LabVIEW™

Getting Started with the LabVIEW Datalogging and Supervisory Control Module

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National Instruments Corporate Headquarters

11500 North Mopac Expressway   Austin, Texas 78759-3504   USA   Tel: 512 683 0100

Worldwide Offices

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The following conventions are used in this manual:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

This icon denotes a note, which alerts you to important information.

bold Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

monospace Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

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1

Introduction to the LabVIEW DSC Module

This manual gets you started using the LabVIEW Datalogging and Supervisory Control (DSC) Module, an add-on to LabVIEW. If you are not familiar with LabVIEW, start with the LabVIEW documentation and examples. When you are familiar with LabVIEW, complete the activities in this manual.

The DSC Module helps you design and deploy monitoring and data logging systems. The DSC Module adds the following features and capabilities to LabVIEW:

- Configuration utilities and wizards
- Historical data collection and trending
- Alarm and event reporting and logging
- Security
- Connection to PLC (Programmable Logic Controller) and industrial device networks
- OPC (OLE for Process Control) server and client capabilities
- Connection to a wide selection of device servers
- DSC Module Control and indicator palettes
- DSC Module Function palettes

Open and Run a VI

In the following activity, you will become familiar with some basic features of the DSC Module by exploring a DSC Module example.

You can complete this activity in approximately 20 minutes.

1. Select **File»Open** in LabVIEW, and open the HMI Security VI in the `LabVIEW\examples\lvdsc\Security` directory.

This example VI shows a conveyor system that can be controlled and monitored.

2. Right-click the front panel to open the **Controls** palette if it is not already displayed. Click the pushpin button, click the **Options** button, and set the **Palette View** to **Advanced**. Click the **OK** button. The DSC Module controls and indicators are available in the **Advanced** palette view.

Take a moment to open the **DSC** palette, shown at left, and browse the DSC Module control palettes shown in the following figure.

3. Switch to the block diagram and take a moment to browse the DSC function palettes shown in the following figure.

4. Select **Tools»DSC Module** to view the menu that provides access to many DSC Module features.

5. Make sure the Tag Utilities toolbar is displayed by selecting **Tools»DSC Module»Show Toolbar**. The Tag Utilities toolbar provides shortcuts to several DSC Module tools.

6. Return to the front panel and run the VI. The Tag Engine launches.

The Tag Engine runs independently, communicating between devices and the DSC Module application.

7. Click the **Login** button on the front panel of the VI to launch the **User Login** dialog box, part of the DSC Module security capabilities. Enter `Administrator` in the **Username** field. Click the **OK** button. You do not need to enter a password unless you created one for the Administrator account.

   As an administrator, you have access to controls and indicators at the bottom of this example's front panel.

8. Set the **Set Speed** knob to 10. When the conveyor's **Current Speed** exceeds 8, an alarm is generated. You will see this alarm later.

9. Select **Tools»DSC Module»Monitor Tags** to launch Tag Monitor.

   The DSC Module's Tag Monitor allows you to view value, time stamp, alarm state, and connection information for selected tags.

10. Expand the **Demo** item under your computer in the left pane, and double-click the **CurrentSpeed**, **RateofSpeedChange**, and **SetSpeed** tags. Those items are added to the top-right pane view, and their current values are displayed. In the bottom-right pane you can see the alarm generated when the conveyor speed exceeded 8.

    Tags represent a connection to either a real-world I/O (Input/Output) point or a variable held in memory. In a DSC Module application, you use tags to monitor, log, and retrieve data. The convenience and power of tags makes applications easier to create, distribute, and maintain.

11. Close Tag Monitor. Click the **No** button when prompted to save.

12. Stop the HMI Security VI and close it. Stop the Tag Engine when prompted.

Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

DSC Module Features

The DSC Module adds utilities, wizards, controls, indicators, functions, and VIs to LabVIEW. DSC Module features are available on the **Controls** palette, **Functions** palette, Tag Utilities toolbar, and **Tools»DSC Module** menu.

Tags

Tags are important in DSC Module applications. Tags represent a connection to either a real-world I/O point or a variable held in memory. The DSC Module includes tools for easily connecting to and monitoring tags.

Tag Engine

The Tag Engine performs the following tasks:

- Communicates with devices
- Scales and initializes data
- Processes alarms
- Logs alarms and events to the historical database
- Logs historical data

Tag Monitor

Use Tag Monitor to view value, time stamp, alarm state, and connection information for selected tags. You also can use it to write values to tags and debug communication problems.

2

Graphical User Interface

This chapter teaches you how to create a graphical user interface using the LabVIEW Datalogging and Supervisory Control (DSC) Module.
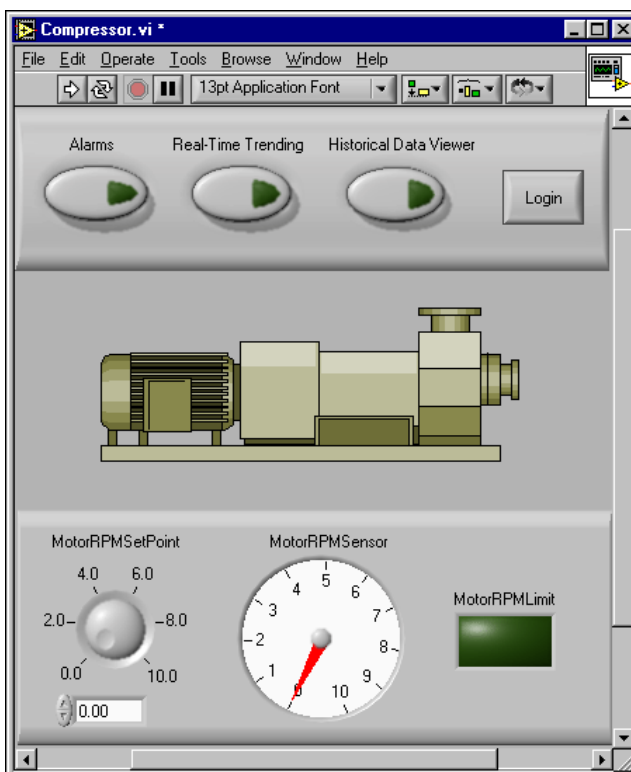
Build a Graphical User Interface

This activity teaches you how to build a front panel to interface with the OPC Demo server.

🕐 **You can complete this activity in approximately 15 minutes.**

Complete the following steps to build the front panel shown in this figure.

1. Create a new VI by clicking the **New VI** button from the **LabVIEW** dialog box, or by selecting **File»New VI** from the front panel or block diagram.

    Make sure to display the Tag Utilities toolbar by selecting **Tools»DSC Module»Show Toolbar**.

2. Click the **Image Navigator** button shown at left on the Tag Utilities toolbar to launch the Image Navigator.

    The DSC Module's Image Navigator provides a collection of more than 4,000 industrial automation graphics that you can use on front panels.

3. Select **Pumps** from the **Categories** list in the Image Navigator. Select the **Heavy-duty plastic centrifugal pump** from the top row of the **Symbols** box and drag the image from the Image Navigator window onto the LabVIEW front panel.

4. In LabVIEW, navigate to the **Numeric** palette and place a **Knob** on the front panel. To show the digital display, right-click the knob and select **Visible Items»Digital Display** from the shortcut menu.

5. Select and place a **Gauge** on the front panel.

6. Navigate to the **Boolean** palette, place a **Square LED** on the front panel, and label it MotorRPMLimit.

7. Select, place, and label three **Push Button** controls on the front panel. Select and place the **OK Button** on the front panel, and change its text to Login.

8. Navigate to the **Decorations** controls palette and add decorations to the front panel to recreate the front panel shown.

9. Resize and label the objects so that your front panel resembles the illustration shown at the beginning of this section.

10. When your front panel is similar to the front panel shown, select **File»Save** and save as Compressor.vi in the examples\lvdsc folder.

Connect the Front Panel Controls to Tags

This activity demonstrates how to connect the OPC Demo server I/O points to the controls and indicators on the front panel of the Compressor VI created in the previous section.

You can complete this activity in approximately 10 minutes.

Make sure that the Tag Engine is not running. If you can see the Tag Engine icon in the Windows taskbar, shown at left, right-click it, and select **Stop** from the shortcut menu.

1. With the Compressor VI open, click the **Start Tag Configuration Editor** button, shown at left, on the Tag Utilities toolbar to launch the Tag Configuration Editor.

2. Select **File»New** to create a new `.scf` file.

    The DSC Module Tag Configuration Editor will store tag information and Tag Engine parameters in a configuration (`.scf`) file, which the Compressor VI will use.

3. Save the file as `Compressor.scf` in the `LabVIEW` folder. Click the **Save** button. Click the **OK** button in the **SCF Summary** dialog box that appears. Close the Tag Configuration Editor.

4. Right-click the knob and select **HMI Wizard** from the shortcut menu.

    The DSC Module's HMI Wizard allows you to quickly and easily create the block diagram code necessary to connect the knob to an I/O point.

5. Click the **Create New Tag** button, shown at left, in the dialog box to select a server item and create a tag to connect to it.

    If you had already created tags for the `Compressor.scf` file, you would be able to select one from the **Tag** drop-down menu. When and how to most effectively create tags depends on the application you are developing.

6. Select **National Instruments.OPCDemo»NI OPC Demo Server» Simulation»MotorRPMSetPoint**, as shown in the following figure. Click the **OK** button.
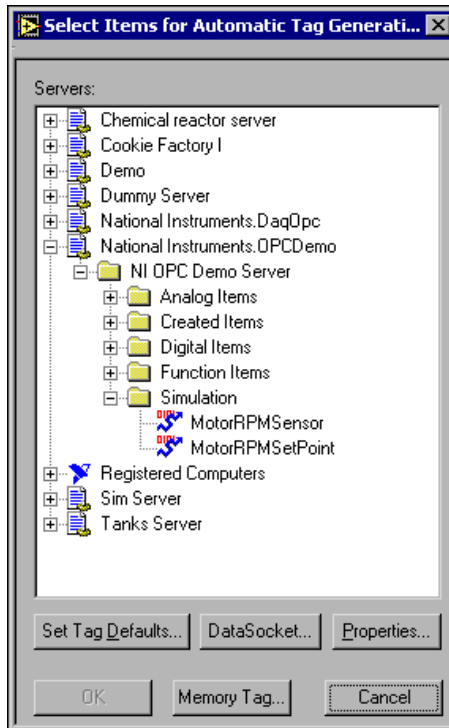
A *server* communicates with and manages I/O such as PLCs and data acquisition (DAQ) plug-in devices.

A server *item* is a channel, I/O point, or variable in a hardware device.

You connect to these items with tags.

7. Click the **OK** button. The configuration file is saved. Click the **OK** button.

8. Repeat steps 4 through 7 for the gauge, selecting **MotorRPMSensor** from **Simulation** this time. You will connect the LED later.

9. Run the VI. The Tag Engine launches.

10. Turn the **MotorRPMSetPoint** knob and notice that the **MotorRPMSensor** adjusts accordingly.

11. Switch to the block diagram to see the generated code.

12. Stop and close the VI.

13. Right-click the Tag Engine icon, shown at left, and select **Stop** from the shortcut menu to stop the Tag Engine.
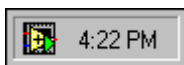
Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Image Navigator

Use the Image Navigator to add standard or customized industrial graphics to DSC Module applications.

Tag Configuration Editor

Use the Tag Configuration Editor to create tags and set their attributes. The Tag Configuration Editor stores tag information and Tag Engine parameters in `.scf` files, which are used by DSC Module applications at execution time.

HMI Wizard

Use the HMI Wizard to quickly and easily create the block diagram code necessary to connect front panel objects to tags. You can unlock and customize wizard-generated code. Alternatively, you could manually drop and wire the DSC Module Tags VIs and Tag Attribute VIs to read tag values, write to tags, access tag attributes, and perform other tag operations.

Servers

The DSC Module can connect to any OPC-compliant server and to many third-party device servers. You also can connect to National Instruments servers, including National Instruments DAQ and FieldPoint servers. Use the DSC Module's Server Browser to see available servers on your computer or across the network, view server information, change OPC settings, and so on.

3

Real-Time Trending

This chapter teaches you how to view data values using the LabVIEW Datalogging and Supervisory Control (DSC) Module's Real-Time Trend capabilities.
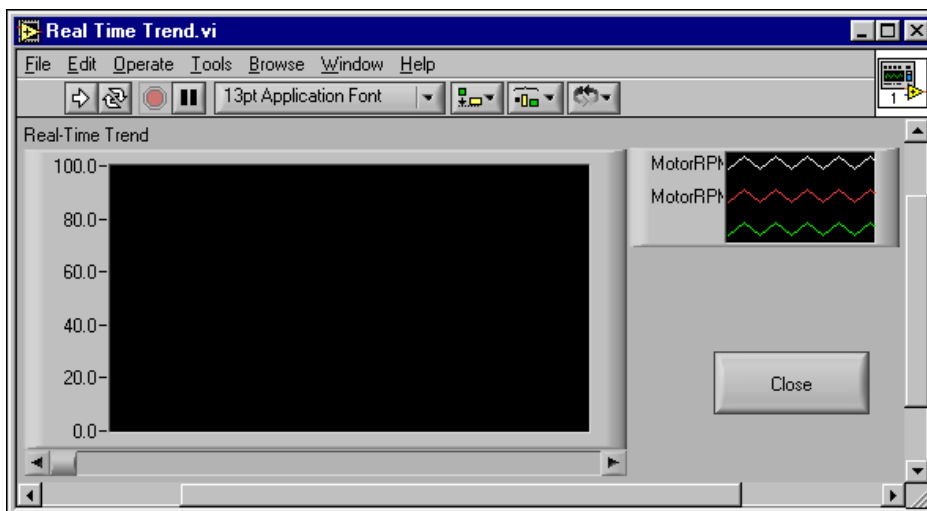
View Real-Time Data

This activity demonstrates how to view real-time data using a Real-Time Trend.

🕐 **You can complete this activity in approximately 15 minutes.**

Create the Real-Time Trend Viewing Panel

Complete the following steps to build the front panel shown in this figure.

1. Select **File»New** from any open window or click the **Create a New VI** button, shown at left, on the Tag Utilities toolbar.

2. Select and place the Real-Time Trend from the **Trends** palette on the front panel and label it `Real-Time Trend`.
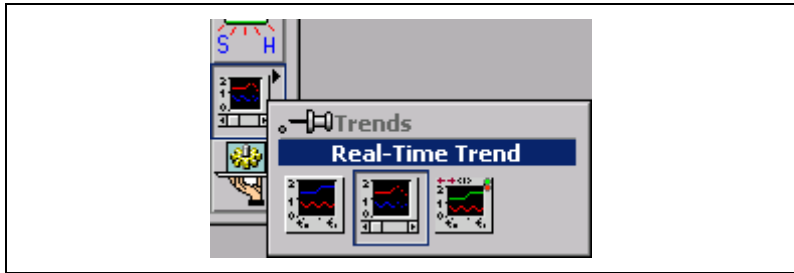
3. Right-click the Real-Time Trend and select **HMI Wizard** from the
    shortcut menu.

4. Select **MotorRPMSensor** from the **Tag** pull-down list and click **Add**
    to add it to the **Tag List**. Repeat for **MotorRPMSetPoint**. Click the
    OK button.

5. Select and place an **OK Button** from the **Boolean** palette on the front
    panel.

6. Right-click the **OK** button and select **Panel Wizard** from the shortcut
    menu. Select **Close this Panel** from the **With this control** pull-down
    menu. Click the **OK** button to close the **Panel Wizard** dialog box. The
    button text changes from **OK** to **Close**.

    The DSC Module's Panel Wizard provides a quick way to create
    navigation among multiple windows and front panels in your
    application.

7. Save this VI as `Real Time Trend.vi` in the `examples\lvdsc`
    folder.

Connect the Viewing Panel to the Application

1. Open the Compressor VI if it is not already open. You will connect this
    VI's **Real-Time Trending** button.

2. Right-click the **Real-Time Trending** button and select **Panel Wizard**
    from the shortcut menu.

3. Select the **VI** radio button on the **Panel** tab. Click the **Browse** button,
    then find and double-click `Real Time Trend.vi`. Click the **OK**
    button to close the **Panel Wizard** dialog box.

    Notice that the button text has changed to **Real Time Trend**.

4. Run the Compressor VI. To view the real-time trends on the Real Time Trend VI's panel, click the **Real Time Trend** button. Move the knob on the Compressor VI front panel and notice the change on the trend display.

5. Stop and save the Compressor VI and the Real Time Trend VI.

Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Trends

Use a Real-Time Trend to view live data on the front panel of a DSC Module application. To view logged historical data on a front panel, use a Historical Trend. For more flexible, powerful trending on a front panel, use the NI HyperTrend.

Panel Wizard

Right-click on a Boolean control and select **Panel Wizard** from the shortcut menu to configure the control to open or close a panel. Using the Panel Wizard, you also can configure a control to launch the User Login dialog box, Historical Trend Viewer, Historical Data Viewer, Tag Monitor, or any VI.

4

Historical Logging

This chapter teaches you how to log and view data values with the LabVIEW Datalogging and Supervisory Control (DSC) Module.

Configure Data Logging

This activity demonstrates how to specify which items are logged by the DSC Module. By default, all data is logged to the Citadel database. If you do not want to log the data of a specific tag, you can change its configuration.

🕐 **You can complete this activity in approximately 3 minutes.**

1. Open the Compressor VI if it is not already open. Display the **Controls** palette and Tag Utilities toolbar.
2. Click the **Start Tag Configuration Editor** button, shown at left, on the Tag Utilities toolbar to open the Tag Configuration Editor.
3. Double-click **MotorRPMSetPoint**.
4. Click the **Operations** tab and remove the checkmark from the **Log Data** checkbox. Click the **OK** button.
5. Select **File»Save** in the Tag Configuration Editor. If the Tag Engine is still running, you are prompted to restart it with the changes. Click the **Yes** button.
6. Close the Tag Configuration Editor, but leave the Tag Engine running.

View Logged Data Using the Historical Data Viewer

This activity demonstrates how to view the data being logged, using the Historical Data Viewer in Measurement & Automation Explorer (MAX).

🕐 **You can complete this activity in approximately 5 minutes.**

1. Open the Compressor VI if it is not already open.

2. Right-click the **Historical Data Viewer** button and select **Panel Wizard** from the shortcut menu.

3. Select **Historical Data Viewer** and click the **OK** button.

4. Run the VI. Adjust the **MotorRPMSetPoint** control several times, waiting a few seconds between each adjustment. This provides logged data for you to access.

5. To view the logged data, click the **Historical Data Viewer** button. MAX launches with the **Historical Data** category visible.

   The DSC Module's Citadel database efficiently stores historical data, alarms, and events. Historical Data Viewer is an easy and powerful way to view and manage Citadel data.

6. Expand the **Historical Data** category and **Citadel 5 Universe** in the left tree view.

7. In the right pane, navigate to **MotorRPMSensor** under your computer name. Highlight **MotorRPMSensor** and click the **View Data** button at the top of that pane.

8. Select the **Display** tab at the bottom of the right pane.

9. Click the **End of Data** button, shown at left, to locate the most recently logged data.

10. Click the stoplight icon, shown at left, in the top-right corner to switch the Historical Data Viewer from historical data to live data mode. To see the display change, adjust the **MotorRPMSetPoint** control on the Compressor VI front panel.

11. Close Historical Data Viewer.

12. Stop and save the VI. Notice that the Tag Engine keeps running and logging data, as shown by the Tag Engine icon in the Windows system tray.
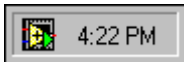
Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Citadel Historical Database

The DSC Module efficiently stores historical data, alarms, and events. Citadel is the DSC Module's historical database. You can use various DSC Module tools or VIs to view and manage Citadel data.

Historical Data Viewer

Historical Data Viewer launches within MAX. Use Historical Data Viewer to view, archive, or delete data logged to Citadel. You can launch it manually in LabVIEW by selecting **Tools»DSC Module»View Historical Data**, or you can launch it programmatically using the Call HDV VI on the **Historical Data** palette.

5

Alarms

This chapter teaches you how to use the basic alarm capabilities of the LabVIEW Datalogging and Supervisory Control (DSC) Module.

Set and View Alarms

This activity demonstrates how to configure, view, and acknowledge alarms using DSC Module utilities.

**You can complete this activity in approximately 5 minutes.**

1. Open the Compressor VI if it is not already open.

2. Click the **Start Tag Configuration Editor** button, shown at left, on the Tag Utilities toolbar to open the Tag Configuration Editor.

3. Double-click **MotorRPMSensor** and select the **Alarms** tab. Configure the alarm characteristics as shown in the following figure. Click the **OK** button.
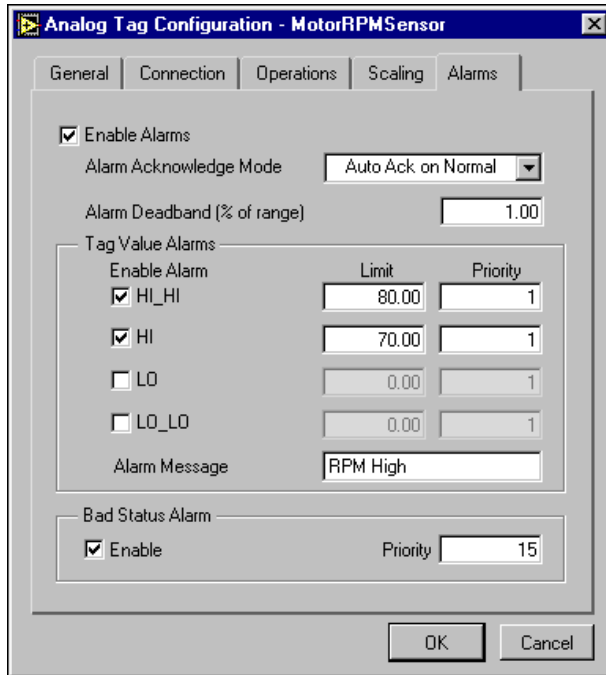
4. Select **File»Save** in the Tag Configuration Editor. If the Tag Engine is still running, you are asked to update the .scf file. Click the **Yes** button to update. Close the Tag Configuration Editor.

5. Create a new VI.

6. Select and place the Alarm & Event Display from the **Alarms & Events** subpalette onto the front panel and label it Alarms and Events.
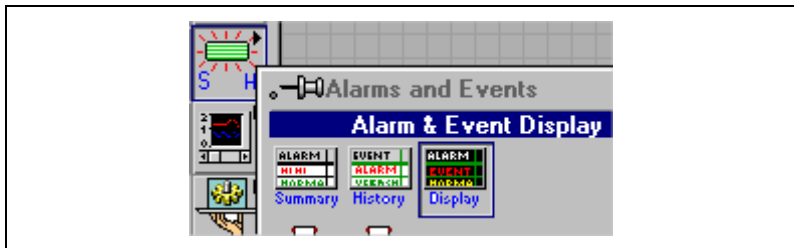
7. Place an **OK Button** from the **Boolean** palette on the front panel.

8. Right-click the **OK** button and select **Panel Wizard** from the shortcut menu. Select **Close this Panel** from the **With this control** pull-down menu. Click the **OK** button.

9. Save this VI as Alarms.vi in the examples\lvdsc folder and close it.

10. Right-click the **Alarms** button on the front panel of the Compressor VI and select **Panel Wizard** from the shortcut menu.

11. Select the **VI** radio button on the **Panel** tab. Browse to the Alarms.vi you created and click the **OK** button.

12. Run the VI. Turn the **MotorRPMSetPoint** knob above 8 to cause alarms. Click the **Alarms** button to launch the Alarms VI and view alarms.

13. To acknowledge the alarms, right-click any alarm and select **Acknowledge All** from the shortcut menu. Click the **OK** button.

14. Stop and close the Alarms VI when you are done.

15. Stop the Compressor VI and save any changes.

Add Alarm Functionality to an Existing VI

This activity demonstrates how to add alarm functionality to an existing VI using the HMI Wizard. This activity demonstrates how to turn on the MotorRPMLimit LED when MotorRPMSensor is in alarm.

You can complete this activity in approximately 7 minutes.

1. Open the Compressor VI if it is not already open.

2. Right-click **MotorRPMLimit** and select **HMI Wizard** from the shortcut menu.

3. Select **Tag Alarm State** from the **Attach Indicator to** pull-down menu. Select **MotorRPMSensor** in the **Tag** pull-down list. Click the **OK** button.

4. Run the VI. Turn the **MotorRPMSetPoint** knob. Notice that the LED lights up when MotorRPMSensor is in alarm (above 70).

5. Stop and save the VI.

6. Right-click the Tag Engine icon in the Windows task bar and select **Stop** from the shortcut menu to stop the Tag Engine.
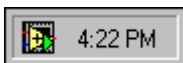
Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Alarms and Events

You can use various DSC Module tools to easily configure, view, and acknowledge alarms and events. An alarm is a specific type of event related to the value of a tag. Events can be tag events, such as a change in alarm state, or system events, such as a user login or Tag Engine launch.

6

Security

This chapter teaches you how to use some of the security features included in the LabVIEW Datalogging and Supervisory Control (DSC) Module.

Add Security to Your System

This activity demonstrates how to create user accounts and implement security for front panels. A login button limits access to front panel objects based on the password-based user accounts.

🕐 **You can complete this activity in approximately 10 minutes.**

1. Open the Compressor VI if it is not already open.

2. Select **Tools»DSC Module»Security»Edit User Accounts**. The User Account Manager launches.

   The DSC Module's User Account Manager allows you to create user and group accounts, assign passwords, set the security level for a user, add or remove users in a group, and so on.

✏️ **Note** If you were not previously logged in as Administrator, you are prompted to do so now. Click the **OK** button. Select **Administrator** from the **Accounts** pull-down menu and click the **OK** button.

3. Select **User»New User Account** in the **User Account Manager** window.

4. Create the following two new accounts. Click the **OK** button after entering the following information for each user. Close the **User Account Manager** window when you are done.

User Name	Password	Security Level
Engineer	Eng	7
Operator	Oper	5

5. After creating the accounts, right-click the **MotorRPMSetPoint** knob on the Compressor VI front panel and select **Security** from the shortcut menu to launch the Security Wizard.

The DSC Module Security Wizard launches the **Access Rights** dialog box so that you can quickly and easily implement security on the control.

6. Click the **Add** button. Double-click **Engineer** and **Operator**. Click the **OK** button.

7. Configure each user's access using the **Access** pull-down menu, as shown in the following figure. Click the **OK** button.
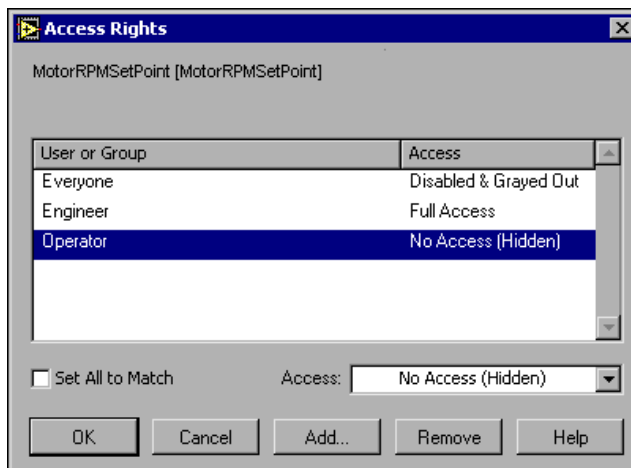
8. Right-click the **Login** button and select **Panel Wizard** from the shortcut menu.

9. Select **Login prompt** on the **Panel** tab. Click the **OK** button.

10. Run the VI. Click the **Login** button on the front panel and log in as Operator. The **MotorRPMSetPoint** knob is no longer visible because the Operator user is not authorized to access it.

Note Security passwords are case sensitive.

11. Click the **Login** button again and log in as Engineer. Notice that the **MotorRPMSetPoint** knob reappears because the Engineer is authorized to adjust it.

12. Stop and save the VI.

Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Security

To implement security for a DSC Module application, first create accounts with the User Account Manager. Then use various DSC Module features such as the Security Wizard or Security VIs to limit access to different aspects of your application as needed.

7

Networking

This chapter teaches you about networking a LabVIEW Datalogging and
Supervisory Control (DSC) Module application.

Note To complete these activities, you must have two computers connected by a network
to act as client and server. Both computers must be running the same version of the DSC
Module.

Access I/O over the Network

To set up a client-server system, you must register network computers, then
import tags from the server machine, and view them on the client machine.

Registering the Server Computer on the Client Machine

This activity demonstrates how to register a network computer with the
DSC Module.

You can complete this activity in approximately 3 minutes.

1. The computer that you have been working on will be your server
   computer. Choose another computer running the same version of the
   DSC Module to be the client computer.

2. On the client computer, log in as Administrator using the **Tools»User
   Name** dialog box.

3. Select **Tools»DSC Module»Options**, select the **Advanced** tab, then
   click **Registered Computers**.

4. If the server computer is not listed, click the **Add** button, select the
   server computer, and click the **Register** button. Click the **OK** button
   to close the **Register Computer** dialog box. Click the **OK** button to
   close the remaining dialog boxes.

Importing Tags to the Client Computer

This activity demonstrates how to access tags over the network. Configuring the client involves adding tags from a server computer configuration (.scf) file to a .scf file on the client.

🕐 **You can complete this activity in approximately 10 minutes.**

1. On the client computer, launch the Tag Configuration Editor.

2. Select **File»New** and then **File»Import Network Tags**.

📝 **Note**   File sharing *must* be enabled on the server computer to view files from the client computer.

3. Click the **Browse** button in the **Data Source** field and navigate across the network to the server computer and the Compressor.scf file.

4. Select the tags to import to the client computer .scf file and click the **Add All** button as shown in the following figure. Click the **Import** button.
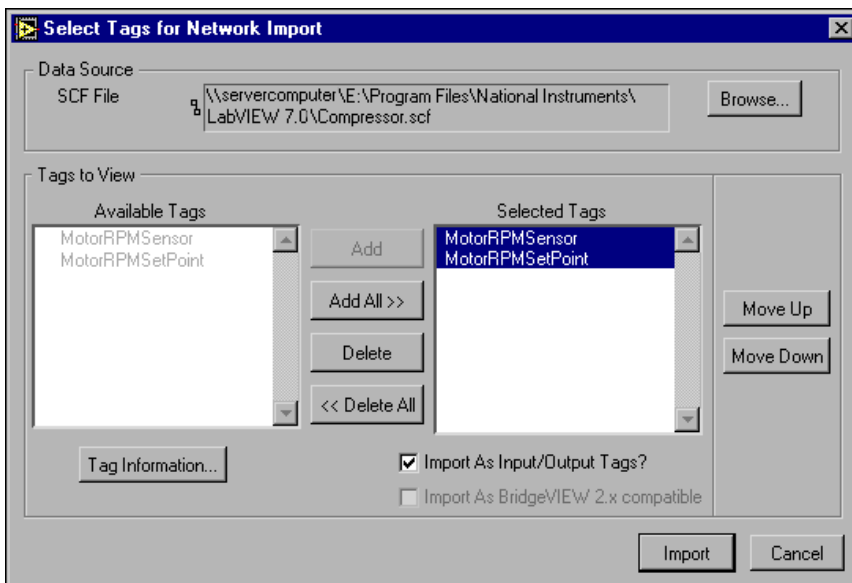
5. Select **File»Save** in the Tag Configuration Editor and save the file as NetworkTags.scf. Click the **OK** button in the **SCF Summary** dialog box. Close the Tag Configuration Editor.

6. Copy the Compressor VI from the server computer onto the client computer and run the VI there. Notice the server tag values are displayed on the client computer.

Summary

For more information about the topics covered in this chapter, refer to the *LabVIEW Help* or the *LabVIEW Datalogging and Supervisory Control Module Developer Manual*.

Networking

After you have registered a network computer, you can import tags from it and log to it using DSC Module functionality.

Where to Go from Here

The DSC Module includes a comprehensive documentation set designed to help you create monitoring and datalogging application*s*. The *LabVIEW DSC Module Bookshelf* is available by selecting **Help»Search the DSC Module Bookshelf** in LabVIEW. It describes and links to the available DSC Module documents. Open and explore the *LabVIEW DSC Module Bookshelf*.

✎ **Note**   You must have Adobe Acrobat Reader version 5.05 or later with Search and Accessibility to use the search functionality in the *LabVIEW DSC Module Bookshelf*.

The *LabVIEW Help* contains information about DSC Module VIs and features. You can access the *LabVIEW Help* by selecting **Help»VI, Function & How-To Help** in LabVIEW. For additional guidance developing DSC Module applications, you can study the DSC Module examples in the examples\lvdsc directory. For additional developer resources, training, technical support, and more, refer to ni.com.

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Technical Support and Professional Services

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