

INSTRUCTION MANUAL
R.E.L. TRANSMITTER

MODEL 518 (D) - DL

1000 WATT F.M.

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TABLE OF CONTENTS

MODEL 518 INSTRUCTION MANUAL

- SECTION I. INSPECTION OF RECEIVED MATERIAL - CLAIMS FOR BREAKAGE IN SHIPMENT
- SECTION II. GENERAL DESCRIPTION OF EQUIPMENT
- SECTION III. ASSEMBLY AND INSTALLATION
- SECTION IV. THEORY OF OPERATION
- SECTION V. PRELIMINARY ADJUSTMENTS AND OPERATION OF THE EQUIPMENT
- SECTION VI. MODULATOR AND POWER AMPLIFIER ADJUSTMENTS
- SECTION VII. CONSOLIDATED PARTS LISTS
- SECTION VIII. MAINTENANCE OF EQUIPMENT - ORDERING SPARE OR REPLACEMENT PARTS - PROCEDURE FOR RETURN OF MATERIAL

ACCESSORY DATA SUPPLIED WITH THIS MANUAL IN REAR COVER POCKET:-
 6 COPIES DEFECTIVE MATERIAL NOTIFICATION FORM
 6 COPIES DEFECTIVE MATERIAL RETURN FORM

IN SEPARATE DRAWING FOLDER:-

| <u>TITLE</u> | <u>NUMBER</u> |
|--|---------------|
| INSTALLATION DRAWING | T-68 |
| STATION WIRING DIAGRAM | B-654 |
| MODEL 518 WIRING DIAGRAM | SS-638 |
| CONTROL CIRCUITS - ACROSS THE LINE DIAGRAM | B-629 |

Typical Meter Readings - Power Amp. - Section VI - 3
Efficiency Rating

SECTION 1

INSPECTION OF RECEIVED MATERIAL RE-ASSEMBLY OF PARTS REMOVED FOR SHIPMENT - CLAIMS FOR BREAKAGE IN SHIPMENT.

1. INSPECTION OF RECEIVED MATERIAL

Received material should be carefully inspected at the time of uncrating for evidence of damage or breaking due to careless handling in transit. Care and good sense should be used in the process of unpacking or uncrating the equipment. Hasty use of improper tools such as crowbars, etc., may easily result in damage to the enclosed equipment. Be sure to note and follow externally marked instructions such as, "This End up" or "Open This End", etc. All equipment is carefully packed at the factory to insure safe delivery with reasonably careful handling. When removing items from packing material check item by item against the enclosed packing list for errors or short shipment.

2. CLAIMS FOR BREAKAGE IN SHIPMENT

In cases of damage to equipment due to faulty handling in shipment, notify carrier immediately leaving broken or damaged item or items exactly as found in package. Do not destroy or remove any of the wrappings or protective material involved in the wrapping of the damaged item. Carrier companies will not accept claims for "Damage in Shipment" unless they can inspect the damaged item and its associated packing material. Claims must usually be made within five days of receipt of shipment.

SECTION II

GENERAL DESCRIPTION OF EQUIPMENT

A. General Description

The REL Model 518 FM Broadcast Transmitter is designed to deliver 1000 watts of radio frequency power at any selected frequency from 88 to 108 megacycles. Modulation is accomplished by the Armstrong Dual Channel Phase Shift method, the modulator being an integral part of the transmitter.

The equipment is completely housed in a vertical steel cabinet normally finished in two tone green lacquer with chrome trim. The cabinet is 84" high, 40" wide and 36" deep.

Various functional units in the equipment have been sectionalized on individual chassis. Each separate chassis is hinged at one end and may be swung out for convenient inspection or maintenance work.

B. Primary Power Connections

Refer to drawing B-654 which shows details of the transmitter input terminal boards and connections.

208/230 volts, 60 cycles single phase should be terminated at the terminals marked A, B, using #10 AWG wire or larger. Primary load for rated output is approximately 3700 volt amperes at 89% power factor. 110 to 120 volts single phase should be connected to terminals 53 and 54 using #12 AWG wires for powering the convenience outlet and interior lighting.

A good low resistance ground should be connected to the terminal marked "0" on the terminal board which is located on the left vertical frame member just inside the lower front panel.

C. Output Transmission Line Connections

The equipment is supplied for operation with a single 7/8" coaxial transmission line which enters the top of the cabinet. Location of this point may be determined by reference to outline drawing T-68.

D. Accessory Data

A 600 ohm balanced audio input line must be connected to the twin conductor jack, which is located behind the lower front panel on the right hand corner post. This line should be of the insulated shielded twisted pair type and should avoid proximity to high level AC lines. Since there is not pre-emphasis included in the transmitter standard 75 micro second pre-emphasis should be included at some point in the audio equipment.

A coaxial jack is provided beside the audio input jack for connecting the monitor to the sampling loop in the power amplifier cabinet.

SECTION III

ASSEMBLY AND INSTALLATION

A. After the equipment has been unpacked remove all panels to permit easy access to the interior. A considerable amount of packing material shipping straps and braces will be found within the equipment, notably in the high voltage supply relay panel, modulator power supply, and power amplifier compartment. This material should all be removed and the supported parts carefully examined for any damage which may have occurred while the equipment was in transit.

B. After the equipment has been located in its final position the power lines may be connected. Provision has been made in the cabinet design to permit cable entrance either through exposed conduit or concealed floor trench type wiring. A "TEE" shaped duct is built into the base of the transmitter which allows conduit entrance via either side near the front or through the rear center. The location of these knockouts is indicated on the installation drawing T-68. In addition an 8" x 2" opening covered with a removable plate is provided for entrance of cables via a floor trench. If used, this plate should be removed and holes cut to permit passage of the cables. Unless the plate is reinstalled, an air leak will result, thus destroying the effectiveness of the intake air filter.

Primary power connections are made to terminals "A" and "B". The auxiliary lighting circuit connections are connected to terminals 53 and 54.

C. The output transmission line connections may now be made up.

D. Connect the audio input line and the monitor by means of the plugs which are provided in their respected jacks.

E. Install plug in resistors which are located as noted below:

| <u>SYMBOL NO.</u> | <u>STOCK NO.</u> | <u>RESISTANCE</u> | <u>LOCATION</u> |
|-------------------|------------------|-------------------|---|
| R-800 | R-5104 or R-5273 | 200,000 ohms | Resistor panel left side, bottom row, center. |
| R-801 | R-5105 | 5 megohm | Resistor panel, bottom row, rear. |
| R-803 | R-5097 or R-5269 | 500 ohms | Resistor panel, bottom row, front. |
| R-805 | R-5109 or R-5271 | 250 ohms | Resistor panel, middle row. |
| R-806 | Same as R-805 | | Resistor panel, middle row. |
| R-807 | R-5321 | 500 ohms | Bottom of grid circuit. |
| R-808 | Same as R-805 | | Resistor panel, middle row. |
| R-809 | Same as R-805 | | Resistor panel, middle row. |
| R-810 | R-5321 | 500 ohms | Below PA tube deck, left. |
| R-811 | R-5269 | 500 ohms | Resistor board, lower right side. |
| R-812 | Same as R-811 | | Resistor board, lower right side. |
| R-818 | R-5336 | 1250 ohms | Resistor panel, left side, top row, rear. |
| R-819 | R-5337 | 2000 ohms | Resistor panel, left side, top row, front. |
| R-820 | R-5321 | 500 ohms | Below PA tube deck, right. |

F. Install all tubes. Pilot lights and glass fuses are shipped in their respective sockets.

G. There are five lumiline lamps to be installed. Two are used to illuminate the meter panel and the sockets for these will be found directly below the meters. Two are used inside the power amplifier compartment and operate when the compartment door is opened. One is located inside the plate compartment on the top front panel. The other is located under the PA tube deck just inside the front flange. The fifth light is located on the rear of the same cornerpost which supports the audio input jack.

SECTION IV

THEORY OF OPERATION

A. POWER CONTROL CIRCUIT

1. General

The power controls are designed to provide either complete manual or semi-automatic control with facilities provided for remote control of the application of power to the various stages, proper protection of equipment in the case of overloads, and reasonable time delays between the application of filament and plate voltages. All cabinet doors with the exception of those over the modulator compartment and the main front doors, are interlocked for the protection of personnel.

2. Primary Power Source

The main operating power is completely supplied by a 208/230 volt (plus or minus 5%) 60 cycles, single phase source. All filament transformer primary voltages are controlled by the variable auto transformer YR-800 which is located on the right hand control panel, and should be adjusted to produce a reading of 5.0 volts on the front panel "FILAMENT VOLTAGE".

3. Control Circuits

The schematic diagram of the control circuits is shown on drawing SS-638. A functional across the line diagram is shown on drawing B-629 which will be useful in understanding the sequence of control operation.

The STANDBY switch S808 should always be on, except for maintenance work on the standby circuit. Even so, the input side of S808 and the main circuit breaker, K800, will be energized, hence it is advisable to open the main safety switch which powers the entire transmitter when maintenance work is required. When S808 is closed, transformer T703 is energized through fuse F806 and protective resistor R-715. The secondary of T703 operates the crystal heater when the transmitter is off the air. The standby fuses F807 and F808 provide protection for the standby and blower shut down circuits.

With all of the switches except the STANDBY SWITCH S808 open, the first switch to be closed is the PRIMARY POWER circuit breaker K800. The coil of the blower relay K806A is energized through the standby fuses F807 and F808 closing contacts K806B, K806C, and K806D. The blower time delay relay K807 is also energized through the normally closed contact K801C of the time delay relay K801. However relay K807 will not operate at this time since its normal time delay is 2 minutes, and contact K801C will open 60 seconds after switch S800 is closed. Contacts K806C and K806D apply power to the blower B800 through the thermal element K806E, and also to the blower pilot light, I803. The meter lights I805 and I806 should come on when K800 is closed.

When the FILAMENT switch S800 is closed and the blower B800 has reached its proper speed, the air switch S807 will be closed thus energizing the filament variable auto transformer YR800 which in turn controls the voltage on T700 through F801 which supplies 6.5 volts AC for the modulator AC filaments; T701 through F802 which supplies 6.6 volts DC for the modulator DC filaments; K700 which switches the crystal heater from 6.0 volts AC standby to 6.6 volts DC operate; T800 through F803 which controls the screen the bias supply filaments; T801 supplying the power amplifier filaments at 5 volts which is read on the FILAMENT VOLTAGE meter; T804, T805 and T806 which supply the high voltage rectifier filaments; K801 the rectifier tube time delay (60 seconds) which withholds application of high voltage until the rectifier tube cathodes are hot and finally I800, the filament pilot light.

60 seconds after the closing of the FILAMENT switch S800, the time delay relay K801 will operate, closing contact K801B and opening contact K801C. If all door interlocks are closed and the MODULATOR HIGH VOLTAGE switch is closed, then the coil of relay K802A will be energized closing contacts K802B and K802C. K802B, when closed, applies power to the modulator high voltage transformer T702 and the modulator high voltage pilot light I801, through fuse F804. K802C when closed energizes the high voltage recycling time delay (5 seconds) through the overload relay contact K805B, and the bias high voltage transformer T802 through fuse F805.

After 5 seconds from the time the MODULATOR HIGH VOLTAGE switch S801 was closed time delay relay K803 will operate, closing its contact, K803B. Then if the HIGH VOLTAGE switch S805 is closed, the PA high voltage relay K804 will be energized, closing contacts K804B and K804C through which power will be applied to the primary of the high voltage transformer T803 through the tap changing switch S818, and to the high voltage pilot light I802. The closing of the power amplifier high voltage switch completes the cycle of manual operation and the equipment is ready for transmission provided that the equipment has been previously adjusted for proper voltages and the tuning controls were properly set. The switching controls are designed so as to control the cycle of operation at any stage desired. If any of the control switches S-800, S-801 or S-805 are opened, the cycle of operation will automatically continue to the stage controlled by the particular switch that is opened and then stop. Further continuation of the operating cycle requires the closing of the switch or switches that follow.

The manual "OFF" operation is performed in the reverse sequence of the "ON" operation: the power amplifier HIGH VOLTAGE SWITCH S-805 is turned off which removes the power amplifier high voltage then the modulator high voltage switch S-801 is turned off, followed by the turning off of the filament power switch S-800 and finally the primary power circuit breaker, K-800.

If for any reason, by manual "OFF" operation or by a heavy overload, the overload breaker K-800 is opened, only one of the parallel sources of supply for the blower relay coil K-806A is removed and contacts K-806C and K-806D remain closed. The power supplied through these contacts will keep the blower B-800 operating. At the same time that the circuit breaker K-800 is opened, power is removed from relay coil K-801A, thus closing contacts K-801C. Contact K-801C energizes the blower time delay relay K-807, and after 2 minutes, the normally closed contact K-807B opens thus removing the second of the two parallel sources of power for relay K-806A. This relay opens contact K-806B which turns off the blower B-800 and the blower pilot light I-803.

CAUTION

The standby crystal heater switch S-808 should never be turned off until the blower B-800 has stopped.

Assuming that S-808 is "on" in the standby position, semi-automatic operation of the control circuit is obtained by turning on all switches (S-800, S-801, S-805) except the main PRIMARY POWER circuit breaker K-800. Then when K-800 is closed, the relays function as previously described and after approximately 65 seconds, the equipment is ready for transmission. The "stop" operation is performed by simply opening circuit breaker K-800. Approximately 2 minutes after the "stop" operation, the blower B-800 will stop and the standby crystal heater power will be the only power on. Care must be exercised when working near switch S-808.

In the power amplifier H.V. supply, an automatic reset overload current relay K-805 protects this stage from overloading. Relays K-802, and K-803 and K-804 will function as previously described under normal conditions after relay K-805 has been opened and automatically closed.

No provision is made to limit the number of recycling periods in the event of serious overload or short circuit in the high voltage circuit. Therefore if recycling persists, the equipment should be turned off and the source of trouble determined. The PRIMARY POWER circuit breaker K-800, which is a manual reset overload breaker protects the entire unit and will open only under much heavier overloads than the other overload relay K-805. Caution should be taken before closing K-800 after an overload.

B. Bias and Screen Supplies

1. The bias and screen grid power supplies are located on the upper hinged chassis on the right side of the cabinet; and are shown schematically on drawing SS-638.
2. Filament voltage is adjusted by the FILAMENT voltage control on the front panel.
3. Primary voltage to the bias high voltage transformer T-802 is applied between common lead #10 and control lead #22 which is energized by closing the "MOD HV" switch. The bias output, after adequate filtering, is connected by lead #48 to the four 250 ohm series connected bleeder resistors R-805, R-806, R-808 and R-809 which are located on the resistor board on the left side of the equipment. The output of the bias supply is approximately -200 volts resulting in 50 volt steps across each of the four bleeder resistors. Lead #29 connects to this bleeder at the -50 volt point to provide bias for the 829B tubes in the IPA chassis and lead #30 connects the -150 volt point to the grid current meter, which in turn connects to the grid leak resistor R-807.
4. The high voltage winding for the screen power supply is contained in the main high voltage transformer, the terminals appearing in a row below the primary terminals. Leads 47 to 49 provide the plate excitation for the screen rectifier tube V-804, and since the screen high voltage winding is part of the plate transformer, screen voltage increases with plate voltage. The DC screen voltage after filtering is connected to both the 50,000 ohm bleeder resistor R-804 and the series screen resistors R-818 and R-819 by lead #15. From this point it is connected via the screen current meter and switch to the screen grids of the power tubes.

C. High Voltage Supply

1. The high voltage anode supply for the power amplifier is obtained from the high voltage transformer T-803 and the four type 872A rectifier tubes which are mounted on the phenolic shelf in the base of the cabinet. Plate voltage is controlled by the PLATE VOLTAGE switch S-816 which is located on the right control panel.
2. Filament voltage for the high voltage rectifier tubes is adjusted by the variable transformer YR-800. Indication is provided by the filament volt meter M-800 which is mounted on the meter panel and should be adjusted to read 5.0 volts.
3. The rectifier circuit is a conventional single phase full wave bridge. Filtering is accomplished by the use of a double section filter consisting of L-800, L-801, C-800, and C-801. In addition an auxiliary filter consisting of C-821 and R-811 and R-812 is connected in series between the high voltage bus and the negative return of the power supply to damp out any parasitic oscillations which might be generated by the input choke.
4. The high voltage lead is connected to both the main bleeder resistor R-800 and the high voltage meter multiplier resistor R-801 and the plate circuit of the power amplifier. The low voltage end of the multiplier resistor is grounded through a parallel circuit consisting of the 10,000 ohm safety resistor R-802 and the high voltage meter M-803. The function of R-802 is to

provide an auxiliary path to ground for the multiplier current in the event that the high voltage meter movement or any of its associated wiring should become open circuited, the resistance being high enough not to impair the meter accuracy, but still low enough to handle bleeder currents.

5. The negative return lead of the power supply is connected to one side of the filter capacitors C-800 and C-801, the low voltage end of the auxiliary filter, the safety resistor R-803 and by lead #46 to the coil of the plate overload relay K-805 and then by lead #13 through the plate current meter M-802 to ground. The function of the 500 ohm safety resistor R-803 is to maintain a secure ground on the return of the power supply in the event that any of the inter-connecting wires or components in the normal return circuit might become open circuited.

D. Modulator

1. The modulator is diagramed in block fashion by figure #1, and schematically by drawing SS-638. It consists of the following equipments:

| | <u>CAT.</u> |
|--|-------------|
| a. Modulator power supply | 592A |
| b. Balanced Modulator | 587A |
| c. Audio Panel | 586A |
| d. Multiplier and Single Ended Converter | 589 |
| e. Multiplier and Balanced Converter | 588 |
| f. Semi Final Multiplier | 590 |
| g. Intermediate Power Multiplier | 590 |

2. The modulator power supply furnishes filament and plate voltages for the modulator chassis. On the modulator power supply terminal board; terminal #3 supplies the crystal heater with 6.0 volts AC during standby, and 6.6 volts DC while operating #4 is the DC filaments for the modulator, #8 is the filament supply, #9 the regulated 250 volt plate supply, and #11 the unregulated 450 volt plate supply.
3. The Balanced Modulator Cat. #587A contains a source of low radio frequency energy Y-200 and V-200, which is differentially phase modulated by V-202 and V-203 after amplification by the buffer amplifier V-201. V-204 and V-205 are triplers which drive the Multiplier and Single Ended Converter, Cat. #589, and the Multiplier and Balanced Converter, Cat. #588. The latter two panels are parallel frequency multiplying channels with a total multiplication of 81 times with their frequency deviations separated by 180° and terminated in a converter stage. If as an example a 200 KC crystal is used in the balanced modulator panel the input voltages to the two converters from the channels will be 16,200 KC.
4. The audio panel contains in addition to the audio stages, the control frequency oscillator, the frequency of which is 1/48 that of the transmitter output frequency. To continue the example of paragraph 3, assume a control crystal frequency of 2,000 KC. This voltage is introduced into the balanced converter and heterodyned with the multiplied input from the first crystal at 16,200 KC. The plate circuit of the balanced converter is tuned to

the difference frequency or 14,200 KC. This voltage is combined in the single ended converter with the 16,200 KC from the second channel and again the difference frequency, 2,000 KC, appears in the plate circuit. This voltage is used to drive the semi-final multiplier panel and has an operating frequency of plus/minus 1,560 cycles.

5. The purpose of this dual conversion is multi-fold;

- a. A large amount of multiplication is provided so that the initial Phase shift in the modulator tubes may be kept as low as possible while at the same time maintaining a low multiplication of the control frequency oscillator thereby producing a stable center frequency. Multiplication ratios are 7776 over all but only 48 times from the control frequency crystal.
- b. By the use of the dual conversion dual channel system the output frequency of the transmitter becomes independent of the low frequency oscillator, its stability being dependent only upon the stability of the control frequency oscillator.
- c. Noise products which are generated in the low frequency oscillator and buffer amplifier stages are cancelled out in the conversion process thereby producing noise levels of minus 70 db. below 100% modulation.
- d. Since the modulation is applied differentially to each channel the conversion process results in an additional double in the deviation frequency without the use of an additional multiplier.

6. The Semi-final multiplying panel provides a multiplication of 8 times in two amplifier and three doubler stages. Its output, and again using the example above, is 16 megacycles. The final multiplier panel provides a multiplication of 6 times in a doubler stage, a tripler stage, and an amplifier stage. The output from this panel for the conditions of the example will be 96 megacycles, which is coupled by a balanced transmission line consisting of RG-8U cable to the grids of the power amplifier.

E. Power Amplifier

The power amplifier stage of the model 518 transmitter utilizes 2 Eimac type 4-400A internal anode tetrodes in conjunction with linear circuit elements comprised of short sections of 2 wire transmission lines.

The balanced coaxial coupling line from the final multiplier panel is terminated in a hairpin which in turn is coupled to the grid circuit.

Neutralization is accomplished by resonating the screen grid lead of each tube to ground with a variable capacitor. Screen voltage is applied to each tube through a 500 ohm wire wound resistor which acts as a heavily damped choke. Individual screen currents and total screen current are metered by means of the SCREEN CURRENT meter and selector switch which are located at the top of the right control panel.

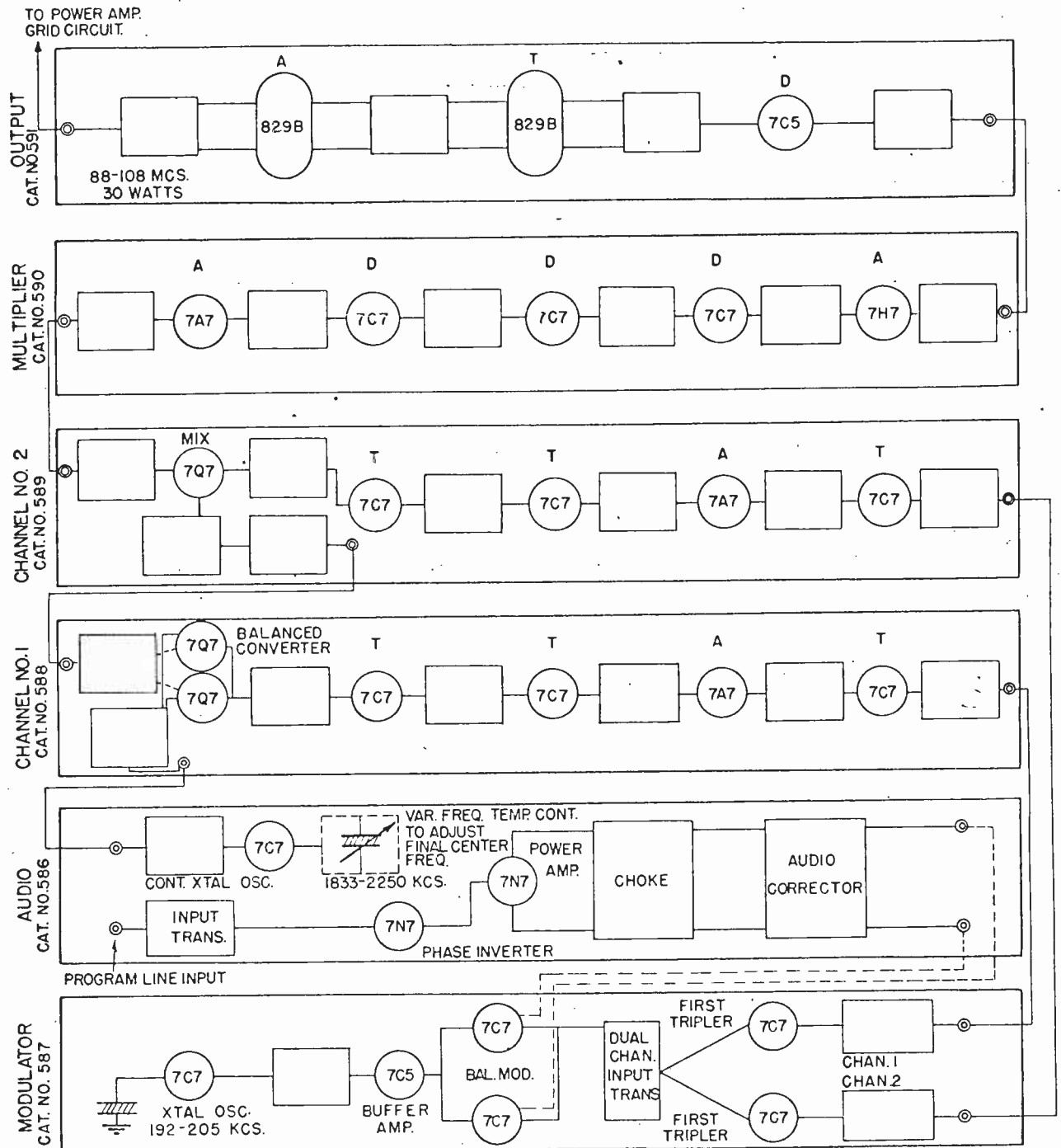
Output coupling from the anode circuit is accomplished by means of a hairpin mounted on the rear wall of the power amplifier compartment. The position of this hairpin with respect to the plate lines is variable from the right hand control panel for coupling control. Two air dielectric series capacitors are provided just behind the hairpin for tuning purposes.

Connection of the single 7/8" output transmission line is accomplished just inside the top of the transmitter proper.

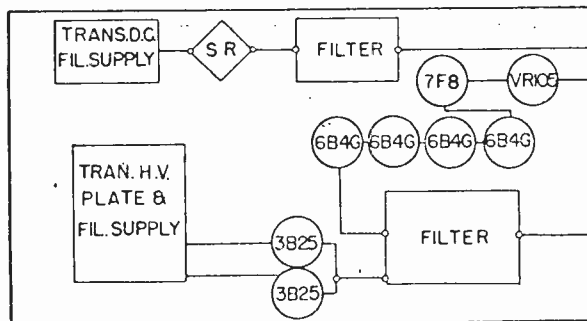
F. Power Output Indicator

The power output indicator is a voltage operated device which provides a relative indication of transmission line voltage at the point of insertion into the transmission line. The pickup unit is brazed to the short section of transmission line inside the power amplifier cabinet. It consists of a small adjustable probe, a crystal detector, and RF filters. The indicator is a 1 milliamper meter mounted on the meter panel, accessible behind the upper right panel of the power amplifier cabinet for setting a convenient mid-scale meter reading for full power output.

BLOCK DIAGRAM OF THE DUAL CHANNEL MODULATOR



A = AMPLIFIER
 D = DOUBLER
 T = TRIPLER
 MIX = MIXER



FILAMENT AND PLATE SUPPLY TO ALL UNITS EXCEPT 'OUTPUT' UNIT.

FILAMENT AND PLATE SUPPLY TO OUTPUT UNIT.

FIG. 1

SECTION VI

MODULATOR AND POWER AMPLIFIER ADJUSTMENT PROCEDURE

A. MODULATOR LINE UP PROCEDURE

The tuning of the modulator is extremely simple, and ordinarily should require only a few minutes. In each of the panels the signal direction is from right to left, and one must proceed this way in alignment. Assuming that complete alignment is needed, the following procedure should be followed:

1. Place the voltmeter probe in J-204 and adjust the trimmer on Z-200 until a voltage is obtained. This serves to indicate that the low frequency crystal oscillator is operative.
2. With the probe in J-303 go through the Balanced Modulator Chassis, Cat. #587A from right to left adjusting Z-201, Z-203 and Z-204 for maximum drive as read at J-303. Z-202 is not adjusted at this time. See paragraph 26 for detailed procedure. Then, when Z-300 is peaked the drive at J-303 should be 20 to 30 volts.
3. With the probe in J-402, Z-205 and Z-400 are peaked for maximum drive. the voltage at J-402 should be 20 to 30 volts.
4. Return the probe to J-204 and tune the low frequency oscillator tank, Z-200, until the voltage indicated is zero. It is important that V-201 is not driven into the grid current region, which is indicated by a voltage reading at J-204.
5. The multiplier and Balanced Converter, Cat. #588, may now be tuned by inserting the probe in J-304 and peaking transformer Z-301 for a 20 to 30 volt indication.
6. Insert the probe in J-305 and peak Z-302 for a 60 to 70 volt indication.
7. With the probe in J-306, peak Z-303 for 35 to 45 volts of drive.
8. Insert the probe in J-307 and peak Z-304 for a reading of 5.0 to 8.0 volts.
9. Insert the probe in J-308 and tune Z-100 in the control crystal oscillator circuit and Z-305 to maximum. After Z-305 is peaked lower the drive with Z-100 until 8 to 10 volts at J-308 is obtained.
10. For line up of the Multiplier and Single Ended Converter Cat. #589, insert the probe in J-403 and peak transformer Z-401 for a 20 to 30 volt indication.
11. Insert the probe in J-404 and peak Z-402 for a 60 to 70 volt indication.
12. With the probe in J-405, peak Z-403 for 35 to 45 volts of drive.
13. Insert the probe in J-406 and peak Z-404 for a 6 to 10 volt reading.
14. Insert the probe in J-408 and peak Z-306 and Z-406 for a 0.5 to 4 volt indication.

SECTION VI

MODULATOR AND POWER AMPLIFIER ADJUSTMENT PROCEDURE

15. The Semi Final Multiplier, Cat. #590 is now tuned by inserting the probe in J-501 and peaking Z-405 and Z-500 for 15 to 25 volts of drive.
16. Insert the probe in J-502, and peak Z-501 for 40 to 50 volts. 48.5V
17. With the probe in J-503, Z-502 is peaked for 45 to 55 volts. 48.5V
18. Z-503 is next peaked for 60 to 70 volts as read at J-504. 75V
19. Insert the probe in J-505 and peak Z-504 for a 50 to 60 volt indication. 60V
20. The Final Multiplier Cat. #591A is tuned by inserting the probe in J-601 and peaking Z-505 and Z-600 for 40 to 50 volts. Approximate resonance of Z-505 may be noted by a slight increase of approximately 1 volt at J-505 as Z-505 becomes resonant.
21. With the probe in J-602 the doubler plate and tripler grid are tuned for 120 to 150 volts of drive.
22. Tune the tripler plate for minimum reading on the plate meter, M-600, (Plate resonance dip.)
23. Insert the probe in J-603 and tune the amplifier grid for maximum drive repeak both the tripler plate and amplifier grid controls. The amplifier grid drive should be between 130 and 180 volts, and the tripler plate current, as shown on the plate current meter, between 60 to 100 mills.
24. Tune the amplifier plate for minimum reading on the plate meter M-601, (Plate resonance dip.)
25. Tune Power Amplifier grid circuit and the intermediate Amplifier output tuning for maximum indication on the Power Amplifier grid meter. Check Amplifier plate and output tuning and grid tuning for maximum drive. The grid meter should read 30 to 35 ma. This completes the Modulator tuning adjustments. A simplified chart of the above adjustments is included on the next page.
26. Z-202 and Z-407 cannot be adjusted by simply peaking a reading on a volt-meter. In the absence of proper equipment necessary for their adjustments, they must be set at the factory marked position, which is not in the least critical. The equipment required for these adjustments is as follows:
 - a. Distortionless or very low distortion receiver.
 - b. Distortion measuring equipment.
 - c. A means of determining frequency deviation. The REL Cat. #600 Monitor may be used for this or one of the more fundamental methods may be used.
 - d. A good, high gain, oscilloscope such as the Dumont 208B.
 - e. A source of sinusoidal 50 cps.

SECTION VI

MODULATOR AND POWER AMPLIFIER ADJUSTMENT PROCEDURE

Z-202 is merely adjusted for minimum distortion, with a modulation frequency of 50 cycles per second and a deviation of plus/minus 75 kc. This adjustment is very broad and not critical as to distortion.

Z-407 is adjusted by modulating 100% (plus/minus 75 Kc. deviation) at 50 cycles and observing the output of the low distortion receiver on the oscilloscope. Make the image very large and observe particularly the peaks. Then adjust Z-407 for the purest sine wave peak. If no high frequency hash is seen on the peaks of the 50 cycles waveform, do not disturb the adjustment of Z-407. Again this adjustment is non-critical making approximately 0.1 db difference in distortion measurements at 50 cycles.

SIMPLIFIED CHART OF MODULATOR TUNING

| PLACE PROBE IN JACK | ADJUST | APPROXIMATE RANGE OF CORRECT INDICATION | ORDER OF TUNING OPERATION |
|---------------------------|---------------------------------|---|---------------------------------|
| J-204 | Z-200 | (All voltages negative with respect to ground) Any voltage | 1 |
| J-303 | Z-201, Z-203 Z-204, Z-300 | 20 - 30V | 2 |
| J-402 | Z-205, Z-400 | 20 - 30V | 3 |
| J-204 | Z-200 | Must be zero. | 4 |
| J-304 | Z-301 | 20 - 30V | 5 |
| J-305 | Z-302 | 60 - 70V | 6 |
| J-306 | Z-303 | 35 - 45V | 7 |
| J-307 | Z-304 | 5 - 8V | 8 |
| J-308 | Z-100, Z-305 | After tuning Z-305 to maximum, lower voltage with Z-100 to 8-10 volts. | 9 |
| J-403 | Z-401 | 20 - 30V | 10 |
| J-404 | Z-402 | 60 - 70V | 11 |
| J-405 | Z-403 | 35 - 45V | 12 |
| J-406 | Z-404 | 6V - 10V | 13 |
| J-408 | Z-306, Z-406 | 0.5V - 4V | 14 |
| J-501 | Z-405, Z-500 | 15V - 25V | 15 |
| J-502 | Z-501 | 40V - 50V | 16 |
| J-503 | Z-502 | 45 - 55V | 17 |
| J-504 | Z-503 | 60 - 70V | 18 |
| J-505 | Z-504 | 50 - 60V | 19 |
| J-601 | Z-505, Z-600 | 40 - 50V | 20 |
| J-602 | Doubler Plate & Tripler Grid | 120 - 150V | 21 |

SIMPLIFIED CHART OF MODULATOR TUNING

| PLACE PROBE IN JACK | ADJUST | APPROXIMATE RANGE OF CORRECT INDICATION | ORDER OF TUNING OPERATION |
|---|---|---|---------------------------------|
| Observe Tripler Plate Cur. Meter | Tripler Plate | Tune for dip 66 - 100 Ma. | 22 |
| J-603 | Amp. Grid & Tripler Plate | 130 180V Drive | 23 |
| Observe Intermediate Amplifier Plate Cur- rent meter. | Intermediate Amplifier Plate | Tune for dip 110 - 150 Ma. | 24 |
| Observe Power Ampli- fier Grid current meter. | Intermediate Amp- lifier Plate, Out- put tuning, P.A. Grid tuning. | 30 to 35 Ma Grid Drive on Power Amplifier | 25 |

MODULATOR AND POWER AMPLIFIER ADJUSTMENT PROCEDURE

B. POWER AMPLIFIER ADJUSTMENTS

1. Neutralizing

- a. Neutralizing of the final amplifier is conventional and straight forward. Decouple the output coupling link as far as possible. Set the neutralizing capacitors at half capacity.
- b. Turn on the driver and tune the power amplifier grid circuit. Tune the plate circuit while observing both grid and plate current meters. A slight dip in the low reading of the plate current meter will indicate resonance. If the grid current passes through a minimum at this point, peak it with the neutralizing capacitors. Recheck the plate tuning. It will be necessary to repeat this procedure several times until no reaction or perhaps a slight peaking of the grid current occurs as the plate circuit is tuned through resonance.
- c. Remove the plate cap from the right front high voltage rectifier tube, and set the high voltage selector switch to the low position. Turn on the high voltage.
- d. Check the grid tuning, then tune the plate circuit. Perfect neutralizing occurs when, as the plate current passes through its dip, the grid current passes through its peak. If this condition is not apparent readjust the neutralizing capacitors slightly until it is.
- e. Replace the cap on the high voltage rectifier tube and tune the plate circuit off resonance on each side. A condition may appear in which the plate current will swing to approximately 500 Ma. on the low frequency side of resonance but will not reach this value on the high frequency side before breaking over and starting into another dip. In this case tune the plate circuit in the high frequency direction stopping just before the plate current starts to dip again. At this point adjust the neutralizing capacitors slightly in the direction which will tend to raise the grid current. Recheck the coincidence of plate current dip and grid current peak and then detune the plate circuit on the high frequency side of resonance to see that the plate current rises to approximately the same value as that achieved on the low frequency side. It may be necessary to repeat this procedure several times before the plate current swing is roughly equal on both sides of resonance.
- f. Hold down the interlock of the door over the final multiplier panel and open the switch which controls the 829B screen voltage. Plate and grid current on the final amplifier should disappear completely. If a slight residual current remains, adjust the neutralizing capacitors until it disappears, then turn on the drive again and recheck the tracking of grid and plate currents and the off resonance swing of the plate current.

SECTION V

PRELIMINARY ADJUSTMENTS & OPERATION OF THE EQUIPMENT

A. CONTROL CIRCUIT ADJUSTMENTS

(All necessary control circuit adjustments have been made at the factory, however for future checks, they are listed below.)

1. FILAMENT TIME DELAY K801

This relay should be adjusted for approximately 60 seconds. Adjustment is made by the small screw at the top of the relay, and direction of rotation is indicated.

2. HIGH VOLTAGE TIME DELAY K803

This relay should be adjusted for approximately 3 to 5 seconds. Adjustment procedure is the same as for filament time delay, K801, above.

3. BLOWER TIME DELAY RELAY K807

This relay should be adjusted for 2 to 2½ minutes. Adjustment procedure is the same as for the filament time delay K801 above.

4. OVERLOAD RELAY K805

This relay should be adjusted to trip at 600 milliamperes. Adjustment instructions are given on the relay itself.

B. ADJUSTMENTS FOR TURNING ON THE TRANSMITTER

NOTE: Adjustments and checks given below have all been made at the factory, but should be re-checked for the station line voltage and to disclose any damage to adjustments during shipping.

1. 110V CIRCUITS

(a) With 110 volts, single phase, 60 cycle AC connected to terminals 53 and 54, the convenience outlet in the rear base of the transmitter should be checked for power availability.

(b) After the lumiline lamps have been installed the power amplifier compartment should be illuminated when its door is opened. With the front lower panel or the right lower panel removed the bottom deck should be illuminated.

2. APPLICATION OF POWER

NOTE: All switches should be opened.

A. STANDBY CIRCUIT

1. Close the standby switch S-808, and the crystal pilot light, I-804 should light.

2. The voltage at the crystal heater should be checked and if not 6.0 to 6.3 volts AC, R-715 behind the rear cover plate of the modulator power supply should be adjusted to give the proper voltage. This resistor is mounted near T-703 and is connected in series with terminal #1 of T-703.

SECTION V

PRELIMINARY ADJUSTMENTS & OPERATION OF THE EQUIPMENT

3. S-808 is normally closed to provide standby power for the crystal heater and blower shutdown circuits and should not be opened unless work is being performed on these circuits.

3. FILAMENT CIRCUIT

- a. Close the main circuit breaker K-800, the blower B-800 should start, the blower pilot light I-803 should light and the meter lights I-805 and I-806 should light.
- b. The filament switch S-800 may now be closed. The filament voltage control should be raised until the filament volt meter reads 5.0 volts. As the voltage is raised, relay K-700 will close and may chatter a bit, but when the meter reads 5.0 volts the relay will have sealed closed.
- c. All tube filaments will now be energized, and the crystal heater will be powered by DC after relay K-700 closes. A check should be made of the DC filament voltage at terminal #4 on the Modulator Chassis. R-712 should be adjusted for 6.6V DC at terminal #4, to ground, while the crystal is heating up. Terminal #8 on the multiplier and balanced converter chassis should be checked to see that 6.6 volts AC exist between it and ground.
- d. The compensating resistor, R-711, should be checked for proper setting to absorb the power normally taken by the crystal heater when the heater thermostat opens. The voltage while the crystal is heating up will be 6.6V DC as explained in (c) above. When the heater has reached its temperature and the thermostat opens, relay K-701A will open and contact K-701B, will close putting R-711 in place of the crystal heater. Therefore, to keep the 6.6V DC constant, R-711 should be adjusted so that when the crystal is removed from its socket the DC voltage remains at 6.6 volts.
- e. The Filament Pilot light will also be lighted.

4. MODULATOR HIGH VOLTAGE

- a. If all door interlocks are closed, and relay K-801 has closed its contact K-801A after 60 seconds time delay, then closing the Modulator High Voltage switch S-801 will close relay K-802.
- b. Modulator high voltage will be on, and the 250 volt regulated supply may be checked at terminal #9 on the Modulator Power Supply chassis. If other than 250 volts, R-709 should be adjusted to give the proper value. The unregulated supply should be checked at terminal #11 for approximately 450 volts.
- c. The bias high voltage will also be on and R-808 on the resistor board should indicate approximately - 200 volts to ground.
- d. The relay K-803 will be energized and start its 5 second time delay cycle. The Modulator High Voltage Pilot light will be on.
- e. Check the operation of the door interlocks by opening each door and panel with the exception of those over the modulator compartment and see that the Modulator High Voltage pilot light and modulator high voltage go off.

SECTION V

PRELIMINARY ADJUSTMENTS & OPERATION OF THE EQUIPMENT

- f. Tune the Power Amplifier grid circuit. See Section VI for detailed modulator and power amplifier adjustment data.

5. P.A. HIGH VOLTAGE

- a. Close the P.A. High Voltage switch S-805. If 5 seconds have elapsed since the closing of the modulator high voltage switch S-801, the high voltage recycling time delay K-803 will have closed, thus energizing the coil of the high voltage relay K-804 which closes contacts K-804B and K-804C, and applying power to the primary of the high voltage transformer through the tap changing switch S-816. Plate voltage should be indicated by the Plate Voltage Meter M-803, and screen voltage (about 350-400 volts) should be present at lead #15 on the resistor panel. At the screens of the tubes, under normal operating conditions, this voltage will be approximately 190 volts due to the action of the series resistors R-818 and R-819. The P.A. HV pilot light I-802 should light.
- b. Tune the amplifier plate circuit to resonance. See Section VI for detailed power amplifier tuning procedure.

C. TURNING OFF THE TRANSMITTER

1. The transmitter may be turned off by opening each switch, except the Standby switch S-808, and the Primary Power circuit breaker. The equipment will shut down in sequence, the crystal heater will be in the standby mode of operation, and the blower will stop after 2 to 2.5 minutes, depending upon the adjustment of time delay K-807.
2. The equipment may also be shut down by merely opening the Primary Power circuit breaker, leaving all other switches on with the results noted above.

D. TURNING ON THE TRANSMITTER - SEMI-AUTOMATIC OPERATION

To turn on the equipment semi-automatically, close all switches including the Primary Power circuit breaker and select the high voltage desired by means of the high voltage tap changing switch S-816. The equipment will then cycle up automatically, with the application of all supply voltages controlled by time delay action.

2. ADJUSTMENT OF OUTPUT TUNING CAPACITORS

CAUTION

FOR THE PROTECTION OF BOTH TRANSMISSION LINES AND THE TRANSMITTER - THE TRANSMISSION LINE SYSTEM MUST BE WELL TERMINATED BEFORE ATTEMPTING TO APPLY POWER.

- a. A poorly terminated transmission line system will reflect reactance into the plate circuit of the transmitter, the severity of the reflection depending upon the magnitude of the transmission line standing wave ratio - Under poor conditions of termination, ie. standing wave ratios in excess of 1.5 to 1, it is very difficult to make the correct initial adjustments of the power amplifier output circuits.
- b. Adjust the output coupling control so that the output coupling link is swung in for about 75% of its total available adjustment. With the high voltage switch in the low position turn on the plate voltage. Resonate the plate circuit.
- c. Rotate the coupling control so that the link is backed away from the plate circuit. Retune the plate circuit, noting the direction of rotation of the plate tuning control. If the plate circuit requires lengthening, more capacity is required in the series output capacitors. The balance between these capacitors should be maintained closely. Conversely, if the plate lines required shortening less series capacity is required.
- d. After noting the sense of the capacity change required, adjust the series capacitors by approximately one turn in the proper direction. Engage the coupling hairpin again and repeat the above procedure until plate resonance is maintained regardless of the position of coupling hairpin. It should be noted that as the resonance point of the series capacitors is approached their effect becomes much more pronounced and even a quarter turn may be sufficient to go through the true resonance point.

3. SCREEN CURRENT BALANCE -- ANODE COLOR

- a. With the transmitter completely tuned, the output coupling link should be adjusted for approximately 250 Ma. plate current. Raise the plate voltage to the medium position by means of the selector switch. Check the screen currents on each tube as well as the anode color. If an unbalance is present as indicated by either the screen current or the anode color, a slight readjustment of the output tuning capacitors, that is, slightly less capacity on one side with a corresponding increase on the other to maintain the resonance of the output circuit, will generally rectify any tendency to unbalance.

4. WARMING UP THE EQUIPMENT

- a. When starting the transmitter, it is advisable to operate at the low voltage level for approximately 5 minutes before raising the plate voltage to normal operating level. During the first few minutes the grid and plate circuits may be slightly out of resonance until they reach operating temperature. It should be unnecessary to retune any of the circuits during

MODULATOR AND POWER AMPLIFIER ADJUSTMENT PROCEDURE

this period of warm up and under no condition should an attempt be made to touch up neutralizing unless the transmitter is at its operating temperature.

5. OUTPUT VOLTMETER COUPLING

- a. The pickup probe for the RF output meter is attached to the output coaxial line inside the transmitter cabinet. If insufficient indication is obtained even with the control potentiometer R-821 at maximum, unscrew the large section of the probe housing and with a $7/16$ " socket wrench remove the miniature spark plug from the line. A brass probe is attached to the center conductor of the plug and may be extended slightly or enlarged if necessary.

SECTION VI

TYPICAL METER READINGS

POWER AMPLIFIER

| <u>Filament Voltage</u> | <u>Grid Current</u> | <u>Grid Voltage - Term. #44</u> | <u>Screen Currents</u> | | |
|-------------------------|---------------------|---------------------------------|------------------------|------------|---------------|
| 5.0 | 30-35ma | - 140 | #1 20ma | #2 20ma | Total 40ma |

| <u>Screen Voltage</u> | <u>Plate Current</u> | <u>Plate Voltage</u> | <u>Power Output</u> | <u>Efficiency</u> |
|-----------------------|----------------------|----------------------|---------------------|-------------------|
| 185 | 365ma | 3900 | 1000 watts | 70% |

MODULATOR

NOTE: Readings should be taken with a 20,000 Ohms/volt multitester, Voltohmyst, or similar type of instrument. Readings indicated below taken with a Voltohmyst.

Audio Panel Cat. 586A

| <u>Jack</u> | <u>Reading</u> | <u>Comments</u> |
|-------------|----------------|-----------------|
| J-100 | +2.2V. | Average |
| J-101 | +8.5V. | Average |

Balanced Modulator Cat. 587A

| <u>Jack</u> | <u>Reading</u> | <u>Comments</u> |
|-------------|----------------|--------------------------|
| J-204 | 0.0 | Should always read zero. |

Multplier and Balanced Converter Cat. 588

| <u>Jack</u> | <u>Reading</u> | <u>Comments</u> |
|-------------|----------------|-----------------|
| J-303 | -25V | Average |
| J-304 | -25V | Average |
| J-305 | -65V | Average |
| J-306 | -30V | Average |
| J-307 | -6.6V | Average |
| J-308 | -8 to -10 | Critical |

SECTION VI

TYPICAL METER READINGS

Multiplier and Single Ended Converter Cat. 589

| JACK | READING | COMMENTS |
|-------|---------|----------|
| J-402 | -25V | Average |
| J-403 | -25V | Average |
| J-404 | -65V | Average |
| J-405 | -40V | Average |
| J-406 | -8.0 | Average |
| J-408 | -2.2 | Average |

Semi-Final Multiplier Cat. 590

| JACK | READING | COMMENTS |
|-------|---------|----------|
| J-501 | -20V | Average |
| J-502 | -45V | Average |
| J-503 | -50V | Average |
| J-504 | -65V | Average |
| J-505 | -55V | Average |

Intermediate Power Multiplier Cat. 695

| JACK | READING | COMMENTS |
|-------|---------|---|
| J-601 | -45V | Average |
| J-602 | -135V | Average |
| M-600 | 80Ma. | V-601 Plate Current as read on trip- ler plate met- er. |
| J-603 | -155V | Average |
| M-601 | 130Ma. | V-601 plate current as read on ampli- fier plate met- er. |

SECTION VI

TYPICAL METER READINGS

Modulator Power Supply

| <u>TERMINAL NUMBER</u> | <u>READING</u> | <u>COMMENT</u> |
|------------------------|----------------|--------------------------|
| #3 | 6.6V DC | In operating condition |
| | 6.3V AC | In standby condition |
| #8 | 6.6V AC | AC Fil voltage |
| #4 | † 6.6V DC | DC Fil. voltage |
| #9 | † 250 volts | Regulated high voltage |
| #11 | † 450 volts | Unregulated high voltage |

SECTION VII

PARTS LIST FOR CAT. #586A
AUDIO PANEL FOR F.M. MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-100 | C-5178-S1 | Capacitor -- fixed, mica, .00015 mfd, 500 VDCW, 10% |
| C-101 | C-5122-I4 | Capacitor - fixed, dry electrolytic, 25 mfd. 50 VDCW |
| C-102 | C-5089-H2 | Capacitor, variable, air, 35 mmfd. |
| C-103 | C-5107-I4 | Capacitor -- fixed, paper, oil filled, 1 mfd. 600 VDCW |
| C-104 | | Capacitor -- Same as C-103 |
| C-105 | C-5124-I4 | Capacitor -- fixed, paper, oil filled, 0.05 mfd. 400 VDCW |
| C-106 | | Capacitor -- Same as C-105 |
| C-107 | | Capacitor -- Same as C-103 |
| C-108 | C-5016-M6 | Capacitor -- fixed, molded paper, .01 mfd. 300 VDCW 20% |
| C-109 | C-5125-I4 | Capacitor - fixed, paper, oil filled, 0.5 mfd. 400 VDCW |
| C-110 | | Capacitor -- Same as C-109 |
| C-111 | | Capacitor -- Same as C-109 |
| C-112 | C-5047-S1 | Capacitor -- fixed, mica, .001 mfd. 500 VDCW, 20% |
| C-113 | | Capacitor -- Same as C-112 |
| C-114 | | Capacitor -- Same as C-112 |
| C-115 | | Capacitor -- Same as C-112 |
| C-116 | | Capacitor -- Same as C-108 |
| C-117 | C-5165-E5 | Capacitor -- fixed, ceramic, 3 mmfd, 500 VDCW, 5% |
| C-118 | | Capacitor -- See Z-100 |
| C-119 | | Capacitor -- See Z-100 |
| C-120 | | Capacitor -- Same as C-112 |
| C-121 | | Capacitor -- Same as C-112 |

PARTS LIST FOR CAT. #586A
AUDIO PANEL FOR F.M. MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-122 | C-5017-S7 | Capacitor - fixed, paper, 1 mfd. 400 VDCW, 20% |
| C-123 | | Capacitor - Same as C-108 |
| C-124 | | Capacitor - Same as C-112 |
| C-125 | | Capacitor - Same as C-112 |
| C-126 | | Capacitor - Same as C-112 |
| C-127 | | Capacitor - Same as C-112 |
| C-128 | C-5000-M5 | Capacitor - 1200 mfd. ceramic, 300 VDCW, 20% |
| C-129 | | Capacitor - Same as C-124 |
| E-100 | E-5004-J2 | Terminal Strip 4 terminals |
| J-100 | J-5015-II | Jack - pin type, female contact |
| J-101 | | Jack - Same as J-100 |
| J-102 | J-5018-A5 | Jack - twin contacts, chassis connector, female contacts |
| J-103 | J-5001-A5 | Jack - female contact, chassis mounting type |
| J-103A | J-5017-A5 | Jack Hood - for use with REL part J-5001-A5 |
| J-104 | | Jack - Same as J-103 |
| J-104A | | Jack Hood - Same as J-103A |
| J-105 | | Jack - Same as J-103 |
| J-105A | | Jack Hood - Same as J-103A |
| L-100 | L-5012-C14 | Choke, A.F. - 50 henries C.T. |
| L-101 | L-5027-R7 | Choke, R.F. - 7.5 microhenries |
| L-102 | L-5026-R7 | Choke, R.F. - 12.5 microhenries |
| L-103 | | Choke, R.F. - Same as L-101 |
| L-104 | L-5028-M3 | Choke, R.F. - 2.5 millihenries |

PARTS LIST FOR CAT. #586A
AUDIO PANEL FOR F.M. MODULATOR

| SYMBOL NO. | | |
|---------------|-------------------------------|--|
| L-105 | | Choke, R.F. - 40 microhenries |
| L-106 | | Same as L-105 |
| R-101 | R-5087-A11 | Resistor, fixed, composition, 500 ohms, 1 watt, 10% |
| R-102 | R-5231-A11 | Resistor - fixed, composition, 1500 ohms, 1/2 watt, 10% |
| R-103 | | Resistor - Same as R-102 |
| R-104 | R-5181-A11 | Resistor - fixed, composition, 0.27 meg ohm, 1 watt, 10% |
| R-105 | R-5187-A11 | Resistor - fixed, composition, 470 ohms, 1 watt, 10% |
| R-106 | R-5084-I2 or R-5186-A11 | Resistor - fixed, composition, 50,000 ohms, 1 watt, 10% Resistor - fixed, composition, 47,000 ohms, 1 watt, 10% |
| R-107 | R-5057-A11 | Resistor - fixed, composition, 1000 ohms, 2 watts, 10% |
| R-108 | R-5200-A11 | Resistor - fixed, composition, 100,000 ohms, 1/2 watt, 10% |
| R-109 | | Resistor - not used |
| R-110 | | Resistor - Same as R-104 |
| R-111 | | Resistor - Same as R-104 |
| R-112 | | Resistor - Same as R-104 |
| R-113 | R-5112-A11 | Resistor - fixed, composition, 100,000 ohms, 1 watt, 10% |
| R-114 | | Resistor - Same as R-104 |
| R-115 | | Resistor - Same as R-105 |
| R-116 | R-5182-A11 | Resistor - fixed, composition, 390,000 ohms, 1 watt, 10% |
| R-117 | | Resistor - Same as R-104 |
| R-118 | R-5191-A11 | Resistor - fixed, composition, 39,000 ohms, 1 watt, 10% |
| R-119 | | Resistor - Same as R-104 |
| R-120 | | Resistor - Same as R-118 |
| R-121 | R-5198-A11 | Resistor - fixed, composition, 10 ohms, 1 watt, 5% |
| R-122 | | Resistor - Same as R-121 |

PARTS LIST FOR CAT. #586A
 AUDIO PANEL FOR F.M. MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|--|
| T-100 | T-5020-C14 | Transformer, AF - primary impedance 500 ohms, secondary impedance 500 ohms, input level 6 milliwatts, frequency characteristic flat from 30 - 15,000 cycles, distortion less than .1% RMS |
| V-100 | | Tube - Type 7N7 loctal |
| V-101 | | Tube - Same as V-100 |
| V-102 | | Tube - Type 7C7 loctal |
| X-100 | X-5007-E1 or X-5047-A5 | Socket - loctal, ceramic Socket - loctal, mica filled bakelite |
| X-101 | | Socket - Same as X-100 |
| X-102 | | Socket - Same as X-100 |
| X-103 | X-5018-J4 | Socket - for crystal - ceramic, 7 prong large |
| Y-100 | Y-5011-B4 | Crystal, quartz - Frequency dependent upon customers required frequency |
| Z-100 | Z-5028-S5 | Tuning assembly - tuning range 1833-2250 kc. - Consists of: Primary Inductance - 120 microhenries, 3% Secondary Inductance - 40 microhenries, 5% C-118 - Capacitor, variable, air 3.4 - 32 mmf. C-119 - Capacitor, fixed, ceramic, 10 mmf, 500 VDCW, 5% |

SECTION VII

PARTS LIST CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| C-200 | C-5016-M6 | Capacitor - fixed, molded paper, .01 mfd. 300 VDCW, 20% |
| C-201 | | Capacitor - Same as C-200 |
| C-202 | | Capacitor - Same as C-200 |
| C-203 | | Capacitor - See Z-200 |
| C-204 | | Capacitor - See Z-200 |
| C-205 | | Capacitor - Same as C-200 |
| C-206 | | Not used. |
| C-207 | | Capacitor - Same as C-200 |
| C-208 | | Capacitor - See Z-201. |
| C-209 | | Capacitor - See Z-201 |
| C-210 | | Capacitor - See Z-201 |
| C-211 | | Capacitor - See Z-201 |
| C-212 | C-5082-E5 | Capacitor - fixed, ceramic, 200 mmfd. 500 VDCW, 1% |
| C-213 | | Capacitor - Same as C-212 |
| C-214 | C-5122-I4 | Capacitor - fixed, dry electrolytic, 25 mfd. 50 VDCW |
| C-215 | | Capacitor - Same as C-200 |
| C-216 | | Capacitor - Same as C-200 |
| C-217 | | Capacitor - Same as C-200 |
| C-218 | | Capacitor - See Z-202 |
| C-219 | | Capacitor - Same as C-200 |
| C-220 | | Capacitor - Part of Z-202 Assembly |
| C-221 | | Capacitor - Part of Z-203 Assembly |
| C-222 | | Capacitor - Part of Z-203 Assembly |
| C-223 | | Capacitor - Part of Z-203 Assembly |

PARTS LIST CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-224 | | Capacitor - Same as C-200 |
| C-225 | | Capacitor - Same as C-200 |
| C-226 | | Capacitor - See Z-205 |
| C-227 | | Capacitor - See Z-205 |
| C-228 | | Capacitor - Same as C-200 |
| C-229 | | Capacitor - Same as C-200 |
| C-230 | | Capacitor - See Z-204 |
| C-231 | | Capacitor - See Z-204 |
| C-232 | | Capacitor - Not used |
| C-238 | C-5047-S1 | Capacitor - fixed, mica, .001 mfd., 500 VDCW, 20% |
| C-239 | | Capacitor - Same as C-238 |
| C-240 | | Capacitor - Same as C-238 |
| C-241 | | Capacitor - Same as C-238 |
| C-242 | | Capacitor - See Z-200 |
| C-243 | | Capacitor - Same as C-200 |
| C-244 | | Capacitor - Part of Z-202 Assembly |
| C-245 | C-5165-E5 | Capacitor - fixed, ceramic, 3 mmfd, 500 VDCW, 5% |
| C-246 | C-5000-M5 | Capacitor - fixed, ceramic, 1200 mmfd, 300 VDCW, 20% |
| C-247 | | Capacitor - Same as C-246 |
| E-200 | E-5012-J2 | Terminal strip, 3 terminals |
| J-200 | J-5001-A5 | Jack - female contact - chassis mounting type |
| J-200A | J-5017-A5 | Jack Hood - For use with J-5001-A5 |
| J-201 | | Jack - Same as J-200 |
| J-201A | | Jack Hood - Same as J-200A |

PARTS LIST CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| J-202 | | Jack - Same as J-200 |
| J-202A | | Jack Hood - Same as J-200A |
| J-203 | | Jack - Same as J-200 |
| J-203A | | Jack Hood - Same as J-200A |
| J-204 | J-5015-I1 | Jack - pin type, female contact |
| L-200 | L-5028-M3 | Choke, R. F. - 2.5 millihenries |
| L-202 | L-5027-R7 | Choke, R. F. - 7.5 microhenries |
| L-203 | L-5026-R7 | Choke, R. F. - 12.5 microhenries |
| L-204 | | Choke - Same as L-200 |
| L-205 | | Choke - Same as L-200 |
| R-200 | R-5181-A11 | Resistor - fixed, composition, 0.27 meg ohm 1 watt, 10% |
| R-201 | R-5187-A11 | Resistor - fixed, composition, 470 ohms, 1 watt, 10% |
| R-202 | R-5086-A11 | Resistor - fixed, composition, 1000 ohms, 1 watt, 10% |
| R-203 | R-5185-A11 | Resistor - fixed, composition, 27,000 ohms, 1 watt, 10% |
| R-204 | | Resistor - Same as R-203 |
| R-206 | R-5113-A11 | Resistor - fixed, composition, 270 ohms, 1 watt, 10% |
| R-209 | R-5234-A11 | Resistor - fixed, composition, 100 ohms, 1 watt, 5% |
| R-210 | | Resistor - Same as R-209 |
| R-211 | R-5193-A11 | Resistor - fixed, composition, 2700 ohms, 1 watt, 10% |
| R-212 | | Resistor - See Z-202 |
| R-213 | | Resistor - Same as R-202 |
| R-214 | | Resistor - See Z-202 |
| R-215 | R-5235-A11 | Resistor - fixed, composition, 330,000 ohms, 1 watt, 5% |
| R-216 | | Resistor - Same as R-215 |

PARTS LIST CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|--|
| R-217 | | Resistor - See Z-203 |
| R-218 | R-5236-A11 | Resistor - fixed, composition, 4700 ohms, 1 watt, 5% |
| R-219 | | Resistor - See Z-204 |
| R-220 | | Resistor - Same as R-218 |
| R-221 | | Resistor - See Z-205 |
| R-222 | | Resistor - Same as R-203 |
| R-223 | | Resistor - Same as R-203 |
| V-200 | | Tube - Type 707, loctal |
| V-201 | | Tube - Type 705, loctal |
| V-202 | | Tube - Same as V-200 |
| V-203 | | Tube - Same as V-200 |
| V-204 | | Tube - Same as V-200 |
| V-205 | | Tube - Same as V-200 |
| X-200 | X-5007-E1 or X-5047-A5 | Socket - loctal tube, ceramic Socket - loctal, mica filled bakelite |
| X-201 | | Socket - Same as X-200 |
| X-202 | | Socket - Same as X-200 |
| X-203 | | Socket - Same as X-200 |
| X-204 | | Socket - Same as X-200 |
| X-205 | | Socket - Same as X-200 |
| X-208 | X-5019-M2 | Socket - crystal, 2 prong. |
| Y-200 | Y-5000-B4 | Crystal, quartz - Frequency dependent upon customers requirements |

PARTS LIST FOR CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|--|
| Z-200 | Z-5023-S5 | Tuning assembly, tuning range 192-205KC. Consists of: Inductance: 2 millihenries, 3% C-203 - Capacitor, variable, air, 5-97 mmf. C-204 - Capacitor, fixed, mica, .01 mfd, 400 VDCW, 10% C-242 - Capacitor, fixed, ceramic, 240 mmf, 500 VDCW, 5% |
| Z-201 | Z-5024-S5 | Tuning Assembly, tuning range 192-205KC Consists of: Primary Inductance: 1.5 millihenries, 3% Secondary Inductance: 4.7 millihenries, 3% C-208 - Capacitor, fixed, ceramic, 350 mmf, 500 VDCW, 1% C-209 - Capacitor, variable, air, 5-97 mmf. C-210 - Capacitor, fixed, ceramic, 10 mmf, 500 VDCW, 5% C-211 - Capacitor, variable, air, 3.6-40 mmf. |
| Z-202 | Z-5025-S5 | Tuning assembly, tuning range 192-205KC Consists of: Inductance: 8.5 millihenries, 3% C-218 - Capacitor, fixed, mica, .01 mfd, 400 VDCW, 10% C-220 - Capacitor, variable, air, 3.6-43 mmf C-244 - Capacitor, fixed, ceramic, 47 mmf, 500 VDCW, 1% R-212 - Resistor, fixed, composition, 10,000 ohms, 1 watt, 5% R-214 - Resistor, fixed, composition, 220,000 ohms, 1 watt, 10% |

PARTS LIST FOR CAT. #587A
BALANCED MODULATOR

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|--|
| Z-203 | Z-5026-S5 | Tuning Assembly, tuning range 192-205KC Consists of: Inductance: 2 - 3.3 millihenry coils, 3% connected series aiding C-221 - Capacitor, variable, air, split stator, 5-50 mmf per section C-222 - Capacitor, fixed, ceramic, 75 mmf, 500 VDCW, 1% C-223 - Same as C-222 R-217 - Resistor, fixed, composition, 62,000 ohms, 1 watt, 5% |
| Z-204 | Z-5027-S5 | Tuning Assembly - tuning range 576-615KC Consists of: Primary Inductance: 1 millihenry, 3% Secondary Inductance: 300 microhenries, 5% C-230 - Capacitor, fixed, ceramic, 36 mmf, 500 VDCW, 5% C-231 - Capacitor, variable, air, 3.4-36 mmf. R-219 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |
| Z-205 | Z-5027-S5 | Tuning assembly, same as Z-204 |

SECTION VII

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| C-300 | | Capacitor - See Z-300 |
| C-301 | | Capacitor - See Z-300 |
| C-302 | C-5016-M6 | Capacitor - fixed, molded paper, .01 mfd. 300 VDCW, 20% |
| C-303 | | Capacitor - Same as C-302 |
| C-304 | | Capacitor - See Z-301 |
| C-305 | | Capacitor - See Z-301 |
| C-306 | | Capacitor - See Z-301 |
| C-307 | | Capacitor - See Z-301 |
| C-308 | | Capacitor - Same as C-302 |
| C-309 | | Capacitor - Same as C-302 |
| C-310 | | Capacitor - Same as C-302 |
| C-311 | | Capacitor - See Z-302 |
| C-312 | | Capacitor - See Z-302 |
| C-313 | | Capacitor - See Z-302 |
| C-314 | | Capacitor - See Z-302 |
| C-315 | | Capacitor - Same as C-302 |
| C-316 | | Capacitor - See Z-303 |
| C-317 | | Capacitor - See Z-303 |
| C-318 | | Capacitor - See Z-303 |
| C-319 | | Capacitor - See Z-303 |
| C-320 | | Capacitor - Same as C-302 |
| C-321 | | Capacitor - Same as C-302 |
| C-322 | | Capacitor - See Z-304 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-323 | | Capacitor - See Z-304 Assembly |
| C-324 | | Capacitor - Not used |
| C-325 | | Capacitor - See Z-304 Assembly |
| C-326 | | Capacitor - Same as C-302 |
| C-327 | | Capacitor - See Z-305 |
| C-328 | | Capacitor - See Z-305 |
| C-329 | | Capacitor - Same as C-302 |
| C-330 | | Capacitor - See Z-305 |
| C-331 | | Capacitor - Same as C-302 |
| C-332 | | Capacitor - Same as C-302 |
| C-333 | | Capacitor - Same as C-302 |
| C-334 | | Capacitor - See Z-306 |
| C-336 | | Capacitor - Same as C-302 |
| C-337 | | Capacitor - Same as C-302 |
| C-339 | C-5047-S1 | Capacitor - fixed, mica, .001 mmd. 500 VDCW, 20% |
| C-340 | | Capacitor - Same as C-339 |
| C-341 | | Capacitor - Same as C-339 |
| C-342 | | Capacitor - Same as C-339 |
| E-300 | E-5012-J2 | Terminal strip, 3 terminals |
| J-300 | J-5001-A5 | Jack - female contact, chassis mounting type |
| J-300A | J-5017-A5 | Jack Hood - for use with part J-5001-A5 |
| J-301 | | Jack - Same as J-300 |
| J-301A | | Jack Hood - Same as J-300A |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL. NO. | REL STOCK NO. | DESCRIPTION |
|----------------|------------------|--|
| J-302 | | Jack - Same as J-300 |
| J-302A | | Jack Hood - Same as J-300A |
| J-303 | J-5015-11 | Jack - pin type, female contact, black bakelite insulation |
| J-304 | | Jack - Same as J-303 |
| J-305 | | Jack - Same as J-303 |
| J-306 | | Jack - Same as J-303 |
| J-307 | | Jack - Same as J-303 |
| J-308 | | Jack - Same as J-303 |
| J-309 | | Jack - Same as J-303 |
| L-300 | L-5026-R7 | Coil, R.F. - 12.5 microhenries |
| L-301 | L-5027-R7 | Coil, R.F. - 7.5 microhenries |
| R-300 | | Resistor - See Z-300 |
| R-301 | R-5189-A11 | Resistor - fixed, composition, 220,000 ohms, 1 watt, 10% |
| R-302 | R-5185-A11 | Resistor - fixed, composition, 27,000 ohms, 1 watt, 10% |
| R-303 | | Resistor - See Z-301 |
| R-304 | | Resistor - See Z-301 |
| R-305 | R-5112-A11 | Resistor - fixed, composition, 100,000 ohms, 1 watt, 10% |
| R-306 | R-5113-A11 | Resistor - fixed, composition, 270 ohms, 1 watt, 10% |
| R-307 | | Resistor - Same as R-302 |
| R-308 | | Resistor - See Z-302 |
| R-309 | | Resistor - See Z-302 |
| R-310 | | Resistor - Same as R-305 |
| R-311 | | Resistor - Same as R-302 |
| R-312 | | Resistor - See Z-303 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|---|
| R-313 | | Resistor - See Z-303 |
| R-314 | | Resistor - Same as R-305 |
| R-315 | | Resistor - Same as R-302 |
| R-316 | | Resistor - See Z-304 |
| R-317 | | Resistor - See Z-304 |
| R-318 | R-5197-I2 | Resistor - fixed, composition, 20,000 ohms, 1 watt, 10% |
| R-319 | R-5051-A11 | Resistor - fixed, composition, 10,000 ohms, 1 watt, 10% |
| R-320 | | Resistor - Same as R-319 |
| R-321 | R-5119-A11 | Resistor - fixed, composition, 100 ohms, 1 watt, 10% |
| R-322 | R-5060-A11 | Resistor - fixed, composition, 22,000 ohms, 2 watts, 10% |
| R-323 | | Resistor - Same as R-322 |
| R-324 | R-5086-A11 | Resistor - fixed, composition, 1000 ohms, 1 watt, 10% |
| R-325 | | Resistor - See Z-306 |
| V-300 | | Tube - type 707, loctal |
| V-301 | | Tube - type 7A7, loctal |
| V-302 | | Tube - Same as V-300 |
| V-303 | | Tube - Same as V-300 |
| V-304 | | Tube - type 7Q7, loctal |
| V-305 | | Tube - Same as V-304 |
| X-300 | X-5007-E1 or X-5047-A5 | Socket - loctal, ceramic Socket - loctal, mica filled bakelite |
| X-301 | | Socket - Same as X-300 |
| X-302 | | Socket - Same as X-300 |
| X-303 | | Socket - Same as X-300 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| X-304 | | Socket - Same as X-300 |
| X-305 | | Socket - Same as X-300 |
| Z-300 | Z-5004-S5 | Tuning Assembly, tuning range 576-615KC Consists of: Primary Inductance: 300 microhenries, 5% Secondary Inductance: 1 millihenry, 3% C-300 - Capacitor, fixed, ceramic, 36 mmf., 500 VDCW, 5% C-301 - Capacitor, variable, air, 3.4-36 mmf. R-300 - Resistor, fixed, composition, 100,000 ohms, 1 watt, 10% |
| Z-301 | Z-5005-S5 | Tuning Assembly, tuning range 1728-1845KC. Consists of: Primary Inductance: 80 microhenries $\pm 3\%$ Secondary Inductance: 80 microhenries $\pm 3\%$ C-304 - Capacitor, variable, air 3.6-40 mmf. C-305 - Capacitor, fixed, ceramic, 62 mmf., 500 VDCW, 5% C-306 - Capacitor, Same as C-305 C-307 - Capacitor, Same as C-304 R-303 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% R-304 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL. STOCK NO. | DESCRIPTION |
|---------------|-------------------|---|
| Z-302 | Z-5006-S5 | Tuning Assembly, tuning range 1728-1845KC Consists of: Primary Inductance: 120 microhenries, 3% Secondary Inductance: 120 microhenries, 3% C-311 - Capacitor, variable, air, 3.2-29 mmf. C-312 - Capacitor, fixed, ceramic, 39 mmf, 500 VDCW, 5% C-313 - Capacitor, Same as C-312 C-314 - Capacitor, Same as C-311 R-308 - Resistor, fixed, composition, 39,000 ohms, 1 watt, 10% R-309 - Resistor, fixed, composition, 180,000 ohms, 1 watt, 10% |
| Z-303 | Z-5007-S5 | Tuning Assembly, tuning range 5184-5535KC. Consists of: Primary Inductance: 20 microhenries, 3% Secondary Inductance: 20 microhenries, 3% C-316 - Capacitor, variable, air, 3-21 mmf. C-317 - Capacitor, fixed, ceramic, 20 mmf., 500 VDCW, 5% C-318 - Capacitor, Same as C-317 C-319 - Capacitor, Same as C-316 R-312 - Resistor, fixed, composition, 27,000 ohms, 1 watt, 10% R-313 - Resistor, fixed, composition, 68,000 ohms, 1 watt, 10% |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND BALANCED CONVERTER - CAT. #588

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|---|
| Z-304 | Z-5008-S5 | Tuning Assembly, tuning range 15.5-16.6MC <p>Consists of:</p> <ul style="list-style-type: none"> Primary Inductance: 3 microhenries, 3% Secondary Inductance: Same, less one turn C-322 - Capacitor, variable, air, 2.8-10 mmf., C-323 - Capacitor, fixed, ceramic, 15 mmf., 500 VDCW, 5% C-325 - Capacitor, variable, air, 2.8-14 mmf. R-316 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% R-317 - Resistor, fixed, composition, 4700 ohms, 1 watt, 10% |
| Z-305 | Z-5009-S5 | Tuning Assembly, tuning range 1833-2250KC <p>Consists of:</p> <ul style="list-style-type: none"> Primary Inductance: 40 microhenries, 5% Secondary Inductance: 120 microhenries, 3%, C.T. C-327 - Capacitor, fixed, ceramic, 51 mmf, 500 VDCW, 1% C-328 - Capacitor, Same as C-327 C-330 - Capacitor, variable, air, 4-50 mmf. |
| Z-306 | Z-5010-S5 | Tuning Assembly, tuning range 13.4-14.6 MC <p>Consists of:</p> <ul style="list-style-type: none"> Primary Inductance: 4 microhenries, 3%, C.T. Secondary Inductance: 5 turn link, interwound on primary. C-334 - Capacitor, variable, air, 3.6-43 mmf. R-325 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% |

SECTION VII

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-400 | | Capacitor - See Z-400 |
| C-401 | | Capacitor - See Z-400 |
| C-402 | C-5016-M6 | Capacitor - fixed, paper, .01 mfd. 300 VDCW, 20% |
| C-403 | | Capacitor - Same as C-402 |
| C-404 | | Capacitor - See Z-401 |
| C-405 | | Capacitor - See Z-401 |
| C-406 | | Capacitor - See Z-401 |
| C-407 | | Capacitor - See Z-401 |
| C-408 | | Capacitor - Same as C-402 |
| C-409 | | Capacitor - Same as C-402 |
| C-410 | | Capacitor - See Z-402 |
| C-411 | | Capacitor - See Z-402 |
| C-412 | | Capacitor - See Z-402 |
| C-413 | | Capacitor - See Z-402 |
| C-414 | | Capacitor - Same as C-402 |
| C-415 | | Capacitor - Same as C-402 |
| C-416 | | Capacitor - See Z-403 |
| C-417 | | Capacitor - See Z-403 |
| C-418 | | Capacitor - See Z-403 |
| C-419 | | Capacitor - See Z-403 |
| C-420 | | Capacitor - Same as C-402 |
| C-421 | | Capacitor - Same as C-402 |
| C-422 | | Capacitor - See Z-404 |
| C-423 | | Capacitor - See Z-404 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-424 | | Capacitor - See Z-404 |
| C-425 | | Capacitor - See Z-404 |
| C-426 | | Capacitor - Same as C-402 |
| C-427 | | Capacitor - Same as C-402 |
| C-428 | | Capacitor - Same as C-402 |
| C-429 | | Capacitor - Same as C-402 |
| C-430 | | Capacitor - See Z-405 |
| C-431 | | Capacitor - See Z-405 |
| C-433 | | Capacitor - See Z-406 |
| C-434 | | Capacitor - See Z-406 |
| C-435 | | Capacitor - Same as C-402 |
| C-436 | | Capacitor - See Z-407 |
| C-437 | | Capacitor - See Z-407 |
| C-438 | C-5047-S1 | Capacitor - fixed, mica, .001 mfd. 500 VRCW, 20% |
| C-439 | | Capacitor - Same as C-438 |
| C-440 | | Capacitor - Same as C-438 |
| C-441 | | Capacitor - Same as C-438 |
| E-400 | E-5012-J2 | Terminal strip, 3 terminals |
| J-400 | J-5001-A5 | Jack - female contact, chassis mounting type |
| J-400A | J-5017-A5 | Jack Hood - for use with part J-5001-A5 |
| J-401 | | Jack - Same as J-400 |
| J-401A | | Jack Hood - Same as J-400A |
| J-402 | J-5015-II | Jack - pin type, female contact |
| J-403 | | Jack - Same as J-402 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| J-404 | | Jack - Same as J-402 |
| J-405 | | Jack - Same as J-402 |
| J-406 | | Jack - Same as J-402 |
| J-407 | | Jack - Same as J-400 |
| J-407A | | Jack Hood - Same as J-400A |
| J-408 | | Jack - Same as J-402 |
| J-409 | | Jack - Same as J-402 |
| L-400 | | Choke R.F., - Not used |
| L-401 | L-5026-R7 | Choke, R.F. - 12.5 microhenries |
| L-402 | L-5027-R7 | Choke, R.F. - 7.5 microhenries |
| R-400 | | Resistor - See Z-400 |
| R-401 | R-5116-A11 | Resistor - fixed, composition, 200,000 ohms, 1 watt, 10% |
| R-402 | R-5185-A11 | Resistor - fixed, composition, 27,000 ohms, 1 watt, 10% |
| R-403 | | Resistor - See Z-401 |
| R-404 | | Resistor - See Z-401 |
| R-405 | R-5112-A11 | Resistor - fixed, composition, 100,000 ohms, 1 watt, 10% |
| R-406 | | Resistor - See Z-406 |
| R-407 | | Resistor - Same as R-402 |
| R-408 | | Resistor - See Z-402 |
| R-409 | | Resistor - See Z-402 |
| R-410 | | Resistor - Same as R-405 |
| R-411 | | Resistor - Same as R-402 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|---|
| R-412 | | Resistor - See Z-403 |
| R-413 | | Resistor - See Z-403 |
| R-414 | | Resistor - Same as R-405 |
| R-415 | | Resistor - Same as R-402 |
| R-416 | | Resistor - See Z-404 |
| R-417 | | Resistor - See Z-404 |
| R-418 | | Resistor - Same as R-405 |
| R-419 | R-5190-A11 | Resistor - fixed, composition, 560 ohms, 1 watt, 10% |
| R-420 | R-5136-A11 | Resistor - fixed, composition, 20,000 ohms, 2 watt, 10% |
| R-421 | R-5086-A11 | Resistor - fixed, composition, 1000 ohms, 1 watt, 10% |
| R-422 | | Resistor - See Z-405 |
| R-423 | R-5084-A11 | Resistor - fixed, composition, 50,000 ohms, 1 watt, 10% |
| 7-400 | | Tube - type 707, loctal |
| 7-401 | | Tube - type 7A7, loctal |
| 7-402 | | Tube - Same as V-400 |
| 7-403 | | Tube - Same as V-400 |
| 7-404 | | Tube - type 7Q7, loctal |
| X-400 | X-5007-E1 or X-5047-A5 | Socket - loctal, ceramic Socket - loctal, mica filled bakelite |
| X-401 | | Socket - Same as X-400 |
| X-402 | | Socket - Same as X-400 |
| X-403 | | Socket - Same as X-400 |
| X-404 | | Socket - Same as X-400 |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| Z-400 | Z-5004-S5 | Tuning Assembly, tuning range 576-615KC Consists of: Primary Inductance: 300 microhenries, 5% Secondary Inductance: 1 millihenry, 3% C-400 - Capacitor, fixed, ceramic, 36 mmf, 500 VDCW, 5% C-401 - Capacitor, variable, air, 3.4-36 mmf. R-400 - Resistor, fixed, composition, 100,000 ohms, 1 watt, 10% |
| Z-401 | Z-5005-S5 | Tuning Assembly, tuning range 1728-1845KC Consists of: Primary Inductance: 80 microhenries 3% Secondary Inductance: 80 microhenries 3% C-404 - Capacitor, variable, air 3.6-40 mmf. C-405 - Capacitor, fixed, ceramic, 62 mmf., 500 VDCW, 5% C-406 - Capacitor, same as C-405 C-407 - Capacitor, same as C-404 R-403 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% R-404 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |
| Z-402 | Z-5006-S5 | Tuning Assembly, tuning range 1728-1845KC Consists of: Primary Inductance: 120 microhenries, 3% Secondary Inductance: 120 microhenries, 3% C-410 - Capacitor, variable, air, 3.2-29 mmf. C-411 - Capacitor, fixed, ceramic 39 mmf. 500 VDCW, 5% |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| | | C-412 - Capacitor, same as C-411 |
| | | C-413 - Capacitor, same as C-410 |
| | | R-408 - Resistor, fixed, composition, 39,000 ohms, 1 watt, 10% |
| | | R-409 - Resistor, fixed, composition, 180,000 ohms, 1 watt, 10% |
| Z-403 | Z-5011-S5 | Tuning Assembly, tuning range 5184-5535KC Consists of: Primary Inductance: 20 microhenries, 3% Secondary Inductance: 20 microhenries, 3% C-416 - Capacitor, variable, air, 3-21 mmf. C-417 - Capacitor, fixed, ceramic, 20 mmf., 500 VDCW, 5% C-418 - Capacitor, same as C-417 C-419 - Capacitor, same as C-416 |
| Z-404 | Z-5011-S5 | Tuning Assembly, tuning range 15.5-16.6MC Consists of: Primary Inductance: 3 microhenries, 3% Secondary Inductance: 3 microhenries, 3% C-422 - Capacitor, variable, air 2.8-10 mmf. C-423 - Capacitor, fixed, ceramic, 15 mmf., 500 VDCW, 5% C-424 - Capacitor, fixed, ceramic, 10 mmf., 500 VDCW, 5% C-425 - Capacitor, same as C-422 R-416 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% R-417 - Resistor, fixed, composition, 4700 ohms, 1 watt, 10% |

PARTS LIST FOR SINGLE CHANNEL MULTIPLIER
AND SINGLE ENDED CONVERTER - CAT. #589

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|--|
| Z-405 | Z-5012-S5 | Tuning Assembly, tuning range 1833-2250KC. <p>Consists of:</p> <ul style="list-style-type: none"> Primary Inductance: 120 microhenries, 3% Secondary Inductance: 40 microhenries, 5% C-430 - Capacitor, variable, air, 3.4-32 mmf. C-431 - Capacitor, fixed, ceramic, 27 mmf., 500 VDCW, 5% R-422 - Resistor, fixed, composition, 39,000 ohms, 1 watt, 10% |
| Z-406 | Z-5013-S5 | Tuning Assembly, tuning range 13.4-14.6MC <p>Consists of:</p> <ul style="list-style-type: none"> Primary Inductance: 5 turn link Secondary Inductance: 4 microhenries, 3% C-433 - Capacitor, fixed, ceramic, 6 mmf., 500 VDCW, 5% C-434 - Capacitor, variable, air, 3.2-25 mmf., R-406 - Resistor, fixed, composition, 22,000 ohms, 1 watt, 10% |
| Z-407 | Z-5014-S5 | Tuned filter unit, tuning range 15.5-16.6MC. <p>Consists of:</p> <ul style="list-style-type: none"> Inductance: #24 tinned wire or 5/8" form, 5 3/4 turns 1/4" long. C-436 - Capacitor, fixed, ceramic, 39 mmf., 500 VDCW, 5% C-437 - Capacitor, variable, air, 5-97 mmf. |

SECTION VII

PARTS LIST FOR SEMI FINAL
MULTIPLIER - CAT. #590

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| C-500 | | Capacitor - See Z-500 |
| C-501 | | Capacitor - See Z-500 |
| C-502 | C-5016-M6 | Capacitor - fixed, molded paper, .01 mfd. 300 VDCW, 20% |
| C-503 | | Capacitor - Same as C-502 |
| C-504 | | Capacitor - See Z-501 |
| C-505 | | Capacitor - See Z-501 |
| C-506 | | Capacitor - See Z-501 |
| C-507 | | Capacitor - See Z-501 |
| C-508 | | Capacitor - Same as C-502 |
| C-509 | | Capacitor - Same as C-502 |
| C-510 | | Capacitor - See Z-502 |
| C-511 | | Capacitor - See Z-502 |
| C-512 | | Capacitor - Same as C-502 |
| C-513 | | Capacitor - Same as C-502 |
| C-514 | | Capacitor - See Z-503 |
| C-515 | | Capacitor - See Z-503 |
| C-516 | | Capacitor - Same as C-502 |
| C-517 | | Capacitor - Same as C-502 |
| C-518 | | Capacitor - See Z-504 |
| C-519 | | Capacitor - See Z-504 |
| C-520 | | Capacitor - Same as C-502 |
| C-521 | | Capacitor - Same as C-502 |
| C-522 | | Capacitor - Same as C-502 |
| C-523 | | Capacitor - See Z-505 |

PARTS LIST FOR SEMI FINAL
MULTIPLIER - CAT. #590

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-524 | C-5047-S1 | Capacitor - fixed, mica, .001 mfd. 500 VDCW, 20% |
| C-525 | | Capacitor - Same as C-524 |
| C-526 | | Capacitor - Same as C-524 |
| C-527 | | Capacitor - Same as C-524 |
| E-500 | E-5012-J2 | Terminal strip - 3 terminals |
| J-500 | J-5001-A5 | Jack - female contact - chassis mounting type |
| J-500A | J-5017-A5 | Jack Hood - for use with part J-5001-A5 |
| J-501 | J-5015-I1 | Jack - pin type, female contact, black bakelite insulation |
| J-502 | | Jack - Same as J-501 |
| J-503 | | Jack - Same as J-501 |
| J-504 | | Jack - Same as J-501 |
| J-505 | | Jack - Same as J-501 |
| J-506 | | Jack - Same as J-501 |
| J-507 | | Jack - Same as J-500 |
| J-507A | | Jack Hood - Same as J-500A |
| L-500 | L-5028-M3 | Choke, R.F. - 2.5 millihenries, |
| L-501 | L-5026-R7 | Choke, R.F. - 12.5 microhenries |
| L-502 | L-5027-R7 | Choke, R.F. - 7.5 microhenries |
| R-500 | R-5112-A11 | Resistor - fixed, composition, 100,000 ohms, 1 watt, 10% |
| R-501 | R-5185-A11 | Resistor - fixed, composition, 27,000 ohms, 1 watt, 10% |
| R-502 | | Resistor - Same as R-500 |
| R-503 | | Resistor - Same as R-501 |

PARTS LIST FOR SEMI FINAL
MULTIPLIER - CAT. #590

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|---|
| R-504 | | Resistor - Same as R-500 |
| R-505 | | Resistor - Same as R-501 |
| R-506 | | Resistor - Same as R-500 |
| R-507 | | Resistor - Same as R-501 |
| R-508 | | Resistor - Same as R-500 |
| R-509 | R-5115-All | Resistor - fixed, composition, 40,000 ohms, 1 watt, 10% |
| R-510 | | Resistor - See Z-500 |
| R-511 | | Resistor - See Z-501 |
| R-512 | | Resistor - See Z-501 |
| R-513 | | Resistor - See Z-502 |
| R-514 | | Resistor - See Z-503 |
| R-515 | | Resistor - See Z-504 |
| R-516 | | Resistor - See Z-505 |
| V-500 | | Tube - type 7A7, loctal |
| V-501 | | Tube - type 7C7, loctal |
| V-502 | | Tube - Same as V-501 |
| V-503 | | Tube - Same as V-501 |
| V-504 | | Tube - type 7H7, loctal |
| X-500 | X-5007-E1 or X-5047-A5 | Socket - loctal, ceramic Socket - loctal, mica filled bakelite |
| X-501 | | Socket - Same as X-500 |
| X-502 | | Socket - Same as X-500 |
| X-503 | | Socket - Same as X-500 |
| X-504 | | Socket - Same as X-500 |

PARTS LIST FOR SEMI FINAL
MULTIPLIER - CAT. #590

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| Z-500 | Z-5015-S5 | Tuning Assembly, tuning range 1833-2250KC Consists of: Primary Inductance: 40 microhenries, 5% Secondary Inductance: 120 microhenries, 3% C-500 - Capacitor, fixed, ceramic, 18 mmf., 500 VDCW, 1% C-501 - Capacitor, variable, air 3.6-40 mmf. R-510 - Resistor, fixed, composition, 180,000 ohms, 1 watt, 10% |
| Z-501 | Z-5016-S5 | Tuning Assembly, tuning range 1833-2250KC Consists of: Primary Inductance: 120 microhenries, 3% Secondary Inductance: 120 microhenries, 3% C-504 - Capacitor, variable, air 3.6-40 mmf. C-505 - Capacitor, fixed, ceramic, 15 mmf., 500 VDCW, 5% C-506 - Capacitor, same as C-504 C-507 - Capacitor, same as C-505 R-511 - Resistor, fixed, composition, 39,000 ohms, 1 watt, 10% R-512 - Resistor, fixed, composition, 180,000 ohms, 1 watt, 10% |
| Z-502 | Z-5017-S5 | Tuning Assembly, tuning range 3667-4500KC Consists of: Primary Inductance: 40 microhenries, 3% Secondary Inductance: 40 microhenries, 3% C-510 - Capacitor, variable, air, 3.4-36 mmf. C-511 - Capacitor, same as C-510 R-513 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |

PARTS LIST FOR SEMI FINAL
MULTIPLIER - CAT. #590

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| Z-503 | Z-5018-S5 | Tuning Assembly, tuning range 7300-9000 KC Consists of: Primary Inductance: 13 microhenries, 3% Secondary Inductance: 13 microhenries, 3% C-514 - Capacitor, variable, air 3.4-32 mmf. C-515 - Capacitor, same as C-514 R-514 - Resistor, fixed, composition, 100,000 ohms, 1 watt, 10% |
| Z-504 | Z-5019-S5 | Tuning Assembly, tuning range 14.6-18.0MC Consists of: Primary Inductance: 3.5 microhenries, 3% Secondary Inductance: 3.5 microhenries, 3% C-518 - Capacitor, variable, air 3.4-32 mmf. C-519 - Capacitor, same as C-518 R-515 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |
| Z-505 | Z-5020-S5 | Tuning Assembly, tuning range 14.6-18.0MC Consists of: Primary Inductance: 3.5 microhenries, 3% Secondary Inductance: 5 turn link C-523 - Capacitor, variable, air 3.4-32 mmf. R-516 - Resistor, fixed, composition, 47,000 ohms, 1 watt, 10% |

SECTION VII

PARTS LIST
FINAL MULTIPLIER PANEL CAT. 591A

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-600 | | Capacitor - part of Z-600 |
| C-601 | C-5047-S1 | Capacitor - fixed, mica, .001 mfd., 500 VDCW, 20% |
| C-602 | C-5016-M6 | Capacitor - fixed, molded paper, .01 mfd., 300 VDCW, 20% |
| C-603 | | Capacitor - Same as C-601 |
| C-604 | | Capacitor - Same as C-602 |
| C-605 | C-5089-H2 | Capacitor - variable, air, 35 mmfd. |
| C-606 | | Capacitor - Same as C-601 |
| C-607 | C-5088-H2 | Capacitor - variable, air split stator, 35 mmfd. per section |
| C-608 | | Capacitor - Same as C-601 |
| C-609 | | Capacitor - Same as C-607 |
| C-610 | C-5121-S1 | Capacitor - fixed, mica, .001 mfd. 1200 VDCW, 20% |
| C-611 | | Capacitor - Same as C-607 |
| C-612 | | Capacitor - Same as C-607 |
| C-613 | | Capacitor - Same as C-601 |
| C-614 | | Capacitor - Same as C-601 |
| C-615 | | Capacitor - Same as C-601 |
| C-616 | | Capacitor - Same as C-601 |
| C-617 | | Capacitor - Same as C-610 |
| C-618 | | Capacitor - Same as C-610 |
| C-619 | | Capacitor - Same as C-610 |
| C-620 | | Capacitor - Same as C-601 |
| C-621 | | Capacitor - Same as C-601 |
| C-622 | | Capacitor - Same as C-601 |

PARTS LIST
FINAL MULTIPLIER PANEL CAT. #591A

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| C-623 | | Capacitor - Same as C-601 |
| C-624 | | Capacitor - Same as C-601 |
| C-625 | | Capacitor - Same as C-601 |
| C-626 | | Capacitor - Same as C-605 |
| C-627 | | Capacitor - Not used |
| C-628 | | Capacitor - Same as C-602 |
| E-600 | E-5003-J2 | Terminal strip - 5 terminals |
| J-600 | J-5001-A5 | Jack - for coaxial cable female contact, chassis mounting type. |
| J-600A | J-5017-A5 | Jack Hood - for part J-5001-A5 |
| J-601 | J-5015-I1 | Jack - pin type, female contact, black insulation bakelite |
| J-602 | | Jack - Same as J-601 |
| J-603 | | Jack - Same as J-601 |
| J-604 | | Jack - Same as J-600 |
| J-604A | | Jack Hood - Same as J-600A |
| J-605 | | Jack - Same as J-600 |
| J-605A | | Jack Hood - Same as J-600A |
| I-600 | | Coil, R.F. - tuning range 29.2-36 MC, when used with 35 mmfd. variable condenser |
| I-600A | | Coil, R.F. - coupling link mtd. with I-600 |
| I-601 | | Coil, R.F., C.T. - tuning range 29.2-36 MC, when used with 35 mmfd. section split stator variable condenser |
| I-601A | | Coil, R.F. - coupling link mtd. with I-601 |
| I-602 | | Coil, R.F., C.T. - tuning range 88-108 MC, when used with 35 mmfd. section split stator variable condenser |

PARTS LIST
FINAL MULTIPLIER PANEL - CAT. #591A

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| L-602A | | Coil, R.F. - coupling link mtd. with L-602 |
| L-603 | | Coil, R.F. - tuning range 88-108 MC, used with 35 mmfd/ section split stator variable condenser |
| L-603A | | Coil, R.F. - coupling link mtd. with L-603 |
| L-604 | | Coil, R.F. - tuning range 88-108 MC, when used with 35 mmfd/section split stator variable condenser |
| L-604A | | Coil, R.F. - output coupling link |
| L-605 | L-5018-01 | Choke, R.F. - 2.3 microhenries |
| L-610 | L-5026-R7 | Choke, R.F. - 12.5 microhenries |
| L-611 | | Choke, R.F. - Same as L-610 |
| L-612 | | Choke, R.F. - Same as L-610 |
| L-613 | L-5027-R7 | Choke, R.F. - 7.5 microhenries |
| M-600 | M-5005-W2 | Meter - 300 Ma, full scale, 2% |
| M-601 | | Meter - Same as M-600 |
| R-600 | R-5084-A11 | Resistor - fixed, composition, 50,000 ohms, 1 watt, 10% |
| R-601 | R-5113-A11 | Resistor - fixed, composition, 270 ohms, 1 watt 10% |
| R-602 | R-5139-A11 | Resistor - fixed, composition, 6800 ohms, 2 watt, 10% |
| R-603 | R-5141-C18 | Resistor - fixed, composition, 22,000 ohms, 5 watt, 20% |
| R-604 | | Resistor - Same as R-602 |
| R-605 | R-5010-A11 | Resistor - fixed, composition, 6200 ohms, 2 watt, 5% |
| R-606 | R-5170-A11 | Resistor - fixed, composition, 1000 ohms, 1 watt, 20% |
| R-607 | | Resistor - Same as R-606 |
| S-600 | S-5015-A19 | Switch - toggle, SPST, 3A at 250V |

PARTS LIST
FINAL MULTIPLIER PANEL - CAT. 591A

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|---|
| V-600 | | Tube - loctal, type 705 |
| V-601 | | Tube - type 829B |
| V-602 | | Tube Same as V-601 |
| X-600 | X-5007-E1 or X-5047-A5 | Socket - loctal, tube, ceramic Socket - loctal, mica filled bakelite |
| X-601 | X-5011-J4 | Socket - ceramic, 7 prong, small transmitting |
| X-602 | | Socket - Same as X-601 |
| Z-600 | Z-5021-35 | Tuning Assembly, tuning range 14.6-18.0 MC |

Consists of:

Primary Inductance: 5 turn link

Secondary Inductance: 3.5 microhenries, 3%

C-600 - Capacitor, variable, air 3.4-32 mmf.

SECTION VII

PARTS LIST FOR MODULATOR POWER
SUPPLY UNIT - CAT. #592

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|--|
| C-700 | C-5104-I4 | Capacitor - fixed, paper, oil filled, 8 mfd. 600 VDCW, 10% |
| C-701 | | Capacitor - Same as C-700 |
| C-702 | | Capacitor - Same as C-700 |
| C-703 | | Capacitor - Same as C-700 |
| C-704 | | Capacitor - Same as C-700 |
| C-705 | C-5097-I4 | Capacitor - fixed, paper, oil filled, 2 section each sec. 0.1 mfd. 1000 VDCW, 10% |
| C-706 | C-5098-I4 | Capacitor - fixed, paper, oil filled, 0.1 mfd. 1000 VDCW, 10% |
| C-707 | | Capacitor - Same as C-700 |
| C-708 | | Capacitor - Not used |
| C-709 | C-5108-I4 | Capacitor - fixed, paper, oil filled, 1.0 mfd. 200 VDCW |
| C-710 | C-5099-I4 | Capacitor - fixed, dry electrolytic, 2000 mfd., 25 VDCW, 10% |
| C-711 | | Capacitor - Same as C-710 |
| CR-700 | CR-5004-S23 | Selenium Rectifier - 6.3V 5.2A |
| E-700 | E-5003-J2 | Terminal strip - 5 terminals |
| E-701 | E-5014-J2 | Terminal strip - 11 terminals |
| F-700 | F-5005-L3 | Fuse - glass enclosed, 10 amp, 250 volt |
| K-700 | K-5014-A2 | Relay - DPDT contacts, coil for 208/230 volts, 60 cycles |
| K-701 | K-5024-C17 | Relay - DPST contacts, N.C. 3 amp - coil operates on min. current of 1.2 amps with continuous duty on 1.7 amps |
| L-700 | L-5014-C14 | Choke, A.F. - smoothing, 5 henries, 650 M.A., 75 ohms DC |

PARTS LIST FOR MODULATOR POWER
SUPPLY UNIT - CAT. #592

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| L-701 | | Choke, A.F. - Same as L-700 |
| L-702 | L-5015-C14 | Choke, A.F. - smoothing, 50 millihenries, 5.4 amps, 0.5 ohms DC, resistance tolerance 10% |
| R-700 | R-5098-S7 | Resistor - fixed, wire wound, 50,000 ohms, 10 watt, 10% |
| R-701 | R-5099-A11 | Resistor - fixed, composition, 1 meg ohm, 1 watt, 10% |
| R-702 | R-5100-A11 | Resistor - fixed, composition, 1500 ohms, 1 watt, 10% |
| R-703 | | Resistor - Same as R-702 |
| R-704 | | Resistor - Same as R-702 |
| R-705 | | Resistor - Same as R-702 |
| R-706 | R-5060-A11 | Resistor - fixed, composition, 22,000 ohm, 2 watt, 10% |
| R-707 | R-5101-A11 | Resistor - fixed, composition, 150,000 ohm, 1 watt, 10% |
| R-708 | R-5102-A11 | Resistor - fixed, composition, 68,000 ohm, 1 watt, 10% |
| R-709 | R-5103-06 | Resistor - variable, wire wound, 25,000 ohm, max. current 11 M.A., linear taper, 10% |
| R-710 | | Resistor - Same as R-707 |
| R-711 | R-5111-01 | Resistor - variable wire wound, 6 ohms, 25 watts, 2 amps max., 10% |
| R-712 | R-5237-02 | Resistor - variable, wire wound 150 ohms, 50 watts, 10% |
| R-713 | R-5335 | Resistor - fixed, wire wound, 50 ohms, 25 watts, 10% |
| R-714 | | Resistor - Same as R-713 |
| R-715 | R-5333-I2 | Resistor - adjustable, wire wound, 600 ohms, 10 watts, 10% |
| T-700 | T-5024-C14 | Transformer, filament - Pri. 208V, 60 cycles, single phase; Sec. #1, 2.5V, 10A - Sec. #2, 6.3V, 4.0A C.T. - Sec. #3, 6.3V, 9.0A - Insulation test 2000 volts |

PARTS LIST FOR MODULATOR POWER
SUPPLY UNIT - CAT. #592

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|---|
| T-701 | T-5025-C14 | Transformer, filament - Pri. 208 volts, 60 cycles, single phase; Sec. 18 volts, 6.5 amps C.T. - Insulation test 2000 volts |
| | or | ABOVE FOR SETS SERIAL # 6877, 6880, 6879, 6878, 6883, 6884, 6885 |
| | | ALL OTHERS USE: |
| | T-5053-C14 | Transformer, filament - Pri. 200/208 volts, 60 cycles, single phase - Sec. 19.5V, 6.5A C.T. - Insulation test 1000 volts |
| T-702 | T-5026-C14 | Transformer, plate - Pri. 208 volts, 60 cycles, single phase - Sec. 550-0-550 volts AC RMS, 650 MA - Insulation test 5000 volts |
| T-703 | T-5027-C14 | Transformer, crystal heater - Pri. 208 volts, 60 cycles, single phase - Sec. 6.3 volts, 2.0 amps |
| V-700 | | Tube - rectifier, type 3B25 |
| V-701 | | Tube - Same as V-700 |
| V-702 | | Tube - regulator, type 6L6, or 6B4G |
| V-703 | | Tube - Same as V-702 |
| V-704 | | Tube - Same as V-702 |
| V-705 | | Tube - Same as V-702 |
| V-706 | | Tube - loctal, type 7F8 |
| V-707 | | Tube - type VE-105 |
| X-700 | X-5005-A5 | Socket - 4 prong, medium, ceramic |
| X-701 | | Socket - Same as X-700 |
| X-702 | X-5006-U5 | Socket - octal, ceramic |
| | or | |
| | X-5060-A5 | Socket - octal, mica filled bakelite |

PARTS LIST FOR MODULATOR POWER
SUPPLY UNIT - CAT. #592

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------------------|---------------------------------------|
| X-703 | | Socket - Same as X-702 |
| X-704 | | Socket - Same as X-702 |
| X-705 | | Socket - Same as X-702 |
| X-706 | X-5007-E1 or X-5047-A5 | Socket - loctal, ceramic |
| | | Socket - loctal, mica filled bakelite |
| X-707 | | Socket - Same as X-702 |

SECTION VII

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|------------------|---|
| B-800 | B-5001-A21 | Blower - centrifugal, 457 CFM against 3" static pressure, Equipped with 208/230 volt, single phase, 60 cycle, 3450 RPM, 1/2 H.P. Motor |
| | or B-5002-A21 | Blower - centrifugal, 463 CFM against 3" static pressure, Sirocco type, equipped with 208/230 volt, 60 cycle, single phase, 3450 RPM, 1/2 H.P. Motor. |
| C-800 | C-5103-I4 | Capacitor - fixed, paper, oil filled, 4 mfd., 5000 VDCW, 10% |
| C-801 | | Capacitor - Same as C-800 |
| C-802 | C-5096-I4 | Capacitor - fixed, paper, oil filled, 8 mfd. 1000 VDCW, 10% |
| C-803 | | Capacitor - Same as C-802 |
| C-804 | C-5104-I4 | Capacitor - fixed, paper, oil filled, 8 mfd. 600 VDCW, 10% |
| C-805 | | Capacitor - Same as C-804 |
| C-806 | C-5047-S1 | Capacitor - fixed, mica, .001 mfd. 500 VDCW, 20% |
| C-807 | | Capacitor - Same as C-806 |
| C-808 | | Capacitor - Same as C-806 |
| C-809 | | Capacitor - Same as C-806 |
| C-810 | | Capacitor - Same as C-806 |
| C-811 | | Capacitor - variable, air, 3" diameter discs. |
| C-812 | | Capacitor - fixed, "Teflon dielectric" approximately 100 mmf. |
| C-813 | | Capacitor - fixed, vinylite dielectric, approximately 400 mmf. |
| C-814 | | Capacitor - Same as C-811 |
| C-815 | | Capacitor - Same as C-811 |
| C-816 | | Capacitor - Same as C-811 |
| C-817 | C-5251-H2 | Capacitor - variable, air, 100 mmf. |
| C-818 | | Capacitor - Same as C-817 |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|---------------|---------------------------------------|---|
| C-819 | C-5100-S1 | Capacitor - fixed, mica, .001 mfd, 10,000 VDCW, 10% |
| C-820 | C-5230 ¹ / ₂ S1 | Capacitor - fixed, mica, 0.0001 mfd, 2500 VDCW, 20% |
| C-821 | C-5193-I4 | Capacitor - fixed, paper, oil filled, .25 mfd, 6000 VDCW, 20% |
| C-822 | | Capacitor - Same as C-813 |
| C-823 | | Capacitor - Not used |
| C-824 | | Capacitor - Not used |
| C-825 | C-5000-M5 | Capacitor - fixed, ceramic, 1200 mmf, 300 VDCW, 20% |
| C-826 | | Capacitor - Same as C-820 |
| C-827 | | Capacitor - Same as C-820 |
| C-828 | | Capacitor - Same as C-820 |
| E-800 | | Terminal board - 2-1/4 x 20 stud terminals |
| E-801 | E-5001-J2 | Terminal strip - 8 terminals |
| E-802 | E-5003-J2 | Terminal strip - 5 terminals |
| E-803 | | Terminal strip - Same as E-801 |
| E-804 | | Terminal strip - Same as E-801 |
| E-805 | | Terminal strip - Same as E-801 |
| E-806 | | Terminal strip - Same as E-801 - Not used in later units |
| E-807 | | Terminal strip - Not used |
| E-808 | | Terminal strip - 1 strip, 18 terminals, 1 strip 6 terminals |
| E-809 | | Terminal strip - Not used |
| E-810 | | Terminal strip - Same as E-802 |
| E-811 | | Terminal strip - 2 terminals |
| E-812 | E-5012-J2 | Terminal strip - 4 terminals |
| E-813 | E-5004-J2 | Terminal strip - 3 terminals |
| E-814 | | Terminal strip - Same as E-813 |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|--|
| E-815 | | Terminal strip - Same as E-813 |
| E-816 | | Terminal strip - Same as E-813 |
| E-817 | | Terminal strip - Same as E-812 |
| E-818 | | Terminal strip - Same as E-812 |
| E-819 | | Terminal strip - Same as E-802 |
| F-801 | F-5003-L3 | Fuse - glass enclosed, 3 ampere, 250 volt |
| F-802 | F-5000-L3 | Fuse - glass enclosed, 1 ampere, 250 volt |
| F-803 | | Fuse - Same as F-801 |
| F-804 | | Fuse - Same as F-801 |
| F-805 | F-5010-L3 | Fuse - glass enclosed, 5 ampere, 250 volt |
| F-806 | F-5002-L3 | Fuse - glass enclosed, 1/2 ampere, 250 volt |
| F-807 | F-5007-B11 | Fusetron - cartridge type, 15 ampere, 250 volt |
| F-808 | | Fusetron - Same as F-807 |
| F-809 | F-5012-L3 | Fuse - tiny cartridge type, bakelite enclosed, 15 ampere, 250 volt |
| F-810 | | Fuse - Same as F-809 |
| I-800 | I-5004-G2 | Lamp - pilot light, candelabra base, 115 volts, 6 watts |
| I-801 | | Lamp - Same as I-800 |
| I-802 | | Lamp - Same as I-800 |
| I-803 | | Lamp - Same as I-800 |
| I-804 | I-5009-G2 | Lamp - pilot light, double contact, bayonet base, 6-8 volts |
| I-805 | I-5010-G2 | Lamp - illuminating, lumiline type, 115 volts, 40 watts |
| I-806 | | Lamp - Same as I-805 |
| I-807 | | Lamp - Same as I-805 |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| MBOL O. | REL STOCK NO. | DESCRIPTION |
|------------|-----------------------------------|--|
| 804 | K-5019-A11 or K-5043-F3 | Relay - open type, contacts rated 25 amps, 250 volts, AC, 2 pole, N.O. coil for 208/230 volts, 60 cycles. |
| 805 | K-5020-A11 or K-5059-W2 | Relay - overload, dashpot type, adjustable trip, adjusted for 600 ma, self resetting contacts rated 3 amps, 250 volts, AC, one pole N.C. Relay - overload, direct current, self resetting contacts rated 3 amps, 250 volts, AC, SPDT, range adjustable from 0.5-2 amps. |
| 806 | K-5021-A11 or K-5044-F3 | Relay - motor starter, open type, with 4.47 amp thermal overload elements, contacts rated 15 amps, 250 volts, AC, 3 pole N.O., coil for 208/230 volts, 60 cycles. Relay - motor starter, open type, with 5 amp thermal overload elements, contacts rated 15 amps, 250 volts, AC, 3 pole, N.O. coil for 208/230 volts, AC. |
| 807 | K-5023-S1 or K-5038-A23 | Relay - time delay, synchronous, adjustable, motor for 230 volts, 60 cycles, contacts rated 2.5 amps, 250 volts, AC, SPST, N.O. See alternate K-801 |
| 800 | L-5016-C14 | Choke, A.F. - smoothing, 15 henries, 600 ma, 200 ohms DC resistance, insulation test 10,000 volts. |
| 801 | | Choke A.F. - Same as L-800 |
| 802 | L-5017-C14 | Choke, A.F. - smoothing, 8 henries, 250 ma, 100 ohms, DC resistance, insulation test 2000 volts. |
| 803 | | Choke, A.F. - Same as L-802 |
| 804 | | Choke, A.F. - Same as L-802 |
| 805 | | Choke, A.F. - Same as L-802 |
| 806 | | Lines, R.F. - final amplifier plate circuit |
| 807 | | Output coupling link |
| 808 | | Lines, R.F. - final amplifier grid circuit |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|------------------------------|---|
| L-809 | | Input coupling link |
| L-810 | | Choke, R.F. - plate |
| L-811 | L-5066-E9 | Choke, R.F. - 3 microhenries, 25% |
| L-812 | | Choke, R.F. - Same as L-811 |
| L-813 | | Not used |
| L-814 | | Monitor coupling link |
| M-800 | M-5009-W2 | Meter, AC volts - 0-7.5 volts, 60 cycles, 2% |
| M-801 | M-5010-W2 | Meter, DC milliammeter - 0-50 ma, 2% |
| M-802 | M-5011-W2 | Meter, DC milliammeter - 0-600 ma, 2% |
| M-803 | M-5012-S2 | Meter, DC volts - 0-1 milliamper movement fitted with 0-5000 volt scale, 2%, used with external multiplier |
| M-804 | M-5013-W2 or M-5054-W2 | Meter, DC milliammeter - 0-1 ma, 2% Meter, DC milliammeter - 0-1 ma, 2% with special scale |
| M-805 | M-5007-W2 | Meter, DC milliammeter - 0-100 ma, 2% |
| P-800 | P-5002-A5 | Plug - coaxial, single male contact |
| P-801 | P-5009-A5 | Plug - twin male contacts |
| P-802 | P-5011-A5 | Plug - coaxial, 90° elbow, single male contact |
| P-803 | | Plug - Same as P-802 |
| P-804 | | Plug - Same as P-802 |
| P-805 | | Plug - Same as P-802 |
| R-800 | R-5104-I2 or R-5273-C6 | Resistor - fixed, wire wound, 200,000 ohms, 120 watts, 5% Resistor - fixed, wire wound, 200,000 ohms, 160 watts, 10% |
| R-801 | R-5105-I2 | Resistor - fixed, wire wound, 5 meg ohms, max. current 1.0 milliamper 0.5% |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER.

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|-----------------|---|
| R-802 | R-5089-A11 | Resistor - fixed, composition, 10,000 ohms, 2 watts, 10% |
| R-803 | R-5097-I2 | Resistor - fixed, wire wound, 500 ohms, 120 watts, 5% |
| | or R-5269-C6 | Resistor - fixed, wire wound, 500 ohms, 160 watts, 10% |
| R-804 | R-5098-S7 | Resistor - fixed, wire wound, 50,000 ohms, 10 watts, 10% |
| R-805 | R-5109-I2 | Resistor - fixed, wire wound, 250 ohms, 40 watts, 5%, fer- rules for 60 ampere fuse clips |
| | or R-5271-C6 | Resistor - fixed, wire wound, 250 ohms, 40 watts, 10%, fer- rules for 30 ampere fuse clips |
| R-806 | | Resistor - Same as R-805 |
| R-807 | R-5321-C6 | Resistor, fixed, wire wound, 500 ohms, 20 watts, 10% |
| R-808 | | Resistor - Same as R-805 |
| R-809 | | Resistor - Same as R-805 |
| R-810 | | Resistor - Same as R-807 |
| R-811 | R-5269-C6 | Resistor - fixed, wire wound, 500 ohms, 160 watts, 10% |
| R-812 | | Resistor - Same as R-811 |
| R-813 | R-5270-C6 | Resistor - fixed, wire wound, 2500 ohms, 10 watts, 10% |
| R-814 | | Resistor - Same as R-813 |
| R-815 | | Resistor - Same as R-813 |
| R-816 | R-5334-I2 | Resistor - fixed, composition, 5.1 ohms, 1 watt, 10% |
| R-817 | | Resistor - Same as R-813 |
| R-818 | R-5336-S7 | Resistor - fixed, wire wound, 1250 ohms, 50 watts, 10% |
| R-819 | R-5337-S7 | Resistor - fixed, wire wound, 2000 ohms, 50 watt, 10% |
| R-820 | | Resistor - Same as R-807 |
| R-821 | R-5331-C6 | Resistor - variable, wire wound, 5000 ohms |
| S-800 | S-5010-H8 | Switch toggle - SPST, rated 20 amperes, 250 volts |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|---|
| S-801 | | Switch - Same as S-800 |
| S-802 | S-5052-A18 | Switch - cabinet light interlock, 1 pole, N.C., 5 amps, 250 volts, AC |
| S-803 | | Switch - Same as S-802 |
| S-804 | S-5031-A18 | Switch - door interlock, 1 pole, N.O., 5 amps, 250 volts AC |
| S-805 | | Switch - Same as S-800 |
| S-806 | | Switch - Same as S-804 |
| S-807 | | Special air switch - sail type, with mercury switch rated 5 amps, 250 volts |
| S-808 | S-5013-H8 | Switch, toggle - DPST, 20 amperes, 250 volts, AC |
| S-809 | | Switch - Same as S-804 |
| S-810 | | Switch - Same as S-804 |
| S-811 | | Switch - Same as S-804 |
| S-812 | | Switch - Same as S-804 |
| S-813 | | Switch - Same as S-804 |
| S-814 | | Switch - Same as S-804 |
| S-815 | | Switch - Same as S-802 |
| S-816 | S-5057-A17 | Switch - rotary, snap, 3 position, one pole, contacts rated 30 amps, 550 volts, AC |
| S-817 | S-5045-A17 | Switch - rotary, snap, 3 position, 2 pole, with 1 section having shorting contacts, rated 10 amperes, 250 volts AC |
| T-800 | T-5028-C14 | Transformer, rectifier filament - Pri. 208V, 60 cy. single phase - Sec. #1, 5.0V, 3.0A - Sec. #2, 5.0V, 3.0A - Insulation test 2000 volts |
| T-801 | T-5029-C14 | Transformer, filament - Pri. 208V, 60 cy. single phase - Sec. 5.0V 24.5A CT - Insulation test 1000 volts |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| REL STOCK NO. | DESCRIPTION |
|------------------|---|
| T-5030-C14 | Transformer, plate - Pri. 208 volts, 60 cycles, single phase - Sec. 290-0-290 volts AC RMS, 250 M.A. Insulation test 2000 volts |
| T-5031-C14 | Transformer, plate - Pri. nominal 208V, 60 cy. single phase, tapped so that Sec. #1 will deliver 3000,3600,4200 volts AC RMS. Sec. #1 to deliver voltages at .60 amps, choke input filter - Sec. #2, 490-0-490 volts AC RMS, 200 M.A. when pri. is connected to highest tap - Insulation test 10,000 volts |
| T-5032-C14 | Transformer, rectifier filament - Pri. 208V, 60 cy. single phase Sec. 5.0V, 15 amps CT - Insulation test 10,000 V |
| T-5033-C14 | Transformer, rectifier filament - Pri. 208V, 60 cy. single phase Sec. 5.0V, 7.5A CT - Insulation test 10,000V |
| | Transformer - Same as T-805 |
| | Tube - Rectifier type 872A |
| | Tube - Same as V-800 |
| | Tube - Same as V-800. |
| | Tube - Same as V-800 |
| | Tube - rectifier type 5U4G |
| | Tube - Same as V-804 |
| | Tube - tetrode, type 4-400A |
| | Tube - Same as V-806 |
| X-5009-J4 | Socket - ceramic, 4 contact |
| | Socket - Same as X-800 |
| | Socket - Same as X-800 |
| | Socket - Same as X-800 |
| X-5006-U5 | Socket - octal, ceramic |
| or X-5060-A5 | Socket - octal, mica filled bakelite |

PARTS LIST FOR MODEL 518
1000 WATT FM TRANSMITTER

| SYMBOL NO. | REL STOCK NO. | DESCRIPTION |
|------------|---------------|--|
| X-805 | | Socket - Same as X-804 |
| X-806 | X-5012-G7 | Socket - pilot light assembly, candelabra base, 1" green indicator jewel |
| X-807 | X-5013-G7 | Socket - pilot light assembly, candelabra base, 1" clear indicator jewel |
| X-808 | X-5014-G7 | Socket - pilot light assembly, candelabra base, 1" red indicator jewel |
| X-809 | X-5061-G7 | Socket - pilot light assembly, 2 prong bayonet base, 1" amber indicator jewel |
| X-810 | X-5017-G7 | Socket - pilot light assembly, candelabra base, 1" blue indicator jewel |
| X-811 | X-5021-H8 | Socket - meter and illuminating lights, lumiline lamp holder fitted with bakelite cap |
| X-812 | | Socket - Same as X-811 |
| X-813 | | Socket - Same as X-811 |
| X-814 | | Socket - Same as X-811 |
| X-815 | | Socket - Same as X-811 |
| X-816 | | Socket - Same as X-811 |
| X-817 | | Socket - Same as X-811 |
| X-818 | | Socket - Same as X-811 |
| X-819 | | Socket - Same as X-811 |
| X-820 | | Socket - Same as X-811 |
| Y-800 | | Crystal - germanium, rectifier, type 1N34 |
| YR-800 | YR-5000-G3 | Voltage regulator - variable, 2.0 KVA, Input 230 volts, 60 cycles, output 0-270 volts, 60 cycles |

SECTION VIII

MAINTENANCE OF EQUIPMENT - ORDERING SPARE OR REPLACEMENT PARTS - PRO- CEDURE FOR RETURN OF MATERIAL.

MAINTENANCE OF EQUIPMENT

Normal maintenance requires periodic inspection of equipment with careful scrutiny of the various components to detect signs of overload or imminent failure.

Components which require periodic maintenance are tabulated below. Where applicable this equipment, instructions given should be followed.

MOTORS, PUMPS AND BLOWERS - rotating machinery of this type may require periodic lubrication if not of the sealed roller bearing type. Follow lubrication instructions attached to machine.

MECHANICAL DRIVE SYSTEMS - Panel bearings, shafting, belt pulley and chain drive arrangements require occasional lubrication with a few drops of light machine oil. Do not apply oil to sliding contacts found in Radio Frequency "Line" assemblies.

MECHANICAL CONNECTIONS - Terminal strips should be inspected occasionally for loose lugs, broken or badly frayed wires. Chuck or clamp type plate and grid lead connectors should be tried for secure fit. Coaxial cables may break loose from plug assemblies if subject to repeated handling or flexing.

RELAYS-CONTACTORS - Relays and contactors with enclosed contacts do not require servicing for the life of equipment. Telephone type relays and other exposed contact relays may require occasional cleansing or burnishing of contact surfaces. Sand paper strips saturated in pure ethyl alcohol may be drawn between contacts while holding relay closed normally.

Electro-pneumatic and oil-dashpot type timing relays should be checked for maintenance of correct timing interval. Adjustment instructions for these items are found in Section V of this manual.

RESISTORS - Low voltage resistors should be examined for discoloration of paint indicating overloaded operating conditions. Large size plug-in sticks should be checked for loose ferrules and clean contact surfaces.

CLEANING - The necessity for maintaining equipment in clean condition should be obvious. Dust and dirt will definitely have a deleterious effect on the operation of most electronic components. The necessity and frequency of cleaning operations will vary with the type and location of equipment. Equipment in pressurized cabinets with air filters on intake and exhaust ducts will require less service than rack mounted receiver.

Air filters may be cleaned by immersing in gasoline to wash out dust and old oil. Clean stand up to drain then reimmerse in SAE 30 motor oil. Again stand to drain. Wipe off excess and reinstall.

Special attention should be paid to wiping dust off of insulators in high voltage circuits and also glass envelopes on vacuum tubes having plate and grid caps.

When cleaning vacuum tube envelopes an excellent opportunity presents itself for an examination and check for loose or corroded tube or tube socket pins.

The more carefully "Preventive Maintenance" is performed, the less service and trouble shooting will be encountered.

2. ORDERING SPARE OR REPLACEMENT PARTS

All components used in R.E.L. equipment have been assigned REL Stock Numbers, and are designated as such either on the component itself, or if impracticable, on the Tabular List of Parts of this Instruction Manual. When ordering spare or replacement parts, please state quantity and REL Stock Number to insure exact duplication.

Another method of ordering components when the above is impracticable is as follows:

All components used in REL equipment are designated on the Tabular List of Parts and Wiring Diagrams as a circuit symbol i.e. R-100, C-500, C-300, etc. This symbol may be used in ordering spare or replacement parts, however, the catalogue number of the equipment must be stated.

3. PROCEDURE FOR RETURN OF MATERIAL

In the envelope attached to the rear cover, are copies of forms used by REL in dealing with return of defective materials used in our catalogued articles.

If for any reason you have a reject which is due to faulty manufacture or a direct fault of manufacture, please forward this information in the "NOTIFICATION" form letter. Within ten days we will notify you of what disposition is to be made.

NOTE: Do not forward the rejects to us before being notified by our acceptance letter. This will save you cost of shipping in certain cases where a return is not required, and also permits us to keep our records in order.

When you receive our disposition notice requesting that the subject material may be returned, the "RETURN MATERIAL REPORT" is to be forwarded us, packed with material itself, along with your regular packing slip via either Parcel Post or Railway Express Prepaid. In certain cases, additional information may be required in order for us to complete our examination. Forms will be forwarded for compliance.