



N-Tron[®] Series

CIP[™] Installation & User Manual
NT24k[®] Products

Software Manual | March 2017

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PREFACE

Disclaimer Portions of this document are intended solely as an outline of CIP™ methodologies to be followed during the maintenance and operation of N-Tron® Series NT24k® equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Purpose This manual gives specific information on how to apply and use the CIP functions on the N-Tron series NT24k switches.

Audience The manual is intended for use by personnel who are responsible for operating and maintaining network equipment; consequently, it assumes a basic working knowledge of general switch functions and the Industrial Protocol (IP).

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Certifications Red Lion Controls, Inc. ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.



Conventions The following conventions are used throughout this manual to show information:

Note: Emphasizes important information or calls your attention to related features or instructions.

Related Publications and Document Updates This document is revised only at major releases and therefore, may not always contain the latest product information. As needed, Tech Notes and or other product documentation can be provided between major releases to describe any new information or document changes.

Also, as part of the NT24k software, there is an online web-based help that describes all management related features.

The latest online version of this document and all product updates can be accessed at the Technical Resources page on the Red Lion web site at:
www.redlion.net/n-tron_documentation

Red Lion appreciates all comments that will help us to improve our documentation quality. The user can submit comments through the Red Lion Customer Service. Simply email us at customer.service@redlion.net

- References**
- [1] The CIP Networks Library, Volume 1: Common Industrial Protocol (CIP™), Edition 3.16, Publication Number: PUB00001, Open DeviceNet™ Vendor Association, Inc., 4220 Varsity Drive, Suite A, Ann Arbor, MI 48108-5006 USA
 - [2] The CIP Networks Library, Volume 2: EtherNet/IP Adaptation of CIP™, Edition 1.17, Publication Number: PUB00002, Open DeviceNet Vendor Association, Inc., 4220 Varsity Drive, Suite A, Ann Arbor, MI 48108-5006 USA

Revision History The following information lists the release history of this document.

Issue / Revision Date	Content Description
July 2013	Initial version with support for switches in the NT24k product line.
August 23, 2013	Added missing documentation for the Power Configuration attribute of the N-Tron object.
October 2013	Added faceplate installation instructions and quick reference guide.
March 2014	Added a description of the faceplate error messages.
October 2014	Added support for NT24k-8TX, NT24k-8TX-POE, and NT24k-16TX switches.
November 2014	Added 802.1X port role.
March 2015	Revised face plates for NT24k-8TX, NT24k-8TX-POE, NT24k-16TX switches. Added support for: NT24k-10FX2, NT24k-10FX2-POE NT24k-10GX2, NT24k-10GX2-POE NT24k-11FX3, NT24k-11FX3-POE NT24k-11GX3, NT24k-11GX3-POE NT24k-12FX4, NT24k-12FX4-POE NT24k-12GX4, NT24k-12GX4-POE NT24k-14FX6, NT24k-14FX6-POE NT24k-14GX6, NT24k-14GX6-POE, NT24k-12SFP-DM4, NT24k-12SFP-DM4-POE
November 2015	Revised to comply with updated ODVA requirements. Formatted to comply with updated Red Lion Controls technical documentation standards.
May 2016	Added support for NT24k-16TX-POE switch
March 2017	Added support for: NT24k-16M12, NT24k-16M12-POE, NT24k-16M12-R, NT24k-16M12-POE-R

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CHAPTER 1 INTRODUCTION TO CIP™ COMPONENTS

EtherNet/IP™, better known as the Common Industrial Protocol (CIP™), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of individual devices.

Red Lion Controls N-Tron® series NT24k® switches with CIP support can be used to communicate with other industrial devices, such as Rockwell controllers.

1.1 CIP™ Components

The following CIP components are available with Red Lion Controls N-Tron series NT24k CIP enabled switches.

1.1.1 Electronic Data Sheets

An electronic data sheet for each NT24k switch is provided.

In a Rockwell environment EDS files are installed using the “EDS Hardware Installation Tool”. This allows NT24k switches to be recognized in an RSLinx environment.

EDS and associated Icon files for each NT24k switch are included in the CIP Installation Kit file in the subdirectory “Cip”.

1.1.2 CIP Objects

“Objects” are used to organize various information about the switch. There are four types of objects provided. Three are specified by the ODVA™, and one is N-Tron series specific:

- Identity object
- TCP/IP Interface object
- Ethernet Link object
- N-Tron switch object

Standard “services” are associated with objects. Services exist for reading an attribute, setting an attribute, resetting a device, etc. See references [1] and [2] for specific details.

The following sections describe the attributes associated with each object type, such as attribute Id number and data format. All attributes can be read, but only some can be set, as shown by the “Set” column.

1.1.2.1 Identity Object

The identity object class (Class code = 0x01) and instance attributes are implemented as defined by CIP Vol 1, 5-2 [1]. There is one instance (1) of this object. Service code (0x32) will get all attributes, including optional attributes. [Table 1-1](#) summarizes the attributes in the Identity object.

Table 1-1 Identity Object Attributes

ID	Name	Set	Format	Description
1	Vendor ID		UINT (16)	1006. This is N-Tron's ODVA EtherNet/IP Vendor ID
2	Device Type		UINT (16)	0x0C. Communications Adapter
3	Product Code		UINT (16)	Switch product code: NT24k -RM= 24001 NT24k-DR16= 24002 NT24k-DR24= 24003 NT24k-8TX= 24004 NT24k-8TX-POE= 24005 NT24k-16TX= 24006 NT24k-16TX-POE= 24007 NT24k-10FX2= 24008 NT24k-10GX2= 24009 NT24k-11FX3= 24010 NT24k-11GX3= 24011 NT24k-12FX4= 24012 NT24k-12GX4= 24013 NT24k-14FX6= 24014 NT24k-14GX6= 24015 NT24k-12SFP-DM4= 24016 NT24k-10FX2-POE= 24017 NT24k-10GX2-POE= 24018 NT24k-11FX3-POE= 24019 NT24k-11GX3-POE= 24020 NT24k-12FX4-POE= 24021 NT24k-12GX4-POE= 24022 NT24k-14FX6-POE= 24023 NT24k-14GX6-POE= 24024 NT24k-12SFP-DM4-POE= 24025 NT24k-16M12= 24026 NT24k-16M12-POE= 24027 NT24k-16M12-R= 24028 NT24k-16M12-POE-R= 24029
4	Major Revision		USINT (8)	Major version of CIP implementation
	Minor Revision		USINT (8)	Minor version of CIP implementation

ID	Name	Set	Format	Description
5	Status		WORD (16)	Summary status of device. Bits: Bit 0: if set, device has an owner Bit 1: reserved Bit 2: if set, device has non-default configuration Bit 3: reserved Bits 4-7: Extended device status – not used Bit 8: Minor recoverable fault Bit 9: Minor unrecoverable fault Bit 10: Major recoverable fault Bit 11: Major unrecoverable fault Bits 12-15: reserved (see Table 1-2) (see Identity Object Fault Table 1-2)
6	Serial Number		UDINT (32)	Serial number of the device. This is the last 4 octets of the base switch MAC
7	Product Name		SHORT_STRING	Switch Model Name. EX: NT24k
15	Assigned_Name	Set	STRINGI	This is the user assigned switch name
17	Geographic_Location	Set	STRINGI	This is the user assigned switch location

[Table 1-2](#) defines fault bits within the Status attribute of the Identity Object.

Table 1-2 Identity Object Fault Bit Definitions

Bit	Called	Definition
8	Minor Recoverable Fault	Power supply 1, Power supply 2, N-Ring Full, System, Port utilization, Temperature, N-Link partner is down, N-Link integrity fault
9	Minor Unrecoverable Fault	Configuration device error
10	Major Recoverable Fault	N-Ring partial low, N-Ring partial high, N-Ring multiple managers, Boot loader version, N-Link partner port unknown, N-Link multiple masters, N-Link control fault, N-Link configuration fault, Settings fault
11	Major Unrecoverable Fault	none

1.1.2.2 TCP/IP Interface Object

The TCP/IP Interface object class (Class code = 0xF5) and instance attributes are implemented as defined by CIP Vol 2, 5-3 [2]. There is only one instance (1) of this object. [Table 1-3](#) summarizes the attributes in the TCP/IP Interface object.

Table 1-3 TCP/IP Interface Object Attributes

ID	Name	Set	Format	Description
1	Status		DWORD (32)	Interface status Bit 0: interface configuration attrib not configured Bit 1: interface configuration attrib is valid
2	Configuration Capability		DWORD (32)	Interface capability flags. Bits: Bit 0: BOOTP client capable Bit 1: DNS client capable Bit 2: DHCP client capable Bit 3: DHCP-DNS update capable Bit 4: configuration is settable Bit 5: through Bit 31 reserved
3	Configuration Control	Set	DWORD (32)	Interface control flags Bits 0-3: 0: use interface configuration previously stored 1: get interface configuration via BOOTP 2: get interface configuration via DHCP 3: through Bit 15 reserved 4 =1 device shall resolve host names by querying a DNS server
4	Physical Link Object		STRUCT of:	
	Path Size		UINT (16)	Size of Path
	Path		Padded EPATH	Logical segments identifying the physical link object
5	Interface Configuration		STRUCT of:	
	IP Address	Set	UDINT (32)	The device's IP address
	Network Mask	Set	UDINT (32)	The device's network mask
	Gateway Address	Set	UDINT (32)	Default gateway address
	Name Server	Set	UDINT (32)	Primary name server
	Name Server 2	Set	UDINT (32)	Secondary name server
	Domain Name	Set	STRING	Default domain name
6	Host Name	Set	STRING	Host name
8	TTL Value		USINT	TTL Value for EtherNet/IP multicast packets. Default is 1. Range is 1-255
9	Mcast Config		STRUCT of:	IP multicast configuration
	Alloc Control		USINT	Multicast address allocation control word. Determines how addresses are allocated
	Reserved		USINT	Reserved for future use. Shall be 0
	Num Mcast		UINT	Number of IP multicast addresses to allocate for EtherNet/IP
	Mcast Start Addr		USDINT	Starting multicast address from which to begin allocation
13	Encapsulation Inactivity Timeout	Set	UINT	Number of seconds of inactivity before TCP connection is closed. 0 = Disable, 1-3600 = timeout in seconds, Default = 120

1.1.2.3 Ethernet Link Object

The Ethernet Link object class (Class code = 0xF6) and instance attributes are implemented as defined by CIP Vol 2, 5-4 [2]. There is one instance of this object per switch port where instance 1 = port 1, instance 2 = port 2, etc. As per the CIP specification, the get all service code (0x01) will get all attributes, excluding vendor extensions. Service code (0x32) will get all attributes, including the N-Tron vendor extensions. Table 1-4 summarizes the attributes in the Ethernet Link object.

Table 1-4 Ethernet Link Object Attributes

ID	Name	Set	Format	Description
1	Interface Speed		UDINT (32)	Interface speed currently in use. Speed in Mbps (e.g., 0, 10, 100, 1000, etc.)
2	Interface Flags		DWORD (32)	Interface status flags Bit map of interface flags. See section 5-4.3.2.1. Includes Link status, duplex mode, auto-negotiation status, etc
3	Physical Address		ARRAY of 6 USINTs (8)	MAC address of switch port
4	Interface Counters		STRUCT of:	
	In Octets		UDINT (32)	Octets received on the interface
	In Ucast Packets		UDINT (32)	Unicast packets received on the interface
	In Nucast Packets		UDINT (32)	Non-unicast packets received on the interface
	In Discards		UDINT (32)	Inbound packets received on the interface but discarded
	In Errors		UDINT (32)	= 0. Not available. Inbound packets that contain errors (does not include In Discards)
	In Unknown Protos		UDINT (32)	= 0. Not available. Inbound packets with unknown protocol
	Out Octets		UDINT (32)	Octets sent on the interface
	Out Ucast Packets		UDINT (32)	Unicast packets sent on the interface
	Out Nucast Packets		UDINT (32)	Non-unicast packets sent on the interface
	Out Discards		UDINT (32)	Outbound packets discarded
	Out Errors		UDINT (32)	= 0. Not available. Outbound packets that contain errors
5	Media Counters		STRUCT of:	
	Alignment Errors		UDINT (32)	Frames received that are not an integral number of octets in length
	FCS Errors		UDINT (32)	Frames received that do not pass the FCS check
	Single Collisions		UDINT (32)	Successfully transmitted frames which experienced exactly one collision
	Multiple Collisions		UDINT (32)	Successfully transmitted frames which experienced more than one collision
	SQE Test Errors		UDINT (32)	= 0. Not available. Number of times SQE test error message is generated

ID	Name	Set	Format	Description
	Deferred Transmissions		UDINT (32)	Frames for which first transmission attempt is delayed because the medium is busy
	Late Collisions		UDINT (32)	Number of times a collision is detected later than 512 bit times into the transmission of a packet
	Excessive Collisions		UDINT (32)	Frames for which transmission fails due to excessive collisions
	MAC Transmit Errors		UDINT (32)	= 0. Not available. Frames for which transmission fails due to an internal MAC sub layer transmit error
	Carrier Sense Errors		UDINT (32)	= 0. Not available. Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
	Frame Too Long		UDINT (32)	Frames received that exceed the maximum permitted frame size
	MAC Receive Errors		UDINT (32)	= 0. Not available. Frames for which reception on an interface fails due to an internal MAC sub layer receive error
6	Interface Control		STRUCT of:	
	Control Bits	Set	WORD (16)	Interface Control Bits. Includes auto-negotiation and duplex settings.
	Forced Interface Speed	Set	UINT (16)	Speed at which the interface shall be forced to operate. Speed in Mbps (10, 100, 1000, etc.)
7	Interface Type		USINT (8)	Type of interface: twisted pair, fiber, internal, etc
8	Interface State		USINT (8)	Current state of the interface: operational, disabled, etc
9	Admin State	Set	USINT (8)	Administrative state: enable, disable
10	Interface Label		SHORT_STRING	Human readable identification: TX1, FX1, GB1, A4, C8, etc
100	Interface Description		SHORT_STRING	Human readable description. For example: Port 1 - 10/100 Mbit TX Port 15 - 100 MBit FX
101	Interface Utilization		USINT (8)	Percentage of entire interface bandwidth being used (0-100)
102	Utilization Alarm Upper Threshold	Set	USINT (8)	Upper percentage at which to declare utilization alarm (0-100)
103	Utilization Alarm Lower Threshold	Set	USINT (8)	Lower percentage at which to declare a utilization alarm (0-100)
104	Broadcast Limit	Set	USINT (8)	Broadcast limiting percentage (0-100). (BPCL)
105	TX Unicast Packet Rate		UDINT32	Number of TX unicast packets per second
106	RX Unicast Packet Rate		UDINT32	Number of RX unicast packets per second
107	TX Multicast Packet Rate		UDINT32	Number of TX multicast packets per second

ID	Name	Set	Format	Description
108	RX Multicast Packet Rate		UDINT32	Number of RX multicast packets per second
109	TX Broadcast Packet Rate		UDINT32	Number of TX broadcast packets per second
110	RX Broadcast Packet Rate		UDINT32	Number of RX broadcast packets per second
111	TX Multicast Packets		UDINT32	Total number of TX multicast packets
112	RX Multicast Packets		UDINT32	Total number of RX multicast packets
113	TX Broadcast Packets		UDINT32	Total number of TX broadcast packets
114	RX Broadcast Packets		UDINT32	Total number of RX broadcast packets
115	Port Role		UDINT32	Bit mask of port roles Bit 0: RSTP Bit 1: N-Ring Bit 2: N-Link Control Bit 3: N-Link Partner Bit 4: N-Link Coupler Bit 5: 802.1X

1.1.2.4 NT24k® Object

The N-Tron object (Class code = 0xC0) is a vendor specific object and is implemented as defined by CIP Vol 1, 4 [1]. There is only one instance (1) of this object. [Table 1-5](#) summarizes the attributes of the N-Tron object.

Table 1-5 N-Tron Object Attributes

ID	Name	Set	Format	Description
1	Device Up Time		UDINT (32)	Number of seconds since device was powered up
2	Port Count		UDINT (32)	Total port count
3	Valid Ports		LWORD (64) AB: DINT[2]	0 = Invalid Port, 1=Port Exists on device Bit 0: Port 1 Bit 1: Port 2 etc
4	Global Admin Status		LWORD (64) AB: DINT[2]	0 = Port Disabled, 1 = Port Enabled Bit 0: Port 1 Bit 1: Port 2 etc
5	Global Link Status		LWORD (64) AB: DINT[2]	0 = Link Down, 1 = Link Up Bit 0: Port 1 Bit 1: Port 2 etc
6	System Faults		DWORD (32)	Bit 00: Power Supply 1 Bit 01: Power Supply 2 Bit 02: N-Ring Fault (complete) Bit 03: N-Ring Partial Fault (low port) Bit 04: N-Ring Partial Fault (high port) Bit 05: N-Ring Multiple Managers Bit 06: System error Bit 07: the configuration on an installed configuration device is invalid Bit 08: N-Link Fault Bit 09: Boot loader version mismatch Bit 10: Port Utilization Alarm Bit 11: Temperature Alarm Bit 12: Settings fault

ID	Name	Set	Format	Description
7	IGMP Querier Status		USINT (8)	Query Status: 0 = Disabled, 1 = Active (manual), 2 = Active (Auto), 3 = Backup (Auto) [enabled but not active]
8	IGMP Version		USINT (8)	IGMP Version (V1, V2, V3, etc.)
9	IGMP Resource Usage		USINT (8)	Percent of maximum capacity. Takes into account the number of groups used per max groups and any other possible resource limitations (0-100)
10	IGMP Active Querier		UDINT (32)	IP of the active IGMP querier
11	CPU Usage		USINT (8)	Percent of usage (0-100)
12	Class 1 Connections		UINT (16)	Number of CIP EtherNet/IP class 1 (multicast) connections
13	Class 3 Connections		UINT (16)	Number of CIP EtherNet/IP class 3 (unicast) connections
14	Temperature Alarm Upper Threshold	Set	INT (16)	Upper temperature (C) at which to declare an alarm
15	Temperature Alarm Lower Threshold	Set	INT (16)	Lower temperature (C) at which to declare an alarm
16	Contact Status		BYTE (8)	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed
17	Temperature_C		INT (16)	Temperature in degrees C. 0x7FFF = Not Supported on device
18	Temperature_F		INT (16)	Temperature in degrees F. 0x7FFF = Not Supported on device
19	Reset MIB Counts	Set	LWORD (64)	Reset port MIB counters. (1 bit per port to reset)
20	Device MAC Address		ARRAY of 6 USINTs (8)	MAC address of device
21	Device Role		UDINT (32)	Bit mask of device roles Bit 0: N-Ring Manager Bit 1: N-Ring Member Bit 2: N-Ring AutoDetect Bit 3: N-Link Master Bit 4: N-Link Slave Bit 5: N-Link Coupler
22	Config Device Status		BYTE (8)	0 = Not Supported, 1 = Not Present, 2 = Present
23	System Configuration	Set	UDINT (32)	Bit mask of system config. Bits= Bit 0: GET: Changes have been made that have not been saved SET: Save system configuration to flash. Bit 1: GET: Changes have been made that require a reboot to take effect. SET: Shutdown and reboot device*
24	System Firmware Version String		SHORT_STRING	Human readable representation of firmware version string.
25	System Boot Loader Version String		SHORT_STRING	Human readable representation of boot loader version string

ID	Name	Set	Format	Description
26	System Fault String		STRINGI	Human readable representation of error status. May contain multiple errors. Length is contained as part of the STRINGI data type
27	Power Configuration		UDINT (32)	4 Bits per power supply 0000 = DC Power, 0001 = AC Power, 1111 = Unknown. Power supply 1 configuration is in bits 0-3 Power supply 2 configuration is in bits 4-7
* ID 23 Bit 1 SET: This feature will be removed in a future release.				

1.1.2.5 CIP Services

Table 1-6 presents a summary of the supported services as defined by CIP Vol 1, Appendix A: Explicit Messaging Services [1].

Table 1-6 Summary of Supported CIP Services

Service Code	Service Description	Identity	TCP/IP	Ethernet Link	N-Tron
1	Get_Attributes_All	yes	yes	yes	yes
5	Reset	Yes – reset switch or restore factory configuration			
14	Get_Attribute_Single	yes	yes	yes	yes
16	Set_Attribute_Single	Attributes 15,17	Attributes 3,5	Attributes 6,9, 102-104	Attributes 14,15,19,23
Vendor Specific					
50	Get_All_Attributes – including vendor defined attributes	yes		yes	
Object Specific					
76	Get_And_Clear			Attributes 4,5	

1.1.3 Accessing Data

1.1.3.1 Explicit Messaging

Explicit messaging refers to a request/response form of communications over a CIP (TCP/IP) connection. Applications can use explicit messaging, for example, to invoke the “Get All Attributes” service and read all attributes of the Identity object.

1.1.3.2 I/O Connections

I/O connections are used to send data (grouped in assemblies) between devices periodically. The interval between sends is the “Requested Packet Interval”, or RPI.

The N-Tron Series switch assemblies (Input, Output, and Configuration) are defined in [Table 1-7](#).

Table 1-7 Switch I/O and Configuration NT24k

Switch	Assembly Number	Size (bytes)
Input (to switch)*	101	4
Output (from switch)	102	104
Configuration*	103	0

* - not currently used

In an RSLogix 5000 environment, these assemblies are configured in the “Connection Parameters” panel of the Generic Ethernet Module.



Note: Input and output assemblies are reversed.

More information is contained in Chapter 2 [Rockwell RSLogix 5000 - AOI for Add-On Instruction installation](#).

CHAPTER 2 ROCKWELL RSLOGIX 5000 - AOI

2.1 Material Prerequisites

- N-Tron® series Switch
- RSLogix Add-On Instructions (AOI)

2.2 Installation Instructions

2.2.1 Software Installation Prerequisites

- RSLogix 5000 version 17 or later
- N-Tron switch with firmware version that includes CIP™ support

2.2.2 Summary of Installation Steps

1. Import the Add-On Instruction (AOI)
2. Add your NT24k® switch to the I/O Configuration tree
3. Add an instance of the AOI in your application
4. Create and configure tags for the AOI

2.3 Configuration of RSLogix Project

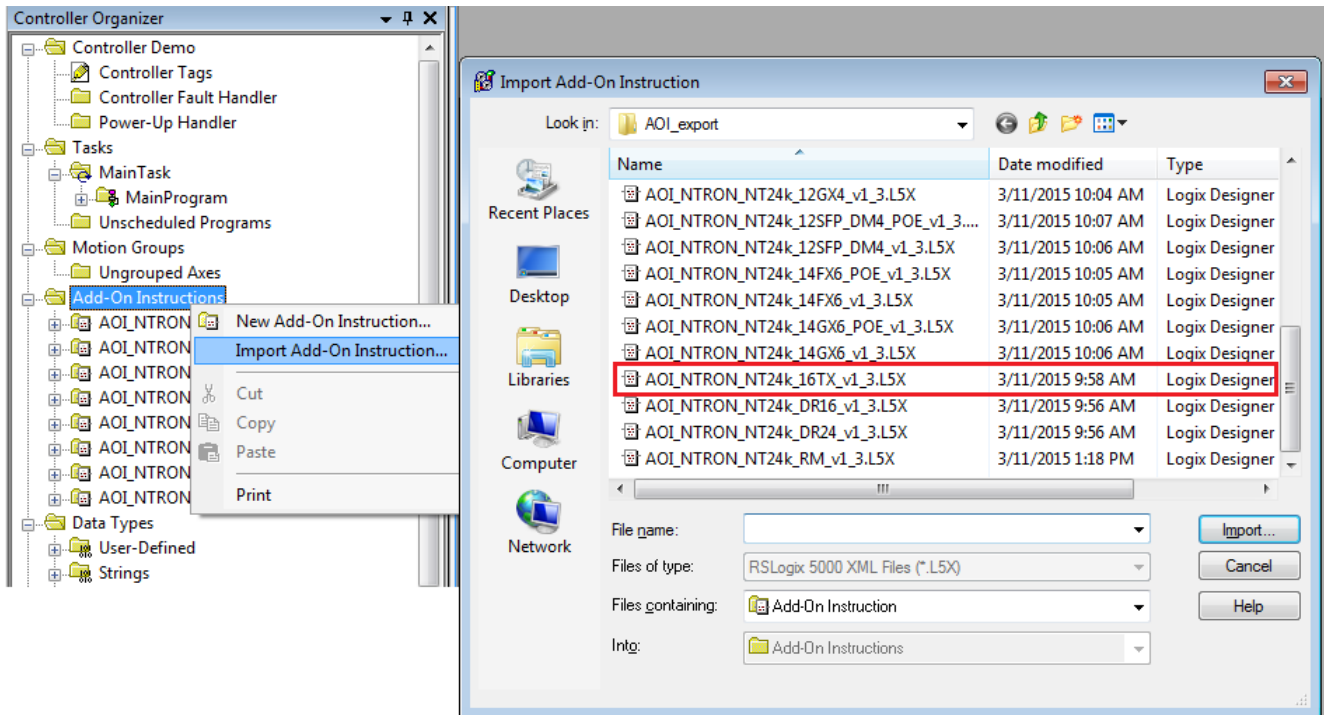


Note: The screen shots shown in the RSLogix5000 portion of this document are taken from the RSLogix5000 demonstration project file “N-Tron_Demo.ACD” which is included in the CIP Installation Kit file under the subdirectory “RSLogix5000”.

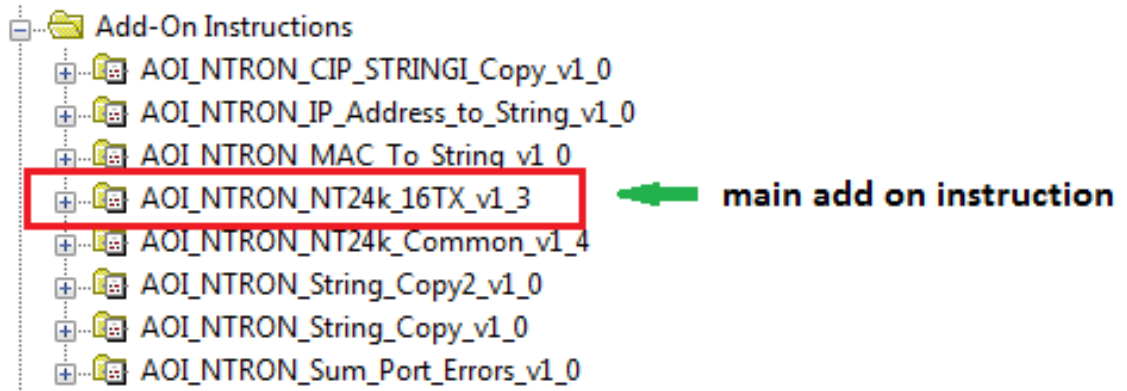
2.3.1 Importing an Add-On Instruction

All NT24k® Add-On Instruction files are included in the CIP Installation Kit file in the subdirectory “RSLogix5000\AOI_export”.

1. Open an RSLogix project.
2. Import the N-Tron Add-On Instruction (AOI).
3. In the controller organizer window, right click “Add-On Instructions” folder, select “Import Add-On Instruction” and browse to the folder containing AOI_N-Tron_*.L5X files. Import an AOI for each switch type installed.

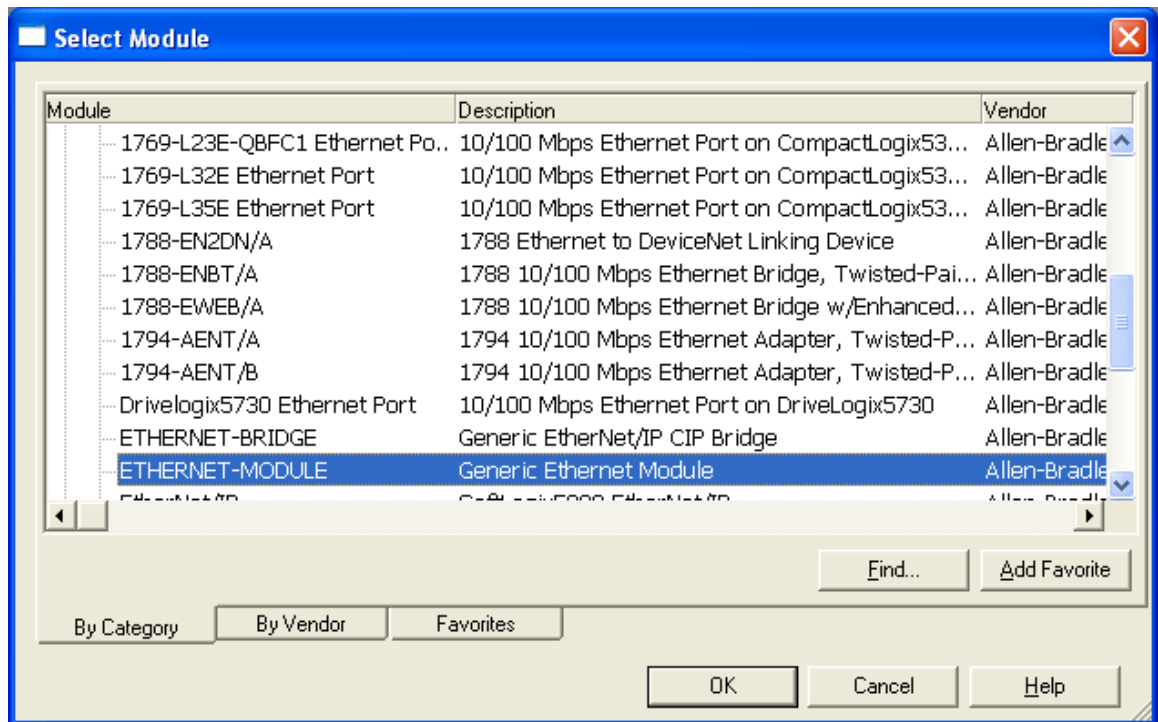
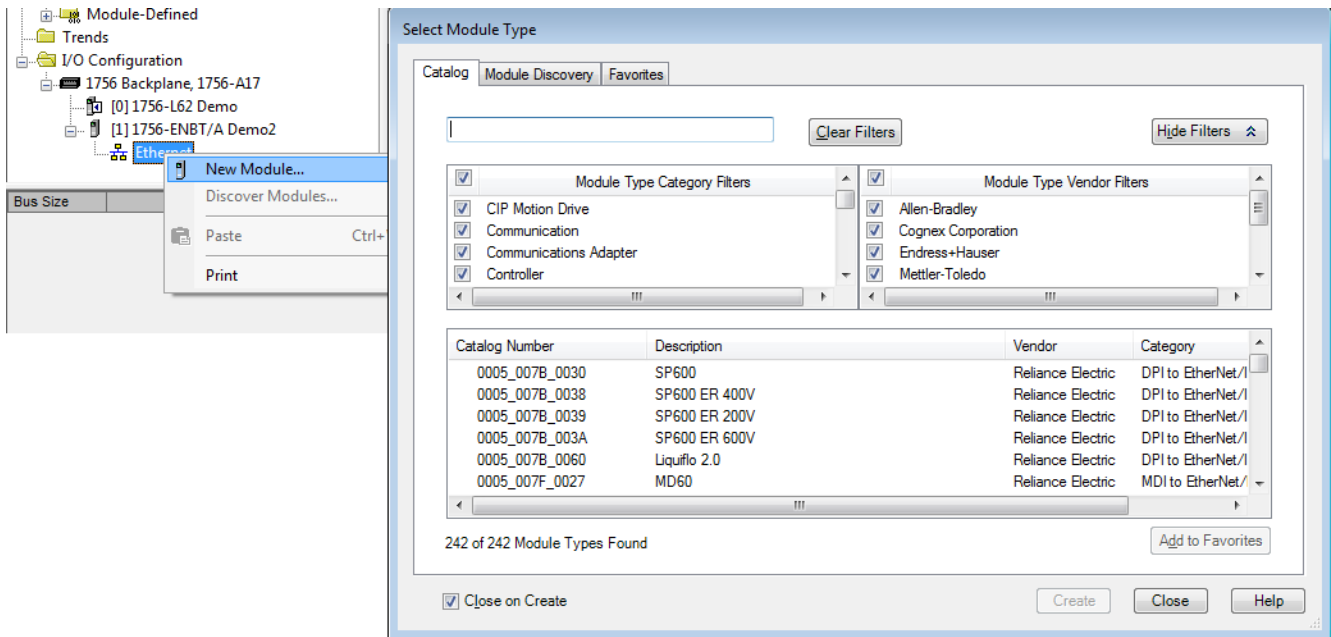


- The Add-On Instruction tree showing an AOI for the NT24k switch, and several auxiliary AOIs which get loaded as part of the main AOI.

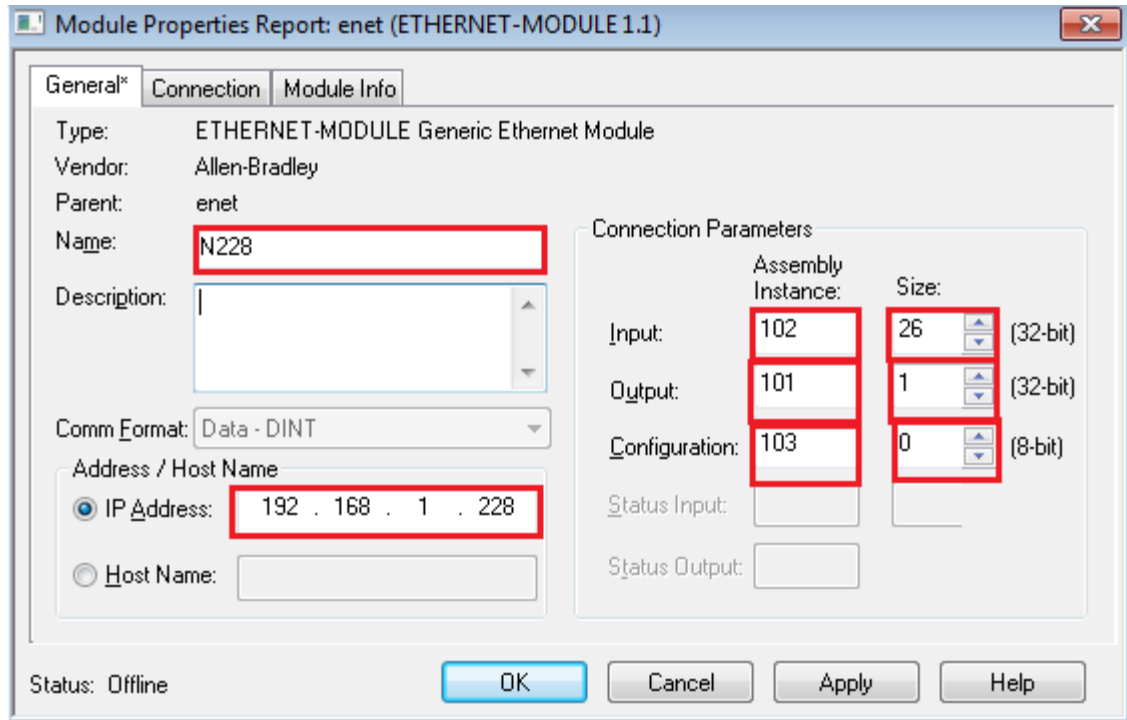


2.3.2 Add a Generic Ethernet Module to the I/O Configuration

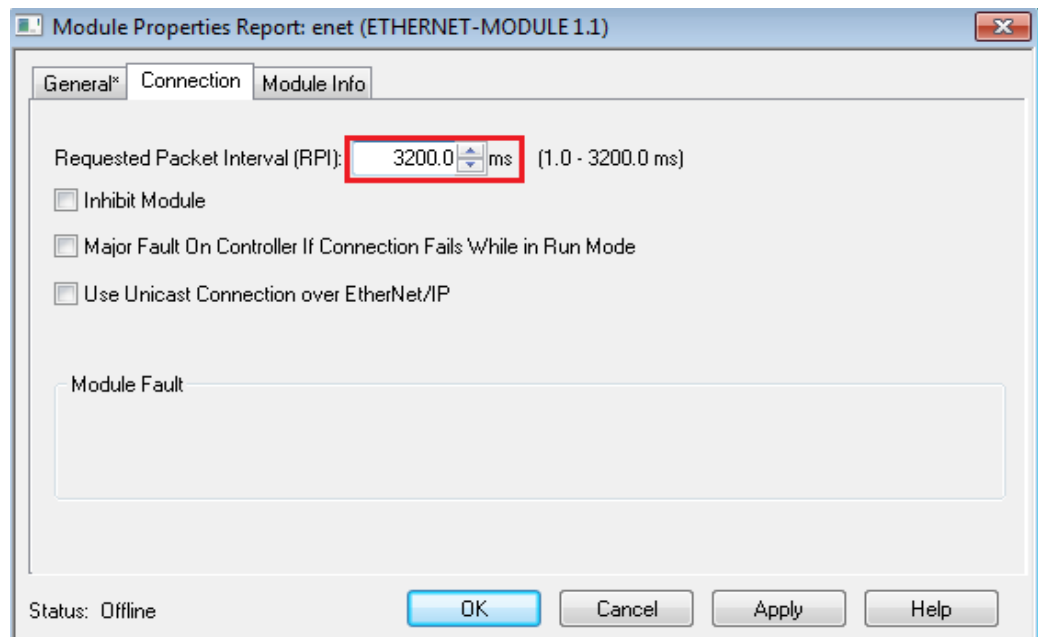
The Generic Ethernet Module is located under the “Communications” group:



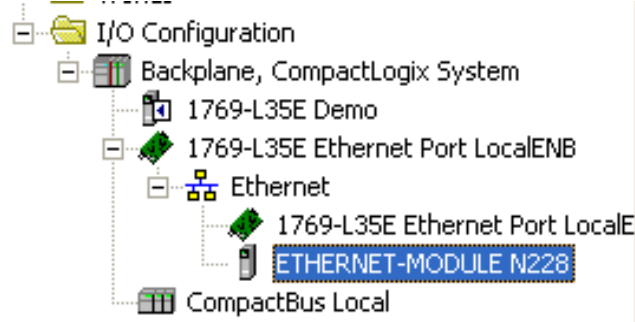
Configure the module as shown. Use the proper IP address for the new switch and the connection parameters for your installation. For the purpose of demonstration, the module Name will be set to N228 throughout this document.



1. Click the Connection tab and set the desired RPI. The input assembly will be received from the switch at the selected RPI.

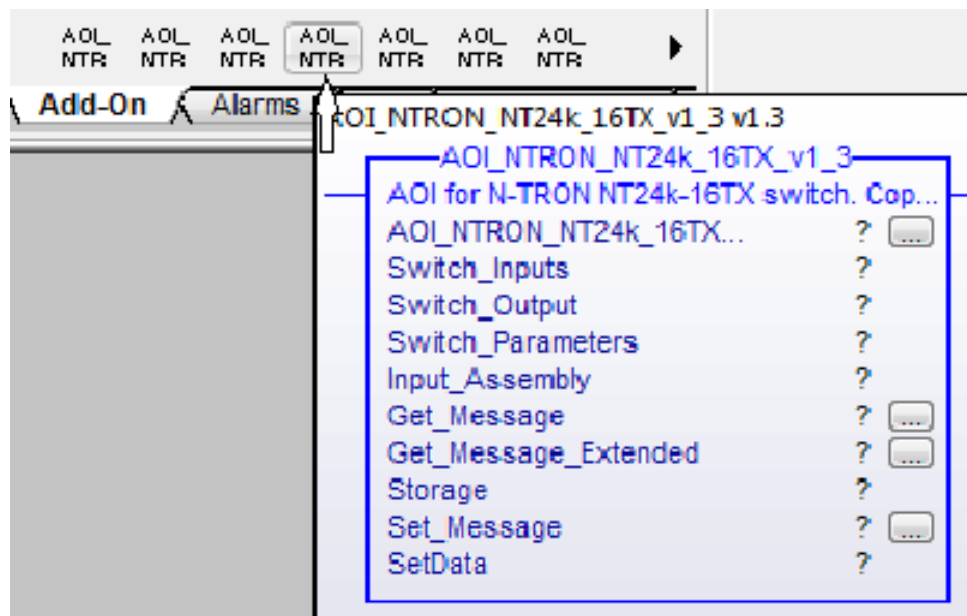


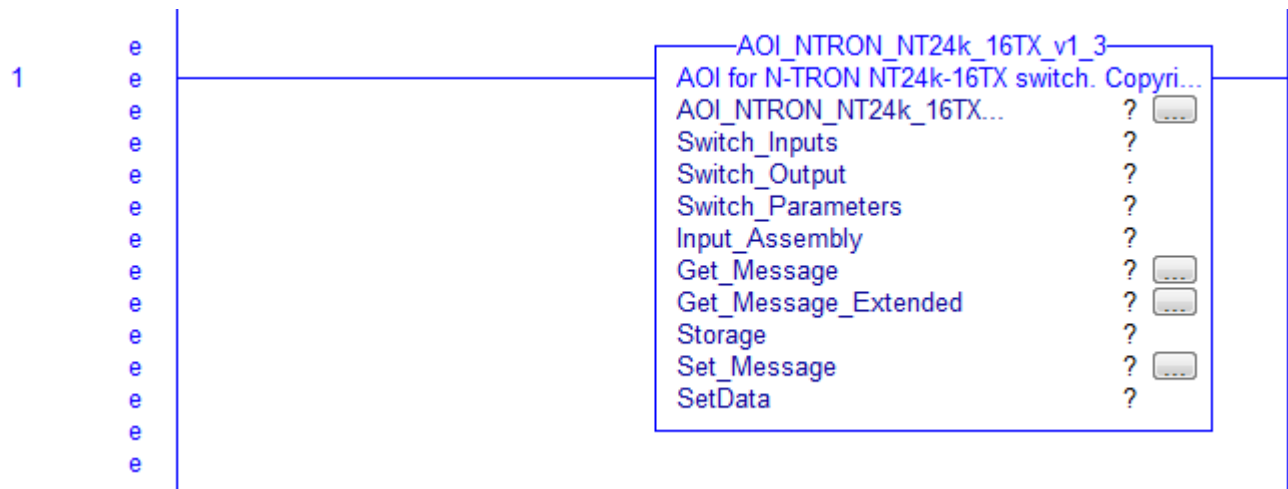
2. Click OK. The new module will appear in the I/O Configuration tree:



2.3.3 Add an Instance of the AOI in your Application.

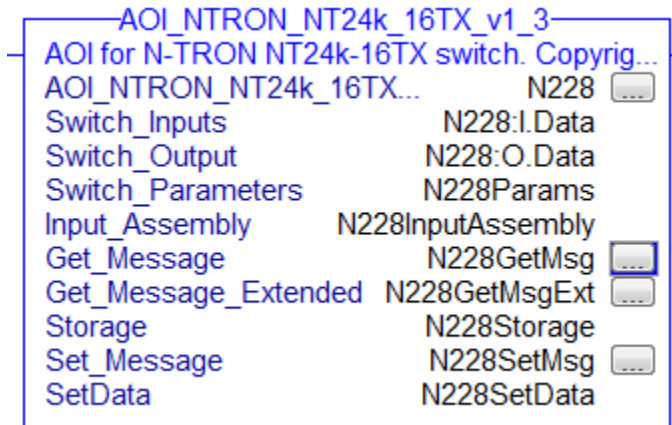
Create a new rung in the MainRoutine and add the AOI for your specific switch to the rung.





2.3.4 Create and Configure Tags for the AOI

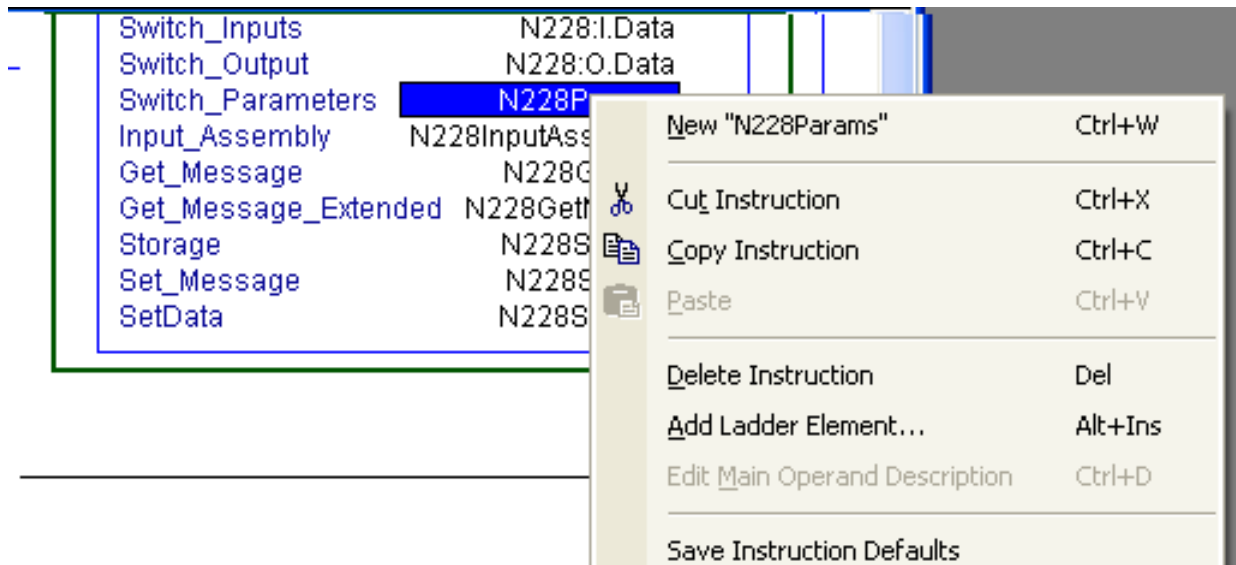
Create and configure tags for the AOI Add tag names for the various fields. For example:



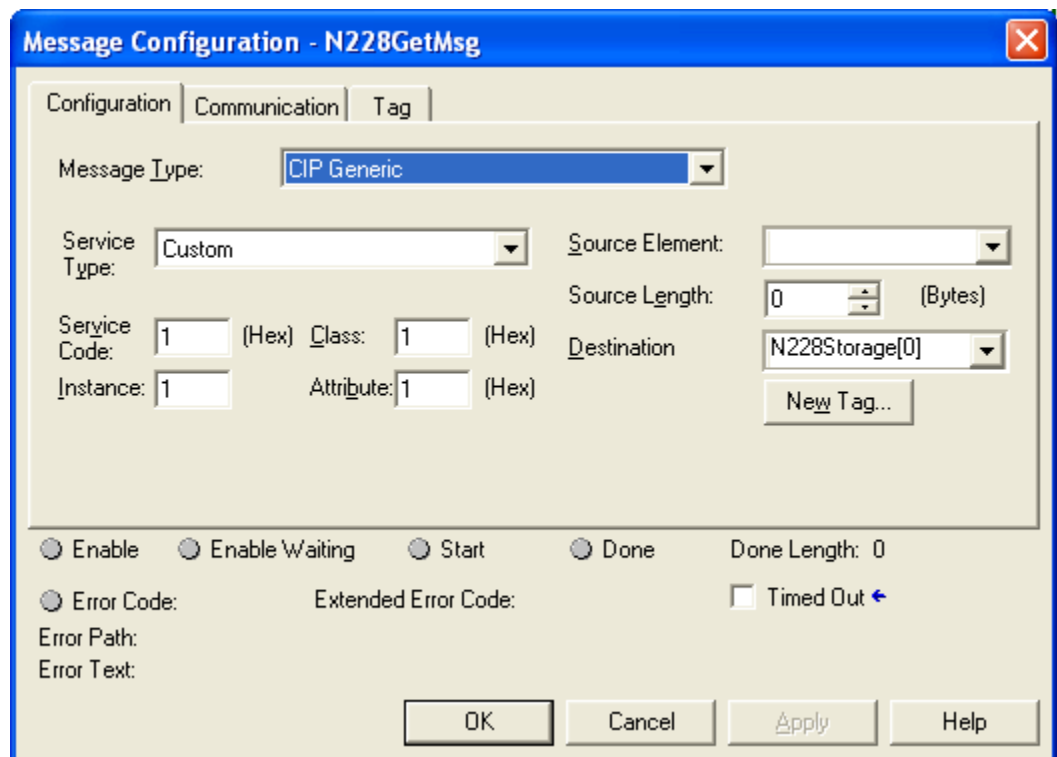
1. Right click on each new tag name and create each tag.

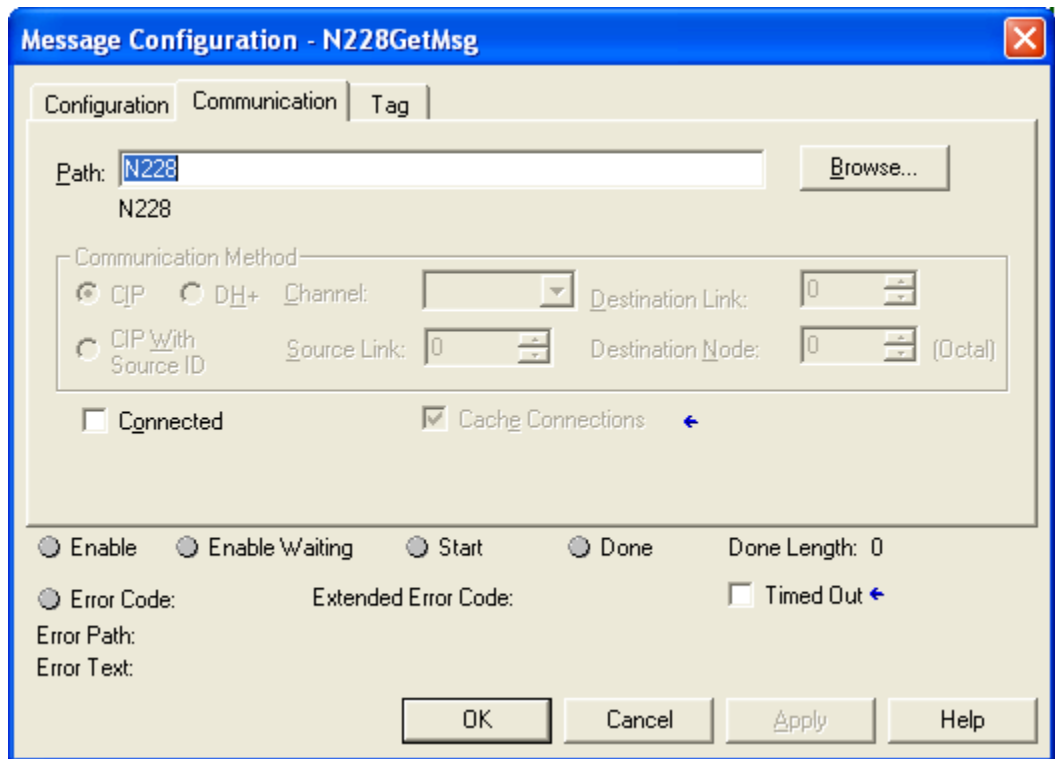


Note: The tags for Switch_Inputs and Switch_Outputs, shown in the rectangle above, were created when the Generic Ethernet Module was added.

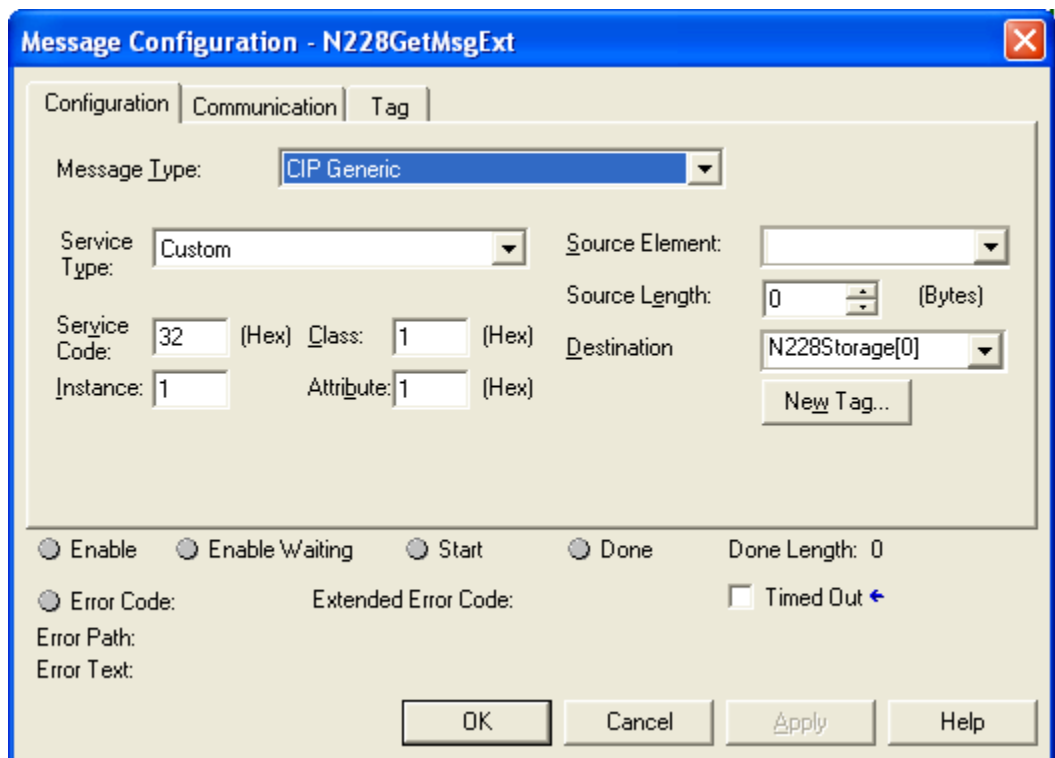


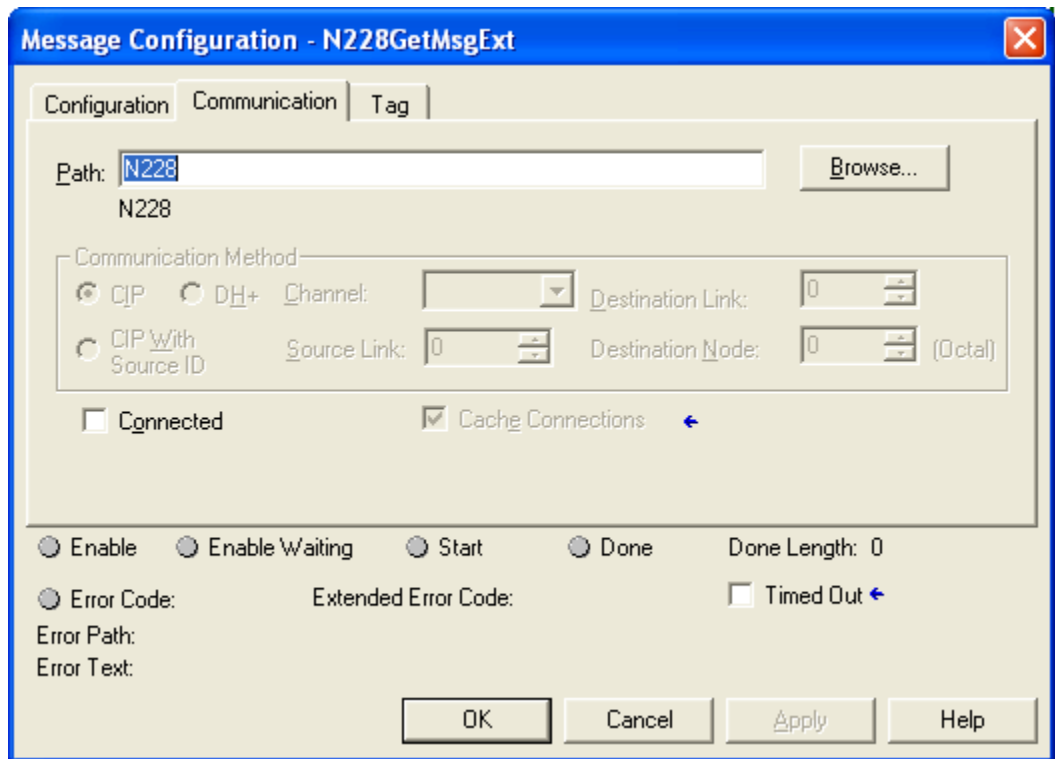
2. Click the button to the right of the "Get_Message" tag and configure as shown:



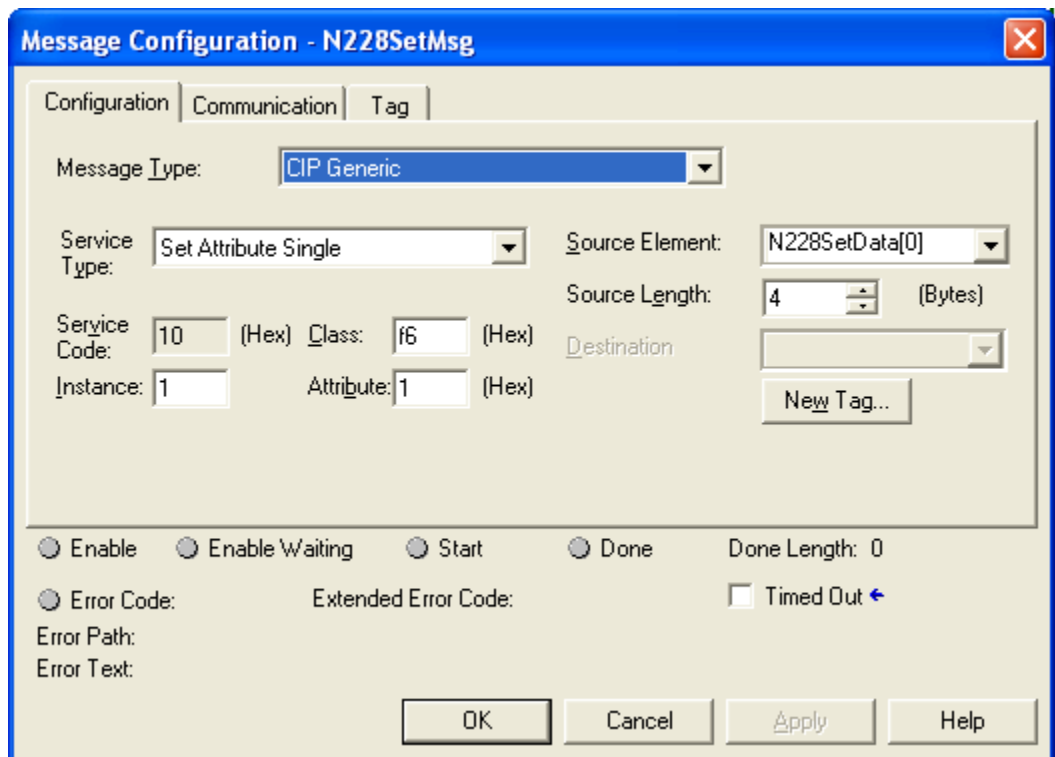


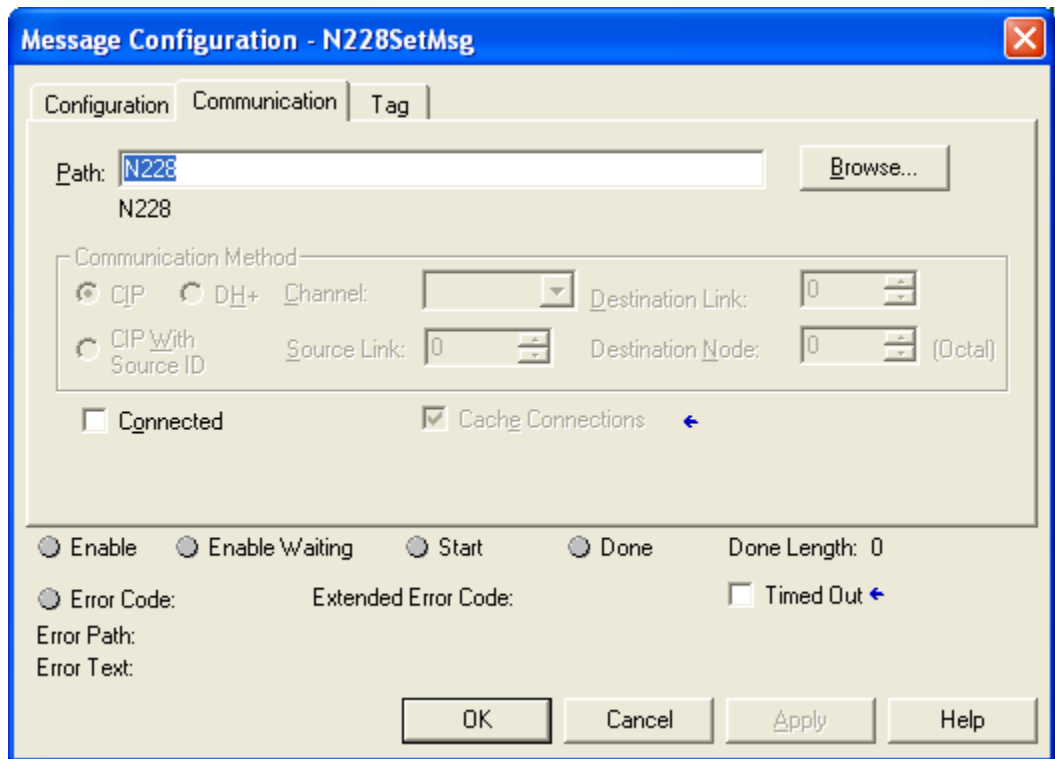
3. Click the button to the right of the "Get_Message_Extended" tag and configure as shown:





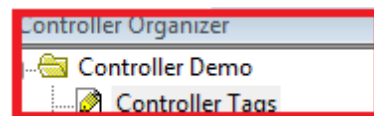
4. Click the button to the right of the "Set_Message" tag and configure as shown:





2.3.5 Verify the new RSLogix Configuration.

1. Verify your changes by clicking Logic > Verify > Controller. If there are no warnings or errors, the RSLogix configuration is complete.
2. If errors are reported, verify that the data types defined in Controller Demo->Controller Tags matches the data type expected by the AOI tags just created.
3. The settings for the sample switch are shown below:



Controller Tags - Demo(controller)

Scope: Demo Show: All Tags

Name	Val*	For	Style	Data Type	Description
bSetMessage	0		Decimal	BOOL	Set to 1 to i
bSetSpeedDuplex	0		Decimal	BOOL	
+ N228	{.. {..			AOI_NTRON_NT24k_16TX_v1_3	AOI for N-T
+ N228.C	{.. {..			A8:ETHERNET_MODULE:C:0	
+ N228.I	{.. {..			A8:ETHERNET_MODULE_DINT_104Bytes:I:0	
+ N228.O	{.. {..			A8:ETHERNET_MODULE_DINT_48bytes:O:0	
+ N228GetMsg	{.. {..			MESSAGE	
+ N228GetMsgExt	{.. {..			MESSAGE	
+ N228Params	{.. {..			UDT_NTRON_Switch_Common_NT24k_v1	Created to i
+ N228SetData	{.. {..		Decimal	INT[2]	
+ N228SetMag	{.. {..			MESSAGE	
+ N228Storage	{.. {..		Decimal	SINT[1200]	
+ N228InputAssembly	{.. {..			UDT_NTRON_Switch_NT24k_16TX_In_v1	N-TRON N
+ Reset_Message	{.. {..			MESSAGE	Configure s
+ ResetMsg	0		Decimal	SINT	0 = Emulate

Monitor Tags / Edit Tags

2.4 Input_Assembly Parameter

Some data comes from the switch at the RPI (requested packet interval) set for the Generic Ethernet Module. The data is available in tags like these in the following screenshot (a mapping of the Switch_Inputs data):

-	N228InputAssembly
+	N228InputAssembly.System_Faults
+	N228InputAssembly.Admin_Status
-	N228InputAssembly.Admin_Status_P1
-	N228InputAssembly.Admin_Status_P2
-	N228InputAssembly.Admin_Status_P3
-	N228InputAssembly.Admin_Status_P4
-	N228InputAssembly.Admin_Status_P5
-	N228InputAssembly.Admin_Status_P6
-	N228InputAssembly.Admin_Status_P7
-	N228InputAssembly.Admin_Status_P8
-	N228InputAssembly.Admin_Status_P9
-	N228InputAssembly.Admin_Status_P10
-	N228InputAssembly.Admin_Status_P11
-	N228InputAssembly.Admin_Status_P12
-	N228InputAssembly.Admin_Status_P13
-	N228InputAssembly.Admin_Status_P14
-	N228InputAssembly.Admin_Status_P15
-	N228InputAssembly.Admin_Status_P16
+	N228InputAssembly.Link_Status
-	N228InputAssembly.Link_Status_P1
-	N228InputAssembly.Link_Status_P2
-	N228InputAssembly.Link_Status_P3
-	N228InputAssembly.Link_Status_P4
-	N228InputAssembly.Link_Status_P5
-	N228InputAssembly.Link_Status_P6

These tags represent a switch specific (NT24k-16TX) view of the assembly data.

2.5 Switch_Parameters Parameter

The AOI requests additional information from the switch as needed by a faceplate display (and when started). This includes the CIP Identity object, the CIP TCP/IP object, an instance of the CIP Ethernet Link object, and the N-Tron Switch object.

The following RSLogix 5000 screenshot shows a top level view of some of the AOI “Switch_Parameters” structure:

N228Params	{...}	{...}		UDT_NTRON_Switch_Common_NT24k_v1
+ N228Params.Generic_Inputs	{...}	{...}		UDT_NTRON_Switch_In_NT24k_v0
+ N228Params.Output	0		Decimal	DINT
+ N228Params.Identity	{...}	{...}		UDT_NTRON_CIP_Identity_v0
+ N228Params.TCPIP	{...}	{...}		UDT_NTRON_CIP_TCPIP_Interface_v0
+ N228Params.Switch	{...}	{...}		UDT_NTRON_CIP_Switch_NT24k_v1
+ N228Params.Ethernet_Link	{...}	{...}		UDT_NTRON_CIP_Ethernet_Link_v0[64]
+ N228Params.Data	{...}	{...}		UDT_NTRON_CIP_DATA_v0
+ N228Params.Control	{...}	{...}		UDT_NTRON_CIP_Control_v0

N228Params.Generic_Inputs is a generic view of the assembly data from a switch.

2.6 Explicit Messaging Options

To direct the AOI to gather this information (via explicit messaging) for other purposes (example: not using faceplate’s), use the members of the N228Params.Control tag: displayed in [Table 2-1](#).

Table 2-1 N228Params.Control Tag Members

Name	Data Type	Description
Selected_Port	INT	Use this member to read Ethernet Link object for one port. To read more than one port, use Read_Port_Mask. Set by the faceplate. Port data is copied to the UDT_N-Tron_CIP_DATA_v0 data type
Request_Data	BOOL	0 - explicit messaging is disabled; 1 - explicit messaging is enabled
Read_Port_Mask	DINT	Set bit to read Ethernet Link object for port n+1
Explicit_Messaging_Time_r_Reset	DINT	Used to control time between each MSG call to read CIP Identity object, TCPIP object, N-Tron object, and selected Ethernet Link objects. Minimum is 200 ms. Default is 1000 ms

Sample ladder logic rungs are available that show how to control explicit messaging.

2.7 Troubleshooting

Module Fault (Code 16#0315) Connection Request Error: Invalid segment type.

This error occurs when the assembly information specified for the Generic Ethernet Module does not match the assembly information on the N-Tron switch.

2.8 Sample Project

A sample project is included in the CIP Installation Kit. It is named N-Tron_Demo.ACD.

To use the sample project, you may need to change the controller type used in your environment, and you will need to setup the Project path.

If you have any suggestions for improving the AOI or the installation instructions, please send them to support@redlion.net with subject "RSLogix5000 AOI".

CHAPTER 3 ROCKWELL RSLOGIX 5000 - TAG REFERENCE

The assembly data received from an N-Tron® switch can be viewed with generic tags or switch specific tags.

Generic tags are defined by the data type UDT_N-Tron_Switch_In_NT24k_v0. Switch specific tags are defined by a switch specific data type as shown in [Table 3-1](#).

Table 3-1 NT24k Switch and Data Types

Switch	Data Type
NT24k-RM NT24k-RM	UDT_NTRON_Switch_NT24k_In_v1
NT24k-DR16	UDT_NTRON_Switch_NT24kDR16_In_v1
NT24k-DR24	UDT_NTRON_Switch_NT24kDR24_In_v1
NT24k-8TX	UDT_NTRON_Switch_NT24k8TX_In_v1
NT24k-8TX-POE	UDT_NTRON_Switch_NT24k8TXPOE_In_v1
NT24k-16TX	UDT_NTRON_Switch_NT24k16TX_In_v1
NT24k-10FX2	UDT_NTRON_Switch_NT24k10FX2_In_v1
NT24K-16TX-POE	UDT_NTRON_Switch_NT24k_16TX_POE_In_v1".
NT24k-10GX2	UDT_NTRON_Switch_NT24k10GX2_In_v1
NT24k-11FX3	UDT_NTRON_Switch_NT24k11FX3_In_v1
NT24k-11GX3	UDT_NTRON_Switch_NT24k11GX3_In_v1
NT24k-12FX4	UDT_NTRON_Switch_NT24k12FX4_In_v1
NT24k-12GX4	UDT_NTRON_Switch_NT24k12GX4_In_v1
NT24k-14FX6	UDT_NTRON_Switch_NT24k14FX6_In_v1
NT24k-14GX6	UDT_NTRON_Switch_NT24k14GX6_In_v1
NT24k-12SFP-DM4	UDT_NTRON_Switch_NT24k12SFPDM4_In_v1
NT24k-10FX2-POE	UDT_NTRON_Switch_NT24k10FX2POE_In_v1
NT24k-10GX2-POE	UDT_NTRON_Switch_NT24k10GX2POE_In_v1
NT24k-11FX3-POE	UDT_NTRON_Switch_NT24k11FX3POE_In_v1
NT24k-11GX3-POE	UDT_NTRON_Switch_NT24k11GX3POE_In_v1
NT24k-12FX4-POE	UDT_NTRON_Switch_NT24k12FX4POE_In_v1
NT24k-12GX4-POE	UDT_NTRON_Switch_NT24k12GX4POE_In_v1
NT24k-14FX6-POE	UDT_NTRON_Switch_NT24k14FX6POE_In_v1
NT24k-14GX6-POE	UDT_NTRON_Switch_NT24k14GX6POE_In_v1
NT24k-12SFP-DM4-POE	UDT_NTRON_Switch_NT24k12SFPDM4POE_In_v1
NT24k-16M12	UDT_NTRON_Switch_NT24k_16M12_In_v1
NT24k-16M12-POE	UDT_NTRON_Switch_NT24k_16M12POE_In_v1
NT24k-16M12-R	UDT_NTRON_Switch_NT24k_16M12_R_In_v1
NT24k-16M12-POE-R	UDT_NTRON_Switch_NT24k_16M12_POE_R_In_v1

The following sections present some of the tag descriptions:.

3.1 Generic Assembly Tags

DATA TYPE: UDT_N-TRON_SWITCH_IN_NT24k_v0

Table 3-2 Generic View of Assembly Data Received from an N-Tron Switch

Name	Data Type	Description
System_Faults	UDT_NTRON_System_Faults_NT24k_v0	Status of various system faults.
Admin_Status	DINT	Admin Status of first 32 ports. Also available as port specific tags.
Admin_Status_1	BOOL	1=enabled, 0=disabled
Admin_Status_2		
Admin_Status_3		
...		
Admin_Status_30		
Admin_Status_31		
Admin_Status_32		
Admin_Status2	DINT	Admin Status of second 32 ports. Also available as port specific tags.
Admin_Status_33	BOOL	1=enabled, 0=disabled
Admin_Status_34		
Admin_Status_35		
...		
Admin_Status_62		
Admin_Status_63		
Admin_Status_64		
Link_Status	DINT	Link Status of first 32 ports. Also available as port specific tags.
Link_Status_1	BOOL	1=active, 0=inactive
Link_Status_2		
Link_Status_3		
...		
Link_Status_30		
Link_Status_31		
Link_Status_32		
Link_Status2	DINT	Link Status of second 32 ports. Also available as port specific tags.
Link_Status_33	BOOL	1=active, 0=inactive
Link_Status_34		
Link_Status_35		
...		
Link_Status_62		
Link_Status_63		
Link_Status_64		

Name	Data Type	Description
Utilization_Alarm	DINT	Bandwidth utilization alarms for first 32 ports. Also available as port specific tags.
Utilization_Alarm_1	BOOL	1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
Utilization_Alarm_2		
Utilization_Alarm_3		
...		
Utilization_Alarm_30		
Utilization_Alarm_31		
Utilization_Alarm_32		
Utilization_Alarm2	DINT	Bandwidth utilization alarms for second 32 ports. Also available as port specific tags.
Utilization_Alarm_33	BOOL	1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
Utilization_Alarm_34		
Utilization_Alarm_35		
...		
Utilization_Alarm_62		
Utilization_Alarm_63		
Utilization_Alarm_64		
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections
Temperature_C	INT	Temperature in degrees Celsius. 0x7FFF = Not supported on device.
Temperature_F	INT	Temperature in degrees Fahrenheit. 0x7FFF = Not supported on device.
CPU_Utilization	SINT	Percent of CPU usage, 0-100
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Utilization_1	SINT	bandwidth utilization in percent
Utilization_2		
Utilization_3		
...		
Utilization_62		
Utilization_63		
Utilization_64		
Update_Counter	INT	

3.2 NT24k Assembly Tags

DATA TYPE: UDT_N-TRON_SWITCH_NT24K_IN_V0

Specific view of assembly data received from an N-Tron NT24k Switch.

Table 3-3 Generic View of Assembly Data Received from an N-Tron Switch

Name	Data Type	Description
System_Faults	UDT_N-Tron_System_Faults_NT24k_v0	Status of various system faults.
Admin_Status	DINT	Admin Status of first 32 ports. Also available as port specific tags.
Admin_Status_A1	BOOL	1=enabled, 0=disabled
...		
Admin_Status_A8		
Admin_Status_B1		
...		
Admin_Status_B8		
Admin_Status_C1		
...		
Admin_Status_C8		
Link_Status	DINT	Link Status of first 32 ports. Also available as port specific tags.
Link_Status_A1	BOOL	1=active, 0=inactive
...		
Link_Status_A8		
Link_Status_B1		
...		
Link_Status_B8		
Link_Status_C1		
...		
Link_Status_C8		
Utilization_Alarm	DINT	Bandwidth utilization alarms for first 32 ports. Also available as port specific tags.
Utilization_Alarm_A1	BOOL	1=bandwidth utilization exceeds a high or low limit, 0=bandwidth utilization within limits
...		
Utilization_Alarm_A8		
Utilization_Alarm_B1		
...		
Utilization_Alarm_B8		
Utilization_Alarm_C1		
...		
Utilization_Alarm_C8		

Name	Data Type	Description
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections
Temperature_C	INT	Temperature in degrees Celsius. 0x7FFF = Not supported on device.
Temperature_F	INT	Temperature in degrees Fahrenheit. 0x7FFF = Not supported on device.
CPU_Utilization	SINT	Percent of CPU usage, 0-100
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Utilization_A1	SINT	bandwidth utilization in percent
...		
Utilization_A8		
Utilization_B1		
...		
Utilization_B8		
Utilization_C1		
...		
Utilization_C8		

3.3 System Fault Tags

Table 3-4 N-Tron Switch System Fault Tags

Name	Data Type	Description
Faults	DINT	
Power_Supply_1	BOOL	1=Indicates a low voltage on power supply 1
Power_Supply_2	BOOL	1=Indicates a low voltage on power supply 2
NRing_Full	BOOL	1=Indicates that an N-Ring connection is completely broken.
NRing_Part_Low	BOOL	1=Indicates that an N-Ring connection is only broken in one direction. The lower N-Ring port is not receiving self-health frames around the N-Ring but the higher N-Ring port is.
NRing_Part_High	BOOL	1=Indicates that an N-Ring connection is only broken in one direction. The higher N-Ring port is not receiving self-health frames around the N-Ring but the lower N-Ring port is.
NRing_Multiple_Managers	BOOL	1=Indicates that more than one N-Ring Manager exists on an N-Ring.
System	BOOL	1=Indicates a system fault.
Config_Device	BOOL	1=Indicates a problem with the configuration device.
NLink	BOOL	1=Indicates that the N-Link Master or Slave encountered a problem.
Boot_Loader_Version	BOOL	1=Indicates a problem with the version of the boot loader firmware.
Port_Utilization	BOOL	1=Indicates one or more ports have exceeded a high or low bandwidth utilization limit.
Temperature	BOOL	1=Indicates the switch temperature has exceeded a high or low temperature limit.
Settings_Fault	BOOL	1=Indicates that a settings misconfiguration needs to be resolved.

3.4 CIP™ Tags

There are tags for each CIP™ object. The tags correspond to the object's attributes.

- Identity Object (Table 3-5)
- TCP/IP Interface Object (Table 3-6)
- Ethernet Link Object (Table 3-7)
- N-Tron switch Object (Table 3-8)

3.4.1 Identity Object

DATA TYPE: UDT_N-TRON_CIP_IDENTITY_V0

Table 3-5 N-Tron Switch Identity Object Tags

Name	Data Type	Description
Vendor_ID	INT	ODVA Vendor ID. N-Tron = 1006
Device_Type	INT	0x0C. Communications Adapter
Product_Code	INT	NT24k-RM= 24001 NT24k-DR16= 24002 NT24k-DR24= 24003 NT24k-8TX= 24004 NT24k-8TX-POE= 24005 NT24k-16TX= 24006 NT24k-16TX-POE= 24007 NT24k-10FX2= 24008 NT24k-10GX2= 24009 NT24k-11FX3= 24010 NT24k-11GX3= 24011 NT24k-12FX4= 24012 NT24k-12GX4= 24013 NT24k-14FX4= 24014 NT24k-14GX4= 24015 NT24k-12SFP-DM4= 24016 NT24k-10FX2-POE= 24017 NT24k-10GX2-POE= 24018 NT24k-11FX3-POE= 24019 NT24k-11GX3-POE= 24020 NT24k-12FX4-POE= 24021 NT24k-12GX4-POE= 24022 NT24k-14FX6-POE= 24023 NT24k-14GX6-POE= 24024 NT24k-12SFP-DM4-POE= 24025 NT24k-16M12= 24026 NT24k-16M12-POE= 24027 NT24k-16M12-R= 24028 NT24k-16M12-POE-R= 24029
Major_Revision	SINT	Major revision of the item the Identity Object represents
Minor_Revision	SINT	Minor revision of the item the Identity Object represents
Status	INT	Summary status of device
Serial_Number	DINT	Serial number of device
Product_Name	STRING	Human readable identification. Switch model number. Ex: N-Tron NT24k
Assigned_Name	UDT_NTRO N_String102 4	User assigned switch name.
Geographic_Location	UDT_NTRO N_String102 4	This is the user assigned switch location.

3.4.2 TCPIP Object

DATA TYPE: UDT_N-TRON_CIP_TCPIP_INTERFACE_V0

Table 3-6 N-Tron Switch TCPIP Object Tags

Name	Data Type	Description
Status	DINT	Interface status
Configuration_Capability	DINT	Interface capability flags
Configuration_Control	DINT	Interface control flags
Path_Size	INT	Size of Path
Object_Path_1	INT	Logical segments identifying the physical link object
Object_Path_2	INT	Logical segments identifying the physical link object
IP_Address	DINT	The device's IP address.
Network_Mask	DINT	The device's network mask
Gateway_Address	DINT	Default gateway address
Name_Server_1	DINT	Primary name server
Name_Server_2	DINT	Secondary name server
Domain_Name	STRING	Default domain name
Host_Name	STRING	Host name

3.4.3 Ethernet Link Object

DATA TYPE: UDT_N-TRON_CIP_ETHERNET_LINK_V0

Table 3-7 N-Tron Switch Ethernet Link Object Tags

Name	Data Type	Description
Interface_Speed	DINT	Interface speed currently in use. Speed in Mbps (e.g., 0, 10, 100, 1000, etc.)
Interface_Flags	UDT_NTRON_CIP_Interface_Flags_v0	Interface status flags
Physical_Address	SINT[6]	MAC layer address
InOctets	DINT	Octets received on the interface
InUcastPackets	DINT	Unicast packets received on the interface
InNucastPackets	DINT	Non-unicast packets received on the interface
InDiscards	DINT	Inbound packets received on the interface but discarded
InErrors	DINT	Inbound packets that contain errors (does not include In Discards)
InUnknownProtos	DINT	Inbound packets with unknown protocol
OutOctets	DINT	Octets sent on the interface
OutUcastPackets	DINT	Unicast packets sent on the interface
OutNucastPackets	DINT	Non-unicast packets sent on the interface
OutDiscards	DINT	Outbound packets discarded

Name	Data Type	Description
OutErrors	DINT	Outbound packets that contain errors
Alignment_Errors	DINT	Frames received that are not an integral number of octets in length
FCS_Errors	DINT	Frames received that do not pass the FCS check
Single_Collisions	DINT	Successfully transmitted frames which experienced exactly one collision
Multiple_Collisions	DINT	Successfully transmitted frames which experienced more than one collision
SQE_Test_Errors	DINT	Number of times SQE test error message is generated
Deferred_Transmissions	DINT	Frames for which first transmission attempt is delayed because the medium is busy
Late_Collisions	DINT	Number of times a collision is detected later than 512 bit-times into the transmission of a packet
Excessive_Collisions	DINT	Frames for which transmission fails due to excessive collisions
MAC_Transmit_Errors	DINT	Frames for which transmission fails due to an internal MAC sub layer transmit error
Carrier_Sense_Errors	DINT	Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
Frame_Too_Long	DINT	Frames received that exceed the maximum permitted frame size
MAC_Receive_Errors	DINT	Frames for which reception on an interface fails due to an internal MAC sub layer receive error
Control_Bits	INT	0 Auto-negotiate 0 indicates 802.3 link auto-negotiation is disabled. 1 indicates auto-negotiation is enabled. If auto-negotiation is disabled, then the device shall use the settings indicated by the Forced Duplex Mode and Forced Interface Speed bits; 1 Forced Duplex Mode If the Auto-negotiate bit is 0, the Forced Duplex Mode bit indicates whether the interface shall operate in full or half duplex mode. 0 indicates the interface duplex should be half duplex. 1 indicates the interface duplex
Forced_Interface_Speed	INT	Speed at which the interface shall be forced to operate. Speed in Mbps (10, 100, 1000, etc.)
Interface_Type	SINT	0-unknown, 1-internal, 2-twisted pair, 3- optical
Interface_State	SINT	0-unknown, 1-enabled and ready, 2- disabled, 3-testing
Admin_State	SINT	1=enabled, 0=disabled
Interface_Label	STRING	Label like "A5"
Interface_Description	STRING	Something like: Port 1 - 10/100 Mbit TX Port 15 - 100 MBit FX
Interface_Utilization	SINT	Percentage of entire interface bandwidth being used (0-100)
Utilization_Alarm_Upper_Threshold	SINT	Upper percentage at which to declare a utilization alarm (0-100)
Utilization_Alarm_Lower_Threshold	SINT	Lower percentage at which to declare a utilization alarm (0-100)
Broadcast_Limit	SINT	Broadcast limiting percentage (0-100). (BPCL)
TX_Unicast_Packet_Rate	DINT	Number of TX unicast packets per second

Name	Data Type	Description
RX_Unicast_Packet_Rate	DINT	Number of RX unicast packets per second
TX_Multicast_Packet_Rate	DINT	Number of TX multicast packets per second
RX_Multicast_Packet_Rate	DINT	Number of RX multicast packets per second
TX_Broadcast_Packet_Rate	DINT	Number of TX broadcast packets per second
RX_Broadcast_Packet_Rate	DINT	Number of RX broadcast packets per second
TX_Multicast_Packets	DINT	Total number of TX multicast packets
RX_Multicast_Packets	DINT	Total number of RX multicast packets
TX_Broadcast_Packets	DINT	Total number of TX broadcast packets
RX_Broadcast_Packets	DINT	Total number of RX broadcast packets
Port_Role	DINT	Bit 0 = RSTP Bit 1 = N-Ring Bit 2 = N-Link Control Bit 3 = N-Link Partner Bit 4 = N-Link Coupler

3.4.4 N-Tron Switch Object

DATA TYPE: UDT_N-TRON_CIP_SWITCH_NT24k_v1

Table 3-8 N-Tron Switch Object Tags

Name	Data Type	Description
Device_Uptime	DINT	Number of seconds since device was powered up
Port_Count	DINT	Total port count
Valid_Ports	DINT[2]	0 = Invalid port, 1 = Port exists on device Bit 0: Port 1 Bit 1: Port 2 etc
Global_Admin_Status	DINT[2]	0 = Port disabled, 1 = Port enabled Bit n: Port n+1
Global_Link_Status	DINT[2]	0 = Link down, 1 = Link up Bit n: Port n+1
System_Faults	UDT_NTR ON_System _Faults_NT 24k_v0	See System Fault Tags
IGMP_Querier_Status	SINT	Query Status: 0 = Disabled, 1 = Active (manual), 2 = Active (Auto), 3 = Backup (Auto) [enabled but not active].
IGMP_Version	SINT	IGMP Version (V1, V2, V3, etc).
IGMP_Resource_Usage	SINT	Percent of maximum capacity. Takes into account the number of groups used per max groups and any other possible resource limitations.
IGMP_Active_Querier	DINT	IP of the active IGMP querier.
CPU_Usage	SINT	Percent usage
Class1_Connections	INT	Number of CIP EtherNet/IP class 1 (multicast) connections.
Class3_Connections	INT	Number of CIP EtherNet/IP class 3 (unicast) connections.
Temperature_Alarm_Upper_Threshold	INT	Upper temperature (C) at which to declare an alarm
Temperature_Alarm_Lower_Threshold	INT	Lower temperature (C) at which to declare an alarm
Contact_Status	SINT	2 Bits per contact. 00=Not Present, 01=Open, 10=Closed.
Temperature_C	INT	Temperature in degrees C. Only available on devices that support temperature.
Temperature_F	INT	Temperature in degrees F. Only available on devices that support temperature.
Reset_MIB_Counts	DINT[2]	Reset port MIB counters. (1 bit per port to reset).
Device_MAC_Address	SINT[6]	MAC address of device

Name	Data Type	Description
Device_Role	DINT	Bit mask of device roles. Bits= 0 = N-Ring Manager 1 = N-Ring Member 2 = N-Ring AutoDetect 3 = N-Link Master 4 = N-Link Slave 5 = N-Link Coupler
Config_Device_Status	SINT	0 = Not Supported, 1 = Not Present, 2 = Present
System_Configuration	DINT	Bit mask of system config. Bits= 0 = Save system configuration to flash 1 = Shutdown and reboot device
System_Firmware_Version_String	STRING	Human readable representation of firmware version string.
System_Boot_Loader_Version_String	STRING	Human readable representation of boot loader version string.
System_Fault_String	UDT_NTRON_String1024	Human readable representation of error status. May contain multiple errors. Length is contained as part of the STRING1 data type.
Power_Configuration	DINT	4 Bits per power supply. 0000 = DC Power, 0001 = AC Power, 1111 = Unknown. Power supply 1 configuration is in bits 0-3 and Power supply 2 configuration is in bits 4-7.

CHAPTER 4 ROCKWELL AUTOMATION® FACTORYTALK™ - FACEPLATE INSTALLATION

4.1 Material Prerequisites

- N-Tron® series Switch
- FactoryTalk View ME/SE Faceplate Displays

4.2 Installation Instructions

4.2.1 Software Installation Prerequisites

- FactoryTalk View Studio – ME/SE version 5 or later
- N-Tron series switch with firmware version that includes CIP support

4.2.2 Summary of Faceplate Installation Steps

1. Create shortcut to PLC
2. Import global objects into your project
3. Add local messages
4. Add images
5. Import HMI tags
6. Create faceplate display
7. Configure display startup macro
8. Configure display parameter file
9. Optionally add composite switch image to display
10. Optionally add specific switch image to display

In the instructions below, “ME” refers to FactoryTalk View ME (Machine Edition) and “SE” refers to FactoryTalk View SE (Site Edition).

4.3 Configuration of FactoryTalk View Faceplate Displays

All faceplate files are included in the “CIP Installation Kit” file.

FactoryTalk View ME faceplate files are found in the subdirectory “FactoryTalk_View_ME\Display_export”.

FactoryTalk View SE files are found in the subdirectory “FactoryTalk_View_SE\Display_export”.

Files used by both FactoryTalk View ME and FactoryTalk View SE are found in the subdirectory “FactoryTalk_View_ME\Display_export”.

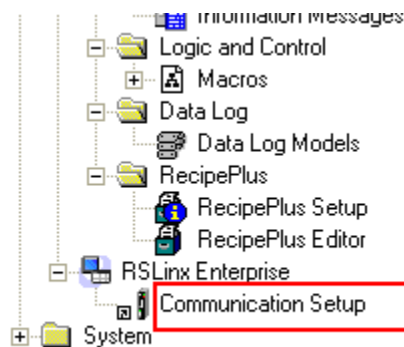
The FactoryTalk View ME screen shots in this document were taken while using the “N-Tron_demo.apa” file in the subdirectory “FactoryTalk_View_ME”.

The FactoryTalk View SE screen shots in this document were taken while using the “N-Tron_demo.apa” file in the subdirectory “FactoryTalk_View_SE”.

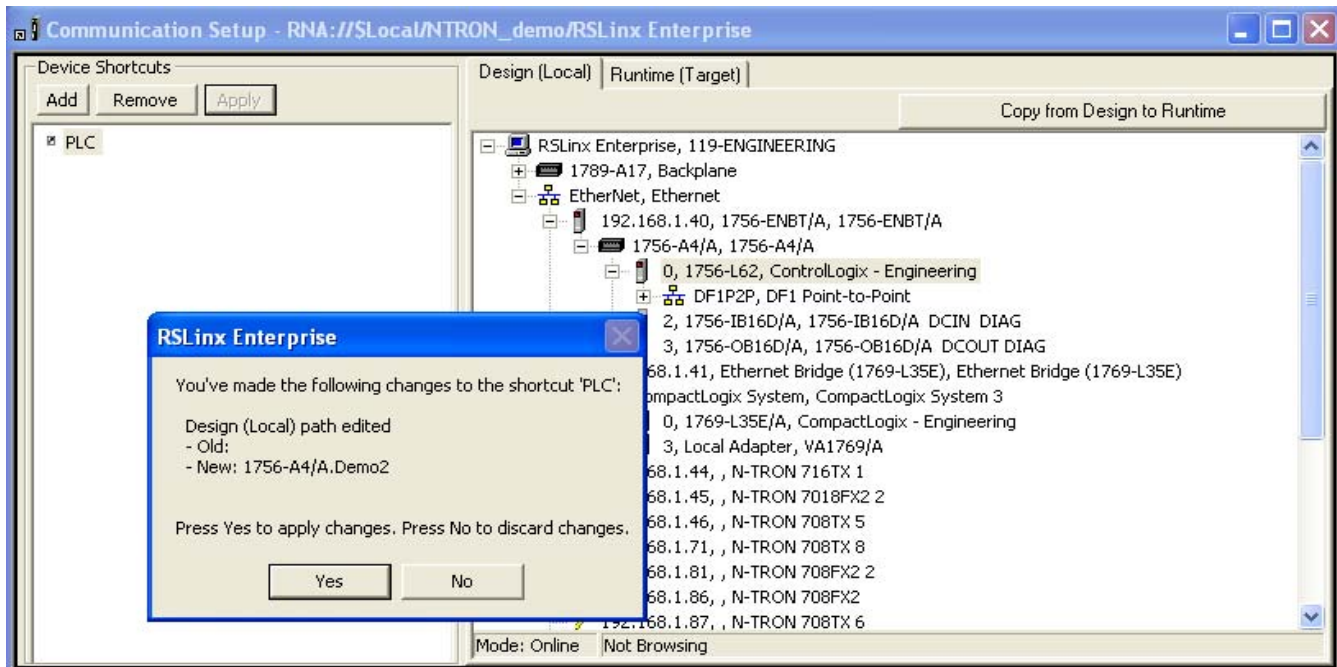
Start with an existing FactoryTalk View ME/SE application.

4.3.1 Configure a Shortcut to the PLC that is Running the Desired N-Tron Switch AOI

1. Double click Communications Setup.



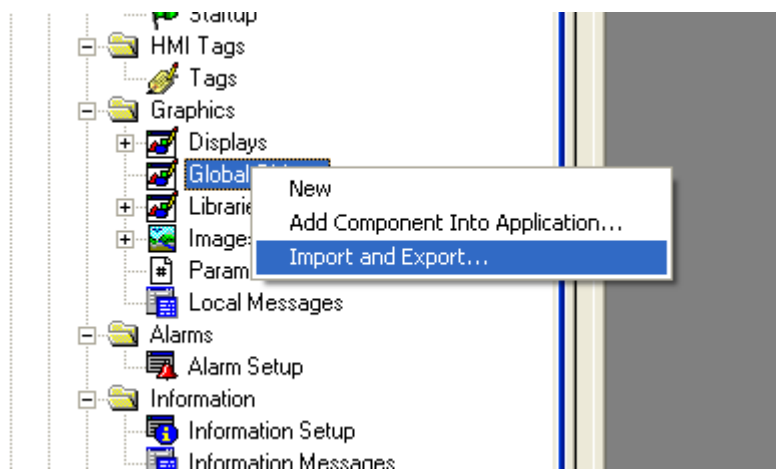
2. In the following screenshot, the shortcut is named PLC.



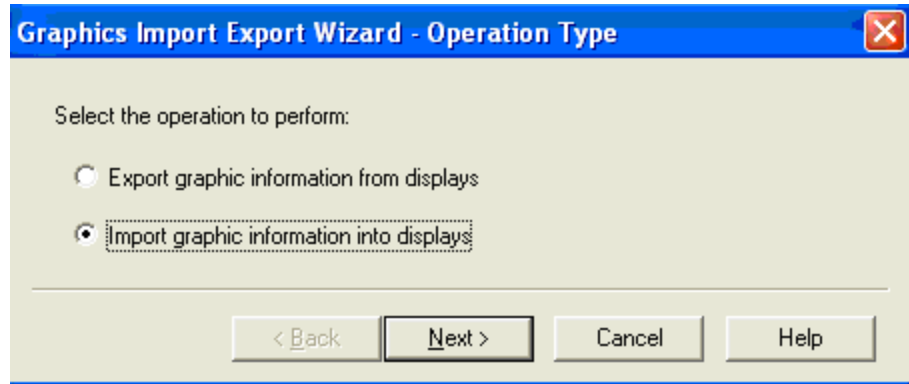
3. Click the “Yes” button and if ME, click the “Copy from Design to Runtime” button.

4.3.2 Import Graphics into your Project

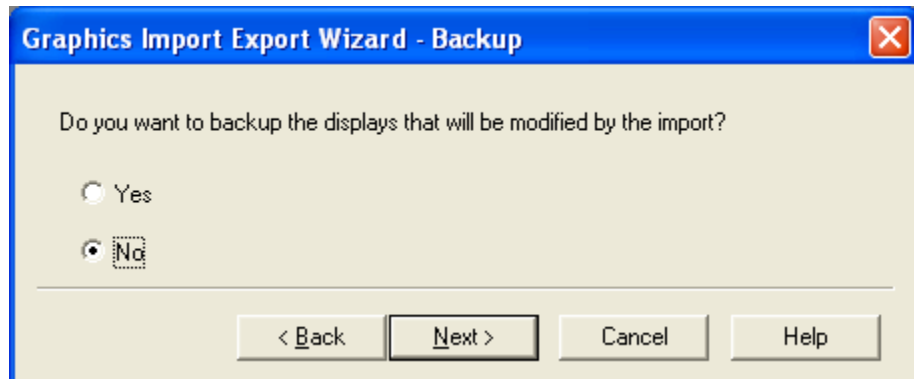
1. Right-click on Global in the Graphics folder and select Import and Export from the pop up.



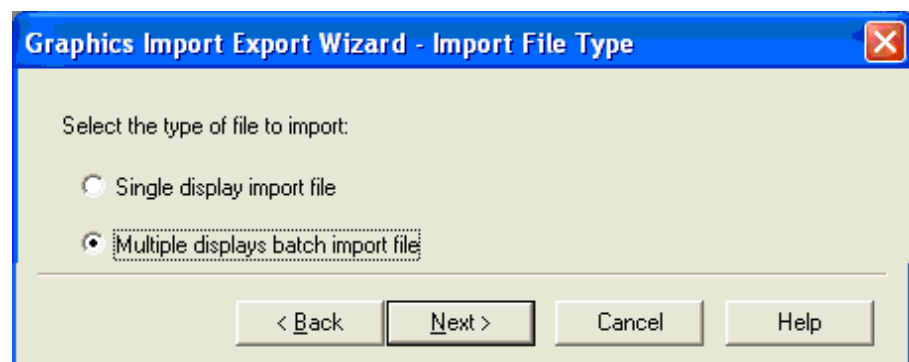
2. Click on the radio button as shown and click Next.



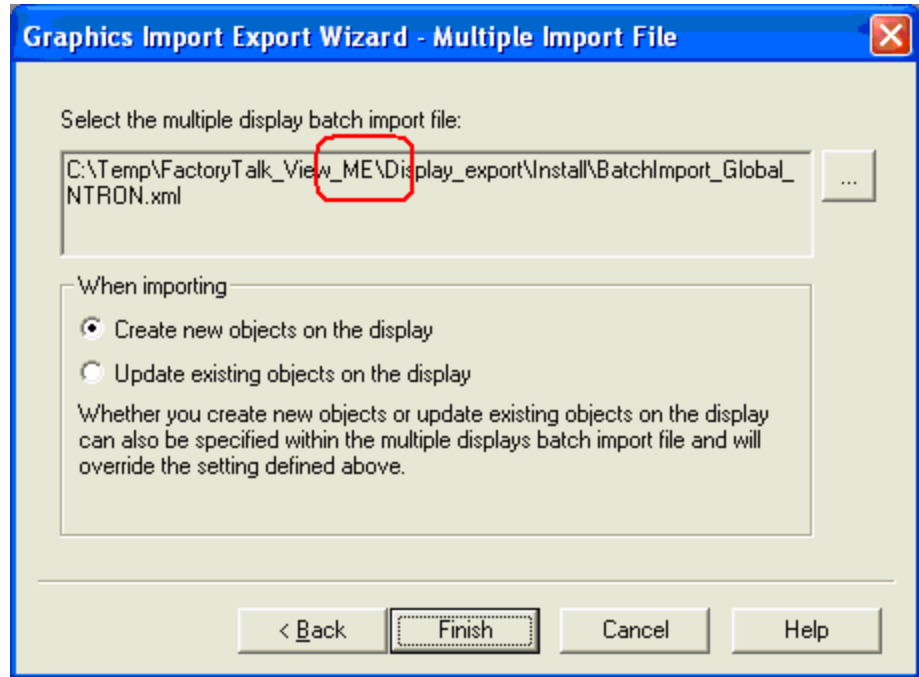
3. Click on the desired radio button as shown and click Next.:



4. Click on the desired option radio button as shown and click Next.

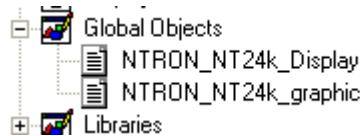


5. The following dialog screen should appear.



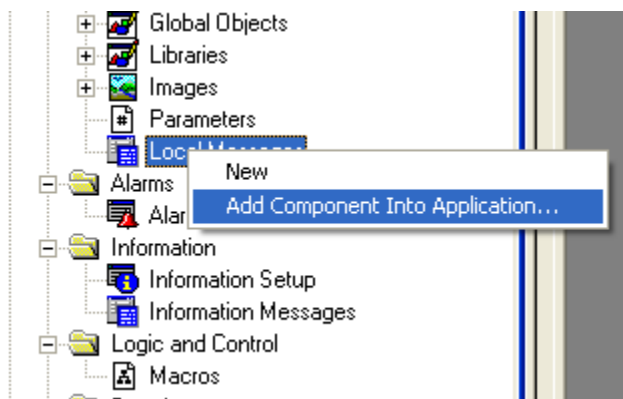
6. For SE, use the FactoryTalk_View_SE folder in the above dialog.

7. The following global objects should appear in the Explorer window.

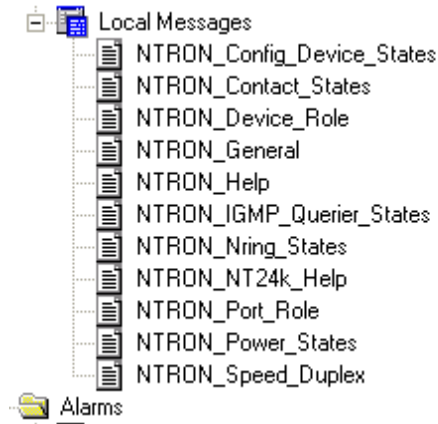


4.3.3 Import Local Messages

1. Select the folder (FactoryTalk_View_ME\Display_export\local) containing the local message files (.loc). Import all N-Tron*.loc files.

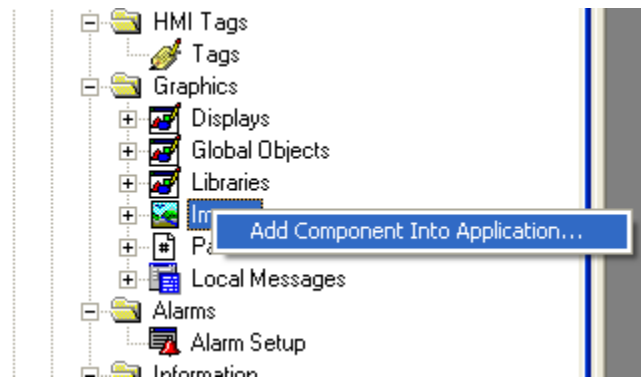


- The Explorer window should show these files:

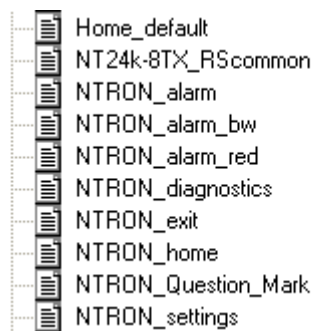


4.3.4 Import Images

- Select the folder (FactoryTalk_View_ME\Display_export\images) containing the image files (.bmp). Import all N-Tron*.bmp files.



- The Explorer window should show several new files:



4.3.5 Import HMI tags

1. Use the Tag Import and Export Wizard.
2. Select the N-Tron-Tags.CSV to import (FactoryTalk_View_ME\Display_export\tags).
3. The result should be these tags:

	Tag Name	Type	Description
1	NTRON Help	Digital	
2	NTRON_Settings_Selection	Analog	
3	NTRON_Trend_Selection	Analog	
4			

4.3.6 Create Faceplate Display

1. To access the faceplate displays, create a display using the global object N-Tron_NT24k_Display. (File > New > Display).
2. Select all objects in the N-Tron_NT24k_Display global object and paste them into the new display.
3. Save the new display.

4.3.7 Configure the Display Startup Macro.

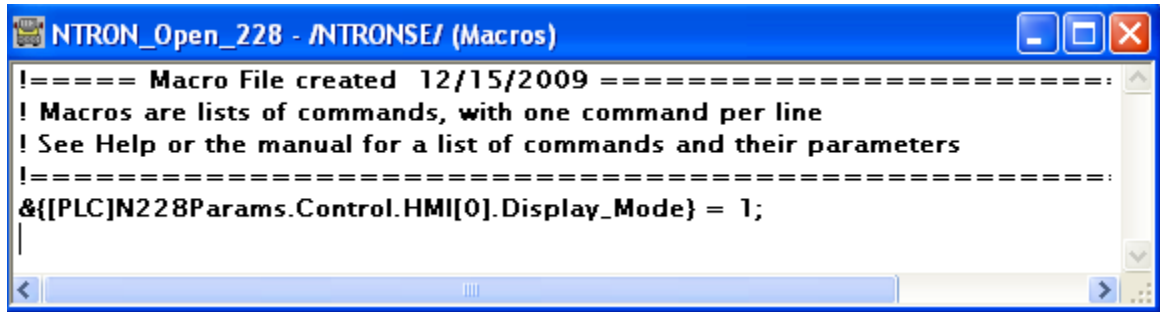
1. Configure a macro for opening your display.

Here is the ME form for this example: (This example uses the N228 information from the demo RSLogix 5000 project shown earlier in this manual)

	Tag	Tag	Expression	Exprn
1	{[PLC]N228Params.Control.HMI[0].Display_Mode}	...	1	...
2	

Tag from screenshot: {[PLC]N228Params.Control.HMI[0].Display_Mode}

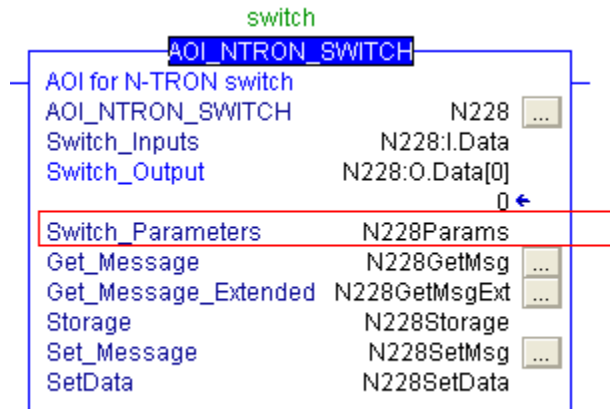
2. Here is the SE form displayed:



Tag from screenshot: `&{[PLC]N228Params.Control.HMI[0].Display_Mode} = 1;`



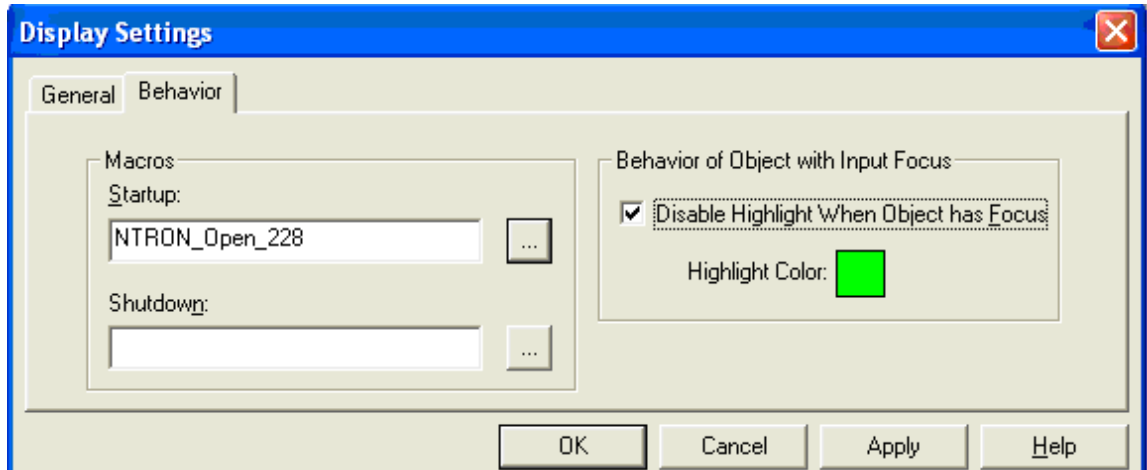
Note: In the macro definition (and later in the parameter file), the shortcut “PLC” was created earlier. The other important piece is “N228Params”, which must match the name of the Switch_Parameters tag created for the N-Tron_SWITCH AOI in your RSLogix project.



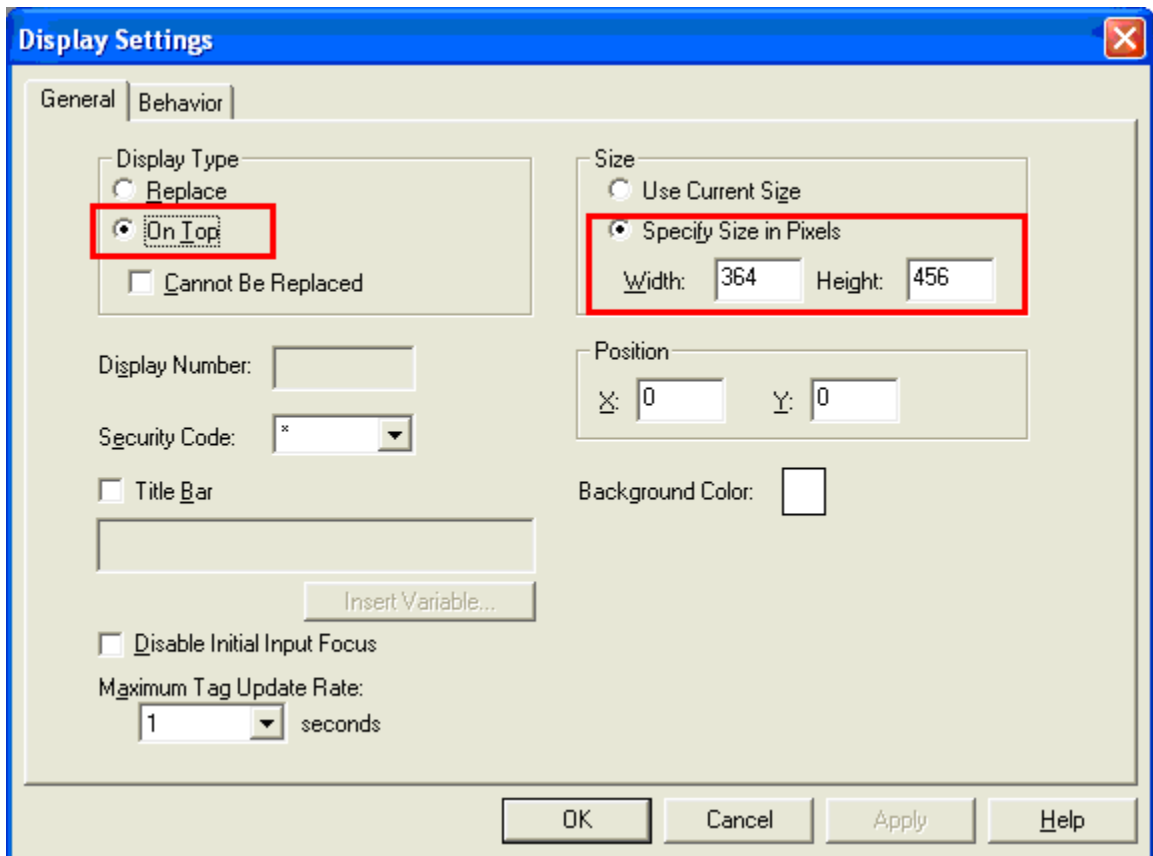
Example of RSLogix 5000 Switch Entry

3. In the Display Settings for the N-Tron_NT24k_Display (open the N-Tron_NT24k_Display display, Edit > Display Settings).

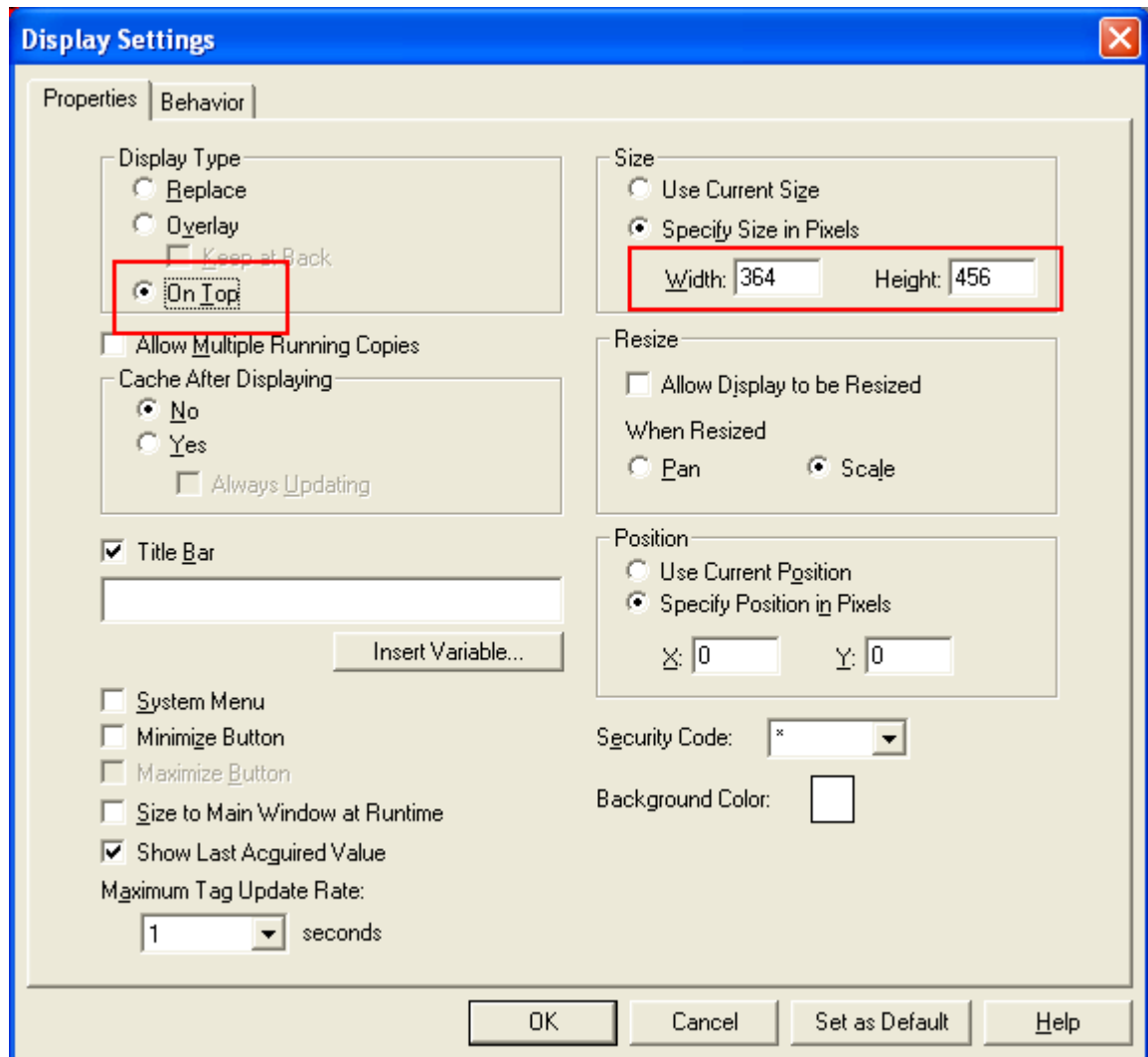
- Click the Behavior panel and assign the newly created macro as the startup macro.



- Click the General tab and change Display Type and Size.
- Here is the ME form displayed:

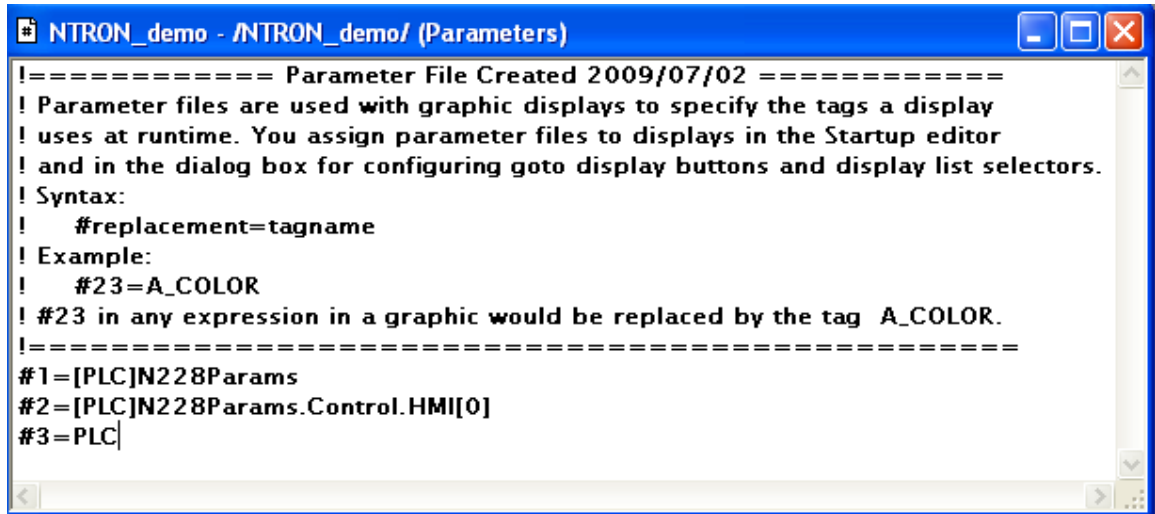


7. Here is the SE form displayed:

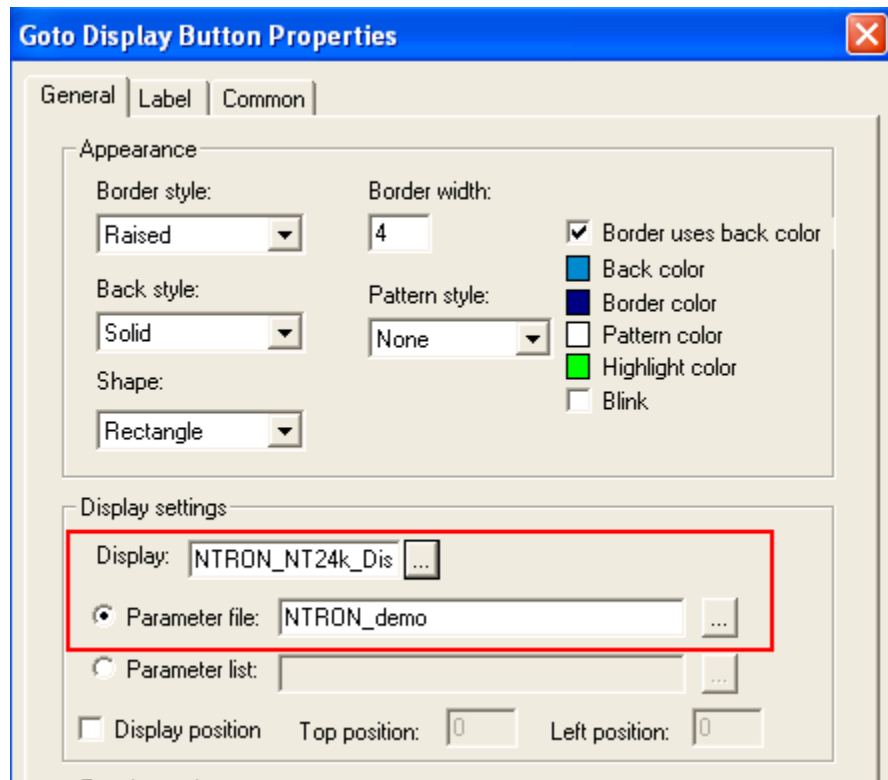


4.3.8 Configure Display Parameter File.

1. On the display where you wish to show the faceplate, create a Goto Display button.
2. Create a parameter file that will be associated with the button.



3. Substitute your shortcut for “PLC” and the name of your Switch_Parameters for N228Params, in the parameter file.
4. Assign a display and parameter file to the Goto Display in the Demo display button.
5. Here is the ME form displayed:



6. Here is the SE form displayed.



4.3.9 Optionally Add Composite Switch Image to Display

You can also display an image of an N-Tron switch using the global object N-Tron_NT24k_graphic.

When used, define Global Object Parameter #1 as shown here:

	Name	Value	Tag	Description
1	#1	[PLC]N228Params	...	Path to Switch_Parameters, like [PLC]N228Params

4.3.10 Optionally Add Specific Switch Image to Display

The N-Tron_NT24k_graphic global object is a composite of several N-Tron switches. Due to the number of switches, and the tags used for each switch, you may run into the limit for maximum tags allowed on a display.

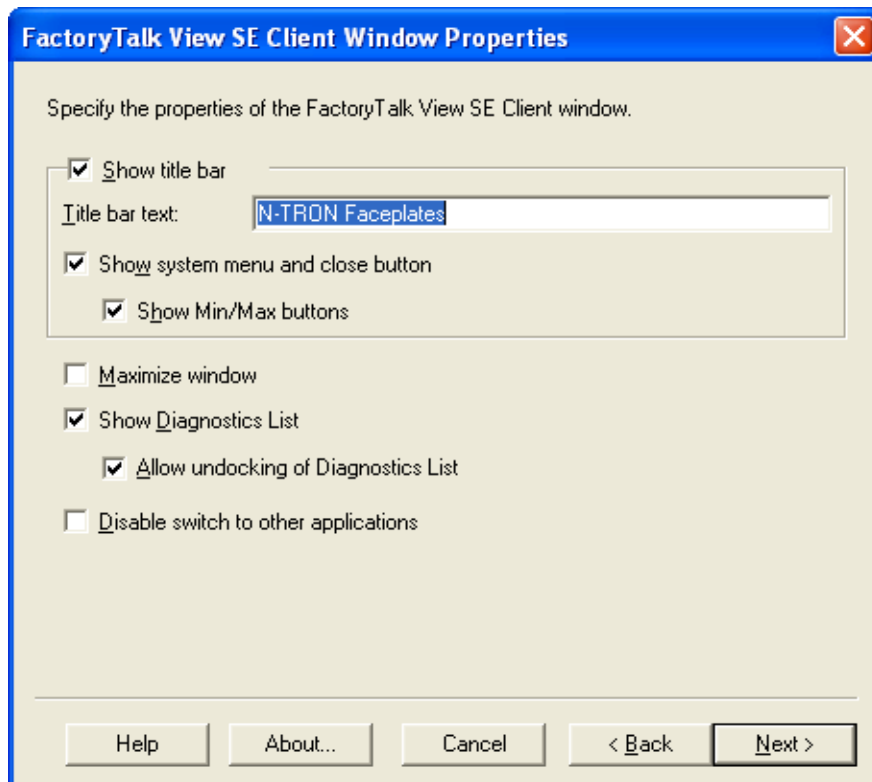
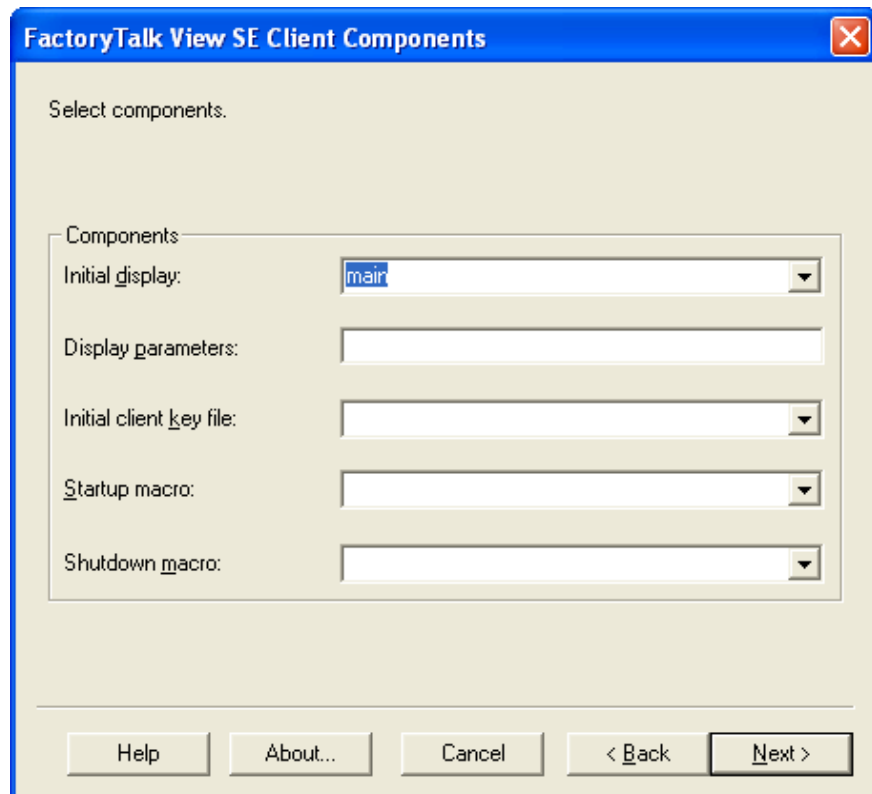
To work around this limitation use individual global objects for each switch.

1. Import individual global objects using the BatchImport_Global_N-Tron_Switches.xml import file.

The global object names contain the switch name, such as N-Tron_NT24k_DR16.

2. Setup Global Object Parameter #1 as described for the N-Tron_NT24k_graphic object.
3. For more information on the displays, including screen shots, see the Faceplate Quick Reference.

4.3.11 FactoryTalk View SE Client Setup



4.4 Sample Project

To view a sample project refer to the ME or SE sample project archive named N-Tron_demo.apa.

If you have any suggestions for improving the faceplate's or the installation instructions, please send them to support@redlion.net with subject "FactoryTalk Faceplates".

CHAPTER 5 ROCKWELL FACEPLATE QUICK REFERENCE GUIDE

5.1 Introduction

The Faceplate's consist of several displays:

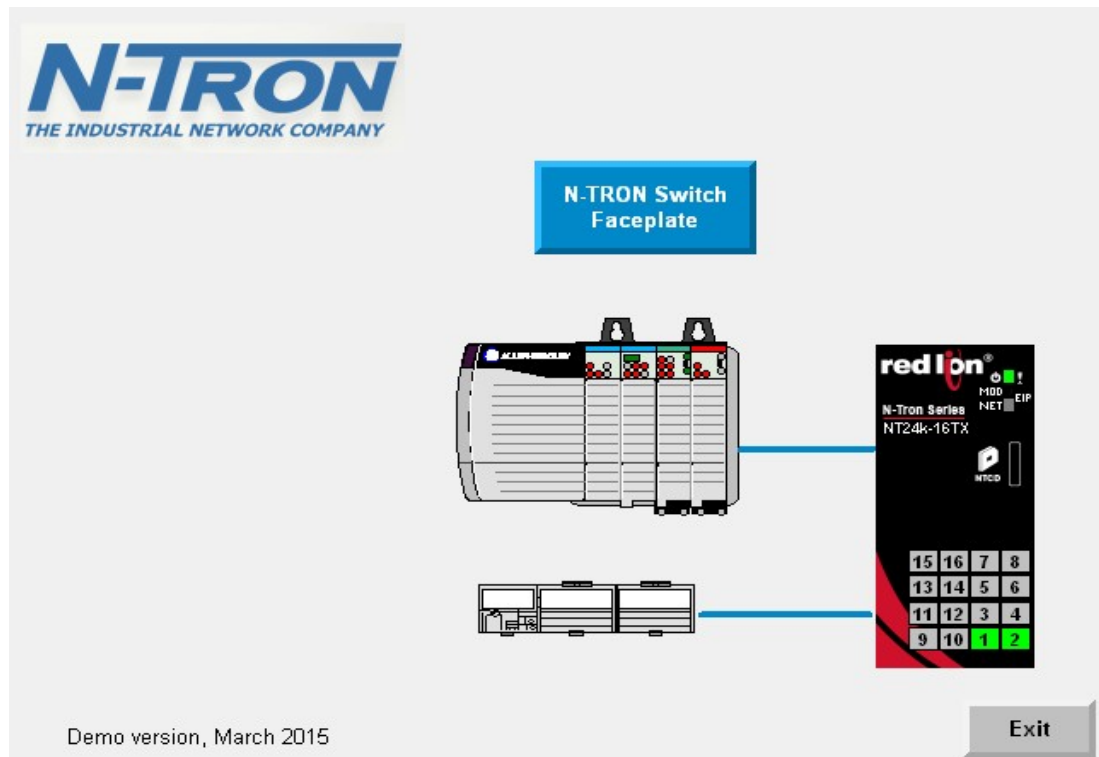
- Home
- Diagnostics
- Settings and
- Alarm

Click the buttons at the top of the screen to navigate between the displays.

The “?” button is used to toggle the display of help text, and the “X” button is used to exit the Faceplate's.

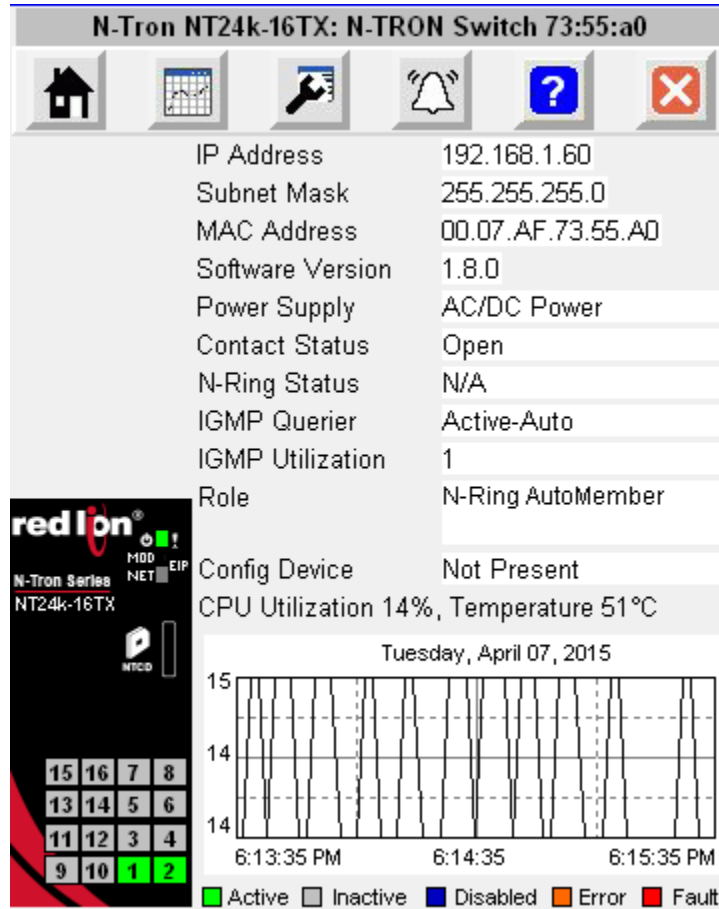


The caption at the top of the screen includes the switch product name and the user assigned switch name, separated by a colon.



5.2 Home Display

The home display shows general switch information. The trend shows CPU utilization.



Some fields show simple values, such as IP Address. Other fields, such as Device Role, show values that depend on the switch configuration. Fields that do not apply to a specific switch model will be hidden.

Table 5-1 describes the Home Display fields and values.

Table 5-1 Home Display Fields

Field	Values	Description
IP Address	Like 192.168.1.201	Switch IP address
Subnet Mask	Like 255.255.255.0	Switch subnet mask
MAC Address	Like 00:07:AF:FE:8F:A0	MAC address of switch
Software Version	Like 3.0.2	Software version of switch

Field	Values	Description
Power Supply	PSU1 PSU2 PSU and PSU2 Unknown AC/DC Power	PSU1 – Power Supply 1 PSU2 – Power Supply 2
Contact Status	Not Supported Open Closed	The status of the contact on the switch
N-Ring Status	Fault Partial-Low Partial-High Multiple-Managers OK N/A (if N-Ring auto-member, or N-Ring disabled) Unknown (if N-Ring member)	The N-Ring status, if the switch is configured as an N-Ring manager
IGMP Querier	Disabled Active-Manual Active-Auto Backup-Auto Unknown	Internet Group Management Protocol Querier status
IGMP Utilization	0-100 percent	Internet Group Management Protocol Utilization
Config Device	Not Supported Not Present Present Unknown	This field is displayed for switches that support a configuration device
Role	N-Ring Manager N-Ring Member N-Ring AutoMember N-Link Master N-Ring Mem, N-Link Master N-Ring Auto, N-Link Master N-Link Slave N-Ring Mem, N-Link Slave N-Ring Auto, N-Link Slave N-Link Coupler N-Ring Mem, N-Link Coupler N-Ring Auto, N-Link Coupler Unknown	The role of the switch, which is based on the switch configuration
CPU Utilization	0-100 percent	CPU utilization percentage
CPU Trend	0-100 percent	Trend of CPU utilization

The color of each port, on the switch image, changes based on the port state as described in [Table 5-2](#).

Table 5-2 Port Color/State Definition

Port Color	Port State
Active	The port is active
Inactive	The port is inactive
Disabled	The port is administratively disabled
Error	A port utilization limit, high or low, has been exceeded

The LED at the top of the switch graphic will be green if there are no faults, red if a fault has occurred. Faults can be viewed on the alarms display.

5.3 Diagnostics Display

The diagnostics display shows information for a selected switch port. Use the buttons at the bottom to select a switch port and use the buttons at the left to select a port variable to trend. The highlighted variable is trended at the bottom.

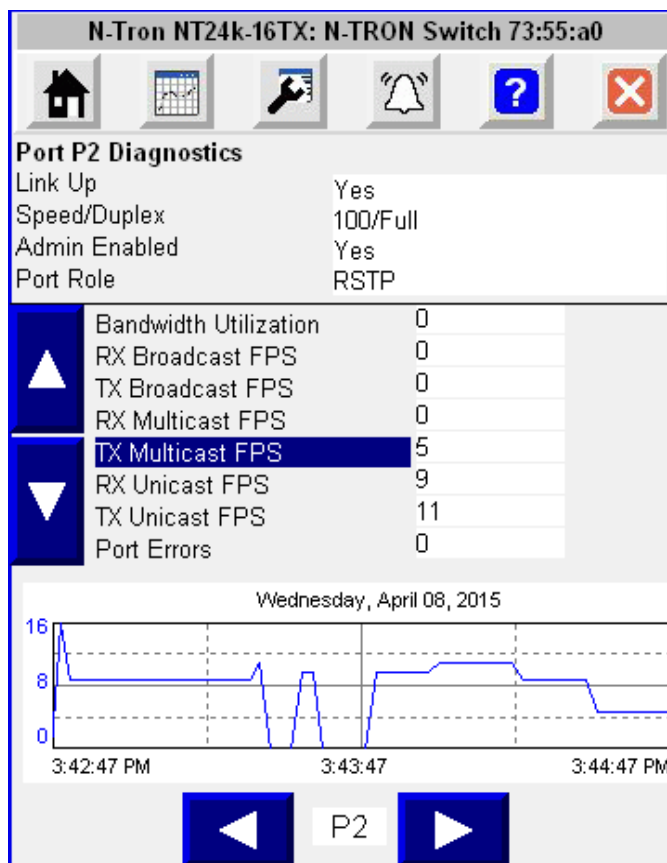


Table 5-3 describes the Diagnostic Display fields and values.

Table 5-3 Diagnostic Display Fields and Values

Field	Values	Description
Link Up	Yes No	Current link state
Speed/Duplex	10/Full 100/Full 1000/Full 10/Half 100/Half Unknown	This configurable field displays the current speed and mode of the port
Admin Enabled	Yes No	This configurable field displays the existing status of the port whether it is Enabled/ Disabled
Port Role	RSTP N-Ring N-Link Control N-Link Partner RSTP, N-Link Partner N-Ring, N-Link Partner N-Link Coupler RSTP, N-Link Coupler 802.1X RSTP, 802.1X	The role of the port, which is based on the switch configuration. Some combinations are possible. For more details, see the user manual for the NT24k switch family
Bandwidth Utilization	0-100 percent	Bandwidth utilization displayed as a percentage
RX Broadcast FPS		The frames per second rate of received broadcast frames
TX Broadcast FPS		The frames per second rate of transmitted broadcast frames
RX Multicast FPS		The frames per second rate of received multicast frames
TX Multicast FPS		The frames per second rate of transmitted multicast frames
RX Unicast FPS		The frames per second rate of received unicast frames
TX Unicast FPS		The frames per second rate of transmitted unicast frames
Port Errors		The sum of alignment errors, FCS errors, SQE Test errors, excessive collisions, MAC transmit errors, carrier sense errors, frame too long, and MAC receive errors

5.3.1 Settings Display

The settings display allows some switch port related settings to be changed.

Use the buttons at the bottom to select a switch port and use the buttons at the left to select a port setting to change. Use the wide up/down buttons toward the bottom to select a value, and the Enter button to accept the change.

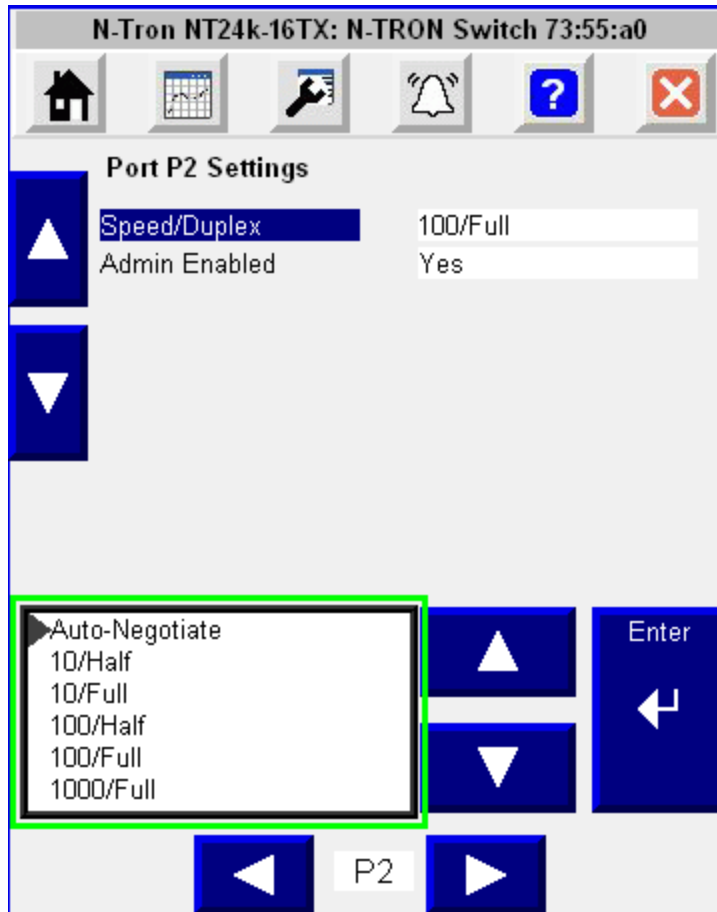


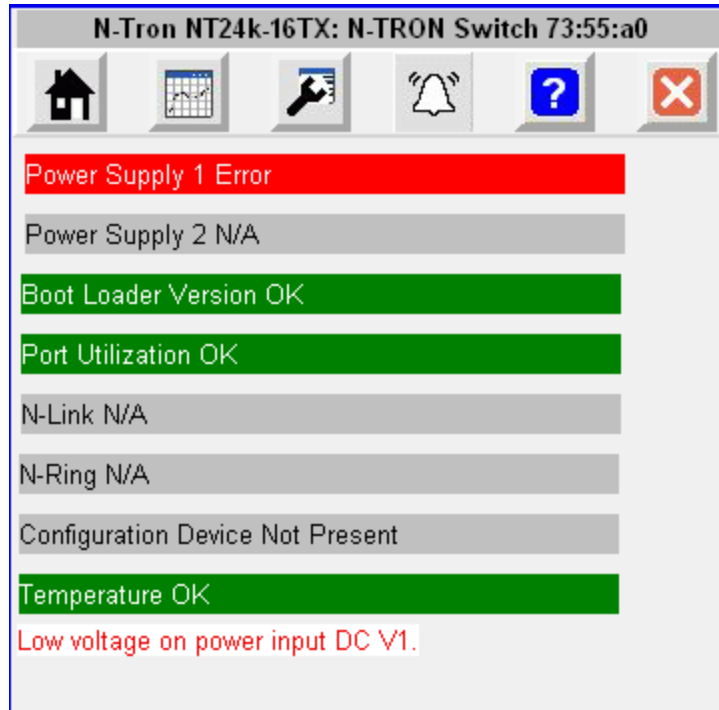
Table 5-4 describes the Settings Display fields and values.

Table 5-4 Settings Display Fields and Values

Field	Values	Description
Speed/Duplex	10/Full 100/Full 1000/Full 10/Half 100/Half Unknown	This configurable field displays the current speed and mode of the port
Admin Enabled	Yes No	This configurable field displays the existing status of the port whether it is Enabled/ Disabled

5.3.2 Alarm Display

The alarm display shows the status of several alarms. Alarms with a gray background and an “N/A” suffix do not apply for the switch type, or for the current configuration of the switch.



Values ending with “OK” will be green, values ending with “Error” will be red, and those with “N/A” will be gray. Fields that do not apply to a specific switch model will be hidden.

Table 5-5 describes the Alarm Display fields and values.

Table 5-5 Alarm Display Fields and Values

Field	Values	Description
Power Supply 1	Power Supply 1 OK Power Supply 1 Error	PSU1
Power Supply 2	Power Supply 2 OK Power Supply 2 Error	PSU2
Boot Loader Version	Boot Loader Version OK Boot Loader Version Error	
Port Utilization	Port Utilization OK Port Utilization Error	Shows error if utilization limits on any port is exceeded
N-Link	N-Link OK N-Link Error N-Link N/A	Shows N/A if not configured for N-Link

Field	Values	Description
N-Ring	N-Ring Error (Redundancy Lost) N-Ring Error (Partial Low) N-Ring Error (Partial High) N-Ring Error (Multiple Managers) N-Ring Error (Redundancy Lost, Mult Mgrs) N-Ring Error (Partial Low, Mult Mgrs) N-Ring Error (Partial High, Mult Mgrs) N-Ring OK N-Ring N/A	Shows N/A if not configured as an N-Ring manager
Configuration Device	Configuration Device OK Configuration Device Error Configuration Device N/A	This field is displayed if the switch supports a configuration device
Temperature	Temperature OK Temperature Error Temperature N/A	This field is displayed if the switch supports a temperature sensor

The system fault string is shown at the bottom of the display.

5.3.3 Error Messages

There are a few messages that appear near the top on the faceplate when certain errors are detected.

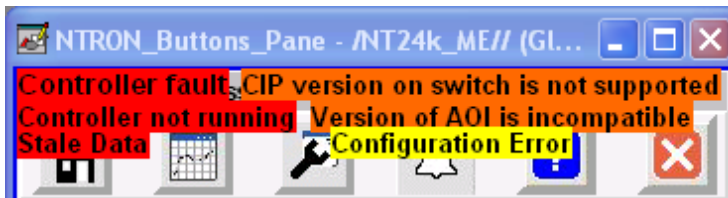


Table 5-6 describes the error messages.

Table 5-6 Error Messages

Background Color	Message	Description
Red	Controller fault	The controller ¹ is in the “Faulted” mode
Red	Controller not running	The controller ¹ is not in the “Run” or “Remote Run” mode
Red	Stale Data	The controller ¹ has stopped receiving data updates from the switch ²
Orange	CIP version on switch is not supported	The CIP version on the switch ² is not supported by the add-on instruction on the controller ¹
Orange	Version of AOI is incompatible	The add-on instruction on the controller ¹ does not support the switch ²
Yellow	Configuration Error	The product code for the switch ² is invalid or has not been read

¹ **Controller** refers to the third replacement text (example: #3=PLC) of the [parameter file](#) associated with the display.

² **Switch** refers to the switch associated with the first replacement text (example: #1=[PLC]N228Params) of the [parameter file](#) associated with the display

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LIMITED WARRANTY

(a) Red Lion Controls Inc. warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). EXCEPT FOR THE ABOVE- STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE. Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law. (b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company. (c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company. (d) THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).