Module Overview

The 2600-13 module is a high speed limit switch module that resides in a Rockwell Automation CompactlLogix or MicroLogix 1500 system rack, connects to a resolver and switches outputs based on that resolver position which ranges from 0 to 4095 for each rotation (0.088 degree resolution). Based on the change of the resolver position it also transmits a 5V quadrature differential signal with 1024 pulse per revolutions.

There are three versions of the 2600-13 module. The 2611-13 consist of the resolver interface module and has 16 virtual, backplane only, inputs and outputs. The 2612-13 module adds one I/O module containing 8 physical inputs and 8 physical outputs to the 2611-13. The 2613-13 adds two I/O modules to the 2611-13 for a total of 16 physical inputs and 16 physical outputs. The virtual inputs and outputs are always numbered 0 to 15 while the physical inputs and outputs are numbered 16 to 31.

Each output can be programmed with 16 On/Off setpoints. Alternatively, each of the outputs can be programmed for stitching operations or as timed outputs.

The outputs can be Anded with the inputs, and or with the speed of the rotating resolver.

The 2600-13 Press Module also has the several features specific to controlling stamping presses, including five types of Die Monitoring checks (Normally True, Normally False, Cyclical, Constant, and Quick) , the counting of Die Monitoring Inputs, Stopping Time, Brake Applied position, Time for Rotation, and an additional method of programming speed compensation advances based on fixed and variable parameters.

The 2600-13 module is fully programmable from the ladder logic program using a handshaking sequence; no special software packages are required. The module will accept the data located in the output registers as programming data whenever it detects either a 0 to 1 or a 1 to 0 transition of a bit, named the Transmit Bit, in the output registers. The module also has the ability to store all of its parameters in a Flash memory. If this feature is not used, the module will have to be programmed at every power up. The Flash Memory device can be programmed a minimum of 10,000 times.

The throughput time of the 2600-13 module is less than 20 microseconds. The repeatability of the output firing, that is how much the output will vary from one turn to the next, is 1 microsecond.

All three versions of the 2600-13 module have the ability to both output and receive serial position data, allowing multiple units to be “slaved” together.

Sample programs showing how to program the 2600-13 module in both MicroLogix and CompactLogix systems are available from the following page of our website.

http://www.amci.com/sampleprograms.asp

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 at 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 that you can be reached at. 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

Chapter 1: Installing the 2600-13 module

WARNING **Disconnect power before attempting to install or remove the 2600-13 module**

1. Verify that your system's power supply has adequate reserve current capacity. The 2600-13 module requires

   550mA @5Vdc for the *2613-13* (600mA when pins 17 and 18 on the resolver connector are shorted)
   500mA @5Vdc for the *2612-13* (550mA when pins 17 and 18 on the resolver connector are shorted)
   450mA @5Vdc for the *2611-13* (500mA when pins 17 and 18 on the resolver connector are shorted)

2. The 2600-13 cannot be any farther than the 7th module away from the power supply.
3. Align the tongue-and-groove guides on the left side of the module with the existing rack system and slide the module backwards.
4. When the 2600-13 module is in position, move the white bus connector lever on the top of the module to the left.
5. If the 2600-13 module is the right most module in a system, a 1769-ECR End Cap MUST be installed to the right of the module for the system to operate correctly.

Configuring a CompactLogix PLC for the 2600-13 module

1. Open RSLogix 5000 and the project in which you want to install the AMCI 2600-13 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 = 1769-MODULE
   Description = Generic 1769 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 Data-INT)
   Slot: *location of 2600-13 module (The 2611-13, 2612-13, and 2613-13 all appear as one slot to the PLC.)*
7. Enter the Connection Parameters from the following table.

CONNECTION PARAMETERS

	Assembly Instance	Size in 16 bit words
INPUT	101	8
OUTPUT	100	8
CONFIGURATION	102	0

8. Click on Finish >>

The 2600-13 module will now appear in the project tree and three new data tags will have been created, Local:X.I.Data[Y], Local:X.O.Data[Y] and Local:X.C.Data[Y] where "X" is the slot number and "Y" is the word number. The status, current position, encoder position, and captured data value are located in the Input tags. All commands are sent to the 2600-13 module through the Output tags. The 2600-13 module does not use the Configuration tags.

Configuring a MicroLogix 1500 PLC for the 2600-13 module

1. Open or create the RSLogix 500 project in which you want to use the 2600-13 module.
2. Double click on I/O Configuration in the project tree.
3. Select the slot where the 2600-13 module will be installed.
4. Double click on "Other.. Requires I/O Card Type ID" from the bottom of the list of available modules.
5. Enter the following information in the window that appears.

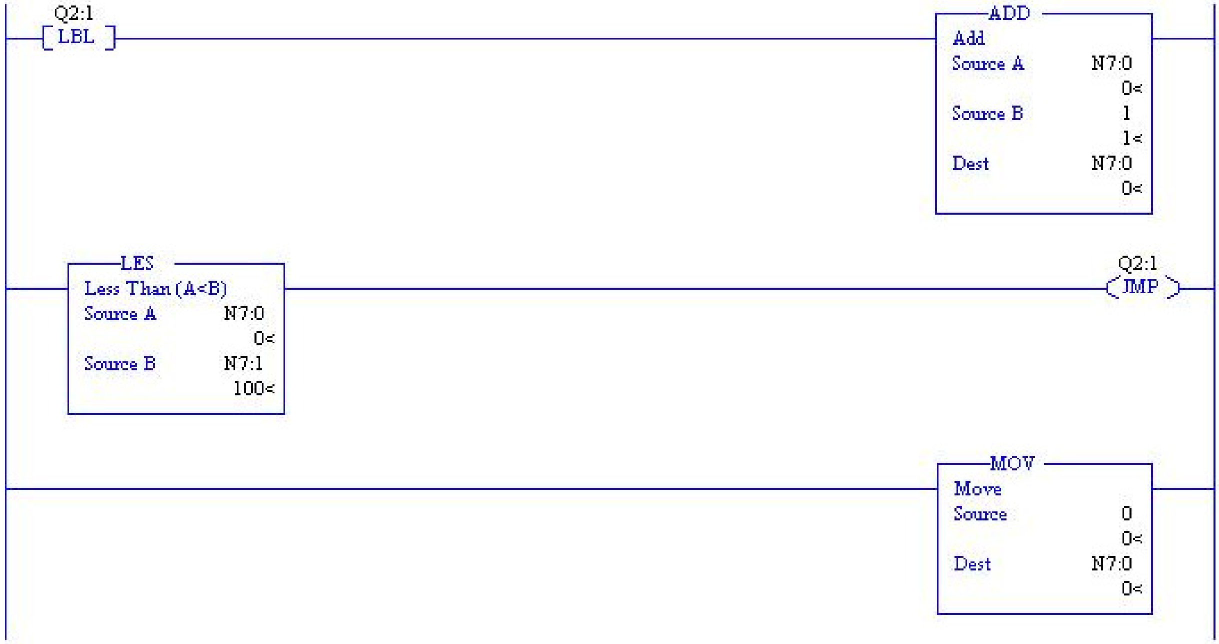
Vendor ID:	3
Product Type:	9
Product Code:	27
Input Words:	8
Output Words:	8
Input Bits:	0
Output Bits:	0
Extra Data Length:	0
Ignore Configuration Error:	*Your Choice, but not recommended*

6. The 2600-13 module will now appear in the I/O Configuration with a Part Number of Other and a Description of I/O Module – ID Code = 27.
7. Input Data (data from the 2600-13 module to the PLC) will appear in Input Image Table registers I:X.0 to I:X.7, where X is the slot number.
   Output Data (data from the PLC to the 2600-13 module) will be written to registers O:X.0 to O:X.7, where X is the slot number.

NOTE

Because of a problem with the communication ASIC, it may necessary to use the following rungs to increase the scan time of your ladder logic program.

The value that you use in register N7:1 may be different.


Q2:1
LBL
ADD
Add
Source A N7:0
0<
Source B 1
1<
Dest N7:0
0<
LES
Less Than (A<B)
Source A N7:0
0<
Source B N7:1
100<
Q2:1
JMP
MOV
Move
Source 0
0<
Dest N7:0
0<

Chapter 2: Hardware Overview

Module Specifications

Current Draw

2613-13: 550mA @5Vdc (600mA when pins 17 and 18 on the resolver connector are shorted)
2612-13: 500mA @5Vdc (550mA when pins 17 and 18 on the resolver connector are shorted)
2611-13: 450mA @5Vdc (500mA when pins 17 and 18 on the resolver connector are shorted)

Throughput Time from Position Change to Output Reaction (Activation/Deactivation):

- The 2600-13 PLS module is capable of detecting 0.088 degree changes in a resolver's position at 1800 RPM.
- Master Module: 10 microseconds to 20 microseconds depending on load and the programmed PLS configuration
- Slave Module: The Slave module will operate about 0.05ms behind the Master Module.

Repeatability of Output Reaction on Position Change (Jitter when positioning):

- 1 microsecond (The is the repeatability of the output firing, that is how much it will vary from one turn to the next.)

Velocity Update

- The velocity data is always reported in Revolutions per Minute (RPM).
- The 2600-13 PLS module calculates resolver for given *Resolver Rollover Counts*. Positive RPM indicates increasing counts, and a negative RPM indicates decreasing counts. The increasing count direction can be changed by a bit in the *PLS Global Configuration,* or by reversing the S2 S4 resolver signals wires.
- The 2600-13 RPM value is updated every 14.6mS applying a first order digital filter with programmable *RPM Filter* value.

Environmental Conditions

- Operating Temperature: 0 to 60° C
- Relative Humidity: 5 to 95% (non-condensing)
- Storage Temperature: -40 to 85° C

Sinking Inputs

Nominal Voltage Range:	12 to 24Vdc
On State:	10 to 30Vdc
Off State:	0 to 5Vdc
Impedance @ 24Vdc:	3.3kOhm
Input Current	8mA @ 24Vdc, 3.75mA @12Vdc
Isolation	Inputs are isolated from PLC backplane
Scanning Rate	Inputs are scanned every 50µs

Resolver Compatibility

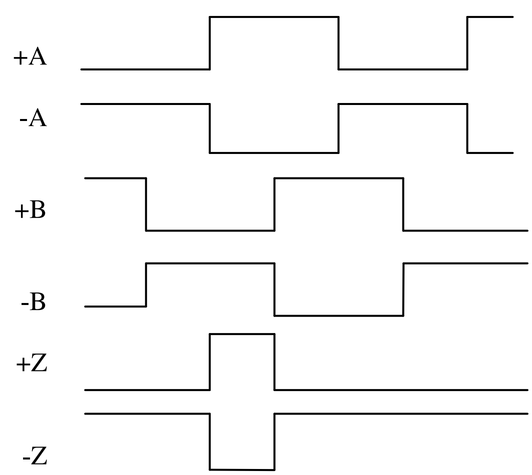
The 2600-13 module uses a reference voltage of 10kHz and is designed to work with resolvers that have a transformation ratio of 0.95.

Sourcing Outputs

Nominal Voltage Range:	12 to 24Vdc (dependent on the connected power supply)
Operating range:	10 to 30Vdc
Current Rating Per Output Point:	1A maximum @ 30°C (0.5A @ 60°C)
Current Limit Per Two:	<4A (Overload)
Output Short Circuit Protection:	Electronic (No program indication of fault) Remove load and cycle power to restore. Overloading one output shuts down all 8 in the group
Reverse Overshoot Protection:	Yes (Current limited) If wired incorrectly, outputs may be permanently disabled
Isolation	Outputs are isolated from PLC backplane

Quadrature Output

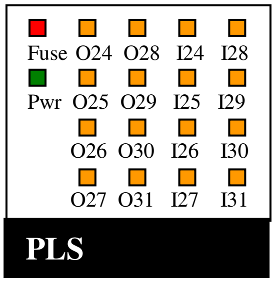
- Resolution fixed at 1024 pulses / revolution
- 5Vdc differential output, typical amplitude of 3.5 to 4Vdc
- One Z Pulse per revolution that is half the width of the A and B pulses
- Maximum current output = 20mA
- The quadrature output will be unstable, that is the A and B pulses will turn on and off randomly, when the 2600-13 module has a non clearable transducer fault. However, the quadrature output will be stable when there is a clearable transducer fault.
- The Quadrature Output is not affected by the count direction parameter. If the quadrature signals are counting in the wrong direction for your application, simply reverse +A for +B and –A for –B.
- The Quadrature Output has the following waveforms.
- The Z output is aligned with the electrical zero of the resolver and is not affected by any offsets programmed into the module.



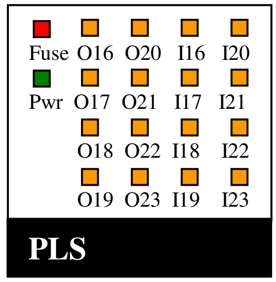
FLASH Memory

The 2600-13 module's parameter values are stored in a non-volatile Flash memory. This memory type can store parameter values in the absence of power for over twenty years, but you can only write to it a limited number of times before it will be damaged. The Flash Memory that AMCI uses is guaranteed for a minimum of 10,000 write cycles.

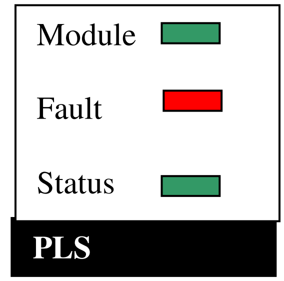
I/O Panel 2



I/O Panel 1



Main Panel



LED Functions

Module **LED**
<u>Solid Green</u>: Module Owned, two-way communication;

Master Module Fault **LED**
<u>Solid Red</u>: Module Fault (faulty Flash Memory or no reference voltage)
Non-Clearable Transducer Fault
<u>Blinking Red</u>: Clearable Transducer Fault;

Slave Module Fault **LED**
<u>Solid Red</u>: Module Fault (faulty Flash Memory or no reference voltage),
Serial data signals are not present
Master Module has a Clearable or Non-Clearable Transducer Fault
<u>Blinking Red</u>: Clearable Transducer Fault

Status **LED**
<u>Solid Green</u>: Module and Transducer are working fine;
<u>Blinking Green</u>: Outputs are overridden (forced);

Fuse **LED**
<u>Solid Red</u>: Outputs overloaded
Main module not communicating with I/O module.

Pwr **LED**
<u>Solid Green</u>: Outputs working normally

In/Out_xx **LED**
<u>Solid Yellow</u>: Input/Output_xx activated

Connectors Pinout

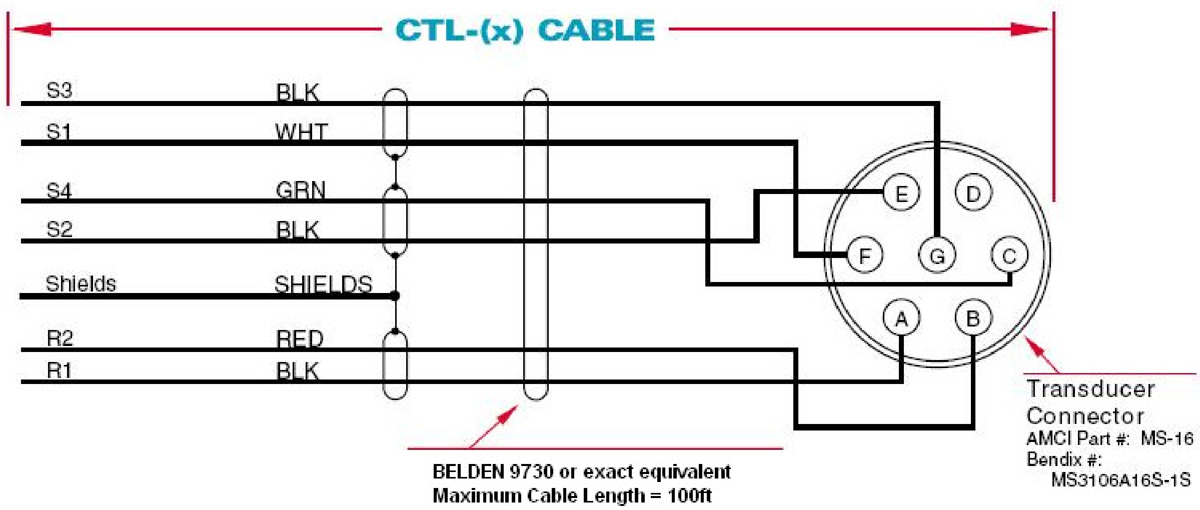
The peripheral signals are brought into the 2600-13 module through an 18-pin connector AB 1769-RTBN18. This connector is included with the 2600-13 module.

Main Board Connector

Signal	Pin	Pin	Signal
-RxD (Slave Input -)	1	2	+RxD (Slave Input +)
-TxD (Master Output -)	3	4	+TxD (Master Output +)
Cable Shields	5	6	Ground
-Z Quadrature Output	7	8	+Z Quadrature Output
-B Quadrature Output	9	10	+B Quadrature Output
-A Quadrature Output	11	12	+A Quadrature Output
-COS (S2 resolver signal)	13	14	+COS (S4 resolver signal)
-SIN (S1 resolver signal)	15	16	+SIN (S3 resolver signal)
-REF (R2 resolver signal)	17	18	+REF (R1 resolver signal)

Pre made cables are available from AMCI. These cables come with a Bendix connector that mates with the resolver transducer. The other end is pigtailed at the factory for easy connection to the 18 pin connector that is included with the 2600-13 module. This cable has a part number of CTL-X, where X equals the length in feet.

The CTL-X cable shown below is used to connect an AMCI single resolver transducer to the 2600-13 module.



Wiring Notes

- When plugged into the 2600-13 module, pin 1 is located in the upper left hand corner.
- The cable between the resolver and the module can have a maximum length of 100ft.
- The reference voltage output on the R1 & R2 terminals has an amplitude of 1.35Vrms and a frequency of 10kHz.
- Transducer signals are generally low voltage, low power signals. If you are using A-B guidelines for cabling installation, treat the transducer cable as a Category 2 cable. It can be installed in conduit along with other low power cabling such as communication cables and low power ac/dc I/O lines. It cannot be installed in conduit with ac power lines or high power ac/dc I/O lines.
- Like all signal and communication cable, the transducer cable should be shielded. These shields must be grounded only at one end of the cable. Because the rack cabinet is typically better grounded than the machine, AMCI recommends that the cable shields be terminated at the 2600-13 module.
- If a junction must be made in the signal cable, treat the shield as a signal-carrying conductor. Do not connect the shield to ground at any junction box or the transducer.
- If the signal cable must cross power feed lines, it should do so at right angles.
- Route the cable at least five feet from high voltage enclosures, or sources of “rf” radiation.
- The Ground Terminal pin 6 and the Cable Shields Terminal pin 5 are internally connected together.
- The Cable Shields pin 5 is connected to the rack’s chassis ground. The cable shields should be connected to these terminals. If you are still experiencing noise related problems, try running a heavy wire directly from the cable shields pin to your Earth Ground bus.
- When wiring a module in slave mode, connect the Transmit Output Terminals of the master module to the Receive Input Terminals of the slave module. Specifically,

Master Module	Slave Module
Pin 4 (+TxD)	Pin 2 (+RxD)
Pin 3 (-TxD)	Pin 1 (-RxD)

- Inputs and outputs 16 to 23 are only available on 2612-13 and 2613-13 modules and will always be located on the module directly to the left of the resolver input portion of the 2600-13 module.
- Inputs and outputs 24 to 31 are only available on the 2613-13 module and are only located on the second module from the left of the resolver input portion of the 2600-13 module.
- The inputs are sinking and are referenced to pin 18, the Power Supply Common pin. The inputs will not activate if this pin is left floating.
- The outputs are sourcing and are powered from an external power supply connected to pins 17 and 18. The outputs have a nominal voltage range of 12 to 24Vdc and each output can source a maximum of 1A of current.
- Overloading of any of the outputs leads to hardware shutting down the entire I/O card.
- The two Input / Output connectors of a 2613-13 module can be connected to different external power supplies.
- All terminal connections on the 2600-13 module are isolated from the backplane of the PLC.

Input and Output Board Connector (2612-13 and 2613-13 modules only)

Output 16 or 24	1	2	Input 16 or 24
Output 17 or 25	3	4	Input 17 or 25
Output 18 or 26	5	6	Input 18 or 26
Output 19 or 27	7	8	Input 19 or 27
Output 20 or 28	9	10	Input 20 or 28
Output 21 or 29	11	12	Input 21 or 29
Output 22 or 30	13	14	Input 22 or 30
Output 23 or 31	15	16	Input 23 or 31
+Vcc (12 to 24Vdc)	17	18	Power Supply Common

Inputs and Outputs 16 to 23 are located on the I/O module directly to the left of the Main Module.

Inputs and Outputs 24 to 31 are located on the left most module of a 2613-13.

Sinking Inputs

The Inputs are Sinking and are referenced to pin 18, the Power Supply Common, pin.

Nominal Voltage Range:	12 to 24Vdc
On State:	10 to 30Vdc
Off State:	0 to 5Vdc
Impedance @ 24Vdc:	3.3kOhm
Input Current	8mA @ 24Vdc, 3.75mA @12Vdc
Isolation	Inputs are isolated from PLC backplane
Scanning Rate	Inputs are scanned every 50µs

Sourcing Outputs

The outputs are Sourcing and are powered by an external power supply that is connected to pins 17 and 18.

Nominal Voltage Range:	12 to 24Vdc (dependent on the connected power supply)
Operating range:	10 to 30Vdc
Current Rating Per Output Point:	1A maximum @ 30°C (0.5A @ 60°C)
Current Limit Per Two:	<4A (Overload)
Output Short Circuit Protection:	Electronic (No program indication of fault) Remove load and cycle power to restore. Overloading one output shuts down all 8 in the group
Reverse Overshoot Protection:	Yes (Current limited) If wired incorrectly, outputs may be permanently disabled
Isolation	Outputs are isolated from PLC backplane

NOTE The outputs will be on if the PLC is off and the external DC supply is still on.

Chapter 3: Programmable Parameters

Clear Errors: This command bit exists on all of the programming blocks and will remove a latched transducer fault and all programming errors.

Disable Physical Outputs: This bit exists in all of the programming blocks. Setting this bit will cause all of the physical outputs to turn off. Resetting this bit will cause the physical outputs to turn on or off based on programmed on/off setpoints, the resolver position, and the state of the ANDing Inputs.

Void Entire setup of Specified Output: This bit exists in all of the Programming Blocks that are used to program when a PLS output will fire. Setting this bit clears the entire setup of the Output defined by the Output Being Programmed parameter. This includes all of the On/Off setpoints, the Limit Offset, and any ANDing functions that have been assigned to the input.

Transmit Bit: This bit exists on all of the programming blocks. The 2600-13 module only acts on the data located in the output registers on the 0 to 1 and the 1 to 0 transition of this bit.

Global Configuration Data

Master / Slave Mode: This bit level parameter configures the 2600-13 module to be used either as a Master Module or as a Slave Module. When configured as a slave, the module will receive its position data over a serial link from a 2600-13 module that has been configured as a Master. When configured as a Slave, the 2600-13 module follows the direction of the Master module.

The default state of this parameter is Master.

Transducer Fault Latch: This bit level parameter configures the 2600-13 module to either Latch or Self Clear a transducer fault that will occur if the signals between the module and the resolver are interrupted and then restored. A loose connection or electronic noise are two possible causes of interrupted resolver signals.

The default state of this parameter has the faults latched.

Hold Last Output State: This bit level parameter allows the outputs to remain in their last state if there is a loss of communication, if there is a transducer fault, or if the PLC is switched to Program Mode. In the case of the transducer fault, the outputs will remain in their last state even if it is a Clearable transducer fault, which is indicated by a blinking Fault LED.

The default state of this parameter has the outputs turn off if one or more of the previous conditions are met.

Count Direction: This bit level parameter controls the direction of increasing counts. If the resolver cable is wired as shown in this manual, then the position counts will increase as the resolver's shaft rotates Clockwise, looking at the shaft. Using the count direction parameter will cause the position counts to increase as the resolver's shaft rotates Counter Clockwise, looking at the shaft.

The default state of this parameter is Clockwise Increasing.

Resolver Rollover Counts: Internally, the 2600-13 module decodes the resolver's position at 4096 counts per turn. The Resolver Rollover Count parameter allows you to program the 2600-13 module to go through a complete cycle (0 to maximum) in only part of a turn.

This parameter is used in combination with the Resolver Rollover Position.

This value must be equal for both master and all slave modules.
Any change to this constant resets all previously programmed limit switch setpoint parameters.
This parameter has a range of 1 to 4095.
The factory default value is 4095.

Resolver Rollover Position: This parameter is used in combination with the Resolver Rollover Counts parameter to define the highest count value that the position will reach before wrapping around to zero. This parameter is different than most AMCI resolver modules where the Scale Factor Parameter defines a position that counts from (0 to (Scale Factor – 1)).

This parameter has a range of 1 to the Resolver Rollover Counts
The factory default value is 359.

The following table contains examples of using the Resolver Rollover Counts and the Resolver Rollover position parameters.

Resolver Rollover Counts	Resolver Rollover Position	Result
4095	359	0 to 359 counts over one turn of the resolver
3071	359	0 to 359 counts over ¾ of a turn of the resolver
2047	359	0 to 359 counts over ½ a turn of the resolver
1023	89	0 to 89 counts over ¼ turn of the resolver

NOTE

The Rollover Count parameter also effects how the 2600-13 module calculates the velocity data. For example, if the shaft speed is 100 rev/min, then depending on the programmed Rollover Resolver Counts, the 2600-13 module will report the following velocity data.

Rollover Count	Reported Velocity
4095	100
2047	200
1023	400

Scaled Machine Offset: This value is added to the absolute resolver position that the 2600-13 module reports to the PLC. This offset position is also used when determining when to fire the Limit Switch Outputs.

This parameter has a range of (–Rollover Position to + Rollover Position)
The factory default value is 0.

RPM Filter Value: The *RPM Filter* determines how quickly the velocity value, in RPM, is reported to the PLC. The velocity value is also used internally for the speed compensation calculations. The smaller the RPM Filter Value, the reported RPM matches very closely matches the actual RPM. Higher RPM Filter Values eliminate RPM jitter but increase the lagging to the actual RPM

This parameter has a range of 0 to 65535 (0 to FFFFh)
The factory default value is 40960 (A000h).

Physical Outputs Inverting Constant: When applied, each bit of this word inverts the state of the corresponding physical output. Bit 0 controls output 16, bit 1 controls output 17 … bit 15 controls output 31. For example, if output 16 is programmed to turn on at 10 degrees and off at 20 degrees, then using the Physical Outputs Inverting Constant will cause the output to turn on at 20 degrees and off at 10 degrees.

The factory default value is 0.

Physical Inputs Inverting Constant: When applied, each bit of this word inverts the corresponding physical input. Bit 0 controls input 16, bit 1 controls input 17 … bit 15 controls input 31. For example, if input 16 being used and the Physical Inverting Constant bit is reset, then the input will be acted on when the input is receiving power (connected to a normally open contact). If the Physical Inverting Constant bit is set, then the input will be acted on when the input is not receiving power (connected to a normally closed contact).

The factory default value is 0.

Global Machine Offset Data

Preset Input: This parameter defines the input that, when energized, will set the Scaled Position data equal to the Preset Value.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Preset Value: The scaled position is set to this value when the *Preset Input* is energized. The module automatically recalculates the Scaled Machine Offset.

The Preset Value has a range of (0 to Resolver Rollover Position)
The factory default is 0

Nudge Up Input: This parameter defines the input that, when energized, will increase the Scaled Machine Offset and the Preset Value by the Nudge Up Value. Because the Scaled Machine Offset is being changed, the Scaled Position data will also be changed.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Nudge Up Value: The Offset and Preset values are increased by this value when the Nudge Up Input is energized.

The Nudge Up Value has a range of (0 to Resolver Rollover Position)
The factory default is 0

Nudge Down Input: This parameter defines the input that, when energized, will decrease the Scaled Machine Offset and the Preset Value by the Nudge Down Value. Because the Scaled Machine Offset is being changed, the Scaled Position data will also be changed.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Nudge Down Value: The Offset and Preset values are decreased by this value when the Nudge Down Input is energized.

The Nudge Down Value has a range of (0 to Resolver Rollover Position)
The factory default is 0

Limit Switch Data

Output Being Programmed: This parameter defines to what output the remaining Limit Switch setup parameters are being assigned to.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Limit Offset: Each of the 2600-13 modules outputs fires based on its own internal position, which may or may not be equal to the Scaled Machine Position. The Limit Offset parameter is added to this internal position adjusting where the On/Off setpoints fire. Please note that a positive Limit Offset causes the output to turn on earlier and a negative Limit Offset causes the output to turn on later.

This parameter has a range of (–Rollover Position to + Rollover Position)
The factory default value is 0.

Output Setpoint: Each of the 2600-13 modules outputs can be programmed with 16 on / off setpoints. This parameter defines which of these 16 on/off setpoint is being programmed with the current block of data.

This parameter has a range of 0 to 15

From Position: This parameter defines the resolver position where the Output Position will turn on.

This parameter has a range of (0 to Resolver Rollover Position)

To Position: This parameter defines the resolver position where the Output Position will turn off.

This parameter has a range of (0 to Resolver Rollover Position)

NOTE The Limit Switch Output will be on for the entire rotation of the resolver if the From and To setpoints are equal to each other.

Stitching Outputs Data

In place of programming multiple On / Off setpoints, it is also possible to program the 2600-13 module with stitching outputs that that define a pattern that is contained between the From and To Positions.

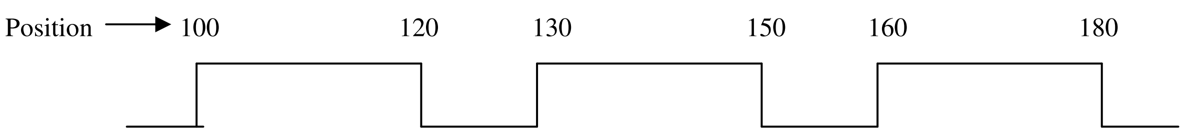
On Stitch Distance: This parameter defines when the Output will be ON between the programmed From and To positions. For the stitching operation to occur, there must be enough distance between the From and To positions for the output to turn on at least twice.

This parameter has a range of (1 to ((To Position – From Position) - 1) / 2)

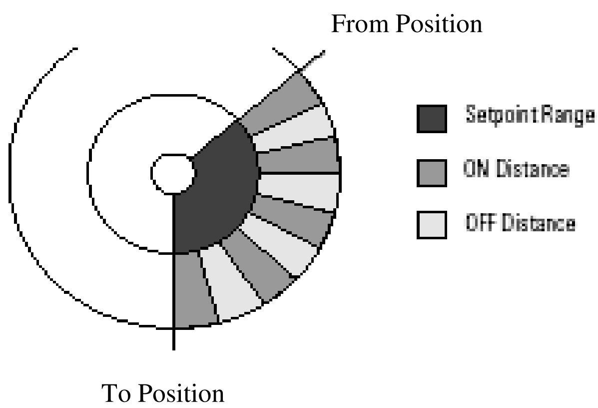
Off Stitch Distance: This parameter defines when the Output will be OFF between the programmed From and To positions. Because the stitching outputs are based on the internal resolver position, it may be necessary to increase the TO Position by one count to get the stitching operation to work correctly.

This parameter has a range of (1 to ((To Position – From Position) – 2 * On Stitch Distance)

Stitching Example 1
From Position = 100
To Position = 180
On Stitch Distance = 20
Off Stitch Distance = 10



Stitching Example 2



Speed Compensation Advances and Timed Outputs

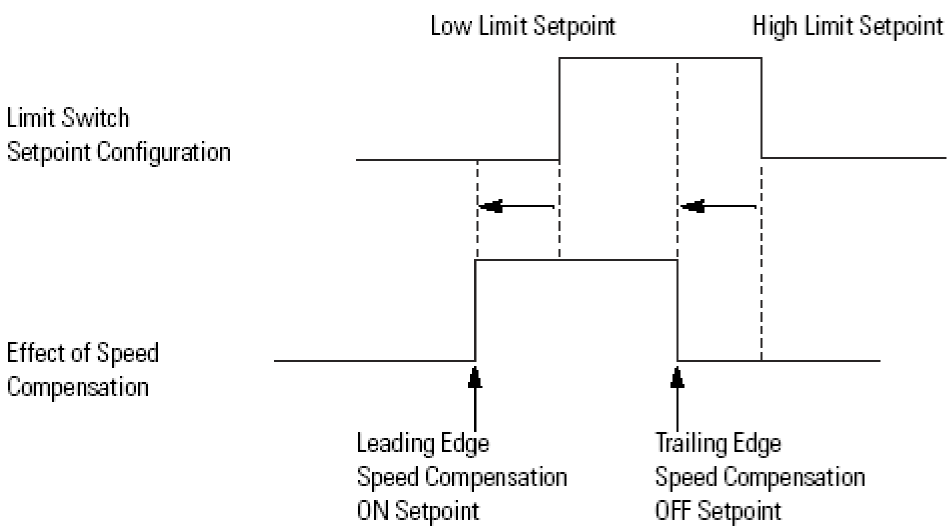
The 2600-13 module has the ability to adjust the outputs to compensate for fixed delays in the system. Based on this programmed value, and the speed of the resolver, the 2600-13 module will turn the outputs on and or off earlier so that the output will be On or Off when the position value actually reaches the programmed on setpoint.

The speed compensation parameters can be programmed in three ways.

- Distance and Speed in RPM
- Time in milliseconds
- Clutch Pole advance based on fixed and variable delay parameters.

The programmed Speed Compensation value will be used on all of the From To setpoints assigned to the Output Being Programmed.

Separate speed compensation advances can be programmed for both the FROM and TO setpoints when the Distance and RPM or Time advanced types are used, but both the FROM and the TO setpoints will be advanced by the same amount when the Clutch Pole advanced type is used.



Timed Outputs

All 32 of the 2600-13 modules outputs can be programmed as Timed Outputs. There are two types of Timed Outputs, *Time or Position* or *Absolute Time*. When programmed for *Time or Position*, the output will turn on when the first edge of the FROM TO window is reached, and turn off either at the other Setpoint or at the Programmed Time value, whichever occurs first. When programmed for *Absolute Time*, the output will turn on when either edge of the FROM TO window is reached, and turn off at the programmed time value. The setpoint at the other edge of the programmed window is not used.

Timed Outputs have a range of 1 to 32767 and are programmed in 1ms increments.

Output Being Programmed: This parameter defines to what output the remaining Speed Compensation and Timed Output parameters are being assigned to.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Advance based on Distance (in counts) and Speed (in RPM)

Lead Position Distance: This parameter defines the distance, in counts, to advance the beginning, the OFF to ON edge, of the From To Setpoint window.

This parameter has a range of (0 to Resolver Rollover Position)

Lead Speed RPM: This parameter sets the speed at which the resolver must be turning in order to compensate by *Lead Position Distance*.

This parameter has a range of 0 to 32767 and can only be equal to zero when the Lead Position Distance is equal to 0.

Trailing Position Distance: This parameter defines the distance, in counts, to advance the ending, the ON to OFF edge, of the From To Setpoint window.

This parameter has a range of (0 to Resolver Rollover Position)

Trailing Speed RPM: This parameter sets the speed at which the resolver must be turning in order to compensate by *Trailing Position Distance*.

This parameter has a range of 0 to 32767 and can only be equal to zero when the Trailing Position Distance is equal to 0.

Advance based on Time (in milliseconds)

Lead Advance Time: This parameter defines the time to advance the beginning, the OFF to ON edge, of a setpoint window for Speed Compensation.

This parameter has a range of 0 to 32767.

Trail Advance Time: This parameter defines the time to advance the ending, the ON to OFF edge, of a setpoint window for Speed Compensation.

This parameter has a range of 0 to 32767.

Clutch Pole Advances

The Clutch Pole advance is programmed with two parameters, a Fixed Delay and a Variable Delay.

- The Fixed Delay has a range of 0 to 32767ms.
- The Variable Delay has a range of 0 to 9,999µs/rpm.
- Both parameters have a default value of 0.
- The Clutch Pole Advance = Fixed Delay (in ms) + ½ * speed (in rpm) * variable delay (in µs/rpm) * (1ms / 1000µs)

WARNING

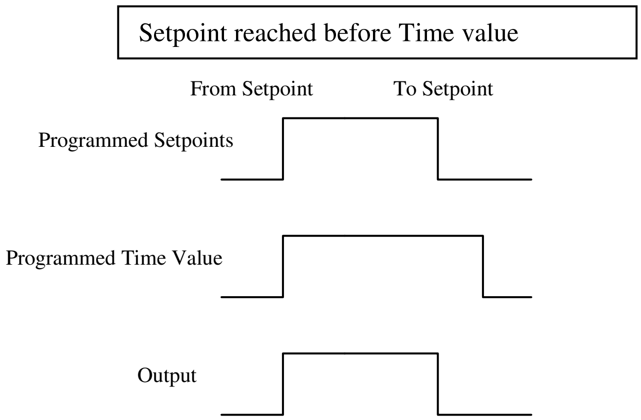
The 2600-13 module calculates how much an output needs to be advanced, in counts, based on the programmed advanced values and the rotating speed of the resolver. Unpredictable operations will occur if this number of counts exceeds the programmed Rollover Count Value. The 2600-13 module will set input word 0 bit 10, the RPM Clamped bit, to indicate to the PLC that the advanced output may not be firing correctly.

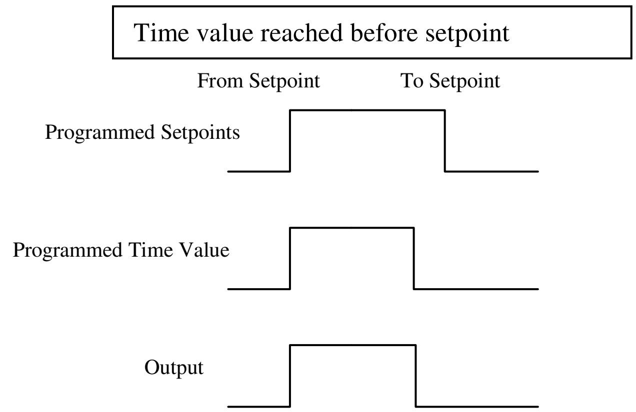
Timed Outputs

All 32 of the 2600-13 modules outputs can be programmed as Timed Outputs. There are two types of Timed Outputs, Time or Position or Absolute Time.

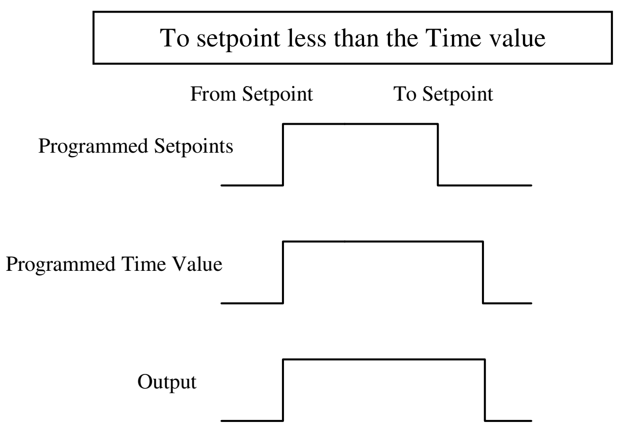
Both types have a range of 1 to 32767ms.

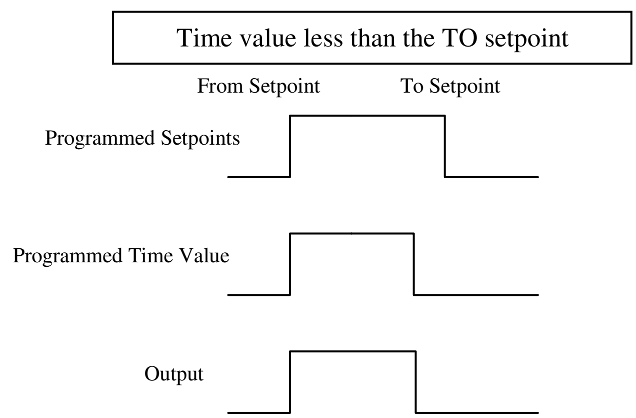
When programmed for **Time or Position**, the output will turn on at the programmed Setpoint and turn off either at the other Setpoint or at the Programmed Time value, whichever occurs first.





When programmed for **Absolute Time**, the output will turn on when either edge of the FROM TO window is reached, and turn off at the programmed time value. The setpoint at the other edge of the programmed window is not used.





NOTE

If an input is being used as an ANDing condition to a Timed Output, the timer will only start timing after the input has transitioned from Inactive to Active.

If Simple ANDing is being used, the timing function will be reset each time the input transitions from Inactive to Active.

If Pulsed or Window ANDing is used, the timing function will reset itself only when the resolver position has reached the next enable window.

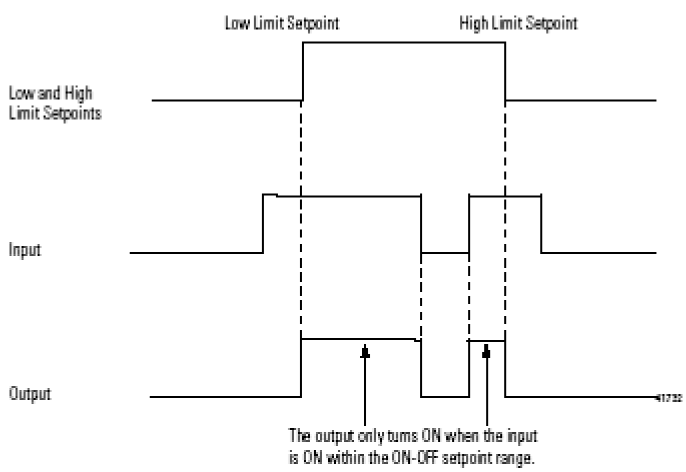
ANDing Functions

The 2600-13 module provides the ability to condition when the outputs fire by ANDing the output with an input(s), with the RPM value, or both. It is also possible to combine two or more ANDing types and functions together.

There are three types of Input ANDing. They are *Simple ANDing*, *Pulse ANDing*, and *Window ANDing*.

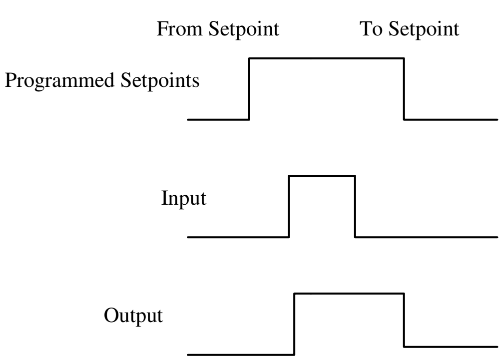
Simple ANDing

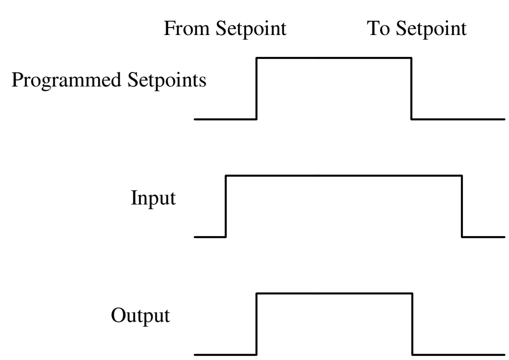
When using Simple ANDing, the output will only fire when the corresponding input is active.



Pulse ANDing

When using Pulse ANDing, the output will fire once if the corresponding input becomes active within the programmed FROM TO range, and will remain active until the TO setpoint is reached.

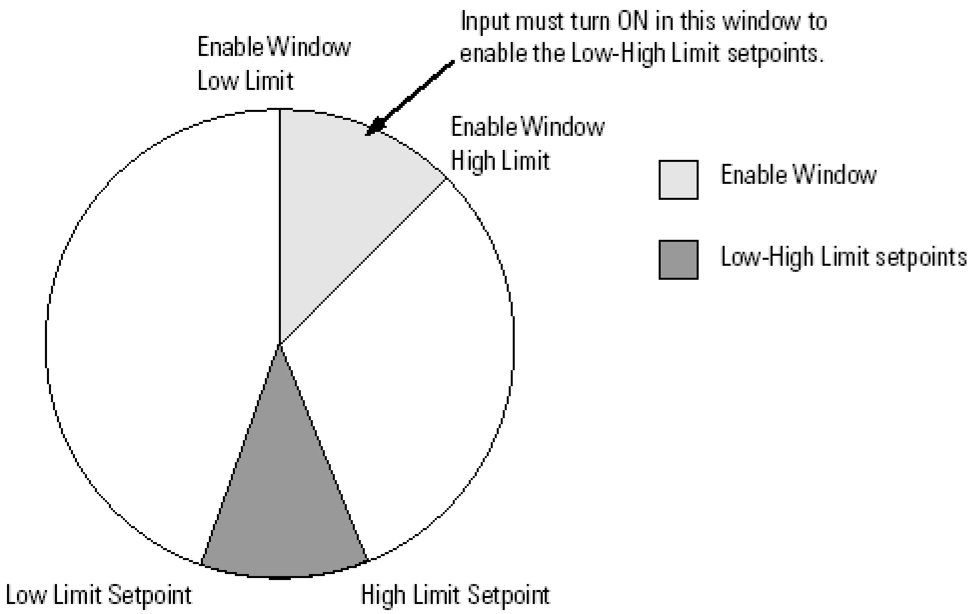




If multiple FROM TO setpoints have been programmed, then the input must become active in each of the FROM TO setpoints.

Window ANDing

When using Window ANDing, for the output to fire, the corresponding input must be active at some point within the Enable Window.



WARNING Unpredictable operations will occur if the Enable Window is contained within or overlaps any portion of the programmed FROM TO setpoints. Simple or Pulse ANDing should be used in these cases.

For all three Input ANDing types, the Input Parameter has the following ranges.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

For the Window ANDing, the Enable Window FROM and TO setpoints have a range of (0 to Resolver Rollover Position)

RPM ANDing

This function consists of two words, a RPM Enable Low Limit and a RPM Enable High Limit. When used, the corresponding output will only fire when the velocity value is either between or outside of the programmed ranges.

If the low limit is less than the high limit, then the output will be on when the velocity is between the two setpoints and off at all other speeds. If the low limit is greater than the high limit, then the output will be off when the velocity is between the two setpoints and on at all other speeds.

The RPM Low and High Limits both have a range of (-32768 to 32767)
RPM ANDing can be combined with any of the other ANDing types listed above.

Limit Switch Shifting Data

The 2600-13 does not necessarily fire its outputs based on the Scaled Machine Position. Each of the Limit Switch outputs instead maintains its own internal position that can be offset or adjusted based on the state of the module's inputs. The **Limit Switch Shifting** parameters allow you to assign which of the 2600-13 module's inputs will control these shifting functions.

NOTE

The Nudge Up parameter makes the output turn on earlier in the turn, and the Nudge Down parameter makes the output turn on later in the turn. For example, assume that you have programmed an output to turn on at 100 degrees and off at 150 degrees, and that your Nudge Up value is equal to 10.

The output will fire from 90 to 140 degrees after the first inactive to active transition of the Nudge Up Input, and from 80 to 130 on the second inactive to active transition of the Nudge Up Input.

Output Being Programmed: This parameter defines to what output the remaining Limit Switch Shifting parameters are being assigned to. This parameter has the following ranges

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Limit Preset Input Number: When this input becomes active, the internal position that the Output Being Programmed is using will be set to the Limit Preset Value. This parameter has the following ranges.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Limit Preset Value: This is the value to which the Internal Limit Switch Position will be set when the Limit Preset Input becomes active.

This parameter has a range of (0 to Resolver Rollover Position)
Default Value = 0

Limit Nudge Up Input Number: When this input becomes active, the internal position that the Output Being Programmed is using will be increased by the Nudge Up Value. The Limit Preset Value will also be increased by this amount. This parameter has the following ranges.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Limit Nudge Up Value: This is the value by which the Internal Limit Switch Position and the Limit Preset Value will be increased when the Nudge Up Input becomes active.

This parameter has a range of (0 to Resolver Rollover Position)
Default Value = 0

Limit Nudge Down Input Number: When this input becomes active, the internal position that the Output Being Programmed is using will be decreased by the Nudge Down Value. The Limit Preset Value will also be decreased by this amount. This parameter has the following ranges.

2611-13 module range: 0 to 15
2612-13 module range: 0 to 23
2613-13 module range: 0 to 31

Limit Nudge Down Value: This is the value by which the Internal Limit Switch Position and the Limit Preset Value will be decreased when the Nudge Down Input becomes active.

This parameter has a range of (0 to Resolver Rollover Position)
Default Value = 0

Forcing, Virtual Inputs, & Get Attributes Data

These functions are all sent to the 2600-13 module with one programming block.

The first is the ability to Force both the outputs and the inputs ON or OFF. This function is useful for testing the wiring of your system, or for giving the PLC direct control over the 2600-13 module's outputs.

The second is the control of the 2600-13 modules Virtual Inputs, which are always numbered 0 to 15 and have no physical presence. That is, to activate the input, the ladder logic program must set a bit in the output registers assigned to the 2600-13 module. These bits exist in this programming block.

The third is the ability to read back additional information from the 2600-13 module. This includes internal Preset values, the state of the outputs before they have been modified by the ANDing or Forcing functions, and the resolver position where the inputs transition both on and off.

Override Output Enable Bits: Setting any of the bits in this word cause the corresponding Physical Output to be assigned to the state specified by the bits in the Override Output Value word. Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31.

Override Output Value: The bits in this word are combined with the bits in the Override Output Enable Bits to Force the Physical Inputs on or off. Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31. For example,

Override Output Enable Bit	Override Output Value	Result
0	0	Output fires based on the programmed On / Off setpoints and ANDing conditions.
0	1	Output fires based on the programmed On / Off setpoints and ANDing conditions.
1	0	Output Always OFF
1	1	Output Always ON

Override Input Enable Bits: Setting any of the bits in this word cause the corresponding Physical Input to be assigned to the state specified by the bits in the Override Input Value word. Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31.

Override Input Value: The bits in this word are combined with the bits in the Override Input Enable Bits to simulate the Physical Inputs on or off. Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31. For Example

Override Input Enable Bit	**Override Input Value**	**Result**
0	0	The state of the Input on the connector is used by the 2600-13 module.
0	1	The state of the Input on the connector is used by the 2600-13 module.
1	0	The 2600-13 module considers the corresponding input to be inactive.
1	1	The 2600-13 module considers the corresponding input to be active.

Virtual Inputs: These bits give the PLC control over the 2600-13 module's Virtual Inputs, which are defined as inputs 0 to 15. The virtual inputs have no physical presence. These the bits, and therefore the state of the inputs, are directly controlled by the ladder logic program Bit 0 = Input 0, Bit 1 = Input 1 … Bit 15 = Input 15.

Get Attributes: The value entered in these words controls what data is transferred to input words 6 and 7.

Attribute Number	**Attribute Data**	**Displayed in *Status Word 0* of *PLC Input Registers***		**Displayed in *Word 6* of *PLC Input Registers***	**Displayed in *Word 7* of *PLC Input Registers***
		Bits 6,5	***Bits 4..0***		
0	Not used	00	00	2600-13 modification read from the module;	Firmware version (MSB) + revision (LSB) number;
1	Not used	00	01	*Physical Output* state without inversion or override;	*Physical Input* state after applying override and inversion;
2	Not used	00	02	*Virtual Outputs* calculated from the *Limit Switch Setpoints;*	*Physical Outputs* calculated from the *Limit Switch Setpoints;*
3	Not used	00	03	The last valid position accounting for the programmed *Resolver Rollover Counts;*	12-bit *Resolver Position* from the front connector;
4	Not used	00	04	+/- signed *Turn Count* MSW (1000s places);	+/- signed *Turn Count* LSW (1s, 10s and 100s places);
5	Not used	00	05	=0 (reserved);	=0 (reserved);
6	32	00	06	*Global Preset* Value;	*Global Offset* Value;
	Output xx (0..31)	10	xx	*Preset* Value for *Output Point* xx*;*	*Offset* Value for *Output Point* xx*;*
7	Input xx (0..31)	11	xx	*(Rising) Position* at which the *Input Point* xx changed from 0 to 1;	*(Falling) Position* at which the *Input Point* xx changed from 1 to 0;

Displayed Attributes continued

Attribute Number	Attribute Data	Displayed in *Status Word 0* of *PLC Input Registers*		Displayed in *Word 6* of *PLC Input Registers*	Displayed in *Word 7* of *PLC Input Registers*
		Bits 6,5	***Bits 4..0***		
8	Output xx (0...31)	01	xx	Output xx *Leading Advance* Position;	Output xx *Trailing Advance* Position;
9	Input xx (0...31)	00	09	*xx*;	Number of times *INPUT xx* causes FAULT condition;
10	Not Used	00	0xA	*Virtual Inputs* which first caused FAULT condition;	*Physical Inputs* which first caused FAULT condition;
11	Not Used	00	0xB	*Virtual Inputs* causing FAULT condition;	*Physical Inputs* causing FAULT condition;
12	Not Used	00	0xC	*Stopping Time* from applying 0 to *Brake* Input till complete stop;	*Stopping Angle Position* at which the *Brake* signal (= 0) was applied;
13	Not Used	00	0xD	0000;	Time for rotation between two zero points in 100uS increments (in Master unit only);

Die Monitor Parameters

Each of the 2600-13 module's inputs can be configured to verify that an expected condition occurred during the press operation. Depending on how the 2600-13 has been configured, an unexpected event will cause status bits to be set, fault output(s) to be activated, the input number where the first error occurred to be captured, and a counter incremented to indicating the number of errors detected.

- There are five types of Die Monitoring checks:

  Normally True. This is defined as the input being true over the entire turn of the resolver. The fault will be detected and the count incremented immediately each time the input goes from true to false. When in continuous count mode, the counter will increment every time the input transitions from true to false. When in self resetting count mode, the counter will become one when the input is false, and then be reset to zero when the input becomes true.
  Normally False. This is defined as the input being false over the entire turn of the resolver. The fault will be detected and the count incremented immediately each time the input goes from false to true. When in continuous count mode, the counter will increment every time the input transitions from false to true. When in self resetting count mode, the counter will become one when the input is true, and then be reset to zero when the input becomes false.
  Cyclical Check. This is defined as the input being true at least once inside the programmed range, and false at least once outside of the programmed range. The fault will be detected and the count incremented at the trailing edge of the window if the sensor is never ON within the window, or at the leading edge of the window if the sensor is never OFF outside of the window. In self resetting mode, the counter will be reset to zero if no errors are detected between two consecutive check window off setpoints. In either counting mode, the counter will increment only once between two consecutive check window off setpoints

  The Cyclical check type begins checking immediately after the unit is programmed, even if machine operations begin in the middle of the check window. An input pulse that had occurred in the window before the unit was programmed will be ignored.

  Constant Check. This is defined as the input being True inside the entire programmed range, and false at least once outside of the programmed range. The fault will be detected and the count incremented immediately if the sensor is OFF at any point in the window, or at the leading edge of the window if the sensor is never OFF outside of the window. In self resetting mode, the counter will be reset to zero if no errors are detected between two consecutive check window off setpoints. In either counting mode, the counter will increment only once between two consecutive check window off setpoints

  NOTE: Clearing a Cyclical or Constant Check Die Fault outside of the window with the input on will cause the fault condition to be met when the resolver position enters the check window.

  Quick Check. This is defined as being True at least once inside the programmed range and false outside of the entire range. The fault will be detected and the count incremented immediately if the sensor is ever ON at any point outside of the window, or at the trailing edge of the window if the sensor is never ON inside the window. In self resetting mode, the counter will be reset to zero if no errors are detected between two consecutive check window off setpoints. In either counting mode, the counter will increment only once between two consecutive check window off setpoints

- The Die Monitor Input Check programming includes up to four resolver position based On / Off check windows. Depending on the checking type used, the expected input must be active at some point within these windows.

- Fault Outputs being controlled: This parameter determines which output(s) will be affected when a fault condition is detected. Multiple outputs can be assigned to each Die Monitor test. This is a bit level parameter where a bit in one of the two words represents an output.

  2611-13: Outputs 0 to 15
  2612-13: Outputs 0 to 23
  2613-13: Outputs 0 to 31

  NOTE

  The Fault Controlled Output must also be programmed using the Limit Switch Programming Block before it will function as a Fault Output. The output will turn OFF if a Die Monitor Fault condition is detected.

  If you want the output to be on for the entire turn, program both the FROM and TO setpoints to zero.

  The Limit Switch used as a fault output does not need to be programmed to be on for the entire turn. If desired, the fault output can be programmed to turn on and off based on the resolver's position and any ANDing functions until a fault condition is detected.

- Input Point being examined: This word level parameter determines to which of the modules inputs the current die monitor check function is being assigned. This parameter has the following ranges.

  2611-13: Inputs 0 to 15
  2612-13: Inputs 0 to 23
  2613-13: Inputs 0 to 31

- Window Number: This word level parameter determines which of the four check windows is currently being programmed.

  This parameter has a range of 0 to 3.
  This parameter will be ignored for the Normally True and Normally False check types.

- Window FROM TO setpoints: This two word parameter defines the window in which the Input Point programmed above will be examined.

  These parameters have a range of (0 to Scaled Rollover Position)
  These parameters will be ignored for the Normally True and Normally False check types.

Press Control Diagnostics

- Brake Input: This parameter defines which of the module's inputs is used to measure the time between when the input transitions from ON to OFF and when the resolver stops moving. The Stopping Angle, the position at which the falling edge of the input is detected, is also captured. These parameters are reported to the PLC as part of the Get Attribute Data. This parameter has the following ranges.

  2611-13: Inputs 0 to 15
  2612-13: Inputs 0 to 23
  2613-13: Inputs 0 to 31

  The stop time measuring function has a maximum value of 65535ms. The timer value will roll over to zero and start again if this value is exceeded.

- Complete Stop Count: This value determines the number of counts out of 4096 counts / turn that the position can change by in 125ms and still be considered stopped during a stop time operation.

  The Stop Time Count Value has a range of 0 to 255.
  The Default value is 0.
  If a value of 0 is entered, a value of 1 will be used.
  The larger this value, the smaller the measured stopping time will be.

- Virtual and Physical Input Fault Counter Mask: This bit level parameter determines which method the module will use to count the number of times the die monitor input detects a fault condition.

  This function counts how many times each of the die protection inputs have detected a fault. Each counter can count from 0 to 255. If the count exceeds 255, the counter will roll over to zero and start counting again. The counter for each input will function whenever the sensor check has been enabled. The count value is reported to the PLC as part of the Get Attribute Data.

  "0" = continuous count mode "1" = self resetting count mode

  In continuous count mode, the count operation is independent of whether or not a die protection fault affects the fault output, and the counters are reset to zero only at power up or when a clear error command has been issued by the PLC.

  In self resetting count mode, the counters are reset to zero if no error is detected between two consecutive check window off setpoints, and cannot control the fault output.

  This is a bit level parameter where a bit in one of the two words represents an input.

- FAULT Output Mask: These three words determine whether or not the output will be affected by the detection of a die monitor fault condition.

  The first of the three words is the fault output to which the mask is being applied.

  2611-13: Inputs 0 to 15
  2612-13: Inputs 0 to 23
  2613-13: Inputs 0 to 31

The next two words define how each of the inputs will affect the output defined in the first word. Each bit represents an input.

When the bits are reset to zero, a detected die protection fault on the input will cause the count of the die protection fault to increment, the input number of the first die protection fault detected to be captured, and the fault output specified in word 0 to turn off.

When the bits are set to one, a detected die protection fault will increment the count and capture the input number. The fault output will not turn off.

This method of programming allows you to relate multiple outputs to multiple inputs and individually select how a Die Protection fault will affect the output.

Save Configuration Data

The 2600-13 module contains a Flash Memory that can be used to retain the configuration and limit switch data through power down. However, because this Flash Memory has a usable life of 10,000 write operations, the data that is sent from the output registers to the 2600-13 module is not automatically saved in the memory.

The Save Configuration Programming block can be used to save all of the data to the Flash Memory at one time, thereby reducing the number of times that the memory is accessed.

If this programming block is not used, the 2600-13 module will power up using its default parameters, and with no Limit Switch setpoints programmed.

The saved data is divided into two categories, Module Setup and Output Parameters. The data from either or both of these can be saved in the flash memory at one time.

Module Setup	Output Parameters
Bit Configuration	Setpoints and Stitching Values
Resolver Rollover Counts	Advances
Scaled Rollover Position	On Time
RPM Filter value	Offsets
Global Machine Offset	Preset Values + Inputs
Global Preset Value + Input Number	Nudge Up Values + Inputs
Global Nudge Up Value + Input Number	Nudge Down Values + Inputs
Global Nudge Down Value + Input Number	Enabling Inputs
Inverting Constants for the Inputs and the Outputs	Enabling RPM Values
	Enabling Window Positions + Inputs
	Display Attribute
	Die Monitor Parameters
	Press Control Diagnostics

FLASH Memory

The Flash Memory type can store parameter values in the absence of power for over twenty years, but you can only write to it a limited number of times before it will be damaged. The Flash Memory that AMCI uses is guaranteed for a minimum of 10,000 write cycles.

Chapter 4: Output Registers (Eight 16 bits words sent from the PLC to the 2600-13 module)

The data sent from the PLC to the 2600-13 module is divided into nine separate programming blocks. Word 0 always contains the Transmit Bit, a Clear Error bit, a bit that disables all of the physical outputs, and four bits (bits 0 to 3) that define the function of the programming block.

The Transmit Bit is part of a Programming Sequence used to send data from the PLC to the 2600-13 module. The following is a description of this programming sequence.

Programming Sequence

1. The ladder logic program writes the data into the *Output Registers*.
2. The ladder logic program then toggles the *Transmit Bit*. The 2600-13 module only acts on the data in the output registers when the Transmit Bit transitions from 0 to 1 or 1 to 0. It will ignore the data in the output registers when the Transmit Bit is in a constant state.
3. When the module detects the transition of the *Transmit Bit*, it will examine and execute the command, and respond by setting any error bits and toggling the *Acknowledge Bit* in the input registers to be equal to the *Transmit Bit*.
4. When the ladder logic program sees that the *Acknowledge Bit* is equal to the *Transmit Bit*, it will examine any error bits.
5. The programming sequence is now complete.

The first of the programming blocks only contains the standard commands that exists in all of the programming blocks and does not send any additional programming data to the 2600-13 module.

General Control Programming Block

Word	Function	Range
0	Control Word	See description below
1 to 7	Not Used	These words are considered "don't cares"

Word 0: Control Word (bits 3 to 0 = 0 0 0 0)

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	0	0	0	0	0	Disable all Physical Outputs	Clear Errors	0	0	0	0

Global Configuration Programming Block

Word	Function	Range
0	Control Word	See description below
1	Configuration Bits	See description below
2	Resolver Rollover Counts	1 to 4095
3	Resolver Rollover Position	1 to the Resolver Rollover Counts
4	Scaled Machine Offset	(–Resolver Rollover Position to + Resolver Rollover Position)
5	RPM Filter	0 to 65535 (0 to FFFFh)
6	Inverted Physical Outputs Constant	0 to FFFFh Bit 0 controls output 16, bit 1 controls output 17 … bit 15 controls output 31
7	Inverted Physical Inputs Constant	0 to FFFFh Bit 0 controls input 16, bit 1 controls input 17 … bit 15 controls input 31

Word 0: Control Word (bits 3 to 0 = 0 0 0 1)

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	Apply Word 7 as the Inverted Physical Input Constant	Apply Word 6 as the Inverted Physical Outputs Constant	Apply Word 5 as the RPM Filter	Apply Word 4 as the Scaled Machine Offset	Apply Word 3 as Resolver Rollover Position	Apply Word 2 as Resolver Rollover Counts	Apply Word 1 as Configuration Bits	0	Apply Factory Initialization Constants	Disable all Physical Outputs	Clear Errors	0	0	0	1

NOTE

The Apply Factory Initialization Constants bit returns all of the 2600-13 module's parameters back to their default values. This includes a Rollover Count value of 4095, a Rollover position value of 359, resetting all of the Preset and Offset Values to zero, and all of the inputs and Limit Switch Outputs not used.

NOTE

Control Word bits 8 to 14 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word will be ignored. For example, the configuration bits in Word 1 will only be read and acted on when bit 8 is set.

Global Configuration Programming Block (continued)

Word 1: 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
0	0	0	0	0 = CW Increasing Counts 1 = CCW Increasing Counts	0 = Outputs are reset when fault 1 = Outputs hold last state	0 = Latching Transducer Fault 1 = Self Clearing Transducer Fault	0 = Master Mode 1 = Slave Mode	0	0	0	0	0	0	0	0

Global Machine Offset Programming Block

Word	Function	Range
0	Control Word	See description below
1	Preset Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Preset Value	0 to Resolver Rollover Position
3	Nudge Up Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
4	Nudge Up Value	0 to Resolver Rollover Position
5	Nudge Down Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
6	Nudge Down Value	0 to Resolver Rollover Position
7	0	Don't Care

Word 0: Control Word (bits 3 to 0 = 0 0 1 0)

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	Apply words 5 & 6 as Nudge Down Input and Value	Apply words 3 & 4 as Nudge Up Input and Value	Apply Words 1 & 2 as Preset Input and Value	Void Existing Global Machine Constants	Apply Factory Initialization Constants	Disable all Physical Outputs	Clear Errors	0	0	1	0

NOTE The Apply Factory Initialization Constants bit returns all of the 2600-13 module's parameters back to their default values. This includes a Rollover Count value of 4095, a Rollover position value of 359, resetting all of the Preset and Offset Values to zero, and all of the inputs and Limit Switch Outputs not used.

NOTE Control Word bits 8 to 10 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word(s) will be ignored. For example, the Preset Input and Value in Words 1 and 2 will only be read and acted on when bit 8 is set.

Limit Switch Programming Block

Word	Function	Range
0	Control Word	See description below
1	Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Limit Offset	–Rollover Position to + Rollover Position
3	Output Setpoint	0 to 15
4	From Position	0 to Resolver Rollover Position
5	To Position	0 to Resolver Rollover Position
6	On Stitch Distance	(1 to ((To Position – From Position) - 1) / 2)
7	Off Stitch Distance	(1 to ((To Position – From Position) – 2 * On Stitch Distance)

Word 0: Control Word (bits 3 to 0 = 0 0 1 1)

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	Apply Words 3 to 7 as Stitching Limit Switch Parameters	Apply Words 3, 4, and 5 as Limit Switch Parameters	Apply Word 2 as the Limit Offset	Delete the Setpoint defined in output word 3	Void the setup for output defined in output word 1	Disable all Physical Outputs	Clear Errors	0	0	1	1

NOTE Control Word bits 8 to 10 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word will be ignored. For example, the Limit Switch Parameters in Word 3, 4, and 5 will only be read and acted on when bit 9 is set.

NOTE Setting both Control Word bits 9 and 10 at the same time will result in the Stitching Type output being programmed. No error bit will be set.

NOTE The Limit Switch Output will be on for the entire rotation of the resolver if the From and To setpoints are equal to each other.

Speed Compensation Advances and Timed Outputs Programming Block

Speed Compensation Advances Programmed as Distance and RPM and Timed Outputs

Word	Function	Range
0	Control Word	See description below
1	Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Lead Position Distance	0 to Resolver Rollover Position
3	Lead Speed RPM	0 to 32767
4	Trail Position Distance	0 to Resolver Rollover Position
5	Trail Speed RPM	0 to 32767
6	Time Output	1 to 32767 milliseconds
7	Not Used	0

Speed Compensation Advances Programmed in Milliseconds and Timed Outputs

Function	Range
Control Word	See description below
Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
Lead Advance Time	0 to 32767 milliseconds
0	Must Be Zero
Trail Advance Time	0 to 32767 milliseconds
0	Must Be Zero
Time Output	1 to 32767 milliseconds
Not Used	0

Clutch Pole Speed Compensation Advances Programmed with a fixed and Variable parameters and Timed Outputs

Word	Function	Range
0	Control Word	See description below
1	Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Clutch Pole Fixed time	0 to 32767 milliseconds
3	Clutch Pole Variable Time	0 to 9999
4	Not Used	0
5	Not Used	0
6	Time Output	1 to 32767 milliseconds
7	Not Used	0

NOTE

Control Word 0 bit 8 is used to program both Advances in milliseconds and Clutch Pole Advances. The difference is that Clutch Pole Advances use a value in output word 3 while <u>output word 3 must be zero</u> for Advances in milliseconds.

There is no separate trailing advance when using Clutch Pole Advances, meaning that if word 3 is not equal to zero, then words 4 and 5 must be zero when using this advance type.

Word 0: Control Word (bits 3 to 0 = 0 1 0 0)

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	Apply Word 6 as an Absolute On Time Timed Output	Apply Word 6 as a Time or Position Timed Output	Apply Words 2 to 5 as Advance Time in milliseconds or Clutch Pole Advances	Apply Word 2 to 5 as Advance Distance and RPM	Delete all of the Advance and Timed output parameters for the output defined in word 1.	Void the setup, including the on/off setpoints, for the output defined in output word 1	Disable all Physical Outputs	Clear Errors	0	1	0	0

NOTE

Control Word bits 8 to 11 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word(s) will be ignored. For example, the data in Word 2 through 5 will only be read and acted on as the Limit Switch Advances in Milliseconds when bit 9 is set.

NOTE

Setting both Control Word bits 8 and 9 is not allowed and will cause the module to generate a Programming Error.

If both bits 10 and 11 are set, the Timed Output will be programmed as an Absolute On Time Timed Output.

ANDing Functions Programming Block

Word	Function	Range
0	Control Word	See description below
1	Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	RPM Enable Low Limit	-32,768 to 32767
3	RPM Enable High Limit	-32,768 to 32767
4	Simple or Pulse ANDing Enabling Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
5	Window ANDing Enabling Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
6	Window ANDing From Setpoint	0 to Resolver Rollover Position
7	Window ANDing To Setpoint	0 to Resolver Rollover Position

Word 0: Control Word (bits 3 to 0 = 0 1 0 1)

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	Apply Words 5 to 7 as the Window ANDing Conditions	Apply Word 4 as the Pulse ANDing Input	Apply Word 4 as the Simple ANDing Input	Apply Words 2 and 3 as the RPM Enable ANDing Conditions	Delete all of the ANDing parameters for the output defined in word 1.	Void the setup, including the on/off setpoints, for the output defined in output word 1	Disable all Physical Outputs	Clear Errors	0	1	0	1

NOTE

Control Word bits 8 to 11 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word will be ignored. For example, the RPM Enable ANDing in Words 2 and 3 will only be read and acted on when bit 8 is set.

NOTE

A Programming Error will be generated if you set bits 9 and 10 at the same time. That is, if you attempt to program the same input for both Simple ANDing and Pulse ANDing at the same time.

Limit Switch Shifting Programming Block

Word	Function	Range
0	Control Word	See description below
1	Output Being Programmed	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Limit Preset Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
3	Limit Preset Value	0 to Resolver Rollover Position
4	Limit Nudge Up Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
5	Limit Nudge Up Value	0 to Resolver Rollover Position
6	Limit Nudge Down Input Number	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
7	Limit Nudge Down Value	0 to Resolver Rollover Position

Word 0: Control Word (bits 3 to 0 = 0 1 1 0)

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	Apply Words 6 and 7 as Limit Nudge Down Parameters	Apply Words 4 and 5 as Limit Nudge Up Parameters	Apply Words 2 and 3 as the Limit Preset Parameters	Delete all of the Limit Switch Shifting parameters for the output defined in word 1.	Void the setup, including the on/off setpoints, for the output defined in output word 1	Disable all Physical Outputs	Clear Errors	0	1	1	0

NOTE

Control Word bits 8 to 10 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output word will be ignored. For example, the Limit Preset Parameters in Words 2 and 3 will only be read and acted on when bit 8 is set.

NOTE

The Nudge Up parameter makes the output turn on earlier in the turn, and the Nudge Down parameter makes the output turn on later in the turn. For example, assume that you have programmed an output to turn on at 100 degrees and off at 150 degrees, and that your Nudge Up value is equal to 10.

The output will fire from 90 to 140 degrees after the first inactive to active transition of the Nudge Up Input, and from 80 to 130 on the second inactive to active transition of the Nudge Up Input.

Forcing, Virtual Inputs, & Get Attributes Programming Block

Word	Function	Range
0	Control Word	See description below
1	Override Output Enable Bits	Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31
2	Override Output Value	Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31
3	Override Input Enable Bits	Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31
4	Override Input Value	Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31
5	Virtual Inputs	Bit 0 = Input 0, Bit 1 = Input 1 … Bit 15 = Input 15
6	Attribute Number	0 to 13
7	Attribute Data	Only valid when the Attribute Number is a value between 6 and 13 and defines the input or output value being read. 2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31

Word 0: Control Word (bits 3 to 0 = 0 1 1 1)

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	Apply Words 6 and 7 as the Get Attribute Function	Apply Word 5 as the Virtual (backplane) inputs	Apply Words 3 and 4 to Force the Inputs ON or OFF	Apply Words 1 and 2 to Force the Outputs ON or OFF	0	0	Disable all Physical Outputs	Clear Errors	0	1	1	1

NOTE

Control Word bits 8 to 11 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output words will be ignored. For example, the Output Force function in Words 1 and 2 will only be read and acted on when bit 8 is set.

NOTE

In order for the operations controlled by the Virtual Inputs (inputs 0 to 15), such as Preset, Nudge Up, or Nudge Down, to occur more than once, the 2600-13 module must see a transition of the Transmit bit with both states of the Virtual Input. That is, the first operation will occur when the Virtual Input must transition 0 to 1. There must be a 1 to 0 transition before the next 0 to 1 transition will be acted upon.

Die Monitoring Programming Block

Word	Function	Range
0	Control Word	See description below
1	Virtual Fault Output being Controlled	Bit 0 = Output 0, Bit 1 = Output 1 … Bit 15 = Output 15 Multiple bits can be set in this word
2	Physical Fault Output being Controlled	Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31 Multiple bits can be set in this word 2611-13 module range: none of the bits can be set 2612-13 module range: only bits 0 to 7 can be set 2613-13 module range: all bits can be set
3	Input Being examined	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
4	Die Monitor Check Type	0=Disable Input Check 1= Normally True Check 2=Normally False Check 3=Cyclical Check 4=Constant Check 5=Quick Check
5	Check Window Being Programmed	0 to 3 This number defines which of the four possible position regions where the Input programmed in word 3 above will be examined.
6	Window From Point	(0 to Scaled Rollover Position) The edge of the Die Monitor check window's region
7	Window To Point	(0 to Scaled Rollover Position) The other edge of the Die Monitor check window's region

Word 0: Control Word (bits 3 to 0 = 1 0 0 0)

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	0	0	Apply Words 1 to 7 as Die Monitor Setup	Void any setup for the fault monitoring input defined in word 3	Void any fault monitoring setup for the Fault Outputs in words 1 & 2	Disable all Physical Outputs	Clear Errors	1	0	0	0

NOTE

Control Word bit 8 controls what data is being programmed in output words 1 to 7. If this bit is not set, the data in the corresponding output words will be ignored.

The values in words output words 5, 6, and 7 will be don't cares if either the Normally True or Normally False check types are selected.

Press Control Diagnostics Programming Block

Word	Function	Range
0	Control Word	See description below
1	Brake Input	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
2	Complete Stop Count	0 to 255
3	Virtual Input Fault Counter Mask	Bit 0 = Input 0, Bit 1 = Input 1 … Bit 15 = Input 15 Multiple bits can be set in this word
4	Physical Input Fault Counter Mask	Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31 Multiple bits can be set in this word
5	Fault Output Number being masked by the data in words 6 and 7	2611-13 module range: 0 to 15 2612-13 module range: 0 to 23 2613-13 module range: 0 to 31
6	Virtual Fault Input Mask	Bit 0 = Input 0, Bit 1 = Input 1 … Bit 15 = Input 15 Multiple bits can be set in this word
7	Physical Fault Input Mask	Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31 Multiple bits can be set in this word

Word 0: Control Word (bits 3 to 0 = 1 0 0 1)

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	Apply Words 5 to 7 as Fault Output Mask	Apply Words 3 and 4 as Fault Counter Mask	Apply Words 1 and 2 as Brake Input and Complete Stop Count	Zero all diagnostic Counter and Control Masks	Void the Brake Monitor Function	Disable all Physical Outputs	Clear Errors	1	0	0	1

NOTE

Control Word bits 8 to 10 control what data is being programmed in output words 1 to 7. If these bits are not set, the data in the corresponding output words will be ignored. For example, the Brake Parameters in Words 1 and 2 will only be read and acted on when bit 8 is set.

Save Configuration Programming Block

Word	Function	Range
0	Control Word	See description below
1	Not Used	0
2	Not Used	0
3	Not Used	0
4	Not Used	0
5	Not Used	0
6	Not Used	0
7	Not Used	0

Word 0: Control Word (bits 3 to 0 = 1 1 1 1)

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	0	Save the Output Parameters Data in the Flash Memory	Save the Module Setup Data in the Flash Memory	0	0	Disable all Physical Outputs	Clear Errors	1	1	1	1

Module Setup	Output Parameters
Bit Configuration	Setpoints and Stitching Values
Resolver Rollover Counts	Advances
Resolver Rollover Position	On Time
RPM Filter value	Offsets
Global Machine Offset	Preset Values + Inputs
Global Preset Value + Input Number	Nudge Up Values + Inputs
Global Nudge Up Value + Input Number	Nudge Down Values + Inputs
Global Nudge Down Value + Input Number	Enabling Inputs
Inverting Constants for the Inputs and the Outputs	Enabling RPM Values
	Enabling Window Positions + Inputs
	Display Attribute

FLASH Memory

The 2600-13 module's parameter values are stored in a non-volatile Flash memory. This memory type can store parameter values in the absence of power for over twenty years, but you can only write to it a limited number of times before it will be damaged. The Flash Memory that AMCI uses is guaranteed for a minimum of 10,000 write cycles. Each time a Programming Cycle sends the Save Configuration Programming block to the 2600-13 module will be considered one write cycle.

Chapter 5: Input Registers (Eight 16 bits words sent from the 2600-13 module to the PLC)

Word	Function	Range
0	Status Word	See description below
1	Scaled Position	0 to Resolver Rollover Position (This value will not be updated when there is a Clearable Transducer Fault)
2	Velocity in Revolutions per Minute (RPM)	A positive value indicates that the counts are increasing, and a negative value indicates that the counts are decreasing. One rotation is considered the time it takes the resolver to pass through the programmed rollover counts. For example, if the shaft speed is 100 rpm, and the rollover resolver counts is 2048, then the reported velocity will be 200.
3	Virtual (Backplane) Output State	Bit 0 = Output 0, Bit 1 = Output 1 … Bit 15 = Output 15
4	Physical Output State at the Terminal Block	Bit 0 = Output 16, Bit 1 = Output 17 … Bit 15 = Output 31
5	Physical Input State at the Terminal Block	Bit 0 = Input 16, Bit 1 = Input 17 … Bit 15 = Input 31
6	Displayed Attribute Data	See Attribute Table Below
7		

Word 0: 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	Programming Error Codes (See Programming Error Code Table Below)				RPM clamped when an Advance Value Exceeds the Rollover Count Value	Flash memory has been corrupted	Transducer Fault	Set when the Outputs are Overridden	Displayed Attribute Data (See Displayed Attribute Table Below)						

Bit 7: <u>Set when the Outputs are Overridden.</u> This bit will be set when the PLC is in Program Mode, when the outputs have been Forced either On or Off, or when the Physical Outputs have been disabled.

Bit 8: <u>Set when there is a Transducer Fault</u>. This bit will be set if a Transducer Fault has been detected. Possible causes are a miss wired cable, an incompatible resolver transducer, a faulty transducer, or a faulty 2600-13 module. A document showing *How Do I Test an AMCI Resolver System* to determine which of the previous is the cause of the Transducer Fault is available from the FAQ section of our website.

Bit 9: Set when the Flash Memory has been corrupted. The 2600-13 module saves its setup parameters through power down in a Flash Memory. This bit will be set to indicate that data stored in this device is in some way not valid. To clear this error, program the module with new parameters, or restore the factory default parameters, and then save these new parameters in the flash memory. If this does not work, the flash memory may be damaged and the unit may have to be returned to be repaired.

Bit 10: RPM clamped when an Advance Value Exceeds the Rollover Count Value The 2600-13 module calculates how much an output needs to be advanced, in counts, based on the programmed advanced values and the rotating speed of the resolver. Unpredictable operations will occur if this number of counts exceeds the programmed Rollover Count Value. The 2600-13 module sets this bit to indicate to the PLC that the advanced output may not be firing correctly.

Bits 11 to 14: Programming Error Bits

Programming Error Codes

Bit 14	Bit 13	Bit 12	Bit 11	Description
0	0	0	0	No Errors
1	0	0	0	*Command Word Error* • Set if the unused bits are set in the Command Word • Selecting both Simple and Pulse ANDing at the same time • Will be cleared with next correct Command Word
1	0	0	1	*Programmed Parameter is outside defined boundary* • Entering a value other than zero in the unused words (output words 1 to 7) that exist in some of the programming blocks • Programming inputs and or outputs greater than 15 on 2611-13 modules • Programming inputs and or outputs greater than 23 on 2612-13 modules • Requires *Clear Error* command bit
1	0	1	0	*Parameter bits are set in reserved bit fields that must be 0* • Requires *Clear Error* command bit
1	0	1	1	*Programmed parameter is in conflict with another programmed parameter* • For example, Rollover Position = 359 and a Limit Switch ON Setpoint = 360 • Setting the Count Direction and Slave Mode bits at the same time • Selecting both Distance and RPM Advances and Millisecond Advances at the same time • Programming a trailing advance value when using the Clutch Pole Advance type. • Requires *Clear Error* command bit
1	1	0	0	*Programmed setpoint overlays another setpoint of the same output or input windows* • For Example, setpoint 0 = 10 to 20 degrees, setpoint 1 = 15 to 25 • Requires *Clear Error* command bit

Displayed Attribute Table

Attribute Number	Attribute Data	Displayed in *Status Word 0* of *PLC Input Registers*		Displayed in *Word 6* of *PLC Input Registers*	Displayed in *Word 7* of *PLC Input Registers*
		Bits 6,5	*Bits 4..0*		
0	Not used	00	00	2600-13 modification read from the module;	Firmware version (MSB) + revision (LSB) number;
1	Not used	00	01	*Physical Output* state without inversion or override;	*Physical Input* state after applying override and inversion;
2	Not used	00	02	*Virtual Outputs* calculated from the *Limit Switch Setpoints;*	*Physical Outputs* calculated from the *Limit Switch Setpoints;*
3	Not used	00	03	The last valid position accounting for the programmed *Resolver Rollover Counts;*	12-bit *Resolver Position* from the front connector;
4	Not used	00	04	+/- signed *Turn Count* MSW (1000s places);	+/- signed *Turn Count* LSW (1s, 10s and 100s places);
5	Not used	00	05	=0 (reserved);	=0 (reserved);
6	32	00	06	*Global Preset* Value;	*Global Offset* Value;
	Output xx (0..31)	10	xx	*Preset* Value for *Output Point* xx*;*	*Offset* Value for *Output Point* xx*;*
7	Input xx (0..31)	11	xx	*(Rising) Position* at which the *Input Point* xx changed from 0 to 1;	*(Falling) Position* at which the *Input Point* xx changed from 1 to 0;
8	Output xx (0...31)	01	xx	*Output xx Leading Advance Position;*	*Output xx Trailing Advance Position;*
9	Input xx (0...31)	00	09	*xx;*	*Number of times INPUT xx causes FAULT condition;*
10	Not Used	00	0xA	*Virtual Inputs which first caused FAULT condition;*	*Physical Inputs which first caused FAULT condition;*
11	Not Used	00	0xB	*Virtual Inputs causing FAULT condition;*	*Physical Inputs causing FAULT condition;*
12	Not Used	00	0xC	*Stopping Time from applying 0 to Brake Input till complete stop;*	*Stopping Angle Position at which the Brake signal (= 0) was applied;*
13	Not Used	00	0xD	*0000;*	*Time for rotation between two zero points in 100uS increments (in Master unit only);* *Values between 0.15 and 0.30 rev / sec will be displayed as negative*

Chapter 6: Revision History

Revision 1.0 was released on 3/25/09 and was the initial release of the manual.

Revision 1.1 was released on 5/20/09. The following changes were made.

- The module overview text was changed to make the concepts of timed outputs and the transmit bit clearer.
- One of the LED names on the main module was changed from the incorrect Run to the correct Status.
- More details were added to the Hold Last State function and the Timed Output functions.

Revision 2.0 was released on 10/12/10 and added the press control functions to the manual.

Revision 2.1 was released on 10/17/11. The 2600-13 with press control functions now has its own part number of 2600-13.