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TIMS-0201

USB Single Axis Stepper Motor Driver

Operating Manual

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Model TIMS-0201

Part No. 910-0201

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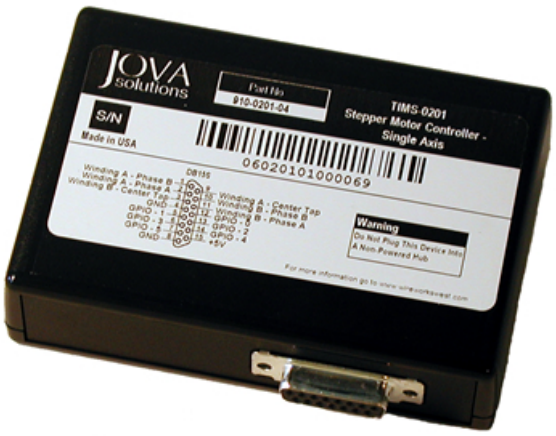
INTRODUCTION

WireWorks West's TIMS-0201 module offers a quick and easy method of controlling a stepper motor. The module is a single axis controller and supports quadrature encoder inputs and both hard and soft limits. There are also 6 pins of general purpose I/O functionality including digital inputs and outputs, an analog input, a timer/counter, and a PWM output.

The TIMS-0201 module includes a USB 1.1/2.0 Full Speed interface for connection to a host PC. A separate 2.1 mm connector accepts power from an external +10 to +40 VDC power supply. A DB15S connector contains the motor control and the GPIO signals.

The TIMS-0201 module firmware combined with the included driver software allows for flexible, accurate, and consistent motion control.



TIMS-0201 Main Features

- USB Interface
- Upgradeable Firmware
- Home, CW Limit, CCW Limit Inputs
- Quadrature Encoder Inputs
- Half and Full Stepping
- General Purpose I/O Pins
- Bipolar Constant Current Motor Drive with Wide Range of Programmable Current Control (5 – 1000 mA)
- Fast Recovery Schottley Commutation Diodes
- Thermal Overload Protection
- Single 10 – 40VDC Power Supply Input up to 2 amps

A complete LabVIEW driver library is provided for easy integration into higher level applications. A low-level Dynamic Link Library (DLL) is also provided for integration with other programming languages.

1. TIMS-0201 STEPPER CONTROLLER MODULE HARDWARE

The TIMS-0201 Stepper Motor Driver module consists of electronic circuitry packaged in a 1.20”-high by 4.50”-wide by 3.25”-deep (including the connector) plastic enclosure. A USB Type-B connector is located on the rear panel and an additional 2.1 mm 10 – 40 VDC power input connector. The front panel contains both a DB-15S connector.

1.1 CONNECTOR DETAILS

USB Connector

The TIMS-0201 USB interface is a USB 1.1 and USB 2.0 Full Speed compliant interface, available through a USB Type-B connector on the rear panel. This device, when connected to user circuitry, could draw up to 500 mA. *Do not plug the TIMS-0102 into a non-powered hub.*

Motor Power Connector

A 3-pin 2.1 mm power input connector on the rear panel accepts 10 – 40 VDC for motor power. The TIMS-0201 module uses a maximum on 1 Amp per winding for a total of 2 Amps maximum current for the module.

Motor Signal and GPIO Connector

A DB15S connector on the front panel of the TIMS-0201 module contains the 6 connections that go to the motor, 6 GPIO pins, 2 ground connections and a +5V connection.

DB-15S Pin Descriptions

Pin No.	Signal	Notes
1	Winding A – Phase B	
9	Winding A – Center Tap	Not Connected – Reserved for Future Use
2	Winding A – Phase A	
10	Winding B – Phase B	
3	Winding B – Center Tap	Not Connected – Reserved for Future Use
11	Winding B – Phase A	
4	GND	
12	GPIO-0	
5	GPIO-1	

13	GPIO-2	
6	GPIO-3	
14	GPIO-4	
7	GPIO-5	
15	+5V thru 120 Ohms	
8	GND	

Note: the GPIO pin functionality for pins 4,5,6,7,12,13,14,15 is programmable. The options available for each pin are shown in the table below.

GPIO Configuration Table

GPIO	Configuration
0	**GPIO-0** 0 = Digital Input 1 = Digital Output 2 = Home Limit Input 3 = FWD Limit Input 4 = REV Limit Input 5 = Quadrature Encoder Phase-A Input 6 = Quadrature Encoder Phase-B Input
1	**GPIO-1** 0 = Digital Input 1 = Digital Output 2 = Home Limit Input 3 = FWD Limit Input 4 = REV Limit Input 5 = Quadrature Encoder Phase-A Input 6 = Quadrature Encoder Phase-B Input
2	**GPIO-2** 0 = Digital Input 1 = Digital Output 2 = Home Limit Input 3 = FWD Limit Input 4 = REV Limit Input
3	**GPIO-3** 0 = Digital Input 1 = Digital Output 2 = Home Limit Input 3 = FWD Limit Input 4 = REV Limit Input 5 = Counter/Timer Input
4	**GPIO-4** 0 = Digital Input 1 = Digital Output 2 = Home Limit Input 3 = FWD Limit Input 4 = REV Limit Input 5 = PWM Output
5	**GPIO-5** 0 = Analog Input to 10-Bit ADC, 4.096 VDC Reference. 1 = Analog Input to 10-Bit ADC, USB 5 VDC Reference.

1.2 TIMS-0201 SIGNALS

Motor Control Signals

The TIMS-0201 module provides half and full stepping of 2-phase stepper motors. The stepper motor drive circuit utilizes two Unitrode (Texas Instruments) UC3717 integrated circuit devices. Six pins of the DB15S connector are used for the motor control signals and need to be wired directly to the motor. Pins 1,2, and 9 are dedicated to winding A phase B, center tap, and winding A phase A signals. Pins 10, 3 and 11 are the same but for winding B. The power for these signals is provided from the external power connector and the voltage levels and current restrictions are based on the external power supply used.

The TIMS-0201 has the ability to drive a stepper motor in both full and half steps. The step mode is controlled by firmware in the TIMS-0201 and programmable thru the driver. Please consult product literature for the motor you wish to drive to determine which mode is correct for your application.

GPIO Signals

The TIMS-0201 module contains 6 pins of general purpose I/O. Each pin's functionality is programmable according to the table shown above. Some of the GPIO pins can be configured to be limit or home switches. The DB15S connector also contains +5V and GND for use in wiring external switches.

1.2.1.1 Digital I/O Signals

The first five GPIO pins (DB15S pins 12,5,13,6, and 14) can be used for digital input or output. These signals are standard TTL level signals.

1.2.1.2 Forward and Reverse Limits and Home

Any of the first five GPIO pins (DB15S pins 12,5,13,6, and 14) can be used for limit or home switch signals. These signals are standard TTL level signals and are configurable thru the driver software. When configured as home or limit inputs the voltage will be monitored and a low level input will affect a motion stop.

1.2.1.3 Encoder Input Signals

The first two GPIO pins (DB15S pins 12 and 5) can be used for quadrature encoder inputs. These signals are standard TTL level signals. The TIMS-0201 can use these encoder inputs or an internal counter when controlling motion or reporting position and can be enabled thru the driver.

1.2.1.4 Timer/Counter Signal

One of the GPIO pins (DB15S pin 6) can be used as a timer/counter input. This signal is a standard TTL level signal.

1.2.1.5 PWM Signal

One of the GPIO pins (DB15S pin 14) can be used as a PWM Output. This signal is a standard TTL level signal. The period and duty cycle of this PWM output is programmable thru the driver software.

1.2.1.6 Analog Input Signal

One of the GPIO pins (DB15S pin 7) can be used as a 10-bit analog input. This input can be configured to use the USB 5VDC as a reference or a built-in 4.096 VDC reference.

+5V and GND Signals

Pin 15 of the DB15S connector on the TIMS-0201 module is connected to the USB bus +5V supply. Pin 8 is connected to USB Ground.

1.3 TIMS-0201 FUNCTIONAL DETAILS

1.3.1 Full Stepping Vs Half Stepping

The 0201 has the ability to drive a stepper motor in both full and half steps. Please consult product literature for the motor you wish to drive to determine which mode is correct for your application. The position counter is incremented one count for each half step and two counts for each full step performed.

1.3.2 Encoder Vs Counter

All stepper motors can be driven by specifying the number of steps to move. However, in this mode there is no feedback to the controller. It is entirely possible that the motor will get out of sync with the controller. For example, the controller may output the electrical signals that should cause the motor to move 100 steps, but due to the load on the motor, the motor actually moves only 96 steps. This is called **losing steps**.

To prevent this, one can use a motor equipped with an encoder. The encoder is a feedback device that outputs signals back to the motor controller as the axis moves. The controller keeps track of these signals and is able to use this information to determine actual position. In order to use this feature of the 0201, you must first have a motor equipped with an encoder. You must then configure the 0201 General Purpose IO pins (GPIO) to utilize the encoder, and then physical make the connections.

The 0201 is capable of control using either motor counts or encoder counts and is programmable.

1.3.3 Home and Hard Limits

When a motor controller is first powered on, it has no way of knowing what state the motor and physical system is in. In order to determine this, the system is usually carefully and slowly driven to a safe, known position, and then the step (and possible encoder) counters are set back to zero. This is known as the **Home** position.

The home position is usually specified by tripping an optical sensor with a flag. The signal from the sensor is connected to the HOME input on the controller. When *homing*, the 0201 will move at a pre-configured *seek* speed toward the home sensor. This seek speed is usually much less than normal operating speed. When the controller sees that the optical sensor has been tripped, it will stop the motor. At this point the counters are set to zero, and normal movement can take place.

Additionally, most physical systems have travel limits. That is, the system is physically unable to move past certain points. These points are known as *hard stops*, and they may be designed with the intent that there be physical contact with moving parts, or designed in such a way that the moving parts are not ever supposed to touch the hard stops.

The **Hard Limits** sensors were designed for this purpose. Physically these are optical sensors like the home sensor, set up at the forward (FOR) and reverse (REV) limits of travel. When properly configured, the 0201 controller will stop movement of the motor when it detects that one of these limits has been reached. Only movement in the opposite direction will be allowed.

The 0201 is configured such that if a hard travel limit is reached while seeking home, the motor will be reversed until home is reached.

1.3.4 Soft Limits

The 0201 is also capable of using **Soft Limits**. Soft limits are programmable limits that act like hard limits, except that they may be changed programmatically and enabled/disabled. The 0201 is programmed such that if soft limits are enabled and the controller detects that the motor is beyond one of the limits (min or max), then movement will stop and further movement will only be allowed in the opposite direction.

2. GENERAL SOFTWARE DESCRIPTION

The TIMS-0201 module is delivered with a full LabVIEW instrument driver and is available for use in custom applications written using LabVIEW. A low level DLL interface is also available with a fully documented API for use in other applications.

This document is limited to the LabVIEW Driver library. Contact WireWorks West for a copy of the TIMS Packet I/O Developers Manual for more information on the lower level interfaces available for integration with other programming languages.

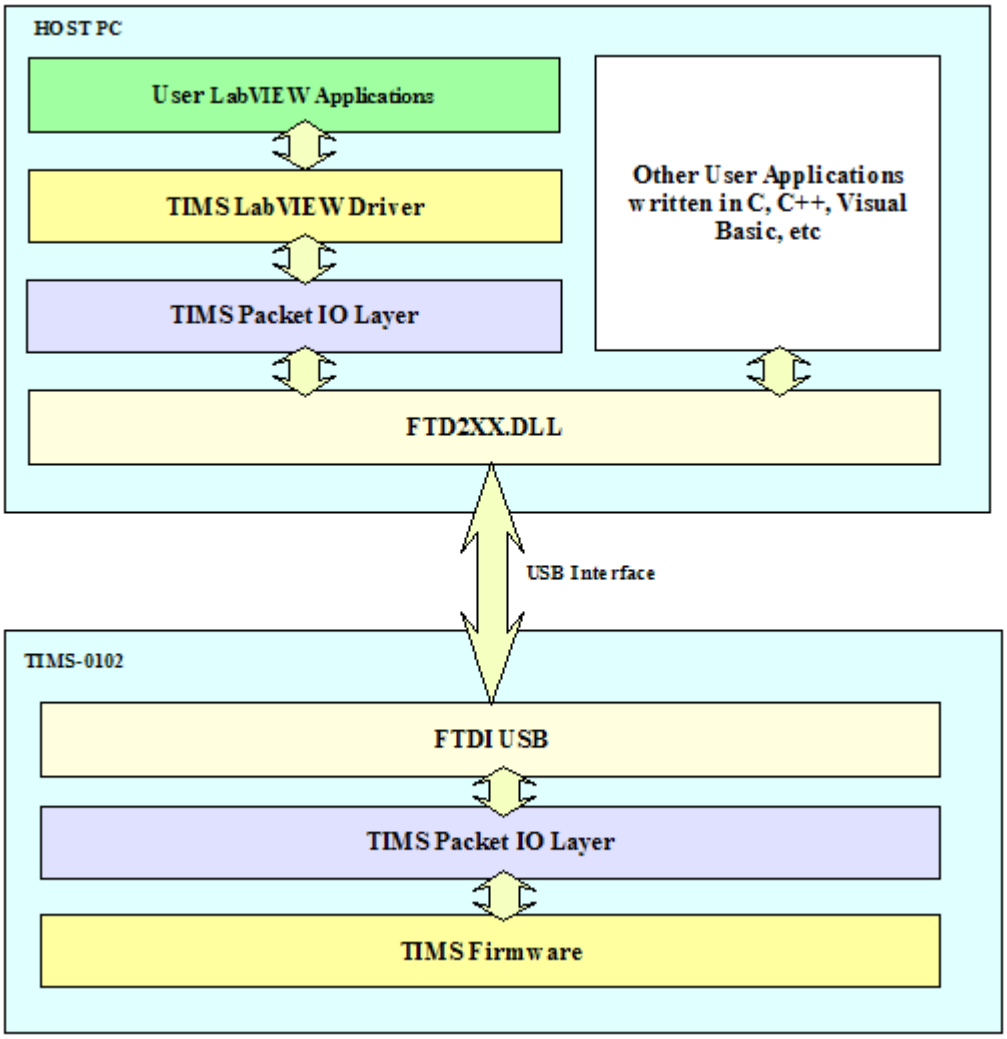


Figure 1 – Software Organization

The TIMS-0201 module utilizes USB interface chips from FTDI. The FTD2XX.DLL is the lowest level software component on the Host PC and all communications to the TIMS-0201 goes through this DLL.

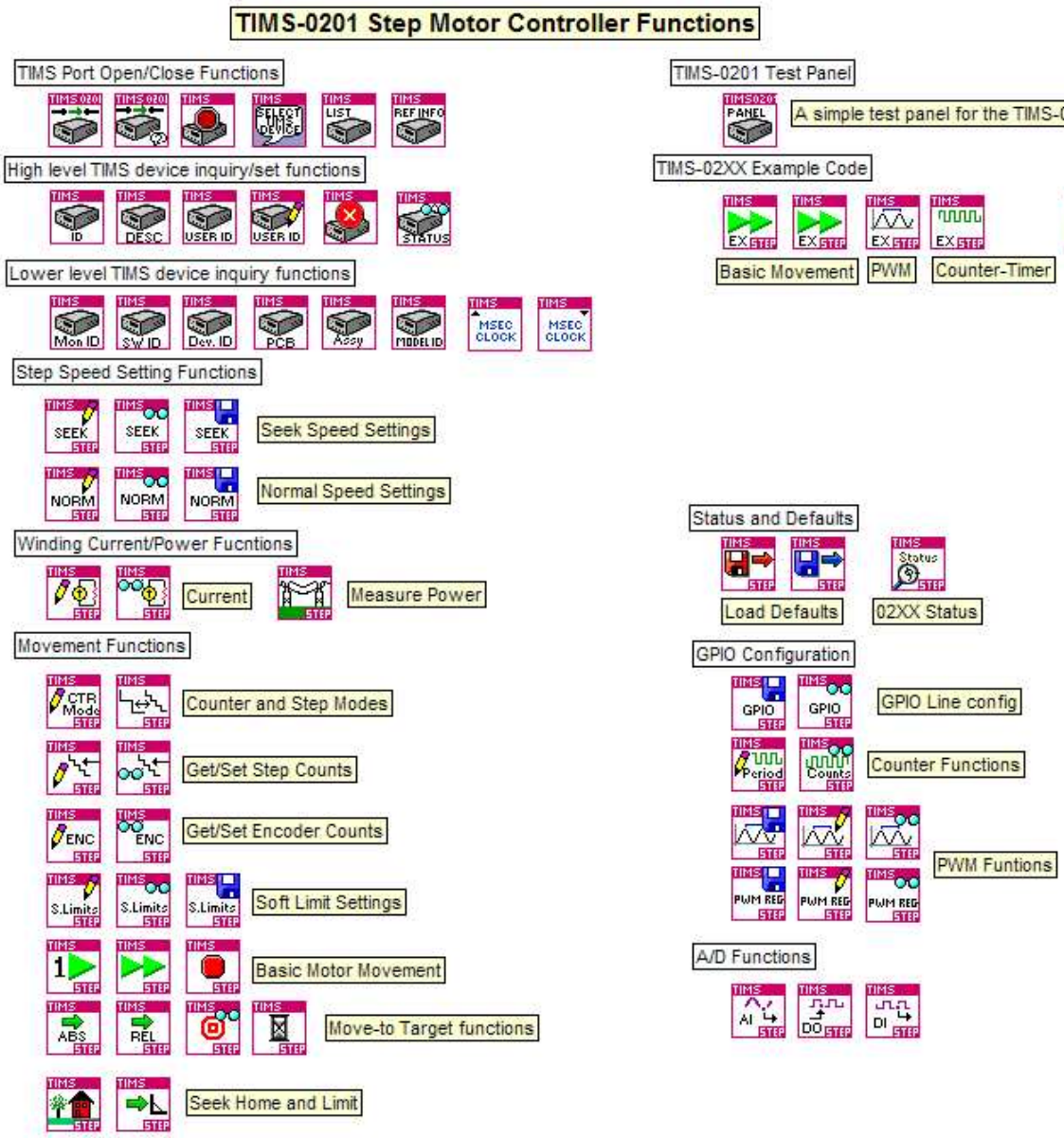
A complete LabVIEW Driver Library is provided for those who use LabVIEW, which eliminates the need to communicate directly with the DLL.

The complete low level packet communication protocol is also provided later in this section so that C, C++, Visual Basic, and other programmers can communicate with the TIMS-0201 directly through the FTD2XX.DLL.

Each of these software layers is described in detail in the following sections.

3. TIMS-0201 LABVIEW INSTRUMENT DRIVERS

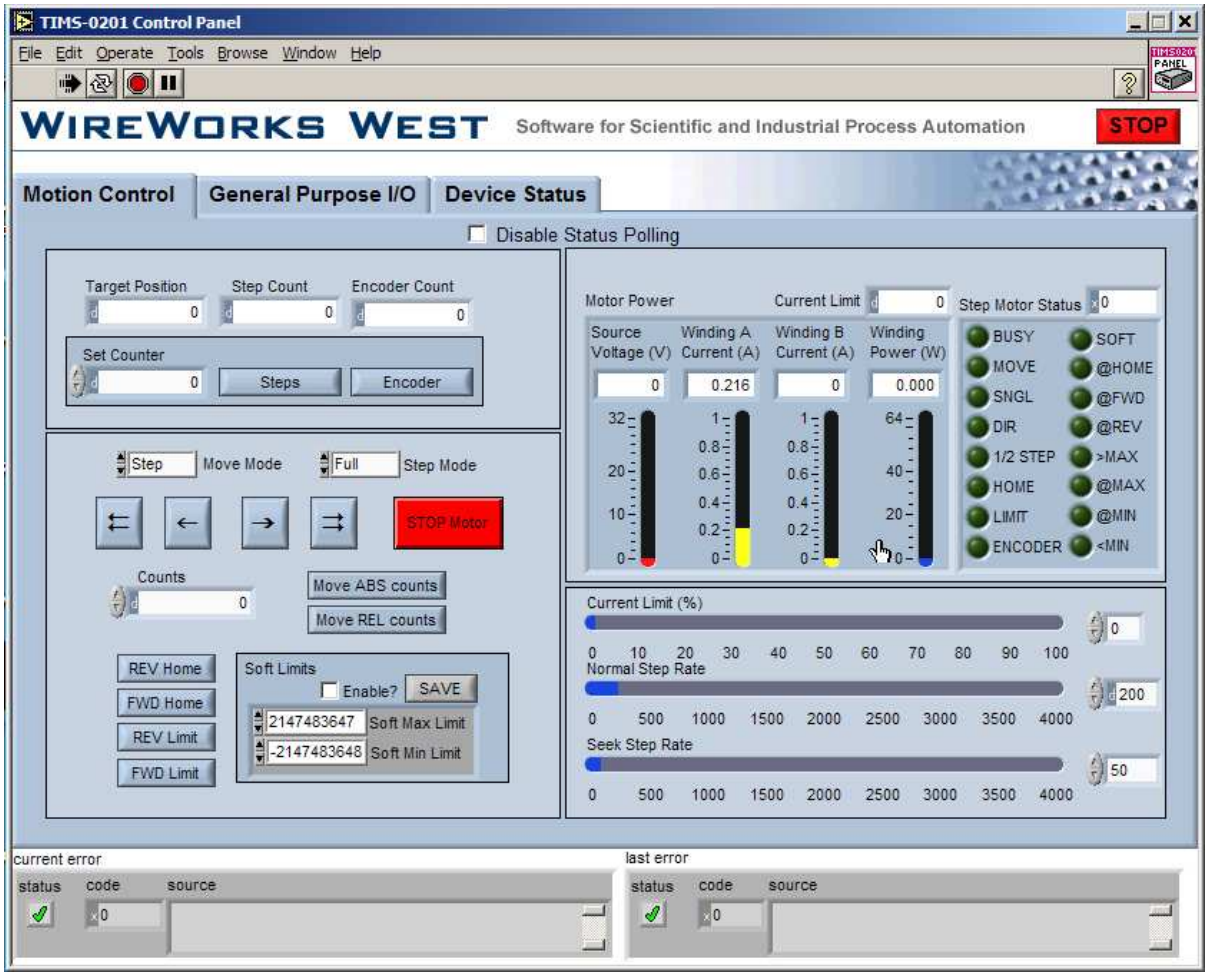
The LabVIEW drivers are installed, by default, into aTIMS-0201 directory. The driver library can be broken down into the functional groups shown in the TIMS-0201 Tree.vi diagram below. (installed to C:\WireWorksWest\TIMS-0201\lib\02XX\TIMS_0201_Tree.vi) diagram contains all the top-level functions needed for most applications as well as several examples.



3.1 TIMS-0201 CONTROL PANEL

The TIMS-0201_Control_Panel.vi is a higher level LabVIEW application that utilizes all the TIMS-0201 VI library functions to fully exercise and test the TIMS-0201 device. This application is a good

place to start when first receiving the TIMS-0201 device. It will verify functional operation and also exposes most of the functionality of the device.



The TIMS-0201 Control Panel.vi contains three tabs that divide the functionality into Motion Control, General Purpose I/O, and Device Status.

The Motion Control tab provides user controls for commanding motion related functions from the TIMS-0201 device. This tab displays the position, encoder and target position counters. The Step Count indicator displays the current value of the internal step counter. The internal step counter is the default counter used for move commands. The Move Mode panel control allows the selection of the

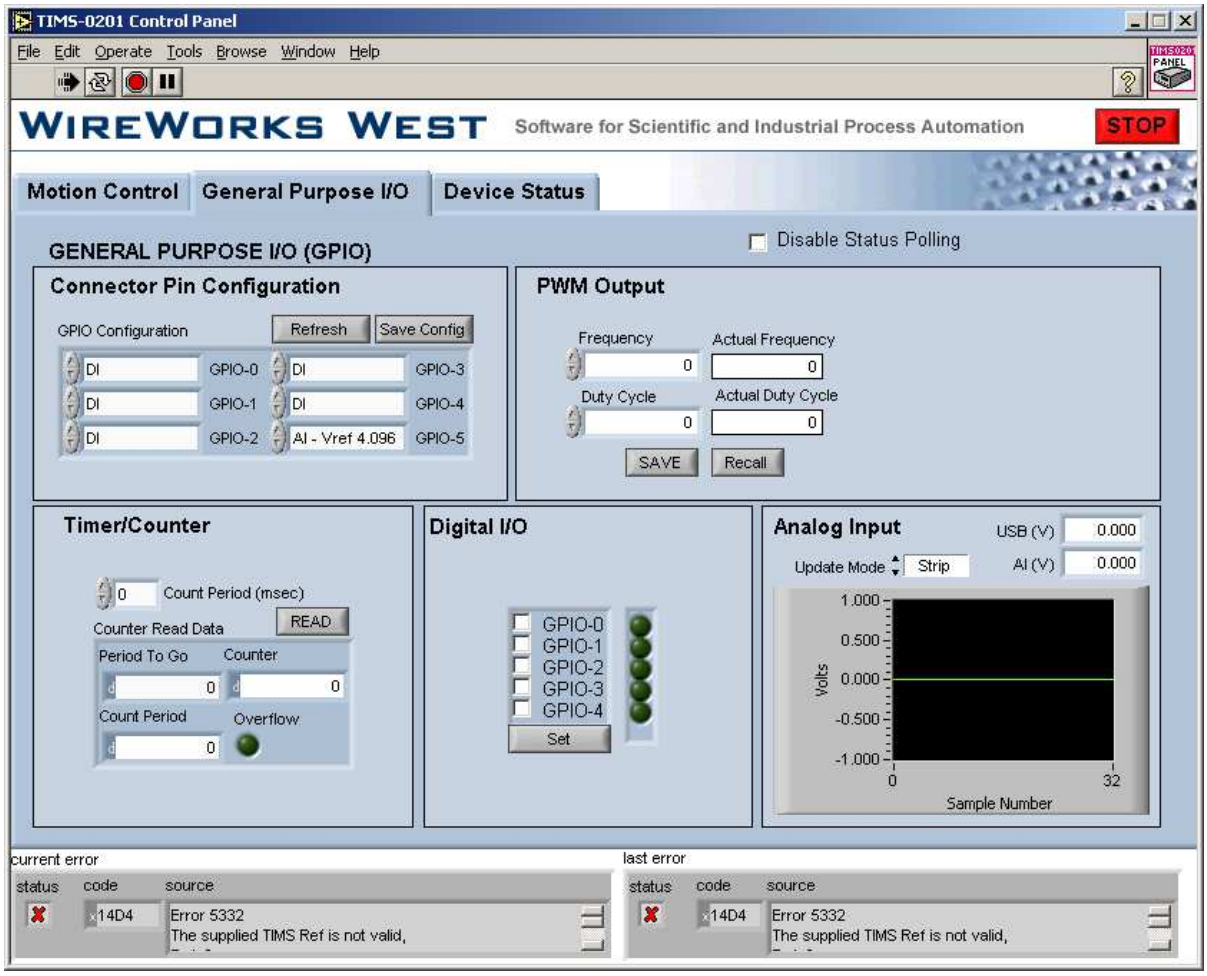
default step counter or the optional encoder counter for use in move commands. When the encoder move mode is selected the Encoder Count indicator then updates as the motor moves. The target position indicator shows the final target position when commanding relative or absolute moves.

Before using any of the motion controls the Current Limit (%) horizontal slider (bottom right) should be set to a position other than the default of zero otherwise the motor will not be able to respond to the motion commands. A current limit setting of 80% should work for most applications.

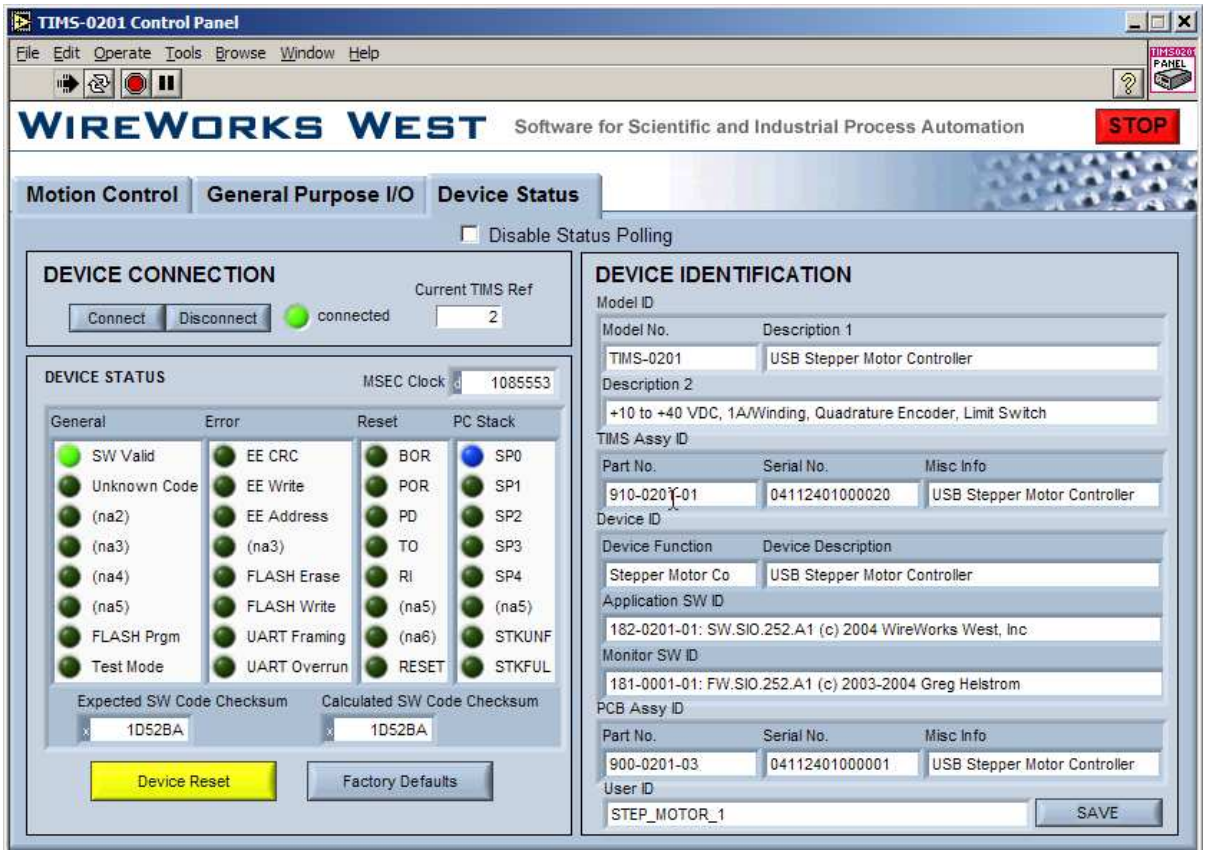
There are two additional horizontal slide controls for adjusting both the Normal Step Rate as well as the Seek Step Rate. The Step Rate controls have a range from 2 to 4000 steps/sec.

The upper right section of the Motion Control tab displays motor status. Vertical slider indicators display the motor voltage and winding currents as well as the overall motor power being consumed. The 16 motor status bits are also displayed. The status bits include busy, direction, limit, home, and other indicators.

There are seek to home or limit position buttons in the lower left. These controls require that you first configure the GPIO pins to function as home and/or limits inputs using the General Purpose I/O tab.



The General Purpose I/O tab allows configuration of the six GPIO pins. There are also sections of this tab that can be used to exercise all the various I/O capabilities of the GPIO pins including timer/counter, digital I/O, PWM, and Analog Input functionality.

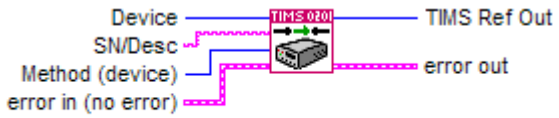


The final tab of the TIMS-0201 Control Panel.vi contains device status and connection information.

This tab allows issuing a hardware device reset or a reset of configuration information to the factory defaults. Configuration information stored in EEPROM in the TIMS-0201 devices is also displayed on this tab. This information includes serial number, model and assembly numbers, firmware revisions and other additional information that can be useful in identifying the device.

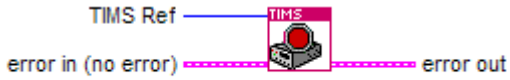
3.2 TIMS-0201 COMMUNICATION PORT

A communications port must be opened through USB to the TIMS-0201 before any other driver function call. It is imperative that the port also be closed at the conclusion of a communications session. Leaving a port open will cause some function calls to error and, will also disallow other consumers from opening another communications port to the same device.



TIMS_0201_Open_Device.vi

The driver VI's **TIMS_0201_Open_Device.vi** and **TIMS_Port_Close.vi** are used for opening and closing communications ports to the TIMS-0201 module.



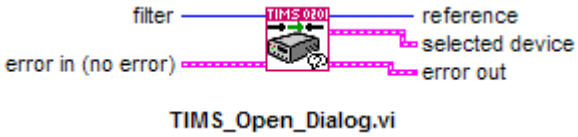
TIMS_Port_Close.vi

The **TIMS_0201_Open_Device.vi** creates a TIMS reference (Ref), which is a reference that is used by all other VI's in the driver library.

There are several methods available for opening a connection to a TIMS device.

- **Open by Device Index –** uses the index the FTD2XX.DLL has assigned to the device. This index is dynamic and changes if the device is moved or any other devices are plugged into any USB port on the system. The FTD2XX.DLL can change the Device Index even on a "live" already opened connection, if another device is plugged into the system.
- **Open by USB Serial Number-** uses the serial number of the TIMS-0201 top assembly. This is the serial number on the product label on the outside of the enclosure.
- **Open by USB Description –** By USB Description: If you have multiple models of TIMS units, you can access the unit by specifying the USB description. However, this method is not recommended if you have multiple units of the same model attached to the system. In this case the USB descriptions will be the same for similar models, and it is impossible to predict which specific device you will gain access to.

The **TIMS_Open_Dialog.vi** provides an easy user dialog for selecting any TIMS device connected to the system. This VI scans the USB bus and can list devices with opened and/or closed connections.



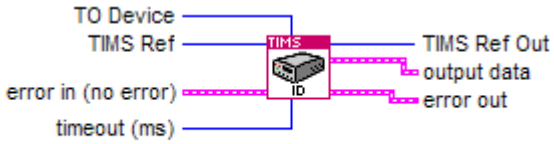
TIMS_Open_Dialog.vi

Every application should start with this VI and conclude with a call to the TIMS Port Close.vi.

Once the TIMS port is open, communications with the TIMS module can take place. Configuration information can be read from or written to EEPROM memory in the TIMS module and I^2C or SPI communications transactions can be performed to devices connected to the TIMS module.

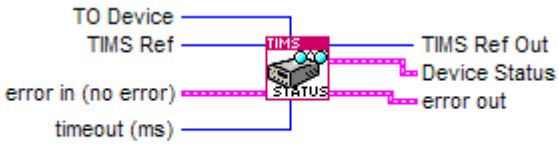
3.3 TIMS-0201 DEVICE IDENTIFICATION AND STATUS

There are several VI's that provide device identification and status information. The **TIMS _Device_Unit_ID_Get.vi** calls several of the other library VI's and provides a summary including serial number, assembly numbers, firmware versions, user assigned ID, and others.



TIMS_DEVICE_Unit_ID_Get.vi

The **TIMS _Device_Status.vi** returns 4 bytes of status information from the processor in the TIMS device.



TIMS_Device_Status.vi

Device Status Byte-0

Bit	Name	Description
0	SW Valid	**Device Application SW Valid** 1 = SW is valid. 0 = SW is NOT valid.
1	Unknown Code	**Unknown Control Code Detected** 1 = An unknown control code was detected since the last status query. 0 = No unknown control codes detected. This bit is cleared following device status query.
2	(na)	Not Assigned
3	(na)	Not Assigned
4	(na)	Not Assigned
5	(na)	Not Assigned
6	FLASH Prgm	**Microcontroller FLASH Programming In-Progress** 1 = FLASH programming is in-progress, SW forced invalid. 0 = FLASH programming operation is not in-progress.
7	Test Mode	**Manufacturing Test Mode** 1 = Test mode enabled. 0 = Test mode disabled.

Device Status Byte-1

Bit	Name	Description
0	EE CRC	**Microcontroller EEPROM CRC Error Detected** 1 = An EE CRC error was detected since the last status query. 0 = No error. This bit is cleared following device status query.
1	EE Write	**Microcontroller EEPROM Write Error Detected** 1 = An EE Write error was detected since the last status query. 0 = No error. This bit is cleared following device status query.
2	EE Address	**Microcontroller EEPROM Address Error Detected** 1 = A Protected EE location was attempted to be addressed. 0 = No error. This bit is cleared following device status query.
3	(na)	Not Assigned
4	FLASH Erase	**Microcontroller FLASH Erase Error Detected** 1 = A FLASH Erase error was detected since the last status query. 0 = No error. This bit is cleared following device status query.
5	FLASH Write	**Microcontroller FLASH Write Error Detected** 1 = A FLASH Write error was detected since the last status query. 0 = No error. This bit is cleared following device status query.
6	UART	**Microcontroller UART Framing Error Detected**

	Framing	1 = A UART Framing error was detected since the last status query. 0 = No error. This bit is cleared following device status query. Valid only for SIO interfaced TIMS devices. Indicates the potential for baud rate incompatibility.
7	**UART Overrun**	**Microcontroller UART Overrun Error Detected** 1 = A UART Overrun error was detected since the last status query. 0 = No error. This bit is cleared following device status query. Valid only for SIO interfaced TIMS devices. Indicates the potential for firmware unable to service incoming data stream.

Device Status Byte-2

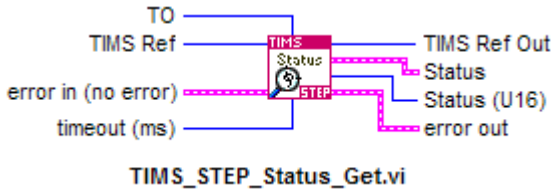
Bit	*Name*	*Description*
0	**BOR***	**Microcontroller Brown Out Reset** 1 = BOR reset not detected. 0 = BOR reset has occurred since the last device status query. (<4.5V) This bit is cleared following device status query.
1	**POR***	**Microcontroller Power On Reset** 1 = POR reset not detected. 0 = POR reset has occurred since the last device status query. This bit is cleared following device status query.
2	**PD***	**Microcontroller Power Down Reset** 1 = PD reset not detected. 0 = PD reset has occurred since the last device status query. This bit is cleared following device status query.
3	**TO***	**Microcontroller Watchdog Timer Time Out Reset** 1 = TO reset not detected. 0 = TO reset has occurred since the last device status query. This bit is cleared following device status query.
4	**RI***	**Microcontroller Reset Instruction Reset** 1 = RI reset not detected. 0 = RI reset has occurred since the last device status query. This bit is cleared following device status query.
5	**(na)**	Not Assigned
6	**(na)**	Not Assigned
7	**RESET**	**Microcontroller Reset** 1 = A Reset has occurred since the last device status query. 0 = No reset detected This bit is cleared following device status query.

Device Status Byte-3

Bit	*Name*	*Description*
0 **1** **2** **3**	**SP0** **SP1** **SP2** **SP3**	**Microcontroller Stack Pointer**

4	SP4	
5	(na)	Not Assigned
6	STKUNF	**Microcontroller Stack Underflow Reset** 1 = A stack underflow reset condition occurred since the last device status query. 0 = No stack underflow reset detected This bit is cleared following device status query.
7	STKFUL	**Microcontroller Stack Overflow Reset** 1 = A stack overflow reset condition occurred since the last device status query. 0 = No stack overflow reset detected This bit is cleared following device status query.

The **TIMS _STEP_Status_Get.vi** a status cluster containing 16 bits of motor status information.



TIMS_STEP_Status_Get.vi

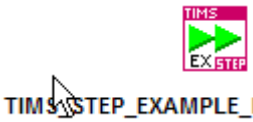
Status Flags Table

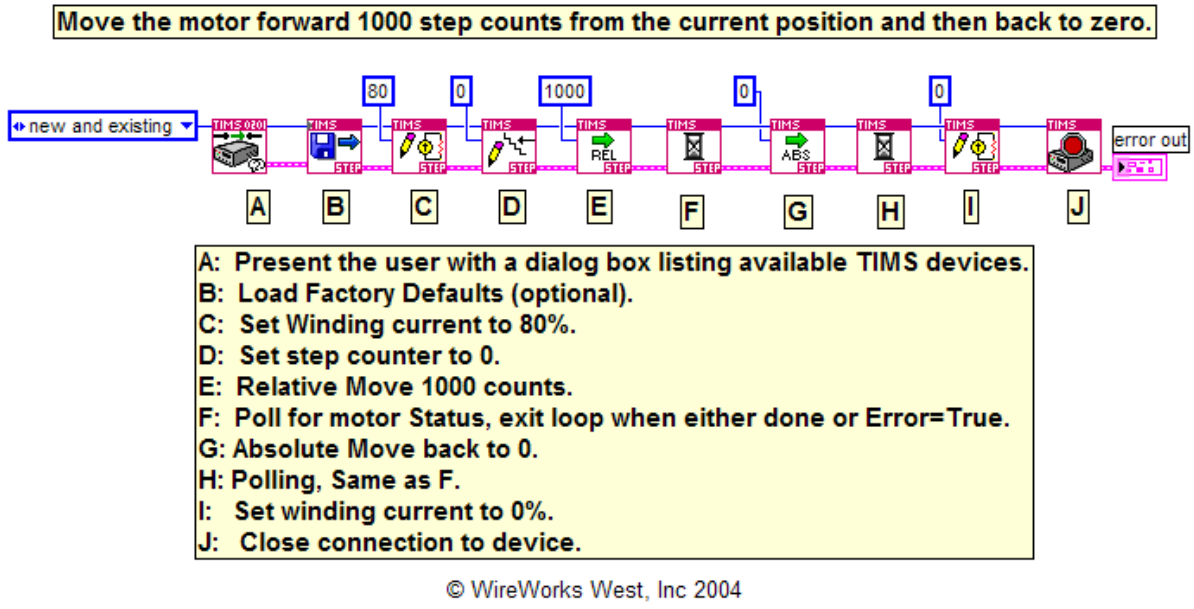
Bit	*Name*	*Description*
0	BUSY	**Stepper Motor Busy** 1 = Busy, stepping operation in progress 0 = Not busy
1	MOVE	**Move to Target Position** 1 = Absolute or relative move to target position in progress 0 = Move function not in progress
2	SNGL	**Single Step** 1 = Single step in progress 0 = Move function not in progress
3	DIR	**Step Direction** 1 = Step forward, increment step counter 0 = Step reverse, decrement step counter
4	STEP	**Step Mode** 1 = Half step mode 0 = Full step mode
5	HOME	**Seek Home** 1 = Seek home position operation in progress. 0 = Seek home operation not in progress.
6	LIMIT	**Seek Limit** 1 = Seek limit position operation in progress. 0 = Seek limit operation not in progress.
7	COUNT	**Counter Mode**

		1 = Use encoder counter in absolute or relative move operations. 0 = Use step counter in absolute or relative move operations.
8	SOFT	**Soft Limits Mode** 1 = Use of soft limits to stop stepping operation is enabled. 0 = Use of soft limits is disabled.
9	@HOME	**At Home Position** 1 = Home limit input is enabled and low. 0 = Home limit input is either not enabled or is high.
10	@FWD	**At FWD Limit Position** 1 = FWD limit input is enabled and low. 0 = FWD limit input is either not enabled or is high.
11	@REV	**At REV Limit Position** 1 = REV limit input is enabled and low. 0 = REV limit input is either not enabled or is high.
12	>MAX	**Max Soft Limit Exceeded** 1 = Current position exceeds the soft maximum position limit. 0 = Limit not exceeded.
13	@MAX	**At Max Soft Limit Position** 1 = Current position equals the soft maximum position limit. 0 = Limit and position not equal.
14	@MIN	**At Min Soft Limit Position** 1 = Current position equals the soft minimum position limit. 0 = Limit and position not equal.
15	<MIN	**Min Soft Limit Exceeded** 1 = Current position exceeds the soft minimum position limit. 0 = Limit not exceeded.

3.4 TIMS-0201 EXAMPLES

The **TIMS_STEP_EXAMPLE_Basic_Moves.vi** servers as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a basic move operation.





The starting **TIMS_0201_Open_Device.vi** and final **TIMS_Port_Close.vi** are mandatory. Ports should not be left open indefinitely as some VIs return errors when connecting to open ports.

The **TIMS_0201_Open_Device.vi** creates a reference that is used by all other VI's in the driver library. Every application should start with this VI and ensure that the TIMS Port Close.vi is also called once for every port open command.

If the port has been opened but not closed, another attempt to open the port will result in an “Invalid Handle” 5220 error code.

Once the TIMS port is open, communications with the TIMS module can take place. In this example the next step, step B, is to load the factory defaults, an optional step that ensures a consistent starting point. This VI restores the factory default Soft Limits, Step Rate and GPIO Configuration.

In Step C the motor current is set to a level up from it’s power up default of 0%.

In Step D the step counter is set to 0. This basic example does not use the encoder and uses the internal step counter to keep track of position. The internal step counter counts one for each half step and two for each full step.

In Step E a command for 1000 relative steps is issued.

Step F waits for motion to complete. When the step counter reaches the target count the VI completes execution.

Step G issues an absolute move command to location 0.

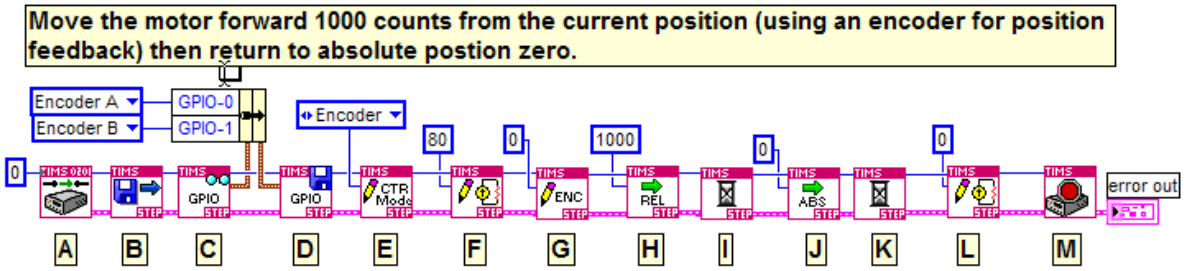
Step H again waits for motion to complete.

Step I returns the motor current level to 0%, it's power up default value.

Step J closes the device connection or port. This releases the device for use by another application.

The **TIMS_STEP_EXAMPLE_Basic_Encoder.vi** servers as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a basic move operation using an encoder for position feedback.

TIMS_STEP_EXAMPLE_Basic_Encoder.vi



A: Open a connection to Device 0
B: Load Factory Defaults (optional)
C: Read current GPIO Info, adjust only encoder inputs
D: Set GPIO lines.
E: Set Move_Counter_Mode to ENCODER.
F: Set Winding current to 80%
G: Set Encoder counter to 0
H: Relative Move 1000 counts.
I: Poll for motor Status, exit loop when either done or Error=True.
J: Absolute Move back to 0.
K: Polling, Same as I.
L: Set winding current to 0%.
M: Close connection to device.

This example is very similar to the previous example that uses the internal step counter.

Step C reads the current GPIO port configuration and Step D writes the GPIO port configuration with GPIO-0 and GPIO-1 configured for the Encoder A and B inputs.

Step E specifies the use of the encoder counter for all move functions.

The remaining steps are identical to the previous example.

4. WARRANTY

WireWorks West, Inc. warrants its products for a period of one year from date of delivery against defects in material or workmanship. Returned product will either be repaired or replaced at the option of WireWorks West, Inc.

Specifications are subject to change without notice.

5. ABOUT WIREWORKS WEST, INC.

Founded in 1998, WireWorks West, Inc. provides software and services for industrial automation and interactive data networking. WireWorks West, Inc. focuses on industry-specific solutions for Pharmaceuticals and Biotechnology, Electronics Manufacturing, Networking, and Telecommunications.

WireWorks West, Inc. is a privately held company with headquarters in San Francisco, CA.

6. CONTACTING WIREWORKS WEST, INC.

To find out more about the TIMS-0102, please contact us at: 1-800-755-1400

For information on our products and services, please visit our website at: www.wireworkswest.com.

For technical support issues, please contact us at 1-415-348-1408

Appendix A

LabVIEW Function Reference

TIMS-0201_Control_Panel.vi
This TIMS-0201 Control Panel demonstrates the functionality of the TIMS-0201 and the LabVIEW driver library.

http://www.wireworkswest.com
==========
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Connector Pane

Controls and Indicators

TIMS_0201_Open_Device.vi
Opens a USB connection to a TIMS-0201 device. Returns a managed TIMS Reference for use in accessing this device.

The TIMS Reference can be opened by Device number, TIMS Serial Number, or USB Description.
1. By device number: If you have only one TIMS unit connected to your system, this is the easiest method to use. Supply '0' to the Device number. If you have more than one device, you can access the devices by supplying their device number. NOTE: The windows OS is responsible for enumerating the devices, and therefore the assigned device numbers may change at any time. We do not recommend using the device number when you have more than one TIMS device attached to your system.
2. By TIMS Serial Number: You can open by TIMS Serial Number as well. This is the Serial Number printed on the label on the outside of your TIMS device.
3. By USB Description: If you have multiple models of TIMS units, you can access the unit by specifying the USB description. However, this method is not recommended if you have multiple units of the same model attached to the system. In this case the USB descriptions will be the same for similar models, and it is impossible to predict which specific device you will gain access to.

==========
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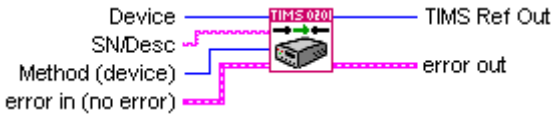
Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Device

SN/Desc

Method (device)

error out The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_Clock_Get.vi
Gets the current value of the **millisecond clock** of a TIMS device.

==========
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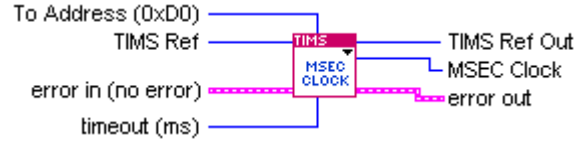
Connector Pane



Controls and Indicators

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

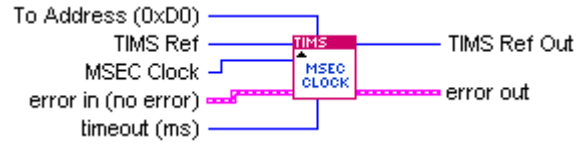
MSEC Clock

TIMS_DEVICE_Clock_Set.vi

Sets the current value of the **millisecond clock** of a TIMS device.

==========

Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

MSEC Clock

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Device_Descriptor_Get.vi
Gets the Device Descriptor for the TIMS device. The device descriptor includes the model number, serial number, function, and user ID.
==========
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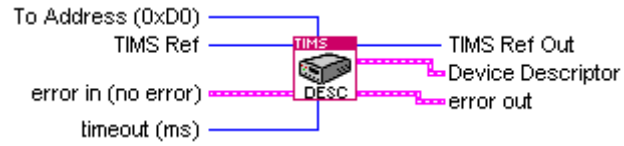
Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Device Descriptor Device Descriptor contains general information about the TIMS device.

Model No.

Serial No.

Function

User ID

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Device_ID_Get.vi
Gets the **Device ID** for the TIMS device.

==========
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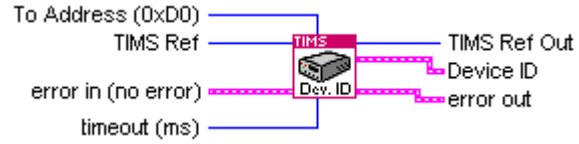
Connector Pane



Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address. The default value of 0xD0 refers to the main processor on any TIMS unit.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Device ID

Device Function

Device Description

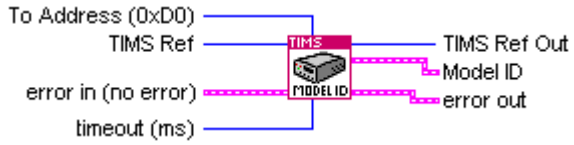
Application SW ID

Monitor SW ID

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_Model_ID_Get.vi
Returns the **Model ID** information from the firmware of a TIMS device.
==========

Connector Pane



Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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source The **source** string describes the origin of the error or warning.

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Model ID

Model No.

Description 1

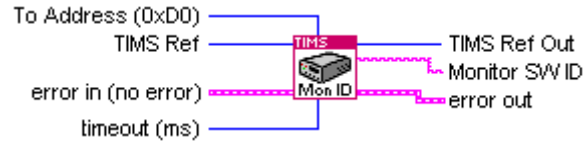
Description 2

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_Monitor_SW_ID_Get.vi
Retrieves the microcontroller device **Monitor Software ID** identification from a TIMS device.

==========

Connector Pane



Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Monitor SW ID

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_PCB_Assy_ID_Get.vi
Returns **PCB Assembly** information from the firmware of a TIMS device.

==========
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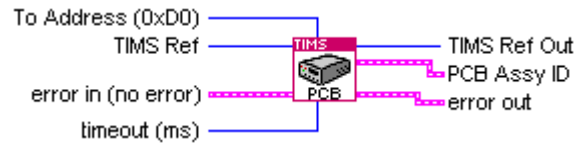

Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address. The default value of 0xD0 refers to the main processor on any TIMS unit.

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

PCB Assy ID

Part No.

Serial No.

Misc Info

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Device_Reset.vi
Directs a specified TIMS device to perform a hardware reset.
==========
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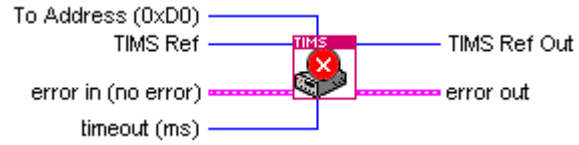

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

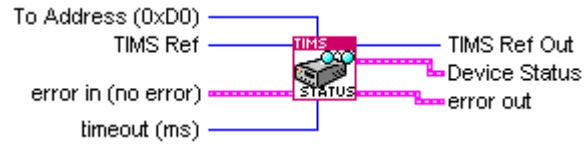
TIMS_Device_Status.vi

Returns the Status Information of a TIMS device.

General Status Byte-0 - u8
Error Status Byte-1 - u8
Reset Status Byte-2 - u8
PC Stack Status Byte-3 - u8
Expected SW Code Checksum - u32
Calculated SW Code Checksum - u32

==========

Connector Pane



Controls and Indicators

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an

error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Device Status Contains the **Status Information.**

General

SW Valid

Unknown Code

TX Overflow

RX Timeout

(na4)

(na5)

- FLASH Prgm
- Test Mode
- Error
  - EE CRC
  - EE Write
  - EE Address
  - (na3)
  - FLASH Erase
  - FLASH Write
  - UART Framing
  - UART Overrun
- Reset
  - BOR
  - POR
  - PD
  - TO
  - RI
  - (na5)
  - (na6)
  - RESET
- PC Stack
  - SP0

SP1

SP2

SP3

SP4

(na5)

STKUNF

STKFUL

Monitor FW Code Checksum

Expected SW Code Checksum

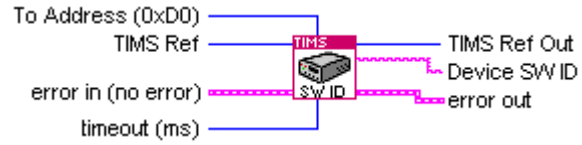
Calculated SW Code Checksum

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Device_SW_ID_Get.vi
Returns the microntroller **Application Software ID** from a TIMS device.

==========

Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

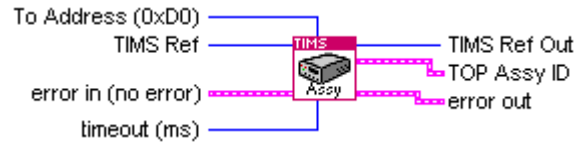
Device SW ID

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_TOP_Assy_ID_Get.vi
Returns the **Top Assembly Info** from the firmware of a TIMS device.

==========

Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TOP Assy ID

Part No.

Serial No.

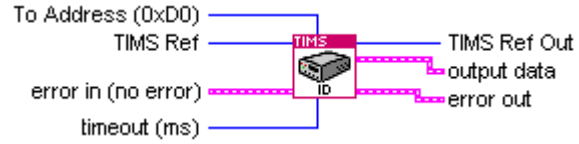
Misc Info

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_DEVICE_Unit_ID_Get.vi
Gets the complete set of Device Unit Identification for the TIMS device.

==========

Connector Pane



Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

output data This cluster contains information about the TIMS device software, hardware and firmware.

User ID User supplied Name of the TIMS device.

Model ID Factory information about the TIMS device model.

Model No.

Description 1

Description 2

PCB Assy ID Factory information abou the TIMS device PCB assembly

Part No.

Serial No.

Misc Info

Device ID

Device Function

Device Description

Application SW ID

Monitor SW ID

TOP Assy ID

Part No.

Serial No.

Misc Info

TIMS_DEVICE_User_ID_Get.vi
Gets the user specified Name for the TIMS device.
==========
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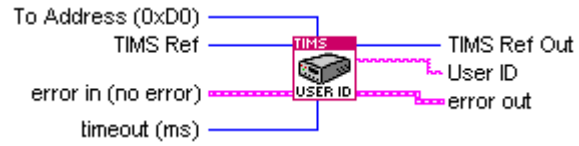
Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

TIMS Ref The TIMS Reference used to communicate with a device.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

User ID The user specified name for the TIMS device.

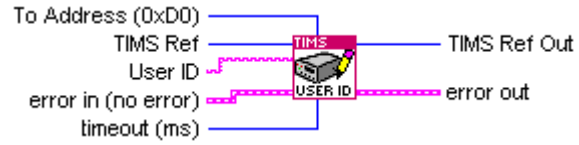
TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Device_User_ID_Set.vi

Sets the user specified **Name** for the TIMS device.

==========

Connector Pane



Controls and Indicators

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

User ID The user-specified name for the TIMS device.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_Get_Ref_Info.vi
Returns the connection information associated with a TIMS device reference.

==========
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Connector Pane

Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the

error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref In The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

device connection info

Status

Type

Index

Model No.

Description

User ID User supplied Name of the TIMS device.

Serial No.

reference

USB Serial Number

USB Product Description

TIMS_List_Devices.vi
Lists all TIMS devices. opened and unopened, connected to this computer.

==========
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Connector Pane

Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

FOUND TIMS USB DEVICES

Cluster

Status

Type

Index

Model No.

Description

User ID User supplied Name of the TIMS device.

Serial No.

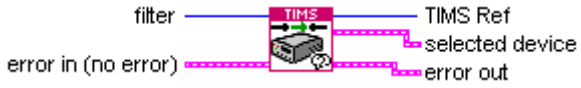
reference

USB Serial Number

USB Product Description

TIMS_Open_Dialog.vi
Presents a user dialog for selecting a TIMS device. Opens a USB connection to a TIMS device. Returns a managed TIMS Reference to be used to access this device.
==========
© WireWorks West, Inc

Connector Pane



Controls and Indicators

filter

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

selected device

Status

Type

Index

Model No.

Description

User ID User supplied Name of the TIMS device.

Serial No.

reference

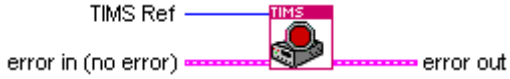
USB Serial Number

USB Product Description

TIMS_Port_Close.vi
Closes an opened TIMS reference.
Note: This VI will operate even if there is an incoming error.

==========

Connector Pane



Controls and Indicators

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref The TIMS Reference used to communicate with a device.

error out The **error out** cluster passes error or warning information out of a VI to be

used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS_PWM_Actual_RD.vi
Returns the current actual PWM settings.

PWM Period

Period = (PWM Period+1) * 4 * (Base Period) * Prescale
Frequency = 1/Period

PWM Duty Period

10-Bit max resolution

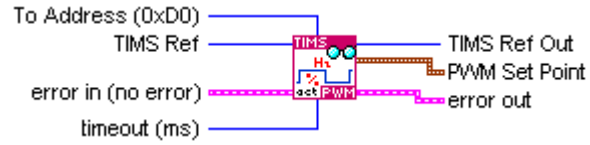
Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

==========

Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

TIMS_PWM_Actual_RE.vi
Returns the actual PWM signal from EEPROM memory.

PWM Period

Period = (PWM Period+1) * 4 * (Base Period) * Prescale
Frequency = 1/Period

PWM Duty Period

10-Bit max resolution

Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

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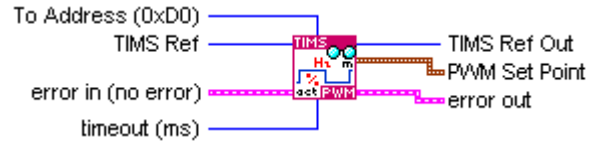
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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TIMS Ref Out The TIMS Reference used to communicate with a device.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

TIMS_PWM_Set_Point_RD.vi
Returns the PWM Set point.

PWM Period

Period = (PWM Period+1) * 4 * (Base Period) * Prescale
Frequency = 1/Period

PWM Duty Period

10-Bit max resolution

Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

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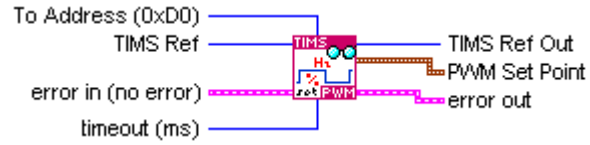
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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TIMS Ref Out The TIMS Reference used to communicate with a device.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

TIMS_PWM_Set_Point_RE.vi
Returns the PWM Set point from EEPROM
PWM Period

Period = (PWM Period+1) * 4 * (Base Period) * Prescale

Frequency = 1/Period

PWM Duty Period

10-Bit max resolution

Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

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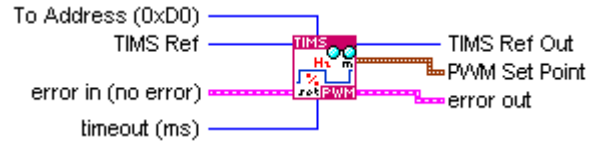
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

TIMS_PWM_Set_Point_WE.vi
Sets the PWM Set point to EEPROM memory

PWM Period

Period = (PWM Period+1) * 4 * (Base Period) * Prescale
Frequency = 1/Period

PWM Duty Period

10-Bit max resolution

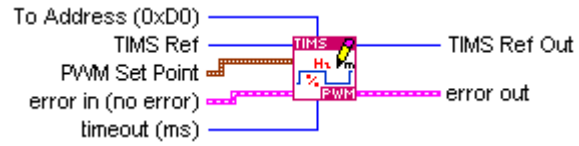
Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

==========

Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_PWM_Set_Point_WR.vi
Set the PWM Set point

PWM Duty Period

10-Bit max resolution

Period = (PWM Duty Period+1) * (Base Period) * Prescale

Note: A Duty period greater then the PWM period will result in the output always being a 1.
The effective duty period value is in the range of zero to (PWM Period +1 *4), but less than 0x0400.

PWM Resolution (max) = [log(10 MHz/Fpwm)]/log(2) bits

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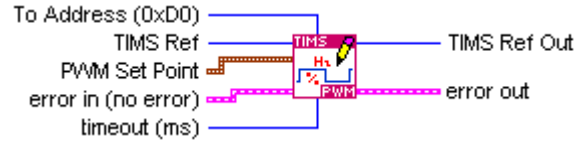
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

PWM Set Point

Frequency (Hz)

Duty Cycle (%)

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Continuous_Stepping.vi
Performs continuous stepping in either the forward or reverse direction.

Performs either a full or half step depending on the Full/Half Step Mode.
Uses Normal step rate.
Returns an error if Busy.
Stops if Stepping FWD and reaches FWD Limit.
Stops if Stepping REV and reaches REV Limit.

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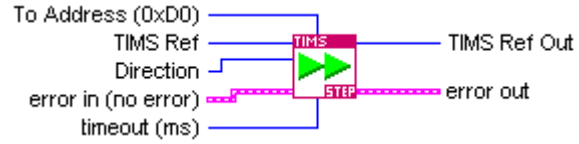
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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source The **source** string describes the origin of the error or warning.

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Direction

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Encoder_Count_Get.vi
Gets the encoder count value for the current motor position.

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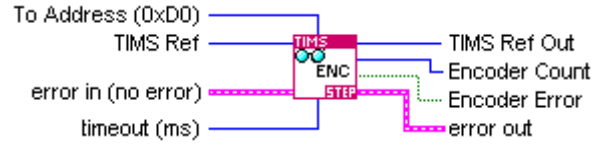

Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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source The **source** string describes the origin of the error or warning.

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Encoder Count

Encoder Error

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Encoder_Count_Set.vi
Sets the encoder count value for the current motor position.

NOTE: Returns an error if Busy.

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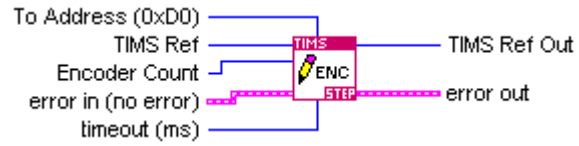
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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Encoder Count

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
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source The **source** string describes the origin of the error or warning.

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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_EXAMPLE_Basic_Encoder.vi
This VI serves as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a basic move operation using the encoder option.

==========
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Controls and Indicators

TIMS_STEP_EXAMPLE_Basic_Moves.vi
This VI serves as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a basic move operation.

==========
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Controls and Indicators

TIMS_STEP_EXAMPLE_Counter.vi

This VI serves as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a basic timer/counter operation. .

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Connector Pane

Controls and Indicators

TIMS_STEP_EXAMPLE_General Info.vi

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Connector Pane

Controls and Indicators

TIMS_STEP_EXAMPLE_Pwm.vi
This VI server as an example showing the use of the TIMS-0201 LabVIEW driver vi library to perform a PWM output operation.

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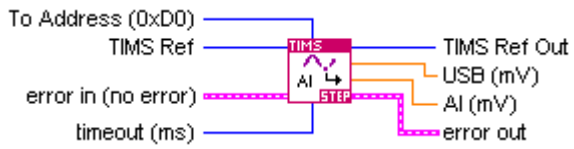
Connector Pane

Controls and Indicators

TIMS_STEP_GPIO-AI_Read.vi
Reads the GPIO Analog Input line.
==========

Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
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error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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USB (mV)

TIMS Ref Out The TIMS Reference used to communicate with a device.

AI (mV)

TIMS_STEP_GPIO_Configuration_Get.vi
Gets the General Purpose IO pin configurations.

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Connector Pane

Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

GPIO Configuration

GPIO-0 GPIO-0
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input

4 = REV Limit Input
5 = Quadrature Encoder Phase-A Input
6 = Quadrature Encoder Phase-B Input

U8 **GPIO-1** GPIO-1
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = Quadrature Encoder Phase-A Input
6 = Quadrature Encoder Phase-B Input

U8 **GPIO-2** GPIO-2
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input

U8 **GPIO-3** GPIO-3
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = Counter/Timer Input

U8 **GPIO-4** GPIO-4
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = PWM Output

U8 **GPIO-5** GPIO-5
0 = Analog Input to 10-Bit ADC, 4.096 VDC Reference.
1 = Analog Input to 10-Bit ADC, USB 5 VDC Reference.

U32 **TIMS Ref Out** The TIMS Reference used to communicate with a device.

TIMS_STEP_GPIO_Configuration_Save.vi
Sets the General Purpose IO pin configurations, and saves settings into non-volatile memory.

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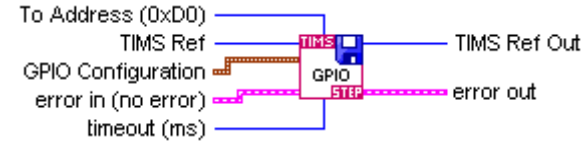
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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GPIO Configuration

GPIO-0 GPIO-0
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input

5 = Quadrature Encoder Phase-A Input
6 = Quadrature Encoder Phase-B Input

GPIO-1 GPIO-1
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = Quadrature Encoder Phase-A Input
6 = Quadrature Encoder Phase-B Input

GPIO-2 GPIO-2
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input

GPIO-3 GPIO-3
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = Counter/Timer Input

GPIO-4 GPIO-4
0 = Digital Input
1 = Digital Output
2 = Home Limit Input
3 = FWD Limit Input
4 = REV Limit Input
5 = PWM Output

GPIO-5 GPIO-5
0 = Analog Input to 10-Bit ADC, 4.096 VDC Reference.
1 = Analog Input to 10-Bit ADC, USB 5 VDC Reference.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_GPIO_Counter_Get.vi
Returns GPIO Counter information.

Returned Variables:
Period to go (u8)
Count Period (u8)
Counter (u32)
Overflow (u8)

Returns an error if input not configured for counter operation.
If the Period To Go is 0 and the Count Period is >0 and <255 then the period to go will be refreshed with the count period and the counter will be cleared at the end of this function.

==========
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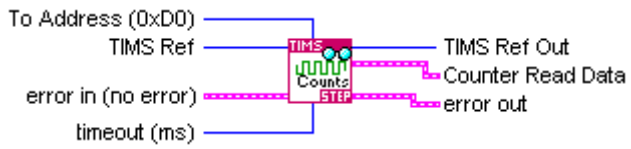

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TIMS Ref Out The TIMS Reference used to communicate with a device.

Counter Read Data

Period To Go

Count Period

Counter

Overflow

TIMS_STEP_GPIO_Counter_Period_Set.vi
Set the counter period in msec - U8 - Count Period; 0 = OFF, 255 = Always Counting, else N Milliseconds

Returns an error if input not configured for counter operation.

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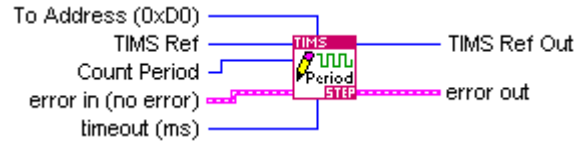

Controls and Indicators

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Count Period Count Period in milliseconds (u8)

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_GPIO_DI_Get.vi
Read GPIO-DIO pin logic states.

U8 bits 0 through 4 maps to GPIO-DIO pins 0 through 4 respectively.
Both input and output states are read.

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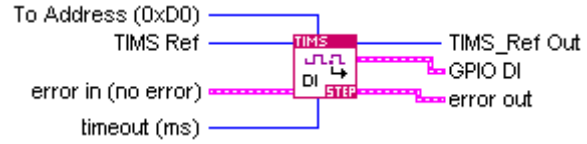

Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

GPIO DI

GPIO-0

GPIO-1

GPIO-2

GPIO-3

GPIO-4

TIMS_Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_GPIO_DO_Set.vi
Write GPIO-DO output pin logic states

U8 bits 0 through 4 maps to GPIO-DO pin 0 through 4 respectively.
Only those pins configured as outputs will be effected.

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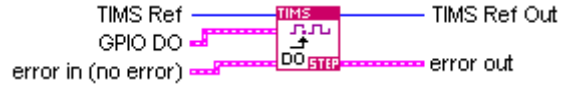
Connector Pane



Controls and Indicators

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GPIO DO

GPIO-0

GPIO-1

GPIO-2

GPIO-3

GPIO-4

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Motor_Current_Limit_Get.vi
Returns the motor current limit.

Motor current limit is expressed percentage from 0% to 100%.

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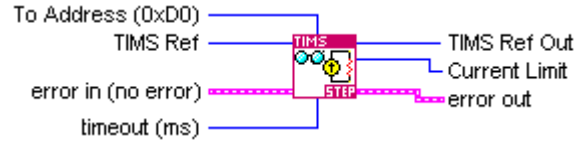
Connector Pane



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To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Current Limit Motor current limit is expressed percentage from 0% to 100%.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Motor_Current_Limit_Set.vi
Set the motor current limit.

Motor current limit is expressed percentage from 0% to 100%.
Any value over 100% is coerced to be 100%.

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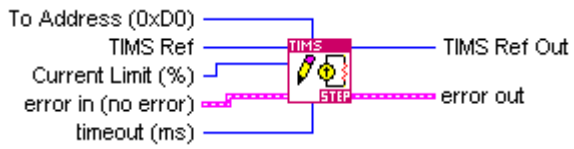
Connector Pane



Controls and Indicators

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Current Limit (%) Motor current limit is expressed percentage from 0% to 100%.
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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Motor_Power_Measure.vi
Returns the motor source voltage and winding currents.

Motor Source Voltage in millivolts (u16)
Motor Winding-A Current in milliamps (u16)
Motor Winding-B Current in milliamps (u16)

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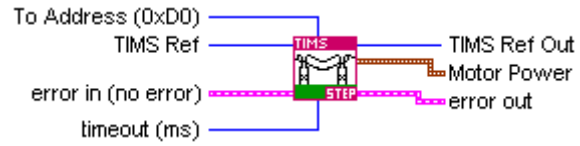
Connector Pane



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source The **source** string describes the origin of the error or warning.

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Motor Power

Source Voltage (V)

Winding A Current (A)

Winding B Current (A)

Winding Power (W)

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Motor_Stop.vi
Stops the motor stepping operation of the specified TIMS device.

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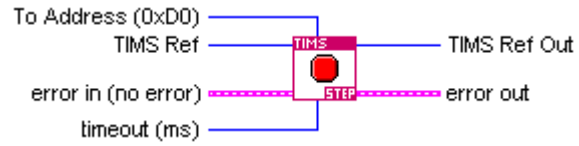
Connector Pane



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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Move_Absolute.vi
Initiates stepping to a specified position.

Performs either a full or half step depending on the Full/Half Step Mode.
Uses either step count or encoder count depending on Step/Encoder Count Mode.
Uses Normal step rate.
Returns an error if Busy.
Returns an error if soft limits are enabled and absolute position is outside of the soft limits.
Stops stepping if FWD or REV limit is enabled and reached.

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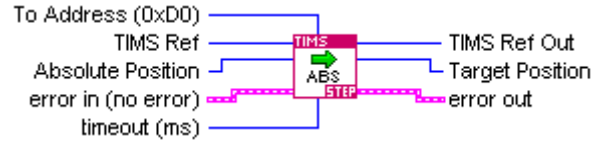
Connector Pane



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source The **source** string describes the origin of the error or warning.

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Absolute Position

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

Target Position

TIMS_STEP_Move_Counter_Mode_Set.vi
Sets, the counter to use for move functions (Encoder/Step).

Returns an error if Busy.
Returns an error if selecting encoder counter and a DIO has not been configured for encoder input.

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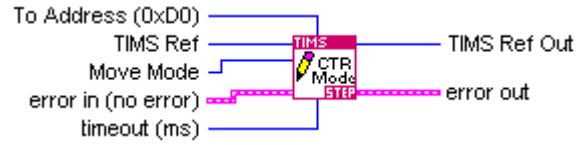
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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code The **code** input identifies the error or warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Move Mode Sets, the counter to use for move functions (Encoder/Step)

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.

If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Move_Relative.vi
Initiates stepping to a position relative to the current position.

Performs either a full or half step depending on the Full/Half Step Mode.
Uses either step count or encoder count depending on Step/Encoder Count Mode.
Uses Normal step rate.
Returns an error if Busy.
Returns an error if soft limits are enabled and the computed target position is outside of the soft limits.
Stops stepping if FWD or REV limit is enabled and reached.

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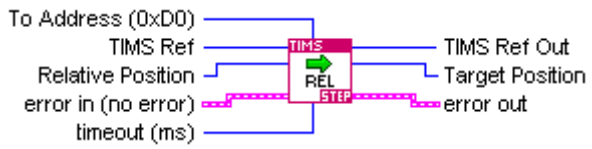
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Relative Position

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the

error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

Target Position

TIMS_STEP_Normal_Step_Rate_Get.vi
Return the step rate for normal stepping operations.

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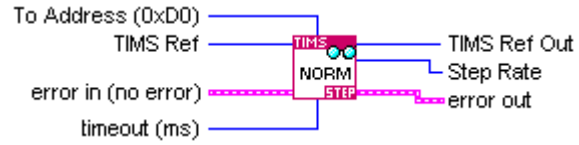
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information

about the error displayed.

Step Rate

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Normal_Step_Rate_Save.vi
Set the step rate for normal stepping operations, and saves the setting into non-volatile memory.

Steps/Sec (u16) - Range: 4000 Max, 2 Min

An error is returned if the setting is out of range.

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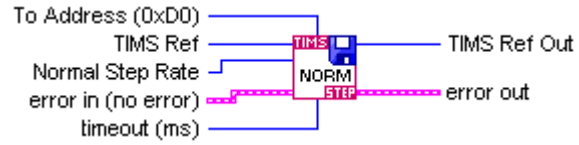
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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code The **code** input identifies the error or warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Normal Step Rate

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Normal_Step_Rate_Set.vi
Set the step rate for normal stepping operations.

Steps/Sec (u16) - Range: 4000 Max, 2 Min

An error is returned if the setting is out of range.

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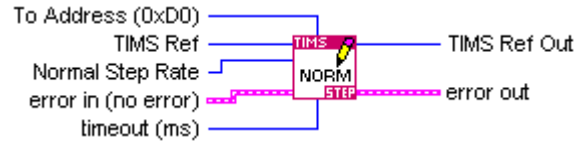
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Normal Step Rate Steps/Sec (u16) - Range: 4000 Max, 2 Min

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.

If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Restore_Factory_Defaults.vi
Restores the factory default settings into non-volatile memory of the specified TIMS device.

Factory Default Settings:
Soft Limits: 2,147,483,647 Max, -2,147,483,648 Min
Normal Step Rate: 200 Steps/Sec
Seek Step Rate: 50 Steps/Sec
GPIO Configuration: GPIO-0 thru -4 Digital In, GPIO-5 ADC 5Vref
PWM Frequency: Low, 2441 Hz, 50% Duty

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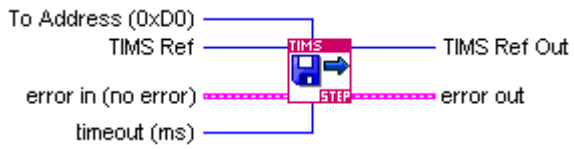
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Restore_User_Defaults.vi
Causes a TIMS-0201 device to restore user saved EEPROM settings. Values for various parameters can be saved by calling their individual SAVE functions.

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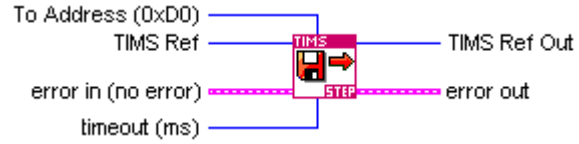
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Seek_Home.vi
Performs continuous stepping in either the forward or reverse direction until home detected.

Performs either a full or half step depending on the Full/Half Step Mode.
Uses Seek step rate.
Returns an error if Busy.
Returns an error if a DIO not configured as Home input.
Reverses direction if the Fwd or Rev limit is reached.

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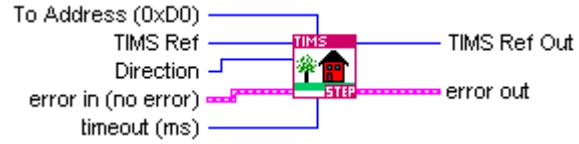
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Direction

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Seek_Limit.vi
Performs continuous stepping in either the forward or reverse direction until either the FWD or REV limit, as indicated by direction, is detected.

Performs either a full or half step depending on the Full/Half Step Mode.
Uses Seek step rate.
Returns an error if Busy.

Returns an error if a DIO is not configured as limit input or soft limits are not enabled.

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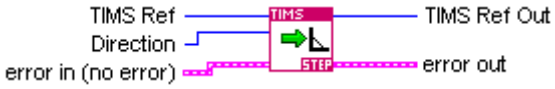
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Direction

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Seek_Step_Rate_Get.vi
Return the step rate for seek stepping operations.

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Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in (no error) The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

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source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Step Rate

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Seek_Step_Rate_Save.vi
Set the step rate for seek stepping operations, and saves the setting into non-volatile memory.

Steps/Sec (u16) - Range: 4000 Max, 2 Min

An error is returned if the setting is out of range.

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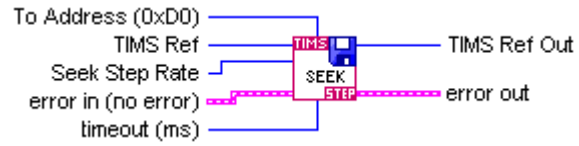
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information

about the error displayed.

Seek Step Rate

To Address (0xD0) To Address specifies the TIMS processor address.
The default value of 0xD0 refers to the main processor on any TIMS unit.

timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
If the next byte is not received within the specified timeout, the IO function will return an error and any byte received up to that point.

error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Seek_Step_Rate_Set.vi
Set the step rate for seek stepping operations.

Steps/Sec (u16) - Range: 4000 Max, 2 Min

An error is returned if the setting is out of range.

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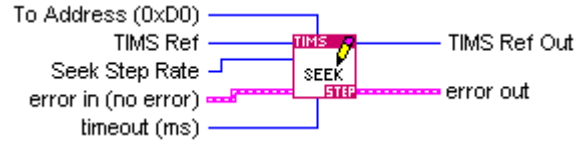
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

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Seek Step Rate Steps/Sec (u16) - Range: 4000 Max, 2 Min

To Address (0xD0) To Address specifies the TIMS processor address.
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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Single_Step.vi
Performs a single step in either the forward or reverse direction.

Performs either a full or half step depending on the Full/Half Step Mode.
Returns an error if Busy.
Returns an error if Step FWD and at FWD Limit.
Returns an error if Step REV and at REV Limit.
The step counter will be incremented by stepping in the forward direction, and decremented by stepping in the reverse direction.
The step counter will be incremented, or decremented, by one in half step mode and by two in the full step mode

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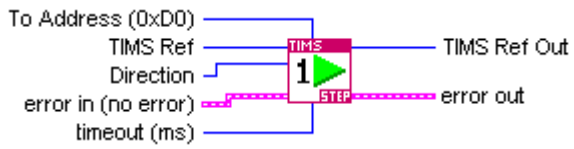
Connector Pane



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Direction

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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Soft_Limits_Get.vi
Returns the soft Fwd and Rev limits for motor position.

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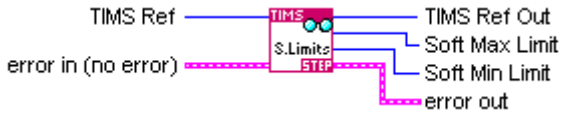
Connector Pane



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Soft Max Limit

TIMS Ref Out The TIMS Reference used to communicate with a device.

Soft Min Limit

TIMS_STEP_Soft_Limits_Mode_Set.vi
Sets the soft limits mode. Enables or disables the use of soft limits.

Returns an error if Busy.
If enabled, motor stepping is ceased when a limit is reached.

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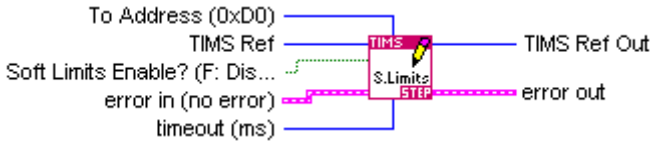
Connector Pane



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Soft Limits Enable? (F: Disabled)

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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Soft_Limits_Save.vi
Saves the soft FWD and REV limits for motor position, and saves the values into non-volatile memory.

Returns an error if Busy.
Returns an error if Length not equal to 8
Returns an error if max not greater than min.

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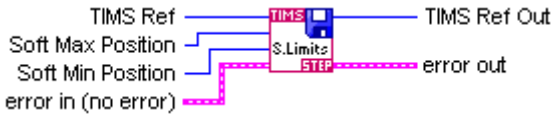
Connector Pane



Controls and Indicators

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Soft Max Position

Soft Min Position

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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Status_Get.vi
Returns stepper controller status flags for a TIMS-0201 device.

BIT	NAME	DESCRIPTION
0	BUSY	Stepper Motor Busy 1 = Busy, stepping operation in progress 0 = Not busy
1	MOVE	Move to Target Position 1 = Absolute or relative move to target position in progress 0 = Move function not in progress
2	SNGL	Single Step 1 = Single step in progress 0 = Move function not in progress
3	DIR	Step Direction 1 = Step forward, increment step counter 0 = Step reverse, decrement step counter
4	STEP	Step Mode 1 = Half step mode 0 = Full step mode
5	HOME	Seek Home 1 = Seek home position operation in progress. 0 = Seek home operation not in progress.
6	LIMIT	Seek Limit 1 = Seek limit position operation in progress. 0 = Seek limit operation not in progress.
7	COUNT	Counter Mode 1 = Use encoder counter in absolute or relative move operations. 0 = Use step counter in absolute or relative move operations.
8	SOFT	Soft Limits Mode 1 = Use of soft limits to stop stepping operation is enabled. 0 = Use of soft limits is disabled.

9 @HOME At Home Position
1 = Home limit input is enabled and low.
0 = Home limit input is either not enabled or is high.
10 @FWD At FWD Limit Position
1 = FWD limit input is enabled and low.
0 = FWD limit input is either not enabled or is high.
11 @REV At REV Limit Position
1 = REV limit input is enabled and low.
0 = REV limit input is either not enabled or is high.
12 >MAX Max Soft Limit Exceeded
1 = Current position exceeds the soft maximum position limit.
0 = Limit not exceeded.
13 @MAX At Max Soft Limit Position
1 = Current position equals the soft maximum position limit.
0 = Limit and position not equal.
14 @MIN At Min Soft Limit Position
1 = Current position equals the soft minimum position limit.
0 = Limit and position not equal.
15 <MIN Min Soft Limit Exceeded
1 = Current position exceeds the soft minimum position limit.
0 = Limit not exceeded.

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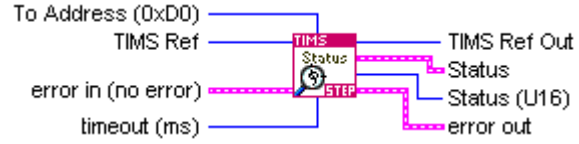
Connector Pane



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TIMS Ref Out The TIMS Reference used to communicate with a device.

Status Contains status bits for a TIMS-0201 Stepper.

- **BUSY** BUSY: The stepper is carrying out an operation.
- **MOVE** Indicates that the driver is moving towards a target.
- **SNGL** SNGL: The stepper driver is driving a single step.
- **DIR** DIR: The direction the motor is moving.
  0 = Negative
  1 = Positive
- **STEP** STEP: Indicates that the driver is in FULL-STEP (=0) or HALF-STEP (=1) mode.
- **HOME** Indicates the driver is searching for the HOME limit.
- **LIMIT** Indicates that the stepper is searching for a hard limit. The DIR status bit indicates which limit.
- **COUNT** Indicates the counter mode:
  0 = STEP
  1 =ENCODER
- **SOFT** When on, indicates that SOFT LIMITS are enabled.
- **@HOME** Indicates that the HOME sensor is tripped.
- **@FWD** Indicates that the FWD limit sensor is tripped.
- **@REV** Indicates that the REV limit sensor is tripped.
- **>MAX** Indicates that the device has exceeded the Soft Limit Max.
- **@MAX** Indicates that the driver is at the Soft Limit Max.
- **@MIN** Indicates that the device has exceeded the Soft Limit Min.
- **<MIN** Indicates that the driver is at the Soft Limit Min.

Status (U16) Status Word: a numeric representation of the status bits.

TIMS_STEP_Step_Count_Get.vi

Gets the step count value for the current motor position.

NOTE: Step Position in half step units

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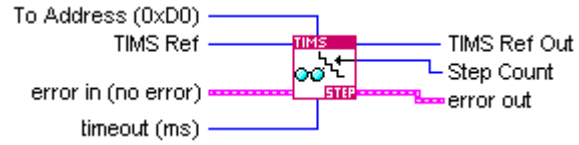
Connector Pane



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Step Count current step counter value

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Step_Count_Set.vi
Sets the step count value for the current motor position.

NOTE: Step Position in half step units.
Returns an error if Busy.

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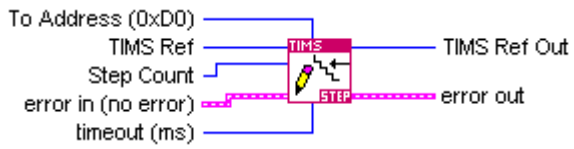
Connector Pane



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Step Count

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timeout (ms) timeout specifies the amount of time (in milliseconds) that the LabVIEW driver will wait after each byte is received from a TIMS unit.
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error out The **error out** cluster passes error or warning information out of a VI to be used by other VIs.

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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Step_Mode_Set.vi
Sets the state of the Step Mode (Half/Full).

Returns an error if Busy.
Note: If changing from half to full step mode and the step counter is odd, a single half step will be performed prior to any full steps as part of the next move function.

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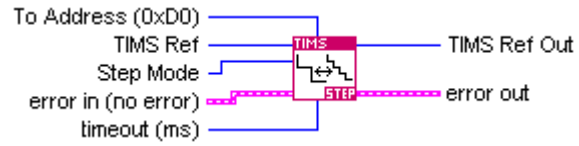
Connector Pane



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Step Mode Sets the state of the Step Mode (Half/Full)

To Address (0xD0) To Address specifies the TIMS processor address.
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TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Target_Position_Get.vi
Gets the target position value computed by the last move command.

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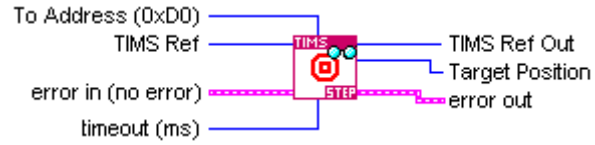
Connector Pane



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source The **source** string describes the origin of the error or warning.

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Target Position

TIMS Ref Out The TIMS Reference used to communicate with a device.

TIMS_STEP_Wait_Until_Move_Done.vi
Polls the TIMS device waiting until it is not busy moving.
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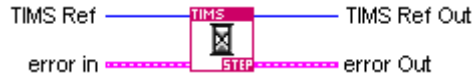
Connector Pane



Controls and Indicators

TIMS Ref The TIMS Reference used to communicate with a device.

error in The **error in** cluster can accept error information wired from VIs previously called. Use this information to decide if any functionality should be bypassed in the event of errors from other VIs.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status The **status** boolean is either TRUE (X) for an error, or FALSE (checkmark) for no error or a warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

code The **code** input identifies the error or warning.

The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source The **source** string describes the origin of the error or warning.

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