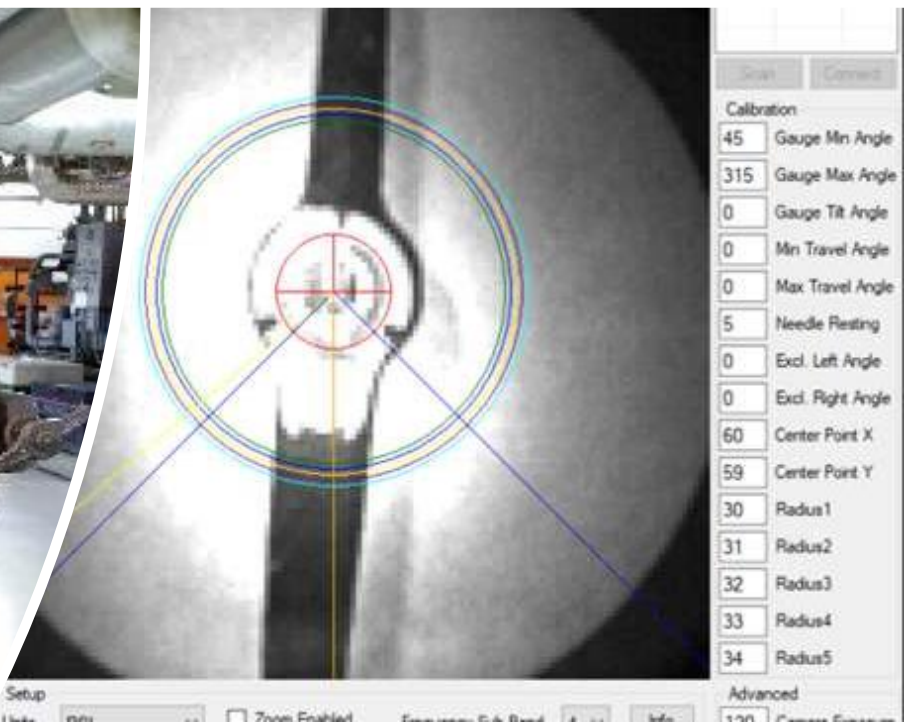
Wireless Gauge Reader

Installation and Calibration Training

Version 3.5 – July 2025



CYPRESS ENVIROSYSTEMS™

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Physically Attaching WGR to Gauge

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Clamp Around

Use for small gauges
Less than 2.5” dia

Method B
Doublesticky tape

Use for gauge diameters
larger than 2.5” dia

Method C
Flip Door

Use when full operator visibility of needle is important

More expensive than A or B

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How to attach a WGR to a Gauge – Method A

Method A – for conventional gauges less than 2.5” outside diameter

1) Attach **Rubber Shims** to gauge (as needed

2) Attach **WGR Mounting Adapter** to gauge

3) Note alignment mark on **WGR Mounting Adapter** should be at upper left corner.

4) Tighten **Hose Clamp** to hand torque using slot screwdriver

5) Attach **WGR Sensor** to WGR Mounting Adapter using 1/8 turn quick disconnect.

Note: start with WGR Sensor rotated counterclockwise 1/8 turn and attach to WGR Mounting Adapter. Then turn WGR Sensor clockwise till you hear a click to lock the quick disconnect.

USE ONE HAND TO HOLD BASE AND OTHER TO TURN WGR TO AVOID TORQUING THE GAUGE!

Fully Mounted **WGR Assembly**

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How to attach a WGR to a Gauge – Method B

1) Using UHB tape, attach **WGR Adhesive Ring** to:

   a. Gauge Lens
   (if mounting on large diameter gauge)

   b. or front panel
   (if mounting on panel mounted gauge)

2) Attach **WGR Mounting Adapter** to WGR Adhesive Ring

3) Note alignment mark on **WGR Mounting Adapter** should be at upper left corner.

4) Tighten **Hose Clamp** to hand torque using slot screwdriver

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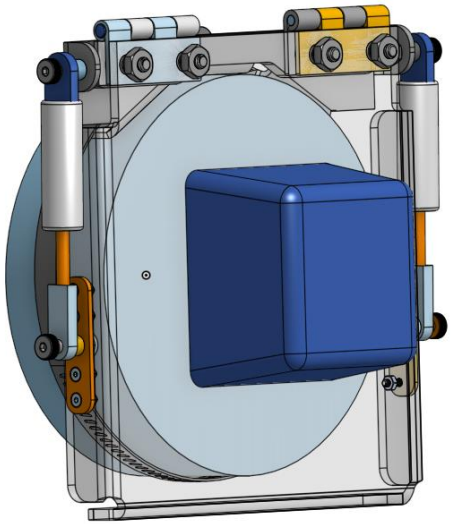
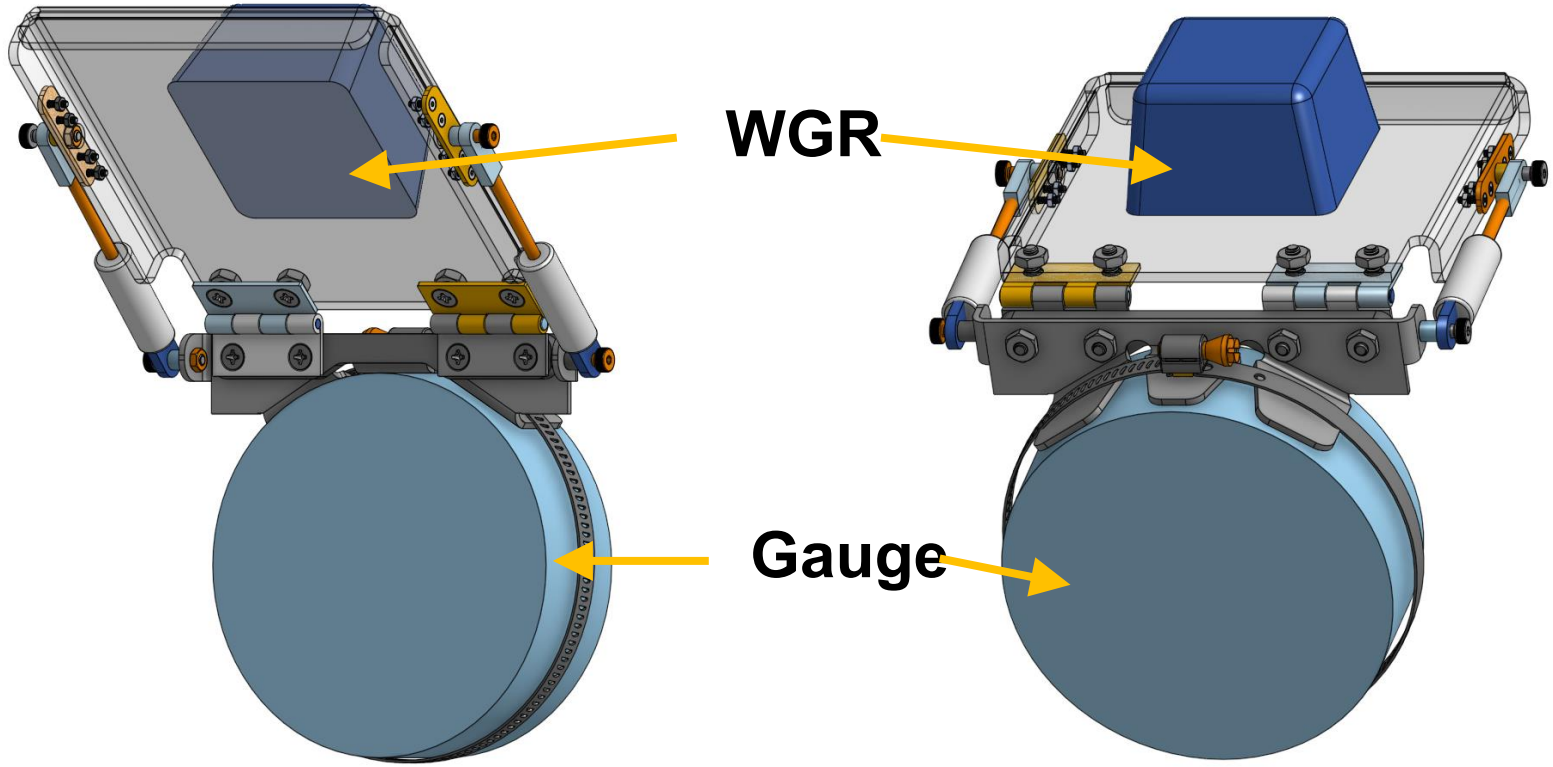
Attachment - Method B Example

How to attach a WGR to a Gauge – Method C





Gas struts keep door open in flipped open position, keeps door closed in down position
Flip door assembly (without WGR) weighs 0.6 lbs

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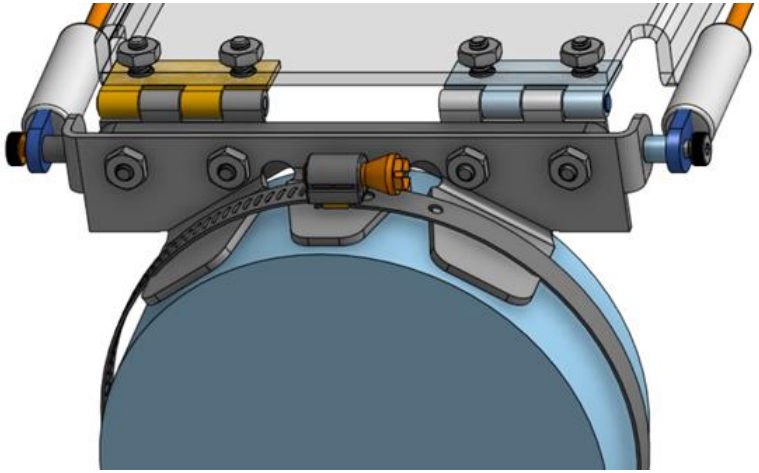
Step 1: Select Proper Model of Flip Door Assy

Flip Door Part Number	Description
GRA-FLD-030	For gauges with OD of 3" to 4"
GRA-FLD-040	For gauges with OD of 4" to 5.5"
GRA-FLD-045	For gauges with OD of 5.5" to 7"
GRA-FLD-050	For gauges with OD of 7" to 9"

Step 2: Attach Flip Door Assy to Gauge



- **Flip Doors come fully assembled from the factory.**
- **To attach to the gauge, position the hose clamp and tighten, using a flat head screwdriver.**

Step 3: Check that Flip Door can Open/Close

- **Flip door to open position and verify that it stays open hands-free**
- **Flip door to closed position and verify that it stays closed hands-free**

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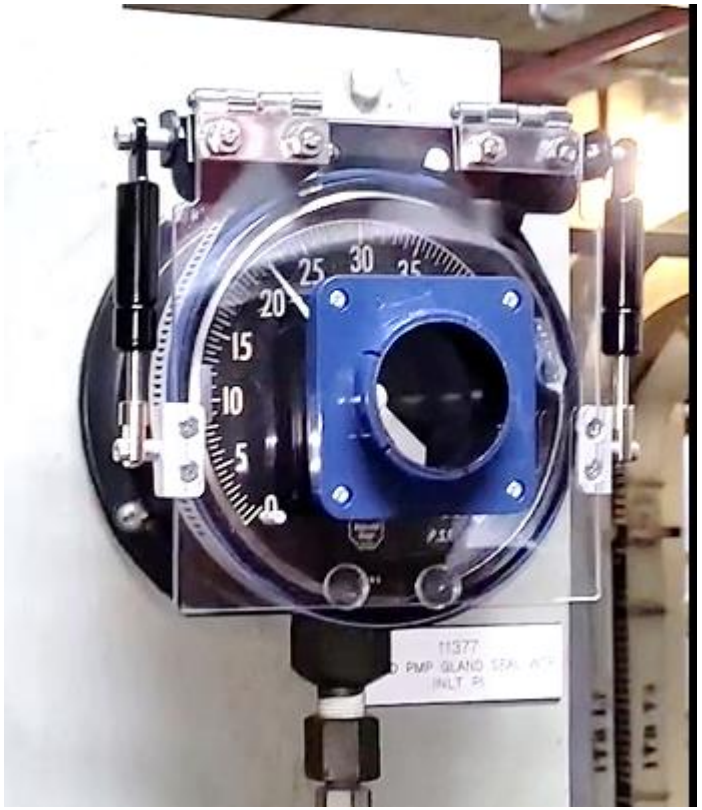
Step 4: Attach GRA-110-001 Adapter to Door



- **Peel off double sticky tape from the Ring Mounting Adapter (GRA-110-001) and attach to door.**
- **Take care to center the adapter on the center pivot point of the needle.**
- **Make sure the part number is at the six o'clock position to ensure proper orientation of the quick disconnect.**

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Step 5: Attach WGR using Quick Disconnect

- **Attach the WGR to the GRA-110-001 adapter using the twist-on quick disconnect.**

Step 6: Check that Flip Door can Open/Close, with WGR

- Flip door to open position and verify that it stays open hands-free
- Flip door to closed position and verify that it stays closed hands-free
- Flip door should return to original closed position even after repeated cycles of opening/closing.

Method C - installed

Detailed Calibration Instructions

Overview of Optical Algorithm

- Choosing the right “circles” is the key
- Need to choose 5 concentric circles with different radius
- Ideally each circle should see the needle, but nothing else (i.e. no labeling, marks or screws)

Takes picture of gauge face

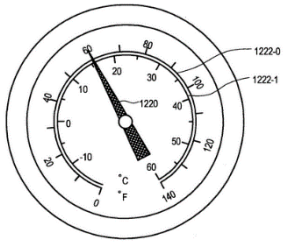
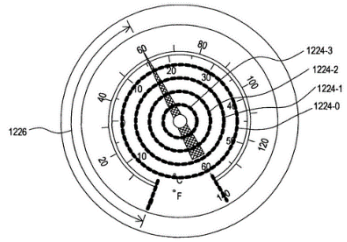


FIG. 12B

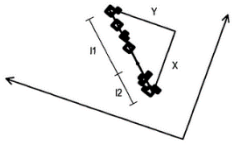
Scans pixels at predefined radius “circles” from center (5 rings)



Detects needle along radius of circles


FIG. 12D

Use a linear regression algorithm to detect needle angle, convert angle to gauge reading



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Overview - Key Steps in Calibration Process

1. Choose your “circles” (i.e. radius)
2. Put WGR into Calibration Mode
3. Calibration Process
   a) Start Calibration Tool
   b) Get image of gauge and enter circles
   c) Get sample and adjust as needed
   d) Enter gauge units and range
   e) Correct for Tilt (if needed)
   f) Finish and Exit tool
4. Take test sample and verify reading

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Step 1: Choose Your Circles

- Before starting to calibrate, decide where you want to choose the circles. Particularly:
  - Will each circle see both the tip and tail of the needle, or only the head?
  - Are they close-in to the center of the gauge or towards to outer edge?

- Note your responses to the two questions above. You are now ready to start the calibration steps.

Example:
ALL circles see both head and tail of needle

Example:
SOME circles only see the head and not the tail.

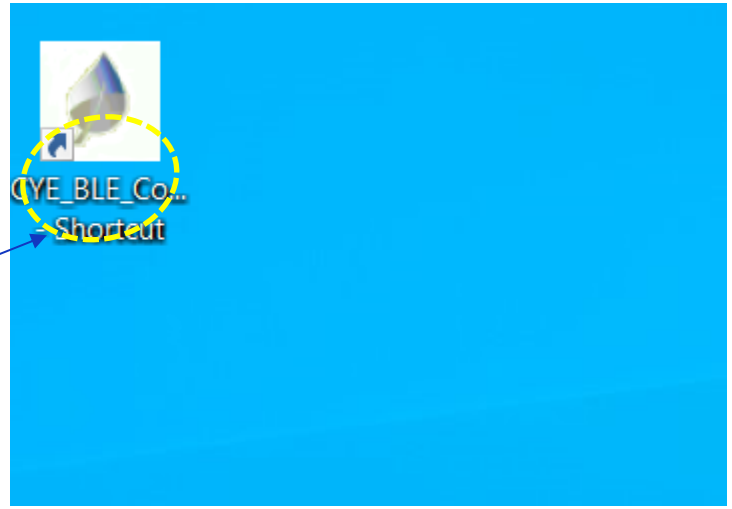
Step 2: Put WGR in Calibration Mode

- Press the right button on the WGR four times to “CONFIG” menu
- Press center button to select. You will be prompted for a password
- Enter password: Center, Center, Right, Left, Center
- WGR should now be in Calibration Mode ready to receive commands from the Calibration Dongle. The last five digits of the MAC address is displayed on the lower right corner.

WGR in Calibration Mode

Step 3a: Start Calibration Tool

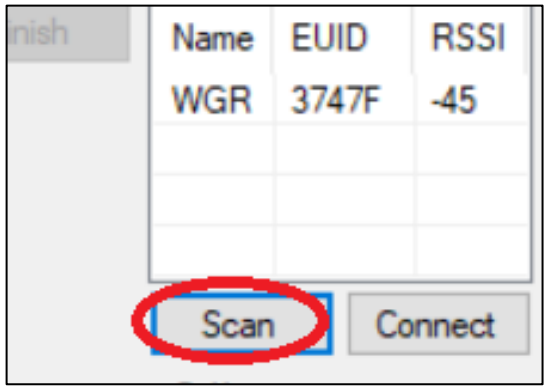
- Power up Calibration Tablet
- Windows username/password: cypress/cypress123
- Open application “CYE_BLE_Config Tool” by doubleclicking the icon on the desktop

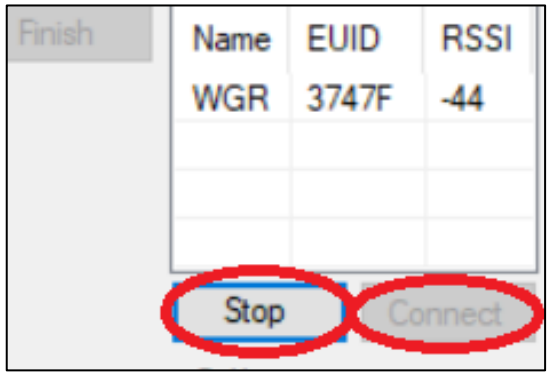


Doubleclick this icon to start calibration application

Step 3a: Start Calibration Tool - continued

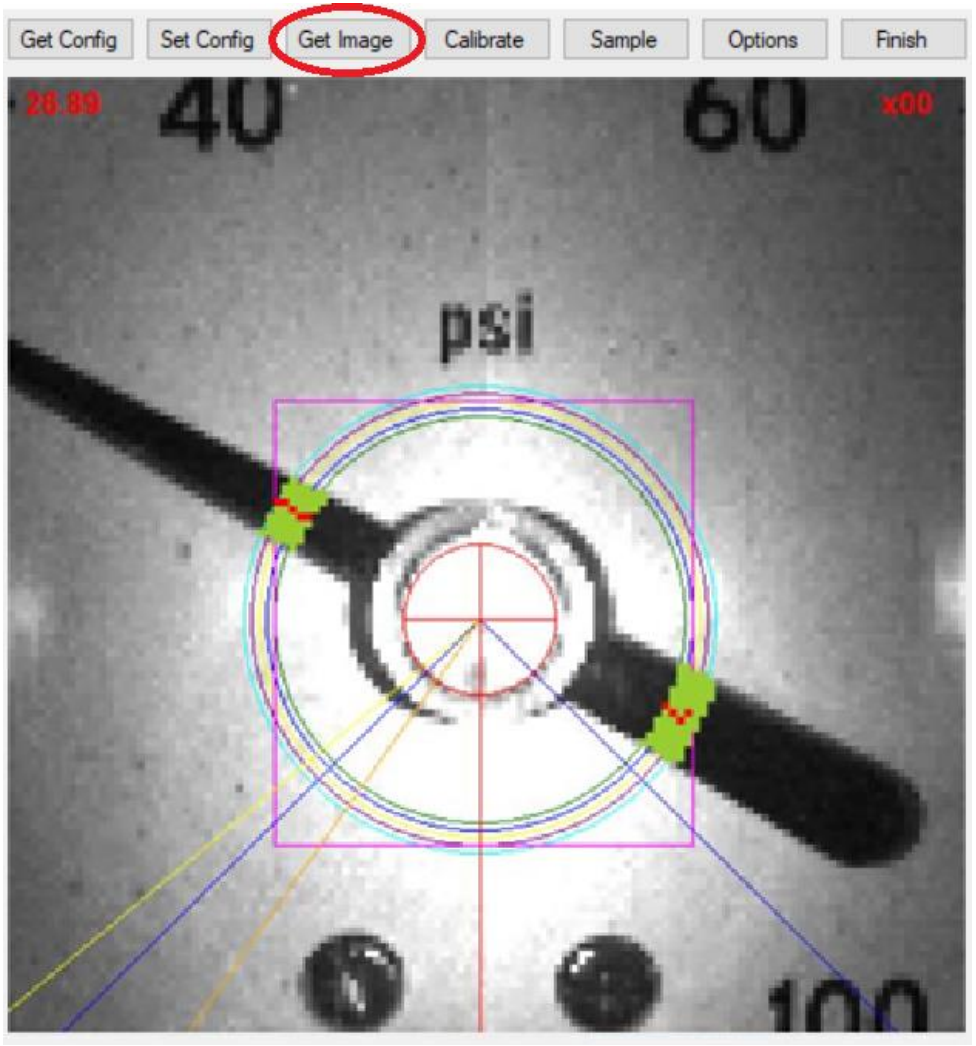
- Place the tablet close to the WGR.
- Click “Scan”, and a list of nearby WGR’s will appear on the top window. Select the WGR on the drop down list (check that the MAC address matches the one displayed on the WGR display).
- Click “Stop” and “Connect”, and after few seconds, you should see configuration parameters.





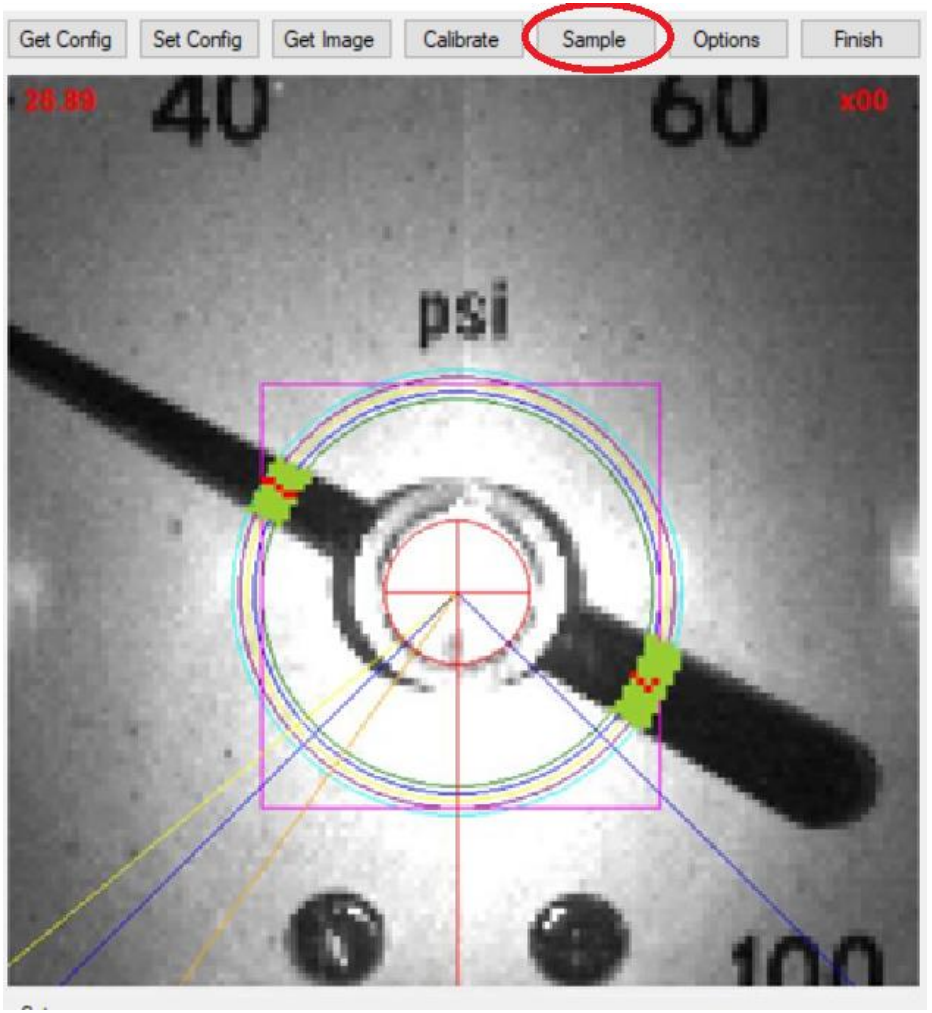
Step 3b: Get Image and Enter Circles

- Click the “Get Image” button to capture an image of the gauge. It takes about 5-10 seconds.
- Now click the Calibrate button.
- You will be asked to click the middle of the gauge, then choose five rings. Make sure you click each ring in a sequentially larger radius.
- If you are not satisfied with the center point and/or the rings, you can redo it by click the Calibrate button again.

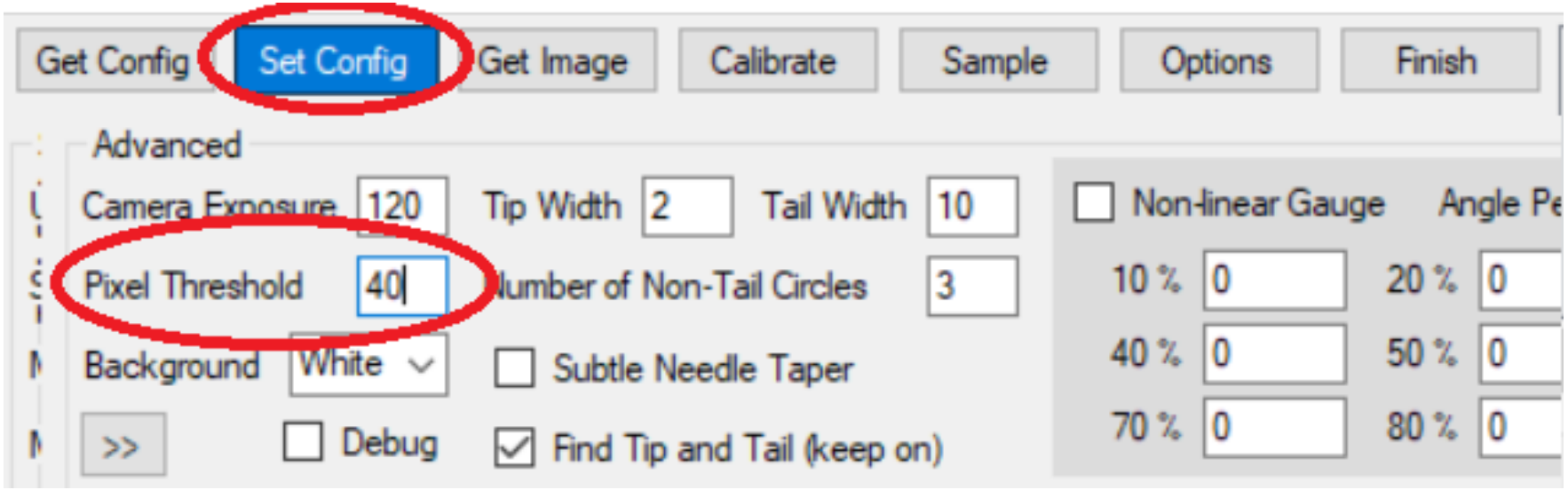


Step 3c: Get Sample

- Click the “Sample” button. You should see green pixels indicating where the needle is, and should not see green pixels elsewhere. Click “Sample” a few times to verify.
- If there are too many green pixels besides on the needle, then go to the Adv section, and increase the “threshold” by 10 and click the “Set Config” button.
- If there are too few green pixels (needle not found), then go to the Adv section, and decrease the “threshold” by 10 and click the “Set Config” button.
- Repeat last three steps till you have a green pixels on the needle and not anywhere else.
- The upper right corner of the screen should show X00 to indicate there is no error.

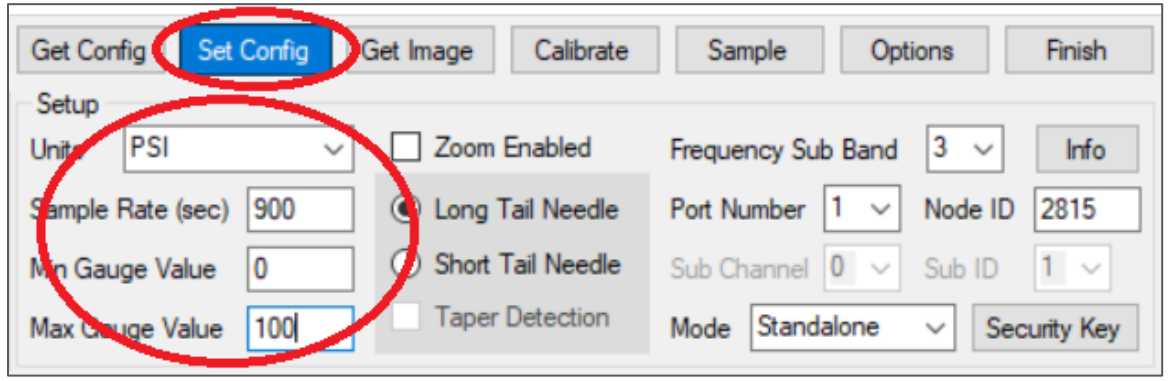


Step 3c: Get Sample - continued



Step 3d: Enter Gauge Units and Range

- Go to the Setup section
- Select proper units from the drop down menu (e.g. PSI, deg F, etc.)
- Select Sample Rate, in seconds
- Select Minimum and Maximum Gauge Values (the minimum and maximum markings on the gauge face).
- Click the “Set Config” button on the upper right hand corner.

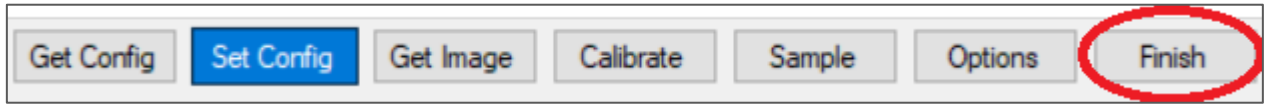


Step 3e: Correct for Tilt

- This step checks and corrects if the WGR is tilted:
- Step 1: Click the Sample button.
- The WGR reading is on the upper left corner of the display – compare with the actual needle reading.
- If necessary, adjust the “Gauge Tilt Angle” as follows:
  - If the WGR reading is less than the needle reading, increase the Gauge Tilt Angle by 1 or 2 degrees
  - If the WGR reading is more than the needle reading, decrease the Tile Angle by 1 or 2 degrees (enter negative value to rotate tilt counterclockwise).
  - Click “Set Config”
- Go to Step 1 on this page and repeat process

Step 3f: Finish and Exit Calibration Tool

- VERY IMPORTANT – You must press “Finish” to properly save and exit from the configuration process, or else the settings will not be saved.



Step 4: Take Test Sample

- Press the Middle button of the WGR to take a sample, and note the reading.
- Now remove the WGR Sensor from the WGR Mounting Adapter (turn counterclockwise 1/8 turn and remove), and read the physical needle.
- Compare with the reading on the WGR Sensor to confirm it is accurate. If not accurate, then repeat calibration process.
- Reattach the WGR Sensor to the Mounting Adapter.

✓

OK

Special Case:
Zoom Out

Special Case: Zoom Out to See Rings

- In some cases, you may want to avoid zoom-in to see a bigger part of the gauge. This is true when you want to select circles farther away from the center

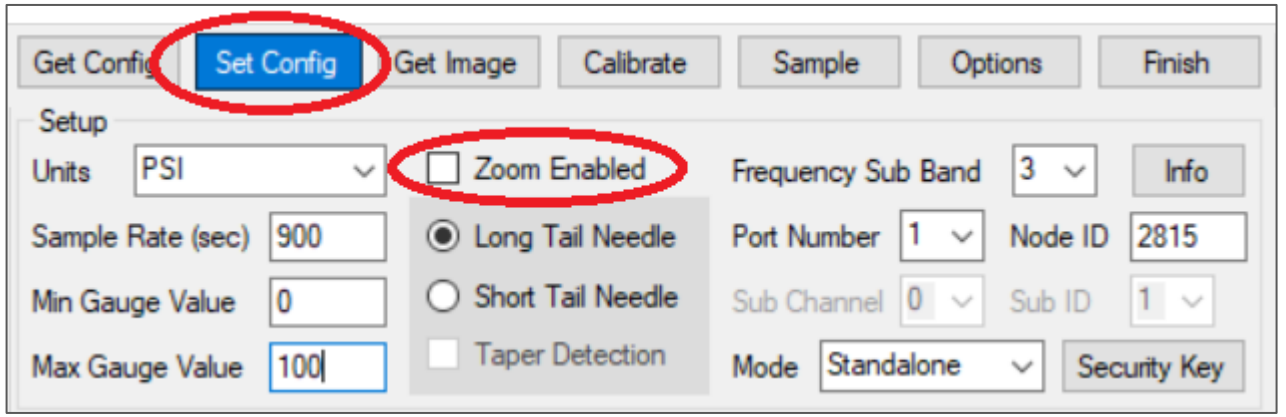
Original Gauge

Zoomed-in Image

Zoomed-out Image

Special Case: Zoom Out to See Rings – continued

- To Zoom Out, go to the Setup section, and deselect the “Zoom Enabled” checkbox, then click Set Config.



Special Case:
Short Tail Needles

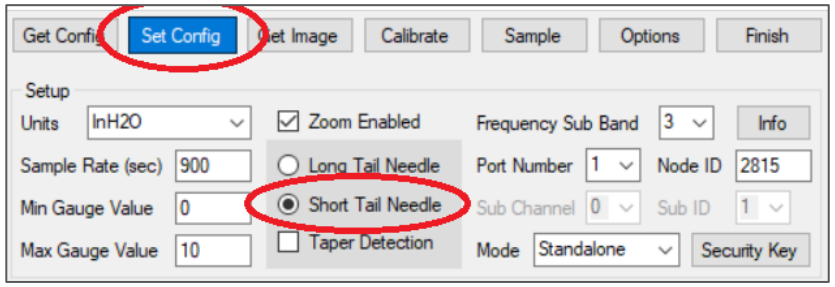
Special Case: Short Tail Needles

- In some gauges, the needle has a short tail. When you select the circles, some or all of the circles may NOT see a tail.
- In this case, you must use the Short Tail algorithm.

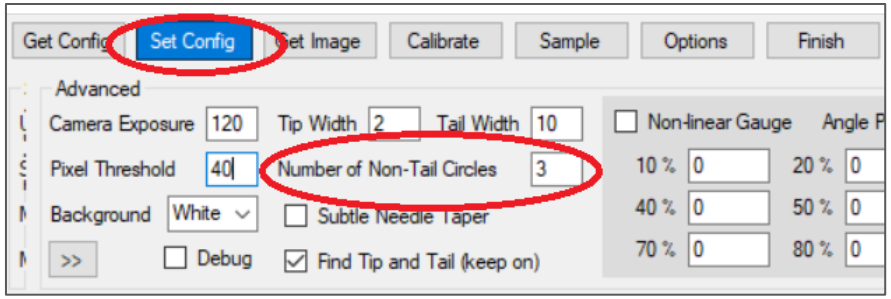
Example: Two of Five Circles do NOT see the Tail

Special Case: Short Tail Needles - continued

- Go to Setup section, select the “Short Tail Needle” button, and click Set Config.



- Go to Adv section, enter the number of circles which see a tail, i.e. 3 in the last example, and click Set Config.

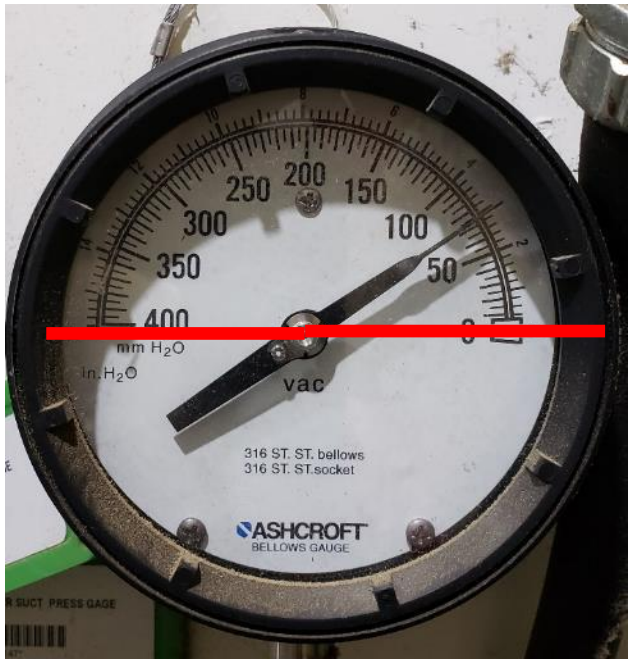


Special Case:
Unusual Gauge Angles

Special Case: Unusual Gauge Min/Max Angles

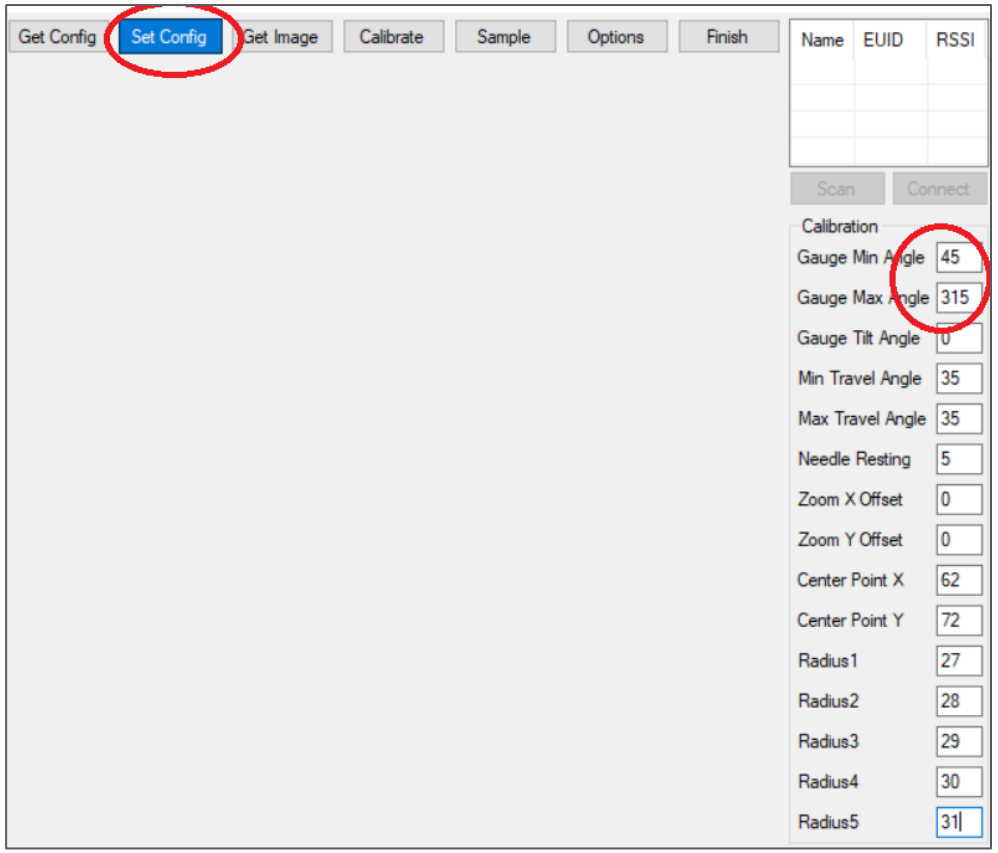
- Most gauges have angles like this one.

- But what if you have angles like this instead?



Special Case: Unusual Gauge Min/Max Angles

- Go to Cal section, enter the Gauge Min Angle and Gauge Max Angle, and click “Set Config”.

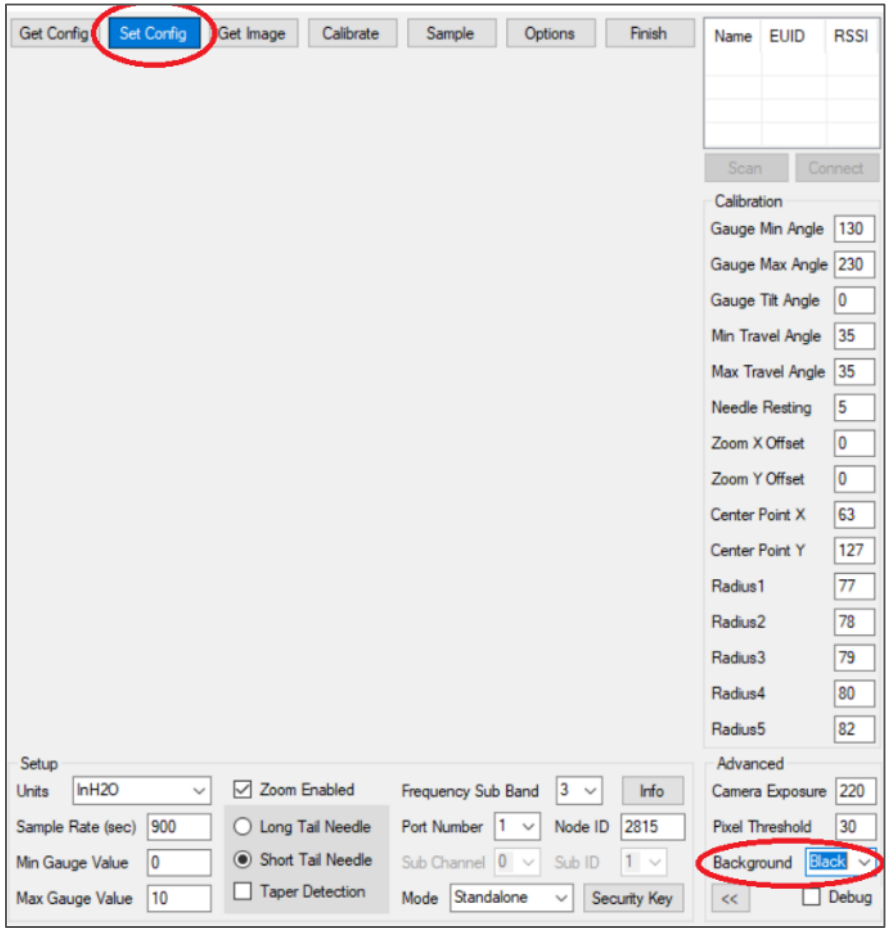


Special Case:
Black Background Gauges

Special Case: Black Background Gauges

- If black background….

- Go to Adv section, select Black Background, and click Set Config.



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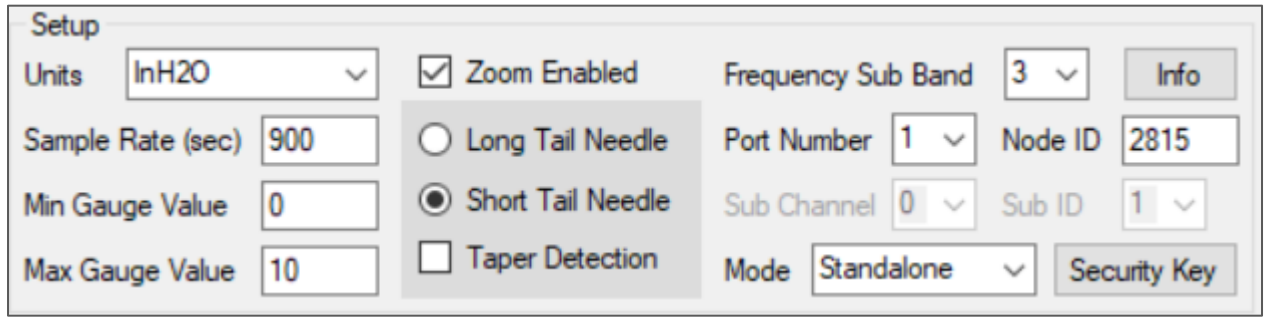
Special Case:
Magnehelic Gauges

Setup Section

- Units: InH2O
- Min Gauge Value: 0
- Max Gauge Value: XX
- Zoom Enabled Checked
- Short Tail Checked



Cal Section

- Min Gauge Angle: ~130
- Max Gauge Angle: ~230

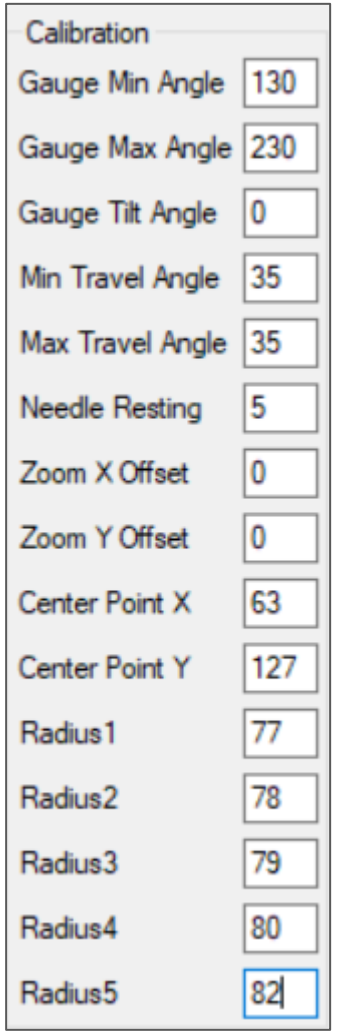
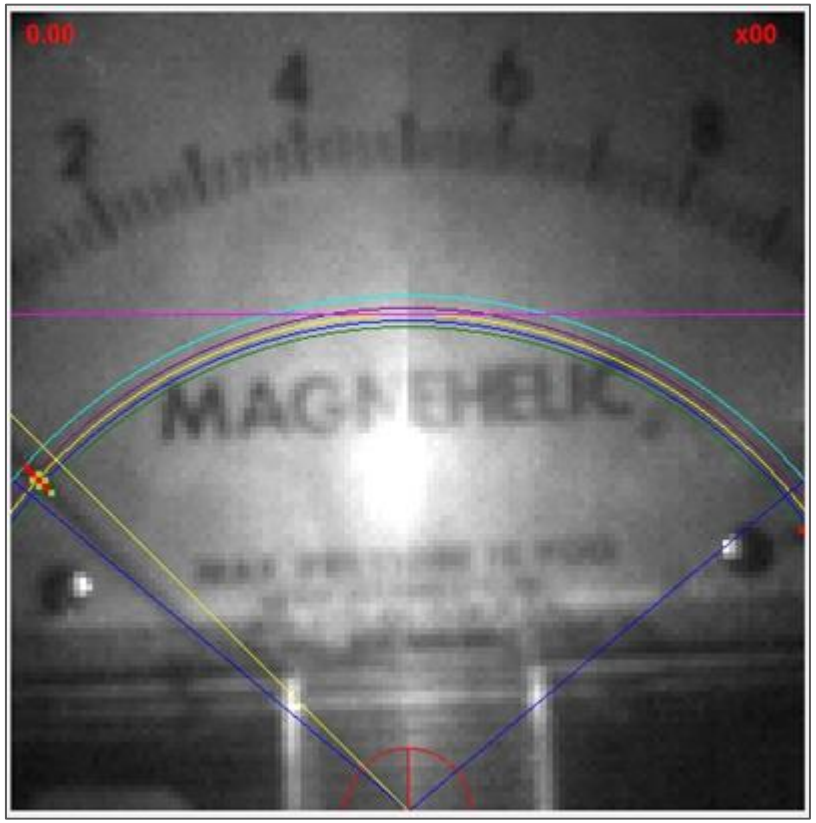


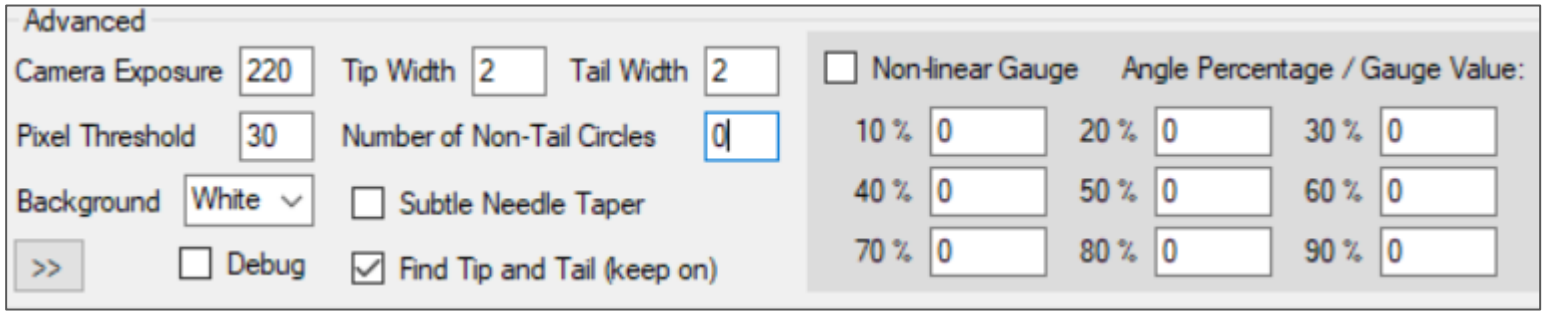
Image Section

- Center: all the way to the bottom, middle
- 1st ring: just beyond “C” in Magnehelic
- 2nd – 5th rings increment by 1 pixel each



Adv Section

- Exposure: 220
- Threshold: ~30
- Tip Width: 2
- Tail Width: 2
- Number of Non-Tail Circles: 0



How to Replace Batteries

Battery Replacement - Tools Needed

Small flat head screwdriver

#8 Torx head screwdriver

Step 1: Remove WGR from Adapter

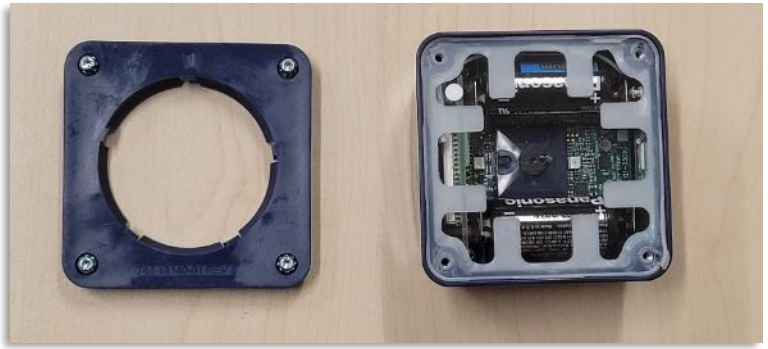
Rotate WGR counter-clockwise 1/8 turn and remove the WGR from the adapter base.

USE ONE HAND TO HOLD BASE AND OTHER TO TURN WGR TO AVOID TORQUING THE GAUGE!

Step 2: Remove Back Cover

Use the Torx head screwdriver to remove the four screws.

Note orientation of markings (for reassembly later)



Remove back cover

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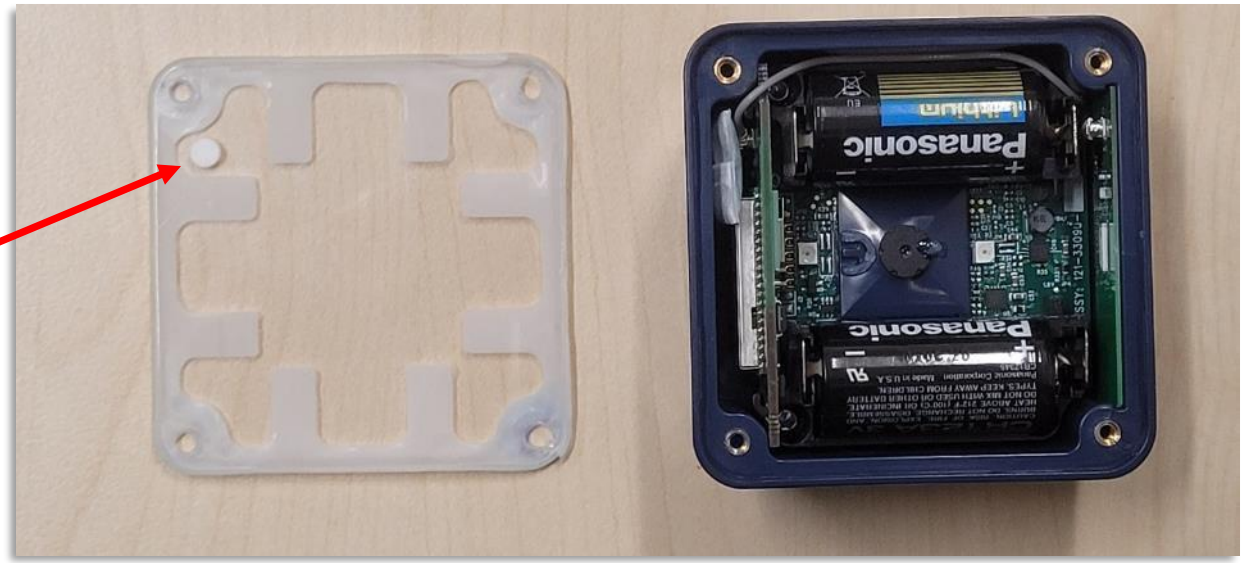
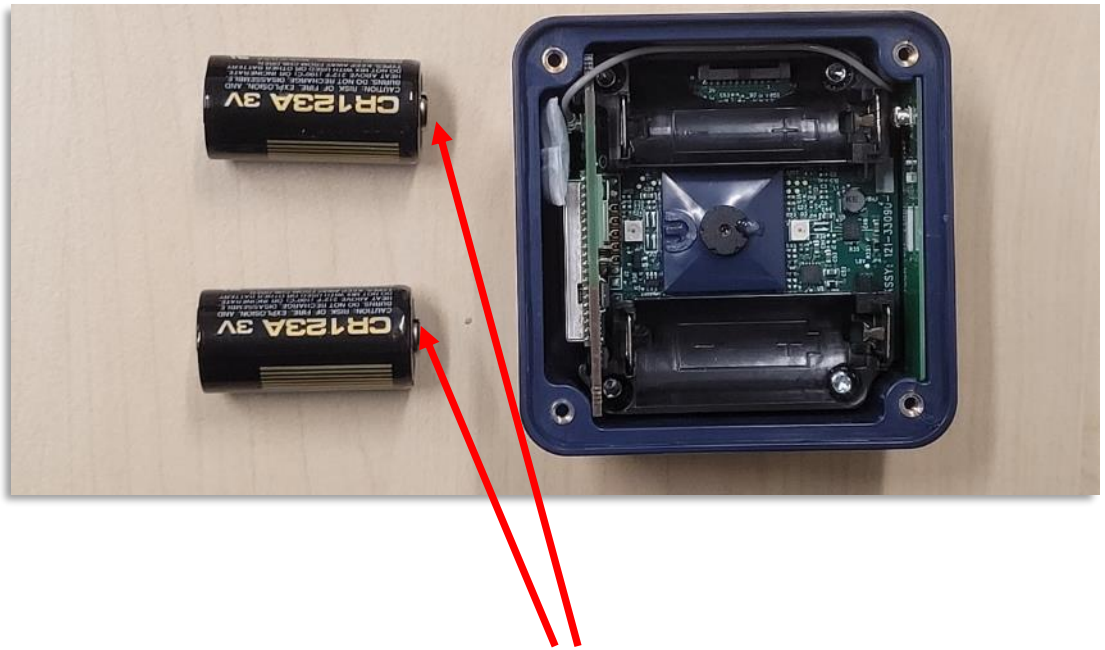
Step 3: Remove Plastic Window

Note orientation of markings (for reassembly later)



Step 4: Remove Old Batteries and Replace



Replace with two CR123A cells. Panasonic brand recommended.

Note orientation of battery polarity. Positive (+) side faces same direction for both cells.

Step 5: Reassemble all Parts

Remember orientation of markings for plastic window and for back cover.

Step 6: Re-attach WGR to Adapter Base

- Attach **WGR Sensor** to WGR Mounting Adapter using 1/8 turn quick disconnect.
- Note: start with WGR Sensor rotated counterclockwise 1/8 turn and attach to WGR Mounting Adapter. Then turn WGR Sensor clockwise till you hear a click to lock the quick disconnect.
- USE ONE HAND TO HOLD BASE AND OTHER TO TURN WGR TO AVOID TORQUING THE GAUGE!

How to Add WGR
On Gateway and GBC

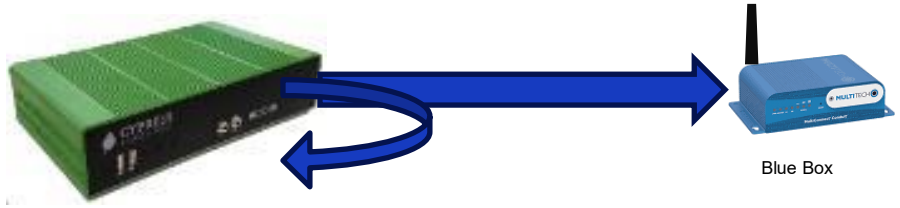
Overview

1. Configure WGR

DevEUI	JoinEUI	AppKey	CYEID	Description	Info
0004A30B	CC1701D000000000A	4C9F751900B3293DF4975D51A8AB1175	031F07B8	LoRa WGR 8120/0	STANDALONE:900:0:160

2a. Use tablet to create csv file

2b. Copy CSV file to GBC



Blue Box

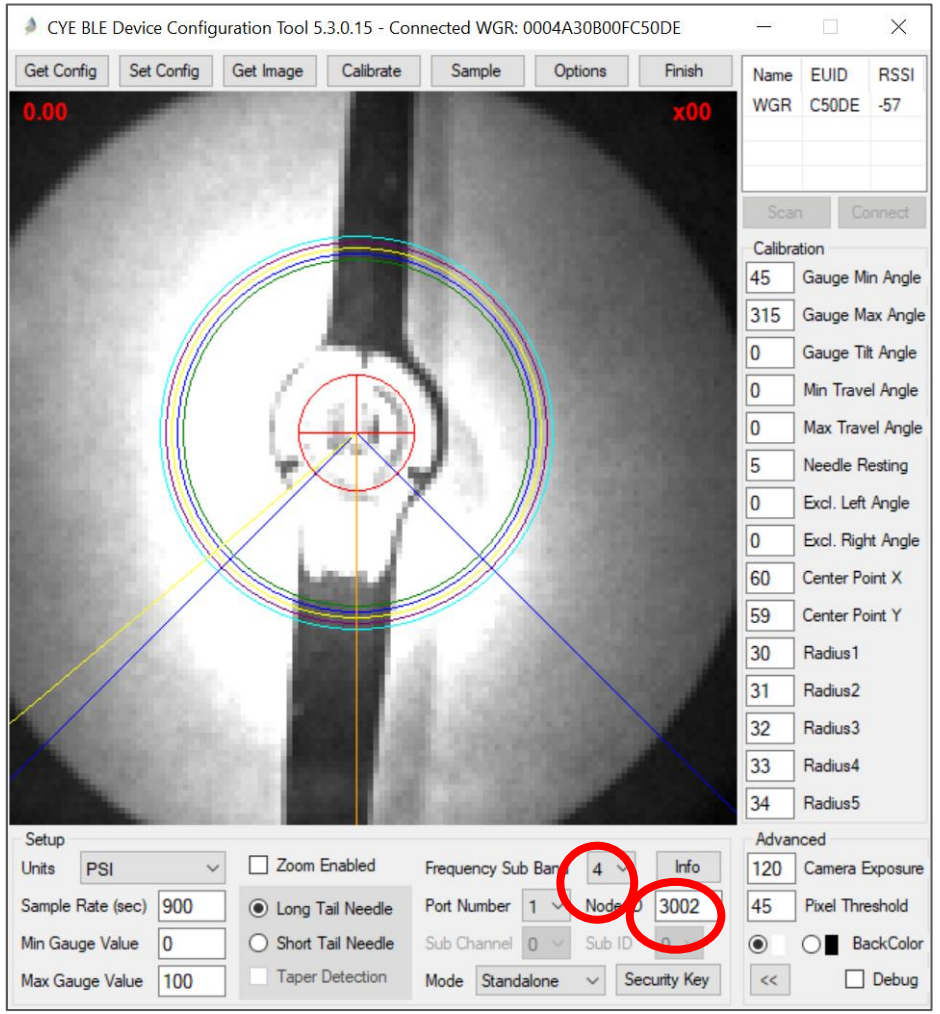
Green Box Controller*

3. Run Device Importer tool to update both GBC and GW

4. Done!

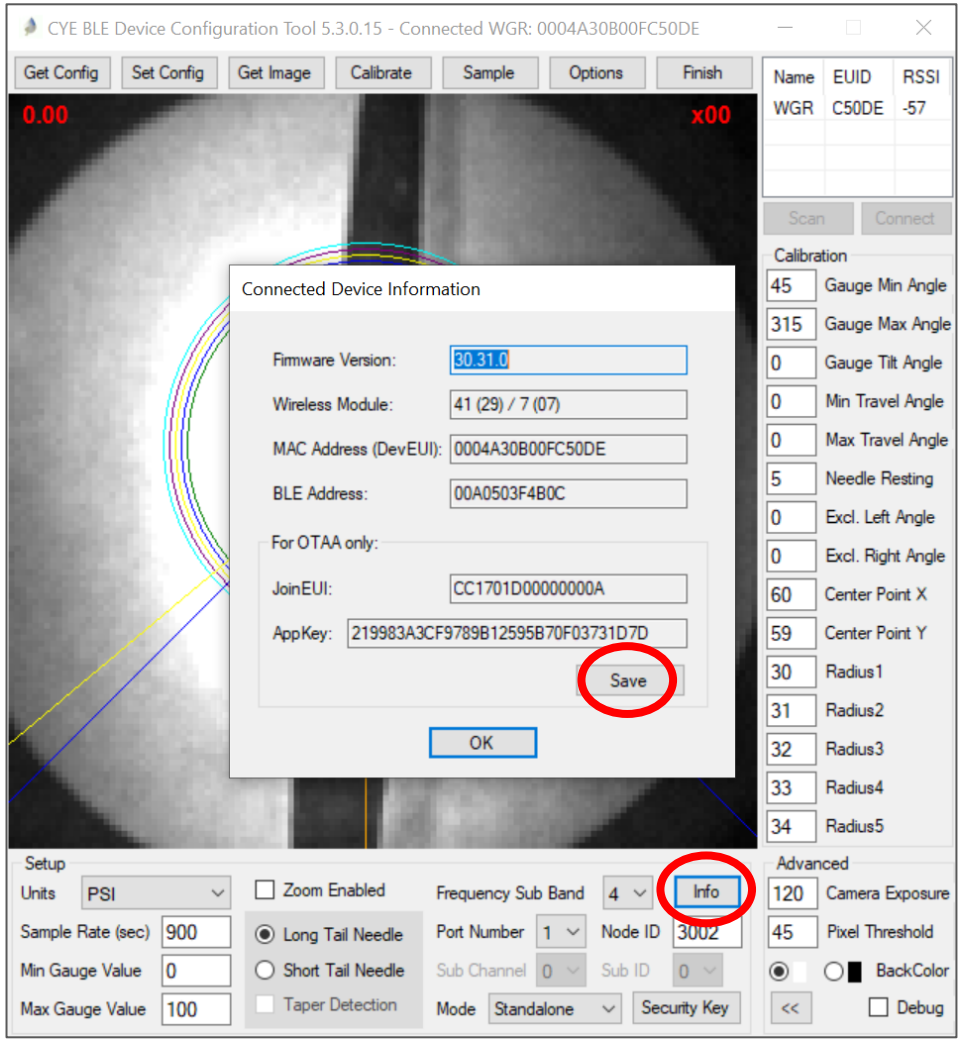
How to Add a WGR to the GW and GBC - Step 1

- Configure new WGR using tablet tool:
  - Assign unique nodeID (4 digits, usually the next number in sequence)
  - Select sub-frequency (1 to 8, depending on which gateway this WGR will communicate with – typically the closest one)



How to Add a WGR to the GW and GBC - Step 2

- Create CSV File:
  - Click the “Info” button.
  - Click “Save”
  - Default filename is:
    Cypress_Device_Info_OTAA.csv
    (you may change if you wish)
  - Save on Desktop of the tablet tool
  - Give this file to I.T. (William Carelock)

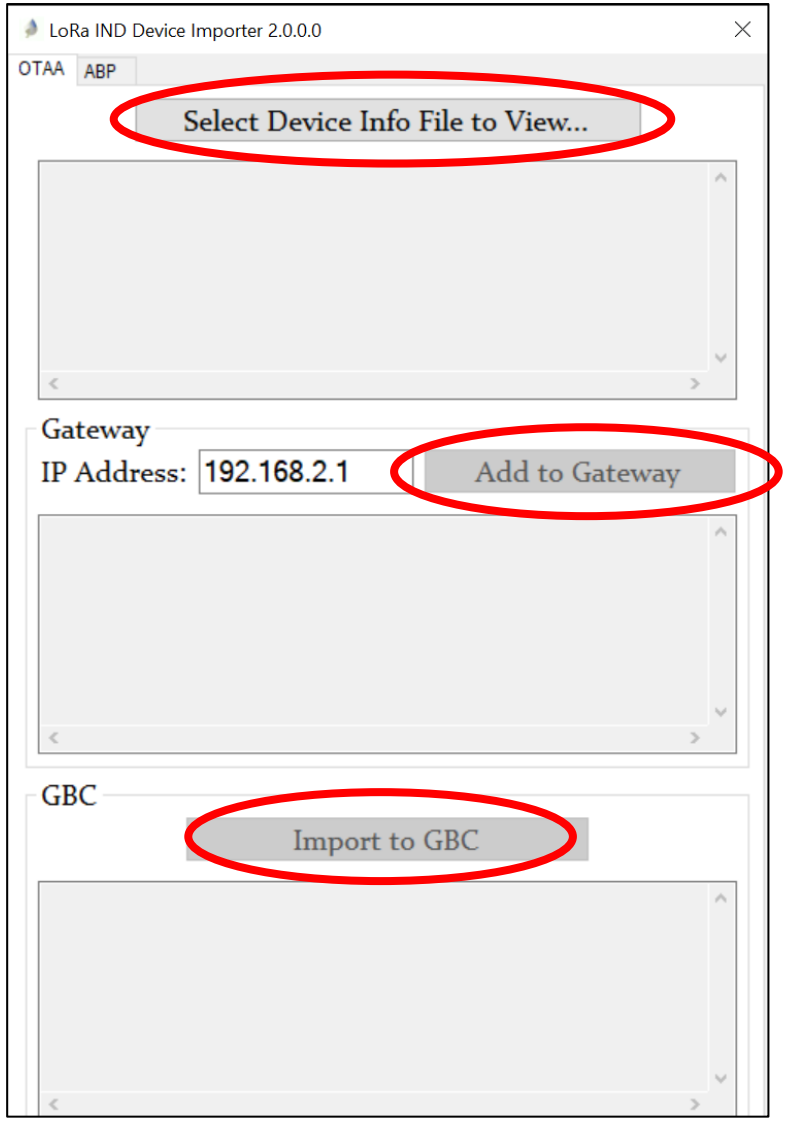


Typical CSV file

A	B	C	D	E	F
DevEUI	JoinEUI	AppKey	CYEID	Description	Info
0004A30B(	CC1701D00000000A	4C9F751900B3293DF4975D51A8AB1175	031F07B8	LoRa WGR 8120/0	STANDALONE:900:0:160

How to Add a WGR to the GW and GBC - Step 3

- Add the CSV file to the GW and GBC (for I.T.):
  - Put a copy of the csv file on the desktop of the GBC you want to add the WGR to
  - Remote Desktop onto the GBC, and run the Device Importer tool (shortcut on GBC desktop)
  - Select the csv file, and click Add to Gateway, and then Add to GBC (leave default IP Address unchanged).
  - DONE!



CYPRESS ENVIROSYSTEMS™

Training Exercises
How to Calibrate a WGR to Read a Gauge

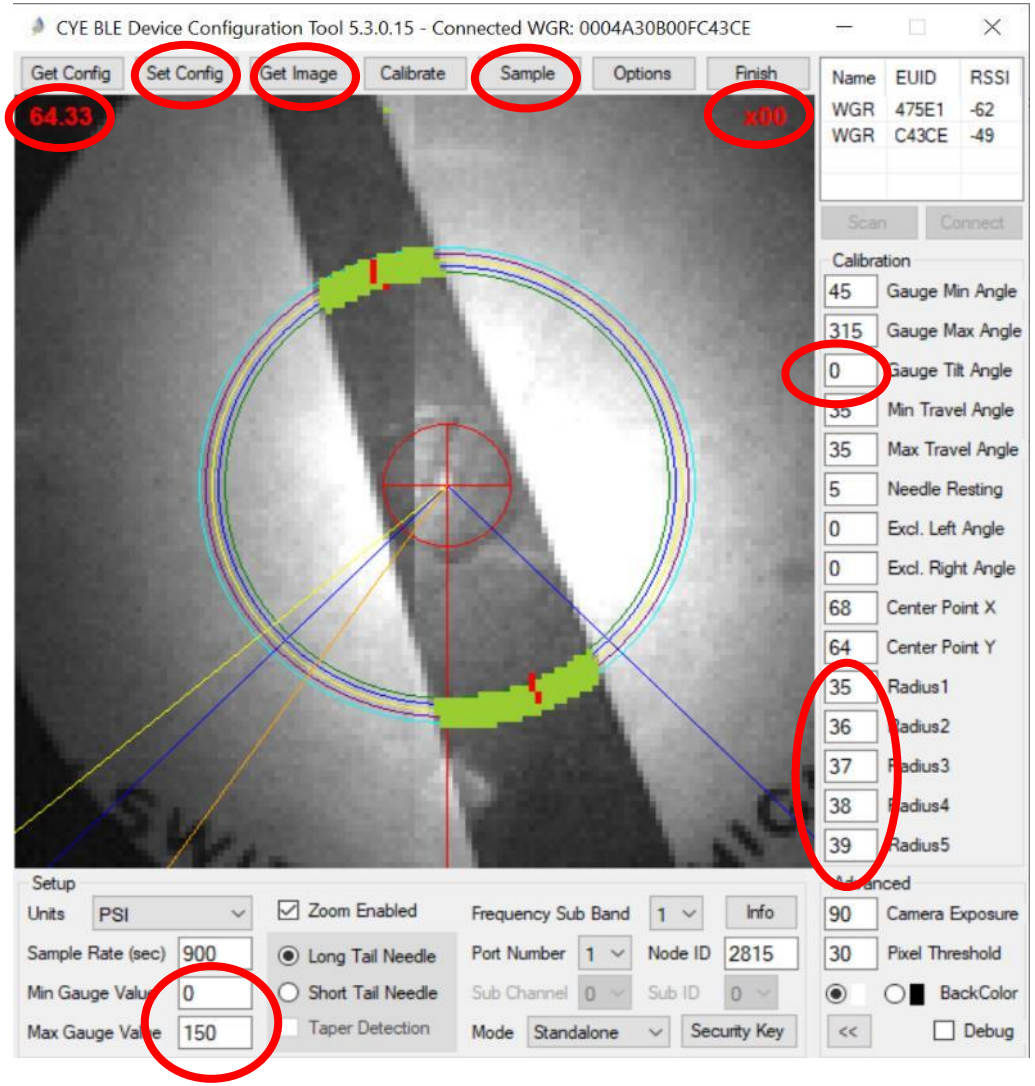
Tabletop Calibration Exercises

Gauge Type:

1. Standard gauge standard settings
2. Adjusting exposure and threshold
3. Non-standard angles
4. Non-Linear
5. Black background
6. Short tail

1. Standard Gauge

1. Standard Gauge (continued)

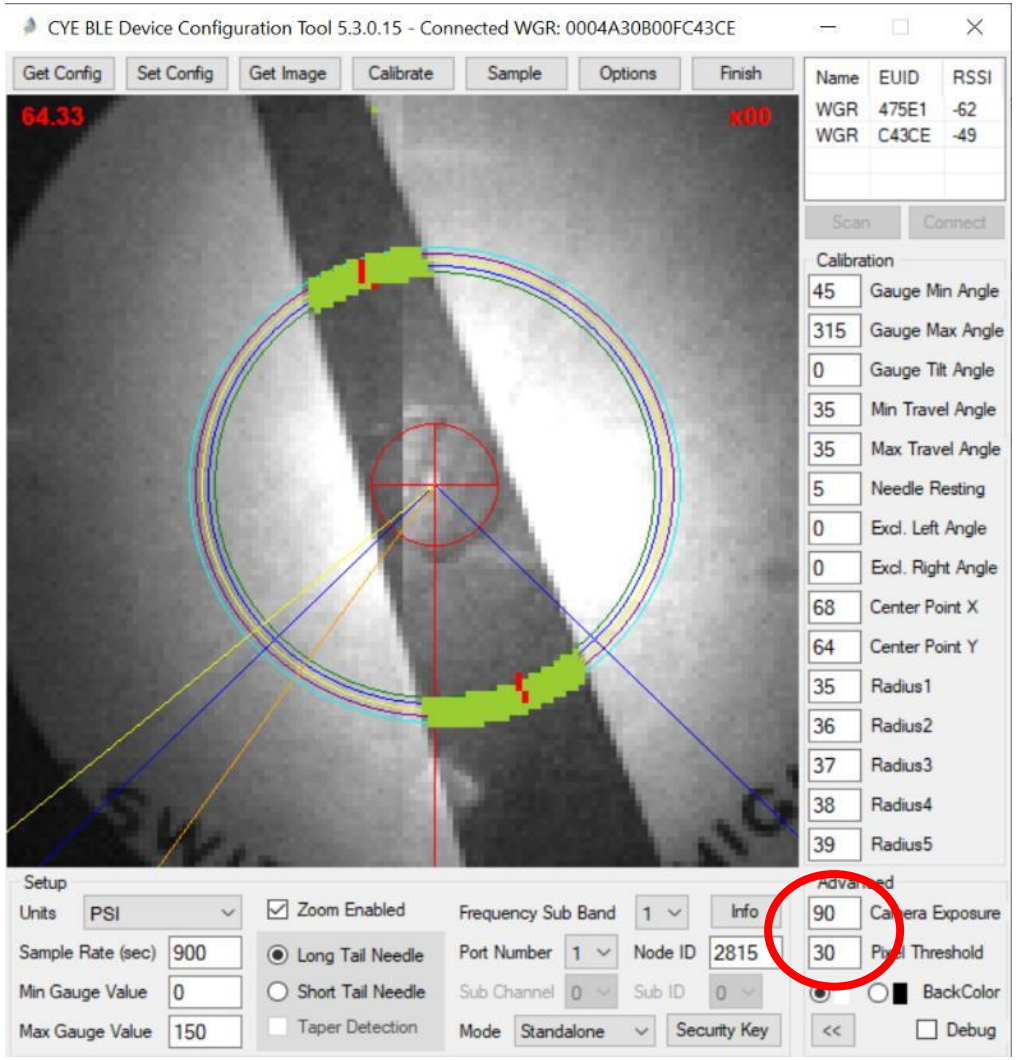


2. Adjusting Exposure and Threshold

When to use:

- Lighting and contrast of needle is not optimal

2. Adjusting Exposure and Threshold (cont'd)



3. Non-Standard Angles

When to use:

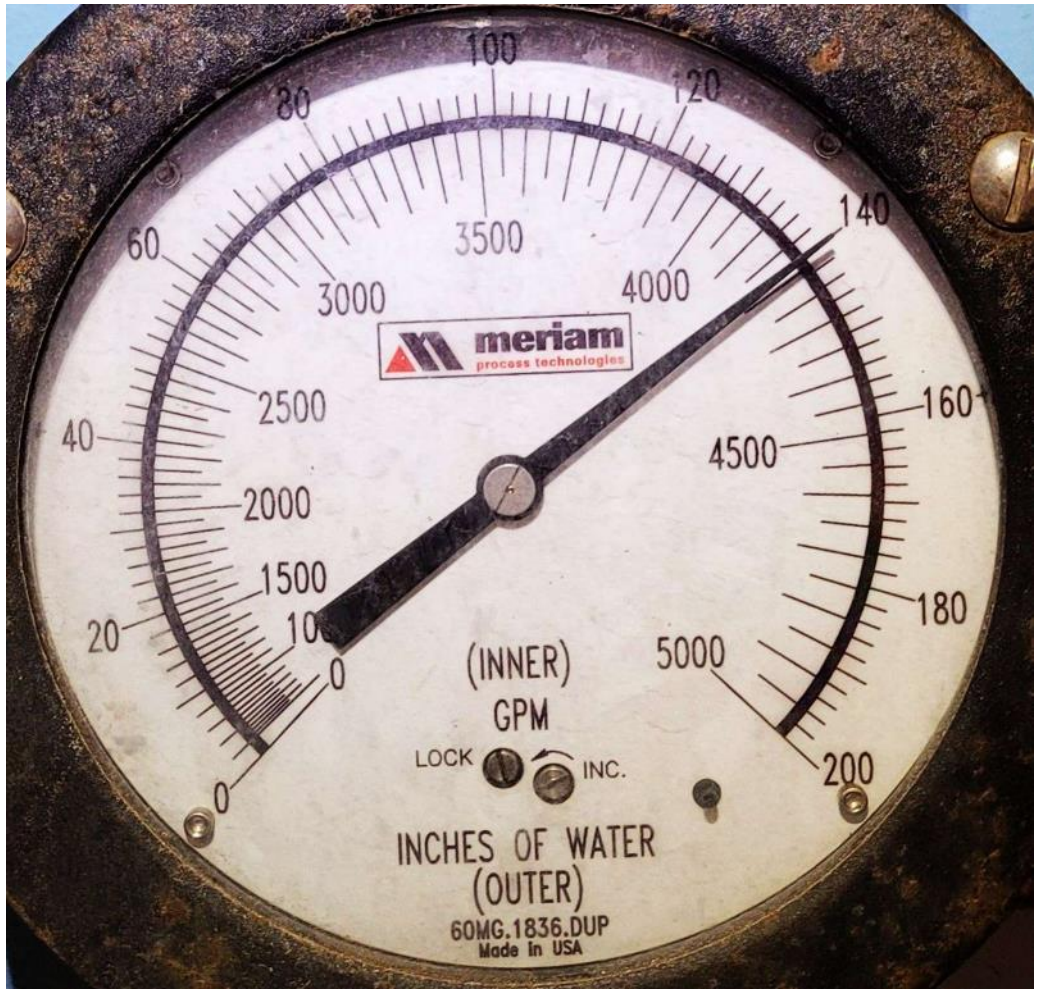
- Min and Max angles are not standard 45 deg and 325 deg.

3. Non-Standard Angles (cont'd)

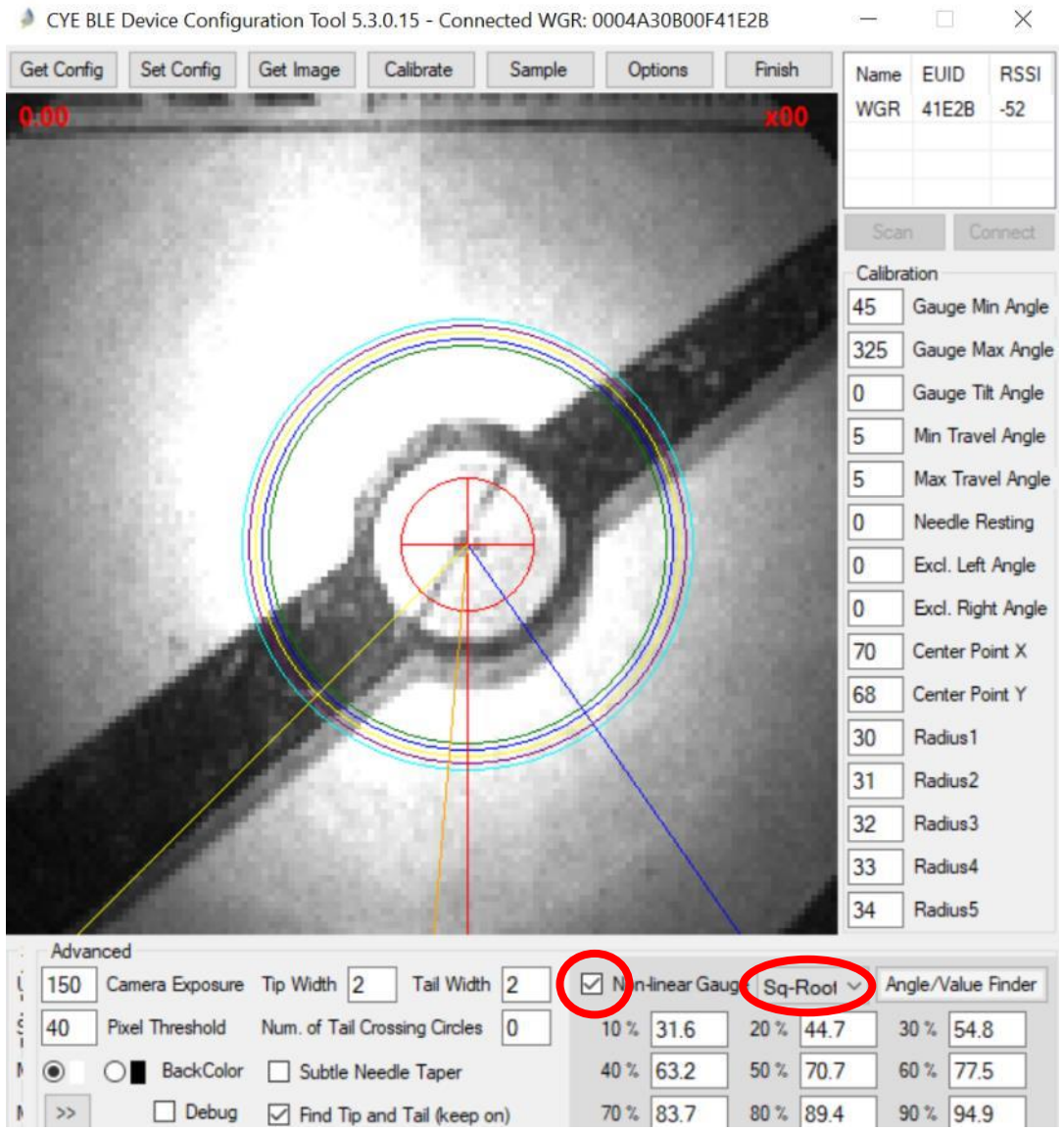
4. Non-Linear Gauges

When to use:

- Gauge Scale is non-linear.



4. Non-Linear Gauges (cont'd)



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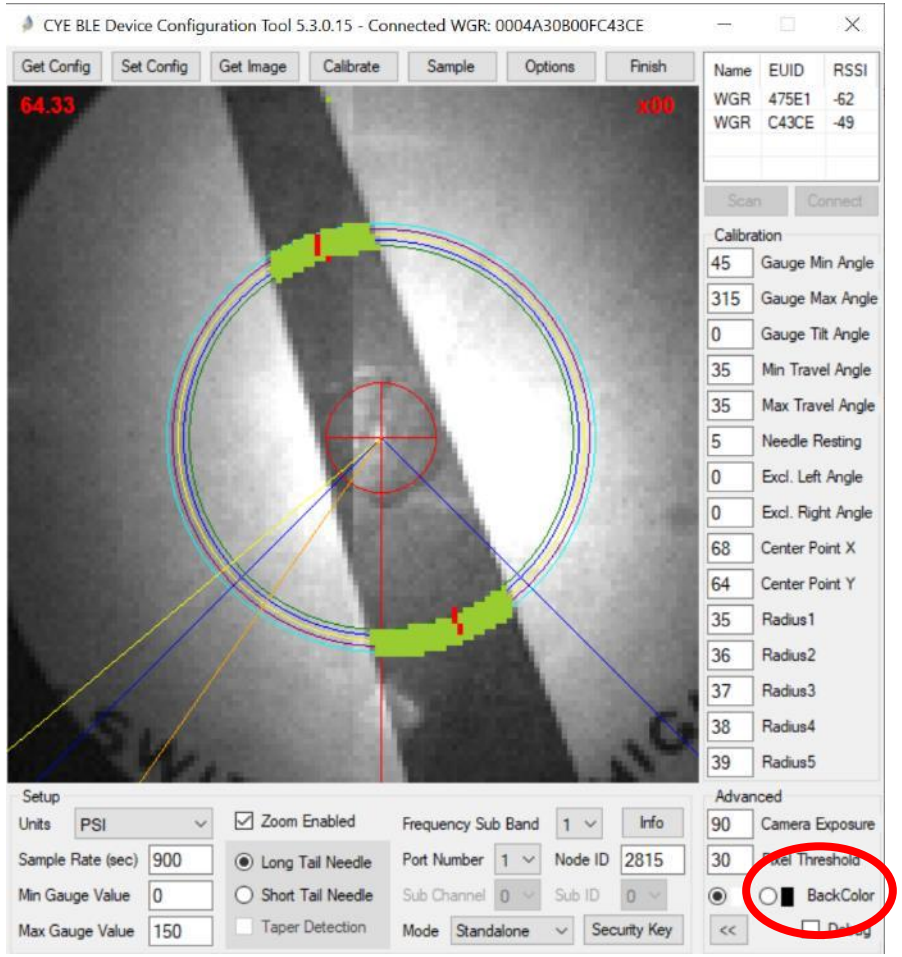
5. Black Background Gauges

When to use:

- Needle is white, background is black.

5. Black Background Gauges (cont'd)

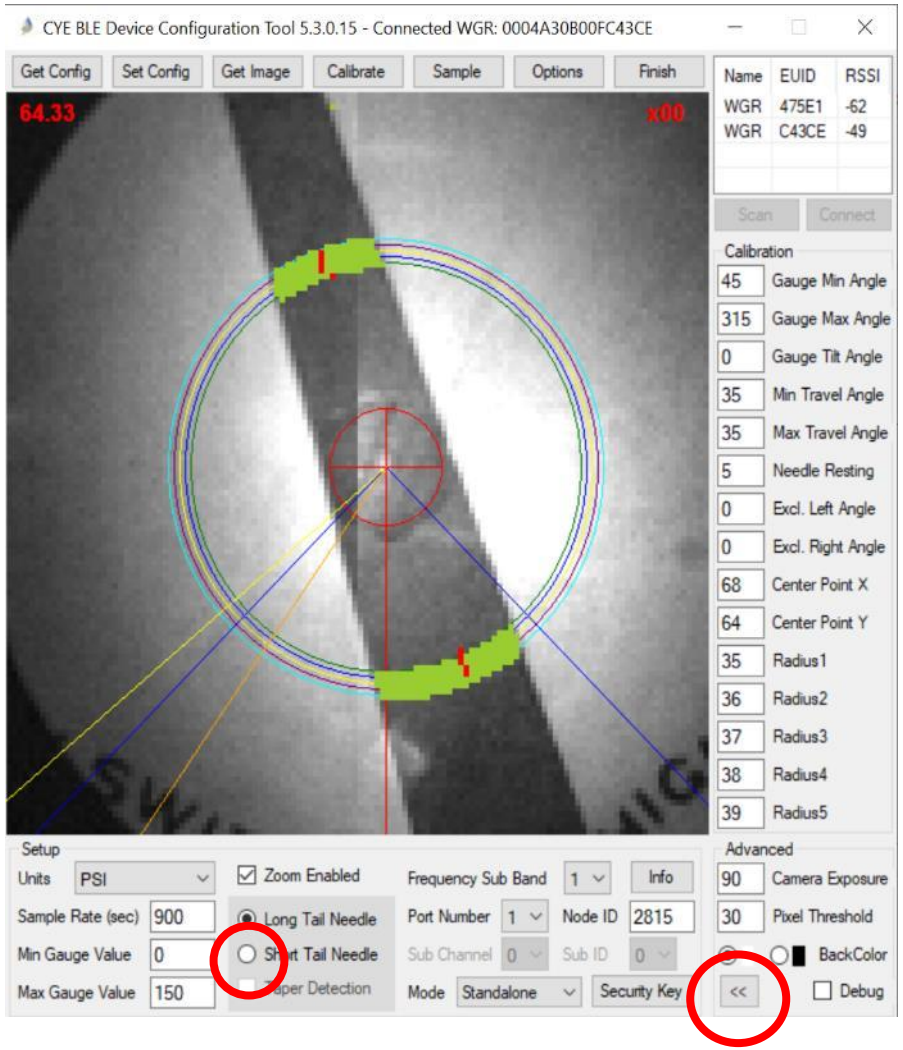


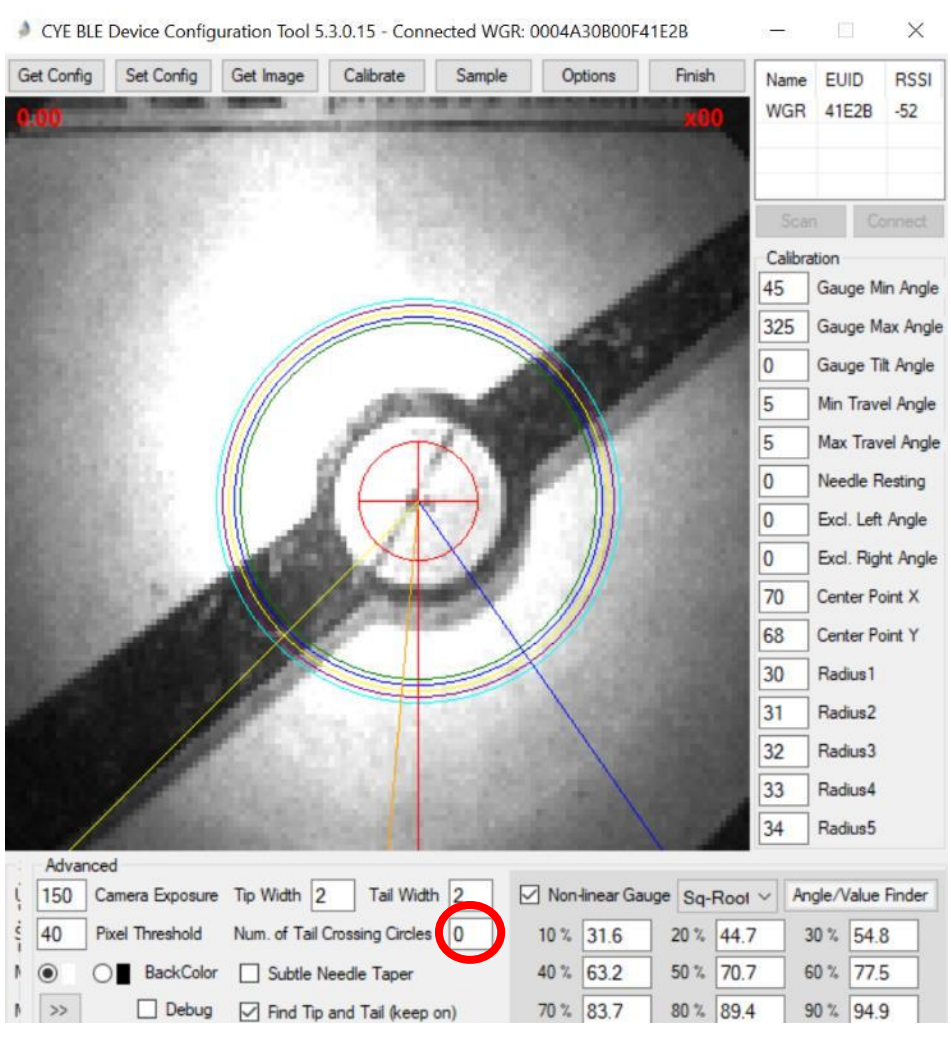
6. Short Tail Gauges

When to use:

- Want to read only the tip of the needle (to avoid background items)
- Gauge needle does not have a tail.

5. Short Tail Gauges (cont'd)





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