CE

DAAS

DATA ACQUISITION AND ANALYSIS SYSTEM

OPERATING MANUAL

CALDER
VALVE TESTING & REPAIR SYSTEMS BY CLIMAX

P/N 89360
February 2019
Revision 4

CLIMAX | BORTECH CALDER H&S TOOL

At CLIMAX, we value your opinion.

For comments or questions about this manual or other CLIMAX documentation, please e-mail documentation@cpmt.com.

For comments or questions about CLIMAX products or services, please call CLIMAX or e-mail info@cpmt.com. For quick and accurate service, please provide your representative with the following:

- Your name
- Shipping address
- Telephone number
- Machine model
- Serial number (if applicable)
- Date of purchase

CLIMAX World Headquarters

2712 East 2nd Street
Newberg, Oregon 97132 USA

Telephone (worldwide): +1-503-538-2815
Toll-free (North America): 1-800-333-8311
Fax: 503-538-7600

H&S Tool World Headquarters

715 Weber Dr.
Wadsworth, OH 44281 USA

Telephone: +1-330-336-4550
Fax: 1-330-336-9159
hstool.com

CLIMAX | H&S Tool (UK Headquarters)

Unit 7 Castlehill Industrial Estate
Bredbury Industrial Park
Horsfield Way
Stockport SK6 2SU, UK

Telephone: +44 (0) 161-406-1720

CLIMAX | H&S Tool (European Headquarters)

Am Langen Graben 8
52353 Düren, Germany

Telephone: +49 (0) 242-191-7710
E-mail: ClimaxEurope@cpmt.com

CLIMAX | H&S Tool (Asia Pacific Headquarters)

316 Tanglin Road #02-01
Singapore 247978

Telephone: +65-9647-2289
Fax: +65-6801-0699

CLIMAX | H&S Tool (Middle East Headquarters)

Warehouse #5, Plot: 369 272
Um Sequim Road
Al Quoz 4
PO Box 414 084
Dubai, UAE

Telephone: +971-04-321-0328

CLIMAX GLOBAL LOCATIONS

CE DOCUMENTATION

DECLARATION OF CONFORMITY

2006/42/EC Machinery Directive

Name of manufacturer or supplier
Climax Portable Machine Tools, Inc.

Full postal address including country of origin
2717 E. Second St., Newberg OR 97132

Description of product
Calder Data Acquisition System

Name, type or model, batch or serial number
88951, 88952, 88953, 88954, 88955, 88956 DAAS 3K, 6K, 10K
88957, 88958, 88959

Standards used, including number, title, issue date and other relative documents
IEC 60204-1/2016; ISO 12100/2010; IEC61000-6-4:2006+AMD1:2010CSV; IEC 61000-6-3:2006+AMD1:2010; IEC 6100-6-2:2016 RLV; Directive 2014/53/EU

Name of Responsible Person within the EU Tom Cunningham

Full postal address if different from manufacturers
Climax GmBH
Am Langen Graben 8
52353 Duren, Germany

Declaration

I declare that as the Manufacturer, the above information in relation to the supply / manufacture of this product, is in conformity with the stated standards and other related documents following the provisions of the above Directives and their amendments.

Signature of Manufacturer:

Position Held: Director of Engineering; Research and Development

Date: April 5, 2017

CE

LIMITED WARRANTY

CLIMAX Portable Machine Tools, Inc. (hereafter referred to as “CLIMAX”) warrants that all new machines are free from defects in materials and workmanship. This warranty is available to the original purchaser for a period of two years after delivery. If the original purchaser finds any defect in materials or workmanship within the warranty period, the original purchaser should contact its factory representative and return the entire machine, shipping prepaid, to the factory. CLIMAX will, at its option, either repair or replace the defective machine at no charge and will return the machine with shipping prepaid.

CLIMAX warrants that all parts are free from defects in materials and workmanship, and that all labor has been performed properly. This warranty is available to the customer purchasing parts or labor for a period of 90 days after delivery of the part or repaired machine or 180 days on used machines and components. If the customer purchasing parts or labor finds any defect in materials or workmanship within the warranty period, the purchaser should contact its factory representative and return the part or repaired machine, shipping pre-paid, to the factory. CLIMAX will, at its option, either repair or replace the defective part and/ or correct any defect in the labor performed, both at no charge, and return the part or repaired machine shipping prepaid.

These warranties do not apply to the following:

- Damage after the date of shipment not caused by defects in materials or workmanship
- Damage caused by improper or inadequate machine maintenance
- Damage caused by unauthorized machine modification or repair
- Damage caused by machine abuse
- Damage caused by using the machine beyond its rated capacity

All other warranties, express or implied, including without limitation the warranties of merchantability and fitness for a particular purpose are disclaimed and excluded.

Terms of sale

Be sure to review the terms of sale which appear on the reverse side of your invoice. These terms control and limit your rights with respect to the goods purchased from CLIMAX.

About this manual

CLIMAX provides the contents of this manual in good faith as a guideline to the operator. CLIMAX cannot guarantee that the information contained in this manual is correct for applications other than the application described in this manual. Product specifications are subject to change without notice.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

FIGURE PAGE

LIST OF FIGURES (CONTINUED)

FIGURE PAGE

LIST OF TABLES

This page intentionally left blank

1 INTRODUCTION

IN THIS CHAPTER:

1.1 How to use this manual

This manual describes information necessary for the setup, operation, maintenance, storage, shipping, and decommissioning of the DAAS.

The first page of each chapter includes a summary of the chapter contents to help you locate specific information. The appendices contain supplemental product information to aid in setup, operation, and maintenance tasks.

Read this entire manual to familiarize yourself with the DAAS before attempting to set it up or operate it.

1.2 Safety alerts

Pay careful attention to the safety alerts printed throughout this manual. Safety alerts will call your attention to specific hazardous situations that may be encountered when operating this machine.

Examples of safety alerts used in this manual are defined here[1]:

⚠ DANGER

indicates a hazardous situation which, if not avoided, ***WILL*** result in death or severe injury.

1. For more information on safety alerts, refer to *ANSI/NEMA Z535.6-2011, Product safety Information in Product Manuals, Instructions, and Other Collateral Materials*.

⚠ WARNING

indicates a hazardous situation which, if not avoided, ***COULD*** result in death or severe injury.

⚠ CAUTION

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

indicates a hazardous situation which, if not avoided, could result in property damage, equipment failure, or undesired work results.

1.3 GENERAL SAFETY PRECAUTIONS

CLIMAX leads the way in promoting the safe use of portable machine tools and valve testers. Safety is a joint effort. You, the end user, must do your part by being aware of your work environment and closely following the operating procedures and safety precautions contained in this manual, as well as your employer's safety guidelines.

Observe the following safety precautions when operating or working around the machine.

Training – Before operating this or any machine tool, you should receive instruction from a qualified trainer. Contact CLIMAX for machine-specific training information.

Risk assessment – Working with and around this machine poses risks to your safety. You, the end user, are responsible for conducting a risk assessment of each job site before setting up and operating this machine.

Intended use – Use this machine in accordance with the instructions and precautions in this manual. Do not use this machine for any purpose other than its intended use as described in this manual.

Personal protective equipment – Always wear appropriate personal protective gear when operating this or any other machine tool.

Work area – Keep the work area around the machine clear of clutter. Restrain cords and hoses connected to the machine. Keep other cords and hoses away from the work area.

Lifting – Many CLIMAX machine components are very heavy. Whenever possible, lift the machine or its components using proper hoisting equipment and rigging. Always use designated lifting points on the machine.

Lock-out/tag-out – Lock-out and tag-out the machine before performing maintenance.

1.4 MACHINE-SPECIFIC SAFETY PRECAUTIONS

Hazardous environments – Do not operate the machine in environments where potentially explosive materials, toxic chemicals, or radiation may be present.

Utility service requirements – The utility service requires 120–240V/1 Ph/50–60 Hz.

NOTICE

It is the user's responsibility to assure that the pressure transducers and other sensing devices used with the Climax Calder Data Acquisition System (DAAS) are properly calibrated and that the calibration information has been correctly entered into the DAAS system.

Given that any electronic sensor can be subject to a variety of outside influences or failure modes that may result in inaccurate readings, it is strongly recommended that the test pressure source be fitted with a separate calibrated pressure gauge and the operator verify its readings against the DAAS pressure readings. This check should be done daily, at the beginning of each shift, and periodically during any valve testing.

Climax will not be held accountable for the failure of any pressure sensing devices, for any inaccuracy in the recorded readings from such devices, or any adverse consequences that may result. It is the operator's responsibility to independently verify the accuracy of all pressure transducer readings.

1.5 RISK ASSESSMENT AND HAZARD MITIGATION

To achieve the intended results and to promote safety, the operator must understand and follow the design intent, set-up, and operation practices that are unique to valve testers.

The operator must perform an overall review and on-site risk assessment of the intended application. Due to the unique nature of high-pressure valve testing, identifying one or more hazards that must be addressed is typical.

When performing the on-site risk assessment, it is important to consider the valve tester and the workpiece as a whole.

⚠ WARNING

High-pressure valve testing may result in the sudden, unexpected release of stored energy with the potential to cause property damage or personnel injury. Potential hazards may include the possibility of high-velocity fluid escaping and high-energy projectile impact. The end-user must assess the application and install protective barrier devices, as appropriate.

1.6 RISK ASSESSMENT CHECKLIST

The following checklist is not intended to be an all inclusive list of things to watch out for when setting up and operating this data acquisition system. However, these checklists are typical of the types of risks the assembler and operator should consider. Use these checklists as part of your risk assessment:

TABLE 1-1. RISK ASSESSMENT CHECKLIST BEFORE SET-UP

	Before set-up
☐	I took note of all the warning labels on the machine.
☐	I removed or mitigated all identified risks (such as tripping, cutting, crushing, entanglement, shearing, or falling objects).
☐	I considered the need for personnel safety guarding and installed any necessary guards.
☐	I considered the potential hazards that are inherent in high-pressure valve testing, including the possibility of high velocity fluid escape or workpiece fragmentation, and have installed appropriate protective barriers.
☐	I read the system setup instructions (Section 3) and took inventory of all the items required but not supplied (Section 2.5).
☐	I considered how this system operates and identified the best placement for the controls, cabling, and the operator.
☐	I evaluated and mitigated any other potential risks specific to my work area.

TABLE 1-2. RISK ASSESSMENT CHECKLIST AFTER SET-UP

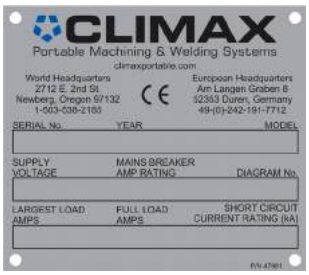
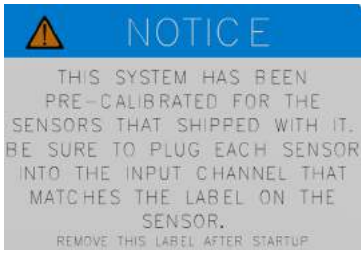
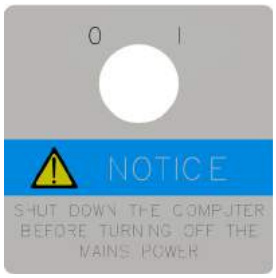
	After set-up
☐	I checked that the data acquisition system is safely installed (according to Section 3).
☐	I followed the required maintenance checklist (Section 5).
☐	I checked that all affected personnel have the recommended personal protective equipment, as well as any site-required or regulatory equipment.
☐	I checked that all affected personnel understand and are clear of the danger zone.
☐	I evaluated and mitigated any other potential risks specific to my work area.

1.7 LABELS

1.7.1 Label identification

The following warning and identification labels should be on your machine. If any are defaced or missing, contact CLIMAX immediately for replacements.

TABLE 1-3. DAAS LABELS

	P/N 47981 Serial plate		P/N 88837 Notice: sensors labeled for channels
	P/N 88992 Notice: shut down computer before mains power		
	P/N 89110 Calder DAAS label		

1.7.2 Label location

The following figures display the location of the labels on each of the components of the DAAS. For further identification of location placement, refer to the exploded views in Appendix A.

FIGURE 1-1. FRONT LABEL LOCATION

Label P/N: 47981, 88837, 88992, 89110

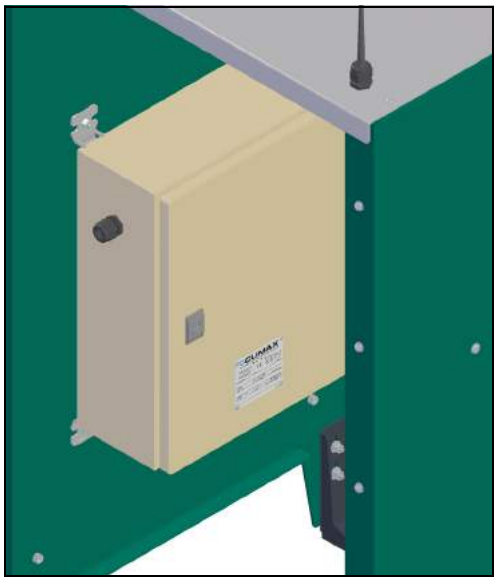


FIGURE 1-2. LABEL LOCATION

Label P/N: 47981

1.8 SOFTWARE

The DAAS software that has been supplied with your Calder DAAS console is proprietary to CLIMAX. CLIMAX retains ownership of all intellectual property rights, including copyrights and patent rights associated with the software.

CLIMAX hereby grants to the purchaser of the Calder DAAS console a fully paid up, nonexclusive, limited, perpetual, irrevocable, worldwide license for the use of the software.

The software shall not be reproduced, modified, copied, distributed, published, or used for a purpose other than its original intended purpose without express written permission from Climax.

NOTICE

Do not accept Windows 10 or National Instruments LabView update requests because updating the operating system or LabView may cause the DAAS program to stop running.

This page intentionally left blank

2 OVERVIEW

IN THIS CHAPTER:

2.1 FEATURES AND COMPONENTS

The Calder DAAS console is capable of monitoring hydrostatic pressure, seat leakage, or SRV set pressure testing with simultaneous monitoring and data acquisition of up to four channels of analog input.

The pressure range is limited only by the pressure rating of the pressure transducer that the user selects. The four analog channels may be assigned to monitor either pressure or temperature. The operator can enter a custom channel name for each sensor input, and these names can be changed at any time.

Each test produces the following:

- A test report containing all the relevant metadata about the device under test and the test parameters, as well as a graphic of the testing screen.
- A .csv file containing the actual test data for all of the enabled channels.

The test report and data file are saved to the hard drive of the DAAS computer.

The reports may be accessed any of the following ways (refer to Figure 2-1 on page 10):

- Opened on the DAAS computer.
- Transferred to an external drive via the USB port on the front of the DAAS console.
- Transmitted via the customer's in-house network using the Ethernet port on the back of the DAAS computer.
- Transmitted via the built-in 2.4 gHz Wi-Fi radio.
- Emailed to an address stored by the operator in the DAAS computer.

TIP:

It may be necessary to request assistance from your IT support personnel when connecting via Ethernet network, Wi-Fi, or email system.

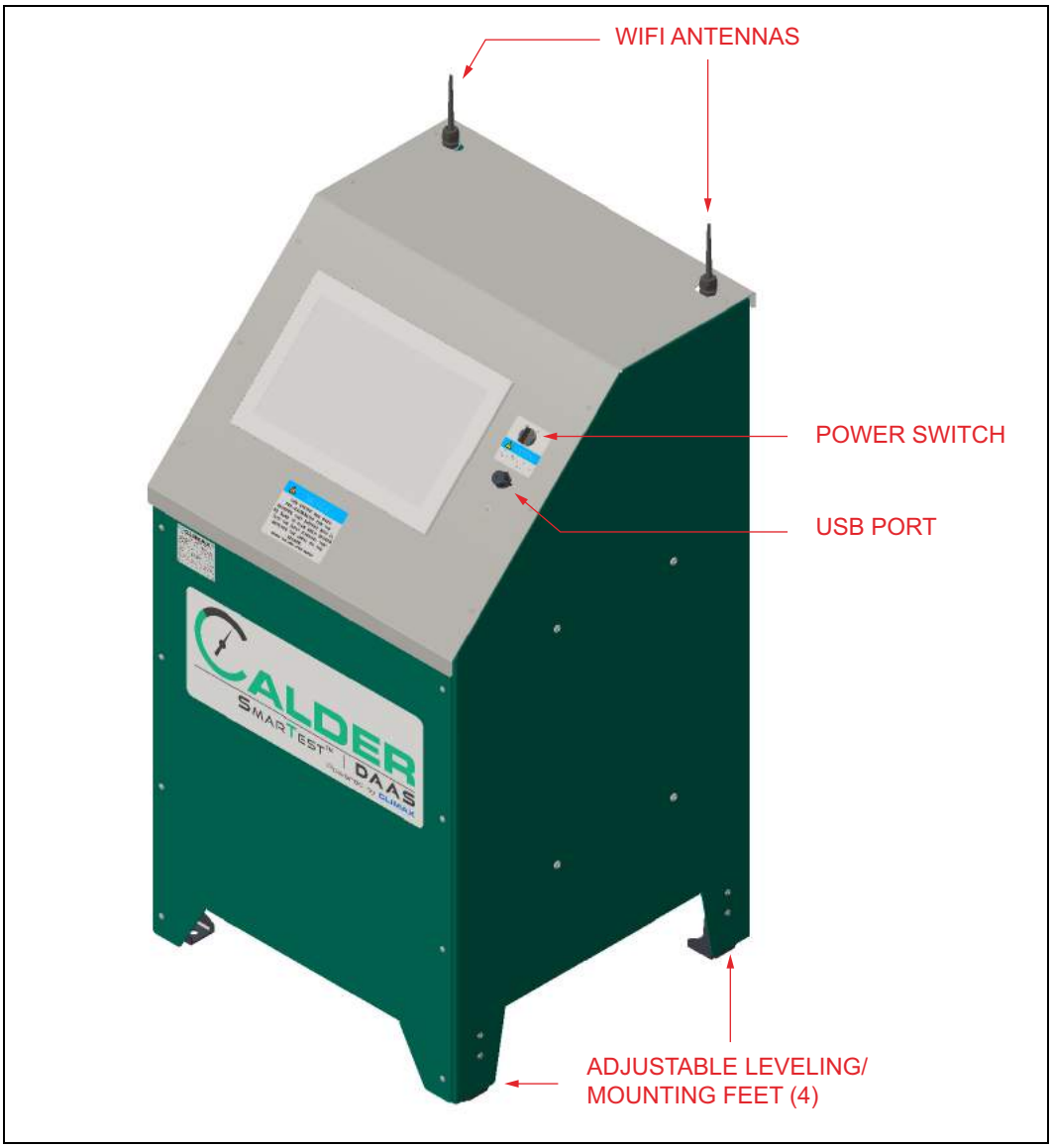


FIGURE 2-1. COMPONENTS

2.2 CONTROLS

The DAAS controls are all located on the machine (shown in Figure 2-2).

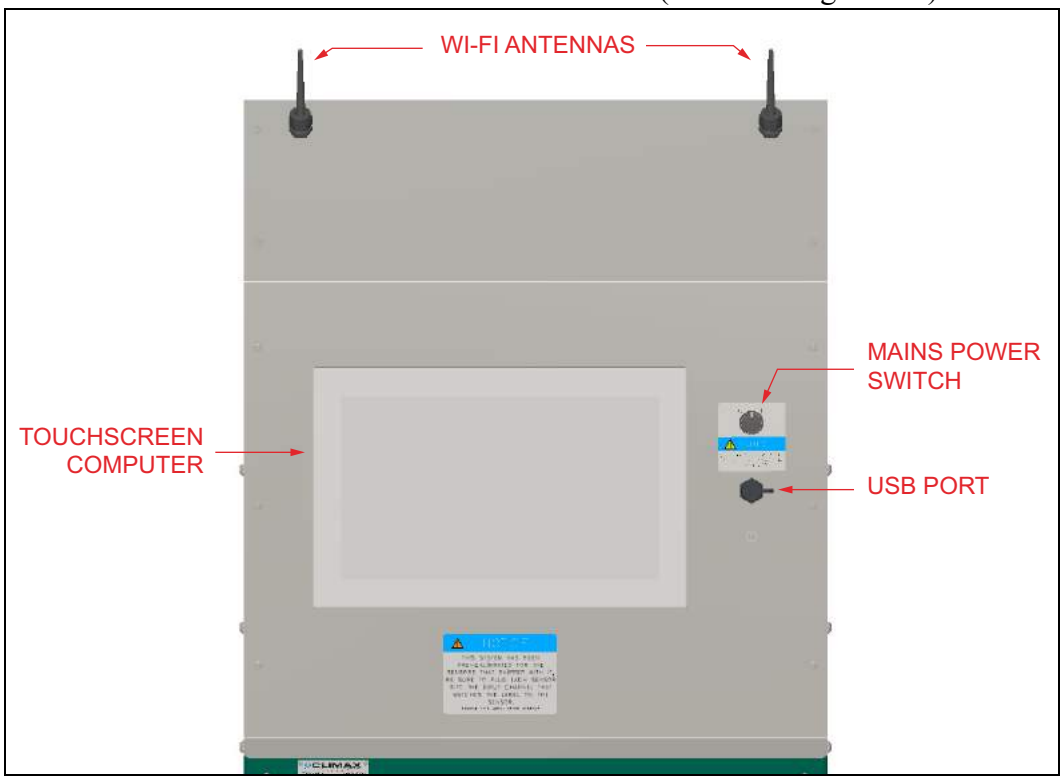


FIGURE 2-2. CONSOLE CONTROLS

Principle components include:

Wi-Fi antennas–This system is Wi-Fi enabled to allow for the wireless transfer or automatic emailing of test reports. To enable these functions, the DAAS system must have access to the local network. Email functions require access to the internet and a sender's email address.

Touchscreen computer–This is an industrial touchscreen computer with the following features:

- Windows 10 Pro operating system
- Intel Core i3-4010U processor
- 15.6" WXGA touch screen
- 4GB ram
- 128Gb solid state hard drive
- Wi-Fi enabled
- The front panel of the computer is rated IP64.

The computer has Ethernet ports (RJ45) and additional USB ports on the back. These ports can be accessed by removing the front or back cover of the DAAS console.

NOTICE

Do not remove the top cover as there are cables running between the computer and the control enclosure inside the console, which may be damaged if pulled on. These cables must be disconnected before the top cover can be removed.

Mains power switch–The following guidelines apply:

NOTICE

Always shut down the computer before turning off the mains power switch.

- Always turn off the mains power switch when the computer is not in use.
- Turning the mains power on boots the computer up automatically.
- The switch must be turned off for a minimum of 15 seconds before turning it back on in order for the computer to turn on.

USB port–This port can be used for the following functions:

- Store test reports and data files to an external drive.
- Plug in a mouse and keyboard.
- Plug in a dongle for use with a wireless keyboard and mouse (use the provided water-resistant cover over the dongle and keep water out of the USB port).

NOTICE

Do not accept Windows 10 or National Instruments LabView update requests because updating the operating system or LabView may cause the DAAS program to stop running.

2.3 DIMENSIONS

Figure 2-3 on page 13 show the machine and operating dimensions.

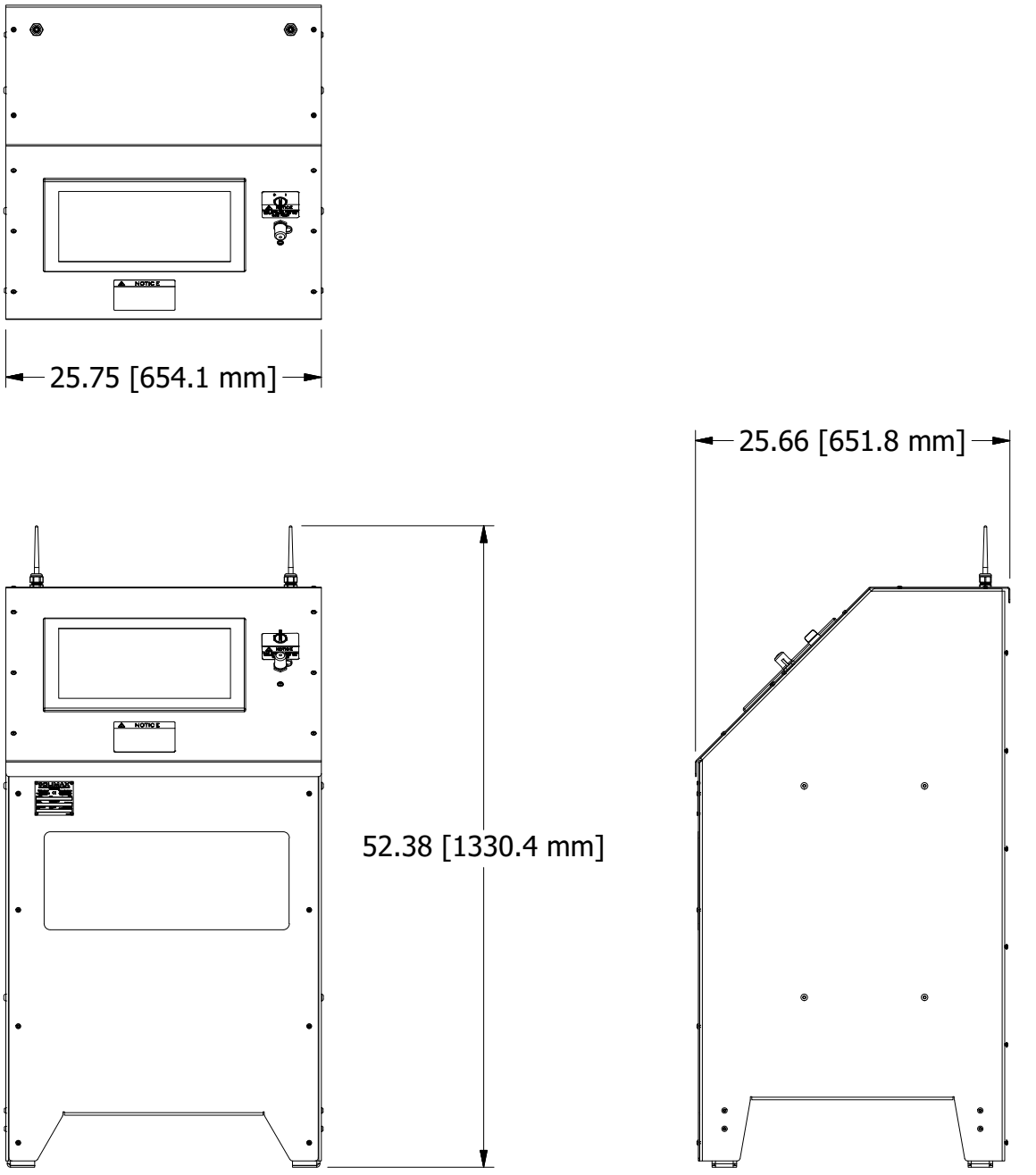


FIGURE 2-3. DIMENSIONS

2.4 SPECIFICATIONS

TABLE 2-1. SPECIFICATIONS

Mains power:	One of the following: • 1 ampere at 100–120V/1ph • 0.5 ampere at 200–240V/1ph Voltage: 120V ±10% or 230V ±10% Frequency: 50-60 Hz ± 4%
Weight:	145 lbs (66 kg)
Operational temperature:	32–122°F (0–50°C)
Storage temperature:	-4–140°F (-20–60°C)
Relative humidity:	10–95% (non-condensing)
Shock:	10G peak acceleration (11ms duration)
Vibration:	5–500 Hz 1G RMS maximum
Altitude:	6,500 ft (2,000M)
DAAS console environmental rating:	Computer front panel: IP65 USB port: • IP65 when the water resistant cover is installed. • IP20 if the cover is removed or if the cable is plugged in (no protection against liquids). Power switch, antennas, and electrical enclosure: IP54

All DAAS consoles ship with a 120V plug on the mains power cord.

If the system is to be operated on 230V power, cut off the 120V plug and install the included 230V Schuko plug (for Europe) or any other suitable 200-240V single phase plug. No other changes are necessary.

⚠ WARNING

Do not use the machine in any application that exceeds these operating specifications. Failure to follow these guidelines could result in personnel injury and property damage, and will void the warranty.

Special precautions

⚠ CAUTION

For operator safety and to protect the electrical and electronic components, check that the ground terminal of the mains power receptacle is solidly bonded to a low impedance ground. The lack of a good low-impedance path to ground may result in equipment damage or injury to personnel.

Follow these guidelines:

- Keep the pressure transducer cables at least 18" (457 mm) away from any power cables, welding cables high current extension cords, or other conductors. Failure to do so may result in inaccurate pressure measurements.
- Do not coil excess pressure transducer cable length into a loop. Coiling the cable will increase the effects of any radiated, conducted, or capacative coupled interference. Pull the excess cable length back inside the metal DAAS console and secure it as shown in Figure 2-4.

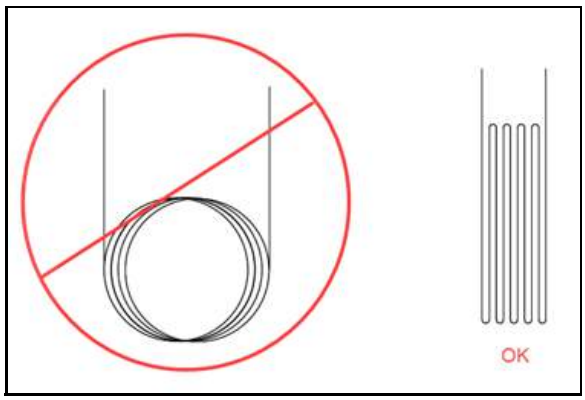


FIGURE 2-4. CABLE RECOMMENDATION

- Do not allow water or spray to get into the USB port. Any liquid in the USB port may damage the port and the computer.

2.5 ITEMS REQUIRED BUT NOT SUPPLIED

The following items are required but not supplied:

- Pressure-containing hardware (such as tubing, hoses, and fittings), as required to suit the test parameters as defined by the operator.
- Instrumentation, such as pressure transducers, if not purchased from CLIMAX.

The controls are fitted with a mains power line filter/surge suppressor. If the power source at the DAAS console operation location tends to fluctuate or experience interruptions, the user should provide an un-interruptible power supply (UPS).

If the local power outlets are fitted with ground fault circuit interrupter (GFCI) devices, the power line filter may cause nuisance tripping of the GFCI. This may be solved with the use of a UPS or an isolation transformer.

This page intentionally left blank

3 SETUP

IN THIS CHAPTER:

This section describes the setup and assembly procedures for the DAAS Calder data acquisition and analysis system.

3.1 RECEIPT AND INSPECTION

Your CLIMAX product was inspected and tested prior to shipment, and packaged for normal shipment conditions. CLIMAX does not guarantee the condition of your machine upon delivery.

When you receive your CLIMAX product, perform the following receipt checks:

1. Inspect the shipping containers for damage.
2. Check the contents of the shipping containers against the included invoice to make sure that all components have been shipped.
3. Inspect all components for damage.

Contact CLIMAX immediately to report damaged or missing components.

NOTICE

Keep the shipping container and all packing materials for future storage and shipping of the machine.

The operator is responsible for performing the design assessment to integrate the pressure transducers and temperature sensors (if supplied) into non-CLIMAX test console systems, and for supplying any necessary hardware and labor required to accomplish the retrofit. Note that any modification of a non-CLIMAX system may invalidate the original equipment manufacturer's warranty. CLIMAX is not responsible for potential invalidation of non-CLIMAX manufacturer's warranties, or any performance loss of non-CLIMAX equipment that may arise as a result of installing test-monitoring hardware.

Only qualified personnel should install pressure transducers into the high-pressure system. Always use fittings and parts rated for the pressures involved. Never use any fittings that have insufficient pressure ratings.

⚠ WARNING

The use of under-rated fittings may result in fittings leaking or fracturing when pressurized. The failure of an under-rated fitting could result in personnel injury and property damage and will void the warranty.

3.2 STARTING THE DAAS PROGRAM

If you purchased pressure transducers or temperature sensors from Climax to ship with the DAAS console, Climax will enter the calibration information for the sensors into the DAAS computer before shipping. The sensors are labeled according to the channel with which they were calibrated.

NOTICE

Connect the sensors to the correct input channels of the DAAS console, or inaccurate readings will result.

The following figures show the system settings screens.

Start the program by clicking on the DAAS icon shown in Figure 3-1 on page 19.

NOTICE

It is the user's responsibility to assure that the pressure transducers and other sensing devices used with the Climax Calder Data Acquisition System (DAAS) are properly calibrated and that the calibration information has been correctly entered into the DAAS system.

Given that any electronic sensor can be subject to a variety of outside influences or failure modes that may result in inaccurate readings, it is strongly recommended that the test pressure source be fitted with a separate calibrated pressure gauge and the operator verify its readings against the DAAS pressure readings. This check should be done daily, at the beginning of each shift, and periodically during any valve testing.

Climax will not be held accountable for the failure of any pressure sensing devices, for any inaccuracy in the recorded readings from such devices, or any adverse consequences that may result. It is the operator's responsibility to independently verify the accuracy of all pressure transducer readings.

NOTICE

Do not accept Windows 10 or National Instruments LabView update requests because updating the operating system or LabView may cause the DAAS program to stop running.

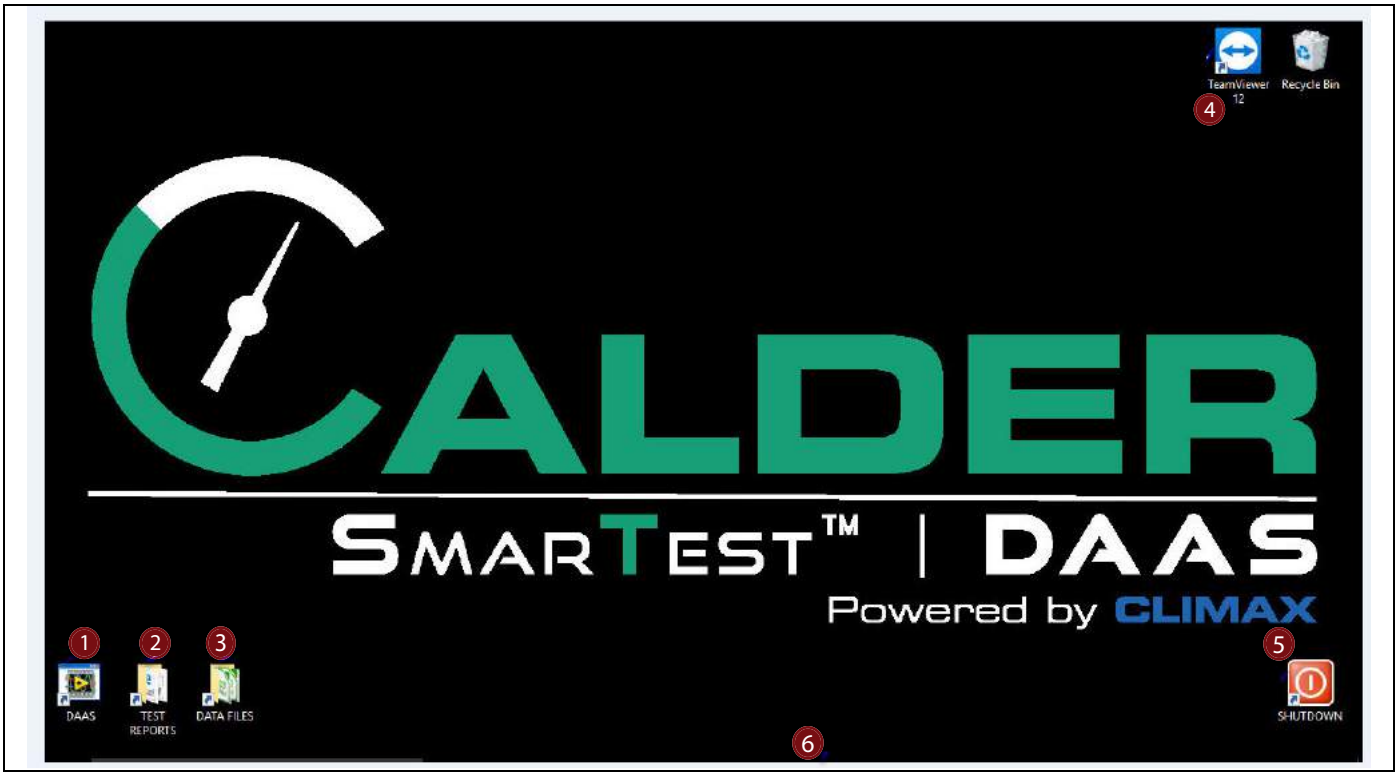


FIGURE 3-1. DESKTOP ICONS

TABLE 3-1. DESKTOP FUNCTIONS

Number	Name	Function
1	DAAS application	This icon starts the DAAS program.
2	Test reports	Shortcut to the folder in which all test reports are stored.
3	Data files	Shortcut to the folder in which all test data files are stored.

TABLE 3-1. DESKTOP FUNCTIONS

Number	Name	Function
4	TeamViewer	This program allows for technical support remote access by doing the following: 1. Connect the computer to the internet either by Wi-Fi or by the Ethernet connection on the back of the computer. 2. Start up TeamViewer. 3. Send the ID number and password to the person who needs to connect remotely (see Table 3-1). TeamViewer can also allow someone to view the DAAS valve test screens remotely during a test. This enables a customer to witness the testing of their valve without being on site. It is necessary for the remote user to install TeamViewer on their computer.
5	Shutdown	This icon shuts down the computer. Always allow the computer to shut down completely before turning off the mains power. Failure to do this may corrupt some of the operating system files and cause problems with the next startup. It is very important that this step be followed every time.
6	Windows taskbar	The Windows 10 taskbar is hidden until the operator swipes upwards from the bottom of the screen with one finger. The task bar will appear, giving access to all of the Windows functionality.

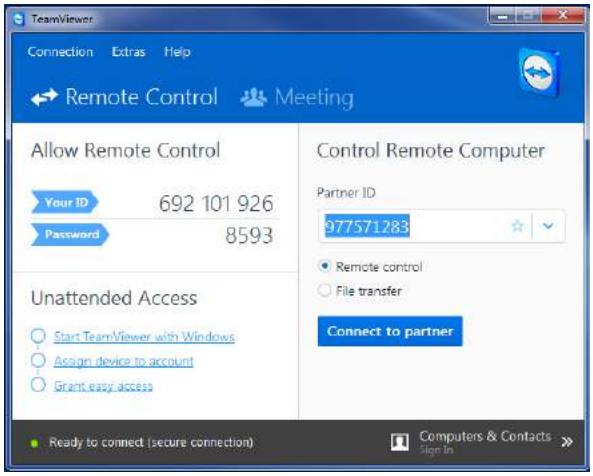


FIGURE 3-2. REMOTE CONTROL WINDOW

The DAAS icon opens the test menu with the available tests (see Figure 3-3).

Tests that have not been purchased will appear grayed out with an ACTIVATE option below it. Clicking ACTIVATE will open a password request window.

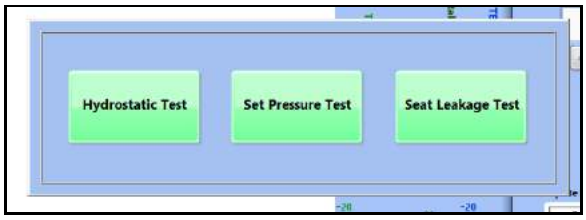


FIGURE 3-3. TESTING POP-UP MENU

3.3 CUSTOMIZING LOGO AND DATA FIELDS

The DAAS has the ability to customize the logo and data fields used when testing.

Do the following to customize the logo:

1. In Windows Explorer on your DAAS machine, open the C drive > PProject > Logo (see Figure 3-4).
2. Replace the existing logo .png file with the new logo that meets the following specifications:
   - The image is in the PNG format
   - The file name is “logo.png”.
   - The image is no larger than 200x80 pixels.

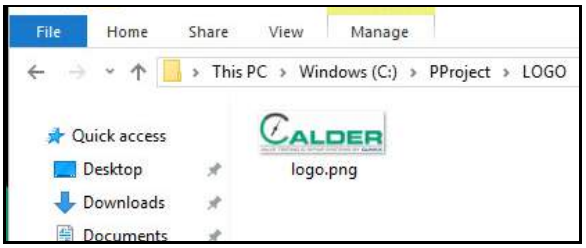


FIGURE 3-4. LOGO FILE LOCATION

Do the following to customize the titles of the data fields:

1. In Windows Explorer on your DAAS machine, open the C drive > PProject > TEST PARAMETERS (see Figure 3-5).

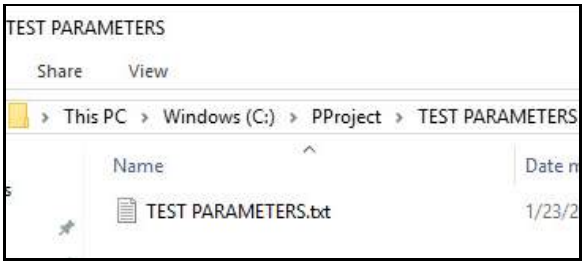


FIGURE 3-5. TEST PARAMETERS FILE LOCATION

2. Open the TEST PARAMETERS.txt file (see Figure 3-6) and follow these instructions:
   - To disable any field, replace ENABLE with DISABLE before the field name.

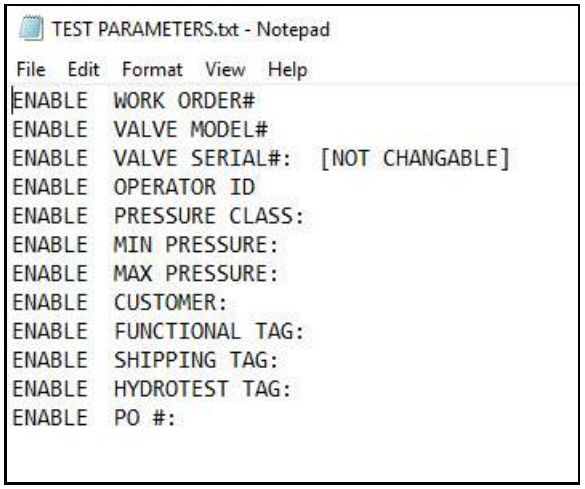


FIGURE 3-6. TEST PARAMETER DEFAULT TITLES

TIP:

The disabled field will not appear on test screens or reports until the TEST PARAMETERS.txt file is modified again and DISABLE is replaced with ENABLE.

- To replace the title of any data field (except the VALVE SERIAL # field, which must not be changed), replace the existing name with the new name (no more than 24 characters).

TIP:

The VALVE SERIAL # name must not be changed. Attempting to change this will create errors in the test report file names.

3. Save and close the file.

3.4 SETTINGS CONFIGURATION

Configure one-time settings options with the SETTINGS button on the bottom of the main screen of any of the testing options (see Section 4 on page 33).

3.4.1 Scaling configuration

The DAAS offers both two-point and five-point scaling configuration.

Five-point scaling (described in Section 3.4.1.2 on page 25) is often preferable as it compensates for nonlinearity across the entire transducer range, as it allows for four distinct slope and offset values.

Two-point scaling (described in Section 3.4.1.1 on page 23) produces a single slope and offset, but it may be the only option available based on the information provided on the transducer calibration certificate.

3.4.1.1 Two-point scaling

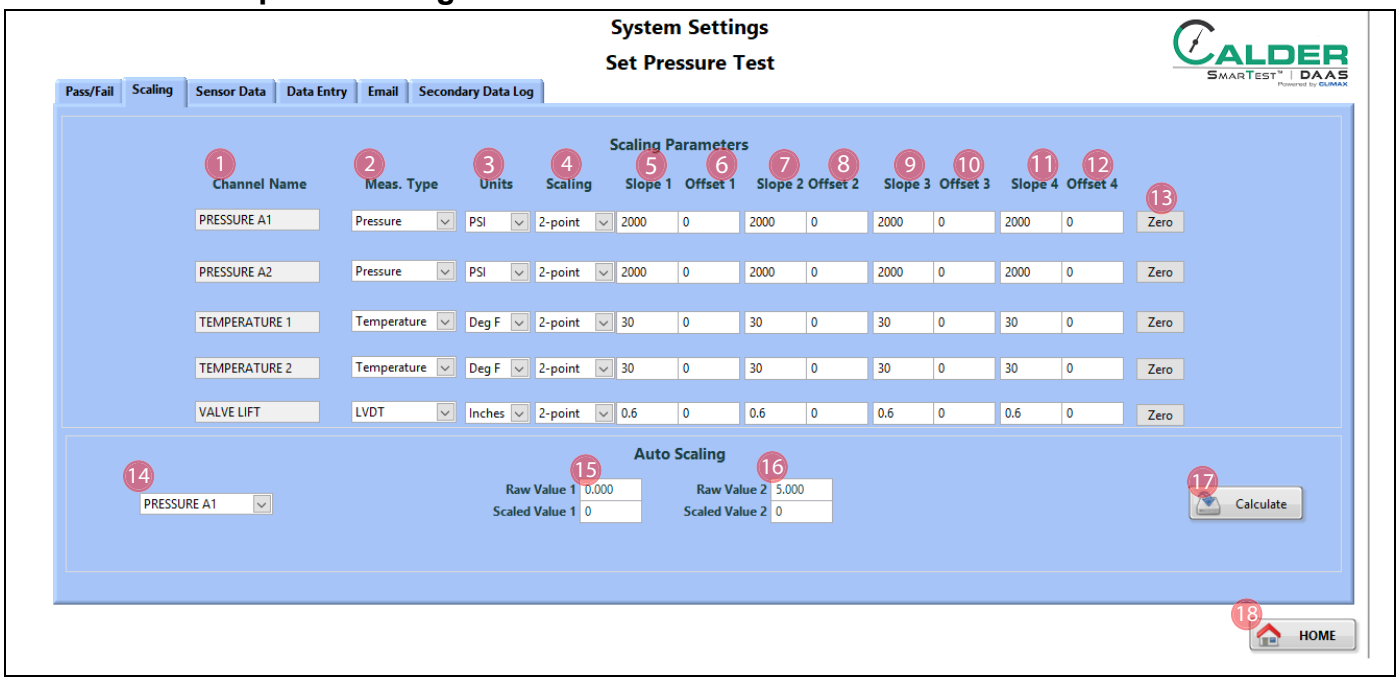


FIGURE 3-7. TWO-POINT SCALING SCREEN

TABLE 3-2. TWO-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
1	Channel name	This field is the user-generated name for the input channel.
2	Measurement type	Select from the drop-down menu the type of sensor connected to this channel: • Pressure • Temperature
3	Units	Select from the drop-down menu which units will be shown on the test screen graph and on the reports: • PSI: pounds per square inch • Bar: atmospheric pressure at sea level • Deg F: temperature in degrees Fahrenheit • Deg C: temperature in degrees Celsius • Raw: displays the actual raw data value of volts of the signal from the sensor (0-5V or 0-10V). This data may be used for sensor calibration. Select the appropriate units for the sensor. After the sensor has been scaled, changing the units will change all displayed values and scaling data to the new units.

TABLE 3-2. TWO-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
4	Scaling	Select from the drop-down menu one of the following: • 2-point calibration: the operator uses two data points from the calibration certificate with the sensor and calculates a single slope and offset, which is then entered in the Slope 1 and Offset 1 data fields. • 5- point calibration: the operator uses five data points from the calibration certificate supplied with the sensor and calculates four slope and offset values. 5-point calibration compensates for nonlinearity in several different ranges across the signal span and provides slightly more accurate data. Select the appropriate units for the sensor. After the sensor has been scaled, changing the units will change all displayed values and scaling data to the new units.
5	Slope 1	First calculated slope value (the only one used if using 2-point calibration; 0-25% of full scale if using 5-point calibration)
6	Offset 1	First calculated offset value (the only one used if using 2-point calibration; 0-25% of full scale if using 5-point calibration)
7	Slope 2	Second calculated slope value (25-50% of full scale)
8	Offset 2	Second calculated offset value (25-50% of full scale)
9	Slope 3	Third calculated slope value (50-75% of full scale)
10	Offset 3	Third calculated offset value (50-75% of full scale)
11	Slope 4	Fourth calculated slope value (75-100% of full scale)
12	Offset 4	Second calculated offset value (75-100% of full scale)
13	Zero	Automatically adjusts the offset of the sensor scaling so that the displayed value is 0. This allows the operator to compensate for minor drift in the sensor signal caused by temperature changes or time. Important: The actual pressure applied to the pressure transducer must be at zero when this is done, or it will cause an error in the reading.
14	Auto scaling channel selection	Select the Channel Name of the sensor for which you want to perform auto scaling. • If 2-point calibration has been selected for the channel, only 2 data points will show (items 21 and 22). • If 5-point calibration has been selected for the channel, all 5 data points will show (items 21, 22, 23, 24, and 25).
15	Raw Value 1 Scaled Value 1	This is the value of the analog input from the sensor at 0 pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar). The value should always be 0. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit.

TABLE 3-2. TWO-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
16	Raw Value 2 Scaled Value 2	This is the value of the analog input from the sensor at approximately 25% of the full-scale pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar) at approximately 25% of the full-scale pressure. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit. • Do not use metric units for scaling.
17	Calculate	Do the following: 1. Check that the correct Channel Name has been selected on the right side of the Auto Calibrate area. 2. Enter the raw value and scaled value data in all the preceding fields. 3. Press CALCULATE. The 5-point slope and offset values are automatically calculated and stored in the system memory.
18	Exit	Closes the System Settings screen and returns to the Testing screen.

3.4.1.2 Five-point scaling

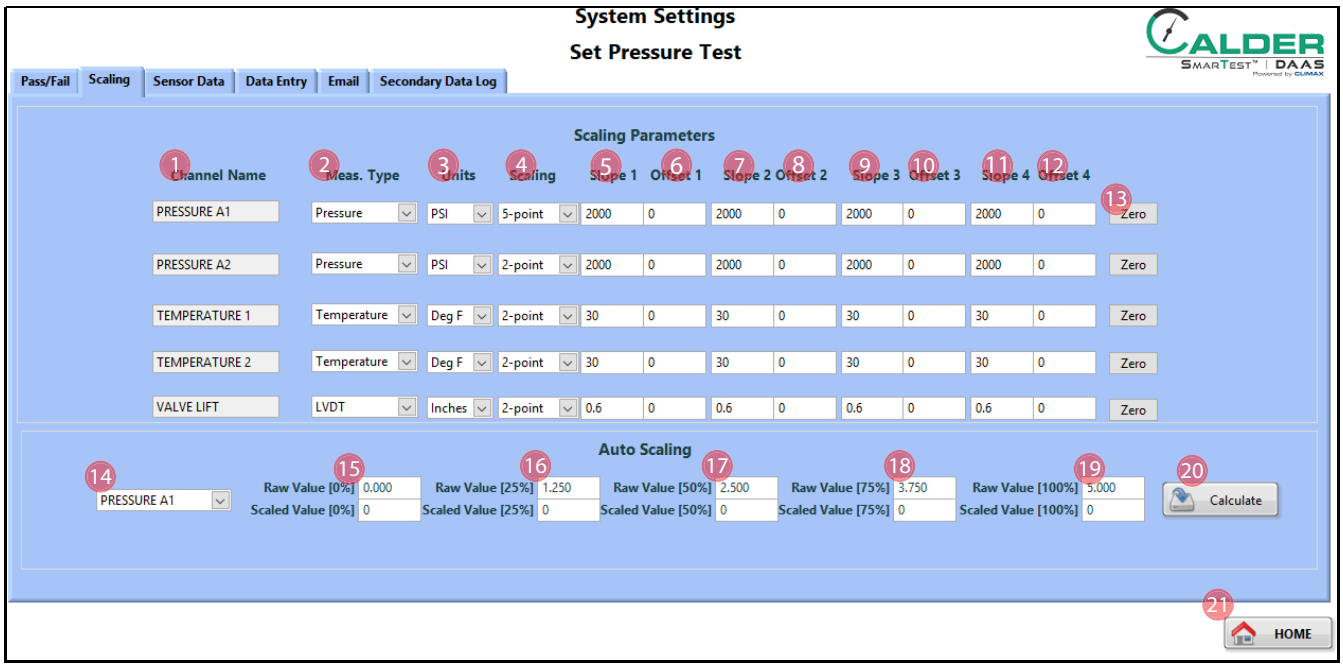


FIGURE 3-8. FIVE-POINT SCALING SCREEN

TABLE 3-3. FIVE-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
1	Channel name	This field is for display only.
2	Measurement type	Select from the drop-down menu the type of sensor connected to this channel: • Pressure • Temperature
3	Units	Select from the drop-down menu which units will be shown on the test screen graph and on the reports: • PSI: pounds per square inch • Bar: atmospheric pressure at sea level • Deg F: temperature in degrees Fahrenheit • Deg C: temperature in degrees Celsius • Raw: displays the actual raw data value of volts of the signal from the sensor (0-5V or 0-10V). This data may be used for sensor calibration. Select the appropriate units for the sensor. After the sensor has been scaled, changing the units will change all displayed values and scaling data to the new units.
4	Scaling	Select from the drop-down menu one of the following: • 2-point calibration: the operator uses two data points from the calibration certificate with the sensor and calculates a single slope and offset, which is then entered in the Slope 1 and Offset 1 data fields. • 5- point calibration: the operator uses five data points from the calibration certificate supplied with the sensor and calculates four slope and offset values. 5-point calibration compensates for nonlinearity in several different ranges across the signal span and provides slightly more accurate data. Select the appropriate units for the sensor. After the sensor has been scaled, changing the units will change all displayed values and scaling data to the new units.
5	Slope 1	First calculated slope value (the only one used if using 2-point calibration; 0-25% of full scale if using 5-point calibration)
6	Offset 1	First calculated offset value (the only one used if using 2-point calibration; 0-25% of full scale if using 5-point calibration)
7	Slope 2	Second calculated slope value (25-50% of full scale)
8	Offset 2	Second calculated offset value (25-50% of full scale)
9	Slope 3	Third calculated slope value (50-75% of full scale)
10	Offset 3	Third calculated offset value (50-75% of full scale)
11	Slope 4	Fourth calculated slope value (75-100% of full scale)
12	Offset 4	Second calculated offset value (75-100% of full scale)

TABLE 3-3. FIVE-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
13	Zero	Automatically adjusts the offset of the sensor scaling so that the displayed value is 0. This allows the operator to compensate for minor drift in the sensor signal caused by temperature changes or time. Important: The actual pressure applied to the pressure transducer must be at zero when this is done, or it will cause an error in the reading.
14	Auto scaling channel selection	Select the Channel Name of the sensor for which you want to perform auto scaling. • If 2-point calibration has been selected for the channel, only 2 data points will show (items 21 and 22). • If 5-point calibration has been selected for the channel, all 5 data points will show (items 21, 22, 23, 24, and 25).
15	Raw Value [0%] Scaled Value [0%]	This is the value of the analog input from the sensor at 0 pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar). The value should always be 0. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit.
16	Raw Value [25%] Scaled Value [250%]	This is the value of the analog input from the sensor at approximately 25% of the full-scale pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar) at approximately 25% of the full-scale pressure. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit. • Do not use metric units for scaling.
17	Raw Value [50%] Scaled Value [50%]	This is the value of the analog input from the sensor at approximately 50% of the full-scale pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar) at approximately 50% of the full-scale pressure. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit. • Do not use metric units for scaling.
18	Raw Value [75%] Scaled Value [75%]	This is the value of the analog input from the sensor at approximately 75% of the full-scale pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar) at approximately 75% of the full-scale pressure. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit. • Do not use metric units for scaling.

TABLE 3-3. FIVE-POINT SCALING SCREEN FUNCTIONS

Number	Name	Function
19	Raw Value [100%] Scaled Value [100%]	This is the value of the analog input from the sensor at approximately 75% of the full-scale pressure. Scaled value: pressure reading from a calibration instrument (PSI or bar) at approximately 75% of the full-scale pressure. Important: remember when scaling a sensor: • Raw value is always volts. • Scaled value is always psi or degrees Fahrenheit. • Do not use metric units for scaling.
20	Calculate	Do the following: 1. Check that the correct Channel Name has been selected on the right side of the Auto Calibrate area. 2. Enter the raw value and scaled value data in all the preceding fields. 3. Press CALCULATE. The 5-point slope and offset values are automatically calculated and stored in the system memory.
21	Exit	Closes the System Settings screen and returns to the Testing screen.

3.4.2 Sensor data configuration

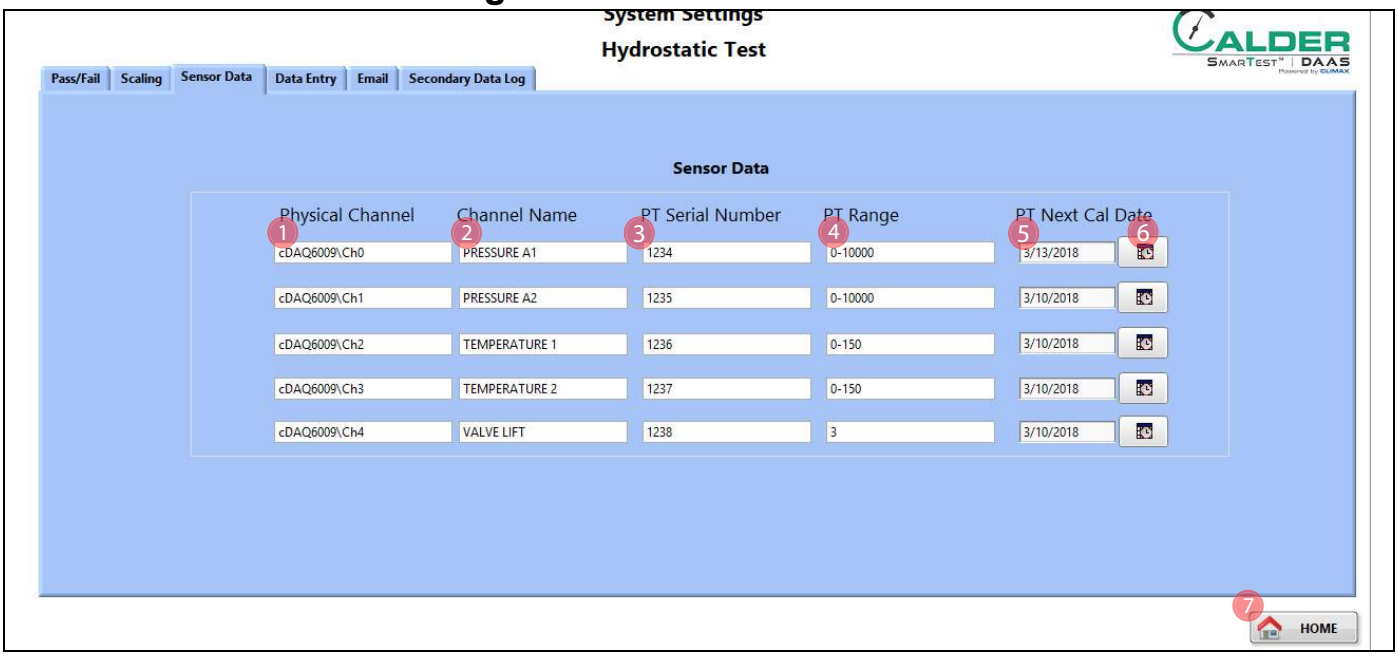


FIGURE 3-9. SENSOR DATA SCREEN

TABLE 3-4. SENSOR DATA SCREEN FUNCTIONS

Number	Name	Function
1	Physical channel	This identifies the analog input channel on the analog input device to which the sensors are connected. This field cannot be edited by the user.

TABLE 3-4. SENSOR DATA SCREEN FUNCTIONS

Number	Name	Function
2	Channel name	Define the name for the sensor connected to this channel. Text entered here is displayed on the test screen and the reports. The name choice is open to the user. Common choices include PRESSURE A1, PRESSURE A2, TOP PLATE, BOTTOM PLATE, TEMPERATURE, and LIFT.
3	PT Serial Number	Serial number of the pressure transducer that is connected to this input channel
4	PT Range	The rated pressure range of transducer (for example 0-10,000 psi)
5	PT Next Cal	The date that the pressure transducer is due for the next calibration (usually required annually)
6	Date	This is a popup calendar that can be used for selecting the calibration date if desired.
7	Exit	Closes the System Settings screen and returns to the Testing screen.

Choose between keyboard or touch screen on the Data Entry tab (Figure 3-10).

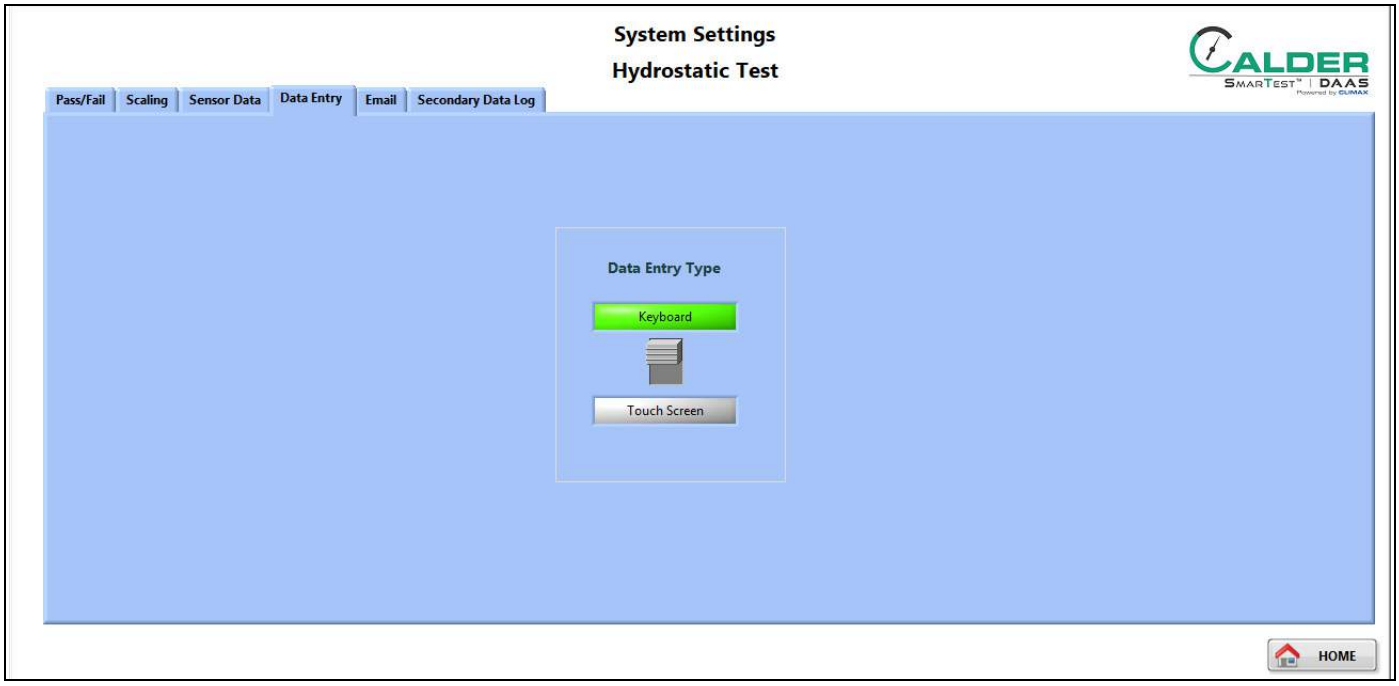


FIGURE 3-10. DATA ENTRY TYPE SCREEN

This toggle switch selects between the methods used to type data into the DAAS program:

- Touch screen
- Keyboard and mouse

The system is provided with only the touchscreen option. The operator may connect a USB or wireless keyboard and mouse to the computer. The touch screen is disabled when keyboard is selected.

3.4.3 Email settings

Complete the email specification fields in the Email tab (Figure 3-11).

When all the correct information is entered in the email configuration screen, then whenever the “Save To PDF” button is pressed on the Reports screen, an email is sent to the designated email recipient with the test report and test data file attached.

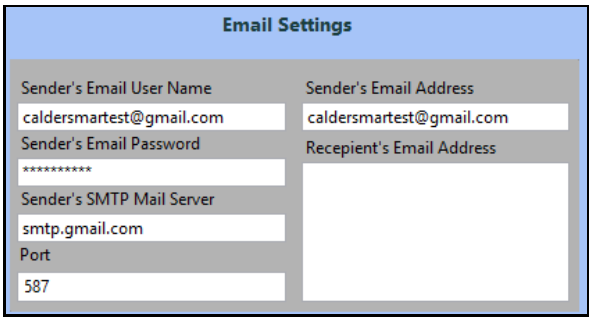


FIGURE 3-11. EMAIL SETTINGS TAB

To stop sending the emails, delete the recipient’s email address.

It may be necessary to call the operator’s in-house IT support staff to provide the correct information to enter in the sender’s information.

TIP:

Some companies prefer to create a separate Gmail email account for the DAAS system to use. If you use a Gmail SMTP account, then use port 587. You may also need to adjust the settings of the email sender account and set it to “Allow access from less secure devices.”

3.4.4 Secondary data log

In the secondary data log tab, enable or disable the secondary log feature.

When enabled, enter the network addresses of the locations where the data files and test reports will be saved.

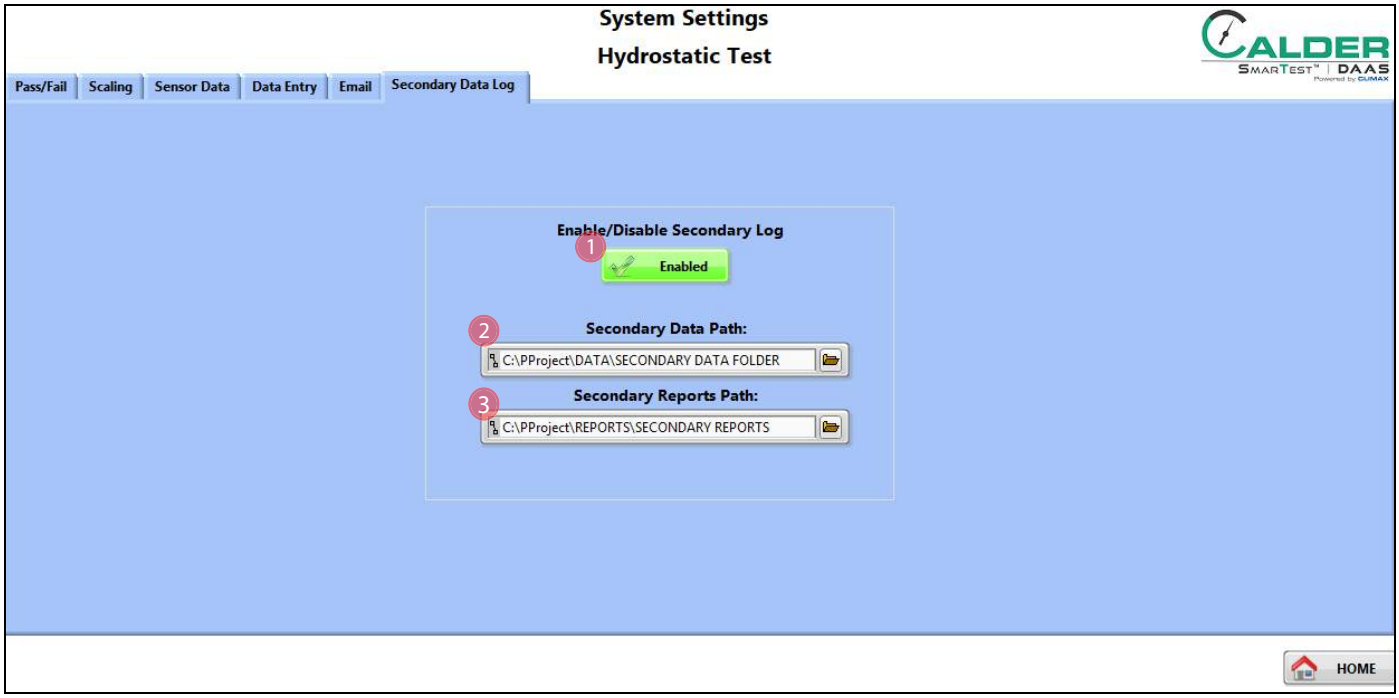


FIGURE 3-12. SECONDARY DATA LOG SCREEN

TABLE 3-5. SENSOR DATA SCREEN FUNCTIONS

Number	Name	Function
1	Enable/Disable Secondary Log	Toggle to enable/disable the storing of test reports and data files to a second network location.
2	Secondary Data Path	Enter the network path where a second copy of the data files are to be automatically stored.
3	Secondary Reports Path	Enter the network path where a second copy of the test reports are to be automatically stored.

This page intentionally left blank

4 OPERATION

IN THIS CHAPTER:

4.1 PRE-OPERATION CHECKS

Do the following checks before operating the machine:

1. Complete the risk assessment checklist in Table 1-3 on page 5.
2. Check that the work area is clear of non-essential personnel and equipment.
3. Check that the machine control/observation area will not be in the path of high pressure fluid or flying parts should the valve under test fail.
4. Check that air and fluid hoses are routed and secured to avoid tripping, entanglement, damage from parts dropping on them, or other damage should a hose or connection fail.

NOTICE

Do not accept Windows 10 or National Instruments LabView update requests because updating the operating system or LabView may cause the DAAS program to stop running.

The power switch must be turned off for a minimum of 15 seconds before turning it back on in order for the computer to turn on.

NOTICE

Always allow the computer to shut down completely before turning off the mains power. Failure to do this may corrupt some of the operating system files and cause problems with the next startup. It is very important that this step be followed every time.

4.2 HYDROSTATIC TEST

4.2.1 Main screen

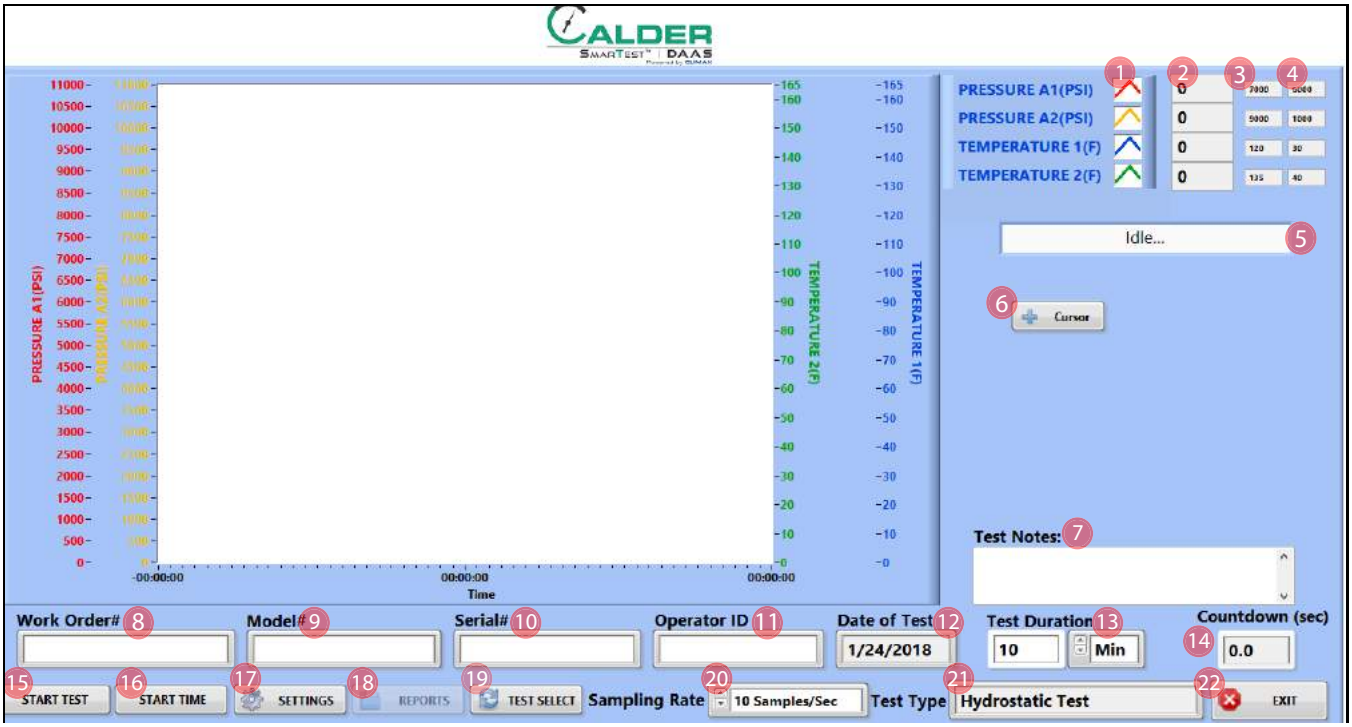


FIGURE 4-1. HYDROSTATIC TEST MAIN SCREEN

TABLE 4-1. HYDROSTATIC TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
1	Channel on/off	Displays the color of chart scale and trace line for that axis. The background is white when the channel is enabled, and gray when disabled.
2	Current scaled value	Displays the current scaled value units of PSI, bar, degrees or raw volts.
3	Maximum limit	Displays the maximum test limit, as entered on the Settings > Pass/Fail screen.
4	Minimum limit	Displays the minimum test limit, as entered on the Settings > Pass/Fail screen.

TABLE 4-1. HYDROSTATIC TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
5	Status bar	Displays the current status of the DAAS system, which may be one of the following: • Idle • Testing • Test Passed • Test Failed • Test Aborted
6	Manual cursor show/hide	Controls the visibility of the pop-up controls palette for the manual cursor. It is necessary to use a mouse for control of the manual cursor as right-button clicks are required and the touch screen cannot execute a right click. See Section 4.5 on page 57.
7	Test notes	Enter up to 300 characters. These notes will be visible in the Report screen and in the Test Report .pdf file.
8	Work order	Enter here the work order number. Any alphanumeric value is accepted, including spaces.
9	Model number	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
10	Serial number	This value is shown in the report and data file. Important: The serial number becomes part of the file name for the test report and test data file. Do not use punctuation or special characters (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < ,{ } [} |\ / or *_) that cannot be included in a file name.
11	Operator ID	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
12	Date of test	The DAAS program automatically fills this field.
13	Test duration	Complete this field by doing the following: 1. Enter the numeric value of the test duration. 2. Select from the drop-down menu the units of the test time duration: seconds, minutes, or hours.
14	Countdown (seconds)	Displays the remaining time of the test duration. This value is always displayed in seconds regardless of the units used for the test duration.
15	Start test	Press to start the test (this also opens the test parameters window seen in Figure 4-2 on page 36). Press again to abort the test.
16	Start time	Press to initiate the preset test duration timer.
17	Settings	Press to navigate to the Settings screens.
18	Reports	After running a test, press this button to navigate to the Reports screen to save a test report and data file.
19	Test select	Press to select the type of test: • Hydrostatic • Set Pressure • Seat Leakage

TABLE 4-1. HYDROSTATIC TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
20	Sampling rate	Select from the drop-down menu the frequency of data samples saved to the test data report: • 10 samples/sec • 1 sample/sec • 20 samples/min • 10 samples/min • 1 sample/min
21	Test type	Displays the test type: • Hydrostatic • Set Pressure • Seat Leakage
22	Exit	Closes the DAAS program and returns to the Windows desktop.

Pressing START TEST (function #15 in Figure 4-1 on page 34) opens the test parameters pop-up window (see Figure 4-2).

Complete the relevant fields for the test, and then press START TEST at the bottom of the window.

TIP:

Any data entered will be saved for all subsequent tests until modified again.

TIP:

The test parameter titles seen in Figure 4-2 may be modified by following the instructions in Section 3.3 on page 21.

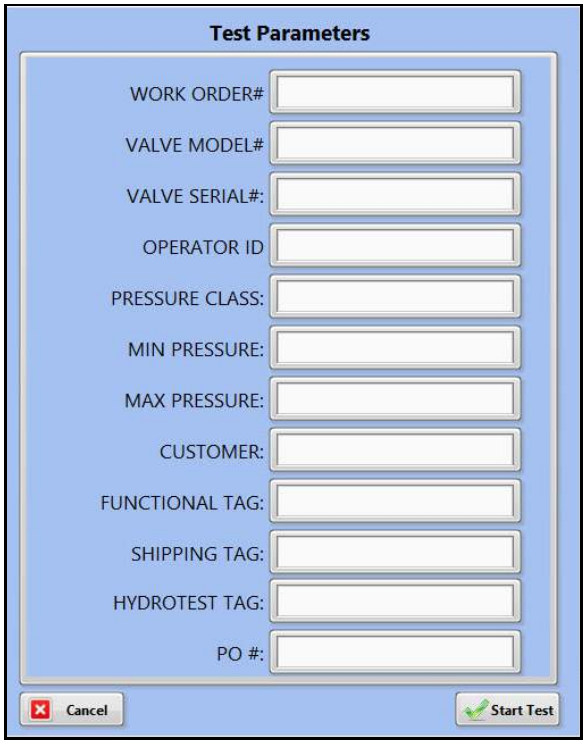


FIGURE 4-2. TEST PARAMETERS POP-UP WINDOW

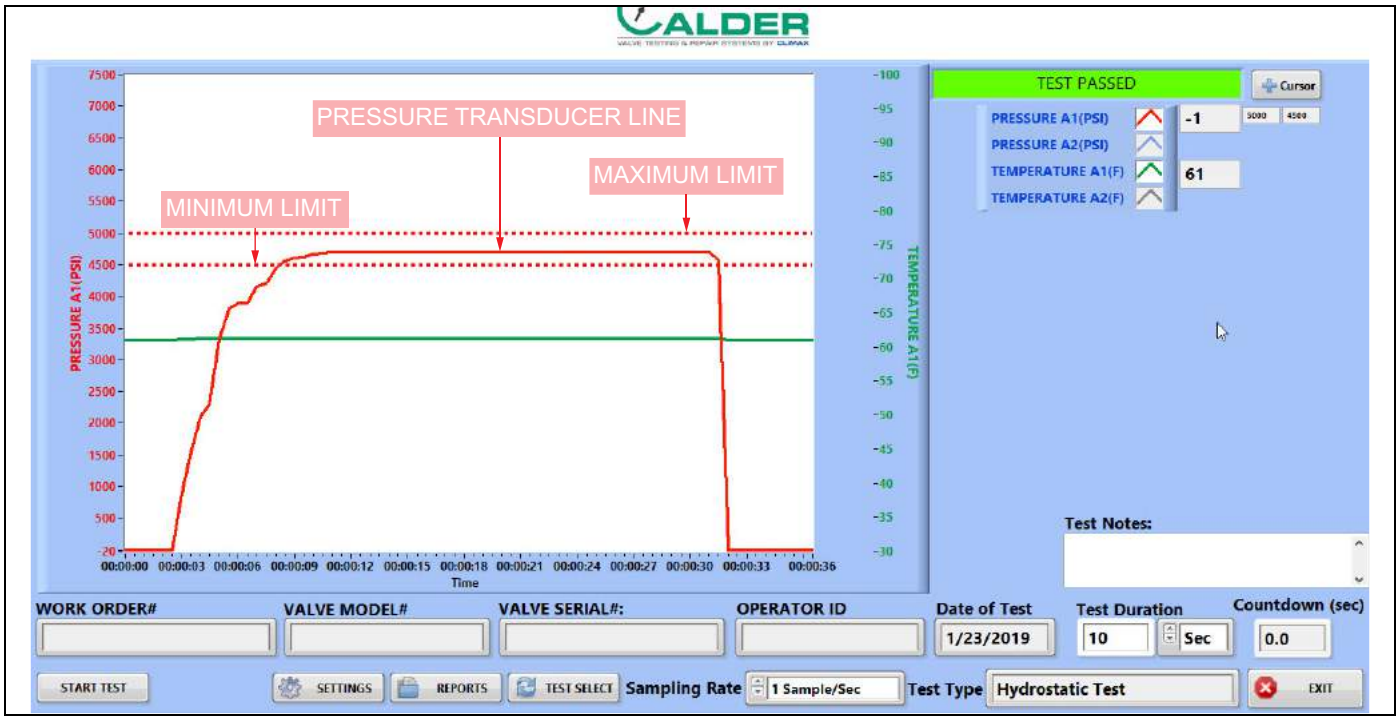


FIGURE 4-3. HYDROSTATIC TEST SAMPLE

Figure 4-3 identifies the different types of lines that appear in tests. Maximum and minimum lines may appear for each channel, as they are set in the main screen.

The maximum is for reference only. If the pressure is below the minimum line at the end of the test, then the system will determine that the test failed.

4.2.2 Pass/fail configuration screens

FIGURE 4-4. HYDROSTATIC TEST PASS-FAIL CONFIGURATION SCREEN

TABLE 4-2. HYDROSTATIC TEST PASS-FAIL CONFIGURATION SCREEN FUNCTIONS

Number	Name	Function
1	Display limits	Determines whether or not the limit cursor lines are displayed.
2	Y maximum	Defines the maximum value (top) of the Y-axis scale on the testing screen graph.
3	Y minimum	Defines the minimum value (bottom) of the Y-axis scale on the testing screen.
4	Upper limit	A horizontal line will show on the testing main screen and on the test report at the value entered in this field. No automatic functions are associated with this value; it is for reference only.
5	Lower limit	A horizontal line will show on the testing main screen and on the test report at the value entered in this field. Also, the Automatic Pass/Fail function uses this value. • Pass: if the test pressure is above this value at the end of the test. • Fail: if the test pressure is below this valve at the end of the test.
6	Enable	Check this box to evaluate this sensor input for automatic pass/fail of the test as determined by the lower limit. If the measured pressure falls below the lower limit value, then the device under test has failed the hydrostatic leakage test. Usually only pressure measurements, not temperature, are used for pass/fail.

4.2.3 Testing screens

Figure 4-5 shows the hydrostatic test pass screen.

FIGURE 4-5. HYDROSTATIC TEST PASS EXAMPLE

Figure 4-6 shows the hydrostatic test fail screen.

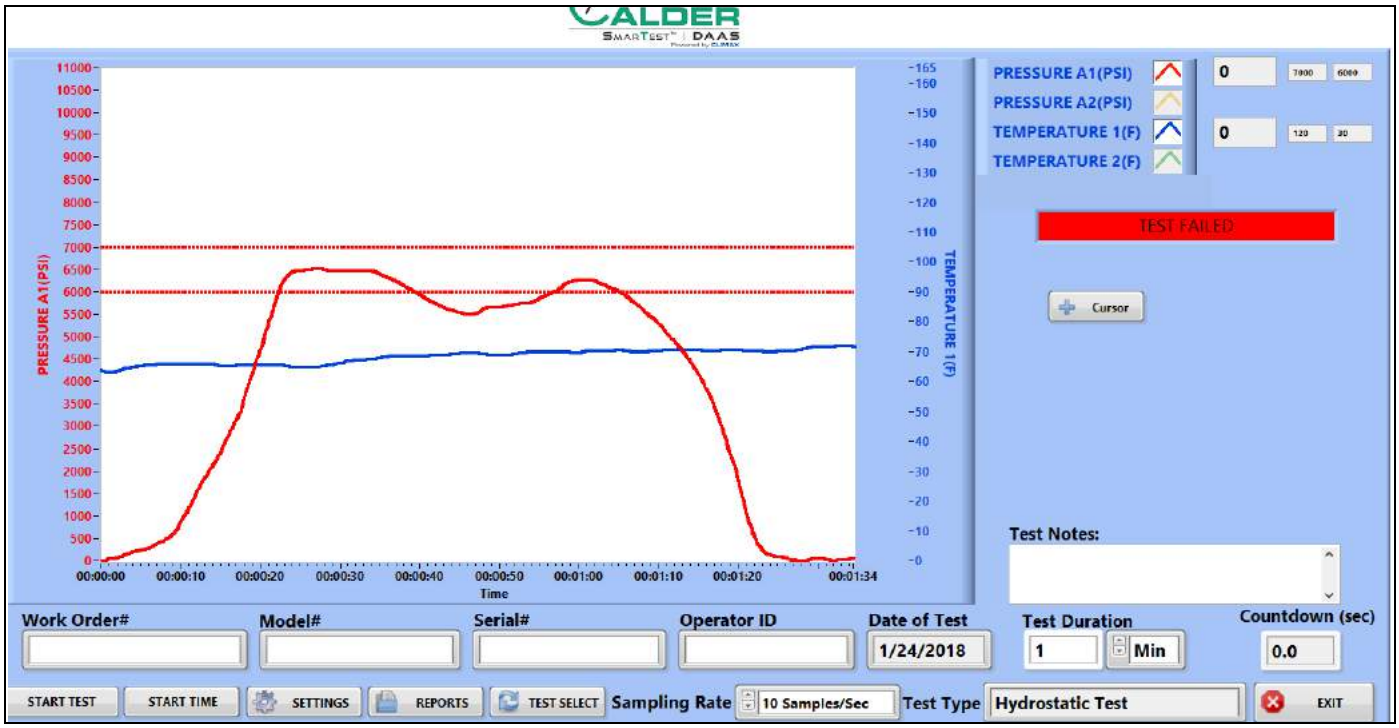


FIGURE 4-6. HYDROSTATIC TEST FAIL EXAMPLE

4.2.4 Reports

Figure 4-7 shows the report input screen.

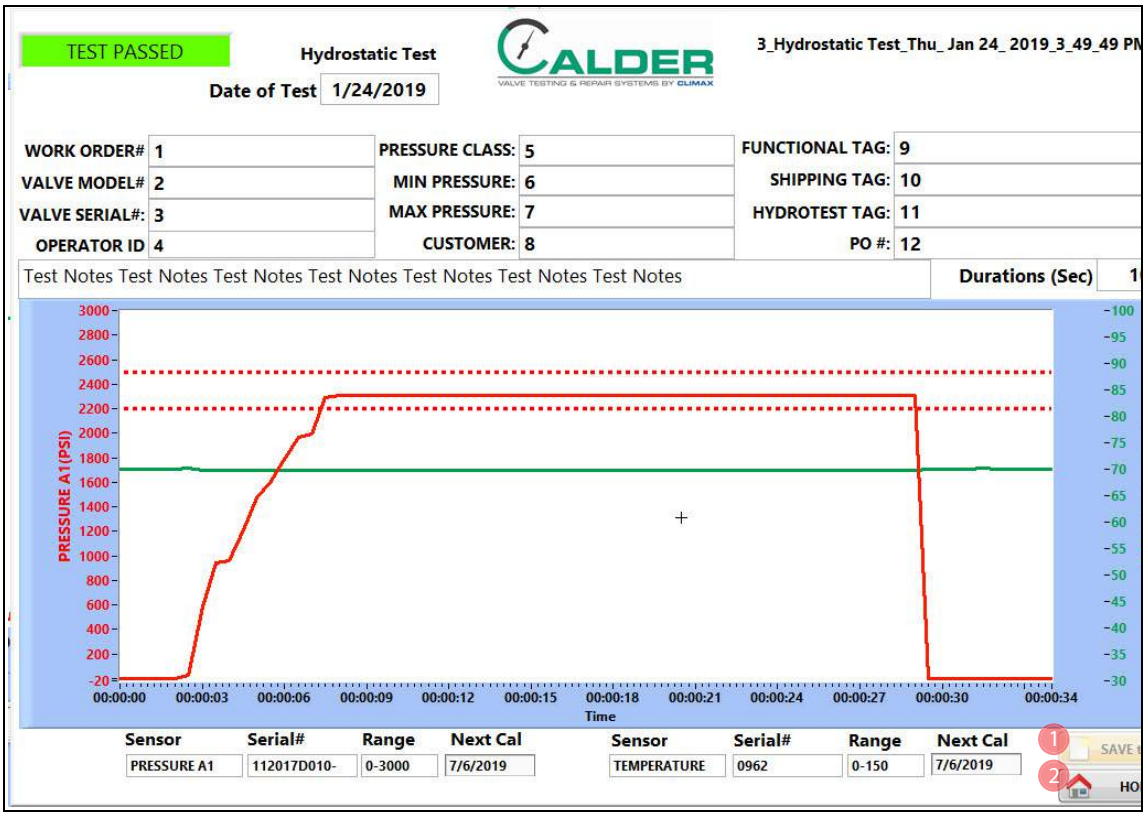


FIGURE 4-7. HYDROSTATIC REPORT INPUT SCREEN

TABLE 4-3. HYDROSTATIC REPORT INPUT FUNCTIONS

Number	Name	Function
1	Save to PDF	Clicking this results in the following: • Saves the test report to .pdf file. • Saves the test data to a .csv file. • If auto-email is configured, then the test report and data files are emailed.
2	Exit	Returns to the testing screen.

The test report and test data files are named automatically using the serial number and the day/date/time stamp.

Example: If the serial number is SN1234, the file names will be the following:

- SN1234Fri_Feb 10_2017_10_32_24 AM.pdf
- SN1234Fri_Feb 10_2017_10_32_24 AM.csv

Therefore do not use special characters or punctuation (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < , { } [ ] |\ / or *) in the serial number, as they cannot be part of a file name.

4.3 SET PRESSURE TEST

4.3.1 Main screen

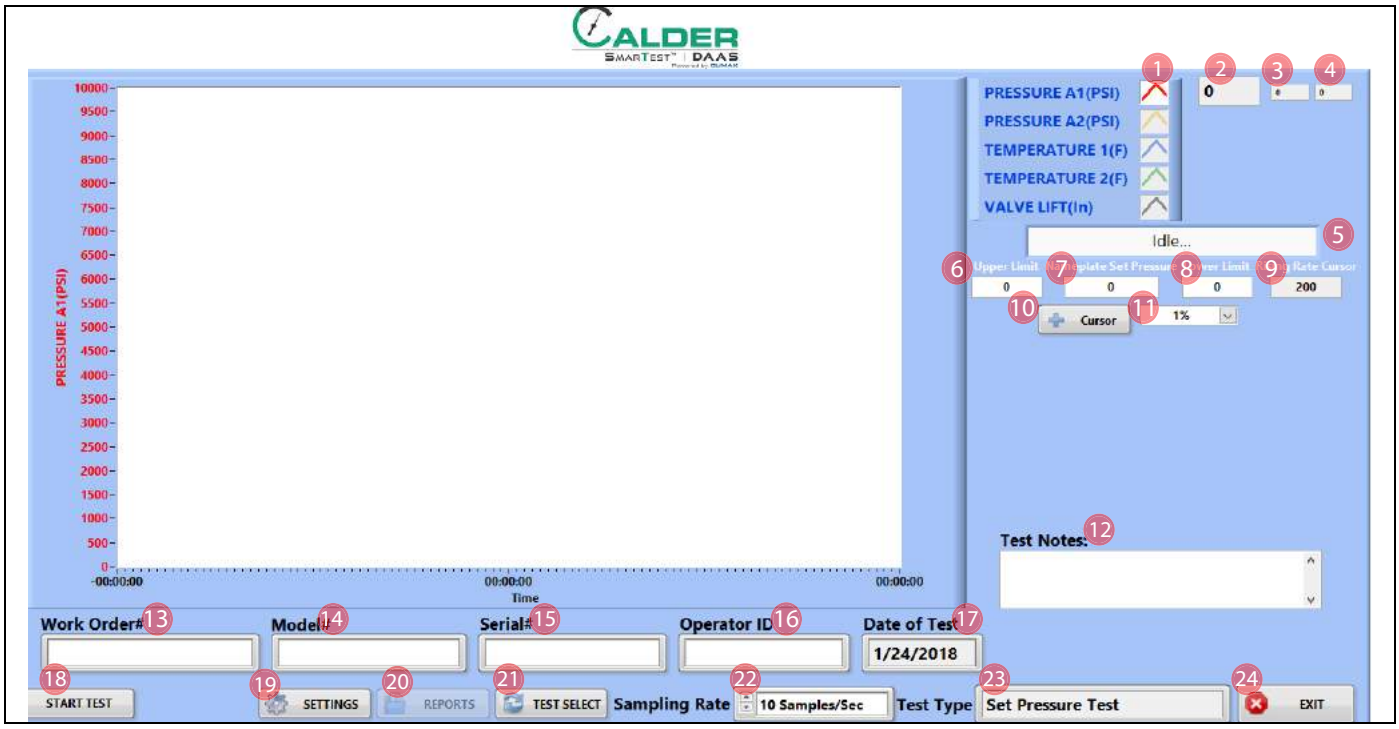


FIGURE 4-8. SET PRESSURE TEST MAIN SCREEN

TABLE 4-4. SET PRESSURE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
1	Channel on/off	Displays the color of chart scale and trace line for that axis. The background is white when the channel is enabled, and gray when disabled.
2	Current scaled value	Displays the current scaled value units of PSI, bar, degrees or raw volts.
3	Maximum limit	Displays the maximum test limit, as entered on the Settings > Pass/Fail screen.
4	Minimum limit	Displays the minimum test limit, as entered on the Settings > Pass/Fail screen.
5	Status bar	Displays the current status of the DAAS system, which may be one of the following: • Idle • Testing • Test Passed • Test Failed • Test Aborted
6	Upper Limit	Displays the upper limit value of the test pressure, as determined by the Pressure Limit Tolerance and the Nameplate Set Pressure.
7	Nameplate Set Pressure	Enter the set pressure value from the nameplate of the valve to be tested.

TABLE 4-4. SET PRESSURE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
8	Lower Limit	Displays the lower limit value of the test pressure as determined by the Pressure Limit Tolerance and the Nameplate Set Pressure.
9	Rising Rate Cursor	Displays the rise rate (in pressure per second) value, as entered in the Settings > Pass/Fail screen.
10	Manual cursor show/hide	Controls the visibility of the pop-up controls palette for the manual cursor. It is necessary to use a mouse for control of the manual cursor as right-button clicks are required and the touch screen cannot execute a right click. See Section 4.5 on page 57.
11	Pressure Limit Tolerance	Select from the drop-down menu the tolerance of the test pressure limits based on the Nameplate Set Pressure: • 1% • 3% • 2 PSI • 10 PSI • Other (enter a value)
12	Test notes	Enter up to 300 characters. These notes will be visible in the Report screen and in the Test Report .pdf file.
13	Work order	Enter here the work order number. Any alphanumeric value is accepted, including spaces.
14	Model number	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
15	Serial number	This value is shown in the report and data file. Important: The serial number becomes part of the file name for the test report and test data file. Do not use punctuation or special characters (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < ,{ } [} |\ / or *_) that cannot be included in a file name.
16	Operator ID	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
17	Date of test	The DAAS program automatically fills this field.
18	Start Test	Press to start the test (this also opens the test parameters window seen in Figure 4-9 on page 43). Press again to abort the test.
19	Settings	Press to navigate to the Settings screens.
20	Reports	After running a test, press this button to navigate to the Reports screen to save a test report and data file.
21	Sampling rate	Select from the drop-down menu the frequency of data samples saved to the test data report: • 10 samples/sec • 1 sample/sec • 20 samples/min • 10 samples/min • 1 sample/min

TABLE 4-4. SET PRESSURE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
22	Test type	Displays the selected test type: • Hydrostatic Test • Set Pressure Test • Seat Leakage Test
23	Exit	Closes the DAAS program and returns to the Windows desktop.

Pressing START TEST (function #15 in Figure 4-8 on page 41) opens the test parameters pop-up window (see Figure 4-9).

Complete the relevant fields for the test, and then press START TEST at the bottom of the window.

TIP:

Any data entered will be saved for all subsequent tests until modified again.

TIP:

The test parameter titles seen in Figure 4-9 may be modified by following the instructions in Section 3.3 on page 21.

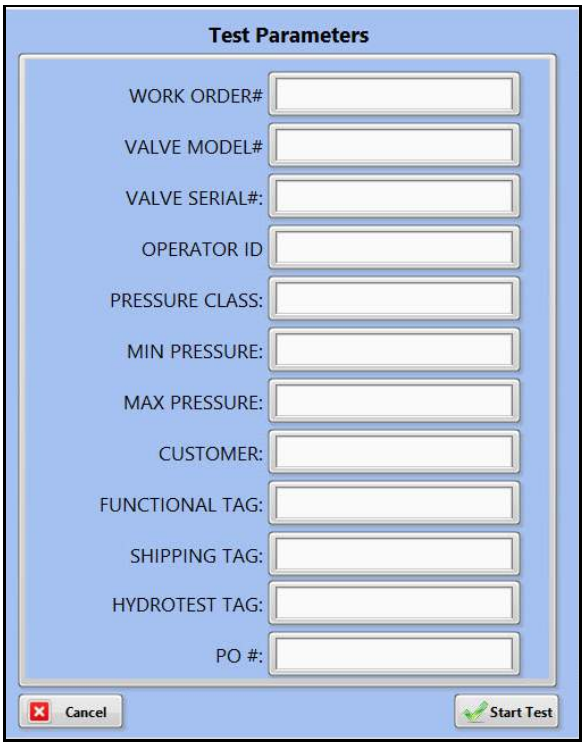


FIGURE 4-9. TEST PARAMETERS POP-UP WINDOW

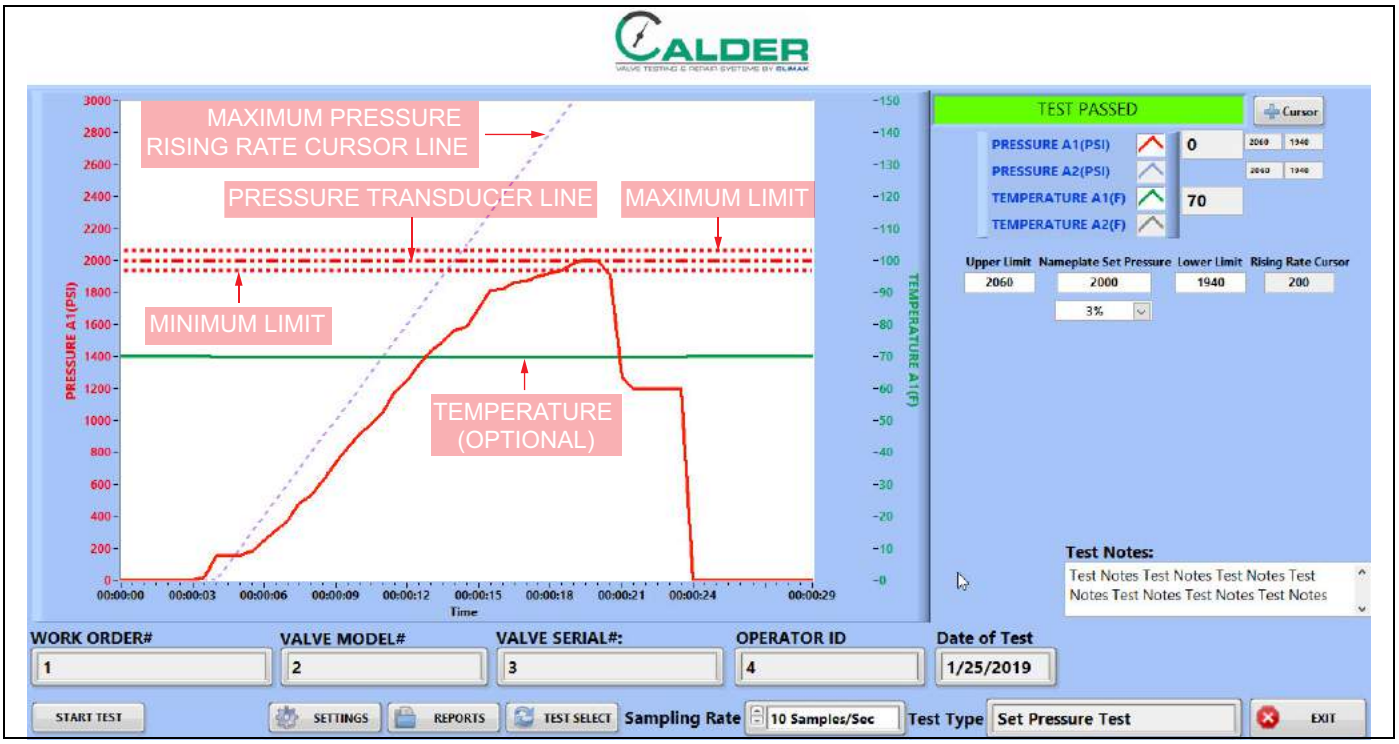


FIGURE 4-10. SET PRESSURE TEST SAMPLE

Figure 4-10 identifies the different types of lines that appear in tests. Maximum and minimum lines may appear for each channel, as they are set in the main screen.

The maximum is for reference only. If the pressure is below the minimum line at the end of the test, then the system will determine that the test failed.

4.3.2 Pass/fail configuration screen

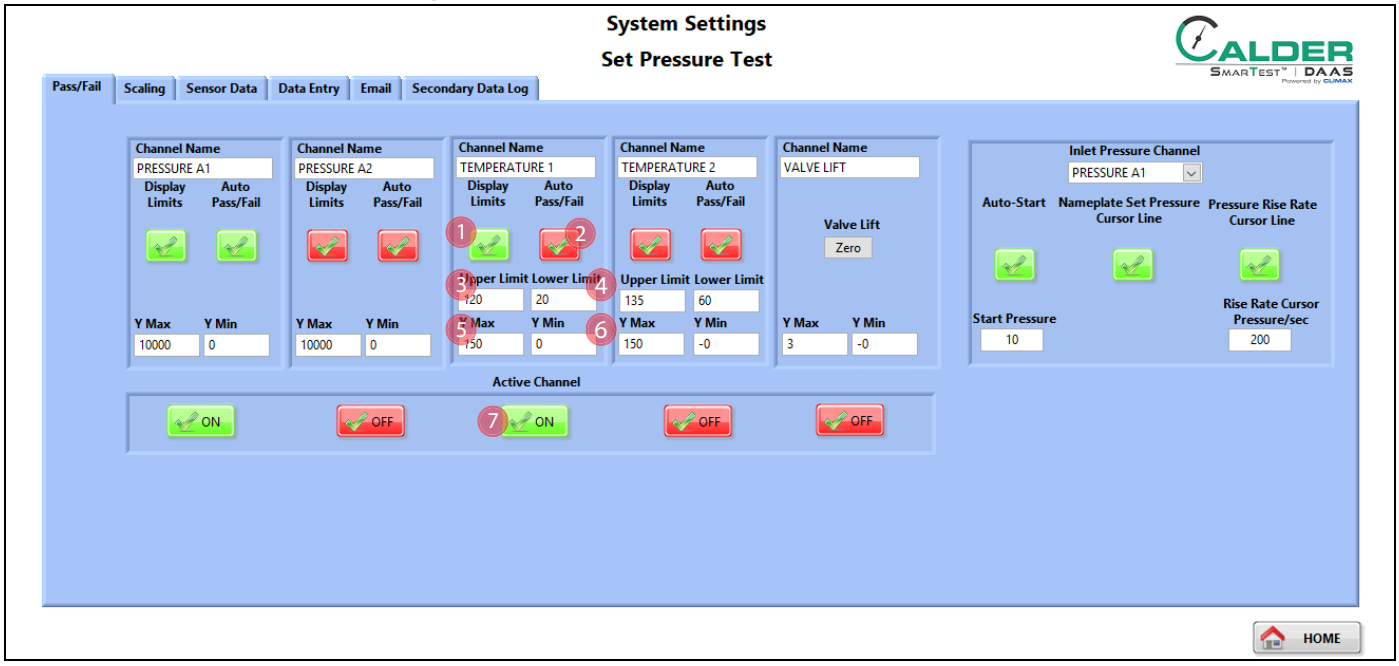


FIGURE 4-11. SET PRESSURE TEST PASS-FAIL CONFIGURATION SCREEN

TABLE 4-5. SET PRESSURE TEST PASS-FAIL CONFIGURATION SCREEN FUNCTIONS

Number	Name	Function
1	Display limits	Determines whether or not the limit cursor lines are displayed.
2	Auto pass/fail	Enables or disables auto pass/fail.
3	Upper limit	A horizontal line will show on the testing main screen and on the test report at the value entered in this field. No automatic functions are associated with this value; it is for reference only.
4	Lower limit	A horizontal line will show on the testing main screen and on the test report at the value entered in this field. Also, the Automatic Pass/Fail function uses this value. • Pass: if the test pressure is above this value at the end of the test. • Fail: if the test pressure is below this valve at the end of the test.
5	Y maximum	Defines the maximum value (top) of the Y-axis scale on the testing screen graph.
6	Y minimum	Defines the minimum value (bottom) of the Y-axis scale on the testing screen.
7	Enable	Check this box to evaluate this sensor input for automatic pass/fail of the test as determined by the lower limit. If the measured pressure falls below the lower limit value, then the device under test has failed the hydrostatic leakage test. Usually only pressure measurements, not temperature, are used for pass/fail.

4.3.3 Testing screens

Figure 4-12 shows the waiting for pressure screen, which indicates that the test has started and the operator needs to increase the test pressure.

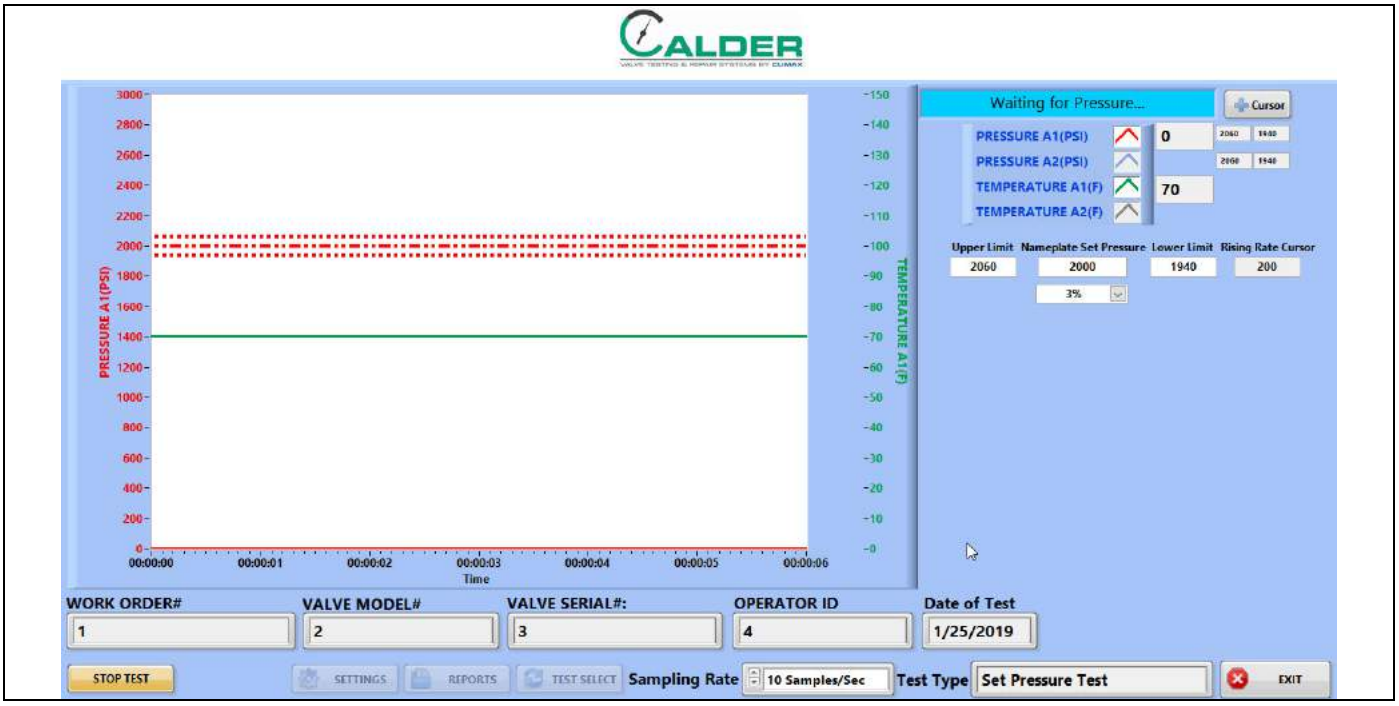


FIGURE 4-12. SET PRESSURE WAITING FOR PRESSURE SCREEN

Figure 4-13 shows the set pressure test pass screen.

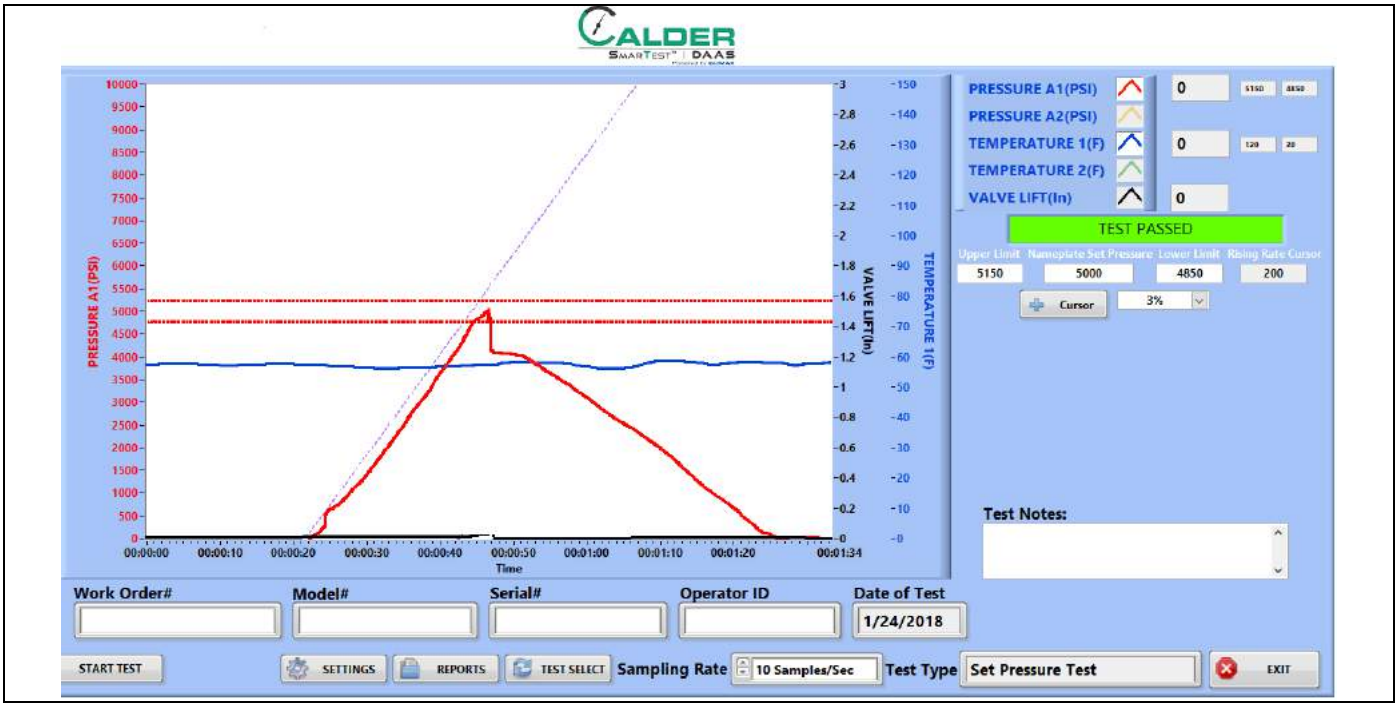


FIGURE 4-13. SET PRESSURE PASS EXAMPLE

Figure 4-14 shows the set pressure test fail screen.

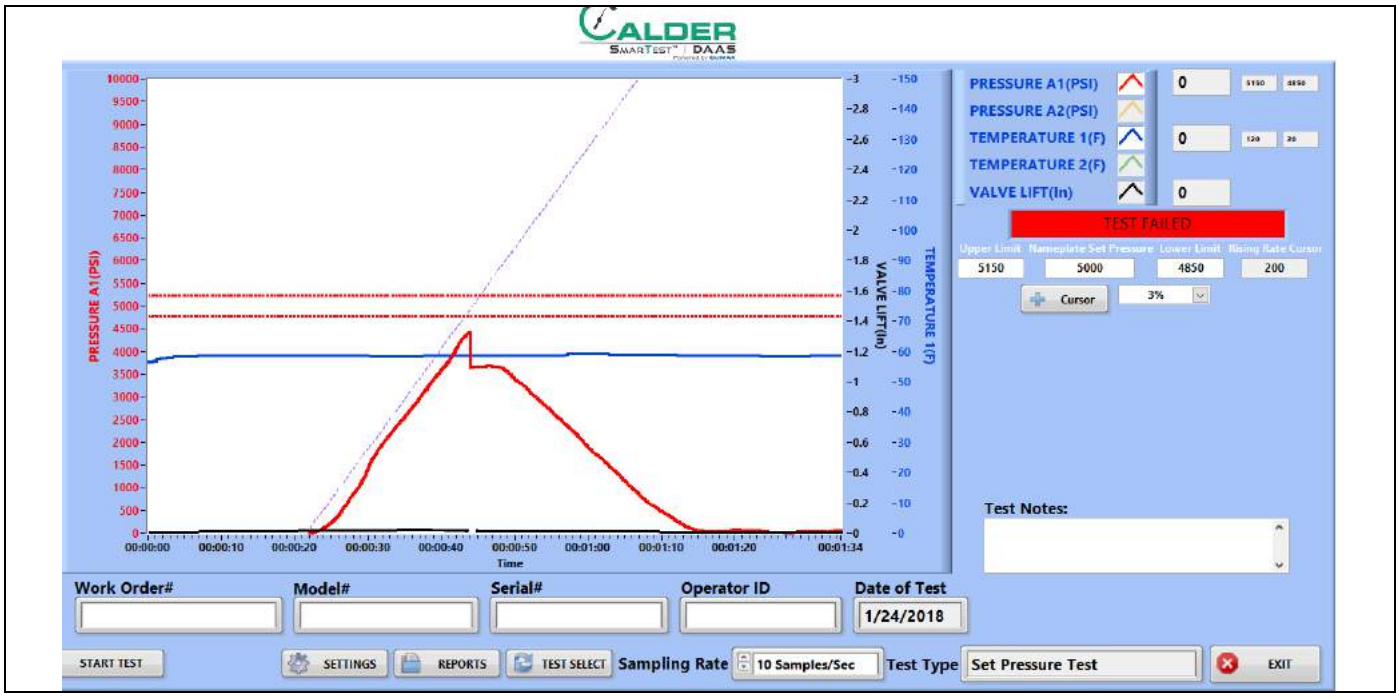


FIGURE 4-14. SET PRESSURE FAIL EXAMPLE

4.3.4 Reports

Figure 4-15 shows the report input screen.

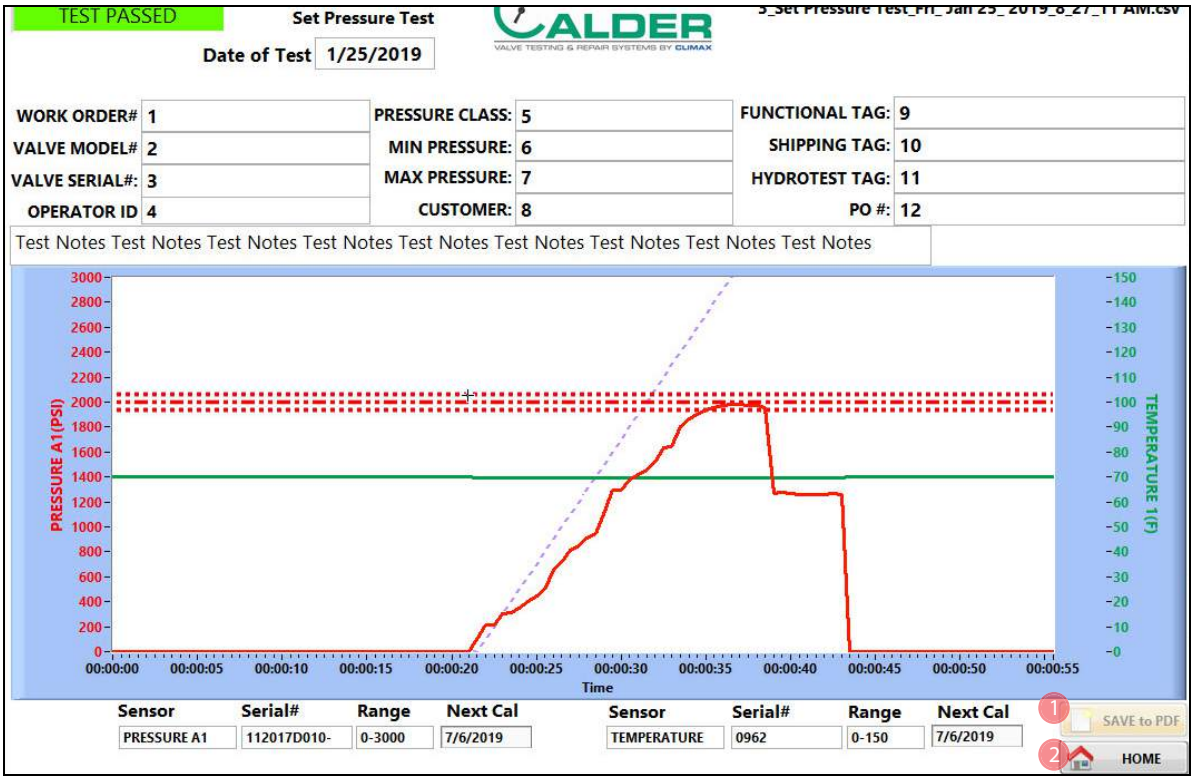


FIGURE 4-15. SET PRESSURE REPORT INPUT SCREEN

TABLE 4-6. SET PRESSURE REPORT INPUT FUNCTIONS

Number	Name	Function
1	Save to PDF	Clicking this results in the following: • Saves the test report to .pdf file. • Saves the test data to a .csv file. • If auto-email is configured, then the test report and data files are emailed.
2	Home	Returns to the testing screen.

The test report and test data files are named automatically using the serial number and the day/date/time stamp.

Example: If the serial number is SN1234, the file names will be the following:

- SN1234Fri_Feb 10_2017_10_32_24 AM.pdf
- SN1234Fri_Feb 10_2017_10_32_24 AM.csv

Therefore do not use special characters or punctuation (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < ,{ } [} |\ / or *) in the serial number, as they cannot be part of a file name.

4.4 SEAT LEAKAGE TEST

4.4.1 Main screen

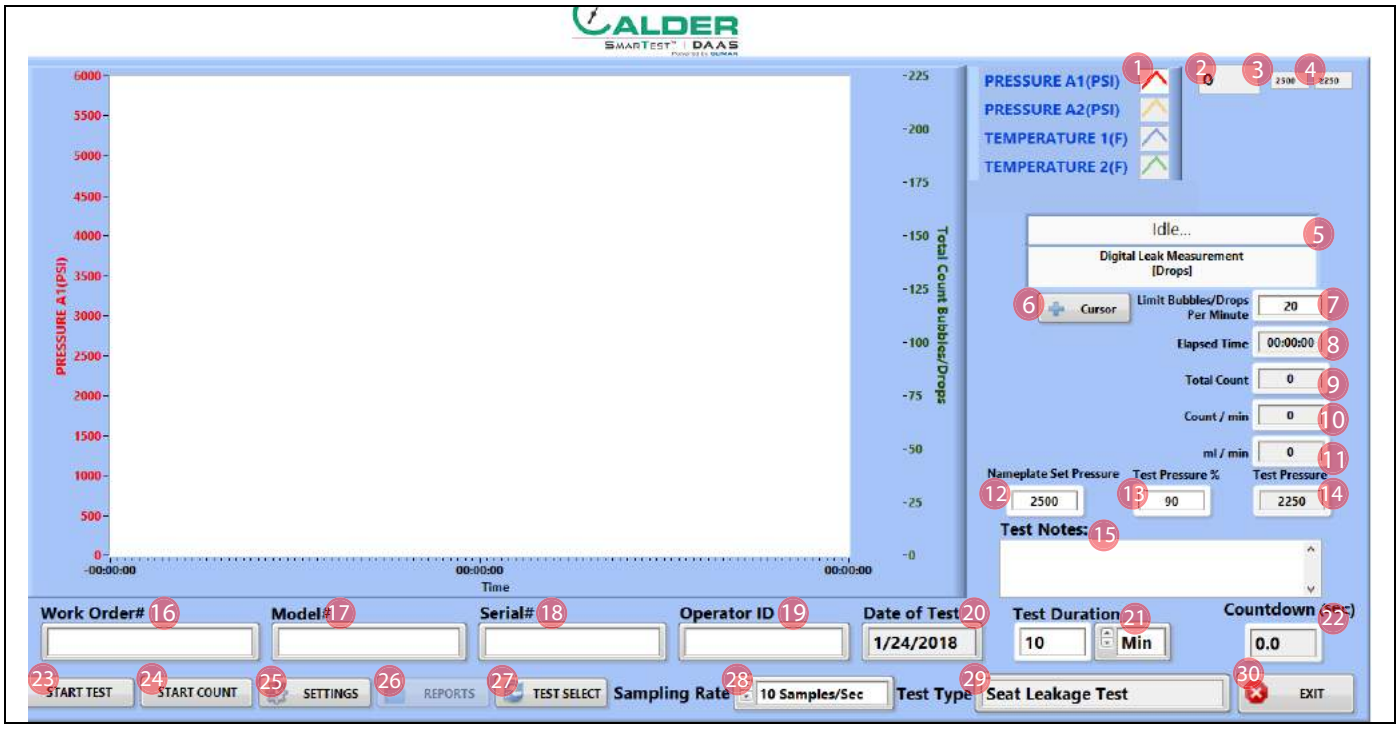


FIGURE 4-16. SEAT LEAKAGE TEST MAIN SCREEN

TABLE 4-7. SEAT LEAKAGE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
1	Channel on/off	Displays the color of chart scale and trace line for that axis. The background is white when the channel is enabled, and gray when disabled.
2	Current scaled value	Displays the current scaled value units of PSI, bar, degrees, or raw volts.
3	Maximum limit	Displays the maximum test limit, as entered on the Settings > Pass/Fail screen.
4	Minimum limit	Displays the minimum test limit, as entered on the Settings > Pass/Fail screen.
5	Status bar	Displays the current status of the DAAS system, which may be one of the following: • Idle • Testing • Test Passed • Test Failed • Test Aborted
6	Manual cursor show/hide	Controls the visibility of the pop-up controls palette for the manual cursor. It is necessary to use a mouse for control of the manual cursor as right-button clicks are required and the touch screen cannot execute a right click. See Section 4.5 on page 57.

TABLE 4-7. SEAT LEAKAGE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
7	Limit Bubbles/ Drop Per Minute	Enter the allowable number of bubbles/drops per minute.
8	Elapsed Time	Displays the amount of time between starting and stopping the count of bubbles/ drops.
9	Total Count	Displays the total number of bubbles/drops that occurred during the count time period.
10	Count/min	Displays the number of bubbles/drops per minute. This value is calculated once the count time period has been stopped.
11	ml/min	Displays the amount of leakage in milliliters per minute over the count time period. This value is calculated using the values of # BUBBLES/ML or # DROPS/ML in the Settings > Pass/Fail screen.
12	Nameplate Set Pressure	Enter the set pressure value from the nameplate of the valve to be tested.
13	Test Pressure %	Enter the desired percentage of the nameplate set pressure at which the valve will be tested.
14	Test Pressure	Displays the test pressure value as determined by the Nameplate Set Pressure and the Test Pressure %.
15	Test Notes	Enter up to 300 characters. These notes will be visible in the Report screen and in the Test Report .pdf file.
16	Work Order #	Enter here the work order number. Any alphanumeric value is accepted, including spaces.
17	Model #	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
18	Serial #	This value is shown in the report and data file. Important: The serial number becomes part of the file name for the test report and test data file. Do not use punctuation or special characters (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < ,{ } [ ] |\ / or *_) that cannot be included in a file name.
19	Operator ID	This value is shown in the report and data file. There are no restrictions on special characters or punctuation.
20	Date of Test	The DAAS program automatically fills this field.
21	Test Duration	Complete this field by doing the following: 1. Enter the numeric value of the test duration. 2. Select from the drop-down menu the units of the test time duration: seconds, minutes, or hours.
22	Countdown (sec)	Displays the remaining time of the test duration. This value is always displayed in seconds regardless of the units used for the test duration.
23	Start Test	Press to start the test (this also opens the test parameters window seen in Figure 4-17 on page 51). Press again to abort the test.
24	Start Count	Press to begin the bubble/drop counting period.

TABLE 4-7. SEAT LEAKAGE TEST MAIN SCREEN FUNCTIONS

Number	Name	Function
25	Settings	Press to navigate to the Settings screens.
26	Reports	After running a test, press this button to navigate to the Reports screen to save a test report and data file.
27	Test Select	Press to select the test type: • Hydrostatic Test • Set Pressure Test • Seat Leakage Test
28	Sampling Rate	Select from the drop-down menu the frequency of data samples saved to the test data report: • 10 samples/sec • 1 sample/sec • 20 samples/min • 10 samples/min • 1 sample/min
29	Test Type	Displays the selected test type: • Hydrostatic Test • Set Pressure Test • Seat Leakage Test
30	Exit	Closes the DAAS program and returns to the Windows desktop.

Pressing START TEST (function #15 in Figure 4-16 on page 49) opens the test parameters pop-up window (see Figure 4-17).

Complete the relevant fields for the test, and then press START TEST at the bottom of the window.

TIP:

Any data entered will be saved for all subsequent tests until modified again.

TIP:

The test parameter titles seen in Figure 4-17 may be modified by following the instructions in Section 3.3 on page 21.

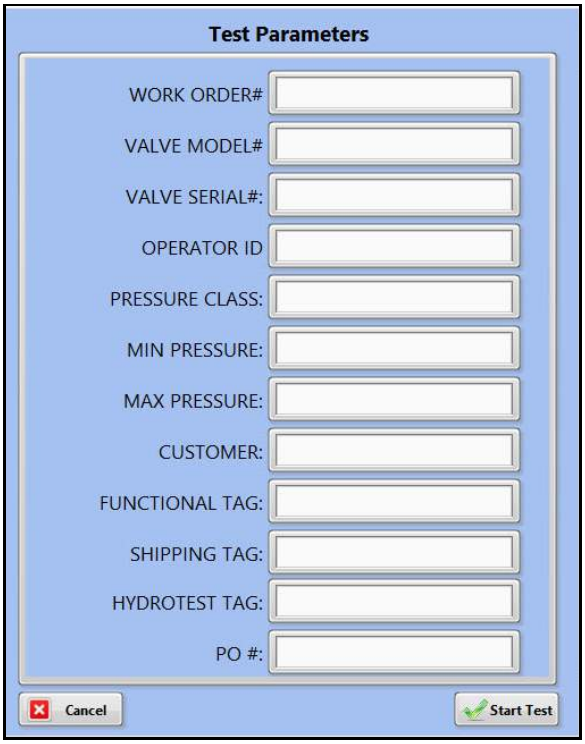


FIGURE 4-17. TEST PARAMETERS POP-UP WINDOW

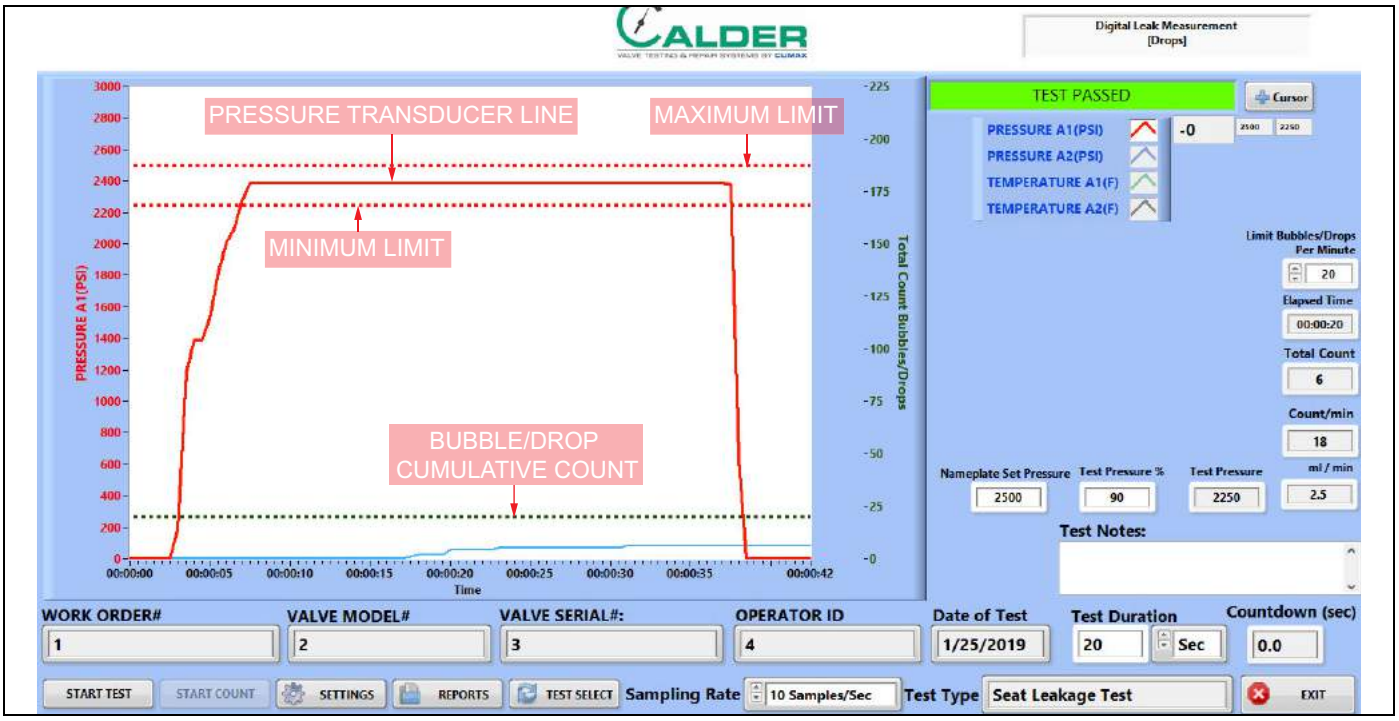


FIGURE 4-18. SEAT LEAKAGE TEST SAMPLE

Figure 4-18 identifies the different types of lines that appear in tests. Maximum and minimum lines may not appear for each channel, as they are set in the main screen.

The maximum is for reference only. If the pressure is below the minimum line at the end of the test, then the system will determine that the test failed.

4.4.2 Pass/fail configuration screen

FIGURE 4-19. SEAT LEAKAGE PASS-FAIL CONFIGURATION

TABLE 4-8. SEAT LEAKAGE PASS-FAIL CONFIGURATION SCREEN FUNCTIONS

Number	Name	Function
1	Display limits	Determines whether or not the limit cursor lines are displayed.
2	Y maximum	Defines the maximum value (top) of the Y-axis scale on the testing screen graph.
3	Y minimum	Defines the minimum value (bottom) of the Y-axis scale on the testing screen.
4	Enable	Check this box to evaluate this sensor input for automatic pass/fail of the test as determined by the lower limit. If the measured pressure falls below the lower limit value, then the device under test has failed the hydrostatic leakage test. Usually only pressure measurements, not temperature, are used for pass/fail.
5	Digital Input Channel	Select the channel of the bubble/drop counter.
6	Input Buffer -ms	Select a sensor time delay in milliseconds (ms) to prevent false triggering of the bubble/drop sensor. The default value of 20 ms is recommended.
7	# Bubbles/ml	Enter the quantity of bubbles per milliliter of volume.
8	# Drops/ml	Enter the quantity of drops per milliliter of volume.

4.4.3 Testing screens

Figure 4-20 shows the seat leakage test pass screen.

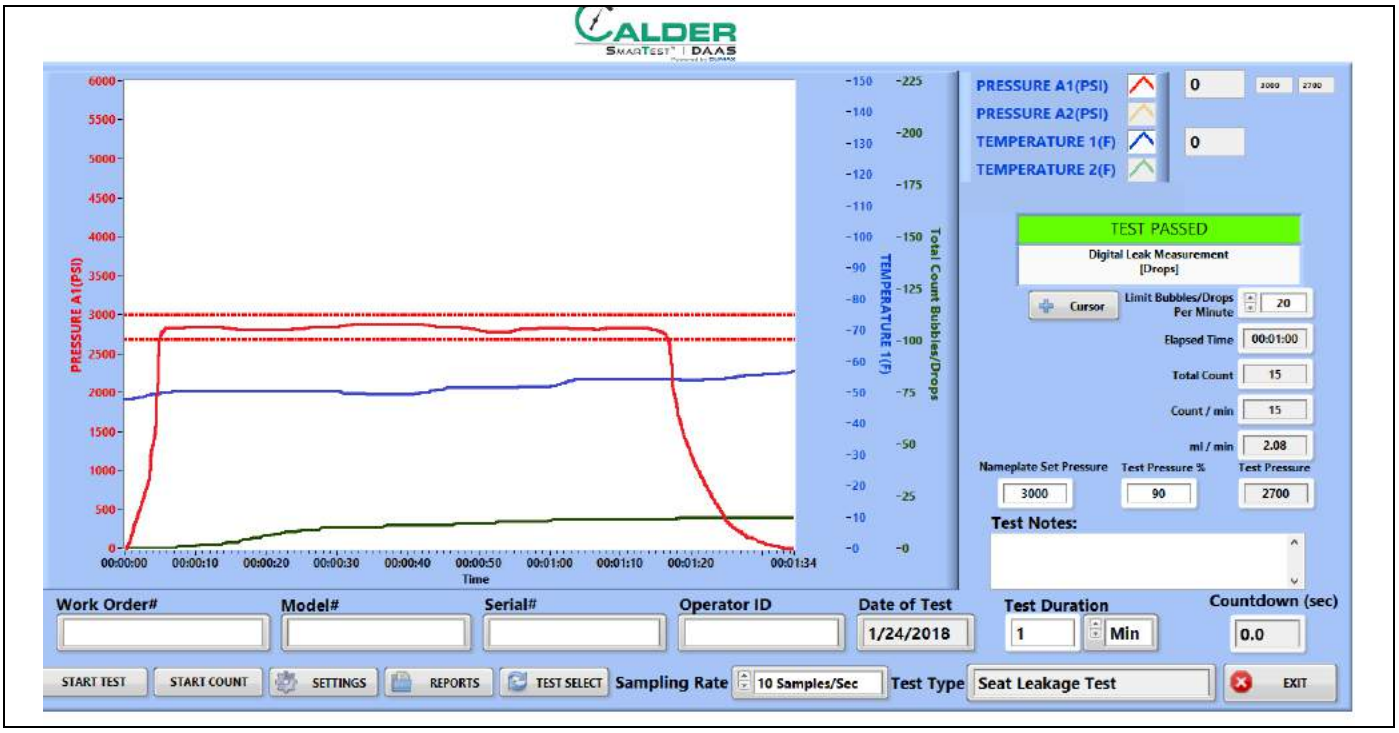


FIGURE 4-20. SEAT LEAKAGE PASS EXAMPLE

Figure 4-21 shows the seat leakage test fail screen.

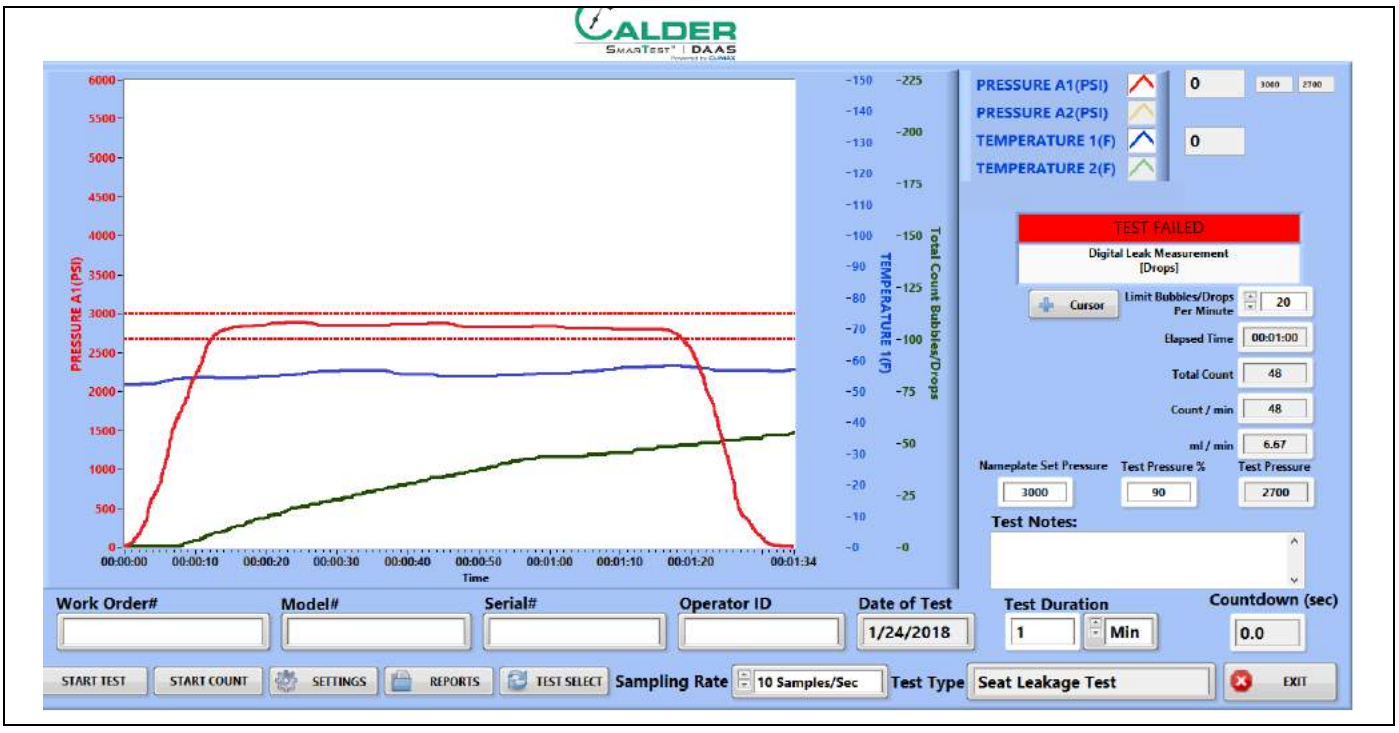


FIGURE 4-21. SEAT LEAKAGE FAIL EXAMPLE

4.4.4 Reports

Figure 4-22 shows the report input screen.

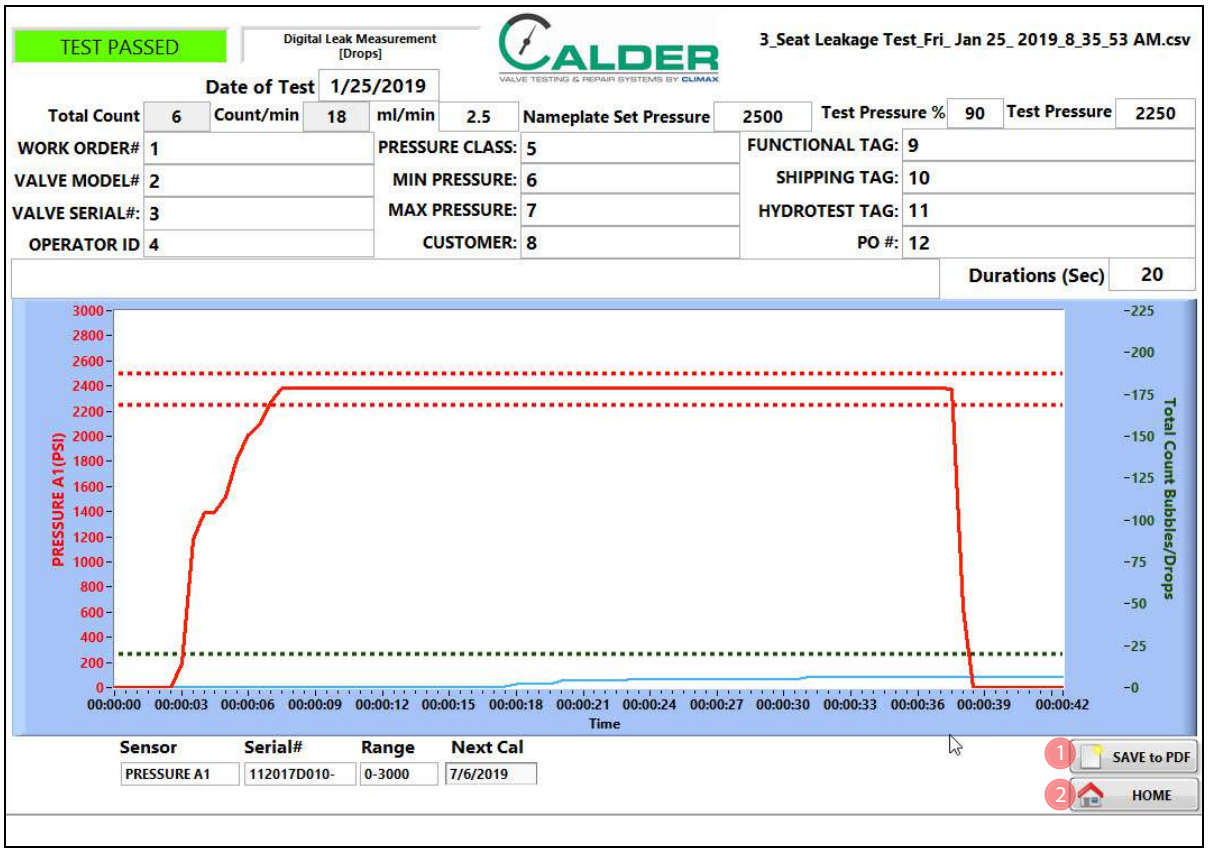


FIGURE 4-22. SEAT LEAKAGE REPORT INPUT SCREEN

TABLE 4-9. SEAT LEAKAGE REPORT INPUT FUNCTIONS

Number	Name	Function
1	Save to PDF	Clicking this results in the following: • Saves the test report to .pdf file. • Saves the test data to a .csv file. • If auto-email is configured, then the test report and data files are emailed.
2	Home	Returns to the testing screen.

The test report and test data files are named automatically using the serial number and the day/date/time stamp.

Example: If the serial number is SN1234, the file names will be the following:

- SN1234Fri_Feb 10_2017_10_32_24 AM.pdf
- SN1234Fri_Feb 10_2017_10_32_24 AM.csv

Therefore do not use special characters or punctuation (such as: @ # $ % ^ & * ( ) + _ - ~ : ; ” ? > < ,{ } [} |\ / or *) in the serial number, as they cannot be part of a file name.

4.4.5 Digital leakage measurement sensor

Check that the digital leakage measurement sensor is installed so that the tube bottom and the groove are aligned with the bottom of the hole.

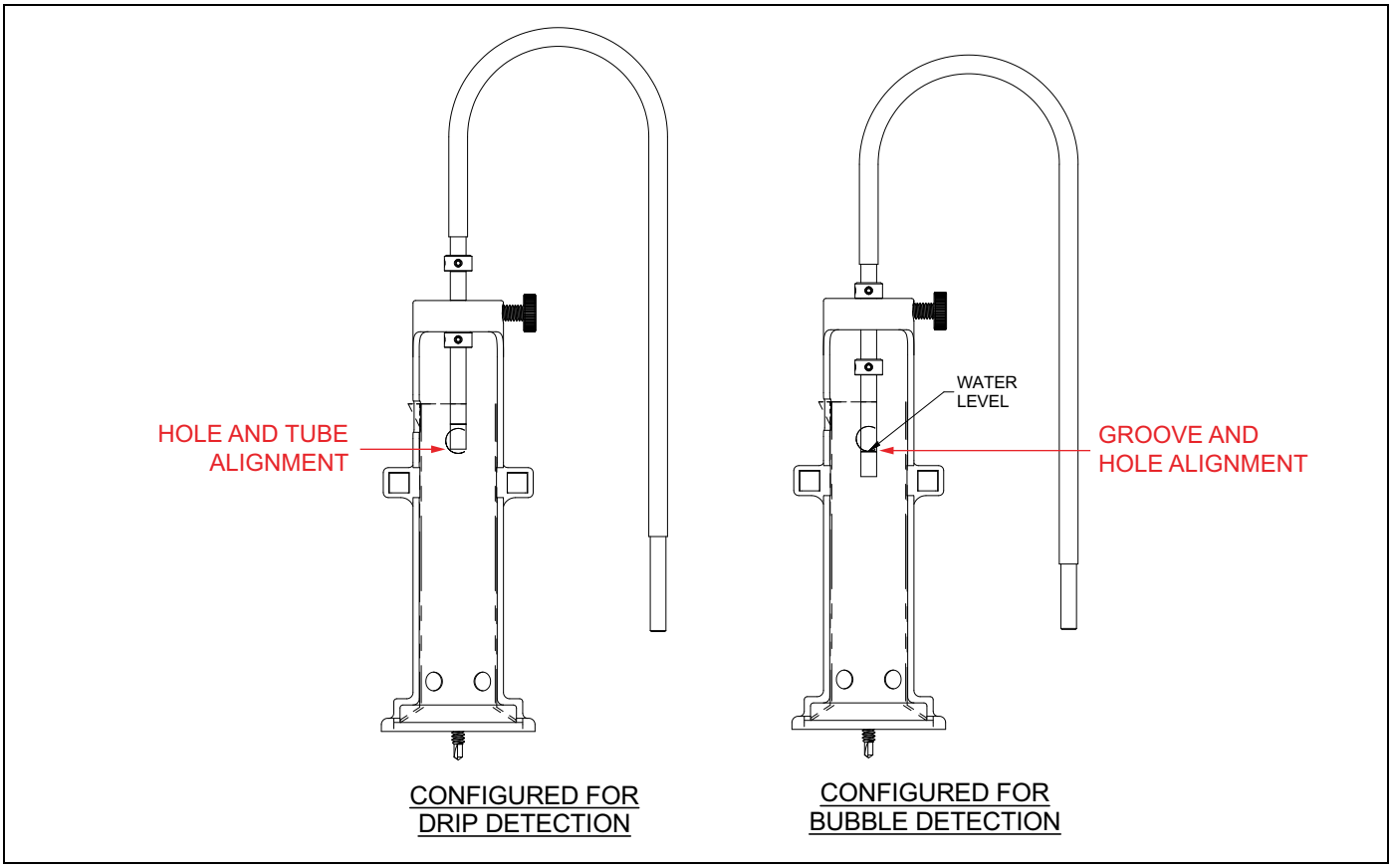


FIGURE 4-23. DIGITAL LEAKAGE MEASUREMENT SENSOR

4.5 CURSOR OPTIONS

Before the zoom and pan functions can be used, right-click the mouse on the X axis (time) and uncheck the box next to AUTOSCALE X. This will enable the X axis to be manually controlled.

FIGURE 4-24. MAIN SCREEN WITH CURSOR OPTIONS

TABLE 4-10. CURSOR OPTIONS

Number	Name	Function
1	Manual pan	Click to put the mouse cursor in manual pan mode, then do the following: 1. Position the mouse cursor where desired to start panning. 2. Hold the left mouse button down. 3. Drag the mouse to pan the view. 4. Release the left mouse button to release the screen and re-position the mouse
2	Zoom pan pallet	Click to bring up the zoom and pan control pallet.
3	Manual pan mode	Click to turn on manual pan mode for the mouse. 1. Place the cursor on the screen, then click and hold the left mouse button. 2. Drag the screen to the desired area. 3. Release the left mouse button.
4	Cursor on/off	Turns the manual cursor for each channel on and off.
5	Channel name	Right-click on the channel name to bring up the cursor control instruction pallet.
6	X value	Displays the X-axis value of the current position of the manual cursor. This value will always be time.

TABLE 4-10. CURSOR OPTIONS

Number	Name	Function
7	Y value	Displays the Y-axis value of the current position of the manual cursor. This value will be in scaled units specific to each sensor (such as psi, bar, degrees Fahrenheit, or degrees Celsius).

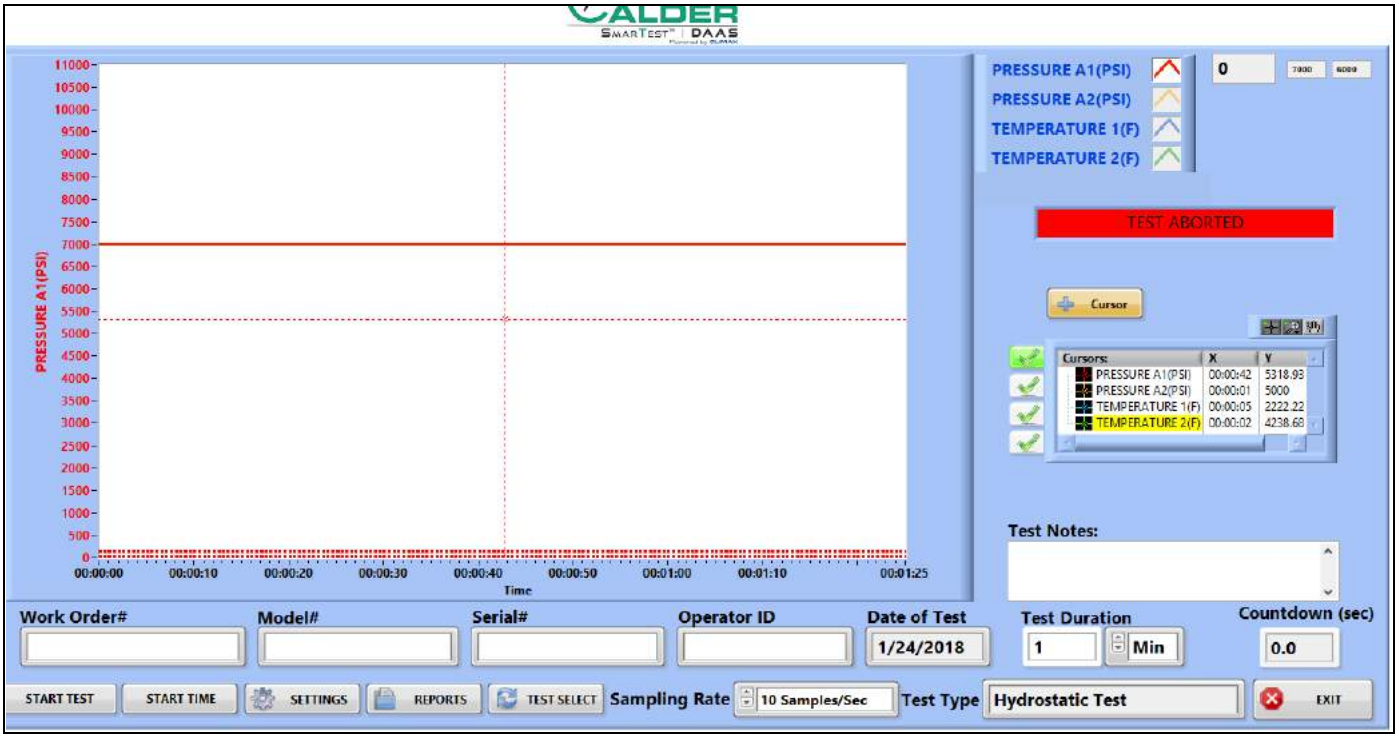


FIGURE 4-25. MANUAL PAN SCREEN

Do the following to manually pan:

1. Select the Manual Pan button (which resembles a hand).
2. Position the cursor (the white cross) over the intersection of the vertical and horizontal manual cursor lines.
3. Press and hold the left mouse button.
4. Drag the manual cursor to the desired position.
5. Release the left mouse button.

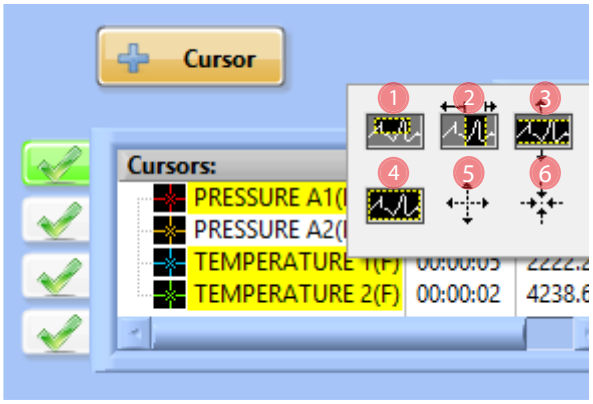


FIGURE 4-26. PAN AND ZOOM OPTIONS

TABLE 4-11. PAN AND ZOOM OPTION FUNCTIONS

Number	Name	Function
1	Zoom window	Use the mouse to select a random area of the screen to zoom.
2	Zoom vertical	Zoom to a vertical slice of the screen.
3	Zoom horizontal	Zoom to a horizontal slice of the screen.
4	Zoom all	Zoom to the entire screen area.
5	Zoom out	Each left click of the mouse zooms out the screen.
6	Zoom in	Each left click of the mouse zooms in the screen.

Figure 4-27 shows an example of a test data file report.

	A	B	C	D	E	F
1	File Name	_Hydrostatic Test_Fri_ Jan 26_ 2018_8_52_40 AM.csv				
2	Work Order#	WO1234				
3	Model#	M1234				
4	Serial#	SN1234				
5	Operator ID	OP1234				
6	Test Type	Hydrostatic Test				
7	Date of Test	1/26/2018				
8	Test Notes	ENTER UP TO 300 CHARACTERS OF NOTES				
9						
10	Channel Name	PRESSURE A1	PRESSURE A2	TEMPERATURE 1	TEMPERATURE 2	VALVE LIFT
11	PT Serial Number	1234	1235	1236	1237	1238
12	Sensor Range	0-10000	0-10000	0-150	0-150	3
13	PT Next Cal Date	3/13/2018	3/10/2018	3/10/2018	3/10/2018	3/10/2018
14						
15	Date	Time	PRESSURE A1		TEMPERATURE 1	
16	1/26/2018	8:52:40 AM	2881.301067		56.25	
17	1/26/2018	8:52:40 AM	2884.156486		56.73	
18	1/26/2018	8:52:41 AM	2892.875713		57.02	
19	1/26/2018	8:52:41 AM	2888.286646		58.01	
20	1/26/2018	8:52:41 AM	2884.615393		57.56	
21	1/26/2018	8:52:41 AM	2878.547627		58.21	
22	1/26/2018	8:52:41 AM	2884.717372		57.95	
23	1/26/2018	8:52:41 AM	2891.702951		57.82	
24	1/26/2018	8:52:41 AM	2889.765345		56.25	
25	1/26/2018	8:52:41 AM	2886.043103		56.73	
26	1/26/2018	8:52:41 AM	2881.301067		57.02	
27	1/26/2018	8:52:41 AM	2884.156486		58.01	
28	1/26/2018	8:52:42 AM	2892.875713		57.56	
29	1/26/2018	8:52:42 AM	2888.286646		58.21	
30	1/26/2018	8:52:42 AM	2884.615393		57.95	
31	1/26/2018	8:52:42 AM	2878.547627		57.82	
32	1/26/2018	8:52:42 AM	2884.717372		56.25	
33	1/26/2018	8:52:42 AM	2891.702951		56.73	

FIGURE 4-27. TEST DATA FILE EXAMPLE

4.6 CALIBRATION

Figure 4-28 shows a sample manufacturers calibration certificate. It contains the information needed to properly scale the input to the DAAS system.

O M E G A E N G I N E E R I N G I N C.

PRESSURE TRANSDUCER
FINAL CALIBRATION

0.00 - 10000.00 PSIG
Excitation 28.000 Vdc

Job: WHS0007210 Serial: 122815D200
Model: PX319-10KG5V Tested By: GP
Date: 4/21/2016 Temperature Range: -20 to +85 C
Calibrated: 0.00 - 10000.00 PSIG Specfile: PX319-5V+=100G

Pressure PSIG	Unit Data Vdc
0.00	0.016
5000.00	2.509
10000.00	5.005
5000.00	2.512
0.00	0.017

Balance 0.016 Vdc
Sensitivity 4.989 Vdc

ELECTRICAL LEAKAGE: PASS
PRESSURE CONNECTION/FITTING: 1/4-18 NPT Male
ELECTRICAL WIRING/CONNECTOR: Pin 1 = +EXC
Pin 2 = -EXC
Pin 3 = SIG

This Calibration was performed using Instruments and Standards that are traceable to the United States National Institute of Standards Technology.

S/N	Description	Range	Reference	Cal Cert
11568	Ametek 15K	0 - 10000.00 PSIG	C-2505	C-2505
MY41005044	HP 34970A DMM	Unit Under Test	C-2469	N/A

Q.A. Representative : Gary Perez Date: 4/21/2016

This transducer is tested to & meets published specifications. After final calibration our products are stored in a controlled stock room & considered in bonded storage. Depending on environment & severity of use factory calibration is recommended every one to three years after initial service installation date.

Omega Engineering Inc., One Omega Drive, Stamford, CT 06907
http://www.omega.com email: info@omega.com phone (800) 826-6342

FIGURE 4-28. SAMPLE CALIBRATION CERTIFICATE

Using the data from the Calibration certificate in Figure 4-28, the slope and offset calculations are done as shown in Figure 4-29 on page 62.

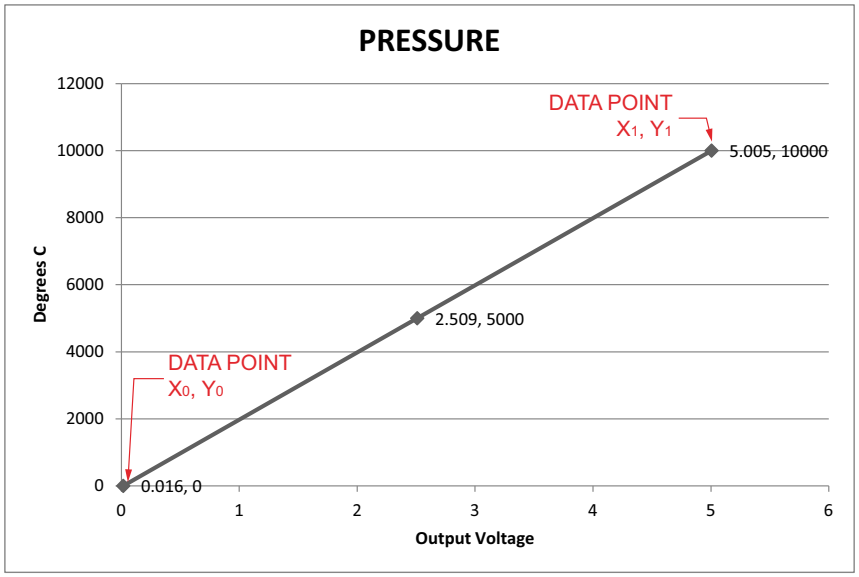
NOTICE

When scaling a sensor, remember the following:

- Raw value is always volts.
- Scaled value is always psi or degrees Fahrenheit.
- Do not use metric units for scaling.

CALIBRATION DATA - 10,000 PSI Pressure Transducer

	VOLTS	PRESSURE
X_0, Y_0 →	0.016	0
	2.509	5000
X_1, Y_1 →	5.005	10000
	2.512	5000
	0.017	0



FORMULA FOR A STRAIGHT LINE **Y=MX+B**

Y = Data point on the Y axis (Pressure)
X= Data point on the X axis (volts output of the sensor)
M= Slope of the line (degrees C per volt output)
B= Y intercept, or Offset. (Value of Y when X=0)

FIND M - THE SLOPE OF THE LINE
M = Rise / Run
M = (Y1 - Y0) / (X1-X0)
M = (10,000-0) / (5.005-0)
M = 10,000/5.005
M= 1998.0002

FIND B -The Offset (Assume that X = 0)
We know from the calibration information that when the Pressure is 0 psi then the output of the sensor will be 0.016V
Y = (M*X) + B
0 = (1998.002*.016) + B
0= (32) + B
B = -31.968

Let's check our work using one of the other data points CALCULATE THE VALUE OF x FOR y=5000 PSI
Y = (M*X) + B
5000 = (1998.0002*x) +(-31.968)
x = ((5000-(-31.968)) / 1998.0002
x = ((5000-(-31.968)) / 1998.0002
X = 2.5185

You can see that calculated value of X at 5000 psi is very close to the value given on the calibration sheet.

This small difference can be attirbuted to rounding errors in the math and perhaps to slight non-linearity in the sensor output.
The important thing is that the check has shown that the calculation was done properly.
The difference is (2.5185 - 2.512)/2.5185 *100 = 0.25%

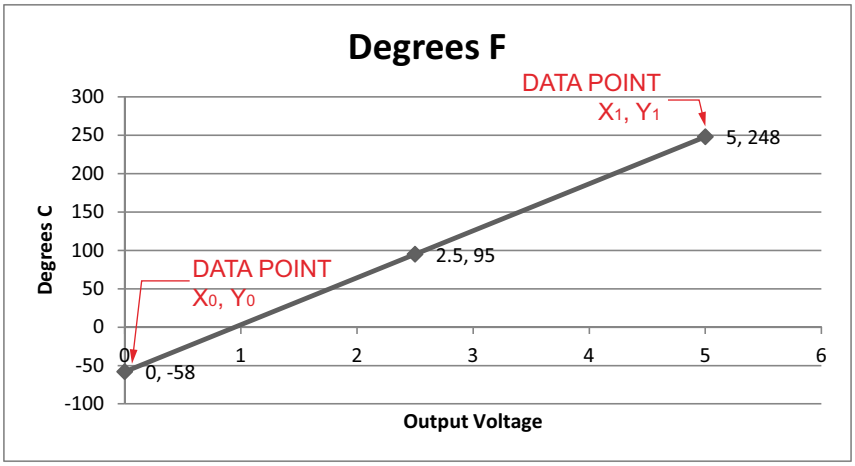
From the calculations above, here is the information that is entered into the calibration fields in the DAAS setup screen

SLOPE = 1998.002
OFFSET = -32

FIGURE 4-29. SAMPLE PRESSURE CALIBRATION CALCULATION

CALIBRATION DATA - -58 to 258 Degree F Temperature sensor

	VOLTS	Degrees F
X_0, Y_0 →	0	-58
	2.5	95
X_1, Y_1 →	5	248



FORMULA FOR A STRAIGHT LINE **Y=MX+B**

Y = Data point on the Y axis (Pressure)
X= Data point on the X axis (volts output of the sensor)
M= Slope of the line (degrees C per volt output)
B= Y intercept, or Offset. (Value of Y when X=0)

FIND M - THE SLOPE OF THE LINE
M = Rise / Run
M = (Y1 - Y0) / (X1-X0)
M = ((248-(-58)) / (5-0)
M = 306/5
M= 61.2

FIND B -The Offset (Assume that X = 0)
We know from the calibration information that when the tempertaure is -58 Deg F that the signal is 0V
Y = (M*X) + B
-58 = (61.2 *0) + B
-58= B
B = -58

Let's check our work using one of the other known data points Temperature (Y)=95 and Volts (X)= 2.5
Y = (M*X) + B
95 = (61.2 * X) +(-58)
X = (95 + 58) /61.2
X = 2.5

You can see that the calculated value for X at the middle of the sensor range is 2.5. This is correct

From the calculations above, here is the information that is entered into the calibration fields in the DAAS setup screen

SLOPE = 61.2
OFFSET = -32

FIGURE 4-30. SAMPLE TEMPERATURE CALIBRATION CALCULATION

This page intentionally left blank

5 MAINTENANCE

Table 5-1 lists maintenance intervals and their associated tasks.

TABLE 5-1. MAINTENANCE INTERVALS AND TASKS

Interval	Task
Before each use	Clean the touch screen with a soft, clean cloth.
	Inspect the sensor cables and mains power cable for damage. Replace if necessary.
Every ten operation cycles	Replace the screen protector if it becomes significantly scratched, damaged, or if it begins peeling off of the computer screen.
	Recalibrate the pressure sensors at least once per year.

This page intentionally left blank

6 STORAGE AND SHIPPING

IN THIS CHAPTER:

6.1 STORAGE

Proper storage of the DAAS will extend its usefulness and prevent undue damage.

Before storing, do the following:

1. Clean the console with a damp cloth. Do not use strong detergent or solvents on the computer screen.
2. Disconnect the sensor from the control panel and store the sensors and cables in a separate box.

Store the DAAS in its original shipping container. Keep all packing materials for repackaging the machine.

6.1.1 Short-term storage

Do the following for short-term storage (three months or less):

1. Disconnect the mains power.
2. Clean the touch screen with a soft damp cloth.
3. Secure the sensor cables so that they will not be damaged.
4. Remove the machine from the workpiece.
5. Clean the console to remove dirt, oil, glycol, or water.
6. Store the machine in its original shipping box.

6.1.2 Long-term storage

Do the following for long-term storage (longer than three months):

1. Follow the short-term storage instructions.
2. Disconnect the sensor cables form the pressure transducers and temperature sensors.
3. Store the shipping container in an environment out of direct sunlight with temperature < 70ºF (21ºC) and humidity < 50%.

6.2 SHIPPING

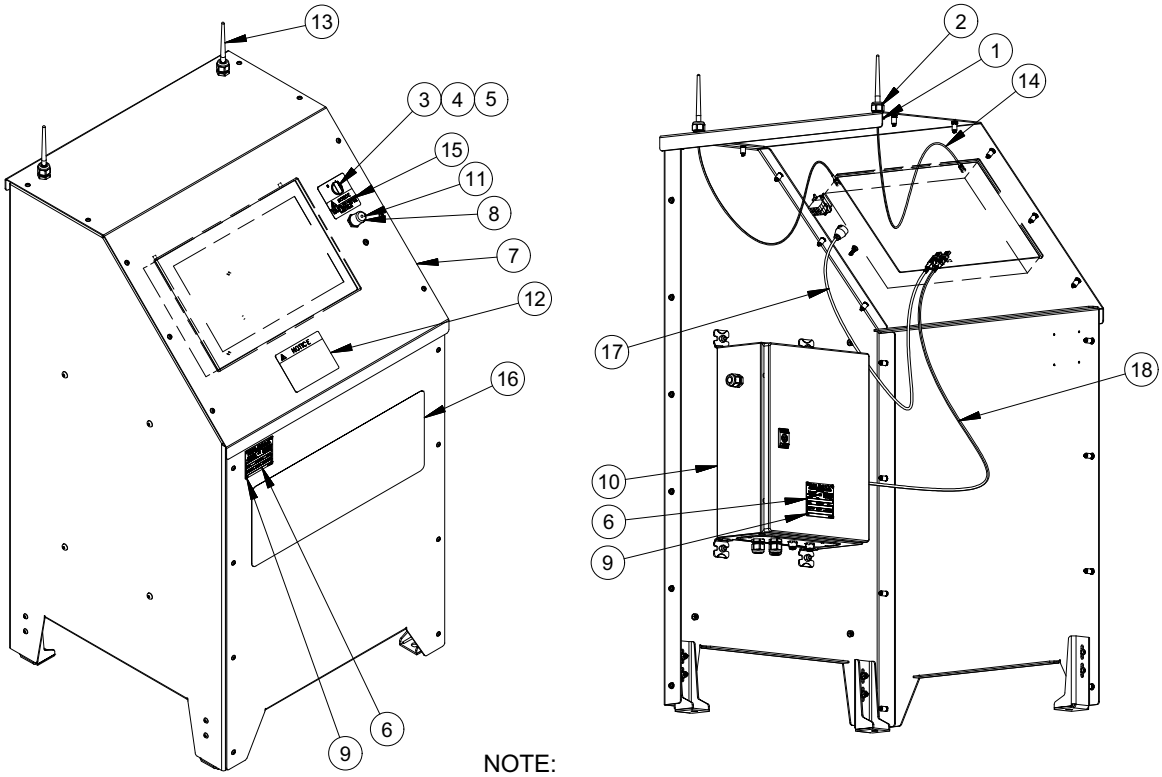
The DAAS can be shipped in its original shipping container.

6.3 DECOMMISSIONING

To decommission the machine prior to disposal, remove the computer from the console and dispose of it separately from the rest of the DAASconsole.

APPENDIX A ASSEMBLY DRAWINGS

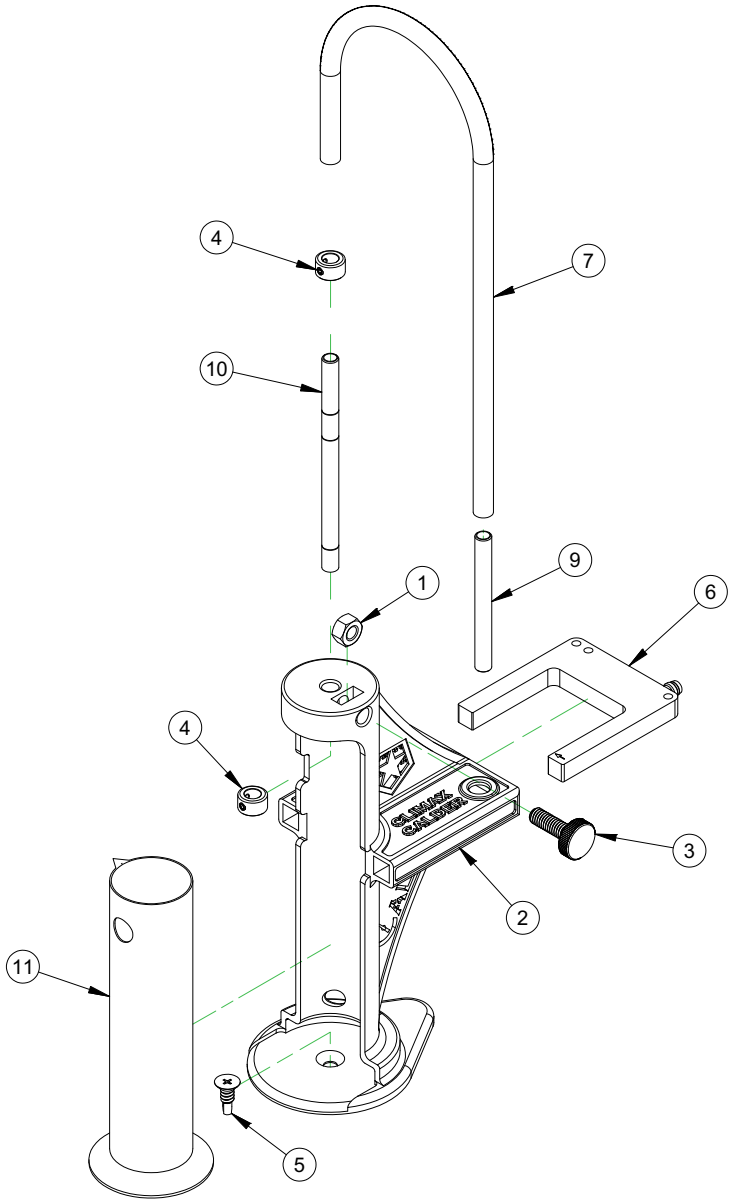
Drawing list



NOTE:
ITEM 8 (PN 87256) IS FOR USE WITH USB DONGLE

PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	2	12574	CONDUIT NUT 1/2 NPT
2	2	37739	CORD GRIP NONMETALLIC .17-.47 DIA X 1/2 NPT
3	1	38040	SELECTOR SWITCH 2 POS M-M 22MM
4	1	38048	MOUNTING COLLAR W/O CONTACTS 22MM
5	2	38050	CONTACT BLOCK 1 N.O.
6	2	47981	NAMEPLATE ELECTRICAL CONTROL PANELS CE
7	1	87199	26" DAAS CONSOLE
8	1	87256	CAP ROUND FLEXIBLE VINYL 3/4 TO 13/16 ID BLACK
9	8	87775	RIVET BLIND 1/8 DIA SS 316
10	1	87958	ASSY CALDER DAAS CONTROL PANEL 1-4 AXIS 120/230V
11	1	88417	CAP WATERPROOF L-COM USB RECEPTACLE
12	1	88837	LABEL CALDER DAAS NOTICE PLUG SENSORS INTO THE CORRECT CHANNEL
13	2	88982	ANTENNA WI-FI FOR ADVANTECH PANEL PC 10.9 CM LONG R/P SMA CONNECTION
14	2	88983	CABLE COAX RP-SMA PLUG TO RP-SMA JACK BULKHEAD PIGTAIL 25 IN LONG 100-SERIES
15	1	88992	LABEL SHUT DOWN THE COMPUTER BEFORE TURNING OFF POWER
16	1	89110	LABEL CALDER SMARTEST DAAS 20 X 8
17	1	88416	USB CABLE WATERPROOF PANEL MOUNT TYPE A FEMALE - STANDARD TYPE A MALE 0.5M LONG
18	1	88767	CABLE USB 3.0 TYPE A MALE TO A MALE TO A MALE SHIELDED 2M LONG
19	6	13243	(NOT SHOWN) WIRE TIE MEDIUM .14 x 8
20	6	13296	(NOT SHOWN) MOUNTING BASE WIRE TIE ADHESIVE BACKED LARGE
21	1	48430	(NOT SHOWN) SCHUKO PLUG 2P +G RUBBER BLACK FIELD ASSEMBLABLE
22	1	88838	(NOT SHOWN) LABEL DAAS CHANNELS 0-3
23	1	88912	(NOT SHOWN) PALLET AND ENCLOSURE SHIPPING KIT CALDER DAAS 38 X 37 X 54

FIGURE A-1. DAAS ASSEMBLY (P/N 87206)



PARTS LIST			
ITEM	QTY	P/N:	DESCRIPTION
1	1	13904	NUT 5/16-18 STDN STAINLESS STEEL
2	1	90034	HOUSING CALDER DIGITAL LEAK DETECTION SENSOR
3	1	90036	THUMB SCREW 5/16-18 NYLON LOW PROFILE 1" LONG
4	2	90198	COLLAR SHAFT 8MM ID SET SCREW 304 STAINLESS
5	1	90199	SCREW 1/4-14 X 3/4 SELF DRILLING FLAT HEAD 410 STAINLESS
6	1	90200	SENSOR 50MM FORK INFRARED NPN OUTPUT 24VDC M8 X 1 CONNECTOR
7	24	90201	TUBING POLYURETHANE VERY FLEXIBLE 1/4 ID X 3/8 OD -40F-180F 30 PSI
8	1	90202	(NOT SHOWN) SYRINGE 60 ML CLEAR POLYPROPYLENE
9	1	90219	TUBE 3/8 BUBBLE COUNTER 3IN LENGTH
10	1	90224	BUBBLE/DRIP TUBE DIGITAL LEAKAGE MEASUREMENT SYSTEM
11	1	90239	GRADUATED CYLINDER 100 ML POLYPROPYLENE MODIFIED

FIGURE A-2. DIGITAL LEAKAGE SENSOR (P/N 90225)

TABLE A-1. DAAS

Part number	Description	Quantity
90227	ASSY SMARTEST DAAS CONSOLE	1

TABLE A-2. OPTIONS

Part number	Description	Quantity
88972	KIT ADDER CALDER TEMPERATURE SENSOR -58–248°F	1
88978	KIT ADDER CALDER 3K PRESSURE TRANSDUCER	1
88979	KIT ADDER CALDER 6K PRESSURE TRANSDUCER	1
88980	KIT ADDER CALDER 10K PRESSURE TRANSDUCER	1
90225	ASSY DIGITAL LEAKAGE MEASUREMENT SENSOR	1

TABLE A-3. SERVICE PARTS KIT

Part number	Description	Quantity
88833	PRESSURE TRANSDUCER 3000 PSIG 0-5V OUTPUT M12 CONNECTOR	1
88834	PRESSURE TRANSDUCER 7500 PSI 0-5V OUTPUT M12 CONNECTOR	1
88835	PRESSURE TRANSDUCER 10000 PSIG 0-5V OUTPUT M12 CONNECTOR	1
87491	PRESSURE TRANSDUCER 20000 PSI 9/16-18UNF-2B CONN 1-10 V OUT-PUT M12-1 W/ CALIBRATION CERT	1
90163	PRESSURE TRANSDUCER 30000 PSI F250C AUTOCLAVE CONNECTION 0-10 V OUTPUT M12-1 W/ CALIBRATION CERT	1
90364	PRESSURE TRANSDUCER 500 PSI 1/4 NPTM CONNECTION 0-10 V OUT-PUT M12-1 W/ CALIBRATION CERT	1
88938	CORDSET EXTENSION EUROFAST 4 CONDUCTOR PUR JACKET 6M LONG	1
88946	TEMPERATURE SENSOR TS400 FOR TP-100 RDT PROBES 0-10V OUT-PUT	1
88973	TEMPERATURE PROBE TYPE TP 6MM DIA X 50MM LONG -50 TO +120 C	1
89009	KIT SPARE PARTS CALDER 5 SCREEN PROTECTOR SHEETS AND INSTALLATION KIT	1

TABLE A-3. SERVICE PARTS KIT

Part number	Description	Quantity
89011	COMPUTER CONFIGURED CALDER PANEL PC W/ DAAS SMARTEST SOFTWARE	1
89013	KIT SPARE PARTS CALDER WATERPROOF USB RECEPTACLE AND CAP	1
89014	KIT SPARE PARTS CALDER DAAS WI-FI ANTENNAS AND CABLES	1

This page intentionally left blank

APPENDIX B SCHEMATICS

Schematic list

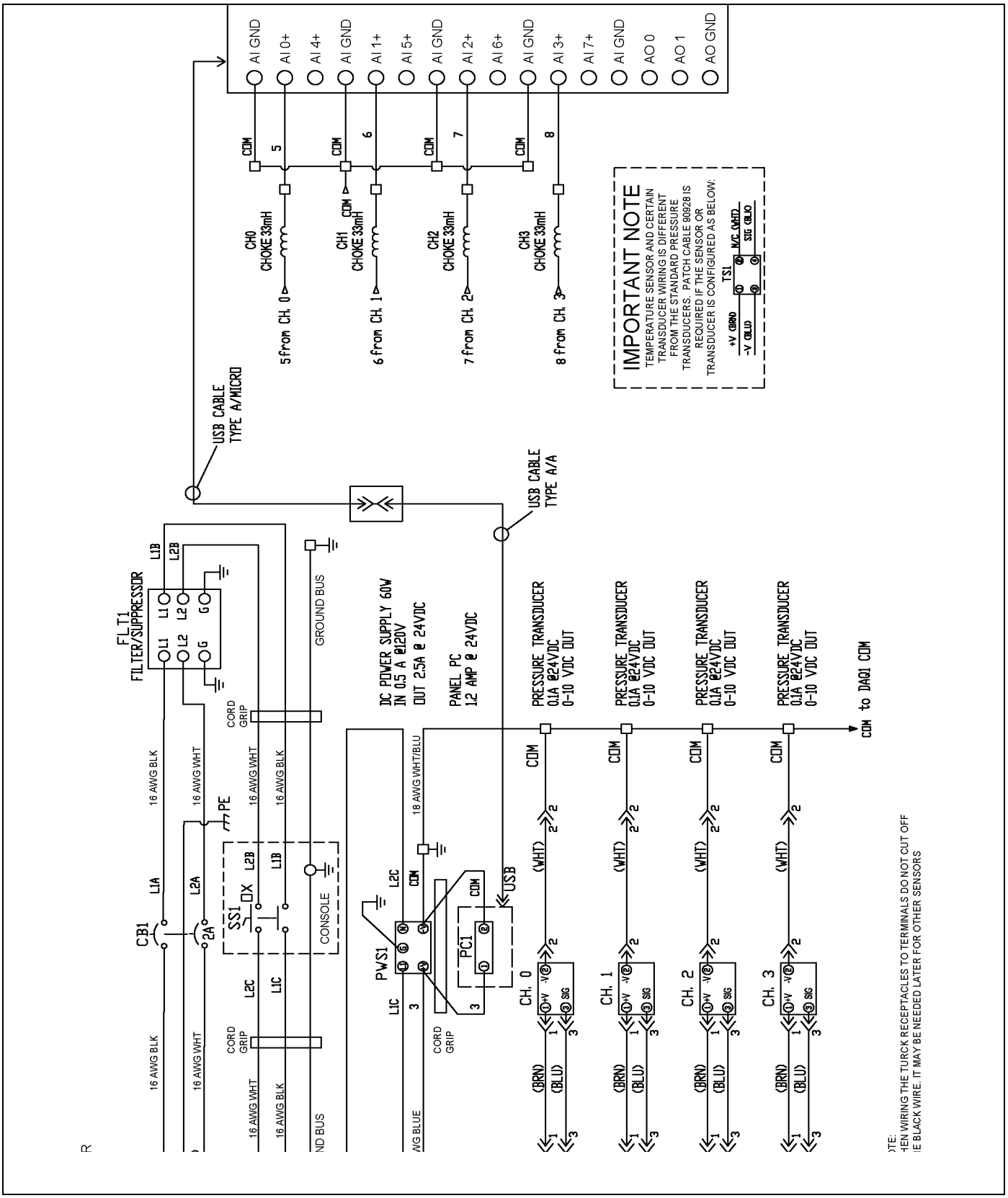


FIGURE B-1. CONTROL PANEL SCHEMATIC 1 (P/N 87958)

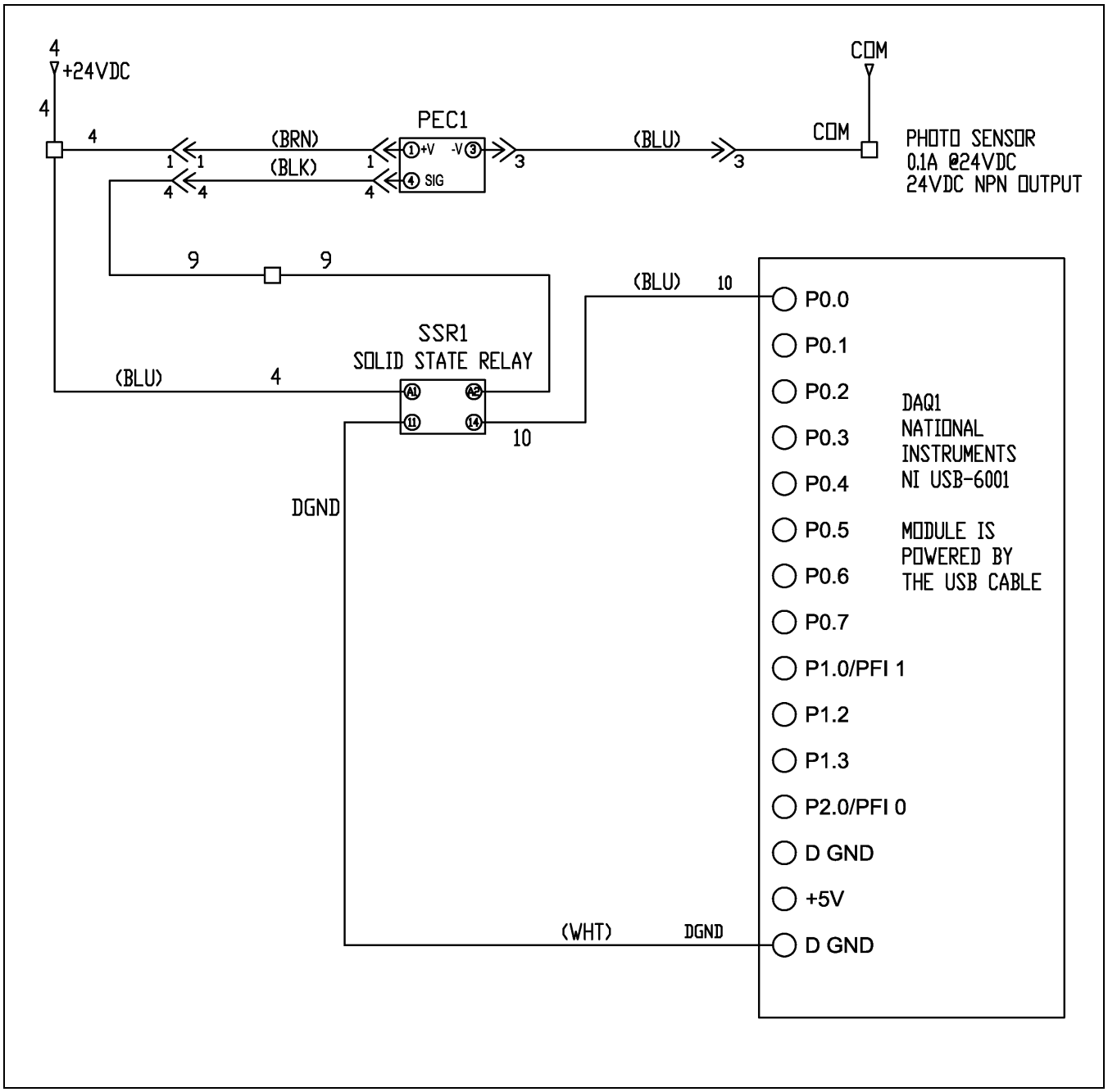
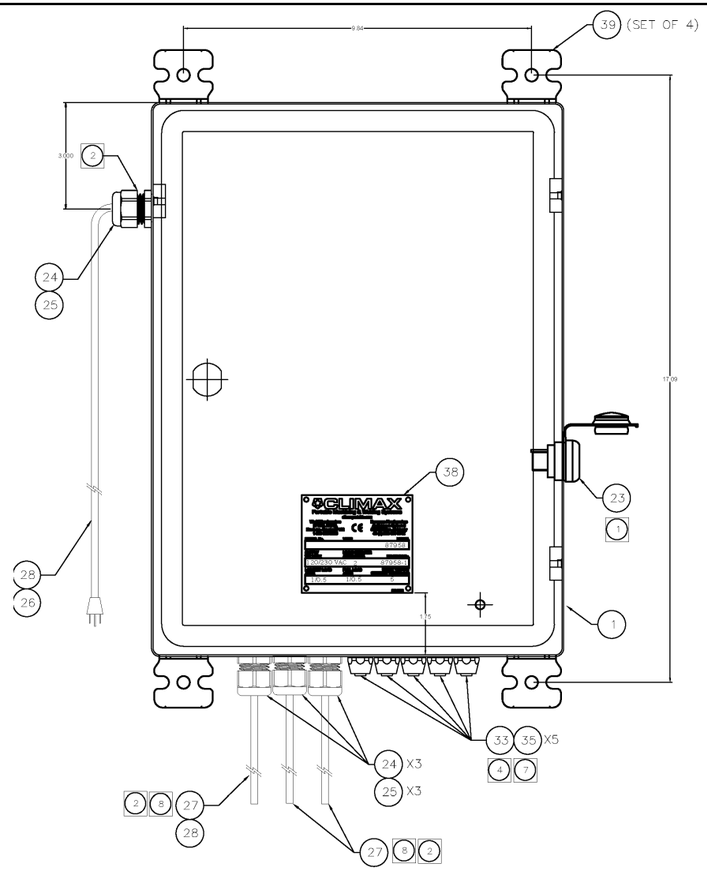
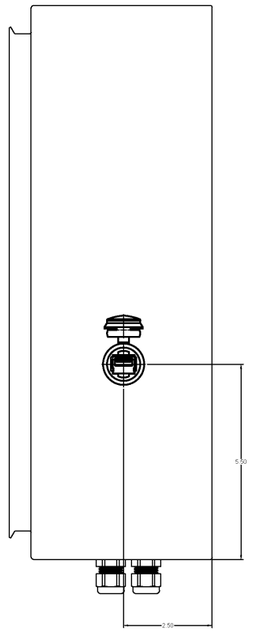


FIGURE B-2. CONTROL PANEL SCHEMATIC 2 (P/N 87958)

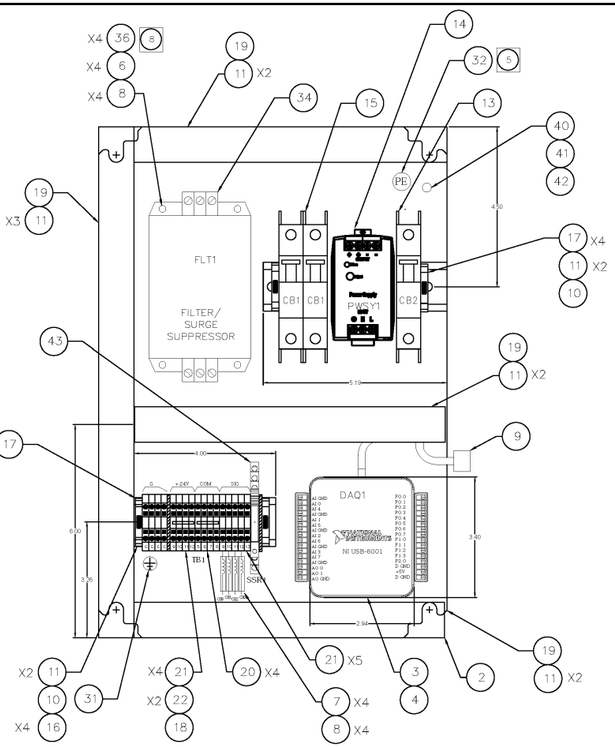
This page intentionally left blank



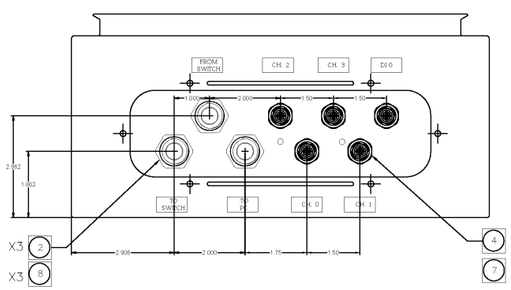
FRONT VIEW



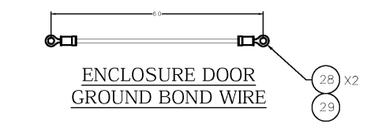
RIGHT SIDE VIEW



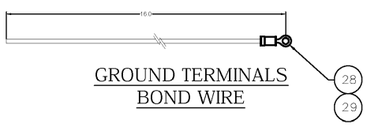
BACKPAN ASSEMBLY VIEW



BOTTOM VIEW



ENCLOSURE DOOR
GROUND BOND WIRE



GROUND TERMINALS
BOND WIRE

1. DRILL 1-1/8" DIA MOUNTING HOLE FOR USB RECEPTACLE
2. DRILL 7/8 IN MOUNTING HOLE FOR ALL CORD GRIPS
3. ENCLOSURE MOUNTING HOLE PATTERN IS 225MM WIDE X 325MM TALL. USE $\frac{5}{16}$ BOLTS W/WASHERS INSIDE AND OUTSIDE
4. DRILL 9/16" HOLE FOR THE $\frac{1}{4}$ NPT TURCK RECEPTACLES
5. INSTALL NEXT TO THE INCOMING PE GROUND STUD INSIDE THE ENCLOSURE
6. COVER AS MUCH OF THE BACK SURFACE AS POSSIBLE WITH THE DOUBLE SIDED TAPE
7. WHEN WIRING THE TURCK RECEPTACLES TO TERMINALS DO NOT CUT OFF THE SPARE WIRES. THEY MAY BE NEEDED FOR OTHER SENSORS
8. EACH OF THE 3 POWER CABLES MUST HAVE A MINIMUM OF 60 INCHES EXPOSED OUTSIDE THE CONTROL ENCLOSURE

ITEM	QTY	CLIMAX P/N	DESCRIPTION	MFG & P/N
43	1	84604	RELAY SOLID STATE 24VDC INPUT 3.5A	CRYDOM DRA-CN024D24
42	1	67871	NUT 5/16-18 WITH EXTERNAL TOOTH LOCK WASHER (KEPS NUT)	MCMASTER-CARR 90675A030
41	1	11876	NUT 5/16-18	ANY PER PRINT
40	1	10431	SCREW 5/16-18 x 1 SOCKET HEAD CAP SCREW	FASTENAL 37405
39	1	89321	MOUNTING LUGS FOR SCHNEIDER NSY SPACIAL ENCLOSURE (SET OF 4)	SCHNEIDER NSYPFCR
38	1	47981	NAMEPLATE SERIAL YEAR MODEL ELECTRICAL PANELS CE 2.75 X 3.13	ANY PER PRINT
37	-	-	-	-
36	3	10838	SCREW 6-32 X 3/8 SOCKET HEAD	OBSOLETE ORBGON BOLT 12C037SHCS
35	5	88948	CLOSURE CAP FOR FEMALE M12 CONNECTOR PLASTIC	TURCK RS-MC
34	1	88943	FILTER / SURGE SUPPRESSOR 1PH 240V 2.5A	CONTROL CONCEPTS ISLATROL IC+202
33	5	88836	RECEPTACLE EUROFAST 4PIN 4 WIRE 22AWG 0.5M LEADS	TURCK FK 4.4-0.5/18-25
32	1	77568	LABEL PE PROTECTIVE EARTH TERMINAL	ACCUFORM LSCE120
31	1	37572	LABEL GROUND TERMINAL	EUROPORT 1300194
30	*	*	*	*
29	22	27571	WIRE 16 AWG 600V GRN/YEL TYPE MTW	BELDEN 8521 GRNYEL
28	5	88764	TERMINAL RING TONGUE 16-14 AWG 1/4 IN STUD BLUE	TE CONNECTIVITY 34162
27	252	12675	CORD 16-3 TYPE SJEOW 300V	ROYAL 16-3 TYPE SJEOW
26	1	12401	CORDSET 120V POWER 16-3 X 9 FT LG 5-15 PLUG TYPE SJ JACKET	VOLEX 17419.10.B1
25	4	37739	CORD GRIP NONMETALLIC .17-.47 DIA X 1/2 NPT	HEYCO 3231
24	4	12574	CONDUIT NUT 1/2 NPT STEEL	BRIDGEPORT 1015
23	1	88739	RECEPTACLE AND COVER USB A/A BULKHEAD MOUNT	CONEC 17-200161
22	2	88763	JUMPER WAGO TOPJOB TERMINAL BLOCKS 4 POSITION	WAGO 2002-404
21	9	88762	TERMINAL 5MM WIDE 22-12 AGW 20A 800V BLUE	WAGO 2002-1204
20	4	88760	TERMINAL 5MM WIDE 22-12 AGW 20A 800V GRAY	WAGO 2002-1201
19	44	88759	WIRE DUCT AND COVER 1 IN WIDE X 3 IN TALL GRAY	ABB QD100X300SG
18	1	88761	TERMINAL END PLATE ORANGE	WAGO 2002-1292
17	6	88758	END STOP SCREWLESS 35MM DIN RAIL TERMINAL BLOCKS	WAGO 249-116
16	4	88757	TERMINAL BLOCK 5MM WIDE GREEN/YELLOW GROUND	WAGO 2002-1207
15	1	79196	CIRCUIT BREAKER 2P 2A C CURVE DIN MOUNT UL489	SCHNEIDER 60137
14	1	72942	POWER SUPPLY 60W 100-240VAC / 24VDC 2.5A	PULS ML60.241
13	1	40345	CIRCUIT BREAKER 1P 2A C CURVE	SCHNEIDER 60103
12	*	*	*	*
11	11	88741	RIVET 3/16 DIA ALUMINUM GRIP RANGE .376 TO .5	MCMASTER 97447A060
10	10	67171	DIN RAIL 35MM X 7.5 MM ZINC PLATED	SQUARE-D AM1DP200
9	1	*	CABLE USB A TO USB B 1M LONG (INCLUDED WITH NI USB-6001)	NATIONAL INSTRUMENTS 192256A-01
8	8	29435	TUBE SHRINK .375 DIA BLACK	3M FP301-3/8 BLK
7	4	48451	CHOKE RF VARNISHED 33 mH 10% AXIAL LEAD .16 AMPS	API DELEVAN 4590-336K
6	4	20758	WASHER #6 INTERNAL STAR	FASTENAL 33707
5	*	*	*	*
4	20	88754	TAPE 3M VHB 1/2 WIDE X .120 THICK ADHESIVE ON BOTH SIDES	3M 4959
3	1	89014	MULTIFUNCTION I/O AND DAQMX MODULE	NATIONAL INSTRUMENTS NI USB-6001
2	1	88747	BACKPAN FOR SCHNEIDER 400 X 300 ENCLOSURE	SCHNEIDER NSYMM43
1	1	88746	ENCLOSURE 400 MM X 300 MM X 150 MM IP66 MILD STEEL	SCHNEIDER NSYCRN43150

BILL OF MATERIALS

FIGURE B-3. CONTROL ENCLOSURE SCHEMATIC (P/N 87958)

This page intentionally left blank

APPENDIX C MANUFACTURER MANUALS

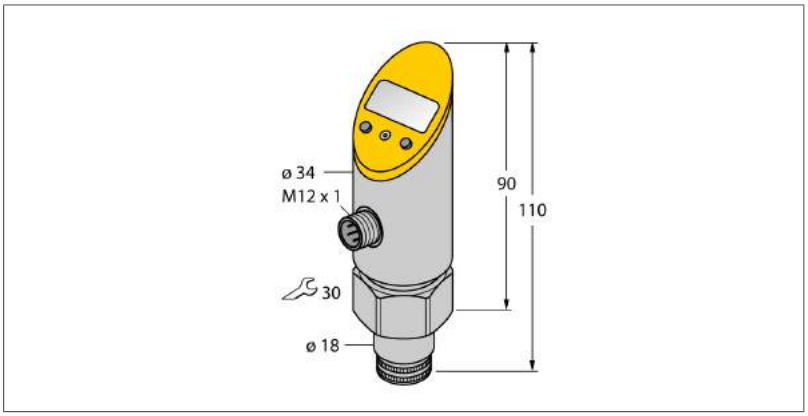
Relevant excerpts of manufacturers' operating manual list:

NOTICE

For additional information about this computer, visit Advantech.com and search for the manufacturing part number PPC-4151W.

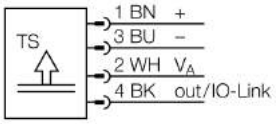
This page intentionally left blank

Temperature measurement
with voltage output and PNP/NPN transistor switching output
TS-400-LUUPN8X-H1141



- **Reading of adjusted values without tools**
- **Recessed pushbutton and keylock for secure programming**
- **Permanent display of temperature unit (°C, °F, K, Ohm)**
- **Temperature peak memory**

Wiring Diagram



General description

The TS series is a compact processing unit with a 4-digit, 7-segment display. Available are versions with non-rotatable (TS400) or rotatable (TS500) body and various output types.

Type designation	TS-400-LUUPN8X-H1141
Ident-No.	6840008
Ident-No (TUSA)	M6840008
Temperature range	-50…500 °C
Temperature operating range	-58…932 °F
Measuring element	For connection to probes of the TP series
Response time	100
Power supply	
Operating voltage	18…30 VDC
Current consumption	≤ 50 mA
Voltage drop at I_e	≤ 2 V
Protective measure	SELV; PELV according to EN 50178
Short-circuit/reverse polarity protection	yes/ yes
Protection type and class	IP67/ III
Outputs	
Output 1	Switching output or IO-Link mode
Output 2	analog output
Switching output	
Output function	NO/NC programmable, PNP/NPN
Switching point accuracy	± 0.2 K
Rated operational current	0.2 A
Switching frequency	≤ 180 Hz
Switching point distance	≥ 0.2 K
Switching cycles	≥ 100 mil.
Release points	-50…+499.8°C
Switching point	-49.8…+500°C
Analog output	
Voltage output	0…10V
Operating range	0…10 V/0…5 V/1…6 V (3-wire)
Load	≥ 2 kΩ
Accuracy (Lin. + Hys. + Rep.)	± 0.2 K
Remark	0.1% of full scale applies to temperatures > +200 °C
Repeatability	0.1 K
IO-Link	IO-Link
IO-Link Specification	Specified acc. to version 1.0
Programming	FDT / DTM
Transmission physics	corresponds to 3-wire physics (PHY2)
Transmission rate	COM 2 / 38.4 kbps
Process data width	16 bit
Measured value information	14 bit
Switchpoint information	1 bit
Frame type	2.2
Genauigkeit	± 0.2 K

Edition • Rev. A • 2017-09-15T10:42:53+02:00

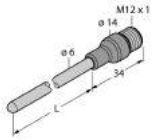
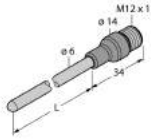
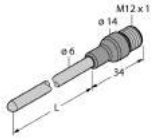
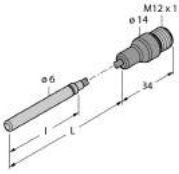
Temperature measurement
with voltage output and PNP/NPN transistor switching output
TS-400-LUUPN8X-H1141

Temperature behaviour	
Temperature coefficient zero point Tk0	± 0.15 % of full scale/10 K
Temperature coefficient span T_{ks}	± 0.15 % of full scale/10 K
Ambient conditions	
Ambient temperature	-40…+80 °C
Storage temperature	-40…+80°C
Vibration resistance	20 g (9…2000 Hz), according to IEC 68-2-6
Shock resistance	50 g (11 ms) , according to IEC 61508
EMC	EN 61000-4-2 ESD:4 kV CD / 8 kV AD EN 61000-4-3 HF radiated:15 V/m EN 61000-4-4 Burst:2 kV EN 61000-4-5 Surge: 1 kV, 42 Ohm EN 61000-4-6 HF conducted:10 V
Housing	
Housing material	Stainless-steel/Plastic, V2A (1.4305)
Process connection	Cylindrical, Ø 18 mm
Electrical connection	Connector, M12 × 1
Reference conditions acc. to IEC 61298-1	
Temperature	15…+25 °C
Atmospheric pressure	860…1060 hPa abs.
Humidity	45…75 % rel.
Auxiliary power	24 VDC
Display	
Display	4-digit 7-segment, rotatable by 180°
Switching state	LED yellow
Programming options	switch/release point, hysteresis/window mode, NO/NC; unit
Unit display	4 x green LED (°C, °F, K, Ohm)
MTTF	255 acc. to SN 29500 (Ed. 99) 20 °C

Edition • Rev. A • 2017-09-15T10:42:53+02:00

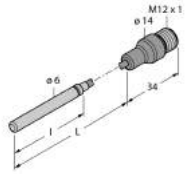
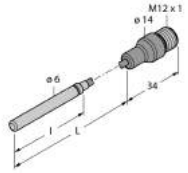
Temperature measurement
with voltage output and PNP/NPN transistor switching output
TS-400-LUUPN8X-H1141

Accessories

Type code	Ident-No.	Description	
TP-206A-CF-H1141-L200	9910477	temperature detector for liquid and gaseous media	
TP-206A-CF-H1141-L100	9910475	temperature detector for liquid and gaseous media	
TP-206A-CF-H1141-L150	9910476	temperature detector for liquid and gaseous media	
TP-206A-CF-H1141-L300	9910478	temperature detector for liquid and gaseous media	
TP-306A-CF-H1141-L1000	9910479	temperature detector for liquid and gaseous media	

Edition • Rev. A • 2017-09-15T10:42:53+02:00

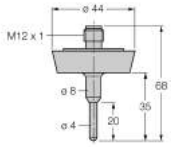
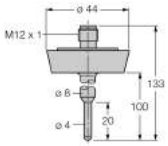
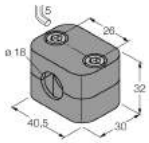
Accessories

Type code	Ident-No.	Description	
TP-306A-CF-H1141-L2000	9910480	temperature detector for liquid and gaseous media	
TP-306A-CF-H1141-L5000	9910481	temperature detector for liquid and gaseous media	
TP-103A-G1/8-H1141-L013	9910400	temperature detector for liquid and gaseous media	
TP-103A-G1/8-H1141-L024	9910401	temperature detector for liquid and gaseous media	
TP-504A-TRI3/4-H1141-L035	9910429	temperature detector for liquid and gaseous media	

Edition • Rev. A • 2017-09-15T10:42:53+02:00

Temperature measurement
with voltage output and PNP/NPN transistor switching output
TS-400-LUUPN8X-H1141

Accessories

Type code	Ident-No.	Description	
TP-504A-TRI3/4-H1141-L100	9910430	temperature detector for liquid and gaseous media	
TP-504A-DN25K-H1141-L035	9910431	temperature detector for liquid and gaseous media	
TP-504A-DN25K-H1141-L100	9910432	temperature detector for liquid and gaseous media	
BSS-18	6901320	Mounting bracket for smooth and threaded barrel devices; material: Polypropylene	
TP-103A-N1/8-H1141-L013	9910765	temperature detector for liquid and gaseous media	

Edition • Rev. A • 2017-09-15T10:42:53+02:00

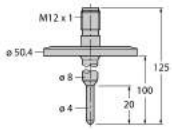
Accessories

Type code	Ident-No.	Description	
TP-103A-N1/8-H1141-L024	9910766	temperature detector for liquid and gaseous media	
TP-103A-G1/8-H1141-L035	9910576	temperature detector for liquid and gaseous media	
TP-303B-M6-L15-6M	9910810	temperature detector for liquid and gaseous media	
TP-206.35A-CF-H1141-L100	9910819	temperature detector for liquid and gaseous media	
TP-206.35A-CF-H1141-L150	9910820	temperature detector for liquid and gaseous media	

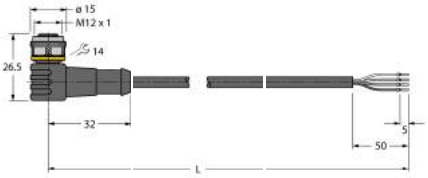
Edition • Rev. A • 2017-09-15T10:42:53+02:00

Temperature measurement
with voltage output and PNP/NPN transistor switching output
TS-400-LUUPN8X-H1141

Accessories

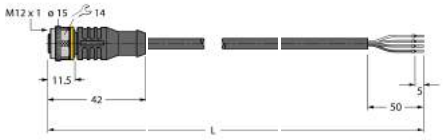
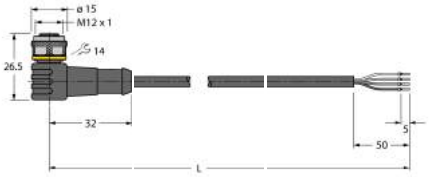
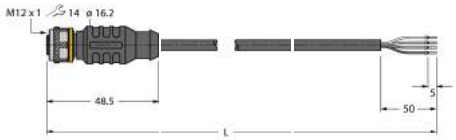
Type code	Ident-No.	Description	
TP-206.35A-CF-H1141-L200	9910821	temperature detector for liquid and gaseous media	
TP-206.35A-CF-H1141-L300	9910822	temperature detector for liquid and gaseous media	
TP-104A-G1/8-H1141-L035	9910840	temperature detector for liquid and gaseous media	
TP-504A-TRI1.5-H1141-L100	9910860	temperature detector for liquid and gaseous media	

Wiring accessories

Type code	Ident-No.	Description	
WKC4.4T-2/TEL	6625025	Connection cable, female M12, angled, 4-pin, cable length: 2 m, sheath material: PVC, black; cULus approval; other cable lengths and qualities available, see www.turck.com	

Edition • Rev. A • 2017-09-15T10:42:53+02:00

Wiring accessories

Type code	Ident-No.	Description	
RKC4.4T-2/TXL	6625503	Connection cable, female M12, straight, 4-pin, cable length: 2 m, sheath material: PUR, black; cULus approval; other cable lengths and qualities available, see www.turck.com	
WKC4.4T-2/TXL	6625515	Connection cable, female M12, angled, 4-pin, cable length: 2 m, sheath material: PUR, black; cULus approval; other cable lengths and qualities available, see www.turck.com	
RKC4.4T-P7X2-10/TXL	6626184	Connection cable, female M12, angled, 4-pin, cable length: 10m, sheath material: PUR, black; cULus approval; other cable lengths and qualities available, see www.turck.com	

Edition • Rev. A • 2017-09-15T10:42:53+02:00

PPC-4151W

15.6" Fanless Wide Screen Panel PC with Intel® Core™ i5-4300U/i3-4010U Processor

Features

- 15.6" WXGA entirely flat panel with Projected Capacitive Touchscreen or flat panel with resistive touchscreen
- High performance Intel Core i CPU with Fanless design
- PCIe x4 or PCI expansion support
- Automatic data flow control over RS-485
- Wide Range DC 9-32V support
- Dual Gigabit Ethernet, support IEEE1588
- 3 x Independent display

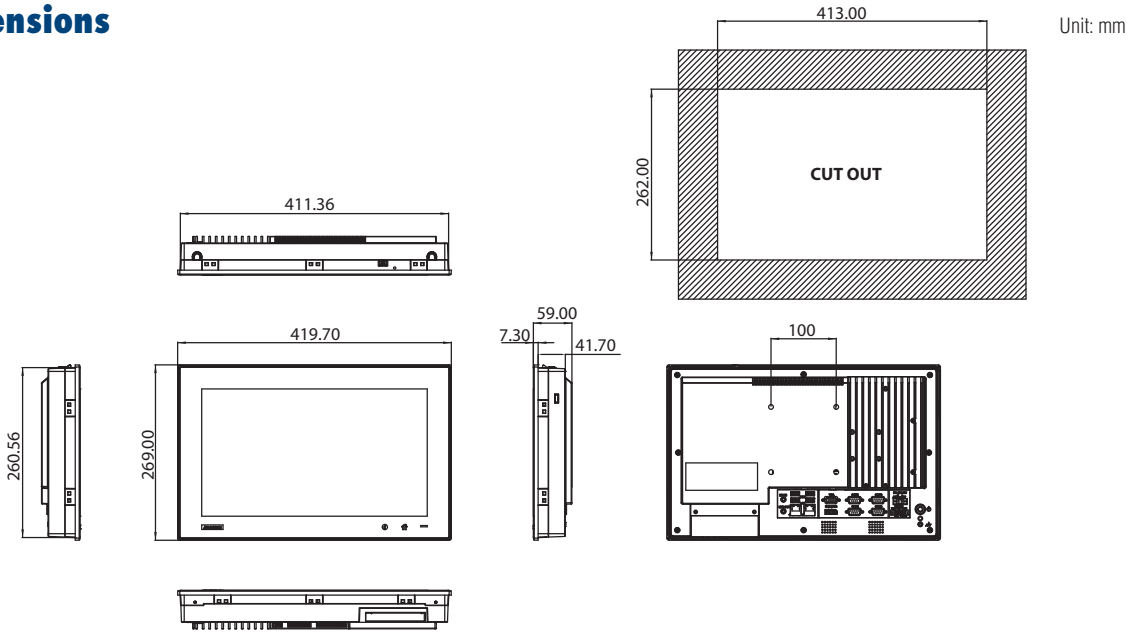
Introduction

The PPC-4151W is a new generation Panel PC with a WXGA (1366 x 768) screen. Most importantly, the system is equipped with a high performance Intel® Core™ i CPU, yet operating heat is easily dispatched by the high efficiency, fanless thermal design. This is a big step forward in HMI, consolidating performance and reliability in one system. Besides, rich I/O such as 5 x COM, 5 x USB and dual Gigabit ethernet make device connection and integration easy. In addition, PCI/PCIe expansion allows adding field bus or proprietary cards for even more application possibilities. Last but not least, the multi touch screen makes the HMI more intuitive, delivering the best operating experience.

Specifications

Model		PPC-4151W-P5AE	PPC-4151W-R3AE
Processor System	CPU	Intel Core i5-4300U, Dual Core	Intel Core i3-4010U, Dual Core
	Frequency	1.9GHz, turbo boost to 2.9GHz	1.7GHz
	2nd Cache	3MB	
	Memory	1 x SO-DIMM, DDR3L1333/1600, Max 8GB (1.35V)	
	Storage	1 x 2.5" SATA Bay 1 x mSATA Bay	
	Network (LAN)	2 x 10/100/1000 Mbps Ethernet (Intel I211-AT; Intel I218LM)	
	I/O ports	5 x Serial ports: 4 x RS-232, 1 x RS-422/485 with isolation 1K V_{DC} 4 x USB 3.0 ports in rear side, 1 x USB 2.0 in right side 1 x Line-out, 1x MIC-in 1 x DB15 VGA 1 x Display Port (1.2)	
	Expansion	1 x Mini PCIe 1 x PCIe x 4 (default); 1 x PCI (in the accessory box)	
	Watchdog Timer	255 timer levels, set up by software	
	Speaker	2 x 1W	
Physical Characteristics	Dimensions	419.7 x 269 x 59 mm (16.5" x 10.6" x 2.3")	
	Weight	5.8 kg (12.79 lb)	
OS Support	OS Support	Microsoft® Windows 7 32 and 64-bit/Windows 8.1 32 and 64-bit/WES 7 32 and 64-bit/Windows 10 32 and 64-bit/Linux	
Power Consumption	Input Voltage	9 - 32 Vdc	
	Power Consumption	i5-4300U/i3-4010U: 56W (Burn-in test 7.0 in Windows 7 64 bit)	
LCD Display	Display Type	15.6" TFT LCD (LED Backlight)	
	Max. Resolution	1366 x 768	
	Viewing Angle	85 (Left), 85 (Right), 80 (Up), 80 (Down)	
	Luminance (cd/m²)	400	
	Contrast Ratio	500	
	Backlight Lifetime	50,000 hrs min.	
Touchscreen	Touch Type	Projected Capacitive Multi-Touch 10 Point	Analog Resistive 5-Wire
	Light Transmission	88 % ± 2 %	80% ± 5%
	Controller	USB Interface	
Environment	Operating Temperature	0 ~ 50° C (32 ~ 122° F) for SSD, 0 ~ 45° C (32 ~ 113° F) for HDD	
	Storage Temperature	-40 ~ 60°C (-40 ~ 140°F)	
	Relative Humidity	10 ~ 95% @ 40°C (Non-Condensing)	
	Shock	Operating 10 G Peak Acceleration (11 ms Duration), Follows IEC 60068-2-27	
	Vibration	Operating Random Vibration Test 5 ~ 500Hz, 1Grms @with HDD; 2Grms @with SSD, Follows IEC 60068-2-64	
	EMC	CE, FCC Class B, BSMI	
	Safety	CB, UL, CCC, BSMI	
	Front Panel Protection	IP65 Compliant	

Dimensions

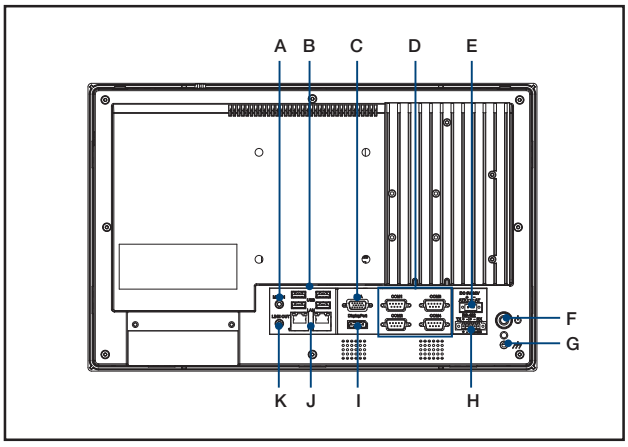


Cut-out dimensions: 413 x 262 mm

Ordering Information

Part NO	Description
PPC-4151W-P5AE	15.6" Wide screen PPC with PCT Multi-touch, Intel Core i5-4300U
PPC-4151W-R3AE	15.6" Wide screen PPC with resistive touch, Intel Core i3-4010U
96PSA-A90W19OT-1	Adapter AC100-240V 90W 19V
1700001524	POWER Cord 3P UL 10A 125V 180cm
170203183C	POWER Code 3P Europe (WS-010+083)183cm
1700008921	POWER CORD 3P/3P POWER SUPPLY 1.8M PSE
96CB-POWER-B-1.8M	Power code 3P CCC(China) 1.8M
PPC-174T-WL-MTE	Wall mount kit for PPC series
PPC-STAND-A1E	Stand for PPC series
PPC-ARM-A03	ARM VESA Standard (A-CLEVER) for PPC series
PPC-WLAN-B1E	Wi-Fi Module with Antenna Cable 40cm for PPC
2070012905	Image WES7P 32-bit Multi PPC-4151W/4211W-P
2070013051	Image WES7P 64-bit Multi PPC-4151W/4211W-P
98R3415010E	Front USB on cabinet module with Cable 100cm
98R3612000E	mSATA/CFast to USB Card Reader

I/O Appearance



A. Mic-in
B. 4 x USB 3.0
C. VGA Port
D. 4 x RS-232
E. DC Inlet
F. Power Button
G. Ground Line
H. 1 x RS-422/485
I. Display Port
J. 2 x 10/100/1000 Mbps Ethernet
K. Line Out

All Stainless Steel Transducer/ Transmitter Multimedia Compatibility

High-Performance Silicon Technology

Imperial Model

0-1 to 0-10,000 psi
0-0.07 to 0-690 bar
100 mV, 0 to 5 V,
and 4 to 20 mA Outputs

PX309 Series

NIST CE
Standard

- **1, 2 & 5 psi Low Pressure Ranges!**
- **All Stainless Steel Construction**
- **Gage, Absolute, Compound Gage or Vacuum Pressure**
- **Rugged Solid State Design**
- **High Stability, Low Drift**
- **0.25% Static Accuracy**
- **IP65 Protection Class**

We provide a complete range of services—from product inception, through design and prototypes, to manufacturing and testing. Our application engineers work closely with our customers to **customize**, **design** or create entirely **new products**. Call us—whether you're an OEM, manufacturer, or end user.

LARGE INVENTORY Fast Shipment!

All models shown smaller than actual size.

Rugged, General Purpose Transducer

Common Specifications for 100 mV, 0 to 5 Vdc, and 4 to 20 mA Outputs

- **1, 2 & 5 psi Low Pressure Ranges!**
- **All Stainless Steel Construction**
- **Gage or Absolute Pressure**
- **Rugged Solid State Design**
- **High Stability, Low Drift**
- **0.25% Static Accuracy**
- **IP 65 Protection Class**

OMEGA's PX309 Series models below 100 psi use a high-accuracy silicon sensor protected by an oil-filled stainless steel diaphragm. Units 100 psi and above use silicon strain gages molecularly bonded to the stainless steel diaphragm.

Common Specifications

Ranges: -15 to 50 psig, 0 to 1000 psia, 100 to 10,000 psig

Accuracy (Combined Linearity, Hysteresis and Repeatability): ±0.25% BSL, max

Minimum Resistance Between Transducer Body and Any Wire: 1M Ω @ 25 Vdc

Calibration: In vertical direction with fitting down

Pressure Cycles: 10 million, minimum

Pressure Overload: -15 to 50 psig and 0 to 1000 psia: 3 times rated pressure or 20 psi whichever is greater, 100 to 10,000 psig: 2 times rated pressure

Burst Pressure: -15 to 50 psig and 0 to 1000 psia: 4 times rated pressure or 25 psi whichever is greater, 100 to 10,000 psig: 5 times rated pressure

Long Term Stability (1 Year): ±0.25% of FS, typical

Operating Temperature: -40 to 85°C (-40 to 185°F)

Pressure Port: ¼-18 MNPT

Pressure Port Material: -15 to 50 psig and 0 to 1000 psia: 316 SS, 100 to 10,000 psig: 17-4 PH SS

Bandwidth: DC to 1 kHz (typical)

CE: Compliant

Shock: 50 g, 11 ms half-sine

Vibration: ±20 g

Response Time: <1 millisecond

Weight:
PX309: 154 g (5.4 oz),
PX319/329/359: 100 g (3.5 oz)

IP Rating: IP65

RoHS: Compliant

Order a snubber to protect your pressure transducer!

PS-4G, shown actual size.

Snubbers protect sensors from fluid hammers/spikes.

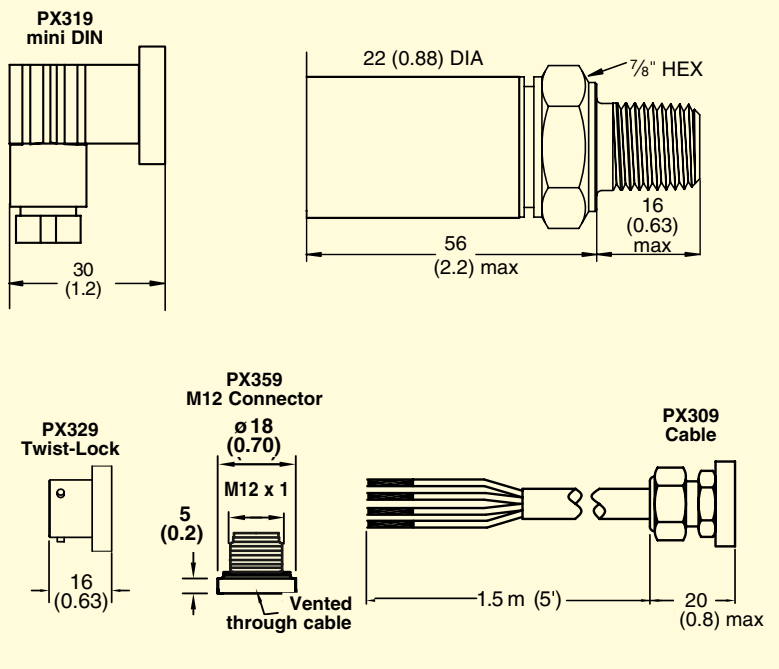
mV Output Wiring			
Wiring	**Cable**	**M12 and mini DIN**	**Twist-Lock**
Excitation (+)	Red	Pin 1	Pin A
Output (+)	White	Pin 3	Pin C
Output (-)	Green	Pin 4	Pin D
Excitation (-)	Black	Pin 2	Pin B
Spare	–	–	Pin E
Vent	–	–	Pin F

5 Vdc Output Wiring			
Wiring	**Cable**	**M12 and mini DIN**	**Twist-Lock**
Excitation (+)	Red	Pin 1	Pin A
Excitation (-)	Black	Pin 2	Pin B
Output (+)	White	Pin 3	Pin C
N/C†	–	Pin 4	Pin D
Spare	–	–	Pin E
Vent	–	–	Pin F

mA Output Wiring			
Wiring	**Cable**	**M12 and mini DIN**	**Twist-Lock**
Supply (+)	Red	Pin 1	Pin A
Supply (-)	Black	Pin 2	Pin B
N/C†	–	Pin 3	Pin C
N/C†	–	Pin 4	Pin D
Spare	–	–	Pin E
Vent	–	–	Pin F

† N/C: Do not connect any wires to this pin.

Dimensions: mm (inch)
ø = diameter



How to Order PX309 Series
with 0 to 5 Vdc Output

0 to 5 Vdc Output
0-1 to 0-10,000 psi
0-70 mbar to 0-690 bar

PX329-015G5V shown smaller than actual size.

Twist-lock style.

PX309 Series

Standard

5V Output Specifications
(In Addition to Common Specifications on page 2)

Total Error Band (Includes Linearity, Hysteresis, Repeatability, Thermal Hysteresis and Thermal Errors, Not Including Zero and Span Setting Accuracy): ±1.0% (5 psig/psia is ±1.5%, 2 psig is 3.0% and 1 psig is 4.5%)

Supply Voltage: 9 to 30 Vdc, Supply Current < 10 mA

0 to 5 Vdc Outputs		
Range	**Output**	**Excitation***
5 to 1000 psia	0 to 5 Vdc	9 to 30 Vdc
1 to 10,000 psig	0 to 5 Vdc	9 to 30 Vdc
-15 to 30/50/100/150 psig	0 to 5 Vdc	9 to 30 Vdc
0 to -15 psig	0 to 5 Vdc	9 to 30 Vdc
-15 to 0 to +15 psig	-5 to 0 to +5 Vdc	9 to 30 Vdc

** Supply Current < 10 mA*

Compensated Temperature: -20 to 85°C (≤ 5 psig/psia is 0 to 50°C)

Metric Versions of PX309 also available from OMEGA. Please see PXM309 series.

To Order

Range		1.5 m Cable Connection	mini DIN Connection	Twist-Lock Connection	M12 Connection
psi	**bar**				
Absolute Pressure					
0 to 5	0 to 0.34	PX309-005A5V	PX319-005A5V	PX329-005A5V	PX359-005A5V
0 to 15	0 to 1	PX309-015A5V	PX319-015A5V	PX329-015A5V	PX359-015A5V
0 to 30	0 to 2.1	PX309-030A5V	PX319-030A5V	PX329-030A5V	PX359-030A5V
0 to 50	0 to 3.4	PX309-050A5V	PX319-050A5V	PX329-050A5V	PX359-050A5V
0 to 100	0 to 6.9	PX309-100A5V	PX319-100A5V	PX329-100A5V	PX359-100A5V
0 to 200	0 to 14	PX309-200A5V	PX319-200A5V	PX329-200A5V	PX359-200A5V
0 to 300	0 to 21	PX309-300A5V	PX319-300A5V	PX329-300A5V	PX359-300A5V
0 to 500	0 to 34	PX309-500A5V	PX319-500A5V	PX320-500A5V	PX359-500A5V
0 to 1000	0 to 69	PX309-1KA5V	PX319-1KA5V	PX329-1KA5V	PX359-1KA5V
Gage Pressure					
0 to 1	0 to 0.07	PX309-001G5V	PX319-001G5V	PX329-001G5V	PX359-001G5V
0 to 2	0 to 0.14	PX309-002G5V	PX319-002G5V	PX329-002G5V	PX359-002G5V
0 to 5	0 to 0.34	PX309-005G5V	PX319-005G5V	PX329-005G5V	PX359-005G5V
0 to 15	0 to 1	PX309-015G5V	PX319-015G5V	PX329-015G5V	PX359-015G5V
0 to 30	0 to 2.1	PX309-030G5V	PX319-030G5V	PX329-030G5V	PX359-030G5V
0 to 50	0 to 3.4	PX309-050G5V	PX319-050G5V	PX329-050G5V	PX359-050G5V
0 to 100	0 to 6.9	PX309-100G5V	PX319-100G5V	PX329-100G5V	PX359-100G5V
0 to 150	0 to 10	PX309-150G5V	PX319-150G5V	PX329-150G5V	PX359-150G5V
0 to 200	0 to 14	PX309-200G5V	PX319-200G5V	PX329-200G5V	PX359-200G5V
0 to 300	0 to 21	PX309-300G5V	PX319-300G5V	PX329-300G5V	PX359-300G5V
0 to 500	0 to 34	PX309-500G5V	PX319-500G5V	PX329-500G5V	PX359-500G5V
0 to 1000	0 to 69	PX309-1KG5V	PX319-1KG5V	PX329-1KG5V	PX359-1KG5V
0 to 2000	0 to 138	PX309-2KG5V	PX319-2KG5V	PX329-2KG5V	PX359-2KG5V
0 to 3000	0 to 207	PX309-3KG5V	PX319-3KG5V	PX329-3KG5V	PX359-3KG5V
0 to 5000	0 to 345	PX309-5KG5V	PX319-5KG5V	PX329-5KG5V	PX359-5KG5V
0 to 7500	0 to 517	PX309-7.5KG5V	PX319-7.5KG5V	PX329-7.5KG5V	PX359-7.5KG5V
0 to 10,000	0 to 690	PX309-10KG5V	PX319-10KG5V	PX329-10KG5V	PX359-10KG5V
Vacuum and Compound Gage Pressure					
0 to -15	—	PX309-015V5V	PX319-015V5V	PX329-015V5V	PX359-015V5V
-15 to 0 to +15	—	PX309-015CG5V	PX319-015CG5V	PX329-015CG5V	PX359-015CG5V
-15 to 30	-1.03 to 2.1	PX309-V030G5V	PX319-V030G5V	PX329-V030G5V	PX359-V030G5V
-15 to 50	-1.03 to 3.4	PX309-V050G5V	PX319-V050G5V	PX329-V050G5V	PX359-V050G5V
-15 to 100	-1.03 to 6.9	PX309-V100G5V	PX319-V100G5V	PX329-V100G5V	PX359-V100G5V
-15 to 150	-1.03 to 10.3	PX309-V150G5V	PX319-V150G5V	PX329-V150G5V	PX359-V150G5V

Comes complete with 5-point NIST-traceable calibration.

***Notes:** 1. Units 100 psig and above may be subjected to vacuum on the pressure port without damage.*
2. For alternative performance specifications to suit your application, contact Engineering.

***Ordering Examples: PX309-100G5V,** 100 psi gage pressure transducer with 0 to 5 Vdc output and 1.5 m cable termination.*

***PX319-015A5V,** 15 psi absolute pressure transducer with 0 to 5 Vdc output and mini DIN termination.*

***PX329-3KG5V,** 3000 psi gage pressure transducer with 0 to 5 Vdc output and twist-lock 6 pin connector termination. Mating connector sold separately; order **PT06V-10-6S.** Consult Sales for OEM pricing.*


CLIMAX
BORTECH
CALDER
H&S TOOL