



PREVENTIVE MAINTENANCE

Summary

This document describes preventive maintenance that should be performed on all sensors according to the maintenance schedule in Table 1 on page 3 and the Scheduled Maintenance Checklist on page 9. This document describes procedures for preventive maintenance that may be performed by the equipment user or operator, rather than by certified maintenance technicians. Copy the Scheduled Maintenance Checklist as desired for maintenance inspections.

Equipment deterioration that may affect the sensor is usually limited to environmental damage:

- Wind, hail, or ice damage
- Metal corrosion
- Vegetation, climbing vines, etc.
- Insect or rodent infestation

Periodic site and equipment inspections are a required part of preventive maintenance. Regardless of the maintenance schedule, visit the site as soon as possible after any severe weather event and inspect the sensor for wind damage, flooding or soil erosion, and accumulated ice or snow. Remove snow from around the electronics enclosure so as to keep water from entering the vents. Remove ice as much as possible from the enclosure and the antenna. Fill soil erosion to reduce the possibility of further erosion and sensor movement from its original alignment.

Maintenance Log

Keep a Maintenance Log Book to record all preventive and corrective maintenance performed on the sensor. Problems observed and their resolutions should be recorded. Printouts of diagnostic results should be with the log, and are helpful for documenting trouble. Every log entry should be dated and signed. A date for the next scheduled preventive maintenance may also be entered in the log. A sample maintenance log sheet is shown on page 9.

Preventive Maintenance Tools and Equipment

The following is a list of recommended items for performing preventive maintenance on the sensor.

- Laptop computer with terminal emulation software, and the following:
 - Straight-through RS-232, DB9 cable
- Digital voltmeter (DVM)
- Screwdriver, flat blade
- Screwdrivers, Phillips, #1, #2
- Adjustable wrench, 1.5-inch (3.8 cm) capacity
- Wiping cloth or shop towel
- Isopropyl alcohol (medical rubbing alcohol) or alcohol pads
- Anti-corrosion compound (suitable for protecting most metal types)

Preventive Maintenance Checklist

Table 1 below is a condensed checklist for performing preventive maintenance. The first column indicates how often the maintenance should be performed. The third column lists sections of this chapter that provide detailed instructions for each maintenance activity.

Table 1 Preventive Maintenance Checklist

Frequency	Maintenance Check	Maintenance Action
Daily	Selftest pass/fail status	As described in user manual
Daily	Sensor status report	As described in user manual
Monthly	Inspect general condition of site	Vegetation, insect or rodent infestation, soil erosion, etc.
Quarterly	Inspect mast-to-pad mounting	Mounting hardware, hinge pin
Quarterly	Inspect guy lines, VHF sensors only	Tension, condition
Quarterly	Inspect sensor ground connection	Clean, tight
Quarterly	Inspect flexible conduits	Clean, tight
Quarterly	Inspect modem cables and connections (if used)	Manufacturer's instructions
Quarterly	Inspect UPS cables and connections	Manufacturer's instructions
Each maintenance	Update Maintenance Log Book	
Each maintenance	Schedule next maintenance	
After any severe weather event	Inspect the sensor for wind damage, flooding or soil erosion, accumulated ice or snow	As appropriate for the condition

Preventive Maintenance Procedures

The sections describe the primary elements of preventive maintenance that should be performed on the sensor. Each of these sections is listed in Table 1 on page 3, which is a condensed checklist. Using the checklist is the most practical means of performing the maintenance after becoming familiar with the sensor and its maintenance requirements. Refer to the sections listed in the table when more detailed instructions are required.

Check the Selftest Pass/Fail Status

Check the sensor selftest results each day. This is normally performed at the central processor, but it can also be done at the sensor site.

Suspect a problem if the sensor does any of the following:

- Fails the selftest, but still processes lightning
- Correlates in time, but still causes bad solutions
- Fails the selftest in a consistent pattern (same time of day)

To check the selftest results at the central analyzer:

1. At the central analyzer, run the Attach command to attach to a particular sensor.
2. To display the results of the last selftest, press <Control-A> and type the following:

***STATUS<Enter>**

- The status message gives the result of the most recent selftest, and a history of selftest results since the sensor was reset.

Check the Sensor Status Report

Check the sensor status report summary on a daily basis during lightning season, or on a weekly basis during the less active seasons. Examine these reports for changes in any of the reported values, but especially note rising trends in selftest failures, humidity and rate.

Inspect the Sensor Site

Inspect the area surrounding the sensor installation and ensure that the area surrounding the site has not changed substantially since sensor installation. Note major changes to the site and report them to the individual responsible for sensor operation. The following are some notable changes:

- New construction
- Tower or antenna installation or modification

- Fence installation or modification
- Overhead wire installation or modification
- Installation or modification of electrical apparatus
- Installation or modification of buried cable or pipe
- Soil erosion
- Cracking or movement of concrete mounting pad
- Evidence of tampering with, or damage to sensor
- Encroaching plant life
- Insect or rodent infestation

Inspect all the surfaces of the sensor. All painted surfaces must be smooth and free of chips and bubbles. Flaked, chipped, or blistered paint should be reported to the Customer Response Center.

Upon instructions from the Customer Response Center, the damaged area may be painted after appropriate preparation of the surface:

1. Remove loose paint.
2. Thoroughly clean and degrease the affected area.
3. Sand and feather the edges of the affected area.
4. Prime the bare metal.
 - Use a primer that is suitable for the underlying metal.
5. Paint the affected area with outdoor paint approved for metal surfaces.
 - Use paint that is suitable for the underlying primer.

Exposed, unpainted metal surfaces should be coated with a corrosion preventive compound.

Inspect the Mast-to-Pad Mounting Hardware

Perform the following procedure at the first preventive maintenance check following installation, then inspected quarterly thereafter.

1. Inspect the four hex nuts that attach the mast mounting flange to the mounting pad.
2. Verify that the nuts are tight.
3. If the nuts are loose, check the level and plumb of the sensor base and mast. See the sensor installation instructions for this information.

Inspect the Sensor Ground Connection

The sensor is attached to the trench ground by way of the ground lug on the bottom of the enclosure. Inspect the ground wires as follows:

1. Grasp each ground wire near the clamp on the lug, then pull slowly and firmly to verify that the wire is firmly attached.
2. Check the ground clamp for corrosion; clean, tighten, or replace the hardware as needed.
3. Pull on the trench ground wire to verify that it is firmly embedded in the pad.
4. If a ground wire is used at the junction box, pull slowly and firmly on the wire to verify that it is firmly attached.
5. Clean connections and tighten any that are loose. Apply anti-corrosion compound.

Inspect the Flexible Conduits

1. Inspect the flexible conduits that attach to the enclosure.
2. Verify that the conduits are free of kinks, sharp bends, cuts, or abrasions.
3. Ensure that the cable connectors are tight.

Inspect the Enclosure Door Gasket

Prior to opening the enclosure door, remove moisture that may have collected between the top of the door and the enclosure.

Inspect the enclosure door gasket for surface irregularities, tears, cracks, or deterioration. Contact the Customer Response Center if the gasket is damaged.

Observe the LED Indicators

Note any fault in the Maintenance Log Book so corrective action can be taken later. LEDs are for use in diagnosing failures, and have little use in preventive maintenance.

Data being received by the sensor will cause the RD LED to blink. Data being transmitted from the sensor will cause the TD LED to blink.

Verify that the following LED states:

MDB Board	SP Board
Power: On, Green	1 On
Life: Flashing Green	2 Flashing, 1/sec
PPS: Flashing Green	3 Off, On during Selftest
	4 Occasional flash

Update the Maintenance Log Book

1. Enter completion of sensor preventive maintenance in the Maintenance Log Book.
2. Note any discrepancies observed and any remedial action taken or recommended.
3. Sign and date all entries.
4. Inform the person responsible for the sensor if any problems were found.

Schedule the Next Preventive Maintenance

Enter into the Maintenance Log Book recommendations for the next preventive maintenance based on site conditions and any work performed on the sensor.

Scheduled Maintenance Checklist		Date: _____
Maintenance Item	Maintenance Task	√
Sensor Operation and Testing	Self-test, performing test and interpreting results: Pass/Fail	
	Diagnostic tests and results, user level: Pass/Fail	
	Notes: Sensor reset/clear/return to default settings	
Site Inspection		
New equipment installed near the sensor	Note type and proximity to sensor site	
New buildings or construction near the sensor	Note approximate size and proximity to sensor site	
Trees, bushes, grass, climbing vines around sensor	Trim, remove as necessary	
Antenna mast and mounting hardware, guy lines	Inspect for visible corrosion	
Notes:		
Civil Works		
Communication and power service	Inspect for damage to cables, conduits, connections	
	Inspect connectors for corrosion	
Mounting pads, inspect for	Soil erosion	
	Tilting, sinking	
	Corrosion on attaching hardware and base plates	
Sensor Inspection		
Antenna inspection		
LFIA	Visible damage to dome	
	Environmental deposits, ice, bird/insect nests	
VHF array	Visible damage to dipoles or arms	
	Visible misalignment of dipoles or arms	
	Environmental deposits, ice, bird/insect nests	
Wireless communication antenna	Cable connections	
	Visible damage the antenna	
Notes:		
Electronics Enclosure		
External inspection	Mechanical integrity, hinge, lock	
	External cable cover, secure	
	External cable connections, secure	
	Mounting hardware and brackets tight, secure	
	Vents, filters, screens: clean as necessary	
Notes:		
Internal inspection	Cleanliness: moisture/dust, etc.	
	Door seal	
	Cable connections, secure	
	Insect intrusion	
	Visible corrosion: metal parts, electrical connectors	
Notes:		
Guy Lines, 15 Meter Mast	Visible damage to cables, turnbuckles, attachments, hardware	
	Notes: Tension equal on all lines Significant change in tension may indicate soil erosion or pad settling Mechanical alignment of antenna may be required	

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