



ERL Input/Output Expansion Module

ERL I/O

Product Overview

The ERL I/O expansion module is a digital input / output extension box which supports 128 physical digital inputs (DIs) and 15 output contacts. The I/O module uses IEC 61850-8-1 station bus protocol GOOSE messages to publish the state of the binary inputs to other ERL Devices and any other IEDs supporting IEC 61850 GOOSE subscriptions.

The I/O module can also trigger on the state of digital inputs in GOOSE messages published by ERL devices and other IED's to activate its 15 user configurable output contacts or create records on any of its 128 virtual input channels.

The ERL I/O Expansion system consists primarily of the unit hardware and the TESLA Control Panel user interface software.

TESLA Control Panel user interface software provides tools to configure the unit, retrieve and manage records and display real time digital status values. Control Panel also includes RecordGraph, a graphical record display and analysis software tool.

ERL 61850 IED Configurator software provides tools to manage unit's station bus configuration.

Application:

The ERL I/O module is to be used in any application where there is need for many status (DI) inputs – such as large substations and generating stations. By communicating these digital input statuses to multiple IED's in the network it expands their access to such information and is a cheaper alternative to adding additional IED's. It reduces the problems associated with having these multiple IED's communicate with each other and also reduces the cost.

The ERL I/O IED also provides alarm and control through its 15 output contacts and 15 subscription virtual channels for output contact control.



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Application with TESLA 4000

TESLA 4000 power system recorder has provision for up to 256 virtual inputs which can be mapped to receive and record the time and status of events contained in the IEC 61850 GOOSE messages published by the ERL I/O module. These messages are available for records and oscillography in the same way as the 64 physical status (digital) inputs of the TESLA.

Connect two ERL I/O modules with each TESLA 4000 to monitor and record 256 additional digital inputs.

Application with ERL Relays and other IED's

The ERL I/O can be used to provide access to additional digital input statuses to all ERL relays, and indeed any IED capable of IEC 61850 GOOSE subscription. In protection schemes which need to monitor and act on the status of a large number of digital inputs, the ERL I/O expansion unit provides a more cost effective option than adding protection IED's. It also provides cost savings on the wiring between protection panels and increases safety in the substation.

The I/O module's 15 user-configurable output contacts can

Use the Windows based ERL 61850 IED Configurator to configure and map data between the ERL I/O IED and TESLA 4000. The ERL 61850 IED Configurator can also be used to configure the subscriptions for any other ERL devices.

The I/O module's 15 user-configurable output contacts can be activated by GOOSE triggers from TESLA's thus expanding the number of alarm/trip contacts available to them.

be activated by GOOSE triggers published by relays thus expanding the available alarm/trip contacts.

The ERL I/O box receives unmodulated or modulated IRIG -B time and can distribute the IRIG-B signal to 5 other IED's connected to it. In the event of a loss in the GPS time source, the I/O Expansion IED generates and provides 1pps unmodulated IRIG-B signal across all connected IED's, thereby ensuring time synchronization across these IED's which is critical in some protection scheme.

SCADA Application

The I/O module communicates with SCADA using DNP3, Modbus or IEC 61850 station bus protocol, acting as an RTU for its status inputs.

Easy Configuration

The I/O Expansion IED does not require user configuration for publishing the digital input status changes. The digital inputs 1 to 128 are mapped to DIGRBDR1 – DIGRBDR128 logical nodes of the logical device triggers in sequential order as marked on the IED's rear panel.

Status change events for the digital inputs 1 to 128 will be automatically added to the ERL I/O IED's event log.

The I/O Expansion IED's subscription features of recording and output contact control requires user configuration using the ERL IEC 61850 Configurator.

The TESLA Control Panel configuration software can be used to view I/O Expansion events and to customize the default digital input channel configuration including channel names, status indication and log options.

See chapter 4.1 in the user manual for more details of the ERL I/O IED's communications.

Recording

The I/O Expansion digital inputs are mapped to the logical device triggers for publishing. Any digital input status changes will be published as IEC 61850 GOOSE messages which can be used for triggering recording on TESLA 4000 and on any other IEDs capable of GOOSE subscription.

GOOSE messages published by other IEDs and mapped to the I/O Expansion's subscription virtual channels shall be used to trigger a recording on the I/O Expansion. The I/O Expansion can be used for recording its own physical digital input status changes in a similar manner.

Records created on the I/O Expansion can be retrieved from the IED using the TESLA Control Panel software and viewed with the Record Graph graphical display and analysis tool.

- 500 entry event log (circular)
- Fault records from 0.2 to 15.0 seconds
- Data sample rates for fault recording of 96 samples per cycle

Features

- 128 external (digital) input channels with event tracking which can be published as an IEC 61850 GOOSE status message
- 15 user-configurable output contacts which can be activated by GOOSE or DNP3 Binary Output triggers
- 128 Virtual inputs to trigger and record on subscribed GOOSE messages
- Real-time metering display shows all input statuses
- 500 entry event log (circular)
- 19" rack-mount format, 4U footprint

Communication Protocols

- Standard TCP/IP communication protocol to communicate with TESLA Control Panel
- SCADA protocol DNP3 over Ethernet or Modbus over serial
- IEC 61850 station bus protocol

Time Coordination

- 1 IRIG -B time input - modulated or unmodulated. Supports IEEE 1344 extensions.
- 5 IRIG-B system time sync outputs for common reference time sharing
- Primary/Secondary SNTP time source server provisions
- 1 ms event time tagging of events and records
- Time synchronization indicator in each record

Reliability

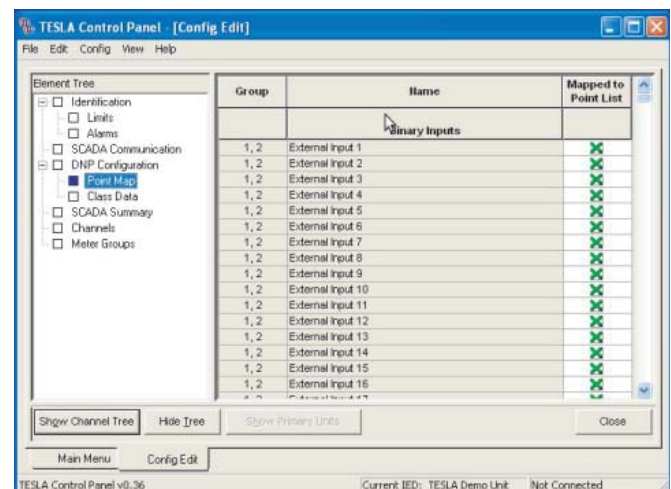
- Self-monitoring supervisory software with hardware self-checking circuit and failure contact
- Flash memory for program and storage
- Compliance with IEC EMC standards

Communication and User Interface Ports

- Front:
 - 1 Ethernet Port (100BASE -Tx RJ 45)
 - 1 USB Port
- Rear:
 - 2 Ethernet ports 100/1000BASE-T – Cu or Optical
 - 5 Ethernet Ports (100/1000BASE-T – RJ 45)
 - 5 local time synchronization 2-wire outputs (IRIG-B format),
 - 1 SCADA RS232
 - 1 RS232 Serial Port

User Interface

- Integrated configuration and record management tools
- Offline mode allows configurations to be created and records viewed without connecting to the device
- Record display shows record summaries with trigger event lists



DNP3 Point Map

Detailed Specifications

ERL Digital I/O Expansion Module

Item	Quantity/Specs	Notes
General		
Weight	20.2 lbs (9.2 kg)	
Dimensions	4U high (7.00"), 19" wide, 12.725" deep	Rack mount
Nominal Frequency	50 or 60 Hz	
Power Supply	38 – 300 Vdc, 90 – 265 Vac	Maximum current: 0.7 A Maximum burden: 35 W
Sample Rate	96 samples/cycle (s/c)	
A/D Resolution	16 bits, 65536 counts full scale	
Recording and Logging:		
Transient Fault	Record Length 0.2 to 15 seconds, 30 second extended	
Record Storage	Up to 150 records	
Event Logging	500 events in the regular log	
Channels and Triggers		
GOOSE Virtual Inputs (digital)	Active, Inactive or both	
Interface & Communication		
Front Panel Indicators	6 LEDs	Unit Functional, IRIG-B Functional, Test Mode, Alarm 1, Alarm 2, Alarm 3
Front User Interfaces	USB port and 100BASE-T Ethernet port	
Rear User Interfaces	LAN Ports: Copper, Optical (ST) style connector	Copper: RJ-45, 100BASE-T Optical: 100BASE-FX, Multimode, 1300 nm, ST style connector
Serial User Interface	Two Serial RS-232 ports to 115 kbd	
SCADA Interface	DNP3 or Modbus	Ethernet: DNP3 RS: 232: DNP3 or Modbus
Self Checking/Recorder Inoperative	1 contact (#1)	Normally closed
Time Sync	IRIG-B, B003,B004,B123 and B124 Time Codes	Inputs: - modulated or unmodulated Outputs: - Retransmits valid IRIG input - Transmits unmodulated IRIG-B using internal real time clock as the reference when IRIG-B input is invalid.
Inputs and Outputs		
External Inputs (digital)	Will turn on: ≥ 38 Vdc Will not turn on: ≤ 25 Vdc Maximum input: < 300 Vdc Burden: > 10 kilo-ohm	128 per unit Externally wetted
Alarm Contacts	300 Vdc max, externally wetted Make: 8 A Vdc Carry: 8 A Vdc Break: 0.15 A at 125 Vdc 0.10 A at 250 Vdc	16 per unit Contact #1: Unit Functional User-definable contacts – Pick-up < 1.0 s, latch 1.0 s

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Item	Quantity/Specs	Notes
Environmental		
Ambient Temperature Range	IEC 60068-2-1/IEC 60068-2-2	-40°C to 85 °C
Humidity	IEC 60068-2-30	Up to 95% without condensation
Insulation Test (Hi-Pot)	IEC 60255-5	Power supply, external inputs, output contacts – 2 kV, 50/60 Hz, 1 minute
Electrostatic Discharge	IEC 61000-4-2 Level 4, IEEE C37.90.3, IEC 60255-22-2 Level 4	
Voltage Dips, Interruptions, Variations	IEC 6100-4-11, IEC 60255-11	200 ms Interrupt
Conducted RF Immunity	IEC 61000-4-6 Level 3, IEC 60255-22-6 Level 3	
Radiated RF Susceptibility	IEC 61000-4-6 Level 3, IEC 60255-22-3 Level 3	
Electrical Fast Track/Burst	IEC 61000-4-4 Level 4 (4 kV), IEC 60255-22-4 Class IV (4 kV)	
Oscillatory Transient	ANSI/IEEE C37.90.1-1989, IEC 61000-4-12 Level 3, IEC 60255-22-1 Level 3	
Oscillatory Vibration	IEC 60068-2-6, IEC 60255-21-1 Class 1	
Seismic	IEC 60068-3-3, IEC 60255-21-3 Class 1	
Shock and Bump	IEC 60255-21-2 Class 1	
RF Emissions	IEC/EN 60255-25 Class A	
Conducted Emissions	IEC/EN 60255-25 Class A	

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 In case of inconsistencies between documents, the version at www.erlphase.com will be considered correct. (D03281R01)

