

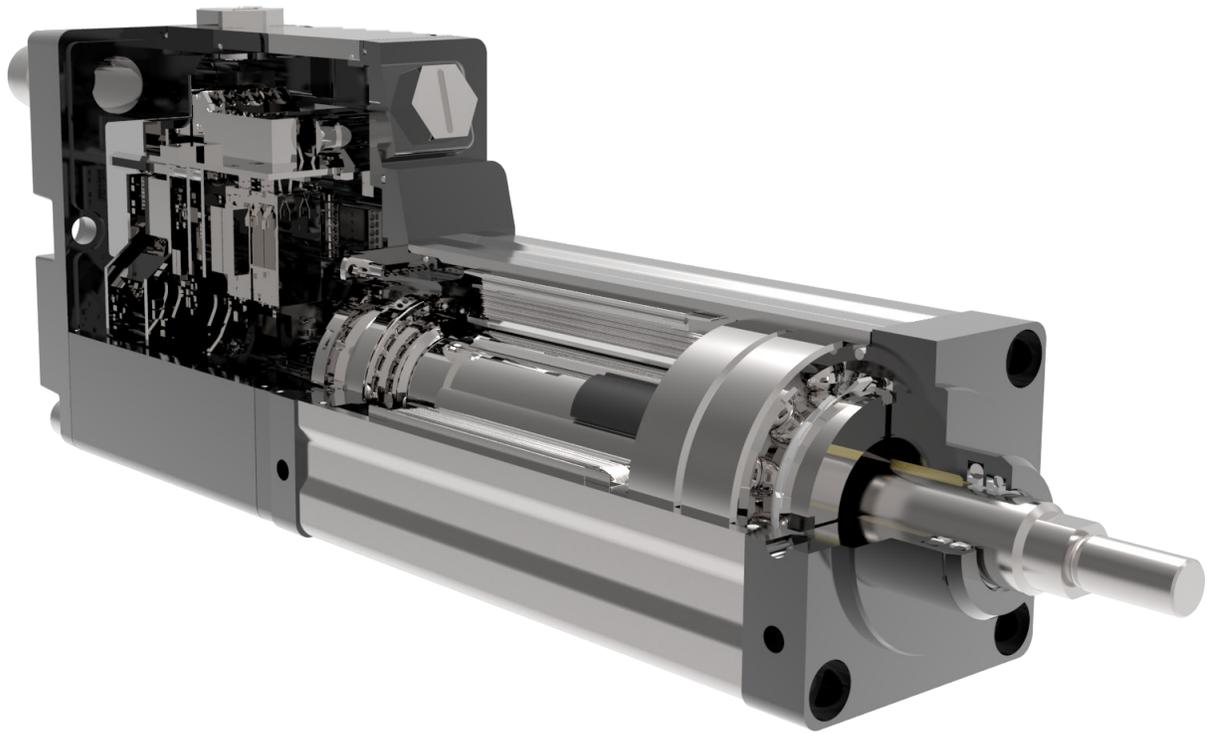
# Tritex II EtherNet/IP - Option

**CURTISS -  
WRIGHT**

## Installation & Maintenance Instructions

**EXLAR®**

Rev. C | PN20191002 | 11/19/2019



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This Declaration of Conformity is issued on **12 May 2010** on behalf of ODVA by:

Katherine Voss  
Executive Director

Vendor Information	
Vendor Name	<b>Exlar Corporation</b>
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Test Information	
Test Date	<b>27 April 2010</b>
Composite Test Revision	<b>7</b>
ODVA File Number	<b>10855</b>

Product Information	
Identity Object Instance 1	
Device(s) Under Test	Value
Vendor ID (Identity Object Attribute 1)	<b>1186</b>
Network Category	<b>Node</b>
Device Type (Identity Object Attribute 2)	<b>0x00</b>
Device Profile Name	<b>Generic Device</b>
Product Revision (Identity Object Attribute 4)	<b>1.001</b>

Products Covered Under This Declaration of Conformity			
No.	Product Code (Identity Object Attribute 3)	Product Name (Identity Object Attribute 7)	SOC File Name
1	100	Tritex	Tritex.stc

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## GENERAL SPECIFICATION

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### ADVISORY

The Tritex II actuator with Ethernet/ip is only one component of a system that must be carefully engineered to provide safe and reliable operation. Normal and anticipated abnormal operating conditions must be taken into account, including start-up sequencing, normal loading and operation, abnormal operating conditions such as jams, failure modes of each component in the system, and shut-down.

### GENERAL SPECIFICATION

	<b>EtherNet/IP specification</b>
Exlar Vendor ID	1186
Device Type	Generic
EDS	Yes
Rockwell AOI available	Yes
BOOTP	Default    Disable
Static IP	Default    192.168.0.254
RPI	Recommend > 20
Messaging Type	Implicit or Explicit
I/O	101 inputs and 101 Outputs, only 100 Inputs and 100 Outputs are configurable Using Tritex Expert Software

# 1.0 WHAT IS ETHERNET/IP

EtherNet/IP (Ethernet Industrial Protocol) is traditional Ethernet combined with an industrial application layer protocol targeted to industrial automation. This application layer protocol is the Control and Information Protocol (CIP™)

Data exchange takes place with the help of an object model. In this way, ControlNet, DeviceNet and EtherNet/IP have the same application protocol and can therefore jointly use device profiles and object libraries. These objects enable plug-and-play interoperability between complex devices of different manufacturers.

CIP™, as a major network independent standard, is use with ControlNet and DeviceNet. Therefore, converting from one of these protocols to EtherNet/IP is easy to do.

## 2.0 INPUT/OUTPUT

The Tritex has a set of 101 input and 101 output 16-bit registers that are transfer with each update. These registers are map to specific parameter definition in the Tritex Expert Software. The first word register in both Input and output block contain unmappable register, which is defined in this section.

### 2.1.1. PLC INPUTS

The first word of the PLC input provides the status of the Tritex communication. It provides information concerning the status of the connection, health of the Tritex option board. Typically this word contain zero unless there is an active error.

PLC Inputs (Tritex Outputs)

Instance	Word	Bit 15 – Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
101	0	Input Status Word								
	...	Assign by Expert software See Section 4 of Manual								
	...									
	100									

Figure 12 – PLC Input Map

Bit (0 = LSB)	Input Status Word
0	Error – Tritex is responding with error codes. Extended Module Status (Attribute 101) contains additional error information.
1	Error – communication with Tritex timed-out (was previously established)
2	Error – communication with Tritex cannot be established at all
3-7	Reserved
8	Unit is currently active at factory defaults
9	Unit has a new configuration that will take effect upon reset.
10-15	Reserved

**NOTE!** If error is active - Expert Software will display Minor fault condition on the EtherNet/IP page. Refer to Module Status Indicators for more information.

When Run/Idle is active (1) both the PLC and Tritex Expert Software have the capability of writing the same command to Tritex; disabling Run/Idle (0) could be used to insure command source.

### 2.1.2. PLC OUTPUTS

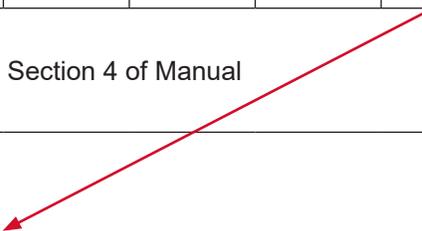
Bit 0 of the first word is defined as the Run/Idle command for the Tritex II Outputs. When an I/O connection is active, a zero (0) in this bit represents Idle Mode and a one (1) represents Run Mode. In Idle mode, the Tritex will only update PLC Inputs (Tritex Output) information.

Outputs PLC (Tritex Inputs)

Instance	Word	Bit 15 – Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
102	0									Run/Idle
	...	Assign by Expert software See Section 4 of Manual								
	...									
	100									

Figure 14 – PLC Outputs

**NOTE!** RUN bit must be enable, allowing Tritex to write PLC output data.



Name	Description
Run/Idle	Enable Output Update 0 : Idle - Tritex Output List are not updated 1: Run - Tritex Output List are updated

Figure 15 – Output Command Bit

### 3.0 CONFIGURING ETHERNET/IP MESSAGING

**NOTE:** The convention in this section of the manual is from the PLC (Client) perspective. As such, an assembly called an “Output Assembly-Instance” when outputted from the PLC and received by the Tritex (Server). An “Input Assembly-Instance” outputted from the Tritex and read by the PLC.

The Tritex EtherNet/IP Input and Output connection can be divide into I/O connections (implicit), and explicit messaging connection methods. Method to use, is based on the Master controller; typically, Rockwell controllers use Implicit Messaging

**Implicit Messages** - exchanged across I/O Connections with an associated Connection ID. The Connection ID defines the meaning of the data and establishes the regular/repeated transport rate and the transport class. No messaging protocol is contained within the message data as with Explicit Messaging. Implicit Messages can be point-to-point (unicast) or multicast and are use to transmit application specific I/O data.

**Explicit Messages**- sent as a connected or unconnected message. CIP defines an Explicit Messaging protocol that states the meaning of the message. This messaging protocol is contained in the message data. Explicit Messaging provide the means by which typical request/response oriented functions are perform. These messages are typically point-to-point. Message rates and latency requirements are typically not as demanding as I/O messaging.

#### 3.1. IMPLICIT CONFIGURATION EXAMPLE

The following example describes the process used to configuring I/O system with RSLogix 5000™ and Tritex with EtherNet/IP.

1. Run RSLogix 5000™ software and configure the PLC for the correct processor, rack and slot configurations.
2. Right click on the Ethernet folder located under I/O Configuration and left click to add a new module to this folder.



Figure 17 – Adding a New module using PLCs Software

3. Choose the Allen-Bradley –Generic Ethernet-Module. After selecting a name for the device, click OK.

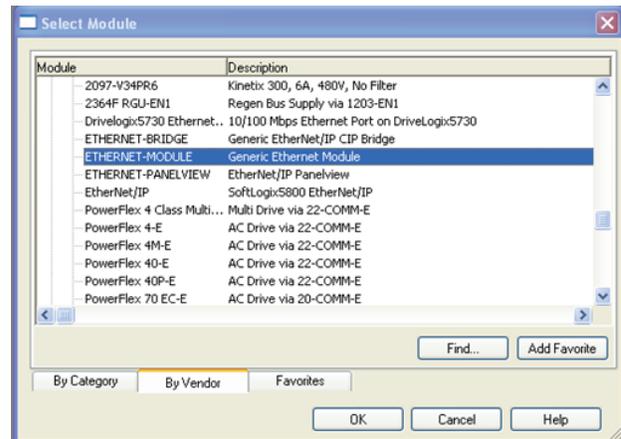


Figure 18 – Choose EtherNet/IP Module type

4. Configure New Module Connection Properties, IP Address and Comm Format. Assign name to new Module (Tritex) and then select OK.

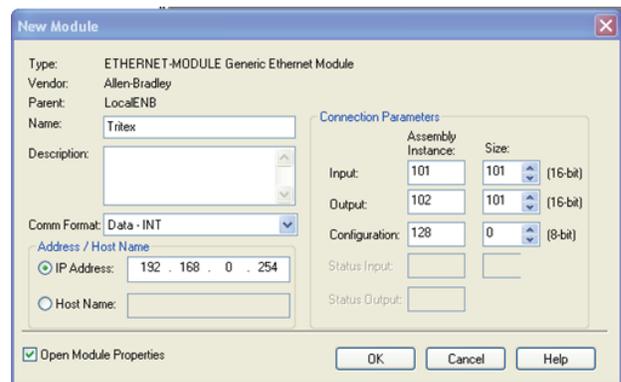


Figure 19 – Specify address and Connection Parameters

5. Connection

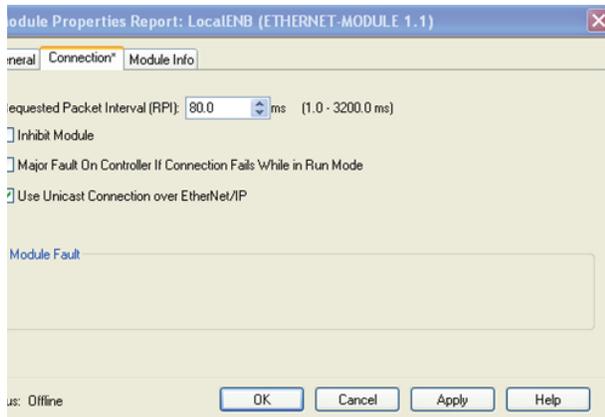


Figure 20 – Configuring New Module Connection

- Request Packet Interval (RPI): This field specifies the Requested Packet Interval (RPI), which defines the amount of time (in milliseconds) between the data exchanges across an implicit messaging connection.

**NOTE!** RPI > 20 Recommended

6. Inhibit Module: Checking this box prevents the PLC from attempting to establish a connection with the Tritex. Refer to RSLogix for additional information on this function.
- Major Fault On Controller If Connection Fails While in Run Mode: This option will cause the controller to generate a major fault when the connection fails.

- Use Unicast Connection over EtherNet/IP: Select Unicast or Multicast for EtherNet/IP connection base on system needs.

**NOTE!** Unicast vs. Multicast Unicast packets are sent directly to a single device. Multicast packets are sent to all devices on the network by default.

## 7. Verify configuration

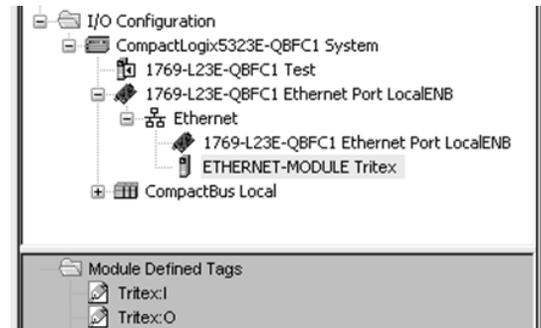


Figure 21 – Example Project tree – Added Tritex

By highlight the “Controller tags” in the project tree, it is possible to view the newly added Tritex. See Figure 22 for a display of the controller tags.

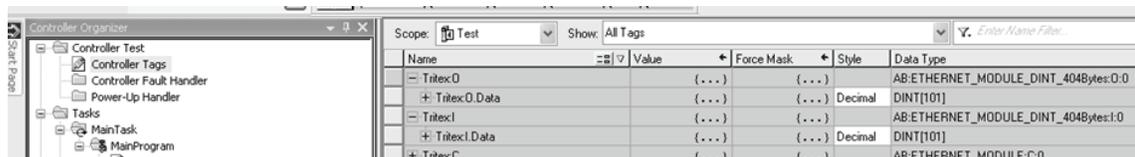


Figure 22 – Example Controller tags for Tritex

**NOTE!** For the above example. To update Tritex Outputs – TritexO.Data[0].0 must be turn ON.

### 3.2. EXPLICIT CONFIGURATION EXAMPLE

Explicit Messaging is use to transfer data that does not require continuous updates. With explicit messaging, you can configure and monitor Tritex parameters on the EtherNet/IP network.

The RSLogix™ software can be configure to send an EtherNet/IP message to the Tritex by using the Message (MSG) Instruction.

- Get Attribute Single (Read)
- Set Attribute Single (Write)

### 3.2.1. Example Get Attribute Single

The following ladder diagram demonstrates the ladder instructions needed to send explicit message from CompactLogix L23E Ethernet to the Tritex Inputs.

1. Add Message Instruction to RSLogix5000™ ladder Diagram. Please see figure 23.



Figure 23 – Ladder Diagram Get

**NOTE!** To display the Message Configuration dialog box in RSLogix5000, add a message instruction (MSG), create a new tag for the message (properties: Base tag type, MESSAGE data type, controller scope), and click the blue box inside the message.

2. Create new tag for the MSG (Message) Instruction.

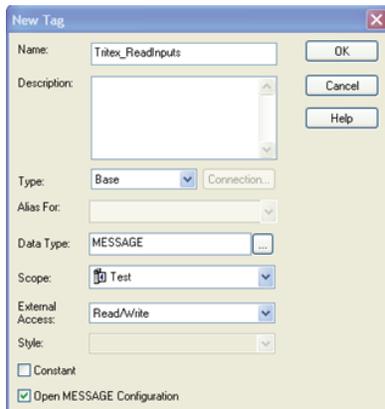


Figure 24 – Get Message New Tag

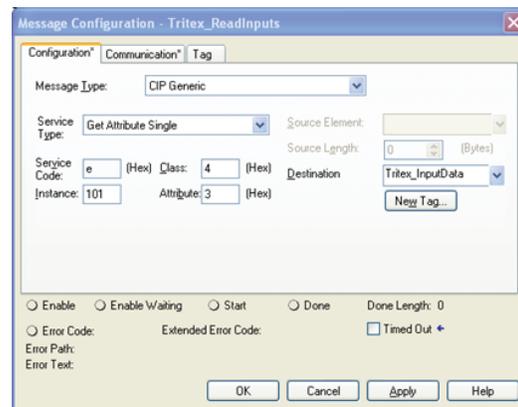


Figure 25 – Get Message Configuration Properties

3. In new Tag menu, assign name to tag, Check Open MESSAGE Configuration box, then click OK. See figure 24.
4. Configure Message Configuration parameters. See figure 25.

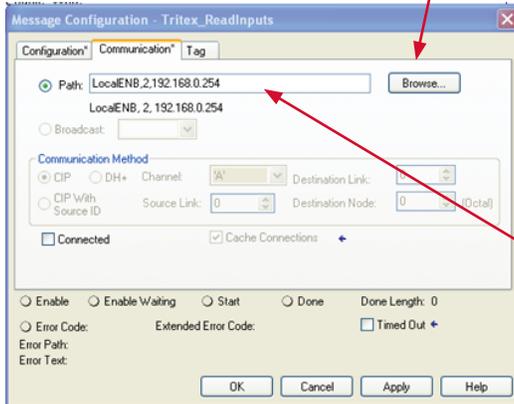
Configuration	Value	Description
Message Type	CIP Generic	Message Format
Service Type	Get Attribute Single	Read parameter data
Service Code	e (Hex)	Get_Attribute_Single
Class	4 (Hex)	Assembly Object
Instance	101 (Dec)	Assembly Input Object Instance
Attribute	3 (Hex)	Parameter Value
Destination	Tritex_InputData	Controller Tag for response data

Figure 26 – Tritex\_ReadInputs

5. In the Message Configuration section for Message click on the Communications Tab, this tab will allow the setting of the target device to get the explicit message. See Figure 27.

5.1 Click and open Message Path Browser and select local Ethernet module in PLC.

5.2 Configure Path



- Path - shows the route that the message takes to get to the destination. It is a combination of the Ethernet Card, location in the PLC and the module address. Refer to your PLC user manual for more information on configuring Path.

- Timed Out option – Time out for an unconnected message or for making a connection.

6. After configuring Path, Return to Configuration Tab.

7. From Configuration Parameters Menu, click New Tag and define Destination Tag for Input data.

Description  
 LocalENB Local communication module  
 2 EtherNet/IP port #  
 192.168.0.254 Tritex address

Figure 27 – Get Communication Properties

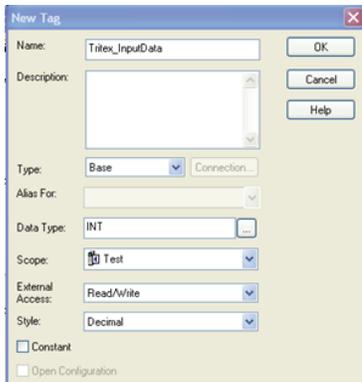


Figure 28 –Destination Tag

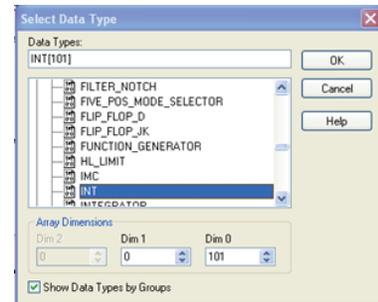


Figure 29 –Destination size

8. From Tag Menu select icon next to Data Type and change INT Dim 0 to “101”, then click OK, returning to New Tag Menu. Click OK to Defined New Destination Tag “Tritex\_InputData” See Figure 28 and 29.

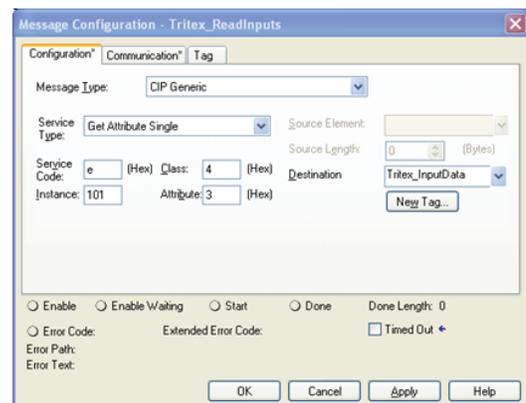


Figure 30 – Get Message Configuration Properties

- From the Message Configuration Menu select Destination Tag name "Tritex\_InputData". Click Apply button to configure Message Instruction

**NOTE!** Refer to Allen-Bradley Logix5000 Controllers General Instruction Manual for additional information on Message (MSG) Instruction and Application Configuration Details. XIC instruction is used to trigger Explicit Message read



Figure 31 – MSG Read Tritex Inputs

### 3.2.2. Example Set Attribute Single

The following ladder diagram demonstrates the ladder instructions needed to send explicit message from CompactLogix™ L23E Ethernet to the Tritex Outputs.

- Add Message Instruction to RSLogix5000™ ladder Diagram. Please see figure 23.
- Create new tag for the MSG (Message) Instruction.
- In new Tag menu, assign name to tag, Check Open MESSAGE Configuration box, then click OK. See figure 32.
- Configure Message Configuration parameters. See figure 33 and 34.

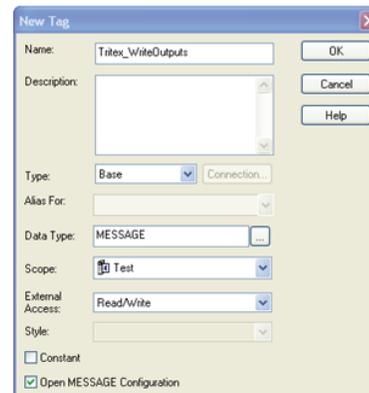


Figure 32 – Set – Message Tag

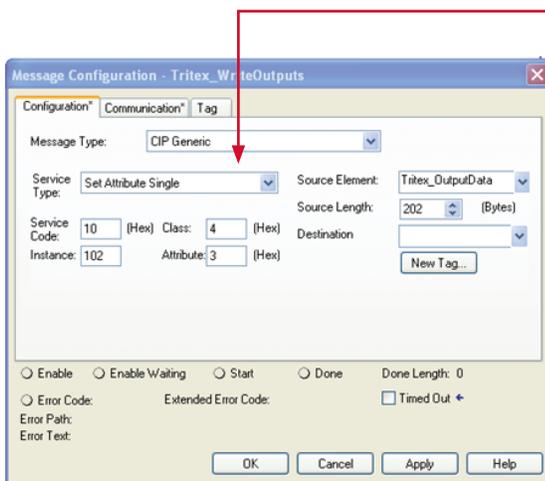


Figure 33 – Set Message Configuration Properties

Configuration	Value	Description
Message Type	CIP Generic	Message Format
Service Type	Set Attribute Single	Write parameter data
Service Code	10 (Hex)	Set_Attribute_Single
Class	4 (Hex)	Assembly Object
Instance	102 (Dec)	Assembly Output Object Instance
Attribute	3 (Hex)	Parameter Value
Source Element	Tritex_Output-Data	Controller Tag for response data
Source Length	202 Bytes	101 16-bit words of data is sent to Tritex

5. In the Message Configuration section for Message click on the Communications Tab, this tab will Allow the setting of the target device to get the explicit message. See Figure 27.
6. After configuring Path, Return to Configuration Tab.
7. From Configuration Parameters Menu, click New Tag and define Source Tag for Output data.

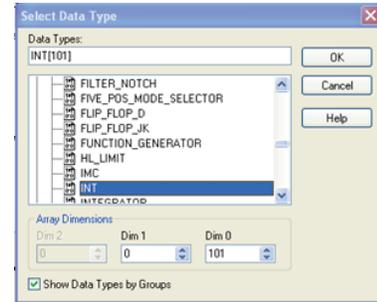


Figure 36 – Set Source Element size

8. From Tag Menu select icon next to Data Type and change INT Dim 0 to “101”, then click OK, returning to New Tag Menu. Click OK to Defined New Source Element Tag “Tritex\_OutputData” See Figure 32 and 33.

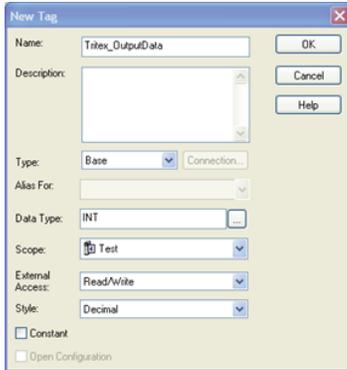


Figure 35 – Set Source Element Tag

General Instruction Manual for additional information on Message (MSG) Instruction and Application Configuration Details. XIC instruction is used to trigger Explicit Message write



Figure 37 – MSG Write Tritex Outputs

**NOTE!** Refer to Allen-Bradley Logix5000 Controllers

## 4.0 TRITEX EXPERT SOFTWARE

### 4.1. PC COMMUNICATION

When using the Expert software, an RS485 converter will be required to interface between one of the PC communication ports and the RS-485. Please refer to the Tritex Installation guide for more information.

### 4.2. IP PARAMETERS AND STATUS

Using the Tritex Expert software, you will see the above values populate the Active IP parameters. Here the Ethernet MAC-ID, IP Address, Subnet Mask and Default Gateway are display. The data enter fields to the right are used to configure the IP Address, Subnet Mask and Default Gateway.

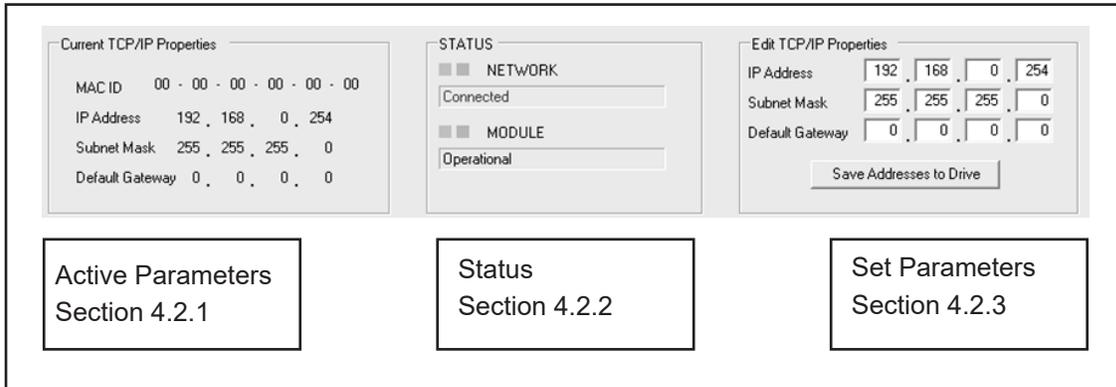
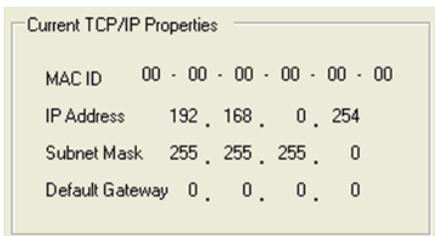


Figure 38 – Offline view of the Active IP parameters and Address Setup fields

#### 4.2.1. Active Parameters



Display Tritex active IP parameters

#### 4.2.2. Status

Status indicators, help maintenance personnel to quickly identify the status of the Network connection and interface module.

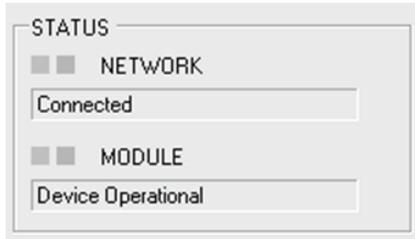


Figure 43 –Ethernet Status Indicators

Two types of status indicators are provided:

- Network status indicator
- Module status indicator

Network		
Indicator State	State	Description
Steady Off	No Powered / No IP	The device is powered off or is powered on but with no IP address configured
Steady Green	Connected	At least one CIP (Implicit) connection is established
Flashing Green	No I/O Connection	An IP address is configured, but no CIP connection is established
Flashing Red	Connection timeout	The established CIP connection has timeout
Steady Red	Duplicate IP	Duplicate IP address detection, the interface module has detected that its IP address is already in use.

Figure 44 -Network Status Indicators

Module		
Indicator State	State	Description
Steady Off	No power	The interface module has no power supplied to it
Steady Green	Operational	The interface module is operating correctly
Flashing Green	Standby	The interface module has not been configured
Flashing Red	Minor fault	Recoverable error is active; the error information will be loaded in the first word of the PLC input status word. Fault will clear on the next valid message
Steady Red	Major Fault	The interface module has detected a non-recoverable major fault.
Flashing Green/Red	Self-Test	The interface module is performing power-up testing

Figure 45 - Module Status Indicators

### 4.2.3. Set Parameters

To set the IP Address use Exlar Expert Software with Modbus/RTU connection. Modify the Subnet Mask or Gateway fields to your specific needs and select Save Addresses to Drive. These changes will not take effect until the power to the Tritex is cycle. Upon power up the new, IP Address will be assign and will show up in the Active MAC-ID parameter container.

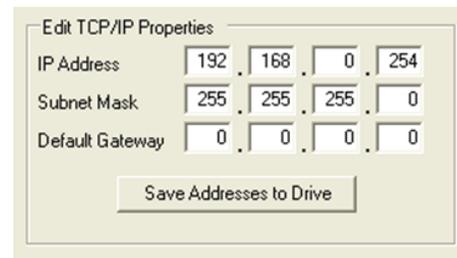


Figure 41 – Set Parameters

**NOTE!** BOOTP must be disabled to utilize the IP address setting through the Tritex Expert Software

### 4.3. TRITEX DATA MAPPING TO I/O REGISTERS

All Tritex functionality is parameter based. This means we have a listing of parameters associated with every functional capability of the Tritex. When setting up the EtherNet/IP mapping to the 101 Inputs and 101 Outputs, first a list of the parameters must be defined and determined whether they are Read Parameters

from the EtherNet/IP Host or Write Parameters to the Host. Once this list is created, mapping the parameters to the Translation Table of registers is done as shown in Figure x.2. The Output Mapping tab is used to map the parameters that are Output by the Tritex and Read into the Host. The Input Mapping tab is used to map the parameters that are Inputs to the Tritex and Written from the Host. The Input Mapping and Output Mapping tabs work in the same manner.

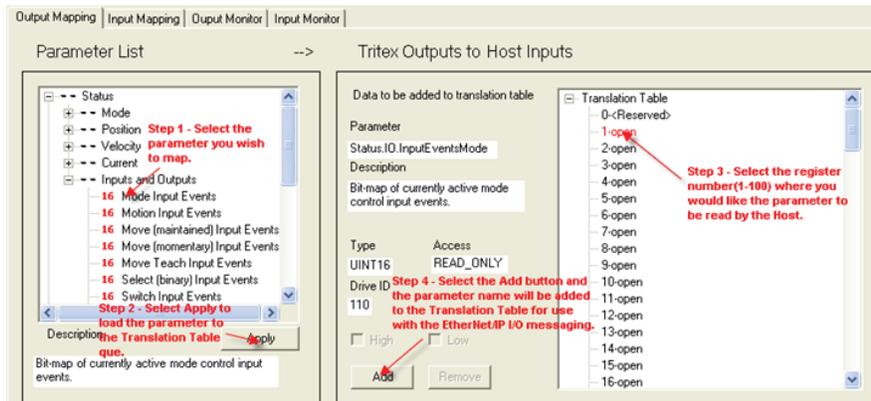


Figure 46– Selecting parameters to be map to the Translation Table.

After step, #2 above information about the parameter is display. 32-bit or double word parameters can only be assigned to tables starting with odd numbers. If a 32-bit parameter is selected and even table number is selected the “Add” button will be gray.

If only half of a 32-bit parameter is needed, for example, all velocities are 32-bit parameters their data format is 8.24 revs/sec, rarely would 24 bits of precision be needed to the right of the decimal point from a user perspective. In this case one could select only the high word of the parameter by un-checking the Low box resulting in a 16 bit velocity parameter in the format of 8.8 revs/sec , 8 bits on each side of the decimal point.

Assigning the parameters to be transferred between the Tritex and PLC is a breeze; the hard part is understanding the Tritex parameters and their format so they can be controlled from the PLC. The Tritex

II Parameters manual describe the function of every parameter, in some cases the interaction with other parameters and most importantly the format of data for each parameter. Parameters such as Move Distances and Velocity are straight forward however many of the parameters used for control are 16 bit registers represented by bit maps or Enumeration tables, the common bit maps are covered in Appendix A of the Parameter Manual.

To assist with validating the data sent/received, the Input/output Monitor tabs allow the user to view the non-scaled decimal value of the 16-bit register. This value will match the value observed from the Host. See figure 47 to identify its use. The Input Monitor and Output Monitor tabs both operate in the same manner.

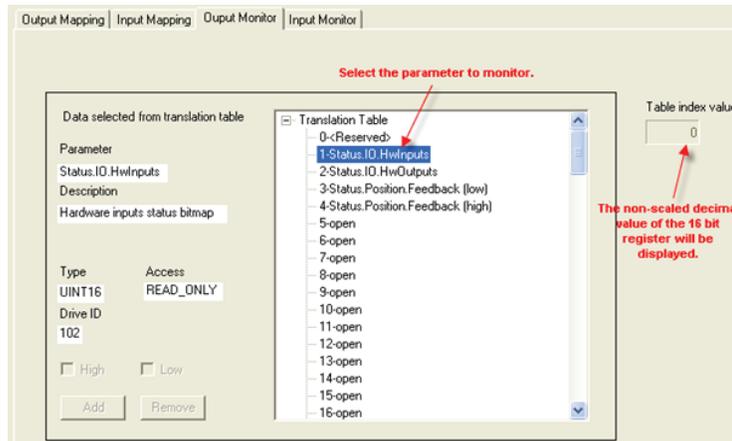


Figure 47– Monitoring parameters to validate data sent/received by the host.

Example 1: Writing Move 0 Position from the PLC to the Tritex

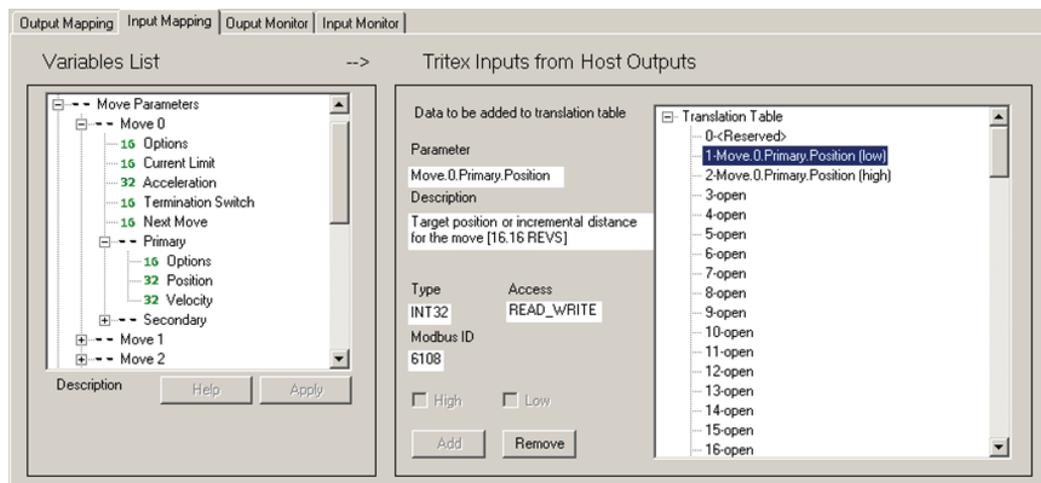


Figure 48 – Example 1

1. Select the Input Mapping tab (Input to the Tritex from the PLC)
2. Select Move 0, Primary, Position
3. Click Apply, information about the parameter is displayed
4. Since this is 32 bit parameter select and Odd number in the Translation table and Click the Add button
5. After a download the Tritex is now ready to receive this data from the place and write it directly to the Move0 position register
6. Determine what to write from the PLC. Click on the Help button and pdf file will open explaining the Move parameter details. Move Position has a variable type of POS 32, in the data table details the format is 16.16, (16 digits on each side of the decimal point), and the units are in Revs (motor revolutions). If the PLC writes a two to register one and five to register 2 and Move0 will have a move command of 5.200 Revs.

Example 2: Enabling the Tritex from a PLC

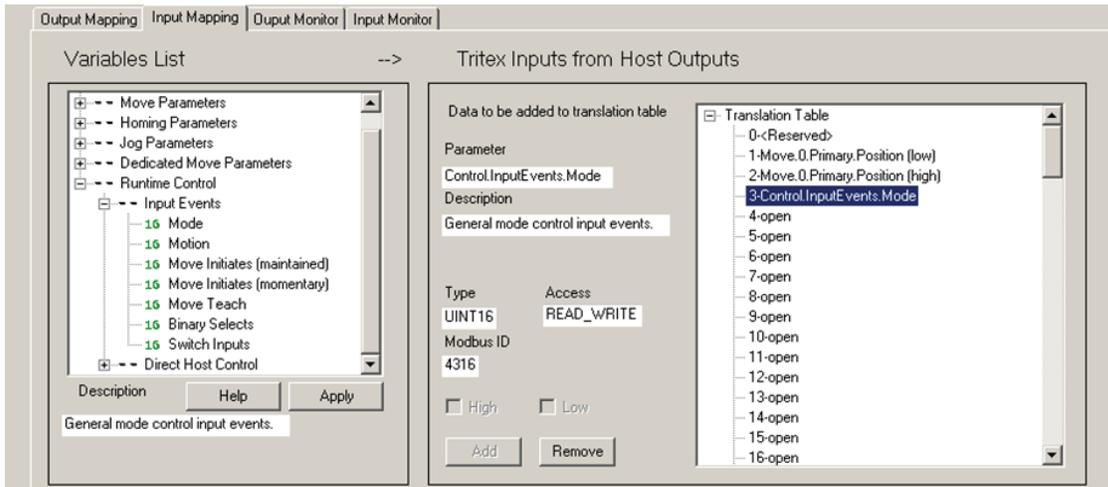


Figure 49 – Example 2

1. Select the Input Mapping tab (Input to the Tritex from the PLC)
2. Enable bit is found in the Mode sub group of Control/ Input Functions. Click the help button for details on the Input Function Events bit map.
3. Select Control, Mode and Click Apply
4. Select the desired register number from the translation table. Since it is a 16-bit parameter either, an odd or even number can be use.
5. From the information in found in the Help pdf, the bit map of the Mode word is shown as:
6. After a download, writing a one or a 0 to bit 1 of word 3 from the PLC will control the Tritex Enable

IEG\_MODE

RESET	BKOV	TSEL	TENA	H2	H1			ALT						EL	EE
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

As described bit 1, EL is Enable Maintained

The Translation tables in the Tritex II is used assign registers to Input/output Blocks allowing Implicit or explicit transferring of data by the PLC and Tritex II. User can defined their own translation tables or use Exlar default application configuration and use Exlar free AOI template.

Below figure shows the relationship of Tritex Input Translation Table to RSLogix Output controller tags.

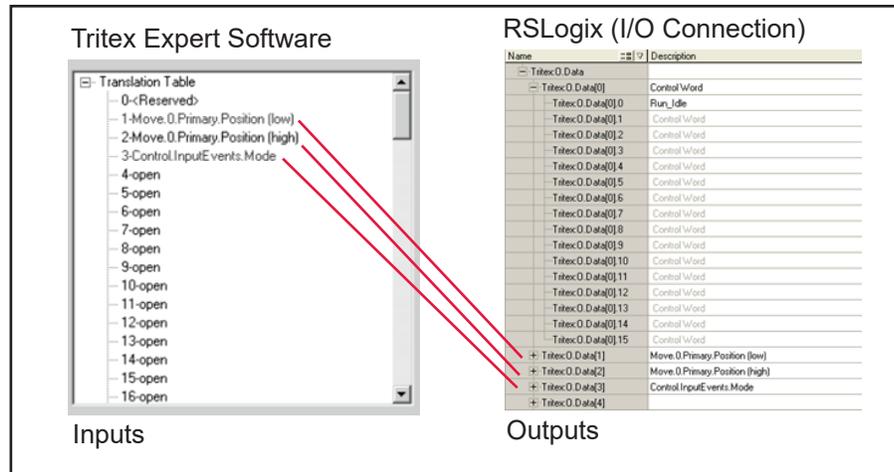


Figure 50 - Tritex Input vs. RSLogix Output Tags

## 5. TROUBLESHOOTING ETHERNET/IP

- Using BOOTP (Bootstrap Protocol) and cannot change IP address?
- Check if Tritex II BOOTP is enable or PC Ethernet connection are not correct. Read Rockwell BOOTP server manual for recommend firewall and virus software setting.
- Replacing Tritex II with another drive at the same IP and PLC does not recognize new Tritex
- Some PLC save the last active MAC ID. To force the PLC to recognize the replacement Tritex using the same IP address, try-power cycling the PLC's, forcing the PLC to map new MAC ID.
- Will not accept new IP address using Expert software BOOTP could be enable. Alternatively, the Factory Parameter could be incorrect. Verify the Factory configuration for EtherNet Option Board is enable and baud rate is at 230,400. See Expert Manual for factory configuration.
- Expert software displaying correct distance or velocity but the PLC application does not The Tritex II has its own units, which the Expert software converts to display user units. The scale factor can be located on Expert software User Units Page or can be calculated using TritexII Parameter Manual scaling application note.
- How to determine if BOOTP Enable User can connect BOOTP server and monitor for BOOTP request. Or with Expert software connected to actuator and no active BOOTP sever connected. At power up the 'Module Status' will be in Standby State for approximately 30 seconds before switching to Operational State.
- What happens if BOOTP is enable and BOOTP service times out
- The last valid BOOTP address will be use after 30 seconds. The factory default address is 192.168.0.254
- How to disable BOOTP
- Refer to Rockwell for more information
- Actuator failed to responded to MSDOS Ping
- After connected to actuator with Modbus RTU and reading Current TCP/IP Properties, verify Network Interface is configured for the same subnet. For Example if Expert software identifies actuator is program at 192.168.0.254 the PC interface set to 192.168.0.1? If you have enabled firewall, make sure firewall is configured correctly to allow network packets?

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