HARRIS ALLIED

Frequency Change Procedure
MW-50/50A/50B/50C/50C3

This procedure assumes the transmitter to be in full working condition, and that the personnel performing the frequency change are knowledgeable of the required test equipment and alignment methods. It is also assumed that the person performing the frequency change has access to and is familiar with the transmitter technical manual for troubleshooting where needed, and clarification on component locations.

It is suggested that this work be performed by 2 engineers to ensure accuracy and safety.

Allow 8 to 10 hours to complete the frequency change.

Warning

Dangerous voltages exist in this equipment. As with any transmitter with high voltages, be sure to utilize safe practices when servicing or making any adjustment which includes having a minimum of 2 persons on site.

Parts Required:

Refer to the frequency determined component list prepared especially for your situation.

Test Equipment Required:

Oscillator AC Line Cord & Dummy Load Harris part # 992-2222-001
Oscilloscope, 15 Mhz or better bandwidth
RF signal generator, capable of 3 times carrier frequency
Frequency counter
Spectrum Analyzer
Notch filter for use with spectrum analyzer

Procedure

For reference, it would be advisable to take a full set of meter readings at the present frequency prior to shutting the transmitter off to change frequency.

HARRIS CORPORATION BROADCAST DIVISION P.O. BOX 4290 3200 WISMANN LANE QUINCY, ILLINOIS 62305 217/222-8200

I. Oscillator setup

1. Remove cover.

2. Connect an oscilloscope to the C1 stator.

3. Connect Line Cord/Dummy Load assembly to jack in rear of oscillator. Plug line cord into 120 VAC line.

4. For reference, note what the output of the Oscillator unit is on the oscilloscope.

5. Disconnect the AC line cord.

6. Replace the existing C2 & C2A on rear of variable capacitor C1 with the values specified on the new frequency determined component list. Solder these in parallel between rotor terminal & stator terminal connected to wire feeding through to under side of chassis.

7. Install the new C12 in place of the former in each Oscillator Board (1A10A1 @ 1A10A2) by soldering into locations marked at rear edge of each board.

8. Replace crystals (YI) in sockets provided on each Oscillator board.

9. Loosen slug clamps on L1 & L2 until slugs are snug but easily movable, turn clamp so it may be easily tightened again using screw driver and nut driver.

10. Using a low capacitance probe, connect an Oscilloscope and frequency counter between the Oscillator chassis and C1 stator, instrument ground to chassis.

11. Connect Line Cord/Dummy Load assembly to jack in rear of oscillator. Plug line cord into 120 VAC line.

12. Verify that RF DRIVER GRID TUNE CONTROL knob is set to stop at each end of its scale then set to 6 1/2.

13. Turn OSCILLATOR switch to OSC 1. Verify RF output on scope then adjust L1 for maximum output. Tighten and seal L1 clamp.

14. Turn OSCILLATOR switch to OSC 2. Verify RF output on scope then adjust L2 for maximum. Tighten and seal L1 clamp.

15. Using the frequency counter adjust FREQ ADJUST 2 to output exact frequency. The frequency adjust capacitor should be about half meshed, if not see note below.

16. Switch to OSC #1 and set Oscillator #1 frequency using FREQ ADJUST 1. The frequency adjust variable capacitor should be about half-meshed.

NOTE:

It may be necessary to change the value of C2 on one or both Oscillator boards to set exact frequency with trim capacitors half-meshed. If trim capacitor is near full mesh increase value of C2, if near open decrease value of C2.

17. Install the RF Oscillator unit back in the transmitter.

II. Preliminary Tuning of Output Network

1. Install frequency determined components using the instruction book and reference designation provided on the component list.

2. 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

3. Refer to Fig. 1 of this procedure for test circuit and test points.

4. Make ground lead on scope and RF generator as short as possible.

5. 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.

6. Establish a reference for the voltage at point A and strive for indicated signal level at C while tuning. Refer to Figure 2C. Point C should not exceed 38% of the voltage at Point A.

7. Set 2L4 tap and 2C3 so that point D is approximately 20% of point A. Try to maintain previous voltage at C.

8. Set the RF Generator to 3 times the carrier frequency. Move the scope back to point A. Adjust 1L3 and 1C1 for maximum signal on the scope.

9. Move the RF generator to point C, without the resistor network, and the scope to point D. Set the RF generator to 2 times the carrier frequency. Adjust C24 for a minimum indication on the scope.

10. Set the RF generator to 3 times the carrier frequency. Tune 2L5 for a minimum reading on the scope at point D.

11. Repeat preceding steps above and try to maintain voltage readings at A, C and D while approaching approximate tuning conditions of output network. Use resistor network except for steps 9 and 10.

III. Preliminary PA Grid Tuning

1. Using the generator and resistor network, drive the plate of V1 at the carrier frequency. Look with the scope at the grid of the PA tube.

2. Tune L1, Driver Plate Tune, for a maximum indication on the scope.

3. Set the RF generator to 3 times the carrier frequency. Adjust L2, grid efficiency resonator, for a maximum signal at this frequency.

4. Repeat this procedure several times because of the interaction of the tuning controls.

5. Disconnect the test equipment, and put all covers and doors in place.

6. Apply AC power to the Main cabinet. Do not apply power to the step start panel.

7. Depress the Filament ON push button.

8. Turn the RF multimeter switch to Driver Grid current.

9. Peak the current by tuning the Driver Grid Control on the Oscillator panel. The meter should read in the upper half scale. Check both oscillators.

10. 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 half scale.

11. 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.

12. Turn the DRIVER PLATE TUNE control to peak the PA SCREEN CURRENT.

IV. Grid Efficiency Resonator

1. Turn the Grid Efficiency resonator 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.

2. Adjust the PA SCREEN CURRENT for 1.8 amps by turning the PA SCREEN PROTECTOR CW.

3. Turn the transmitter off.

V. And now with Supply Voltage...

1. The initial turn on section of the technical manual may serve as a supplement to the following information.

2. Place a scope probe through the grill above the PA tube.

Warning

For safety reasons, the probe tip should not extend any more than about 3 inches through the grill.

3. Apply AC power to the step start panel.

4. Turn the High and Low power controls to their minimum settings.

5. Turn the Filaments ON. After 30 seconds, depress the High Power and then the HV ON button.

6. Observe the Plate Voltage, Plate Current, and Power Output readings. Gradually increase the High power control to bring the Plate voltage up to about 4 kv.

7. Adjust the Plate Tuning to dip the Plate current.

8. Adjust the Loading to achieve 2.8 amps of Plate Current, with 4 kv of Plate Voltage.

VI. Plate and Grid Efficiency Resonators

1. Using a blade screwdriver, rotate each control while watching the Plate Voltage. A small dip should be noted. Dip POWER AMPLIFIER PLATE CURRENT again using the PLATE TUNE control.

2. Check the PA Plate waveform on the scope for third harmonic content as shown in the technical manual and in Figure 2. Rotate Grid efficiency control, looking for a dip in plate voltage, and the proper appearance of the waveform.

3. Gradually increase the High power control for a Plate Voltage of about 9 kv.

4. Dip the Plate current with the Plate Tuning control.

5. Adjust the Loading control for a Plate Current of 6.3 amps.

6. Repeat the adjustment of the Grid and Plate Efficiency resonators for a dip in Plate Voltage and appearance of the Plate wave form.

7. Turn the transmitter off.

VII. Directional Coupler Adjustment

1. 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.

2. Set test jumper TJ3 to the lower vertical position. Switch power meter to Reflected.

3. Turn the transmitter ON at High power. Null the power meter with C4 and C2. Repeat adjustment of C4 and C2 for best meter null.

4. Shut the transmitter off. Return TJ3 to its former position (top).

5. Set test connectors TJI & TJ2 in a vertical position on the directional coupler.

6. Turn the transmitter back on, and adjust transmitter to 50 KW CW output as determined by a calorimetric dummy load. This should occur when the PLATE VOLTAGE is approximately 9.0 KV, and the PLATE CURRENT is 6.3 amps.

7. With the power meter switched to the FORWARD position, null the meter using control C10 on the directional coupler.

8. Switch the Power Meter to reflected power, and adjust R20 so that the power meter indicates 50 KW.

9. Turn the transmitter off.

10. Set Test Jumpers TJI & TJ2 to horizontal position.

11. Turn the transmitter back on at 50 kw. Switch the power meter to the REFLECTED position. Null the meter using control C9.

12. Switch the Power meter to Forward. Adjust control R21 for the correct power reading.

VIII. VSWR Trip (optional test)

1. 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.

2. To test VSWR trip, place (-) lead of VOM to chassis (+) to point 9 on directional coupler. VOM on RX1. VSWR LED will light. After completing check, readjust C4 for a null.

IX. Harmonic Traps

1. Sample the transmitter RF output using a spectrum analyzer. Be careful not to over drive the analyzer, as this will create distortion within the analyzer thus resulting in a false reading. A notch filter must be used to prevent overload of the spectrum analyzer front end.

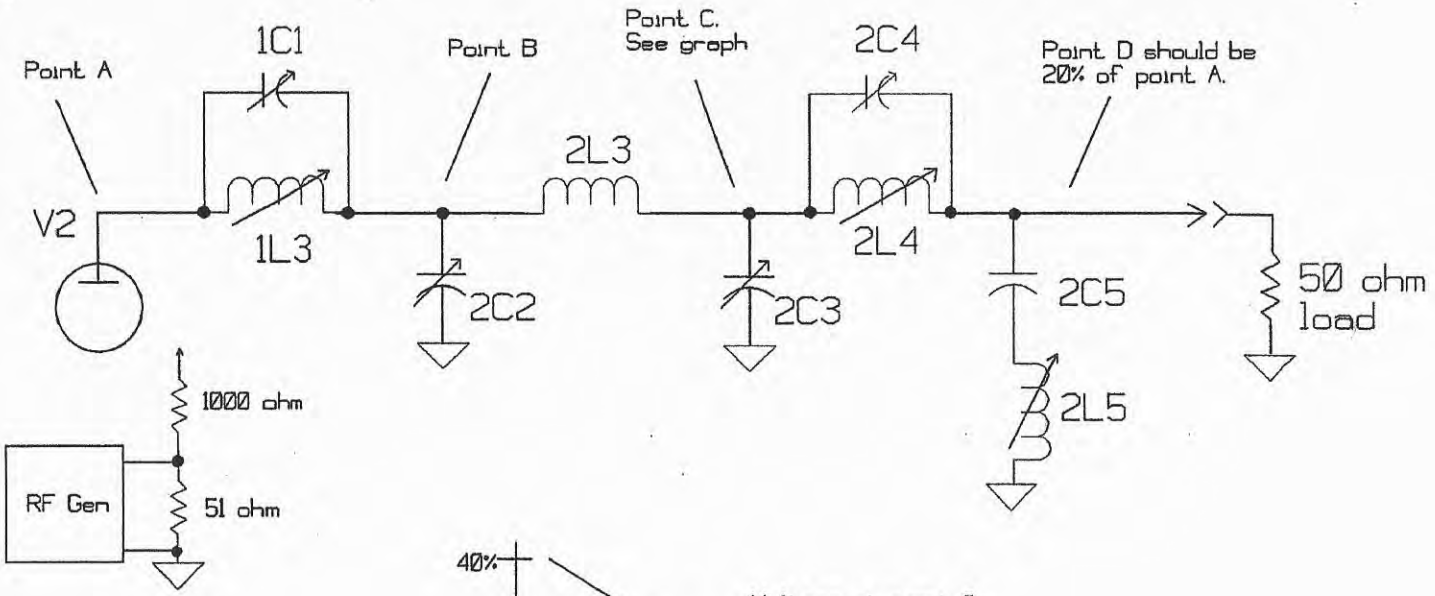
2. Adjust both 2nd and 3rd harmonic traps for minimum signal level at the harmonic frequencies. Harmonics must all be below -80 dB.

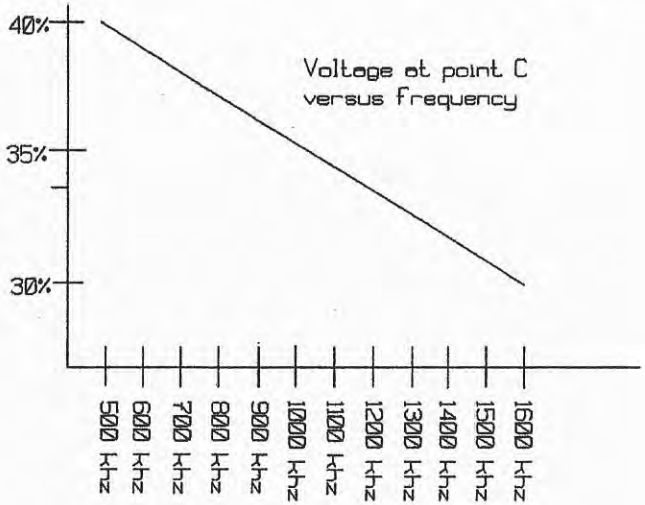
X. Final Checks

1. Check that all tuning controls have at least 25% of their turns remaining to allow future adjustment. Make any corrections to allow this internal to the transmitter. (Turns counter on 2C2 must set between 14.5 and 43.5, on 2C3 between 8.5 and 25.5.

2. Check all meter readings against the typical data, or those taken before beginning the frequency change. If any significant discrepancies are noticed, they should be investigated by reviewing the frequency change procedure, and the technical manual.

Harris Allied Broadcast



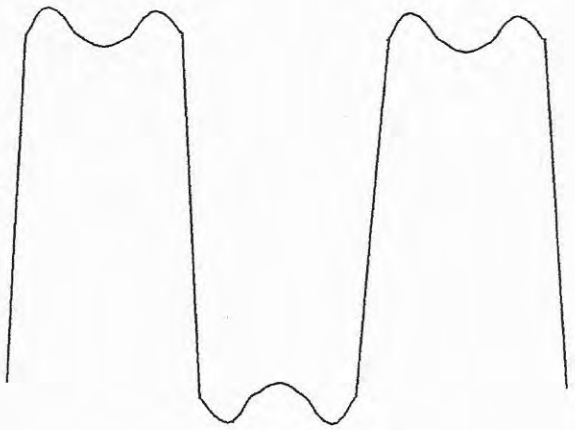


Frequency Change
MW-50 Series

Figure 1

Frequency Change Procedure
MW-50/50A/50B/50C/50C3

figure 2



PA Plate Waveform
(with probe through
grill above PA tube)