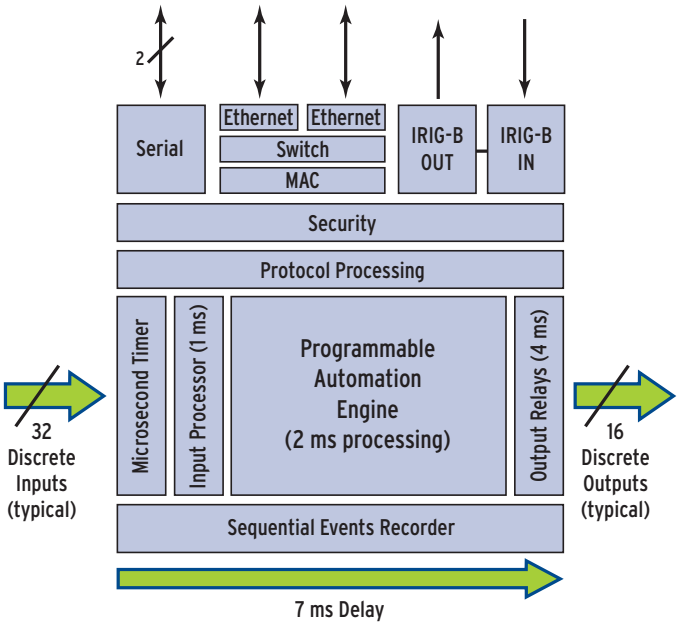
DPAC

SEL-2440 Discrete Programmable Automation Controller

Powerful control and I/O.



Features and Benefits

48 Digital I/O Points at an Economical Price

Distributed I/O Right Out of the Box

- Preprogrammed register maps
- Select protocol and address via switches behind front panel

Fast and Powerful

- 2 ms processing interval
- 7 ms from input to output: auxiliary relay speed
- Events timed to the *micro*second

A Great Communicator and Interpreter

Supported Protocols	Serial	Ethernet
DNP3	✓	✓
Modbus	✓	✓
Mirrored Bits® communications	✓	
SEL Fast Message	✓	
IEC 61850		✓

Convenient Maintenance and Support

- Removable terminal blocks with positive retention
- Continuous self-monitoring diagnostics
- LEDs for system status, every I/O point, and communications port
- Front-panel management port

SEL Quality, Standards, and Global Support

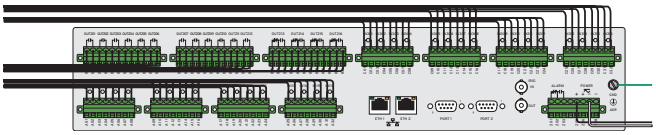
- 2000 Vac/2500 Vdc HiPot
- 8 kV contact/15 kV air ESD tested
- IEEE C37.90-1989
- IEEE 1613-2003 standard
- IEC 60255 protective relay standards

Easy Setup

1

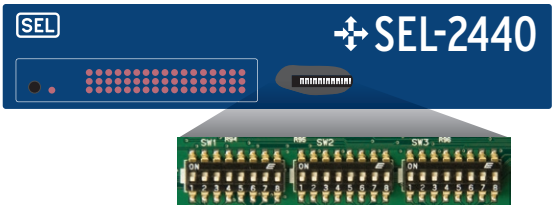
UNPACK AND INSPECT

2



WIRE IT

3



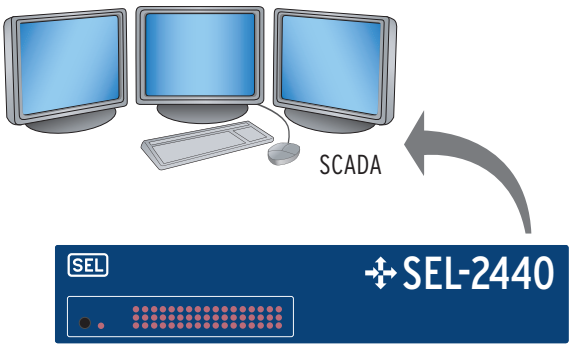
SET PROTOCOL AND ADDRESS USING DIP SWITCHES

4

Press lamp test for:
- *LED status*
- *Port address check*
- *Time-code check*

POWER UP AND VERIFY STATUS

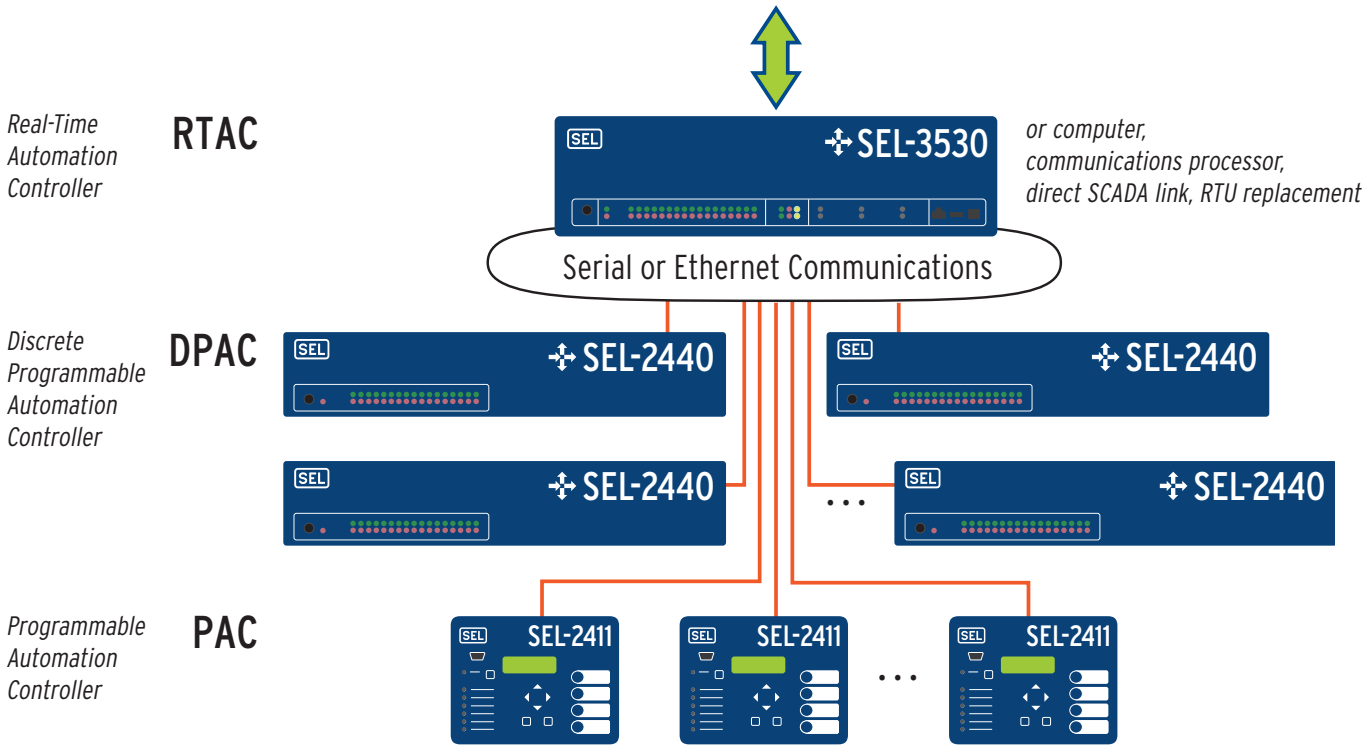
5



VERIFY CONTACT STATUS WITH MASTER

Job Done®

Distributed I/O Expandable to Thousands of Points



Simplify Settings, Analysis, and Design Using acSELerator® Software

Frequently Asked Questions

What if I burn out a relay contact in a DPAC?

First, SEL has a ten-year, no-questions-asked warranty. If you burn out a contact, SEL will repair your DPAC usually within 72 hours. Second, the DPAC is entirely connectorized, so you can easily remove it from service without removing any wires from the connectors. Simply download your settings to a spare unit and insert the connectors for a fast, simple, and economical repair.

Can I expand the I/O of the DPAC?

Yes! The base product typically has 32 inputs and 16 outputs. Want some more? You can add two SEL-2505 Remote I/O Modules (8 in/8 out), one per serial port, for a total of 32 more points. . .for a grand total of 80 I/O points! It can also be cost-effective to simply add another DPAC and double the I/O.

Where is the DPAC designed and made?

It is designed and manufactured in our factory in Pullman, Washington. The DPAC firmware was developed by SEL in Pullman too.

Can I hook two DPACs back-to-back? What kind of performance can I get?

You may be familiar with our SEL-2505 Modules. They communicate 8 points in each direction, so that 8 inputs at one end are 8 outputs at the other, and vice versa. You can do exactly this with 8 inputs and 8 outputs of each DPAC and still have your other I/O. End-to-end delay is about 7 ms. Or, you can use IEC 61850 GOOSE messaging and the Ethernet ports to communicate any desired combination of I/O points; e.g., 16 inputs to 16 outputs one way and 8 inputs to 8 outputs going back.

How can I apply the DPAC in my system?

You can use it as a standalone controller or digital concentrator. Or, you can use the DPAC as a host or I/O expansion for the SEL-2411 Programmable Automation Controller (PAC) that also supports low-level dc or ac analog inputs. For automation and control applications, you can use the SEL-3530 RTAC or our embedded computers. You can also connect your DPAC to SEL-2020, -2030, -2032 communications processors via our SEL protocols, or easily integrate with your existing SCADA infrastructure with DNP3 and Modbus protocols over Ethernet or serial connections.

This is a new product for me. How can SEL assist me?

If you are already familiar with the SEL-2411 PAC, then you will be right at home with the DPAC. They have the same roots. The DPAC is actually easier, because it doesn't need to handle analog signals. If you have never used an SEL device, then now is the time! We have field application engineers around the world who are ready to assist you with your designs at no charge. Or, our systems engineering team can develop a detailed custom design for you in accordance with your needs at reasonable fees. Or, if your local consultant wants help, we are prepared to support him or her as well.

Your literature stresses that you guarantee performance to various standards. What does this mean?

The design engineers at SEL understand these standards, and they know that their designs must not only comply but also have margin *beyond* the standard. For instance, standards require a dielectric strength test (HiPot) of 2000 Vac. SEL adds margin onto the standard and requires the product pass at 2500. . .for a 25 percent margin above the standard! This requires careful attention to clearances, spacing, and many other parameters. Unfortunately, there are many devices, costing much more and having (understandably) weaker warranties, that say their products are "designed to" the standards. . .whatever that means. Be assured that when SEL mentions a standard, we meet it! Not only "designed to." Not only "tested to." But "tested to and passed with margin!" Standards exist for a reason: these devices are put to work in hostile environments, and you and we need to sleep at night, knowing we have taken every step possible to reasonably assure performance in the substation environment for many years.

Be Sure Your Discrete I/O System Measures Up to SEL Safety, Reliability, and Economy

DESIGN	SEL	OTHERS	IMPORTANCE
Positive retention of connectors	ā	no	Control wiring is stiff and heavy. Connectors without positive retention can come off, causing failure or misoperation of your control system.
2000 V all circuits to ground	ā	??	Faults can stress power supply and I/O to high voltages. Flashover can destroy I/O and cause misoperations.
2000 V circuit-to-circuit	ā	??	Adjacent circuits can have different references.
HiPot routine test	ā	??	Every SEL device is HiPot tested in manufacturing before it goes out the door. Others may not be and may fail during HiPot testing of your panels.
Utility-rated power supply	ā	no	SEL makes its own power supplies, which have a 600-year MTBF. Others may use commercial supplies, as found in computers.
AC/DC inputs	ā	no	SEL inputs are dual-rated. Others are typically dc only. AC-rated inputs are needed for monitoring ac loads and voltage transformers.
Level-sensitive inputs	ā	no	SEL input thresholds are near one-half the battery voltage to prevent false assertions. Others may use "universal" inputs, with thresholds as low as 12 V, which may misoperate on battery grounds, transients, and switching events.
−40° to +85°C	ā	no	The SEL DPAC will work in outdoor cabinets and when air conditioning fails. Others probably won't.
Vibration	ā	??	Designed and tested to work in vibration-prone environments.
Tested to IEEE C37.90	ā	??	SEL type tests all products. Others may say only "designed to…" Type tests prove secure, reliable performance.

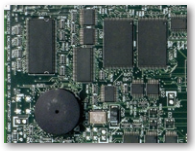
PROTOCOLS			
DNP3 and Modbus	ā	no	SEL recognizes that different applications require one or the other, so we provide both at no additional cost.
IEC 61850	ā	no	SEL supports the international standard for communications and integration in substations.
SEL Fast Message	ā	no	Enables easy additions to SEL communications processors.
SEL Mirrored Bits communications	ā	no	Provides high-speed, secure, point-to-point communication.
SEL Messenger Points	ā	no	Receive station alarms and event notification by telephone with the SEL-3010 Event Messenger.

COMMUNICATIONS	SEL	OTHERS	IMPORTANCE
SERIAL			
EIA-232	ā[1]	no	MOV protection, 5 Vdc pass-through for transceivers, and demodulated IRIG-B pass-through.
EIA-485	ā	??	MOV protection.
Fiber V-pin connector	ā	??	Improves communications reliability and far less susceptible to noise.
Fiber ST connector	ā	??	Improves communications reliability and far less susceptible to noise.
ETHERNET			
Dual 10/100BASE-T with integrated switch	ā	no	Integrated switch allows easy daisy-chaining of IP-based devices.
Dual 100BASE-FX Ethernet with integrated switch	ā	no	Improves communications reliability and far less susceptible to noise.
DEMODULATED IRIG-B			
IRIG-B input and output	ā	no	IRIG-B input and output connectors allow easy daisy-chaining of devices.
Microsecond accurate timing	ā	no	Time-critical events, such as breaker mechanism operations.

PROCESSING CAPABILITIES			
Math and logic	ā	no	Provides local control and processing.
Scheduling and timing of outputs	ā	no	Enable scheduling of outputs based on month, day, hour, and minute variables.
Logic processing interval to less than 2 ms	ā	no	Fast deterministic processing interval.
Command line response processing	ā	no	All programming and control can be accomplished from a command line.

SECURITY			
Strong passwords	ā	no	Supports alpha, numeric, and special characters up to 12 characters in length.
Port enable/disable	ā	no	Set security levels on a per port basis, and turn off unused ports.

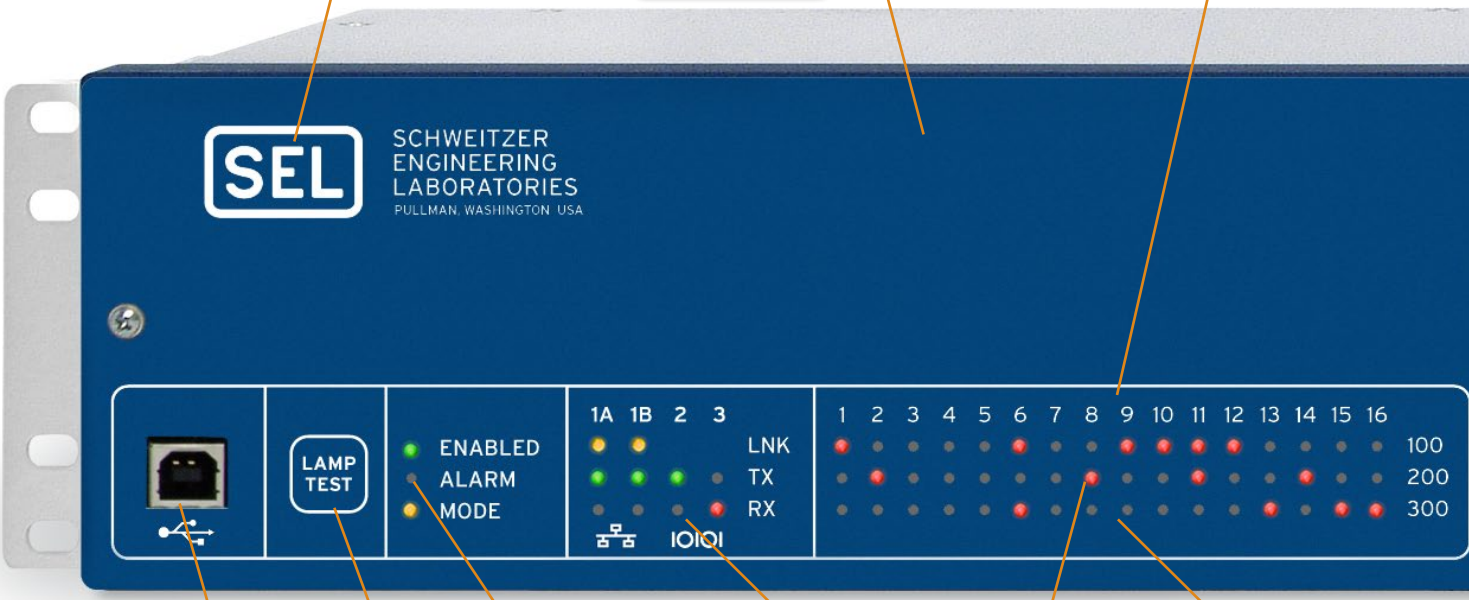
WARRANTY AND SUPPORT			
No-hassle, ten-year, worldwide warranty	ā	no	Best in the industry.
Free worldwide technical support	ā	no	SEL maintains more than 80 offices in over 15 countries.



Powerful 32-bit microcontroller delivers relay-speed I/O, logic, and communications.

LEDs also show port address and IRIG time code after lamp test.

Industry-leading, worldwide, ten-year warranty.



Management and setup port.

Lamp test, port address check, and time-code check.

Diagnostic LEDs.

Continuous display of network activity with communications port activity LEDs.

48 status LEDs, one for every I/O point.

I/O labels match status LEDs.

All outputs are rated for utility grade per IEEE C37.90, eliminating the need for interposing relays.

Digital outputs.

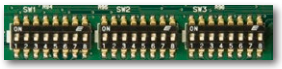
All connectors have positive retention, so wires and cables cannot pull off.

Supports DNP3, Mirrored Bits communications, SEL Fast Messages, Modbus, and IEC 61850 protocols.

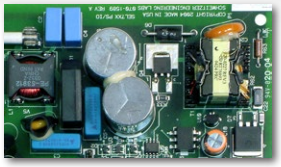
Industry standard 2U height.

Remove two screws to access configuration switches.

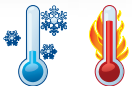
For simple I/O applications, the SEL-2440 can be configured with switch settings—no computer or software required.



SEL rugged power supply has an MTBF of 600 years.

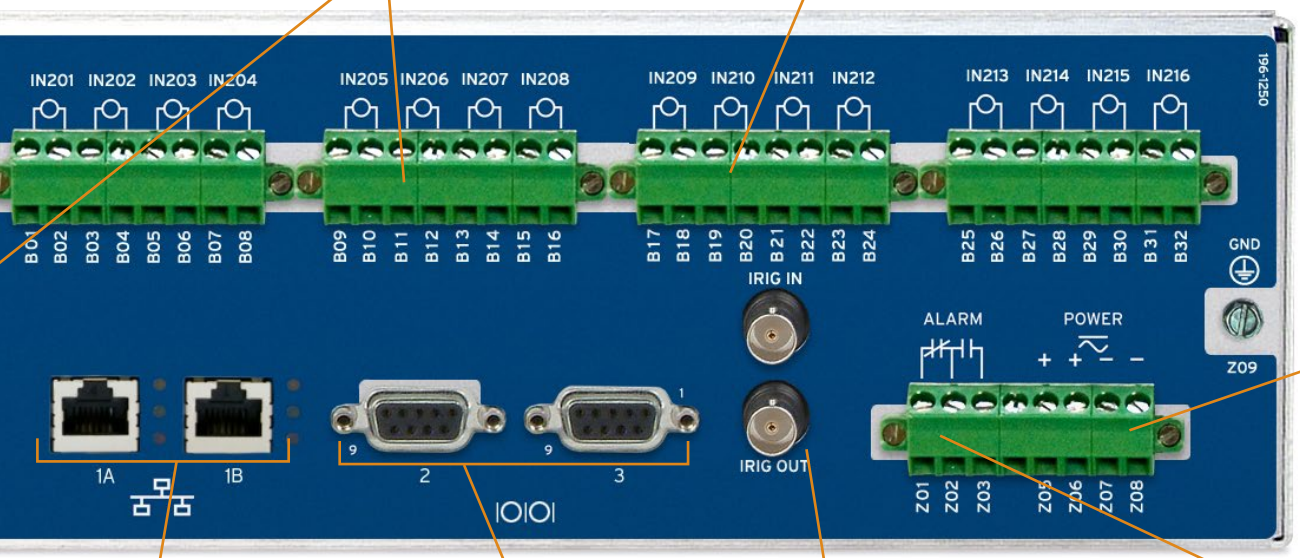


Widest operating temperature range (−40° to +85°C), use indoors and in outdoor cabinets.



All digital inputs are rated for ac and dc and time-stamped to 1 µs accuracy.

All input thresholds are near ½ nominal voltage to avoid false assertions during faults and battery grounds.



Wide-range universal power source, 19.2–275 Vdc, and 19.2–264 Vac.

Standard 10/100BASE-T Ethernet ports with integrated switch eliminate the need for an external switch.

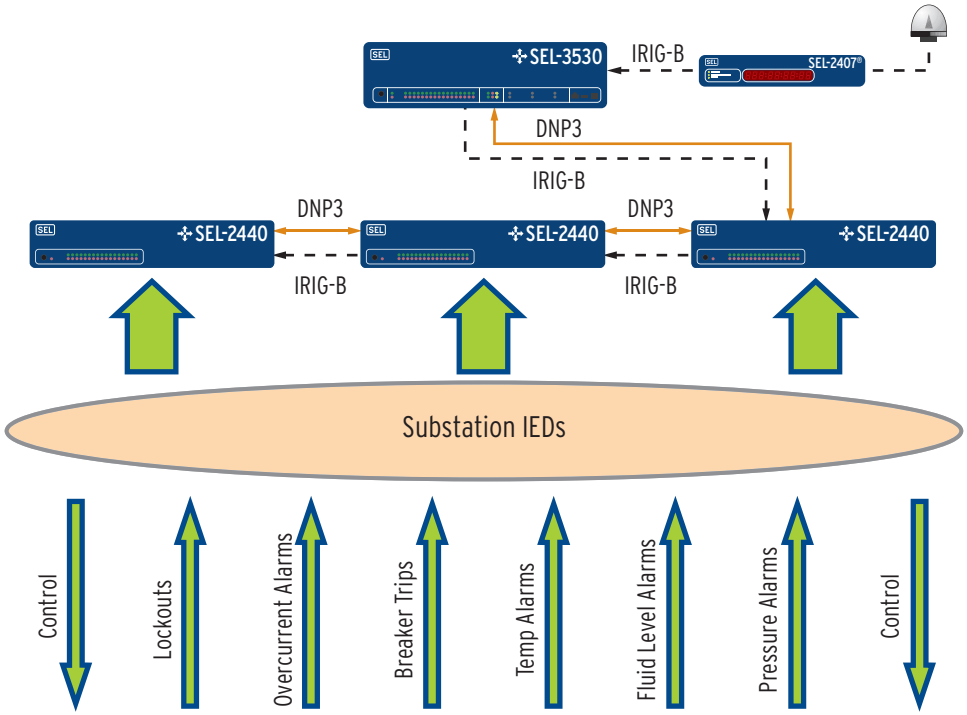
Two standard EIA-232 serial ports, with EIA-485 and fiber options available for one serial port.

Demodulated IRIG-B input synchronizes the microsecond timer to absolute time and drives the demodulated IRIG-B output.

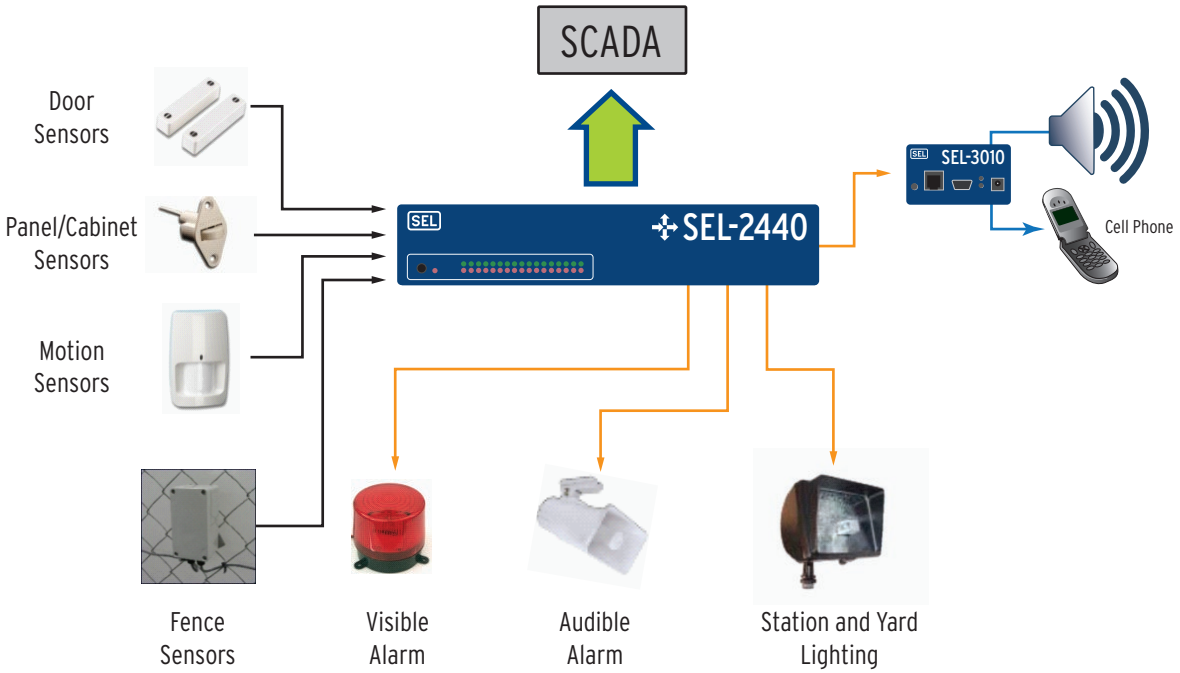
Alarm contact alerts you to self-test failure, communications access, and settings changes.

Applications

Substation RTU/PLC System

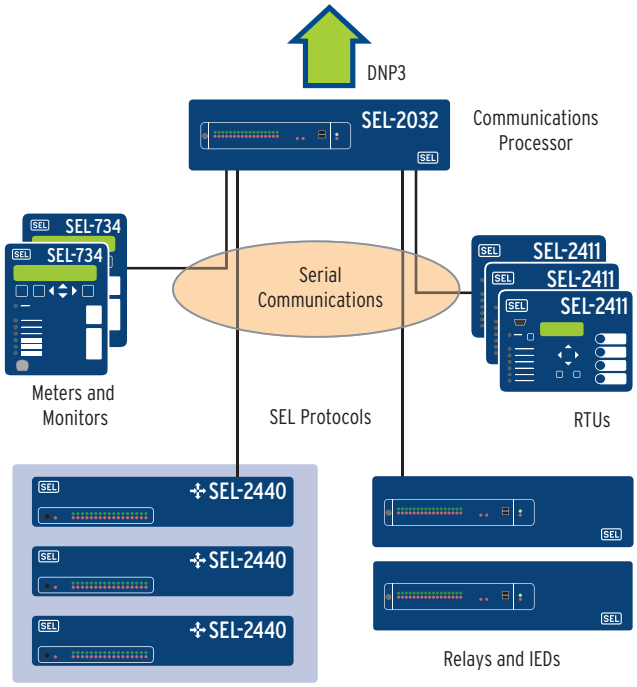


Substation Security

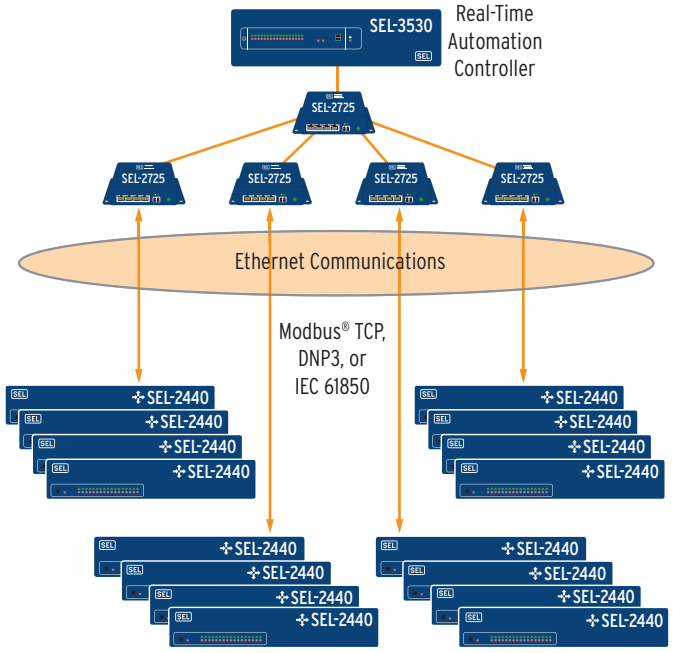


Applications

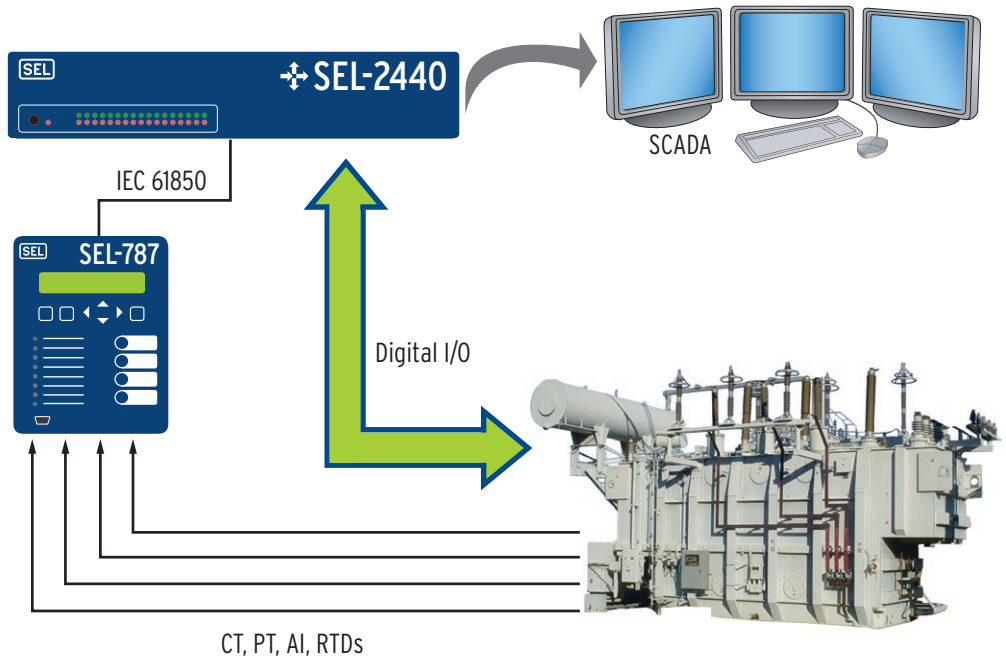
Add Discrete I/O to Legacy Systems



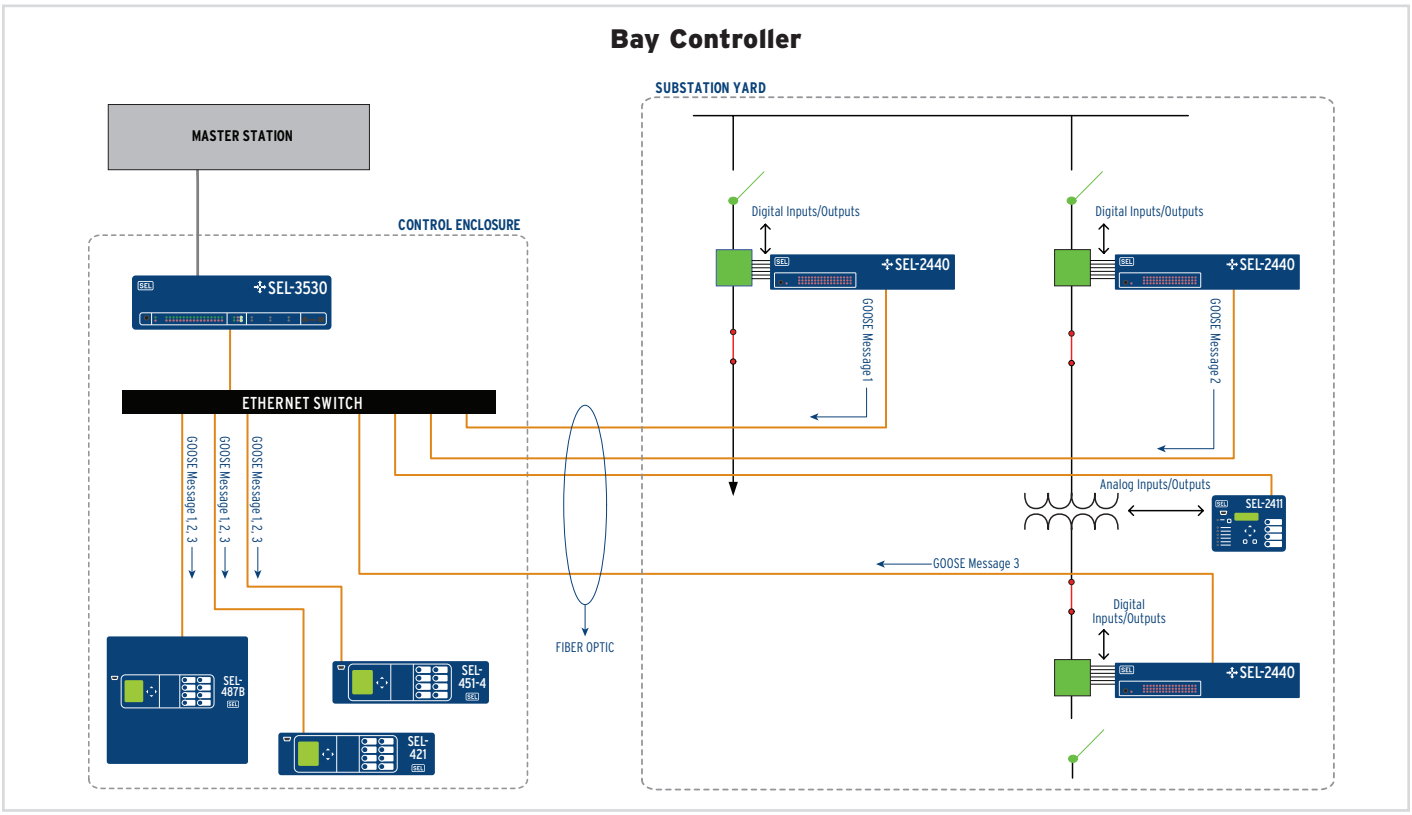
Build High-Density Discrete I/O

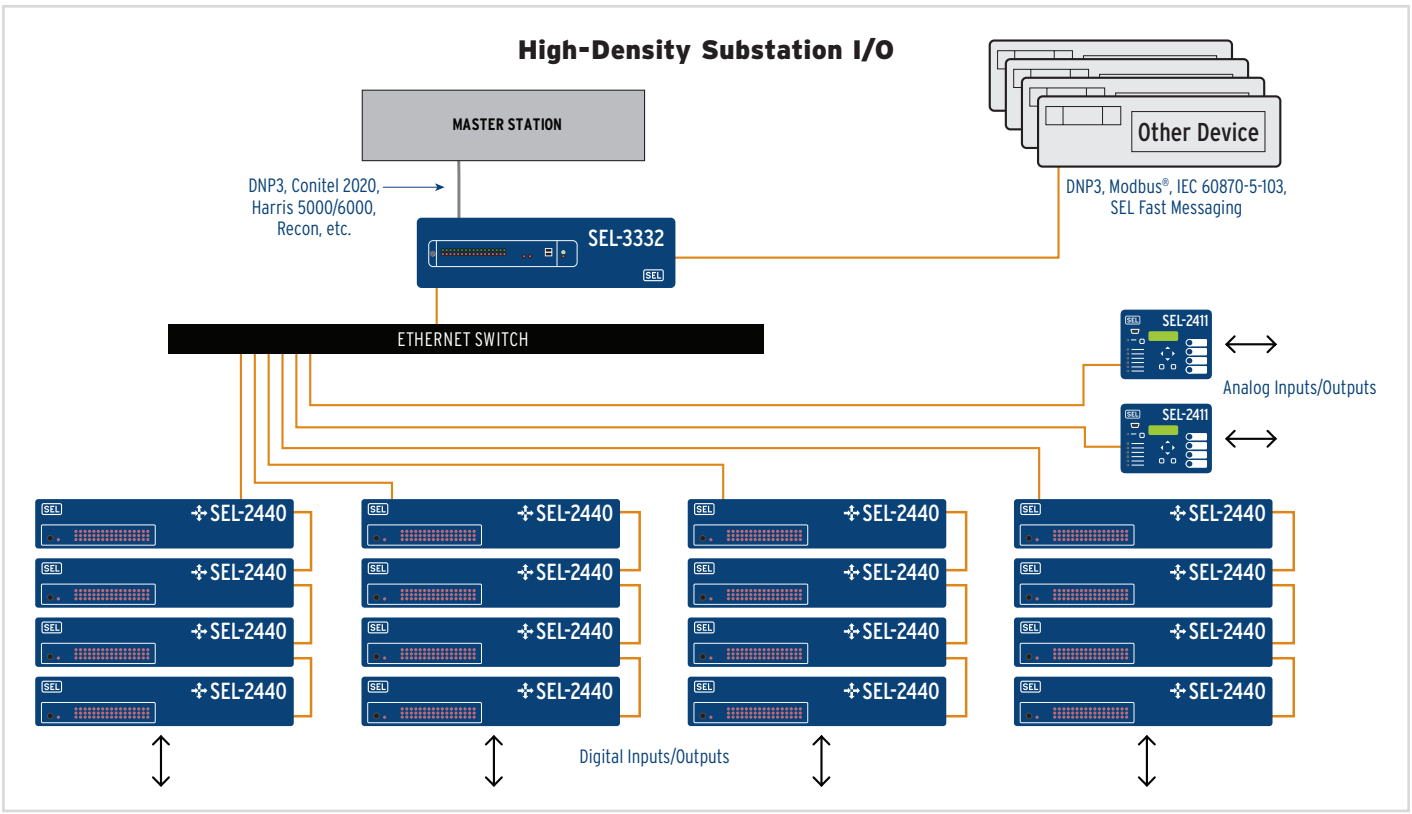


Transformer Protection



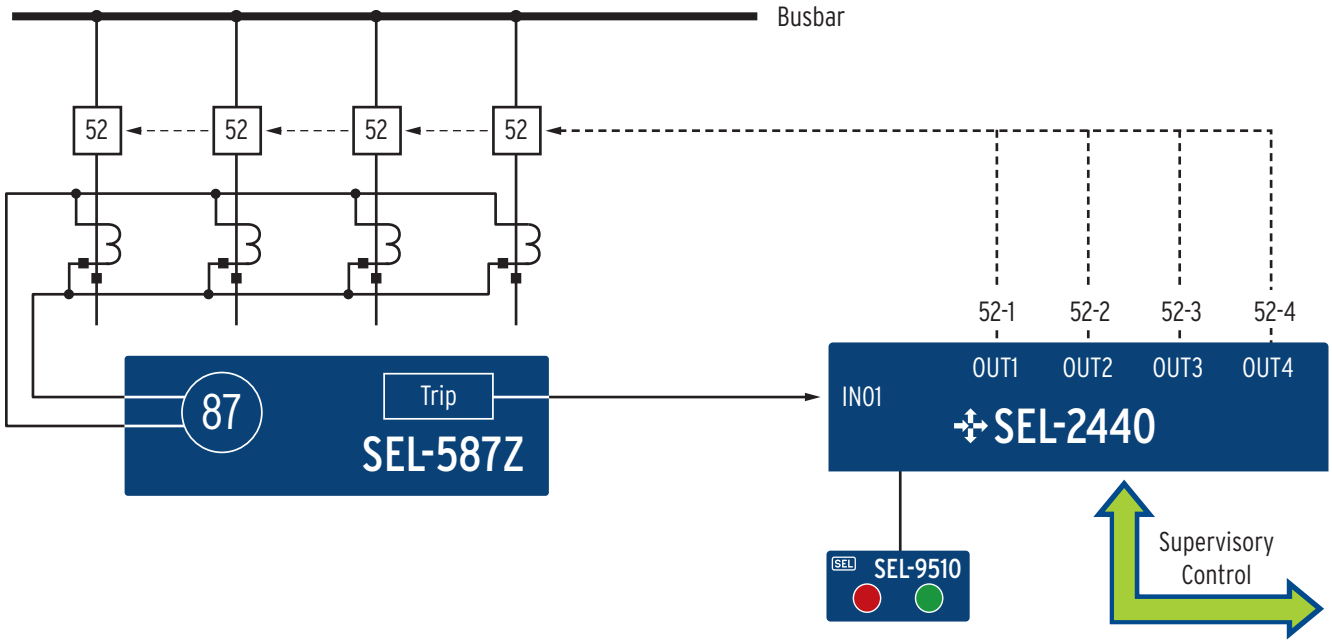
Applications



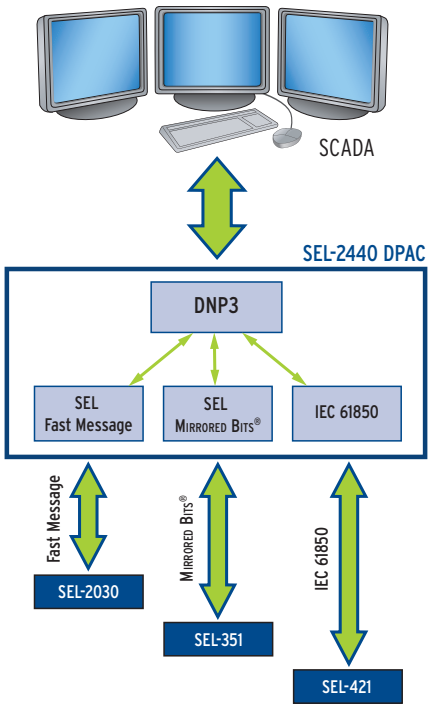


Applications

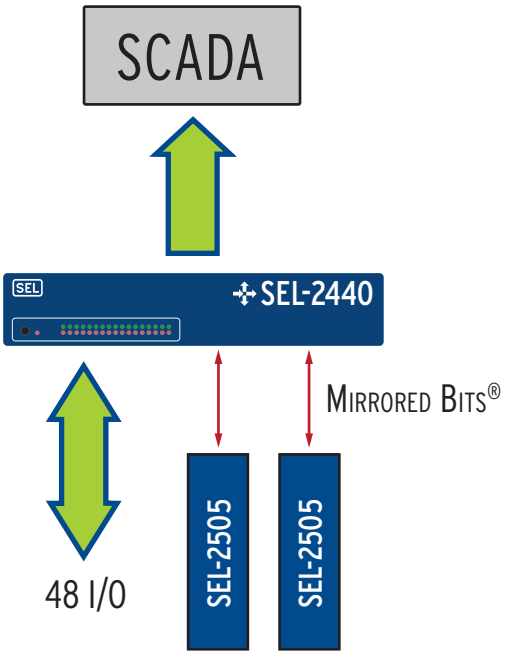
Lockout Relay Contact Multiplier



Protocol Converter



Exchange High-Speed Mirrored Bits Communications



SEL-2440 DPAC Discrete Programmable Automation Controller

General Specifications

Standard Features

32 digital ac and dc inputs

16 digital outputs (12 Form A and 4 Form C)

Dual copper 10/100BASE-T Ethernet port with integrated switch

Dual EIA-232 serial ports (Port 2 and Port 3)

Demodulated IRIG-B input and output

Front USB configuration port

Form C alarm output contact

LEDs for communications status and port activity

Standard Protocols

SEL protocols

SEL MIRRORED BITS communications

SEL ASCII and Fast Message

SEL Messenger Points

Modbus serial and Modbus TCP/IP

DNP3 and DNP LAN/WAN

I/O Configurations

	Inputs	Outputs
Standard Configuration	32	16
Option 1	16	32
Option 2	48	0

Digital Input Ratings

Optoisolated

MOV protection

Level sensitive inputs

300 V input maximum

Digital Output Ratings

Pickup time <5 ms

6 A continuous carry

30 A make per IEEE C37.90

MOV protection

Universal Power Supply

Ratings

120/230 Vac	24/48/125/250 Vdc
Range	19.2–275 Vdc
	19.2–264 Vac

Optional Features

Dual 100BASE-FX fiber Ethernet

Serial module communications (Port 2) options

EIA-485

Fiber-optic, 200 µm V-pin connector

Fiber-optic, 62.5 multimode ST connector

IEC 61850 communications

Conformal coating

Heat (+85°C)

Cold (–40°C)

Programmable Automation and Logic

32 logic variables

32 math variables

32 timers

32 counters

32 remote control points

128 remote analog points

32 latching points

Electrostatic Shock (15 kV)

Vibration (15 g Shock)

Standards

IEEE C37.90-1989

IEC 60255 and 6100

IEEE 1613-2003

Dimensions

2U rack-mount	88.1 mm H x 482.6 mm W x 158.1 mm D (3.47 x 19.00 x 6.23 in)
2U panel-mount	124.5 mm H x 502.9 mm W x 158.1 mm D (4.90 x 19.80 x 6.23 in)
DIN rail-mount	171.1 mm H x 447.0 mm W x 89.4 mm D (6.74 x 17.60 x 3.52 in)
Surface-mount	171.1 mm H x 482.6 mm W x 89.4 mm D (6.74 x 19.00 x 3.52 in)

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