PROJECT FUNCTIONAL DESCRIPTION

POWER ENGINEERS, LLC

Electrical Engineering, Power, Lighting, Technical Studies and Utility Consulting

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ASHLAND, MA
20 Butterfield Drive
2500kW (AC) PHOTOVOLTAIC PROJECT
Utility Interconnection

ELECTRICAL FUNCTIONAL DESCRIPTION

January 2015

1.0 Engineering and Interconnection Requirements

1.0.0 Existing Electrical Infrastructure

The existing property (hereafter referred to as the "facility") is located at 20 Butterfield Drive, Ashland, MA. The proposed site is an open parcel. NStar has 13.8kV primary circuit #274-H1 along Butterfield Drive, which will be the location of the point of interconnection with a new primary tap. The proposed site would be to tap off the existing primary to the site itself.

1.0.1 Electrical Interconnection Plan

There are a number of possible options that have been reviewed to connect the proposed PV system to the existing utility distribution system. The proposed option minimizes the amount of new equipment required, while satisfying the utility interconnection requirements. The proposed interconnection is detailed on the attached Drawing E-1.1 through E-1.3, dated January 2015.

The proposed Interconnection Application will be for a 2,412.8kW AC / 3095.04KW DC PV project. The proposed existing NStar pole tap location is 42.252675°N, 71.426953W off of Butterfield Drive. There will be a single interconnection at this site location.

The proposed interconnections will include a connection to the existing overhead three-phase NStar 13.8kV primary system with a tap to new underground distribution equipment. A proposed tap would be made to an existing 13.8kV overhead feeder, to a number of new poles, with NStar owned recloser and primary meter. This would be the Point of Common Coupling. The next pole would be the customer's 3-phase air break switch for utility lockable disconnect point (S&C Omni-rupter, 15kV 900A). This would be the new customer's riser pole and then continue underground to the new padmount 15kV switchgear.

The metering location will be the Point of Common Coupling (PCC), which is the ownership demarcation point between the utility and the customer.

From the riser pole the connection would be underground to the PV system site, and then to the customer-owned step-down transformer and PV inverters. A new 15kV class three-phase

power cable would be installed in a new conduit ductbank from the new riser poles to a new 15kV padmount switch and new padmount transformers.

The interconnection option includes the installation of a new pad mounted disconnect switches to provide protection for the underground primary cable, via a vacuum interrupter installed in the switch. The padmount switch (S&C Electric Vista) would be equipped with a utility-grade distribution relay (SEL-351A or equal) to provide overcurrent and ground fault protection of the utility 13.8kV feeder.

The proposed interconnection also includes the installation of REC metering and redundant utility protection at the transformer secondaries.

The proposed interconnection would provide redundant utility-grade relaying to protect the NStar system from any negative effects of the PV system, should there be a problem, along with protecting their workers from the PV Systems exporting power into a "dead" line during an outage; which can be a safety issue. These types of protective device would be typical for a project of this size, and would allow protection for variations in voltage, frequency, etc. caused by the inverter. A relay would be included in proposed 15kV padmount interrupter switch, with a redundant protection (for voltage & frequency) installed at the inverter locations (internal inverter controller settings).

The underground primary cables to interconnect the PV System transformers would be three, single conductor, 15kV class, #1/0 AWG, aluminum cables to carry the expected maximum 2500kW AC from the project. New 15kV class cables should be installed in an underground conduit for physical protection rather than being directly buried.

1.0.2 Electrical Interconnection Details

1.0.2.1 - NStar Interconnection Requirements

NStar has specific standards and requirements for the interconnection of distributed generation such as the proposed PV system project. The interconnection requirements address electrical system protection, revenue metering, operation, and the configuration of the primary interconnection equipment. NStar will review the proposed design of the electrical interconnection facilities and will perform analyses to determine the impact of the proposed generation on their electrical distribution system.

Based on the results of NStar's analysis, certain modifications may be needed within the NStar distribution system and/or to the interconnection facilities.

1.0.2.2 - Electrical Interconnection Equipment Details

The technical details of the major power system components associated with the electrical interconnection of the PV system inverter are described in this section.

1.0.2.2.1 Inverter Step-up Transformers

The inverter step-up transformers are described by specifying the transformer voltage rating (primary and secondary), power rating (kilovolt-amperes or kVA), winding configuration (primary and secondary), and construction type. All transformers shall be three phase, padmount type, oil-filled, self-cooled transformers.

The primary voltage rating of the step-up transformer shall be consistent with the nominal voltage of the NStar distribution supply circuit to the facility which is 13.8kV

phase-to-phase for all three phase transformers. To allow flexibility for local voltage deviations that may exist on the NStar distribution system or within the 13.8kV interconnection circuitry, the transformer primary winding shall be equipped with five (5) fixed taps to change the primary voltage rating +/- 5% from nominal voltage in 2-½ % increments. For the inverter step-up transformer, the secondary voltage rating shall be consistent with the PV system inverter voltage which is typically 480 volts.

The three phase power rating of the inverter step-up transformer (expressed in kVA) shall be consistent with the PV system inverter power rating (expressed in kW) and increased for the allowable inverter power factor, in this project 500kVA.

1.0.2.2.2 - Interconnection Circuit 15kV Class Cables

The proposed PV system inverter interconnection option requires the use of 15kV class interconnection circuit cables. A three phase interconnection circuit of is required between each of the inverter step-up transformers, through the proposed padmount disconnect switch and to the riser pole.

The power cables shall be specified for 15kV class insulation and consist of three, single conductor cables with either aluminum or copper conductors. For this project, the size of the power cables shall be a minimum of #1/0 AWG Aluminum.

The power cable between PV system inverter step-up transformers to the 13.8kV interconnection point shall be installed in underground conduit. The conduit shall be Schedule 40 PVC that is encased in concrete. At least one (1) additional conduit for communications and control of the PV system inverter should also be included in the conduit system. It is recommended that the primary cable ductbank be 2-4" conduits.

1.0.2.2.3 - Main 13.8kV Disconnect Switch

The main 13.8kV disconnect switch specified for the proposed PV System interconnection shall be a combination manual load-break switch with relay-operated vacuum interrupter, three pole, switch. The switch shall be rated 600 amperes continuous current with a momentary rating of 12,500 amperes. The main 13.8kV disconnect switch provides an open point between the PV system and the NStar 13.8kV supply circuit. The operating handle of the main 13.8kV disconnect switch (load-break) shall be capable of being padlocked by NStar's lock in the open position. The 13.8kV padmount switch shall be equipped with a utility-grade protective relay (SEL-351A or equal) that provides overcurrent (51), ground over-voltage 3V0 (59N), under-voltage (27), overvoltage (59), under-frequency (81U) and over-frequency (81O) protection for the PV system, underground primary cable, padmount transformers, etc.

1.0.2.2.4 - Protective Relay Scheme

The required protective relays for the selected PV System interconnection option will be specified by NStar based on the results of their system impact study. Based on a review of the NStar Interconnection Requirements, it is anticipated that the protective features the PV system shall be able to detect are over/under frequency and over/under voltage and overcurrent (via the PV Panelboard circuit breakers). Upon sensing conditions that exceed allowable operating limits, the protective features shall disconnect the PV system inverter from the rest of the distribution system. Redundant protection is proposed at the transformers and at the padmount vacuum interrupter

switch. The inverters will also have internal inverter controls with 27, 59, and 81O/U protection.

1.0.3 Revenue Metering Modifications

As mentioned, the proposed interconnection will need to be metered to measure energy produced by the PV system. The proposed interconnection will create a new primary metered point at the facility. A new overhead primary metering cluster is proposed for the tap off the existing NStar system where the PV system circuit will connect to overhead 13.8kV NStar-owned primary infrastructure. This would be the ownership point and the PCC onto the 13.8kV primary system.

The customer will provide Renewable Energy Credit (REC) metering per the project requirements.

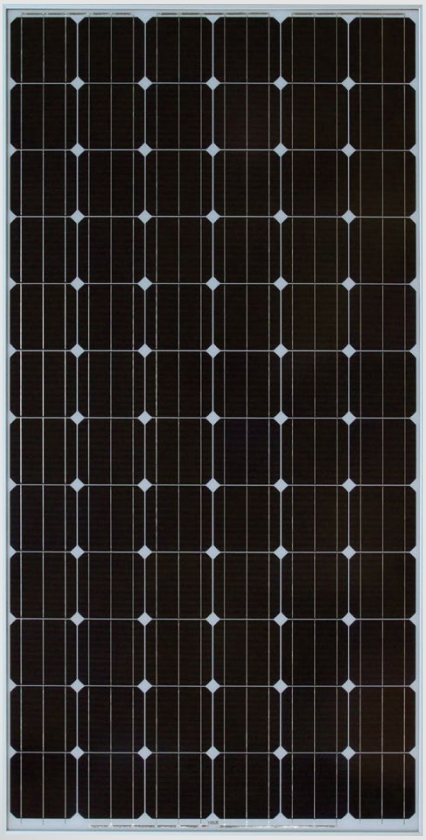
END OF SECTION

PV PANEL TECHNICAL DOCUMENTATION

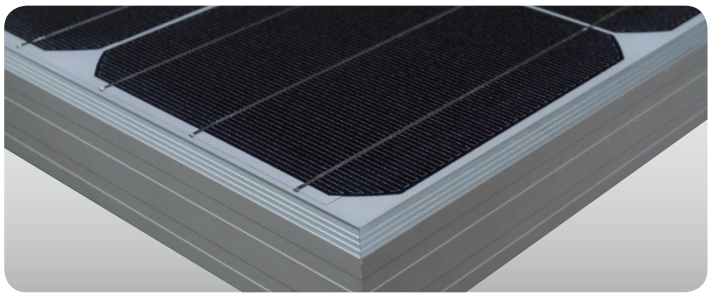
YINGLI – 310W PV MODULES

YL310C-36b

PANDA 315 SERIES



YL315C-36b YL310C-36b YL305C-36b YL300C-36b YL295C-36b



WARRANTIES

» 5-year limited product warranty*
» Limited power warranty*: 10 years at 90% of the minimal rated power output, 25 years at 80% of the minimal rated power output

QUALIFICATIONS AND CERTIFICATES

» ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA8000
» IEC 61215 and IEC 61730 are pending

www.yinglisolar.com

Yingli Solar Panda High Efficiency N-type Monocrystalline Module

ABOUT YINGLI SOLAR

» The first renewable energy company and the first Chinese company to sponsor FIFA World Cup™
» Publicly listed on the New York Stock Exchange (NYSE: YGE)
» One of the leading fully vertically integrated PV manufacturers in the world
» The first Chinese company to receive Social Accountability System SA 8000 Certification

HIGH PERFORMANCE

» N-type monocrystalline solar cells with average efficiency higher than 18.3% combined with high transmission glass leads to module efficiencies up to 16.2%
» Low degradation in comparison with traditional modules with P-type solar cells
» Better performance under high temperature conditions
» Better performance under low irradiation conditions

QUALITY & RELIABILITY

» Robust aluminum frames ensure maximum mechanical load up to 5,400Pa
» Manufactured in our new state-of-the-art production line
» Manufacturing facilities certified by TÜV Rheinland to ISO 9001:2008, ISO 14001:2004 and BS OHSAS 18001:2007

* In compliance with our Warranty Terms and Conditions
Provisional datasheet. Subject to modifications and errors

Official Sponsor of the 2010 FIFA World Cup™

PANDA 315 SERIES

ELECTRICAL PARAMETERS

Electrical parameters at STC (1,000 W/m², 25°C, AM 1.5 according to EN 60904-3)

Module name		Panda 295	Panda 300	Panda 305	Panda 310	Panda 315
Module type		YL295C-36b	YL300C-36b	YL305C-36b	YL310C-36b	YL315C-36b
Power output	[W]	295.0	300.0	305.0	310.0	315.0
Power output production tolerances	[%]	+/- 3	+/- 3	+/- 3	+/- 3	+/- 3
Module efficiency	[%]	15.1	15.4	15.6	15.9	16.2
Voltage at Pmax, V_{mpp}	[V]	36.0	36.3	36.4	36.6	36.7
Current at Pmax, I_{mpp}	[A]	8.19	8.27	8.37	8.48	8.58
Open circuit voltage V_{oc}	[V]	45.4	45.7	46.1	46.4	46.8
Short circuit current I_{sc}	[A]	8.79	8.83	8.87	8.91	8.97
Limiting reverse current I_r	[A]			20		
Max. system voltage	[V]			1,000 VDC		

Electrical parameters at NOCT (800 W/m², AM 1.5, wind velocity 1m/s, Tamb 20°C)

NOCT (Nominal Operating Cell Temperature)	[°C]			46 +/- 2		
Voltage at Pmax, V_{mpp}	[V]	32.6	32.8	33.0	33.1	33.2
Current at Pmax, I_{mpp}	[A]	6.58	6.63	6.72	6.80	6.88
Open circuit voltage V_{oc}	[V]	41.8	42.1	42.4	42.8	43.1
Short circuit current I_{sc}	[A]	7.08	7.12	7.15	7.18	7.23

Thermal characteristics

Temperature coefficient beta of I_{sc}	[%/K]	+ 0.04
Temperature coefficient alpha of V_{oc}	[%/K]	- 0.33
Temperature coefficient gamma of P_{mpp}	[%/K]	- 0.45

MECHANICAL PARAMETERS

Dimensions (length [mm] / width [mm] / thickness [mm])	1,970 / 990 / 50	
Frame heigth [mm]	50	
Weight [kg]	26.3	
Front cover (material / thickness [mm])	Tempered Glass, 4.0mm	
Cell type (quantity / technology / dimensions)	72 / c-Si, Monocrystalline / 156 x 156	
Encapsulation materials	Ethylene Vinyl Acetate (EVA)	
Rear cover (material)	Laminated Polymer Plastic	
Frame (material)	Robust Anodized Aluminum Alloy	

Junction box, cable & connector configuration

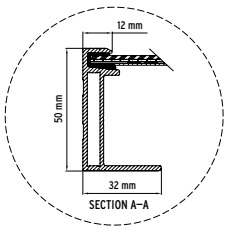
	Configuration is available with 2 different connector types	
Junction box (manufacturer / protection degree)	Renhe / IP65	
Junction box dimensions (length / width / thickness [mm])	151 / 122 / 25	
Positive cable & negative cable (manufacturer / length [mm] / cable cross-section [mm²])	Renhe / 1,200 / 4.0	
Connector (manufacturer / type / protection degree)	Renhe / 05-1 / IP67	MC / MC4 / IP67

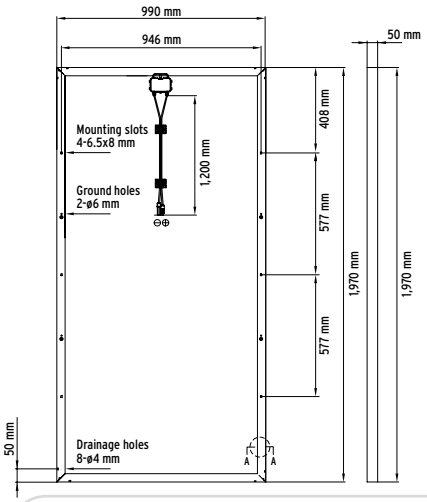
OPERATING CONDITIONS

Operating temperature [°C]	- 40 to + 85
Max. wind load / Max. snow load [Pa]	2.4K / 5.4K
Reduction of efficiency from an irradiance of 1,000 W/m² to 200 W/m² (T_{module} = 25 °C) according to EN 60904-1	5%

PACKAGING

Number of modules per box	21
Box size (length / width / depth [mm])	1,985 / 1,140 / 1,125
Box Gross weight in kg	590
Boxes per pallet	1





* The data does not refer to a single module and they are not part of the offer, they serve for comparison only to different module types.

Provisional datasheet. Subject to modifications and errors

Yingli Green Energy Holding Co. Ltd.
commerce@yinglisolar.com
0086 - (0)312 - 8929802

www.yinglisolar.com

Electrical equipment, check with your installer

Before installation, please check the installation manual provided with the product.

DS-YL315C-36b-EU-EN-20100S-A241-v02

INVERTERS

ADVANCED ENERGY

AE3TL-23

23.2KV INVERTER

TECHNICAL DOCUMENTATION

ADVANCED ENERGY®

AE 3TL 1000 Series

Three-Phase Transformerless String Inverters

The AE 3TL 1000 Series adds broader functionality and system voltage options to a proven, robust design with over 3 GW installed worldwide. It is a well established product with a great reliability track record. The AE 3TL also is lightweight and easy to install. With a peak efficiency over 98% and versatile monitoring options, this is the string inverter of choice for project developers, site designers and installers.

The AE 3TL is designed with many different applications in mind. These high-quality inverters can be used for commercial rooftop and carport installations, as well as solar power plants. With a power range of 12 to 23.2 kilowatts, the AE 3TL is situated to serve installations large and small. The AE 3TL optimizes space in the site design, allowing for placement within the array, saving site owners highly valued space.

Highly precise MPP tracking combined with AE advanced monitoring solutions gives solar stakeholders the vital data needed to operate and maintain a highly efficient site, providing maximum return for investors in solar energy.

AE listens carefully to customer demands. The AE 3TL is fully compliant to NEC 2011 with standard serviceable "touch-safe" fuses and optional AFCI. The 1000 VDC input enables a reduction of BoS costs due to longer strings, fewer home runs, and lower resistive losses. Weighing just over 100 pounds, the easily installed inverter is very well suited for rooftop or space-constrained installations. Additional savings are recognized with lowered shipping costs, and there is no need for the heavy machinery associated with installing larger, heavier inverters. Arrays designed with AE 3TL string inverters have best-in-class uptime, system yields, and problem resolution.

Versatility

- Wide range of output power allows for integration on a variety of site designs, with an emphasis on design flexibility and project yield.
- Superior efficiency, low shipping costs, and distributed design offer solar stakeholders increased return on investment and reduced upfront costs.
- Maximizes space for energy production
- Optional AFCI
- Unprecendented 1.75 DC:AC ratio enables lowest inverter cost per DC Watt.

Reliability

- 3 GW installed worldwide
- Proven reliability
- Low maintenance
- Improved system uptime

Superior installability

- Lightweight, easy to install
- Less space needed on site
- Lowered balance of system (BoS) costs
- Inverters closer to array

AE Solar Energy is a US based company.

Lightweight design supports ease of installation

Maximizes project space and energy production

Highly reliable and efficient; Saves money on maintenance costs and improves energy harvest

Lower initial system costs for projects under 400 kW

Wide range of output power allows for integration on a variety of site designs

ADVANCED ENERGY®

AE 3TL 1000 Series Summary Specifications*

Mechanical	AE 3TL-12	AE 3TL-16	AE 3TL-20	AE 3TL-23
Dimensions	21"(W) x 35"(H) x 11"(D) (535 x 895 x 280 [mm])			
Weight	108 lb (49 kg)			
Environmental Rating	NEMA 4/ connection box NEMA 3R			
DC Input Power Connectors	Terminal block 8-12 AWG			
AC Output Power Connectors	Terminal block 6-10 AWG			
User Interface	LCD			
Electrical				
DC Inputs				
Maximum DC Input Power**	21 kW	28 kW	35 kW	40.6 kW
Maximum Input Voltage	1000 V			
Array Configuration	Ungrounded			
Maximum Operating Input Current	27.5 A	33 A	37.5 A	40 A
Maximum Short Circuit Current (Isc)	76 A			
MPPT Voltage Range	250 V to 900 V			
Minimum Voltage for Full Power	450 V	500 V	550 V	600 V
Open-Circuit Turn-On Voltage	200 V			
Number of Strings	6			
AC Output				
Continuous Output Power	12 kW	16 kW	20 kW	23.2 kW
Operating Voltage Range	423 to 528 V			
Rated Apparent Power	12 kVA	16 kVA	20 kVA	23.2 kVA
Electrical Service Compatibility	3 AC 480 V Wye +N			
Maximum Continuous Current	14.5 A	19.3 A	24.1 A	27.9 A
Short-Circuit Fault Current	16.5 A; duration < 10 msec	21 A; duration < 10 msec	26 A; duration < 10 msec	29 A; duration < 10 msec
Nominal Frequency	60 Hz (57 Hz to 63 Hz adjustable)			
Total Harmonic Distortion	< 3%			
Efficiency				
Peak Efficiency	98.2%			
Weighted Efficiency (CEC Method)	97.5%	97.5%	97.5%	98%
Standby Losses	< 0.5 W			
Inverter Controls and Monitoring				
Anti-Islanding	In accordance with IEEE 1547 and UL 1741			
Reactive Power and Power Factor	±0.99 standard, settable from ±0.90			
Inverter Monitoring				
Communication Interfaces and Protocols	Ethernet, RS-485			
Environmental				
Operating Ambient Temp. Range**	-13°F to +131°F (-25°C to +55°C)			
Standby/Storage Ambient Temp. Range	-22°F to +158°F (-30°C to +70°C)			
Cooling	Natural convection			
Relative Humidity	95% before derating			
Elevation	6500' before derating			
Noise Emission	45 dBA at 16.5'			
Regulatory				
Agency Approvals / Regulatory Compliance	UL 1741, 1699B, IEEE 1547, CSA C22.2, FCC Part 15 (Class A and B)			
Inverter Warranty	5 years standard, extendable to 20 years			
Model Numbers Without AFCI	AE_3TL-12_10-08	AE_3TL-16_10-08	AE_3TL-20_10-08	AE_3TL-23_10-08
Model Numbers With AFCI	AE_3TL-12_10	AE_3TL-16_10	AE_3TL-20_10	AE_3TL-23_10

Subject to change without notice. Refer to user manual for detailed specification.
*Not all performance window specifications can be achieved simultaneously. Performance varies per site.
**Derating at temperatures > 122°F (50°C) for the 12 kW and 16 kW; > 113°F (45°C) for 20 kW; > 104°F (40°C) for 23 kW
Consult your AE sales or service representatives for specific PV system design questions at sales.support@aei.com.

Options

- 5, 10, and 15 year warranty extension; Extensions are optional.
- Premium monitoring solutions
- AFCI

ADVANCED ENERGY®
Advanced Energy Industries, Inc.
1625 Sharp Point Drive • Fort Collins, CO 80525 U.S.A.
www.advanced-energy.com
800.446.9167 • sales.support@aei.com • invertersupport@aei.com

ENG-AE3TL-1000V-250-07 4/14

S&C PADMOUNT SWITCHGEAR

WITH SEL-351A PROTECTIVE RELAY

TECHNICAL DOCUMENTATION

15kV Padmount Switch Specification
Distributed Generation Project
2-Way Switch with SEL-351A Relaying

SF6 Padmount Style Switch
15 kV, 95kV BIL. SF_6 Insulated, Dead-Front, Padmounted, Front Access, Two Way,
Vacuum Interrupter Switch to include:

Line Side: (Way 1)

• One (1) three-phase SF_6 Vacuum Interrupter Switch.
• 600 Amp continuous and loadbreak.
• 40kA asym. momentary and close into fault rating.
• 600 Amp Deepwell Bushing per ANSI/IEEE 386 fig. 3 - elbows and inserts not included.
• Switch ratings per ANSI C37.71-1984 and C37.72-1987.
Viewing window provided for open close indication

Load Side: (Way 2)

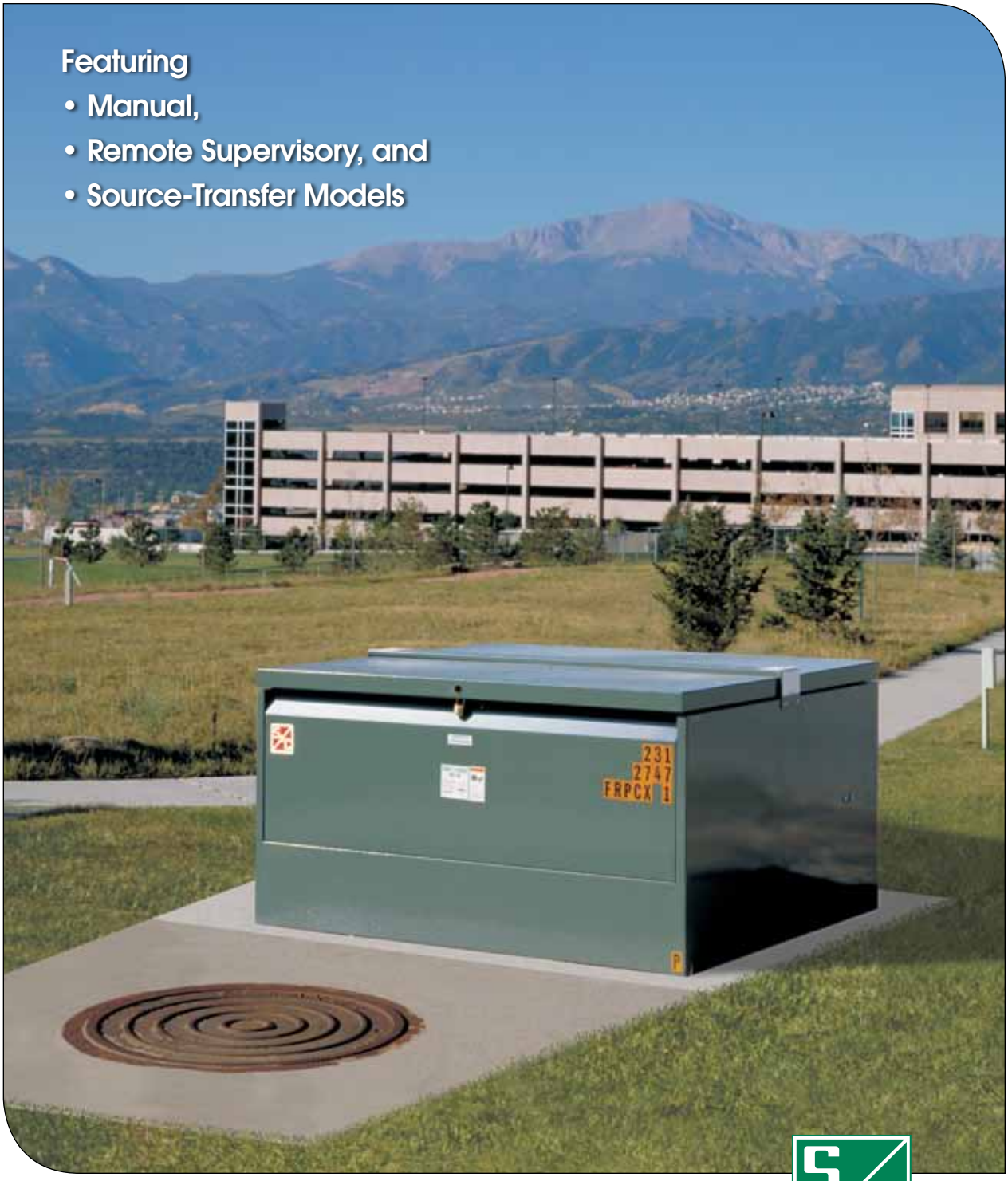
• One (1) single-phase 600 amp vacuum interrupters. Motor operator for interrupter open and close, self-powered.
• SEL351A –Multifunction relay.

1. Overcurrent (50/51), Over/Under voltage (27/59), over/under frequency /810/U) , 3V0 GND overvoltage (59G)
2. Housed in a NEMA 4 enclosure, batteries included.
3. Relay and battery charger self-powered by internal medium-voltage PT's

• 200 Amp Loadbreak Bushing per ANSI/IEEE 386 - elbows and inserts not included..
• (3) Oil filled PT's for Wye System . PT ratio typically 70:1 for 13.8kV systems and 60:1 for 13.2kV primary
• Low pressure warning device.
• **12.5kA sym. maximum** interrupting rating
• Interrupter ratings per ANSI C37.60-1981.

Standard Components:

• Welded ¼" mild steel tank and frame.
• Factory filled with SF_6 gas.
• Tank painted light gray (ANSI 70)
• Parking stands for all bushings.
• Five (5) 1/2"- 13 NC grounding provisions, one per way plus one per tank.
• One removable aluminum operating handle for line side and fixed stainless steel operating handles for each load side ways.
• Padlockable operating mechanism- padlocks not included.
• Open (Green)/Close (Red) indicators on all ways.
• 3" diameter circular viewing window to verify Open/Close position, one per way on the line side plus one per phase on the load side.
• Color coded "Go/No Go" pressure gauge.
• ¼" male flare brass schraeder valve with cap.
• 300 Series stainless steel and/or brass external fittings and hardware.
• 300 Series stainless steel nameplates and aluminum line diagram.



S&C Vista®
Underground Distribution Switchgear

Outdoor Distribution, 15.5 kV through 38 kV

Vista Underground Distribution Switchgear Addresses Your Concerns

- Are you wasting money and resources on time-consuming, labor-intensive routine operation of your switchgear?
- Has coordinating upstream protective devices with downstream fusing become a headache?
- Are your customers complaining that they don't want obtrusive green boxes on their property?

S&C's Vista Underground Distribution Switchgear is the answer to these and many other underground distribution system problems. S&C worked closely with electric utilities and power users to identify and satisfy needs that were not being met by conventional underground distribution equipment. Vista UDS is an exceptional product that meets all of these needs.

Vista Underground Distribution Switchgear is available in manual, remote supervisory, and source-transfer models. All models feature load-interrupter switches and resettable, vacuum fault interrupters or arc spinners in series with disconnect switches, elbow-connected and enclosed in a submersible, SF_6-insulated, welded steel tank. Vista UDS is available with up to six "ways," in ratings through 38 kV and 25 kA symmetrical short-circuit. Large windows in the tank provide a clear view of the open gap, ground position, and ground bus.

Remote Supervisory Pad-Mounted Style Vista UDS installation.

Large viewing windows let you see open gap and grounded positions on load-interrupter switches and fault interrupters. Trip indicators are easily checked too

Optional voltage indicator with liquid-crystal display. You can check the integrity of the voltage indicator by shining a flashlight on the photo-cell-powered test circuit, while placing a gloved finger over the test button. See page 8. No flashlight needed in daylight

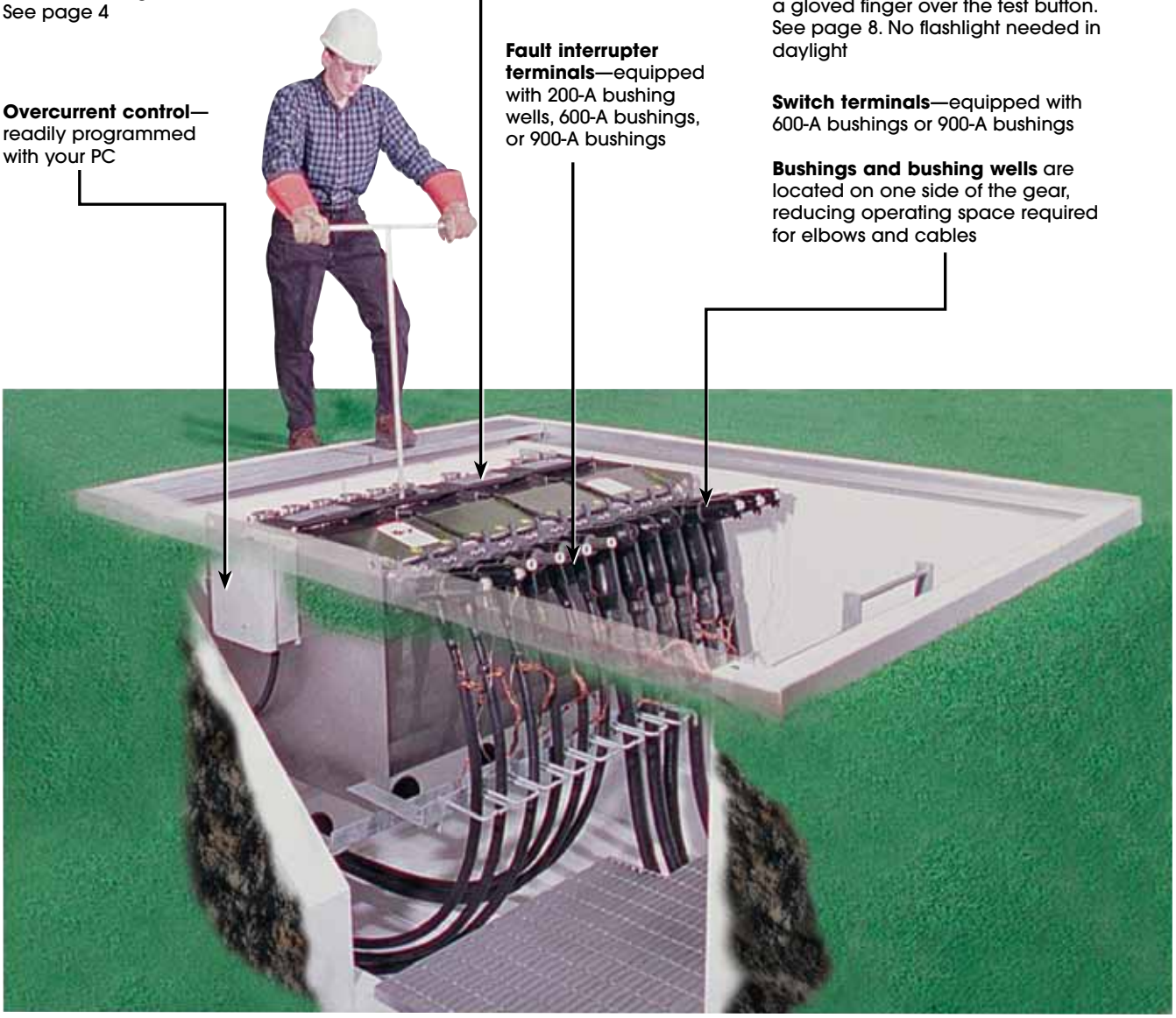
Operating panel is located near grade level so UnderCover™ Style gear is easily operated from a standing position. See page 4

Overcurrent control—readily programmed with your PC

Fault interrupter terminals—equipped with 200-A bushing wells, 600-A bushings, or 900-A bushings

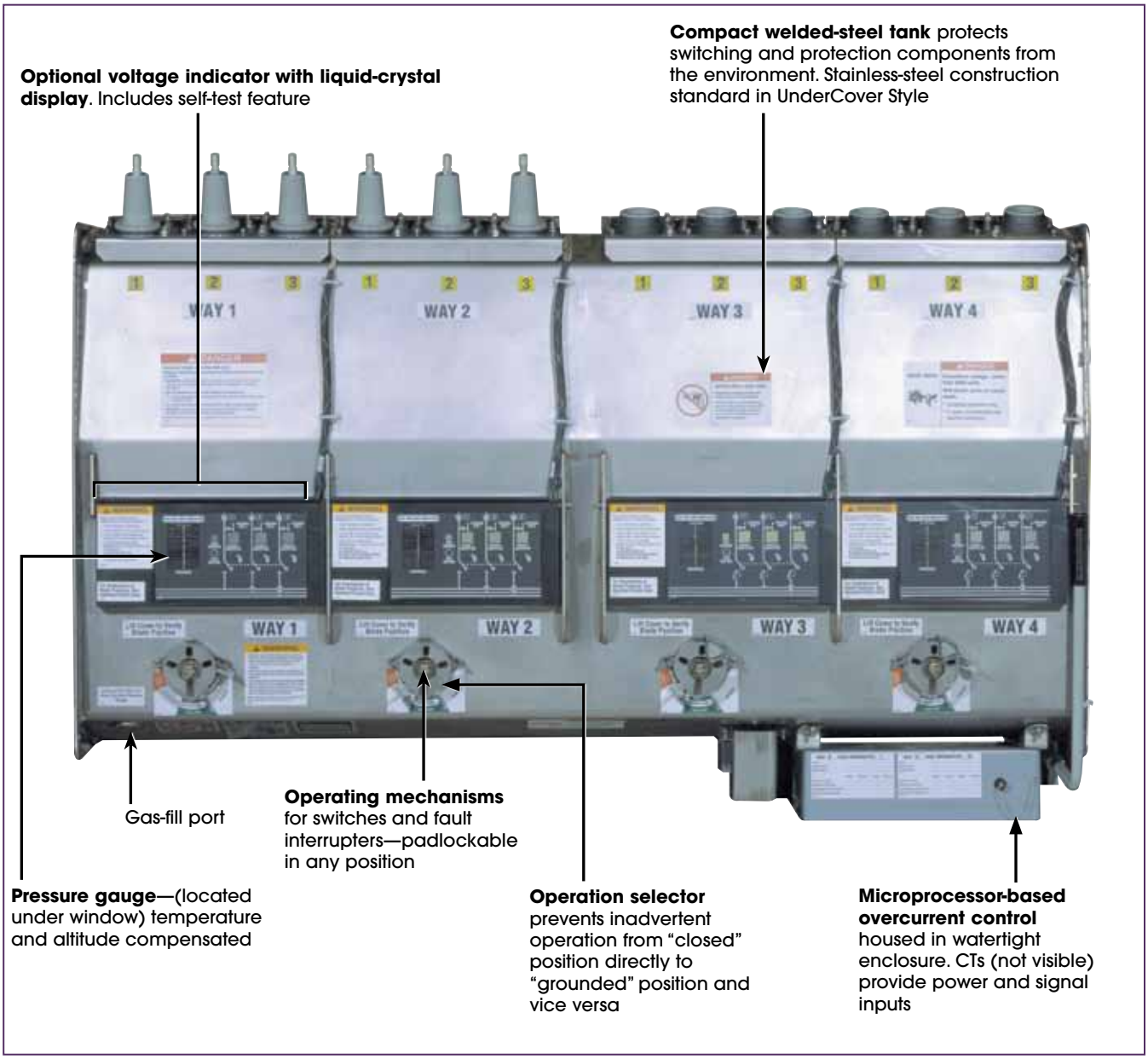
Switch terminals—equipped with 600-A bushings or 900-A bushings

Bushings and bushing wells are located on one side of the gear, reducing operating space required for elbows and cables



15-kV UnderCover Style Model 422.

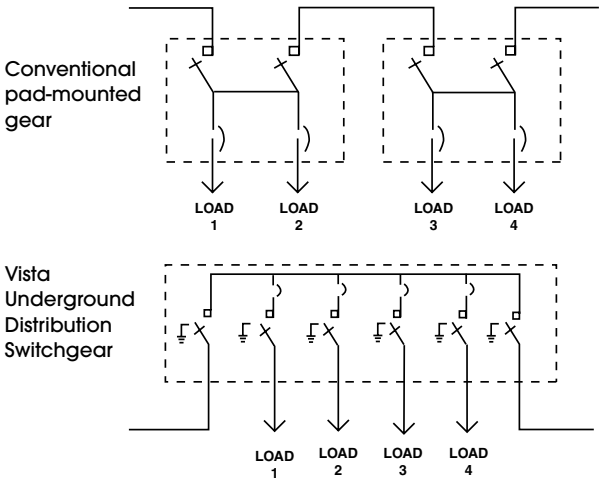
The load-interrupter switches provide three-pole live switching of 600-ampere or 900-ampere three-phase circuits. The switches have three positions (closed-open-grounded) and provide a clearly visible gap when open. The 200-ampere, 600-ampere, and 900-ampere fault interrupters offer 40-ms fault clearing, have three-position (closed-open-grounded) disconnects, and are available with either single-pole or three-pole switching. Most models of Vista UDS use in-series vacuum fault interrupters for fault clearing. However, the popular 15-kV, 12.5-kA manual models now feature arc-spinning technology for fault interruption . . . reducing the height of the tank by nearly a foot!



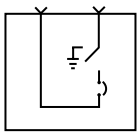
Operating panel of Vista UDS gear. Viewing windows, for confirming open gap and grounded position on load-interrupter switches and fault interrupters, are located under hinged covers of voltage indicators.

Vista UDS is available in up to six "ways." This means it can accommodate any combination of up to six bus taps, load-interrupter switches, or fault interrupters. With conventional pad-mounted gear, for a looped feeder with four taps, two units of gear are necessary. But with Vista UDS, only one six-way unit is needed. Vista UDS simplifies installation and improves aesthetics by reducing the necessary real estate.

The model number indicates the total number of ways, as well as the number of load-interrupter and fault-interrupter ways. For example, Model 321 has "3" ways—"2" load-interrupter switch ways and "1" fault-interrupter way, as shown below.



TYPICAL CONFIGURATIONS OF MANUAL AND REMOTE SUPERVISORY VISTA UDS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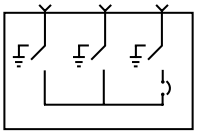
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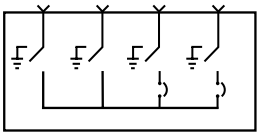
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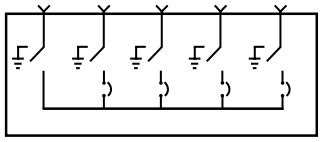
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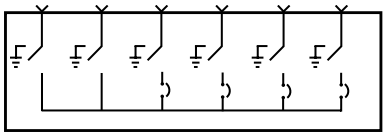
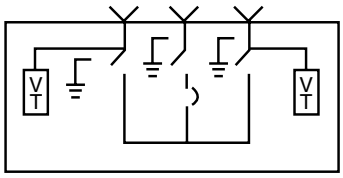

624

TYPICAL CONFIGURATIONS OF SOURCE-TRANSFER VISTA UDS



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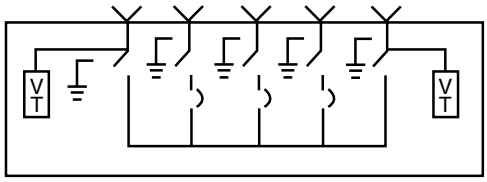

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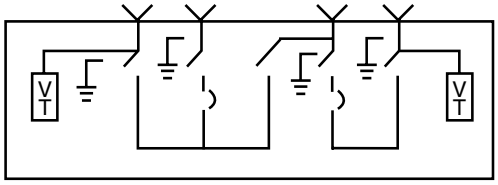


532 (split-bus)

Vista UDS Offers Numerous Unobtrusive Installation Options

One option is the low-profile pad-mounted style. At 15, 25, and even 34.5 kV, pad-mounted Vista UDS is 6 to 14 inches shorter than the average SF_6-insulated gear. And Vista UDS's total real-estate requirement is less than one-third that of a typical SF_6-insulated design. This means that Vista UDS is easier to site and allows more room for landscaping options that further improve aesthetics.

Vista UDS's most innovative installation offering is the UnderCover style. The UnderCover style is ideal for areas with stringent real-estate restrictions or where aesthetics are extremely important. The Vista UDS gear is installed underground, but all operations are easily performed by one operator above ground. UnderCover style installations can also save money by reducing costs associated with trenching and long cable runs.

Vista UDS is also available for floor-mounted or wall-mounted vault installations, and in a man-hole style. With its compact design, rugged construction, and internal visible open point, man-hole style Vista UDS is perfect for applications where installation space is limited.

UnderCover Style.

Pad-Mounted Style.

Vault-Mounted Style—available for floor and wall-mounting.

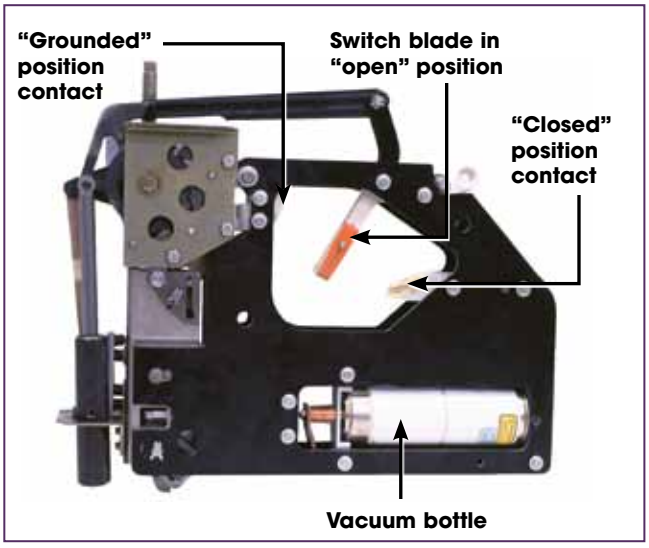
Man-Hole Style.

Vista UDS Operation Is Quicker, Easier, Safer

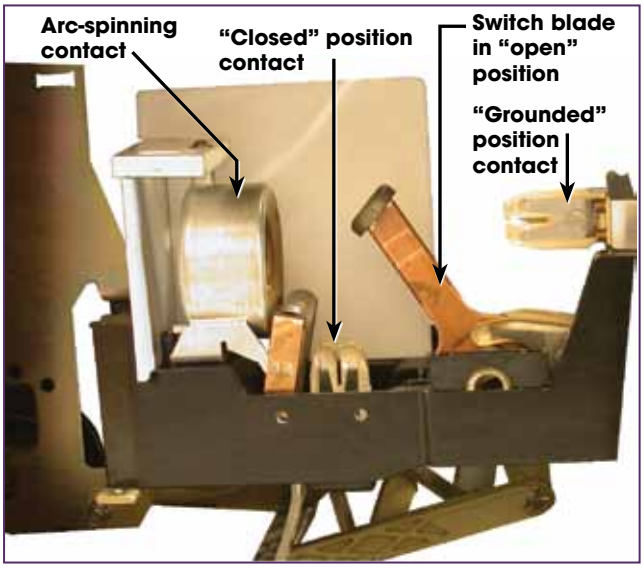
Vista UDS was specifically designed to simplify operating tasks, enhance safety, and minimize the duration of outages. Vista UDS is certified arc-resistant per IEC 298 Appendix AA, for currents up to 12.5 kA symmetrical for 15 cycles (25 kA symmetrical for 15 cycles, for models rated 25 kA short-circuit). In the event of an internal fault, the enclosure will retain its integrity.

Just one person is needed to operate Vista UDS. There's no exposure to medium voltage. The procedure is simple:

1. Rotate the switch operating shaft to the "open" position, then confirm the open gap through the large viewing window. See Figures 1 and 2. With ordinary elbow gear, on the other hand, specially trained operators need to remove the elbows from their bushings using a shotgun clamp stick—a tedious task that must be carefully performed. See Figure 3.



Fault interrupter furnished on all Vista UDS except 15-kV manual models.



Fault interrupter furnished on 15-kV, 12.5-kA manual models.

Figure 1. Opening load-interrupter switch (or fault interrupter).

Figure 2. Window cover lifts for viewing switch-blade positions of load-interrupter switch or fault interrupter.

Figure 3. Operation of typical dead-front gear can be awkward and time-consuming.

2. Confirm that the cable is de-energized so it can be safely grounded. With traditional gear, the medium-voltage cables must be tested directly using a clampstick-mounted tester. But voltage testing with Vista UDS can be accomplished simply and easily without ever accessing the cables. Simply use the voltage indicators shown in Figure 4. The voltage indicator is even equipped with a self-test function, so you can "test the tester." See Figure 5.

3. Ground the cables. Instead of the awkward task of having to move the elbows to parking stands, along with the grounding bushings or elbows, with Vista UDS you need only rotate the switch operating shaft to the "grounded" position. See Figure 6. Grounding can easily be confirmed by looking through the viewing window.

There are even more benefits: The voltage indicator can be furnished with a low-voltage phasing option. See Figure 7. This feature allows confirmation of proper phasing without ever accessing the cables. Vista UDS allows fault-locating and hi-potting tests to be performed with the cables attached—and the bus energized.

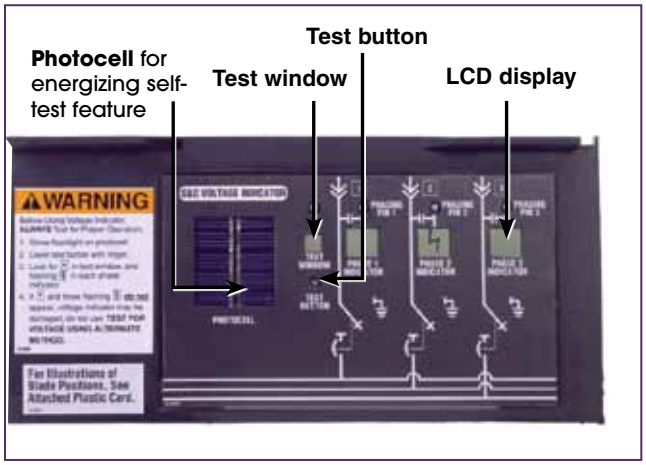


Figure 4. Voltage indicator.

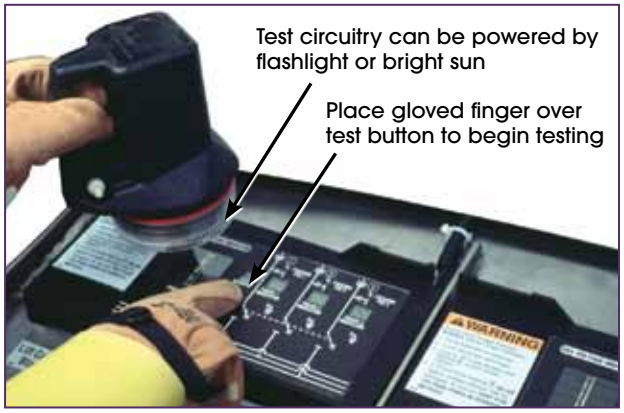


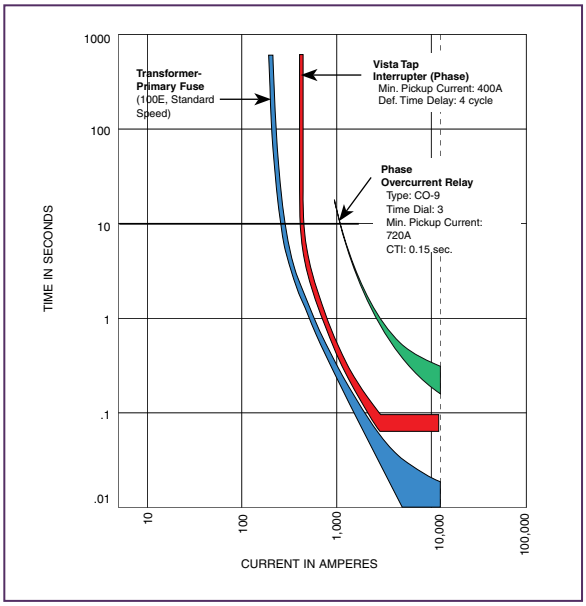
Figure 5. Testing the voltage indicator.

Figure 6. Grounding load-interrupter switch (or fault interrupter).

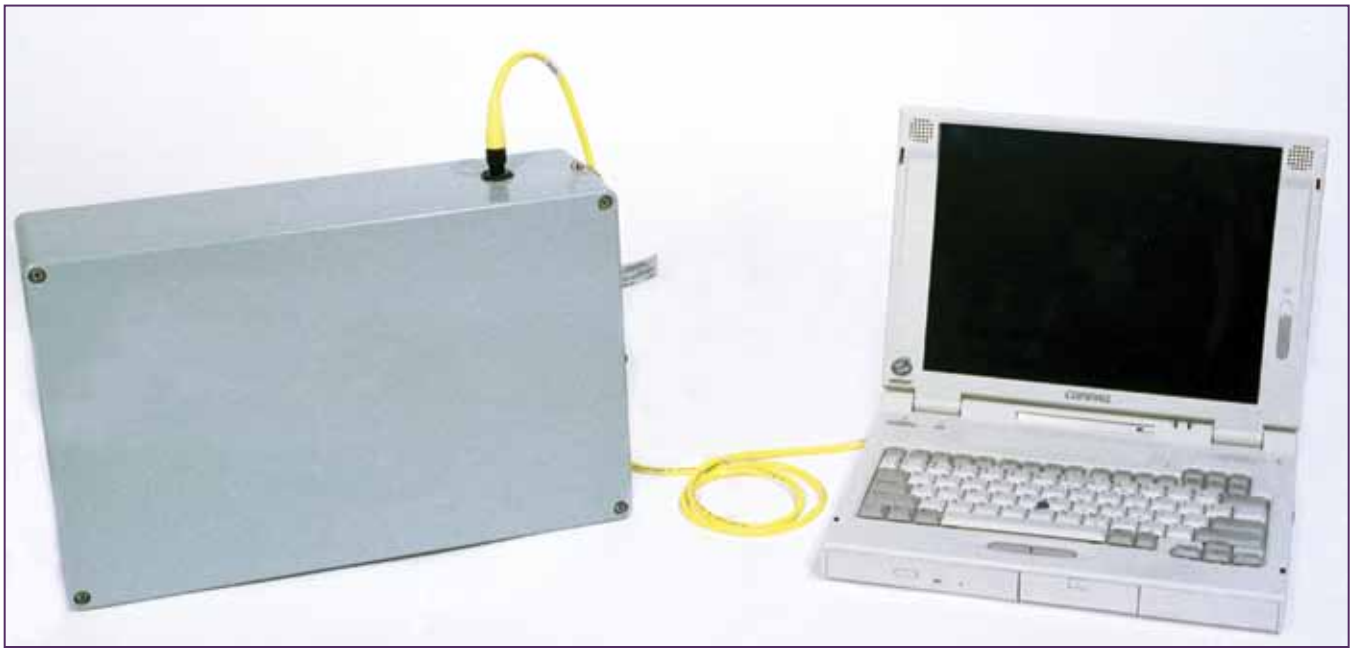
Figure 7. Measuring phase-to-phase voltage—Phase 1 to Phase 1.

Overcurrent Control for Superior Coordination

Vista UDS utilizes a unique microprocessor-based overcurrent control, housed in a watertight enclosure mounted on the gear. The overcurrent control features a variety of TCC (time-current characteristic) curves with selectable instantaneous and definite-time delay attributes, for superior coordination with upstream protective devices and downstream fusing. The parameters for the TCC curves are set using a personal computer connected to the data port of the overcurrent control. There are no knobs or dials, so the settings cannot be inadvertently changed or altered by unauthorized personnel. Integral current transformers provide power and current sensing. There is even an event recorder that captures information on the last twelve operations of each fault interrupter.



Coordinating-speed tap curve with definite-time delay eliminates miscoordination problems frequently encountered with transformer fuses.

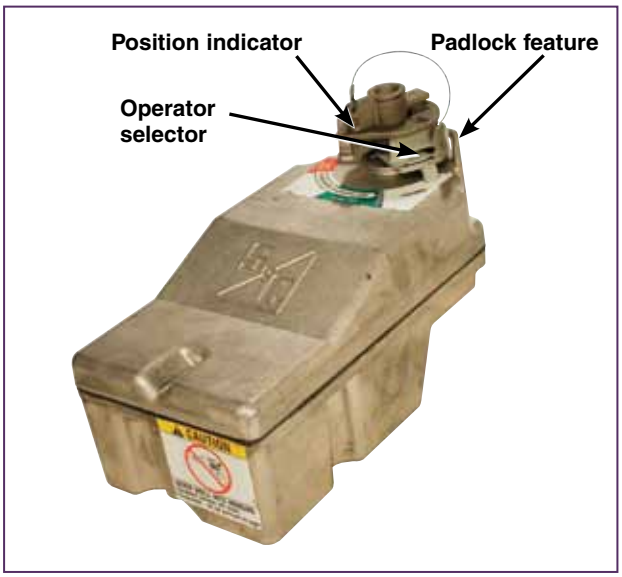


User-supplied personal computer is attached to the overcurrent control for programming the relay in the field.

Remote Supervisory Vista UDS

For distribution automation applications, S&C offers Remote Supervisory Vista UDS. Remote Supervisory Vista UDS provides automated switching and fault protection, and can also perform auto-sectionalizing without tripping the main breaker. Automation features are also retrofittable to existing Manual Vista UDS. Motor operators, current and voltage sensors, and low-voltage compartment are easily installed in the field.

Each motor operator includes a control board that provides local push-button and remote operation between the "closed," "open," and "grounded" positions. Up to six control boards can be accommodated within the low-voltage compartment, so any or all load-interrupter switches or fault interrupters can be motor operated. The motor



Details of motor operator.

15-kV Remote Supervisory Pad-Mounted Style Model 422.

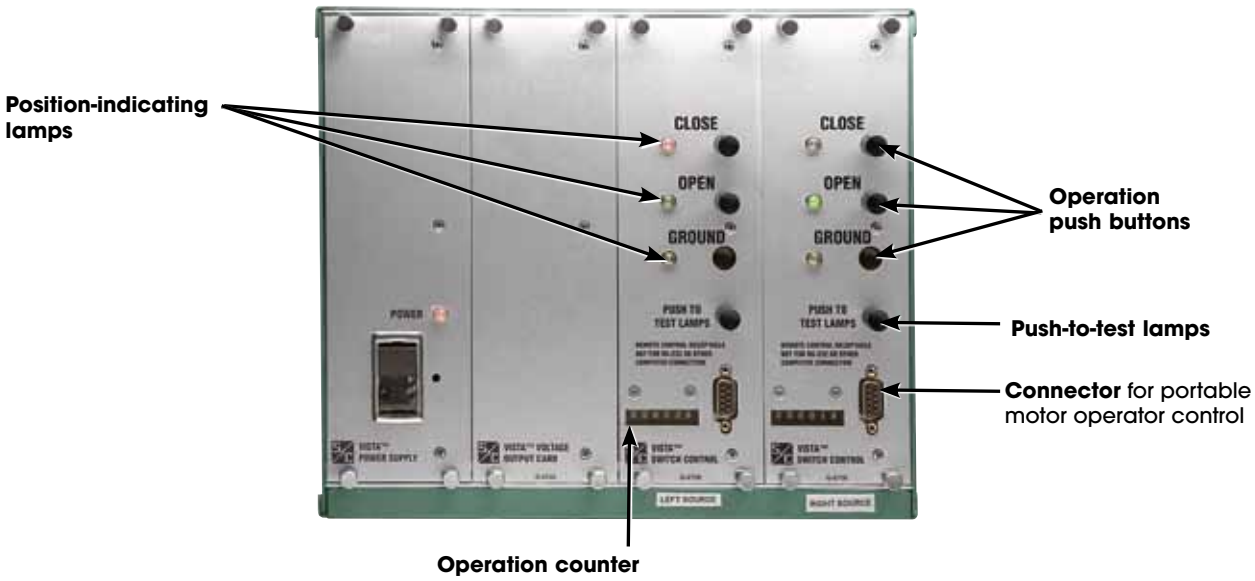
operators may be battery powered or, optionally, self-powered using internal voltage transformers. The low-voltage compartment may also contain a user-specified remote terminal unit and communication device, providing a completely automated switching and protection package. Optional voltage and current sensing round out the Remote Supervisory Vista UDS offering.

A variety of RTUs have been successfully integrated in Remote Supervisory Vista UDS, including: ACS, Harris DART, Valmet PoleCAT, QEI/Quindar, Hathaway/Systems Northwest, Motorola MOSCAD, and DAQ.

And these transceivers have been integrated: Metricom Utilinet, MDS, Dymec, H&L, and Motorola.

RTUs and communication devices of other manufacture can be accommodated too; contact your nearest S&C Sales Office.

Details of low-voltage compartment of Remote Supervisory Vista UDS Model 422.



Vista motor controls for installation with two motor-operated ways.

When Remote Supervisory Vista UDS is furnished with an EnergyLine 5800 Series Switch Control, it can be a member of an IntelliTEAM®, using EnergyLine's revolutionary peer-to-peer communications. IntelliTEAM software supports automatic sectionalizing and reconfiguration, significantly reducing outage time. IntelliTEAM's peer-to-peer communication network uses distributed intelligence, eliminating the need for, but still fully supporting, a SCADA master station. And, when Remote Supervisory Vista UDS is fitted with an EnergyLine switch control, the gear can be used for automatic source transfer, with remote control and monitoring.

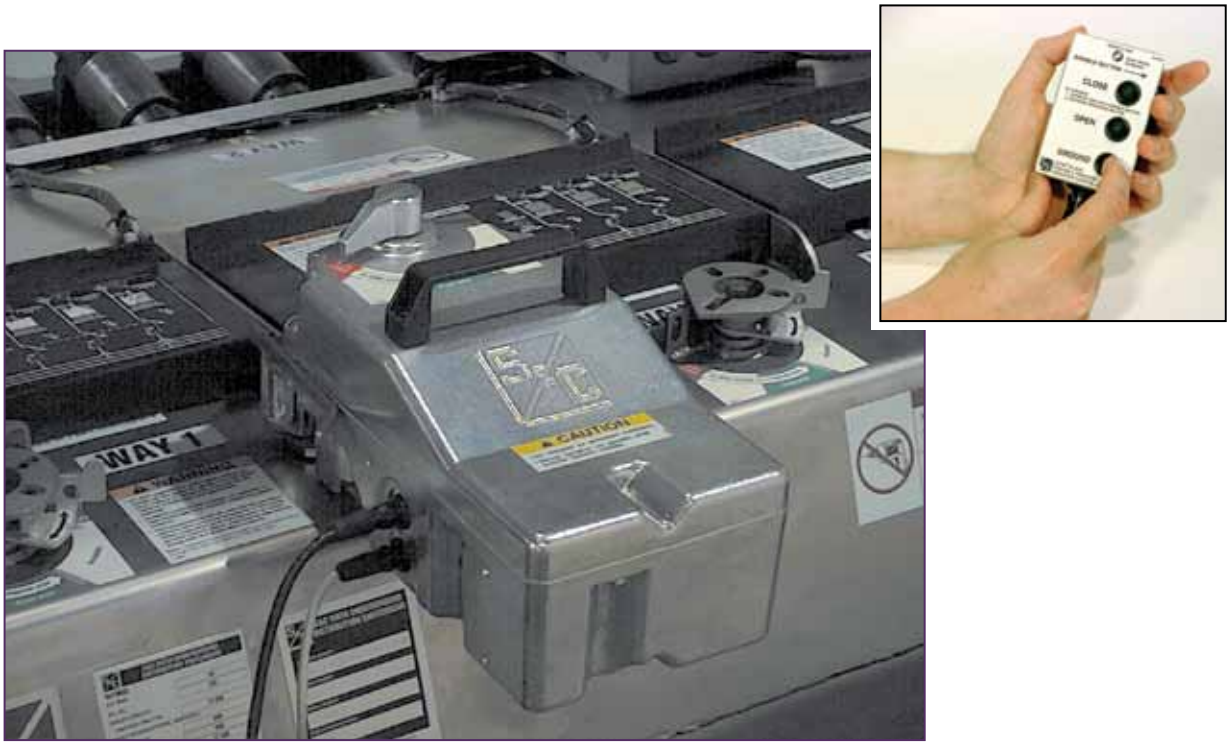
Remote Supervisory Vista UDS with 5800 Series Switch Control.

Remote Supervisory Vista UDS also allows the user to remotely trip the vacuum bottles of any three-phase fault interrupter way using external, user-specified relays. This additional shunt-trip capability permits advanced applications like sensitive earth-ground fault detection, as well as protective relay schemes using high-speed communication for closed-loop and open-loop systems.

Portable Motor Operator

Local motor operation of Vista UDS gear is also available for users who do not require a complete automation package. The portable motor operator includes cabling and hand-held control, all in an easily portable, durable case.

The operator easily attaches to any load-interrupter switch or single-pole or three-pole fault interrupter. Then simply plug in the power cable and the control cable. The hand-held control features "open," "close," and "ground" push buttons, an "enable" button to prevent inadvertent operation, and a "ready" indicating light.



Vista UDS Portable Motor Operator. Inset shows hand-held control.

Case for Vista UDS Portable Operator.

Source-Transfer Vista UDS

Source-Transfer Vista UDS provides fully automatic primary-selective service for one, two, or three critical load circuits. This package includes all the features of Manual Vista UDS, plus the S&C Micro-AT® Source-Transfer Control, three-phase voltage sensing on source ways, and internal power provided by voltage transformers. It is available in common-bus and split-bus configurations.

The Micro-AT Source-Transfer Control, located in the low-voltage compartment, ensures a high degree of critical-load continuity by minimizing interruptions resulting from the loss of one source. Excluding the intentional time delay to coordinate with upstream protective devices and/or transition dwell time, transfer is achieved in 6 seconds maximum.

The Micro-AT Source-Transfer Control utilizes an advanced microprocessor to perform control operations, as directed by settings programmed into the device at the factory and in the field. Such settings, consisting of the control's operating characteristics and voltage-, current-, and time-related operating parameters, are entered into the control by means of a keypad on the front panel.

An unbalance detection feature may be field-programmed in the Micro-AT Source-Transfer Control. This feature protects the loads from any source-side open-phase condition at the same voltage as the Vista Underground Distribution Switchgear. If the voltage unbalance exceeds a preset reference level for a period of time sufficient to confirm that the loss is not transient, an output signal is produced which initiates automatic transfer to the other source.

An overcurrent-lockout feature may be furnished which prevents an automatic transfer operation that would close a source load-interrupter switch into a fault. A light-emitting diode lamp indicates when lockout has occurred. Test keys are provided for simulating an overcurrent condition on each source.

Micro-AT Source-Transfer Control.

Standard Three-Phase Ratings①②③

Applicable Standard	Amperes, RMS									
	Frequency, Hertz	Fault Interrupter			Load-Interrupter Switch				Short-Circuit, Sym.	Main Bus Continuous Current⑦
		Continuous, Load Dropping, and Load Splitting (Parallel or Loop Switching) ④⑤⑥	Fault-Closing, Sym.	Fault Interrupting, Sym.	Continuous, Load Dropping, and Load Splitting (Parallel or Loop Switching) ④⑤⑥	Fault-Closing, Sym.	Momentary, Sym.	1 Sec., Sym.		
IEC	50 or 60	200 or 630	12 500▲	12 500	200 or 630	12 500▲	12 500	12 500	12 500	600
		630	25 500●	25 000	630	25 500●	25 000	25 000	25 000	600
ANSI	50 or 60	200 or 630	12 500▲	12 500	200 or 630	12 500▲	12 500	12 500	12 500	600
		600	25 500●	25 000	600	25 500●	25 000	25 000	25 000	600

① Refer to the nearest S&C Sales Office for other ratings.

② IEC ratings have been assigned in accordance with the applicable portions of IEC 265-1 for a Class A switch.

③ ANSI ratings have been assigned in accordance with the applicable portions of ANSI C37.71, C37.72, and C37.73.

④ Fault interrupters and load-interrupter switches are rated 600 amperes (630 amperes IEC) continuous, load dropping, and loop splitting when furnished with 600-ampere bushings (standard for load-interrupter switches and 25-kA fault interrupters, optional for 12.5-kA fault interrupters). The rating is limited to 200 amperes if 200-ampere bushing wells are used (standard for 12.5-kA fault interrupters, optional for 12.5-kA load-interrupter switches). Models rated 25-kA are only available with 600-ampere bushings.

⑤ Fault interrupters and load-interrupter switches can switch the magnetizing current of transformers associated with the load-dropping rating. In addition, unloaded cable switching ratings are as follows: 10 amperes at 15.5 kV and 20 amperes at 29 kV and 38 kV.

⑥ 900 ampere is also available.

⑦ 1200 ampere is also available.

▲ 32,500-ampere peak ten-time duty-cycle rating.

● 65,000-ampere peak three-time duty-cycle rating. Ten-time duty-cycle fault-clearing rating is 16,000 amperes symmetrical, 41,600 amperes peak.

Printed in U.S.A.

THIS VISTA UDS IS EQUIPPED WITH FAULT-INTERRUPTERS THAT ARE THREE-POLE GROUP-OPERATED FOR MANUAL SWITCHING

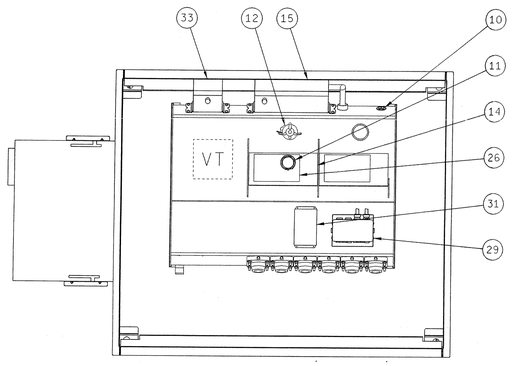
REVISIONS			
NO.	DATE	NOTICE NO.	
000	09-21-10	B5539965	NB

FEATURES:

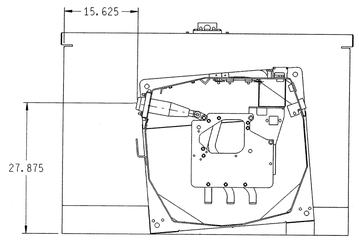
1. ALUMINUM NAMEPLATE
4. THREE-POLE FAULT-INTERRUPTER WITH THREE-POSITION (CLOSED-OPEN-GROUND) DISCONNECT
5. 600-AMPERE ALUMINUM BUS
7. 200-AMPERE BUSHING WELLS FOR FAULT-INTERRUPTERS
8. 200-AMPERE BUSHING WELLS FOR BUS TERMINALS
9. SF6-INSULATED STEEL TANK
10. GAS-FILL PORT
11. PRESSURE GAUGE
12. OPERATING MECHANISM
13. MANUAL OPERATING HANDLE
14. WINDOW FOR VIEWING OPEN GAP AND GROUNDED POSITION OF LOAD-INTERRUPTER SWITCH OR FAULT-INTERRUPTER
15. OVERCURRENT CONTROL (S&C 1000 RELAY) AND REMOTE SHUNT TRIP
16. 14-GAUGE PAD-MOUNTED ENCLOSURE
17. HINGED LIFT-UP ROOF WITH RETAINER TO HOLD ROOF IN POSITION
18. RETRACTABLE LIFTING TAB
19. PENTAHEAD BOLT LOCKING MECHANISM ACCOMMODATES PADLOCK WITH .375" DIAMETER SHACKLE
20. REMOVABLE PANEL
21. OPERATION COMPARTMENT LABEL
22. TERMINATION COMPARTMENT LABEL
23. WARNING SIGN
25. REMOTE SUPERVISORY VISTA LOW-VOLTAGE ENCLOSURE, MILD STEEL
26. POTENTIAL INDICATION WITH TEST FEATURE
28. TWO-HOLE GROUND PAD, ONE PER WAY
29. VISTA JUNCTION BOX ASSEMBLY
31. VOLTAGE SIGNAL AMPLIFIER FOR VOLTAGE SENSING
33. INTERNAL VOLTAGE TRANSFORMER SECONDARY FUSE ENCLOSURE

SPECIAL FEATURES:

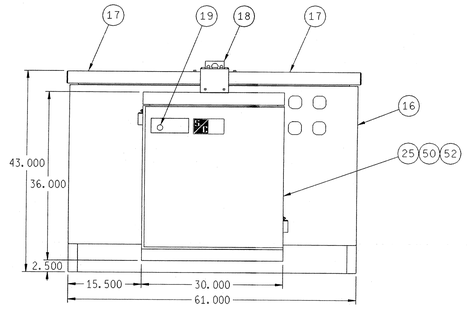
50. 30" WIDE X 21.5" DEEP LOW VOLTAGE ENCLOSURE
51. AUXILIARY CONTACTS ON VUCUUM BOTTLES (TRIPPED) AND DISCONNECT SWITH (CLOSED-OPEN-GROUND) FOR FAULT-INTERRUPTER WAY
52. SEL-351A PROTECTION SYSTEM P/N 0351A0H0X2B11X1



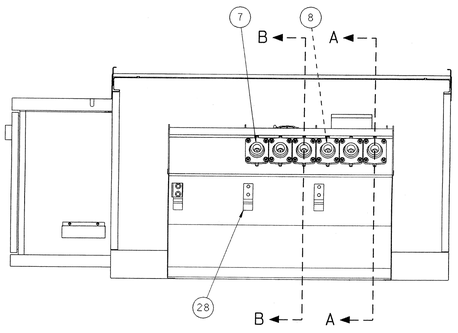
Sectional Open Top View



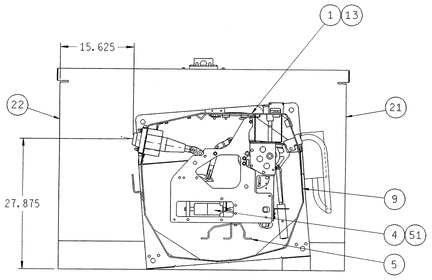
Section A-A: Bus Terminal



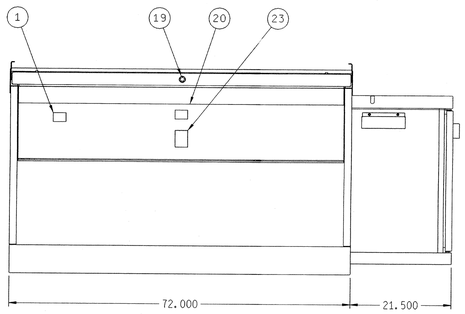
Enclosure Left Side View



Sectional Open Termination View



Section B-B: Fault Interrupter



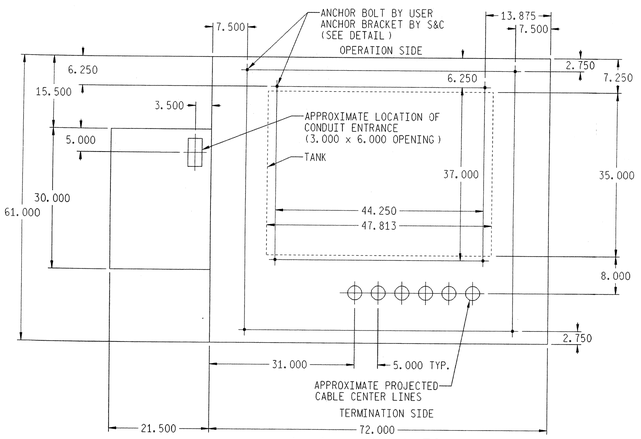
Enclosure Operation View

SUFFIXES:

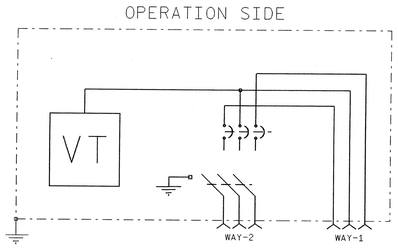
-D1	3-PHASE VOLTAGE SENSING (WAY 1)
-L1	POTENTIAL INDICATION WITH TEST FEATURE
-O	TWO-HOLE GROUND PAD, ONE PER WAY
-P4	PAD-MOUNTED STYLE, THREE OR FOUR-WAY, MILD-STEEL OUTER ENCLOSURE, OLIVE GREEN FINISH
-R11	REMOTE LOW-PRESSURE ALARM WIRED TO LOW-VOLTAGE ENCLOSURE
-R31	EXTERNAL TRIP PROVISIONS IN ADDITION TO STANARD OVERCURRENT CONTROL FOR FAULT-INTERRUPTER
-T1	THREE POLE, GROUP OPERATED FAULT-INTERRUPTER: QTY. 1
-Y4	INTERNAL CONTROL POWER FOR 13.8-14.4 KV SYSTEM VOLTAGE VIA AN INTERNAL VOLTAGE TRANSFORMER, 70:1 RATIO ABB CATALOG NUMBER 7525A66G07

WIRING DIAGRAMS:

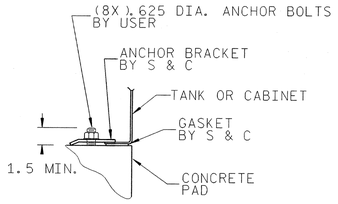
QCDR-14444	REMOTE SUPERVISORY WIRING DIAGRAM, MODEL 201
CDR-6436-S138	OVERCURRENT CONTROL AND REMOTE SHUNT TRIP AND AUXILIARY CONTACTS WAY 2



Anchor Bolt Plan



TERMINATION SIDE
Connection Diagram



ANCHOR BOLT DETAIL

UNLESS OTHERWISE SPECIFIED:
DECIMAL DIMS TO BE ±
ANGLES TO BE ±
WHEN CHECKED, BREAK ALL CORNERS □
WHEN CHECKED, REMOVE ALL BURRS □

PRINT IDENTIFICATION

DATE: 9/27/2010 S&C S.O. NO.: 244881
CUSTOMER: Yale Electric Supply - Canton
CERTIFIED BY:
PURCHASE ORDER NUMBER: 8032525
RELEASE ORDER NUMBER:
SUBSTATION / OTHER :
PROJECT: Mwra Wind Turbine
DRAWING NO.: 942012-D1L1OP4R11R31T1Y4-S121

942012-D1L1OP4R11R31T1Y4-S121

RATINGS

HERTZ			50	60
KV. MAXIMUM			12	15.5
KV. BIL			75	95
AMPERES RMS	MAIN BUS	CONTINUOUS	600	600
	FAULT INTER-RUPTER	CONTINUOUS	200	200
		LOAD DROPPING	200	200
		FAULT CLOSING DUTY-CYCLE TEN TIME SYMMETRICAL	12,500	12,500
		INTERRUPTING SYMMETRICAL	12,500	12,500
	SHORT-CIRCUIT	SYMMETRICAL	12,500	12,500

DRAWING NO. 942012-S121 MST

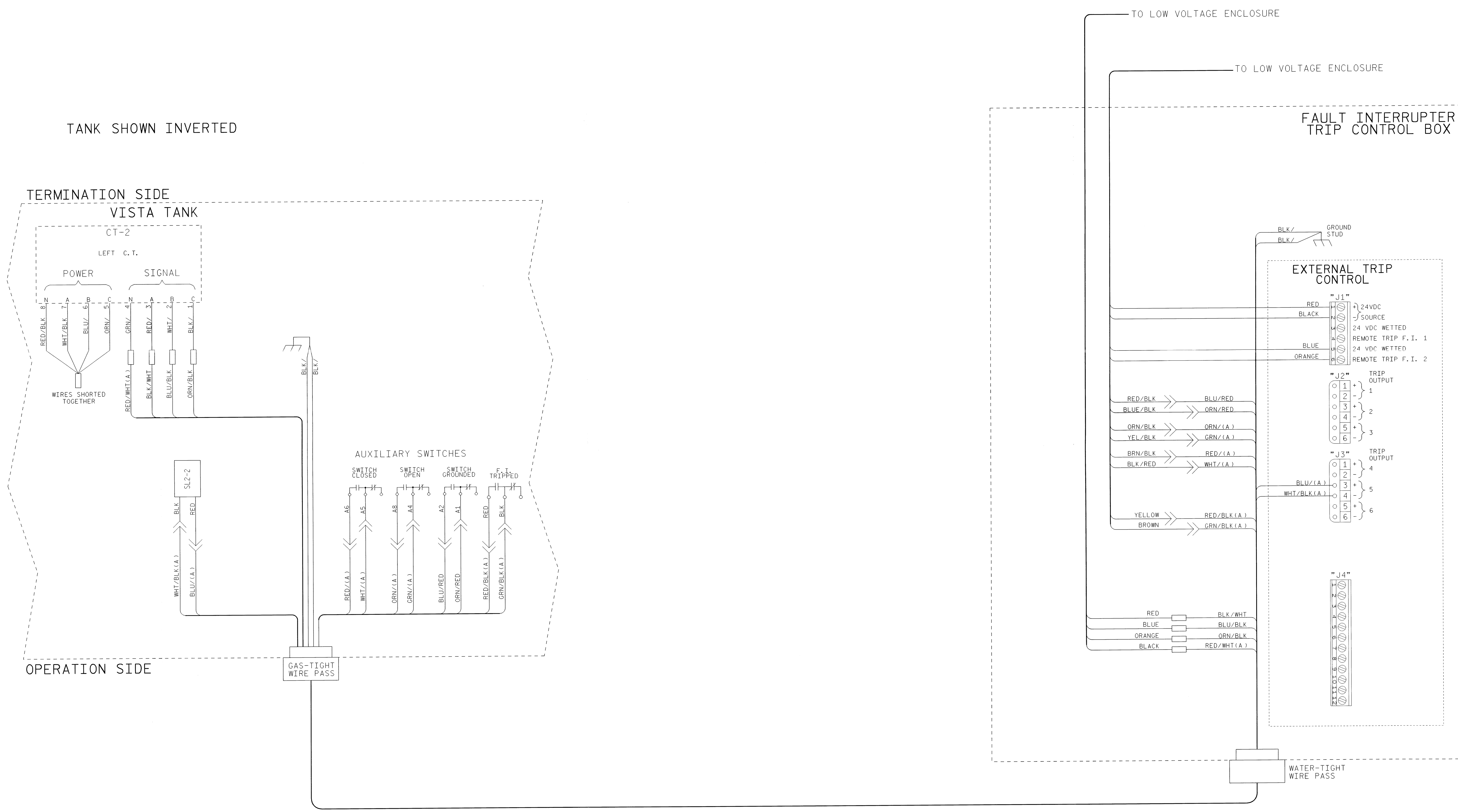
MATERIAL: FINISH:
DRAWING SIZE: D DRAWN BY: bouttavn
SCALE: 1:16 ORIGINATION DATE: 09-21-10
USED ON
NEXT ASSEMBLY
PRODUCT DESCRIPTION: VISTA REMOTE SUPERVISORY

S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION
S&C VISTA REMOTE SUPERVISORY UNDERGROUND DISTRIBUTION SWITCHGEAR MODEL 201, 15.5KV

CATALOG DIMENSIONAL
DRAWING NO. MST
942012-S121

24-SEP-2010 08:17 bouttavn dh\documents and settings\bouttavn\my documents\user team\work\942012-s121-dim.dgn



NOTES:

1. THE CONTROL POWER VOLTAGE TYPE IS SELECTABLE USING A JUMPER LOCATED ON THE PRINTED CIRCUIT BOARD. THE JUMPER MUST BE IN THE DC POSITION.
2. WIRE COLORS ARE REFERENCED AND MARKED "SOLID/STRIPE(STICKER)"

UNLESS OTHERWISE SPECIFIED:
DECIMAL DIMS TO BE ±
FRACTIONAL DIMS TO BE ±
ANGLES TO BE ±
WHEN CHECKED, BREAK ALL CORNERS ☐
WHEN CHECKED, REMOVE ALL BURRS ☐

⚠ CAUTION

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NO.	DATE	NOTICE NO.
0	09-20-10	SC539XXX

REVISIONS

DRAWING NO. CDR-6436-S138 MST

MATERIAL: S&C SPEC NO. DESCRIPTION:

FINISH: S&C SPEC NO. DESCRIPTION:

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NEXT ASSEM.	PRODUCT DESCRIPTION

USED ON

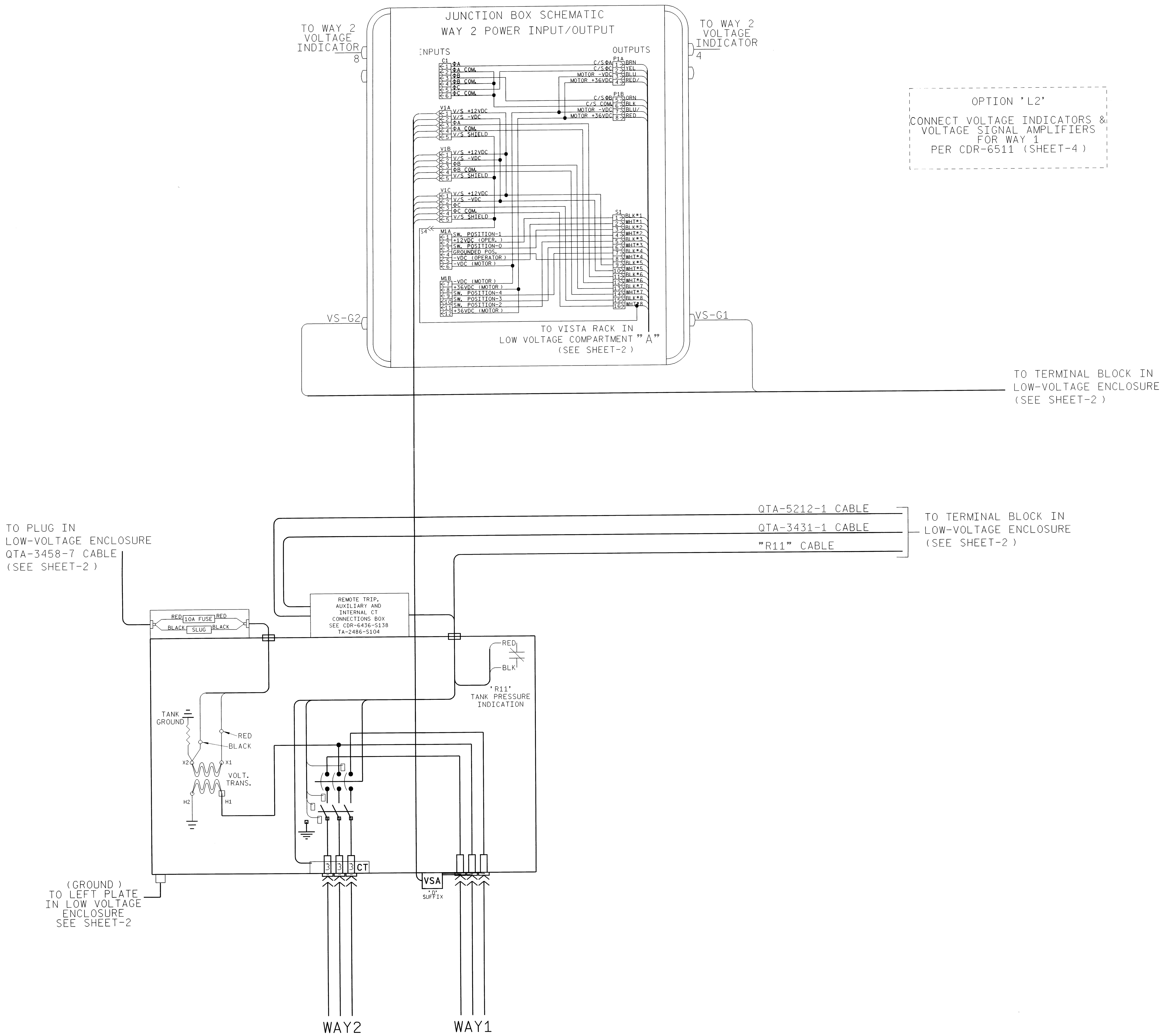
SCALE	NONE
DR. BY	MCM
CH. BY	MCM
APP. BY	MB
DATE	09-20-10

S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION

VISTA FAULT INTERRUPTER TRIP CONTROL W/ AUX. CONTACTS WIRING DIAGRAM

DRAWING NO. CDR-6436-S138 MST



UNLESS OTHERWISE SPECIFIED:
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ANGLES TO BE ±
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WHEN CHECKED, REMOVE ALL BURRS ☐

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NO.	DATE	NOTICE NO.
0	09-16-10	SC539XXX

DRAWING NO. QCDR-14444 MST

MATERIAL:

FINISH:

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DRAWING SIZE: D
DRAWN BY: MCM
SCALE: NONE
ORIGINATION DATE: 09-16-10
USED ON
NEXT ASSEMBLY: 942012-S121
PRODUCT DESCRIPTION: VISTA REMOTE SUPERVISORY

S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION

VISTA REMOTE SUPERVISORY
WIRING DIAGRAM
MODEL 201

SHEET 1 OF 2

DRAWING NO. MST
QCDR-14444

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BATTERY CHARGER ALARM:
A) E2-1 CONTACT IS CLOSED WHEN A BATTERY TEST FAIL CONDITION EXISTS.
B) E2-5 CONTACT IS OPEN WHEN A LOSS OF AC VOLTAGE CONDITION EXISTS.
C) E2-6 CONTACT IS CLOSED WHEN A BATTERY OVER-VOLTAGE CONDITION EXISTS.
D) E2-7 CONTACT IS CLOSED WHEN A BATTERY UNDER-VOLTAGE CONDITION EXISTS.

UNLESS OTHERWISE SPECIFIED:
DECIMAL DIMS TO BE ±
ANGLES TO BE ±
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0	09-16-10	SC539XXX

DRAWING NO. QCDR-14444

MATERIAL:
FINISH:

DRAWING SIZE	DRAWN BY
D	MCM
SCALE	ORIGINATION DATE
NONE	09-16-10

USED ON
NEXT ASSEMBLY: 942012-S121
PRODUCT DESCRIPTION: VISTA REMOTE SUPERVISORY

S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in Electric Power Switching and Protection

DESCRIPTION
VISTA REMOTE SUPERVISORY
WIRING DIAGRAM
MODEL 201

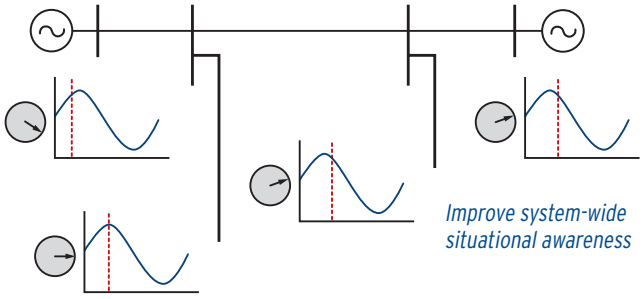
SHEET 2 OF 2
DRAWING NO. QCDR-14444 MST

SEL-351A Protection System

Standard SEL-351A protection system.

The SEL-351A provides comprehensive distribution and overcurrent protection for control and monitoring in a compact, secure, and economical package.

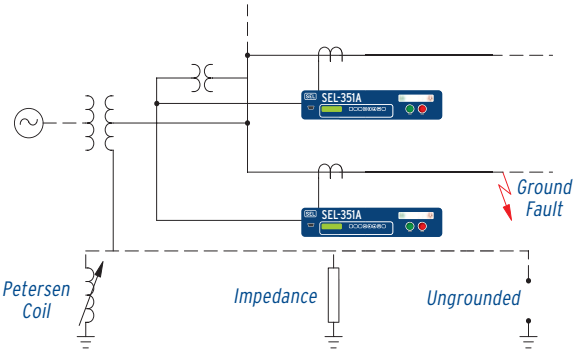
Built-In Synchrophasors



Improve system-wide situational awareness

Industry standard IEEE C37.118 protocol

Comprehensive Distribution Protection



Substation-Hardened Ethernet

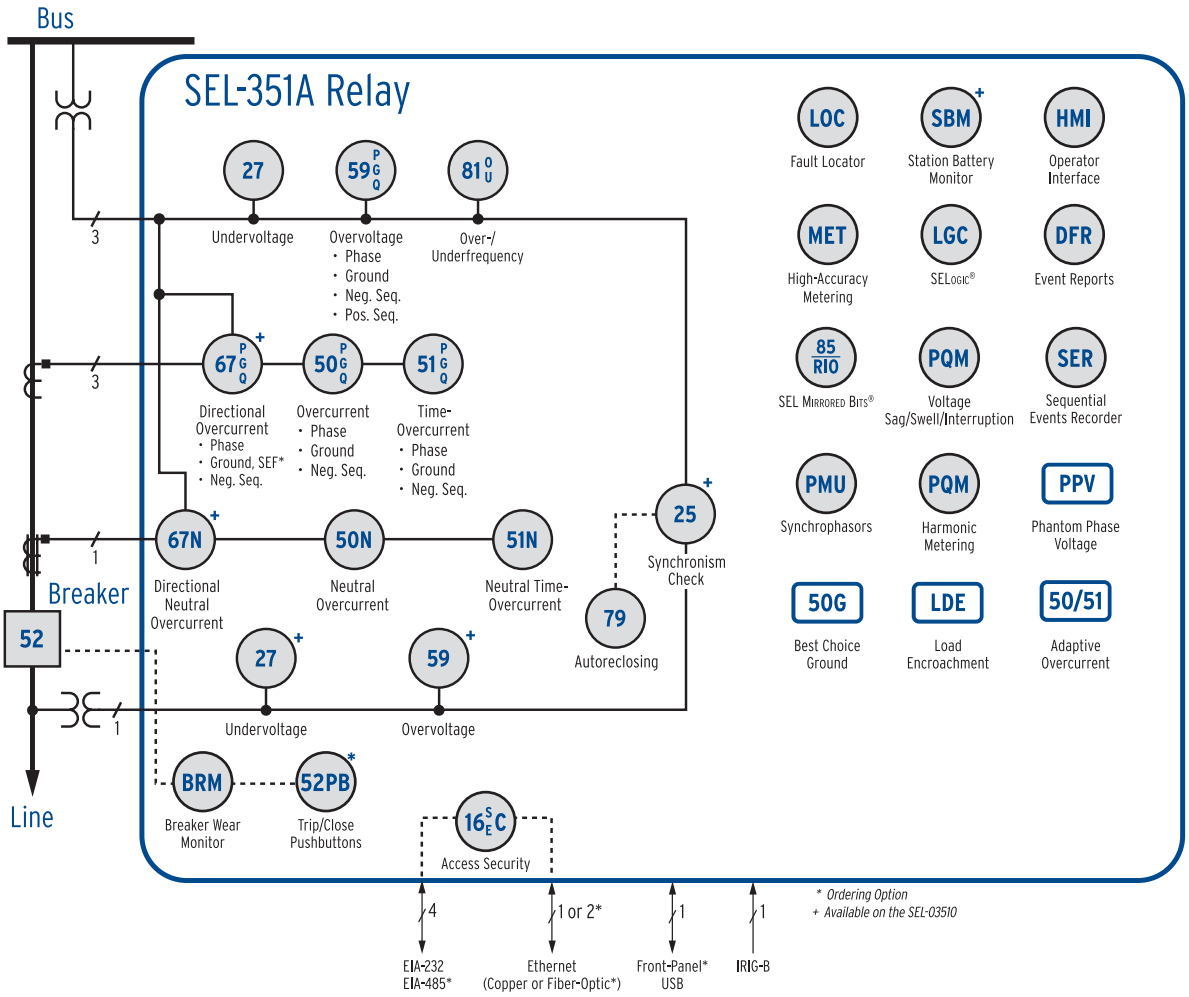
Modbus® TCP, Telnet, DNP3, and IEC 61850 protocols

Withstands electrostatic air discharge of 15 kV

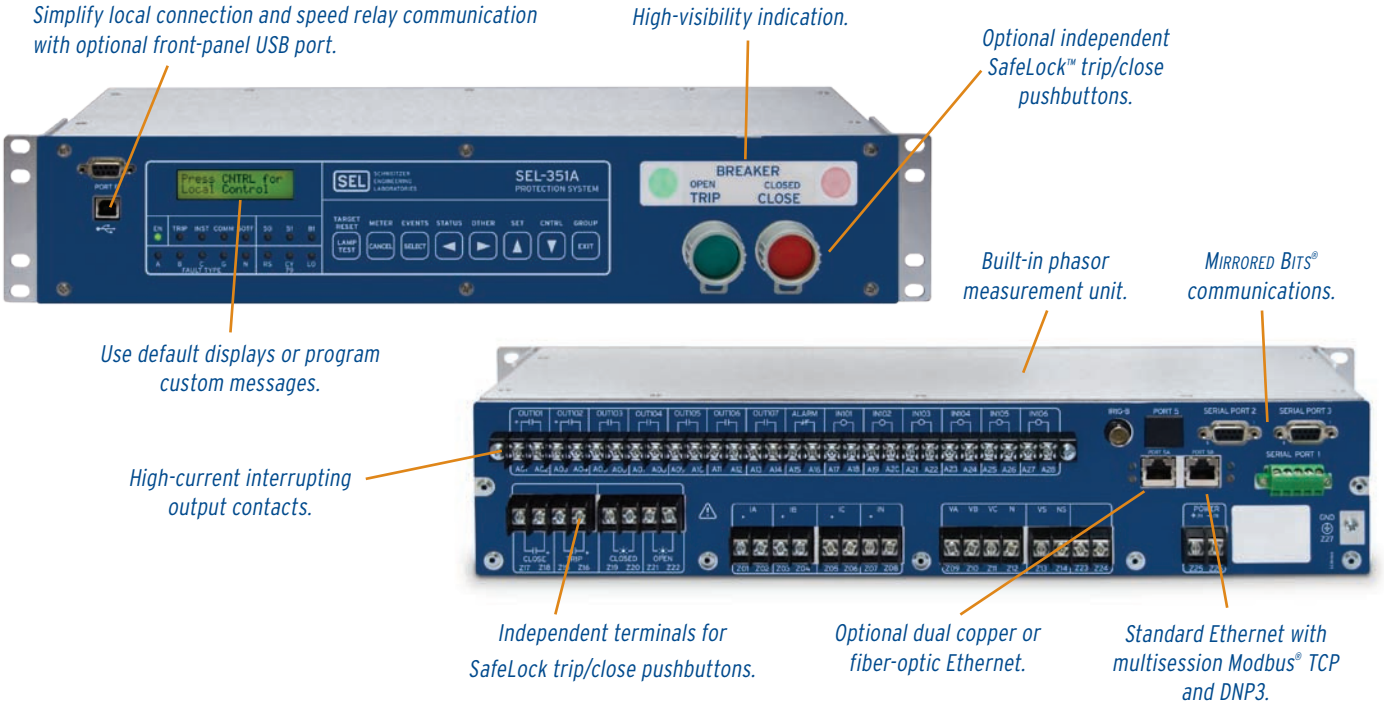
Industry-Leading Quality, Reliability, and Service

Making Electric Power Safer, More Reliable, and More Economical®

Functional Overview



Feature Overview



Flexible Communications

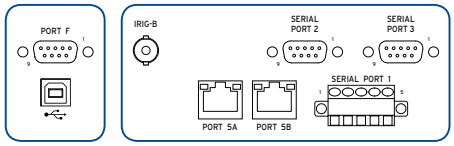
Communications Protocols

- Mirrored Bits® Communications
- IEEE C37.118 Synchrophasors
- IEC 61850
- Modbus TCP
- Modbus RTU
- Telnet
- DNP3 Serial
- DNP3 IP
- Web Server
- Simple Network Time Protocol (SNTP)
- FTP
- SEL Fast Messages
- ASCII
- IRIG-B

Communications Media

- 10/100BASE-T Ethernet
- 100BASE-FX Ethernet
- EIA-232 Serial
- EIA-485 Serial
- USB Type B
- BNC

The SEL-351A Relay offers many communications options.

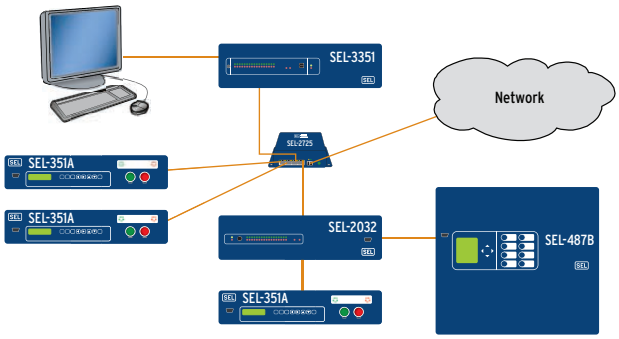


Front panel *Rear panel*

Integrate With Ethernet Networks

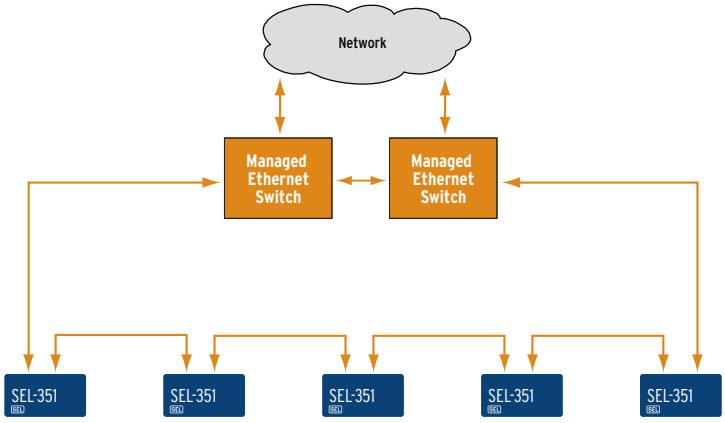
Apply SEL-351A Relays with Ethernet directly to a local network or through an SEL communications processor.

- Use DNP3 LAN/WAN or Modbus TCP to quickly send information through your networks.
- Provide information to the right people for improved system performance.
- Increase communications reliability with failover redundant communications ports.
- Transfer data with high-speed Ethernet for fast HMI updates and file uploads.
- Use popular Telnet applications for easy terminal communication with SEL relays and other devices.
- Combine IEC 61850 technology, Ethernet network, and the SEL-351A for the fastest overall performance of IEC 61850 relays for substation automation and control.
- Access basic relay information on a standard Ethernet network with the built-in web server. View relay status, Sequential Events Recorder (SER) reports, metering information, and settings. Web server access requires relay password and is limited to read-only viewing of information.
- Simplify wiring and installation by receiving a time signal over existing Ethernet networks. SNTP makes a good backup to more accurate IRIG-B time synchronization.

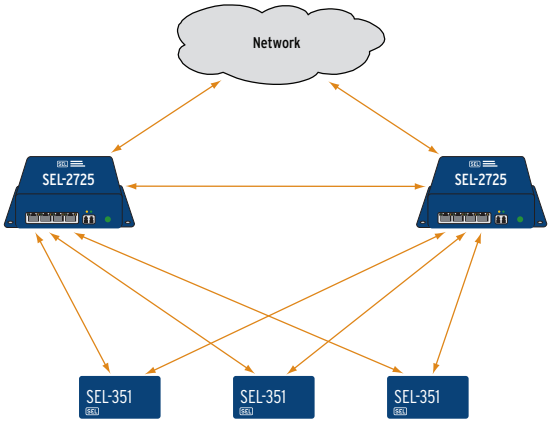


Reliable, Secure Networking Options

Increase network reliability and availability by incorporating dual-port Ethernet SEL-351A Relays with external managed or unmanaged switches. Implement a self-healing ring structure with managed switches, or use unmanaged switches in a dual-redundant configuration.



Typical network configuration for switched-mode operation.

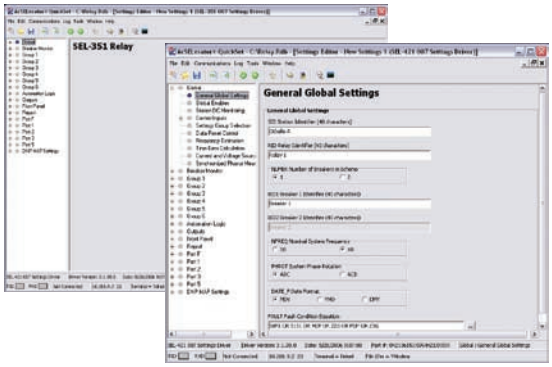


Typical network configuration for failover-mode operation.

Easy to Set and Use

Use ACSELERATOR QuickSet® SEL-5030 Software to set, monitor, and control the SEL-351A.

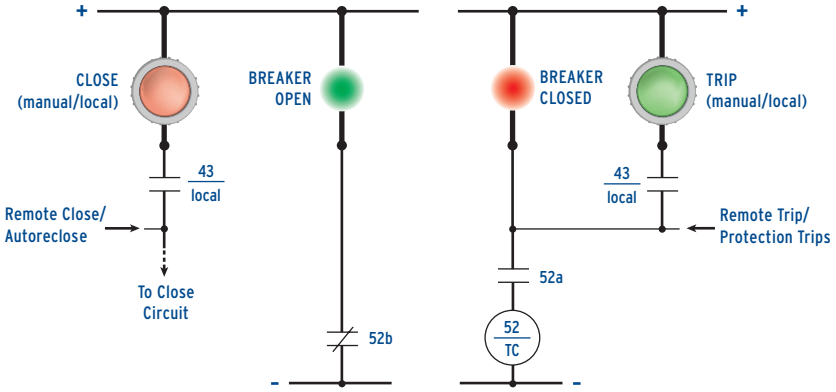
- Save engineering time while maintaining flexibility. Communicate with the SEL-351A through terminal software or with the ACSELERATOR QuickSet graphical user interface.
- Develop settings offline with a menu-driven interface and completely documented help screens. Speed installation by copying existing settings files and modifying application-specific items.
- Simplify the setting procedure with rules-based architecture to automatically check interrelated settings—out-of-range or conflicting settings are highlighted for correction.
- Streamline configuration of IEC 61850-enabled relays with ACSELERATOR Architect® SEL-5032 Software.



Easily set, monitor, and control the SEL-351A with ACSELERATOR QuickSet® SEL-5030 Software.

Eliminate Panel-Mounted Breaker Control Switches

Specify optional SafeLock trip/close pushbuttons and indicating lamps for your next SEL-351A application. The independently operated switches and breaker status lamps are functional even if the relay is out of service. Switch contacts and indicating lamps are separately wired to screw-terminal blocks on the rear of the relay. Choose the wiring arrangement that best suits your need for breaker control and status indication. The trip/close pushbuttons are equipped with the SafeLock system to prevent inadvertent operation and facilitate tagout procedures.



Optional trip/close pushbuttons operate independently from the relay function.

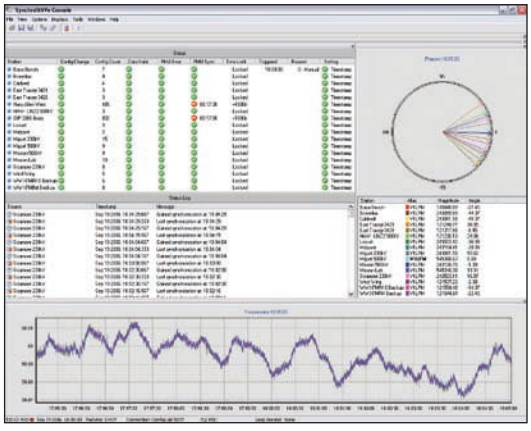
Add Synchrophasors to Your System

Improve System Performance With Synchrophasor Technology

SEL offers complete synchrophasor solutions, including hardware, communication, data collection, viewing and analysis software, and data archiving.

- Improve system performance using real-time, system-state measurement with the time-synchronized voltages and currents available in SEL-351A Relays.
- Help system operators prevent cascading blackouts and monitor system stability with a new synchrophasor view of the power system.
- Use SEL-5078 SYNCHROWAVE® Console Software or third-party software to view and analyze system phase angle, load oscillations, voltage profiles, and other critical system information. Stream synchrophasor data with IEEE C37.118 standard format at up to 60 messages per second.
- Monitor distribution and transmission networks to detect potential cascading voltage collapse before it happens.

SYNCHROWAVE®



SEL SYNCHROWAVE® Software displays and archives power system operating conditions.

SEL®

Pullman, Washington USA
Tel: +1.509.332.1890 • Fax: +1.509.332.7990 • www.selinc.com • info@selinc.com

WORLDWIDE 10 years WARRANTY

ISO 9001 CERTIFIED