M6108A TRANSISTOR MONITOR AMPLIFIER

INSTRUCTION BOOK

HARRIS INTERTYPE CORPORATION

GATES®

GATES RADIO COMPANY • QUINCY, ILLINOIS • 62301 • U.S.A.
A division of Harris-Intertype Corporation

IB #888 0921 001

TECHNICAL DATA

Gain:

53 db (matching 600 ohm).
39 db min. (bridging 6,000 ohm)

Frequency Response:

± 1.0 db from 20 to 20,000 cps @ normal output level.

Harmonic Distortion:

Under 1.0% from 30 to 15,000 cps @ + 38 dbm output (6 watts).
Under 1.0% from 50 to 15,000 cps @ + 39 dbm output (8 watts).

Intermodulation Distortion:

Under 1.0% at + 38 dbm equivalent sine wave power output, using 40 and 7000 cps mixed 4:1.

Noise Level:

- 85 db below rated output level (+ 39 dbm).

Source Impedances:

600 ohms for 600 ohms matching input.
150/600 for 6000 to 10,000 ohm bridging input.

Input Impedances:

600 ohms matching input, balanced (transformer input).
6,000 ohms, bridging input, balanced (bridging pad and transformer input).

Load Impedances:

4 to 16 ohms (8 ohms nominal), unbalanced (transformerless output, isolated from AC ground by power transformer).

Output Impedance:

1.2 ohms, approximately.

Maximum Input Level:

0 dbm.

Maximum Output Level:

+ 39 into 8 ohms (8 watts).

Maximum Operating Ambient Temperature:

55° C. (131° F.)

Maximum Storage Ambient Temperature:

85° C. (185° F.)

Power Requirements:

117 Volts at 50/60 cps., 18 watts.

Transistors:

2	2N1414	1	2N1225
1	2N214	2	2N3614
2	2N1183		

Rectifiers:

4 - X5A2 (silicon)

Finish:

Light grey cover, flat black heat sink chassis.

Mounting:

Two keyhole slots, rubber bumpers on bottom, permanent or movable mounting in any position.

Size:

3-1/4" high, 4-3/8" deep, 8-1/2" long.

Weight:

4 lbs., net. 7 lbs., packed.

Cubage:

0.9 cu. ft.. domestic pack.

DESCRIPTION

The M6108A Monitor Amplifier is a transistorized, self-contained amplifier designed for use in broadcasting, recording, and general sound reinforcement applications. Special techniques have been employed to obtain reliability, low distortion, and good temperature stability. The amplifier can be mounted in any position and does not require ventilation when handling 8 watts of program material. The input, power, output connections, fuse and input level control are mounted on end panels of the chassis.

INSTALLATION

MOUNTING

The amplifier has been provided with two keyhole slots for #8 screws for fixed or permanent mounting.

INPUT CONNECTIONS

Provisions are made for changing from 600 ohm matching to 6,000 ohm bridging on the input terminal strip. Fig. 1 shows the connection for 600 ohms. Fig. 2 shows the connection for 6,000 ohm bridging.

In the event that a preamplifier driver is used requiring a minimum load of 10,000 ohms, a 2200 ohm resistor may be added at each bridging input terminal. With this change, 1.5 volts input will be required for full output.

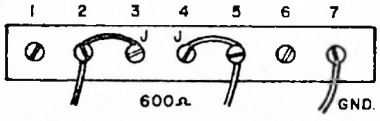


Fig. 1

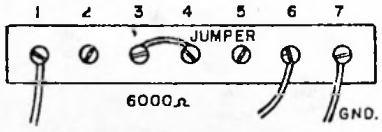


Fig. 2

OUTPUT CONNECTIONS

Output connections are made to the two lug terminal strip on the end plate of the chassis. Groups of speakers may be driven with this amplifier; connected in series, parallel, or series parallel; but the combined impedance should not be less than 4 ohms. With an impedance of more than 12 ohms, the amplifier will not be able to deliver full output power. Speaker matching transformers permit the paralleling of a number of speakers, depending on the unit required. Gates Part No. 480 0005 000 transformer is available, having a primary of 48 ohms and a secondary of 8 ohms for matching purposes.

In wiring speaker loads it should be remembered that 8 watts at 8 ohms represents 1 ampere of audio current. The recommended use of No. 16 gauge twisted and shielded wire will prevent power losses and possible interaction of circuits.

AMPLIFIER PARALLELING

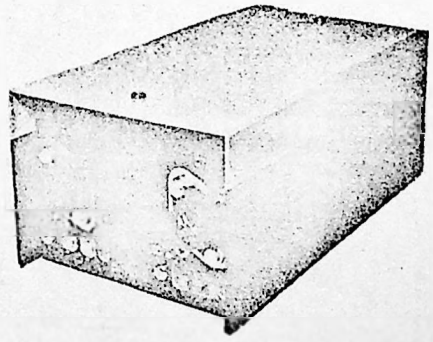
It is not recommended that amplifiers of this type be paralleled at their outputs to obtain higher power. Where more power is required than can be supplied by one amplifier, the speaker load should be divided between several amplifiers which have their inputs bridged across the common signal source.

POWER CONNECTIONS

117 volts A.C., 50/60 cycles is supplied thru the power cord and power plug on th chassis end plate. A power switch is no required due to the low power consumptio and heat dissipation.

NOTE

While the amplifier can handle a continuous 8 watts of program material, CAUTIC should be exercised during full power sine wave testing to avoid exceeding the thermal capabilities of the chassis heat sink. During these tests it is recommended that a duty cycle of 30 seconds on t 3 minutes off be used to allow heat buil up to dissipate.



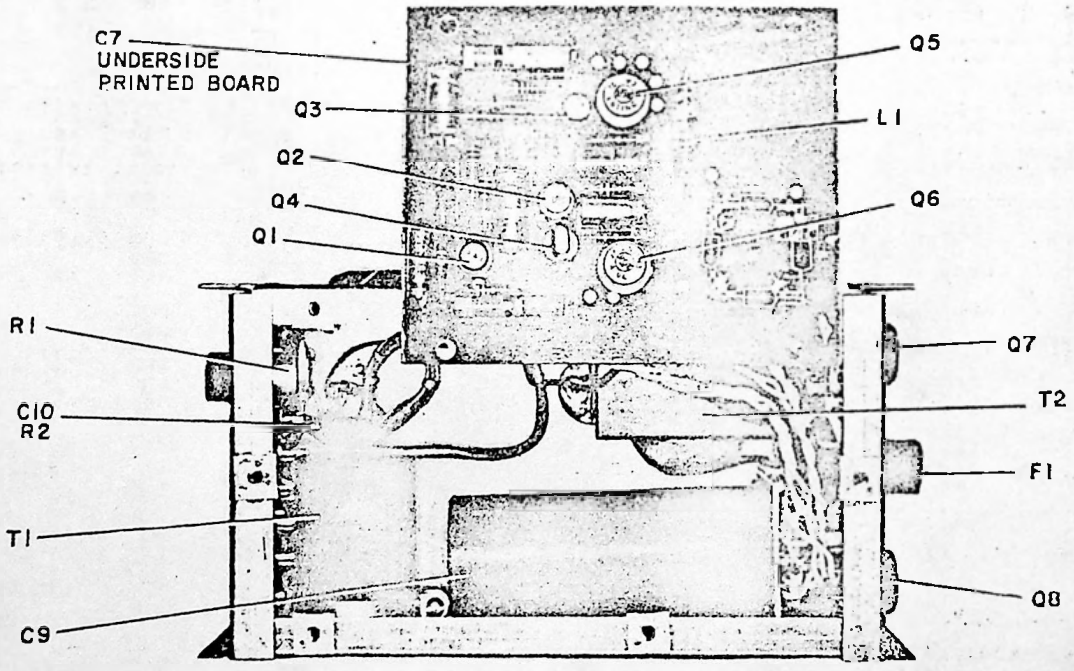
M6108 MONITOR AMPLIFIER

THEORY OF OPERATION

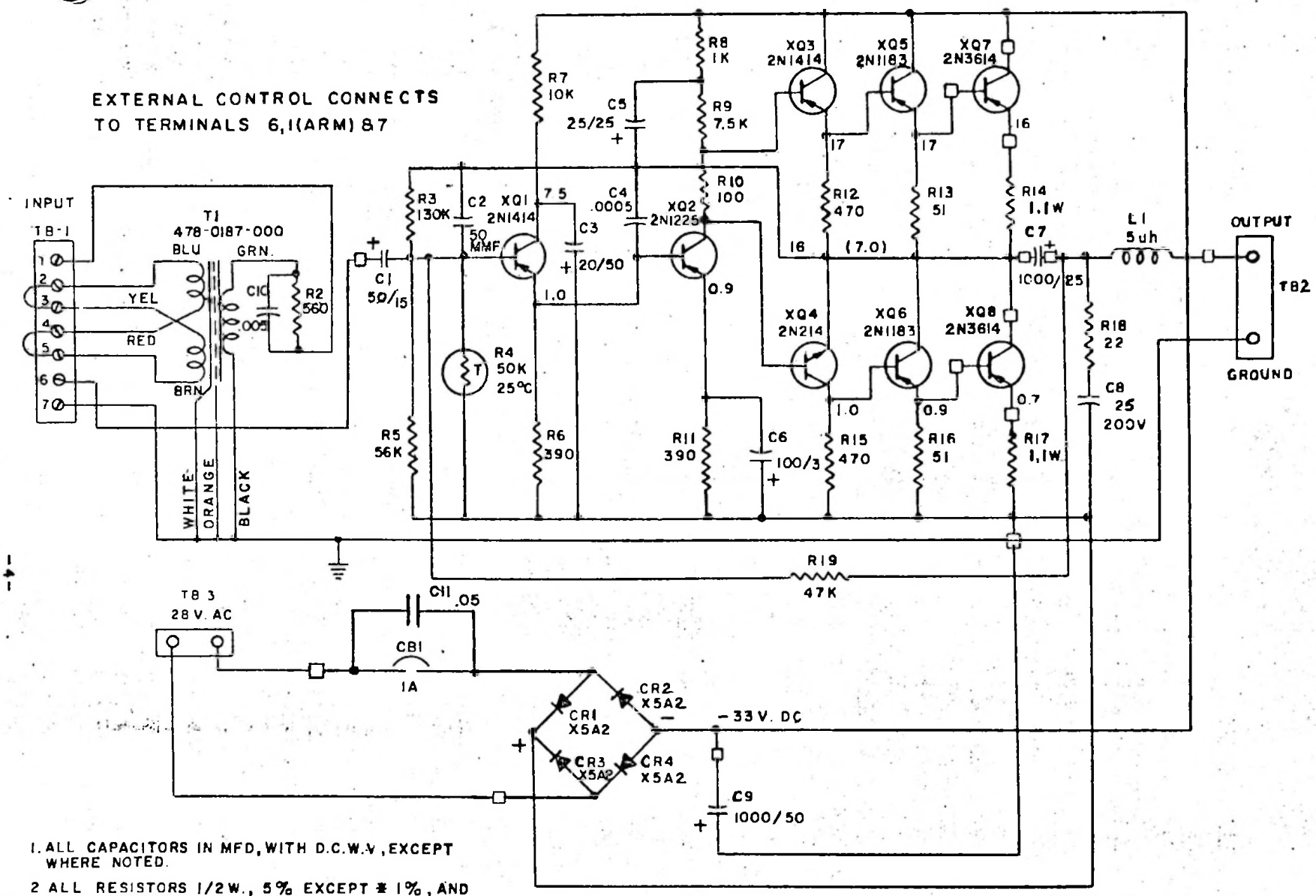
The amplifier is driven by an input transformer which provides for isolation and matching functions in the primary by means of split windings and resistive pads. The input level control provides a constant load to the input transformer secondary while furnishing a gain control function. Transistor Q1 operates as an emitter follower and provides impedance matching from the input to the voltage amplifier, Q2. Note that Q2 is the only stage which has voltage gain. A high frequency transistor is used at this point to improve stability. The output stages of the amplifier operate Class B, and are arranged in the circuit configuration known as "single ended push-pull" or a "followed emitter follower". The upper and lower units are in series across the power supply, and the load is connected at their junction. When the signal at the collector of Q2 goes negative; Q3, Q5, and Q7 conduct; since they are all PNP types. When the signal goes positive; Q4, Q6, and Q8 all conduct; since Q4 is an NPN type. Thus, the full signal appears at the junction point. Q3, Q5, Q7, and Q6, Q8 are connected in a compound or "Darlington" configuration, a connection which provides extremely high current gain, and improves linearity at high signal levels.

General feedback loops are employed in the amplifier including R3, R19, C2, C4, and C5. C2 and C4 provide high frequency feedback while C5 supplies positive feedback from the output to the collector circuit of Q2 to increase the signal handling capacity of this stage.

Thermistor R4 compensates for variations in the amplifier bias due to temperature changes. Choke L1 renders the amplifier insensitive to changes in capacity across the output leads. The power supply is a conventional full wave bridge rectifier with filter capacitor circuit.



PARTS LOCATION
M6108 TRANSISTOR
MONITOR AMPLIFIER



1. ALL CAPACITORS IN MFD, WITH D.C.W.V, EXCEPT WHERE NOTED.
2. ALL RESISTORS 1/2W., 5% EXCEPT * 1%, AND WHERE NOTED.
3. □ DESIGNATES BOARD LUG CONNECTIONS.
4. D C VOLTAGES MEASURED AGAINST B+, WITH 20KΩ VOLT METER, AT +38 DBM OUTPUT.
5. ( ) R.M.S. SIGNAL VOLTAGES AT 1KC, -15 DBM INPUT, (600Ω) +38 DBM OUTPUT

SCHEMATIC
M6108 A TRANSISTOR
MONITOR AMPLIFIER

MAINTENANCE

PREVENTIVE MAINTENANCE

The M6108 Monitor Amplifier is designed for long, trouble-free service. However, as with all high quality electronic equipment, a regular program of inspection should be followed. These points should be covered:

1. Check the power amplifier supply voltage at the collector of Q5 or Q7. On the power transistors, such as the 2N1183 and 2N3614, the collector is connected to the case.

2. Check the speaker bus voltage, which appears at the collectors, or cases of Q6 and Q8.

3. Remove dust which collects on the printed board or in the housing, with a soft brush.

It is recommended that when the amplifier is first placed in operation, that D.C. voltages be measured with the same voltmeter that will be used for maintenance and troubleshooting, and that these readings be recorded on the amplifier schematic. The speaker bus and B- voltages should be recorded with an without signal.

SERVICING

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

1. The condition of the power supply can be most readily checked by measuring the D.C. voltage between the chassis and the case of output transistor Q8. (One of the two power transistors mounted on the end of the chassis). This voltage will be much higher or lower than normal if trouble is present in the power amplifier.

2. Voltages may be checked with Q5, Q6, Q7 and Q8 removed, provided that the speaker load is disconnected.

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

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

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

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

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

8. When replacing either Q7 or Q8, and before turning on the power, check with an ohm-meter between transistor case and chassis to make certain that a short circuit does not exist. Note that insulating washers are placed under the transistors to provide insulation.

PRINTED CHASSIS COMPONENT REPLACEMENT

1. CHECKING COMPONENTS

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 hole. 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.

2. RESOLDERING THE COMPONENT LEAD

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.

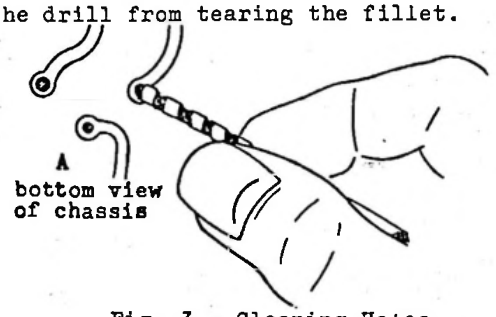


Fig. 3 - Cleaning Holes

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

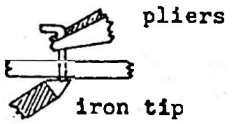


Fig. 4 - Removing Lead

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

3. REPLACING COMPONENTS

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 thru until the hook may be clipped off. Clip the hook off (on the soldered side) with sharp cutters.

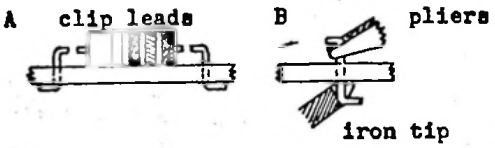


Fig. 5 - Removing Components

After removing the leads, prepare the chassis for the new component as explained in paragraph 2 and Fig. 3.

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. 6 - 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 the 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 mechanical 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 chassis is the best available for this service. The two ounce copper is twice as heavy as used in average applications of this type of equipment. This assures reliable service and repair.

PARTS LIST

Symbol No.	Gates Part No.	Description
C1	522 0227 000	Cap., 50 ufd., 15 V.
C2	500 0818 000	Cap., 50 uufd., 500 V.
C3	522 0256 000	Cap., 20 ufd., 50 V.
C4	516 0045 000	Cap., .0005 uf., 1 KV. ± 10%
C5	522 0242 000	Cap., 25 ufd., 25 V.
C6	522 0160 000	Cap., 100 ufd., 3 V.
C7	522 0306 000	Cap., 1000 ufd., 25 V.
C8	506 0006 000	Cap., .25 ufd., 200 V.
C9	524 0104 000	Cap., 1000 ufd., 50 V.
C10	508 0076 000	Cap., .005 ufd., 100 V.
C11	516 0087 000	Cap., .05 ufd., 600 V.
CB1	606 0116 000	Circuit Breaker, 1 Amp.
CR1, CR2, CR3, CR4	384 0062 000	Silicon Rectifier
L1	494 0135 000	Choke, RF, 5 uh.
Q1, Q3	380 0014 000	Transistor, 2N1414
Q2	380 0013 000	Transistor, 2N1225
Q4	380 0011 000	Transistor, 2N214
Q5, Q6	380 0012 000	Transistor, 2N1183
Q7, Q8	380 0035 000	Transistor, 2N3614
R2	540 0043 000	Resistor, 560 ohm, 1/2W. 5%
R3	540 0100 000	Res., 130K ohm, 1/2W., 5%
R4	559 0002 000	Thermistor, 50K ohm
R5	540 0091 000	Res., 56K ohm, 1/2W., 5%
R6	540 0039 000	Res., 390 ohm, 1/2W., 5%
R7	540 0073 000	Res., 10K ohm, 1/2W., 5%
R8	540 0049 000	Res., 1K ohm, 1/2W., 5%
R9	540 0070 000	Res., 7.5K ohm, 1/2W., 5%
R10	540 0025 000	Res., 100 ohm, 1/2W., 5%
R11	540 0039 000	Res., 390 ohm, 1/2W., 5%
R12, R15	540 0041 000	Res., 470 ohm, 1/2W., 5%
R13, R16	540 0018 000	Res., 51 ohm, 1/2W., 5%
R14, R17	542 1074 000	Res., 1 ohm, 2W., 5%
R18	540 0009 000	Res., 22 ohm, 1/2W., 5%
R19	540 0089 000	Res., 47K ohm, 1/2W., 5%
T1	478 0187 000	Transformer, Input
TB1	614 0218 000	Terminal Strip, 7 terminal
TB2	614 0024 000	Terminal Strip, 2 terminal
TB3	614 0213 000	Terminal Strip, 2 terminal
XQ1, XQ2, XQ3, XQ4	404 0066 000	Socket
XQ7, XQ8	404 0294 000	Socket
XQ5, XQ6	913 8826 001	Socket