

Annual Maintenance Guide

For FTS Manufactured Stations

General Inspection

During your annual maintenance visit thoroughly inspect the station site visually, physically, and as well as possible electronically.

1. Check general site conditions and make note of any items that need to be repaired, such as a fence, gate, or station components.
2. Inspect all guy wires and anchor points, are they secure, do they need tightening. Are the turnbuckles secured to prevent unwinding due to vibration of the guy wires in high winds.
3. Use a compass to check for correct orientation of Station, wind sensors, and any antennas on the station.
4. If there is a GOES antenna, check antenna and cable for physical serviceability. Are any of the antenna's directional elements (small aluminum rods) bent, loose, or missing? Is the antenna properly aligned? Check with compass and inclinometer. Wrap the GOES antenna cable connector with environmental tape.
5. Use a level to check the tower for plumb.
6. Check that all sensor cables are neatly secured. Do you have drip loops in your cables to shed rain, plus have you made a loop in the cables that span any joint on the mast or any sharp edge to prevent cable wear.
7. Check station for animal damage or vandalism.
8. Record all serial numbers of existing sensors, antennas, solar panel, datalogger, all station components if not already recorded.
9. Record model numbers from datalogger, telephone modem (if modem is present), all station sensors, and components. This will be helpful to have should you encounter problems, will assist with troubleshooting efforts.
10. Change out the sensors that need replacement. Record the serial numbers of all new sensors before they are installed.
11. Tighten any loose nuts, bolts, clamps.

Pre – Sensor or Component Change Out

- Know what times the station collects its data at. Stations collect two sets of data, one set is the FTS formatted data on the top of every hour the other set is the BLM formatted data collected prior to the scheduled GOES transmission. Plan your sensor or component change out around these two collection times to avoid missing transmissions, and loss of data.
- All sensors and cables need to be connected to the datalogger, and the station running **twelve minutes** before the scheduled GOES transmit time. This will allow ten minutes for the averaging sensors to collect their data, plus two minutes for the data to be loaded into the G4 transmitter from the datalogger before transmission.
- Data that is collected on the top of every hour all sensors, and cables need to be connected to the datalogger, and the station running **ten minutes** before the scheduled collection. This will allow ten minutes for the averaging sensors to collect their data.
- Using an RD05 display unit, Tool Box, or LDS-2 software read sensors and record the current sensor readings.

Sensor and Component Change Out

Cables

- ✓ Inspect all cables, even if not replacing sensor, remove the cable connector from the sensor inspect, clean if needed, and re-tape connection.
- ✓ Document potential cable problems and note need for next replacement as necessary.
- ✓ Cables are identified by color coding, unique connector size, and pinouts. The colored bands on the cable will match the correct port for that sensor or component on the datalogger. Cables with bands of the same color are identified by connectors of different size.
- ✓ When replacing cables secure with quality black cable-ties (white cable-ties break down in sunlight).
- ✓ Inspect yearly and replace older cable-ties.
- ✓ When attaching cables to the sensors make sure the fitting is snug but not tight. All connectors are thoroughly and carefully wrapped with quality environmental tape.
BE CAREFUL NOT TO COVER DRAIN HOLES ON THE SENSORS WHILE APPLYING TAPE!!
- ✓ Create good rain drip loops when securing cables along support arms, and entering the equipment enclosure. Also create a loop over any joint/union on the mast, and over any sharp edge to prevent cable damage.
- ✓ Prevent cable ends from contacting the ground to avoid moisture or dirt contact.

Tipping Bucket

- ✓ First disconnect cable from datalogger before working on the tipping bucket.
- ✓ Disassemble, inspect, and clean the entire tipping bucket.
- ✓ If installing a new bucket be sure to remove the rubber band securing the tipping mechanism. **JUST AS IMPORTANTLY, RE-INSTALL THE RUBBER BAND ON THE OLD BUCKET TO PREVENT DAMAGE DURING RETURN SHIPPING.**
- ✓ Level and tighten tipping bucket platform as needed.
- ✓ Reassemble.
- ✓ Verify and record the accumulated precipitation amount. This is necessary if you intend to continue with an ongoing count (Note: FWS 11 and FWS 12 do not allow for change of precipitation number but the FWS 12S does).
- ✓ If you wish to reset the accumulated precipitation amount back to zero. Disconnect all power to the datalogger, includes disconnecting cables to the battery port, telemetry port, and display port (if station has a TM modem connected to the display port) on the datalogger. Wait a couple minutes then reconnect all cables.

Wind Sensors

Before lowering the mast to work on the wind sensors, make sure all cables have enough slack in them to allow for lowering, if not disconnect from the datalogger. Also disconnect the top guy wire of the **two that point west**, and remove the locking bolt to lower the mast.

Wind Speed

- ✓ Check that the wind speed cups are tight and properly aligned and all facing in the same direction.
- ✓ Check that the sensor head easily and freely spins listen for any grinding noise indicating dust in the bearings.
- ✓ Check pin connectors for corrosion.
- ✓ When replacing sensor, set the distance into the holder to be comparable to the wind direction sensor for mechanical balance.
- ✓ Do not attempt to put any screw into the sensor drain hole. Tighten up the retaining screws do not over tighten. There is no locating set-screw required for the wind speed sensor.
- ✓ Do not cover the sensor drain hole.
- ✓ Wrap cable connector with environmental tape.
- ✓ Record wind speed sensor type (ice-rated or non ice-rated).

Wind Direction

- ✓ Make sure the wind direction vanes are true, tight, and not bent.
- ✓ Check that the sensor head easily and freely spins listen for any grinding noise indication dust in the bearings.
- ✓ When installing new sensor, align the “north-locating” hole in the shank of the sensor under the empty lower hole in the holder. Insert the north-locating screw into the shank through the holder, and tighten down. Gently tighten down the top retaining screw.
- ✓ Verify that the “arrow” points south (180 degrees).
- ✓ Do not attempt to put any screw into the sensor drain hole.
- ✓ Do not cover the sensor drain hole.
- ✓ Wrap cable connector with environmental tape.
- ✓ Record wind direction sensor type (ice-rated or non ice-rated).
- ✓ **REMEMBER TO REMOVE THE LOCKING PIN FROM THE SENSOR BEFORE RAISING THE MAST.**
- ✓ If able to forscan (read sensors) sensor with the mast down, check in all four direction quadrants.

Raise the mast and insert the locking bolt, reattach the top guy wire to its anchor, adjust the turnbuckles to plum the upper half of the mast. Secure turnbuckles to prevent unwinding due to vibration of the guy wire in high winds.

Relative Humidity/Air Temperature (RH/AT)

- ✓ RH/AT sensor cable is permanently attached to the sensor, disconnect from the datalogger only.
- ✓ Level support arm.

Solar Radiation Sensor

- ✓ Ensure sensor has unobstructed sunlight throughout the day.
- ✓ Level sensor support arm.
- ✓ Clean sensor to maintain accurate readings. Use mild soap and water, dish washing soap is acceptable. Remove hard water deposits from the element with vinegar. Ensure the vertical edges of the white diffuser are cleaned as well.
- ✓ **CAUTION: DO NOT USE ALCOHOL, ORGANIC SOLVENTS, ABRASIVES OR STRONG DETERGENTS TO CLEAN THE SENSOR.**
- ✓ Remember to remove plastic protective cap from top of sensor after installation of a new sensor.

Fuel Temp/Fuel Moisture

- ✓ Part of the process for installing the fuel moisture/temperature sensor is to rehabilitate the fuel bed, pull out all green vegetation, and add fresh material if needed. The stick should be facing south, 10-12 inches above the fuel bed. The fuel bed should be 3 feet square and 2 inches deep using needles, leaves, and twigs (one hour fuels) typical of your area. Reference NFES 2140 Weather Station Handbook-an Interagency Guide for Wildland Managers.
- ✓ When installing sensor do not touch the wood dowel with your hands. Place the fuel stick sensor at the end of the support arm, such that the aluminum shank of the sensor is at the end, but slotted into the U channel, secure with hose clamp.
- ✓ Level the support arm.
- ✓ Wrap cable connector with environmental tape.

Solar Panel and Charge Regulator

- ✓ Inspect for cracks in glass front of the solar panel.
- ✓ Clean with mild soap and water, or glass cleaner.
- ✓ If you have the equipment, check output of solar panel with volt ohmmeter (VOM). In the following manner:
 - First, remove the positive solar panel connection at the Array + charge regulator terminal. You do not have to disconnect the Array – connection for this test.
 - Use a voltmeter to measure the voltage across the positive and negative connectors at the end of the solar panel cable. The panel can produce as much as 18 volts in direct sunlight. (Note: some regulator checks will be inconclusive if the panel voltage is less than 15 volts). Very low readings (below 12 volts) or zero readings in good daylight conditions indicate a solar panel problem.
 - If there is no problem found, connect the wire back to the Array + terminal.
- ✓ Check the charge regulator with the VOM. Disconnect the positive battery connection from the Batt + location on the regulator. Measure the voltage at the regulator, across the Batt + and the Batt – connections. The voltage should be close to 14.3 volts. If the voltage is very low (0 to 5 volts) then the regulator may be defective and requires replacement.
- ✓ Check the temperature sensor wire and probe for damage. If damage is present they must be repaired or replaced. The probe is attached to the side of the 12 volt battery.

The charge regulator begins charging when the battery voltage drops to 13.5 volts, the red LED charging indicator lamp will come on. When the battery voltage reaches 14.3 volts the regulator cuts off charging and the charge indicator LED goes out. This cut-off voltage will vary slightly in accordance with temperature compensation.

Batteries

- ✓ Replace batteries yearly (in battery pack) with 8 new 'D' cell alkaline batteries, if your station still has the battery pack.
- ✓ Check the 12 volt rechargeable battery for leakage or corrosion, clean or replace if needed, and test with voltage meter should be over 12.5 volts. Recommended replacement schedule every three years.

Before You Leave The Station

- ✓ Ensure all cables are secured with cable-ties.
- ✓ Trim the excess off from the cable-ties.
- ✓ Ensure station looks neat and professional.
- ✓ Check the datalogger for any open ports, where you forgot to reconnect a cable.
- ✓ Using an RD05 display unit, Tool Box, or LDS-2 software read sensors and record the current sensor reading of the new sensors. Compare against the forscaned readings of the old sensors you took before you started your annual maintenance. They should be close to the same readings.

The Following Is Not An Annual Maintenance Check, But Is Listed For Your Information.

Steps For Hooking Up The 12 Volt Battery and Solar Panel To The Charge Regulator

1. The positive battery cable is a clear or white wire with the small red marked ring or fork tongue terminal is connected to the regulator terminal marked Batt +. The black wire with the small ring or fork tongue terminal should be connected to the regulator terminal marked Batt -.
2. Connect the battery cable to the battery, IN THE FOLLOWING ORDER:
 - First: The Black wire is connected to the NEGATIVE terminal of the battery.
 - Second: The red-marked CLEAR or WHITE wire is connected to the POSITIVE terminal of the battery.
3. Attach the solar panel cable to the charge regulator, IN THE FOLLOWING ORDER:
 - First: The BLACK wire is connected to the ARRAY NEGATIVE (Array -) terminal of the regulator.
 - Second: The red-marked CLEAR or WHITE wire is connected to the ARRAY POSITIVE (Array +) terminal of the regulator.

To disconnect reverse the above order.