
Chapter S2

Maintenance and Calibration

2.1 Recommended Test Equipment

The following test equipment is recommended to aid in maintenance and calibration of the MW-5D.

- Digital volt meter with .03% accuracy.
- Oscilloscope with minimum bandwidth of 40MHz.
- RF Power Meter (Bird Model 4421).

2.2 Periodic Maintenance

2.2.1 Controller Unit

The Controller unit does not require periodic maintenance.

2.2.2 Tuner Unit

Optimum performance of the MW-5D is ensured if the following mechanical components are maintained consistently.

- Tuning motors and gearboxes.
- Drive belts/Gears
- Variable capacitor bearings
- Capacitor position monitoring potentiometers

It is recommended that these parts be inspected for wear once every twelve months, or if the MW-5D shows signs of reduced performance

Wear is detected by moving each tuning capacitor back and forth to measure the amount of slack in the system. If the capacitor can be moved more than 3mm (1/8 inch), one or more of the drive components may need replacement.

WARNING 

Never run RF power through the MW-5D without having the cover fastened securely.

2.3 MW-5D Calibration

The MW-5D does not contain any external adjustment points. All adjustments are made through the micro-processor based Controller unit and are stored in the Controller's EEPROM. To make these calibrations, connect a computer or terminal to the Controller's Remote Interface port (see Section 3.3.2.2 of the *Operations* manual).

It should be noted that the MW-5D is fully calibrated at the factory and should not require any further calibrations other than nulling the phase/mag tune detectors. Nulling the tune detectors can be done with an RFC-5MW as described in *Appendix 5* of the *Operations* manual. If, however, the unit has had mechanical maintenance or other repair work performed, the unit may require new calibrations.

2.3.1 Accessing the Calibration Menu

Once a computer or terminal is attached, calibrations can be made via a built-in calibration menu. The CAL command is used to call up this menu. However, the CAL command is protected against accidental use by a key code. To access the CAL menu type the following commands in sequence:

```
KEY1234 <Enter>  
CAL     <Enter>
```

2.3.2 Calibration Menu Options

The calibration menu has many options available to configure various operating parameters. Each option is described below.

1 - Matchwork CAL Starting Point

This option sets up the starting point for all other calibrations. Selections are available for the type of Matchwork Tuner used:

MW-5D

MW-10D

MW-25D.

2 - Capacitor Configuration

This option sets the type of tuning capacitors used in the Tuner unit.

3 - Capacitor End Points

This option starts a procedure to individually calibrate the C1 and C2 capacitor MIN and MAX points. Follow the on-screen instructions to complete this procedure.

On the air-variable capacitors, MIN is considered the point where the rotor starts to engage with the stator. MAX is considered the point where the rotor is fully meshed with the stator.

4 - Phase/Mag Null

This option nulls the phase and magnitude tune detectors to optimize tuning for a specific load. Choosing this option from the CAL menu performs the same function as nulling the phase/mag with the RFC-5MW as described in *Appendix 5*.

5 - Motor 1 Dead Band Calibration

This option sets the "acceptable tune" window size from which changes in the phase detector signal can be ignored for driving C1.

This value can be increased or decreased to one of eight fixed hex values between 00 and FF. This is not a linear function; each step has a doubling effect.

A value of 00 is the largest possible window. This means changes in the phase/mag detector signals will be ignored and the tuning capacitor will not respond. With this value auto tuning will be very inaccurate.

A value of FF is the smallest window. This means the slightest change in the phase/mag detector signal will cause the tuning capacitor to respond. With this value auto tuning will be very accurate but it will also be very sensitive to small changes or glitches. If the window is set too small the unit will track minor changes. This "tracking" effect may look like "hunting" but should not be confused.

A typical value for this calibration is FC or FE.

6 - Motor 1 Hysteresis Calibration

After the C1 tuning capacitor falls within the "acceptable tune" window, (set by the dead band calibration), the window can be increased by a small amount as set by this calibration. Increasing this value will help eliminate "tracking" and "hunting" problems.

The values range from 00 to FF hex where 00 is no increase and FF is the largest increase. A typical value for this calibration is between 04 - 10.

7 - Motor 1 Speed Calibration

This adjustment allows you to change the C1 motor drive speeds for different times in the tuning pattern. There are five settings, numbered 0 - 4, and are described as follows:

- 0 - Motor speed when CAP is far from the tune point
- 1 - Next speed as it gets closer
- 2 - Next speed when even closer
- 3 - Motor speed when CAP is very close to the tune point
- 4 - Not used.

Motor speeds 0 - 3 are used in AUTO mode but only speeds 2 - 3 are used in MAN mode. The theory is to slope the speeds such that the motor starts out fast when far from tune and slows down as it approaches the tune point.

Values for each setting range from 00 hex to 7F hex.

00 = FASTEST and 7F = SLOWEST.

Typical settings for the Air Variable capacitor (C1) are as follows:

Setting	0	1	2	3	4
Value	15	25	40	55	--

8 - Motor 2 Dead Band Calibration

This option sets the window size from which changes in the magnitude detector signal can be ignored for driving C2.

This calibration functions the same as Motor 1 Dead Band (Option #5).

9 - Motor 2 Hysteresis Calibration

This option functions the same as Motor 1 Hysteresis (Option #6), but is used to control the hysteresis for C2.

A - Motor 2 Speed Calibration

This option performs the same function as Motor 1 Speed Calibration (Option #7), but is used to control the speeds for the C2 motor.

B - DC Bias Calibration

This option sets an overall software gain for the DC bias circuit. To calibrate this input apply a negative DC voltage to the RF output stud on the Tuner unit and adjust the gain until the reading equals the applied voltage.

WARNING



Never perform this calibration with RF power applied.

C - Vpp Calibration

This option sets an overall software gain for the Vpp input circuit if an optional Vpp detector is used.

E - View Calibration Settings

This option displays the current setting of some of the calibration options.

F - Save Calibrations Permanently and Exit

After you have completed any calibrations you should exit the menu via this option. After choosing this option there will be a short delay before returning to the normal prompt. During this time the calibrations will be permanently saved in the Controller's non-volatile memory.