

**TECHNICAL  
MANUAL**

**AM-80  
AM MODULATION MONITOR**



**HARRIS**  
COMMUNICATIONS AND  
INFORMATION HANDLING

INTRODUCTION

The Gates AM-80, AM Modulation Monitor assures maximum utilization of the RF carrier by providing accurate and reliable indications of the carrier modulation level. The unit is factory calibrated against a precise carrier waveform, at 100% modulation, and carries FCC Type Approval No. 3-208, in agreement with Paragraph 73.50 of the FCC Rules and Regulations covering Standard Broadcast Stations. Modification to the monitor will void the Type Approval.

WARNING

OBSERVE SAFETY REGULATIONS

Voltages and/or currents employed are sufficient to endanger, or under certain conditions, cause death. Always disconnect power before opening or servicing equipment. Always ground circuits before touching them.

DO NOT TAKE CHANCES!

1197

# AM-80, AM MODULATION MONITOR

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Dwg. No. 842 7177 001, AM Modulation Monitor with  
Positive Peak Flasher

## SECTION 1.0 - DESCRIPTION

The Gates Model AM-80, AM Modulation Monitor has been designed to provide accurate indications of the carrier modulation level of a Standard broadcast station.

### 1.1 Physical Construction

The unit will mount in a standard 19 inch mounting rack, occupying 7 inches of vertical space and extending 7 inches in depth.

### 1.2 Technical Specifications

#### Electrical:

RF Input Range:	6-20 VRMS into 50 ohms (0.7 to 8 Watts) 540 kHz to 30 MHz
Frequency Response, Meter and Flasher:	$\pm 0.5$ dB, 30 to 10,000 Hz
Accuracy, Meter and Flasher:	$\pm 2\%$ at full scale at 1,000 Hz
Modulation Range, Meter:	0% to 100% on Negative peaks 0% to 130% on Positive peaks
Negative Flasher:	50% to 100% on Negative peaks, continuously adjustable
Positive Flasher:	50%, 90%, 95%, 100%, 105%, 110%, 115%, 120%, 125%, 130% and off
Meter Response Time:	A modulation pulse of 65, $\pm 25$ milliseconds duration will cause a meter response of 90% of current reading
Meter Recovery Time:	The meter returns to 10% of reading in 650, $\pm 150$ milliseconds after signal removal
Noise:	70 dB below nominal outputs
Monitoring Output- Distortion:	Less than 0.3%
Response:	$\pm 0.5$ dB, from 20 Hz to 20 kHz
Output:	0.55 V (-3 dBm at 100% modulation into 600 ohm load
Output:	600 ohms, unbalanced

High Fidelity Output-	
Distortion:	Less than 0.3%
Response:	$\pm 0.5$ dB, from 20 Hz to 20 kHz
Output:	4.4 volts at 100% modulation, into a resistive load greater than 100k ohms, shunted by a capacitance less than 500pF
Impedance:	4,000 ohms
Remote Meter:	A separate output circuit provides a ballistically correct signal for a remote meter. Loop resistance must be less than 5,000 ohms
Remote Flashers:	The remote flasher switch may be switched "on" or "off" without affecting circuit calibration
Power Requirements:	105 to 125 VAC, 50/60 Hz, 10W.
Dimensions:	7 x 19 inch standard rack panel with depth of 7 inches (17.78 cm x 48.26 cm x 17.78 cm)
Weight:	Twelve (12) pounds (5.44 kg)
Operating Limits-	
Ambient Temperature Range:	-4 <sup>o</sup> to + 125 <sup>o</sup> F. (-20 <sup>o</sup> to +52 <sup>o</sup> C)
Ambient Humidity:	0 to 95%, relative
Altitude:	0 to 7500 Feet (2286 Meters)
1.3	Optional Accessories-
	AM-80 Remote Panel:
	Remote Meter and Flasher Panel, order Gates No. 994 7097 001
	Spare Parts Kit:
	100% spare Fuses, Lamps, Diodes and Transistors for Gates AM-80 Modulation Monitor, order Gates No. 994 7180 001
1-2	

## SECTION 2.0 - INSTALLATION

### 2.1 Damage Claim Information

In case of damage in transportation, notify the delivering carrier at once. After he has approved the damage report, which indicates he will accept your billing for the damage, send the Modulation Monitor back to Gates for repair and factory re-calibration.

This procedure should be followed, as the unit is FCC type approved with factory calibration; field repairs may void this approval.

### 2.2 Unpacking and Inspection

The container and packing should be removed only after a careful examination of the outside of the carton for indication of possible mishandling. Packing material should be retained until installation is completed and the AM Modulation Monitor is placed in operation.

### 2.3 Mounting and Connections

The AM-80 Modulation Monitor should be mounted in an accessory rack near the transmitter. It will require 7 inches of vertical panel space in a standard 19 inch mounting rack. The monitor will operate satisfactorily over an ambient temperature range of  $-4^{\circ}$  to  $+125^{\circ}\text{F}$ . Cabinet ventilation must be provided if the ambient temperature exceeds  $+125^{\circ}\text{F}$ .

#### 2.3.1 AC Connections

The Modulation Monitor is factory wired for three wire, 105 to 125 VAC, 50/60 Hz operation. An adaptor is provided for two wire installations.

#### 2.3.2 RF Connections

The monitor has been designed to operate from the monitor output terminals of the transmitter, or the low impedance output of an RF amplifier; these terminals to provide an RF input to the monitor of 0.7 to 8 watts.

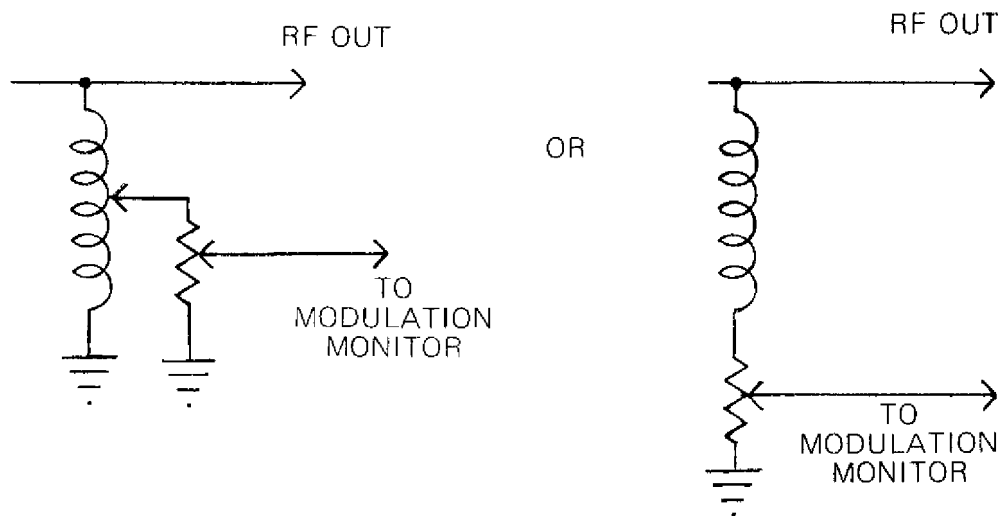
The RF level from these terminals should be initially adjusted to provide 6 to 20 VRMS into a 50 ohm load before connection to the Modulation Monitor. Remove the temporary 50 ohm load after checking, then connect the terminals to J1 on the Modulation Monitor. Use 50 to 75 ohm co-axial cable for connecting the transmitter to the monitor. A UHF connector is supplied with a UHF-to-BNC adaptor.

Transmitters not provided with a monitor output, may be fitted with a coil close to the power amplifier tank circuit. A ground

should be connected to one end only of the co-axial cable outer conductor. This ground will be made automatically when the cable is connected to the monitor.

**CAUTION:** Excessive RF input levels may damage the Modulation Monitor's carrier adjustment control, R2, and other input circuit components R1, R3, CR1 and CR2. Initially set the CARRIER ADJUST control, 2R1, to minimum (counter-clockwise) before applying RF power. Insert 6 to 20 VRMS of RF signal into the Modulation Monitor and immediately check the CARRIER meter. If the reading exceeds 100 (Red line), remove the RF input immediately.

If the pickup coil in the transmitter is not adjustable, connect a potentiometer as shown in Figure 1. Adjust the potentiometer for 6 to 20 VRMS output into a 50 ohm load.



CONNECTIONS FOR AN ADJUSTMENT PICKUP COIL

FIG. 1

In some transmitters an inductively coupled loop is provided to furnish a sample of the transmitter output to the Modulation

Monitor. Gates does not recommend this method as a good solution for the following three reasons-

- 1) The outer conductor of the co-axial cable feeding the monitor often is not grounded at the pickup point. This permits extraneous noise and signals to enter the monitor circuit, causing the monitor to present false indications.
- 2) An inductive pickup performs satisfactorily if the output load current is relatively high. It is usually not satisfactory for transmitters operating into high output impedances of 200 to 300 ohms.
- 3) An inductive pickup may cause erroneous indications of modulation percentage if coupled into a circuit in which there is considerable reactance.

NOTE: Modulation Monitor pickups as shown in Figure 1 offer the added advantage of providing a static drain at the output of the transmitter.

### 2.3.3 Audio/ Indicator Connections

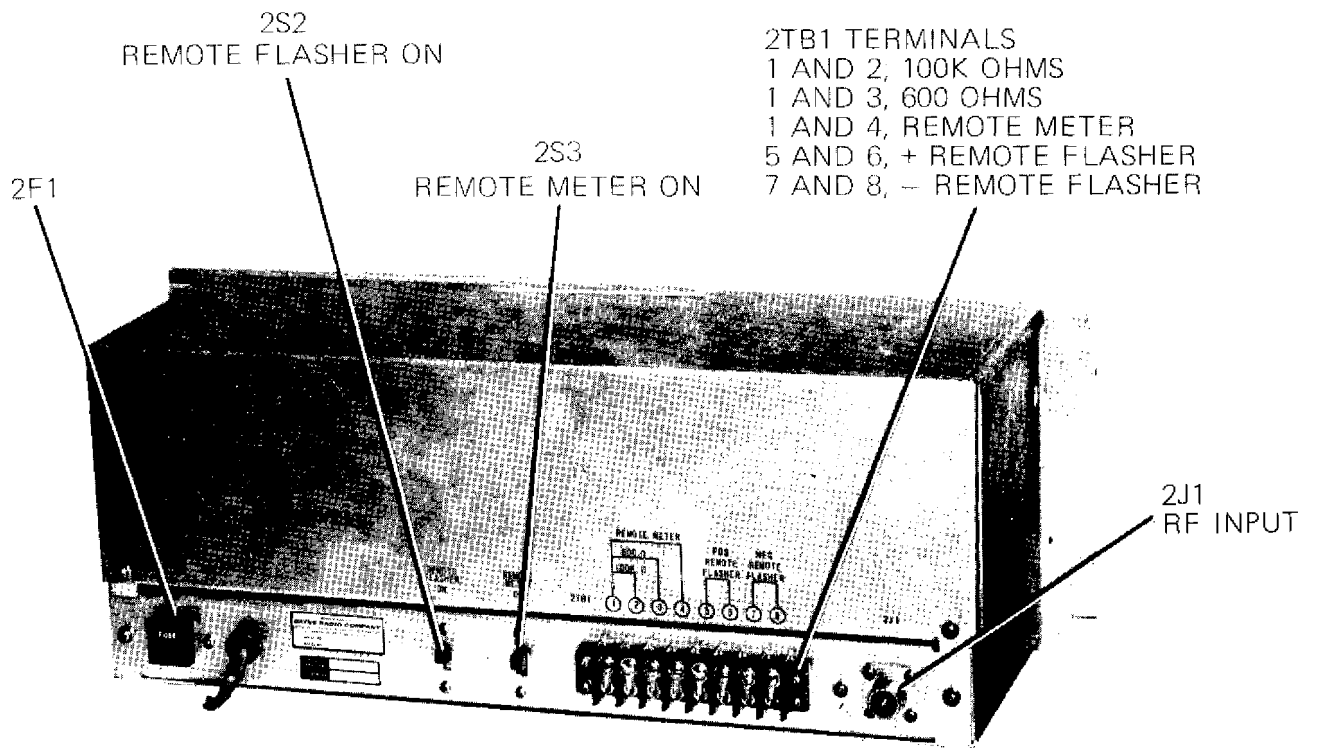
- a) High impedance and 600 ohm audio outputs are provided on the Modulation Monitor to permit Proof-of-Performance measurements and normal signal monitoring. For proof testing, the high impedance inputs of the test equipment should be connected to terminals 2TB1-1 (ground) and 2TB1-2 with shielded wire.
- b) 2TB1-1 (ground) and 2TB1-3 are the 600 ohm outputs, and should be used as the low impedance connection for a monitoring amplifier, or similar device.
- c) The Gates AM-80 Remote Panel will provide remote meter and flasher indications of the transmitter modulation levels. The remote positive flasher of this panel should be connected between terminals 2TB1-5 and 2TB1-6 on the Modulation Monitor, the negative remote flasher of this panel should be connected between terminals 2TB1-7 and 2TB1-8 on the Modulation Monitor.

NOTE: These terminals are above ground

The remote meter should be connected between terminals 2TB1-1 (ground) and 2TB1-4.

For each of these circuits, shielded No. 22 or heavier wire should be used. To preserve the accuracy of the remote meter, the total loop resistance of each external circuit must not exceed 5000 ohms.





AM-80, AM MODULATION MONITOR  
BACK VIEW

FIG. 2

## SECTION 3.0 - CONTROL DESCRIPTION AND UNIT OPERATION

### 3.1 General

The Gates Model AM-80, AM Modulation Monitor is a solid state, highly reliable indicator of AM transmitter operation. The unit meets or exceeds all the requirements of Paragraph 73.50 of the FCC Rules and Regulations covering Standard broadcast stations.

The following controls or indicators are located on the front panel. See Figure 3. Adjust all controls to the required settings for normal transmitter operation. (All rear panel switches "off"). Plug the unit's AC cord into the 117 VAC service and check that the meter lamps light.

#### 3.1.1 Carrier Adjustment

This control (marked CARRIER) adjusts for different input levels of the RF carrier. Initially turn this control fully counterclockwise. Then, with an appropriate RF signal, advance the setting for proper indication (100) on the CARRIER meter.

#### 3.1.2 Percent Negative Peaks Adjustment

This control (marked % NEGATIVE PEAKS) may be set to any modulation percentage between 50% and 100%, thereby controlling the level at which the negative flasher operates. It has no effect on the % MODULATION meter. Initially set this control to 100% position. (See Paragraph 3.1.4)

#### 3.1.3 Percent Positive Peaks Switch

This switch may be set to any of the marked positions between 50% and 130%, thereby controlling the level at which the positive flasher operates. It has no affect on the % MODULATION meter. Initially set this control to 100% position.

#### 3.1.4 Carrier Meter

This meter provides a continuous indication of the RF carrier amplitude. Adjust the CARRIER ADJUST control (Paragraph 3.1.1) until the CARRIER meter reads 100 (Red line indication on meter) in the absence of modulation.

#### 3.1.5 Positive or Negative Peak Selector Switch

This switch allows either positive or negative peaks to be monitored by the % MODULATION meter (Paragraph 3.1.6). Set this switch to either positive or negative as desired.

#### 3.1.6 % of Modulation Meter

This meter provides continuous indication of the modulation

percentage. The meter has a range of 0% to 130% and is also calibrated in dB. 100% modulation is equal to zero dB.

The unit will now be indicating the percentage of modulation on the RF carrier.

3.1.7 % Negative Peaks Flasher Lamp

This flasher lamp indicates the negative peaks when the percentage of modulation exceeds the preset level (Paragraph 3.1.2) of the indicator scale.

3.1.8 % Positive Peaks Flasher Lamp

This flasher lamp indicates the positive peaks when the percentage of modulation exceeds the preset level (Paragraph 3.1.3) of the indicator scale.

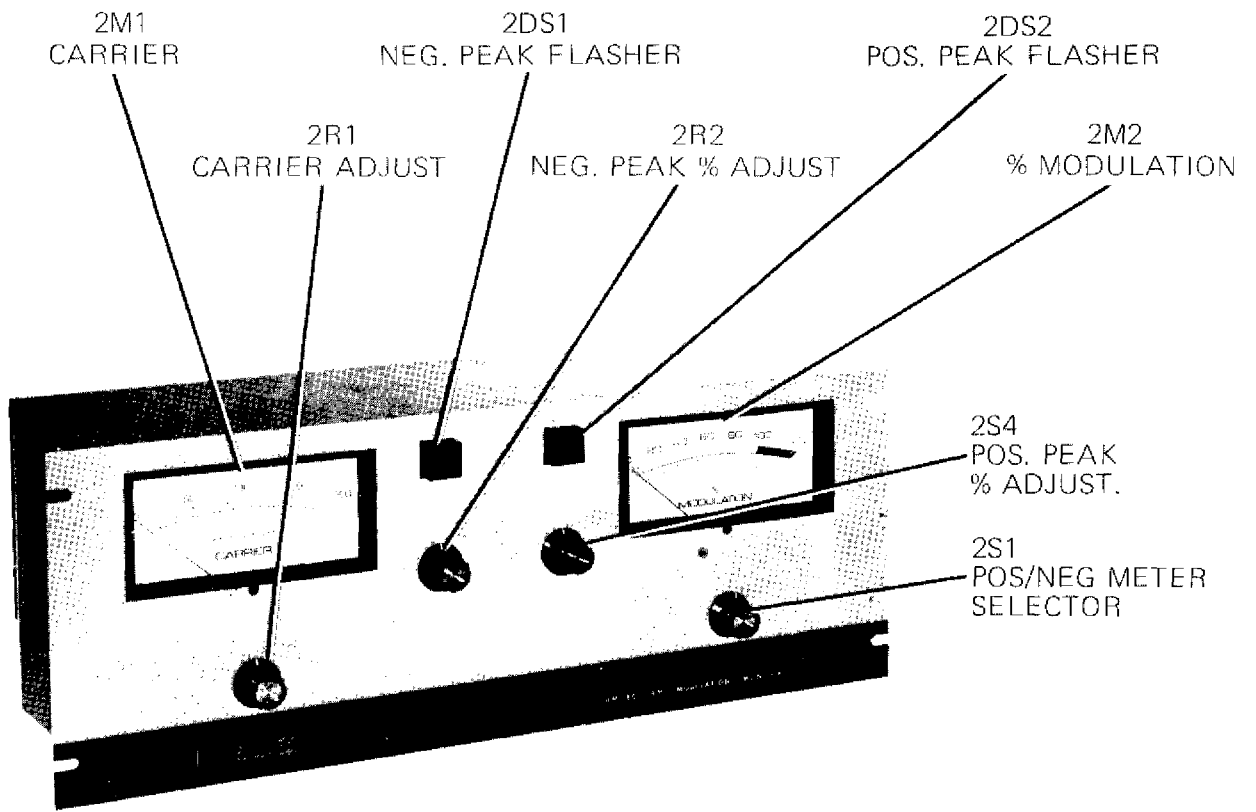
NOTE: The following switches are located on the rear of the Unit. See Fig. 2 for location.

3.1.9 Remote Meter Switch

This switch turns "on" the remotely located % MODULATION meter.

3.1.10 Remote Flasher Switch

This switch turns "on" the remotely located Positive Peak and Negative Peak flasher lamps.



AM-80, AM MODULATION MONITOR  
FRONT PANEL VIEW

FIG. 3

## SECTION 4.0 - THEORY OF OPERATION

### 4.1 Input and Detector Circuits

The upper half of the RF envelope is detected by CR1 for Positive modulation indications, while the action of T1 inverts the RF envelope for detection by CR2, for Negative modulation indications. These detectors are wide band type to permit general coverage of the AM broadcast frequencies, without the necessity of special tuning.

The positive audio peak of the normal envelope and the positive audio peak of the inverted envelope contain the information to provide an indication of the positive and negative modulation peaks. This indication is selected by  $\pm$  peak switch, S2, and used to drive the modulation meter detector circuits.

The positive audio peak of the inverted envelope contains the information to provide an indication of the negative modulation peaks. This indication is used to drive the negative peak flasher detector, CR8, and the audio output circuits.

### 4.2 Modulation Meter Circuit

After  $\pm$  peak selection by switch S2, isolation is provided by a compound emitter follower, and the positive audio peak is detected by CR6. This detected peak drives the internal and remote meters through individual emitter-followers. The meter recovery ballistics are controlled by the collector impedance of a transistor in parallel with the audio filter capacitor.

### 4.3 Negative Flasher and Audio Output Circuits

After detection, the modulation from the lower half of the RF envelope is isolated by an emitter-follower stage and then split to drive the audio output emitter-follower and also through an emitter-follower driver to the flasher detector, CR8. When the modulation level is high enough to overcome the detector bias set by the % NEGATIVE PEAK adjustment (50-100%), the SCR fires to cause operation of the flasher, thereby indicating that the modulation is exceeding the percent setting of the NEGATIVE PEAK adjustment.

### 4.4 Positive Flasher

The detected modulation from the upper half of the RF envelope is isolated by an emitter-follower stage, Q9. Q10 is an emitter-follower driver for the flasher detector, CR16. When the positive modulation level is high enough to overcome the detector bias as set by the % POSITIVE selector switch (50 to 130%), the SCR, CR17, fires, operating the flasher. This flasher operation gives indication that the positive modulation is exceeding the percent setting of the % POSITIVE selector switch.

## SECTION 5.0 - MAINTENANCE AND ADJUSTMENT

### 5.1 General

The Gates Model AM-80, AM Modulation Monitor is factory adjusted to conform to FCC regulations. If a malfunction occurs, the unit should be returned to Gates Division - Harris-Intertype Corporation for repair and/or adjustment.

NOTE: The internal adjustment potentiometers are sealed and warranties are void if the seals are broken.

There are two field adjustments which can be made, if necessary, by the user-

#### 1) Meter Zero Adjustment:

De-energize the unit and remove the RF signal. Allow several minutes for the capacitors to discharge. The CARRIER meter should read zero and the % MODULATION meter needle should be on the lower edge of the scale (not zero). If either meter is misadjusted, turn the adjustment screw (see Figure 3) through the appropriate hole in the front panel, until the needle is in the center of the mark. Then turn the screw in the reverse direction slightly.

#### 2) Remote % MODULATION Meter Calibration:

De-energize the unit. Connect a remote meter, observing proper polarity. Energize the monitor, then modulate the transmitter 90% at 1000 Hz, as observed on the internal % MODULATION meter, with the positive or negative selector switch on NEGATIVE. Turn on the remote flasher and meter switches at the rear of Modulation Monitor. Adjust potentiometer R30 (see Figure 4) for a 90% reading on the remote % MODULATION meter.

NOTE: The remote meter and flasher switches may be turned "on" or "off" without affecting the monitor indications.

### 5.2 Meter Lamp Replacement

To replace burned out meter lamps, the following step by step procedure should be used-

- 1) Disconnect all external connections made to the Modulation Monitor.
- 2) Remove monitor from rack.
- 3) Remove cover (two holding screws at lower back edge).

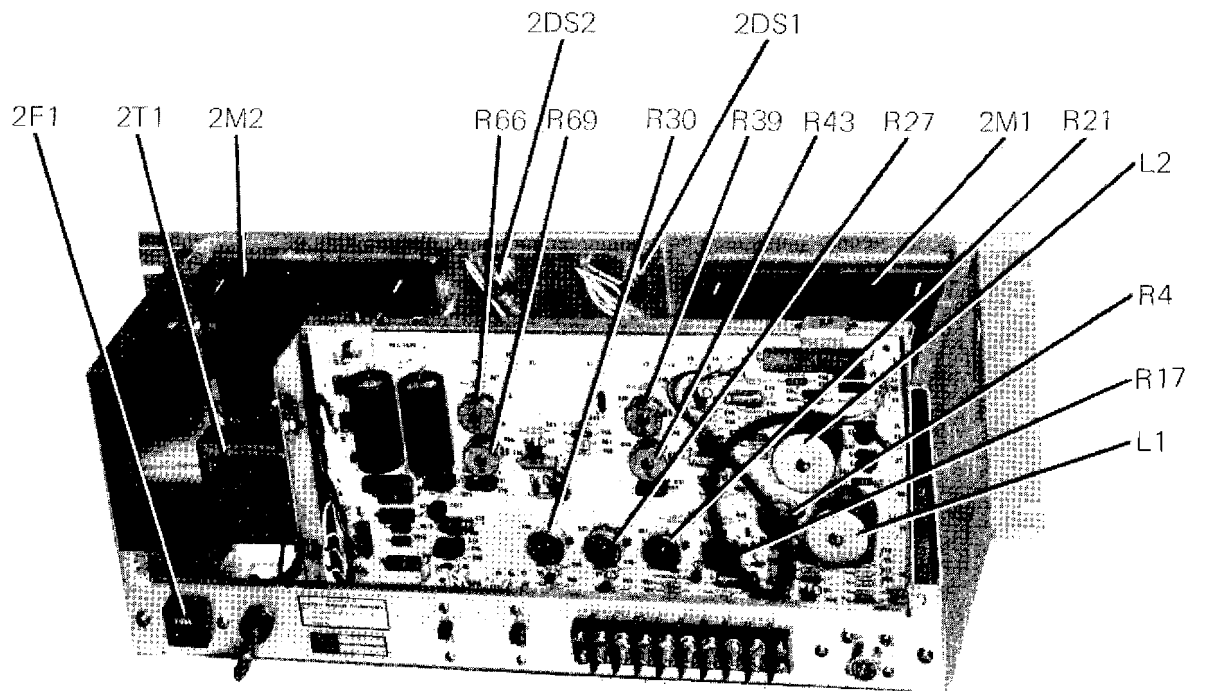
- 4) Remove knobs from CARRIER ADJUST control 2R1, and POS/NEG SELECTOR switch 2S1.
- 5) Remove two chassis mounting screws, one at outside edge of fuseholder, 2XF1, and the other at outside edge of co-ax jack, 2J1.
- 6) Pull chassis back far enough to expose bottom edge of meters.
- 7) After locating burned out meter lamp, remove special hex retaining nut and pull out socket holding burned out lamp.
- 8) Replace lamp with good one.
- 9) Put lamp socket back over meter stud, then replace and tighten special hex nut.
- 10) Slide chassis back into panel and shelf assembly, taking care to align the two protruding control shafts with openings in front panel.
- 11) Replace and tighten the two chassis holding screws on back apron (near fuseholder and co-ax fitting).
- 12) Slide cover on and secure with two screws at lower edge of back cover.
- 13) Put front panel control knobs on shafts and tighten.
- 14) Re-install Monitor in rack.
- 15) Connect all external wires to Monitor.
- 16) Plug AC cord into 117 VAC service.

### 5.3 Removal of R1

In certain instances, it is permissible to remove R1. If the 994 7084 001 AM-80 Modulation Monitor is to be used with an RF amplifier for off-air monitoring, and the cable distance between the RF amplifier and the monitor is less than 15 feet, removal of R1 is permitted.

### 5.4 Safety Summary

Standard safety precautions must be observed at all times. Indiscriminate probing with metal tools will permanently damage sensitive circuits. Relatively low voltage and currents are involved in the AM Modulation Monitor, but under certain conditions, injury to personnel is possible and strict adherence to accepted trouble-shooting practices are recommended.



AM-80, AM MODULATION MONITOR  
BACK INSIDE VIEW

FIG. 4



ELECTRICAL PARTS LIST  
AM-80, AM MODULATION MONITOR

994 7084 001

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>GATES PART NO.</u>	<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>GATES PART NO.</u>
2CR1	Diode, Zener 1N2986B	386 0139 000	2R5	Res 205 ohm 1/2 W, 1%	548 0451 000
2DS1, 2DS2	Lamp, #327	396 0060 000	2R6	Res 210 ohm 1/2 W, 1%	548 0452 000
2DS3 thru 2DS6	Lamp, #334	396 0106 000	2R7	Res 205 ohms 1/2 W, 1%	548 0451 000
2F1	Fuse, Slo- Blo, 1/2 A	398 0049 000	2R8	Res 210 ohm 1/2 W, 1%	548 0452 000
2J1	Jack, UHF	612 0230 000	2R9	Res 205 ohm 1/2 W, 1%	548 0451 000
2M1	Meter (Carrier) Gates Spec. 815 5518 001	632 0722 000	2R10	Res 210 ohm 1/2 W, 1%	548 0452 000
2M2	Meter (% Mod.) Gates Spec. 815 5519 001	632 0723 000	2R11	Res 3240 ohm 1/2 W, 1%	548 0600 000
2P1	Plug, UHF	610 0231 000	2R12	Res 3400 ohm 1/2 W, 1%	548 0601 000
2PA1	Adaptor UHF to BNC	620 0127 000	2R13	Res 10K ohm 1/2 W, 5%	540 1111 000
2R1	Potentiometer 500 ohm, 2 W. Molded	550 0021 000	2R14	Res 27K ohm 1/2 W, 5%	540 1147 000
2R2	Potentiometer, 2,5K ohm, 2 W. Molded	914 8510 004	2S1	Switch, Wafer DPDT	914 8507 007
2R3	Res 205 ohm 1/2 W 1%	548 0451 000	2S2	Switch, Slide 4 PST	604 0542 000
2R4	Res 210 ohm 1/2 W, 1%	548 0452 000	2S3	Switch, Slide SPST	604 0541 000
			2S4	Switch, Wafer 1P11P	914 8507 005
			2T1	Transformer Gates Spec. 815 1092 001	472 0679 000

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
2TB1	Term Board 8 term.	614 0075 000	2TS1	Term Strip 2 term.	614 0131 000
2XA1,2	Socket, Lamp	406 0376 000	2XF1	Fuseholder	402 0119 000
2XA3 thru 2XA6	Socket, Meter Lamp	406 0426 000			

P. C. BOARD ASSEMBLY

992 3630 001

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
C1,C2	Cap 330pF 500V, 5%	500 0756 000	C21	Cap 3300 pF 500V, 5%	500 0902 000
C3,C4	Cap 150 pF 500V, 5%	500 0761 000	C22	Cap 10uF 50V, 20%	522 0418 000
C5,C6	Cap 1 uF 35V, 10%	526 0004 000	C23	Cap 1uF 35V, 10%	526 0004 000
C7,C8	Cap 470pF 1kV, ceramic	516 0043 000	2C24, 2C25	Cap 470pF 1kV, ceramic	516 0043 000
C9	Cap 47uF 35V, 10%	526 0009 000	C26	Cap 25uF 25V	522 0242 000
C10	Cap 3.9uF 35V, 10%	526 0012 000	C27	Cap 3300pF 500V, 5%	500 0902 000
C11,C12	Cap 470pF 1kV, ceramic	516 0043 000	C28	Cap 2700 pF 500V, 5%	500 0903 000
C13	Cap 25uF 25V	522 0242 000	C29	Cap 10uF 50 V, 20%	522 0418 000
C14	Cap 2700pF 500V, 5%	500 0903 000	C30,C31*	Cap 2200pF 500 V, 5%	500 0887 000
C15	Cap 470pF 1kV, ceramic	516 0043 000	CR1,CR2	Diode, HP2800	384 0321 000
C16	Cap 25uF 25V	522 0242 000	CR3 thru CR6	Diode, 1N914A	384 0205 000
C17,C18	Cap 500uF 50V	522 0346 000	CR7	SCR, 2N2324A	384 0232 000
C19,C20	Cap 3.9uF 35V, 10%	526 0012 000	CR8	Diode, Zener 1N5240B	386 0140 000
			CR9	Not used	

\* Factory set for FCC regulations,  
value may vary from that listed.

SYMBOL	DESCRIPTION	GATES	PART NO.	SYMBOL	DESCRIPTION	GATES	PART NO.
CR10 thru CR14	Diode 1N2070	384	0019 000	R9	Res 220K ohm 1/2 W, 5%	540	1212 000
CR15	Diode 1N914A	384	0205 000	R10	Res 1K ohm 1/2 W, 5%	540	1116 000
CR16	Diode, Zener 1N5240B	386	0140 000	R11	Res 300K ohm 1/2 W, 5%	540	1251 000
CR17	SCR, 2N2324A	384	0232 000	R12	Res 75 ohm 1/2 W, 5%	540	1148 000
CR18, CR19	Diode, 1N2070	384	0019 000	R13	Res 39K ohm 1/2 W, 5%	540	1185 000
L1,L2	Coil 25 mH #757	494	0226 000	R14	Res 1K ohm 1/2 W, 5%	540	1116 000
Q1 thru Q9	Transistor 2N3704	380	0088 000	R15	Res., 560 ohm 1/2 W, 5%	540	1191 000
Q10	Transistor 2N3405	380	0256 000	R16	Res 5.6K ohm 1/2 W, 5%	540	1183 000
R1	Res 75 ohm 10 W, 5% NI	546	0064 000	R17	Potentiometer 500 ohm, 2 W WW	552	0815 000
R3	Res 180 ohm 1 W, 5%	540	0314 000	R18	Res 3.3K ohm 1/2 W, 5%	540	1165 000
R4	Potentiometer 2.5K ohm, 2W, WW	552	0813 000	R19	Not used		
R5	Res 10K ohm 1/2 W, 5%	540	1111 000	R20	Not used		
R6	Res 820 ohm 1/2 W, 5%	540	1127 000	R21	Potentiometer 10K ohm, 2W WW	552	0814 000
R7	Res 12K ohm 1/2 W, 5%	540	1171 000	R22	Res 5.6K ohm 1/2 W, 5%	540	1183 000
R8	Res 62K ohm 1/2 W, 5%	540	1222 000	R23,R24	Res 1K ohm 1/2 W, 5%	540	1116 000
				R25	Res 6.8K ohm 1/2 W, 5%	540	1145 000
				R26	Res 6.8K ohm 1/2 W, 5%	540	1145 000

SYMBOL	DESCRIPTION	GATES	PART NO.	SYMBOL	DESCRIPTION	GATES	PART NO.
R27	Potentiometer 10K ohm, 2 W WW	552	0814 000	R43	Potentiometer 2.5K ohm, 2 W WW	552	0813 000
R28	Res 6.8K ohm 1/2 W, 5%	540	1145 000	R44,R45	Res 10K ohm 1/2 W, 5%	540	1111 000
R29	Res 2.7K ohm 1/2 W, 5%	540	1156 000	R46,R47	Res 120 ohm 2W, 5%	540	0589 000
R30	Potentiometer 10K ohm, 2 W WW	552	0814 000	R48	Res 100 ohm 1/2 W, 5%	540	1102 000
R31	Res 150K ohm 1/2 W, 5%	540	1210 000	R49	Res 1K ohm 1/2 W, 5%	540	1116 000
R32	Res 360K ohm 1/2 W, 5%	540	1236 000	R50	Res 1.8K ohm 1/2 W, 5%	540	1119 000
R33	Res 1K ohm 1/2 W, 5%	540	1116 000	R51	Res 3.9K ohm 1/2 W, 5%	540	1137 000
R34	Res 200K ohm 1/2 W, 5%	540	1144 000	R52	Res 2.4K ohm 1/2 W, 5%	540	1193 000
R35	Res 1K ohm 1/2 W, 5%	540	1116 000	R53	Res 820 ohm 1/2 W, 5%	540	1127 000
R36	Res 47K ohm 1/2 W, 5%	540	1122 000	R54	Res 100 ohm 5 W, 5%	542	0015 000
R37	Res 100 ohm 1/2 W, 5%	540	1102 000	R55,R56	Res 240K ohm 1/2 W, 5%	540	1142 000
R38	Res 1.8K ohm 1/2 W, 5%	540	1119 000	R57	Res 120K ohm 1/2 W, 5%	540	1235 000
R39	Potentiometer 10K ohm, 2 W WW	552	0814 000	R58	Res 2K ohm 1/2 W, 5%	540	1104 000
R40	Res 8.2K ohm 1/2 W, 5%	540	1153 000	R59	Res 360K ohm 1/2 W, 5%	540	1236 000
R41	Not used			R60	Res 1K ohm 1/2 W, 5%	540	1116 000
R42	Res 2.2K ohm 1/2 W, 5%	540	1182 000	R61	Res 200K ohm 1/2 W, 5%	540	1144 000

SYMBOL	DESCRIPTION	GATES PART NO.	SYMBOL	DESCRIPTION	GATES PART NO.
R62	Res 1K ohm 1/2 W, 5%	540 1116 000	R70,R71	Res 10K ohm 1/2 W, 5%	540 1111 000
R63	Res 47K ohm 1/2 W, 5%	540 1122 000	R72,R73	Res 120 ohm 2 W, 5%	540 0589 000
R64	Res 10 ohm 1/2 W, 5%	540 1151 000	R74	Res 2K ohm 1/2 W, 5%	540 1104 000
R65	Res 820 ohm 1/2 W, 5%	540 1127 000	T1	Transformer RF Input	916 5119 001
R66	Potentiometer 10K ohm, 2 W WW	552 0814 000			
R67	Res 10K ohm 1/2 W, 5%	540 1111 000			
R68	Res 100 ohm 1/2 W, 5%	540 1102 000			
R69	Potentiometer 2.5K ohm, 2 W WW	522 0813 000			

