

MW-1/1A FREQUENCY CHANGE AND TUNING PROCEDURE

The attached procedure assumes that the person making the frequency change is fairly familiar with the MW-1. It also assumes that the transmitter is functioning normally prior to attempting a frequency change. This includes that all PA modules have all transistors of the specified type, and that the duty cycles, phase shifts, and current of all the PA modules are within 5% of each other. The person performing the frequency change should be alert to any abnormalities in the transmitter's operation, and be equipped to troubleshoot any problems which may arise. A test of transmitter operation at the old frequency with AC power applied is strongly recommended to determine the transmitter condition and make repairs if necessary before commencing the frequency change.

WARNING

**THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS.
PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY REGULATIONS.**

This procedure is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

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WARNING

Disconnect all power from the transmitter before working inside the transmitter.

1. Install all Frequency Determined components. Refer to a factory test data sheet or to the Frequency Change Components list for the correct capacitor values and coil settings.
 - a. Install crystal in the Oscillator P.C. Board, A16.
 - b. For carrier frequencies above 1250 KHZ jumper terminal 7 to 10. (Crystal frequency divided by 2). For carrier frequencies below 1251 KHZ jumper terminals 7 to 9 and 8 to 10 (divide by 4).
 - c. Install C4 in the IPA Module, A14.
 - d. Install L18, L19 and C15 next to the RF driver module, A13.
 - e. Install C8 on RF Driver and PA modules A1 through A13 for transmitters below 1000 KHZ.
 - f. Install 1L1 through 1L12 uniformly using brass hardware.
 - g. Install C1A through C1J, as required, on under side of output network deck. Use shorting straps 816-7545-001 to connect each capacitor to the common buss bar in the center of the inductors.
 - h. Install C2 capacitors as required on top side of output network deck.
 - i. Set the tap on L13 to the number of active turns indicated on the test data sheet.
 - j. Set the rotor on L14. Connect transmitter output to the internal dummy load by moving S11 to the appropriate setting.
2. Remove fuses F2-F7 on gating and power control board.
3. Turn HI POWER control on the Gating and Power Control board fully CCW.
4. Adjust RF DRV VOLT and RF DRV BIAS to center of their range.
5. Turn on transmitter, HIGH POWER.

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NOTE: All commands for transmitter on from this point will be in the HIGH POWER mode.

6. Osc. function test.
 - a. Place scope probe on C4 of IPA, terminal 10.
 - b. Adjust pot on osc. to full output (CCW). Scope should read 15-20Vpp at the correct carrier frequency.
7. IPA Tuning.
 - a. Leaving scope probe on C4 of IPA, adjust L2 for a peak. (This is a very broad peak).
8. RF Driver Tuning and Loading.
 - a. Adjust the slug of L19 to its lowest physical position.
 - b. Adjust L18 for maximum RF Driver current.

If L18 does not go through a peak, the value of C15 will have to be changed slightly. If the slug is all the way up while approaching a peak in RF Driver current, the value of C15 will have to be increased. Conversely, the value will have to be decreased if the RF Driver current is approaching a peak with the slug all the way down.
 - c. Adjust L19 for about 1.3 amps of RF Driver Current. Re-peak L18.
 - d. Turn off transmitter.
 - f. Reinstall fuses F2-F7.
9. RF output adjustment.
 - a. Turn transmitter on, high power. Slowly adjust high power control on the Gating and Power control board clockwise to attain approximately 30V on the PA volt meter. Dip the PA volts with the PA tune control. Adjust the current to 12A with the PA load control. This should give approximately 250W (repeat the above to attain 30V/12A). Always dip the PA volts with the PA tune first, and last.
 - b. PA fault indicators should be extinguished at this time. If not, troubleshoot the cause.
10. At this time REL/VSWR may become a problem, causing a VSWR overload. Turn power meter switch to REL/VSWR.

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- a. Null the REL/VSWR by adjusting the Directional Coupler balance caps C22 and then C20 for zero indication on the power meter. If a null is not obtainable, select capacitors C23, and/or C19 to place the variable capacitors C20 and C22 approximately in the middle of their range with the REL/VSWR nulled to zero. If C22 or C20 are at maximum capacity (screwed tight), C23 or C19 will need to be increased in value. If C22 or C20 are at minimum capacity, C23 or C19 will need to be decreased in value. A selection of capacitors is provided with the frequency change parts. Paralleling two caps may be necessary on some applications.
 - b. If a null cannot be obtained with C22 at minimum capacitance and C23 is 0 capacitance, short out one or more sections of L1 using buss wire on the terminal posts provided to enable C22 to null the REL/VSWR to zero. Re-null C20.
 - c. Repeat the nulling of C20 and C22 until the REL/VSWR nulls at zero.
11. If RF driver current is above 1.5 or below 1.0 Amps, adjust L19, (RF DVR) loading control, to get the current in range, 1.3 amps. Re-peak the RF Driver current by tuning, L18.
 12. Slowly adjust the high power control to attain a PA voltage of 52V. Adjust PA loading in small increments, keeping the PA Volts in the dip with the PA tuning as necessary to obtain 22.5A with PA volts at 52V. Repeat the PA tuning and loading as necessary to obtain the above ratio. Always dip the PA volts with the PA tune first and last. Power should be approximately 900-950W when finished.
 13. Re-peak L18 and reload L19 for approximately 1.3 amps. Re-adjust REL/VSWR balance controls C20 and C22 for zero on the REL/VSWR position. Re-select C19 and C23 or L1 jumpers if necessary.

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14. RF Driver and Bias Voltage Adjustments.
 - a. Adjust RF driver bias and voltage controls for best distortion at 1000 Hz and 10,000 Hz.
15. VSWR Trip Point Adjustment.
 - a. Adjust RF power out to 1000 with the high power pot.
 - b. Turn power meter switch to REL/VSWR.
 - c. Turn PA load control in the direction which lowers PA amps until REL/VSWR is indicating 500 watts.
 - d. Adjust VSWR pot, R8, on the Input and Overload board to trip the VSWR circuit at this 500W indication.
 - e. Return PA load control to normal operating ratio of 52V/22.5A.
16. Output Network Tuning Ratio and DC Feedback voltage adjustment.
 - a. Adjust the transmitter output power with the HI POWER pot to 250 watts. Using a scope with a X10 probe, measure the RF voltages at C1 on the PA tuning buss bar, and at the transmitter output on the antenna/dummy load switch, S11. The voltage at C1 should be 70% plus/minus 5% of the voltage at the antenna/dummy load plug. If this ratio is incorrect, shut off the transmitter, move the tap on L13 one turn either direction, adjust the HI POWER pot on the Gating and Power Control board full counter-clockwise, turn on the transmitter to HI POWER, and repeat the tuning and loading procedure, steps 9 and 12. Repeat this procedure until the ratio is correct. L13 should be tapped no more than 2 turns either side of its assigned setting for the new frequency.
 - b. The Feedback Voltage measurement is made at the two jumpered terminals on R8, the motorized fine power control pot, located on the drop down door. A correct reading is -12 to -16V Volts DC. If the voltage is lower than -12V DC, decrease the value of C18 or C17 on the directional coupler; if the voltage is greater than -16V, increase C17 or C18. A selection of capacitors is provided with the frequency change parts.

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17. D.C. Overload adjustment.

- a. Set the DC overload pot on the front door fully clockwise. Adjust transmitter power to 1100 watts. Modulate the transmitter to 100% with a 20 HZ tone. It is advisable to use a scope connected to the modulation monitor output, TB2-23 & TB2-22 (gnd) on the floor at the back of the transmitter, rather than a modulation monitor, to read this low frequency modulation. Sync the scope via its external input with the applied audio.
- b. Adjust the DC OVERLOAD pot counterclockwise slowly until the transmitter trips off, displaying the fault.
- c. Remove the audio from the transmitter.
- d. Turn transmitter on at 1100 watts. It should not DC overload. If it does, the DC OVERLOAD control is set too tight; repeat the above procedure, adjusting the DC OVERLOAD slowly until the trip point is reached.
- e. When this adjustment is completed, remove all transmitter power.

18. Overvoltage adjustment.

- a. Set the DC OVERVOLTAGE and REGULATOR ADJUST pots on the front door fully clockwise. Remove fuses F1-F7 on the Gating and Power Control board.
- b. Turn on the transmitter to High power. PA Volts should rise to 60-70 Volts. PA Amps should read 0. (If the PA Volt meter pegs, immediately shut off the transmitter. There is a problem with Q4 and its associated components on the Audio Driver board, A17. Fix this problem before proceeding.)
- c. With the Multimeter on the 140V supply position, allow the regulator transformer time to bring the 140V supply reading to 155 volts. Adjust the REGULATOR ADJ. pot for a stable 155V on this supply. If the regulator transformer, T2, won't bring the supply voltage up to 155V with the REGULATOR ADJ. pot at maximum CW, turn off the transmitter, remove power, and temporarily move wire #4 on transformer T1 down one tap from where it is now, unless wire #4 is already on the 210V tap (terminal #3). IN THIS CASE, LEAVE WIRE #4 WHERE IT IS. (Brown wire #22 should always be on the 240 V tap, regardless of where wire #4 is moved.)

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- d. Turn transmitter on and re-adjust the REGULATOR ADJ. pot for 155V, if possible, on the 140V multimeter position. If 155V is not attainable per step c, adjust the regulator for the highest voltage attainable below 155V. Never exceed 155V. Adjust the DC OVERVOLTAGE pot until the transmitter trips off, displaying the OVERVOLTAGE overload. Adjust the pot 1/8 turn clockwise from the trip point.
 - e. Remove transmitter power and restore wire #4 on T1 to its original position. Turn only the REGULATOR ADJ pot fully counterclockwise. Replace fuses F1-F7 on the Gating and Power control board, A15.
19. Regulator Adjustment (T2).
- a. Turn on the transmitter to High power and adjust output power to 1000 watts without modulation. Slowly adjust the REGULATOR ADJ. pot for 135V on the 140V multimeter position, giving transformer T2 time to catch up to the setting. The wiper contact on T2 should be in the middle portion of its travel (1/4 to 2/3 travel).
 - b. If the wiper on T2 is at either extreme, turn off the transmitter and retap transformer T1 by moving gray wire #4 either up or down one tap from its present position. The brown wire, #22, should always stay on the 240V tap, depending on the position of the wiper on T2. If T2's wiper is at the top end of travel, move wire #4 on T1 down one tap. If T2's wiper is at the bottom end of travel, move the #4 wire on T1 up one tap.
 - c. With power re-applied and transmitter output power set to 1000 watts without modulation, adjust the REGULATOR ADJ. pot to 135V on the 140V power supply multimeter position.

This completes the MW-1 Frequency Change. A formal Proof-of-Performance may be done at this time.

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MW-1 DIRECTIONAL COUPLER CAPACITOR SELECTION
+ RF DRIVER PADDER CAP

The following parts must be supplied along with the Frequency Determined Components.

Part #	Description
C17 and C18	
500-0903-000	2700 pf, 500v
500-0881-000	3000 pf, 500v
500-0882-000	3600 pf, 500v
500-0888-000	3900 pf, 500v
500-0883-000	4700 pf, 500v
C23	
500-0804-000	10 pf, 500v
500-0803-000	18 pf, 500v
500-0811-000	27 pf, 500v
500-0817-000	47 pf, 500v
500-0812-000	68 pf, 500v
C19	
500-0759-000	100 pf, 500v
500-0755-000	270 pf, 500v
500-0833-000	390 pf, 500v
500-0835-000	470 pf, 500v
500-0838-000	560 pf, 500v
500-0840-000	680 pf, 500v
C15 PADDER	
500-0852-000	1000 pf, 500v