MW-50

DWG. NO. 880-0429-001

1.0 SCOPE

This test procedure pertains to the required adjustments and performance characteristics of the MW-50A medium wave broadcast transmitter. Gates P.N. 994-7964.

Note: Before attempting to operate this transmitter, it is essential that the Technical Manual 888-1740 be read and thoroughly understood and that the operator become thoroughly familiar with each part location and its function.

2.0 Reference Information

2.1 Instruction Book----------888-1740-001

3.0 Test Conditions

3.1 All test to be performed under normal factory ambient conditions.

3.2 Input Power - as specified by customer order.

4.0 Test Equipment Required

The following list of test equipments or their equivalents is required to perform the specified tests.

4.1 General Test Equipment

Modulation Monitor	Gates 994-7084
Oscilloscope	Tek 543A
Oscillator, Audio	Data Royal F380A
Distortion Analyzer	HP334A
Spectrum Analyzer	Tek 141T/8554L/8552A
Notch Filter	Singer FA/NF - 105
Load	Gates Equipment #648

Note: Depending on carrier power and modulation, the load must be capable of the following dissipation:

APPROVED BY Q.C: J. H. Blackburn Quality Control Manager — Date: 3/30/79	APPROVED BY: J. B. Pickard Engineering Section Manager — Date: 4-3-79
SUBMITTED BY: J. F. Mayenzet Test Engineer — Date: 3/30/79	WITNESSED BY: L. V. Miller Test Department Foreman — Date: 3/30/79

NO.	DATE	REVISION	ECN

HARRIS COMMUNICATIONS AND INFORMATION HANDLING

HARRIS CORPORATION Broadcast Products Division
P.O. Box 290, Quincy, Ill. 62301

TEST PROCEDURE FOR
MW-50A

carrier | SHEET 1 OF 22 | DWG. NO. 880-0429-001

4.1 (Continued)

	AV	PK
50KW @ 100% Mod -	75KW	200KW
55KW @ 100% Mod -	82KW	220KW
50KW @ 120% Mod -	86KW	240KW
55KW @ 120% Mod -	94KW	260KW
50KW @ 140% Mod -	100KW	280KW

Program Source	Tape, Turntable, Limiter/Amplifier
Stop Watch	
Voltmeter	0-12 VAC Iron Vane
Manometer	0-13 in. W.P.
Frequency Counter	HP5245L

5.0 Preliminary Tests

5.1 Mechanical Inspection (Test Operator to Verify)

5.1.1 General Cleanup
Remove all loose hardware, metal chips dust and other extraneous material with a vacuum cleaner.

5.1.2 Mechanical Inspection
Inspect transmitter for obvious mechanical defects, missing parts, assembly damage and loose or incorrect hardware. Sharp edges and burrs in H.V. circuits must be removed.

5.1.3 Mechanical Inspection
Operate all knobs and adjustments. Observe results. See that the required linkages are complete and functioning. Look for evidence of binding, slipping of shafts due to loose set screws, roughness of gears, lubrication, and operation of mechanical stops and detents. Potentiometers should operate without roughness. Circuit breakers should operate smoothly.

5.1.4 Air System
Check to see if air filter is in place. Check for proper fitting of air seal around compartment doors.

5.1.5 Safety Devices
Check that all safety devices, shorting switches and interlocks are operative. Shorting sticks should measure less than 1 ohm to ground.

5.2 Initial Setup and Adjustments

5.2.1 Install frequency determining components - Reference Drawing 843-1058.

5.2.2 Interconnections

External----------Drawing 838-6385-001
Internal----------IB Pages 4-2, 4-3 and 4-4 (Ref)
Load----------50 ohm 100 KW water cooled load required, or as specified by format. Caution - waterflow must be sufficient to reliably dissipate 100 KW total power. Interlock 3TB1-10 and 11, N.O. contacts must be used.
Audio Inputs----------1TB2

5.3 DC Supply Bleeder Circuit Resistance Checks

5.3.1 Modulator Bias----------45K Ohms (A5TB1 - 3-4)

5.3.2 Modulator Screen (+ on 1R23 to Gnd)-----7K Ohms

5.3.3 PA Screen (+ on C17 pos, - to Iso Box)--15K Ohms

5.3.4 Drv Plt (+ on Tube Plate, - to Iso Box)-15K Ohms

5.3.5 PA Bias (- on C21, - to Iso Box)--------45K ohms

5.3.6 H.V. Supply----------5 Meg ohms (shorting switches open)

5.3.7 H.V. Supply----------5 ohms (shorting switches closed, approximate)

5.4 Power Supply Overload Adjustments

5.4.1 DC Supply

- lead to 1E5 or 1R9
+ lead to chassis ground
Set for 4.5 amps
Control - HV overload, 1R10
Relay Operated, 1 A1K9

5.4.2 Mod Screen

+ lead to chassis ground
- lead to 1R12 and 1R36
Set for 3.0 amps
Control - Mod. Scr. Overload, 1R14
Relay operated, 1K2

5.5 Time Delay Relay Adjustments

5.5.1 Blower shut down, Relay 1A1K1
(Off delay - 3 min ±20 sec)

5.5.2 Filament start. Relay 1A1K3
(On delay - 5 sec ±2 sec)

Note: K3 contacts 9-10 are N.C.

5.5.3 Time Delay Relay
TD1 2 sec ± .5

5.5.4 H.V. Step-Start Relay 1A1K5 (On delay - 1 sec ±1 sec)

Note: K5 contacts 5-6 are N.C. 13-14 are N.O.

5.6 Check Ball Gap Adjustment

5.6.1 Modulator Screen 1E6----------.020 inches

5.6.2 Damper 1E3----------.625 inch ± .0625 inches

5.6.3 Modulator 1E1----------.625 ± .06 inches
1E2----------.625 ± .06 inches

5.6.4 Isolated Box E1 and E2----------.020 inches

5.6.5 PA Eff Res 1E4----------.625 inches
2C6 Ball Gaps----------.040 inches

5.7 Set H.V. A.C. Overload (K3, K4, K5) for 108 amps each.

5.8 Check 2T2 auto transformer for proper AC input tap connections to produce 230V AC output.

6.0 Control Circuit Startup

6.1 Set all transmitter CIRCUIT BREAKERS to OFF. Turn on LOW VOLTAGE A.C. source to transmitter. A 440/480 V AC, 3 phase 30 amp service is required or per Format/CS. Do not turn ON the HV AC source at this time.

Note:
It will be necessary to jumper several control circuits at this time in order to start up the transmitter and determine independently the condition of the status lamps. Reference Fig. 1 of this procedure for jumper conections.

6.2 TURN ON CONTROL and BLOWER CIRCUIT BREAKERS.

Set Local/Remote switch to LOCAL. Depress FIL ON switch.

6.2.1 Check for proper rotation of main blower and fan. These are three phase
Note: The blower should turn CW as viewed from the belt end. The fan viewed from the prop end should turn CW.

6.2.2 Set the blower air switch, 1S8, to close contacts at 2.2 in water pressure increasing differential; and open at or above 1.9 decreasing pressure differential.

6.2.3 Determine the operating point of the fan air switch, 2S3. Set the air switch 2 full turns CCW beyond this point. This may have to be readjusted after all panels are on xmter.

6.2.4 Normal condition of the AIR status lamp is OFF when the air system and air switches are operating properly.

6.2.5 The FIL switch lamp status condition should be noted at this time. For normal operation the following conditions will exist:

6.2.5.1 On depression of the FIL ON switch, the FIL ON (green lamp switch) will come ON when the CIRCUIT BREAKER, AIR SWITCH and THERMOSTAT interlock circuits are closed. All these status lamps on the CONTROL panel will be OFF. If any one of these interlock circuits is open, its associated status lamp will come ON and the FIL OFF (red lamp switch) will come ON.

6.2.5.2 Any one of the open interlock circuits will prevent the filaments from being turned ON.

6.2.5.3 On operation of the HV, the HV ON (green lamp switch) will be ON when all door, GND STICK and EXT I.L. circuits are closed. Any one of these circuits being open will turn ON its associated status lamp, cause the HV ON green lamp switch to go OFF and turn ON the red HV OFF lamp switch.

Note: The HV green ON lamp will operate only if the ISO ENC. B+ and 25 Kv switches are in the operate position. Hold HV on until lamp lights.

6.2.5.4 The HV circuit cannot be turned ON with any of the circuits open.

Note: On turning ON each filament circuit breaker, the FIL OFF switch should be operated and then the FIL ON switch operated to take advantage of the FIL STEP-START circuit. This is especially necessary when turning on the filaments to the larger transmitting tubes.

6.3 Filament Circuits, Turn On

Note: For the following filament voltage measurements a calibrated iron vane meter must be used.

6.3.1 Turn on MODULATOR FILAMENT circuit breaker.

6.3.2 Adjust MOD FIL (1T4) for 10.0 $\pm$ .1V.

Note: Change taps on 1T1 if necessary to provide this voltage. Compare standard meter and panel meter.

6.3.3 Turn ON MODULATOR DRIVER circuit breaker. Check for 5.0 $\pm$ 0.1V at filament. Test points TP1 and TP2 are available on modulator driver enclosure.

Note: Change taps on modulator driver filament transformer (1A8T1) if necessary to provide this voltage.

6.3.4 Turn ON ISOL ENCL Circuit Breaker. Set PA FIL ADJ (T1) for 10.0 $\pm$ .1V. Compare standard meter to panel meter.

Notes:

1. Adjust taps on T3 if necessary to obtain this voltge.
2. It may be necessary to reset the circuit breakers within the Isolated Enclosure. Do this by depressing the knob ISOL ENCL C.B. on the ISOL ENCL front panel.

6.3.4 (Continued)

Notes:

3. The status lamps (RED) as viewed through the Isolated Enclosure window indicate the circuit condition. A lamp ON indicates an open circuit breaker.

6.3.5 Check RF DRV filament voltage to 5.0 ± .1V. Adjust taps on T3 or T2 if necessary to provide proper voltage.

6.4 Interlocks

6.4.1 Operate all door interlocks, front panel and grounding hook switches. Note door and gnd stick indicator lamps come ON with operation of respective interlocks.

6.4.2 Listen for the grounding switches to drop for each door or ground stick operation.

Note: Remove jumper still in place across 1A1R10-11.

6.4.3 The RED H.V. Switch Lamp should also come ON for each interlock operation.

6.4.4 Check the External Interlock circuit 3TB1 - 10 and 11 for similar action noting that the EXT I.L. lamp comes ON, the HV Red Lamp comes ON and the H.V. grounding switches drop when this circuit is opened.

6.4.5 Use heat gun to determine operation of thermal interlock switches 3S1 and 3S2 on H.V. step start panel.

6.4.6 Thermostats (1S5, 1S6). Adjust each thermostat to its lowest temperature setting to check interlock operation. Then set each termostat for a final setting of 140° F. Use Heat Gun to check operation of TEMP indicator lamp.

6.4.7 Blower air switches (1S8 and 2S3). Shut off air intake to blower or switches. Air switches should operate and turn off filaments. Note AIR indicator lamp operates.
Note: Remove jumper across 1A1R4-5.

6.5 Turn ON MOD SCREEN and MOD BIAS circuit breakers.

6.6 Place 25KV and ISOL ENCL switches to DISABLE.

Note: No H. V. AC source is connected at this time.

6.7 Preliminary Tuning of Output Network

6.7.1 Set Plate Tuning and Loading Capacitors 2C2 and 2C3 to mid-range.

2C2 Max - Min. 58 turns.	29 Mid Point
2C3 Max - Min. 34 turns.	17 Mid Point

Refer to Fig. 2 of this procedure for test circuit and test points.

Make ground lead on scope and RF gen. as short as possible.

6.7.2 Driving at point A, and looking at point A, tune 2C2 to RESONANCE (Max Signal at A). Generator should be set for transmitter carrier frequency (f).

6.7.3 Set signal level at point A and strive for indicated signal level at C while tuning. Ref. Fig. 2C. Do not exceed .38V at Point C.

6.7.4 Set 2L4 tap and 2C3 for approximately .2V pp at D while driving at A. Try to maintain previous voltages at A and C.

6.7.5 Set Osc to 3f. Move scope to A. Adjust 1L3 and 1C1 for maximum scope output.

6.7.6 Move Osc to C Drive Direct (without resistor network). Set osc. to 2f. Adjust 2C4 for minimum scope output at D.

6.7.7 Set osc to 3f. Tune 2L5 of minimum scope output at D.

6.7.8 Repeat preceeding steps 6.7.2 - 6.7.4 and try to maintain voltage readings at A, C and D while approaching approximate tuning conditions of output network. Use resistor network except for 6.7.6 & 6.7.7.

6.8 Preliminary PA Grid Tuning

6.8.1 Using the same setup as in step 6.7, drive the plate of V1, a 4CX1500, at the carrier frequency. Look with the scope at the grid of the PA tube, V2.

6.8.2 Tune L1, Driver Plate Tune, for a maximum indication of the scope.

6.8.3 Set the generator to 3f. Adjust L2, grid efficiency resonator, for a maximum at this frequency.

6.8.4 Repeat this procedure (6.8.1 - 6.8.3) several times because of the interaction of the tuning controls.

6.8.5 Sweep the 70 KHz filter with generator across 1C3 and 1C4 and scope from isolated box to ground. Determine frequency of minimum scope response. Set 70 KHz oscillator to this frequency.

6.9 Place the following controls on the PDM chassis 1A2A2 to the following positions:

R31 Carrier shift - full CCW
R33 Dissipation Limit - full CW
R4 Audio Adj - mid-range
R32 Hi Pwr - full CW
R28 Low Pwr - full CW
R41 Power adjust control - mid-range

Remove wire #240 from 1A2TB1-8. (PDM OFF).

6.10 TURN ON transmitter H.V. ON switch.

6.11 The green and red hi-voltage switch lamps should not come ON. Press high power switch. The yellow switch lamp should come ON.

NOTE:
Relay 1A2K1 should operate with the operation of the Hi/Lo Power Switch. Relay 1A1K5 should close with the H.V. switch ON.

6.12 Turn the RF multimeter switch to Driver Grid current. Peak the current by tuning the Driver Grid Control on the oscillator panel. The meter should read in the upper 1/2 scale. Check both oscillators.

6.13 Turn the HIGH POWER COARSE control, R32, max CW. The modulator multimeter readings should be about as follows:

		Max CW (low)
6.13.1	Driver Cathode Amps 0-3	1.05
6.13.2	Driver screen volts 0-300	230
6.13.3	Driver plate volts 0-1200	195
6.13.4	Modulator grid volts 0-1200	400
6.13.5	Modulator screen volts 0-1200	860
6.13.6	Modulator screen amps 0-3	1.45
6.13.7	Auxiliary driver amps 0-1.2	0
6.13.8	Auxiliary driver volts 0-120	80-100

6.14 Turn OFF transmitter H.V. switch. Set 25KV OPERATE-DISABLE switch and ISOL LINCL B+ switch to operate.

Return transmitter H.V. switch to ON. The H.V. ON "GREEN" lamp should come ON.

Note 1. No H.V. AC source is to be connected at this time.

Note 2. H.V. step-start circuits should have energized at this time.

Turn the High POWER COARSE control, R32, max CCW. The MODULATOR MULTIMETER readings should be as indicated.

		Max CCW (High)
6.14.1	Driver Cathode Amps 0-3	0
6.14.2	Driver screen volts 0-300	300
6.14.3	Driver plate volts 0-1200	590
6.14.4	Modulator grid volts 0-1200	0
6.14.5	Modulator screen volts 0-1200	300

		Max CCW (High)
6.14.6	Modulator screen amps 0-3	3.0
6.14.7	Auxiliary driver amps 0-1.2	0
6.14.8	Auxiliary driver volts 0-120	80-100

Return the HIGH POWER COARSE control max CW and turn off the HV by pressing the HIGH VOLTAGE OFF button.

NOTE: During the previous test, the Modulator Screen current overload "LED" should light when the screen current reached 3.0 amps and the H.V. contactor, 1A1K5, could have dropped out. Check that this occurred or reset 1R14 as in step 5.4 for this operation.

6.15 Output Arc

6.15.1 Return transmitter to initial conditions.

6.15.2 Open output cabinet rear cover. Return door interlock to closed position.

6.15.3 With the H.V. contactor closed as in the previous steps, remove the grounding stick while holding down the grounding stick interlock hook and touch the output network coil 2L3.

6.15.4 The H.V. contactor, 1A1K5 should drop out and the OUTPUT ARC LED should light.

6.15.5 Return grounding stick and rear cover.

6.16 PA Arc

6.16.1 With the transmitter fully turned off and all supplies shorted, place a pair leads from across L7 on the ISOLATED ENCLOSURE to outside the transmitter.

6.16.2 Set control R1 on the PA Arc Detector board assembly 1A15 to mid-range on side of mod on right.

6.16.3 Return the transmitter to FIL and HV ON condition as in the previous steps.

6.16.4 Charge a 1 mf capacitor to 400V and discharge it across the extended leads.

6.16.5 The HV contactor 1A1K5 should drop and also the PA ARC LED should light. If not adjust 1A15R1 for this operation.

6.16.6 Turn off the transmitter and remove the two test lead after the Isolated Enclosure is fully shorted with a grounding stick.

6.17 Overload Recycle

6.17.1 Set the recycle switch on the flag and overload panel to ON. This test can be performed with the H.V. AC turn OFF and the 25KV and Isolated Enclosure circuits disabled, but with the H.V. switch ON.

NOTE: Recycle switch must be checked as various vendors and switch configurations are used. Switch must be closed when in the OFF position. If not, rewire.

6.17.2 Simulate a VSWR, PA arc or output arc. This simulation must be of a very short duration and repeated 3 or 4 times within 20-30 seconds.

Note: The appropriate led should light on the first overload and on the 3 or 4 overload the H.V. contactor should be tripped open. Check plate eff. res. arc sencor with a lamp or flashlight.

6.18 Place the ISOL, ENCL. SWITCH to operate. Turn the PA SCREEN PROTECTOR max CCW. Only 2 of the RF MULTIMETER positions should read at this time. OSCILLATOR POWER SUPPLY VOLTAGE should be between 100 and 140 volts. DRIVER GRID AMPS SHOULD be over 1/2 scale.

6.19 Press the HIGH VOLTAGE ON button. All the supplies in the isolated enclosure should now come on. The PA SCREEN CURRENT should be less than 2.0 amps.

6.20 Turn the DRIVER PLATE TUNE control for a max of PA SCREEN CURRENT.

6.21 GRID EFFICIENCY RESONATOR

6.21.1 Turn the control with a screwdriver for another peak of the PA SCREEN CURRENT. Both the driver plate and the grid efficiency resonator should peak the PA SCREEN CURRENT at the same time.

6.21.2 Adjust the PA SCREEN CURRENT for 1.8 amps by turning the PA SCREEN PROTECTOR CW. This control is located on the oscillator sub panel.

6.22 VSWR Overload Simulation

6.22.1 Turn ON transmitter filaments and H.V. as in previous stops.

6.22.2 Set VSWR sensitivity control, 2A1R8, to most sensity position Max CW.

6.22.3 With a VOM on the X1 scale, touch and hold the positive (+) lead to the gate of CR2 on the directional coupler. The negaive (-) lead of the VOM must be connected to chassis ground.

6.22.4 On touching the VOM to this point the VSWR overload readout should come on the H.V. contactor should unlatch.

6.22.5 Reset VSWR overload LED.

Note: Dynamic check of VSWR will be made later in this procedure.

6.23 Short pin 10 of overload board to ground. Xmtr should shut down; return to low power and then to high power. This should be done three times. On third time, xmtr will remain off.

6.24 Other Overload ARC Detector Checks

The remainder of the ARC Detector check will have to be made with the transmitter in a disabled condition.

Turn OFF all circuit breakers except CONTROL.

6.24.1 Ball Gap ARC Check

With the transmitter completely turned off and H.V. points shorted out, connect a DC supply capable of 10VP 10 Amps to the following points: (+) lead to junction of 1R54 and 1R52 in the modulator cabinet. (-) lead to chasis ground. (Terminal 22 on 1A3A1 Board). NOTE: 1R54 & 1R52 are located inside air plenum to the right of ballgaps.
Depress filament ON switch to turn on control transformer 1T5. Increase current from supply. At 10amps or less supply current the Ball Gap LED should latch ON, 1A3K1 and K2 should operate and output terminal 1A3 - 20 & 8 should go low (2 V or less) with reference to chassis ground.

Re-connect wire #240 on 1A2TB1-8 (PDM OFF).

Reset Ball Gap LED. Remove control voltage and power supply leads.

6.25 The RF MULTIMETER readings should be about as follows:

PA SCREEN VOLTAGE 0-1200	645
PA GRID AMPS 0-1.2	10 to 40 MA
PA BIAS VOLTS 0-1200	590
DRIVER PLATE VOLTS 0-3000	1300
DRIVER CATHODE AMPS 0-1.2	.600
DRIVER SCREEN VOLTAGE 0-1200	420
DRIVER GRID AMPS 0-0.03	0
OSCILLATOR POWER SUPPLY VOLTS 0-300	100

6.26 Press the HIGH VOLTAGE OFF button.

6.27 Press the HV and FILAMENT OFF buttons.

**********NOTICE - SAFETY TEST**********

Note: The MAIN AC VOLTAGE TO THE HIGH VOLTAGE STEP START ASSEMBLY SHOULD BE OFF.

Visually inspect the H.V. Step-Start panel for correct wiring and to verify that no AC MAIN wiring has a possible short or phase reversals throught the panel. If there is any doubt - check circuit with VOM.

6.29 Start up transmitter. Depress H.V. ON switch. Verify that MAIN AC contactor energizes within approximately 1 second. Turn off Xmtr!

6.30 Connect the high voltage supply for 1/2 voltage, the power supply (+) connection to center tap. The main AC input to the high voltage circuit can now be turned on. This should be a 440/480V AC 3 phase 200 amp minimum service or as stated on format or c.s.

6.31 Press the FILAMENT ON button. The filaments should step start on in about 15 seconds.

6.32 Press the HIGH VOLTAGE ON button. The high voltage should come up to about 12KV. The PA PLATE VOLTAGE SHOULD BE ZERO even after the high voltage is completely cycled on.

6.33 Meter Zero. Adjust meter zero control (Mod Cab) for an electrical zero on the plate voltage meter.

6.34 Open the PDM chassis and turn the DISSIPATION control R33 max CW. Turn the COARSE POWER control slowly CCW until the PA PLATE VOLTAGE begins to rise. Bring the PLATE VOLTAGE up to 5 Kv or the PLATE CURRENT up to 3 amps, which ever comes first, by turning the COARSE POWER control.

6.35 Dip the PA PLATE CURRENT by turning the PA TUNE control. Turn PA LOADING, as required, until the COARSE POWER control can be turned up to 4 Kv with a PA PLATE CURRENT of 2.8 amps. Increase the power until a little less than 4 amps of SUPPLY CURRENT is noted. There should be about 40 KW of output power, 5.2 amps of PLATE CURRENT and 8.7 Kv of PLATE VOLTAGE.

6.36 PA plate efficiency resonator. Using a blade screwdriver, rotate the control while watching the Supply Current. A small dip should be noted. Dip the PA plate current again using the plate tune control. (Check PA waveform with scope for third harmonic wave shaping. Grid Eff. Res. Rotate Grid efficiency control, again looking for a dip in plate voltage.

6.37 Turn the coarse power adjust more CCW to increase the supply current to 4.5 amps. The DC overload should trip and turn off the high voltage. If it doesn't, adjust the HIGH VOLTAGE DC OVERLOAD control until the DC overload LED lights. Reset the indicator flag.

6.38 Directional Coupler Adjustment

Note: During this test, the VSWR overload circuit could operate. Disconnect the VSWR trip lead from the directional coupler during the preliminary steps of this procedure by removing the wire from terminal 2 of the Directional Coupler assembly, 3A1.

6.38.1 Set test jumper TJ3 to the lower vertical position. Switch power meter to Reflected. Null the power meter with C4 and C2. Repeat adjustment of C4 and C2 for best meter null. Return TJ3 to its former position (top).

6.38.2 Set test connectors TJ1 & TJ2 in a vertical position on the directional coupler.

6.38.3 Adjust transmitter to 50 KW CW output as determined by the calormetric dummy load. This should occur when the plate voltage is approximately 9.0 KV, the plate current 6.3 amps and the supply current 4.5 amps.

6.38.4 With the power meter switched to the reflected position, null the meter using control C9 on the directional coupler.
Set Test Connectors TJ1 & TJ2 to horizontal position.

6.38.5 Adjust R20 so that the power meter indicates 50 KW.

6.38.6 Switch the power meter to the forward position. Null the meter using control C10.

6.38.7 Set test jumper TJ1 & TJ2 so that they are in a vertical position.

6.38.8 Adjust control R21 for the same power level as in 6.38.3.

6.38.9 Repeat steps 6.38.4 through 6.38.8 for possible interactions.
Note: Final adjustment of directional coupler should be made at the final 50 KW level. Adjustment controls then should be locked and "Torque-seal" applied on completion.

6.38.10 VSWR TRIP
Switch Power meter to reflected position. Place TJ3 in lower position and adjust C4 out of null. By adjusting R8 VSWR LED will light. PDM will turn off or HV will shut down depending on jumpers on flag and overload board.
To test VSWR trip, place (-) lead of VOM to chassis (+) to point 9 on directional coupler. VOM on Rxl. VSWR LED will light.
After completing check, readjust C4 for a null.

6.39 Transmitter Shutdown

6.39.1 Turn off the H.V. and then the filaments. After blower rundown, remove all AC inputs and use the grounding sticks and check that all the high voltage capacitors are discharged. Open the high voltage, supply and short out the + and 1/2 voltage terminals. Connect the high voltage wire to the + terminal of the high voltage supply for full supply voltage. Hook up remote fixture.

6.39.2 Place all grounding sticks on their holders and close all doors. Turn on both AC mains to the transmitter.

6.40 Turn the coarse power adjust max CW (zero power output). Press the filament on button. After the filaments have step-started, press the high voltage on button. Turn the coarse power adjust CCW until the transmitter is putting out about 50 Kw. The PA plate voltage should be 9.0 Kv and the PA plate current should be 6.0 to 6.4 amps. If the above ratio is not present, change the loading and re-dip the PA tune until this ratio can be found. Tune the PA plate, tune Plate efficiency resonator for dip in supply current and grid efficiency resonator for a dip in plate voltage. The above mentioned ratio should be present. Efficiency must be at least 88%. An efficiency of 90% is typical.

6.41 Turn the auxiliary modulation control, located on the modulator cabinet, to max CCW. Turn the auxiliary driver control, located on the modulator-cabinet, so the auxiliary driver current on the modulator multimeter is reading 40 Ma. This is only one division up from zero - the meter reads 1.2 amps full scale.

6.42 Using a spectrun analyzer, adjust both 2nd and 3rd harmonic traps for minimum output signal level at the transmitters harmonic frequencies. Harmonics must all be below -80 dB. A notch filter must be used to prevent overload of the spectrum analyzer front end.

6.43 Check that all tuning controls have at least 25% of their turns remaining to allow field adjustment. Make any corrections to allow this internal to the transmitter. (2C2 - 14.5 turns equal 25% - 2C3 - 8.5 turns equal 25%).

6.44 Automatic Power Return

6.44.1 With the transmitter set for normal operating condition, but with the H.V. AC mains disconnected, perform the following tests.

6.44.2 Depress the green automatic ON switch. Its switch lamps should come ON.

6.44.3 Momentarily dump the low voltage AC power source which will shut down the transmitter. ON A.C. power return, the transmitter should recycle through filament step-start, H.V. delay and return to full operating condition.

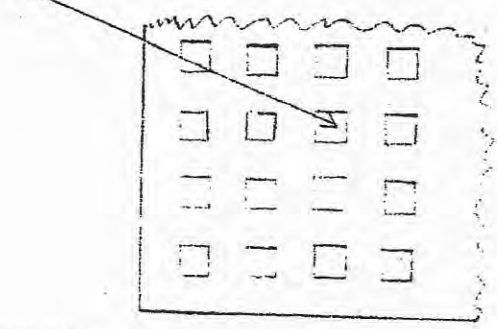
6.44.4 As a further test, the Automatic ON should be reset and a long duration fault should be simulated such as DC overload, PA arc, etc. to check that the automatic function is disabled with a major H.V. fault.

6.45 Distortion Adjustments

6.45.1 Modulate the transmitter to 95% negative with a 1000 Hz tone. Adjust the PA screen protector for a PA screen current of between 1.5 and 2.2 amps for a minimum distortion.

6.45.2 Adjust the auxiliary driver control for minimum distoriton. At 95% modulation, the distortion with a 1000 Hz tone should be 1.5% or less between 1000 Hz and 20 Hz.

Note: The distortion increases as the frequency is increased to 5000 Hz. The distortion decreases again above 5000 Hz except at 95%. modulation with a 10,000 Hz tone. Careful adjustment is required for minimum distortion. Auxiliary Modulation - Auxiliary Driver - PA Plate Efficiency & Grid Efficienty Controls must all be adjusted for best Distortion and noise figures as well as efficiency. A certain amount of interaction is noticed. (i.e.) Best Distortion at 10 KHz will not always result in the best noise. When adjusting Plate and Grid Efficiency Resonators be sure PA Plate Voltage does not rise in excess of 200V from the dip. Third Harmonic waveshaping should be monitored with a scope probe inserted just in the top of the PA Cabinet. Correct position is 3 squares from the left front and 3 squares back from the front.



Air Gril above PA in Transmitter Top.

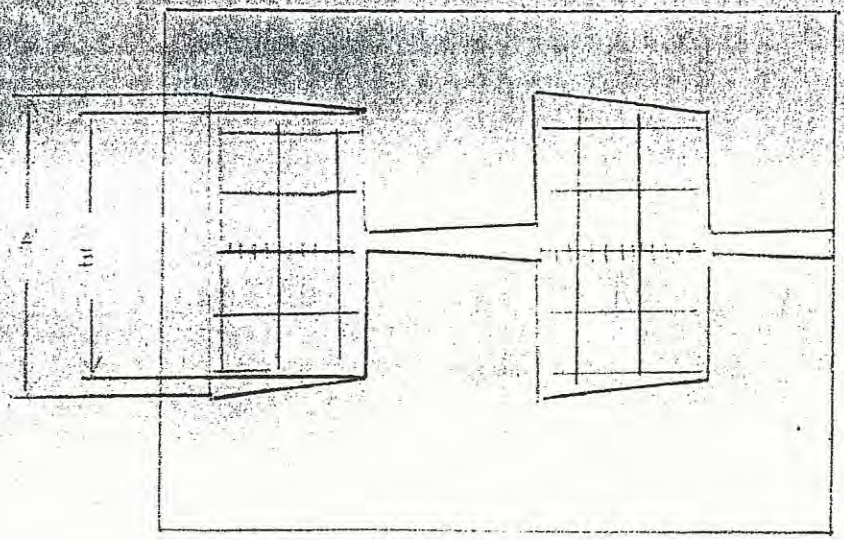
6.45.3 Apply a 20 Hz square wave to audio input @ 100% modulation. Look for an output waveform:

Whose horizontal plane does not exceed a tilt of more than 10% as calculated by subtracting the Ampl. of B(V_{p-p}) from the Ampl. of A (V_{p-p}) and divide the result by the Ampl. of A (V_{p-p}). $\left(\frac{B-A}{A}\right)$

Whose rise and fall time is nearly vertical.

Whose leading and trailing edges are square.

Deviations from desired waveform should be corrected by changing 1A2A2C2 for low frequency compensation or by checking the primary and secondary windings of the audio input transformer (T1 on 1A2A2).



20Hz - 100%

6.46 Record operating specifications.

6.46.1 Operate transmitter at 55 KW carrier level.

6.46.2 Check audio input level for +10 dBm ±2 dB for 100% modulation at 1000 Hz input frequency. 1A2A2R18 is selected for proper input level.

6.46.3 Record frequency response and distortion (20 - 10,000 Hz) at a 95% modulation level.

Limits: Response ±1.5 dB (Use 1000 Hz as reference)
Distortion - 3%

6.46.4 Measure AM noise. Modulate to 100% at 1000 Hz audio input. Remove audio input signal and measure remaining signal level.

Limits: Signal to Noise Ratio -57 MW50A

6.46.5 Carrier Shift. Set carrier level to a 100% reference level. Modulate to 100% with a 400 Hz audio input signal. Change in carrier level must not exceed ±2%. Adjust carrier shift control 1A2A2R31 for "0" carrier shift.

6.46.6 Record operating meter readings on data sheet for rated (50Kw) carrier and at 100% modulation.

6.46.7 Recheck operating frequency.

6.47 Operate transmitter at customers reduced power level. Use 10KW if low power level is unknown.

6.47.1 Turn the low power coarse adjustment (R28) max CCW.

6.47.2 Press the low power button. The low power lamp must come ON. The power will not drop much if any.

6.47.3 Adjust the low power coarse control (R28) for the power you require (either 25 or 10KW)

NOTE: Distortion is minimized by changing the tapped resistor 1AIR3 for a minimum distortion from 20 to 10,000 Hz. Audio level is adjusted using R4 in the PDM chassis.

6.48 Record operating characteristics and specification test results at reduced power level, on test data sheets as in paragraph 6.46.3.

6.49 Dissipation Limiting Adjustment

Return tranmitter to Hi Power mode.

Apply program audio with high modulation content.

Adjust dissipation limiting control 1A2R33 CCW until carrier shift is indicated. Back R33 CW 1/8 turn.

6.50 Remote Control Checks

6.50.1 Exercise the transmitter using the remote control fixture for the following functions:

1) Fil ON/OFF

2) HV ON

3) HV OFF

4) High/Low Power Selection

5) Raise/Low Power Control

6) Automatic ON

7) Remote Carrier OFF

Verify that each remote tuntions performs correctly.

6.51 Remote Plate Voltage Adjustment

NOTE: This test is to be performed using the MW-50A remote control test fixture. The adjustment mentioned is located in the flag and overload assembly, 1A3.
Check tracking of test meter vs transmitter plate volts meter for tranmitter plate voltage variation available from RMT power adjustment. Tracking of meters should agree within 5%. Adjustment to indicate actual plate voltage as indicated on the remote test may require selection of R23, R24 or R25.

6.52 Plate Current Remote Check
Using the remote test fixture as in the previous step, adjust the test fixture current meter relative to the transmitter plate current. Check tracking of the meters over the nominal operating plate current range for agreement within 5%. Nominal output 1.0V minimum across 25K ohm.

6.53 Measure the radiation emission of the transmitter. All covers, panels, doors, etc. must be in place and the transmitter operating at maximum rated power and modulation. Use the Victoreen Radiation Meter, Model 440 RF/A. Survey all external surfaces of the transmitter and record the highest reading on the Test Data Sheet.

Note: Handle the "Meter" with extreme care because it has proved to be mechanically fragile.
Limit: The reading on the "Meter" must not exceed 0.5 milliroentgen/hour.

6.54 Operate the transmitter at rated power output. Use a program material source which will result in high level modulation peaks.

Check operation for consistent ability of the transmitter to modulate to 130%.

6.55 Shut the transmitter down. Install a piece of solder from chassis ground to within 1/8" of the RF output line after the directional coupler. If possible, do this in the dummy load cabinet. If this is not possible, protect any transmitter lines with a tightly wrapped protective cover such as aluminum foil. Check that VSWR control (R4 in Flag and O/L Box) is maximum CW. Return the transmitter on at reduced output power and no modulation.

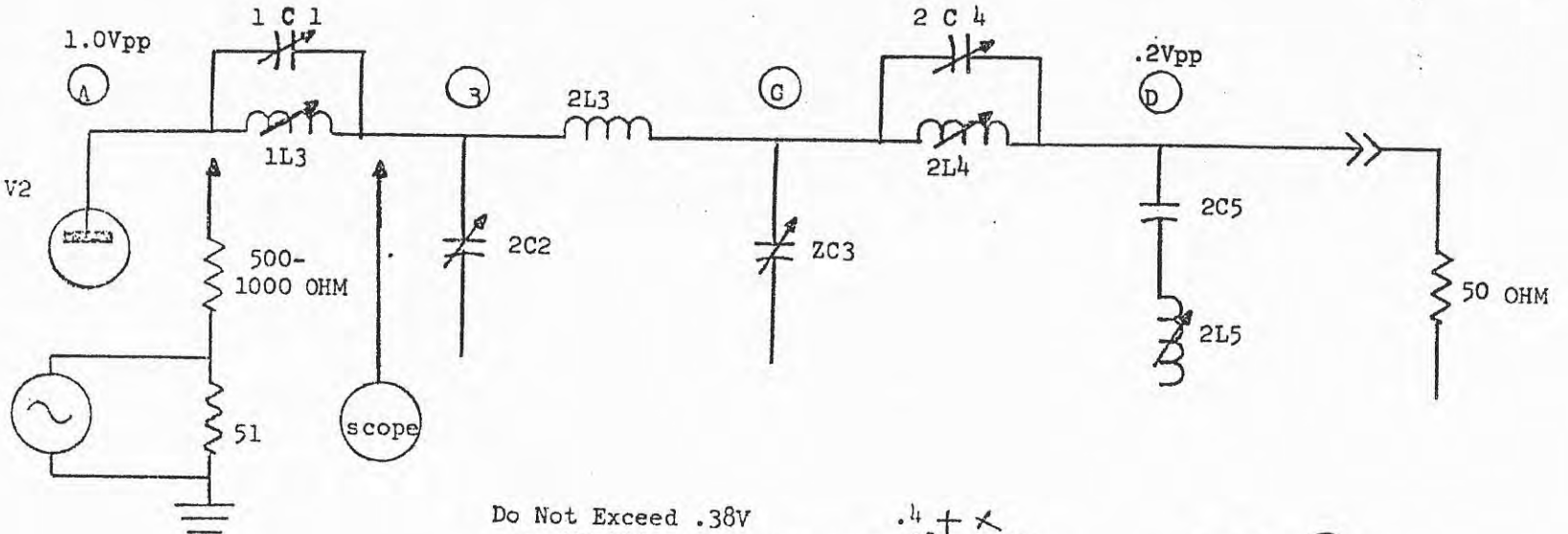
Monitor VSWR and VSWR overload light. Increase power and modulation until an arc results and a VSWR O/L trip is indicated.

6.56 Operate the transmitter at full rated output power with program type modulation for a minimum of six (6) hours. Exercise various ON-OFF functions and operating controls during this period. The transmitter must operate without malfunction for this period. (Outside problems such as power line failure, external interlocks, etc. are excluded). At the end of this test period "spot" check transmitter to determine that it is still meeting operating specifications and all meter readings are nominal. This test is mandatory. If this test is not made, authorization from the Manager Quality Control is required for shipment of this transmitter.

Magic Mark coil setting on

P.A. 3rd Harmonic coil _____
Driver plate coil _____
Grid Resonator coil _____

Technician stamp off on xmtr _____



Do Not Exceed .38V
on MW-50A

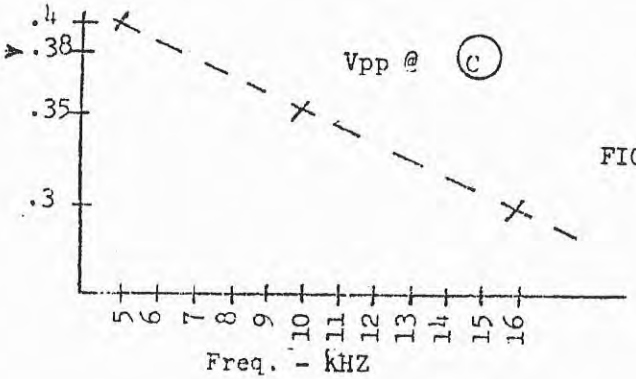
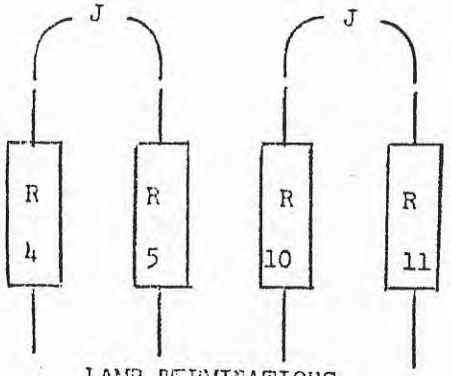


FIGURE 2



LAMP TERMINATIONS

FIGURE 1

SHEET 19 OF 22

DWG. NO. 880-0429-001

DWG. NO. 880-0429-001

Operating Characteristics

Modulator	50KW Carrier	50 KW 100% Mod.	Red Pwr. 100% Mod.
Fil Volts			
Multimeter			
Drv. Cath.			
Drv. Scr. V.			
Drv. Plt. V.			
Mod. Grd.			
Mod. Scr. V.			
Mod. Scr. A.			
Aux. Drv. A.			
Aux. Drv. V			
PA			
Fil. Volts			
PA Plt. V.			
PA Plt. Amps.			
PA Scr. A			
Multimeter			
PA Scr. V.			
PA Grd. A.			
PA Bias V.			
Drv. Plt. V.			
Drv. Cath. A.			
Drv. Scr. V.			
Dr. Grd. A.			
Osc. P.S.V.			

	50 KW Carrier	50KW 100% Mod.	Red Pwr 100%. Mod.
Supply Volts			
Supply Current			
Power Output			
Reflected Pwr.			
PA Eff %			
Line Voltage			
Phase			
Filament Hour Meter			

Tubes

PA Type 4CX35000C Sym. No. 1A9V2 Ser. No._____

Mod. Type 4CX35000C Sym. No. 1V1 Ser. No._____

Tubes (Continued)

RF Drv. Type 4CX1500A Sym. No. 1A9V1 Ser. No._____

Mod. Drv. Type 4CX1500A Sym. No. 1A8V1 Ser. No._____

Frequency Determing Components

	Value	Part Number
2L3 Turns Used		
2L4 Turns Used		
1L3 Turns Used		
2C4B		
1A9C4		
1A9C5		
1A9C7		
1A9C9		
2C15		
1C24		
1A10C2A		
1A10C2		
RF Osc.		
1A10A1 C12		
1A10A2 C12		

Specification Tests

Power Output----------_____55KW (6.45.1)

Carrier Frequency----------_____KHz (6.45.7)

Audio Input Level----------_____+10 dBm ±2 db for 100% modulation (6.45.2)

Audio Response and Distortion (6.45.3)

	Response		Distortion	
Freq. Hz	55KW	Red Pwr	55KW	Red Pwr
20				
50				
100				
500				
1000				
2500				
5000				
10000				

Audio response measured at 95% modulation.
Limits: ±1.5 dB

Audio distortion measured at 95% modulation
Limits: 3%

AM Noise----------(-57db)_____(6.45.4)

Carier Shift----------(±2%)_____(6.45.5)

Release for

Shipment_____Manufacturing

Release for

Shipment_____Engineering

Test Technician_____Date_____