# NI-IMAQ I/O

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Use the NI-IMAQ I/O parameters and VIs to create applications to control the I/O lines on an NI-IMAQ I/O device.

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## **NI-IMAQ I/O Controls**

The digital I/O features on NI-IMAQ I/O devices include 13 isolated inputs, two TTL inputs, 10 TTL outputs, and four isolated outputs. Use the <u>Read/Write Control</u> to configure pulse generators, triggers, <u>quadrature</u> <u>encoder</u> counts, change detectors, and the watchdog timer on NI-IMAQ I/O devices.

Refer to your hardware documentation for pinouts and specifications for the digital I/O components on the NI-IMAQ I/O device.

Pulse 1 through Pulse 6 are TTL pulse generators.

- All Elements adds a control to the <u>Read/Write Control</u> for each pulse parameter.
- Trigger controls which input triggers the pulse generator. Valid values include Immediate and the following signals: ISO Input 5, ISO Input 8, TRIG 0, TTL Input 0, and TTL Input 1. When the Trigger is Immediate, the pulses are generated continuously without waiting for a trigger.
- **Trigger Polarity** indicates the signal edge on which the pulse is triggered. The default value is TRUE, which triggers on the rising edge. Multiple pulse generators can use the same trigger line. You can set the trigger polarity independently for each pulse generator.
- Delay is the time from a trigger to the first edge of a pulse. The pulse delay is configurable in units of microseconds or quadrature encoder counts. If configured for microseconds, available values range from 10 μs to 4,294,967,295 μs, which is approximately 4,294 seconds, or 71 minutes. If the delay is configured for quadrature encoder counts, valid values range from 0 counts to 4,294,967,295 counts. Use Delay Units to set the unit of measure for the Delay.
- Delay Units indicates if the Delay is calculated in microseconds or quadrature encoder counts.
- Width is the amount of time between the first (assertion) edge of a pulse and the second (deassertion) edge. Width is configurable only in microseconds from 10 μs to 4,294,967,295 μs.

**Polarity** specifies the value of the pulse line during assertion. The default is TRUE, which indicates the pulse asserts high.



- Mode indicates the current state of the pulse generator. Valid values are Start, Single Shot, and Stop. If the Mode is Stop, the pulses are not generated. You must configure the pulse generator when it is in Stop mode. When you finish configuring the pulse generator, set the mode to Start or Single Shot. Start mode works in conjunction with the triggers listed in Trigger. Use Start mode for continuous or rearmed pulses. Use Single Shot mode for pulses that should assert only once.
  - Note When Mode is set to Stop, the <u>TTL Outputs</u> parameters control the output state of the corresponding pulse generator. **Polarity** has no effect on the output until **Mode** is set to **Start**.
  - Tip <u>The Read/Write Control</u> executes from top to bottom. To ensure that the pulse parameters take effect simultaneously, set **Mode** to **Stop** before you configure the pulse parameters.
  - Note To use the general-purpose TTL outputs that are available for each of the pulses, set the pulse **Mode** to **Stop**.
- TTL Enables enable the TTL lines to drive output data.
- All Elements adds a control to the <u>Read/Write</u> control for each **TTL Enables** parameter.
- **Enable 0** enables **TTL Outputs.Out 0** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state

condition.

- **Enable 1** enables **TTL Outputs.Out 1** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 2** enables **TTL Outputs.Out 2** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 3** enables **TTL Outputs.Out 3** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 4** enables **TTL Outputs.Out 4** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 5** enables **TTL Outputs.Out 5** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 6** enables **TTL Outputs.Out 6** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable 7** enables **TTL Outputs.Out 7** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable TRIG 1** enables **TRIG 1** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.
- **Enable TRIG 2** enables **TRIG 2** to drive output data. If you set this parameter to FALSE, the output is left in a tri-state condition.

**TTL Outputs** are general-purpose outputs. When the signal is <u>enabled</u>, TRUE drives the signal high, and FALSE drives the signal low.

- All Elements adds a control to the <u>Read/Write</u> control for each **TTL Outputs** parameter.
- **Out 0** is a watchdog output or a general-purpose output.

- **Out 1** is a general-purpose output when **Pulse 1.Mode** is set to **Stop**.
- **Out 2** is a general-purpose output when **Pulse 2.Mode** is set to **Stop**.
- **Out 3** is a general-purpose output when **Pulse 3.Mode** is set to **Stop**.
- **Out 4** is a general-purpose output when **Pulse 4.Mode** is set to **Stop**.
- **Out 5** is a general-purpose output.
- **Out 7** is a general-purpose output.
- **TRIG 1** is a general-purpose output when **Pulse 5.Mode** is set to **Stop**.
- **TRIG 2** is a general-purpose output when **Pulse 6.Mode** is set to **Stop**.

**ISO Outputs** are general-purpose outputs. TRUE turns on the output, and FALSE turns off the output.

- All Elements adds a control to the <u>Read/Write</u> control for each **ISO Outputs** parameter.
- **Out 0** is a general-purpose isolated output.
- **Out 1** is a general-purpose isolated output.
- **Out 2** is a general-purpose isolated output.
- **Out 3** is a general-purpose isolated output.

**ISO Inputs** include pulse trigger inputs, a shutdown input, trigger change detectors, and a quadrature encoder input. Using the <u>Read/Write</u> control, you can read the **ISO Inputs** as general-purpose inputs even when they are configurable triggers.

- All Elements adds a control to the <u>Read/Write</u> control for each **ISO Inputs** parameter.
- **In 6** is a general-purpose input or the Phase A input to the quadrature encoder.
- **In 7** is a general-purpose input or the Phase B input to the quadrature encoder.
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**In 8** is a configurable trigger that you could also use as a general-purpose input or a trigger change detector.

- **III 9** is a general-purpose input or a trigger change detector.
- **III** In **10** is a general-purpose input or a trigger change detector.
- **In 11** is the shutdown input.
  - Caution When shutdown mode is enabled and the shutdown input signal, ISO Inputs.In 11, turns off, the NI-IMAQ I/O device registers an external shutdown condition. Refer to your hardware documentation for information about the device shutdown behavior.
  - Note You *must* use the <u>IMAQ IO Enable Shutdown</u> VI to enable the NI-IMAQ I/O device to handle fault conditions and detect user shutdown for this parameter to take effect on the NI-IMAQ I/O device.
- **TRIG 0** is a configurable trigger that you could also use as a general-purpose input or a trigger change detector.
- TTL Inputs are general-purpose inputs.
- All Elements adds a control to the <u>Read/Write</u> control for each **TTL Inputs** parameter.
- **In 0** is a configurable trigger that you could also use as a general-purpose input or a trigger change detector.
- **In 1** is a configurable trigger that you could also use as a general-purpose input or a trigger change detector.

**Input Port** includes ISO Input 4:0, which is 5 bits of data, and ISO Input 5. ISO Input 5 latches in the data. When ISO Input 5 is on a rising edge, data is stored in **Latched Value**. You can use this port to receive communication from external devices that provide information such as product selection or classification. The minimum high time on a latch pulse is 1  $\mu$ s.

- All Elements adds a control to the <u>Read/Write Control</u> for each **Input Port** parameter.
- Latched Value is the value of the input port as of the last latch pulse. Latched Value acts as a buffer to retain the value of the input port until the next latch pulse.

- Current Value reflects the state of the input port regardless of the latch pulse.
- Caution Use the Watchdog Indicator Only option only to test the watchdog. If software becomes unresponsive, it cannot be relied upon to send notification to the host.

**Watchdog** monitors software on the NI-IMAQ I/O device and takes action if the software is unresponsive. The millisecond counter on the watchdog timer is configurable up to 65,534 ms, in 1 ms increments, before it expires.

- All Elements adds a control to the <u>Read/Write</u> control for each Watchdog parameter.
- **Expiration Actions** determines what action the Watchdog takes when it expires.
- Timeout (ms) specifies the length of time after a whack (reset) until the timeout occurs.
- **Arm** activates the timer.
- **Whack** resets the counter.
- **Status** displays the status of the timer.

<**Trigger Number**> Change allows you to detect edges on various trigger input lines.

- All Elements adds a control to the <u>Read/Write</u> control for each Change parameter.
- Mode specifies which type of signal edge to be sensitive to. Valid modes are **Any Edge**, **Rising Edge**, and **Falling Edge**.
- **Filter** is used to suppress high-frequency noise from the change detection. After receiving an edge, the trigger line must be held steady in the new logic state for (**Filter** × 25 ns) in order for the device to register a successful change detection. Set this parameter to 0 to disable filtering.
- **Filter Timebase Multiplier** is used to increase the duration of the filter. The trigger line must be held steady in the new logic state for [**Filter Timebase Multiplier** × (**Filter** × 25 ns)]. Use a **Filter Timebase Multiplier** of 1 for filter durations up to 1.6

ms. Increase the **Filter Timebase Multiplier** to support filters up to 417.7 ms. The valid range of values for the **Filter Timebase Multiplier** is 1 to 255.

- **Result** returns True if an edge has been detected on the trigger line and returns False otherwise.
- **Reset** is used to reset the change detection mechanism for the trigger line. This rearms the change detector logic for detection of a new trigger edge.
- **Isolated Power Present** indicates if isolated power is being supplied to the NI-IMAQ I/O device.

#### **Quadrature Encoder**

The quadrature encoder uses ISO Input 6 for its Phase A input and ISO Input 7 for its Phase B input. Encoder speed is limited by the speed of the isolated inputs. Each isolated input can change at a maximum rate of 100 kHz, making the maximum encoder rate 400,000 counts/s. The quadrature encoder also can be used as a timebase for the pulse generation delay.

### **Read/Write Control**

<u>Reads a value</u> from or <u>writes a value</u> to a control or indicator in the VI running on the NI-IMAQ I/O device. <u>Details</u>



- **FPGA VI Reference In** is the reference to the VI running on the NI-IMAQ I/O device.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
  - **status** is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
  - **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **FPGA VI Reference Out** returns a reference to the VI running on the NI-IMAQ I/O device.
- **error out** contains error information. If **error in** indicates that an error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** indicator on the front panel and select **Explain Error** from the shortcut menu for more information about the error.

- **status** is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- **code** is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

#### **Read/Write Control Details**

You can use the Read/Write Control to read whole clusters or an individual element of a cluster. If you need to read multiple elements of a cluster, read the whole cluster. You can write to a whole cluster, but you cannot write to individual elements of a cluster. When you run the host VI, the Read/Write Control reads and writes controls and indicators in the order they appear in the Read/Write Control on the block diagram.

Refer to <u>NI-IMAQ I/O Controls</u> for a list of parameters you can set with this control.

## **NI-IMAQ IO Write Shutdown States**

Use NI-IMAQ IO Write Shutdown States to configure the action that the TTL and ISO outputs take in the event of a fault condition on the NI-IMAQ I/O device. Refer to your hardware documentation for more information about the NI-IMAQ I/O device shutdown configuration settings and effects.



**Caution** If you do *not* enable the NI-IMAQ I/O device to handle fault conditions and to detect user shutdown, the settings you make in this VI do not take effect. Use the <u>IMAQ IO Enable</u> <u>Shutdown</u> VI to enable the NI-IMAQ I/O device shutdown features.



**Caution** Because the shutdown states are stored in volatile memory, you *must* configure the NI-IMAQ I/O device shutdown actions each time your system is booted.

**Resource In** specifies the name of the device to write shutdown values. You can select the device name from the list of devices on your machine, or you can type the name and IP address of the device you want to target.

In the list of device names, the names are the VISA name for the device, which is defined in Measurement & Automation Explorer (MAX). For example, the device name might be similar to RIO#::INSTR, where # represents the number of the RIO device, depending on how many RIO devices are installed in the system.

#### **TTL Outputs** are general-purpose outputs.

- **Out 0** indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are **Drive High**, **Drive Low**, or **3-State**. The default is **3-State**, which puts the output in a tri-state condition.
- **Out 1** indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are **Drive High**, **Drive Low**, or **3-State**. The

default is **3-State**, which puts the output in a tri-state condition.

- Out 2 indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are Drive High, Drive Low, or 3-State. The default is 3-State, which puts the output in a tri-state condition.
- **Out 3** indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are **Drive High**, **Drive Low**, or **3-State**. The default is **3-State**, which puts the output in a tri-state condition.
- Out 4 Indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are Drive High, Drive Low, or 3-State. The default is 3-State, which puts the output in a tri-state condition.
- **Out 5** indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are **Drive High**, **Drive Low**, or **3-State**. The default is **3-State**, which puts the output in a tri-state condition.
- **Out 7** indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are **Drive High**, **Drive Low**, or **3-State**. The default is **3-State**, which puts the output in a tri-state condition.
- TRIG 1 indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are Drive High, Drive Low and 3-State. The default is 3-State, which puts the output in a tri-state condition.
- TRIG 2 indicates the action that takes place on the output in response to a fault condition on the NI-IMAQ I/O device. Valid actions are Drive High, Drive Low, or 3-State. The default is 3-State, which puts the output in a tri-state

condition.

#### Isolated Outputs

- Out 0 indicates the action that takes place in response to a fault condition on the NI-IMAQ I/O device. Valid actions are Off or On. The default is Off.
- **Out 1** indicates the action that takes place in response to a fault condition on the NI-IMAQ I/O device. Valid values are **Off** or **On**. The default is **Off**.
- **Out 2** indicates the action that takes place in response to a fault condition on the NI-IMAQ I/O device. Valid values are **Off** or **On**. The default is **Off**.
- **Out 3** indicates the action that takes place in response to a fault condition on the NI-IMAQ I/O device. Valid values are **Off** or **On**. The default is **Off**.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the <u>Simple Error Handler</u> or <u>General Error</u> <u>Handler</u> VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
  - **status** is TRUE if an error occurred before this VI or function ran or FALSE to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
  - **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Resource Out** is a string output that represents the name of the

device.

- **error out** contains error information. If **error in** indicates that an error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** indicator on the front panel and select **Explain Error** from the shortcut menu for more information about the error.
  - **status** is TRUE if an error occurred or FALSE to indicate a warning or that no error occurred.
  - **code** is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

## **IMAQ IO Read Shutdown States**

Use IMAQ IO Read Shutdown States to review the shutdown settings for the TTL and ISO outputs on the NI-IMAQ I/O device.



**Resource In** is a string input that represents the name of the device to read shutdown values from. You can select the device name from the list of devices on your machine, or you can type the name and IP address of the device you want to target.

In the list of device names, the names are the VISA name for the device, which is defined in Measurement & Automation Explorer (MAX). For example, the device name might be similar to RIO#::INSTR, where # represents the number of the RIO device, depending on how many RIO devices are installed in the system.

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the <u>Simple Error Handler</u> or <u>General Error</u> <u>Handler</u> VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- **status** is TRUE if an error occurred before this VI or function ran or FALSE to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

#### **TTL Outputs**

- Out 0—Valid values are Drive High, Drive Low, and 3-State.
- Out 1—Valid values are Drive High, Drive Low, and 3-State.
- Out 2—Valid values are Drive High, Drive Low, and 3-State.
- Out 3—Valid values are Drive High, Drive Low, and 3-State.
- Out 4—Valid values are Drive High, Drive Low, and 3-State.
- Out 5—Valid values are Drive High, Drive Low, and 3-State.
- Out 7—Valid values are Drive High, Drive Low, and 3-State.
- TRIG 1—Valid values are Drive High, Drive Low, and 3-State.
- TRIG 2—Valid values are Drive High, Drive Low, and 3-State.
- [Isolated Outputs
  - **Out 0**—Valid values are **Off** and **On**.
  - **Out 1**—Valid values are **Off** and **On**.
  - Out 2—Valid values are Off and On.
  - **Out 3**—Valid values are **Off** and **On**.
- **Resource Out** is a string output that represents the name of the device.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out indicator on the front panel and select **Explain Error** from the shortcut menu for more information about the error.
  - **status** is TRUE if an error occurred or FALSE to indicate a

warning or that no error occurred.

- **code** is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

# **IMAQ IO Enable Shutdown**

Use IMAQ IO Enable Shutdown to enable the NI-IMAQ I/O device to handle fault conditions and detect user shutdown. If you do not enable shutdown on the NI-IMAQ I/O device, the settings you define in the IMAQ IO Write Shutdown States VI do not take effect. Refer to your hardware documentation for more information about the NI-IMAQ I/O device shutdown configuration settings and effects. Details





**Caution** When Shutdown mode is enabled and the shutdown input signal, <u>ISO Inputs.In 11</u>, turns off, the NI-IMAQ I/O device registers an external shutdown condition. Refer to your hardware documentation for information about the device shutdown behavior.



**Caution** Because the shutdown states are stored in volatile memory, you *must* configure the NI-IMAQ I/O device shutdown actions each time your system is booted.

**Resource In** is a string input that represents the name of the device to enable shutdown for. You can select the device name from the list of devices on your machine, or you can type the name and IP address of the device you want to target.

In the list of device names, the names are the VISA name for the device, which is defined in Measurement & Automation Explorer (MAX). For example, the device name might be similar to RIO#::INSTR, where # represents the number of the RIO device, depending on how many RIO devices are installed in the system.

- **Enable Shutdown** allows you to configure the NI-IMAQ I/O device to control outputs when a fault condition occurs. When you set Enable Shutdown to TRUE, the NI-IMAQ I/O device uses the settings you specify in the <u>IMAQ IO Write Shutdown States</u> VI.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error

occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error</u> <u>Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- **status** is TRUE if an error occurred before this VI or function ran or FALSE to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Resource Out** is a string output that represents the name of the device.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out indicator on the front panel and select **Explain Error** from the shortcut menu for more information about the error.
  - **status** is TRUE if an error occurred or FALSE to indicate a warning or that no error occurred.
  - **code** is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

#### **Using This VI**



Note Clear shutdown by powering off and then powering on your system.



**Caution** Because the shutdown states are stored in volatile memory, you *must* configure the NI-IMAQ I/O device shutdown actions each time your system is booted.

# **IMAQ IO Query Shutdown**

Use IMAQ IO Query Shutdown to determine if the NI-IMAQ I/O device is configured to handle fault conditions and detect user shutdown.

Resource In	IMAGIO ******** Resource Out
error in	Population Enable Shutdown

**Resource In** is a string input that represents the name of the device to query shutdown for. You can select the device name from the list of devices on your machine, or you can type the name and IP address of the device you want to target.

In the list of device names, the names are the VISA name for the device, which is defined in Measurement & Automation Explorer (MAX). For example, the device name might be similar to RIO#::INSTR, where # represents the number of the RIO device, depending on how many RIO devices are installed in the system.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the <u>Simple Error Handler</u> or <u>General Error</u> <u>Handler</u> VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
  - **status** is TRUE if an error occurred before this VI or function ran or FALSE to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
  - **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

**Resource Out** is a string output that represents the name of the device.

Enable Shutdown TRUE indicates the NI-IMAQ I/O device is configured to handle fault conditions and detect user shutdown.FALSE indicates the NI-IMAQ I/O device is not configured to handle fault conditions and detect user shutdown.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out indicator on the front panel and select **Explain Error** from the shortcut menu for more information about the error.
  - **status** is TRUE if an error occurred or FALSE to indicate a warning or that no error occurred.
  - **code** is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
  - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

# Controlling the Digital I/O for NI-IMAQ I/O Devices

The following table shows the VI icons you use to control the digital I/O on NI-IMAQ I/O devices.

lcon	VI
	Open IMAQ IO VI
<u>60000</u>	Read/Write Control
Ď	Close FPGA VI Reference VI

Complete the following steps to control the digital I/O components on the NI-IMAQ I/O device with LabVIEW.

- 1. Launch LabVIEW.
- 2. If you are targeting an RT target, complete the following substeps. Otherwise, skip this step and its substeps.
  - a. Create a project using the Real-Time Project Wizard or the Project Explorer window.
  - b. Right-click the project root and select New»Targets and Devices from the shortcut menu to display the Add Targets and Devices dialog box.
  - c. Select one of the following types of RT targets:
    - **Existing target or device**—An RT target that you have configured in Measurement & Automation Explorer (MAX) and connected to the same subnet as the host computer.
    - Existing device on remote subnet—An RT target that you configured in MAX and connected to a remote subnet.
    - New target or device—A target in a project that is not bound to existing RT Series hardware. You must change the properties for the target from the Project Explorer window to bind it to an existing RT Series

hardware before you attempt to connect or run a VI on the target.

- d. Click **OK**. The RT target appears in the Project Explorer window.
- 3. Click **New** to open the **New** dialog box. Select **Blank VI**, and click **OK**.
- 4. Place the Open IMAQ IO VI on the block diagram.
- 5. Place the <u>Read/Write</u> control on the block diagram.
- 6. Wire the **FPGA VI Reference Out** and **error out** outputs of the Open IMAQ IO VI to the Read/Write control.
- 7. Click the **Unselected** output of the Read/Write control, and select the NI-IMAQ I/O device feature you want to configure from the shortcut menu.
- 8. Right-click the top portion of the Read/Write control and select **Add Element (Add Control** in LabVIEW 7.*x*) from the shortcut menu to add another control. Right-click the new control, and select the NI-IMAQ I/O device feature you want to configure. Repeat this step for each of the NI-IMAQ I/O device features you want to configure from the shortcut menu.
- 9. To configure the controls you added for the NI-IMAQ I/O device features, wire the appropriate values to the inputs on each of the controls you added to the Read/Write control.
- 10. If you want to manage your own run and abort functionality, complete the following steps:
  - a. Place the <u>Invoke</u> method on the block diagram.
  - b. Wire the **FPGA VI Reference Out** and **error out** outputs of the Read/Write Control function to the Invoke method.
  - c. Right-click the Invoke method and select the action you want the VI to perform.
- 11. Place the <u>Close FPGA VI Reference</u> function on the block diagram.
- 12. Wire the **FPGA VI Reference Out** and **error out** outputs of the Invoke method to the **FPGA VI Reference In** and **error in** inputs of the Close FPGA VI Reference function.

Search the *LabVIEW Help* by selecting **Help**»**Search the LabVIEW Help** for more information about using the LabVIEW FPGA Interface VIs and

functions to communicate with LabVIEW FPGA VIs.

#### **Related Topics**

NI-IMAQ I/O Controls

IMAQ IO Write Shutdown States

IMAQ IO Read Shutdown States

IMAQ IO Enable Shutdown

IMAQ IO Query Shutdown