MC MARTIN

INSTRUCTION MANUAL
TBM—2500
RF AMPLIFIER

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INSTRUCTION MANUAL

TBM-2500

RF AMPLIFIER

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I. GENERAL DESCRIPTION

The TBM-2500 is designed to amplify a transmitted FM signal to a level suitable for any Frequency, Modulation, or Multiplex station monitor when remote operation is desired. Although specifically designed for the McMartin TBM-3000, TBM-3500, and TBM-4000, it is also designed for use with other brands of monitors which require a higher input signal level. The TBM-2500 has two separate RF outputs. One is high level and the other is low level. Sufficient isolation is provided between the output to prevent interaction between McMartin and other type monitors.

A carrier failure relay is incorporated for connection to a warning system. Should an RF failure occur at the transmitter, the relay is activated. A front panel meter indicates relative input signal strength.

A cut-to-frequency antenna, 50 feet of coaxial cable with connectors is also supplied. Long tube life and stable operation were the prime design consideration of the TBM-2500.

II. TECHNICAL SPECIFICATIONS

Operating Frequency	88-108 mc
RF Sensitivity	100 μv input for ½ watt output 1000 μv input for 2 watts output
Rear Chassis Connections	
RF Input	50 ohms coaxial
High RF Output	50 ohms coaxial
Low RF Output	50 ohms coaxial
Carrier Relay	3 terminal board (SPDT)
Rear Chassis Control	Carrier Relay Threshold
Top Chassis Control	RF Gain
Front Panel Controls	Complete RF tuning Power ON-OFF
Front Panel Indicators	RF Level Meter Pilot Lamp
Tubes	1-6AK5 1-6BH6 2-6AG5 1-5763
Dimensions	Standard Rack Panel 19" x 5¼" Depth behind panel 7"
Finish	Natural Gray Panel, Cadmium Chassis
Shipping Weight	19 lbs.
Power	120 VAC, 50-60 cps, 55 watts
Antenna	Cut-to-frequency, 4 element yagi with coaxial fitting.
Coaxial Cable	RG-59U (50')

III. INSTALLATION and INITIAL ADJUSTMENT

Inspection: Upon receipt of your TBM-2500, remove it from the packing material and inspect for any damage caused in transit due to handling or vibration. If damage is found, notify the shipping agency and advise McMartin Industries, Inc. of such action.

Location: Installation preferably should be made in a standard equipment rack which also contains the station monitor(s) with which it will operate. The equipment rack should be located as near to the antenna as is practical. Adequate ventilation is necessary for long term dependability of the TBM-2500. Free convection air flow from bottom to top should be allowed as the chassis is designed with ventilation screens located by the final output tube.

Connections, Input: The AC line cord is plugged into a nominal 120 VAC, 50-60 cps receptacle.

With the 50 feet of coaxial cable supplied, connect the antenna lead-in between the antenna and ANT INPUT to the TBM-2500. Follow normal, good practice when mounting the antenna and running the lead-in. At the TBM-2500, dress the lead-in away from the output cables.

Connections, Output: Either the HI OUT or LO OUT output is satisfactory for operation with any McMartin monitor(TBM-3000, TBM-3500, TBM-4000). If a combination of two McMartin monitors are being operated, use both outputs and feed the monitors separately.

If a McMartin monitor is being operated with another type of monitor, connect the McMartin to LO OUT and the other monitor to HI OUT. If only one monitor of any type is being operated, connect to the HI OUT. Coaxial cable is used (keep as short as possible) for connection between the TBM-2500 output and the monitor input(s). Amphenol Type 83-ISP (or equivalent) connectors are required. If only one monitor is being used, be sure to cap the unused output receptacle. This will prevent unwanted RF radiation.

Initial Adjustments: Turn on the AC power for the TBM-2500 and any monitor which is being operated. Allow sufficient time for warm-up of all equipment. Orient the antenna for maximum indication on the SIGNAL LEVEL meter. If the SIGNAL LEVEL meter goes off-scale during antenna orientation, reduce the RF GAIN control (top chassis).

The TBM-2500 is factory aligned to your frequency, however due to unpredictable input and output loading effects at your location, the complete alignment should now be re-touched. In the following order, adjust for maximum indication on the SIGNAL LEVEL meter: ANT, 1, 2, 3, and FINAL. Repeat this procedure until no further improvement can be made. Reduce the RF GAIN control as may be necessary.

III. INSTALLATION and INITIAL ADJUSTMENT (cont.)

At this point, check the RF input level indicated on the monitor(s) being operated. Adjust the monitor RF input control for the proper level into the monitor. Follow the manufacturer's recommendation. Initial adjustment is now complete.

IV. OPERATION

Optimum operation of the TBM-2500 is with the RF GAIN control set as low as possible while still maintaining the recommended RF input level to the monitor(s). Check the setting of the monitor RF input level control. It may be desirable to increase the monitor RF level control(s) and decrease the TBM-2500 RF GAIN control. If this is done, repeat the complete TBM-2500 alignment once again, starting with L-2, L-3, etc.

With no RF carrier present at the input to the TBM-2500, considerable noise may be generated at the output. This would cause erratic readings on the connected monitor(s). In this event the TBM-2500 should be turned off.

V. INTERFERENCE FILTER:

Most station monitors are generally broad-tuned and therefore not capable of separating strong, alternate channel signals. The TBM-2500 contains a parallel resonant tuned circuit which when tuned properly, will reduce the intensity of the interferring signal. As the TBM-2500 is shipped this filter is tuned to a frequency other than the station frequency. If interference is not a problem it is unecessary to adjust this filter. If an interferring station is present, adjust the FILTER (top chassis) for maximum rejection. After this adjustment is made, it will be necessary to re-align the antenna coil L-1, and RF coil L-2.

VI. CARRIER FAILURE RELAY:

The carrier failure relay is factory adjusted for a threshold corresponding to approximately 50 μv RF input level at the antenna input. Should the RF carrier level fall below this point, the relay is activated. The required signal to reopen relay is approximately 250 μv. The threshold can be adjusted to any point by the rear-chassis RELAY control.

The RELAY terminal board has 3 connections to an SPDT relay. Terminal B is the common pole. Terminal A is shorted to B during normal operation. With a carrier failure, B is shorted to C. The relay contacts are rated a 1 amp. Almost any type of external alarm circuit may be connected to this automatic relay circuit.

WARRANTY

McMartin Broadcast and Audio Products are warranted to be free from defects in workmanship - FOREVER.

At our discretion we will exchange or repair any defective unit or component, at any time, without charge. Material and components are guaranteed for a minimum period of 90 days from the date of the original purchase. Transportation charges must be prepaid on equipment returned for warranty service.

This warranty does not extend to any of our products which have been subjected to misuse, neglect, accidents, incorrect wiring not our own, improper installation, or to use in violation of the instructions furnished by us; nor to units that have been altered outside our factory.

VII. CIRCUIT DESCRIPTION:

A signal will be traced through the TBM-2500 referring to the schematic.

RF input from the antenna is fed through ANT INPUT to the tuned circuit L-1 and the grid of V-1. A parallel resonant circuit FL-1, when tuned to an interferring frequency, presents a very high impedance block to the grid of V-1.

The RF signal is amplified consecutively by V-1, V-2, and V-3. L-2, L-3, and L-4 are the tuned circuits forming an impedance coupled amplifier. The gain of this amplifier is controlled by adjusting the cathode bias of V-2. Each stage of amplification is shielded from the others by individual compartments within the chassis. Filament and plate voltages are fed to these compartments via feed-through capacitors, thus preventing interaction between the stages.

The plate output of V-3 drives the final amplifier stage, V-4. This final RF output stage is a shunt-fed class C amplifier. For optimum stability, V-4 is neutralized with a small voltage fed back from L-5 to the input of V-4. Capacitor C-14 and RF choke CH-2 form the neutralization network.

L-5 is the output tank coil and is tapped to provide a nominal output impedance of 50 ohms. R-18 and C-21 form a voltage divider and also attenuate 200 kc. This filter action serves to reduce interference from monitors which radiate 200 kc from their internal frequency counter circuits. The voltage divider enables connection of two monitors which require different input levels.

A sample of the RF appearing across L-5 is rectified by D-1. This negative DC voltage appears across R-22, and meter M-1 (in series with R-21). The meter indicates relative RF input signal strength. Adjustment of R-22 determines the threshold of the relay control tube V-5.

The primary of the power transformer (T-1) is fused and RF filtered. Silicon rectifiers, SR-1 and SR-2 form a DC voltage doubler. The filament winding of T-1 supplies only 6.0 volts for extended tube life.

PARTS LIST

C-1	47 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-2	.001 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-3	.005 mfd +80%-20% 600 v	" " "	" "
C-4	.005 mfd +80%-20% 600 v	" " "	" "
C-5	.001 mfd +80%-20% 600 v	" " "	" "
C-6	47 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-7	.005 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-8	.005 mfd +80%-20% 600 v	" " "	" "
C-9	.001 mfd +80%-20% 600 v	" " "	" "
C-10	100 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-11	.005 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-12	.005 mfd +80%-20% 600 v	" " "	" "
C-13	47 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-14	1.5-3pf 500 v	adjustable ceramic capacitor	Centralab
C-15	24 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-16	.005 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-17	.005 mfd +80%-20% 600 v	" " "	" "
C-18	.005 mfd +80%-20% 600 v	" " "	" "
C-19	.005 mfd +80%-20% 600 v	" " "	" "
C-20	470 pf ±10% 500 v	dipped mica capacitor	Cornell Dubilier
C-21	82 pf ±10% 500 v	" " "	" "
C-22	.005 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-23	.001 mfd ±20% 500 v	ceramic feed thru capacitor	Centralab

PARTS LIST (cont.)

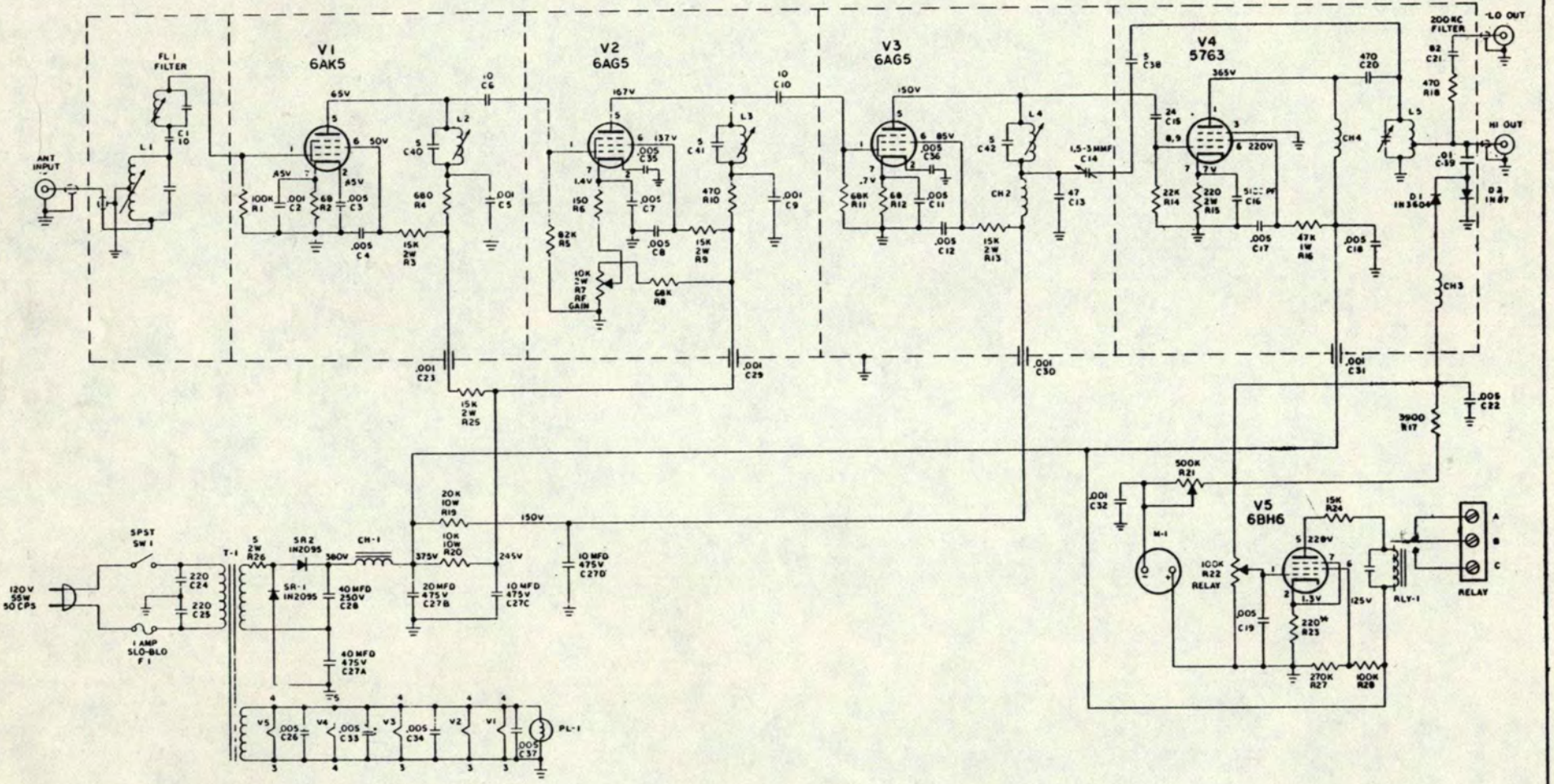
C-24	220 pf ±10% 500 v	dipped mica capacitor	Cornell Dublilier
C-25	220 pf ±10% 500 v	" " "	" "
C-26	.005 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-27A	40 mfd 475 v 4 section	twist prong electrolytic	Cornell Dubilier
C-27B	20 mfd 475 v	" " "	" "
C-27C	10 mfd 475 v	" " "	" "
C-27D	10 mfd 475 v	" " "	" "
C-28	40 mfd 250 v	" " "	" "
C-29	.001 mfd ±20% 500v	ceramic feed thru capacitor	Centralab
C-30	.001 mfd ±20% 500 v	" " "	"
C-31	.001 mfd ±20% 500 v	" " "	"
C-32	.001 mfd +80%-20% 600 v	disc ceramic capacitor	Radio Material
C-33	.005 mfd +80%-20% 600 v	" " "	" "
C-34	.005 mfd +80%-20% 600 v	" " "	" "
C-35	.005 mfd +80%-20% 600 v	" " "	" "
C-36	.005 mfd +80%-20% 600 v	" " "	" "
C-37	.005 mfd +80%-20% 600 v	" " "	" "
C-38	2 pf ±20% 500 v	dipped mica capacitor	Cornell Dubilier
R-1	100 K ±10% ½ w	composition carbon fixed resistor	Allen Bradley
R-2	68 ±10% ½ w	" " " "	" "
R-3	15 K ±10% 2 w	" " " "	" "
R-4	680 ±10% ½ w	" " " "	" "
R-5	82 K ±10% ½ w	" " " "	" "
R-6	150 ±10% ½ w	" " " "	" "

PARTS LIST (cont)

R-7	10 K ±10% 2 w	composition carbon	control type AB	Ohmite
R-8	68 K ±10% ½ w	" "	fixed resistor	Allen Bradley
R-9	15 K ±10% 2 w	" "	" "	" "
R-10	470 ±10% ½ w	" "	" "	" "
R-11	68 K ±10% ½ w	" "	" "	" "
R-12	68 ±10% ½ w	" "	" "	" "
R-13	15 K ±10% 2 w	" "	" "	" "
R-14	22 K ±10% ½ w	" "	" "	" "
R-15	200 ±10% 2 w	" "	" "	" "
R-16	47 K ±10% 1 w	" "	" "	" "
R-17	3900 ±10% ½ w	" "	" "	" "
R-18	470 ±10% ½ w	" "	" "	" "
R-19	20 K ±10% 10 w	wire wound	fixed resistor	Ohmite
R-20	10 K ±10% 10 w	" "	" "	"
R-21	68 K ±10% ½ w	composition carbon	" "	Allen Bradley
R-22	100 K ±10% 2 w	" "	control type AB	Ohmite
R-23	220 ±10% ½ w	" "	fixed resistor	Allen Bradley
R-24	15 K ±10% ½ w	" "	" "	" "
R-25	15 K ±10% 2 w	" "	" "	" "
R-26	5 ±10% 2 w	" "	" "	" "
R-27	270 K ±10% ½ w	" "	" "	" "
R-28	100 K ±10% ½ w	" "	" "	" "
T-1	117 VAC	power transformer	type 14K9A	McMartin Industries

PARTS LIST (cont.)

SW-1	SPST bat handle toggle switch	Cutler Hammer
L-1	Ant. coil assembly with nominal value capacitor (39 pf ±10% 500 v)	McMartin Industries
L-2	1st RF plate coil assembly	" "
L-3	2nd RF plate coil assembly	" "
L-4	3rd RF plate coil assembly	" "
L-5	Output coil assembly 3.3 - 17 pf adjustable capacitor	" "
FL-1	RF filter assembly with 6.8 pf ±10% 500 v capacitor	" "
PL-1	Pilot light #47 bulb	General Electric
CH-1	Filter choke, 6H @ 150 ma. dc	Quality transformer
CH-2	RF choke, 1 µh	McMartin Industries
CH-3	RF choke, 1 µh	" "
CH-4	RF choke, 1 µh	" "
M-1	Meter, 0-100 µa DC	Simpson Electric
F-1	Fuse, 1 amp 125 v Slo-Blo	Littelfuse
RLY-1	Relay, SPST 10,000 ohms	Potter Brumfield
V-1	Tube - 6AK5	General Electric
V-2	Tube - 6AG5	" "
V-3	Tube - 6AG5	" "
V-4	Tube - 5763	RCA
V-5	Tube - 6BH6	General Electric
SR-1	1N2095 Silicon rectifier 600 piv @ 700 ma.	Mallory
SR-2	1N2095 Silicon rectifier 600 piv @ 700 ma.	"
D-1	1N51 germanium diode	Erie Resistor



NOTES

1. ALL RESISTORS ± 10% ½W UNLESS OTHERWISE SPECIFIED.
2. CAPACITORS: WHOLE NO'S ARE IN MMFD UNLESS OTHERWISE SPECIFIED DECIMALS ARE IN MFD
3. ALL VOLTAGES TAKEN WITH A 20,000Ω/V METER, WITH NO SIGNAL AND WITH R7 & R22 ADJUSTED TO A MAX. CLOCKWISE POSITION
4. VOLTAGE READINGS MAY VARY ± 20%
5. ✱ COMPONENT ADJUSTED AT FACTORY WITH NOMINAL VALUE MARKED ON COMPONENT

McMARTIN INDUSTRIES, INC. OMAHA, NEBRASKA		
TITLE: SCHEMATIC, TBM 2500		
DRAWING NO. D-1023	DR. BY: GLB	DATE: 6-14-63
	CHK. BY: ✱✱	SCALE: —

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