
# Asia Pacific AERONET Calibration and Training Center

# Cimel Sunphotometer

## Operation and Maintenance Manual

Revision: 2026-07-07

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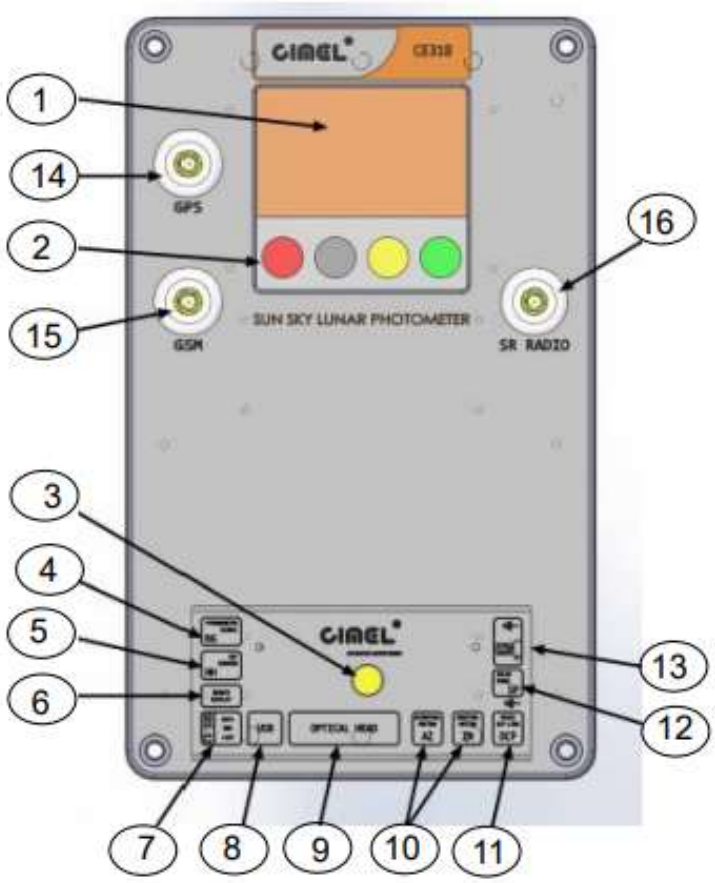
# 1 Parts of Cimel Sunphotometer

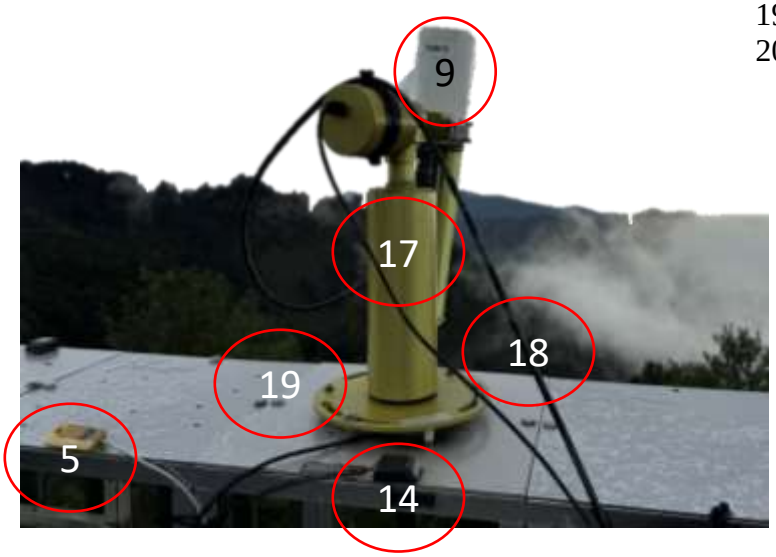
The parts of cimel sunphotometer have been shown in the diagram below:

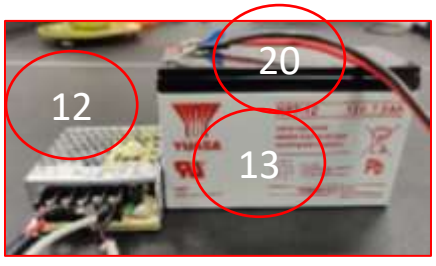



**User Interface**
1. Graphic display
2. Capacitive Keys
3. Mechanical push button

**Connector Panel**
4. Not used
5. Wet sensor
6. Not used
7. Not used
8. USB
9. Sensor head
10. Robot Azimuth and Zenith motion
11. DCP/Serial Communication
12. Solar panel/ 12V charger
13. External battery

**Others:**
14. GPS antenna
15. GSM antenna
16. Not used
17. Robot
18. Sensor head cable
19. Level adjustment screw
20. Battery Cable



# 2 Installing Cimel Sunphotometer

To install the cimel sunphotometer, please follow the following procedures:

1. Mount Collimator on the sensor head
2. Connect all connections except power supply and battery
3. Update GPS location
4. Park the robot and align the robot to East (zn robot)- West (robot claw) direction
5. Mount the sensor head to the robot
6. Perform Park, then Go sun
7. Rotate the base to adjust the target position
8. Level the robot
9. Perform Park, GO SUN, and TRACK SUN to confirm the sun pointing.
10. Tighten the bolts turn by turn without moving the direction and level
11. Tie sensor head cable to the zn robot
12. Perform Park, GO SUN, and TRACK SUN to confirm the sun pointing repeatedly.
13. Set the instrument to “auto” mode
14. Connect the instrument to the PC for data communication
15. Check if the data (K8 file) is posted in AERONET website.

These steps have been explained in detail below:

**1. Mount collimator on the sensor head**

Place the sensor head on a stable plain surface facing its lens upwards. Face the semi-circular notch of the collimator towards the four-quadrant sensor.

Carefully place the collimator on top of the sensor head with the screw of collimator exactly on its groove in the collimator. The groove is in between two lenses. Be careful not to touch the lens of the sensor head with the screw.

Tighten the screw with hand. Then tighten it with a plier with the help of a plier. Check if the collimator is loose or if it is seated properly. DONOT overtighten the screw, and DONOT leave it too loose.

**2. Connect all connections and then connect power supply and battery**

Connect all other connections like GPS antenna, wet sensor, ZN motor, AZ motor, and sensor head cable. Then connect the battery and the solar panel (or power supply) at last. The screen of the control box should turn ON.

3. **Update GPS location**

Place the GPS antenna facing upwards in an open space. The GPS antenna has an indicator of upward facing arrow. Follow the direction of the arrow to place it correctly.

In the control box, go to Cimel> GPS Info> Enter


It will show “Init.” on the screen, which means that it is initializing the GPS. It will take few minutes to find the GPS location.

After it is done, it will show off.

Then check the longitude, latitude and altitude of the location with that provided by your phone or other devices.

4. **Park the robot and align the robot to East (zn robot )- West (robot claw) direction.**

In the control box, Go to Scenario> Park>Enter.

Place the robot on the platform with ZN robot towards East and the claw towards west as shown in the figure below. Place the screws in the grooves, but do not tighten them yet.


5. **Mount the sensor head on the robot.**

In the control box, go to Scenario>Park>Enter. The robot will park itself into its neutral position.

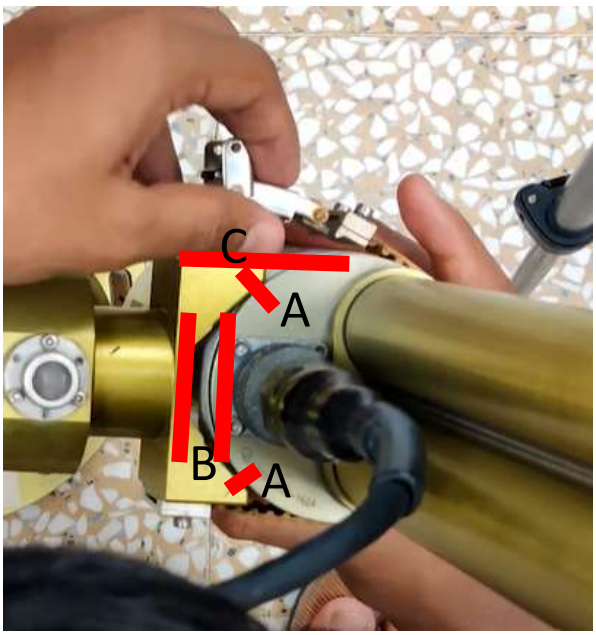
Rotate the robot claw to face it upwards. The robot has cut-marks on the claw. This side should face upwards. Then mount the sensor head on the robot claw as shown in the figure below.

Important! The following points must be checked for proper installation:

1. The cut marks on the sensor head must match the cut marks in the robot arm as indicated in the figure (A).
2. In case if there is no cut mark in the robot, the rectangular part of the sensor head connector should be parallel to the robot arm as shown in the figure (B).
3. The level of the flat surface should be same as the level of the sensor head. (C)

After mounting the sensor head on the robot arm, connect the sensor head cable to the sensor head. For that, align the biggest mark on the sensor head connector to the biggest mark on the sensorhead. Then insert the sensor head connector to the connection port. DONOT force the connector into the port. It will damage the pins in the connection port.

Then slowly rotate the connector clockwise. You will hear a click sound. You will see the white aluminum dot on the side-hole of the connector as shown in the figure if it is connected properly.

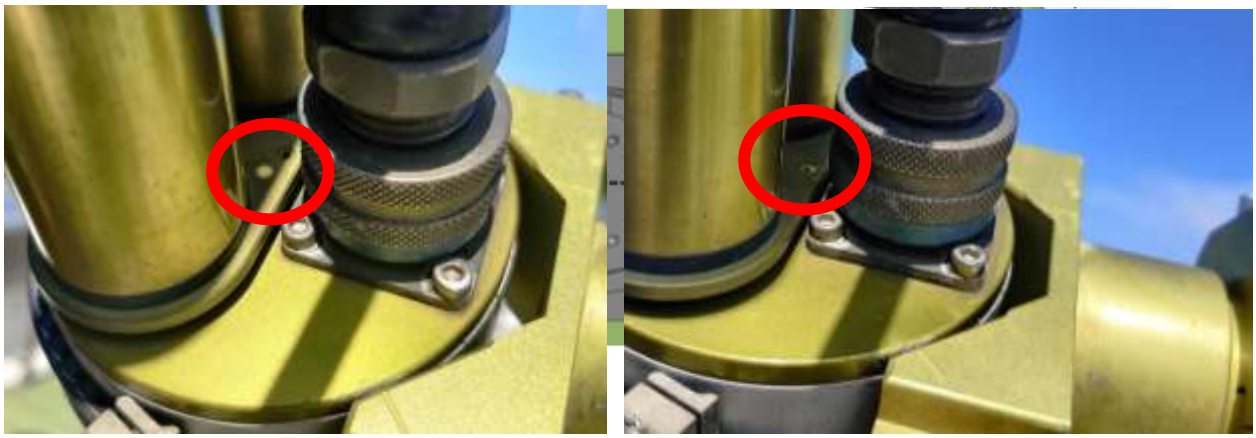



### 6. Perform Park, then Go sun


Go to Scenarios> Park.

Wait for the robot to park, and then go to Scenarios> GOSUN.

7. **Rotate the base to adjust the target position.**

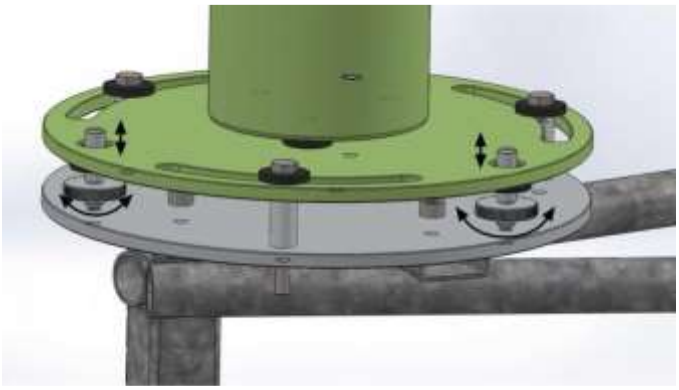


The robot will point tentatively towards the sun. Hold the robot at the base and rotate it to so that the dot points towards the sun. The site manager should hold the robot at the base so that the whole robot moves, not only the motor.

This step should be performed during a sunny day, preferably during the morning or afternoon.

Once the light circle overlaps close to the circular hole on the collimator as shown in the figure, go to the next step.

**8. Level the robot**

Place the leveler on the AZ robot as shown in the figure such that the leveler is parallel to the two levelling screws. Adjust the levelling screws so that the leveler is levelled.

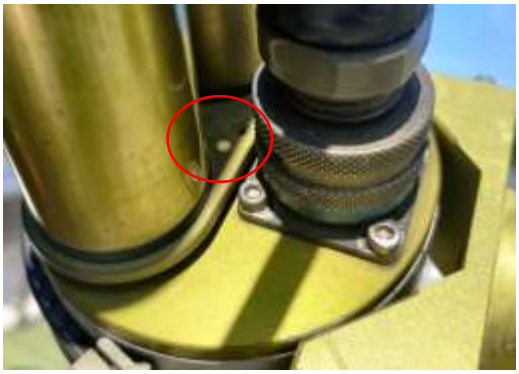
Then place the leveler perpendicular to the previous position of the levelling screws as shown in the second figure. Rotate both of the levelling screws equally to level the leveler.

**9. Perform Park, GO SUN, and Track sun to confirm the sun pointing.**

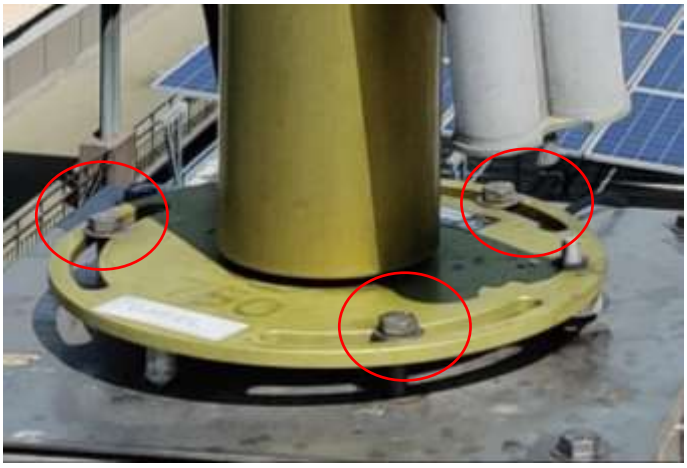
Once the robot is levelled, go to Scenarios>Park, GOSUN. The light should tentatively point close to the circular hole on the collimator.

Then go to Scenarios> Track.

The light should fall exactly on the circular hole on the collimator. Take a picture of this step as shown in the picture and report it.




**10. Tighten the mounting bolts without moving the direction and level**



Then tighten the three bolts shown in the figure without disturbing the level of the robot.

**11. Tie the sensor head cable to the ZN robot.**

Tie the sensor head cable using any one of the methods shown in the figures.

The length of the loop should not be too long or short. If it is too long, the cable gets tangled around the collimator, and if it is too short, it will restrict the movement of the robot.

The appropriate length of the cable is as shown in the first picture.

12. **Perform Park, GO SUN, and TRACK SUN to confirm the sun pointing repeatedly for 3 times**

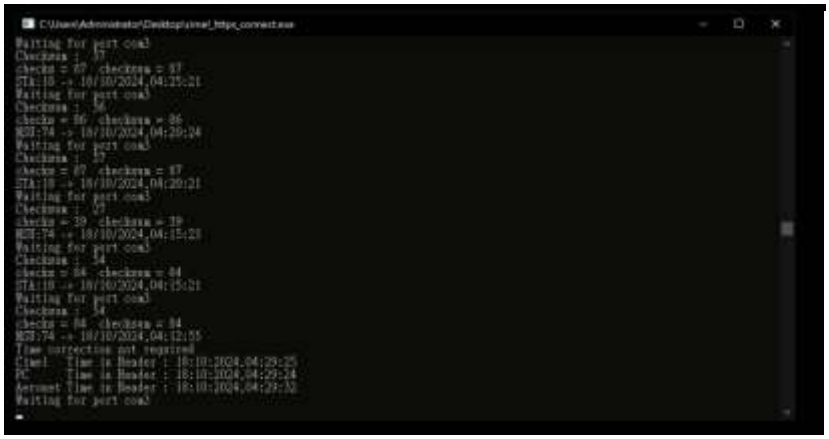
13. **Set the instrument to “auto” mode**


14. **Connect the instrument to the PC for data communication using latest version of cimelTS_https_connect software from AERONET website.**

15. **Check if the aeronet data (K8 file) is posted in AERONET website.**

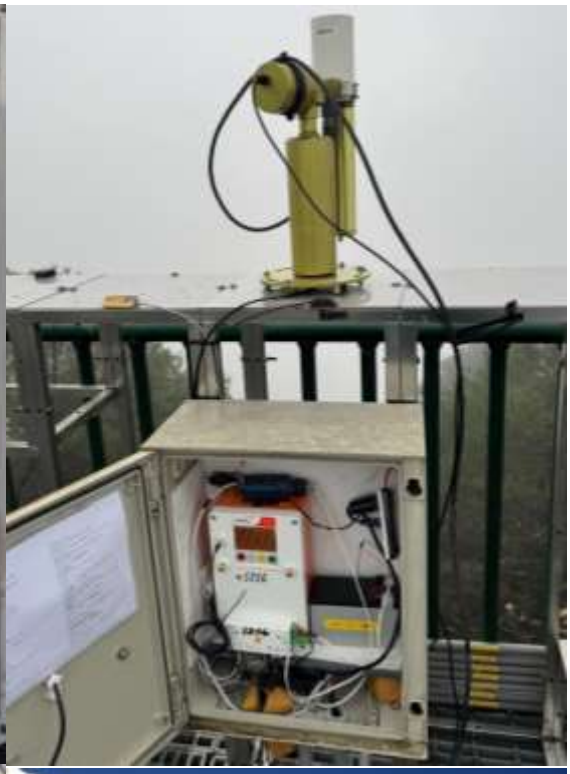
The link to check the k8 file is as follows:

https://aeronet.gsfc.nasa.gov/new_web/Data_Transfer_Logs/K8/last_1440_minutes.html



After the installation, please wait for the instrument to take the measurement. Please take few pictures of the installation with some close-up picture of the instrument and some showing the background as shown in the pictures below.


# 131
CIMEL



# 3 Uninstalling Cimel Sunphotometer

1. **Physical inspection**

   a. **Take a picture** of the Instrument before uninstalling the instrument.
   b. Please note and report if there are any unusual situation or damage to the instrument.
   c. Check if the movement of the robot is restricted by the cable.

2. **Remove the instrument from auto mode.**

   - Got to Settings.
   - The first option is Auto. Press Edit (Green button) to change it. Use + or – to change it to "off".


   - Then press "Return" twice to go back. An option will show up asking you if you want to save.
     Select Yes.

3. **Disconnect the solar panel (or charger), and battery. (VERY IMPORTANT)**

   - Also disconnect the solar panel and battery of power supply of satellite device if present.
   - Cover the terminals of the battery with tape to prevent short circuit while transporting.

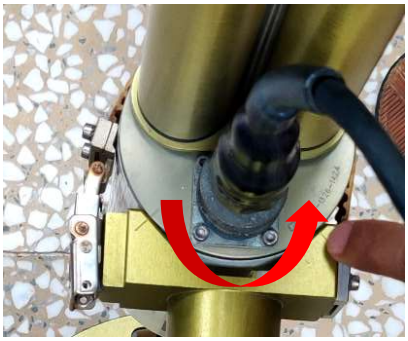
4. **Disconnect all the accessories from the control box and pack the control box.**

   - To disconnect the sensor head cable from the control box, first unscrew the connector then pull out the connector.
   - If you are shipping camel sunphotometer without foam padding (with foam cut in the shape of the instrument parts), please wrap the control box in bubble wrap. And also pay attention that the sharp edges of metal parts should not damage the sensitive parts like the screen.
   - Make loops of the cables of accessories like rain sensor and GPS to avoid entanglement.

5. **Unmount the sensor head from the robot.**

To disconnect the sensor head cable from the sensor head, please rotate the connector anticlockwise. If it has been long time, it might be a bit a bit tight due to weathering. So use a rug or cloth to hold it.

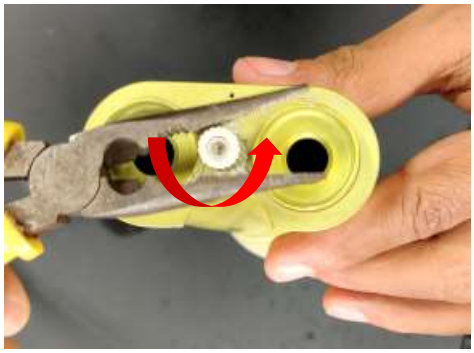
Then open the buckle holding the sensor head. Please provide support to avoid the sensor head from dropping.

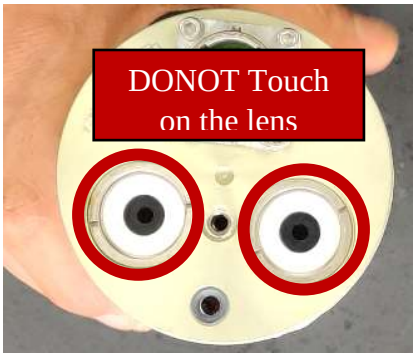


When the wet sensor is dry, the screen should show dry if there is wet sensor is dry. If the screen still shows dry or wet, change the wet sensor and try again.

6. **Unmount collimator from the sensor head.**

- Unmount the collimator from the sensor head.
- Be careful not to touch the lens.






7. **Pack the sensor head and collimator in bubble wrap. (VERY IMPORTANT)**

While wrapping, be careful not to touch the lens. Also, be careful that while packing in the box, the lens is not damaged by hard objects in the box. Therefore, provide enough packing materials to pack the box tightly.

8. **Unscrew the screw of the robot, unmount it from the base, and wind the robot cable to prevent entanglement.**

9. **Make a large loop of sensor head cable (about 20 cm diameter) so that the cable does is not strained.**

- Also, be careful that the connectors are safe while packing.

**10. Unmount and pack the satellite communication device (if present).**

- Disconnect all the connectors and pack the satellite communication device in bubble wrap.
- Cover the terminal of the battery with tape to prevent short circuit.
- Wrap the cables in the loop to avoid entanglement.
- Disconnect the antenna cable and pack the satellite antenna in a separate box.

**11. Final packing and checks: (VERY IMPORTANT)**

- Ensure that the sensitive parts like the lens of Sensor head, and display of the control box are safe from the sharp edges of the metal.
- Ensure that enough packing materials are provided. Try shaking the box and make sure that the parts do not shift of move too much.
- Take a picture of the contents inside the box and report before closing.

# 4 Instrument Inspection and Maintenance

## 1. Physical inspection

- Check for robot and sensor-head cable winded around the robot. Also, take some pictures from different angles and report them.
- Check if there are any unwanted substances from insects like spider, or snail, or birds on any part like sensor-head, robot or wet sensor. Please take a picture if anything unwanted is observed.
- Check if the movement of the robot is restricted by the cable.
- Check if the sensor head cable is tied to the sensor robot properly. Check if the sensor head cable can move freely. Check if the cable is too long or too short. The length of the cable from the connector to the point where it is tied on the robot should be around the length of the collimator. Take the following picture for reference.

2. **Remove the instrument from auto mode.**

Got to Settings.
The first option is Auto. Press Edit (Green button) to change it. Use + or – to change it to "off".


Then press "Return" twice to go back. An option will show up asking you if you want to save.
Select Yes.

3. **Check the date/time**

The date and time are shown on the top of the home screen. The time is in GMT. Check if the date and time shown on the screen is correct. Remember to convert the time on your phone to GMT to check it.

**4. Check the GPS location**

- Go to Cimel > GPS info
  Check if the GPS location shown on the instrument is same as that shown in your




phone.

**5. Check the voltages**

- In the control box, go to Measures option. There, make sure that the battery voltage and solar voltage are above 12V.


6. **C**heck the wet sensor



- Go to Measures and go down until you see “Wetting”.

- When the wet sensor is dry, the screen should show dry if there is wet sensor is dry. If the screen still shows dry or wet, change the wet sensor and try again.

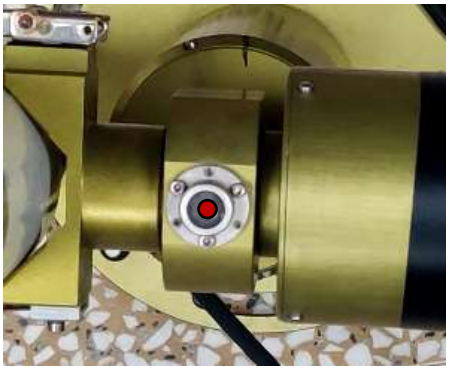
Now, put some drops of water on the wet sensor. Now the screen should show wet. If the screen still shows dry or absent, change the wet sensor and try again. If there is any discrepancy, report it.


## 7. Check robot levels

Check if the level of the robot is centered. If it is not levelled, please adjust it.

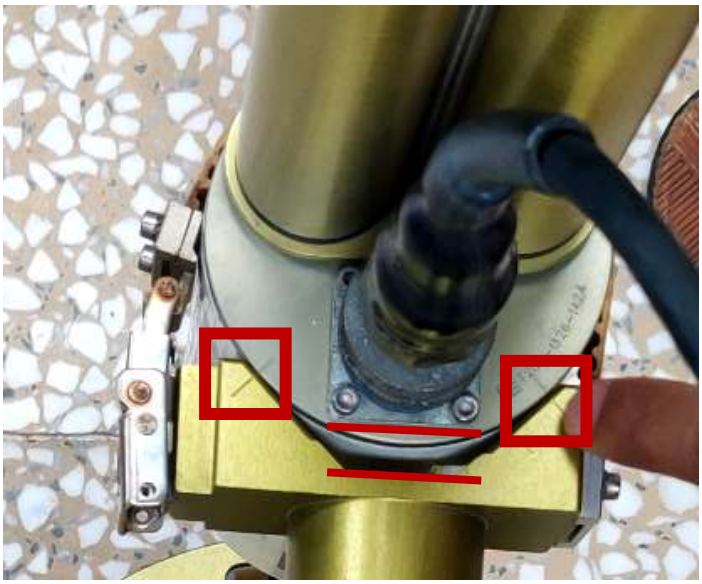

If you do not have a leveler, use the level indicator on the top of the robot. Center the bubble on the robot by rotating the levelling screw on the base of the robot.

Take a picture of the level indicators and report it.



**8. Check mounting of the sensor head on the robot arm**

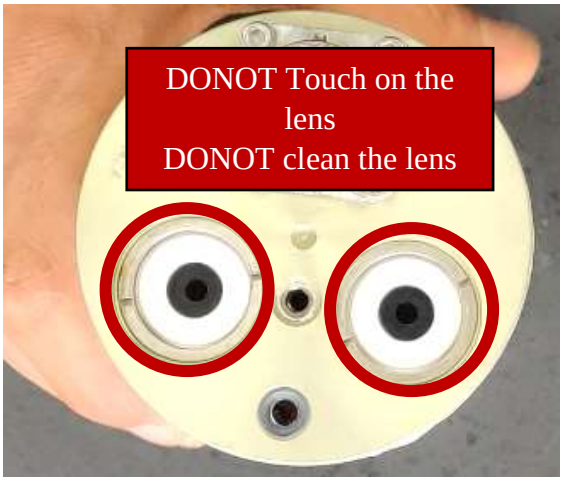
- Check if the lines on the sensor head are in line with the robot arm.



- Make sure that the sensor head and the robot arm are at same level. Take a picture at the position shown in the picture.

**9. Check collimator**

- Unmount the collimator. DONOT TOUCH LENS with anything.
  Also, DONOT CLEAN THE LENS.



- Check if there are any spider web or dust inside the collimator by pointing it towards the sun or any bright light. If there is any, clean it with a brush.

- After checking the collimator, mount the collimator back. To do that, follow following steps:
  Point the semi-circular notch on the collimator towards the four-quadrant sensor on the sensor head.

  Place the collimator on the sensor-head as perfectly perpendicular as possible. Hand-tight the screw on the collimator.

After hand-tightening, use a plier to tighten the screw for 1/4$^{th}$ of a turn.

Make sure that the collimator is tightly mounted and does not shake.

**10. Check sun pointing and tracking**

- This should be done when the sun is not covered with cloud.
  Go to Scenarios>Park

  Go to Scenarios> Go Sun

Now check if the bright spot falls around the hole as shown on the picture. A little deviation is acceptable. Please take a picture similar to the one shown in the picture below.

Now go to Scenarios> Track Sun

Now the bright spot should fall exactly on the hole. Please take a picture similar to the one shown in the picture above. If there is any discrepancy, please report it.

**11. Check robot sar/sae value**

- Go to scenarios>Park.
- Once the instrument parks, the screen shows AZ sar/sae: XX/XX, and Zn sar/sae: XX/XX. Please note and report these values and take the picture of the screen.



**12. Set the instrument back to auto mode.**

Got to Settings then change the option from “OFF” to “ON”. Then go back. An option will show up asking you if you want to save. Select Yes.
If the step is successful, the screen should show (auto) together with the date/time. Please take a picture of the screen and the instrument and report this picture.


If you are using a PC for data transmission, check if the data is transmitted to PC properly. After you set the instrument to Auto mode, check the data in the AERONET website (https://aeronet.gsfc.nasa.gov/new_web/Data_Transfer_Logs/K8/last_1440_minutes.html) or report to the APAC.
Take few pictures, some with close-up of the instrument, instrument box and some with surrounding.


The inspection is suggested to be carried out every week. During the weekly check, the site manager is requested to fill up the log sheet attached in this document below.

## Weekly Check Log - AERONET Cimel Sunphtotmeter

| | | |
|---|---|---|
| Date: (yyyy-mm-dd) | | Time: (hh:mm) |
| Weather | ☐ Sunny ☐ Cloudy ☐ Rainy | |
| Take Picture | ☐ Take pictures of the instrument and inside the box before troubleshooting. Take detailed picture of the parts before changing any parts. | |
| Start Maintenance | ☐ Change the mode from Auto "ON" to "OFF" before performing maintenance.<br>SETTINGS>AUTO→OFF | |
| Instrument Appearance | ☐ Check for spider web or insect nest on any part of the robot. (If yes, please note at the bottom if any.)<br>☐ Is it dry inside the DCP box?<br>☐ Are all the cables and external battery connected?<br>☐ Check whether the cable interfaces with the operation of the robot<br>☐ Clean the dirt or foreign objects inside the collimators. Detach the collimator from the sensor head and use brush to clean the collimator.<br>!!! DONOT TOUCH OR CLEAN THE LENS.<br>☐ Clean the four-quadrant sensor (small black circle near lens) | |
| Function Test | Check the direction of robot. If any of the following is not okay, please note at the bottom. SCENARIOS>PARK>GOSUN>TRACKSUN>PARK<br>☐ Go to Scenario: PARK<br>ZN sar/sae: _____ AZ sar/sae: _____<br>☐ Go to Scenario: GOSUN (Take a picture of the light dot and circular mark)<br>☐ Go to Scenario: TRACKSUN<br>☐ Is the light pointing exactly at the center of the circular mark? | |
| Power and Time setting | ☐ Check the functioning of Wet Sensor<br>☐ Keep the external battery voltage above 12.5 V and confirm if it is connected to the control box.<br>Voltage: _____V<br>☐ The control box time is within 10 seconds of UTC | |
| End Maintenance | ☐ Change the mode from Auto "OFF" to "ON" before performing maintenance.<br>SETTINGS>AUTO→ON<br>☐ The DCP box is covered properly.<br>☐ Wait for the first observation and make sure that the instrument points towards the sun correctly. | |
| Remarks (Please note and report any abnormal condition of the instrument or surrounding below): | | |
| Maintainer's Signature: | | Supervisor's Signature: |

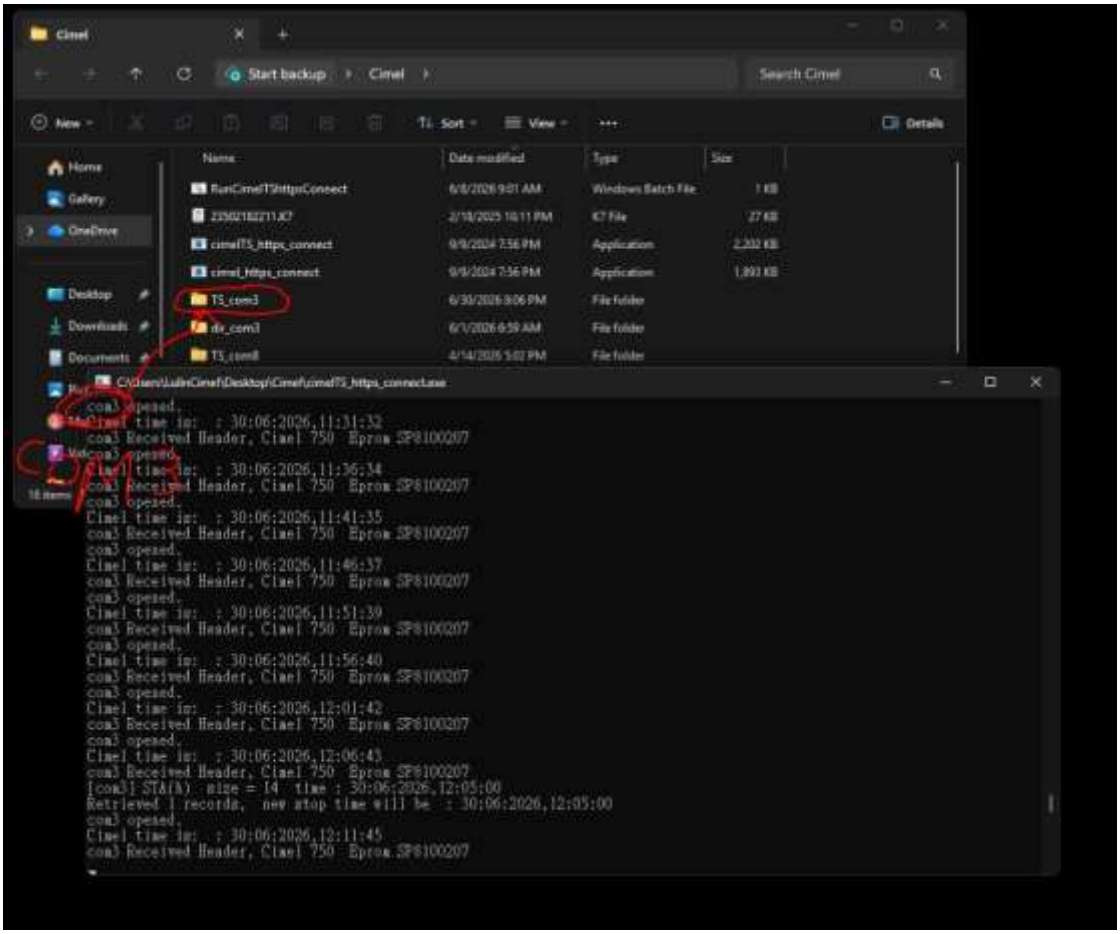
# 5 Common Issues and Solutions

## 5.1 Uploading the data manually from the PC

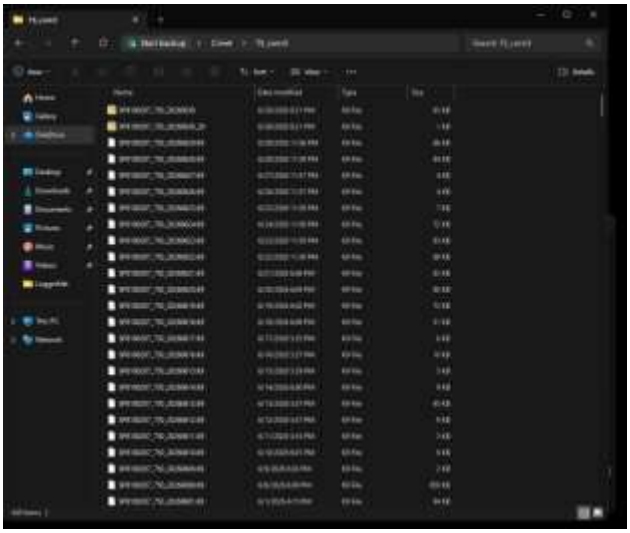
If an instrument uses PC to transfer the data, but it cannot upload the data to the AERONET server due to internet issue, the data can be uploaded manually to avoid the data gap. Or, it can be sent to APAC or AERONET to be uploaded manually.

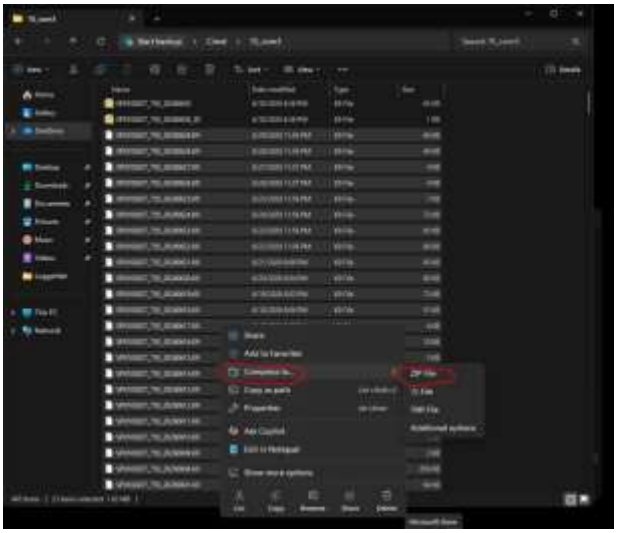
To send us the data, please follow following steps:

1. In the "Cimel" folder, Open "TS_comX". (It can be TS_com3, TS_com4, TS_com5, etc.). In the screenshot attached in the command prompt, the data is being received from com3. Therefore, we open "TS_com3" folder.




2. Inside the TS_comX (e.g. TS_com3) folder, sort the files by date. Copy the files for the recent month to another location.





3. To upload the data to the AERONET server manually, go to the following link and upload the. K8 files:

https://aeronet.gsfc.nasa.gov/K7_upload.html

4. If you want to send the data to APAC or AERONET, compress the data to zip file and send it through email. For that, right click the new folder and compress the folder. Please send us the compressed folder.

Also, when you visit the site, please send us some of the pictures of the instrument so that we can make sure that the instrument is functioning properly even if the internet is not working.

## 5.2 Copying Data from SD card of Cimel Sunphotometer

### 1. Preparation

a. Remove the instrument from Auto mode

- Got to Settings.
- The first option is Auto. Press Edit (Green button) to change it. Use + or – to change it to "off".


- Then press "Return" twice to go back. An option will show up asking you if you want to save.
- Select Yes.

**b.** Disconnect all of the connectors from the control box including sensor head cable, robot cable, GPS, solar panel/charger, and battery.

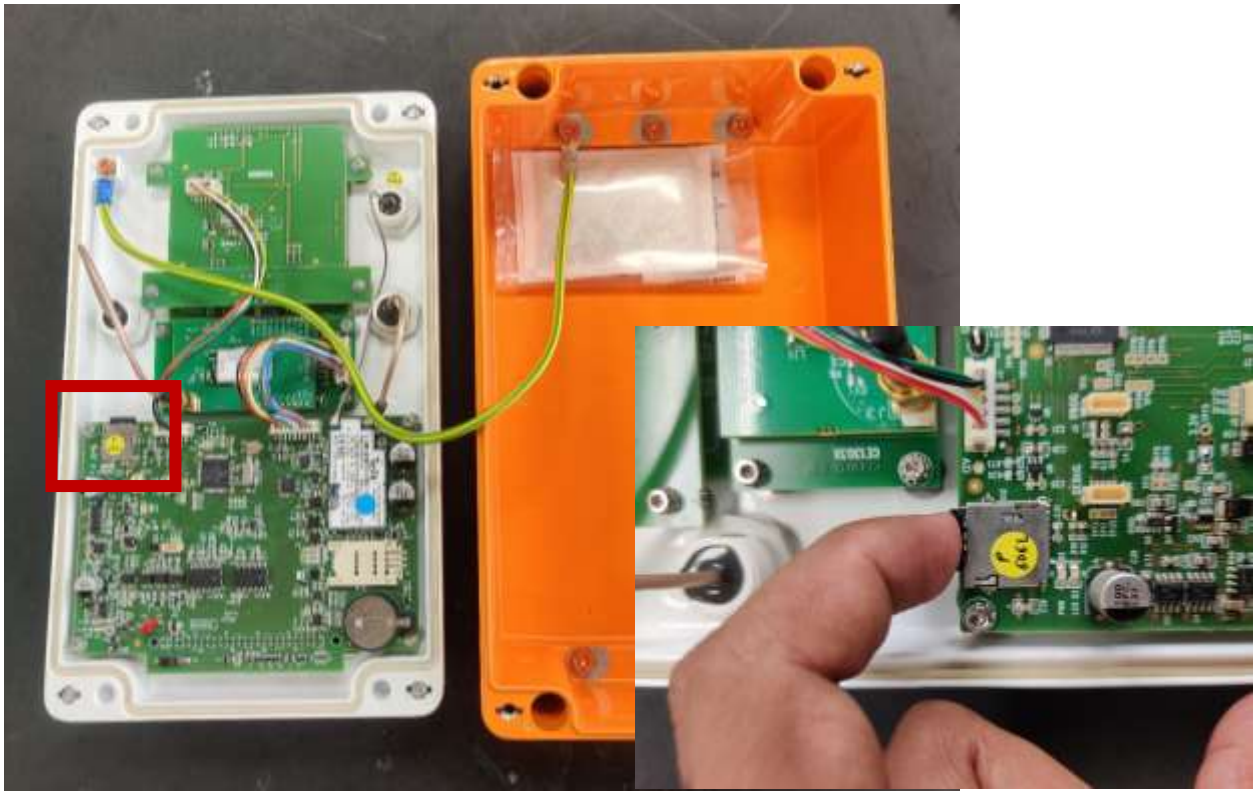
**c.** Take the control box indoors to a safe place like lab, or station.

**2. Retrieve the SD card**

a. Use the screw driver to open the four screws on the control box as shown in the figure.


b. Gently lift the front part of the control box. You will find the circuit board as shown in the following figure. The SD card is present at the location shown below.

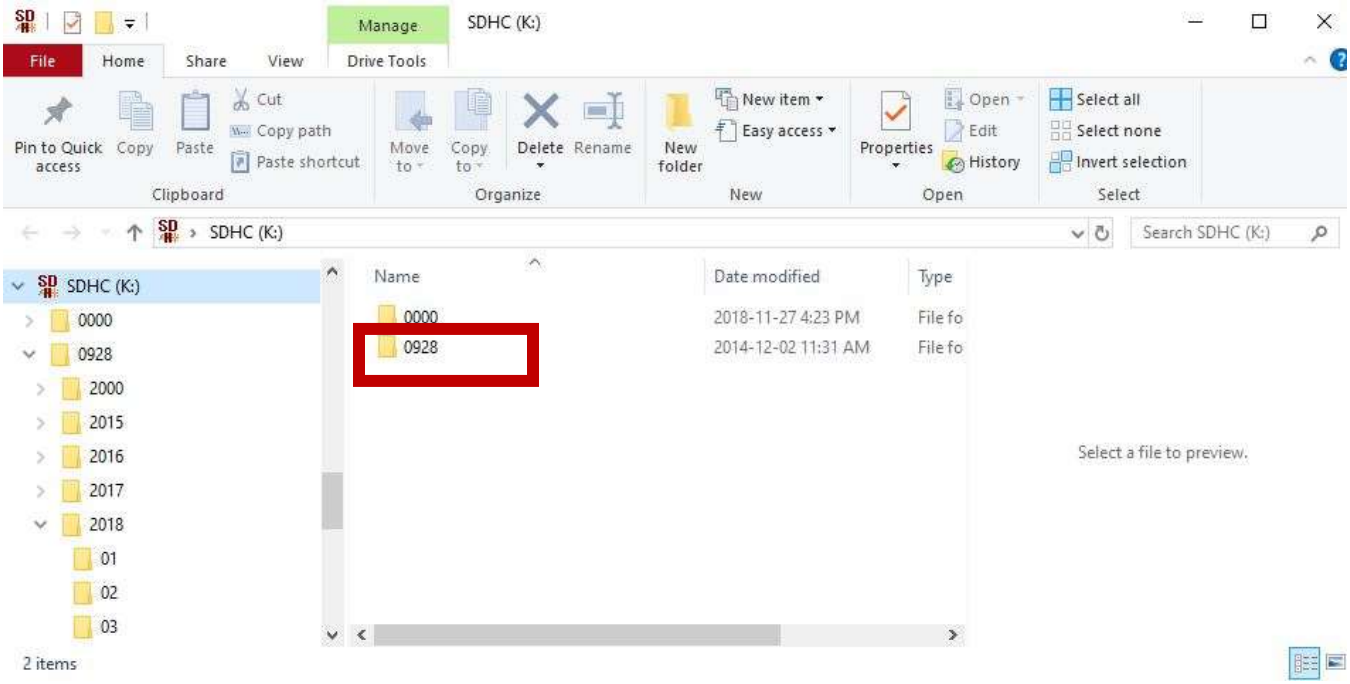
c. Gently press the SD card, and it will eject the SD card out.



**3. Copy the data**

a. Insert the SD card to a card reader and connect the card reader to the computer.

b. In the SD card, a folder can be seen with the folder name same as that of Cimel number. E.g. for Cimel #928, a folder "0928" can be seen.




c. Copy the data in the folder with the same name as your Cimel number and send it. E.g. In this case, copy the data in the folder "0928".

## 4. Finishing

a. Insert the SD card back to the Cimel control box.
b. Close the control box and tighten the screw.
c. Connect all the cables to the control box including sensor head cable, robot cable, GPS, solar panel/charger, and battery.

5. **Set the instrument back to auto mode.**

   Got to Settings then change the option from “OFF” to “ON”. Then go back. An option will show up asking you if you want to save. Select Yes.
   If the step is successful, the screen should show (auto) together with the date/time. Please take a picture of the screen and the instrument and report this picture.


   If you are using a PC for data transmission, check if the data is transmitted to PC properly. After you set the instrument to Auto mode, check the data in the AERONET website (https://aeronet.gsfc.nasa.gov/new_web/Data_Transfer_Logs/K8/last_1440_minutes.html) or report to the APAC.

## 5.3 Case Study: Troubleshooting robot microswitch error

### Summary

The Cimel sunphotometer (No. 965) at Hokkaido_University has experienced mechanical issues characterized by frequent stab (robot microstep lost) and staw (robot switches error) flags. These errors are directly linked to diagnostic test values (**AZ_switch_SAE** and **ZN_switch_SAE**) that have deviated significantly from the nominal operational range of 65 to 85. The frequency of the errors started with 2 per day from 22nd of march, which gradually increased throughout April. While recent logs from early May 2026 show that the instrument has stopped reporting the error flag, the value of the (**AZ_switch_SAE** and **ZN_switch_SAE**) are still above the range. So, we will continue to monitor the instrument closely.

### Detail Report:

The instrument at Hokkaido_University reported stab and staw errors. The status of the instrument can be monitored near real time from this link. https://aeronet.gsfc.nasa.gov/new_web/Data_Transfer_Logs/K8/last_1440_minutes.html.

**stab** (Robot Microstep Lost): Indicates the robot's movement is not synchronized with the intended electronic steps.

**staw** (Robot Switches Error): Indicates a failure or misalignment in the proximity switches that define the robot's coordinate system.

The instrument has frequently exceeded the safety limit of 10 errors per day and 35 errors per week.

**2026-04-23**

**Cimel No 965 System location : Hokkaido_University**

**23:04:2026,03:02:27(UTC)** (K8 Total: **3633**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) sta(42) staw(1)** [file : SP8100207_965_20260423_11.k8]
**23:04:2026,02:01:46(UTC)** (K8 Total: **6063**) [K8 Coord :**Hokkaido_University**] Data: **sun(10) hyb(16) sta(49) stab(2) staw(2)** [file : SP8100207_965_20260423_10.k8]
**23:04:2026,01:01:09(UTC)** (K8 Total: **3277**) [K8 Coord :**Hokkaido_University**] Data: **sun(12) sta(47)** [file : SP8100207_965_20260423_09.k8]
**23:04:2026,00:00:33(UTC)** (K8 Total: **6988**) [K8 Coord :**Hokkaido_University**] Data: **sun(8) alm(14) hyb(16) sta(43) stab(1) staw(2)** [file : SP8100207_965_20260423_08.k8]
**22:04:2026,23:04:56(UTC)** (K8 Total: **8501**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) alm(16) hyb(16) sta(23) stab(4) staw(4)** [file : SP8100207_965_20260423_07.k8]
**22:04:2026,22:04:15(UTC)** (K8 Total: **10601**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) alm(32) hyb(16) sta(16) stab(1) staw(4)** [file : SP8100207_965_20260423_06.k8]
**22:04:2026,21:03:14(UTC)** (K8 Total: **2071**) [K8 Coord :**Hokkaido_University**] Data: **sun(5) sta(5)** [file : SP8100207_965_20260423_05.k8]
**22:04:2026,16:01:38(UTC)** (K8 Total: **602**) [K8 Coord :**Hokkaido_University**] Data: **sta(2) stat(1)** [file : SP8100207_965_20260423_00.k8]
**22:04:2026,15:01:18(UTC)** (K8 Total: **55340**) [K8 Coord :**Hokkaido_University**] Data: **sun(120) alm(47) hyb(90) blk(1) sta(523) stab(6) staw(12) stat(1)** [file : SP8100207_965_20260422.k8]
**22:04:2026,09:04:14(UTC)** (K8 Total: **5508**) [K8 Coord :**Hokkaido_University**] Data: **sun(8) alm(15) sta(31)** [file : SP8100207_965_20260422_17.k8]
**22:04:2026,08:03:41(UTC)** (K8 Total: **3469**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) sta(47)** [file : SP8100207_965_20260422_16.k8]
**22:04:2026,07:03:06(UTC)** (K8 Total: **5144**) [K8 Coord :**Hokkaido_University**] Data: **sun(10) hyb(14) sta(56)** [file : SP8100207_965_20260422_15.k8]
**22:04:2026,06:02:23(UTC)** (K8 Total: **6695**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) hyb(15) blk(1) sta(56)** [file : SP8100207_965_20260422_14.k8]
**22:04:2026,05:01:37(UTC)** (K8 Total: **3146**) [K8 Coord :**Hokkaido_University**] Data: **sun(12) sta(48)** [file : SP8100207_965_20260422_13.k8]
**22:04:2026,04:01:00(UTC)** (K8 Total: **3671**) [K8 Coord :**Hokkaido_University**] Data: **sun(12) sta(44) staw(1)** [file : SP8100207_965_20260422_12.k8]

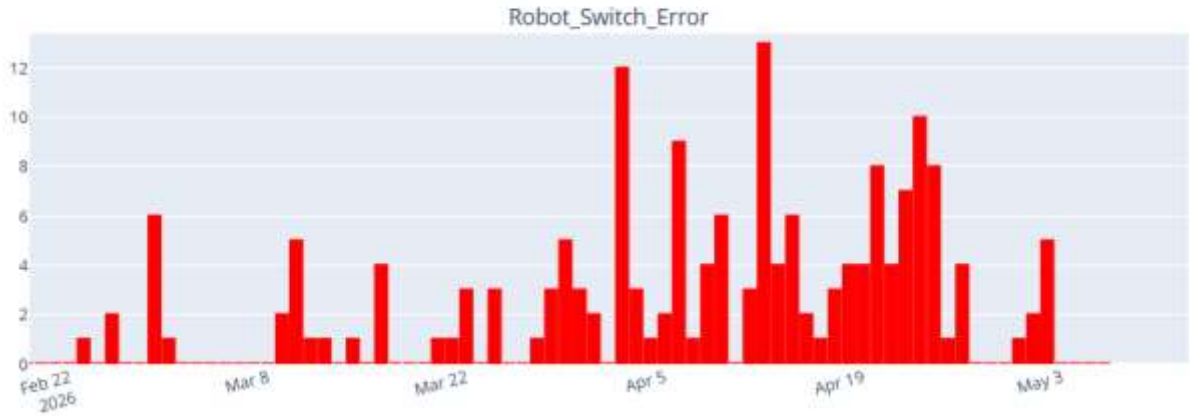
**2026-05-07**

**Cimel No 965 System location : Hokkaido_University**

**07:05:2026,02:03:04(UTC)** (K8 Total: **5770**) [K8 Coord :**Hokkaido_University**] Data: **sun(9) hyb(16) sta(16)** [file : SP8100207_965_20260507_10.k8]
**07:05:2026,01:02:31(UTC)** (K8 Total: **1709**) [K8 Coord :**Hokkaido_University**] Data: **sun(2) sta(31)** [file : SP8100207_965_20260507_09.k8]
**07:05:2026,00:02:07(UTC)** (K8 Total: **1071**) [K8 Coord :**Hokkaido_University**] Data: **sta(25)** [file : SP8100207_965_20260507_08.k8]
**06:05:2026,23:01:45(UTC)** (K8 Total: **2654**) [K8 Coord :**Hokkaido_University**] Data: **sun(9) sta(48)** [file : SP8100207_965_20260507_07.k8]
**06:05:2026,22:01:16(UTC)** (K8 Total: **4191**) [K8 Coord :**Hokkaido_University**] Data: **sun(10) alm(10) sta(55)** [file : SP8100207_965_20260507_06.k8]
**06:05:2026,21:00:32(UTC)** (K8 Total: **5227**) [K8 Coord :**Hokkaido_University**] Data: **sun(13) alm(4) sta(21)** [file : SP8100207_965_20260507_05.k8]
**06:05:2026,19:04:40(UTC)** (K8 Total: **1826**) [K8 Coord :**Hokkaido_University**] Data: **sta(8)** [file : SP8100207_965_20260507_03.k8]
**06:05:2026,18:04:16(UTC)** (K8 Total: **2486**) [K8 Coord :**Hokkaido_University**] Data: **sta(12)** [file : SP8100207_965_20260507_02.k8]
**06:05:2026,17:03:51(UTC)** (K8 Total: **2486**) [K8 Coord :**Hokkaido_University**] Data: **sta(12)** [file : SP8100207_965_20260507_01.k8]
**06:05:2026,16:03:25(UTC)** (K8 Total: **1592**) [K8 Coord :**Hokkaido_University**] Data: **sta(8) stat(1)** [file : SP8100207_965_20260507_00.k8]
**06:05:2026,15:03:02(UTC)** (K8 Total: **94427**) [K8 Coord :**Hokkaido_University**] Data: **sun(138) alm(128) hyb(174) blk(2) sta(326) stat(1)** [file : SP8100207_965_20260506.k8]
**06:05:2026,09:01:01(UTC)** (K8 Total: **8626**) [K8 Coord :**Hokkaido_University**] Data: **sun(15) alm(25) sta(15)** [file : SP8100207_965_20260506_17.k8]
**06:05:2026,08:05:12(UTC)** (K8 Total: **8985**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) alm(21) hyb(16) sta(10)** [file : SP8100207_965_20260506_16.k8]
**06:05:2026,07:04:22(UTC)** (K8 Total: **10133**) [K8 Coord :**Hokkaido_University**] Data: **sun(9) alm(18) hyb(32) sta(9)** [file : SP8100207_965_20260506_15.k8]
**06:05:2026,06:03:35(UTC)** (K8 Total: **8949**) [K8 Coord :**Hokkaido_University**] Data: **sun(11) alm(16) hyb(16) blk(1) sta(9)** [file : SP8100207_965_20260506_14.k8]
**06:05:2026,05:02:52(UTC)** (K8 Total: **5828**) [K8 Coord :**Hokkaido_University**] Data: **sun(10) hyb(16) sta(10)** [file : SP8100207_965_20260506_13.k8]
**06:05:2026,04:02:10(UTC)** (K8 Total: **5726**) [K8 Coord :**Hokkaido_University**] Data: **sun(7) hyb(16) sta(32)** [file : SP8100207_965_20260506_12.k8]
**06:05:2026,03:01:36(UTC)** (K8 Total: **6062**) [K8 Coord :**Hokkaido_University**] Data: **sun(10) hyb(16) sta(28)** [file : SP8100207_965_20260506_11.k8]

The frequency of errors increased gradually starting from **March 22, 2026**. As of May 7, 2026, the error flags have temporarily disappeared from the K8 logs, but the high SAE values suggest the mechanical tension or misalignment persists.


Day totals of robot errors




The diagnostics chart shows that the AZ_switch_SAE (95) and ZN_switch_SAE (102) are above

the operational range between 65 to 85. The diagnostics chart for the site can be viewed from this link:
https://aeronet.gsfc.nasa.gov/new_web/diagnostic_charts/Hokkaido_University.diag.Lab.html


**What are the causes of this issue?**

The drift of the microstep value of the robot is the main reason for this issue.

Along with that there can be following potential causes resulting this issue:

The instrumentation engineer notes that these specific SAE values and error flags lead to several physical risks:

- Cable Entanglement: The sensor head cable is prone to winding around the robot arm when movements are missed.
- Cable Tension: During sky scans, the cable may be stretched, restricting movement and causing motor strain.
- Mechanical Breakage: The ZN robot cable is particularly vulnerable to breaking at the point where it exits the cable gland.

### 5.3.1 Troubleshoot:

**Short-term action plan:**

1. **Visual Inspection**: Verify if the sensor head cable is winded around the robot arm or pulled tight during movement.
2. **Structural Check**: Inspect the ZN robot cable specifically outside the cable gland of ZN robot for signs of fraying or impending breakage.
3. **Documentation**: Capture clear photographs of the instrument's current cable positioning and any identified damage to send to NASA AERONET or APAC.

**Long-Term Solutions:**
Please discuss with APAC or NASA AERONET personnel before carrying out following procedures.

- **Microstep Adjustment**: If cables are intact, a manual adjustment of the robot microsteps is required to bring SAE values back to the 65–85 range.
- **Cable Repair**: If physical damage is found, the broken section of the cable must be removed or the cable replaced.

# 6 APAC Shipping Information

For shipping the instrument to and from APAC for calibration and repairs, please follow the following procedures:

1. **Prepare your Package**

    1. Make sure your cimel is well-protected to prevent damage during shipping.
    2. Use original package for shipping, include cables.
    3. Measuring the size and weight of the package.

2. **Shipping to APAC**

    **Prepare proforma invoice**

    1. Insert your full address, department, name, zip code, country, phone number.
    2. Insert the instrument's description, number, size, weight, HS code, country of origin and value.
    3. Insert APAC information (check on website: http://apac.atm.ncu.edu.tw/contacts/).

    **Carrier**

    1. Please ship as DAP – Delivered at place. (Incoterms 2020)
    2. Shipping cost to APAC should be paid by sender.
    3. Add shipping insurance if needed.
    4. Contact your international express company (DHL, FedEx, UPS…).
    5. Inform us when the express start shipping.

3. **Calibration**

When we receive your cimel, we'll start calibration process, usually it will take 2 months depending on weather conditions.

4. **Shipping back**

1. After calibration completed, we'll inform you and ship your cimel back.
2. The shipping fee will pay by APAC, but not include VAT in your country. (DAP)