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Designing the Power Structure for Compliance with Contemporary Codes

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Jack Smith, Schaedler Yesco Distribution

Complying to Standards While Maximizing Productivity

1. NFPA 79

2. NFPA 70E

3. 508A

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- NFPA 79
- VDE 0660
- CSA 22.2 No. 4
- DIN
- CSA 22.2 No. 14



194R 30A / 60A Rotary Disconnect Switches

194R Next Generation 30/60A

- 194R 30A & 60A rotary switches designed for service entrance (UL98) and motor (UL508) disconnect applications
- Meets requirements per NFPA 79
 - (5.3.4) Operating Handle...
 - “readily accessible with doors in open or closed position”
 - (6.2) Protection from Electrical Shock...
 - “live parts operating at 50V rms or more shall be guarded against contact”
 - (6.2.3.2) Interlocking Means
 - “prevent closing of disconnecting means while the enclosure door is open, unless the interlock is operated by deliberate means

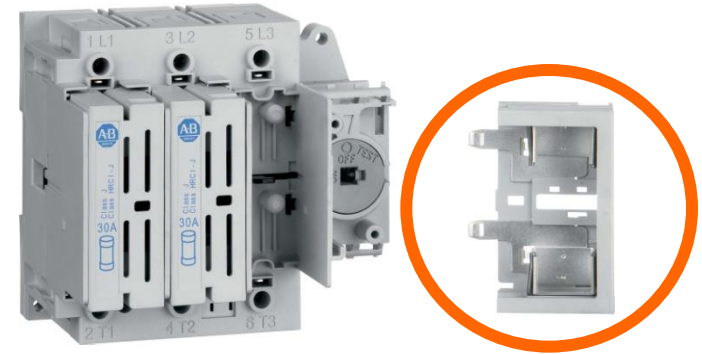


194R Next Gen 30/60A Benefits

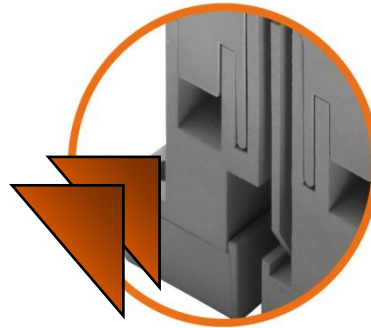
Key Benefits

1. Safety:

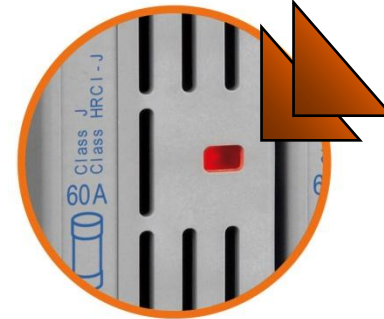
- ✓ Removable fuse carriers – for J, CC, DIN, BS88 and NFC fuses
- ✓ Fuse carriers interlock with switch when switch is ON



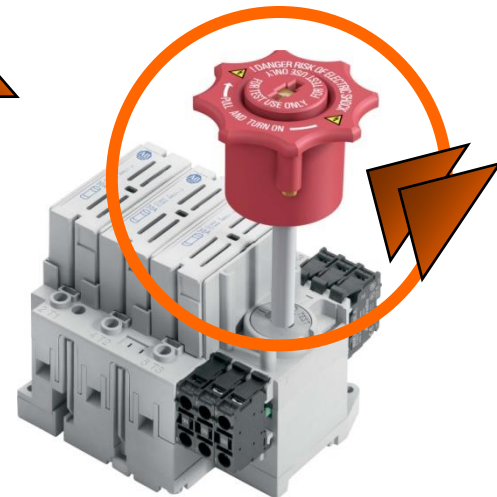
- ✓ IP20 finger-safe terminals



- ✓ Blown fuse indication in fuse carriers



- ✓ Internal handle for compliance with NFPA 79 requirements

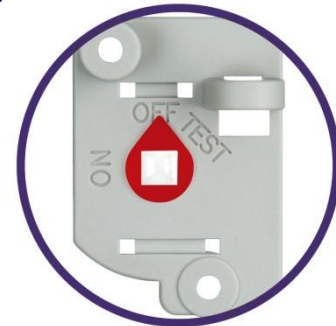
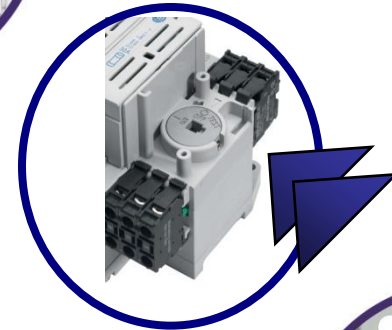


194R Next Gen 30/60A Benefits

Key Benefits

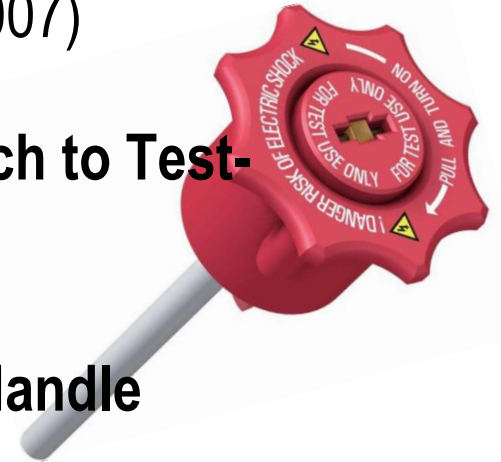
2. Modularity:

- ✓ 4th pole accessory available for field assembly
- ✓ Utilizes snap-on 800F contacts as standard and “test-mode” auxiliaries
- ✓ Top-mount padlock accessory for lock-out / tag-out at switch
- ✓ External handle for switch test-mode position to test control circuitry
- ✓ Multi-tap 3/6 wire terminal lugs eliminate need for distribution block



194R Handles for NFPA 79 Compliance

- **Internal Handle for Bulletin 194R Disconnects for NFPA 79 Compliance**
 - And Compliance with UL508A (effective March 2007)
- **Also Use to Actuate Bulletin 194R Next Gen Switch to Test-Mode**
- **Interfaces with Standard Bulletin 194R External Handle**



Simple Operation:

- **Turn Handle CCW to Turn Switch Off (No Tools)**
- **Pull Handle and Turn CW to Turn Switch On (Deliberate Action & No Tools)**



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Bulletin 193/592 E1 Plus Remote Indication Display

NFPA 70E...

Keeping you Safe, but may be costing
Time, Productivity and Money

Traditional Analysis of an Overload Trip

1. For safety purposes, maintenance personnel are required to wear the appropriate PPE when opening energized enclosures.



2. Identifying the reason for an overload trip can be difficult and cumbersome for maintenance personnel when wearing PPE.

3. Analyzing motor protection trips can consume a lot of valuable time and is not the most enjoyable task of maintenance personnel.



E1 Plus Remote Indicator Display

An intelligent reset button for the E1 Plus protection side mount modules

E1 Plus & Display Status

Overload Trip & Warning

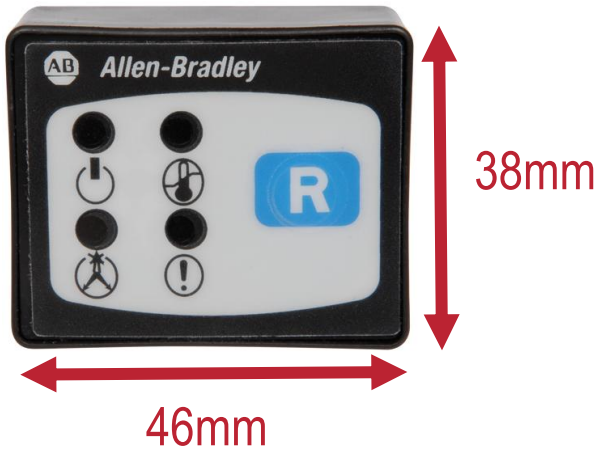
Phase Loss

Protection Module Trip

E1 Plus Reset



Easy to Install



- Fits into a standard 22mm pushbutton cutout
 - Adapter Available for 30mm applications (800F-AHA1)
- Connect only two wires for:
 - Display Power
 - Communications
 - Reset Signal
- Environmental Ratings:
 - NEMA 4 / 4X / 12 / 13
 - IP 65 / 66
- Dimensions
 - 46mm x 38mm x 18mm

Operates with E1 Plus Protection Modules

- Remote Indication Display communicates to the following E1 Plus Protection Side Mount Modules (Series B or later)
 - 193-EJM *Jam*
 - 193-EGF *Ground Fault (Earth Leakage) Current*
 - 193-EGJ *Ground Fault & Jam*
 - 193-EPT *Thermistor*
 - 193-ERR *Remote Reset*



E1 Plus Remote Indicator Display



Increase Your Motor Maintenance Productivity

Improve Motor Management Productivity & Safety

Upgrade your MCC's and Panels with Rockwell Automation's extensive offering of safety and maintenance productivity solutions

Maintenance Productivity

- Motor Overload Upgrades
 - Eutectic alloy to Electronic
 - New "Pass Thru" design
- Contact Repair Kits

Maintenance Safety

- Finger Safe Covers for
 - Contactors
 - Push Buttons
 - Fuse Blocks
 - Terminals & Lugs

Maintenance Cost Savings

- LED Indicator Lights
- Energy Savings
- Contact Repair Kits
- Reduce downtime

Safety Accessories



599TC01	Size 0-1
599TC2N	Size 2
599TC3N	Size 3

Terminal & Lug Covers



1495N64
1495N65
1495N66

Protective Fuse Covers



599PS01	Size 0-1
599PS2	Size 2
599PS3	Size 3

Starter
Protective Covers



800T-N323
800T Contact Block
Protective Covers

Incandescent to LED Bulb Conversion...

Saves Time & Money

800T Incandescent to LED bulb conversion chart							
Application Pilot Lights, Illuminated Push Buttons, Illuminated Push-Pull/Twist to Release							
Incandescent				LED			
Part Number	Type	Typical Current	Lamp Voltage	Part Number	Type	Typical Current	Lamp Voltage
800T-N65	Full Voltage Transformer	150mA/250mA	6.3V AC	800T-N318X	Transformer	50mA	6V AC
800T-N141	Full Voltage	80mA	14V AC/DC	800T-N362X	Full Voltage	13mA/22mA	12V AC/DC
800T-N157	Full Voltage	70mA	24V AC/DC	800T-N319X	Full Voltage	13mA/21mA	24V AC/DC
800T-N365	Full Voltage	50mA	48V AC/DC	800T-N364X	Full Voltage	9mA/14mA	48V AC/DC
800T-N169	Full Voltage	22mA	120V AC/DC	800T-N320	Full Voltage	3.3mA/6mA	120V AC
Application: Illuminated Selector Switches							
Incandescent				LED			
Part Number	Type	Current	Voltage	Number	Type	Current	Lamp Voltage
800T-N65	Full Voltage Transformer	150mA/250mA	6.3V AC	800T-N318X	Transformer	50mA	6V AC
800T-N157	Full Voltage	70mA	24V AC/DC	800T-N319X	Full Voltage	13mA/21mA	24V AC/DC
Note: To complete LED part number replace "X" with appropriate number for color as follows							
A=Amber		G=Green		R=Red		B=Blue	
				W=White			

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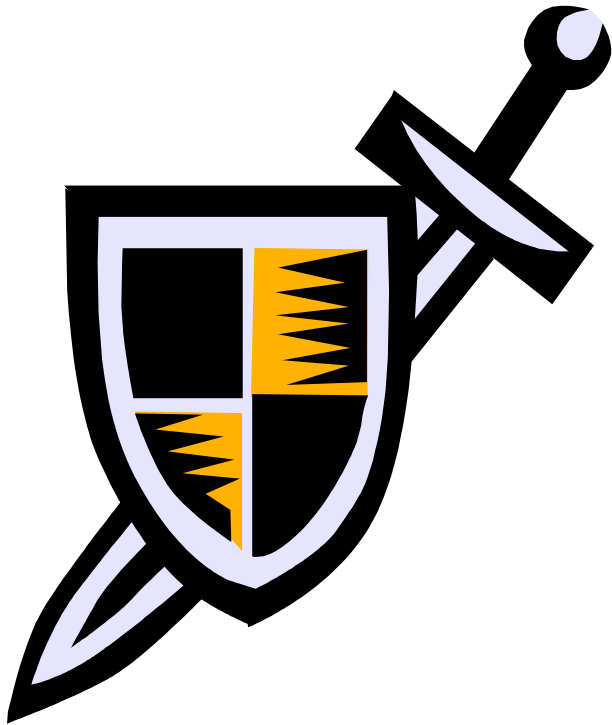
Bulletin 193 E1 Plus Pass-Thru Electronic Overload Relay

E1 Plus Pass-Thru Electronic Overload Relay

- The E1 Plus Pass-Thru Electronic Overload Relay provides cost effective, scalable protection to ensure top performance of your electric motor investment by providing:
 - Enhanced Motor Protection
 - Expandable Protection & Communications
 - Space Saving Footprint
 - Integrated Mounting



Enhanced Motor Protection



- The E1 Plus Pass-Thru Electronic Overload Relay protects your electric motor investment by preventing damage from the following events:
 - Thermal overload
 - Phase loss

Expandable Protection & Communications



- The E1 Plus Pass-Thru Electronic Overload Relay can be expanded to provide additional protection and communications to warrant your electric motor investment including:
 - Ground Fault (Earth Leakage) Current
 - Jam
 - Ground Fault & Jam
 - Thermistor
 - DeviceNet Communications & Protection
 - PROFIBUS Communications & Protection
 - EtherNet Communications and Protection

Space Saving Footprint

- The E1 Plus Pass-Thru Electronic Overload Relay lowers total system cost for these applications:
 - Panel Mounting
 - Bulletin 100-K mini-Contactor



Space Saving Footprint

Panel Mount Applications



111 mm



58 mm

- The E1 Plus Pass-Thru consumes 48% less panel space compared to a standard E1 Plus mounted in a panel mount adapter

E1 Plus Pass-Thru Product Offering

- **Bulletin 193-ED**
 - Current range of 1A to 27A
 - Three-phase
 - Trip Class 10
 - Manual Reset
- **Bulletin 193S-EE**
 - Current range of 1A to 27A
 - Single-phase
 - Selectable Trip Class 10, 15, 20, or 30
 - Selectable Manual or Automatic Reset
 - Expandable Protection with option side mount modules
- **Bulletin 193-EE**
 - Current range of 1A to 27A
 - Three-phase
 - Selectable Trip Class 10, 15, 20, or 30
 - Selectable Manual or Automatic Reset
 - Expandable Protection with option side mount modules



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Expandable Protection and Communications



Expandable Protection & Communications

DeviceNet Communications, I/O, & Protection

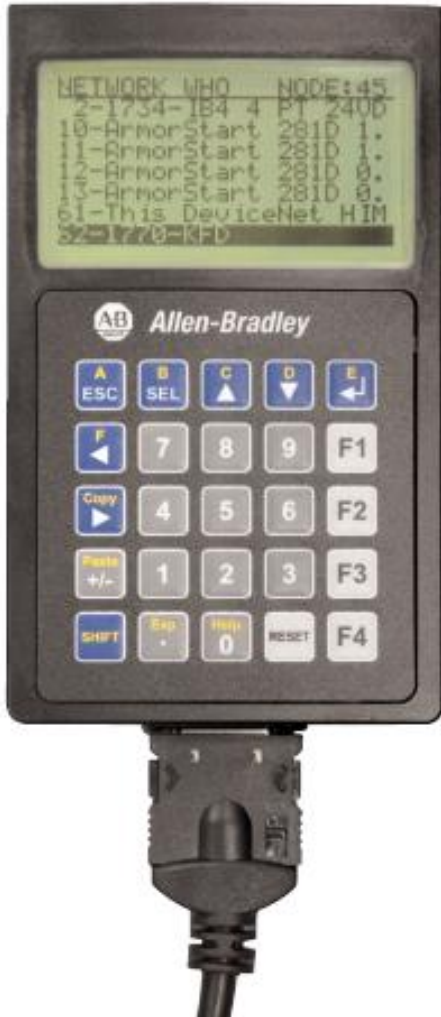
The E1 Plus DeviceNet Side Mount Module (193-EDN) extends the functionality of an E1 Plus Overload Relay by providing the following functions:

- DeviceNet Communications
- Additional I/O
- Enhanced Motor Protection



Expandable Protection & Communications

DeviceNet Communications Continued



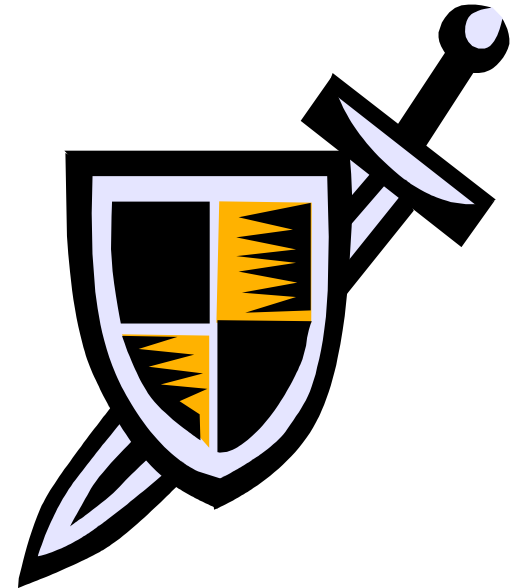
- The DeviceNet Configuration Terminal (193-DNCT) is an optional device that provides users the capability to configure and view data for any DeviceNet component including the E1 Plus Pass-Thru Electronic Overload Relay
- Users can perform these functions locally on a DeviceNet network:
 - Parameter monitoring
 - Parameter editing
 - Storage of device configuration data
 - Network who
 - Display network diagnostics
 - Editing DeviceLogix programs
 - Trend parameters

Expandable Protection & Communications

DeviceNet Enhanced Motor Protection

The E1 Plus DeviceNet Side Mount Module enhances the motor protection capabilities of the E1 Plus by providing these additional motor protection functions:

- **Jam Protection** – Trip the overload relay when the motor current is greater than the motor's nameplate rating
- **Jam Warning** – Motor current greater than the motor's nameplate rating
- **Overload Warning** – Percentage of the thermal utilization (%TCU)
- **Underload Warning** – Motor current less than a specific level
- **Communication Fault Warning** – Disruption of the communication link
- **Communication Idle Warning** – The network goes into an idle state



Expandable Protection & Communications

PROFIBUS Communications, I/O, & Protection

The E1 Plus PROFIBUS Side Mount Module (193-EPRB) extends the functionality of an E1 Plus Overload Relay by providing the following functions:

- PROFIBUS Communications
- Additional I/O
- Enhanced Motor Protection



Expandable Protection & Communications

PROFIBUS Additional I/O

- The E1 Plus PROFIBUS Side Mount Module includes the following extended I/O points:
 - (2) Discrete Inputs
 - Type 1
 - 24 VDC
 - (1) Discrete Output
 - Form A (SPST Normally Open)
 - B300 (1.5 Amps @ 240 VAC)
- Inputs 1 & 2 can be configured for:
 - General purpose inputs
 - Resetting the trip relay
 - Monitoring the state of the overload relay contacts
- Output A can be energized by the following:
 - Network communications
 - PROFIBUS network Fault
 - Idle network

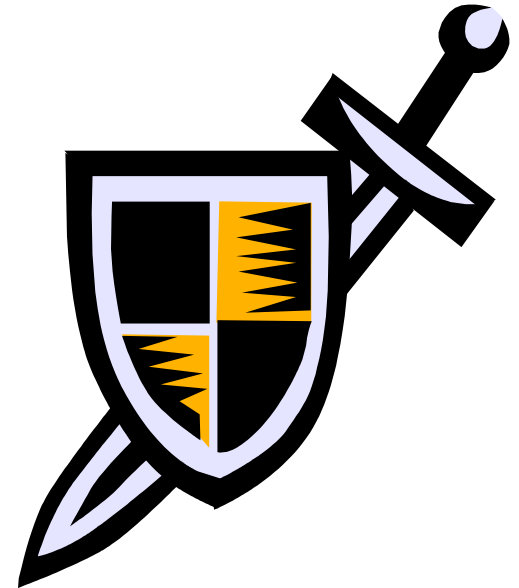


Expandable Protection & Communications

PROFIBUS Enhanced Motor Protection

The E1 Plus PROFIBUS Side Mount Module enhances the motor protection capabilities of the E1 Plus by providing these additional motor protection functions:

- **Jam Protection** – Trip the overload relay when the motor current is greater than the motor's nameplate rating
- **Jam Warning** – Motor current greater than the motor's nameplate rating
- **Overload Warning** – Percentage of the thermal utilization (%TCU)
- **Underload Warning** – Motor current less than a specific level
- **Communication Fault Warning** – Disruption of the communication link
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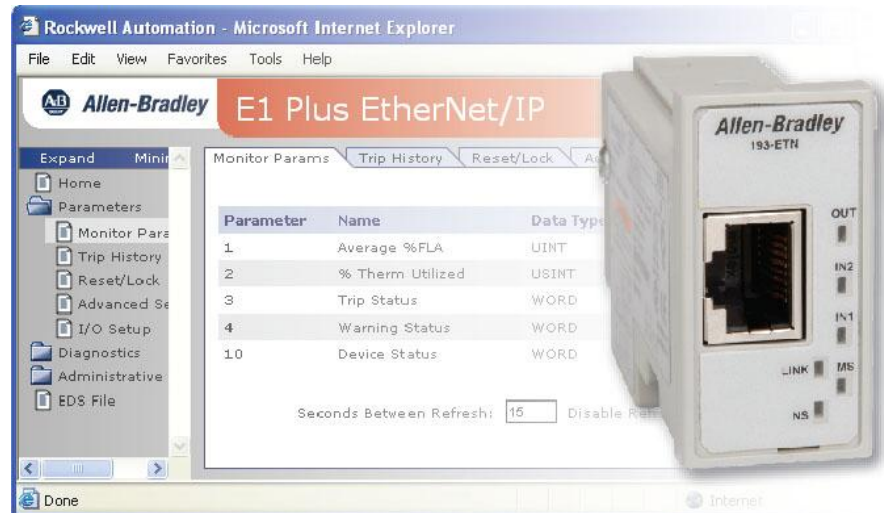
E1 Plus EtherNet/IP Side Mount Module

- The E1 Plus EtherNet/IP side mount module (193-ETN) extends the functionality of an E1 Plus overload relay by providing the following functions:
 - EtherNet/IP communications
 - Additional I/O
 - Enhanced motor protection



EtherNet/IP Communications

- The E1 Plus EtherNet/IP side mount module supports the following message types:
 - I/O messaging, deterministic messaging of I/O data
 - Explicit messaging, back ground messaging of information
- Perform device configuration and view real-time data via an integrated web server
- Sends e-mail and text messages for trip and warning conditions
- Contains predefined ControlLogix style tags for direct software access of data
- Available diagnostic data
 - Average %FLA
 - %Therm Utilized
 - Trip Status
 - Warning Status
 - Device Status
 - Trip Log



I/O Messaging

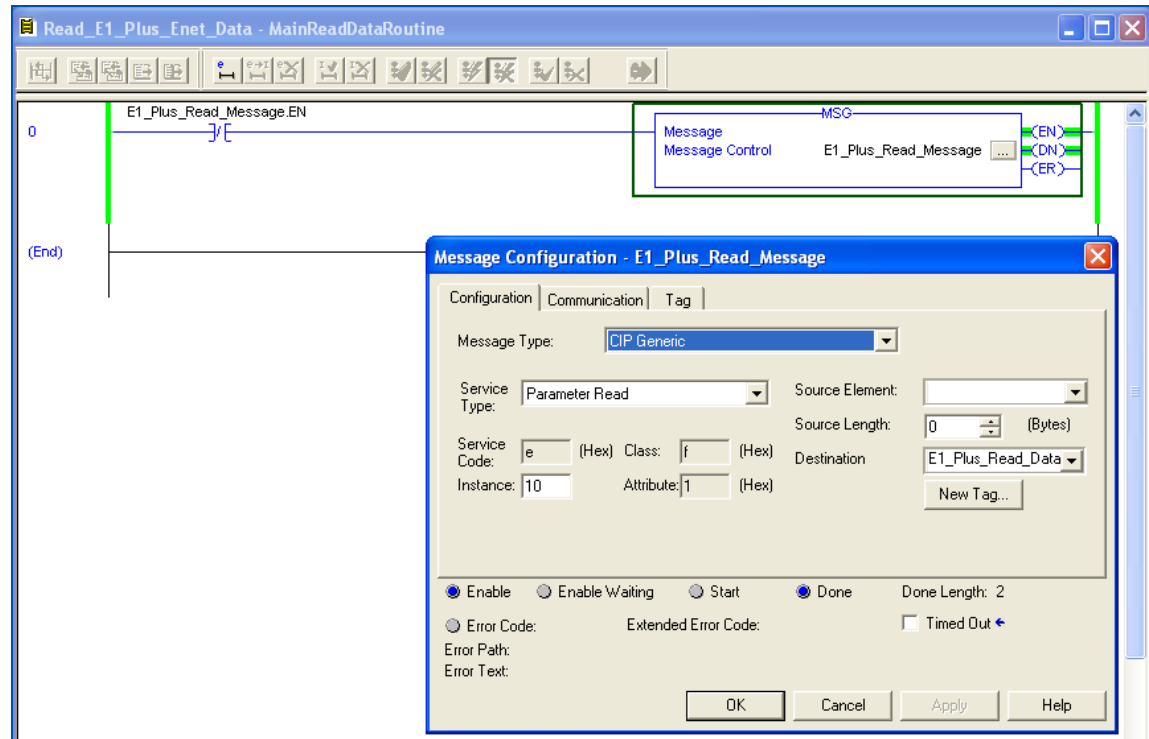
- Supports I/O messaging with ControlLogix, CompactLogix, and SoftLogix controllers and EtherNet/IP scanners
- Used to control a motor starter

The screenshot displays the RSLogix 5000 software interface. The main window shows the 'Controller Tags - E1_Plus(controller)' dialog box. The 'Scope' is set to 'E1_Plus'. The table below shows the configuration for the controller tags.

Name	Value	Force Mask	Style
- E1Plus:0	{...}	{...}	
- E1Plus:0.Data	{...}	{...}	Decimal
- E1Plus:0.Data[0]	0		Decimal
E1Plus:0.Data[0].0	0		Decimal
E1Plus:0.Data[0].1	0		Decimal
E1Plus:0.Data[0].2	0		Decimal
E1Plus:0.Data[0].3	0		Decimal
E1Plus:0.Data[0].4	0		Decimal
E1Plus:0.Data[0].5	0		Decimal
E1Plus:0.Data[0].6	0		Decimal
E1Plus:0.Data[0].7	0		Decimal
- E1Plus:1	{...}	{...}	
- E1Plus:1.Data	{...}	{...}	Decimal
+ E1Plus:1.Data[0]	33		Decimal
+ E1Plus:1.Data[1]	0		Decimal
+ E1Plus:1.Data[2]	0		Decimal
+ E1Plus:1.Data[3]	0		Decimal
+ E1Plus:1.Data[4]	0		Decimal
+ E1Plus:1.Data[5]	0		Decimal
+ E1Plus:1.Data[6]	1		Decimal
+ E1Plus:1.Data[7]	0		Decimal
+ E1Plus:1.Data[8]	0		Decimal
+ E1Plus:1.Data[9]	0		Decimal

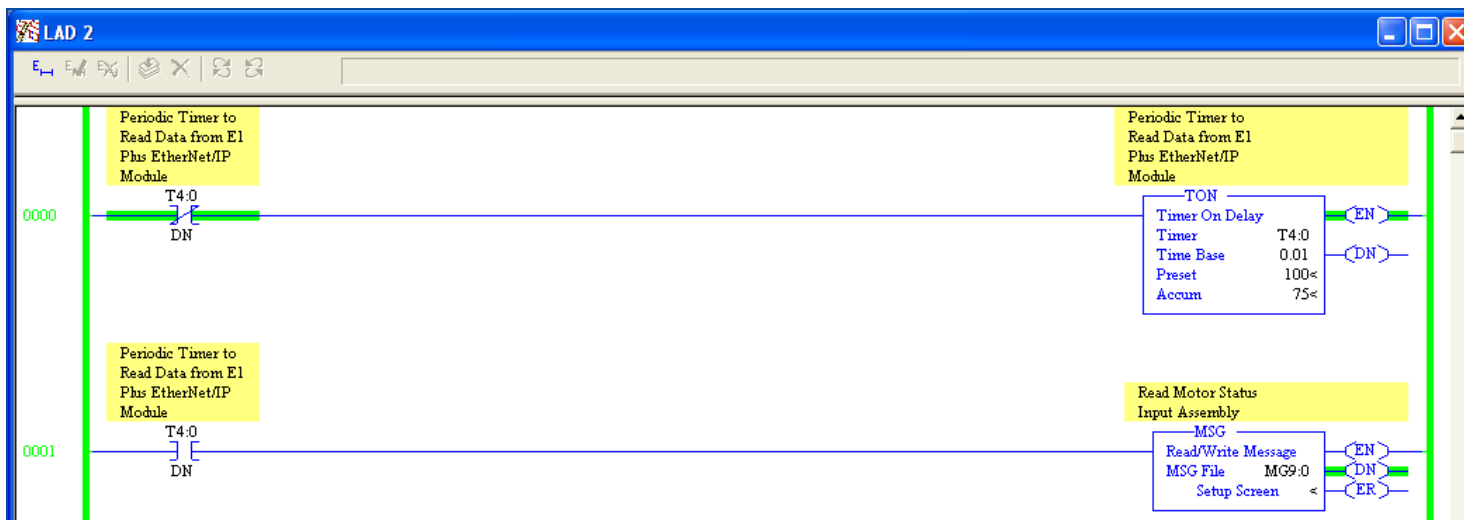
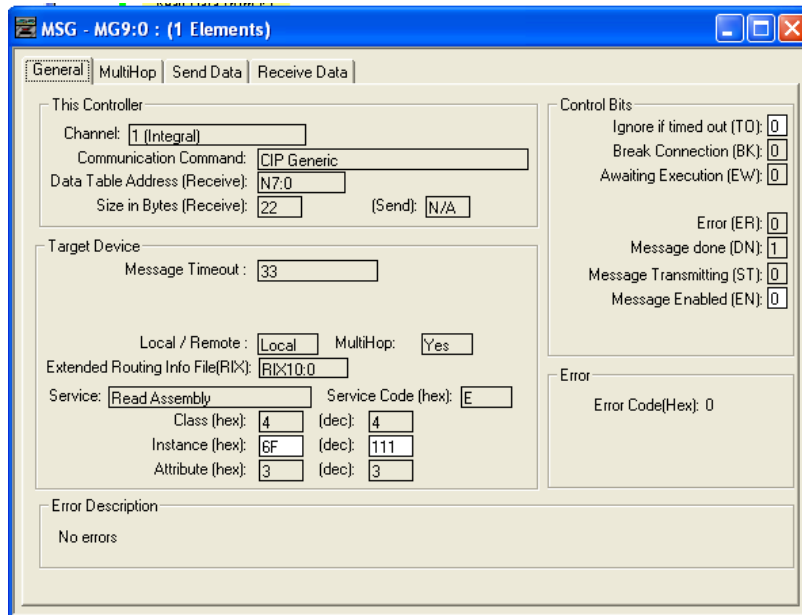
Explicit Messaging - Logix Controllers

- Supports explicit messaging with ControLogix, CompactLogix, and SoftLogix controllers
- Used to read motor diagnostic data into the controller



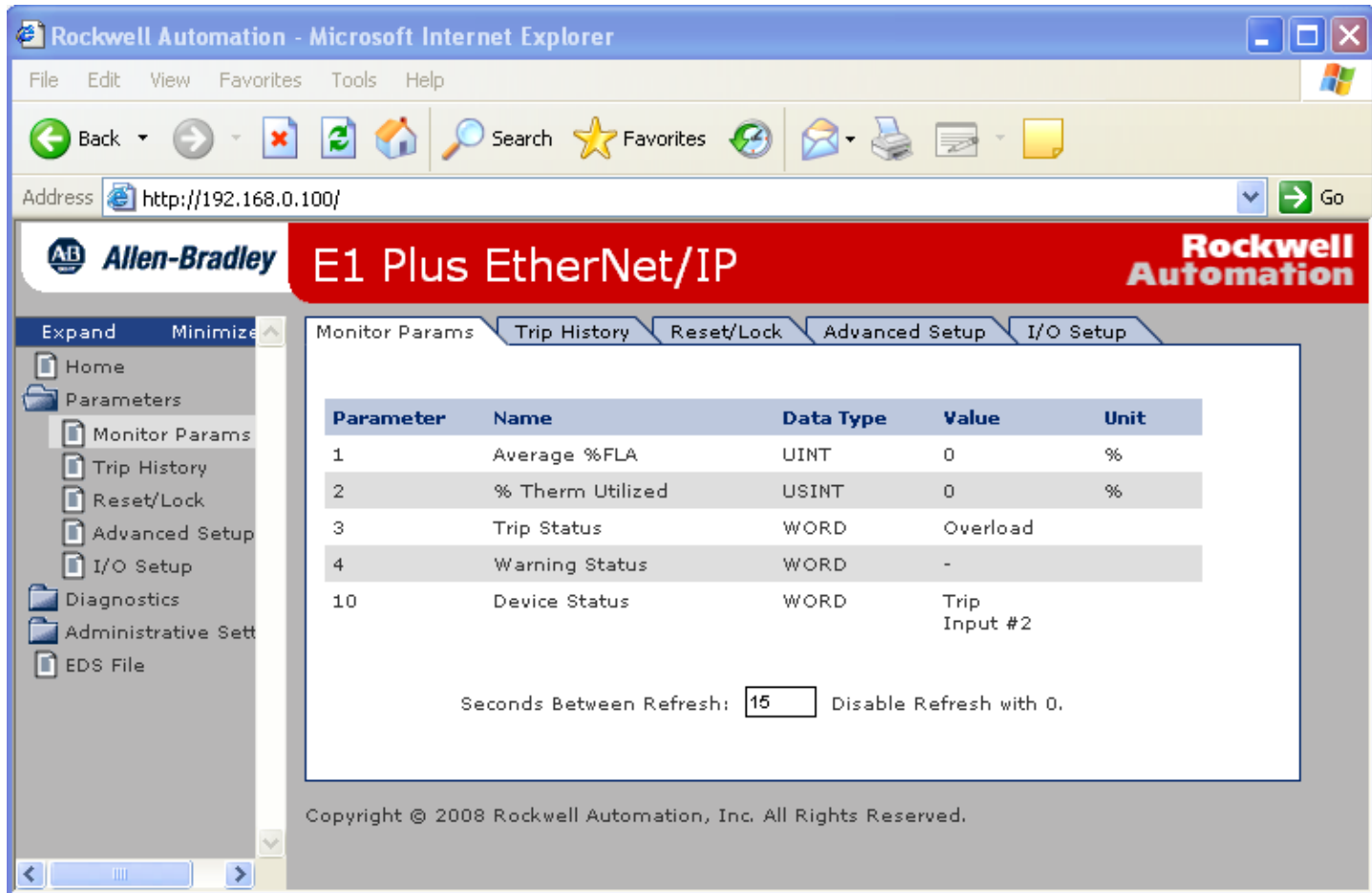
Explicit Messaging - MicroLogix & SLC-5/05

- Supports explicit messaging with MicroLogix 1100, MicroLogix 1400, and SLC-5/05 controllers
- Used to read motor diagnostic data into the controller



Internal Web Server

- Perform device configuration and view real-time data via a web browser




The screenshot shows a Microsoft Internet Explorer browser window displaying the Rockwell Automation E1 Plus EtherNet/IP configuration page. The address bar shows the URL `http://192.168.0.100/`. The page features a navigation menu on the left and a main content area with several tabs: Monitor Params, Trip History, Reset/Lock, Advanced Setup, and I/O Setup. The "Monitor Params" tab is active, showing a table of parameters.

Parameter	Name	Data Type	Value	Unit
1	Average %FLA	UINT	0	%
2	% Therm Utilized	USINT	0	%
3	Trip Status	WORD	Overload	
4	Warning Status	WORD	-	
10	Device Status	WORD	Trip Input #2	

Below the table, there is a text input field for "Seconds Between Refresh" with the value "15" and a note "Disable Refresh with 0." The footer of the page reads "Copyright © 2008 Rockwell Automation, Inc. All Rights Reserved."

E-mail and Text Message Support

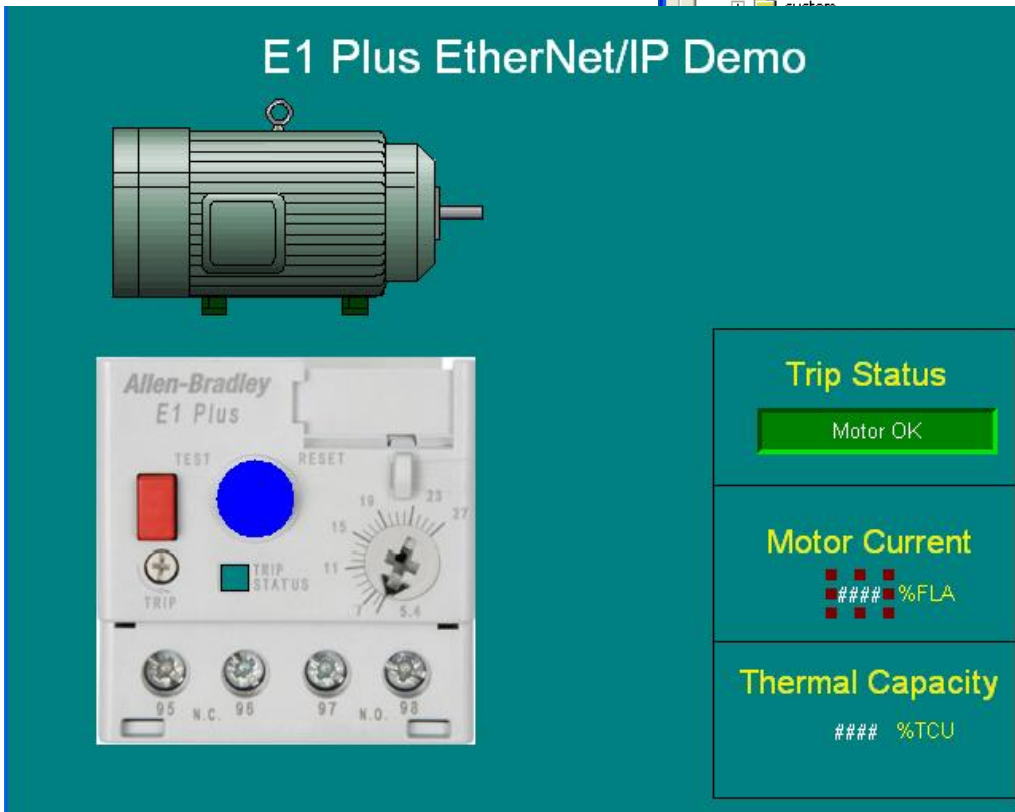
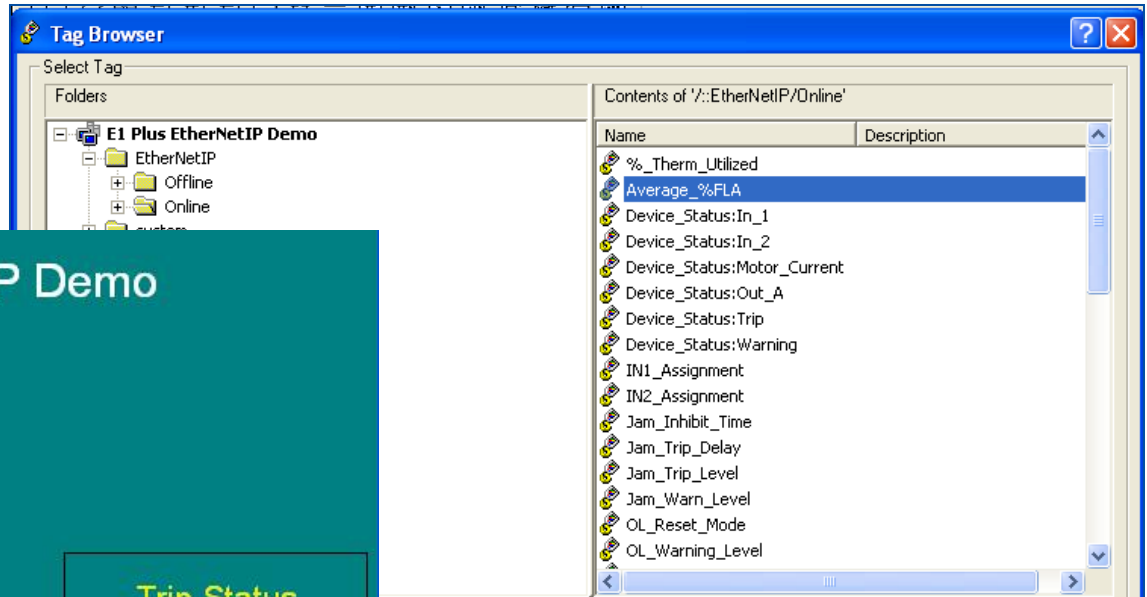
- Proactively manage motors and machines by sending e-mail or text messages when trip and warning conditions occur

	Cooling_Pump_2@ra.rockwell.com	To	<input type="text" value="maintenance@ra.rockwell.com"/>
	03/19/2009 04:58 PM	cc	<input type="text"/>
		bcc	<input type="text"/>
		Subject	<input type="text" value="Cooling Pump #2 has detected a Overload trip"/>

Trip status:	Overload
Device Name:	Cooling Pump #2
Device Description:	Cooling Pump #2 for the HVAC System
Device Location:	6-U29
Contact Info:	Bob Smith 414-555-1212

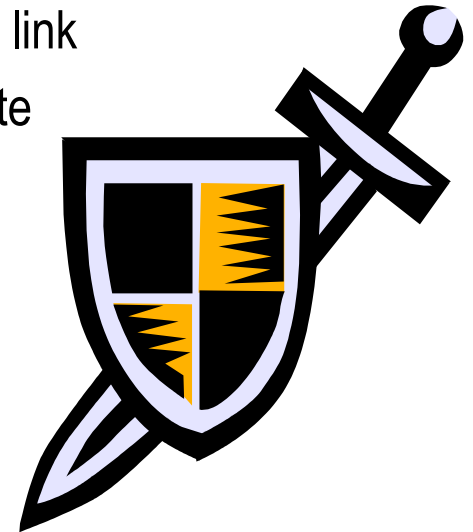
ControlLogix Style Tags

- Software can directly access data from the module using the embedded ControlLogix style tags



Enhanced Motor Protection

- The E1 Plus EtherNet/IP Side Mount Module enhances the motor protection capabilities of the E1 Plus by providing these additional motor protection functions:
 - **Jam protection**, trip the overload relay when the motor current is greater than the motor's nameplate rating
 - **Jam warning**, motor current greater than the motor's nameplate rating
 - **Overload warning**, percentage of the thermal utilization (%TCU)
 - **Underload warning**, motor current less than a specific level
 - **Communication fault warning**, disruption of the communication link
 - **Communication idle warning**, the network goes into an idle state



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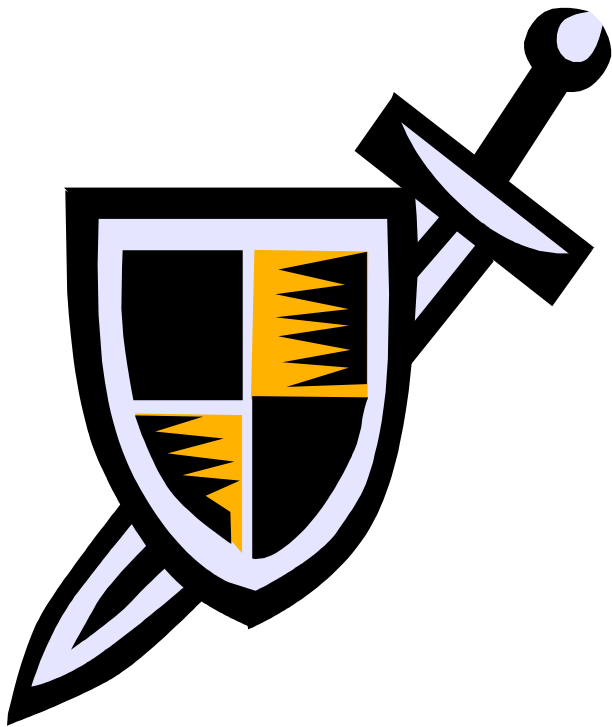
Bulletin 193/592 E3 & E3 Plus Electronic Overload Relay - Series C

E3/E3 Plus Electronic Overload Relay

- The E3/E3 Plus Electronic Overload Relay helps to ensure top performance of your electric motor investment by providing:
 - Enhanced motor protection
 - Motor diagnostics
 - Control
 - Communications



Enhanced Motor Protection

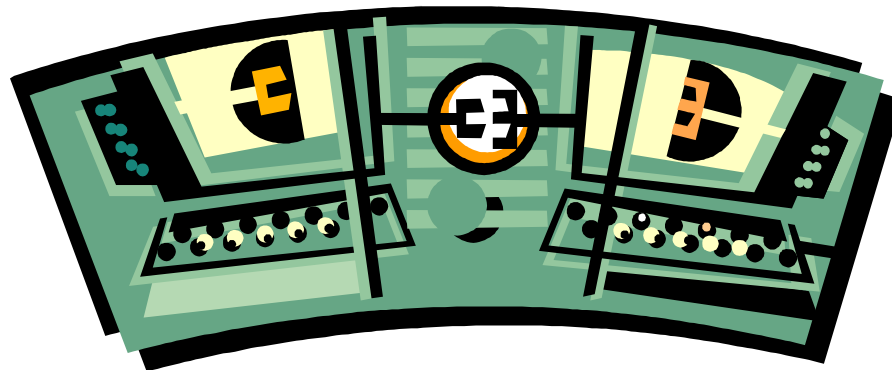


- The E3/E3 Plus Electronic Overload Relay helps to protect your electric motor investment by preventing damage from the following events:
 - Thermal overload
 - Phase loss
 - Ground fault
 - Stall
 - Jam
 - Underload
 - Temperature
 - Current imbalance
 - Communications

Enhanced Protection

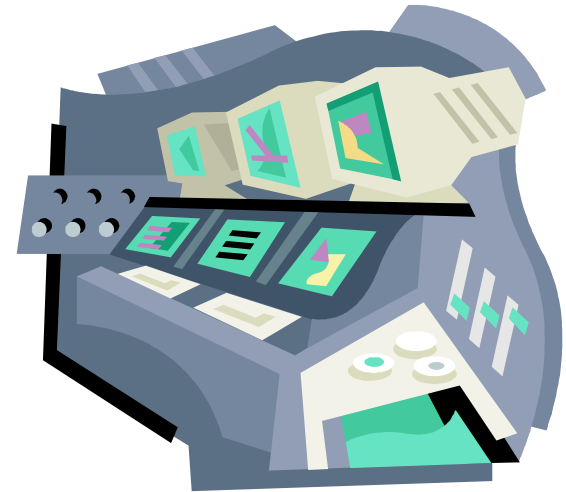
Communications

- The E3/E3 Plus provides electric motor and machine protection for the reliability of the automation infrastructure
- When the coordination of machines is important in a process, communication protection is useful to prevent machines from operating in the following network states:
 - Communication fault
 - Disruption of the communication link
 - Communication idle
 - The network goes into an idle state



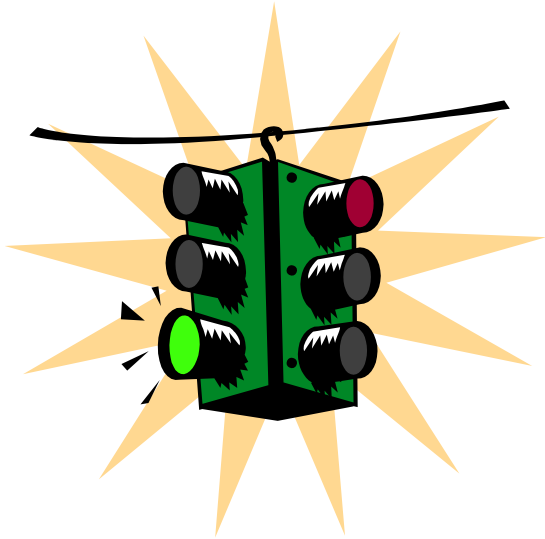
Motor Diagnostics

- The E3/E3 Plus Electronic Overload Relay not only helps protect your electric motor investment, but it can proactively assist in maintaining the electric motor by limiting:
 - Number of starts
 - Operating hours
- The E3/E3 Plus Electronic Overload Relay can also help provide diagnostic and metering information to help you understand the consumption patterns for the motor or process by providing:
 - RMS current
 - Percentage of full load current (%FLA)
 - Current imbalance
 - Thermal Capacity Utilization (%TCU)
 - Trip log
 - Warning log



Motor Diagnostics

Number of Starts



- The E3/E3 Plus Electronic Overload Relay can help prevent subsequent startups of an electric motor from occurring by limiting:
 - Starts/hour
 - Time between starts
- To aid the operator in understanding why a motor did not start, the following starting diagnostic data is also available:
 - Starts counter
 - Starts available
 - Time until next start
- Trips and warnings can be configured to assist with preventative maintenance programs that are based on the number of starts

Motor Diagnostics

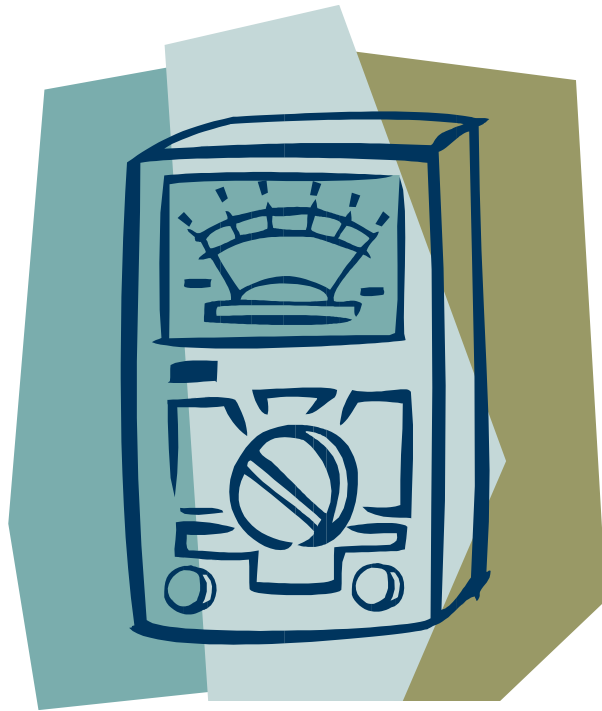
Operating Hours

- The E3/E3 Plus Electronic Overload Relay can help assist with preventative maintenance programs that are based on the number of **operating hours**
- A warning can be configured to alert maintenance personnel that routine maintenance is needed for an electric motor based on operating time
- To assist maintenance personnel, the **elapsed operating time** is available to indicate how long a motor has been running



Motor Diagnostics

Current



- The E3/E3 Plus Electronic Overload Relay measures current usage for an electric motor including:
 - L1, L2, L3, & average RMS current
 - L1, L2, L3, & average % Full Load Amperes (%FLA)
 - Ground fault current
 - Current unbalance
- These parameters can be historically collected to provide the user with a better understanding of:
 - Loading patterns
 - Energy usage
 - Power quality
 - Equipment maintenance

Motor Diagnostics

Thermal Capacity Utilization

- The E3/E3 Plus Electronic Overload Relay helps provide insightful information regarding the thermal properties of an electric motor
- **Thermal Capacity Utilization (%TCU)** represents the thermal operating condition of an electric motor
- Recording this information historically and viewing in real-time allows operators to identify potential issues before they can cause harm to an electric motor or machine
- These other parameters are also available to assist maintenance personnel during an overload event:
 - Time until overload (seconds)
 - Time remaining before overload reset (seconds)



Motor Diagnostics

Historical Logs

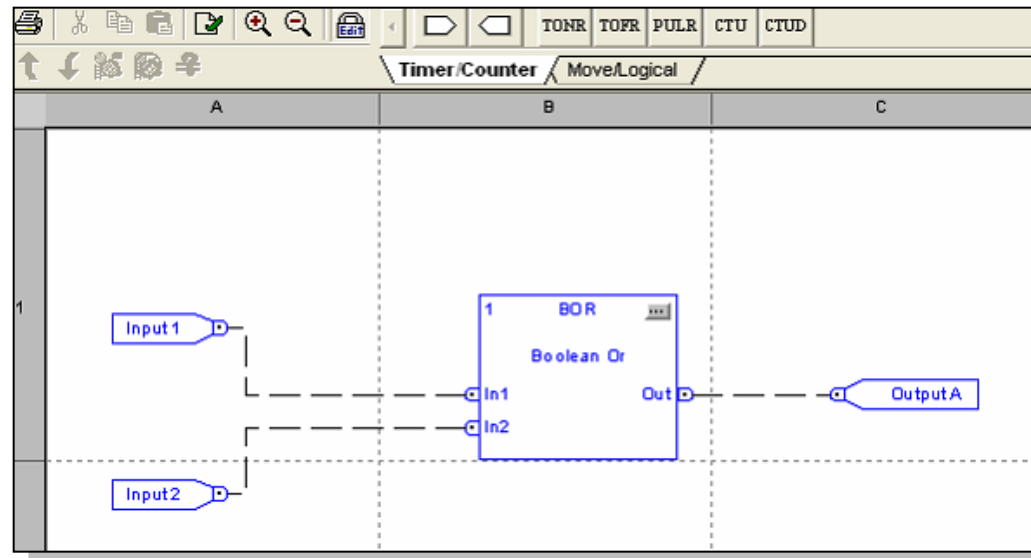


- The E3/E3 Plus Electronic Overload Relay internally records the last five trips and last five warnings
- Maintenance personnel can use the **trip log** to determine if there is a re-occurring theme or systematic reason for the trip to occur which helps minimize down time
- Maintenance personnel can use the **warning log** to determine if there is a potential problem that might occur and prevent unplanned down time

Controls

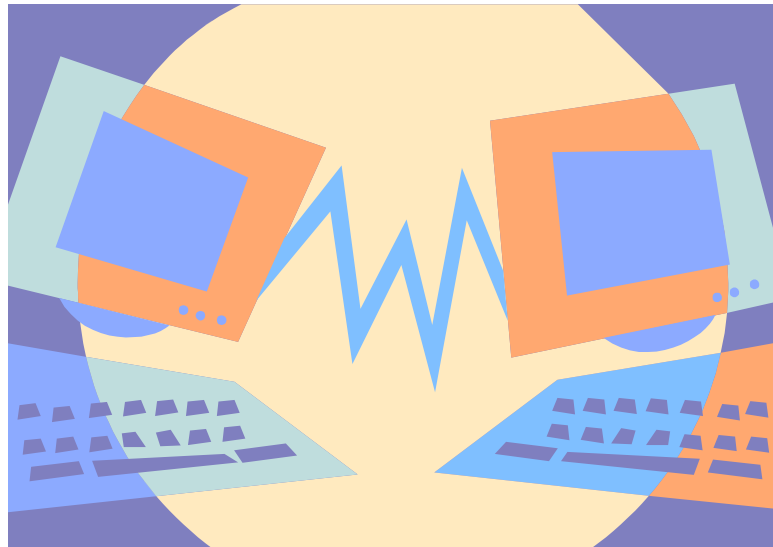
DeviceLogix

- The E3 Plus Electronic Overload Relay helps provide programmable logical control for its inputs and outputs using embedded DeviceLogix
- DeviceLogix is programmed using RSNetWorx for DeviceNet
- DeviceLogix can be used for:
 - Distributed discreet control
 - Customized motor control
 - Customized indication of a fault or warning



Communications

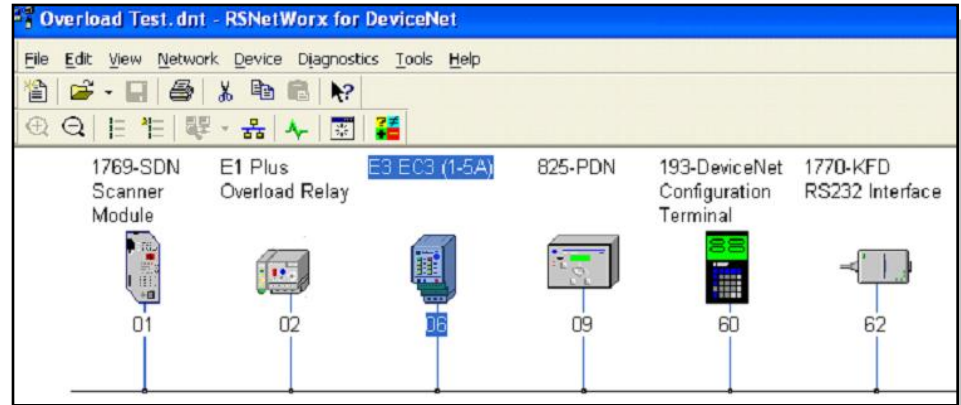
- Every E3/E3 Plus Electronic Overload Relay provides a communication network and configuration option that allow users to remotely configure and view information from a network
 - DeviceNet
 - DeviceNet configuration terminal



Communications

DeviceNet

- Every E3/E3 Plus Electronic Overload Relay supports the following DeviceNet messaging types:
 - Polled I/O messaging
 - Change-of-state/cyclic messaging
 - Explicit messaging
 - Group 4 off-line node recovery messaging
 - Unconnected Message Manager (UCMM)
- The E3/E3 Plus also supports the following functions to minimize network configuration time:
 - Full parameter object support
 - Auto-baud rate identification
 - Configuration consistency value
 - Automatic Device Replacement (ADR)



E3/E3 Plus Product Offering

- Current range of 0.4A to 5000A
- **Bulletin 193** for use with C09..C85 and D95..D860 IEC contactors
- **Bulletin 592** for use with NEMA 00 thru NEMA 3 contactors
- Configurable settings
 - Single or three-phase
 - Trip Class 5 thru 30
 - Reset mode
 - I/O
- Available Models
 - 193/592-EC1 - E3
 - 193/592-EC2 - E3 Plus with internal ground fault detection
 - 193/592-EC3 - E3 Plus with external ground fault detection



Bulletin 592
NEMA



Bulletin 193
IEC

E3/E3 Plus Model Comparisons

Model	193/592-EC1	193/592-EC2	193/592-EC3
Type	<i>E3 Electronic Overload Relay</i>	<i>E3 Plus Electronic Overload Relay</i>	<i>E3 Plus Electronic Overload Relay</i>
Current Range	0.4... 5000 A	0.4... 90 A	0.4... 5000 A
Thermal Overload Protection	✓	✓	✓
Phase Loss Protection	✓	✓	✓
Stall Protection	✓	✓	✓
Jam Protection	✓	✓	✓
Underload Protection	✓	✓	✓
Current Imbalance Protection	✓	✓	✓
Ground Fault Current Protection	✗	Internal	External
Temperature (PTC) Protection	✗	✓	✓
Number of Outputs	1	2	2
Number of Inputs	2	4	4
DeviceNet	✓	✓	✓
DeviceLogix	✗	✓	✓

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Bulletin 193/592 - Model EC5 E3 Plus Electronic Overload Relay with Voltage Protection and Energy Monitoring



E3 Plus with Voltage Protection & Energy Monitoring

- The E3 Plus Electronic Overload Relay with Voltage Protection and Energy Monitoring provides you with enhanced motor protection and motor energy consumption information
 - Enhanced Protection
 - Current Protection
 - Voltage Protection
 - Power Protection
 - Advanced Diagnostics
 - Voltage Metering
 - Energy Metering
 - Additional Features
 - Trip History
 - Warning History
 - Snapshot Record
 - 6 Digital Inputs
 - E3 Status Object (Object Class 0x375)

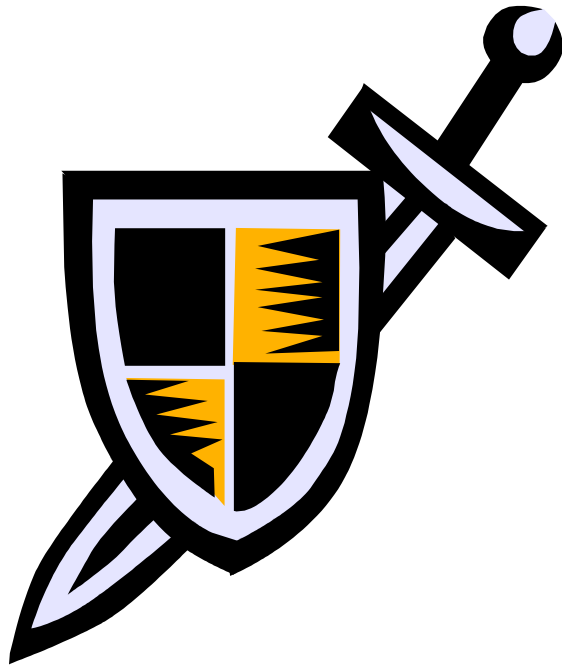


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Current Protection



- The E3 Plus with Voltage Protection and Energy Monitoring helps protect your electric motor investment by preventing damage from the following events:
 - *Thermal Overload*
 - *Phase Loss*
 - *Jam Warning*
 - *Stall*
 - *Under Load*
 - *Current Unbalance*
 - *Ground Fault Current*
 - *Ground Fault Current Filtering for High Resistance Ground Systems*

E3 Plus with Voltage Protection & Energy Monitoring

– Enhanced Protection

- Current Protection
- Voltage Protection
- Power Protection

– Advanced Diagnostics

- Voltage Metering
- Energy Metering

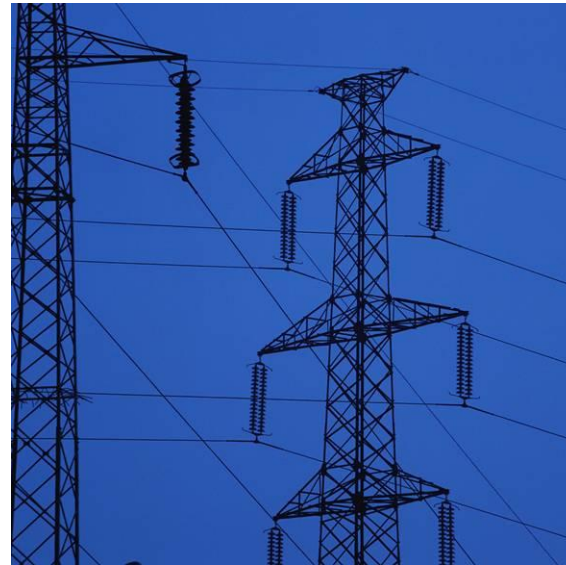
– Additional Features

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Voltage Protection

- The E3 Plus with Voltage Protection and Energy Monitoring helps you to protect against the following voltage issues:
 - *Under Voltage*
 - *Over Voltage*
 - *Phase Failure*
 - *Voltage Unbalance*
 - *Phase Rotation Mismatch*
 - *Under Frequency*
 - *Over Frequency*



Protection on the Line Side of the Contactor

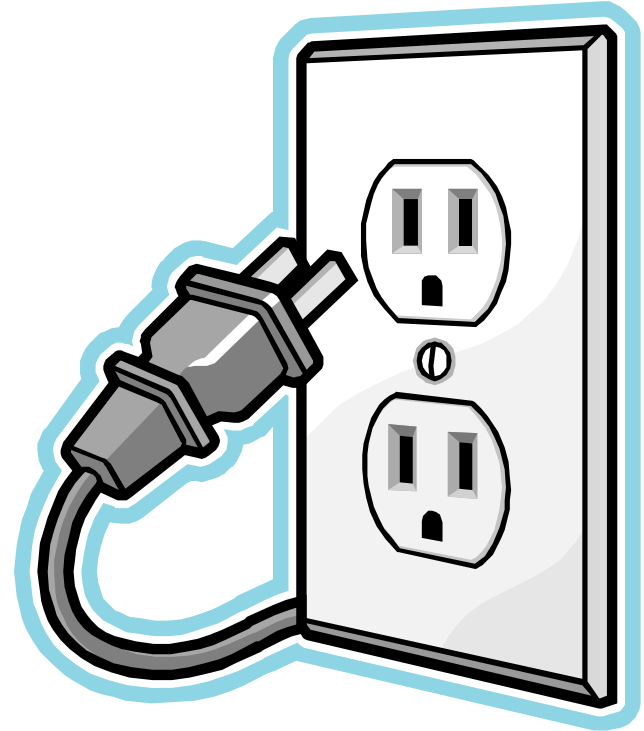
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Power Protection

- To address power quality issues that could occur due to a specific application, the E3 Plus Electronic Overload Relay with Voltage Protection and Energy Monitoring also provides you with the following power based protection :
 - *Real Power (kW)*
 - *Reactive Power (kVAR)*
 - *Apparent Power (kVA)*
 - *Power Factor (PF)*
 - *Leading*
 - *Lagging*



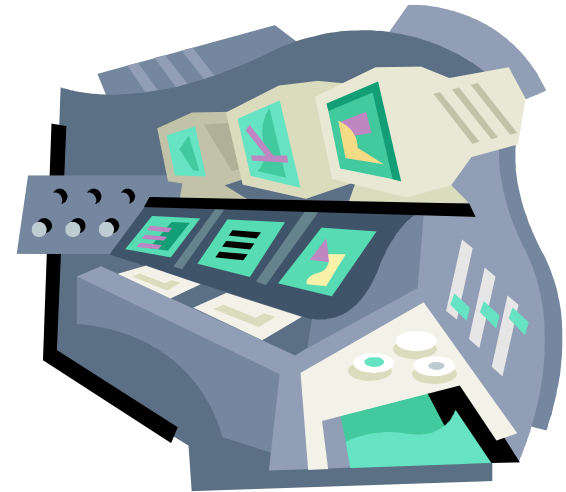
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Advanced Diagnostics

- The E3 Plus Electronic Overload Relay not only helps protect your electric motor investment, but it can proactively assist in maintaining the electric motor by limiting:
 - Number of starts
 - Operating hours
- The E3 Plus Electronic Overload Relay can also help provide diagnostic and metering information to help you understand the consumption patterns for the motor or process by providing:
 - RMS current
 - Percentage of full load current (%FLA)
 - Current imbalance
 - Thermal Capacity Utilization (%TCU)
 - Trip log
 - Warning log



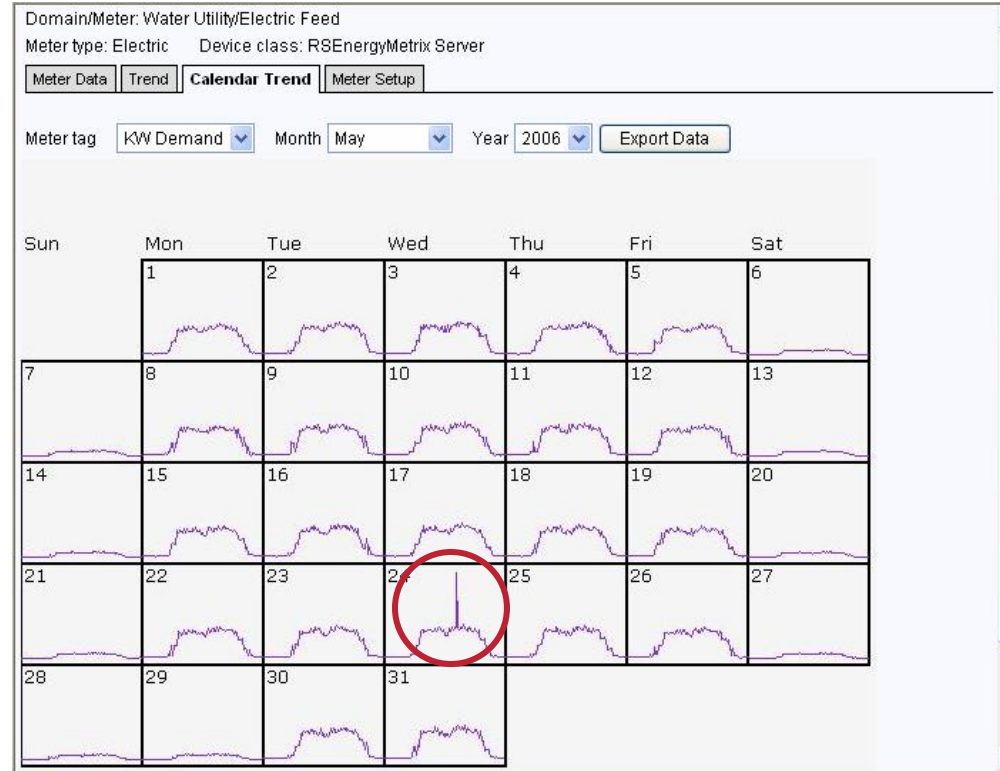
Energy Diagnostics



- To address energy usage concerns, the E3 Plus Electronic Overload Relay with Voltage Protection and Energy Monitoring provides you with the following energy diagnostic information:
 - *Real Energy (kWh)*
 - *Reactive Energy (kVARh)*
 - *Apparent Energy (kVAh)*
 - *kW Demand*
 - *kVAR Demand*
 - *kVA Demand*

Energy Diagnostics

- The E3 Plus Model EC5 can be included in your energy management system
 - Helps identify which motors contribute to the monthly peak demand and power factor line items on a utility bill
 - Helps to verify energy reduction initiatives



Monitoring consumption patterns and adjusting manufacturing procedures helps to use electricity more efficiently!

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Historical Logs

- The E3 Plus Model EC5 internally records the last five trips and last five warnings
 - **Trip History** - *Selectively record trip events*
 - **Warning History** - *Selectively record warning events*
 - **Snapshot Record** – *Records 12 real-time parameters at the time of the trip event*
- Your maintenance personnel can use the **historical logs** to minimize down time during an unplanned event

The screenshot displays two overlapping windows from a software interface. The top window, titled 'TripWarn History', shows a list of parameters with their current values. The bottom window, titled 'Trip Snapshot', shows a list of parameters with their current values.

ID	Parameter	Current Value
TripWarn History		
132	Trip History 0	No Fault
133	Trip History 1	No Fault
134	Trip History 2	No Fault
135	Trip History 3	No Fault
136	Trip History 4	No Fault
137	Warn History 0	No Warning
138	Warn History 1	No Warning
139	Warn History 2	No Warning
140	Warn History 3	No Warning
141	Warn History 4	No Warning
142	TripHistory Mask	11011111 0111111

ID	Parameter	Current Value
Trip Snapshot		
144	SS L1 Current	0 Amps
145	SS L2 Current	0 Amps
146	SS L3 Current	0 Amps
147	SS %TCU	0 %
148	SS GF Current	0.00 Amps
149	SS L1-L2 Voltage	0 Volt
150	SS L2-L3 Voltage	0 Volt
151	SS L3-L1 Voltage	0 Volt
152	SS Tot Real Pwr	0.0
153	SS Tot kVAR	0.0
154	SS Tot kVA	0.0
155	SS Total PF	0 %

Trip History
Warning History
Snapshot Record

Inputs & Outputs



- The E3 Plus Model EC5 offers direct control capabilities by offering discreet inputs and outputs in addition to the overload trip relay
 - 6 Inputs
 - 2 Outputs
- The E3 Plus Model EC5 also provides discreet outputs that can be used for:
 - Remotely starting a motor
 - Indicating a fault or warning
 - Two speed motor control
 - Logical discreet control
- DeviceLogix enabled

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Thank you for Attending

**Please complete your survey to receive
additional product information or
application assistance**

