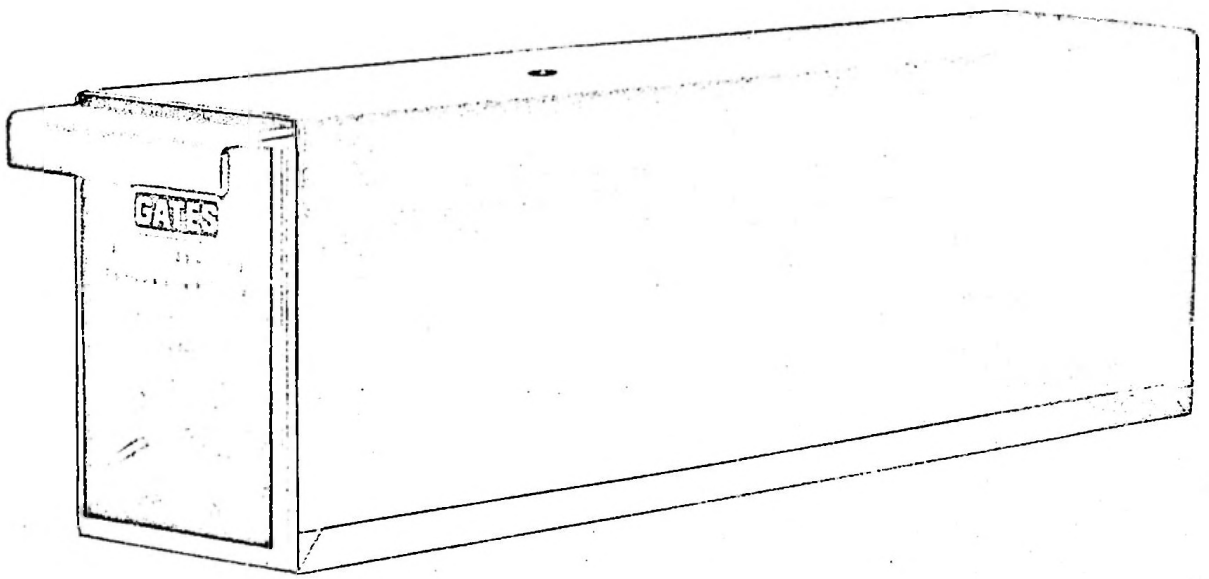


Fig. 1 - M5700 Transistor Program Amplifier

The Gates Transistor Program Amplifier is available in two versions:

1. The M5700 is designed specifically for use in Gates Transistor Consoles. It is supplied less the interstage level control, and with the input unterminated. The control is mounted externally on the Console panel.

2. The M5700B is designed for rack mounting in system installations with the level control mounted internally. The input of the amplifier is unterminated to facilitate application. Terminate the input connections on the amplifier mounting tray in the proper resistance (150 or 600 ohms). The gain of the M5700B will then be approximately 70 db maximum.

TECHNICAL DATA

Gain:
M5700: 80 DB, M5700B: 76 DB, may be reduced as required with internal volume control.

Frequency Response:
± 1 db from 30 to 15,000 cps.

Harmonic Distortion:
Under 0.75% at 30 cps., 0.5% from 50 to 15,000 cps., at +24 dbm output.

Intermodulation Distortion:
Under 0.3% at +14 dbm equivalent sine wave power output, using 40 and 7000 cps., mixed 4:1. Under 1.5% at +24 dbm.

Noise Level:
-122 dbm equivalent input noise.

Source Impedance:
150/250 ohms, or 500/600 ohms.

Input Impedance:
Factory connected for 150 ohms. May also be connected for 600 ohms.

Load Impedance:
Factory connected for 600 ohms. May also be connected for 150 ohms.
Maximum Input Level:
-35 dbm.
Maximum Output Level:
+24 dbm.
Maximum Operating Ambient Temperature:
55° C. (131° F.)
Maximum Storage Ambient Temperature:
85° C. (185° F.)
Power Requirements:
30 volts D.C., 90 ma., 0.1 mv. maximum ripple.
Transistors:
4 - 2N1414 2 - 2N5087
1 - 2N1183

Finish:
Satin-silver cover, black escutcheon plate.
Mounting:
M6031 Mounting Tray required to mount in M6029 Shelf Assembly. Shelf assembly accommodates seven Program Amplifiers and requires panel space of 3-1/2" X 19".
Size:
2-7/32" wide, 3-1/8" high, 10-3/4" long, overall.
Weight:
4-1/4 lbs. net. 8-1/4 lbs. packed.
Cubage:
0.8 cu. ft. domestic pack.

DESCRIPTION

The M5700 Program Amplifier is completely transistorized, and is designed for use as a line or isolation amplifier in broadcasting and recording applications. Special techniques have been employed to obtain low noise, low distortion, and good temperature stability.

The amplifier is used with the M6031 Mounting Tray which carries a mating receptacle and is supplied with mounting hardware. Up to seven trays may be installed on the M6029 Shelf Assembly, which mounts in a standard Gates rack cabinet, and occupies 3-1/2" of panel space. A keying pin is provided with the mounting tray to prevent accidental interchange of non-similar plug-in units in the system.

The interstage level control is located on the front panel of the M5700B model. The output transformer and receptacle are attached to the frame, and all other components are mounted on the printed wiring boards.

Typical frequency response and distortion curves are shown in Fig. 2. These measurements were taken with all transistors selected at random.

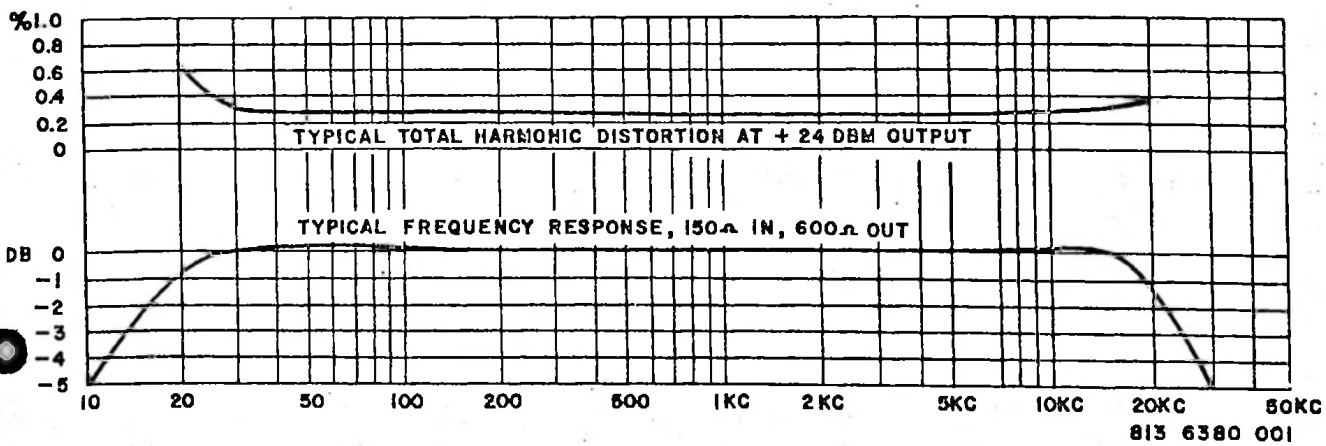


Fig. 2 - Response and Distortion.

INSTALLATION

MOUNTING TRAY AND SHELF ASSEMBLY

Mounting holes have been spaced in the shelf assembly to allow it to be completely filled with trays of any one type for the Gates transistorized units. It is possible, where maximum use of shelf space is not required, to mix trays of different sizes. Thus a program amplifier and preamplifier could be placed at the left and a power supply at the extreme right. Proceed as follows:

1. Locate the first tray at the extreme left or right of the shelf assembly, with the receptacle at the rear. The countersunk holes of the tray will fit into the matching holes in the shelf, when properly located. Leave a 1/16" space between trays.

2. Secure the tray to the shelf with the two #4-40 x 1/4" flat head screws with the two #6 internal-external shakeproof washers under two #4 hex nuts.

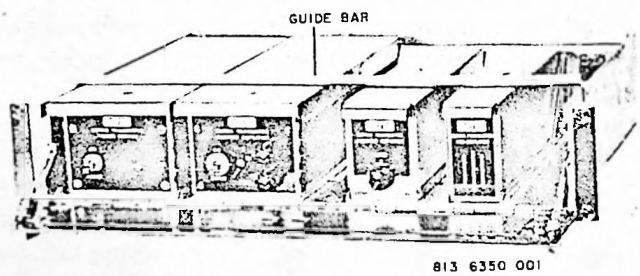


Fig. 3 - Shelf Assembly With Guide Bar

3. Determine whether or not the guide bar, shown in Fig. 3, will be required. The purpose of this bar is to prevent possible damage to the mating connectors when upward pressure is inadvertently applied to the amplifier during withdrawal. The bar will be required only where no other protecting obstruction is present in the rack, or where the shelf is used at a location such as a work bench.

It will not be required where another M6029 Shelf Assembly is mounted directly above, or where overhead equipment interferes with mounting of the shelf due to the presence of the bar. The mounting screws are located so that they may be removed from within the shelf.

4. Mount the shelf in the rack using hardware supplied with the rack. The two end strips mount under the screw heads, and are to be flush with the drop panel.

INPUT AND OUTPUT TRANSFORMERS

The input transformer is factory connected for 150 ohms primary impedance, as shown on the schematic diagram and on Fig. 4. If a terminated input is desired, a 150 ohm resistor should be connected to terminals 9 and 10 on the amplifier mounting tray, since the amplifier input is unterminated.

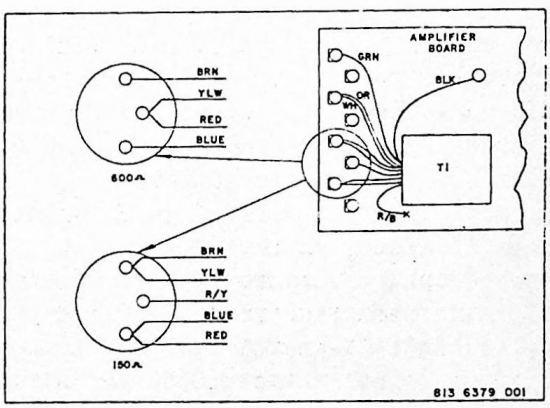


Fig. 4 - Input Transformer Connections

Refer to Fig. 4 for connection to 600 ohms impedance. If a terminated input is required, connect a 620 ohm resistor across terminals 9 and 10 on the amplifier mounting tray.

If 6db more gain is desired in some applications, the input terminating resistor may be deleted. In this case, however, the system component preceeding the amplifier will not be properly terminated.

The output transformer is factory connected

for 600 ohms secondary impedance. To reconnect for 150 ohms refer to the schematic diagram. Remove the green/white and black wires from terminal #7. Connect the black wire to terminal #5 and the green/white wire to terminal #6.

EXTERNAL CONNECTIONS

External connections are made to the mounting tray receptacle as follows:

Circuit	Terminals
External Control (Optional)	1,2,3
+30 V.	4
Circuit Ground	4
Output Connections	5,6
Output Center-Tap (600 ohms)	7
Input Connections	9,10
Input Center-Rap	11
-30 V.	12
Chasis Ground	13
No Connection	8,14,15,16

Jumper together all #13 terminals on the shelf, whether program amplifiers or other types, and connect to the rack ground bus. Connection from rack ground to the circuit ground in the program amplifier (B+) should be made at the amplifier (not at the power supply). Make a connection from the rack ground bus to each amplifier terminal #14, SEPARATELY, with at least 18 guage wire. These circuit grounds must be carried separately to prevent the possibility of interaction (due to mixing of return currents in a common wire). Where other types of amplifiers are mounted on the same shelf, consult their respective Instruction Book for grounding information. Where many amplifiers and power supplies are mounted in a rack, it is preferable to run a vertical rack ground bus-bar, to pick up grounds at each shelf.

Run the D. C. supply leads, output pair, and chassis and circuit ground leads along the rear edge of the shelf. The D.C. supply leads should be at least 18 gauge, and must be run SEPARATELY from each program amplifier to its respective power supply, to prevent the possibility of common coupling in the power wiring. See the power supply Instruction Book for further information.

Run input pairs and external control leads along the shelf brace, above the receptacles.

EXTERNAL VOLUME CONTROL

Reference to the schematic diagram will indicate that the program amplifier is wired to accommodate an external volume control. This feature makes it possible to locate the volume control on an adjacent rack panel, or on a console control panel, when the amplifier is mounted internally. The internal control, R30, must be disconnected when the amplifier is to be used in this way. The (R30) control may be ordered as part number 550 0218 000.

THEORY OF OPERATION

For the purpose of explanation, the program amplifier can be considered to be made up of two parts: the preamplifier, and the high level amplifier.

THE PREAMPLIFIER

The four stage preamplifier has a transformer coupled input and emitter follower output, with direct coupling utilized between Q1 and Q2, and between Q3 and Q4. Q1 and Q2 transistors are low noise types designed for use in critical low noise applications.

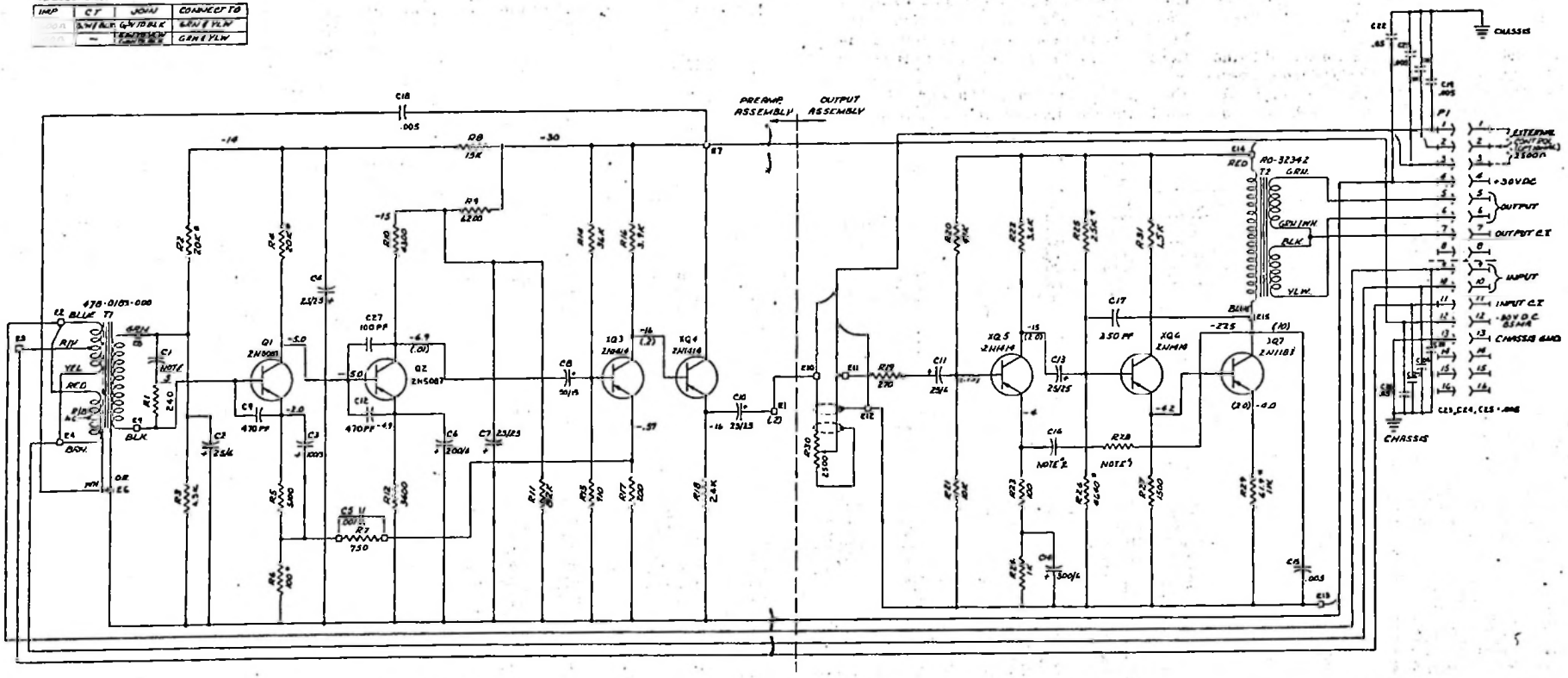
Biasing is accomplished by a combination of voltage divider and emitter resistance, as with R2, R3, and R5. This method of biasing also insures a high degree of temperature stability. Signal degeneration is provided for Q1 by R6, and for Q3 by R17. A loop feedback network connects from Q3, thru R7 and C5, to Q1. The large amount of feedback and degeneration obtained by these

T1 PRIMARY

IMP.	C.T.	JOIN	CONNECT TO
600 Ω	YEL.	YEL. TO RED	BLUE & BRN.
150 Ω	RED		BLUE & BRN.

T2 SECONDARY

IMP.	C.T.	JOIN	CONNECT TO
[illegible]	GRN TO BLK		GRN & YLW
[illegible]	—	TEMPORARILY [illegible]	GRN & YLW



(1) D.C. VOLTAGES MEASURED WITH 20K Ω/VOLT METER.
(2) ( ) R.M.S. SIGNAL VOLTAGE AT INC., -36 DBM IN, +24 DBM OUT.
(3) ALL RESISTORS 1/2 WATT, 5 % EXCEPT ± 1 % AND WHERE NOTED.
(4) ALL CAPACITORS IN MFD, WITH D.C.W.V., UNLESS NOTED PF
(5) □ DESIGNATES BOARD LUG CONNECTION.

NOTE 1 R28: 8.7K FOR MS700A
R28: 4.3K FOR MS700
NOTE 2 C16: .5 MFD FOR MS700B
C16: 1 MFD FOR MS700
NOTE 3 C1: .01 MFD FOR MS700B
C1: .05 MFD FOR MS900

Fig. 5 - Schematic Diagram

methods reduces distortion in the preamplifier to an extremely low value, and makes the operation almost completely independent of variations in transistor parameters.

THE HIGH LEVEL AMPLIFIER

The output stage, Q7, is connected in the common emitter configuration, with a series fed output transformer, T2, in the collector circuit. Emitter resistor R29 provides a large amount of degeneration, to reduce large-signal distortion to a low value.

The low driving impedance required by a stage of this type is obtained from the emitter follower, Q6. The stages are direct coupled, with R25 and R26 establishing the bias on both Q6 and Q7. Q5 provides additional gain for the high level amplifier.

The feedback network, R28 and C16, is used primarily for low frequency response compensation.

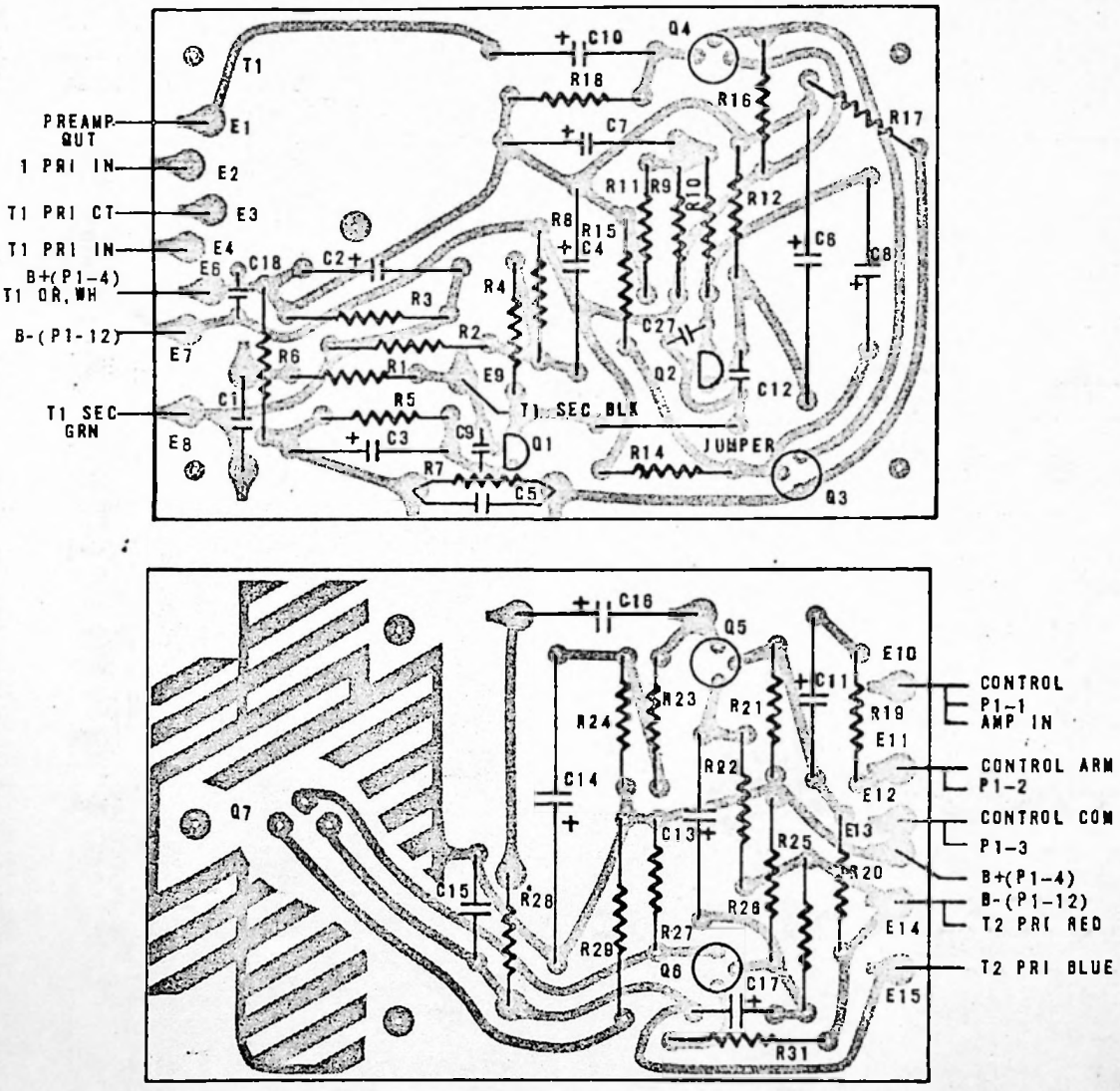


Fig. 6 - Printed Board Component Location, Viewed from Wiring Side.

MAINTENANCE

PREVENTIVE MAINTENANCE

The M5700 Program Amplifier is designed for long, trouble-free service. However, as with all high quality electronic equipment, a regular program of inspection should be followed.

It is recommended that when the amplifier is first placed in operation, D.C. voltage be measured with the same voltmeter that will be used for maintenance and trouble shooting, and that these readings be recorded on the amplifier schematic above the typical voltage shown.

Dust and dirt should be periodically removed with a soft brush.

SERVICING

When servicing the amplifier, the following points should be observed:

1. The condition of the output stages, Q7 and Q6, can be most readily checked by measuring the D. C. voltages associated with these stages.

2. Circuit resistances should be measured only after removing the associated transistor or transistors, to prevent damage due to ohm-meter battery voltage.

3. Do not remove or insert transistors with the power on.

4. Do not probe the printed board with a metal probe with the power on.

5. Circuit voltages are reversed from standard vacuum tube practice, as is the polarity of all the electrolytic capacitors.

6. The location of the positive end of each electrolytic capacitor is indicated by the white dot marked on the top of the circuit board.

PRINTED CHASSIS COMPONENT REPLACEMENT

CHECKING COMPONENTS

1. The components should be carefully checked by measuring circuit voltages and resistances before attempting to remove one of the leads from the printed chassis. Extreme care must be exercised in removing the lead to prevent damage to the board or conductors. This operation should not be considered unless it is the only way the component can be checked. If one lead must be removed without damage to the component, apply a well cleaned and tinned 25 to 60 watt iron to the fillet adjacent to the lead. With small long nose pliers or thin screwdriver, pry the folded portion of the lead in line with the holes. Applying the iron for more than four seconds at a time may damage the chassis base material.

Remove as much solder from the lead as possible. Remove all the kinks in the wire. With heat applied, gently pull the wire through the hole.

RESOLDERING THE COMPONENT

2. If the component is good, replace as follows: Use a metal twist drill (1/8" dia. or less) to clear the hole only in the fillet of solder. Turn with the fingers only remove solder slowly to prevent the drill from tearing the fillet.

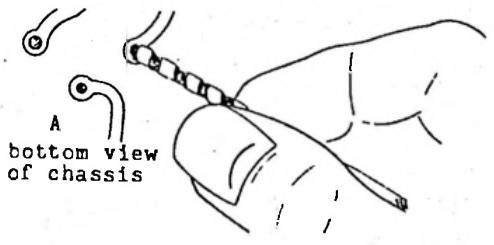


Fig. 7 - Cleaning Holes

Be sure the component lead is straight and free of solder. Push it gently back through the hole until some of it shows on the other side. Solder carefully but rapidly to prevent chassis damage.

REPLACING COMPONENTS

3. Components can be replaced with less chance of damage to the chassis than the removal and rewiring of one of the leads. Remove as follows: Clip the leads close to the body of the component. Heat the fillet and gently push the wire through until the hook may be clipped off. Clip the hook off (on the soldered side) with sharp cutters.

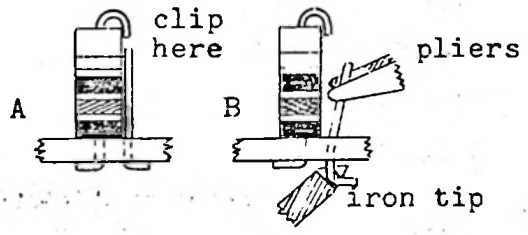


Fig. 9 - Removing Components

With the iron applied to the fillet, pull the wire gently out of the component side of the chassis.

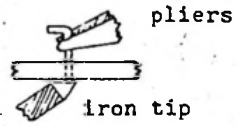


Fig 8 Fig. 8 - Removing Lead

After removing the leads, prepare the chassis for the new component as explained in Fig. 7, paragraph 2.

To replace the component, fold the leads on the new part to the same spacing as the mounting holes. Insert the part and fold the leads under the chassis to hold the component firmly against it.

Fig. 10 - Installing New Component

Clip off the excess wire. Place the iron on both the component lead and fillet. Solder carefully and rapidly to prevent damage to the chassis base. If one of the conductors is damaged, it is seldom necessary to scrap the printed chassis. Lay a small piece of wire (#18 to 24 ga.) across the break and solder each end to the conductor.

If a fillet is pulled loose, break it off to get rid of the loose end. Fold the new component lead to lay on the conductor and solder. If the component lead is too short, solder in another piece of wire to bridge the gap. Printed chassis construction places no strain on repairs of this nature, thus, soldering alone will provide sufficient mechanical strength even with heavy shock and vibration in almost every case.

The base material used on the printed chas sis is the best available for this service The two oz. copper is twice as heavy as us ed in average applications of this type o equipment. This assures reliable service and repair, if and when required. If replacement parts are ordered from the Gates Radio Company, please list the Gates stock number given in the parts list, as well as the description of the part. This will assure receipt of the right part immediately.

PARTS LIST

Symbol No.	Gates Stock No.	Description
C1 (M5700)	508 0076 000	Cap., .005 uf., 100 V.
C1 (M5700B)	508 0215 000	Cap., .01 uf., 100 V.
C2, C11	522 0178 000	Cap., 25 uf., 6 V. D.C.
C3	522 0160 000	Cap., 100 uf., 3 V. D.C.

Symbol No.	Gates Stock No.	Description
C8	522 0227 000	Cap., 50 uf., 15 V. D.C.
C4, C7, C10, C13	522 0242 000	Cap., 25 uf., 25 V. D.C.
C5	516 0054 000	Cap., .001 uf., 1KV
C6	522 0187 000	Cap., 200 uf., 6V D.C.
C9, C12	516 0043 000	Cap., 470 pf., 1KV
C14	522 0189 000	Cap., 300 uf., 6V. D.C.
C15	516 0075 000	Cap., .005 uf., 1 KV
C16 (M5700)	522 0335 000	Cap., 1.5 uf., 50 V. D.C.
C16 (M5700B)	522 0251 000	Cap., 5 uf., 50 V. D.C.
C17	516 0035 000	Cap., 250 uuf., 1 KV
C18,C19,C20,C21, C23,C24,C25	516 0426 000	Cap., .005 uf., 500V
C22,C26	516 0435 000	Cap., .05 uf., 100V
C 27	500 0759 000	Cap., 100pf., 500 V.
P1	610 0244 000	Plug
Q1, Q2	380 0112 000	Transistor, 2N5087
Q3, Q4, Q5, Q6,	380 0014 000	Transistor, 2N1414
Q7	380 0012 000	Transistor, 2N1183
R1 (M5700A)	540 0044 000	Res., 620 ohm, 1/2 W., 5%
R1 (M5700,B)	540 0034 000	Res., 240 ohm, 1/2 W., 5%
R2, R4	548 0050 000	Res., 20K ohm, 1/2 W., 1%
R12, R22	540 0062 000	Res., 3600 ohm, 1/2 W., 5%
R5	540 0066 000	Res., 5100 ohm, 1/2 W., 5%
R6	548 0049 000	Res., 100 ohm, 1/2 W., 1%
R7	540 0046 000	Res., 750 ohm, 1/2 W., 5%
R8	540 0077 000	Res., 15K ohm, 1/2 W., 5%
R9	540 0068 000	Res., 6200 ohm, 1/2 W., 5%
R3, R10	540 0064 000	Res., 4300 ohm, 1/2 W., 5%
R11	540 0095 000	Res., 82K ohm, 1/2 W., 5%
R14	540 0086 000	Res., 36K ohm, 1/2 W., 5%
R15	540 0048 000	Res., 910 ohm, 1/2 W., 5%
R16	540 0063 000	Res., 3900 ohm, 1/2 W., 5%
R17	540 0032 000	Res., 200 ohm, 1/2 W., 5%
R18	540 0058 000	Res., 2400 ohm, 1/2 W., 5%
R19	540 0035 000	Res., 270 ohm, 1/2 W., 5%
R20	540 0089 000	Res., 47K ohm, 1/2 W., 5%
R21	540 0073 000	Res., 10K ohm, 1/2 W., 5%
R23	540 0025 000	Res., 100 ohm, 1/2 W., 5%
R24	540 0049 000	Res., 1000 ohm, 1/2 W., 5%
R25	548 0135 000	Res., 25K ohm, 1/2 W., 1%
R26	548 0095 000	Res., 4640 ohm, 1/2 W., 1%
R27, R31	540 0053 000	Res., 1500 ohm, 1/2W., 5%
R28 (M5700)	540 0064 000	Res., 4.3K ohm, 1/2 W., 5%
R28 (M5700B)	540 0059 000	Res., 2.7K ohm, 1/2 W., 5%
R29	548 0093 000	Res., 61.9 ohm, 1 W., 1%
R30 (M5700A/B)	550 0218 000	Potentiometer, 2500 ohm
T1	478 0183 000	Transformer, Input
T2	478 0125 000	Transformer, Output
XQ3,XQ4,XQ5,XQ6	404 0066 000	Socket
XQ7	404 0149 000	Socket