



**MOTOROLA**

# ROUTINE MAINTENANCE

**For MTR2000 Station  
and Ancillary Equipment**

## 1

## INTRODUCTION

This section provides routine maintenance recommendations and procedures for the station and associated ancillary equipment.

### Routine Maintenance Overview



It is recommended that the station be cleaned with a soft dry cloth when the station is being serviced.

The station and ancillary equipment have been designed with state-of-the-art technology and operate under software control, thus requiring minimal routine maintenance. Virtually all station operating parameters are monitored and self-corrected by the Station Control Module, making virtually all periodic adjustments and tuning unnecessary.

Providing that the equipment is installed in an area which meets the specified environmental requirements (see Installation section, Pre-Installation Considerations for environmental specifications), the only routine maintenance task required is the calibration of the station reference oscillator circuit. Details are provided under the heading Calibrating Station Reference Oscillator.

## 2

### RECOMMENDED TEST EQUIPMENT

The following list of test equipment is recommended to perform calibration of the station reference oscillator.

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#### List of Test Equipment

- R2001 or R2600 Communications Analyzer with optional external frequency standard
- 2 portable radios (for the operating band) if available
- In-line wattmeter
- IBM PC (or 100% compatible) equipped with Microsoft Windows™ 3.1 or Windows™ 95, and Motorola Radio Service Software (RSS) application.

## 3

### CALIBRATING STATION REFERENCE OSCILLATOR

The circuit devices responsible for determining the station reference frequency exhibit slight variations in their operating characteristics over time (“infant aging”). Approximately 90% of the component aging process occurs during the first year of operation. After the first year, the devices remain stable for a substantially longer period of time. Therefore, it is recommended that the station reference oscillator (internal) be calibrated after one year of operation, and thereafter less often; Table 1 provides a recommended schedule of periodic calibration.

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#### Station Reference Calibration Schedule

After performing the initial one year calibration procedure, periodic calibration is required according to the schedule shown below. Note that the intervals are affected by the accuracy (in PPM) required either for regulatory compliance or by the system requirements, whichever is more stringent.

**Table 1. Recommended Intervals for Calibrating Station Reference Oscillator (After Initial One-Year Calibration)**

Accuracy Desired/Required	Recommended Interval
±5 PPM	Every 4 years
±3.5 PPM	Every 2 years
±2 PPM	Once yearly

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## Station Reference Calibration Procedure

### Manual Alignment Procedure

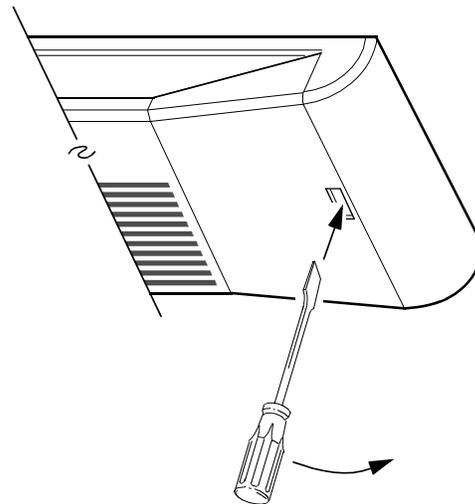
It is recommended that the frequency measurement equipment have an accuracy ten times greater than the accuracy required by the measurement. For example, if the frequency must be measured to within  $\pm 5$  PPM, the accuracy of the measurement equipment should be  $\pm 0.5$  PPM.

Perform the following procedure to calibrate the station reference oscillator circuitry.

1. Perform necessary setup for measuring transmitter frequency (typically an R2001 with external frequency standard).
2. Remove station front panel by inserting a small flat-blade screwdriver into one of two access holes at either end of the panel and, by carefully moving the handle of the screwdriver away from the center, release the front panel locking clip from the chassis and pull away the panel (refer to Figure 1).



**Some station components can become extremely hot during station operation. Turn off all power to the station, and wait until sufficiently cool before touching the station.**



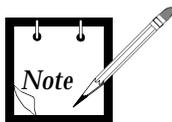
**Figure 1. Front Panel Removal**

3. Connect IBM PC (or compatible) to RSS port connector located on the front of the Station Control Module (see RSS Startup Manual for details on making connection).

4. Launch the RSS application (under Microsoft Windows 3.1 or Windows 95) and access the **Alignment** panel.  
Refer to the RSS Startup Manual, 68P81096E15, for complete details on installing and starting the RSS application.
5. With the mouse, press the **PTT** button on the **Station Operation Controls** panel to key the station.
6. Adjust the reference oscillator slider (if necessary) by dragging it with the mouse while observing the frequency reading on the frequency measuring equipment. Continue adjustment until you obtain a reading as close as possible to the transmit frequency. (The RSS display indicates the current setting of the transmit frequency within the possible range. This graph is provided as a guide only and may not be used to adjust the frequency.)

### Auto-Calibrate Alignment Procedure (Standard SCM Only)

Perform the following procedure to calibrate the station reference oscillator using a 5/10 MHz external reference signal.



The accuracy of this procedure depends on the accuracy of the 5/10 MHz external reference signal. Be sure the 5/10 MHz external reference signal provides the necessary accuracy (as described in Table 1).

1. Connect the output of a stable 5/10 MHz reference source to the BNC connector located on the front of the Station Control Module.
2. Set the 5/10 MHz source for a  $1.0 \pm 0.5$  Vrms output. The Station Control Module senses the 5/10 MHz input and commences calibrating the reference oscillator using the 5/10 MHz signal as a reference.
3. Connect the station RSS port to a PC and start up the MTR2000 Radio Service Software application.
4. Within the RSS application, access the **Service** menu **Alignment** window. The Online Help associated with this window provides details for the following alignment functions:
  - Reference Oscillator
  - Audio Input/Output
  - Receiver
  - Transmitter