

SER. NO. 7387  
Dusacker 7/28/75

# MULTIPHASE EXCITER

MODEL 10-B

INSTRUCTION MANUAL

This unit is licensed under one or  
both of the following U.S. Patents

No. 2,566,876

No. 2,611,036

CENTRAL ELECTRONICS, INC.

1247 W. Belmont Avenue

Chicago 13, Illinois

## MULTI-BAND OPERATION OF THE MULTIPHASE EXCITER MODELS 10 AND 20

The following chart indicates the injection frequencies required with the 9 mc. master oscillator:

<u>OUTPUT FREQUENCY</u>	<u>INJECTION FREQUENCY</u>
1800 kc.	7200 kc.* or 10800 kc.
2000 kc.	7000 kc.* or 11000 kc.
3500 kc.	5500 kc.* or 12500 kc.
3800 kc.	5200 kc.* or 12800 kc.
4000 kc.	5000 kc.* or 13000 kc.
4350 kc.	4750 or 13350
7000 kc.	16000 kc. or 5333.3 x 3 Kc.
7200 kc.	16200 kc. or 5400 x 3 kc.
7300 kc.	16300 kc. or 5433.3 x 3 kc.
14000 kc.	5000 kc.* or 23000 kc.
14200 kc.	5200 kc.* or 23200 kc.
14300 kc.	5300 kc.* or 23300 kc.
21000 kc.	30000 kc.
21250 kc.	12250 kc. or 30250 kc.
21450 kc.	12450 kc. or 30450 kc.
28000 kc.	37000 kc.
28500 kc.	37500 kc.
29700 kc.	38700 kc.

\* Injection at these frequencies may be obtained from crystals plugged into the front panel socket.

### NOVICE OR C.W. OPERATION ONLY

Break-in CW may be used on the 160, 80 and 40 meter bands with direct frequency crystals. Turn the MODULATION selector to C.W. Then plug the 160, 80 or 40 meter crystal into the socket on the front panel and tune the controls to frequency.

Frequency multiplication may be used only when the Exciter feeds a high "Q" antenna tuner or power amplifier stage due to probable radiation of sub-multiple frequencies. It is possible to obtain 80 meter output from 160 meter crystals; 40 meter output from 80 meter crystals; and 20 meter output from 7 mc. or 4.7 mc. crystals.

## CONDENSED OPERATING INSTRUCTIONS FOR MULTIPHASE EXCITER MODEL 10B

Connect an antenna or a linear amplifier to the 52 ohm RF output. Plug in proper coils and set the VFO-XTAL switch on the proper position. Turn CARRIER knob fully clockwise. Turn OPERATION selector to MANUAL and tune the MIXER and AMPLIFIER for maximum output as shown on an oscilloscope or an antenna meter.

### TO OPERATE SINGLE SIDEBAND

Set the MODULATION selector to one of the sideband positions (SB1 or SB2). Turn the OPERATION selector to MANUAL. With the carrier knob set at "0" adjust the CARRIER NULL controls A and B for minimum RF indication. Adjust the SPEECH LEVEL control between 9 and 12 o'clock, depending upon microphone gain. Talk into the microphone and you're on SSB!

### TO OPERATE AM

Place the MODULATION selector in the AM position. Leave the CARRIER NULL knobs in the balanced-out condition. Advance the CARRIER knob until maximum output is obtained. Then reduce the CARRIER level to one half of the maximum value on the scope or to one half the maximum antenna current. Adjust the SPEECH LEVEL until the modulation peaks just reach the maximum output value on the scope. Too little or too much carrier will make the AM transmission sound distorted.

### TO OPERATE PM (Narrow band phase modulation)

Turn the MODULATION selector to PM position. Leave the CARRIER NULL knobs on the balanced-out condition. Advance the CARRIER knob to nearly full output. Adjust the SPEECH LEVEL control so that the modulation peaks do not exceed the carrier.

### TO OPERATE CW

Turn the MODULATION selector to CW. Place the OPERATION selector on MANUAL. Advance the CARRIER control to nearly full output. Plug key into jack on rear of chassis.

### TO USE THE VOICE CONTROL CIRCUIT (VOX)

Connect the receiver speaker to the Exciter as shown in the circuit diagram. The resistor across 1 and 2 on the rear terminal strip should be about two to three times the speaker voice coil impedance and rated at twice the power output. The extra contacts on 8, 9 and 10 may be used to operate an antenna relay, additional receiver silencing circuits, etc. With the OPERATION selector in VOX position talk into the microphone and adjust the VOX sensitivity control on the rear of the chassis for proper operation.

### CALIBRATION LEVEL CONTROL

When the OPERATION selector is in the CALIBRATE position the CAL LEVEL control will vary the output of the Exciter for frequency "spotting".

### EXTERNAL BLOCKING BIAS

In the standby position, -100 volts DC appears at terminal 7 on the rear terminal strip. If a bias supply is used for a linear amplifier the positive should be returned to this terminal of the Exciter. All positive components in the bias supply must be "floating" from ground and connected only to the positive lead.

When zero bias tubes are used, the amplifier grid return lead should be by-passed and then connected to terminal 7. A secure ground connection should be made between the Exciter, linear amplifier, linear amplifier power supply and the bias supply.

If an antenna relay with auxiliary contacts is used, these auxiliary "make" contacts can be used to key the blocking bias by connecting them to #6 and #7 on the rear terminal strip. Proper keying sequence is required so that the antenna circuit makes before the blocking bias is removed.

When the auxiliary contacts on an antenna relay are not used to key the transmitter, the jumper should remain between terminals 6 and 7 on the strip.

### RESISTIVE LOADING OR "SWAMPING"

If the Exciter is used to feed an antenna directly, the junction between the two 4700 ohm 2 watt carbon resistors located inside the 5 prong Amplifier plate tank coil (L9) should be unsoldered.

When driving a linear amplifier, this resistive loading should remain in the circuit. If additional resistive loading is desired, it may be added at the amplifier grid circuit, or else at the two terminal screw strip at the rear of the Exciter. The amount of resistive loading will depend on the type of tubes used in the amplifier. Pentodes, tetrodes and zero bias triodes require only a small amount; while medium and low mu triodes will require heavier swamping for low distortion.

## MATCHING THE GRID CIRCUIT OF A LINEAR AMPLIFIER STAGE

In order to obtain a maximum transfer of RF from the Exciter to grid circuit of a linear amplifier stage, it is often necessary to tune the reactance out of the link on the grid coil. This is especially true when Multiband tuners are used. A suitable unit for this purpose is a two gang, or three gang midget type of broadcast capacitor, about 400 mmfd. per section, with all the stators connected in parallel. This should be connected to either series tune, or parallel tune the PA grid link coil, and can usually be inserted right at the PA coaxial cable connector. It is sometimes beneficial to experiment with the number of turns on the grid coil link to obtain maximum grid current.

Tuning the reactance out the plate coil link in the Linear Amplifier in the same manner will assist in obtaining the heavy loading required for this type of service.

## PRELIMINARY ALIGNMENT INSTRUCTIONS

### THE FOLLOWING IS RECOMMENDED FOR UNITS CONSTRUCTED FROM KITS

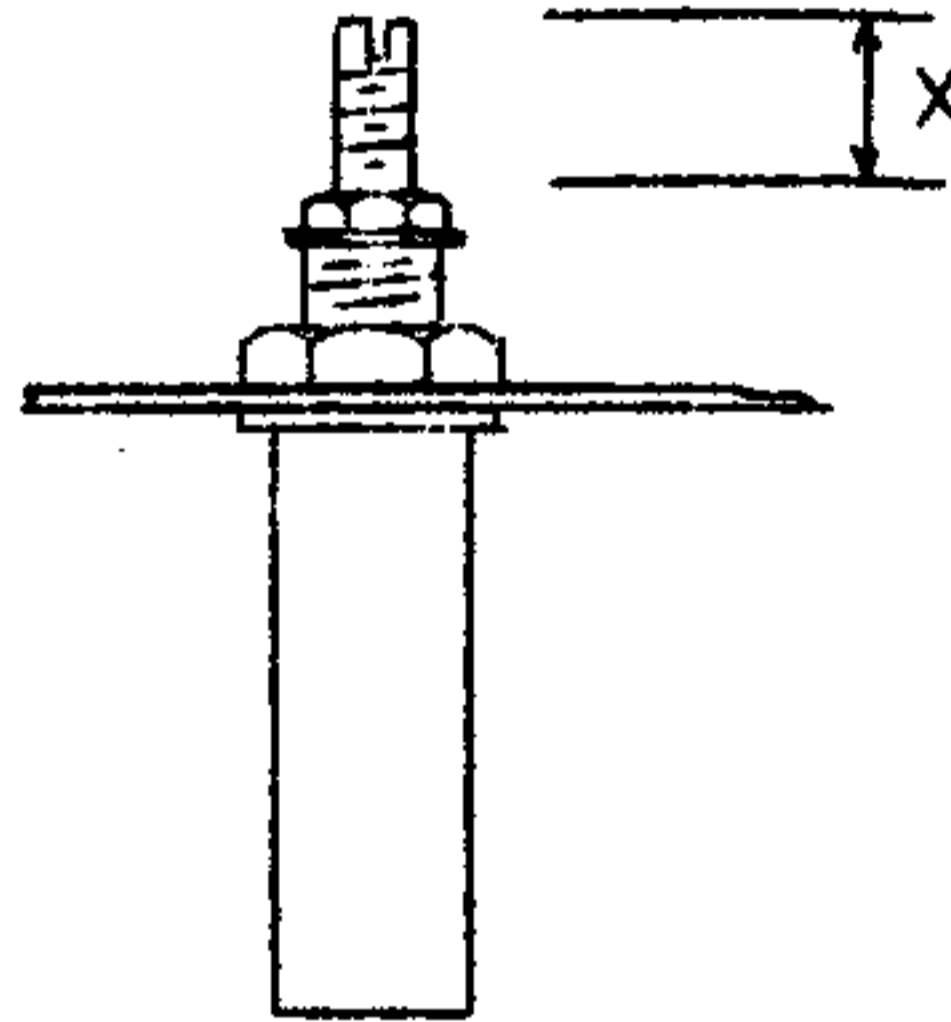
Check for "B" shorts with an ohmmeter before power is applied.

Before plate voltage is applied, the 6AG7 grid bias should be checked. This should be done by removing the 5U4G rectifier tube. With the relay in the normal position, the reading at Pin #4 of the 6AG7 should be minus 100V DC plus or minus 10% measured with a VTVM. When the relay is operated by hand, there should be approximately minus 11V DC at this point. After the 5U4G is inserted, the operating bias should be minus 10.5V DC obtained from the voltage divider R47 and R48.

Insert the 5U4G rectifier and apply power. Check "B" voltages in accordance with the chart on the circuit diagram, with the OPERATION switch on MANUAL.

Preliminary rough alignment of the slug-tuned coils. If a grid dipper is available the coils should be aligned to the frequencies indicated on the Alignment Data Chart (Fig. B). If no dipper is available they should be set as follows BEFORE POWER IS APPLIED:

No. 1	Red	1/2"
No. 2	Green	3/16"
No. 3	White	1/2"
No. 4	Black	1/2"
No. 5	Blue	1/2"
No. 6	Orange	5/16"
No. 7	Yellow	5/16"
No. 8	Blue	3/8" (Not used on Model 10B)



The Audio Balance controls should be set in approximately mid-position.

During alignment, a slight amount of tension should be kept on the adjusting screws by proper adjustment of the locking nut to prevent erratic operation.

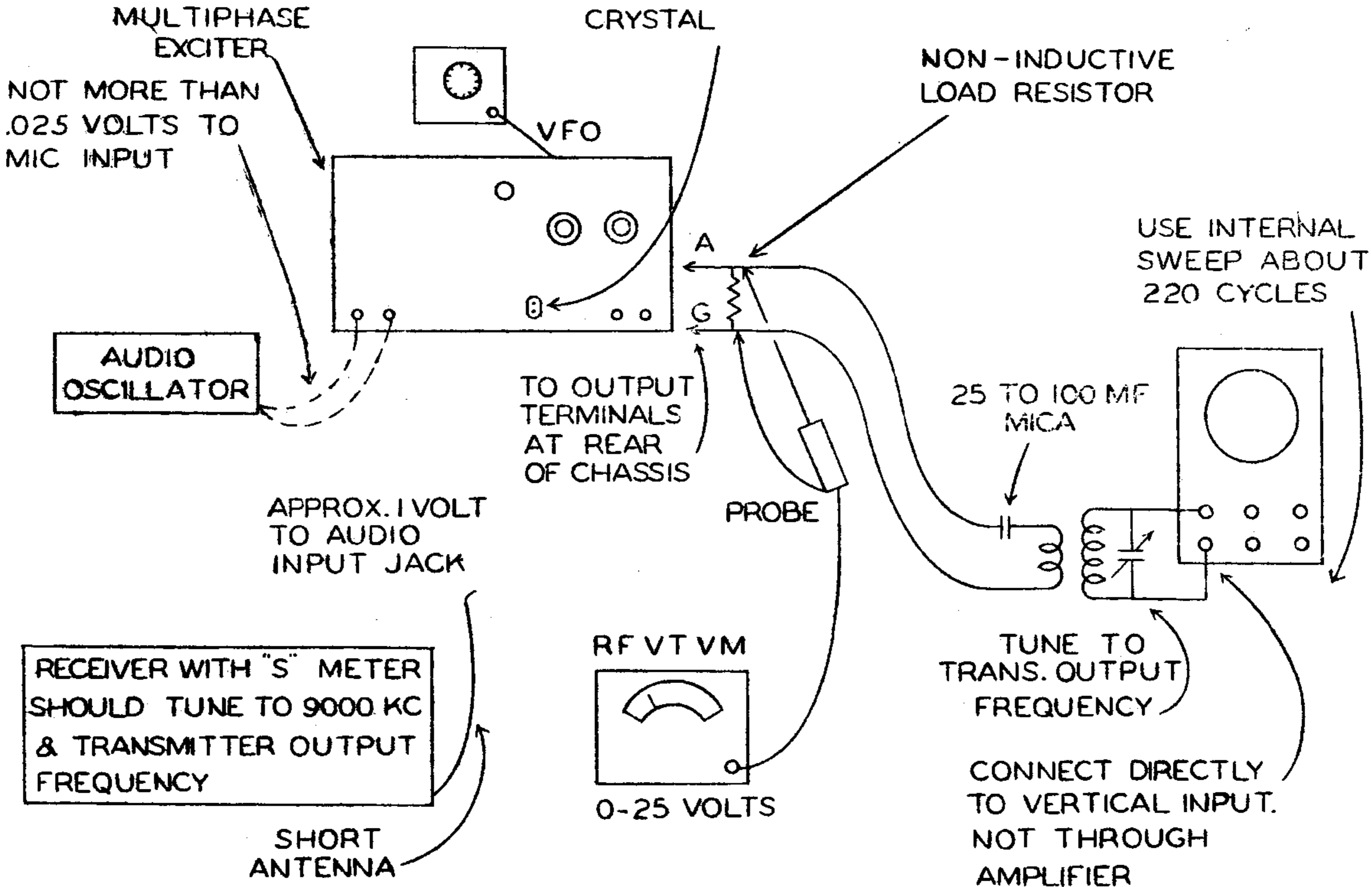


FIG A

## 10B GENERAL ALIGNMENT PROCEDURE

Plug in the proper coils.

The front panel controls should be set as follows:

OPERATION SWITCH, in MANUAL  
SPEECH LEVEL, completely counter-clockwise  
MODULATION SWITCH, Sideband 1  
CARRIER NULL A, middle position  
CARRIER NULL B, 80% clockwise  
CARRIER, completely counter-clockwise  
VFO-XTAL SWITCH, in correct position  
TUNING CONTROLS, to output frequency

Refer to Fig. A. Connect a non-inductive load resistor of about 50 ohms, 10 watts to the Exciter output terminals. This resistive load may consist of several one or two watt composition resistors in parallel or series-parallel to provide the proper resistance and dissipation.

Connect an oscilloscope, lightly coupled, to the RF output.

If available, a RF vacuum tube voltmeter with a 25 to 50 volt RMS range should be connected to the RF output.

In Exciters that are constructed from kits and are being aligned for the first time, it is recommended that the initial 9 MC alignment of L1 through L5 be made with the red lead removed from the center arm of CARRIER NULL pot A (R23). This will prevent interlocking of the adjustments. After peaking these circuits twice, connect the red wire back to the pot. This procedure will not be required on units previously aligned.

Tune the crystal oscillator plate circuit (L1) until the signal is heard in a receiver tuned to 9 MC.

At this time it should be possible to hear a signal on the output frequency with the receiver operating near full sensitivity (AVC on) provided the VFO or frequency conversion crystal is operating. The receiver should be coupled lightly to the Exciter RF output terminal. Refer to Fig. B. Adjust L2, L3, L4, L5 and the MIXER AND AMPLIFIER tuning capacitors for maximum output. As maximum output is reached, it will become necessary to reduce the carrier output by adjusting CARRIER NULL pot B. Now adjust CARRIER NULL knobs for minimum carrier output. If you have removed the red lead from R23, it must be connected at this time. Next, unbalance CARRIER NULL pot B a slight amount and peak L2 through L5 again. Now adjust both CARRIER NULL controls for minimum output. Minimum output will not necessarily occur at the center of the rotation due to stray capacities, etc.

When L2 (green) is mounted approximately 3/4" (center to center) away from L1 (red), the RF voltage from the arm of each CARRIER NULL pot to ground will be equal when the carrier is balanced out. If desired, this may be checked with an RF vacuum tube voltmeter.

#### ADJUSTMENT OF 15 MC TRAP L6 (ORANGE)

When operating on the 20 meter band, this trap circuit will reduce radiation of the third harmonic generated in the mixer by the heterodyning crystal or VFO operating in the vicinity of 5 MC. With the 20 meter coils plugged in, the SPEECH LEVEL turned off, carrier balanced out or 9 MC master oscillator tube removed, and the OPERATION switch in the MANUAL position, RF output will be found when the Mixer and Amplifier tuning controls are resonated at approximately 15 MC. Adjust slug in trap L6 for minimum 15 MC output.

#### ADJUSTMENT OF L7 (YELLOW) TRAP

This trap is tuned to 13 MC or 15 MC, depending upon the age of the unit and whether Modification "C" has been made. Modification "C" adds a 180 ohm resistor, bypassed with a .005 capacitor, to the cathode of the 6BA7 Mixer. The Yellow trap coil is removed to the Mixer plate circuit and is tuned to 13 MC. For details refer to Change Notice #M169. If the change has been made, adjust L7 to 13 MC by any one of the three following methods:

1. Use a grid dipper.
2. If no dipper is available, a 6.5MC crystal can be used in the socket on the front panel, with the VFO-XTAL switch in the XTAL position. With the 20 meter coils plugged in, OPERATION switch in MANUAL, carrier balanced out (or 9 MC master oscillator tube removed) and the TUNING controls peaked for maximum 13 MC output, L7 should be adjusted for minimum 13 MC signal.
3. The receiver S meter can also be used as an indicator. It should be tuned to the 13 MC signal, or to 26 MC for Collins receivers. With this method the 9 MC master oscillator tube must be operating with full carrier insertion and 5 MC injection from a crystal or VFO.

The VFO output should be advanced to the point where additional coupling will not increase the Exciter output. Over-injection to the Mixer can cause unnecessary spurious radiation.

#### SIDEBAND SUPPRESSION ADJUSTMENT

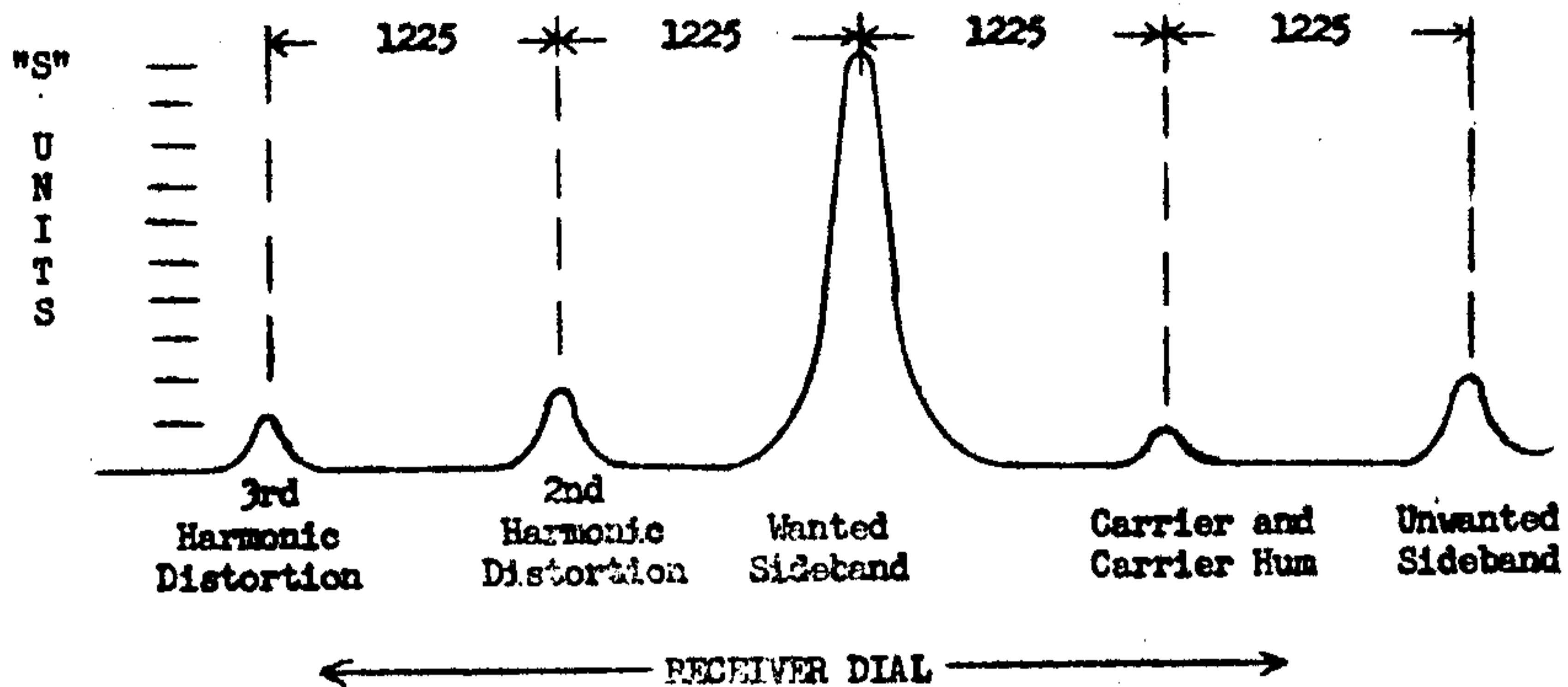
Before proceeding with the Single Sideband adjustments, it is recommended that the operator familiarize himself with the illustrations of the oscilloscope patterns shown in this manual. The ultimate objective in the single sideband alignment is to obtain a pattern containing a minimum amount of ripple when a pure sine wave is applied to the microphone input. These adjustments should preferably be made at less than full output, to prevent amplifier overloading which might "wipe off" the small modulation ripple.

A low distortion audio oscillator (less than 1%) set to approx. 1,225 cycles, cycles, with an output level between .005 and .05 volts should be connected to the microphone jack. CAUTION: If a voltage in excess of .075 is applied to the Mic. input the speech amplifier will overload and it will be impossible to adjust the Exciter properly.

Adjust both CARRIER NULL pots for minimum carrier output. Advance the SPEECH LEVEL control until about half of maximum output is obtained on the oscilloscope. At this point a fair amount of ripple will be observed on the output wave. Adjust the Audio Balance controls for minimum ripple. Now switch from Sideband 1 to Sideband 2 and observe the ripple in each. If the amount of ripple is not equal, vary the adjustment slightly on L2 until the displays are identical in either sideband position. However, each time L2 is tuned, it will be necessary to rebalance both carrier null controls for minimum. It will also be necessary to readjust the Audio Balance controls again. Now loosen the set screws on the CARRIER NULL knobs and set the pointers on the lines when carrier is balanced out.

It is possible to make these sideband suppression adjustments using a receiver in place of an oscilloscope. Turn the AVC on, the BFO off, and remove the antenna to prevent receiver overload. Now tune in the signal. Minimum modulation heard in the loudspeaker corresponds to minimum modulation of the R.F. envelope. Adjust as described in the previous paragraph.

After the alignment has been completed, an analysis of the emitted wave may be made if the receiver has a sharp crystal filter and a calibrated "S" meter. The following illustration is an example of the "S" meter levels as the receiver dial is tuned through the signal with a 1225 cycle tone input to the Exciter.



It is possible to obtain an almost ripple-free pattern in one sideband at the expense of degradation of the other. Under this condition the suppression of the better sideband will be about 45 db., while the other is only 35 db. down. The object is to have them both equal, approximately 40 db. down.

If a deep modulation ripple is noticed on both sideband positions (with carrier balanced out), one side of the audio phase shift circuit is probably operating improperly. Check the Audio Balance controls adjustment, the 12AT7 (B) modulator tube, sideband switching circuit, or the phase shift network.

After the alignment has been completed, be sure to tighten the #6 lock-nuts on the iron core slugs.



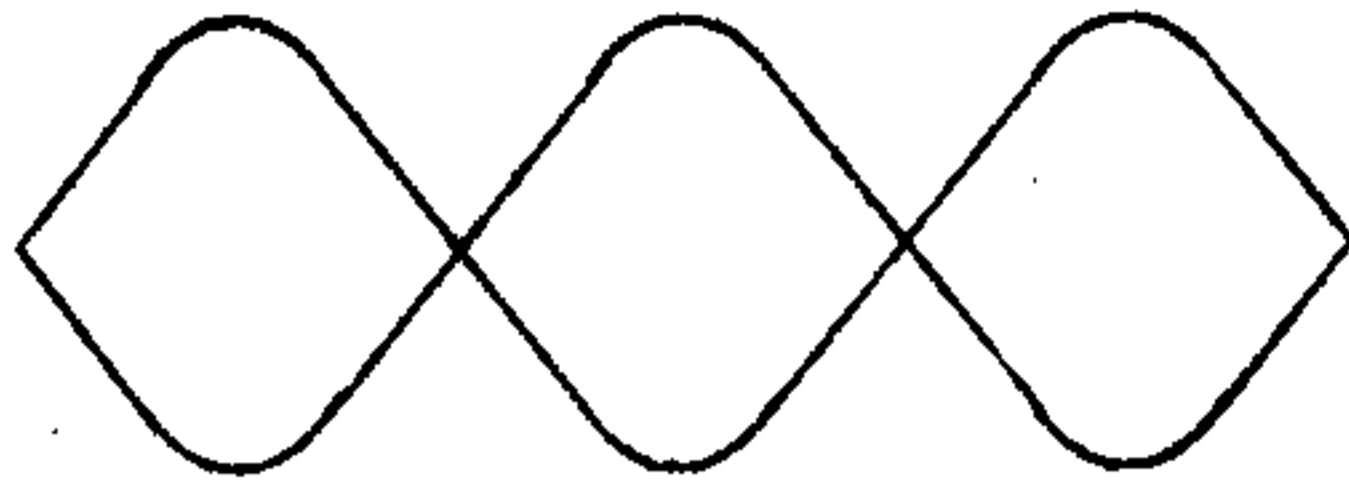
Good SSB Signal  
Pure Tone Input



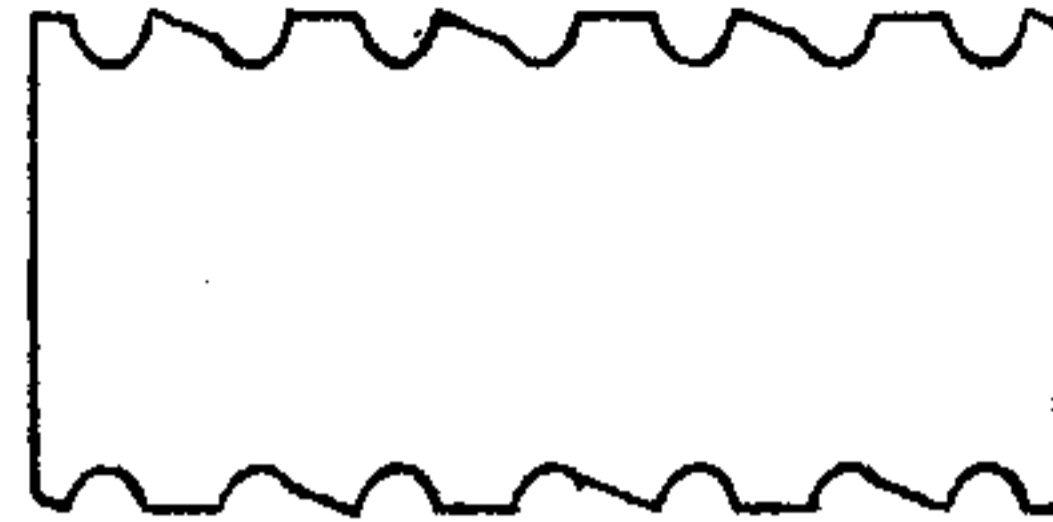
- SSB Signal, Tone Input
1. Carrier leakage
  2. Improper RF phasing (L2)
  3. Improper AF balance (R18-15A)
  4. Balanced Mod detuned (K3)
  5. Poor sideband rejection

108-9 MX  
M69A

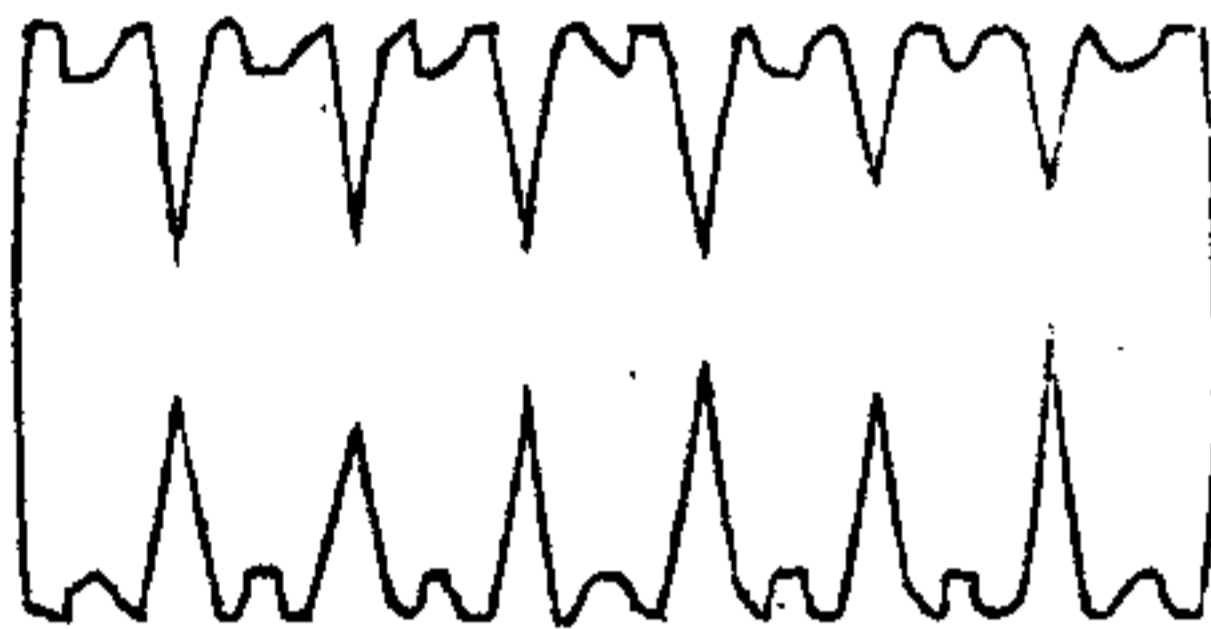
5-26-55  
Alignment 10-204  
Printed in USA



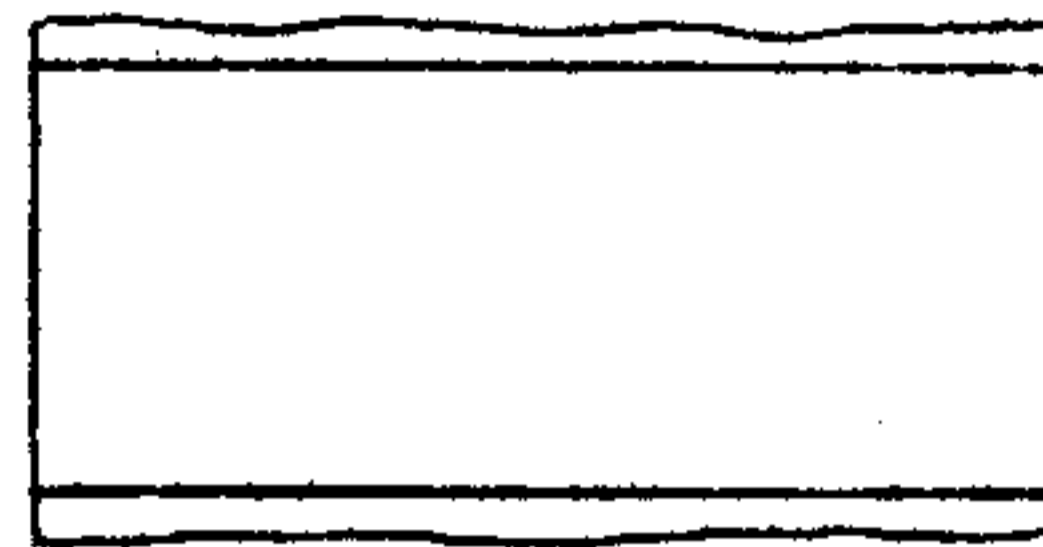
SSB SIGNAL, TONE INPUT  
WITH PROPER CARRIER INSERTED  
100% MODULATED



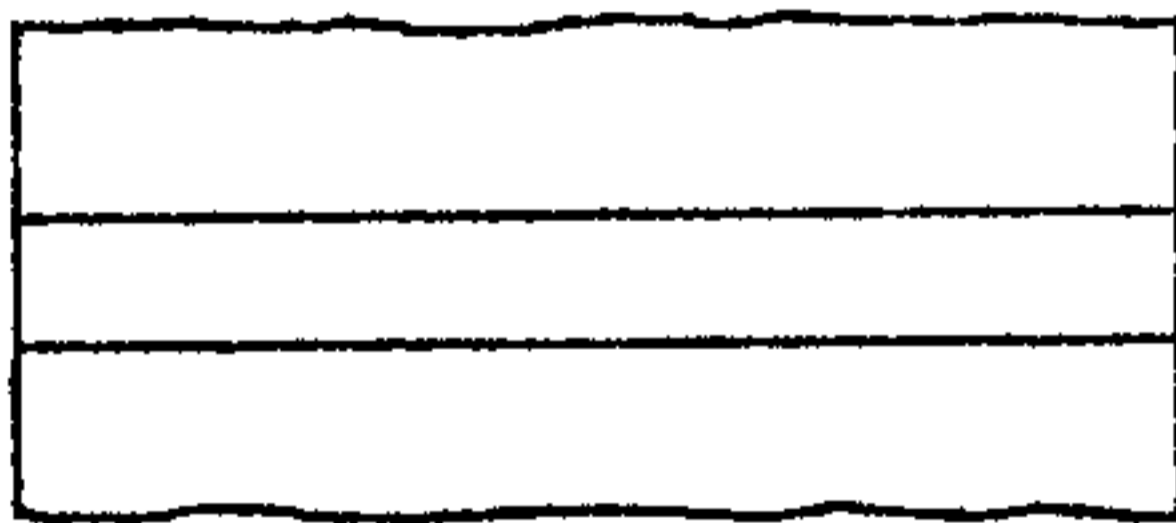
SSB SIGNAL, TONE INPUT  
AUDIO DISTORTION  
EXCESSIVE AUDIO INPUT



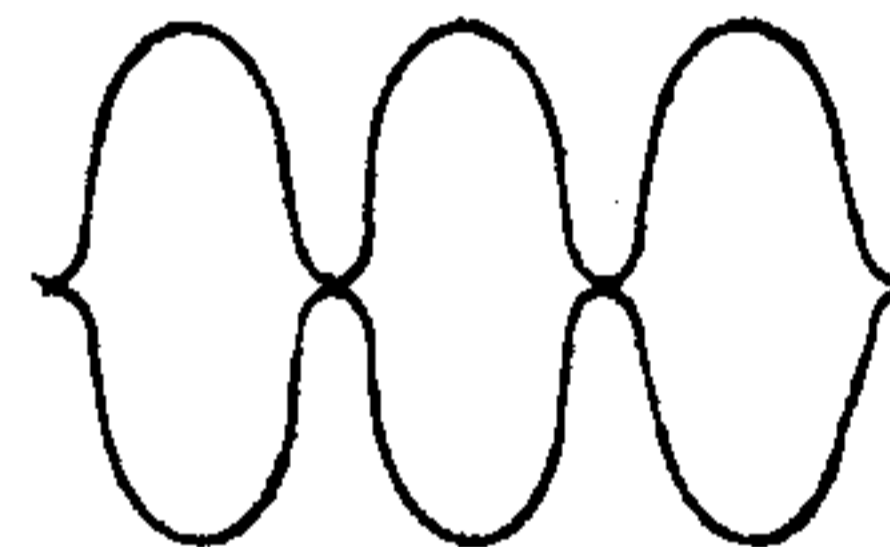
SSB SIGNAL, TONE INPUT  
INSUFFICIENT 9600 kc. XTAL  
OSCILLATOR OUTPUT



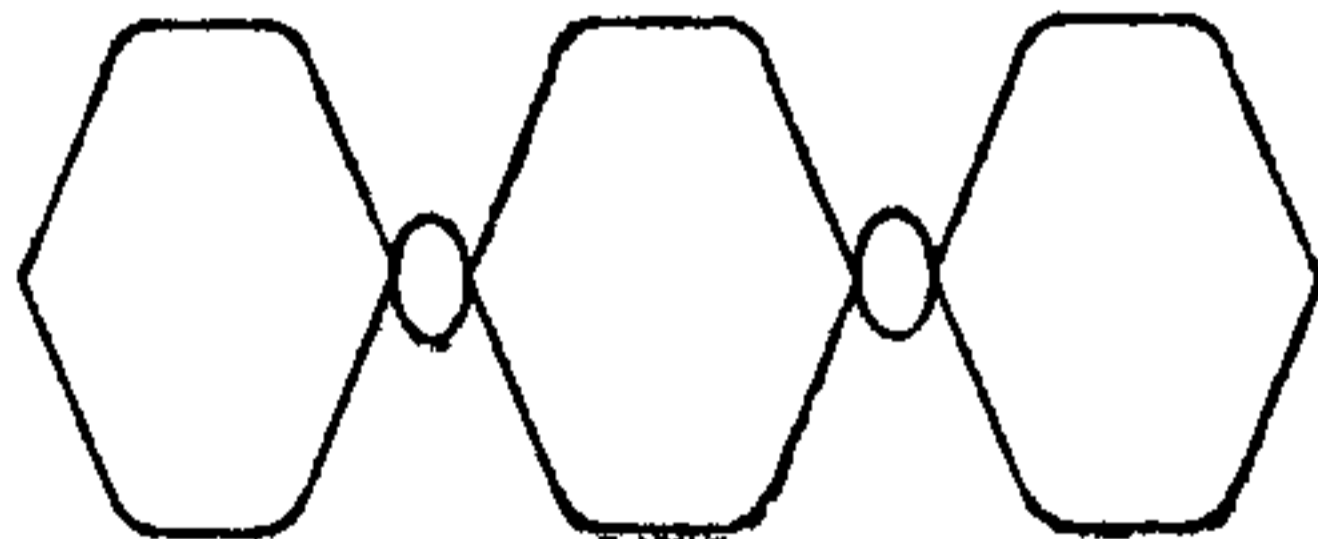
GOOD SSB SIGNAL, TONE  
INPUT WITH SMALL PER-  
CENT OF SPURIOUS RADIA-  
TION (RF)



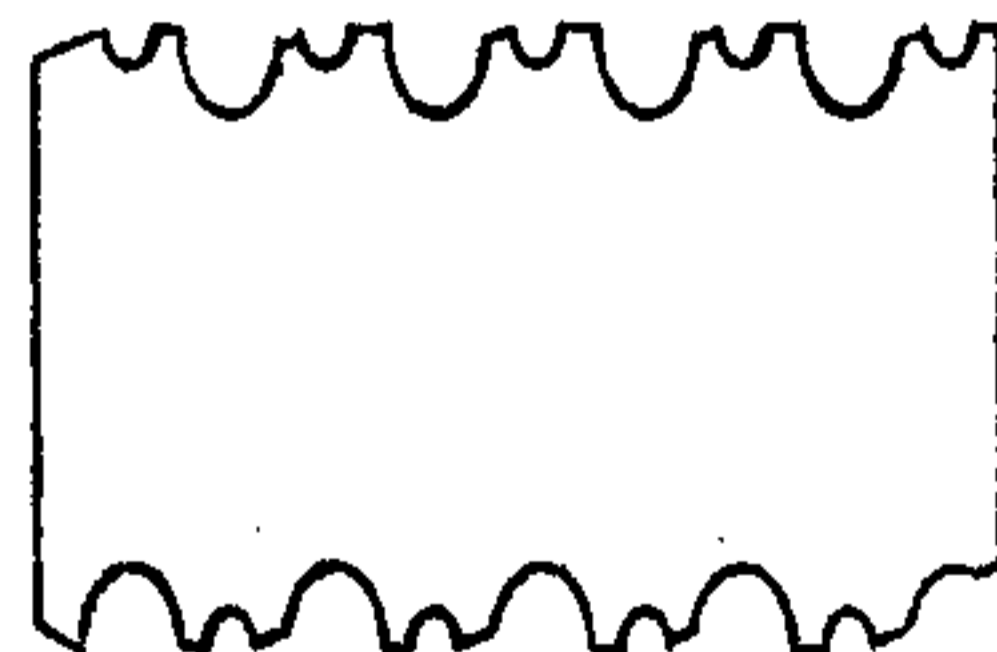
GOOD SSB SIGNAL, TONE INPUT  
WITH LARGE PERCENT OF  
SPURIOUS RF RADIATION



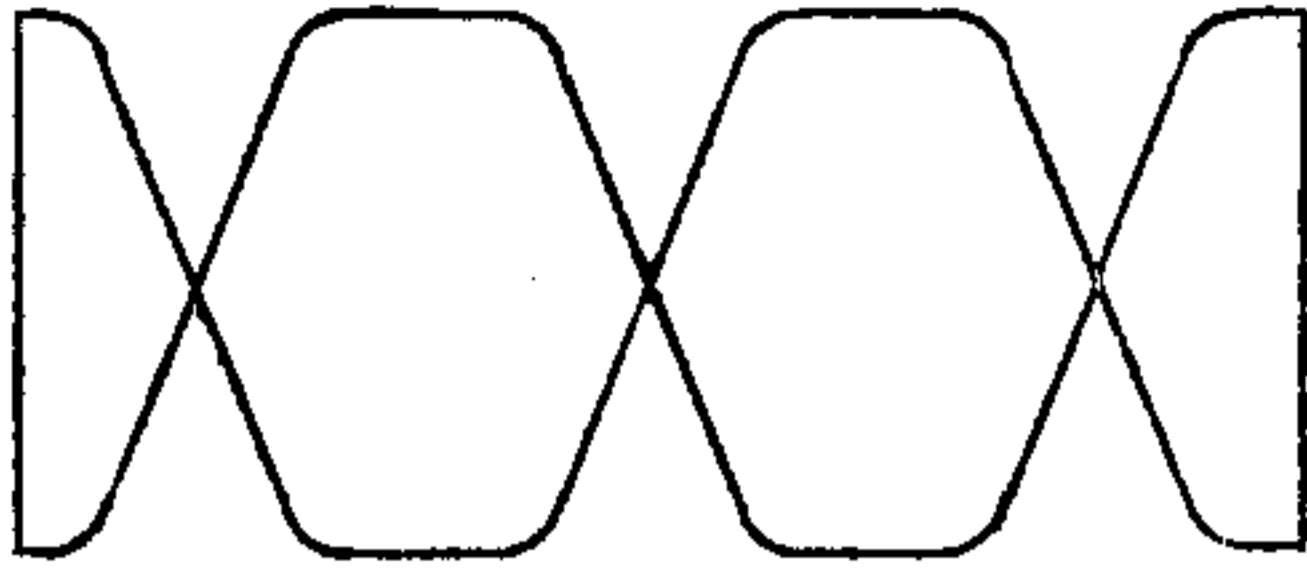
SSB WITH CARRIER, TONE  
INPUT IMPROPER AMPLIFIER  
BIAS



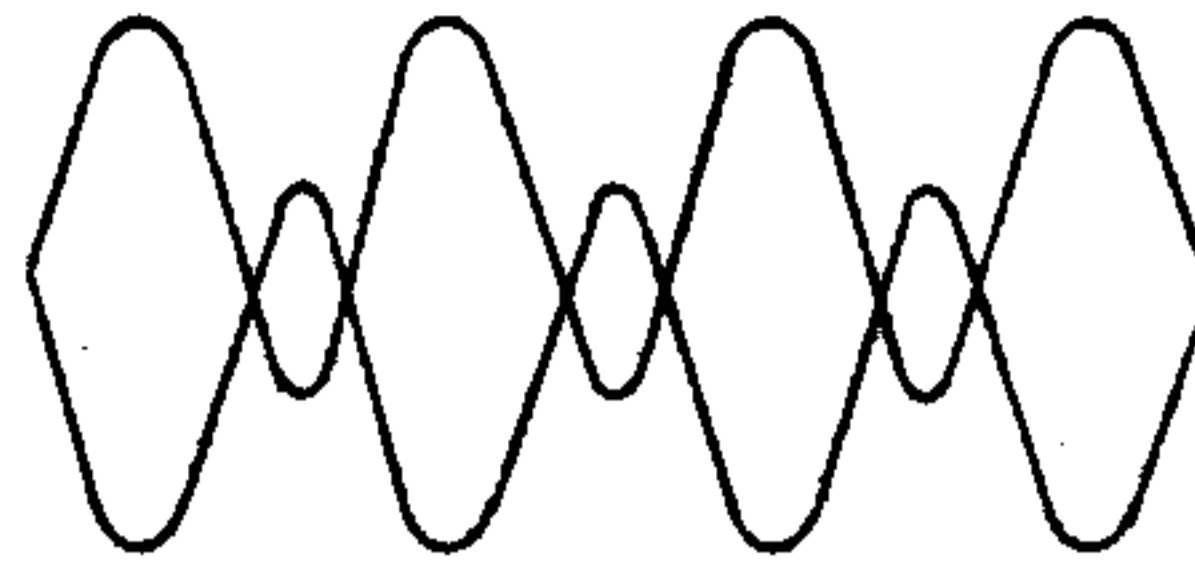
DOUBLE SIDEBAND WITH CARRIER  
EXCESSIVE TONE MODULATION  
WITH AUDIO PEAKS SQUARING OFF



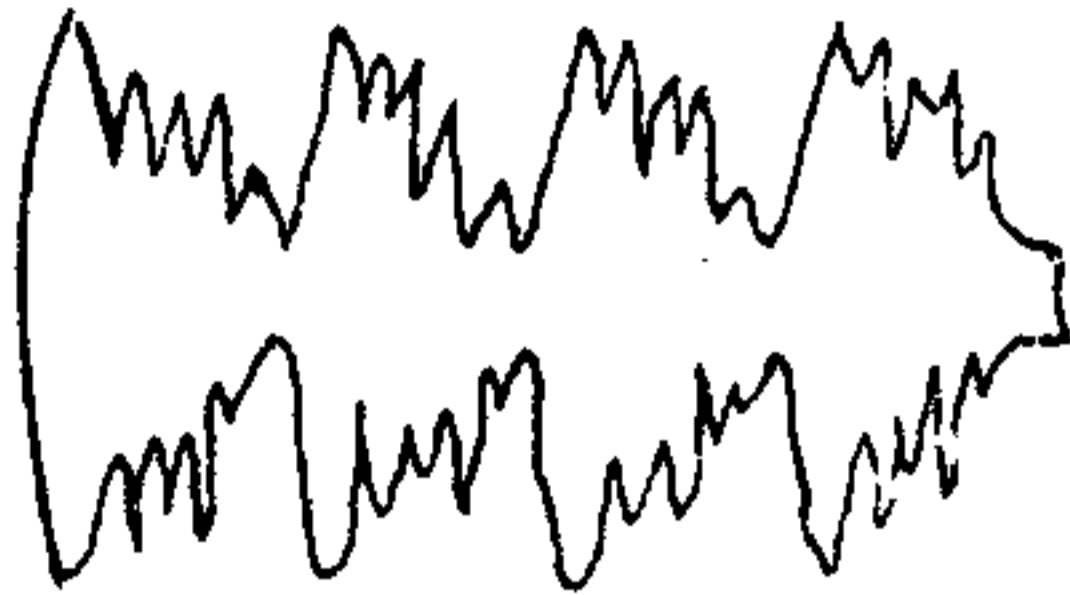
SSB SIGNAL, TONE INPUT  
BALANCED MOD DETUNED (L3)



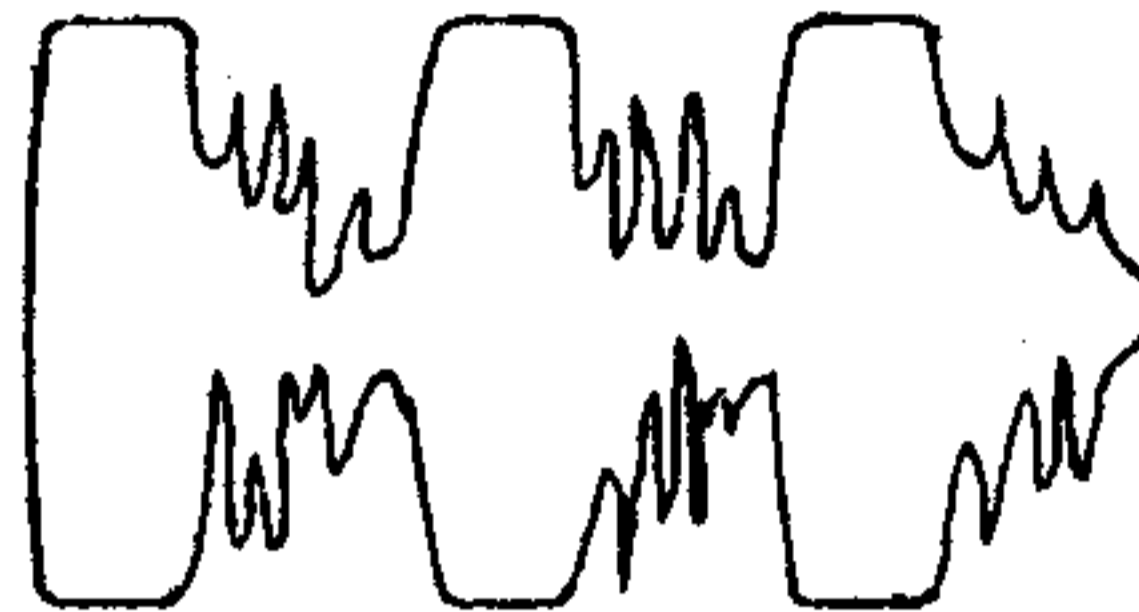
SSB WITH CARRIER, TONE INPUT.  
 1. EXCESSIVE AUDIO  
 2. INSUFFICIENT ANT. LOADING



DSRC DOUBLE SIDEBAND REDUCED CARRIER OBTAINED BY REDUCING CARRIER LEVEL AND INCREASING AUDIO INPUT LEVEL.



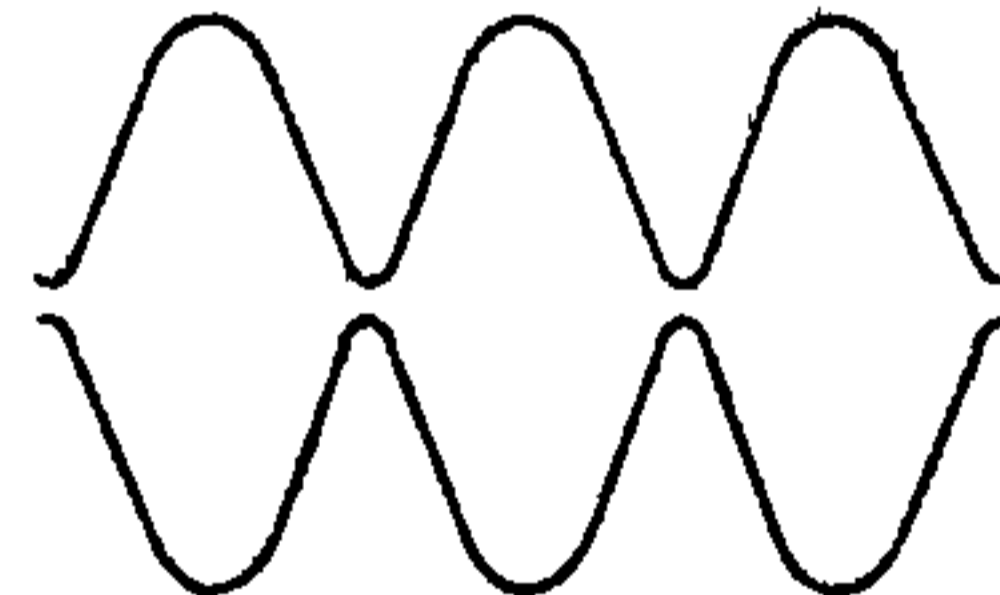
GOOD SSB SIGNAL VOICE INPUT



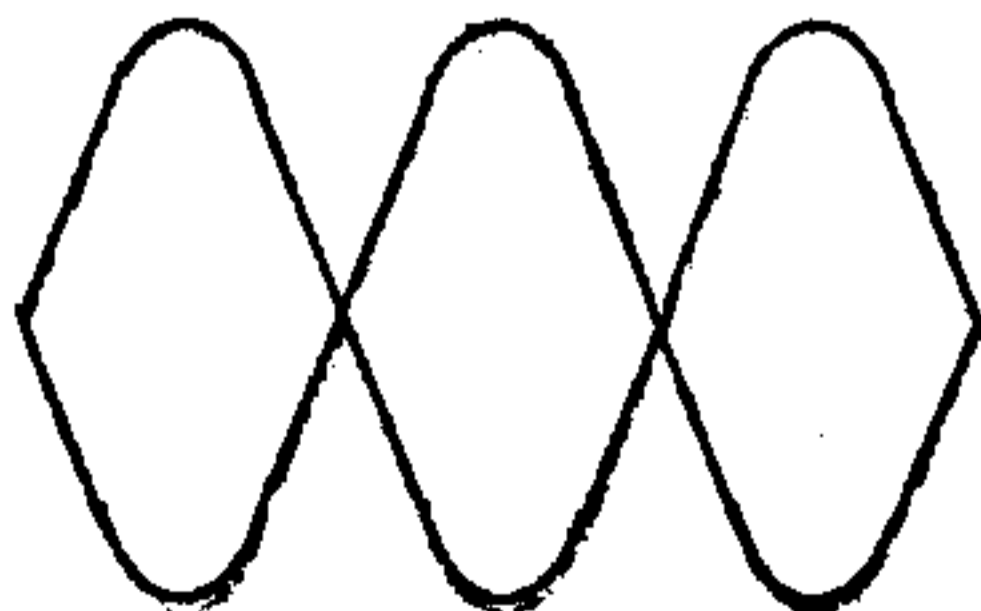
SSB SIGNAL, VOICE INPUT SQUARING AUDIO PEAKS EXCESSIVE SPEECH GAIN



SSB SIGNAL, TONE INPUT AMPLIFIER OVERLOADING DUE TO EXCESSIVE AF OR RF DRIVE. NOTE THE LACK OF SMALL RIPPLE ON ENVELOPE



DOUBLE SIDEBAND AM WITH CARRIER 100% MODULATED



TWO TONE LINEARITY TEST OBTAINED WITH SINGLE TONE INPUT, WITH CARRIER BALANCED OUT ON AM

FOR ADDITIONAL REFERENCE THE FOLLOWING IS RECOMMENDED:

SUGAR COATED LINEAR AMPLIFIER THEORY - OCTOBER '51 QST

HOW TO TEST AND ALIGN A LINEAR AMPLIFIER - MAY '52 QST

R18



R18 AUDIO BALANCE

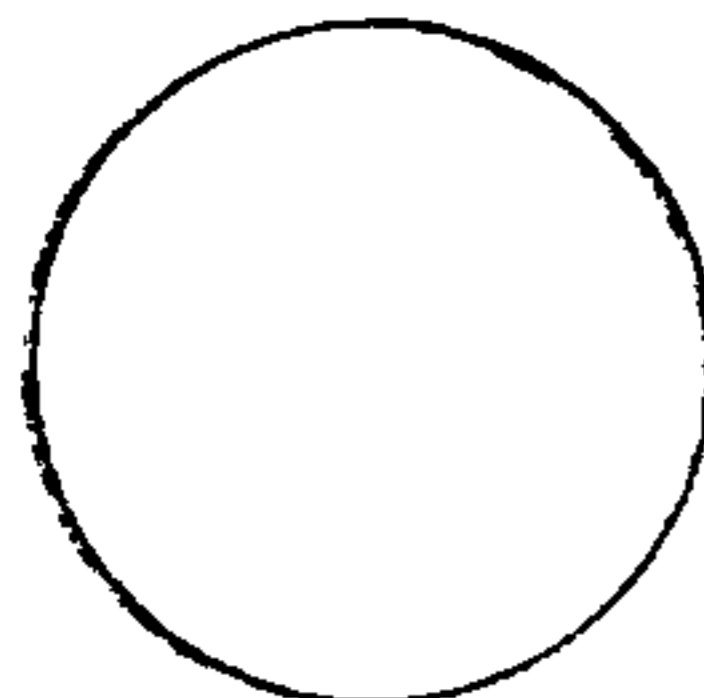
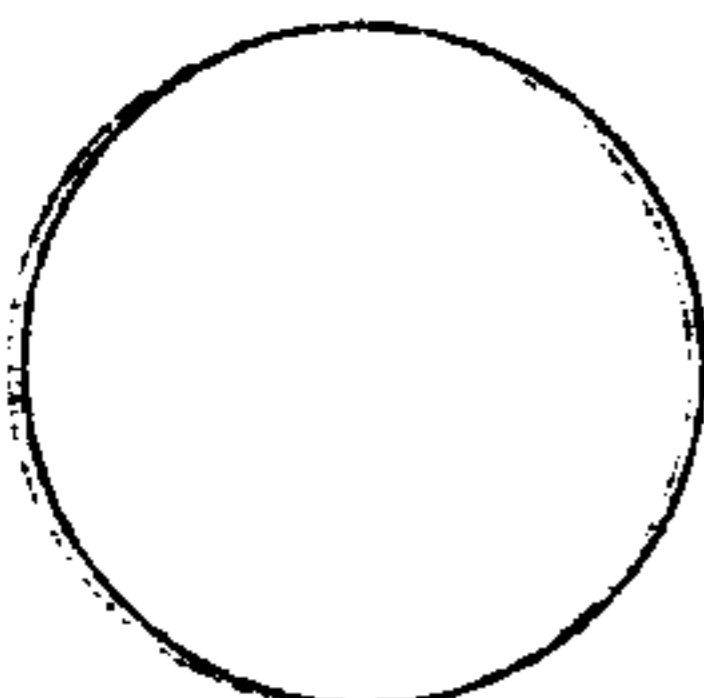
Adjust for minimum unwanted sideband ripple with 1225 cycle tone input.

R15A



R15A AUDIO BALANCE

Adjust same as R18



L1

1. RED XTAL OSC.  
9000 KC

Peak for max output with CARRIER NULL B nearly fully clockwise.



L2

2. GREEN 90° RF PHASE SHIFT  
9000 KC

Peak for max output with CARRIER NULL A control adjusted for minimum, and CARRIER NULL B control unbalanced to give nearly full output. Afterward adjust for equal sideband suppression with 1225 cycle tone.



L5

5. BLUE 9000 KC FILTER

Adjust for max output with CARRIER NULL B unbalanced to give nearly full output.



L4

4. BLACK 9000 KC FILTER

Adjust for max output with CARRIER NULL B unbalanced to give nearly full output.



L3

3. WHITE BALANCED MODULATOR  
9000 KC

Adjust for max output with CARRIER NULL B unbalanced to give nearly full output.



L6

6. ORANGE 15 MC TRAP

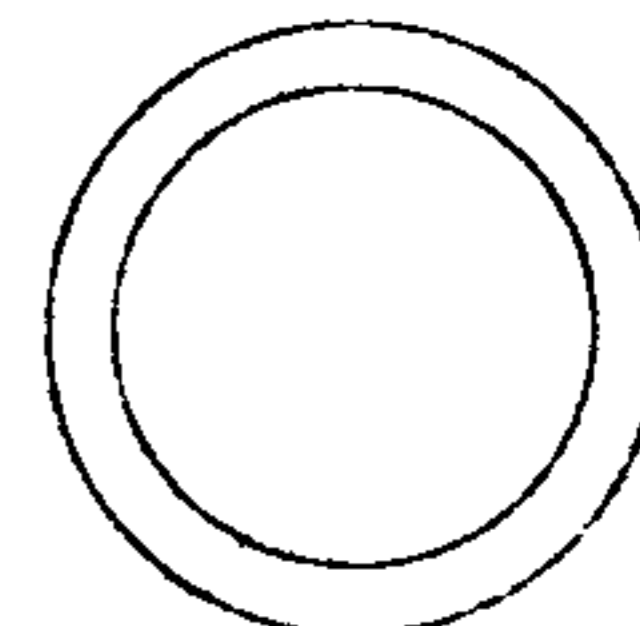
With 20 meter coils plugged in, 5 MC VFO or Xtal injection, and carrier balanced out, adjust for minimum 15 MC output.

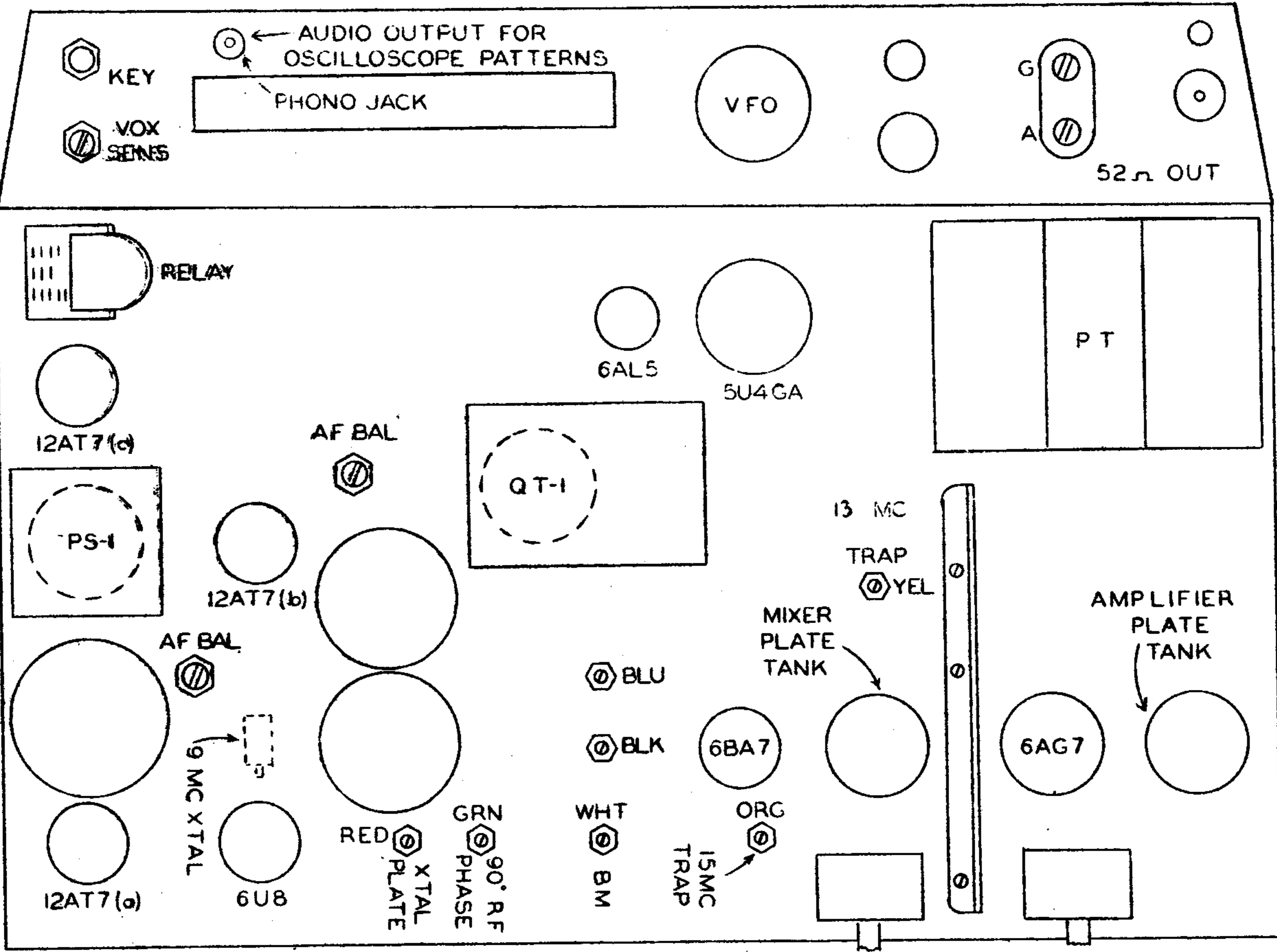


L7

7. YELLOW 13 MC TRAP

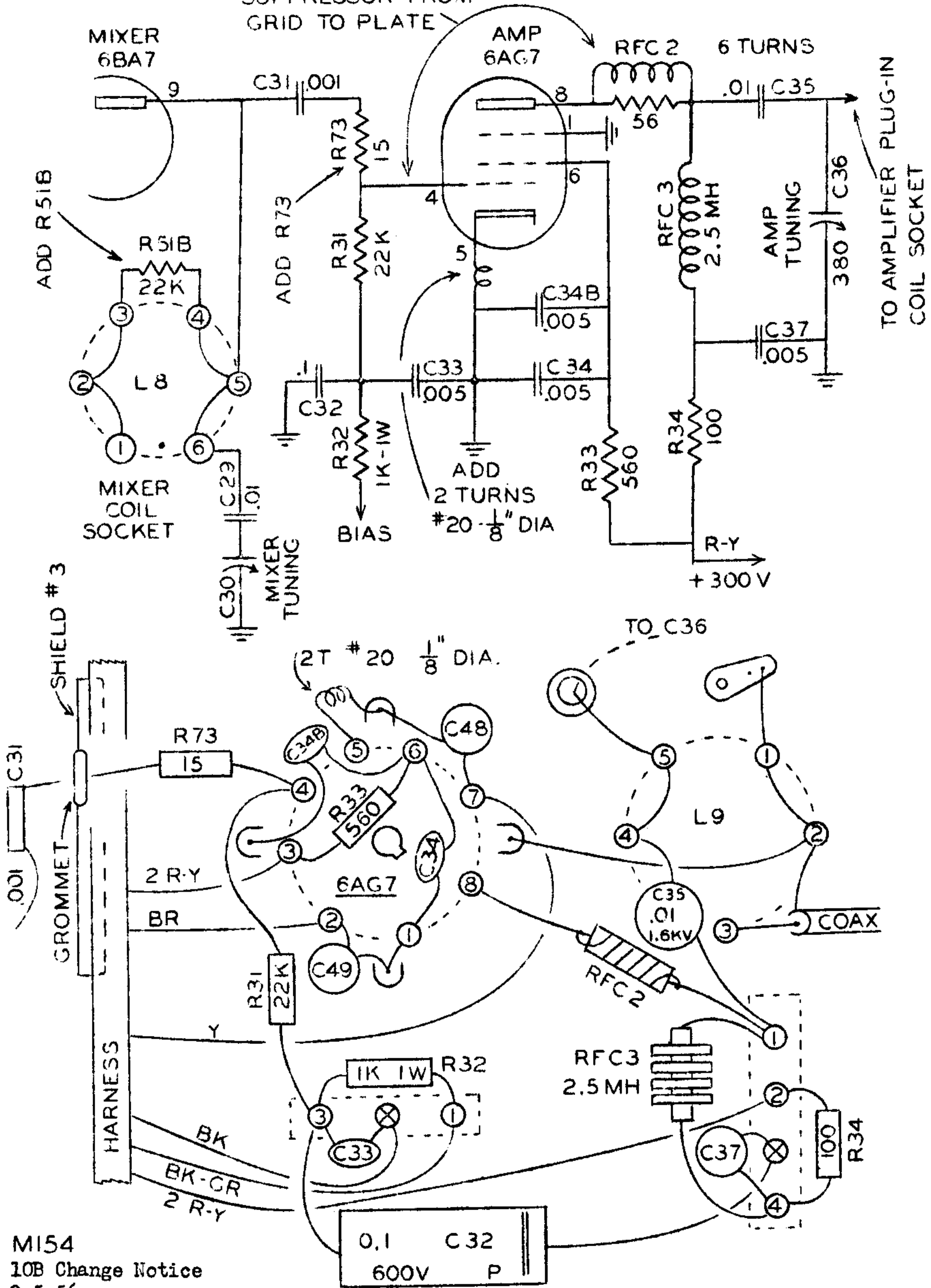
With 20 meter coils plugged in, 5 MC VFO or Xtal injection, and full carrier inserted, adjust for minimum 13 MC output.





CENTRAL ELECTRONICS, INC.

MOVE PARASITIC  
SUPPRESSOR FROM  
GRID TO PLATE



MI54  
10B Change Notice  
9-5-56

CENTAL ELECTRONICS, INC.

CENTRAL ELECTRONICS, INC.

CHANGE NOTICE

10B - 20A

KEYING CIRCUIT CHANGE

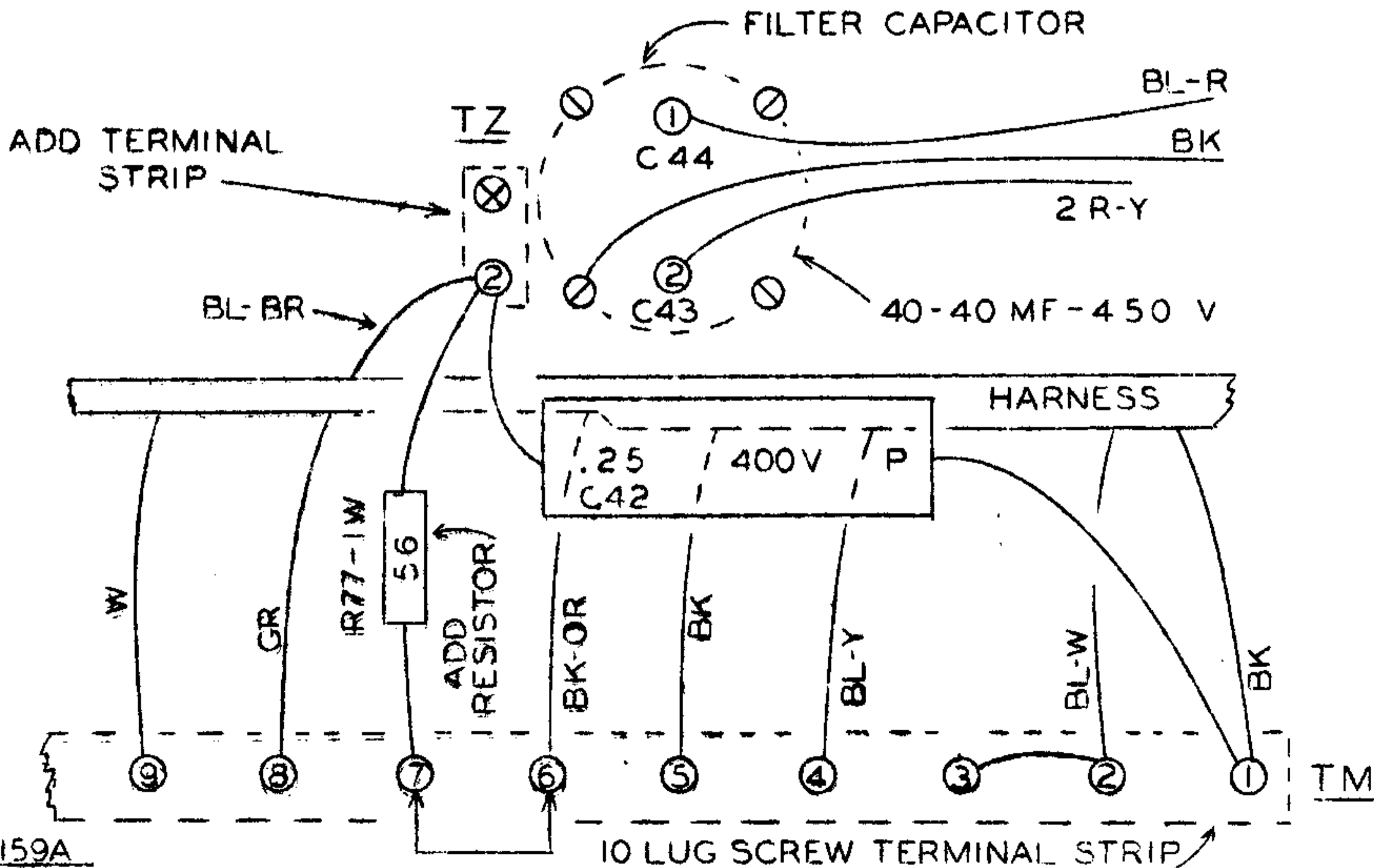
Mount a two lug terminal strip TZ together with the filter capacitor plate as shown.

The Blue-Brown lead from harness goes to terminal strip TZ lug #2 (NS).

A 56 ohm 1 watt resistor, R77, from two lug terminal strip lug TZ #2 (NS) to lug #7 of 10 lug rear screw terminal strip TM. Capacitor C42 (.25 mfd.) goes to terminal #2 of TZ two lug strip (S).

NOTE: On units below serial No. 7300, C42 was connected to #7 of 10 lug rear terminal strip TM.

The grounded terminal #1 of TZ is not wired.



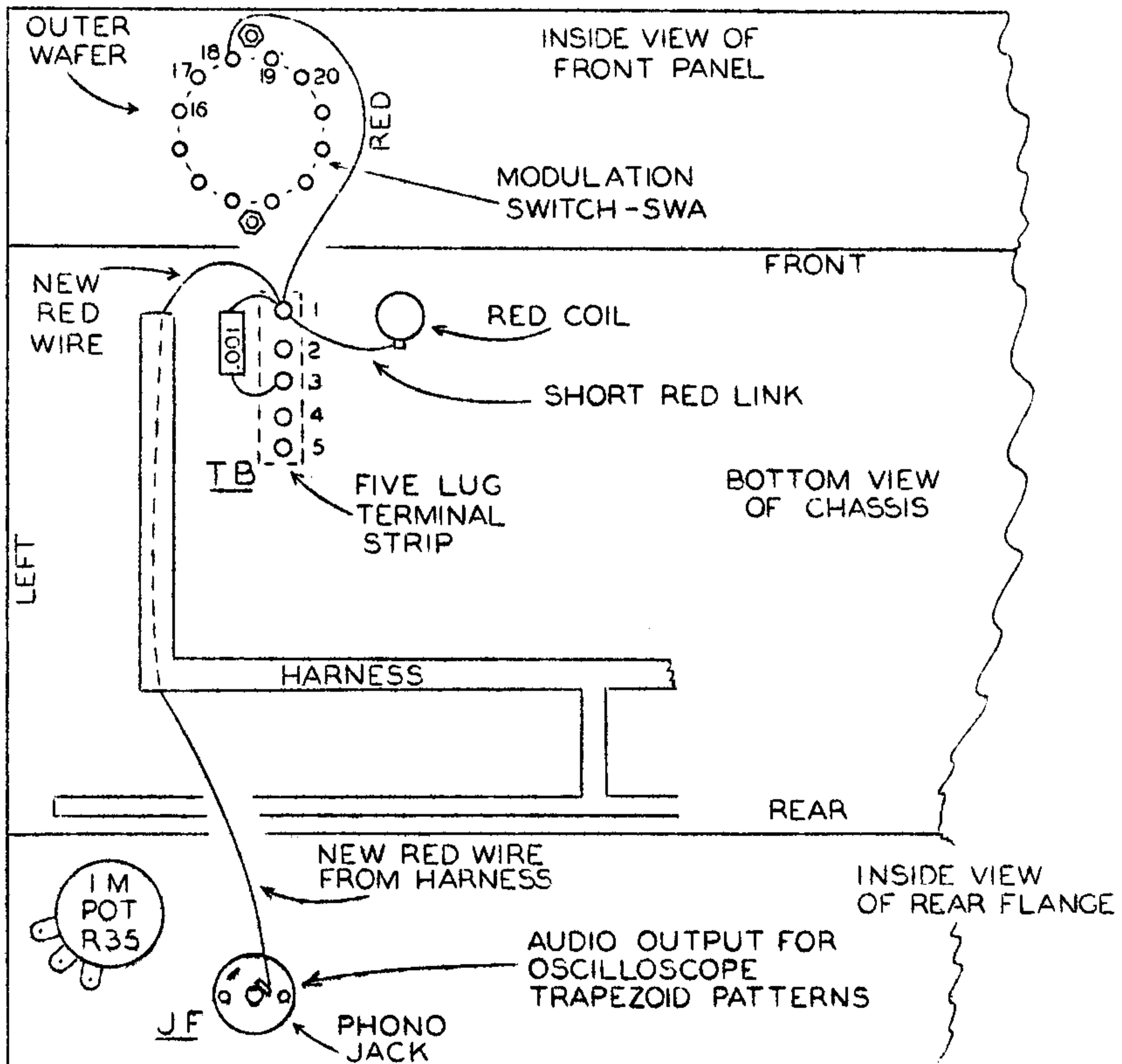
# 10B-20A CHANGE NOTICE

## AUDIO CONNECTION FOR OSCILLOSCOPE

A phono jack has been added to the rear of the chassis, which connects to the output of one of the modulators. This jack can be used to supply the audio voltage to an oscilloscope, such as the MM-1, for obtaining trapezoid patterns.

Mount the phono connector on the rear of the chassis with #6 hardware, as shown below. The red wire from the harness connects to terminal strip TB, Term. #1, near the front of the chassis. Solder the other end of this lead to the phono jack at the rear of the chassis.

This red wire is included in the harness in all Exciters which have the letter "C" following the serial number. On earlier Exciters the holes must be drilled for the connector and the red wire must be added.

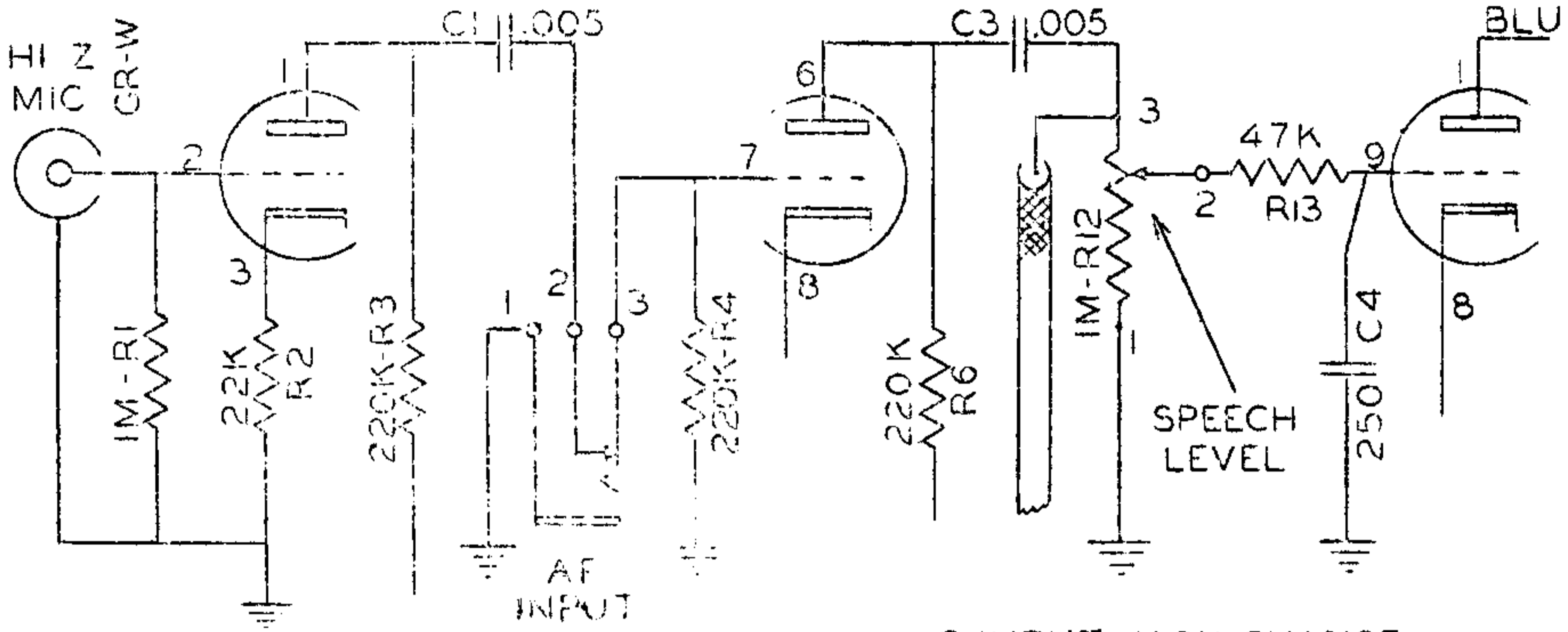


CENTRAL ELECTRONICS, INC.

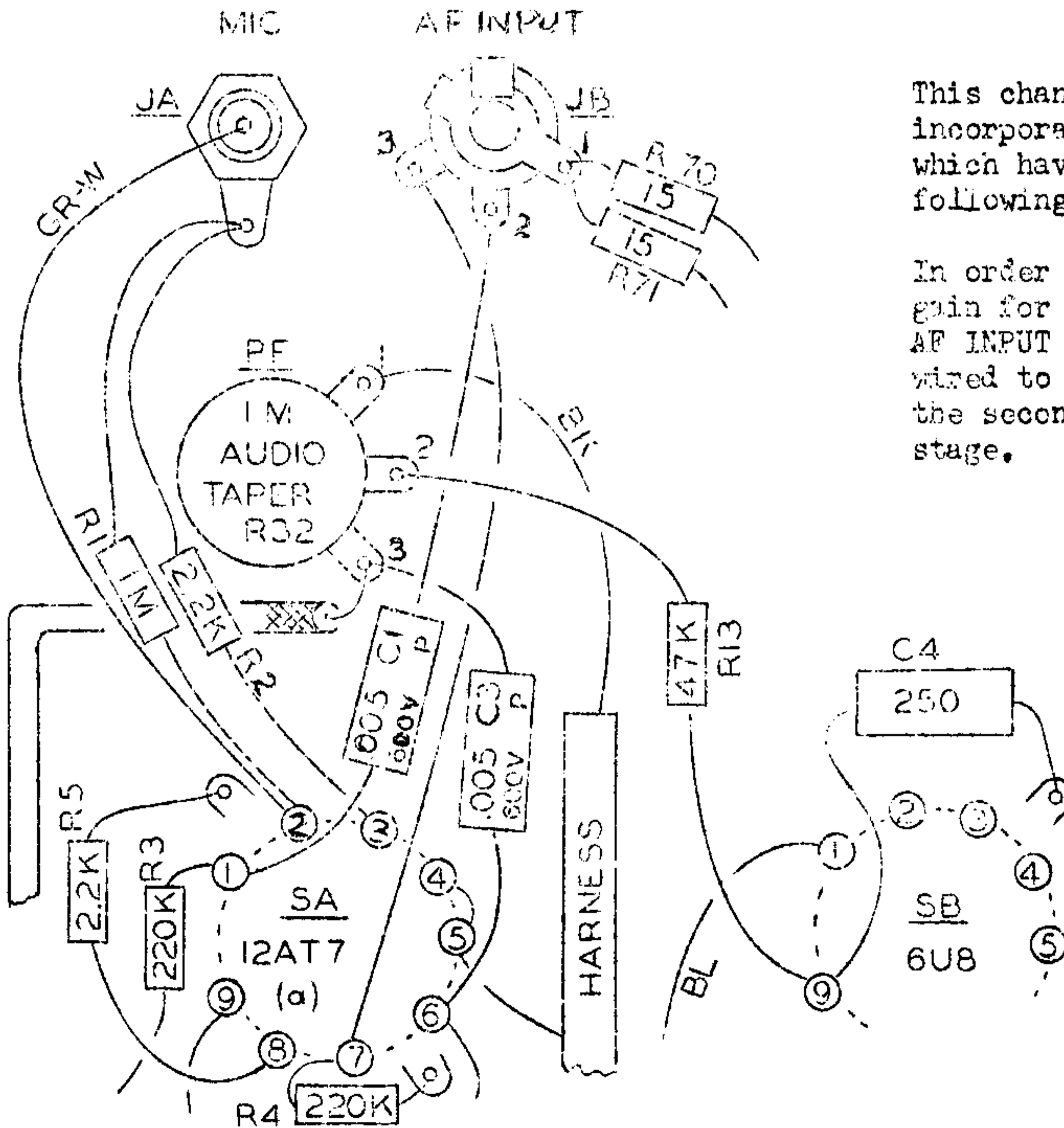
10B-20A CHANGE NOTICE - MODIFICATION "C"

SPEECH PRE-AMP  
12AT7 (a)

AF  
DRIVER  
1/2 6U8



AF INPUT JACK CHANGE

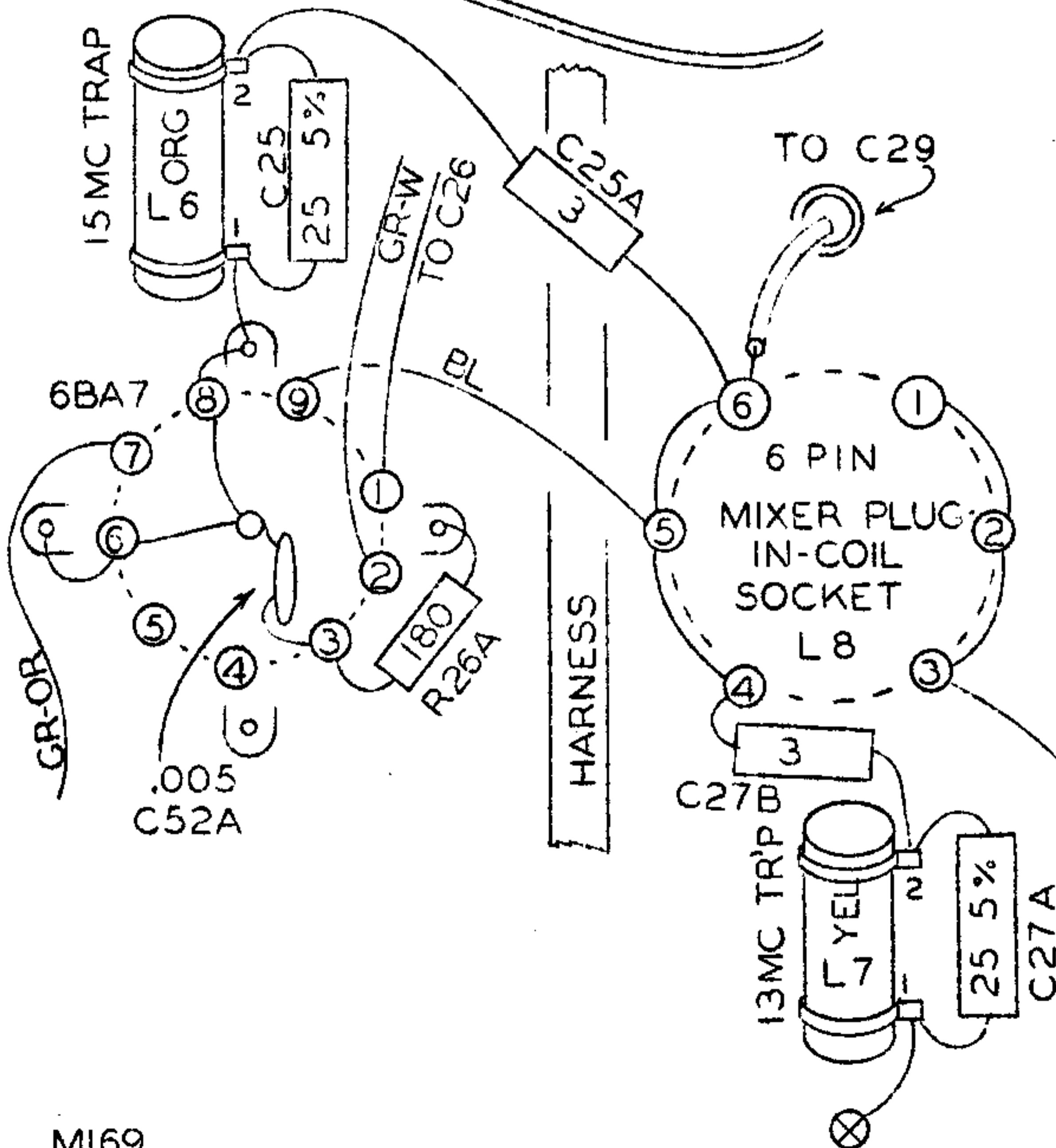
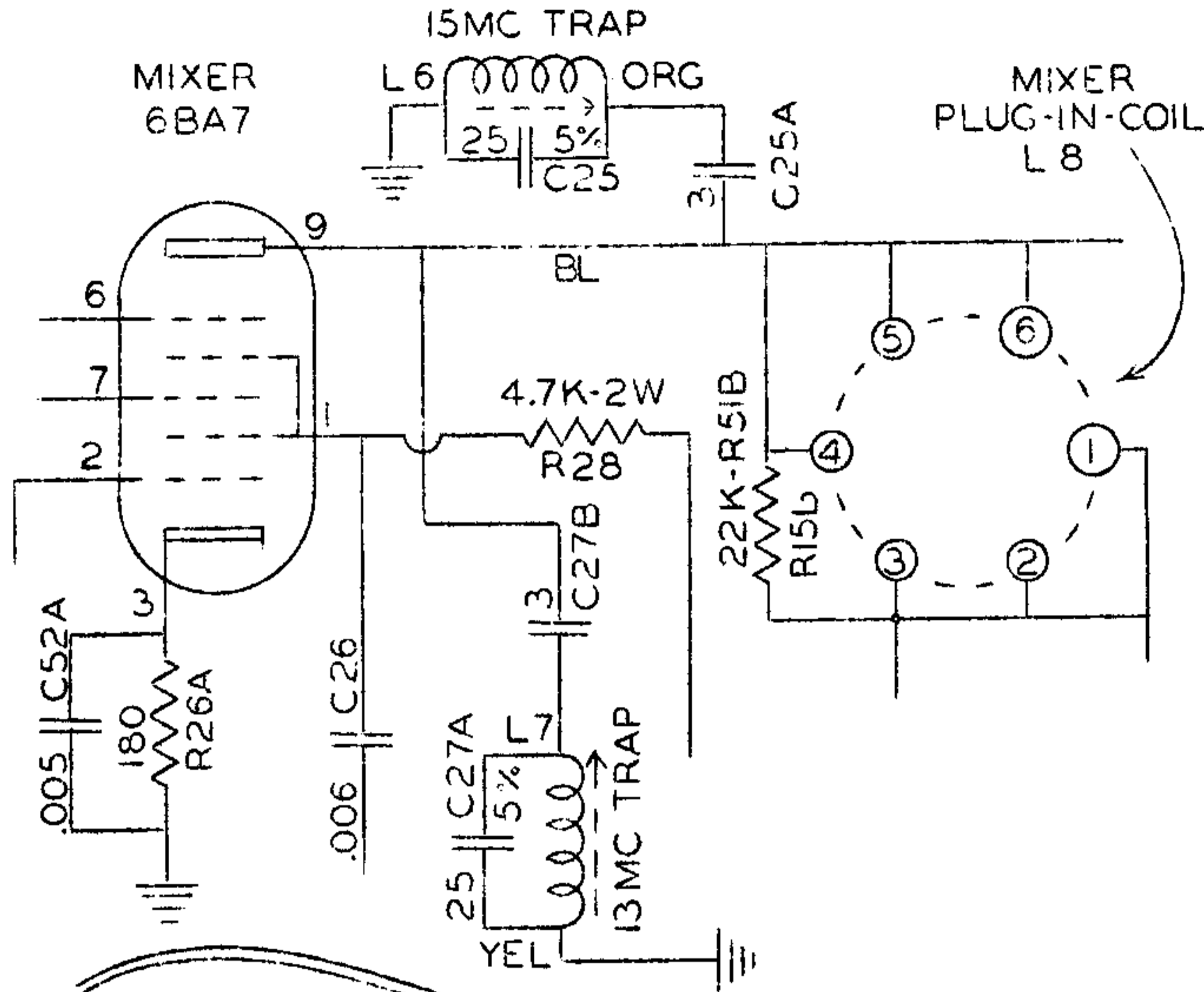


This change has been incorporated in all Exciters which have the letter "C" following the serial number.

In order to provide more AF gain for phone patch operation AF INPUT jack JB has been wired to the input grid of the second speech preamplifier stage.

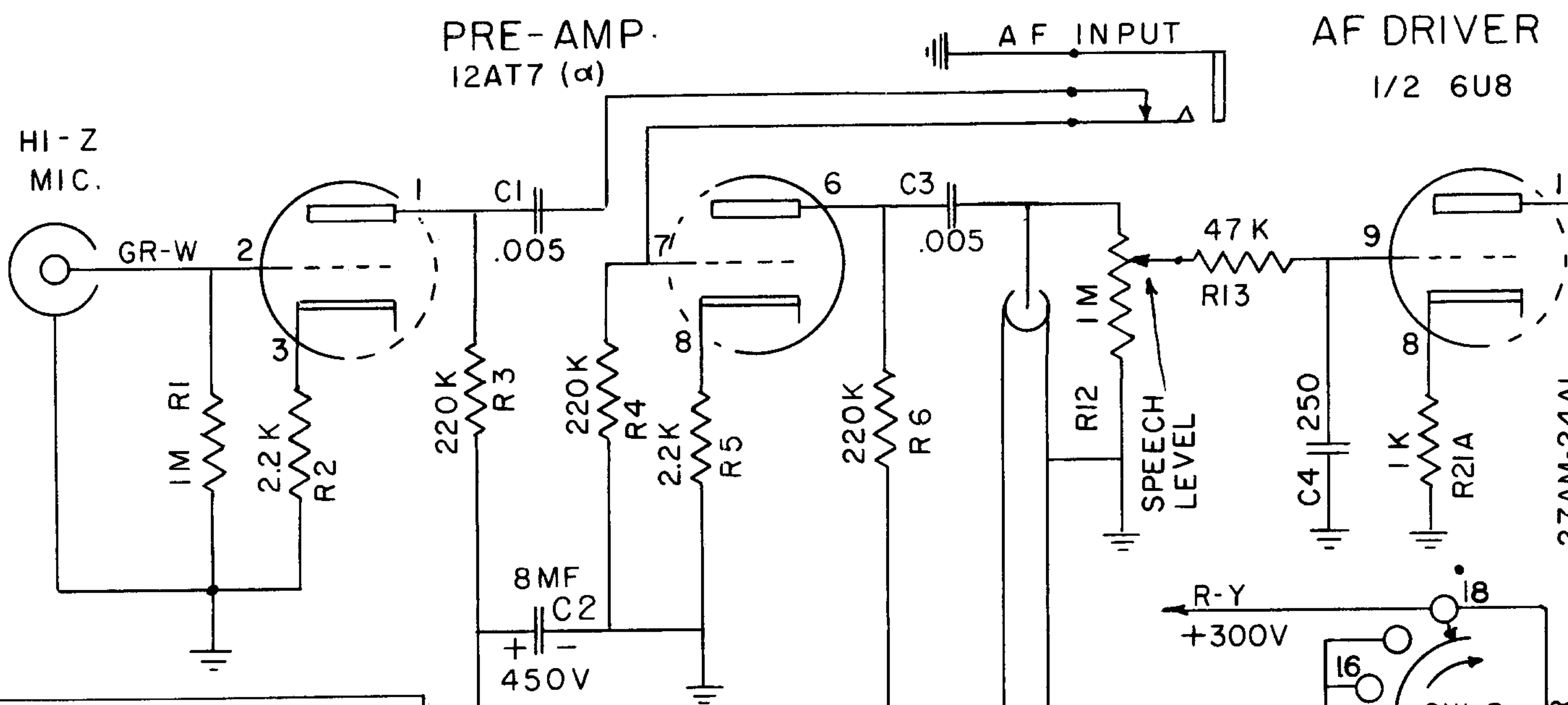
CENTRAL ELECTRONICS, INC.

10B CHANGE NOTICE - MODIFICATION "C"  
MIXER CIRCUIT CHANGE

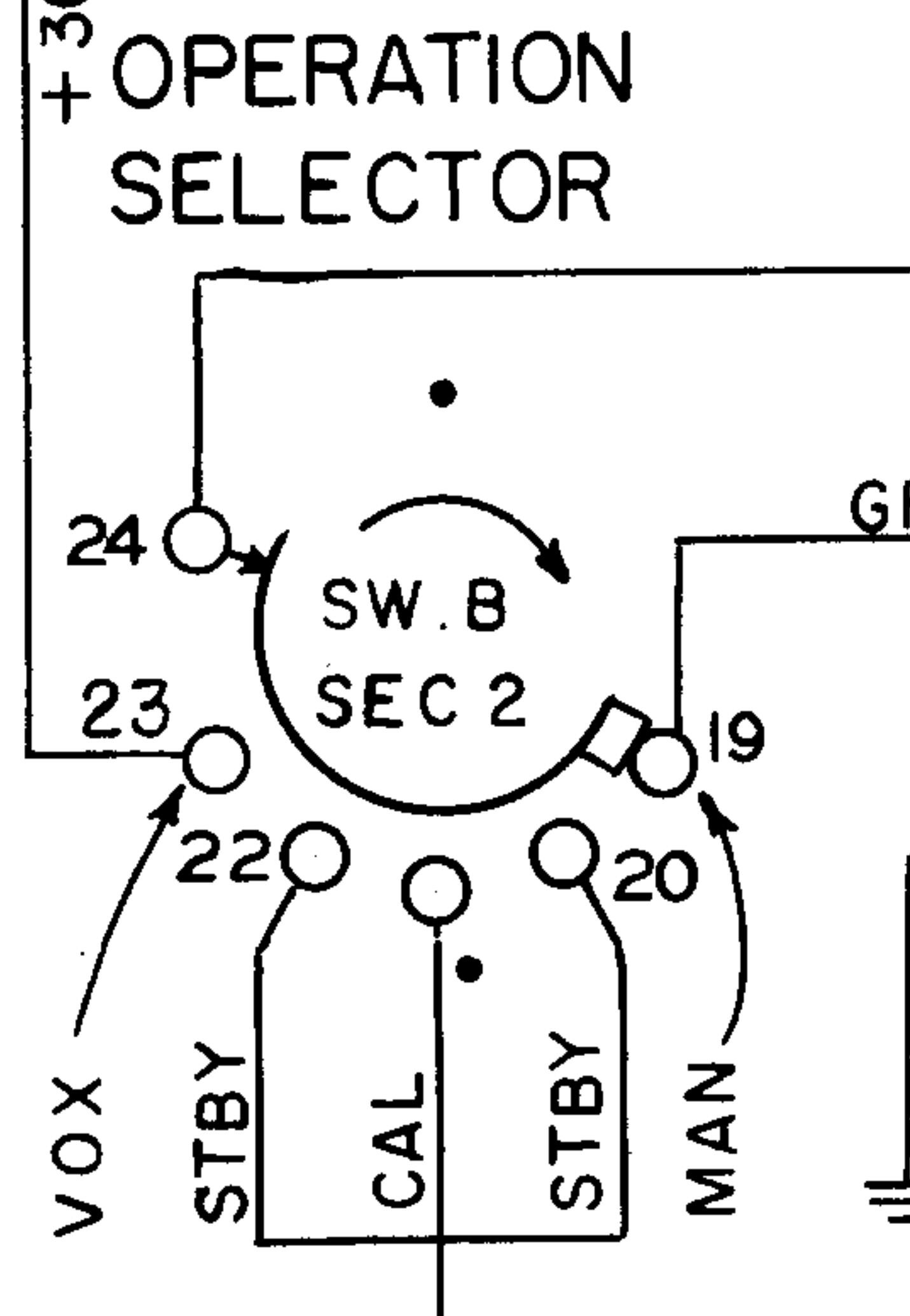
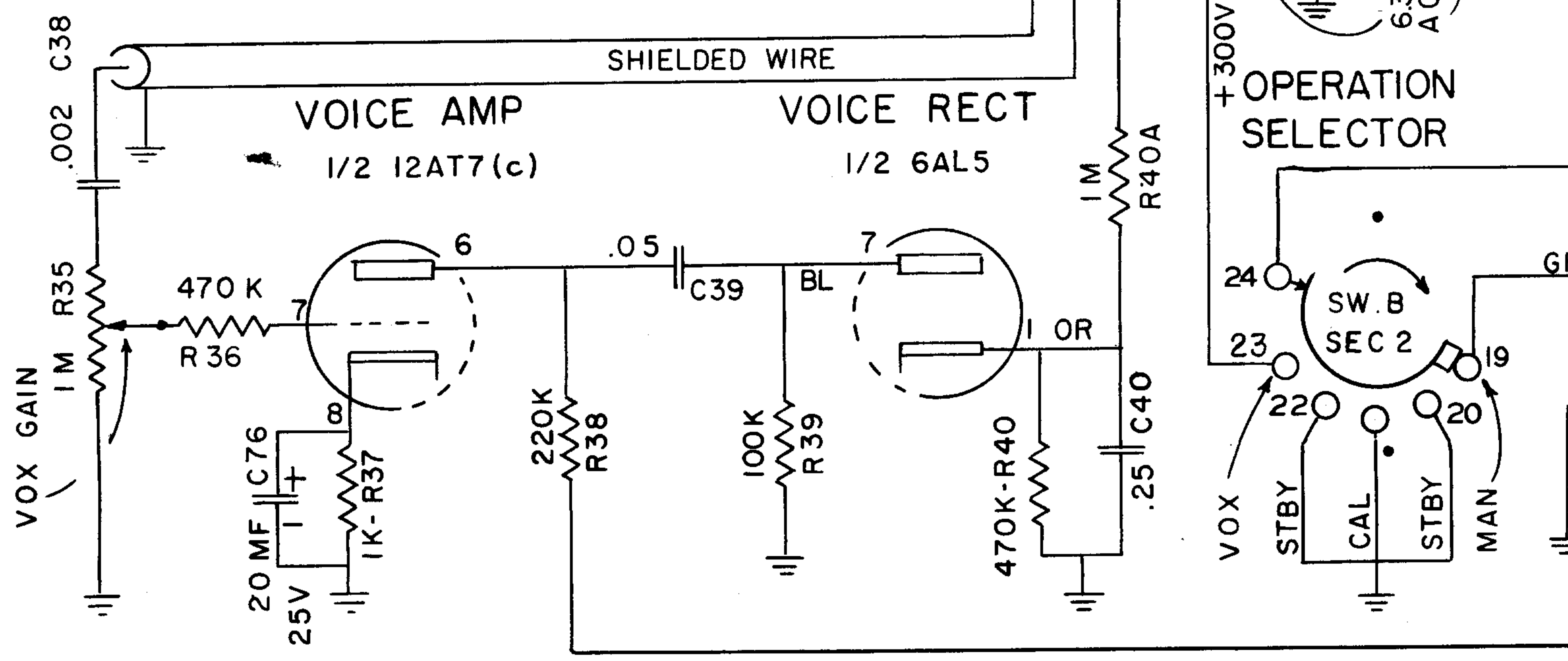


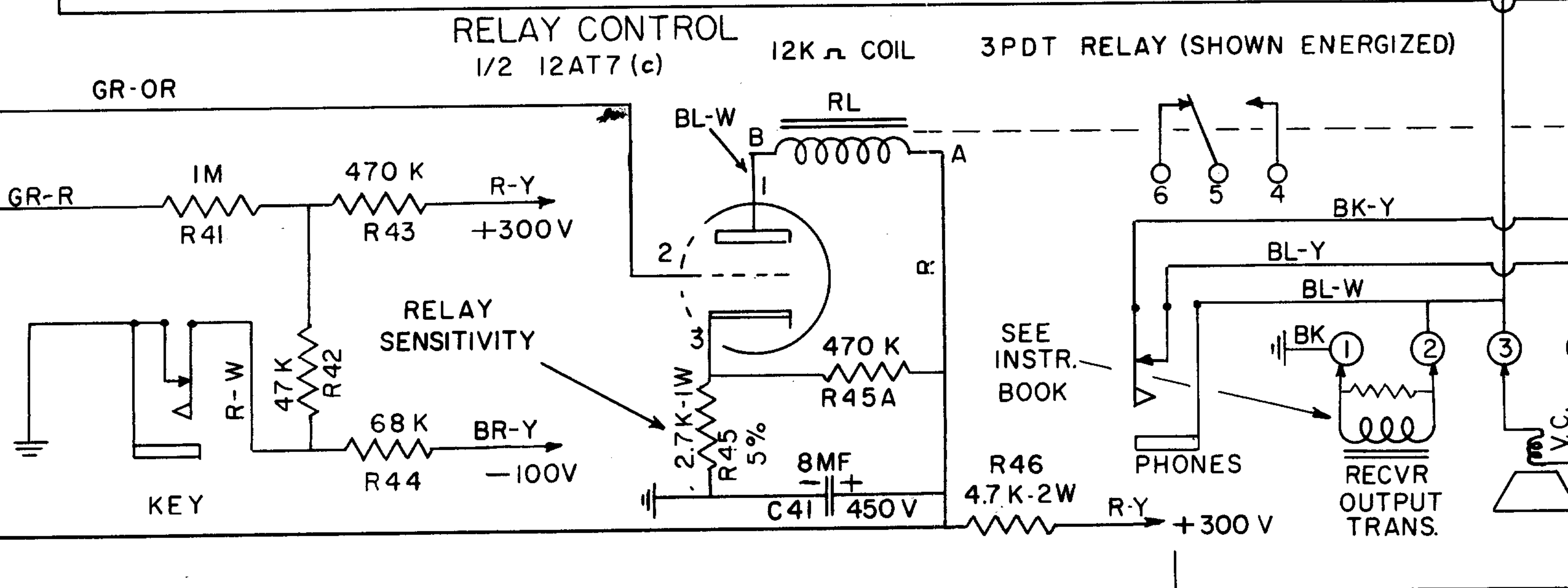
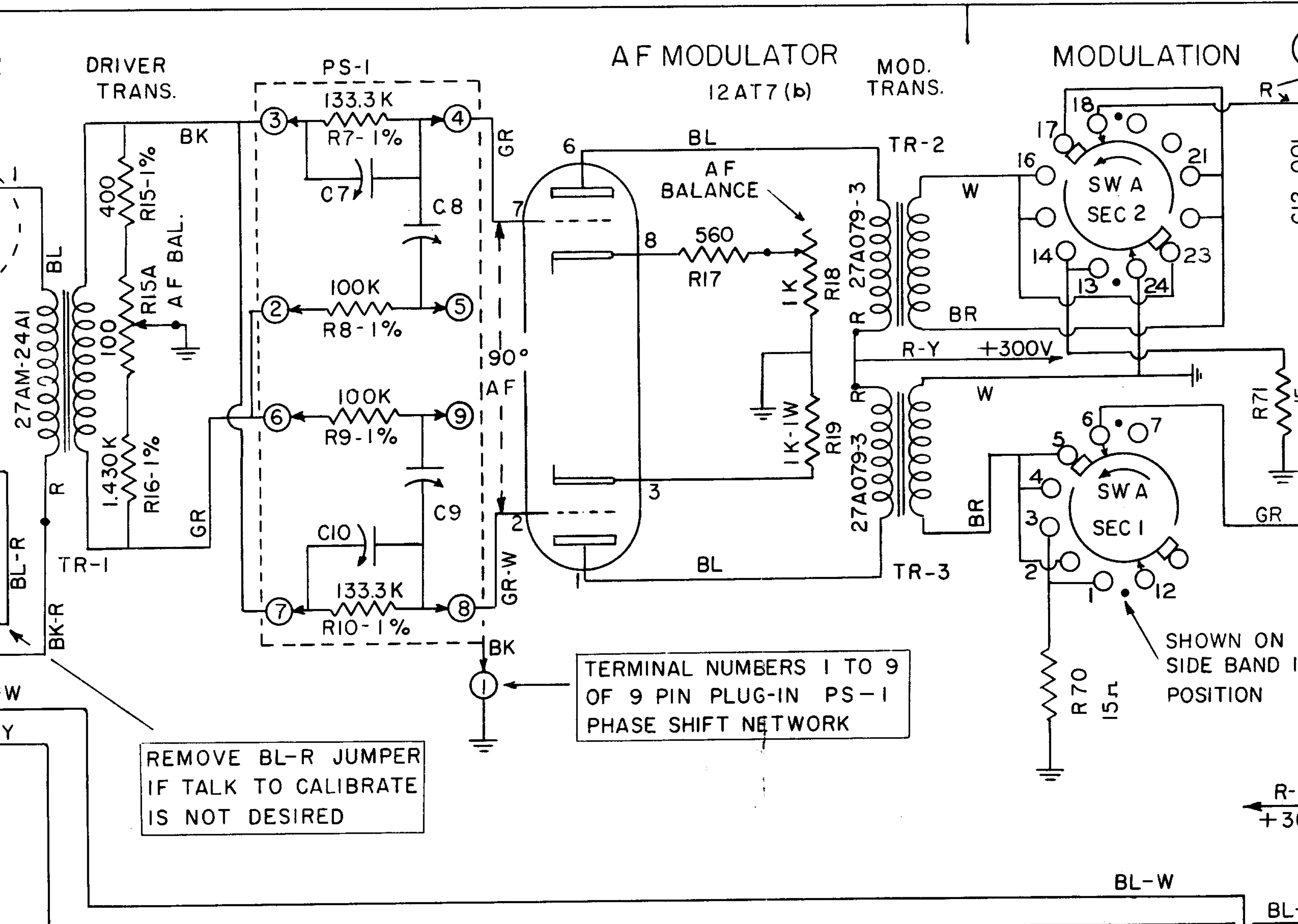
This change has been incorporated in all Exciters which have the letter "C" following the serial number.

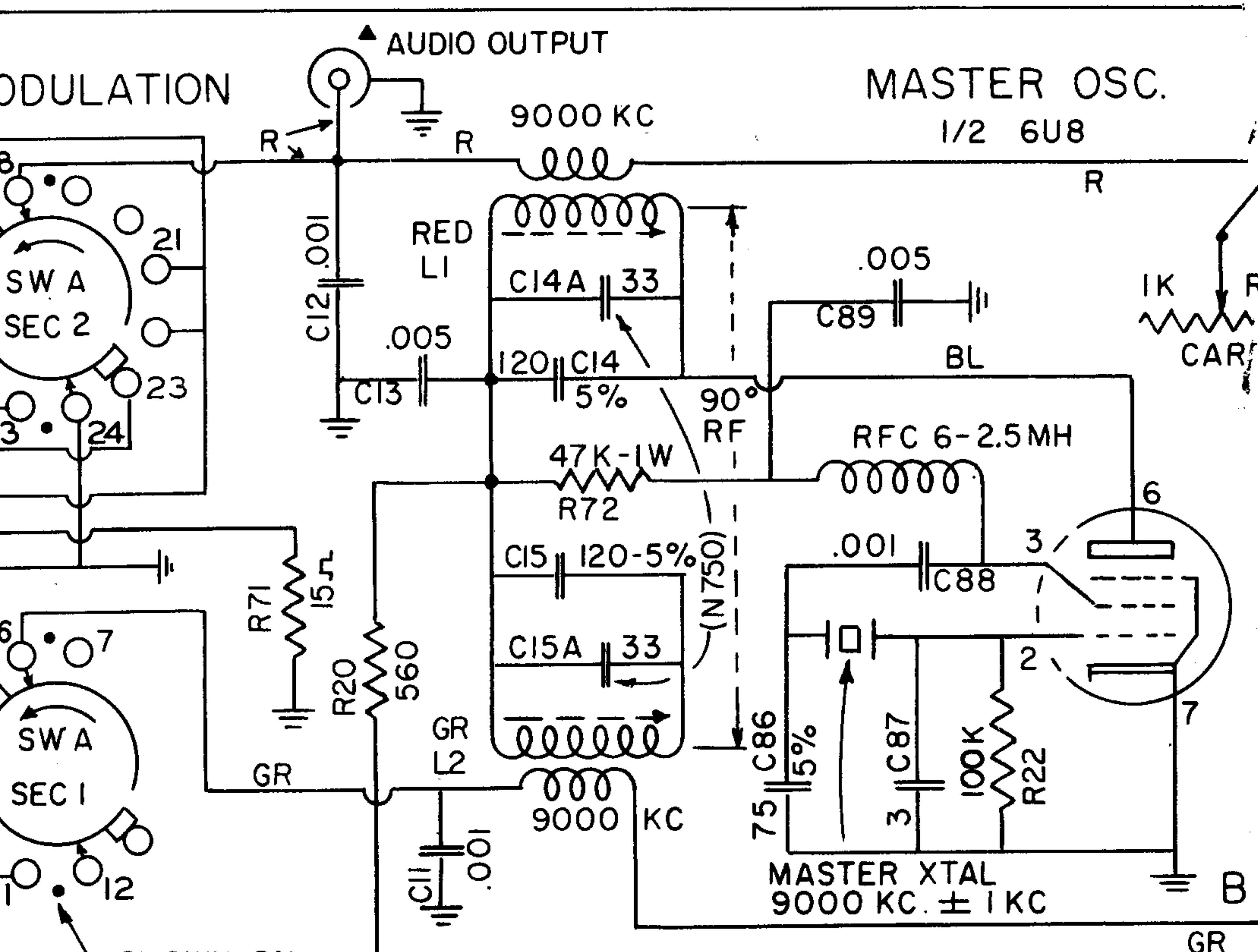
To obtain better linearity in the Mixer stage a 180 ohm resistor, bypassed with a .005 capacitor, is used in series with the cathode of the 6BA7 Mixer stage. The yellow trap coil should be moved from the Mixer screen circuit to the plate circuit and tuned to 13 MC, with the new capacitor values shown above.



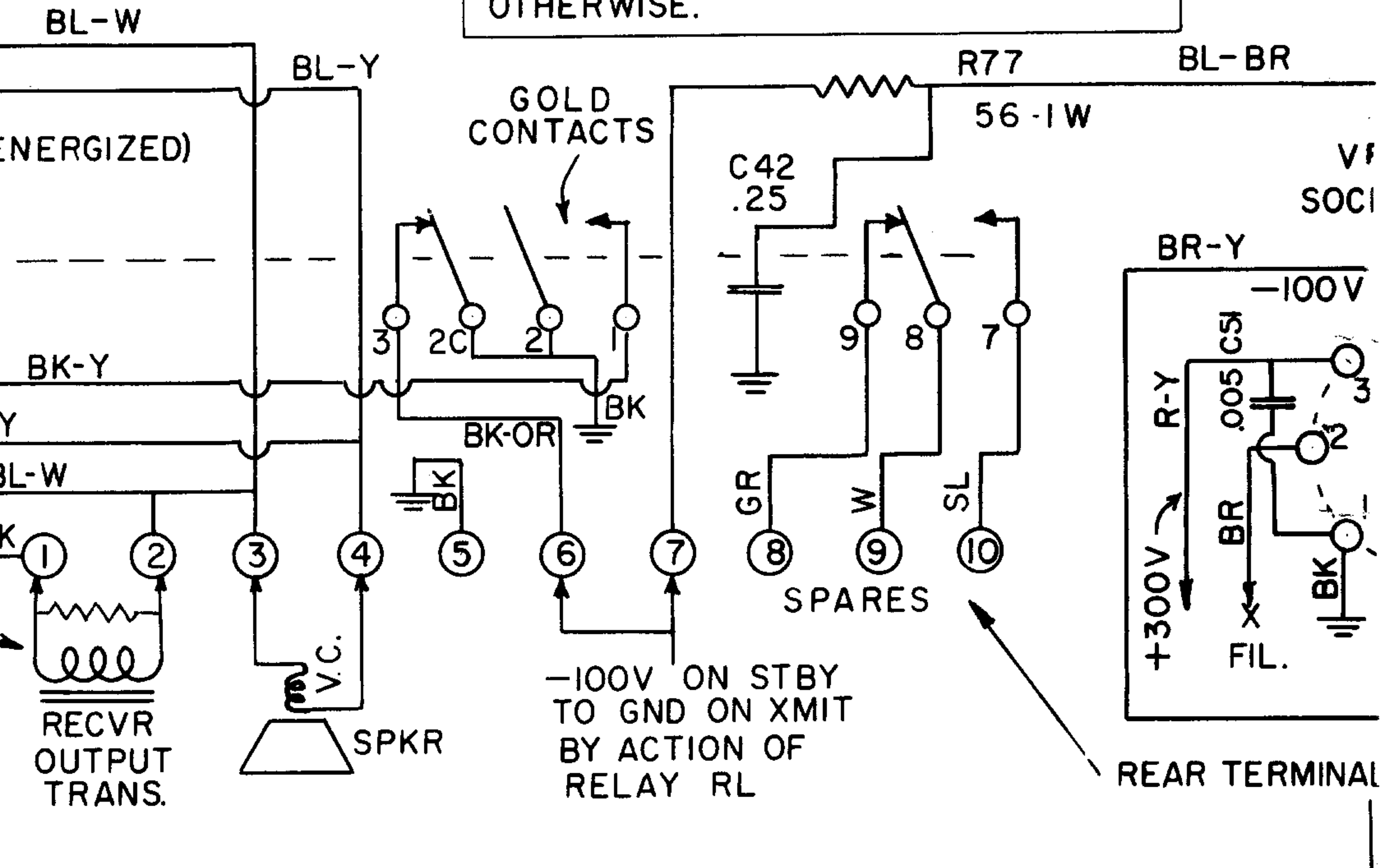
IN SOME UNITS A .0068 IS USED IN PLACE OF A .006  
 IN SOME UNITS A 2.7 IS USED IN PLACE OF A 3 MMF.

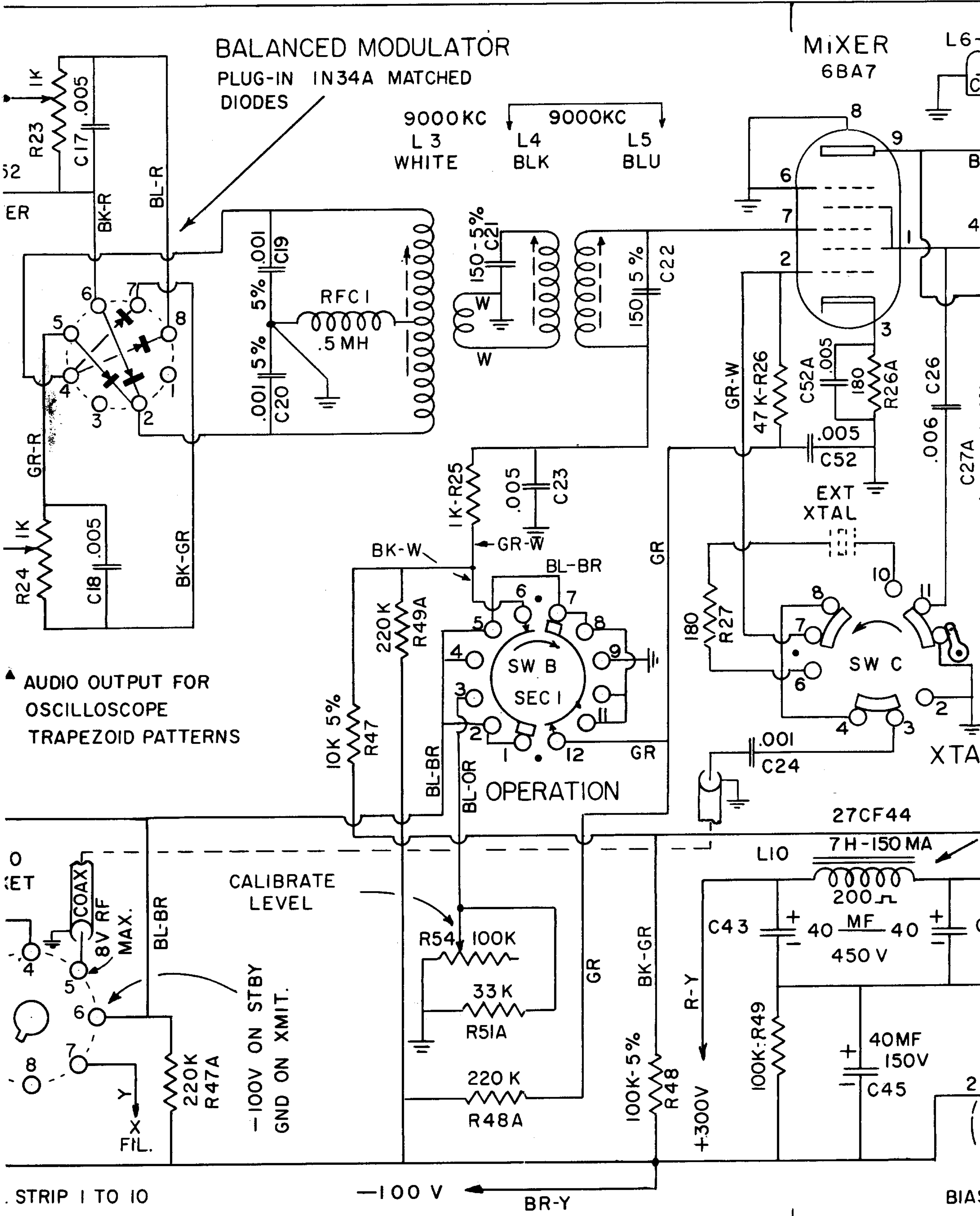






SWITCHES ARE SHOWN FROM REAR.  
SEC I IS NEXT TO PANEL.  
K = X 1000      M = MEGOHMS  
RESISTORS ARE 1/2 WATT EXCEPT  
AS NOTED.  
DECIMAL CAPACITOR VALUES IN MFD.,  
OTHERS IN MMFD UNLESS SHOWN  
OTHERWISE.





▲ AUDIO OUTPUT FOR  
OSCILLOSCOPE  
TRAPEZOID PATTERNS

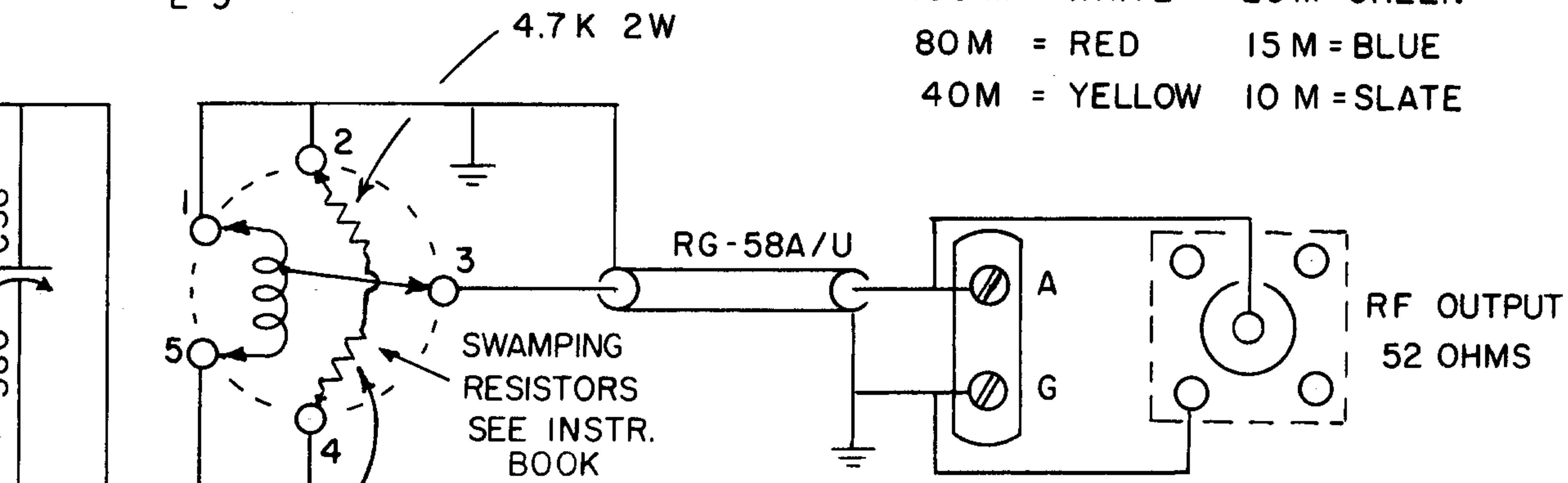
OPERATION



AMPLIFIER  
PLUG-IN COIL  
L-9

PLUG-IN COIL COLOR CODE

160 M = WHITE    20M=GREEN  
80M = RED        15M=BLUE  
40M = YELLOW    10M=SLATE



ALL DC, AC, & RF VOLTAGES TAKEN WITH VTVM \*

	1	2	3	4	5	6	7	8	9
12AT7 (α) PREAMP	120	0	2.1	3.15 AC	3.15 AC	120	0	2.1	3.15 AC
6U8 AF DRIVER MASTER OSC.	320	-8 11	200 1.5	"	"	320 27 RF	0	10	0
12AT7 (b) AF MODULATOR	320	0	4.2	"	"	320	0	4.2	3.15 AC
6BA7 MIXER	100	-5.6DC 6.4 RF	2	"	"	0	-0.3 4.5RF*	0	330 13RF
6AG7 POWER AMP	0	3.15 AC	330	-15DC 18RF	0	330	3.15 AC	320 200RF	
12AT7 (c) VOICE AMP RELAY CONTROL	180	30	32	3.15 AC	3.15 AC	70	0	1.0	3.15 AC
6AL5 VOICE RECT BIAS RECT	0.4	-110	3.15 AC	3.15 AC	89 AC	0	-0.1		
5U4 G H V RECT	0	330	0	340 AC	0	340 AC	0	330	

RF VOLTAGES ARE PEAK, MULTIPLY BY .707 FOR RMS  
\* WITH COIL REPEAKED

CONDITIONS

MANUAL  
= MAX  
LEVEL = OFF  
SENS = OFF  
OUTPUT = 4 MC

PAIRS ARE BR & Y

REV. 2-4-57		REV. 7-3-57		SCHEMATIC MODEL 10 B MULTIPHASE EXCITER	
FOR SERIAL NO. 4687 & UP RFC2-CER. CAPS. - R51B REV. 4-24-56		PREVIOUS REVISION 6-11-54 FOR 6U8 OSC. - FOR SERIAL NO. 1364 & UP MOD. CKT. COR'T. 7-19-54.			
				CENTRAL ELECTRONICS, INC. 1247 BELMONT AVE. CHICAGO, 13, ILL	

A.W. A.W.

BASIC MODIFICATION OF THE BC-457, BC-458 or BC-459  
 AS A VFO FOR MODEL 10 or 20 MULTIPHASE EXCITER FOR 12 VOLT OPERATION

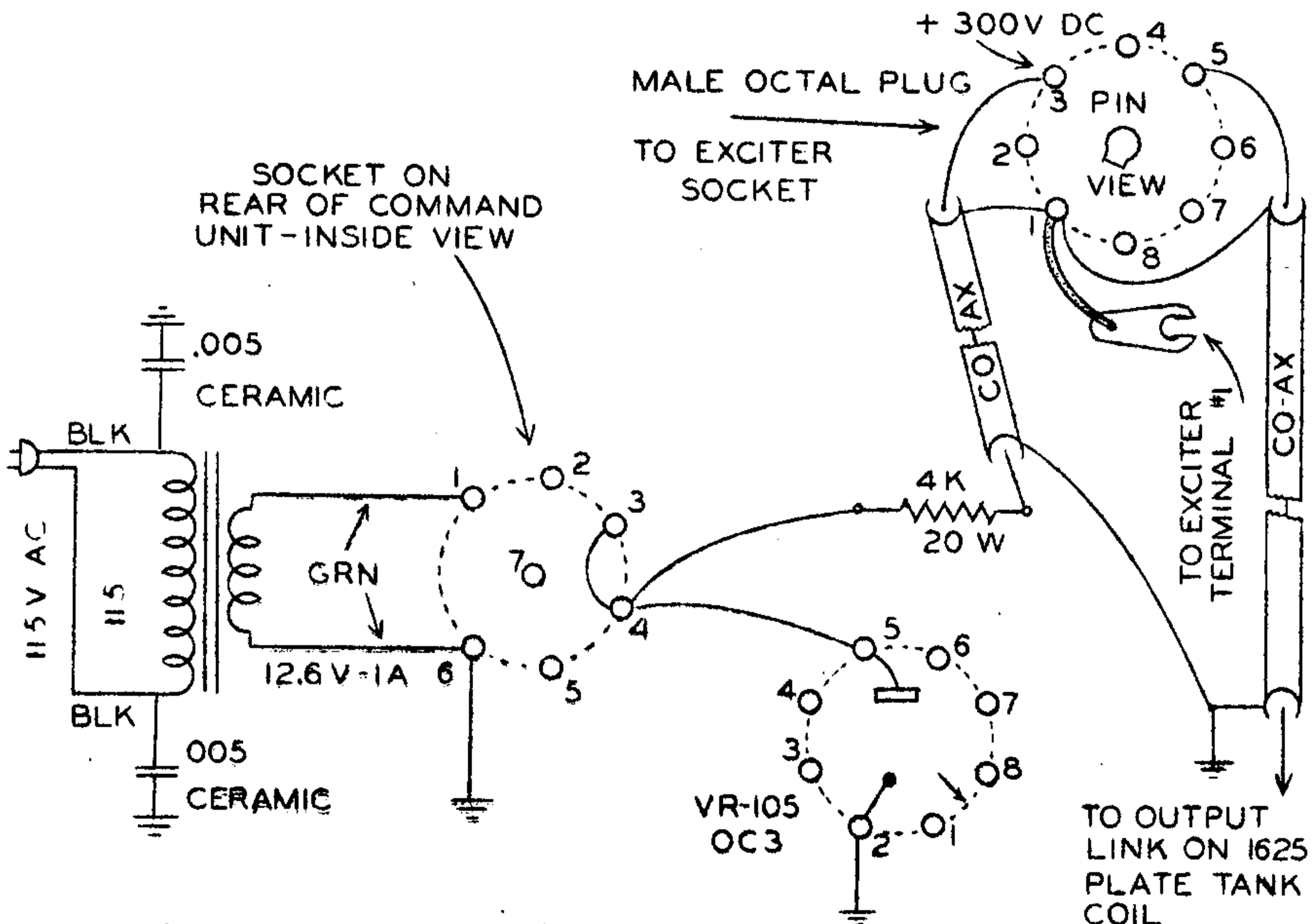
The contacts on the keying relay (beneath the chassis) should be closed by using jumpers or soldering the contacts together. This applies B plus to the oscillator and also grounds the cathode circuit on the 1625 stage. Remove the 1629 eye tube and also the 1625 located near the tuning shaft. Jumpers should be installed across the filament terminals of these unused sockets. Only one 1625 is necessary for proper operation.

The antenna loading coil and antenna relay are not necessary and can be removed. The co-ax cable to the Exciter can be attached directly to the output link of the 1625 final tank coil.

Plate voltage for the VFO is supplied from the Exciter through an octal socket on the rear.

The electrical connections for the external wiring are shown below.

Advance the antenna coupling adjustment on the VFO to the point where additional coupling will not increase the Exciter output. Over-injection to the mixer will generate harmonics of the VFO frequency that can appear in the output as spurious radiation.



10-5-56  
 VFO for 10 - 20

MV131  
 108-9 MX

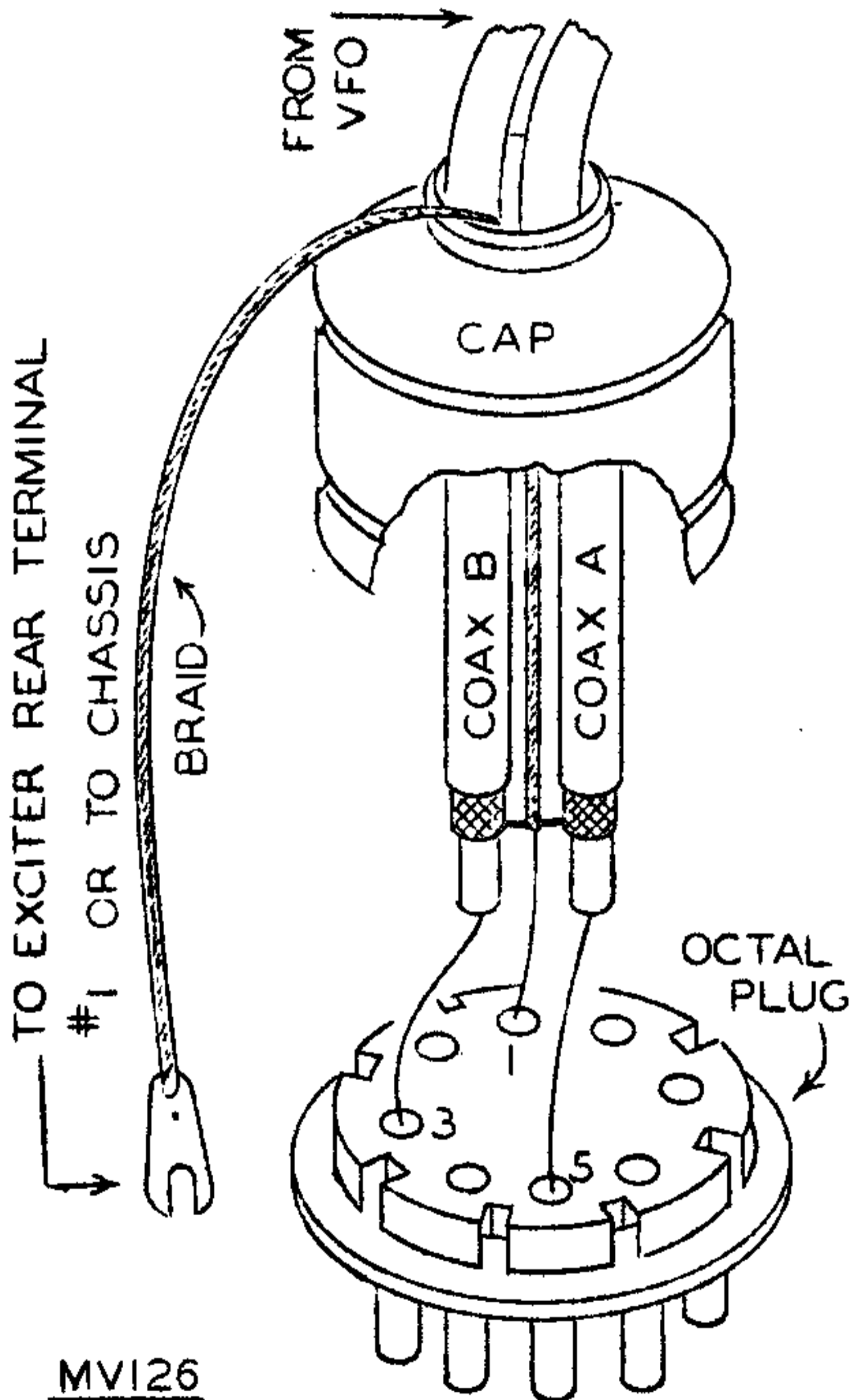
458 VFO

C H A N G E   N O T I C E

In order to provide sufficient output when the 1625 is operating as a frequency tripler to 16 mc. (for 40 meter operation) the Voltage Regulator tube has been changed to a VR105. The dropping resistor for the Regulator Tube is now 4000 ohms.

If the 1625 grid bias resistor (located on terminals 6 and 7 on the VR tube socket) is increased to 100,000 ohms, additional reserve output will be obtained.

-----  
\*   \*   \*   \*



It is advisable to provide an additional low impedance ground path for the coaxial cable shields as shown on the left. This will prevent the exciter from self-oscillating, particularly on the higher frequency bands.

MVI26  
101MX

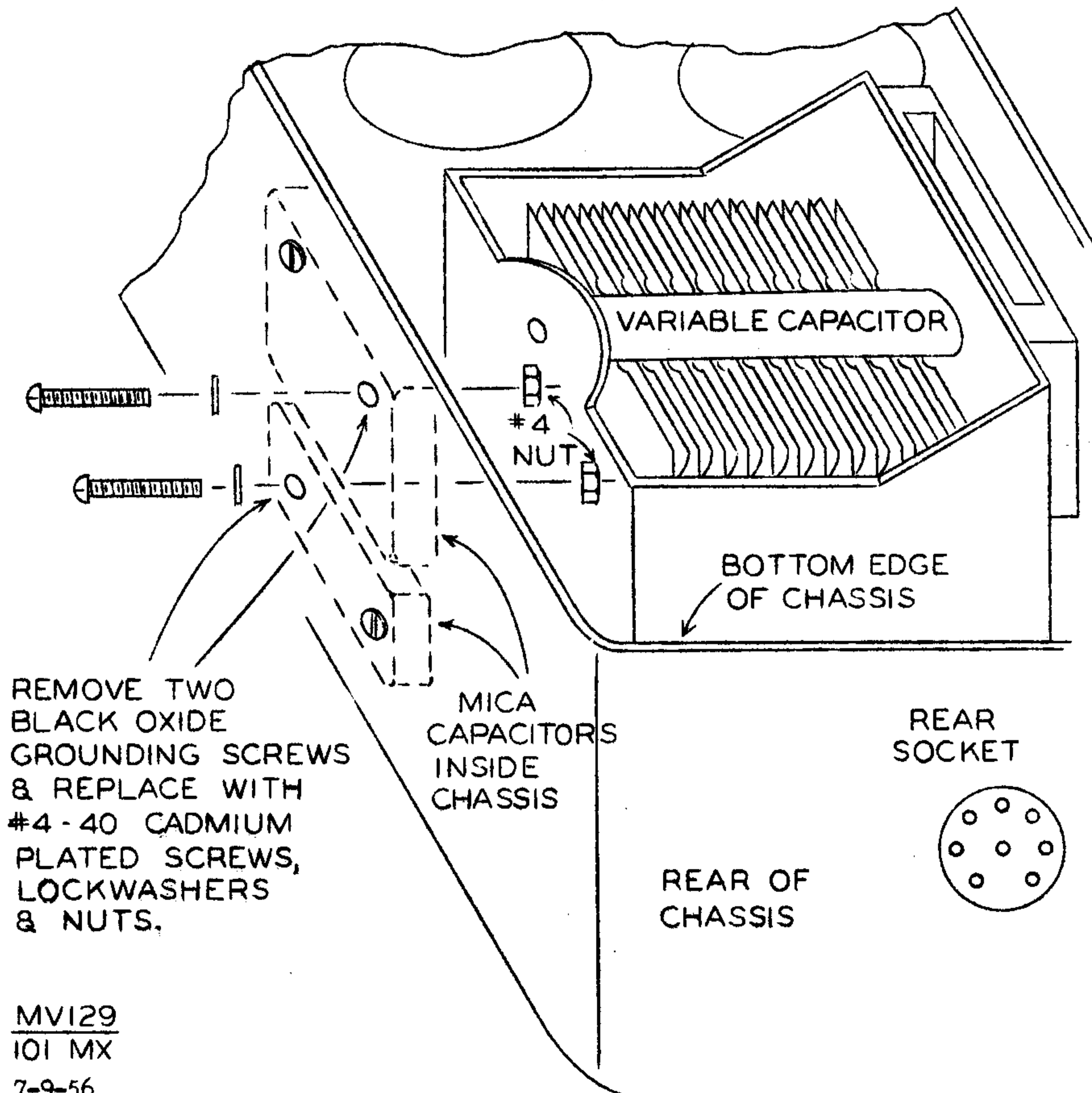
CENTRAL ELECTRONICS, INC.  
1247 W. BELMONT AVENUE  
CHICAGO 13, ILLINOIS

458K  
5-11-56  
Printed in USA

458 CHANGE NOTICE

The black oxide screws sometimes make poor R.F. contact and must be replaced. Before installing coax F, remove two black oxide #3 nuts, screws and washers from the right side of chassis near rear, as shown. These two screws hold two mica capacitors and two ground lugs to the side of chassis. The two ground lugs should be cleaned, if necessary, to insure good contact. Two #4-40 x 5/8" screws, nuts and lockwashers are used to replace the #3 screws, as shown.

Place a lockwasher under head of screw; push through hole in side of chassis and capacitor. A #4 nut is used to hold lug and capacitor to inside of chassis. If your 458 is painted black wrinkle, it is advisable to scratch paint from around the two holes before adding #4 screws.



REMOVE TWO  
BLACK OXIDE  
GROUNDING SCREWS  
& REPLACE WITH  
#4-40 CADMIUM  
PLATED SCREWS,  
LOCKWASHERS  
& NUTS.

MICA  
CAPACITORS  
INSIDE  
CHASSIS

REAR  
SOCKET

REAR OF  
CHASSIS

MVI29  
101 MX

7-9-56

Printed in USA

DETAILED CONVERSION INSTRUCTIONS  
FOR  
BC-457, BC-458, BC-459 WITH 12 VOLT OPERATION

This modification procedure allows the installation of a VR75 into the socket originally intended for the crystal calibrator and mounts the filament transformer and dropping resistor on the rear of the chassis.

NOTE: Socket connections read clockwise from underneath chassis. Pin #7 on power socket (rear) is the center pin.

1. CRYSTAL SOCKET (Center octal socket rear of chassis)

- a. Remove resistor between pin #3 and #8 - discard.
- b. Remove black lead from pin #3 and take out of circuit.
- c. Unsolder end of resistor from pin #5.
- d. Unsolder two black leads from pin #5.
- e. Disconnect black wire from pin #5 on rear socket and remove from circuit.
- f. Reconnect remaining black wire (from pin #5) and end of resistor (c above) to pin #6.
- g. Add a jumper between pins #1 and #2.
- h. At the 1626 socket - remove red lead from pin #4 and tape end, or remove from circuit.
- i. Solder a jumper from 1626 socket pin #4 to VR tube socket pin #5.

2. REAR SOCKET (Inside chassis)

- a. Remove the white lead from pin #1 and discard.
- b. Remove red lead from pin #4 and tape end.
- c. Remove two black leads from pin #2 and discard.
- d. Remove black lead from rear socket pin #6 and VR socket pin #7 and discard.
- e. Remove Red-White lead from rear socket pin #7 and attach to VR socket pin #5.
- f. Solder a jumper from VR socket pin #5 to rear socket pin #4.
- g. On rear socket - solder a jumper from pin #3 to pin #4.

3. EYE TUBE SOCKET (VT138 - 1629)

- a. Remove the two resistors from pin #8 and discard. Add a jumper from pin #2 to pin #7.

4. AT THE RELAY (Underneath the chassis, centered on right side viewing from front)

- a. Cut black and tan leads from relay coil and remove from circuit.
- b. Cut the two red leads from relay contacts and tape separately or remove from circuit.
- c. Cut the bare wire at relay that goes to the 1625 socket pin #6.
- d. Remove and discard the Relay. Enlarge the hole which formerly held relay and mount a solder lug with #6 hardware.
- e. Solder bare wire from 1625 socket pin #6 to grounded solder lug.

5. 1625

- a. Add a jumper from pin #1 to pin #7 on the 1625 socket next to the tuning shaft.

6. FILAMENT TRANSFORMER 12 volts - 1 amp.

- a. Mount on 1/2" spacers slightly above (horizontally) rear socket with secondary (green) leads down. Place two solder lugs under screw heads inside chassis.
- b. Trim secondary leads to proper length and solder into rear socket pins #1 and #6 (from outside)
- c. Drill hole for 3/8" grommet slightly below and to left of rear socket (viewed from rear).
- d. Solder filament transformer primary leads to rear socket pins #2 and #5 outside of chassis.
- e. Solder a .005 ceramic by-pass condenser from pin #2 on rear socket to ground lug.
- f. Solder a .005 ceramic by-pass condenser from pin #5 on rear socket to ground lug.
- g. Insert proper length of primary A.C. cord through grommet hole, tie a knot and solder leads to pins #2 and #5 of rear socket.

7. VR TUBE DROPPING RESISTOR 6000 ohm 20 watts

- a. Mount a 6000 ohm 20 watt resistor on the back of the chassis slightly below and to the left of rear socket. (Resistor is mounted outside chassis for heat radiation).
- b. From outside chassis, solder a jumper from rear socket pin #4 to low potential end of 6000 ohm 20 watt resistor.
- c. Plate voltage is supplied from the Exciter through an octal plug and cable, as shown on page 2. Inner conductor is soldered to one lug of 6000 ohm 20 watt resistor.

## ADAPTING THE BC-458 FOR 20 AND 80 METER OPERATION

The BC-458 (5.3 to 7 mc.) is recommended as a VFO rather than the BC-457 (4 to 5.3 mc.) for greater stability.

### ADJUSTING THE FREQUENCY RANGE

After completing the proper modifications, plug the VFO into the socket on the rear of the Exciter. Remove the oscillator section shield can. Set the single plate adjustment trimmer to mid-capacity. Now loosen the two bristol set screws on the oscillator padding capacitor. It will be necessary to increase the capacity until the oscillator is at 5 mc. with the dial set at 5.3 mc. after the shield can is replaced. The iron core slug will change the frequency several hundred kilocycles and the capacity should be increased in small steps until 5 megacycles is reached. By drilling a 3/8" hole approximately 3/4" below the present one, the adjustment can be made with the shield can in place. If your receiver does not tune to 5 mc., use the Exciter tuned to 4 mc. with some carrier inserted. After the correct setting has been determined, be sure to tighten the set screws.

The amplifier air padder located beneath the chassis must be tuned to the new oscillator frequency. Adjust for maximum VR tube brilliance, or for maximum Exciter output with the VFO coupling set to about 4.

### BANDSPREAD MULTIBAND OPERATION OF THE BC-458

By the addition of a bandswitch, three Miniductors and a 50 uufd. variable capacitor, operation in the 160, 80, 40, 20 and 15 meter bands is possible. CW operation from 21,000 to 21,200 is not recommended with this conversion, but satisfactory performance is obtained in the rest of the 21 mc. band.

It is suggested that whenever the 1625 stage is used as a frequency multiplier, the filament of the oscillator tube be operated on direct current to minimize hum. One method of obtaining this DC is to use a 12 volt filament transformer for the unit, with a full wave bridge rectifier and a filter capacitor of at least 1000 mfd.

Bandspread is accomplished by carefully removing the rotor plates from both the oscillator and amplifier variable tuning capacitors. Those plates farthest from the worm gear drive should be removed so that only 8 rotors remain in use in each tuning capacitor. With the capacitors open, gently rock the plates, one at a time, with a long nose pliers until they become loose. If too much force is used, the rotor shaft may become dislodged and you will then very likely spend the rest of the day and evening recovering the small ball bearings and trying to figure out a method of reassembling everything. Care should also be taken not to exert any pressure on the stator sections as this can cause the glass insulating beads to fall out.

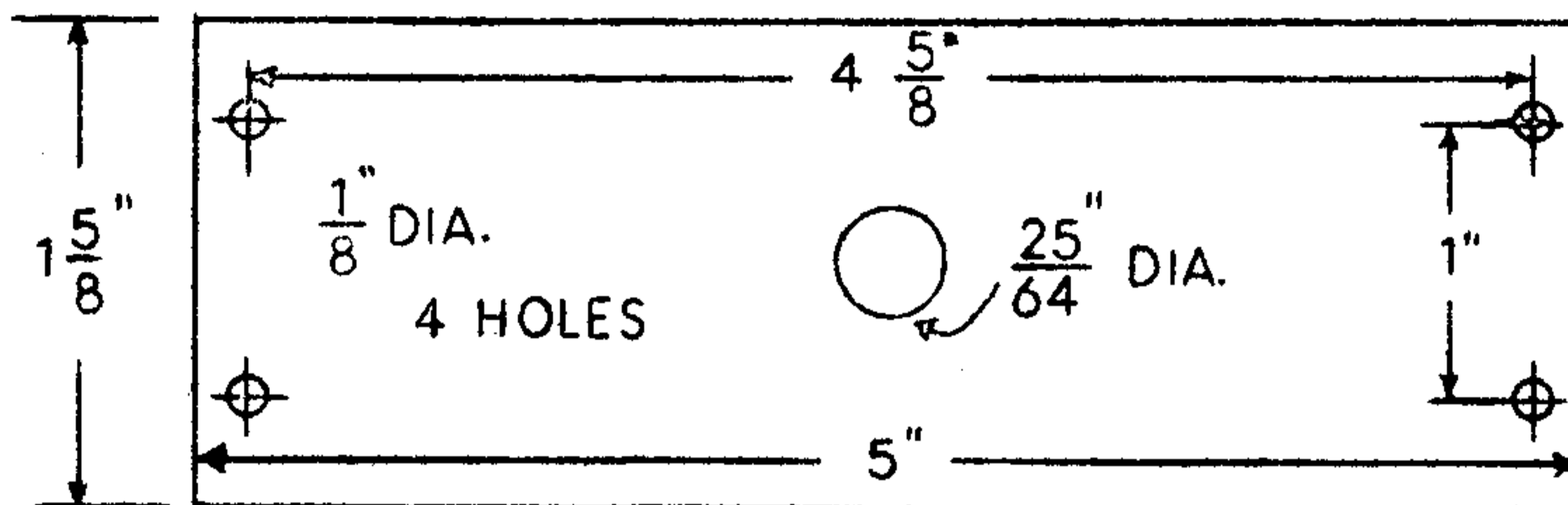
The 50 mmfd. variable capacitor should be mounted in the hole occupied by the Antenna binding post. File two notches in the edges of the hole to accept the mounting screws.

For 40 meter operation a coil consisting of 3-1/4 turns of #3014 B & W Miniductor (8 turns per inch) is shunted across the amplifier plate inductor so that it will triple into the range of 16 to 16.3 mc.

For 160 meters a coil consisting of 6-1/2 turns of #3015 B & W Miniductor (16 turns per inch) is used to double to 10,800 to 11,000 kc. Five turns are used for 15 meters, which requires 12,250 to 12,450 kc.

The antenna loading coil assembly should be removed and a metal plate installed in the window.

Suggested plate dimensions:



The entire unit should rest on a sponge rubber pad or soft rubber feet.

#### ALIGNMENT PROCEDURE.

Set receiver and Exciter to 21,450 kc. Advance the CARRIER knob. With the VFO switch in the 21 mc. position and the dial at 7.0 mc., adjust the oscillator air padder (inside the can) for zero beat. This will occur with a little more than half capacity and the slot in the shaft will be slightly beyond the horizontal position, at an angle about 8:30 to 2:30.

With the receiver and Exciter tuned to 4.0 mc., set the VFO bandswitch to 80 meters and dial to 5.3 mc. Tune the 50 mmfd. APC capacitor for zero beat. Zero beat should occur with the plates of this capacitor about 95% meshed. If zero beat occurs at less than 95% capacity, you have selected the wrong signal at 21,450 kc. Peak the amplifier air padding capacitor (under the chassis) for maximum VR tube brilliance or maximum Exciter output with the VFO loading set at 4.

Now return to the 21 mc. band. Slowly replace the large shield cover on the BC-458 and observe the effect upon the output of the Exciter. Replacing this cover reduces the inductance of the coils and increases the

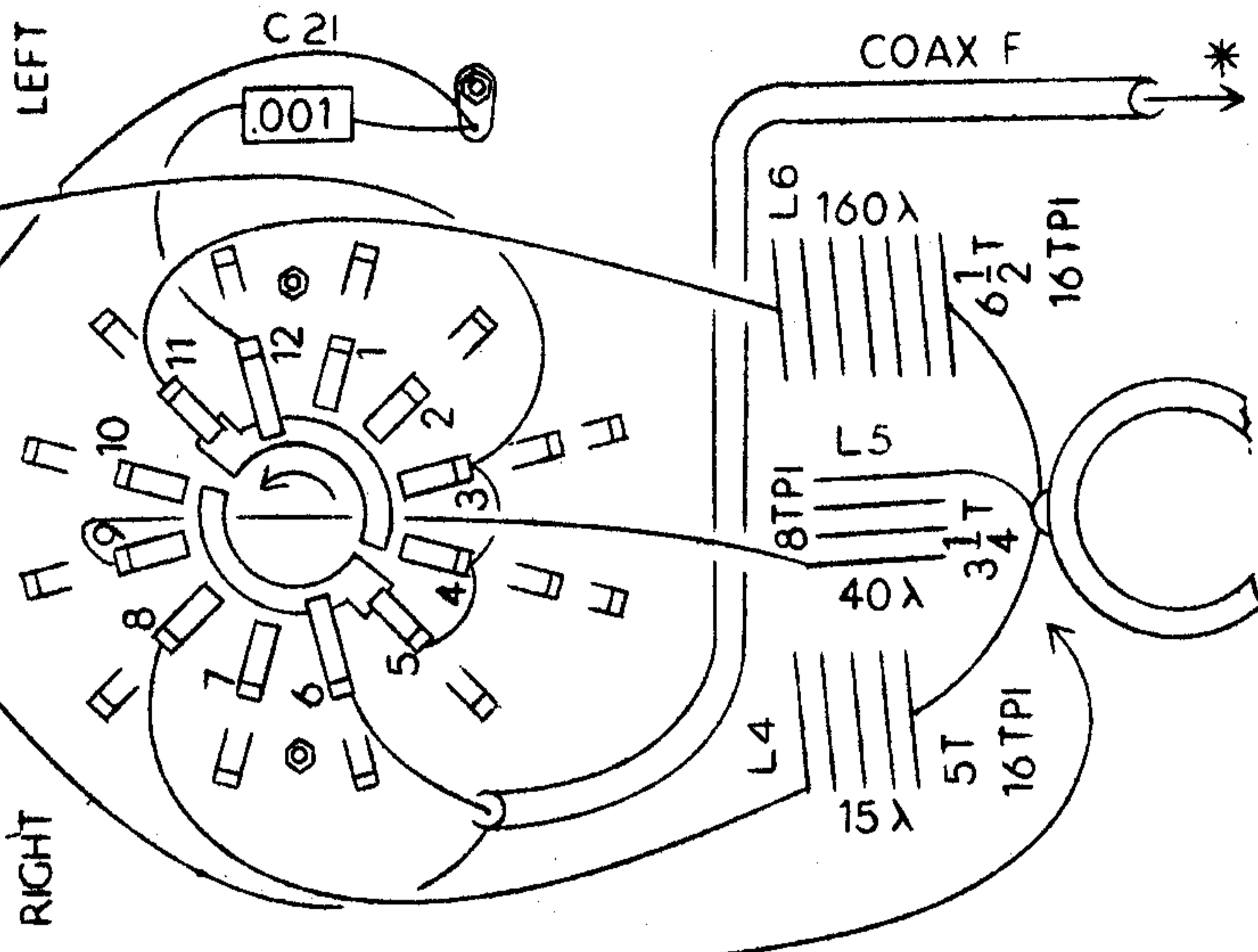
resonant frequency. When the cover is off, the coil should have slightly more inductance than necessary. The inductance may be adjusted by breaking the polystyrene strip so that the last half turn can be varied to trim the inductor to the required value. This effect must also be checked on 40 and 160 meters.

CALIBRATION CHART FOR BANDSPREAD VFO

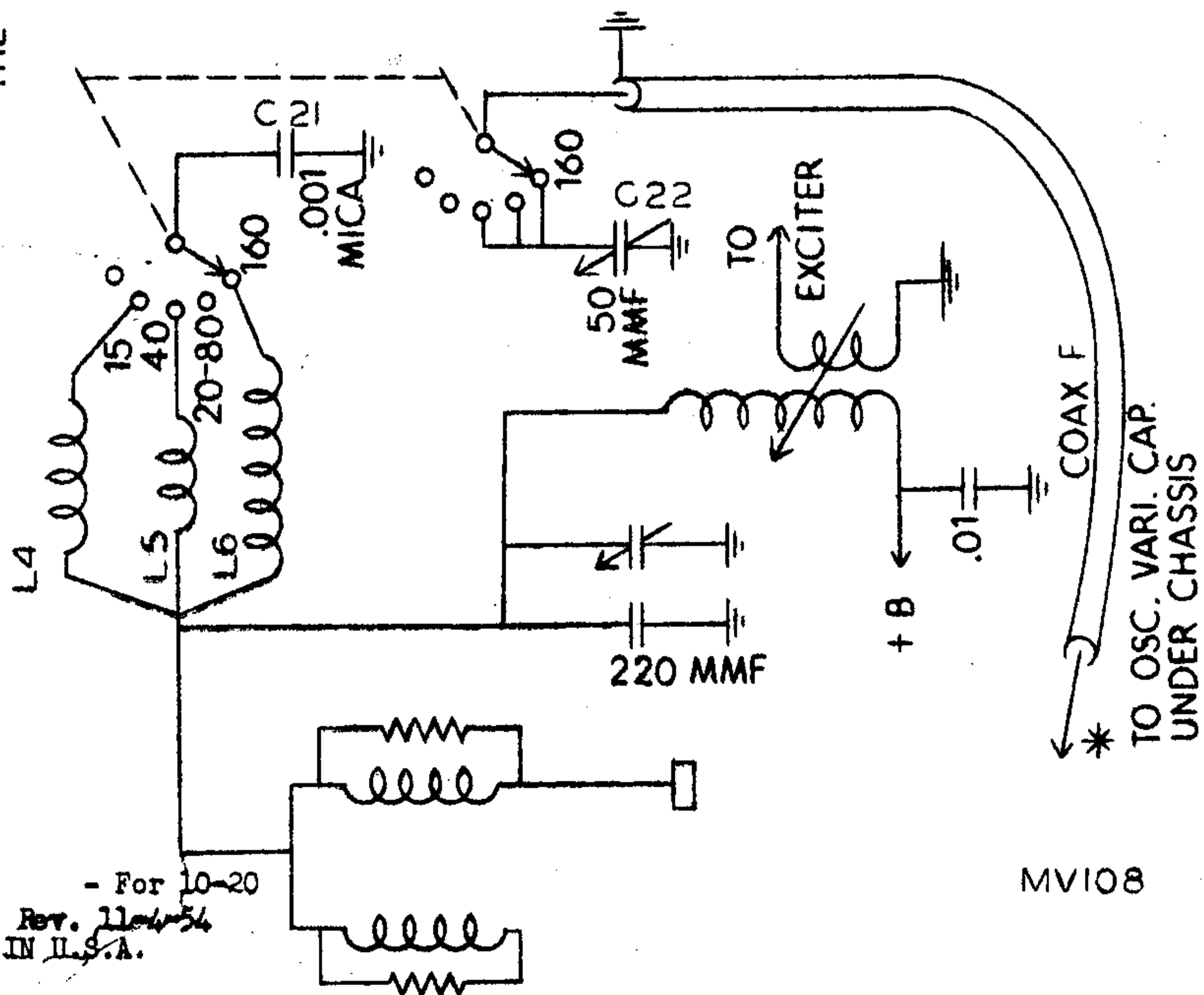
1800 6485	7000 6248
1825 6531	7100 6363
	7200 6481
1875 6627	7300 6605
1900 6674	
1925 6724	14000 5300
	14100 5562
3500 6585	14200 5844
3700 6153	14300 6153
3800 5844	
3900 5562	21250 6715
4000 5300	21350 6855
	21450 7000

FILE 2  
50 MMF  
NOTCHES  
TO MOUNT  
VARI. CAP.

BREAK THE POLYSTYRENE STRIP  
SO THAT THE LAST HALF TURN  
MAY BE VARIED TO ADJUST  
THE INDUCTANCE



TERM.# 1 TO 12 ON WAFER FARTHEST FROM PANEL



5  
VFO - 16  
10-27-56 Rev. 11-4-56  
PRINTED IN U.S.A.  
- For 10-20

MV108



