

Maintenance Guide for Vaisala

Pre Trip

Before you go to the field, get the Most Recent 48 Hours of Observation report from WFMI to check if any sensors are having problems. Also get last transmission header information to check for transmission problems such as Power, Frequency, and to check that the station is transmitting on time. Call RAWs depot for info if no WFMI access.

Also before you go out, have a reliable time piece set to the correct time in GMT if your station does not have GPS with auto start program. (A handheld GPS is a good tool)

Use the Rehab Form to record last data, serial numbers and to make any notes.

General Inspection

1. Check general site conditions and make note of any corrections that need to be made, such as fence repair.
2. Check vegetation. Is there anything growing up that needs to be cut back?
3. Inspect all guy wires and footings.
4. Use torpedo level on tower to check for plumb.
5. Check that cables are tied down neatly and secured.
6. Check for animal damage or vandalism.
7. Check for corrosion.
8. Check GOES antenna and cable for physical serviceability.
 - Are any of the elements (prongs) bent or missing. Is the antenna properly aligned for the GOES satellite? Check with compass and inclinometer.
 - Are antenna drain holes on bottom? Check that cable is installed correctly to prevent water intrusion. Make sure connector is environmentally taped.
9. Record all the serial numbers of the existing sensors, antenna, solar panel, GPS or WWV, and DCP (if needed).
10. Does Station meet NFDRS standards?

Vaisala Online 2000

1. **Connect computer to DCP. Open Vaisala Online 2000**
2. **Retrieve Last Data:**
 - Click on '*Data*' (Online 2000). This opens up Retrieved Archived Data box.
 - Click on '*Select All*' button, then '*Next.*'
 - Select '*number of data stores to return*' and enter 1. Click on '*Retrieve Data Now*' box. This will retrieve the last transmitted data.
 - Record the last data.
 - **NOTE: (For stations with GPS)** LOG STATS is the number of GPS satellites the GPS locked onto last. If this number is 0, the GPS is probably bad and DCP will not auto-start.
3. **Put DCP in STOP mode:**
 - Click on '*Mode*' (Online 2000), and then select '*STOP*' under DCP program control.
4. **View Program and Firmware information in DCP:**
 - Click on '*View*' (Online 2000). Record Program Name and Firmware revision.

Inspect or Replace Sensors

Tipping Bucket

- Remove the cover and inspect and clean the tipping bucket and funnels. Check all connections. Check for corrosion on cable terminal leads.
- Level and tighten tipping bucket platform as needed.
- 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.** Reassemble.
- Replace sensor every 3 years.

Wind Speed 430A

- Check that wind speed cups are tight and properly aligned and all facing in the same direction.
- Check for free movement of bearings and cups spin easily and freely.
- Verify and record W/S sensor ice skirt size (either 1-3/4" or 2"). If you are using a Vaisala 555 DCP, you must make sure that the ice skirt is 1 3/4". If you have a Handar 540, you must enter the correct size into the programming.
- Replace sensor every 2 years.

Wind Direction 431A

- Make sure the wind direction vanes are true and tight.
- Check for free movement of bearings.
- Verify and record cross-arm orientation to assure proper installation of WD sensor.
- When installing the wind direction sensor verify the "arrow" points south (180 degrees) and remove the pin only after securing the sensor in its bracket.
- Check to see that all 4 quadrants (0, 90, 180, and 270) report correctly during Force Scan.
- Replace sensor every 2 years

Ultra-sonic WS/WD 425A

- Inspect for corrosion and damage. Clean probes if dirty.
- Replace sensor if prongs are bent.
- Replace sensor only when necessary.

Relative Humidity/Air Temperature

- Replace sensor yearly.
- Wrap connector with environmental tape

Cables

- Inspect and clean cable ends as necessary.
- Even if not replacing sensor, remove cable connector; inspect, clean if necessary. Check o-ring serviceability at each connector
- Document potential cable problems and note need for replacement as necessary.
- Be sure that cable is installed with the shielding alignment to prevent water from entering cable.
- If replacing cables use quality black tie-down straps (white tie-downs break down in sunlight).
- Inspect/replace older tie-down straps as necessary.
- When attaching sensors to the cable make sure the fitting is snug but not tight.

- RH/AT, FM/FT, and GOES antenna need to be wrapped with quality environmental tape at sensor end only. **BE CAREFUL NOT TO COVER DRAIN HOLES ON THE SENSORS WHILE APPLYING TAPE!!**

Fuel Temp/Fuel Moisture

- Part of the process for installing the fuel temperature or fuel moisture/temperature sensor is to rehabilitate the fuel bed. The stick should be facing south, approximately 10" above the fuel bed. The fuel bed should be 3 feet square and 2" deep using typical vegetation found in the area (conifer needles or hardwood leaves). This is especially important if you have a fuel moisture/temperature sensor. **PLEASE REFER TO NFES 2140** "Weather Station Handbook - an Interagency Guide for Wildland Managers" for complete information on appropriate fuel bed conditions.
- Replace fuel moisture/temperature sensor yearly.
- Replace fuel temperature only sensor every 3 years.

Solar Radiation

- Check condition of sensor and cable. Critters like to chew on cable, especially where it hangs down below DCP. Wrap this cable tight around tower frame and tie wrap slack up high. Replace if damaged.
- Change out sensor every 3 years.

Battery and Solar Panel Power Checks

- Turn power switch off inside DCP.
- Check batteries (internal and external) for leakage or corrosion and test with voltage meter or load tester.
- Replace battery every 3 years.
- Check Solar Panel Voltage and Current. (Approx 20 Volts and 1 Amp at full sunlight for 20watt). Positive to pin A, negative to pin C. Re-connect solar panel cable.
- Check Regulator Voltage. (Approx 14 Volts) Positive to red battery lead, negative to ground.
- Check Regulator Current. (Slightly less than Solar Panel Current). Positive to red battery lead, negative to positive battery terminal. Make sure black battery lead is on negative battery terminal.
- Re-connect battery leads. Turn power switch back on. **NOTE:** For Auto-Start programs the DCP will go to RUN in approx 4 minutes. Put DCP in back in STOP mode if you need to.

GPS or WWV

- GPS – Check condition of cable. Critters like to chew on cable, especially where it hangs down below DCP. Wrap this cable tight around tower frame and tie wrap slack up high. Replace if damaged.
- WWV – Check condition of antenna and receiver for damage. Replace if necessary.

Vaisala Online 2000

1. For Stations with WWV: Check WWV Lock-on History

- **NOTE:** SDI-12 Commands start with a zero or a one, this is the sensor address. For stations that have an Ultra-sonic sensor, the WWV address may be one. Select “*Send Command*” button after entering SDI-12 commands.
- Click on ‘*SDI-12*’ (Online 2000). Select ‘*Enter Commands Manually*’ and enter *0s!* to get results of number of tries and number of lock-ons. Record results.
- A low number of lock-ons as compared to number of tries indicate a possible problem with the WWV.

2. For Stations with WWV: Test WWV

- Make sure WWV antenna is connected to WWV Receiver.
- Click on ‘*SDI-12*’ (Online 2000). Select “*Enter Commands Manually*” and enter *0S3!* to clear results. Then enter *0s!* to make sure everything is zero.
- Enter *0M!* to test WWV lock-on. Wait Approx 3 minutes for WWV to test.
- Enter *0s!* to get results. There should be 1 try and 1 lock-on at 5M, 10M, or 15M (any will do). If there is 1 try and no lock-ons, then there may be a problem with the WWV. Try test again.

3. Archive the 555 program if updating firmware or loading a new program:

- Click on ‘*Archive*’ button (Online 2000); select Program Save Location C:\Program Files\Vaisala\555\Wrk.
- Click on ‘*Save Program*’ button. The program in the DCP will be saved to the **Wrk** file. Note the name of the program being saved. This program can be loaded back into the same DCP. Never load an archived program into another DCP.

1. Update Firmware (If necessary):

- Click on '*Firmware*' button, a file box will open up. Open the correct firmware file. (Currently 4.09 for standard 555 and 7.09 for Enhanced 555)
- A warning will appear that all archived data will be lost. Also the program will be lost. Click on '*Yes*' to continue.
- After the firmware has been updated a new program (or archived program) will need to be loaded into the DCP.

2. Load Program into DCP (If necessary):

- Click on '*Load*' (Online 2000). Then select program type: Archived Program or Assembled Program. (Only select archived if loading original program back into DCP) If archived, go to the 'Wrk' file where program was archived earlier.
- Select the program to be loaded into DCP by highlighting the BIN file. (The program must be "Assembled" using Vaisala Winpro prior to this)
- Click on '*Load Program*' button. Select '*Yes*' to warning. If errors occur during program loading, repeat steps until program load complete is indicated.
- If program is Auto-Start, program will go to RUN in approx 4 minutes. FAV information needs to be updated prior to this.

3. Check or update FAV (Field Accessible Variables):

- Click on '*FAV*' (Online 2000). Check or update Instant Start and Average Start. Instant Start needs to be at 2 minutes before transmit time. Average Start needs to be 12 minutes before transmit time.
- GPS should be set to update every 5 hours. (If WWV, set to 16:30:00)
- Check or update Solar Rad calibration constant. (Cal constant should be on sensor)
- Check or reset Rain Gage (Precip).
- Ignore Clock Error (Information only).
- There may be other settings depending on station configuration (weigh gage, B.P. etc.)

4. Check or update Satellite information:

- Click on '*Satellite*' (Online 2000). Information can only be changed in STOP mode.
- Check that Satellite NESS I.D., Transmit Time, Baud rate, and Transmit Window Size are correct.

5. Force Scan Sensors:

- Force Scan can be done in RUN or STOP.
- Click on '*Scan*' (Online 2000). A list of the sensors will appear. Highlight each sensor and click on '*Force Scan*.' Record results for each sensor.
- Check Wind Speed slow and fast. Check Wind Direction in all 4 quadrants. (Can not do this for Ultrasonic sensors)
- **555 with GPS:** GPS will give a timeout error. This is normal. When force scanning the GPS, the DCP will put power to the GPS for 20 minutes. This is useful when the GPS internal batteries need charged or the GPS has lost its "Almanac Data."

6. Set DCP Date and Time:

- If program is Auto-Start, the GPS will set the Date and Time for you. Go to the next step.
- Click on '*Clock*' (Online 2000). Next, click on '*Set DCP Date*' and enter today's date in GMT time. (GMT Time may be on the next day)
- Click on '*Set DCP Time*' and enter GMT time slightly ahead in the future. When the current GMT time matches, enter that time into DCP. Now the DCP Time should match with GMT time.

7. Put DCP into RUN mode:

- Select '*Mode*' (Online 2000). Click on '*RUN*.' Select '*Yes*' to warning. If program is Auto-Start, an error message will appear. Ignore error message as DCP will go to RUN in approx 4 minutes. Also turning DCP off and back on will start the Auto-Start process and DCP will go to RUN in approx 4 minutes.
- NOTE: If DCP goes to RUN after Average Start Time (in FAV), the averaging channels will not come in until the following hour (WS, WD, RH).

8. Perform Tipping Bucket Test:

- Tipping Bucket will only count in the RUN mode. Make sure you have enough time to do the test and reset the rain gage several minutes before station transmit time.
- If not enough time, let station transmit first, then perform tipping bucket test.
- 400 mille-liters equals 50 tips (+ or - 2 tips). OR – manually put in 10 tips
- Reset rain gage in '*FAV*.'

Check Transmission

- After Station has transmitted, call Boise RAWS Depot, 1-208-387-5475 to check the status.
- Make sure station came in **On Time**, the **Correct Channel**, and **Power** and **Frequency** is good.
- Also check that the data is good. Everything should come in except Wind Gusts and Solar Rad, which will start to come in on the next transmission.

RAWS Final Inspection

- Check all connections.
- Check plastic tie straps and replace old brittle ones with new ones.
- Make sure RH/AT, FM/FT, and GOES antenna connectors have environmental tape.