POINT I/O Very High-speed Counter Modules

Catalog Numbers 1734-VHSC5, 1734-VHSC24

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.

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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.

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, and recognize the consequence.

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

These labels may also be on or inside the equipment to provide specific precautions.

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

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.

Identifies information that is useful and can help to make a process easier to do or easier to understand.

Table of Contents

About This Publication

Read this manual for information about how to install, configure, and troubleshoot your POINT I/O™ very high-speed counter module.

You must be able to use the RSNetWorx™ application 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, see your software user manuals or online help before attempting to use these modules.

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated template	throughout
Updated filter configuration figure	35
Added note on 1734-VHSC24 filter setting	35
Added History of Changes appendix	41

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Resource	Description
POINT I/O Wiring Base Assembly Installation Instructions, publication 1734-IN511	Describes how to install and wire the POINT I/O base.
POINT I/O Wiring Base Assembly Installation Instructions publication 1734-IN013	Describes how to install and wire the POINT I/O base and removable terminal base assembly.
POINT I/O 24V DC Expansion Power Supply Installation Instructions, publication 1734-IN058	Describes how to install and wire the POINT I/O 24V DC expansion power supply.
POINT I/O Modules Selection Guide, publication 1734-SG001	A description and overview of the POINT I/O modules and compatible control platforms.
EtherNet/IP Network Devices User Manual, publication ENET-UM006	Describes how to configure and use EtherNet/IP™ devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, publication ENET-RM002	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
System Security Design Guidelines Reference Manual, publication SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication IC-AT001	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Selection and Configuration website, rok.auto/systemtools	Helps configure complete, valid catalog numbers and build complete quotes based on detailed product information.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

Notes:

About the Modules

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 5V DC (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 0.5 A at 10…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.

Table 1 - Operation Modes

Mode	Description
Counter	Read incoming single-phase pulses, return a binary count.
Encoder	Read incoming two-phase quadrature pulses, return a binary count.
Period/Rate	Count internal clocks during the On period, return a frequency. Outputs updated only at the end of the period.
Continuous/Rate	Count internal clocks during the On period, return a frequency. Outputs are updated continuously during the period.
Rate Measurement	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

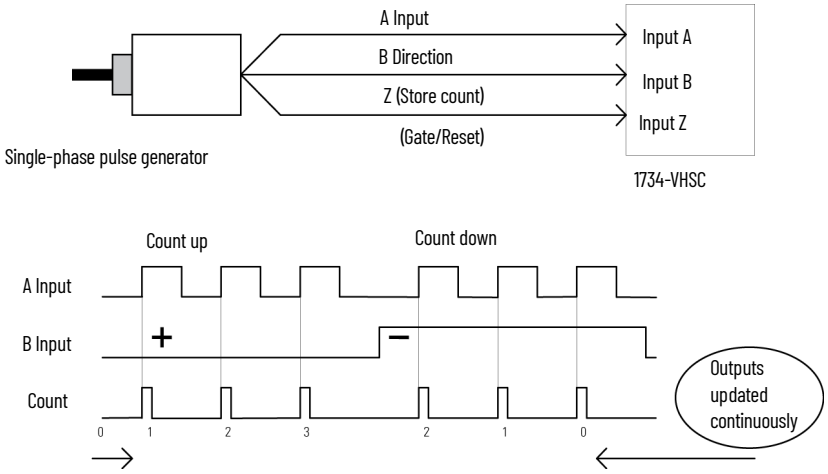
The counter mode reads incoming pulses and returns a binary number (0...16,777,215) to the POINTBus. The counter mode only accepts **single-phase** inputs. The module determines the Phase B input state, and counts up or down accordingly.

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.

Figure 1 - Example of Counter Mode



Encoder Modes

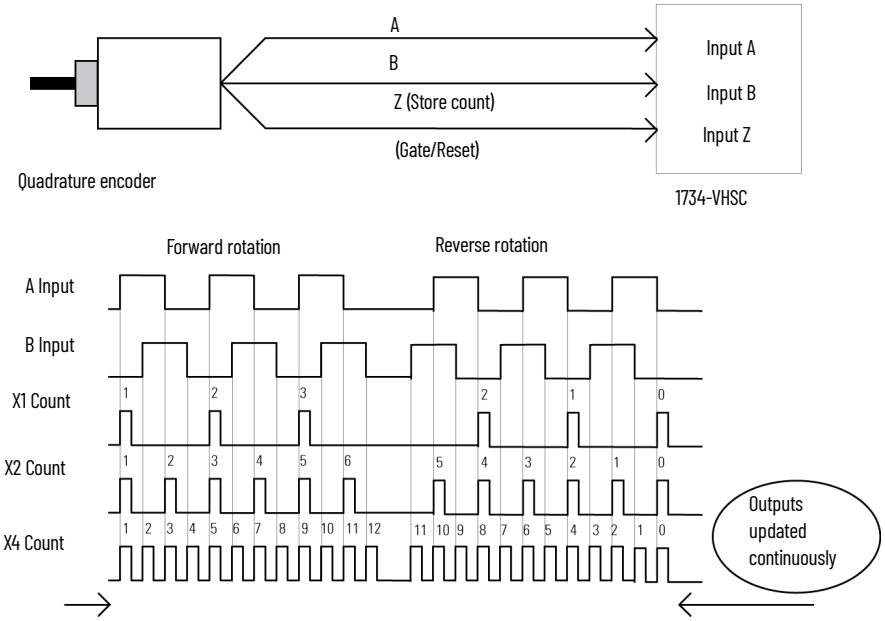
The encoder mode reads incoming pulses and returns a binary number (0...16,777,215) to the POINTBus. The encoder mode only accepts two-phase quadrature inputs. The module senses the relationship between the 2 phases, and counts up or down accordingly.

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.

Figure 2 - 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.

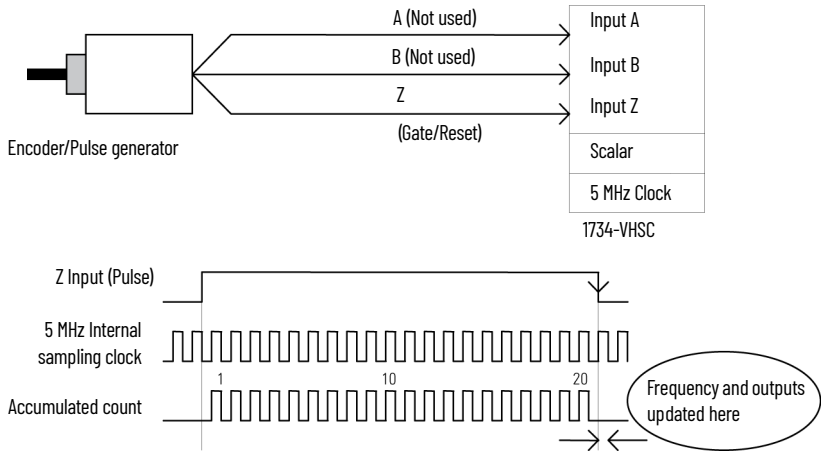
[B = Leads A, Count = Down; B = Follows A, Count = Up]

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 5 MHz 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.

Figure 3 - 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, 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. See Table 2 for more information.

Table 2 - Relationship Between Sampled Pulse 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 k
500 Hz	5 k
1 kHz	2.5 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.

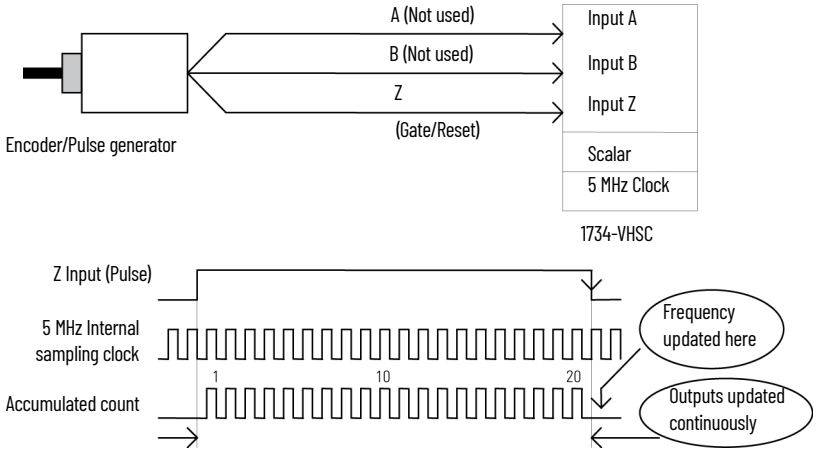
(5 MHz sample time = 200 ns; 16,777,216 counts x 200 ns x 2 half cycles of Z = 6.71 s)

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.

Figure 4 - 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, Clock Period = (1 / 5 MHz)
Frequency = 1 / [(20 / 1) x (1 / 5 MHz) x 2] = 125 kHz

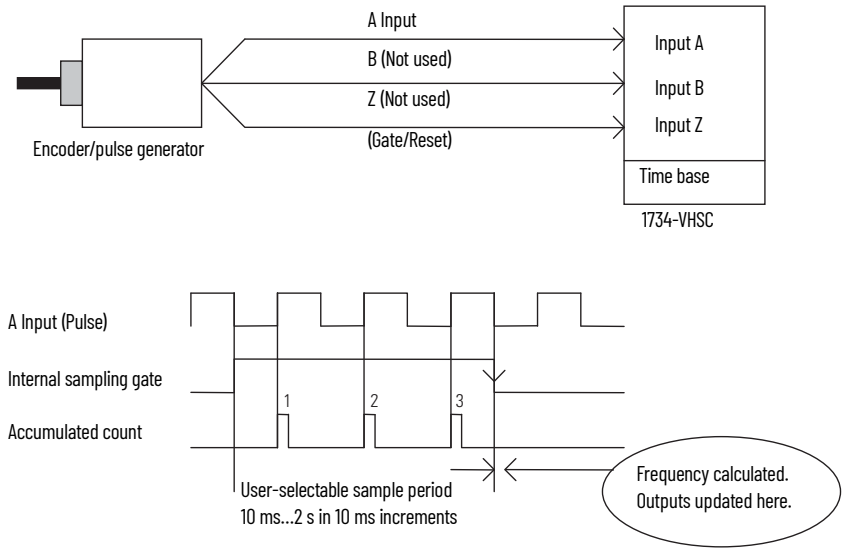
As the frequency of the incoming pulse train at the Z Gate/Reset terminal increases, the number of sampled pulses from the 5 MHz clock decreases. Since accuracy is related to the number of pulses received over the sample period, the accuracy decreases with increasing frequencies at the Gate/Reset terminal. See Operation of Scalar on page 10 for more information.

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.

Figure 5 - Example of Rate Measurement Mode



If Sample Period is 50 ms and Count = 3, then Frequency = 3 / 50 ms = 60 Hz

Pulse-width Modulation Mode

The Pulse-width Modulation (PWM) 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 Table 3 for a summary of features active in each mode.

Table 3 - Features Active in Each Operating 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 (Count)
Sample Period	N	N	N	N	Y	Y

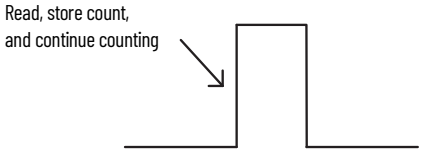
Operating Mode Features

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.

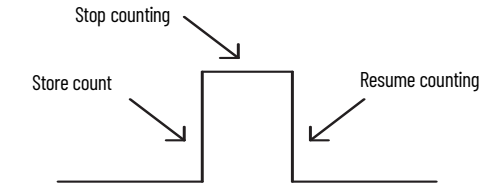
Figure 6 - Store/Continue



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.

Figure 7 - Store/Wait/Resume

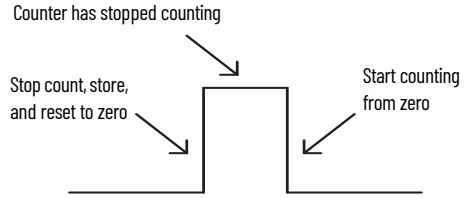


Store Count Mode 3: Store-Reset/Wait/Start

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.

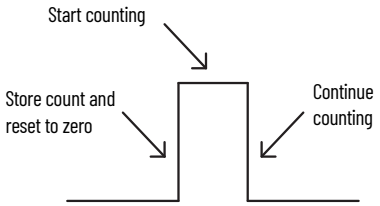
Figure 8 - Store-Reset/Wait/Start



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.

Figure 9 - Store-Reset/Start

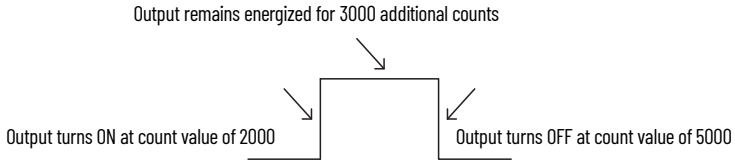


Output Control

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

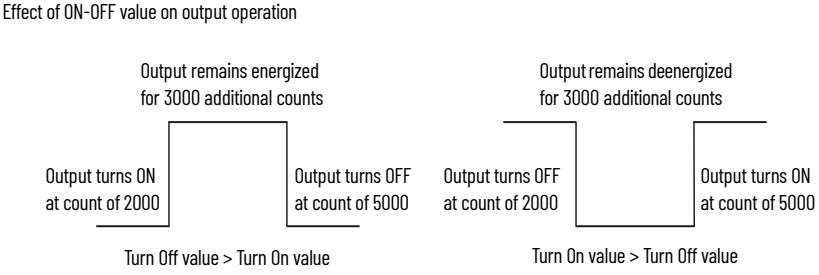
- Tie Output 0 to Window 0.
- Program Window 0 ON Value to 2000.
- Program Window 0 OFF Value to 5000.

Figure 10 - 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.

Figure 11 - ON-OFF Value on Output Operation



Very High-speed Counter Module Input and Output Data

In this chapter, you learn about the input and output data table of your 1734-VHSC24 and 1734-VHSC5 modules.

Data Table

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

Table 4 - Input and Output Data Format

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
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	F0	DS	ES	OE	F0
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															
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	F0	DS	ES	OE	F0

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 ≤ value ≤ 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 ≤ value ≤ 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 s).

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, F0, 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 (F0) - When this bit is set to 1, outputs are turned on if OE is 1. When F0 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, and the counter rollover, which is defined as the first ON and first 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.

Use this byte to select the type of counter desired.

Table 5 - Counter Configuration (Word 1)

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

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

Table 6 - Filter Selection (Word 2)

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)

Table 6 - Filter Selection (Word 2) (Continued)

			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 (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 while 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. Do not use scalars of Z/128, Z/64, Z/32, and Z/16 when applying positioning. 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 (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 (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 (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 (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.

Table 7 - 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 (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 first Compare Window (also the PWM signal in PWM [3] configuration)

T1 - Tie Output to second Compare Window

T2 - Tie Output to third Compare Window

T3 - Tie Output to fourth Compare Window

Rollover (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 usable range of 1 ≤ value ≤ 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 ≤ value ≤ 0x00FFFFFF (16,777,215).

Counter ON and OFF Windows (Configuration Words 12...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 ≤ value ≤ 0x00FFFFFF (16,777,215). When a tie is connected to a compare window, that window must be specified (ON value ≠ OFF value ≠ 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 x 2.5E6) / desired_frequency

Rate Measurement

counts = time_base [sec] x gate_interval x desired_frequency

Safe State Values (Configuration Words 20...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 performed.

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. Table 8 shows the words which can be exchanged.

Table 8 - Explicit Message Words

Instance	Service	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

Table 8 - Explicit Message Words (Continued)

Instance	Service	Field	Bytes
#108 (0x6c)	Set/Get	PWM Safe State Value	2
		Counter Control SSV	1
		Output Control SSV	1

Configure Your Module

Configuration Overview

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

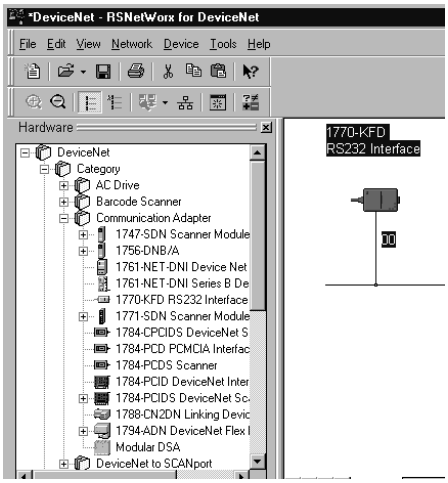
This chapter shows configuration in the online mode. Configuration dialogs appear similar in both modes. The primary difference is that if you make changes offline, you must go online before the configuration changes take effect.

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 RS-232 Interface.

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

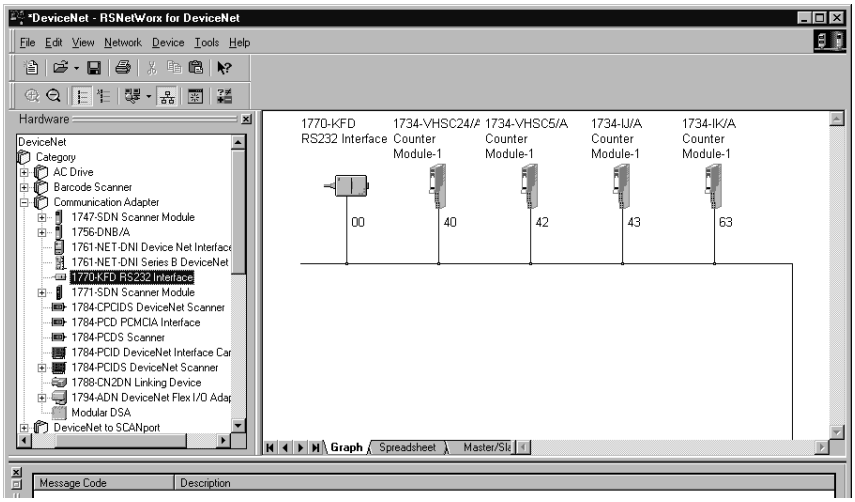


1. From the Hardware list, expand the list of communication adapters.
2. Select the 1734-ADN POINT I/O Scanner. You can also select and drag the scanner name onto the network.

   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, expand the Specialty I/O module selection.
2. From the DeviceNet - RSNetWorx for DeviceNet dialog, to choose a module, select the catalog number, or drag the module name onto the network.

The out-of-the-box node setting for POINT I/O 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.

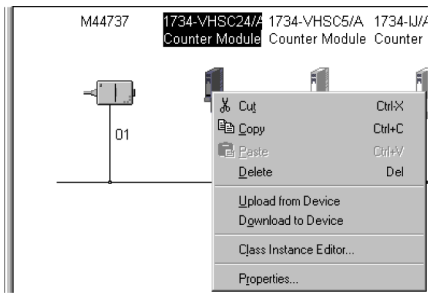
3. From the DeviceNet - RSNetWorx for DeviceNet dialog, go to the dropdown Tools. Select Node Commissioning.
4. Select Browse.
5. Select the module to change.
6. The node commissioning dialog returns. It displays the node number and data rate.
7. Change the node number and select Apply. The dialog then identifies the new setting.
8. To continue, select Close.

Set the Counter Parameters

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

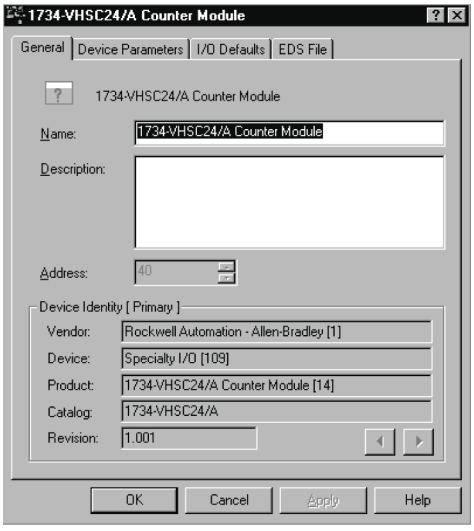
IMPORTANT This procedure shows configuration in the online mode. Changes set in this mode take effect when you download to the individual module.

1. From the DeviceNet - RSNetWorx for DeviceNet dialog, select the module.



2. Select Properties to configure your adapter.

The counter module dialog displays with a series of tabs at the top of the dialog. See the tabs in the figure. The dialog is for the 1734-VHSC24 module. Use identical dialogs for the 1734-VHSC5 module.



3. From the counter module General dialog, enter the module name and description, and then select OK.

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

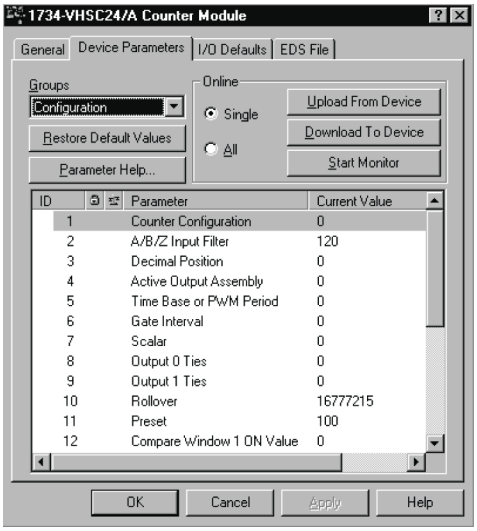
4. From the General dialog, select Device Parameters.

   The EDS Editor dialog appears.

5. To upload the existing parameters from the module, select Upload.

   The counter module dialog shows the existing parameters set on the module.

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

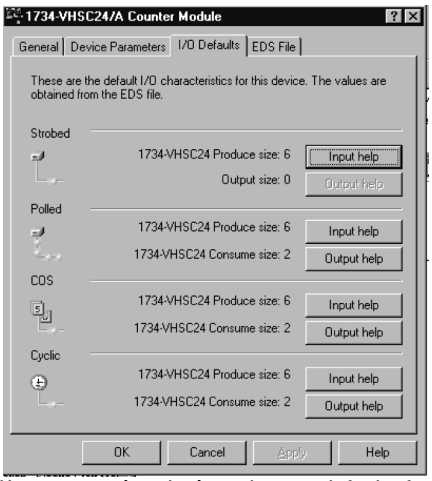


7. When complete, download the parameters to your module by selecting Download to Device.
   - To download each change as you make it, select the Single download option.
   - To download all changes at once, select the All download option.

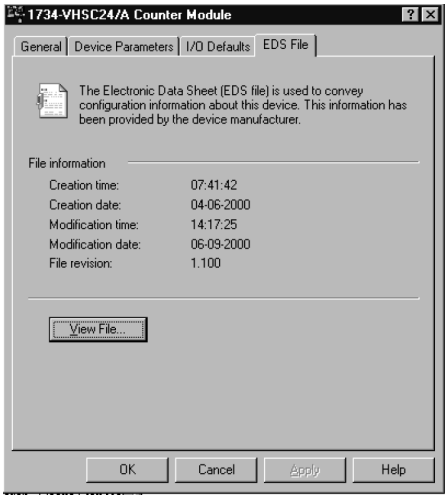
Check I/O Status and View the EDS File

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

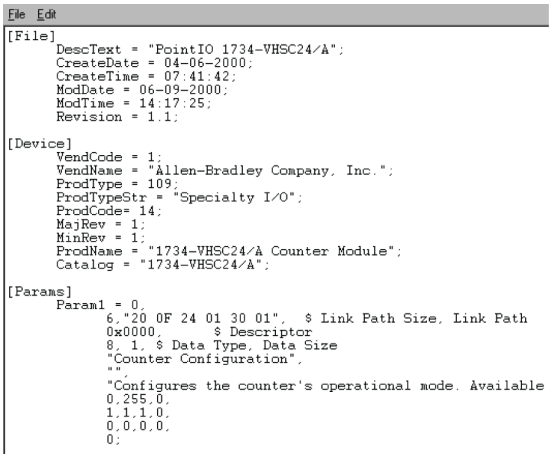
1. From the Counter Module dialog, select the I/O Defaults tab.



2. You can monitor the input/output defaults for:
   - Strobe
   - Polled
   - Change of State
   - Cyclic
3. From the Counter Module dialog, select the EDS File tab.



4. From the EDS File dialog, select View File.



5. You can view or edit the EDS file.

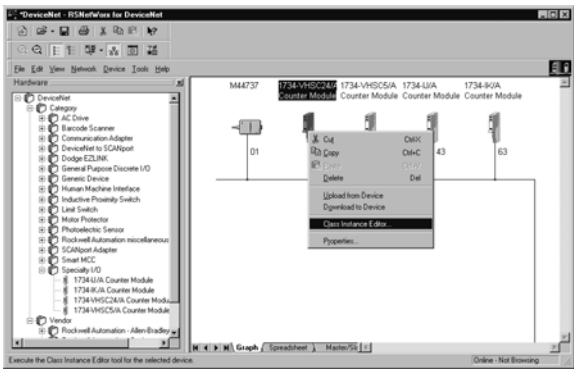
Access Instantiated Instances

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.

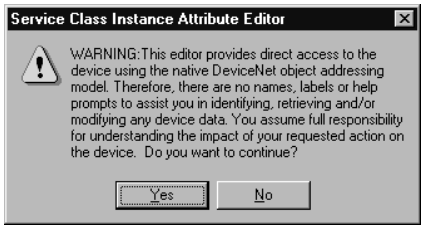
Use Instantiated Instances

To use Instantiated Instances, follow these procedures.

1. Select the module and then select the Class Instance Editor.

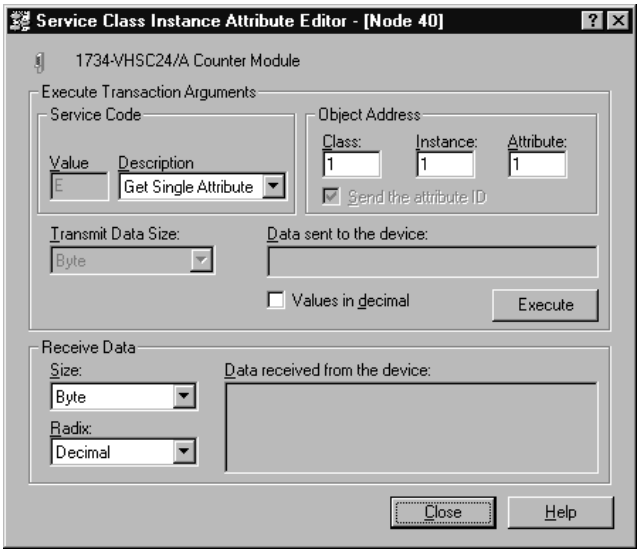


The Service Class Instance Attribute Editor Warning dialog displays.



2. Select Yes.

   The Service Class Instance Attribute Editor dialog displays.



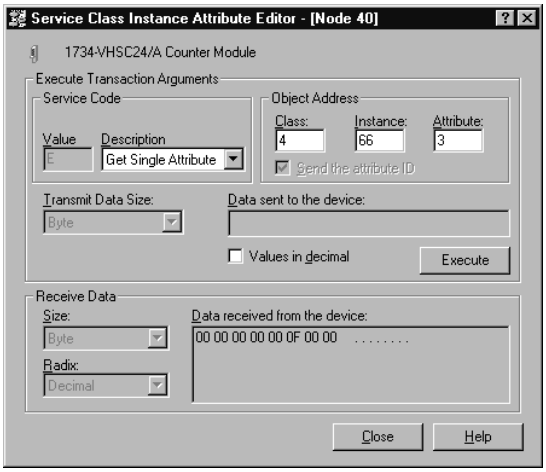
3. From the Service Class Instance Attribute Editor dialog, complete these actions.
   a. Select the service code. The service code options are:
   - Get Single Attribute

- Set Single Attribute
- Set All Attributes
- Apply Attribute
- Reset
- Stop
- Create
- Delete
- Restore
- Save
- Connection No-op

b. For Receive Data, select Size and Radix.

c. Enter the class, instance, and attribute as shown in Figure 12. Note that the class is always 4 and the attribute is always 3.

Figure 12 - Example for Assembly 102



4. To initiate the action, select Execute.
5. To finish, select Close.

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, Table 9 shows assembly 101 for the 1734-OE module.

Table 9 - Assembly 101 for 1734-OE Module

Service	Class	Instance	Attribute
OE (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

Notes:

Configure Modules in the Studio 5000 Logix Designer Application

This chapter explains how to configure your modules in the Studio 5000 Logix Designer® application, including how to complete entries on these dialogs.

- Fault/Program Action
- Counter Configuration
- Output Configuration

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 of formats for the module depend on the Communication format for the adapter. Table 10 lists possible module Connection formats based on adapter Communication formats.

Table 10 - Module Connection Format Options

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 that:

- 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.

Table 11 lists tags and dialogs based on Connection type.

Table 11 - Configuration Tags and Dialogs

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 the Studio 5000 Logix Designer application, use this procedure.

1. Configure your adapter.

   For more information on how to add an adapter to a Studio 5000 Logix Designer project, see the User Manual for the adapter.
2. Add a 1734-VHSC5 or 1734-VHSC24 specialty module, according to the instructions in your adapter user manual.

From the Module Properties Connection tab, complete the following tasks:

- Select a value for the Requested Packet Interval (RPI) entry.
  - Default value is 80.0 ms.
  - Range is 2.0…750.0 ms.
- Leave these options unselected:
  - Inhibit Module
  - Major Fault On Controller If Connection Fails While in Run Mode

From the Module Properties dialog, the following tabs are described in this section:

- Fault/Program Action
- Counter Configuration
- Output Configuration

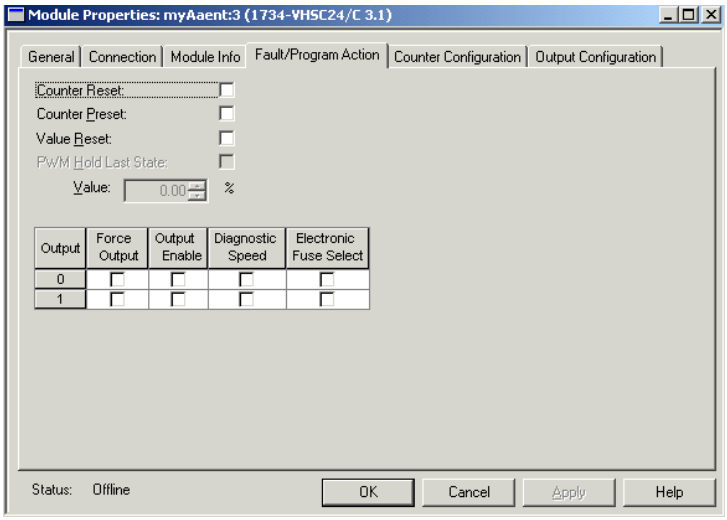
Fault/Program Action

From the Fault/Program Action tab, complete the following tasks:

- Enable or disable counter options.
- Select a Hold Last State value.
- Enable or disable output options.

The options on this view are disabled with a Listen Only connection.

Figure 13 - Fault/Program Action Dialog



3. 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.
4. 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.

5. Complete one of these actions.
   - Select another tab at the top of the dialog.
   - Select OK, which closes the dialog.
   - Select Cancel to return to default values.
   - Select 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.

Counter Configuration

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, see Table 12 to see what other entries are available in the dialog.

Table 12 - Entries Available based on Type Selection

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

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

  See Table 13 on page 35 for which entries to complete based on your selection for Type.

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

6. For Rollover, select a value greater than the value for Preset.
   - Default is 16777215.
   - Select a value from 1…16777216.
7. For Preset, select a value smaller than the value for Rollover.
   - Default is 0.
   - Select a value from 0…16777215.
8. For Counter Attenuator, select a value from 0…255 to attenuate the counter display, noting that the default is 1.
9. For Frequency Precision, select a value, per the Selections for Period/Rate and Rate Measurement table, to multiply the frequency by the factor selected.
10. For Gate Multiplier, select a value, so that the product of Gate Multiplier and Time Base does not exceed 3 s (3000 ms), referring to the table.
11. For Time Base, select a value between 10…3000 ms, in multiples of 10, referring to the table.

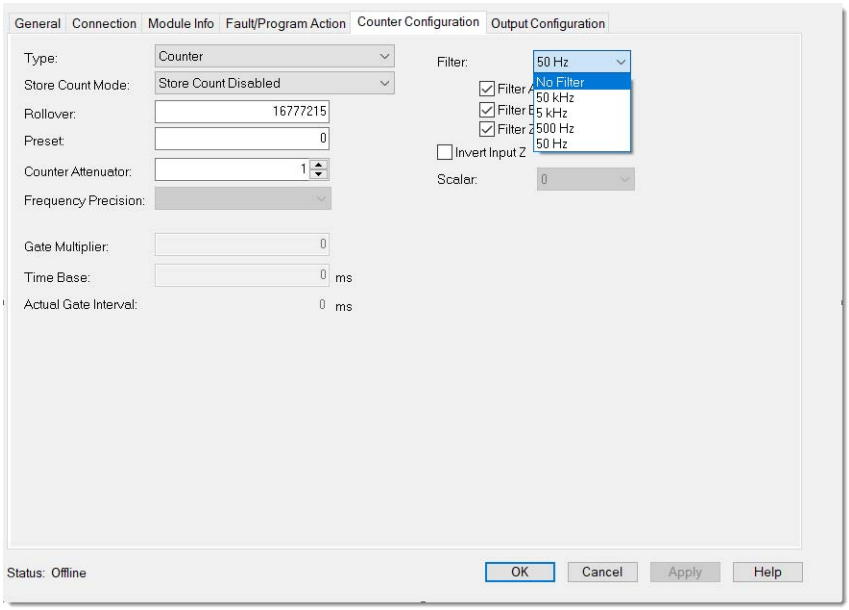
Table 13 - Selections for Period/Rate and Rate Measurement

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...200
Time Base	1000	10...3000 in multiples of 10

12. The value for Actual Gate Interval that appears when the counter type is Rate Measurement and shows the product of Gate Multiplier and Time Base below 3 s (3000 ms).
13. For Filter, select the Frequency, which is the value you use to filter A/B/Z inputs when you select 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
14. Select the checkboxes for the following, which use the value you selected for Filter.
    - Filter A
    - Filter B
    - Filter Z



Note: When using the 1734-VHSC24 module in counter mode, use appropriate filter settings to avoid extra counts being reported.

15. For Invert Input Z, check the checkbox to invert the signal at Z input.
16. 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 ≤ 1.

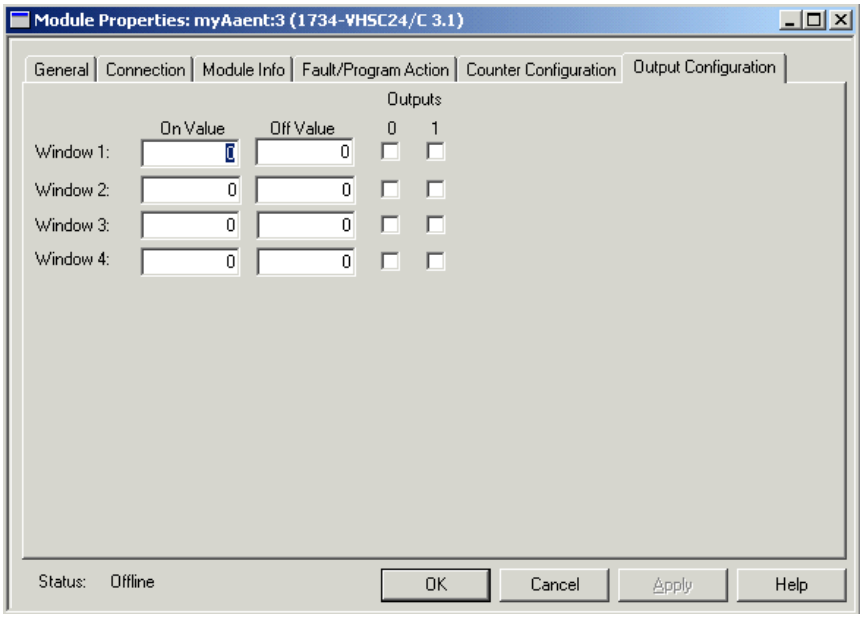
- 16
- 32
- 64
- 128

17. Complete one of these.
    - Select another tab at the top of the dialog.
    - Select OK, which closes the dialog.
    - Select Cancel to return to default values.
    - Select 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.

Output Configuration

Use the Output Configuration 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.

Figure 14 - Output Configuration Dialog



1. Select a checkbox for Outputs.
2. Select entries for On Value and Off Value (see Table 14).
3. Complete one of these.
    - Select another tab at the top of the dialog.
    - Select OK, which closes the dialog.
    - Select Cancel to return to default values.

- Select 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.

Table 14 - Output On and Off Values

Selection	On Values	Off Values
• Period • Continuous • Rate	• Not equal to Off Value • Between 0…16777215	• Not equal to On Value • 0…16777215
• Counter • Encoder • Pulse Generator	• Not equal to Off Value • > 0 • < Rollover Value	• Not equal to On Value • > 0 • < Rollover Value

Notes:

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.

Figure 15 - Module Status Indicators

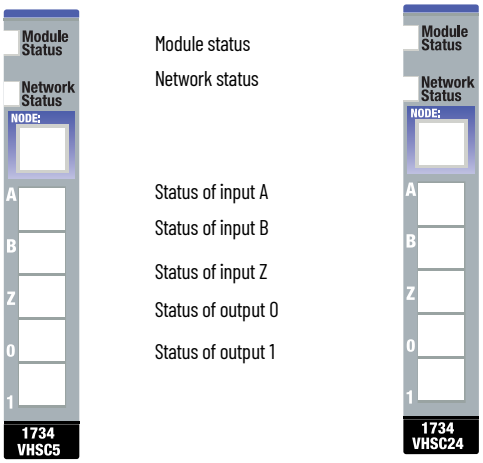


Table 15 - Status Indicator Descriptions — Module Status

Indication	Probable Cause
Off	No power is applied to the device.
Steady green	Device is operating normally.
Flashing green	Device needs commissioning due to configuration missing, incomplete, or incorrect.
Flashing red	Recoverable fault is present.
Steady red	Unrecoverable fault may require device replacement.
Flashing red/green	Device is in self-test.

Table 16 - Status Indicator Descriptions — Network Status

Indication	Probable Cause
Off	Device is not online. • Device has not completed dup_MAC_id test. • Device not powered - Check module status indicator.
Steady green	Device is online and has connections in the established state.
Flashing green	Device is online but has no connections in the established state.
Flashing red	One or more I/O connections are in timed-out state.
Steady 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. The device received and accepted an Identify Communication Faulted Request - Long protocol message.

Table 17 - Status Indicator Descriptions — I/O Status

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

Table 17 - Status Indicator Descriptions — I/O Status (Continued)

Indication	Probable Cause
Output Status	
Off	Output is inactive.
Steady 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).

History of Changes

This appendix contains the new or updated information for each revision of this publication. These lists include substantive updates only and are not intended to reflect all changes. Translated versions are not always available for each revision.

1734-UM003B-EN-P, August 2005

Change
Updated Additional Resources
Added Before You Begin section
Added attention and warning statements
Updated Appendix A

Numerics

A

C

D

E

F

G

I

M

N

O

P

R

S

V

Z

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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Publication 1734-UM003C-EN-P - November 2023
Supersedes Publication 1734-UM003B-EN-P - August 2005