363S-15.	P-7768830-P3
6S15	Circuit breaker: 25 amp, 3 pole, time overload curve # 1. Heinemann Cat. # 3363S-25.	P-7768830-P5
7S1	Airflow switch: spdt, vertical up airstream, actuates on increasing at 1600 fpm, de-actuates on decreasing at 1350 fpm.	B-7487948-P3
7S2	Door interlock.	ML-7460330-G4
7S3	Push button type, green cap.	A-7135306-G2
7S4	Door interlock, with actuator: max current 10 amp, 125 v a-c. Similar to Micro Switch actuator #MCD2711 with dpdt microswitch #DT-2R-A7 installed; operating force 2.5 lbs, release force 0.25 lb.	B-7487976-P1
7S5	Toggle type, dpdt omitting positive off center position, 10 amp at 125 v, 5 amp at 250 v. Arrow Hart and Hegeman Cat. # 80638.	K-7116628-P1
7S6	Circuit breaker: 1 amp, time overload curve # 3. Heinemann Cat. # 3363S-1.	P-7768830-P32
7S7	Circuit breaker: 50 amp, time overload curve # 3. Heinemann Cat. # 3363S-50.	P-7768830-P21
7S8	Lever switch. G-E Type 16SB1NB504LSM2P.	C-7773780-P1

Symbol	Description	G-E Drawing
	SWITCHES (CONT'D)	
7S9	Circuit breaker: 3 amp, time overload curve #2. Heinemann Cat. #2263S-3.	P-7768829-P28
7S10	Circuit breaker: 15 amp, time overload curve #2. Heinemann Cat. #3363S-15.	P-7768830-P10
7S11 and 7S12	Circuit breakers: 5 amp, time overload curve #3. Heinemann Cat. #2263S-5.	P-7768829-P15
7S13	Safety ground switch.	PL-7486297-G1
7S14	Toggle type, dpdt, 1 amp at 250 v, 3 amp at 125 v. Arrow Hart and Hegeman Type 20905-WJB.	M-7478623-P4
7S15	Rotary type, 2 sections, 1 pole per section, 2 - 12 positions, nonshorting. Oak Type HC.	C-7773781-P3
7S16	Lever switch. G-E Cat. #16SB1CF1 modified.	A-7144995-P1
7S17	Toggle type, spst, 3 amp at 250 v, Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
7S18	Door interlock, with actuator: max current 10 amp, 125 v a-c. Similar to Micro Switch actuator #MCD2711 with dpdt microswitch #DT-2R-A7 installed; operating force 2.5 lbs, release force 0.25 lb.	B-7487976-P1
7S19	Circuit breaker: 1 amp, time overload curve #3. Heinemann Cat. #2263S-1.	P-7768829-P32
7S20	Rotary type, 2 sections, 5 poles, 2 positions, nonshorting. Oak Type DHC.	P-7703271-P4
7S21	Limit switch: 1 NO. and 1 NC circuit, solder lug terminals. G-E Cat. # CR-1070D122C3.	K-7132529-P1
7S22	Door interlock.	ML-7460330-G4
7S23 thru 7S28	Limit switches: 1 NO. and 1 NC circuit, solder lug terminals. G-E Cat. # CR-1070D122C3.	K-7132529-P1
7S29 thru 7S31	Lever type, 4 form A contacts, nonlocking, in each section. CP Clare Cat. # A-28308.	P-7769218-P10
7S32	Toggle type, dpdt, 1 amp at 250 v, 3 amp at 125 v. Arrow Hart and Hegeman Type 20905-WJB.	M-7478623-P4
7S33 and 7S34	Flow switches, interlock: contact point OFF at 8 gpm, the actual switch is a normally closed device held in an actuated position when no water is flowing. Hays Cat. # 2600-3011.	B-7488111-P1
7S35 and 7S36	Thermometers, remote: NC contact opens at 158° F. US Gauge Cat. #921S.	M-7480264-P2
7S37	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
8S1	Door interlock.	ML-7460330-G4
8S2	Push button type, green cap.	A-7135306-G2
8S3 and 8S4	Door interlocks, with actuator: max current 10 amp, 125 v a-c. Similar to Micro Switch actuator #MCD2711 with dpdt microswitch #DT-2R-A7 installed; operating force 2.5 lbs, release force 0.25 lb.	B-7487976-P1
8S5	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
8S6	Circuit breaker: 10 amp, time overload curve #3. Heinemann Cat. #2263S-10.	P-7768829-P16
8S7	Circuit breaker: 15 amp, time overload curve #2. Heinemann Cat. #3363S-15.	P-7768830-P10
8S8	Airflow switch: spdt, vertical up airstream, actuates on increasing at 1600 fpm, de-actuates on decreasing at 1350 fpm. Rotron Type 1600.	B-7487948-P3
8S9	Circuit breaker: 3 amp, time overload curve #2. Heinemann Cat. #2263S-3.	P-7768829-P28
8S10	Circuit breaker: 1 amp, time overload curve #3. Heinemann Cat. #3363S-1.	P-7768830-P32
8S11	Door interlock.	ML-7460330-G4
8S12	Rotary type, 1 section, 1 pole, 2 - 12 positions, nonshorting. Oak Type HC.	C-7773781-P1
8S13	Safety grounding switch.	PL-7486297-G1
8S15 and 8S16	Toggle type, dpdt, 1 amp at 250 v, 3 amp at 125 v. Arrow Hart and Hegeman Type 20905-WJB.	M-7478623-P4
8S17	Rotary type, 2 sections, 5 poles, 2 positions, nonshorting. Oak Type DHC.	P-7703271-P4
8S18	Limit switch: 1 NO. and 1 NC circuit, solder lug terminals. G-E Cat. # CR-1070D122C3.	K-7132529-P1
8S19	Rotary type, 2 sections, 1 pole per section, 2 - 12 positions, nonshorting. Oak Type HC.	C-7773781-P3
8S20 thru 8S25	Limit switches: 1 NO. and 1 NC circuit, solder lug terminals. G-E Cat. # CR-1070D122C3.	K-7132529-P1
8S26 thru 8S28	Lever type, 4 form A contacts, nonlocking, in each section. CP Clare Cat. # 28308.	P-7769218-P10

Symbol	Description	G-E Drawing
	SWITCHES (CONT'D)	
8S29	Toggle type, dpdt, 1 amp at 250 v, 3 amp at 125 v. Arrow Hart and Hegeman Type 20905-WJB.	M-7478623-P4
8S30	Rotary type, 1 section, 1 pole, 2 - 12 positions, nonshorting. Oak Type HC.	C-7773781-P1
8S31 and 8S32	Flow switches, interlock: contact point OFF at 8 gpm, the actual switch is a normally closed device held in an actuated position when no water is flowing. Hays Cat. #2600-3011.	B-7488111-P1
8S33 and 8S34	Thermometers, remote: NC contact opens at 158° F. U.S. Gauge Cat. #921S.	M-7480264-P2
8S35	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
8S101	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
8S102	Rotary type, 2 sections, 1 pole per section, 2 - 12 positions, nonshorting. Oak Type HC.	P-7773781-P3
8S103	Rotary type, 1 section, 1 pole, 5 positions, shorting. Oak Type DHC.	M-7480297-P1
8S104 thru 8S106	Toggle type, spst, 3 amp at 250 v. Arrow Hart and Hegeman Type 20994-WJB.	M-7478623-P1
	TUBES	
5V1	Type 6AL5.	
6V1 thru 6V6	Type GL-869B.	
6V10 thru 6V15	Type 5823.	
6V16 thru 6V19	Type GL-8008.	
7V6 and 7V7	Type GL-6251.	
7V10	Type 6SN7-GT.	
7V11	Type 5R4GY.	
8V10 and 8V11	Type GL-6251.	
8V13	Type 6AK5.	
8V14	Type 12AU7.	
8V15 thru 8V17	Type 6AS7G.	
8V20	Type 6AS7G.	
8V21 thru 8V23	Type GL-OC3/VR105.	
8V101	Type 6BK7.	
8V102	Type GL-832A.	
8V103 and 8V104	Type 6U8.	
	TRANSFORMERS	
5T1	3 phase plate transformer and interphase reactor.	B-7487257-P1
6T1	Pri: 208/230 v, 50/60 cycles; sec: 115 v, 6 amp or 96 v, 7.2 amp, never both simultaneously.	M-7477718-P1
6T2 and 6T3	Indicating light transformers. Pri: 115 v, 50/60 cycles; sec: 4 v, 0.003 kva.	M-7467402-P1
6T4	Single phase plate transformer. Pri: 230 v, 50/60 cycles; sec: 210 v/105 v, 0.075 amp.	M-7483271-P1
6T6	Single phase plate transformer. Pri: 230 v, 50/60 cycles; sec: 2920/1460 v, 0.65 amp.	M-7486322-P1
6T7	Filament transformer. Pri: 230 v, 50/60 cycles; sec: 5/2.5 v, 15 amp.	M-7486324-P1
6T8	Single phase plate transformer. Pri: 230 v, 50/60 cycles; sec: 2920/1460 v, 0.65 amp.	M-7486322-P1
6T9	Filament transformer. Pri: 230 v, 50/60 cycles; sec: 5/2.5 v, 15 amp.	M-7486324-P1
6T10 thru 6T16	Filament transformers. Pri: 230 v, 50/60 cycles; sec: 5/2.5 v +4% −0%, 20 amp.	B-7485598-P1
7T1 thru 7T6	Indicating light transformers. Pri: 115 v, 50/60 cycles; sec: 4 v, 0.003 kva.	M-7467402-P1
7T7	Filament transformer. Pri: 115/230 v, 50/60 cycles; sec: 5 v, 1.5 amp.	M-7467883-P1
7T8	Indicating light transformers. Pri: 115 v, 50/60 cycles; sec: 4 v, 0.003 kva.	M-7467402-P1
7T10 and 7T11	Indicating light transformers. Pri: 115 v, 50/60 cycles; sec: 4 v, 0.003 kva.	M-7467402-P1

Symbol	Description	G-E Drawing
	TRANSFORMERS (CONT'D)	
7T12	3 phase plate transformer. Pri phase voltage: 230 v, 50/60 cycles, delta connected; sec phase voltage: 37 v under load.	B-7487241-P1
7T14	Powerstat. Input: 190-250 v, 50/60 cycles, 3 phase; output 220 v, 3 phase, 25 amp, 9.5 kva. Similar to Superior Elec. Type 1226L2 (S766P) modified by tapping 3 holes 1/2 - 13.	K-7121422-P2
7T15 and 7T16	Filament transformers. Pri: 100 v, 50/60 cycles; sec: 37.5 v, 20 amp.	B-7486396-P1
7T17	Powerstat. Input: 230 v, 50/60 cycles; output 0-270 v, 9 amp, 2.4 kva. Superior Elec. Type 1226 modified.	ML-7123885-G3
7T18	Filament and control transformer. Pri: 230 v, 50/60 cycles; sec # 1: 2.5/5/7.5/10 v ±2%; sec # 2: 2.5/5/7.5/10 v ±2%, 0.134 kva.	D-7668104-P1
7T19	Filament and control transformer. Pri: 199.2 v, 50/60 cycles; sec: 4.33/8.66/12.99/13.32 v ±2%, 0.116 kva.	D-7668104-P2
7T20	Filament and control transformer. Pri: 220 v, 50/60 cycles; sec: 5.5/2.75 v ±4%, 190 amp.	D-7668104-P3
7T21	Filament and control transformer. Pri: 190.5 v, 50/60 cycles; sec: 5.5/2.75 v ±4%, 190 amp.	D-7668104-P4
7T23	Pri: 115/230 v, 50/60 cycles; sec: 6.3/3.15 v, 0.60 amp.	M-7470685-P1
7T24	Single phase plate transformer. Pri: 230 v, 50/60 cycles; sec: 210/105 v, 0.075 amp.	M-7483271-P1
7T25	Filament transformer. Pri: 208/230 v, 50/60 cycles: sec: 6.3 v, 3 amp.	M-7477912-P1
7T26	Single phase plate transformer. Pri: 230 v, 50/60 cycles; sec: 935/467.5 v, 0.165 kva.	M-7483273-P1
7T27	Filament transformer. Pri: 208/230 v, 50/60 cycles; sec: 5/2.5 v, 2.0 amp.	M-7477793-P1
8T1 thru 8T5	Indicating light transformers. Pri: 115 v, 50/60 cycles; sec: 4 v, 0.003 kva.	M-7467402-P1
8T7	3 phase plate transformer. Pri phase voltage: 230 v, 50/60 cycles, delta connected; sec phase voltage: 46.5 v under load.	B-7487240-P1
8T8	Powerstat. Input: 230 v, 50/60 cycles; output: 0 - 270 v, 9 amp, 2.4 kva. Similar to Superior Elec. Type 1226 modified by tapping 3 holes 1/2 - 13.	K-7121422-P3
8T9	Filament and plate transformer. Pri: 230 v, 50/60 cycles; sec # 1: 2.5/5/7.5/10 v ±2%; sec # 2: 2.5/5/7.5/10 v ±2%.	D-7668104-P1
8T10	Filament and control transformer. Pri: 199.2 v, 50/60 cycles; sec: 4.33/8.66/12.99/17.32 v ±2%, 0.166 kva.	D-7668104-P2
8T11	Filament transformer. Pri: 230 v, 50/60 cycles; sec # 1: 6.3 v, 10.0 amp; sec # 2: 6.3 v, 0.3 amp; sec # 3: 6.3 v, 0.3 amp.	M-7486326-P1
8T12	Filament and control transformer. Pri: 220 v, 50/60 cycles; sec: 5.5/2.75 v ±4%, 190 amp.	D-7668104-P3
8T13	Filament and control transformer. Pri: 190.5 v, 50/60 cycles; sec: 5.5/2.75 v ±4%, 190 amp.	D-7668104-P4
8T14	Filament transformer. Pri: 208/230 v, 50/60 cycles; sec: 6.3 v, 3 amp.	M-7477912-P1
8T16	Pri: 115/230 v, 50/60 cycles; sec: 6.3/3.15 v, 0.60 amp.	M-7470685-P1
	LAMP SOCKETS AND DIAL LIGHTS	
6XI1	Lamp socket: 660 w, 250 v. G-E Cat. # 9402.	K-7108411-P1
6XI2	Dial light: translucent white jewel. Dial Light Co. Cat. # 95410-975.	K-7117809-P1
7XI1 thru 7XI15	Dial lights: translucent white jewel. Dial Light Co. Cat # 95410-975.	K-7117809-P1
7XI16	Dial light: translucent dark red jewel. Dial Light Co. Cat. # 95410-971.	K-7117809-P5
7XI17	Dial light: translucent light green jewel. Dial Light Co. Cat. # 95410-952.	K-7119809-P4
7XI18 and 7XI19	Lamp sockets: 660 w, 250 v. G-E Cat. # 9402.	K-7108411-P1
8XI1 thru 8XI6	Dial lights: translucent white jewel. Dial Light Co. Cat. # 95410-975.	K-7117809-P1
8XI7	Dial light: translucent light green jewel. Dial Light Co. Cat. # 95410-952.	K-7117809-P4

Symbol	Description	G-E Drawing
	LAMP SOCKETS AND DIAL LIGHTS (CONT'D)	
8XI8 thru 8XI10	Dial lights: translucent white jewel. Dial Light Co. Cat. #95410-975.	K-7117809-P1
8XI11 and 8XI12	Lamp sockets: 660 w, 250 v. G-E Cat. #9402.	K-7108411-P1
	TUBE SOCKETS	
5XV1	Mica filled phenolic, 7 pin miniature. RETMA Type TSE7T201.	P-7768887-P9
6XV1 thru 6XV7	Tube mountings: porcelain base, special grid end assembly. Johnson Cat. #23.53-2.	M-7484157-P2
6XV10 thru 6XV15	Mica filled phenolic 7 pin miniature, bottom mount flat top, 4 ground lugs.	P-7768887-P14
6XV16 thru 6XV19	Ceramic 4 pin wafer type sockets for superjumbo based tubes. EF Johnson Cat. #122-244-5.	K-7115212-P2
7XV6 and 7XV7	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
7XV10 and 7XV11	Mica filled phenolic, octal. Cinch Type 9886.	K-7103053-P1

Symbol	Description	G-E Drawing
	TUBE SOCKETS (CONT'D)	
8XV10 and 8XV11	Part of basic construction of Cavity Assembly PL-7668731-G1. Refer to Mechanical parts list and photographs.	
8XV13	Mica filled phenolic, 7 pin miniature. RETMA Type TSE7T201.	P-7768887-P9
8XV14	Mica filled phenolic, 9 pin miniature, tube shield base. RETMA Type TSE9T201.	M-7480532-P3
8XV15 thru 8XV17	Mica filled phenolic, octal. Cinch Type 9886.	K-7103053-P1
8XV20 thru 8XV23	Mica filled phenolic, octal. Cinch Type 9886.	K-7103053-P1
8XV101	Mica filled phenolic 9 pin miniature, 4 ground ears.	M-7480532-P8
8XV102	7 pin steatite. Similar to Ucinite Part #115342 except omitting spring clips.	M-7478654-P1
8XV103 and 8XV104	Mica filled phenolic 9 pin miniature, 4 ground ears.	M-7480532-P8
	CRYSTAL SOCKETS	
8XY101 and 8XY102	2 pin steatite. Type CR-7, HH Eby Cat. #9006.	K-7128948-P1

CRYSTALS

8Y101 and 8Y102

When reordering, in addition to Drawing Number and Part Number give channel of operation, function, and exact frequency. In the tabulation the functions are abbreviated as follows:

VL: Visual Lower Marker (visual carrier frequency minus 0.75 mc)

AL: Aural Lower Marker (aural carrier frequency minus 1.0 mc)

AU: Aural Upper Marker (aural carrier frequency plus 1.0 mc)

VS: Visual Lower-Sideband Limit (visual carrier frequency minus 1.25 mc)

VU-C: Visual Upper Marker (visual carrier frequency plus 4.2 mc)

Channel	Crystal Frequency in MC	Output Freq. (3X Crystal Frequency)	Function	G-E Drawing
7	58.167	174.50	VL	C-7774471-P1
7	59.417	178.25	AL	-P2
7	60.417	181.25	AU	-P4
7	58.000	174.00	VS	-P29
7	59.817	179.45	VU-C	-P36
8	60.167	180.50	VL	C-7774471-P5
8	61.417	184.25	AL	-P6
8	62.417	187.25	AU	-P8
8	60.000	180.00	VS	-P30
8	61.817	185.45	VU-C	-P37

CRYSTALS (CONT'D.)

Channel	Crystal Frequency in MC	Output Freq. (3X Crystal Frequency)	Function	G-E Drawing
9	62.167	186.50	VL	C-7774471-P9
9	63.417	190.25	AL	-P10
9	64.417	193.25	AU	-P12
9	62.000	186.00	VS	-P31
9	63.817	191.45	VU-C	-P38
10	64.167	192.50	VL	C-7774471-P13
10	65.417	196.25	AL	-P14
10	66.417	199.25	AU	-P16
10	64.000	192.00	VS	-P32
10	65.817	197.45	VU-C	-P39
11	66.167	198.50	VL	C-7774471-P17
11	67.417	202.25	AL	-P18
11	68.417	205.25	AU	-P20
11	66.000	198.00	VS	-P33
11	67.817	203.45	VU-C	-P40
12	68.167	204.50	VL	C-7774471-P21
12	69.417	208.25	AL	-P22
12	70.417	211.25	AU	-P24
12	68.000	204.00	VS	-P34
12	69.817	209.45	VU-C	-P41
13	70.167	210.50	VL	C-7774471-P25
13	71.417	214.25	AL	-P26
13	72.417	217.25	AU	-P28
13	70.000	210.00	VS	-P35
13	71.817	215.45	VU-C	-P42

MECHANICAL

Description or Name	Quantity*	G-E Drawing
Targets	8	A-7141305-G1
"V" belts for heater exchanger (in matched sets of two). Goodyear #A64, or equivalent matched sets of two. †	2 sets	
"V" belts for cubicle blowers (in matched sets of two). Browning Cat. #4L350 "A" section, matched sets of two. †	2 sets	
Water pressure gauges. Ashcroft #2-1000, 0-30 lb. scale, bottom connected.†	6	
J.C.S. mechanical seal used on "Motorpump" water pump. Order from nearest Ingersoll-Rand distributor as listed on last page of "Motorpump" book inserted in this book, specifying "J.C.S. Shaft Seal for 1RVNL-5 Motor Pump."	1	
Mica insulator, 2.50 OD x .375 ID x .005 thk clear mica, used on filament bypasses 7C22, 7C23, 7C24, 7C25, 8C28, 8C29, 8C30, and 8C31.	16	D-7668731-P63
Composition bushing used on 7C22, 7C23, 7C24, 7C25, 8C28, 8C29, 8C30 and 8C31.	8	D-7668731-P64
Insulating sheet composition mica used on bottom anode bypass 7C39 and 8C52.	2	A-7145087-G2
Insulating sheet composition mica used on top anode bypass 7C38 and 8C44.	2	A-7145087-G1
Insulating sheet composition mica used on screen bypass 7C34, 7C35, 8C40 and 8C41.	2	A-7145088-G1
Insulating sheet composition mica used on control grid bypass 7C36, 7C37, 8C42, and 8C43.	2	B-7486578-P1
Mica sheets used as part of 7C26, 7C27, 7C28, 7C29, 8C32, 8C33, 8C34, and 8C35.	12 and 4	A-7141543-P1 A-7141544-P1

* Quantity used per equipment.
† May be obtained from local hardware supply houses.

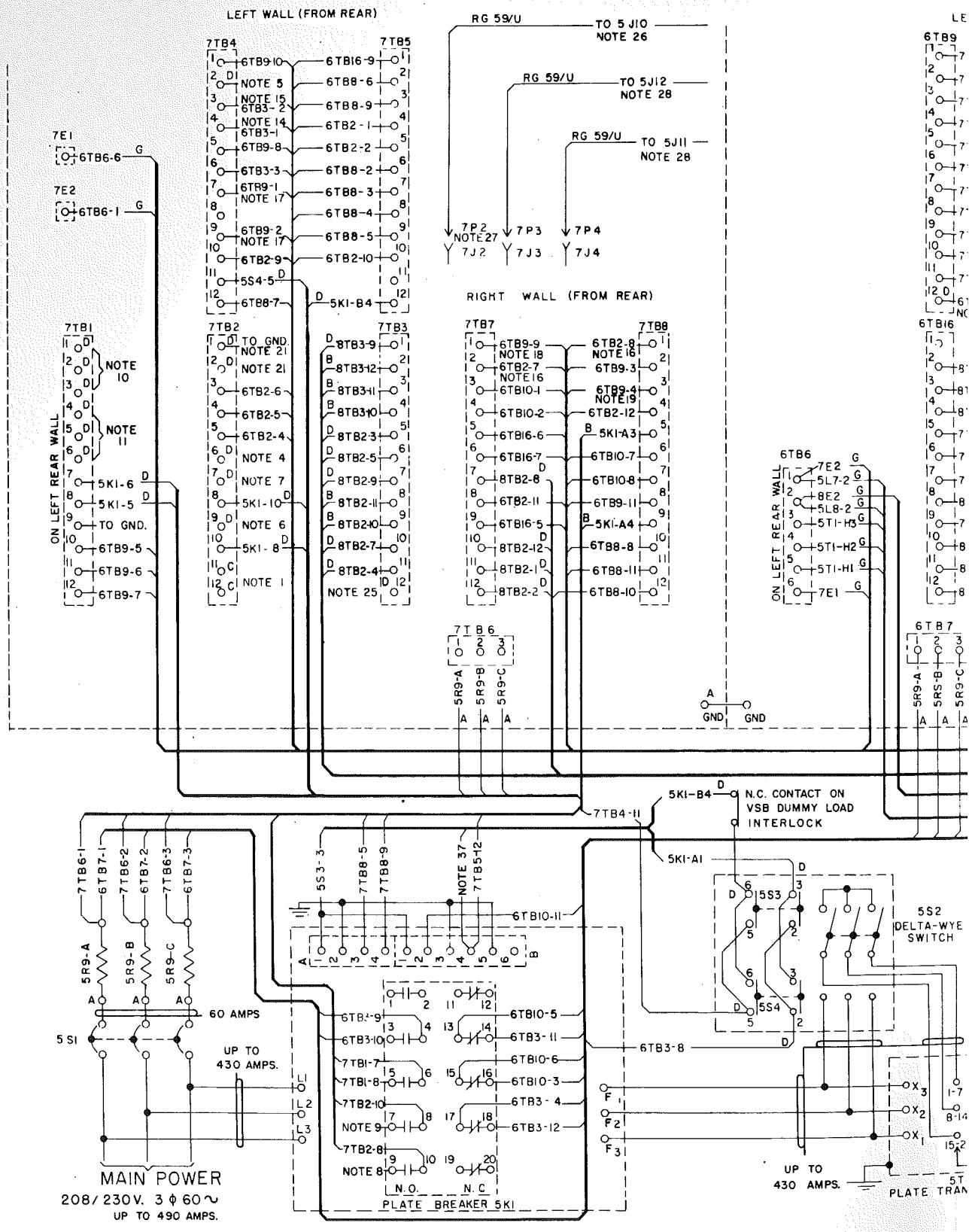
Description	Quantity *	G-E Drawing
Insulator, ceramic, 1.38 OD, used on anode bypass assemblies 7C38, 7C39, 8C44, and 8C52.	64	A-7144055-P1
Insulator, ceramic, 1.00 OD, used on screen bypass assemblies 7C34, 7C35, 8C40, and 8C41.	12	A-7144055-P3
Insulator, ceramic, 0.69 OD, used on control grid bypass assemblies 7C36, 7C37, 8C42, and 8C43.	12	A-7144055-P2
Insulator, composition, 0.408 OD, used on assembly of 7C26, 7C27, 7C28, 7C29, 8C32, 8C33, 8C34, and 8C35.	24	PL-7487745-P8
Insulator, fused quartz, part of capacitor assembly A-7145291-G1.	2	A-7145646-P2

* Quantity used per equipment.

APPLE SAUCE HOSE
GATES RUBBER PRODUCT # 3119-32
3/4" - 19 W-B 4 PLY HOSE

IA MACHINERY & SUPPLY
2 8-0123 CAN SUPPLY

GASKETS ~~M-7[illegible]~~
716 2896-P10
GASKET ONLY FOR QUICK DISCONNECTS


AURAL CUBICLE
LEFT WALL (FROM REAR)
RIGHT WALL (FROM REAR)
RG 59/U
TO 5J10
NOTE 26
RG 59/U
TO 5J12
NOTE 28
RG 59/U
TO 5J11
NOTE 28
7P2
NOTE 27
7P3
7P4
7J2
7J3
7J4
7TB4
7TB5
7TB1
7TB2
7TB3
7TB7
7TB8
7E1
7E2
6TB6-6
6TB6-1
ON LEFT REAR WALL
NOTE 10
NOTE 11
5KI-6
5KI-5
TO GND.
6TB9-5
6TB9-6
6TB9-7
TO GND
NOTE 21
NOTE 4
NOTE 7
NOTE 6
NOTE 1
NOTE 25
5KI-10
5KI-8
5KI-B4
6TB6
6TB7
5R9-A
5R9-B
5R9-C
A
GND
GND
5KI-B4
N.C. CONTACT ON
VSB DUMMY LOAD
INTERLOCK
7TB4-11
5KI-A1
5S3
5S2
DELTA-WYE
SWITCH
5S4
6TB10-11
6TB3-8
7TB6-1
7TB7-1
7TB6-2
7TB7-2
7TB6-3
7TB7-3
60 AMPS
5 SI
UP TO
430 AMPS.
L1
L2
L3
MAIN POWER
208/230V. 3 ϕ 60 ~
UP TO 490 AMPS.
NOTE 37
7TB5-12
7TB8-5
7TB8-9
5S3-3
6TB9-10
6TB3-2
6TB3-1
6TB9-8
6TB3-3
6TB9-1
6TB9-2
6TB2-9
5S4-5
6TB8-7
6TB16-9
6TB8-6
6TB8-9
6TB2-1
6TB2-2
6TB8-2
6TB8-3
6TB8-4
6TB8-5
6TB2-10
6TB9-9
6TB2-7
6TB10-1
6TB10-2
6TB16-6
6TB16-7
8TB2-8
6TB2-11
6TB16-5
8TB2-12
8TB2-1
8TB2-2
6TB2-8
6TB9-3
6TB9-4
6TB2-12
5KI-A3
6TB10-7
6TB10-8
6TB9-11
5KI-A4
6TB8-8
6TB8-11
6TB8-10
6TB9
6TB16
5L7-2
8E2
5L8-2
5TI-H3
5TI-H2
5TI-H1
F1
F2
F3
X3
X2
X1
1-7
8-14
15-2
UP TO
430 AMPS.
5T
PLATE TRAN
6TB10-5
6TB3-11
6TB10-6
6TB10-3
6TB3-4
6TB3-12
6TB9-10
6TB3-10
7TB1-7
7TB1-8
7TB2-10
NOTE 9
7TB2-8
NOTE 8
N.O.
N.C.
PLATE BREAKER 5KI

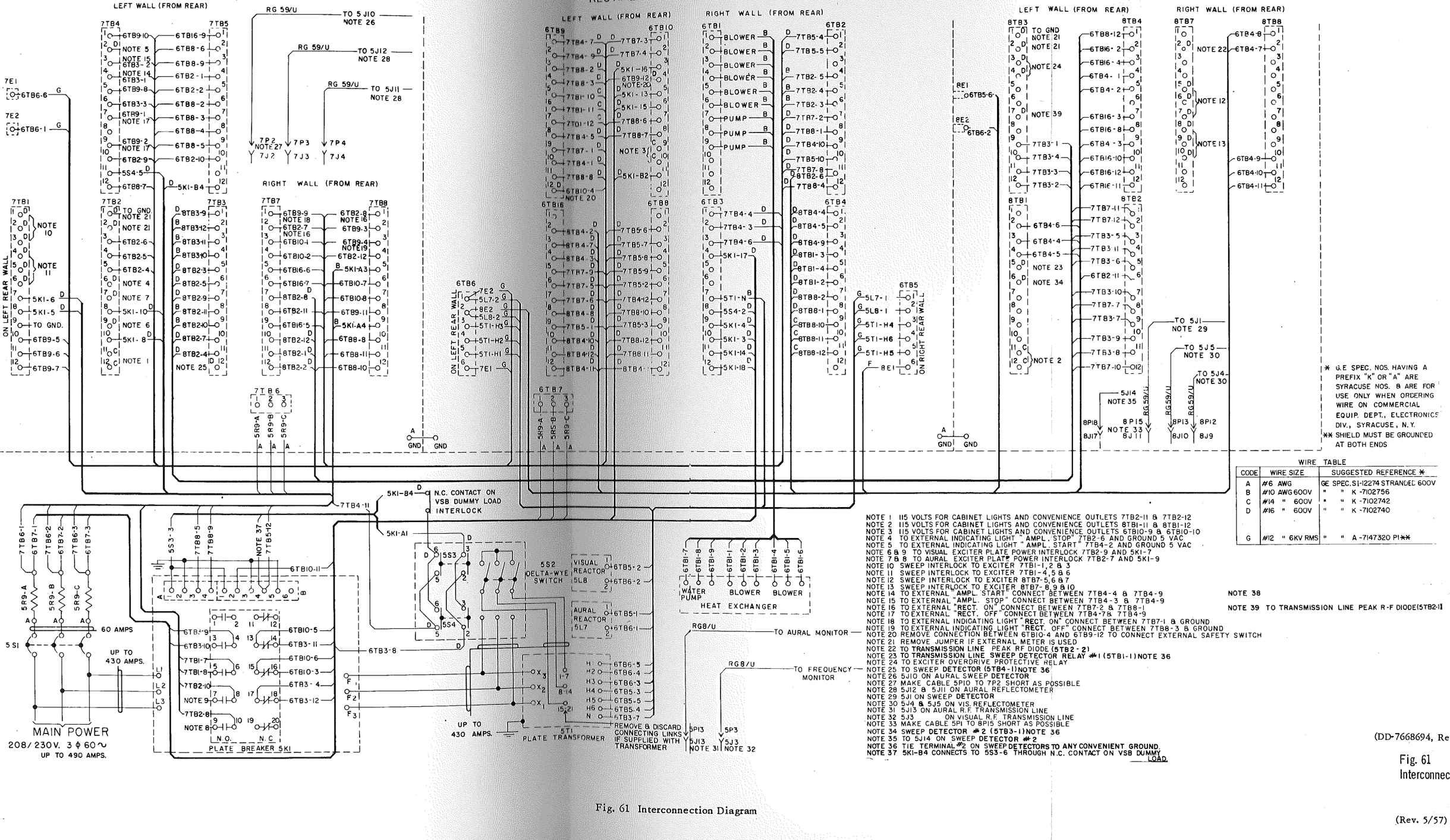


Fig. 61 Interconnection Diagram

* G.E SPEC. NOS. HAVING A PREFIX "K" OR "A" ARE SYRACUSE NOS. & ARE FOR USE ONLY WHEN ORDERING WIRE ON COMMERCIAL EQUIP. DEPT., ELECTRONICS DIV., SYRACUSE, N.Y.

** SHIELD MUST BE GROUNDED AT BOTH ENDS

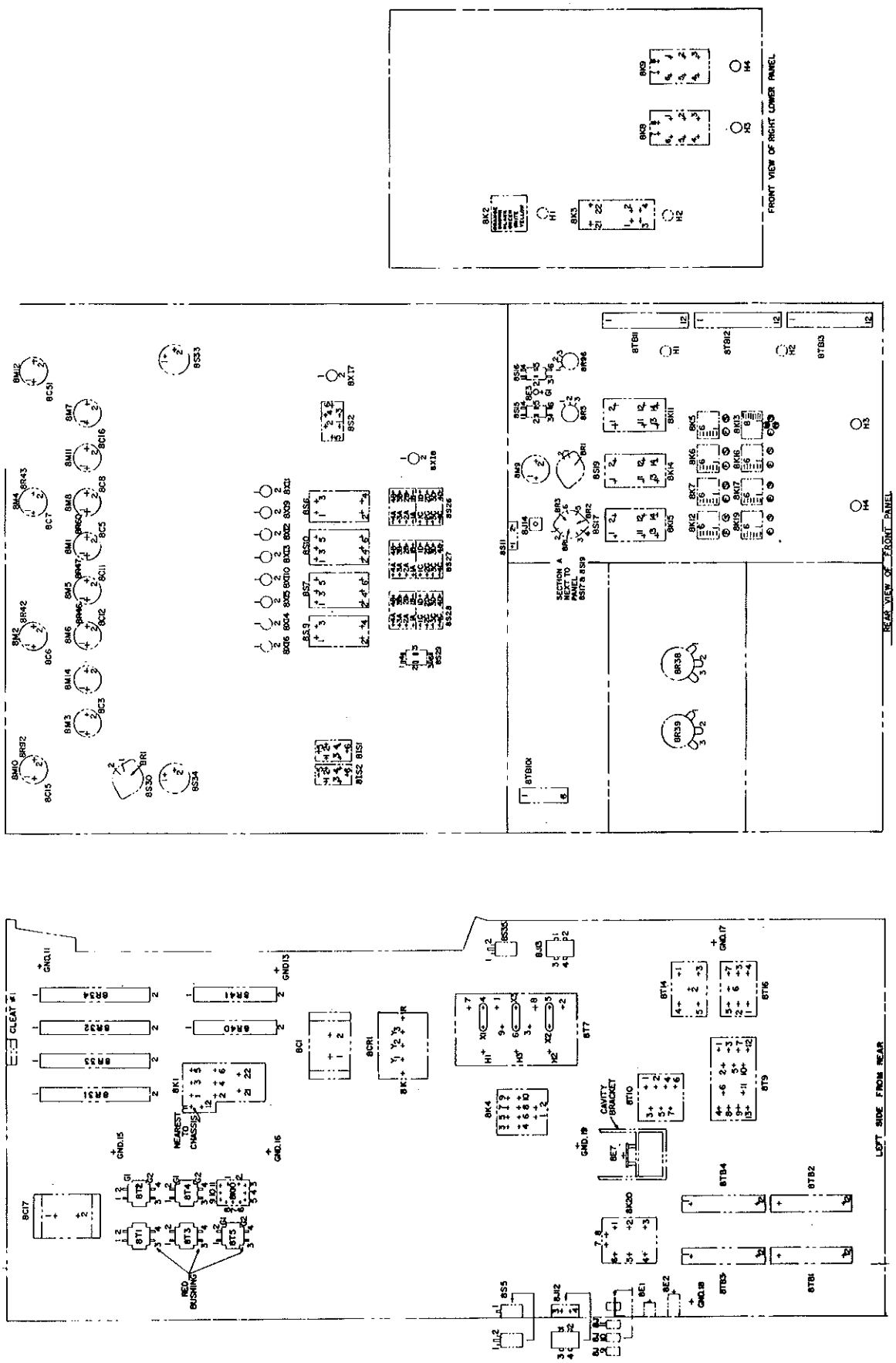
WIRE TABLE

CODE	WIRE SIZE	SUGGESTED REFERENCE *
A	#6 AWG	GE SPEC. S1-12274 STRANDED 600V
B	#10 AWG 600V	" " K-7102756
C	#14 " 600V	" " K-7102742
D	#16 " 600V	" " K-7102740
G	#12 " 6KV RMS	" " A-7147320 P1**

NOTE 1 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 7TB2-11 & 7TB2-12
NOTE 2 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 8TB1-11 & 8TB1-12
NOTE 3 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 6TB10-9 & 6TB10-10
NOTE 4 TO EXTERNAL INDICATING LIGHT "AMPL. STOP" 7TB2-6 AND GROUND 5 VAC
NOTE 5 TO EXTERNAL INDICATING LIGHT "AMPL. START" 7TB4-2 AND GROUND 5 VAC
NOTE 6 & 9 TO VISUAL EXCITER PLATE POWER INTERLOCK 7TB2-9 AND 5KI-7
NOTE 7 & 8 TO AURAL EXCITER PLATE POWER INTERLOCK 7TB2-7 AND 5KI-9
NOTE 10 SWEEP INTERLOCK TO EXCITER 7TB1-1, 2 & 3
NOTE 11 SWEEP INTERLOCK TO EXCITER 7TB1-4, 5 & 6
NOTE 12 SWEEP INTERLOCK TO EXCITER 8TB7-5, 6 & 7
NOTE 13 SWEEP INTERLOCK TO EXCITER 8TB7-8, 9 & 10
NOTE 14 TO EXTERNAL "AMPL. START" CONNECT BETWEEN 7TB4-4 & 7TB4-9
NOTE 15 TO EXTERNAL "AMPL. STOP" CONNECT BETWEEN 7TB4-3 & 7TB4-9
NOTE 16 TO EXTERNAL "RECT. ON" CONNECT BETWEEN 7TB7-2 & 7TB8-1
NOTE 17 TO EXTERNAL "RECT. OFF" CONNECT BETWEEN 7TB4-7 & 7TB4-9
NOTE 18 TO EXTERNAL INDICATING LIGHT "RECT. ON" CONNECT BETWEEN 7TB7-1 & GROUND
NOTE 19 TO EXTERNAL INDICATING LIGHT "RECT. OFF" CONNECT BETWEEN 7TB8-3 & GROUND
NOTE 20 REMOVE CONNECTION BETWEEN 6TB10-4 AND 6TB9-12 TO CONNECT EXTERNAL SAFETY SWITCH
NOTE 21 REMOVE JUMPER IF EXTERNAL METER IS USED
NOTE 22 TO TRANSMISSION LINE PEAK RF DIODE (5TB2-2)
NOTE 23 TO TRANSMISSION LINE SWEEP DETECTOR RELAY #1 (5TB1-1) NOTE 36
NOTE 24 TO EXCITER OVERDRIVE PROTECTIVE RELAY
NOTE 25 TO SWEEP DETECTOR (5TB4-1) NOTE 36
NOTE 26 5J10 ON AURAL SWEEP DETECTOR
NOTE 27 MAKE CABLE 5P10 TO 7P2 SHORT AS POSSIBLE
NOTE 28 5J12 & 5J11 ON AURAL REFLECTOMETER
NOTE 29 5J1 ON SWEEP DETECTOR
NOTE 30 5J4 & 5J5 ON VIS. REFLECTOMETER
NOTE 31 5J13 ON AURAL R.F. TRANSMISSION LINE
NOTE 32 5J3 ON VISUAL R.F. TRANSMISSION LINE
NOTE 33 MAKE CABLE 5P1 TO 8P15 SHORT AS POSSIBLE
NOTE 34 SWEEP DETECTOR #2 (5TB3-1) NOTE 36
NOTE 35 TO 5J14 ON SWEEP DETECTOR #2
NOTE 36 TIE TERMINAL #2 ON SWEEP DETECTORS TO ANY CONVENIENT GROUND.
NOTE 37 5KI-B4 CONNECTS TO 5S3-6 THROUGH N.C. CONTACT ON VSB DUMMY LOAD
NOTE 38
NOTE 39 TO TRANSMISSION LINE PEAK R-F DIODE (5TB2-1)

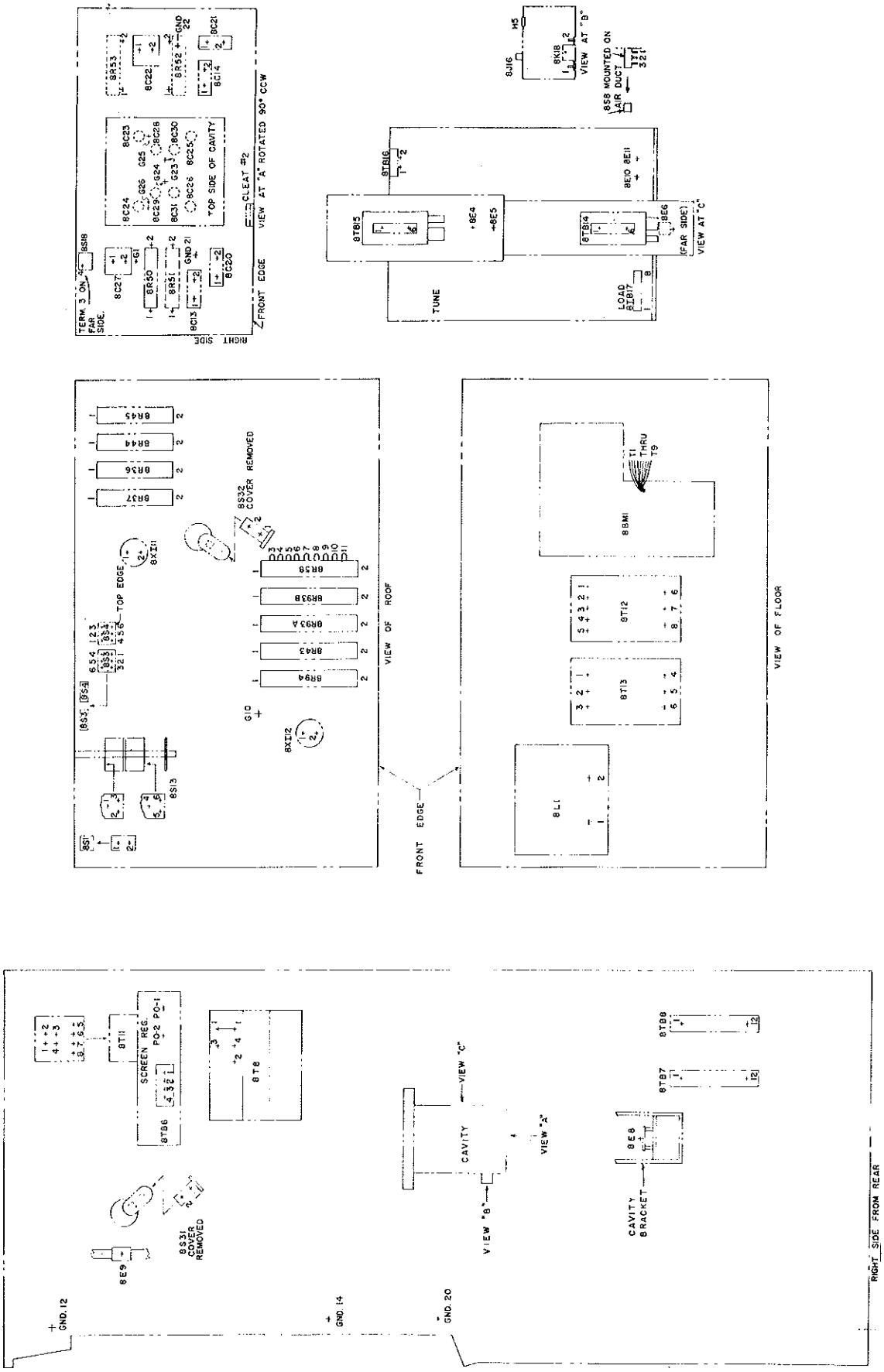
(DD-7668694, Rev. 6)

Fig. 61
Interconnection



(D-7668736, Sheet 1, Rev. 2)

Fig. 62 Visual Amplifier Connection Diagram



(D-7668736, Sheet 2, Rev. 5)

Fig. 63 Visual Amplifier Connection Diagram

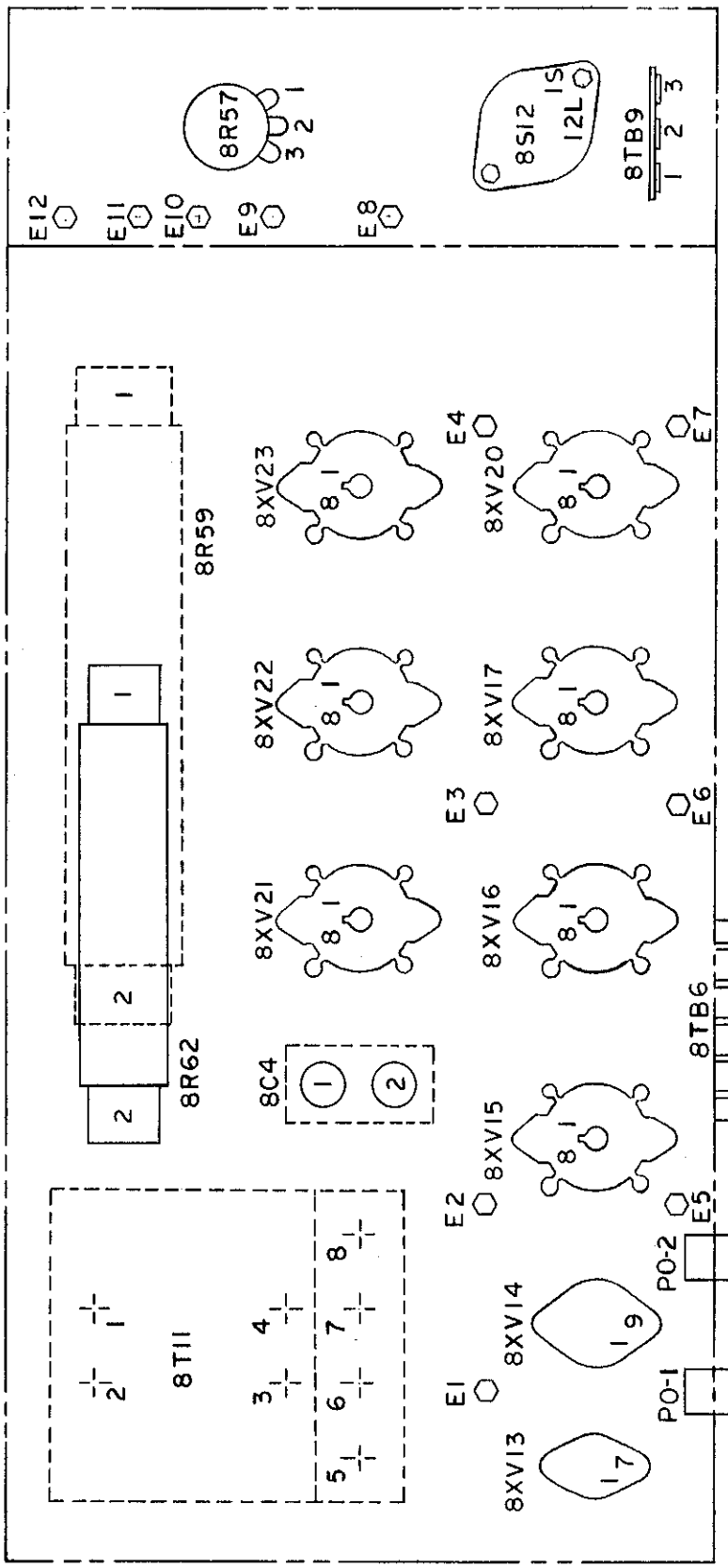
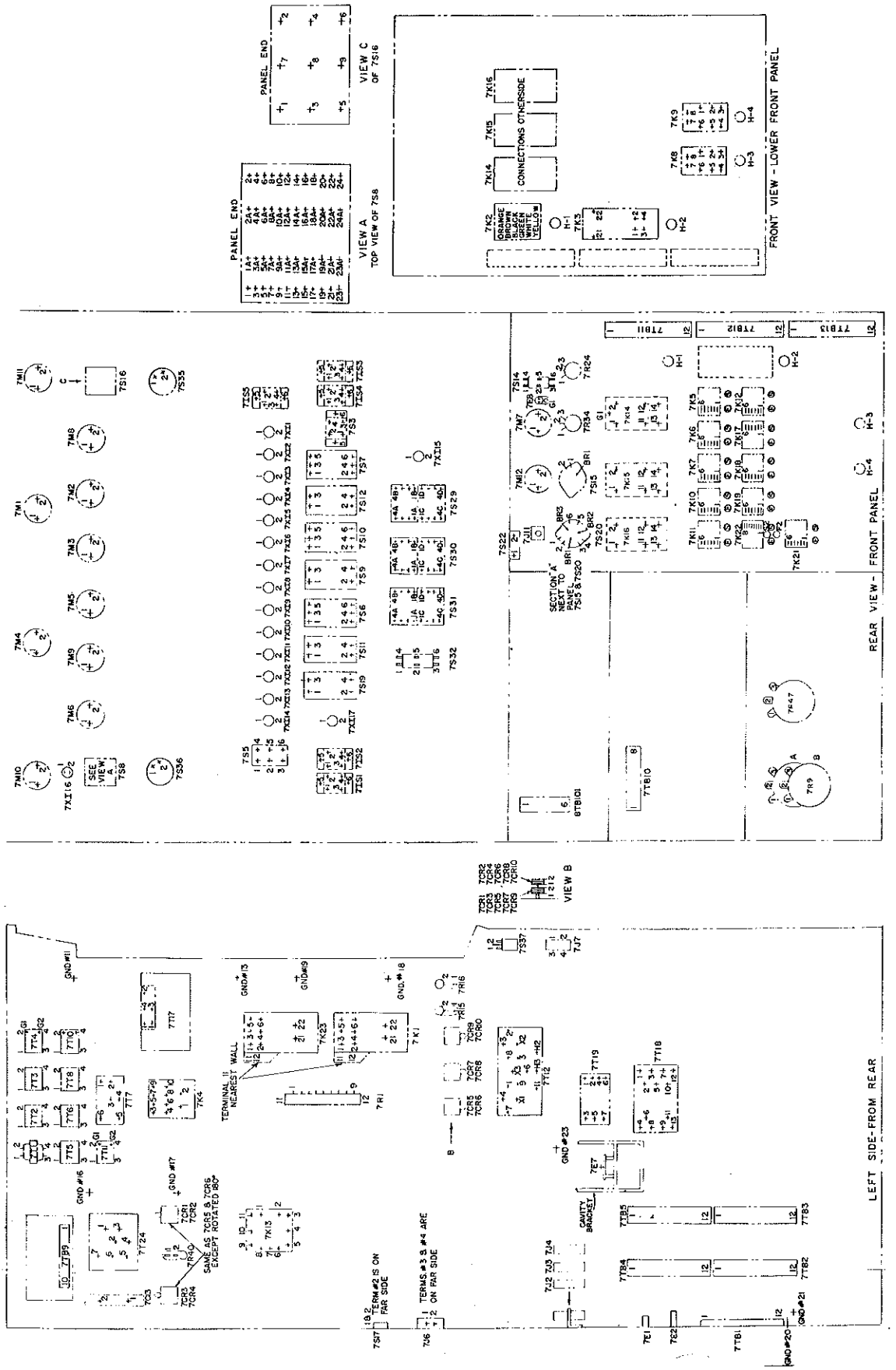


Fig. 64 Screen Regulator Connection Diagram

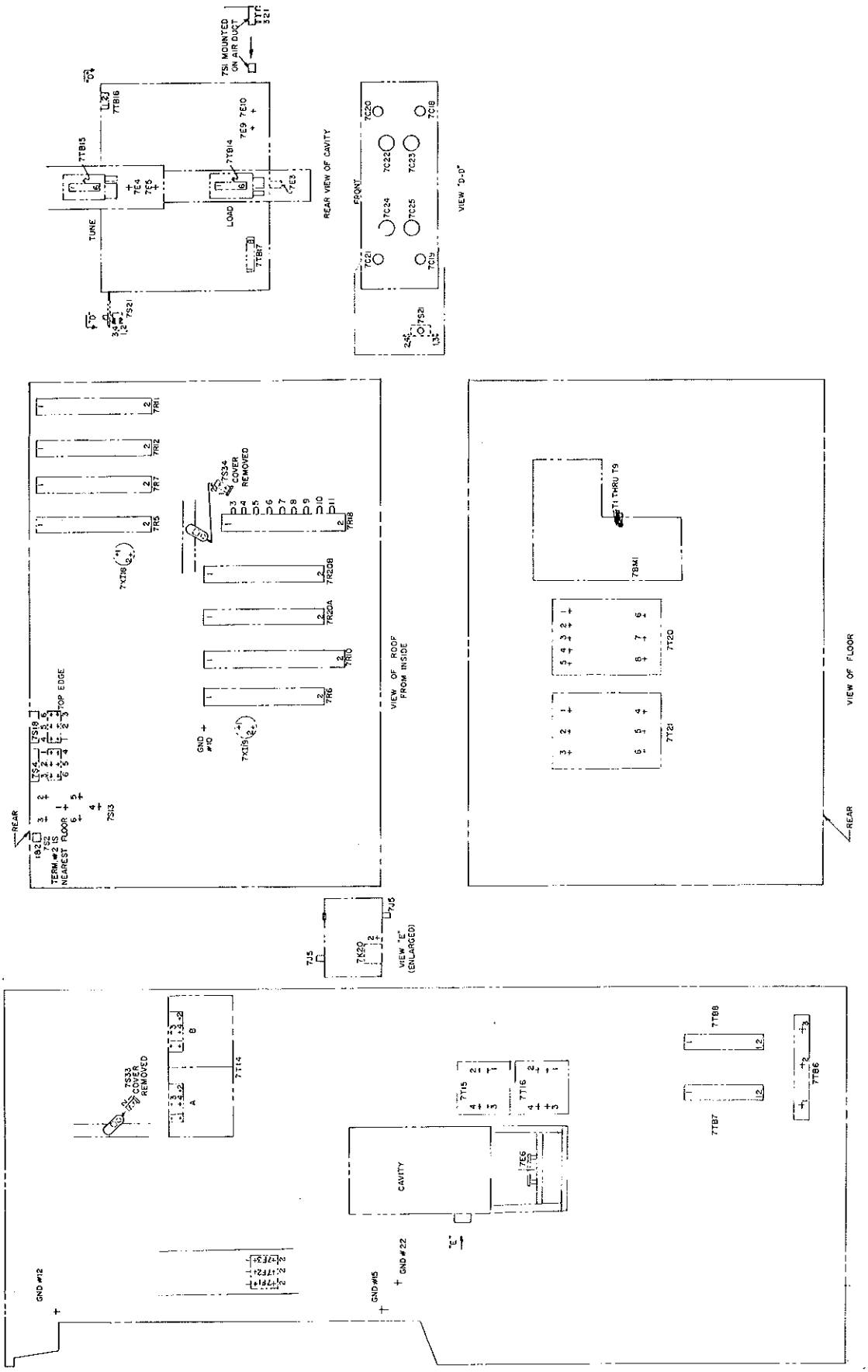
(EE-7353681, Rev. 8)

Fig. 65 Visual Amplifier Elementary Diagram



(D-7667977, Sheet 1, Rev. 3)

Fig. 66 Aural Amplifier Connection Diagram



(D-7667977, Sheet 2, Rev. 7)

Fig. 67 Aural Amplifier Connection Diagram

SWEEP POWER SUPPLY
REFLECTOMETER AMPLIFIER
SWEEP GENERATOR ELEMENTARY DIAGRAM
REFLECTOMETER
OUTPUT CIRCUIT
GROUND SWITCH
SWEEP-OPERATE SWITCH
TO AURAL MONITOR
RF OUTPUT PROTECTION
7TB1-1
7TB1-2
7TB1-3
7TB1-4
7TB1-5
7TB1-6
7TB7-12
7TB7-11
7TB7-10
7TB2-1
7TB2-2
7TB3-12
7TB12-9
7TB12-10
7TB13-5
7TE2
7S20
7S14
7S13
7S12
7S11
7S10
7K20
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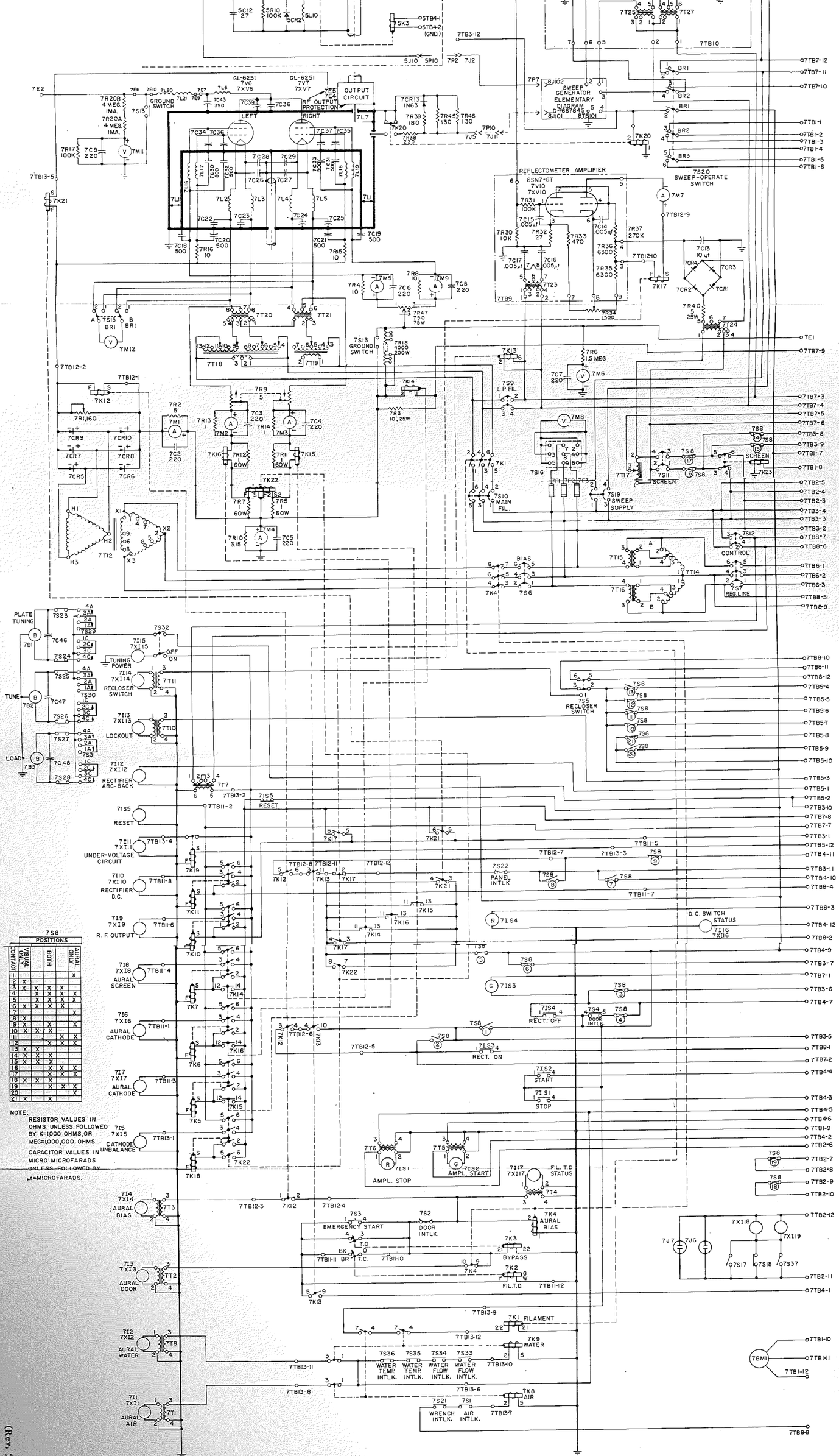
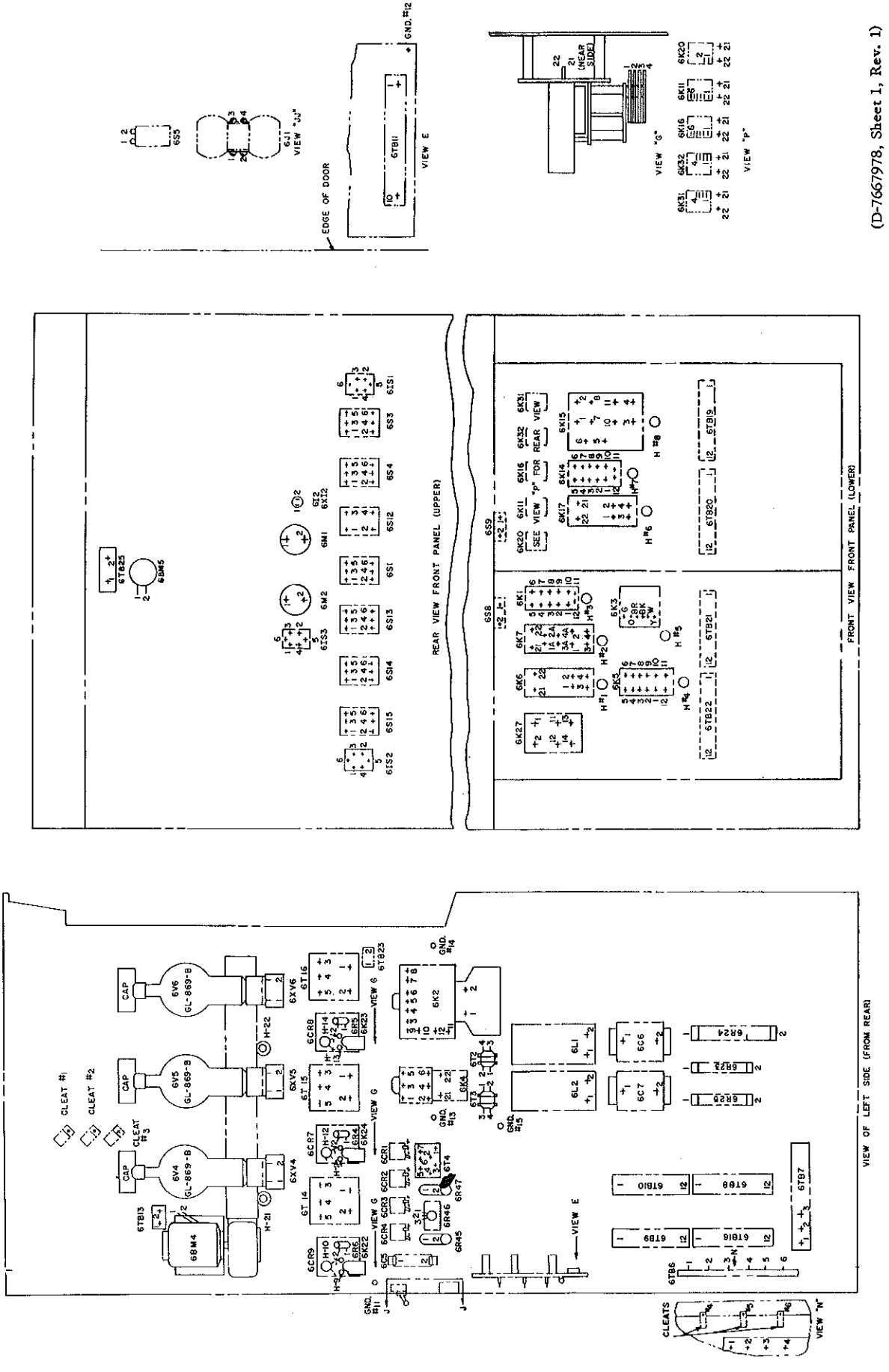


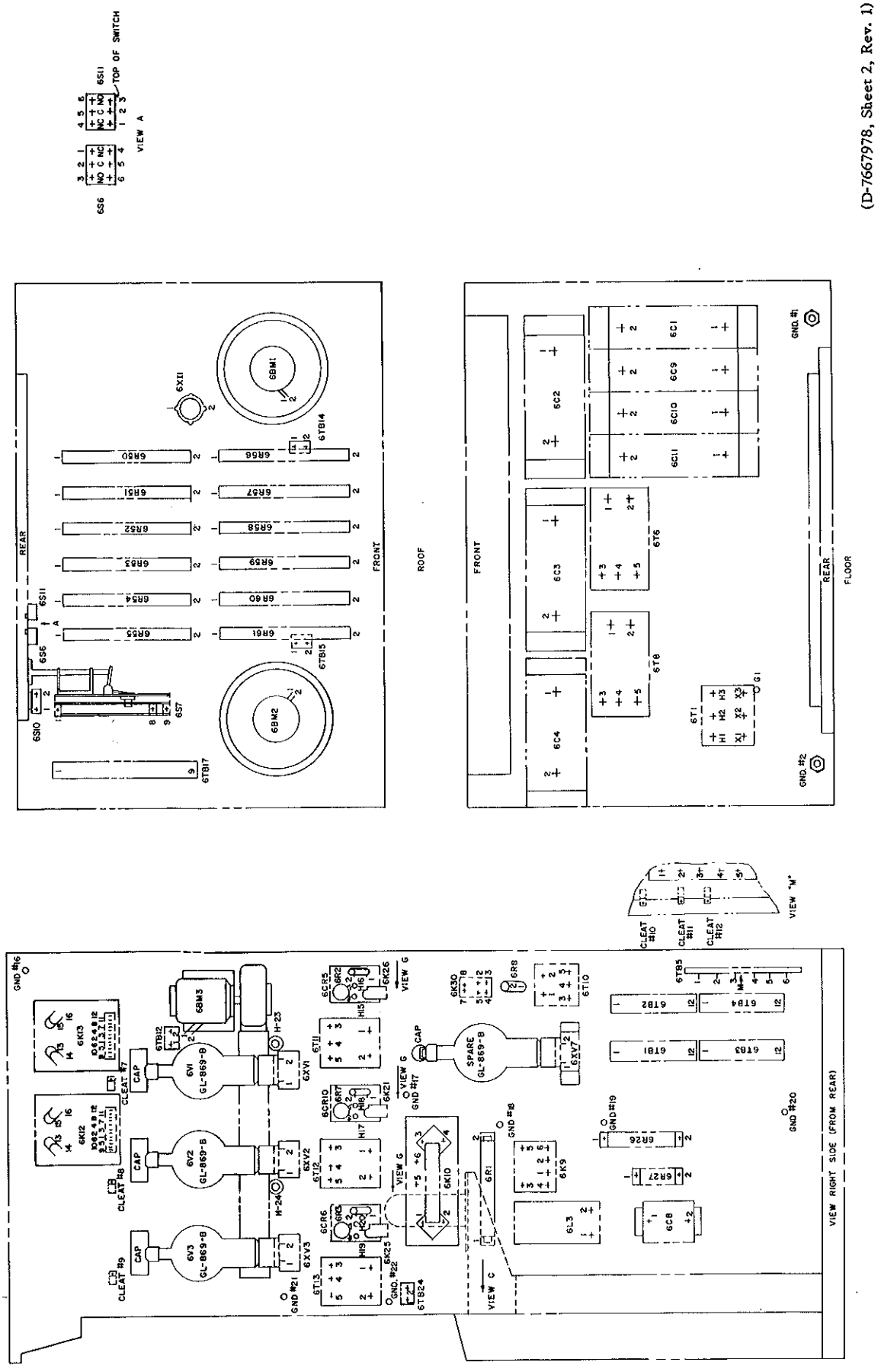
Fig. 68 Aural Amplifier Elementary Diagram

(EE-7353682, Rev. 7)



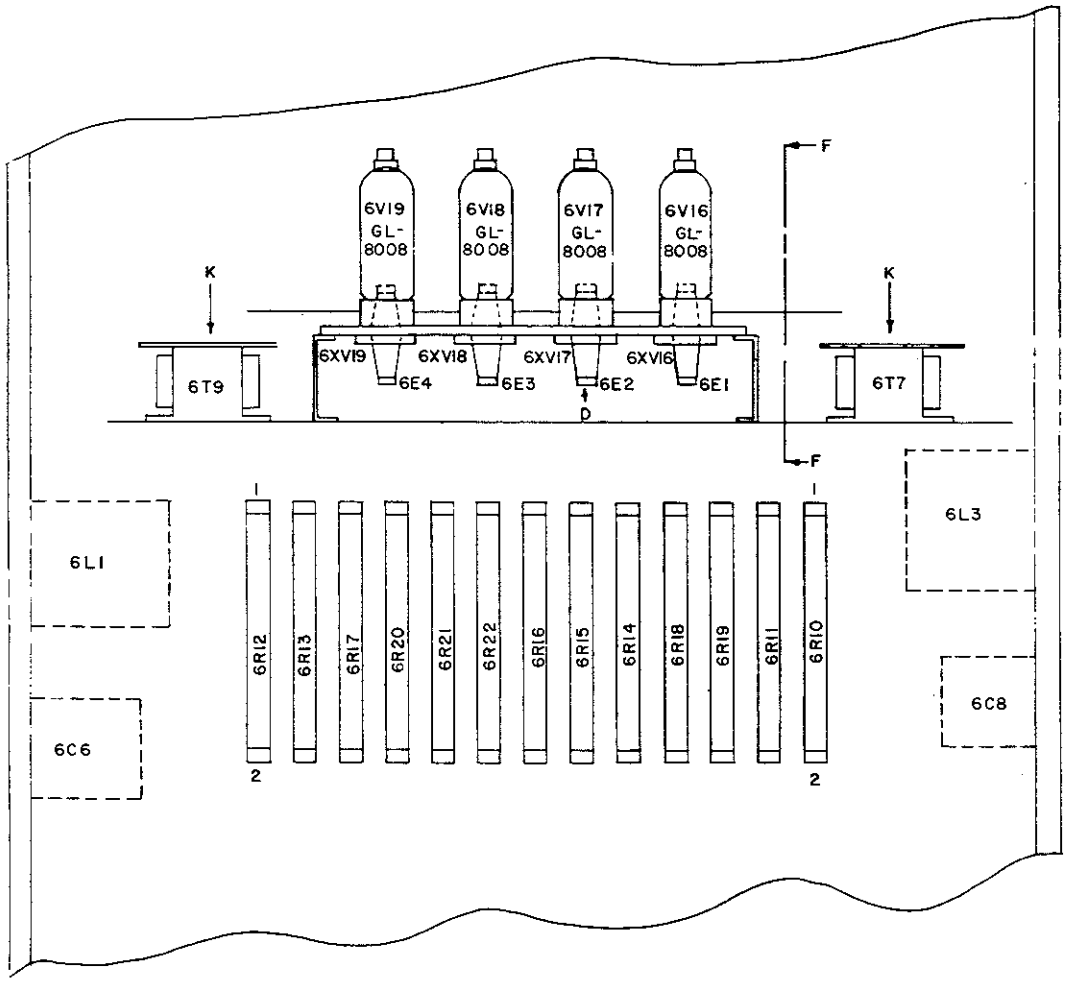
(D-7667978, Sheet 1, Rev. 1)

Fig. 69 Rectifier and Control Connection Diagram

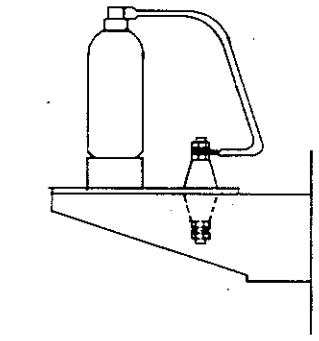


(D-7667978, Sheet 2, Rev. 1)

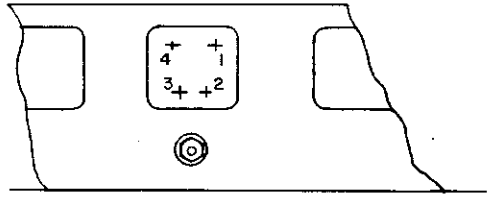
Fig. 70 Rectifier and Control Connection Diagram



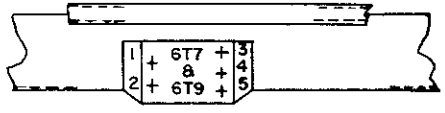
INSIDE VIEW FROM REAR - "C"



SECTION F-F



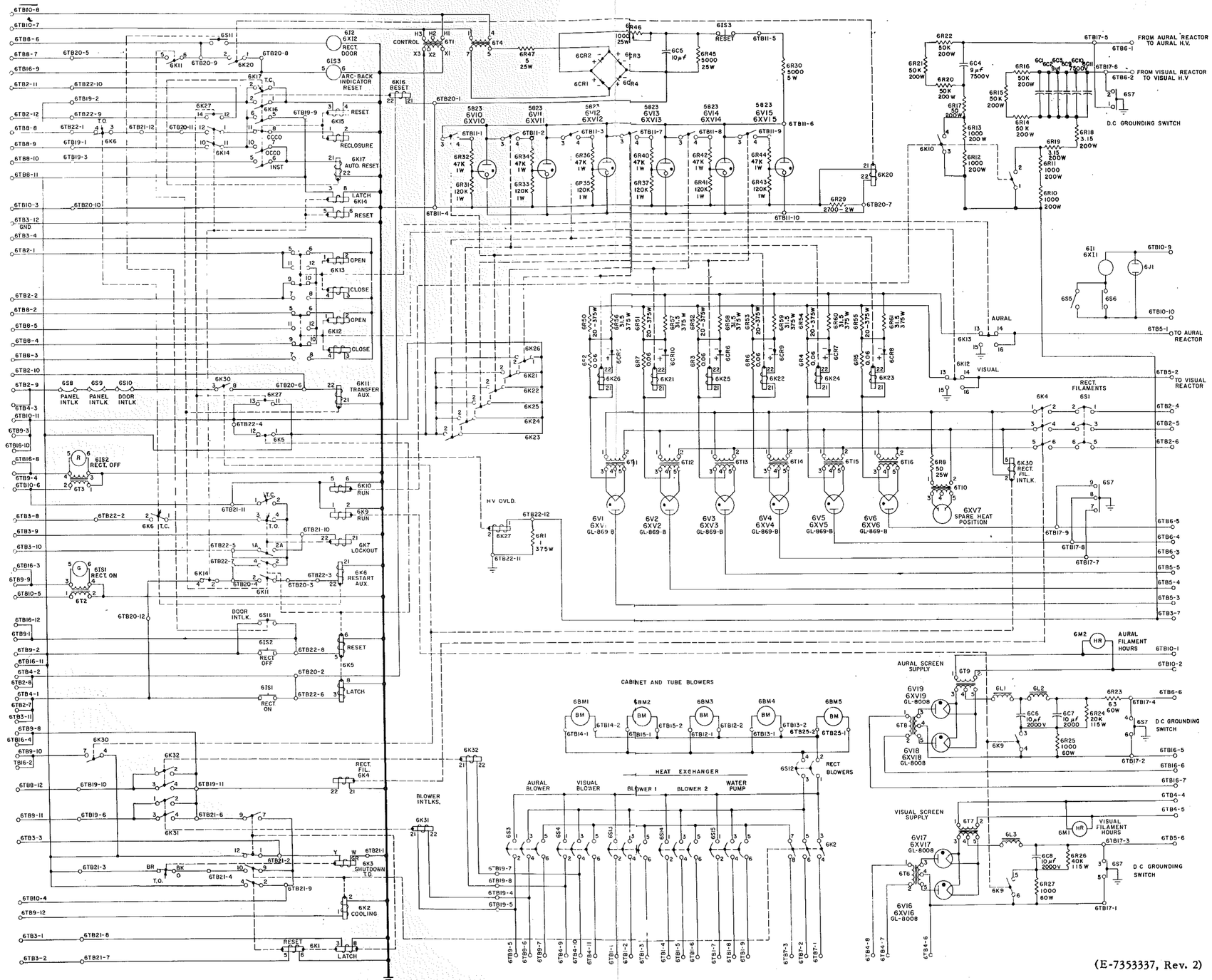
VIEW D



VIEW AT K

(D-7667978, Sheet 3, Rev. 1)

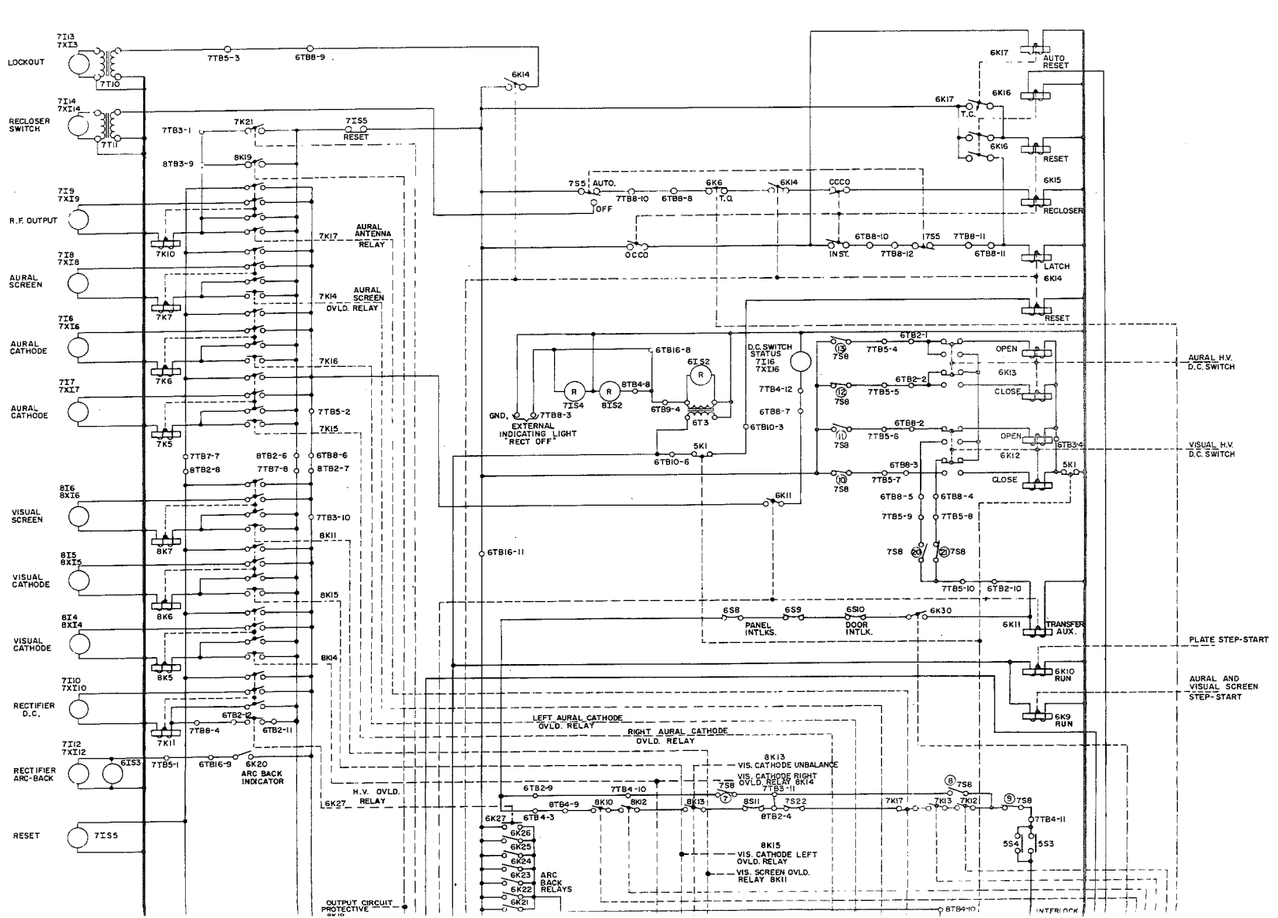
Fig. 71 Rectifier and Control Connection Diagram



(E-7353337, Rev. 2)

Fig. 72
Elementary

Fig. 72 Rectifier and Control Elementary Diagram


LOCKOUT
RECLOSER SWITCH
R.F. OUTPUT
AURAL SCREEN
AURAL CATHODE
AURAL CATHODE
VISUAL SCREEN
VISUAL CATHODE
VISUAL CATHODE
RECTIFIER D.C.
RECTIFIER ARC-BACK
RESET
AURAL ANTENNA RELAY
AURAL SCREEN OVLD. RELAY
ARC BACK INDICATOR
H.V. OVLD. RELAY
OUTPUT CIRCUIT PROTECTIVE
LEFT AURAL CATHODE OVLD. RELAY
RIGHT AURAL CATHODE OVLD. RELAY
ARC BACK RELAYS
AUTO. RESET
T.C.
RESET
RECLOSER
LATCH
RESET
AURAL H.V. D.C. SWITCH
VISUAL H.V. D.C. SWITCH
TRANSFER AUX.
PLATE STEP-START
AURAL AND VISUAL SCREEN STEP-START
RUN
RUN
D.C. SWITCH STATUS
EXTERNAL INDICATING LIGHT RECT OFF
PANEL INT'LKS.
DOOR INT'LK.
VIS. CATHODE UNBALANCE OVLD. RELAY
VIS. CATHODE RIGHT OVLD. RELAY
VIS. CATHODE LEFT OVLD. RELAY
VIS. SCREEN OVLD. RELAY
AUTO.
OFF
T.C.
INST.
OPEN
CLOSE
OPEN
CLOSE
INTERLOCK

(EE-735368, Rev. 2)

Fig. 73 Simplified Control Circuit Elementary Diagram

7S8 POSITIONS	BOTH	VISUAL ONLY	AURAL ONLY
CONTACT			
2	X	X	X
3	X	X	X
4	X	X	X
5	X	X	X
6	X	X	X
7			
8	X	X	X
9	X	X	X
10	X	X	X
11			
12	X	X	X
13	X	X	X
14	X	X	X
15			
16	X	X	X
17	X	X	X
18	X	X	X
19			
20	X	X	X
21			

X – CLOSED

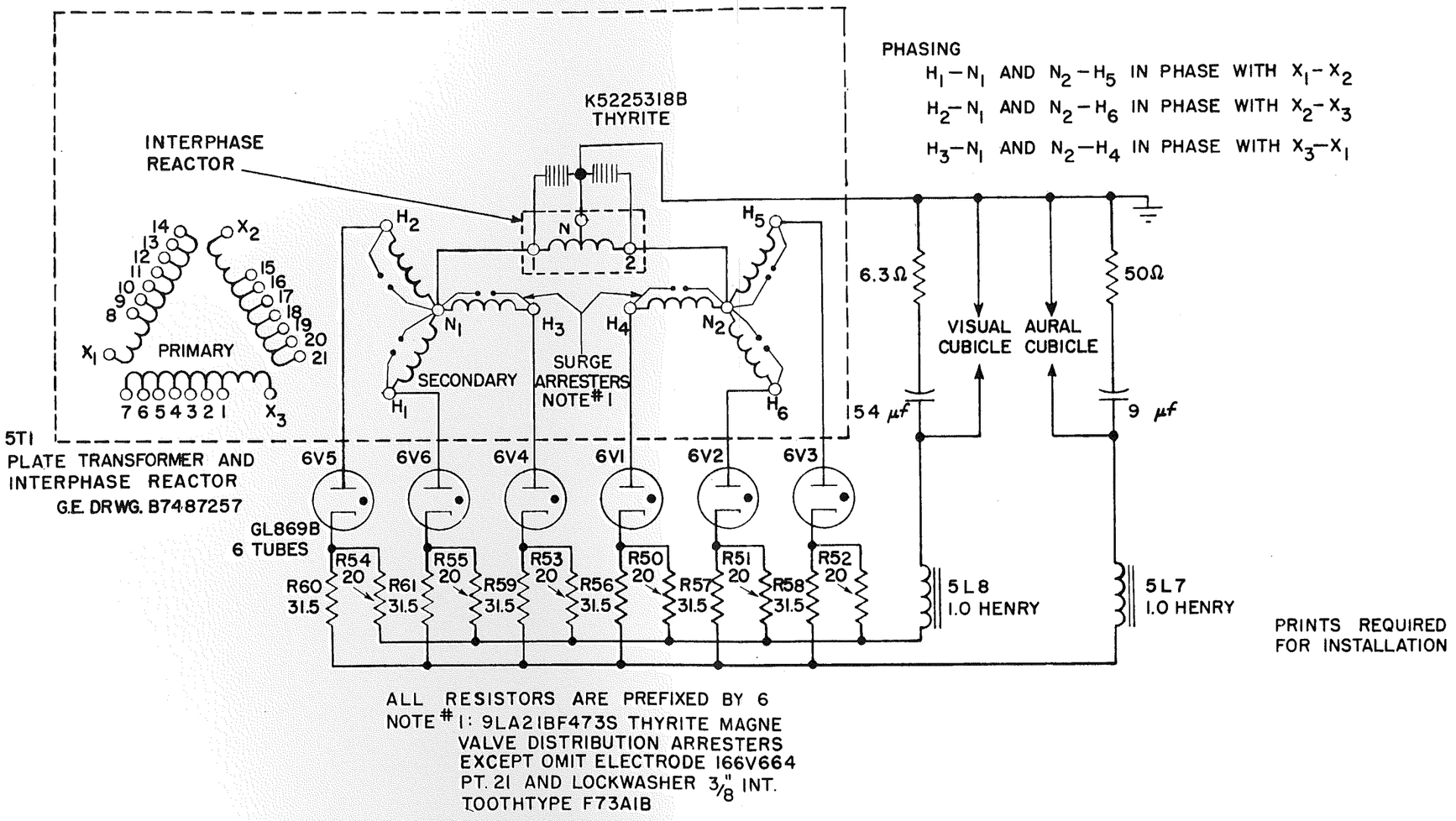


Fig. 74 Plate Transformer Connections Elementary Diagram

Fig. 74
Elementary

(B-7948271, Rev. 4)

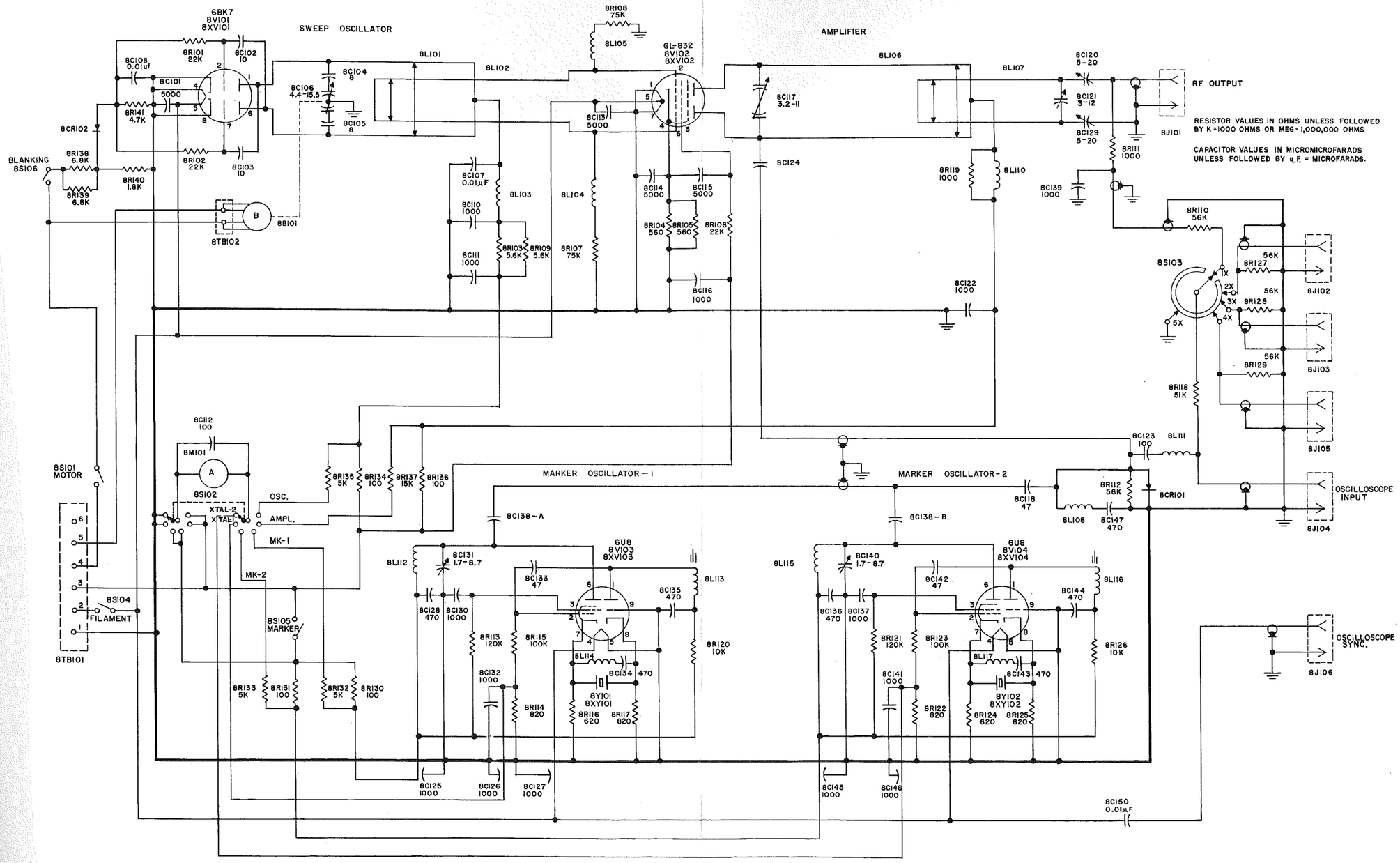


Fig. 75 Sweep Generator Elementary Diagram

(D-7667845, Rev. 3)

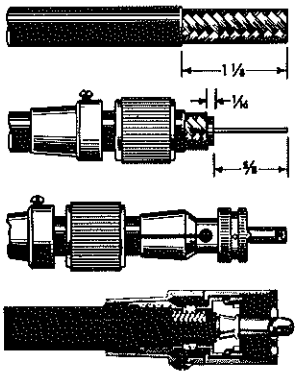
Fig. 75
Elementary


BACK SHELL


COUPLING RING


PLUG SUB-ASSEMBLY

Assembly of Cables to 83-1SPN Plug



Cut end of cable even. Remove vinyl jacket 1⅛".

Bare ⅝" of center conductor. Tin exposed conductor and braid. Slide back shell and coupling ring on cable.

Screw the plug sub-assembly on cable. Solder this assembly to braid through solder holes. Solder center conductor to contact. Do not use excessive heat.

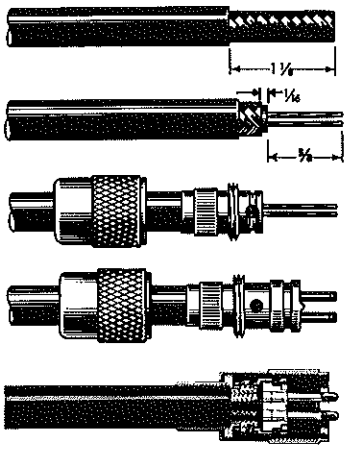
For final assembly, slide coupling ring over plug sub-assembly, then position back shell with sufficient clearance to permit free rotation of coupling nut and tighten set screw.


COUPLING RING


BACK SHELL


FRONT SHELL

Assembly of Twinax Cables to 83-22SP Plug



Cut end of cable even. Remove vinyl jacket 1⅛".

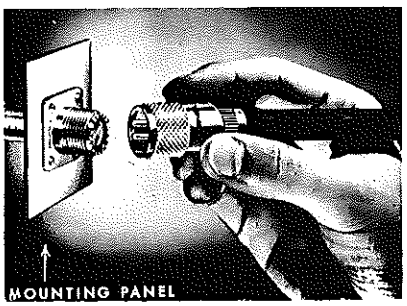
Bare ⅝" of conductors. Tin exposed conductors and braid.

Slide coupling ring on cable. Screw back shell on cable. Solder hole should align with conductors as shown.

Assemble front shell to back shell. Solder holes in both front and back shells should align. Solder braid to shells through solder holes. Solder conductors to contacts. Do not use excessive heat.

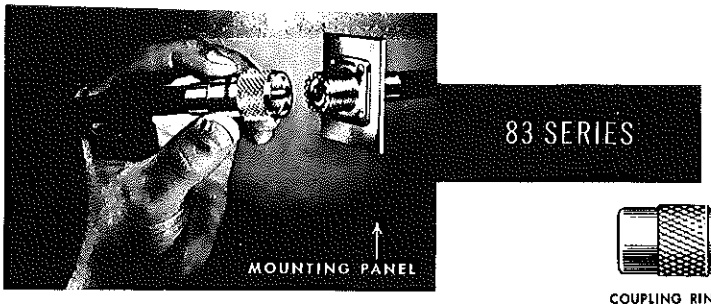
(Plugs 83-2SP and 83-21SP are assembled as shown except remove vinyl jacket 1¼".)

For final assembly screw coupling ring on back shell.



(3-3950)

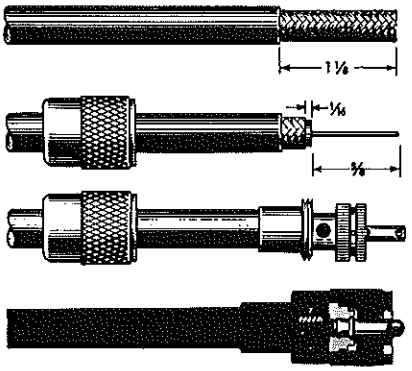
Fig. 76 Preparation of Cable and Assembly of "UHF" Set-Screw Type Connector, Amphenol 83-1-SPN (Courtesy of American Phenolic Corp.)



COUPLING RING


PLUG SUB-ASSEMBLY

Assembly of Cables to 83-1SP Plug



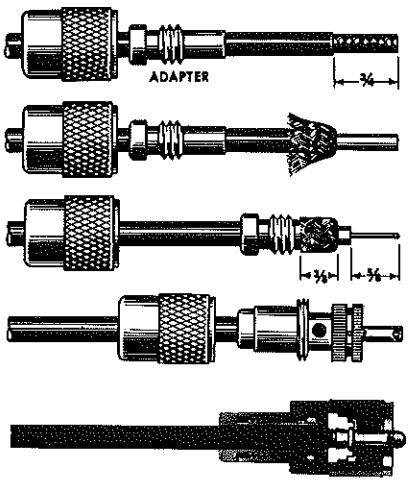
Cut end of cable even. Remove vinyl jacket 1⅛".

Bare ⅝" of center conductor. Trim braided shield. Slide coupling ring on cable. Tin exposed center conductor and braid.

Screw the plug sub-assembly on cable. Solder assembly to braid through solder holes. Use enough heat to create bond of braid to shell. Solder center conductor to contact.

For final assembly, screw coupling ring on plug sub-assembly.

Assembly of Cables to 83-1SP Plug using Adapter 83-168 or 83-185



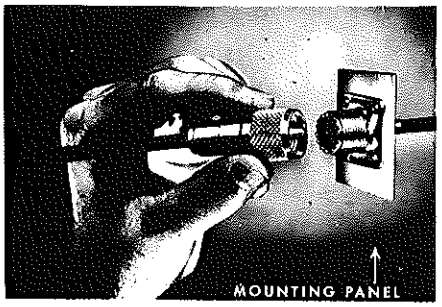
Cut end of cable even. Remove vinyl jacket ¾". Slide coupling ring and adapter on cable.

Fan braid slightly and fold back as shown.

Position adapter to dimension shown. Press braid down over body of adapter and trim to ⅜". Bare ⅝" of conductor. Tin exposed center conductor.

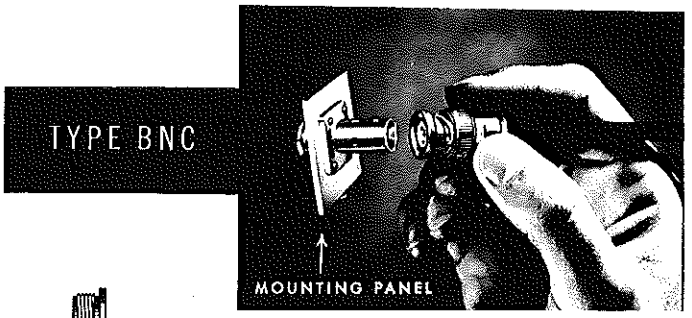
Screw plug sub-assembly on adapter. Solder braid to shell through solder holes. Use enough heat to create bond of braid to shell. Solder conductor to contact.

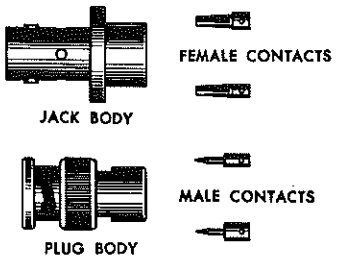
For final assembly, screw coupling ring on plug sub-assembly.

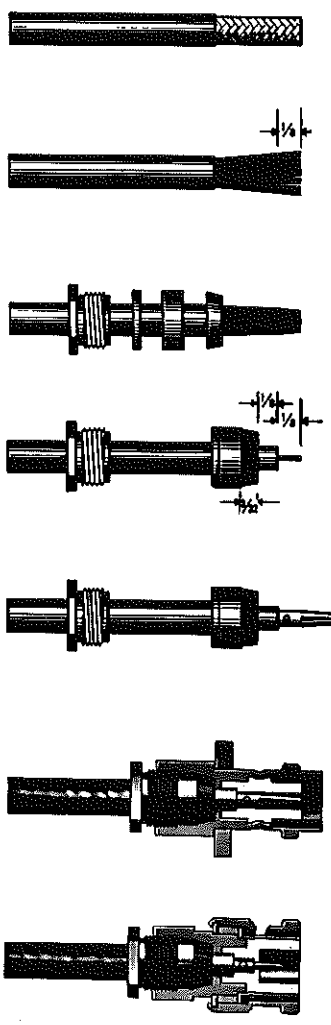


(3-3951)

Fig. 77 Preparation of Cable and Assembly of "UHF" Coupling Ring Type Connector, Amphenol 83-1-SP (Courtesy of American Phenolic Corp.)







Trim jacket ¼" for RG-58/U, 5/16" for RG-59/U or 7/16" for RG-71/U.

Fray shield and strip inner dielectric ⅛". Tin center conductor.

Taper braid and slide nut, washer, gasket and clamp over braid. Clamp is inserted so that its inner shoulder fits squarely against end of cable jacket.

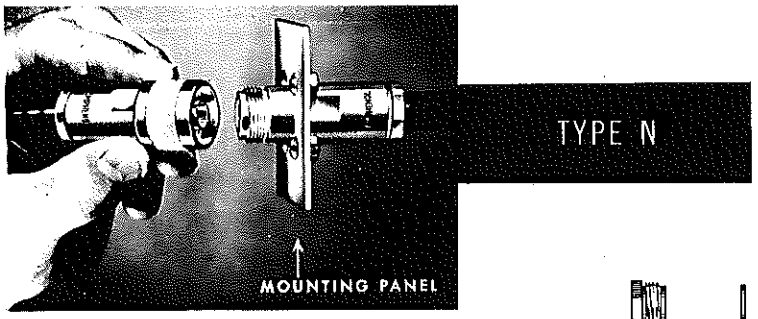
With clamp in place, comb out braid, fold back smooth as shown and trim 3/32" from end.

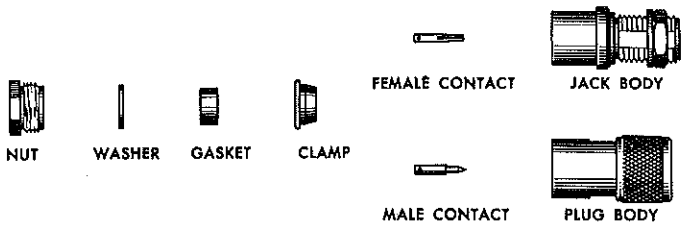
Slip contact in place, butt against dielectric and solder. Remove excess solder from outside of contact. Be sure cable dielectric is not heated excessively and swollen so as to prevent dielectric from entering into connector body.

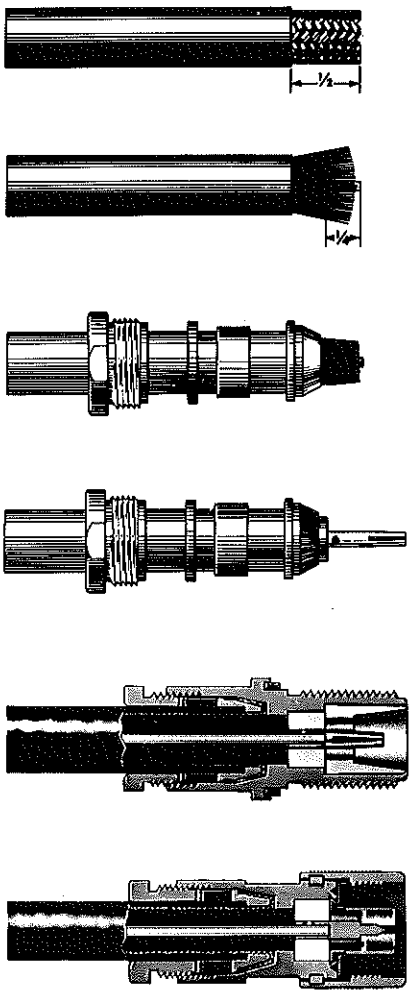
Push assembly into body as far as it will go. Slide nut into body and screw in place with wrench until tight. For this operation, hold cable and shell rigid and rotate nut.

(3-3956)

Fig. 78 Preparation of Cable and Assembly of Type BNC Connector
(Courtesy of American Phenolic Corp.)







Remove ½" of vinyl jacket. When using double shielded cable, remove 9/16" of vinyl jacket.

Comb out copper braid as shown. Cut off dielectric ¼" from end. Tin center conductor.

Taper braid as shown. Slide nut, washer and gasket over vinyl jacket. Slide clamp over braid with internal shoulder of clamp flush against end of vinyl jacket.

Smooth braid back over clamp and trim. Soft solder contact to center conductor. Avoid use of excessive heat and solder. See that end of dielectric is clean. Contact must be flush against dielectric. Outside of contact must be free of solder.

Slide body into place carefully so that contact enters hole in insulator. Face of dielectric must be flush against insulator. Slide completed assembly into body by pushing nut. When nut is in place, tighten with wrenches until sufficiently tight.

(3-3954)

Fig. 79 Preparation of Cable and Assembly of Type N Connector
(Courtesy of American Phenolic Corp.)

INDEX

SUPPLEMENT A

Whenever possible, additions, corrections, or new information affecting the Type TF-5-A Television Amplifier will be added to existing books by reprinting the pertinent pages of EBI-3295. When this cannot be effectively accomplished, such information will from time to time be incorporated in supplements to EBI-3295, these supplements to be distributed for insertion in the instruction books. The present Supplement A includes the first of such additional material.

CORRECT LOADING OF THE VISUAL AMPLIFIER

Proper loading on the Visual Amplifier is important. In addition to the procedures outlined on pages 37 through 39, the following criteria must also be considered in determining correct loading on the Amplifier. These indications are to be observed even if the final sweep termination varies slightly from those shown in Figs. 45 through 48.

Refer to page 40 for typical meter readings.

If there is insufficient loading (coupling too light),

1. Plate current will be low for full power output.
2. Sync compression between the driver and the Amplifier output will be in excess of the allowable 7 to 8 percent.
3. Grid current may run higher than normal.
4. The driver power output required for full power output from the Amplifier will be low.
5. Screen currents will run high.

The cure for this condition is to increase the coupling. See page 37, paragraph 8 (d), for the procedure.

If the Amplifier is too heavily loaded (too much coupling),

1. Plate current will be excessive for full power output.
2. Grid current will be higher than normal because of the excessive driving power required.
3. Sync compression between the driver output and the Amplifier output will be less than the allowable 7 to 8 percent normal.
4. Screen current will be lower than normal.
5. The driver power required will be high.

The cure for this condition is to decrease the coupling. See page 37, paragraph 8 (d), for the correct procedure.

In general, operating this Amplifier too lightly loaded, in addition to causing sync compression, will cause the peak voltage between screen and anode to rise toward an unsafe value. This may cause excessive dielectric heating of the plate screen ceramic and thereby adversely affect tube life.

Too heavy loading may shorten tube life because of the higher plate currents drawn by the Amplifier tubes and the resulting loss of plate efficiency.

INTERLOCKS WITH THE GENERAL ELECTRIC 10-KW HIGH-CHANNEL TELEVISION TRANSMITTER, TYPE TT-32-B

The necessary interlocking between the Type TF-5-A Amplifier and the Type TT-32-B Transmitter used as a driver is as follows (all wires should be 16-gauge, 600 volts d-c):

DISCONNECT	the wire in the intercubicle interconnection cable going from 2TB8-3 to 1TB8-3 in the Type TT-32-B Transmitter.
CONNECT	2TB8-3 to 8TB7-5 1TB8-3 to 8TB7-6. (Removes plate voltage from the Visual Exciter of the TT-32-B when the Visual Amplifier is in the SWEEP position.)
REMOVE	the jumper between 2TB1-13 and 2TB1-12 in the Rectifier and Control cubicle of the TT-32-B.
CONNECT	7TB2-9 to 2TB1-12 5K1-7 to 2TB1-13. (Removes plate and screen voltage from the PA, IPA, and Modulated Stage of the TT-32-B when plate voltage is not on the Visual Amplifier.)
REMOVE	the jumper between 2TB1-14 and 2TB1-15.
CONNECT	5K1-9 to 2TB1-14 7TB2-7 to 2TB1-15. (Removes plate and screen voltages from the Aural PA and 2nd IPA of the TT-32-B when plate voltage is not on the Aural Amplifier of the TF-5-A.)
CONNECT	7TB1-5 to 8TB7-9 7TB1-6 to 8TB7-10 7TB1-5 to 2TB10-9 7TB1-6 to 2TB10-10. (Turns off the plate voltage on the Aural section of the TT-32-B when

the Visual or Aural Amplifier of the TF-5-A is in the SWEEP position.)

CONNECT 7TB1-3 to 2TB1-7
7TB1-2 to 2TB1-6

(Turns off the plate voltage on the Visual section of the TT-32-B when the Aural Amplifier of the TF-5-A is in the SWEEP position.)

WATER SYSTEM

Care should be taken to prevent a restriction in the outlet water line from the Amplifiers. The water jackets on the GL-6251 tubes are rated for 80 pounds of pressure, and this rating could be exceeded if sufficient restriction is present in the water outlet line. If the plumbing is installed according to Figs. 28 and 29, no appreciable restriction will be present. Also see Fig. 21, Note 3, for recommended sizes of pipe.

CARE OF PAINTED SURFACES

The outside surfaces of this equipment have been carefully finished in lacquer. Minor scratches may be touched up by using a brush and the paint supplied. Major scratches and gouges, however, require the use of special equipment for the correct application of paint. This special equipment and the personnel familiar with its operation are usually available at an auto body repair shop.

The "furniture finish" outside lacquer on this equipment may be preserved and polished with any good lacquer polish. Care should be taken not to use a combination "cleaner-polish" containing an abrasive. This type of cleaner may remove the markings from the panel.

The decorative trim used is brushed stainless steel, which may be cleaned with a chromium cleaner such as that used on automobiles.

An acid type chrome cleaner should not be used.

INSTALLATION OF 5T1, 5L7, 5L8

The main plate transformer 5T1 and the Aural and Visual filter reactors 5L7 and 5L8 are air cooled, dry-type units. Care must be taken when locating them to allow for free convection of air through the unit. The room should be dry and well ventilated. Do not install these units against a wall which would obstruct the cooling louvres in the cases.

SUPPLEMENT B

GL-6251 FILAMENT LIFE

It is extremely important to accurately maintain correct filament voltage on thoriated tungsten filament tubes such as the GL-6251 if maximum filament life is to be obtained.

It has been common knowledge in the past that the filament life of pure tungsten filament tubes is a function of the evaporation rate of tungsten and, therefore, of the filament temperature. Since bright tungsten filaments may be operated at complete emission saturation without damage, increased filament life can be obtained by reducing filament voltage to the point where just exactly enough emission is obtained for proper circuit operation.

A similar relation between filament life and filament voltage is now known to hold for thoriated-tungsten filament tubes provided that the filament is never operated at or near emission saturation. Unlike pure tungsten filament tubes, the temperature of thoriated-tungsten filaments is such that tungsten evaporation is negligible. The source of emission is a thin layer of thorium on the filament surface. During operation the thorium in this layer is constantly being removed by evaporation and is constantly being replenished from within the wire by a thoria reduction process. The rate of thoria reduction depends upon the filament temperature and, therefore, upon the filament voltage. Longest filament life will be obtained when the supply of thorium provided by the thoria reduction process just equals the loss by evaporation from the filament surface. In order to maintain the balance between the loss and the replacement of an active layer of thorium, therefore, operation within a comparatively narrow range of temperature is required.

The filament voltage corresponding to this temperature can best be determined for a specific application by the tube designer. Unusually short filament life may result from the operation of thoriated filaments much below or much above this value.

Recent tests have been made which show that the filament voltage of the GL-6251 tubes as applied in the Type TF-5-A 50-KW High-Channel Television Amplifier should be held as closely as possible to 5.25 volts for maximum filament life. It should be noted that this is approximately 5% lower than the nominal 5.5 volts indicated in the tube specification. This voltage must be maintained as accurately as possible, preferably within ± 1%. In order to be sure that this is done, the following steps should be taken:

1. The GL-6251 filament voltmeters in the Visual and Aural Amplifiers should be accurately checked with a standard meter, such as a calibrated G-E Type DP-3AC Voltmeter or its equivalent, after installation of the TF-5-A Amplifier. The filament voltmeters supplied in the TF-5-A have an initial accuracy of ± 2%. When calibrated, however, the zero can be offset slightly to provide much better accuracy at normal operating voltage.

2. When checking meter accuracy, the actual tube filament voltage should be measured by using long, insulated test leads for the standard voltmeter inserted through the circuit cavity walls via the filament clamp holes to actually measure the voltage at the filament clamps. The voltage at this point should normally be only about 0.05 volt less than the filament line voltage at the bypass points on top of the circuit where the Transmitter voltmeters are connected.

3. With the REGulated LINE VOLTAGE adjusted for 230 volts, choose the filament transformer taps as described on page 31 to give the nearest possible voltage on each tube to 5.25 volts. If the nearest tap gives a filament voltage less than 5.2 volts, choose the tap for the next higher voltage.

4. Maintain the REGulated LINE VOLTAGE as nearly as possible to 230 volts during normal operation. This should be checked by the operator and adjusted, if necessary, at regular intervals.

5. As tubes age, if there is evidence of decreasing emission, the operation may be improved by increasing the filament voltage slightly. In no event, however, should the voltage be increased to a value greater than 5.5 volts.

REDUCTION OF GL-6251 SCREEN DISSIPATION

Life experience with GL-6251 tubes indicates that the possibility of internal grid shorts can be reduced by operation that reduces the screen dissipation to a minimum. Although a value of 700 volts is shown under TYPICAL METER READINGS on page 40 for both Visual and Aural screen voltages, it has been found that power can be maintained at a value considerably less than this. In many instances the Aural screen voltage may be as low as 500 volts, resulting in a very substantial reduction of screen dissipation, since the screen current is usually also somewhat reduced. It is therefore recommended that the screen voltage be reduced as much as possible, particularly that of the Aural Amplifier, consistent with maintenance of the required output power.

When the resistance of the screen supply bleeder

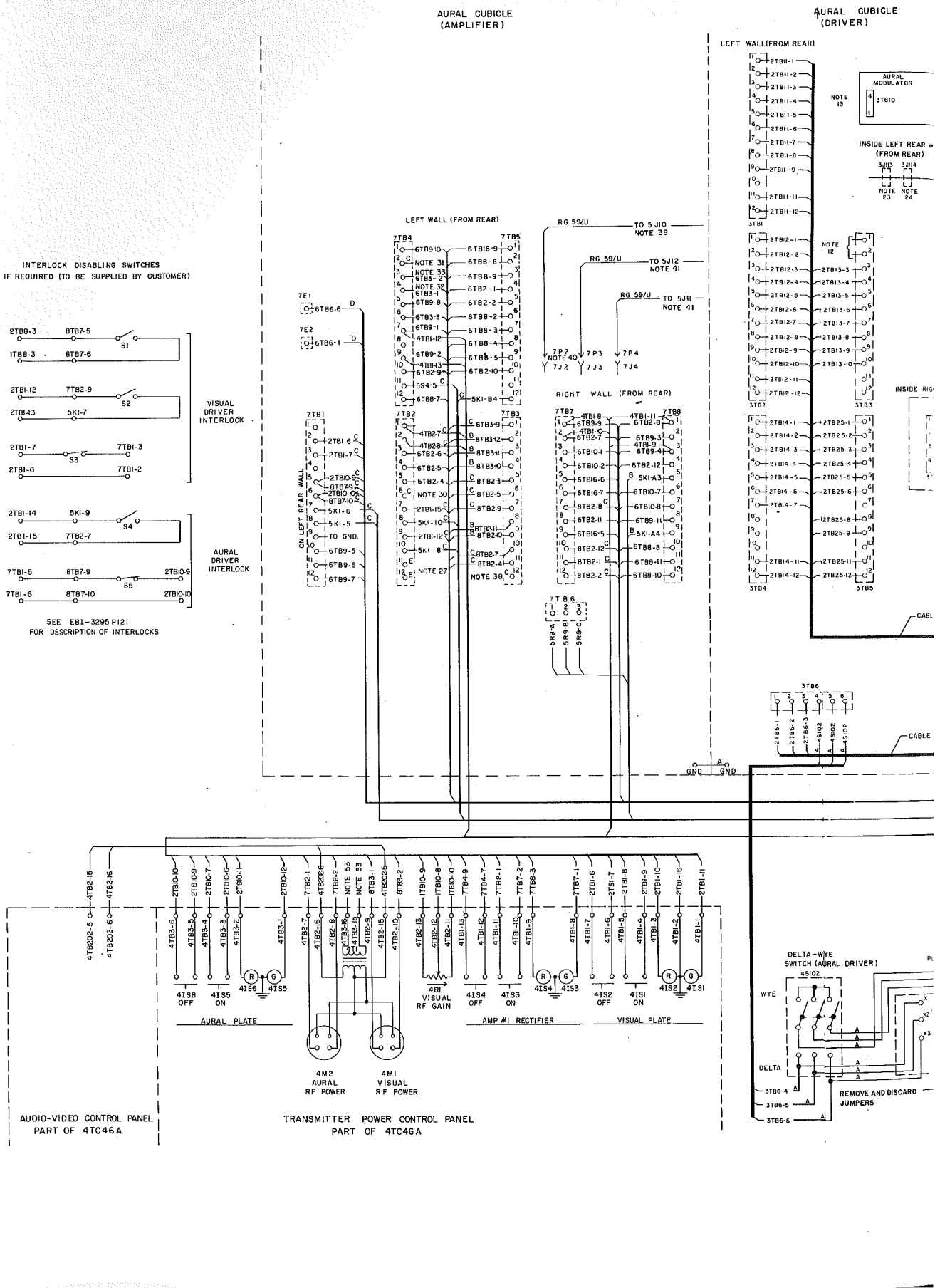
resistors, 7R18 and 8R58, is not low enough, the screen rectifiers may tend to cut off, so that the negative screen current of some GL-6251 tubes supplies the screen voltage. Since 7R18 and 8R58 are tapped resistors, their resistance can be reduced merely by use of a jumper wire to short out sufficient sections of the resistor. However, in order not to exceed dissipation on the resistor, do not exceed the following voltages:

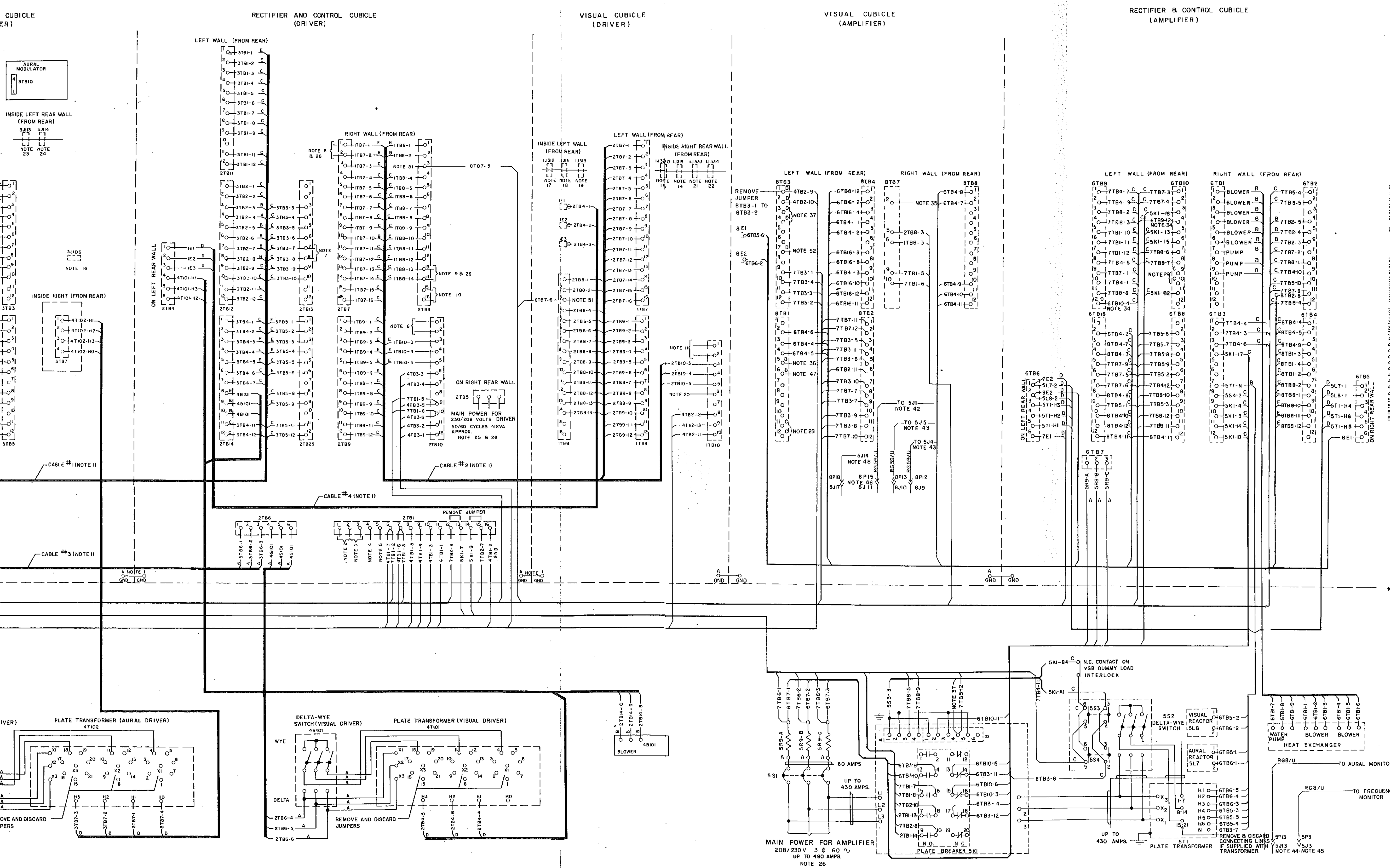
Maximum Screen Supply Voltage (DC)	Sections of Resistor in Use
850 v	10 (all)
765 v	9 (1 shorted out)
680 v	8 (2 shorted out)
595 v	7 (3 shorted out)
510 v	6 (4 shorted out)

A means is also provided to balance the GL-6251 screen currents in the Aural Amplifier in order to avoid excessive screen dissipation in the event of appreciable unbalance. It will be noted that adjustment of the SCREEN BALance potentiometer, 7R47, changes the series screen resistance between the tubes and, therefore, adjusts the screen voltage for best current balance. Adjustment of the screen balance may affect the cathode balance to some extent. Adjust each of them until the best compromise is made between cathode and screen current balances.

TYPE TT-36-A TRANSMITTER INTERCONNECTION WITH TYPE TC-46-A CONSOLE

For interconnection of the Type TT-36-A Transmitter, which consists of the Type TF-5-A Amplifier and the Type TT-32-B 10-KW Transmitter used as the driver, with the Type TC-46-A Television Transmitter Control Console, refer to Fig. 81 following this Supplement.


AURAL CUBICLE (AMPLIFIER)
AURAL CUBICLE (DRIVER)
LEFT WALL(FROM REAR)
INTERLOCK DISABLING SWITCHES IF REQUIRED (TO BE SUPPLIED BY CUSTOMER)
VISUAL DRIVER INTERLOCK
AURAL DRIVER INTERLOCK
SEE EBI-3295 P121 FOR DESCRIPTION OF INTERLOCKS
LEFT WALL (FROM REAR)
RIGHT WALL (FROM REAR)
RG 59/U
TO 5J10 NOTE 39
TO 5J12 NOTE 41
TO 5J11 NOTE 41
AURAL MODULATOR
INSIDE LEFT REAR W. (FROM REAR)
GND
CABLE
DELTA-WYE SWITCH (AURAL DRIVER)
WYE
DELTA
REMOVE AND DISCARD JUMPERS
AURAL PLATE
AMP #1 RECTIFIER
VISUAL PLATE
4M2 AURAL RF POWER
4M1 VISUAL RF POWER
AUDIO-VIDEO CONTROL PANEL PART OF 4TC46A
TRANSMITTER POWER CONTROL PANEL PART OF 4TC46A



NOTES

1. WIRING LABELED AS CABLES #1, #2, #3 AND #4 SUPPLIED.
2. EXTERNAL TRANSMITTER START-CONNECT BETWEEN 2TB1-1 AND 2TB1-2.
3. EXTERNAL TRANSMITTER STOP-CONNECT BETWEEN 2TB1-2 AND 2TB1-3.
4. EXTERNAL TRANSMITTER START-INDICATING LIGHTS-CONNECT BETWEEN 2TB1-4 AND GND.
5. EXTERNAL TRANSMITTER STOP-INDICATING LIGHTS-CONNECT BETWEEN 2TB1-5 AND GND.
6. EXTERNAL VISUAL EMERGENCY START-CONNECT BETWEEN 2TB10-1 AND 2TB10-2.
7. EXTERNAL AURAL EMERGENCY START-CONNECT BETWEEN 2TB13-8 AND 2TB13-7.
8. 115 V AC FOR CUBICLE LIGHTING-CONNECT BETWEEN 2TB7-1 AND 2TB7-2.
9. 115 V AC FOR CRYSTAL HEATERS-CONNECT BETWEEN 2TB8-13 AND 2TB8 14.
10. EXTERNAL SAFETY SWITCH IF USED-CONNECT BETWEEN 2TB8-15 AND 2TB8-16.
11. VISUAL REMOTE POWER LEVEL METER-CONNECT BETWEEN 1TB9-1 AND 1TB9-2.
12. AURAL REMOTE POWER LEVEL METER-CONNECT BETWEEN 3TB3-1 AND 3TB3-2
13. AURAL MODULATOR INPUT-CONNECT TO 3TB10. SEE INSTRUCTION BOOK FOR CONNECTIONS.
14. VISUAL MODULATOR. INPUT BNC CONNECTOR-RG59/U.
15. VISUAL MODULATOR OUTPUT MONITOR. BNC CONNECTOR-RG59/U.
16. TO AURAL STATION MONITOR-TYPE N CONNECTOR-RG8/U CABLE.
17. TO Z4-J2 SWEEP DETECTOR #1 BEFORE VSB FILTER-RG59/U.
18. TO Z5-J2 SWEEP DETECTOR #2 AFTER VSB FILTER-RG59/U.
19. TO DIRECTIONAL COUPLER - TYPE N CONNECTOR-RG8/U.
20. TO Z4-TB1-1.
21. TO 4E101-4J109-RG59/U.
22. TO 4E101-4J110-RG59/U
23. TO 4E102-4J111-RG59/U.
24. TO 4E102-4J112-RG59/U.
25. THE SHORT CIRCUIT CURRENT CAPACITY OF THE POWER SOURCE TO WHICH THIS EQUIPMENT IS CONNECTED SHOULD NOT EXCEED 10,000 AMPS RMS.
26. WIRING EXTERNAL TO THE TRANSMITTER CUBICLES MUST CONFORM IN SIZE, INSULATION, OVERCURRENT PROTECTION, ETC TO THE REQUIREMENTS OF THE LOCAL ELECTRIC WIRING CODE APPLICABLE TO THE INSTALLATION. RECOMMENDATIONS MADE ON THIS DRAWING MAY HAVE TO BE MODIFIED TO MEET LOCAL ELECTRIC WIRING CODE REQUIREMENTS.
27. 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 7TB2-11 & 7TB2-12.
28. 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 8TB1-11 & 8TB1-12.
29. 115 VOLTS FOR CABINET LIGHTS AND CONVENIENCE OUTLETS 6TB10-9 & 6TB10-10.
30. TO EXTERNAL INDICATING LIGHT "AMPL STOP" 7TB2-6 AND GROUND 5 V AC.
31. TO EXTERNAL INDICATING LIGHT "AMPL START" 7TB4-2 AND GROUND 5V AC.
32. TO EXTERNAL "AMPL START" CONNECT BETWEEN 7TB4-4 & 7TB4-9.
33. TO EXTERNAL "AMPL STOP" CONNECT BETWEEN 7TB4-3 & 7TB4-9.
34. REMOVE CONNECTION BETWEEN 6TB10-4 AND 6TB9-12 TO CONNECT EXTERNAL SAFETY SWITCH.
35. TO TRANSMISSION LINE PEAK RF DIODE (5TB2-2).
36. TO TRANSMISSION LINE SWEEP DETECTOR RELAY #1 (5TB1-1) NOTE 49.
37. TO EXCITER OVERDRIVE PROTECTIVE RHEOSTAT IF USED.
38. TO SWEEP DETECTOR (5TB4-1) NOTE 49.
39. 5J10 ON AURAL SWEEP DETECTOR.
40. MAKE CABLE 5P10 TO 7P2 SHORT AS POSSIBLE.
41. 5J12 & 5J11 ON AURAL REFLECTOMETER.
42. 5J1 ON SWEEP DETECTOR.
43. 5J4 & 5J5 ON VIS REFLECTOMETER.
44. 5J13 ON AURAL RF TRANSMISSION LINE.
45. 5J3 ON VISUAL RF TRANSMISSION LINE.
46. MAKE CABLE 5P1 TO 8P15 SHORT AS POSSIBLE.
47. SWEEP DETECTOR #2 (5TB3-1) NOTE 49.
48. TO 5J14 ON SWEEP DETECTOR #2.
49. TIE TERMINAL #2 ON SWEEP DETECTORS TO ANY CONVENIENT GROUND.
50. 5K1-84 CONNECTS TO 5S3-6 THROUGH NC CONTACT ON VSB DUMMY LOAD.
51. DISCONNECT WIRE FROM 1TB8-3 TO 2TB8-3 IN CABLE 2.
52. TO TRANSMISSION LINE PEAK RF DIODE (5TB2-1).
53. 115 VAC METER LIGHTS ON CONTROL CONSOLE CONNECT TO 4TB3-15 & 4TB3-16.

CODE	WIRE SIZE	SUGGESTED REFERENCE *
A	#6 AWG GND WIRE	GE SPEC SI-12274 STRANDED 600V
B	#10 AWG 600V	" " A7144687
C	#16 AWG 600 V	" " A7144684
D	#12 AWG 6KV RMS	" " A7147320 **
E	#14 AWG 600 V	" " A7144685

* GE SPEC NO'S HAVING A PREFIX "A" OR "K" ARE SYRACUSE NUMBERS AND ARE FOR USE ONLY WHEN ORDERING WIRE ON TECHNICAL PRODUCTS DEPARTMENT, ELECTRONICS DIVISION, SYRACUSE, NY.

** SHIELD MUST BE GROUNDED AT BOTH ENDS OF SHIELDED-JACKETED WIRE - STRIP SHIELD A MINIMUM OF 4 INCHES FROM END OF INSULATION EACH END.

FOR INSTRUCTIONS AND PARTS TO TERMINATE THIS WIRE ORDER PLA-7150412 G1, FOR DRIVER AND PLA-7150412 G2 FOR AMPLIFIER AVAILABLE FROM GE CO, SYRACUSE, NY.

(EE-7354314, Rev. 0)

Fig. 81 Interconnection Diagram, Type TT-36-A Transmitter and Type TC-46-A Console

INSTRUCTIONS

HARMONIC FILTER

MODEL 4PY25F1

EBI-3310A

ELECTRONICS DIVISION

GENERAL ELECTRIC

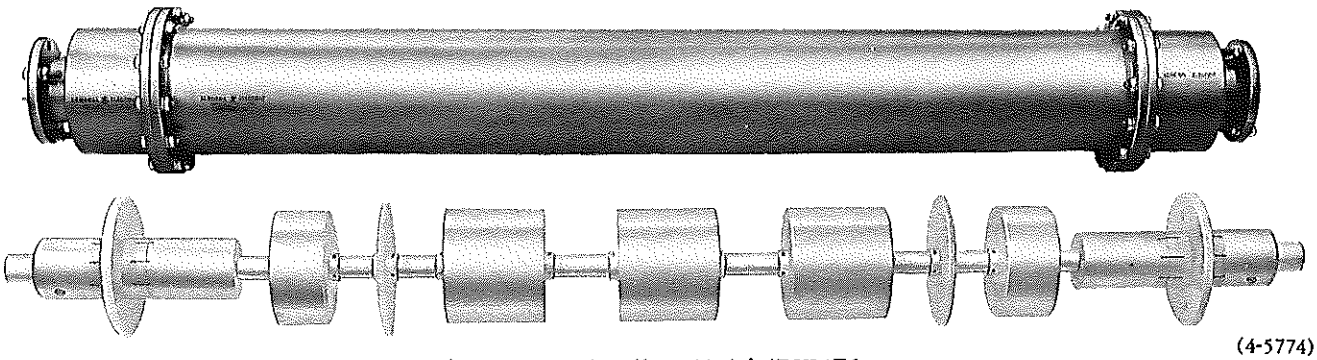
ELECTRONICS PARK, SYRACUSE, N. Y.

11/54 (500)

PRINTED IN U.S.A.

CONTENTS

ILLUSTRATIONS



(4-5774)

Fig. 1 Harmonic Filter, Model 4PY25F1

INTRODUCTION

The General Electric Harmonic Filter (Fig. 1), Model 4PY25F1 (comprising a 4PY31C1 Filter and 4PY30B1 Adapter), is designed for use with a VHF 50-kilowatt high-channel system (channels 7 through 13) to provide a high order of harmonic attenuation with negligible attenuation in the television channel. The Filter simply replaces a corresponding length of transmission line and requires no adjustments.

TECHNICAL SUMMARY

ELECTRICAL

POWER

The Filter is designed for use with television transmitters having a power output up to and including 50 kilowatts (peak) when operating into a transmission line having a standing wave ratio no greater than 1.10. The Model 4PY25F1 Filter has an average power rating of 30 kilowatts.

FREQUENCY

The Model 4PY25F1 Filter is fixed-tuned for any channel in the range of 174 to 216 megacycles (channels 7 through 13).

ATTENUATION

Harmonic attenuation is in excess of 60 db up to and including the fifth harmonic. There are no spurious pass bands in this range. Attenuation in the pass band is negligible.

INPUT AND OUTPUT IMPEDANCE

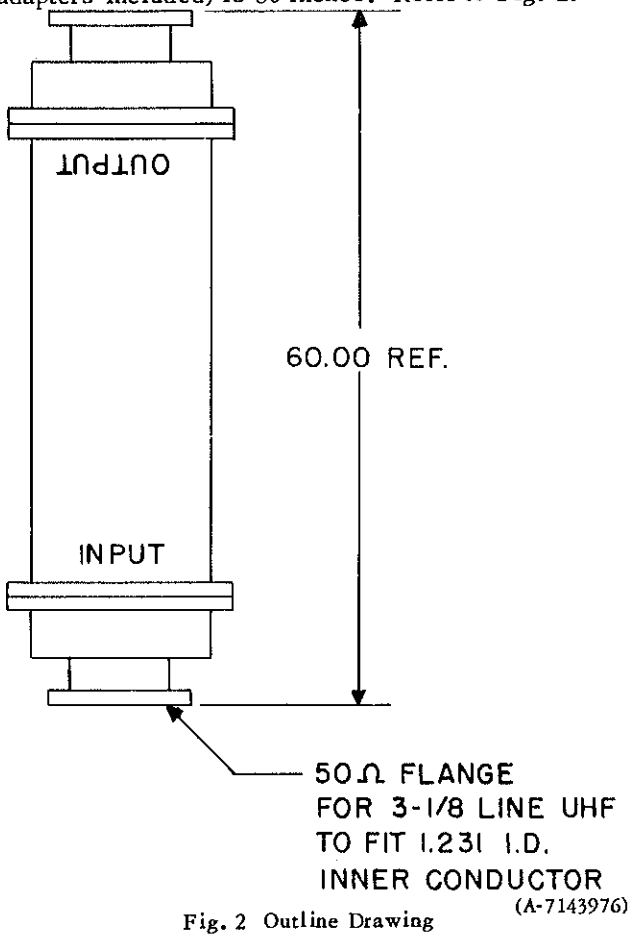
50.0 ohms nominal, 6-1/8 inch line reduced by Model 4PY30B1 Adapter (supplied) from 6-1/8 inch to 3-1/8 inch, 50.0 ohm line.

STANDING WAVE RATIO

The VSWR is under 1.07 over the specified channel. Note that the VSWR will not exceed 1.15 for the balance of the channels in the range of channels 7 through 13.

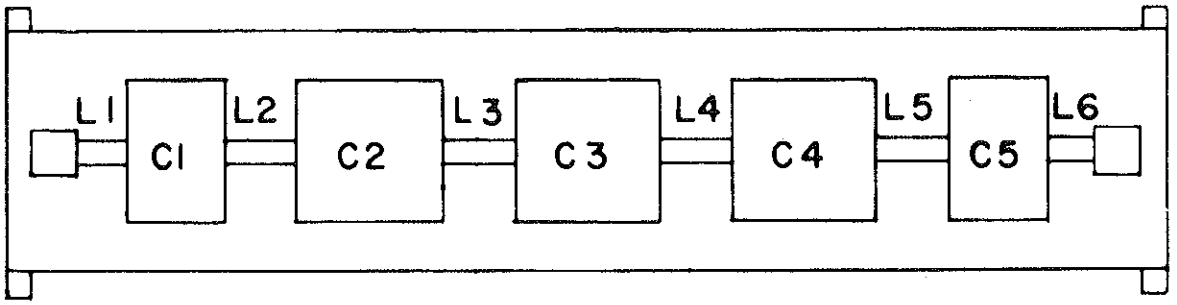
PHYSICAL DIMENSIONS

The length of the Filter from flange to flange (adapters included) is 60 inches. Refer to Fig. 2.



(A-7143976)

Fig. 2 Outline Drawing



(A-7991291, Sheet 2)

Fig. 3 Internal Arrangement of Filter Sections

INSTALLATION

The Model 4PY25F1 Filter is designed to be inserted in a standard 3-1/8 inch, 50.0-ohm transmission line (using adapters supplied) between the transmitter and the antenna. If used beyond the diplexer, one unit is required for each transmission line and should be located as close to the diplexer as possible. If used between the transmitter and the diplexer, one unit each is required in the visual and aural lines. UHF flange-type connectors with UHF bullet connectors and "O" rings are provided. The Filter is air tight but will pass air as required in a pressurized system.

To install the unit, simply replace a section of transmission line with the Filter and make connections in the standard manner. In the installation observe the INPUT and OUTPUT markings on the Filter.

OPERATING NOTES

The temperature rise of the Filter is slightly greater than that of the standard transmission line. Forced air cooling is not required.

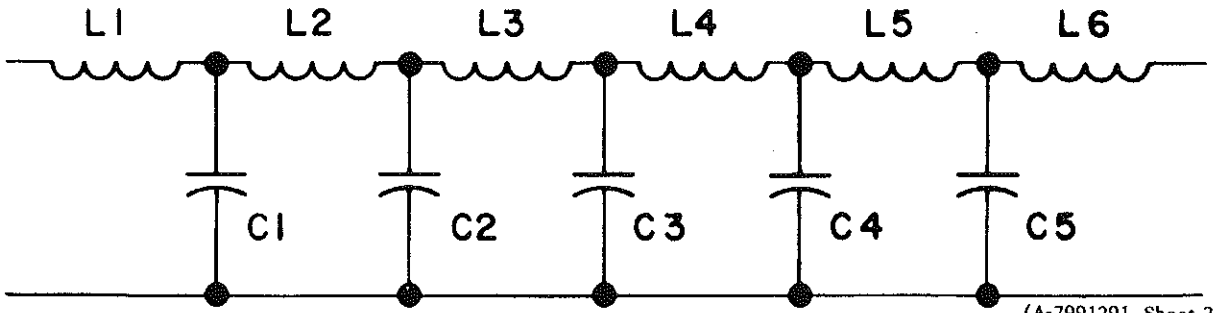
No adjustments of the Filter are required in the field. Replacement of the unit is made in terms of the whole assembly.

THEORY

The Filter consists of a series of constant-K type mid-sections with a constant-K half-section at the input and the output to provide an impedance match to the 50-ohm transmission line. The constant-K sections have been designed according to conventional filter theory and assembled as shown in Fig. 3; the equivalent electrical circuit is shown in Fig. 4. The mid-sections have a cutoff frequency of 220 megacycles, while the half-sections are designed with a slightly higher cutoff frequency to provide a good impedance match over the range of 174 to 216 megacycles.

The L and C circuit elements are made up of lengths of coaxial transmission line. A section of low Z_o line is used for C, while a section of high Z_o line is used for L, as illustrated by Fig. 3.

The Filter has a VSWR under 1.15 for the frequency range of 174 to 216 megacycles. During test of the unit, the positions of the C sections are adjusted slightly to obtain a VSWR under 1.07 for a specified customer's channel. The Filter will still operate over the entire range of channels 7 through 13 but will give best performance on the specified channel.



(A-7991291, Sheet 2)

Fig. 4 Equivalent Electrical Circuit

INSTRUCTIONS

VESTIGIAL-SIDEBAND FILTER

PL - 7776403-G1, -G2

EBI—3389

ELECTRONICS DIVISION

GENERAL ELECTRIC

ELECTRONICS PARK, SYRACUSE, N. Y.

5-56 (1000)

PRINTED IN U.S.A.

CONTENTS

ILLUSTRATIONS

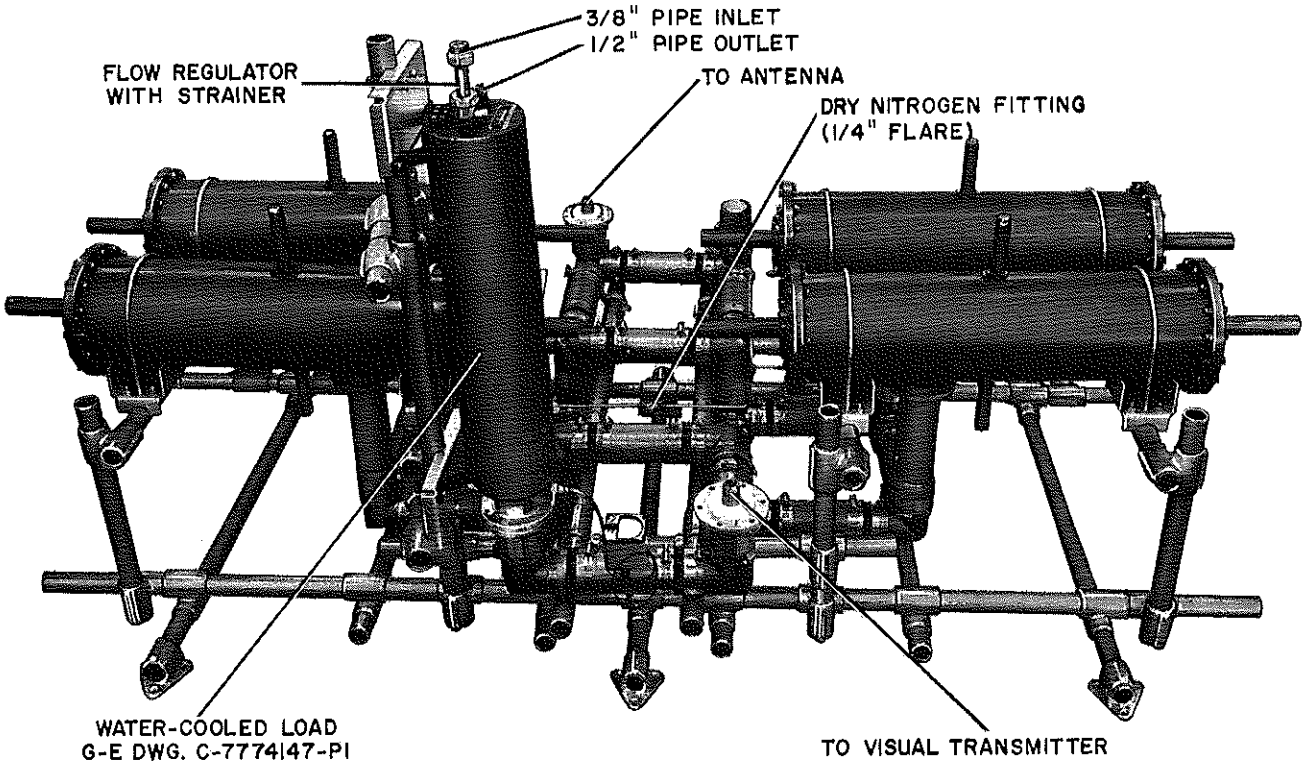


Fig. 1 Vestigial-Sideband Filter, PL-7776403-G1 (6-1495)

INTRODUCTION

The General Electric Vestigial-Sideband Filter (Figs. 1 and 2), PL-7776403-G1, -G2, is a constant-impedance device designed to add to the response characteristic of a television transmitter operating in the range of channels 7 through 13 a sufficient additional attenuation such that the over-all characteristic will comply with the FCC specification for lower-sideband attenuation.

The Vestigial-Sideband Filter identified as PL-7776403-G1 (Fig. 1) is used with and supplied as part of the General Electric 50-KW High-Channel Television Amplifier, Model 4TF5A2. The Filter identified as PL-7776403-G2 (Fig. 2) is used with and supplied as part of the General Electric 10-KW High-Channel Television Transmitter, Model 4TT32B3.

TECHNICAL SUMMARY

Electrical

Power Rating: The Group 1 Filter is designed to accept 50 kilowatts (peak) of visual power; the Group 2, 20 kilowatts.

VSWR: The input VSWR is 1.1 or under at the visual carrier and the visual pass band.

RF Connections: The input and output are 3-1/8 inch, 50-ohm coaxial transmission line.

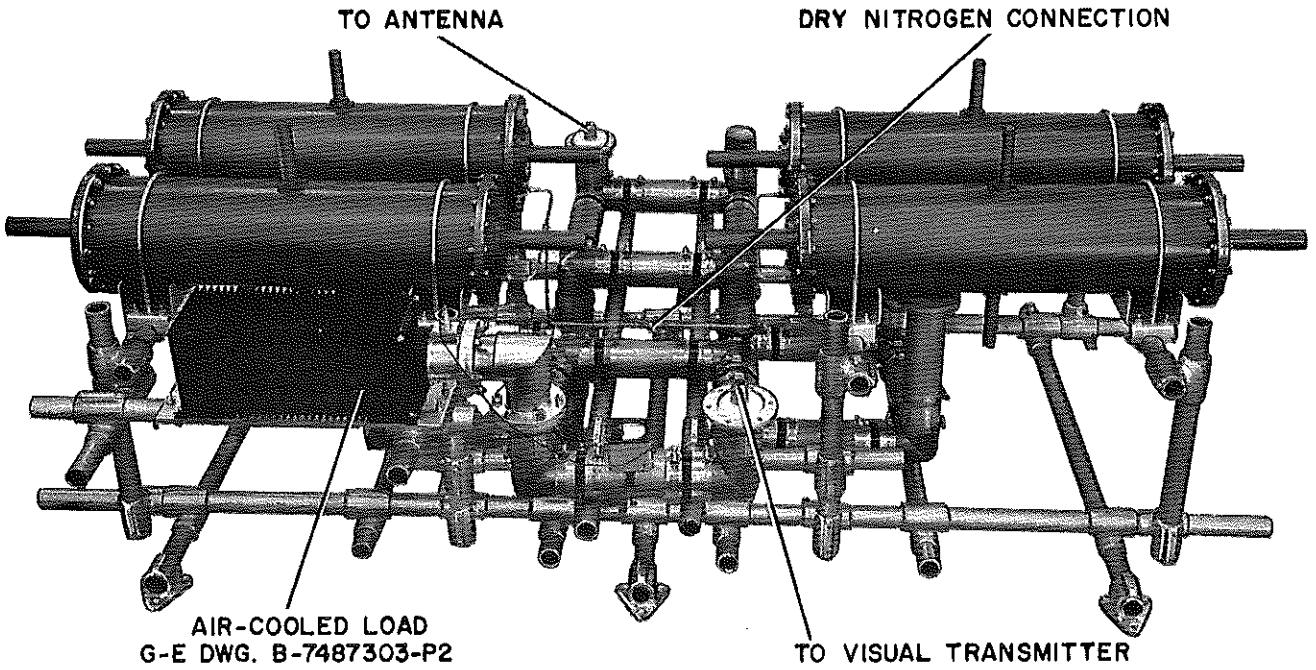


Fig. 2 Vestigial-Sideband Filter, PL-7776403-G2 (6-1494)

Lower Sideband Attenuation: The unit is designed to complement the transmitter response so that the over-all system response will meet FCC and RETMA specifications.

Insertion Loss: The insertion loss at the visual carrier frequency is in the order of 0.2 db. Of this loss, about 0.1 db is mismatch loss and corresponds to the VSWR of 1.1. The remaining loss results from loss in the cavities.

Mechanical

The Vestigial-Sideband Filter is manufactured for operation on a specified channel in the VHF high-channel range of 174 to 216 megacycles.

Pressurization: The filter is so designed that the cavities only may be pressurized. It is recommended that dry nitrogen at about one pound per square inch be maintained in the cavities.

Dimensions:

Over-all Length:	112 inches maximum, plus 12 inches for removing cavity caps
Width:	54 inches maximum
Height:	60 inches maximum for Group 1 Filter 36 inches maximum for Group 2 Filter
Weight:	Approximately 1000 pounds

INSTALLATION

The VSB Filter is designed for floor or platform mounting. The final mounting of the Filter at the installation should not be designed until the delivery of the unit, since all dimensions are subject to change in final assembly and test.

When the Filter is received, it should be examined for any damage which may have occurred during shipment.

Install the Filter close to the transmitter and preceding the diplexer. It is recommended that a harmonic filter (the G-E Model 4PY25F1 Harmonic Filter for the G-E 50-KW Amplifier, Model 4TF5A2, and the G-E Model 4PY1F1 Harmonic Filter for the G-E 10-KW Transmitter, Model 4TT32B3) be installed between the transmitter and the VSB Filter. Adequate clearance should be allowed for ac-

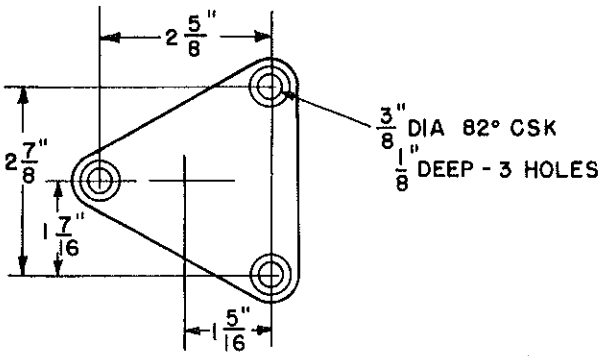


Fig. 3 Top View of Mounting Foot (A-7991275)

cess to the tuning adjustments. It is desirable to arrange the plumbing to the input and output terminals in such a way that the 3-1/8 inch coaxial lines may be disconnected and test equipment connected in their place. Fig. 3 shows the dimensions of the mounting foot used for the supporting frame of the Filter.

The loads supplied with the Filter may be removed to some other point in the installation as long as they remain in the proper orientation. The water-cooled load supplied with the Group 1 Filter (water flow of one gallon per minute) must be mounted in a vertical position with the water connections on top. The fins of the air-cooled load supplied with the Group 2 Filter must be in a vertical plane. Fig. 4 is a dimensional view of the flow regulator with strainer used with the water-cooled load (see Fig. 1).

If wall or ceiling mounting of the Filter is desired, it is recommended that the unit be mounted in a horizontal position on a pair of supporting members hung from the ceiling.

Care should be taken to see that the unit is adequately ventilated.

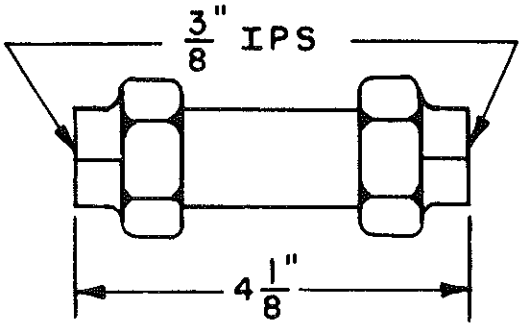


Fig. 4 Dimensional View of Flow Regulator with Strainer (A-7991275)

OPERATION

The VSB Filter is adjusted at the factory for the customer's allocated channel of operation. After it has been installed and connections made, the Filter tuning should be checked by a field engineer from the General Electric Company before power is applied. Should retuning of the Filter become necessary, it should be done only by a General Electric field representative who has the necessary training and equipment to make the adjustments.

The Filter should not be pressurized with nitrogen in excess of 10 pounds per square inch. The dry nitrogen connection is a 1/4-inch flare fitting; it is recommended that the tubing connected to this point be 1/4-inch copper. A pressure relief valve set at 15 pounds per square inch is supplied.

THEORY

The Vestigial-Sideband Filter is a constant-impedance device designed to add sufficient attenuation to the transmitter reference characteristic so that the over-all characteristic will meet the FCC specification for lower-sideband attenuation.

The band reject characteristic is obtained by the use of two filters, each tuned in an identical fashion and connected in parallel by the use of two hybrid rings. Refer to Fig. 5.

Power incident at the visual input at the pass frequencies, that is, the visual passband, divides equally between the two lines containing the filters and enters the output ring. In the output ring this power re-combines and leaves at the antenna terminal. The fourth terminal of the output ring is isolated by about 30 to 40 db and is merely capped. Any power reflected from the antenna retraces the same path and returns to the transmitter. This

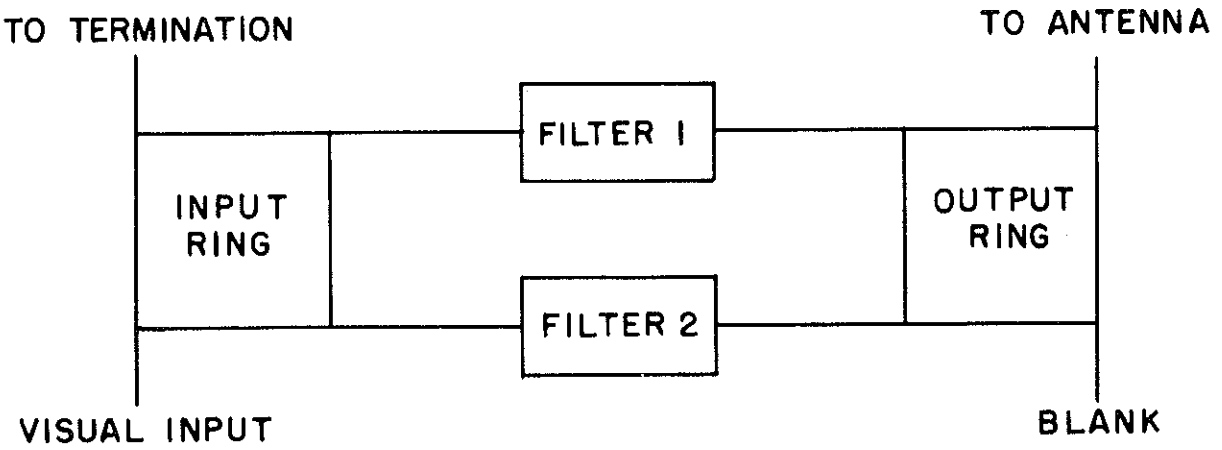


Fig. 5 Diagram of Basic VSB Filter Circuit (A-7991275)

may result in a ghost, but the trouble is caused by antenna mismatch and cannot be corrected by the Filter.

Power incident at the visual input at the reject frequencies, that is, the vestigial sideband, divides equally between the two lines containing the filters and is reflected by the filters to the input ring. This power re-combines in the input ring and leaves at the terminal that is terminated and is dissipated in the termination. Since all power entering the visual input is accepted and passed either to the antenna terminal or to the termination, the device is said to be a constant-impedance device. Note that power in the pass band that is reflected by the filters because of the mismatch of the Filter itself is also dissipated in the termination.

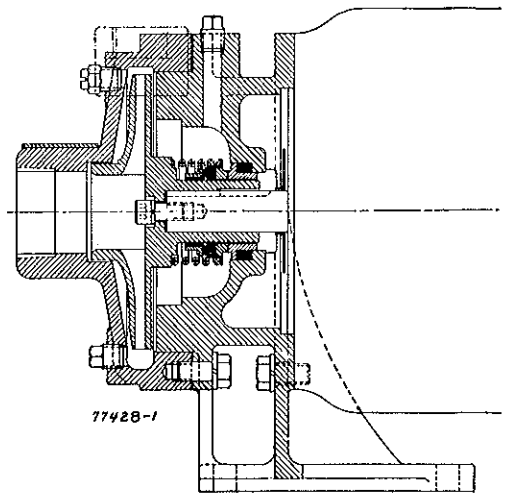
The termination of the Group 1 Filter is a water-cooled wattmeter rated at 6 kilowatts continuous. The termination of the Group 2 Filter is an air-cooled wattmeter rated at 600 watts continuous. The manufacturer's specification for VSWR is 1.1 maximum. Any power reflected from this termination will retrace the same path and appear at the visual input terminal and will be reflected through the Filter back again to the termination.

The individual filter consists of two cavities and a hybrid ring. Each cavity is a double-tuned cavity. The response of one cavity is added in quadrature to that of the other double-tuned cavity so that the reactance slopes compensate on the high-frequency side to give the desired cutoff from -0.75 mc to -1.25 mc and to provide an impedance match at the visual frequency. The coupling of the cavities to the hybrid ring is loose enough to keep the conductance at the visual frequency small. This is required in order to prevent excessive insertion loss at the visual frequency; the coupling, however, is sufficiently tight to provide the required attenuation in the reject band.

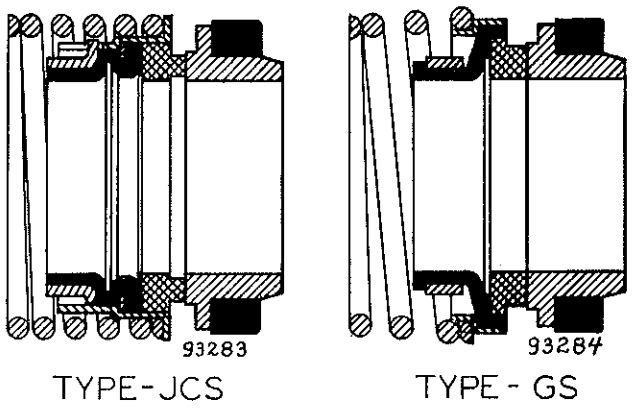
Form 7674-F
April, 1953

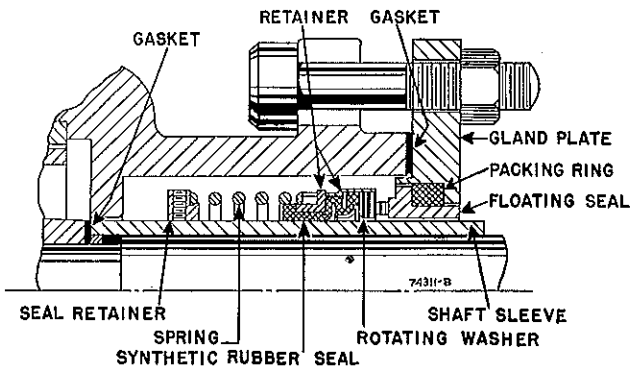
INSTALLATION and OPERATING INSTRUCTIONS
for
MOTORPUMP TYPES JCS and GS SHAFT SEAL

Type JCS and GS shaft seals are supplied as standard equipment in KRVS, KRVSP and RVNP pumps. Seals can be furnished from stock for installation in other pumps of the RV line which are normally equipped with packed type stuffing boxes. For commercial reasons seals of two makes are stocked and, although they are fully interchangeable basic physical dimensions and materials, they are designated as types JCS and GS for shop identification and record purposes—Sectional assembly drawings of each seal type are shown. Ingersoll-Rand will furnish either type seal at their option depending on availability at time it is required.



KRVS Assembly





RV Assembly

SERVICE

JCS and GS Shaft Seals are intended for use on the CAMERON Motorpump for handling relatively clear liquids which will not destroy Hycar or Neoprene sealing members.

Stock Seals are furnished of materials to give service commensurate with that of the pumps in which they are used. Stock Seal materials follow:

Part	Reg. Fitted	Iron	Bronze
Floating Seat	Bronze	Ni-Resist	Ceramic
Rotating Washer	Carbon	Carbon	Carbon
Spring	Stainless	Stainless	Stainless
Retainer	Brass	Steel	Brass
Packing Ring	Neoprene	Hycar	Hycar
Bellows	Neoprene	Hycar	Hycar

Do not use regular fitted seals on hydrocarbons such as gasoline, etc.

Stock Seals may be used for vacuum service up to 20″ Hg. on the Stuffing Box, and for pressures up to 75 P.S.I.G.

Normal temperature limits range from minus 30° to plus 180°F. When handling abnormal liquids such as strong acids or alkalies, the maximum operating temperature must be limited. Refer to Ingersoll-Rand for recommendations.

CONSTRUCTION

JCS and GS shaft seals are precision equipment and as such should be handled accordingly. Refer to the cut showing installation of this seal in the Motorpump. Sealing takes place between the floating seat and a carbon rotating washer. Through the proper choice of materials for the floating face it is possible to maintain highly polished rubbing surfaces and thus insure a tight seal. The carbon rotating face is sealed against leakage along the shaft by a synthetic rubber sealing ring which is held in place by the retainer. Because of the use of synthetic rubber at this point it is evident that the unit is very flexible and the rotating washer is practically self aligning. A spring provides the thrust necessary to maintain the proper contact between the sealing faces.

ASSEMBLY—RV PUMPS

Seals may be installed in pumps already in the field or may be furnished in new pumps. For installation in the field in pumps having 1⅛″ O.D. Shaft Sleeves, the original standard Sleeves may be used if not worn below 1.122″ O.D. at any point of contact with the synthetic rubber seal. (See cut). For pumps having larger Shaft Sleeves, a special Sleeve is furnished. With the exception of the 1MRVN Model A pump, all standard pump stuffing boxes will accommodate these seals. Before inserting this seal in a 1MRVN Model A pump, the box must be bored through at the original diameter.

With the 1⅛″ Seal, a separate retaining ring is furnished, and, as shown in cut, a setting of $1\frac{19}{32}$″ from outside of Gland must be made. To obtain this setting, the Stuffing

Box and Shaft Sleeve are placed in their proper location on the pump. A line is scribed on the Shaft Sleeve directly under end of the Stuffing Box. The Stuffing Box is then removed and Seal parts—Gland and Gasket, put on the Sleeve in the relationship shown in the cut. The retaining ring may then be set 1 19/32" from the scribed mark on the Shaft Sleeve. After locating retaining ring, set screws should be firmly tightened and threads "peened over". Pump may then be assembled.

With Sleeves larger than 1 1/8" O.D., seal setting is automatically established by the shoulder machined on the special Shaft Sleeve furnished. This sleeve has a smaller diameter than that used in a packed box and the keyway is omitted. As there is little frictional drag from the seal, the omission of the shaft sleeve key is satisfactory.

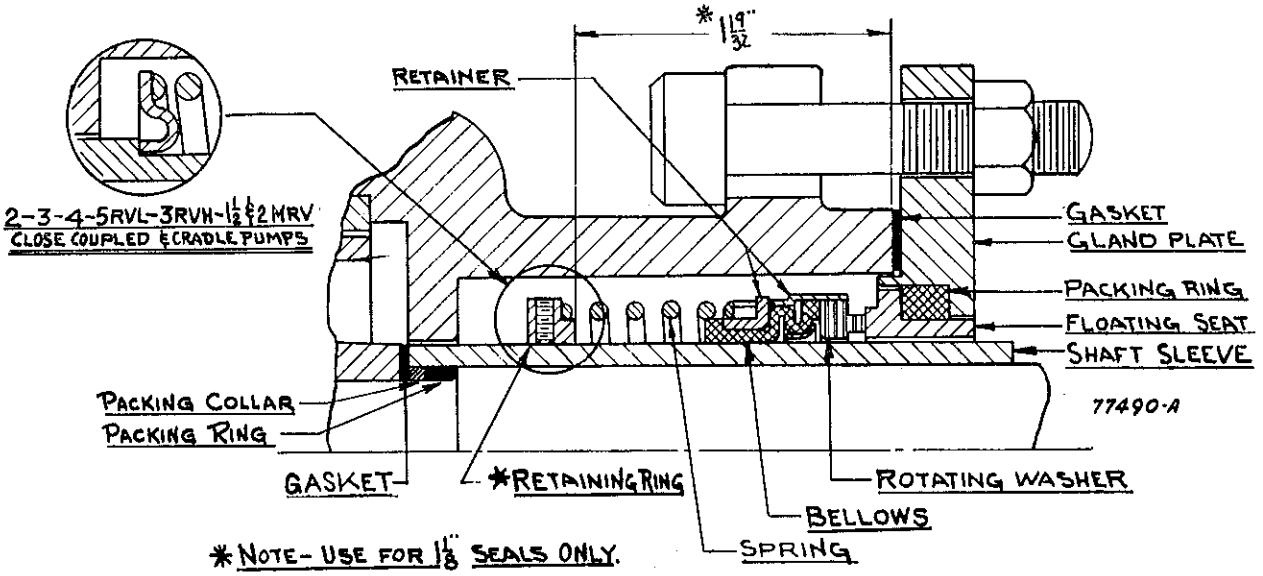
Details of assembly and disassembly of each particular pump are given in pump instruction manual 7720-E, 7721-E and 7758-B. Before assembling the seal in a pump all parts should be thoroughly cleaned. The rubber packing ring and floating seat should be installed in the gland plate before assembly on the shaft sleeve. Oil the rubber portion and be sure the floating seat is firmly and squarely in place. Avoid cramping and distorting the seating surface.

Be sure shaft on which seal is placed is polished clean and free from any foreign material. Oil shaft so that portion of seal fitting snuggly to shaft can be pushed over it to location without undue force. The seal should be pushed on the shaft sleeve until the ends of the spring rest firmly against the supporting shoulders on the sealing member and the retainer. Final compression of the spring takes place when the gland is bolted in place. The sealing faces will then automatically establish themselves in the correct operating position.

After mounting the seal on the shaft sleeve, the pump may be reassembled using particular care not to mar the sealing surfaces. Faces should be carefully cleaned before they are brought in contact. Oil should be placed on the rubbing surfaces to avoid abrasion of seat and washer faces when starting.

The use of the Seal in a dead ended box is not recommended. A small circulation thru and around the seal should be provided to prevent excessive temperatures at the seal. "All RV heavy duty pumps, having cored internal seal passages, are shipped with a special fixed orifice type internal seal when a mechanical seal is used. The fixed orifice will allow passage of sufficient liquid for best seal operation. In ordering seal parts for conversion from packed stuffing box in the field, a fixed orifice bushing should be specified." On the RVN standard duty it is suggested that the external seal connection be piped to one of the vents on the casing. If the liquid has dirt in suspension, a suitable strainer in this line will contribute to longer seal life. On KRVS pumps, to prevent air binding and dry seal operation, the 1/8" pipe plug in the supporting head should be unscrewed to vent air from the seal chamber when starting.

After pumps have been in service they should not be drained and allowed to stand dry for extended periods. Pumps should be kept full of liquid to avoid shrinkage of synthetic members in seals. This applies particularly on hydrocarbon service.



ASSEMBLY: KRVS PUMPS

On this pump the seal is assembled on the impeller hub instead of a shaft sleeve. The floating seat is pressed into the supporting head instead of the gland plate. The technique of installation is the same as described above. Details of the assembly of the KRVS pump is covered in Form 7707E.

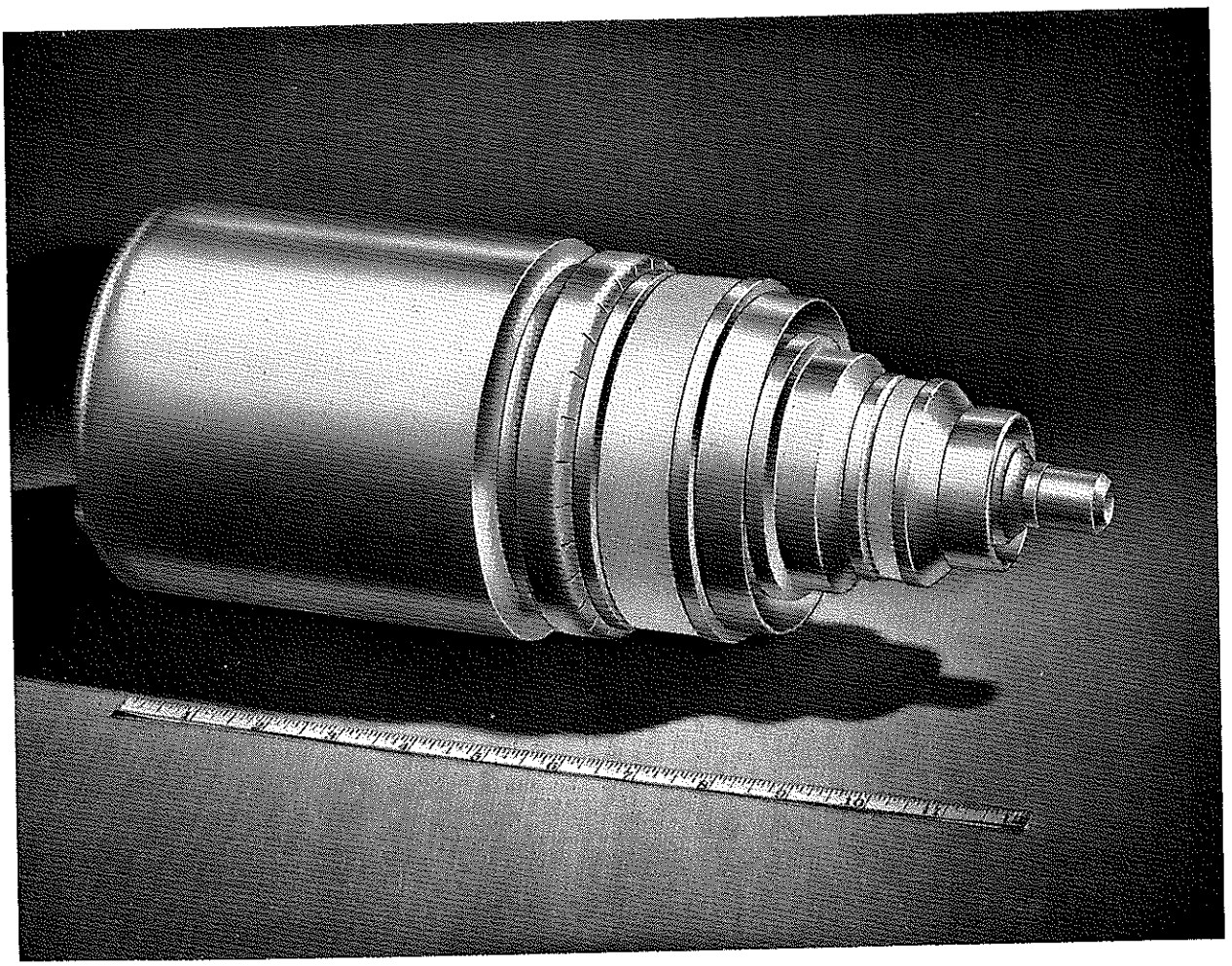
OPERATION

The seals may leak a few drops per minute when just started, but this should stop after a few hours operation. Vent seal chamber on KRVS pumps when starting.

Excessive seal leakage may be due to improper assembly, worn sealing faces, improper sealing ring fit, broken carbon ring, etc.

The compression of the friction rings should take care of any wear that occurs over an extended period. If excessive wear is encountered, it may be due to the following:

1. Corrosion of seal faces due to character of liquid pumped.
2. Excessive amounts of abrasive material in liquid causing an accumulation around the rotating assembly which results in faces opening up and allowing grit between them.
3. Improper spring load caused by spring itself or improper setting of retaining ring.
4. Dry seal operation and subsequent scoring of seal faces due to improper venting or circulation through seal chamber.



TETRODE

25-KILOWATTS VHF TELEVISION OUTPUT
VHF TETRODE
GROUNDED-GRID CIRCUITS

WATER COOLED
METAL AND CERAMIC
GAIN IN EXCESS OF 10

The GL-6251 is a four-electrode, water-and-forced-air-cooled transmitting tube for use as a power amplifier or oscillator in grounded-grid circuits with both grids maintained at radio-frequency ground potential. The output circuit is connected between the anode and the screen grid. The anode is capable of dissipating twenty-five kilowatts. The cathode is a thoriated-tungsten filament. Maximum ratings apply up to 220 megacycles.

In Class B grounded-grid broadband television amplifier service this tube has a useful synchronizing peak-power output of twenty-five kilowatts at 220 megacycles. Because of its ratings, the tube is also well adapted to use in dielectric-heating equipment.

High operating efficiency is assured because of the close spacing of the tube electrodes, the ring-seal construction, and the low-loss factor due to the silver-plated external parts and the ceramic insulator. The ring-seal design permits quick plug-in installation. In addition, the grounded-grid construction eliminates the necessity for neutralization in a properly designed circuit.

GENERAL ELECTRIC

Supersedes ET-T1060 dated 2-54

TECHNICAL INFORMATION

GENERAL

Electrical	Minimum	Bogey	Maximum	
Filament Voltage	5.25	5.5	5.75	Volts
Filament Current at 5.5 Volts	....	190	....	Amperes
Filament Starting Current	....	....	360	Amperes
Filament Cold Resistance	....	0.004	....	Ohms
Filament Heating Time	30	....	....	Seconds
Amplification Factor, G_2 to G_1				
E_b=1000 Volts, I_b=0.1 Amperes	....	20	...	
Peak Cathode Current*	....	....	30	Amperes
Direct Interelectrode Capacitances				
Grounded-Grid Circuit				
Cathode-Plate†	....	0.06	....	$\mu\mu$f
Input	....	75	....	$\mu\mu$f
Output	....	27	....	$\mu\mu$f

Mechanical

Mounting Position—Vertical		
Net Weight, approximate	15	Pounds

Thermal

Type of Cooling—Water and Forced Air		
Water Cooling		
Water Flow		
Anode	12 Min	Gallons per Minute
Water Pressure	80 Max	Pounds per Square Inch
Pressure Drop at Rated Flow	13	Pounds per Square Inch
Outlet Water Temperature	70 Max	C
Air Cooling		
Air Flow		
Anode Seal	30 Min	Cubic Feet per Minute
Filament Seal	15 Min	Cubic Feet per Minute
Grid-to-Grid Seal	10 Min	Cubic Feet per Minute
Ceramic Temperature	200 Max	C

MAXIMUM RATINGS AND TYPICAL OPERATION

RADIO-FREQUENCY AMPLIFIER—CLASS B TELEVISION SERVICE

Synchronizing-Level Conditions Per Tube Unless Otherwise Specified

Maximum Ratings, Absolute Values

DC Plate Voltage	7000 Max	Volts
⊕ DC Grid-No. 2 Voltage	750 Max	Volts
DC Plate Current	8 Max	Amperes
Plate Input	50 Max	Kilowatts
⊕ Grid-No. 2 Input‡	350 Max	Watts
□DC Grid-No. 2 Current	0.250 Max	Amperes
Plate Dissipation	25 Max	Kilowatts
Grid-No. 1 Dissipation	150 Max	Watts
□DC Grid-No. 1 Current	0.7 Max	Amperes

Typical Operation—Grounded-Grid Circuit up to 216 Megacycles

Bandwidth 7 Megacycles, 1 Decibel Voltage		
⊕ DC Plate Voltage	6800	Volts
⊕ DC Grid-No. 2 Voltage	700	Volts
⊕ DC Grid-No. 1 Voltage	−20	Volts
Peak RF Plate Voltage		
⊕ Synchronizing Level	4800	Volts
⊕ Pedestal Level	3600	Volts
Peak RF Driving Voltage		
⊕ Synchronizing Level	350	Volts
⊕ Pedestal Level	250	Volts

TECHNICAL INFORMATION (CONT'D)

Typical Operation (Cont'd)

DC Plate Current		
⊕ Synchronizing Level	7.5	Amperes
⊕ Pedestal Level	5.8	Amperes
DC Grid-No. 2 Current	0.05	Amperes
⊕ Pedestal Level§		
DC Grid-No. 1 Current		
⊕ Synchronizing Level	0.90	Amperes
⊕ Pedestal Level	0.55	Amperes
Driving Power at Tube, approximate		
⊕ Synchronizing Level	2.3	Kilowatts
⊕ Pedestal Level	1.3	Kilowatts
Power Output, approximate		
⊕ Synchronizing Level π	25	Kilowatts
⊕ Pedestal Level π	15	Kilowatts

* Maximum usable cathode current (plate current plus current to each grid) for any condition of operation.

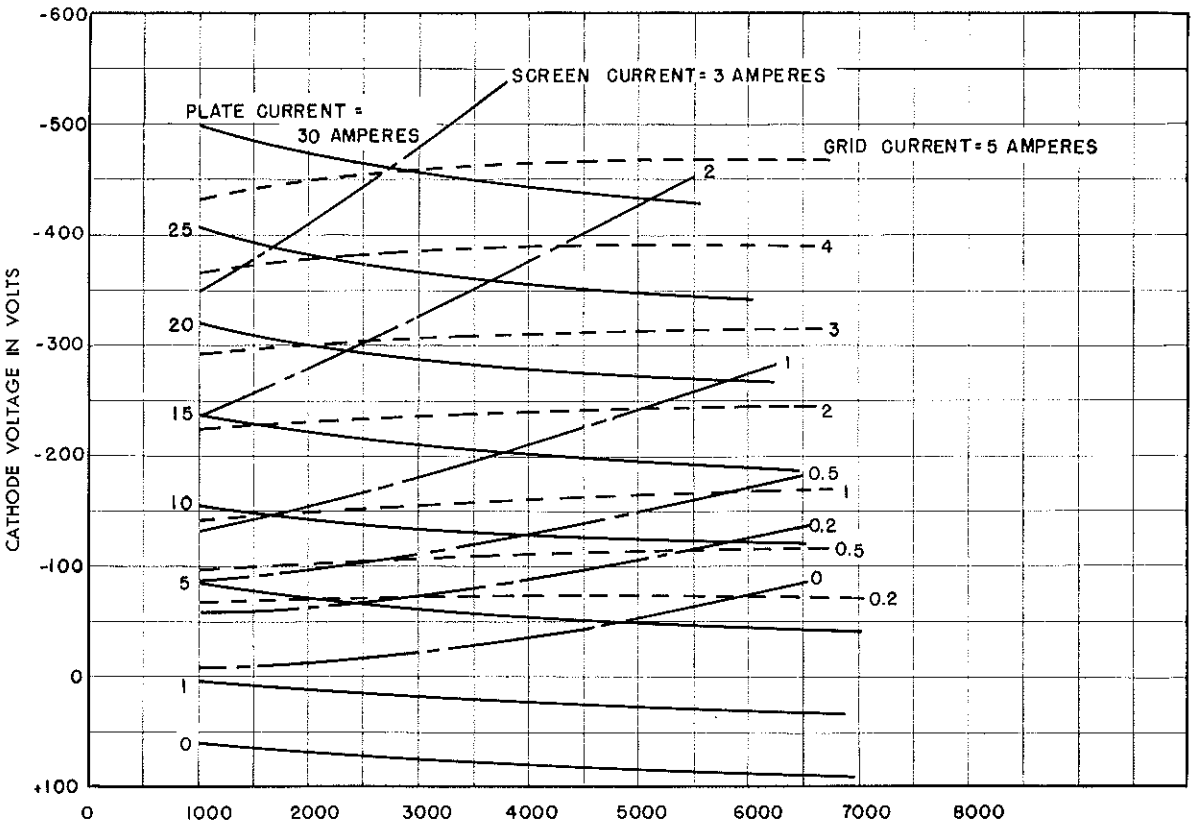
† Measured with 12-inch diameter flat metal disk attached to the screen-grid terminal and grounded.

‡ Calculated from characteristic curve only. This value includes dissipation transferred from driving power. Maximum allowable screen input as indicated by measured DC current and voltage is much lower because of secondary screen emission.

§ May vary considerably due to slight changes in load impedance. Negative values of screen current are frequently encountered.

π Useful power output including power transferred from driver stage.

⊕ Denotes a change. □Denotes an addition.



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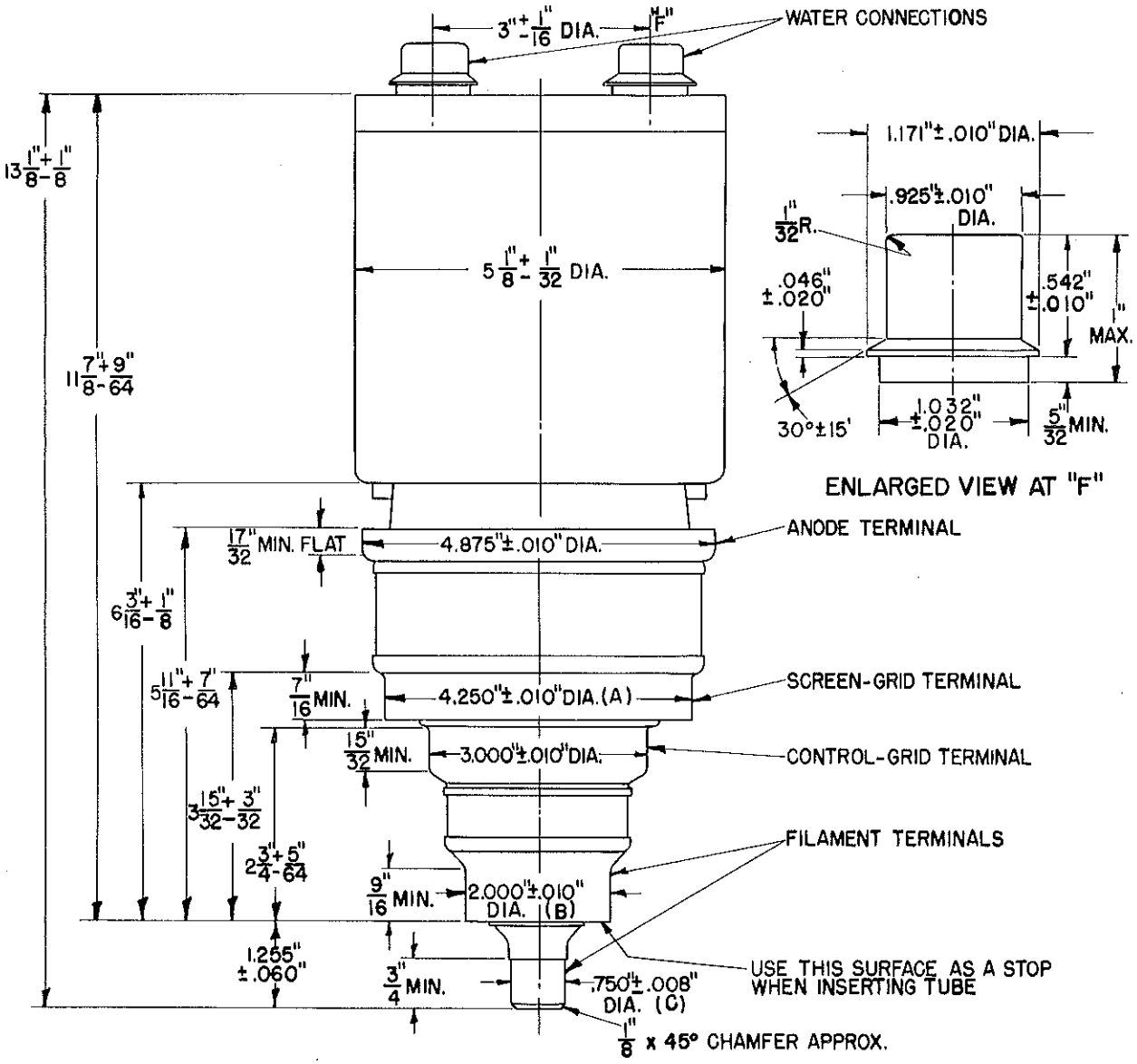
12-30-54

CONSTANT CURRENT CHARACTERISTICS
SCREEN VOLTAGE = 700 VOLTS, CONTROL-GRID GROUNDED
ELECTRODE VOLTAGES MEASURED TO GROUND



(A) MAX. ECCENTRICITY .040"
(B) MAX. ECCENTRICITY .040"
(C) MAX. ECCENTRICITY .050"
WITH RESPECT TO CENTERLINE DETERMINED BY CENTERS OF ANODE TERMINAL & CONTROL-GRID TERMINAL.

N-20726AZ

12-28-54

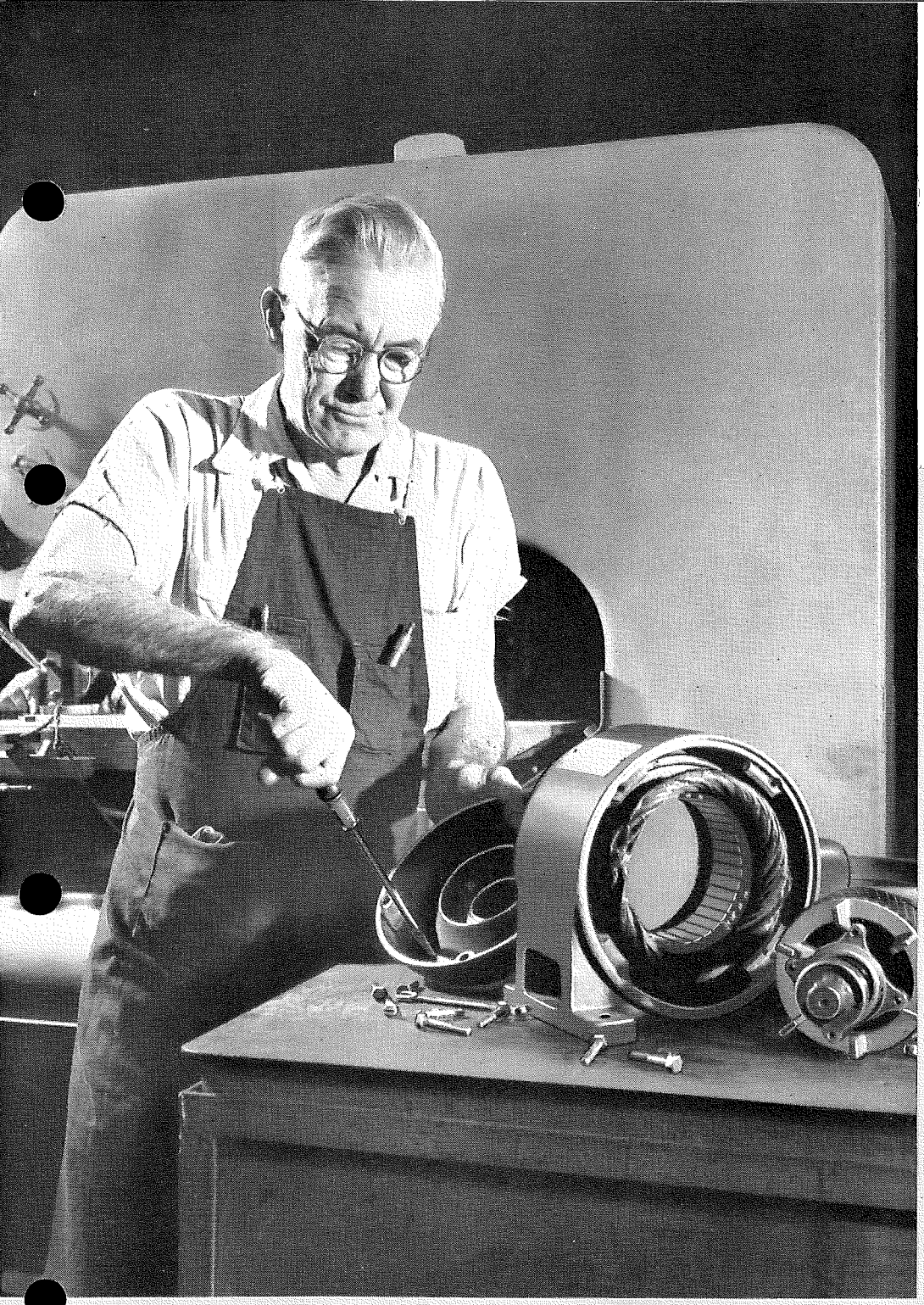
TUBE DEPARTMENT

GENERAL ELECTRIC

Schenectady 5, N. Y.

PRINTED IN U.S.A.

INDEX



Small-Motor Service Station Plan

. . . Provides nationwide exchange and repair service on G-E fractional-hp and integral-hp motors and generators

GENERAL ELECTRIC

Small-motor Service Station Plan

LIST OF G-E AUTHORIZED SMALL-MOTOR SERVICE STATIONS (Continued)

Oklahoma

Oklahoma City	Hacket Elec. Co., 602 N. Douglas
Tulsa	Dodge Elec. Co., 211 S. Lansing

Oregon

Coos Bay	Marsh Field Elec. Co., 285 S. Broadway
Eugene	Bishop Elec. Co., 1991 W. 6th Ave.
Klamath Falls	Hahn Elec. Co., 735 Commercial St.
Medford	Gage Electric Motor Serv. Inc., 112 N. Front St.
Portland	G.E. Service Shop, Swan Island
Roseburg	Industrial Elec. Service Co., 118 S. Stephens St.

Pennsylvania

Allentown	Curio Elec. Co., 825 S. 5th St.
Altoona	Blair Elec. Co., 3108 Pleasant Valley Blvd.
Bradford	Bovaird and Co., 181 Main St.
DuBois	Keystone Elec. Mtr., 51 Delaware St.
Erie	G.E. Serv. Shop, 525 French St.
Johnstown	G.E. Service Shop, 841 Oak St.
Philadelphia	G.E. Service Shop, 429 N. Seventh St.
Pittsburgh	G.E. Service Shop, 6519 Penn. Ave.
Reading	General Engng. Co., Inc., 813 Walnut St.
Scranton	Scranton Elec. Const. Co., 420 Dix Court
Williamsport	Prior and Sallada Co., Inc., 231 Pine St.
York	G.E. Service Shop, 54 N. Harrison St.

Rhode Island

Pawtucket	New England Mach. & Elec. Co., 77 Bayley
Providence	J & H Elec. Co., 200 Richmond St.

South Carolina

Columbia	Rotureau Elec. Co., 1823 Main St.

South Dakota

Aberdeen	Nelson Auto Elec. Co., 309 S. First St.
Rapid City	Industrial Elec. Supply Co., 2332 W. Main St.
Sioux Falls	Malloy Electric Mtr. Rep., 307 E. 12th St.

Tennessee

Chattanooga	Chattanooga Arm. Wks., Inc., 1215 Duncan Ave.
Kingsport	Kingsport Arm. & Mtr. Wks. Inc., 323–325 E. Market St.
Knoxville	Tenn. Elec. Mtr. Serv., 109 Jennings Ave.
Memphis	Tri-State Arm. & Elec. Wks., 321 E. Butler
Nashville	Nashville Arm. Wks., 303 8th Ave. South

Texas

Amarillo	C & S Elec. Co., 1717 E. 10th St.
Corpus Christi	Bradley Mtr. & Arm. Wks., 1920 N. Port Ave.
Dallas	G.E. Service Shop, 3202 Manor Way
El Paso	Elec. Mtr. Co., 1517 Wyoming St.
Fort Worth	Central Elec. Co., 712 N. Main St.
Houston	G.E. Serv. Shop, 5534 Harvey Wilson Dr.
Longview	Longview Elec. Motor Co., 317 E. Cotton St.
Lubbock	Lubbock Elec. Co., 1944 Texas Ave.
Marshall	Rudd Mtr. Co., 109 E. Burleson St.
McAllen	McAllen Armature Works, 1306 Chicago Ave.
San Antonio	San Ant. Arm. Wks., Inc., 637 N. Flores St.
Wichita Falls	United Elec. Serv. Co., 11th & Scott Sts.

Utah

Salt Lake City	G.E. Serv. Shop, 301 S. Seventh West St.

Virginia

Norfolk	Caddell Elec. Co., 245 Court St.
Richmond	G.E. Service Shop, 1403 Ingram Ave.
Roanoke	Riles Arm. Winding, 521 Rorer Ave., S.W.

Washington

Bellingham	Mac & Mac Elec., 1310 Indian St.
Ephrata	Gardner Elec., 1007 B, S.W.
Everett	Indust. Elec. Supply Co., 2701 Hewitt Ave.
Mount Vernon	Mount Vernon Elec. Motor Serv., 819 Cleveland St
Pasco	Tri-Co. Elec. Works, Inc., Indiana and "A" Sts.
Seattle	G.E. Service Shop, 3422 First Ave., S.
Spokane	G.E. Service Shop, S. 155 Sherman St.
Tacoma	Stone & Trobridge, 21st & Jefferson
Walla Walla	Harold Elec. Co., 211 E. Alder St.
Wenatchee	Pacific Elec. Serv., 742½ S. Wenatchee Ave.

West Virginia

Charleston	G.E. Service Shop, 306 McCorkle Ave.

Wisconsin

Appleton	G.E. Serv. Shop, County Highway P
La Crosse	Lackore Elec. Mtr. Rep., Inc., 201 Main St.
Madison	Elec. Mtr. Serv. Co., 323 E. Wilson St.
Milwaukee	G.E. Serv. Shop, 940 W. St. Paul Ave.
Wausau	Snapp Elec. Wks., 416 Grand Ave.

Wyoming

Casper	Elec. Serv. Co., 1120 East B St.

SERVICE IN CANADA

In Canada, any requests for in-warranty service can be referred to the following addresses where shipping information for inoperative motors can be obtained. For service on fractional-hp shaded-pole motors in Canada, refer to the device manufacturer.

For shipping instructions for in-warranty service repairs, address requests to:

Product Service Manager
Wholesale Division
Canadian General Electric Company, Ltd.

at the following locations*:

Alberta

Calgary	502 11th Ave., West
Edmonton	10147 104th St.

British Columbia

Vancouver	1095 Pender St., West
Victoria	711 Broughton St.

Manitoba

Winnipeg	265 Notre Dame Ave., West (for motors through 40 frame) 945 St. James St. (for motors above 60 frame)

New Brunswick

St. John	101 Germain St., P.O. Box 340

Newfoundland

St. John's	434 Water St., P.O. Box 134

Nova Scotia

Halifax	129 Hollis St., P.O. Box 460

Ontario

Fort William	1034 Memorial Ave.
Hamilton	100 James St., South
London	174 King St.
New Leskeard	Whitewood Ave., P.O. Box 760
Ottawa	172 Richmond Rd., P.O. Dist. 4
Sudbury	164 Elm St., P.O. Box 398
Toronto	1350 Castlefield Ave.
Windsor	180 Church St.

Quebec

Montreal	1000 Beaver Hall Hill, P.O. Box 340
Quebec City	130 St. Dominique St., P.O. Box 1545
Sherbrooke	33 Belvidere St., South, P.O. Box 743
Trois Rivieres	2369 Royale St., P.O. Box 1087

Saskatchewan

Regina	1850 Cornwall St.
Saskatoon	401 2nd Ave., North

* On motors larger than 60-diameter frame (7½-in. diameter), refer to the addresses in Montreal, Toronto and Vancouver, and to 945 St. James Street, Winnipeg.

For further information, contact your nearest G-E Apparatus Sales Office

GENERAL ELECTRIC

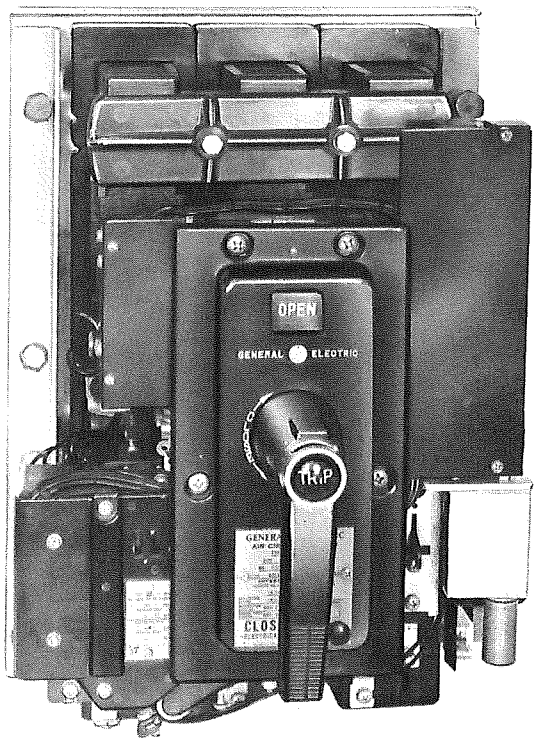
SCHENECTADY, N. Y.

3-54 (60M) 100, 3800

GEF-3506A
Supersedes GEF-3506

RENEWAL PARTS

TYPE AK-1-15 AND AK-1-25 AIR CIRCUIT BREAKERS
TYPE AKF-1 FIELD BREAKERS



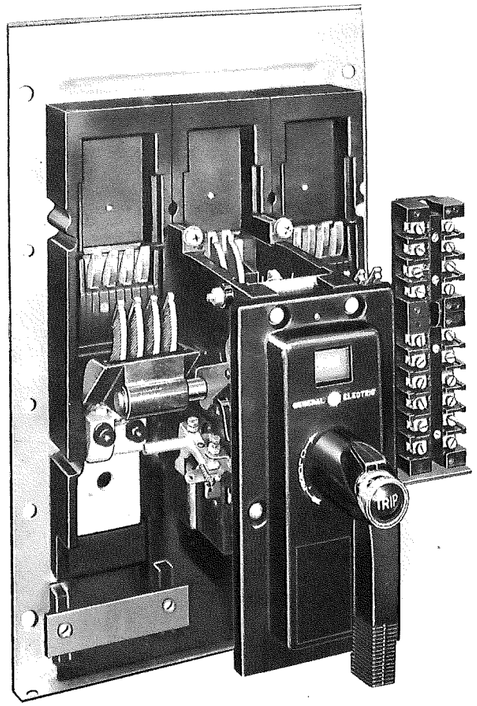
(PHOTO 8007142)

Fig. 1. Type AK-1-15 air circuit breaker with time-delay undervoltage tripping device, front view

NOTE: All reference to "right" and "left" designate the location of the part when facing the operating mechanism end of the breaker.

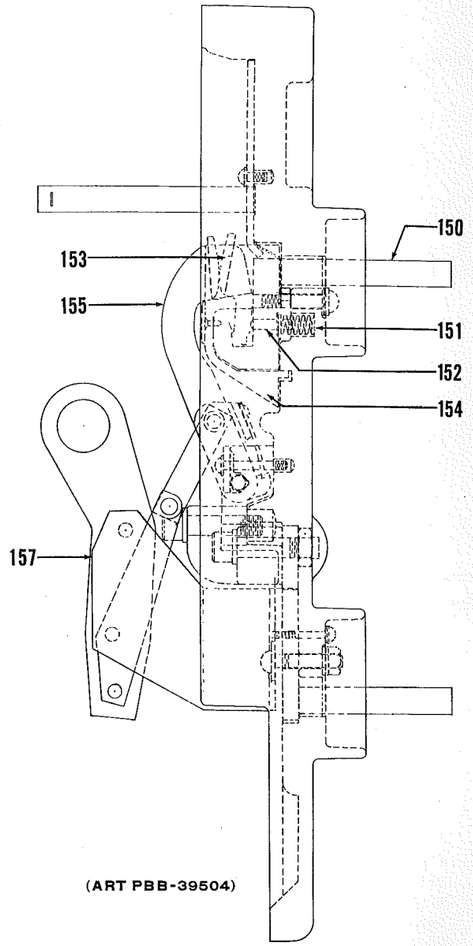
ORDERING INSTRUCTIONS

1. Always specify the complete nameplate data of the breaker.
2. Specify the quantity, catalog number (if listed), reference number (if listed), description, and this bulletin number.
3. CAUTION: When local facilities for breaker recalibration are not available, the breaker should be forwarded to the nearest G-E Service Shop, or to the General Electric Company, 6901 Elmwood Ave., Philadelphia 42, Pa.
4. Standard hardware, such as screws, bolts, nuts, washers, etc., is not listed in this bulletin. Such items should be purchased locally.
5. For prices, refer to the nearest office of the General Electric Company.



(PHOTO 8005192)

Fig. 21. Type AKF-1 field breaker



(ART PBB-39504)

Fig. 22. Center pole unit

NOTE: Except for the parts listed below, the Type AKF Field Breaker has the same renewal parts as listed for the Type AK-1-25 breakers.

Ref. No.	Catalog No.		No. Per Breaker	Description
	Center Pole	Outside Pole		
150	6403109G4	6403109G4	3	Upper stud
151	6403324	6372917	#	Stationary contact spring
152	6248887P2	6248887P2	10	Spring pin
153	6372777G2	6372777G2	#	Stationary contact finger
154	6403687P2	6403687P2	3	Upper stud cap
155	6317995G3	6317995G2	¶	Movable contact assembly
*156	6444433P1	6317719P3	¶	Insulator
157	6319474G1	----------	1	Switch mechanism assembly
*158	6403321	----------	1	Switch mechanism spring

* Not illustrated.
\# 2 furnished on center pole; 4 furnished on each outside pole.
¶ 1 furnished on center pole; 2 furnished on each outside pole.

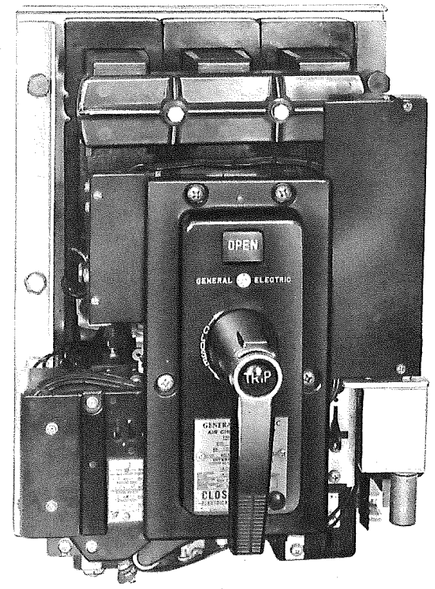
LOW VOLTAGE SWITCHGEAR DEPARTMENT, GENERAL ELECTRIC COMPANY, PHILADELPHIA, PA.

3-54 (8M)
10-54 (8M)

Handbook Ref. 6726 PRINTED IN U.S.A.

RENEWAL PARTS

TYPE AK-1-15 AND AK-1-25 AIR CIRCUIT BREAKERS
TYPE AKF-1 FIELD BREAKERS



(PHOTO 8007142)

Fig. 1. Type AK-1-15 air circuit breaker with time-delay undervoltage tripping device, front view

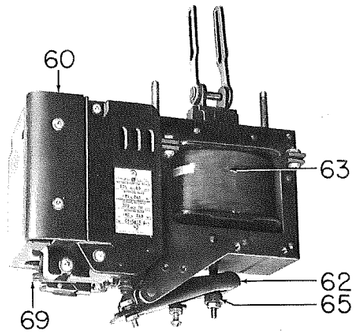
NOTE: All reference to "right" and "left" designate the location of the part when facing the operating mechanism end of the breaker.

ORDERING INSTRUCTIONS

1. Always specify the complete nameplate data of the breaker.
2. Specify the quantity, catalog number (if listed), reference number (if listed), description, and this bulletin number.
3. CAUTION: When local facilities for breaker recalibration are not available, the breaker should be forwarded to the nearest G-E Service Shop, or to the General Electric Company, 6901 Elmwood Ave., Philadelphia 42, Pa.
4. Standard hardware, such as screws, bolts, nuts, washers, etc., is not listed in this bulletin. Such items should be purchased locally.
5. For prices, refer to the nearest office of the General Electric Company.

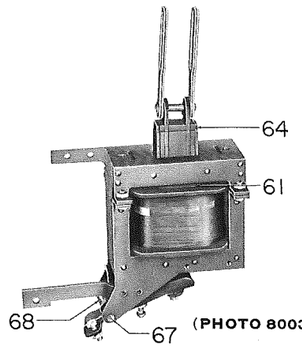
GENERAL ELECTRIC

Data subject to change without notice.



(PHOTO 8004005)

Fig. 11. Solenoid operating mechanism and solenoid control device



(PHOTO 8003992)

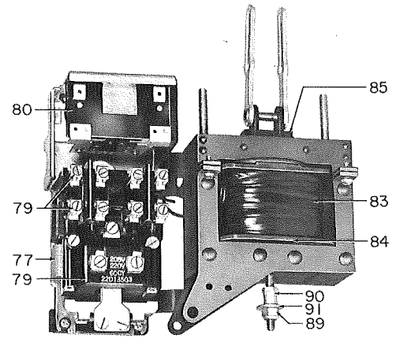
Fig. 12. Solenoid operating mechanism

Ref. No.	Catalog No.	Description
59	176L137G1	%Conversion parts for stationary manual breaker; with push button
59	176L137G2	%Conversion parts for stationary electrically operated breaker; with push button
59	176L137G3	%Same as Cat. 176L137G1 except for drawout breaker
59	176L137G4	%Same as Cat. 176L137G2 except for drawout breaker
59	176L137G5	%Parts to convert stationary manual breaker to electrically operated; with push button
59	176L137G6	%Parts to convert old electrical breaker to new electrical system; no push button
59	176L137G7	Same as 176L137G5 except for drawout breaker
59	176L137G8	Same as 176L137G6 except for drawout breaker

% Complete set of parts furnished for converting from old control system to new-design control system. Parts include relays and prop switch, wiring and instructions for installation. When ordering SPECIFY VOLTAGE AND FREQUENCY.

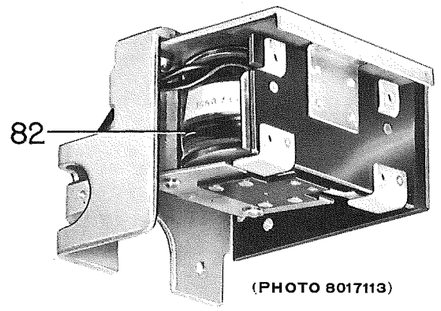
Ref. No.	No. Per Breaker AK-1-15- Δ	AK-1-15- -1	AK-1-25- Δ	AK-1-25- -1	Catalog No.	Description
#60	1	1	1	1	6319467G3	Solenoid control device, d-c
#60	1	1	1	1	6319467G1	Solenoid control device, a-c
61	2	2	2	2	6372797P1	Guide
62	1	1	1	1	6372800P1	Lever
§ 63	1	1	1	1	See Table I	Solenoid mechanism coil
64	1	1	1	1	6403836P1	Armature and link assembly
65	1	1	1	1	6444434P1	Collar
*66	1	1	1	1	6444008P1	Pin (use with link Ref. 64)
67	1	1	1	1	6444104P1	Pin
68	1	1	1	1	6403318	Return spring
69	1	1	1	1	CR1070-C122A3	Switchette
§ *70	1	1	1	1	See Table I	Solenoid control device coil
*71	2	2	2	2	6403075P1	Main stationary contact
*72	1	1	1	1	6403076P1	Main moving contact
*73	1	1	1	1	6302791	Main contact spring, d-c
*73	1	1	1	1	6302797	Main contact spring, a-c
¶ *74	1	1	1	1	6444849P1	Movable contact pin, seal-in
¶ *74	1	1	1	1	6444848P1	Movable contact pin, seal-in
¶ *75	2	2	2	2	6404345P1	Stationary contact strip, seal-in
*76	1	1	1	1	6302795	Beam return spring, d-c
*76	1	1	1	1	6403351	Beam return spring, a-c
	Δ	-1	Δ	-1		

* Not illustrated. Δ No suffix used for original breaker model.
\# When ordering specify coil voltage and frequency.
¶ These parts must be furnished together as individual parts are not interchangeable.
§ Recommended for normal maintenance



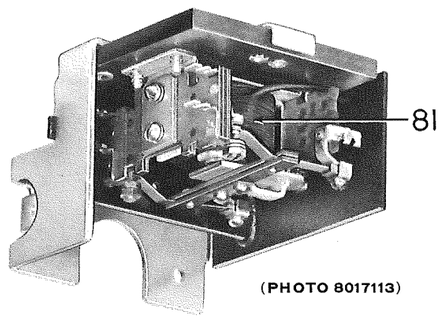
(PHOTO 8017111)

Fig. 13. Closing solenoid and solenoid control relays



(PHOTO 8017113)

Fig. 14. "Y" relay for type AK-1-15-4 and AK-1-25-4 relay



(PHOTO 8017113)

Fig. 15. "Y" relay for type AK-1-15A, -2, -3, and AK-1-25A, AK-1-25-2, AK-1-25-3

Ref. No.	No. Per Breaker AK-1-15- A	-2	-3	-4	AK-1-25- A	-2	-3	-4	Catalog No.	Description
77	1	1	1	1	1	1	1	1	See Table II	"X" relay, complete
§ 78	1	1	1	1	1	1	1	1	See Table II	Coil ("X" relay)
§ 79	1	1	1	1	1	1	1	1	101X100	#Contact kit ("X" relay)
80	¶	¶	¶	1	¶	¶	¶	1	See Table III	"Y" relay, complete
§ 81	†	†	†	-	†	†	†	-		Coil ("Y" relay)
§ 82	-	-	-	1	-	-	-	1	See Table III	Coil ("Y" relay)
§ 83	1	1	1	1	1	1	1	1	See Table I	Coil (closing solenoid)
84	2	2	2	2	2	2	2	2	6372797P1	Guide
85	1	1	1	1	1	1	1	1	372A354G1	Armature and link assembly
*86	1	1	1	1	1	1	1	1	6444008	Pin (use with links on Ref. 85)
*87	1	1	1	1	1	1	1	1	9921661P4	Prop switch
*88	1	1	1	1	1	1	1	1	372A214G1	Bracket (prop switch)
89	1	1	1	1	1	1	1	1	175L329P304	Stop nut
90	1	1	1	1	1	1	1	1	377A811P2	Nut
91	1	1	1	1	1	1	1	1	175L329P306	Washer

\# Kit contains stationary and movable contacts with compression springs and screws for four poles.
¶ "Y" relay supplied will be the new design which is interchangeable with the old design.
* Not illustrated.
§ Recommended for normal maintenance † Order complete relay under ref. No. 80

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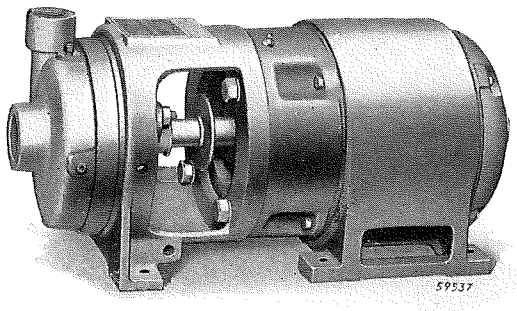

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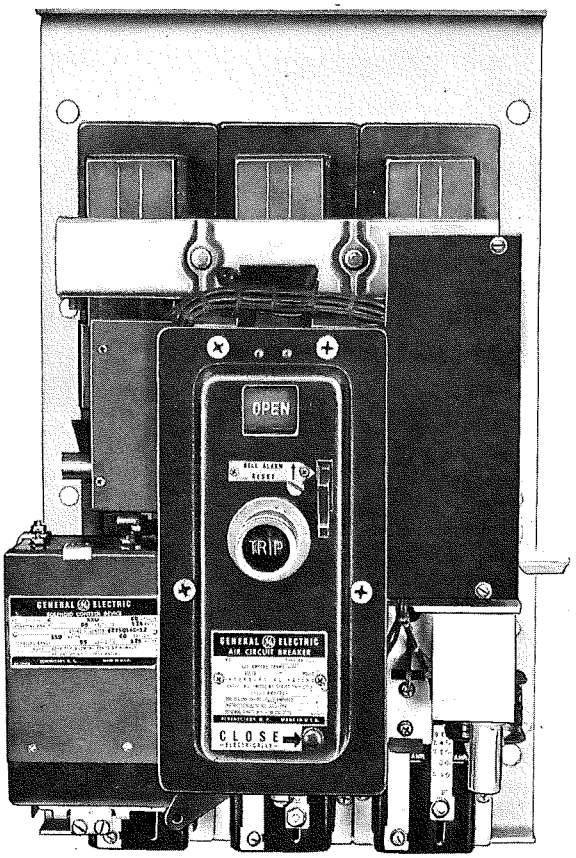
AIR CIRCUIT BREAKERS



Types
AK-1-15 and AK-1-25
Electrically Operated

GENERAL ELECTRIC

WHEN YOU NEED SERVICE

GEZ-85R

IF YOU NEED TO REPAIR, recondition, or rebuild any electric apparatus, a G-E service shop near you is available day and night, seven days a week, for work in the shops or on your premises. Latest factory methods and genuine G-E renewal parts are used to maintain the original performance of your G-E equipment. For full information about these services, contact the nearest service shop or sales office listed below:

APPARATUS SERVICE SHOPS

Atlanta—Chamblee, Ga.....4639 Peachtree Indus. Blvd.
Baltimore 30, Md.....920 E. Fort Ave.
Boston—Medford 55, Mass.....Mystic Valley Pkwy.
Buffalo 11, N. Y.....318 Urban St.
Charleston 28, W. Va..306 MacCorkle Ave., S.E.
Charlotte, N. C.....2328 Thrift Road
Chicago 80, Ill.....849 S. Clinton St.
Cincinnati 2, Ohio.....444 W. Third St.
Cleveland 4, Ohio.....4966 Woodland Ave.
Columbus 15, Ohio.....213 Cozzens St.
Dallas 9, Texas.....3202 Manor Way
Denver 5, Colo.....3353 Larimer St.
Detroit 2, Mich.....5950 Third Ave.
Houston 20, Texas..5534 Harvey Wilson Drive
Johnstown, Pa.....841 Oak St.
Kansas City 8, Mo.....819 E. 19th St.
Los Angeles 1, Calif.....6900 Stanford Ave.
Milwaukee 3, Wisc.....940 W. St. Paul Ave.
Minneapolis 12, Minn.....2025 49th Ave., N.
New York 14, N. Y.....416 W. 13th St.
Philadelphia 23, Pa.....429 N. Seventh St.
Pittsburgh 6, Pa.....6519 Penn Ave.
Portland 18, Oregon....2727 N.W. 29th Ave.
Richmond 24, Va.....1403 Ingram Ave.
St. Louis 10, Mo.....1115 East Road
San Francisco 3, Calif.....1098 Harrison St.

For service outside the United States, Canada, and Hawaii, consult the nearest office of the International General Electric Company.

Salt Lake City 4, Utah.301 S. Seventh West St.
Seattle 4, Wash.....3422 First Ave., S.
Spokane 3, Wash.....S. 155 Sherman St.
Toledo 4, Ohio.....1 So. St. Clair St.
York, Pa.....54 N. Harrison St.
Youngstown 5, Ohio....272 E. Indianola Ave.

APPARATUS SALES OFFICES

Abilene, Texas.....442 Cedar St.
Akron 8, Ohio.....335 S. Main St.
Albany 7, N. Y.....90 State St.
Albuquerque, N. Mex....323 Third St., S.W.
Alexandria, La.....720 Murray St.
Allentown, Pa.....1014 Hamilton St.
Amarillo, Texas.....719 Amarillo Bldg.
Appleton, Wisc.....531 W. College Ave.
Atlanta 3, Ga..Peachtree Rd. at 28th St., N.W.
Augusta, Ga.....423 Masonic Bldg.
Augusta, Me.....15 Grove St.
Bakersfield, Calif.....211 E. 18th St.
Baltimore 1, Md.....111 Park Ave.
Bangor, Maine.....77 Central St.
Battle Creek, Mich.....25 W. Michigan Ave.
Beaumont, Texas.....1385 Calder Ave.
Binghamton, N. Y.....19 Chenango St.
Birmingham 3, Ala.....1804 Seventh Ave., N.
Bismarck, N. Dak.....117½ Fifth St.
Bluefield, W.Va. P.O. Box 447, Appalachian Bldg.
Boston 1, Mass.....140 Federal St.
Buffalo 3, N. Y.....535 Washington St.
Butte, Mont..P.O. Box 836, 103 N. Wyoming St.
Canton 2, Ohio.....700 Tuscarawas St., W.
Cedar Rapids, Iowa.....210 Second St., S.E.
Charleston 28, W. Va..306 MacCorkle Ave., S.E.
Charlotte 1, N. C.....112 S. Tryon St.
Charlottesville, Va.....123 E. Main St.
Chattanooga 2, Tenn.....832 Georgia Ave.
Chicago 80, Ill..P.O. Box 5970A, 840 S. Canal St.
Cincinnati 2, Ohio.....215 W. Third St.
Cleveland 4, Ohio.....4966 Woodland Ave.
Columbia 1, S.C..P.O. Box 1434, 1420 Lady St.
Columbus 15, Ohio.....40 S. Third St.
Corpus Christi, Texas.....205 N. Chaparral
Dallas 2, Texas.....1801 N. Lamar St.
Davenport, Iowa.....511 Pershing Ave.
Dayton 2, Ohio.....118 W. First St.
Denver 2, Colo.....650 Seventeenth St.
Des Moines 9, Iowa.....505 W. Fifth Ave.
Detroit 2, Mich.....700 Antoinette St.
Duluth 2, Minn.....14 W. Superior St.
Elmira, N. Y.....Main and Woodlawn Aves.
El Paso, Texas.....109 N. Oregon St.
Erie, Pa.....1001 State St.
Eugene, Ore.....29 W. Eleventh St.
Evansville 19, Ind.....123 N.W. Fourth St.
Fairmont, W. Va.....310 Jacobs Bldg., P.O. Box 1626
Fergus Falls, Minn.....108 N. Court Ave. P.O. Box 197
Flint 3, Mich.....653 S. Saginaw St.
Fort Wayne 2, Ind.....127 W. Berry St.
Fort Worth 2, Texas.....408 W. Seventh St.
Fresno 1, Calif.....407 Patterson Bldg. Tulare and Fulton St.
Grand Rapids 2, Mich..148 Monroe Ave., N.W.
Greensboro, N. C.....301 S. Elm St.
Greenville, S. C.....108 W. Washington St.
Hagerstown, Md.....Professional Arts Bldg.
Harrisburg, Pa.....300 N. Second St.
Hartford 3, Conn.....410 Asylum St.
Houston 1, Texas.....1312 Live Oak St.
Huntsville, Ala.....1107 Times Bldg.
Indianapolis 4, Ind.....110 N. Illinois St.
Jackson, Mich.....120 W. Michigan Ave.
Jackson 1, Miss.....203 W. Capitol St.
Jacksonville 2, Fla.....700 E. Union St.
Jamestown, N. Y...P.O. Box 548, 2 Second St.
Johnson City, Tenn....321-323 W. Walnut St.
Johnstown, Pa.....841 Oak St.
Joplin, Mo..P.O. Box 931, 220½ W. Fourth St.
Kansas City 6, Mo.....106 W. Fourteenth St.
Knoxville 08, Tenn.....602 S. Gay St.
Lansing 8, Mich.....106 W. Allegan St.
Lexington, Ky.....First National Bank Bldg.
Lincoln 8, Nebr.....1001 "O" St.
Little Rock, Ark.....103 W. Capitol Ave.
Los Angeles 54, Calif.....212 N. Vignes St.
Louisville 2, Ky.....455 S. Fourth St.
Macon, Ga.....682 Cherry St.
Madison 3, Wisc.....16 N. Carroll St.
Manchester, N. H.....875 Elm St.
Medford, Ore., P.O. Box 1349, 205 W. Main St.
Memphis 3, Tenn.....8 N. Third St.
Miami 32, Fla.....25 S.E. Second Ave.
Milwaukee 3, Wisc.....940 W. St. Paul Ave.
Minneapolis 3, Minn.....12 S. Sixth St.
Mobile 13, Ala.....54 St. Joseph St.
Montgomery 4, Ala.....205 Montgomery St.
Nashville 3, Tenn.....234 Third Ave., N.
Newark 2, N. J.....744 Broad St.
New Haven 6, Conn.....129 Church St.
New Orleans 12, La.....837 Gravier St.
New York 22, N. Y.....570 Lexington Ave.
Niagara Falls, N. Y.....253 Second St.
Norfolk 10, Va.....229 W. Bute St.
Oakland 12, Calif.....409 Thirteenth St.
Oklahoma City 2, Okla....119 N. Robinson St.
Omaha 2, Nebr.....409 S. Seventeenth St.
Paducah, Ky..P.O. Box 1001, 231 S. Fourth St.
Pasco, Wash.....421 W. Clark St.
Peoria 2, Ill.....309 Jefferson Bldg.
Philadelphia 2, Pa.....1405 Locust St.
Phoenix, Ariz..P.O. Box 4037, 303 Luhrs Tower
Pittsburgh 22, Pa.....535 Smithfield St.
Portland 3, Maine.....477 Congress St.
Portland 7, Ore.....920 S.W. Sixth Ave.
Portsmouth, Ohio..P.O. Box 37, 721 Sixth St.
Providence 3, R. I.....Industrial Trust Bldg.
Raleigh, N. C.....336 Fayetteville St.
Reading, Pa.....31 N. Sixth St.
Richmond 17, Va.....700 E. Franklin St.
Riverside, Calif.....3808 Main St.
Roanoke 16, Va.....920-924 S. Jefferson St.
Rochester 4, N. Y.....89 E. Ave.
Rockford, Ill.....110 S. First St.
Rutland, Vt.....38½ Center St.
Sacramento 14, Calif.....626 Forum Bldg.
Saginaw, Mich.....501 Bearinger Bldg.
St. Louis 2, Mo.....112 N. Fourth St.
Salt Lake City 9, Utah.....200 S. Main St.
San Antonio 5, Texas....310 S. St. Mary's St.
San Diego 1, Calif.....1240 Seventh Ave.
San Francisco 6, Calif....235 Montgomery St.
San Jose 10, Calif.....460 Park Ave.
Savannah, Ga.....4 E. Bryan St.
Seattle 4, Wash.....710 Second Ave.
Shreveport, La.....910 Shelby Bldg.
Sioux City 13, Iowa. 572 Orpheum Electric Bldg.
Sioux Falls, S. D.....306 South Phillips Ave.
South Bend 1, Ind.....112 W. Jefferson Blvd.
Spokane 8, Wash.....S. 162 Post St.
Springfield, Ill.....607 E. Adams St.
Springfield 3, Mass.....1387 Main St.
Stockton, Calif.....11 So. San Joaquin St.
Syracuse 2, N. Y.....113 S. Salina St.
Tacoma 1, Wash.....1202 Washington Bldg.
Tampa 6, Fla.....1206 North A St.
Toledo 4, Ohio.....420 Madison Ave.
Trenton 8, N. J.....214 E. Hanover St.
Tulsa 3, Okla.....320 S. Boston Ave.
Tucson, Ariz..P.O. Box 710, 650 N. Sixth Ave.
Utica 2, N. Y.....258 Genesee St.
Washington 5, D.C.....777–14th St., N.W.
Waterbury 89, Conn.....111 W. Main St.
Waterloo, Iowa.....206 W. 4th St.
Wenatchee, Wash...328 N. Wenatchee Ave.
Wheeling, W. Va.....40 Fourteenth St.
Wichita 2, Kan.....200 E. First St.
Williamston, N. C.....115 E. Main St.
Wilmington 98, Del.....1326 N. Market St.
Worcester 8, Mass.....507 Main St.
York, Pa.....56 N. Harrison St.
Youngstown 5, Ohio....272 E. Indianola Ave.

Hawaii: American Factors, Ltd., P. O. Box 3230, Honolulu 1 **Canada: Canadian General Electric Company, Ltd., Toronto**

GENERAL ELECTRIC

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Handbook Reference No. 6726 and 6736
Supersedes GEH-1807

GEH-790Q
Supersedes GEH-790P

INSTRUCTIONS

HORIZONTAL, POLYPHASE INDUCTION MOTORS

SQUIRREL CAGE AND WOUND ROTOR—OPEN AND SPLASHPROOF

FRAMES 203 TO 579 INCLUSIVE AND FRAMES 6323 TO 6359 INCLUSIVE

INSTALLATION

Location

1. OPEN MOTORS. Install in a clean, well-ventilated place. If motors are stored, store in a clean, dry place.

2. SPLASHPROOF MOTORS. Where a choice of locations is possible, locate the motor so that it will be subjected to the least amount of splashing.

Lifting

When lifting a motor, it is advisable to lift by means of slings placed under the bearing housings.

Floor Mounting

1. FOUNDATION should be rigid and solid. Level the motor base (or motor). A motor base on a concrete foundation should be grouted in place.

Wall or Ceiling Mounting

1. OIL-LUBRICATED, SLEEVE-BEARING MOTORS (may be identified by spring-cover sight hole on top of bearing housing): End shields should be located with oil-filler gage in horizontal position below the center of the shaft.

2. GREASE-LUBRICATED, BALL-BEARING MOTORS (may be identified by pressure-grease fitting on top of bearing housing): End shields should be located with pressure-gun fitting on top as close to vertical as the bolt holes permit.

Note: Screenless open-type textile motors are not designed to permit end shield rotation for wall or ceiling mounting.

Tilted and Vertical Mounting

1. SLEEVE-BEARING, OIL-LUBRICATED MOTORS should always be mounted with the shaft horizontal.

2. GREASE-LUBRICATED, BALL-BEARING MOTORS in Frames 203-505 (incl) may be operated in any position, provided excessive thrust loads are not imposed.

Motors in Frames 6323 and larger should have the bearings modified for vertical operation.

Face or Flange Mounting

Carefully align the motor with the driven unit and securely bolt into place.

Alignment

Always align accurately with the driven unit. When aligning an adjustable base, allow for movement, and locate the adjusting screwhead away from the driven unit.

Coupled Drive

When the motor and driven unit together have four or more bearings, flexible couplings may be used to facilitate alignment. Three-bearing construction requires rigid coupling.

Belt and Chain Drives

To avoid overstressing of motor bearings and belts, or chains, use pulley sheaves or sprockets no smaller than those recommended by belt or chain manufacturers and the General Electric Company.

Flat Belt Drive

Arrange the location of the driving and driven shaft so that they are parallel. Adjust belt tension just enough to prevent slippage; excess tension unnecessarily loads the bearings. Avoid a vertical drive; an angle of 45 degrees or less between the line of shaft centers and the horizontal is desirable. Distance between centers should be at least 2½ times the diameter of the larger pulley unless a belt-tightener attachment is used. Pulley ratio should not exceed 5 to 1. Belt speed should not exceed 5000 feet per minute. If possible, make the lower side of belt the driving side. Run the grain or smooth side of the belt on the pulleys.

"V" Belt Drive

Align the sheaves carefully to avoid axial thrust on the bearings. Adjust belt tension just enough to prevent excessive bow of the slack side. "V" belts do not require as much tension as flat belts. If possible, make the lower side of belt the driving side. Pulley ratio should not exceed 8 to 1. Belt speeds should not exceed 5000 feet per minute, unless otherwise recommended by belt manufacturer.

Chain Drive

Align sprockets and adjust chain just enough to permit a slight sag on the slack side. Avoid vertical drive; an angle of 45 degrees or less between the line of shaft centers and the horizontal is desirable. The distance between shaft centers should not be less than the diameter of the larger sprocket plus the radius of the smaller. Consult the chain manufacturer for maximum ratio speed and lubrication of the chain.

Gear Drive

Motor should be ball-bearing type for helical gear since they impose axial thrust on the bearings. The pinion diameter should not be less than that recommended by the General Electric Company. When quiet gear drive is desired, Textolite* pinions with helical teeth should be used.

* *Reg. trade-mark of General Electric Company.*

GENERAL ELECTRIC

service, the brushes should be set down on the collector surface; clean off slush before seating brushes.

Keep the rings clean and maintain their polished surfaces. Ordinarily the rings will require only occasional wiping with a piece of canvas or nonlinting cloth. Do not let dust or dirt accumulate between the collector rings.

Brushes (Wound-rotor Motors Only)

See that the brushes move freely in the holders and at the same time make firm, even contact with the collector rings. The pressure should be between 2 and 3 pounds per square inch of brush surface.

When installing new brushes, fit them carefully to the collector rings. Be sure that the copper pigtail conductors are securely fastened to, and make good contact with, the brush holders.

Locating Troubles

If trouble is experienced in the operation of a motor, make sure that:

1. The bearings are in good condition and are lubricated properly.

2. There is no mechanical obstruction preventing rotation.

3. The air gap is substantially uniform.

4. All bolts and nuts are tightened securely.

In checking for electrical troubles, be sure:

1. That voltage is actually available in all phases at the motor terminals.

2. That line voltage and frequency correspond to the values stamped on the motor nameplate. (Refer to paragraph on "Allowable Voltage and Frequency Range.")

3. That the overload protective devices are in proper condition.

4. That all connections and contacts are properly made in the circuits between the control apparatus and the motor.

5. That the motor is not excessively overloaded. This may be checked by comparing line amperes with the full-load ampere rating stamped on the nameplate.

RENEWAL PARTS

When ordering renewal parts give quantity, catalog number if available, description of each item required, and the model number of the motor.

Requests for additional copies of these instructions or inquiries for specific information should be addressed to the nearest sales office of the General Electric Company.

MEDIUM INDUCTION MOTOR DEPARTMENT

GENERAL ELECTRIC

SCHENECTADY, N. Y.

1-53 (50M)
7-54 (25M)

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