Module Summary

The AMCI 5274 High Speed Analog Profile Module is designed to provide high-speed analog to digital control. The design criteria require output updates below 50µs. The primary applications are part inspection and rejection, but the module will be capable of serving other applications that require high-speed interpolation of analog signals.

The AMCI 5274 will operate as a stand-alone module with continuous reporting of status information to the 1756 system. It will take analog samples at known points; defined by position, time, or digital input, and compare the measured values to a programmed profile and determine the pass/fail of the inspection.

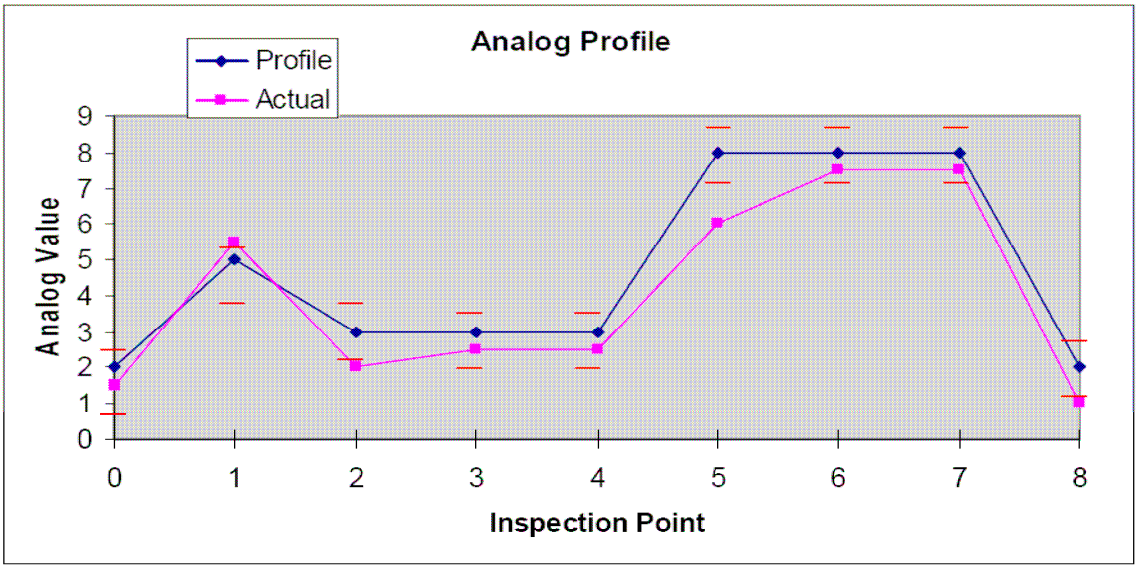
The module will consist of the following I/O:

4 analog inputs
4 digital inputs
4 digital outputs

The 5274 module does not contain any non-volatile memory and will have to be programmed at every power up.

Functional Summary

The following graph shows the basic function of the module. The module will acquire an analog signal (analog value) and sample that analog signal along known points. (Inspection points) The starting point of the sample is based upon the gate input (DI02). The inspection points can be defined by the trigger input (DI03), encoder position, or time value. The measurement cycle begins on the first OFF to ON transition of the Gate input, after the module has been switched from Configuration to Run Mode. At each inspection point the module will capture the analog value and compare the measured value to pre-programmed target, high, and low values. The module will then make decisions of pass/fail based upon how it is configured. The module will also report statistical information of each inspection point to the PLC for process improvement.



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. Throughout this manual the following two notices are used to highlight important points.

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

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

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 one year 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 and serial numbers along with a description of the problem. A "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

Technical Support, in the form of documents, FAQs, and sample programs, is available from our website, www.amci.com. 24 Hour technical support is also available on this product. For technical support, call (860) 583-7271. Your call will be answered by the factory during regular business hours, Monday through Friday, 8AM - 5PM EST. During non-business hours, an automated system will ask you to leave a detailed message and the telephone number where you can be reached. The system will page an engineer on call. Please have your product model number and a description of the problem ready before you call.

Table of Contents

Configuring the ControlLogix System

1. Open RSLogix 5000 and the project in which you want to install the AMCI 5274 module.
2. Right click on I/O Configuration in the Project Tree.
3. Select New Module.
4. Select the following module type and description from the list that appears.

   Type = 1756-MODULE
   Description = Generic 1756 Module
5. Click on OK.
6. Enter the following module properties.

   Name: *Your Choice* (must begin with a letter)
   Description: *Your Choice*
   Comm Format: *Data-INT* (must be changed from the default Data DINT to Data-INT)
   Slot: *location of 5274 module*

7. Enter the Connection Parameters from the following table.

	Owner Controller		Listen Only	
Parameter	**Assembly Instance**	**Size in 16 bit words**	**Assembly Instance**	**Size in 16 bit words**
INPUT	100	32	101	32
OUTPUT	194	16	195	1
CONFIGURATION	232	0	2	0

8. Click on Next >
9. Set the RPI (Rate Packet Interval) Time to the desired value. To reduce the PLC scan, the recommended RPI time is 5ms. However, the minimum value for the 5274 module is 0.5ms.
10. Click on Finish >>

The module should now appear in the project tree. The Input data will be referenced as Local:X.I.Data[Y] and the output data will be referenced as Local:X.O.Data[Y] where "X" is the slot number and "Y" is the word number

An EDS file for the 5274 module is available and can be downloaded from the following page of our website. http://www.amci.com/driverfiles.asp

Module Specifications

Backplane Current Draw	610mA @ 5Vdc The module can be removed and inserted under power in accordance with ASA guidelines
Minimum Acquisition Time:	25 µS/ per Trigger
Data Types	2's complement Integer
Scaling	User- Defined
Alarms	High / Low Alarms, Under / Over Range bits
Wire-Off Detection	only via Under/ Over Range bits
Filtering	User- Defined
Calibration	On-board Offset and Gain
Time Stamping	CST reported on each positive transition of the Gate Input
Throughput time	32µs (trigger input to physical output)
Environmental Conditions	Operating Temperature: 0 to 60° C Relative Humidity: 5 to 95% without condensation Storage Temperature: -40 to 85°

Analog Inputs

Four analog inputs with 30 VDC over-voltage protection.

All inputs are capable to operate in one of four user-selectable ranges: +/- 10V, 0 – 10V, 0 – 5V, and 0-20mA. The ranges are selectable on per channel basis. The voltage inputs additionally can be selected as either single ended or differential. The current inputs can only be used as single ended inputs.

Each channel provides 14 bit resolution over a –10.25/+10.25V span. This yields 16,384 counts for the –10.25/+10.25V range, 8,192 counts for the 0-10.25V and 0-21mA range, and 4096 counts for the 0- 5.125V range. Regardless of the range selected, the user will realize a LSB change for every 1.25mV of input change.

Minimum conversion time is 25µS for all channels.

Digital Inputs

The module provides four digital inputs, labeled DIN0 to DIN3. The inputs are jumper selectable for 5V/24Vdc operation. Two of the inputs, DIN0 and DIN1, can be configured as inputs for the onboard 16 bit counter. The counter can be user-configured as a Quadrature (A quad B) counter or as Pulse Counter.. Input DIN2 is the gate input used in all modes of operation. DIN3 is the trigger input used in Gate/Trigger Mode.

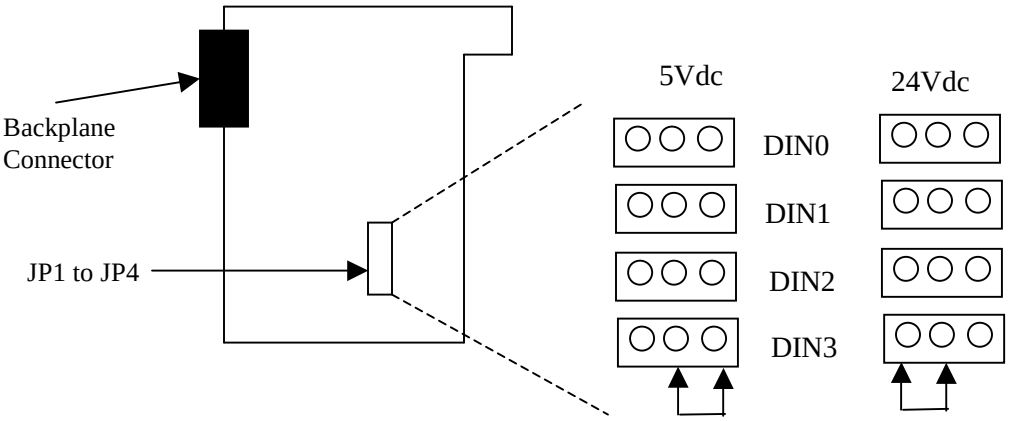
Configured for 24Vdc operation
Voltage Range: 0 to 26.4Vdc
On State ≥ 10Vdc
Off State ≤ 2Vdc
Current Draw = 25mA @24Vdc
Default Setting of all Digital Inputs

Configured for 5Vdc operation
Voltage Range: 0 to 7.5Vdc
On State ≥ 3.5Vdc
Off State ≤ 1Vdc
Current Draw = 15mA @5Vdc

Digital Inputs that are active when the module is switched from Configuration to Run Mode will be ignored.

Changing the Digital Input Voltage Level

1. Place the unit on the bench so that the board side of the unit is closer to the bench.
2. Remove the two screws holding the side panel to the unit.
3. Locate jumpers JP1 to JP4.



WARNING

The module will be damaged if 24Vdc is applied when the inputs are configured for 5Vdc

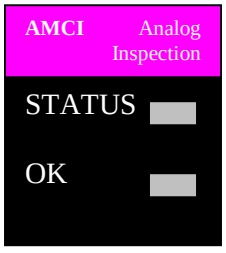
4. Place the jumper straps in the desired location. For 5Vdc inputs, place the jumper strap on the right two pins, those closer to the Removable Terminal Block, and for 24Vdc inputs, place the jumper strap on the left two pins, those farther from the removable terminal block.
5. Replace the side panel and the screws.

Digital Outputs

The module provides 4 digital outputs (DOUT0 – DOUT3). These outputs are capable of sourcing up to 0.5A each output and require a 5-24V external power supply. The outputs are optically isolated from the back plane. The outputs are pre-assigned to the corresponding analog input channels (i.e. DOUT0 is assigned to AIN0, DOUT1 is assigned to AIN1, etc.).

- The Digital Outputs are disabled at power up and when the 5274 module is in Configuration Mode.
- The fault output will turn on 32µs after an analog signal has been detected as being outside of its valid range.
- Once on, the output will remain on until the beginning of the next gate cycle.

Front Panel



Status LED

Steady RED	Module Fault
Blinking RED	Calibration Mode
Blinking GREEN	Configuration Mode
Steady GREEN	Inspection (RUN) Mode

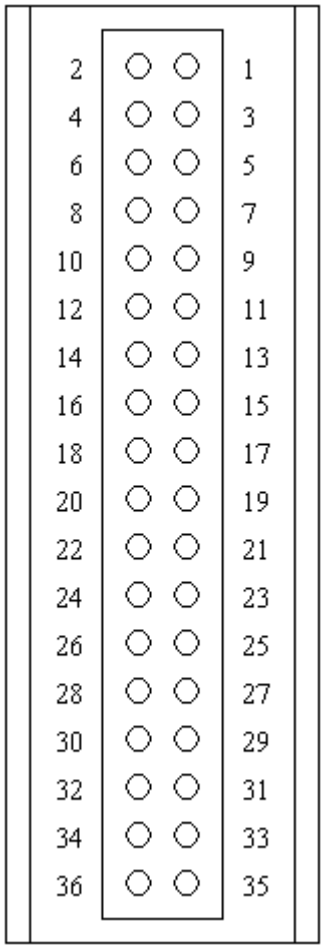
OK LED

Solid Green	Module Owned, two way communication
Blinking Green	PLC in Program Mode
Blinking Red	Communication between module and PLC Interrupted

Connector Pin-Out

The input connector consists of a Removable Terminal Block with the Rockwell Automation Part Numbers 1756-TBCH (36 position cage clamp) or 1756-TBS6H (36 position spring clamp). **The terminal block is <u>not</u> supplied with the 5274 module.**

+Analog input 1(voltage input)	2	1	+Analog input0 (voltage input)
+Analog input 1(current input)	4	3	+Analog input 0(current input)
-Analog input1	6	5	-Analog input 0
+Analog input 3(voltage input)	8	7	+Analog input 2 (voltage input)
+Analog input 3(current input)	10	9	+Analog input 2(current input)
-Analog input3	12	11	-Analog input2
Analog1/3Common	14	13	***Analog0/2Common***
Not Used	16	15	Not Used
+Digital Input0	18	17	+Digital Input1
-Digital Input0	20	19	-Digital Input1
+Digital Input2	22	21	+Digital Input3
-Digital Input2	24	23	-Digital Input3
Not Used	26	25	Not Used
Not Used	28	27	Not Used
Vdc	30	29	Vdc
Digital Output 1	32	31	Digital Output0
Digital Output3	34	33	Digital Output2
Vcom	36	35	Vcom



Vdc Pins 29 and 30 are connected internally
Vcom Pins 35 and 36 are connected internally

Analog Common Pins 13 and 14 are connected internally

Wiring Methods

The 5274 module support four wiring methods.

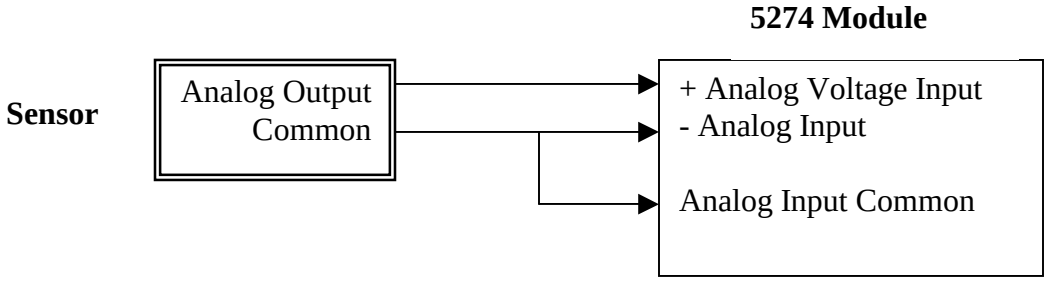
- Differential Voltage Wiring Method
- Single Ended Voltage Wiring Method
- Current Input Wiring
- Calibration Wiring

You will have to configure each of the module's four channels with your selected wiring method. This parameter is located in the Channel Configuration word in the Module Configuration Programming block.

WARNING Wiring a Single Ended sensor into an Analog Input that has been configured to operate as a Differential Input will result in only half the scale being read. For example, the output of a 0 to 10Vdc sensor will be decoded as a 0 to 5Vdc sensor.

Single Ended Voltage Wiring Method

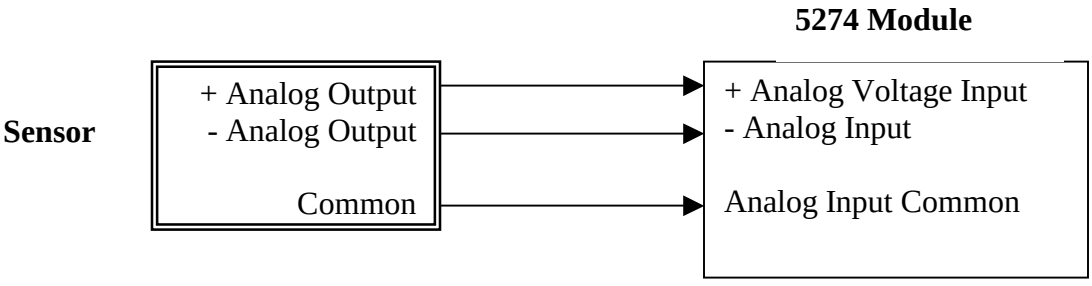
Single Ended wiring compares one side of the signal input to signal ground. This difference is used by the module in decoding the analog signal.



Differential Voltage Wiring Method

The differential wiring method is recommended for applications in which it is advantageous or required to have separate signal pairs or a common ground is not available. (However, the use of a common ground is recommended.) Differential wiring is also recommended for environments where additional noise immunity is needed.

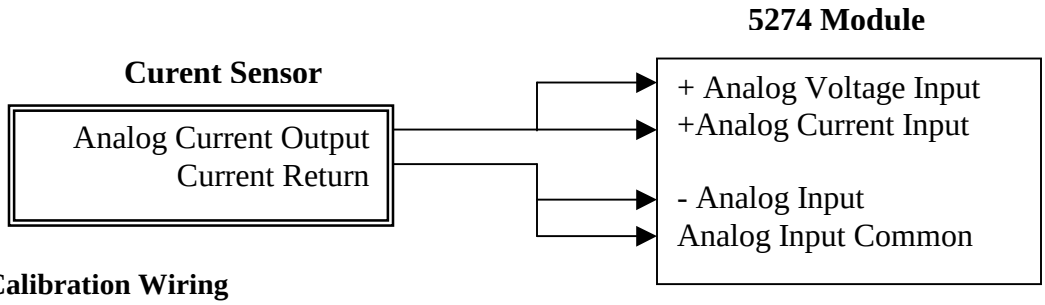
The differential output sensor will output two analog signals, one that it positive and one that is negative. For example, if your sensor is currently outputting a 5.5Vdc signal, than the +Analog Output terminal will be outputting 5.5Vdc, and the –Analog Output terminal will be outputting –5.5Vdc.



Current Input Wiring Method

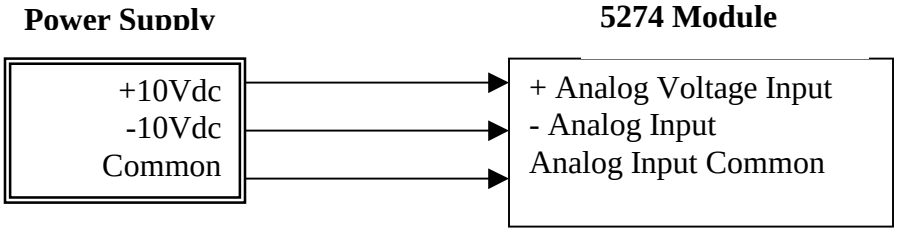
As shown in the following diagram, when wiring an Analog Current sensor to the 5274 module, the Analog Output must be wired to both the current and voltage inputs, and the Return must be wired to both the –Analog Input and the Input Common.

Current Inputs are always Single Ended, regardless of how the Input Type parameter has been programmed.



Calibration Wiring

The 5274 module will be calibrated before it leaves the factory. However, the following wiring can be used if it becomes necessary to calibrate it again. Please note that this wiring MUST be connected to each of the 5274 module's four channels.



Calibration Procedure

1. For best results, allow the 5274 module to be powered up for 30 minutes before calibrating.
2. Wire the unit as shown in the previous diagram.
3. Place the unit in Configuration Mode.
4. Reset the Transmit Bit.
5. Place the module in Calibration Mode. (Command = 16# 8040) The module will set bit 6 in input word 0 to indicate it is in Calibration Mode.
6. Reset the Transmit Bit.
7. Calibrate the module at the +10Vdc level. (Command = 16# 8140) Input Registers 5, 12, 19, and 26 should go to about 32000. The module will set bit 8 in input word 0.
8. Reset the Transmit Bit.
9. Reverse the + and – 10Vdc connections at the power supply.
10. Calibrate the module at the –10Vdc level. (Command = 16# 8240) Input Registers 5, 12, 19, and 26 should go to about -32000. The module will reset bit 8 and set bit 9 in input word 0.
11. Reset the Transmit Bit.
12. Save the calibration values to the 5274 module's flash memory. (Command = 16# 8440) The module will reset bit 9 and set bit 10 in input word 0.
13. Reset the Transmit Bit.
14. Exit from Calibration Mode to Configuration Mode. (Command = 16# 8020)
15. Reset the Transmit Bit.

Module Functional Overview

The modules provides 3 operational modes:

- Calibration Mode
- Configuration Mode
- Inspection Mode

Calibration Mode

The module is delivered calibrated at the factory. Recalibration is done for the -10V/+10V input range by applying a known voltage reference to the analog inputs. The Calibration process is implemented through the Output Registers. All channels are configured simultaneously.

Calibration Mode can only be entered from Configuration Mode. Trying to enter Calibration from Run (Inspection) Mode, will cause an error.

After calibrating the unit, you must exit to Configuration Mode.

Configuration Mode

The module enters Configuration Mode at power-up or if the PLC is switched to Program Mode. Configuration data consists of but not limited to input type, engineering units, and filter constant. The configuration process is implemented by Message Instructions in the RSLogix5000 ladder diagrams. All four channels are configured with one message.

Run (Inspection) Mode -

Run (inspection Mode the module supports 6 types of Sample Modes:

- Gate/Trigger Mode
- Gate/Quad Counter Mode
- Gate/Counter Mode
- Gate/Timer Mode
- Gate Only Mode
- Multi-Gate Only Mode

Gate/Trigger Mode (Mode 0)

The Gate Input (DIN2) defines the starting point of the measurement cycle. The Gate Input can be either level or edge active. The rising edge of the Trigger (DIN3) defines the sample point. All channels are sampled simultaneously. The start of the measurement cycle can be delayed by user-defined number of trigger pulses. The module will continue to sample the signal until a pre-programmed number of samples are reached or the Gate Timeout value is reached.

Gate/Quad Counter Mode (Mode 1)

Digital Inputs DIN0 and DIN1 are used as counter inputs for the onboard 16 bit counter. DIN0 is used as A-Pulse Input, DIN1 is used as B input for the counter. The rising edge of Gate clears the counter and starts the sample cycle. This mode does not use the Trigger Input. The position value from the counter is used to determine the inspection points of the analog profile. The module samples the input until the final inspection point is reached or the Gate Timeout value is reached.

In Gate / Quad mode, the 5274 module uses X4 decoding to decode the encoder signals and the count value must be increasing. That is, the A signal must lead the B signal. The 5274 module will turn the Fault Output on at the end of the gate signal and off at the beginning of the next gate signal if the counts are decreasing.

Simply reverse the A and B wires to change the direction of increasing counts.

Gate/Counter Mode (Mode 2)

Digital Input DIN0 as counter input for the onboard 16 bit counter. The DIN1 input is not used. The counter counts up. The rising edge of Gate clears the counter and starts the sample cycle. This mode does not use the Trigger Input. The position value from the counter is used to determine the inspection points of the analog profile. The module samples the input until the final inspection point is reached or the Gate Timeout value is reached.

In Gate / Incremental Counter mode, the 5274 module uses X1 decoding to decode the pulse signals.

Gate/Time Mode (Mode 3)

This mode allows for time based sample cycle. The Gate Input defines the measurement starting point. An additional Time Profile, in 10µs increments, defines the sample points of the channels. The sample is completed while the final Time Profile point is reach or the Gate Timeout value is reached.

The Gate/Time Mode is used when the sample cycle is determined by a known time sequence. The time measurement points can be of equal or non-equal intervals.

Gate Only Mode (Mode 4)

Gate Only mode is used for applications where no external trigger is available and/or a sample profile cannot be defined. In this Mode there is only one high pass value and one low pass value per channel, which is sampled at a programmed interval. The signal sample period is equal to ((Sample Value * 10µs) + 50µs). For example, if the Sample Value is set to 0, the analog inputs will be sampled every 50µs. If the Sample Value is set to 1, the analog inputs will be sampled ever 60µs. This mode uses only one Gate Input located on DIN2 and the Sample Period for all four of the analog channels is the same.

The maximum sample value has a range of 0 to 255.

This function will cover applications where the expected measured value is constant and there is no trigger or position sensor to determine specific measuring points.

MultiGate Only Mode (Mode 5)

This mode allows for four independent measurements of the analog inputs. Each of the digital inputs is used as a Gate Input. The Gate Inputs are pre-assigned. DIN0 is the Gate Input for Analog Input 0, DIN1 is the Gate Input for AIN1, etc.

Each input has its own Sample Period that is equal to ((Sample Value * 50µs) + 50µs). For example, if the Sample Value is set to 0, the analog inputs will be sampled every 50µs. If the Sample Value is set to 1, the analog inputs will be sampled ever 100µs.

The rest of the functionality is identical to Gate Only Mode 4.

If you are getting false error readings when using Modes 4 and 5, it may be caused by the 5274 module reading the Analog signal very close to the transition of the Gate Input. This can be solved by increasing the Sample Period and or the number of Critical Points.

Analog Profiling

The Inspection Profile can accommodate up to 32 Inspection Points per channel. Each Inspection Point is defined by three 16-bit integer values: *Target*, *Low Pass*, and *High Pass*. A measured value is considered to pass the test if it is less than or equal to the High Pass Value, or greater than or equal to the Low Pass value.

Depending on the Sample Mode, the inspection points are defined based on Trigger Input, Position, or Time.

Some or all of the inspection points can be configured as critical. The user can also specify how many critical point violations constitute a failure.

Pass Fail Handling

The user can configure which of the following criteria to define an inspection failure:

- Gate Time Out
- Reactivation of the Gate Input before the end of the measurement cycle
- Number of critical point violations

The module can be configured to activate the digital outputs when a failure condition has been detected. The module supports two modes of activating the outputs, immediately when the failure is detected or a delayed activation by a programmed number of Gate Pulses. The state of the digital outputs is also reported to the PLC and can be found in the modules input registers.

Module Reporting

The 5274 module reports data to the PLC in two ways. Time critical data is reported to the input registers at the programmed RPI time. Additionally, it is possible to program the module with a Change of State (COS) function to interrupt the processor with new data when a fault condition is detected, and or when a new average value has been calculated. Non-time critical data such as new inspection data is accessed using Message Instructions.

In all modes the module supports averaging over user defined number of measurement cycles. The averaging is accomplished by a running average filter.

In Gate Only and Multi-Gate Only modes the module supports additional statistical data archiving: Average Value, Maximum Value, Minimum Value, Maximum Positive Deviation, Maximum Negative Deviation. A real time update of the inspection point is also implemented.

Data types:

The module reports channel data to the system in 2's complement 16bit integer.

Scaling:

The module provides scaling to user-defined engineering units. The scaling is based on the input range of the channel. The user will define the engineering units for the low and high end of the span. The module will scale the analog values accordingly.

Alarming: The module can be configured to check for both **UnderRange** and **Overrange** conditions on the Analog Inputs. The following table shows the maximum and minimum values based on the programmed Analog Input ranges.

Analog Input Range	UnderRange	OverRange
-10V to +10V	-10.25V	10.25V
0 to 10V	-0.2V	10.25V
0 to 5V	-0.125V	5.125V
0 to 20mA	-0.5mA	20.5mA

Filtering:

When operating in modes 4 and 5, the module supports a first order digital filter on per channel basis. The time constant of the filter is defined in 10µs increments. A time constant of 0 disables the filter.

Time Stamping:

The module returns a 32 bit Coordinated System Time (CST) value. The value is based on the time of activation of the Gate input. In modes 0 to 4, this is DIN2. In mode 5, this is DIN0. The CST time is synchronized with the PLC CST.

For the Time Stamping function to work correctly, the PLC must be configured as the System Time Master. This is accomplished by opening the Controller Properties and clicking on the Date/Time tab. Click on the box next the "Make this controller the Coordinated System Time Master" text so that a check mark appears in the box and accept the changes by clicking on OK.

Programmable Parameters

Module Configuration

Sample Mode
This parameter defines the type of measuring operation that the 5274 module will perform. There are six options.

- Gate / Trigger Mode
- Gate / Quadrature Counter Mode
- Gate / Incremental Counter Mode
- Gate / Timer Mode
- Gate Only Mode
- Multi Gate Mode

Number of Channels
Defines how many of the 5274 module's four analog input channels are to be used.

Change of State (COS) on Fault
When this bit level module configuration bit is set, the 5274 module will interrupt the processor whenever a fault condition is detected.

- The fault bit will remain set until the beginning of the next gate cycle.

Change of State (COS) on Average Number
When this bit level module configuration bit is set, the 5274 module will interrupt the processor to immediately indicate that new Average Values are available.

- It will be necessary to use a Message Instruction to read the Average data from the 5274 module.

NOTE

- The data sent with the COS function will be in addition to the data sent at the Rate Packet Interval (RPI) time.
- While using the COS function will decrease the update time of the 5274 module, it will also increase your overall scan time because the processor will be forced to service the additional interrupt signals.

Fail Part on Missing Trigger
When set, this bit level parameter will cause the module to activate the fault output if there are not enough trigger pulses to reach the programmed number of Inspection Points.

- The number of trigger pulses must be equal to or greater than the (Number of Inspection Points + the Number of Trigger delays).
- This function will also indicate if there are no trigger pulses, no encoder counts, or if the A and B encoder signals are counting down.
- When a missing trigger is detected, the fault output will be on for the entire length of the gate pulse.

Gate Mode
This bit level parameter defines how each of the four analog channels interprets the Gate Signal.

The Gate Inputs can be defined as Level or Edge active. In Level Mode the measurement cycle is defined by the duration of the Gate Input. In Edge Mode the rising edge of the Gate defines the start of the measurement cycle.

There is a slight difference in interpreting the Gate Time Out value in Level and Edge mode. In Level Mode, the Gate Time Out defines the maximum allowable time for the Gate to stay at high level. If this time expires before the specified number of inspection points is reached, a fault is defined. In Edge Mode the Gate Time Out value defines the end of the measurement cycle.

A Gate Time Out of 0 disables the Time Out function in Level mode but is not a valid configuration for Edge mode and will generate a configuration error.

- The default value is Level Active
- Only the Gate Mode for DIN2 is used in Modes 0 to 4
- Gate Mode bits for DIN 0, 1, and 3 are only used in Mode 5
- A Gate Timeout value must be programmed in the Channel 0 module configuration data when using Rising Edge Active in modes 0 to 4
- A Gate Timeout value must be programmed in all of the used channels module configuration data when using Rising Edge Active in mode 5
- When Rising Edge Active, the module will indicate an error if the Gate Signal is on for longer than the programmed Gate Timeout parameter. This is bit 14 in each of the Channel Status Words. The Digital Output will also be activated to indicate a Gate Timeout Error.

Channel Configuration

Analog Input Range
Defines the range of the analog signal that will be applied to the 5274 module's Analog inputs. There are four options.

- -10Vdc to +10Vdc
- 0Vdc to +10Vdc
- 0Vdc to +5Vdc
- 0 to 20mA

Input Type
Defines whether the Analog Input will be Differential or Single Ended

- Each Analog Channel can be programmed with its own Input Type
- The default input type is Differential
- Current Inputs are always Single Ended, regardless of the state of this bit level parameter.

Under Range Check Enable
When set, this bit level parameter will set a status bit to indicate that the Analog Signal is below the valid level for the programmed Analog Input Range. This check will only occur on a transition of the trigger pulse, and only up until the last programmed trigger inspection point is reached, and is intended to detect a broken sensor cable.

Over Range Check Enable

When set, this bit level parameter will set a status bit to indicate that the Analog Signal is above the valid level for the programmed Analog Input Range. This check will only occur on a transition of the trigger pulse, and only up until the last programmed trigger inspection point is reached, and is intended to detect a broken sensor cable.

Output Enable

This bit level parameter will cause the Analog Inputs corresponding Digital Output to fire whenever a fault condition is detected.

- Reset this bit to disable the Digital Output
- Set this bit to have the Digital Output fire
- The default value is disabled

Sample Value

This eight bit parameter is only used in modes 4 and 5 and defines how often the analog signal is measured in 10µs or 50µs increments. The value programmed here is added to the base 50µs sample value. For example, setting the Sample Increment value to a decimal value of two in mode 4 will result in the analog input being sampled every 70µs.

- Range = 0 to 255
- The Sample Value Parameter must be zero in modes 0 to 3
- In mode 4, the rate at which the analog signal will be sampled will be equal to ((Sample Value * 10µs) + 50µs).
- In mode 5, the rate at which the analog signal will be sampled will be equal to ((Sample Value * 50µs) + 50µs).

Low and High Engineering Units

These two word level parameters define are used to scale the Analog Signal into usable units.

- The Engineering Units have a range of –32768 to 32767.
- The Low Engineering Unit value must be less than the High Engineering Unit value
- When configured to read a Voltage Analog Signal, the maximum difference between the Low and High Engineering unit is equal to

  (Upper Analog Range – Lower Analog Range) * 1000

- When configured to read a Current Analog Signal, the maximum difference between the Low and High Engineering unit is equal to 5000.

  To read the current value in 0.01mA increments, set the Low Engineering Units to 0 and the High Engineering Units to 2000.

- The Inspection Point parameters are programmed in Engineering Units values

Channel Filter Constant

This word level parameter defines the filter applied to the measuring of the analog value. The filter constant is used to smooth out the measured analog value thereby ignoring any noise spikes. The filter has the following formula.

$$\text{Filtered Analog Value} = \text{Last Filtered Analog Value} + \frac{\text{Sample Value Rate}}{\text{Filter Constant}} \left[\text{Actual Analog Value} - \text{Last Filtered Analog Value} \right]$$

- The Channel Filter Constant is only used in modes 4 and 5.
- It is the Filtered Value that is compared against the Inspection Profile Setpoints.
- The Filter Constant is programmed in units of 10µs.
- In mode 4, the Filter Constant has a range of 0 or ((Sample Value) + 6) to 65535
- Only the channel 0 Filter Constant is used in Mode 4.
- In mode 5, the Filter Constant has a range of 0 or ((Sample Value * 5) + 6) to 65535
- This parameter must be larger than the programmed Sample Time Parameter. However, it should not be much larger than the sample time because it will take a long time for the module to reach the analog value.
- In both modes 4 and 5, each of the four channels have their own Filter Constant Value.

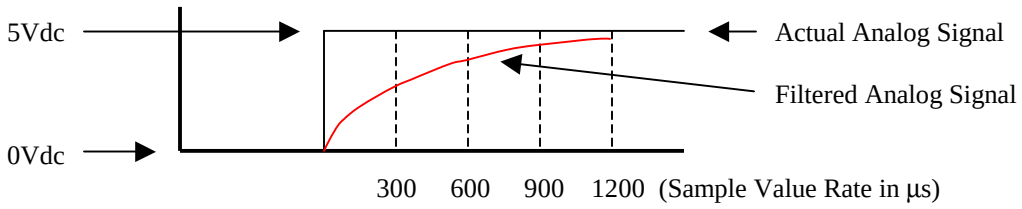
The Filter Constant parameter is intended to remove any influence of noise from the Analog Signal. Although it is not intended to be used in this way, the following example illustrates the results of using a Filter Constant in Mode 4.

- Mode 4
- Module Sampling Base time = 50µs
- Mode 4 Sampling Base time = 10µs
- Programmed Filter Constant = 60 (for 600µs)
- Programmed Sample Value Increment = 25

Sample Value Rate = ((Sample Value Increment * Mode 4 Sampling Base) + Module Sampling Base)
Sample Value Rate = ((25 * 10µs) + 50µs) = 300µs

Assume an Analog Value that changes from 0 to 5Vdc.

First Filtered Value = 0 + (300µs/600µs * (5 – 0)) = 2.5V
Second Filtered Value = 2.5 + (300µs/600µs * (5 – 2.5)) = 3.75V
Third Filtered Value = 3.75 + (300µs/600µs * (5 – 3.75)) = 4.375V
Fourth Filtered Value = 4.375 + (300µs/600µs * (5 – 4.375)) = 4.85V

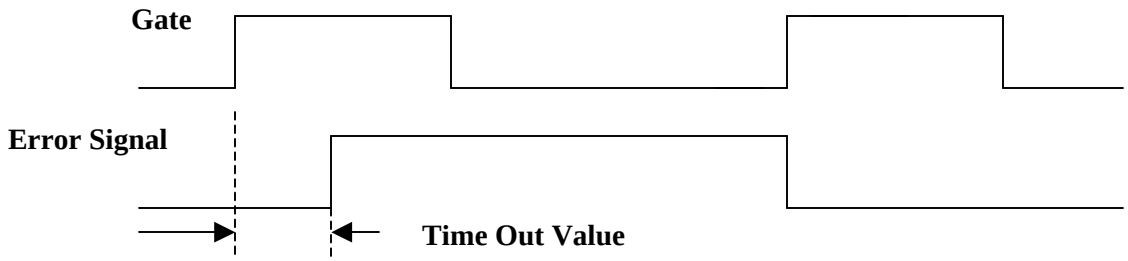


Therefore, even though the analog signal reached 5Vdc almost immediately, to the 5274 module, it will take four measurement cycles, 1200µs in this example, before the module sees and acts on any value above 4.85V.

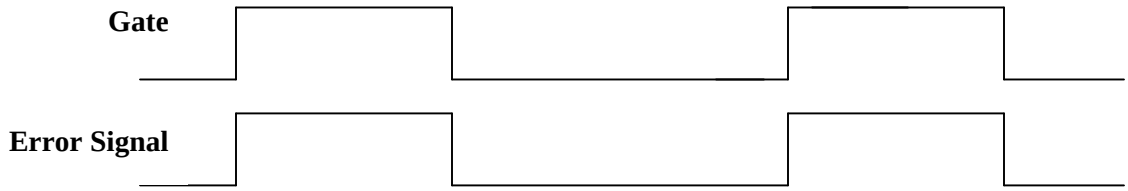
Channel Gate Time Out

This parameter defines the maximum amount of time that the Gate Signal can be on before a fault condition is generated. It is intended to detect a stalled condition.

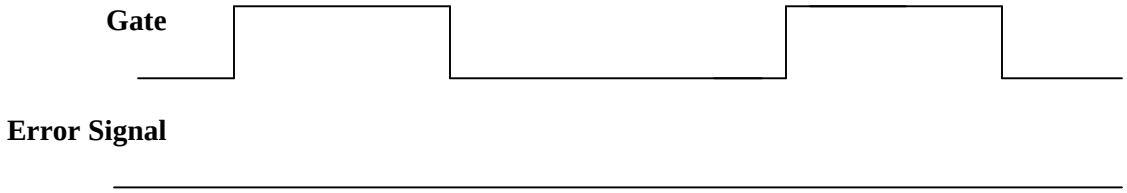
- A value of 0 disables the Gate Time Out feature
- The value can only be zero if the Gate Input is Level Active
- Modes 0 to 3 range of 0 or (21 to 65535)
- Mode 4 range of 0 or (2 * (sample value + 5)) to 6553
- Mode 5 range of 0 or (2 * ((sample value * 5) + 5)) to 6553
- The Gate Time Out parameter is programmed in units of 10µs
- The Time Out error will be indicated in the following way if the channel is programmed for level input, and with the output delay equal to zero.



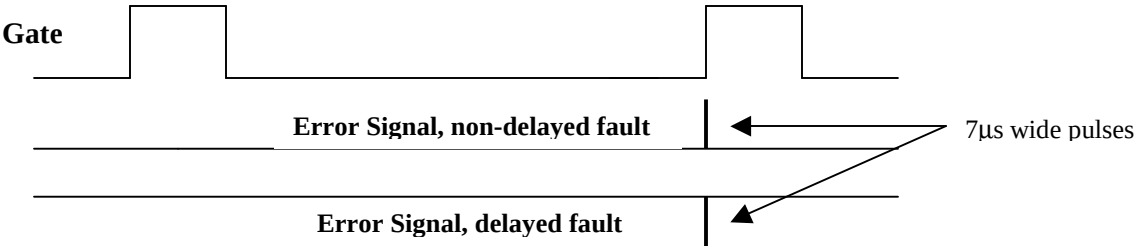
- The Time Out error will be indicated in the following way if the channel is programmed with an output delay and the Gate Input has been programmed to be Level Triggered.



- The fault output will not turn on if there is a Time Out condition and the channel is programmed to be Edged Triggered and either with or without an output delay.



- The timeout value must be less than the time between gate pulses. If it is not, the module will still activate the fault output, but the error signal will be too small to be detected.



Inspection Profile Data

Number of Inspection Points

This parameter defines how many inspection ranges are going to be programmed. Range of 0 to 32. Only one inspection range is used in modes 4 and 5.

Number of Critical Points

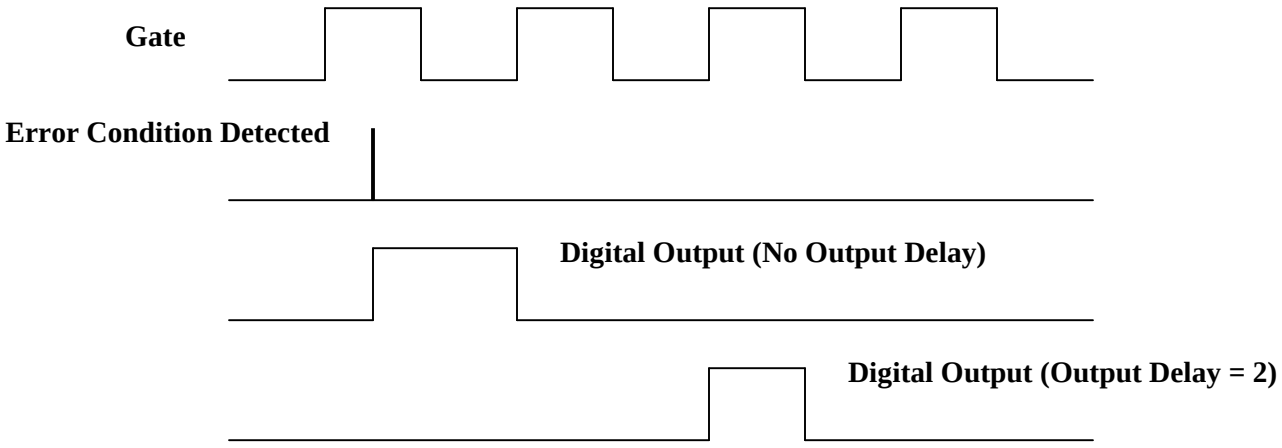
This parameter defines how many incorrect measurements have to be made before an alarm condition is indicated by the status bit and the Digital Fault Output.

- Range of 0 to the Number of Inspection Points
- A value of 0 disables the Inspection Operation

Output Delay

This parameter is used to delay the number of Gate Cycles later that the Digital Output will fire to indicate that a fault condition has occurred. This feature is intended to reject product at some point later in the cycle.

- The Output Delay Parameter has a range of 0 to 255
- A value of zero will cause the digital output to fire immediately when the Number of Critical Points parameter has been reached. In this case, the output will remain on until the beginning of the next gate cycle.
- A value between 1 and 255 will cause the output to turn on the programmed number of cycles later. When the Output Delay function is used, the Digital Output will be on only for the duration of the Gate Pulse.
- In modes 4 and 5, an immediate error, no programmed output delay, will turn on based on the programmed sample value and the number of critical points.
- A delayed fault will have the same width as the gate signal.
- The following diagram shows an example of how the output will fire with both no Output Delay and an Output Delay of 2.



Trigger Delay

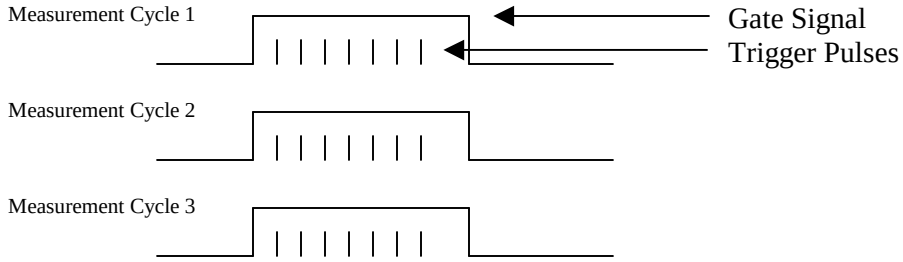
This parameter defines how many trigger inputs or inspection points will occur before the 5274 module starts performing inspection operations.

- The Trigger Delay has a range of 0 to 15
- A *Gate Reactivated* fault will be generated if the number of Trigger Inputs is less than the sum of the Trigger Delay and the Number of Inspection Points when the Gate Signal turns off.

Running Average

This parameter is used when calculating the average value of the analog signal.

- Seven acceptable values; 0, 2, 4, 8, 16, 32, and 64
- Entering a value of zero disables the Average calculation, and will cause an Extended Error code of 7 if you attempt to use a Message Instruction to try and read the average data from the module.
- The Running Average parameter is <u>not used</u> during the inspection operations. It is only used when determining the Average Value that is read using a Message Instruction.
- The 5274 module does not calculate an Average Value for the first Running Average number of samples.
- In modes 0 to 3, the Average Value is calculated at the same trigger point in of the average number of gate cycles. For example, if you are operating in mode 0 and have the Running Average Parameter set equal to 2.

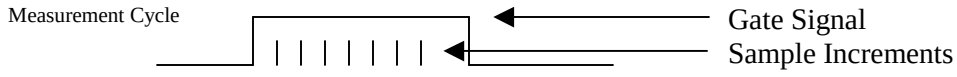


An Average Value <u>for each Trigger Pulse</u> of Measurement Cycles 1 and 2 will be calculated and be available after Measurement Cycle 2 has been completed.

An Average Value <u>for each Trigger Pulse</u> of Measurement Cycles 2 and 3 will be calculated and be available after Measurement Cycle 3 has been completed.

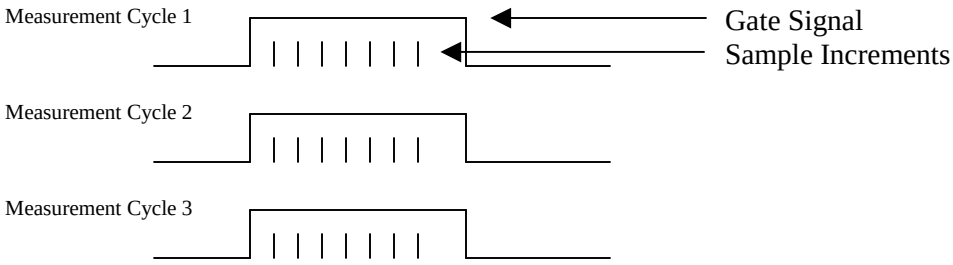
- In modes 4 and 5, the Average Value is calculated in two ways.

The first is at every sample increment over the previous number of Running Average samples.



It is this value that will be reported in word 11 when a Message Instruction is used to read the Current Inspection Data (Message Instances 110 to 113) from the 5274 module.

The second uses the average value calculated using the first method, and averages it over the Running Average number of Gate Cycles.



An Average Value for Measurement Cycles 1 and 2 will be calculated and be available after Measurement Cycle 2 has been completed.

An Average Value for Measurement Cycles 2 and 3 will be calculated and be available after Measurement Cycle 3 has been completed.

It is this Average Value, along with the Minimum Average, the Maximum Average, the Minimum Positive Deviation, and the Maximum Negative Deviation, that will be reported in when a Message Instruction is used to read the Average data (Message Instances 114 to 117) from the 5274 module

Critical Inspection Points Mask

This parameter defines which of the 32 inspection points are critical. The Digital Fault Output will not fire unless one or more of the bits in the word are set.

Target Value

This parameter defines the expected Analog Input value in Engineering Units.

- Range = Within the Engineering Units programmed in the Module Configuration Data
- While programmed in all of the sampling modes, the Target Position parameter is only used in modes four and five
- There are separate Target Position values for each of 32 possible inspection points
- An extended Error code of 4 (Too Much Data) will be generated if the number of Target Position values exceeds the programmed number of Inspection Points.

Low Pass Value

This parameter defines the lower acceptable range in an Inspection Operation

- Range = (Low Engineering Unit to Target Value)
- There are separate Low Pass values for each of 32 possible inspection points
- An extended Error code of 4 (Too Much Data) will be generated if the number of Low Pass values exceeds the programmed number of Inspection Points.

High Pass Value

This parameter defines the upper acceptable range in an Inspection Operation

- Range = (Target Value to High Engineering Unit)
- There are separate High Pass values for each of 32 possible inspection points
- An extended Error code of 4 (Too Much Data) will be generated if the number of High Pass values exceeds the programmed number of Inspection Points.

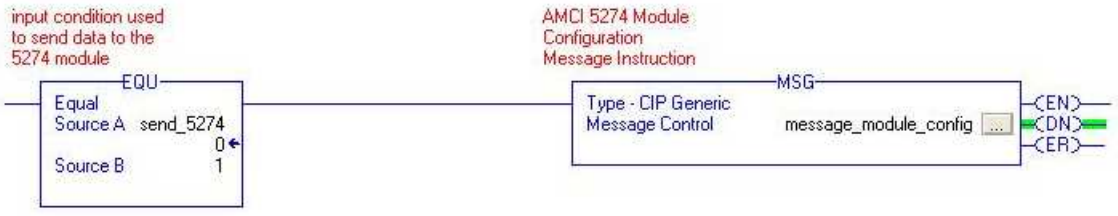
Counter / Timer Configuration Data

This programming block contains the inspection data used in modes 1, 2, or 3.

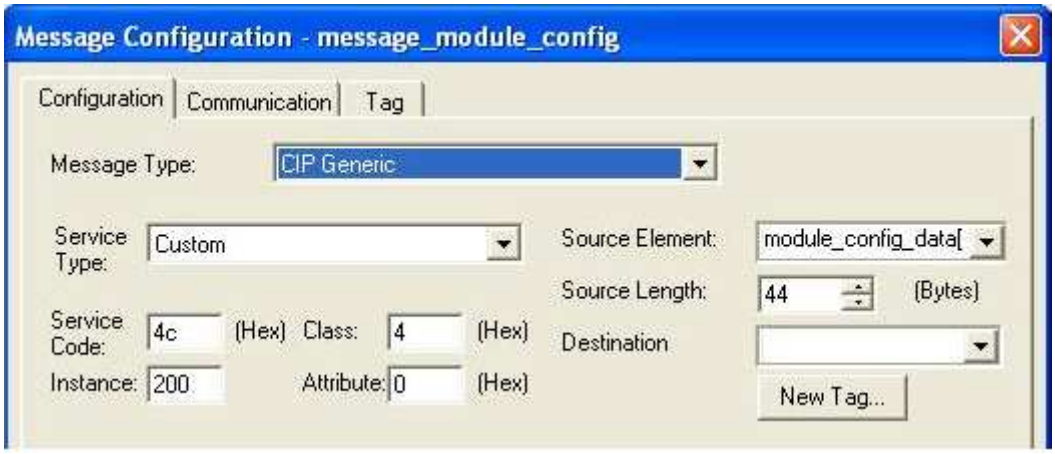
- Up to 32 inspection point values can be programmed
- Each value must be greater than the previous value
- The Counter / Timer programming block must be programmed after the Inspection Profile Data programming blocks
- (Number of Inspection Points + Number of Trigger Delays) $\leq$ Number of Counter / Timer profile points
- Count values have a range of 0 to 65535
- Time values have a range of 0 to 65535 and are programmed in 10µs increments. Each time value must be at least 10 (100µs) greater than the previous value.

Message Instructions

Message Instructions are used to both program the 5274 module parameters, and to read status and setup data from the module. The format of this instruction is shown below.



1. A different message instruction is needed for each channel of the 5274 module.
2. The message instruction sends data to or reads data from the 5274 module only when the rung transitions from false to true.
3. The Message Control tag, message_module_config in this example, used for Message Instruction Control must have the MESSAGE data type.
4. Clicking on the button in the Message Instruction opens the Message Configuration Window, an example of which is shown below. Enter the appropriate data for the operation being performed. When finished, click on the Apply button to accept the new data.



Message Type: CIP Generic
Service Type: Must be Custom
Service Code: 4C to write data to the 5274 module, 4B to read data from the 5274 module
Class: Must be equal to 4.
Instance: Determined by the type of data being transferred, see the table below.
Attribute: Must be set to zero.
Source Element: If the Message Instruction is being used to send data to the 5274 module, then the source parameter will be the first tag of the array that contains the data to be sent to the 5274 module.

If the Message Instruction is being used to read data from the 5274 module, than the source parameter must be left blank.

Source Length: If the Message Instruction is being used to send data to the 5274 module, then the Source Length parameter must be equal to the value shown in the following table.

If the Message Instruction is being used to read data from the 5274 module, then the Source Length Parameter must be set to zero.

Destination: If the Message Instruction is being used to send data to the 5274 module, then the Destination Parameter must be left blank.

If the Message Instruction is being used to read data from the 5274 module, then the Destination Parameter must be set to the first tag of the array where the data will be placed.

The Message Instruction is used with the following information to send data to the 5274 module.

Programming Block	Message Instruction Setup Information				Length in Bytes
Module Configuration	Service Code	4C	Class	4	44
	Instance	200	Attribute	0	
Ch 0 Inspection Profile	Service Code	4C	Class	4	204
	Instance	210	Attribute	0	
Ch 1 Inspection Profile	Service Code	4C	Class	4	204
	Instance	211	Attribute	0	
Ch 2 Inspection Profile	Service Code	4C	Class	4	204
	Instance	212	Attribute	0	
Ch 3 Inspection Profile	Service Code	4C	Class	4	204
	Instance	213	Attribute	0	
Counter Timer Profile	Service Code	4C	Class	4	66
	Instance	220	Attribute	0	

These message instructions can only be used to send data to the 5274 module when it is operating in Configuration Mode. The message instruction will report an Extended Error code of "7" if you attempt to send it data when the module is in Run Mode.

The Message Instruction is used with the following information to <u>read</u> data from the 5274 module.

Data to be Read	Message Instruction Setup Information				Minimum Destination Array Length (16 bit words)
Ch 0 Current Inspection Data	Service Code	4B	Class	4	44 words
	Instance	110	Attribute	0	
Ch 1 Current Inspection Data	Service Code	4B	Class	4	44 words
	Instance	111	Attribute	0	
Ch 2 Current Inspection Data	Service Code	4B	Class	4	44 words
	Instance	112	Attribute	0	
Ch 3 Current Inspection Data	Service Code	4B	Class	4	44 words
	Instance	113	Attribute	0	
Ch 0 Average Data	Service Code	4B	Class	4	44 words
	Instance	114	Attribute	0	
Ch 1 Average Data	Service Code	4B	Class	4	44 words
	Instance	115	Attribute	0	
Ch 2 Average Data	Service Code	4B	Class	4	44 words
	Instance	116	Attribute	0	
Ch 3 Average Data	Service Code	4B	Class	4	44 words
	Instance	117	Attribute	0	
Read Module Configuration	Service Code	4B	Class	4	22 words
	Instance	200	Attribute	0	
Read Ch 0 Inspection Profile	Service Code	4B	Class	4	102 words
	Instance	210	Attribute	0	
Read Ch 1 Inspection Profile	Service Code	4B	Class	4	102 words
	Instance	211	Attribute	0	
Read Ch 2 Inspection Profile	Service Code	4B	Class	4	102 words
	Instance	212	Attribute	0	
Read Ch 3 Inspection Profile	Service Code	4B	Class	4	102 words
	Instance	213	Attribute	0	
Read Counter Timer Profile	Service Code	4B	Class	4	33 words
	Instance	220	Attribute	0	

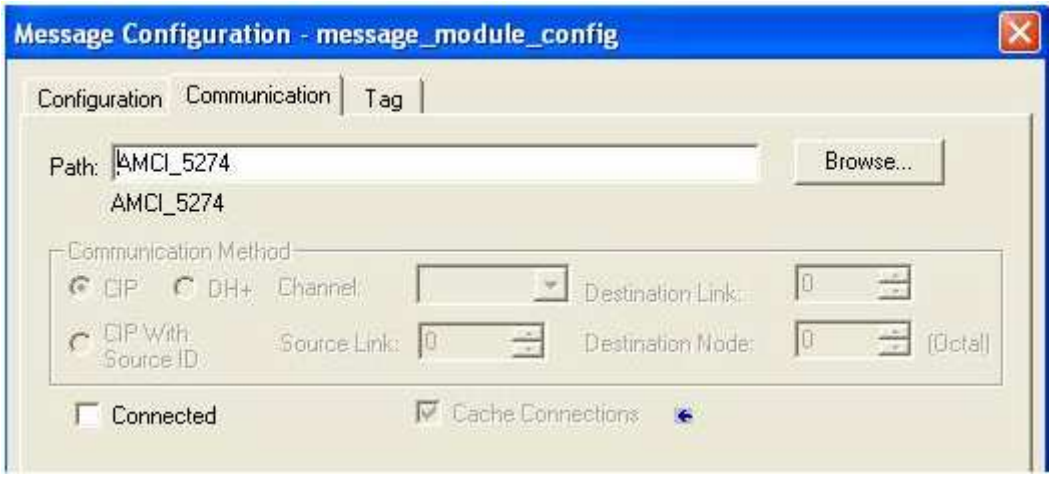
Message instructions with Instances of 110 to 117 can be used to read data from the 5274 module when it is operating in either Configuration or Run Mode.

Message instructions with Instances of 200 to 220 can only be used to read data from the 5274 module when it is operating in Configuration Mode. The message instruction will report an Extended Error code of "7" if you attempt to read data when the module is in Run Mode.

When operating in modes 4 and 5, if the output registers are used to change the inspection setpoints, the new value can only be read back <u>after</u> an off to on transition of the gate input(s) has started a new measurement cycle. Both the old and new data will be reported if the message instruction is used before the next gate cycle has occurred.

Message Configuration – (Communication Tab)

When the Configuration window shown above is completed, click on the Communication tab. The following window will open. Click on the Browse button and set the path parameter to the slot where the 5274 module is located. All of the remaining Communication parameters can remain at their default settings.



Extended Error Codes

The Message Instructions used to communicate with the 5274 module have an error register that can be used to obtain diagnostic information from the module. This register's address is *user_tag*.exerr. The following table shows the values that will be displayed in this register if the data sent to the 5274 module is not valid.

Extended Error Codes	Meaning
1	Invalid Module Configuration • Programming the Sample time in modes 0 to 3 • Setting any of the unused bits in the module configuration word • If data is present in unused Module Configuration word 1
2	Invalid Sample Mode
3	Invalid Channel Configuration • Setting unused bits in the channel configuration word • If the Sample Value Increment in modes 0 to 3 is not equal to zero
4	Too Much Data • Too many Inspection point inspection data values for the number of inspection values programmed. • Data in a channel configuration word that is not being used • Programming more than one Inspection Point range in modes 4 and 5 • If the two Critical Inspection point words (words 3 and 4 of the Inspection Profile Data) are not equal to 0 in modes 4 and 5 • If the critical inspection points in words three and four of the module configuration data are not equal to zero in modes 4 and 5. • If number of Count or Time values programmed is greater than the Number of Profile points defined in word 0. All unused registers must be set to zero.
5	Invalid Engineering Units • Set if the difference between the Low and High Engineering units are outside the following ranges Voltage Span = (Upper Analog Range – Lower Analog Range) * 1000 Current Span = 5000 • Set if the Low and High Engineering Units are equal
6	Module Not Configured • Trying to read the average or inspection data before the module has been configured or programmed.

Extended Error Codes	Meaning
7	Unsupported Mode • Trying to program the module configuration or channel inspection data when the module is in Run mode. • Trying to program counter / timer data when using modes 0, 4, and 5. • Trying to read Module Configuration, Inspection Setup, or Counter/Timer data when the unit is in Run Mode • Trying to read Average Data if the Running Average Parameter in the Inspection Setup data is equal to 0. A Running Average of zero disables the calculation of the average data. • Programming the Counter / Timer data before the Module Configuration • Programming the Counter / Timer data before all of the used channels Inspection Data
	Invalid Counter / Timer Profile • Programming more count values than defined by the number of Profile Points • Counter / Timer Values that are equal to each other • Profile Points that are less than any of the previous profile points • A time value that is greater than the Gate Timeout value that is programmed with the Module Configuration Data. This is true for Gate Inputs that are both Level and Rising Edge active.
9	Undefined Channel • Using a Message Instruction to program an unused channel • Programming the Counter / Timer data block before the data on all of the used Inspection channels have been programmed
A	The Number of Inspection points is greater than 32
B	Invalid Number of Critical and Inspection Points • If you try to program more critical points than 32 inspection points • If the Number of Inspection points equal to 0.
C	Number of Running Average Points not equal to 0, 2, 4, 8, 16, 32, or 64
D	• Trigger Delay outside the range of 0 to 15 • Setting any of the unused bits in the Trigger Delay and Output Delay word

Extended Error Codes	Meaning
E	Invalid Low Pass Value • Set if the Target Value is Less than the Low Engineering Units • Set if the Low Pass Value is less than the Low Engineering Units • Programming the Inspection Data value without specifying the number of inspection points
F	Invalid High Pass Value • Set if the Target Value is greater than the High Engineering Units • Set if the High Pass Value is greater than the High Engineering Units
10	Invalid Counter / Timer Number of Profile Points • If the number of Counter / Timer profile points is less than the (Number of Inspection Points + Number of Trigger Delays) • If the number of Counter / Timer profile points is outside the range of 0 to 32.
11	Invalid Counter / Timer Profile Value data • If two values are equal but non zero • If a value is less than any of the previous values • If the first time value is less than 10 • If the difference between two consecutive time values is less than 10
12	Invalid Filter Constant Values • Programming a Filter Constant value in modes 0 to 3 • If the Filter Constant Value is outside the range of 0 or ((Sample Value) + 6) to 65535in mode 4 • If the Filter Constant Value is outside the range of 0 or ((Sample Value * 5) + 6) to 65535 in mode 5
13	Invalid Gate Timeout Values • A Gate Timeout value of zero when the Gate input is Rising Edge Active • A Gate Timeout value outside the range of 0 or (21 to 65535) in modes 0 to 3 • A Gate Timeout value outside the range of 0 or (2 * (sample value + 5)) to 6553 in mode 4. • A Gate Timeout value outside the range of 0 or (2 * ((sample value * 5) + 5)) to 6553 in mode 5

- These error codes are only valid when register address *user_tag.err* is equal to F.
- The Message Instructions Error bit and the Extended Error Code can only be cleared by sending valid data to the 5274 module.

Using Message Instructions to Send Data to the 5274 Module

Module Configuration Data:

Word	Function	Range	Units
0	Sample Mode Configuration	See description on the next page	
1	Always Zero		
2	Channel 0 Configuration Word	See description on the next page	
3	Channel 0 Low Engineering Units	-32768 to 32767*	
4	Channel 0 High Engineering Units	(Low Units + 1) to 32767*	
5	Channel 0 Filter Constant	See Below **	
6	Channel 0 Gate Time Out	See Below ***	10 µs
7	Channel 1 Configuration Word	See description on the next page	
8	Channel 1 Low Engineering Units	-32768 to 32767*	
9	Channel 1 High Engineering Units	(Low Units + 1) to 32767*	
10	Channel 1 Filter Constant	See Below **	
11	Channel 1 Gate Time Out	See Below ***	10 µs
12	Channel 2 Configuration Word	See description on the next page	
13	Channel 2 Low Engineering Units	-32768 to 32767*	
14	Channel 2 High Engineering Units	(Low Units + 1) to 32767*	
15	Channel 2 Filter Constant	See Below **	
16	Channel 2 Gate Time Out	See Below ***	10 µs
17	Channel 3 Configuration Word	See description on the next page	
18	Channel 3 Low Engineering Units	-32768 to 32767*	
19	Channel 3 High Engineering Units	(Low Units + 1) to 32767*	
20	Channel 3 Filter Constant	See Below **	
21	Channel 3 Gate Time Out	See Below ***	10 µs

***** **Engineering Units**

- When configured to measure voltage, the maximum difference between the Low and High Engineering Units is equal to (Upper Analog Range – Lower Analog Range) * 1000
- When configured to measure current, the maximum difference between the Low and High Engineering Units is equal to 5000. To read the current value in 0.01mA increments, set the Low Engineering Units to 0 and the High Engineering Units to 2000.

** **Filter Constant**

- The Channel Filter Constant must be zero in modes 0 to 3
- In mode 4, the Filter Constant has a range of 0 or ((Sample Value) + 6) to 65535
- In mode 5, the Filter Constant has a range of 0 or ((Sample Value * 5) + 6) to 65535
- The Filter Constant has units of 10µs in mode 4 and 50µs in mode 5
- Only the Channel 0 Filter Constant is used in Mode 4. However, the Filter Constant Values for channels 1 to 3 must also be within the valid ranges defined above.

*** **Gate Time Out**

- The Gate Timeout value can only be zero if the Gate Input is Level Active
- Modes 0 to 3 range of 0 or (21 to 65535)
- Mode 4 range of 0 or (2 * (sample value + 5)) to 6553
- Mode 5 range of 0 or (2 * ((sample value * 5) + 5)) to 6553
- Only the channel 0 Gate Time Out value is used in modes 0 to 4

Sample Mode Configuration Word

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Gate Mode DIN3	Gate Mode DIN2	Gate Mode DIN1	Gate Mode DIN0	0	Fail Part on Missing Trigger	COS Event of Average	COS Event on Fault	0	0	Number Of Channels		0	Sample Mode		

0 = Level Input
1 = Rising Edge Active

Sample Mode

Bit 2	Bit 1	Bit 0	Function
0	0	0	Gate / Trigger Mode (mode 0)
0	0	1	Gate / Quadrature Counter Mode (mode 1)
0	1	0	Gate / Counter Mode (mode 2)
0	1	1	Gate / Timer Mode (mode 3)
1	0	0	Gate / Only Mode (mode 4)
1	0	1	Multi Gate Mode (mode 5)
1	1	0	Reserved
1	1	1	Reserved

Number of Channels

Bit 5	Bit 4	Function
0	0	1
0	1	2
1	0	3
1	1	4

Channel Configuration Word

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Sample Value Increment Range = 0 to 255 (Each value will be multiplied by 10µs in mode 4 or 50µs in mode 5 and added to the 50 µs base sample time. Used only in modes 4 and 5. Must be 0 in modes 0 to 3.Only the Channel 0 Sample Value Increment is used in Mode 4.)								Output Enable	0	Over Range Check Enabled	Under Range Check Enabled	0	Input Type 0 = differential 1= single ended	Analog Input Range	

Analog Input Range

Bit 1	Bit 0	Function
0	0	-10Vdc to +10Vdc
0	1	0Vdc to +10Vdc
1	0	0Vdc to +5Vdc
1	1	0 to 20mA

Inspection Profile Data:

Word(s)	Function	Range
0	Number of Inspection and Critical Points	See description below
1	Running Average	0, 2, 4, 8, 16, 32, or 64
2	Trigger Delay and Output Delay	See description below
3	Critical Inspection Points LSW (0 to 15)	Bit 0 = inspection 0, Bit 1 = inspection 1, … Bit 31 = inspection 31
4	Critical Inspection Points MSW (16 to 31)	
5 to 7	Inspection Point 0 Programming Block	See description below
8 to 10	Inspection Point 1 Programming Block	See description below
11 to 13	Inspection Point 2 Programming Block	See description below
14 to 16	Inspection Point 3 Programming Block	See description below
17 to 19	Inspection Point 4 Programming Block	See description below
20 to 22	Inspection Point 5 Programming Block	See description below
23 to 25	Inspection Point 6 Programming Block	See description below
26 to 28	Inspection Point 7 Programming Block	See description below
29 to 31	Inspection Point 8 Programming Block	See description below
32 to 34	Inspection Point 9 Programming Block	See description below
35 to 37	Inspection Point 10 Programming Block	See description below
38 to 40	Inspection Point 11 Programming Block	See description below
41 to 43	Inspection Point 12 Programming Block	See description below
44 to 46	Inspection Point 13 Programming Block	See description below
47 to 49	Inspection Point 14 Programming Block	See description below
50 to 52	Inspection Point 15 Programming Block	See description below
53 to 55	Inspection Point 16 Programming Block	See description below
56 to 58	Inspection Point 17 Programming Block	See description below
59 to 61	Inspection Point 18 Programming Block	See description below
62 to 64	Inspection Point 19 Programming Block	See description below
65 to 67	Inspection Point 20 Programming Block	See description below
68 to 70	Inspection Point 21 Programming Block	See description below
71 to 73	Inspection Point 22 Programming Block	See description below
74 to 76	Inspection Point 23 Programming Block	See description below
77 to 79	Inspection Point 24 Programming Block	See description below
80 to 82	Inspection Point 25 Programming Block	See description below
83 to 85	Inspection Point 26 Programming Block	See description below
86 to 88	Inspection Point 27 Programming Block	See description below
89 to 91	Inspection Point 28 Programming Block	See description below
92 to 94	Inspection Point 29 Programming Block	See description below
95 to 97	Inspection Point 30 Programming Block	See description below
98 to 100	Inspection Point 31 Programming Block	See description below
101	Reserved	

Notes:

1. The number of programmed Inspection Points must be equal to the Number of Inspection Points, specified in Word 0. All other values must be 0.
2. Only one Inspection Point is supported for Sample Modes 4 and 5. All other points must be 0.
3. No Critical Inspection Points are defined for sample modes 4 and 5. All inspection points are considered critical.

Number of Inspection and Critical Points

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Number of Inspection Points (0 to 32) (Not used in modes 4 and 5)								Number of Critical Points (0 to Number of Inspection points in modes 1 to 3, 1 to 255 in modes 4 and 5) (0 disables the Inspection Operations)							

Output Delay and Trigger Delay

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Output Delay (0 to 255)								0	0	0	0	Trigger Delay (0 to 15)			

Critical Inspection Points (LSW)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Inspection Point 15 is critical	Inspection Point 14 is critical	Inspection Point 13 is critical	Inspection Point 12 is critical	Inspection Point 11 is critical	Inspection Point 10 is critical	Inspection Point 9 is critical	Inspection Point 8 is critical	Inspection Point 7 is critical	Inspection Point 6 is critical	Inspection Point 5 is critical	Inspection Point 4 is critical	Inspection Point 3 is critical	Inspection Point 2 is critical	Inspection Point 1 is critical	Inspection Point 0 is critical

Critical Inspection Points (MSW)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Inspection Point 31 is critical	Inspection Point 30 is critical	Inspection Point 29 is critical	Inspection Point 28 is critical	Inspection Point 27 is critical	Inspection Point 26 is critical	Inspection Point 25 is critical	Inspection Point 24 is critical	Inspection Point 23 is critical	Inspection Point 22 is critical	Inspection Point 21 is critical	Inspection Point 20 is critical	Inspection Point 19 is critical	Inspection Point 18 is critical	Inspection Point 17 is critical	Inspection Point 16 is critical

Inspection Programming Block

Word	Function	Range
N	Target Value	Within the Engineering Units programmed in the Module Configuration Data
N + 1	Low Pass Value	(Low Engineering Unit to (Target Value))
N + 2	High Pass Value	(Target Value) to High Engineering Unit))

The data in the Inspection Programming Block defines which of the 102 words in the Inspection Profile Data is assigned to the each inspection point. For example, if you wanted to program Inspection Point 4, then word N = 17, word (N+1) = 18, and word (N+2) = 19.

Counter Configuration Data (Modes 1 & 2):

Word(s)	Function	Range	Units
0	Number of Profile Points	0 to 32	
1	Count or Time Value 0	1 to 65535	Counts
2	Count Value 1	(Value 0 + 1) to 65535	Counts
3	Count Value 2	(Value 1 + 1) to 65535	Counts
4	Count Value 3	(Value 2 + 1) to 65535	Counts
5	Count Value 4	(Value 3 + 1) to 65535	Counts
6	Count Value 5	(Value 4 + 1) to 65535	Counts
7	Count Value 6	(Value 5 + 1) to 65535	Counts
8	Count Value 7	(Value 6 + 1) to 65535	Counts
9	Count Value 8	(Value 7 + 1) to 65535	Counts
10	Count Value 9	(Value 8 + 1) to 65535	Counts
11	Count Value 10	(Value 9 + 1) to 65535	Counts
12	Count Value 11	(Value 10 + 1) to 65535	Counts
13	Count Value 12	(Value 11 + 1) to 65535	Counts
14	Count Value 13	(Value 12 + 1) to 65535	Counts
15	Count Value 14	(Value 13 + 1) to 65535	Counts
16	Count Value 15	(Value 14 + 1) to 65535	Counts
17	Count Value 16	(Value 15 + 1) to 65535	Counts
18	Count Value 17	(Value 16 + 1) to 65535	Counts
19	Count Value 18	(Value 17 + 1) to 65535	Counts
20	Count Value 19	(Value 18 + 1) to 65535	Counts
21	Count Value 20	(Value 19 + 1) to 65535	Counts
22	Count Value 21	(Value 20 + 1) to 65535	Counts
23	Count Value 22	(Value 21 + 1) to 65535	Counts
24	Count Value 23	(Value 22 + 1) to 65535	Counts
25	Count Value 24	(Value 23 + 1) to 65535	Counts
26	Count Value 25	(Value 24 + 1) to 65535	Counts
27	Count Value 26	(Value 25 + 1) to 65535	Counts
28	Count Value 27	(Value 26 + 1) to 65535	Counts
29	Count Value 28	(Value 27 + 1) to 65535	Counts
30	Count Value 29	(Value 28 + 1) to 65535	Counts
31	Count Value 30	(Value 29 + 1) to 65535	Counts
32	Count Value 31	(Value 30 + 1) to 65535	Counts

Notes

1. Count values greater than 32767 will be displayed as negative numbers.
2. X4 decoding is used to decode the encoder signals when the module is operating in Gate / Quad Counter Mode (Mode 1).
3. X1 decoding is used to decode the pulse signals when the channel is operating in Gate / Incremental Counter Mode (Mode 2).
4. It is possible to program more, but not less, Counter Profile Points than Inspection Points.
5. The Counter data must be programmed after the Inspection Data of all of the used channels.
6. Unused Count values can be set to zero.

Timer Configuration Data (Mode 3):

Word(s)	Function	Range	Units
0	Number of Profile Points	0 to 32	
1	Time Value 0	10 to 65535	10µs
2	Time Value 1	(Value 0 + 10) to 65535	10µs
3	Time Value 2	(Value 1 + 10) to 65535	10µs
4	Time Value 3	(Value 2 + 10) to 65535	10µs
5	Time Value 4	(Value 3 + 10) to 65535	10µs
6	Time Value 5	(Value 4 + 10) to 65535	10µs
7	Time Value 6	(Value 5 + 10) to 65535	10µs
8	Time Value 7	(Value 6 + 10) to 65535	10µs
9	Time Value 8	(Value 7 + 10) to 65535	10µs
10	Time Value 9	(Value 8 + 10) to 65535	10µs
11	Time Value 10	(Value 9 + 10) to 65535	10µs
12	Time Value 11	(Value 10 + 10) to 65535	10µs
13	Time Value 12	(Value 11 + 10) to 65535	10µs
14	Time Value 13	(Value 12 + 10) to 65535	10µs
15	Time Value 14	(Value 13 + 10) to 65535	10µs
16	Time Value 15	(Value 14 + 10) to 65535	10µs
17	Time Value 16	(Value 15 + 10) to 65535	10µs
18	Time Value 17	(Value 16 + 10) to 65535	10µs
19	Time Value 18	(Value 17 + 10) to 65535	10µs
20	Time Value 19	(Value 18 + 10) to 65535	10µs
21	Time Value 20	(Value 19 + 10) to 65535	10µs
22	Time Value 21	(Value 20 + 10) to 65535	10µs
23	Time Value 22	(Value 21 + 10) to 65535	10µs
24	Time Value 23	(Value 22 + 10) to 65535	10µs
25	Time Value 24	(Value 23 + 10) to 65535	10µs
26	Time Value 25	(Value 24 + 10) to 65535	10µs
27	Time Value 26	(Value 25 + 10) to 65535	10µs
28	Time Value 27	(Value 26 + 10) to 65535	10µs
29	Time Value 28	(Value 27 + 10) to 65535	10µs
30	Time Value 29	(Value 28 + 10) to 65535	10µs
31	Time Value 30	(Value 29 + 10) to 65535	10µs
32	Time Value 31	(Value 30 + 10) to 65535	10µs

Notes

1. Time values greater than 32767 will be displayed as negative numbers.
2. The time values must be 10 or more (100µs) apart.
3. It is possible to program more, but not less Timer Profile Points than Inspection Points.
4. The Timer data must be programmed after the Inspection Data of all of the used channels.
5. Unused Time values can be set to zero.

Using Message Instructions to Read Data from the 5274 Module

The following Read Functions are available in both Configuration and Inspection Mode.

Inspection Data: (One message instruction per channel)

Word	Inspection Data Modes 0, 1, 2, and 3	Inspection Data Modes 4 and 5
0	Module Status	Module Status
1	Reserved	Reserved
2	LSW Coordinated System Time	LSW Coordinated System Time
3	MSW Coordinated System Time	MSW Coordinated System Time
4	Channel Status	Channel Status
5	Channel Sequence Number	Channel Sequence Number
6	Channel High Fail [15 to 0]	Current Sample Count
7	Channel High Fail [31 to 16]	Number of High Fail
8	Channel Low Fail [15 to 0]	Number of Low Fail
9	Channel Low Fail [31 to 16]	Reserved
10	Channel Current Data Point 0	Channel Current Data
11	Channel Current Data Point 1	Channel Current Data Average
12	Channel Current Data Point 2	Channel Current Minimum Value
13	Channel Current Data Point 3	Channel Current Maximum Value
14	Channel Current Data Point 4	Channel Maximum Negative Deviation
15	Channel Current Data Point 5	Channel Maximum Positive Deviation
16	Channel Current Data Point 6	Reserved
17	Channel Current Data Point 7	Reserved
18	Channel Current Data Point 8	Reserved
19	Channel Current Data Point 9	Reserved
20	Channel Current Data Point 10	Reserved
21	Channel Current Data Point 11	Reserved
22	Channel Current Data Point 12	Reserved
23	Channel Current Data Point 13	Reserved
24	Channel Current Data Point 14	Reserved
25	Channel Current Data Point 15	Reserved
26	Channel Current Data Point 16	Reserved
27	Channel Current Data Point 17	Reserved
28	Channel Current Data Point 18	Reserved
29	Channel Current Data Point 19	Reserved
30	Channel Current Data Point 20	Reserved
31	Channel Current Data Point 21	Reserved
32	Channel Current Data Point 22	Reserved
33	Channel Current Data Point 23	Reserved
34	Channel Current Data Point 24	Reserved
35	Channel Current Data Point 25	Reserved
36	Channel Current Data Point 26	Reserved
37	Channel Current Data Point 27	Reserved
38	Channel Current Data Point 28	Reserved
39	Channel Current Data Point 29	Reserved
40	Channel Current Data Point 30	Reserved
41	Channel Current Data Point 31	Reserved
42	Channel Current Total LSW	Reserved
43	Channel Current Total MSW	Reserved

Note 1
The inspection data is reset to zero at the beginning of each Gate Cycle. To guarantee that all of the available data is read, you should only read this data between Gate Cycles.

Note 2
The Average Data in Word 11 is only calculated if the channel has been configured with a Running Average parameter.

Note 3
The Negative Deviation = (Target Value – Minimum Value)

The Positive Deviation = (Maximum Value – Target Value)

Average Inspection Data (One message instruction per channel)

Word	Average Data Modes 0, 1, 2, and 3	Average Data Modes 4 and 5
0	Module Status	Module Status
1	Reserved	Reserved
2	LSW Coordinated System Time	LSW Coordinated System Time
3	MSW Coordinated System Time	MSW Coordinated System Time
4	Channel Status	Channel Status
5	Channel Sequence Number	Channel Sequence Number
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	Reserved	Reserved
10	Channel Data Point Average 0	Reserved
11	Channel Data Point Average 1	Channel Average Data
12	Channel Data Point Average 2	Channel Average Minimum Value
13	Channel Data Point Average 3	Channel Average Maximum Value
14	Channel Data Point Average 4	Channel Maximum Negative Deviation
15	Channel Data Point Average 5	Channel Maximum Positive Deviation
16	Channel Data Point Average 6	Reserved
17	Channel Data Point Average 7	Reserved
18	Channel Data Point Average 8	Reserved
19	Channel Data Point Average 9	Reserved
20	Channel Data Point Average 10	Reserved
21	Channel Data Point Average 11	Reserved
22	Channel Data Point Average 12	Reserved
23	Channel Data Point Average 13	Reserved
24	Channel Data Point Average 14	Reserved
25	Channel Data Point Average 15	Reserved
26	Channel Data Point Average 16	Reserved
27	Channel Data Point Average 17	Reserved
28	Channel Data Point Average 18	Reserved
29	Channel Data Point Average 19	Reserved
30	Channel Data Point Average 20	Reserved
31	Channel Data Point Average 21	Reserved
32	Channel Data Point Average 22	Reserved
33	Channel Data Point Average 23	Reserved
34	Channel Data Point Average 24	Reserved
35	Channel Data Point Average 25	Reserved
36	Channel Data Point Average 26	Reserved
37	Channel Data Point Average 27	Reserved
38	Channel Data Point Average 28	Reserved
39	Channel Data Point Average 29	Reserved
40	Channel Data Point Average 30	Reserved
41	Channel Data Point Average 31	Reserved
42	Channel Total Average LSW	Reserved
43	Channel Total Average MSW	Reserved

Note 1
The Average Data in Word 11 is only calculated if the channel has been configured with a Running Average parameter.

Note 2
The Negative Deviation will be zero if the calculated average is above the Target Value.

Note 3
The Positive Deviation will be zero if the calculated average is below the Target Value.

Input Data (Data Sent from the 5274 to the PLC at the RPI time and or with a COS message)

Word	Function	Notes
0	Module Status	See description below
1	Command Errors	See description below
2	LSW Coordinated System Time	System Time read from the PLC on the rising edge of the gate signal.
3	MSW Coordinated System Time	
4	Channel 0 Status	See description on the next page
5	Channel 0 Sequence Number	Increments at the end of each measurement cycle *
6	Channel 0 High Fail Number [0..15]	Inspection points 0 to 15 that are above the high pass value
7	Channel 0 High Fail Number [16..31]	Inspection points 16 to 31 that are above the high pass value
8	Channel 0 Low Fail Number [0..15]	Inspection points 0 to 15 that are below the low pass value
9	Channel 0 Low Fail Number [16..31]	Inspection points 16 to 31 that are below the low pass value
10	Channel 0 Current Analog Value	Updated only on each trigger pulse, or when each count/time value is reached. In modes 4 and 5, the current analog value is updated at each sample value increment.
11	Channel 1 Status	See description on the next page
12	Channel 1 Sequence Number	Increments at the end of each measurement cycle *
13	Channel 1 High Fail Number [0..15]	Inspection points 0 to 15 that are above the high pass value
14	Channel 1 High Fail Number [16..31]	Inspection points 16 to 31 that are above the high pass value
15	Channel 1 Low Fail Number [0..15]	Inspection points 0 to 15 that are below the low pass value
16	Channel 1 Low Fail Number [16..31]	Inspection points 16 to 31 that are below the low pass value
17	Channel 1 Current Analog Value	Updated only on each trigger pulse, or when each count/time value is reached. In modes 4 and 5, the current analog value is updated at each sample value increment.
18	Channel 2 Status	See description on the next page
19	Channel 2 Sequence Number	Increments at the end of each measurement cycle *
20	Channel 2 High Fail Number [0..15]	Inspection points 0 to 15 that are above the high pass value
21	Channel 2 High Fail Number [16..31]	Inspection points 16 to 31 that are above the high pass value
22	Channel 2 Low Fail Number [0..15]	Inspection points 0 to 15 that are below the low pass value
23	Channel 2 Low Fail Number [16..31]	Inspection points 16 to 31 that are below the low pass value
24	Channel 2 Current Analog Value	Updated only on each trigger pulse, or when each count/time value is reached. In modes 4 and 5, the current analog value is updated at each sample value increment.
25	Channel 3 Status	See description on the next page
26	Channel 3 Sequence Number	Increments at the end of each measurement cycle *
27	Channel 3 High Fail Number [0..15]	Inspection points 0 to 15 that are above the high pass value
28	Channel 3 High Fail Number [16..31]	Inspection points 16 to 31 that are above the high pass value
29	Channel 3 Low Fail Number [0..15]	Inspection points 0 to 15 that are below the low pass value
30	Channel 3 Low Fail Number [16..31]	Inspection points 16 to 31 that are below the low pass value
31	Channel 3 Current Analog Value	Updated only on each trigger pulse, or when each count/time value is reached. In modes 4 and 5, the current analog value is updated at each sample value increment.

Input Data Notes

1. The data from the 5274 module is updated at the RPI time asynchronously to the program scan. AMCI recommends that the input data be buffered before it is used by the ladder logic program.
2. The Channel Sequence number is incremented when the measurement cycle is done. That is, it will be incremented when the number of trigger points, the number of encoder counts, the time value, or the number of critical points at the sample value has been reached. If none of this occurs, it will increment when the gate signal ends or when the gate timeout value is reached.
3. The Sequence number will count from 0 to FFFFh and then roll over to 0.
4. The Low and High Fail status bits are updated immediately when an error is detected. These bits are reset at the beginning of the next gate cycle.
5. The Low and High Fail status bits will be set even if the fault output is programmed not to fire, or if an inspection point has been masked by the Critical Inspection Points LSW and MSW setup words.
6. In modes 4 and 5, the Low Fail Number [0..15] will increment by one at each Sample Increment as long as the analog value remains less than the Low Pass Value. The High Fail Number [0..15] will increment by one at each Sample Increment as long as the analog value remains greater than the High Pass Value. If the value reaches 16# FFFF, the number will roll over to 0 and start counting again. In both cases, the Low Fail Number [16..31] and the High Fail Number [16..31] are not used.

Module Status Word

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Acknowledge Bit	Command Error	Module OK	Module configured	0	Calibration values saved	Calibration -10Vdc flag	Calibration +10Vdc flag	Update Next Inspection Point (modes 4 & 5 only)	Set when 5274 is in Calibration Mode	Set when 5274 is in Configuration Mode	Set when 5274 is in Run Mode	Digital Input 3 Status	Digital Input 2 Status	Digital Input 1 Status	Digital Input 0 Status

Digital Input State — (bits 0 to 3) Indicates when the specified Digital Input is active. These bits only indicate the Gate Signals and trigger signals and those appropriate for the mode. Digital Inputs 0 and 1 will not show the state of the encoder inputs in modes 0 and 1, but will show the state of the gate inputs in mode 5.

Mode bits — (bits 4 to 6) Indicates the operating mode of the 5274 module

Update Next Inspection Point — (bit 7) Modes 4 and 5 only. Set to indicate that the 5274 module has accepted a new inspection point from the output registers. This bit will remain set until the module is switched back to command mode (command word = 16#8010) or configuration mode (command word = 16#8020).

Calibration +/- 10V flags — (bits 8 and 9) set to indicate that the Analog Inputs have been correctly calibrated.

Calibration Values Saved — (bit 10) set to indicate that the calibration values have been saved in the modules flash memory.

Module Configured — (bit 12) set when the Module Configuration Message Instruction, the configured number of channels Inspection Profile data, and if necessary the Counter / Timer data, has successfully been sent to the 5274 module. This bit will be reset at power up, and when the PLC is switched from Program to Run mode.

Module OK — (bit 13) set when the module passes its power up self test and is functioning correctly.

Command Error — (bit 14) set when data programmed in the output image table is incorrect. See Input Word 1 for a more detailed description.

Acknowledge Bit — (bit 15) set by the module to acknowledge the receipt of programming data from the processor. This bit will remain set as long as the Transmit Bit remains set. The module resets the Acknowledge Bit after the processor resets the Transmit Bit.

Command Error Codes

Error Code	Meaning
1	Invalid Command • Updating inspection setpoints from the output registers when the module is in configuration mode • Setting the Transmit bit without setting bits in the Module Command Word. • Setting any of the unused bits in the Command Word. • If inspection profile data for all for all of the running channels is not present when changing the setpoints from the output registers. (Modes 4 and 5 only.) • Trying to change the inspection setpoints from the output registers without setting both bit 4 (Set Run Mode) and bit 7 (Update Inspection Points). (Modes 4 and 5 only.) • Attempting to calibrate the unit, by setting Command Word bits 8, 9, or 10, without also setting Calibration Mode bit 6.
2	Invalid Calibration Command
3	Calibration Not Complete
4	Invalid Mode • Attempting to change the Inspection Points before the module is in Run Mode. • Attempting to change the Inspection Points if the module is not operating in modes 0 to 3. • Attempting to enter Calibration Mode while the module is in Run Mode. (Calibration Mode can only be entered from Configuration mode.) • Attempting to exit Calibration Mode directly to Run Mode. (You must go from Calibration mode to Configuration Mode.)
5	Module Not Configured
6	Invalid Inspection Point • Placing the module in Run Mode before programming the Module Configuration data and the Inspection Data on all selected channels • Placing the module in Run Mode when using any of the Counter / Timer modes without programming the Counter / Timer Data • Placing the module in Run Mode after reprogramming the Module Configuration and not the Inspection Data.
7	Invalid Inspection Parameters • If the Target Value, Low Pass, or High Pass values are outside of their valid ranges when changed from the output registers. • If the new Low Pass value is less than the Low Engineering Unit • If the new Low Pass value is greater than the new Target Value • If the new High Pass value is greater than the High Engineering Unit • If the new High Pass value is less than the new Target Value
8	Attempting to Calibrate the 5274 module with more than one Calibration bit (Module Control Word bits 8, 9, and 10) set.

Channel Status Word

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Critical Point Fault	Gate Time Out Fault	Gate Reactivated Fault	Delayed Fault	0	0	0	Digital Output State	0	0	Over Range Flag	Under Range Flag	0	0	0	Measurement Cycle Status

Measurement Cycle Status — (bit 0) Indicates when a measurement cycle is occurring. This bit will be set when the first trigger pulse is received (mode 0). This bit will also be set when the first value programmed with the Counter Timer programming block (modes 1 to 3) is reached. For modes 1 and 2, this value will be the (count value + 1). For mode 3, this value will be the (time value + 10µs).

Under Range Flag — (bit 4) Set to indicate that the Analog Signal is below the valid level for the programmed Analog Input Range. The most likely cause is a broken sensor cable. This bit will remain on until the beginning of the next gate cycle.

Over Range Flag — (bit 5) Set to indicate the Analog Signal is above the valid level for the programmed Analog Input Range. . The most likely cause is a broken sensor cable. This bit will remain on until the beginning of the next gate cycle.

Digital Output Status — (bit 8) Set when the channels dedicated digital output is active. Channel 0 uses digital output 0, channel 1 uses digital output 1, etc.

Delayed Fault — (bit 12) This bit will be set when the delayed fault output turns on. This bit will remain on until the beginning of the next Gate cycle.

Gate Reactivated Fault — (bit 13) Set if the Gate Signal turned off before the programmed number of inspections points or the programmed count value was reached. This bit will remain on until the beginning of the next gate cycle.

This bit is only located in the channel 0 status word.

The Gate Reactivated fault condition does not cause the fault output to turn on.

Gate Time Out Fault — (bit 14) Set when the Gate Input has been on for longer than then Gate Time Out value programmed with the module configuration data. This bit will remain on until the beginning of the next gate cycle. In modes 0 to 4, this bit only exists in the channel 0 status word.

Critical Points Fault — (bit 15) Set when the analog value is outside the range of one or more of the Inspection Points. This bit will turn on immediately even if the fault output has been delayed. This bit will stay on until the next time the gate input transitions from off to on.

Output Data (Data Sent from the PLC to the 5274 at the RPI time)

The 5274 module supports a limited number of real-time commands. They are; *Set Run (Inspection) Mode, Set Configuration Mode, Calibrate at +10Vdc, Calibrate at -10Vdc, Save Calibration Value to Flash,* and *Update Next Inspection Point. (modes 4 and 5 only).* They are implemented through the Output Registers and will be updated at the RPI time whenever the transmit bit transitions from 0 to 1.

Word	Function	Range
0	Module Command	See description below
1	Reserved	Must be equal to zero
2	Ch 0 Next Target Value	Within the Engineering Units programmed in the Module Configuration Data
3	Ch 0 Next Low Pass Value	(Low Engineering Unit to (Target Value)
4	Ch 0 Next High Pass Value	(Target Value to High Engineering Unit)
5	Ch 1 Next Target Value	Within the Engineering Units programmed in the Module Configuration Data
6	Ch 1 Next Low Pass Value	(Low Engineering Unit to (Target Value)
7	Ch 1 Next High Pass Value	(Target Value to High Engineering Unit)
8	Ch 2 Next Target Value	Within the Engineering Units programmed in the Module Configuration Data
9	Ch 2 Next Low Pass Value	(Low Engineering Unit to (Target Value)
10	Ch 2 Next High Pass Value	(Target Value to High Engineering Unit)
11	Ch 3 Next Target Value	Within the Engineering Units programmed in the Module Configuration Data
12	Ch 3 Next Low Pass Value	(Low Engineering Unit to (Target Value)
13	Ch 3 Next High Pass Value	(Target Value to High Engineering Unit)
14	Reserved	Must be equal to zero
15	Reserved	Must be equal to zero

Module Command Word

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 09	Bit 08	Bit 07	Bit 06	Bit 05	Bit 04	Bit 03	Bit 02	Bit 01	Bit 00
Transmit bit	0	0	0	0	Save Calibration values to flash (Calibration Mode Only)	Calibrate –10Vdc (Calibration Mode Only)	Calibrate +10Vdc (Calibration Mode Only)	Update Inspection Points (Modes 4 & 5 only)	Set Calibration Mode	Set Configuration Mode	Set Run (Inspection) Mode	0	0	0	0

Output Data Notes:

1. After power up, both Module Configuration and Inspection data must be sent to the module before entering Run Mode.
2. Changing from Configuration Mode to Run Mode resets the results of any Inspection Operations. While in Configuration Mode the module will retain all Module Configuration and Inspection Data
3. Modified inspection points take affect on the next off to on transition of the gate input(s).
4. Modified inspection points can only be read back after at least one off to on transition of the gate input(s).
5. Both bit 4 (Run Mode) and bit 7 (Update Inspection Points) must be set when modifying the Inspection Setpoints.
6. Data for all of the active channels must be present when updating the Inspection setpoints from the output registers.
7. Calibration Mode can only be entered only from Configuration Mode (not from Run Mode).
8. You can only exit from Calibration Mode to Configuration Mode.
9. Bit 6 (Calibration Mode) must also be set when performing any of the calibration operations (bits 8, 9, or 10 set).

Programming Cycle

a. Write the new programming data into the output registers with the Transmit Bit reset. This step insures that the correct data is in the output data words before the Programming Cycle begins.
b. Set the Transmit bit. A Programming Cycle is initiated when this bit makes a 0 to 1 transition.
c. Once the unit is done with the programming data, it will set any necessary error bits and the Acknowledge Bit in its input data words.
d. Once you see the Acknowledge Bit set, check for any errors.
e. Respond to any errors and reset the Transmit Bit.
f. The 5274 module responds by resetting the Acknowledge Bit. The Programming Cycle is complete.

Specification Revision History

Revision 1.0 was released on 7/5/07 and was the second version of the specifications. Anything shown in red needs additional details or to be verified.

Revision 2.0 was released on 11/27/07. Additional causes of Extended Error codes were added and most time parameter ranges were changed from 1µs increments to 10µs increments. Additional information on valid ranges was also added.

Revision 3.0 was released on 7/28/08. The following changes were made.

- Additional causes of error codes were added.
- Wiring for Current Inputs and Calibration Mode were added
- Additional information, including an example, on how the Filter Constant works was added

Revision 4.0 was released on 10/1/08. The following changes were made.

- The addition of a table of contents
- The addition of general information
- Details were added to the module specifications
- Details were added to the calibration procedure
- The Additional Information on how modes 1, 2, and 3 operate is no longer true and has been removed
- Details on how the Running Average function works was added.
- More Extended Error codes were added
- The Counter / Timer programming table was divided into two separate tables, one for the counter information and one for the timer information.