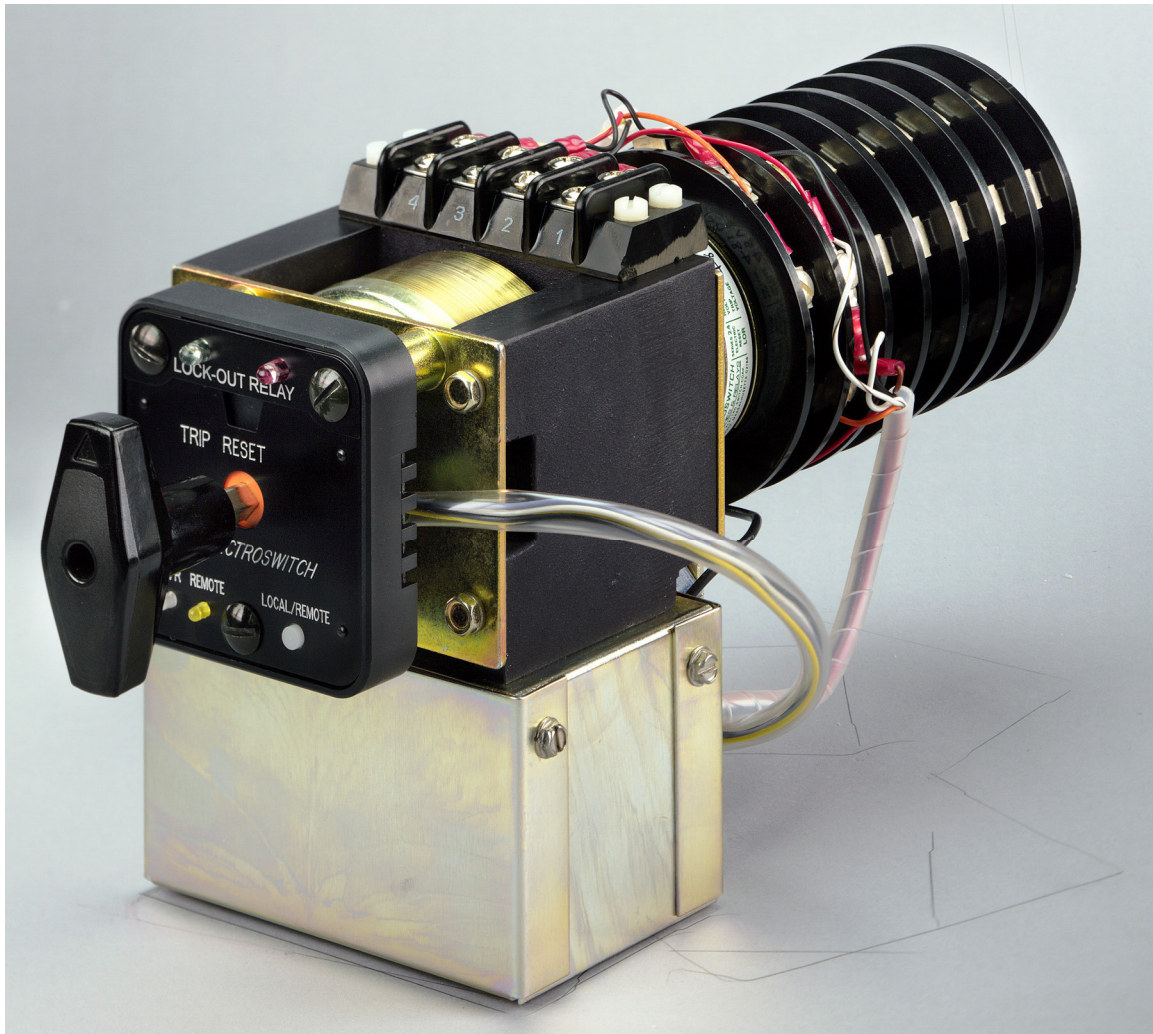


SCADA Controlled LOR/ER - DNP3.0 Communications Protocol - TECHNICAL MANUAL

ES-SLOR-1



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Introduction

The SCADA Controlled Lock Out Relay series (SLOR Series) are lock out relays that can be controlled over a RS485 serial SCADA link using the RTU Modbus or DNP3 protocol. Lockout relays are generally used in conjunction with protective relays.

There are two main versions of the Serial Lock Out Relay: manual reset and electric reset. The electric reset lock out relay can also be configured as a self-reset lock out relay. When configured as a self-reset LOR, many of the functions of a simple reclosing relay are available. All versions of the Serial Lockout Relay can be tripped via a serial SCADA command or an external contact closure. They provide high speed switching of contacts for the purpose of tripping and locking out circuit breakers or other devices. Serial lock out relays can be ordered with or without a mechanical target, and for 48 volt and 125 Volt DC systems. The SLOR provides for monitoring of breaker position, trip coil integrity, and system battery voltage.

Other options include lighted nameplate for local indication of position, presence of trip input, and trip coil status.

Basic Operation

Manual Lock Out Relay

The manual reset version can only be reset by turning the handle. There is no remote reset capability, and the relay cannot be tripped manually. The serial link can be used to determine trip coil integrity, to determine whether the relay is in the trip or reset position, and to trip the relay.

Other specifications and options, including trip time, current ratings, deck configurations and available coils are identical to those of the Electroswitch 78 series of lock out relays.

Electric Reset Lock Out Relay

The electric reset version can be reset by turning the handle or via a serial command. It is available in high-speed trip and standard trip versions. The serial link can be used to determine trip coil integrity, to determine whether the relay is in the trip or reset position and to trip or reset the relay.

The electric reset LOR is available in standard trip speed and high trip speed versions.

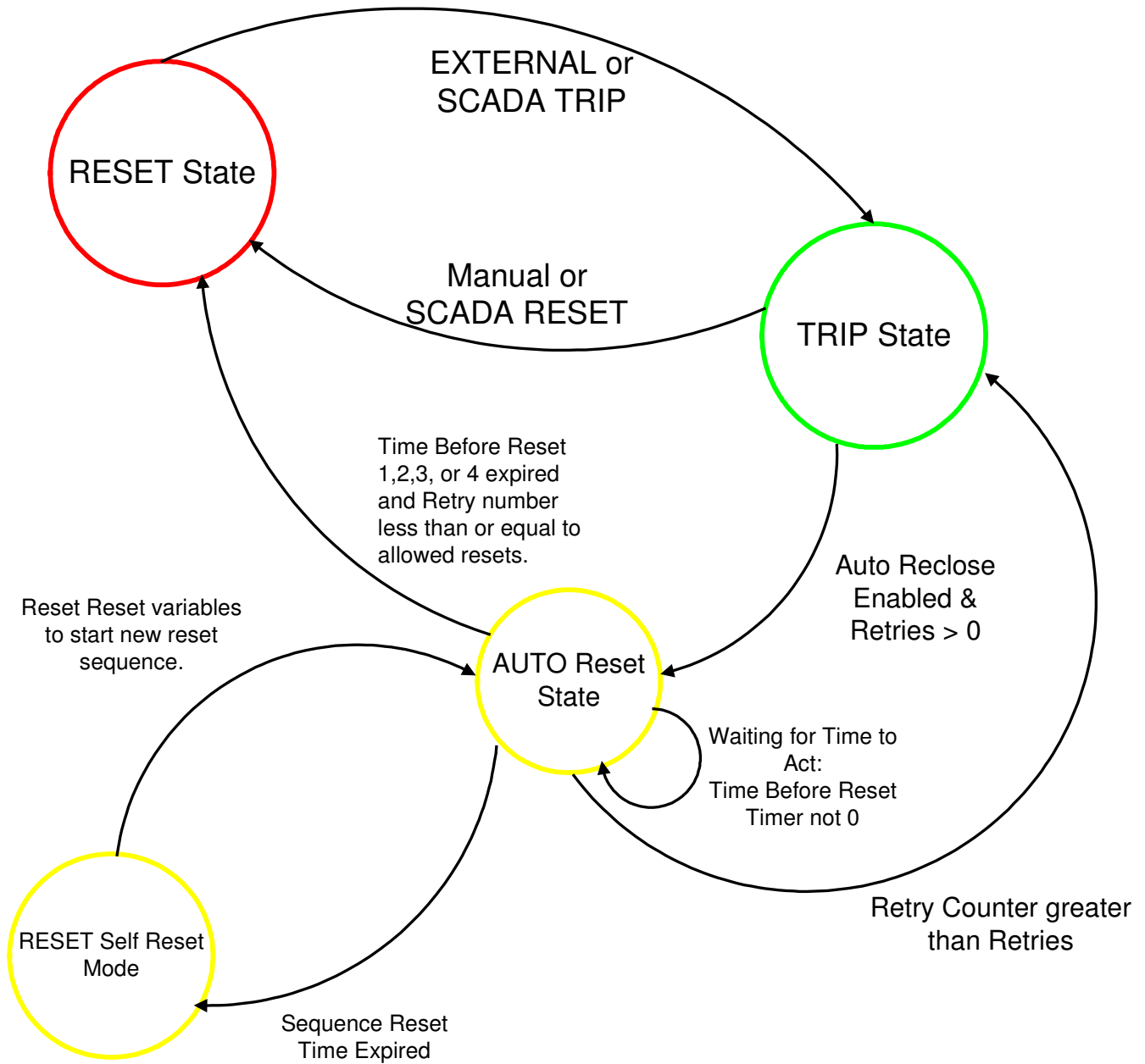
Self Reset Mode

When the SLOR is configured for automatic reset, by turning on switch 8 of the S2 dip switch assembly on the communications board, it will begin an automatic sequence of resetting as programmed by the user over the DNP3 bus. Programming of the reset parameters, shown below, is accomplished by using the DNP3 object Analog Output 16 bit, (g41v2). The reset programmed values are returned with every class 0 poll using the DNP3 object Analog Output Status 16 bit, (g40v2). See appendix A, the DNP3 Profile Document, for specific details.

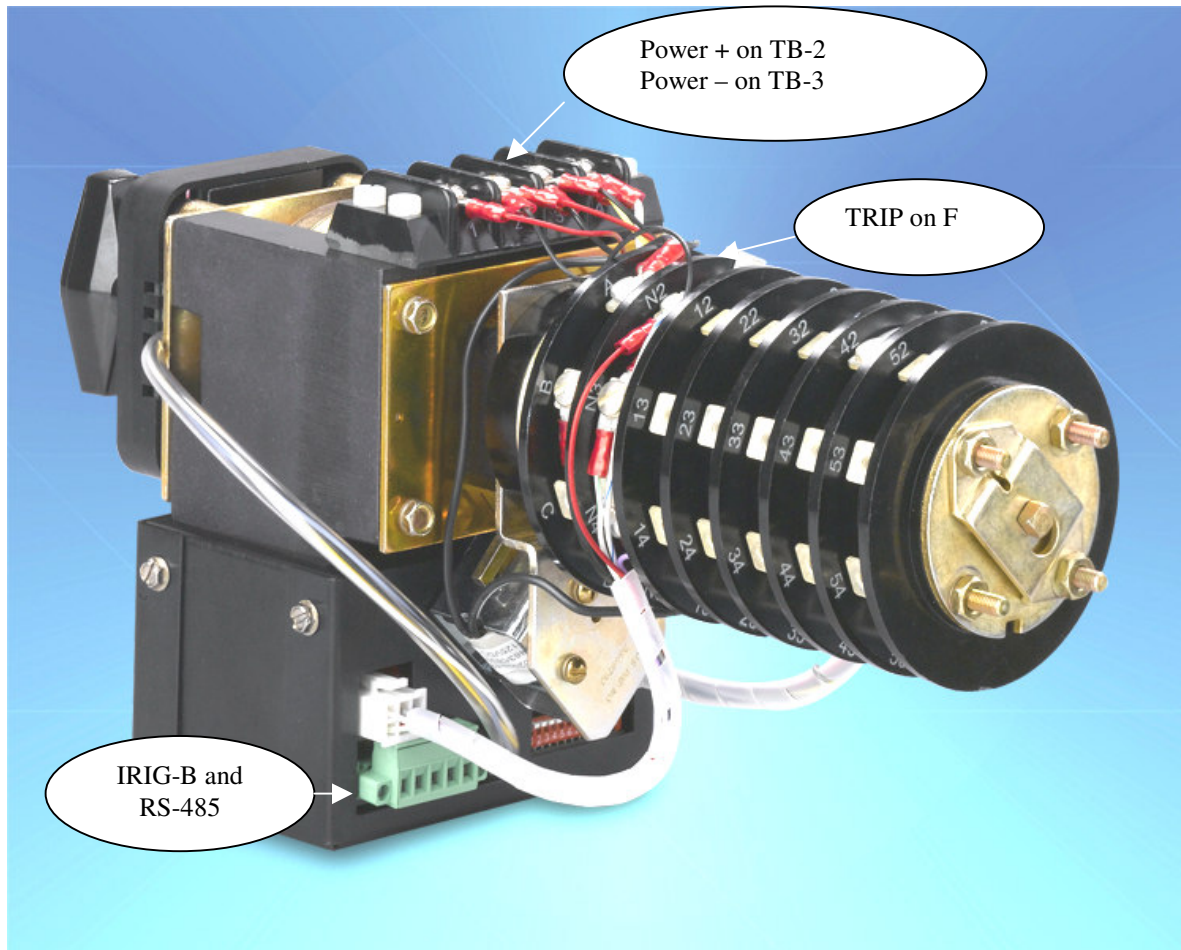
Table 1:

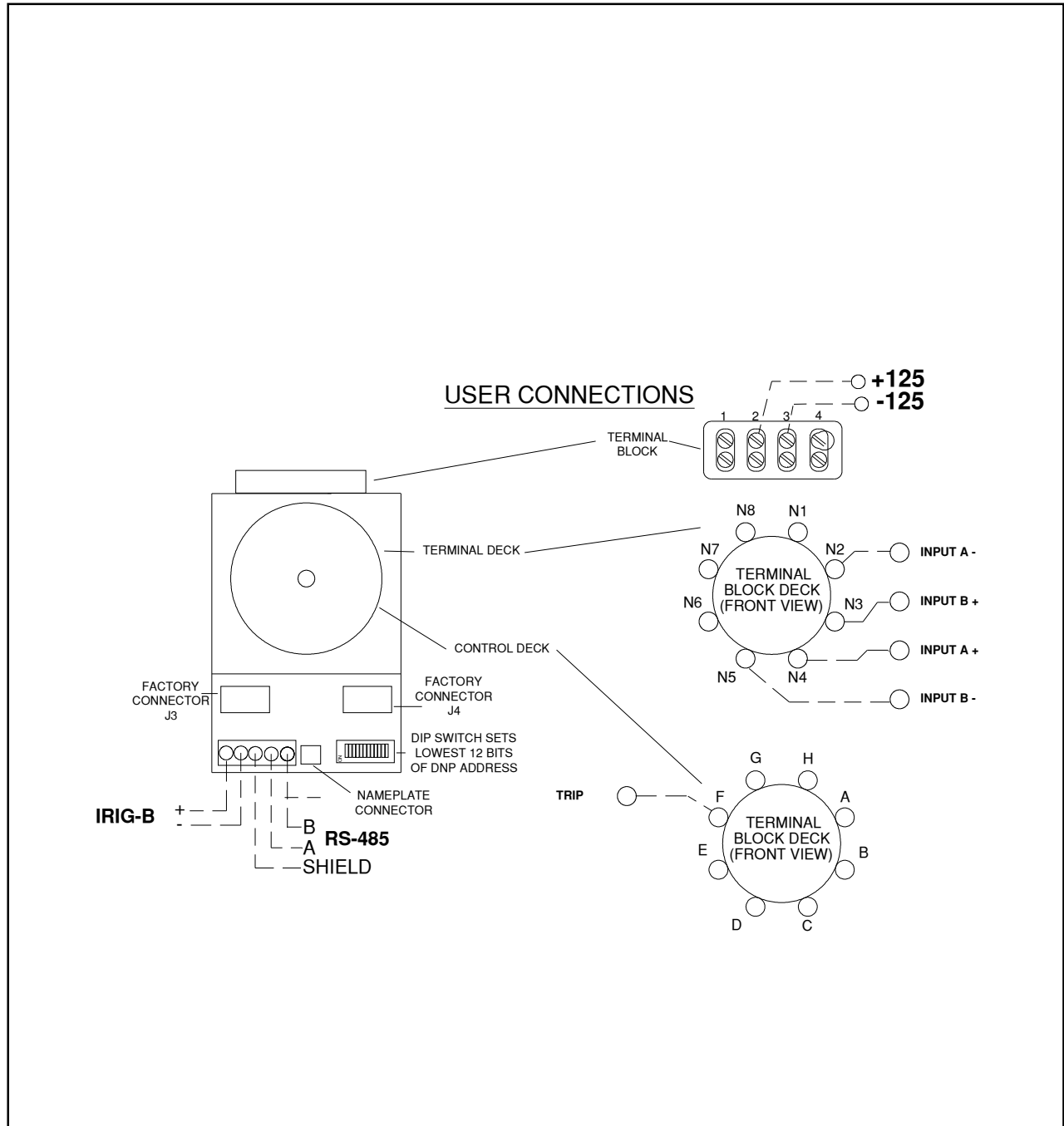
Reset Parameter	Description	Limits
Retries	Number of reset attempts (shots) before lockout. If retries is set to zero then auto reclosing is disabled.	If retries is greater than 4 then retries defaults to 0, so that resetting is disabled.
Time Before Retry 1 (TBR1)	Time in milliseconds before the SLOR will reset. Timing starts at the removal of the trip signal.	100 ms to 60000 ms Value only changes if within these limits.
Time Before Retry 2 (TBR2)	Time in milliseconds before the SLOR will reset. Timing starts at the removal of the trip signal.	100 ms to 60000 ms Value only changes if within these limits.
Time Before Retry 3 (TBR3)	Time in milliseconds before the SLOR will reset. Timing starts at the removal of the trip signal.	100 ms to 60000 ms Value only changes if within these limits.
Time Before Retry 4 (TBR4)	Time in milliseconds before the SLOR will reset. Timing starts at the removal of the trip signal.	100 ms to 60000 ms Value only changes if within these limits.
Sequence Reset Time	Time in seconds after which the automatic reset operation is restarted. Timing starts at removal of first trip signal.	30S to 30000 S Value changes only if within limits.

Automatic Reclose Operation Logic



Connections





Power is connected to TB-2 (plus) and TB-3 (minus) on the main terminal block.
The trip input is connected directly to the F point on the control deck.
IRIG-B and RS-485 connections (IRIG plus, IRIG minus, Shield, A, and B) are made to the serial terminal block.

SCADA Communication System

Two communications protocols are supported in the SLOR series, Modbus and DNP 3.0. The same basic functions for control, status polling and event logging are supported in both protocols. Via the RS-485 bus the user can trip or reset the relay, determine the position of the relay and if the trip coil is intact, and extract time-stamped information on the last 20 events that have occurred.

DNP Protocol

This section describes the “DNP3” operational information and communications setup. Unsolicited responses and application level retries are not supported. See the DNP profile document for further information.

The SLOR is referred to as an IED (Intelligent Electronic Device) and will respond to a DNP3 message if there are no detected errors in the message, the address of the SLOR matches the address of the destination field in the message, and message requires a reply. The communications LED on the front panel will blink green with on the receipt of a DNP3 message and red when it is transmitting a response.

Point List

Static Input Points Reported

Static (Steady-State) Object Number: Object 1, Object 30, and Object 40.
Change Event Object Number: 2 for binary inputs and 32 for battery voltage
Request Function Codes supported: 1 (read) Class 0

Point Index	Name/Description	Change Event Class (1, 2, 3 or none)
0	System Battery Fail (1 = Voltage not between 100 and 140 VDC) (Object 1)	Reported on 2% change
1	Local SLOR XB Contact (1 = Tripped) (Object 1)	1
2	Local SLOR XA Contact (1 = Closed) (Object 1)	1
3	AUX 1 Input (1 = Closed) (Object 1)	1
4	AUX 2 Input (1 = Closed). (Object 1)	1
5	Trip Coil (1 = Good, 0 = Bad) (Object 1)	1
6	SCADA ENABLED/DISABLED (1 = ENABLED) (Object 1)	1
7	Trip Input (1 = Active) (Object 1)	1
8	Reset Enable/Disable (1 = ENABLED) (Object 1)	None
9	Retries (Up to 4) (Object 40)	None
10	Time Before Retry 1 (Milliseconds) (Object 40)	None
11	Time Before Retry 2 (Milliseconds) (Object 40)	None
12	Time Before Retry 3 (Milliseconds) (Object 40)	None
13	Time Before Retry 4 (Milliseconds) (Object 40)	None
14	Reclose Reset Time (Seconds) (Object 40)	None
0	Battery Voltage (mV) (Object 30)	1

Changes of in any of these inputs will set the class 1 data IIN bit indicating class 1 data available. If more than 20 events occur without being read then the buffer overflow IIN bit will be set and the oldest event data will be lost.

Class 1 Point Description

Class 1 (Change Events) are returned as Data Object 02 - Variation: 02 Type: Event
 Except battery change event is reported as Object 32 variation 1

CLASS 1 POLL POINTS

Point Index	Name/Description	Change Event Class (1, 2, 3 or none)
0	Battery Voltage Changed more than 2% (Object 32)	1
1	Local SLOR XB Contact (Object 2)	1
2	Local SLOR XA Contact (Object 2)	1
3	AUX 1 Input (Object 2)	1
4	AUX 2 Input (Object 2)	1
5	Trip Coil Condition change event (1 = OK, 0 = Bad). (Object 2)	1
6	SCADA ENABLE/DISABLE Event (Object 2)	1
7	Trip Input (Object 2)	1

This data is returned in an Object 2 in response to a Class 1,2 or 3 poll and shows the point that changed and when. i.e. if a point 2 is returned with a time stamp of 04/30/00 15:03:45.002 it means that the SLOR was reset at that time and date. Reported with one millisecond resolution. Once a changed event is read and acknowledged it is erased. A maximum of the ten most recent changed events will be returned. This feature will allow the master to poll less frequently and still get real time status change data.

Binary Output Status Points & Control Relay Output Blocks

The following table lists both the Binary Output Status Points (Object 10) and the Control Relay Output Blocks (Object 12) points.

Binary output Status Points

Object Number: 10

Request function code: 1 (Read)

Control Relay Output Blocks

Object Number: 12

Request Function Codes supported: **3 (select), 4 (operate),**

Point Index	Name/Description	Supported Control Relay Output Block Fields
2	SLOR Reset Binary Output	Pulse On, Reset SLOR
1	SLOR Trip Binary Output	Pulse On, Trip SLOR

Object Description

<u>SLOR Receives</u>	<u>REPLIES WITH</u>
Read Class 0	Reply with Object 1, Var 1 Qualifier 0 start at 0 end at 7 - Represents status as shown in document attached Object 30 Variation 3, Qualifier 0 1 point at point 0 - Represents station battery voltage in millivolts. Object 40 Variation 2, Qualifier 0 Start point 9 - End Point 14 - Represents programmed reset values.
Read Class 1	Reply with Null Response if no events else will reply with Object 2 Variation 2, Qualifier 17 HEX. And last X number of events for the points up to a maximum of Twenty.
Direct Operate	Object 12 (CROB) Variation 1, Qualifier 28HEX & 17 HEX. Replies with echo of received message.
Direct Operate No ACK	Object 12 (CROB) Variation 1, Qualifier 28HEX & 17 HEX. Replies with echo of received message.
SELECT	Object 12 (CROB) Variation 1, Qualifier 28HEX & 17 HEX. Select Before Operate Timer is 5 seconds. Replies with echo of received message.
OPERATE	Object 12(CROB) Variation 1, Qualifier 28 HEX & 17 HEX
Receive ILEN WRITE	Object 80 Variation 1, Qualifier Start Point 7 End Point 7. If Data sent is a 0 this bit in the ILEN byte will be cleared. This bit is also known as the RESTART BIT.
Receive SET Time	Object 50 Variation 1 Qualifier 7 Count 1 - Replies with a NULL Response.

ILEN bits supported - NEED Time, RESTART, buffer overflow, and LOCAL
 Need Time set at power up and every 10 minutes after last time set.

For additional details see the 716 DNP3.0 Device Profile Document.

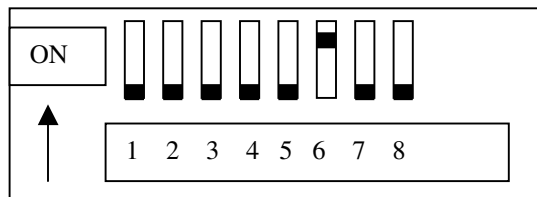
Serial Transmission Details

This section describes details of setting the SLOR series serial transmission parameters.

Transmission of each 8-bit data byte occurs with one start bit and one stop bit.

The low 12 bits of the address (bit 0 through bit 11) are set by the 12 position DIP switch accessible from the rear of the unit without opening the case.

The remaining four bits of the address and the baud rate are set by an 8 position DIP switch on the communications board inside the enclosure. The switch usage is given in the table below.



Shown for 4800 Baud, DNP Address bits 12..15 = 0

Internal 8 Position DIP Switch Functions	
Switch Position	Function
1	DNP Address 12 (Factory Default = 0)
2	DNP Address 13 (Factory Default = 0)
3	DNP Address 14 (Factory Default = 0)
4	DNP Address 15 (Factory Default = 0)
5	Switches 5 and 6 control baud rate See following Baud Rate Table
6	
7	Spare
8	Enable Self Reset (Factory Default = 0)

Baud Rate Table		
Switch 5	Switch 6	Baud Rate
Off	Off	9600
On	Off	1200
Off	On	4800
On	On	19200

The SLOR Series complies with the standard RS-485 requirements as stated in EIA/TIA-485. The SLOR series are two wire half duplex systems. A common cause of problems are reversed RS-485 polarity.

Specifications and Tests

Operating Voltage	48 VDC Nominal or 125 VDC nominal, IEEE ranges
Contact Ratings (Breaking)	Unchanged from series 24 LOR specifications.
Contact Ratings (Continuous)	Same as standard LOR
Contact Ratings (Momentary Current)	Same as standard LOR
Contact Ratings (Overload Current)	Same as standard LOR
Response Time	Identical to series 24 LOR for contact trip input. Serial response time for trip and reset depends on protocol and baud rate.
Battery Measurement	Value in millivolts.
SCADA	RS 485 Two-wire
Ambient Temperature Rating	-20 deg. C to +55 deg. C
Surge Withstand Capability	Per IEEE C37.90.1(1995) - 2500 V Oscillatory Surge 5000 V Fast Transient
EMI/RFI (Radio Frequency Immunity)	Per IEEE C37.90.2(1995)
Dielectric Withstand Voltage	1500 VDC for 60 seconds
Tested Life Under Rated Load	10,000 Operations
Environmental Testing	80 C for 120 hours 40C for 96 hours at 90 to 95% RH

Appendix A

DNP Profile Document

For 716-500C.C
SLOR



Self Certified by Robert Callahan
11/15/2007

Tests performed using Triangle Microworks Communication Protocol Test Harness Version 2.0.50
DNP3 IED Certification Procedure Subset Level 1 Version 2.5 2-Oct-2005
Triangle MicroWorks, Inc. Test Scripts Version 2.0.50.0

	Capabilities	Current Value	If configurable, list methods
Device Function: <i>Masters send DNP requests, while Outstations send DNP responses. If a single physical device can perform both functions, a separate Device Profile Document must be provided for each function.</i>	<input type="checkbox"/> Master <input checked="" type="checkbox"/> Outstation	<input type="checkbox"/> Master <input checked="" type="checkbox"/> Outstation	
Vendor Name: <i>The name of the organization producing the device.</i>			
Device Name: <i>The model and name of the device, sufficient to distinguish it from any other device from the same organization.</i>			
Device manufacturer's hardware version string:			
Device manufacturer's software version string:		716-500C Rev. A	
Device Profile Document Version Number: <i>Version of the Device Profile Document is indicated by a whole number incremented with each new release. This should match the latest version shown in the Revision History at the beginning of this document.</i>			

	Capabilities	Current Value	If configurable, list methods
<p>DNP Levels Supported for: Indicate each DNP3 Level to which the device conforms fully. For Masters, requests and responses can be indicated independently.</p>	<p>Masters Only Requests Responses</p> <p><input type="checkbox"/> <input type="checkbox"/> None <input type="checkbox"/> <input type="checkbox"/> Level 1 <input type="checkbox"/> <input type="checkbox"/> Level 2 <input type="checkbox"/> <input type="checkbox"/> Level 3</p> <p>Outstations Only Requests and Responses</p> <p><input type="checkbox"/> None <input checked="" type="checkbox"/> Level 1 <input type="checkbox"/> Level 2 <input type="checkbox"/> Level 3</p>	Level 1	
<p>Supported Function Blocks:</p>	<p><input type="checkbox"/> Self-Address Reservation <input type="checkbox"/> Object 0 – attribute objects <input type="checkbox"/> Data Sets <input type="checkbox"/> File Transfer <input type="checkbox"/> Virtual Terminal <input type="checkbox"/> Mapping to IEC 61850 Object Models defined in a DNP3 XML file <input type="checkbox"/> Function code 31, activate configuration</p>		
<p>Notable Additions: A brief description intended to quickly identify for the reader the most obvious features the device supports in addition to the Highest DNP Level Supported. The complete list of features is described in the Implementation Table.</p>	<p>Analog Outputs used for programming automatic reset operations.</p>		
<p>Methods to set Configurable Parameters:</p>	<p><input type="checkbox"/> XML – Loaded via DNP3 File Transfer <input type="checkbox"/> XML – Loaded via other transport mechanism <input type="checkbox"/> Terminal – ASCII Terminal Command Line <input type="checkbox"/> Software – Vendor software named</p> <p><input type="checkbox"/> Proprietary file loaded via DNP3 file transfer <input type="checkbox"/> Proprietary file loaded via other transport mechanism <input type="checkbox"/> Direct – Keypad on device front panel <input type="checkbox"/> Factory – Specified when device is ordered <input type="checkbox"/> Protocol – Set via DNP3 (e.g. assign class) <input type="checkbox"/> Other – explain</p>	Not configurable	

	Capabilities	Current Value	If configurable, list methods																				
<p>DNP3 XML files available On-Line: XML configuration file names that can be read or written through DNP3 File Transfer to a device</p> <p>A device's currently running configuration is returned by DNP3 on-line XML file read from the device.</p> <p>DNP3 on-line XML file write to a device will update the device's configuration when the Activate Configuration (function code 31) is received.</p>	<table border="0"> <tr> <td>Rd</td> <td>Wr</td> <td>Filename</td> <td>Description of Contents</td> </tr> <tr> <td><input type="checkbox"/></td> <td></td> <td>dnpDP.xml</td> <td>Complete Device Profile</td> </tr> <tr> <td><input type="checkbox"/></td> <td></td> <td>dnpDPCap.xml</td> <td>Device Profile Capabilities</td> </tr> <tr> <td><input type="checkbox"/></td> <td></td> <td>dnpDPCfg.xml</td> <td>Device Profile config. values</td> </tr> <tr> <td><input type="checkbox"/></td> <td></td> <td>_____*.xml</td> <td>_____</td> </tr> </table> <p>* The Complete Device Profile Document contains the capabilities, Current Value, and configurable methods columns. * The Device Profile Capabilities contains only the capabilities and configurable methods columns. * The Device Profile Config. Values contains only the Current Value column.</p>	Rd	Wr	Filename	Description of Contents	<input type="checkbox"/>		dnpDP.xml	Complete Device Profile	<input type="checkbox"/>		dnpDPCap.xml	Device Profile Capabilities	<input type="checkbox"/>		dnpDPCfg.xml	Device Profile config. values	<input type="checkbox"/>		_____*.xml	_____	None	
Rd	Wr	Filename	Description of Contents																				
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<input type="checkbox"/>		dnpDPCap.xml	Device Profile Capabilities																				
<input type="checkbox"/>		dnpDPCfg.xml	Device Profile config. values																				
<input type="checkbox"/>		_____*.xml	_____																				
<p>External DNP3 XML files available Off-line: XML configuration file names that can be read or written from an external system, typically from a system that maintains the outstation configuration.</p> <p>External off-line XML file read permits an XML definition of a new configuration to be supplied from off-line configuration tools.</p> <p>External off-line XML file write permits an XML definition of a new configuration to be supplied to off-line configuration tools.</p>	<table border="0"> <tr> <td>Rd</td> <td>Wr</td> <td>Filename</td> <td>Description of Contents</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>dnpDP.xml</td> <td>Complete Device Profile</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>dnpDPCap.xml</td> <td>Device Profile Capabilities</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>dnpDPCfg.xml</td> <td>Device Profile config. values</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>_____*.xml</td> <td>_____</td> </tr> </table> <p>* The Complete Device Profile Document contains the capabilities, Current Value, and configurable methods columns. * The Device Profile Capabilities contains only the capabilities and configurable methods columns. * The Device Profile Config. Values contains only the Current Value column.</p>	Rd	Wr	Filename	Description of Contents	<input type="checkbox"/>	<input type="checkbox"/>	dnpDP.xml	Complete Device Profile	<input type="checkbox"/>	<input type="checkbox"/>	dnpDPCap.xml	Device Profile Capabilities	<input type="checkbox"/>	<input type="checkbox"/>	dnpDPCfg.xml	Device Profile config. values	<input type="checkbox"/>	<input type="checkbox"/>	_____*.xml	_____	None	
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<input type="checkbox"/>	<input type="checkbox"/>	dnpDPCfg.xml	Device Profile config. values																				
<input type="checkbox"/>	<input type="checkbox"/>	_____*.xml	_____																				
<p>Connections Supported:</p>	<input checked="" type="checkbox"/> Serial (complete section 0) <input type="checkbox"/> IP Networking (complete section 0) <input type="checkbox"/> Other, explain _____																						

Serial Connections	Capabilities	Current Value	If configurable list methods
<p>Supports DNP3 Collision Avoidance: <i>Indicates whether a device uses a collision avoidance algorithm. Documentation by the vendor will provide information on collision avoidance schemes.</i></p>	<p><input checked="" type="checkbox"/> No <input type="checkbox"/> Yes, explain:</p>		
<p>Receiver Inter-character Timeout: <i>When serial interfaces with asynchronous character framing are used, this parameter indicates if the receiver makes a check for gaps between characters (i.e. extension of the stop bit time of one character prior to the start bit of the following character within a message). If the receiver performs this check and the timeout is exceeded then the receiver discards the current data link frame. A receiver that does not discard data link frames on the basis of inter-character gaps is considered to not perform this check.</i> <i>Where no asynchronous serial interface is fitted, this parameter is not applicable. In this case none of the options shall be selected.</i></p>	<p><input checked="" type="checkbox"/> Not checked <input type="checkbox"/> No gap permitted <input type="checkbox"/> Fixed at _____ bit times <input type="checkbox"/> Fixed at _____ ms <input type="checkbox"/> Configurable, range ____ to ____ bit times <input type="checkbox"/> Configurable, range ____ to ____ ms <input type="checkbox"/> Configurable, Selectable from ____, ____, ____ bit times <input type="checkbox"/> Configurable, Selectable from ____, ____, ____ ms <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____</p>		
<p>Inter-character gaps in transmission: <i>When serial interfaces with asynchronous character framing are used, this parameter indicates whether extra delay is ever introduced between characters in the message, and if so, the maximum width of the gap.</i> <i>Where no asynchronous serial interface is fitted, this parameter is not applicable. In this case none of the options shall be selected.</i></p>	<p><input checked="" type="checkbox"/> None (always transmits with no inter-character gap) <input type="checkbox"/> Maximum _____ bit times <input type="checkbox"/> Maximum _____ ms</p>		

IP Networking (Not Implemented)

Link Layer	Capabilities	Current Value	If configurable list methods
Data Link Address: <i>Indicates if the link address is configurable over the entire valid range of 0 to 65,519. Data link addresses 0xFFFF0 through 0xFFFFF are reserved for broadcast or other special purposes.</i>	<input type="checkbox"/> Fixed at _____ <input checked="" type="checkbox"/> Configurable, range <u> 0 </u> to <u> 65,519 </u> <input type="checkbox"/> Configurable, selectable from _____,_____,_____ <input type="checkbox"/> Configurable, other, describe _____		
DNP3 Source Address Validation: <i>Indicates whether the device will filter out messages not from a specific source address.</i>	<input checked="" type="checkbox"/> Never <input type="checkbox"/> Always, one address allowed (shown in 1.4.3) <input type="checkbox"/> Always, any one of multiple addresses allowed (each selectable as shown in 1.4.3) <input type="checkbox"/> Sometimes, explain _____		
DNP3 Source Address(es) expected when Validation is Enabled: <i>Selects the allowed source address(es).</i>	<input type="checkbox"/> Configurable to any 16 bit DNP Data Link Address value <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from _____,_____,_____ <input type="checkbox"/> Configurable, other, describe _____		
Self Address Support using address 0xFFFFC: <i>If an Outstation receives a message with a destination address of 0xFFFFC it shall respond normally with its own source address. It must be possible to disable the feature if supported.</i>	<input type="checkbox"/> Yes (only allowed if configurable) <input checked="" type="checkbox"/> No		
Sends Confirmed User Data Frames: <i>A list of conditions under which the device transmits confirmed link layer services (TEST_LINK_STATES, RESET_LINK_STATES, CONFIRMED_USER_DATA).</i>	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes, explain _____ <input checked="" type="checkbox"/> Never		
Data Link Layer Confirmation Timeout: <i>This timeout applies to any secondary data link message that requires a confirm or response (link reset, link status, user data, etc)</i>	<input type="checkbox"/> None <input type="checkbox"/> Fixed at _____ms <input type="checkbox"/> Configurable, range _____ to _____ms <input type="checkbox"/> Configurable, selectable from _____,_____,____ms <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____		

Link Layer	Capabilities	Current Value	If configurable list methods
<p>Maximum Data Link Retries: <i>The number of times the device will retransmit a frame that requests Link Layer confirmation.</i></p>	<input checked="" type="checkbox"/> Never Retries <input type="checkbox"/> Fixed at _____ <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		
<p>Maximum number of octets Transmitted in a Data Link Frame: <i>This number includes the CRCs. With a length field of 255, the maximum size would be 292.</i></p>	<input checked="" type="checkbox"/> Fixed at <u>292</u> <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		
<p>Maximum number of octets that can be Received in a Data Link Frame: <i>This number includes the CRCs. With a length field of 255, the maximum size would be 292. The device must be able to receive 292 octets to be compliant.</i></p>	<input checked="" type="checkbox"/> Fixed at <u>292</u> <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		

Application Layer	Capabilities	Current Value	If configurable list methods
<p>Maximum number of octets Transmitted in an Application Layer Fragment other than File Transfer: <i>This size does not include any transport or frame octets.</i></p> <ul style="list-style-type: none"> <i>Masters must provide a setting less than or equal to 249.</i> <i>Outstations must provide a setting less than or equal to 2048.</i> 	<input checked="" type="checkbox"/> Fixed at <u>140</u> <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		

Application Layer	Capabilities	Current Value	If configurable list methods
<p>Maximum number of octets Transmitted in an Application Layer Fragment containing File Transfer:</p>	<input type="checkbox"/> Fixed at _____ <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		
<p>Maximum number of octets that can be Received in an Application Layer Fragment: <i>This size does not include any transport or frame octets.</i></p> <ul style="list-style-type: none"> • Masters must provide a setting greater than or equal to 2048. • Outstations must provide a setting greater than or equal to 249. 	<input checked="" type="checkbox"/> Fixed at <u>249</u> _____ <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____		
<p>Timeout waiting for Complete Application Layer Fragment: <i>Timeout if all frames of a message fragment are not received in the specified time. Measured from time first frame of a fragment is received until the last frame is received.</i></p>	<input checked="" type="checkbox"/> None <input type="checkbox"/> Fixed at _____ms <input type="checkbox"/> Configurable, range _____ to _____ms <input type="checkbox"/> Configurable, selectable from ____, ____, ____ms <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____		
<p>Maximum number of objects allowed in a single control request for CROB (group 12):</p>	<input checked="" type="checkbox"/> Fixed at <u>1</u> (enter 0 if controls are not supported) <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____		
<p>Maximum number of objects allowed in a single control request for Analog Outputs (group 41):</p>	<input type="checkbox"/> Fixed at <u>1</u> (enter 0 if controls are not supported) <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____	No analog outputs	
<p>Maximum number of objects allowed in a single control request for Data Sets (groups 85,86,87):</p>	<input type="checkbox"/> Fixed at <u>0</u> (enter 0 if controls are not supported) <input type="checkbox"/> Configurable, range _____ to _____ <input type="checkbox"/> Configurable, selectable from ____, ____, ____ <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____	No Data Sets	
<p>Supports mixing object groups (AOBs, CROBs and Data Sets) in the same control request:</p>	<input checked="" type="checkbox"/> Not applicable – controls are not supported <input type="checkbox"/> Yes <input type="checkbox"/> No	No Data Sets and AOB's	

Fill Out The Following Items For Outstations Only	Capabilities	Current Value	If configurable list methods
<p>Timeout waiting for Application Confirm of solicited response message:</p>	<input checked="" type="checkbox"/> None <input type="checkbox"/> Fixed at _____ms <input type="checkbox"/> Configurable, range _____ to _____ms <input type="checkbox"/> Configurable, selectable from ____, ____, ____ms <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____		
<p>How often is time synchronization required from the master?</p>	<input type="checkbox"/> Never needs time <input checked="" type="checkbox"/> Within <u>30</u> seconds after IIN1.4 is set <input type="checkbox"/> Periodically every _____ seconds		
<p>Device Trouble Bit IIN1.6: <i>If IIN1.6 device trouble bit is set under certain conditions, explain the possible causes.</i></p>	<input type="checkbox"/> Never used <input checked="" type="checkbox"/> Reason for setting: <u>When device internal communications malfunction</u>		
<p>File Handle Timeout: <i>If there is no activity referencing a file handle for a configurable length of time, the outstation must do an automatic close on the file. The timeout value must be configurable up to 1 hour. When this condition occurs the outstation will send a File Transport Status Object (group 70 var 6) using a status code value of file handle expired (0x02).</i></p>	<input checked="" type="checkbox"/> Not applicable, files not supported <input type="checkbox"/> Fixed at _____ms <input type="checkbox"/> Configurable, range _____ to _____ms <input type="checkbox"/> Configurable, selectable from ____, ____, ____ms <input type="checkbox"/> Configurable, other, describe _____ <input type="checkbox"/> Variable, explain _____	No File Handle	
<p>Event Buffer Overflow Behavior:</p>	<input checked="" type="checkbox"/> Discard the oldest event <input type="checkbox"/> Discard the newest event <input type="checkbox"/> Other, explain _____		
<p>Event Buffer Organization: <i>Explain how event buffers are arranged (per Object Group, per Class, single buffer, etc.) and provide their sizes</i></p>	<p>Event buffer size: 20 Most recent events for binary input change and for analog input the buffer size is 1.</p>		

Fill Out The Following Items For Outstations Only	Capabilities	Current Value	If configurable list methods
Sends Multi-Fragment Responses: <i>Indicates whether an Outstation sends multi-fragment responses (Masters do not send multi-fragment requests).</i>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
DNP Command Settings preserved through a device reset: <i>If any of these settings are written through the DNP protocol and they are not preserved through a restart of the Outstation, the Master will have to write them again anytime the Restart IIN bit is set.</i>	<input type="checkbox"/> Assign Class <input type="checkbox"/> Analog Deadbands <input type="checkbox"/> Data Set Prototypes <input type="checkbox"/> Data Set Descriptors <input type="checkbox"/> Function Code 31 Activate Configuration <input checked="" type="checkbox"/> Analog Outputs		

Outstation Unsolicited Response Support (Not Implemented)	Capabilities	Current Value	If configurable list methods
Supports Unsolicited Reporting: <i>When the unsolicited response mode is configured "off", the device is to behave exactly like an equivalent device that has no support for unsolicited responses. If set to On, the Outstation will send a null Unsolicited Response after it restarts, then wait for an Enable Unsolicited Response command from the master before sending additional Unsolicited Responses containing event data.</i>	<input checked="" type="checkbox"/> Not Supported <input type="checkbox"/> Configurable, selectable from On and Off	<input type="radio"/> Off <input type="radio"/> On	

Outstation Performance	Capabilities	Current Value	If configurable list methods
Maximum Time Base Drift (milliseconds per minute): <i>If the protocol is synchronized by DNP, what is the clock drift rate over the full operating temperature range.</i>	6 ms/min		
When does outstation set IIN1.4?	<input type="checkbox"/> Never <input checked="" type="checkbox"/> Asserted at startup until first Time Synchronization request received <input checked="" type="checkbox"/> Periodically, every ten minutes since last set. <input type="checkbox"/> Periodically, selectable from __, __, __ seconds <input type="checkbox"/> Range __ to __ seconds after last time sync <input type="checkbox"/> Selectable from __, __, __ seconds after last time sync <input type="checkbox"/> When time error may have drifted by range __ to __ ms <input type="checkbox"/> When time error may have drifted by selectable from __, __, __		
Maximum Internal Time Reference Error when set via DNP (ms): <i>The difference between the time set in a DNP Write Time message, and the time actually set in the Outstation.</i>	1 ms		
Maximum Delay Measurement error (ms): <i>The difference between the time reported in the delay measurement response and the actual time between receipt of the delay measurement request and issuing the delay measurement reply.</i>	10 ms		
Maximum Response time (ms): <i>The amount of time an Outstation will take to respond upon receipt of a valid request. This does not include the message transmission time.</i>	Typically 30-70 ms, maximum of 200 ms		
Maximum time from start-up to IIN 1.4 assertion (ms):	50 ms		

Outstation Performance	Capabilities	Current Value	If configurable list methods
Maximum Event Time-tag error for local Binary and Double-bit I/O (ms): <i>The error between the time-tag reported and the absolute time of the physical event. This error includes the Internal Time Reference Error.</i>	2 ms		
Maximum Event Time-tag error for local I/O other than Binary and Double-bit data types (ms):	No other time tag data types.		

CAPABILITIES AND CURRENT SETTINGS FOR DEVICE DATABASE (OUTSTATION ONLY)

The following tables identify the capabilities and current settings for each DNP3 data type. Each data type also provides a table defining the data points available in the device or a description of how this information can be obtained if the database is configurable. Tables for data types not supported may be deleted. Additional columns may be added to the point list table if necessary.

Single-Bit Binary Inputs Static (Steady-State) Group Number: 1 Event Group Number: 2	Capabilities	Current Value	If configurable, list methods
Static Variation reported when variation 0 requested:	<input checked="" type="checkbox"/> Variation 1 – Single-bit Packed format <input type="checkbox"/> Variation 2 – Single-bit with flag <input type="checkbox"/> Based on point Index (add column to table below)		
Event Variation reported when variation 0 requested:	<input type="checkbox"/> Variation 1 – without time <input checked="" type="checkbox"/> Variation 2 – with absolute time <input type="checkbox"/> Variation 3 – with relative time <input type="checkbox"/> Based on point Index (add column to table below)		
Event reporting mode: <i>When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event. All events are typically reported for Binary Inputs.</i>	<input type="checkbox"/> Only most recent <input checked="" type="checkbox"/> All events		
Binary Inputs included in Class 0 response: <i>If Binary Inputs are not included in the Class 0 response, Binary Input Events (group 2) may not be reported.</i>	<input checked="" type="checkbox"/> Always <input type="checkbox"/> Never <input type="checkbox"/> Only if point is assigned to Class 1, 2, or 3 <input type="checkbox"/> Based on point Index (add column to table below)		
Definition of Binary Input Point List: <i>List all addressable points. Points that do not exist (for example, because an option is not installed) shall be omitted from the table.</i>	<input checked="" type="checkbox"/> Fixed, list shown in table below <input type="checkbox"/> Configurable(current list may be shown in table below) <input type="checkbox"/> Other, explain _____		

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
0	Battery Fail	Class 1	OK	BAD	Set when battery voltage is less than 100 volts or greater than 140 volts.
1	Local XB	Class 1	Reset	Tripped	Set when local switch XB contact is closed.
2	Local XA	Class 1	Tripped	Reset	Set when local switch XA contact is closed.
3	Aux. 1	Class 1	Input Open	Input Closed	Set when input active.
4	Aux. 2	Class 1	Input Open	Input Closed	Set when input active.
5	Trip Coil	Class 1	BAD	OK	Set when coil continuity is ok.
6	SCADA LOCAL/REMOTE	Class 1	Disabled	Enabled	Controlled by front panel button.
7	External Trip	Class 1	Inactive	Active	Trip Input from Protective device.
8	Auto reset	None	Disabled	Enabled	Dip switch setting that enables auto reset

Double-bit Input Points

(Not Implemented)

Static (Steady-State) Group Number: 3

Event Group Number: 4

Binary Output Status and Control Relay Output Block Binary Output Status Group Number: 10 Binary Output Event Group Number: 11 CROB Group Number: 12 Binary Output Command Event Object Num: 13	Capabilities	Current Value	If configurable, list methods
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Minimum pulse time allowed with Trip, Close, and Pulse On commands:	<input checked="" type="checkbox"/> Fixed at <u>200</u> ms (hardware may limit this further) <input type="checkbox"/> Based on point Index (add column to table below)		
Maximum pulse time allowed with Trip, Close, and Pulse On commands:	<input checked="" type="checkbox"/> Fixed at <u>200</u> ms (hardware may limit this further) <input type="checkbox"/> Based on point Index (add column to table below)		
Binary Output Status included in Class 0 response: <i>If Binary Output Status points are not included in the Class 0 response, Binary Output Status Events (group 11) may not be reported.</i>	<input checked="" type="checkbox"/> Always <input type="checkbox"/> Never <input type="checkbox"/> Only if point is assigned to Class 1, 2, or 3 <input type="checkbox"/> Based on point Index (add column to table below)		
Reports Output Command Event Objects:	<input checked="" type="checkbox"/> Never <input type="checkbox"/> Only upon a successful Control <input type="checkbox"/> Upon all control attempts		
Event Variation reported when variation 0 requested:	<input type="checkbox"/> Variation 1 – without time <input type="checkbox"/> Variation 2 – with absolute time <input type="checkbox"/> Based on point Index (add column to table below)		
Command Event Variation reported when variation 0 requested:	<input type="checkbox"/> Variation 1 – without time <input type="checkbox"/> Variation 2 – with absolute time <input type="checkbox"/> Based on point Index (add column to table below)		

Event reporting mode: <i>When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event.</i>	<input checked="" type="checkbox"/> Only most recent 20 events <input type="checkbox"/> All events		
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Point Index	Name	Supported Control Operations											Name for State when value is 0	Name for State when value is 1	Default Class Assigned to Events (1, 2, 3 or none)		Description	
		Select/Operate	Direct Operate	Direct Operate – No Ack	Pulse On	Pulse Off	Latch On	Latch Off	Trip	Close	Count > 1	Cancel Currently Running Operation			Change	Command		
0																		
1	Local XB	X	X	X	X				X	X	N/A		Reset	Trip	NO	NO		
2	Local XA	X	X	X	X				X	X	N/A		Trip	Reset	NO	NO		

Counters/Frozen Counters (Not Implemented)
 Static Counter Group Number: **20**
 Static Frozen Counter Group Number: **21**
 Counter Event Group Number: **22**
 Frozen Counter Event Group Number: **23**

Analog Input Points Static (Steady-State) Group Number: 30 Event Group Number: 32	Capabilities	Current Value	If configurable list methods
Static Variation reported when variation 0 requested:	<input type="checkbox"/> Variation 1 – 32-bit with flag <input type="checkbox"/> Variation 2 – 16-bit with flag <input checked="" type="checkbox"/> Variation 3 – 32-bit without flag <input type="checkbox"/> Variation 4 – 16-bit without flag <input type="checkbox"/> Variation 5 – single-precision floating point with flag <input type="checkbox"/> Variation 6 – double-precision floating point with flag <input type="checkbox"/> Based on point Index (add column to table below)		
Event Variation reported when variation 0 requested:	<input checked="" type="checkbox"/> Variation 1 – 32-bit without time <input type="checkbox"/> Variation 2 – 16-bit without time <input type="checkbox"/> Variation 3 – 32-bit with time <input type="checkbox"/> Variation 4 – 16-bit with time <input type="checkbox"/> Variation 5 – single-precision floating point w/o time <input type="checkbox"/> Variation 6 – double-precision floating point w/o time <input type="checkbox"/> Variation 7 – single-precision floating point with time <input type="checkbox"/> Variation 8 – double-precision floating point with time <input type="checkbox"/> Based on point Index (add column to table below)		
Event reporting mode: <i>When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event. Only the most recent event is typically reported for Analog Inputs.</i>	<input checked="" type="checkbox"/> Only most recent <input type="checkbox"/> All events		
Analog Inputs Included in Class 0 response: <i>If Analog Inputs are not included in the Class 0 response, Analog Input Events (group 32) may not be reported.</i>	<input checked="" type="checkbox"/> Always <input type="checkbox"/> Never <input type="checkbox"/> Only if point is assigned to Class 1, 2, or 3 <input type="checkbox"/> Based on point Index (add column to table below)		
How Deadbands are set:	<input checked="" type="checkbox"/> A. Global Fixed <input type="checkbox"/> B. Configurable through DNP <input type="checkbox"/> C. Configurable via other means <input type="checkbox"/> D. Other, explain _____ <input type="checkbox"/> Based on point Index - column specifies which of the options applies, B, C, or D		
Analog Deadband Algorithm: <i>Simple -just compares the difference from the previous reported value integrating - keeps track of the accumulated change other - indicating another algorithm</i>	<input checked="" type="checkbox"/> Simple <input type="checkbox"/> Integrating <input type="checkbox"/> Other, explain _____		
Definition of Analog Input Point List: <i>List all addressable points. Points that do not exist (for example, because an option is not installed) shall be omitted from the table.</i>	<input checked="" type="checkbox"/> Fixed, list shown in table below <input type="checkbox"/> Configurable(current list may be shown in table below) <input type="checkbox"/> Other, explain _____		

Analog Input Points			Capabilities				Current Value	If configurable list methods
Static (Steady-State) Group Number: 30 Event Group Number: 32								
Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Transmitted Value ¹		Scaling ²		Resolution ³	Description
			Minimum	Maximum	Multiplier	Offset		
0	Battery Voltage	Class 1	0	200000			100 mv	

¹ The minimum and maximum transmitted values are the lowest and highest values that the outstation will report in DNP analog input objects. These values are integers if the outstation transmits only integers. If the outstation is capable of transmitting both integers and floating-point, then integer and floating-point values are required for the minimums and maximums.

For example, a pressure sensor is able to measure 0 to 500 kPa. The outstation provides a linear conversion of the sensor's output signal to integers in the range of 0 to 25000 or floating-point values of 0 to 500.000. The sensor and outstation are used in an application where the maximum possible pressure is 380 kPa. For this input, the minimum transmitted value would be stated as 0 / 0.0 and the maximum transmitted value would be stated as 19000 / 380.000.

² The scaling information for each point specifies how data transmitted in integer variations (16 bit and 32 bit) is converted to engineering units when received by the Master (i.e. scaled according to the equation: scaled value = multiplier * raw + offset). Scaling is not applied to Floating point variations since they are already transmitted in engineering units.

³ Resolution is the smallest change that may be detected in the value due to quantization errors and is given in the units shown in the previous column. This parameter does not represent the accuracy of the measurement.

<p>Analog Output Status and Analog Output Control Block Analog Output Status Group Number: 40 Analog Output Event Group Number: 41 Analog Output Event Group Number: 42 Analog Output Command Event Group Number: 43</p>	<p>Capabilites</p>	<p>Current Value</p>
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3.6.1 Static Analog Output Status Variation reported when variation 0 requested:

- Variation 1 – 32-bit with flag
- Variation 2 – 16-bit with flag
- Variation 3 – single-precision floating point with flag
- Variation 4 – double-precision floating point with flag
- Based on point Index (add column to table below)

3.6.2 Analog Output Status Included in Class 0 response:

- Always
- Never
- Only if point is assigned to Class 1, 2, or 3
- Based on point Index (add column to table below)

If Analog Output Status points are not included in the Class 0 response, Analog Output Events (group 42) may not be reported.

3.6.3 Reports Output Command Event Objects:

- Never
- Only upon a successful Control
- Upon all control attempts

3.6.4 Event Variation reported when variation 0 requested:

- Variation 1 – 32-bit without time
- Variation 2 – 16-bit without time
- Variation 3 – 32-bit with time
- Variation 4 – 16-bit with time
- Variation 5 – single-precision floating point w/o time
- Variation 6 – double-precision floating point w/o time
- Variation 7 – single-precision floating point with time
- Variation 8 – double-precision floating point with time
- Based on point Index (add column to table below)

3.6.5 Command Event Variation reported when variation 0 requested:

- Variation 1 – 32-bit without time
- Variation 2 – 16-bit without time
- Variation 3 – 32-bit with time
- Variation 4 – 16-bit with time
- Variation 5 – single-precision floating point w/o time
- Variation 6 – double-precision floating point w/o time
- Variation 7 – single-precision floating point with time
- Variation 8 – double-precision floating point with time
- Based on point Index (add column to table below)
- Only most recent
- All events

3.6.6 Event reporting mode:

When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event.

- Only most recent
- All events

3.6.7 Command Event reporting mode:

When responding with event data and more than one event has occurred for a data point, an Outstation may include all events or only the most recent event.

3.6.8 Maximum Time between Select and Operate:

- Not Applicable
- Fixed at 5 seconds
- Configurable, range _____ to _____ seconds
- Configurable, selectable from _____, _____, _____ seconds
- Configurable, other, describe _____
- Variable, explain _____
- Based on point Index (add column to table below)

3.6.9 Definition of Analog Output Status/Analog Output Control Block Point List

- Fixed, list shown in table below.
- Configurable
- Other, Explain _____

Point Index	Name	Default Class Assigned to Events (1, 2, 3 or none)	Name for State when value is 0	Name for State when value is 1	Description
9	Retries	None	N/A	N/A	Holds number of retries up to 4 (Group 40)
10	Time Before Retry 1	None	N/A	N/A	Holds number of milliseconds to wait before first Reset (Group 40)
11	Time Before Retry 1	None	N/A	N/A	Holds number of milliseconds to wait before second Reset (Group 40)
12	Time Before Retry 1	None	N/A	N/A	Holds number of milliseconds to wait before third Reset (Group 40)
13	Time Before Retry 1	None	N/A	N/A	Holds number of milliseconds to wait before fourth Reset (Group 40)
14	Reclose Reset Time	None	N/A	N/A	Holds number of milliseconds to wait before reset of retries (Group 40)

Sequential File Transfer (Not Implemented) Group Number: 70	Capabilities	Current Value	If configurable, list methods
File Transfer Supported:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (do not complete any further entries in section)		

Octet String Points (Not Implemented)
Static (Steady-State) Group Number: 110
Event Group Number: 111

Virtual Terminal Port Numbers (Points) (Not Implemented)
Static (Steady-State) Group Number: 112
Event Group Number: 113

Data Set Prototype (Not Implemented)
Group Number: 85
Variation Number: 1
Duplicate this table for each Data Set Prototype defined

Data Set Descriptor Contents and Characteristics (Not Implemented)
(Not Implemented)
Group Number: 86
Variation Number: 1
Duplicate this table for each Data Set Descriptor defined

Data Set Descriptor – Point Index Attributes (Not Implemented)

Group Number: **86**
Variation Number: **3**

The following table is optional and correlates data set elements to point indexes of standard DNP3 Data Objects. The element number below refers to the position in the present value (object 87) or event (object 88) data set and will not match the element number in the data set descriptor or data set prototype tables above.

Duplicate this table for each Data Set Descriptor defined

IMPLEMENTATION TABLE

The following implementation table identifies which object groups and variations, function codes and qualifiers the device supports in both requests and responses. The *Request* columns identify all requests that may be sent by a Master, or all requests that must be parsed by an Outstation. The *Response* columns identify all responses that must be parsed by a Master, or all responses that may be sent by an Outstation. Items in **GREEN** are implemented.

Device Implementation Table

Object			Request		Response	
Object Number	Variation Number	Description	Function Codes	Qualifier Codes	Function Codes	Qualifier Codes
1	0	Binary input	1 (Read)	0,1,6,7,8		
1	1	Binary input	1 (Read)	0,1,6,7,8		
1	2	Binary input	1 (Read)	0,1,6,7,8		
2	0	Binary input change	1 (Read)	0,6,7,8		
2	1	Binary input change	1 (Read)	0,6,7,8		
2	2	Binary input change	1 (Read)	0,6,7,8		
2	3	Binary input change	1 (Read)	0,6,7,8		
10	0	Binary output	1 (Read)	06	129 Response Obj. 10	Qual 00
10	2	Binary output	1 (Read)	0,6,7,8		
12	1	Control relay; output block	3 (Select) 4 (Operate) 5 (Direct Operate) 6 (Direct Operate No ACK)	17, 28	129 Response	Echo of request
20	0	Binary counter	1 (Read)	0,1,6,7,8		
20	6	16 bit binary counter	1 (Read)	0,1,6,7,8		
21	0	Frozen counter	1 (Read)	0,1,6,7,8		
21	10	16 bit frozen counter	1 (Read)	0,1,6,7,8		
22	0	Counter change	1 (Read)	6,7,8		
30	0	Analog input	1 (Read)	0,1,6,7,8		
30	1	32 bit analog input	1 (Read)	0,1,6,7,8		
30	2	16 bit analog input	1 (Read)	0,1,6,7,8		
30	3	32 bit analog input	1 (Read)	0,1,6,7,8		
30	4	16 bit analog input	1 (Read)	0,1,6,7,8		
32	0	Analog change	1 (Read)	0,6,7,8		

32	1	Analog change	1 (Read)	0,6,7,8		
32	2	Analog change	1 (Read)	0,6,7,8		
32	3	Analog change	1 (Read)	0,6,7,8		
32	4	Analog change	1 (Read)	0,6,7,8		
40	0	Analog Output	1 (Read)	0,1,6,7,8		
40	2	Analog Output	1 (Read)	0,1,6,7,8,17,28		
41	2	16 Bit Analog Output Block	3 (Select) 4 (Operate) 5 (Direct Operate) 6 (Direct Operate No ACK)	17, 28	129 Response	Echo of request
50	0	Time date	1 (Read)	0,1,6,7,8,17,28		
50	1	Time date	2 (Write)	07	129	Null Response
52	2	Time delay fine	17 (Delay Measurement)	07	129 Obj. 52	Qual 07, quantity = 1
60	0	All class data	1 (Read)	6		
60	1	Class 0	1 (Read)	06	129 Responses Obj. 1 Obj. 30 Obj. 10 Obj. 40	Qual 00
60	2	Class 1	1 (Read)	06,07,08	129 Response Obj. 2 Obj. 32	Qual 17
80	1	IIEN	2 (Write)	0 Index 7		Null Response

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