Broadcast Equipment

BTA-1R3
AM TRANSMITTER

ES-27238-D

IB-8027536-1

Broadcast Equipment

Instructions

BTA-1R3
AM TRANSMITTER

ES-27238-D

PAUCE – RCA SVC – STU COOKE
Broadcast
856-~~644~~ ~~4013~~
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9931

Communications Systems Division/Front and Cooper Streets/Camden, New Jersey, U.S.A. 08102

SUP79IM

IB-8027536-1

EMERGENCY
FIRST AID INSTRUCTIONS

WARNING

VOLTAGES THAT ARE DANGEROUS TO LIFE ARE INVOLVED IN THE OPERATION OF THIS ELECTRONIC EQUIPMENT. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH VOLTAGES APPLIED. DANGEROUS CONDITIONS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS, ETC. ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM TO AVOID PERSONAL INJURY OR LOSS OF LIFE.

Personnel engaged in the installation, operation, or maintenance of this equipment or similar equipment are urged to become familiar with the following rules both in theory and practice. It is the duty of all operating personnel to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

RESCUE BREATHING

GENERAL INFORMATION

A. START IMMEDIATELY, SECONDS COUNT

Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing. Warm the victim or apply stimulants. The main purpose is to GET AIR INTO THE VICTIM'S LUNGS.

B. WIPE OUT VICTIM'S MOUTH

Wipe out quickly any mucus, food, or any foreign matter in the victim's mouth using your fingers or a cloth wrapped around your fingers.

C. LOOSEN CLOTHING - KEEP WARM

Do this when the victim is breathing by himself or help is available. Keep him quiet as possible and from becoming chilled. Otherwise, treat him for shock.

D. DON'T GIVE UP

Continue emergency rescue breathing without interruption until victim is breathing without help or until all hope of reviving him as determined by a physician is gone.

E. CALL A PHYSICIAN

Have someone summon medical aid since respiratory and other disturbances may develop as a aftermath. A physician is necessary during the recovery period.

PROCEDURE

FIG. A

FIG. B

FIG. C

TILT HEAD BACK - Lift neck and point chin up to open air passage.

EXTEND JAW - Pull or push jaw into jutting out position (Fig. A).

PINCH NOSE - Close nostrils to prevent air leakage, or close mouth when using mouth-to-nose breathing.

BLOW - Seal victim's mouth or nose with your mouth. (Fig. B) Blow until chest rises.

REMOVE MOUTH - Listen for exchange of air; if none, check throat for obstruction. To remove it, place victim in position shown in Fig. C, and slap sharply between shoulder blades.

REPEAT - 12 times per minute for adults; at least 20 times per minute for children.

BURNS

SKIN REDDENED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Consult a physician.

SKIN BLISTERED OR FLESH CHARRED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to Hospital.

EXTENSIVE BURN-SKIN BROKEN: Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

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Blower Motor

TECHNICAL SUMMARY

ELECTRICAL SPECIFICATIONS

AF Input Impedance	150 or 600 ohms
AF Input Level (100% modulation)	+10 ±2 dBm
AF Response:	
50-7500 Hz	±1 dB
30-10,000 Hz	±1.5 dB
AF Distortion (95% modulation):	
50-10,000 Hz	2%
50-12,000 Hz	3%
Noise (below 100% modulation):	60 dB
Frequency Range	535 to 1620 kHz
Frequency Stability	±5 Hz
Type of Output	Single ended
Carrier Shift (0 to 100% modulation)	3%
Output Impedance (Reactive component not to exceed 10% of resistance)	40 to 250 ohms
RF Voltage (for frequency monitoring)	10V RMS 75 ohms
RF Voltage (for modulation monitoring)	10V RMS 75 ohms
Power Output (nominal)	1000 watts
Power Output Capability	1100 watts

POWER LINE REQUIREMENTS

Power Supply	208 or 240 Vac ±11V
Line Frequency	50-60 Hz
Phase	Single
Power Consumption:	
0% Modulation	2900 watts (approx)
100% Modulation	3900 watts (approx)
Average Program Modulation	3200 watts (approx)
Power Factor	90%
Permissible Combined Line Voltage Variation and Regulation	±5%
Crystal Heater Power Supply	115V, 50-60 Hz

PHYSICAL SPECIFICATIONS

Maximum Altitude	5000 feet
Ambient Temperature Range	-20° to +45° C
Dimensions:	
Width	34"
Height	84"
Depth	32-1/2" (less door handle)
Weight (net)	1700 lbs. approx.

TUBE COMPLEMENT

Symbol	Type	Function	Symbol	Type	Function
*1V101	6AK5	Oscillator	1V304	4-400A	Modulator
*1V102	5763	RF Amplifier	1V601	6146	Buffer
1V301	4-400A	Power Amplifier	1V603	2E26	1st AF Amplifier
1V302	4-400A	Power Amplifier	1V604	2E26	1st AF Amplifier
1V303	4-400A	Modulator			

*Crystal Oscillator MI-27632-A Only

RECOMMENDED TEST EQUIPMENT

RCA Type WV-98C VoltOhmist	RCA Type BW-11A AM Frequency Monitor
RCA Type WO-91B Oscilloscope	RCA Type BW-66F Modulation Monitor
Waveforms Type 401B Audio Oscillator	Dummy Load
Waveforms Type 456A Distortion Meter	RF Detector or equivalent (see figure 5)

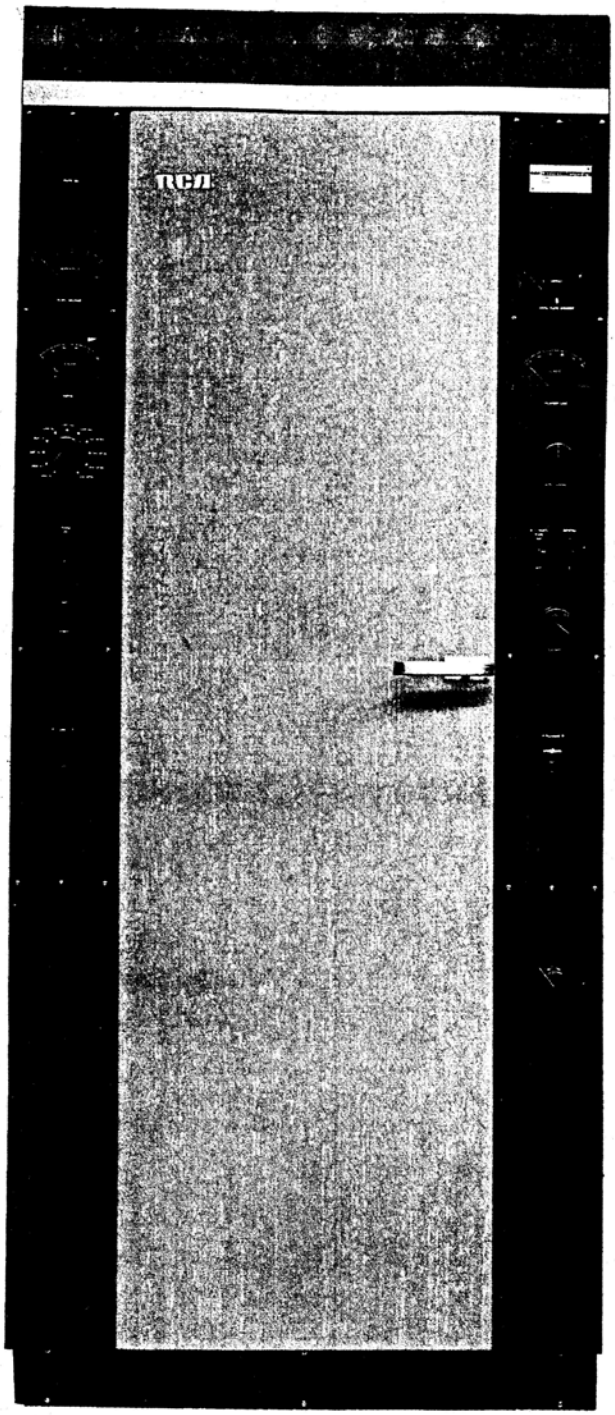

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Figure 1. BTA-1R3 AM Transmitter

EQUIPMENT LIST

TYPE BTA-1R3 A-M TRANSMITTER
ES-27238-D

Quantity	Description	Reference
1	BTA-1R3 AM Transmitter	MI-27649-D
1	Set of Operating Tubes	MI-27695-A
1	Set of Frequency Determining Parts	MI-27691
1	Crystal, Type TMV-130B	MI-27493
1	Nameplate	MI-28180-A
2	Instruction Books	IB-8027536
*	AM Broadcast Crystal Oscillator (tube)	MI-27632-A
*	AM Broadcast Crystal Oscillator (S.S.)	MI-27592
**	Touch-Up Finish Kit	MI-27660-C

* Supply one MI as specified on sales order.
** Supply if and as specified on sales order.

OPTIONAL AND ACCESSORY EQUIPMENT

Set of Spare Tubes MI-27696-A
Crystal, Type TMV-130B (Option of two spares) MI-27493-A
Antenna Tuning Equipment ES-27250
**Remote Control System
Studio Control Unit
Transmitter Control Unit
**Remote Control System
Studio Control Unit
Transmitter Control Unit
Remote Control Metering Panel ES-27220
Power Cutback Kit MI-34079
Remote Power Adjustment Kit MI-34080
RF Ammeter 7157F-*
Associated Hardware MI-34656

**Contact RCA Representative for latest control system information.

INTRODUCTION

The RCA Type BTA-1R3 AM Transmitter (see figure 1) is designed for high fidelity broadcasting within a frequency range of 535 kHz to 1620 kHz. The BTA-1R3 has a nominal rated output of 1000 watts and a maximum rated output of 1100 watts which provides compensation for losses in the transmission line and antenna tuning equipment.

Included in the following paragraphs are general and circuit descriptions, equipment layout, installation procedures, tuning procedures, operating instructions, maintenance information; replacement parts list, and station spare parts. Reference wiring and schematic drawings are included in this instruction book to aid during servicing and repair.

DESCRIPTION

GENERAL

The RCA Type BTA-1R3 Transmitter, shown in figure 1, is designed for high fidelity broadcasting within a frequency range of 535 kHz to 1620 kHz. The BTA-1R3 has a nominal rated output of 1000 watts and a maximum rated output of 1100 watts, which provides compensation for losses in the transmission line and antenna tuning equipment.

Air cooled tubes are used throughout the transmitter, and the output frequency is regulated by a crystal mounted in a thermostatically controlled, heated enclosure. The crystal heaters require a nominal operating

voltage of 117 volts, 60 Hz, single phase. An input voltage of 208-240 volts, 60 Hz, single phase, is required for transmitter operation.

The transmitter is completely self-contained in an attractively styled metal cabinet with wiring ducts, front and rear. Removable panels provide an easy access to the interconnecting wiring in the ducts. To provide maximum accessibility to all components during maintenance and service, the component chassis are mounted vertically in the cabinet.

All operating controls and meters are located on the panels at each side of the front door. In figure 11, the BTA-1R3 is shown with the front door panel removed; figure 14 is a rear view with the two panels removed, and figure 15 is a closeup view of the exciter section.

Opening the front door of the transmitter or removing either rear panel will release a safety interlock switch. This, in turn, opens the high voltage supply line to the transmitter and automatically grounds the high voltage buss.

Power for the blower motor is supplied through a motor starter which not only protects the blower motor but also opens the filament circuit in case the blower fails.

The transmitter is wired to permit remote control operation of all essential transmitter functions. Convenient installation of the RCA Remote Control System can be made by using the transmitter terminal board provided for external connections. If other than RCA remote control equipment is to be used, installation instructions should be obtained from the manufacturer or supplier.

The oscillator section, MI-27632A or MI-27592, including the buffer amplifier, consists of a removable, printed-circuit wiring, dip-soldered panel that provides for two temperature controlled crystals of the plug-in type: an operating crystal and one standby crystal. The oscillator can be switched instantaneously to either of the two separate crystals without retuning in the event of a crystal failure. This arrangement has the advantage of putting a heated standby crystal into operation instantly without the necessity of an additional oscillator. A relay switching arrangement enables the operator to change crystals through a front-panel lever switch without loss of air time even when the transmitter is being operated through remote control equipment.

The temperature-controlled crystals are completely unaffected by ambient temperature because they are maintained at a high temperature by individual 14-watt thermostatically-controlled heaters. The crystal units will remain constant within ±5 hertz. This property makes them ideal for silicon-rectifier-equipped transmitters in that the combination of the two permits transmitter operation in unheated, indoor surroundings in temperatures down to -4°F.

The unit is built on a printed circuit panel easily accessible for servicing by simply removing the connecting plug from the convenient plug-in terminal strip and six retaining thumbscrews. The unit is mounted in a vertical position which provides ease of maintenance. The printed wiring simplifies servicing and helps to improve oscillator stability.

Provision for reducing the power from 1000 to 500 or 250 watts with the use of an optional Power Cutback Kit MI-34079 has been incorporated in the design of the transmitter. See figure 12.

CIRCUIT

The rf circuit of the BTA-1R3 consists of four stages. See figure 21. Using MI-27632-A, the first two stages, 1V101 and 1V102, include the oscillator and buffer and are built on the printed circuit panel mentioned above. This unit incorporates broadband circuits that require no adjustment. The oscillator tube, a type 6AK5, (1V101) is operated at very low cathode current to assure long, dependable life while a type 5763 pentode (1V102) is used for the buffer amplifier.

When the solid state exciter, MI-27592 is utilized, a field effect transistor, Q1, serves as the oscillator. See figure 20. The oscillator output is fed through U1, the saturated amplifier, to Q2, the output amplifier. These stages employ broadband circuits that require no adjustment. The voltage doubler output of CR103 and CR104 is regulated by U2, the voltage regulator, and is applied to the oscillator and the saturated amplifier. High voltage for Q2, the common base output amplifier, is supplied by the transmitter. Zener diodes CR106 through CR109 limit the voltage applied to Q2 collector to 186 volts.

A hermetically sealed plug-in latching relay, K101, is used to select either crystal. The latching relay is polarized and is operated by reversing the polarity of the dc voltage momentarily applied to the coil when the crystal switch is operated. AC applied to the printed circuit board terminals is rectified by diodes CR101 and CR102 and applied to K101.

The output from the printed circuit combination is applied to the grid of 1V601, a 6146 class "C" buffer amplifier, which, in turn, is the driver for the power amplifier stage. The PA consists of two 4-400A type tubes (1V301 and 1V302) connected in parallel. The PA is plate modulated by 1T501 and screen modulated by the high value screen dropping resistor (self modulation).

The buffer amplifier is designed for broadband tuning which eliminates the necessity of fine tuning adjustments. This stage is tuned by shorting a portion of the plate choke coil, 1L601. A series of taps covering the broadcast band are provided on coil 1L601 for this purpose. A sample of rf for monitoring purposes is taken off the cathode resistor of 1V601. This sample is fed to connector 1J601 and is then applied to the station's frequency monitor.

The parallel connected 4-400A tubes in the PA function as class "C" amplifiers and feed into the output network. The output network is a double-pi type consisting of the PA tank, 1L301, the second harmonic filter, 1L302, and a combination of six capacitors, 1C304 through 1C309. Different combinations of these capacitors are used to tune the output network to match the low impedance of the antenna or transmission line to the high impedance of the plate. The PA tank, 1L301, is tuned by a silver-plated copper slug, and is the only tuning control in the transmitter.

The output network is designed to minimize harmonic radiation. In particular, the second harmonic is reduced by a trap consisting of a series tuned coil, 1L304, and capacitor 1C324. Tuning is accomplished by adjusting a shorting strap on coil 1L304. The power output of the PA stage is controlled by resistor 1R405, which varies the plate and screen voltage applied to the PA stage.

For modulation monitoring, rf voltage at 10 volts, 75 ohms, is supplied at the taps of the modulation monitoring coil, 1L305. These taps provide for voltage adjustment, as required, when different loads and different power levels are used.

The audio system consists of a two-stage, push-pull amplifier, which uses a pair of 2E26's (1V603, 1V604) in the first stage and two 4-400A's (1V303, 1V304) in the second stage. Input coupling to the first stage is provided by the audio input transformer, 1T601; the primaries can be connected in parallel for 150-ohm input, or in series for a 600-ohm input. Feedback voltage from feedback ladders 1Z301 and 1Z302 is applied to the first audio stage through the secondary of input transformer 1T601. The two 2E26 tubes (1V603, 1V604) operate in push-pull to drive the two 4-400A tubes (1V303, 1V304) in the second stage. The latter, in turn, are used to modulate the plates of the PA stage, 1V301 and 1V302, another pair of 4-400A's.

DC voltage is obtained from the three power supplies, all of which make use of silicon avalanche rectifiers. The high voltage supply furnishes high voltage for the PA and modulator tubes. The other two supplies are the low voltage and bias supplies. Filament voltage on all tubes may be adjusted by variable resistor 1R203, which is controlled from the front panel. Voltmeter 1M202 indicates the input voltage to the filament transformers, 1T301, 1T302, 1T602, and 1T603.

The power control circuit utilizes a time-delay relay, 1K601, to prevent application of plate power until the filament power has been applied. In addition, the plate voltage will be removed if an overload occurs. After the cause of the overload has been corrected, the transmitter may be returned to the air by operating the overload reset switch, 1S204, on the front panel. A short occurring in any circuit will cause the transmitter to shutdown. Before the transmitter can be returned to the air, corrective action must be taken to remove the cause of the short.

LAYOUT

The base step in the installation of the BTA-1R3 Transmitter is to decide upon the equipment layout and make provisions for the necessary external connections. After the space requirements have been determined, the equipment can be unpacked, assembled, and connected as specified. Outline dimensions for the transmitter are shown in figure 10.

Inasmuch as some of the optional and associated items include their own instruction books, the installation procedure for such units will not be repeated. Instead reference should be made to the instruction books (IB's) accompanying such equipment. These books are:

BPA-11A/B Antenna Tuning Unit IB-30223
Remote Pickup Unit IB-30209-1
Transmission Lines,
Hangers and Accessories IB-36164-1

Factors to be considered in layout are incoming power lines, accessibility of a good station ground, and the route for the transmission line to the antenna. The room where the transmitter is to be installed should be well ventilated and have an abundant supply of clean, dry air. The maximum ambient temperature is listed under TECHNICAL SUMMARY.

> **NOTE:** If air ducts are used on the ventilation system, a 250 to 350 CFM exhaust fan should be installed at the point of exit.

Separate disconnect switches and power leads must be supplied for the 208-240 volt and 110-125 volt

incoming power lines. When an external circuit breaker is to be used as a disconnect switch for the 208-240 volt power line, a 40 ampere rating should be specified. The time delay characteristics should be such that a 1000% current overload will cause the breaker to trip in approximately one second. A shorter time delay may cause the external breaker to trip before the transmitter breaker in the event of a heavy overload. Residential or lighting type breakers are not normally suitable for this application. The transmitter is protected by a 25 amp line circuit breaker in the 208-240 volt incoming line. Note that the crystal ovens require a separate 110-125 volt line so that the ovens may be energized 24 hours a day without interruption.

Disconnect switches and wiring must be provided for such items as the transmitter room exhaust fan, and monitoring racks. The tower lighting circuit should also be planned, although no material is provided for this item.

Wiring to and from the transmitter should be carried in conduit or a trench terminating below the unit. The base plan of the outline drawing, figure 10, indicates where this wiring should enter the unit. The ground connection must be connected to the station ground with a copper strap about 3 inches wide. Table 1 lists the external connections to be made.

These instructions are not intended to supersede any applicable local codes. Where these instructions conflict with any local electrical, construction, or building code, the provisions of the applicable local code should be followed.

TRANSMISSION LINE

The rf output from the transmitter terminates at the insulated fitting, as shown in figure 10. Beyond this point no lines or fittings are supplied with this transmitter and must be ordered separately.

A coaxial or open-type' transmission line with a resistive impedance of either 51.5 ohms, 72 ohms, or 230 ohms may be used. If the transmitter is to be connected directly to the antenna without a transmission line, the resistance measured at the transmitter output should be between 40 and 250 ohms with a reactive component not exceeding 10% of the resistance. The coupling network capacitors are supplied to match the transmitter output to a specific transmission line impedance at the operating frequency.

Where an underground transmission line is to be used, coaxial lines and fittings must be used. Layout information, dimensions, and installation data for the coaxial transmission lines are supplied in the transmission line instruction book.

If coaxial transmission line is used, the installation of items such as dehydrating or gassing units, if required, should not be overlooked. Data for installation of these items is supplied in the transmission line instruction book, IB-36164-1.

The RCA Type BPA-21A/B/C/D Antenna Tuning Unit is recommended for matching the antenna to the BTA-1R3 Transmitter. If desired, the unit can also be furnished to supply a rectified carrier current for remote antenna current indication.

An antenna tuning house is also desirable, especially when multi-element arrays are used, since it offers weather protection and facilities for test and measuring units, tower lighting equipment, and intercommunication components.

Before completing the layout from the transmitter to the transmission line and antenna, station engineering personnel should check the antenna system for protection against atmospheric static accumulations and electrical storms. If this is not done, the transmitter may be damaged. Refer to the next two headings for a discussion of the details involved.

ATMOSPHERIC STATIC ACCUMULATIONS

In certain localities atmospheric conditions build up high static potentials on the antenna towers, making it imperative to provide a drain path to ground for these accumulations. If no direct path is provided, the charge will build up potential until flashover occurs, either across the tower base arc-gap or across one of the capacitors in the antenna coupling system.

Where tower lighting chokes are used and one side of the ac supply line is grounded, the lighting choke will act as a satisfactory discharge path. When neither side of the ac line is grounded or when a toroidal tower lighter transformer is utilized, a drain path must be provided. Such a path, however, may already exist in the transmitter output circuit or antenna coupling unit. Existence of such a path may be checked after installation and before any circuits are energized by connecting an ohmmeter between the tower and ground. Any resistance up to approximately 250,000 ohms will provide a satisfactory return circuit. When no discharge path is indicated, one may be supplied by the installation of an rf choke or a 100,000 to 200,000-ohm Globar resistor. Connect either the choke or the resistor from the antenna feed line to ground. The line terminating unit will generally serve to house the component used.

ELECTRICAL STORMS

In areas subject to lightning storms, a direct electrical

path from the tower to ground is required to avoid capacitor and antenna current meter burnout if lightning strikes the tower. This requirement can generally be met by installing arc-gaps across the base insulators. If properly spaced, the gaps will present a low impedance path to ground, at the instant of discharge, and thus carry directly to ground any current caused by lightning striking the tower. Although there is a second path to ground through the tuning equipment or transmitter output, the higher impedance of this second path usually prevents excessive discharge under normal conditions. In instances where the tuning house is located under the tower or directly adjacent to it, the ratio of these two impedances may not be sufficiently high to prevent appreciable discharge current through the tuning equipment to ground with consequent destruction of the coupling equipment. To increase this ratio, a one or two-turn loop should be installed in the antenna lead from the tower to the tuning house. No such loop is required where the tuning house is more than several feet from the tower. In the latter instance, the longer lead provides the necessary higher impedance.

ANTENNA CURRENT READINGS

Under certain circumstances, when the tower lights are on, the 60 hertz tower lighting current may cause fluctuations or inaccuracies in the antenna current meter reading. This condition is created when the tower itself serves as one side of the lighting circuit and, hence, provides a common path for the tower lighting current and the rf current. Where this situation exists, it is possible to have two ground return paths for the 60-hertz lighting current: one through the antenna coupling equipment and transmitter output circuit; the other in the ac lighting circuit through the tower lighting chokes to ground where one side of the ac is grounded. A simplified schematic diagram of a typical circuit illustrating this possibility is shown in figure 2. To prevent the meter fluctuations, it is necessary for the 60 hertz tower lighting current to be returned by a path other than the rf circuits feeding the tower.

If a toroidal tower lighting transformer is used, no antenna current meter fluctuations will occur. Where lighting chokes are used, the circuit should be checked for the existence of a second ground path as previously described.

Elimination of the 60 hertz return path through the coupling equipment or transmitter output circuit is achieved by inserting a blocking capacitor in the antenna feed line. The capacitor may be connected in either of two places: just ahead of the antenna current meter or between the transmitter output and the transmission line. The location depends upon the type of coupling circuit used in the line terminating unit. As a general

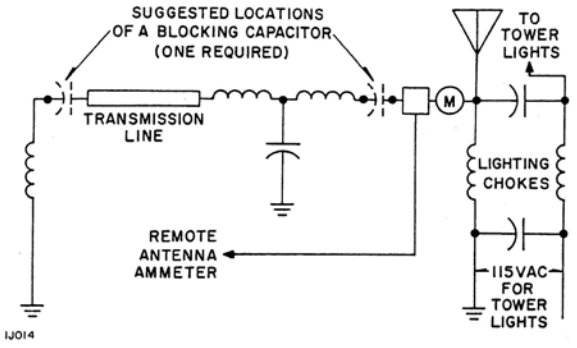


Figure 2. Typical Tower Lighting Circuit

rule, the reactance of the blocking capacitor, shown dotted in figure 2, should not be greater than approximately one-tenth of the characteristic impedance of the transmission line.

To determine if antenna current meter variations are caused by the condition just described, turn on the tower lights when the transmitter is off. The presence of any current reading on the antenna current meter at this time indicates the need for corrective measures.

UNPACKING

An understanding of the overall shipping system will be of assistance in unpacking the equipment and locating items. Each piece of RCA equipment is accompanied by a packing slip which lists the complete contents of the shipment by Master Item (MI) numbers. This shipping voucher is usually packed in one of the smaller cardboard cartons, appropriately marked.

Where more than one item is listed on an MI sheet, a subdivision of "item" number is listed after the MI number. Thus, a component might carry the designation "MI-99999-2". This indicates that the part is "item 2" on the MI-99999 list. These MI sheets are essentially packing lists, and where there are two or more boxes to a major unit, the box containing the MI sheet is identified by stenciling. Thus it is possible to identify the contents of each box and systematically plan the overall uncrating. All items listed on the MI sheets should be located before crates or boxes are destroyed, to avoid loss of small items overlooked during unpacking.

The MI sheets, as previously noted, are of value only

in locating items for assembly. The MI sheets should not be used for installation sequence nor for installation details. Refer to the appropriate drawings and the following notes for this information.

It is possible that the configuration or mechanical design of a component or part may be different in appearance or that its location may have changed from that shown in the photographs or drawings. Changes such as these are the result of manufacturing considerations or design modifications that have been incorporated during production, after the photographs and drawings have been released for publication. However, the function of any different appearing component or part is the same as that of its illustrated counterpart, unless otherwise specified.

The equipment may now be unpacked. Tubes and crystals should not be unpacked until required. In addition, the frequency-determining parts, MI-27691, should be left in their carton until installation is specified.

INSTALLATION

Be sure to remove all red metal straps supporting the larger projecting components in the transmitter cabinet before installing the components shipped separately. These straps were installed at the factory to brace these large in-place components during shipment.

Various components have been removed from the transmitter cabinet and packed separately for shipment. All such parts are individually tagged with an MI and item number. Do not remove any identification tags until all the components have been installed.

Refer to the appropriate drawings and photographs for the location and placement of these components.

Hardware required for reassembly is shipped in place or the hardware required will be specified as needed.

Before making any connections or installing any components, place all switches and circuit breakers in the OFF position. This will prevent possible damage to the equipment if the incoming power switch is closed accidentally.

The following items are shipped separately as part of MI-27649-D.

Modulation Transformer 1T201 (item 2)
Plate Transformer 1T202 (item 3)
Modulation Reactor 1L201 (item 4)
HV Filter Reactor 1L202 (item 5)
Modulator Blocking Capacitor 1C205 and Brackets (item 6)
Blower 1B201 (item 7)

With the exception of the blower, 1B201 (item 7), these components are to be mounted on the floor of the transmitter. However, it may be more convenient to set the arc-gap on the HV filter reactor (item 5) and the modulation transformer (item 2) before installing them in the cabinet. Adjust the contacts on 1L202 for a gap of 1/16 inch; adjust the contacts on 1T201 for a gap of 3/16 inch. Although this is the nominal setting for 1T201, a readjustment may be required later as part of the final operational adjustments.

Refer to figure 14 for the placement of these components and then make the required connections according to the connection tags attached to the leads and the terminals.

Refer to figure 14 and install the blower, 1B201, in the upper rear section, using the mounted hardware to fasten the blower to the cabinet. Make the connections according to the connection tags attached to the leads and terminals.

The installation of the Crystal Oscillator consists merely of placing it in the proper position and tightening up the six thumbscrews. Plug in the multiple connector and the output lead in the small jack. A cover is not used on the oscillator as there are no exposed relay contacts.

One precaution to be observed when installing the oscillator is to see that the miniature relay has been inserted in its socket in the proper position. The relay is color coded, i.e., there is a red dot on the bottom of the relay case which, when the relay is installed correctly, will be adjacent to the white dot on the board next to the relay socket.

When all components, except the frequency determining parts, tubes, and crystals have been installed, make the external connections required. Carefully check the wiring for accuracy. If a buzzer and battery are used for circuit checking, temporarily short circuit all meters in the transmitter or disconnect one side of each meter to prevent meter damage.

Check the high-voltage grounding switches, 1S217 to 1S219 for proper operation, using a battery and buzzer or the lowest scale on an ohmmeter.

Set aside the tubes, crystal, and frequency-determining parts for specific instructions given as part of the PRELIMINARY TUNING PROCEDURE.

NOTE: Be sure all electrical connections are tight before applying power to the transmitter.

TABLE 1. EXTERNAL CONNECTIONS

Point of Connection	External Circuit	Point of Connection	External Circuit
1B	Ground	22B & 21B	
2B		15B	#1 crystal
3B	208/240 volts, 60 hertz power input	19B & 21B	Remote control
4B		15B	#2 crystal crystal switching
5B	117 volts, 50/60 hertz for crystal heater		
8B	External plate voltage interlock		
9B	connections		
10B			
11B	Remote control plate off	23B	
11B		24B	Remote plate voltage metering
12B	Remote control plate on	25B	
13B		24B	Remote cathode current metering
15B	Remote control transmitter on	26B	
14B		27B	Spare
15B	Remote control transmitter off	28B	
		29B	Audio input
		1J601	RF to frequency monitor
		1K302	RF to modulation monitor

CONTROL CIRCUIT CHECK

To ensure that all connections have been correctly made, the following control circuit check should be made before applying plate and bias voltages to the transmitter.

1. Disconnect and tape the primary leads of 1T402 and 1T202 at terminals 36F and 37F and the primary of 1T403 at terminals 10D and 11D.

2. Switch the LINE CIRCUIT BREAKER, 1S210, to the ON position.

3. Switch the TRANS ON/OFF control, 1S203, to the ON position. This will energize the TRANSMITTER ON latching relay, 1K604.

4. Switch the BLOWER ON/OFF control, 1S301 (located on the tube shelf near 1V304), to the ON position. This will start the blower, 1B201.

5. Switch the FILAMENT CIRCUIT BREAKER, 1S211, to the ON position. This will cause FILAMENT LINE METER, 1M202, to indicate, and a short time later, the PLATE TIME DELAY contactor, 1K601, to energize.

TABLE 2. TRANSFORMER PRIMARY TAPS

Transformer	208 v Line Taps			240 v Line Taps		
	-11	0	+11	-11	0	+11
1T301	197	208	219	229	240	251
1T302	197	208	219	229	240	251
1T402	197	208	219	229	240	251
1T403	–	208	–	–	240	–
1T202	197	208	219	229	240	251
1T602	197	208	219	229	240	251
1T603	197	208	219	229	240	251

6. Turn the FILAMENT CONTROL, 1R203, fully clockwise and read the incoming line voltage on the FILAMENT LINE meter, 1M202. Adjust the taps on the transformer primaries to the same voltage as that of the line, or as close as possible to the line voltage if the range of transformer taps does not permit setting to the exact voltage. Refer to table 2 for a list of the transformers and their taps. Figures 14 and 15 show the location of these transformers in the cabinet. The schematic diagram, figure 21, shows the electrical connections.

7. Place the OL RESET-PLATE ON/OFF switch, 1S204, to the ON position. This will energize the PLATE ON contactor, 1K602, and cause the PLATE ON lamp, 1I201, to glow.

8. To check the operation of the interlock circuit, open and close the door and then remove the rear panels one-by-one, replacing the first panel before removing the second. As each door and panel is opened, the interlock switch, 1S214, 1S215 or 1S216 will operate: the PLATE ON lamp, 1I201, will go off; and the PLATE ON contactor 1K602, will de-energize. Each time 1K602 is de-energized, it will be necessary to operate 1S204 to energize 1K602.

9. Switch the TRANS ON/OFF control, 1S203, to the OFF position and re-connect the primary leads of transformers 1T402 and 1T403.

TUNING PROCEDURE

WARNING

Use extreme caution when tuning or repairing the transmitter. The voltages are sufficiently high to cause serious injury or loss of life.

Switch the PLATE to OFF and momentarily ground all capacitors and coils before touching them when making tuning adjustments or repairs.

1. Place all switches and circuit breakers in the OFF position.

2. Rotate 1R402 and 1R403 fully counterclockwise.

3. Install all tubes in the transmitter except the 4-400A modulators (1V303, 1V304). Connect a dummy load of the proper impedance to the transmitter antenna connections.

4. Place the crystals in their sockets, and apply power to the crystal heaters. Allow the crystal heaters to operate for at least 30 minutes before making any adjustments.

5. Place the following switches in the ON position.

a. LINE CIRCUIT BREAKER, 1S210
b. FILAMENT CIRCUIT BREAKER, 1S211
c. BLOWER MOTOR BREAKER, 1S301
d. TRANS ON/OFF, 1S203

The blower motor will start and filament voltage will be applied to all tubes.

6. Measure the filament voltage at pins 1 and 5 of the 4-400A tubes (1V301, 1V302, 1V303, and 1V304) with an ac voltmeter and adjust the filament control, 1R203, to obtain 5 volts across the filaments. Note that the voltage measured at the modulator sockets may be higher than normal since the tubes are not yet in their sockets.

7. Place the TRANS ON/OFF switch, 1S203, in the OFF position.

TABLE 3. BUFFER COIL 1L601 SETTINGS

Frequency in kHz	Tap
535 to 620	Full Coil
630 to 810	1
820 to 1040	2
1050 to 1350	3
1360 to 1620	4

TABLE 4. BTA-1R3 FREQUENCY-DETERMINING PARTS

Output Line (Ohms)	Frequency (kHz)	1C304	1C305	Connect 1C304, 1C305	1C308	1C309	Connect 1C308, 1C309	1C306	1C307	Connect 1C306, 1C307	1C324
51.5	535-640	1500	1500	Series	10000	–		10000	10000	Series	620
	650-770	1300	1300	Series	8200	–		8200	8200	Series	510
	780-930	1000	1000	Series	6200	–		6200	6200	Series	510
	940-1110	100	330	Parallel	3300	2000	Parallel	6200	6200	Series	360
	1120-1330	620	620	Series	10000	10000	Series	1000	1300	Parallel	360
	1340-1620	620	620	Series	3900	–		1000	1000	Parallel	360
72	535-640	1500	1500	Series	10000	–		10000	10000	Series	620
	650-770	1300	1300	Series	8200	–		8200	8200	Series	510
	780-930	1000	1000	Series	6200	–		6200	6200	Series	510
	940-1110	100	330	Parallel	3900	1300	Parallel	6200	6200	Series	360
	1120-1330	620	620	Series	3900	–		1000	1300	Parallel	360
	1340-1620	620	620	Series	3900	–		1000	1000	Parallel	360
230	535-640	1500	1500	Series	3900	1300	Parallel	10000	10000	Series	620
	650-770	1300	1300	Series	3300	1300	Parallel	8200	8200	Series	510
	780-930	1000	1000	Series	3900	–		6200	6200	Series	510
	940-1110	100	330	Parallel	1300	1300	Parallel	6200	6200	Series	360
	1120-1330	620	620	Series	1300	1300	Parallel	1000	1300	Parallel	360
	1340-1620	620	620	Series	1000	1000	Parallel	1000	1000	Parallel	360

8. Connect the tap on the buffer plate coil, 1L601, to the desired frequency as shown in table 3. Place the TRANS ON/OFF and the PLATE ON/OFF switches in the ON position. Place the 11-POSITION METER switch, 1S201, in the AMP Ig position. Note the meter reading. It may be necessary to select an adjacent tap on the buffer plate coil, 1L601, to obtain maximum amplifier grid current.

9. Place the PLATE ON/OFF and the TRANS ON/OFF controls in the OFF position.

10. The frequency determining capacitors are supplied under MI-27691. These capacitors must be installed in various values and combinations as listed in table 4 according to the transmitter's frequency and load impedance. Make the connections according to the schematic diagram of figure 21.

11. Adjust the shorting strap on the harmonic filter coil, 1L302, leaving 5 turns in the circuit.

12. Refer to the tuning charts, figures 3 and 4, and adjust the shorting straps on the PA tank coil, 1L301, and the second harmonic trap coil, 1L304, according to the assigned frequency.

CAUTION

Make certain that the coil clip on the shorting strap of 1L301 does not touch the adjacent turns of the coil.

13. Place the TRANS ON/OFF switch in the ON position and set 1R405 at the mid-point of its travel.

14. Place the TRANS ON/OFF switch in the OFF position. Place the 4-400A modulator tubes in their sockets. Connect the plate cap on each modulator tube.

15. Refer to step 6 and check that the specified filament voltage is being maintained on all tubes.

16. Reconnect the primary leads of transformer 1T202.

17. Tune the output network as indicated in table 5.

18. Make final adjustments as indicated in table 6.

OPERATION

In routine operation operate the PLATE ON/OFF and TRANS ON/OFF switches to shutdown the transmitter. All other circuit breakers and switches should be left in the ON position.

Where conditions require additonal heating time before applying plate voltage, operate only the TRANS switch to the ON position and after the required interval, operate the PLATE switch to the ON position. Normally, sufficient warm-up time is provided by the plate time-delay relay.

To interrupt transmission for a short interval, operate only the PLATE switch to OFF. This will maintain filament power on the tubes, and the transmitter will be returned to immediate operation when the PLATE switch is closed.

The crystal heaters should be operated at all times, except when the transmitter is to be shutdown for extended periods. The crystal units require a minimum of 30 minutes warm-up time before operating the transmitter.

If an overload occurs, plate power will be removed from the transmitter. After the cause of the overload has been corrected, operate the overload reset switch on the front panel to place the transmitter back on the air.

At start-up, and at regular intervals during operation, note and record the panel meter readings in a suitable log. This will aid in maintaining the proper values of voltage and current and will disclose operating irregularities and gradual changes in transmitter operation. Refer to table 7 for typical meter readings.

MAINTENANCE

GENERAL

With ordinary care a minimum of service will be required to keep the BTA-1R3 transmitter in operation. To avoid interruptions during broadcasts, however, a regular schedule of inspection as shown in table 8, should be correlated with other station equipment maintenance to insure overall peak efficiency.

Always open the LINE circuit breaker and discharge circuits with a grounding stick before touching any component.

CLEANING

Ceramic insulators and bushings should be kept clean at all times. Insulators are subject to stress in high-voltage dc fields and may rupture if sufficient dust accumulates to cause corona discharge. Clean insulators

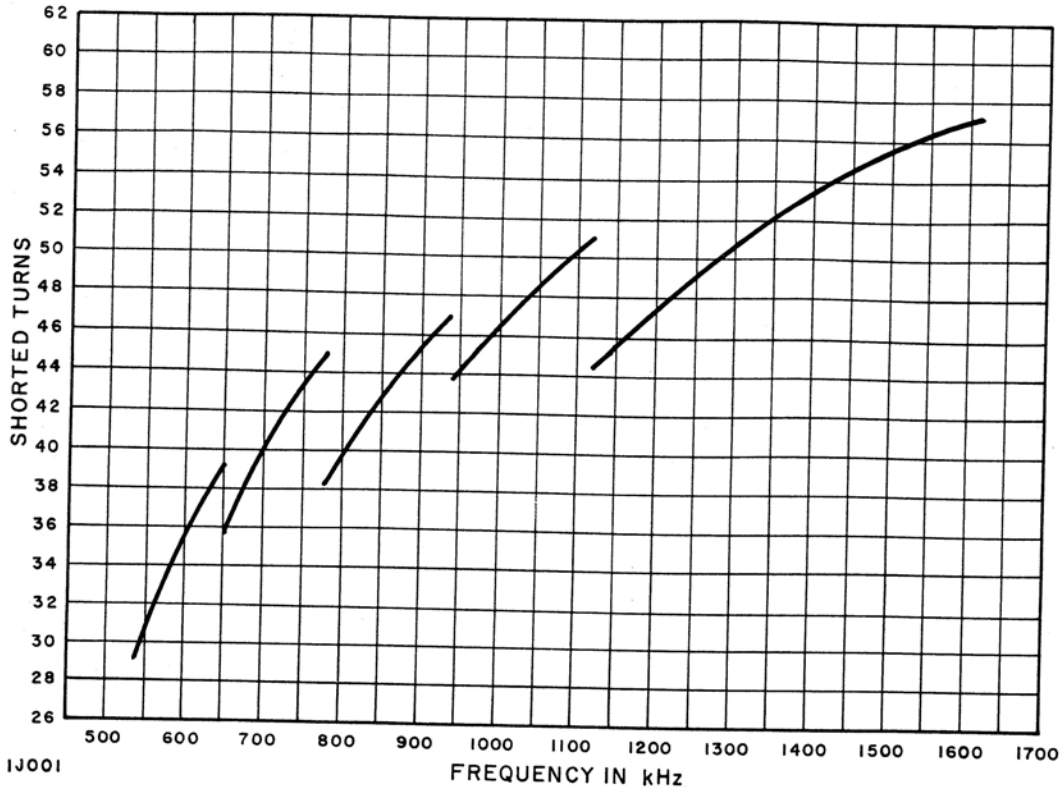


Figure 3. Tuning Chart, PA Tank, 1L301 Jumper Connections

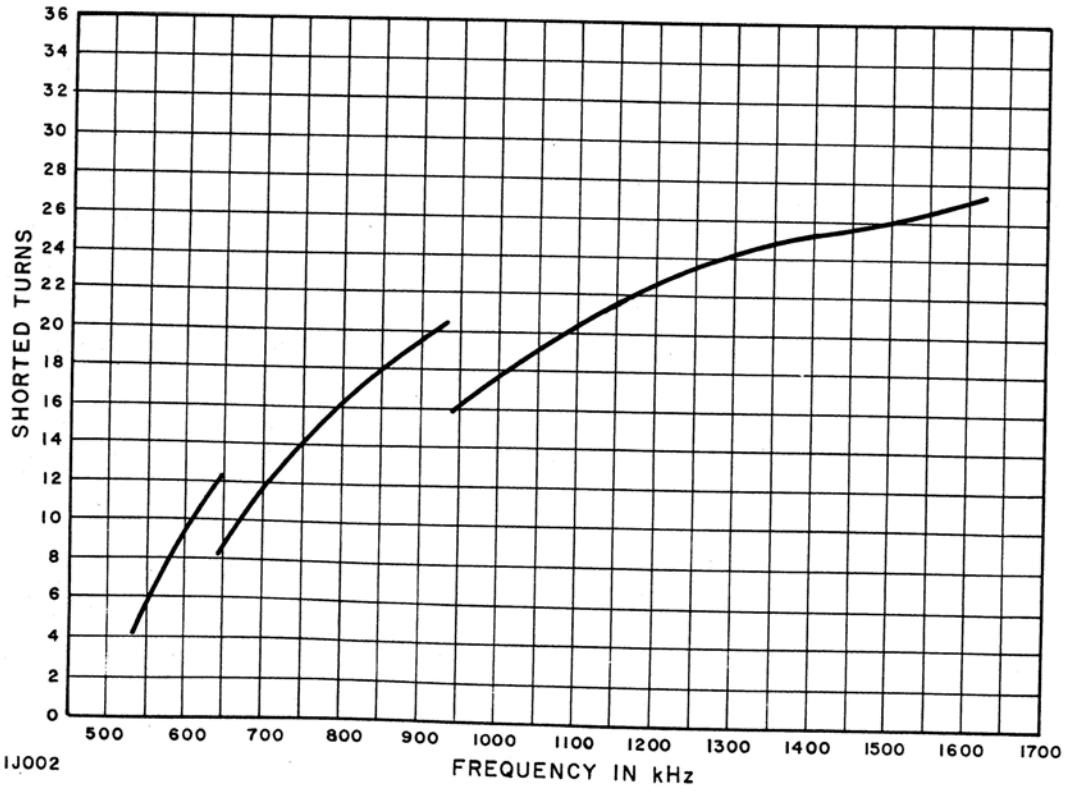


Figure 4. Tuning Chart, Second Harmonic Trap, 1L304 Jumper Connections

TABLE 5. OUTPUT NETWORK TUNING

Step	Switches or Breakers		Component	Operation	Procedure
	Control	Position			
1	TRANS PLATE	ON ON	1L301	Quickly rotate the AMP TUNING control until a minimum reading is obtained on the AMP PLATE CURRENT meter.	If a minimum dip cannot be obtained, place the PLATE ON/OFF control in the OFF position, while making any internal adjustments. Move the shorting strap on the PA tank coil, 1L301, one turn in either direction. It may be necessary to repeat this procedure, moving the shorting strap on 1L301 up or down until a minimum reading is obtained on the AMP PLATE CURRENT meter. IMPORTANT – To insure optimum transmitter efficiency, the final tuning adjustment of 1L301 should be such that minimum current is obtained with the tuning slug just out of the coil. CAUTION Make certain that the coil clip on the shorting strap of 1L301 does not touch the adjacent turns of the coil.
2	TRANS PLATE	ON ON	1C324 1L304	Measure and note the rf voltage across this capacitor using an rf detector (as shown in figure 5).	Place the PLATE ON/OFF control in the OFF position while making any internal connections or adjustments. Move the shorting strap on 1L304 up or down until maximum voltage is obtained. The second harmonic trap, 1L304 and 1C324, will be tuned on the second harmonic of the carrier frequency when the shorting strap is connected to the coil turn giving maximum voltage output. NOTE: Alternatively, the second harmonic trap may be adjusted by using a receiver tuned to the second harmonic and adjusting for a minimum signal.
3	PLATE	OFF	1L302	Adjust shorting strap on 1L302 to obtain 95% of rated rf power, then adjust AMP TUNING control for rated power output.	Place the PLATE ON/OFF control in the OFF position while making any internal connections or adjustments. Move the shorting strap on the harmonic filter, 1L302, tap-by-tap, in the direction of increasing inductance. Note the power output. Continue to move the shorting strap and, with each change of tap, adjust the AMP TUNING control for a minimum reading on the AMP PLATE CURRENT meter. Plate current dip and maximum power (100%) should occur simultaneously. If the maximum power is not obtained at this time, increase the number of active turns on 1L302 and readjust the AMP TUNING control 1L301.

TABLE 6. FINAL ADJUSTMENTS

Step	Switches or Breakers		Component	Operation	Procedure
	Control	Position			
1	TRANS PLATE	ON ON	1R402 1R403	Adjust bias potentiometers for a 30%, indication on PERCENT meter.	Place the PERCENT meter control to second AF I_{k-1}, then to second AF I_{k-r} and adjust 1R402 and 1R403 so that the meter reading is identical for each position.
2	TRANS PLATE	ON ON	C101 or C102	Crystal unit trimmer adjustment for carrier frequency correction.	Check the operating frequency with a frequency monitor. If a slight correction in transmitter frequency is indicated, adjust trimmer C101 or C102 with an insulated alignment tool. When connecting the frequency monitor to 1J601, clip out the shorting jumper across the jack. Note: Whenever the station's Frequency Monitor is disconnected from the Frequency Monitor connector, 1J601, this connector should be grounded.
3	TRANS PLATE	ON OFF	1L305 1R328	Adjusting modulation monitoring coil and vernier resistor for required output.	Connect the lead from 1R328 to 1L305. Place the PLATE ON/OFF control in the ON position. Vary the tap on 1R328 until the "CARRIER" meter of the modulation monitor reads 100%. It may be necessary to select a different tap on 1L305.
4	TRANS PLATE	ON ON		Adjusting audio input levels.	Connect output of audio oscillator to terminals 28B and 29B. Adjust 1000 hertz level until modulation monitor reads 85% modulation.
5	TRANS PLATE	OFF ON	1T201	Setting arc gap on modulator transformer.	Adjust the spacing on the modulation transformer, 1T201, until the gaps occasionally flash over on 100% modulation peaks. Then increase the spacing slightly beyond this point.
6	TRANS PLATE	OFF OFF		Disconnect the dummy rf load and connect the antenna transmission line.	Readjust coils 1L301 and 1L302 if necessary. Record all meter readings and tap settings. Typical panel meter readings are given in table 7.

by using a soft, clean cloth. Insulator details are shown in table 11.

Keep the tube envelopes clean to avoid possible damage of the glass due to ion bombardment or corona. Tissue paper and alcohol are effective for this purpose.

Clean plate tank coils with a dry cloth. NEVER USE LIQUID POLISH OR STEEL WOOL ON THESE ITEMS. Avoid any scratches on the silver-plated surfaces.

Keep safety gaps clean. If gaps are pitted, polish them with crocus cloth.

Periodic inspection of circuit breakers and relays should be made, and all contacts should be cleaned and adjusted if necessary.

Relay contacts should be cleaned with trichloroethylene applied with a soft brush, and then burnished with a tool such as the RCA Contact Cleaning Tool, Stock No. 22963. Finally, the contacts should be wiped with a clean piece of bond paper.

TABLE 7. TYPICAL PANEL METER READINGS

Meter Symbol	Panel Designation	Meter Reading	Modulation Percentage	Remarks Meter 1M201 Currents At 100% Indication
		1000 WATTS		
1M203	Plate Voltage	3100 V	0-100	
1M204	Amp Plate Current	460 mA	0-100	
1M201	Meter			
	Amp I_{k-r}	120-135%		233 mA
	Amp I_{k-l}	120-135%		233 mA
		500 WATTS		
1M203	Plate Voltage	2200 V	0-100	
1M204	Amp Plate Current	325 mA	0-100	
1M201	Meter			
	Amp I_{k-r}	75%		233 mA
	Amp I_{k-l}	75%		233 mA
		250 WATTS		
1M203	Plate Voltage	1550 V	0-100	
1M204	Amp Plate Current	230 mA	0-100	
1M201	Meter			
	Amp I_{k-r}	52%		233 mA
	Amp I_{k-l}	52%		233 mA
		1000 – 500 – 250 WATTS		
1M201	Meter			
	*Osc I_{k-1}	83-88%	0-100	4.5 mA
	*Osc I_{k-2} (rf Amp)	75-80%	0-100	50.0 mA
	Buf I_g	50-58%	0-100	4.2 mA
	Buf I_p	65-85%	0-100	76.0 mA
	Amp I_g	95-110%	0-100	18.0 mA
	1st AF I_{k-r}	55-70%	0-100	7.2 mA
	1st AF I_{k-l}	55-70%	0-100	7.2 mA
	2nd AF I_{k-r} (Mod)	25-30%	0	265 mA
	2nd AF I_{k-l} (Mod)	25-30%	0	265 mA
	2nd AF I_{k-r} (Mod)	90-105%	100	265 mA
	2nd AF I_{k-l} (Mod)	90-105%	100	265 mA

Note 1: Variation in the meter readings of ±20% may be considered normal.
Note 2: Subscripts r and l refer to the left and right tubes.
*Crystal oscillator MI-27632-A only

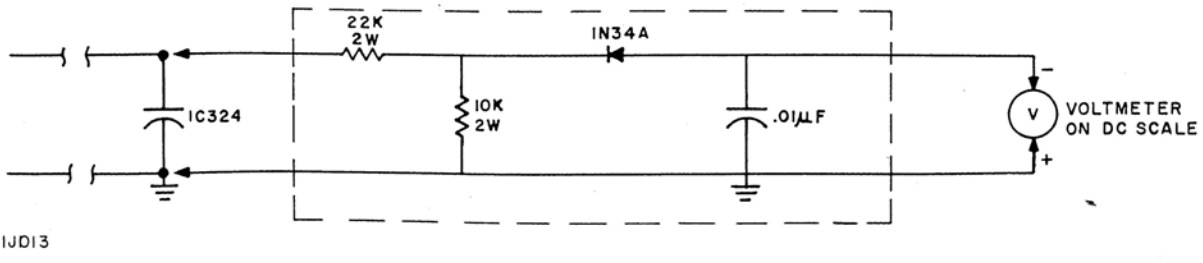


Figure 5. RF Detector

TABLE 8. RECOMMENDED OVERALL MAINTENANCE SCHEDULE

DAILY
– Check and compare all meter readings at start-up. Adjust filament voltages if necessary. Take steps to correct any condition revealed by abnormal readings. – For increased tube life, check filament voltages every hour. – Make a general visual inspection after shutdown. – If overloads have occurred, examine components concerned at shutdown, and repair or replace as necessary.
WEEKLY
– Clean internal parts of the transmitter. Use a clean, soft cloth on the insulators. Use a vacuum cleaner or hand blower for removing dust or dirt. – Test all door interlocks and grounding switches. – Check PA and output rf circuits for evidence of heating at connector or junction points. – Make an overall check of distortion and noise level.
MONTHLY
– Check spare crystal in operating crystal socket. – Check condition of relay contacts. Service if necessary. – Check and record tube socket voltages. Compare with previous readings to detect irregularities. – Inspect air filter. Clean, if necessary, using a vacuum cleaner or brush. – Inspect blowerwheel blades and remove accumulation of dirt, if necessary. – Tighten all connections in transmitter.
QUARTERLY
– Lubricate all tuning drive mechanism gears and bearings. Use petrolatum, Lubriplate No. 110, or equivalent. – Clean air filter.
SEMI-ANNUALLY
– Inspect relay contacts and replace where required. – Test spare tubes.

OVERLOAD RELAYS

The sensitivity of the overload relays is controlled by spring tension. This is set at the factory and usually no further adjustment is required. However, if the transmitter shuts down without apparently overloading, the sensitivity of the overload relays should be checked. Table 9 shows the nominal energizing voltage required to trip each relay. Refer to figure 11 for the location of the relays and to the schematic diagram (figure 21) for their electrical connections.

The relays designated in table 9 can be easily checked by the use of a simple test circuit consisting of a battery in series with a variable resistor. An RCA VoltOhmyst is used to monitor the variable voltage source as it is applied to the relay coil. It may be desirable to temporarily disconnect the resistor shunting the relay coil to reduce the battery current.

Before connecting this external source of power to the relays, the panel meters in the relay circuits should be shorted. This will prevent possible damage to the meters should there be excessive deflection while the variable resistor is being adjusted.

Ground the negative side of the battery to the chassis and connect the lead from the variable resistor to the high-potential terminal of the relay coil. Terminals are indicated on the schematic diagram (figure 21).

TABLE 9. RELAY SETTINGS

Symbol	Function	Voltage
1K401	HV Overload	1V
1K603	Modulation Overload	1V
1K605	LV Overload	3/4V
1K606	PA Overload	1V

The contacts on the overload relays should just close at the voltage values shown in table 9. If a relay trips at a voltage other than that shown, reset the sensitivity of that relay by turning the spring tension screw located at the right of the tension spring. Turning the screw in a clockwise direction reduces the spring tension, thus increasing the sensitivity; conversely, counterclockwise rotation of the screw will reduce the sensitivity of the relay.

FUSES

The crystal heater circuit is protected by two-1 amp fuses, 1F601 and 1F602, connected in the crystal heater input line. These fuses are readily accessible from the front panel as indicated in figure 11.

CONTROL COMPONENTS

The components for the operating controls on each front panel are located on a sub-chassis which is bolted on the back of each front panel. The sub-chassis can be removed from inside the front of the cabinet, thus making any component that might require replacement readily accessible.

To remove the sub-chassis from the rear of the right side control panel, take the AMP TUNING and FILA-

MENT control knobs off their shafts and remove the handles from OL RESET switch and the CRYSTAL switches. Disconnect the AMP TUNING cable from the cable drum; then remove the six nuts from the sub-chassis mounting bolts. Be careful not to kink the control cable tubing when lifting the sub-chassis free. Also, provide adequate support to the sub-chassis so that the wiring connected to the control components is not subjected to undue strain. When removing the left side sub-chassis follow the same procedure, first disconnecting resistor 1R202 from switch 1S201.

SOLID-STATE RECTIFIERS

The major cause of failure in high voltage rectifiers is due to power line transients that often occur in the open delta distribution systems designed for electro-mechanical equipment. If the open delta system is used and solid-state rectifier failures occur, it is suggested that the problem be reviewed with the power company in an effort to improve the service.

Heat is also a major factor in the destruction of silicon properties. It is therefore advisable to check and tighten all electrical connections to and from the rectifiers. This not only ensures good electrical continuity but also provides a path for proper heat conduction.

The high voltage silicon rectifiers should be periodically tested to isolate defective cells. Completely or nearly shorted cells can be detected by use of a volt-ohmmeter.

TUBES

Check all tubes periodically. Tube failure can be anticipated by keeping a log of tube life and replacing tubes when indicated by the log or when reduced output is apparent. Typical tube voltages are given in table 10.

FEEDBACK LADDERS

Excessive distortion may result if there is an unbalance in the feedback ladders, 1Z301 and 1Z302. Unbalance is usually caused by an open or shorted capacitor or resistor in the feedback ladder network. If excessive distortion or unbalance of the 2E26 cathode current exists, a check of the feedback voltages can be made at terminals 8 and 9 of the secondary of the audio input transformer, 1T601. The dc voltage measured from each terminal to ground should be approximately 21 volts (1000 watts), and the two voltages should be balanced within approximately 2%. If the dc voltages are unbalanced by more than 2%, the resistors are unbalanced, and the ladders should be checked for a defective resistor.

To check the feedback capacitors, apply a 1000-hertz signal to the transmitter input at approximately 50% modulation and measure the ac voltages at terminals 8 and 9 of the input transformer, 1T601, to ground with a VoltOhmyst or other ac voltmeter. Again, the voltage should be balanced within 2%. A balance exceeding 2% indicates a defective capacitor.

PRINTED CIRCUITS

In general, the same techniques used in servicing wired chassis work equally well in servicing printed circuit boards. Circuit analysis and troubleshooting procedures remain the same, as does the test equipment normally utilized for this purpose. However, the methods usually used in replacing components on a wired chassis must be amended slightly to suit the physical characteristics peculiar to printed circuit board construction. In addition, the board itself may, on occasion, require repairs due to surface blisters or cracks.

The following information and accompanying illustrations, figures 6, 7, 8 and 9 are intended to acquaint the reader with the accepted practices used in repairing circuit boards and replacing components.

During the actual soldering process, it is of the utmost importance that only enough heat necessary to melt the solder be applied to the printed wiring or component connection. Excessive heat or heat applied for a long duration will cause the adhesive that holds the copper foil to the board to lose its adhesive qualities. This, in turn, will cause the printed circuitry to become separated from the board.

EQUIPMENT

Low wattage soldering iron, 35 to 50 watts
Diagonal cutters
Long nose pliers
Solder aid or scribe
Small knife
Single-edge razor blade
Small stiff bristle brush
Camel hair brush
Solvent, such as denatured alcohol or lacquer thinner
Clear lacquer

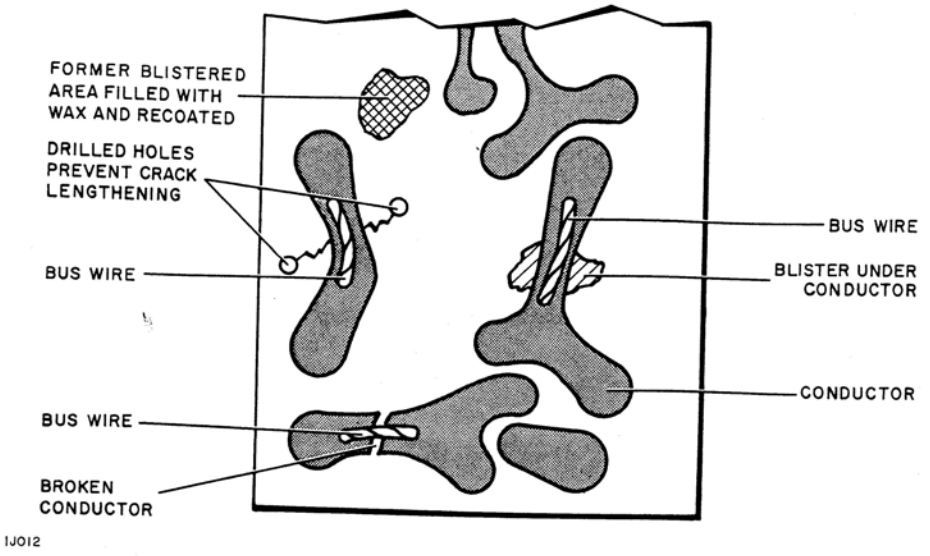


Figure 6. Repair of Surface Damage to Board and Printed Wiring

BOARD REPAIR

When the crack runs under the circuit path, drill a 1/16-inch hole at each end of the crack to prevent the crack from lengthening.

To repair a break in the printed wiring, place a piece of tinned bus wire across the broken printed wiring. Hold the bus wire in place with a soldering aid or scribe. Heat the bus wire with a soldering iron and flow on low-temperature solder along the length of bus wire. Use a solvent to clean the soldered area.

If there is a blister on an open area of the board, peel the blistered area with a razor blade. Smooth AT-N wax over this area until level with the board, and then apply a coating of lacquer over the waxed area with a camel hair brush.

If there is a severe crack in the board running through the printed wiring, a support must be used to relieve the strain. This can be done by drilling a 1/16-inch hole in each side of the crack, first making certain that there are no components or adjacent printed wiring on the side opposite the holes. Form a piece of wire into a "U" and insert it through the holes so that the loop portion is on the under side of the board. Bend the protruding ends of wire flat against the printed wiring and then solder them to the surface of the printed wiring.

COMPONENT REPLACEMENT

Remove the defective component by clipping the component leads so approximately 1/4-inch of lead is left protruding through the board. Form each of these wire ends into a loop with long nose pliers. Run the leads of the replacement component through the loops, twisting them to make a solid mechanical connection and then solder. Keep tension on each lead through the board while soldering so that any overheating can be quickly detected.

Particular care should be exercised when replacing single-ended components, such as transformers, coils, and electrolytic capacitors. These components are mounted vertically on the board and they must be unsoldered from the printed side of the board.

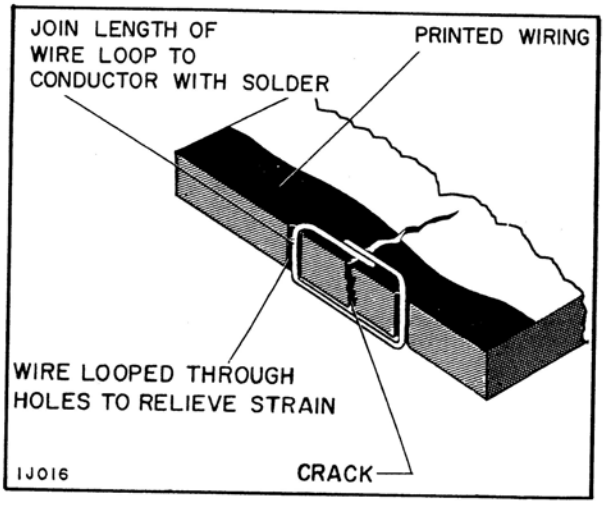


Figure 7. Repair of Severe Crack

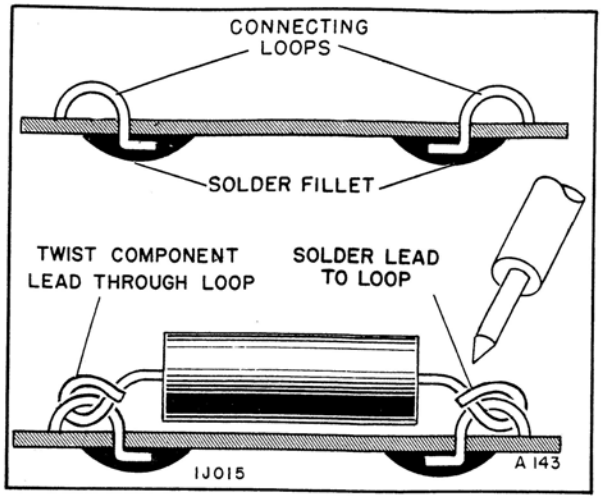


Figure 8. Replacing Double-Ended Component

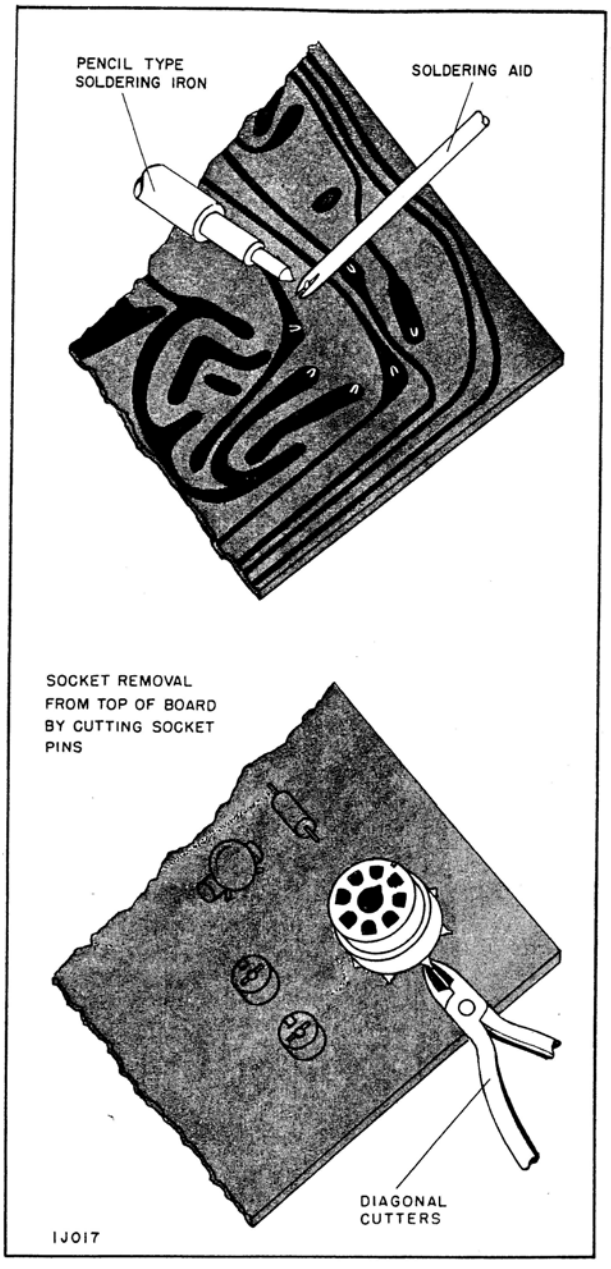


Figure 9. Removal of Multi-Element Component

To remove a multi-element component, e.g., a socket with six or eight terminals, hold the wired side down if possible and apply heat to each terminal in turn. When most of the excess solder has been removed, repeat the unsoldering process, this time using a knife or soldering aid to pry up the socket terminals from the printed foil. Use a small stiff brush to clean off any remaining solder from the terminals. In some instances, it may be more convenient to remove the tube socket from the top of the board. Use a pair of diagonal cutters to clip the socket terminals between the base of the socket and the top of the board. Then apply just enough heat to loosen the socket terminals so they can be removed freely from the printed wiring with a pair of long nose pliers.

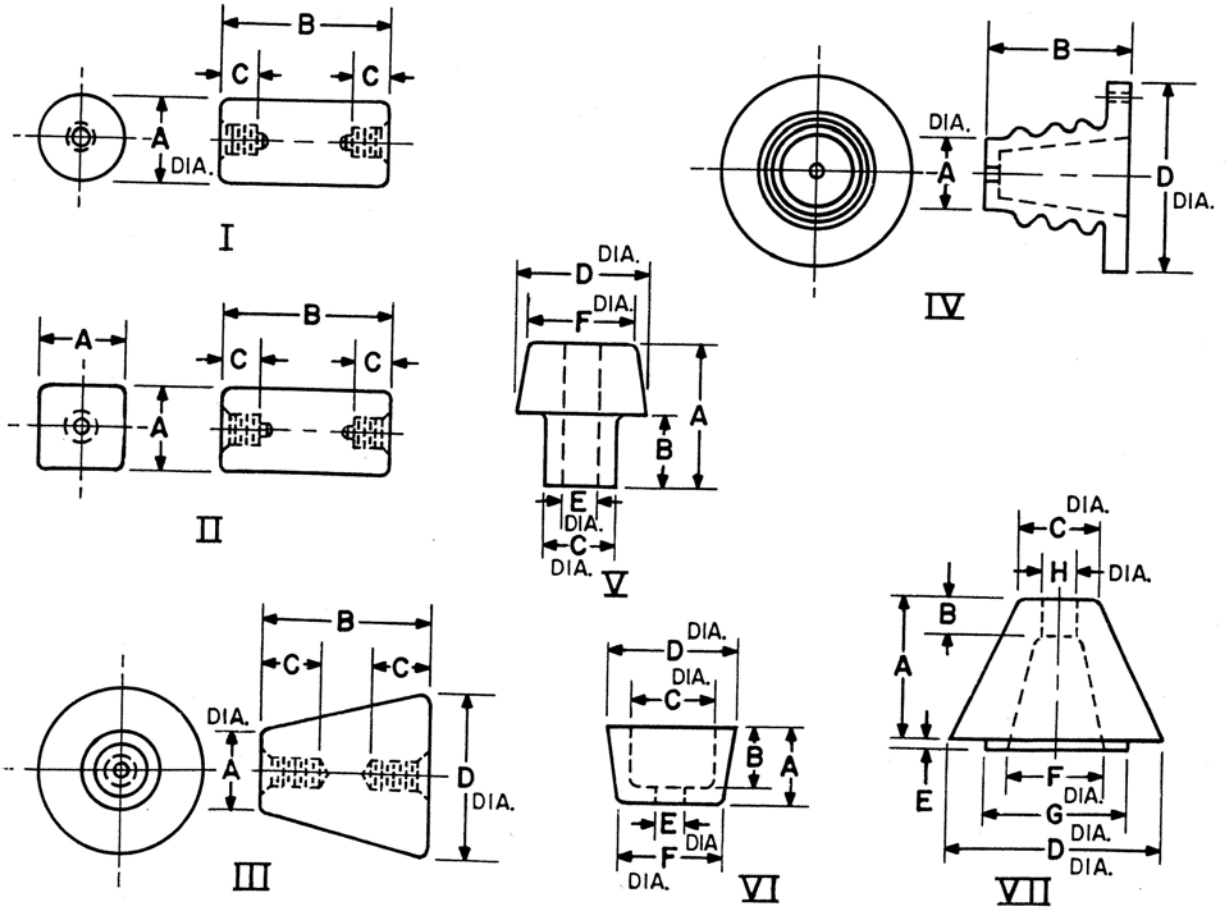
TABLE 10. BTA-1R3 TUBE SOCKET VOLTAGES

Tube	Type	Function	Plate		Cathode		Grid		Screen		Filament	
			Pin No.	Volts dc	Pin No.	Volts dc	Pin No.	Volts dc	Pin No.	Volts dc	Pin No.	Volts ac
1000 Watts												
*1V101	6AK5	OSC.	5	165	7	1	1	-	6	75	3-4	6.3
*1V102	5763	R-F AMP	1	220	7	1	8, 9	-	6	192	4-5	6.0
1V601	6146	BUFFER	CAP	550	1, 4, 6	-	5	-60	3	180	2-7	6.3
1V603	2E26	1st AF_r	CAP	400	1, 4, 6	40	5	21	3	165	2-7	6.3
1V604	2E26	1st AF_l	CAP	400	1, 4, 6	40	5	21	3	165	2-7	6.3
1V301	4-400A	AMP_r	CAP	3000	-	-	3	-400	2, 4	580	1-5	5
1V302	4-400A	AMP_l	CAP	3000	-	-	3	-400	2, 4	580	1-5	5
1V303	4-400A	MOD_r	CAP	3100	-	-	3	-145	2, 4	750	1-5	5
1V304	4-400A	MOD_l	CAP	3100	-	-	3	-145	2, 4	750	1-5	5
500 Watts												
*1V101	6AK5	OSC.	5	165	7	1	1	-	6	75	3-4	6.3
*1V102	5763	R-F AMP	1	220	7	1	8, 9	-	6	192	4-5	6.0
1V601	6146	BUFFER	CAP	550	1, 4, 6	-	5	-60	3	180	2-7	6.3
1V603	2E26	1st AF_r	CAP	400	1, 4, 6	40	5	14.7	3	180	2-7	6.3
1V604	2E26	1st AF_l	CAP	400	1, 4, 6	40	5	14.7	3	180	2-7	6.3
1V301	4-400A	AMP_r	CAP	2150	-	-	3	-400	2, 4	370	1-5	5
1V302	4-400A	AMP_l	CAP	2150	-	-	3	-400	2, 4	370	1-5	5
1V303	4-400A	MOD_r	CAP	2200	-	-	3	-150	2, 4	750	1-5	5
1V304	4-400A	MOD_l	CAP	2200	-	-	3	-150	2, 4	750	1-5	5
250 Watts												
*1V101	6AK5	OSC.	5	165	7	1	1	-	6	75	3-4	6.3
*1V102	5763	R-F AMP	1	220	7	1	8, 9	-	6	192	4-5	6.0
1V601	6146	BUFFER	CAP	550	1, 4, 6	-	5	-60	3	180	2-7	6.3
1V603	2E26	1st AF_r	CAP	500	1, 4, 6	32	5	10.5	3	175	2-7	6.3
1V604	2E26	1st AF_l	CAP	500	-	32	5	10.5	3	175	2-7	6.3
1V301	4-400A	AMP_r	CAP	1550	-	-	3	-400	2, 4	290	1-5	5
1V302	4-400A	AMP_l	CAP	1550	-	-	3	-400	2, 4	290	1-5	5
1V303	4-400A	MOD_r	CAP	1575	-	-	3	-115	2, 4	450	1-5	5
1V304	4-400A	MOD_l	CAP	1575	-	-	3	-115	2, 4	450	1-5	5

NOTE: Subscripts r and l refer to the left and right tubes.
*Crystal Oscillator MI-27632-A only

TABLE 11. INSULATOR DATA

Type Designation	Stock No.	Drawing No.	Figure	Dimensions in Inches								Tap Size
				A	B	C	D	E	F	G	H	
NS5WP104	211423	426765-3	I	3/8	1/2	.16	-	-	-	-	-	.138-32
NS5W0108	208116	426765-12	I	3/8	1	.38	-	-	-	-	-	.138-32
NS5W0110	212086	426765-15	I	3/8	1-1/4	.38	-	-	-	-	-	.138-32
NS5W0116	217752	416765-21	I	3/8	2	.38	-	-	-	-	-	.138-32
NS5W0208	210376	426766-9	I	1/2	1	3/8	-	-	-	-	-	8-32
NS5WP412	55800A	426768-6	I	1	1-1/2	1/2	-	-	-	-	-	1/4-20
NS5W1208	210084	426773-3	II	3/4	1	3/8	-	-	-	-	-	10-32
NS5W1210	209664	426773-6	II	3/4	1-1/4	3/8	-	-	-	-	-	10-32
NS5W1212	209711	426773-9	II	3/4	1-1/2	3/8	-	-	-	-	-	10-32
NS5W1220	213360	426773-15	II	3/4	2-1/2	3/8	-	-	-	-	-	10-32
NS5W2012	51781A	426762-6	III	1/2	1-1/2	3/8	1	-	-	-	-	8-32
NS5W2501	48459A	99067-6	IV	25/32	1-3/8	-	2-1/8	-	-	-	-	-
NS5W4101	211247	426764-3	V	5/8	1/4	15/64	1/2	.143	3/8	-	-	-
NS5W4104	210340	426764-12	V	1-5/16	9/16	47/64	1-1/8	.200	1	-	-	-
NS5W4201	211246	426764-53	VI	3/8	1/4	1/4	1/2	.143	3/8	-	-	-
NS5W4502	51088A	426761-12	VII	1-1/8	7/16	7/8	1-3/4	1/16	1	1-1/4	17/64	-



REPLACEMENT PARTS

Symbol	Stock No.	Drawing No.	Description
			BASIC TRANSMITTER MI-27649D
			P/L 3459852-501 REV 2
1C203	610003	36655 503	METER BY-PASS, .01 MF 600 V
1C204	610003	36655 503	METER BY-PASS, .01 MF 600 V
1C205	097537	990193 184	PAPER, 1.0 MF -10 7500 V
1B201	215696	8703683 001	BLOWER - 230 V., 1 PHASE, 50/60 HERTZ
1I201		459610 008	LAMP - INDICATOR, RED, PLATE ON
	099765		JEWEL - RED
	016154		LAMP
	016155		RESISTOR - WIREWOUND, 2800 OHMS
	099763		SOCKET - LAMP
1L201	208210	900289 001	REACTOR - MODULATOR
1L202	052038A	900304 001	REACTOR - HIGH VOLTAGE FILTER
1M201	245239	3469670 003	METER - MULTIMETER, 0-150%
1M202	245240	3469670 004	METER - FILAMENT BUS, 0-300 V AC
1M203	245238	3469670 002	METER - 0-4 KV
1M204	245237	3469670 001	METER - 0-1 A
1R201	217614	8871557 053	REMOTE METER SHUNT, 1250 OHMS 1%
1R202	217614	8871557 053	REMOTE METER SHUNT, 1250 OHMS 1%
1R203	216027	415724 014	RESISTOR, VARIABLE, 25 OHMS, 150W
1R204	418601	993005 041	RESISTOR, 10 OHMS, 5%, 5W
TO			
1R207			RESISTOR - 10 OHMS
1S201	218704	480092 002	SWITCH - METER
1S202	211065	738998 005	SWITCH - DAY-NIGHT
1S203	211065	738998 005	SWITCH - TRANS, ON-OFF
1S204	215702	738998 012	SWITCH - OVERLOAD RESET, PLATE ON, OFF
1S205	211065	738998 005	SWITCH - CRYSTAL, 1 AND 2
1S210	215947	482740 002	CIRCUIT BREAKER - LINE
1S211	215946	482740 001	CIRCUIT BREAKER - FILAMENT
1S214	054920	8881052 001	SWITCH - INTERLOCK
1S215	054920	8881052 001	SWITCH - INTERLOCK
1S216	054920	8881052 001	SWITCH - INTERLOCK
1S217	216022	8953364 501	SWITCH - GROUNDING
1S218	216022	8953364 501	SWITCH - GROUNDING
1S219	216022	8953364 501	SWITCH - GROUNDING
1T201	215700	486140 001	TRANSFORMER - MODULATOR
1T202	243842	8442994 001	TRANSFORMER - PLATE
1Z201			
TO			
1Z204			
			RECTIFIER ASSEMBLY
	246276	3459836- 6	RECTIFIER
	209711	426773 009	INSULATOR - 0.750 SQ X 1.50 LONG
	051088A	426761 012	INSULATOR
	208116	426765 012	INSULATOR - 0.375 DIA X 2.00 LONG
	017269	737820 501	KNOB
	070527	8888539 122	SCREW - SET, 6-32 X 0.188 LONG
	217144	8898735 003	TELEFLEX - CONTROL BOX
	097745	486041 014	TERMINAL - STANDOFF
	211297	8910643 002	UNIVERSAL JOINT
			MODULATOR and RF UNIT
			P/L 3459854-501 REV 2
1C301	217987	990701 083	MICA, .033 MF 1200 V
1C302	217987	990701 083	MICA, .033 MF 1200 V
1C303	246541	345983 132	MICA, 620 PF 10,000 V

Symbol	Stock No.	Drawing No.	Description
1C304 TO 1C309			FREQUENCY DETERMINING PART-SEE ES-27691
1C310	217987	990701 083	MICA, .033 MF 1200 V
1C311	217987	990701 083	MICA, .033 MF 1200 V
1C312	215595	940173 102	SCREEN BY-PASS, 500 PF 30,000 V
1C313	215595	940173 102	PLATE BY-PASS, 500 PF 30,000 V
1C314 TO 1C317	215600	8843560 017	MICA, 300 PF 5000 V., PART OF 1Z301
1C318	068466	728647 365	MICA, .01 MF 1200 V., PART OF 1Z301
1C319 TO 1C322	215600	8843560 017	MICA, 300 PF 5000 V., PART OF 1Z301
1C323	068466	728647 365	MICA, .01 MF 1200 V., PART OF 1Z301
1C324			FREQUENCY DETERMINING PART-SEE ES-27691
1K301	240235	8486469 002	RELAY - SURGE SUPPRESSOR
1L301	215598	740486 503	COIL - TANK, INDUCTANCE 230 UH
1L302	216296	757431 002	COIL - FILTER, INDUCTANCE 57 UH
1L303	215593	418486 502	CHOKE - P.A. PLATE
1L304	246549	3469665 501	COIL - HARM. FILTER, INDUCTANCE 40 UH
1L305	246548	3469665 501	COIL - MOD. MONITORING
1R301	522110	99126 007	100 OHMS 5% 2 W
1R302	522110	99126 007	100 OHMS 5% 2 W
1R303	217993	722393 041	50 OHM 4 W
1R304	216020	8702674 507	4 MEGOHM
1R305	522024	99126 120	24 OHMS 5% 2 W
1R306 TO 1R309	215599	8928565 001	2,2 MEGOHM PART OF 1Z301
1R310	215588	891769 023	62,000 OHMS PART OF 1Z301
1R311 TO 1R314	215599	8928565 001	2,2 MEGOHM PART OF 1Z301
1R315	215588	891769 023	62,000 OHMS PART OF 1Z301
1R316	219649	8986541 004	3,75 OHMS 2 W
1R317	219649	8986541 004	3,75 OHMS 2 W
1R318	219648	8986541 003	3,16 OHMS 2 W
1R319	219648	8986541 003	3,16 OHMS 2 W
1R320	219647	8986541 002	1,5 OHMS 2 W
1R321	219647	8986541 002	1,5 OHMS 2 W
1R322	522410	99126 025	100,000 OHMS 5% 2 W
1R323	502110	99126 007	100 OHMS 5% 2 W
1R324	502110	99126 007	100 OHMS 5% 2 W
1R326	502110	99126 007	100 OHMS 5% 2 W
1R327	502110	99126 007	100 OHMS 5% 2 W
1R328	099803	427230 045	250 ADJ. 25 W WITH MOUNTING BRACKET
1R329	237679	890015 021	25,000 OHMS 200 W TAPPED
1R330	239766	99037 045	25,000 OHMS 200 W
1R331	215698	99029 044	20,000 OHMS 45 W
1S301	234685	3455521 016	SWITCH
1T301	215591	992045 001	TRANSFORMER - FILAMENT
1T302	215591	992045 001	TRANSFORMER - FILAMENT
1XV301 TO 1XV304			SOCKET - TUBE
1Z301		482771 504	LADDER - FEED BACK
	215600	8843560 017	CAPACITOR -MICA, 300 PF ±2% 5000 V
	068466	728647 365	CAPACITOR -MICA, .01 MF ±2% 1200 V
	215599	8928565 001	RESISTOR -WIREWOUND, 2.2 MEGOHM ±1% 1 W
	215588	891769 023	RESISTOR -FILM, 62,000 OHMS ±1% 2W
1Z302		482771 504	LADDER - FEED BACK
	215600	8843560 017	CAPACITOR -MICA, 300 PF ±2% 5000 V
	068466	728647 365	CAPACITOR -MICA, .01 MF ±2% 1200 V
	215599	8928565 001	RESISTOR -WIREWOUND, 2.2 MEGOHM ±1% 1 W
	215588	891769 023	RESISTOR -FILM, 62,000 OHMS ±1% 2 W

Symbol	Stock No.	Drawing No.	Description
			MISCELLANEOUS
	096480	8833154 001	CLIP ASSEMBLY - COIL
	211323	893090 002	CLIP - COIL
	215590	8920938 001	CONTACT - TUBE
	242393	7862770 010	FUSE CLIP
	052717	7862770 001	FUSE CLIP
	290408	57421 026	GROMMET
	055800A	426768 006	INSULATOR - STANDOFF, 1.00 DIA X 1.50 LG
	210084	426773 003	INSULATOR - STANDOFF, 0.750 DIA X 1.00 LG
	051781A	426762 006	INSULATOR - CONICAL, 1.00 DIA X 1.50 LG
	048459A	99067 006	INSULATOR - CONICAL, 2.125 DIA X 1.375 LG
	215589	8413482 001	PLATE - TUBE SOCKETS
			HV RECTIFIER
			P/L 3459853-501 REV 1
1C401	209618	990193 127	PAPER, 6 MF 4000 V
1C402	209618	990193 127	PAPER, 6 MF 4000 V
1C403	219175	450184 004	10 MF 400 V
1C404	219175	450184 004	10 MF 400 V
1CR401	245307	3459829 004	RECTIFIER
1K401	215504	754291 003	RELAY - HIGH VOLTAGE OVERLOAD
1R401	048568	458574 047	1000 OHMS 10 W
1R402	215554	737809 005	5000 OHMS
1R403	215554	737809 005	5000 OHMS
1R404	045515	458574 056	2500 OHMS 10W
1R405	246550	3730694 001	VARIABLE, 400 OHMS 225 W
1R406	219670	8986541 001	0.75 OHMS 1%
1R407	243539	993008 035	5 OHMS 10 W
1R408 TO 1R409	304336	993008 041	10 OHMS 10 W
1T402	215553	482736 001	TRANSFORMER
1T403	215558	482737 001	TRANSFORMER
1T404	245294	3730555 001	TRANSFORMER - CONTROL
1Z401		3469666 502	RECTIFIER ASSEMBLY
	246276	3459836 006	RECTIFIER
10	051781A	426762 006	INSULATOR - CONICAL, 1.00 DIA X 1.50 LG
65	097457	426767 003	INSULATOR - STANDOFF, 0.750 DIA X 1.00 LG
66	211371	426766 006	INSULATOR - STANDOFF, 0.500 DIA X 0.750 LG
			EXCITER
			P/L 3459855-501 REV 3
1C601	227807	727866 165	5600 PF 500 V
1C602	300196	727866 147	1000 PF 500 V
1C603	610003	728647 065	.01 MF 2500 V
1C604	601002	728647 041	1000 PF 2500 V
1C607	211133	990193 031	15 MF 1000 V
1C608	018501	990193 008	10 MF 600 V
1C609	056124	984678 008	1 MF 600 V
1C612	921660	727866 159	3300 PF 500 V
1C614	239767	990421 193	0.1 MF 1000 V
1C615	239767	990421 193	0.1 MF 1000 V
1F601	300218	990157 008	FUSE - 3 AG, 1 AMP 250 V
1F602	300218	990157 008	FUSE - 3 AG, 1 AMP 250 V
1J601	051800	1510021 111	CONNECTOR
1K601	245295	3730654 001	RELAY - PLATE T.D.
1K602	216988	8412197 003	CONTACTOR - PLATE ON
1K603	215504	754291 003	RELAY - MOD. OVERLOAD
1K604	216181	480070 001	RELAY - TRANS. ON LATCHING
1K605	215504	754291 003	RELAY - LOW VOLTAGE, OVERLOAD
1K606	215504	754291 003	RELAY - LOW VOLTAGE, OVERLOAD

Symbol	Stock No.	Drawing No.	Description
1L601	209621	429932 502	COIL ASSEMBLY - BUF. PLATE
1L602	093659	949250 001	REACTOR - LOW VOLTAGE FILTER, 10H-0 0.2A
1P602	216156	8415018 001	CONNECTOR
1P603	921421	8949731 001	CONNECTOR
1R601	522147	99126 058	470 OHMS 5% 2 W
1R602	093644	8871557 015	11,5 OHMS 1% 1 W
1R603	522327	99126 079	27,000 OHMS 5% 2 W
1R604	215507	8871557 045	260 OHMS 1% 1 W
1R605	522315	99126 076	15,000 OHMS 5% 2 W
1R606	097134	458574 082	25,000 OHMS 10 W
1R607	215509	8871557 047	51 OHMS 1 W
1R608	219648	8986541 003	3,16 OHMS 2 W
1R609	512333	90496 195	33,000 OHMS 1 W
1R610	512333	90496 195	33,000 OHMS 1 W
1R611	512110	90496 050	100 OHMS 1 W
1R612	512110	90496 050	100 OHMS 1 W
1R613	215511	8871557 048	132 OHMS 1 W
1R614	522247	99126 175	4700 OHMS 2 W
1R615	215511	8871557 048	132 OHMS 1 W
1R620	522410	99126 086	100,000 OHMS 2 W
1R621	522410	99126 086	100,000 OHMS 2 W
1R626	019688	99027 039	6300 OHMS 25 W
1R627	054626	99031 036	3150 OHMS 55 W
1R628	215698	99029 044	20,000 OHMS 45 W
1R629	047267	99031 042	12,000 OHMS 55 W
1R630 TO 1R633	522410	99126 207	100,000 OHMS 2 W
1R634	522410	99126 086	100,000 OHMS 2 W
1R635	522410	99126 086	100,000 OHMS 2 W
1T601	093800	949347 001	TRANSFORMER - INPUT
1T602	215512	8412123 001	TRANSFORMER - FILAMENT
1T603	215512	8412123 001	TRANSFORMER - FILAMENT
1XV601	068590	99391 001	SOCKET - BUF.
1XV603	068590	99391 001	SOCKET - 1ST AF
1XV604	068590	99391 001	SOCKET - 1ST AF
1XF601	224848	8817617 001	HOLDER - FUSE
1XF602	224848	8817617 001	HOLDER - FUSE
1Z601	245874		OSCILLATOR ASSEMBLY, SOLID STATE, MI-27592
1Z602		755773 501	EQUALIZER ASSEMBLY
C1	210803	990417 124	PAPER, .068 MF 10% 200 V
C2	099630	722031 513	MICA, 330 MMF 5% 300 V
L1	210804	862943 012	CHOKE
L2	210805	8913168 001	CHOKE
R1	502139	82283 057	390 OHMS 10% 1/2 W
R2	502139	82283 057	390 OHMS 10% 1/2 W
R3 TO R6	502212	82283 063	1200 OHMS 10% 1/2 W
R7	502218	82283 065	1800 OHMS 10% 1/2 W
			PART OF 1Z602
			MISCELLANEOUS
	099745	885286 001	CLAMP - CAPACITOR
	242393	7862770 010	FUSE CLIP
	053325	99045 005	FUSE CLIP
	211247	426764 003	INSULATOR - BUSHING, 0,500 DIA X ,625 LONG
	211246	426764 053	INSULATOR - BUSHING, 0,500 DIA X ,375 LONG
	210376	426766 009	INSULATOR - STANDOFF, 0,500 DIA X 1,00 LONG
	211423	426765 003	INSULATOR - STANDOFF, 0,375 DIA X ,500 LONG
	209664	426773 006	INSULATOR - STANDOFF, 0,750 DIA X 1,25 LONG
	217752	426765 021	INSULATOR - STANDOFF, 0,375 DIA X 2,00 LG
	215612	8928515 001	KNOB
	057692	899617 003	SHOCK MOUNT
	097745	186041 014	TERMINAL - STUD

Symbol	Stock No.	Drawing No.	Description
			CRYSTAL OSCILLATOR MI-27632-A
			P/L 8528957-501-502 REV.7
			CAPACITORS
C101	215924	8946100 001	VARIABLE CERAMIC, 5-25 MMF
C102	215924	8946100 001	VARIABLE CERAMIC, 5-25 MMF
C104	300546	990160 103	MICA, 12 MMF 10%, 300 V
C105	079191	990161 135	MICA, 330 MMF 10%, 300 V
C106	300586	990161 137	MICA, 390 MMF 10%, 300 V
C107	300586	990161 137	MICA, 390 MMF 10%, 300 V
C108	227807	727871 165	MICA, 5600 MMF 10%, 500 V
C109	227807	727871 165	MICA, 5600 MMF 10%, 500 V
C110	227807	727871 165	MICA, 5600 MMF 10%, 500 V
C111 TO C120	205656	1510003 037	CERAMIC, 10000 MMF 500 V
CR101	225200		DIODE - TYPE 1N2861
CR102	225200		DIODE - TYPE 1N2861
K101	227558	8744972 001	RELAY - LATCHING DPDT
L101	215920	8914343 505	COIL - 400 MH
			RESISTORS - FIXED COMPOSITION, UNLESS NOTED
R101	502410	82283 086	100,000 OHMS 10%, 1/2 W
R102	512410	90496 086	100,000 OHMS 10%, 1 W
R103	512410	90496 086	100,000 OHMS 10%, 1 W
R104	512247	90496 070	4700 OHMS 10%, 1 W
R105	522347	99126 082	47,000 OHMS 10%, 2 W
R106	522327	99126 079	27,000 OHMS 10%, 2 W
R107	069297	993008 093	W.W. 4,000 OHMS 5%, 10 W
R108	243663	993022 206	WIREWOUND, 0.39 OHMS 10% 2 W
R109	512018	90496 117	18 OHMS 5%, 1 W
R110	512124	90496 144	240 OHMS 5%, 1 W
R111	512210	90496 062	1000 OHMS 10%, 1 W
R112			NOT USED
R113	502110	82283 050	100 OHMS 10%, 1/2 W
V101			TUBE, 6AK5
V102			TUBE, 5763
XK101	227559	8528973 001	SOCKET - RELAY 8 PIN
XV101	245229	3456981 001	SOCKET - MINIATURE 7 PIN PRINTED CIRCUIT
XV102	230381	3453366 005	SOCKET - TUBE, 9 PIN
XY101	245228	3456980 001	SOCKET - OCTAL, PRINTED CIRCUIT
XY102	245228	3456980 001	SOCKET - OCTAL, PRINTED CIRCUIT
			CRYSTAL OSCILLATOR MI-27592
	245874	MI-27592	P/L 2510135-501 REV 3
			SOLID STATE AM CRYSTAL OSCILLATOR
C101	215924	8946100 001	VARIABLE, CERAMIC, 5-25 MMF
C102	215924	8946100 001	VARIABLE, CERAMIC, 5-25 MMF
C103	205656	1510003 037	CERAMIC, 10,000 MMF 500 V
C104 or C104	216971	993025 421	MICA, 22 MMF
	300546	993025 415	MICA, 12 MMF
C105	300189	993025 448	MICA, 300 MMF
C106	300189	993025 448	MICA, 300 MMF
C107	226545	993025 450	MICA, 360 MMF
C108	226545	993025 450	MICA, 360 MMF
C109	234981	993026 476	MICA, 4300 MMF
C110	921660	993026 473	MICA, 3300 MMF
C111	418176	1588411 065	TANTALUM, 270 MFD
C112	418176	1588411 065	TANTALUM, 270 MFD
C113	300184	993025 437	MICA, 100 MMF
C114 TO C119	205656	1510003 037	CERAMIC, 10,000 MMF 500 V

Symbol	Stock No.	Drawing No.	Description
C120	235976	1586956 755	TANTALUM, 22 MFD 15 V DC
C121	235680	1510003 029	CERAMIC, 2200 MMF 500 V
CR101 TO CR104	227720		DIODE - TYPE 1N3254
CR105 CR106 TO CR109	231665		DIODE - TYPE 1N457
	418179		DIODE - ZENER, TYPE UZ845
K1	418178	2511683 001	RELAY - LATCHING, DPDT
Q1	241710		TRANSISTOR - TYPE 3N128
Q2	245962		TRANSISTOR - TYPE 40390
R101	238430	99206 216	240,000 OHMS 5% 1/4 W
R102	108866	99206 066	2200 OHMS 5% 1/4 W
R103	219464	99206 071	5600 OHMS 5% 1/4 W
R104	236525	82263 521	1 OHM 5% 1/2 W
R105	108860	99206 046	47 OHMS 5% 1/4 W
R106	108860	99206 046	47 OHMS 5% 1/4 W
R107	418177	2511694 001	5600 OHMS 5%
R108		99206 000	FACTORY SELECTED
R109	285573	99206 038	10 OHMS 5% 1/4 W
R110	108865	99206 062	1000 OHMS 5% 1/4 W
R111	512247	90496 070	4700 OHMS 5% 1 W
R112	219464	99206 071	5600 OHMS 5% 1/4 W
R113	300598	99206 063	1200 OHMS 5% 1/4 W
XY101	245228	3456980 001	SOCKET - OCTAL
XY102	245228	3456980 001	SOCKET - OCTAL
U1	244245	1058732 021	CIRCUIT INTERGRATED CA3020
U2	249677		CIRCUIT INTERGRATED uA723-C

TRANSMITTER ASSEMBLY

P/L 3459856-501 REV 2

052717	7862770 001	FUSE CLIP
209664	426773 006	INSULATOR - STEATITE, 3/4 SQ, X 1 1/4 LG
030075	737820 507	KNOB

FREQUENCY DETERMINING KITS ES-27691 and MI-27691

ES-27691-1 535-649 KC 51.5 OHM LINE

1C304	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
1C305	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
1C307	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
1C308	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING

MI-27691-1 535-650 KHZ 51.5 OHMS LINE

1C304	096176	990705 251	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C305	096176	990705 251	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C306 TO 1C308	921613	32229 621	CAPACITOR - MICA, 10,000 MMF 5% 5000 V
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING

Symbol	Stock No.	Drawing No.	Description
			ES-27691-2 535-649 KC 72 OHM LINE
1C304	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
1C305	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
1C307	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
1C308	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-2 535-650 KHZ 72 OHM LINE
1C304	096176	32229 521	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C305	096176	32229 521	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C306 TO 1C308	921613	32229 621	CAPACITOR - MICA, 10,000 MMF 5% 5000 V
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			ES-27691-3 535-649 KC 230 OHM LINE
1C304	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
1C305	422652	3459834 141	CAPACITOR - MICA, 1500 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
1C307	422656	3459834 164	CAPACITOR - MICA, 10,000 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422646	3459834 051	CAPACITOR - MICA, 3900 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C309	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-3 535-650 KHZ 230 OHM LINE
1C304	096176	32229 521	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C305	096176	32229 521	CAPACITOR - MICA, 1500 MMF 5% 10,000 V
1C306	921613	32229 621	CAPACITOR - MICA, 10,000 MMF 5% 5000 V
1C307	921613	32229 621	CAPACITOR - MICA, 10,000 MMF 5% 5000 V
1C308	217365	990704 261	CAPACITOR - MICA, 3900 MMF 5% 6000 V
1C309	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C324	246973	3459834 032	CAPACITOR - MICA, 620 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			ES-27691-4 650-779 KC 51.5 OHM LINE
1C304	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
1C305	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
1C307	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
1C308	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-4 650-780 KHZ 51.5 OHM LINE
1C304	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C305	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C306 TO 1C308	096180	32229 611	CAPACITOR - MICA, 8200 MMF 5% 5000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V

Symbol	Stock No.	Drawing No.	Description
			ES-27691-5 650-779 KC 72 OHM LINE
1C304	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
1C305	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
1C307	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
1C308	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-5 650-780 KHZ 72 OHM LINE
1C304	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C305	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C306 TO 1C308	096180	32229 611	CAPACITOR - MICA, 8200 MMF 5% 5000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V
			ES-27691-6 650-779 KC 230 OHM LINE
1C304	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
1C305	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
1C307	422655	3459834 162	CAPACITOR - MICA, 8200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422645	3459834 049	CAPACITOR - MICA, 3300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C309	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-6 650-780 KHZ 230 OHM LINE
1C304	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C305	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C306	096180	32229 611	CAPACITOR - MICA, 8200 MMF 5% 5000 V
1C307	096180	32229 611	CAPACITOR - MICA, 8200 MMF 5% 5000 V
1C308	217366	990704 259	CAPACITOR - MICA, 3300 MMF 5% 6000 V
1C309	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V
			ES-27691-7 780-939 KC 51.5 OHM LINE
1C304	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C305	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C308	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-7 780-940 KHZ 51.5 OHM LINE
1C304	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C305	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C306 TO 1C308	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V

Symbol	Stock No.	Drawing No.	Description
			ES-27691-8 780-939 KC 72 OHM LINE
1C304	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C305	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C308	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-8 780-940 KHZ 72 OHM LINE
1C304	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C305	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C306 TO 1C308	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V
			ES-27691-9 780-939 KC 230 OHM LINE
1C304	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C305	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422653	3459834 151	CAPACITOR - MICA, 3900 PF 5% 8000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422642	3459834 030	CAPACITOR - MICA, 510 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-9 780-940 KC 230 OHM LINE
1C304	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C305	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C306	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C307	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C308	096178	32229 571	CAPACITOR - MICA, 3900 MMF 5% 8000 V
1C324	093928	990704 240	CAPACITOR - MICA, 510 MMF 5% 6000 V
			ES-27691-10 940-1119 KC 51.1 OHM LINE
1C304	422648	3459834 110	CAPACITOR - MICA, 100 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C305	422649	3459834 123	CAPACITOR - MICA, 330 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422645	3459834 049	CAPACITOR - MICA, 3300 PF 5% 6000 V
1C309	422644	3459834 049	CAPACITOR - MICA, 3300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-10 940-1120 KC 51.5 OHM LINE
1C304	211956	32228 541	CAPACITOR - MICA, 100 MMF 5% 10,000 V
1C305	211957	32228 601	CAPACITOR - MICA, 330 MMF 5% 10,000 V
1C306	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C307	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C308	217366	990704 259	CAPACITOR - MICA, 3300 MMF 5% 6000 V
1C309	217366	990704 259	CAPACITOR - MICA, 3300 MMF 5% 6000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V

Symbol	Stock No.	Drawing No.	Description
			ES-27691-11 940-1119 KC 72 OHM LINE
1C304	422648	3459834 110	CAPACITOR - MICA, 100 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C305	422649	3459834 123	CAPACITOR - MICA, 330 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C308	422646	3459834 051	CAPACITOR - MICA, 3900 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C309	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-11 940-1120 KHZ 72 OHM LINE
1C304	211956	32228 541	CAPACITOR - MICA, 100 MMF 5% 10,000 V
1C305	211957	32228 601	CAPACITOR - MICA, 330 MMF 5% 10,000 V
1C306	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C307	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C308	217365	990704 261	CAPACITOR - MICA, 3900 MMF 5% 6000 V
1C309	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
			ES-27691-12 949-1119 KC 230 OHM LINE
1C304	422648	3459834 110	CAPACITOR - MICA, 100 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C305	422649	3459834 123	CAPACITOR - MICA, 330 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
1C307	422654	3459834 159	CAPACITOR - MICA, 6200 PF 5% 5000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
1C309	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-12 940-1120 KHZ 230 OHM LINE
1C304	211956	32228 541	CAPACITOR - MICA, 100 MMF 5% 10,000 V
1C305	211957	32228 601	CAPACITOR - MICA, 330 MMF 5% 10,000 V
1C306	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C307	096179	32229 596	CAPACITOR - MICA, 6200 MMF 5% 5000 V
1C308	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C309	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-13 1120-1339 KC 51.5 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C307	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422647	3459834 064	CAPACITOR - MICA, 10,000 PF 5% 4000 V
1C309	422647	3459834 064	CAPACITOR - MICA, 10,000 PF 5% 4000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING

Symbol	Stock No.	Drawing No.	Description
			MI-27691-13 1120-1340 KHZ 51.5 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C307	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C308	217364	990704 271	CAPACITOR - MICA, 10,000 MMF 5% 4000 V
1C309	217364	990704 271	CAPACITOR - MICA, 10,000 MMF 5% 4000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-14 1120-1339 KC 72 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C307	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422646	3459834 051	CAPACITOR - MICA, 3900 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-14 1120-1340 KHZ 72 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C307	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C308	217365	990704 261	CAPACITOR - MICA, 3900 MMF 5% 6000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-15 1120-1339 KC 230 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C307	422651	3459834 140	CAPACITOR - MICA, 1300 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
1C309	422643	3459834 040	CAPACITOR - MICA, 1300 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-15 1120-1340 KHZ 230 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C307	096175	32229 516	CAPACITOR - MICA, 1300 MMF 5% 10,000 V
1C308	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C309	217367	990704 250	CAPACITOR - MICA, 1300 MMF 5% 6000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-16 1340-1620 KC 51.5 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C307	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V

Symbol	Stock No.	Drawing No.	Description
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422653	3459834 151	CAPACITOR - MICA, 3900 PF 5% 8000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-16 1340-1620 KHZ 51.5 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C307	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C308	096178	32229 571	CAPACITOR - MICA, 3900 MMF 5% 8000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-17 1340-1620 KC 72 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C307	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C308	422653	3459834 151	CAPACITOR - MICA, 3900 PF 5% 8000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-17 1340-1620 KHZ 72 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C307	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C308	096178	32229 571	CAPACITOR - MICA, 3900 MMF 5% 8000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V
			ES-27691-18 1340-1620 KC 230 OHM LINE
1C304	246541	3459834 132	CAPACITOR - MICA, 620 PF
1C305	246541	3459834 132	CAPACITOR - MICA, 620 PF
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C306	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C307	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C308	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
1C309	422650	3459834 137	CAPACITOR - MICA, 1000 PF 5% 10,000 V
	246972	3459835 002	FLANGE - CAPACITOR MOUNTING
1C324	422641	3459834 024	CAPACITOR - MICA, 360 PF 5% 6000 V
	246971	3459835 001	FLANGE - CAPACITOR MOUNTING
			MI-27691-18 1340-1620 KHZ 230 OHM LINE
1C304	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C305	096173	32228 636	CAPACITOR - MICA, 620 MMF 5% 10,000 V
1C306 TO 1C309	096174	32229 501	CAPACITOR - MICA, 1000 MMF 5% 10,000 V
1C324	217368	990704 236	CAPACITOR - MICA, 360 MMF 5% 6000 V

Symbol	Stock No.	Drawing No.	Description
			TOUCH UP KITS MI-27660C
A	227696	2016175 013	16 OUNCE AEROSOL CAN FINISH 1985532 MIDNIGHT BLUE
B	227697	2016175 015	16 OUNCE AEROSOL CAN FINISH 1985534 SHADOW BLUE
C	217108	2016115 034	16 OUNCE AEROSOL CAN FINISH 1980572 SILVER GRAY
D	247749	2016115 031	16 OUNCE AEROSOL CAN FINISH 1980423 BLACK VINYL
			POWER CUTBACK KIT (OPTIONAL) MI-34079
			P/L 3459950-501 REV 3
1C801	018023	990193 024	CAPACITOR - PAPER, 1 MF 1000 V
1K801	223858	8467689 001	RELAY
1K802	223857	8412197 006	RELAY
1K803	223857	8412197 006	RELAY
1K804	234525	8980567 004	RELAY
1K805	418280	3720323 001	RELAY
1K806	240235	8486469 002	RELAY
1K807	221179	8449729 001	RELAY
1R801	207172	8744934 001	VARIABLE, 600 OHMS 10 W
1R802	225355	415457 034	VARIABLE, 7500 OHMS 25 W
1R803	225356	890014 021	TAPPED, 2500 OHMS 150 W
1R804	225357	737847 062	VARIABLE, 6 OHMS 4 W
6	246458	3462141 002	CAPACITOR - 6 MFD 200 V
7	921608		DIODE - TYPE 1N2070
			MISCELLANEOUS
8	052717	7862770 001	CLIP - FUSE
6	209664	426773 006	INSULATOR - 0.75 SQ X 1.25
9	030075	737820 507	KNOB

RECOMMENDED STATION SPARES

Symbol	Stock No.	Drawing No.	Qty.	Description
1C203, 1C204	610003	36655-503	1	CAPACITOR, METER BY-PASS, 0.01 MF, 1200 V
1C205	97537	990193-184	1	CAPACITOR, PAPER, 1 MF, ±10%, 7500 V
1C301, 1C302, 1C310, 1C311	217987	990701-083	2	CAPACITOR, FILAMENT BY-PASS, 0.033 MF, 1200 V
1C303	246541	3459834-132	1	CAPACITOR, PLATE BLOCKING, 620 PF, ±5%, 10,000 V
1C312, 1C313	215595	940173-102	1	CAPACITOR, PLATE AND SCREEN BY-PASS, 500 PF, 30 KV
1C314 to 1C317, 1C319 to 1C322	215600	8843560-017	2	CAPACITOR, FEED-BACK, 300 PF, 5000 V
1C318, 1C323	68466	728647-365	2	CAPACITOR, FEED-BACK, 0.01 MF, ±2%, 1200 V
1C401, 1C402	209618	990193-127	1	CAPACITOR, PAPER, 6 MF, ±10%, 4000 V
1C403, 1C404	219175	450184-004	1	CAPACITOR, PAPER, 10 MF, 400 V
1C601	227807	727866-165	1	CAPACITOR, MICA, 5600 PF, ±10%, 500 V
1C602	300196	727866-147	1	CAPACITOR, MICA, 1000 PF, ±10%, 500 V
1C603	610003	728647-065	1	CAPACITOR, MICA, 0.01 MF, ±20%, 2500 V
1C604	601002	728647-041	1	CAPACITOR, MICA, 1000 PF, ±20%, 2500 V
1C608	18501	990193-008	1	CAPACITOR, PAPER, 10 MF, ±10%, 600 V
1C609	56124	984678-008	1	CAPACITOR, PAPER, 1 MF, ±10%, 600 V
1I201	16154	459610-036	2	"PLATE ON" 1 AMP
1F601, 1F602	14133	990157-008	3	FUSE, 1 AMP
1K601	245295	3730654-001	1	RELAY, PLATE TIME DELAY
1K602	216988	8412197-003	1	RELAY, PLATE ON
1K401, 1K603, 1K605, 1K606	215504	754291-003	1	RELAY, OVERLOAD
1K604	216181	480070-001	1	RELAY, TRANSMITTER ON, LATCHING
1R203	216027	415724-014	1	RESISTOR, VARIABLE, 25 OHM, 150 W
1R306 to 1R309, 1R311 to 1R314	215599	8928565-001	2	RESISTOR, PRECISION, 2.2 MEG, ±1%, 1 W
1R310, 1R315	215588	891769-023	2	RESISTOR, FILM, 62,000 OHM, ±1%, 2 W
1R329	237697	890015-021	1	RESISTOR, WIREWOUND, TAPPED, 25,000 OHM, 200 W
1R402, 1R403	215554	737809-005	1	RESISTOR, VARIABLE, W.W., 5000 OHM, ±20%, 3 W
1R405	246550	3730694-001	1	RESISTOR, VARIABLE, 400 OHM 225 W
1S214 to 1S216	54920	8881052-001	1	SWITCH, INTERLOCK
1S210	215947	482740-002	1	CIRCUIT BREAKER, LINE
1S211	215946	842740-001	1	CIRCUIT BREAKER, FILAMENT
1S301	234685	3455521-016	1	SWITCH, BLOWER MOTOR

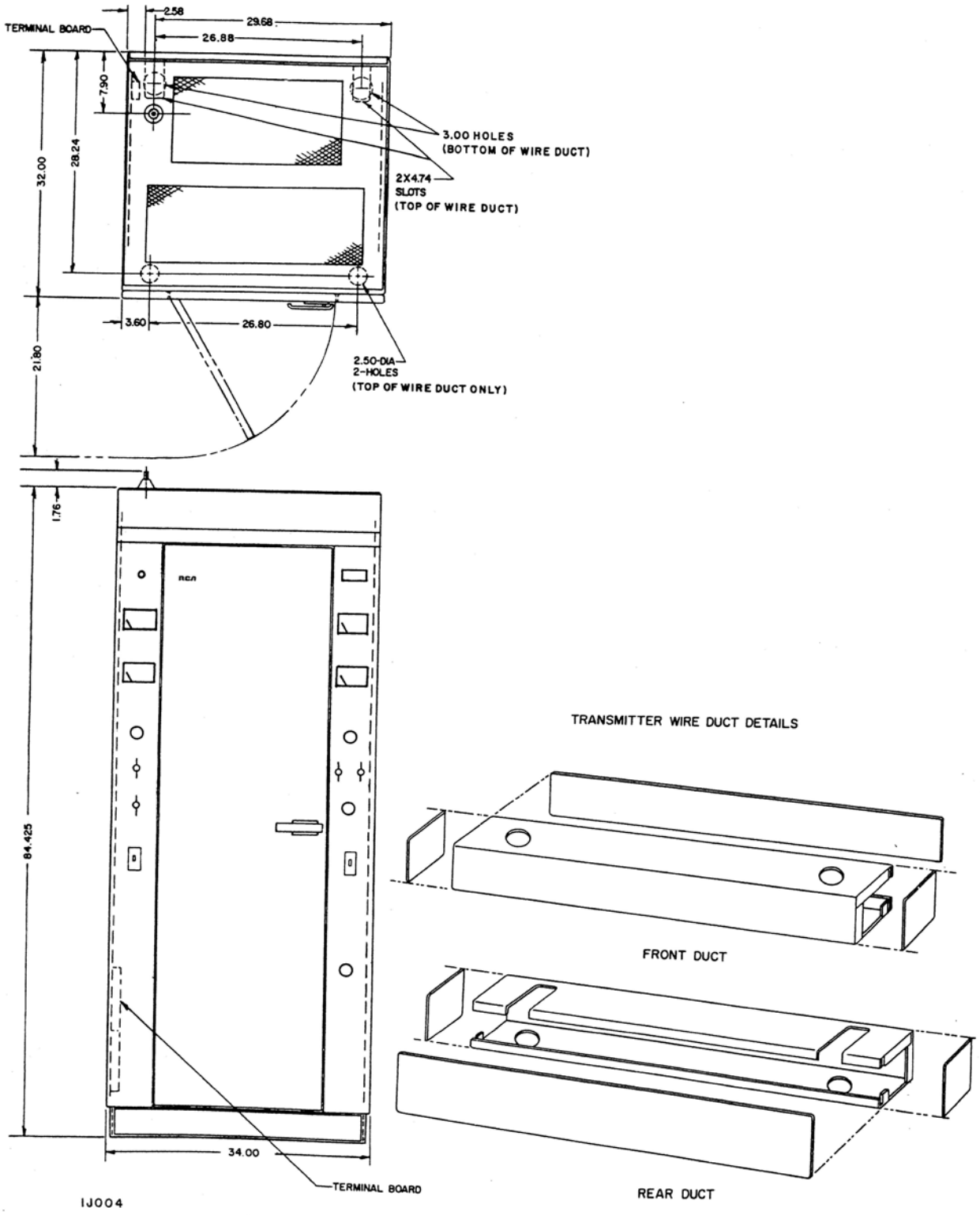


Figure 10. BTA-1R3, Outline Drawing

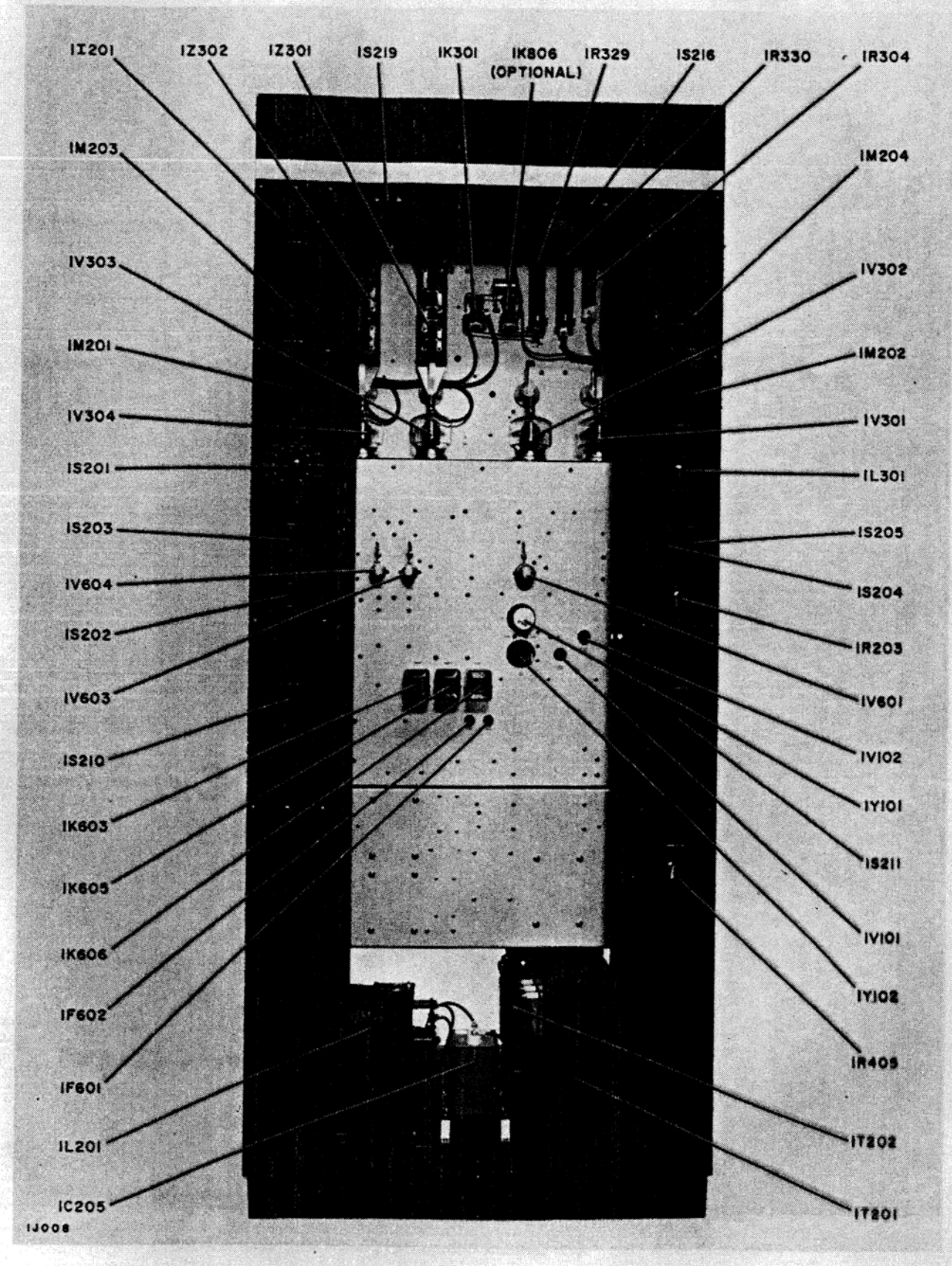


Figure 11. Transmitter, Front View, Door Removed

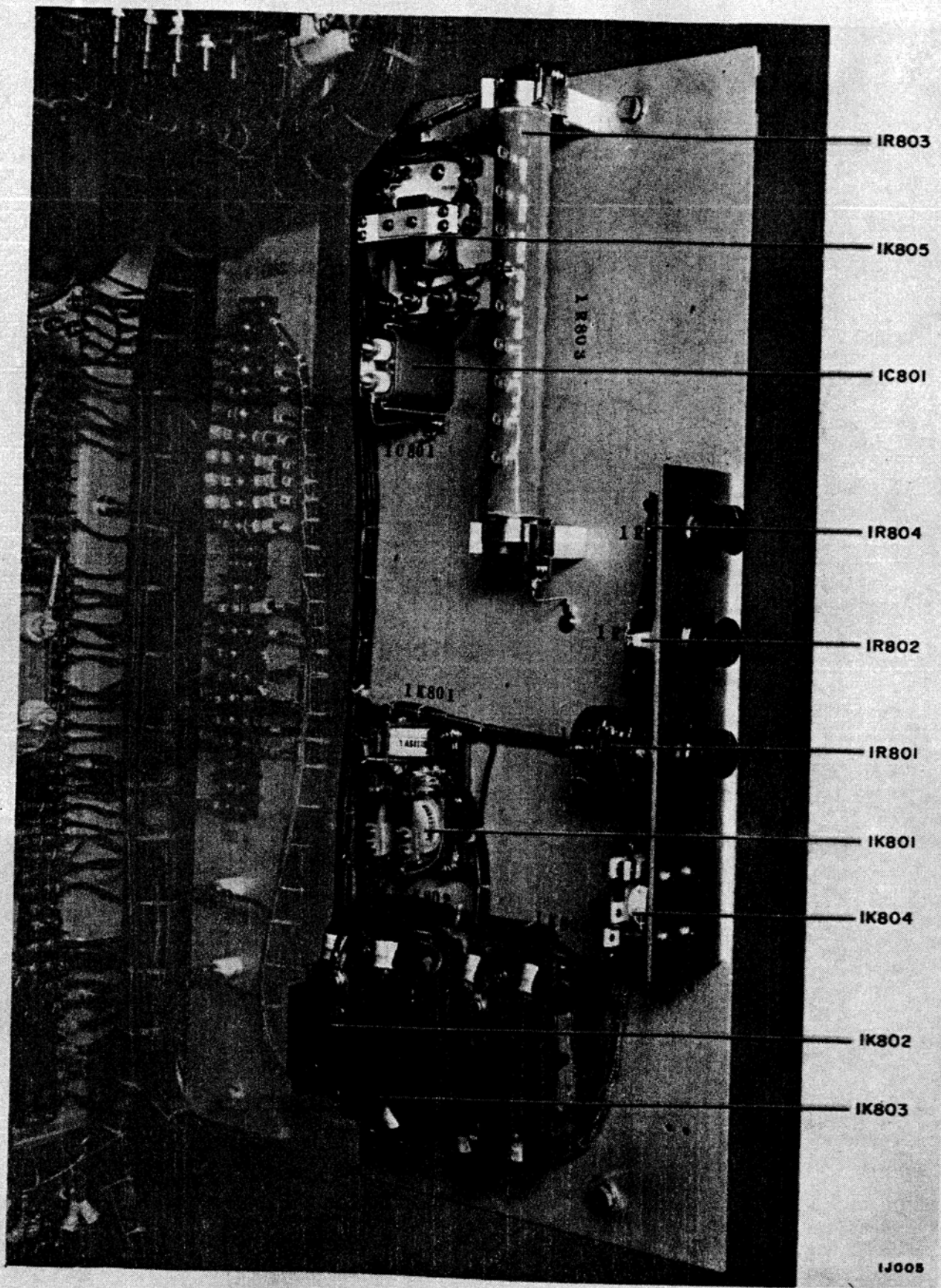


Figure 12. BTA-1R3 Power Cutback Component Chassis (Optional) MI-34079

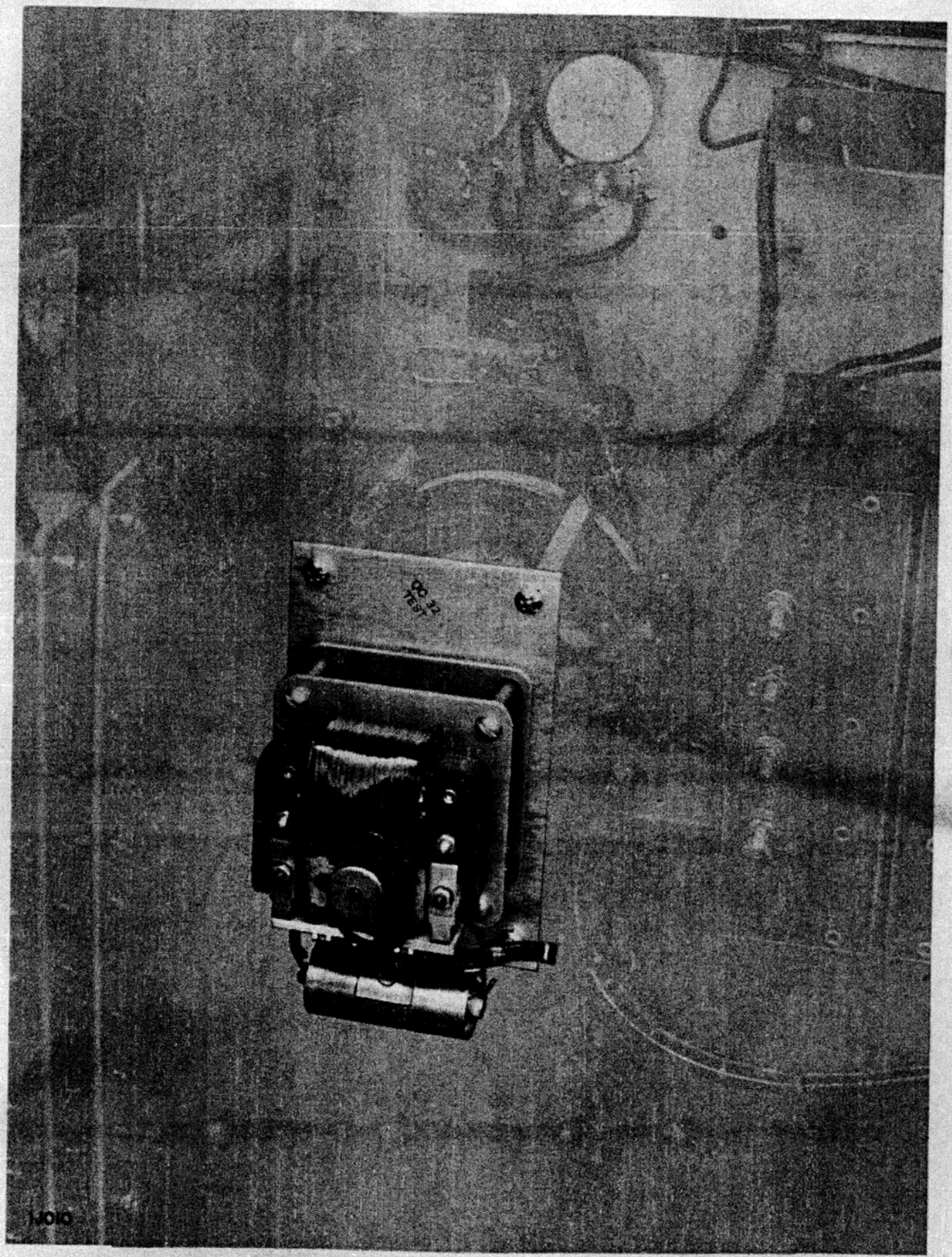


Figure 13. BTA-1R3 Remote Power Adjustment Kit (Optional), MI-34080

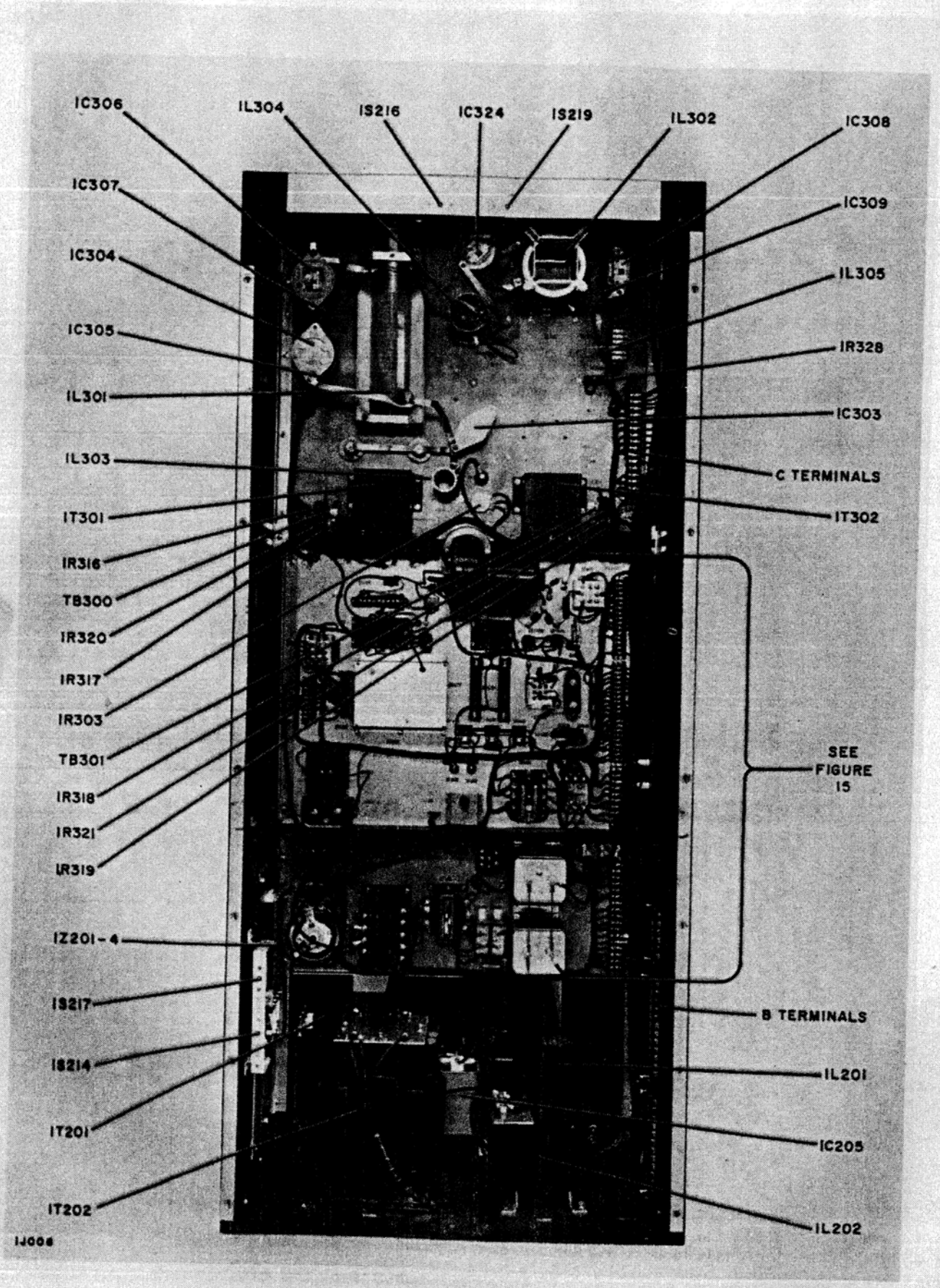


Figure 14. Transmitter, Rear View, Panels Removed

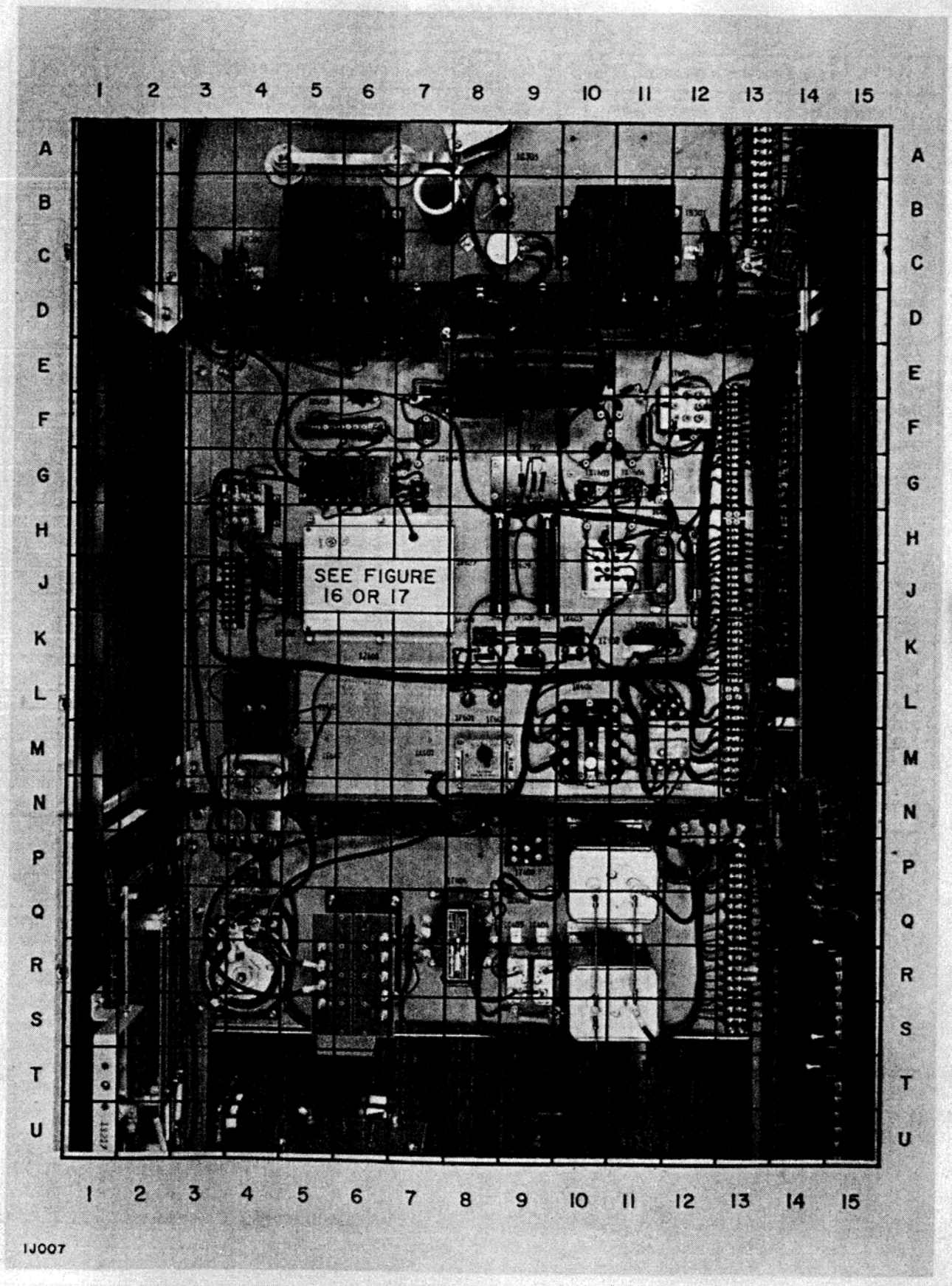


Figure 15. Transmitter, Exciter Section and Rectifier Chassis

COMPONENT LOCATIONS

HV RECTIFIER CHASSIS

By Symbol		By Coordinate	
C401	11P	N4	R402
C402	11S	N4	R403
C403	9R	N7	Z401
C404	9R	N12	10
CR401	9Q	P4	R404
K401	4P	P4	K401
R401	9R	P9	T403
R402	4N	P11	C401
R403	4N	Q4	R406
R404	4P	Q9	CR401
R405	4R	Q13	D Terminals
R406	4Q	R4	R405
R407	9S	R6	T402
T402	6R	R8	T404
T403	9P	R9	C403
T404	8R	R9	C404
Z401	7N	R9	R401
D Terminals	13Q	S9	R407
10	12N	S11	C402

MISCELLANEOUS

By Symbol		By Coordinate	
B901	9E	E5	R323
C312	6E	E6	C312
R302	11E	E6	R324
R323	5E	E9	B901
R324	6E	E11	R302
Z201	3R	L14	65
Z202	3R	Q2	66
Z203	2R	R2	Z203
Z204	2R	R2	Z204
65	14L	R3	Z201
66	2Q	R3	Z202

EXCITER CHASSIS

By Symbol				By Coordinate			
C601	6G	R610	10H	E4	J601	G11	R611
C602	7H	R611	11G	E10	R634	G11	R616
C603	6F	R612	10G	E11	R635	G11	XV604
C604	7F	R613	9G	F5	L601	H4	T602
C607	4M	R614	9G	F6	C603	H7	C602
C608	11J	R615	9G	F7	C604	H7	P603
C609	11G	R616	11G	F7	R628	H10	R610
C612	9F	R617	12H	F9	C612	H11	R609
C614	10F	R626	12J	F9	R607	H12	R617
C615	11F	R627	8J	F10	C614	H13	F Terminals
F601	8L	R628	7F	F10	R630	J5	P602
F602	8L	R629	9J	F10	R631	J6	Z601
J601	4E	R630	10F	F11	C615	J8	R627
K601	8M	R631	10F	F11	R632	J9	R629
K602	12M	R632	11F	F11	R633	J10	T601
K603	10K	R633	11F	F12	T603	J11	C608
K604	10M	R634	10E	G5	R605	J12	R626
K605	9K	R635	11E	G5	R606	K8	K606
K606	8K	TB1	5G	G5	TB1	K9	K605
L601	5F	TB2	9G	G6	C601	K9	R608
L602	4L	T601	10J	G6	R601	K10	K603
P602	5J	T602	4H	G6	R602	K11	Z602
P603	7H	T603	12F	G6	R603	L4	L602
R601	6G	1XF601	8L	G6	R604	L8	F601
R602	6G	1XF602	8L	G7	XV601	L8	F602
R603	6G	1XV601	7G	G9	R613	L8	XF601
R604	6G	1XV603	10G	G9	R614	L8	XF602
R605	5G	1XV604	11G	G9	R615	M4	C607
R606	5G	1Z601	6J	G9	TB2	M8	K601
R607	9F	1Z602	11K	G10	R612	M10	K604
R608	9K	F Terminals	13H	G10	XV603	M12	K602
R609	11H			G11	C609		

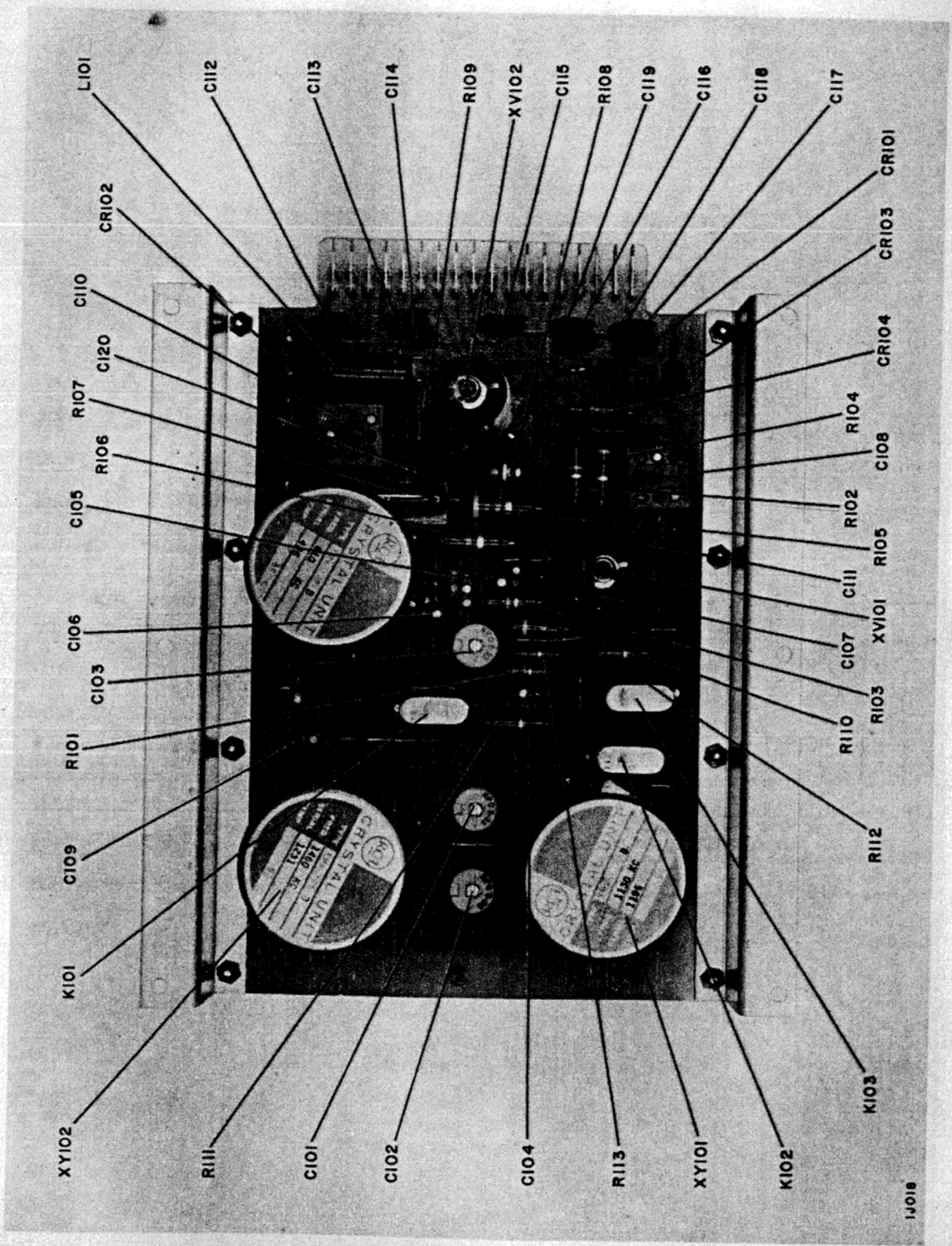


Figure 16. Crystal Oscillator, MI-27632-A, Parts Location

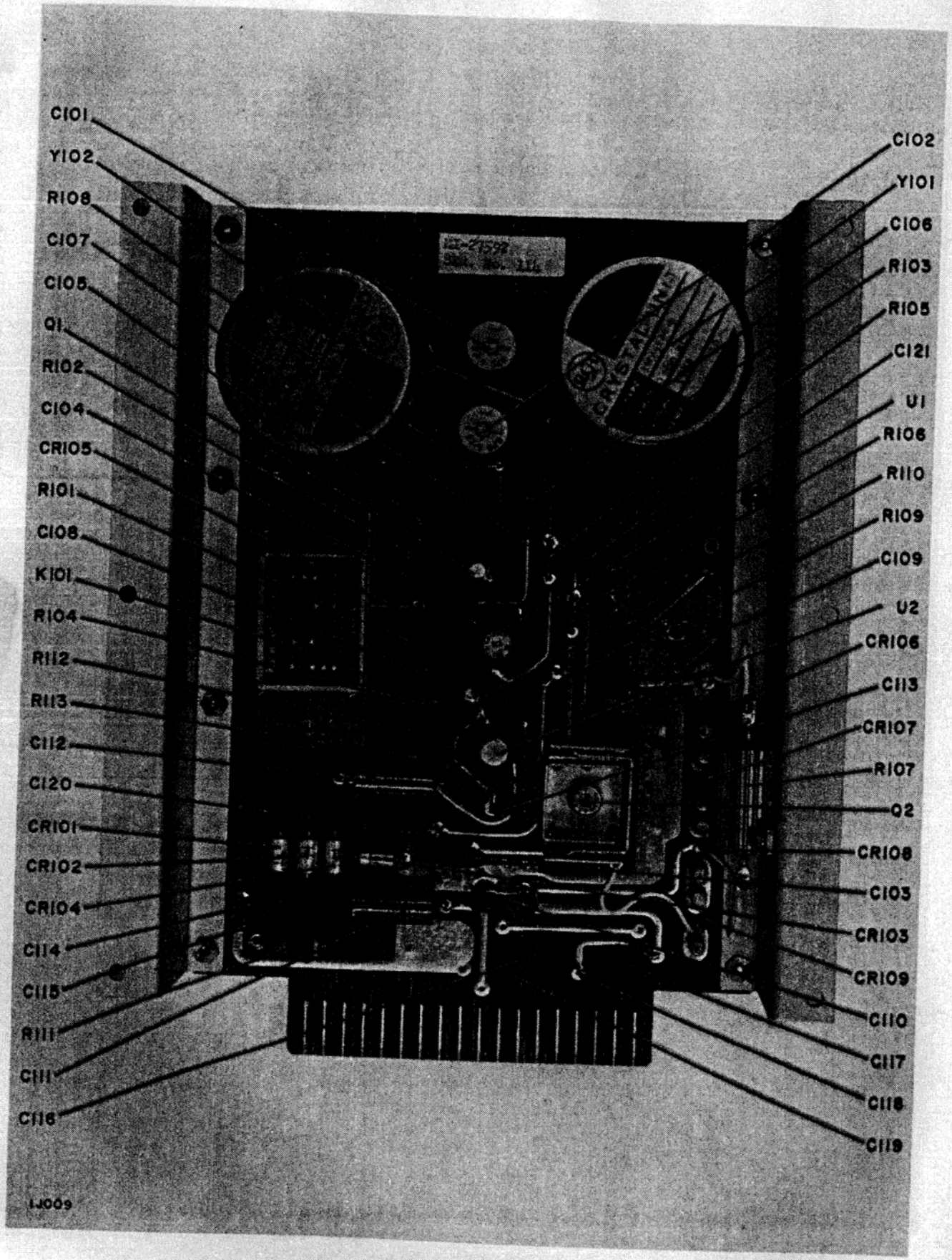


Figure 17. Crystal Oscillator, MI-27592, Parts Location

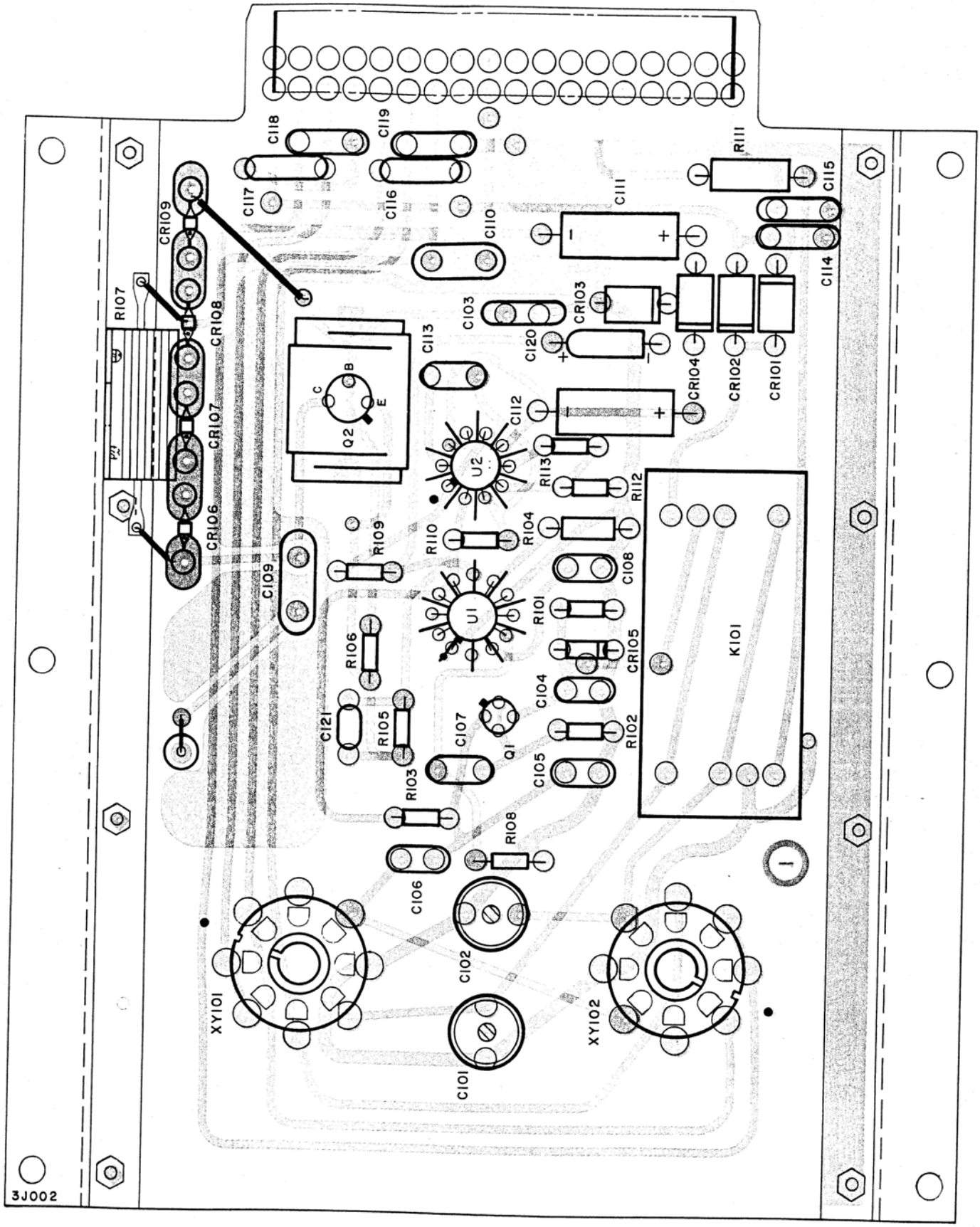


Figure 18. MI-27592, Parts Overlay, Top

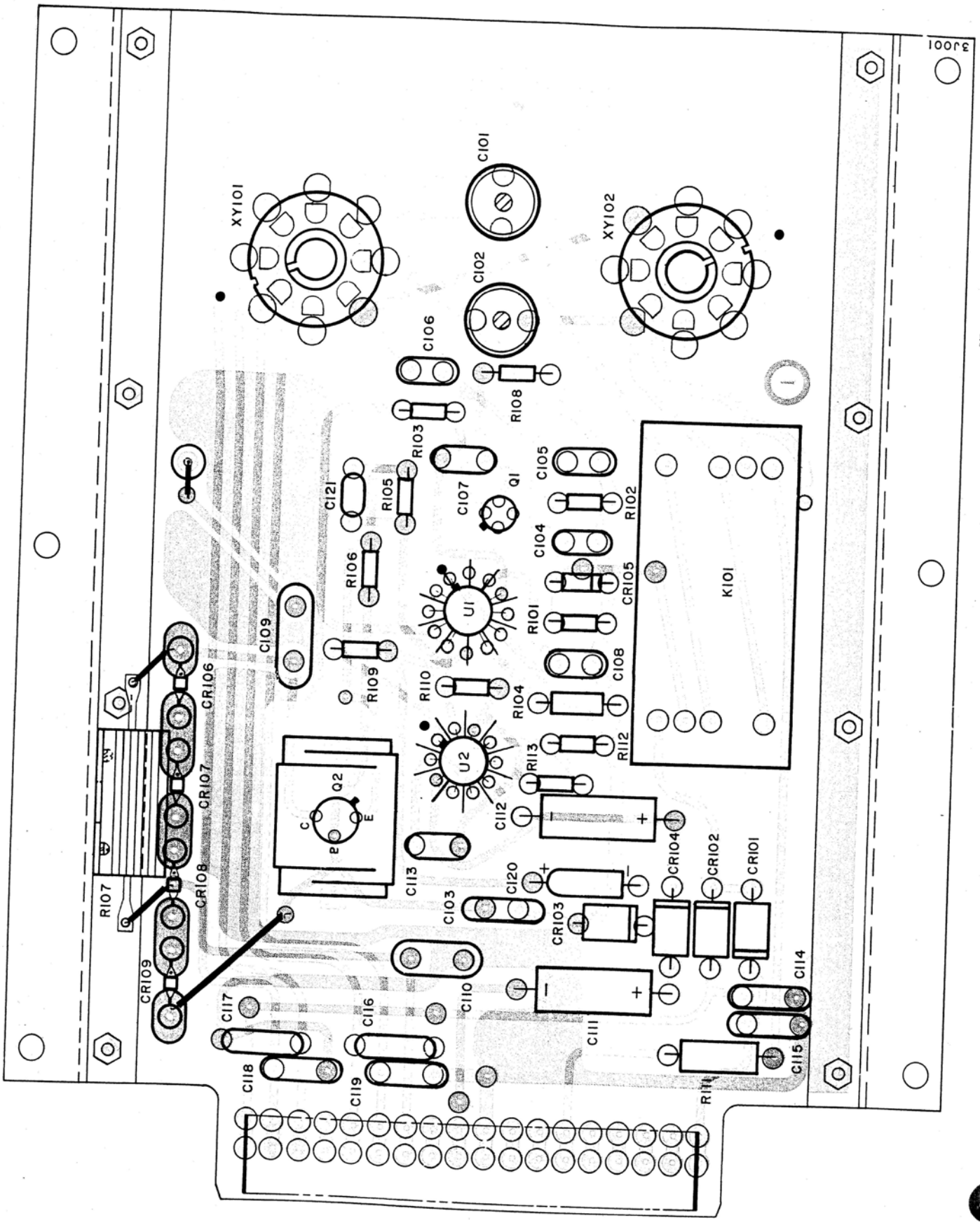


Figure 19. MI-27592, Parts Overlay, Bottom

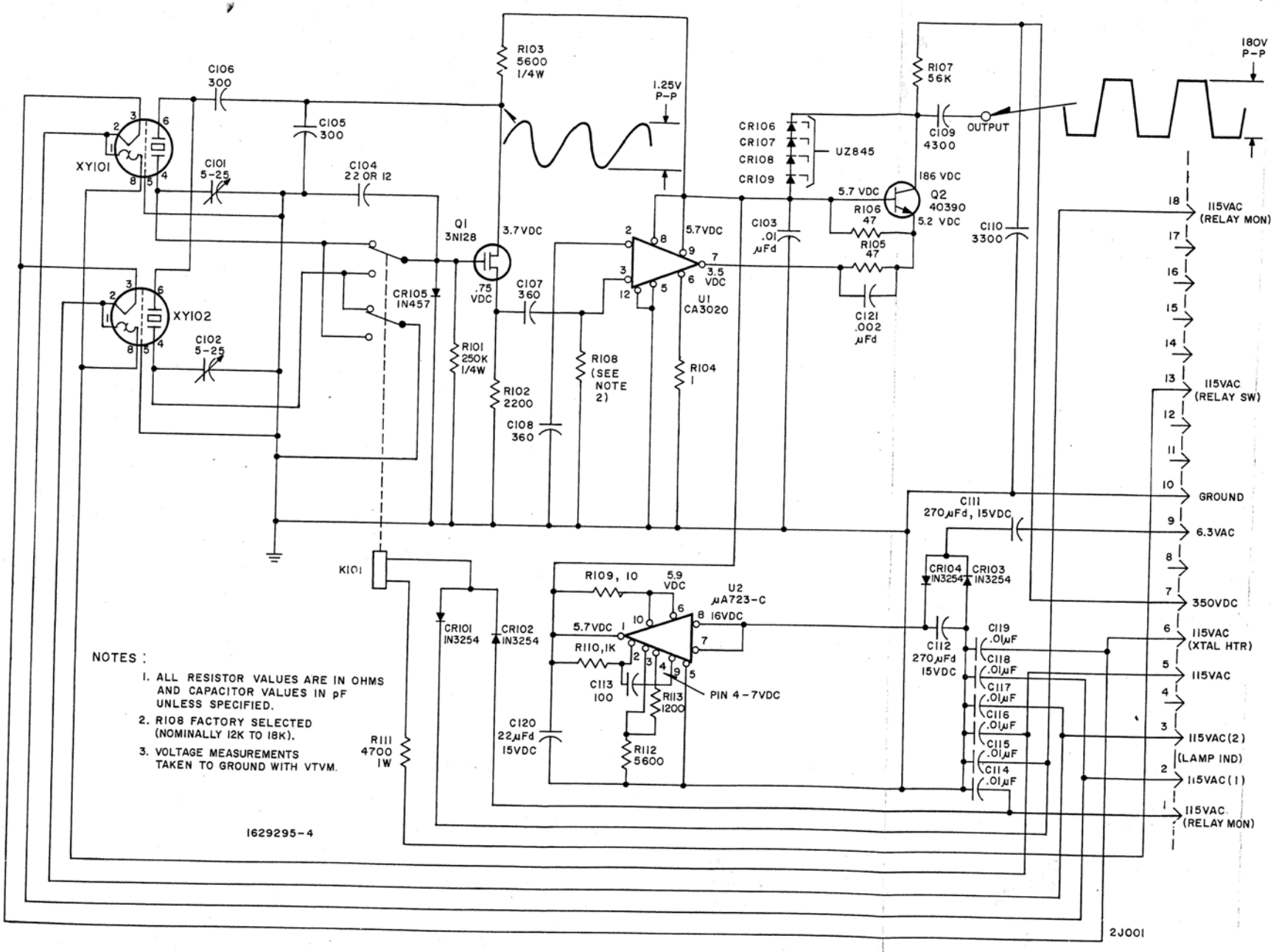
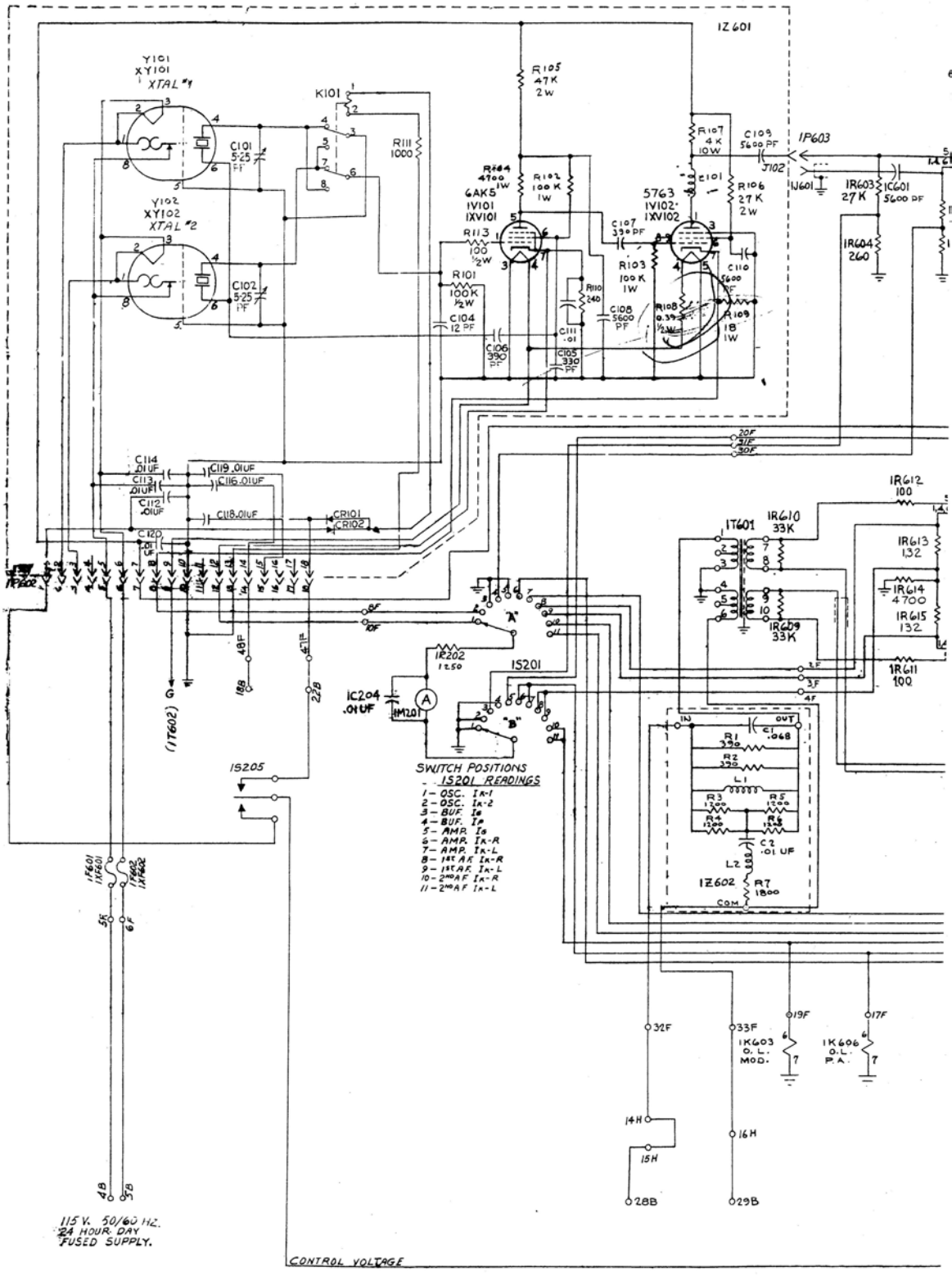
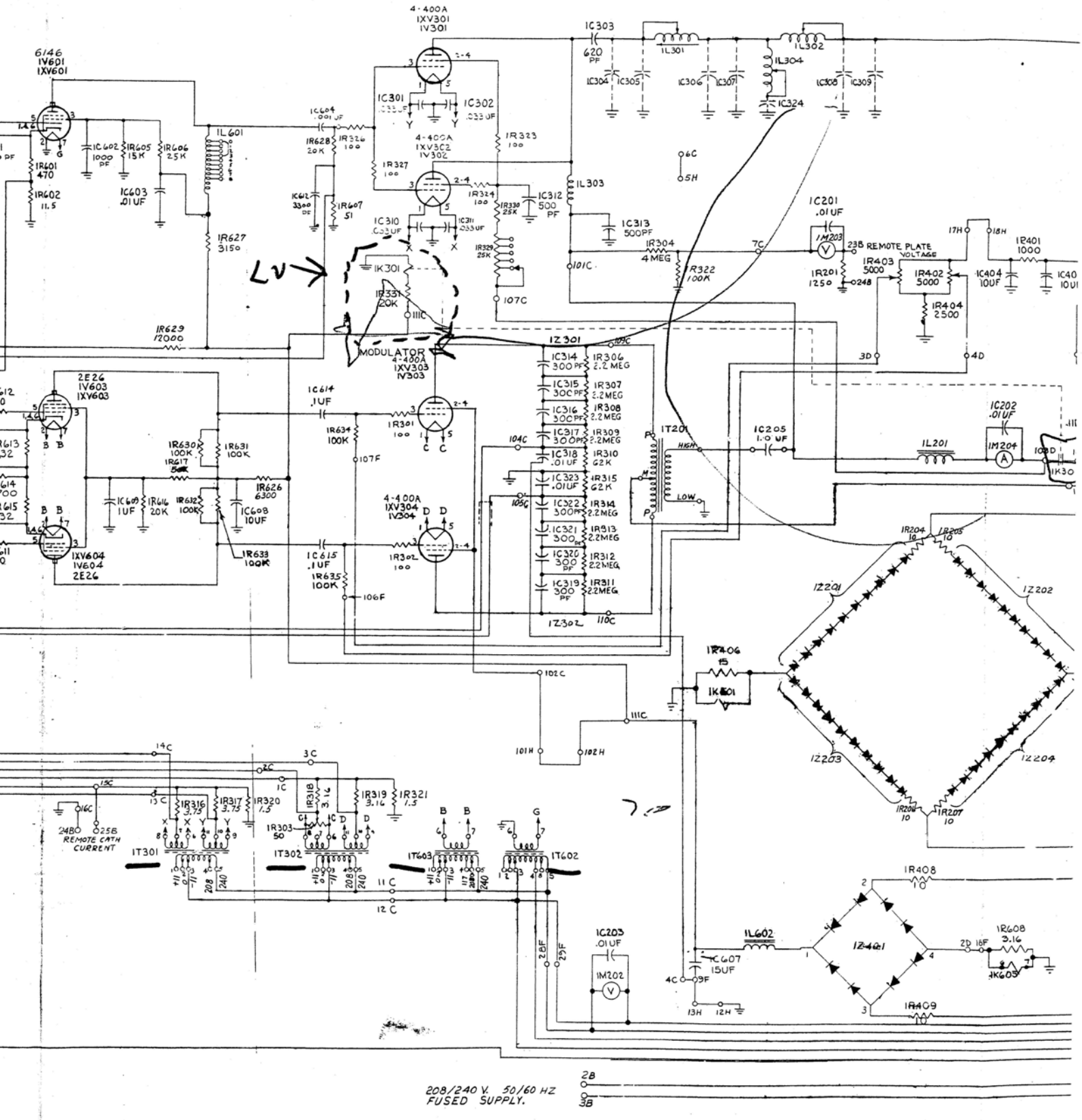


Figure 20. MI-27592, Solid State Oscillator, Schematic


1Z601
Y101
XY101
XTAL #1
Y102
XY102
XTAL #2
K101
C101
5-25 PF
C102
5-25 PF
R111
1000
R105
47K
2W
R104
4700
1W
R102
100K
1W
6AK5
1V101
1XV101
R113
100
½W
R101
100K
½W
C104
12 PF
C106
390 PF
C105
330 PF
C111
.01
R110
240
C108
5600 PF
C107
390 PF
5763
1V102
1XV102
R103
100K
1W
R108
0.39
½W
R109
18
1W
C110
5600 PF
R107
4K
10W
C109
5600 PF
R106
27K
2W
C101
1P603
J102
1J601
IR603
27K
IC601
5600 PF
IR604
260
C114
.01UF
C113
.01UF
C112
.01UF
C119 .01UF
C116 .01UF
C118 .01UF
C120
.01
CR101
CR102
1R202
1.2.50
IC204
.01 UF
1M201
1S201
SWITCH POSITIONS
1S201 READINGS
1 - OSC. IK-1
2 - OSC. IK-2
3 - BUF. IG
4 - BUF. IP
5 - AMP. IG
6 - AMP. IK-R
7 - AMP. IK-L
8 - 1ST A.F. IK-R
9 - 1ST A.F. IK-L
10 - 2ND A.F. IK-R
11 - 2ND A.F. IK-L
1S205
(1T602)
1T601
IR610
33K
IR612
100
IR613
132
IR614
4700
IR615
132
IR609
33K
IR611
100
IN
OUT
C1
.068
R1
390
R2
330
L1
R3
1200
R5
1200
R4
1200
R6
1200
C2
.01 UF
L2
1Z602
R7
1800
COM
1FG01
1XFG01
1FG02
1XFG02
115 V. 50/60 HZ.
24 HOUR DAY
FUSED SUPPLY.
CONTROL VOLTAGE
1K603
O.L.
MOD.
1K606
O.L.
P.A.


4-400A
1XV301
1V301
6146
1V601
1XV601
IC303
620 PF
IL301
IL302
IL304
IC304 IC305
IC306 IC307
IC308 IC309
IC324
IC301 .033 UF
IC302 .033 UF
4-400A
1XV302
IC604 .001 UF
IR628 20K
IR326 100
IR323 100
IR327 100
IR324 100
IC312 500 PF
IL303
IC602 1000 PF
IR605 15K
IR606 2.5K
IR601 470
IR602 11.5
IC603 .01 UF
IC612 3300 PF
IR607 51
IC310 .033 UF
IC311 .033 UF
IR330 25K
IR329 25K
IR627 3150
IK301
IR331 20K
111C
MODULATOR
4-400A
1XV303
1V303
IR629 12000
IZ301
IC314 300 PF
IC315 300 PF
IC316 300 PF
IC317 300 PF
IC318 .01 UF
IC323 .01 UF
IC322 300 PF
IC321 300 PF
IC320 300 PF
IC319 300 PF
IR306 2.2 MEG
IR307 2.2 MEG
IR308 2.2 MEG
IR309 2.2 MEG
IR310 62K
IR315 62K
IR314 2.2 MEG
IR313 2.2 MEG
IR312 2.2 MEG
IR311 2.2 MEG
IZ302
110C
IC313 500PF
IR304 4 MEG
IR322 100K
101C
107C
IC201 .01 UF
IM203
238 REMOTE PLATE VOLTAGE
IR403 5000
IR201 1250
248
IR402 5000
IR404 2500
IR401 1000
IC404 10UF
IC40 10UF
17H
18H
3D
4D
7C
6C
5H
2E26
1V603
1XV603
IC614 .1UF
IR634 100K
IR301 100
107F
IR630 100K
IR617 5MEG
IR631 100K
IR626 6300
IC609 1UF
IR616 20K
IR632 100K
IC608 10UF
IR633 100K
IC615 .1UF
IR635 100K
106F
4-400A
1XV304
1V304
IR302 100
1XV604
1V604
2E26
104C
105C
1T201
HIGH
LOW
IC205 1.0 UF
IL201
IC202 .01 UF
IM204
IK30
IR204 10
IR205 10
IZ201
IZ202
IZ203
IZ204
IR206 10
IR207 10
IR406 15
IK601
102C
111C
101H
102H
14C
3C
2C
1C
13C
16C
24BO
025B
REMOTE CATH CURRENT
IR316 3.75
IR317 3.75
IR320 1.5
IR318 3.16
IR303 50
IR319 3.16
IR321 1.5
IT301
IT302
IT603
IT602
208
240
117
11 C
12 C
IC203 .01 UF
IM202
IL602
IC607 15UF
IZ401
IR408 10
IR608 3.16
IK603
IR409
2D
16F
28F
29F
4C
9F
13H
12H
208/240 V. 50/60 HZ
FUSED SUPPLY.
28
3B

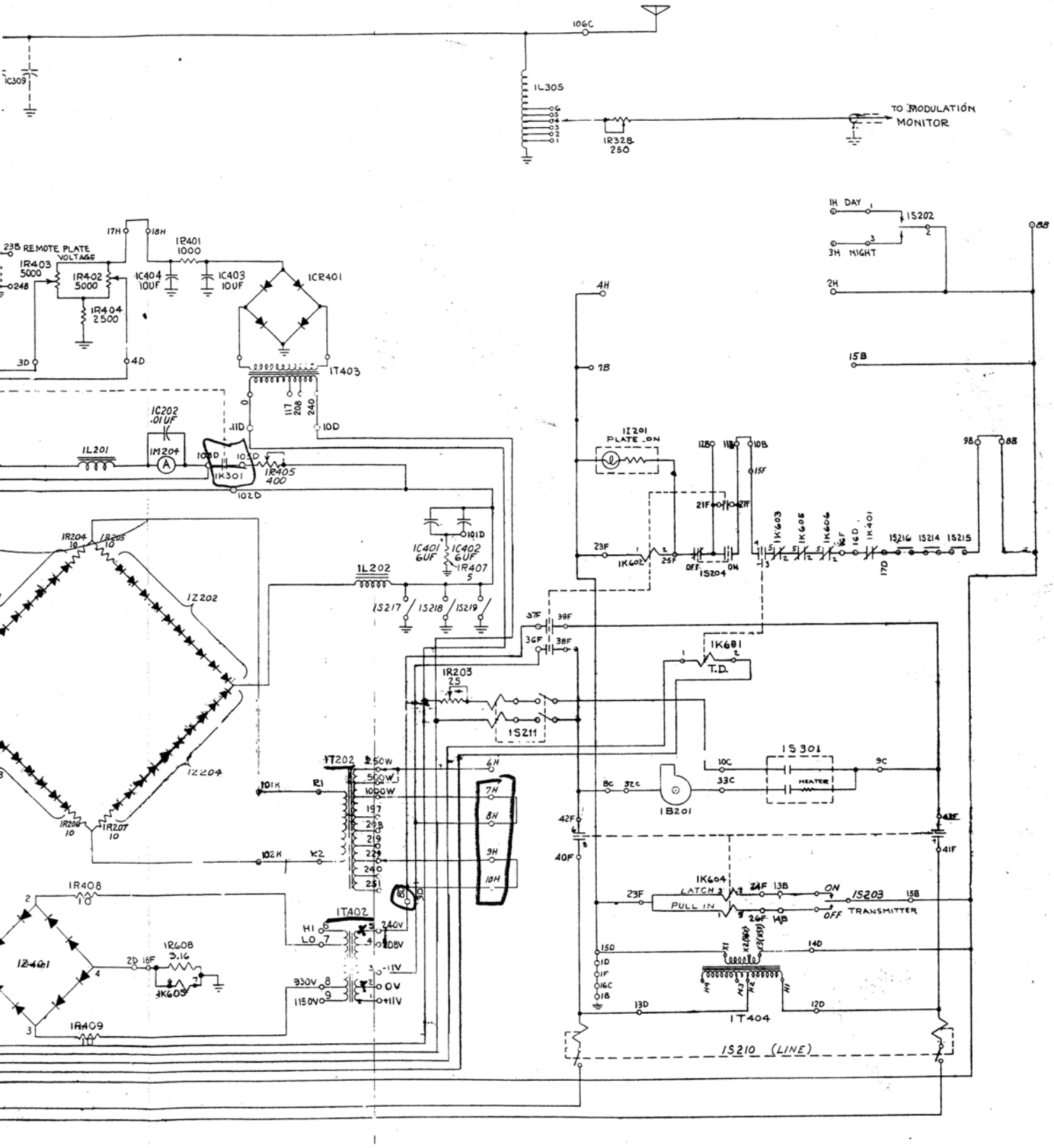


Figure 21. BTA-1R3, Schematic Diagram

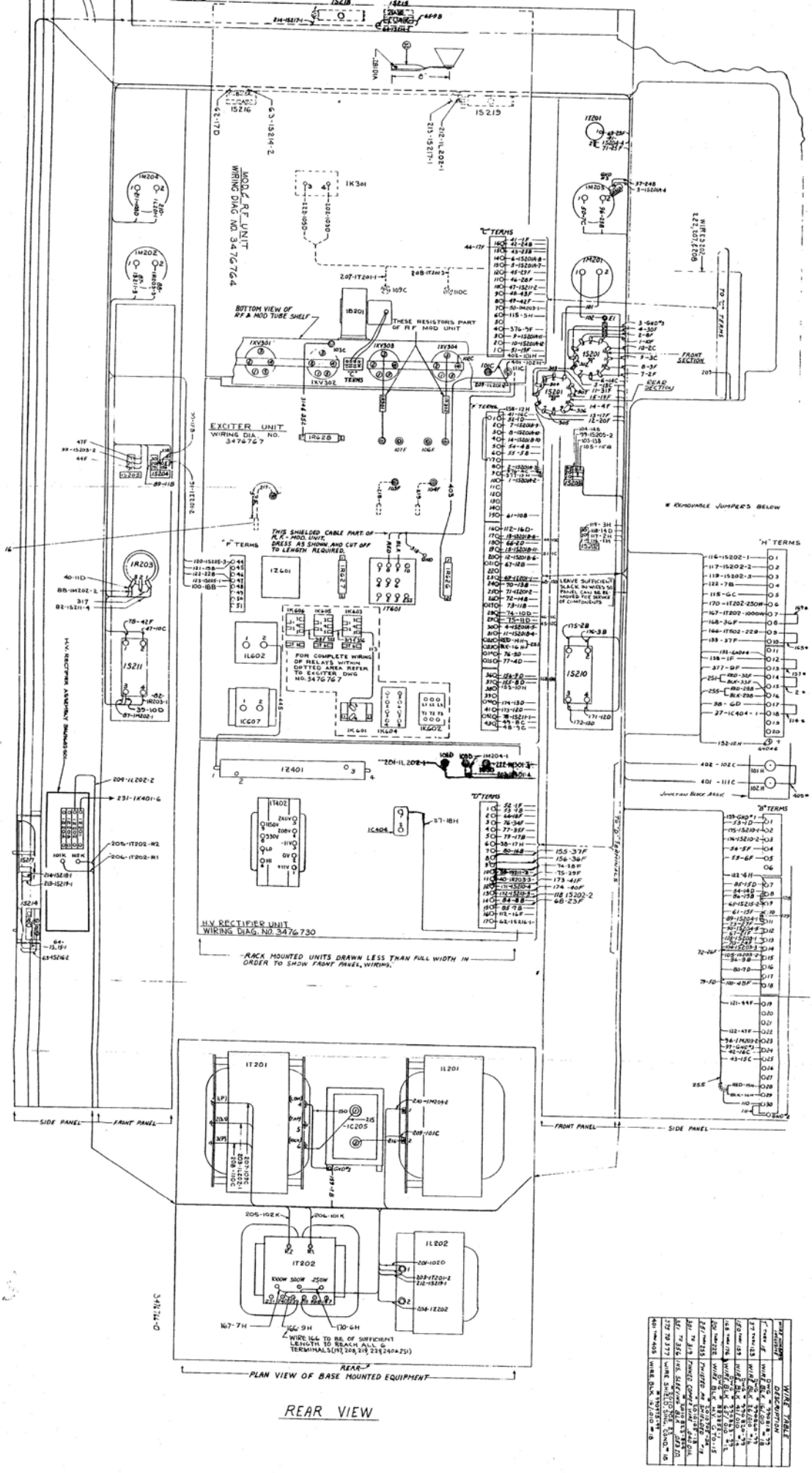


Figure 22. BTA-1R3, Wiring Diagram

WIRE TABLE

WIRE NO (INCLUSIVE)	DESCRIPTION COLOR AND GAGE	PS-NP OR DWG NO
1 TO 8, 15 TO 26	BLK 41/.010	PS 392-10
9 TO 14, 27 TO 33, 50 TO 56	BLK 26/.010	PS 392-33
34 TO 36, 49	BLK #14	PS 870-15 (8838252-1)
37 TO 48, 57 TO 60	TIN. COP. .057 DIA	2690105-15
51	SHIELDED CABLE TWISTED PR #18	2010705-24
61	TINNED ROPE LAY CABLE	2010341-3
91	BLK 16/.010	7990375-99
81	WIRE, SHIELDED SINGLE COND.	2010705-23

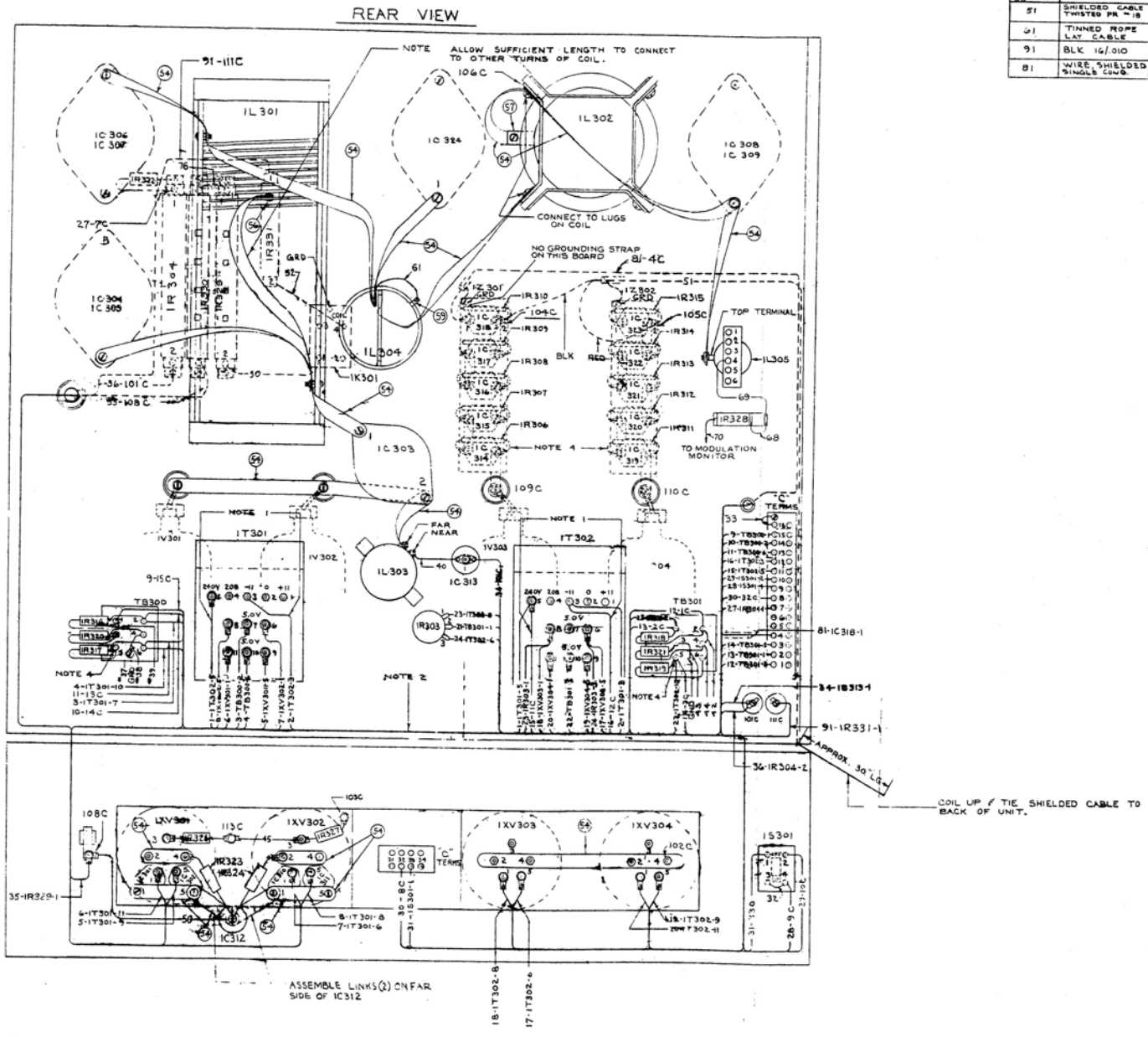


Figure 23. Modulator and RF Unit, Wiring Diagram

WIRE TABLE	
WIRE NO. (INCLUSIVE)	DESCRIPTION
1 TO 51	BLK 16/.010
301 TO 304	BLK 16/.010
100 TO 140	TINNED COPPER .064
150 TO 151	TINNED COPPER .128
200 TO 233	INSUL TUBING .453
350	INSUL TUBING .198
300	CABLE COAX
351 TO 355	CABLE 3/C(X-RED
361 TO 366	BLK 16/.010
400 TO 405	TINNED COPPER .064
420 TO 425	INSUL TUBING .0761
440 TO 447	BLK 41/.010
450 TO 451	BLK 65/.010

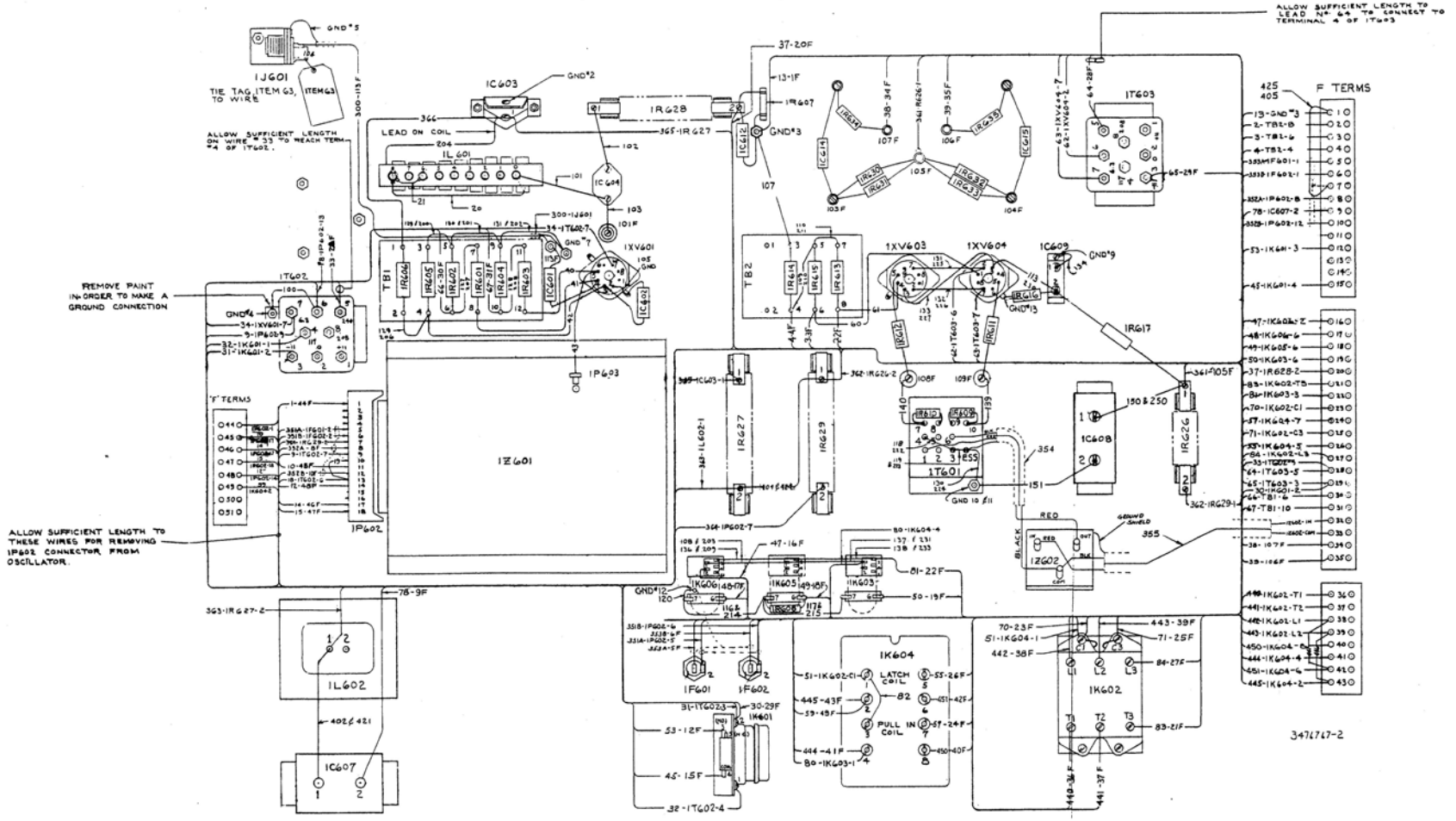


Figure 24. Exciter Unit, Wiring Diagram

WIRE TABLE	
WIRE NOS INCLUSIVE	DESCRIPTION
1 TO 13	WIRE, BLK, 2010892-10, 600V #14 AWG
17 TO 37	WIRE, BLK, 2010892-38, 600V #18 AWG
41 TO 44	CABLE, BLK, 8858BL-1, HV #14 AWG
51 TO 52	TINNED COPPER WIRE, 2010105-18, .040 DIA
61 TO 63	TINNED COPPER WIRE, 2010105-8, .128 DIA
71 TO 72	TINNED COPPER WIRE, 2010105-14, .064 DIA

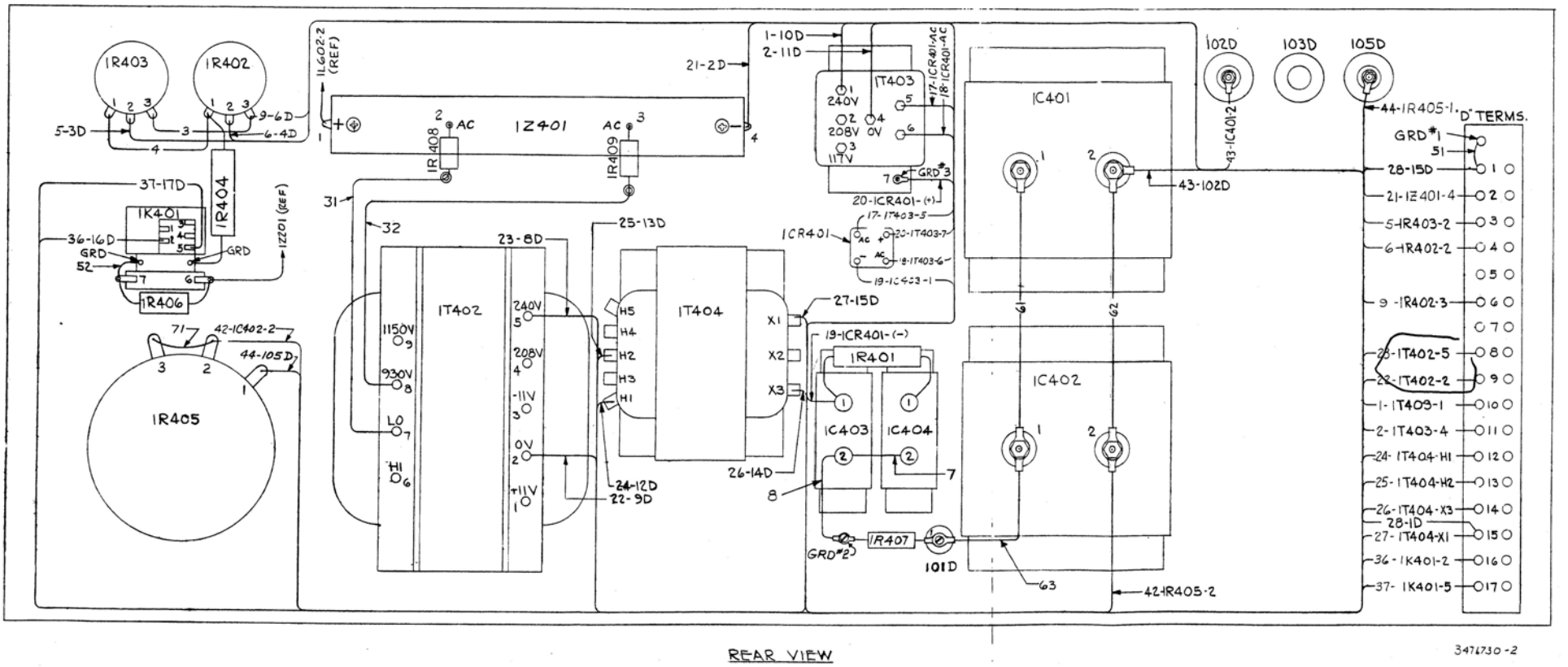
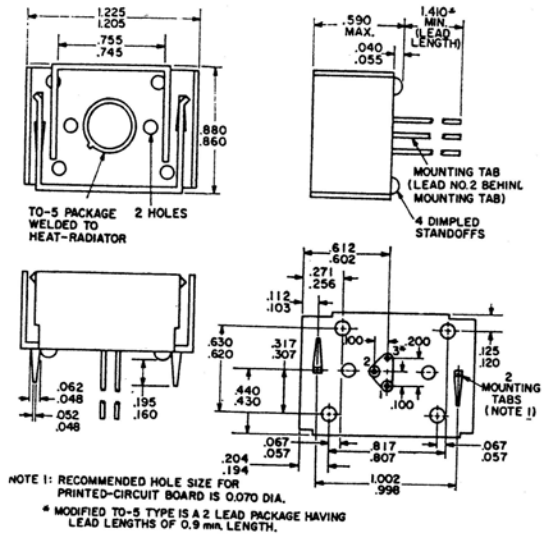
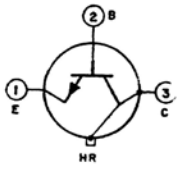


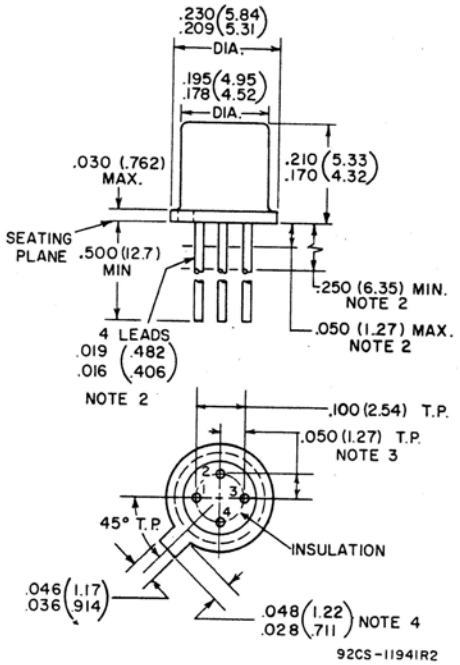
Figure 25. HV Rectifier Unit, Wiring Diagram



40390



DIMENSIONAL OUTLINE
JEDEC TO-72

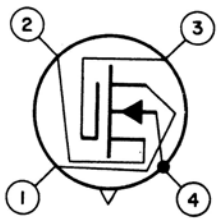


3N128

Dimensions in Inches and Millimeters

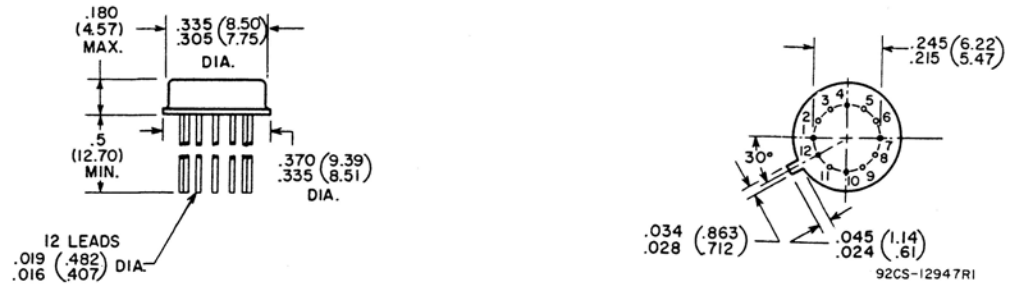
Note 1: *Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated.*

TERMINAL DIAGRAM

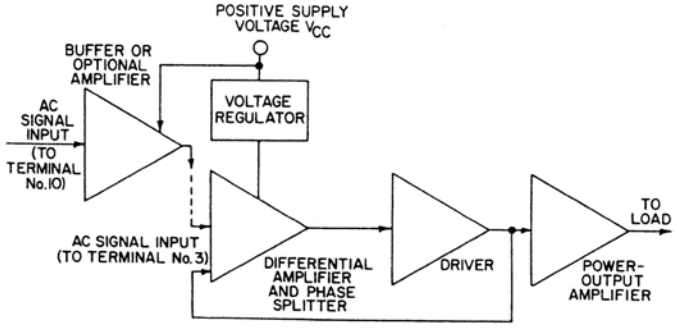


1 - Drain
2 - Source
3 - Insulated Gate
4 - Bulk (Substrate) and Case

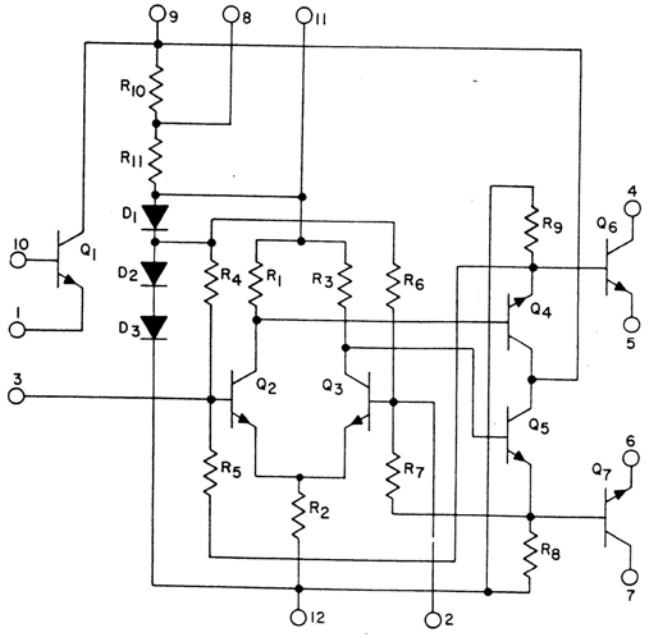
CA3020 WIDE-BAND AMPLIFIER



BASE DATA

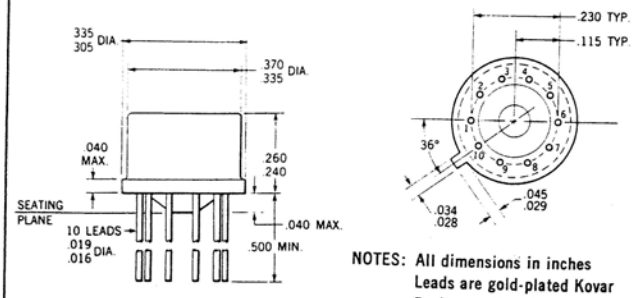


FUNCTIONAL DIAGRAM



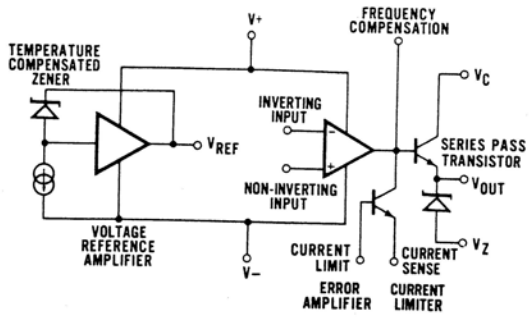
SCHEMATIC DIAGRAM

μA723 PRECISION VOLTAGE REGULATOR

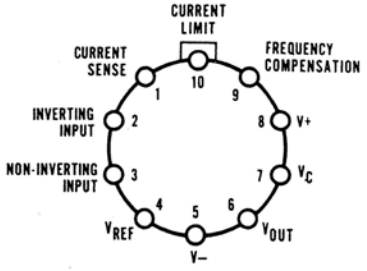


NOTES: All dimensions in inches
Leads are gold-plated Kovar
Package weight is 1.32 grams

PHYSICAL DIMENSIONS

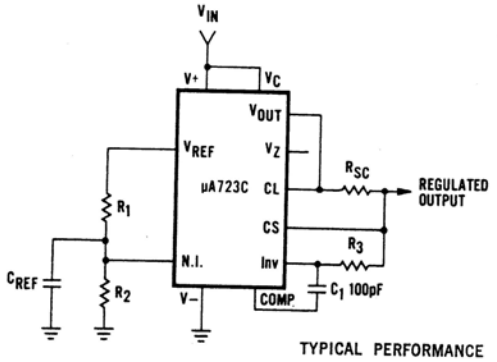


EQUIVALENT CIRCUIT



Note: On metal can, pin 5 is connected to case

CONNECTION DIAGRAMS(Top Views)



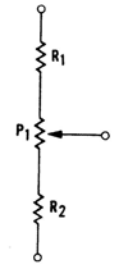
TYPICAL PERFORMANCE

Regulated Output Voltage	5 V
Line Regulation ($\Delta V_{IN} = 3$ V)	0.5 mV
Load Regulation (ΔI_L=50 mA)	1.5 mV

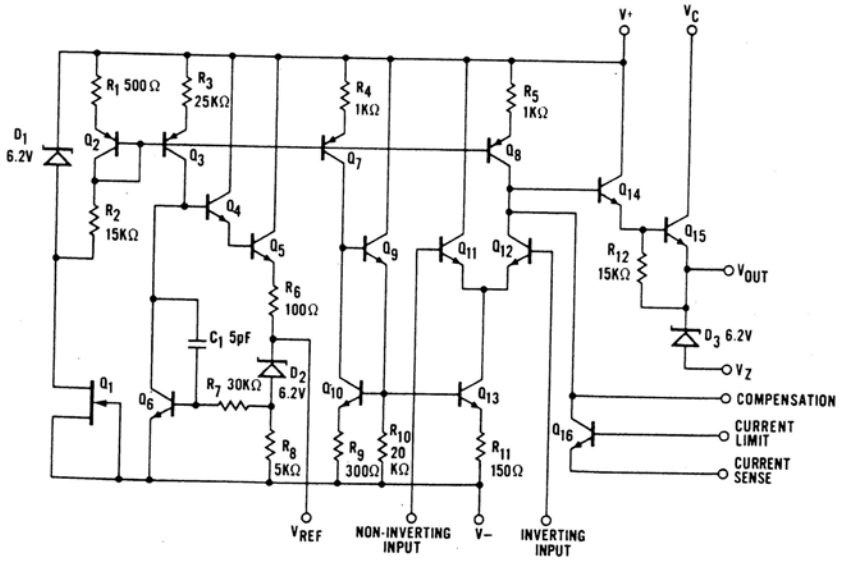
Note: $R_3 = \frac{R_1 R_2}{R_1 + R_2}$ for minimum temperature drift.

R_3 may be eliminated for minimum component count

BASIC LOW VOLTAGE REGULATOR
Vout=2 to 7 Volts



OUTPUT VOLTAGE ADJUST



SCHEMATIC DIAGRAM

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