Fisher™ FIELDVUE™ DVC6200f Digital Valve Controller PST Calibration and Testing using ValveLink™ Software

The test procedure contained in this Instruction Manual Supplement is to be considered as a guideline only and should be modified to address site-specific requirements. Use this procedure in conjunction with the DVC6200 Series quick start guide (D103556X012) and the DVC6200f instruction manual (D103412X012). In addition, exercise good engineering practices and abide by specific plant safety guidelines for safe operation.

For additional information on Partial Stroke Testing and associated parameters refer to Partial Stroke Test Information on page 19.

PST Calibration

This document covers the basic PST calibration, as well as details for making adjustments to the normal end, using Advanced Settings (see figure 11).

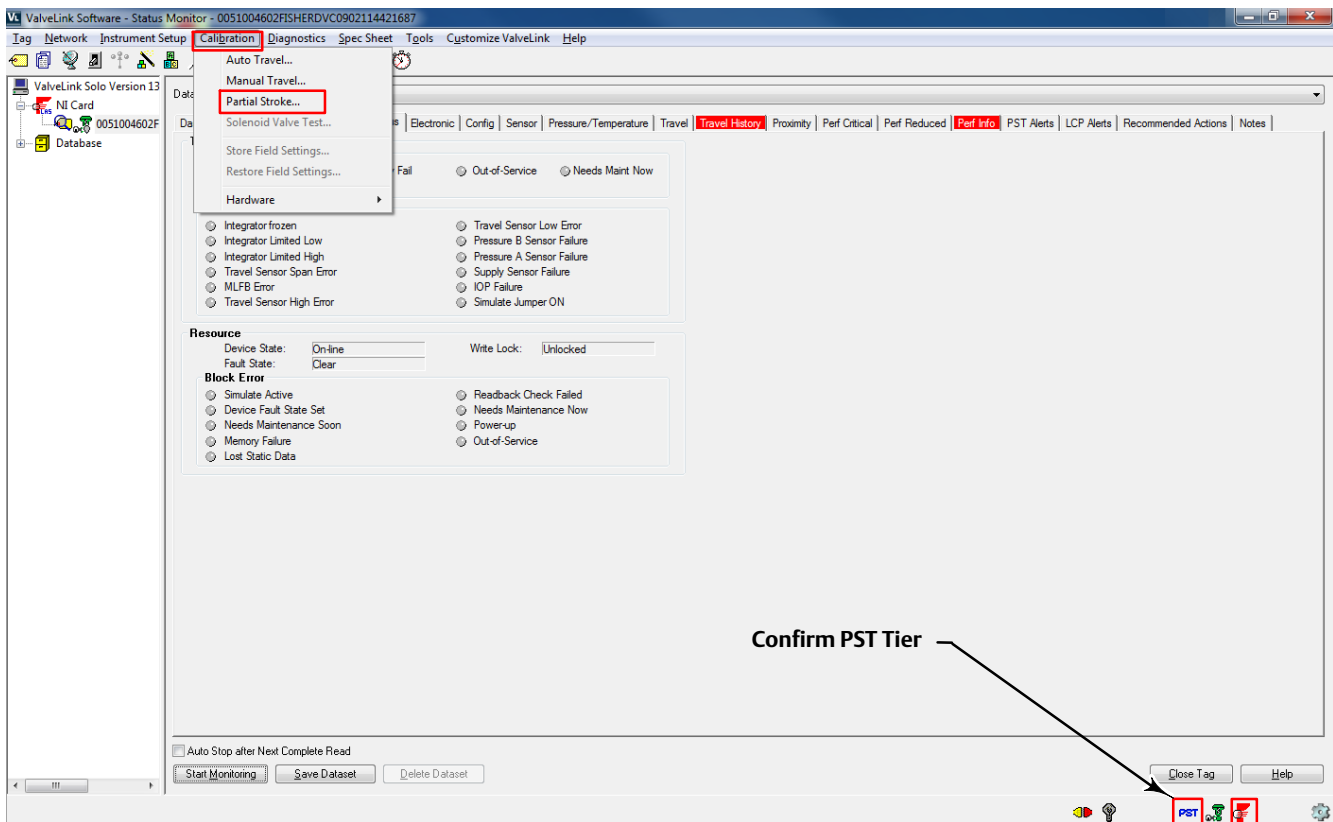Figure 1. Calibration > Partial Stroke
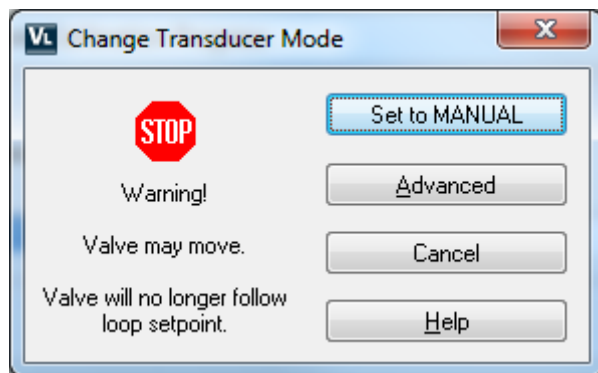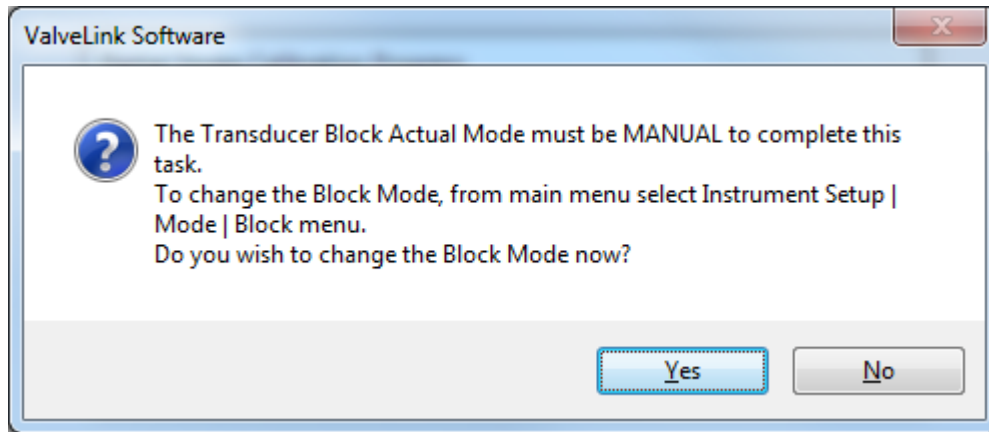
Figure 2. Set Transducer Block to Manual

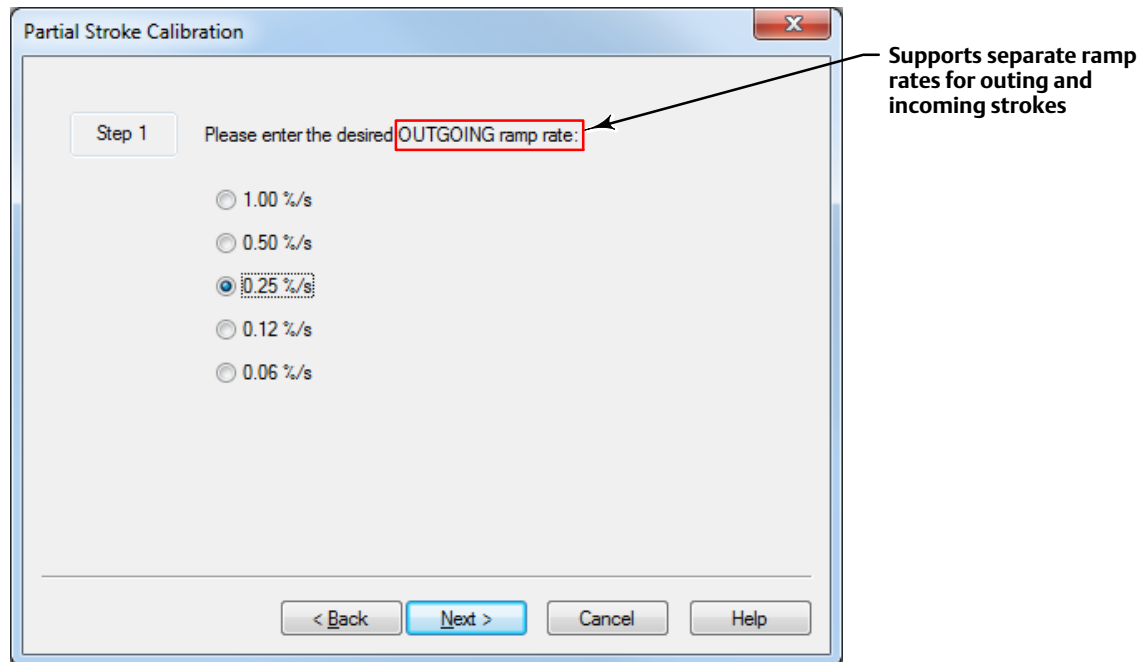Figure 3. Enter the Desire Outgoing Ramp Rate

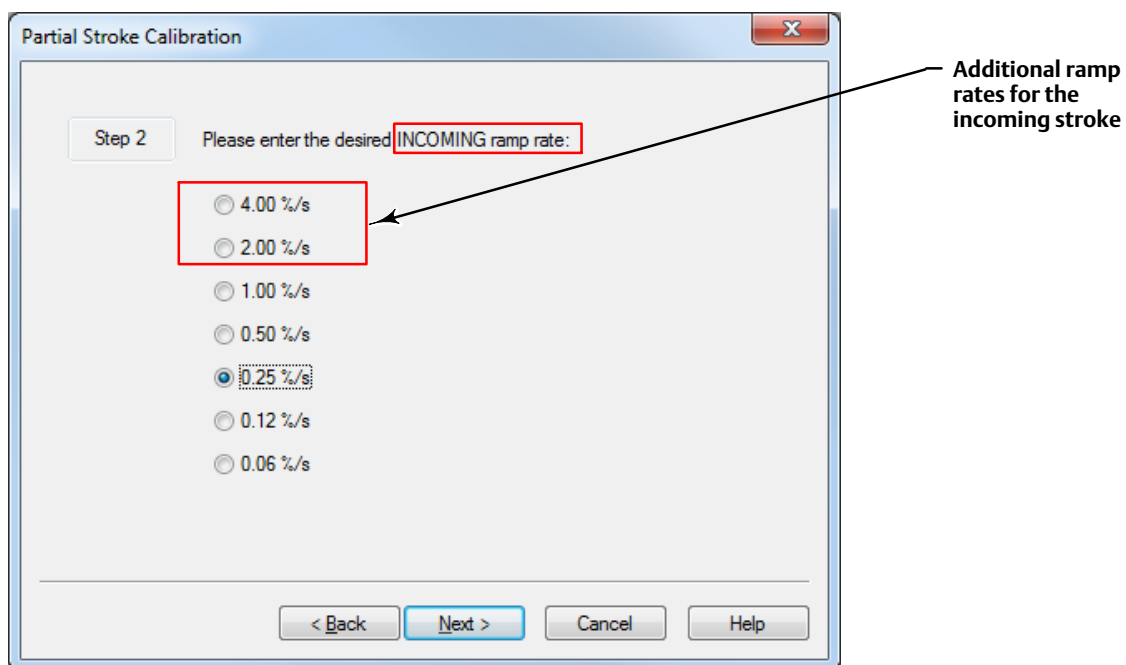Figure 4. Enter the Desired Incoming Ramp Rate
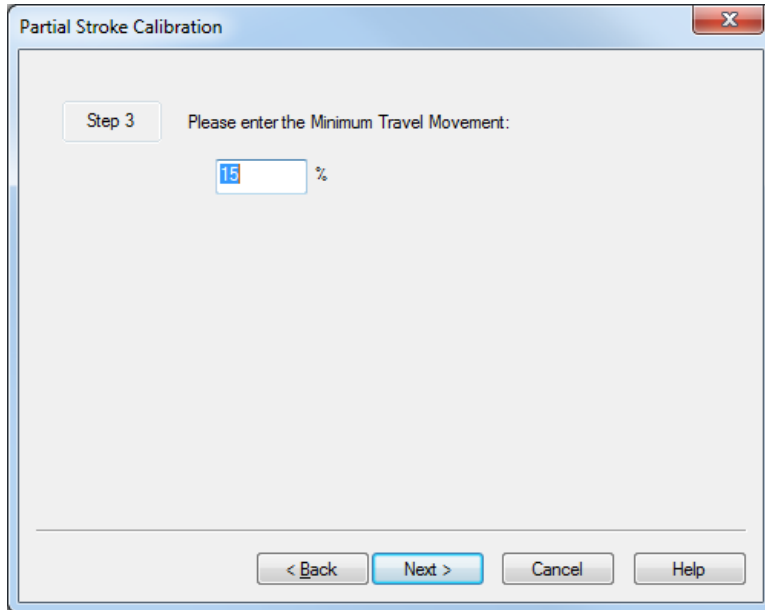
Figure 5. Enter the Minimum Travel Movement

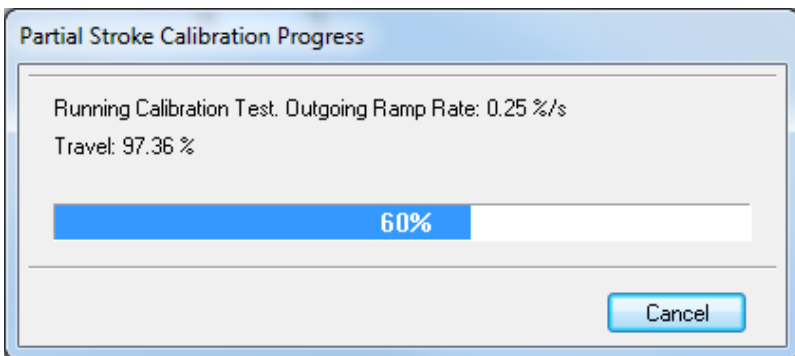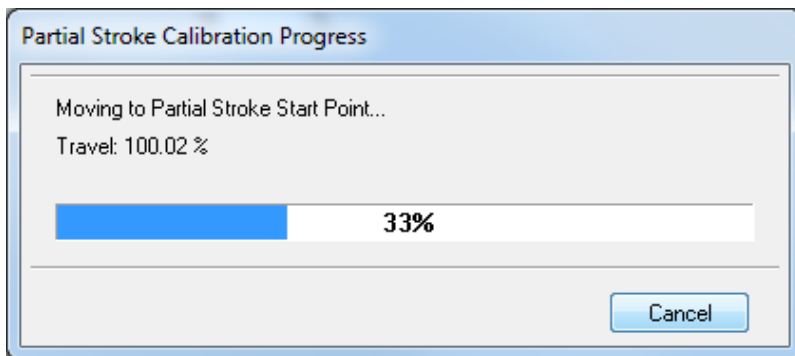Figure 6. Partial Stroke Calibration progress

Figure 7. Partial Stroke Calibration progress
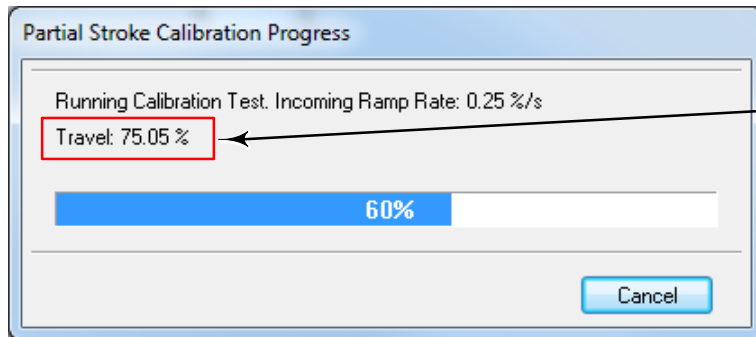
Will calibrate to 30% from the normal end if the Minimum Travel Movement + Set Point Over Drive is less than 30%

If it is greater than 30% the user-defined point will be calibrated
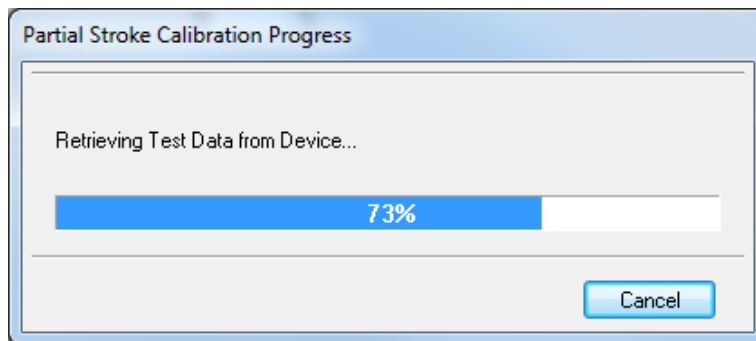
Figure 8. Step or Ramp to Normal Position on Failed PST
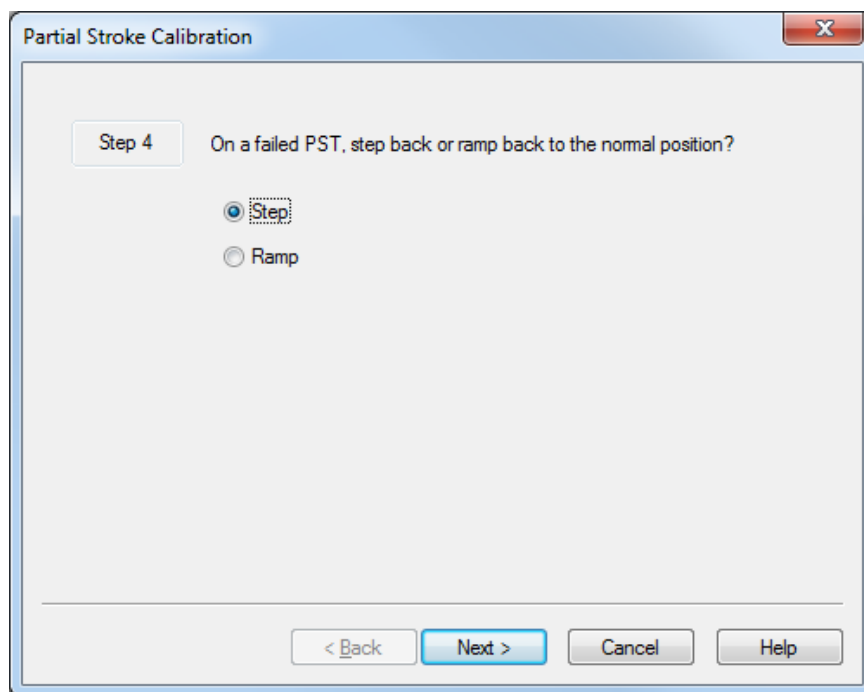
Figure 9. Partial Stroke Calibration Progress
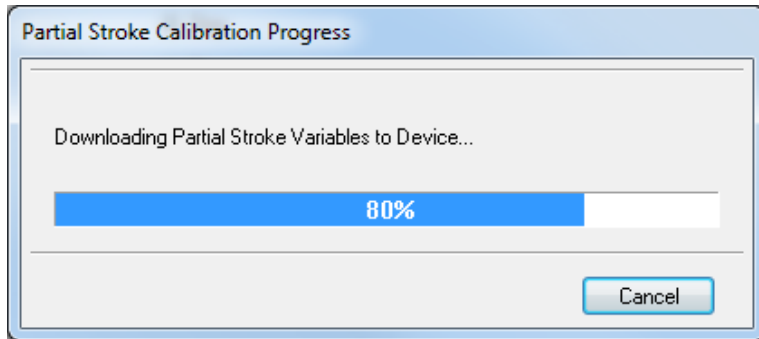
Figure 10. Calibration Procedure Complete
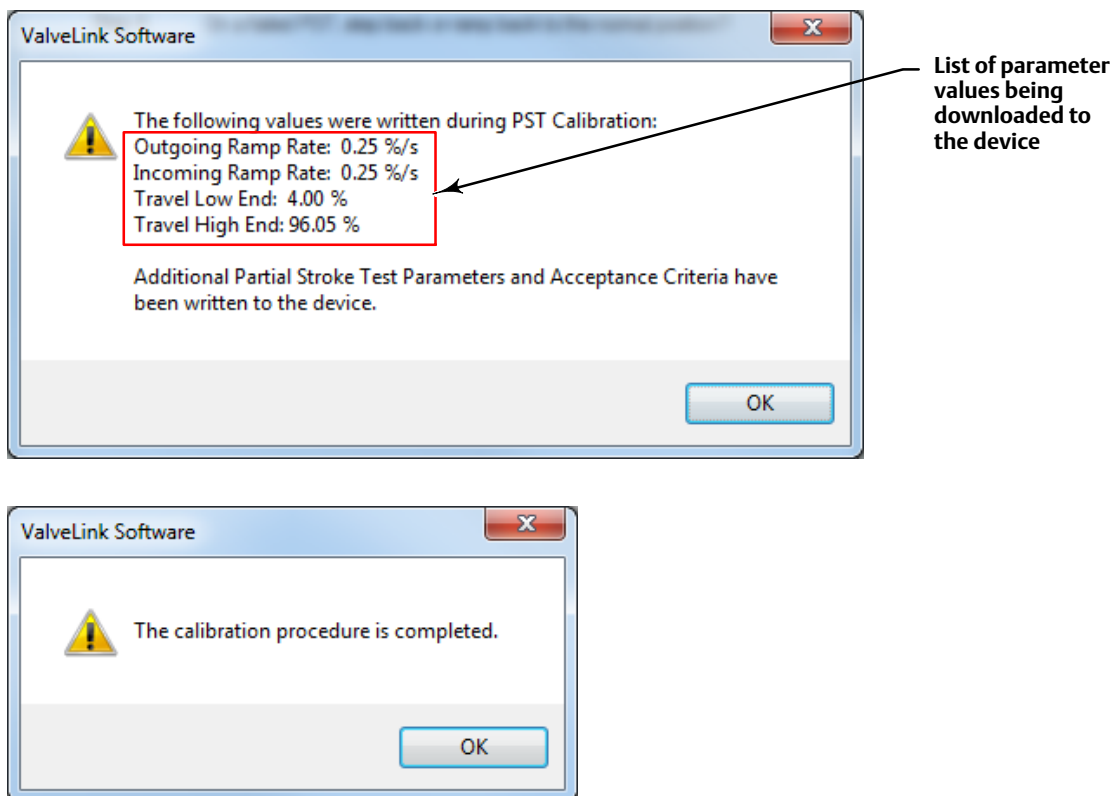
If you need to make adjustments to the normal end default settings, select Advanced Settings, as shown in figure 11, and make the necessary adjustments.

Figure 11. Select Advanced Settings to Make Adjustments to the Normal End

Select to define the normal end
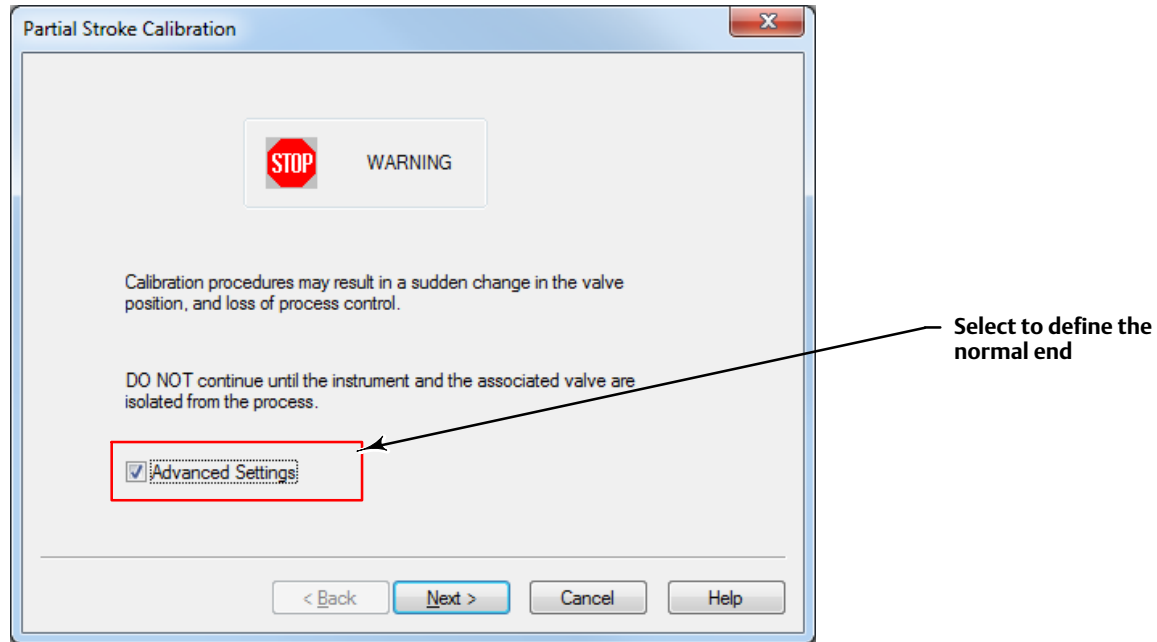
Figure 12. Set Travel High End

Defines the end of travel
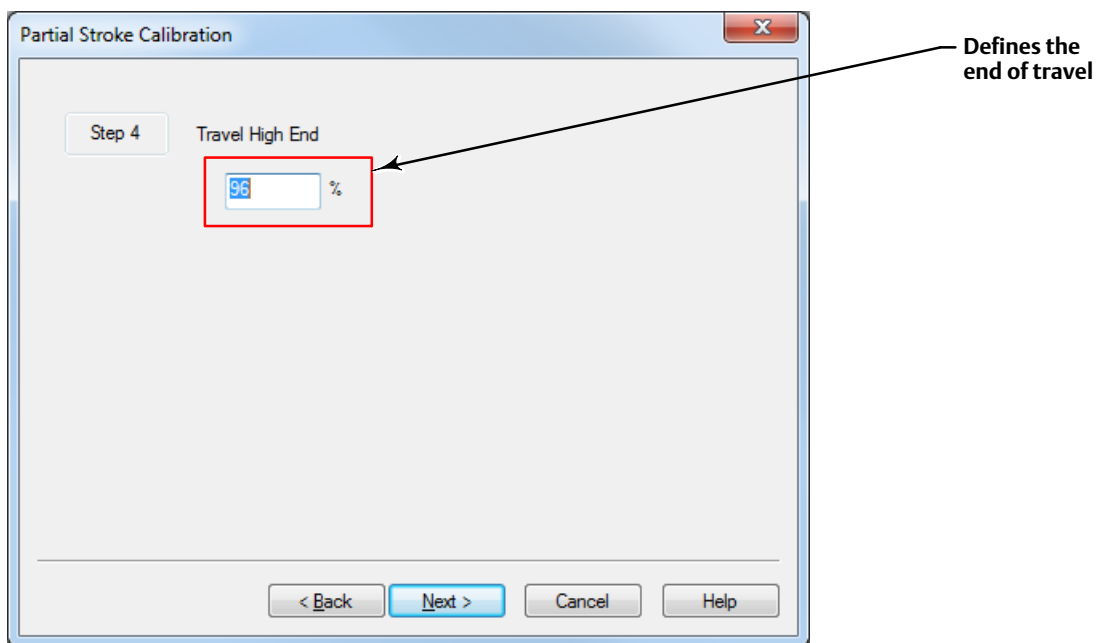
Figure 13. Enter Minimum Travel Movement
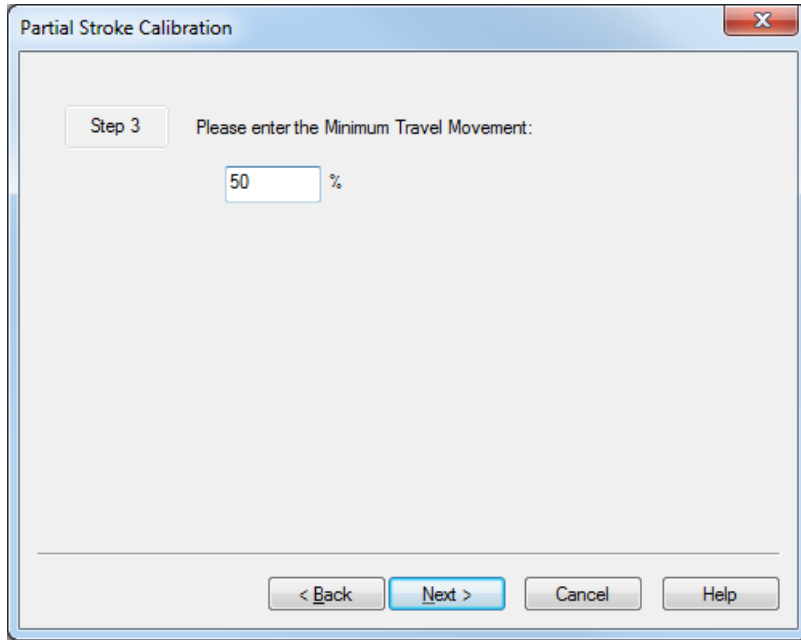
If Minimum Travel Movement + Set Point Overdrive is more than Maximum Allowable Travel then the below message is presented and you are directed to the next screen as shown in figure 14

Figure 14. Review Inputs

Minimum Travel Movement +
PST Overdrive Amount
is greater than the
Maximum Allowable Travel
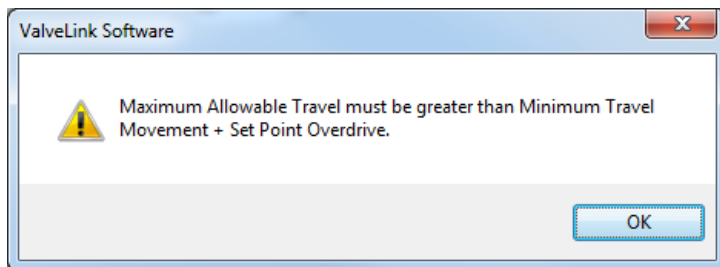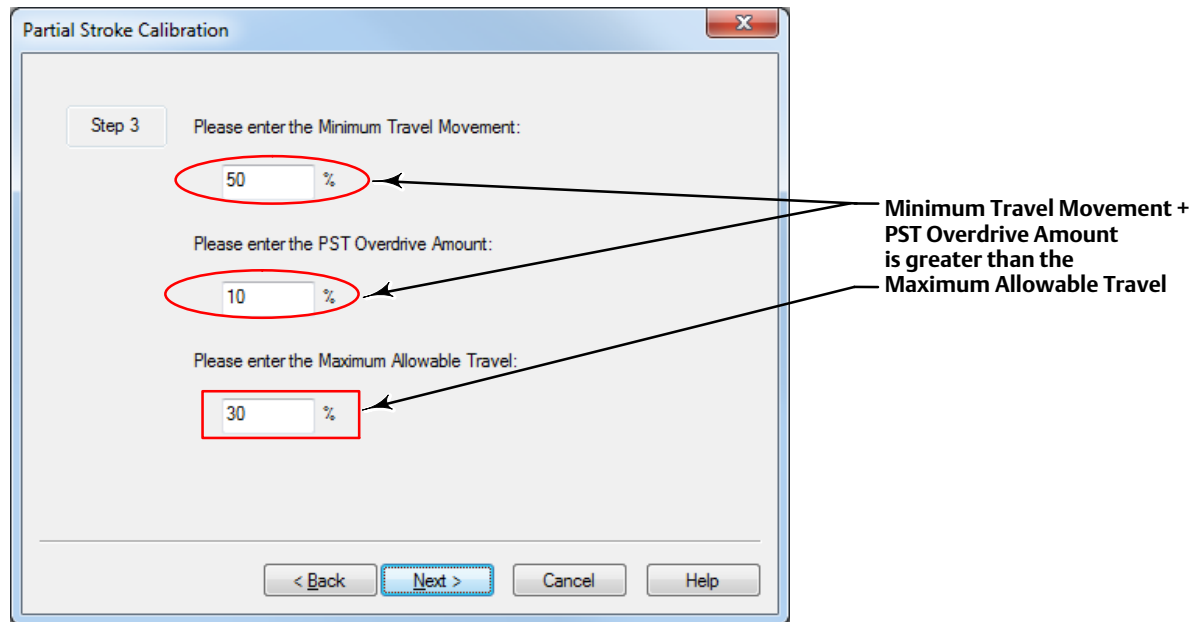
Figure 15. Enter New Maximum Allowable Travel

Enter a value greater
than Minimum Travel
Movement + PST
Overdrive Amount
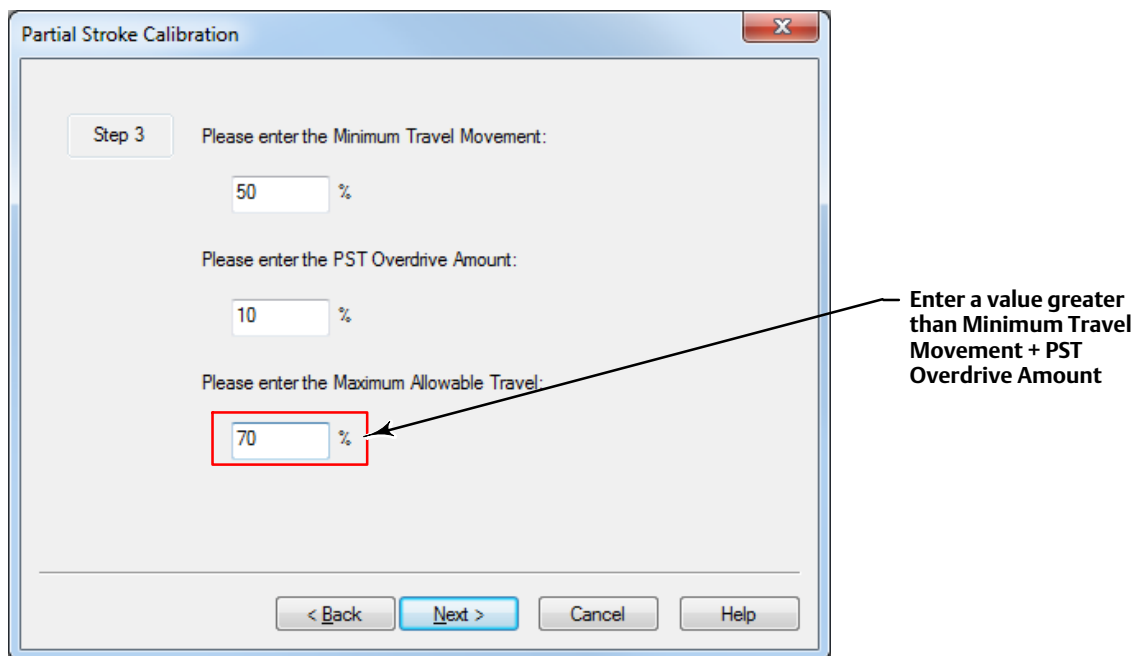
Figure 16. Partial Stroke Calibration Progress
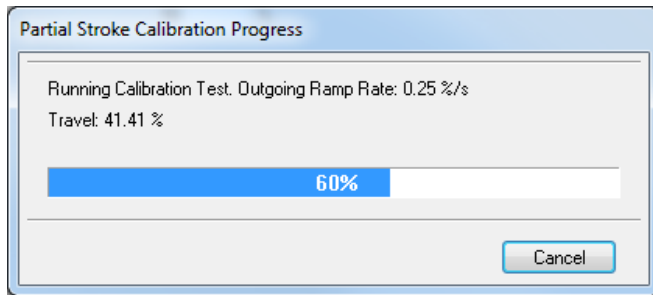
Configuration

After successfully calibrating the valve for PST go to the Detailed Setup FST/ PST tab and verify that the values for the parameters in the Valve Stroke Test group box are correct. Then go to the Partial Stroke group box and enable any of the behaviors required for the PST.

Figure 17. Verify FST/PST Values
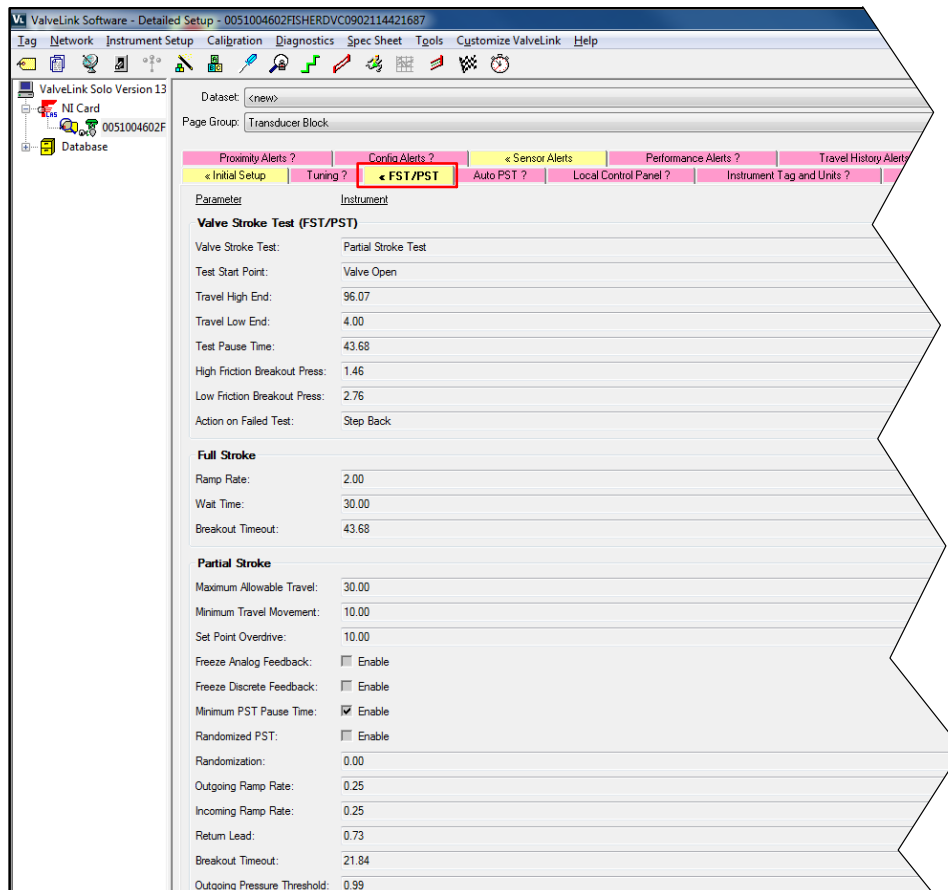
Once the PST has been setup and calibrated go to the VST Abnormal Criteria group box and select the criteria to be used to evaluate PST after they are run. Then, select the criteria to be used to abort a PST immediately on initiation, and the criteria to be used to prohibit a PST before initiation.

Figure 18. Select VST and PST Criteria
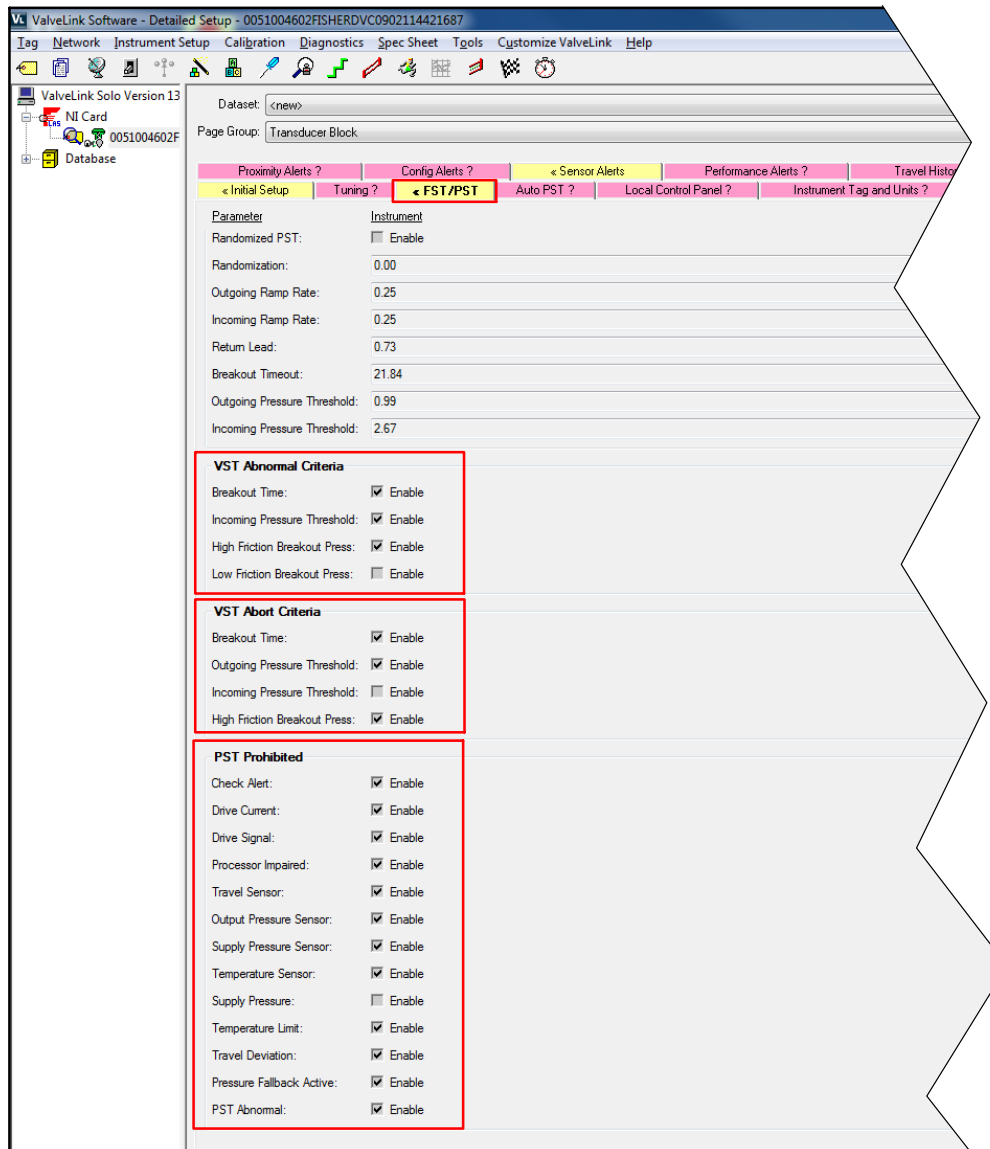
Categorize the stroke alerts from the Valve Stroke Alerts tab into one of the Field Diagnostic Alert categories and suppress them if publishing on the segment is not desired.

Figure 19. Set Valve Stroke Alerts
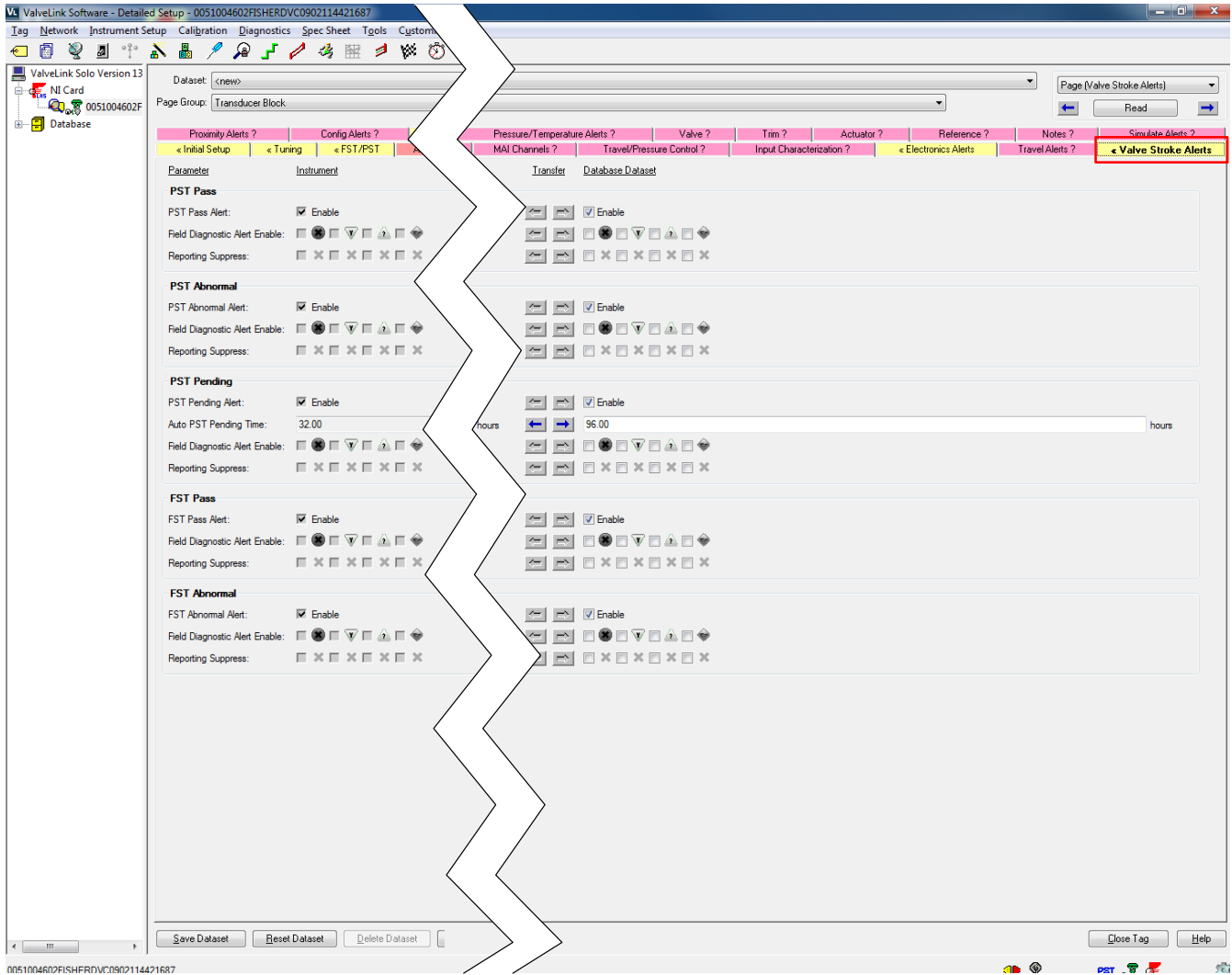
Initiating a PST Diagnostic

If an Auto PST is desired then go to the Auto PST tab and set up the PST schedule. The instrument will present a message when the next PST becomes due. If a scheduled PST is not initiated then a PST overdue alert is generated.

Figure 20. Setting Auto PST
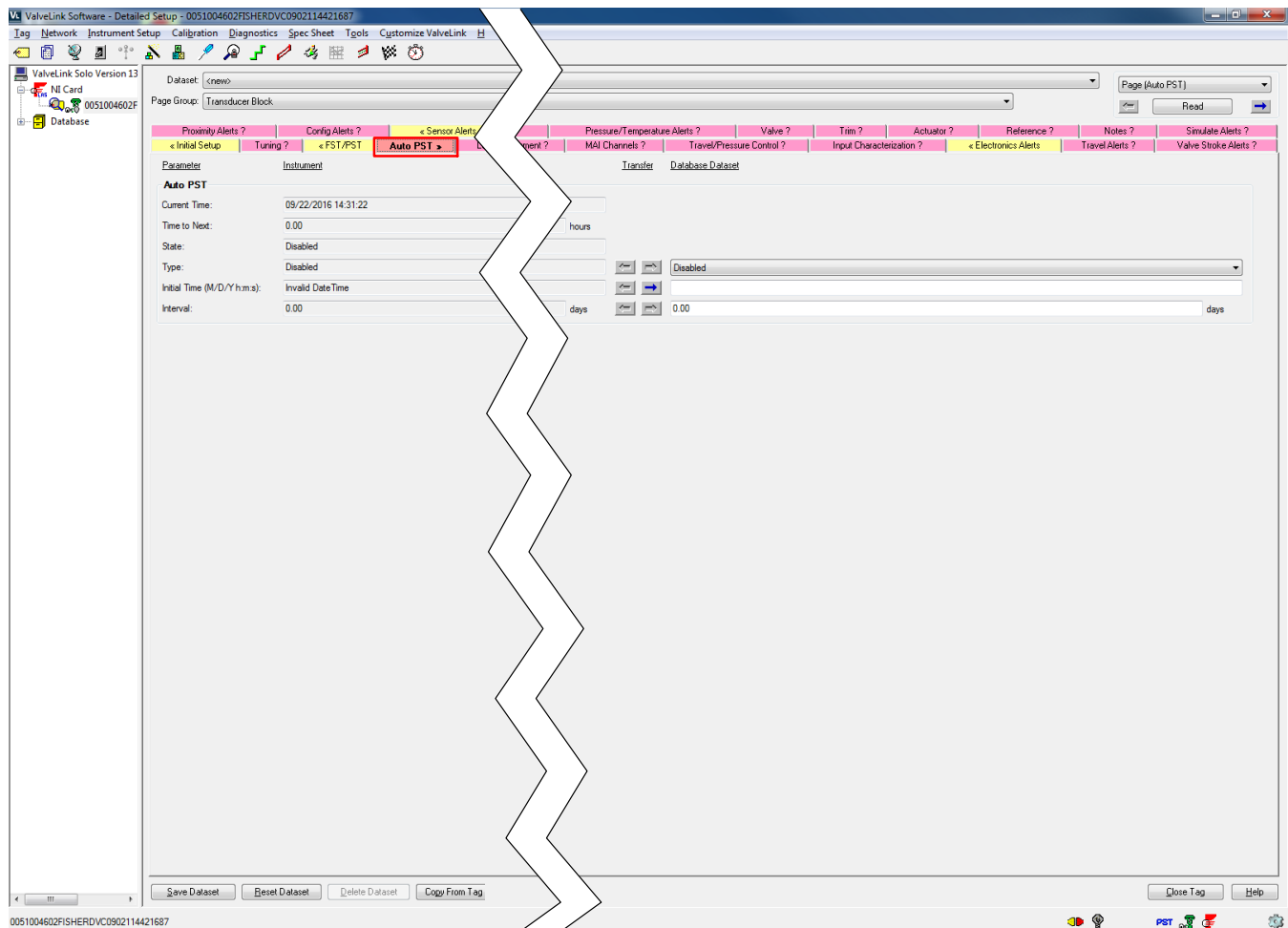
To run a manual PST select the Partial Stroke Test icon as shown in figure 21.

Figure 21. Initiating a Manual PST
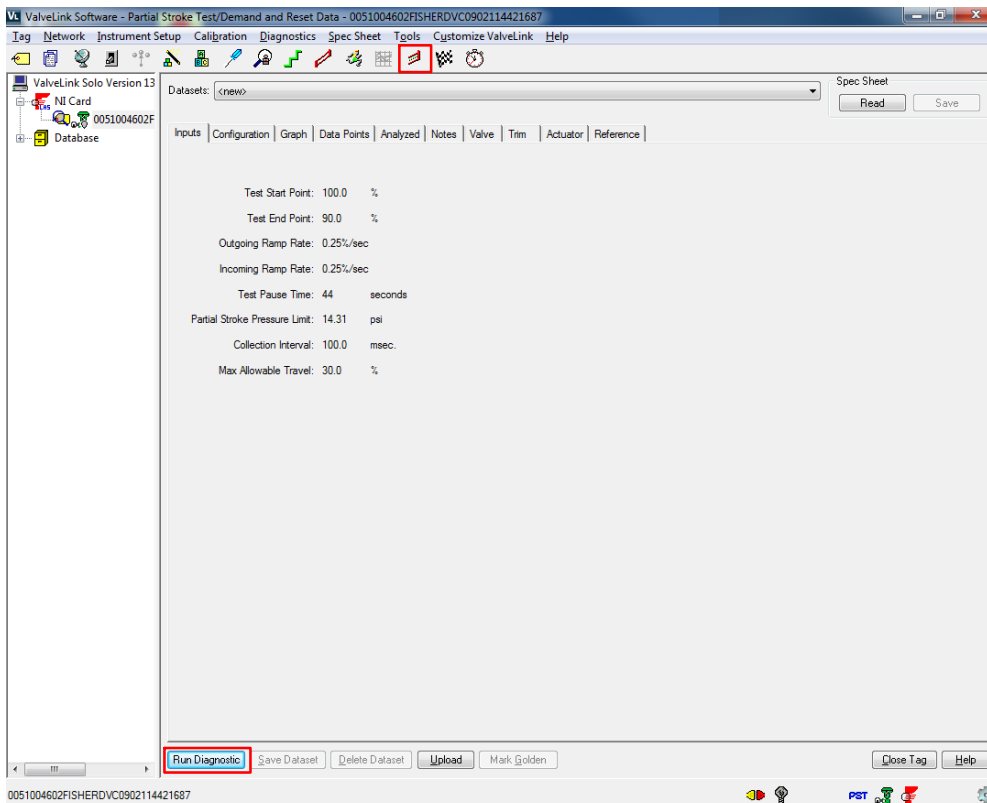
Figure 22. Upload or Delete Saved Partial Stroke Diagnostics
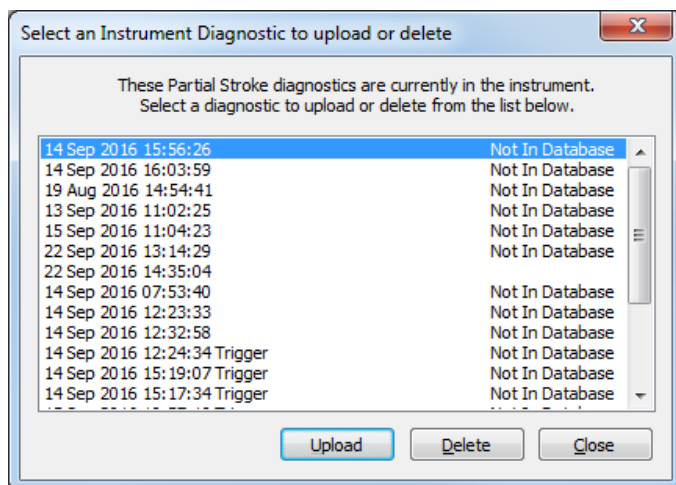
Before the manual PST initiates, you are given the opportunity to upload and save the instrument diagnostic data to ValveLink software. Select the datasets that are Not In Database and upload. Deletion of the data from the instrument is not necessary as new data will overwrite the oldest dataset. Datasets that are not uploaded to ValveLink software will not be accessible in the instrument once they are overwritten by new data

Figure 23. Partial Stroke Test Progress
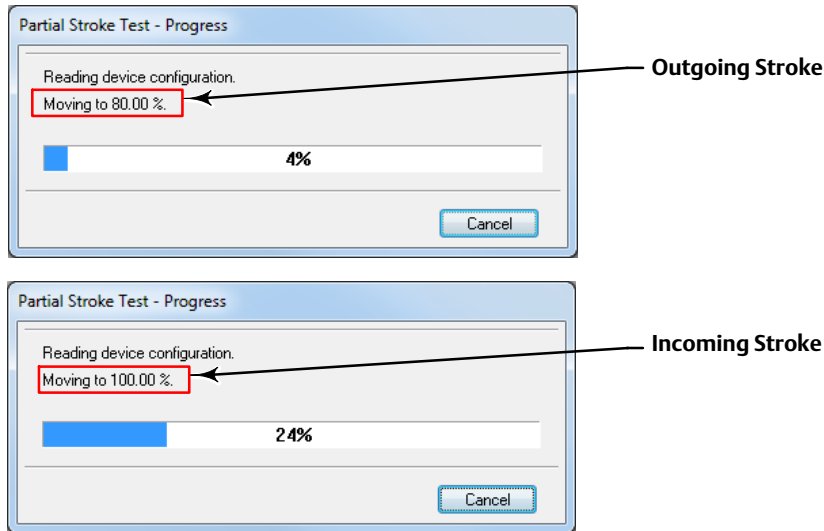
Figure 24. PST Analyzed Data
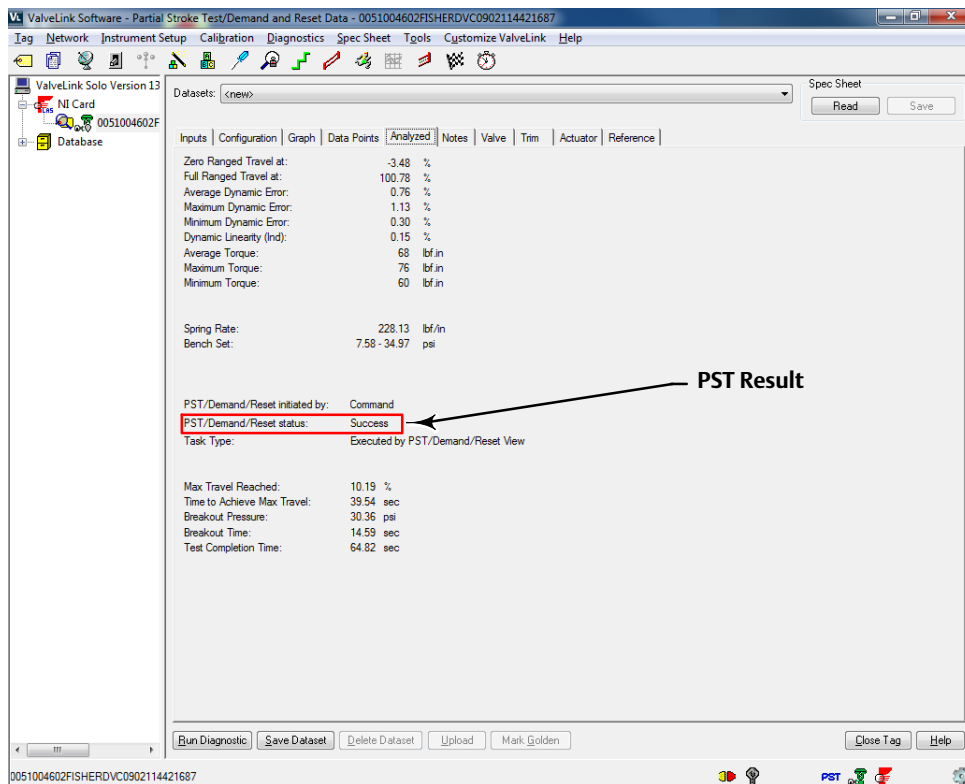
Figure 25. Resulting Press/Tvl Graph Results
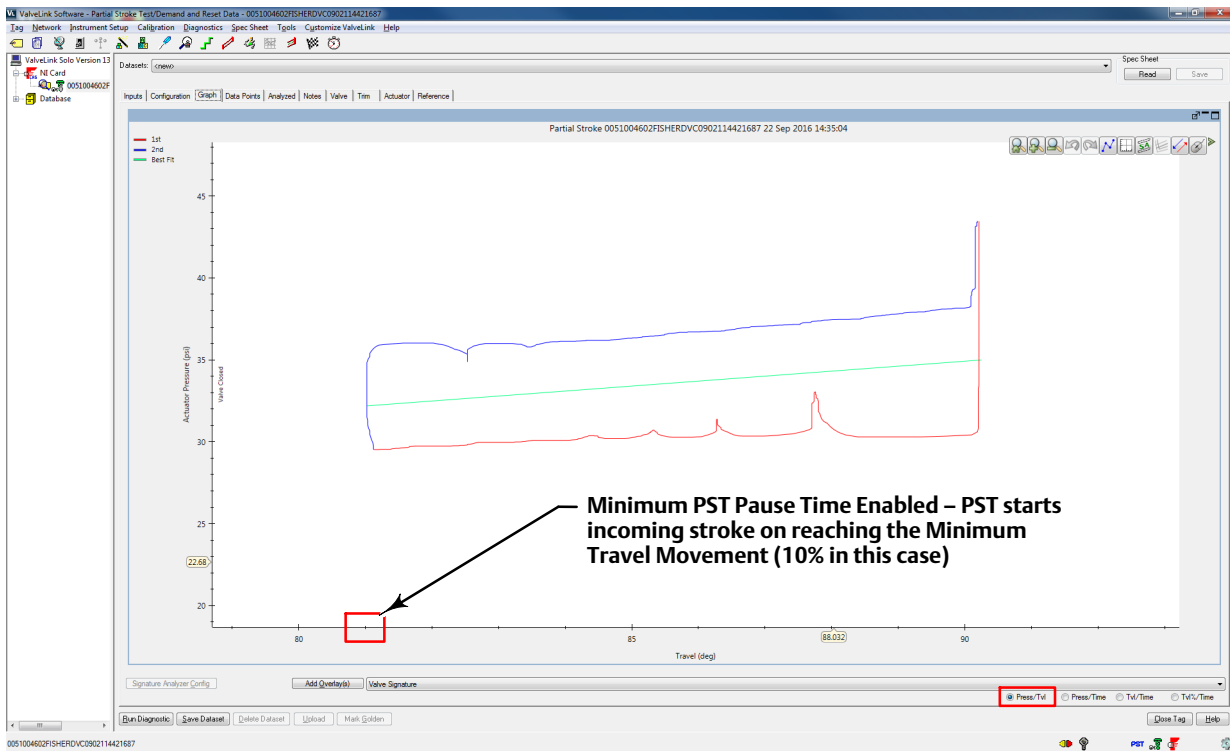
Figure 26. Resulting Tvl/Time Graph Results
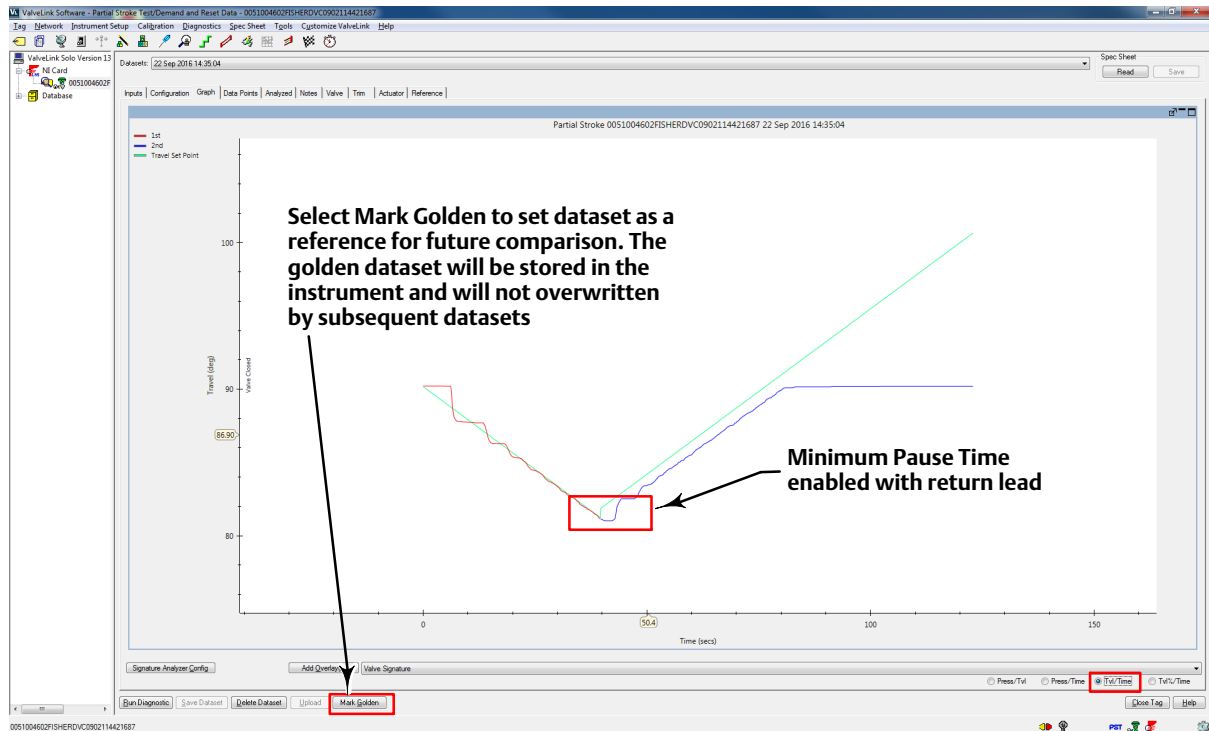
A PST Diagnostic can be run with Minimum PST Pause Time disabled, as shown in the figure below. When Minimum PST Pause Time is disabled the pause time will be in effect when the valve reaches the desired test point, resulting in a slower PST.

Figure 27. Disable Minimum PST Pause Time in FST/PST Partial Stroke

Figure 28. Resulting Press/Tvl Graph Results with Minimum Pause Time Disabled
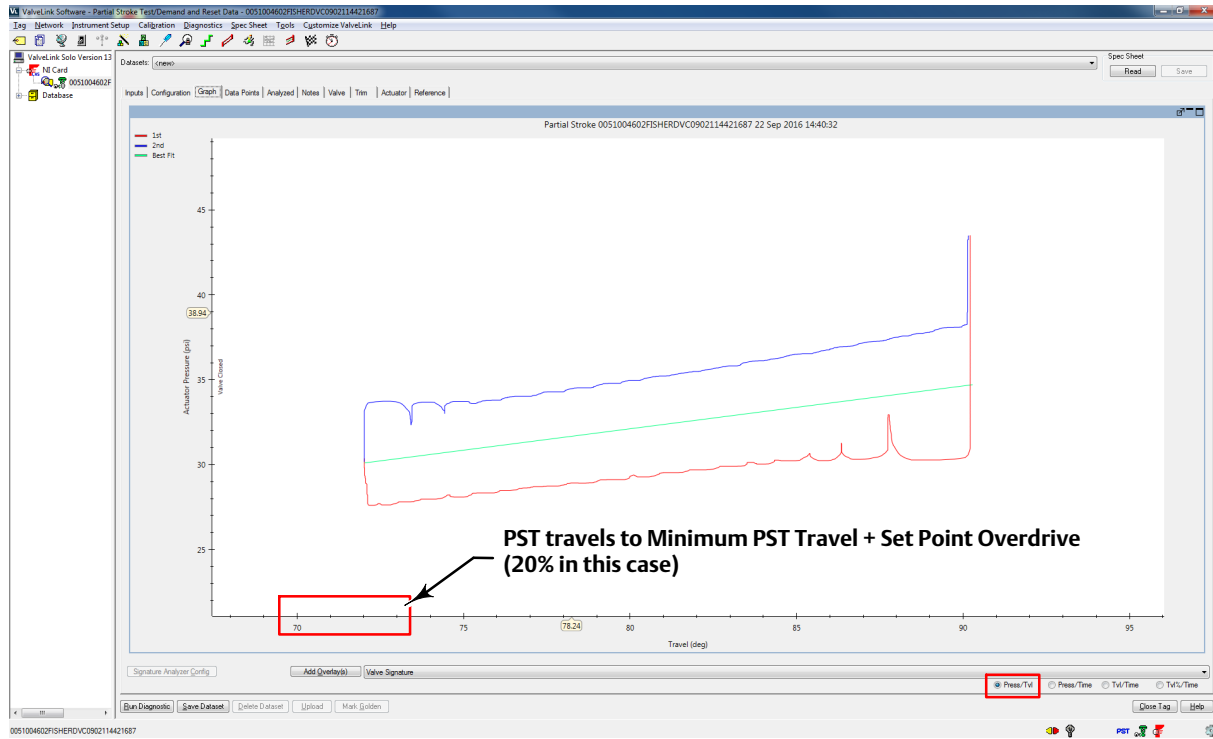
Figure 29. Resulting Tvl/Time Graph Results with Minimum Pause Time Disabled
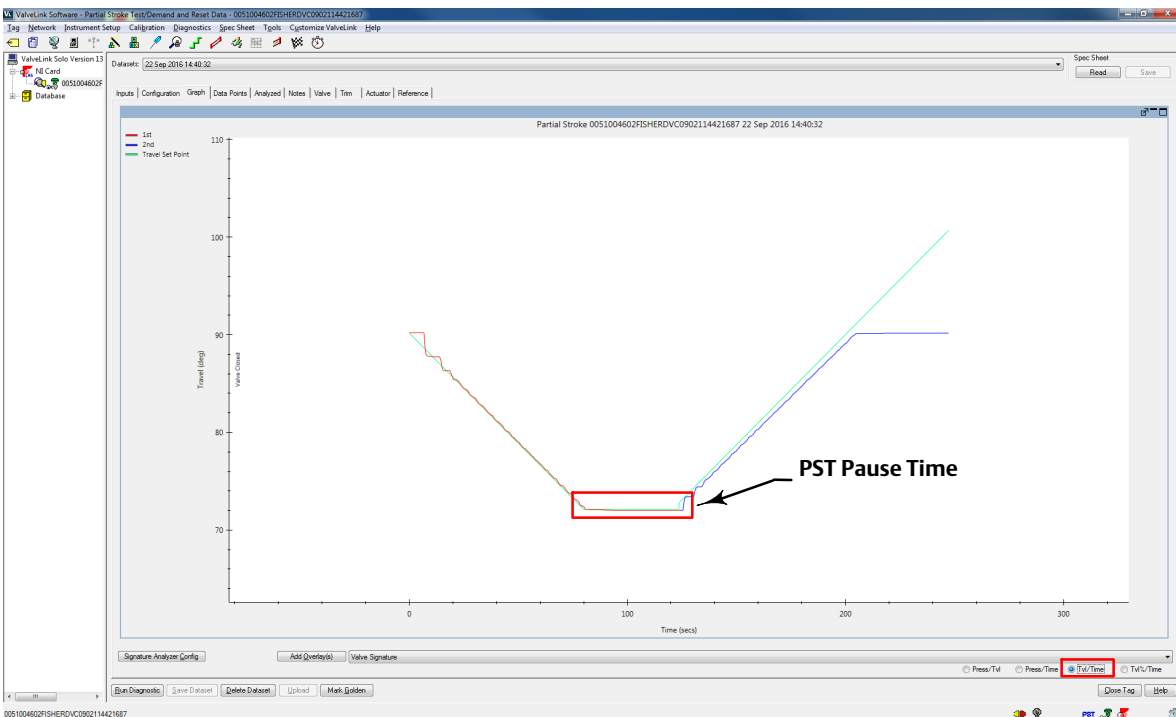
Figure 30. PST Analyzed Data with Minimum Pause Time Disabled
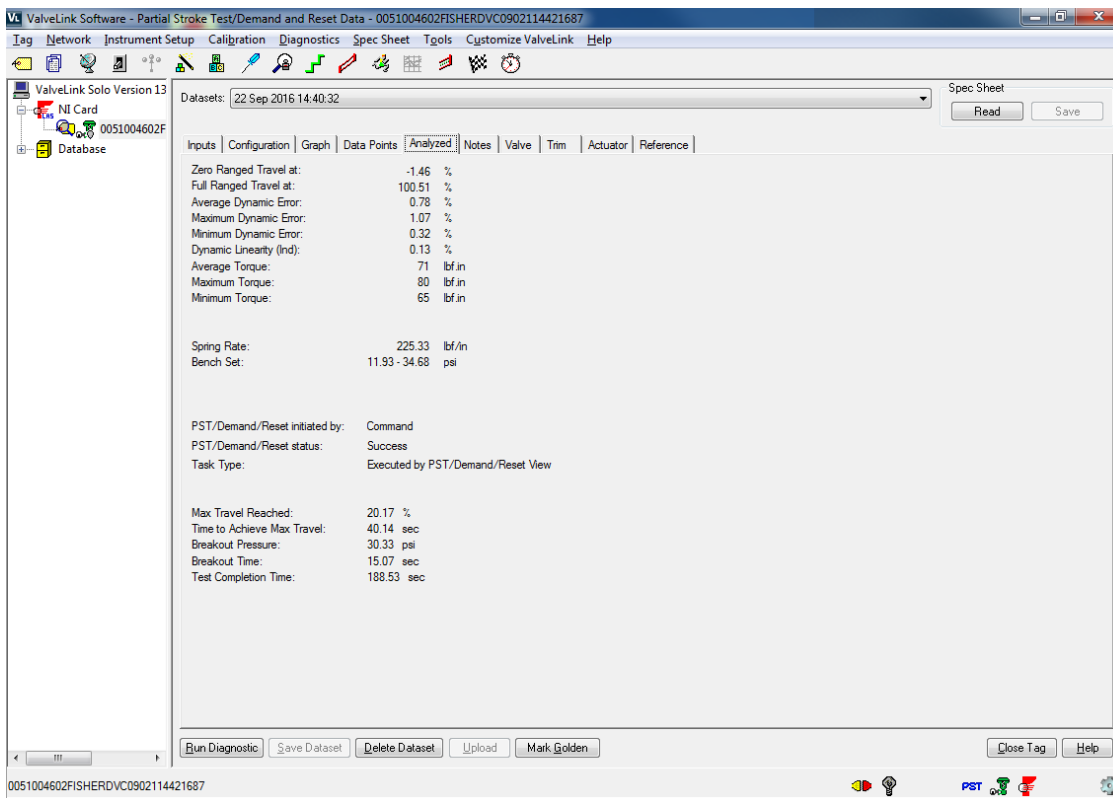
Select a PST style, either with or without Minimize PST Pause Time, and standardize on that style, as the data may be difficult to compare between the two styles. If the desire is to minimize the amount of time the valve is away from the normal end, then enabling Minimize PST Pause Time is recommended. If the amount of time away from the normal end is not a concern, then disabling Minimize 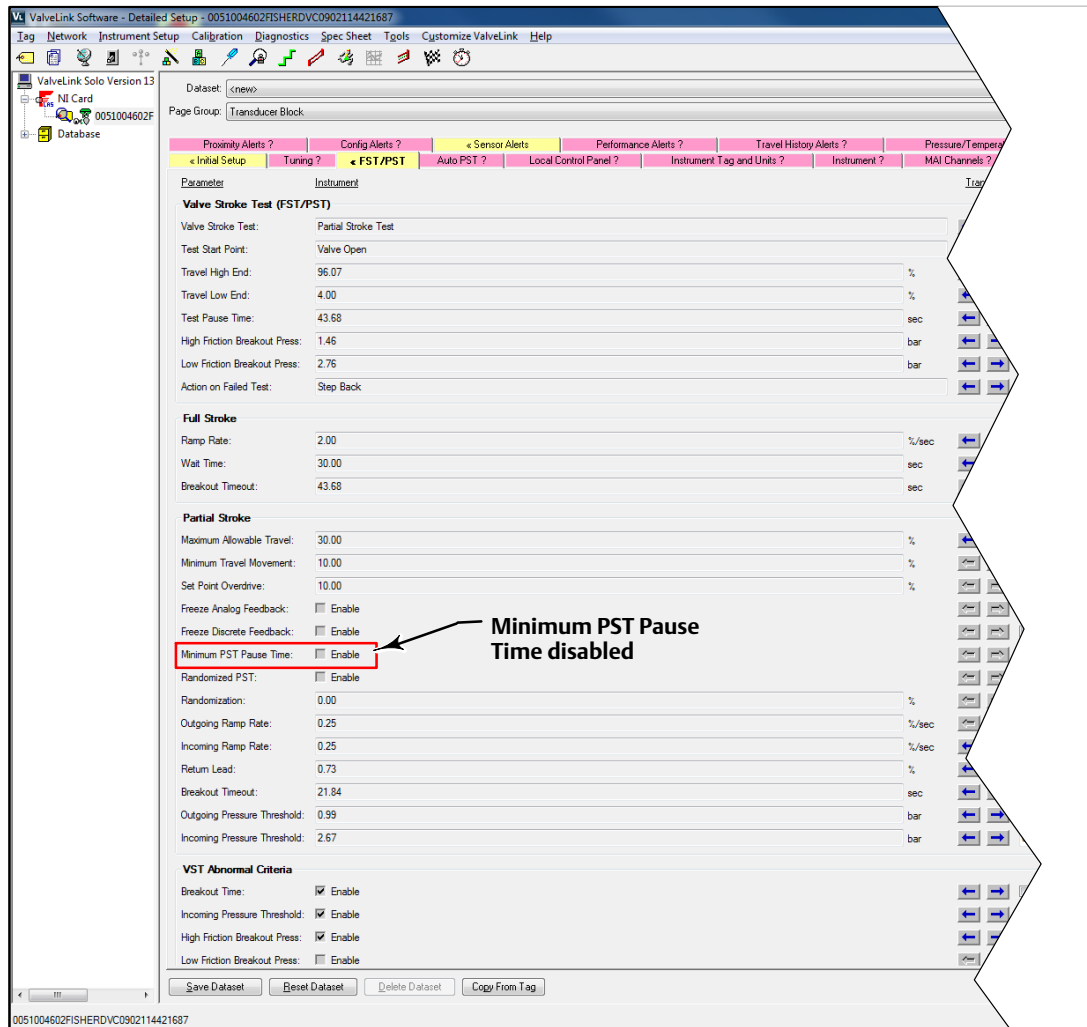PST Pause Time will cause the set point to pause at the end of the outgoing stroke for the travel to catchup to the set point. The results of the test with the Minimize PST Pause Time disabled will be similar to the PST as offered in earlier versions of SIS instruments.

Partial Stroke Test Information

Valve Stroke Test

A valve stroke test is the process of taking the valve from the normal end to another target position at a preconfigured ramp rate before returning to the normal end while gathering data. The data is analyzed to evaluate the condition of the valve assembly against a set of user defined thresholds. A valve stroke test is only run if everything is normal in the instrument. A safety demand signal will always take precedence over a valve stroke test.

● **Valve Stroke Test**, select Partial Stroke Test, Full Stroke Test, or Disable to select the test to run when the test is initiated using the VST_COMMAND parameter.

● **Partial Stroke Start Point** defines the normal end of the valve. The valve needs to be at this end for a PST to be initiated. When a FST is initiated the valve will be moved by the test to this end before being ramped to the opposite end and ramped back. Setting this value to Not Configured will disable partial stroke tests.

- **Travel Open End** defines, in percent (%) of calibrated travel, the point above which the valve is considered to have reached the high end.

- **Travel Closed End** defines, in percent (%) of calibrated travel, the point below which the valve is considered to have reached the low end.

- **Test Pause Time** is the time between the outgoing and incoming strokes of the test. The default value is 5 seconds. Pause Time will not be used if Minimum PST Pause Time is enabled. The outgoing stroke is from the normal end to the PST target and the incoming stroke is the return stroke to normal. See figure 31.

- **VST High Friction Breakout Pressure** indicates that the breakout required a higher force than configured by the user. Refer to figure 31.

- **VST Low Friction Breakout Pressure** indicates that the breakout required a lower force than configured by the user. Refer to figure 31.

- **Action On a Failed Test** defines if the valve should step or ramp back on a failed stroke test.

Figure 31. Valve Signature Representation
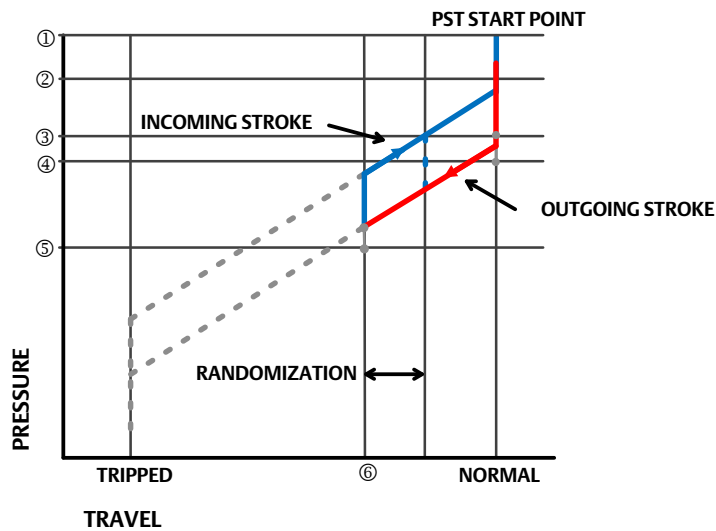
① SUPPLY PRESSURE
② INCOMING PRESSURE THRESHOLD
③ LOW FRICTION BREAKOUT PRESSURE THRESHOLD
④ HIGH FRICTION BREAKOUT PRESSURE THRESHOLD
⑤ OUTGOING PRESSURE THRESHOLD
⑥ TARGET TRAVEL MOVEMENT ≤ 100%

VST Abnormal & Abort Criteria

- VST Abnormal Criteria

A partial stroke test is marked as abnormal if it fails one of the following criteria.

The device always evaluates a PST on the following criteria:

  1. Target Travel achieved

2. Return to the normal end

In addition to the above, any of the following can be selected to evaluate a Partial Stroke Test.

1. Breakout Time
2. Outgoing Pressure Threshold
3. Incoming Pressure Threshold
4. High Friction Breakout Pressure
5. Low Friction Breakout Pressure

● VST Abort Criteria

The PST is terminated and the valve is returned to the normal end. The return to the normal end will be per the user configuration for an aborted test. The abort criteria will only be active if it is added as a criteria to be evaluated during PST by adding it to the PST Abnormal Criteria.

The device always aborts a PST if the Max Travel displacement is exceeded.

In addition to the above, any of the following can be selected to abort a Partial Stroke Test:

1. Breakout Time
2. Incoming Pressure Threshold
3. High Friction Breakout Pressure

Partial & Full Stroke

● Partial Stroke

PST Max Travel defines how much travel displacement is allowed before the PST aborts (see figure 32).

PST Minimum Travel is the percentage of total span that the valve moves away from its normal operating end of travel towards its tripped end of travel during the test. The default value is 10%.

Set Point Overdrive defines the extent of the set point overdrive over the Minimum Travel Movement when the early turn around is enabled. When the early turn around is not enabled it defines the travel target.

Freeze Analog / Discrete Feedback when enabled, freezes the corresponding feedback during a partial stroke test.

Minimum PST Pause Time, when enabled, the incoming stroke is initiated as soon as the travel reaches the minimum travel movement. Refer to figure 32 for a time series representation of this parameter.

Randomized PST, when enabled the instrument randomizes the target travel, for each PST.

PST Randomization is defined in percent (%) of calibrated travel span, it defines the extent of randomization from the minimum travel movement towards the normal end. If the user defined randomization is too large the instrument will cap the max randomization to ensure that there will be at least 1% travel movement away from the defined normal end. Refer to figure 31.

Figure 32. Time Series Representation of Minimum PST Pause Time
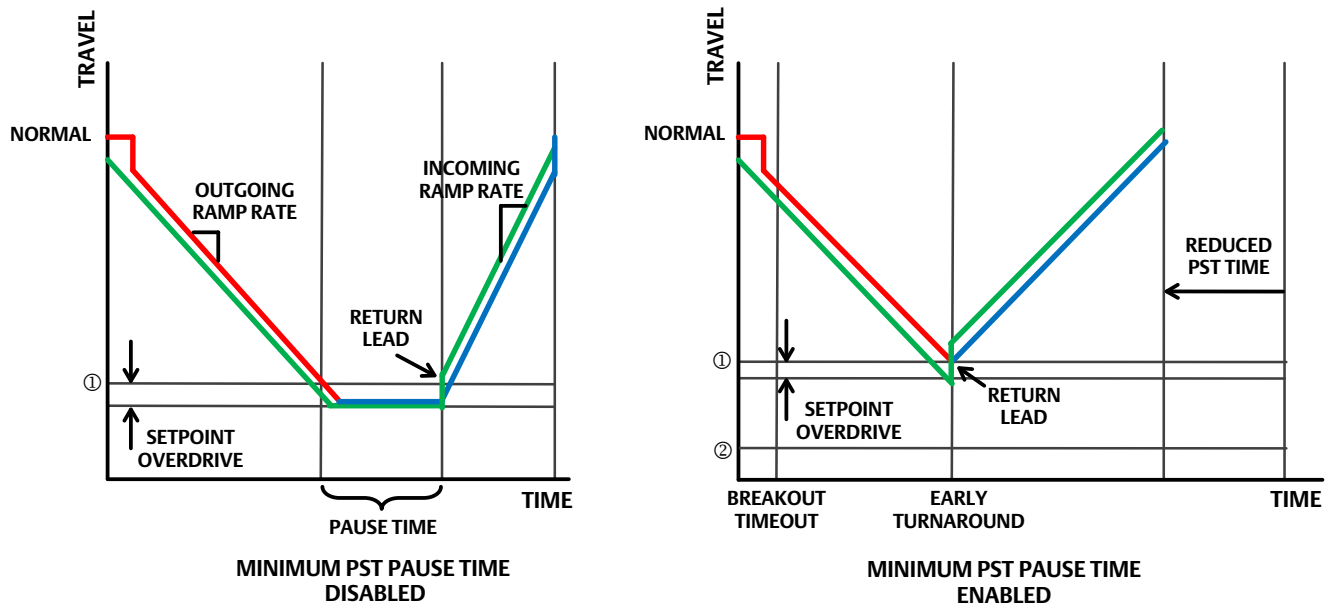
① **MINIMUM TRAVEL MOVEMENT**
② **MAX. ALLOWABLE TRAVEL**

Outgoing Ramp Rate is the rate at which the valve will move during the Outgoing stroke of the Partial Stroke test. The default value is 0.25%/second.

Incoming Ramp Rate is the rate at which the valve will move during the Incoming stroke of the Partial Stroke test. The default value is 0.25%/second.

PST Return Lead defines the percent (%) change in setpoint to overcome the hysteresis in the valve assembly. The error between setpoint and actual error is added to this percent change. For example, if the Return Lead is set at 0.5% and there is a 1% error this will be set at 1.5%

PST Breakout Timeout is the user configured amount of time before which the valve must leave the normal end during a PST.

VST Outgoing Pressure Threshold defines the actuator pressure at which a partial stroke test will abort during the outgoing stroke (see figure 31). This prevents the DVC6200f from exhausting (or building) excessive pressure from/to the actuator in an attempt to move a stuck valve. During PST Calibration, the Partial Stroke Outgoing Pressure Threshold will be set automatically.

VST Incoming Pressure Threshold defines the actuator pressure at which a partial stroke test will abort during the incoming stroke (see figure 31). This prevents the DVC6200f from exhausting (or building) excessive pressure from / to the actuator in an attempt to move a stuck valve.

● Full Stroke

Full Stroke Ramp Rate is the rate at which the valve will move during the full stroke test.

FST Wait Time is the amount of time to wait for the valve to move to the normal end after initiation of the full stroke test.

Full Stroke Breakout Timeout is the user configured amount of time before which the valve must leave the normal end during a full stroke test.

PST Prohibited

A partial stroke test will not be initiated if any of the following user-configurable conditions are active:

1. Check Bit Alert
2. Drive Current
3. Drive Signal
4. Processor Impaired
5. Travel Sensor
6. Output Pressure sensor
7. Supply Pressure Sensor
8. Temperature Sensor
9. Supply Pressure
10. Temperature Limit
11. Travel Deviation
12. Pressure Fallback
13. PST Abnormal

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