



TR LE200 Encoder

Module and AOI Configuration Guide

email: customer care@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300

Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483

Contents

Introduction	3
Prerequisites	3
Add Module and Import AOI.....	4
Add module.....	4
Import AOI.....	8
Configuring Encoder and AOI.....	10
Configure Encoder	10
Configure the AOI.....	10
Using the AOI	14
Appendix	15
TR_LE200 UDT.....	15
Write Attributes to Device	16
Unsigned Vs Signed	17
Logic Examples	18

Introduction

This guide is intended to help install and use a TR LE200 Ethernet IP encoder quickly and successfully. It goes through all of the critical implementation steps in detail including: EDS (Electronic Data Sheets) installation, RSLogix module configuration, and AOI (Add-On-Instruction) implementation.

It is important to note that this guide does not need to be followed to have success with a TR LE200 encoder. There are plenty of ways to successfully integrate the device into an automation environment. However, this guide is recommended as an efficient way to ensure the encoder is configured as expected, and position values are properly understood.

Prerequisites

Before beginning this guide, it is recommended you have the following files downloaded and stored in a known location:

- Required:
 - Device user manual: “Laser LE-200”.
 - <http://www.tr-electronic.com/service/downloads/operating-manuals/encoder-and-linear-transducer.html#c17692>
 - Device EDS file: “04710022_TR_LE200_010102.eds” and icon “LinearEIP.ICO”.
 - <http://www.tr-electronic.com/service/downloads/file-download.html>
- Required if you plan on using the AOI:
 - AOI file: “TR_LE200_AOI.L5X”

email: customercare@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300

Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483

Add Module and Import AOI

The first step to successfully using the AOI is adding the TR_LE200 module and corresponding AOI to your project RSLogix project.

Add module

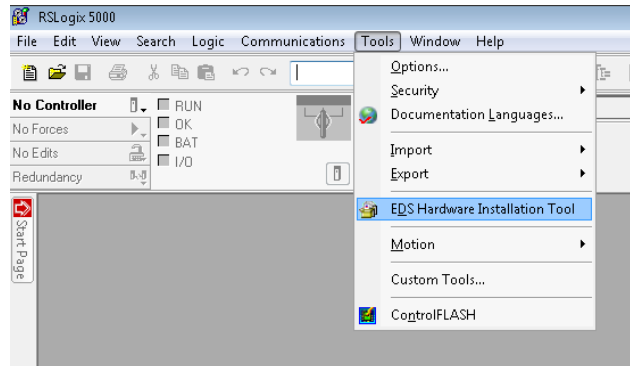
Ethernet IP communications require that a module for the encoder is added to the IO tree in your RSLogix project. There are two possible modules that could be used: TR_LE200_ENIP or a Generic Ethernet Module. If you plan on using the AOI provided, the TR_LE200_ENIP must be used. It is still recommended to use the TR_LE200_ENIP even if you do not plan to use the AOI, but if you'd like to use the Generic Ethernet Module then this document will not be helpful. Please refer to "Laser LE-200" for the IO and Configuration Assembly Object information.

The AOI was designed to work with EDS version 1.2 of the TR_LE200_ENIP module. If you've already installed version 1.2 of the TR_LE200_ENIP, this step can be skipped.

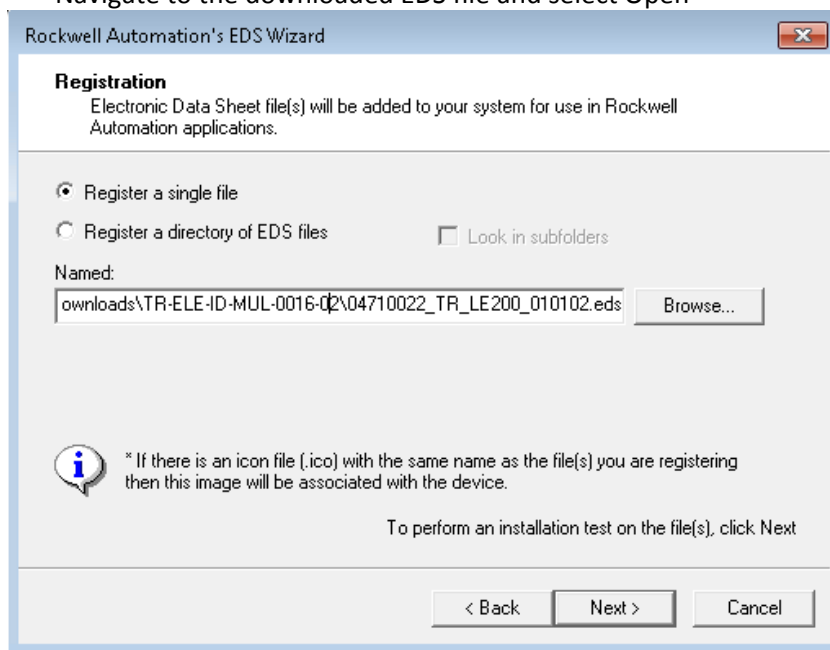
Install EDS

To install the EDS file, open RSLogix and select:

- Tools
 - EDS Hardware Installation Tool



- Within the Rockwell Automation's EDS Wizard select:
 - Next
 - Next – with Register and EDS file(s) selected
 - Browse:
 - Navigate to the downloaded EDS file and select Open



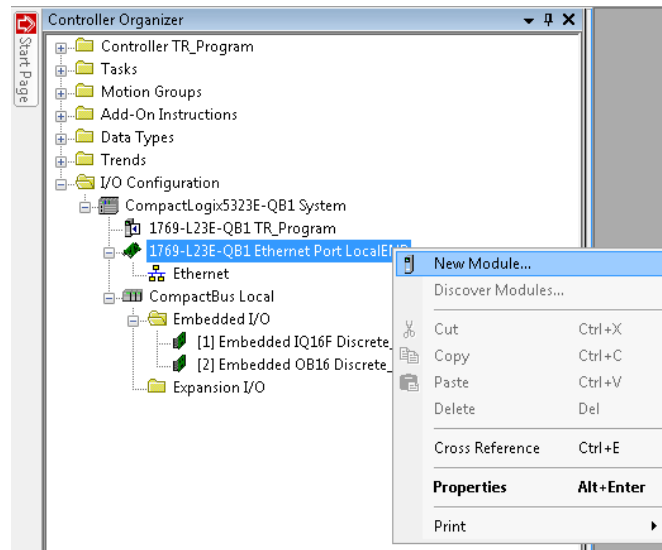
- Next, Next, Next, Next, Finish

email: customercare@trelectronic.com | web: www.trelectronic.com

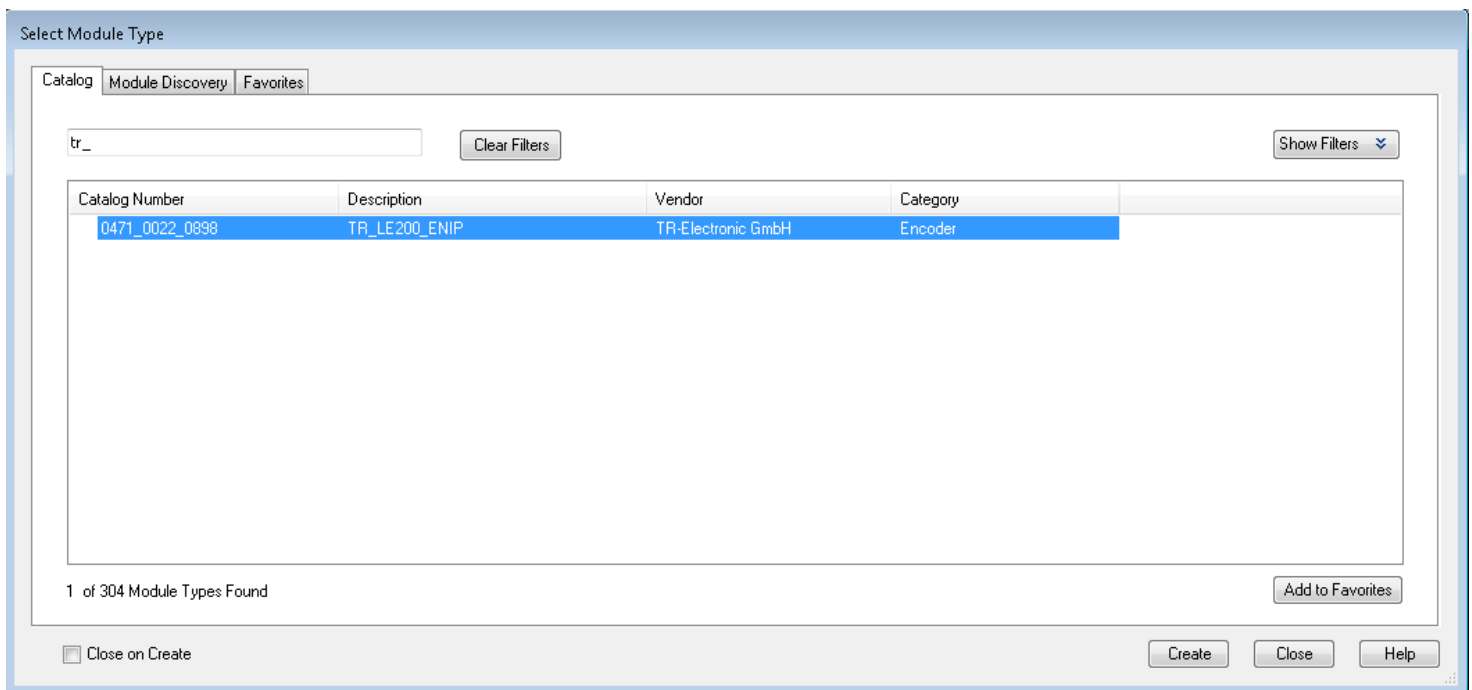
Add Module

Once the correct EDS file has been installed, a module needs to be added to the project. Start by opening your working project.

- Right click on your Ethernet module in the IO tree and select new module



- Search for “tr_”, select TR C-Series Encoder and then select Create.



email: customer@trelectronic.com | web: www.trelectronic.com

- Give the module a name, description (optional) and IP address and select change
 - This guide will continue using the name LE200. However you may choose a name of your preference. Whenever LE200 is referenced in this document, replace it with your module name.

The 'New Module' dialog box shows the following configuration:

- Type: TR_LE200_ENIP
- Vendor: TR-Electronic GmbH
- Parent: LocalENB
- Name: LE200
- Description: (empty)
- Ethernet Address:
 - Private Network: 192.168.1
 - IP Address: 192.168.1.7
 - Host Name: (empty)
- Module Definition:
 - Revision: 1.1
 - Electronic Keying: Compatible Module
 - Connections: Position+Speed+Intensity+State

The 'Change...' button at the bottom right is highlighted with a red circle.

- Within the Module Definition ensure the Connections Name and Size match below. This is a requirement for the AOI to function.

The 'Module Definition' dialog box shows the following configuration:

- Revision: 1
- Electronic Keying: Compatible Module
- Connections:

Name	Input	Size	Tag Suffix
Position+Speed+Inter	8	SINT	1
Output	0		<none>

The 'OK' button at the bottom right is highlighted with a red circle.

If a popup appears, click Yes. Click OK again to exit Module Properties.

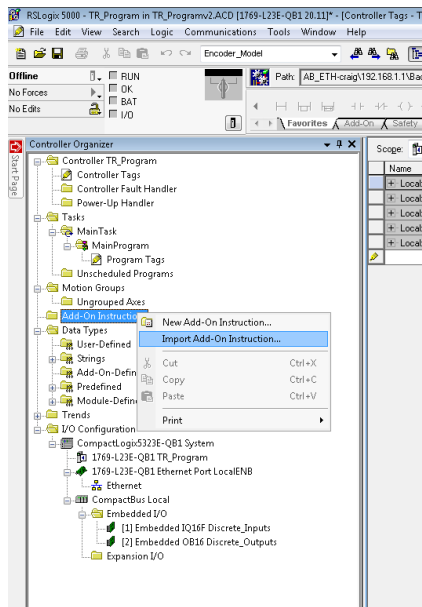
If you do not plan on using the AOI, then please skip to the “Configure Encoder” section. It is the final section of the manual that will be helpful for module configuration only.

email: customer care@trelectronic.com | web: www.trelectronic.com

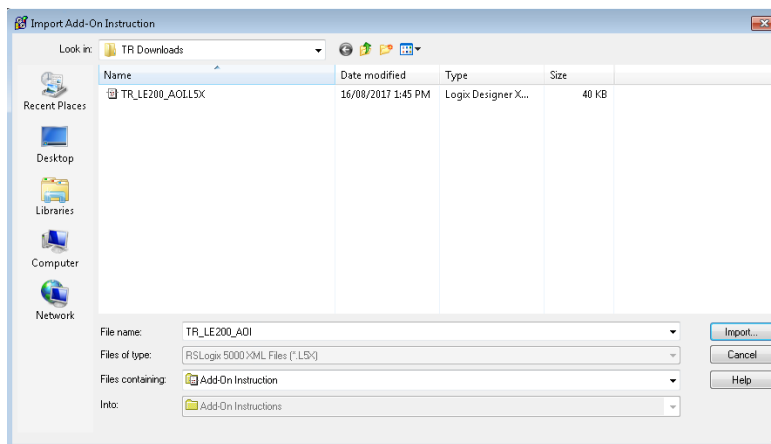
Import AOI

Now that a module has been added to the program, we need to add the logic that will interact with the module. This piece of logic is an AOI (Add-On Instruction) that must be imported into the project.

- Right click on Add-On Instructions in RSLogix under the Controller Organizer and select Import Add-On Instruction.

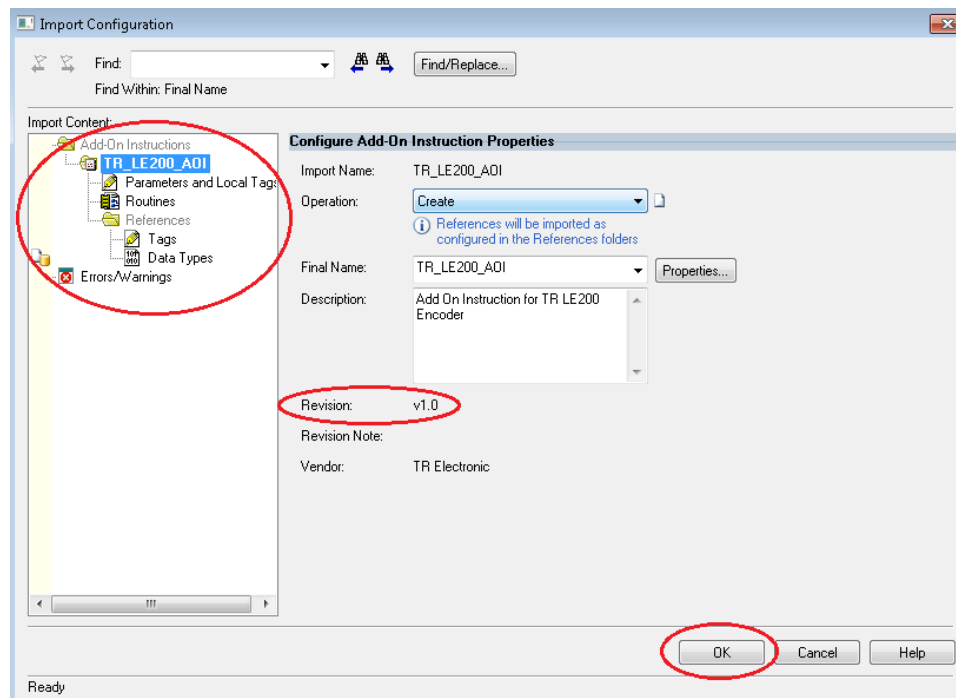


- Navigate to the AOI file that was downloaded and select Import:

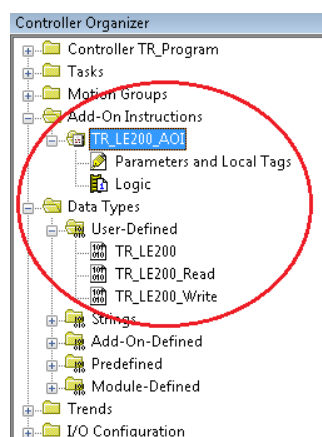


email: customer@trelectronic.com | web: www.trelectronic.com

- An Import Configuration dialog box will open with information regarding changes that come along with importing this AOI (Routines, Tags, Data Types, etc). Navigate around this dialog box for more information, then select OK.
 - Note the revision. If you've previously installed and are using an earlier revision, please review the consequences of overwriting. It might be best to change the "final name" of the AOI and imported Data Types to something else, so the new AOIs and UDT can be installed without impacting the old one.



- When the AOI is imported, you'll see it under Add-On-Instruction in Controller Properties. In addition, under Data Types -> User Defined, you should see 3 new datatypes. These are the new datatypes introduced when the AOI was imported. They will be discussed in further detail in later sections.



email: customer@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300

Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483

Configuring Encoder and AOI

Configure Encoder

After adding the module, you'll see a new tag in your tag database. The tag name will depend on what you named the new module, which was "LE200" in this example.

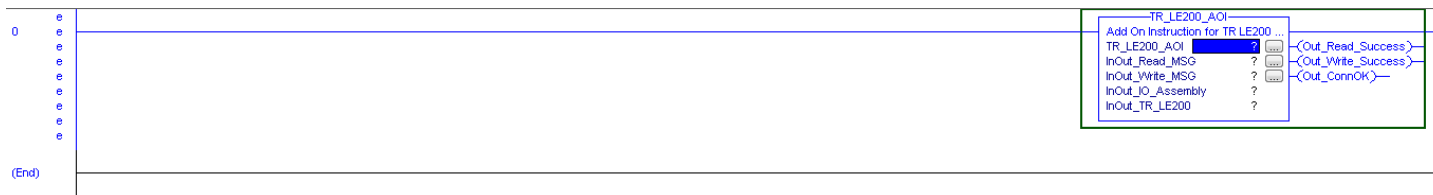
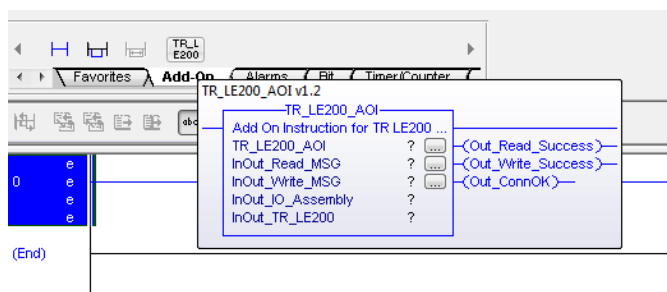
Scope:	TR_Program	Show:	All Tags
Name	Alias For	Base Tag	Data Type
+ LE200:I1			_0471:0022_0898_F211ADCF:I:0

LE200:I1 is the IO Assembly which reads the encoder's position, intensity, speed and the device state directly from the device.

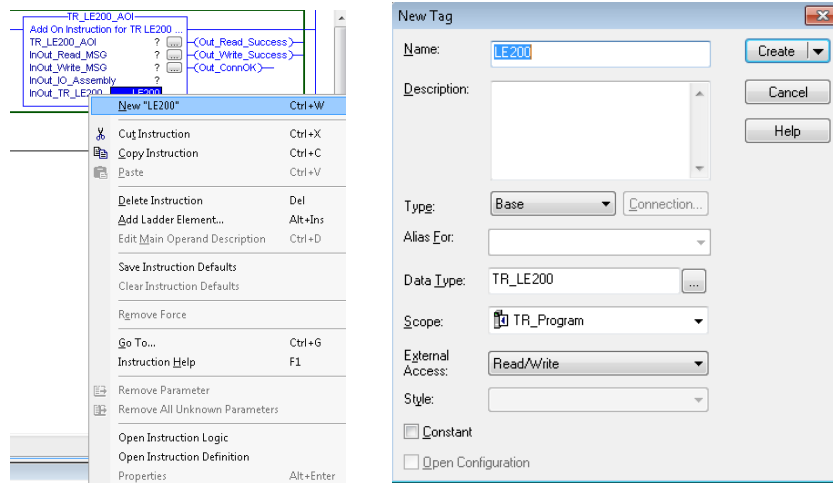
Configure the AOI

Now that the AOI has been imported, it has to be implemented in ladder logic.

- The new instruction can be called by navigating to the desired routine and rung by selecting it on the standard instruction toolbar:

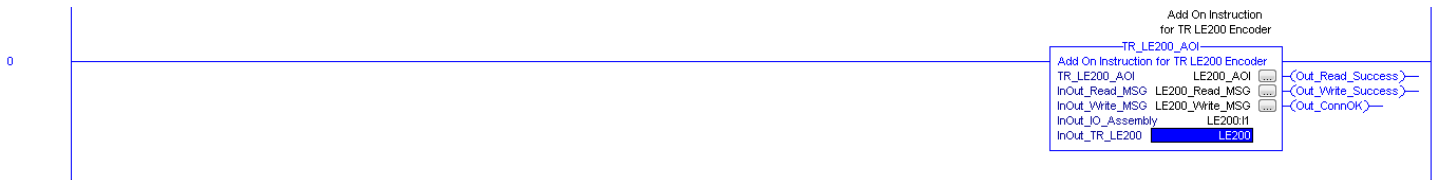


- Now we have "called" the AOI. However it requires certain variables to be passed to it to function properly. Variable fields can be edited by double clicking.
 - InOut_TR_LE200 field:
 - Enter desired encoder name, you can re-use the module name as I have done here. You'll have to create a new variable (of type TR_LE200) to use the AOI as discussed later. Note the scope (adjust if necessary) and add a description to the tag if you wish.

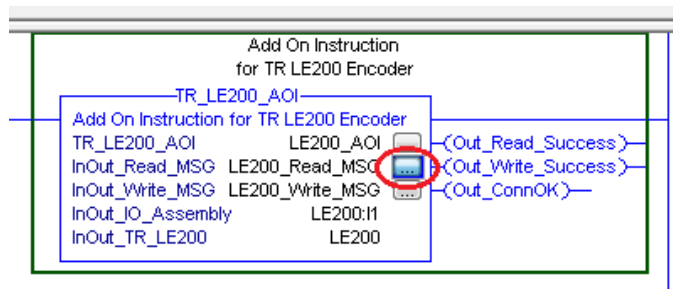


- InOut_IO_Assembly:
 - Enter LE200:I1
 - NOTE: The AOI requires this variable to be of a certain type as defined in the module properties (Position+Speed+Intensity+State, SINTs). If you'd like to change the module properties to something else, you'll have to change the AOI parameters accordingly.
- TR_LE200_AOI:
 - Enter LE200_AOI and create a new tag.
- InOut_Read_MSG Field:
 - Enter LE200_Read_MSG and create a new tag.
- InOut_Write_MSG Field:
 - Enter LE200_Write_MSG and create a new tag.

- The rung should now look something like this:

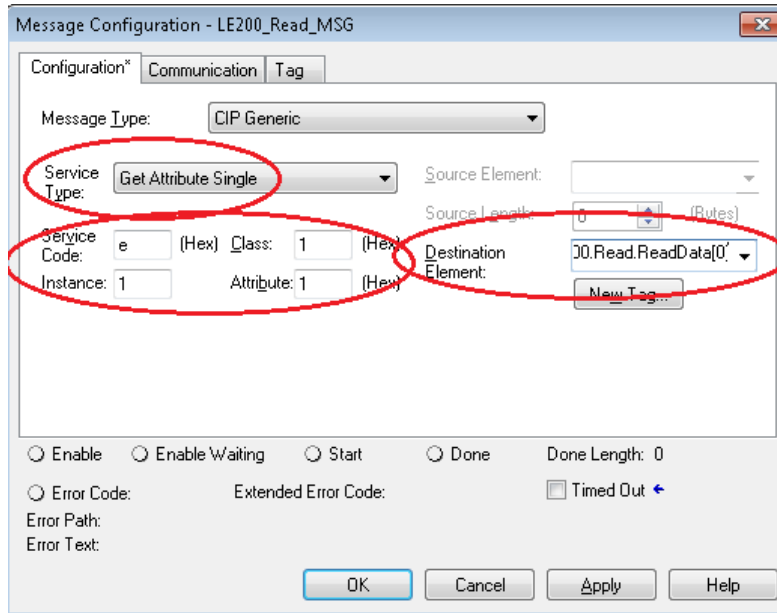


- Now the MSG instruction must be configured. Start with the LE200_Read_MSG. Select the "... " button:

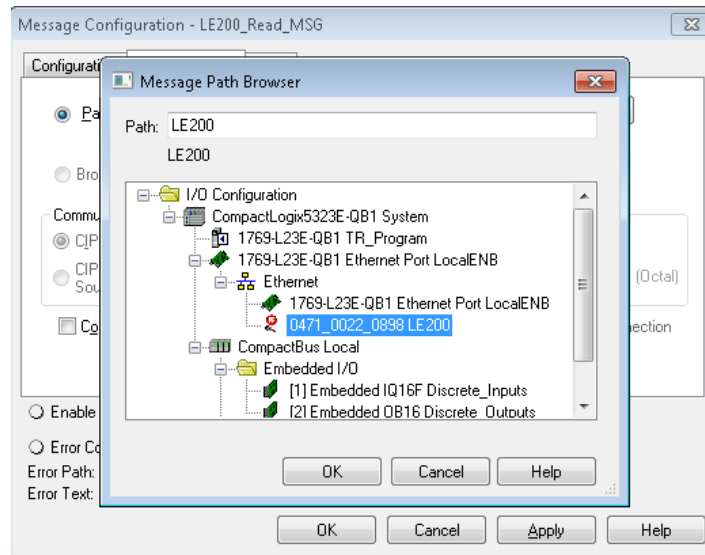


email: customer care@trelectronic.com | web: www.trelectronic.com

- Enter the following information (Destination Element reads LE200.Read.ReadData[0])
 - Destination element is critical. If a different value is entered the MSG instruction may still yield a successful result, which will set the AOI's success output even though data could be misallocated.

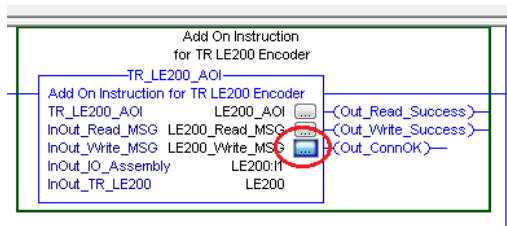


- Then select the Communication tab to configure the path. Click Browse and navigate to the new module:



- Select OK on the Message Path Browser to close the dialog box.
- Select OK to close the Message Configuration dialog box.

- Then the LE200_Write_MSG message must be configured. Click on the “...” button:



- Enter the following information (Source Element reads LE200.Write.WriteData[0]).
 - Source element is critical. See notes regarding destination element for the read message above.

- Configure the communication path as shown for the read message.
- Click OK to close the Message Configuration dialog box.

The module and AOI are now configured and ready to use. The program can be downloaded to the controller and set to run mode if appropriate.

Using the AOI

Importing the AOI also introduced a new UDT (User-Defined Data Type) called TR_LE200. Refer to Appendix TR_LE200 UDT for detailed information about the data types. The UDT and AOI work together to perform 3 main tasks:

1. Parse encoder feedback into an understandable and usable format. This parsing takes place every scan.
 - a. Laser Intensity: LE200.Intensity
 - b. Absolute Speed: LE200.SpeedAbsolute
 - c. Device State: LE200.DeviceState
 - d. Position feedback: LE200.Position
2. Read important encoder attributes: LE200.Read.XXXXXXXX. **This is done so that a user can validate the settings read from the encoder against their intended configuration.**
 - a. Automatic:
 - i. Two seconds after a successful re-connection between PLC and encoder.
 - b. On Demand: LE200.Read.Command
 - i. Read begins upon positive transition of trigger bit. This bit will be automatically cleared when the read is successful or a read failure is detected.
 - c. Outputs: LE200_AOI.Out_Read_Success
 - i. Cleared when read initiated or connection between encoder and PLC is lost.
 - ii. Set upon successful read.
 - iii. Once the AOI has been setup and a successful read has occurred, there should be no read failures in the future (assuming the encoder is powered and connected). However if you want to monitor explicitly for read failures you may use LE200_Read_MSG.ER.
3. Write important encoder attributes: LE200.Write.XXXXXXXX.
 - a. On Demand: LE200.Write.Command
 - i. Write operation begins upon positive transition of trigger bit, so it is recommended that this bit is set using a one-shot (ONS instruction). This bit will be automatically cleared when the write operation is successful or an error is detected.
 - ii. A write operation will fail if a number outside that attribute's acceptable range is attempted.
 - iii. The write step that failed is stored in variable "lcl_Write_MSG_steps"
 - b. Outputs: LE200_AOI.Out_Write_Success
 - i. Cleared on first scan or when write operation is initiated.
 - ii. Set upon successful write operation of all configured attributes.
 1. Configuring attributes is discussed in detail in Appendix: Write Attributes to Device.

The AOI has an additional output called LE200_AOI.ConnOK. This bit is set to true when the PLC and encoder have been connected successfully for two seconds. It is cleared when a communication fault is detected.

AOI output usage is at the programmer discretion. They can be used for in logic, but do not need to be.

Appendix

TR_LE200 UDT

Member Variable		Data Type	Usage	Description
Intensity		INT	Read Only (LE200. Intensity)	IO Assembly from Device – Laser Intensity Percent
SpeedAbsolute		INT	Read Only (LE200. SpeedAbsolute)	IO Assembly from Device – Current Absolute Speed
DeviceState		SINT	Read Only (LE200. DeviceState)	IO Assembly from Device – Error Messages
Position		DINT	Read Only (LE200. Position)	IO Assembly from Device - Position
Read	PositionSensorType	SINT (8 bits)	Read Only (LE200.Read.PositionSensorType)	Read From Device - Attribute: 11
	Direction	BOOL (1 bit)	Read Only (LE200.Read.Direction)	Read From Device - Attribute: 12
	SpeedFormat	SINT (8 bits)	Read Only (LE200.Read. SpeedFormat)	Read From Device - Attribute: 103
	PresetValue	DINT (32 bits)	Read Only (LE200.Read. PresetValue)	Read From Device - Attribute: 104
	FailureAutoQuit	BOOL (1 bit)	Read Only (LE200.Read. FailureAutoQuit)	Read From Device - Attribute: 105
	Resolution	SINT (8 bits)	Read Only (LE200.Read. Resolution)	Read From Device - Attribute: 106
	FreeResolution	DINT (32 bits)	Read Only (LE200.Read. FreeResolution)	Read From Device - Attribute: 107
	PresetClear	BOOL (1 bit)	Read Only (LE200.Read. PresetClear)	Read From Device - Attribute: 108
	FunctionExtInput	SINT (8 bits)	Read Only (LE200.Read. FunctionExtInput)	Read From Device - Attribute: 109
	FunctionExtOutput	SINT (8 bits)	Read Only (LE200.Read. FunctionExtOutput)	Read From Device - Attribute: 110
	FailOutputValue	SINT (8 bits)	Read Only (LE200.Read. FailOutputValue)	Read From Device - Attribute: 111
	LevelExtOutput	BOOL (1 bit)	Read Only (LE200.Read. LevelExtOutput)	Read From Device - Attribute: 112
	InputSlopeExtInput	BOOL (1 bit)	Read Only (LE200.Read.EncoderFirmwareNumber)	Read From Device - Attribute: 113
	ReadData	SINT[4] (4x8 bits)	N/A	Internal working variables - do not use.
	Command	BOOL (1 bit)	Read/Write (LE200.Read.Command)	Read Params Trigger
Write	Direction	BOOL (1 bit)	Write Only (LE200.Write.Direction)	Write To Device - Attribute: 12
	LaserDiode*	BOOL (1 bit)	Write Only (LE200.Write.LaserDiode)	Write To Device – Attribute: 3
	SpeedFormat	SINT (8 bits)	Write Only (LE200.Write. SpeedFormat)	Write To Device - Attribute: 103
	PresetValue*	DINT (32 bits)	Write Only (LE200.Write. PresetValue)	Write To Device - Attribute: 104
	FailureAutoQuit	BOOL (1 bit)	Write Only (LE200.Write. FailureAutoQuit)	Write To Device - Attribute: 105
	Resolution	SINT (8 bits)	Write Only (LE200.Write. Resolution)	Write To Device - Attribute: 106
	FreeResolution	DINT (32 bits)	Write Only (LE200.Write. FreeResolution)	Write To Device - Attribute: 107
	PresetClear	BOOL (1 bit)	Write Only (LE200.Write. PresetClear)	Write To Device - Attribute: 108
	FunctionExtInput	SINT (8 bits)	Write Only (LE200.Write. FunctionExtInput)	Write To Device - Attribute: 109
	FunctionExtOutput	SINT (8 bits)	Write Only (LE200.Write. FunctionExtOutput)	Write To Device - Attribute: 110
	FailOutputValue	SINT (8 bits)	Write Only (LE200.Write. FailOutputValue)	Write To Device - Attribute: 111
	LevelExtOutput	BOOL (1 bit)	Write Only (LE200.Write. LevelExtOutput)	Write To Device - Attribute: 112
	InputSlopeExtInput	BOOL (1 bit)	Write Only (LE200.Write.EncoderFirmwareNumber)	Write To Device - Attribute: 113
	Adjustment*	DINT (32 bits)	Write Only (LE200.Write.Adjustment, bits 30 & 31 ignored)	Write To Device – Attribute: 3
	WriteData	SINT[4] (4x8 bits)	N/A	Internal working variables - do not use.
	Command	BOOL (1 bit)	Read/Write (LE200. Write.Command)	Write Params Trigger
	WriteConfig	INT (16 bits)	Read/Write (LE200. Write. WriteConfig)	See Appendix Write Attributes to Device

Note: Attribute numbers refer to Object 0x23 Position Sensor Object. Definitions can be found in the “Laser Measuring Device LE200”.

Note*: Please see Appendix Write Attributes to Device Special Considerations. Refer to User Manual for additional information on all reads and writes.

email: customercare@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300

Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483

Write Attributes to Device

The variable LE200.Write.WriteConfig is a 16 bit integer used to define which Position Sensor Object attributes will be written to the device when the LE200.Write.Command bit transitions to high. It is up to the user to decide which attributes they wish to write to the device. If the corresponding bit is high that attribute will be written to the device. Otherwise, it will be skipped. When multiple attributes are configured to write, they are performed in order (WriteConfig bit 0 -> 15).

WriteConfig	Bit	Attribute	Value Written - (LE200.Write.XXXXX)	Special Considerations
	0	12	Direction	
	1	3	LaserDiode	Firmware V1.03* or higher required and Attribute 109 must not equal 2. Set to 1 to turn diode off, 0 to turn diode on.
	2	103	SpeedFormat	
	3	104	PresetValue	Preset can only be performed via extinput – attribute 109. Attribute 108 must be 0.
	4	105	FailureAutoQuit	
	5	106	Resolution	
	6	107	FreeResolution	
	7	108	PresetClear	
	8	109	FunctionExtInput	
	9	110	FunctionExtOutput	
	10	111	FailOutputValue	
	11	112	LevelExtOutput	
	12	113	InputSlopeExtInput	
	13	3	Adjustment	Firmware V1.03* or higher required and Attribute 108 must equal 0. AOI automatically sets bit 31 of attribute, user does not need to.
	14,15	Spare	N/A	

Note: The Write.WriteConfig value is saved upon positive transition of the Write.Command bit. Any changes to the Write.WriteConfig after a write is initialized, won't be realized until the next positive transition of Write.Command.

Note*: MAC 00:03:12:0B:02:C9 and higher will have V1.03.

All of the attributes that can be written to the device require an “Accept Parameter” message to be sent (except LaserDiode) which commits the change to non-volatile memory. This means that once an encoder is configured with the correct values, it will not need to be re-configured after power cycles or communication issues.

It is best to have a small delay before and after the “Accept Parameter” message. To ensure that all desired attributes are successfully written and saved, the AOI automatically uses the following sequence to write attributes:

- Write attribute
- Delay 100ms
- Write Accept Parameter
- Delay 100ms
- Continue with next attribute

Depending on the WriteConfig value and because of the multiple accept parameter messages and delays, the write operation may take up-to three seconds to successfully complete.

email: customer care@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300

Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483

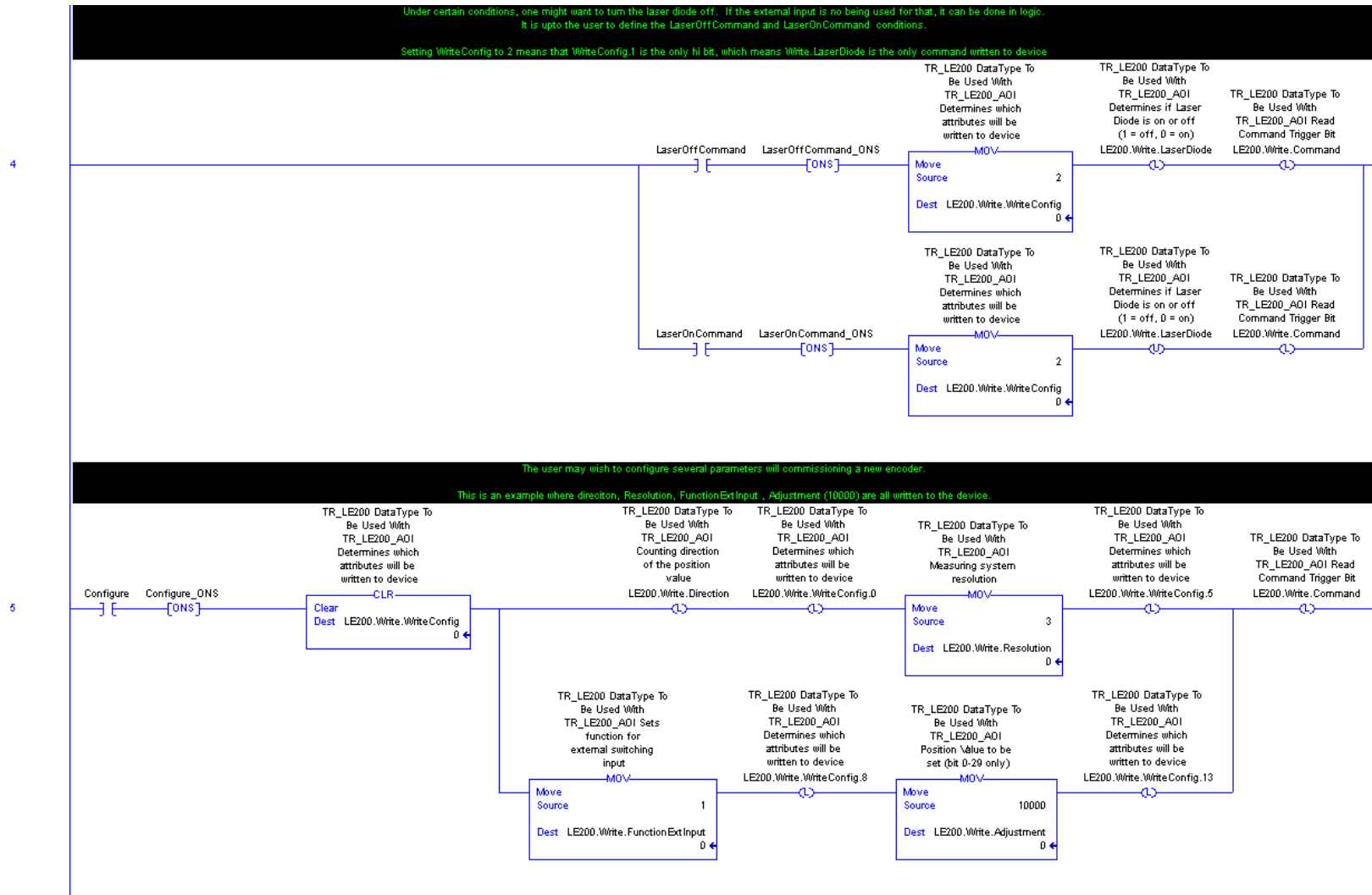
Unsigned Vs Signed

RSLogix uses signed integers (SINTs, DINTs) which can catch some users off guard. This is general RSLogix behaviour and can't be influenced by an AOI, so this appendix has been included to help the user's understanding.

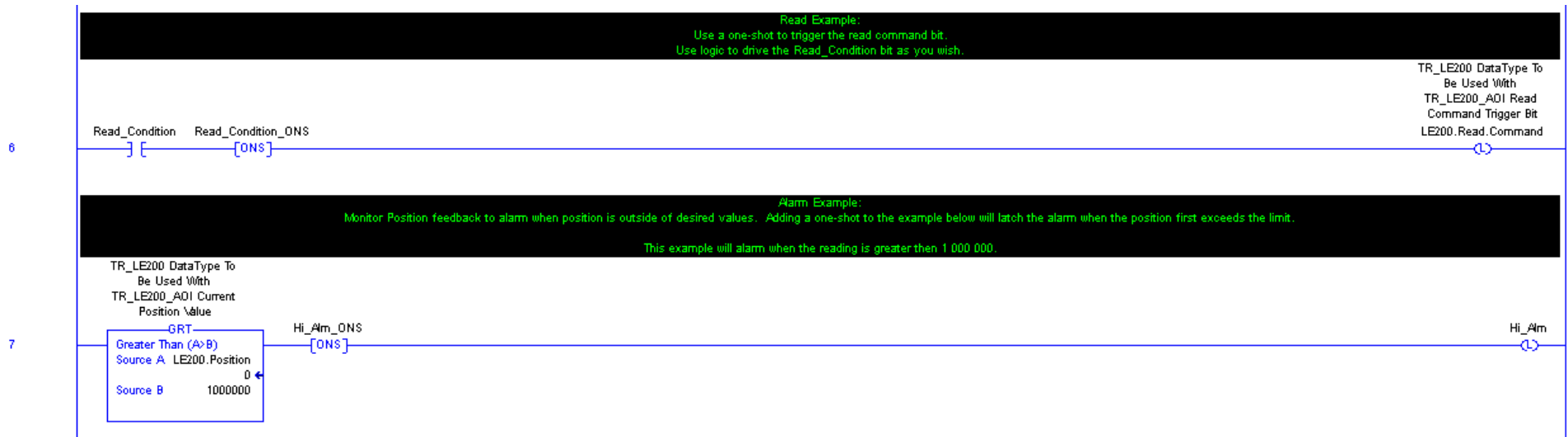
When the most significant bit of the variable is high, RSLogix will interpret and display this number as a negative. Using SINT (this also applies to INTs and DINTs) as an example:

Binary	RSLogix Value
00000001	1
00000011	3
01111111	127
10000000	-128 (2's complement of 128)
10000001	-127 (2's complement of 129)
10000011	-125 (2's complement of 131)
11111111	-1 (2's complement of 255)

Logic Examples



email: customercare@trelectronic.com | web: www.trelectronic.com



email: customercare@trelectronic.com | web: www.trelectronic.com

US: Head Office: P.O. Box 4448, Troy, Michigan, 48099 | Tel: (248)-244-2280 | Fax: (248)-244-2283 | Toll Free: 1-800-709-3300
 Canada: Head Office: P.O. Box 2543, Station B, London, Ontario, N6A 4G9 | Tel: (519)-452-1999 | Fax: (519)-452-1177 | Toll Free: 1-800-265-9483