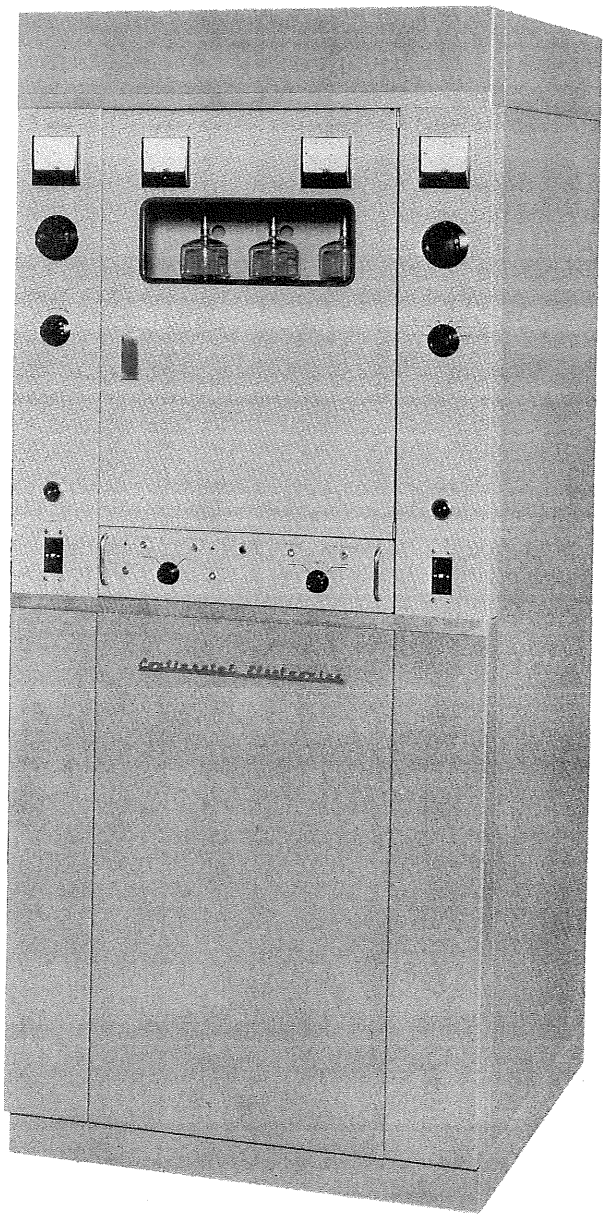

CONTINENTAL ELECTRONICS MANUFACTURING COMPANY
TYPE 314D 1 KW BROADCAST TRANSMITTER

INSTRUCTION MANUAL

TYPE 314D - 1000 WATT

AM TRANSMITTER

1-26-62

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W A R N I N G

The voltages employed in this equipment are sufficiently high to endanger human life. Use extreme care when operating and servicing the transmitter.

Every reasonable precaution has been observed in the design of this transmitter to safeguard the operating personnel. Series-connected interlock switches disable all high-voltage supplies when any door which exposes dangerous voltages is opened. Do not, under any circumstances, tamper with these switches or incapacitate them.

For added safety, a mechanical grounding switch is associated with each cabinet door. This switch places a positive short circuit on all hazardous circuits within the cabinet when the door is opened.

I - GENERAL DESCRIPTION

The Continental Electronics Type 314-D is a standard broadcast band transmitter with a nominal power output of 1000 watts. Amplitude modulation is accomplished by variation of the screen grid voltage of the R.F. output stage. Since no transformers are required in the audio and modulator stages, the R.F. output envelope can be demodulated and applied as inverse feedback to the first audio stage, which results in exceptionally good audio frequency response, gain stability, low noise and harmonic distortion.

Included in the equipment cubicle is a phantom antenna, which greatly facilitates routine testing and performance checking. The R.F. output of the transmitter can be transferred from the operating antenna to the phantom antenna by operation of a knife switch on the inside front panel of the transmitter. Operation of this switch will also cause alarm contacts to open or close, depending on choice, so that the transmitter will not be accidentally left on the phantom antenna.

All necessary wiring for remote control operation has been included. All that is required for unattended operation is the installation of necessary relays and external wiring to the remote control and metering units. Provision for automatic instantaneous frequency change for Conelrad operation is also included.

A high degree of harmonic attenuation has been accomplished by complete shielding of the R.F. output network and by compact construction of its components.

The equipment can be supplied with instantaneous power cutback to 500 or 250 watts for nighttime operation of stations so licensed.

Vacuum type crystals are utilized, which require no ovens or thermostats, and which eliminate the need for separate power feed from house circuits. The only power input required is from a 208/230 volt single phase three wire service.

The transmitter is housed in a frameless steel spot welded enclosure. The inner construction, which includes tube chassis, coil shields and vertical panel is of aluminum. The use of both front and rear doors provides maximum accessibility.

Technical Summary

Frequency Range	535=1620 kc
Power Output Capability	1100 watts
Frequency Stability	± 5 cps
Audio Frequency Response	± 1.0 db, 50-10,000 cps ± 1.5 db, 30-15,000 cps
Audio Frequency Distortion	3% or less, 50-10,000 cps
Residual Hum and Noise	60 db below 95% mod. (400 cps) signal
Carrier Shift	Less than 2% (0-100% modulation)
RF Output Impedance	51.5 ohm(or as specified)
Audio Input Impedance	150/600 ohm
Audio Input Level	+ 10 dbm ± 2 dbm
Power Source	208/230 volt single phase 3 wire, 50-60 cps
Power Consumption	4400 watts @ 85% power factor (100% modulation)

Cabinet Dimensions

Height	75"
Width	32"
Depth	32"
Net Weight (approximately)	1100 lbs.
Building Entrance Requirement	36" x 36"

Tube Complement

Crystal Oscillator	6AG7
Oscillator Voltage Regulator	0B2
RF Buffer Amplifier	807
Power Amplifier (4 tubes in parallel)	4-400A
Audio Amplifier	6AG7
Audio Driver	807
Modulator (2 tubes in parallel)	807
Feedback Rectifier	6X5
Low Voltage Rectifier	5R4 GY
High Voltage Rectifier (2 tubes)	8008 A
Screen Grid Voltage Regulator	0D3
Screen Grid Voltage Regulator	0C3

II - CIRCUIT DESCRIPTION

Radio Frequency Stages

A Type 6AG7 tube is used for the oscillator stage with its grid circuit switchable to one of two vacuum type crystals. A variable condenser is connected across each crystal for precise adjustment of operating frequency. Screen grid voltage for the oscillator tube is regulated at 108 volts by a Type 0B2 gaseous regulator tube. The plate circuit of this stage is broadband untuned and therefore requires no adjustment. Plate voltage for the oscillator tube is fed through a normally closed pushbutton switch, which can be used to cut off R.F. excitation for Conelrad tests or pattern switching.

The R.F. output of the oscillator is fed to a Type 807 buffer amplifier tube. The screen grid voltage for this stage is fed through a potentiometer mounted on the front panel of the transmitter. Operation of this control will vary the screen voltage of the buffer stage; thereby varying theR.F. excitation to the final stage, which will adjust the power output of the transmitter. The plate circuit of the buffer is tuned by adjustment of a screwdriver-slotted control brought out to the front panel of the transmitter. A pick-up loop is coupled to the plate coil of this stage for feeding carrier frequency voltage to the station frequency monitor.

The final radio frequency stage consists of four Type 4-400A tubes connected in parallel. A combination of fixed and grid leak bias is used on this stage, the fixed bias being sufficient to protect the tubes from over-dissipation in the event of loss of excitation. Screen grid voltage is held at 250 volts DC by the two series-connected gaseous regulator tubes. A modulation reactor is placed in series with the screen voltage lead across which the modulating voltage is superimposed upon the DC voltage.

The R.F. output circuit consists of a "pi" circuit and a "tee" circuit. Two shunt inductors, one for sampling the output R.F. envelope for feedback and one for feeding the station modulation monitor are used. These also serve as static drain chokes. A pick-up loop for driving the panel-mounted transmission line R.F. meter is also incorporated in the equipment.

Audio Frequency Stages

The first audio amplifier stage utilizes a Type 6AG7 tube in a resistance-coupled circuit. The program input is fed through an isolation pad to an input transformer, which matches the high impedance grid circuit to either a 150 or 600 ohm program line. A resistor is placed in series with the ground end of the transformer secondary across which the overall inverse feedback is applied.

The second audio amplifier stage uses a Type 807 tube, which is triode-connected. The triod connection is necessary so that this stage can deliver the relatively high audio voltage swing required to drive the cathode-follower modulator. The output of this stage is resistance-coupled to the grid circuit of the modulator.

The modulator stage utilizes two triode-connected Type 807 tubes in parallel in a cathode-follower circuit. Plate supply voltage is obtained from the 1500 volt point on the high voltage supply bleeder resistor. The cathode is operated at 1000 volts positive due to the drop across the cathode resistor. A bypass capacitor is connected from plate to ground so that all the audio voltage will develop across the cathode resistor and none in the plate circuit. The audio output of this stage is coupled to the power amplifier screen circuit by a capacitor.

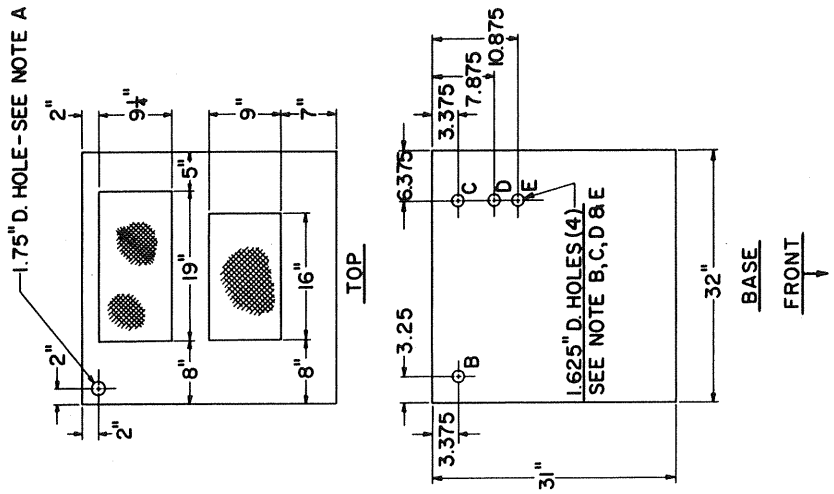
A sample of the modulated R.F. output of the transmitter is fed to a Type 6X5 rectifier tube. The demodulated audio output is coupled through a capacitor to the grid circuit of the first stage where, depending on the amount of feedback used, it will partially cancel the fundamental modulating frequency and distortion and noise frequencies which are generated in the transmitter.

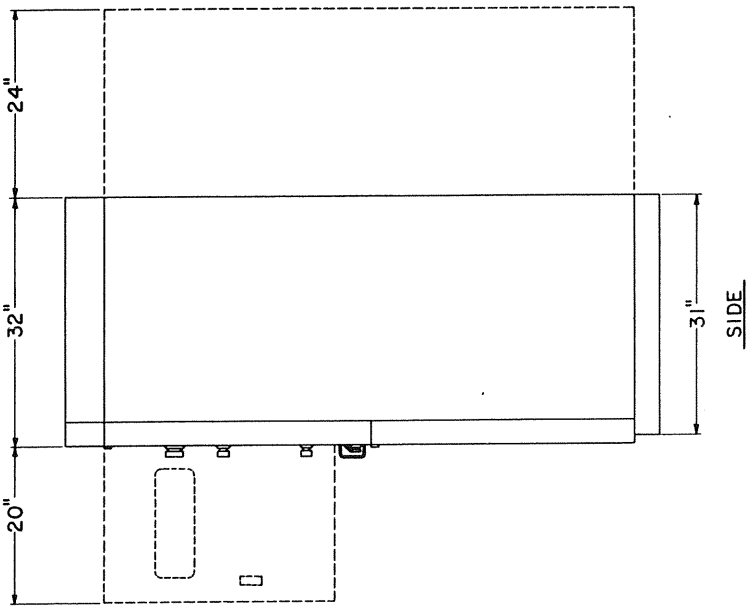
Power Supplies and Control Circuits

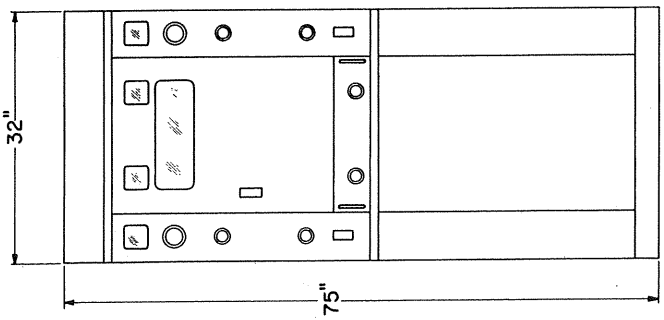
The 314-D transmitter utilizes two power supplies. The low voltage supply delivers approximately 700 volts DC, with 600 volts of this being positive with respect to ground, and 100 volts being negative. The 600 volts positive is used to supply plate and screen voltage for low level stages and the negative 100 volts is used for fixed bias on the R.F. output stage. This supply uses a Type 5R4GY rectifier in a single-phase full-wave center-tapped rectifier.

The 4000 volt plate supply uses two Type 8008 A rectifier tubes in a full-wave center-tapped supply. Primary voltage is fed through series resistors which are shorted by a contactor for full voltage operation. For power reduction to 500 watts, the plate voltage is dropped to 3000 volts by insertion of these primary resistors. For reduction to 250 watts, two of these resistors are shorted and the other two are disconnected, and one side of the plate transformer primary is grounded, which results in 2000 volts, or half-voltage output from the plate supply. A sensitive DC relay with a variable resistor across its operating coil is placed in series with the ground end of the load circuit. Operation of this relay due to overload will energize the coil of a latching relay which will shut off the high voltage and leave it off until restored by manual operation of the high voltage reset switch.

The Type 314D transmitter uses high speed magnetically operated circuit breakers for protection of electronic parts and wiring. 230 volts is fed through the FILAMENT breaker to all filament transformers, control relays, low voltage supply and cooling blower. Primary voltage for the high voltage plate transformer is fed through the PLATE circuit breaker. A large high-speed fan supplies cooling air to all tubes and parts in a quantity far in excess of that required so that cool operation and long life is assured. Both doors are provided with interlock switches which remove all high voltage DC when a door is opened.







NOTES:

A. TRANSMISSION LINE OUT TOP.
B. TRANSMISSION LINE OUT BOTTOM.
C. 230 V. 1 PHASE-3 WIRE ENTRANCE- 3 #10 AWG WIRES-FUSED 30 AMPERES AT DISCONNECT BOX.
D. PROGRAM LINE & MONITORING ENTRANCE.
E. REMOTE CONTROL WIRE ENTRANCE.

INSTALLATION DIAGRAM, TYPE 314D 1 KW BROADCAST TRANSMITTER

III - INSTALLATION

Upon receipt of the 314-D transmitter, make a thorough visual inspection of the cabinet and all components which are shipped in place and also inspect all items which are separately packed. Any claim for damage incurred in shipment should be made before signing for the equipment.

The cabinet should be placed on a level floor in its operating position. At least two feet of space should be allowed behind the unit so that the rear door may swing fully open. The cabinet may be enclosed on both sides if it is desirable to place it in line with equipment racks or against a side wall.

All power input, speech input, monitoring output and remote control wiring is brought in through the cabinet floor. Three conduit entrance holes are provided for this purpose, if it is desired to run power, speech input and remote control wiring in separate conduit. The R.F. output connection is made on the phantom transfer switch located on top of the output network coil enclosure. A stud is provided close by for grounding the transmission line shield. The output line may be routed either out of the roof of the transmitter or out through a hole provided in the floor. In order that access may be had to the phantom antenna transfer switch, the screened cover on the roof over the phantom resistors is made removable.

The main power feed to the transmitter should be run from a fused 300 volt disconnect box. For 230 volt line, 25 ampere fuses should be used. For 208 volt, 30 ampere fuses should be used. Three wires of at least No. 10 AWG should be run from the box, through the designated conduit entrance in the floor and terminated at terminals 1, 2, and 3 on TB1, with the grounded neutral on terminal 2.

A two conductor, twisted shielded cable should be run from the speech input equipment to terminals 1, 2, and 3 on TB2. The shield of this cable is connected to terminal 1. The transmitter, as received, will have the audio input transformer connected for 600 ohm termination. When fed from a balanced, ungrounded 600 ohm source, the program level required for 100% modulation will be +10 dbm $\pm$2 dbm.

Type RG-58/U or RG-59/U coaxial cable should be used for feeding R.F. voltage from the transmitter to the station modulation monitor and frequency monitor. The frequency monitor connection is made to terminals 4 and 5 on TB2 with the shield

connected to terminal 4. The modulation monitor feed is connected to terminals 6 and 7 on TB2 with the shield on terminal 6.

The phantom alarm unit may be used in several ways. As received, the alarm switch will be connected so that, when the R.F. transfer switch is in the PHANTOM position, 115 volts 60 cycles will appear across terminals 10 and 11 on TB2, with a ground on terminal 10. This voltage may be used to light an external indicator lamp or to ring an alarm bell. If it is desired for any reason to require the 115 volts during normal operation, the alarm switch, S11, may be connected normally closed.

The transmitter cabinet should be connected to the station earth ground with a heavy copper strap. The connection should be made by the shortest possible path.

The Company's prices do not include installation. The equipment shall be installed by the Purchaser, who assumes all responsibility for installation and operation of the equipment, as well as for obtaining all permits, licenses, and certificates required by any regulatory agency or any other body, for the installation and use of the equipment.

IV - OPERATION

The transmitter has been thoroughly tested on the customer's operating frequency prior to shipment. If all components have been properly installed and all external wiring completed, no trouble should be encountered in the initial tune-up.

With 230 volts input connected to the transmitter, operate FILAMENT circuit breaker to the "ON" position. The cooling blower, MB1, should run and all filament transformers should be energized. The heater on the thermal delay relay, K1, should be energized.

If air switch, S1, has closed and if both transmitter doors are closed, plate contactor, K2, should close after about a 30 second delay. The amber READY lamp should light, which indicates that the low voltage rectifier is energized. If the preceding operations fail to occur, check the following:

Note on the schematic diagram (Drawing No. 25600-E) that 115 volts is routed to the operating solenoid of plate contactor, K2, first through air switch, S1, then through contacts on time delay relay, K1, which should close after 30 seconds, then through the door interlock switches, S2 and S3, and finally through normally closed contacts on the overload auxiliary latching relay, K3. Failure to obtain a ready indication could mean that:

A. Air switch, S1, has failed to close.

B. Thermal delay relay, K1, has failed to close. Check that continuity exists between pins 2 and 3, which are the heater terminals on K1. If it is suspected that the contacts are failing to close on K1, a jumper wire can be placed from pin 5 to pin 7, which will parallel the contacts.

C. Front or rear door interlock switches may be out of alignment.

D. The overload latching relay may have accidentally been operated to the lockout position. Press H.V. RESET button, S7, and note that K3 is released to its normal position.

When the READY indication has been obtained, verify that the low voltage supply is energized by operating TEST METER SELECTOR switch to the "OSC KX100" position and noting on the TEST METER that the oscillator tube is drawing current. Failure to obtain a reading on the meter would indicate that:

A. The oscillator tube is defective.

B. The low voltage rectifier tube is defective.

C. 300 volts DC plate voltage for the oscillator tube is routed through terminals 8 and 9 on TB2, which are connected for factory test. These leads are brought out to facilitate carrier cut-off by external switching, if required for antenna pattern changing, Conelrad tests or other purposes. If external circuits have been connected, make certain that continuity exists between terminals 8 and 9 on TB2.

An oscillator cathode current of approximately 15 milliamperes will be noted if the stage is oscillating properly. If the crystal is not oscillating, a reading of 20-25 MA will be noted.

Move the TEST METER SELECTOR switch to the "BUFFER KX100" position. Note that operation of the OUTPUT control, R69, causes the buffer cathode current to vary between approximately 5-40 MA. Set the control to abour mid-range.

Move the TEST METER SELECTOR switch to the "PA GRID X100" position. With a screwdriver, adjust the DRIVER TUNING control (located to the right of the crystal selector switch) for maximum P A Grid current.

At this time, the crystal frequency may be adjusted. With a screwdriver, adjust the FREQUENCY control corresponding to the crystal which has been selected by the CRYSTAL SELECTOR switch, until the station frequency monitor indicates zero deviation. If both crystal positions are utilized, switch to the other crystal and zero it with its FREQUENCY control.

Unless the Type 8008 high voltage rectifier tubes have been previously pre-heated, these should be allowed to operate with filament voltage only for at least one-half hour in order to redistribute mercury which might have been deposited on the electrodes during shipment.

Before attempting to apply high voltage to the transmitter, make certain that an R.F. load, either the phantom antenna or the operating antenna, is connected to the transmitter output. It would be better to do initial testing into the phantom antenna, since "on the air" testing is not necessary at first.

A. Place the R. F. TRANSFER switch in the PHANTOM position.

B. Set the POWER-LOW-HIGH switch in the LOW position.

C. Set the FEEDBACK control full counter-clockwise.

D. Set the HUM BALANCE control at about mid-range.

E. Place the TEST METER SELECTOR switch in the FB RECT X100 position.

Operate PLATE circuit breaker, CB2, to the "ON" position. Adjust the TUNING control for maximum output as indicated on the LINE CURRENT meter. Since the POWER-LOW-HIGH switch is in the LOW position, the DC plate voltage, as indicated on the PLATE VOLTAGE meter, should be about 3000 volts, (2000 volts for 250 watt cutback). With the OUTPUT control set at mid-range, the linecurrent should be about 3.5 to 4 amperes, (1.5 to 2 amperes for 250 watt cutback).

Full clockwise rotation of the OUTPUT control should give a line current of at least 4 amperes, (2 amperes for 250 watt cutback). If less than 4 amperes (2 amperes for 250 watt cutback) is obtained, turn the LOADING adjustment counter-clockwise, at the same time adjusting the TUNING control for maximum line current. The pick-up loop which drives the LINE CURRENT meter thermocouple, has been adjusted at the factory. If it is suspected that this adjustment has been disturbed in shipping, the following procedure should be carried out in calibrating the meter:

A. Remove the screened cover from above the phantom antenna resistors.

B. Remove the strap connection from the R.F. output bowl to the center arm post of the R. F. TRANSFER switch S12.

C. Obtain an R. F. ampere meter with a full-scale reading of not less than 5 amperes or more than 10 amperes.

D. Connect this meter in place of the strap which has just been removed. Care should be taken that the meter and connecting leads are kept well away from ground.

It is well to place the meter on a cardboard box to insulate it and so that it can be seen while tuning the transmitter.

E. The meter is now in series with the pick-up loop,which drives the panel meter and can be used as a standard for calibrating the panel meter.

F. Turn on the transmitter at low plate voltage and set the OUTPUT control for a line current of 4 amperes on the STANDARD meter.

G. Loosen the shaft locking nut on R70, located on the top of the cabinet above the line current meter, and adjust it so that the line current panel meter agrees with the STANDARD meter.

H. If the panel meter is reading too low with R70 run full clockwise, it will be necessary to obtain more pick up. Turn off the transmitter plate voltage and increase the coupling between L13 and L12 by bending L12 closer to L13. Be careful to maintain at least 1/8" of space between L12 and the static shield around L13.

I. Rotate R70 fully clockwise, if it has not already been done, and turn on the transmitter. If the panel meter is reading more than 6 amperes while the standard is indicating 4 amperes, too much coupling between L12 and L13 has been obtained. It can be considered that satisfactory coupling exists when, with R70 fully clockwise, (maximum meter reading) a panel meter indication of no more than 6 amperes exists, with an actual line current of 4 amperes. The reason for this is because the panel meter thermocouple may be damaged by too much coupling, this being the amount that would cause more than full scale deflection of the panel meter at full power and 100% modulation with R70 fully clockwise.

J. The final adjustment of coupling should be that which results in similar readings of the panel meter and a standard meter with R70 set at about mid-range.

K. Lock the shaft of R70 and proceed.

Low Voltage Power Supply Adjustments

A. Adjusting for Proper Oscillator Plate Voltage:

The low voltage power supply bleeder resistor, R66, is supplied with two slider adjustments. The lower adjustment sets the oscillator plate voltage. The following procedure is used to establish this setting:

1. Set the bottom slider adjustment 3-1/8 inches below the top of R66; that is, 3-1/8 inches from the top of the resistor body to the top of the slider ring.

2. Close the transmitter doors to energize the L.V. supply. Do not turn on high voltage.

3. Set the test meter selector to "OSC K100" and move the crystal selector switch halfway between the two positions. The meter should read between 25-28 MA.

B. Adjusting for Proper P.A. Screen Voltage:

Although the PWR. AMP. screen voltage is regulated by gaseous regulator tubes, the regulator supply voltage must be properly set so that the voltage regulator tubes will not be over-dissipated. If the V R tubes fail to glow when plate voltage is applied to the transmitter, then the screen supply voltage is too low. The following procedure is used to check for proper supply voltage:

1. Set OUTPUT control to minimum (fully counter-clockwise).

2. Remove either one of the V R tubes from its socket (V12 or V13).

3. Set the upper slider adjustment on R66 about 1-7/8 inches from the top of the resistor.

4. Connect a DC voltmeter between the bottom terminal of modulation reactor, L5, and ground. If the voltmeter is placed on the shelf in front of the P.A. tubes, it can be seen through the window when the door is closed.

5. Close the transmitter doors to energize the low voltage supply. Do not apply high voltage.

6. Push the EXCITATION RELEASE switch S5, and read the meter. The slider on R66 should be adjusted until a reading of 375 to 390 volts is obtained. The reason for pushing the EXCITATION RELEASE is so that there will be no PWR. AMP. screen current flowing. This current could be quite high if excitation were applied with no plate voltage.

7. Securely tighten the slider on R66.

8. Replace the VR tube in its socket.

250 Watt Operation

If the transmitter has been equipped for 250 watt operation, place the POWER switch in LOW position, and check for the following operation:

A. Set OUTPUT Control for a line current of 2.2 amperes.

B. The plate current should be approximately 300 ma with the TUNING control set for maximum line current. Plate current higher than 320 ma indicates over-coupling. If this condition exists adjust the LOADING control counter-clockwise, at the same time maintaining maximum output with the TUNING control and adjusting the output control for 2.2 amperes.

C. Proper adjustment results in a line current of 2.2 amperes with a plate current of 290 to 310 ma, with the TUNING control set for maximum line current. The output control will be almost fully clockwise.

500 Watt Operation

If the transmitter has been equipped for 500 watt operation, place the POWER switch in LOW position, and check for the following operation:

A. Set OUTPUT control for a line current of 3.15 amperes.

B. The plate current should be approximately 450 ma with the TUNING control set for maximum line current. Plate current higher than 450 ma means that the output stage is over-coupled. If so, adjust the LOADING control counter-clockwise, at the same time maintaining maximum output with the TUNING control and adjusting the OUTPUT control for 3.15 amperes line current.

C. The final adjustment will be one which results in a line current of 3.15 amperes with a plate current of 440 to 460 ma, with the TUNING adjustment tuned for maximum line current. It will be normal for the OUTPUT control to be almost fully counter-clockwise.

Full Power Operation

Operate the POWER-LOW-HIGH switch to the "HIGH" position. Check the following for full power operation:

A. Rotate the OUTPUT control until a line current of 4.4 amperes is obtained.

B. If the loading adjustments made at reduced power were carefully set, the plate current should be between 630 and 650 ma, with a plate voltage of 4000 volts. Check the tuning for maximum line current and adjust the loading and output controls as described for reduced power operation so that the plate current is between 630 and 650 ma.

C. Check the meter readings against the table of typical meter readings.

NOTE: It is normal for the 4-400A output tube plates to glow red. They will begin to glow at a little more than one-half their plate dissipation rating.

Modulating the Transmitter

After it has been determined that the transmitter is properly functioning into the phantom antenna, tone modulation may be applied as a final test of performance.

A suitable low distortion audio oscillator should be connected to the program input line to the transmitter. A volume indicator with attenuator should be used to measure program input level so that a check of frequency response can be made.

The coax line from L11, which connects from TB2, 6 and 7, to the modulation monitor should be installed. The transmitter as received will have the coax line connected on L11 so that ample voltage will be available to drive a General Radio Type 1931-A modulation monitor. If other types are used, it may be necessary to adjust the tap point on L11 to suit the requirement of the monitor in use.

The audio output terminals of the modulation monitor should be connected to the input of a suitable distortion meter.

Adjustment of Hum Balance Control

Check that the FEEDBACK control is still set fully counter-clockwise, and operate the transmitter at full power into the phantom antenna. Set the carrier level meter on the modulation monitor to 100 and modulate the transmitter at 1000 cycles. Increase the modulation until the negative peaks indicate 95% modulation. Calibrate the distortion and noise meter, and then remove the 1000 cycle tone. While noting the residual noise level of the transmitter, operate the HUM BALANCE control in a direction that minimizes the indication on the noise meter. If the control needs to be moved fully in one direction, exchange positions of any of the 4-400A output tubes. When a minimum indication has been obtained, it should indicate a noise level of at least 43 db below the 95% modulation level. Readings of from 43 to 48 db are typical.

Modulate the transmitter 95% at 1000 cycles and while watching the modulation meter, operate the FEEDBACK control in a clockwise direction until the modulation is reduced to about 18%. This reduction in modulation is caused by the application of approximately 15 db of overall negative feedback. Increase the 1000 cycle tone level until the transmitter is modulated 95%. Note the tone input level. It should be between +8 and +12 dbm (or VU). Check the noise level again and note that it is at least 60 db below 95% modulation.

Make a complete set of distortion and frequency response measurements and record them for future reference. If it is found that the distortion at 7500 cycles and higher is greater than 3%, or that negative carrier shift is greater than 2%, increase the output stage loading slightly by turning the LOADING control clockwise, and at the same time adjust the TUNING control for maximum output and the OUTPUT control for full power output. An increase of PWR. AMP. plate current of 10 or 20 ma from the nominal 650 ma should be sufficient.

Operation On The Air

If the antenna system is fed from 51.5 ohm line, so that the transmitter load is the same as with the phantom antenna, then no difficulty should be encountered in duplicating the performance and operating conditions on the air. In some cases, such as multi-tower directional arrays at the low end of the broadcast band, which represent sharply tuned loads, it may not be possible to apply 15 db of overall feedback, This is because the higher audio frequency sidebands undergo a considerable phase delay due to the selective antenna load, and when demodulated and fed back into the audio system, are applied as positive, rather than negative feedback and therefore cause the audio stages to oscillate at a high frequency.

If this is the case, feedback should be reduced until the oscillation ceases, and then be reduced about 3 to 5 db more for safety margin.

Operation at Other Load Resistances

The phantom antenna is made up of ten 500 ohm, 160 watt non-inductive resistors connected in parallel. This results in a load having 1600 watts of power dissipation with a measured R.F. resistance of approximately 51 ohms.

The inductive reactance is slight and will vary from 3 ohms at 550 KC to 7 ohms at 1600 KC. Since the power capability is sufficient to handle full power output at 100% modulation continuously; then, if desired, the load resistance may be increased by decreasing the number of parallel elements. The resistors will not be damaged if as many as four are disconnected. The six remaining will dissipate 960 watts, and due to the intermittent nature of tone tests and program material, no excessive over-heating will be noted with modulation.

Removing the resistors in steps of one, up to four, will result in load resistances of approximately:

10 units	-	51 ohms
9 units	-	57 ohms
8 units	-	64 ohms
7 units	-	73 ohms
6 units	-	86 ohms

If the antenna load comes close to any of these values, the phantom antenna may be altered accordingly, so that very little adjustment of transmitter tuning and loading will be required when changing from phantom antenna to operating antenna.

If the antenna is fed from a 230 ohm open wire line, the phantom can be changed to approximately 205 ohms by connecting two groups of five resistors in parallel and connecting these groups in series.

When tuning the transmitter on the air into a load resistance considerably different from the phantom resistance, make initial adjustments at low plate voltage according to the instructions outlined previously under Operation.

V - MAINTENANCE

Air Filters

The air filter located in the rear door of the transmitter is of the non-reuseable type and must be replaced when it becomes noticeably clogged. This may occur at any time after 30 to 90 days, depending upon local conditions. Since this filter is relatively inexpensive, there is very little to be gained economically by attempting to clean it.

Vacuum Tubes

The glass envelopes of all vacuum tubes in the equipment should be cleaned with a dry, lint-free rag every month.

Blower

The blower motor is equipped with oilers on both bearings and should be oiled every 30 days with two or three drops of SAE 20 or SAE 30 weight oil.

Relays and Contactors

All relays and contactors should be inspected every 30 days for contact pitting, mis-alignment, dragging, sticking and tightness of connections. Contacts on small control relay should be cleaned with a burnishing tool every 30 days as a preventive measure. Severely pitted contactors should be cleaned with emery cloth.

General

A thorough visual inspection should be made very week for loose connections, signs of over-heating, cracked insulators and resistors, and any other potential trouble spots. Some dust will settle in the transmitter and should be removed with a clean dry rag when it appears, especially from insulators.

VI - TABLE OF TYPICAL METER READINGS

For 1000 Watts Output (Unmodulated)

Line Current (51.5 ohm load)	4.4. amperes
Plate Voltage	4100 volts
Plate Current	650 MA
Test Meter Positions:	
OSC KX100	17 MA
BUFF KX100	* 25 MA
PA GRID X100	* 32 MA
F B RECT X10	3.7 MA
1st AUD KX10	2.2 MA
2nd AUD KX100	20 MA
MOD KX100	78 MA

*These values are typical and will vary, depending upon the setting of the OUTPUT control, which may cause buffer cathode current to vary from 10 to 35 MA, and P.A. grid current to vary from 5 to 40 MA.

500 Watts Output (Unmodulated)

Line Current (51.5 ohm load)	3.12 amperes
Plate Voltage	3100 volts
Plate Current	440 MA
Test Meter Positions:	
OSC KX100	17 MA
BUFF KX 100	11 MA
PA GRID X100	10 MA

500 Watts Output (Unmodulated) Continued:

F B RECT X10	**2.6 MA**
1st AUD KX100	**2.0 MA**
2nd AUD KX 100	**16 MA**
MOD XK100	**60 MA**

250 Watts Output (Unmodulated):

Line Current (51.5 ohm load)	2.2 Amperes
Plate Voltage	2000 Volts
Plate Current	300 MA
Test Meter Positions	
Osc. K X 100	15 MA
Buff K X 100	34 MA
PA Grid X 100	2 MA
FB Rect. X 10	4.5 MA
1st. Audio K X 100	2.1 MA
2nd Audio K X 100	12 MA
Mod. K X 100	49 MA

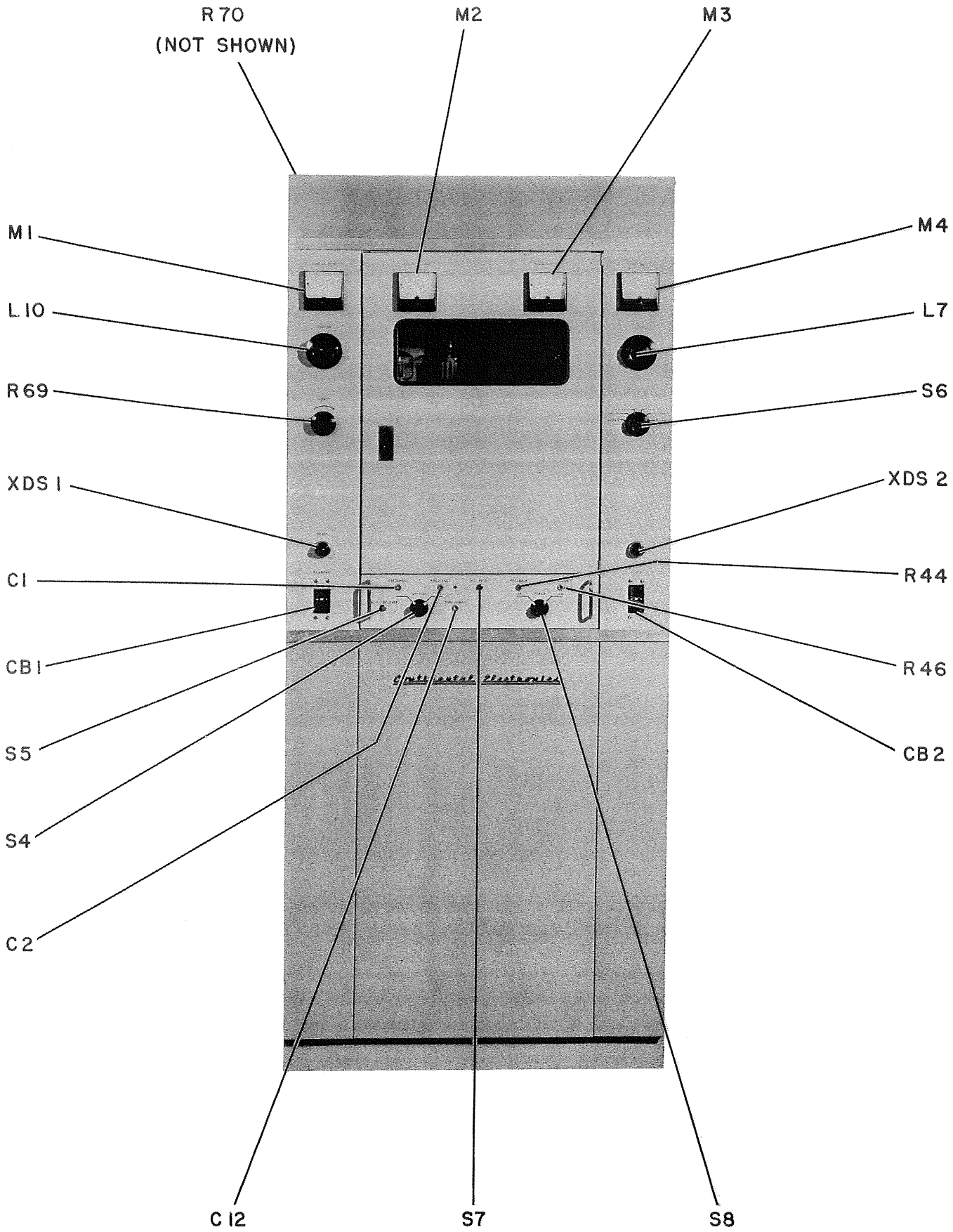


FIGURE 1
LOCATION OF CONTROLS

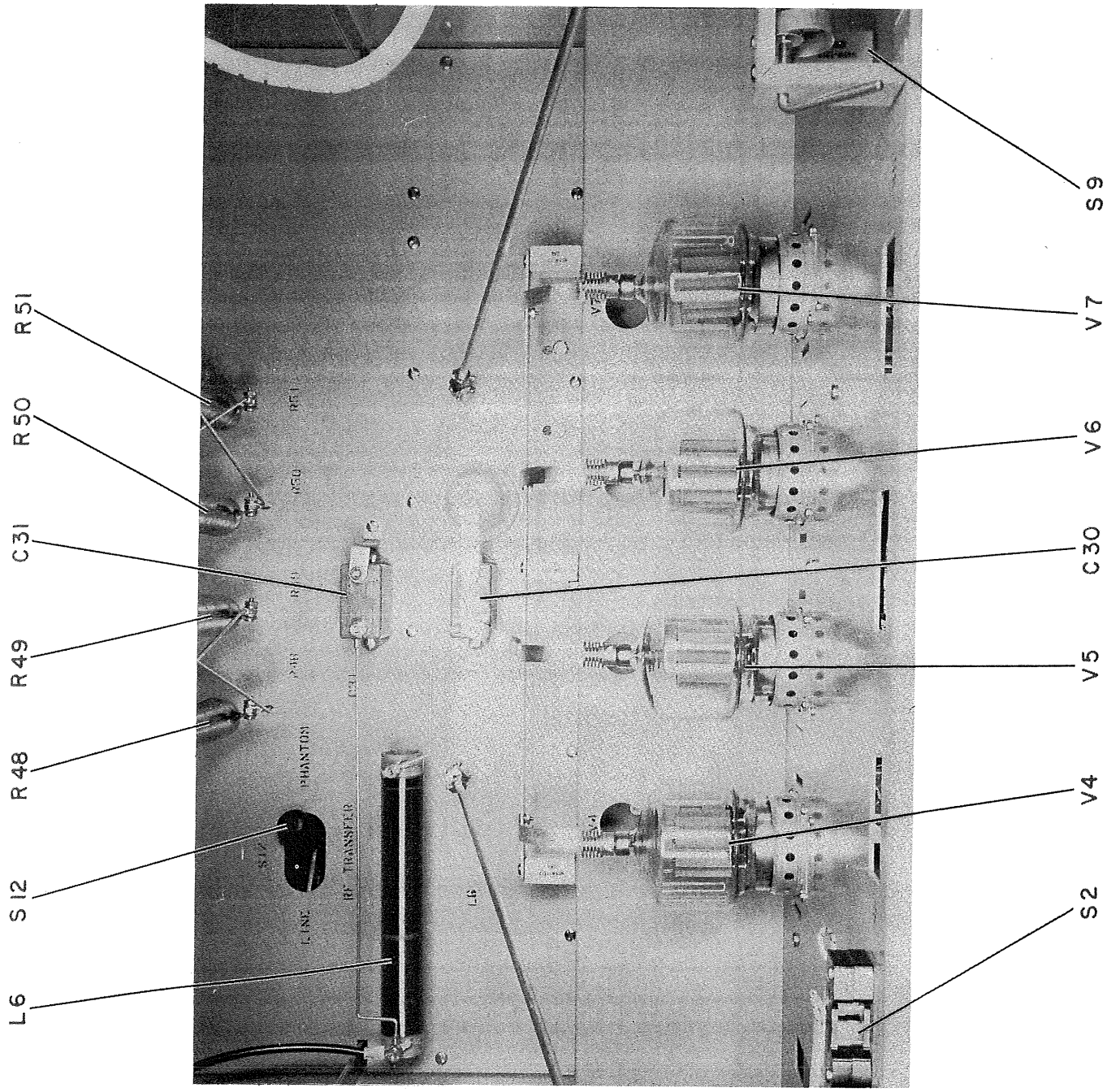


FIGURE 2
POWER AMPLIFIER SHELF, UPPER SECTION

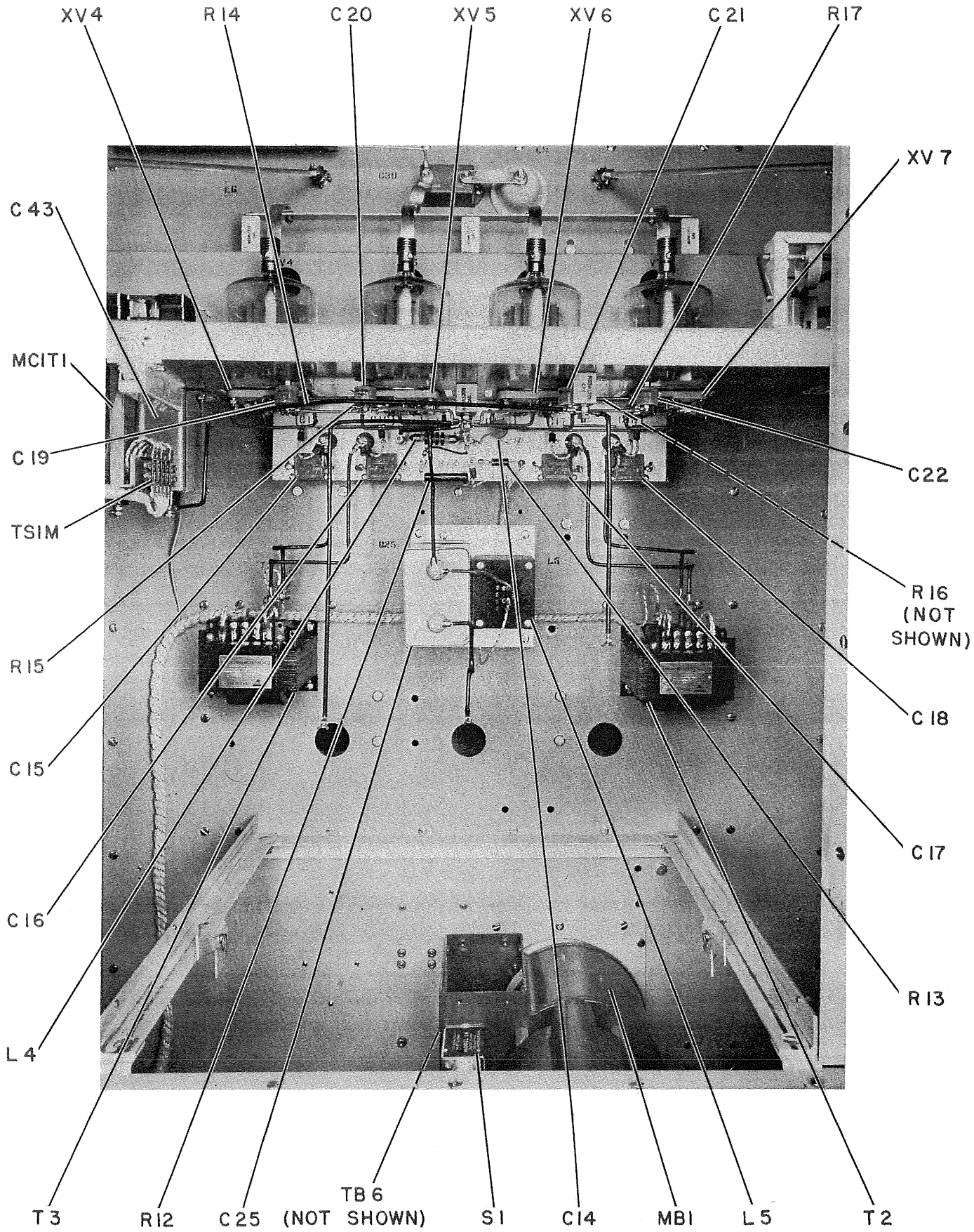


FIGURE 3

POWER AMPLIFIER SHELF, LOWER SECTION WITH EXCITER SHELF REMOVED

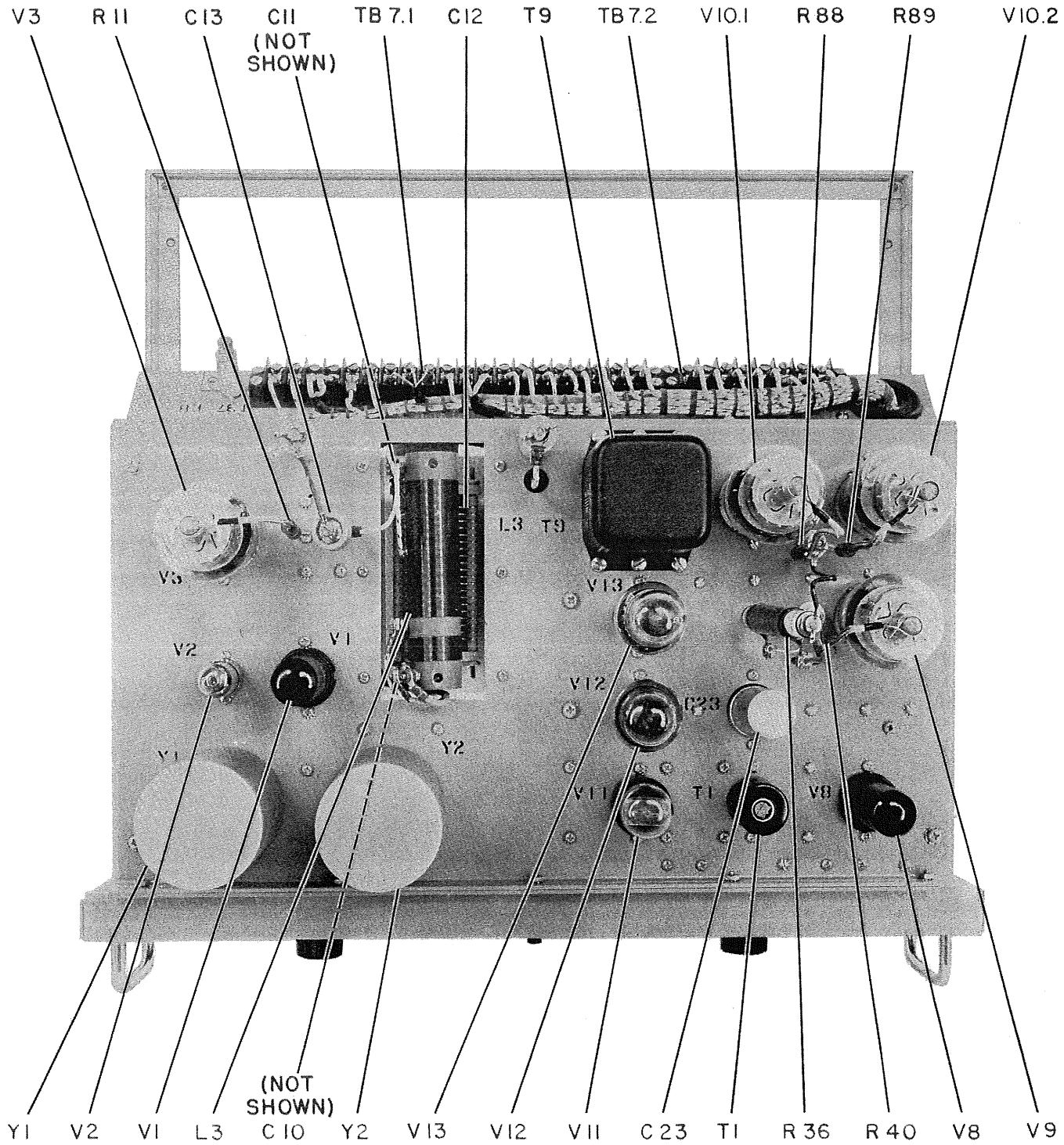


FIGURE 4
EXCITER SHELF, TOP VIEW

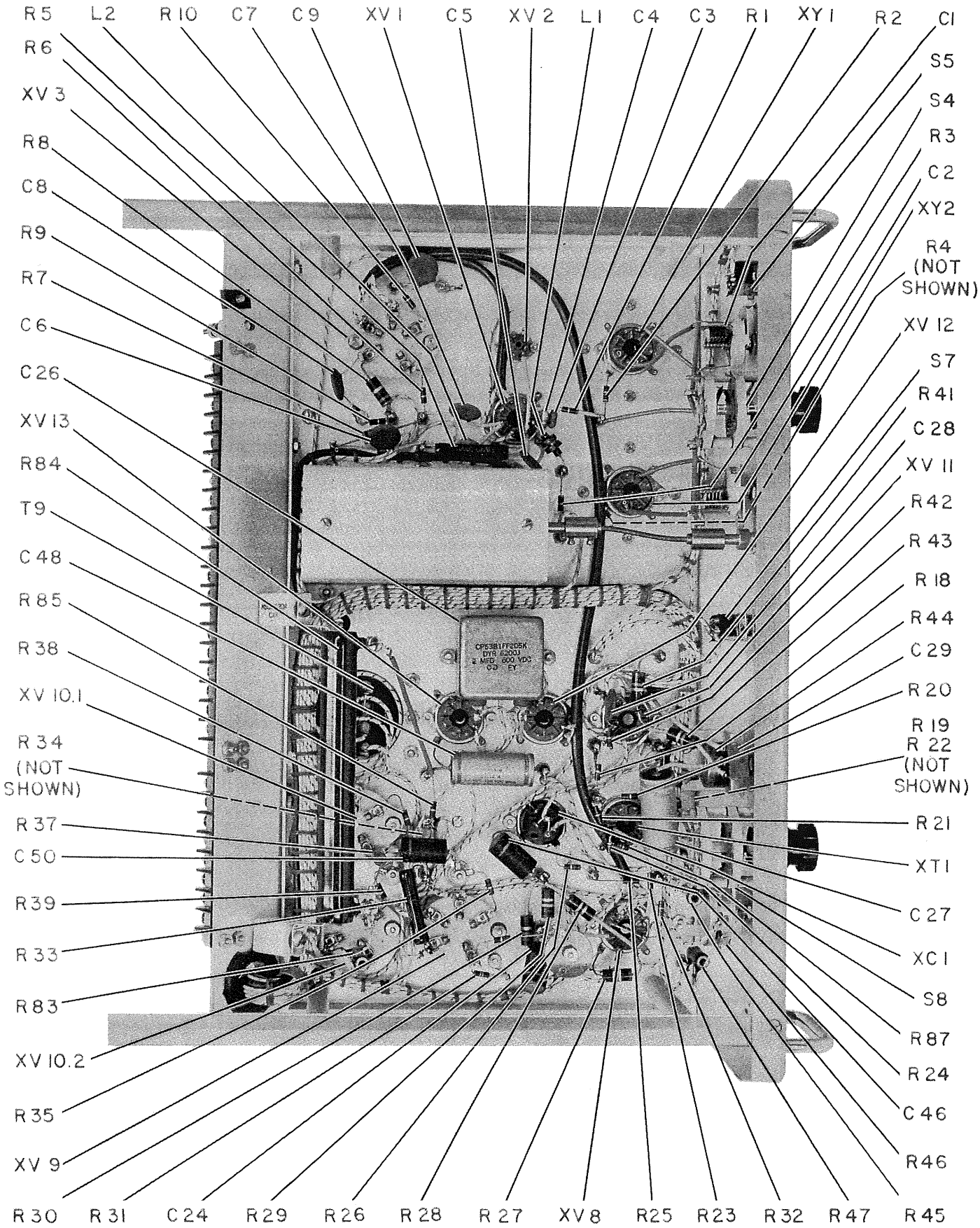


FIGURE 5
EXCITER SHELF, BOTTOM VIEW

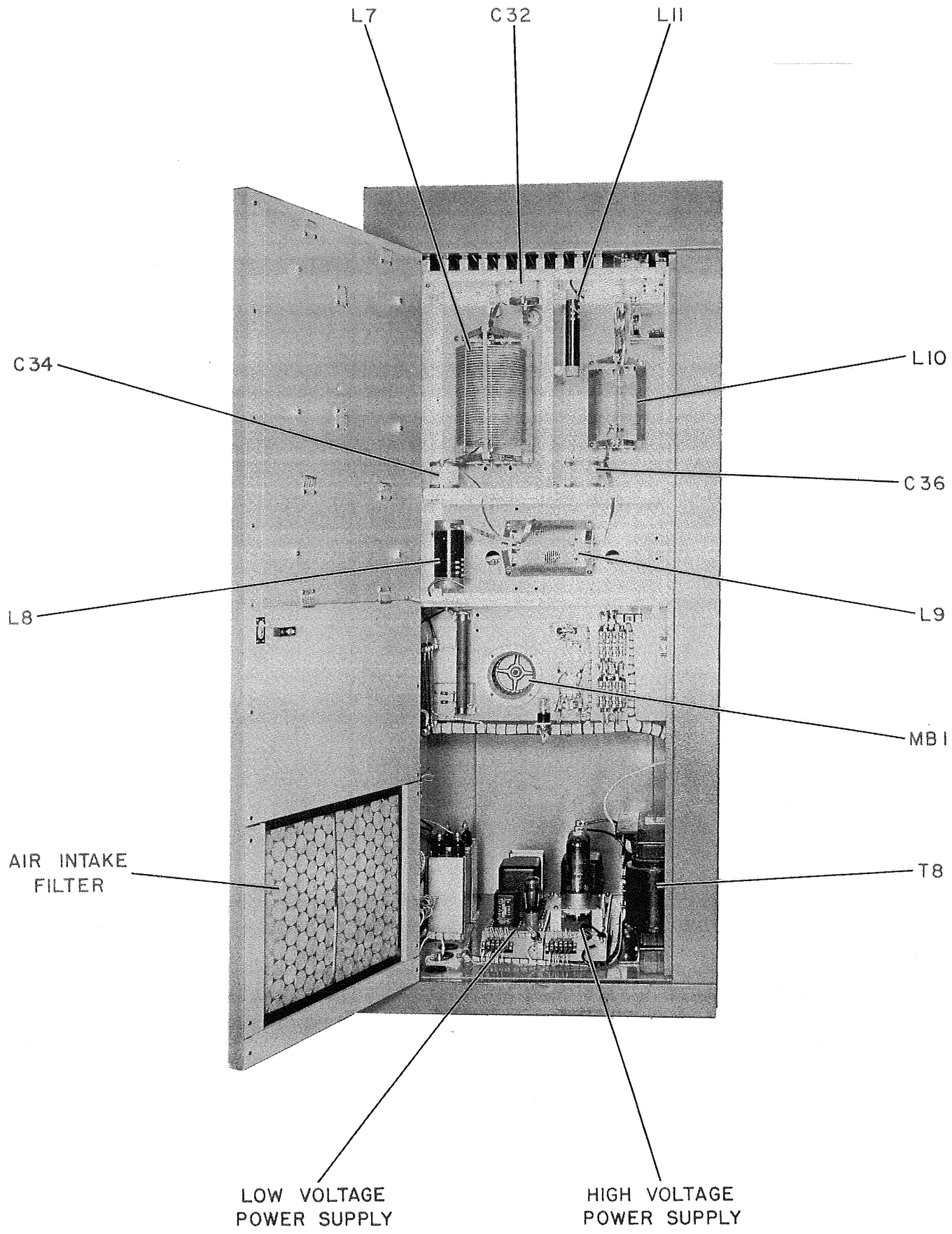


FIGURE 6
REAR VIEW, OVERALL WITH DOOR OPEN

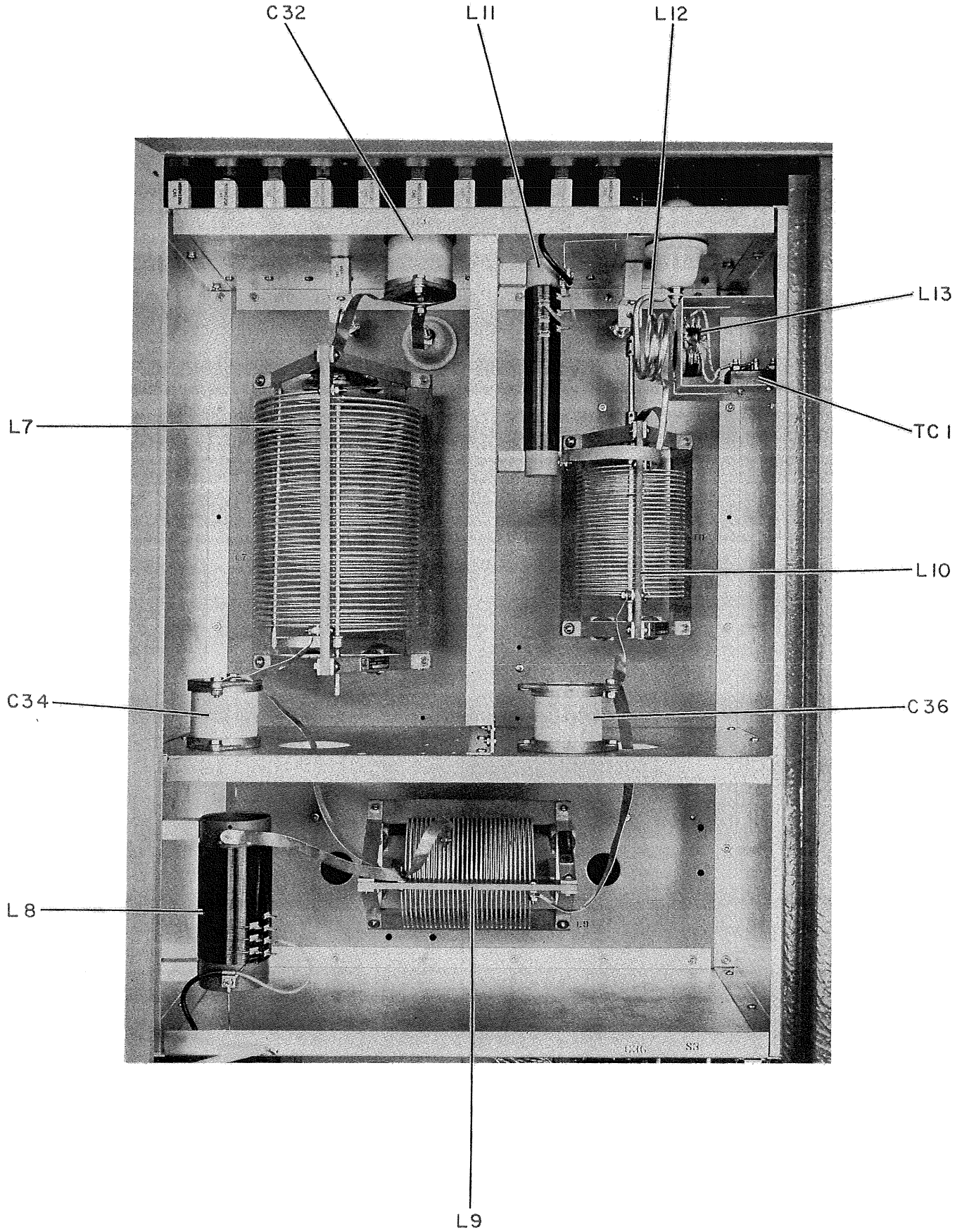


FIGURE 7
REAR VIEW, UPPER SECTION

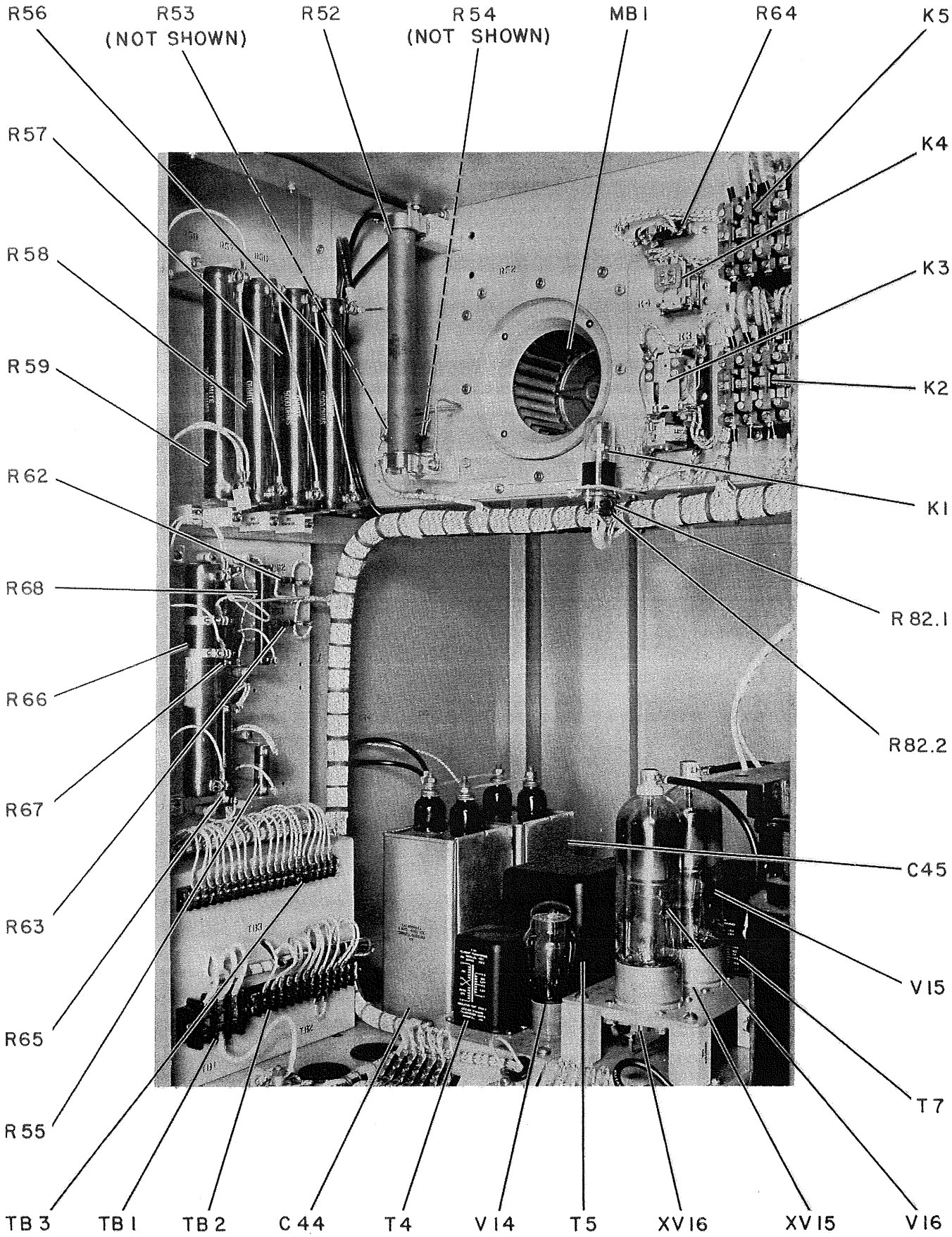


FIGURE 8
REAR VIEW, LOWER LEFT SECTION

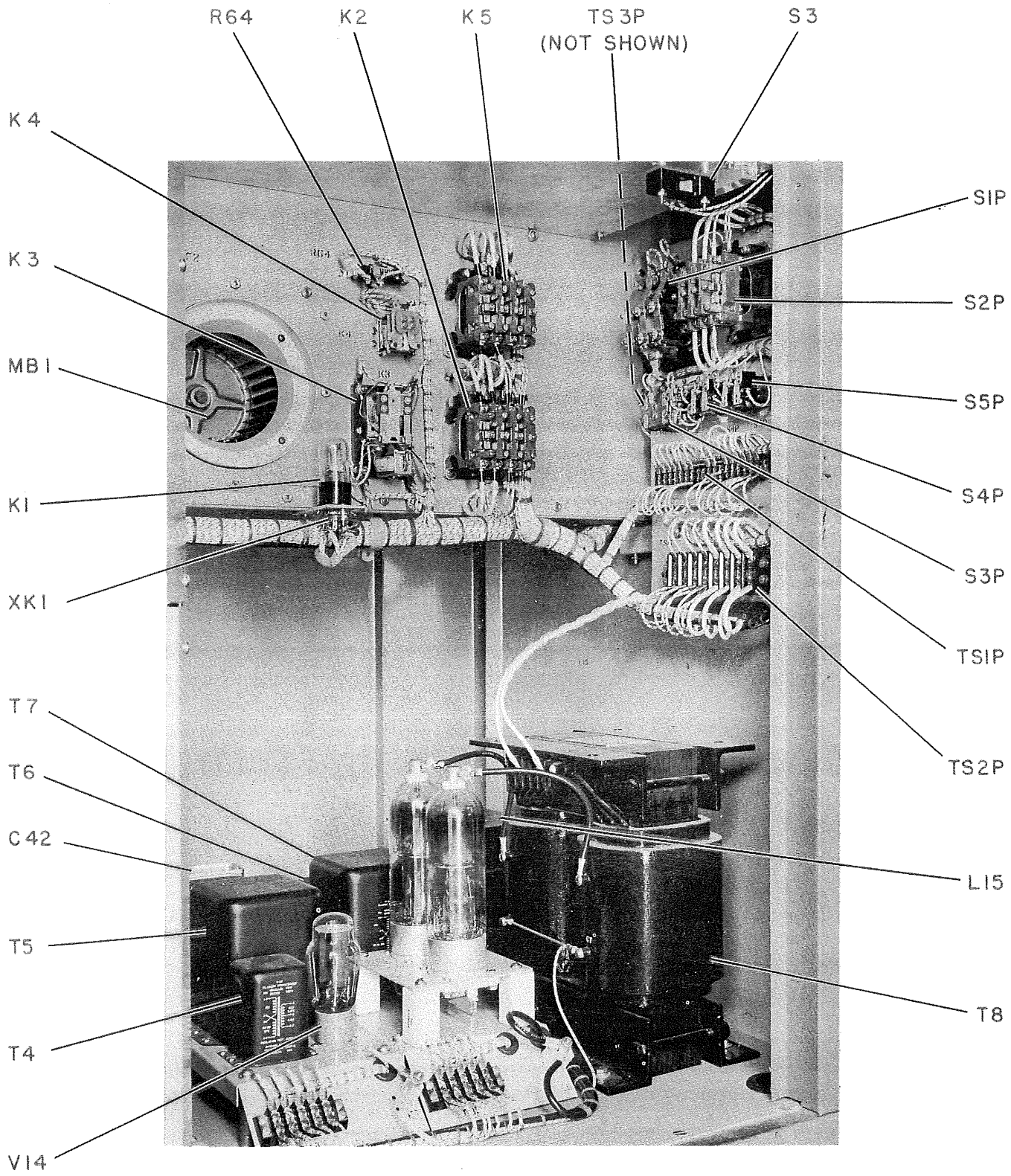


FIGURE 9
REAR VIEW, LOWER RIGHT SIDE

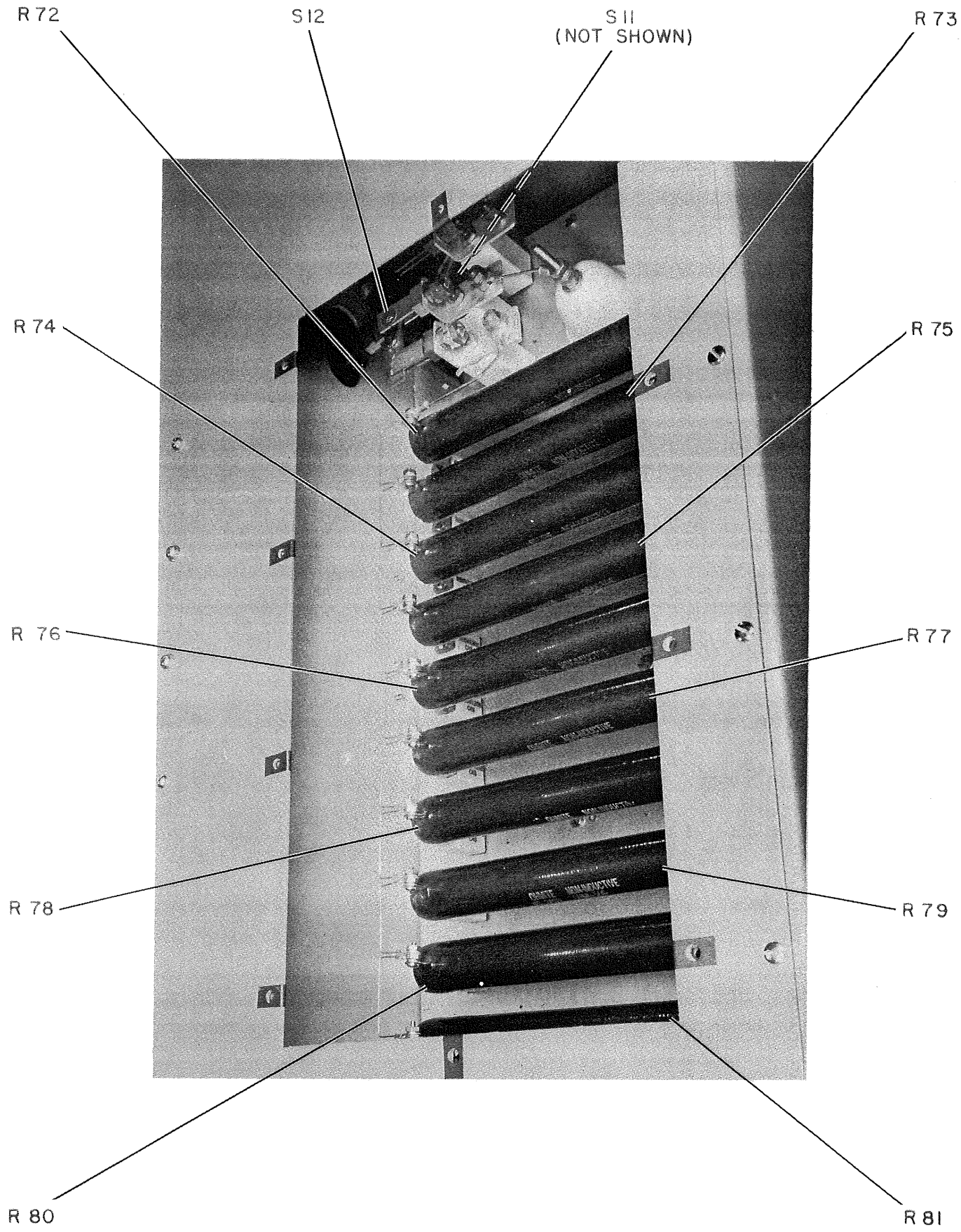


FIGURE 10
TOP VIEW, SCREEN REMOVED, DUMMY LOAD

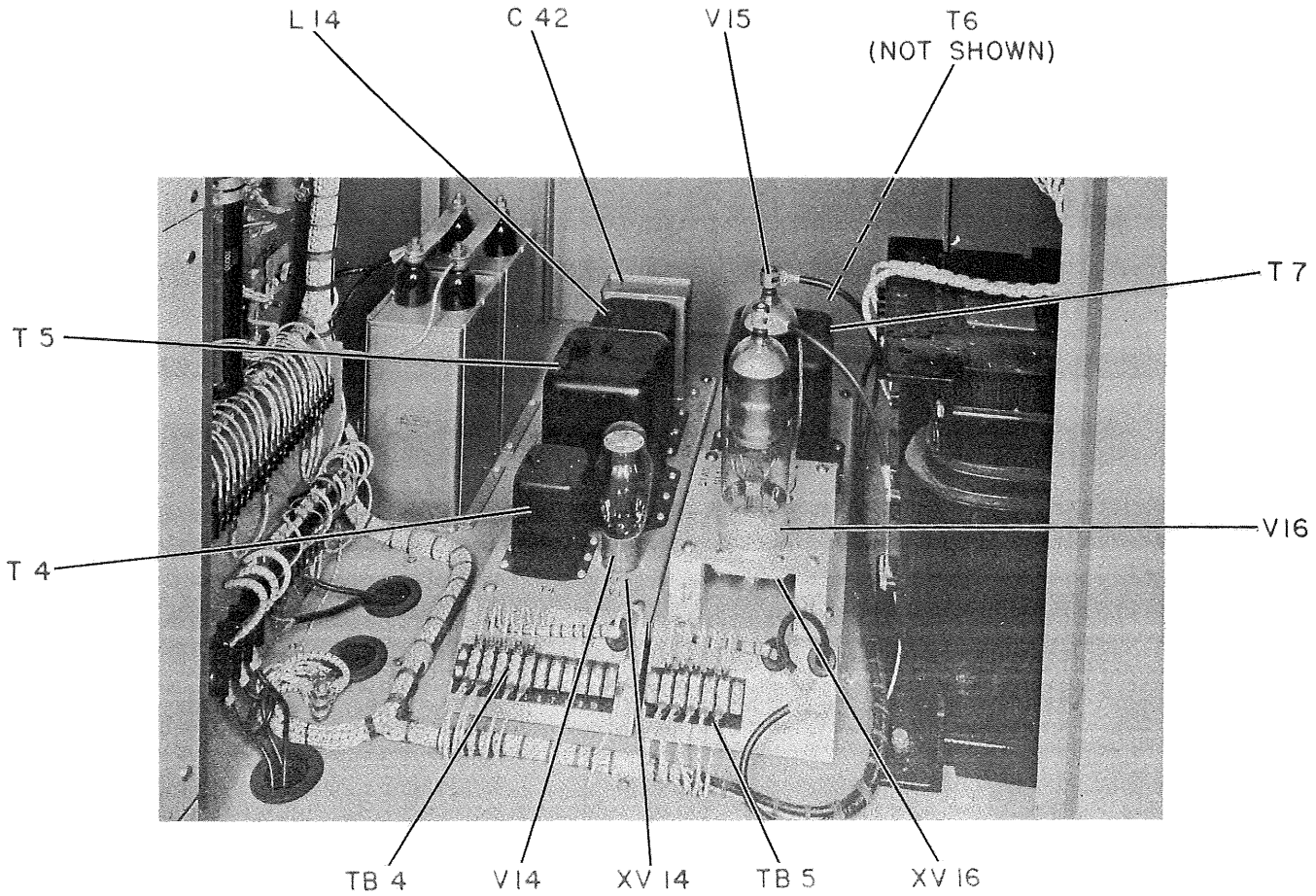


FIGURE 11
POWER SUPPLIES

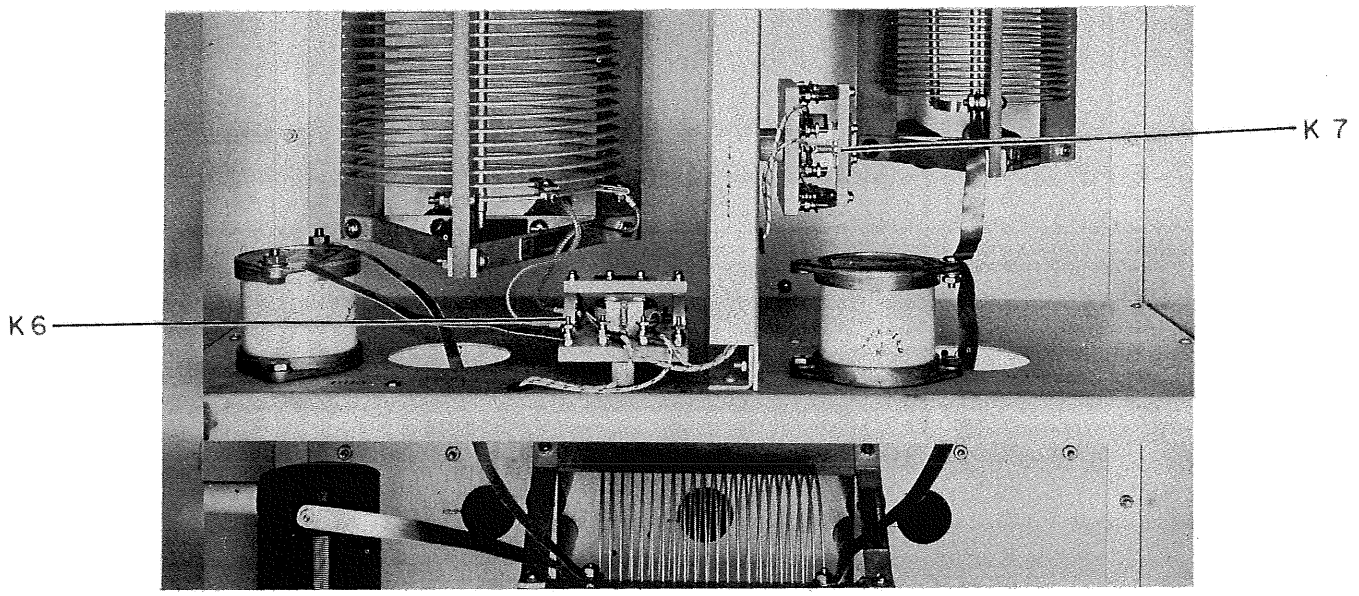


FIGURE 12
CONELRAD MODIFICATIONS

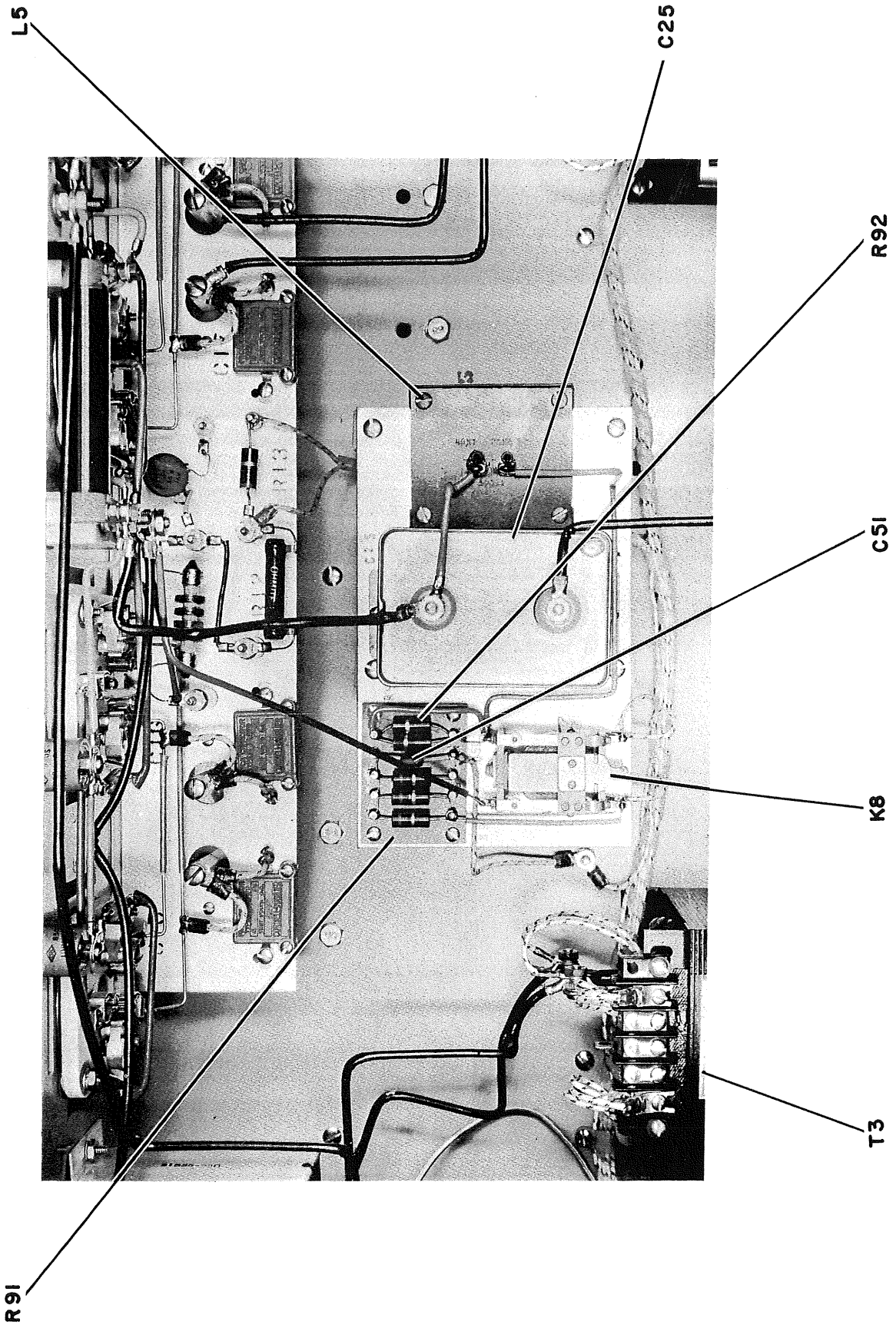


FIGURE 13

250 WATT CUTBACK MODIFICATIONS
POWER AMPLIFIER SHELF, LOWER SECTION
(T3 SECONDARY LEADS REMOVED FOR CLARITY)

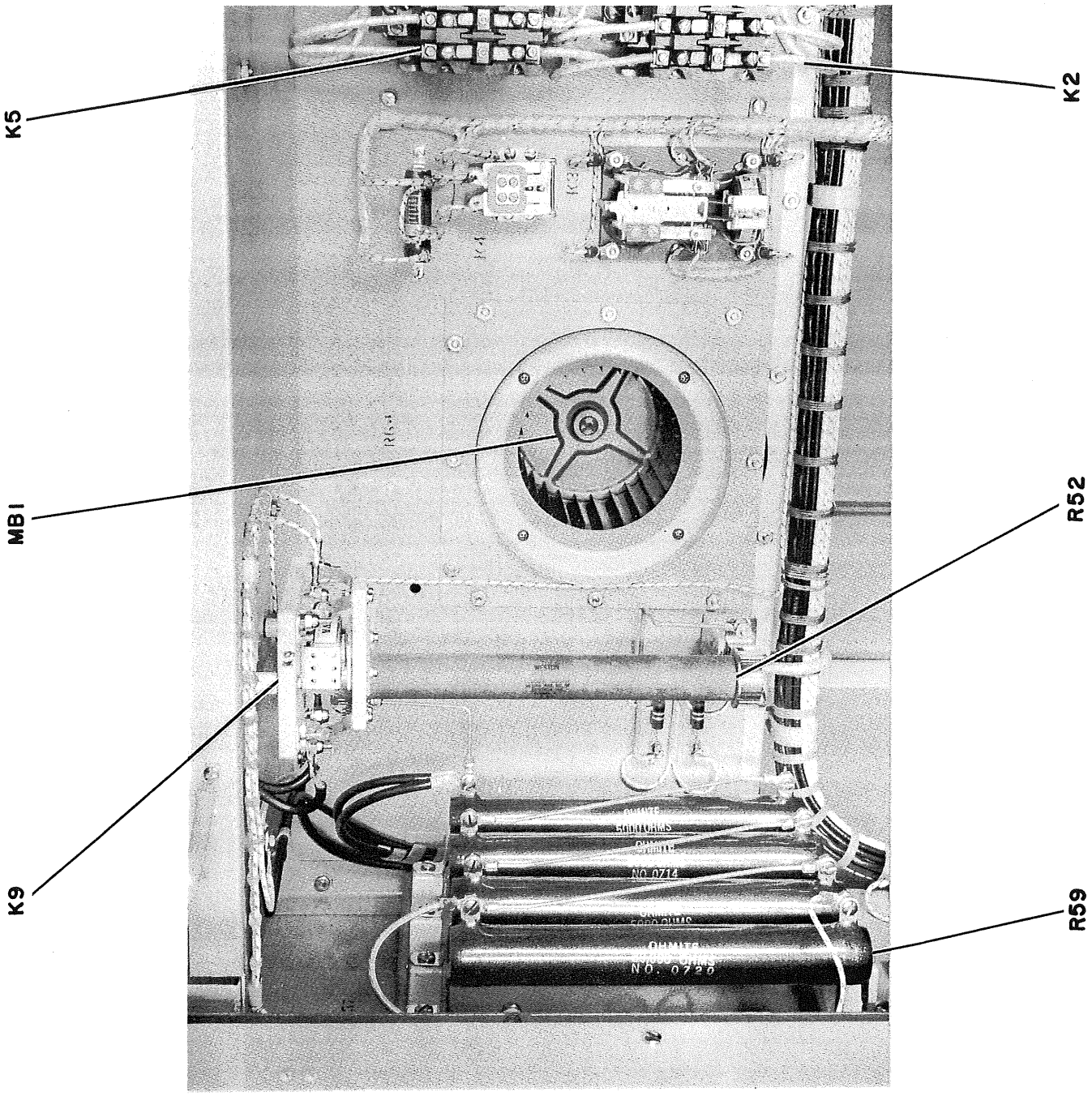


FIGURE 14

250 WATT CUTBACK MODIFICATIONS

REAR VIEW, LOWER SECTION

MWS Wire Industries

Resistance Wire

Major Alloy Resistance Data

Back to Main
Click here for Trade Name Cross Reference
Click here for Properties of Major Alloys

SIZE	DIA.	NOMINAL OHMS PER LINEAR FT. AT 20°C												
(B&S)	(INCHES)	NI 270*	NI 205	MWS-875	MWS-800	MWS-675	MWS-650	MANGANIN	MWS-294	ALLOY 180	MWS-120	ALLOY 90	ALLOY 60	ALLOY 30
4	.204	.001081	.001442	.02103	-	.01622	.01562	.006968	.0070	-	.002884	-	-	-
5	.182	.001358	.001811	.02642	-	.02038	.01962	.008755	.0088	-	.003622	-	-	-
6	.162	.01715	.002286	.03334	-	.02572	.02476	.01105	.0112	-	.004572	-	-	-
7	.144	.002170	.002894	.04220	-	.03255	.03135	.01399	.0142	-	.005788	-	-	-
8	.128	.002747	.003662	.05341	-	.04120	.03967	.01770	.0180	.01099	.007324	.00549	.003662	.00183
9	.114	.003463	.004617	.06733	-	.05194	.05001	.02231	.0226	.01385	.009234	.006925	.004617	.00230
10	.102	.004325	.005767	.08410	-	.06488	.06248	.02787	.0283	.01730	.01153	.00865	.005767	.00288
11	.091	.005434	.007246	.10566	-	.08151	.07849	.03502	.0355	.02174	.01449	.01082	.007246	.00362
12	.081	.006859	.009145	.13336	-	.1029	.09907	.04420	.0448	.02744	.01829	.01372	.009145	.00457
13	.072	.008681	.001157	.1688	-	.1302	.1254	.05594	.0567	.03471	.02314	.01735	.001157	.00578
14	.064	.010986	.01465	.2136	-	.1648	.1587	.07080	.0717	.04395	.02930	.02197	.01465	.00732
15	.057	.013850	.01847	.2693	.2462	.2078	.2000	.08926	.0905	.05541	.03694	.02770	.01847	.00923
16	.051	.017301	.02307	.3364	.3076	.2595	.2499	.1115	.1130	.06921	.04614	.03460	.02307	.01153
17	.045	.022222	.02963	.4321	.3951	.3333	.3209	.1432	.1452	08889	.05926	.04444	.02963	.01482
18	.040	.028125	.03750	.5469	.5000	.4219	.4062	.1813	.1837	.1125	.0750	.0562	.03750	.01825
19	.036	.034722	.04630	.6752	.6173	.5208	.5015	.2238	.2268	.1389	.0926	.06945	.04630	.02315
20	.032	.043945	.05859	.8545	.7813	.6592	.6347	.2832	.2871	.1758	.1171	.0879	.05859	.02924
21	.0285	.055400	.07387	1.077	.9849	.831	.8002	.3570	.3619	.2216	.1477	.1108	.07387	.03693
22	.0253	.07030	.09374	1.367	1.250	1.055	1.017	.4531	.4590	.2812	.1860	.1406	.09374	.04687
23	.0226	.08810	.1175	1.713	1.566	1.322	1.272	.5678	.5756	.3525	.2350	.1762	.1175	.05875
24	.0201	.11138	.1485	2.166	1.980	1.671	1.609	.7178	.7280	.4455	.2970	.2227	.1485	.07425
25	.0179	.14044	.1873	2.731	2.497	2.107	2.029	.9051	.9176	.5619	.3746	.2809	.1873	.09365
26	.0159	.1780	.2373	3.461	3.164	2.670	2.571	1.147	1.163	.7119	.4746	.3554	.2373	.11865
27	.0142	.2232	.2976	4.339	3.967	3.348	3.228	1.438	1.458	.8928	.5952	.4464	.2976	.14880
28	.0126	.2834	.3778	5.511	5.039	4.251	4.090	1.826	1.852	1.133	.7556	.5665	.3778	.18890
29	.0113	.3524	.4699	6.853	6.265	5.286	5.090	2.271	2.302	1.401	.9398	.7001	.4669	.23494
30	.010	.4500	.6000	8.750	8.00	6.750	6.500	2.900	2.940	1.800	1.200	.9000	.6000	.30000
31	.0089	.5681	.7576	11.047	10.10	8.523	8.206	3.662	3.710	2.273	1.515	1.1365	.7576	.37830
32	.008	.7031	.9375	13.672	12.50	10.55	10.16	4.531	4.594	2.813	1.875	1.4065	.9375	.46875
33	.0071	.8927	1.1090	17.358	15.87	13.39	12.90	5.754	5.833	3.572	2.380	1.786	1.1905	.59525
34	.0063	1.1338	1.511	22.046	20.16	17.00	16.37	7.305	7.408	4.534	3.022	2.267	1.5113	.75565
35	.0056	1.4349	1.913	27.902	25.51	21.52	20.72	9.274	9.375	5.740	3.826	2.870	1.9132	.9566
36	.005	1.8000	2.400	35.00	32.00	27.00	26.00	11.60	11.76	7.200	4.800	3.600	2.400	1.2000
37	.0045	2.2222	2.963	43.210	39.51	33.33	32.09	14.32	14.52	8.889	5.926	4.444	2.963	1.4815
38	.004	2.8125	3.750	54.688	50.00	42.19	40.62	18.13	18.37	11.25	7.500	5.625	3.750	1.8750
39	.0035	3.6735	4.898	71.429	65.31	55.10	53.06	23.67	24.00	14.69	9.796	7.345	4.898	2.4490
40	.0031	4.6826	6.243	91.051	83.25	70.24	67.63	30.18	30.59	18.72	12.49	9.360	6.240	3.1200
No B&S sizes below 40	.00275	5.9504	7.937	115.702	105.8	89.29	85.98	38.36	38.87	23.97	15.86	11.985	7.937	3.9635
	.0025	7.2000	9.600	140.000	128.0	108.0	104.00	46.40	47.04	28.80	19.20	14.400	9.60	4.800
	.00225	8.8889	11.85	172.840	158.0	133.4	128.5	57.31	58.07	35.58	23.70	17.790	11.86	5.930
	.002	11.2500	15.00	218.750	200.0	168.8	162.5	72.50	73.50	45.00	30.00	22.500	15.00	7.500
	.00175	14.6939	19.59	285.714	261.3	220.6	212.4	94.69	96.00	58.83	39.18	29.915	19.61	9.805
-	.0015	20.0000	26.66	388.889	355.6	300.0	288.9	128.9	130.66	-	53.33	-	-	-
-	.0014	22.9592	-	446.429	408.2	344.4	331.6	148.0	150.00	-	61.22	-	-	-
-	.0013	26.6272	-	517.752	473.4	399.4	384.6	171.6	174.00	-	71.01	-	-	-
-	.0012	31.2500	-	607.639	555.0	468.7	451.4	201.4	204.00	-	83.33	-	-	-
-	.0011	37.1901	-	723.140	661.2	557.8	537.2	239.7	243.00	-	99.17	-	-	-
-	.001	45.0000	-	875.000	800.0	675.0	650.0	290.0	294.00	-	120.0	-	-	-
-	.0009	55.5556	-	1080.247	987.7	833.3	802.0	-	-	-	-	-	-	-
-	.0008	70.3125	-	1367.188	1250.0	1054.6	1016.0	-	-	-	-	-	-	-
-	.0007	91.8367	-	1785.714	1633.0	1377.5	1327.0	-	-	-	-	-	-	-
-	.0006	125.0000	-	2430.556	2222.0	1875.0	1806.0	-	-	-	-	-	-	-
-	.0005	180.0000	-	3500.000	3200.0	2700.0	2600.0	-	-	-	-	-	-	-

* Using 45 OHMS/CMF

Click here for Trade Name Cross Reference
Click here for Properties of Major Alloys

MWS Wire Industries
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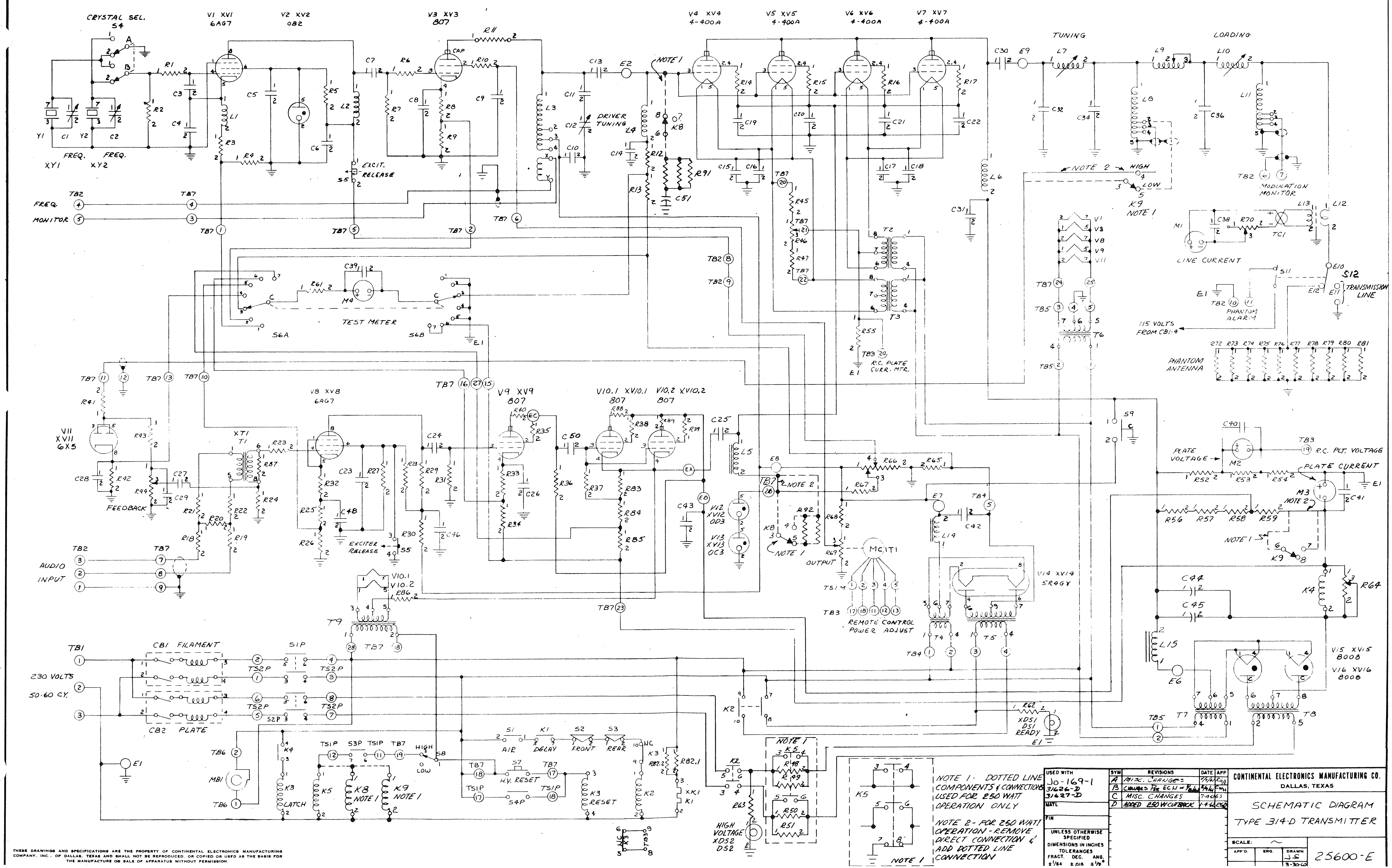


USED WITH	SYM	REVISIONS	DATE	APP
Jo-169-1	A	MISC. CHANGES		
31626-D	B	CHANGES PER ECN		
31627-D	C	MISC. CHANGES		
	D	ADDED 250 W CUTBACK	1-4-62	

MATL

FIN

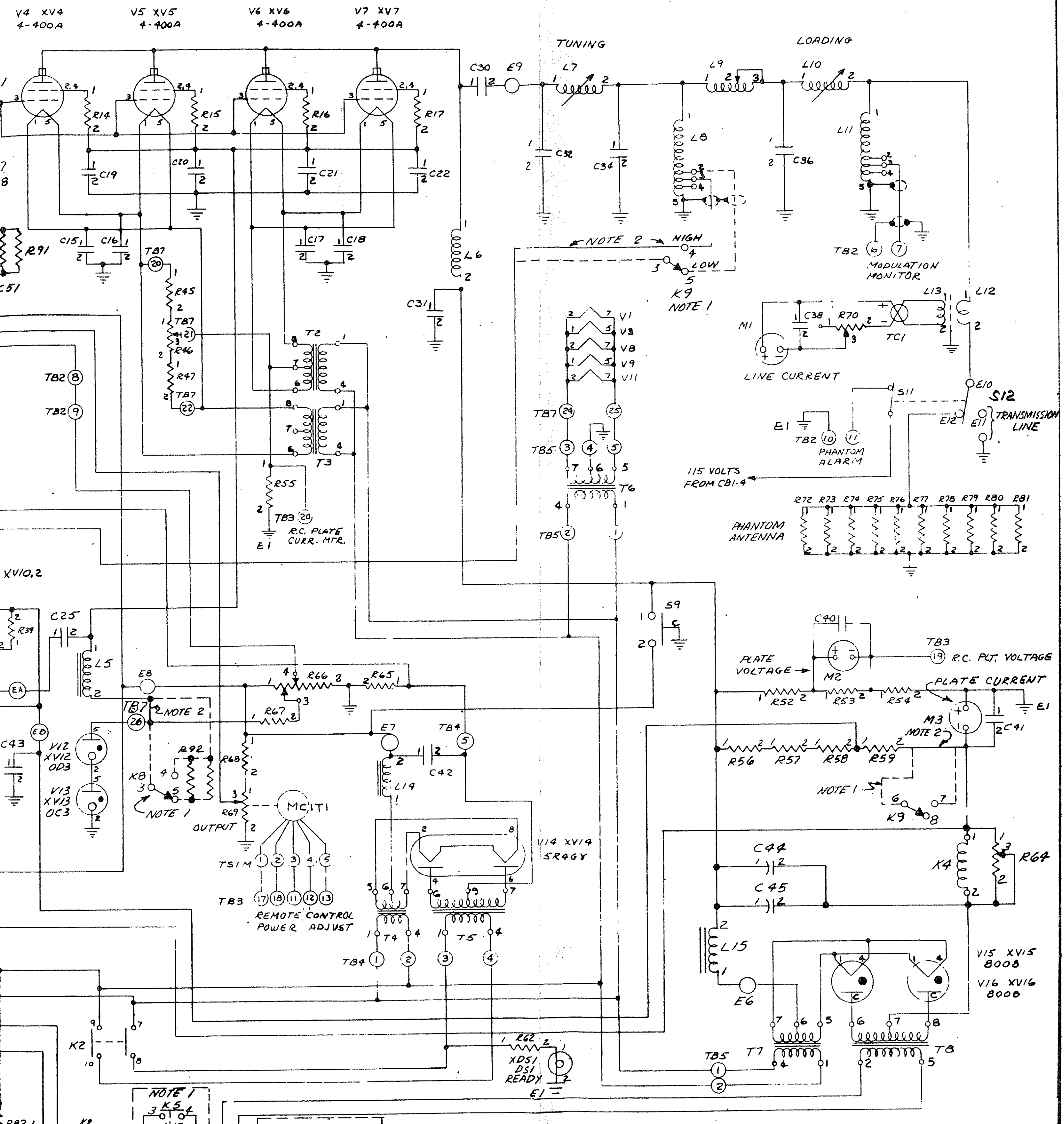
UNLESS OTHERWISE SPECIFIED
DIMENSIONS IN INCHES
TOLERANCES
FRACT. $\pm 1/64$ DEC. $\pm .015$ ANG. $\pm 1/2°$

CONTINENTAL ELECTRONICS MANUFACTURING CO.
DALLAS, TEXAS

SCHEMATIC DIAGRAM
TYPE 314-D TRANSMITTER

SCALE: ~
APP'D. | ENG. | DRAWN JS 3-30-60

25600-E



K5

NOTE 1 - DOTTED LINE COMPONENTS & CONNECTIONS USED FOR 250 WATT OPERATION ONLY

NOTE 2 - FOR 250 WATT OPERATION - REMOVE DIRECT CONNECTION & ADD DOTTED LINE CONNECTION

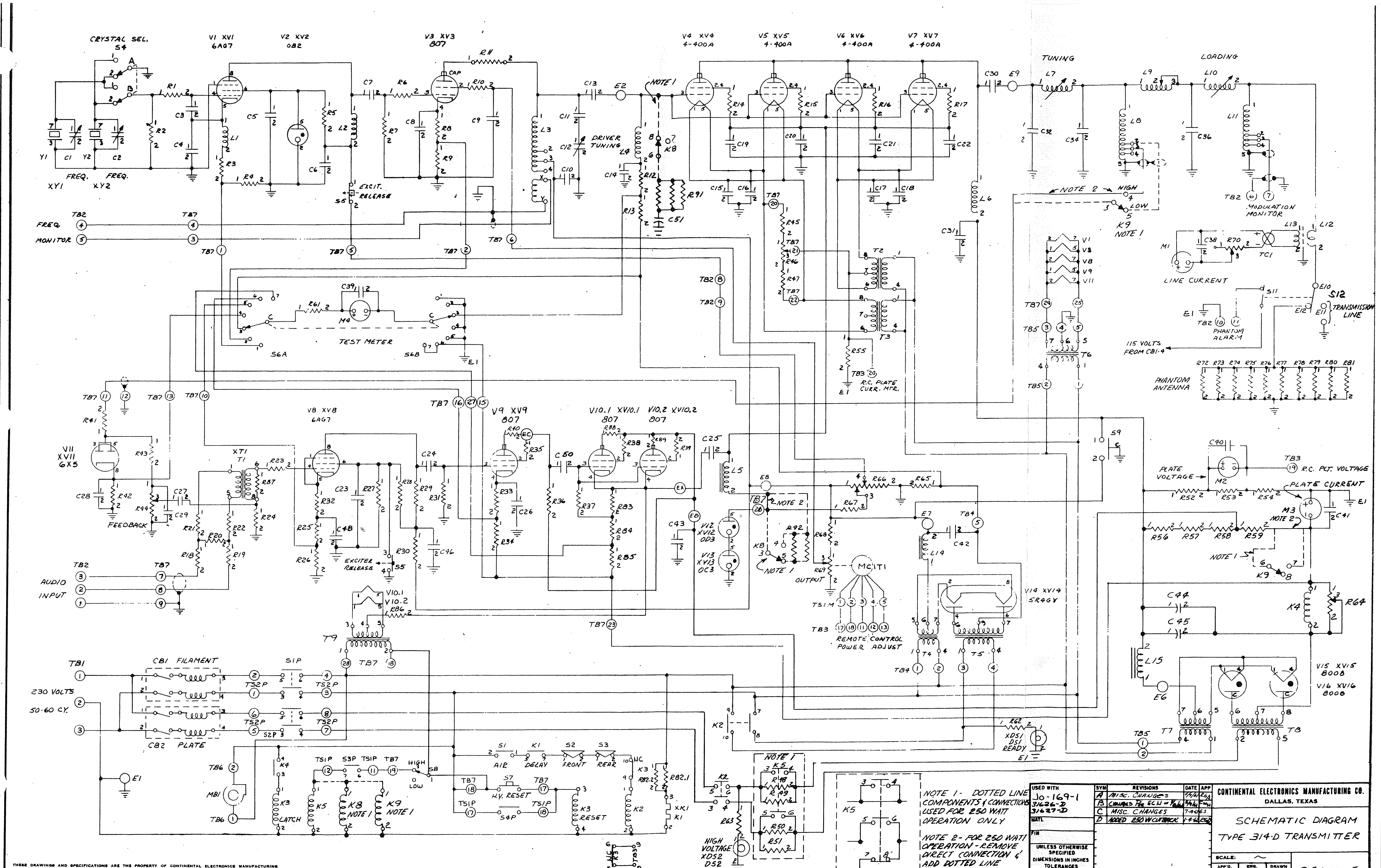
USED WITH	SYM	REVISIONS	DATE	APP
Jo-169-1 31626-D 31627-D	A	MISC. CHANGES		
	B	CHANGES PER ECN		
	C	MISC. CHANGES		
	D	ADDED 250 W CUTBACK		

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES TOLERANCES FRACT. DEC. ANG.

CONTINENTAL ELECTRONICS MANUFACTURING CO.
DALLAS, TEXAS

SCHEMATIC DIAGRAM
TYPE 314-D TRANSMITTER

SCALE: ~ DRAWN JS 25600-E



NOTE 1- DOTTED LINE COMPONENTS & CONNECTIONS USED FOR 250 WATT OPERATION ONLY

NOTE 2- FOR 250 WATT OPERATION - REMOVE DIRECT CONNECTION & ADD DOTTED LINE CONNECTION

USED WITH
JO-169-1
31626-D
31627-D

SYM	REVISIONS	DATE	APP
A	MISC. CHANGES		
B	CHANGES Per ECN		
C	MISC. CHANGES		
D	ADDED 250W CUTBACK		

CONTINENTAL ELECTRONICS MANUFACTURING CO.
DALLAS, TEXAS

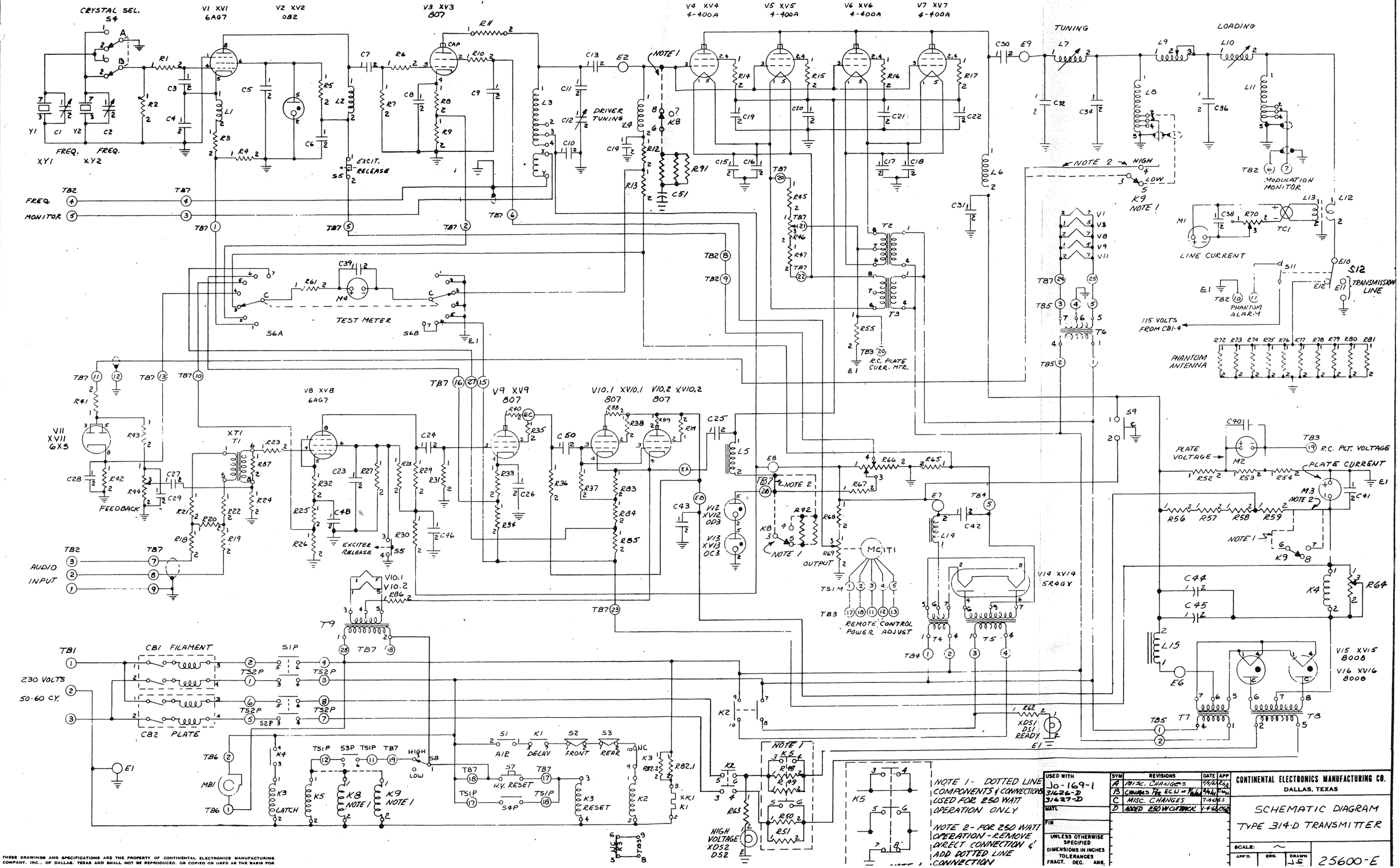
SCHEMATIC DIAGRAM
TYPE 314-D TRANSMITTER

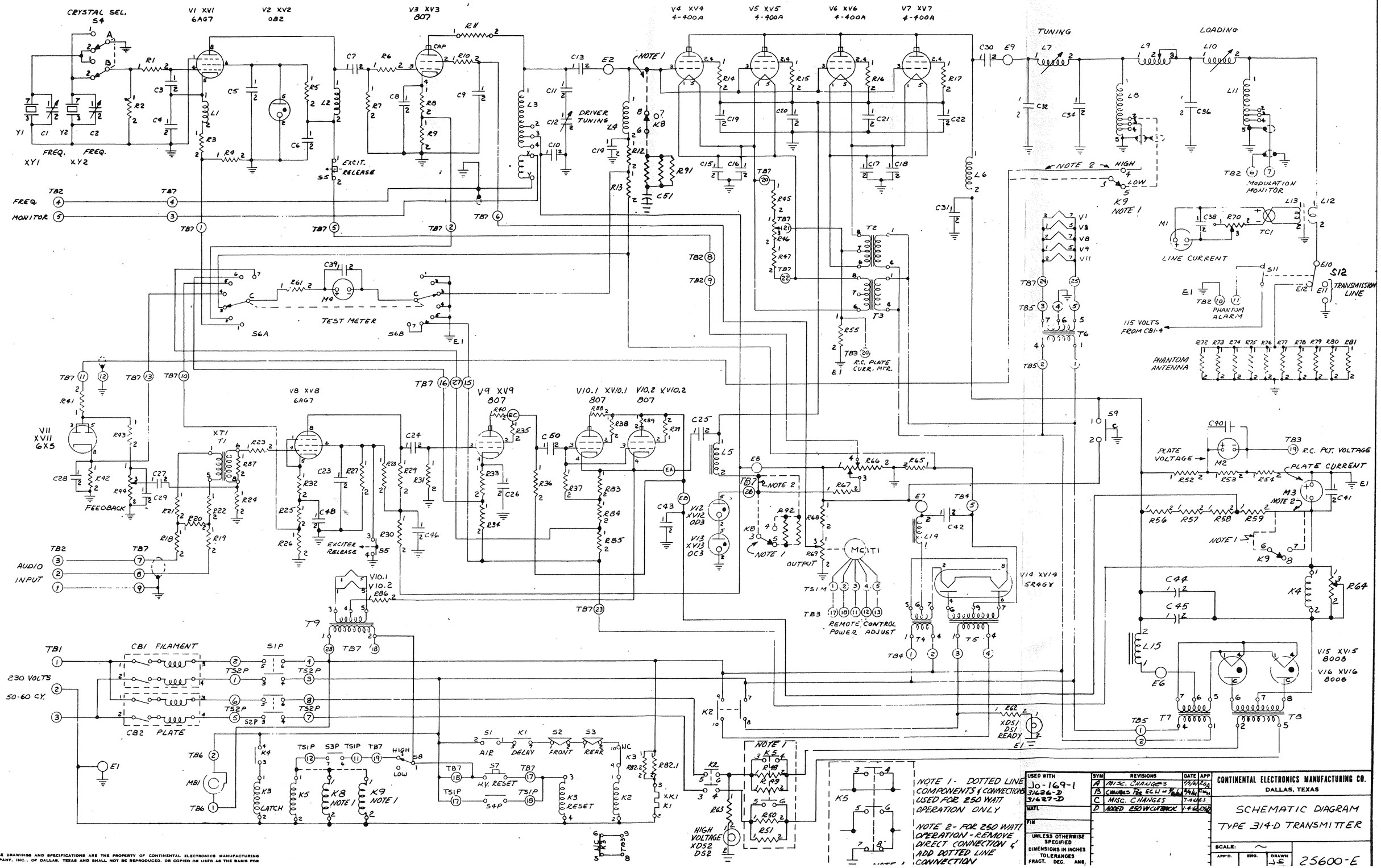
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES TOLERANCES FRACT. DEC. ANG.

SCALE: ~

APP'D. ENG. DRAWN JS

25600-E





USED WITH	SYM	REVISIONS	DATE	APP
Jo-169-1	A	MISC. CHANGES	11/4/64	[illegible]
3126-D	B	CHANGED PER ECN # [illegible]	5/4/65	[illegible]
3127-D	C	MISC. CHANGES	7-4-65	[illegible]
MAT'L	D	ADDED 250 W CUTBACK	1-4-66	[illegible]
FIN				

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES TOLERANCES FRACT. DEC. ANG.

CONTINENTAL ELECTRONICS MANUFACTURING CO.
DALLAS, TEXAS

SCHEMATIC DIAGRAM
TYPE 314-D TRANSMITTER

SCALE: ~

APP'D. | ENG. | DRAWN JS

25600-E