

Troubleshooting Guide

Context: *As a field technician for Fruition Sciences, I was responsible for analyzing data, identifying issues and then troubleshooting the issue with the hardware in the field. I wrote this guide as part of a team effort that culminated in a Field Technician Handbook to standardize the protocols and benefit future technicians.*

I. FROM THE DATA CHECK

1. Identify Type of Problem

- a. Out of Range Data- *gets progressively worse/more frequent*
 - Ah: negative during day or $> |.2|$
 - Bh: negative anytime
 - Ch: negative or $> |.3|$
- b. Electrical/Vin- *often occurs all of a sudden*
 - Ah, Bh, Ch at 00.00 or 99.99
 - Vin $>$ or $<$ AVRS/100
 - i. Eg. AVRS 4000, vin~4.0
- c. Overflow-*occurs at peak heat*
 - -Ch
 - dt $<$ 0.5
 - flow status = High
- d. Low/High Battery
 - Voltage $<$ 11.5 or $>$ 14.5

2. Diagnosis/Remote Troubleshoot

- a. Out of Range Data
 - Most likely an issue between sensor & vine
- b. Electrical/Vin
 - Connection issue or short circuit caused by cable, harness or SapIp
 - Equipment failure caused by sensor, cable, harness or SapIp
- c. Overflow
 - Increase AVRS on Agrisensors (see #)
 - i. Check for improvement next day
 - Insulation issue
- d. Low/High Battery

- Battery or Sunguard issue

II. IN THE FIELD: GENERAL

1. Preliminary Check

i. Equipment Damage/Mistakes

- Sliced cables?
- Anything left unplugged?
- Sensors in the right direction?
- Vine 1 & Vine 2 plugged into correct harness cables?

ii. Check Battery Box

- Connections tight?
- Corrosion?

iii. Check Vine Health

- On par with neighbor vines?

2. Field Diagnosis

i. Plug into Coolterm

- Stat
 - Battery voltage
 - Date and time
- AVRS
 - On?
- ADC
 - 55505550?
 - If not, see configuration(page #)

ii. Stop, Test

- Do readings match problem diagnosed remotely?
- Problem appearing on correct vine?

iii. Stop, Rboot

iv. Stop, Test

- Problem persists?

v. Physical power cycle

- Wait 1 minute before plugging back in

vi. Invert cables

- Does problem follow cable or harness?

III. IN THE FIELD: SPECIFIC

Tips:

- *Isolate the problem*
- *Swap out equipment one piece at a time*
- *Rboot or powercycle after each adjustment/swap*
- *Let coolterm tests run for a while, up to 20 minutes*

- *If the problem appears in both channels, it is most likely a harness or Saplp issue*
- *If the problem appears in one channel, it is most likely a harness, sensor or cable issue*

A. Out of Range Data Troubleshoot

1. Unwrap vine
 - i. Interfering roots, mold, moisture?
 - Slice off roots, alcohol, oil, let dry
 - ii. Check physical state of sensor
2. Test Sensor
 - i. Chop sticks test (see pin diagram)
 - ii. Thumb test
 - Either test fails? Replace sensor
 - Pass? Go on to #3
3. TC Contact
 - i. Elastic Check
 - Sensor flush against vine?
 - ii. Node Check
 - Thermocouple on a node?
 - iii. Sensor Size
 - Sensor scrunched between spurs
4. Trial & Error
 - i. Experiment with different orientations and sensor sizes
 - *(this takes patience, but TCs are extremely sensitive and tiny adjustments can make a difference)*
 - ii. Rboot, test
 - iii. If problem persists, call to see if it's possible to change vines/stem sections

B. Electrical/Vin Troubleshoot

1. Check connections
 - Clean?
 - Silicon?
 - O-rings?
2. 00.00 or 99.99
 - i. Ah, Bh, Ch 00.00= Closed circuit
 - The harness/sap recognizes there is a sensor/cable plugged in but there are no readings.
 - Most likely equipment failure
 - ii. Ah, Bh, Ch 99.99= Open circuit
 - The harness/sap does not recognize there is a sensor/cable plugged in, or something was left unplugged.

- Rboot and relaunch test
3. Experiment & Run tests
 - i. Harness with cables detached
 - ii. Harness with cables individually
 - With sensors
 - Without sensors
 - iii. Sensor plugged directly into harness
 4. Swap Equipment & Run Tests
 - i. 1 piece of new equipment per test
 - ii. If you need to replace SapIP- set up with gateway. See network

C. Overflow

1. AVRS
 - i. Run Coolterm test to see that set AVRS is registering
 - AVRS/100
2. Insulation
 - i. Foam well before and after sensor section?
 - ii. No gaps in foil
3. Increase sensor size?
 - i. Need to check back on 2017 tshoots to see if this is valid
4. Shade
 - i. Stem section unshaded by canopy?
 - Make a foil shade tent

D. Battery

1. Test voltage
2. Check connections between:
 - i. Solar panel & Sunguard
 - ii. Sunguard & SP wire
 - iii. SP wire & battery
3. See Sunguard setup (page #)
4. Replace battery

IV. Check Before Leaving

1. All connections plugged in
2. Set Date & Time
3. Restarted logger
4. AVRS On

