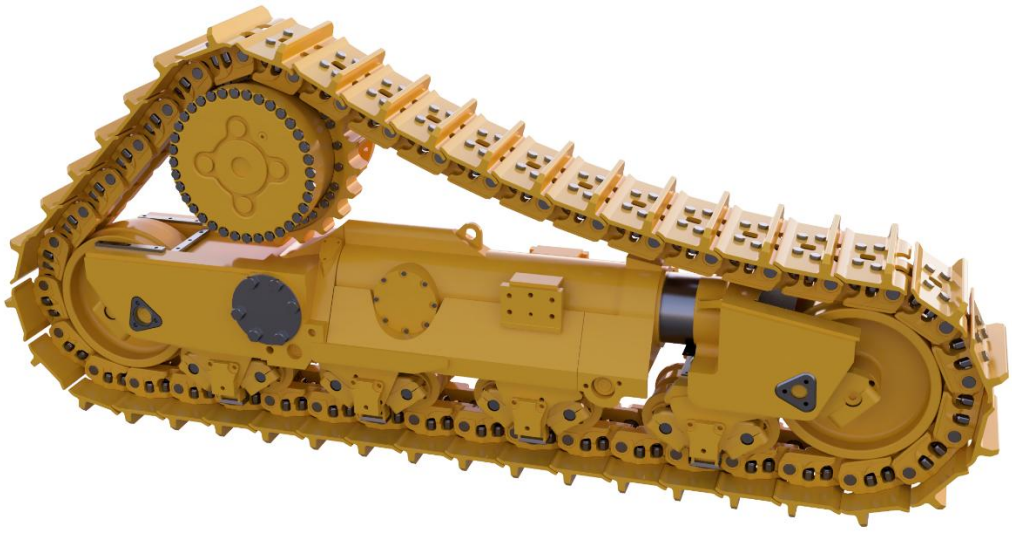
Elevated Sprocket Dozers

Undercarriage Inspection Guide

Undercarriage

Contents

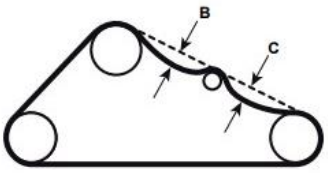
Orientation of Machine for reference to Track Rollers



Note: Position 1 Track Roller is closest to the front of the machine.

Track Sag

Track Sag with Carrier Roller



1 – Ensure machine is brought to a halt on a flat surface, without applying the brake.

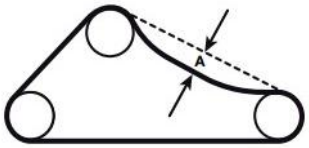
2 – Ensure no slack between sprocket and idler. If there is, move machine forward slightly.

3 – Hook a string under the shoe, over the front idler, and extend to hook over end of shoe as it curves over the sprocket.

4 – Measure distance between string and grouser on either side of the carrier roller.

5 – Add the lowest measurements together and divide by two to obtain the average.

Track Sag without Carrier Roller



1 – Ensure machine is brought to a halt on a flat surface, without applying the brake.

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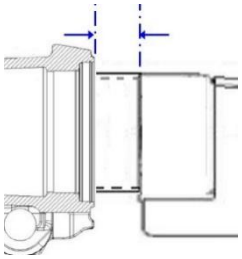
Cannon Extension



1 – Place the tape measure or ruler right up against the flange.

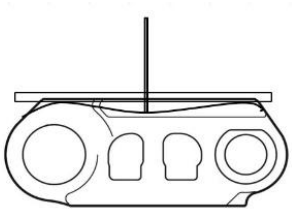
2 – Measure to the end of the chrome.

Scallop Measurement

1 – Place the depth gauge across the length of the link.

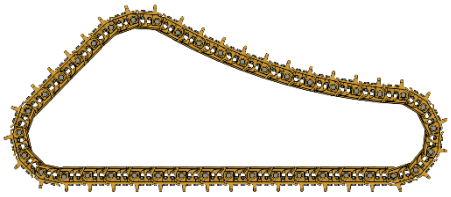
2 – Push the pin through the middle of the lowest point of wear of the link.

3 – Measure the length of the pin.



Number of Links

This is a count of the number of link in the chain. Commence from the master link moving in a clockwise direction around the chain.

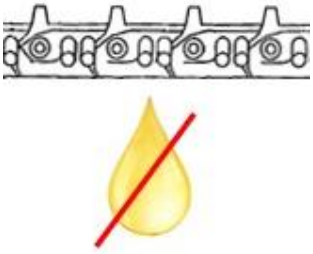


Identifying Dry Joints

1 – Using a temperature gun, hold it between 3-5cm away from the centre of a pin.

2 – Measure the temperature and continue onto the next pin, measuring all pins in the same way.

3 – Dry joints would be indicated by a pin which is 15 degrees or more than the average for the other pins, or the ambient temperature.



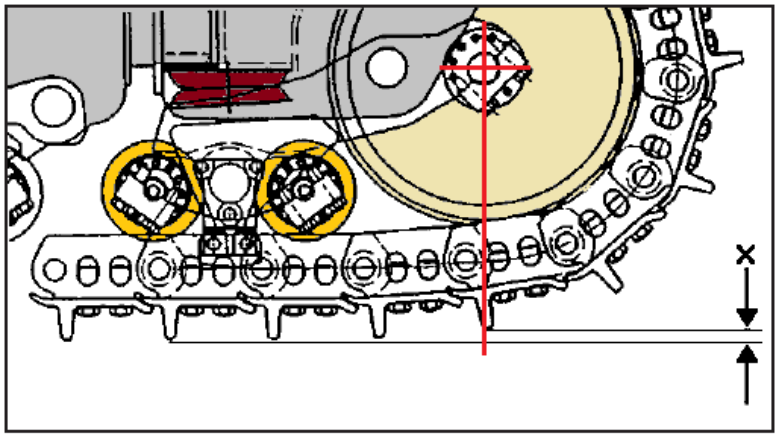
Idler Rise Height or Grouser Rise Height

Grouser rise height is the height of the shoe grouser tip above the ground when:

1 - The machine is on hard flat surface such as concrete, and…

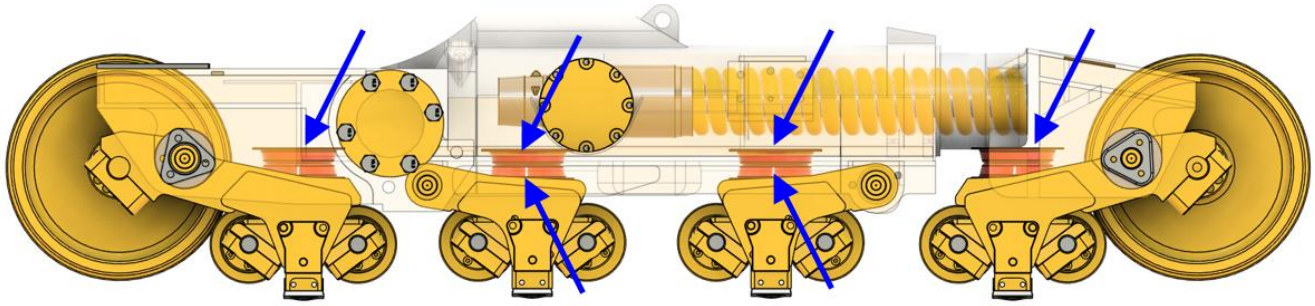
2 - The grouser is aligned directly under the center point of the idler or idler shaft.

3 - Where the grouser rise height is too low, this will cause the front/Rear idler to load the weight of the machine on the Grouser bar directly below the Idler.

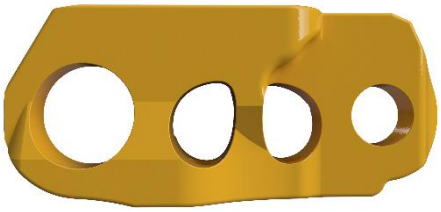


Measuring the number of Shims under each Bogie Bump Pad

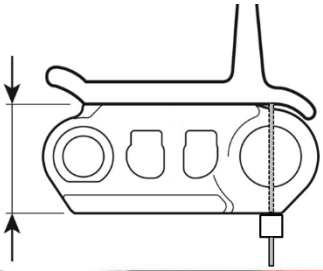
Check for each major Bogie and count the **number** of shims included under the bump pads. Record this number in each inspection.



Links

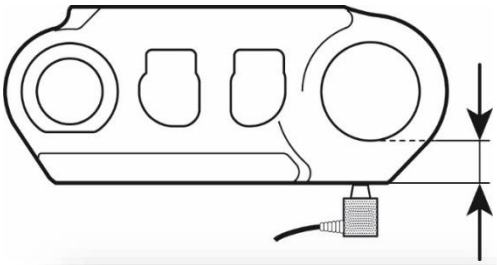


Measuring the Link with a Depth Gauge

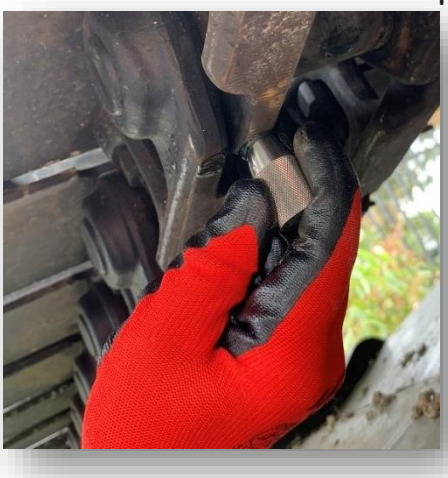


1. Make sure under surface on rail is clean.
2. Place the bar of the Depth Gauge on the rail in the position indicated. Push the pin all the way to the underside of the shoe just before the curvature of the shoe begins.
3. Measure the amount of material between the rail and the bush as shown in the following diagram.
4. Place the depth gauge on the bottom of the rail with pin passing directly through the centre of the bush and touching the under surface of the shoe.
5. Then measure the Pin length exposed using a ruler as demonstrated below.

Measuring Link with an Ultrasonic Probe



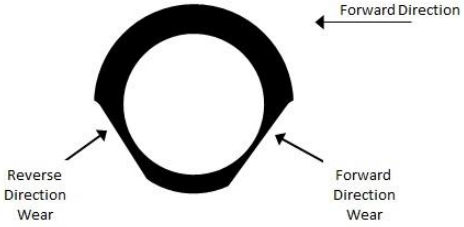
1. Make sure surface is clean of debris, paint, rust and dirt using a scrapper or wire brush.
2. Place a small amount of gel on the probe surface then place the probe in the centre of the link, using the centre of the bush as a guide.
3. To ensure correct measurement is taken, always measure on the inside of the link joins.
4. If the UT is not returning a reading, gently rotate the probe from left to right until reading is found.



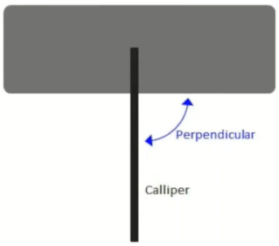
Bush

Bush with Callipers

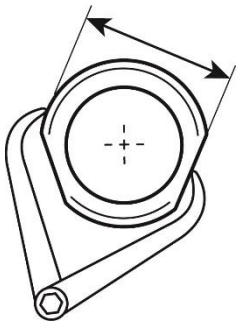
1 – Feel the bush with your hand to see if it has been turned. If it has been turned, a calliper cannot be used to measure the bush.



2 – The bush is worn on both sides from forward and reverse motions.



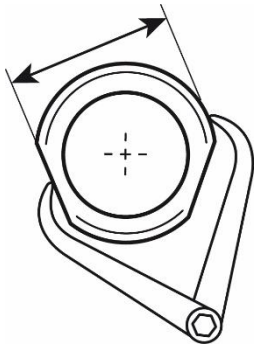
3 – Ensure the callipers are at 90° to the bush.



4 – Measure the forward wear surface, as per the diagram.

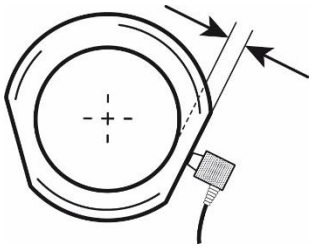
5 - Check the gap between the Caliper teeth with a ruler.

5 - Measure the reverse wear side. Check the measurement with a tape measure.



6 – Use the lowest value to calculate the percentage worn.

Bush with Ultrasonic Tool



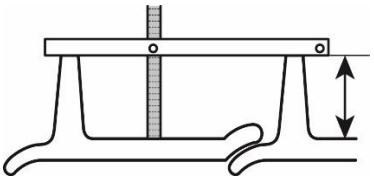
1 – Measure both sides of the bush with the ultrasonic tool.

2 – Test several points on both sides of the bush until you find the lowest reading.

3 - Use the lowest value to calculate the percentage worn.

Shoe

Shoe with Depth Gauge

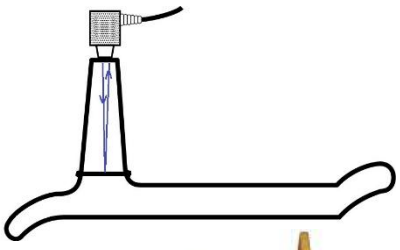


1 – Place the depth gauge across two flat shoes from grouser to grouser.

2 – Place the pin through the depth gauge to the top of shoe.

3 – Measure pin length with a tape measure.

Shoe with Ultrasonic Tool



1 – Check that the grouser bar has not been re-welded. If so, the ultrasonic tool cannot be used for this measurement. Use a depth gauge instead.

2 – Find the midpoint of the grouser bar.

3 – Find the midpoint between the edge and the middle of the grouser for the measurement.

4 – Place Couplant at this point on this point of the grouser bar.

5 – Measure the depth with the ultrasonic tool.

Idler Front and Rear

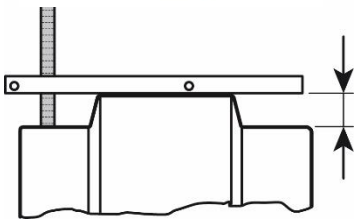
Idler with Depth Gauge

1 – Brush idler clean of debris.

2 – Lay depth gauge bar onto flat surface of the idler.

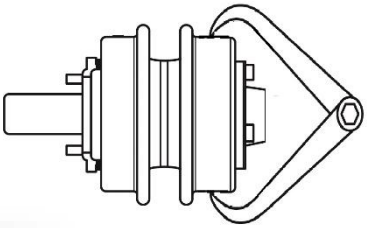
3 – Push pins down to the wear surface, ensure there is no riding.

4 – Measure each of the pins to obtain the average measurement.



Carrier Roller

Carrier Roller with Callipers

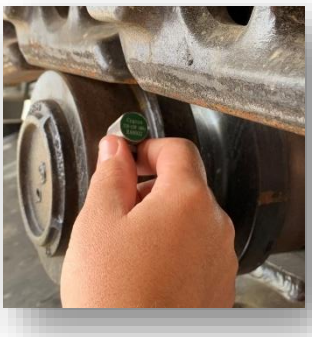


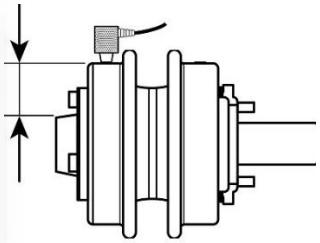
1 – Place callipers at right angle to the carrier roller.

2 – Find the lowest points of measurements with the tips of the callipers.

3 – Measure the gap in the Calliper using a ruler

Carrier Roller with Ultrasonic Tool





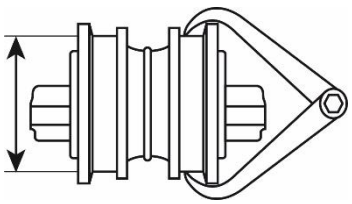
1 – Measure different points using the ultrasonic tool.

2 – Find and record the lowest reading.

3 – Ensure your measurement is not over a bolt hole.

Track Roller Measurement

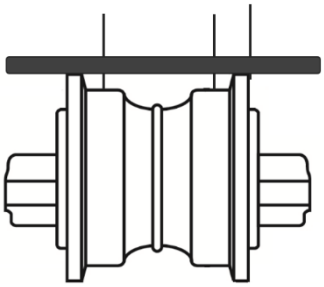
Track Roller with Callipers

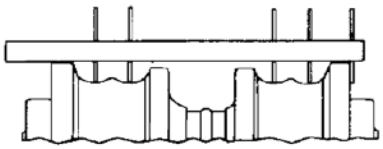


1 – Place callipers at right angle to the track roller.

2 – Find the lowest points of measurements with the tips of the callipers.

Track Roller with Depth Gauge



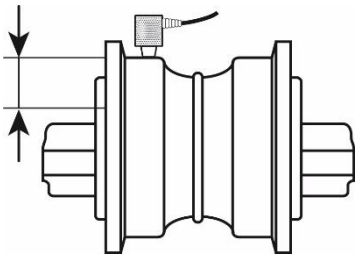


1 – Place depth gauge locating pin on rear of flange.

2 – Press pins down to roller tread surface.

3 – Measure length of each pin to get an average length.

Track Roller with Ultrasonic Tool

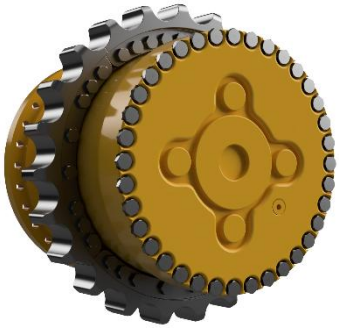


1 – Measure different points using the ultrasonic tool.

2 – Find and record the lowest reading.

3 – Ensure measurement is not over a bolt hole.

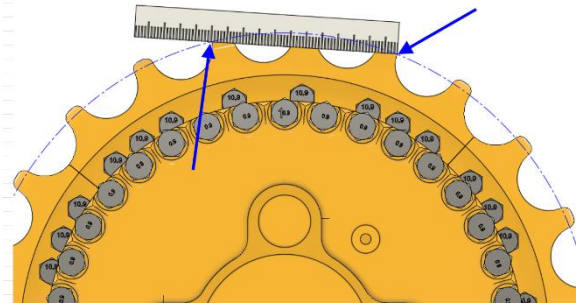
Sprocket

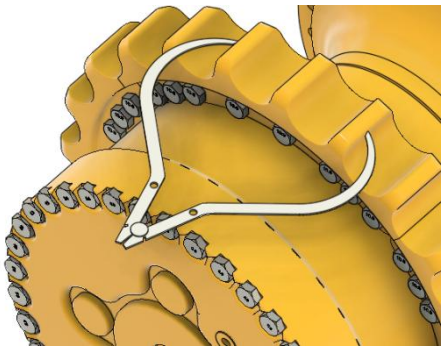


Measuring the Sprocket with a Ruler (caliper)

Sprockets are measured with a ruler across three teeth.

Measure from the forward drive side of a tooth to the Reverse Drive side of the tooth 3 teeth further away. Make sure the teeth are on the same segment





Cygnus Unit Quick Reference Guide

Selecting Bluetooth Low Energy

Fitting the batteries

1. The gauge requires 3 x AA/LR6/UM3 Batteries
2. You can locate the batteries behind a cover on the rear of the gauge.

3. The battery cover is removed by pressing in with your thumb at the base to release the clip.

Note: The gauge can be fitted with NiCad or NiMH rechargeable batteries but this may alter the specified operating time.

Measurement Modes

Although either of the 2 modes outlined below can be used, we have found that Single echo tends to perform better in the environment of Undercarriage measurement.

Multiple Echo

- Multiple Echo measurement mode is by far the most reliable and quickest method for thickness measurements.
- It works by looking for three matched echoes it can verify the thickness measurement is valid.

- Multiple echo mode will ignore surface coatings.
- However because it requires three echoes to take a measurement in heavily corroded steels there is often an insufficient number of echoes to take a measurement.
- Not normally used during inspections.

Single Echo

- Single Echo measurement mode is most useful on heavily corroded metals where Multiple Echo fails. Because it only needs the first return echo to take a measurement it performs well on virtually all steel conditions.
- Single echo mode will not ignore surface coatings.
- Single echo measurements use a twin element (twin crystal) probe, which require 'zeroing' at regular intervals especially if the ambient temperature is changing.

Because components on the undercarriage do not have surface coatings and are made of steel, this is the measurement mode that is used during inspections.

Gauge Controls

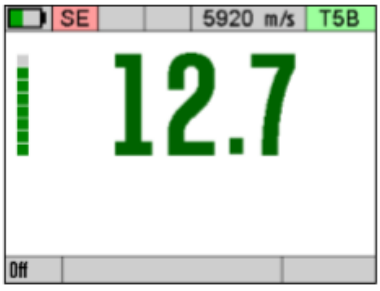
End view of gauge

Front view of gauge

Measurement Screen Views

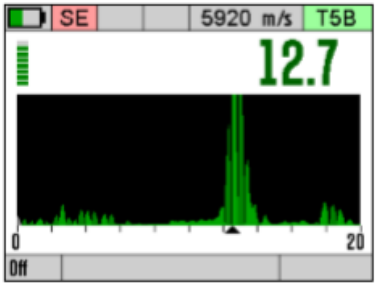
Basic Screen

Displays a large thickness measurement value.



A-Scan Screen

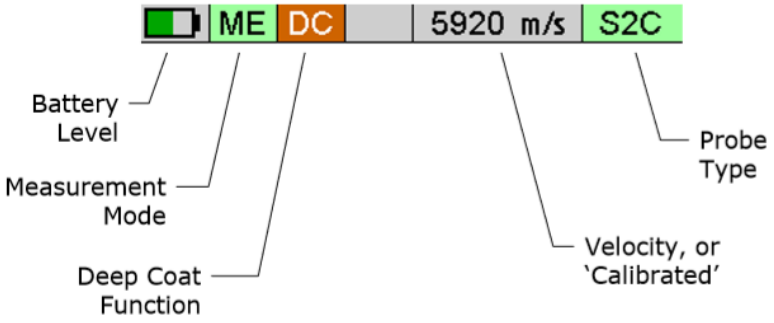
Displays the thickness measurement and a live A-Scan display of the ultrasound signals received.



Status Bar Summary

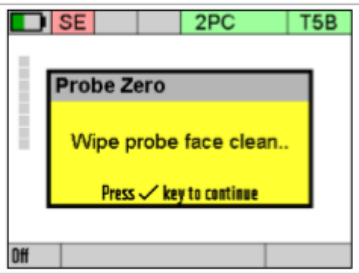
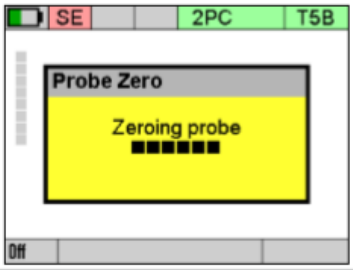
At the top of the display is an area that shows information about the gauge's status;

- Battery
- Measurement Mode - ME (Multiple Echo), SE (Single Echo), EE (Echo-Echo)
- Deep Coat Function
- Velocity of Sound Value/Calibration Status
- Probe Type (Background is green when connected and grey when disconnected)



Zero the Probe

Before you begin taking measurements you must first zero the probe.

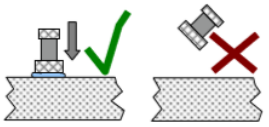
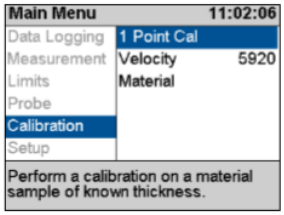
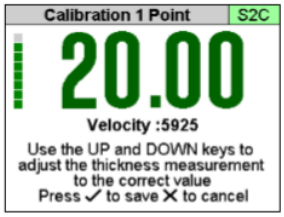
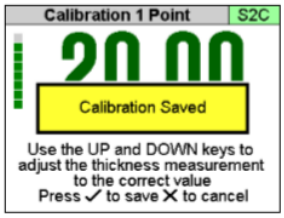
Display shows the Zero Probe message. **Important** - Wipe any couplant from the probe face	 
Press the OK/Select key to proceed The gauge measures the probe zero point... ..this takes about 2 seconds.	

Cygnus Tool Calibration

The Cygnus Ultrasonic tool should be calibrated before commencing an inspection on a piece of equipment.

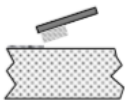
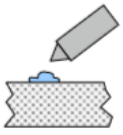
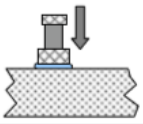
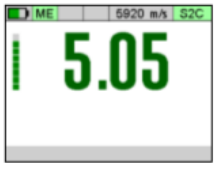
The calibration process is as follows:

1. Switch the Cygnus tool on and zero the probe.
2. Check at the top of the screen that the speed of sound in metal is set to 5890m/s
3. Using the standard gauge block, measure the block (15mm).
4. If the measurement is not 15mm displayed on the screen please perform the following steps:

Place the Probe on the sample and verify the gauge can get a thickness value.	
Access the Menu and scroll down to the 'Calibration' group. Then scroll right to the '1 Point Cal' item. Press the Ok/Select key to open the '1 Point Cal' function	
While holding the probe firmly on the sample and while a steady thickness measurement is displayed..	
...use the Up and Down keys to adjust the thickness to the required value.	
When done press the OK/Select key to save the calibration. A Calibration Saved message will be shown. Or press the X/Cancel key to exit without saving the calibration.	

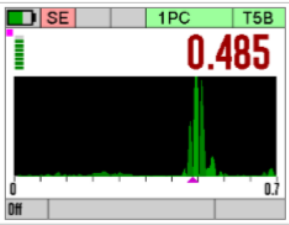
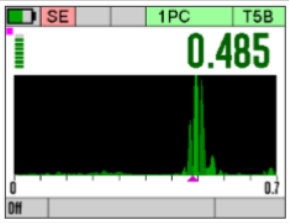
Taking thickness measurements

Taking ultrasonic thickness measurements is a straight forward process that involves first making sure the surface is clean and prepared, applying an ultrasonic couplant gel then placing the probe on the surface and observing the display for the measurement.

1.	Remove all scale, rust, dirt or loose coatings and brush the test area clean.	
2.	Apply ultrasonic couplant to the test surface.	
3.	Place the probe-face on the clean, lubricated test surface and make firm contact applying gentle pressure.	
4.	The gauge will display a thickness measurement. (Or an indication of Echo Strength if no valid measurement has been found in Multiple Echo mode).	

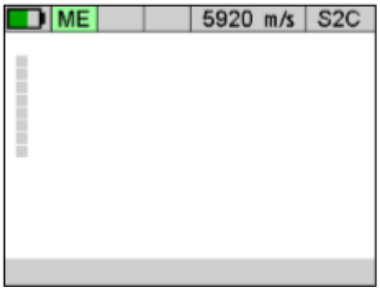
Measurement stability Indication

To help indicate when a Single Echo or Echo-Echo measurement is stable – and thus probably reliable – the gauge changes the thickness measurement number colour from Red to Green when the measurement has been stable for 2 consecutive seconds.

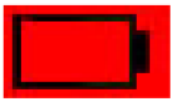
1.	Initial measurements will be displayed as red numbers.	
2.	If the measurement remains stable for 2 consecutive seconds then the measurement will change to green.	

Battery level

A battery level graphic is displayed at the top left position of the display



The gauge will periodically flash a red Low Battery warning sign when the batteries have approximately 1 hour of use remaining.

Low battery indication	

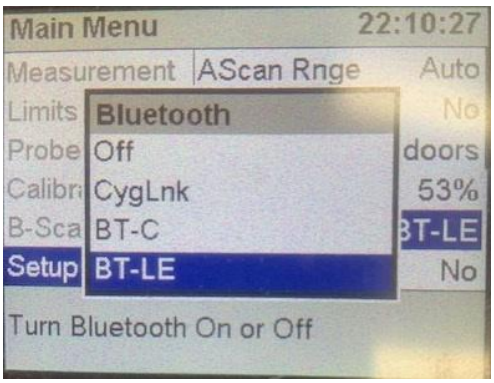
Switching Bluetooth On to communicate with TrackTreads Mobile App.

Press the menu button and

Select Setup

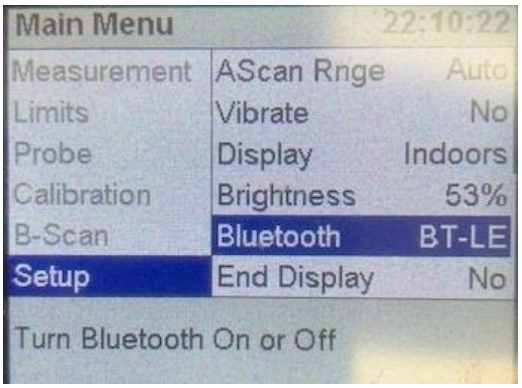
Navigate with Arrows to the right screen and select Bluetooth

Select the BLE (Blue Tooth Low Energy Mode which is the method of communicating with the Mobile App.



Turn on Vibrate Mode

Having the device vibrate when the ultrasonic signal is useful especially when the inspector is contorted under a machine trying to capture readings for Track Rollers. The vibration is quite audible, and the vibration can be felt easily. To switch on or off, select Setup from the Main Menu, then select Vibrate in the right hand menu



Troubleshooting

The Gauge will not switch on

- Are the batteries exhausted?
- Check the batteries are inserted correctly.

Difficulty obtaining a Reading

- Check that the Probe lead is properly connected to both Probe and Gauge.
- Check the gauge is set for the probe connected.
- Check the condition of the lead, replace if necessary.
- Check the Probe and its membrane are properly assembled (if a single element probe).
- On heavily corroded areas this is often a problem, try and take measurements in adjacent areas of the same material.
- Check the Gauge and Probe together on a test block, if there is still no reading the Gauge may require servicing.

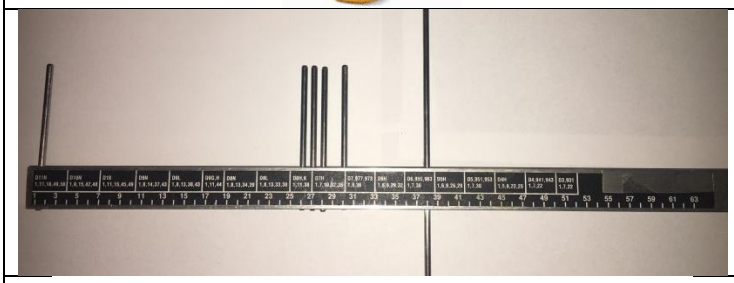
If Readings are Erratic or Unstable

- Check that the Probe-lead is properly connected to both Probe and Gauge.
- Check that the Probe and its membrane are correctly assembled with sufficient couplant between the probe face and membrane (if a single element probe).
- Check the Probe Type is suitable for the probable minimum thickness of the material being measured. Probe frequencies too low cause doubling and tripling of the actual thickness.

Tips for Optimising Battery Life

- Couplant left on the probe face will stop the gauge entering low power saving mode – so wipe couplant off the probe face between measurement sessions.
- Turning down the backlight brightness will extend battery life.
- Turn Bluetooth off if you are not using it.

Inspection Tool Kit Components

	150 mm Maxigear Outside Callipers
	300mm Maxigear Outside Callipers
	Fluke 64 Max Infra Red Thermometer
	Depth Gauge
	300 mm metal ruler
	5 Meter Tape Measure
	Wire Brush

	**Scraper**
	**String Line**
	**Cygnus Ultrasonic Tool and Probe with Cable**
	**Cleaning Cloth**
	**Safety Gloves**
	**Protective Case for Kit**