

Weather Station Calibration Procedure

SUMMARY

This procedure provides guidance to safely perform calibration of weather stations.

Level of Use: Informational Use

TARGET AUDIENCE

Telecommunications employees and those who by nature of their supervisory responsibilities are required to have a thorough understanding concerning work performed by Telecommunication employees when calibrating a PGE weather station.

SAFETY

Some work may involve work at heights, near energized conductors and apparatuses, and at field locations with varying safety hazards. Only persons who are qualified by experience and training are permitted to perform the steps provided.

BEFORE YOU START

- ATTEND TCOM-9056 Overhead Qualified Telecom Worker training.
- READ and COMPLY with IT-3900P-01, Telecommunications Work in Proximity to Overhead Energized Equipment.
- READ and COMPLY with IT-3902P-01, Overhead Qualified Telecom Work in Proximity to Energized Equipment.
- PERFORM tailboard per IT-3052P-01, Telecom Tailboard Briefing Requirements Procedure.
- PERFORM and DOCUMENT all bucket truck and safety inspections.
- ENSURE you have a fully charged battery in the test case.

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PROCEDURE STEPS

- 1 Inspect Weather Station for Issues**
 - 1.1 INSPECT pole for loose or missing hardware.
 - 1.2 INSPECT pole for any General Order 95 (GO95) or installation standard issues.
 - 1.3 INSPECT Weather Station for any damaged or missing equipment.
 - 1.4 NOTIFY Western Weather Group (WWG) at (530) 342-1700 that you are performing a calibration check.

NOTE

If working on weekends, notify WWG Friday prior to work being performed with locations

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2 Document Weather Station Information

2.1 ATTACH Keypad #1 to the weather station datalogger CS I/O port (DB9)

2.2 SET weather station in calibration mode.

1. PRESS Esc a couple times to get to the Campbell Scientific main screen.
2. PRESS Enter.
3. SELECT "Data" and PRESS Enter.
4. SELECT "Real Time Tables" and PRESS Enter.
5. SELECT "Public" and PRESS Enter.
6. SELECT "Cal_Timer" and PRESS Enter.

NOTE

Cal_Timer will show default current value of 0.

7. ENTER value of 1 and press Enter.

NOTE

Weather Station is now in Calibration Mode. Cal_Timer will start adding up, and automatically go back to normal operation after 2 hours. When in Calibration Mode testing data is NOT sent into Western Weather Group (WWG) as valid data.

2.3 RECORD Datalogger information on calibration checklist.

1. USING Keypad #1, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
2. PRESS Enter.
3. SELECT "Ports and Status" and PRESS Enter.

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2.3 (continued)

4. SELECT "Status Table" and PRESS Enter.
5. SELECT "CR1000X OS" and PRESS right arrow key.

NOTE

OS Version is the first variable on the top of the screen.
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6. SCROLL to view "Serial Number", "ProgName", "WatchdogErrors", "Battery Voltage", "Lithium Battery Voltage", "Low12VCount" and "ProgErrors".

IF there are "ProgErrors",

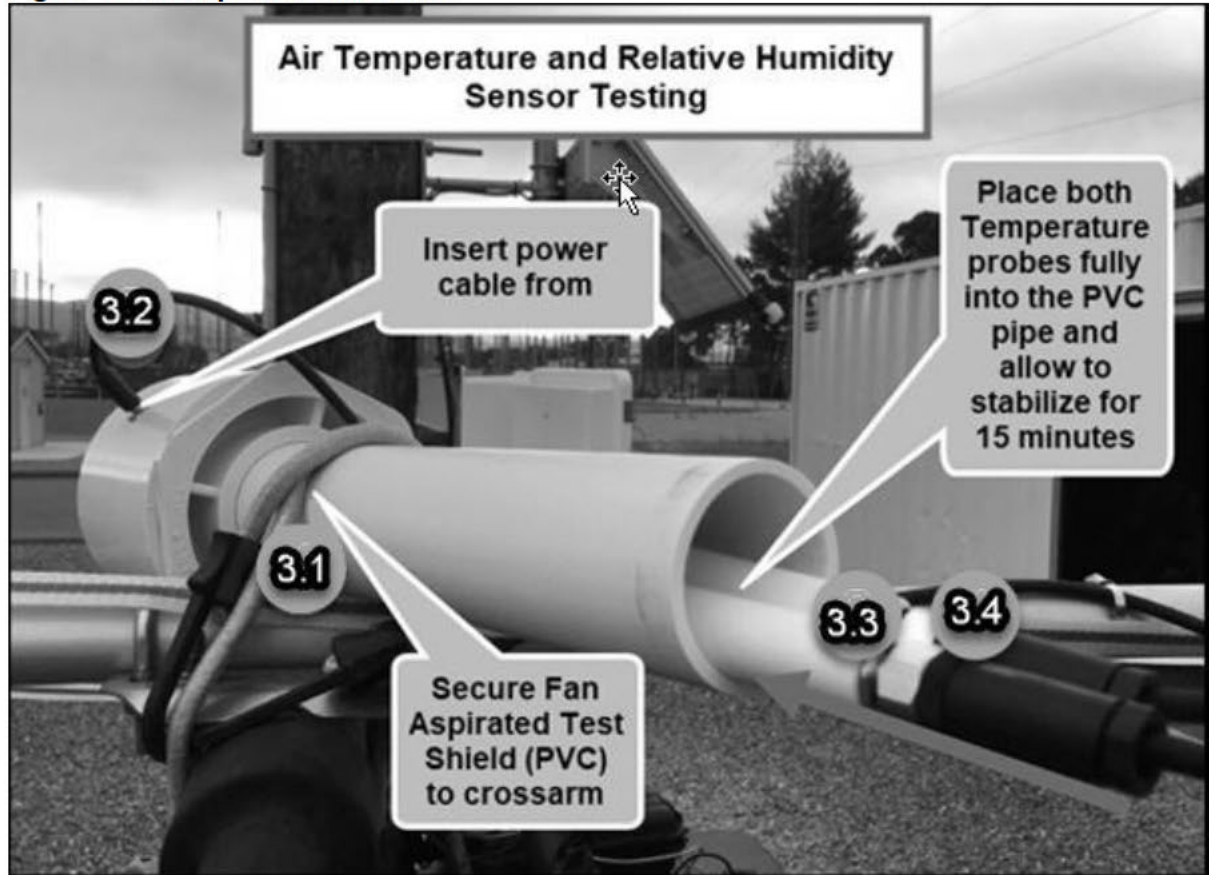
THEN log error under NOTES on calibration checklist and reset errors with keypad #1 by pressing Enter on error, you will be prompted to "Reset Value".

3 Setup Fan Aspirated Test Shield for Calibration.

- 3.1 SECURE fan aspirated test shield (PVC pipe) to weather station crossarm. (SEE Figure 1: Fan Aspirated Test Shield).
 1. USE bungee cord or electrical tape to secure.
- 3.2 INSERT power cord from calibration case into fan aspirated test shield.
- 3.3 REMOVE Temp/RH sensor from white multi-plate radiation shield on weather station and PLACE into fan aspirated test shield.
- 3.4 PLACE Calibrated reference Temp/RH sensor from calibration case into fan aspirated test shield along-side weather station Temp/RH sensor.
- 3.5 ALLOW 15-20 minutes to stabilize.

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Figure 1: Fan Aspirated Test Shield



4 Setup Keypad #2

- 4.1 CONNECT keypad #2 to test case datalogger CS I/O port (DB9).
- 4.2 TURN ON calibration case datalogger.
- 4.3 SYNC test case and weather station datalogger clocks.
 1. SET both keypads side by side.
 2. USING Keypad #2, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
 3. PRESS Enter.
 4. SELECT "Configure Settings" and PRESS Enter.
 5. SELECT "Set Time/Date" and PRESS Enter.

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4.3 (continued)

6. SELECT "Minute" and PRESS Enter.
7. Using Up/Down Keys, CHANGE minute value to one minute after time shown on keypad #1 and PRESS Enter.

NOTE

Example: If keypad #1 shows 11:10, set keypad #2 to 11:11

8. SELECT "Set".
9. PRESS Enter on keypad #2 when keypad #1 clock reaches zero seconds.
10. VERIFY time on keypad #1 and keypad #2 is within two seconds of each other.
IF time on keypad #2 is not within two seconds of keypad #1,
THEN go back to step 6 and repeat syncing process.

NOTE

The PG&E Weather Stations DO NOT observe daylight savings time.

5 Inspect Anemometer (Wind Speed and Direction Sensor)

- 5.1 RECORD anemometer serial number on calibration checklist.
- 5.2 PERFORM a "Before Removal" south-check.
 1. HOLD wind vane at 180° (due south) using a compass for reference.

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5.2 (continued)

2. VIEW "WindDir" reading on keypad #1 and RECORD on calibration checklist.
 - a. USING Keypad #1, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
 - b. PRESS Enter.
 - c. SELECT "Data" and PRESS Enter.
 - d. SELECT "Real Time Tables" and PRESS Enter.
 - e. SELECT "Public" and PRESS Enter.
 - f. VIEW value under "WindDir".
 - g. RECORD values under "Before Removal" on calibration checklist.

5.3 REMOVE propeller from anemometer.

5.4 RECORD propeller serial number on calibration checklist.

5.5 REMOVE anemometer from pole mounting post.

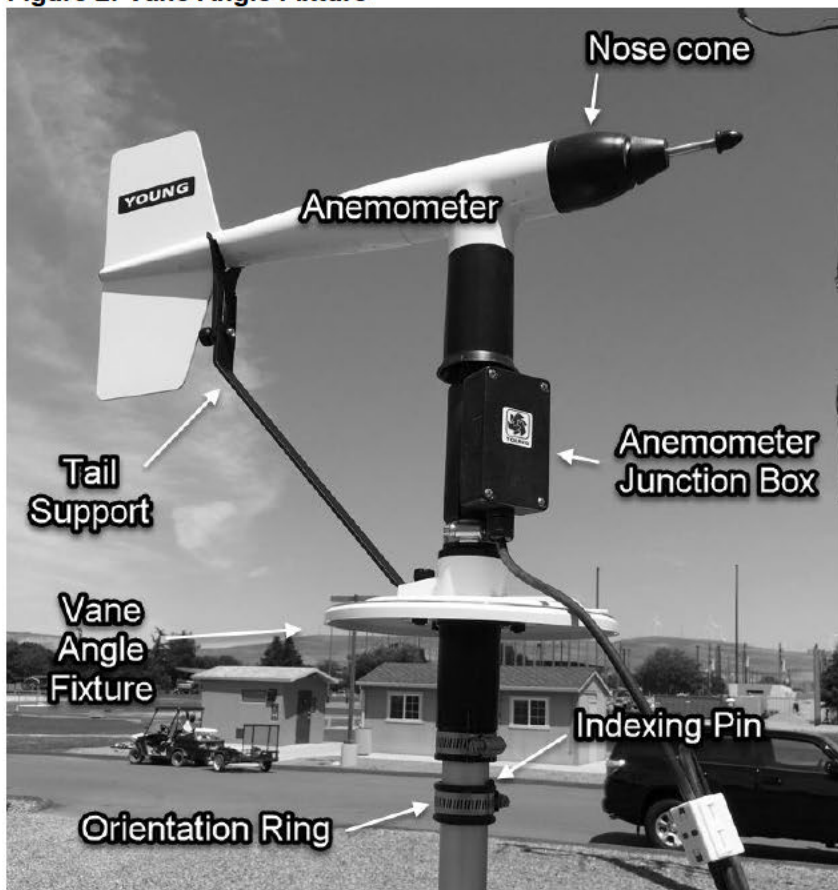
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- 5.6 PLACE Vane Angle Fixture mount onto pole mounting post. Align 0/360 degrees mark with true north using a compass and tighten clamp (SEE Figure 2: Vane Angle Fixture).

IF orientation ring is not contacting bottom of vane angle fixture,

THEN loosen orientation ring, move orientation ring to bottom of vane angle fixture, align indexing pin, and tighten.

Figure 2: Vane Angle Fixture



- 5.7 PLACE Anemometer onto vane angle fixture making sure the key on the anemometer aligns to the key on the vane angle fixture then tighten clamp (See Figure 2: Vane Angle Fixture).
- 5.8 ADJUST vane angle fixture tail support to lightly contact tail on anemometer to maintain alignment.
- 5.9 SET vane angle fixture at 0/360°.

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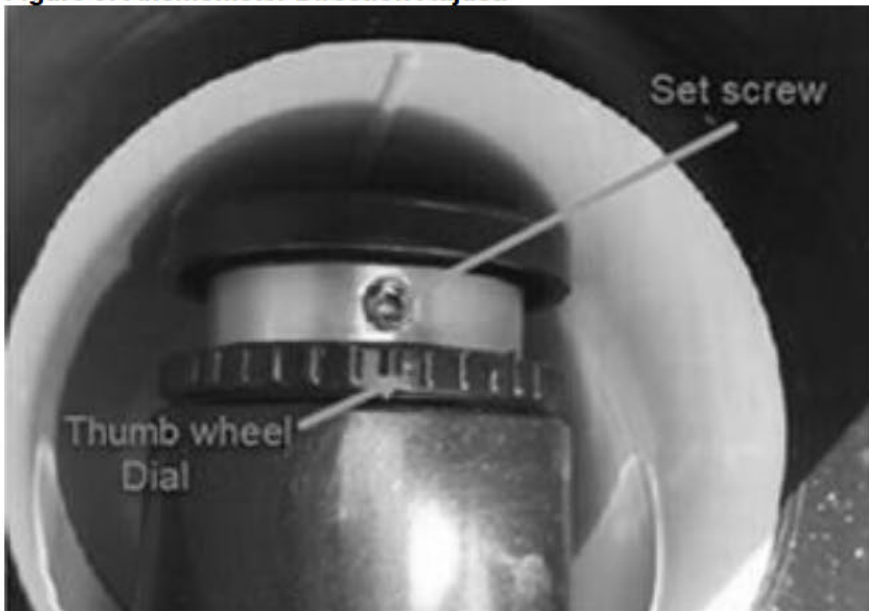
5.10 VERIFY Keypad #1 "WindDir" displays 0° +/- 1°.

IF it is more than +/- 1° out of calibration.

THEN perform steps below (SEE Figure 3: Anemometer Direction Adjust).

- a. UNSCREW and REMOVE nose cone assembly.
- b. LOOSEN set screw inside anemometer.
- c. ROTATE thumb wheel dial until keypad #1 displays 0° +/- 1°.
- d. TIGHTEN set screw inside anemometer.
- e. REINSTALL nose cone assembly.

Figure 3: Anemometer Direction Adjust.



5.11 TEST wind direction calibration points noted on calibration checklist and RECORD value displayed on keypad #1 "WindDir" at each calibration point.

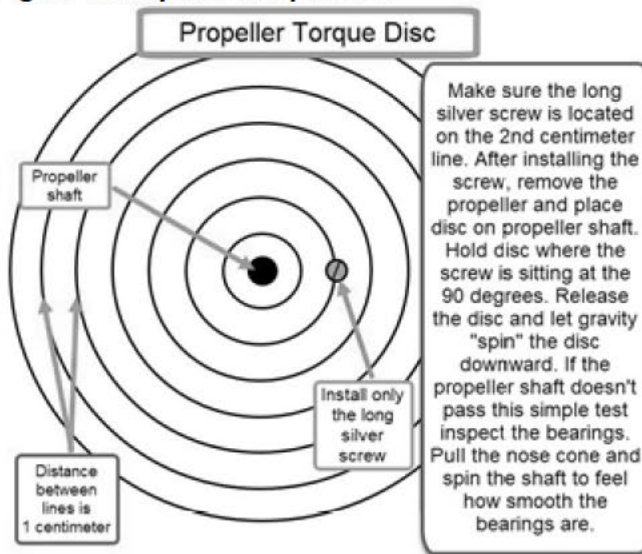
1. TEST clockwise starting at 0° and working your way around to 360°.
2. TEST counterclockwise starting at 360° and working your way around to 0°.

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5.12 CHECK "Torque and Speed Test" using propeller torque disc tool.

1. VERIFY screw in propeller torque disc is located in second ring hole. (See Figure 4: Propeller Torque Disc).

Figure 4: Propeller Torque Disc



2. PLACE propeller torque disc on end of anemometer propeller shaft with screw at 90°.

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5.12 (continued)

3. RELEASE propeller torque disc and let gravity “spin” the disc downward.

IF propeller torque disc rotates freely to 180° (screw faces straight down).

THEN note “Pass” on calibration check list under “Torque and Speed Test” and proceed to step 5.13.

IF NOT, note “Fail” on calibration check list under “Torque and Speed Test” or REPLACE flange bearings on propeller shaft.

- a. REMOVE old bearings.

- (1) UNSCREW nose cone. SET O-ring aside for later use.
- (2) LOOSEN set screw on magnet shaft collar and REMOVE magnet.
- (3) SLIDE propeller shaft out of nose cone assembly.
- (4) REMOVE front bearing cap which covers front bearing.
- (5) REMOVE both front and rear bearings from nose cone assembly.

- b. INSTALL new bearings.

- (1) INSERT new front and rear bearings into nose cone.
- (2) REPLACE front bearing cap.
- (3) Carefully SLIDE propeller shaft thru bearings.
- (4) PLACE magnet on propeller shaft allowing 0.5 mm (0.020”) clearance from rear bearing.
- (5) TIGHTEN set screw on magnet shaft collar.

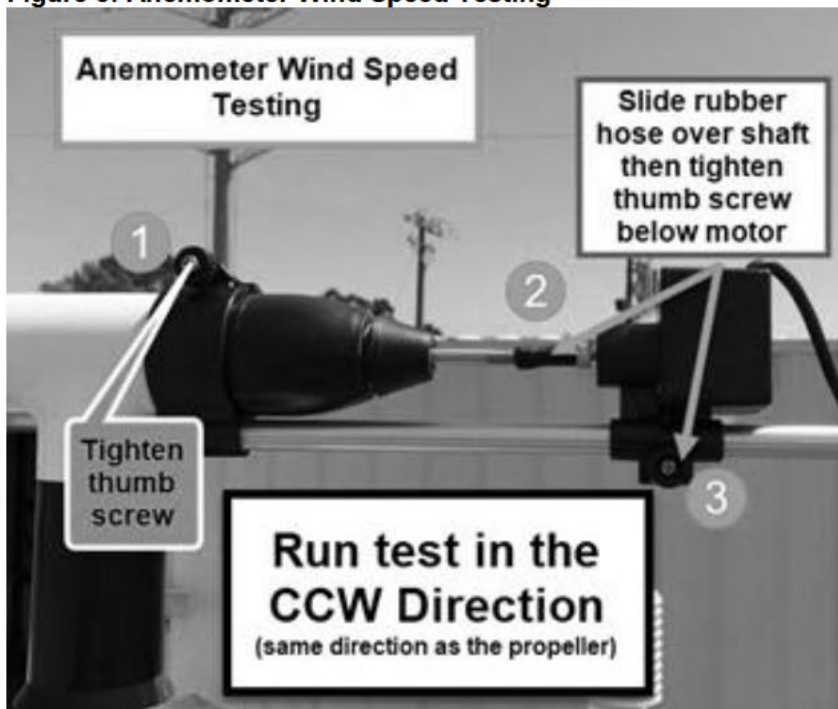
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- (6) SCREW nose cone into main housing until O-ring seal is seated. Be certain threads are properly engaged to avoid cross-threading.
- (7) REPEAT step 5.12.

5.13 ATTACH anemometer drive to anemometer (See Figure 5: Anemometer Wind Speed Testing).

1. ATTACH anemometer drive clamp and bar assembly to anemometer just behind nose cone and tighten thumb screw.
2. ATTACH anemometer drive flexible coupling to end of propeller shaft.
3. TIGHTEN anemometer drive motor assembly thumb screw.

Figure 5: Anemometer Wind Speed Testing



5.14 CHECK wind speed output at RPM test points noted on calibration check list in the counterclockwise direction.

1. VERIFY anemometer drive control unit is set for CCW (counterclockwise) rotation.
2. TURN ON anemometer drive control unit.

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5.14 (continued)

3. SET desired RPM (revolutions per minute) using the up/down keys on the anemometer drive control unit.
4. VIEW wind speed values on Keypad #1 and record on calibration check list under "WIND SPEED".
 - a. USING Keypad #1, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
 - b. PRESS Enter.
 - c. SELECT "Data" and PRESS Enter.
 - d. SELECT "Real Time Tables" and PRESS Enter.
 - e. SELECT "Public" and PRESS Enter.
 - f. VIEW value under "WindSpeed".

NOTE

Be sure to allow unit to stabilize at each RPM set point before moving on to the next RPM set point.

- 5.15 REMOVE anemometer drive from anemometer.
- 5.16 REMOVE anemometer from vane angle fixture.
- 5.17 REMOVE vane angle fixture from crossarm mount.
- 5.18 REPLACE anemometer on crossarm mount and align orientation ring indexing pin.

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- 5.19 PERFORM a “After Removal” south-check.
1. HOLD wind vane at 180° (due south) using a compass for reference.
 2. VIEW “WindDir” reading on keypad #1 and RECORD on calibration checklist.
 - a. USING Keypad #1, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
 - b. PRESS Enter.
 - c. SELECT “Data” and PRESS Enter.
 - d. SELECT “Real Time Tables” and PRESS Enter.
 - e. SELECT “Public” and PRESS Enter.
 - f. VIEW value under “WindDir”.
 - g. RECORD values under “After Removal” on calibration checklist.
- 5.20 REPLACE propeller on anemometer propeller shaft, ALIGN notches on propeller with nose cone and INSTALL propeller nut using propeller nut wrench.

NOTE

USE ONLY BLACK UV RESISTANT TIE-WRAPS to secure cables to crossarm when calibrations finished.

- 5.21 VERIFY anemometer junction box is facing due south (180°) and RECORD “Pass/Fail” on calibration checklist next to “Anemometer Check (True South)”.

6 Inspect Air Temp and Relative Humidity Sensor

- 6.1 Record info from Keypad #1 and Keypad #2
1. USING Keypad #1, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
 2. PRESS Enter.
 3. SELECT “Data” and PRESS Enter.
 4. SELECT “Real Time Tables” and PRESS Enter.

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5. SELECT "Cal Data" and PRESS Enter.
6. RECORD temperature, relative humidity, and dew point temp under "Station Value".
7. USING Keypad #2, repeatedly PRESS Esc until Campbell Scientific main screen is displayed.
8. PRESS Enter.
9. SELECT "Data" and PRESS Enter.
10. SELECT "Real Time Tables" and PRESS Enter.
11. SELECT "Cal Data" and PRESS Enter.
12. RECORD temperature, relative humidity, and dew point temp under "Reference Value".
IF "Diff" value exceeds "Factory Spec.",

THEN REPLACE temp/RH sensor, allow sensor to stabilize in aspirated test shield for fifteen minutes, and REPEAT step 6.1.

6.2 CLEAN the multi-plate radiation shield with soap and water if dirty.

6.3 REINSTALL temp/RH sensor in multi-plate radiation shield leaving quarter inch of white sensor showing, and hand TIGHTEN cord grip.

6.4 REMOVE fan aspirated test shield from weather station crossarm.

7 Completion

7.1 RETURN weather station to normal operation mode.

1. USING Keypad #1, PRESS Esc a couple times to get to the Campbell Scientific main screen.
2. PRESS Enter.
3. SELECT "Data" and PRESS Enter.
4. SELECT "Real Time Tables" and PRESS Enter.
5. SELECT "Public" and PRESS Enter.
6. SELECT "Cal_Timer" and PRESS Enter.
7. ENTER value of 0 and press Enter.

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- 7.2 DISCONNECT Keypad #1 from weather station datalogger.
- 7.3 RECORD weather station Serial Number, SAPID#, Latitude, Longitude, Performed by, and Date/Time.
- Serial Number – located outside of control box.
 - SAPID# - found in Maps+.
 - Latitude and Longitude – found on GPS or cellphone.
 - Performed by – use LAN ID.
 - Date/Time – current date and time performed.
- 7.4 RECORD anemometer junction box height on calibration checklist under “Sensor Height (feet)”.
- 7.5 Before leaving CALL Western Weather Group (WWG) (530) 342-1700 to verify weather station is communicating normally.
- 7.6 TAKE 4 good photos of weather station and background from North, South, East, and West.
- 7.7 UPLOAD calibration checklist and photos to location specified on work order.

END of Instructions

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DEFINITIONS

Anemometer: A device used for measuring wind speed and direction.

Anemometer motor drive: Converts mechanical wind power to electrical signal.

Campbell Scientific: Campbell Scientific is a worldwide provider of rugged, reliable dataloggers and data acquisition systems for long-term, unattended monitoring.

Control box: Enclosure that contains battery, charger and datalogger.

Cord grip: Strain relief fitting for electrical wiring.

Fan aspirated test shield: Custom test tool comprised of PVC tubing with fan mounted at one end for testing Temp/RH sensor.

Multi-plate radiation shield: Enclosure that protects the Temp/RH sensor from error-producing solar radiation and precipitation.

Orientation ring: Ring with indexing pin that is located below anemometer used to keep orientation after calibration is performed.

Propeller torque disc: Custom test tool, weighted disk that checks anemometer bearing drag/resistance.

Temp/RH sensor: Air Temp and Relative Humidity Sensor.

Vane Angle Fixture: Custom test tool used to verify accuracy of anemometer radial direction alignment readings.

Weather Station Datalogger: An electronic device that records data over time from external instruments and sensors.

Western Weather Group (WWG): A supplier of industrial grade meteorological and environmental monitoring systems.

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IMPLEMENTATION RESPONSIBILITIES

Telecommunications Work Methods and Procedures Manager or assigned delegate will ensure access to this procedure is provided and communicated to Telecommunications employees qualified to complete the associated tasks.

Telecommunications Work Methods and Procedures Manager or assigned delegate will ensure access to this procedure is provided and communicated to other relevant lines of business for distribution within their organizations.

Telecommunications Managers and Supervisors with employees who perform the steps provided in this procedure will ensure work is completed as specified.

Employees who perform tasks specified in this procedure are responsible for complying with the steps provided.

GOVERNING DOCUMENT

GOV-1038S, "Inspection and Corrective Maintenance Governance

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

Records and Information Management:

Information or records generated by this procedure must be managed in accordance with the Enterprise Records and Information (ERIM) program Policy, Standards and Enterprise Records Retention Schedule (ERRS). REFER [GOV-7101S, "Enterprise Records and Information Management Standard"](#) and related standards. Management of records includes, but is not limited to:

- Integrity
- Storage
- Retention and Disposition
- Classification and Protection

Records generated during Calibration are stored on the Weather Station Sharepoint site. Access to the site is provided within the Calibration Work Order. Records are to be retained for 3 years after completion (CR+3)

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REFERENCE DOCUMENTS

Developmental References:

N/A

Supplemental References:

N/A

APPENDICES

N/A

ATTACHMENTS

N/A

DOCUMENT REVISION

N/A

DOCUMENT APPROVER

██████████ Sr. Director IT Maintenance & Client Support

DOCUMENT OWNER

██████████ Manager Infrastructure & Operations

DOCUMENT CONTACT

██████████ Work Methods & Procedures Specialist, Sr

REVISION NOTES

Where	What Changed
Entire Document	N/A – New Procedure