PIT5000 Pipeline Integrity Tester

…for pipeline hydrostatic pressure testing

Nov., 2011

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What is a Hydrostatic Pressure Test?

A hydrostatic pressure test is run on a pipeline section to determine pressure integrity.

A pipeline section is filled with water.

More water is injected using a positive displacement pump to raise the pressure to a predetermined test value.

The pipe section under test is shut in at test pressure and the pressure is monitored (and recorded) for signs of leakage.

Temperature changes in a closed system also affect pressure; therefore ambient temperature and pipeline temperature are also monitored and recorded.

A successful test shows no sign of pressure decay due to leaks.

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When is a Hydrostatic Pressure Test required?

The Federal Department of Transportation regulates the pipeline transportation industry. Pipeline constructors and operators must comply with 49 CFR Part 192 and Part 195 requirements.

Pressure tests must be run for:

- New pipeline construction
- Reclassification of existing pipelines to higher operating pressures
- Repaired pipeline sections
- Stress Corrosion testing programs
- Impact of outside events (subsidence, landslides, damage)

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Demand for Hydrostatic Pressure Testing

On Oct. 17, 2011, the United States Senate passed S. 275, the Pipeline Transportation Safety Improvement Act of 2011. The Act rescinds an exemption found in 49 CFR Part 192 [see 192.619(a)(3)] that allowed pre-1970 pipelines to operate at higher pressures than Part 192 permitted for new pipelines. Furthermore, pre-1970 pipelines may not have been pressure tested per Part 192 Subpart J.

The recent Act potentially doubles the length of buried natural gas pipeline subject to the hydrostatic pressure testing requirements of Subpart J. The Sept. 2010 San Bruno, CA explosion and fire is an example of previously exempt pipeline that would have been required to have hydrostatic pressure testing performed under Pipeline Transportation Safety Improvement Act of 2011.

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Traditional Equipment

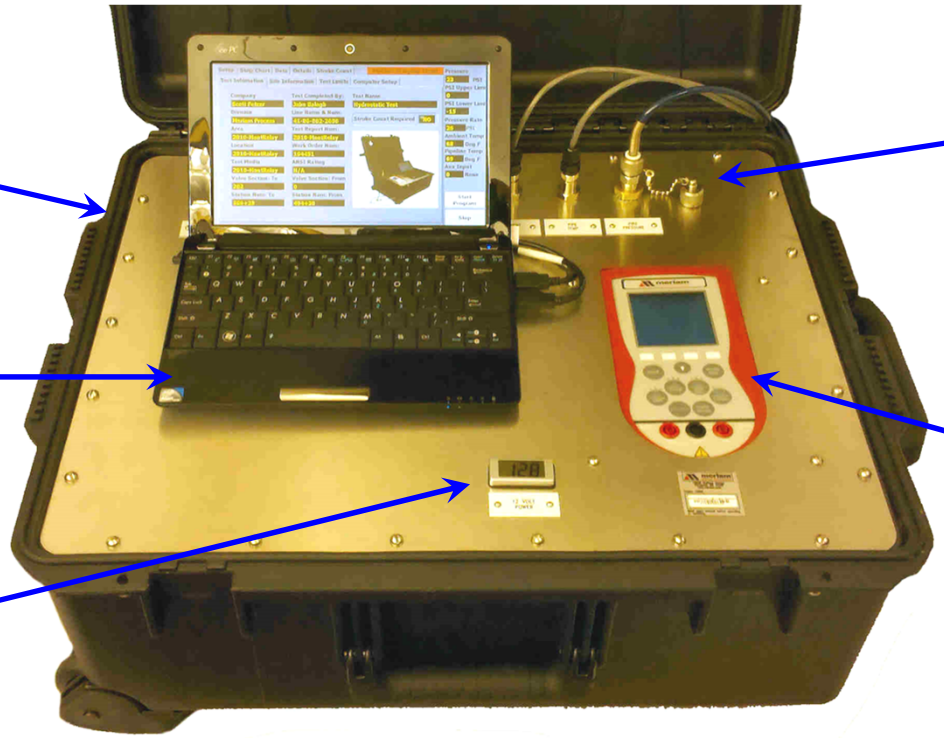
Hydraulic dead weight testers – must be level and clean to work well, technician must be sure it free-spins for accurate readings

Press. / Temp. chart recorders document P, T and test time – delicate linkages, pens dry out, paper charts to replace, timer batteries or manual wind up

Mechanical temperature recorder documents pipeline temperature on a separate chart – charts, pens, timer batteries or manual wind up

PIT5000 Pipeline Integrity Tester

The **PIT5000** from Meriam Process Technologies is a modern tool for conducting and documenting pipeline hydrostatic tests. Pressure, ambient temperature and pipeline temperature are measured by the system and plotted versus time on *one* graph.



Pelican Case

Mini-laptop PC with Software

Battery indicator

Bulkhead temperature, pressure and stroke counting connections

MFT 4000 with temperature (2) and pressure (1) modules

Oct, 2011

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PIT5000 for Today's Testing Requirements

The Meriam PIT5000 Pipeline Integrity Tester is designed to significantly improve pipeline Integrity Management over traditional hydrostatic pressure testing tool. The PIT automatically collects NIST traceable pressure and temperature values versus time and saves the time stamped data to the PC hard drive. The system guarantees consistency of data, eliminates transcription errors, prevents data manipulation during testing and produces an electronically secure final report. Operator work load is also reduced, allowing he/she to focus on protecting the pipeline. PIT5000 provides unique rate information to monitor pressurization/depressurization and provides user-settable visual alerts active during the shut in period.

The PIT5000 is the only system available that addresses today's integrity management requirements.

PIT5000

Features

- Durable HPX resin case with built in wheels and telescoping pull handle, 3 handles for carrying or lifting
- Control panel organizes measurement device, mini-laptop PC, switches and connections
- 12 hour or 28 hour sealed cell battery options
- 115V AC 50/60 Hz charger for system battery
- 30 ft DC extension cord with DC automotive plugs
- Charger or DC extension cord can be used to power the PIT5000
- Option for “no battery” is available for use where 115V AC or 12V DC power is readily available

PIT5000 Features

Features, con't

- Mini-laptop PC with hydro-testing software, includes 4GB SD card
- Meriam MFT4000 with pressure module and two (2) RTD temperature modules
- 5,000 PSI pressure hose with quick test ends
- Two (2) Pt100, 4-wire RTDs, 1/4" diameter, 6" length, with cables
- Pump stroke counter and cable
- User selects PSI, kg/cm2, kPa, or Bar pressure units as well as feet or meters length units

PIT5000 Features

Feature	Benefit
•Electronic pressure sensing	•No need to spin weights or precisely level the instrument
•Pressure sensor wetted parts are all 316L SS	•No problem using water in contact with sensor
•NIST traceable accuracy: ±0.05% FS with no temp. effect from -20° to +50° C	•No need to density correct weights
•PIT 5000 software records pressure vs time to hard drive file	•No charts or pens to change or replace. No linkages to slip. No pen lines to interpret.

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PIT5000 Features

Feature	Benefit
•T_{amb} and T_{pipe} recorded vs time to same hard drive file	•No circular charts or pens to change out
•Real time plot of Pressure, T_{amb} and T_{pipe} vs. time on PC display	•All test data on one display improves control while easing operator workload
•Data sets (time, P, T_{amb}, T_{pipe}, stroke count and notes) saved each minute to file	•Secure MS Excel report provides detailed test information. Backup .csv is also saved
•Stroke count vs time screen avoids overstressing pipe	•Consolidates data collection to PC and saves to file

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PIT5000 Features

Feature	Benefit
•Stroke Count tab provides convenient data sets and strokes vs time graph	•Automatic data collection for pressure, stroke count, and time plus graphic presentation reduces operator workload, allowing him to concentrate on protecting the pipeline.
•MFT4000's Field Re-calibration allows re-certification by qualified local suppliers	•Flexibility in maintaining NIST traceability

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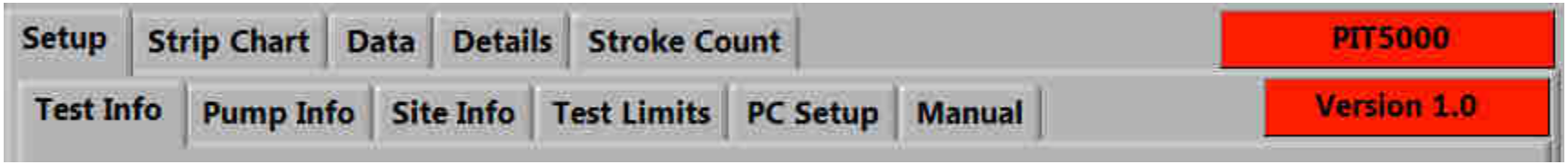
PIT5000 Software Screens – Setup / Test Info

PIT5000 software uses a convenient tab structure to allow user to select the area of interest. The Setup tab has sub-tabs for entering a complete set of information and test parameters prior to starting the test program.



The Setup / Test Info tab, shown on the next slide, provide entry for test information, units selection, etc…

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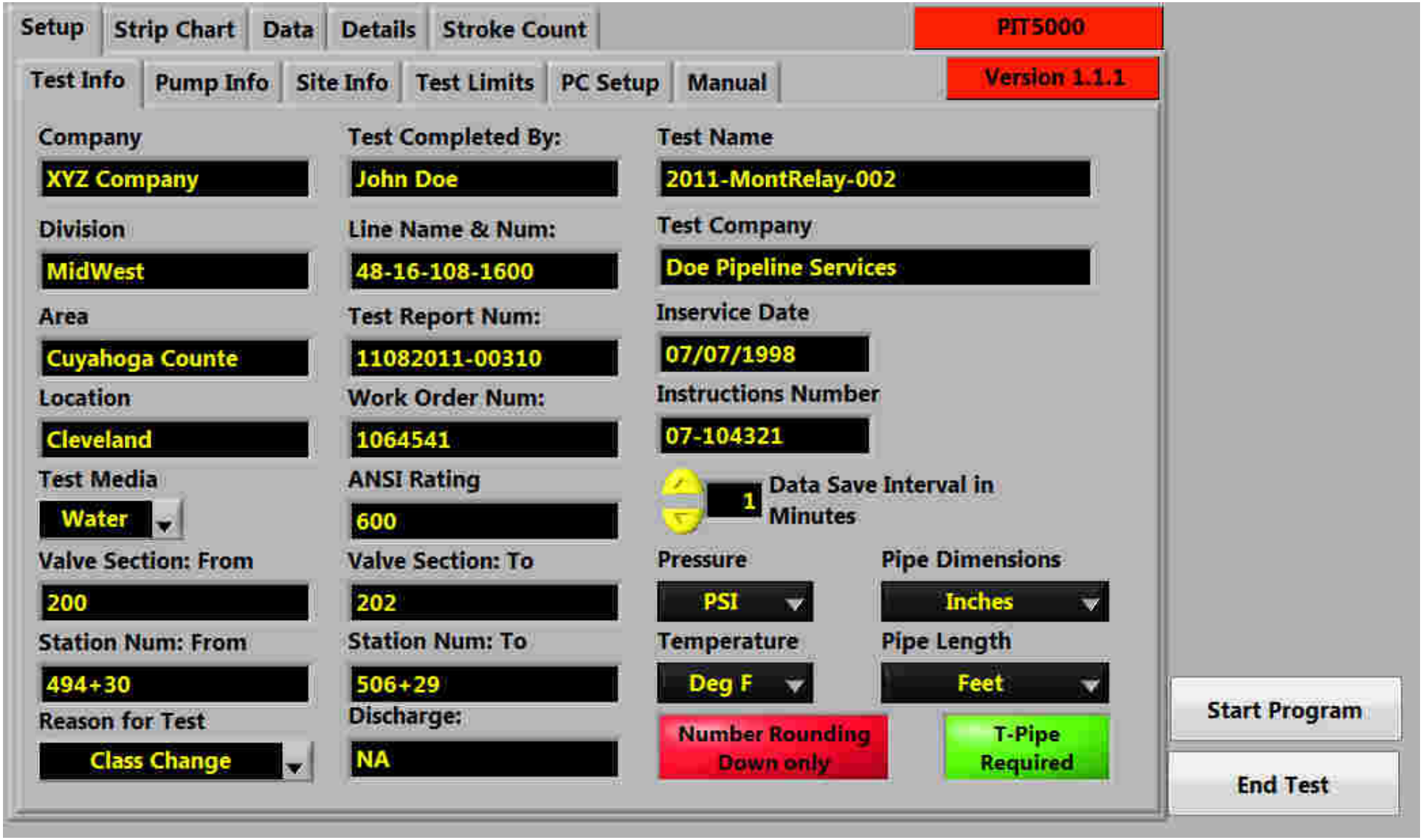
PIT5000 Software Screens – Setup / Test Info



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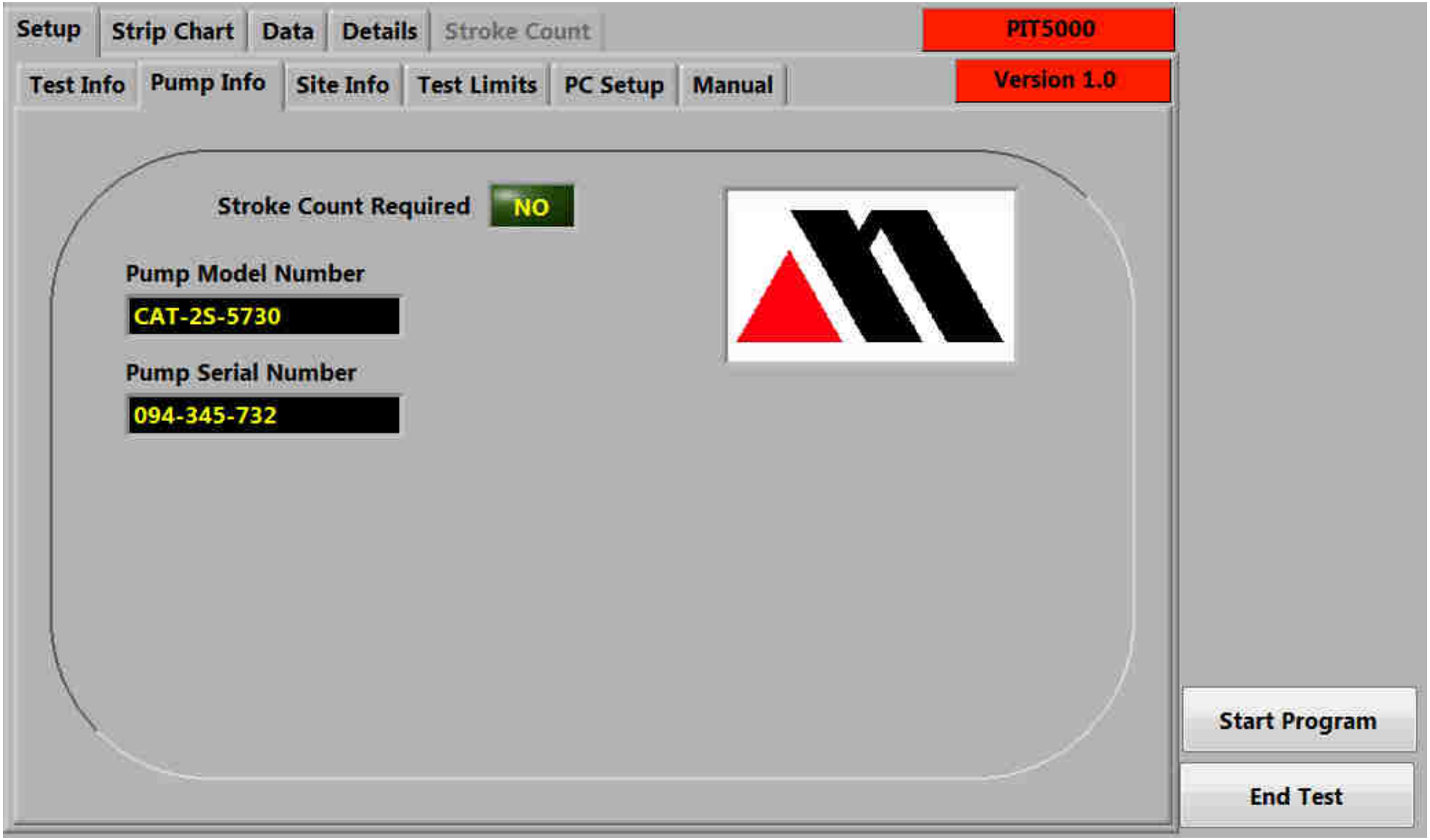
PIT5000 Software Screens – Setup / Pump Info

The Pump Info sub-tab provides for entry of the pressure pump's model and serial numbers for record purposes.

If Stroke Count is not required, set the selection button to NO.

If Stroke Count is required, set the selection button to YES. Also enter the Volume Per Stroke, the desired Stroke Start Pressure and the Stroke Rate Target value. Note the test light button that allows confirmation of stroke count prior to starting the test program.

PIT5000 Software Screens – Setup / Pump Info



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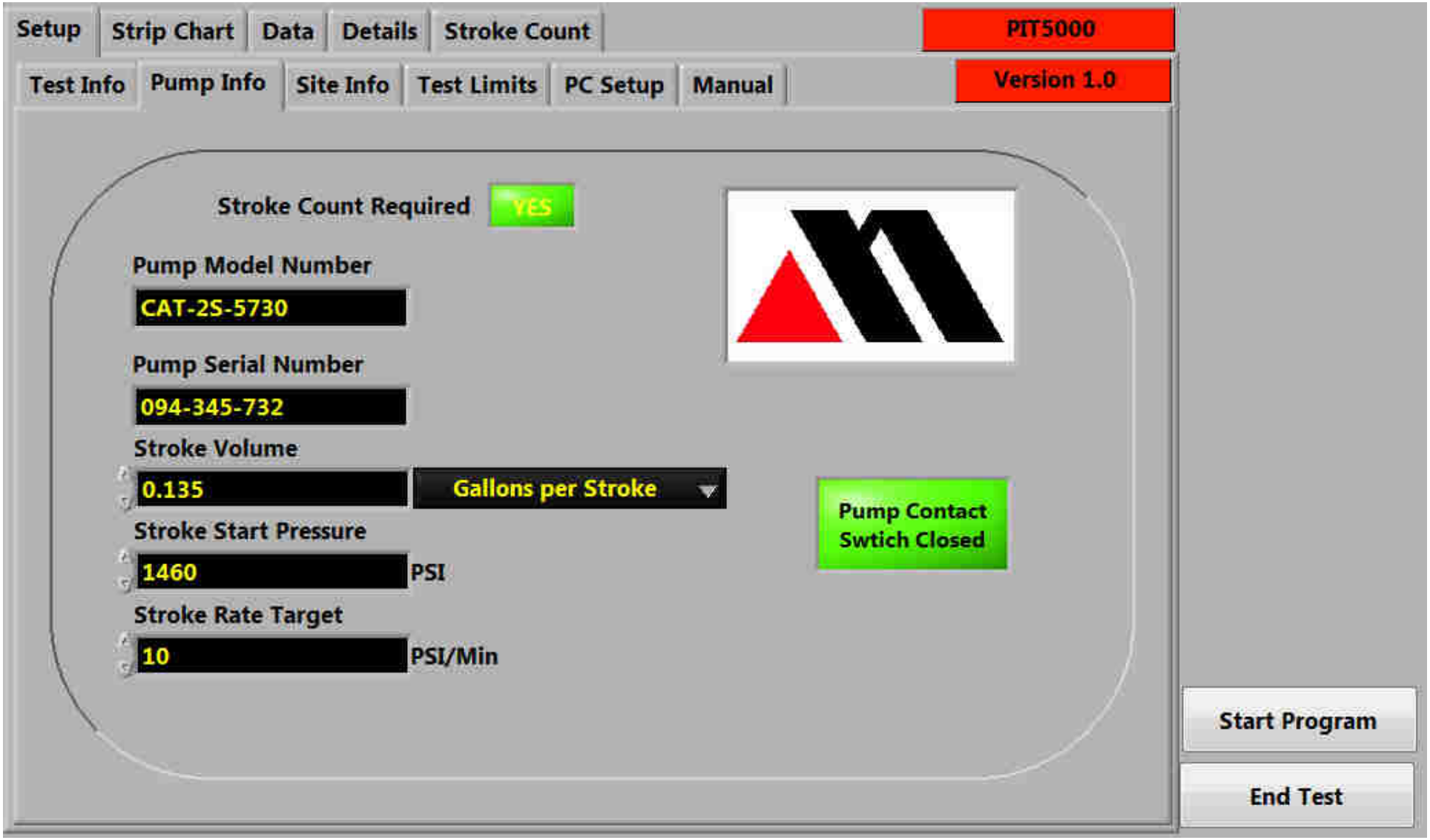
PIT5000 Software Screens – Setup / Pump Info



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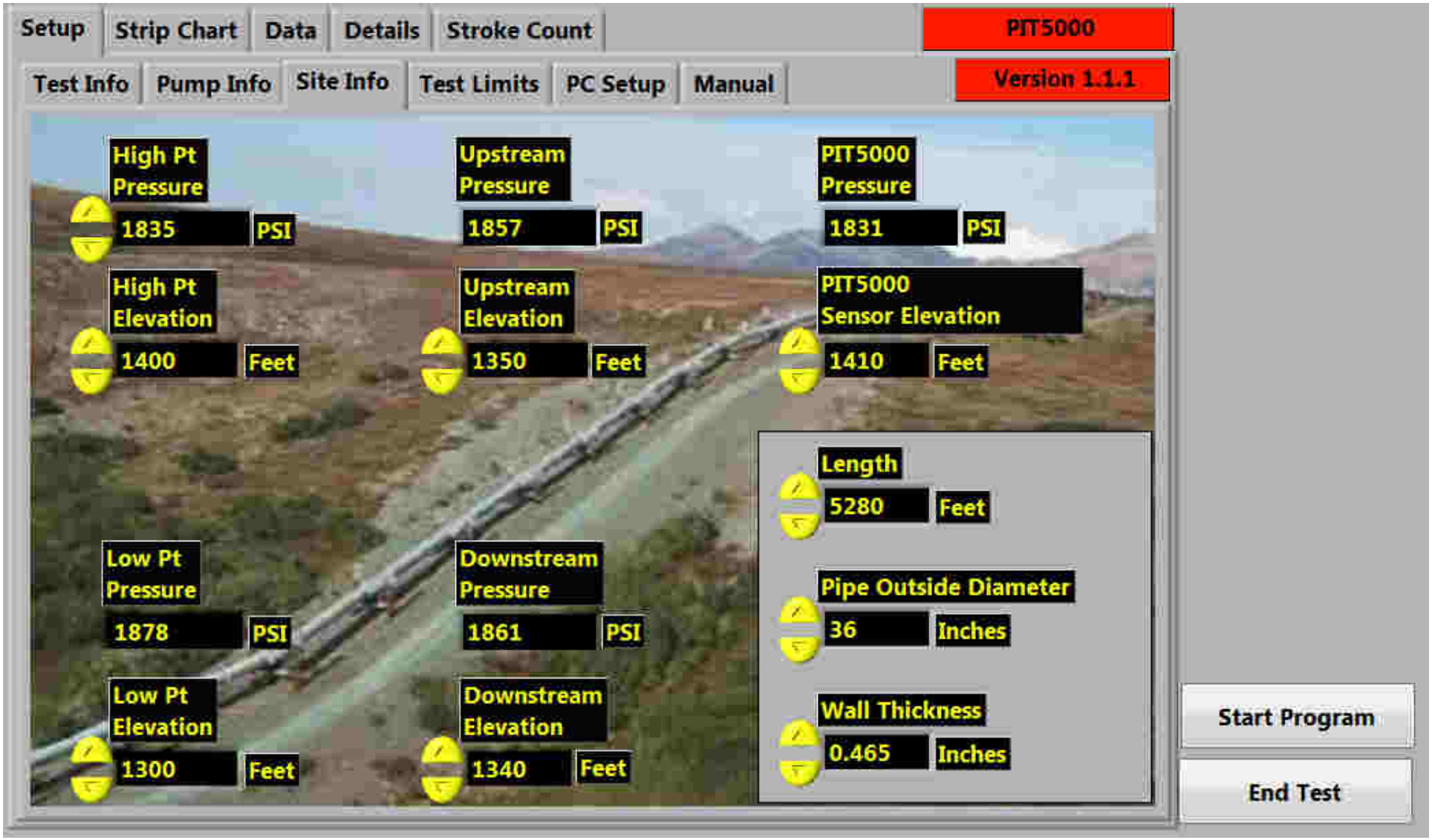
PIT5000 Software Screens – Setup / Site Info

The Site Info tab provides entry for the High Point Pressure and for other test section elevations that may be necessary to meet documentation requirements.

Once this information is entered, the program automatically calculates the pressures at the other elevations including the pressure at the PIT5000 elevation. This pressure becomes the “PTest Instrument Pressure” on the Test Limits sub-tab.

Enter the length of the test section and pipe dimensions on this tab as well.

PIT5000 Software Screens – Setup / Site Info



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PIT5000 Software Screens – Setup / Test Limits

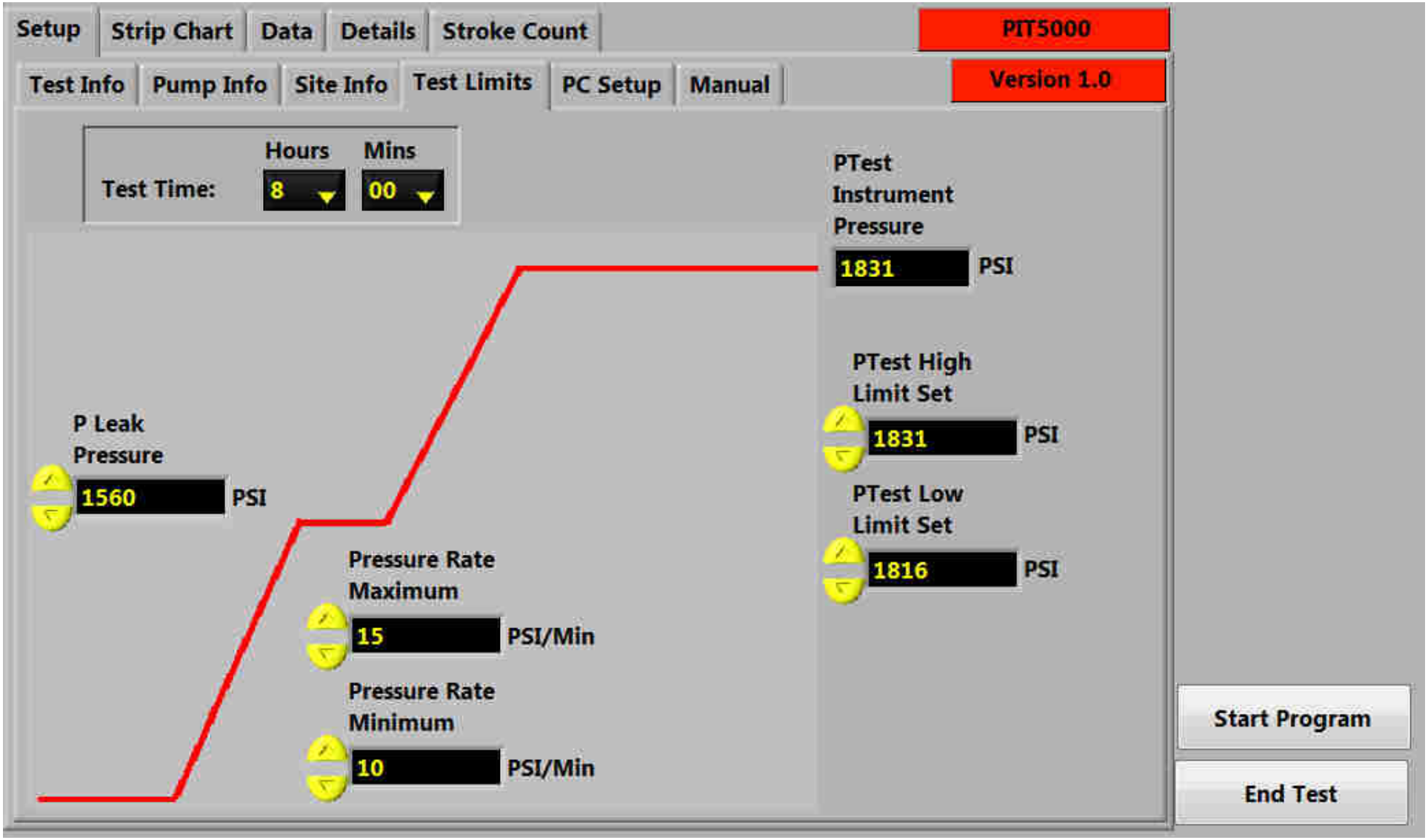
The Test Limits sub-tab is for entry of Test Time, Maximum and Minimum pressure rate during pressurization phase and High and Low Limits on the PTest Instrument Pressure during test phase.

Some companies require a mini-leak test prior to going to higher pressures. Entry for this pressure value, labeled PLeak, is also provide here.

PTest Instrument Pressure is forwarded from the Site Info sub-tab.

Stroke Start Pressure, if stroke count is active, is forwarded from the Pump Info sub-tab.

PIT5000 Software Screens – Setup / Test Limits



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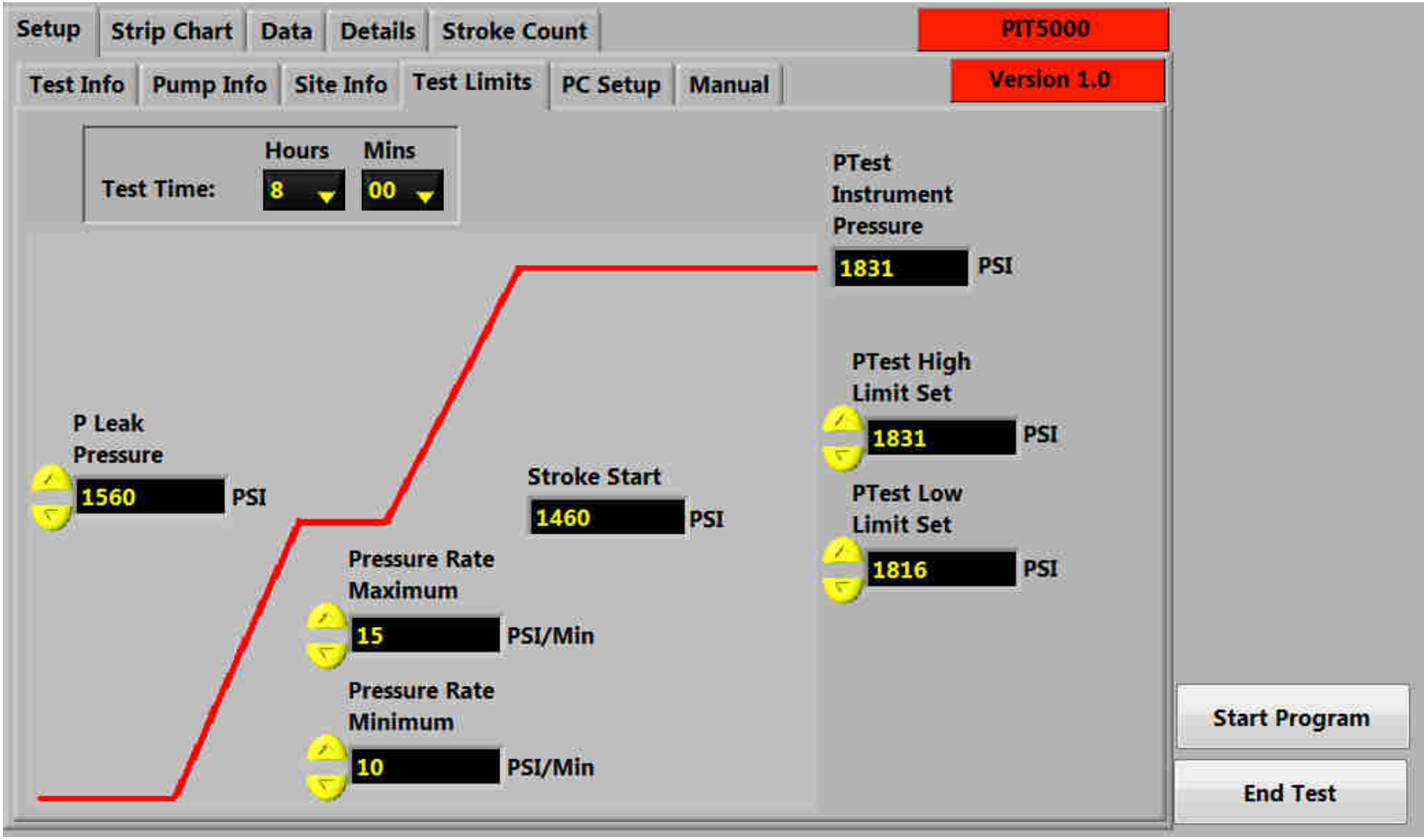
PIT5000 Software Screens – Setup / Test Limits



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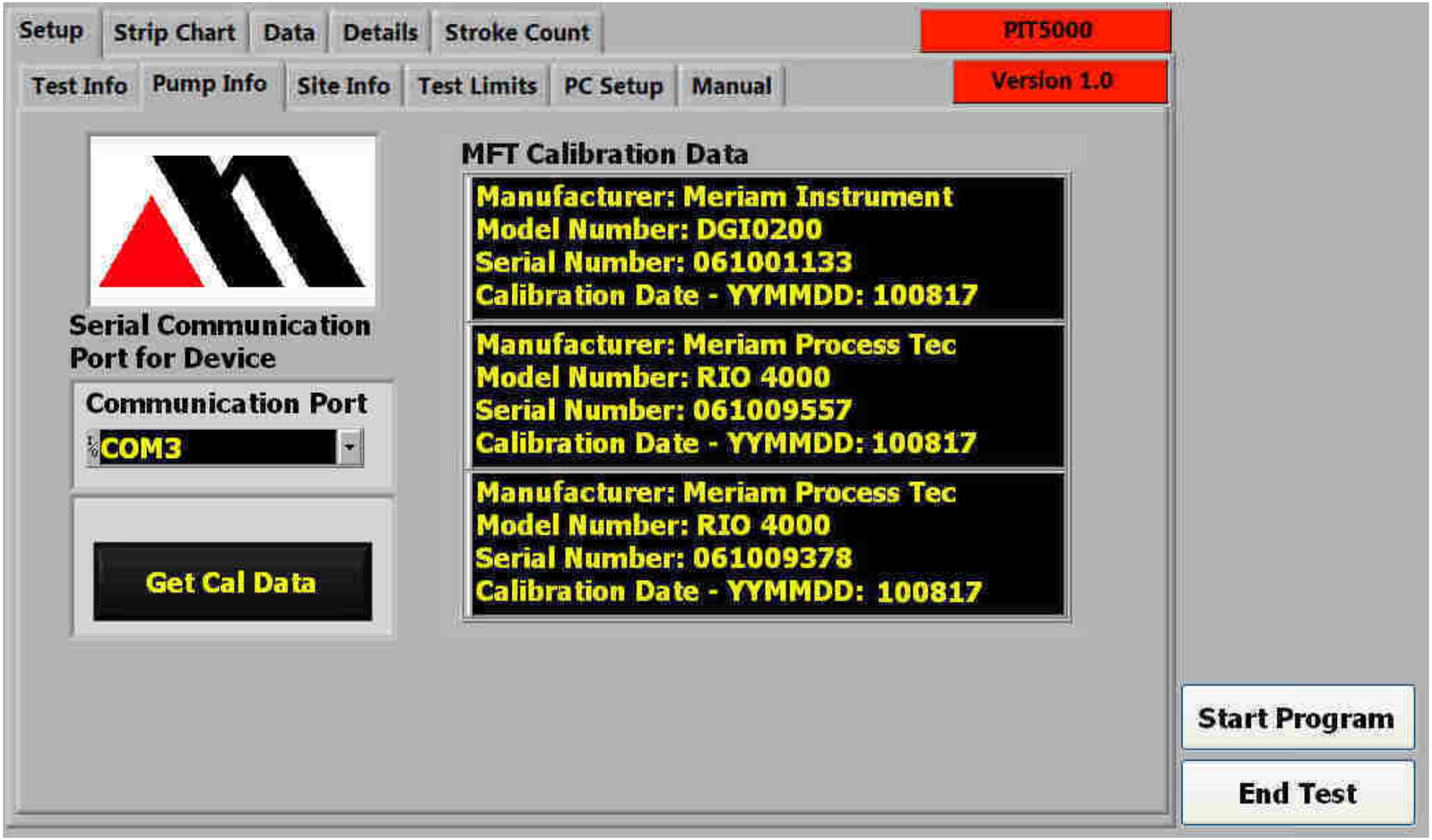
PIT5000 Software Screens – Setup / PC Setup

The PIT5000 features National Institute of Standards and Technology (NIST) traceable certification on its pressure and temperature measurement devices. Certificates are shipped with each unit.

Open the Setup / PC Setup tab and click on “Get Cal Data” button to confirm measurement device model and serial numbers. This feature confirms that the PIT5000 is using the measurement devices documented by the NIST certificates and also confirms communication with the MFT measurement device.

PIT5000 Software Screens – Setup / PC Setup



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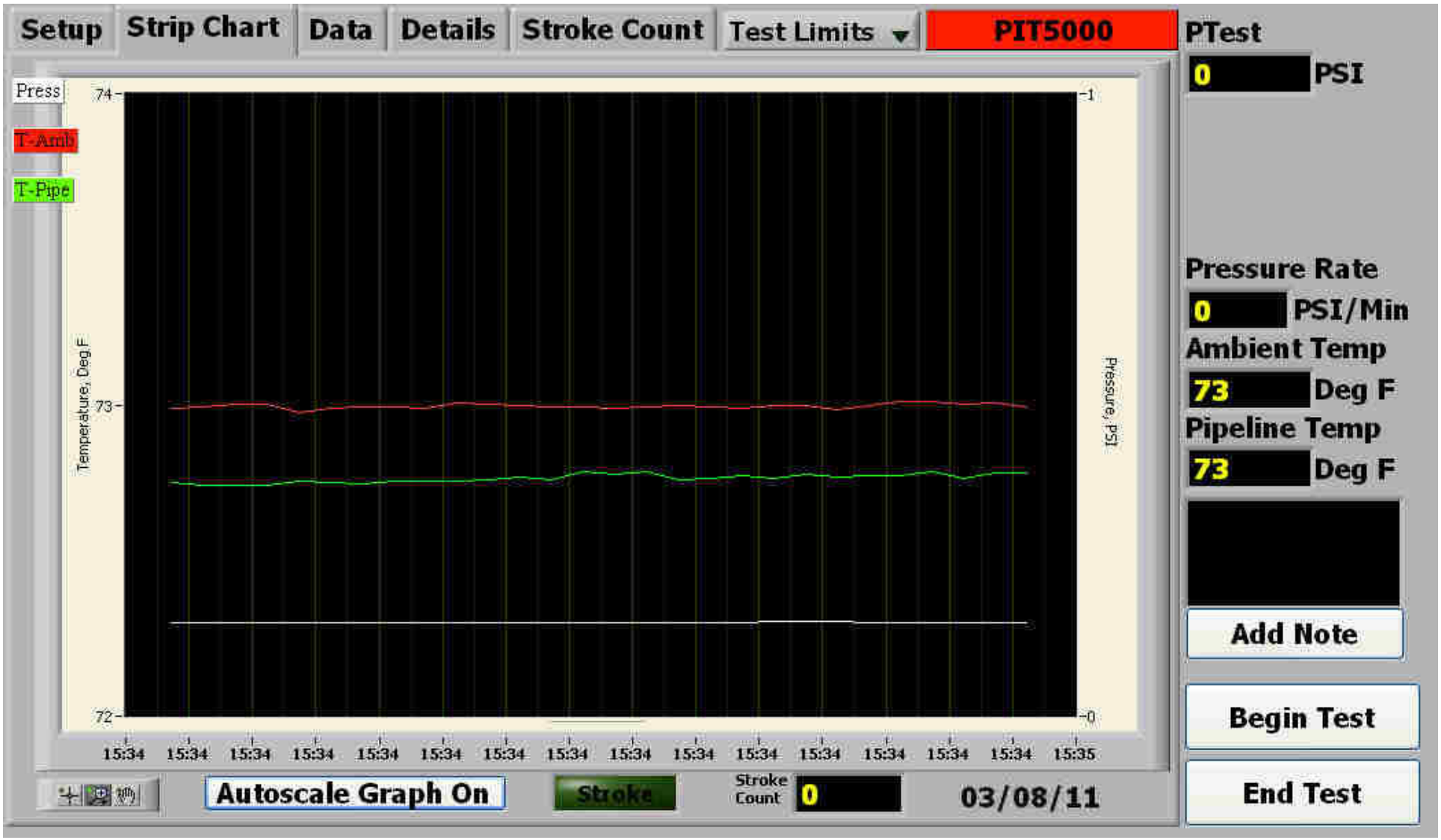
PIT5000 Software – Start Program

Once all information is entered in the Setup sub-tabs, left click on the Start Program button, located on the lower right of the screen, to begin data collection and plotting data on the Strip Chart tab.

PIT5000 Software Screens – Strip Chart



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Strip Chart – Scaling Y-axes

• Temperature Y-axis is set to 0 – 150 deg F (-40 to +70 deg C). Scale end points can be changed by right clicking on the value and entering the new value.

•Auto-scaling of Time X-axis and Pressure Y-axis is standard in PIT5000 software; as time and pressure advance, the scale adjusts automatically

• To reset the scale end points of Pressure Y-axis to different values:

  • Move cursor over any Pressure-axis scale number and Right Click

  • Left click on the "Autoscale" menu option to remove the "check mark", deactivating the Auto-scaling from the Pressure-axis.

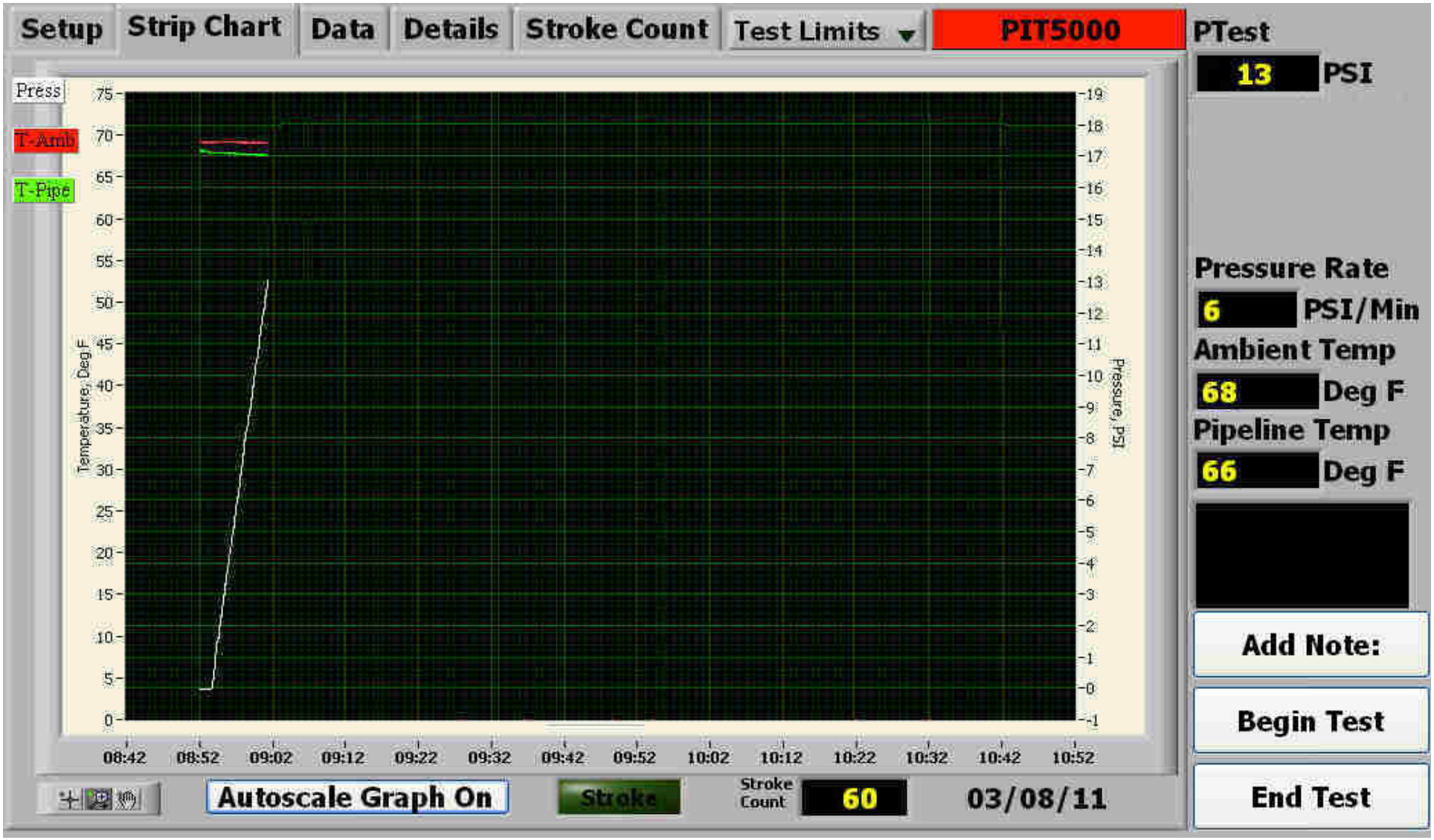
  • Move cursor over either scale end point value, left click, and change end point value to desired value.

  • Click anywhere on perimeter of display to finish.

  • Change the other end point if desired.

NOTE: Do not fix the scale of Time X-axis or plot will not continue as the time proceeds.

PIT5000 Software Screens – Strip Chart



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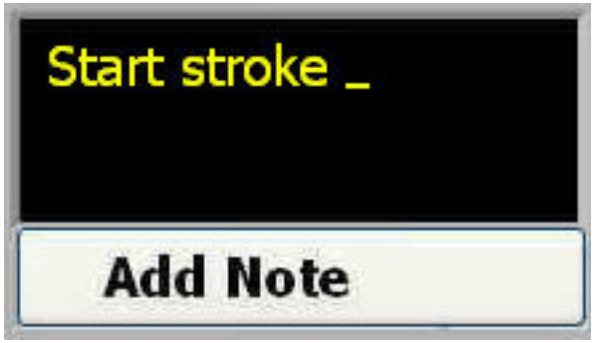
PIT5000 Software Screens – Adding Notes

Operator notes can be added to the PIT5000 data file any time after the Start Program button is selected.

Locate and click on the "Add Note" text entry field (see graphic below, right) in the lower portion of the Data Panel. Type in the desired note, up to 60 characters in length.

When the note is complete, click the "Add Note" button. The note will be merged into the data file, along with its corresponding data set, for permanent record.

Notes can be reviewed on the Data tab at any time during the test.



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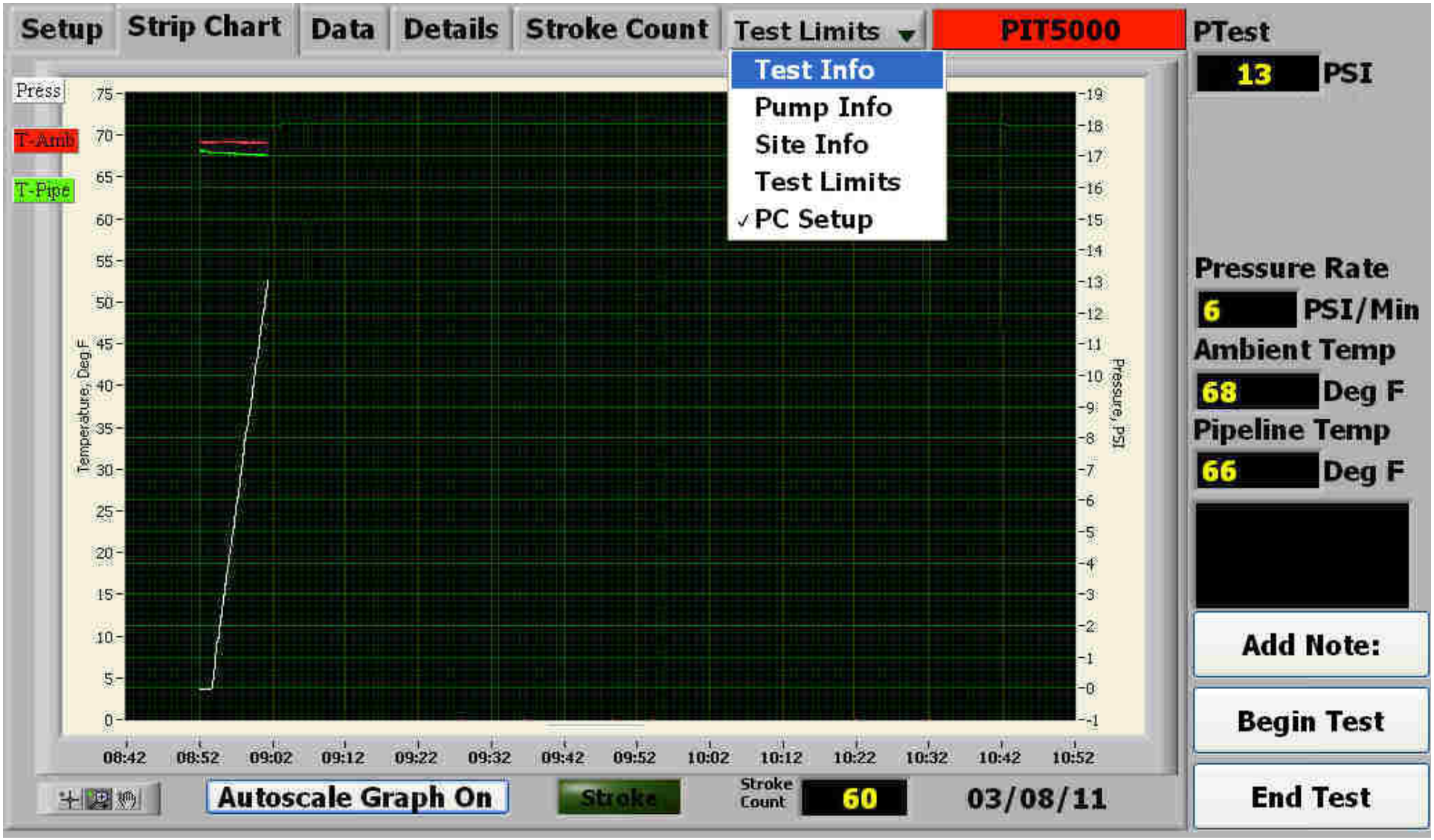
Reviewing Setup Sub-tabs after Program Start

Editable Setup information is locked out, but remains viewable, once the Start Program button is selected. To view Setup information after a test program is started, click on the Setup tab. Then click on the button located between the Stroke Count tab and the PIT5000 name block. Select the desired Setup sub-tab from the drop down box and view the grayed-out data on the display.

PIT5000 Software – Acessing Setup after Program Start



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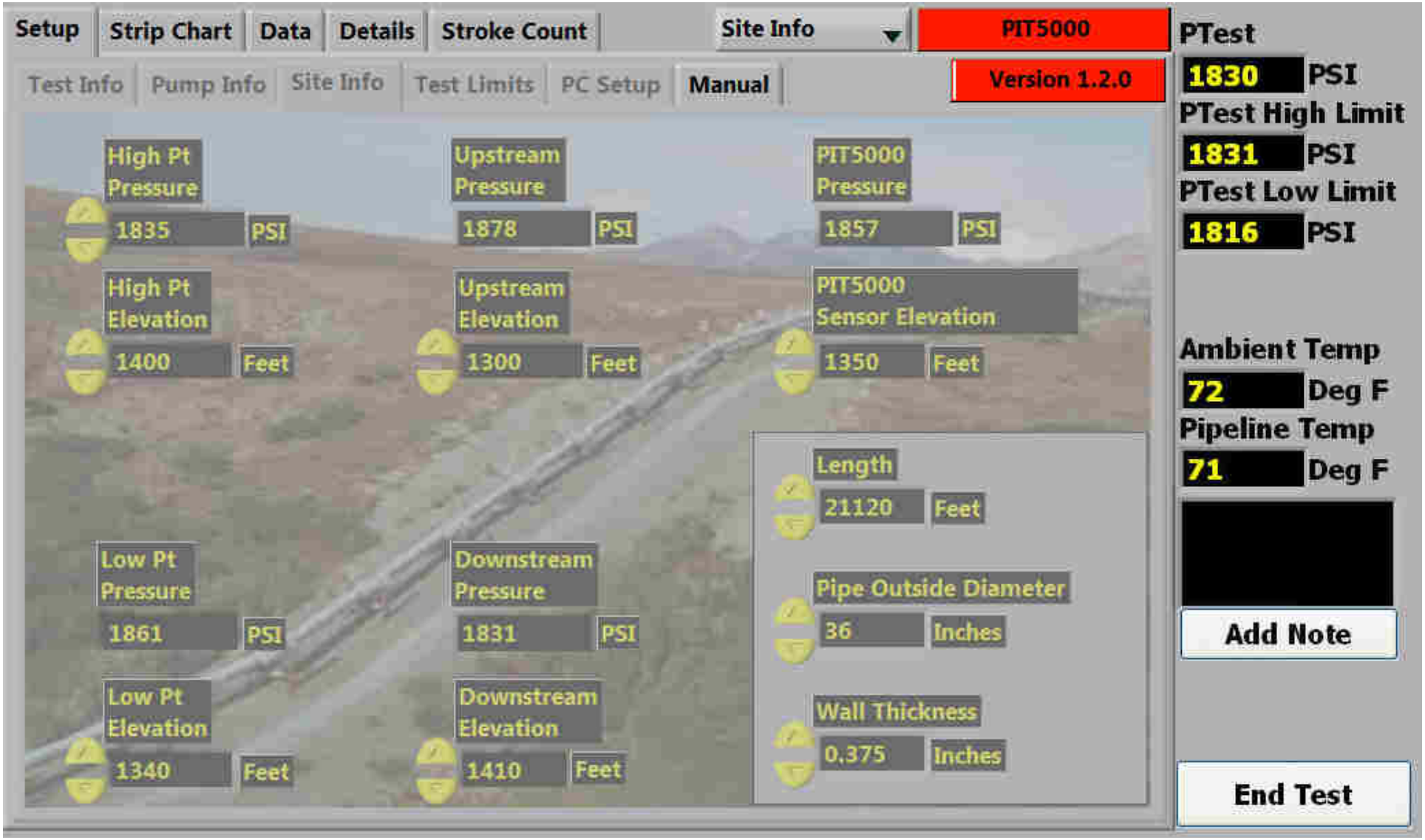
PIT5000 Software – Setup Info after Start Program



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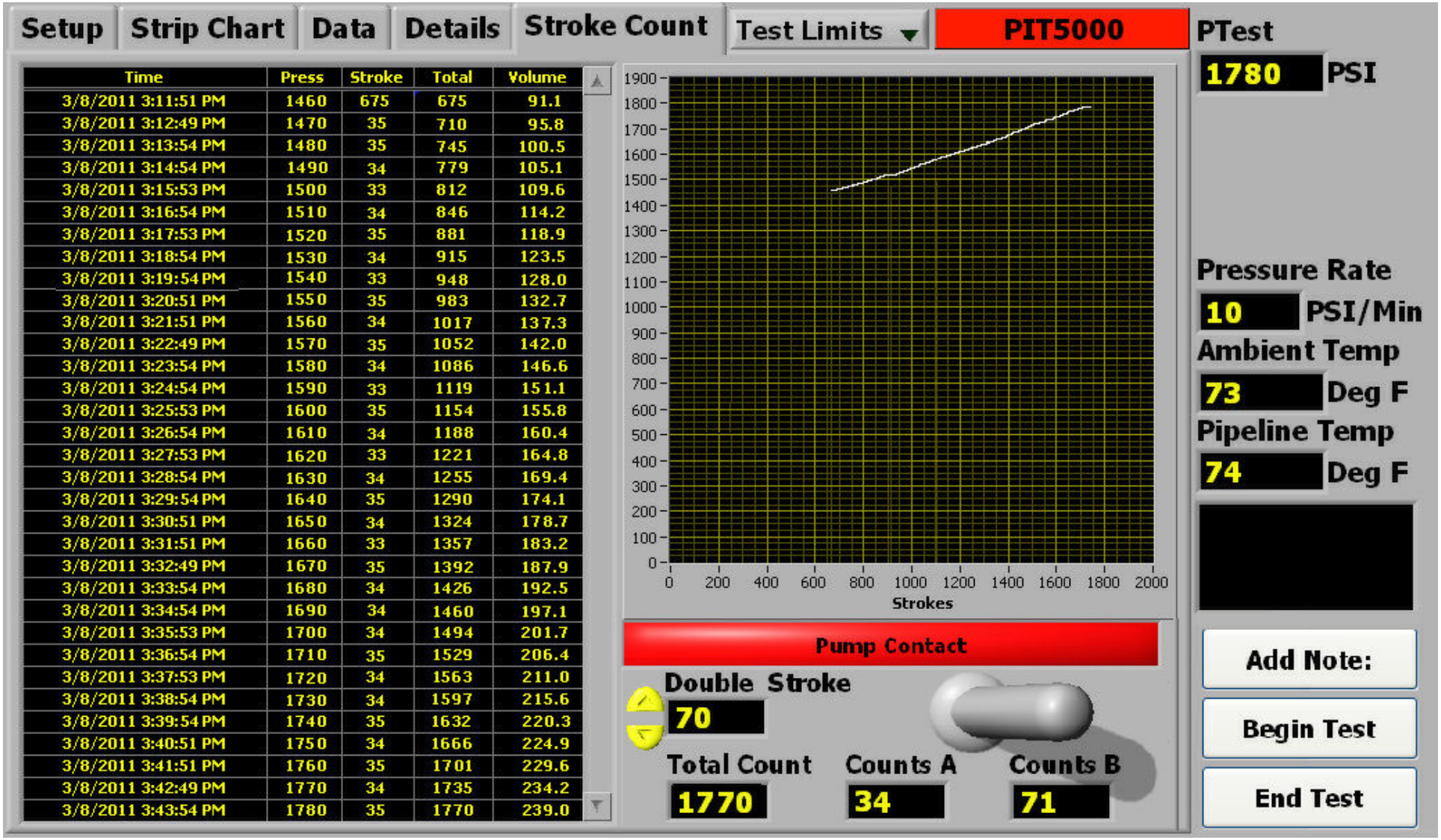
PIT5000 Software Screens – Stroke Count

The Stroke Count feature requires the user to provide a set of normally open, dry, electrical contacts from the positive displacement pump's stroke counter. Connect the factory supplied stroke count cable to the pump's dry contact set. The PIT5000 supplies +5VDC output to the dry contact set and counts pump strokes based on contact closures.

Beginning at the Stroke Start Pressure (from Setup / Pump Info sub-tab), the Stroke Count tab displays stroke data sets in tabular format and a live plot of pressure vs. pump strokes. In addition, three digital displays are provided: 1) Total Stroke Count, 2) stroke count recorded for previous 10 PSI increment (Counts A, next slide) and 3) running stroke count for the current 10 PSI increment period (Counts B, next slide). The virtual toggle switch automatically points to the active Counts window.

Users can input a "Double Stroke" value to activate colored alarm features in the Pump Contact bar.

PIT5000 Software Screens – Stroke Count



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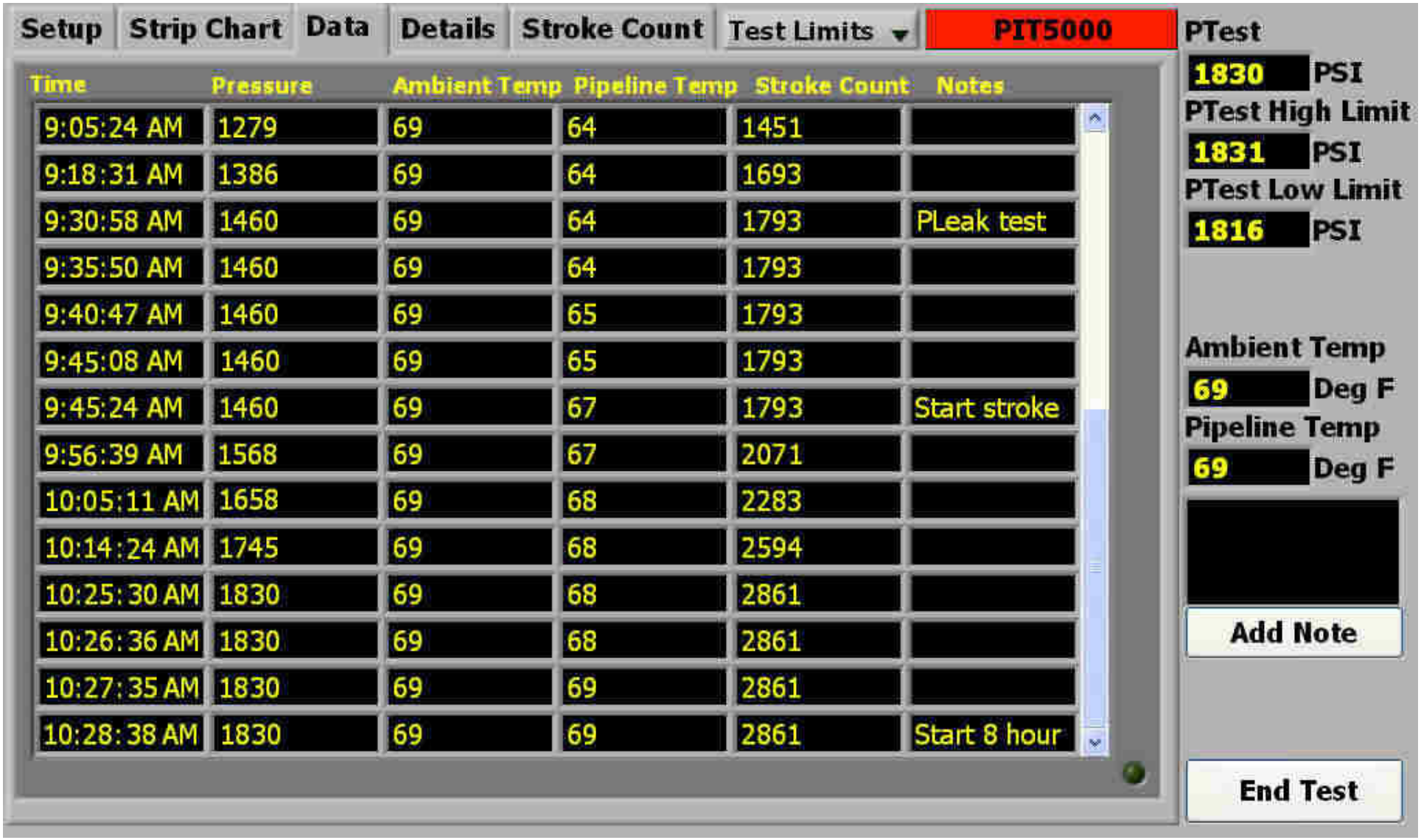
PIT5000 Software Screens – Data

The Data tab is available for viewing at any time. This tab provides tabular data sets taken at one minute intervals after the Start Program button is selected (unless modified on the Setup / Test Info / Data Interval value). Setting the Data Save Interval for 15 minutes would result in data sets each minute during pressurization phase, data sets every 15 minutes during test phase and data sets each minute during depressurization.

One data set consists of Time / Pressure / Ambient Temperature / Pipe Temperature / Stroke Count / Notes

PIT5000 Software Screens – Data



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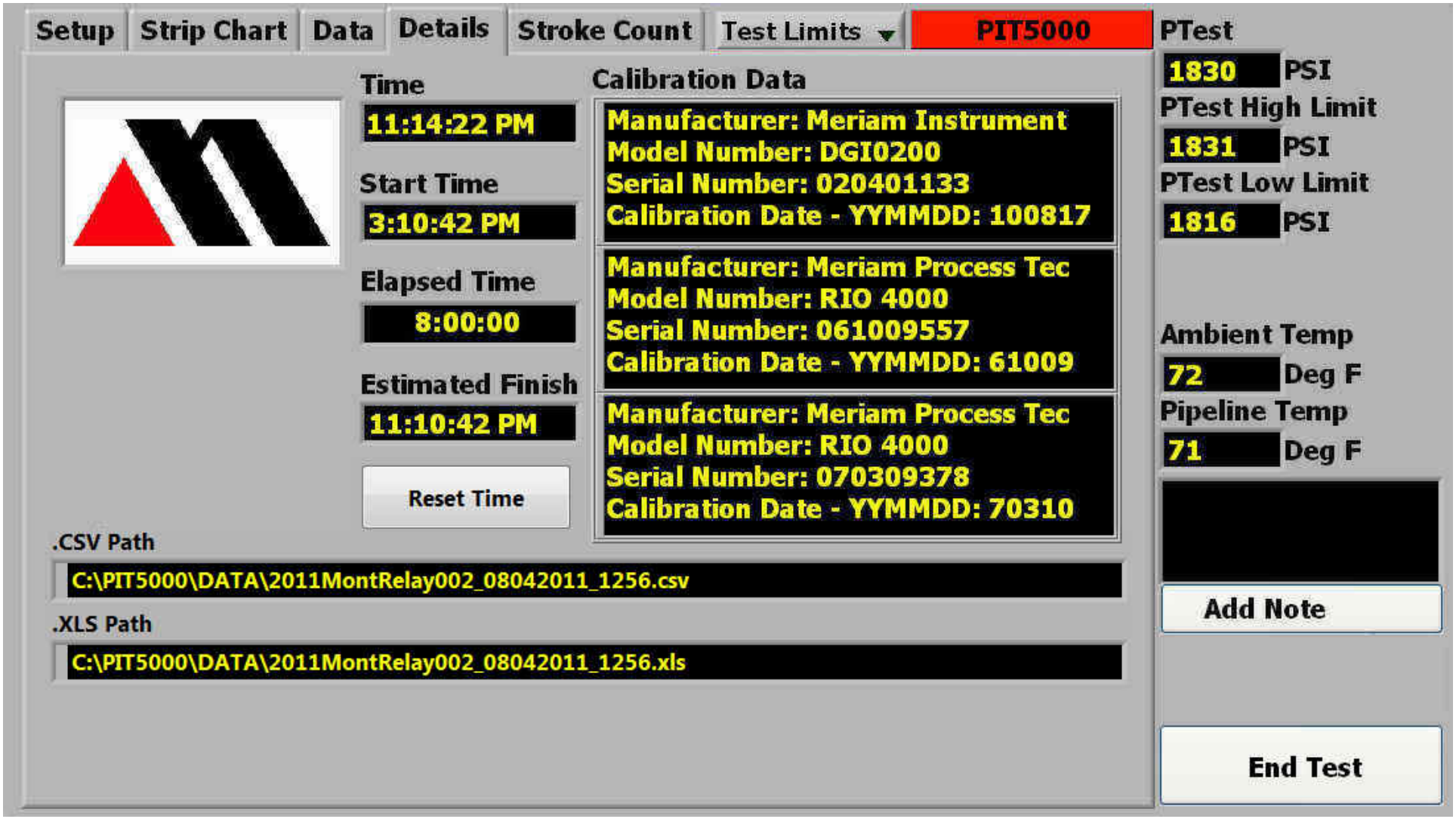
PIT5000 Software Screens – Details

The Details tab is available for viewing at any time. This tab provides a clock and the estimated test finish time (corresponding to the shut in pressure test duration) prior to Begin Test selection. After the Begin Test button is selected, a clock, start time and estimated test finish time is provided along with an elapsed timer.

The calibration data for the pressure and temperature measurement devices is also included on the Details tab.

The file path for both .csv and .xls files is shown on the Details tab.

PIT5000 Software Screens – Details



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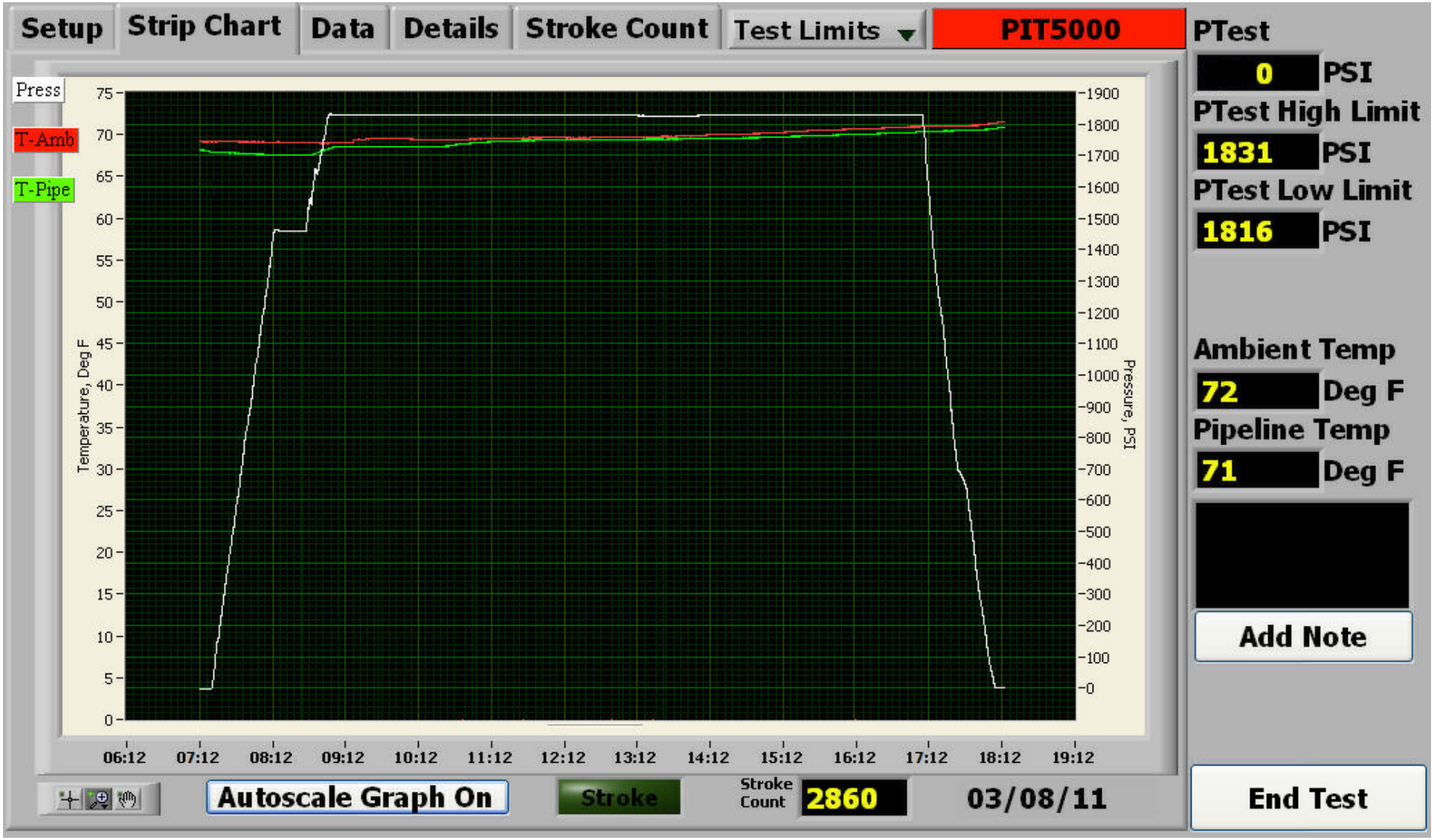
PIT5000 Software Screens – Test Complete



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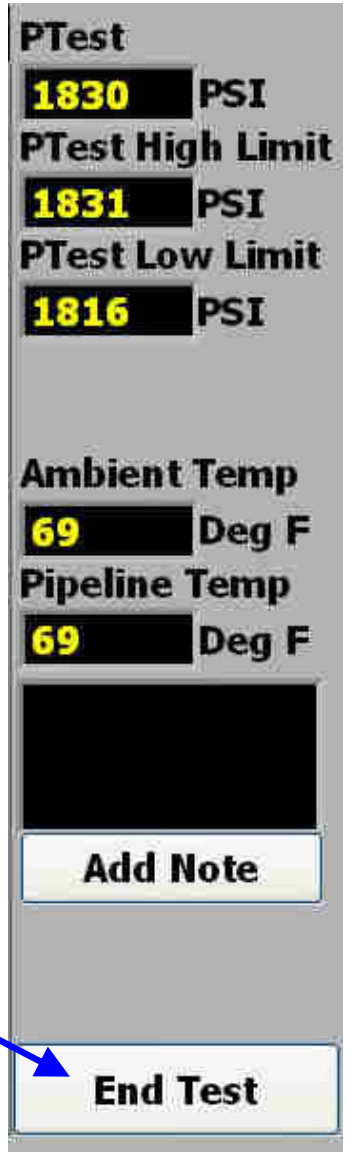
PIT5000 Software – End Program

To end a PIT5000 session, left click on “End Test” button at the lower right of any tab.

A confirmation question prevents accidentally ending a test in process.

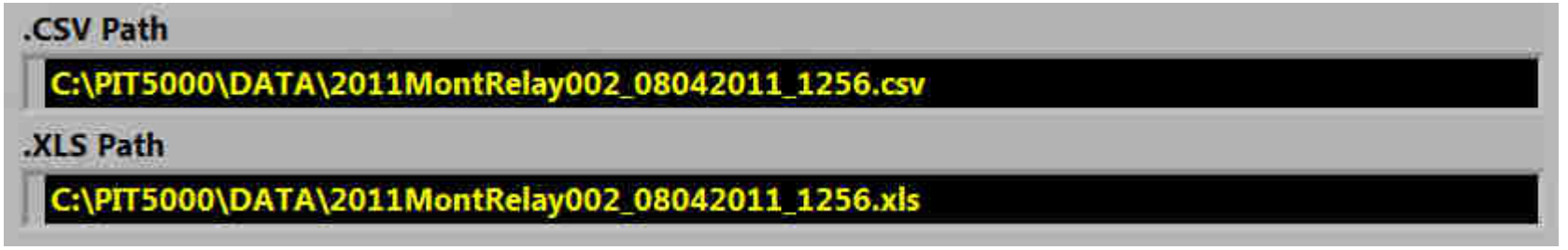


PIT5000 Software - Reports

The PIT5000 generates two report files:
1: *.xls file contains all parameter labels, parameter values and measured information in tabular and graphic form for easy viewing. The data in this file is completely secure.

2: *.csv file contains all parameter labels, parameter values and measured information. The information is listed line by line and is not formatted for easy viewing. This data can be mapped to the user's customer spreadsheet applications.

Note that the file name comes from the Setup / Test Info tab's "Test Name" field and has a date (MMDDYYYY) and number code after it:



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PIT5000 Spreadsheet Report – Test Info

Division:	Midwest	Area:	Zionsville		Location:	Miller	
Test Report Number:	2011-26-inch pretest-001			Date:	5/12/2011		
Line Name & Number:	26"			Test Completed By:	Jay Barker		
Valve Section:	From: NA	To:	NA		Work Order Number:	104726	
Station Number:	From: NA	To:	NA		Actual Test Pressures		
Length:	543 Feet				Minimum	Maximum	
ANSI Rating:	600				1810 PSI	1825 PSI	
Test Name:	2011_26inch_pretest_001				Instructions Number:	7T-234	
Reason for Test:	New		Test Media:	Water		S.G.:	1
Inservice Date:	New		Discharge:	NA			
Pump Model Number:			Pump Serial Number:				
Stroke Count Req:	No		Pump Stroke Volume:	0.100GPM	Stroke Start Press:		0 PSI

	End		Point		PIT5000	
	Upstream	Downstream	High	Low		
Pipe Elevation	0 Feet	0 Feet	0 Feet	0 Feet	PIT Elev.: 0 Feet	Test Max:
Desired Maximum Pressure	1825 PSI	1825 PSI	1825 PSI	1825 PSI	PIT Press: 1825 PSI	Test Min:
PSI Rate Maximum	15 PSI/Min		PTest Instrument Press:	1825 PSI		Test Time: 8:00 Hours
PSI Rate Minimum	5 PSI/Min		PLeak Pressure:	1540 PSI		Start Time: 9:18:54 PM

Calibration Information Bay #1:

Manufacturer: Meriam Instrument
Model Number: GGI3300
Serial Number: 101020134
Calibration Date - YYMMDD: 110217

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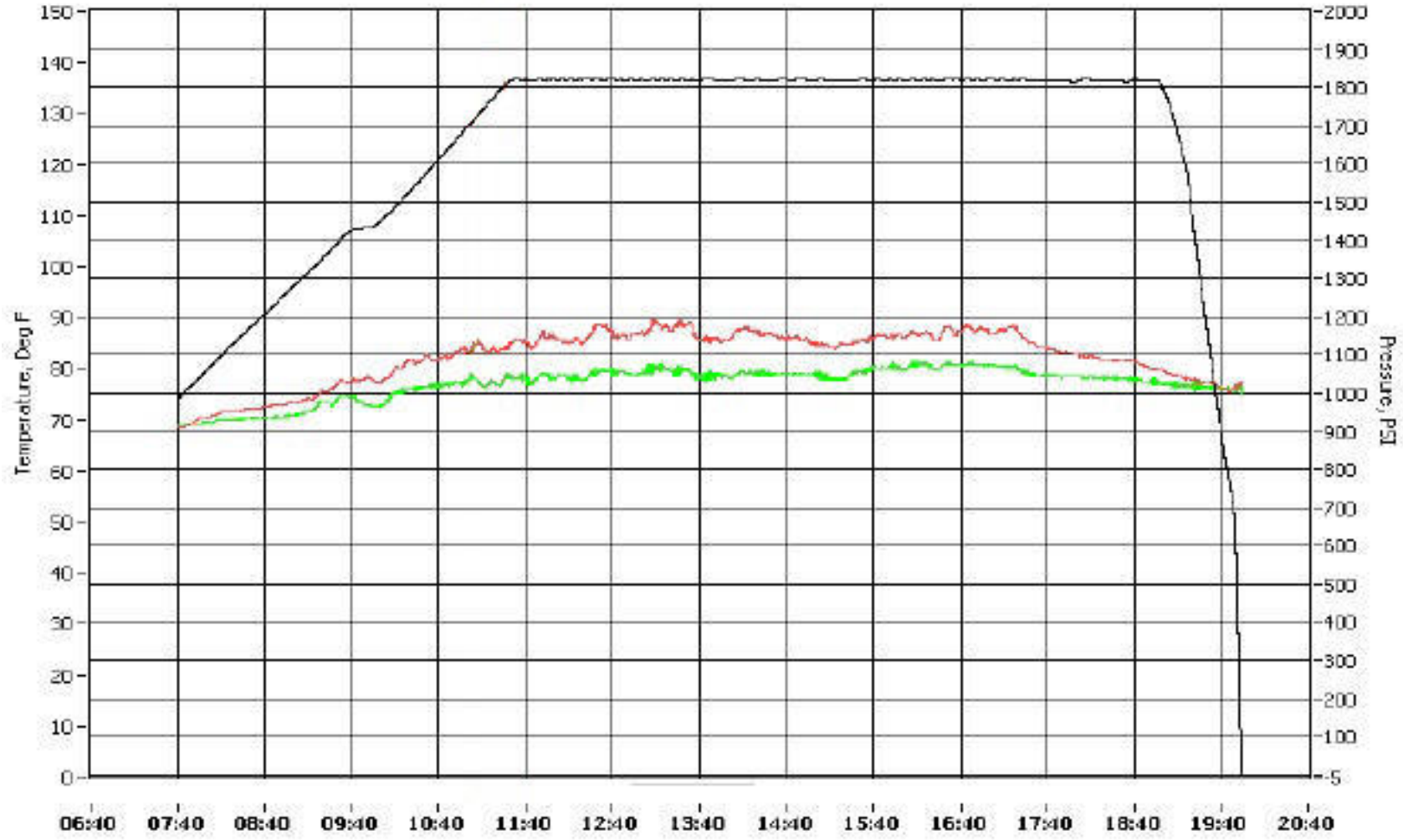
PIT5000 Spreadsheet Report – Test Data Sets

11:54:51 AM	1818 PSI	85 Deg F	78 Deg F	0	
11:55:46 AM	1820 PSI	85 Deg F	79 Deg F	0	
11:55:59 AM	1820 PSI	85 Deg F	79 Deg F	0	pump shut down, start 8 hr test
11:56:41 AM	1820 PSI	85 Deg F	79 Deg F	0	
11:57:36 AM	1821 PSI	85 Deg F	78 Deg F	0	
11:58:31 AM	1822 PSI	86 Deg F	78 Deg F	0	
11:59:26 AM	1822 PSI	86 Deg F	78 Deg F	0	
12:00:22 PM	1823 PSI	86 Deg F	78 Deg F	0	
12:01:18 PM	1823 PSI	86 Deg F	78 Deg F	0	
12:02:13 PM	1823 PSI	86 Deg F	78 Deg F	0	
12:02:49 PM	1820 PSI	86 Deg F	78 Deg F	0	
12:03:08 PM	1818 PSI	86 Deg F	79 Deg F	0	
12:04:05 PM	1819 PSI	85 Deg F	79 Deg F	0	
12:05:00 PM	1820 PSI	85 Deg F	78 Deg F	0	
12:05:55 PM	1821 PSI	86 Deg F	78 Deg F	0	
12:06:50 PM	1822 PSI	85 Deg F	78 Deg F	0	
12:07:42 PM	1823 PSI	85 Deg F	77 Deg F	0	bleed
12:07:45 PM	1823 PSI	85 Deg F	77 Deg F	0	
12:08:41 PM	1818 PSI	85 Deg F	77 Deg F	0	
12:08:44 PM	1818 PSI	85 Deg F	78 Deg F	0	stop bleed
12:09:36 PM	1818 PSI	85 Deg F	78 Deg F	0	
12:10:31 PM	1819 PSI	84 Deg F	77 Deg F	0	
12:11:26 PM	1820 PSI	84 Deg F	77 Deg F	0	

PIT5000 Spreadsheet Report – Final Plot



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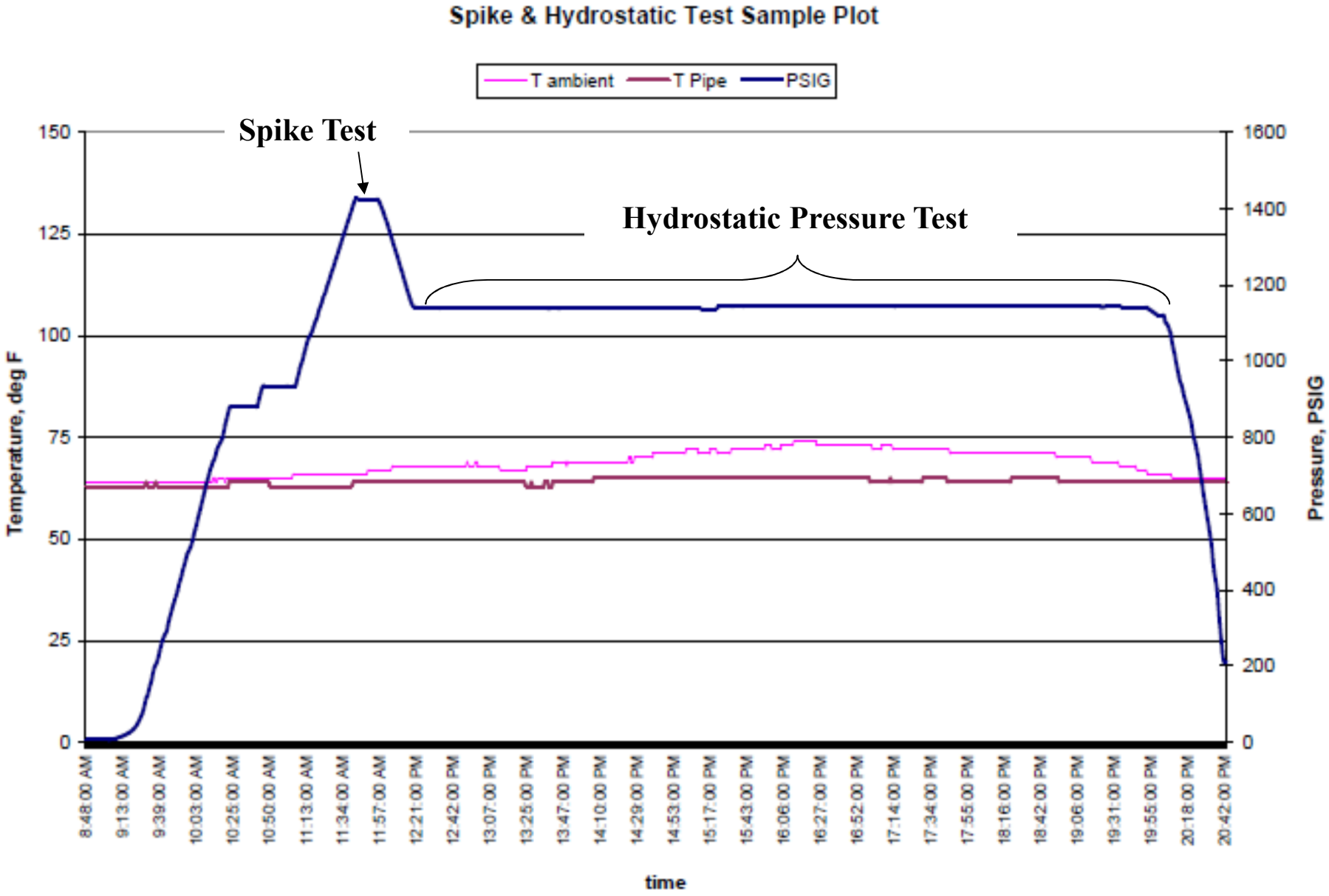
PIT5000 – Spike Testing

A spike test is a higher pressure, shorter duration variation of a hydrostatic pressure test. A spike test is normally performed prior to and in conjunction with a hydrostatic test.

The goal of a spike test is to expose pipeline flaws that otherwise grow and cause failure during the longer hydrostatic pressure test or during normal operational pressure cycles.

The PIT5000 software will document a spike test without any special set up or adjustments. See a sample plot on the next slide.

PIT5000 – Spike Testing Sample Plot



PIT5000 Configuration List

Model				
ZPIT5000	Pipeline Integrity Tester			
	Battery			
	-00	No internal battery. Run from supplied 115V AC charger or 12V DC extension		
	-12	12 hour supply for PIT5000 devices, rechargeable from 115V AC or 12V DC		
	-28	28 hour supply for PIT5000 devices, rechargeable from 115V AC or 12V DC		
		Hose/Cable Lengths		
		-00	No cables or hoses. Tester includes M12 RTD connections, M12 counter connection, 1/4" NPT(F) pressure connection	
		-50	50 ft RTD cables, 150 ft counter cable, 1/4" NPT(F) pressure connection, NO PRESSURE HOSE	
		-51	50 ft RTD cables, 150 ft counter cable, 50 ft pressure hose (5000 PSI rated), adapter fitting	
		-150	150 ft RTD cables, 150 ft counter cable, 1/4" NPT(F) pressure connection, NO PRESSURE HOSE	
		-151	150 ft RTD cables, 150 ft counter cable, 150 ft pressure hose (5000 PSI rated), adapter fitting	
			Pressure Range	
			-1500	0 - 1500 PSIG, ±0.025% FS
			-3300	0 - 3300 PSIG, ±0.05% FS

Example: ZPIT5000-12-151-3300

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PIT5000 Pipeline Integrity Tester

- Modern measurement tools for pipeline Integrity Management
- Better accuracy
- One graph of Pressure, T_{pipe} and $T_{ambient}$ vs Time
- Tamper proof, reliable data
- Field portable
- Secure, electronic records

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