Allen-Bradley

Very High-Speed Counter Modules

1734-VHSC5 and 1734-VHSC24

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • identify a hazard • avoid a hazard • recognize the consequence

SHOCK HAZARD	Labels may be located on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.

BURN HAZARD	Labels may be located on or inside the equipment (for example, drive or motor) to alert people that surfaces may be dangerous temperatures.

POINT I/O, POINTBus, and RSLogix 5000 are trademarks of Rockwell Automation.

ControlNet is a trademark of ControlNet International, Ltd. DeviceNet is a trademark of Open DeviceNet Vendor Association, Inc.

Summary of Changes

This publication contains new and revised information not in the last release.

New and Revised Information

See the table for a summary of the major changes in this manual.

Chapter	Change
Preface	Update of list of publications
	Indication that for specifications and safety approval information refer to the installation instructions
2	Addition of Before You Begin section
	Addition of attention and warning statements
Appendix A	Update on how to configure modules in RSLogix 5000 software

Change Bars

We marked with change bars (as shown with this paragraph) the areas in this manual that differ from previous editions and indicate the addition of new or revised information.

Notes:

Table of Contents

Purpose of This Manual

Read this manual for information about how to install, configure, and troubleshoot your module.

For This Information	See
About the Modules	Chapter 1
Install the Modules	Chapter 2
Input and Output Data	Chapter 3
Configure Your Module	Chapter 4
Access Instantiated Instances	Chapter 5
Troubleshoot with the Indicators	Chapter 6

Who Should Use This Manual

You must be able to use RSNetWorx software or similar configuration software to set up and calibrate these modules. You must have the capability to download and use Electronic Data Sheet files.

We assume you know how to do this in this manual. If you do not, refer to your software user manuals or online help before attempting to use these modules.

Related Products and Documentation

For specification, safety approval, and other information refer to the following.

- Publication Number 1734-IN003
  5V and 24V Very High-speed Counter Modules
  Installation Instructions

For related 1734 products and documentation see the table.

Description	Cat. No.	Publication
Analog Input Modules Installation Instructions	1734-IE2C 17340IE2V	1734-IN027
Analog Output Modules Installation Instructions	1734-OE2C 1734-OE2V	1734-IN002
DeviceNet Communication Interface Installation Instructions	1734-PDN	1734-IN057
Field Potential Distributor Installation Instructions	1734-FPD	1734-IN059
POINT I/O 24V dc Expansion Power Supply Installation Instructions	1734-EP24DC	1734-IN058
POINT I/O Selection Guide	1734 series	1734-SG001
Protected Output Module s Installation Instructions	1734-OB2E 1734-OB4E 1734-OB8E	1734-IN056
Relay Output Modules Installation Instructions	1734-OW2 1734-OW4	1734-IN055
Sink Input Modules Installation Instructions	1734-IB2 1734-IB4 1734-IB8	1734-IN051
Source Output Modules Installation Instructions	1734-IV2 1734-IV4 1734-IV8	1734-IN052
Wiring Base Assembly Installation Instructions	1734-TB 1734-TBS	1734-IN511
Wiring Base Assembly Installation Instructions	1734-TB3 1734-TB3S	1734-IN013

Definitions

The following define the intended operation of the module.

Term	Definition
Lead Breakage	Typically requires a shunt resistor (across the load) to detect 3 levels of current/input states - • Open (Wire Off, Device = ?) • Off (Wire OK, Device Off) • On (Wire OK, Device On) This method does not check the input against a time base, only that the device wiring (current loop) is intact.
Missing Pulse	Typically uses an input pulse to reset a watchdog timer (fixed or programmable HW). This method does detect Lead Breakage, since a broken wire will time-out the watchdog.
Zero Frequency	Typically uses an input pulse to calculate an input frequency and verify it is above an error threshold. This method does detect Lead Breakage, since a broken wire will generate a 0Hz frequency. Missing Pulse or Zero Frequency will also detect a customer device stuck high or low, since the counter is monitoring for a change in the input state. Currently, the Counter/Encoder Modes **do not** have Zero Frequency Detection - the A and B inputs are time independent, only looking for input edge changes to increment/decrement the count value. The Period/Rate and Continuous Rate modes **do** have Zero Frequency Detection, since the Z input is monitored for Zero Frequency in Firmware (A and B inputs are not used and not monitored). The Rate Measurement mode inherently has Zero Frequency Detection, since no A pulses in any sample period are = 0Hz (B and Z inputs are not used and not monitored).

Operational Mode	Zero Frequency Detection	Input Monitored
Counter	No	None
Encoder	No	None
Period/Rate	Yes	Z Only
Rate Measurement	Y	A Only

About the Modules

What This Chapter Contains

Read this chapter to learn about types, features, and capabilities of the encoder/counter modules.

Module Description and Features

The modules install into the POINT I/O terminal base (1734-TB or 1734-TBS) and interface with the Point I/O DeviceNet Pass-through (1734-PDN) or the Point I/O DeviceNet Adapter (1734-ADN).

A module serves as a signal conditioner, function block, and counter between the customer process signals on the terminal base and the POINTBus containing the command information. The main functional blocks are the following.

- Customer digital I/O interface
- Counter ASIC
- Microprocessor

The module accepts feedback from the following.

- Encoders (either single ended or differential)
- Pulse generators
- Mechanical limit switches
- Frequencies up to 1 MHz

A filter is available with the following settings.
- 50 Hz
- 500 Hz
- 5 kHz
- 50 kHz)

Turn the filter off to achieve the fastest counting rate. The input voltage range is 5Vdc (VHSC5) or 15-24V dc (VHSC24). The module returns the count or frequency in the form of a 24 bit binary number (0 - 16,777,215) expressed in a 32 bit long word.

Each counter has a user-selectable preset and rollover value associated with it.

The module has 2 outputs that access customer power from the POINTBus to facilitate various output device voltage requirements.

The outputs are rated to source 0.5A at 10 to 28.8V dc. The output may be tied to an input. This lets you cascade counters of multiple 1734-VHSC modules. The counter has 4 user-selectable On-Off values (windows) associated with it. Tie either output to any or all of the window signals.

Operating Modes

The modules operate in the modes shown in the table.

Mode	Description
Counter Mode	Read read incoming single-phase pulses, return a binary count.
Encoder Mode	Read incoming two-phase quadrature pulses, return a binary count.
Period/Rate Mode	Count internal clocks during the On period, return a frequency. Outputs updated only at the end of the period.
Continuous/Rate Mode	Count internal clocks during the On period, return a frequency. Outputs are updated continuously during the period.
Rate Measurement Mode	Read pulses during the sample period, return a frequency.
PWM Mode (pulse width modulation)	Generate a pulse width modulated signal.

The operation of the counter and encoder modes is nearly identical. The difference between the two modes is in the type of feedback (single-phase versus two-phase) for the count direction (up or down). In **encoder mode**, a transition is expected on the B input for counting to proceed in a direction; whereas, in **counter mode**, the B input may be left at a static level.

You select all operating modes by writing appropriate configuration data to the module.

Counter Mode

The counter mode reads incoming pulses and returns a binary number (0 - $16,777,215_{max}$) to the POINTBus. The counter mode only accepts **single-phase** inputs. The module determines the Phase B input state, and counts up or down accordingly.
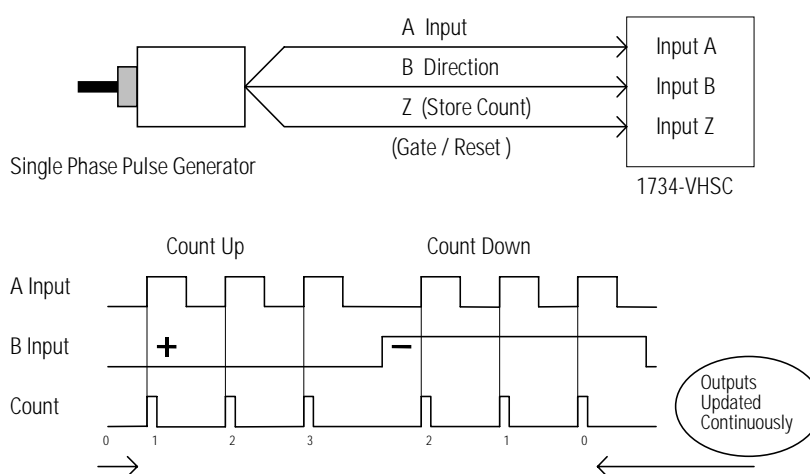
Channel A input is used as the counting pulse while channel B is used to determine the direction.

[B = High, Count = Down; B = Low or floating (not connected), Count = Up]

The Channel B input may be tied high or low for unidirectional counting, or toggled for bidirectional counting.

EXAMPLE

Example of Counter Mode

Encoder Modes

The encoder mode reads incoming pulses and returns a binary number ($0 - 16,777,215_{max}$) to the POINTBus. The encoder mode only accepts two-phase quadrature inputs. The module senses the relationship between the 2 phases, and counts up or down accordingly.

There are two basic encoder types, absolute and incremental. A single-output incremental encoder is called a tachometer encoder. A dual channel incremental encoder with one channel leading the other by 90° is called a quadrature encoder.

A system using a quadrature encoder may include an optional zero pulse, or index, serving as a reference mark for system reset. The principal disadvantage of a system using incremental encoders is that a power interruption causes the loss of position reference, so a system must be reinitialized or returned to a known zero position.

Absolute encoders typically have higher speed requirements (200 KHz typical) for motion control applications. An absolute encoder has a unique code associated with each position, so the exact position is always known, even if the system power is turned off.

EXAMPLE

Example of Multiplying Encoder Mode X1, X2 and X4
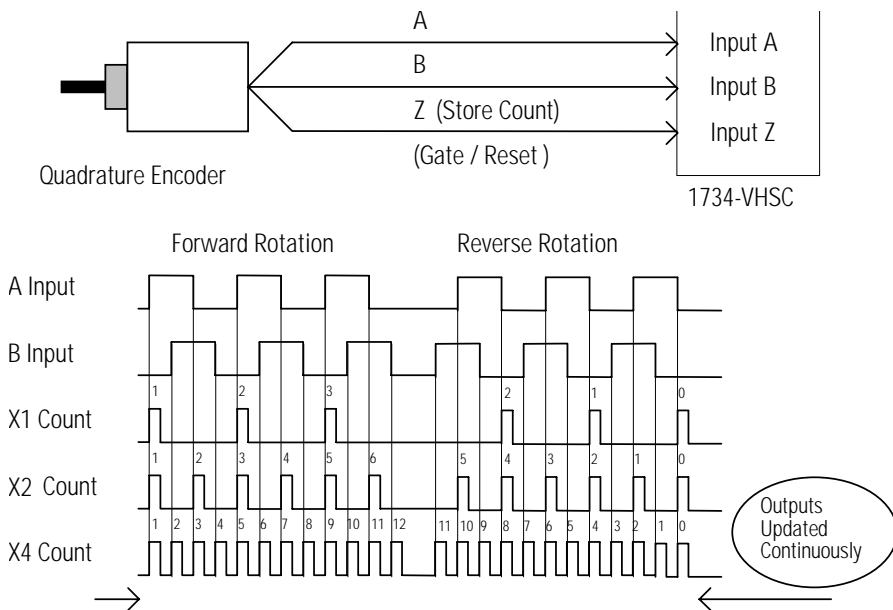
X1 Multiplying Encoder Mode

Quadrature input signals are used to count on the leading (up direction) or trailing (down direction) edge of A for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

X2 Multiplying Encoder Mode

Quadrature input signals are used to count on leading and trailing edges of A for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

X4 Multiplying Encoder Mode

Quadrature input signals are used to count on leading and trailing edges of A and B for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

Period/Rate Mode

The Period/Rate mode returns an incoming frequency and a total accumulated count to the POINTBus, by gating an internal 5 MHz internal clock with an external signal.

This mode determines the frequency and total number of input pulses by counting the number of internal 5MHz clock pulses over a user-specified number of input signal pulses. At the end of the specified number of pulses, the module returns the frequency (0 - 1 MHz). When the frequency is updated, both outputs are checked against their associated presets.

EXAMPLE

Example of Period/Rate Mode
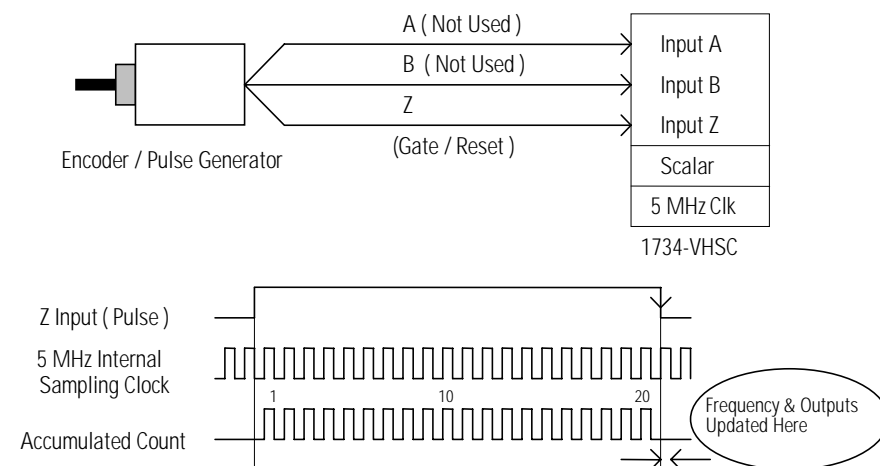
Assumes symmetrical pulse, 50% duty cycle, so Period = Sample Time On X 2 {On & Off}
Frequency = 1 / Period   If Count = 20, Scalar = 1, and Clock Period = (1 / 5 MHz)
Frequency = 1 / [(20 / 1) X (1 / 5 MHz) X 2] = 125 kHz

As the frequency of the incoming pulse train at the Z (Gate/Reset) terminal increases, the number of sampled pulses from the 5MHz clock decreases. Since accuracy is related to the number of pulses received over the sample period, the accuracy decreases with increasing frequencies at the Gate/Reset terminal. Refer to the following Scaling table.

Relationship Between Sampled Pulses and Input Frequency	
Input Frequency at Z Gate/Reset Terminal	Sample Pulses for 1/2 Cycle of Z Gate/Reset Pulse
2.5 Hz	1 M
5 Hz	500 k
10 Hz	250 k
20 Hz	125 k
50 Hz	50 k
100 Hz	25 k
200 Hz	12.5
500 Hz	5 k
1k Hz	2.5 k
2 Hz	1.25 k
5 kHz	500
10 kHz	250
20 kHz	125
50 kHz	50
100 kHz	25

Scaling the input frequency through the use of a scalar can lessen the decrease in accuracy. A scalar value of 1 returns an accurate input frequency if incoming input pulses have a 50% duty cycle.

Operation of Scalar

In the Period/Rate mode, the scalar lets the incoming pulse train at the Z Gate/Reset pin be divided by a user-defined number. There is one scalar value for each counter. Acceptable values for the scalar are 1, 2, 4, 8, 16, 32, 64, and 128. The default value for each scalar is 1. Note that a 0 scalar is equivalent to a 1.

The product of the Sample Period times the scalar should be less than 6.71 seconds in order to avoid a zero frequency detect indication.

(5 MHz sample time = 200ns; 16,777,216 counts x 200ns x 2 half cycles of Z = 6.71 seconds)
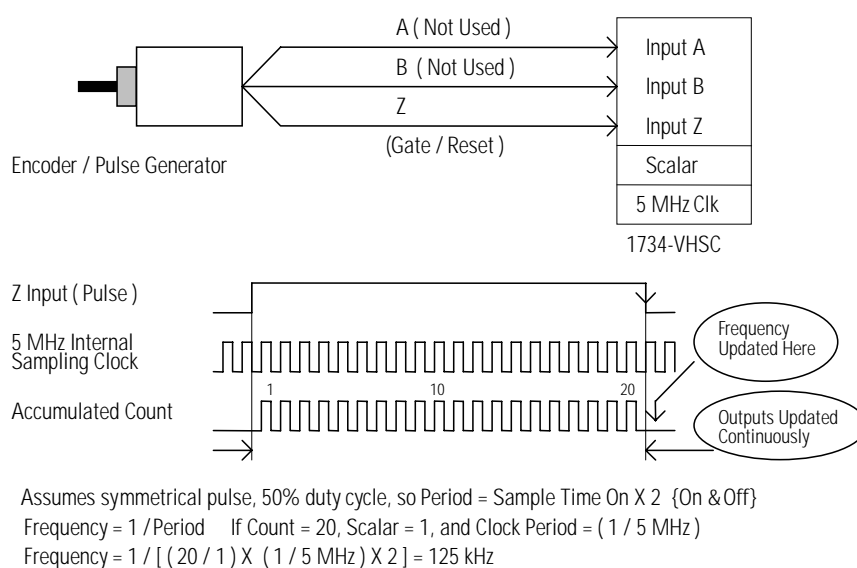
Continuous/Rate Mode

The Continuous/Rate Mode returns an incoming frequency and a total accumulated count to POINTBus, by gating an internal 5 MHz internal clock with an external signal.

Similar to the Period/Rate mode except outputs in this mode are updated continuously. This mode determines the frequency and total number of input pulses by counting the number of internal 5 MHz clock pulses over a user-specified number of input signal pulses. Each output is turned on as soon as the turn-on count is reached, and turned off as soon as the turn-off count is reached. As the internal 5 MHz clock is counted, the outputs dynamically track the 5 MHz count.

EXAMPLE

Example of Continuous/Rate Mode

Assumes symmetrical pulse, 50% duty cycle, so Period = Sample Time On X 2 {On & Off}
Frequency = 1 / Period   If Count = 20, Scalar = 1, and Clock Period = (1 / 5 MHz)
Frequency = 1 / [(20 / 1) X (1 / 5 MHz) X 2] = 125 kHz

As the frequency of the incoming pulse train at the Z Gate/Reset terminal increases, the number of sampled pulses from the 5 MHz clock decreases. Since accuracy is related to the number of pulses received over the sample period, the accuracy decreases with increasing frequencies at the Gate/Reset terminal. (Refer to the "Operation of Scalar" information and table in the Period/Rate Mode.)

Rate Measurement Mode

The Rate Measurement mode determines the frequency and total number of input pulses over a user-specified sample period. At the end of the interval, the module returns a value representing the sampled number of pulses and a value indicating the incoming frequency.

When you update the count and frequency, you check any associated outputs against their associated presets. Frequency is calculated by dividing the accumulated count by the user-selected time period, and is returned in the read data. Allowable time periods are 10 ms to 3 s in 10 ms increments, with a default value of 1 s. Note that a 0 time period is equivalent to the 1 s default.

EXAMPLE

Example of Rate Measurement Mode
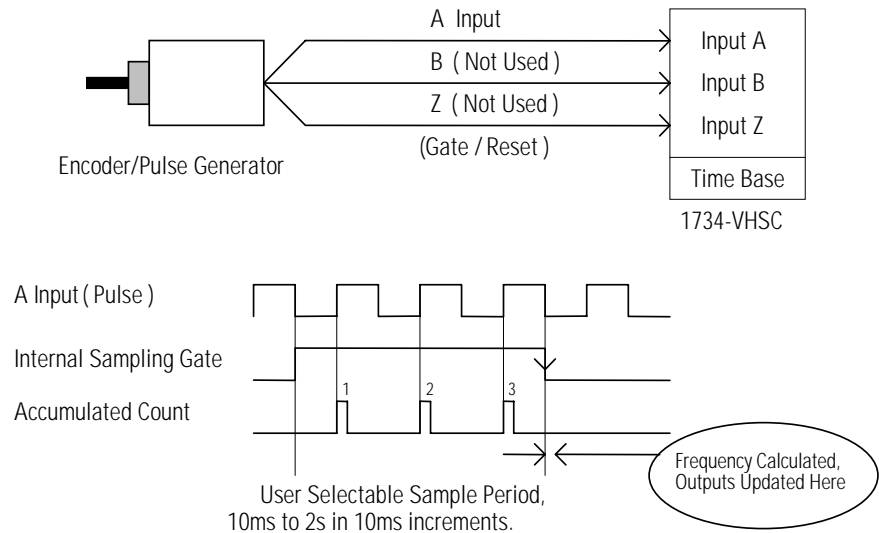
If Sample Period is 50ms, and Count = 3, then Frequency = 3 /50ms = 60Hz

Pulse Width Modulation (PWM) Mode

The Pulse Width Modulation mode uses the counter to generate a continuous rolling sequence of numbers. The real-time PWM value written to the module is converted to a window edge so that a variable duty-cycle signal can be generated. The counter resets to zero based upon the PWM period programmed into the module. Any output tied to Window 0 transmits the PWM signal.

New Data Indicator

A two-bit counter, C1 and C0, is updated every time an event occurs, indicating that new data is available in the Stored/Accumulated Count words. Events are defined as:

> Any active gate transition in any of the **Store Count** (Counter or Encoder) modes

> The end of the gate sample period in either the **Period / Rate**, **Continuous / Rate** or **PWM** modes

> The end of the programmed sample period in the **Rate Measurement** mode

To use these bits reliably, acquisition of data from the counter module must occur faster than the events, which cause C1/C0 to increment. When C1/C0 is updated, a change of state (COS) message can be sent.

Default Configuration

The module default configuration on startup are the following.

- Counter mode
- 50 Hz filter on A, B, and Z
- No time base
- Active Output Assembly = 105
- Rollover = 0x00FFFFFF
- Preset = 0
- No scalar
- Output 0 untied
- Output 1 untied
- Window comparators = 0
- Counter Control Safe State = 0
- Output Control Safe State = 0

To modify the default settings to those required for your application, refer to the appropriate section of this publication.

Operating Mode Features

See the table for a summary of features active in each mode.

Operating Feature	Counter Up / Down	Encoder X1, X2 & X4	Period /Rate	Continuous /Rate	Rate Measurement	PWM
Preset	Y	Y	N	N	N	N
Rollover	Y	Y	N	N	N	N
Software Reset	Y	Y	Y	Y	Y	Y
Store Count - Z Gate / Reset 4 modes	Y	Y	N	N	N	N
Scale Input Count at Z Gate / Reset	N	N	Y	Y	N	N
Z Gate / Reset Invert Bit	Y	Y	Y	Y	N	N
Enable /Force Outputs	Y	Y	Y	Y	Y	Y
Assign Outputs	Y	Y	Y	Y	Y	Y
Operate Outputs (Based On)	Y (Count)	Y (Count)	Y (Count)	Y (Count)	Y (Count)	Y (PWM Value)
Sample Period	N	N	N	N	Y	Y

Operating Mode Features

The Z Gate/Reset Terminal operates in one of four modes when the Store Count feature is in use. The four figures below detail the operation in each mode.

Store Count Mode 1: Store/Continue

In mode 1, the rising edge of a pulse input on the Z Gate/Reset terminal causes the current counter value to be read and stored in the Read Data file. The counter continues counting. The stored count is available in the Stored/Accumulated Count word. The stored count information remains until it is overwritten with new data.

Store/Continue

Read, Store Count, and Continue Counting
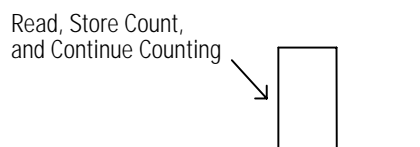
Store Count Mode 2: Store/Wait/Resume

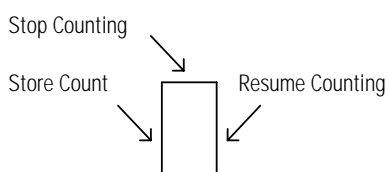In mode 2, the rising edge of a pulse input on the Z Gate/Reset terminal reads and stores the current counter value in the Stored/Accumulated Count word and inhibit counting while the Z Gate/Reset terminal is high. Counting resumes on the falling edge of the pulse at the Z Gate/Reset terminal. The stored count information remains until it is overwritten with new data.

Store/Wait/Resume

Stop Counting

Store Count   Resume Counting

Store Count Mode 3: Store-Reset/Wait/Start

In mode 3, the rising edge of a pulse input on the Z Gate/Reset terminal stops counting, reads, and stores the current counter value in the Stored/Accumulated Count word, and resets the counter to zero. The counter does not count while the input pulse on the Z Gate/Reset terminal is high. Counting resumes from zero on the falling edge of the pulse at the Gate/Reset terminal. The stored count information remains until it is overwritten with new data.

Store-Reset/Wait/Start

Counter has stopped Counting

Stop Count, Store,   Start Counting
and Reset to zero   from zero
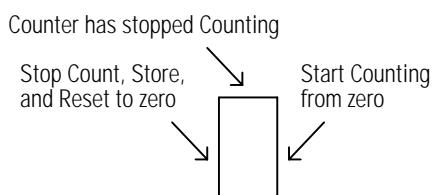
Store Count Mode 4: Store-Reset/Start

In mode 4, the rising edge of a pulse input on the Z Gate/Reset terminal stores the current counter value in the Stored/Accumulated Count word and reset the counter to zero. The counter continues counting while the Z Gate/Reset terminal is high. The stored count information remains until it is overwritten with new data.

Store-Reset/Start
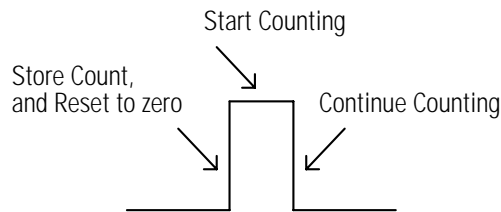
Output Control

To connect an output to a compare window, you could program the module accordingly:

- Tie Output 0 to Window 0
- Program Window 0 ON Value to 2000
- Program Window 0 OFF Value to 5000

ON-OFF Operation of Output 0
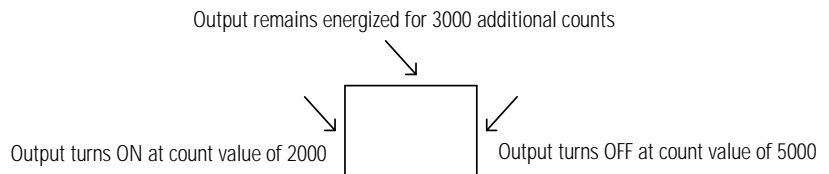
If the OFF value is greater than the ON value, the output turns ON at 2000 and OFF at 5000. If the ON value is greater than the OFF value, the output turns OFF at 2000 and ON at 5000.

Effect of ON-OFF Value on Output Operation

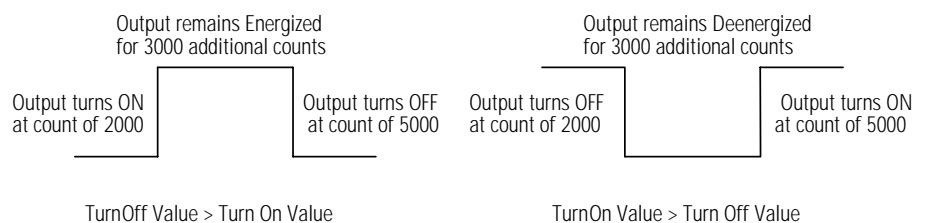# Install the Module

What This Chapter Contains Read this chapter for information about how to install the modules.

The 1734-VHSC module is a two-module set. Module 1 houses the 1734-VHSC functionality while module 2 provides screw terminals necessary to access chassis ground (Chas Gnd) and common (C).

Module 2 also connects terminal 4 to 5 and terminal 6 to 7 for ease of wiring power to the input device. Module 2 is not necessary for VHSC functionality but eases customer wiring. Module 2 does not use a node address, and it doesn't consume power from the POINTBus. To reduce loop area, place module 2 adjacent (either side) to module 1.

For Information About How To	See Page
Before You Begin	2-1
Install the Mounting Base Assembly	2-1
Install the Module	2-4
Install the Removable Terminal Block	2-6
Remove a Mounting Base	2-6
Wire the Modules	2-7

Before You Begin

ATTENTION ⚠	**Preventing Electrostatic Discharge**

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

ATTENTION	**Environment and Enclosure**
⚠	This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 (Industrial Automation Wiring and Grounding Guidelines), for additional installation requirements pertaining to this equipment.

Use these Series C modules with the following:

- ControlNet adapters
  with RSLogix 5000 software, version 11 or higher
- DeviceNet adapters
- EtherNet/IP adapters
  with RSLogix 5000 software, version 11 or higher
- PROFIBUS adapters

Install the Mounting Base Assembly

The wiring base assembly (1734-TB or 1734-TBS) consists of a mounting base (cat. no. 1734-MB) and a removable terminal block (cat. no. 1734-RTB or 1734-RTBS).

You can install the assembly, or just the mounting base. To install the mounting base and wiring base assembly on the DIN rail, proceed as follows.

ATTENTION ⚠	POINT I/O is grounded through the DIN rail to chassis ground. Use zinc-plated, yellow-chromated steel DIN rail to assure proper grounding. The use of DIN rail materials (for example, aluminum, plastic) that can corrode, oxidize, or are poor conductors can result in improper or intermittent grounding.
	Secure DIN rail to mounting surface approximately every 200 mm (7.8 inches).

1. Position the mounting base and wiring base assembly vertically above the installed units (adapter, power supply, or existing module).

2. Slide the mounting base down so that the interlocking side pieces engage the adjacent module or adapter.

Slide-in Writable Label

Module Locking Mechanism

Insertable I/O Module

Module Wiring Diagram

Mechanical Keying (orange)

DIN Rail Locking Screw (orange)

RTB Removing Handle

Removable Terminal Block (RTB)

Interlocking Side Pieces
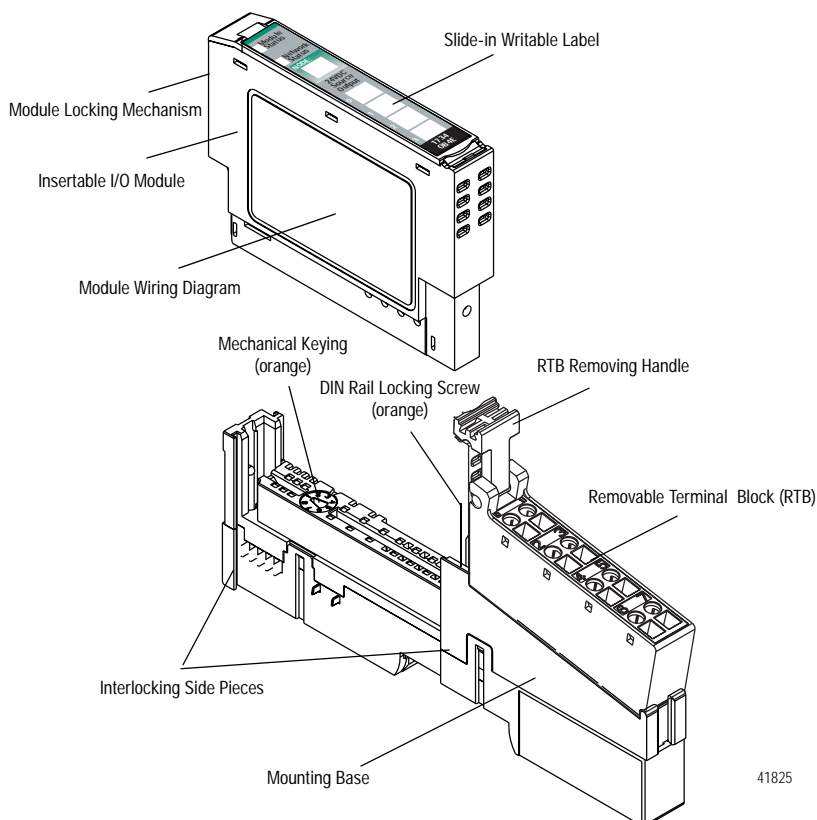
Mounting Base

41825

3. Press firmly to seat the mounting base on the DIN rail.

The mounting base snaps into place.
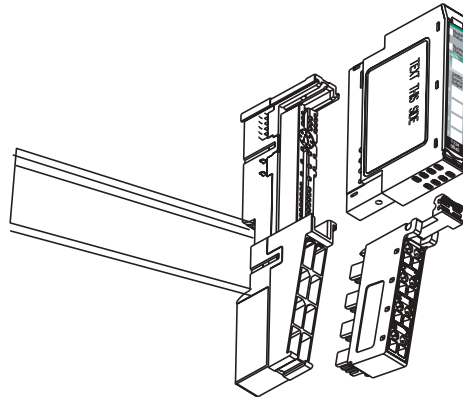
44013

ATTENTION ⚠️	Do not discard the end cap shipped with an adapter or communication interface. Use this end cap to cover the exposed interconnections on the last mounting base on the DIN rail. Failure to do so could result in equipment damage or injury from electric shock.

Install the Module

Install the module before or after base installation. Make sure that you correctly key the mounting base before installing the module into the mounting base. In addition, make sure you position the mounting base locking screw horizontal as referenced to the base.

WARNING ⚠️	When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.
	Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number required for the type of module you are installing aligns with the notch in the base.

1734-VHSC24 - Position 2
1734-VHSC5 - Position 2

Turn the keyswitch to align
the number with the notch.

Notch
(position 3 shown)

44009
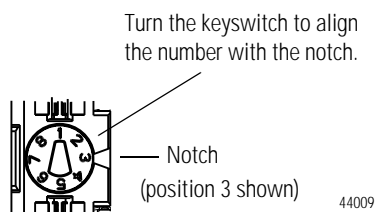
2. Make certain the DIN rail locking screw is in the horizontal position, noting that you cannot insert the module if you unlock the locking mechanism.

Make sure the DIN rail
locking screw is in the
horizontal position.

44010
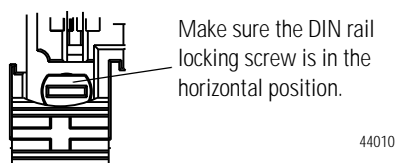
3. Insert the module straight down into the mounting base, and press to secure.

The module locks into place.

44012

Install the Removable Terminal Block

A removable terminal block comes with your mounting base assembly. Pull up on the RTB handle to remove and replace as necessary without removing any of the wiring. To reinsert the removable terminal block, use this procedure.

1. Insert the RTB end opposite the handle into the base unit.

This end has a curved section that engages with the mounting base.

Hook the RTB end into the mounting base end, and rotate until it locks into place.
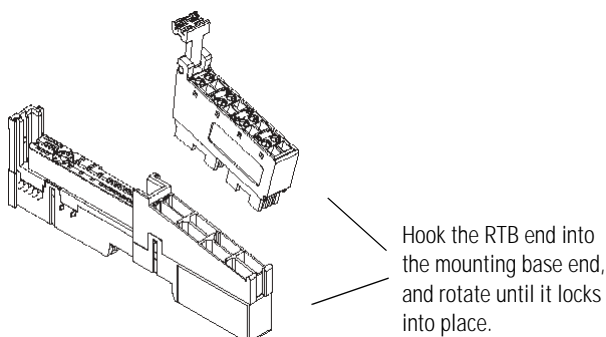
44011

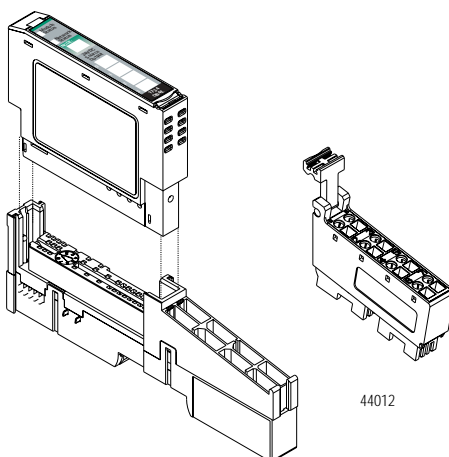**2.** Rotate the terminal block into the mounting base until it locks itself in place.

3. If an I/O module is installed, snap the RTB handle into place on the module.

WARNING ⚠	When you connect or disconnect the removable terminal block (RTB) with field-side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Remove a Mounting Base

To remove a mounting base, remove any installed module and the removable terminal block (if wired).

1. Unlatch the RTB handle on the I/O module.

2. Pull on the RTB handle to remove the removable terminal block.

WARNING	When you connect or disconnect the removable terminal block (RTB) with field-side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

3. Press in on the module lock on the top of the module, and pull up on the I/O module to remove from the base.

4. Remove the module to the right of the base you are removing.

   The interlocking portion of the base sits under the adjacent module.

5. Use a small-bladed screwdriver to rotate the orange DIN rail locking screw on the mounting base to a vertical position.

   This releases the locking mechanism.

6. Lift the mounting base straight up to remove.

Wire the Modules

Refer to the figures and tables to wire the modules.

WARNING	If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.
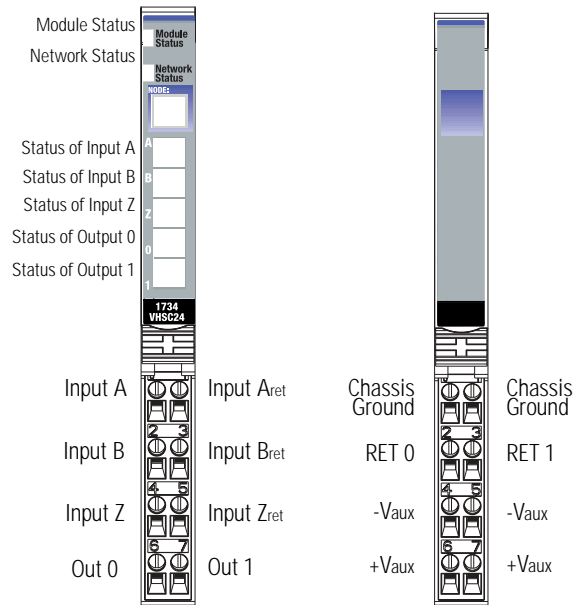
42016

	Module 1		Module 2
0 A	1 Aret	0 Chas Gnd	1 Chas Gnd
2 B	3 Bret	2 RET 0	3 RET 1
4 Z	5 Zret	4 -Vaux	5 -Vaux
6 Out 0	7 Out 1	6 +Vaux	7 +Vaux

Module 1 Terminations		Module 2 Terminations	
0	A	0	Chassis ground
1	Aret	1	Chassis ground
2	B	2	Out 1 RET
3	Bret	3	Out 0 RET
4	Z	4	Vaux -
5	Zret	5	Vaux -
6	Out 0	6	Vaux +
7	Out 1	7	Vaux +

Chapter **3**

Very High-Speed Counter Module Input and Output Data

What This Chapter Contains   In this chapter, you learn about the input and output data table of your 1734-VHSC24 and 1734-VHSC5 Modules.

For More Information About	See Page
Data Table	3-1
Detailed Description of Data Table Information	3-2
Output Data	3-5
Configuration Data	3-6
Communicating Real Time Information	3-11

Data Table   The following table shows the complete format of the input and output data.

		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	0
	Input Information																
	Present Channel Data	32-bit Value of the present counter state															
	Stored Channel Data	32-bit value of the stored/accumulated count															
	Status	PE	EF	NR	0	FS	FS	OS	OS	0	ZS	BS	AS	C1	C0	ZD	0
	Programming Error Code	PE	0	0	0	0	E10	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
	Output Information																
	Counter Control									0	0	0	0	0	VR	CP	CR
	Output Control									DS	ES	OE	FO	DS	ES	OE	FO
	PWM Value	16-bit decimal value with range from 0-9500 (0-95.00%)															
	Configuration Information																
	Counter Configuration									ZI	MD	MD	MD	CF	CF	CF	CF
	Filter Selection									0	ZF	BF	AF	FS	FS	FS	FS
	Decimal Position	8-bit value used to modify the present channel data display															
	Active Output Assembly									Assembly number (0, 105 or 106)							
	Time Base/PWM Period	16-bit value used to set the time base or PWM period															
	Gate Interval	8-bit value used to set the gate interval															

		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	0
	Scalar	8-bit value used to divide the Z input by 2^n															
	Output Ties 0									0	0	0	0	T3	T2	T1	T0
	Output Ties 1									0	0	0	0	T3	T2	T1	T0
	Rollover Value	32-bit value at which the counter is commanded to rollover															
	Preset Value	32-bit value the counter is to be set to when CP is asserted															
	On Value 1	32-bit value that sets the compare window															
	Off Value 1	32-bit value that sets the compare window															
	On Value 2	32-bit value that sets the compare window															
	Off Value 2	32-bit value that sets the compare window															
	On Value 3	32-bit value that sets the compare window															
	Off Value 3	32-bit value that sets the compare window															
	On Value 4	32-bit value that sets the compare window															
	Off Value 4	32-bit value that sets the compare window															
	PWM Safe State Value	16-bit safe state value for the PWM signal															
	Counter Control SS Value									0	0	0	0	0	VR	CP	CR
	Output Control SS Value									DS	ES	OE	FO	DS	ES	OE	FO

Detailed Description of Data Table Information

Present Channel Data (Input Word 1)

This is a 32-bit unsigned long-word value representing the current count of the 24-bit counter (configurations: count [0], x1 encoder [1], x2 encoder [2], PWM [3], x4 encoder [4]) or the frequency (configurations: period/rate [5], continuous/rate [6], rate measurement [7]). The range of values is $0 \leq value \leq 0x00FFFFFF$ (16,777,215).

Stored/Accumulated Channel Data (Input Word 2)

This is a 32-bit unsigned long-word value representing the stored count of the counter at the time of some specified event. In counter configurations (configurations: count [0], x1 encoder [1], x2 encoder [2], x4 encoder [4]) without store modes selected, these words are not updated. With store modes selected, they are the stored value of the counter at the time of the specified event (for example, rising edge of Z input). In PWM [3] configuration it is the counter value at the end of the period specified by the product of the time base x gate interval. In period/rate [5] and continuous/rate [6] configurations it is the total accumulation of unscaled Z pulses (for example, if scaling is set to 128, after 128 Z pulses the accumulator increases by 128 counts).

The maximum frequency that accumulation can follow in these two modes is 200 Hz x scalar value (for example, 200 Hz x 128 is 25 kHz).

Finally, in rate measurement [7] configuration, it is the total number of pulses seen at the A input accumulated over each period as specified by the product of the time base x gate interval. The range of values occupy the entire 32-bit size from $0 \leq value \leq 0xFFFFFFFF$ (4,294,967,295). Changing the configuration does not clear these words.

Module/Channel Status and Programming Error Codes (Input Words 3 and 4)

Programming Error bit (PE) - If an incomplete, incorrect, or conflicting set of configuration parameters is sent to the module, the PE bit is asserted and an error code is placed in the Programming Error Code word (assembly 68_{16}). The module will **not** enter a normal operational state.

Bit definitions for the error code are:

E10:   An invalid assembly was chosen for poll consumption (0, 105, or 106 are valid).

E9:   The decimal point position is outside of acceptable range.

E8:   Counter 0 window ON and OFF values are equal and not zero OR Counter 0 window ON or OFF value greater than 0x00FFFFFF.

E7:   A tie has been connected to an unprogrammed window.

E6:   A configuration was selected that requires the scalar and none was programmed or Multiple scalars were selected.

E5:   The preset is out of range (> 0x00FFFFFF).

E4:   A rollover of zero was programmed though PWM was not selected OR A rollover was programmed and PWM was selected OR Rollover is out of range (> 0x01000000).

E3:   A configuration requiring time base was selected and no gate interval was set OR Gate interval is out of range (> 200) OR Product of time base and gate interval is greater than 3 seconds.

E2:   A time base was entered that is not a multiple of 10 OR Time base is out of range (> 3000 or 3 seconds).

E1:   ZF/BF/AF were selected and no filter was programmed OR Multiple filters were selected.

E0:   A reserved configuration/mode was programmed.

EEPROM Fault status bit (EF) - If a fault is detected with the EEPROM during power up tests, this bit is asserted to 1. It indicates that the content of the EEPROM has been corrupted, most likely caused by loss of power during an executing write.

Not Ready status bit (NR) - Whenever power is applied to the module, the hardware must be initialized. During this time, the NR bit is asserted and the **green module status indicator flashes**.

Output Fault Status indicators (FS) - where bit 11 is output 1 and bit 10 is output 0. A 1 indicates the output is either shorted or open.

Output Status indicators (OS) - where bit 9 is output 1 and bit 8 is output 0. A 1 indicates the output is ON, 0 it is OFF.

Z input Status (ZS) - This bit indicates the present status of the Z input (1 indicates Z is ON, 0 indicates Z is OFF). This bit is unaffected by Z Invert, ZI, in the Counter Configuration word.

B input Status (BS) - This bit indicates the present status of the B input (1 indicates B is ON, 0 indicates B is OFF).

A input Status (AS) - This bit indicates the present status of the A input (1 indicates A is ON, 0 indicates A is OFF).

C[1,0] Stored data count - This count cycles through [0 0], [0 1], [1 0], [1 1], [0 0]… Each time the stored/accumulated count words are updated, C[1,0] is incremented. This feature assumes the host's sample rate (including network delay and program scan) is as fast or faster than the frequency of the event which updates C[1,0].

Zero frequency Detected (ZD) - This bit is operational when frequency configurations are programmed (configurations: period/rate [5], continuous/rate [6], rate measurement [7]).

> In period/rate [5] and continuous/rate [6] configurations, counts are acquired during the ON state of the Z input. At very low frequencies the counter saturates, indicating a zero frequency detect. The time it takes to determine a zero frequency in these two configurations can be as long as 6.7 seconds (16,777,216 counts x 1/5 MHz x 2 half cycles of Z).

> In rate measurement [7] configuration pulses on the A input are counted over a sample interval specified by the time base. The time it takes to determine a zero frequency in this configuration is determined by the sample interval (for example, time base = 0.300 second therefore 300 milliseconds to determine ZF).

Output Data

Counter Control (Word 1)

VR   Value Reset of stored/accumulated count. The transition of this bit from 0 to 1 clears the stored/accumulated count word.

CP   Counter Preset. The transition of this bit from 0 to 1 sets the counter to the value specified by the Preset words. Outputs are adjusted according to the window compare values.

CR   Counter Reset. The transition of this bit from 0 to 1 clears the counter. Outputs are adjusted according to the window compare values.

Output Control (Word 2)

Diagnostic speed (DS) - When this bit is set (1), the short circuit and open wire diagnostics are filtered (50 ms) to prevent nuisance trips caused by noisy environments. When the bit is reset (0), diagnostics responds to a fault condition in less than 8 ms.Bits 7 and 3 report output 1 and 0, respectively.

Electronic-fuse Select (ES) - When this bit is set (1), outputs are disabled upon the detection of a fault (short circuit or open wire) and the output fault status indicator, FS, is latched. Recovery from a faulted state is achieved by sending ES = 0 and OE = 1 for the afflicted output. When ES equals zero, a faulted output continues to operate as instructed until the fault is removed. In either case, FS is asserted to indicate a fault. Bits 6 and 2 report output 1 and 0 respectively.

Output Enable (OE) - When this bit is set (1), outputs are permitted to turn on from either a force on, FO, a compare match or as directed by the PWM settings. When OE equals zero, the module turns the associated output OFF. Bits 5 and 1 represent outputs 1 and 0 respectively.

Force Output (FO) - When this bit is set to 1, outputs are turned on if OE is 1. When FO equals zero, outputs may then be controlled by a compare match or as directed by the PWM settings. Bits 4 and 0 represent outputs 1 and 0 respectively.

Pulse Width Modulation (PWM) Value (Output Word 3)

When the module is programmed for a *PWM [3]* configuration, the time base is enabled, the counter rollover, which is defined as the 1st ON and 1st OFF value for the respective channel is used. Ties can be used to direct the PWM signal to any or both outputs. The range of PWM values is 0 ≤value ≤9500 decimal (0.00% ≤value ≤95.00%). Entering a value below 0 results in a PWM of 0%; a value greater than 9500 results in a PWM of 95.00%. The actual duty cycle observed at the output depends on the turn on and turn off times of the MOSFET, the energy storage capability of the cable/load and the resistance from output to return.

Configuration Data

The following represents the configuration data used by the 1734-VHSC24 module.

Counter Configuration (Configuration Word 1)

Use this byte to select the type of counter desired.

07	06	05	04	03	02	01	00	
ZI	MD			CF				Counter 0
				0	0	0	0	Counter
				0	0	0	1	Encoder X1
				0	0	1	0	Encoder X2
				0	0	1	1	PWM
				0	1	0	0	Encoder X4
				0	1	0	1	Period/Rate
				0	1	1	0	Continuous/Rate
				0	1	1	1	Rate Measurement
	0	0	0					Store Count Disabled
	0	0	1					Mode 1 - store/continue
	0	1	0					Mode 2 - store/wait/resume
	0	1	1					Mode 3 - store, reset/wait/start
	1	0	0					Mode 4 - store, reset/start
	1	0	1					Reserved
	1	1	0					Reserved
	1	1	1					Reserved
0								Z input - 0 = not inverted
1								Z input - 1 = inverted

Filter Selection (Configuration Word 2)

This byte sets the A/B/Z input filters.

Filter Selection

07	06	05	04	03	02	01	00	
0	ZF	BF	AF	FS				
				0	0	0	0	No Filter
				0	0	0	1	50 kHz (10 μs + 0 μs/-1.6 μs)
				0	0	1	0	5 kHz (100 μs + 0 μs/-13.2 μs)
				0	1	0	0	500 Hz (1.0 ms + 0 μs/-125 μs)
				1	0	0	0	50 Hz (10 ms + 0 ms/-1.25 ms)
			0					A input not filtered
			1					A input filtered
		0						B input not filtered
		1						B input filtered
	0							Z input not filtered
	1							Z input filtered

Decimal Position (Configuration Word 3)

This byte changes the significant digits of the frequency or counter display.

In the frequency modes (period/rate [5], continuous/rate [6], rate measurement [7]) for example, a -2 moves the decimal point left 2 places, dividing the frequency value by 100, a +1 moves it right, multiplying by 10. The firmware checks for placement to be in the range -4 ≤value ≤+2. A value outside the range moves the decimal point to the zero position and asserts the programming error (PE) bit. Moving the decimal point to the left (negative), allows high frequencies, commonly present in rate measurement mode, to fit within a single 16-bit word. Moving the decimal point to the right (positive), allows low frequencies, commonly present in period and continuous rate modes, to have resolution displayed to 0.1 Hz and 0.01 Hz. Keep frequencies below 3.2 kHz for 0.1 Hz resolution and below 320 Hz for 0.01 Hz. Scalars of Z/128, Z/64, Z/32, and Z/16 should not be used when positioning is applied. 0 is the default setting.

In the counter modes (counter [0], x1 encoder [1], x2 encoder [2], pwm [3], x4 encoder [4]), it attenuates the counter display, for example, 20 divides count+1 by 20. The value may be in the range 0 < value ≤255. The result of requesting a number other than 1 performs the function: (COUNT + 1) / ATTENUATION. This is useful for scaling a large counter value to a smaller 16-bit value or a percentage. 1 is the default setting and zero reverts to 1 to prevent a divide by zero.

Active Output Assembly (Configuration Word 4)

This byte permits selection of either assembly 105 (0x69 - Counter/ Output Control) or 106 (0x6A - PWM Value) for poll consumption. Entering a zero causes the default assembly, 105, to be selected.

Time Base/Pulse Width Modulation (PWM) Period (Configuration Word 5)

This word sets the fundamental time base for the counter. Its resolution is in milliseconds with minimum 10 ms intervals (an interval of 10 milliseconds is a value of 10, 1 second is 1000). The maximum value that may be programmed is 3 seconds (3000). The time base must be entered when the PWM [3] and rate measurement [7] configurations are used.

Gate Interval (Configuration Word 6)

This byte sets the counter's gate interval using the time base setting as its time unit. Its resolution is determined by the time base. The actual gate interval is the product of the time base and the gate interval (for example, 50 ms gate interval may be produced with a time base of 10 and a gate interval of 5 or a time base of 50 and a gate interval of 1). The maximum value of the product of time base x gate interval is 3 seconds. The gate interval must be entered when the PWM [3] and rate measurement [7] configurations are used. The maximum value is 200.

Scalar (Configuration Word 7)

This byte scales the Z signal in the period/rate [5] and continuous/rate [6] configurations. If the filter is applied, then the filtered Z is scaled. Only one bit of the scalar should be set. Selecting a scalar causes accumulated counts to be adjusted accordingly. Selecting a scalar of 128 increases the accumulated count by 128 after 128 Z pulses are received. We highly recommend that anytime Z is scaled (divide by 2, 4, 8...), the Z input should be filtered; otherwise, noise could cause erroneous frequency readings.

Scalar Selection

07	06	05	04	03	02	01	00	Scalar[1]
0	0	0	0	0	0	0	1	Z - F_{min} = 0.149 Hz
0	0	0	0	0	0	1	0	Z/2 - F_{min} = 0.298 Hz
0	0	0	0	0	1	0	0	Z/4 - F_{min} = 0.596 Hz
0	0	0	0	1	0	0	0	Z/8 - F_{min} = 1.192 Hz
0	0	0	1	0	0	0	0	Z/16 - F_{min} = 2.384 Hz
0	0	1	0	0	0	0	0	Z/32 - F_{min} = 4.768 Hz
0	1	0	0	0	0	0	0	Z/64 - F_{min} = 9.537 Hz
1	0	0	0	0	0	0	0	Z/128 - F_{min} = 19.073 Hz

1 Where F_{min} indicates the frequency at which the zero frequency detect is asserted due to counter overflow.

Output 0-1 Ties (Configuration Words 8 and 9)

The bits in these two bytes connect the specified output to the appropriate compare window. There are 4 windows associated with the counter. Each output may be connected to any number of windows, from 1 to all 4. The bits are defined as follows:

T0 - Tie Output to 1st Compare Window (also the PWM signal in PWM [3] configuration)

T1 - Tie Output to 2nd Compare Window

T2 - Tie Output to 3rd Compare Window

T3 - Tie Output to 4th Compare Window

Rollover (Configuration Word 10)

This long word sets the number of counts the counter accumulates before rolling over. For example, a value of 1000 produces a count sequence of: 998, 999, 0, 1, 2… while incrementing or 2, 1, 0, 999, 998… while decrementing. Rollover is a 32-bit number with a useable range of $1 \leq value \leq 0x01000000$ (16,777,216). In PWM [3] configuration, this value should be zero; in count [0], x1 encoder [1], x2 encoder [2] and x4 encoder [4] configurations, it should be specified to some non-zero value; and in period/rate [5], continuous/rate [6] and rate measurement [7] configurations is a 'don't care'.

Preset (Configuration Word 11)

This long word sets the preset value the counter is loaded with, when a Counter Preset, CP, command is issued. Preset is a 32-bit number with a range of $0 \leq value \leq 0x00FFFFFF$ (16,777,215).

Counter ON and OFF Windows (Configuration Words 12 to 19)

These long words program the four compare window's ON and OFF values. The first compare window for each counter is used in PWM [3] configuration and, when PWM is programmed for a channel, the associated compare window should remain at 0. The range of each entry is $0 \leq value \leq 0x00FFFFFF$ (16,777,215). When a tie is connected to a compare window, that window must be specified (ON value $\neq$ OFF value $\neq$ 0). These windows are always interpreted as counts, regardless of the configuration setting and may be computed as follows for frequency modes 5, 6, and 7:

Period/Rate (5) and Continuous Rate

$$counts = (scalar \times 2.5E6) / desired\_frequency$$

Rate Measurement

$$counts = time\_base [sec] \times gate\_interval \times desired\_frequency$$

Safe State Values (Configuration Words 20 through 22)

When either the host transitions to PROGRAM mode or a communication fault (broken network cable) occurs, the module copies these safe state words (counter control, output control, and PWM value) into its real-time working buffer. The definitions are identical to those described under Real-time Output Data with the following exception: entering a PWM Safe State value outside of the range, 0-9500, results in a **Hold Last State** to be executed.

Communicating Real Time Information

The Very High-Speed Counter Module uses several words to communicate real time input and output data as well as non-real time module information (such as description and revision) and configuration.

Assembly 101 is produced for a polled connection. Assembly 102 is produced for a Change Of State (COS) connection. Assemblies 103, 104, 107 and 108 are by Explicit message only. Assemblies 105 and 106 are consumed in a polled connection (as directed by parameter 4).

Data may be read (get) or written (set) using an Explicit Message. For example, to read the Present Channel Data, assembly 101_{10} (65_{16}) can be requested. The following table shows the words which can be exchanged.

Instances	Services	Field	Bytes
#101 (0x65)	Get	Present Channel Data	4
		Status	2
#102 (0x66)	Get	Stored Channel Data	4
		Status	2
#103 (0x67)	Get	Present Channel Data	4
		Stored Channel Data	4
		Status	2
#104 (0x68)	Get	Programming Error Code	2
#105 (0x69)	Set/Get	Counter Control	1
		Output Control	1
#106 (0x6a)	Set/Get	PWM Value	2
#107 (0x6b)	Set/Get	PWM Value	2
		Counter Control	1
		Output Control	1

#108 (0x6c)	Set/Get	Counter Configuration	1
		Filter Selection	1
		Decimal Position	1
		Active Output Assembly	1
		Time Base or PWM Period	2
		Gate Interval	1
		Scalar	1
		Output 0 Ties	1
		Output 1 Ties	1
		Rollover Value	4
		Preset Value	4
		ON Value # 1	4
		OFF Value #1	4
		ON Value # 2	4
		OFF Value #2	4
		ON Value # 3	4
		OFF Value #3	4
		ON Value # 4	4
		OFF Value #4	4
		PWM Safe State Value	2
		Counter Control SSV	1
		Output Control SSV	1

Configure Your Module

What This Chapter Contains

This chapter describes how to configure your Very High-Speed Counter modules with RSNetWorx.

For More Information About	See Page
Configuration Overview	4-1
Add the Adapter to Your Network	4-1
Add I/O Modules to Your Network	4-2
Set the Counter's Parameters	4-5
Check I/O Status and View the EDS File	4-9

Configuration Overview

Use RSNetWorx for DeviceNet software to configure your module. You can configure the module while it is online or offline.

This chapter shows configuration in the online mode. Configuration dialogs appear similar in both modes. The primary difference is that if you make changes offline, you must go online before the configuration changes take effect.

Add the Adapter to Your Network

Follow these steps to add an adapter to your network.

1. Start the RSNetWorx for DeviceNet software.

2. Add the communication device as shown in the figure, where we chose a 1770-KFD RS232 Interface.

IMPORTANT	The scanner must always exist on the DeviceNet network at Node 00.

1. Click here to expand the list of communication adapters.

2. Double-click here to choose the scanner. You can also click and drag the scanner name onto the network. Make sure you choose the 1734-ADN POINT I/O Scanner.

The scanner appears on the network.
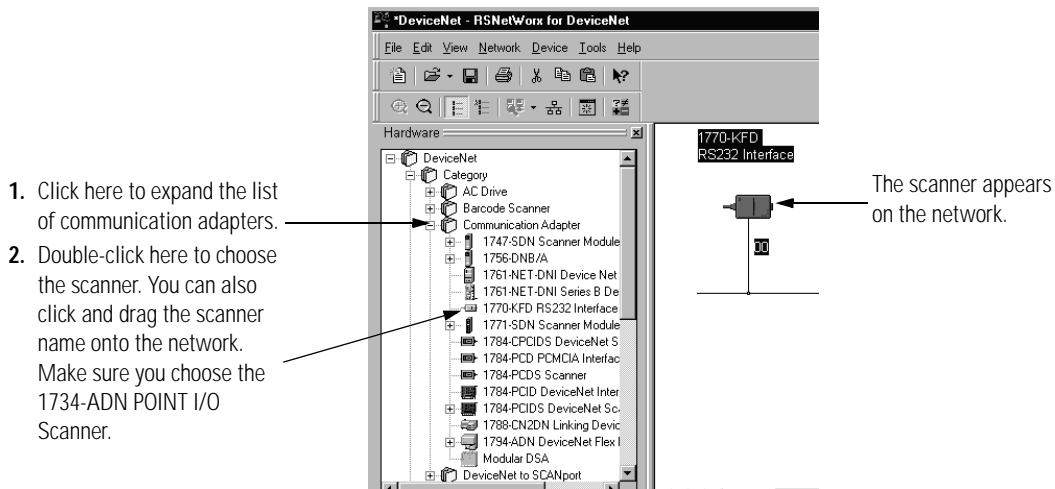
Add I/O Modules to Your Network

After you add the communication device, you must add the POINT I/O modules connected to the scanner on the POINTBus. Use these procedures.

1. From the DeviceNet - RSNetWorx for DeviceNet dialog, click + next to Specialty I/O module to expand the selection.

2. From the DeviceNet - RSNetWorx for DeviceNet dialog, to choose a module, do one of the following, as shown in the figure.

   • Double-click the catalog number to choose the module.

   • Click and drag the module name onto the network.

The out-of-the-box node setting for 1734 modules is 63. You can change the setting by using the node commissioning tool. The node commissioning tool is available either online or offline.

IMPORTANT	If you commission a node online, you must power down your system before the change takes place.

1. Click here to expand the list of Specialty modules.

2. Double-click the catalog number to choose the module. You can also click and drag the module name onto the network.
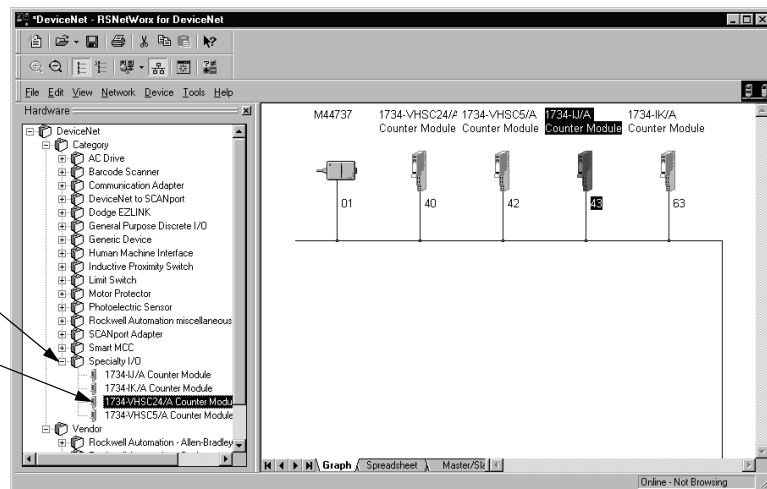
3. From the DeviceNet - RSNetWorx for DeviceNet dialog, complete the actions shown in the figure.
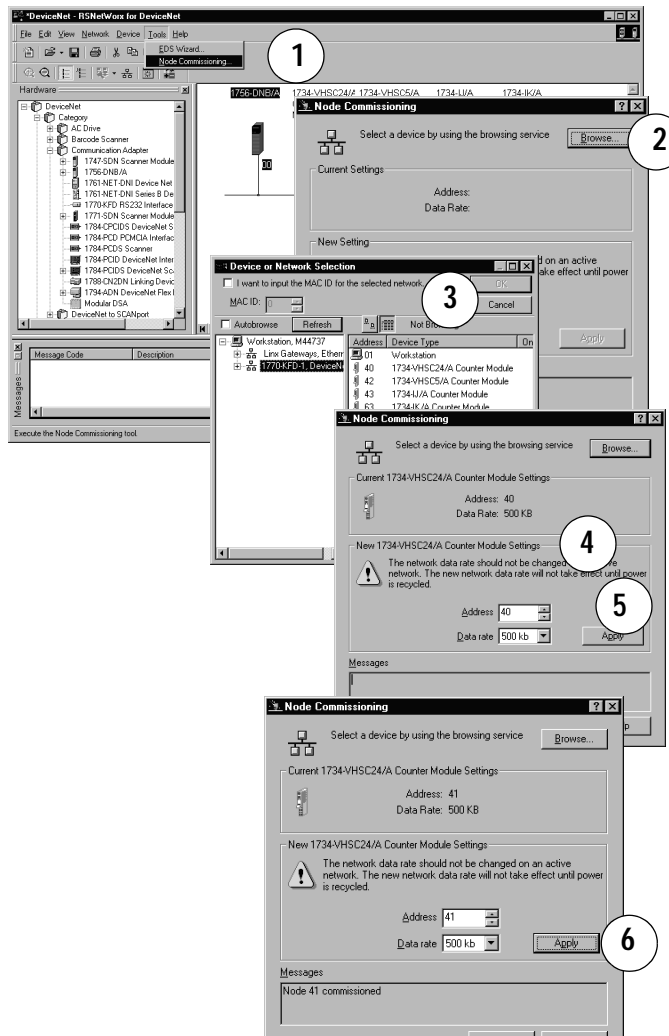
1. Go to the pulldown Tools. Select Node Commissioning.

2. Click Browse.

3. Select the module to change.

4. The node commissioning dialog returns. It displays the node number and data rate.

5. Change the node number and Apply. The dialog then identifies the new setting.

6. Click Close to continue.

Set the Counter's Parameters

After adding the module to the network, you must configure the modules for use. Use this procedure.

> **IMPORTANT**   This procedure shows configuration in the online mode. Changes set in this mode take effect when you download to the individual module.

1. From the DeviceNet - RSNetWorx for DeviceNet dialog, complete the actions shown in the figure.

1. Right-click the module.

You can also left-click the module or name and the property dialog appears.

2. Click Properties to configure your adapter.
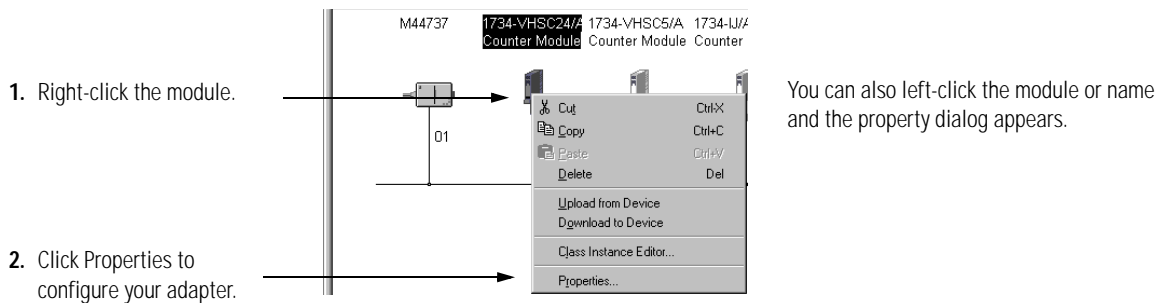
You see a counter module dialog with a series of tabs at the top of the dialog. See the tabs in the figure.

These dialogs are for the 1734-VHSC24 module. Use identical dialogs for the 1734-VHSC5 module.

These are the tabs you click to view the options.
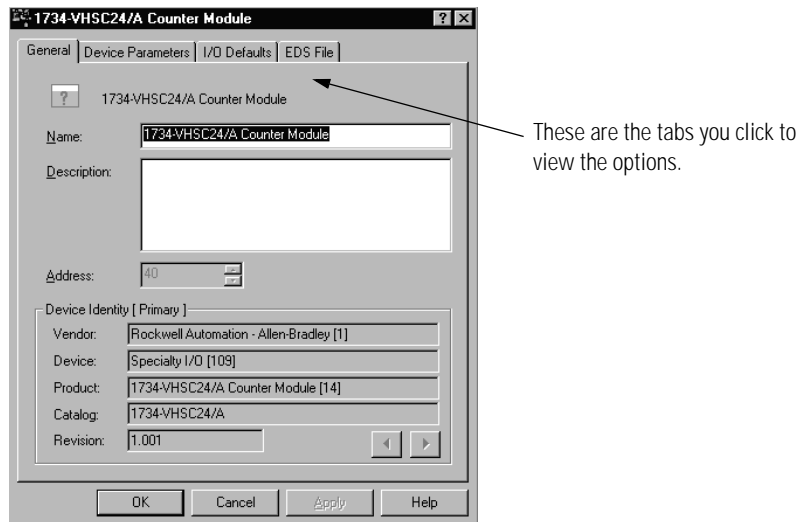
2. From the counter module dialog, complete the actions shown in the figure for the General dialog.

The module's name appears here.

Type a description here.

The module's address appears here. (This field is read only.)

This dialog also shows the module's device identity. These fields are read-only.
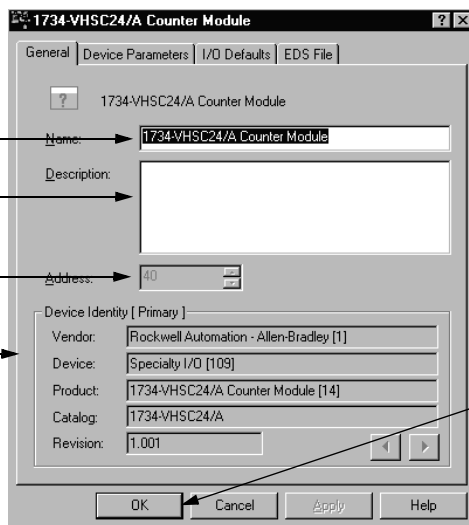
At any point, you can click here to finish changing configuration parameters.

If configuration changes are made in offline mode, they do not take effect until the system goes online..

3. From the General dialog, click Device Parameters and complete the actions shown in the figure.

EDS Editor   ✕

❓ Do you want to upload the configuration from the device, updating the software's configuration; or download the software's configuration to the device, updating the device?

For more information, press F1

[Upload]   [Download]   [Cancel]
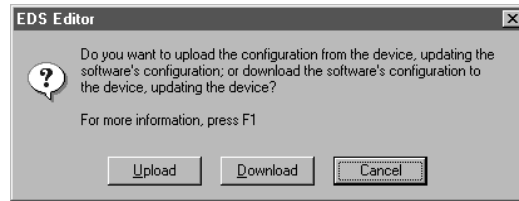
This dialog appears after clicking the Device Parameters tab. If you want the existing parameters uploaded from the module, select Upload. The following dialog then shows the existing parameters set on the module.

Use this pulldown menu to edit or view the parameters. Available choices are:

All parameters ▾
All parameters
Status
Configuration
PointBus

1734-VHSC24/A Counter Module   ? ✕

General | Device Parameters | I/O Defaults | EDS File |

Groups
PointBus ▾

Online
◉ Single
○ All

[Restore Default Values]
[Parameter Help...]

[Upload From Device]
[Download To Device]
[Start Monitor]

Configuration

POINTBus

ID			Parameter	Current Value
24			Sequential AutoAddress	Do Nothing
25			Broadcast Baud Rate	125 kHz
26			Broadcast AutoBaud	Enable
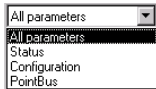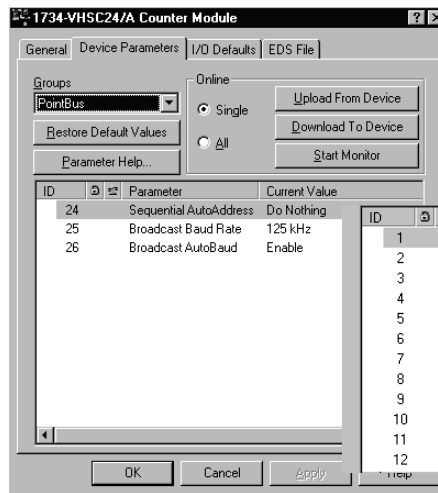
ID			Parameter	Current Value
1			Counter Configuration	0
2			A/B/Z Input Filter	120
3			Decimal Position	0
4			Active Output Assembly	0
5			Time Base or PWM Period	0
6			Gate Interval	0
7			Scalar	0
8			Output 0 Ties	0
9			Output 1 Ties	0
10			Rollover	16777215
11			Preset	100
12			Compare Window 1 ON Value	0

[OK]   [Cancel]   [Apply]   [Help]

Status

ID			Parameter	Current Value
27	🔒		Programming Error	0

4. To configure your module, from the Device Parameters dialog, select Configuration and complete the actions in the figure.

To configure your module, select Configuration and modify the parameters as desired for your application.

When complete, download to your module by clicking the Download to Device button. You can download each change as you make it using "Single," or download all your changes using "All."

Click here when finished.
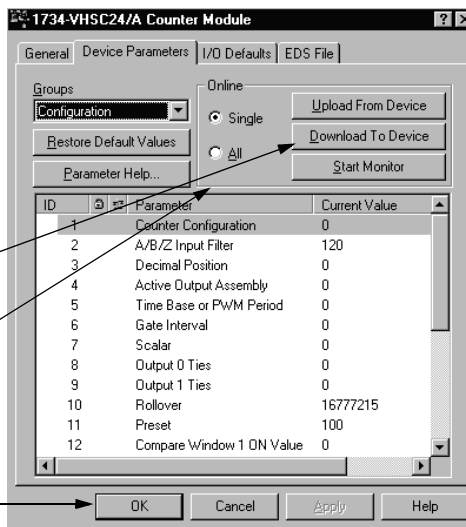
Check I/O Status and View the EDS File

Use this procedure to complete the entries on the dialogs you display by clicking the appropriate tab for I/O Defaults and EDS File.

1. From the Counter Module screen, click I/O Defaults from the top of the dialog, completing the entries shown in the figure.

Click the I/O Defaults tab to display the default characteristics for this module.

This dialog shows the input/output defaults for the four modes. These are:
Strobe
Polled
Change of state and
Cyclic
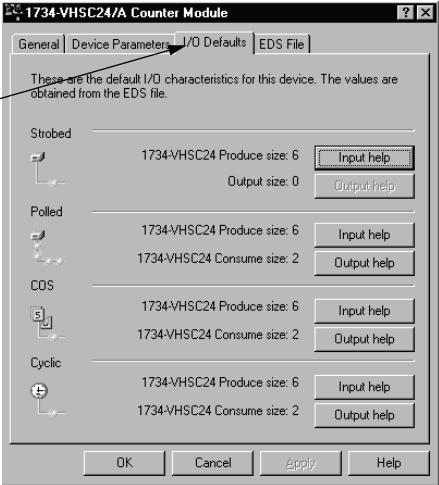
2. From the Counter Module dialog, click EDS File from the top of the dialog, completing the entries shown in the figure.

Click the EDS File tab to display the statistics of the EDS file used to configure this module.

1734-VHSC24/A Counter Module

General | Device Parameters | I/O Defaults | **EDS File**

The Electronic Data Sheet (EDS file) is used to convey configuration information about this device. This information has been provided by the device manufacturer.

File information

Creation time:	07:41:42
Creation date:	04-06-2000
Modification time:	14:17:25
Modification date:	06-09-2000
File revision:	1.100

Click View File to view the actual EDS file (shown at the left).

View File...

OK

You can view the actual EDS file or edit the file.

File   Edit

```
[File]
        DescText = "PointIO 1734-VHSC24/A";
        CreateDate = 04-06-2000;
        CreateTime = 07:41:42;
        ModDate = 06-09-2000;
        ModTime = 14:17:25;
        Revision = 1.1;

[Device]
        VendCode = 1;
        VendName = "Allen-Bradley Company, Inc.";
        ProdType = 109;
        ProdTypeStr = "Specialty I/O";
        ProdCode= 14;
        MajRev = 1;
        MinRev = 1;
        ProdName = "1734-VHSC24/A Counter Module";
        Catalog = "1734-VHSC24/A";

[Params]
        Param1 = 0,
            6,"20 0F 24 01 30 01",  $ Link Path Size, Link Path
            0x0000,      $ Descriptor
            8, 1, $ Data Type, Data Size
            "Counter Configuration",
            "",
            "Configures the counter's operational mode. Available
            0,255,0,
            1,1,1,0,
            0,0,0,0,
            0;
```

Access Instantiated Instances

What This Chapter Contains

In this chapter, you learn how to access imbedded Instantiated Instances (assemblies) in the software. The Very High-Speed Counter Module uses several words to communicate real time input and output data as well as non-real time module information (such as description and revision) and configuration. These words have been preprogrammed into Instantiated Instances.

Use Instantiated Instances

To use Instantiated Instances, follow these procedures.

1. Click the module to select the Class Instance Editor.
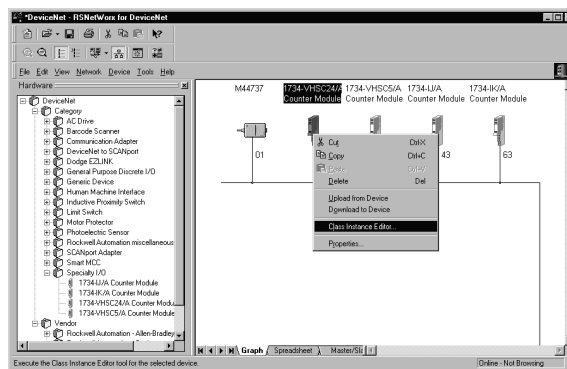
Click the module to select the Class Instance Editor.

You see the Service Class Instance Attribute Editor Warning dialog.
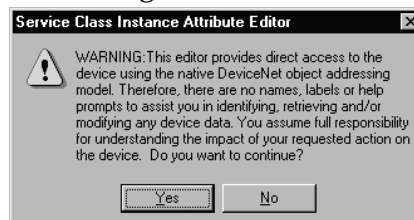
Click Yes when this dialog appears.

2. From the Service Class Instance Attribute Editor Warning dialog, click Yes.

You see the Service Class Instance Attribute Editor dialog.

3. From the Service Class Instance Attribute Editor dialog, complete these actions, referring to the figure.

a. Select the service code.
b. For Recevie Data, select Size and Radix.
c. Enter the class, instance, and attribute.
d. Click Execute to initiate the action.
e. Click Close to finish.

a. Select the service code from the list.
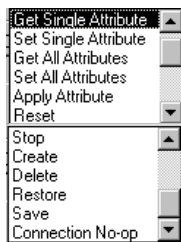
b. Select the Receive Data size and radix.
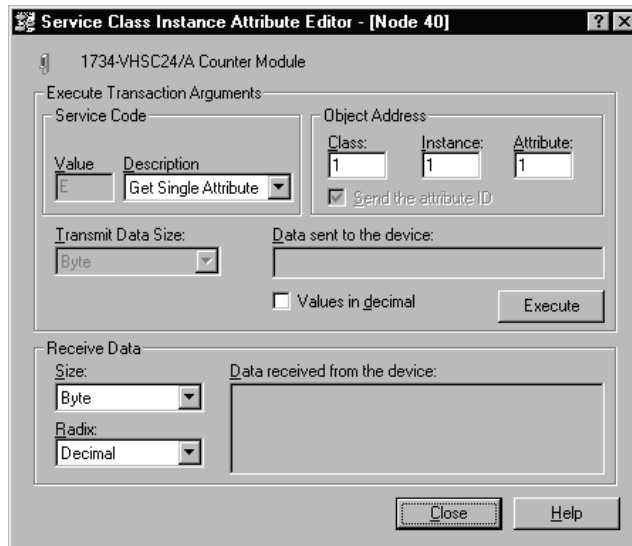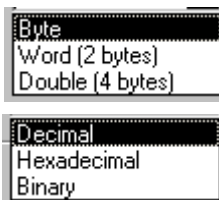
c. Enter the class, instance and attribute here.

d. Click Execute to initiate the action.

See the figure for an example, where you select Instance 101 (polled connection).
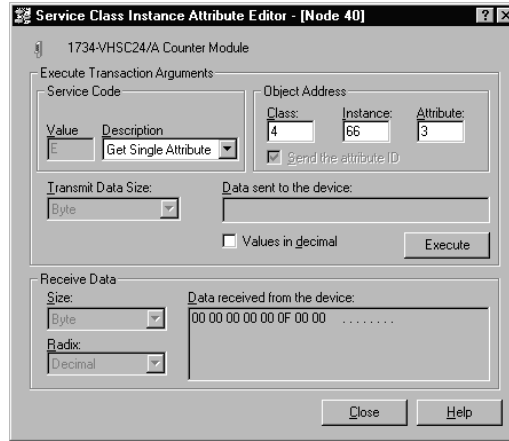
1. Type in the instance number here. This is an example of assembly number 102 (0x66). The class is always 4 and the attribute is always 3.

2. Click Execute.

3. Data received and status information is recorded here.

4. Click Close to finish.

Assemblies

Available assemblies are:

- Assembly 101 is produced for a polled connection.
- Assembly 102 is produced for a Change Of State (COS) connection.
- Assemblies 103, 104, 107 and 108 are by Explicit message only.
- Assemblies 105 and 106 are consumed in a polled connection (as directed by parameter 4).

Data may be read (get) or written (set) using an Explicit Message. For example, to read the Present Channel Data, assembly 101_{10} (65_{16}) can be requested.

Data is ordered as follows (byte 0 is the least significant byte):
8 bit byte   Byte 0
16-bit word   Byte 0, byte 1
32-bit long word   Byte 0, byte 1, byte 2, byte 3

In this example, the table shows assembly 101 for the 1734-OE module.

Service	Class	Instance	Attribute
0E (Get)	04 (Assembly)	65 (Present Data)	03 (Data Attribute)

Instances	Services	Field	Bytes
#101 (0x65)	Get	Present Channel Data	4
		Status	2
#102 (0x66)	Get	Stored Channel Data	4
		Status	2
#103 (0x67)	Get	Present Channel Data	4
		Stored Channel Data	4
		Status	2
#104 (0x68)	Get	Programming Error Code	2
#105 (0x69)	Set/Get	Counter Control	1
		Output Control	1
#106 (0x6a)	Set/Get	PWM Value	2
#107 (0x6b)	Set/Get	PWM Value	2
		Counter Control	1
		Output Control	1
#108 (0x6c)	Set/Get	Counter Configuration	1
		Filter Selection	1
		Decimal Position	1
		Active Output Assembly	1
		Time Base or PWM Period	2
		Gate Interval	1
		Scalar	1
		Output 0 Ties	1
		Output 1 Ties	1
		Rollover Value	4
		Preset Value	4
		ON Value # 1	4
		OFF Value #1	4
		ON Value # 2	4
		OFF Value #2	4
		ON Value # 3	4
		OFF Value #3	4
		ON Value # 4	4
		OFF Value #4	4
		PWM Safe State Value	2
		Counter Control SSV	1
		Output Control SSV	1

Troubleshoot with the Indicators

Use the Indicators for Troubleshooting

Each 1734-VHSC module has 7 indicators on the frontplate. Use these indicators for troubleshooting, referring to the figures and tables.
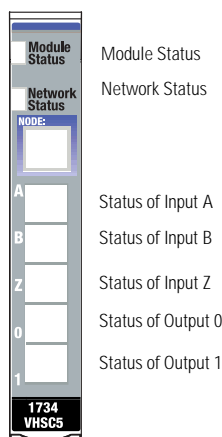
Indication	Probable Cause
Module Status	
Off	No power applied to device.
Green	Device is operating normally.
Flashing Green	Device needs commissioning due to configuration missing, incomplete or incorrect.
Flashing Red	Recoverable fault is present.
Red	Unrecoverable fault may require device replacement.
Flashing Red/Green	Device is in self-test.

Indication	Probable Cause
Network Status	
Off	Device is not online. - Device has not completed dup_MAC_id test. - Device not powered - check module status indicator.
Flashing Green	Device is online but has no connections in the established state.
Green	Device is online and has connections in the established state.
Flashing Red	One or more I/O connections are in timed-out state
Red	Critical link failure is present - failed communication device. Device detected error that prevents it communicating on the network.
Flashing Red/Green	Communication faulted device - the device detected a network access error and is in communication faulted state. Device received and accepted an Identify Communication Faulted Request - long protocol message.

Indication	Probable Cause
Input Status	
Off	Input is inactive.
Yellow	Input is active and under control.

Indication	Probable Cause
Output Status	
Off	Output is inactive.
Yellow	Output is active and under control.
Flashing Yellow	Output is toggling.
Flashing Red	Output is faulted (open, short or no output power).
Flashing Red/Yellow	Output is toggling and faulted (possibly open).

Configure Modules in RSLogix 5000 Software

What This Appendix Contains

Read this appendix for information about how to configure your modules in RSLogix 5000 software, including how to complete entries on these dialogs.

- Fault/Program Action
- Counter Configuration
- Output Configuration

Understand Data, Connection, and Communication Formats

Before you configure your modules, note the following about Data formats and Connection types.

- Data format type is Integer.
- Connection types are as follows.
  - Data
  - Listen Only

Communication formats for adapters are as follows.

- Listen Only - Rack Optimization
- None
- Rack Optimization

Choices for formats for the module depend on the Communication format for the adapter. See the table for a listing of possible module Connection formats based on adapter Communication formats.

Adapter Communication Formats	Possible Module Connection Formats
Listen Only - Rack Optimization	Data (default)
	Listen Only
None	Data (default)
	Listen Only
Rack Optimization	Data (default)
	Listen Only

When you change Connection and Data Format note the following.

- You do not delete the existing module.
- You do not create a new module.
- You bring forward all possible configuration data for the new setting.
- Configuration data that you cannot bring forward sets to the default value.

Once you apply new settings, this becomes the base configuration for the next change in Connection and Data Format settings. When you select Apply, you lose all configuration data from previous data formats.

See the table for a listing of tags and dialogs based on Connection type.

Connection Type	Tags	Dialogs
Data	Input Output Configuration	General Connection Module Information Fault/Program Action Counter Configuration Output Configuration
Listen Only	Input	General Connection Module Information

Configure Your Module

To configure your module in RSLogix 5000, use this procedure.

1. Configure your adapter, referring to the user manual for your adapter for information on how to configure the adapter and add modules to the I/O configuration to include selecting a controller and communication module.

2. Add a 1734-VHSC3 or 1734-VHSC24 specialty module, according to the instructions in your adapter user manual.

3. From the Connection dialog, select a value for the Requested Packet Interval (RPI) entry.
   - Default value is 80.0 milliseconds.
   - Range is 2.0 to 750.0 milliseconds.

4. From the Connection dialog, leave these unchecked.
   - Inhibit Module
   - Major Fault On Controller If Connection Fails While in Run Mode

5. Complete entries for these dialogs, as explained in this chapter.
   - Fault/Program Action
   - Counter Configuration
   - Output Configuration

Use the Help Button

From the Fault/Program Action, Counter Configuration, and Output Configuration dialogs, click Help at the bottom of the dialog for information about how to complete entries on the dialogs.

From a warning dialog, click Help at the bottom of the dialog to get information about that specific error.

Work with the Fault/Program Action Dialog

Use these procedures to complete the entries from this dialog, which is not available with a Listen Only connection.
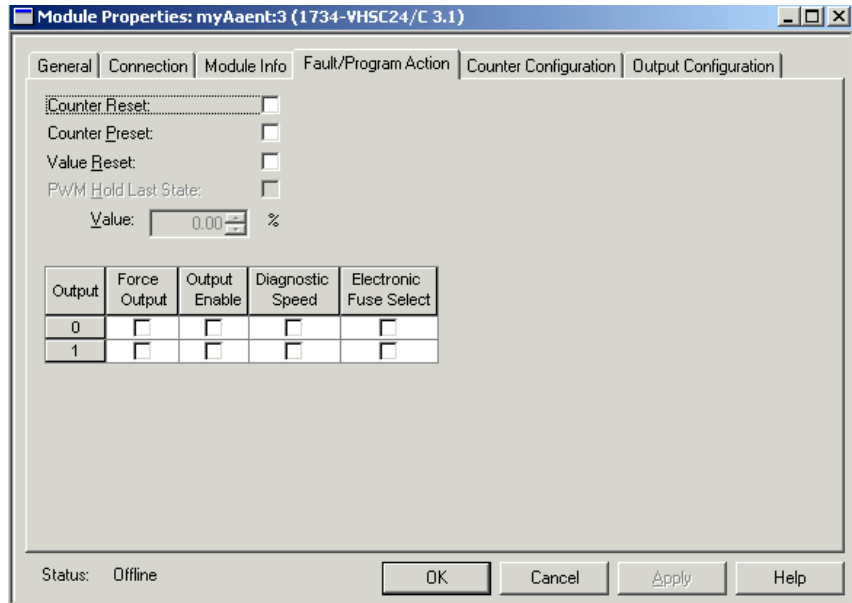
1. Check the checkboxes, as shown in the table.

Check this Checkbox	To
Counter Reset	Reset the counter
Counter Preset	Set the value of the counter, as specified by the preset words
Value Reset	Reset the value of the accumulated (stored) count

2. If you selected PWM for Type, proceed as follows; otherwise, see the next step.

   a. For PWM Hold State, make a selection as follows.

      - Check the checkbox to disable the PWM Value field.
      - Uncheck the checkbox to set the PWM Value field.

   b. For Value, select 0 -95%, if you did the following.

      - Selected PWM for Type.
      - Unchecked the checkbox for PWM Hold State.

3. For the appropriate Output number, check the checkboxes for the values in the table.

Value	Description
Force Output	If checked, you turn outputs on if you check Output Enable. If unchecked, you control the outputs by a compare match or as directed by the PWM settings.
Output Enable	If checked, you permit outputs to turn on from one of the these. • Force on • Force Output • Compare match • As directed by the PWM settings If unchecked, the module turns the associated output OFF.
Diagnostic Speed	If checked, you filter at 50 ms short for circuit and open wire diagnostics to prevent trips caused by a noisy environment. If unchecked, diagnostics respond to a fault condition in less than 8 ms.
Electronic Fuse Select	If checked, outputs are disabled upon the detection of a fault (short circuit or open wire) and the output fault status indicator, Fuse Select, is latched. You achieve recovery from a faulted state if you check Electronic Fuse Select and Output Enable for the output. If unchecked, a faulted output continues to operate as instructed until the fault is removed. In either case, Fuse Select is asserted to indicate a fault.

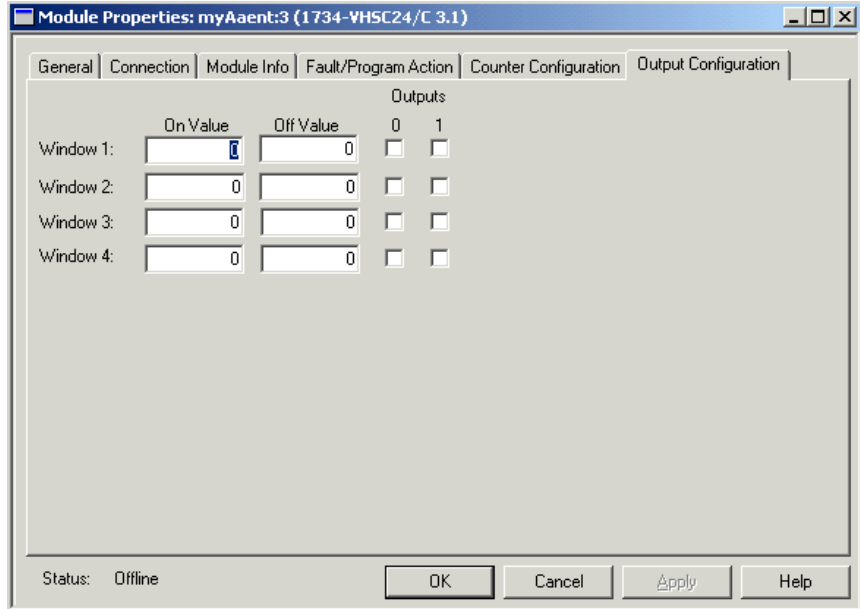**4.** Complete one of these actions.
- Click another tab at the top of the dialog.
  or
- Click OK, which closes the dialog.
  or
- Click Cancel to return to default values.
  or
- Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.

Work with the Counter Configuration Dialog

In Hard Run mode, you disable all controls on the Counter Configuration dialog, in addition to the enable and disable state for each control.

Use the following procedures to complete entries from this dialog. After you select Type, refer to the table to see what other entries are available in the dialog.

These Entries Are Available	If You Select This For Type						
	Counter	Encoder X1, X2, X4	PWM	Period/Rate	Continuous/ Rate	Rate Measurement	Pulse Generator
Store Count Mode	X	X					
Rollover	X	X	Set to Zero				
Counter Attenuator	X	X	X				
Frequency Precision				X	X	X	
Time Base/Gate Interval			X			X	
Invert Input Z	X	X		X	X		X
Scalar				X	X		X

.
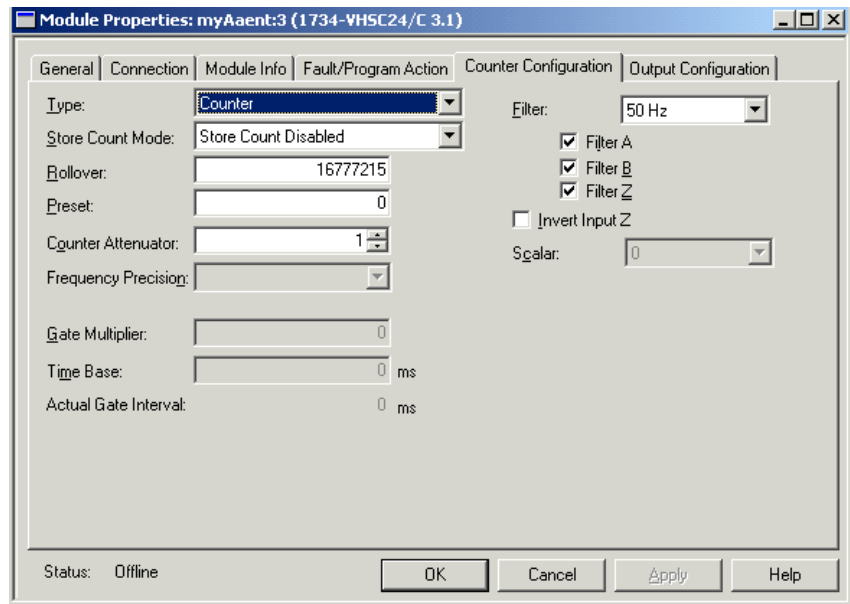
1. For Type, select one of these to set the Counter Configuration mode.

   - Counter (default)
   - Encoder X1, Encoder X2, or Encoder X4
   - Pulse Width Modulation (PWM)
   - Period/Rate
   - Continuous Rate
   - Rate Measurement
   - Pulse Generator

2. Refer to the table to see what entries to complete based on your selection for Type.

3. For Store Count Mode, select an option to determine which of the following modules you use for operating the Z Gate/Reset Terminal.
   - Store Count Disabled (default)
   - Store/Continue
   - Store/Wait/Resume
   - Store-Reset/Wait/Start
   - Store-Reset/Start

4. For Rollover, select a value greater than the value for Preset.
   - Default is 16777215.
   - Select a value from 1 to 16777216.

5. For Preset, select a value smaller than the value for Rollover.
   - Default is 0.
   - Select a value from 0 to 16777215.

6. For Counter Attenuator, select a value from 0 to 255 to attenuate the counter display, noting that the default is 1.

7. For Frequency Precision, select a value, per the Selections for Period/Rate and Rate Measurement table, to multiply the frequency by the factor selected.

8. For Gate Multiplier, select a value, so that the product of Gate Multiplier and Time Base does not exceed 3 seconds (3000 milliseconds), referring to the table.

9. For Time Base, select a value between 10 and 3000 milliseconds, in multiples of 10, referring to the table.

Selections for Period/Rate and Rate Measurement

For This Value	Default Is:	Select
Frequency Precision	X 1	X 0.0001 X 0.001 X 0.01 X 0.1 X 1 X 10 X 100
Gate Multiplier	1	1 to 200
Time Base	1000	10 to 3000 in multiples of 10

10. Note that the value for Actual Gate Interval that appears when counter type is Rate Measurement and shows the product of Gate Multiplier and Time Base below 3 seconds (3000 milliseconds).

11. For Filter, select the Frequency, which is the value you use to filter A/B/Z/ inputs when you check the checkboxes.

The frequency default and selections are the following.

- Default is 50 Hz.
- Selections for Filter include these.
  - No Filter
  - 50 kHz
  - 5 kHz
  - 500 Hz
  - 50 Hz

12. Check the checkboxes for the following, which use the value you selected for Filter.
   - Filter A
   - Filter B
   - Filter Z

13. For Invert Input Z, check the checkbox to invert the signal at Z input.

14. For Scalar, choose one of these.
    - 1
    - 2
    - 4
    - 8
    - 16
    - 32
    - 64
    - 128

    When the value for Scalar is one of the following, note that frequency precision $\leq$ 1.

    - 16
    - 32
    - 64
    - 128

15. Complete one of these.
    - Click another tab at the top of the dialog.
      or
    - Click OK, which closes the dialog.
      or
    - Click Cancel to return to default values.
      or
    - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.

Work with the Output Configuration Dialog

Use this dialog to make On Value and Off Value entries for each output you select. If you make no entries for Outputs on this dialog, leave On Value and Off Value entries as 0; otherwise, use these procedures.

1. Check a checkbox for Outputs.

2. Select entries for On Value and Off Value, referring to the table.

3. Complete one of these.
   - Click another tab at the top of the dialog.
     or
   - Click OK, which closes the dialog.
     or
   - Click Cancel to return to default values.
     or
   - Click Apply to save changes you made on any of the dialogs and continue to display the dialog, noting that you enable the Apply button when you make changes to any of the dialogs.

If you select	For On Value Make an Entry	For Off Value Make an Entry
Period Continuous Rate	Not equal to Off Value Between 0-16777215	Not equal to On Value Between 0-16777215
Counter Encoder Pulse Generator	Not equal to Off Value Greater than 0 Less than Rollover Value	Not equal to On Value Greater than 0 Less than Rollover Value

How Are We Doing?

Your comments on our technical publications will help us serve you better in the future. Thank you for taking the time to provide us feedback.

You can complete this form and mail (or fax) it back to us or email us at RADocumentComments@ra.rockwell.com

Pub. Title/Type Very High-Speed Module

Cat. No.   1734-VHSC5 VHSC24   Pub. No.   1734-UM006B-EN-P   Pub. Date   August 2005   Part No.   957974-42

Please complete the sections below. Where applicable, rank the feature (1=needs improvement, 2=satisfactory, and 3=outstanding).

Overall Usefulness	1	2	3	How can we make this publication more useful for you?

Completeness (all necessary information is provided)	1	2	3	Can we add more information to help you?

procedure/step   illustration   feature

example   guideline   other

explanation   definition

Technical Accuracy (all provided information is correct)	1	2	3	Can we be more accurate?

text   illustration

Clarity (all provided information is easy to understand)	1	2	3	How can we make things clearer?

Other Comments	You can add additional comments on the back of this form.

Your Name

Your Title/Function

Location/Phone

Would you like us to contact you regarding your comments?

___No, there is no need to contact me

___Yes, please call me

___Yes, please email me at _____

___Yes, please contact me via _____

Return this form to: Rockwell Automation Technical Communications, 1 Allen-Bradley Dr., Mayfield Hts., OH 44124-9705

Fax: 440-646-3525   Email: RADocumentComments@ra.rockwell.com

Other Comments

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

PLEASE FOLD HERE
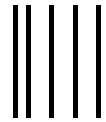
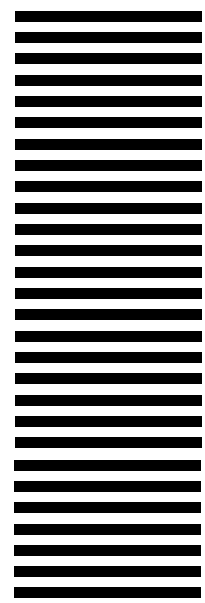NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 18235 CLEVELAND OH

POSTAGE WILL BE PAID BY THE ADDRESSEE

Allen-Bradley

RELIANCE ELECTRIC   DODGE

ROCKWELL SOFTWARE

Rockwell Automation

www.rockwellautomation.com