



# Integritest® 5 OPC-UA Automation User Guide

Version 1.1

© 2023 Millipore

The M logo, Integritest, Millipak, Millidisk®, Opticap, Millipore Express, and Viresolve are registered trademarks of Merck KGaA, Darmstadt, Germany.

HydroCorr™ is a servicemark of Merck KGaA, Darmstadt, Germany. All trademarks of third parties are the property of their respective owners.

<b>1.</b>	<b>IT5 Automation Introduction</b>	<b>4</b>
<b>2.</b>	<b>Additional Resources</b>	<b>5</b>
<b>3.</b>	<b>Automation Features</b>	<b>6</b>
<b>4.</b>	<b>IT5 Automation Operation</b>	<b>9</b>
4.1	<b>Configuration and Control</b>	<b>10</b>
4.1.1	Monitor Mode	12
4.1.2	Full Control Mode	13
4.2	<b>Automation Home Screen when Idle</b>	<b>14</b>
4.3	<b>Automation Login for Operators and Supervisors</b>	<b>16</b>
4.4	<b>Start Test without Credentials</b>	<b>17</b>
4.5	<b>Start Test with Credentials</b>	<b>18</b>
4.6	<b>Start Test Run Confirmation Screen</b>	<b>20</b>
4.7	<b>Start Test with Auto-Run</b>	<b>21</b>
4.8	<b>Test Prompt Handling</b>	<b>22</b>
4.9	<b>Temperature Override Confirmation</b>	<b>24</b>
4.10	<b>Automation Home Screen with Running Test</b>	<b>26</b>
4.11	<b>Abort Test without Credentials</b>	<b>27</b>
4.12	<b>Abort Test with Credentials</b>	<b>28</b>
<b>5.</b>	<b>Getting Started</b>	<b>29</b>
<b>6.</b>	<b>Testing with UAExpert</b>	<b>32</b>
6.1	Configuring UAExpert	33
6.2	Viewing IT5 Status	39
6.3	Starting a Test	41
6.4	Testing Get Notifications	43
<b>7.</b>	<b>IT5 Certificate Management</b>	<b>44</b>
<b>8.</b>	<b>IT5 OPC Organization</b>	<b>46</b>
<b>9.</b>	<b>IT5 OPC Test Controller</b>	<b>47</b>
9.1	Register Calls	48
9.2	Test Execution	50
9.2.1	Check_Ready and Check_Ready_Registers	51
9.2.2	Start_Test and Start_Test_Registers	52
9.2.3	Abort_Test and Abort_Test_Registers	54

9.2.4	Get_Report_Data and Get_Report_Data_Registers .....	55
9.2.5	Get_Unread and Get_Unread_Registers .....	56
9.2.6	Set_Read and Set_Read_Registers .....	57
<b>9.3</b>	<b>Test Distribution .....</b>	<b>58</b>
9.3.1	Upload_Test .....	59
9.3.2	Download_Test .....	60
<b>9.4</b>	<b>Test Creation .....</b>	<b>61</b>
9.4.1	Define_Test_Bubble_Point .....	63
9.4.2	Define_Test_Enhanced_Bubble_Point .....	65
9.4.3	Define_Test_Diffusion .....	67
9.4.4	Define_Test_HydroCorr .....	71
9.4.5	Define_Test_Pressure_Hold .....	74
<b>9.5</b>	<b>Audit and Notifications .....</b>	<b>76</b>
9.5.1	Get_Notifications .....	77
9.5.2	Get_Audit_Log .....	78
<b>10.</b>	<b>IT5 OPC Results Monitor .....</b>	<b>79</b>
<b>10.1</b>	<b>Status Data .....</b>	<b>80</b>
<b>10.2</b>	<b>Watchdog Function .....</b>	<b>82</b>
<b>10.3</b>	<b>Test Result Data .....</b>	<b>83</b>
10.3.1	Common Data .....	84
10.3.2	Bubble Point Data .....	87
10.3.3	Diffusion Data .....	89
10.3.4	Enhanced Bubble Point Data .....	91
10.3.5	HydroCorr Data .....	93
10.3.6	Pressure Hold Data .....	95
<b>10.4</b>	<b>Reference Codes .....</b>	<b>96</b>
10.4.1	Test Run State Codes .....	97
10.4.2	Status Codes .....	98
10.4.3	Test Type Codes .....	99
<b>Index</b>		<b>100</b>

# 1 IT5 Automation Introduction

---

This document is the user guide for the IT5 Automation OPC-UA server that permits integration with common control systems.

An organization with OPC-UA expertise, working with an IT5 operator, can incorporate the IT5 into their automation control systems.

## See Also

[Additional Resources](#)  10

[Automation Features](#)  6



## 2 Additional Resources

---

The following additional resources are available.

<b>Item</b>	<b>Reference #</b>
IT5 User Guide	UG1801EN00
IT5 Network User Guide	* Available upon request.
IT5 Automation Catalog Number	IT5INOPCUA

## 3 Automation Features

---

### All IT5 Features are Supported

Automation is an add-on to the IT5 that fully compliments an IT5 system. All IT5 systems operate with automation including domain log in, domain mapping, report archiving, and automatic backup.

### Complimentary OPC-UA Features

The OPC-UA interface is implemented with fields and methods mapped directly to the English test definition and reports fields with spaces replaced with under bars. An OPC operator armed with a test report printout can work with a control system specialist to implement automation. All OPC methods and registers are documented in the published interface viewable by any standard OPC client.

### IT5 Automation Simulator

The IT5 simulator can be installed to develop and test automation control systems. All features operate as the IT5 but test result data is simulated.

### Real time System Status

The control system can poll the IT5 for the current system status that includes the following items.

- Active Test Information including the current test state.
- Current Test Pressure (when applicable)
- Flow Rate (when applicable)
- Last Test Result
- Audit trail and alarm notifications

### Manual and Full Automation Test Execution

Automation control systems can start tests that require manual intervention or use the full automation feature for installations with attached machinery that wets the filter, select the test recipe, and starts the test.

### On-Screen Status and Control

When automation is configured in Full Control, it has a new home screen that includes the following.

- Displays the active test status or the status of the last test.
- Digital signature button for completed tests (when configured).
- View Report button.
- Login button that provides access for signatures and instrument administration.

### System Configuration Information

This information is available to the control system:

- Unit name
- Unit serial number
- IT5 application software version
- Windows 10 software version and update level
- Last and next calibration date
- Automation Mode – Disabled, Monitor, or Full Control

## Test Definition Control

IT5 test definitions, also known as recipes, are maintained in the control system. The control system can perform the following operations.

- Upload a test defined on an IT5
- Download a previously uploaded test definition to an IT5
- Define a new test definition directly from the control system

## Test Execution

The control system can perform the following test control operations.

- Start test with or without user intervention to permit the user to sign the filter.
- Abort test running test.
- Control the start test confirmation message.

## Test Result Data Archive Support

The control system can read and save test result data for archiving and centralized storage.

When a test ends (completed, invalid or aborted), the current test data is available for retrieval. The control system can load the test result for unread tests. Once archived, the "read" flag can be set. The control system can then request the next "unread" test.

## Monitor and Full Control Modes

Automation can be configured in Monitor and Full Control modes.

Monitor mode has the following features.

- There are no changes to the instrument operation.
- Instrument status and test results are accessible to the control system using the OPC-UA interface.

Full Control has the following features.

- The Automation Home Screen displays the instrument status, allows digital signatures, report viewing, and administrative login.
- Automation test execution, test definition, and distribution.

## See Also

[Configuration and Control](#) 10

[Test Controller](#) 47

[Results Monitor](#) 79

## 4 IT5 Automation Operation

---

IT5 Automation is active when it is configured in Monitor mode or Full Control. When active, the control system can access the IT5 status and test results.

In monitor mode, there are no changes to the IT5 instrument interface.

In full control mode, the Automation Home screen is displayed when the system is idle.

### See Also

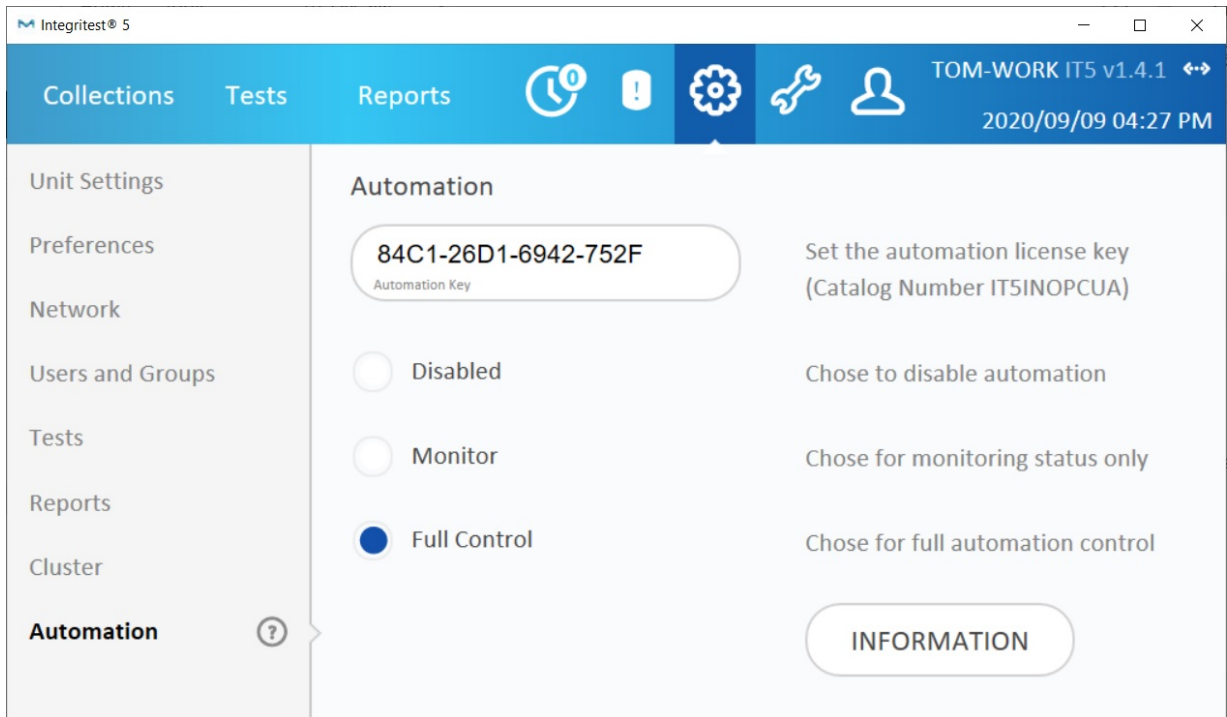
[Configuration and Control](#) 

## 4.1 Configuration and Control

The IT5 software SP 4.2 and later has the IT5 automation feature pre-installed. IT5 Automation requires a license key for each instrument.

The IT5 Simulator can be installed on any Windows system and is licensed to run automation. The simulator can be used to try and stage Automation. The results are simulated for each test but the interface and methods are the same as the instrument. IT5 Instruments are licensed using an activation key that is locked on the serial number of the unit.

Automation can be licensed and configured on the instrument using Settings | Automation menu.



Once licensed the Automation can be set to the following modes.

Disabled	Disables automation and stops the automation server.
Monitor	Starts the automation server in monitor mode. OPC-UA clients can monitor status and retrieve test result data.
Full Control	Starts the automation server to full control mode. OPC-UA clients can create tests, distribute tests, start tests, monitor status and retrieve test result data.

Note: The IT5 Simulator is automatically licensed using the "IT5-SIM" key. The simulator must run Windows elevated (Administrator) account that permits the OPC-UA server process to operate.

The remainder of this section describes IT5 automation in full control mode.

[See Also](#)

[IT5 Automation Operation](#)  9

[IT5 OPC Test Controller](#)  47

[Test Execution](#)  50

### 4.1.1 Monitor Mode

---

Monitor mode can be used by the control system to access all status information on the IT5 operation.

The following functions can be accessed in monitor mode.

Item	Description
Test result retrieval methods	The Get_Report_Data, Get_Unread, and Set_Read methods.
Audit and Notifications	The audit log and current notifications for the instrument.
Status Data	The instrument and Windows versions, the last calibration dates, and current instrument state.
Test Result Data	The current test or test results loaded using the Get_Report_Data method. Test results specific to each test type are contained in the Bubble Point, Diffusion, Enhanced Bubble Point, HydroCorr, and Pressure hold data sections.

#### See Also

[Configuration and Control](#) <sup>→10</sup>

[Get\\_Report\\_Data](#) <sup>→55</sup>

[Get\\_Unread](#) <sup>→56</sup>

[Set\\_Read](#) <sup>→57</sup>

[Audit and Notifications](#) <sup>→76</sup>

[Test Result Data](#) <sup>→83</sup>






## 4.1.2 Full Control Mode

---

Full control mode can be used by the control system to access all status information, execute tests, and define tests, distribute tests between IT5s.

Full control provides all the features of monitor mode plus the following functions.

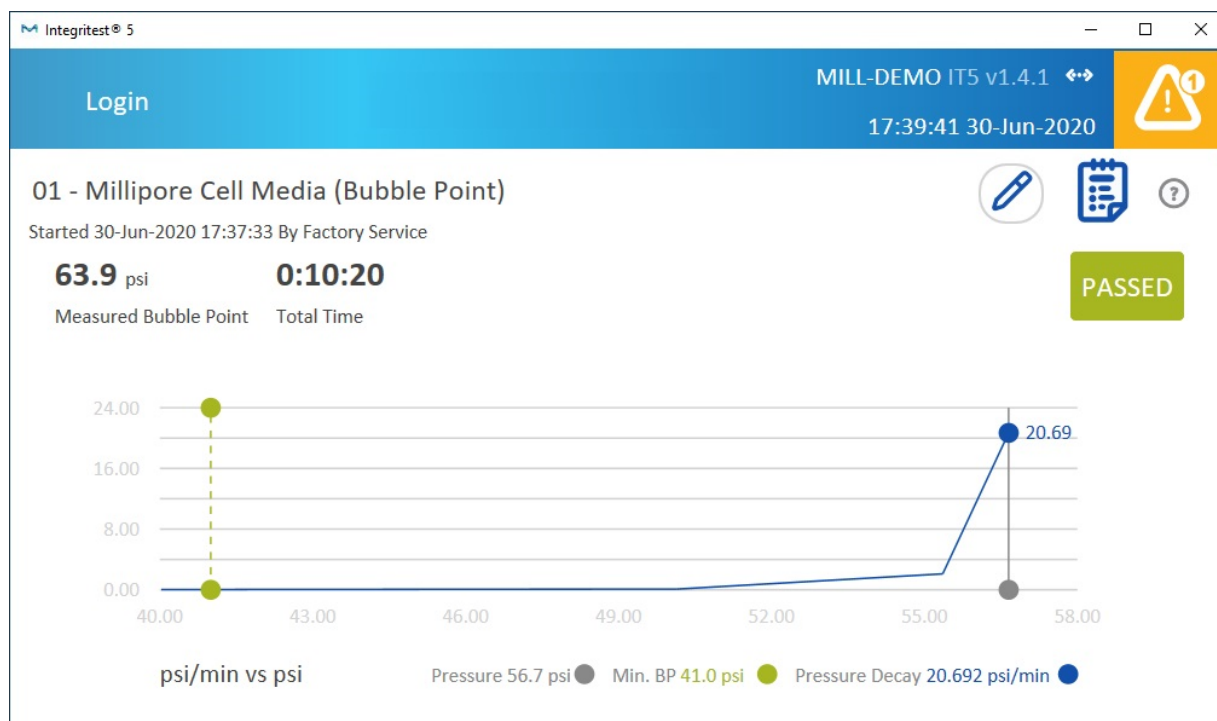
Item	Description
<a href="#">Test Execution</a>  50	The Check_Ready, Start_Test, and Abort_Test test execution methods.
<a href="#">Test Distribution</a>  58	The Upload_test and Download_Test methods used to load test definitions created on IT5s and download them to other IT5s.
<a href="#">Test Creation</a>  61	The Define Bubble Point, Enhanced Bubble Point, Diffusion, HydroCorr, and Pressure Hold test definition methods.






### See Also

[Configuration and Control](#) 10

## 4.2 Automation Home Screen when Idle

The automation home screen when idle (no test running) displays the results of the last test run with the option to log in, view notifications, sign, and view reports.



Item	Description
Login	The Login button is visible when the system is idle and permits IT5 users to log in to the instrument.
	The notifications button is visible when there are notification messages and toggles the display of the active notifications. Administrator and Instrument Management role users may log in to delete notifications.
	Sign the first digital signature (when configured).
	Sign the seconds digital signature (when configured).
	All signatures are complete (when configured).
	View the test report.



Open the on screen help.

---

## See Also

[IT5 Automation Operation](#)  9

[IT5 OPC Test Controller](#)  47

[Test Execution](#)  50

## 4.3 Automation Login for Operators and Supervisors

Automation full control allows IT5 users to log in when the IT5 is idle (not running a test).

Administrator and Instrument Manager role users IT5 functions are unchanged.

Operator and Supervisor role users are limited to accessing the Reports menu to permit viewing, printing, and signing reports. The Reports list is unchanged from the IT5.

Start Date	Test Name	Batch#/Material#	Status	Sign
03-Sep-2020 09:59:44	. Enhanced Bub...	112	✓	
03-Sep-2020 09:34:05	. ExtBP		!	
03-Sep-2020 08:56:06	. ExtBP		✓	
03-Sep-2020 08:55:31	. ExtBP		!	
02-Sep-2020 18:26:33	. ExtBP	RH1	!	

1-5 of 245 reports

Item	Description
Reports	The list of reports run on the instrument.
	Access the user profile menu that permit the user to logout and perform administrative functions.
	Open the on screen help.

### See Also

[IT5 Automation Operation](#) <sup>9</sup>

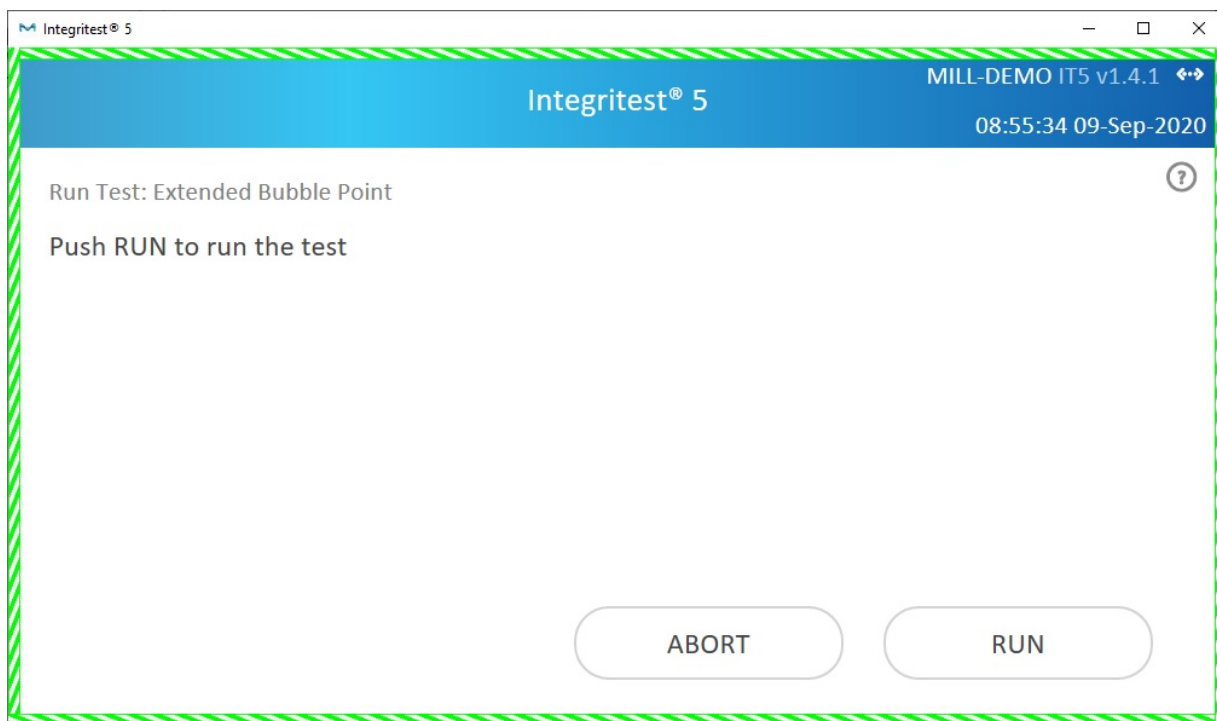
[IT5 OPC Test Controller](#) <sup>47</sup>

[IT5-OPC Results Monitor](#) <sup>79</sup>

## 4.4 Start Test without Credentials

The start test function without authentication displays the start test screen that permits the user to run or abort the test.

The Start\_Test Operator\_Name parameter can be supplied to be displayed on test reports and in the automation status registers.



Item	Description
Caption	The Start_Caption supplied in the Start_Test call or the default caption.
Message	The Start_Message supplied in the Start_Test call or the default message.
ABORT	Aborts the test.
RUN	Runs the test and proceeds to the Prompts, when defined, and the start confirmation screen.

### See Also

[Abort\\_Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

[IT5 OPC Test Controller](#) <sup>47</sup>

[Test Execution](#) <sup>50</sup>

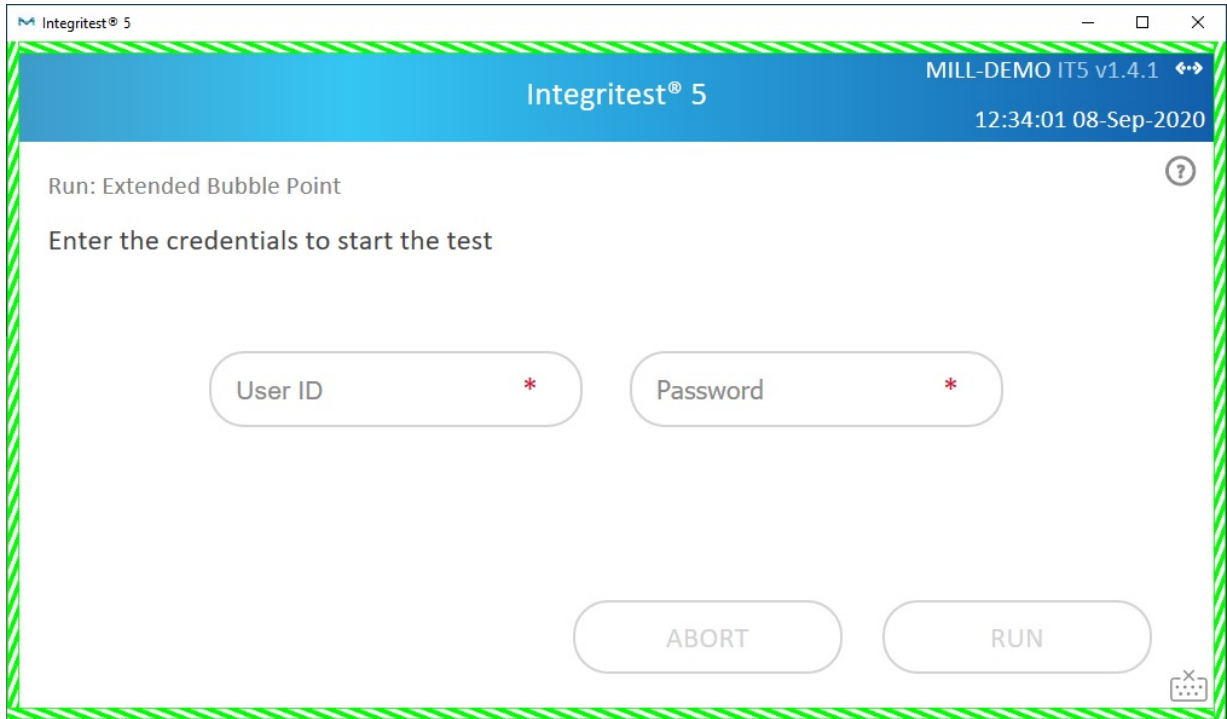
[IT5-OPC Results Monitor](#) <sup>79</sup>

## 4.5 Start Test with Credentials

The OPC start test function with credentials displays the start test dialog that requires the IT5 user and password required to run or abort the test execution.

The user starting the test is reported to the control system in the Operator\_Name status register.

The user supplied is displayed on test reports and in the automation status registers.



Item	Description
Caption	The Start_Caption supplied in the Start_Test call or the default caption.
Message	The Start_Message supplied in the Start_Test call or the default message.
User ID	The IT5 user ID starting the test.
Password	The password for the user starting the test.
ABORT	Aborts the test.
RUN	Runs the test and proceeds to the Prompts, when defined, and the start confirmation screen.

Note: The system is blocked from all operations until one of the following:

- The user selects ABORT with credentials
- The user selects RUN with credentials

- The control system issues an Abort call.

## See Also

[Start Test](#)  52

[Abort Test](#)  54

[IT5 Automation Operation](#)  9

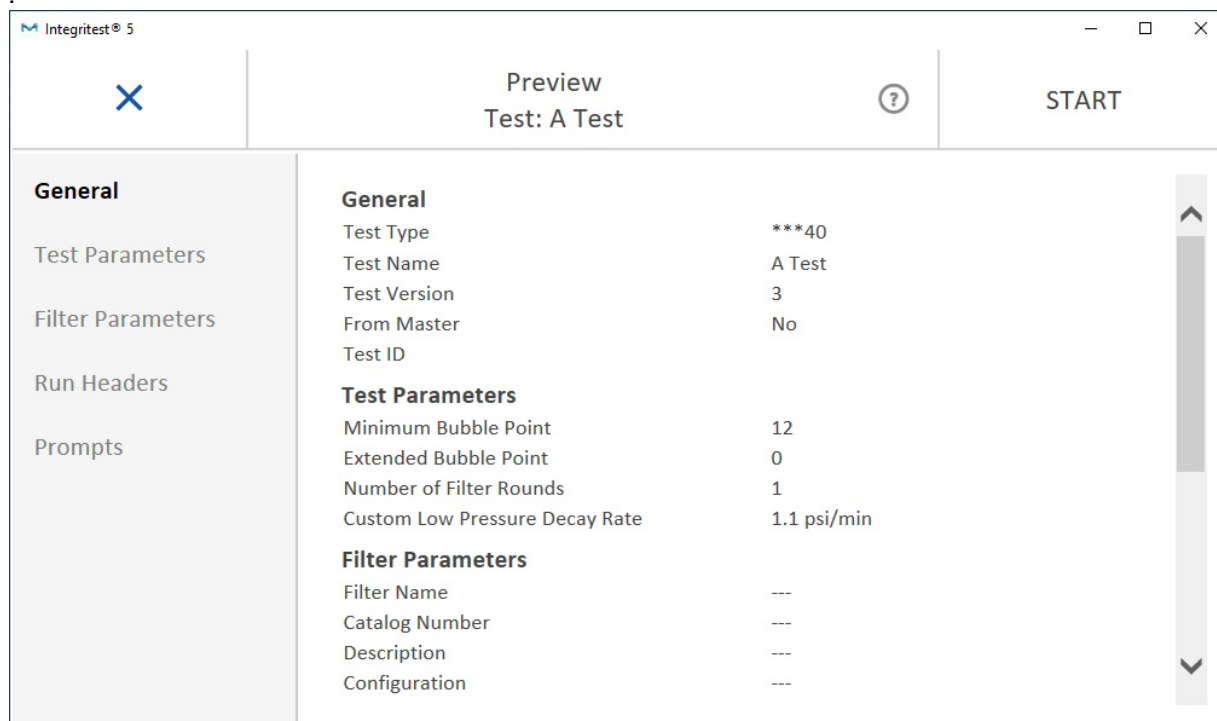
[IT5 OPC Test Controller](#)  47

[Test Execution](#)  50

[IT5-OPC Results Monitor](#)  79

## 4.6 Start Test Run Confirmation Screen

The start confirmation screen is unchanged from the standard IT5 screen.



Item	Description
X	Returns to the Run screen. If started with credentials, the user will have to provide credentials to continue.
START	Begins the test execution.

### See Also

[Start Test](#) <sup>52</sup>

[Abort Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

[IT5 OPC Test Controller](#) <sup>47</sup>

[Test Execution](#) <sup>50</sup>

[IT5-OPC Results Monitor](#) <sup>79</sup>



## 4.7 Start Test with Auto-Run

---

The Start\_Test AutoStart parameter permits starting a test without user intervention in a fully automated environment.

When the AutoStart is set to true, the following actions occur:

- The Run Screen is bypassed so there are no credentials required.
- When there are no prompts in the test definition, the start test confirmation screen is bypassed and execution begins immediately.
- When there are prompts in the test definition, the first Prompt Screen is shown and the confirmation screen is not bypassed.

### See Also

[Start\\_Test](#)  52

[IT5 Automation Operation](#)  9

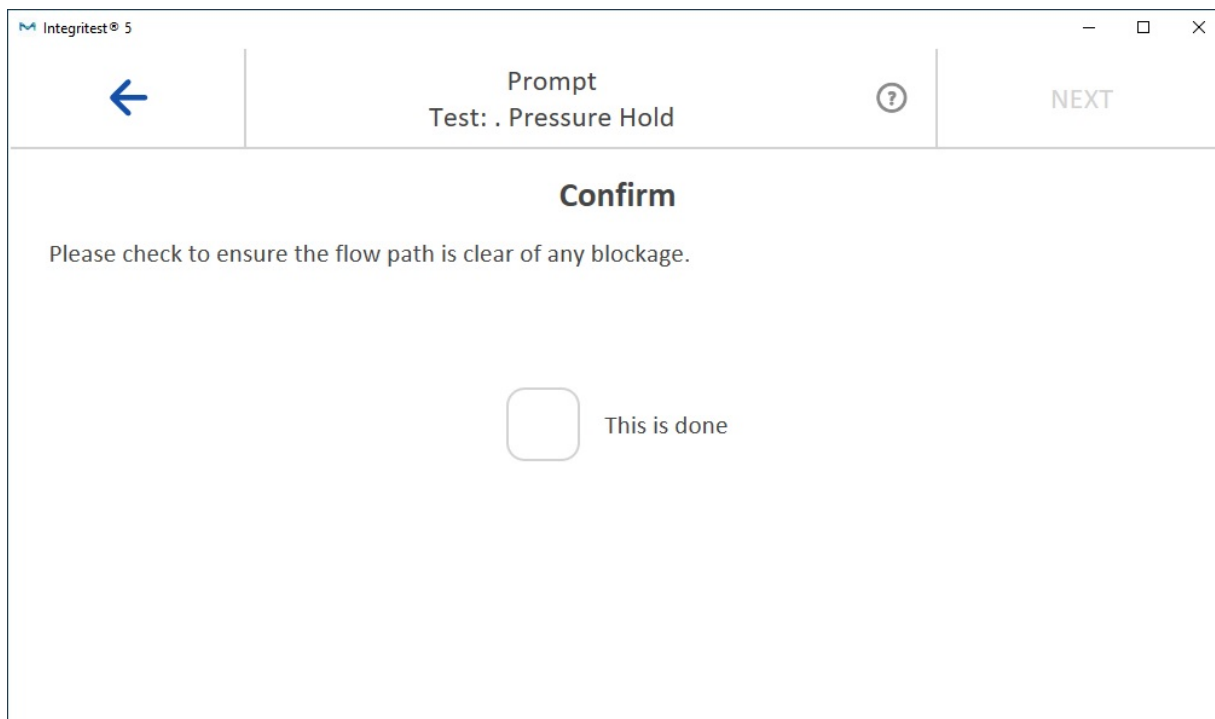
[IT5 OPC Test Controller](#)  47


[Test Execution](#)  50

[IT5-OPC Results Monitor](#)  79

## 4.8 Test Prompt Handling

Test prompts are specified in the test definition. When test is started with defined prompts, the RUN button proceeds to the to the first Prompt Screen. The Prompt Screens are unchanged from the standard IT5 screens.



Item	Description
	Returns to the previous screen. When returning to the Run Screen and started with credentials, the user will have to provide credentials to continue.
NEXT	Proceeds to the next screen which is either the next prompt or the start Confirmation Screen.
Prompt	The prompt defined in the test. Prompts are remembered when the test times-out. Once the RUN is pressed, all text prompt responses are remembered. Checkbox prompts are not remembered because checking them is the method most often used to advance to the next screen.

### See Also


[Start Test](#) <sup>52</sup>

[Abort Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

[IT5 OPC Test Controller](#) <sup>47</sup>

[Test Execution](#) <sup>50</sup>

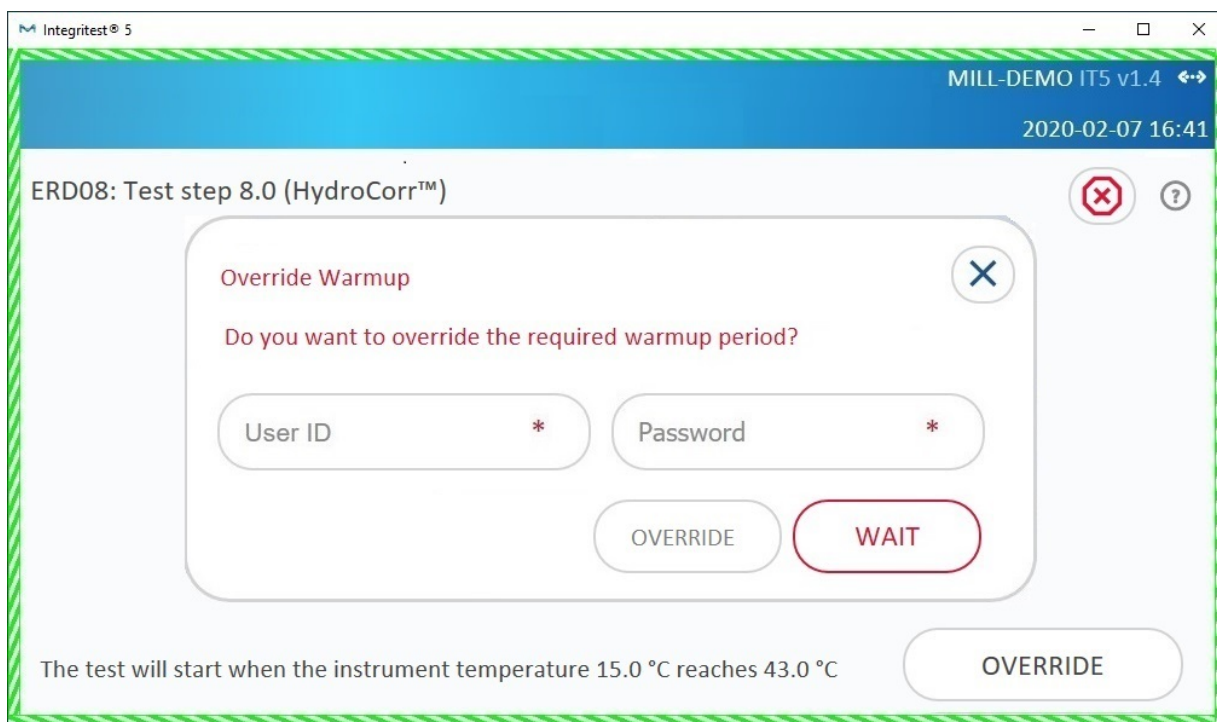
[IT5-OPC Results Monitor](#) 

## 4.9 Temperature Override Confirmation

IT5 Test start waits for the instrument temperature to stabilize. When the Start\_Test Override option is false, the override button is shown.

For tests started without credentials, the override confirmation also does not require credentials and the standard override confirmation is shown.

For tests started with credentials, the override confirmation (shown below) also requires credentials.



Item	Description
User ID	The IT5 user ID overriding temperature stabilization.
Password	The IT5 password for the user overriding temperature stabilization.
OVERRIDE	Confirms and override and starts test execution.
WAIT	Closes the override dialog and waits for temperature stabilization before starting the test.

### See Also

[Start\\_Test](#) <sup>52</sup>

[Abort\\_Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

[IT5 OPC Test Controller](#) <sup>47</sup>

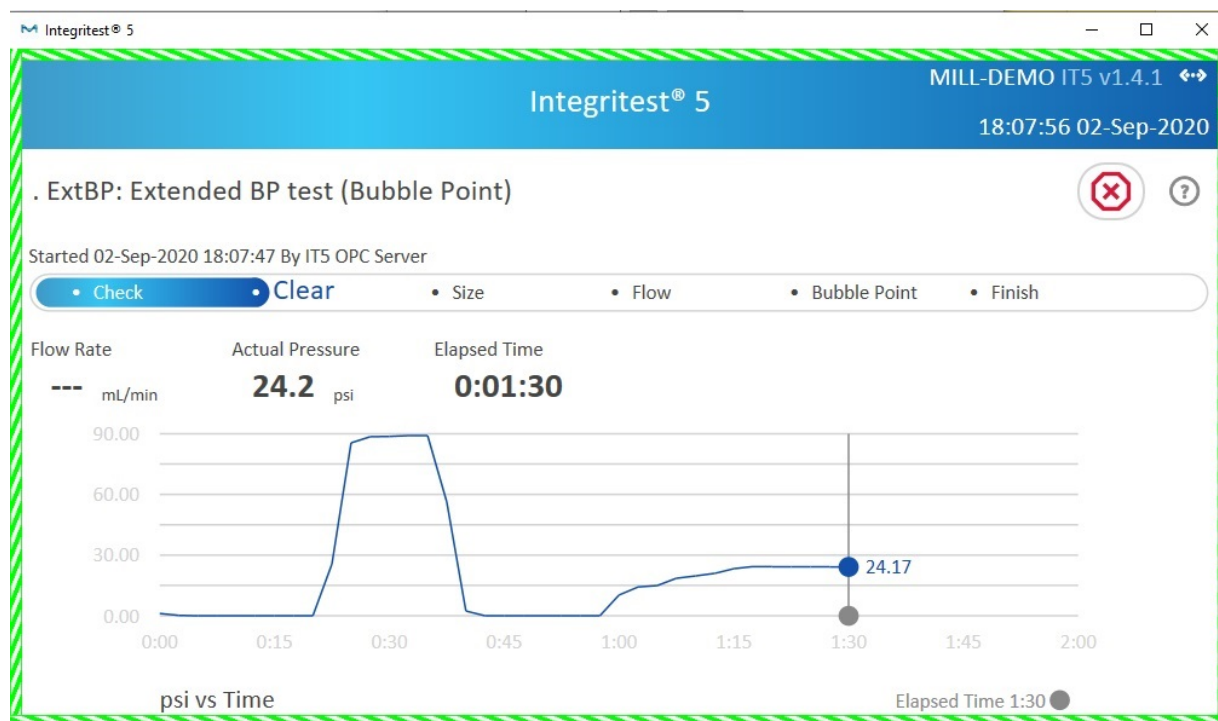
[Test Execution](#) 50



[IT5-OPC Results Monitor](#) 79

## 4.10 Automation Home Screen with Running Test

The automation home screen when a test is running displays the test execution state with the option to log abort the test.

When the test completes, the home screen displays the results from the last test run.



Item	Description
	Abort the test. Tests started with credentials require authentication to abort.
	Open the on screen help.

### See Also

[Abort Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

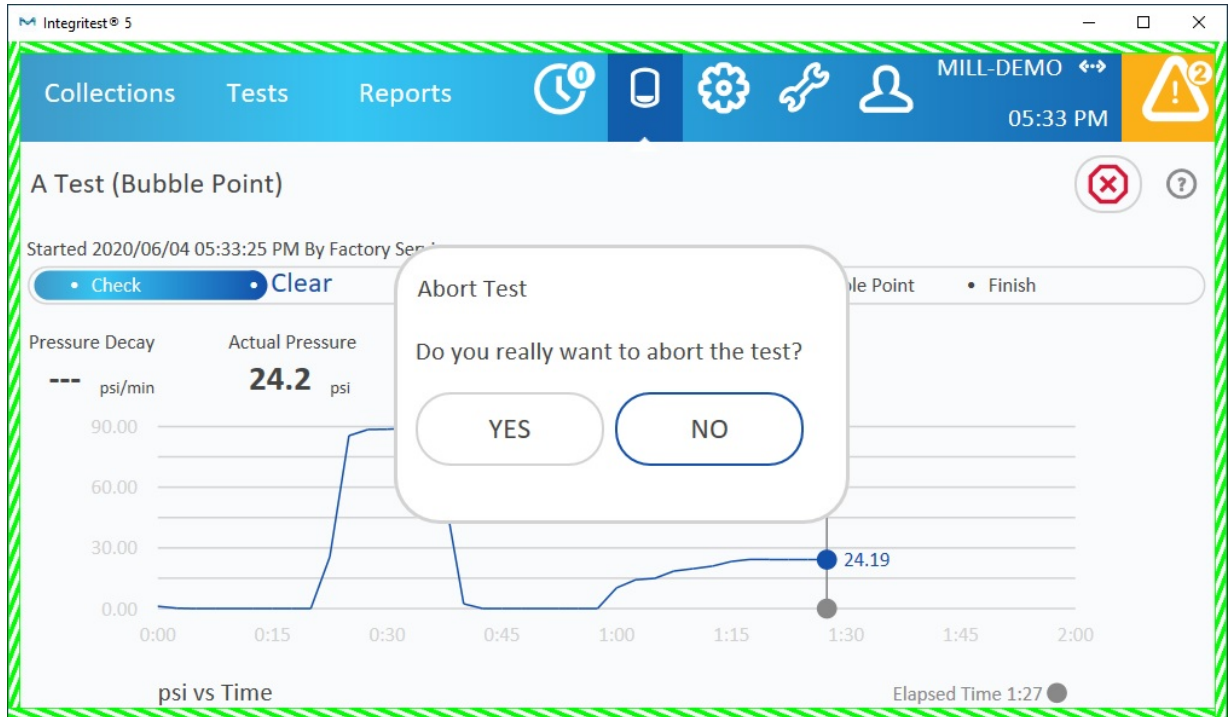
[IT5 OPC Test Controller](#) <sup>47</sup>

[Test Execution](#) <sup>50</sup>

[IT5-OPC Results Monitor](#) <sup>79</sup>

## 4.11 Abort Test without Credentials

The abort test confirmation dialog is shown without requiring user credentials for tests started without credentials, Start\_Test with Require\_Credentials set to false.



Item	Description
YES	Aborts the test.
NO	Does not abort the test allowing test execution to continue.

### See Also

[Start\\_Test](#) <sup>52</sup>

[Abort\\_Test](#) <sup>54</sup>

[IT5 Automation Operation](#) <sup>9</sup>

[IT5 OPC Test Controller](#) <sup>47</sup>

[Test Execution](#) <sup>50</sup>

[IT5-OPC Results Monitor](#) <sup>79</sup>

## 4.12 Abort Test with Credentials

---

The abort test confirmation dialog is shown requiring user credentials for tests started with credentials, Start\_Test with Require\_Credentials set to true.



Item	Description
User ID	The IT5 user ID aborting the test.
Password	The password for the user aborting the test.
YES	Aborts the test.
NO	Does not abort the test allowing test execution to continue.

### See Also

[Start\\_Test](#) 52

[Abort\\_Test](#) 54

[IT5 Automation Operation](#) 9

[IT5 OPC Test Controller](#) 47

[Test Execution](#) 50

[IT5-OPC Results Monitor](#) 79



## 5 Getting Started

Any IT5 with software version 1.4.2 or greater comes installed with the IT5 automation software. Instruments require a license key to enable automation. The IT5 simulator is pre-configured with the automation license.

The IT5 simulator is the recommended method to integrate and test IT5 automation. The IT5 simulator is installed using the IT5 application available for download.

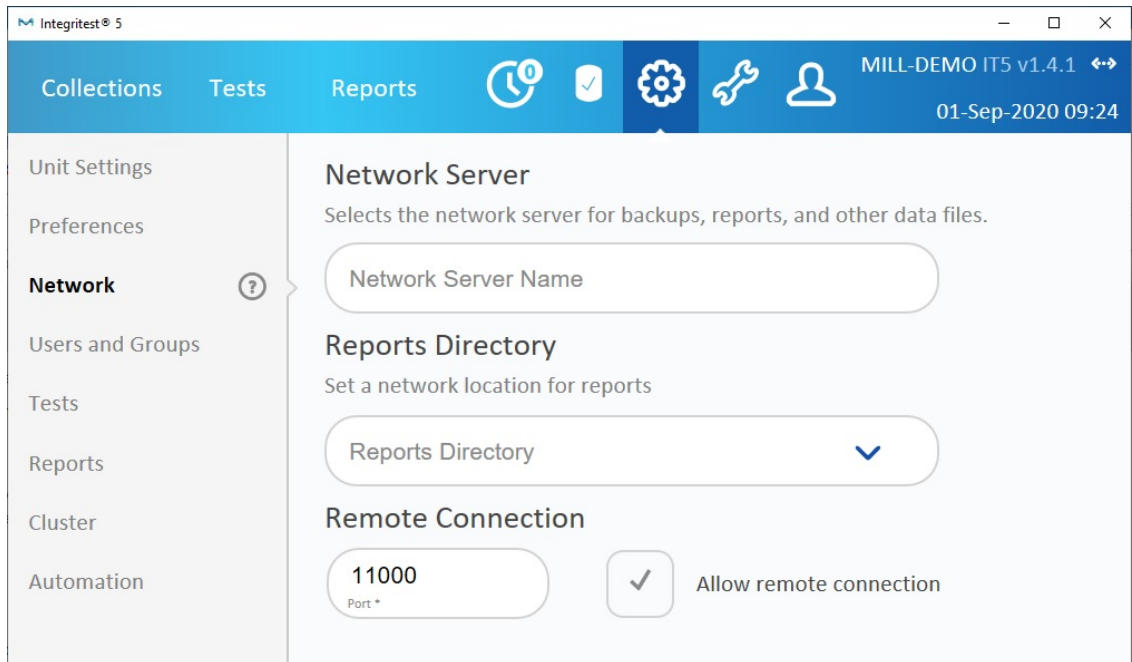
### Automation Requirements

When enabled, automation starts a OPC-UA server process that communicates with the IT5 Remote Connection Port and therefore must be run with an Administrator (elevated) process. The IT5 instrument runs elevated so this is not an issue but the simulator must be installed and run as an Administrator login.

Automation, on the IT5 and simulator, requires two ports opened (not blocked) by the Windows firewall software:

- The OPC-UA server port 62480.
- The Remote connection port, normally 11000.

Consult the IT5 Network settings for the Remote Connection port setting.



### Set up the Simulator in Windows

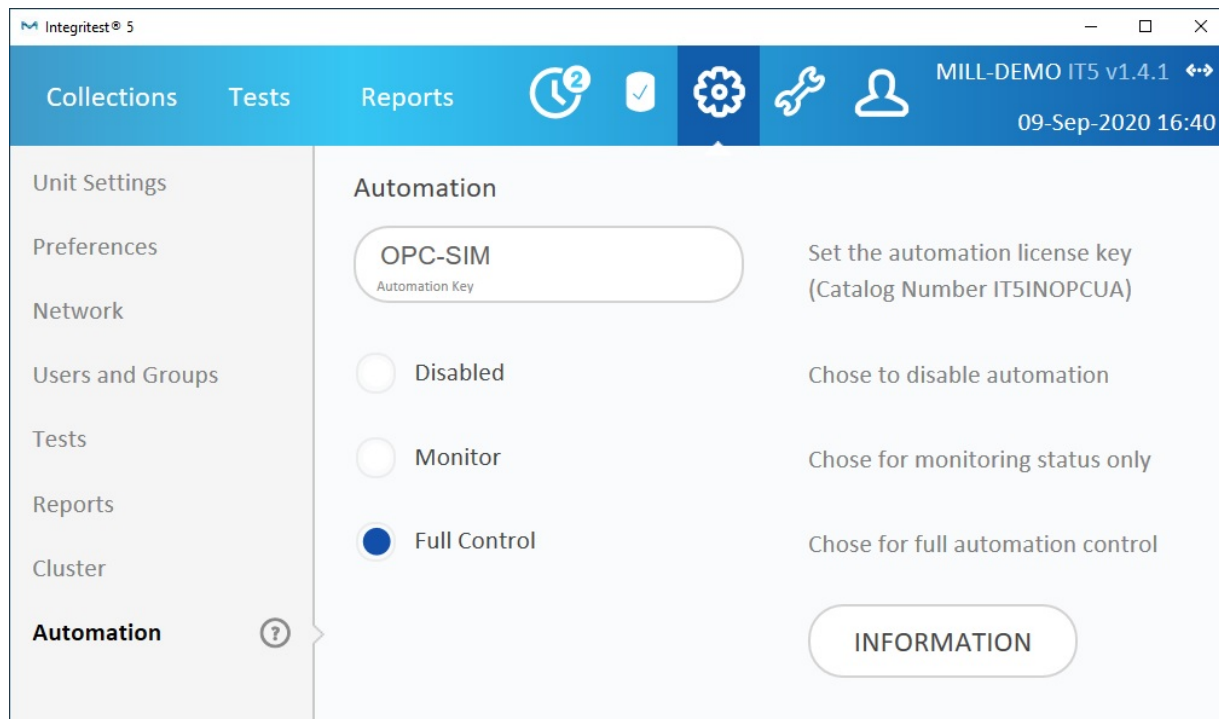
To get started with the Simulator:

1. Obtain the IT5 Application Install.
2. Create a dedicated account with administrator (elevated) privileges on a Windows system.
3. Log in to the dedicated administrator account.

4. Install the IT5 application software.

## Enable Automation

Enable Full Control on the simulator or instrument. Instruments require a supplied license key.



Press the information button to display the URL required to access the OPC-UA automation server from an OPC client. The URL is also copied to the file system to allow cut-and-paste.



## Open Firewall Ports

Configure the Windows firewall to assure that the Remote Connection port (normally 11000) and the OPC-UA server port 62480 are opened.

## Test Remote Access

Test the remote connection using Windows IE or Edge browser to access the IT5. The IT5 URL is the computer name followed by the port.

For example for a computer named IT5001 using the default port, the URL is <http://IT5001:11000>.

## See Also

[OPC-UA Client Access](#) 

## 6 Testing with UAExpert

---

The IT5 OPC-UA Automation server is accessible by any OPC-UA client. Free clients are provided by many OPC-UA vendors.

Download the install UAExpert OPC-UA client available here: <https://www.unified-automation.com/downloads/opc-ua-clients.html>.

At this point, the IT5 should have automation enabled in Full Control mode to test the client access.

### See Also

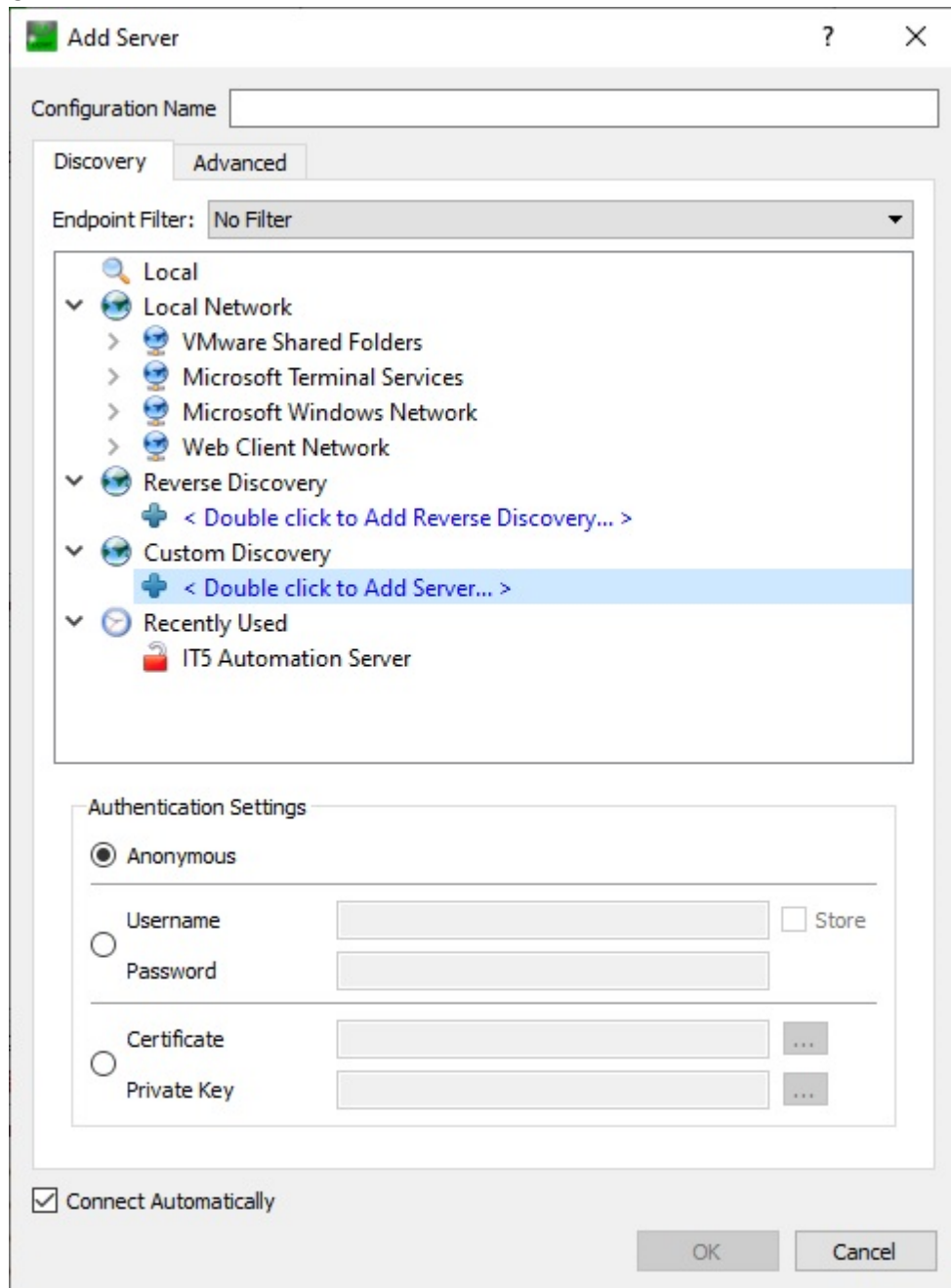
[Getting Started](#)  29

[Configuration and Control](#)  10

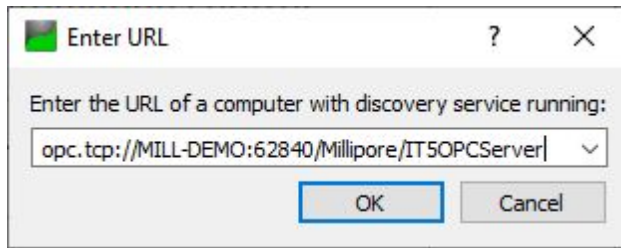
## 6.1 Configuring UAExpert

This section illustrates how to configure the UAExpert software to access the IT5 automation server.

1. Make sure the IT5 or simulator is running.
2. Run UAExpert.
3. Click on the Plus button to add a new server.

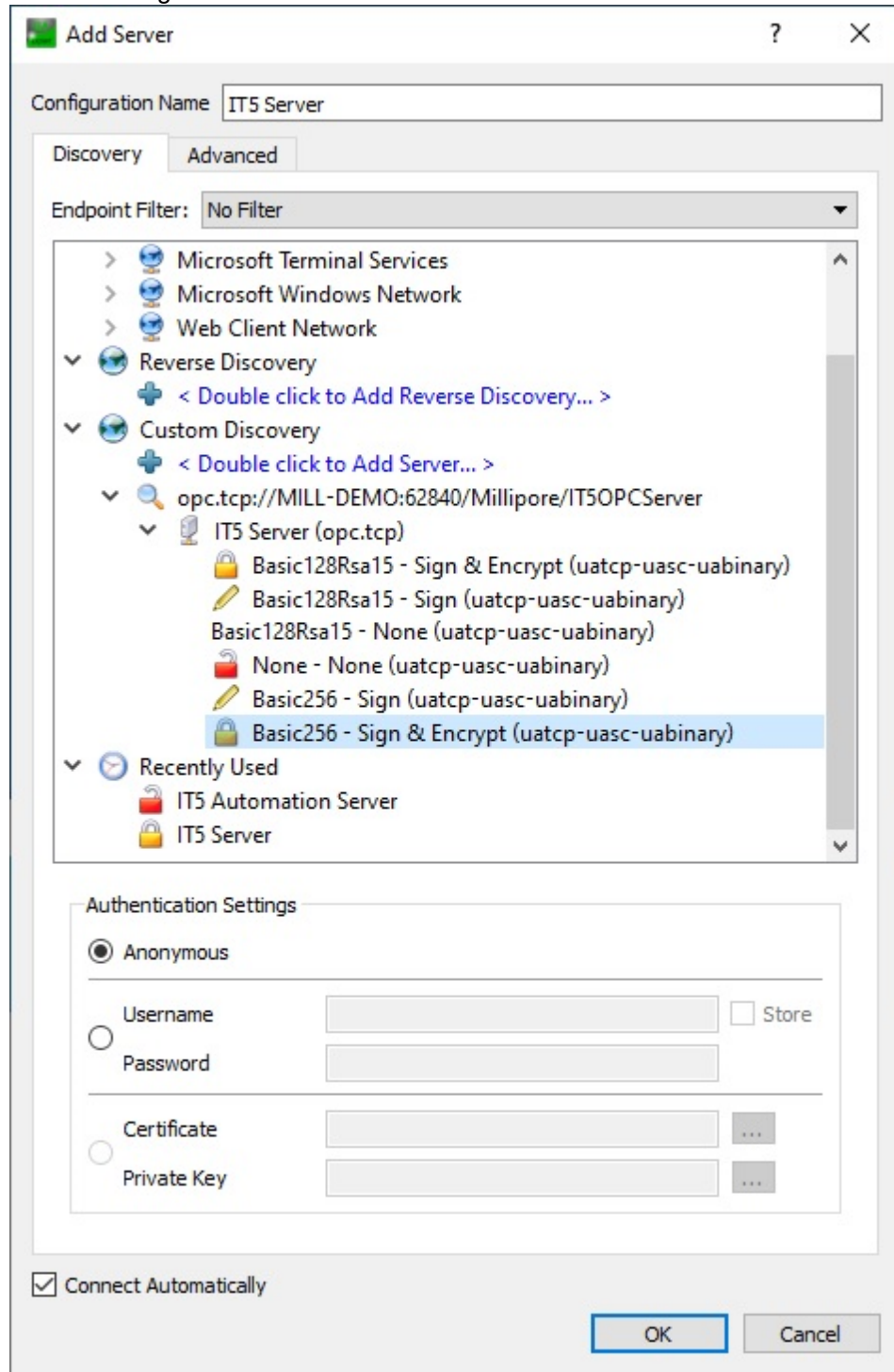


4. Double-click on <Double click to Add Server...> and enter the IT5 Automation URL and Select OK.



5. Select the URL entered listed in the Custom Discovery section.
6. The URL now appears below.
7. Expand the IT5 URL fully and select the "Basic256 - Sign & Encrypt" for security.
8. Select Connect Automatically to connect to the server when the dialog closes.

9. Set the Configuration Name desired.

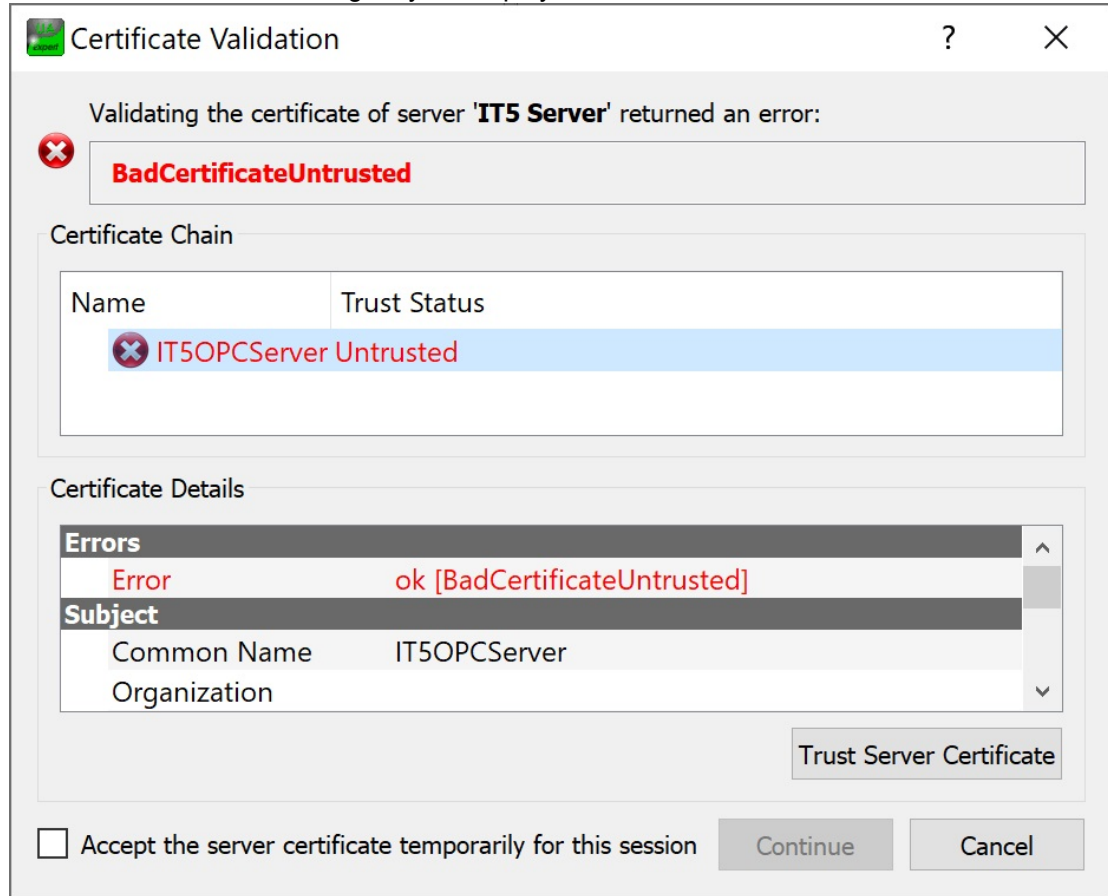


10. Select OK.

It may be necessary to trust the IT5 OPC-UA server certificate.

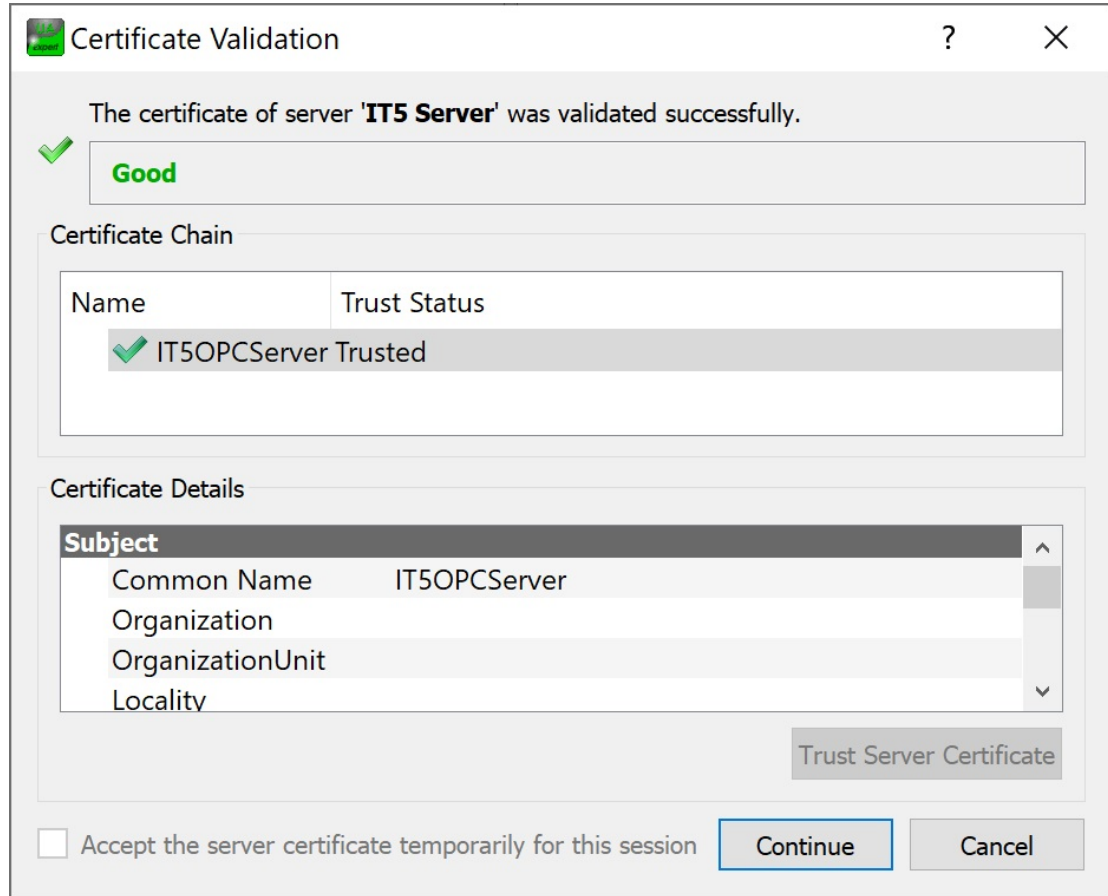
If the Certificate Validation dialog is shown, follow steps 11 through 13 to trust the IT5 OPC-UA server certificate.

11. A Certificate Validation dialog may be displayed.





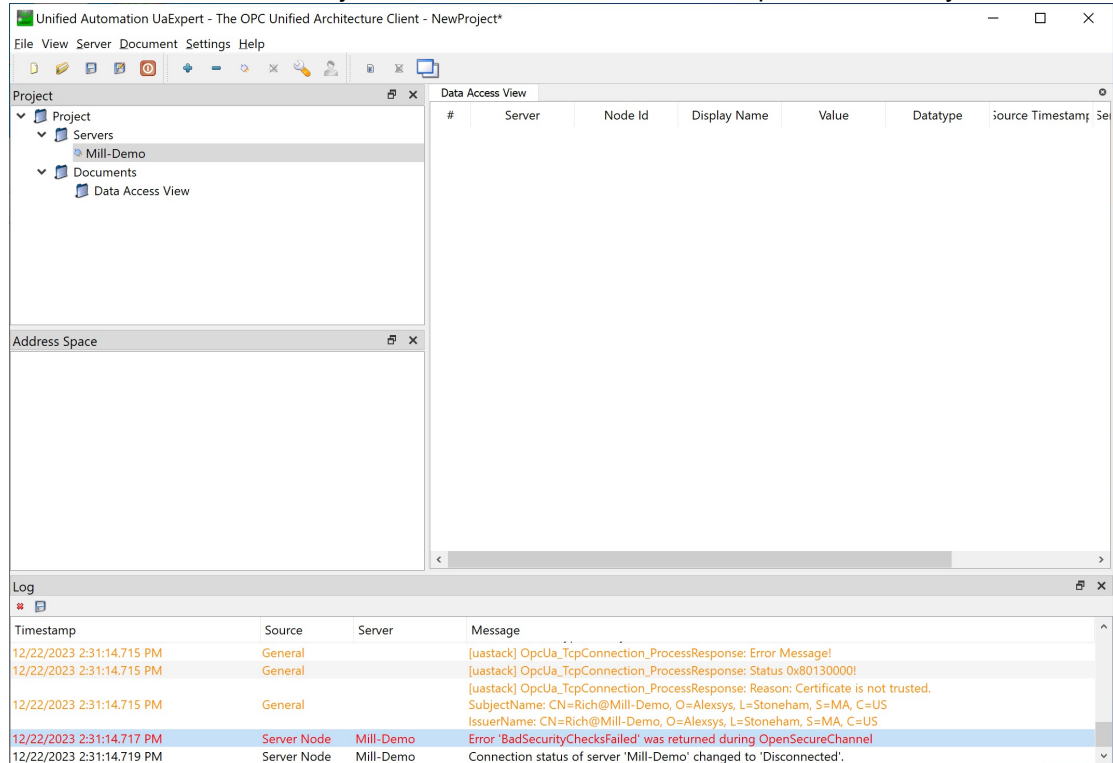
## 12. Select Trust Server Certificate.



## 13. Select Continue.

## 14. Right Click on the Mill-Demo (new connection) and select Connect.

15. If the client connection is rejected, an error is shown, for example "BadSecurityChecksFailed".



16. Proceed to IT5 Certificate Management section to configure the IT5 OPC-UA server to accept the client application certificate.

## See Also

[Testing with UAExpert](#) ➔32

[IT5 Certificate Management](#) ➔44

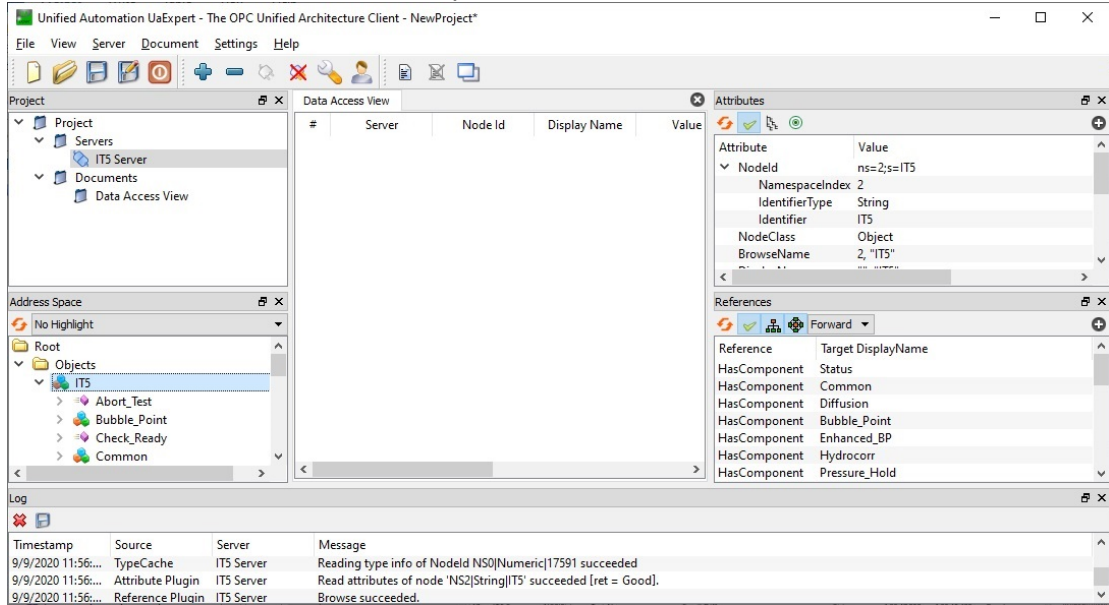
[Test Controller](#) ➔47

[Status Codes](#) ➔98

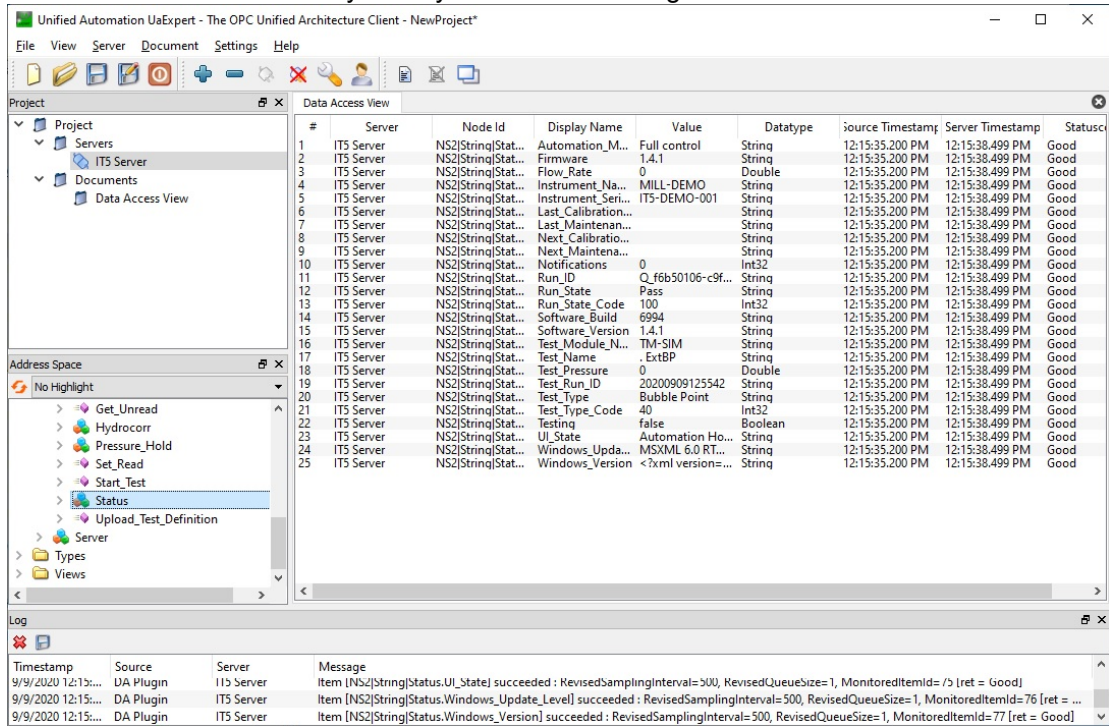
## 6.2 Viewing IT5 Status

The IT5 status can be viewed using the following procedure:

1. If not connected, right-click and select Connect to the IT5 OPC server.
2. Select the IT5 node in the Address Space section:



3. Optionally, close the Attributes and References sections.
4. In the Address Space section for IT5, scroll down and select "Status" and drag it to the Data Access View window. Note: you may also chose to drag individual items.



5. Verify the Instrument name and other data is displayed.

6. Select File | Save to save this configuration to a UAExpert project file, for example, IT5Testing.uap.

## See Also

[Testing with UAExpert](#) →32

[Test Controller](#) →47

[Status Codes](#) →98

## 6.3 Starting a Test

Start a Test on the IT5 using the following procedure:

1. Log out of the IT5 to display the Automation home screen.
2. If not running and connected, Run UAExpert and load the IT5Testing.uap configuration file and connect to the server.
3. Select the IT5 Server.
4. Select IT5 in the Address Space window, scroll, and select the Start\_Test method.

The screenshot shows the Unified Automation UAExpert interface. The main window displays the Data Access View for the IT5 Server, listing various nodes and their values. The Address Space window is open, showing a tree view of the server's address space. The 'Start\_Test' method is highlighted in the tree view. The Log window at the bottom shows the results of the test execution, indicating that the test was successful.

#	Server	Node Id	Display Name	Value	Datatype	Source Timestamp	Server Timestamp	Status
1	IT5 Server	NS2 String Stat...	Automation_M...	Full control	String	12:15:35.200 PM	12:15:38.499 PM	Good
2	IT5 Server	NS2 String Stat...	Firmware	1.4.1	String	12:15:35.200 PM	12:15:38.499 PM	Good
3	IT5 Server	NS2 String Stat...	Flow_Rate	0	Double	12:15:35.200 PM	12:15:38.499 PM	Good
4	IT5 Server	NS2 String Stat...	Instrument_Na...	MILL-DEMO	String	12:15:35.200 PM	12:15:38.499 PM	Good
5	IT5 Server	NS2 String Stat...	Instrument_Seri...	IT5-DEMO-001	String	12:15:35.200 PM	12:15:38.499 PM	Good
6	IT5 Server	NS2 String Stat...	Last_Calibration...		String	12:15:35.200 PM	12:15:38.499 PM	Good
7	IT5 Server	NS2 String Stat...	Last_Maintenan...		String	12:15:35.200 PM	12:15:38.499 PM	Good
8	IT5 Server	NS2 String Stat...	Next_Calibratio...		String	12:15:35.200 PM	12:15:38.499 PM	Good
9	IT5 Server	NS2 String Stat...	Next_Maintena...		String	12:15:35.200 PM	12:15:38.499 PM	Good
10	IT5 Server	NS2 String Stat...	Notifications	0	Int32	12:15:35.200 PM	12:15:38.499 PM	Good
11	IT5 Server	NS2 String Stat...	Run_ID	Q_f6b50106-c9f...	String	12:15:35.200 PM	12:15:38.499 PM	Good
12	IT5 Server	NS2 String Stat...	Run_State	Pass	String	12:15:35.200 PM	12:15:38.499 PM	Good
13	IT5 Server	NS2 String Stat...	Run_State_Code	100	Int32	12:15:35.200 PM	12:15:38.499 PM	Good
14	IT5 Server	NS2 String Stat...	Software_Build	6994	String	12:15:35.200 PM	12:15:38.499 PM	Good
15	IT5 Server	NS2 String Stat...	Software_Version	1.4.1	String	12:15:35.200 PM	12:15:38.499 PM	Good
16	IT5 Server	NS2 String Stat...	Test_Module_N...	TM-SIM	String	12:15:35.200 PM	12:15:38.499 PM	Good
17	IT5 Server	NS2 String Stat...	Test_Name	.ExtBP	String	12:15:35.200 PM	12:15:38.499 PM	Good
18	IT5 Server	NS2 String Stat...	Test_Pressure	0	Double	12:15:35.200 PM	12:15:38.499 PM	Good
19	IT5 Server	NS2 String Stat...	Test_Run_ID	20200909125542	String	12:15:35.200 PM	12:15:38.499 PM	Good
20	IT5 Server	NS2 String Stat...	Test_Type	Bubble Point	String	12:15:35.200 PM	12:15:38.499 PM	Good
21	IT5 Server	NS2 String Stat...	Test_Type_Code	40	Int32	12:15:35.200 PM	12:15:38.499 PM	Good
22	IT5 Server	NS2 String Stat...	Testinq	false	Boolean	12:15:35.200 PM	12:15:38.499 PM	Good
23	IT5 Server	NS2 String Stat...	UI_State	Automation Ho...	String	12:15:35.200 PM	12:15:38.499 PM	Good
24	IT5 Server	NS2 String Stat...	Windows_Upda...	MSXML 6.0 RT...	String	12:15:35.200 PM	12:15:38.499 PM	Good
25	IT5 Server	NS2 String Stat...	Windows_Version	<?xml version=...	String	12:15:35.200 PM	12:15:38.499 PM	Good

Timestamp	Source	Server	Message
9/9/2020 12:13:...	UA Plugin	IT5 Server	Item [NS2 String Status.Windows_Version] succeeded : RevisedSamplingInterval=300, RevisedQueueSize=1, MonitoredItemId= // [ret = Good]
9/9/2020 12:29:...	Attribute Plugin	IT5 Server	Read attributes of node 'NS2 String IT5.Start_Test' succeeded [ret = Good].
9/9/2020 12:29:...	Reference Plugin	IT5 Server	Browse succeeded.

## 5. Right-Click the Start\_Test method and select Call...

Call Start\_Test on IT5

Starts the execution of a predefined IT5 test.

**Input Arguments**

Name	Value	Data Type	Description
Test_Name	<input type="text"/> ... Load file...	String	The IT5 test name or test id (GUID).
Override	<input type="checkbox"/>	Boolean	The option to override the wait for temperature stability.
Start_Caption	<input type="text"/> ... Load file...	String	The optional start dialog caption.
Start_Message	<input type="text"/> ... Load file...	String	The optional start dialog message.
Require_Credentials	<input type="checkbox"/>	Boolean	When true, requires the user name and password for the operator.
Run_Timeout	<input type="text"/>	Int32	When started with credentials, the number of inactive minutes before the user must authenticate.
AutoStart	<input type="checkbox"/>	Boolean	When true, bypasses the start dialog and confirmation screens.
Run_Header_1	<input type="text"/> ... Load file...	String	The optional run header 1.
Run_Header_2	<input type="text"/> ... Load file...	String	The optional run header 2.
Run_Header_3	<input type="text"/> ... Load file...	String	The optional run header 3.
Run_Header_4	<input type="text"/> ... Load file...	String	The optional run header 4.
Run_Header_5	<input type="text"/> ... Load file...	String	The optional run header 5.
Run_Header_6	<input type="text"/> ... Load file...	String	The optional run header 6.
Operator_Name	<input type="text"/> ... Load file...	String	The value to use for the operator name for reports when credentials are not required.

**Output Arguments**

Name	Value	Data Type	Description
Status	<input type="text"/>	Int32	Zero is returned when there is no error.
Message	<input type="text"/> ... Save as...	String	The message returned when there is an error reported.
Run_ID	<input type="text"/> ... Save as...	String	The test run ID.

**Result**

6. Enter the name of a test configured on the IT5 or simulator.
7. Select Call to start the test.
8. Inspect the call result status for proper execution (0 result) and record the Run ID.
9. Select Close.
10. View the Status node in UAExpert to monitor the test execution progress.

## See Also

[Testing with UAExpert](#) <sup>32</sup>

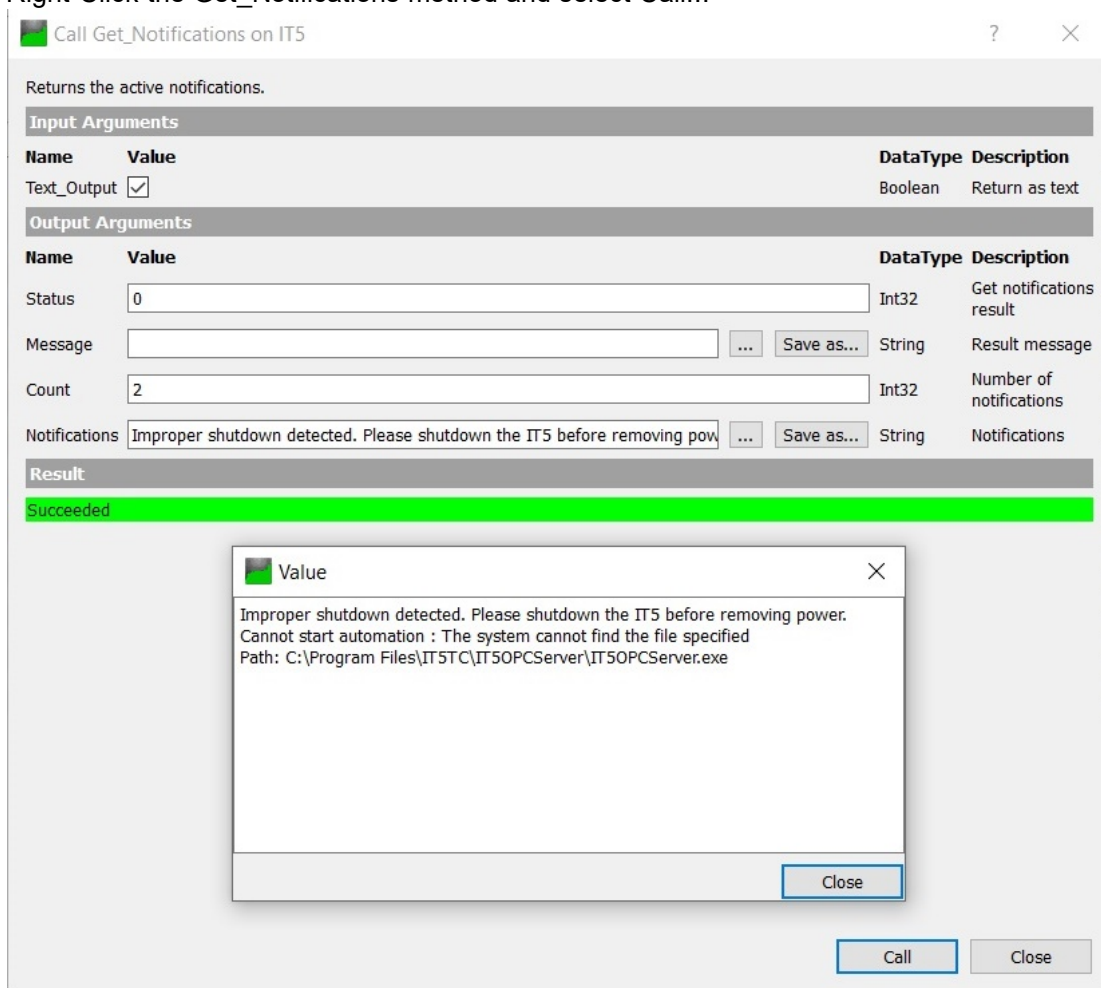
[Test Controller](#) <sup>47</sup>

[Status Codes](#) <sup>98</sup>

## 6.4 Testing Get Notifications

Test obtaining notifications from the IT5 using the following procedure:

1. If not running and connected, Run UAExpert and load the IT5Testing.uap configuration file and connect to the server.
2. Right-Click the Get\_Notifications method and select Call...



3. Select Call to obtain the notifications. There may be no notifications, in this case this is the correct result.
4. Inspect the results shown.
5. Select Close.

### See Also

[Testing with UAExpert](#) <sup>32</sup>

[Test Controller](#) <sup>47</sup>

[Status Codes](#) <sup>98</sup>

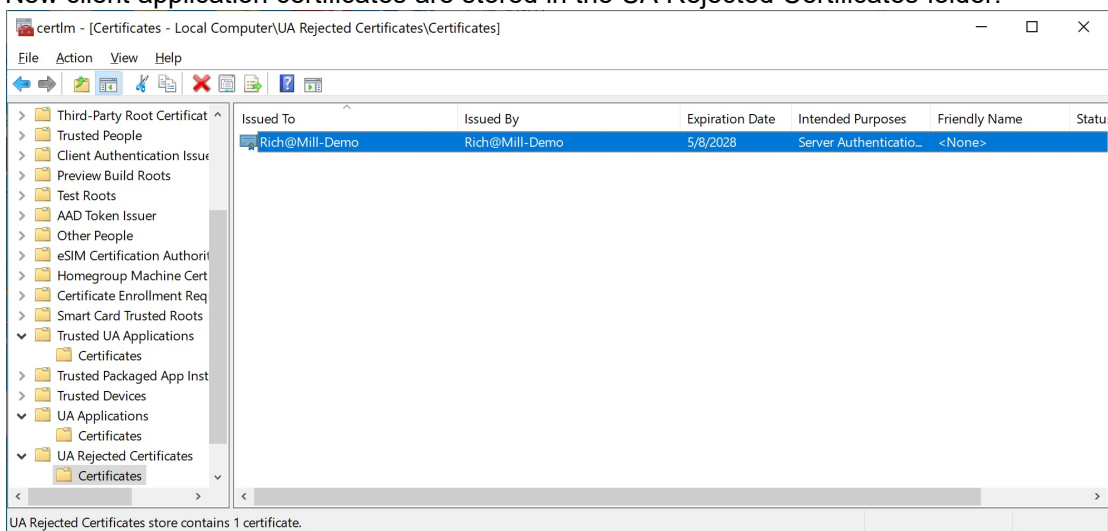


## 7 IT5 Certificate Management

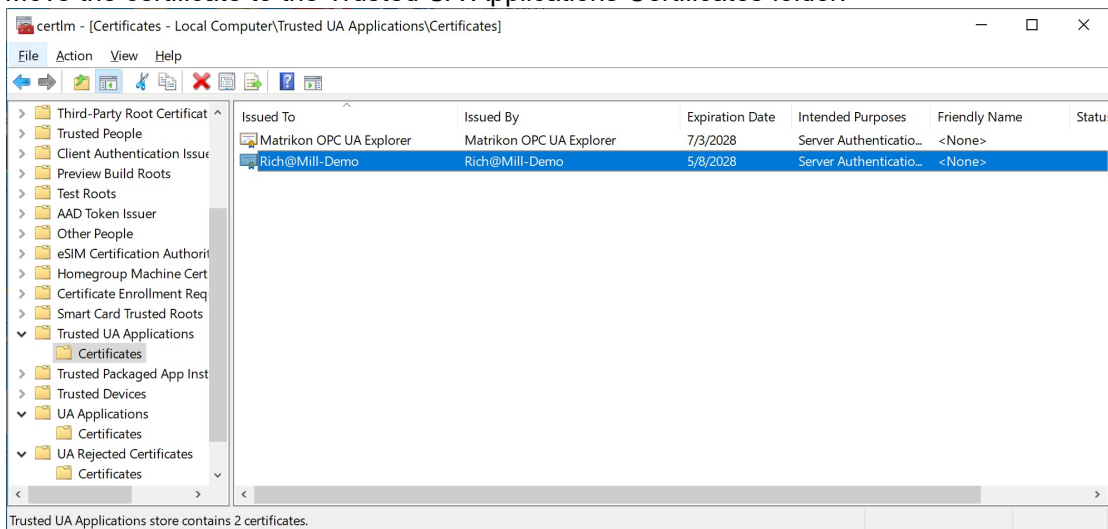
This section illustrates how to configure the IT5 OPC-UA server to accept the client application certificate.

A UA-Client (such as UAExpert) sends a certification to the IT5 when the connection is first configured and the IT5 is trusted by the client.

1. Access Windows from the IT5.
2. Log in as a Local Administrator.
3. Run "certlm.msc". to access to the Manage Computer Certificates application.
4. New client application certificates are stored in the UA Rejected Certificates folder.



5. Move the certificate to the Trusted UA Applications Certificates folder.



6. Connect from the UA application.

If the UA client connect issues persist, please contact support for additional assistance.

[See Also](#)



[Configuration and Control](#)  10

[Getting Started](#)  29

## 8 IT5 OPC Organization

---

The IT5 OPC root node is called IT5 all IT5 status nodes and methods are directly under this root IT5 node.

Data nodes and methods are often listed alphabetically by OPC-UA clients.

This document organizes the nodes into two functional categories.

---

### [IT5 OPC Test Controller](#)

The methods are used to start tests, distribute tests, and create new test definitions.

---

### [IT5 OPC Results Monitor](#)






The results monitor is used to view the IT5 status, test progress, and test results.

---

## 9 IT5 OPC Test Controller

---

The test controller methods are used to start tests, distribute tests, and create new test definitions.

Item	Description
<a href="#">Test Execution</a> 	Tests the IT5 status, start tests, abort tests, and load test result data.
<a href="#">Test Distribution</a> 	Uploads and downloads tests defined on an IT5.
<a href="#">Test Creation</a> 	Permits the control system to create new Bubble Point, Diffusion, Enhanced Bubble Point, HydroCorr, and Pressure Hold tests.
<a href="#">Audit and Notifications</a> 	Retrieves the IT5 audit log entries and active notifications.
<a href="#">Status Codes</a> 	Contains the standard test execution status codes.

### See Also

[IT5-OPC Results Monitor](#) 

## 9.1 Register Calls

---

Register calls are provided to support OPC-UA client application that do not support methods.

There are register variants for most functions available. The register implementation is provided in a folder.

The folder has the same name as the method with the "\_Registers" suffix.

For example, the Start\_Test method has a corresponding Start\_Test\_Registers folder.

Each Register folder can have the following items.

Item Name	Datatype	Description
Clear	Boolean	When true, sets all Input and Output registers to their default values. The value of Clear is reset to false upon completion of the call.
Execute	Boolean	When true, executes the call using the current Input Register values. The value of Execute is reset to false upon completion of the call.
Input Arguments	Folder	The function specific Input values associated with the call.
Output Arguments	Folder	The standard and function specific values values associated with the call.

The following common output arguments are provided for each function.

Item Name	Datatype	Description
Status	Integer	Zero is returned when there is no error. Refer to Status Codes for more information.
Message	String	The message returned when there is an error reported. If there is no error, the message is blank.

Input Argument string values can be set using arrays to support systems that cannot directly write string values.

For example, DeltaV systems require arrays to set string values.

String values in register calls have the same name Input Argument with the "\_Array" suffix.

Item Name	Datatype	Description
[item]_Array	Array of Uint	<p>The input argument string value that is set using the array. The array is encoded as unsigned integers. The default size is 50 Uint elements. Element zero _Array[0] is the number of characters supplied; Elements 1 to N are the value of each character. The string is in UTF-8 format to support extended character sets.</p> <p>The default size is 50 to support systems that individually set each array element. Systems that can set the send the entire array, may use any size, not limited to 50. When cleared, the arrays is set back to 50 elements.</p> <p>The _Array size is the length of the array, so a 50 element array holds the length plus up to 49 character elements.</p> <p>When set, the value is also displayed in the associated string register.</p>

## 9.2 Test Execution

---

These methods are used to execute tests and retrieve load test results into the OPC registers.

These functions are also available using a collection of registers to support systems that do not support OPC-UA methods.

Item	Description
<a href="#">Check Ready</a> <sup>→51</sup> and <a href="#">Check Ready Registers</a> <sup>→51</sup>	Checks the IT5 readiness to run a test.
<a href="#">Start Test</a> <sup>→52</sup> and <a href="#">Start Test Registers</a> <sup>→52</sup>	Starts a test using the test name or the test id.
<a href="#">Abort Test</a> <sup>→54</sup> and <a href="#">Abort Test Registers</a> <sup>→54</sup>	Aborts the current test or a test with a specific test run id.
<a href="#">Get Report Data</a> <sup>→55</sup> and <a href="#">Get Report Data Registers</a> <sup>→54</sup>	Loads the OPC data nodes with the data for a specific test run.
<a href="#">Get Unread</a> <sup>→56</sup> and <a href="#">Get Unread Registers</a> <sup>→56</sup>	Gets the run ID of the first unread test results to be used with <code>Get_Report_Data</code> .
<a href="#">Set Read</a> <sup>→57</sup> and <a href="#">Set Read Registers</a> <sup>→57</sup>	Sets the run ID as read that is used after the report data is loaded.

### See Also

[IT5 OPC Test Controller](#) <sup>→47</sup>

[Register Calls](#) <sup>→48</sup>

## 9.2.1 Check\_Ready and Check\_Ready\_Registers

Check\_Ready tests if the IT5 is ready to start a test. Since there are several conditions where the IT5 cannot start a test, Check\_Ready provides a simple test for the control system. It is possible for an IT5 to be ready when tested but fail to start a test due to a state change after the call. In this case, the Start\_Test reports the error.

Ready is true when the following conditions are met:

- Full Automation mode is licensed and enabled.
- The IT5 application is active and communication has been established.
- There is no test running.
- There is no interactive user logged in.
- The sign test dialog is not visible.
- The report viewer is not active.

Note: When an administrator is logged in, Automation can still issue commands to query the instrument, for example, retrieve test status but cannot start a new test.

### Input Arguments:

None
------

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.

### See Also

[Test Execution](#) <sup>50</sup>

[Start Test](#) <sup>52</sup>

[Abort Test](#) <sup>54</sup>

[Test Controller](#) <sup>47</sup>

[Status Codes](#) <sup>98</sup>

## 9.2.2 Start\_Test and Start\_Test\_Registers

Start\_Test starts the execution of a predefined IT5 test. Start\_Test includes the ability to set the run headers. The run headers provided by the IT5 are named run header 1 through 6. On the IT5, alternate labels can be supplied and run headers may be individually required or not required.

### Input Arguments

#	Name	Datatype	Description
1	Test_Name	String	The IT5 test name or test id (GUID). When a test id is supplied this test will be run and can be used to run a specific version of a test. The test id can be obtained from an IT5 printed test definition. This parameter is required.
2	Override	Boolean	The option to override the wait for temperature stability. The default is False which waits for temperature stability.
3	Start_Caption	string	The optional start dialog caption.
4	Start_Message	string	The optional start dialog message.
5	Require_Credentials	Boolean	When true, requires the user name and password for the operator.
6	Run_Timeout	Int	After the run test screen, the user must enter prompts and start the test within the number of minutes specified.
7	AutoStart	Boolean	When true, bypasses the start dialog and confirmation screens. When prompts are defined, the run dialog is bypassed, the prompts shown and the confirmation screen is shown to permit returning to the prompts.
8	Run_Header_1	String	The optional run header 1.
9	Run_Header_2	String	The optional run header 2.
10	Run_Header_3	String	The optional run header 3.
11	Run_Header_4	String	The optional run header 4.
12	Run_Header_5	String	The optional run header 5.
13	Run_Header_6	String	The optional run header 6.



14	Operator_Name	String	The operator name used for reports when credentials are not required. Operator_Name has no effect on tests started with credentials. When using Credentials, the operator name is the user supplying credentials on the run screen.
----	---------------	--------	---

## Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Run_ID	String	The unique identifier for the test run.

## See Also

[Test Execution](#) ↗50

[Check Ready](#) ↗51

[Abort Test](#) ↗54

[Test Controller](#) ↗47

[Status Codes](#) ↗98

## 9.2.3 Abort\_Test and Abort\_Test\_Registers

---

Abort\_Test aborts a specific test or the currently executing test.

### Input Arguments:

#	Name	Datatype	Description
1	Run_ID	String	The run ID of the test to abort.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.

### Result

Returns invalid arguments or the OK status.

### See Also

[Test Execution](#) <sup>50</sup>

[Start Test](#) <sup>52</sup>

[Test Controller](#) <sup>47</sup>

[Status Codes](#) <sup>98</sup>

## 9.2.4 Get\_Report\_Data and Get\_Report\_Data\_Registers

---

Get\_Report\_Data loads the results for a specific test run.

The results are loaded into the results monitor OPC data nodes. Once a specific result is loaded, the results remain static to permit the OPC client to reference and load all required results. When called with a blank run id, the current or last test results are loaded and these results become live.

Note: Get\_Report\_Data should be called with a specific run id to make certain the result nodes remain static to avoid reading the results for different tests.

### Input Arguments

#	Name	Datatype	Description
1	Run_ID	String	The test Run_ID returned from Start_Test.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.

### See Also

[Test Execution](#) 50

[Test Controller](#) 47

[Status Codes](#) 98

## 9.2.5 Get\_Unread and Get\_Unread\_Registers

Get\_Unread returns the Run\_ID for the first unread test result.

The Get\_Unread is used with the Get\_Report\_Date and Set\_Read functions to retrieve test run information. The control system can use the following procedure to retrieve test run information for completed tests.

- Issue Get\_Unread to retrieve the first test not results not retrieved.
- Issue a Get\_Report\_Data to load the OPC registers with the test results.
- Retrieve the results for use by the control system.
- Issue a Set\_Read for the run ID to mark the test results as processed

This procedure can be repeated until all test results are retrieved.

### Input Arguments:

#	Name	Datatype	Description
1	Latest	Boolean	When true, returns the most recent unread test run id. When false, returns the oldest unread test run id.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Run_ID	String	The unique identifier for the test run.

### See Also

[Test Execution](#) <sup>50</sup>

[Get\\_Report\\_Data](#) <sup>55</sup>

[Set\\_Unread](#) <sup>57</sup>

[Test\\_Controller](#) <sup>47</sup>

[Status Codes](#) <sup>98</sup>

## 9.2.6 Set\_Read and Set\_Read\_Registers

---

Set\_Read sets the test run to indicate that processing has been completed.

### Input Arguments:

#	Name	Datatype	Description
1	Run_ID	String	The unique identifier for the test run.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.

### See Also

[Test Execution](#) →50

[Get\\_Report\\_Data](#) →55

[Get\\_Unread](#) →56



[Test\\_Controller](#) →47

[Status Codes](#) →98

## 9.3 Test Distribution

---

These functions permit test definitions to be loaded that have been defined on an IT5 and distributed to other IT5s using the control system. Uploaded test definitions are protected and may not be altered.

Item	Description
<a href="#">Upload Test</a> 	Loads a test definition from the IT5.
<a href="#">Download Test</a> 	Sends the test definition to the IT5.

### See Also

[IT5 OPC Test Controller](#) 

### 9.3.1 Upload\_Test

---

The Upload\_Test method loads a test definition created on an IT5. This definition is not alterable.

#### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name or unique test ID. When test name is used, the latest version of the test is loaded.
2	Base64	Boolean	The test is loaded in Base64 format to obfuscate the information.

#### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Definition_Text	String	The test definition text.

#### See Also

[Distributing Tests](#) 58

[Download Test](#) 60

## 9.3.2 Download\_Test

---

The Download\_Test method stores an uploaded test definition to the IT5. The test may or may not exist on the destination IT5. This definition is not alterable.

### Input Arguments:

#	Name	Datatype	Description
1	Test_Definition_Text	String	The test definition text.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.

### See Also

[Distributing Tests](#) 58

[Upload\\_Test](#) 59



## 9.4 Test Creation

---

The define test methods are used to create new test definitions on the IT5.






Define test methods stores test definitions the IT5 with automatic version and recipe control.

Feature	Description
Test Management	<p>For new tests, define test calls create the new test and Test_ID.</p> <p>For existing tests, define update the Test_ID and revision as follows.</p> <ul style="list-style-type: none"> <li>• An unchanged test definition returns the previously created test Test_ID and revision.</li> <li>• A changed test creates a new version of the test and returns the new Test_ID and revision.</li> </ul>
Test Revisions	<p>Define test calls for new test definitions are stored with revision 0.</p> <p>Define test calls with Test_Revision supplied revision sets this test revision, disabling internal revision control.</p> <p>Define test with blank Test_Revision automatically increment the revision when the existing test definition is replaced.</p>
Test IDs	<p>Define Test calls return a unique Test_ID. Start_Test calls with a Test_ID runs the test regardless of its state. Disabled and deprecated tests can be run by Test_ID.</p> <p>Execution by Test_ID guarantees that a specific test definition is executed when required by organizational or regulatory requirements.</p> <p>The Test_IDs is available on the IT5 using View or Print test definition functions.</p>

All define test calls return the following.

Return Value	Description
Message	<p>The message returned when there is an error reported.</p> <p>All errors in the test definition are included in this message that include missing and out-of-range value.</p>
Test_ID	The globally unique test identifier that can be used to start tests.
Test_Revision	The test revision for the test definition is always returned.

The following define test methods are supported.

Item	Description
<a href="#">Define Test Bubble Point</a> 	Creates a new Bubble Point test.
<a href="#">Define Test Enhanced Bubble Point</a> 	Creates a new Enhanced Bubble Point test.
<a href="#">Define Test Diffusion</a> 	Creates a new Diffusion test.
<a href="#">Define Test HydroCorr</a> 	Creates a new HydroCorr test.
<a href="#">Define Test Pressure Hold</a> 	Creates a new Pressure Hold test.

## See Also

[IT5 OPC Test Controller](#) 

[Test Execution](#) 

[Start Test](#) 

## 9.4.1 Define\_Test\_Bubble\_Point

Creates a new bubble point test definition.

### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name.
2	Test_Revision	String	The test revision.
3	Filter	String	The name identifier for the filter.
4	Filter_Description	String	The description of the filter.
5	Catalog_Number	String	The catalog number of the filter.
6	Configuration	String	The configuration used on the test or physical set up of the filter.
7	Manufacturer	String	The name of the filter manufacturer.
8	Filter_Size	Double	The filter size in length (inches); typically the published cartridge size.
9	Filter_Pore_Size	String	The filter pore size that is specified by the manufacturer.
10	Prompts	String	The prompts list in the format <type>,<prompt> where <type> T is text and C for checkmark and <prompt> is the prompt text.
11	Wetting_Fluid	String	The wetting fluid: Aqueous or NonAqueous.
12	Wetting_Fluid_Description	String	The name or type of the wetting fluid.
13	Minimum_Bubble_Point	Double	The minimum bubble point pressure at which the test will pass.
14	PES/Asymmetric	Boolean	The PES/Asymmetric refers to the filter membrane material and pore material.
15	Extended_Bubble_Point	Boolean	Runs a bubble point test that is longer and takes more data points.
16	Perform_Self_Check	Boolean	Performs a system check calibration before executing the test.
17	Number_of_Rounds_Used	Int	Rounds is the number of filters in each housing.
18	Preset_Upstream_Volume	Boolean	When true, the upstream volume is accurately known to speed up the test by eliminating the sizing step.

19	Manual_Sizing_Volume	Int	The upstream volume used when preset upstream volume is true that is used to calculate flowrates.
20	Custom_Low_Flow	Boolean	When true, use the low flow limit value.
21	Low_Flow_Limit	Double	When the flow is below this level, the test terminates and reports an error.
22	Custom_Maximum_Decay_Time	Boolean	When true, use maximum decay measurement value.
23	Maximum_Decay_Time	Int	When the maximum decay measurement time exceeds this value, the test terminates and reports an error.
24	Custom_Maximum_Pressure	Boolean	When true, use maximum test pressure value.
25	Maximum_Test_Pressure	Double	When the test pressure being requested maximum meets or exceeds this value, the test terminates and reports and error.

## Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Revision	Int	The test revision.

## See Also

[Test Creation](#) 

## 9.4.2 Define\_Test\_Enhanced\_Bubble\_Point

---

Creates a new enhanced bubble point test definition.

### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name.
2	Test_Revision	String	The test revision.
3	Filter	String	The name identifier for the filter.
4	Filter_Description	String	The description of the filter.
5	Catalog_Number	String	The catalog number of the filter.
6	Configuration	String	The configuration used on the test or physical set up of the filter.
7	Manufacturer	String	The name of the filter manufacturer.
8	Filter_Size	Double	The filter size in length (inches); typically the published cartridge size.
9	Filter_Pore_Size	String	The filter pore size that is specified by the manufacturer.
10	Prompts	String	The prompts list in the format <type>,<prompt> where <type> T is text and C for checkmark and <prompt> is the prompt text.
11	Wetting_Fluid	String	The wetting fluid: Aqueous or NonAqueous.
12	Wetting_Fluid_Description	String	The name or type of the wetting fluid.
13	Diffusion_Pressure_Specification	Double	The test pressure at which the test is conducted that is specified.
14	Diffusion_Flowrate_Specification	Double	The maximum acceptable flowrate result at which the test will pass.
15	Minimum_Bubble_Point	Double	The minimum bubble point pressure at which the test will pass.
16	PES/Asymmetric	Boolean	The PES/Asymmetric refers to the filter membrane material and pore material.
17	Extended_Bubble_Point	Boolean	Runs a bubble point test that is longer and takes more data points.

18	Perform_Self_Check	Boolean	Performs a system check calibration before executing the test.
19	Number_of_Rounds_Used	Int	Rounds is the number of filters in each housing.
20	Preset_Upstream_Volume	Boolean	When true, the manual sizing volume is used to speed up the test by eliminating the sizing step.
21	Manual_Sizing_Volume	Int	The upstream volume used when preset upstream volume is true that is used to calculate flowrates.
22	Custom_Low_Flow	Boolean	When true, use the low flow limit value.
23	Low_Flow_Limit	Double	When the flow is below this level, the test terminates and reports an error.
24	Custom_Maximum_Decay_Time	Boolean	When true, use maximum decay measurement value.
25	Maximum_Decay_Time	Int	When the maximum decay measurement time exceeds this value, the test terminates and reports an error.
26	Custom_Maximum_Pressure	Boolean	When true, use maximum test pressure value.
27	Maximum_Test_Pressure	Double	When the test pressure being requested maximum meets or exceeds this value, the test terminates and reports and error.

## Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Revision	Int	The test revision.

## See Also

[Test Creation](#) 

### 9.4.3 Define\_Test\_Diffusion

Creates a new diffusion test definition.

#### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name.
2	Test_Revision	String	The test revision.
3	Filter	String	The name identifier for the filter.
4	Filter_Description	String	The description of the filter.
5	Catalog_Number	String	The catalog number of the filter.
6	Configuration	String	The configuration used on the test or physical set up of the filter.
7	Manufacturer	String	The name of the filter manufacturer.
8	Filter_Size	Double	The filter size in length (inches); typically the published cartridge size.
9	Filter_Pore_Size	String	The filter pore size that is specified by the manufacturer.
10	Prompts	String	The prompts list in the format <type>,<prompt> where <type> T is text and C for checkmark and <prompt> is the prompt text.
11	Wetting_Fluid_Pre-Pressurization	String	The pre-pressurization and stabilization selection sets optimal values and determines the required and optional fields. <a href="#">Refer to the Wetting Fluid Pre-Pressurization Types table below.</a> <sup>70</sup>
12	Wetting_Fluid_Description	String	The name or type of the wetting fluid.
13	Diffusion_Pressure_Specification	Double	The manufacturer specified test pressure for the filter.
14	Diffusion_Flowrate_Specification	Double	The manufacturer specified maximum acceptable flowrate result at which the test will pass.
15	Pre-Pressurize_Pressure	Double	The pressure used to stabilize the filter prior to sizing.
16	Pre-Pressurize_Time	Int	The minutes to hold the pre-pressurize pressure to stabilize the filter prior to sizing.

17	De-Pressurize_Time	Int	The minutes to vent the housing prior to sizing.
18	Second_Pre-Pressurize_Time	Int	The minutes to pre-pressurize during a second pre-pressurization step prior to sizing.
19	Extended_Diffusion	Boolean	Runs a slow diffusion test that adds stabilization after sizing prior to taking data points.
20	Extended_Diffusion_Time	Int	The minutes of stabilization time used in the extended diffusion test.
21	Perform_Self_Check	Boolean	Performs a system check calibration before executing the test.
22	Number_of_Rounds_Used	Int	Rounds is the number of filters in each housing.
23	Preset_Upstream_Volume	Boolean	When true, the upstream volume is accurately known to speed up the test by eliminating the sizing step.
24	Manual_Sizing_Volume	Int	The upstream volume used when preset upstream volume is true that is used to calculate flowrates.
25	Custom_Low_Flow	Boolean	When true, use the low flow limit value.
26	Low_Flow_Limit	Double	When the flow is below this level, the test terminates and reports an error.
27	Custom_High_Volume_Limit	Boolean	When true, use the high volume limit value.
28	High_Volume_Limit	Int	When the test pressure being requested meets or exceeds this value, the test terminates and reports and error.
29	Custom_Low_Volume_Limit	Boolean	When true, use the low volume limit value.
30	Low_Volume_Limit	Int	When the measured upstream volume is lower than this threshold, the test terminates and reports and error.

## Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.



2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Revision	Int	The test revision.

## Wetting Fluid Pre-Pressurization Types

Name	Additional Required Diffusion Input Arguments
Aqueous Wetting Fluid	Extended_Diffusion - <b>must be True</b> Extended_Diffusion_Time - <b>must be 2</b>
Non-Aqueous Wetting Fluid	Extended_Diffusion (must be False)
Viresolve Pro	Pre-Pressurize_Pressure Pre-Pressurize_Time De-Pressurize_Time Second_Pre-Pressurize_Time Extended_Diffusion - <b>must be False</b>
Viresolve NFR / NFP	Diffusion_Pressure_Specification Diffusion_Flowrate_Specification Extended_Diffusion - <b>must be True</b> Extended_Diffusion_Time - <b>must be 13</b>
Custom	Diffusion_Pressure_Specification Diffusion_Flowrate_Specification Pre-Pressurize_Pressure Pre-Pressurize_Time De-Pressurize_Time Second_Pre-Pressurize_Time Extended_Diffusion Extended_Diffusion_Time

### See Also

[Test Creation](#) 61

## 9.4.4 Define\_Test\_HydroCorr

Creates a new HydroCorr test definition.

### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name.
2	Test_Revision	String	The test revision.
3	Filter	String	The name identifier for the filter.
4	Filter_Description	String	The description of the filter.
5	Catalog_Number	String	The catalog number of the filter.
6	Configuration	String	The configuration used on the test or physical set up of the filter.
7	Manufacturer	String	The name of the filter manufacturer.
8	Filter_Size	Double	The filter size in length (inches); typically the published cartridge size.
9	Filter_Pore_Size	String	The filter pore size that is specified by the manufacturer.
10	Prompts	String	The prompts list in the format <type>,<prompt> where <type> T is text and C for checkmark and <prompt> is the prompt text.
11	Filter_Type	String	The HydroCorr™ filter type name used to select the test parameters. <a href="#">Refer to the HydroCorr™ Filter Types table for the selections.</a> <sup>73</sup>
12	HydroCorr_Pressure_Specification	Double	The pressure at which the HydroCorr test is conducted as specified by the manufacturer.
13	HydroCorr_Flowrate_Specification	Double	The flowrate at which the HydroCorr test is conducted as specified by the manufacturer.
14	Perform_Self_Check	Boolean	Performs a system check calibration before executing the test.
15	Number_of_Rounds_Used	Int	Rounds is the number of filters in each housing.
16	Preset_Upstream_Volume	Boolean	When true, the manual sizing volume is used to speed up the test by eliminating the sizing step.

17	Manual_Sizing_Volume	Int	The upstream volume used when preset upstream volume is true that is used to calculate flowrates.
18	Custom_Low_Flow	Boolean	When true, use the low flow limit value.
19	Low_Flow_Limit	Double	When the flow is below this level, the test terminates and reports an error.
20	Custom_High_Volume_Limit	Boolean	When true, use the high volume limit value.
21	High_Volume_Limit	Int	When the test pressure being requested meets or exceeds this value, the test terminates and reports and error.
22	Custom_Low_Volume_Limit	Boolean	When true, use the low volume limit value.
23	Low_Volume_Limit	Int	When the measured upstream volume is lower than this threshold, the test terminates and reports and error.

## Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Revision	Int	The test revision.

## HydroCorr™ Filter Types

<b>Name (Aervent)</b>	<b>Name (Durapore)</b>	<b>Name (Others)</b>
Aervent Millidisk 50 mm	Durapore Millidisk 500 cm2	PES Express XL 300
Aervent Opticap 2"	Durapore Opticap 4"	PES Express XL50
Aervent Opticap 4"	Durapore Opticap 5"	PTFE / Aerex Cartridge 10"
Aervent Opticap 5"	Durapore Opticap 10"	PTFE / Aerex Cartridge 20"
Aervent Opticap 10"	Durapore Optiseal 4"	PTFE / Aerex Cartridge 30"
Aervent Optiseal 4"	Durapore Cartridge 4"	PTFE / Aerex Cartridge 40"
Aervent Cartridge 4"	Durapore Cartridge 5"	PES Cartridges
Aervent Cartridge 5"	Durapore Cartridge 10"	PVDF Cartridges
Aervent Cartridge 10"	Durapore Cartridge 20"	PTFE Cartridges
Aervent Cartridge 20"	Durapore Cartridge 30"	
Aervent Cartridge 30"		
Aervent Cartridge 40"		

### See Also

[Test Creation](#) 

## 9.4.5 Define\_Test\_Pressure\_Hold

Creates a new pressure hold test definition.

### Input Arguments:

#	Name	Datatype	Description
1	Test_Name	String	The test name.
2	Test_Revision	String	The test revision.
3	Vessel	String	The vessel name.
4	Vessel_Description	String	The vessel description.
5	Identifier	String	The vessel identifier.
6	Configuration	String	The configuration used on the test or physical set up of the filter.
7	Manufacturer	String	The name of the vessel manufacturer.
8	Prompts	String	The prompts list in the format <type>,<prompt> where <type> T is text and C for checkmark and <prompt> is the prompt text.
9	Pressure_Hold_Pressure	Double	The starting pressure.
10	Max_Test_Time	Int	The maximum minutes for the test to run.
11	Pressure_Drop_Specification	Double	The minimum acceptable pressure drop at the end of the test.
12	Perform_Self_Check	Boolean	Performs a system check calibration before executing the test.
13	Size_By_Filter_Capacity	Boolean	Select to use the Filter_Size and Number_of_Rounds parameters to provide volume sizing information.
14	Filter_Size	Double	The filter size in length (inches); typically the published cartridge size.
15	Number_of_Rounds	int	The total number of rounds the housing can hold.

### Output Arguments

#	Name	Datatype	Description
---	------	----------	-------------

1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Test_ID	String	The globally unique test identifier.
4	Test_Revision	Int	The test revision.

## See Also

[Test Creation](#) 61

## 9.5 Audit and Notifications

---

These methods retrieve audit log and active notifications.

Item	Description
Get_Notifications	Retrieves all active notifications on the instrument.
Get_Audit_Log	Retrieves the audit log entries from the IT5.

### See Also

[IT5 OPC Test Controller](#) 



## 9.5.1 Get\_Notifications

---

The Get\_Notifications method returns the active notifications. These are notifications that have not been automatically dismissed (when the error is corrected) or manually dismissed by an operator.

### Input Arguments:

#	Name	Datatype	Description
1	Text_Output	Boolean	When true, returns the output in newline separated string list. When false, returns XML.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Count	Int	The number of active notifications.
4	Notifications	String	The notifications data in string or XML format.

### See Also

[Audit and Notifications](#) <sup>76</sup>

[Get Audit Log](#) <sup>78</sup>

## 9.5.2 Get\_Audit\_Log

---

The Get\_Audit\_Log method returns the selected audit log entries. The audit log is very large so it may be necessary to make multiple calls.

The input arguments are filters to select the audit log entry class and allows selecting a date range to include.

### Input Arguments:

#	Name	Datatype	Description
1	Security	Boolean	When true, returns security events.
2	Tests	Boolean	When true, returns test events.
3	Settings	Boolean	When true, returns setting change events.
4	Tools	Boolean	When true, returns tool events.
5	Exceptions	Boolean	When true, returns exception events.
6	Start_Date	DateTime	When set, limits the returned events until after the UTC date time sent.
7	End_Date	DateTime	When set, limits the returned events until before the UTC date time sent.

### Output Arguments

#	Name	Datatype	Description
1	Status	Int	Zero is returned when there is no error. Refer to Status Codes for more information.
2	Message	String	The message returned when there is an error reported. If there is no error, the message is blank.
3	Count	Int	The number of audit entries returned.
4	Entries	String	The audit log entries in XML format.

### See Also

[Audit and Notifications](#) <sup>76</sup>




[Get Notifications](#) <sup>77</sup>

## 10 IT5 OPC Results Monitor

---

The results monitor is used to view the IT5 status, test progress, and test results.

The results monitor includes the following.

Item	Description
<a href="#">Status Data</a>  80	The instrument and Windows versions, the last calibration dates, and current instrument state.
<a href="#">Audit and Notifications</a>  76	The audit log and current notifications for the instrument.
<a href="#">Test Result Data</a>  83	The test result data for the current test or the test data loaded from the Get_Report_Data method.

### See Also

[Test Execution](#) 50


[Get\\_Report\\_Data](#) 55


## 10.1 Status Data

---

The OPC interface may monitor the current status of the IT5. A user can be logged in locally or remotely with no interference with monitoring.

The status node data items are shown below.

Item	Datatype	Description
Automation_Mode	String	The Automation mode of the system: Off, Monitor, or Full Control.
Firmware	String	The IT5 firmware version.
Flow_Rate	Double	The current flow rate value.
Instrument_Name	String	The instrument name which is the IT5 network computer name.
Instrument_Serial_Number	String	The instrument serial number.
Last_Calibration_Date	DateTime	The last calibration date and time.
Last_Maintenance_Date	DateTime	The last maintenance date and time.
Next_Calibration_Date	DateTime	The next calibration date and time.
Next_Maintenance_Date	DateTime	The next maintenance date and time.
Notifications	Int	The number of notifications.
Run_ID	String	The globally unique test run ID.
Run_State	String	The current run state.
Run_State_Code	Int	The current run state numeric code. <a href="#">Refer to Test Run State Codes.</a> 
Server_Version	String	The IT5 OPC server version.
Software_Build	String	The IT5 software build number.
Software_Version	String	The IT5 software version.
Tag_ID	String	The IT5 Tag ID of the instrument.
Test_Module_Number	String	The test module serial number.
Test_Name	String	The current test name.
Test_Pressure	Double	The current test pressure value.
Test_Run_ID	String	The report run ID.

Test_Type	String	The current test type.
Test_Type_Code	Int	The test type code. <a href="#">Refer to Test Type Codes.</a> 
Testing	Boolean	The unit is running a test.
UI_State	String	The current instrument user interface state.
Watchdog_Counter	Int	The watchdog data poll counter.
Watchdog_Error	String	The watchdog data poll error.
Windows_Update_Level	String	The level of the applied Windows update.
Windows_Version	String	The Microsoft Windows version.

## See Also

[Test Results Monitor](#) 

## 10.2 Watchdog Function

---

The IT5 Watchdog function includes the Status Watchdog\_Counter integer and Watchdog\_Error string.

The Watchdog counter increments each time the IT5 OPC-UA server retrieves data from the IT5, approximately every 3 seconds.

This indicates the server and IT5 are communicating without error. The Watchdog\_Counter can be set OPC-UA client application.

The Watchdog\_Error register contains an error message when communication to the IT5 is unsuccessful.

Note: The IT5 instrument also reports IT5 OPC-UA server error notifications when communication or no data is returned from the IT5.

## 10.3 Test Result Data

---

The test result data contains the test results for the last test run or the test loaded using the `Get_Report_Data` call.

Test result data is organized into common data for all tests and test specific data for each test type.

### See Also

[Bubble Point Data](#) 87

[Diffusion Data](#) 89

[Enhanced Bubble Point Data](#) 91

[HydroCorr Data](#) 93

[Pressure Hold Data](#) 95

[Get\\_Report\\_Data](#) 55

### 10.3.1 Common Data

The common section contains the test results common to all test types.

The common node data items are shown below:

Item	Datatype	Description
Abort_Fullname	String	The full name of the user that aborted the test.
Abort_User_ID	String	The user ID that aborted the test.
Catalog_Number	String	The filter catalog number.
Configuration	String	The filter or vessel configuration.
Description	String	The filter or vessel description.
Error_Message	String	The error message reported.
Firmware	String	The IT5 firmware version when the test was run.
From	String	The test definition source: Local  IT5 Master   Automation.
Instrument_Name	String	The instrument name which is the IT5 network computer name.
Instrument_Serial_Number	String	The instrument serial number.
Last_Calibration_Date_and_Time	DateTime	The last calibration date and time.
Last_Maintenance_Date_and_Time	DateTime	The last maintenance date and time.
Manufacturer	String	The filter manufacturer.
Messages	String	The test messages reported.
Operator_Name	String	The full name of the test operator.
Override_Fullname	String	The full name of the user that overrode temperature stabilization.
Override_User_ID	String	The user ID of the user that overrode temperature stabilization.
Perform_Self_Check	Boolean	The self check was performed.
Prompts	String	The prompt data entered when the test was run.
Report_Generated_Date	DateTime	The date the report was generated.



Report_Name	String	The name of the report generated.
Result_Rows	String	The test results row data used for reports.
Run_Header_1_Text	String	The run header 1 entered when the test was run.
Run_Header_2_Text	String	The run header 2 entered when the test was run.
Run_Header_3_Text	String	The run header 3 entered when the test was run.
Run_Header_4_Text	String	The run header 4 entered when the test was run.
Run_Header_5_Text	String	The run header 5 entered when the test was run.
Run_Header_6_Text	String	The run header 6 entered when the test was run.
Run_ID	String	The globally unique test run ID.
Self_Check_Pass_Fail	Int	The self-check pass fail indicator: 0 = fail, 1 = pass.
Signatures	String	The report signature data.
Software_Version	String	The IT5 software version.
Start_Autostart	Boolean	The start test was automatically started.
Start_Caption	String	The start test message caption displayed.
Start_Date	DateTime	The test start date and time.
Start_Date_UTC	DateTime	The test start UTC date and time.
Start_Fullname	String	The start test user name when started with credentials.
Start_Message	String	The start test message displayed.
Start_Override	Boolean	The start test temperature override was permitted.
Start_Require_Credentials	Boolean	The start test required credentials.
Start_Timeout	Int	The start test timeout in minutes required for a user response.
Start_User_ID	String	The start test user ID when started with credentials.

Test_Description	String	The test description.
Test_ID	String	The globally unique test ID.
Test_Module_Number	String	The test module serial number.
Test_Name	String	The test name.
Test_Pass_Fail	String	The test pass/fail result: ABORTED, INVALID, PASSED or FAILED.
Test_Run_ID	String	The run ID displayed on the report.
Test_Type	Int	The IT5 test definition test type or system test type.
Test_Version	Int	The test revision version number.
Test_Description	String	The test description.
Self_Check_Pass_Fail	String	The self-check pass fail indicator: 0 = fail, 1 = pass
Start_Date_UTC	DateTime	The UTC start date and time.
Start_Date	String	The test start date and time.

## See Also

[Test Type Codes](#) 

[Status Data](#) 

[Results Monitor](#) 

[Test Controller](#) 

## 10.3.2 Bubble Point Data

The bubble point data contains the test results specific to bubble point tests.

The bubble point node data items are shown below:

Item	Datatype	Description
Custom_Low_Flow	Boolean	The custom low flow option value is supplied.
Custom_Low_Pressure_Decay_Rate	Boolean	The custom low pressure decay rate option value is supplied.
Custom_Maximum_Decay_Time	Boolean	The custom maximum decay time option value is supplied.
Custom_Maximum_Pressure	Boolean	The custom maximum pressure option value is supplied.
Extended_Bubble_Point	Boolean	The test is an extended bubble point.
Filter_Name	String	The filter name.
Filter_Pore_Size	String	The published filter pore size.
Filter_Size	Double	The filter size in inches (typically the cartridge size).
Low_Flow	Double	The custom low flow value when the option is selected.
Low_Pressure_Decay_Rate	Double	The custom low pressure decay rate when the option is selected.
Manual_Sizing_Volume	Double	The manual sizing volume in ml when the preset upstream volume option is selected.
Maximum_Decay_Time	Int	The custom maximum decay time in minutes when the option is selected.
Maximum_Pressure	Double	The custom maximum pressure when the option is selected.
Measured_Bubble_Point	Double	The measured bubble point.
Measured_Upstream_Volume	Int	The measured upstream volume in ml when preset upstream volume is not selected.
Minimum_Bubble_Point	Double	The minimum bubble point at which the test will pass.
Number_of_Filter_Rounds	Int	The number of filter rounds.

Number_of_Rounds_Housing_Can_Hold	Int	The number of rounds housing can hold.
Wetting_Fluid	String	The wetting fluid: Aqueous or Non-Aqueous.
Wetting_Fluid_Description	String	The name or type of wetting fluid.

## See Also

[Test Type Codes](#) 99

[Common Data](#) 84

[Results Monitor](#) 79

[Test Controller](#) 47

### 10.3.3 Diffusion Data

The diffusion data contains the test results specific to diffusion tests.

The diffusion node data items are shown below:

Item	Datatype	Description
Constant_Pressure_Flowrate	Double	The constant pressure flow rate.
Custom_High_Volume_Limit	Boolean	The custom high volume limit value is supplied.
Custom_Low_Flow	Boolean	The custom low flow value is supplied.
Custom_Low_Volume_Limit	Boolean	The custom low volume limit value is supplied.
Custom_Maximum_Decay_Time	Boolean	The custom maximum decay time in minutes when the option is selected.
Diffusion_Flowrate_Specification	Double	The manufacturer's maximum diffusion flow rate specification.
Diffusion_Pressure_Specification	Double	The manufacturer's diffusion pressure specification.
Extended_Diffusion	Boolean	The test is an extended diffusion.
Extended_Diffusion_Time	Int	The slow diffusion test that stabilization time in minutes.
Filter_Name	String	The filter name.
Filter_Pore_Size	String	The published filter pore size.
Filter_Size	Double	The filter size in inches (typically the cartridge size).
High_Volume_Limit	Double	The custom high volume limit when the option is selected.
Low_Flow	Double	The custom low flow value when the option is selected.
Low_Volume_Limit	Double	The custom low volume limit when the option is selected.
Manual_Sizing_Volume	Double	The manual sizing volume in ml when the preset upstream volume option is selected.
Measured_Upstream_Volume	Int	The measured upstream volume in ml when preset upstream volume is not selected.

Number_of_Filter_Rounds	Int	The number of filter rounds.
Total_Diffusion_Flow	Int	The total diffusion flow.
Wetting_Fluid___Pre-Pressurization	String	The wetting fluid or pre-pressurization option for used for stabilization.
Wetting_Fluid_Description	String	The name or type of wetting fluid.

## See Also

[Test Type Codes](#) 99

[Common Data](#) 84

[Results Monitor](#) 79

[Test Controller](#) 47

### 10.3.4 Enhanced Bubble Point Data

The enhanced bubble point data contains the test results specific to enhanced bubble point tests.

The enhanced bubble point node data items are shown below:

Item	Datatype	Description
Constant_Pressure_Flowrate	Double	The constant pressure flow rate.
Custom_High_Volume_Limit	Boolean	The custom low flow option value is supplied.
Custom_Low_Flow	Boolean	The custom low flow value is supplied.
Custom_Low_Volume_Limit	Boolean	The custom low volume limit value is supplied.
Custom_Maximum_Pressure	Boolean	The custom maximum pressure option value is supplied.
Diffusion_Flowrate_Specification	Double	The manufacturer's maximum diffusion flow rate specification.
Diffusion_Pressure_Specification	Double	The manufacturer's diffusion pressure specification.
EBP_Bubble_Point_Pass_Fail	String	The pass/fail result of the bubble point portion of the enhanced bubble point test.
EBP_Diffusion_Pass_Fail	String	The pass/fail result of the diffusion portion of the enhanced bubble point test.
Extended_Bubble_Point	Boolean	The test is an extended bubble point.
Filter_Name	String	The filter name.
Filter_Pore_Size	String	The published filter pore size.
Filter_Size	Double	The filter size in inches (typically the cartridge size).
High_Volume_Limit	Double	The custom high volume limit when the option is selected.
Low_Flow	Double	The custom low flow value when the option is selected.
Low_Volume_Limit	Double	The custom low volume limit when the option is selected.
Maximum_Pressure	Double	The custom maximum pressure when the option is selected.

Measured_Bubble_Point	Double	The measured bubble point.
Measured_Upstream_Volume	Int	The measured upstream volume in ml when preset upstream volume is not selected.
Minimum_Bubble_Point	Double	The minimum bubble point at which the test will pass.
Number_of_Filter_Rounds	Int	The number of filter rounds.
Total_Diffusion_Flow	Int	The total diffusion flow.
Wetting_Fluid___Pre-Pressurization	String	The wetting fluid or pre-pressurization option for used for stabilization.
Wetting_Fluid_Description	String	The name or type of wetting fluid.

## See Also

[Test Type Codes](#)  99

[Common Data](#)  84

[Results Monitor](#)  79

[Test Controller](#)  47



### 10.3.5 HydroCorr Data

The HydroCorr data contains the test results specific to HydroCorr tests.

The HydroCorr node data items are shown below:

Item	Datatype	Description
Constant_Pressure_Flowrate	Double	The constant pressure flow rate.
Custom_High_Volume_Limit	Boolean	The custom high volume limit value is supplied.
Custom_Low_Flow	Boolean	The custom low flow value is supplied.
Custom_Low_Volume_Limit	Boolean	The custom low volume limit value is supplied.
Filter_Name	String	The filter name.
Filter_Pore_Size	String	The published filter pore size.
Filter_Size	Double	The filter size in inches (typically the cartridge size).
High_Volume_Limit	Double	The custom high volume limit when the option is selected.
HydroCorr_Filter_Type	String	The HydroCorr™ filter type.
HydroCorr_Flowrate_Specification	Double	The HydroCorr™ flow rate specification.
HydroCorr_Pressure_Specification	Double	The HydroCorr™ pressure specification.
Low_Flow	Double	The custom low flow value when the option is selected.
Low_Volume_Limit	Double	The custom low volume limit when the option is selected.
Manual_Sizing_Volume	Double	The manual sizing volume in ml when the preset upstream volume option is selected.
Measured_Upstream_Volume	Int	The measured upstream volume in ml when preset upstream volume is not selected.
Number_of_Filter_Rounds	Int	The number of filter rounds.
Total_Diffusion_Flow	Int	The total diffusion flow.
Wetting_Fluid_Description	String	The name or type of wetting fluid.

#### See Also

[Test Type Codes](#) 

[Common Data](#) 84

[Results Monitor](#) 79

[Test Controller](#) 47

### 10.3.6 Pressure Hold Data

---

The pressure hold data contains the test results specific to pressure hold tests.

The pressure hold node data items are shown below:

Item	Datatype	Description
Filter_Size	Double	The filter size in inches (typically the cartridge size).
Number_of_Rounds	Int	The total number of rounds the housing can hold.
Pressure_Changed	Double	The pressure-hold pressure changed value.
Pressure_Drop_Specification	Double	The maximum acceptable pressure drop specification.
Pressure_Hold_Pressure	Double	The pressure hold starting pressure.
Pressure_Hold_Test_Time	Int	The pressure hold maximum test time.
Size_By_Filter_Capacity	Boolean	The Filter_Size and Number_of_Rounds parameters were used to to compute volume sizing information.
Vessel_Name	String	The vessel name (used in pressure hold tests).

#### See Also

[Test Type Codes](#) <sup>99</sup>

[Common Data](#) <sup>84</sup>



[Results Monitor](#) <sup>79</sup>

[Test Controller](#) <sup>47</sup>

## 10.4 Reference Codes

---

The section includes the reference data for the test run states and test type codes.

Item	Description
<a href="#">Test Run States</a> 	The numeric states used during test execution and at completion
<a href="#">Test Type Codes</a> 	The internal numeric values used for each test type.

### See Also

[IT5-OPC Results Monitor](#) 

## 10.4.1 Test Run State Codes

The test run states are shown below.

Run State	Text	Description
0	Unknown	No test running.
10	Pending	The test is waiting to start.
11	Starting	The test is starting.
12	StartWait	The test is waiting for a user action, run or abort.
14	Warmup	The test is waiting for warmup.
15	CalibrationWarning	The calibration is the past due warning.
20	Started	The test has started.
21	Check	The test is in check state.
22	Clear	The test is in the clear state.
23	Sizing	The test is in the sizing state.
24	Flow	The test is in the flow state.
25	BubblePoint	The test has reached the bubble point state.
26	Finish	The test finished status.
30-34	Reserved	These states are reserved.
90	Aborting	The test is in the process of aborting.
91	Aborted	The test has been aborted.
100	Passed	The test has passed.
101	Accepted	The verify calibration was accepted.
102	Saved	The full calibration coefficients have been saved.
110	Fail	The test has failed.
120	Invalid	The test was invalid.

### See Also

[Status Data](#) 80

[Test Results Monitor](#) 79

## 10.4.2 Status Codes

---

### Status Codes

The status codes are returned in the output arguments in the IT5 OPC method calls.

The status codes are shown below:

Status Code	Description
0	The test started with no error.
1	Test name or run id not found.
2	Test engine not responding.
3	Test engine busy.
4	Test failed to abort.
255	Other error.

### See Also

[Test Controller](#) <sup>47</sup>

[Abort Test](#) <sup>54</sup>

[Start Test](#) <sup>52</sup>

[Get Report Data](#) <sup>55</sup>

### 10.4.3 Test Type Codes


---

The IT5 test types are identified by the following codes:

Test Type	Test Type Name
10	Leak Test
20	Diffusion
22	Virus Filter
24	Diffusion - Pre-Pressurized
28	Pressure Hold
30	HydroCorr™
40	Bubble Point
60	Enhanced Bubble Point
120	Full Calibration
121	Full Calibration with Factory Defaults
130	Verify Calibration

#### See Also

[Status Data](#)  80

[Test Results Monitor](#)  79

**- A -**

Abort Test  
     Abort\_Test Method 54  
     Dialog with Credentials 28  
     Dialog without Credentials 27  
 Abort\_Test 54  
 Abort\_Test\_Registers 54  
 Advanced Configuration 44  
 Automation Configuration 10  
 Automation Home Screen  
     when Idle 14  
     when Running 26  
 Automation Login for Operators and Supervisors 16  
 Automation Requirements 29  
 Automation, enable 30  
 AutoStart 21

**- B -**

Bubble Point Data 87

**- C -**

Check\_Ready 51  
 Check\_Ready\_Registers 51  
 Common Data 84  
 Configuration and Control 10  
 Configuring UAExpert 33

**- D -**

Diffusion Data 89  
 Download\_Test 60

**- E -**

Enhanced Bubble Point Data 91  
 Extended\_Bubble\_Point 87, 91

**- F -**

Firewall Requirements 30  
 Full Control Mode 13

**- G -**

Get\_Report\_Data 55  
 Get\_Report\_Data\_Registers 55  
 Get\_Unread 56  
 Get\_Unread\_Registers 56

**- H -**

Hydrocorr Data 93  
 HydroCorr\_Filter\_Type 93

**- L -**

Login 16

**- M -**

Methods  
     Abort\_Test 54  
     Check\_Ready 51  
     Define\_Test\_Bubble\_Point 63  
     Define\_Test\_Diffusion 67  
     Define\_Test\_Enhanced\_Bubble\_Point 65  
     Define\_Test\_HydroCorr 71  
     Define\_Test\_Pressure\_Hold 74  
     Download\_Test 60  
     Get\_Audit\_Log 78  
     Get\_Notifications 77  
     Get\_Report\_Data 55  
     Get\_Unread 56  
     Set\_Read 57  
     Start\_Test 52  
     Upload\_Test 59  
 Monitor Mode 12

**- O -**

Override 24

**- P -**

Pressure Hold Data 95



## - R -

- Register Calls 48
- Remote Access Testing 30
- Results
  - Bubble-Point-Data 87
  - Diffusion-Data 89
  - Enhanced-Bubble-Point-Data 91
  - Hydrocorr-Data 93
  - Pressure-Hold-Data 95
  - Test-Run-States 97
  - Test-Type-Codes 99

## - S -

- Set\_Read 57
- Set\_Read\_Registers 57
- Simulator Setup 29
- Start Test Run Confirmation Screen 20
- Start Test with Auto-Run 21
- Start Test with Credentials 18
- Start Test without Credentials 17
- Start\_Test 52
- Start\_Test\_Registers 52
- Starting a Test 41
- Status Codes 98
- Status Data 80

## - T -

- Temperature Override Confirmation 24
- Test Creation
  - Define\_Test\_Bubble\_Point 63
  - Define\_Test\_Diffusion 67
  - Define\_Test\_Enhanced\_Bubble\_Point 65
  - Define\_Test\_HydroCorr 71
  - Define\_Test\_Pressure\_Hold 74
- Test Prompt Handling 22
- Test Run States 97
- Test Type Codes 99
- Testing Get Notifications 43
- Testing with UAExpert 32
  - Configuration and setup 33
  - Get Notifications 43
  - Starting a Test 41
  - Viewing Status 39

## - U -

- UAExpert 32
- Upload\_Test 59

## - V -

- View IT5 Status 39
- Viewing IT5 Status 39

## - W -

- Watchdog Function 82
- Watchdog\_Counter 82
- Watchdog\_Error 82