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High thermal event system

General

The High Thermal Event System (HTES) from Eaton leverages over 80 years of network protection experience. With its robust, flexible and scalable design, the HTES is an evolving solution suited for any network system.

As demand for electrical equipment and infrastructure grows, the risk of catastrophic fires and electrical hazards become increasingly important. Unique fire hazards require unique solutions. Eaton's High Thermal Event System helps reduce vault equipment damage in electrical vaults for utility, industrial, commercial, and institutional facilities from fires or electrical equipment failures that may occur. When systems fail, immediate action is required.

The HTES is designed for plug and play installation that offers immediate high thermal monitoring that can be used with almost any customer digital sensor.

Reduce vault equipment damage caused by:

- Transformer failure
- Network protector thermal fire
- Collector bus thermal event
- Catastrophic vault fire
- Ground fault event

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Features

The HTES is rugged, reliable, and tailored to our customer's thermal monitoring requirements. They are easy to setup and use, making the HTES a complimentary fit, while retrofitable for any network system.

The system is fully assembled and tested at the factory. It has plug and play functionality for up to six (6) network protectors. The remote terminal unit (RTU) handles the functional logic and is integrated with an HMI screen that allows remote supervisory automation.

Fire detection sensors (network protector, collector bus and vault), transformer sudden pressure relays, and ground fault sensing when wired through the network protector bulkhead can plug directly into the HTES cabinet with a single cable.

The HTES is available for use with Eaton's VaultGard™ gateway. The VaultGard gateway can connect up to 32 devices and is rated for harsh environmental stresses typically found in underground vaults. The VaultGard gateway offers alarms and logging of captured relay data.

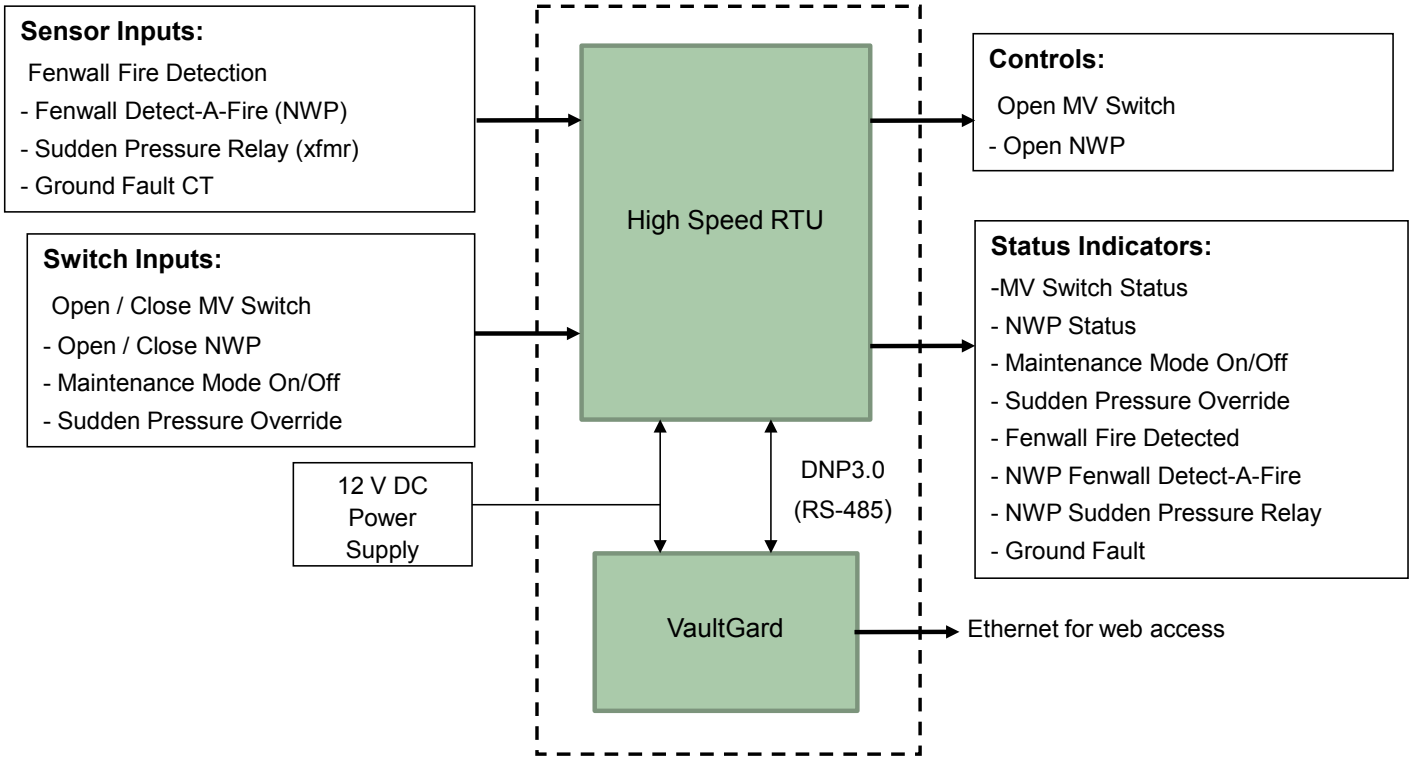

Figure 1. System layout diagram.

Operation and maintenance

The HTES is equipped with an HMI screen accessible from inside or outside the vault depending on user requirements. The system works autonomously providing around the clock thermal monitoring of vault equipment. The plug and play features offer configuration versatility to allow the end user to tailor the system to address their specific needs. See Figure 2 for a conceptual physical system layout.

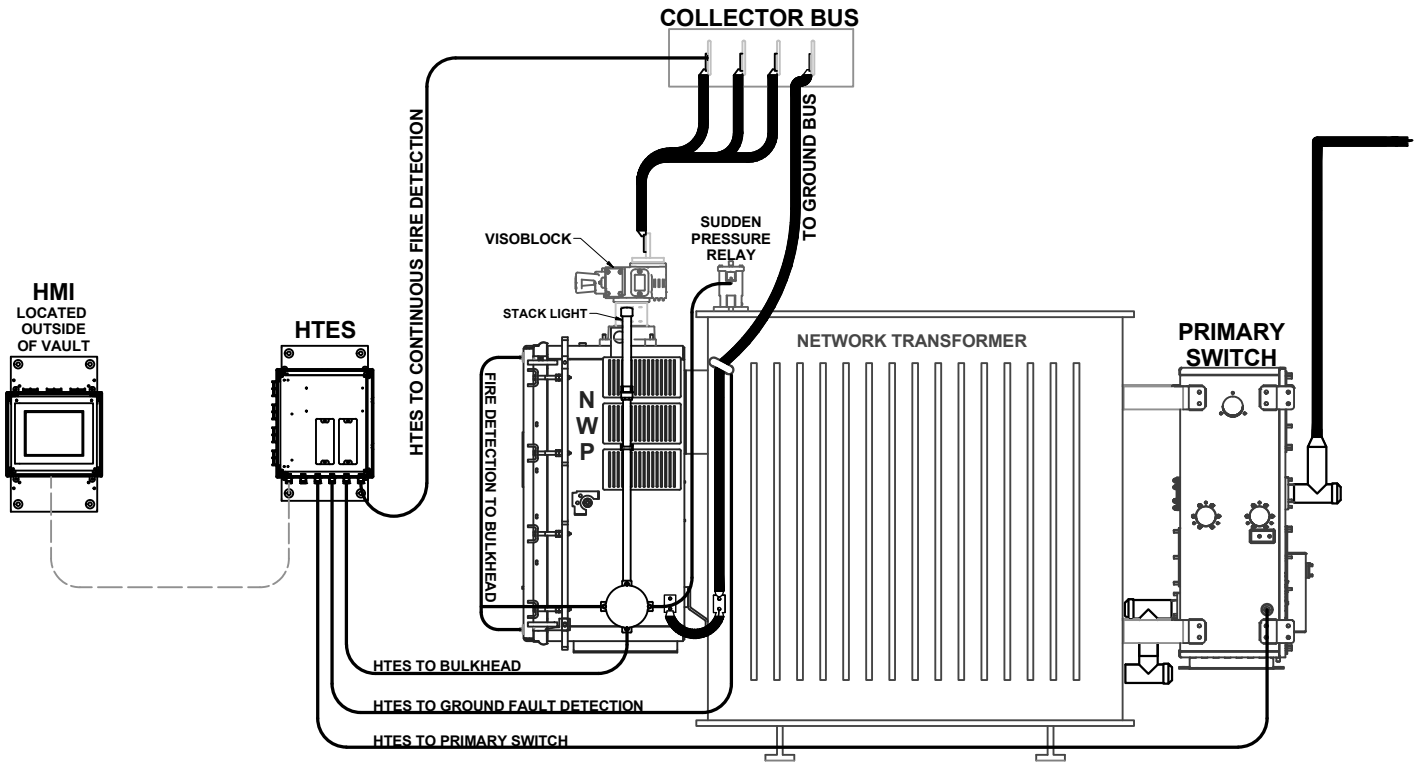

Figure 2. Physical system layout.

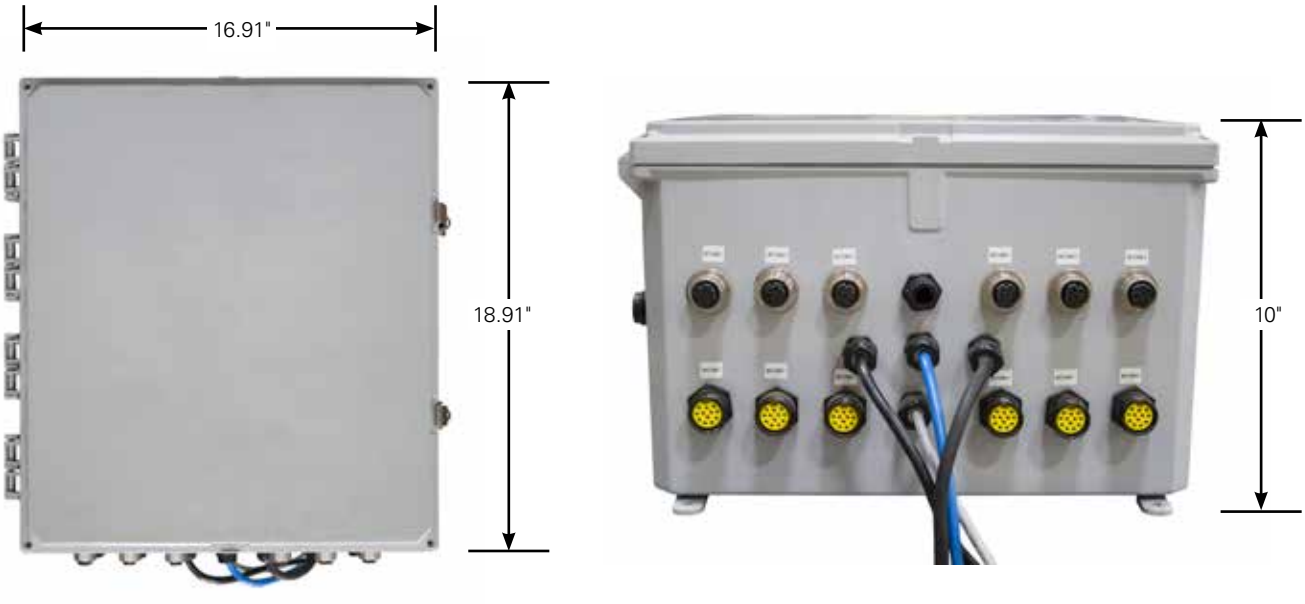

Figure 3. RTU enclosure.

Table 1. RTU Enclosure Specifications

Mechanical and Thermal (18 X 16 X 10)	Instrumented Dart Impact @ 73 °F, 565 in-lb.
	Falling Ball Impact @ 73° 900 in/lb. Test Spec. UL®-746
	Deflection Temperature @264 psi, 270 °F, Test Spec. ASTM D648
	Modulus of Elasticity 340 ksi, Test Spec. ASTM D790
	Temperature Range, -40 to 265 °F
Flammable/UV Ratings	Flame Rating – UL®, 5 VA. Test Spec. UL®-94
	Outdoor UV Exposure, F1. Test Spec UL®
3rd Party Approvals	UL®-50/c-UL® Listed (files #E229365, #E207562)

HMI-Human interface terminal

The HMI is a rugged graphic human-machine interface terminal for use in a wide-range of commercial and industrial applications. It has been designed with a robust set of industrial-grade features and options.

The HMI comes preassembled and tested. It is mounted on a rugged polycarbonate submersible enclosure which can be mounted anywhere the end user desires.

Figure 4. HMI back view.

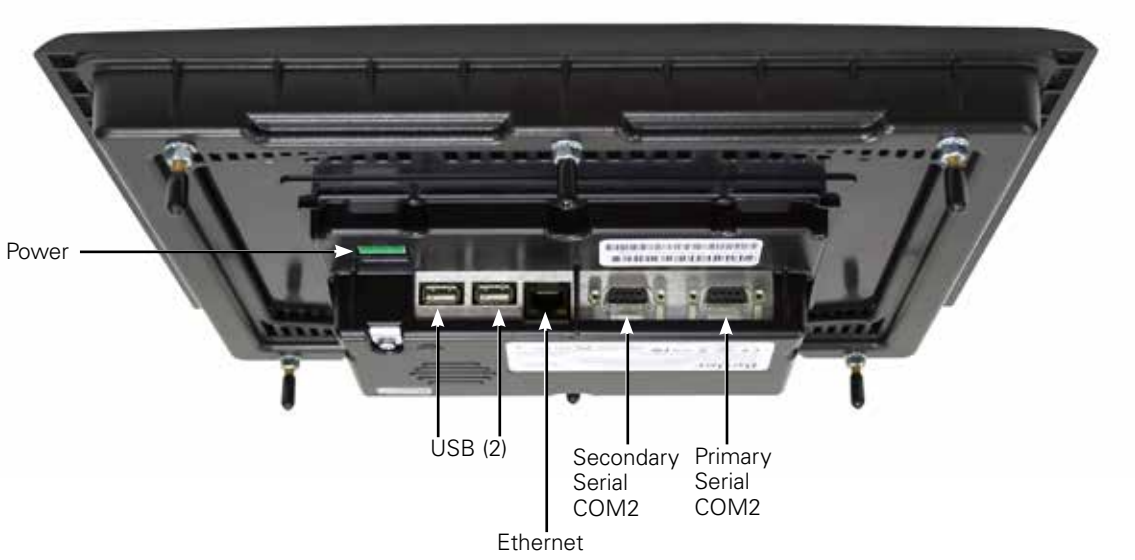

Figure 5. HMI bottom view.

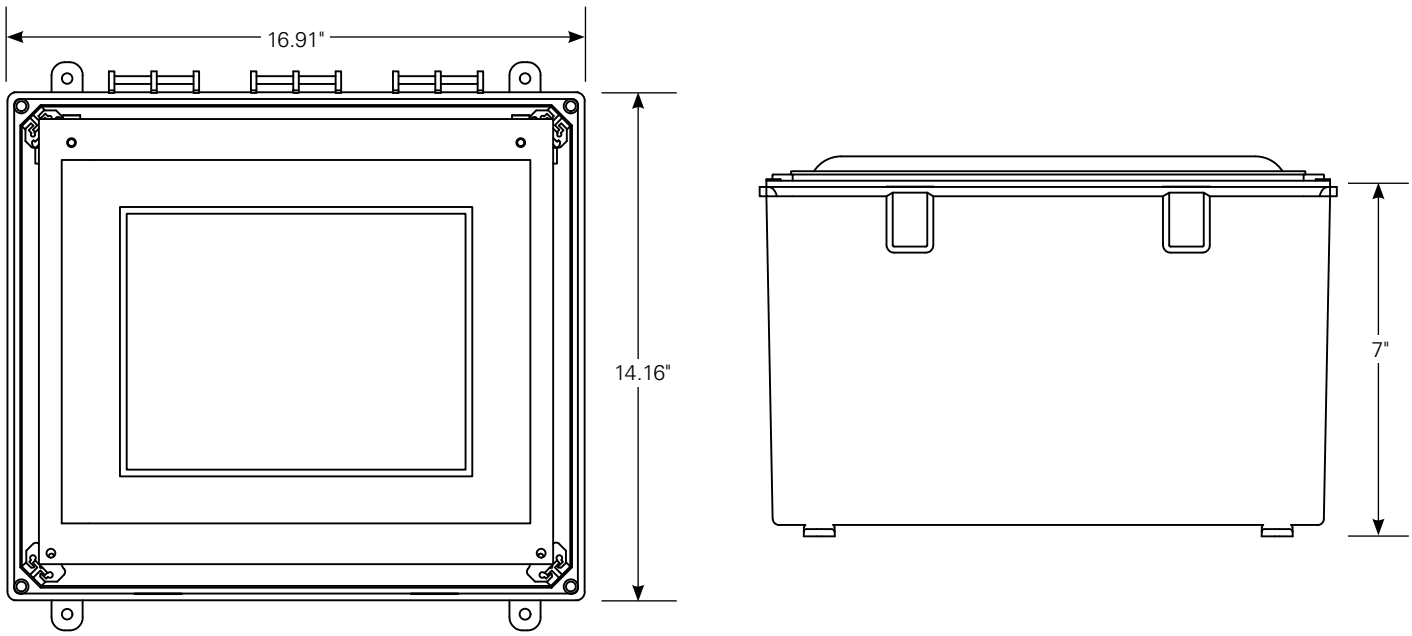

Figure 6. HMI enclosure.

Table 2. HMI Enclosure Specifications

Mechanical and Thermal (16 X 14 X 7)	Instrumented Dart Impact @ 73 °F, 565 in-lb.
	Falling Ball Impact @ 73° 900 in/lb. Test Spec. UL®-746
	Deflection Temperature @264 psi, 270 °F, Test Spec. ASTM D648
	Modulus of Elasticity 340 ksi, Test Spec. ASTM D790
	Temperature Range, -40 to 265 °F
Flammable/UV Ratings	Flame Rating – UL®, 5 VA. Test Spec. UL®-94
	Outdoor UV Exposure, F1. Test Spec UL
3rd Party Approvals	UL®-50/c-UL® Listed (files#E229365, #E207562)

Table 3. HMI Screen Specifications

Feature	Detail	Description
Display	Type	800 x 600 SVGA, TFT color LCD
	Size	12.1" (307 mm) diagonal
	Lighting	LED
Touch Screen	Type	Analog-resistive
Interface	Ethernet	10/100Base-T, RJ-45
	Serial	One EIA-232/422/485 DB9f; one EIA-232 DB9f
	USB	Two 2.0 full-speed host ports (Type A connectors)
	Communication modules	Two isolated CANbus ports (optional)
Processor	Type	XScale PXA300® ARM 624 MHz
Memory	RAM	128 MB
	Flash	4 GB
Realtime Clock	Standard	Battery-backed, 1 second resolution
Audio	Speaker	8 Ohms 0.7 Watts
Power	Input	10 to 32 Vdc
	Consumption	9 Watts @ 24 Vdc (typical), 13 Watts @ 24 Vdc (max)
	PoE	10.5 Watts @ 48 Vdc (typical), 14.2 Watts @ 48 Vdc (max)
Mechanical	Type	Panel-mount
	Size	344.4 (W) x 267 (H) x 69.1 (D) mm
	Mass	2.05 kg
	Housing Material	Polymer
Environmental	Sealing - Front Panel	UL® 50 Type 4X (outdoor), IP66, NEMA®-4X
	Temperature	Operating: -30 to 70 ºC; Storage: -40 to 85 ºC
	Humidity	5 to 95%, non-condensing
	Vibration	4 g 10-1500 Hz
Certifications	Hazardous Locations	ANSI®/ISA 12.12.01 (formerly UL® 1604) Class I, Div 2
	UL	UL® 508
	CE	EN55022, EN55024 and EN60950
	EMC	FCC Part 15
	Marine	ABS
Software	Operating System	Windows® Embedded CE 6.0
	Development Environments	Visual Studio®, iX Developer
	Development Languages	Visual Basic®, Visual C#®, Visual C++®, iX Software
	Runtime Environments	.NET Compact Framework, iX Runtime

The HMI home screen provides current status for thermal sensing for each network protector, sudden pressure status on each respective transformer, ground fault sensing, thermal sensing on the collector bus and lets the user know if the protection status enabled.

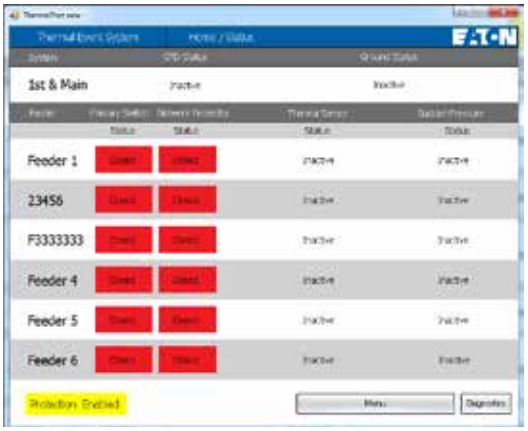

Figure 7. HMI home screen shown.

Additional HMI screens provided:

- Navigation Screen links to maintenance, sensor reset, protection, sensor configuration, and home status screens

Figure 8. Navigation screen shown.

- Maintenance Screen provides thermal protection, sudden pressure, ground fault and continuous fire status as well as abilities to lock open a network protector, and reset the primary switch

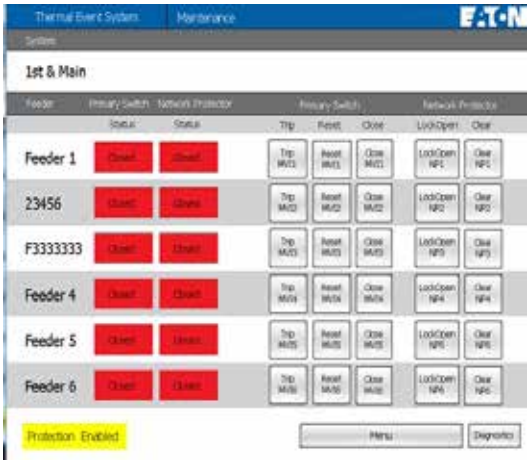

Figure 9. Maintenance screen shown.

- Sensor Reset Screen resets sensors, i.e. thermal sensors, sudden pressure sensors, continuous fire sensors and ground fault sensors

Figure 10. Sensor Reset screen shown.

- Protection Screen clears all network protectors from lockout state as well as the ability to close and reset the primary switch

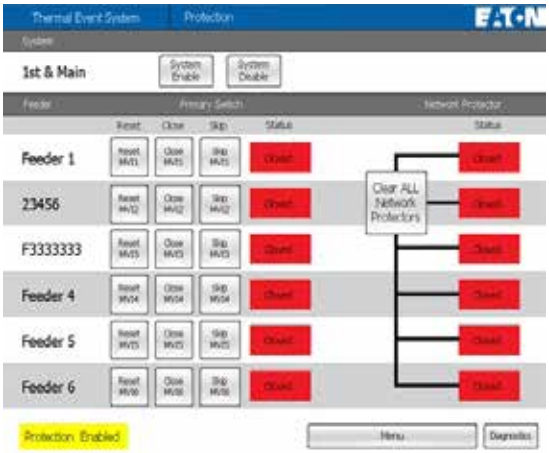

Figure 11. Sensor Reset screen shown.

- Sensor Configuration Screen enables and disables functionally for all sensors, i.e. ground fault, continuous fire protection, thermal and sudden pressure

Figure 12. Sensor Reset screen shown.

Remote terminal unit (RTU)

The HTES is equipped with a high speed RTU which provides autonomous functionality. The RTU comes preassembled, wired, tested and preprogrammed ready to install. The RTU is mounted in a rugged polycarbonate submersible enclosure which can be mounted in the vault anywhere the end user desires.

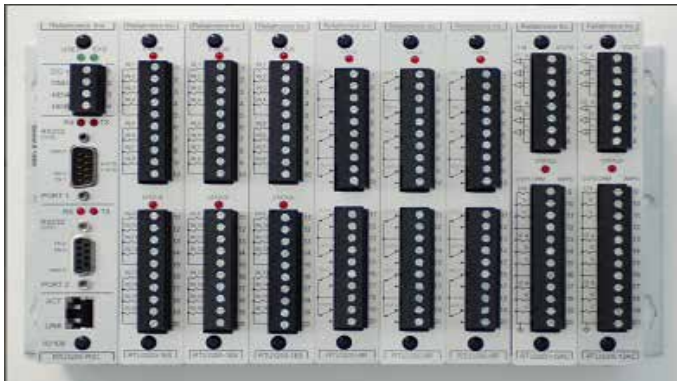

Figure 13. Remote Terminal Unit - front panel view.

The RTU3200 main processor and I/O boards plug into an aluminum chassis. Custom versions are available, but standard versions have five or nine module capacity. In all versions, the processor occupies the first module slot, leaving four or eight slots, respectively, for I/O modules.

The High Thermal Event System base unit includes:

- CPU module
- Power supply
- Two (2) serial ports
- One (1) Ethernet port

The High Thermal Event System can be ordered with up to six (6) network protectors. The available models are:

- 3-Protector Build
- 4-Protector Build
- 5-protector Build
- 6-Protector Build

Dimension	5 Module Chassis	9 Module Chassis
L1	6.250"	10.250"
L2	5.750"	9.750"

Table 4. RTU Specifications

General Features	Supported Protocols	Security Features
Data concentration	DNP3	Undefined instruction detection - Hardware instantly detects an attempt to execute a non-valid instruction and resets the CPU when any illegitimate operation occurs
Processing Power	32-bit Advance RISC Machine (ARM) processors	Resets the CPU when the processor fails to refresh the timer in a timely manner.
Serial HMI teaming	MODBUS	Account management:
Ethernet DB9-F RS232	10/100 Base-T connection via an RJ-45 connector	
Mounting Details	The mounting details are shown below. The keyhole slots accept a #6 machine screw with a maximum head size of 0.312" and a body size of 0.140". The center holes are 0.187" in diameter.	
Address range detection	Hardware instantly detects an attempt to read or write to any location in memory without the correct access permissions.	Detailed group permissions
Privileged Mode operation	The main processor normally operates in "User" mode and is unable to access certain protected system resources.	Access management
IO board dependent features	The relay output boards have separate hardware drivers for both the positive and negative relay coil connections, along with a means of constantly checking these drivers. The processor will report the output as "offline" if there is a driver failure (open or short). A driver therefore cannot cause a false operation of the relay.	
Power consumption	Each output relay that is latched on will cause the RTU to draw about 17 mA at 12 V, and about 9 mA at 24 V	
Database Memory Usage	Live data is stored in the processor board's random access memory (RAM), with a total of 16,384 bytes of memory allocated for the database. For our purposes, this is more than enough memory for any possible configuration of IO modules. However, if the RTU is used to poll external devices, this memory could be used up. The following table lists the database memory requirements for each module.	

Available Accessories

- Cabinet
  - Program logical controller
  - Internal terminal blocks
  - Optional VaultGard™ gateway
- Cables
  - RS-232 cable for connection to PC
- I/O Contacts
  - 4 module binary Inputs
  - 4 module output relays
- Communications accessories
  - Default RS-232 port
  - Multiple serial and Ethernet options with wire
- Battery
  - 12-volt power supply
- Monitoring
  - HMI screen

Additional Information

PA024001EN, Reduce Network Equipment Damage with the High Thermal Event System

PS024001EN, High Thermal Event System Specification

BR024001EN, VaultGard Network Underground Communications Solutions

IL02400002E, VaultGard Instruction Booklet

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Cooper Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Cooperpower.com

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