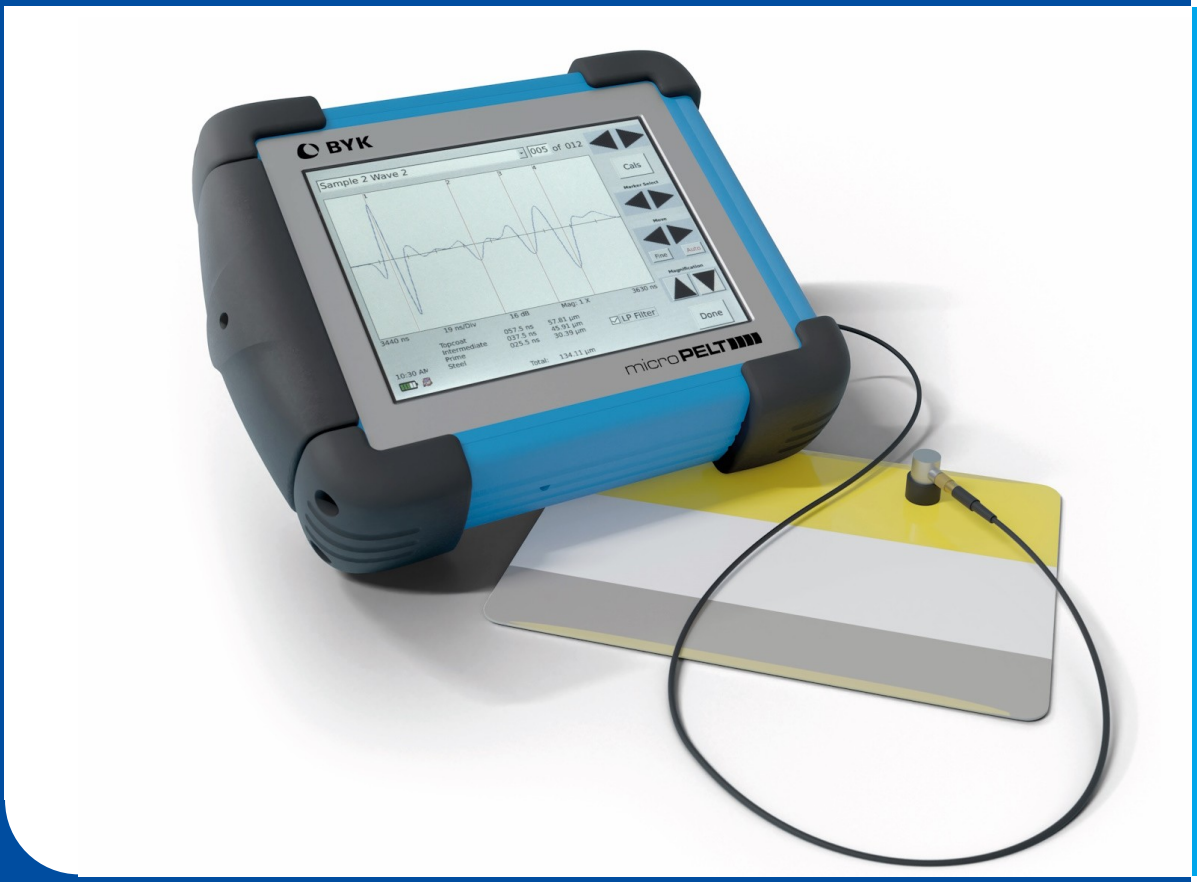
BYK



µPELT-ts Family

Multilayer Thickness Measurement

Operator Manual

A member of ALTANA

Table of Contents

1

Introduction

Dear customer,

Thank you for deciding to use a BYK-Gardner product. BYK-Gardner is committed to providing you with quality products and services. We offer complete system solutions to solve your problems in areas of color, appearance and physical properties. As the basis of our worldwide business, we strongly believe in total customer satisfaction.

Therefore, in addition to our products, we offer many VALUE-ADDED services:

- Technical Sales Force
- Technical and Application Support
- Application and Technical Seminars
- Repair and Certification Service

BYK-Gardner is part of ALTANA AG and a direct subsidiary of BYK, a leading supplier of additives for coatings and plastics. Together, we offer complete and unique solutions for you, our customer.

Thank you for your trust and confidence. If there is anything we can do better to serve your needs, do not hesitate to let us know.

Your BYK-Gardner Team

https://www.byk-instruments.com

1.1 Safety Advisories

For more safety information refer to the separate safety instructions along with the instrument.

DANGER: Injuries possible

Defects and extraordinary loads: If safe operation can no longer be presumed, shut down the device and secure it against unintended operation.

The device must be presumed unsafe to operate:

- If visible damage is evident,
- if the instrument is no longer working,
- if it has been stored for long periods under adverse conditions or
- after harsh treatment during shipping.

DANGER: Injuries possible

The µPELT-ts system is a portable device that can be easily carried anywhere. BYK-Gardner does not recommend using the system on a moving production line since you will not be able to focus on the moving assembly line and achieve reliable measurements at the same time. In the event that you do use the system on a moving production line, we recommend that you remove the neck strap and carrying case so that you minimize the risk of being caught on a moving part. Remember that the instrument can be repaired or replaced in a few days. The same may not be true for a person.

WARNING: Flammable liquids

The µPELT-ts system is designed for manufacturing, laboratory, and office use and should not be operated in environments with direct exposure to flammable substances. Examples of environments where the system should not be used: paint shop mix rooms, paint storage facilities, and paint shop application booths. In general, if you would not light a match in the area, you should not operate the µPELT-ts.

WARNING: Severe material damage

Only devices meeting the requirements for low voltage safety may be connected to the USB interface.

NOTICE: Intended use

Use the µPELT-ts instrumentation as directed by the manufacturer. If you do not use as directed, overall safety could potentially be compromised.

Additional information on disposal

Disused electrical equipment such as this instrument and its batteries must be professionally disposed. Do not dispose it in household garbage and make sure to observe the national law in your country.

1.2 Hardware Limited Warranty

BYK-Gardner warrants that the µPELT-ts instrumentation will be free from defects in materials and workmanship for a period of one year from the date of purchase with the exception of transducers, rechargeable battery packs, wear-caps, and connecting cables, which are under warranty for 90 days. BYK-Gardner will, at its option, repair or replace any of its products that prove to be defective during the warranty period without charge for parts and labor.

This warranty does not apply to any defect, failure, or damage caused by improper use, handling, care, or tampering. Examples include: damage to the finish, scratching of the display, and chipping or fractures in the face of the transducer. Neither will this warranty apply to any equipment damaged from attempts by personnel other than BYK-Gardner to repair or modify the product.

BYK-Gardner disclaims any warranty, either expressed or implied, as to the merchantability or fitness of its hardware, software, or services for a particular purpose or application. BYK-Gardner will not be liable for any indirect, incidental, or consequential damages, irrespective of whether BYK-Gardner received any advance notice of the possibility of such damages.

To obtain service under this warranty, the customer must contact BYK-Gardner to obtain a Return Material Authorization Number (RMA). Once the customer has obtained a number, they must ship the defective product to BYK-Gardner. The RMA number must be clearly marked on the outside of the package being returned. The customer is responsible for the costs associated with shipping, packaging, and insurance of the defective product.

BYK-Gardner owns all parts removed from repaired products. BYK-Gardner uses new and reconditioned parts, made by various manufacturers, in performing warranty repairs and building replacement products. If BYK-Gardner repairs or replaces a product, the warranty term is not extended.

1.3 Software Limited Warranty

BYK-Gardner warrants for a period of 120 days from the date of delivery, that under normal use, the media upon which this program is recorded is not defective and that the user documentation contains the information BYK-Gardner deems necessary to use the PELT Manager software. If during the 120 day warranty period, a demonstrable defect in the media or documentation should appear, BYK-Gardner will replace the software media with functionally equivalent software media within 30 days after BYK-Gardner has been notified of such a defect.

BYK-Gardner disclaims any warranty, either express or implied, as to the merchantability or fitness of the software for a particular purpose or application. BYK-Gardner shall not be liable for any indirect, incidental, or consequential damages irrespective of whether BYK-Gardner received any advance notice of the possibility of such damages.

1.4 License Agreement

The PELT® software (PELT Manager) is licensed by BYK-Gardner, to the original purchaser or lessee of the associated PELT instrument or system for their exclusive use in accord with the terms set forth below.

PELT Manager can be installed and run on any number of desktop, notebook, or laptop computers provided it is used only with data files that were created on PELT® gauges or created by PELT systems sold by BYK-Gardner.

The customer cannot:

- Provide copies of the installation or software on internet or over a network for access by users other than the gauge or system purchaser.
- Provide use of the software over a network except for accessing and saving files related to PELT Manager for use at the customer's local facility.
- Grant others a sub-license, lease, or other rights for the software.
- Make alterations in the software or reverse engineer, de-compile, or disassemble the software.
- Make copies of the software or any related documentation other than for the purpose of backup or use (as defined above).

BYK-Gardner reserves the right to terminate this license agreement following any non-compliance with the terms and conditions of this license agreement. In such an event, the customer must destroy all copies of the software product and its components.

1.5 Application Disclaimer

This product is not intended or designed for use in medical or other devices or systems where malfunction of this product can reasonably be expected to result in personal injury. BYK-Gardner customers using or selling this product for use in such applications do so at their own risk and agree to fully indemnify BYK-Gardner against any damages resulting from such improper use or sale.

1.6 Copyright Information

Specific properties and structural characteristics of the instrument are intellectual property of BYK-Gardner. The copyright of this manual remains with BYK-Gardner.

This document must not be reproduced fully or in party, published or used for any other competitive purposes, no matter whether against payment or not, without prior written authorization from BYK-Gardner.

BYK-Gardner reserves the right to update the instrument, software and written documentation without prior notice.

1.7 Delivery Content

Component	Part Number
Gauge model (*)	94000: µPELT-ts 3 (3 layers) 94002: µPELT-ts 3H (3 layers, high frequency) 94004: µPELT-ts 5 (5 layers) 94006: µPELT-ts 5+ (5 layers, high frequency)
Transportation case	94007
Transducer model (*)	9402x: Depending and gauge model and target thickness
FlexCap model (*)	9404x: Depending on transducer model
Coating calibration records (*)	Per color, on the gauge or by email
Glycerin couplant (2x)	94050
Trigger spray bottle for water	94052
Certified shim for monitoring (*)	9405x: Depending on transducer model
Calibration record for certified shim (*)	On blue USB flash drive
Guide wave for certified shim (*)	On blue USB flash drive
Certificate for certified shim (*)	On blue USB flash drive
Blue substrate plate for shim (*)	For testing with the shim
Transducer cable	94057
Rechargeable Li-Ion battery pack (2x)	94058
PC interface cable (Micro USB)	94059
Battery charger / power supply, 24 V	94060
External power supply for device, 5 V	94061
Hand strap full	94062
Hand strap half	94063
Neck strap	94064
Touch screen protective film (5x)	94073
Software smart-process	4831, with 2 licenses, for download
Software PELT Manager	For guide wave comparison, for download

(*) To be ordered separately - depending and gauge model and target thickness

2

System Description

BYK-Gardner PELT (Pulse/Echo Layer Thickness) gauges are nondestructive ultrasonic coating layer thickness measurement systems. All PELT gauges, including the touch-screen µPELT-ts, can measure multiple layers of coatings on both metallic and non-metallic substrates.

2.1 Terms and Conventions

µPELT-ts	Refers to the BYK-Gardner product line of touch-screen based, hand-held ultrasonic layer thickness measuring systems.
Auto-Gauge	The positioning of the markers in the waveform is done automatically based on the information in the guide wave for the current color calibration. Thickness results are shown immediately.
Auto-Next	After measuring a points (e.g. 001) the system advances automatically to the next measurement point (e.g 002). Use the the browse (arrow) buttons to navigate manually through all measurement.
Auto-Number	Mode where the gauge will automatically increment points as the operator captures waves. Jobs started in Auto-Number mode will start at point#1 and increment until the Done button is pressed, saving all captured waveform point data.
Auto-Shim	An automated process the gauge can complete to determine the best time delay setting to display the desired measurement and live waveform.
Averaging	A user feature that allows the system to collect and process multiple waveform to generate an enhanced wave image.
Batch job	A set of several measurement points grouped together as a single unit or file, usually because they are measurements made at several locations on a single large object such as an automobile body or fuselage.
Echo	The portion of a waveform that corresponds to an ultrasound reflection from a layer boundary.
Calibration	Calibration files (*.ca2) created for the specific coatings and substrates being measured. A single calibration file can include one or more calibration records. Each record is dedicated to a specific color. Calibration records are loaded onto the gauge from the host application, PELT Manager.
Capture	Temporarily saving the live waveform in gauge memory and incrementing to the next point. The waveform can also be re-captured replacing any waveform on an existing job file.
Delay (Start)	Identifies the beginning of the waveform display window. Adjusting the delay shifts the measurement window, causing the displayed waveform to move to the left or right.
Division	The measurement screen consists of 10 time divisions (Div) on the X-axis. A good waveform starts in the 2nd division. Increasing the timebase will show more nanoseconds (ns) per division (squeezing). Decreasing the timebase will show less nanoseconds per division (stretching).
Gain	Determines how much amplification is applied to the displayed waveform. Adjusting gain allows the peaks of the echoes in the displayed waveform to be increased or decreased in height.
Guide wave	The waveform given in a color calibration. It shows all echos for this color and the correct position of the markers. It can be printed using the PELT Manager - to be used as guide for positioning the markers on the gauge.

Guide list	The results of the auto-gauge algorithm can be enhanced by manually marking a measurement point and adding this point to the guide list. Auto-gauging will then be done using the guide wave and the point(s) added the the guide list.
Job file	All µPELT-ts measurement results (single point and batch jobs) are saved in non-volatile memory as job files.
Low-Pass Filter	A component of signal processing that suppresses signals above a certain frequency threshold, called the 'cutoff'.
Magnification	Enhances the gain feature by digitally enlarging the displayed waveform.
Marker select	Selects current active marker, appearing as a dotted line.
Mark	The process of displaying previously recorded waveform and positioning the markers (gates) at the proper echo locations. This process determines the actual layer thicknesses.

Panel file	A text file (*.pnl) created on the host computer than loaded onto the gauge. The panel file can be used to establish a new job with the number of points and point location names. This detail is displayed on the gauge to assist the operator.
H Pulser	The "High-Energy / Low Frequency" pulser/receiver feature, if so equipped. This may be desirable for measuring thicker or more absorptive materials. Selecting H Pulser in system settings can destroy a U pulser, if still connected.
U Pulser	The "High-Frequency / Low Energy" pulser/receiver feature, if so equipped. This is desirable for measuring thinner layers. Selecting the U-Pulser in system settings may be insufficient when using a high energy or low frequency transducer.
PELT Manager	The application on the host computer used for data transfer and analysis.
Reading Order Sequence (ROS)	A sequence file created on the gauge from an existing job file. The ROS file will utilize the length, point detail, and calibrations from the original file to establish a new job.
Recording	The process of applying ultrasound pulses to a sample, or displaying and saving the resulting live waveform.
Stable waveform	An optimum measurement waveform is one that shifts very little to the left or right (< 20% of the space between tick marks on the graph). Small shifts up and down of the waveform peaks (10%) are normal.
Transducer	The small ultrasonic sensor held by the operator and placed in contact with the film build to be measured. The transducer converts an electrical pulse into a high frequency sound wave sent into a film build. The transducer then converts the sound waves reflected by layer boundaries into weak electrical signals to be analyzed by the µPELT-ts gauge.
Timebase	Allows the displayed time to be increased or decreased, in effect squeezing or stretching the waveform in the long direction of the display.
waveform	The amplitude vs. time display of the µPELT-ts transducer output.

2.2 Software Installation

Software version used to create this documentation:

Gauge firmware: 1.3.808

PELT Manager: 1.0.53

smart-process: 10.2.2.800

The installation comprises following steps:

Download the software package

The software can be downloaded from our website:

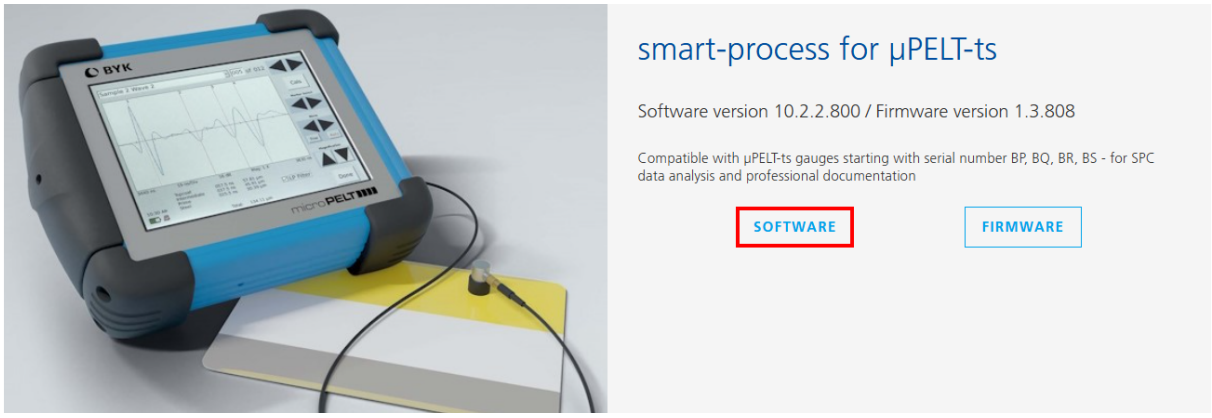
- https://www.byk-instruments.com/de/support/download/software

Software package for PELT Manager as standalone

If you want to use the PELT manager only, you can download the standalone version. It is compatible with **all** µPELT-ts gauges.

Software package for smart-process with PELT Manager

We recommend to download and install the package with smart-chart, if supported. It is compatible with all µPELT-ts gauges **starting with serial number BP, BQ, BR, BS**.



Install PELT Manager as standalone

The software must be installed by a user with administrator privileges. The installer will create the PELT data directories and install the drivers needed to communicate with the µPELT-ts series of gauges. Once installed, users with standard user privileges can then use PELT Manager.

The PELT working directory defaults to "C:\PELTData" (see also below) so it can be shared by several users. A different working directory can be selected during the installation process if required. The administrator performing the installation should ensure the PELT directories and files can be read, written, and modified by all users who will be using the PELT system.

1. Extract the downloaded ZIP file to a local directory.
2. Right-mouse click on “setup.exe” and select option “Run as administrator”.
3. Continue through the PELT Manager installation wizard until completed.
4. After the wizard installs PELT Manager, it will ask to install the driver for the µPELT-ts, called the RNDIS' driver. Continue through the wizard to install the driver.
5. Continue until complete, following the directions displayed.
6. If the installation stops for any reason, starting again later and reinstalling some or all of the needed software components will not cause any issues and should proceed successfully.

A new desktop icon and start menu entry for PELT Manager will be in place after installation.

The PELT user manuals will be accessible from the "PELT" start menu or from the installation folder "C:\Program Files (x86)\PELT\PELTManager".

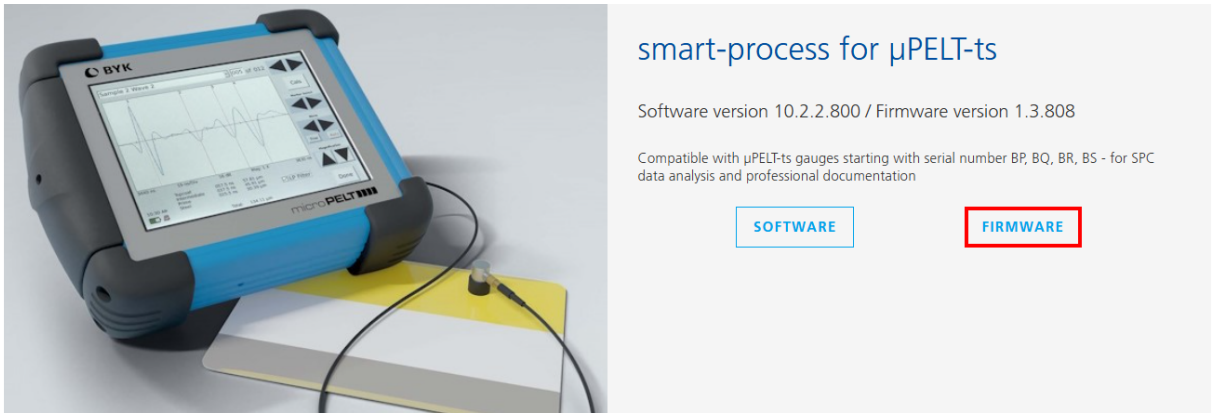
Install smart-chart with PELT Manager

The software must be installed by a user with administrator privileges.

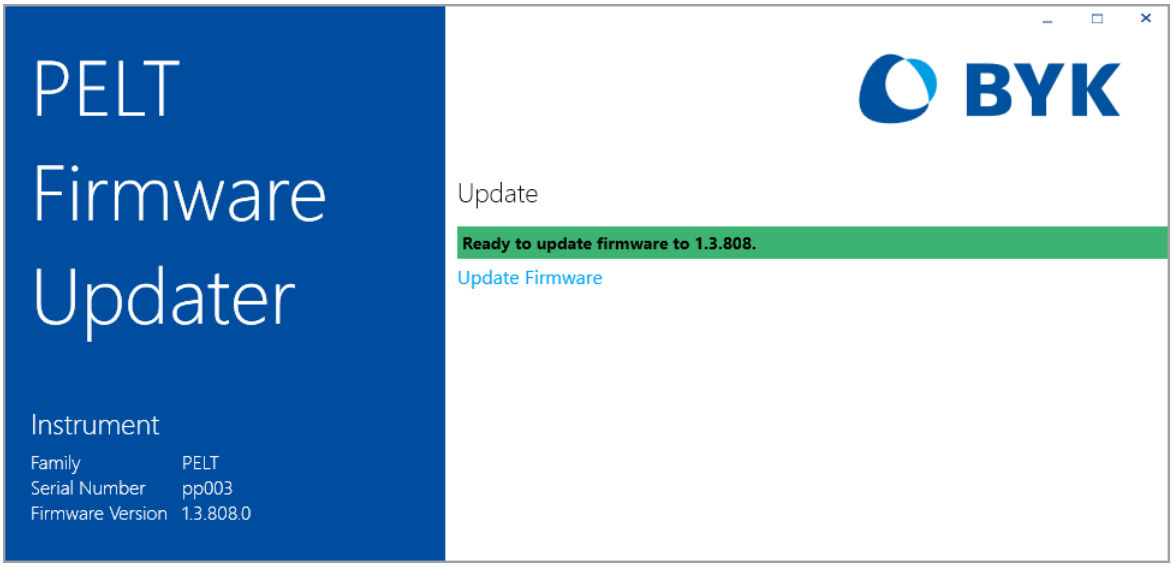
1. Extract the downloaded ZIP file to a local directory.
2. Right-mouse click on “setup.exe” and select option “Run as administrator”.
3. Follow the setup instructions on the screen.
4. A new desktop icon and start menu entry for smart-chart will be in place after installation.
5. In a 2nd step the PELT Manager installation will take place, refer section Install PELT Manager as standalone 15 for details.
6. Continue through the PELT Manager including drivers installation until completed.

Upgrade the PELT gauge firmware

The µPELT-ts series of gauges support field upgrades of internal firmware. The required update program can also be download from our website.



The update provided here is a stand-alone version - just execute the upgrade program in the ZIP container.



The upgrade program will check the firmware version installed on the gauge. Click the green line to start the upgrade and follow the instructions on the screen, including reboot.

The firmware can also be managed from PELT Manager. This requires the proper upgrade file (+.iua). For details refer to PELT Manager software manual.

Check the PELT working directory

Default working directory is “C:\PELTData\”; following sub-folders are created here:

- **Cal**: Color calibration files (*.ca2)
- **Job**: Measurement data (*.wv3)
- **Log**: Application log files (LOG)

Optional you can create following folder:

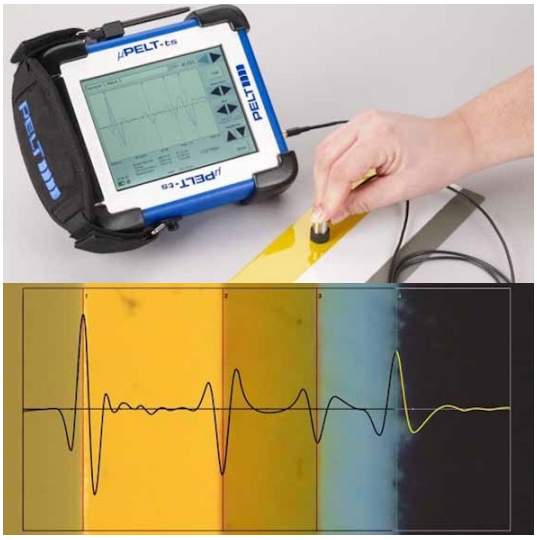
- **Pnl**: Template panel files (*.pnl)

It is advised to become familiar with these folders.

2.3 Theory of Operation

PELT provides a non-destructive measurement solution for multi-layer film thicknesses all within a single measurement. PELT gauges are essentially acoustic microscopes. Very high frequency ultra-short pulses of ultrasound are used to resolve and measure layer coating thickness.

PELT gauges are the highest resolving power ultrasonic thickness gauge on the market. This is achieved via a combination of unique high frequency transducer technology and high frequency ultrasonics.



Overview

The µPELT-ts performs a thickness measurement by applying a very short, high frequency acoustic pulse to the sample being measured. As the acoustic pulse propagates through the coating layers, a portion of the acoustic energy reflects off the layer boundaries. The thickness and acoustic properties of the individual coating layers determine the relative timing of the echoes. The operator uses the µPELT-ts to determine the relative timing, and the gauge combines this information with calibrated sound velocities for each coating material to compute the thickness of each layer.

The µPELT-ts uses an ultrasonic transducer to generate the acoustic pulse. The transducer contacts the sample being measured so that an appreciable portion of the pulse energy is transmitted into the sample coating layers. After the µPELT-ts transducer emits the pulse into the sample being measured, the transducer then converts the received echo reflections into electrical signals for analysis. The µPELT-ts displays a graph of the reflected echo signal amplitude versus time, known as the ‘ waveform’.

Signal to Noise Ratio (SNR)

Even when the transducer is not in contact with a measurement sample, the µPELT-ts waveform display will show some small fluctuations above and below zero axis, or background noise. Noise can be minimized, but never eliminated entirely.

It is customary to characterize signal amplitudes in terms of their ratio to the average background noise level, the ‘signal-to-noise ratio’ or SNR. In order to be used in gauging, the echo amplitude must exceed the background noise level by enough to make its presence and location unmistakable. For example, if the signal-to-noise ratio is 1:1, it is not possible to distinguish the signal from the background noise. In practice, echo strengths depend upon the characteristics of the materials being measured. It is not unusual for the µPELT-ts to achieve signal-to-noise ratios ranging from 2:1 to 10:1 or higher.

Acoustic Contrast

The amplitude of an echo from the interface between layers of different materials is proportional to the difference in the acoustic properties of the materials ('acoustic contrast'). In order for the boundary between two materials to produce an echo having a large enough signal-to-noise ratio to be used in gauging; there must be adequate acoustic contrast between the materials. A layer of sufficient thickness can be gauged providing that there is sufficient acoustic contrast between it and the adjacent layers. There are, however, some pairs of coatings whose acoustic properties are not sufficiently dissimilar to provide adequate contrast. When the contrast between two adjacent layers is too weak to indicate the boundary between the layers, then the µPELT-ts can be used to measure the total thickness of the two layers.

Minimum Thickness Resolution

To be discernible, a coating must have a minimum thickness. The lower limit on coating thickness is determined primarily by the center frequency and damping characteristics of the ultrasonic transducer and the velocity of sound in the layer being gauged. As an individual layer becomes thinner, the successive echoes that define the layer's thickness move closer and closer together until they begin to overlap. Once the overlap exceeds 50%, the individual echoes cannot be distinguished, and the layer thickness cannot be determined. Please reference the appropriate µPELT-ts model specifications sheet for minimum thickness resolution.

Calibrations

The µPELT-ts uses calibration information to convert time measured to a unit of thickness typically displayed in mils or microns. Calibrations are most often prepared by BYK-Gardner for each customer and require routine updates. Detailed information about calibration services and best practices for maintaining accurate calibrations can be obtained through your Technical Service Representative.

2.4 User Documentation

The following documents are provided for the instrument:

1. 403 200 002: Safety Instructions µPELT-ts
2. 403 200 003: Short Instructions µPELT-ts
3. 403 200 004: Operator Manual µPELT-ts
4. 403 200 005: Software Manual µPELT-ts
5. 403 200 006: Guideline for smart-process

You can download these documents from our website:

- www.byk-instruments.com/global-search/94000

The download details can also be found on the back-page of each document.

3

Getting Started

3.1 Using the µPELT-ts Battery

The µPELT-ts is a battery-powered device. The removable battery is seated in the case and held in place by the battery access door on the bottom of the unit. The battery can be recharged inside the unit by plugging in the proper power supply. Charging is automatic and will commence as soon as the powered wall adapter is plugged into the unit. Batteries can also be charged outside the unit in the desktop battery charger.

WARNING

Only batteries and power supplies approved by BYK-Gardner may be used with the µPELT-ts. Use of unapproved batteries or power supplies will void the warranty and may damage the µPELT-ts.

3.1.1 Inserting the Battery

To insert the battery:

- Power off the unit and remove the wall adapter if connected.
- Unlatch the battery door using flat-head screwdriver twisting 1/4 turn counter clockwise.
- Once unlatched, the door will pop up away from the unit and can be removed.
- Remove or replace the battery into the case, carefully matching the connector inside the unit. Take care to fold the plastic handling tab into the gauge along the back edge of the battery.
- Replace the battery door and lock the latch, turning 1/4 turn clockwise.

The following image shows the back of the µPELT-ts gauge where the battery door is located.

1	Battery door latch
2	Removed battery with handling tab

The µPELT-ts gauge charges the battery when powered with the external power supply.

3.1.2 Input/Output Panel

On the side of the gauge the I/O panel is located.

1	Connector for external power supply
2	On/Off switch (*)
3	Port for USB connection to the host PC
4	Connector for the measurement cable

(*) The **On/Off** switch controls power to the µPELT-ts gauge. It is important to power off the unit when not in use if the battery is left inside the gauge. When the switch is in the **OFF** position, the gauge will not drain power from the battery. The automatic power save features can make the gauge appear powered off but continue to drain power from the battery. Battery life is reduced any time the gauge is not powered off. As long as the **On/Off** switch LED is lighted, the gauge is turned on.

NOTICE

Always return to the main screen before turning the gauge off.

3.1.3 Sleep Modes

The system will enter multiple sleep modes automatically. The display may dim or go dark after a few minutes of inactivity. Tapping anywhere on the touch screen display will wake the system and brighten the display. While in sleep modes the system continues to consume power and will eventually drain the battery. The system will not enter full sleep mode if a live waveform is displayed on the screen. Do not turn the unit OFF during live capture as this will result in the loss of working waveforms and thickness data. Always verify your working data is stored properly by returning to the Job Start Screen before powering OFF the unit. Press the touch screen LCD to wake the unit, stop any live capture by tapping **DONE**, and tap **Yes** to save your data and return to the Job Start Screen (or NO if you do not want to save data). You can then power OFF the gauge safely.

3.1.4 Desktop Charger

Batteries are not shipped fully charged. Batteries may need charging before use.

WARNING

The desktop battery charger should only be plugged into the power cord and power supply included with the battery charger. The µPELT-ts system power supply WILL NOT power the desktop battery charger, nor can the battery charger supply be used to power the µPELT-ts gauge.

The µPELT-ts batteries can be charged with the external desktop charger kit included. The charger will charge a fully drained battery in approximately 8 hours. The µPELT-ts batteries do not suffer from any 'memory effect', however their life is prolonged if complete discharge-charge cycles are maintained as often as possible. Battery life on a new battery will improve after the first 4 to 6 full discharge/charge cycles.

The charger is a 'smart' device, and will not over or under charge the batteries if left to complete the cycle. The batteries will not be damaged when left in the charger longer than the required charge time. An unused battery can remain in the charger until needed. Full charge is indicated by a solid green LED on the charger unit. For details refer to the battery charger manual, available for download on our website.

Batteries included with the µPELT-ts have a fuel gauge feature:

- 5 dark square blocks on the LCD at the pull tab side of the battery indicate full charge.
- 4 darkened blocks indicate 4/5 (80%) charge.
- 3 darkened square blocks indicate 3/5 charge, etc.

Charge the battery before operation if needed. Battery charge is indicated similarly on the gauge screens.

Only the included desktop battery charger or the gauge's internal battery charger can be used on the µPELT-ts batteries. Use of an unapproved charger will void the warranty and may damage the gauge or batteries.

3.1.5 Internal Charger

The gauge will automatically charge an installed battery as soon as the gauge is connected to the DC power supply. Internal charging will take approximately 10 hours for a fully discharged battery and will continue with the gauge powered ON or OFF. You can continue to use the gauge for waveform measurement, waveform marking, or host file transfer while charging from a connected DC power supply.

The battery is NOT charged through a USB connection. Simply connecting the gauge to the host computer USB port will not charge the internal battery.

WARNING

The µPELT-ts unit must only be plugged into the power cord and power supply included. Do NOT connect the µPELT-ts to the battery charger power supply or power cords, or any other unapproved wall supply.

3.1.6 Battery Life

µPELT-ts batteries will support approximately 500 charge/discharge cycles. After that the battery performance will degrade. The batteries are 'smart' devices that communicate performance information to the battery charger and the PELT gauge. If the battery electronics become damaged, the battery will not charge. If this situation occurs, please call your BYK-Gardner technical service representative for more details. Batteries do not have a long shelf life. If a battery is stored for long periods it may need recharging to regain full capacity.

3.1.7 Date/Time Backup

The time and date are maintained with separate battery backup. The time and date will be stored in an un-powered gauge for approximately 60 days. The time and date battery is recharged any time the PELT gauge is turned on.

3.1.8 Battery Performance

Best battery performance is achieved by allowing the battery to run through complete charge and discharge cycles. When the gauge is not in use, it should be powered OFF. Do not leave the µPELT-ts in live capture mode (displaying a live waveform) when it is not being used for measurement. Power management is reduced in live waveform mode, shortening battery life. Do not expose the battery to temperature extremes or any liquids.

Temperature range (see also Technical Data 66):

- Battery operation temperature: 10 °C - 40 °C
- Battery storage temperature: -10 °C - 50 °C

3.2 Wrist and Neck Straps

The gauge kit includes a number of straps that are easily configured to make your capture as convenient as possible. There are three attachment points on the gauge that support the half hand strap, a full hand strap, and a neck strap.

The gauge is shipped with the half strap installed as shown.

3.2.1 Full Strap

The full strap is placed across the entire hand grip, and is fastened from one side loop on the gauge to the other.

3.2.2 Half Strap

The half strap has a hook and loop end that is placed through one side loop of choice. The other end is mounted to the center of the Hand Grip with a shoulder screw.

3.2.3 Neck Strap

The neck strap is simply clipped to the side loops allowing the gauge to hang when not in use. The strap can be attached to either side loop as desired.

3.2.4 Straps Configuration

Changing from half strap to the full strap requires use of a a 2.5 mm hex head tool to remove a fastener as described below.

3.2.5 Changing Half to Full

Use the wrench to remove a fastener as described below:

1. Remove the shoulder screw on the hand grip that secures the half strap in place. Press the hex wrench through the soft coating that covers the shoulder screw. This coating hides the hex head socket.
2. Do not replace the shoulder screw back into the hand grip, but do NOT misplace. It will be needed again when re-mounting the half strap.
3. Remove the hook and loop end of the half strap and slide through the side loop on the gauge.
4. Feed each hook and loop end of the full strap through one of the side loops. The strap must be stretched to reach through the loops, and is different material than the other straps.

WARNING

If the gauge is used without the full hand strap in place, the shoulder screw must be fastened through the hand grip as described above. The hand grip is only held securely to the gauge with the shoulder screw. Holding the gauge by the hand grip without the shoulder screw tightly installed may cause the grip to pull off, allowing the operator to drop and damage the gauge.

4

System Operation

Gather all the items needed to collect ultrasonic waveforms including shims, FlexCaps, couplant, and guide waves. Verify that the µPELT-ts battery has adequate power for the desired operation. Additional items may include measurement location templates, spare batteries or the wall adapter for lengthy file recording and transfer to the host computer.

4.1 Software Introduction

Before you can use your gauge you have to install the application software PELT Manager on your PC. The application is used to transfer the required files to the gauge and the measurement results to the PC.

Data Records and Storage

PELT data records are stored in non-volatile memory, provided the operator completes the required SAVE operation after capturing waveform points. Once saved, records will not be lost even if power is removed or the battery is discharged on the µPELT-ts.

Approximately 1000 PELT records can be stored without stopping, although storing this many files may cause the gauge start-up to take longer. This number depends on the total number of files stored in memory. For example, storing more calibration records or panel files reduces the available memory for waveform data files.

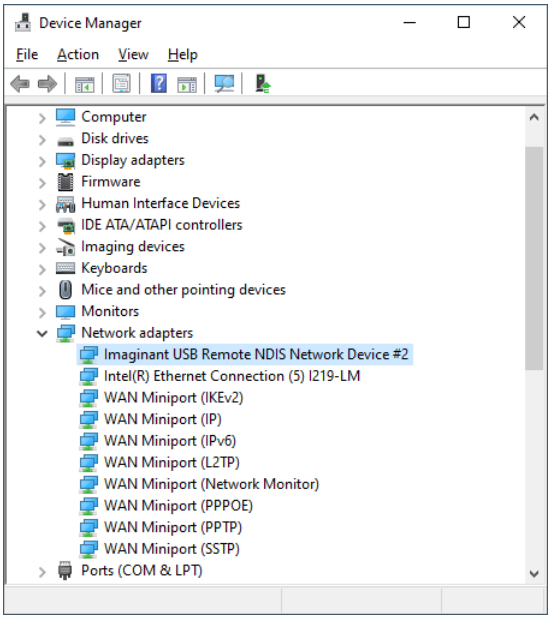
NOTICE

After capturing large data files (hundreds of points), files should be transferred to the host PC and deleted from the µPELT-ts gauge. The files should be transferred after 500 - 1000 combined readings (across all saved jobs) to ensure the gauge remains responsive.

Host Computer / PC Application

Moving files on to and off of the µPELT-ts gauge is done using the host computer. PELT Manager is the application used to transfer files to and from a gauge, review files, and mark waveforms on a Windows host computer. PELT Manager contains the tools required to manage all µPELT-ts model gauges and files needed for measurement. These include waveform files, calibration records, panel files, and Reading Order Sequence files.

When the gauge is connected to the host computer, it is denoted in the Windows Device manager as "Imaginant USB Remote NDIS Network Device".



NOTICE

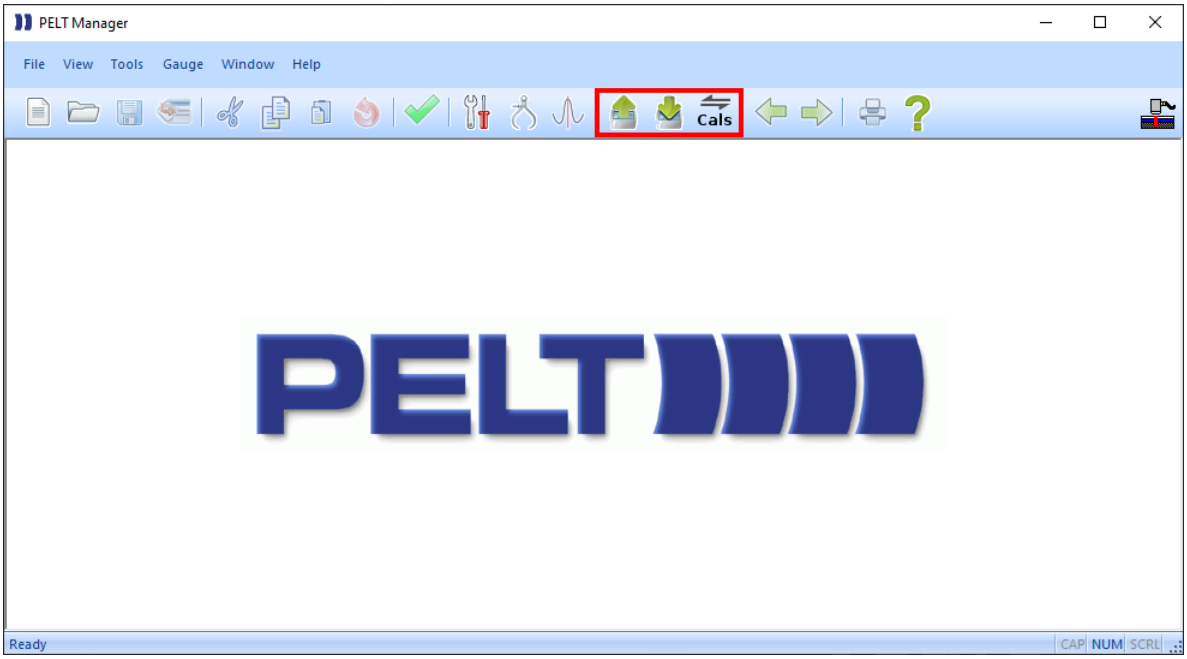
Only ONE gauge can be connected to the host computer at any time.

File and Data Management

Finished job files are usually transferred to the host PC for additional processing. It is also possible to transfer such a file back to the gauge agian, e.g. for repeating a measurement.

Transferring Files

Use the following icons to transfer files between PC and gauge.



The details for installation and operation can be found in the PELT manager user manual. The following functions are most important to start.

Cals	**Transfer Calibration Records to/from Gauge**: Open a calibration file (*.ca2) and, selected records and send them to the gauge.
	Export Files to µPELT Gauge: Send job files (*.wv3) or panel files (*.pnl) to the gauge.
	Import Files from µPELT Gauge: Receive job files (*.wv3) from the gauge. Can also be used to delete files from the gauge.

NOTICE

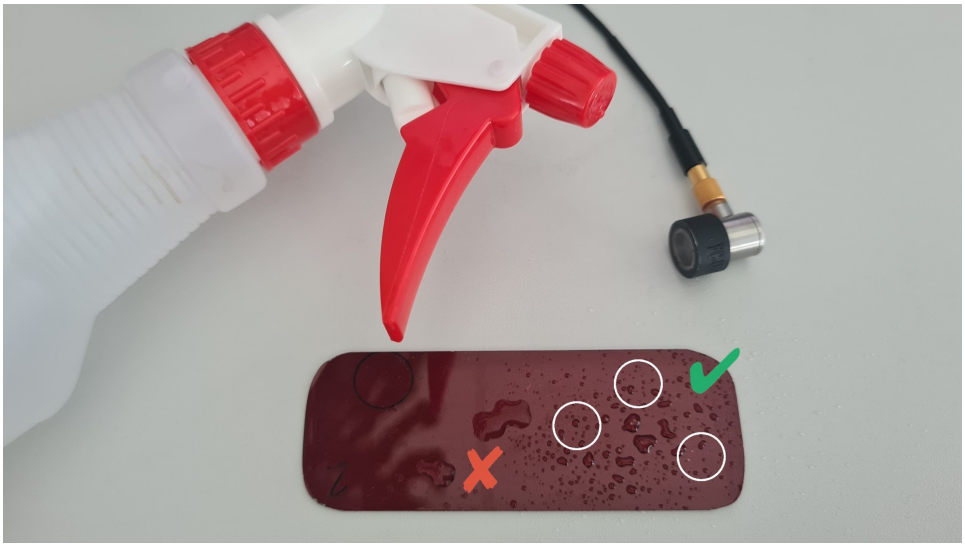
Use **Transfer Calibration Records** to send the required color calibrations to the gauge before you start working with your gauge.

4.2 Transducer Coupling

The µPELT-ts system is a contact measuring system. The ultrasonic probe is placed in contact with the component to be measured. An acoustic couplant is used to facilitate the transmission of the ultrasonic pulse into the coating material. Common couplants include glycerin or water. The most common coupling solution places a drop of glycerin inside the FlexCap and water on the part to be measured.

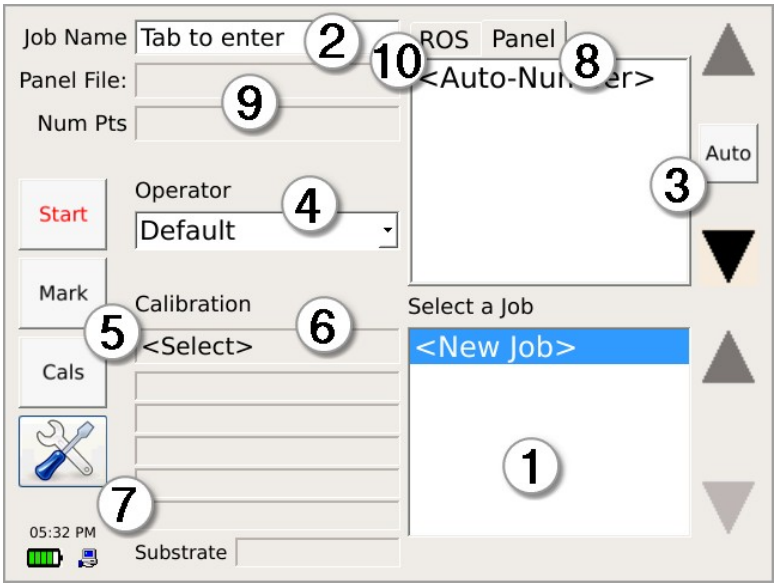
To assemble the transducer:

1. Apply a small drop of glycerin to the face of the transducer.
2. Place the FlexCap snugly on the head of the transducer.
3. Make sure that no air bubbles are inside, repeat the procedure, if necessary.
4. Attach the transducer with the measurement cable to the SMA port on the gauge.
5. Wet the part near the desired measurement location with water, spraying sparsely:
   - Green check mark: A list mist of water on the surface is OK.
   - Red cross: To much water on the surface is not OK.
   - White circle: Denotes a possible measurement location.
6. Start to measure and capture desired points of interest.



4.3 The Main Screen

The main screen is displayed once the gauge is powered on. All setup and measurement sessions are started from this screen. Starting new jobs, continuing partial jobs, and marking jobs will be done from here.



New jobs started with the **<Auto-Number>** feature will automatically increment as you capture new points until you stop and save the job.

A **Panel** file can be used to establish a new job with predetermined point location names, refer Using Panel Files 49 .

A **Read Order Sequence (ROS)** job file can be used to configure a new job based on a previous job point names and calibration selection, refer Using ROS Files 51 .

NOTICE

Menu screens may vary slightly on different gauge models and appear different than those shown below. The functionality remains unchanged despite the different graphic display.

The elements in the main screen have the following meaning.

1	**Select a Job**: Re-open an existing job to measure or for marking, or create a new job.
2	**Job Name**: Current job. New jobs are based on time stamp, tap to change the name.
3	**Auto** button: Activates both options **<New Job>** and **<Auto-Number>**.
4	**Operator**: Select an operator from the list. The name of the operator is recorded in the job file when measurement is complete.
5	Button list: • **Tools**: Check and change current system settings. • **Cals**: Select color calibration record for measurement. • **Start**: Start a measurement and write results into job file. • **Mark**: Place the layer markers to see the thickness results.
6	**Calibration**: Selected calibration record, tap the **Cals** button to change.
7	**System info**: • System time, see System Settings 57 > Date / Time 61 . • Battery status, indicates the remaining charge of the battery. Segments will blink green when the battery is being charged with the attached µPELT-ts power supply. A single blinking red indicates the battery is fully discharged and the gauge will turn off shortly. • PC connection, indicates the gauge is or is not connected to the host computer.
8	**Panel**: Select a panel file with a sequence of measurement points.
9	**Panel file details**: File name and number of measurement points in the file.
10	**Read Order Sequence (ROS)**: Create a new job based on an existing one. Recommended if calibration records change within a job.

4.4 Test the Instrument

It is recommended to test the system before doing real measurements. This way it is ensured that the system is working correctly. Afterward, it should be measured periodically (e.g. weekly) to monitor the µPELT system hardware.

The certified shim with the blue acrylic substrate plate (refer Delivery Content 10) are used for testing.

Perform the following procedure - more details for each step can be found on the following pages:

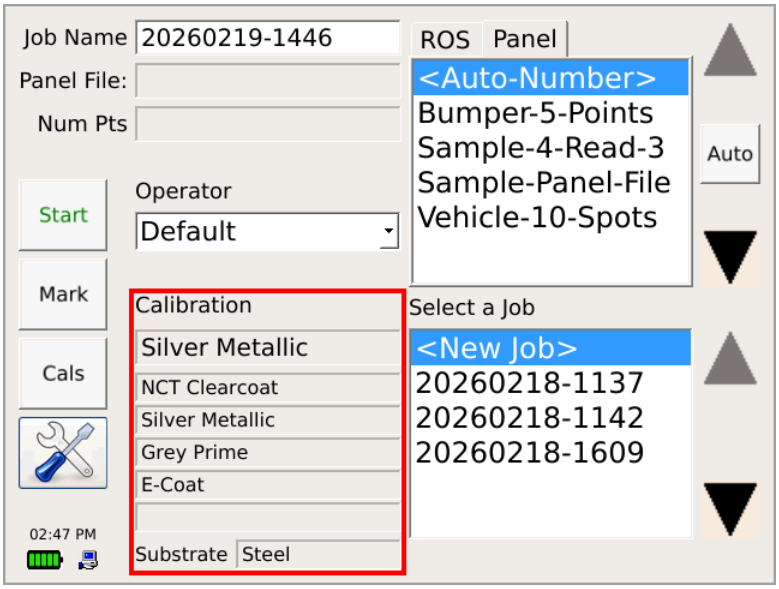
1. Select the calibration record for the certified shim, e.g. “S2893”. This record is usually transferred to the device before delivery. It can also be requested by email.

2. Activate **Autogauge** and deactivate **Auto-next**.

3. Tap **Auto** for a new job and the **Start** button to begin the measurement.

4. Apply a small portion of water on the shim; be sure water doesn't go under the certified shim.

5. Place the transducer on the black circle on the shim.



6. Set the recommended parameters to create a good shim waveform, e.g.:

- **Gain**: 15 dB
- **Delay**: 2696 ns
- **Time Base**: 19 ns/Div

7. When OK, tap **Capture** to measure, the thickness is calculated automatically.

8. Check the position of the markers; reference the appropriate guide wave supplied with the calibration record for the shim.

9. Repeat to have ~ 3 points measured on the shim.

RESULT

- If the result (shown in red above) is in the tolerance listed on the shim certificate, the instrument can be used to measure.
- If the result is outside the tolerance, repeat the measurement.
- If repeating three times does not result in accurate measurement values, contact your PELT technical representative.

BYK-Gardner recommends weekly checks on the certified shim for test equipment monitoring. These checks should be recorded in a log sheet. The following example shows a possible template.

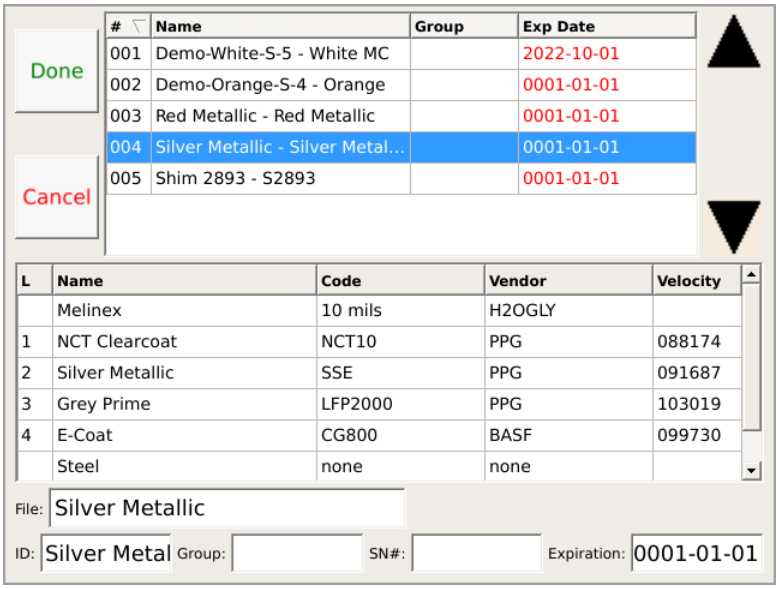
PELT Gauge / Shim Serial Number	Thickness of Certified Shim	Measured Thickness	Absolute Difference	Initials	Date
BP01234 / S2897	**129,50**	**129,23**	**0,27**	**JFI**	**02/24/2026**

4.5 Measure Thickness

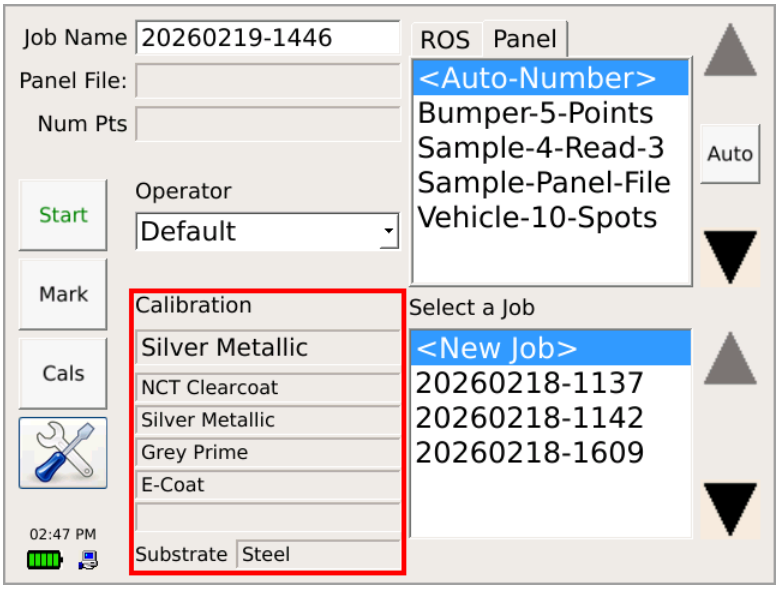
Assure the proper transducer is attached to the gauge using the included sensor cable. Perform the following steps:

1. Apply your desired default settings in System Settings[57] > Options[58] and Parameters[59].

2. Return to the main screen and tap the **Cals** button to open the calibration selection screen.



3. Select a calibration record by tapping the desired coating name. Tap **Done** to return to the main screen.



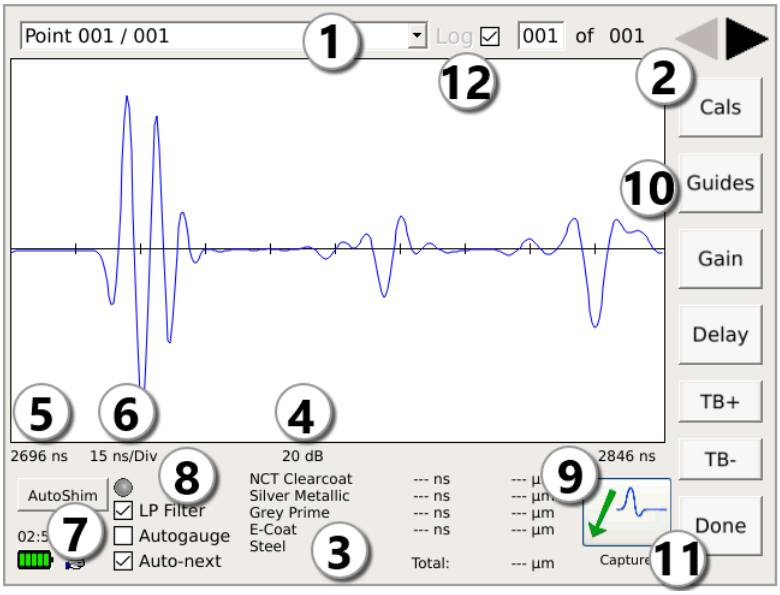
4. Select the desired operator name by tapping in the **Operator** field pull-down. To add a new operator name, tap <New User> and a virtual keypad will appear. Enter the name and tap **OK** to store the new operator name and return to the main screen. The operator names can be managed in System Settings[57] > Operators[61].

5. From the **Select a Job** field tap **<New Job>**. This is usually the default selection.

6. In the **Panel** file field tap **<Auto Number>**. Tapping the button **Auto** in the upper right is a 1-button shortcut to a **<New Job>** with **<Auto Number>** setup.

7. The default name for the new job based on the current date code is pre-entered. This can be changed by tapping in the **Job Name** field.

8. Enter the desired job name and tap the **Start** button to open to the live waveform capture screen.

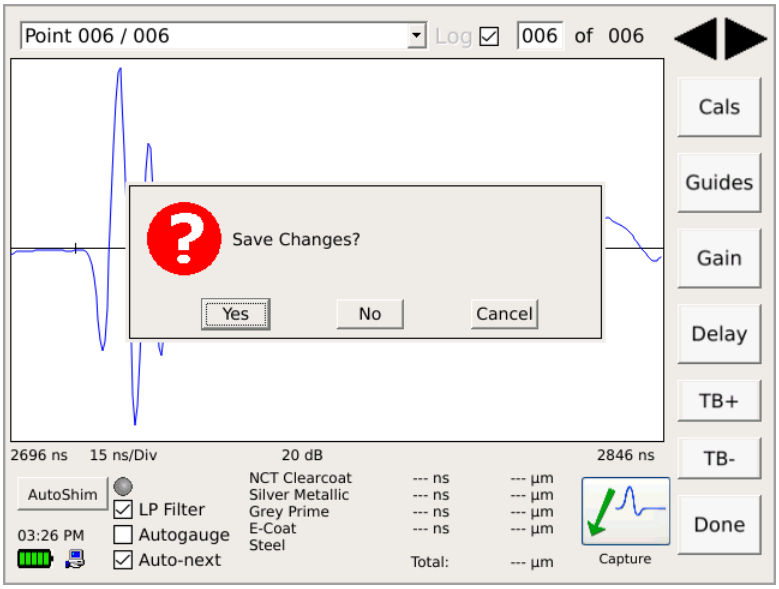


1	**Point 001 / 002**: Point no. or point name if a panel file is used.
2	**Arrows**: Tap the buttons to navigate through the measurement points.
3	**Cals**: Select a calibration record at any time on any wave. For details see Cals[38] .
4	**Gain**: Increase or decrease the amplitude of the waveform. For details see Gain[38] .
5	**Delay**: Increasing or decreasing the delay moves the waveform left or right, respectively, in the display. For details see Delay[39] .
6	**TB+** / **TB-**: Increasing or decreasing the time base zooms out or in, respectively, in the display. For details see System Settings[57] > Parameters[59] .
7	**AutoShim**: Set waveform location & gain automatically. For details see AutoShim[39] .
8	Options: **LP Filter**: Enables the low pass noise filter. For details see Filter[39] . **Autogauge**: The markers are set automatically based on the guide wave. **Auto-next**: Advance to the next point automatically after capturing a point.
9	**Capture**: Captures the live waveform point and increments to the next point. For details see Capture[39] . Tapping anywhere in the live waveform box captures the wave & increments to the next point just like tapping the **Capture** button.
10	**Guides**: Enhances the autogauge feature by adding a point with markers set manually. Autogauge will use this point too.
11	**Done**: Exit the measurement screen and save the waveform data points captured during this session.
12	**Log**: Uncheck to prevent the current measurement point being exported to CSV / XML in PELT Manager.

9. Apply a small portion of water on the desired measurement spot, place the transducer on the spot and measure it. Use the features in the live waveform capture screen to optimize the waveform.

10. Tap the **Capture** button, the current measurement point is measured. Repeat for all points.

11. Tap the **Done** button when the job is completed; you can also continue a job later on. The option to **Save changes? (Yes or No)** is displayed.



12. Tap on **Yes** to store the waveform data in the system memory. With **No** all captured data will be lost. **Cancel** will return you to the waveform.

Control Elements

Cals

Selects the desired calibration record from those stored and available on the gauge. Only calibration records that match and are supported by the specific gauge model will be shown in the calibration selection screen. Calibration records are loaded on to the gauge using PELT Manager or smart-chart when the gauge is connected to the host computer. The calibration records loaded onto the gauge come from the calibration file on the host PC, generally supplied by the BYK-Gardner calibration lab. See PELT Manager software manual for details on loading calibration records onto the gauge.

Gain

Determines how much amplification is applied to the displayed waveform. Adjusting gain controls the amplitude of features in the capture screen live waveform; i.e. the peaks of the echoes in the displayed waveform to be increased or decreased in height. This can improve the visibility of small features in the waveform, and make marker placement easier for those features during waveform marking on the gauge. The optimal gain setting will make large peaks cover the entire display height without clipping, yet allow small peaks to be clearly visible. It is best practice to not force peaks to clip in the display if possible. Setting the gain affects the stored data.

The magnifier feature in the marking screen is similar, allowing the operator to boost the peaks and features of a previously stored waveform. This may be helpful when placing markers on small peaks, and does not change or modify the actual stored data from the original saved waveform. Using the magnifier does not affect the stored data.

Delay

Identifies the beginning of the waveform display window. Adjusting the delay shifts the measurement window, causing the displayed waveform to move to the left or right: It selects the starting time of the live waveform, denoted in nanoseconds (ns) from the initial excitation pulse. This value is displayed in both live and stored waveforms at the lower left corner of the waveform. This value is also displayed in PELT Manager when reviewing wave files downloaded from a gauge to the host computer. A common starting delay may be something like 2600 ns, displayed as "2600 ns" under the waveform. If the operator is unsure what delay value to start with, see AutoShim 54.

Timebase Plus / Minus (TB+ / TB-)

Plus allows squeezing the waveform in the long direction of the display; in effect the displayed time to be increased. It lengthens the amount of time shown across the entire waveform display. This in effect zooms **OUT** on the live waveform, showing more time from the current starting delay value.

Minus reduces the amount of time shown across the entire waveform display. This in effect zooms **IN** on the live waveform, showing less time from the current starting delay value. This causes the displayed end time to decrease along with the timebase value selected, and is shown under the lower right corner of the waveform.

Timebase values are in nanoseconds per division. Divisions are shown as tick marks along the waveform axis. See Parameters 59 for more detail and example timebase values and their associated times.

Capture

Tapping the **Capture** button or tapping anywhere in the live waveform box will save that waveform and increment the counter to the next point. This only stores the waveform data temporarily. Tapping **Done** and saving the job data to permanent storage is required to save the waveform data and make available for marking later. If the gauge loses power for any reason before tapping **Done** (by pressing the **On/Off** switch or if the battery fully discharges), the current waveform data will be lost.

Filter

Enables the Low Pass (LP) filter. This will smooth the waveform, removing noise and may make features in the waveform easier to locate. The filter is only for the displayed waveform and will not change captured and saved data.

AutoShim

Automatically locates and places the waveform at the proper delay for viewing on the display. Place the transducer in position on the test panel, then tap the **AutoShim** button. It will take a few seconds to complete; the progress is noted by the colored on-screen indicator (red, yellow, green). This feature can be enabled automatically for each new job start using the check-box in the Parameters 59 tab.

Autogauge

The information in the guide wave is used to set the markers in the waveform automatically. If the option is activated, the thickness values are shown. To view the values immediately, it is recommended to deactivate Auto-next and to navigate to the next measurement point manually.

Auto-next

If active, the next measurement point is shown automatically after capture. This is recommended in case of fast-measurement mode, i.e. the markers are set at a later time.

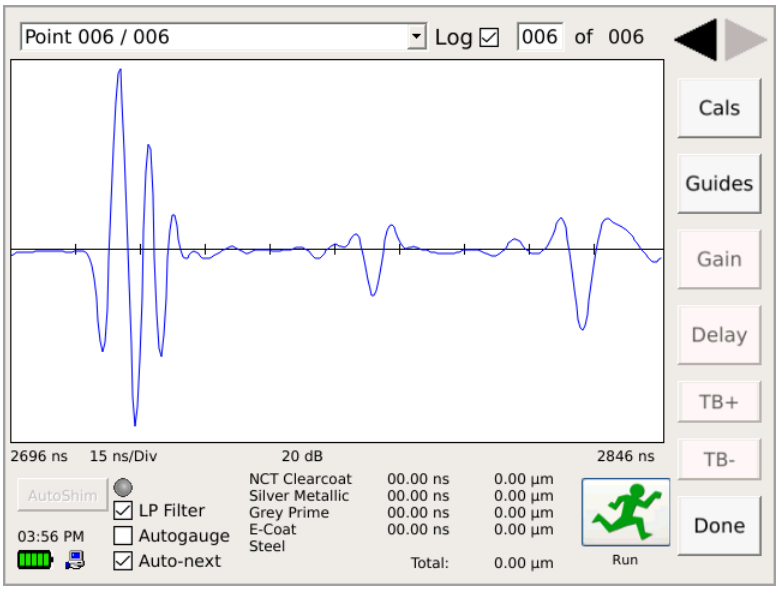
Guides

Tapping this button allows to add one ore more points with the markers already set to the guide wave. A point added will be used in addition to the guide wave for autogauging. It also allows viewing the guide wave for the current color calibration.

4.6 Rework existing Jobs

Captured waves can be reviewed and measured points can be replaced by returning to the main screen, selecting any previously saved file from the **Select a Job** box and tapping **Start**.

1. After re-opening an existing job the waveforms in the selected file are displayed. The **Capture** button is now labeled with **Run**.



2. Review the captured points by navigating with the left or right arrow.

3. Any point can be re-captured by tapping **Run**. This returns the gauge to the live waveform mode. The **Run** button will become the **Capture** button during live waveform viewing.

4. Place the transducer on the item in test at the desired location to obtain the new waveform.

5. Tap the **Capture** button or tap anywhere in the waveform box to capture and replace the original wave point. The display will increment to the next point in review (non-live) mode. Repeat as needed.

6. Tap **Done** when complete to save the updated waveform data. Any new data will be lost if the save is not completed.

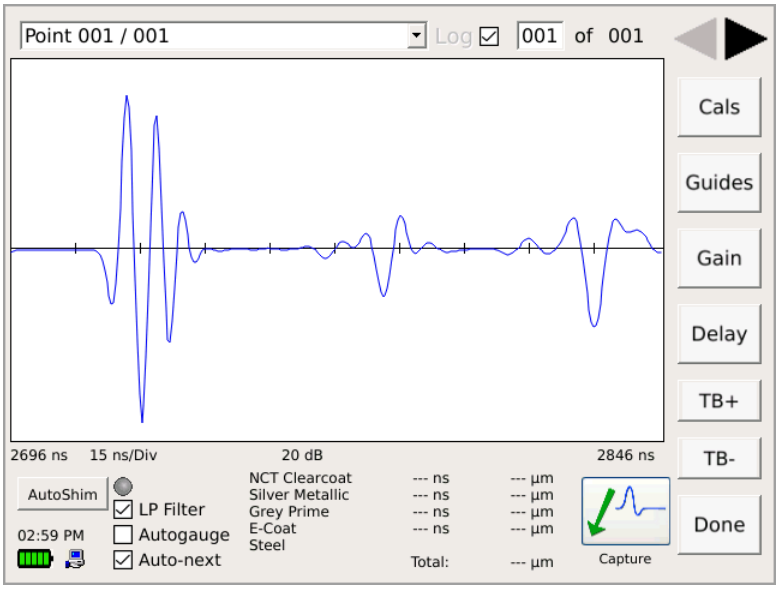
Markers previously placed on a point in a file will still appear when the file is opened with the **Start** button, even though this is not the marking screen.

NOTICE

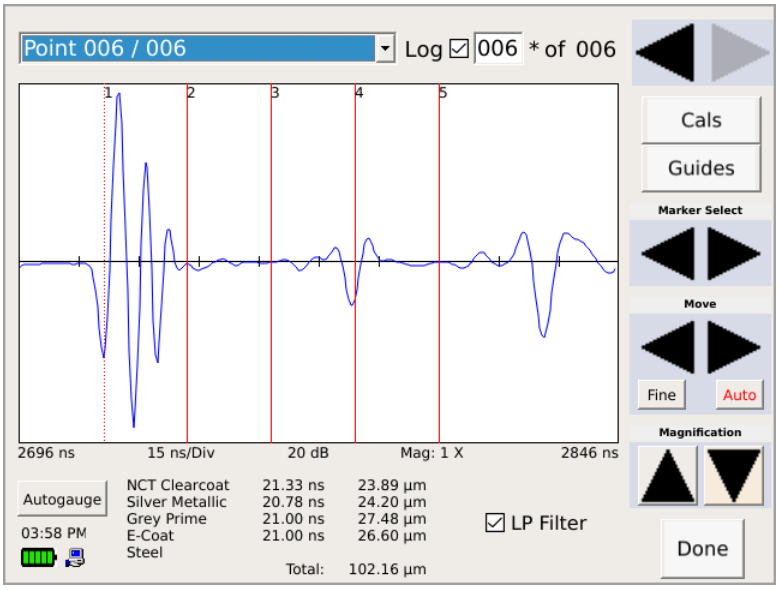
This feature is designed to re-capture existing measurement points in a finished job. Adding new measurement points is not supported.

4.7 View the Guide Wave

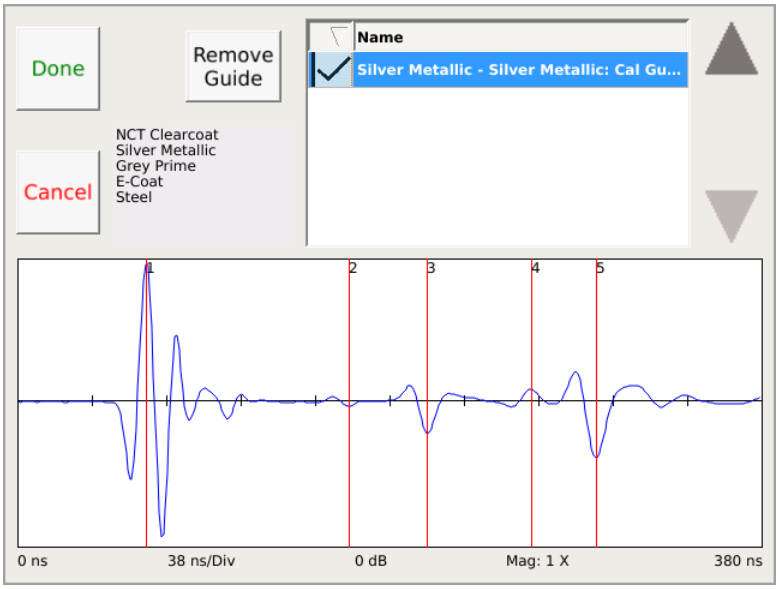
While in measurement mode (**Start** button in the main screen) the **Guides** button can be tapped at any time.



This also works in review mode (**Mark** button in the main screen).



This allows to view the guide wave including marker positions for the current color calibration.



The guide wave is required for correct positioning of the markers in the waveform measured, see previous pages. The **Guides** button can be used in addition to the guide wave printouts created via the PELT Manager.

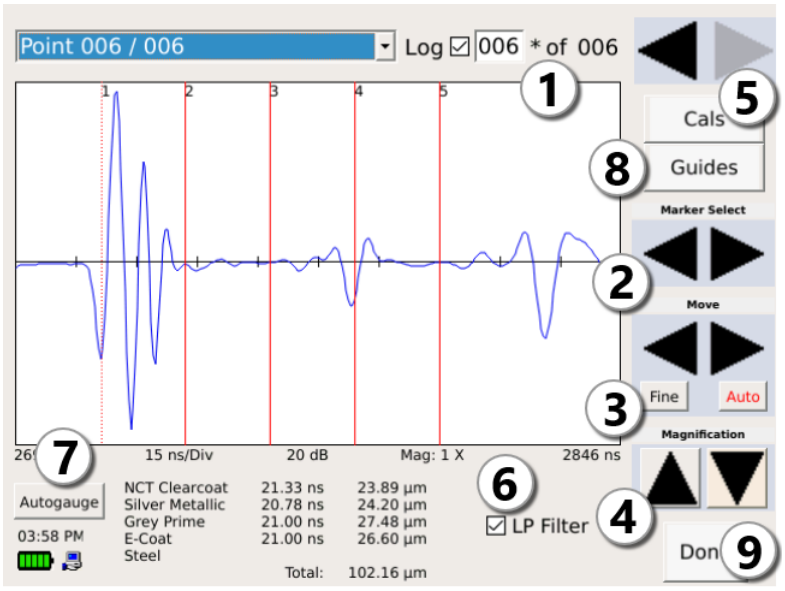
4.8 Set Markers Manually

Captured waveforms have to be marked to calculate the thickness of each layer. Maker placement can take place on the gauge as well as in PELT Manager.

1. Return to the main screen.

2. Select the desired wave file from the **Select a Job** box.

3. Tap the **Mark** button to enter the waveform marking screen. If the wave has not been marked yet, the markers will be in a default position.



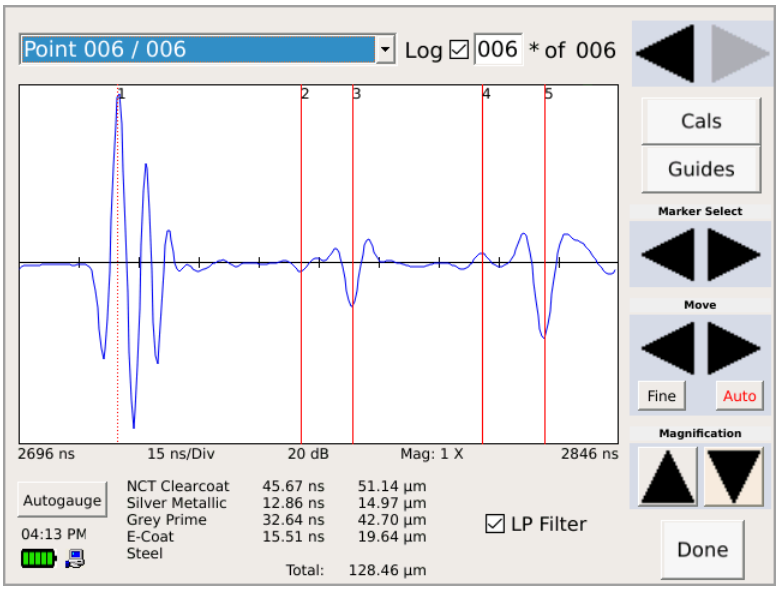
1	**Next/Previous Point**: Move to the next or previous captured point in the job by tapping the left or right arrow at the upper right.
2	**Marker Select**: Select a marker by using the arrows. In the example Marker-1 is selected as indicated by the dotted line. Markers can also be selected by tapping on the desired marker.

3	**Move**: Move the selected marker left or right by peak to peak (**Auto**) or dot to dot (**Fine**). Markers can also be moved by pressing and holding the marker and moving your finger or stylus left or right.
4	**Magnification**: The waveform can be magnified to aid in viewing small features. This does not change the captured and stored data, only the current view.
5	**Cals**: Select a new calibration record for the current point. This updates the list below the wave view
6	**Filter**: Enable or disable the Low Pass (LP) filter. This does not change the captured and stored data.
7	**Autogauge**: See the layer thickness values. See Set Markers Automatically 44 .
8	**Guidelist**: Enhances the **Autogauge** feature. See Use the Guide List 46 .
9	**Done**: Ends the marking session and asks to save the marker positions. All new marker positions will be lost if the save is not completed.

4. Move the markers to the desired waveform positions to calculate the thicknesses for each layer. Reference the guide wave provided for this color - use the PELT Manager print-out or the **Guides** button. The key to proper marker placement is pattern recognition in the waveform.

	"M" wave: Denotes a marker set to a negative peak.
	"W" wave: Denotes a marker set to a positive peak.

5. Continue to position each marker on each desired waveform position. You can return and re-mark any wave using the next/previous arrows. Markers should be placed on specific "M" and "W" peaks (shown above).



TIP

Review the guide waves that are included with the calibration record to help identify desired features. Guide waves can be printed in PELT Manager for reference. Alternatively tap the **Guides** button to view the guide wave for the current color calibration.

6. Tap the **Done** button when the marking is complete.

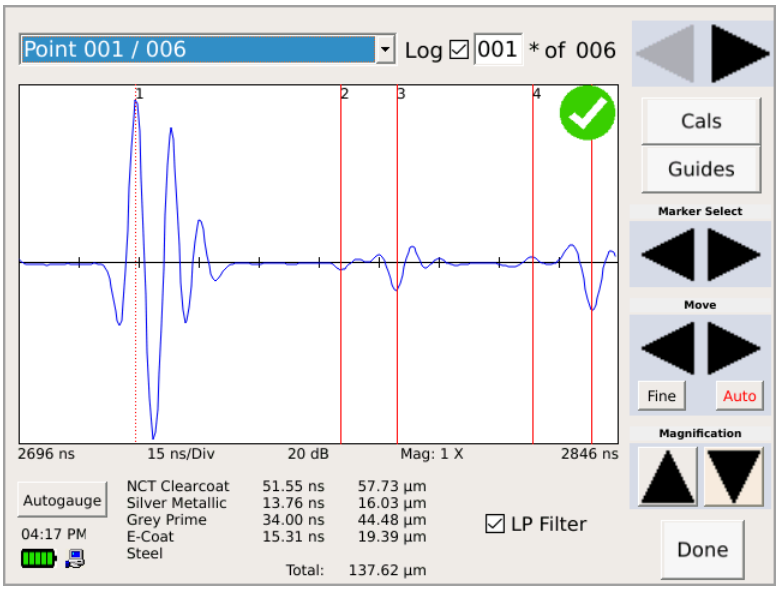
7. Save the changes to store the marker positions. All new marker positions and any other changes made will be lost if the save is not completed with **Yes**.

All saved marker positions set on the gauge will appear exactly the same when the wave file is transferred to the host computer using the PELT Manager.

4.9 Set Markers Automatically

Tapping the **Autogauge** button in the live measurement screen allows to calculate and view the thickness values immediately. The best practice measurement parameters for the feature are provided along with a color calibration. It is recommended to deactivate the option **Auto-next**. Otherwise use the browse buttons to navigate through the points measured.

The feature is also available in the review screen (**Mark** button in the main screen).



Reference the guide wave provided for this color - use the PELT Manager print-out or the **Guides** button.

NOTICE

The autogauge algorithm requires the **Autogauge LPF** parameter set, see System Settings 57 . The LPF value can be modified stepwise to hide or to see features (echos) in the current waveform.

Confidence Value

Along with marker placement and thickness calculations, the autogauge algorithm analysis can determine a "confidence value" for each measurement point:

- **Higher Value**: High confidence values result from peaks and features that are clear, boundaries are easily identified, and match the reference wave.
- **Lower Value**: When layer separations are less clear, autogauge will assign a lower confidence level to that wave. This can result from poor or missing coating material, non-optimum sensor placement, etc. It does not necessarily indicate a bad point, and in fact may be a good wave that indicates an issue with the material under test.

As with other autogauge points, you have to review and check these points before the file can be saved with the resultant marker placement.

The "confidence value" is denoted by an icon in the upper right corner.

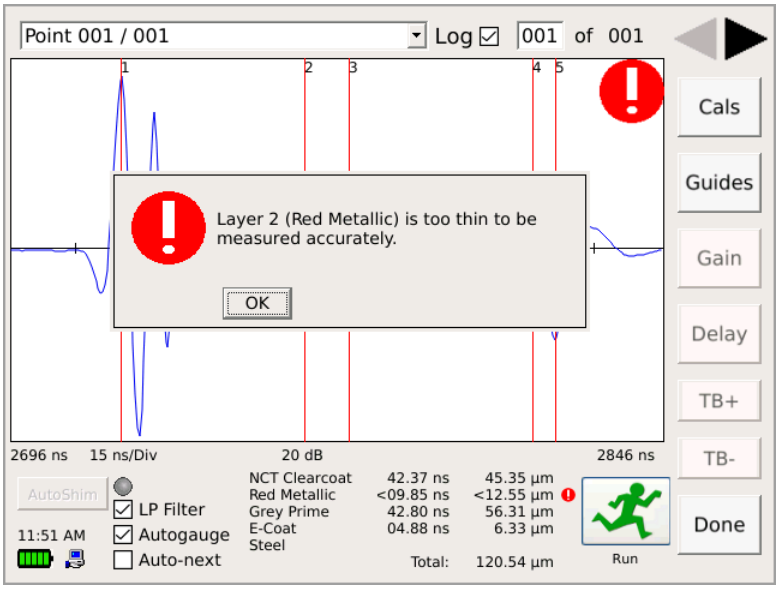
50 < Confidence < 100

40 < Confidence < 50

0 < Confidence < 40

Thickness Limit Warning

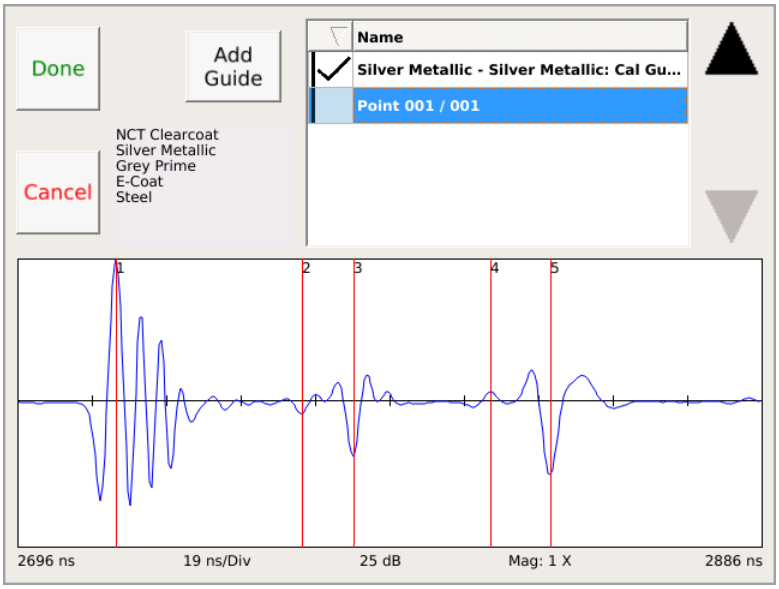
The autogauge algorithm will detect if a layer is thin enough to be at the limit of gauge accurate measurement. In this case a small icon is displayed beside that layer.



When saving such a measurement job also a message is displayed. Confirm the message with OK and save the job.

4.10 Use the Guide List

The autogauge feature can be enhanced by the guide list feature, refer software manual for PELT Manager. Tap the **Guides** button in the live waveform or in the preview / mark screen. It is possible to mark any measurement point in the current job and to add this point to the guide list.

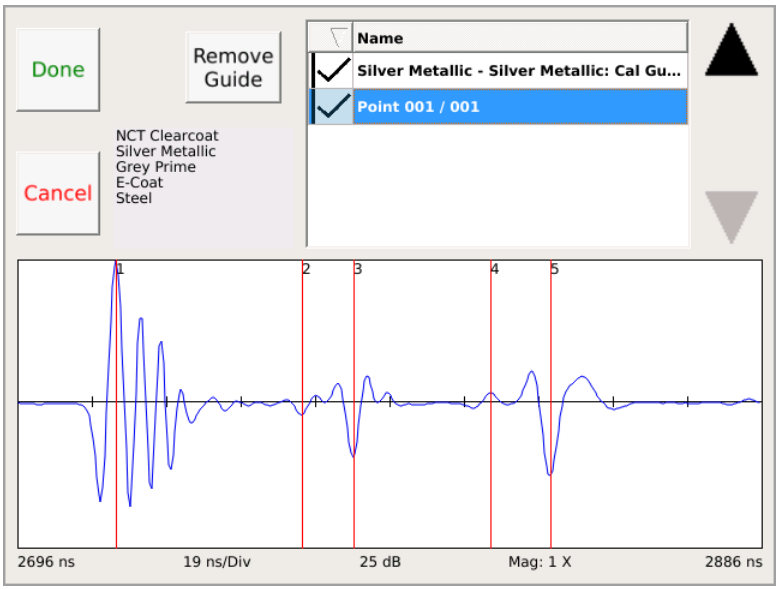


Selecting a point with markers set enables the **Add Guide** button. The point added will be used by the autogauge feature in addition to the information given in the guide wave.

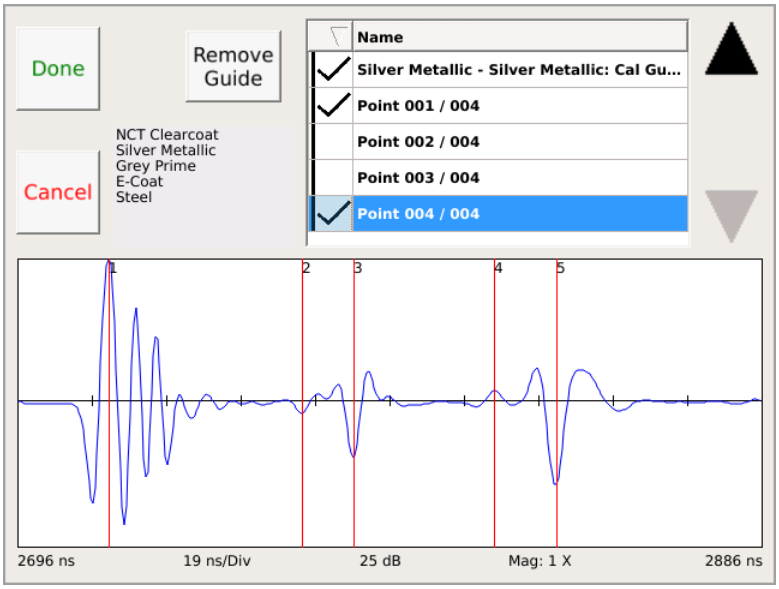
NOTICE

In the live capturing mode you need at least one measurement point, where autogauge was successful.

In the mark mode you can manually place the markers in any measurement point and add this point to the list.



Back in the waveform screen the **Autogauge** button can be tapped to set the markers. Any marked point can be added to the guide list.



All points added will be used by the autogauge feature in addition to the information in the guide wave. Tapping the **Remove** button will remove the selected point from the guide list.

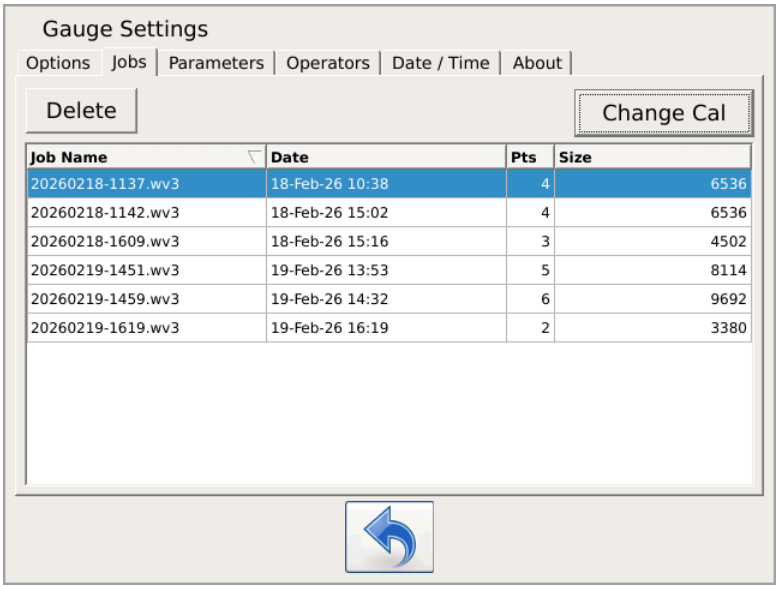
NOTICE

The guide wave from the color calibration is required always and can not be removed from the list.

4.11 Change Calibration

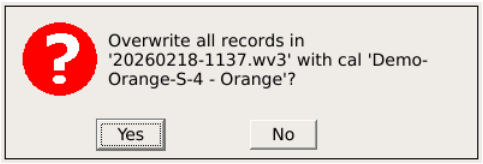
The calibration in a job files (*.wv3) can be changed after completing the measurement job.

1. To change the calibration, enter the main screen.
2. Tap the **Settings** icon.
3. Tap the **Jobs** tab to enter the jobs screen.
4. For sorting the job table refer Delete Job Files 48 .
5. Tap to select and highlight the desired job file to be changed.



6. Tap the **Change Cal** button enter the select calibration screen.

7. Select the calibration record required for the current job, refer Measure Thickness 35 (Step 2), and confirm with **Done**.



8. Answer **Yes** to change the calibration and return to the job screen.

9. Tap the **Return** arrow button to return to the main screen.

NOTICE

You can check the calibration used in job via the mark / review screen, refer Set Markers Manually 42 .

4.12 Delete Job Files

Job files (*.wv3) can be deleted directly on the gauge or with PELT Manager from the host computer. Calibration records on the gauge can be deleted ONLY by using PELT Manager with the gauge connected to the host computer.

1. To delete job files on the gauge, enter the main screen.

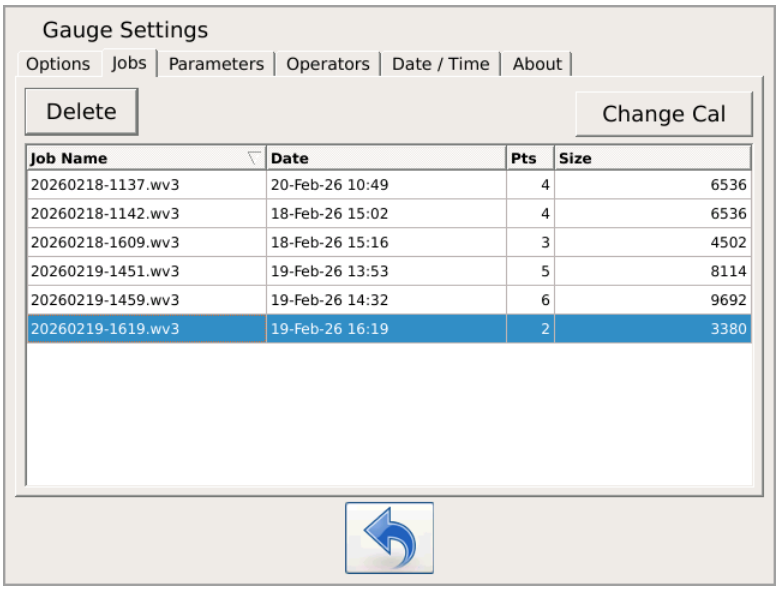
2. Tap the **Settings** icon.

3. Tap the **Jobs** tab to enter the jobs screen.

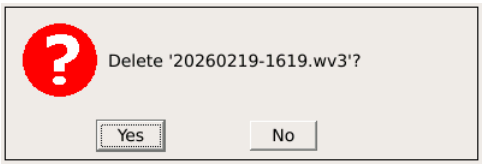
4. Tap any column header to reorder the file list accordingly.

For example, tapping the **Date** header will reorder the file in chronological order. Tap the **Date** header again and the file list will be reordered in reverse, newest to oldest. Jobs can also be ordered alphabetically by **Job Name**, by number of points (**Pts**), or by the file **Size**.

5. Tap to select and highlight the desired job file to delete.



6. Tap the **Delete** button to delete the job file selected.



7. Answer **Yes** to delete. The file is deleted and the screen will update the file list. Continue to erase any desired job files.

8. Tap the **Return** arrow button to return to the main screen.

Once deleted, the files are permanently removed. They cannot be accessed, returned, or recreated. Make sure all needed job files are copied to the host computer with PELT Manager before deleting.

NOTICE

Job files can also be deleted in the file import dialog on PELT Manager. Refer to the PELT Manager software manual for details.

4.13 Using Panel Files

A panel file is helpful when recording many points at predetermined locations on a specific component. A panel file that identifies these predetermined points by a recognizable name is created on a host computer and then transferred to the gauge.

A panel file can be generated in any text editor that will allow saving of plain text files. Refer to the PELT Manager software manual for details. A sample file may look like the following example.

```
Front
Hood
Door FL
Door RL
Rear
Tail
Door RL
Door FL
Roof R
Roof F
```

These names are then displayed on the gauge during capture to assist in finding the proper location. Names are also displayed in the file when reviewing later in PELT Manager.

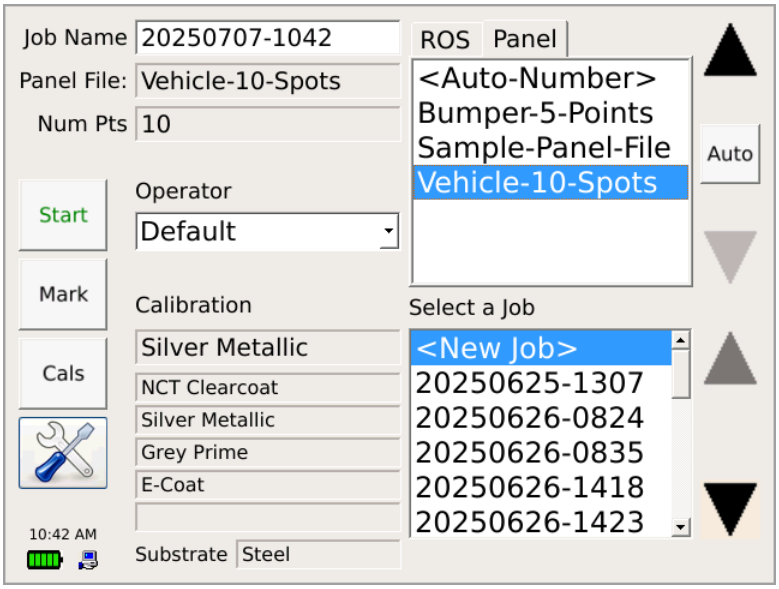
To use a panel file previously transferred to the gauge:

1. Return to the gauge main screen.

2. Tap to select the **Panel** tab.

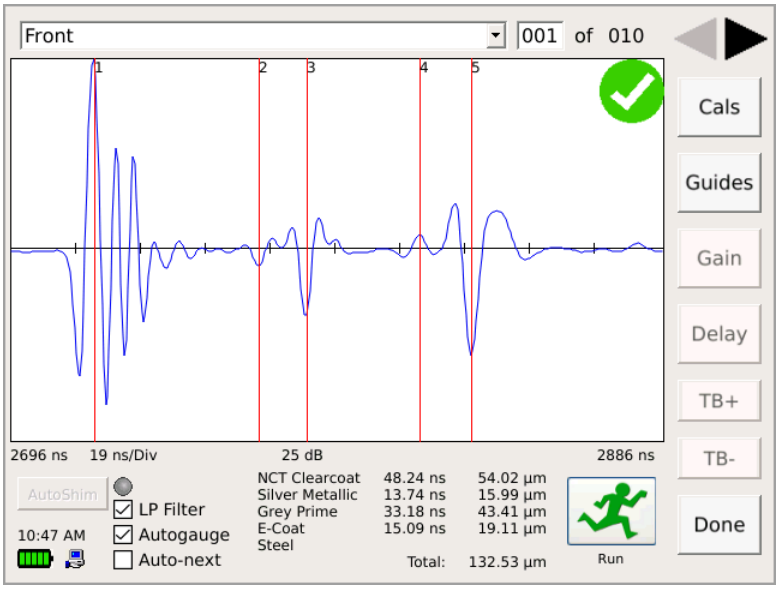
3. Locate and tap on the desired panel file to highlight and select.

4. Some details of the selected panel file will be displayed.



5. Tap the **Job Name** to rename the job file, or leave as default using the time-date stamp name created as shown above.

6. Tap **Start** to continue the measurement session. The panel file 'point name' and other information will now be displayed in the top banner of the waveform screen.



7. Notice the panel file naming used for the first point ("Front" in this example), and the count 001 of 010, agreeing with the number of points in the panel file shown in **Num Pts** field in the main start screen.

8. Points throughout the job can be accessed directly by tapping the banner pull-down and selecting any point in sequence, or using the left/right arrows in the upper right of the screen to navigate.

9. Proceed through the capture process, press **Done** when complete and **Save**.

10. You can save a partial job when using a panel file, and return to complete the job at any time later. This is another benefit of using panel files.

11. As with other jobs, any point can be reviewed and re-measured at any time later.

12. Tap **Done** and **Save** when the job is finished and points of interest are captured. All new data will be lost if the **Save** is not completed.

4.14 Using ROS Files

The µPELT-ts gauge allows to pre-configure a new job based on a previously recorded job file. The previous job parameters will be used for the new job configuration. The operator has the opportunity to select new or keep the old calibration records before starting this new capture session. Any existing job file that was created using a panel file (and that has been renamed) can be used as an ROS file.

Creating ROS Files

To create a valid ROS file:

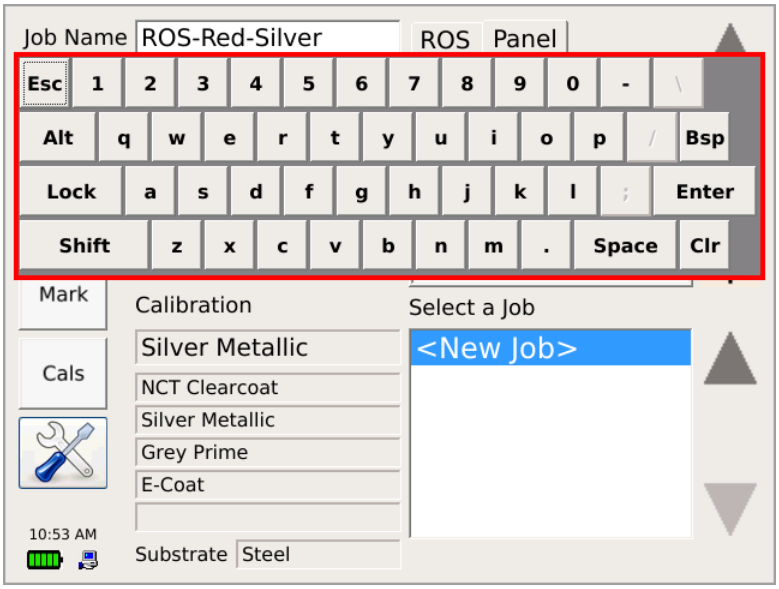
1. Return the gauge to the main screen.

2.Tap the **Panel** tab in the file select box.

3. Select an existing panel file to be used as base.

4. The file details are shown in the upper left corner.

5. Tap the **Job Name** field to rename the job (important step!).



6. Run the panel file job created, change the color between points and save.

Running ROS Files

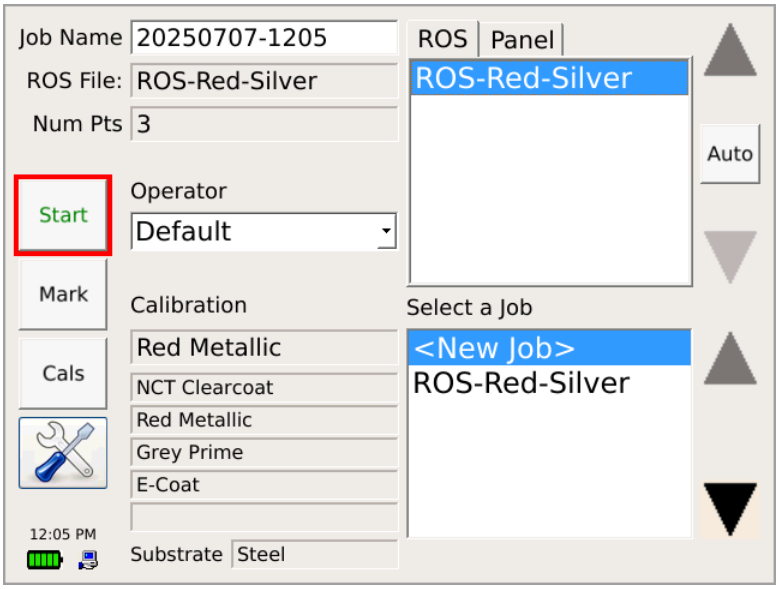
To run an existing ROS file:

1. Return the gauge to the main screen.

2. Tap the **ROS** tab in the file select box. This box now lists all existing job files that are not **<Auto-Numbered>**, including those available to use as ROS jobs.

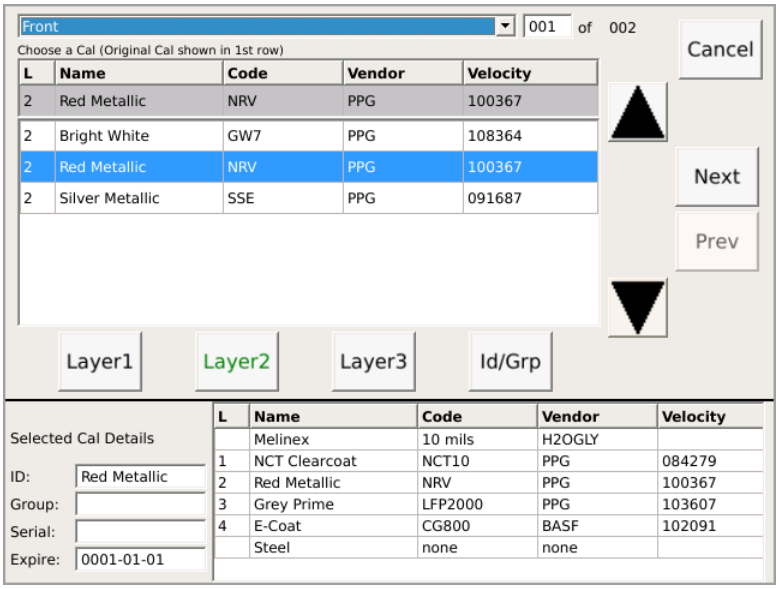
3. Tap to select an existing job file in the **ROS** box. If the job file is acceptable as an ROS file, the **Start** button will be green. If the **Start** button is red, that job file cannot be used (i.e: was not created using a panel file or a compatible calibration record is not on the gauge).

4. Select a job that shows the green **Start** button.



4. Tap in the **Job Name** field to rename the job,or leave it as the date stamp default.

5. Tap **Start** to move to the **Calibration Select** screen.



6. This screen lists the first calibration record found in the ROS file (here: Red Metallic), highlighted in the top line in gray. Below are other available calibrations that may be selected to replace that calibration if desired (i.e. they have the same number of layers). The record used on the original ROS job file (here: Red Metallic), is pre-selected in blue. Layer 2 (L2, generally the color of interest) is used for the calibration record name by default. Other layer tags can be

selected to re-order the list by tapping on their column header (**Name**, **Code**, **Vendor**, or **Velocity**). Other layers can be selected by tapping on the other layer buttons: **Layer1**, **Layer3**, etc.

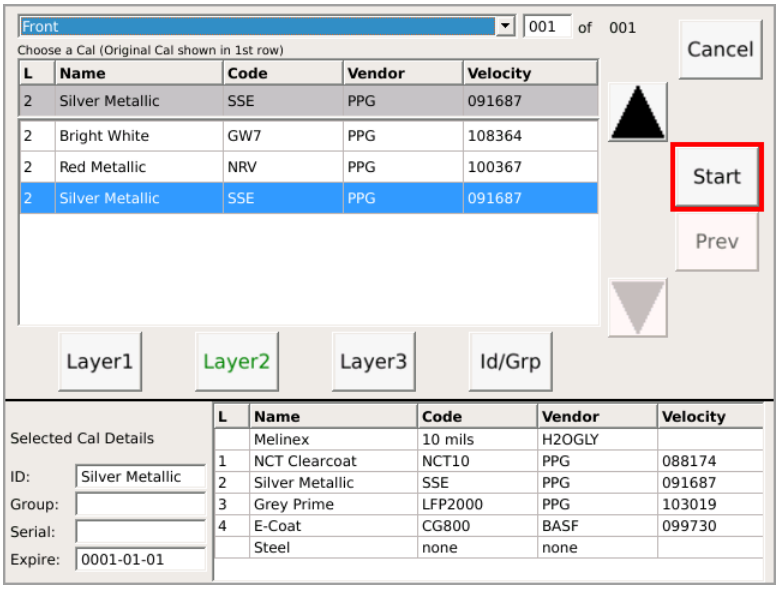
7. To select the desired calibration record, tap on a different calibration in the listing or leave the existing pre-selected calibration. The selected calibration will be in blue. The original is always shown in gray at the top of the list for reference.

8. Navigate through the available calibration choices using the **Up** and **Down** arrows if the list is too large to show in one screen.

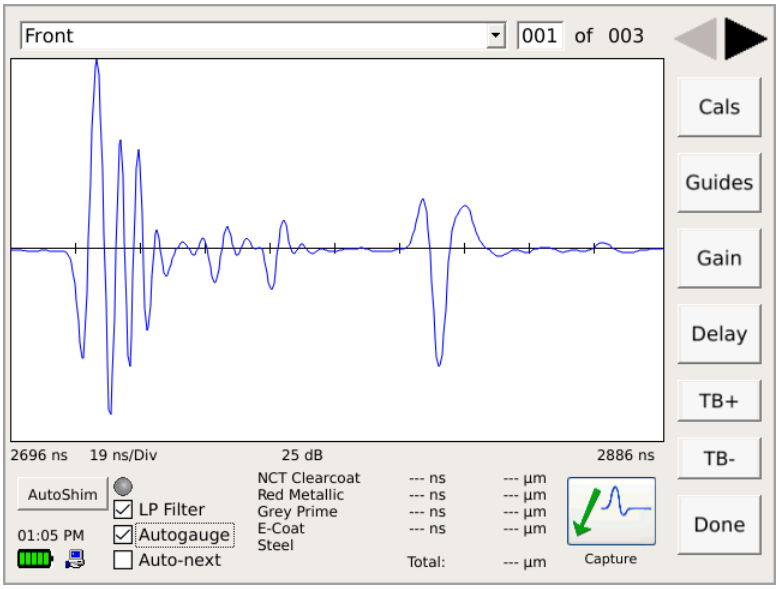
9. Tap **Next** to move to the next found calibration record. As before, the existing calibration will be listed in gray on the top line and pre-selected in blue below. Tap to select a different calibration if desired, or leave the existing calibration selected. Details of each record are shown in the chart at the bottom of the screen.

10. Continue tapping **Next** or **Previous**. Tapping the **Cancel** box in the upper right exits and returns to the main screen with NO new calibration records selected.

11. Once all records are reviewed, the **Next** button becomes a **Start** button, indicating you are ready to start the ROS job in capture mode. You can continue to review the available calibration records by pressing the **Previous** and **Next** buttons as needed.



12. Tap **Start** to proceed to the **Capture Screen** with a live waveform at point #1. All point names and calibration records are in place, including any new calibration records selected in the calibration selection previously (here: point 1 of 3 > Red Metallic).



13. Proceed through the capture process.

14. Tap **Done** when complete and **Save**.

4.15 Using AutoShim

The gauge has the ability to automatically determine the waveform display settings using the AutoShim algorithm. AutoShim will determine the best **Delay** settings for proper display automatically.

The AutoShim feature can be configured to run every time a new waveform capture session is started, or run manually at any time during live waveform capture. AutoShim generally takes from 5 to 10 seconds to complete, depending on the material and the placement of the transducer. Timebases of 30 nsec/div or less should be set when using AutoShim.

The progress is indicated with an indicator to the right of the **AutoShim** button:

- Red: Process started, but waveform not yet stabilized.
- Yellow: waveform stable, AutoShim determining best gain and delay.
- Green: AutoShim processing complete and display settings defined.

To set AutoShim to run at the start of every live waveform capture session:

1. Go to System Settings 57 > Parameters 59 and activate the **AutoShim** option.

To manually start AutoShim at any time during live waveform capture:

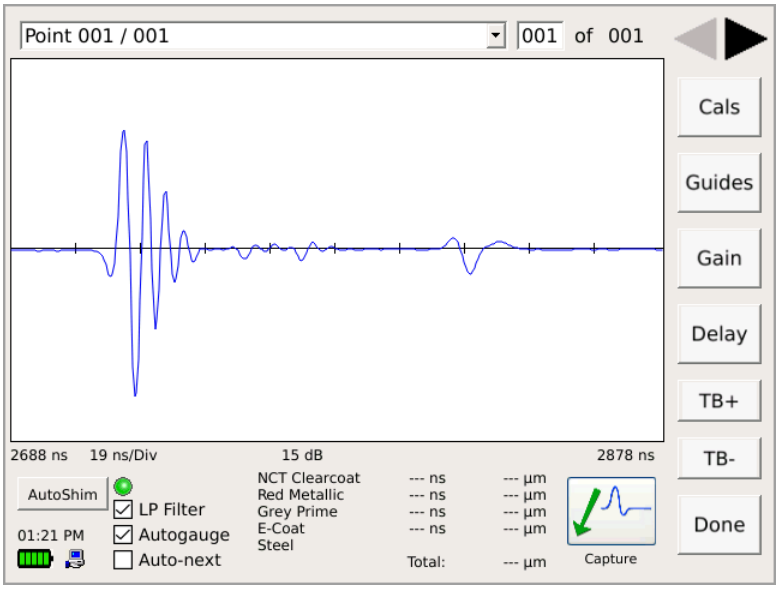
2. Start the live waveform capture session.

3. Set the timebase to 15 nsec/div by tapping a **TB** button. AutoShim will work best with timebases below 30.

4. Position the transducer on the surface of the material or component in test.

5. Tap the **AutoShim** button in the lower right of the capture screen. AutoShim will initiate and show progress with indicator lamp (red, yellow, green).

6. When complete, the determined waveform display parameters will be set, and the gauge will be in live capture mode. You can continue with the capture session, or modify any gauge settings at any time.



NOTICE

AutoShim can be started manually at any time during live capture, regardless of the **AutoShim** checkbox setting in the **System Settings** > **Parameters** tab.

5

System Settings

There are a number of gauge features that are managed from the **Settings** screens. These are arranged as tabs and organized by basic function. Most setting changes are persistent, and will remain after gauge power cycle.

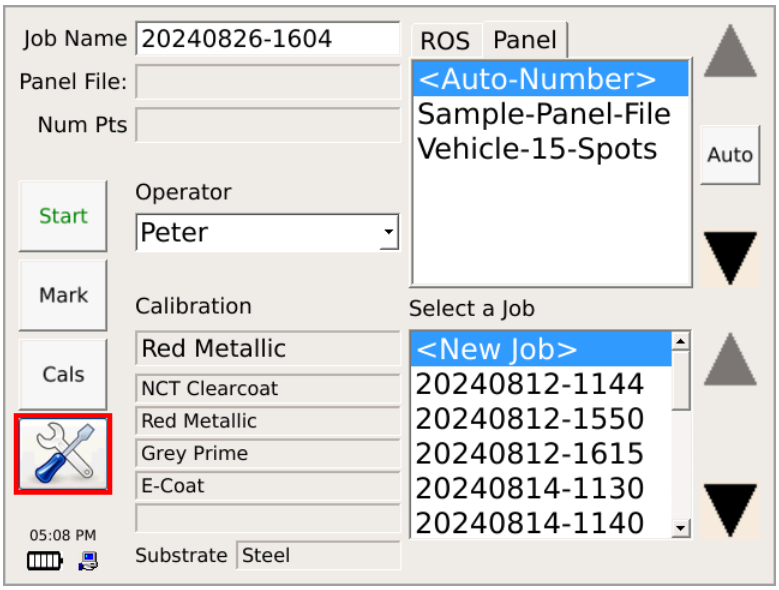
The items found through the settings screens, depending on gauge model:

- Options[58]: Mils or Microns, left hand or right hand orientation, beep on capture, etc.
- Jobs[59]: Delete job files
- Parameters[59]: Pulser select if available, AutoShim, starting gain and delay, etc.
- Operators[61]: Adding or deleting operator names
- Date / Time[61]: Setting date, time and time zone
- About[62]: Viewing various gauge model and revision information

To go to the system settings:

1. Power on the gauge or return to the main screen.

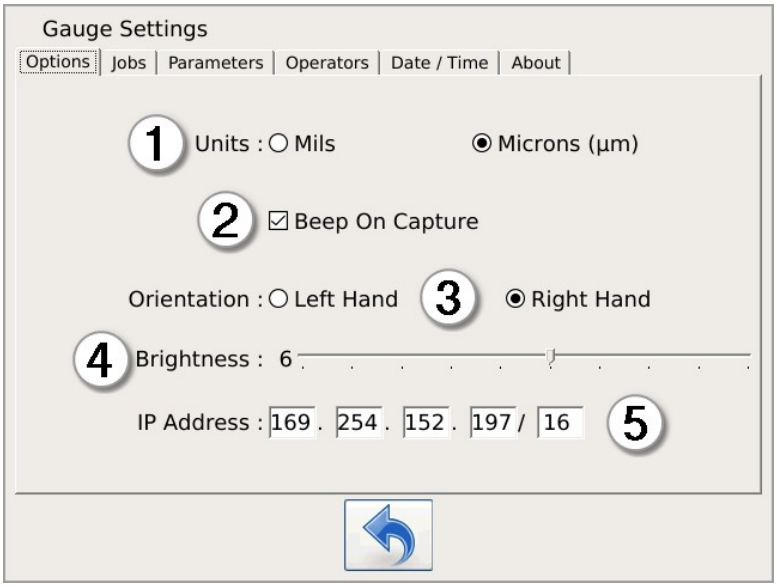
2. Tap the **Settings** button (the "Tools" icon).



You will see a new screen with a number of tabs that allow selection of the different settings screens depending on gauge model.

5.1 Options

The **Options** tab is the first tab shown when the **Settings** button is selected from the main screen. These settings are persistent.



1	**Units**: Select **Microns** (thousandths of a millimeter) or **Mils** (thousandths of an inch). That control sets mils or micron units for all measurement and display. This setting can be changed at any time before or after capturing points and will appear as selected in any waveforms when markers are placed.
2	**Beep On Capture**: Activates an audible beep when the **Capture** button is pressed during live waveform capture.
3	**Left Hand** or **Right Hand**: Selects the screen orientation. The default is **Right Hand** orientation for the operator to measure with the right hand while holding the gauge with the left hand. Changing this setting requires reboot to reset the screen orientation. This will be noted with a pop-up message window when the setting is changed.
4	**Brightness**: Increase or decreases the screen brightness. Increasing the screen brightness will have a large impact on battery life. The setting of 6 is factory default.
5	**IP Address**: Displays the current IP address of the gauge. This setting should not be changed unless recommended by your PELT representative.

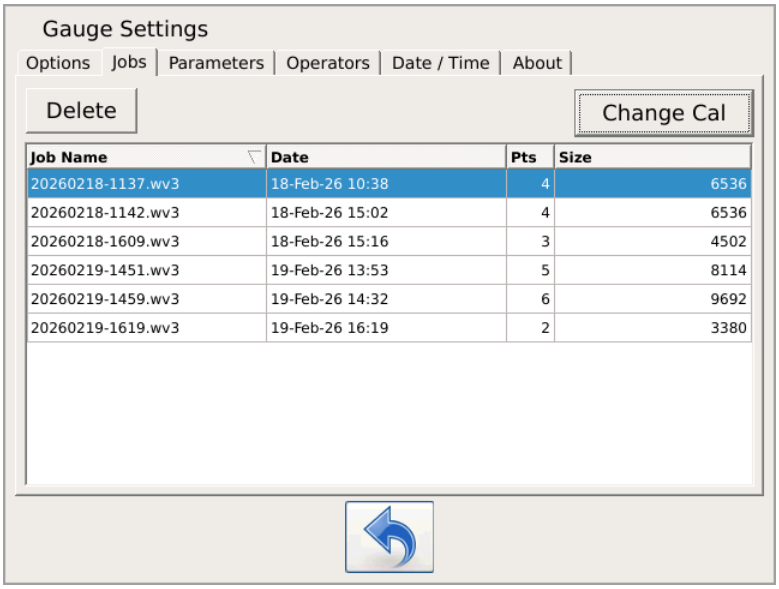
Tap the **Return** arrow button to save changes and return to the main screen. Any changes will be lost without tapping the **Return** arrow button.

WARNING

Changing the **IP Address** may disable the detection of the gauge and the use of PELT Manager to transfer files on to or off of the gauge. Have your IT department contact your PELT representative for details.

5.2 Jobs

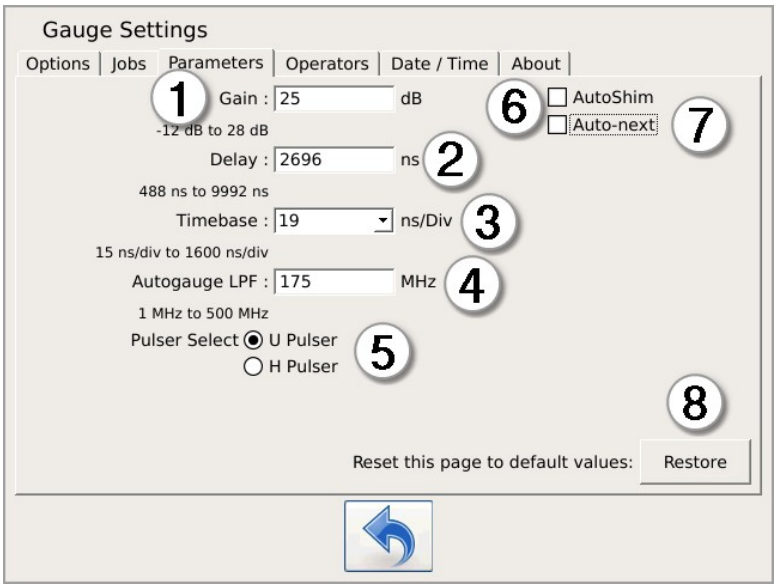
Via the jobs screen it is possible to delete measurement jobs directly on the gauge and to change the calibration to be used in a job. For details refer: Change Calibration 47 and Delete Job Files 48.



Tap the **Return** arrow to return to the main screen.

5.3 Parameters

Initial gauge measurement parameters can be set here. These settings are persistent, but many can also be changed during live capture, see Control Elements 38.



1	**Gain**: Enter a gain value for the live waveform capture system. Use the negative sign (-) to enter a negative gain number. A + sign is not needed for positive gain values. The gain determines the amplitude of live waveform peak amplification during capture.
2	**Delay**: Enter the delay position of the starting capture and display time of the live waveform. This value determines when in time the PELT system will measure and display the live waveform.

3	**Timebase**: Select the live display timebase. A SMALLER timebase displays less of the live waveform, in effect zooming in on the live waveform. A LARGER timebase will display more sampled time, in effect zooming out from the live waveform. Timebase values are in 'nanoseconds per division'. Divisions are shown as the small tick marks along the axis of any displayed waveform. The following example timebase settings will provide the associated length of time displayed. The timebase does not affect thickness calculation.
4	**Autogauge LPF**: The Low Pass Filter (LPF) cuts off noise signals at a higher frequency. The default value can be increased step-by-step in case of using higher frequency transducers.
5	**Pulser Select**: Enable the desired pulser: Ultra-high frequency (**U**) or High Energy (**H**). This will only display the pulsers available with the specific gauge model used.
6	**AutoShim**: Enables **AutoShim** when starting a new live waveform capture. It will immediately sense the material in contact with the sensor and set the delay automatically at the start of a capture session. **AutoShim** is initiated on the first waveform on a new job, and generally takes about 10 seconds. The user must have the transducer (sensor) cabled properly, the FlexCap in place, and the transducer in position in contact with the material under test for **AutoShim** to complete. With **AutoShim** unchecked, this process will not start with a new waveform capture. Timebases of 30 nsec/div or LESS should be set when using **AutoShim**.
7	**Auto-next**: When capturing a measurement point, the system will advance automatically to the next point. This default setting can be changed in the live waveform.
8	**Restore**: Tap the button to return these parameters to the factory defaults for that specific gauge model.

Tapping in any entry box will bring up a virtual keypad used to enter the desired value. A message box will pop up with any values entered out of range. Ranges depend on the gauge model being used.

Timebase	**Length of time shown across the display**
15 nanoseconds per division	150 nanoseconds
25 nsec / div	250 nsec
50 nsec / div	500 nsec

WARNING

Do Do not select the **H Pulser** option (i.e. the high-energy pulser) if a high-frequency transducer (e.g. model 40B or 50B) is equipped! The high energy will destroy the high-frequency transducer.

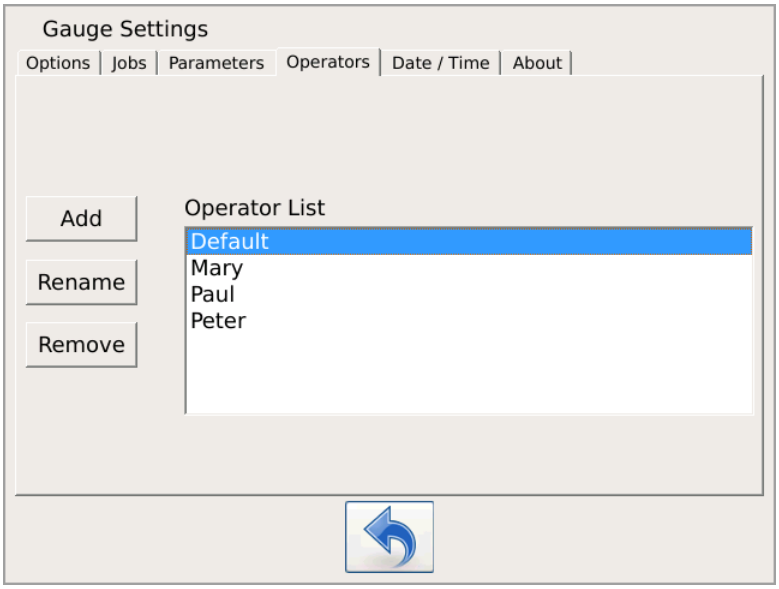
NOTICE

The operator can also run **AutoShim** at any time during live waveform capture by pressing the **AutoShim** button in the live waveform capture screen, even with **AutoShim** unchecked here in the **Settings** > **Parameters** screen.

Tap the **Return** arrow button to save changes and return to the main screen.

5.4 Operators

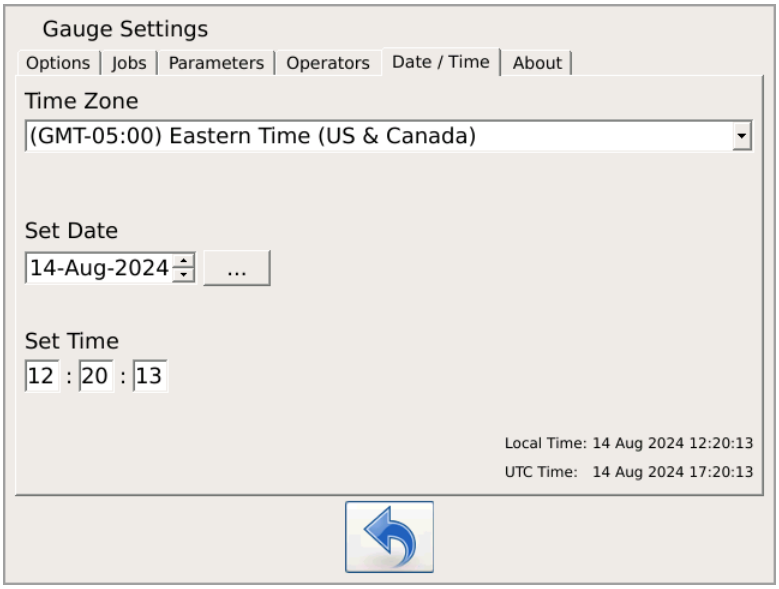
Operator names are added, edited, or deleted from the **Operators** tab in the gauge settings. Entries in job files can be viewed in PELT Manager.



1. Tap the **Add** button to create a new operator name.
2. Tap the **Rename** button to edit the selected operator name.
3. Tap the **Remove** button to delete the selected operator name.
4. Tap the **Return** button to save changes and return to the main screen.

5.5 Date / Time

Dates, times, and time zones are set in the Date / Time tab in gauge settings. Daylight Savings time can be enabled. Local time and UTC (Coordinated Universal Time) are indicated on this screen and validated when the gauge is connected to the host computer. These settings are persistent.



1. Select the regional **Time Zone** using by tapping in the pull-down.

2. Tap in the **Set Date** box to bring up the virtual keypad to select the desired date.

3. Tap in each separate box to bring up a virtual keypad to set the desired hours, minutes, and seconds for current local time.

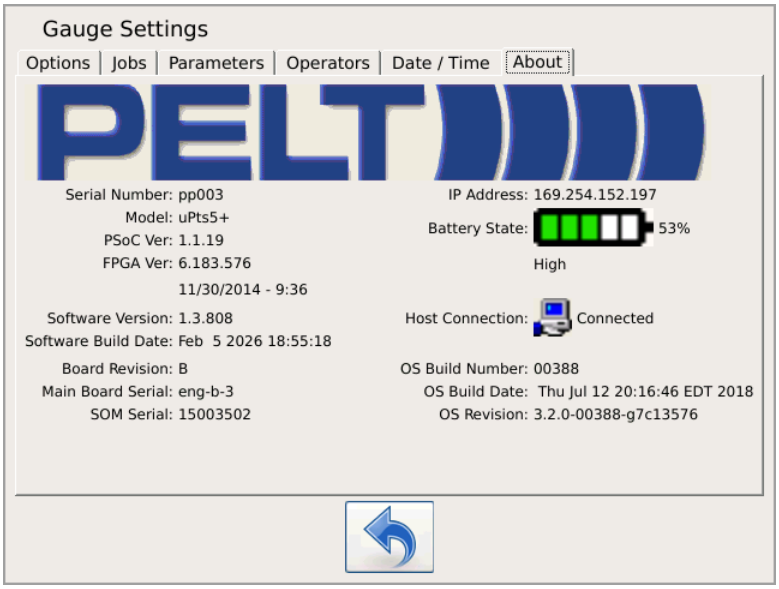
4. Tap the **Return** button to save changes and return to the main screen.

5.6 About

A range of gauge information is displayed in the **Settings** > **About** screen. There are no settings to configure, but some of this information may be requested when communicating with your PELT applications engineer.

1. From the main screen, tap the **Settings** button (the "Tools" icon).

2. Tap the **About** tab at the top of the screen.



3. Notice a range of revision information is available, along with current status of the battery and the connection to a host computer.

4. Tap the **Return** button to return to the main screen.

6
Appendix

6.1 Maintenance

Take care not to drop the unit. Keep the unit dry and in a static-free environment.

Cleaning the µPELT-ts Unit & Display

The µPELT-ts may be cleaned with a slightly damp cloth. The touch screen window may be cleaned using a slightly damp, soft, lint-free cloth. The gauge should not be subjected to amounts of water, and the encasement is not waterproof.

Care of Battery

Take care to not drop the battery. Keep the battery dry and out of extreme temperatures. Only charge the battery with the included desktop charger or inside the gauge using the included wall adapter gauge power supply. Dispose of battery according to the local regulations.

WARNING

A battery that is not in use for more than two months may require charging.

A battery should never be left in a gauge in the ON position. If this happens the battery may be completely discharged and cause the charging process to fail. Charging can then take much longer than the standard charging time of approximately 8 hours. Recalibrating the battery in the external charger can triple the usual charge time.

Equipment Repair

If the equipment needs repair, contact your PELT Technical Support Representative. The Representative will recommend a return or field repair. A detailed explanation or concern will be documented, and an RMA number will be issued if a return is recommended. Before shipping the product to BYK-Gardner, back up ALL data from the µPELT-ts to a host computer. Please package the equipment in the original shipping container and packaging when returning to BYK-Gardner.

Loaner Equipment

BYK-Gardner may supply a loaner while the equipment is being repaired. Contact your BYK-Gardner technical support representative for more information.

If loaner equipment is being sent from BYK-Gardner, do not ship the original equipment to a repair facility until the loaner equipment has been received. Due to availability and customer demand, BYK-Gardner may not ship every kit component that was included with the new µPELT-ts System. Once the loaner equipment has been received, verify your required components are kept for making a functional measurement system. Ship only the parts in need of repair to BYK-Gardner.

6.2 Technical Data

All technical data are subject to change without notice.

Removable Battery

Part number	94058
Battery type	Inspired Energy ND2053HD24, SMB compliant
Purchase	Batteries should be purchased from BYK-Gardner to ensure they are tested to fully meet µPELT-ts requirements.

External Power Supply

Part number	94061
AC input	100 - 240 V AC, 50 - 60Hz, 0.5 A
DC output	+5 V DC, 3 A, 15 W
Power adapter jack	Switchcraft 760-type, center positive

External Battery Charger

Part number	94060
Charger type	Inspired Energy Model CH5000A
Feature	Single bay quick charger
Power supply	External, 12 V DC

Miscellaneous

Power consumption	7 W typical
Dimensions	150 x 175 x 55 mm (5.9 x 6.9 x 2.2 in)
Weight	1.18 kg (2.6 lbs) with battery
Required host PC	UL60950-1 approved PC running 10 with USB port
Installation category	I, battery operated II, AC operated via external power supply

Environmental Conditions

Operating temperature	0 - 40 °C, for indoor use
Storage temperature	-10 - 50 °C
Operating humidity	0 to 80% RH non-condensing for temperatures up to 40 °C
Max. altitude	2000 m
Pollution degree	2

Running Time

Continuous Running Time	5 hours with fully charged battery at rated capacity, various operations, default LCD brightness
Typical running time	8 hour shift with fully charged battery, default LCD brightness and typical measurement usage

6.3 Troubleshooting

This document is divided into 7 main symptom related sections. Refer to the section that best describes the problem being observed. If the symptoms are not included or the troubleshooting suggestions do not resolve the issue, please call your BYK-Gardner technical representative.

Problem	**Solution**
No Response No Display	• Verify the ON/OFF switch is lighted. If not, the unit is not powered on: The battery is uncharged, the switch is off, or the wall adapter is not powered. • Switch power sources (i.e. from battery to wall adapter, different charged battery, etc.). • Confirm that the gauge isn't in sleep mode by tapping on the LCD display. • Verify use of the proper 5 V DC power supply. • Confirm that the battery is properly charged. The "fuel gauge" will show 1-5 dark squares on a display panel on the side of the battery. 5 squares indicates a full charge.
No waveform Noisy waveform	• Confirm that the couplant and the PELT shim and FlexCap are being used properly for measurement. • Confirm that proper gain and delay settings are being used. • Confirm the transducer is cabled to the gauge properly. Enter the live capture screen, press the transducer onto the component in test, and press **Autoshim** to relocate the live waveform. • Confirm that the gauge is in the live waveform capture screen, not the marker screen. • Confirm that the measurements are not being captured on an extremely curved surface. • Confirm that the coatings or shim surfaces don't have foreign debris, scratches or cracks. • Enable (tap) the filter check-box in the capture screen to filter noise from the waveform. • Confirm the connection of the PELT cable to the connector on the gauge. • Confirm the functionality of the transducer and PELT cable. If available, swap each for known functional parts.
Coating Measurement	• Verify the accuracy of the gauge by measuring the certified thickness standard found in your kit. • Proper calibration records must be transferred to the gauge before any measurement. • Confirm that proper timebase, gain, and delay settings are being used, run **AutoShim**. • If points were captured with the incorrect coating calibration, the job should be recaptured. • If the measurements are in question, verify measurements were taken with a certified calibration for the coatings measured. • Verify that the waveforms were marked correctly using the appropriate guide waveform.

	• If the waveform can't be marked properly based upon the guide waveform, verify that the coatings being measured have not changed since they were calibrated. • waveform marking should be based upon echo conformation. The shape of the echoes marked on the guide waveform should match the shape of the echoes the operator is marking. waveform marking should never be based upon counting of peaks between markers or on estimates of the coating thickness. • If an echo is missing, the set of coatings may have a low build layer(s) or there may be a contrast issue. It could be a thickness issue if the missing echoes are present on areas of the unit that receive higher builds.
Shim Measurement	• Confirm that proper timebase, gain, and delay settings are being used for the equipment. • Verify that there are no scratches, wrinkles, dents or excessive wear on the Certified Shim or FlexCap. • Confirm that the surfaces under measurement don't have foreign debris. • If the shim calibration is not available for selection, that cal needs to be transferred to the gauge before shim calibration selection and measurement. • If the shim measurements are in question, verify that the measurements were taken with a certified calibration for the shim and that the waveform was marked correctly using the appropriate guide waveform. • Verify that the surface of the blue acrylic substrate is clean and that there is no couplant between the shim and the blue acrylic substrate (including residue). • When measuring, do not put extreme pressure on the transducer as the pressure may compress the shim material.
File Transfer	• Close PELT Manager, remove the USB cable and power the gauge OFF and then ON. • When the gauge returns to the main screen, reconnect the USB cable. Restart PELT Manager and retry the file transfer. Windows connect can take up to 1 minute. • Verify that the gauge is powered up and return to the main screen. • If exporting to the gauge, confirm that the file being transferred is located on the local drive. Transfer may be limited when the file is on a floppy disk or across a network. • If exporting to the gauge, confirm that the file being transferred does not exceed the max. character count of 31 and that only letter and numbers were used in naming the file. • Confirm that the cable being used is the BYK-Gardner issued interface cable. Check for cable connector damage. • Confirm the gauge connected to the host properly by checking the Windows Device Manager > Network Adapters > "Imaginant USB Remote NDIS Network Device". • Confirm the host is running Windows 10. • Confirm that you are using the most current version of PELT Manager.
Components	• If the battery died during measurement, the battery charge level may have been too low.

	• In the future, always check the battery charge level before beginning large batch measurements. Never start a job when the fuel gauge shows a red icon. • The batteries have a fixed number of charge/discharge cycles. If the battery has exceeded its maximum number of cycles, it will not charge and replacement will be required. The external battery charger will indicate an error condition.
Host Software	• An error box stating "µPELT-ts Device Not Detected" from PELT Manager indicates the connection to the PC is not complete. It may take up to 1 minute for the PC to connect to the µPELT-ts after connecting the USB cable. • Close PELT Manager, remove the USB cable, reboot the gauge and leave in the main screen (the default startup screen). Reconnect the USB cable and restart PELT Manager. Retry file transfer.

Autogauge Algorithm	• "Autoga(u)ge.ini" not found: Transfer it via PELT Manager menu **Gauge** > **Export to Gauge** from "C:\Program Files (x86) \BykWare\PELT\PELTManager" to the instrument.
	• Autogauge process results not good enough:
	  • Try different measurement techniques (e.g. horizontal vs. vertical).
	  • Use the parameters provided along with your color calibration record.
	  • Try to adjust the parameters to match the guide wave as much as possible.
	• Autogauge process to slow:
	  • Mark one of the measurement points manually.
	  • Add this point via **Guides** button to the guide list.
	  • Go back and autogauge all other points again.
	  • Add more marked points to the list, if desired.
	• Life waveform not as expected:
	  • To much noise in the waveform displayed: Reduce the **Autogauge LPF** value.
	  • Expected echos (layer boundaries) missing: Increase the **Autogauge LPF** value.
	• Request deeper analysis: Send both calibration and job file (captures waveforms) to BYK-Gardner.

6.4 Technical Support

We want you to enjoy your µPELT-ts. The answers to most questions regarding the use of the equipment are contained in this manual. If you cannot find an answer in this manual, please contact a member of the PELT technical service team.

Inside the USA

Voice: +1 585 264 0480

Fax: +1 585 264 9642

Please have the following information available before contacting technical support. Most pertinent details of the gauge can be found in **System Settings** > **About**.

- µPELT-ts model (i.e. PELT-µPts5, PELT-µPts3, etc.)
- µPELT-ts serial number (e.g. BK02037)
- Software version numbers
- Nature of the problem; as specific as possible

Please be near the µPELT-ts when you call. Technical support is available Monday through Friday from 8:00 AM to 5:00 PM EST.

Additional information about PELT products can be found at:

https://www.peltgauge.com/coating-thickness-gauges

International

Please refer to our list of world wide service centers, see Service Points 71.

Additional information about BYK-Gardner products can be found at:

www.byk-instruments.com

PELT™ gauges are manufactured by:

BYK-Gardner USA

320 Macedon Center Road

Fairport, New York 14450

USA

6.5 Service Points

List of global service centers with ISO / IEC 17025 accredited laboratories		
Headquarter BYK-Gardner GmbH Lausitzer Strasse 8 82538 Geretsried / Germany		
Service Point USA c/o BYK-Gardner USA 9104 Guilford Road Columbia, Suite H, MD 21046 / USA	**Service Point Austria, Hungary, Slovenia** c/o Friedrich W. Bloch GmbH Wagramerstrasse 201, 1210 Vienna / Austria	**Service Point France** c/o Eckart France S.A.S. 31 Rue Amilcar Cipriani, 93400 Saint Ouen / France
Service Point Spain c/o Actega Artística S.A.U. Calle Balmes 8, Suite: 3º2ª 08291 Ripollet / Spain	**Service Point China** c/o BYK (Tongling) Co. Ltd. Shanghai Branch Block 6A, Building A, No 88 Hong Cao Road, Xuhui District, Shanghai 200233 / P.R. China	**Service Point India** c/o IMCD India Private Limited 1101-03, B-Wing, ONE BKC, Bandra Kurla Complex, Bandra East, Mumbai, MH. Pin.: 400 051 / India
Service Point Japan c/o Tetsutani Co. Ltd. Chuo-ku, Osaka Tokuicho 2-2-2 / Japan	**Service Point South Latin America** c/o MAST Comercial e Importadora LTDA Rua Itaporanga, 340-B, Bairro Paraiso, Santo André - SP, 09190-640 / Brazil	
Complete list: https://www.byk-instruments.com/global-service-centers List of authorized agents: https://www.byk-instruments.com/contact-infos		

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