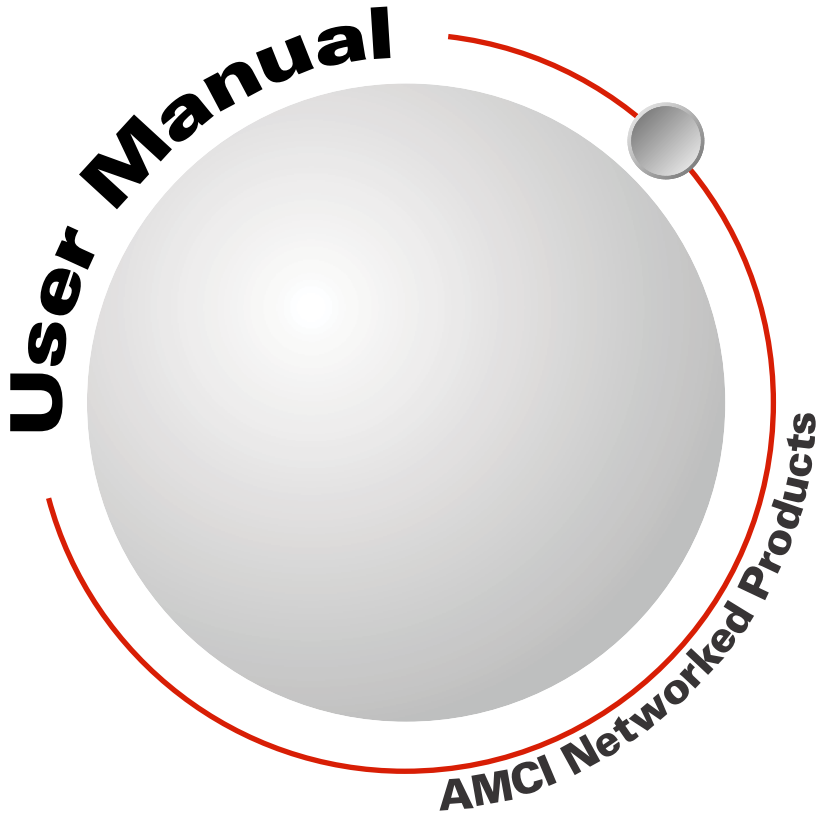
ADVANCED MICRO CONTROLS INC.

Manual #: 940-04051

5034-PWM-AM

PointMax™ I/O
Pulse Width Modulated Output Module



GENERAL INFORMATION

Important User Information

The products and application data described in this manual are useful in a wide variety of different applications. Therefore, the user and others responsible for applying these products described herein are responsible for determining the acceptability for each application. While efforts have been made to provide accurate information within this manual, AMCI assumes no responsibility for the application or the completeness of the information contained herein.

UNDER NO CIRCUMSTANCES WILL ADVANCED MICRO CONTROLS, INC. BE RESPONSIBLE OR LIABLE FOR ANY DAMAGES OR LOSSES, INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM THE USE OF ANY INFORMATION CONTAINED WITHIN THIS MANUAL, OR THE USE OF ANY PRODUCTS OR SERVICES REFERENCED HEREIN.

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

The information contained within this manual is subject to change without notice.

This manual is copyright 2026 by Advanced Micro Controls Inc. You may reproduce this manual, in whole or in part, for your personal use, provided that this copyright notice is included. You may distribute copies of this complete manual in electronic format provided that they are unaltered from the version posted by Advanced Micro Controls Inc. on our official website: *www.amci.com*. You may incorporate portions of this documents in other literature for your own personal use provided that you include the notice "Portions of this document copyright 2026 by Advanced Micro Controls Inc." You may not alter the contents of this document or charge a fee for reproducing or distributing it.

Standard Warranty

ADVANCED MICRO CONTROLS, INC. warrants that all equipment manufactured by it will be free from defects, under normal use, in materials and workmanship for a period of [18] months. Within this warranty period, AMCI shall, at its option, repair or replace, free of charge, any equipment covered by this warranty which is returned, shipping charges prepaid, within eighteen months from date of invoice, and which upon examination proves to be defective in material or workmanship and not caused by accident, misuse, neglect, alteration, improper installation or improper testing.

The provisions of the "STANDARD WARRANTY" are the sole obligations of AMCI and excludes all other warranties expressed or implied. In no event shall AMCI be liable for incidental or consequential damages or for delay in performance of this warranty.

Returns Policy

All equipment being returned to AMCI for repair or replacement, regardless of warranty status, must have a Return Merchandise Authorization number issued by AMCI. Call (860) 585-1254 with the model number and serial number (if applicable) along with a description of the problem during regular business hours, Monday through Friday, 8AM - 5PM Eastern. An "RMA" number will be issued. Equipment must be shipped to AMCI with transportation charges prepaid. Title and risk of loss or damage remains with the customer until shipment is received by AMCI.

24 Hour Technical Support Number

24 Hour technical support is available on this product. If you have Internet access, start at www.amci.com. Product documentation and FAQ's are available on the site that answer most common questions.

If you require additional technical support, call (860) 585-1254. Your call will be answered by the factory during regular business hours, Monday through Friday, 8AM - 5PM Eastern. During non-business hours an automated system will ask you to enter the telephone number you can be reached at. Please remember to include your area code. The system will contact an engineer on call. Please have your product model number and a description of the problem ready before you call.

Waste Electrical and Electronic Equipment (WEEE)

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

Table of Contents

Reference 2: AOI Reference

Reference 3: I/O Data Format

Reference 4: Troubleshooting Information

About this Manual

Read this chapter to learn how to navigate through this manual and familiarize yourself with the conventions used in it. The last section of this chapter highlights the manual's remaining chapters and their target audience.

Audience

This manual explains the installation and operation of the 5034-PWM-AM module from AMCI. It is written for the engineer responsible for its actual installation.

Applicable Units

This manual is applicable to all 5034-PWM-AM devices at the time of its release.

Navigating this Manual

This manual is designed to be used in both printed and on-line forms. Its on-line form is a PDF document. You are allowed to select and copy sections for use in other documents and you are allowed to add notes and annotations. If you decide to print out this manual, all sections contain an even number of pages which allows you to easily print out a single chapter on a duplex (two-sided) printer.

Manual Conventions

Three icons are used to highlight important information in the manual:

NOTES highlight important concepts, decisions you must make, or the implications of those decisions.

CAUTIONS tell you when equipment may be damaged if the procedure is not followed properly.

WARNINGS tell you when people may be hurt or equipment may be damaged if the procedure is not followed properly.

The following table shows the text formatting conventions:

Format	Description
Normal Font	Font used throughout this manual.
Emphasis Font	Font used for parameter names and the first time a new term is introduced.
Cross Reference	When viewing the PDF version of the manual, clicking on a blue cross reference jumps you to referenced section of the manual.
HTML Reference	When viewing the PDF version of the manual, clicking on a red cross reference opens your default web browser to the referenced section of the AMCI website if you have Internet access.

Trademarks Acknowledgments

The AMCI logo is a trademark of Advanced Micro Controls Inc. "PointMax" is a trademark of Rockwell Automation. "EtherNet/IP" is a trademark of ODVA, Inc. "Adobe" and "Acrobat" are registered trademarks of Adobe Systems Incorporated.

All other trademarks contained herein are the property of their respective holders.

Revision Record

This document, 940-04051, is the second release of this manual. It was first released on April 21st, 2026.

Revision History

940-04050: 12/17/2025 Initial Release

Manual Layout

Chapter Title	Page	Chapter Description
5034-PWM-AM Specifications	7	Specifications of the 5034-PWM-AM.
Hardware Installation	17	Task instructions that give you the information and steps needed to physically install 5034-PWM-AM on your machine.
Software Configuration	21	Task instructions to how to add the 5034-PWM-AM module to your PLC project and configure it for your application.
Controlling the 5034-PWM-AM	25	Task instructions that details how to configure your PLC program to control a 5034-PWM-AM from your ladder logic.
AOI Reference	29	Reference chapter that details the parameters and enumerations of the add on instructions supplied by AMCI for the 5034-PWM-AM.
I/O Data Format	33	Reference chapter that details the I/O bits and words used to communicate with the 5034-PWM-AM.
Troubleshooting Information	41	Reference chapter to help you diagnose common problems.

REFERENCE 1

5034-PWM-AM SPECIFICATIONS

Overview

The 5034-PWM-AM is the latest addition to the line of AMCI products for the PointMax™ I/O system from Rockwell Automation. The 5034-PWM-AM offers two channels of pulse width modulated outputs that can be used to control any device that requires a fixed frequency, variable duty cycle signal to control it. The 5034-PWM-AM also offers:

- Dithering functionality to compensate for stiction in proportional control valves or similar loads.
- Ramp functionality to prevent mechanical shocks in the load from changing the PWM duty cycle too quickly.

If your application requires a variable frequency, 50% duty cycle control signal, consider using an AMCI 5034-PTO-AM pulse train output module. The 5034-PTO-AM module is typically used in motion control applications.

Designed around RA licensed technology, installation of the 5034-PWM-AM is the same as all other PointMax I/O modules. The 5034-PWM-AM uses standard eighteen pin wiring block.

The 5034-PWM-AM is configured through the available Add-On Profile. The AOP includes a screen of input fields to simplify configuration. This configuration data is written down to the 5034-PWM-AM when it connects to the network or when it switches from inhibited to enabled. The module can be inhibited and enabled from the AOP Connection screen.

PWM Duty Cycle, PWM Frequency, and Dither Enable/Disable can be programmed using the network output data assigned to the module. The 5034-PWM-AM can be configured to change the value of these parameters as soon as data is received from the host controller. This allows you to use the host to generate complex waveforms and send this data to the 5034-PWM-AM in real time. Updates to a single module can occur as often as every two milliseconds, which is the minimum RPI time.

PWM Outputs

Two outputs are available on the 5034-PWM-AM. These outputs have independent settings. The PWM frequency settings are programmable over a 20 Hz to 20 kHz range with a resolution of 1 Hz. Duty cycle settings depend on the PWM frequency. See ***PWM Outputs***, which starts on page 11, for a complete description.

Ramping

Ramping allows you to program the 5034-PWM-AM to smoothly change between duty cycle setpoints when they are changed. This can be thought of as accelerating or decelerating between two speeds instead of jumping directly from one speed to the other. This can prevent mechanical shocks to a system when an output changes state quickly.

Dithering

Dithering is used to overcome problems associated with static friction, which is often referred to as “stiction”. Static friction can cause errors when a valve is commanded to a new position, but the force generated by the coil is not great enough to overcome the static friction in the mechanical components. Stiction can also cause overshoot errors and dampened output oscillations when the static friction is finally overcome.

Dithering overcomes these errors by imposing an AC signal on top of the PWM signal. This AC signal keeps the valve core in constant motion. The average flow through the valve is unaffected because the average value of the AC signal is zero. When choosing a dithering frequency, system resonance points must be avoided.

Output Drivers

Outputs control high current DC drivers that can power many proportional control valves directly. Total output current for both channels is 4.0 A at 25°C. The 4.0A total can be divided between the two outputs as needed. For example, output 1 can be used to provide three amps while output 2 can be used to provide one amp. Both outputs are sourcing outputs and drive sinking loads directly.

Overview (continued)

DC Inputs

Two differential inputs are available on the 5034-PWM-AM. These inputs are general purpose inputs that do not affect the operation of the unit. These inputs can be wired as sinking or sourcing inputs and accept input voltages between 8 and 27 Vdc. They can be programmed to act as normally open or normally closed contacts and their status is reported in the network input data.

Connector Pinout

Figure R1.1 shows the pin out of the module's eighteen pin connector. A standard removable terminal block is used to wire the module.

- Power for the outputs is supplied from the power supply attached to the ±SA pins of the PointMax I/O network adapter. See *Power Wiring* on page 19 for additional information.
- The outputs are open collector sourcing. The Common pins are attached to the –SA pin of the PointMax I/O network adapter.
- The inputs are fully differential inputs and can be wired as sinking or sourcing inputs.
- Chassis Gnd pins are attached to the grounding connection on the back of the mounting base.

PointMax I/O Terminal Block

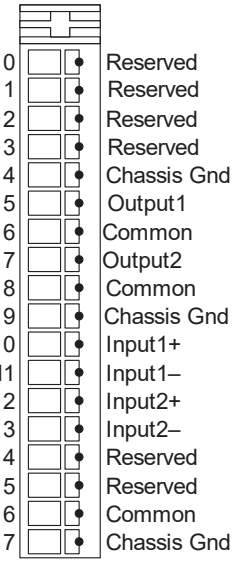


Figure R1.1 Connector Pin Out

Status LED's

The module has a total of four status LED's. The two on the right are controlled by the RA backplane interface IC. The two on the left are controlled by the 5034-PWM-AM module.

MOD

State	Description
Off	The module is not powered
Steady Green	The module is operational and all I/O connections are active.
Flashing Green	The module has no I/O connections.
Flashing Red	One of the following conditions exists: ➤ A module firmware update is in progress. ➤ A module firmware update attempt failed. ➤ The device has experienced a recoverable fault. ➤ A connection to the module has timed out.
Steady Red	The module experienced a nonrecoverable fault.

Figure R1.2 MOD Status LEDs

Status LED's (continued)

S/A PWR

State	Description
Off	The module is not powered
Steady Green	There is SA power to the module.
Steady Red	There is no SA power to the module or the SA power voltage is not in the valid range.

Figure R1.3 S/A PWR Status LEDs

PWM_1

State	Description
Off	Normal Operation. Duty Cycle = 0%
Steady Green	Normal Operation. Output is in its default state
Slow Blinking Green 	Normal Operation. Output is not in its default state
Slow/Fast Blinking Green 	Normal Operation. Output is with an applied dither.
Blinking Red/Green	Configuration or Command error on the channel.

Figure R1.4 PWM_1 Status LEDs

PWM_2

State	Description
Off	Normal Operation. Duty Cycle = 0%
Steady Green	Normal Operation. Output is in its default state
Slow Blinking Green 	Normal Operation. Output is not in its default state
Slow/Fast Blinking Green 	Normal Operation. Output is with an applied dither.
Blinking Red/Green	Configuration or Command error on the channel.

Figure R1.5 PWM_2 Status LEDs

Module State (PWM_1 & PWM_2)

PWM_1 State	PWM_2 State	Description
Steady Red	Don't Care	Hardware Fault - Firmware Error
Don't Care	Steady Red	Hardware Fault - 5034 Backplane Communication Error
Blinking Red	Blinking Red	Outputs Disabled. Power Stage fault or no configuration data.
Steady or Blinking Orange	Steady or Blinking Orange	Module on power up or reset or when firmware update is in progress.

Figure R1.6 PWM_1 & PWM_2 Status LEDs

Specifications

Number of Channels

2. Channels are independent of each other.

Output Frequency Range

20 Hz to 20 kHz.
Programmable with 1 Hz resolution.

Duty Cycle Range

Programmable with 0.1% resolution.

PWM frequency 20Hz to 8kHz
0.0%, 1.0% to 99.0%

PWM frequency > 8kHz
0.0%, 2.5% to 97.5%

Dither Frequency

0 Hz to (PWM Frequency / 4) Hz
Programmable with 1 Hz resolution. Programming to 0 Hz disables the Dither feature. Default of 0 Hz.

Dither Deviation

0.0% to 50.0%
Programmable with 0.1% resolution. Programming to 0.0% disables the Dither feature. Default of 0.0%

Output Drivers

Sourcing drivers.
4.0 A maximum per *module* at 25°C
This current limit can be divided between the two outputs as needed.

Outputs receive power from the power supply attached AS PWR pins.

Discrete Inputs

Type: Fully differential. Can be wired as a sinking or sourcing input.
On Voltage: 8 to 27 Vdc
Off Voltage: 0 to 2 Vdc
Input Current: 5 mA @ 24 Vdc
Active State: Programmable. Can act as a Normally Open or Normally Closed input.

Add-On Profile

Available directly in Studio 5000. The AOP defines the I/O words and offers a UI to configure the unit.

RPI Time

Default: 10 milliseconds
Programmable from 2 to 750 milliseconds.

Maximum Response Time

The greater of 500 microseconds or 1 output period.
Response time is the time between when the data is accepted by the module and when it is acted upon. It does not include network transit time (RPI time) from the host to the module.

SA PWR Power Draw

0.8W max. (0.033A @ 24Vdc)

Refers to power drawn from power supply attached to SA PWR pins on PointMax I/O network adapter.

Note that this power draw is by the module itself and does not include power drawn by the output loads.

Operating Temperature

32°F to 140°F (0°C to 60°C)

Relative Humidity

5% to 95%, non-condensing

Storage Temperature

-40°F to +185°F (-40°C to +85°C)

Connector

Not Included. Uses standard 18 pin PointMax I/O removable terminal block available from Rockwell Automation

PWM Outputs

Each PWM output has six parameters that defines how the output operates. The two PWM outputs are completely independent of each other. There are no shared parameters settings between the two outputs. The basic PWM output is controlled by three parameters. The remaining three parameters control output dithering and they are explained in the next section. The basic control parameters are:

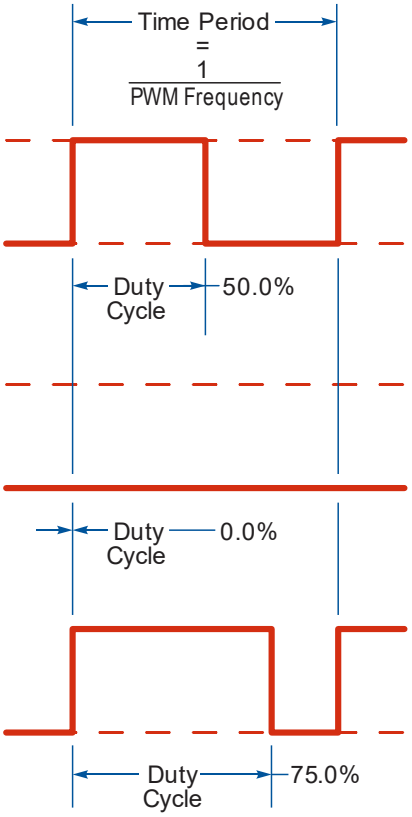


Figure R1.7 PWM Output Examples

PWM Frequency

The PWM Frequency parameter defines the time period of the output. It is programmed in hertz, and is programmable from 20 to 20,000 Hz inclusive. This yields a time period of fifty milliseconds to fifty microseconds.

Duty Cycle

The Duty Cycle parameter defines the time the output is on as a percentage of the programmed time period. The duty cycle value is programmed with a 0.1% resolution. For example, a value of 500 means that the output is on for 50.0% of the time. A value of 255 means that the output is on for 25.5% of the time.

There are limits on the duty cycle value that can be programmed into the 5034-PWM-AM.

- The output can always be programmed to be off. (Parameter value of 0.)
- When the PWM Frequency is between 20 and 8,000 Hz, the Duty Cycle can range from 1.0% to 99.0%. (Parameter value of 10 to 990.)
- When the PWM Frequency is between 8,001 and 20,000 Hz, the Duty Cycle can range from 2.5% to 97.5%. (Parameter value of 25 to 975.)

These range restrictions are needed to guarantee the linearity of the output.

NOTE Changes to the Duty Cycle parameter will take a minimum of 500 microseconds to occur. When the programmed PWM Frequency is 2,000 Hz (1/0.0005 sec) or above, the changes will take 500 microseconds to occur. At frequencies below 2,000 Hz, changes to Duty Cycle will occur at the beginning of the next time period. This means that the changes to the Duty Cycle will take up to 1/{PWM Frequency} seconds to occur. For example, if the PWM Frequency is set to 50 Hz, then any change to the Duty Cycle will take between 500 microseconds and 20 milliseconds to occur. Note that this time does not include the RPI time needed to get the data from your PLC to the 5034-PWM-AM module.

Duty Cycle Ramp

The 5034-PWM-AM can be programmed to slowly switch between the current and programmed Duty Cycle setpoints. This can be thought of as accelerating or decelerating between two speeds instead of jumping directly from one speed to the other. This can prevent mechanical shocks to a system when an output changes state quickly.

The units of the Duty Cycle Ramp parameter is 0.01% change per millisecond. The parameter has a range of 0 to 10,000. A value of zero means that the Duty Cycle Ramp parameter is not applied and the output jumps to the new PWM Duty Cycle value on the next update. A value of 10,000 (100.00%) implies that it will take less that one millisecond to change between the two values.

PWM Outputs (continued)

Duty Cycle Ramp (continued)

The calculation to determine the time to change between two PWM Duty Cycle values is:

$$T_R = \frac{|DC_N - DC_P|}{Ramp}$$

Where: T_R = Ramp Time in milliseconds
DC_N = New Duty Cycle Percentage
DC_P = Present Duty Cycle Percentage
Ramp = Duty Cycle Ramp Percentage

For example: DC_P = 85%, DC_N = 20%, Duty Cycle Ramp = 2.50%/millisecond (250).
T_R = |20% - 85%|÷2.50%/ms = 65%÷2.5%/ms = 26 milliseconds

This is an ideal calculation that does not take the PWM frequency into account. For example, a 200 Hz PWM frequency means that the output can be updated every 5 milliseconds. (1/200Hz). In this case, the ramp time will be 30 milliseconds instead of the calculated 26 milliseconds.

Dithering Control

Dithering imposes an AC signal within the PWM output. This is accomplished by varying the duty cycle of the output in a regular fashion. If the PWM signal were to be properly filtered and observed on an oscilloscope, the output would appear to be an AC signal riding on the DC value defined by the programmed PWM Duty Cycle. The dithering output is defined with three parameters and is enabled or disabled by a bit in the output tags.

Dither Frequency

The Dither Frequency parameter sets the frequency of the imposed AC signal. It has a range of 0 Hz to (PWM Frequency)/4. If a channel's Dither Frequency is set to zero, the dithering functionality is disabled for that channel. In this case, the Dither Deviation parameter for that channel must also equal zero.

Dither Deviation

Like the PWM Duty Cycle, Dither Deviation is programmed as an integer that represents a percentage of the programmed time period. The value has a resolution of 0.1%. The Dither Deviation parameter has a range of 0 to 500, (0.0% to 50.0%) and must equal zero if the channel's Dither Frequency parameter is set to zero.

Dither Deviation Ramp

The 5034-PWM-AM can be programmed to slowly increase the Dither Deviation when it is enabled or disabled. This can be thought of as accelerating or decelerating between two speeds instead of jumping directly from one speed to the other. This can prevent mechanical shocks to a system when an output changes state quickly.

The units of the Dither Deviation Ramp parameter is 0.01% change per millisecond. The parameter has a range of 0 to 10,000. A value of zero means that the Dither Deviation Ramp parameter is not applied and the output jumps to the new Dither Deviation value on the next update. A value of 10,000 (100.00%) implies that it will take less that one millisecond to change between the two values.

The calculation to determine the time to change between two Dither Deviation values is:

$$T_R = \frac{|DD_N - DD_P|}{Ramp}$$

Where: T_R = Ramp Time in milliseconds
DD_N = New Dither Deviation Percentage
DD_P = Present Dither Deviation Percentage
Ramp = Dither Deviation Ramp Percentage

For example: DD_P = 10%, DD_N = 30%, Dither Deviation Ramp = 0.55%/millisecond (55).
T_R = |30% - 10%| ÷ 0.55%/ms = 20% ÷ 0.55%/ms = 36 milliseconds

This is an ideal calculation that does not take the PWM frequency into account. For example, a 200 Hz PWM frequency means that the output can be updated every 5 milliseconds. (1/200Hz). In this case, the ramp time will be 40 milliseconds instead of the calculated 36 milliseconds.

Dithering Control (continued)

Output Duty Cycle Calculation

As shown in figure R1.8 below, the Dithering Period is divided into eight segments, which represent the 45° points of a cycle. The duty cycle at each point is equal to:

$$\text{duty cycle} = \text{Duty Cycle} + \text{Dither Deviation} \times \sin(\omega t)$$

Where:

- Duty Cycle = Present value of the Duty Cycle parameter for the channel
- Dither Deviation = Present value of the Dither Deviation parameter for the channel
- ω = Dither Frequency expressed in radians/second
- t = time in seconds

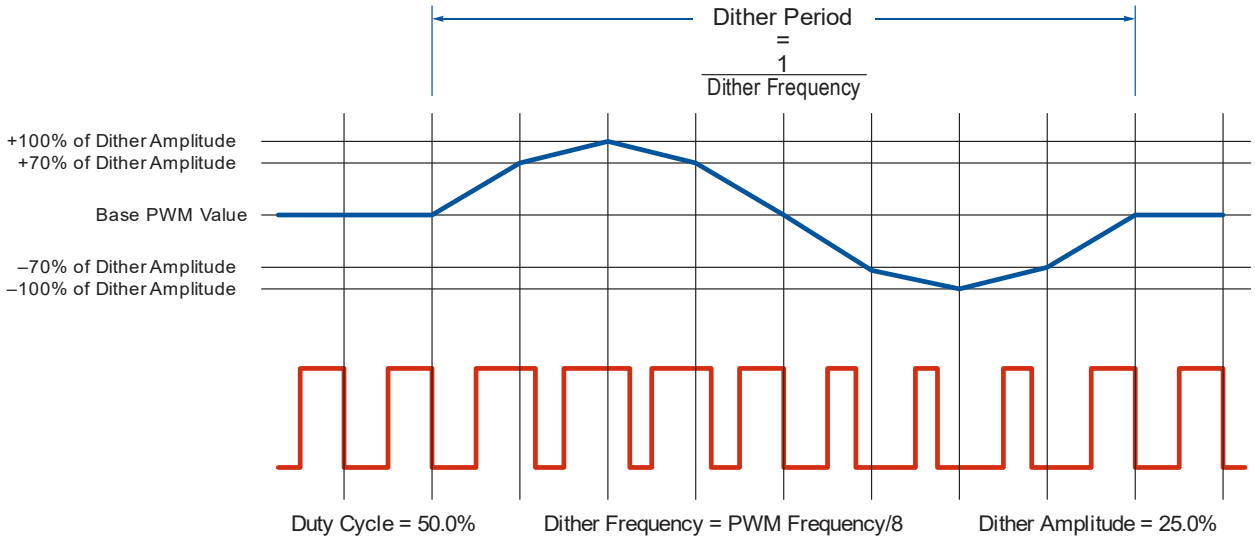


Figure R1.8 Dithering Output Example

If the Dither Frequency is greater than the PWM Frequency/8, the output will be a triangular wave instead of a sine wave, but the DC component will remain zero.

DitherValueOutOfRange Status Bit

The Dither Frequency and Dither Deviation parameters are both set in the module's configuration data. Configuration data is programmed as part of the AOP setup when the module is added to the project. The configuration data is written down to the module when it connects to the network and sets default values for all parameters. The Dither Frequency and Dither Deviation parameters cannot be changed from within the PLC later. However, the PWM Frequency and Duty Cycle can be changed from your PLC program and this can result in parameter mismatches.

When a mismatch occurs, the 5034-PWM-AM will set the *DitherValueOutOfRange* status bit in the module's input tags to inform you of the discrepancy. The module will also modify the Dither Frequency or Dither Deviation parameters to work with the new PWM Frequency or Duty Cycle values.

The Dither Frequency cannot be greater than the (PWM Frequency / 4). This upper limit is enforced when the module is configured. For example, if the default PWM Frequency is set to 2000 Hz in the configuration data, the Dither Frequency cannot be configured to a value greater than 500 Hz.

- When the PWM Frequency is changed, the value of (PWM Frequency/4) is re-calculated. If this calculated value is less than the configured Dither Frequency, the module will set the *DitherValueOutOfRange* status bit in the input tags and uses the new calculated value as the Dither Frequency. This calculation is made whenever the PWM Frequency is reprogrammed.

Dithering Control (continued)

DitherValueOutOfRange Status Bit (continued)

Dithering will never add a DC component to the PWM output. If the programmed Duty Cycle ± the configured Dither Deviation falls outside the range of acceptable Duty Cycle values at the programmed PWM frequency, the *DitherValueOutOfRange* status bit will be set the actual Dither Deviation value used by the output will be clipped.

As a reminder:

- Dither Deviation can be configured to any value between 0.0% and 50.0%
- Calculated output duty cycle can be between 1.0% to 99.0% when the PWM frequency is between 20 Hz to 8000 Hz
- Calculated output duty cycle can be between 2.5% to 97.5% when the PWM frequency is between 8001 Hz and 20000 Hz.

As an example, assume the Dither Deviation has been configured to 20.0% and the PWM frequency is set to 2000 Hz. If the Duty Cycle is programmed to 50.0%, the 5034-PWM-AM will control the output as expected. The output will range from 30.0% to 70.0% (50.0% ± 20.0%). If the Duty Cycle is programmed to 80.0%, the *calculated* output will range from 60.0% to 100.0% (80.0% ± 20.0%). Based on the PWM Frequency, the maximum allowable Duty Cycle is 99.0%. Therefore, the 5034-PTO-AM limits the Duty Cycle output from 61.0% to 99.0% to prevent a DC component from developing in the PWM output. Note that if the Duty Cycle is further increased, the applied Dither Deviation is further decreased to keep the Duty Cycle within its range.

Calculating Duty Cycle from a Desired Current

The outputs of the 5034-PWM-AM are programmed in terms of the output's Duty Cycle, not a desired current value. Use the calculations below to calculate Duty Cycle based on desired current.

- Maximum Required Voltage = (Maximum Desired Current) * (Load Resistance)
- Minimum Required Voltage = (Minimum Desired Current) * (Load Resistance)
- Maximum Duty Cycle Parameter Value = (Maximum Required Voltage)/24 * 1000
- Minimum Duty Cycle Parameter Value = (Minimum Required Voltage)/24 * 1000

1) The calculations assume a 24 Vdc supply is attached to the PointMax I/O base.
2) Verify that the calculated Duty Cycle parameter values can be programmed into the module based on the PWM Frequency.
3) Verify actual currents when commissioning the machine and adjust values as needed.

Programming The 5034-PWM-AM

Programming the 5034-PWM-AM is performed with what AMCI calls a Programming Cycle. With data constantly being updated at the RPI time, two bits are used to control a Programming Cycle. The Transmit Bit in the output data signals when the module should accept new programming data. The Acknowledge Bit in the input data signals when the module has processed the new programming data and its response is valid. The average length of time a Programming Cycle takes is twice the programmed RPI time.

Even though you can write the ladder logic to create your own Programming Cycle, the preferred method of programming the 5034-PWM-AM is through Add On Instructions. There are three AOIs in the 5034-PWM_AM sample program on the amci.com website. These AOIs expose all of the module's settings in simple data entry screens. This allows you to concentrate on configuring the module for your application while the AOI handles formatting the data and completing a Programming Cycle correctly.

Reference chapter 3, ***I/O Data Format***, which starts on page 33, lists the format of the I/O data associated with the 5034-PWM-AM module. Input data is used to monitor the status of the module and is needed when writing your application. Output data is generally handled by the AOIs, but it is also used with Real Time Control of the outputs. (See the following section.) Finally, the data is included to aid in troubleshooting while commissioning your machine.

Real Time Control

PWM Frequency, PWM Duty Cycle, and Dither Enable/Disable are typically changed with a Programming Cycle, which takes a minimum of two RPI updates to complete. It is possible to program the module to update these parameters as soon as they change in the network output data, without a full Programming Cycle. The 5034-PWM-AM calls this functionality Real Time Updates and guarantees that the module will start to update the outputs within a single RPI time. The actual time needed to update the outputs once the data is received is the greater of 500 microseconds or {1/PWM Frequency} seconds.

Output Drivers

In a package as small as the PointMax I/O housing, output drivers must be very efficient and have a low on resistance in order to prevent overheating. The 5034-PWM-AM accomplishes this by using a half H-bridge driver instead of a single low resistance MOSFET.

The limitations on the PWM Duty Cycle parameter exist for two reasons:

1) To guarantee the linearity of the averaged output.
2) To limit driver self-heating due to the turn on and turn off times of the output driver.

The two outputs share a thermal mass for heat dissipation. Because of this, the current limit of four amps per module is the limit on the 5034-PWM-AM instead of a current limit per output. The current limit can be divided between the two outputs as needed. For example, at 25°C, the module can deliver three amps from output 1 and one amp from output 2.

NOTE Total output current must be considered when designing the system to assure that the maximum load on the internal bus is not exceeded.

Power On Behavior

The 5034-PWM-AM is sent configuration data when it attaches to the network. This data can be defined when the module is added to the network or any time after by accessing the Module Properties of the unit. They are available in the Device Properties menu of the Module Properties screen.

Table R1.1 shows factory default settings for all of the parameters.

Parameter	Setting
CH1 & CH2 Output State on Net Loss	Keep Current State
CH1 & CH2 Default Dither State	Dither Off (Disabled)
CH1 & CH2 Discrete Input Active State	Active High
CH1 & CH 2 PWM Frequency	250 Hz
CH1 & CH2 Duty Cycle	10.0% (Integer value of 100)
CH1 & CH2 PWM Duty Cycle Ramp	0.00%/ms
CH1 & CH2 Dither Frequency	0 Hz (Disabled state)
CH1 & CH2 Dither Deviation	0.0% (Disabled state)
CH1 & CH2 Dither Duty Cycle Ramp	0.00%/ms

Table R1.1 Factory Default Settings

With these settings, the 5034-PWM-AM will output at 10% on both channels, with a maximum update time of forty milliseconds (1/250 Hz).

Power On Behavior (continued)

Output State on Net Loss

This parameter defines what occurs to the outputs when a network connection loss occurs. A network connection loss can occur for multiple reasons such as:

- Broken of faulty network cable
- Broken of faulty network connections
- Drop out of network equipment such as a network switch
- Electrical noise on the network cabling
- The 5034-PWM-AM module not seated in the mounting base correctly.

The module can be thought of as having two storage areas in memory for each channel.

- Ch1 and Ch2 Configuration Memory. These memory areas store the configuration data written to the module when it connects to the network. On power up, the configuration data is also copied into the channel's Active Memory.
- Ch1 and Ch2 Active Memory. The data in this memory is used to control the outputs. Changes in programming, such as an update to the Duty Cycle, are written to this memory.

If the Output State on Net Loss parameter is left at its default *Keep Current State* value, no changes are made to the Active Memory when a network connection loss occurs. If the Output State on Net Loss parameter is set to its *Apply Default State* value, the Configuration Memory values are written into the channel's Active Memory when a network connection loss occurs and the outputs switch to the state defined in the Configuration Memory.

Once the network connection is restored, new configuration data is written to module when the connection is established. If the new configuration data is the same as what is already in the channel's Configuration Memory, no changes are made. If the new configuration data is *not* the same as what is in the channel's Configuration Memory, the new configuration data is written to both the channel's Configuration Memory and Active Memory locations and the outputs respond to the new configuration data.

TASK 1
HARDWARE INSTALLATION

This section is intended for the engineer or technician responsible for physically installing the 5034-PWM-AM module.

1.1 Satisfy Environmental and Power Requirements

1.1.1 Module Location

The 5034-PWM-AM module is suitable for use in industrial environments that meet the following criteria:

- Only non-conductive pollutants normally exist in the environment, but an occasional temporary conductivity caused by condensation is expected.
- Transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

Note that these criteria apply to the system as a whole. These criteria are equivalent to the *Pollution Degree 2* and *Over Voltage Category II* designations of the International Electrotechnical Commission (IEC).

Refer to PointMax I/O documentation from Rockwell Automation for information on environmental requirements for the PointMax I/O system as a whole.

NOTE Because of their on board microprocessors, the 5034-PWM-AM modules will become warmer than most PointMax I/O modules. The Rockwell Automation defined spacing around the PointMax I/O system to allow convection cooling is all that is required. Additional spacing or cooling is not required.

1.1.2 Power Requirements

- The 5034-PWM-AM requires 0.8 watts from the PointMax I/O system. Make sure your system's power supply has adequate reserve current capacity.

1.1.3 Safe Handling Guidelines

Prevent Electrostatic Damage

CAUTION Electrostatic discharge can damage an 5034-PWM-AM module if you touch the rear bus connector pins. Follow these guidelines when handling the module.

1) Touch a grounded object to discharge static potential before handling the module.
2) Work in a static-safe environment whenever possible.
3) Wear an approved wrist-strap grounding device.
4) Do not touch the pins of the bus connector or the I/O connector.
5) Do not disassemble the module
6) Store the module in its anti-static bag and shipping box when it is not in use.

Prevent Debris From Entering the Module

WARNING During DIN rail mounting of all devices, be sure that all debris (metal chips, tapping liquid, etc.) is prevented from falling into the module. Debris may cause damage to the module or unintended machine operation with possible personal injury. The DIN rail for the modules should be securely installed and grounded before the modules are mounted on it.

Remove Power Before Servicing in a Hazardous Environment

WARNING Remove power before removing or installing any modules in a hazardous environment.

1.2 Install the Mounting Base

PointMax I/O terminal base assemblies are Rockwell Automation products and RA literature should be considered the authority on installing these products. Steps are given here as a convenience. If you have any questions, refer to RA documentation for additional information.

1) Align the interlocking guides on the left side of the mounting base with the interlocking guides on the right side of the installed adapter.
2) Slide the mounting base towards the DIN rail until the mounting base locks on the DIN rail.
3) Slide the side latch of the mounting base to the locked position. The side latch secures the installed mounting base to the adapter.
4) If this the last mounting base in the block, install the safety end cap to protect the exposed pins.

1.3 Install the 5034-PWM-AM Module

The 5034-PWM-AM installs into the selected wiring base in the same fashion as all other PointMax I/O modules. The 5034-PWM-AM module can be installed in the mounting base before or after the mounting base is installed on the DIN rail.

1.3.1 Remove Power

Power should be removed from the system before installing the 5034-PWM-AM.

1.3.2 Installation

Install the 5034-PWM-AM module by inserting it into the mounting base and pressing straight down. The module will lock into place.

1.4 Install the Removable Terminal Block

1.4.1 RTB Keying

The 5034-PWM-AM module supports RTB keying to prevent the wrong removable terminal block from being inserted into the module. For the 5034-PWM-AM module, the keying slots are 3, 9, and 13. Note that the use of the keys is optional, but can prevent the wrong terminal block from being inserted into the module during initial commissioning or maintenance.

1.4.2 Remove Power

Power should be removed from the system before the RTB is installed or removed. This is to prevent the possibility of creating an electrical arc when the installation or removal is performed.

1.4.3 Installation

1) Hook the RTB pivot clip to the I/O module's mounting base.
2) Pivot the RTB handle until it locks onto the 5034-PWM-AM module

NOTE The PointMax I/O system includes optional colored markers for an RTB as well as shield clamps and wire holders. Refer to RA literature for further information on these products.

1.5 Power Wiring

The 5034-PWM-AM receives all of its power from the PointMax I/O system. Refer to RA documentation to properly size the power supply for your system and connect it to the PointMax I/O network adapter.

1.6 PWM Output Wiring

Figure T1.1 below show that the 5034-PWM-AM obtains its 24 Vdc power from the 24 Vdc supply that is used to power the PointMax I/O drop. The 5034-PWM can source 4.0A per module @ 25°C. This current limit can be divided between the two outputs as needed. For example, at 25°C, the module can deliver three amps from output 1 and one amp from output 2. This current load must be considered when designing the system to assure that the maximum load on the internal bus is not exceeded.

Load 2 is shown attached to the 5034-PWM with a shielded cable. Shielded cables are recommended if the load draws little current which makes the output susceptible to electrical noise. This decision is based on the electrical environment the system is placed in, and must be made on an individual basis..

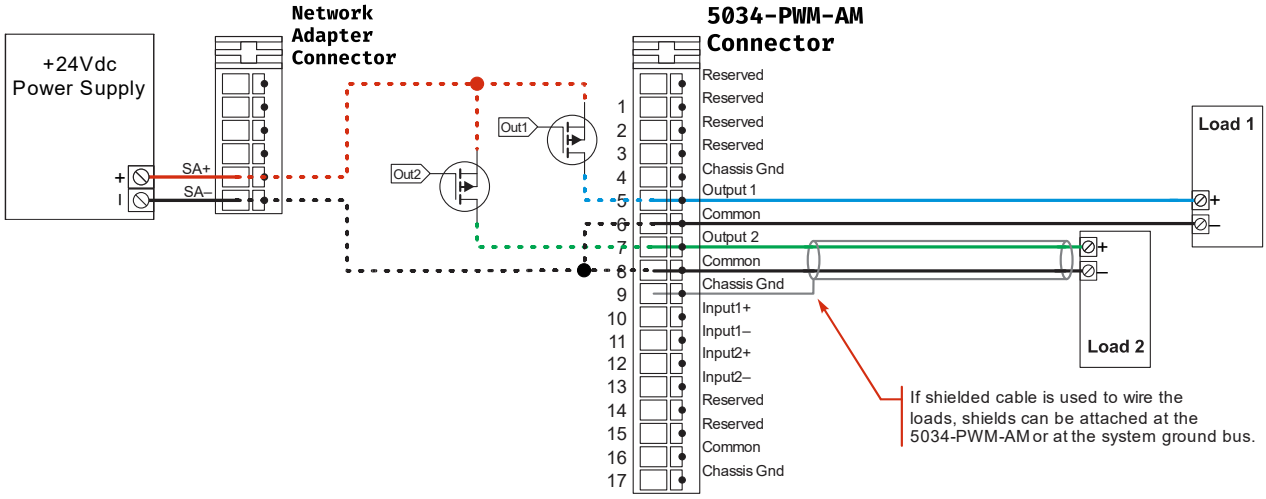


Figure T1.1 PWM Driver Wiring

1.7 General Purpose Input Wiring

1.7.1 Cable Shields

Because they are low power signals, cabling from a sensor to the 5034-PWM-AM input should be done using a twisted pair cable with an overall shield. The shield should be grounded at the end when the signal is generated, which is the sensor end. If this is not practical, the shield should be grounded to the same ground bus as the 5034-PWM-AM.

1.7.2 Input Wiring

Both inputs are differential, and can be wired to sinking or sourcing sensors without requiring a pull up or pull down resistor. They accept 8 to 27 Vdc without the need for an external current limiting resistor. Inputs require 10 mA to activate. Figure T1.3 below shows how to wire a discrete DC sourcing or sinking sensor to an input on the 5034-PWM-AM.

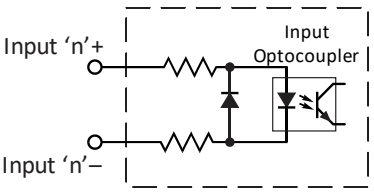


Figure T1.2 Input Schematic

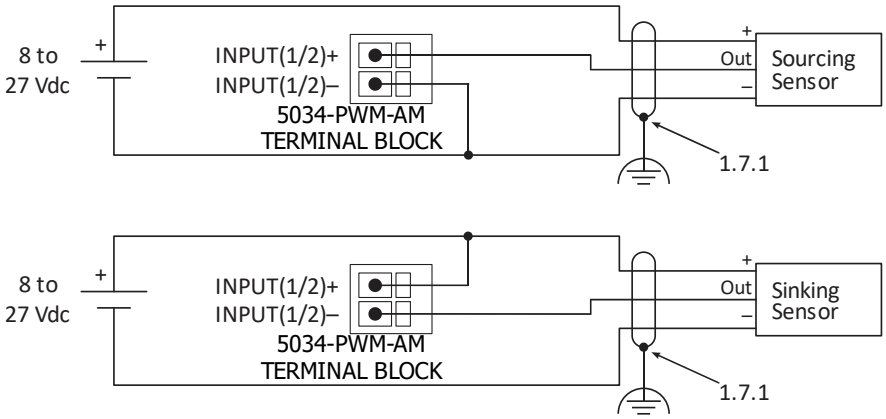


Figure T1.3 Input Wiring

TASK 2

SOFTWARE CONFIGURATION

This chapter explains how to add the 5034-PWM-AM module to your PLC project and configure it for your application.

2.1 Add-On Profile Installation

Systems that support PointMax I/O should have all necessary Add-On Profiles (AOP) installed as part of the Studio 5000 software installation or update. Early adopters of PointMax I/O may have to install the AOP manually.

The AOP for the AMCI 5034-PWM-AM was created by Rockwell Automation and is installed as part of their software update. Contact Rockwell Automation for assistance in installing the AOP update if needed.

2.2 Sample System

The screen captures in this chapter use Studio 5000 v37.0, a 5069-L310ERM processor, and a 5034-AENTR/A PointMax I/O base. This is the same setup used in the sample program which is available from AMCI. Your screens may be different if you are using a different system.

2.3 Add the PointMax I/O Base

1) Right click on the processor's Ethernet port that is attached to the PointMax I/O base. Click on "New Module..." in the pop-up menu that opens.
2) In the resulting Select Module Type screen, type "5034" into the search bar.
3) Select the appropriate base in the resulting list.
4) Click on the [Create] button to create the module.
5) Enter the appropriate information for the base, such as Name and Ethernet Address, and Chassis Size.
6) Click on the [OK] button to accept the base.
7) Click on [Close] if necessary to close the Select Module Type screen.

2.4 Add the 5034-PWM-AM Module

1) Right click on the PointMax I/O base. Click on "New Module..." in the pop-up menu that opens.
2) In the resulting Select Module Type screen, type "5034" into the search bar.
3) Select the 5034-PWM-AM module in the resulting list.
4) Click on the [Create] button to create the module.
5) Enter the appropriate information for the 5034-PWM-AM module.
   - Name: This is a required field. In the sample program, the module is named "AMCI_5034_PWM_AM"
   - Description: This is an optional field.
   - Slot: The slot number occupied by the module.
   - Revision: Leave at its default value.
   - Electronic keying: Set to "Compatible Module".
6) Click on the [OK] button to accept the definition of the 5034-PWM-AM module.
7) Click on [Close] if necessary to close the Select Module Type screen.

2.5 Set the 5034-PWM-AM Module Properties

Right click on the 5034-PWM-AM module that you need to configure. Click on "Properties" in the pop-up menu that opens.

2.5.1 Connection Settings

1) In the left hand menu, click on "Connection" to bring up the connection parameters.

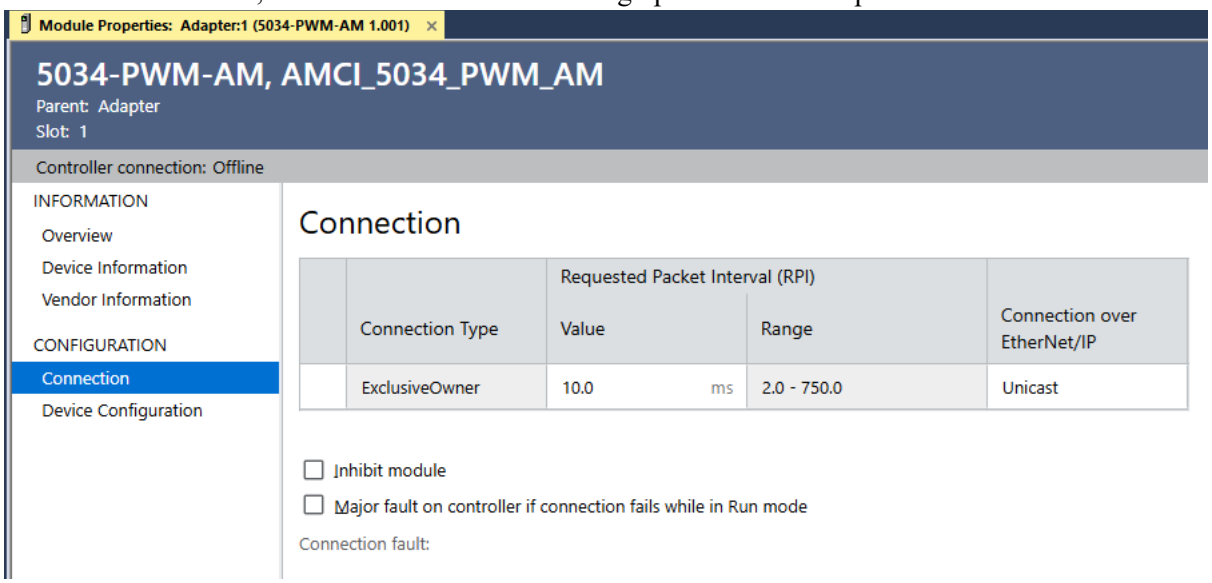


Figure T2.1 Network Connection Configuration

2) If you need to change the RPI time of the 5034-PWM-AM module, click in the "Value" field and change the value. The range of values is 2.0 to 750.0 milliseconds with a default of 10 milliseconds.
3) Click on the "Inhibit Module" checkbox if you need to inhibit the module during machine testing and commission.
4) If you want the processor to issue a Major fault if the connection to this module fails while in Run mode, click on the appropriate checkbox.
5) Click on the [Apply] button to apply changes to these connection parameters.

2.5 Set the 5034-PWM-AM Module Properties (continued)

2.5.2 Configuration Settings

1) In the left hand menu, click on "Device Configuration" to bring up the configuration parameters.

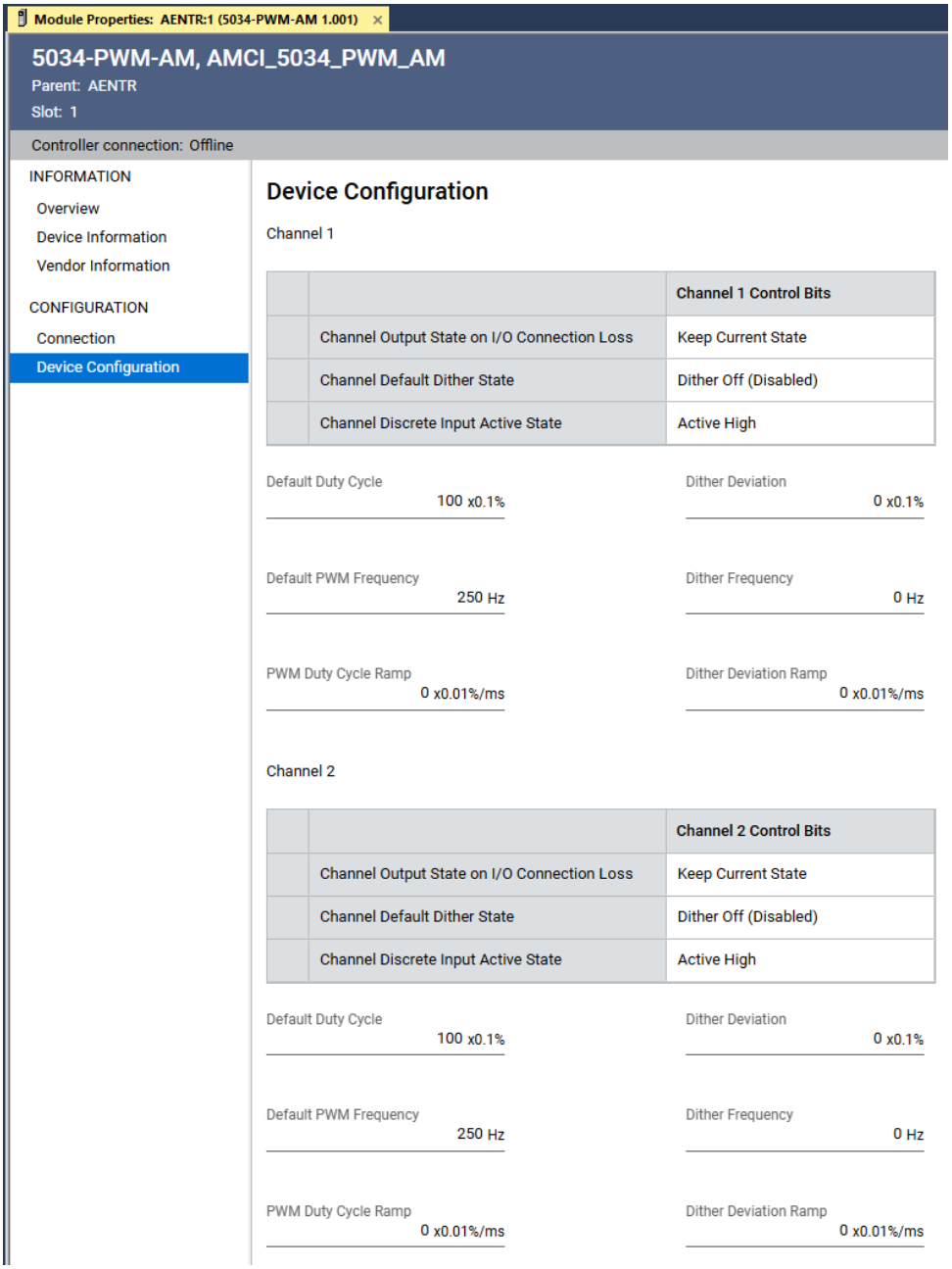


Figure T2.2 AOP Configuration Parameters

Notes

TASK 3

CONTROLLING THE 5034-PWM-AM

This task details how to configure your PLC program to control a 5034-PWM-AM from your ladder logic.

3.1 Download the Sample Program

The AMCI sample program is available as a ZIP file on our website www.amci.com. At the time this manual was written, the direct link to the sample program page is ***https://www.amci.com/industrial-automation-support/sample-programs/***. The ZIP file contains the AMCI User-Defined Data Types, the Add-On Instructions and the ladder logic sample program.

Once the ZIP file has downloaded, extract the files to a separate directory.

3.2 Import the AMCI Data Types

AMCI has created User-Defined Data Types for use with the 5034-PWM-AM module. These data types will be used to create buffers for the I/O data from the module. These AMCI custom data types should be used instead of the RA Module Defined tags assigned to the module when it was added to the project. The RA Module Defined tags are AM:5034_PWM:I and AM:5034_PWM:O. Using the AMCI user-defined data types allows you to access any new feature that may be added to the 5034-PWM-AM without the need to update the AOP in your Studio 5000 software.

1) From the main menu of Studio 5000, select "File" → "Import Component"→ "Data Type..."
2) In the window that opens, navigate to the folder that contains the unzipped AMCI sample program.
3) Navigate to the "Data_Types" folder.
4) Select the "AMCI_5034_PWM_AM_Input_Data_DataType.L5X" and click on the [Open] button.
5) The "Import Configuration" window opens. If needed, change the name of the data type in your project. Use the "Final Name:" text field for this purpose.

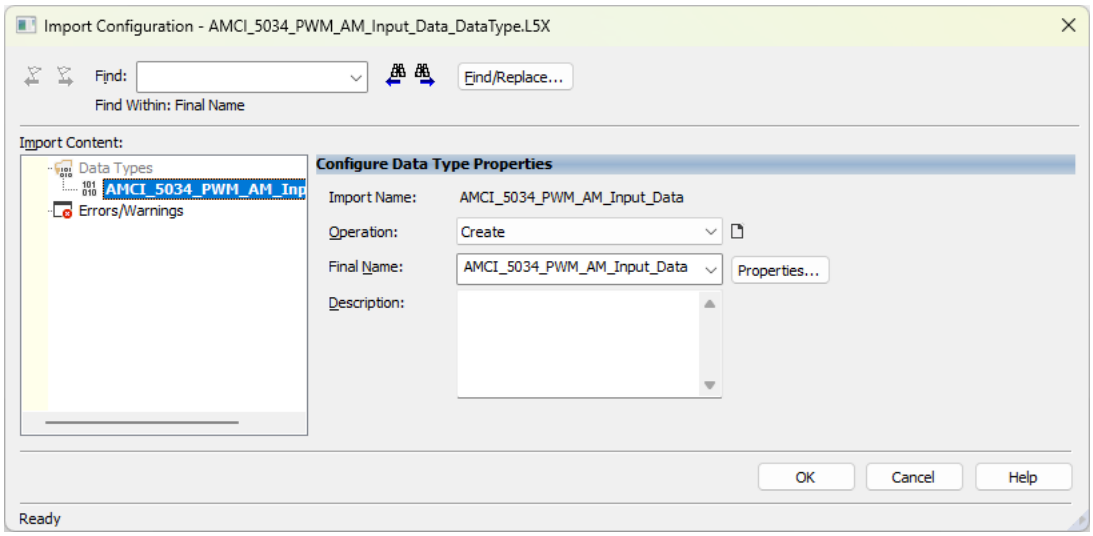


Figure T3.1 Import Data Types

6) Click on the [OK] button to import the data type.
7) Repeat this section to import the Output Data Type. The name of the file used in step 4 is "AMCI_5034_PWM_AM_Output_Data_DataType.L5X".

3.3 Import the Add-On Instructions

AMCI has written Add-On Instructions that covers all of the functionality offered by the 5034-PWM-AM. If needed, complete step 3.1 above to download the AMCI sample program for the 5034-PWM-AM module. Add-On Instructions are located in the "AOI" sub-folder of the directory where you un-zipped the AMCI sample program.

The following table lists all of the instructions and gives descriptions of their uses.

AOI Name	Description
AMCI_5034_PWM_AM_Setup	Use this instruction to program PWM Frequency, PWM Duty Cycle, and to turn Output Dithering on or off.
AMCI_5034_PWM_AM_Real_Time_Updates	Use this instruction to enable or disable Real Time Updates. Once enabled, PWM Frequency and PWM Duty Cycle can be changed, and Output Dithering can be enabled/disabled, by writing new values directly to the output buffer.
AMCI_5034_PWM_AM_Reset_Errors	Use this instruction to reset programming errors and hard-ware faults.

Table T3.1 AMCI Add-On Instructions

The Add-On Instructions are completely independent of each other. You can import only the AOIs you need for your program instead of importing all of them.

To import an AOI:

1) From the main menu of Studio 5000, select "File" → "Import Component"→ "Add-On Instruction..."
2) In the window that opens, navigate to the folder that contains the unzipped AMCI sample program.
3) Navigate to the "AOI" folder.
4) Select one of the AOIs that you need to import and click on the [Open] button.
5) The "Import Configuration" window opens. If needed, change the name of the AOI in your project. Use the "Final Name:" text field for this purpose.

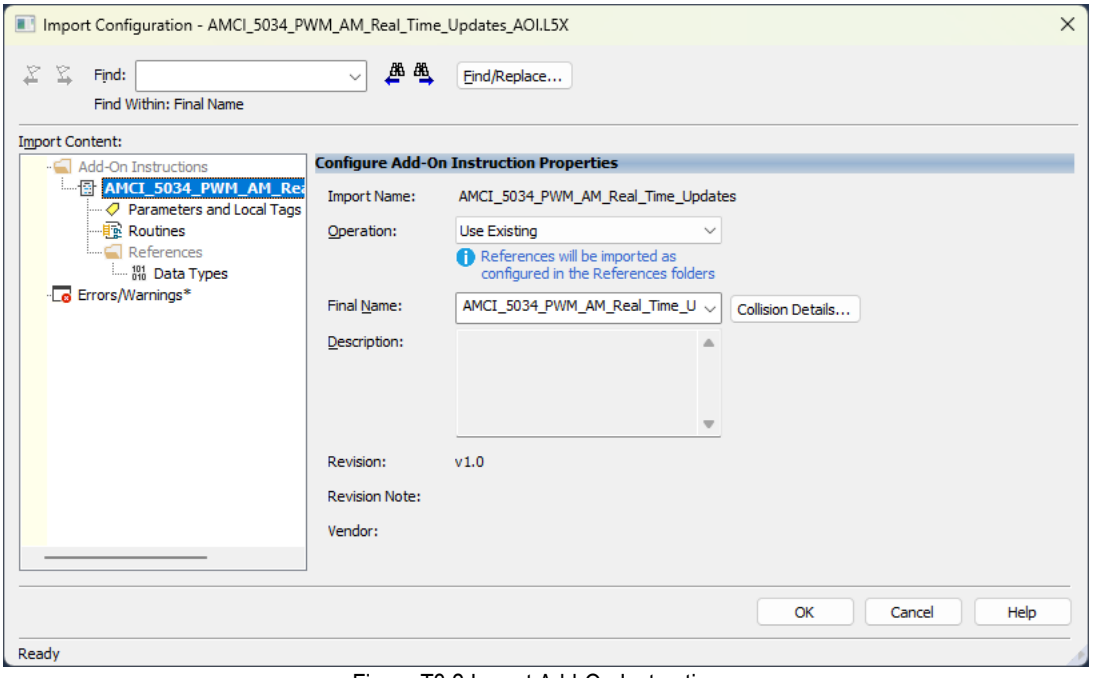


Figure T3.2 Import Add-On Instructions

6) Click on the [OK] button to import the AOI.
7) Repeat this section to import the remaining AOIs needed for your program.

3.4 Create the Input and Output Buffers

NOTE You must complete step 3.2, *Import the AMCI Data Types* on page 25 before creating the I/O buffers.

The add-on instructions require that the input data remain stable while the instructions are scanned. Systems that are programmed with the Studio 5000 software update I/O asynchronously to the program scan. Therefore, the input data from the 5034-PWM-AM must be buffered before any AMCI add-on instructions are scanned.

The 5034-PWM-AM module requires that all output data be updated at the same time. Therefore, the program must write to an output buffer during the program scan. This buffer must be copied to the module's output registers after all AMCI add-on instructions are scanned.

1) In the main menu of the Studio 5000 program, click on "Logic" → "Edit Tags".
2) Enter a name for the input buffer tags.
3) Click in the Data Type field and then click on the [...] button.
4) As shown in the figure below, select the AMCI_5034_PWM_AM_Input_Data data type.

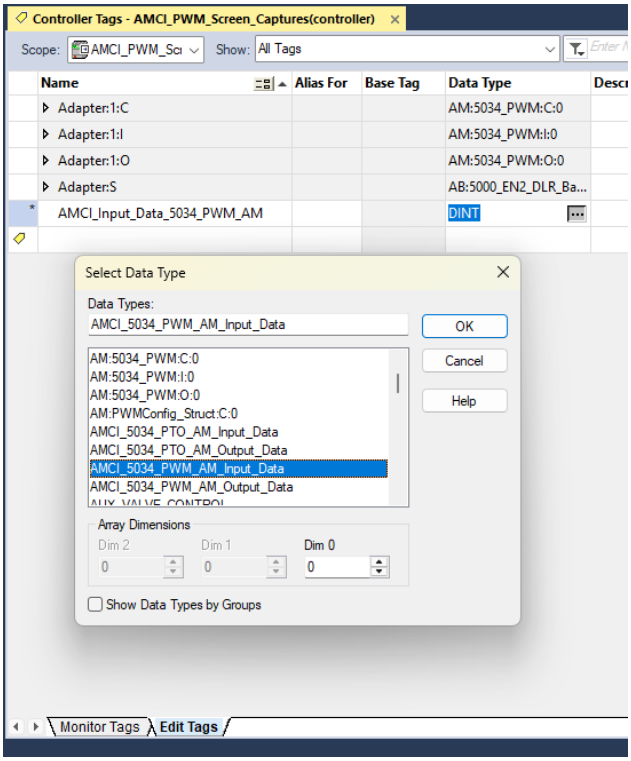


Figure T3.3 Create Input Data Buffer

5) Click on the [OK] button to set the Data Type.
6) Click inside the next row to accept the new data tags.
7) Enter a name for the output buffer tags.
8) Click in the Data Type field and then click on the [...] button.
9) In the "Select Data Type" window that opens, select the AMCI_5034_PWM_AM_Output_Data data type.
10) Click on the [OK] button to set the Data Type.
11) Click inside the next row to accept the new data tags.

3.5 Add Code to Update the Buffers

The input and output buffers should be updated in your code using unconditional CPS (Copy Synchronous) instructions. This ensures that the module is not updated during the copy. Input data from the 5034-PWM-AM is buffered at the top of the ladder logic, and the output buffer is written to the module tags at the bottom of the ladder logic. The figure below shows the two CPS instructions and a single AMCI add-on instruction that programs the setup data.

NOTE The two CPS instructions do not have to be the first and last rungs of your ladder logic, but all logic associated with the AMCI add-on instructions must occur between the two CPS rungs.

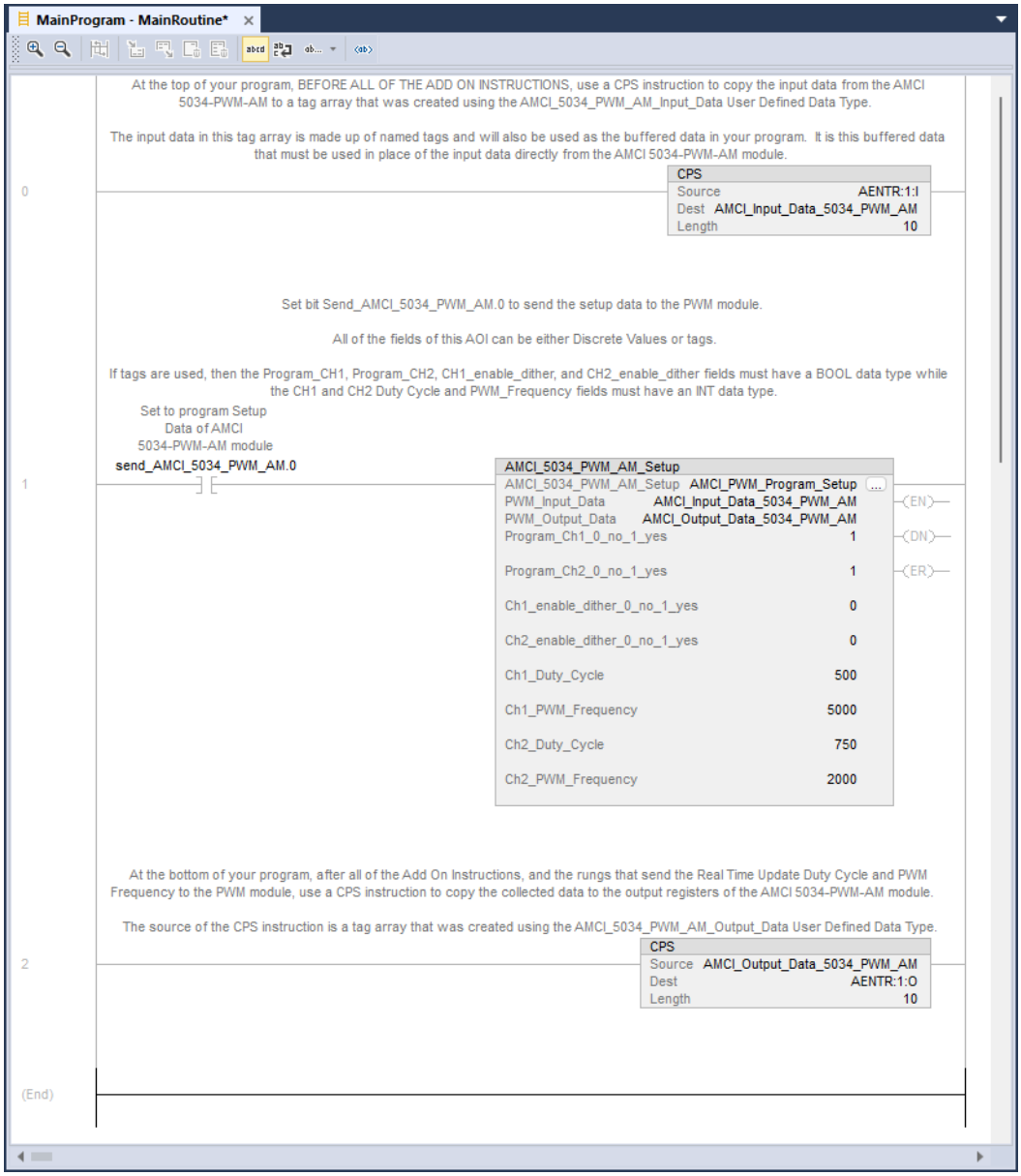


Figure T3.4 Sample Ladder Logic

3.6 Use the Add-On Instructions

Each AMCI add-on instruction requires the rung to make a false-to-true transition before it operates. Please refer to the sample program for information on using the AMCI AOIs.

The *AOI Reference* chapter, which starts on page 29, lists the each AOI, its parameters, and its enumerations.

This chapter lists the AMCI add-on instructions, their parameters, and their Enumerations.

AOI List

AOI Name	Description	Page #
AMCI_5034_PWM_AM_Setup	Use this instruction to program the following parameters:	29
AMCI_5034_PWM_AM_Real_Time_Updates	Use this instruction to enable or disable real time updates of the following parameters: Real Time updates are accomplished by writing directly to the output buffer. An AOI for writing the Real Time Updates is not required.	30
AMCI_5034_PWM_AM_Reset_Errors	Use this instruction to clear programming errors and reset hardware faults.	31

Table R2.1 Add On Instruction List

AMCI_5034_PWM_AM_Setup

Parameter	Description
PWM_Input_Data	Input data from the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the input tags directly associated with the module.
PWM_Output_Data	Output data to the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the output tags directly associated with the module.
Program_Ch1_0_no_1_yes	0 = Do not change the parameter for channel 1. 1 = Change the parameters for channel 1 to the values below.
Program_Ch2_0_no_1_yes	0 = Do not change the parameter for channel 2. 1 = Change the parameters for channel 2 to the values below.
Ch1_enable_dither_0_no_1_yes	0 = Disable Dither for channel 1. 1 = Enable Dither for channel 1.
Ch2_enable_dither_0_no_1_yes	0 = Disable Dither for channel 2. 1 = Enable Dither for channel 2.
Ch1_Duty_Cycle	Range depends on the programmed PWM Frequency: 20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time) 8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)
Ch1_PWM_Frequency	Integer value of 20 to 20,000 (20 to 20,000 Hz)
Ch2_Duty_Cycle	Range depends on the programmed PWM Frequency: 20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time) 8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)
Ch2_PWM_Frequency	Integer value of 20 to 20,000 (20 to 20,000 Hz)

Table R2.2 AMCI_5034_PWM_AM_Setup Parameters

AMCI_5034_PWM_AM_Setup (continued)

Enumeration	Set When...	Reset When...
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the module	Rung is false
ER (Error)	There is an hardware fault or a Command or Configuration Error	Rung is false

Table R2.3 AMCI_5034_PWM_AM_Setup Enumerations

AMCI_5034_PWM_AM_Real_Time_Updates

Parameter	Description
PWM_Input_Data	Input data from the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the input tags directly associated with the module.
PWM_Output_Data	Output data to the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the output tags directly associated with the module.
EN_Ch1_Real_Time_updates_0_no_1_yes	0 = Disable Real Time Updates for channel 1. 1 = Enable Real Time Updates for channel 1.
EN_Ch2_Real_Time_updates_0_no_1_yes	0 = Disable Real Time Updates for channel 2. 1 = Enable Real Time Updates for channel 2.

Table R2.4 AMCI_5034_PWM_AM_Real_Time_Updates Parameters

Enumeration	Set When...	Reset When...
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the module	Rung is false
ER (Error)	There is a hardware fault or a Command or Configuration Error	Rung is false

Table R2.5 AMCI_5034_PWM_AM_Real_Time_Updates Enumerations

AMCI_5034_PWM_AM_Reset_Errors

Parameter	Description
PWM_Input_Data	Input data from the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the input tags directly associated with the module.
PWM_Output_Data	Output data to the 5034-PWM-AM. Use the buffered data created in step 3.4 on page 27 instead of the output tags directly associated with the module.
Clear_Errors_0_no_1_yes	0 = Do not attempt to clear all programming errors. 1 = Attempt to clear all programming errors.
Reset_Hardware_Faults_0_no_1_yes	0 = Do not attempt to clear hardware faults. 1 = Attempt to clear hardware faults.

Table R2.6 AMCI_5034_PWM_AM_Reset_Errors Parameters

Enumeration	Set When...	Reset When...
EN (Enable)	Rung is true	Rung is false
DN (Done)	Command is sent to the module	Rung is false
ER (Error)	There is an hardware fault or a Command or Configuration Error	Rung is false

Table R2.7 AMCI_5034_PWM_AM_Reset_Errors Enumerations

Notes

REFERENCE 3

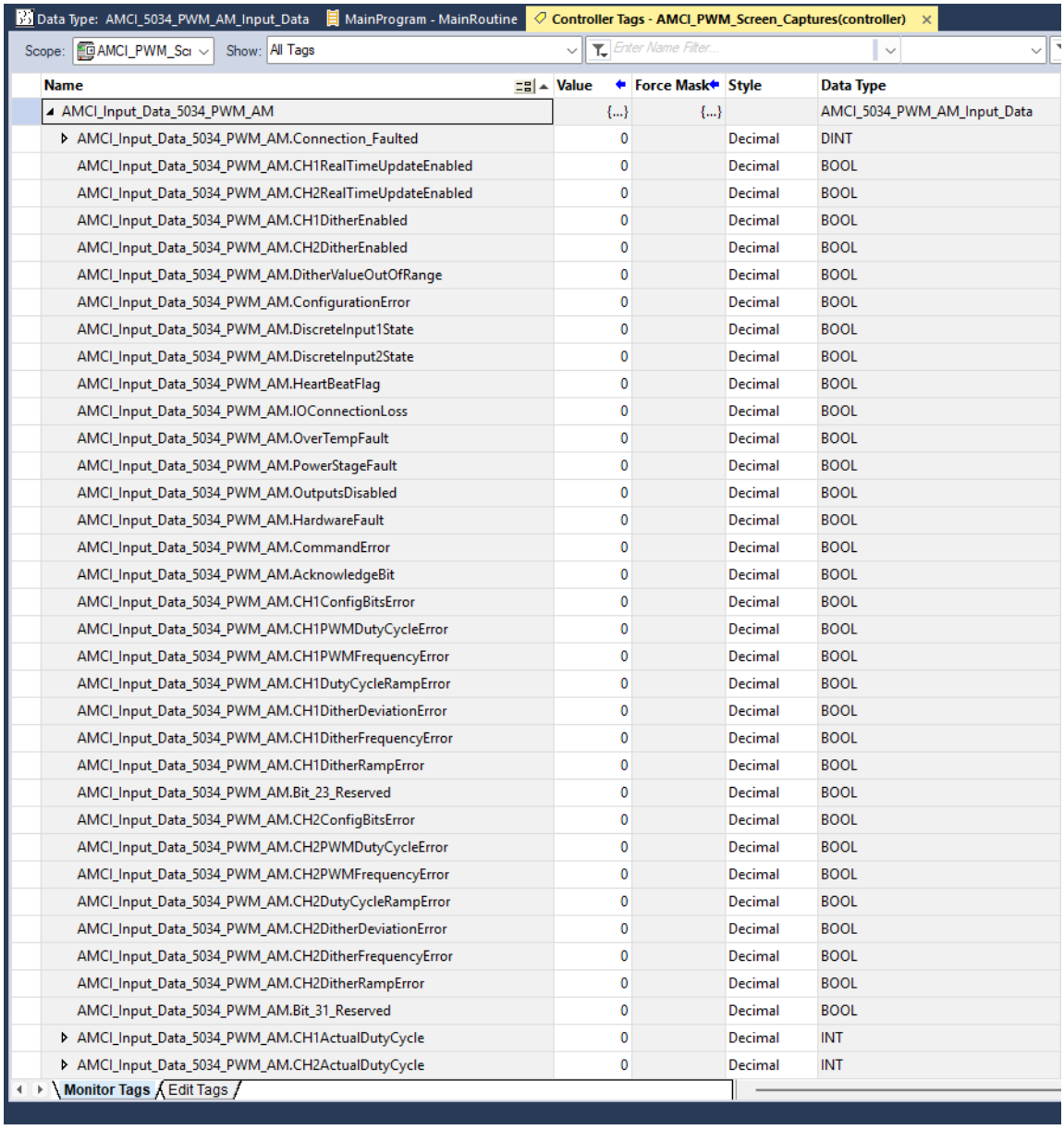
I/O DATA FORMAT

This chapter lists the format of the input and output tags assigned to the 5034-PWM-AM.

Format of Input Data Tags

The format of the buffered input data available from the 5034-PWM-AM is shown below. To access this data, start from the Studio 5000 software's main menu, click on "Logic" and then click on "Monitor Tags". The data is listed under the name of the buffer you created in step 3.4 above. In the image below the name of the buffer is "AMCI_Input_Data_5034_PWM_AM".

The ConnectionFaulted register is controlled by the processor and equals zero if the connection is operating correctly. It will have a non-zero value when there is a communication fault between the processor and the 5034-PWM-AM.



Name	Value	Force Mask	Style	Data Type
AMCI_Input_Data_5034_PWM_AM	{...}	{...}		AMCI_5034_PWM_AM_Input_Data
AMCI_Input_Data_5034_PWM_AM.Connection_Faulted	0		Decimal	DINT
AMCI_Input_Data_5034_PWM_AM.CH1RealTimeUpdateEnabled	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2RealTimeUpdateEnabled	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1DitherEnabled	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2DitherEnabled	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.DitherValueOutOfRange	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.ConfigurationError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.DiscreteInput1State	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.DiscreteInput2State	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.HeartBeatFlag	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.IOConnectionLoss	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.OverTempFault	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.PowerStageFault	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.OutputsDisabled	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.HardwareFault	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CommandError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.AcknowledgeBit	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1ConfigBitsError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1PWMDutyCycleError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1PWMFrequencyError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1DutyCycleRampError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1DitherDeviationError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1DitherFrequencyError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1DitherRampError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.Bit_23_Reserved	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2ConfigBitsError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2PWMDutyCycleError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2PWMFrequencyError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2DutyCycleRampError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2DitherDeviationError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2DitherFrequencyError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH2DitherRampError	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.Bit_31_Reserved	0		Decimal	BOOL
AMCI_Input_Data_5034_PWM_AM.CH1ActualDutyCycle	0		Decimal	INT
AMCI_Input_Data_5034_PWM_AM.CH2ActualDutyCycle	0		Decimal	INT

Figure R3.1 Buffered Input Tag Layout

Format of Input Data Tags (continued)

Boolean Status & Error Bits

All of the boolean bits shown in the figure above are located in the buffered input data. The figure below shows the layout of the bits within the word.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit_31_Reserved	CH2DitherRampError	CH2DitherFrequencyError	CH2DitherDeviationError	CH2DutyCycleRampError	CH2PWMFrequencyError	CH2PWMDutyCycleError	CH2ConfigBitsError	Bit_23_Reserved	CH1DitherRampError	CH1DitherFrequencyError	CH1DitherDeviationError	CH1DutyCycleRampError	CH1PWMFrequencyError	CH1PWMDutyCycleError	CH1ConfigBitsError	AcknowledgeBit	CommandError	HardwareFault	OutputsDisabled	PowerStageFault	OverTempFault	IOConnectionLoss	HeartBeatBit	DiscreteInput2State	DiscreteInput1State	ConfigurationError	DitherValueOutOfRange	CH2DitherEnabled	CH1DitherEnabled	CH2RealTimeUpdateEnabled	CH1RealTimeUpdateEnabled

Figure T3.5 Status Word Input Register

Bit 0: **CH1RealTimeUpdateEnable:** Set to "1" when the channel 1 is programmed to accept changes to CH1 PWM Frequency, CH1 PWM Duty Cycle, and CH1 Dither Enable as soon as the data is written to the module. Set to "0" when a Setup AOI is needed to change these parameter values.

Bit 1: **CH2RealTimeUpdateEnable:** Set to "1" when the channel 2 is programmed to accept changes to CH2 PWM Frequency, CH2 PWM Duty Cycle, and CH2 Dither Enable as soon as the data is written to the module. Set to "0" when a Setup AOI is needed to change these parameter values.

Bit 2: **CH1DitherEnabled:** Set to "1" when Output Dither is enabled on channel 1. Output Dither is programmed in the configuration data written to the module when it connects to the network. These parameters are available in the module properties.

Bit 3: **CH2DitherEnabled:** Set to "1" when Output Dither is enabled on channel 2. Output Dither is programmed in the configuration data written to the module when it connects to the network. These parameters are available in the module properties.

Bit 4: **DitherValueOutOfRange:** Set to "1" under the following conditions:

- The applied dithering value is less than the configured Dither Deviation parameter to keep the calculated Duty Cycle within its acceptable range.
- The configured Dither Frequency is greater that 1/4 of the programmed PWM Frequency. This can occur if the PWM Frequency is changed with a Setup AOI or with Real Time Updates. In this case, the Dither Frequency is reduced to be 1/4 of the programmed PWM Frequency.

Refer to the ***Dithering Control***, which starts on page 12, for a full explanation of when this bit is set.

Bit 5: **ConfigurationError:** Set to "1" when the configuration data written down to the module when it connected to the network is incorrect. Bits 16 through 22 and 24 through 30 report the exact error. Configuration data is set up when the module is added to the project. Refer to section 2.5, ***Set the 5034-PWM-AM Module Properties***, which starts on page 22 for information on setting the configuration data.

Bit 6: **DiscreteInput1State:** Set to "1" when Input 1 is in its active state. Set to "0" when Input 1 is in its inactive state.

Bit 7: **DiscreteInput2State:** Set to "1" when Input 2 is in its active state. Set to "0" when Input 1 is in its inactive state.

Format of Input Data Tags (continued)

Boolean Status & Error Bits (continued)

Bit 8: HeartbeatBit: This bit changes state every 500 milliseconds and can be used to monitor active communications between the 5034-PWM-AM and your PLC.

Bit 9: IOConnectionLoss: This bit is related to the network connection at the protocol level. Normally "0" this bit is set to "1" if there is a loss of communications, once communications is reestablished. This error is often caused by a physical issue, such a physical break or electrical noise in the network cable, or the module not seated in the mounting base correctly.

Bit 10: OverTempFault: Set to "1" if the temperature of the module exceeds 95°C (203°F). This bit will clear itself when the internal temperature falls below 85°C (185°F) The PowerStateFault bit is also set. Both outputs are disabled while the PowerStageFault bit is active.

Bit 11: PowerStageFault: Set to "1" if there is an overcurrent or overtemperature condition, or a short circuit in the field wiring in one or both of the outputs. This bit is latched and the outputs are disabled while this bit equals "1". This bit can be cleared with the AMCI_5034_PWM_AM_Reset_Errors AOI with the Reset_Hardware_Faults_0_no_1_yes parameter is set to "1".

Bit 12: OutputsDisabled: Reset to "0" when the outputs are enabled. Set to "1" if the outputs are disabled for any reason. This is a status bit, not an error bit. The only way to clear this bit is to clear the error or fault that disabled the outputs. The outputs are disabled during an overcurrent or overtemperature condition, or a short circuit in the field wiring in one or both of the outputs, or power has been cycled to the module and correct configuration data has not been sent to it.

Bit 13: HardwareFault: This bit is normally reset to "0" and is set to "1" when there is a hardware fault that is preventing normal operation. The status LED's on the front of the module may help you determine the cause of the error. See ***Status LED's***, which starts on page 8, for additional information.
You may be able to clear this fault by cycling power to the module or using the AMCI_5034_PWM_AM_Reset_Errors AOI with the Reset_Hardware_Faults_0_no_1_yes parameter is set to "1".

Bit 14: CommandError: Set to "1" if there is an error in the last command data written to the module. This includes data written to the module while it is accepting Real Time Updates. Bits 16 through 22 and 24 through 30 report the exact error. This bit is latched and new programming data is not accepted for the channel that has the errors. This bit can be cleared with the AMCI_5034_PWM_AM_Reset_Errors AOI when the Clear_Errors_0_no_1_yes parameter is set to "1".

Bit 15: AcknowledgeBit: Handshake protocol response bit. Used with the Transmit bit in the output data to control the data transfer to the 5034-PWM-AM. This bit is set to '1' when the Transmit bit is '1' and the programming data has been accepted. This bit is set to '0' when the Transmit bit is '0'.

Bit 16: CH1ConfigBitsError: Set to "1" when the Channel Default Dither State parameter is set to its "Dither On (Enabled)" state and either or both of the "Dither Deviation" and "Dither Frequency" parameters are set to zero.

Bit 17: CH1PWMDutyCycleError: Set to "1" when the value for the PWM Duty Cycle parameter for channel 1 is outside its valid range. The valid range of PWM Duty Cycle value is based on the PWM Frequency and are:

20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time)
8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)

Bit 18: CH1PWMFrequencyError: Set to "1" when the value of the PWM Frequency parameter for channel 1 is outside its valid range of 20Hz to 20 kHz.

Bit 19: CH1DutyCycleRampError: Set to "1" when the value for the PWM Duty Cycle Ramp parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the duty cycle ramp functionality for the channel.

Format of Input Data Tags (continued)

Boolean Status & Error Bits (continued)

Bit 20: CH1DitherDeviationError: Set to "1" when the value for the Dither Deviation parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 500, which represents a value of 0 to 50.0%. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Frequency and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.

Bit 21: CH1DitherFrequencyError: Set to "1" when the configured value for the Dither Frequency parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 0.25*{Programmed PWM Frequency}. Note that non-integer values in this calculation must be rounded down. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Deviation and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.
- This bit is only set when if the Configuration data written down to the module when it connects to the network is incorrect. This bit is not set of the PWM frequency is later changed. In this case, Bit 4: *DitherValueOutOfRange* is set to "1" instead.

Bit 22: CH1DitherRampError: Set to "1" when the value for the Dither Deviation Ramp parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the dither ramp functionality.

Bit 23: Bit_23_Reserved: This bit is reserved for future expansion and will always equal "0".

Bit 24: CH2ConfigBitsError: Set to "1" when the Channel Default Dither State parameter is set to its "Dither On (Enabled)" state and either or both of the "Dither Deviation" and "Dither Frequency" parameters are set to zero.

Bit 25: CH2PWMDutyCycleError: Set to "1" when the value for the PWM Duty Cycle parameter for channel 2 is outside its valid range. The valid range of PWM Duty Cycle value is based on the PWM Frequency and are:

20 Hz to 8000 Hz: 1.0% to 99.0%
8001 Hz to 20 kHz: 2.5% to 97.5%

Bit 26: CH2PWMFrequencyError: Set to "1" when the value of the PWM Frequency parameter for channel 2 is outside its valid range of 20Hz to 20 kHz.

Bit 27: CH2DutyCycleRampError: Set to "1" when the value for the PWM Duty Cycle Ramp parameter for channel 2 is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the duty cycle ramp functionality for the channel.

Bit 28: CH2DitherDeviationError: Set to "1" when the value for the Dither Deviation parameter for channel 2 is outside its valid range. The valid range is an integer value between 0 and 500, which represents a value of 0 to 50.0%. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Frequency and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.

Bit 29: CH2DitherFrequencyError: Set to "1" when the value for the Dither Frequency parameter for channel 2 is outside its valid range. The valid range is an integer value between 0 and 0.25*{Programmed PWM Frequency}. Note that non-integer values in this calculation must be rounded down. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Deviation and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.
- This bit is only set when if the Configuration data written down to the module when it connects to the network is incorrect. This bit is not set of the PWM frequency is later changed. In this case, Bit 4: *DitherValueOutOfRange* is set to "1" instead.

Format of Input Data Tags (continued)

Boolean Status & Error Bits (continued)

Bit 30: CH2DitherRampError: Set to "1" when the value for the Dither Deviation Ramp parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the dither ramp functionality.

Bit 31: Bit_31_Reserved: This bit is reserved for future expansion and will always equal "0".

Other Input Tags

CH1ActualDutyCycle: The current duty cycle value of the channel 1 output. This is a real time value and includes any variations caused by the ramping and/or dithering functionality if they are enabled.

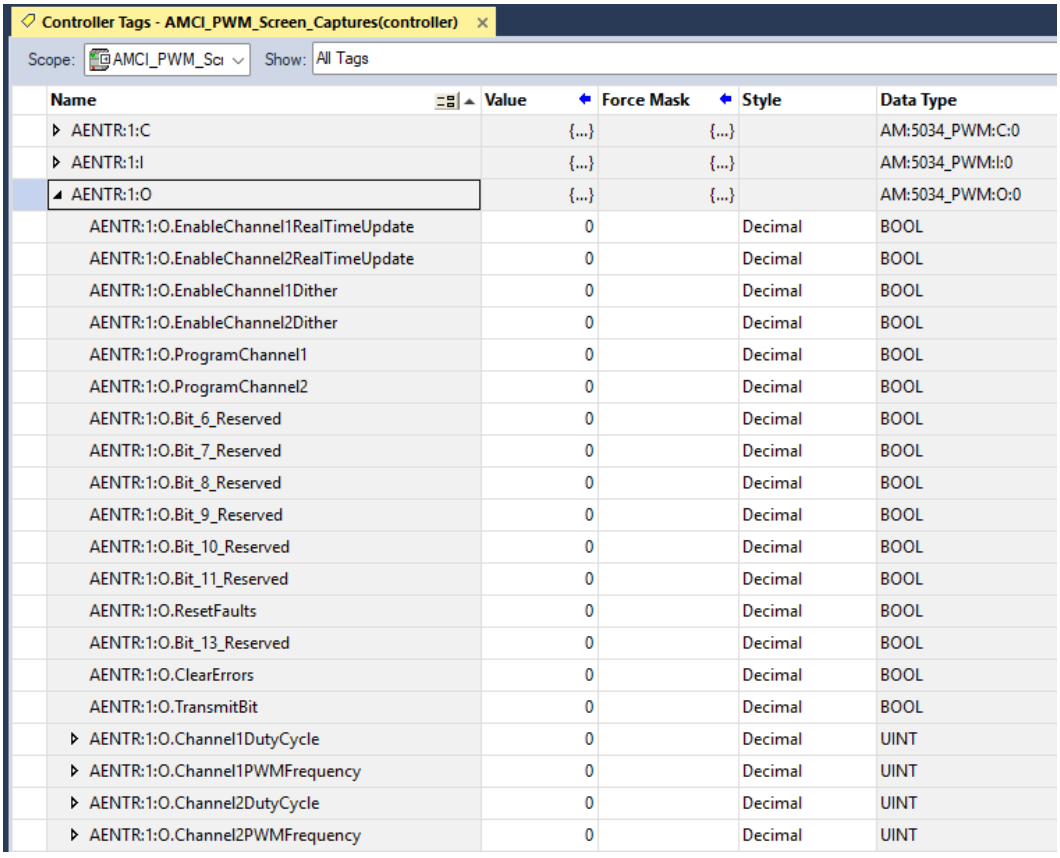
CH2ActualDutyCycle: The current duty cycle value of the channel 2 output. This is a real time value and includes any variations caused by the ramping and/or dithering functionality if they are enabled.

Format of Output Data Tags

Viewing output data values is usually only done during troubleshooting, and there is no advantage to looking at the buffer instead of the actual output data assigned to the module. Therefore, the figure below shows the tags of the output data assigned to the 5034-PWM-AM instead of the output buffer tags.

To access this data, start from the Studio 5000 software's main menu, click on "Logic" and then click on "Monitor Tags". The data is listed under the name of the PointMax I/O adapter, followed by the slot number assigned to the 5034-PWM-AM and then the letter "O". In the image below the name of the PointMax I/O adapter is "AENTR" and the 5034-PWM-AM is assigned to slot 1. The output data from the 5034-PWM-AM is located in the tags that begin "AENTR:1:O".

All of the boolean bits shown in the figure below are located in word 0 of the output data. These bits are directly controlled by the available AOIs. They are shown here to help with troubleshooting.



Name	Value	Force Mask	Style	Data Type
AENTR:1:C	{...}	{...}		AM:5034_PWM:C:0
AENTR:1:I	{...}	{...}		AM:5034_PWM:I:0
AENTR:1:O	{...}	{...}		AM:5034_PWM:O:0
AENTR:1:O.EnableChannel1RealTimeUpdate	0		Decimal	BOOL
AENTR:1:O.EnableChannel2RealTimeUpdate	0		Decimal	BOOL
AENTR:1:O.EnableChannel1Dither	0		Decimal	BOOL
AENTR:1:O.EnableChannel2Dither	0		Decimal	BOOL
AENTR:1:O.ProgramChannel1	0		Decimal	BOOL
AENTR:1:O.ProgramChannel2	0		Decimal	BOOL
AENTR:1:O.Bit_6_Reserved	0		Decimal	BOOL
AENTR:1:O.Bit_7_Reserved	0		Decimal	BOOL
AENTR:1:O.Bit_8_Reserved	0		Decimal	BOOL
AENTR:1:O.Bit_9_Reserved	0		Decimal	BOOL
AENTR:1:O.Bit_10_Reserved	0		Decimal	BOOL
AENTR:1:O.Bit_11_Reserved	0		Decimal	BOOL
AENTR:1:O.ResetFaults	0		Decimal	BOOL
AENTR:1:O.Bit_13_Reserved	0		Decimal	BOOL
AENTR:1:O.ClearErrors	0		Decimal	BOOL
AENTR:1:O.TransmitBit	0		Decimal	BOOL
AENTR:1:O.Channel1DutyCycle	0		Decimal	UINT
AENTR:1:O.Channel1PWMFrequency	0		Decimal	UINT
AENTR:1:O.Channel2DutyCycle	0		Decimal	UINT
AENTR:1:O.Channel2PWMFrequency	0		Decimal	UINT

Figure R3.2 Output Tag Layout

Format of Output Data Tags (continued)

Boolean Control Bits

These control bits are all listed as separate boolean bits in the output tags, but they are all contained in the first output word assigned to the 5034-PWM-AM module.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TransmitBit	ClearErrors	Bit_13_Reserved	ResetFaults	Bit_11_Reserved	Bit_10_Reserved	Bit_9_Reserved	Bit_8_Reserved	Bit_7_Reserved	Bit_6_Reserved	ProgramChannel2	ProgramChannel1	EnableChannel2Dither	EnableChannel1Dither	EnableChannel2RealTimeUpdate	EnableChannel1RealTimeUpdate

Figure T3.6 Boolean Control Output Bits

Bit 0: **EnableChannel1RealTimeUpdate:** Reset to “0” to disable channel 1 real time updates. Set to “1” to enable channel 1 real time updates. This bit is only acted on when Bit 4, ProgramChannel1 bit is “1”. Programmed with the AMCI_5034_PWM_AM_Real_Time_Updates AOI.

Bit 1: **EnableChannel2RealTimeUpdate:** Reset to “0” to disable channel 2 real time updates. Set to “1” to enable channel 2 real time updates. This bit is only acted on when Bit 5, ProgramChannel2 bit is “1”. Programmed with the AMCI_5034_PWM_AM_Real_Time_Updates AOI.

Bit 2: **EnableChannel1Dither:** Reset to “0” to disable channel 1 dither. Set to “1” to enable channel 1 dither. This bit can be programmed with the AMCI_5034_PWM_AM_Setup AOI or changed in real time once Real Time Updates are enabled.

Bit 3: **EnableChannel2Dither:** Reset to “0” to disable channel 2 dither. Set to “1” to enable channel 2 dither. This bit can be programmed with the AMCI_5034_PWM_AM_Setup AOI or changed in real time once Real Time Updates are enabled.

Bit 4: **ProgramChannel1:** Set to “1” to program the PWM Frequency, Duty Cycle, Dither Enable/Disable and Real Time Update Enable/Disable for channel 1. Set to “0” to leave these parameters in their last state. This bit is used by the AMCI_5034_PWM_AM_Real_Time_Updates AOI and the AMCI_5034_PWM_AM_Setup AOI.

Bit 5: **ProgramChannel2:** Set to “1” to program the PWM Frequency, Duty Cycle, Dither Enable/Disable and Real Time Update Enable/Disable for channel 2. Set to “0” to leave these parameters in their last state. This bit is used by the AMCI_5034_PWM_AM_Real_Time_Updates AOI and the AMCI_5034_PWM_AM_Setup AOI.

Bit 6: **Bit_6_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Bit 7: **Bit_7_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Bit 8: **Bit_8_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Bit 9: **Bit_9_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Bit 10: **Bit_10_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Bit 11: **Bit_11_Reserved:** Reserved for future expansion. This bit must always equal “0”.

Format of Output Data Tags (continued)

Boolean Control Bits (continued)

Bit 12: ResetFaults: Set to "1" to reset hardware faults. Reset to "0" when not in use. This bit is used by the AMCI_5034_PWM_AM_Reset_Errors AOI. After using this AOI, check the states of the hardware fault bits. If they are still set to "1", then the condition that caused the fault is still active.

Bit 13: Bit_13_Reserved: Reserved for future expansion. This bit must always equal "0".

Bit 14: ClearErrors: Set to "1" to reset command errors caused when new parameter values are outside of their allowed ranges. Reset to "0" when not in use. Note that command errors must be cleared before attempting to reprogram parameters. This bit is used by the AMCI_5034_PWM_AM_Reset_Errors AOI.

Bit 15: TransmitBit: This bit, along with the Acknowledge bit, is used to control a Programming Cycle to the 5034-PWM-AM module. It is used in all three AOIs supplied by AMCI.

Other Output Tags

Channel1DutyCycle: The duty cycle parameter of channel 1. Its range depends on the channel's programmed PWM Frequency:

- 20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time)
- 8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)

Channel1PWMFrequency: The PWM frequency parameter of channel 1. This is an integer value of 20 to 20,000, representing a frequency of 20 Hz to 20 kHz.

Channel2DutyCycle: The duty cycle parameter of channel 1. Its range depends on the channel's programmed PWM Frequency:

- 20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time)
- 8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)

Channel2PWMFrequency: The PWM frequency parameter of channel 2. This is an integer value of 20 to 20,000, representing a frequency of 20 Hz to 20 kHz.

Notes

REFERENCE 4

TROUBLESHOOTING INFORMATION

This reference lists the available status bits and the conditions under which they are commonly set.

Channel Parameter Error Bits

These bits are set to "1" when the corresponding parameter is outside of its valid range. For some of these parameters, it is possible for the error to exist in the configuration data or in the programming data of the last command sent to the module. If the error is in the configuration data, the *ConfigurationError* bit will also be set. If the error is in the data in the last command, the *CommandError* bit will also be set.

CH'n'ConfigBitsError: Set to "1" when the Channel Default Dither State parameter is set to its "Dither On (Enabled)" state and either or both of the "Dither Deviation" and "Dither Frequency" parameters for the channel are set to zero. This means you are inadvertently enabling the dither functionality on the channel or there is an error in one or more of the other dither functionality parameters.

CH'n'PWMDutyCycleError: Set to "1" when the value for the PWM Duty Cycle parameter for the channel is outside its valid range. The valid range of PWM Duty Cycle value is based on the PWM Frequency and are:

- 20 to 8,000 Hz: 0, 10 to 990 (0.0%, 1.0% to 99.0% on-time)
- 8,001 to 20,000 Hz: 0, 25 to 975 (0.0%, 2.5% to 97.5% on-time)

CH'n'PWMFrequencyError: Set to "1" when the value of the PWM Frequency parameter for the channel is outside its valid range of 20 Hz to 20 kHz.

CH'n'DutyCycleRampError: This parameter is only available in configuration data. Set to "1" when the value for the PWM Duty Cycle Ramp parameter for the channel is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the duty cycle ramp functionality.

CH'n'DitherDeviationError: This parameter is only available in configuration data. Set to "1" when the value for the Dither Deviation parameter for the channel is outside its valid range. The valid range is an integer value between 0 and 500, which represents a value of 0 to 50.0%. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Frequency and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.

CH'n'DitherFrequencyError: This parameter is only available in configuration data. Set to "1" when the value for the Dither Frequency parameter for channel 1 is outside its valid range. The valid range is an integer value between 0 and 0.25*{Configured PWM Frequency}. Note that non-integer values in this calculation must be rounded down. A value of zero disables the dithering functionality.

- If this parameter equals zero then the Dither Deviation and Dither Ramp parameters for the channel must also be zero and the Dither Enable bit for the channel must remain zero.

CH'n'DitherRampError: Set to "1" when the value for the Dither Deviation Ramp parameter for the channel is outside its valid range. The valid range is an integer value between 0 and 10,000, which represents a value from 0 to 100.00%/millisecond. A value of zero disables the dither ramp functionality.

ConfigurationError Bit

This bit is set when there is an error in the configuration data written to the module. Configuration data is accessed from the *Device Configuration* screen of the module's properties. To access this, right click on the module in the IO tree and select "Properties". Then select "Device Configuration" from the left menu bar.

When this bit is set to "1", one of the Channel Parameter Error Bits listed above will also be set. Refer to the descriptions of those bits to determine which parameter has the error.

To clear the error, set the parameter to a value within its range and select "Connection" from the left menu bar. Click on the checkbox next to "Inhibit Module" to select it. Click on the [Apply] button to inhibit the module. Click on the checkbox next to "Inhibit Module" to deselect it. Click on the [Apply] button to enable the module. The new configuration data is written to the module. Check the error bits to see if the problem has been solved.

CommandError Bit

This bit is set if there is an error in the programming data written to the module, typically with the *AMCI_5034_PWM_AM_Setup* AIO. Note that the AOI's ER bit will also set.

Note that a command error must be cleared before new programming data is accepted. This is accomplished by using the *AMCI_52034_PWM_AM_Reset Errors* AOI with the *Clear_Error_0_no_1_yes* parameter set to "1".

The CommandError bit is set under the following conditions:

1) Any bit in the output tags that is marked "Reserved", such as "Bit_6_Reserved", is set to "1".
2) You attempted to enable the channel 1's dither function when the configured Dither Deviation and Dither Frequency parameters equal zero. If you are using the *AMCI_5034_PWM_AM_Setup* AOI, you set the *Ch1_enable_dither_0_no_1_yes* parameter to "1". Note that the CH1DitherDeviationError and CH1DitherFrequencyError bits will also be set.
3) You attempted to enable the channel 2's dither function when the configured Dither Deviation and Dither Frequency parameters equal zero. If you are using the *AMCI_5034_PWM_AM_Setup* AOI, you set the *Ch2_enable_dither_0_no_1_yes* parameter to "1". Note that the CH2DitherDeviationError and CH2DitherFrequencyError bits will also be set.
4) You attempted to program a channel's duty cycle outside of its valid range. The CH1PWMDutyCycleError or CH2PWMDutyCycleError bit will also be set to "1". Refer to the error bit description in the ***Channel Parameter Error Bits***, which starts on page 41, for a description of the valid duty cycle ranges.
5) You attempted to program a channel's PWM frequency outside of its valid range of 20 Hz to 20 kHz. The CH1PWMFrequencyError or CH2PWMFrequencyError bit will also be set to "1".
6) You attempted to program a channel while it has a Configuration Error. The ConfigurationError bit will be set to "1" along with the appropriate parameter bit. See the ***ConfigurationError Bit*** description above.

Real Time Updates

The Real Time Updates feature can only be enabled and disabled with a Programming Cycle. This is accomplished with the *AMCI_5034_PWM_AM_Real_Time_Updates* AOI.

The following parameters can be changed with real time updates once the feature is enabled on the channel.

- Duty Cycle
- PWM Frequency
- Dither Enable/Disable

If you structure your program as given in Task 3, ***Controlling the 5034-PWM-AM***, which starts on page 25, this is typically accomplished by writing directly to the output buffer created in that task. Note that setting the PWM Frequency to zero will not cause an error. The module will continue to use the last programmed value.

Notes

ADVANCED MICRO CONTROLS INC.

20 GEAR DRIVE, TERRYVILLE, CT 06786 T: (860) 585-1254 F: (860) 584-1973

www.amci.com

LEADERS IN ADVANCED CONTROL PRODUCTS