

TWO HARDWARE PLATFORMS

The iTP-100 is available both in the Idea and IdeaPLUS relay platforms. The IdeaPLUS platform is the same as the Idea platform shown in Figure 1 with the addition of a breaker control panel. See Figure 2. These features eliminate the need for separately mounted breaker controls. This control panel provides:

- Large green and red, self-illuminated breaker TRIP and CLOSE pushbuttons that operate even if the relay is not powered.
- Close Inhibit switch which, when enabled, blocks the ability of the relay to issue a close command to the circuit breaker¹.
- Close Circuit disable link. When removed, this link places a physical open in the breaker's close circuit making it impossible to close the breaker via the relay or its CLOSE button under any condition. This is provided in addition to the Close Inhibit control for those situations when extra security is required.
- Nine additional programmable feature pushbuttons with integral indicating LEDs.



Figure 2: IdeaPLUS Relay Hardware with Integral Breaker Control Panel

CUSTOMIZE THE iTP-100 WITH THE *IDEA WORKBENCH*[™]

The iTP-100 is a fully functional relay, ready to use right out of the box. However, there are applications where custom control logic, or custom functions need to be added to the relay. The *IDEA Workbench* is a revolutionary graphical software-programming environment that permits the user to customize the iTP-100.

- Add new features or protective functions by means of *IDEA Workbench* custom modules. Your investment in the relay is protected as future needs and developments may be addressed through new custom modules.
- Create custom control and protection logic using over 400 programming signals and tools, all selectable from drag-off Toolboxes. Logic created using these tools can then be saved as custom modules to be reused or shared with associates.
- Reassign targets and front panel pushbutton functionality.
- Create and display custom text messages.
- Monitor and control practically every aspect of the relay's operation.
- Create custom metering and measurement quantities.
- Create custom sequence of event records.
- Configure communication protocols to match existing SCADA system mappings.

The *IDEA Workbench* offers the user the ability to rapidly and accurately create customizations by working the way the engineer thinks, using logic diagram and flowchart construction methods. No equation-based or commands-based logic programming is required. See Figure 3.

¹ The Close Inhibit switch may be cleared remotely by communications unless Supervisory control is disabled from the relay's front panel.

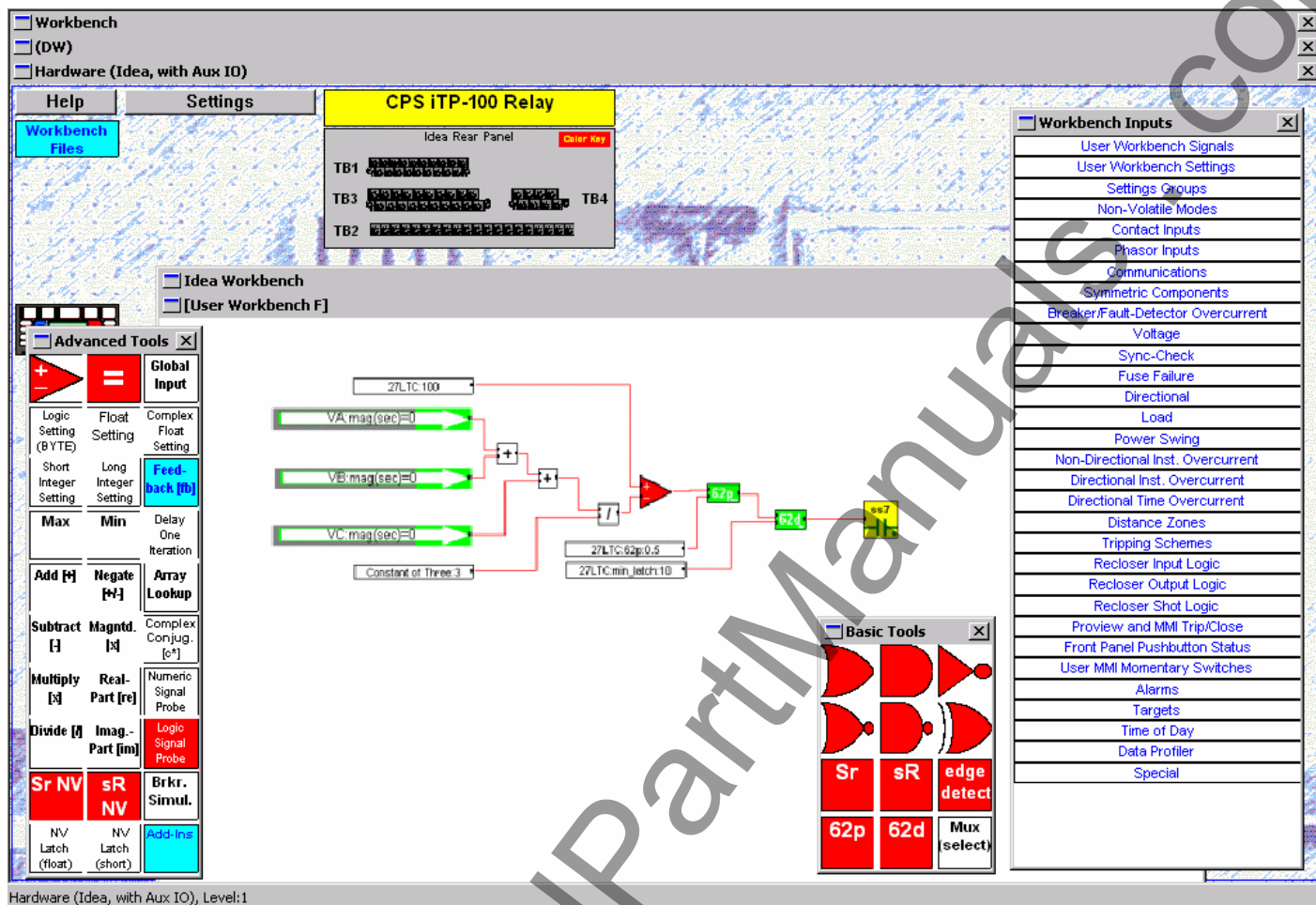


Figure 3: The *IDEA Workbench* Graphical Customization Environment

The *IDEA Workbench* also addresses some of the more difficult questions associated with custom relay programming, namely:

Clarity: Graphical programming results in customization, whose operation is intuitive compared to equation- and command-based programming techniques.

Testing: ProView provides a Virtual Test Set™ (VTS™) that can be used to test the developed logic with realistic fault signals. During test, the logic diagrams become “live” showing the state of all variables, logic gates, contacts, counters, etc. To avoid any question of how the custom logic interacts with the relay itself, the VTS environment models the entire relay in addition to the custom programming. Unlike other programming environments, the VTS does not require the user to have an actual relay or relay test set on hand to verify the proper operation of the programmed logic.

Documentation: Notes regarding how the custom logic operates may be embedded within the *IDEA Workbench*. This improves the ability of others to quickly understand how the logic is designed to work. Links to external files may also be embedded in the *IDEA Workbench* providing fast access to larger documents stored on company’s network servers.

Portability: If the original data files are lost, the entire *IDEA Workbench* may be uploaded from the relay, complete with logic diagrams, embedded notes and external reference links.

DISTANCE PROTECTION

The iTP-100 offers five levels of phase and ground distance protection.

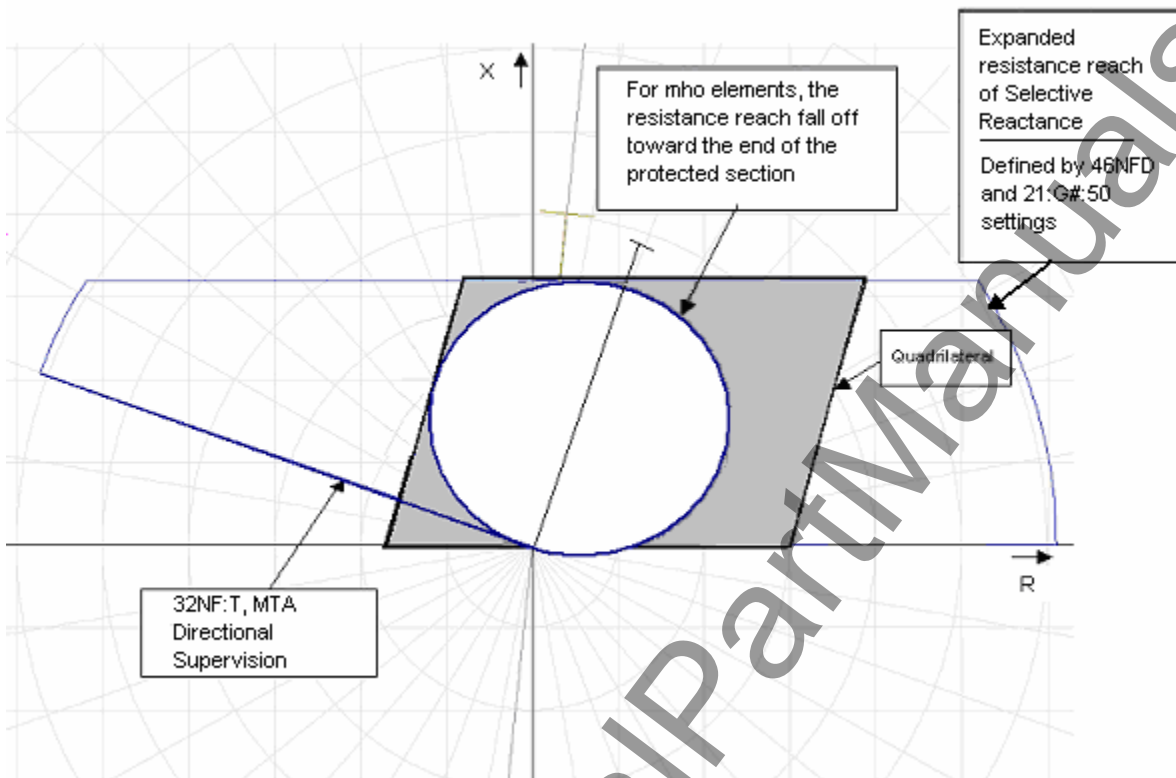


Figure 4: Selective Reactance Characteristic of the iTP-100 Compared to Mho and Quadrilateral Characteristics

Phase Distance Elements

Pick-up range of phase elements (21P1)	0.01 to 20 Per Unit
Pick-up range of phase elements (21P2-5)	0.05 to 20 Per Unit
Time delay	0 to 3600 seconds

Ground Distance Elements

The ground distance elements may be selected to follow a traditional mho characteristic or a ground reactance characteristic.

Pick-up range of ground elements (21G1)	0.01 to 20 Per Unit
Pick-up range of ground elements (21G2-5)	0.05 to 20 Per Unit
Time delay	0 to 3600 seconds

In the iTP-100 scheme, the reactance ground elements – one per zone, five per phase – are supervised by internal selective functions that ensure they do not operate except when a ground fault of the selected type is applied. Thus, for example, the selective A-phase-ground reactance element is permitted to trip only when an unbalanced fault – specifically an A-phase-ground fault – is already detected. Consequently, the selective reactance elements are made generally unresponsive to load.

The practical benefits of this design are two-fold. First, the actual resistive reach of the line protection need no longer be artificially limited to accommodate possible encroachment of load. Accordingly, the effective resistance coverage for

ground faults is expanded – often greatly. Second, versus quadrilateral distance, the required settings for the resistance blinders are no longer needed and are eliminated, simplifying the setting determination, entry, and management process. The result is ground distance protection having the desirable section-end characteristics of the quadrilateral element (no fall-off of resistance reach at the section ends), but with greater resistance reach for the entire protected line than conventional quadrilateral schemes can supply.

POWER SWING PROTECTION

The iTP-100 employs a double blinder characteristic of power swing protection allowing for tripping on the way in and on the way out of the blinder zone. Power Swing logic allows the user to block distance and overcurrent elements for swing conditions.

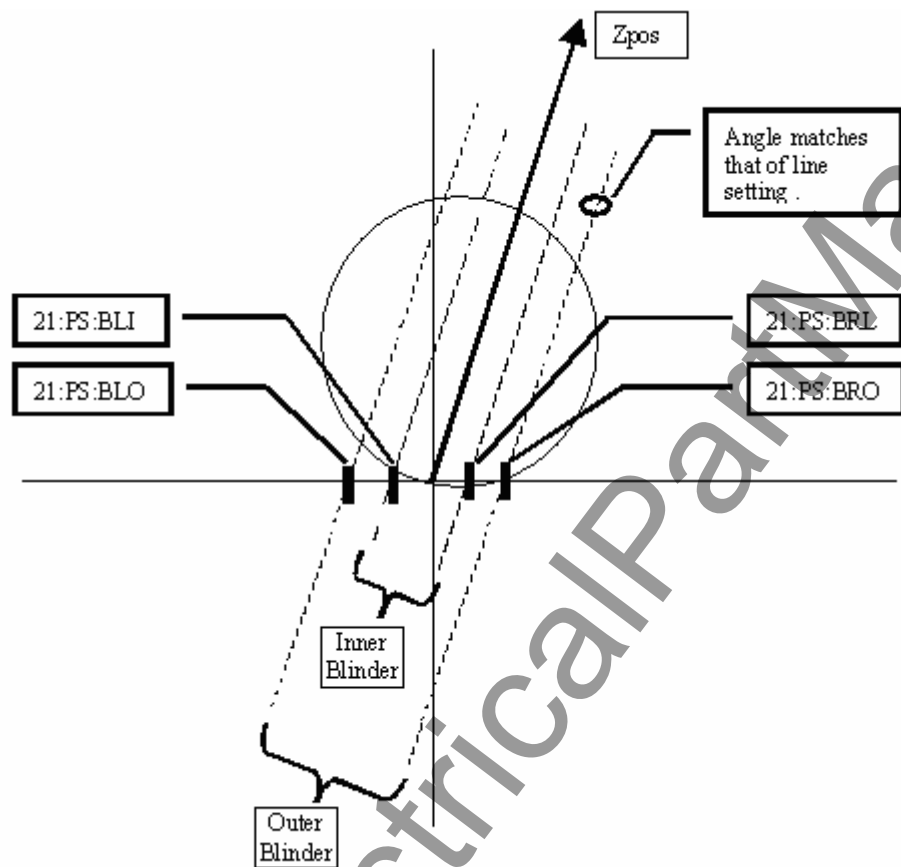


Figure 5: Power Swing Blinder Characteristics

Blinder Range

Inner Left Power Swing Blinder	-1 to -100 ohms sec
Outer Left Power Swing Blinder	-1 to -100 ohms sec
Inner Right Power Swing Blinder	1 to 100 ohms sec
Outer Right Power Swing Blinder	1 to 100 ohms sec

OVERCURRENT PROTECTION

The iTP-100 offers inverse and instantaneous elements for phase, residual and negative sequence overcurrent protection.

Definite Time

Five directional phase (67P), negative sequence (67Q) and residual (67N) elements are provided.

- Anticipatory Close accounts for the time it takes the circuit breaker mechanism to actually close once sent a CLOSE command.
- Anti-motoring control assures that synch-check will be declared only when the resulting power flow will be in the specified direction.
- Synch against voltages of different PT ratios and different nominal phase angle displacements (delta vs. wye)
- Anti-pump logic
- Programmable Hot Bus, Cold Bus, Hot Line and Dead Line operation

VOLTAGE ELEMENTS

Two levels of phase overvoltage and undervoltage elements are provided. One level is for tripping and the other is for alarming purposes.

Overvoltage Elements (59P:Trip, 59P:Alarm)

Two levels overvoltage protection are provided.

Pickup range	1 – 300 volts secondary
Time delay	0 – 3600 seconds

Undervoltage Elements (27P:Trip, 27P:Alarm)

Two levels of undervoltage protection are provided.

Pickup range	1 – 300 volts secondary
Time delay	0 – 3600 seconds

METERING

The iTP-100 offers extensive metering capabilities, including:

- Instantaneous Volt, Amp, Watt, var, PF in both primary and secondary scaled values.
- Demand metering
- Energy metering

EVENT RECORDS AND ANALYSIS TOOLS

The iTP-100 shares the same event record and analysis tools as all Edison Idea relays. The Edison Idea relay allows for the display of event records in a variety of formats including waveforms (oscillography), magnitude plots, phasor diagrams, symmetrical component diagrams and more. ProView, the software for the Edison Idea relay, also provides a unique Application Diagram View that provides a one-screen view of everything that is going on in the relay. Many of these event views are also available in On-Line View mode, where it is possible to monitor the status of the relay in real-time.

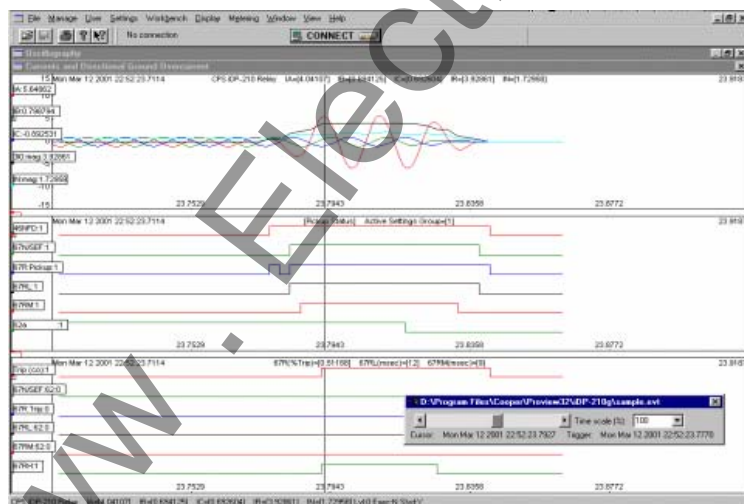


Figure 7: Oscillographic Events

Relay Replay™²

To evaluate the effect different settings would have on the relay, the Relay-Replay feature of the Edison Idea software allows the user to make any number of setting changes and replay an existing event using these new settings without the need for an actual relay or expensive test equipment. The operation of every aspect of the relay's performance, from which elements pick-up to the response time of those elements that do, can be observed. This tool provides unprecedented "what-if" analysis capabilities.

Virtual Test Set™ (VTS™)

To evaluate settings against any arbitrary fault, the Edison Idea software permits the user to create a virtual event record through use of the software's VTS feature. The VTS allows complete control over:

- Pre-fault and post-fault voltage and current levels
- Selection of phase-ground, phase-phase, phase-phase-ground and three-phase fault types
- Fault duration
- Secondary fault impedance
- Fault location
- Selection of DC time constant
- Frequency change, rate of change and acceleration during faults
- Breaker open and close times
- Power Swing and Load Encroachment simulation

BREAKER HEALTH MONITORING

To assist in preventative maintenance programs, the iTP-100 monitors a number of critical breaker statistics. These include the circuit breaker's average, maximum and most recent closing and opening times, the accumulated interrupted current and breaker fail-to-trip, slow-to-trip, fail-to-close and slow-to-close conditions.

COMMUNICATIONS

Both Modbus RTU and DNP 3.0 communication protocols are included with the iTP-100. The Communications Workbench™ provides the user the ability to customize communication maps, add or delete information, add control points, and even create new signals to be brought out through communications. The iTP-100 features three auto-baud (57,600 kbps max) communication ports: two RS-232 and one RS-485. DNP TCP/IP is available with Ethernet ordering options including copper, multimode fiber, single mode fiber or some combinations of each.

² United States Patent Number 5,878,375

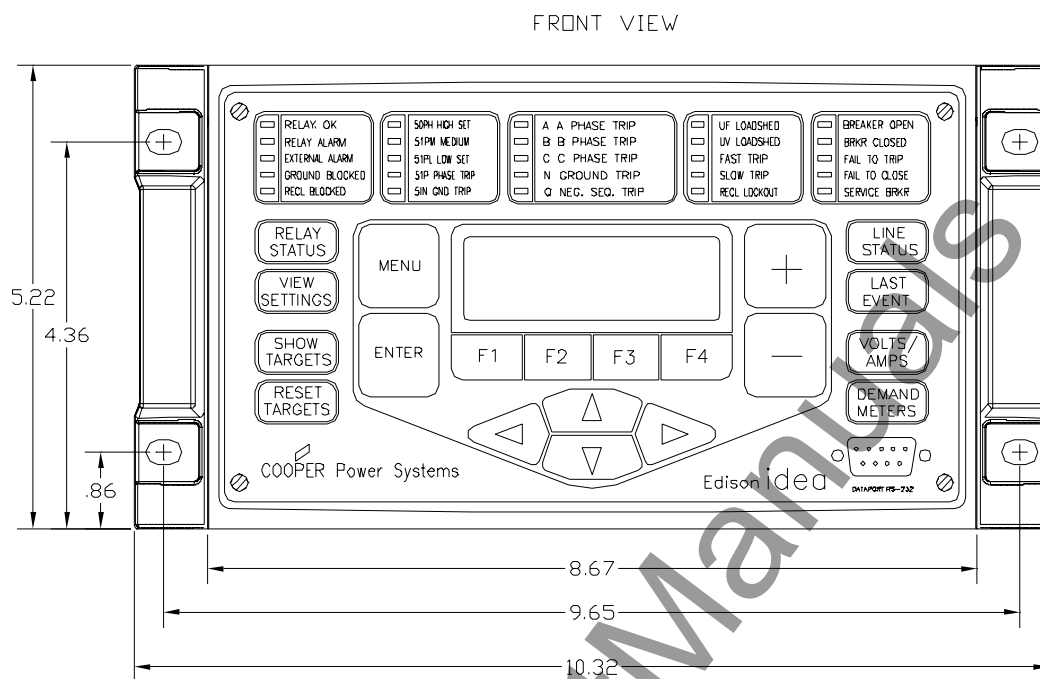


Figure 8: Idea Relay, Front View (inches)

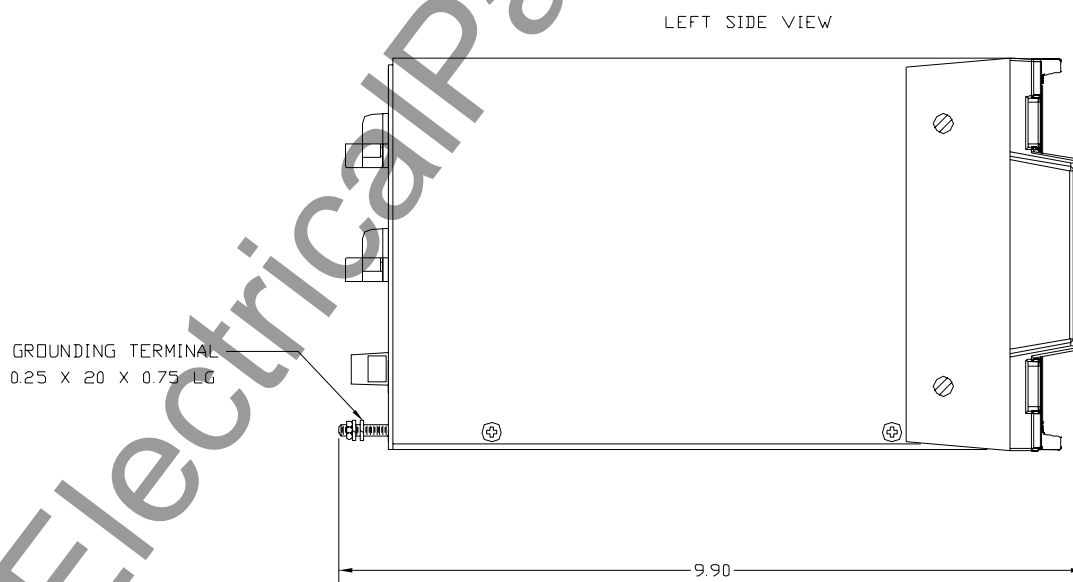


Figure 9: Idea Relay, Side View (inches)

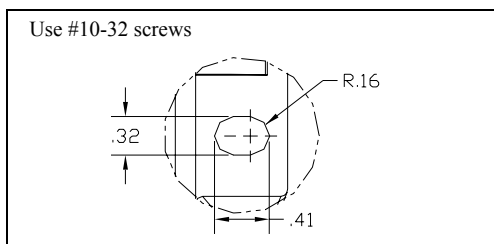


Figure 12: Idea Relay, Mounting Hole Detail (inches)

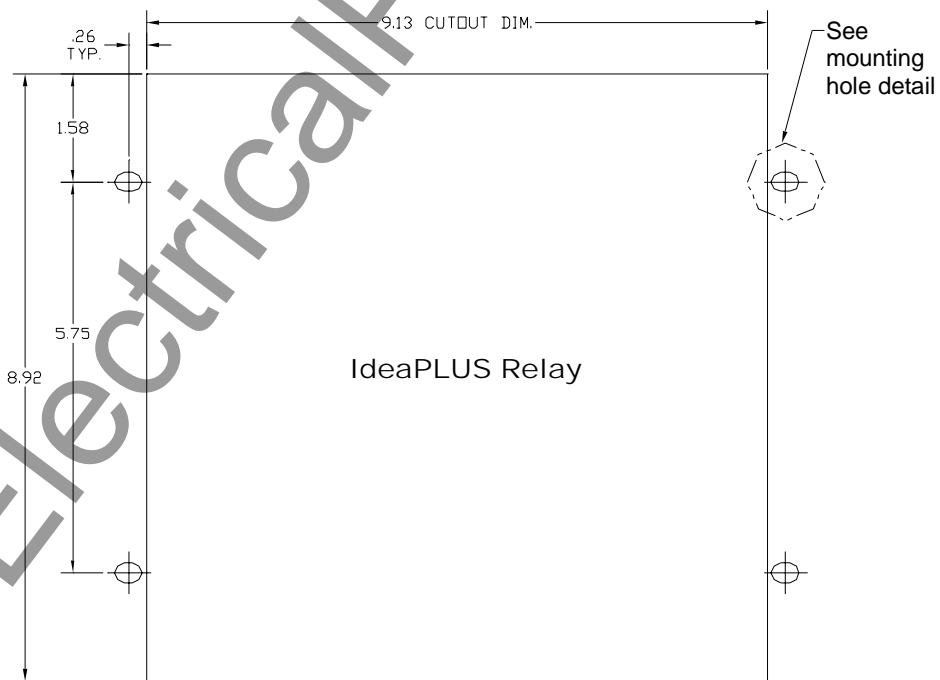
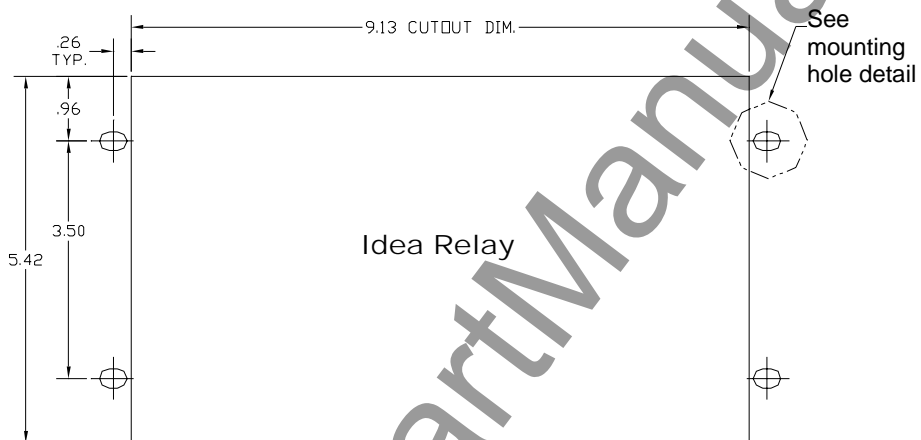


Figure 13: Panel Cutout Dimensions (inches)

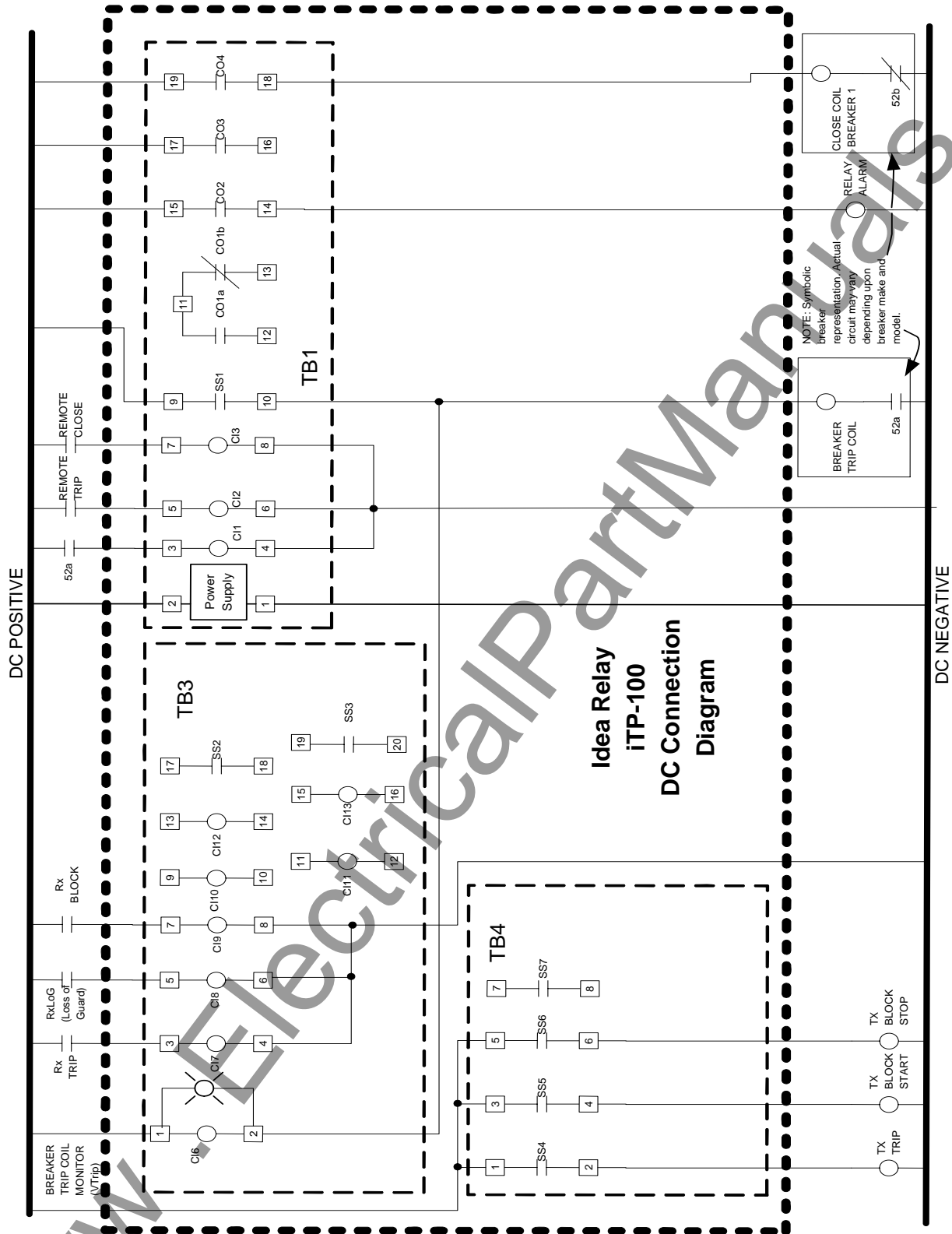


Figure 14: Typical iTP-100 DC Wiring Diagram for Idea Hardware

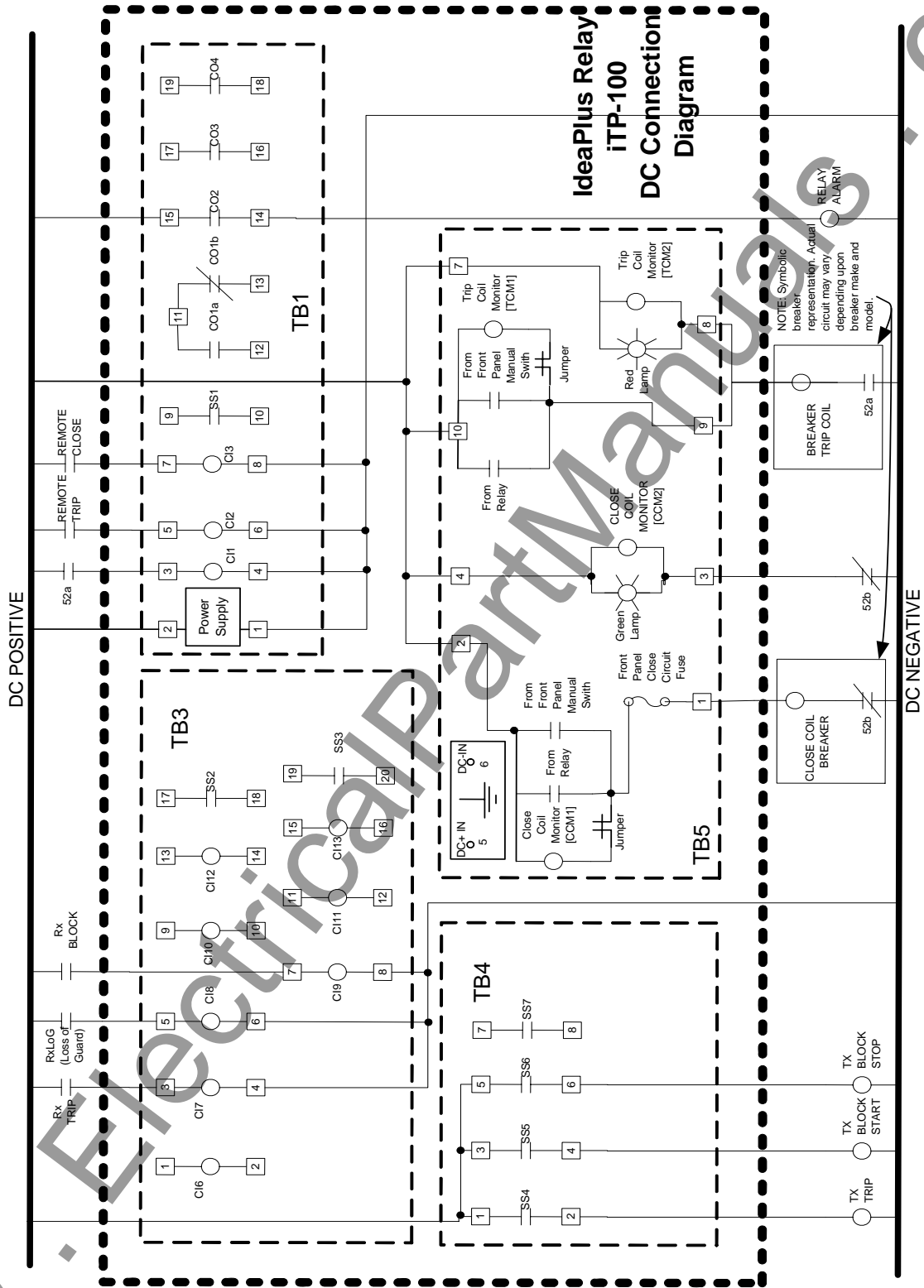


Figure 15: Typical iTP-100 DC Wiring Diagram for IdeaPLUS Hardware

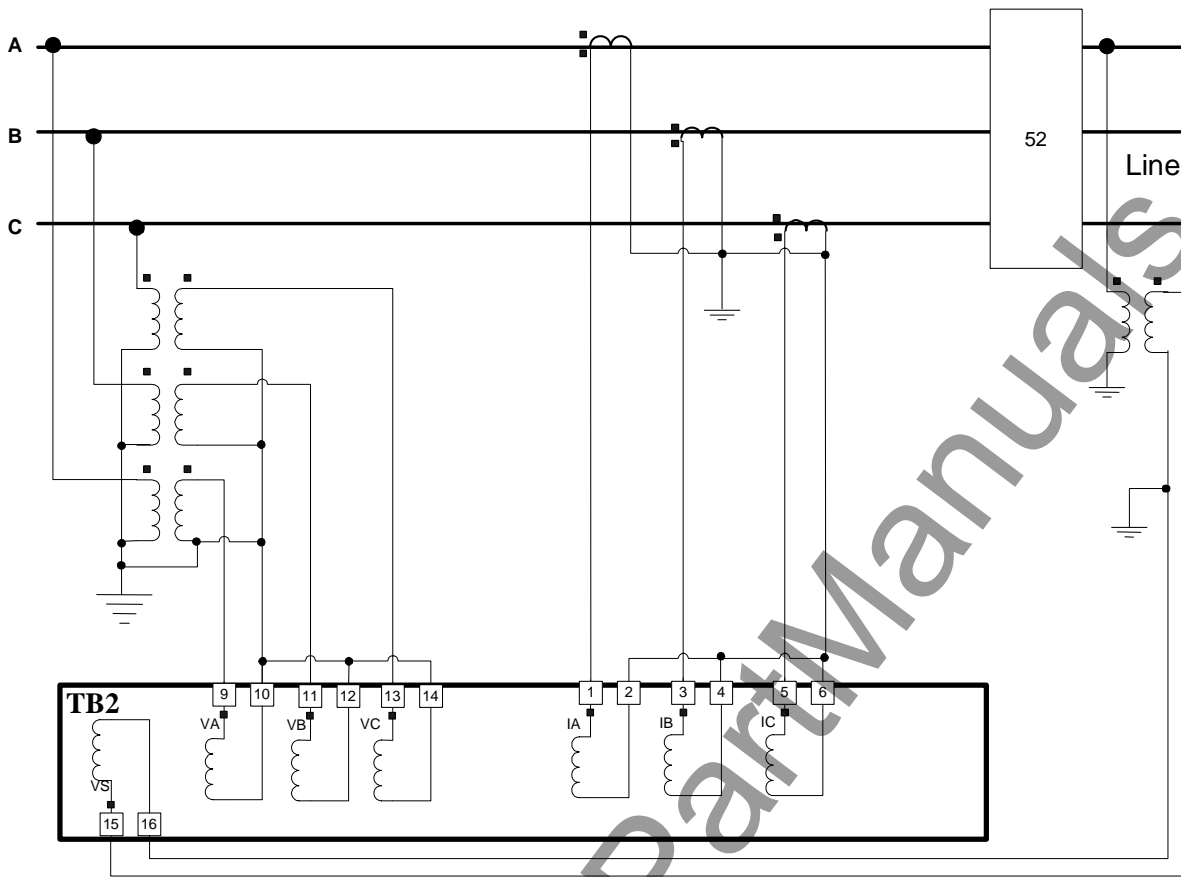


Figure 16: iTP-100 AC Wiring Diagram

Table 1 – Ordering Options

NOTE: Tagging and Lamp Style options (columns J and K) apply only to IdeaPLUS part numbers.

Construct Catalog Number
from this table.

		A	B	C	D	E	F	G	H	I	J	K	
		Idea and IdeaPLUS										IdeaPLUS	
		Product	Enclosure	Scheme	Language	Power	Input Range	Protocol	Aux I/O	TermBlk	Tagging	Lamp Style	
		PR6											
		<i>Sample Catalog Number:</i> PR6 P2 T30 E 1 5 1 4 S C 3											
<i>TYPE</i>	Edison Idea/IdeaPlus Relay Edison Idea Chassis Edison IdeaPlus Chassis	PR6											
			D2										
			P2										
<i>Scheme</i>	iTP-100 Protective Relay			T30									
<i>Inserts Language</i>	English Portuguese Spanish Other				E P S O								
<i>Power</i>	48VDC Power Supply 125VDC/120VAC Power Supply 250VDC/240VAC Power Supply Other					4 1 2 X							
<i>Input Ranges</i>	5 Amp CT Inputs, 67/120V PT Inputs 1 Amp CT Inputs, 67/120V PT Inputs						5 1						
<i>Comm. Protocol</i>	RS 485 Fiber Serial Ethernet: Multimode Fiber MTRJ/MTRJ Ethernet: Multimode Fiber MTRJ/ Wire RJ 45 Ethernet: Wire RJ45/RJ45 Standard: None Ethernet: Single Mode Fiber LC/LC							1 3 4 5 6 7 8					
<i>Aux I/O</i>	Select 8 Contact Inputs and 6 solid state outputs								4				
<i>Term.</i>	All Barrier All Compression									S C			
<i>Tag Type</i>	Software based Close-inhibit, CLOSE inhibited on relay fail Software based Close-inhibit, CLOSE enabled on relay fail										C R		
<i>Trip/Close Lamp Type</i>	24 VDC LED Lamps for Trip and Close Status 24 VDC Incandescent Lamps for Trip and Close Status 48 VDC LED Lamps for Trip and Close Status 48 VDC Incandescent Lamps for Trip and Close Status 125VDC/120VAC LED Lamps for Trip and Close Status Other No Bulbs											1 6 2 7 3 X 0	
Accessories:	Description											Catalog Number	
	19" rack mount panel adapter for Idea relay											PR6DRP	
	19" rack mount panel adapter for IdeaPLUS relay											PR6PRP	
	19" 2-relay side-by-side 19" rack mount adapter for Idea relay											PR6ADRPDR	
	19" 2-relay side-by-side 19" rack mount adapter for IdeaPLUS relay											PR6APRPDR	
	6 foot (2m) front panel RS232 cable											KM5-665	

IDEA iTP-100 Line Distance Protection Relay

Specifications

Frequency	50/60 Hz
Voltage Inputs	Four voltage input channels 50 – 250 VAC continuous (phase-to-neutral) Burden < 0.1VA at 120V Primary DC Resistance 1,454Ω Error % < 0.3% over operating temperature
Current Inputs	Three current input channels $I_{Nominal} = 5A$, $I_{continuous} = 15A$, $I_{3sec} = 150A$, $I_{1sec} = 300A$ Range of overcurrent settings 0.1 A to 90 A Step size 0.01 A Burden < 0.2VA at 5A Primary DC Resistance 3.4 mΩ Error % < 0.3% over operating temperature $I_{Nominal} = 1A$, $I_{continuous} = 3.2A$, $I_{3sec} = 30 A$, $I_{1sec} = 100A$ Range of overcurrent settings 0.02 A to 18 A Step size 0.002 A Burden < 0.2VA at 1A Primary DC Resistance 52.1 mΩ Error % < 0.3% over operating temperature
Digital Inputs (Optically Isolated)	9 – 150 VDC [24 VDC power supply] 36 – 150 VDC [48 VDC power supply] 90 – 300 VDC [120 VAC / 125 VDC power supply] 165 – 300 VDC [240 VAC / 250 VDC power supply] Nominal current draw of 2.5 mA, minimum operating time of 15 msec
Relay Outputs	240 Vac / 250 Vdc. Make: 30A for 0.2 seconds; Carry: 6A continuous. Break: 0.2A (L/R = 40 ms) Pickup time: <8ms; Dropout time: <5ms
Solid-State Outputs	240 Vac / 250 Vdc; Make: 30A for 0.2 seconds; Carry: 8A continuous. Break: 10A (L/R = 40 ms) Pickup time: <1ms; Dropout time: <15ms
Power Supply	24 VDC ± 20% 48 VDC ± 20% 120 VAC / 125 VDC ± 30% 240 VAC / 250 VDC ± 20% Burden: 14W
Local/Remote communications	EIA-RS-232C: 1 ea. located on front and rear panel Baud Rates: Auto baud rate up to 115,200 bps IRIG-B: 1 located on rear panel Optional Comm. Daughterboards (available with ProView 4.0.1): RS-485 (DC isolated) Modbus 57,600 bps; DNP 38,400 bps Serial Fiber Optic (ST) Ethernet, Multi-Mode, Fiber Optic (MTRJ/MTRJ) Ethernet, Multi-Mode, Fiber Optic / Wire (MTRJ/RJ45) Ethernet, Multi-Mode, Wire (RJ45/RJ45) Ethernet, Single-Mode, Fiber Optic (LC/LC)

Front Panel Targets	23 Programmable LEDs
Front Panel Display	20 x 4 character LCD
Front Panel Keypad	8 fixed-function keys, 4 multi-function "soft" keys 8 programmable "Hot-Keys"
Dimensions	Idea relay: 3 U high by 8.5" wide; 19" rack mount adapter plates and side by side mounting kits available
Relay Weight	10 lbs (4.5 kg) – Idea; 15 lbs (6.8 kg) – IdeaPlus;
Mounting	Horizontal
Operating Temperature	-40 °F to 158 °F (-40°C to 70 °C) continuous
Bump & Shock Test	IEC 60255-21-2 (1988) Class 1
Cold Temperature Test	IEC 60068-2-1 (1993) 16 hours at -40C
Electrostatic Discharge	EN 61000-4-2 (2001) Levels 1, 2, 3, and 4.
High temperature Test	IEC 60068-2-2 (1993) 16 hours at 70C
Humidity Test	IEC 60068-2-30 (1999) 25C to 55C, 95% Humidity, 2 cycles
Impulse/Dielectric Withstand	IEC 60255-5 (2000) Impulse Test: 5kV, 1.2 μ s rise time, half wave 50 μ s. Applied 3 impulses at each polarity. Dielectric: 3150 VDC for 1 minute. Insulation Resistance: Greater than 10 Gigaohms.
Radio Frequency Interference	Radiated: EN 61000-4-3 (2001) 20 MHz – 1 GHz, Idea 35 V/m and IdeaPlus 20 V/m. ANSI/IEEE C37.90.2 (1995) 35V/m from 20 MHz to 1 GHz Conducted: IEC 61000-4-6 (2001) 150 kHz – 80 MHz, 10 Vrms IEC 61000-4-16 (2001) 15 Hz – 150 kHz, 10 Vrms
Surge Withstand	ANSI/IEEE C37.90.1 (2002) 2.5 kV oscillatory, \pm 4 kV fast transient
Vibration Test	IEC 60255-21-1 (1988) Class 1
Contact Rating	ANSI/IEEE C37.90, Section 6.7 (1989) 30A for 0.2 seconds, 2000 operations, at 125 VDC, 250 VDC, and 240 VAC.
Object Penetration	IEC 60529 (2001-02) IP3X rating
Emissions	EN 55022, Class A, Radiated and Conducted
Conducted Disturbances	IEC 6100-4-6 (150kHz – 80 MHz)

Specifications subject to change without notice.

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