MR320 Series
ZAPPY® Configuration Software Installation Guide

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1. Overview

This Setup Guide is intended to guide you through the installation and initial setup. A comprehensive User Manual is supplied on the Zappy® CDROM (supplied with the MR320 module) or can be downloaded via this link:
www.micronor.com/products/files/MR320/MICRONOR_MANUAL_MR320.pdf

1.1. A Complete Fiber Optic Incremental Encoder System

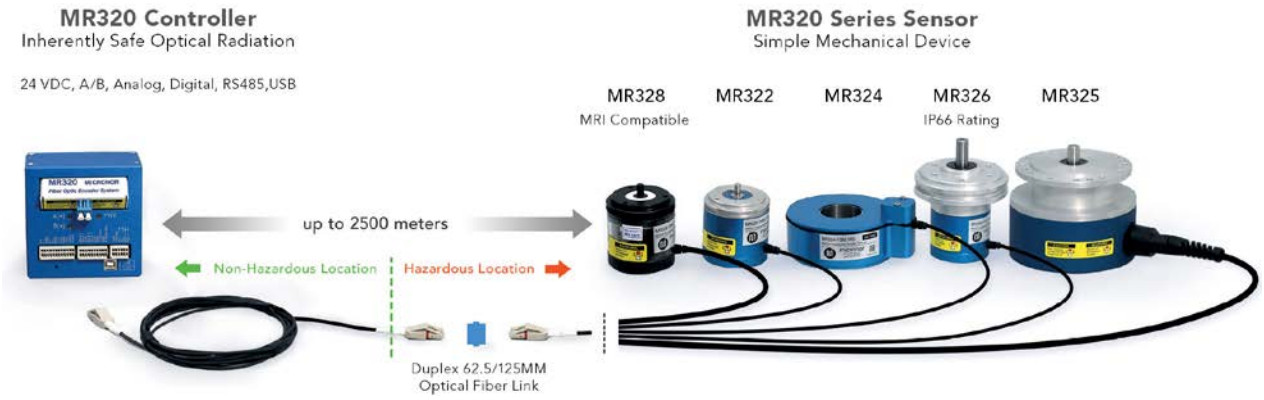


Figure 1: Complete MR320 System

- Sensor – MR322, MR324, MR325, MR326, or MR328
- Controller Module – MR320
- Additional Duplex LC Optical Assemblies and Cabling if required
- Additional Duplex LC Mating Adapter if required

Note:

- Always Keep Optical Connections Clean
- Two-Way Optical Loss Cannot Exceed 12.5dB
- Each Connector Must Meet Duplex LC-UPC Performance with Multimode Return Loss >24dB

2. System in Operation

2.1. Required Optical Signals

If you require only the direct A+B quadrature outputs, then this Quick Setup Guide is all you should need.

If you plan to use the Multiplier, Divider, Position Counter, Analog Outputs or Serial Interface, then you to need to install the ZAPPY® software and reference the more detailed MR320 User Manual. These files are included on the Resource CD supplied with the MR320 module or can be downloaded via a ZIP file at:
www.micronor.com/products/files/ZAPPY/ZAPPY.zip

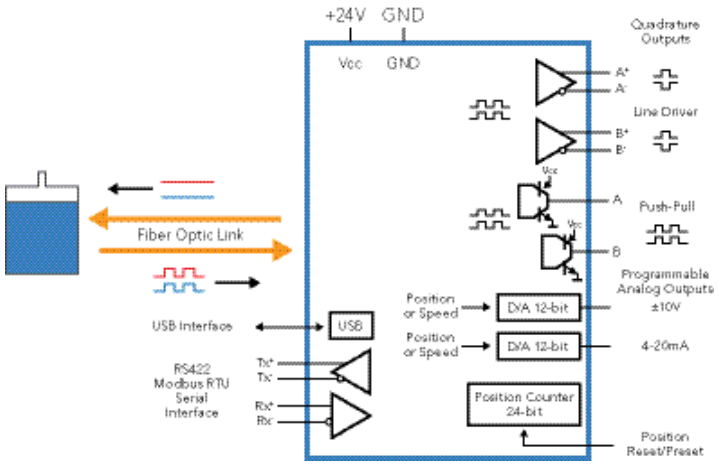


Figure 2: MR320 System Block Diagram

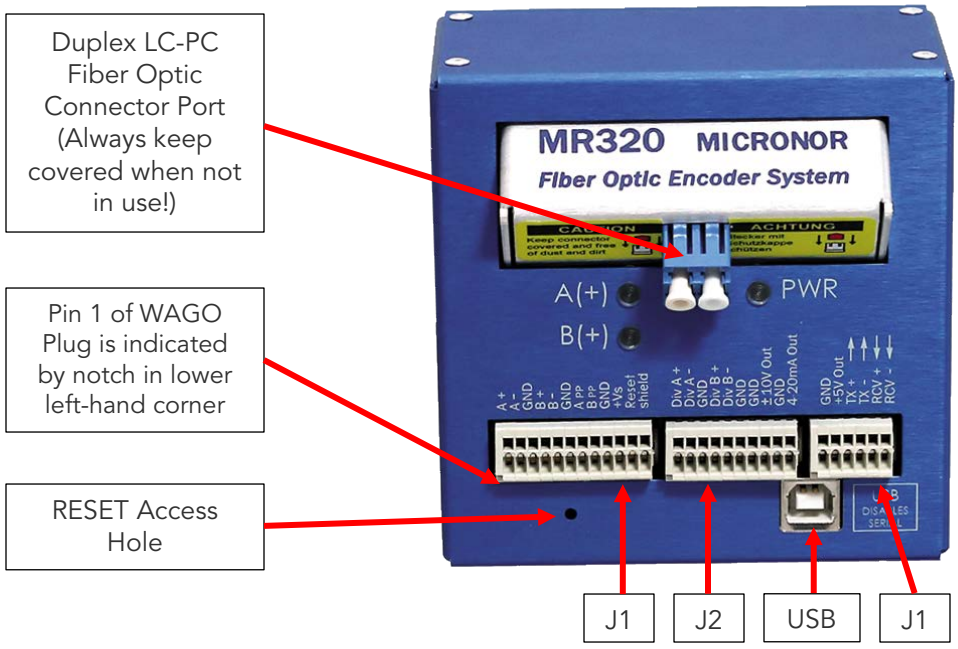
2.2. Quick Connections

Step 1	Connect optical link between Sensor and Module
Step 2	For A+B Push-Pull Quadrature Outputs, connect to A_{PP} and B_{PP} terminals For A+B Line Driver Outputs, connect to A+/A-/B+/B- terminals
Step 3	Connect +24VDC to +Vs and 0V to GND terminals
Step 4	For first time installation, it is necessary to "Calibrate" the Encoder System. While rotating the Encoder Shaft, use the WAGO tool to depress the RESET button on the Module. If the A and B LED lights blink ON/OFF, then the system is "Calibrated" and functioning properly

2.3. Optical Connection

The optical connection between the Encoder and Sensor must be made using 62.5/125µm multimode optical fiber. This is the same fiber used in local area networks (LANs). The cable ends must be terminated with high quality Duplex LC and meet these optical performance requirements: Insertion loss <0.5dB, Return loss >24dB, and meets TELCORDIA GR-326-CORE end face geometry specifications.

2.4. Electrical Connections



J1 WAGO PN: 733-112 (12 Pin Terminal)	
1	A+ (5V)
2	A- (5V)
3	GND
4	B+ (5V)
5	B- (5V)
6	GND
7	A Push-Pull (24V)
8	B Push Pull (24V)
9	GND
10	+Vs
11	Counter Reset
12	Shield

J2 WAGO PN: 733-110 (10 Pin Terminal)	
1	Div A+ (5V)
2	Div A- (24V)
3	GND
4	Div B+ (5V)
5	Div B- (24V)
6	GND
7	GND
8	± 10V Out
9	GND
10	4-20mA

J3 WAGO PN: 733-106 (6 Pin Terminal)	
1	GND
2	+5V Out
3	TX+ (Output)
4	TX- (Output)
5	RCV+ (Input)
6	RCV- (Input)

Note:

- The Line Driver and 24V Push-Pull digital outputs are short circuit protected.
- Avoid any long-term short circuits on outputs.
- Analog output polarity may be inverted by changing the Direction parameter in the Zappy setup.
- The analog voltage output delivers up to 10mA current and is short circuit protected.
- The current loop outputs provides 0-24mA.

2.5. MR320 Error Messages – Blink Codes

In normal operation, the PWR LED is continuously ON. Approximately every 50 seconds the PWR LED blinks indicating execution of the internal Auto Calibration cycle, which is normal. This Auto Cal cycle only executes when the encoder is moving. The PWR LED starts blinking when a change or error in operation occurs. The number of blinks corresponds to an error code as shown below. Consult Section 7.6 of MR320 User Guide for additional information.

Blinks	Description – Cause – Remedy
1	EEPROM Error: Power down unit and re-initialize. If error persists, contact Factory.
2	2.5V Reference Voltage is out of tolerance: Contact Factory
3	Internal +5V Power Supply Voltage is out of tolerance: Contact Factory
4	Internal +12V Power Supply is out of tolerance: Contact Factory
5	The optical encoder cannot be calibrated properly Possible reasons: • Too much or too little optical power • High insertion loss in the data link NOTE: Five blinks indicate that the input optical AMPLIFIER is either at the minimum (3) or maximum GAIN (20) setting. If you install ZAPPY® software and use the Diagnostics Mode, then allowable GAIN range is 3-20. When the amplifier is at its maximum GAIN setting (20), the reason is most likely: • High loss within the optical link – usually a connector problem. Install ZAPPY® and run DIAGNOSTICS Mode. Consult User Guide for additional information. • Defective encoder • Defective module When the amplifier is at its minimum GAIN setting (3), the reason is most likely: • Power is too high • Defective module Contact Micronor factory or distributor for additional troubleshooting assistance.

3. Installing ZAPPY® Software

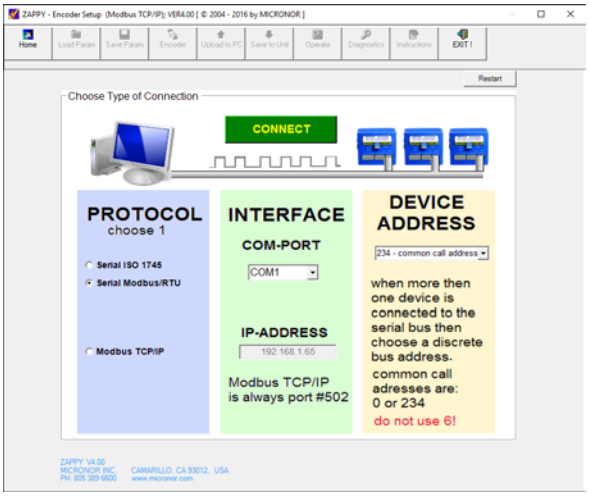
ZAPPY® software is run on a PC and allows users to set the operating parameters of various functions (analog outputs, position counter, etc.), run Diagnostics to verify proper operation as well as to certify the fiber optic connections. Consult *Section 5.10* of the MR320 User Manual or detailed instructions but a summary follows here.

You will need the following:

- ZAPPY® Installation CDROM
- An IBM-compatible PC running Windows XP, 7, or 10
- One of the following cable adapters:
  - If PC has available RS232 Serial port, use MR232-1 RS422-to-RS232 Adapter Cable
  - If PC has available USB port, use MR232-3 or any USB Type A Male to USB Type B Male Cable
  - TCP-IP Ethernet Adapter (Refer to Application Note AN119 for further instructions)

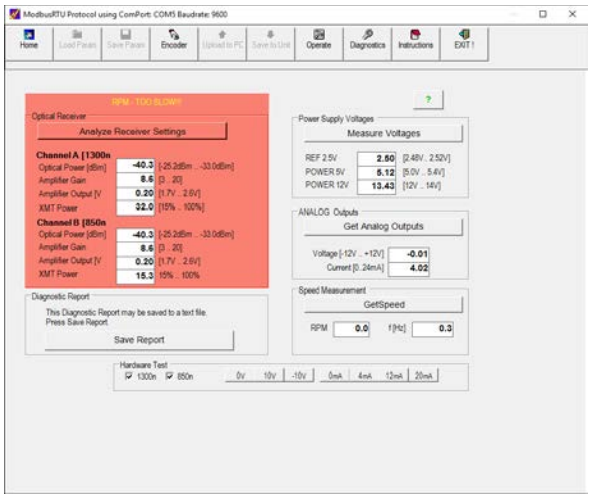
3.1. How to Install ZAPPY® Software

1. Click on ZappyInstall.msi on ZAPPY® CDROM to install Zappy
2. Connect the MR320 to either serial, USB, or Modbus TCP/IP. Turn on power to MR320 module.
3. Run ZAPPY® software. If using MR232-2 USB Adapter cable or port other than COM1, be sure proper COM port number is entered at ZAPPY® Start-Up Screen per example below.
4. Use the device address 234 as a default setting.
   Note: ZAPPY® Versions 3.5.1 and higher will find the MR320 automatically.

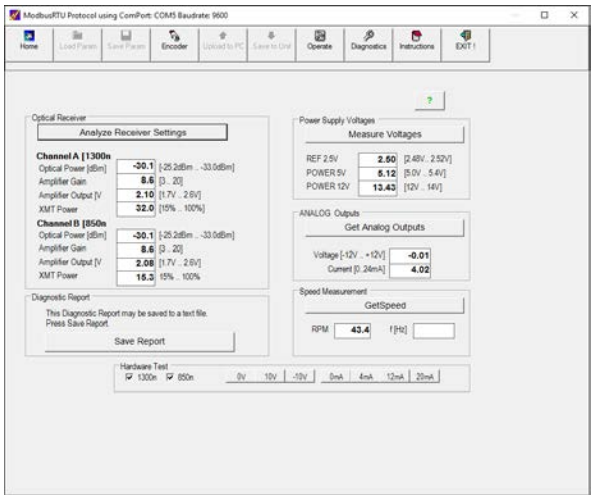


3.2. Verifying the Optical Link Using ZAPPY®

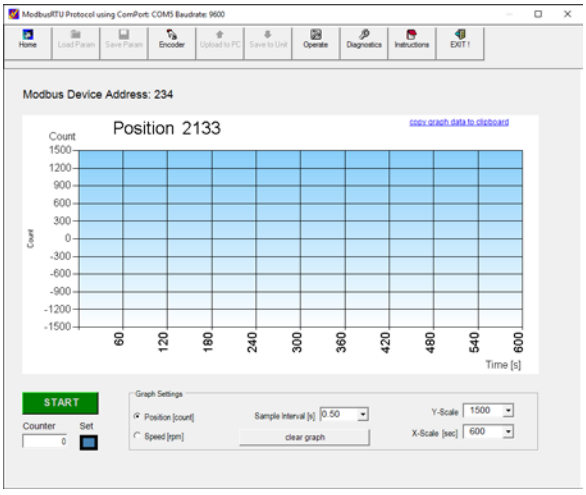
1. Click on [Diagnostics]. If the Encoder is not rotating, you will get the following warning screen. Diagnostics also shows the internal signal status.



2. While rotating the shaft (RPM-Too Slow!!! Warning will go away), click on [Analyze Receiver Settings]. All measured parameters should fall within range of allowed values shown in brackets.

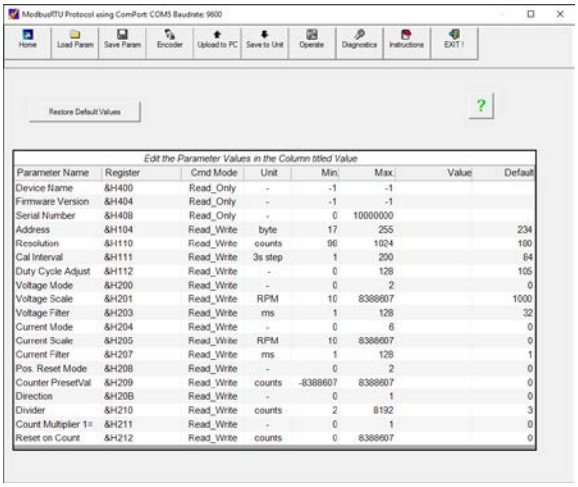


3. Click on [Operate] to view the RPM and Position Counter Value.



3.3. Adjusting Operating Parameters

1. Click on the [Upload to PC] button to view current settings
2. Change settings as required. Consult MR320 Technical Manual for detailed information
3. Click on [Save to MR320] to store all changes in the MR320's nonvolatile memory.
4. Operate the encoder and verify that the changes are functioning as expected.



Parameter Name	Register	Cmd Mode	Unit	Min	Max	Value	Default
Device Name	&H400	Read_Only	-	-1	-1		
Firmware Version	&H404	Read_Only	-	-1	-1		
Serial Number	&H408	Read_Only	-	0	10000000		
Address	&H104	Read_Write	byte	17	255		234
Resolution	&H110	Read_Write	counts	96	1024		160
Cal Interval	&H111	Read_Write	3s step	1	200		64
Duty Cycle Adjust	&H112	Read_Write	-	0	128		105
Voltage Mode	&H200	Read_Write	-	0	2		0
Voltage Scale	&H201	Read_Write	RPM	10	8388607		1000
Voltage Filter	&H203	Read_Write	ms	1	128		32
Current Mode	&H204	Read_Write	-	0	6		0
Current Scale	&H205	Read_Write	RPM	10	8388607		0
Current Filter	&H207	Read_Write	ms	1	128		1
Pos. Reset Mode	&H208	Read_Write	-	0	2		0
Counter PresetVal	&H209	Read_Write	counts	-8388607	8388607		0
Direction	&H20B	Read_Write	-	0	1		0
Divider	&H210	Read_Write	counts	2	8192		3
Count Multiplier 1=	&H211	Read_Write	-	0	1		0
Reset on Count	&H212	Read_Write	counts	0	8388607		0

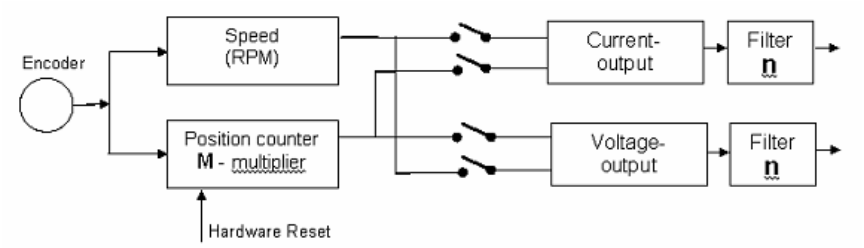
Explanation of MR320 System Parameters **NOTE**: System parameters are set by the factory and should not be altered by the user. The only exception is the RS422 address and the encoder resolution.		
Parameter	**Description**	**Comments**
Device Name	MR320	Fixed. This is the model name.
Firmware Version	Version number of firmware	Fixed
Serial Number	Serial number of unit	Fixed
Address	RS422 bus address	This address may be changed by user when more than one unit resides on the same bus. Common address is 0. Unit always listens and responds to calls on address 0.
Resolution	This number must match the number of slits of the encoder	For example, MR324 encoder has resolution of 1024ppr (pulses-or slits-per revolution). Therefore, the number entered here should be 1024.
Cal Interval	Defines internal time span for automatic calibration check.	Cal Interval value represents multiples of ~3 seconds. A typical value is 82 (~4 minutes). If the value is 0, no automatic calibration will be performed.
Duty Cycle Adjust	This value is for adjustment of the quadrature signal duty cycle.	Typically it should be left between 50 to 70. An oscilloscope is required to adjust the setting.

Explanation of MR320 Operating Parameters **NOTE**: Operating parameters are used to define internal modes of operation and their variables.		
Parameter	**Description**	**Comments**
Divider	Divides quadrature outputs with separate output via DIVIDE A+B line driver outputs	Accepts values 2-8192.

Voltage Mode	Defines output mode (Speed or Position) and function of Voltage analog output	If Voltage output not to be used, then set Voltage Scale=0. Otherwise see following sections describing detailed Speed or Position setup of analog outputs for detailed information.
Voltage Scale	Determines Full Scale value if used for Speed or Position	If Voltage output not used, then set Voltage Scale = 0. Otherwise see following sections describing Speed or Position setup of analog outputs for detailed information.
Voltage Filter	Determines time constant of low pass filter	If no filter function required, then set Voltage Filter=0. Otherwise see following sections describing Speed or Position setup for analog outputs for detailed information.
Current Mode	Defines output mode (Speed or Position) and function of Current analog output	If Current output not to be used, then set Voltage Scale=0. Otherwise see following sections describing Speed or Position setup of analog outputs for detailed information.
Current Scale	Determines Full Scale value if used for Speed or Position	If no filter function required, then set Voltage Filter = 0. Otherwise see following sections describing Speed or Position setup for analog outputs for detailed information.
Current Filter	Determines time constant of low pass filter	If no filter function required, then set Current Filter = 0. Otherwise see following sections describing Speed or Position setup for analog outputs for detailed information.
Position Reset Mode	Programs response of RESET input which resets Internal Position Counter to value either 0 or value of Hardware Reset Point	If value = 0, Internal Position Counter resets on rising edge of hardware RESET input. If value = 1, enables a debounce period for use of an external pushbutton wired to RESET input. For detailed information, see following section describing Position setup for analog outputs.
Quadrature Multiplier	Can increase resolution by clocking Internal Counter on the ½ quadrature cycle	Set value = 0 for standard count mode and value=1 to double resolution. For detailed information, see following section describing Position setup for analog outputs.
Direction	Determines direction of encoder	Direction = 0 for normal CW direction. Otherwise, Direction = 1 to set reverse direction (CCW).
Hardware Reset Point	Internal Position Counter resets to this value when hardware RESET input is activated	For detailed information, see following section describing Position setup for analog outputs.
Reset On Count	Internal Position Counter is automatically reset to 0 whenever absolute value matches this value	Value = 0 deactivates this mode. For detailed information, see following section describing Position setup for analog outputs.

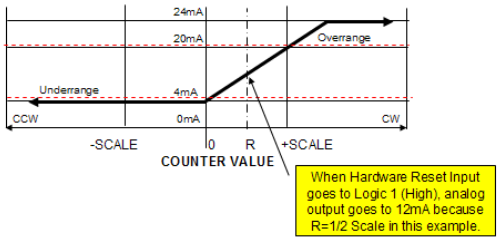
3.4. Setting Parameters for Analog Outputs

The two analog outputs can be independently configured as a Speed (RPM) or an absolute Position indicator. Any Full Scale value >0 will activate the output. The Mode defines which Function the output performs. Each analog output is followed by a programmable low pass Filter. Consult following summary or MR320 User Guide for details.

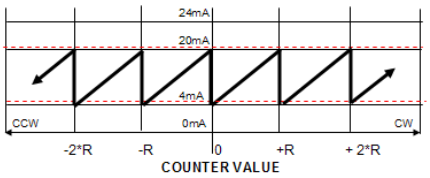


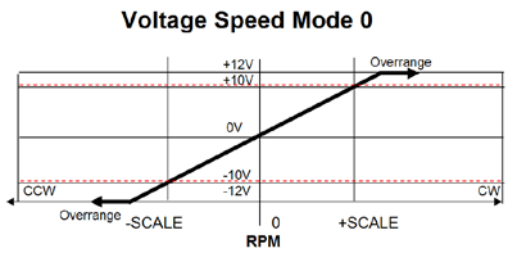
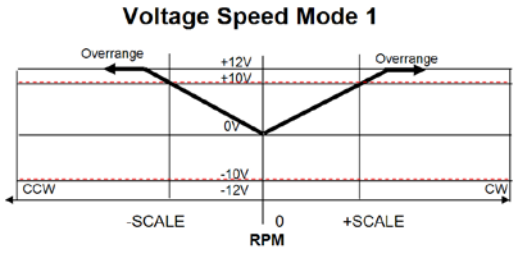
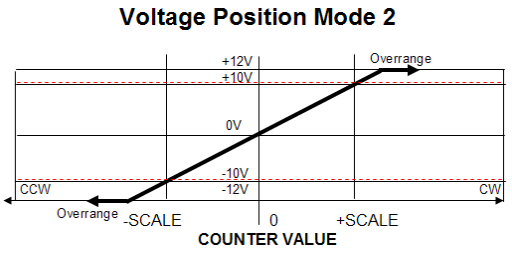
Title	Register	Description
Output Function	Voltage – 23 Current – 27	See Below Table for Output Descriptions
Filter Values	Voltage – 25 Current – 28	• Value 0 corresponds to no filtering • 1-256 correspond to the 3dB filter point per equation provided in the Technical Reference • Default value is 32 (corresponding to 10Hz)
Counter Reset	29	• 0 = Counter is reset on first rising edge of RESET input • 1 = Allows debounce period of 60ms
Counter Multiplier	2A	• 0 = Normal counting (every cycle is one count) • 1 = Allows ½ quadrature cycle to increment/decrement internal Counter – effectively doubling the position resolution.
Encoder Direction	2B	Internal counter increments using either a full or half cycle of the quadrature signal • 0 = Full Cycle Counts • 1 = Half Cycle Counts (2x multiplier)
Hardware Reset	2C	Internal Counter resets to this value when RESET input is activated • Accepts input value of 0-8,388,607 • Sometimes this function is also called "homing" • Analog output value will be determined by Mode selected.
Reset on Count	2D	Internal Position Counter is automatically reset to 0 whenever its absolute value matches this preprogrammed value • 0 = mode deactivated • Accepts input value of 1-8,388,607 for active mode

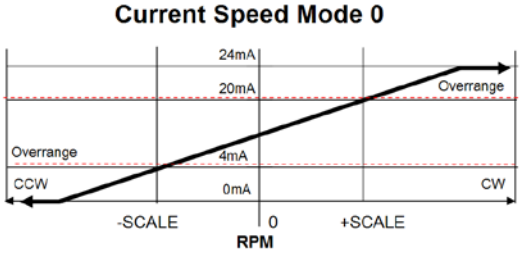
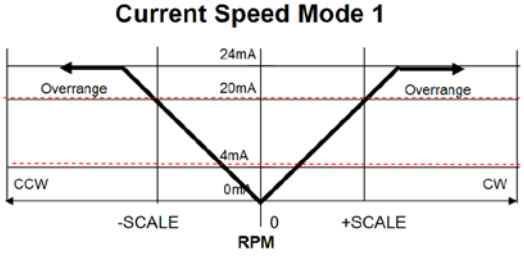
HARDWARE RESET VALUE Mode
(Example shown uses Current Position Mode 6
Where R (RESET Value) = ½ of Current Scale Value)

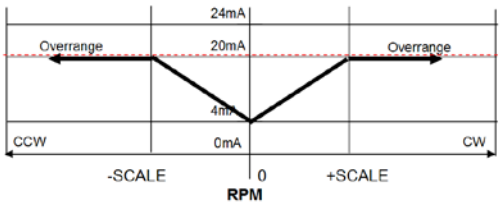
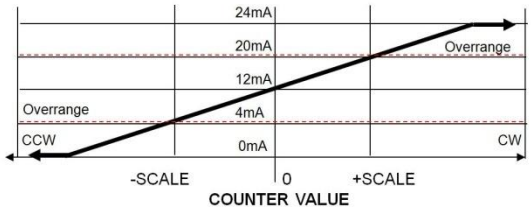
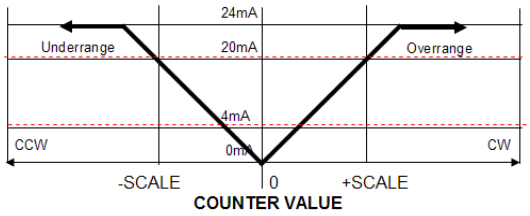
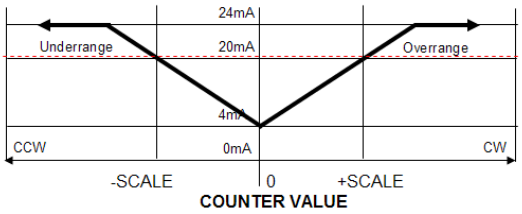


RESET ON COUNT Mode
(Example shown uses Current Position Mode 6
Where R=RESET Value)



Voltage SPEED Mode		
0	Output corresponds to actual RPM where CCW rotation is negative voltage. • The voltage output range is 0V to +10V when the encoder rotates CW. Over range extends from +10V up to +12V • The voltage output range is 0V to -10V when the encoder rotates CCW. Over range extends from -10V to -12V.	
1	Output corresponds to the absolute value of the RPM, regardless of the direction. • The output is always from 0V to +10V regardless of direction of rotation. Over range extends from +10V up to +12V	
Voltage POSITION Mode		
2	The output ranges from 0V to +10V (over range from +10V to +12V) for CW motion with +10V corresponding to the Voltage Scale setting. The output ranges from 0V to -10V (over range from -10V to -12V) for CCW motion with -10V corresponding to the Voltage Scale setting.	

Current SPEED Mode		
0	Bipolar output over 4mA to 12mA to 20mA where 12mA is equal to 0 RPM. • CW rotation from 0RPM to (Current Scale) RPM corresponds to 12mA to 20mA. Over range extends from 20mA to 24mA (Maximum) • CCW rotation from 0RPM to (Current Scale) RPM corresponds to 12mA to 4mA. Over range extends from 4mA to 0mA (Minimum).	
1	Unipolar output range of 0-24mA where 0mA represents 0RPM, regardless of direction.	

2	Unipolar output range of 4-20mA where 4mA represents 0RPM, regardless of direction.	**Current Speed Mode 2** 
Current POSITION Mode		
3	Bipolar output over 0mA to 12mA to 20mA where 12mA is equal to the zero position/counter value. • CW rotation from 0 counter value to Current Scale setting corresponds to 12mA to 20mA. Over range extends from 20mA to 24mA (Maximum) • CCW rotation from 0 counter value to negative Current Scale setting corresponds to 12mA to 4mA. Over range extends from 4mA to 0mA (Minimum).	**Current Position Mode 3** 
4	Unipolar output range of 0-24mA representing the absolute value of the Counter. • 0mA represents the zero position and 20mA corresponds to the Current Scale setting (regardless of direction or sign). Over range extends from 20 24mA (maximum).	**Current Position Mode 4** 
5	Unipolar output range of 4-24mA representing the absolute value of the Counter. • 4mA represents the zero position and 20mA corresponds to the Current Scale setting (regardless of direction or sign). Over range extends over 20-24mA range.	**Current Position Mode 5** 
6	Window mode with Output range of 4-24mA. • 4mA represents zero and negative position and 20mA corresponds to Current Scale. Over range extends over 20-24mA.	**Current Position Mode 6**