

National Instruments™ Switch Executive Getting Started

National Instruments Switch Executive is one aspect of National Instruments test management software, which includes LabVIEW, Measurement Studio, TestStand, and IVI. For validation test and research and development test, Switch Executive works with LabVIEW and Measurement Studio to develop and change systems faster. For production test, Switch Executive integrates with TestStand to give test step ease-of-use in sequence execution.

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Overview

Switch Executive is a configuration tool designed to simplify switching systems. With Switch Executive, you can do the following:

- Develop multiple device switch systems represented as a single virtual device.
- Create end-to-end signal routing.
- Route selections based on signal characteristics and switch capabilities.
- Create switch routing for end-to-end calibration and maximum execution speed.
- Create aliases for channels.
- Preconfigure routes and route groups that can be called by name at run time.
- Control NI and third-party switches.
- Integrate seamlessly with TestStand for automated test systems.



Note This document provides getting started information about National Instruments Switch Executive. For more information about using Switch Executive, select **National Instruments» Switch Executive»Help for Switch Executive** from the Start menu.

Getting Started

Make sure you have the following:

- A development license for Switch Executive
- Measurement & Automation Explorer (MAX) 2.1 or later
- An application development environment (ADE) such as LabVIEW or Measurement Studio
- Windows 2000/NT/XP/Me/9x
- Interchangeable Virtual Instruments (IVI) switches
- Installed IVI instrument drivers for your physical switches
- TestStand test management software (optional)

Installing the Software

Complete the following steps to install Switch Executive.

1. Install your ADE such as LabVIEW or Measurement Studio, or install TestStand test management software.
2. Insert the Switch Executive CD into your CD drive to launch the installation wizard.



Note If the installation wizard does not appear, navigate to your CD drive and run `autorun.exe`.

3. Click **Install Switch Executive**, and complete the installation wizard.
The installer verifies that dependent software is installed prior to installing Switch Executive. Installation of dependent software is automatic and may take a few minutes.
4. Launch MAX from your desktop, or by selecting **Start»Programs»National Instruments»Switch Executive»MAX with Switch Executive**.
5. Expand **Devices and Interfaces**.
6. Click **SwitchExecutiveSample**.
7. Access the *Switch Executive Help* by selecting **Help»Help Topics»Help for Switch Executive** on the MAX menu bar, or for topic-specific help, click **Help** on the Switch Executive toolbar.

Installing the Hardware

Complete the following steps to install your hardware.

1. Install and configure them according to your installation guides.
2. Verify that you properly selected the terminal blocks necessary for your topology.
3. Press <F5> to refresh MAX.

Configuring Switch Executive

The Switch Executive configuration tools are embedded within MAX. In MAX, you implement a Switch Executive design by:

- Creating a Switch Executive Virtual Device
- Adding IVI Switches
- Configuring Channels
- Adding Hardwires to Define Multidevice Topologies

- Defining Route Groups
- Creating Routes

These elements are the foundation of a Switch Executive system. You can use these configurations in an ADE suited to your needs, such as LabVIEW, Measurement Studio, and Visual Basic, or call them directly from TestStand test steps.

Creating a Virtual Device

Complete the following steps to create a Switch Executive virtual device.

1. Right-click **Devices and Interfaces** and select **Create New**.
2. Select **Switch Executive Virtual Device** and click **Next**.
3. On the next dialog box, accept the predefined Virtual Device Name, or enter one of your own. The name you select is the name Switch Executive uses to refer to the virtual device in the application programming interface (API).
4. Complete one of the following steps to attach a configuration file.
 - To create a new configuration file, click **Next**.
 - To import a configuration file, refer to **System Deployment» Importing Configurations** in the *Switch Executive Help*.



Note If you are using a deployment license for Switch Executive, you can only import a configuration file.

5. From the Available Switches list, select the switches you want to use for this configuration and move them to the Switches to Add list by clicking the >> button.



Note If you are using National Instrument switches, click **Configure NI Switches** to configure the logical names and topology settings of those switches.

6. Click **Next** and the wizard creates the virtual device you just configured. The progress window displays status messages and errors.
7. When creation is complete, click **Finish**.

Adding Switches to an Existing Switch Executive Virtual Device

Complete the following steps to add additional devices to an existing Switch Executive virtual device.

1. Expand **Devices and Interfaces**.
2. Select the Switch Executive virtual device you want to change.

3. Click the **IVI Switches** tab.
4. Click **Add** to display the Available Switches list.
5. Select the switches you want to use for this configuration and move them to the Switches to Add list by clicking the >> button.
6. Click **Add** to add the new switch to your configuration.



Note Switch Executive supports only C-based specific drivers. You can create your own C-based specific IVI driver with Measurement Studio templates—specifically in LabWindows™/CVI™. For more information about Measurement Studio, visit ni.com.

Configuring Channels

Channels represent connection points on a switch. Channels can be associated with a hardware or have multiple wires, and are not necessarily relay names.

When you add an additional switch to the virtual device, Switch Executive automatically queries the switch and adds its channels, and their specifications, to the channel list. Each channel has a list of predefined attributes as shown in Figure 1.

Attribute	Value	
Wire Mode	2.0	
Bandwidth	30.0 MHz	
Impedance	3.00 Ohm	
Settling Time	0.0 s	
Attribute	AC	DC
Max Voltage	110.0 V	125.0 V
Carry Current	1.00 A	1.00 A
Switching Current	1.00 A	1.00 A
Carry Power	30.0 W	62.5 W
Switching Power	30.0 W	62.5 W

Figure 1. Predefined Attributes

Complete the following steps to configure channels.

1. Expand **Devices and Interfaces**.
2. Select the Switch Executive virtual device you want to change.
3. Click the **Channels** tab.
4. Select the channel and enter the alias in the Name field.



Note You should not use reserved characters as channel aliases. For a list of reserved characters, refer to **Configuration»Reserved Characters** in the *Switch Executive Help*.

- In the Mode section, select one of the three different modes:
 - Normal**—The channel allows all standard connection operations.
 - Config Chan**—The channel is a configuration channel. Configuration channels are used to complete routes within a switch. For more information, refer to the *Switch Executive Help*.
 - Source Chan**—The channel is a source channel and behaves as a normal channel except that two source channels cannot be connected together.
- Designate whether the channel is connected to a hardware by selecting from the drop-down menu as shown in Figure 2.

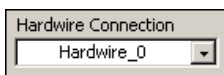


Figure 2. Hardware Connection Drop-Down Menu

You can define hardwires on the Hardwires panel. Associations made in the hardwires interface are reflected in the Hardware Connection control.

- Enter any comments you may have in the Comments field.



Tip Use the Comments field for organizational purposes. Place keywords or letters at the beginning of a comment for convenient sorting and filtering.

- Click **Save**.

Adding Hardwires to Define Multidevice Topologies

A hardwire is any physical connection between switch modules, such as wiring, analog buses, matrix expansion plugs, and so on. Hardwires are defined by the user.

Complete the following steps to define a hardwire.

- Expand **Devices and Interfaces**.
- Select the Switch Executive virtual device you want to change.
- Click the **Hardwires** tab.
- Click **Add** to add a new hardwire to the list of hardwires.
- Accept the predefined name of the hardwire, or change it in the Name field.
- From the Available Channels list, select the channels that are associated with the hardwire and move them to the Associated Channels list by clicking the >> button.



Tip You can quickly define hardware associations on the Channels panel by selecting those channels associated with a hardware and using the Hardware Connection drop-down menu to select the associated hardware.

7. Enter any comments you have in the Comments field.
8. Click **Save**.

Defining Route Groups

Route groups allow you to group individual routes, and/or other route groups, together and associate them with a single alias. Route groups give you the ability to quickly set up simultaneous switching configurations.

Route groups help Switch Executive identify unintentional cross-connects. For example, if you are creating a test system, chances are that you are using multiple routes at the same time. To ensure that these routes do not cross paths where not intended, they must be dependent on one another. Groups help to prevent future errors with your Switch Executive virtual device.

Complete the following steps to define a route group.

1. Expand **Devices and Interfaces**.
2. Select the Switch Executive virtual device you want to change.
3. Click the **Route Groups** tab.
4. Click **Add**.
5. Accept the predefined alias of the route group, or change it in the Name field.
6. From the Available Routes/Groups list, select the routes or route groups you want to associate with the route group and move them to the Grouped Routes/Groups list by clicking the >> button.
7. Enter any comments you have in the Comments field.
8. Click **Save**.

Creating Routes

A route is a connection from one channel, row, or column, to another. Routes are the primary building blocks of any Switch Executive configuration.

Complete the following steps to create a route.

1. Expand **Devices and Interfaces**.
2. Select the Switch Executive virtual device you want to change.
3. Click the **Routes** tab.
4. Click **Add** to add a new route to the list of routes.

5. Accept the predefined alias of the route, or change it in the Name field.
6. Enter any comments you may have in the Comments field.
7. Click the **Signal** tab.
8. Define the wire mode and set the attributes of the route.
9. Complete the following steps to assign groups.
 - a. Click the **Groups** tab.
 - b. From the Available Route Groups list, select any route groups that you want to associate with the newly created route. Associating the route with a route group ensures that the route coexists with all other routes of the route group. You also can associate a route with a route group in the Route Groups tab.

To the right of the Groups tab is the route selection window. It has two columns listing the available endpoints, as shown in Figure 3.

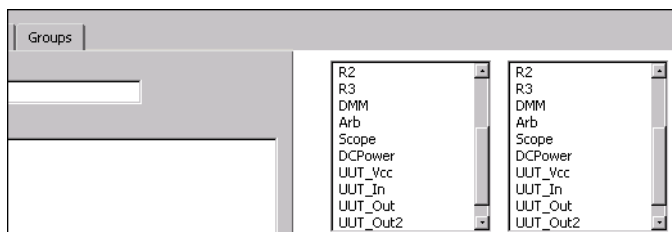


Figure 3. Route Selection Window

10. Endpoints are the beginning and end of a route path. Complete the following steps to define endpoints.
 - a. Select the first endpoint of the route in the left column. Notice the dashed line between the device window and the second endpoint in Figure 4. The dashed line indicates that path is broken or incomplete.

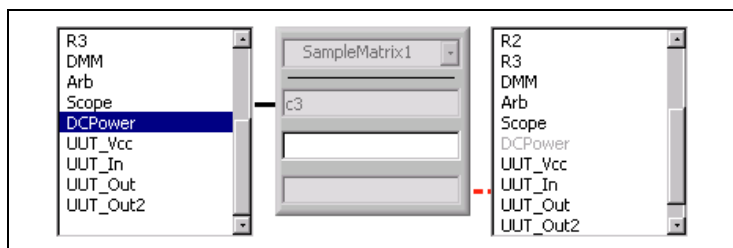


Figure 4. Incomplete Route



Note As you make selections in the route selection window, the text editor is automatically populated with the route specification string that designates your route path.

- b. Select the second endpoint of the route in the right column. Notice how the dashed line becomes a solid line in Figure 5. This solid line indicates the path is complete.

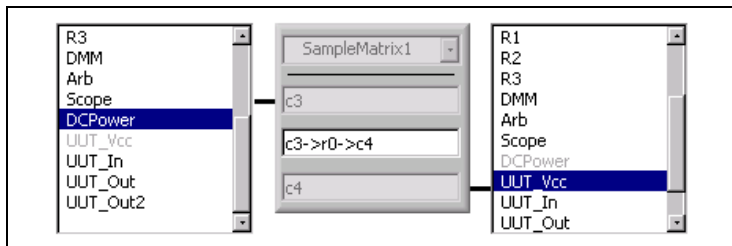


Figure 5. Complete Path

- If the two endpoints are in the same physical switch module, Switch Executive completes the path using configuration channels, if necessary, to complete the route. If you want to change the path Switch Executive selected, use the text editor below the route selection window to make your changes.
- If the two endpoints are in separate switch modules physically connected by a hardware, the selection box in Figure 6 appears between the two endpoint columns. Use the selection box to select a hardware to complete the route.

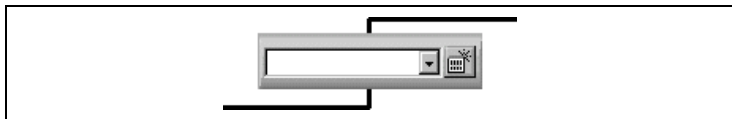


Figure 6. Hardware Selection Box



Note Hardwires are defined by a user. For information on defining new hardwires, refer to **Adding Hardwires** in the *Switch Executive Help*.

- If the two endpoints of a route are in separate switch modules connected by one or more intermediate switches, you must define those switches and the hardwires that connect them.

11. Complete the following steps to add a switch to a route path.



Tip To simplify this process, you can have Switch Executive attempt to complete this path by clicking **Auto Complete**.

- a. Click the **Add Switches** button. A device window appears, as shown in Figure 7.

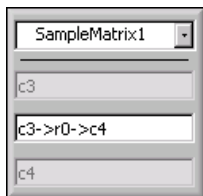


Figure 7. Device Window

- b. Use the drop-down menu of the switch box to select the intermediate device.



Note To add a switch module to your Switch Executive virtual device, refer to **Switch Executive Help»Adding IVI Switches** for more information.

- c. Define the hardwires that connect the switch to the other devices of your route path. Refer to **Adding Hardwires** in the *Switch Executive Help* for more information.



Note To remove a switch from a route path, click the **Delete** button below the switch box.

12. Click **Save** to save the route path you created.

You have finished configuring your Switch Executive virtual device.

Using the Text Editor

An alternative method for creating or modifying a route is to use the text editor below the route selector window, as shown in Figure 8.

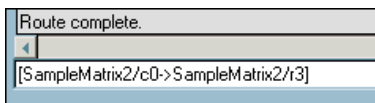


Figure 8. Text Editor

The text editor is automatically populated with the route specification string based on the selections you make in the route selection window. To use the text editor, enter the route path in the text editor box using the fully specified path syntax. Refer to **Programming»Route Specification Strings** in the *Switch Executive Help* for more information.

Identifying Broken Routes

If any two points along a route path are broken, the lines between the points appear as dashed lines, as shown in Figure 9.

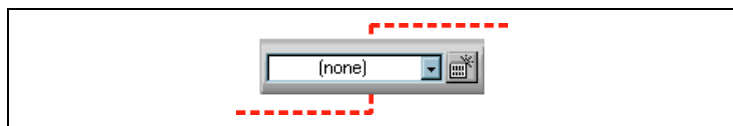


Figure 9. Broken Path

If the two points are connected, a solid line appears between the points. Once you have completed a route path, all lines between all points along the route path appear as a solid line and the Information and Status Bar displays **Route Complete**.

For more information on configuration, select **Help»Help Topics»Help for Switch Executive** on the menu bar. For topic-specific help, click **Help** on the MAX toolbar to access the *Switch Executive Help*.

Programming Switch Executive

Figure 10 shows a typical Switch Executive programming flow.

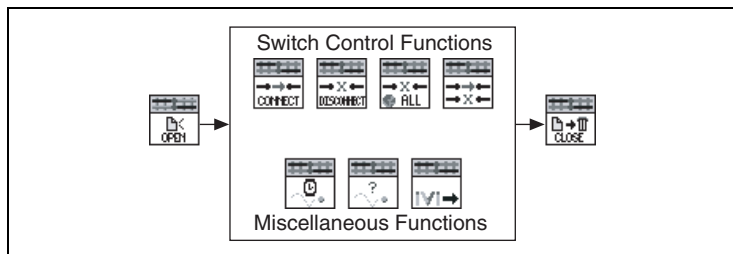


Figure 10. Switch Executive Programming Flow

The basic steps required to use a Switch Executive virtual device are as follows:

- Open a Session
- Control the Switches

- Error Handling
- Close the Session

For more information on programming, refer to **Programming»Tutorial** in the *Switch Executive Help*.

Using TestStand with Switch Executive

TestStand 2.0.1 includes a Switching tab on the step properties dialog box. This feature allows Switch Executive to seamlessly integrate into National Instruments TestStand.

By editing the properties on the TestStand step, you can use the Switching tab to specify the switching action you want TestStand to perform the step. Figure 11 shows the Switching tab in the step properties dialog box.

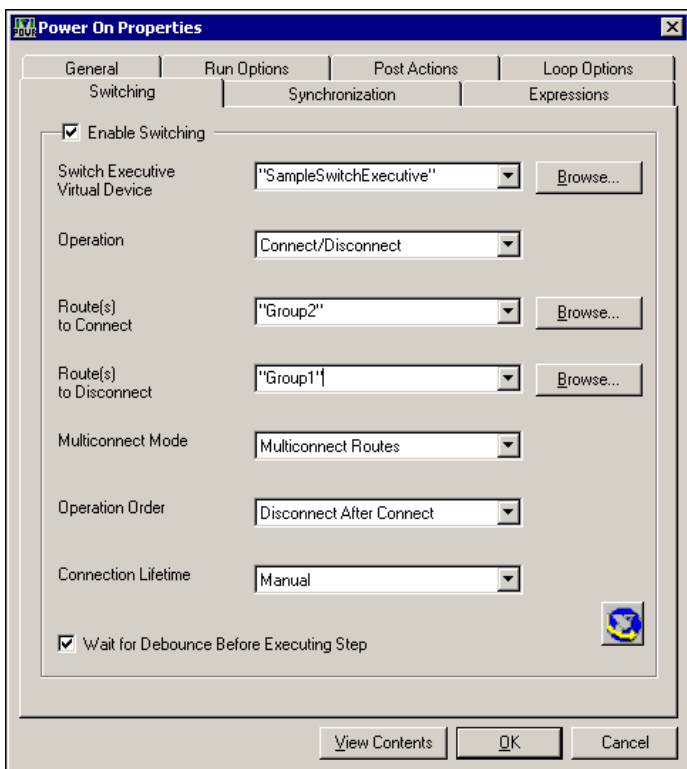


Figure 11. Switching Tab in the TestStand Step Properties Dialog Box

The IVI Switch step type supports not only the IVI class layer but also Switch Executive operations.

For general information about TestStand, refer to your TestStand documentation. For specific information about using Switch Executive with TestStand, refer to the *Switch Executive Help*.

Technical Support Resources

Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of ni.com.

NI Developer Zone

The NI Developer Zone at ni.com/zone is the essential resource for building measurement and automation systems. At the NI Developer Zone, you can easily access the latest example programs, system configurators, tutorials, technical news, as well as a community of developers ready to share their own techniques.

Customer Education

National Instruments provides a number of alternatives to satisfy your training needs, from self-paced tutorials, videos, and interactive CDs to instructor-led hands-on courses at locations around the world. Visit the Customer Education section of ni.com for online course schedules, syllabi, training centers, and class registration.

System Integration

If you have time constraints, limited in-house technical resources, or other dilemmas, you may prefer to employ consulting or system integration services. You can rely on the expertise available through our worldwide network of Alliance Program members. To find out more about our Alliance system integration solutions, visit the System Integration section of ni.com.

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of ni.com. Branch office Web sites provide up-to-date contact information, support phone numbers, email addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 0 662 45 79 90 0,
Belgium 32 0 2 757 00 20, Brazil 55 11 3262 3599,
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Canada (Ottawa) 613 233 5949, Canada (Québec) 514 694 8521,
Canada (Toronto) 905 785 0085, Canada (Vancouver) 514 685 7530,
China 86 21 6555 7838, Czech Republic 420 2 2423 5774,
Denmark 45 45 76 26 00, Finland 385 0 9 725 725 11,
France 33 0 1 48 14 24 24, Germany 49 0 89 741 31 30,
Greece 30 2 10 42 96 427, India 91 80 51190000,
Israel 972 0 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Malaysia 603 9131 0918,
Mexico 001 800 010 0793, Netherlands 31 0 348 433 466,
New Zealand 1800 300 800, Norway 47 0 66 90 76 60,
Poland 48 0 22 3390 150, Portugal 351 210 311 210,
Russia 7 095 238 7139, Singapore 65 6226 5886, Slovenia 386 3 425 4200,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 0 8 587 895 00, Switzerland 41 56 200 51 51,
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