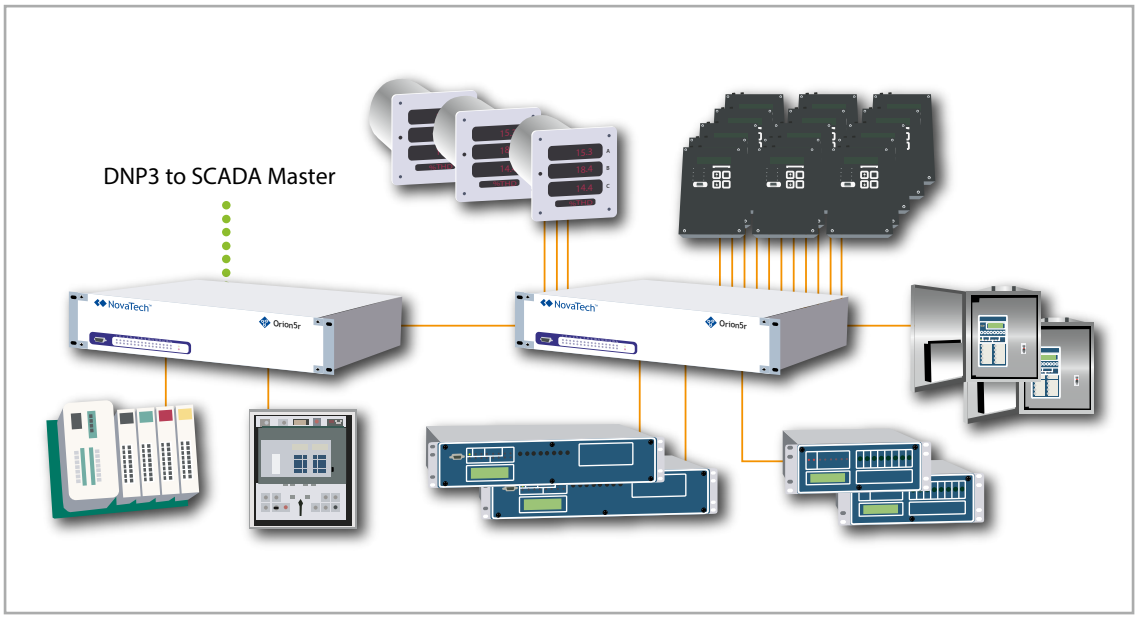

DNP3 to SCADA Master
NovaTech
Orion5r
NovaTech
Orion5r

This page intentionally left blank.

Smart RTU to Reduce Costs

The Orion Automation Platform can be configured as a "Smart" electrical substation RTU. Equipped with protocols and software features, Orion can obtain nearly all of the discrete and analog data required by SCADA from Intelligent Electronic Devices (IEDs) in the substation. Other I/O points can be brought into an Orion via optional Distributed Discrete I/O (DDIO) and ADAM Analog Input Modules.

This application note provides a complete overview of Orion in an RTU role.

Design Philosophy

Orion combines the substation-hardened engineering of a protective relay, the flexibility and modularity of a PLC and standard PC tools into a state-of-the-art automation platform tailored specifically for the electric utility.

Rugged Like a Relay

- Meets ANSI C37.90.1 2002 Fast Transient on I/O and power supplies and ANSI C37.90.2 1995 RFI to 35 volts per meter
- Direct fiber optic available on all serial communication ports
- Designed to operate over -40C to 70C, without heaters or fans

Flexible and Modular Like a PLC

- Complete logic suite for local control and intelligent alarming
- Modular and expandable I/O
- Modular and expandable ports
- Non-volatile memory

Standard PC Tools

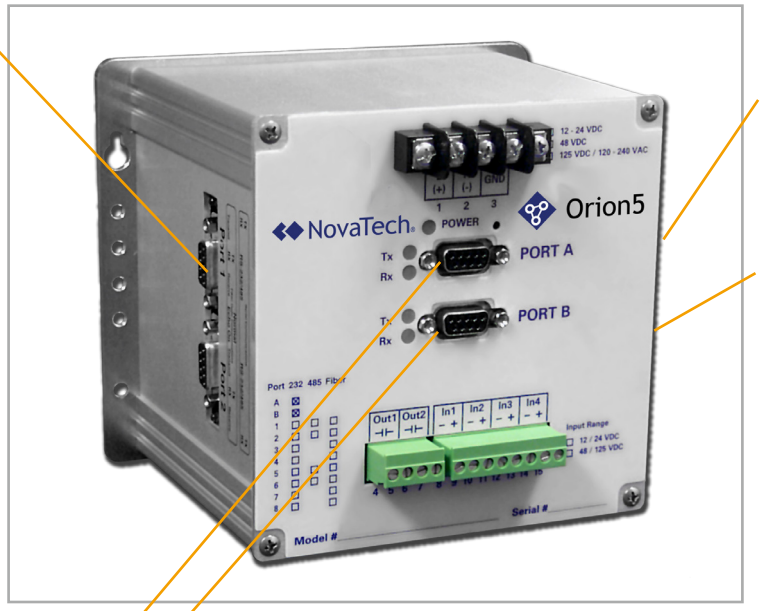
- Large, expandable solid state memory
- Built-in 10/100MB Ethernet
- A variety of communication options such as webpages, FTP, telnet and PPP

Utility-Specific

- Complete Cyber-Security Package
- Built-in breaker control, counter and accumulator functions
- Momentary-Change-Detect function
- Full suite of utility protocols
- Support for bit synchronous communications

Communication Ports - Orion5

Five serial port cards are available
(4) RS-232
(3) RS-232 and (1) RS-485
(2) RS-232 and (2) RS-485
(2) Fiber Optic
(4) Fiber Optic
Fiber Optic ports…Multimode ST connector
RS-485/RS-422 or RS-232 ports...DB9 Female
all up to 115 kbps



Modem
V.34 Phone
Modem RJ11
33.6kbps

Ethernet
Ethernet Port
RJ45 10BaseT
10Mbps

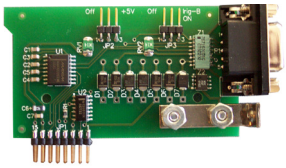
Maintenance RS-232 Port
DB9 Female 115kbps

Standard RS-232 Port
DB9 Female up to 115kbps

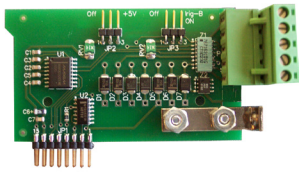
Swappable Communication Ports

Serial
A: RS-232 Standard
B: RS-422/485
C: ST-Fiber Optic
D: Bit Card (Bit-to-byte conversion)
E: RS-232 Isolated
G: RS-485 w/IRIG-B
H: V-Pin Fiber Optic w/ IRIG-B

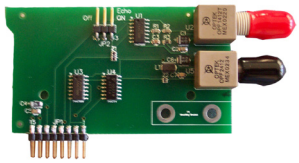
RS-232 ports can be configured to provide port power up to 100mA and can also send IRIG B to SEL® relays or other relays. (All up to 115kbps)



Type A
RS-232



Type B
RS-422/RS485



Type C
ST Multimode

IRIG B
Coax connector

Front Maintenance Port
RS-232 Port
DB9 Female
115kbps

V.34 Phone Modem
RJ11
33.6kbps

One or Two Ethernet Ports
Single port model: RJ45 10BaseT
Dual port model: RJ45 10/100BaseT

Standard RS232 Port
DB9 Female up to 115kbps

Swappable Communication Ports
Same as Orion5r

Front Maintenance Port
RS-232 Port
DB9 Female
115kbps
USB Port

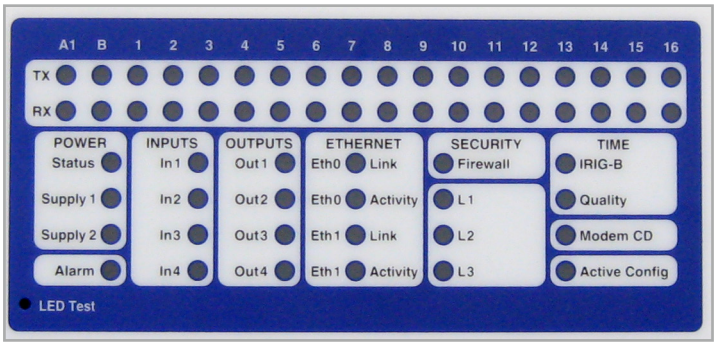
Redundant Power Supply
(Optional)

IRIG B Built-In
Coax connector

V.34 Phone Modem
RJ11
33.6kbps

Standard RS232 Port
DB9 Female up to 115kbps

One or Two Ethernet Ports
Standard Single Port 10/100BaseT RJ45
Optional Second Port: RJ45 10/100BaseT
or
100BaseFX Fiber Multimode

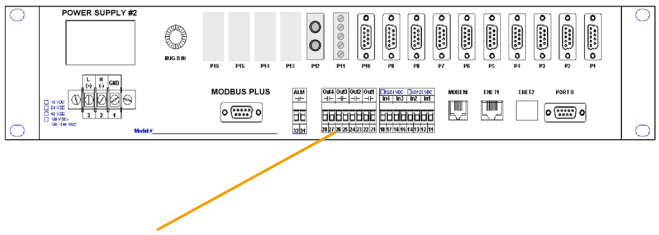


Expanded Diagnostic LEDs

Built-In Discrete I/O

All Orions come standard with built-in discrete inputs and outputs:

Orion5
4 inputs and 2 outputs on front



Orion5r/OrionLX
4 inputs and 4 outputs on back

These I/O circuits detect and switch 24V dc, 48V dc or 125V dc, and may be ordered for a different voltage than the Orion power supply.

All I/O circuits are independent and isolated and designed to meet the same temperature and noise specifications as the Orion RTU, including –40ºC to +70ºC and Fast Transient to C37.90.1.

Distributed Discrete I/O (DDIO) Modules

16 In/8 Out Panel/DIN-Rail Mount Module

These I/O modules can be mounted locally or remotely to the Orion RTU using RS-232, RS-485, serial fiber optic or Ethernet. The next page describes connection options in more detail.

These I/O circuits can be provided to detect and switch 24V dc, 48V dc or 125V dc. The output relay circuits are designed to directly actuate circuit breaker trip and close coils (uses the same relay as used by some protective relay manufacturers).

Discrete I/O modules are also available for Orion in three configurations:

16 inputs / 8 outputs
8 inputs / 16 outputs
24 inputs

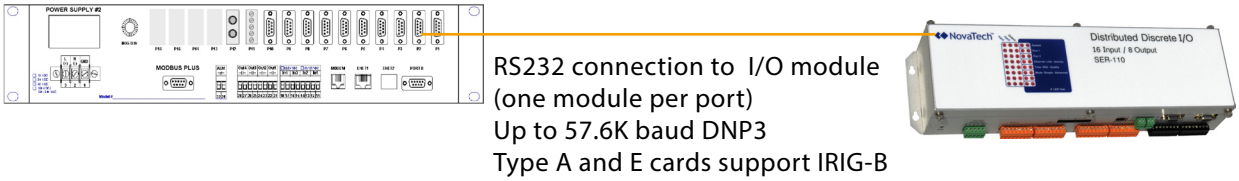
All I/O circuits are isolated and designed to meet the same temperature and noise specifications as the Orion RTU.

These I/O modules can be ordered for mounting in 19-inch racks, on a DIN rail or on a panel surface.

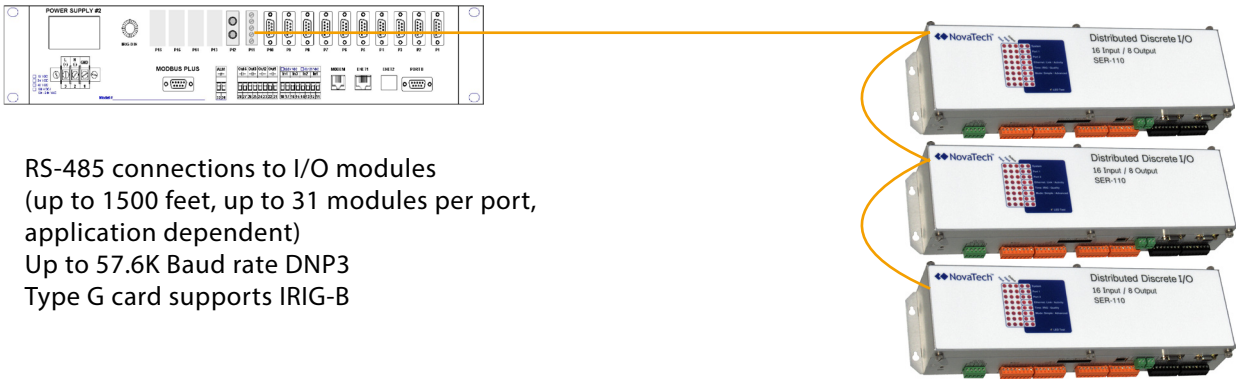
A 1ms Sequence of Events time stamp can be placed on input state changes. The DDIO Module time can be set using IRIG-B or sent down from an Orion.

Connecting Discrete Input and Output Modules to Orion

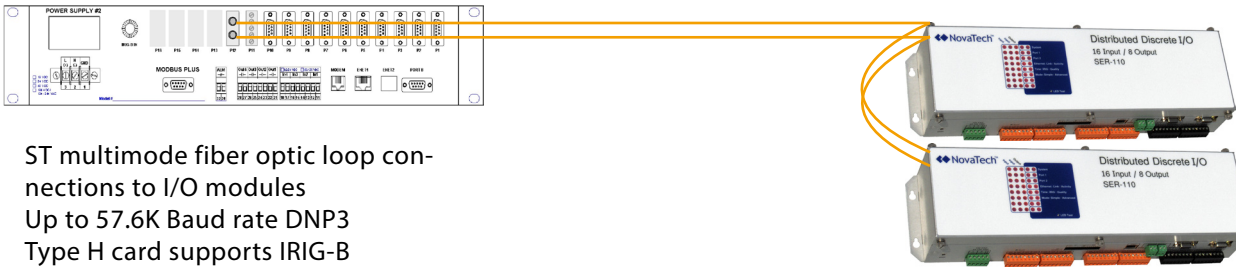
Four Connection Options:



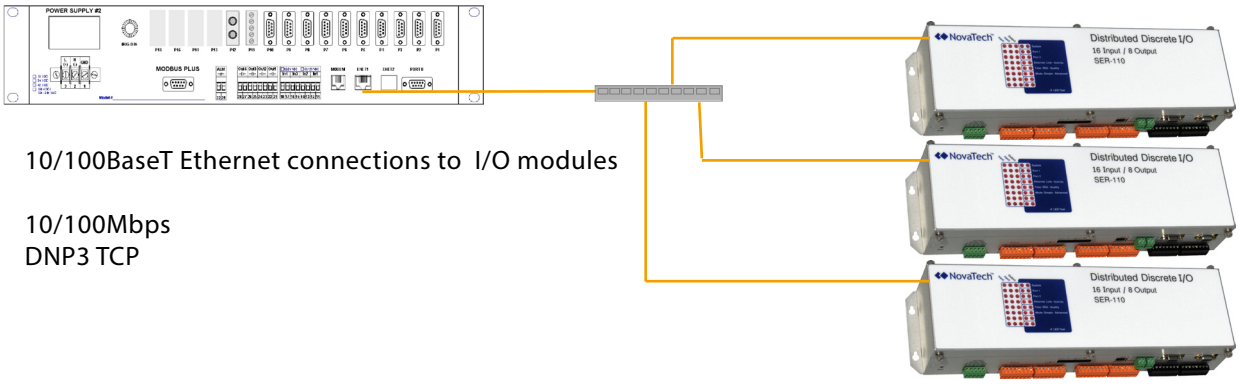
RS232 connection to I/O module
(one module per port)
Up to 57.6K baud DNP3
Type A and E cards support IRIG-B



RS-485 connections to I/O modules
(up to 1500 feet, up to 31 modules per port,
application dependent)
Up to 57.6K Baud rate DNP3
Type G card supports IRIG-B



ST multimode fiber optic loop con-
nections to I/O modules
Up to 57.6K Baud rate DNP3
Type H card supports IRIG-B



10/100BaseT Ethernet connections to I/O modules

10/100Mbps
DNP3 TCP

Orion Analog Inputs

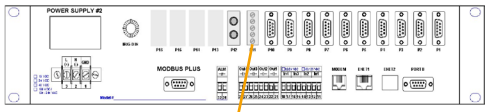
Analog input modules, each with eight differential input circuits, are available for the Orion RTU. The following ranges are supported, and may be individually selected per port:

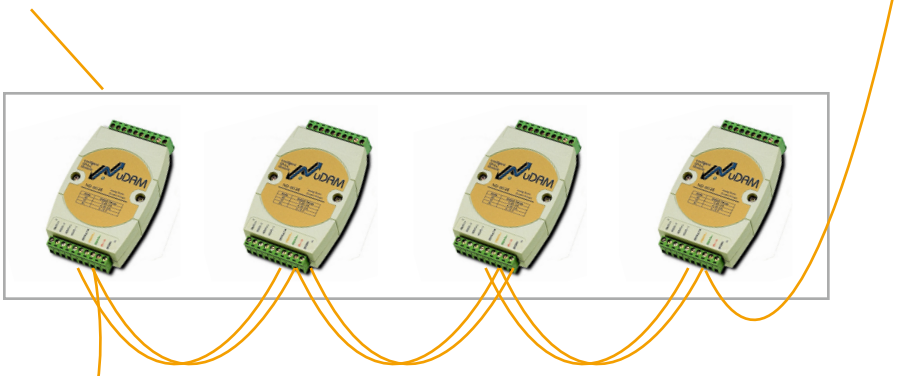
+/- 150mV
+/- 500mV
+/- 1V
+/- 5V
+/- 10V
4-20mA

Channel-channel isolation is up to 3000 V dc and effective resolution is 16 bits.

Analog input modules are connected to Orion using RS-485 with Modbus protocol. Up to 31 modules per Orion RS-485 port can be connected. Analog Input modules are pre-configured in Orion configuration software for fast integration.

Each analog module provides eight independent analog inputs and a communication port.





24V dc
Power

Up to 31 modules can be daisy-chained over a RS-485 physical network.

Protocols Available Through Orion Serial Ports

Protocol	Master / Slave	Notes
ABB DPU	Master	For the older ABB –245 series relays
Basler DFPR	Master	ASCII Protocol for old Basler DFPR feeder protection relay
DF1	Master	Used with Allen-Bradley SLC5 series or PLC5 Series PLCs
Dial (I-Dial)	Interface	Enables Orion to appear as an SEL-20xx Communications Processor, and respond identically
PassThru Interface	Client (Master)	Enables a serial port on Orion to operate as a pure pass through port, independent of the protocol. This is the port connected to the IED. Designed for use when pass through from one Orion serial port to another Orion serial port is required, or when pass through from one Orion network port (PPP or Ethernet) to a serial port is required. This function is ordered as a software option and not as a protocol. See diagrams on final page of this document for clarification.
MMI	Interface	Standard protocol included in all Orions. Enables a computer to be attached to a rear serial port instead of the front port. Will work in conjunction with PassThru Interface Master if direct pass through is desired.
DNP3	Master	Compliant with Level 2. Now includes "DNP3 Pass Through" which facilitates use of DNP3 IED vendor software through Orion to connected IEDs.
DNP3	Slave	Compliant with Level 2
DTO	Master	For communication with TransData meters
GE DLP	Master	For communication with the older GE DLP relays
Harris	Slave	-5000 version
IEC 870-5-103	Master	For International Electrotechnical Commission (IEC) Relays
Ketchikan	Master	For AK utility
Ketchikan	Slave	For AK utility
KITZ	Master	For communication with K-Series GEC/Alstom/Areva relays
L&G	Slave	-8979 version
L&G	Master	-8979 version
Modbus	Master	Supports ASCII or RTU data format
Modbus	Slave	Supports ASCII or RTU data format
Optimho	Master	Polls for data from Optimho relays. Also supports pass through of ASCII data directly from attached PC to Optimho relay, through Orion.
PAC	Master	For communication with GridSense LT40 PAC and LT40 CMS systems
PG&E 2179	Master	For communication with older Cooper and Beckwith IEDs
PG&E 2179	Slave	For communication with the PG&E 2179-based SCADA Masters
Pusher	Slave	Facilitate the reading of data from one Slave and the immediate writing of these data to another Slave
RFL	Master	For communication with RFL 9300 and RFL 9745 IEDs
SEL®	Master	Includes protocols Fast Messaging, Fast Operate, SEL ASCII®, and FastSER. Supports capture of SEL® Standard Event Report Summaries and SEL® Full-length Standard Event Reports. Supports pass through of ASCII data directly from attached PC to SEL® relay, through Orion.
SEL-2030	Master	Supports Fast Messaging protocol to obtain SEL® relay data from an SEL-2030 or SEL-2032 Communication Processor
SPA Bus	Master	For ABB annunicator.
TejasV	Master	For communication with legacy Tejas Systems and Valmet Series V RTUs

Protocols Available Using Bit Synchronous-to-Byte Hardware Interface Board

Protocol	Master/ Slave	Notes
Betac	Slave	Can be either bit (synchronous) or byte (asynchronous); synchronous version requires external bit-to-byte converter board on either Orion5, Orion5r or OrionLX
Conitel	Master	Connection to legacy RTUs.
Conitel	Slave	-300 and 2020 versions; with external bit-to-byte converter board on either Orion5, Orion5r or OrionLX
CDCI	Master	With internal bit-to-byte converter card on Orion5r or OrionLX . Orion5 version with external bit-to-byte converter board available on request
CDCI	Slave	With internal bit-to-byte converter card on Orion5r or OrionLX. Orion5 version with external bit-to-byte converter board available on request
REDAC 70H	Slave	With internal bit-to-byte converter card on Orion5r or OrionLX. Orion5 version with external bit-to-byte converter board available on request

"Network Protocols" Available using Ethernet

Protocol	Client/ Server	Notes
		Automation
DNP3	Client (Master)	Compliant with Level 2
DNP3	Server (Slave)	Compliant with Level 2
Modbus	Master (Client)	Supports ASCII or RTU data format
Modbus	Slave (Server)	Supports ASCII or RTU data format
SEL®	Master	Transmits SEL® protocol over Ethernet to "port switch" Orion
		Web Pages
HTTP	Server	Supports serving out any HTML file residing in Orion. Includes a standard web page that presents an HTML table of all real-time data being polled by Orion.
SOE Data Logger	Server	Serves out a web page with an HTML table of archived time-stamped SOE data points.
ASCII IED Web	Server	Provides a web page for simplifying access of ASCII data directly from SEL® or Optimho relays. Supports access of all files and records, as well as real-time queries. Requires HTTP Server to also be loaded in Orion.
DNP WEB-server	Server	Provides an environment for developing customized web pages using data obtained by Orion or calculated by Orion. DNP3 is the mechanism used for data flow. This function is ordered as a software option and not as a protocol, but requires the HTTP Server protocol to be loaded in Orion.
XML WEB-server	Server	Provides an environment for developing customized web pages using data obtained by Orion or calculated by Orion. XML is the mechanism used for data flow. This function is ordered as a software option and not as a protocol, but requires the HTTP Server protocol to be loaded in Orion.
		Other Network Functions
PassThru Interface	Server (Slave)	Enables a computer, attached to Orion over an Ethernet or PPP connection, to establish a direct pass through connection to one of the rear serial ports on Orion. This function is ordered as a software option and not a protocol. Requires PassThru Interface Client (Master) on the serial port used for pass through, connected to the IED. Usually works with telnet. May require Serial IP or other software utility when PC programs not designed to run over a network are used (e.g. ABB WinECP). See diagrams on final page of this document for clarification.
FTP	Server	File Transfer Protocol. Available for order as a separate protocol for serial PPP applications, included with purchase of ENET or 2ENET hardware options.
SNMP	Server	Enables an SNMP client to monitor and diagnose Orion (config active, active status, points configured, etc.)
SNTP	Client	For receiving time synchronization over Ethernet from an SNTP server; included with purchase of ENET or 2ENET hardware options.
SNTP	Server	For sending time synchronization over Ethernet to SNTP clients; included with purchase of ENET or 2ENET hardware options.
telnet	Server	Supports the pass through of serial ASCII and other serial protocols transparently over networks. A typical application would be where Ethernet is used to connect to Orion. A telnet session (telnet [Orion IP Address]) enables the ASCII data to flow from the PC to Orion over Ethernet. This functionality is identical to a direct serial connection to the front diagnostic port of Orion, with the addition of password protection for denial of service to unauthorized personnel. Included with purchase of ENET, 2ENET hardware options or PPP software option.
XML	Server	Provides mechanism to move data from Orion data base to web pages

Orion RTU Programmable Logic and Math

A complete logic and math editor in Orion can be used to intelligently filter and condition data to make alarming "smarter" and to implement control schemes. For example:

Smart Alarming

Alarm "windows" with high and low thresholds can be set up in Orion, reducing the recording of multiple ON and OFF alarm states.

Timers can be applied to certain alarms to ensure they are ON for a period of time prior to notification

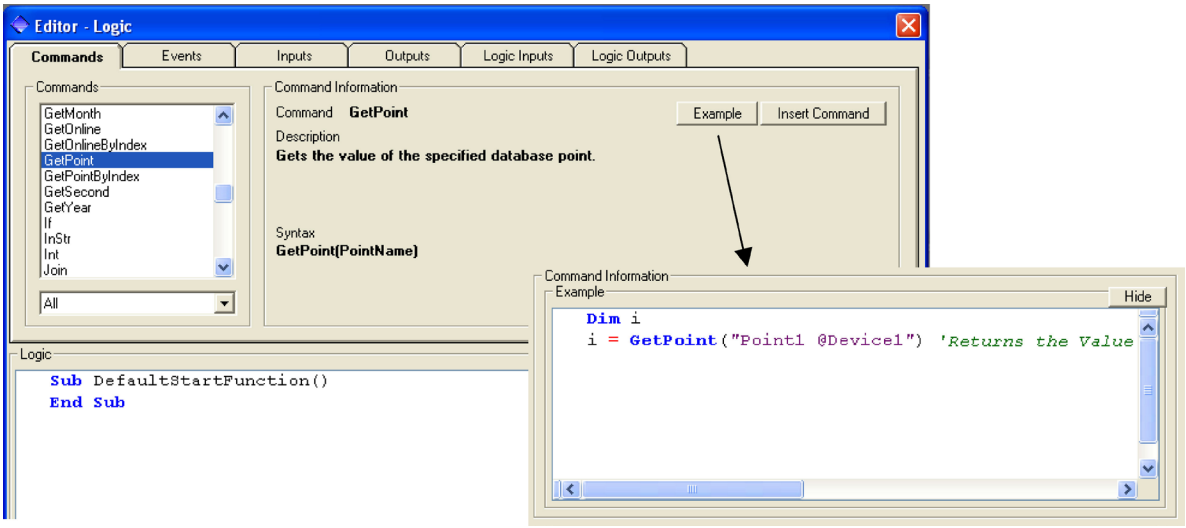
"AND" and "OR" functions can be applied to multiple alarms to make them conditional with respect to other alarms

Intelligence can be applied to groups of alarms to reduce alarm load. For example, if all IEDs go into low power supply voltage at the same time, Orion could be configured to point the user to the substation battery or charger first.

Alarms can be time-stamped in synchronized Orions to simplify analysis of higher-speed event trails

Control Schemes

The real time data resident in Orion can be logically manipulated to intelligently control substation equipment. For instance, tie breaker control can be implemented by reading data from IEDs (source low, breaker open., fault occurred, interlock status, etc.), implementing logic and writing control outputs.



Orion Math and Logic includes a description and example of all commands

Data Archival

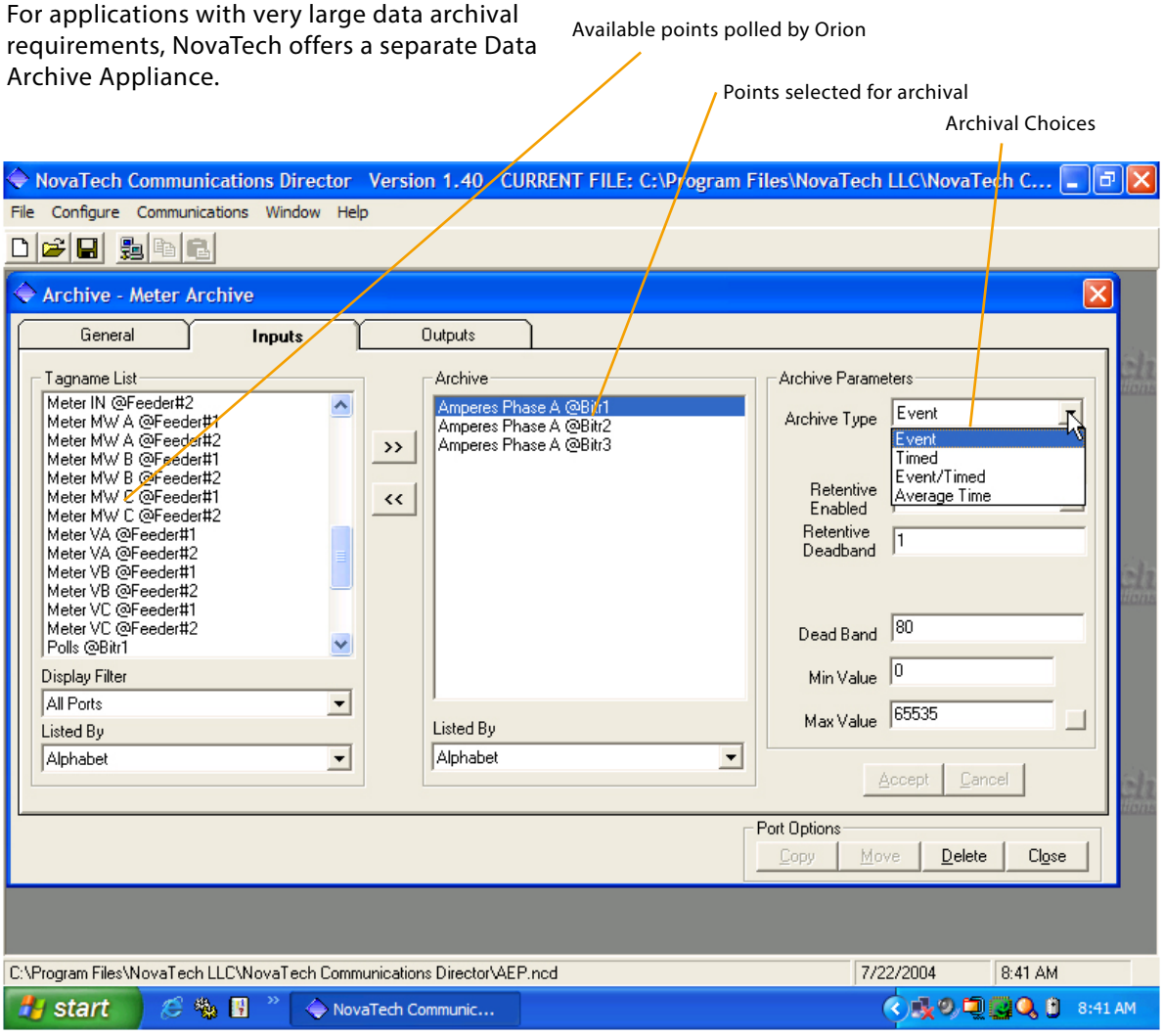
All Orions are provided with a large internal non-volatile memory where any real-time polled data and calculated data can be archived and retrieved for future use.

The following methods can be used to archive data in Orion:

- Archive data based on a change of a discrete data point
- Archive data based on time
- Archive data based on time or a change event

All archived data are stored with a time-stamp. If archived data originated from an IED with time-stamping capability, the time stamps from the IED are stored.

For applications with very large data archival requirements, NovaTech offers a separate Data Archive Appliance.



Orion Local HMI

The NovaTech Orion RTU supports two levels of HMI; a no-cost, terminal emulation-based diagnostic HMI and an operational web page-based HMI with standard and custom web pages . The OrionLX also provides a web page-based diagnostic HMI

Level 1: Online Diagnostic Menus

A simple, no-cost HMI, the online Orion diagnostic menus allow users to view:

- Values of real-time data polled by Orion from IEDs
- Values of real-time data presented to SCADA Masters
- The structure of communications transactions to and from Orion (communications analyzer)
- Communication statistics (polls, responses, comm fail)
- Event logs (all actions done by the Orion or to Orion)
- Other system information (protocols in Orion, system loading, etc)

These menus also enable users to upload and download Orion configurations. No special software needs to be installed on the user PC, and all of the above data are provided at no additional charge. These menus are accessible using standard terminal emulation. Connections can be made serially into the front maintenance port, to any rear RS-232 port, to the Ethernet port in a terminal emulation session, or to the phone modem port.

Level 2: Orion WEBserver

When equipped with Ethernet or a phone modem, the HTTP protocol, and the Orion WEBserver option, Orion can serve out web pages which can be viewed with any standard web browser. Three types of pages can be made available:

1) Orions with HTTP protocol serve out a standard page containing a table of real-time data polled by Orion from attached IEDs.

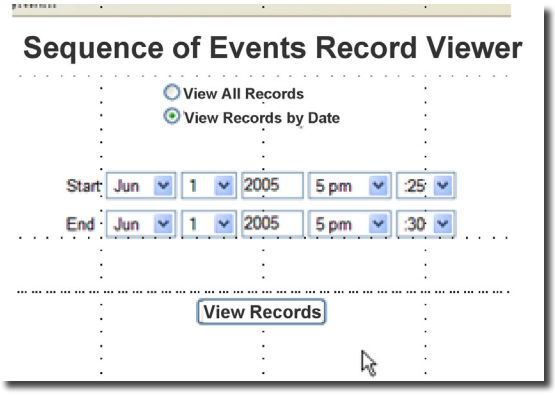
2) When the “ASCII IED Web” option is ordered, real-time engineering data from SEL® relays or Optimho relays, such as settings and fault records, can be accessed from the web page and viewed within the web page.

3) Customized web pages can be developed by the NovaTech System Engineering group or by users.

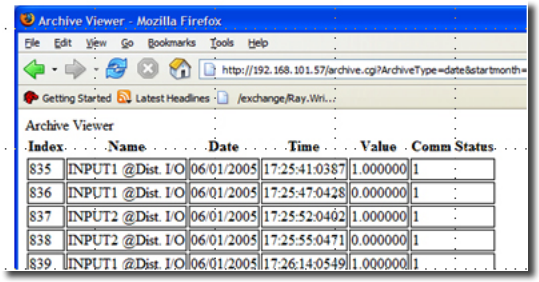
These pages can be engineered to present data residing within Orion in a virtually unlimited number of ways; tables, graphics, one-line diagrams, etc.

Sequence of Events (SOE) Recording

The Orion Smart RTU can be provided with software to capture, store and report time-stamped events to a resolution of 1ms. Events originating in I/O or in IEDs are polled by Orion and configured for storage and reporting. Users select the start date / time and the end date / time to retrieve the desired records in a web page viewable by a browser. Records can be also exported to a .xls spreadsheet.

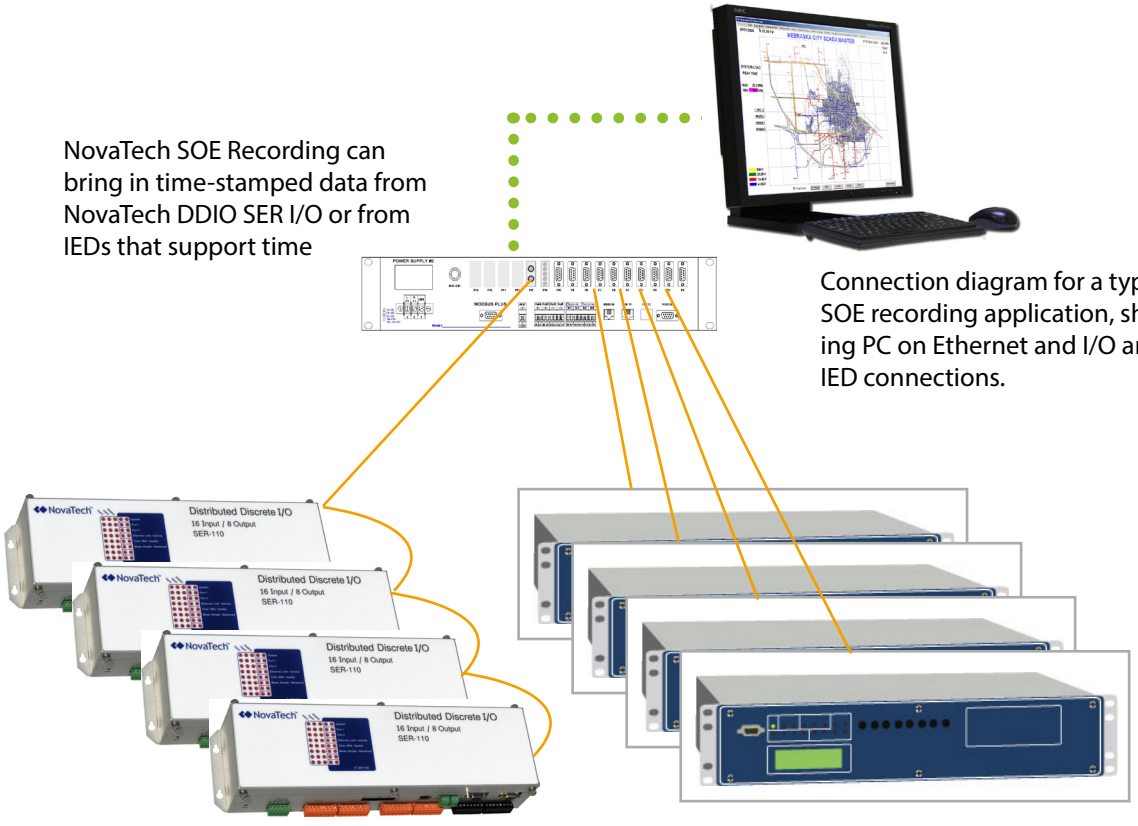


Enter Start and End Time



View contiguous records on a web page using a browser

NovaTech SOE Recording can bring in time-stamped data from NovaTech DDIO SER I/O or from IEDs that support time

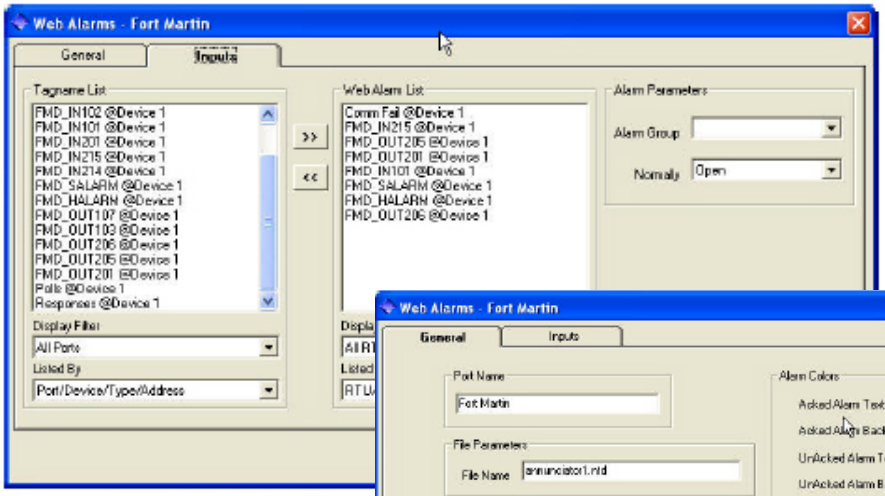


Connection diagram for a typical SOE recording application, showing PC on Ethernet and I/O and IED connections.

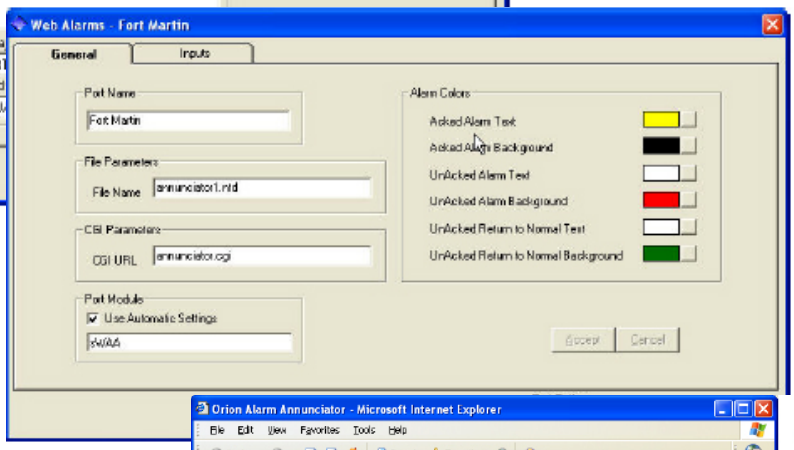
Alarm Annunciation

The Orion Smart RTU can be provided with software to annunciate substation alarms. The functionality is similar to hard-wired alarm annunciators; the main difference is that Orion serves out alarms in color-coded text, in a web page viewable by a browser.

Alarms originating in I/O or in IEDs are polled by Orion and configured for capture, storage and display parameters. Users select whether to view all alarms or to sort alarms by group, date or name.

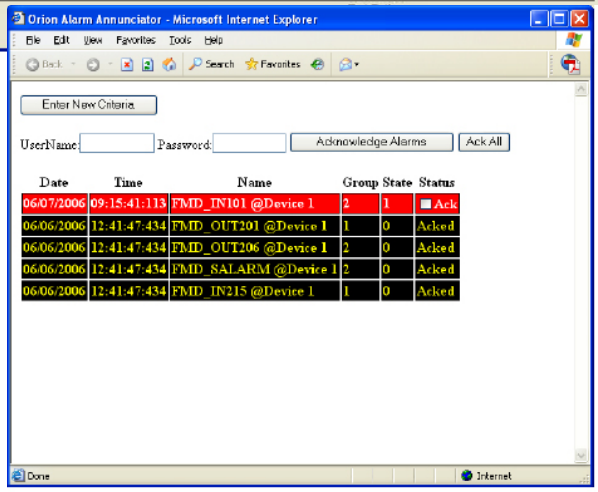


Select Alarm points to be captured and stored



Configure display and storage parameters

Browse opening web page and select how to view alarms



View alarms

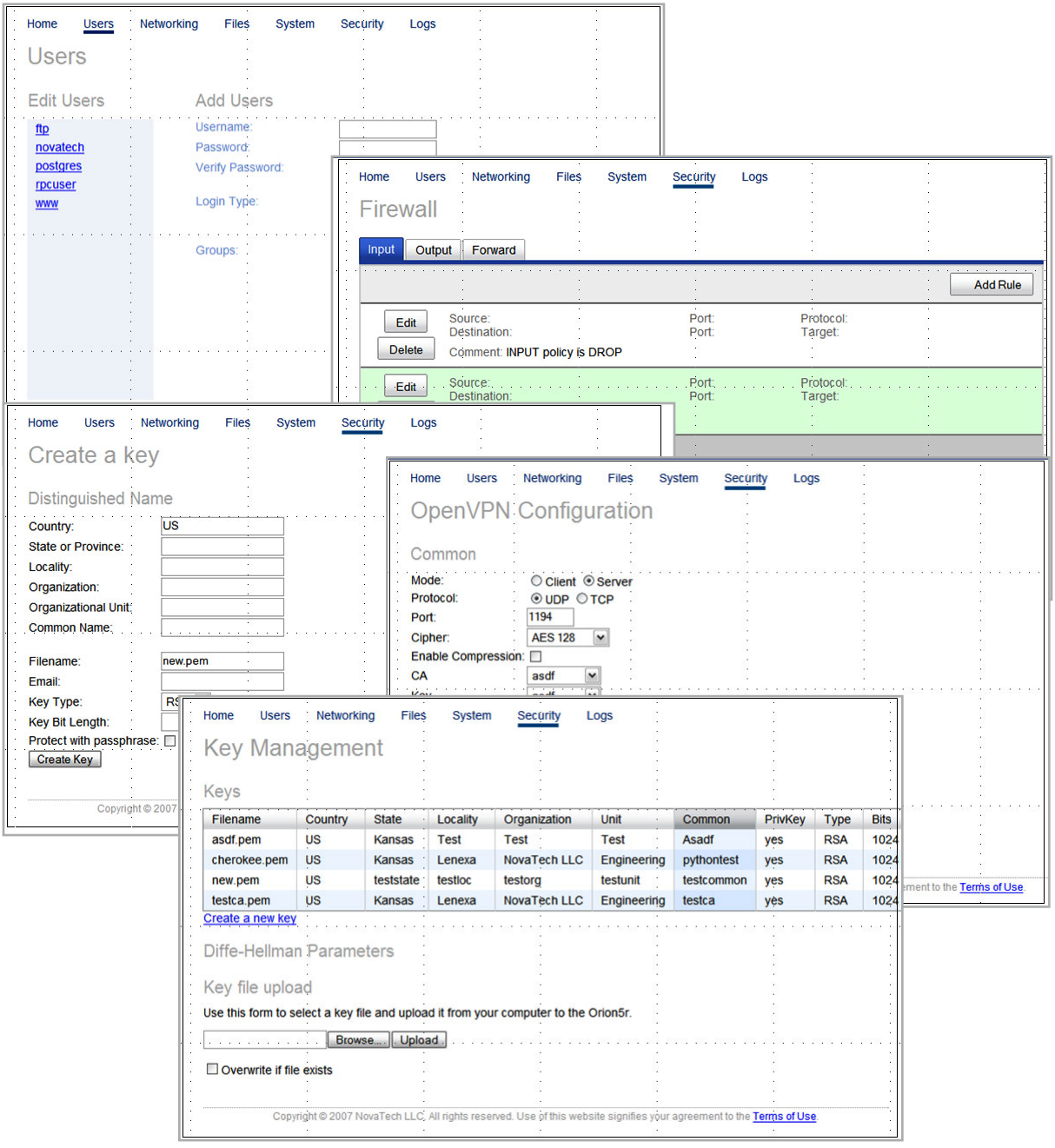
Orion RTU Security

The OrionLX is provided with a Cyber Security package including:

- Multiple Users with Levels of Access
- Remote Authentication Support
- Firewall Support
- VPN and Encryption Protocol Support
- Key Management
- Logging

This security package provides support for NERC CIP compliance.

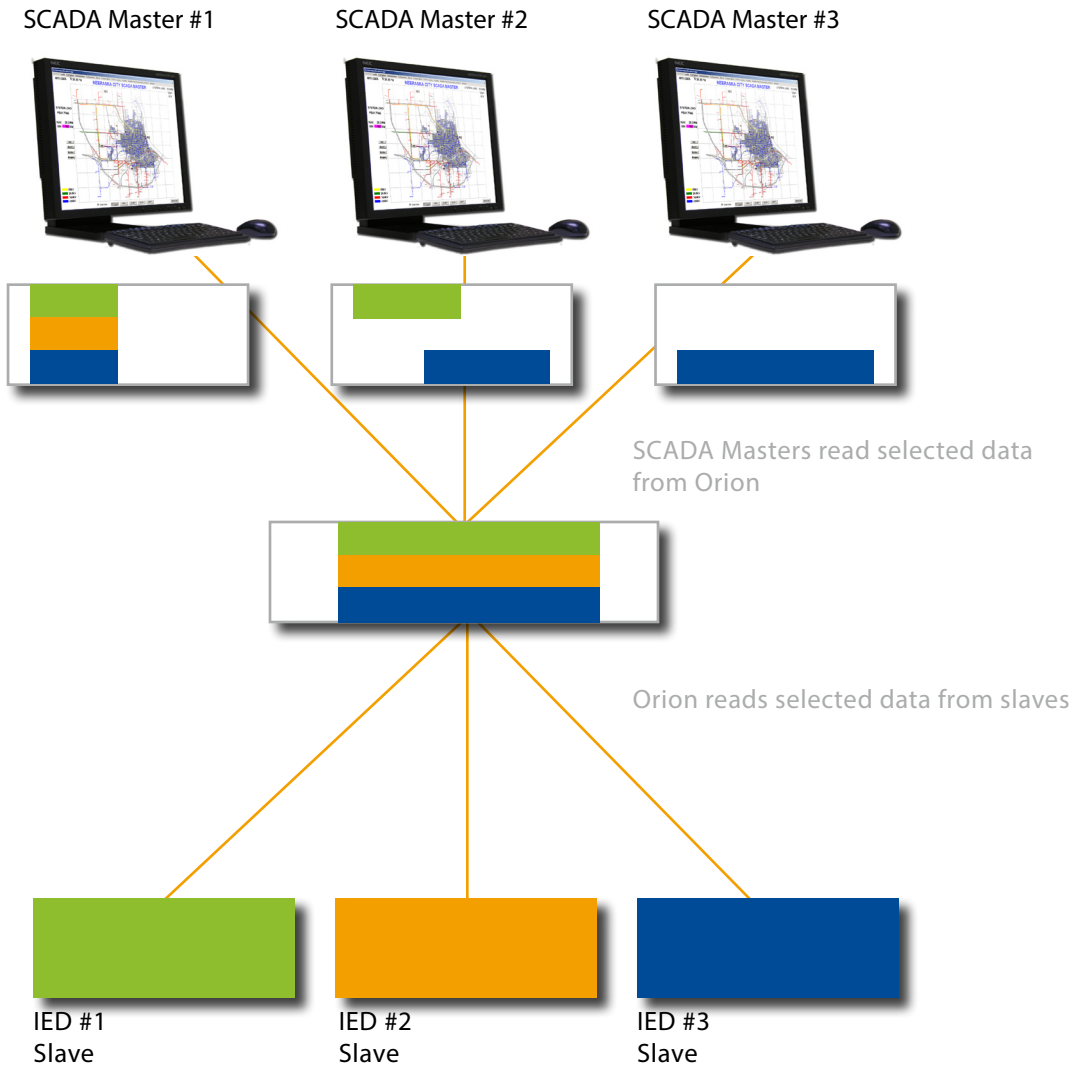
Security parameters are entered online into web pages served from Orion. Security configuration screens are captured below:



Software Feature:
Serving Data to Multiple SCADA Masters

Orion can be configured to present each SCADA Master a subset of its available data. A separate buffer for each Master can be maintained in Orion, enabling each to reset accumulators and counters without affecting the others.

Each SCADA Master can also poll Orion using a different protocol.



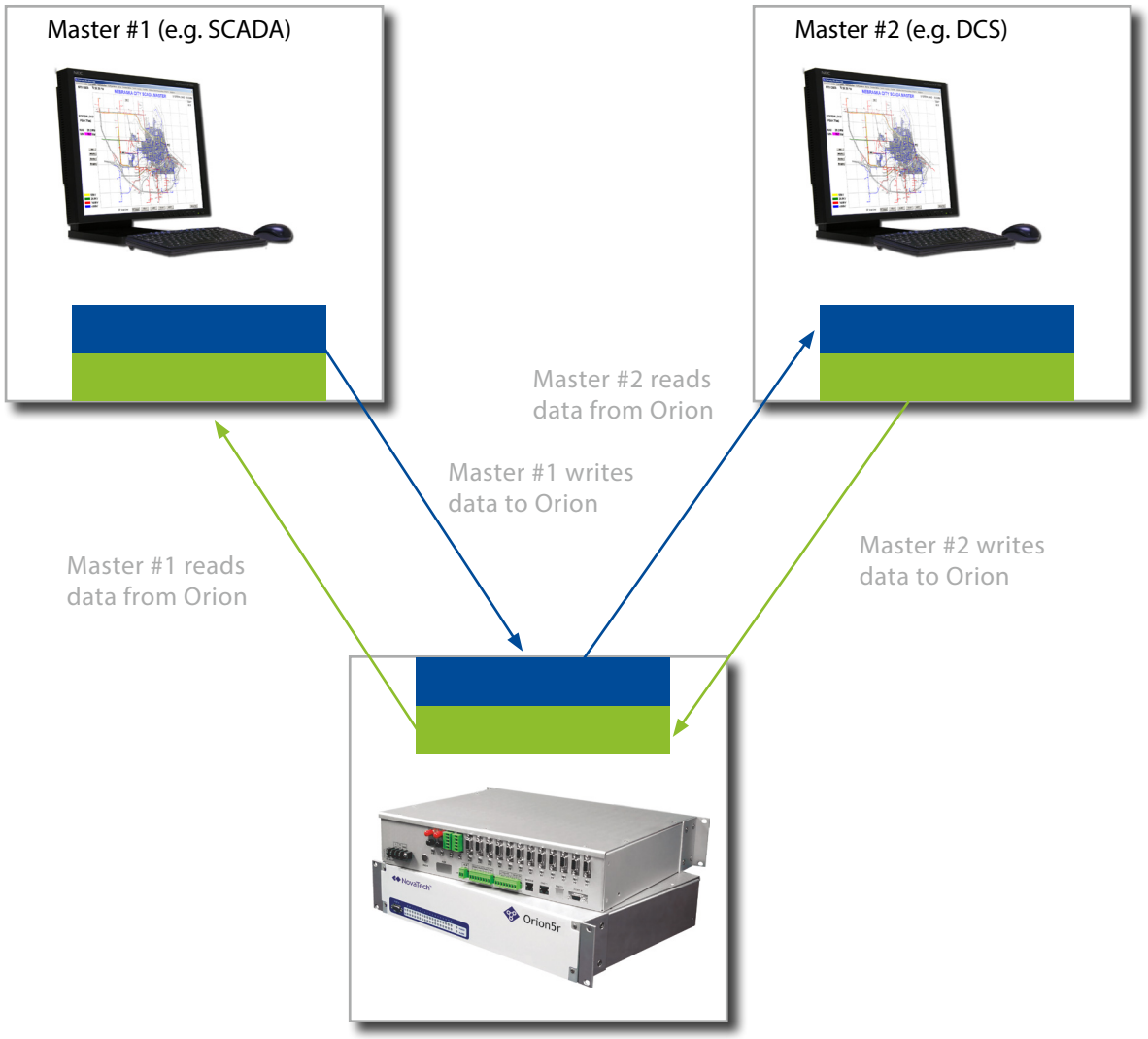
Software Feature:
Orion Serving as a Slave to Multiple Masters

Application example:

Master #1 is a SCADA system. Master #2 is a powerplant Distributed Control System (DCS).

The SCADA system writes power setpoints using DNP3 to Orion which are read by the DCS using Modbus.

The DCS writes real-time operating parameters using Modbus to Orion which are read by the SCADA system using DNP3

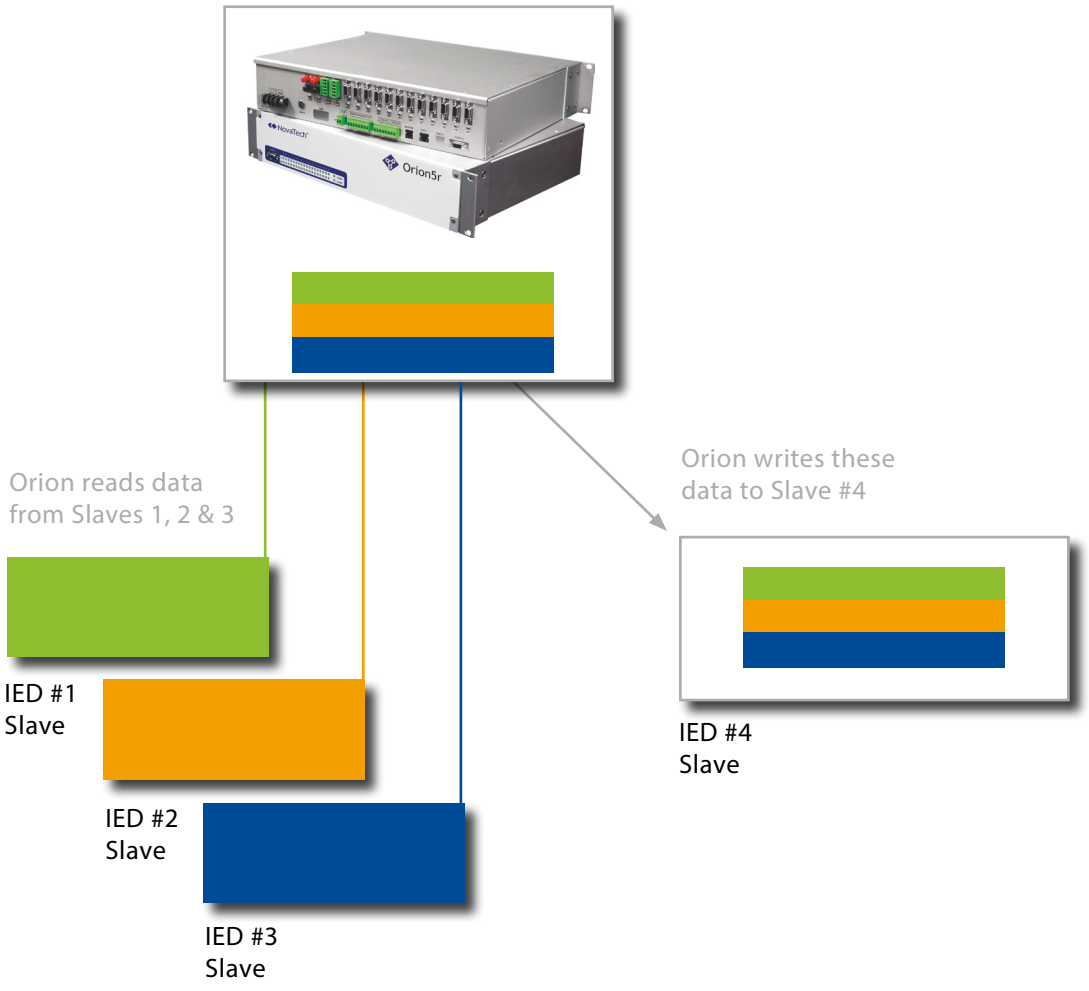


Software Feature:
Orion Serving as a Master to Multiple Slaves

Application example:

Slaves #1-3 are SEL® relays using SEL® protocol. Slave #4 is another relay that talks DNP3.

Orion reads data from slaves #1-3 using SEL® protocol and wrties these data to Slave #4 using DNP3.



Software Feature:
Smart Reading of Metering Data

Orion is available with a preconfigured "logic-Pak" feature to make it possible to read metering values from one IED or a second IED, and to make the transition seamless. This feature makes it possible for SCADA to receive an uninterrupted flow of real-time metering data even if the primary IED providing that data is not on-line.

The feature is set up as follows:

1) An IED is selected as the primary source for metering data (A, V, VAr, W, demand, peak, etc)

2) A second IED is selected as the secondary source for metering data

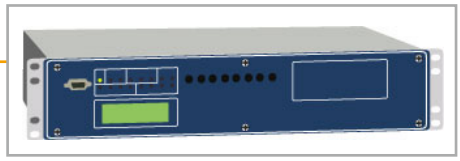
3) A correlation is established between the metering points in the primary IED and the secondary IED. It is possible to use arithmetic scaling and data conversion to present the metering values in a common format even if the format is different from each IED.

4) A discrete value is monitored by Orion to determine if the primary IED is on-line.

5) Configuration complete. Orion will automatically obtain metering values from the secondary IED source when the primary IED source is not online.

Primary source for metering data

SCADA Master



Secondary source for metering data

Orion can provide the SCADA master with metering data from either the primary or secondary source, transparently

Software feature: Oscillographic File Management

Orion offers a number of techniques for users to access and view oscillographic records from relays, meters and recorders.

Retrieving SEL® Full-Length Records

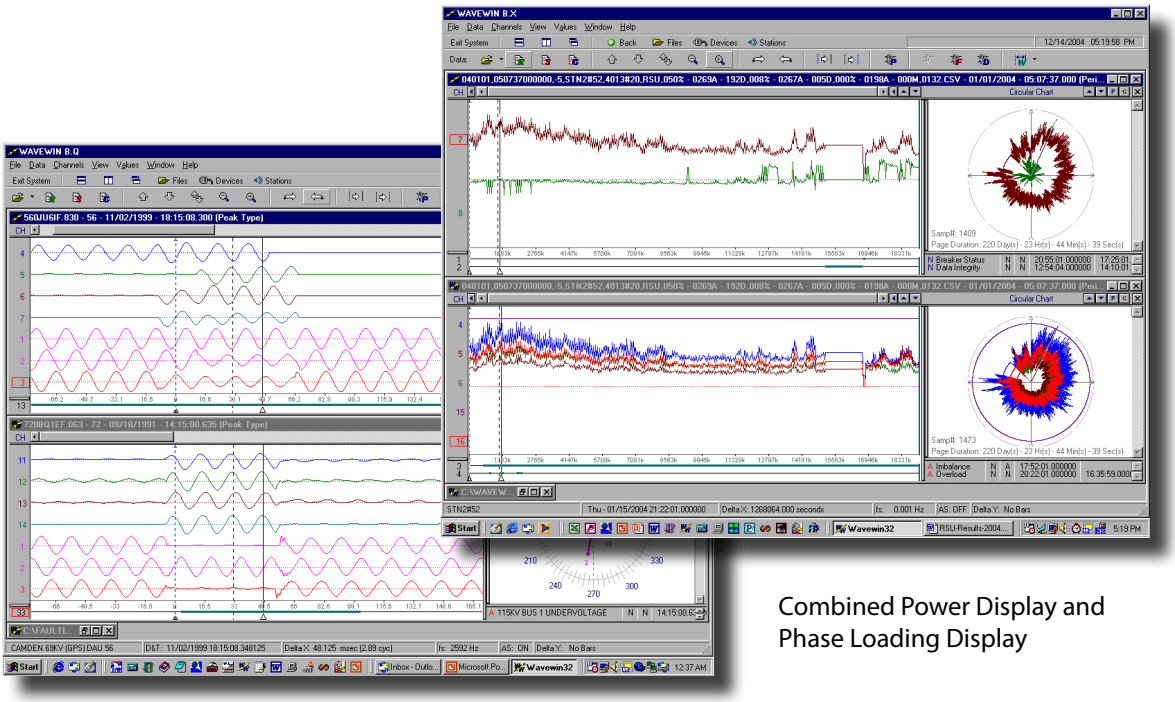
A configuration selection in the Orion interface to SEL® relays ("Event Record"), along with the Data Logger software option ("I-Log"), enables SEL® full-length event records to be retrieved and stored in Orion non-volatile memory. Users can gain access this event log file several ways:

1) The NovaTech utility program, NT-FTP, can automatically retrieve the event log file in Orion, parse and name individual events, and forward to any networked PC for user analysis.
2) Orion can serve out the records attached to a web page.
3) Users can retrieve the event log file from Orion using .ftp
4) Using the I-Dial software option, Orion can dial out to a desgnated PC, make the connection and transfer the file out (in a similar fashion to the SEL-20xx).

The Orion-developed driver to access full-length records was designed to work simultaneously with the driver for real-time SCADA data access and SCADA control. Acceptable SCADA performance is maintained during event report uploads.

Access to Records Using Orion as a Port Switch

Orion can also serve as a true port switch, enabling the manufacturers' software to be used to directly retrieve records. Connections using phone modems, Ethernet, or serial ports are all supported. Please see page 20 for protocols and connections using Orion as a pass-through port switch.



Typical Waveform Capture from Meter or Protective Relay viewed with third-party software

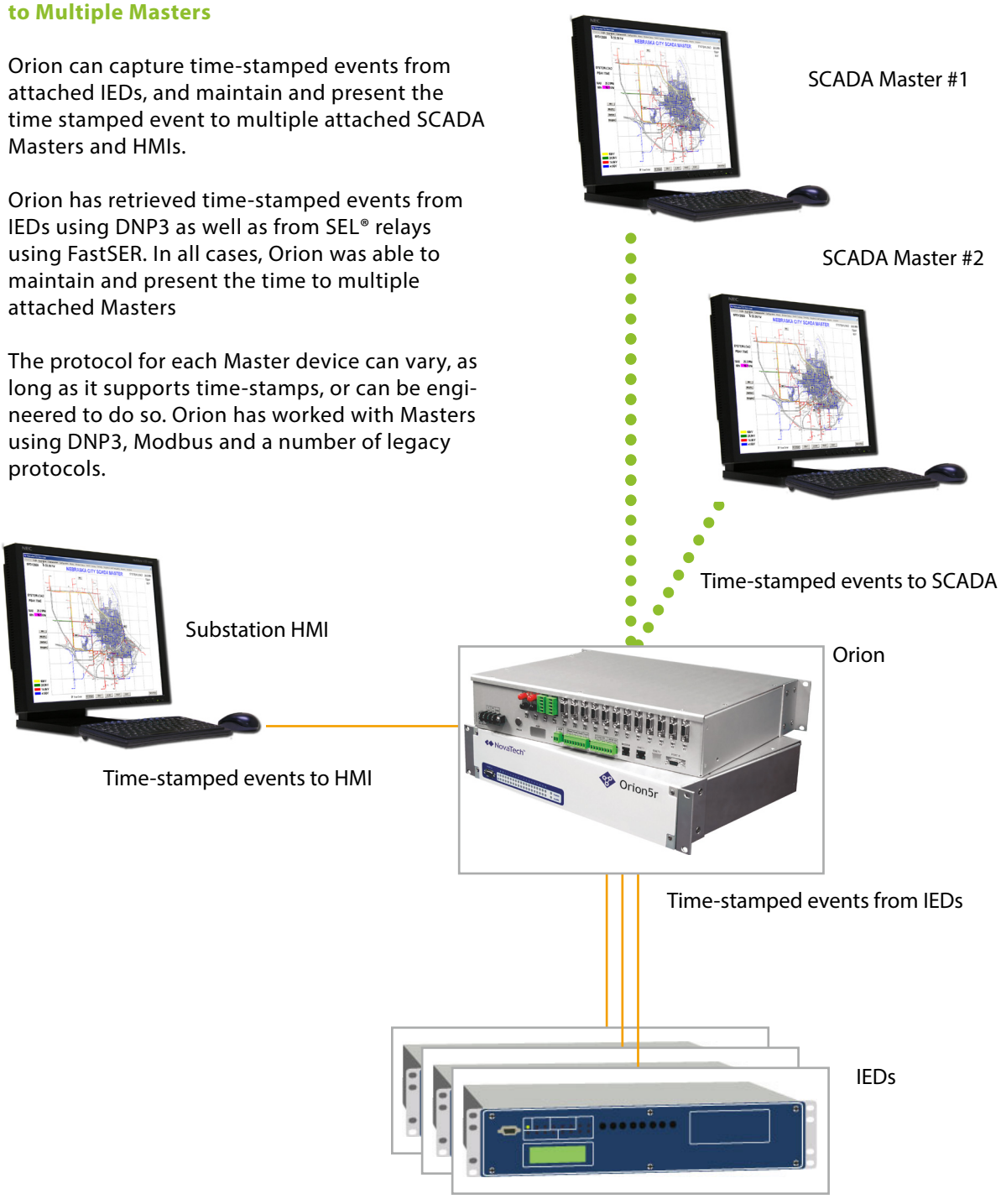
Combined Power Display and Phase Loading Display

Software Feature: Capture Time Stamps from IEDs and Provide to Multiple Masters

Orion can capture time-stamped events from attached IEDs, and maintain and present the time stamped event to multiple attached SCADA Masters and HMIs.

Orion has retrieved time-stamped events from IEDs using DNP3 as well as from SEL® relays using FastSER. In all cases, Orion was able to maintain and present the time to multiple attached Masters

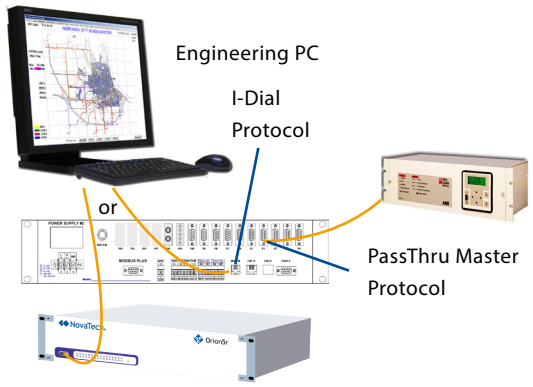
The protocol for each Master device can vary, as long as it supports time-stamps, or can be engineered to do so. Orion has worked with Masters using DNP3, Modbus and a number of legacy protocols.



Software Feature:
Transparent IED Pass Through (Port Switch)

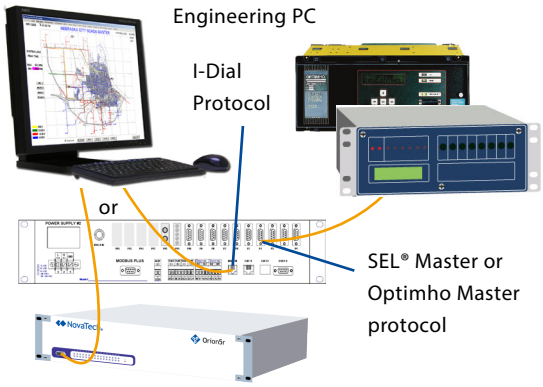
The Orion RTU can be provided with protocols and other software to make it possible to use the Orion as a port switch. This makes it possible to make a single local or remote connection to Orion and gain access to engineering data using the IED manufacturers' software. The following diagrams detail four ways pass through can be configured.

Case 1:
-Serial connection from PC to Orion (direct serial or dial-in modem)
-Serial connection to IED (other than Optimho or SEL®)



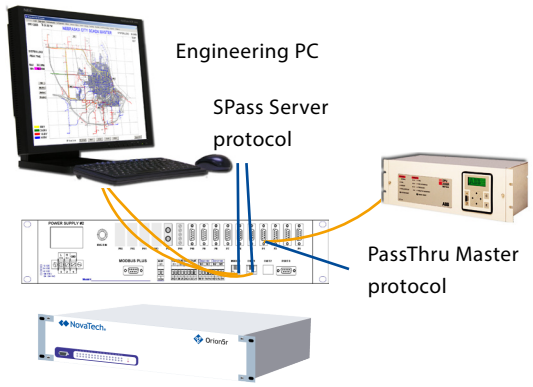
No protocol is required when connecting to front port

Case 2
-Serial connection from PC to Orion (direct serial or dial-in modem)
-Serial connection to Optimho or SEL®

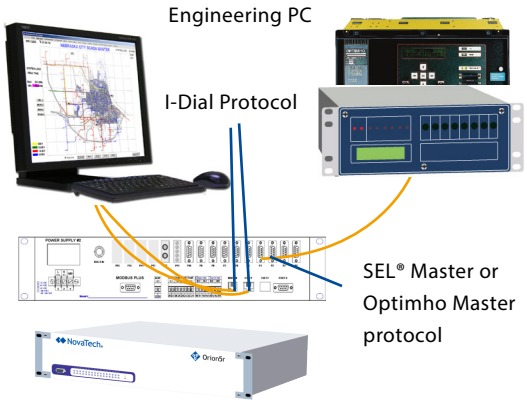


No protocol is required when connecting to front port

Case 3
-Ethernet or PPP phone connection from PC to Orion
-Serial connection to IED (other than Optimho or SEL®)



Case 4
-Ethernet or PPP phone connection from PC to Orion
-Serial connection to Optimho or SEL®



NovaTech Communication Director (NCD)

NCD provides complete off-line configuration of the Orion RTU. NCD also includes a terminal emulation program to perform online operations

All Orion RTUs are shipped with a copy of NCD, which is provided at no additional charge. All Orion models are configured with the same NCD.

Basic operation

1) Load NCD Software on your PC
2) Develop Orion configuration off-line on your PC
3) Go online in terminal emulation mode
4) Download Orion configuration from your PC to Orion
5) Activate configuration in Orion

Offline operations

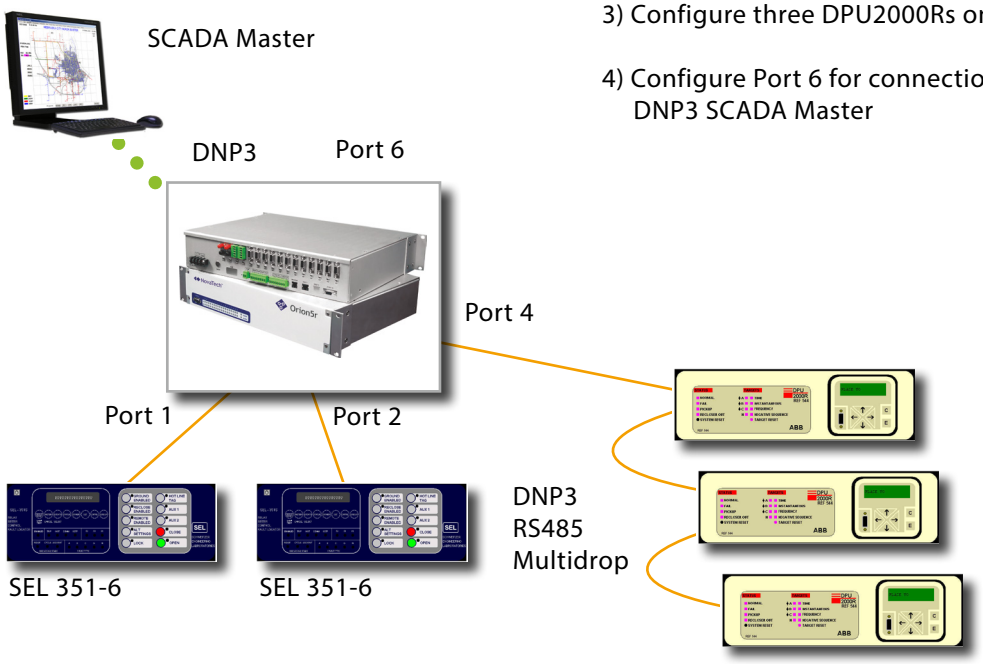
- General settings (passwords, log attempts, system features)
- Ports configuration (RS-232, RS-485, fiber optic and Ethernet ports)
- Selection of points to be read from attached IEDs
- Selection of points to be presented to SCADA Master(s)
- Physical I/O configuration
- IRIG-B configuration
- Archive data configuration
- Logic and math configuration
- Configuration of special applications (e.g. Automatic Transfer and Distribution Automation)

Online operations

- Terminal Emulation via Web browser
- Upload and download Orion configurations
- View values of real-time data polled by Orion from IEDs
- View values of real-time data presented to SCADA Masters
- Monitor the structure of communications transactions to and from Orion (communications analyzer)
- View communication statistics (polls, responses, comm fail)
- View event logs (all actions done by the Orion or to Orion)
- View other system information (protocols in Orion, system loading, etc)
- Force inputs and outputs to desired values for testing

NCD Configuration Example

Note: A complete configuration guide is available for Orion. The following configuration example is an excerpt from the manual.



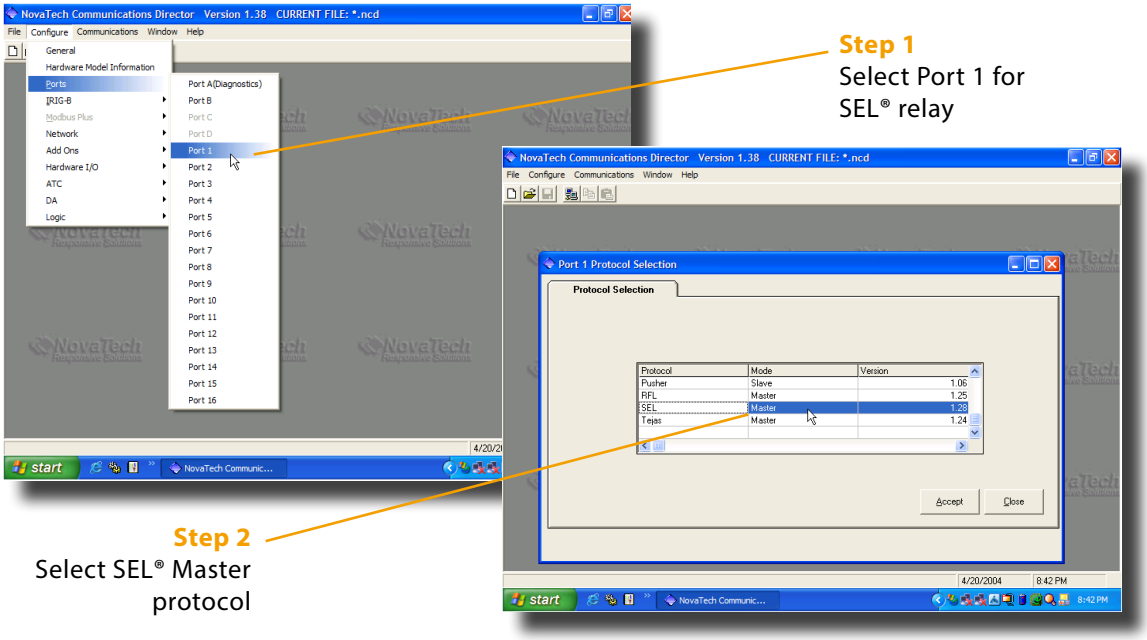
Basic Configuration Steps

1) Configure SEL351-6 on Port 1

2) Configure SEL351-6 on Port 2
(copy, paste, edit)

3) Configure three DPU2000Rs on Port 4

4) Configure Port 6 for connection to
DNP3 SCADA Master

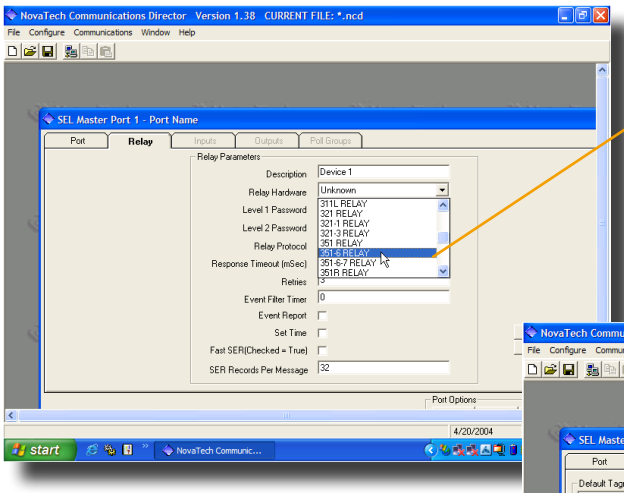


Step 1
Select Port 1 for
SEL® relay

Step 2
Select SEL® Master
protocol

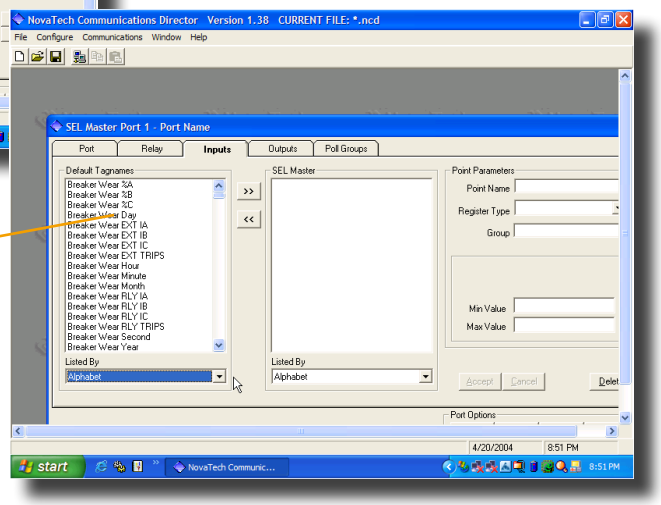
NovaTech Communication Director (NCD)

Configuration Example (cont'd)

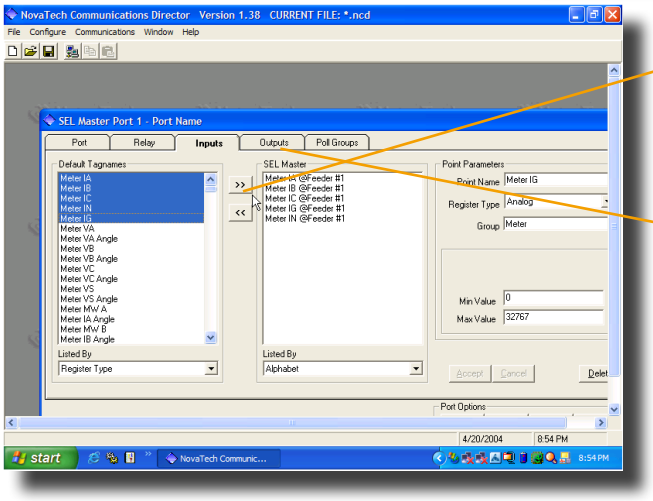


Step 3
Select SEL351-6 from pick list. Enter relay name, password and other relay-specific parameters (read events, read SER, etc)

Step 4
Configure communication port parameters under "Port" tab.



Step 5
Under the "Inputs" tab, review the data points in the SEL-351-6 to be read by Orion. NCD contains pre-configured points lists for over 400 IEDs, included nearly all current SEL® relay products



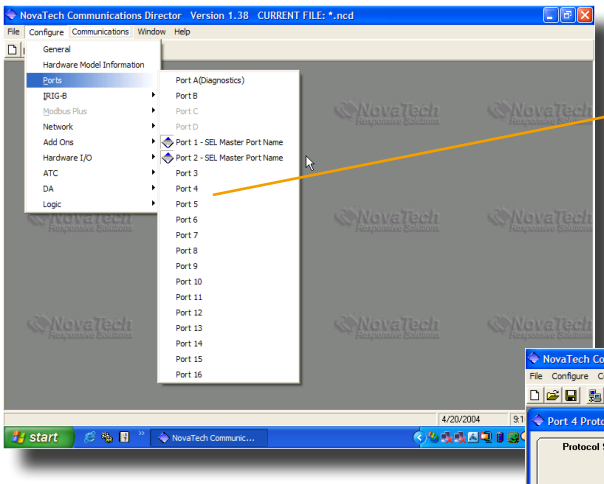
Step 6
Highlight the desired points and move them to the "read" section. Then, select other inputs to be read.

Step 7
In the same manner, under the "Outputs" tab, select the "output" points in the relay that Orion must control

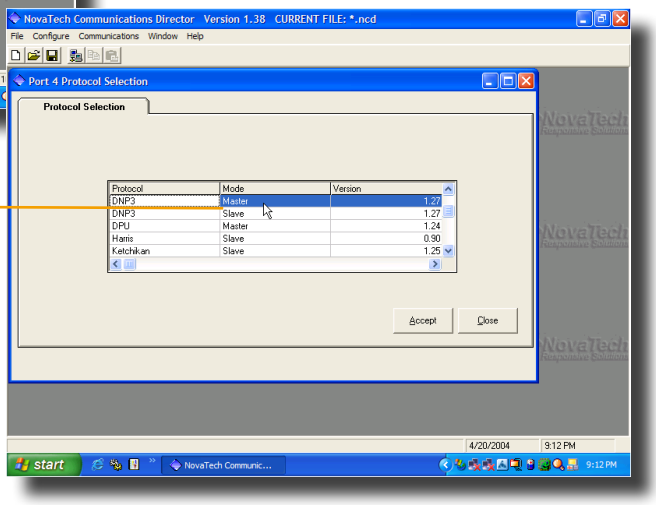
At this point, the first SEL-351-6 is now configured. Cut and paste the configuration to Port 2 for the second SEL-351-6, make the necessary relay name change, and move to the configuration of the DPU2000Rs.

NovaTech Communication Director (NCD)

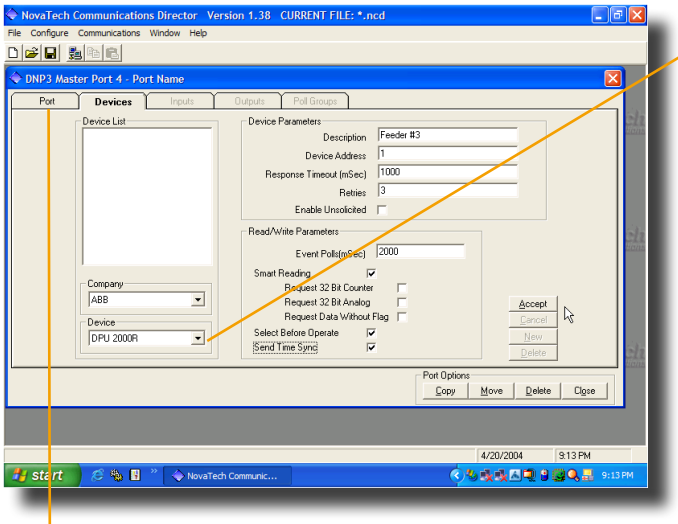
Configuration Example (cont'd)



Step 8
Select Port 4 for DPU2000R relays Notice that the basic configuration of two SEL351-6 relays is already completed



Step 9
Select protocol for the DPU2000R port. Orion will act as a DNP3 Master and poll the the three multidropped DPU2000R Slaves.

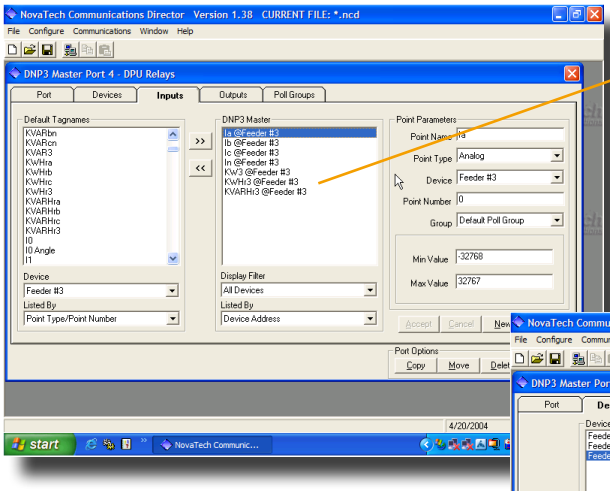


Step 10
Select company (ABB), device (DPU2000R), name relay and configure other parameters.

Step 11
Configure port parameters under "Port" tab.

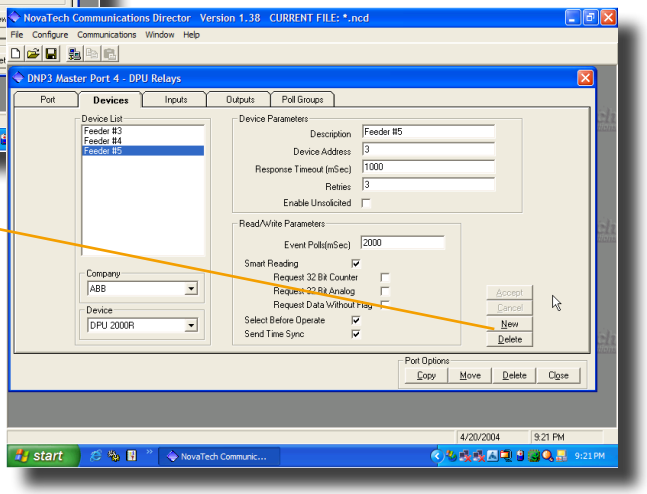
NovaTech Communication Director (NCD)

Configuration Example (cont'd)



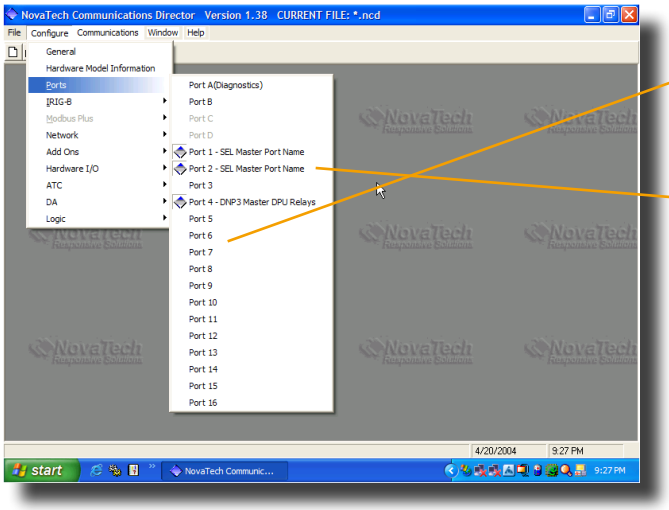
Step 12
Select the points in the DPU2000R ("inputs") to be polled by Orion

Step 13
Select the outputs to be controlled by Orion



Step 14
Use the "New" command to add two more DPU2000R relays to the same RS-485 port. For each relay, configure the inputs and outputs to be read and written to.

At this point, the three DPU2000Rs are configured.

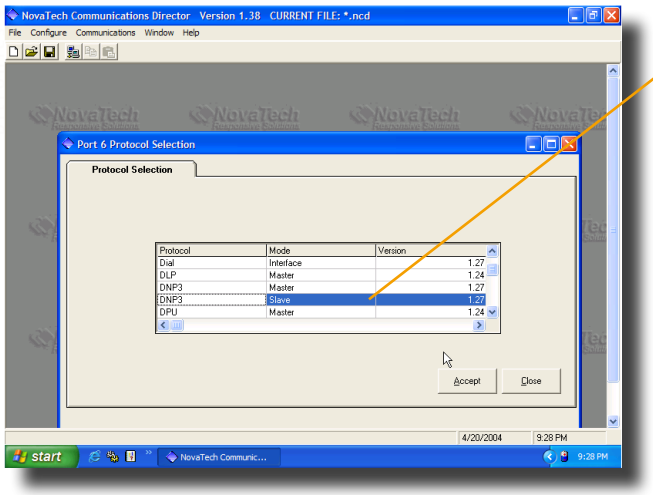


Step 15
Configure Port 6 as the port to be connected to the SCADA Master

Notice that basic configurations of SEL® and ABB relays are completed

NovaTech Communication Director (NCD)

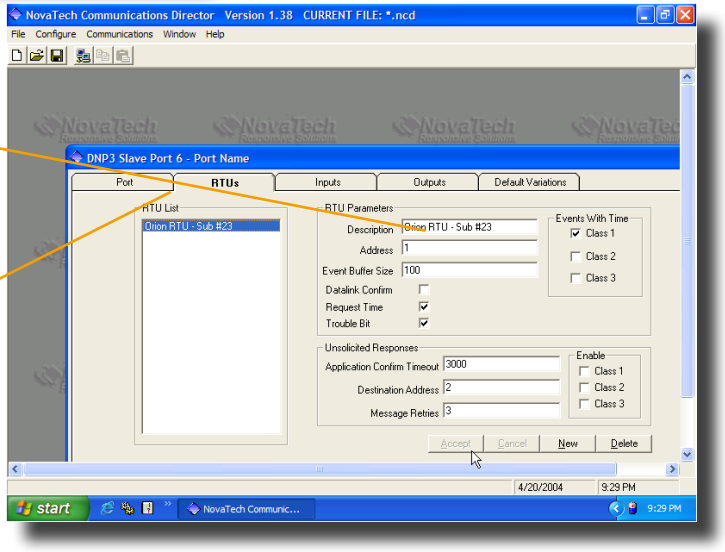
Configuration Example (cont'd)



Step 16
Select SCADA protocol. Orion will act as a DNP3 Slave when connected to the DNP3 SCADA Master.

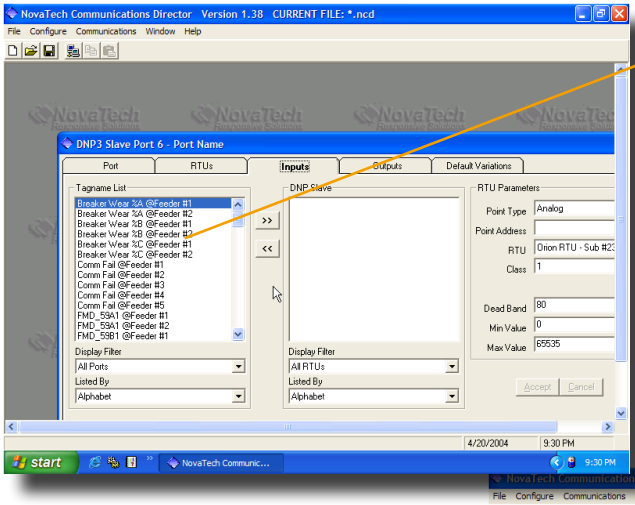
Step 17
Enter a name for Orion and configure address and other parameters.

Step 18
Configure port parameters under "Port" tab.



NovaTech Communication Director (NCD)

Configuration Example (cont'd)

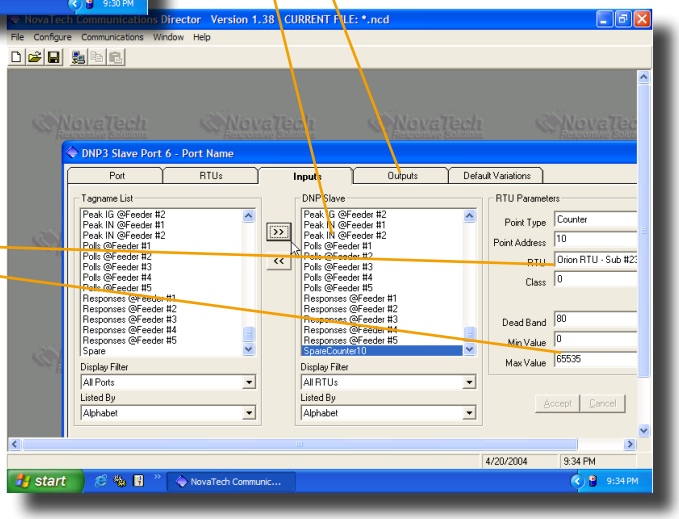


Step 19

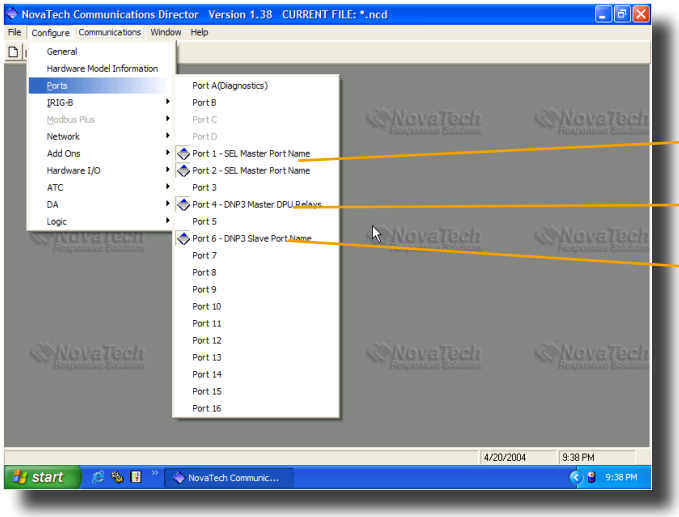
These are all of the points from the SEL® and ABB relays that have been selected for Orion to poll

Select the points to be available to the SCADA Master. These can be a subset of the complete list. Multiple masters can each have their own subset.

Also select outputs for SCADA to write to.



Each of the points selected for SCADA to read or selected for SCADA to control can be individually scaled. The addresses of each can be also be entered to match SCADA configuration.



The basic configuration of this Orion RTU is now complete.

SEL® Relays on Ports 1 and 2

DPU Relays on Port 4

SCADA Master attached to Port 6

Please see Orion Configuration Guide for more details.

Orion Diagnostic and Troubleshooting Tools

The Orion RTU includes extensive diagnostic and troubleshooting tools, including automatic communications statistics, a built-in communications analyzer, a "force values" function and event logging. All these tools can be used locally or remotely without any special software or additional customer investment. NovaTech Communication Director (NCD) includes all the tools. Each is described below.

Automatic Communications Statistics

The Orion configuration software automatically inserts three communications statistics for each attached IED. These are "Polls" and "Responses" counters and a "Comm Fail" discrete. These data can be viewed while online with Orion. These data can also be presented to SCADA masters, the local HMI or to remote workstations. When combined with Orion Math and Logic, schemes can be created to initiate alternate actions if comm fail occurs.

Orion Built-In Communications Analyzer

Each byte associated with commands and response between Orion and attached IEDs, or between Orion and SCADA, can be viewed in real time while online. This feature makes it easy to determine whether commands are being sent properly and responses are being returned properly.

Force Inputs and Outputs

Any polled analog or discrete point can be "forced" to a user-defined value. Any configured output point can also be "forced" to an ON or OFF state. A timer can be set for how long the values remain forced. These "Force" functions simplify troubleshooting by reducing the need to apply real voltages and currents to Orion or to attached IEDs.

Orion Event Logging

Orion5r supports an internal event log for tracking power-up, thread loading, and access events. Status point changes and sequence of events data can also be archived.

Local and Remote Access without Special Software

All online diagnostic features, as well as the file upload and download features, are available via terminal emulation connection on the local maintenance port or dial-up, or via Telnet over the Ethernet port or dial-up (via PPP). Once connected, all diagnostic options are selectable through an intuitive text menu. Text in the diagnostic menus, including raw communications monitoring, can be captured to file through NCD or other terminal emulator program menus to allow for documentation or for off-line analysis at a later time.

Ethernet Diagnostics

A built-in software utility is provided to diagnose Ethernet transactions.

Specification Summary – NovaTech Orion RTUs

	Orion5	Orion5r/OrionLX
		 
Size	6.4"wide x 5.5" high X 5.5" deep (6.7" deep with extended case)	2U, 19" rack mount, 13" deep
Ethernet Ports	One optional, 10Mbps copper	One or two optional, 10/100Mbps copper on Orion 5r; Optional 100FX on OrionLX
Serial Ports	One port standard, plus up to two of any of the following boards: (4) RS-232 (3) RS-232 (1) RS-485 (2) RS-232 and (2) RS-485 (2) Fiber Optic (4) Fiber Optic	One port standard. Each of 16 optional expansion ports individually provided as either RS-232, RS-485/422 or fiber optic modules.
Protocol Flexibility on Serial Ports Ethernet ports	Each serial port can be configured for any of the available protocols in master or slave. All ports can be active at one time. Ethernet ports support multiple protocols simultaneously	Each serial port can be configured for any of the available protocols in master or slave. All ports can be active at one time. Ethernet ports support multiple protocols simultaneously
Bit Synchronous protocols	"Bit Board" with one port, available as an external module	External Bit Board as on the Orion5, plus internal module (inserted into serial port slot). Multiple boards can be inserted into any one slot
Modbus Plus	N/A	One port on Orion5r; Not available on OrionLX
Internal Dial In/Out modem	Built-in dial-up, v.34 33.6kbps	Built-in dial-up, v.34 33.6Kbps
IRIG-B	N/A	Modulated or un-modulated input, un-modulated output
SCADA Modem	External Bell 202	External Bell 202
Physical Inputs/ Outputs	4 in/2 out standard. Optional distributed I/O modules connected via RS-232, RS-485, fiber optic or Ethernet. Versions available: 16 in / 8 out 8 in / 16 out 24 in	4 in/4 out standard. Optional distributed I/O modules connected via RS-232, RS-485, fiber optic or Ethernet. Versions available: 16 in / 8 out 8 in / 16 out 24 in
Database - Points per Orion	5,000 typical	5,000 typical on Orion5r, 20,000 typical on OrionLX
Refresh Rate	Less than two seconds	Less than two seconds
Data Archiving Memory	24MB	24MB on Orion5r; 64MB and expansion option on OrionLX
Configuration Software	NovaTech Communications Director (NCD)	NovaTech Communications Director (NCD)

Contact:
NovaTech, LLC
Orion Utility Automation
13555 W. 107th Street
Lenexa, KS 66215

T: 913.451.1880
F: 913.451.2845
E: orion@novatechweb.com
www.novatechweb.com