

CM52 Network protector



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Table of contents

General	3
Construction and features	4
Enclosure assembly	5
Breaker element	6
IDM (Indicating Diagnostic Module)	6
Relay module	7
MPCV Relay	8
Table 1. General specifications	9
Table 2. MPCV Relay guide	9
Accessories	10
VisoBlocks secondary disconnects	10
ARMS (Arcflash reduction maintenance system)	11
ARMS Graph 1 and 2	11
Rem-Rack (Remote racking device)	12
Stacklight	13
TripSafe	13
Bulkhead connection box	14
Remote operating options	14
Network protector pressure sensor	15
Network protector moisture sensor	15
Network protector water float switch	15
Communications and SCADA	16
VaultGard communication gateway module	16
NPSServe – Analog and digital input control module	16
HTES - High thermal event system	17

General

Eaton's CM52 network protector delivers an unsurpassed state-of-the-art dead-front network protector providing the highest performing and highest rated product for network solutions available. It leverages proven Eaton power breaker technology which delivers the safest and most versatile solution available to the market today. Low voltage network systems are the most reliable distribution schemes in the world. As a result, maintaining the most reliable system requires using the most robust reliable equipment that can handle the heavy demands of a network system from an operational and environment perspective.

The CM52 network protector is the latest design in a long history of Eaton's network protector offerings. The CM52 network protector captures all the benefits of robust legacy network protectors but greatly improves on user and operational safety. The CM52 network protector network protector is manufactured in accordance with and exceeds IEEE Std C57.44-2014 and IEEE Std C57.40-2011.

Features include:

- Advanced Eaton power breaker technology with 4 position draw-out design
- Dead-front design no exposure to live parts
- Compatible with a variety of Eaton ArcFlash safety packages
- Seamless integration into Eaton communication platforms
- 10,000 mechanical operations
- Leverages over 100 years of network expertise



Construction and features

The CM52 network protector is a fully interlocked, dead-front, four (4) position draw-out design available with internally or externally mounted fuses. The dead-front design separates itself from traditional network protectors and is designed for ultimate user safety FIRST. It is the only network protector with a 10kV BIL impulse withstand voltage rating.

The CM52 network protector can be broken down in to three simple sections making it much less complicated to operate and maintain versus all other style network protectors available today. It is comprised of an enclosure assembly, breaker element and relay module.

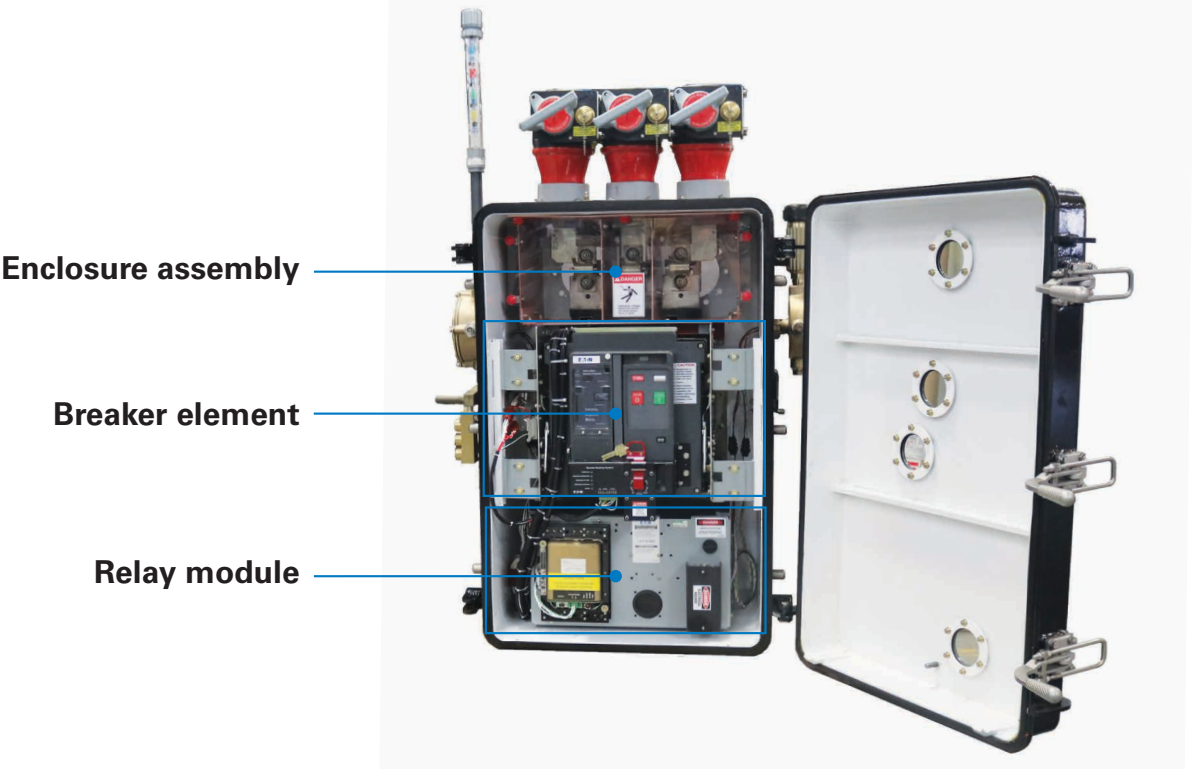


Figure 1. CM52 Network protector 1875A shown

Enclosure assembly

The CM52 network protector is available in two enclosure styles and meets the enclosure requirements of the IEEE C57.12.44TM-2014 for submersible applications. Eaton enclosures are manufactured and constructed with corrosion resistant ¼ inch thick copper bearing steel for submersible environments or in a weather-resistant NEMA 4 style steel enclosure for non-submersible applications. The enclosure is also available in 316 stainless steel.

The submersible tank comes with a two tone finish, black exterior and white interior for highest visibility. The top of the enclosure and the upper portion of the transformer throat are stainless steel. Eaton offers two types of door fasteners,

the standard bolted door design or the easy access quick-latch design (See Figure 2). There also two types of hinged configurations, the standard hinge or yoke style hinge seen on older legacy protectors.

The CM52 network protector comes standard with an electrical close feature, unlike older protectors that use a force mechanical close. Electrical interlocks are utilized to protect operators by preventing closing operations during adverse conditions.

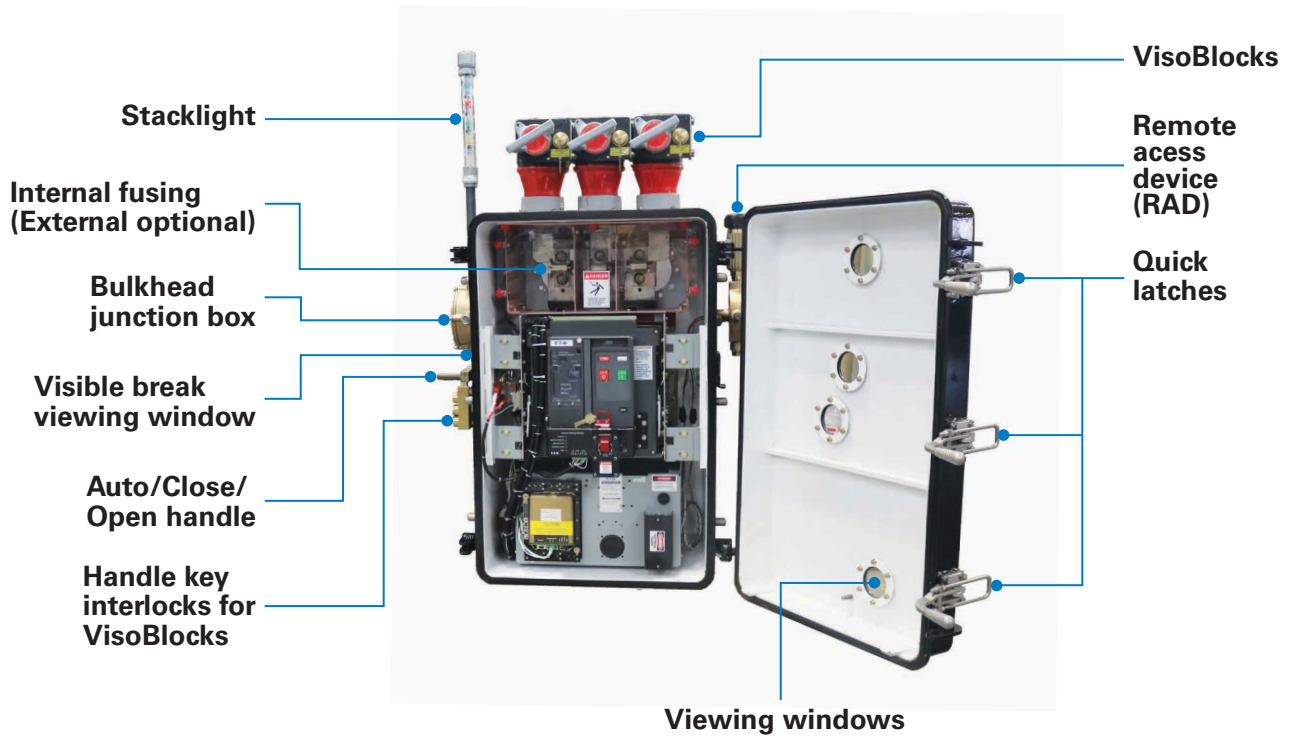
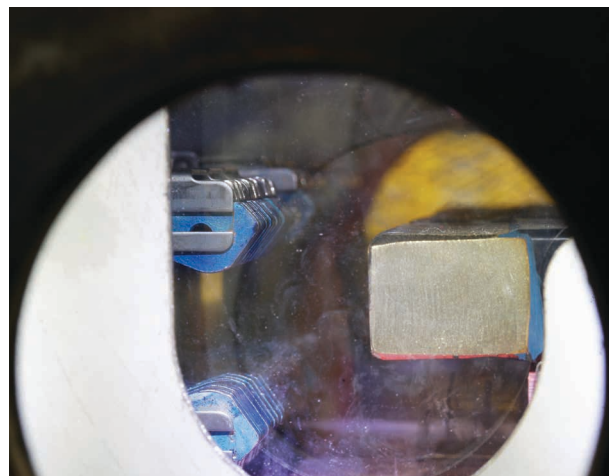


Figure 2. CM52 Network protector enclosure assembly



Visible break viewing window



Rem-rack visible break OPEN

Breaker element

The CM52 network protector utilizes an Eaton power breaker element specifically designed for use on network systems. The breaker is designed for ease of access for inspection and maintenance. It comes standard with 4 operable positions: racked-in, racked-out, test and disconnect (See Rem-Rack under Accessories for details). It features a spring-charge motor with an optional manual spring charging handle for use when the network protector is de-energized or breaker is racked-out.

The design reduces the need to stock a large variety of breaker elements since one breaker is adequate for a specific amperage range and is independent of voltage. Eaton offers three breaker styles: 3 pole, 4 pole and 6 pole. The breaker is molded from a specially designed 180C rated thermoset material required for the service duty levels of network operating conditions.

The breaker element uses an “arc chute” design and finger cluster disconnect contacts for optimal racking functionality. This method is ideal for handling the thermal requirements of the high continuous currents and dynamic loading of fault current levels seen with network applications.

The CM52 network protector has the only network protector breaker element capable of interrupting fast enough to support the Eaton patented Arc Reduction Maintenance System (NPARMS) and is a UL approved designed. See ARMS section for further details.

IDM (Indicating Diagnostic Module)

The IDM is only available with the CM52 network protector and comes standard with all units. This device monitors the health of the major breaker components, the motor, the spring release coil, and the trip circuitry. It does this by inducing a trickle current through the major components to make sure there are no open circuits. The IDM takes its findings and reports back through communications.

Note: The IDM is available with and without ARMS functionality.



Figure 4. Indicating diagnostic module

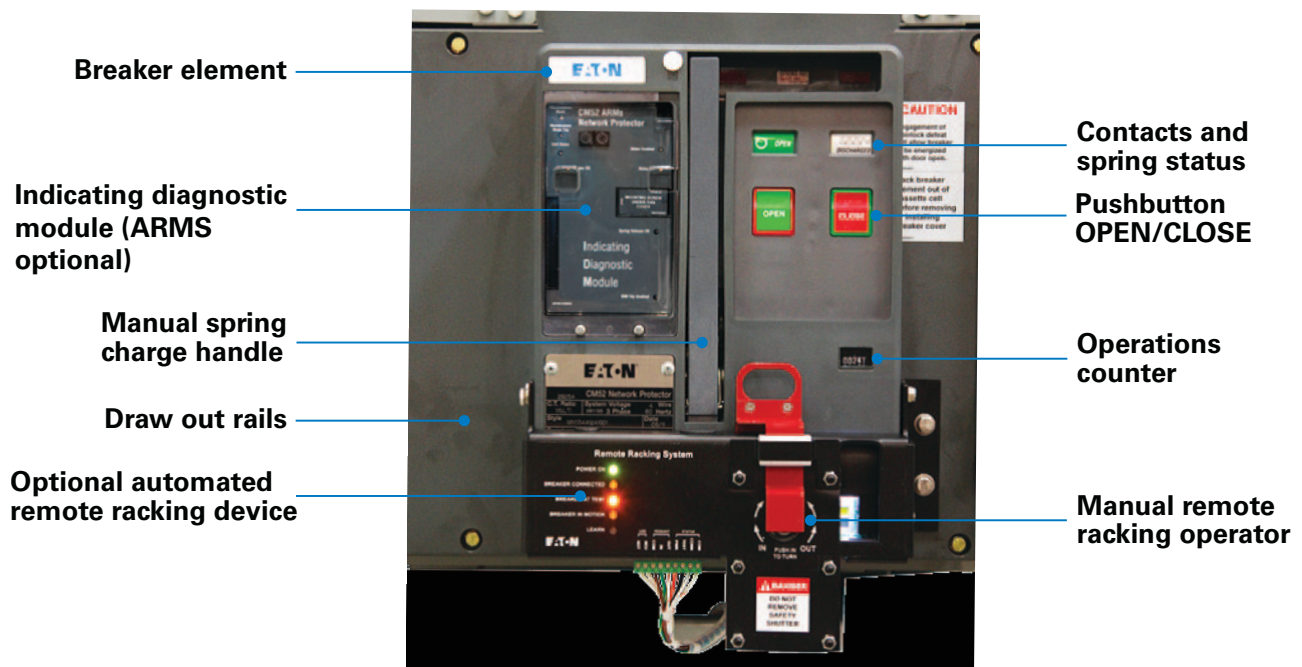


Figure 3. CM52 Network protector breaker element

Relay module

The relay module is a separate compartment, all components interconnected with the other parts of the network protectors can be disconnected via a quick connect system.

The relay module contains the Eaton MPCV network relay, test switches, terminal blocks and control power transformers for 480V or 600V operation.

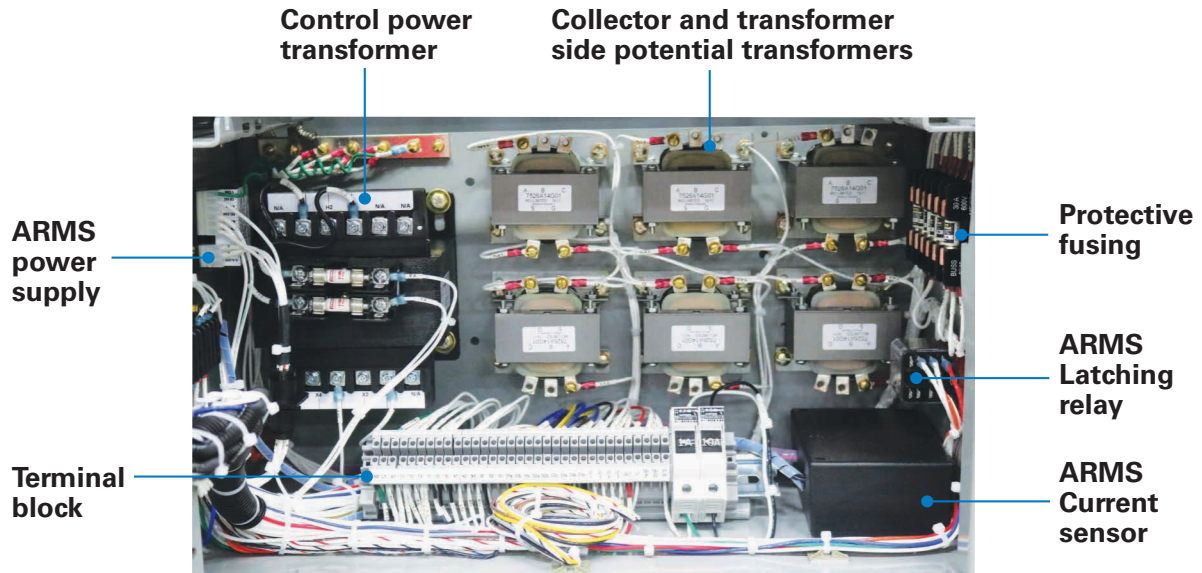


Figure 5. CM52 Relay module
Internal 277/480V Relay assembly with ARMS shown

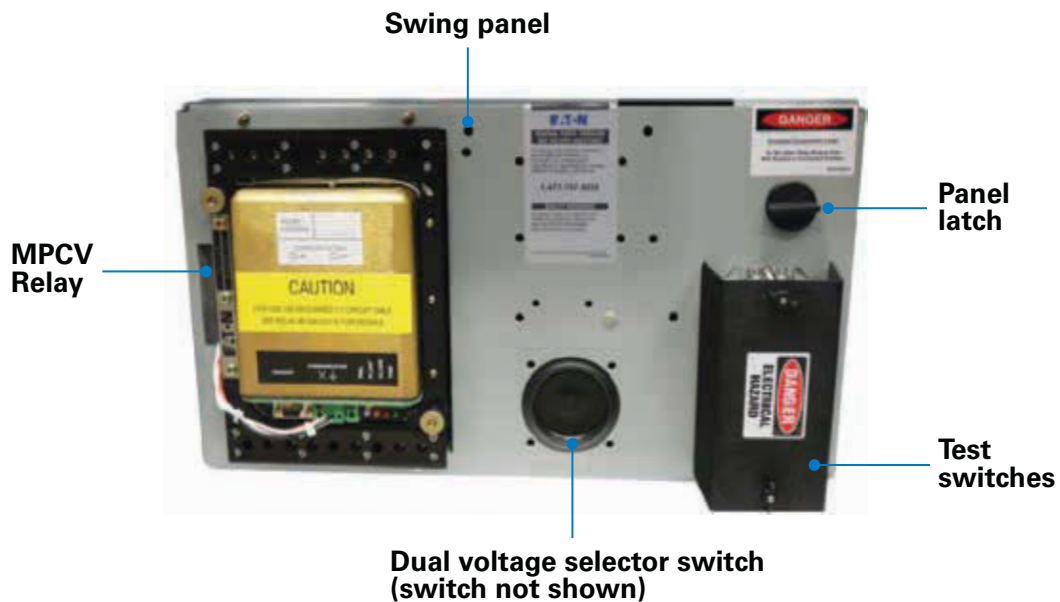


Figure 5. CM52 Relay module
External 277/480V Relay assembly with ARMS shown

MPCV Relay

The MPCV network relay brings the proven performance of a sequence-based microprocessor design in order to give your network protectors in service the most intelligent relay available in the market. Designed for safety, communications, and ease of use. Each MPCV relay is enclosed in a solid brass casted .25" submersible enclosure. LEDs on the front of the relay alert the user if the relay senses adverse or problematic conditions. The operator can use a handheld pendant to directly program the MPCV or a wide range of optional accessories (RAD, VaultGard, DNPMint).

The advantages of the MPCV are:

- Gull wing trip curve- built in 5 degree shift in trip curve for high X/R transformers
- Anti-Pump protection algorithm- reduces pumping on network protectors per your setpoints
- Sensitive and Non-Sensitive trip setpoints
- Built-in time delay function
- Circular close option permits close at lower loads while assuring the watt flow is into the network
- Remote operation & control
- Remote open block open command- trips and blocks Network protector Open under wired or wireless communications
- Protective remote closing command- Advanced safety algorithm insures a positive close without sacrificing safety
- Advanced safety algorithms insure that the MPCV always call for a trip under adverse system conditions

Access and display information from the MPCV such as:

- Voltages
- Currents
- Power factor
- Status
- Temperature
- Phasing voltage
- Positive sequence phase voltage (complex form)
- Operations counter
- Watts
- VARs
- Phasing angle



Figure 6. Eaton MPCV Network relay

Table 1. General specifications

Electrical features

Maximum design voltage (V)(1)	600	600	600	600	600	600	600	600	600	600
Impulse withstand voltage (kV BIL)	10	10	10	10	10	10	10	10	10	10
Maximum continuous current ratings, (50/60Hz) (A)(2)	800	1200	1600/1875	2000	2250	2500/2825	3000	3500	4500	6200(3)
Load break current, (50/60Hz) (A)	800	1200	1600/1875	2000	2250	2500/2825	3000	3500	4500	6200(3)
IEEE/ANSI Suggested matching transformer rating for 216V/125V (kVA)	225	300	500	500	500	750	1000	1000	1000	Rating not defined
IEEE/ANSI Suggested matching transformer rating for 480V/277V (kVA)	500	750	1000	1000	1000	1500	2000	2000	2500	Rating not defined

IEEE/ANSI Sym Interrupting Rating Requirements, (kA)	30	30	30	35	60	60	60	60	60	Product not defined
CM52 Sym interrupting rating, (kA) (5)	42	42	42	42	65	65	65	85	85	85
CM52 Withstand rating (1s), (kA)	42	42	42	42	65	65	65	85	85	85

IEEE/ANSI Sym fault close and latch rating, (kA)	25	25	25	35	40	40	40	40	40	Product not defined
CM52 Sym fault close and latch rating, (kA) (4) (5)	35	35	35	35	45	45	45	65	65	65

Mechanical features

Mechanical operations	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Breaker element poles	3	3	3	3	4	4	4	6	6	6
Breaker element weight (lbs.)	170	170	170	170	185	185	185	350	350	350
Traditional breaker element approx. weight (lbs.)	400	400	400	400	550-650	550-650	550-650	700-1300	700-1300	700-1300
Breaker element width (inches / mm)	17.00 / 431.8	17.00 / 431.8	17.00 / 431.8	17.00 / 431.8	17.00 / 431.8	22.00 / 558.8	22.00 / 558.8	35.00 / 889.0	35.00 / 889.0	35.00 / 889.0

Note: *Ratings apply to submersible and open frame style enclosures

1. CM52 should be specified for 216V, 480V, or 600V use (dual voltage operation available)
2. Protectors sized in accordance with network transformer MVA ratings. Overload safety margins are already included in current ratings.
3. 6200A available in a open frame style only
4. Close and latch ratings apply only to spring close and stored energy mechanisms. The CM22 does not have a close and latch rating.
5. Exceeds IEEE (ANSI) standards.

Table 2. MPCV Relay guide

Catalog #	Description	Typical product application	CT Configuration
6417C82G01	MPCV-D	CM52 & CMD	GRD-Y
6417C83G01	MPCV-22	CM52, CM22, CMR8	Energized*
6417C83G03	MPCV-2X	CM52, CM22, CMR8	GRD-Y
6417C84G01	MPCV-GE	MG8-9 & MG14	Closed loop
NAS0129G01	MPCV-P	MV NWP	Customer specifications

Note: CT's in network protector can be converted to GRD-Y configuration in order to accept MPCV-2X

Accessories

VisoBlocks secondary disconnects

The VisoBlock was designed with total isolation and safety in mind. Crews are never exposed at any time to live components and never have to use tools to disconnect a live link.

The conductors are completely isolated and self-contained within the confines of a special thermoset resin mold. Additionally, crews will never have to worry about inadvertent connection when a user is upstream because the connection rod is completely removable, the rods can be stored away and padlocked until the feeder is scheduled to be put back into service.

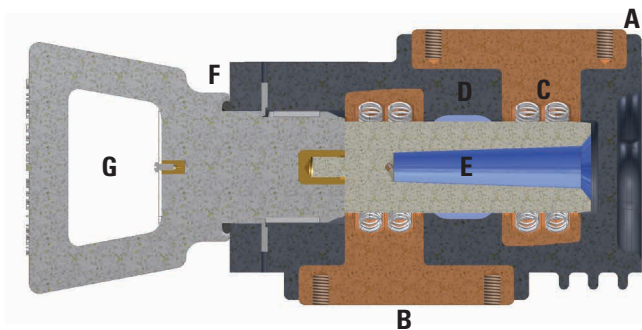
The design is non-load break, which means the network protector must be in the OPEN state before the connection rod can be withdrawn. The conversion kit comes with a Kirk-Key interlock kit that can be quickly placed on the associated network protector, regardless of type or vintage.

This insures the correct procedure is followed by forcing the user to place the handle of the network protector in the OPEN position. Only after this action, can the user gain access to the keys to unlock the disconnect rods for withdrawal. Each VisoBlock also has provisions for users to install a utility approved padlock.

VisoBlock packages include VisoBlock low profile disconnects, safety end caps for when rods are removed, network protector mounting adapters, molded insulated boots to cover adapters, and Kirk-Key interlock package for the network protector. See Eaton VisoBlock Catalog BR024002EN for additional information.

Design highlights

- Disconnect does not require the handling of energized components for isolation
- Completely self-contained with no exposure to live parts
- No tools or hook sticks required
- One model for amp ratings up to 3500A
- Visible break window for isolation or connection verification
- Submersible IP68 Rating
- Adapters available to fit any protector regardless of vintage or type
- Insulation boots for total isolation protection
- Kirk-Key Interlocked to insure that the protector is in the OPEN position before disconnected is removed
- Padlock provisions included
- Can be separately mounted using vault wall bracket
- Low height profile
- Testing probes available that have the ability to safely pull transformer and network voltages to a test set



Design features

- A** Network side always energized rear connection (spade or stud) can be bolted in place.
- B** Network protector connection pad (adapters are used to fit any network protector)
- C** High thermal helical connection contacts @ 100+% IACS
- D** Visual break window
- E** Copper connection rod
- F** Heavy duty O-Ring handle seal
- G** Fully insulated pull handle

Table 01. General specifications

Feature	Rating
Maximum design voltage (V)	600
Continuous current, 50/60 Hz (A)	3500
1s sym withstand rating (kA)	60
Momentary withstand, asym pk. (kA)	138
Submersible rating	IP68



ARMS (Arcflash reduction maintenance system)

The ARMS unit is included as part of the CM52 network protector Indicating Diagnostic Module (IDM) when specified. A CM52 network protector equipped with ARMS can improve safety by providing a simple and reliable method to reduce fault clearing time. The ARMS unit uses a separate analog trip circuit that provides faster interruption times than the standard (digital) “instantaneous” protection. Work locations downstream of the network protector with ARMS engaged can have a significantly lower incident energy level.

The ARMS is capable of detecting a fault in 4ms with a total clear time of 1.8 to 2.4 cycles which is only achievable using the CM52 network protector high-speed breaker element. The ARMS cannot be installed on other or legacy network protectors due to the slower mechanical interrupting time.

Network crews can experience many benefits from using the ARMS unit as part of their standard work and operating procedures:

- Increased worker safety – enabled prior to work, the ARMS unit provides an accelerated instantaneous trip to reduce arc flash
- No power required for fault detection or operation, utilizes energy harvesting technology to derive power generated from fault conditions to actuate the trip functions
- The ARMS unit is non-directional, activates based on forward or reverse power flow
- The unit is preset to 2.5x the CT current rating and does not interfere with normal MPCV relay functions.
- The ARMS comes prewired to the network protector and does not require interconnection with any other devices, it is fully functioning when other protectors on the network are equipped with ARMS.
- ARMS has been proven to reduce the incident energy levels to less 8cal/cm²
- Seamless integration with any standard communications systems for activation and monitoring



Figure 7. Indicating diagnostic module equipped with ARMS

ARMS graphs

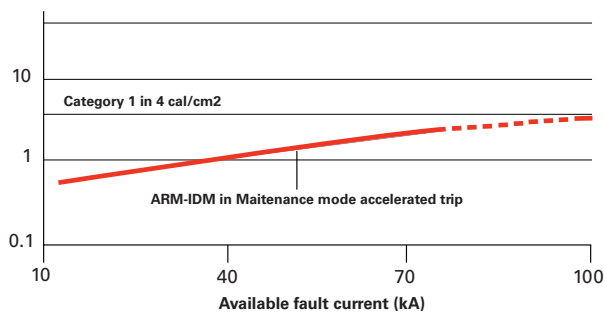
NFPA 70E

Hazard risk category	Clothing description (Typical number of clothing layers in parentheses)	Required minimum Arc rating PPE*
0	Non-melting, flammable materials (i.e. untreated cotton, wool, rayon, silk, or blends of these materials) with a fabric weight of at least 4.5 oz/yd. (1)	N/A
1	FR Shirt and FR pants or FR coverall (1)	4
2	Cotton underwear, conventional short sleeve and briefs/shorts plus FR Shirt and FR pants (1 or 2)	8
3	Cotton underwear plus FR Shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	25
4	Cotton underwear plus FR Shirt and FR pants with full multi-layer flash suit (3 or more)	40

Typical 480v spot network

*(cal/cm²)

CM52 using the ARM-IDM with 2.5 x CT rating



Rem-Rack (Remote racking device)

The CM52 network protector remote racking device provides a means of remotely connecting and disconnecting a network protector from the energized buswork while the door of the network protector remains bolted shut to help mitigate any chance of arc flash exposure. The best way to limit exposure during the process of racking out or in is to put more distance between the operator and the possible point of exposure.

The Eaton network protector remote racking solution is integral to the breaker element and allows operation while the network protector door remains closed.

Features:

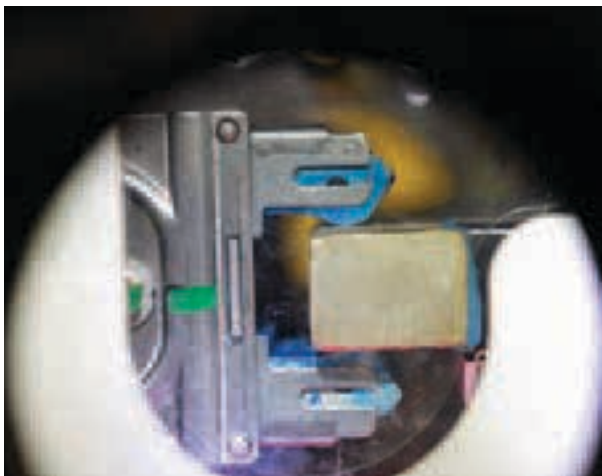
- Integral to breaker element
- No micro-switches or position sensors
- Mechanical safety interlock prevents lifting manual crank shutter while breaker is closed
- Non-volatile memory
- Auto-learn configuration
- Front LEDs for position feedback
- Remote external contacts for position feedback through communications
- Advanced jam detection algorithm
- True visible break (physical contact status)
- Internally powered from network bus
- Device only powered when handle is in the OPEN position
- True visible break indication by the CM52's visual break windows

Benefits:

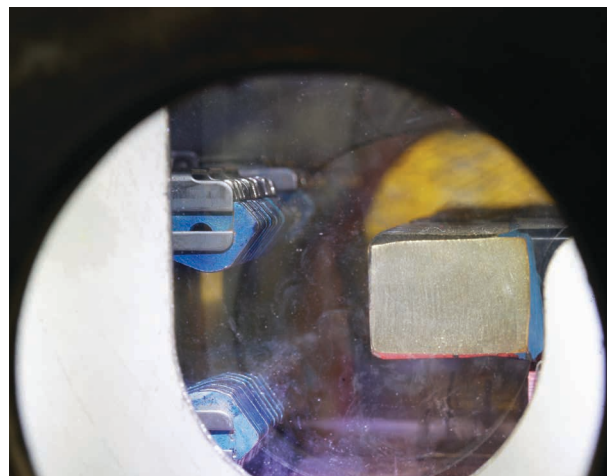
- Device gets operator outside the arc flash boundary
- Racking/operation of breakers can be done without having to wear cumbersome or restrictive PPE apparel
- Allows for manual crank out or in racking
- Can be retrofitted into any existing CM52 network protector network protectors
- Can be controlled by hand-held pendant, remote access device (RAD), control box mounted in vault, or remote communications using the VaultGard communication platform



Figure 8. Rem-Rack device



Visual break windows used on CM52, with or without Rem-rack accessory



Rem-rack visible break OPEN

Stacklight

The submersible Stacklight is an optional visual indication device. It provides operators with a quick and easy verification of the network protector state. It features 5 LED indicating lights, and connects to each protector via the bulkhead connection box. It is available with a PVC or stainless steel mast and is retrofittable to any network protector with a bulkhead connection box.

Indicating Lights represent the following:

- Flashing Blue - ARMS activated
- Green – Network protector open
- Red – Network protector closed
- Yellow - Breaker element Racked-out and in Test position
- White - Breaker element opened, Racked-in and in connect position

See Stacklight brochure PA024007EN for more details.

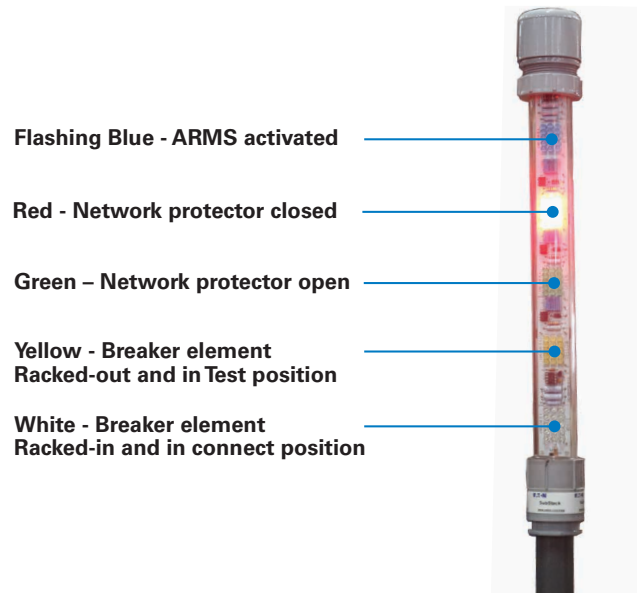


Figure 9. Submersible stacklight

TripSafe

TripSafe is designed to work with any MPCV Relay controlled network protector regardless of model or vintage. TripSafe provides enhanced transformer and network bus surge protection in addition to its ability to detect an unpowered MPCV relay.

TripSafe has an output TRIP contact that can be paralleled with the network breaker trip contact to provide a backup trip mechanism for when bus voltages are sensed to be present and the MPCV is unpowered. It is engineered with appropriate algorithms to insure that noise or other disturbances will not cause nuisance tripping.

The TripSafe device has 4 dry contact outputs as described below:

TRIP: Can be wired in parallel with the network breaker contact to trip the network protector in the event that the MPCV Relay is unpowered.

CLOSE: For GE-type protectors. This contact provision should be wired in series with the GE close circuit to prohibit dead network re-closure if TripSafe initiates a protector trip.

STATUS: Monitors the status of the TripSafe and can be wired to a local indicator and/or a communications system as an alarm for when a trip is initiated.

PROTECT: The TripSafe is designed to issue a contact closure if any of the surge protection circuitry is jeopardized, this contact can be used to signal a remote alarm via communications which increases the reliability and observability of your network.

See TripSafe brochure PA02400046E for more details.



Figure 10. TripSafe

Bulkhead connection box

The bulkhead connection box provides a means of feeding cable/wiring in and out of the submersible network protector tank while maintaining submergibility. The box features up to 16 wire connections to the network protector. This allows the user to easily connect the MPCV relay to communications, as well as incorporate external alarms with the Network protector.

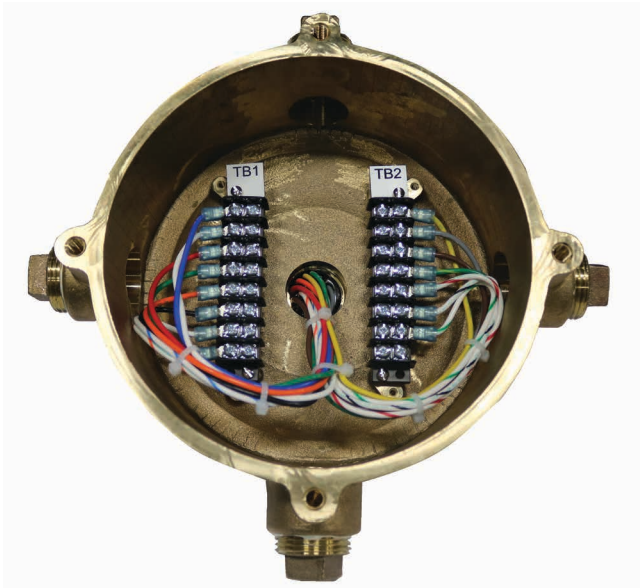
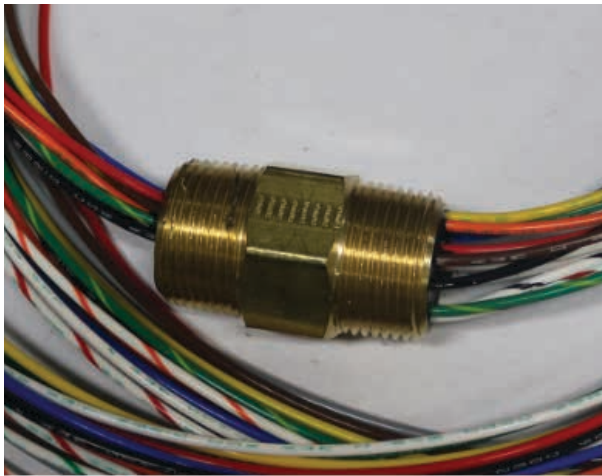


Figure 11. Bulkhead connection box



Submersible feed through 1.0" NPT coupling used with bulkhead in Figure 11.

Remote operating options

Remote operation of the network protector can be accomplished through SCADA using the VaultGard, locally using an HMI, locally using the Eaton Remote Access Device (RAD) or via a removable hand-held pendant cabled to the network protector.

The pendant provides OPEN and CLOSE control of the network protector and options are available that can be used to remotely rack out/in the breaker element and turn ARMS on/off for units equipped with these features.

Users equipped with the VaultGard network communications system can access built-in webpages via SCADA via DNP 3.0 to gather real-time data, employ remote operation, remote-open-block-open (ROBO), and ARMS control. These features are also easily accessible locally via the Eaton network HMI screen. The HMI screen brings control of the network protector to your fingertips. HMI enclosures can be located anywhere to provide safe operation and visibility into the network system.

Users without communication or users seeking advanced next generation control can use the Eaton Remote Access Device (RAD) to have instant access to real-time data and control via a secure WIFI connection to a utility approved smart device.

For more information on VaultGard see SA02400004E

For more information on the network HMI see PA024005EN

For more information on the Remote Access Device (RAD) see PA024008EN.



Figure 12. Pendant



Figure 13. Remote access device (RAD)



Figure 14. VaultGard



Figure 15. HMI

Network protector pressure sensor

The network protector Pressure Sensor monitors the pressure inside of the Network protector tank, and features a normally closed circuit to alarm the system if there is a drop in pressure within an enclosed tank.



Figure 16. Pressure sensor

Network protector moisture sensor

The network protector Moisture Sensor is mounted at the bottom of the network protector tank, and monitors for the presence of any moisture within the tank. It features a NO alarm contact which can be seen through communications via the DIM, NP SERVE, or through one of the MPCV's 3 spare Aux Inputs.



Figure 17. Moisture sensor

Network protector water float switch

Rugged float switch inside of a debris-resistant housing. This float switch alarm can be used in conjunction with any digital input module to sense the presence of liquid up to a certain level inside the network protector.



Figure 18. Water float switch

Communications and SCADA

The CM52 network protector is designed to seamlessly integrate with Eaton's uniquely designed network communications system. These products allow users to access real time data, monitor equipment status, and control.

VaultGard communication gateway module

VaultGard brings a wealth of information from the utility vault to the fingertips of utility personnel in a user-friendly web interface or into existing SCADA. Information contained in VaultGard can be trended and analyzed different ways to determine predictive maintenance schedule. Up to 32 network protectors can be interconnected on a single VaultGard. Protectors can be opened and safety features activated remotely, mitigating potential danger to the operator before they enter the vault.

See VaultGard Brochure SA02400004E for additional details.



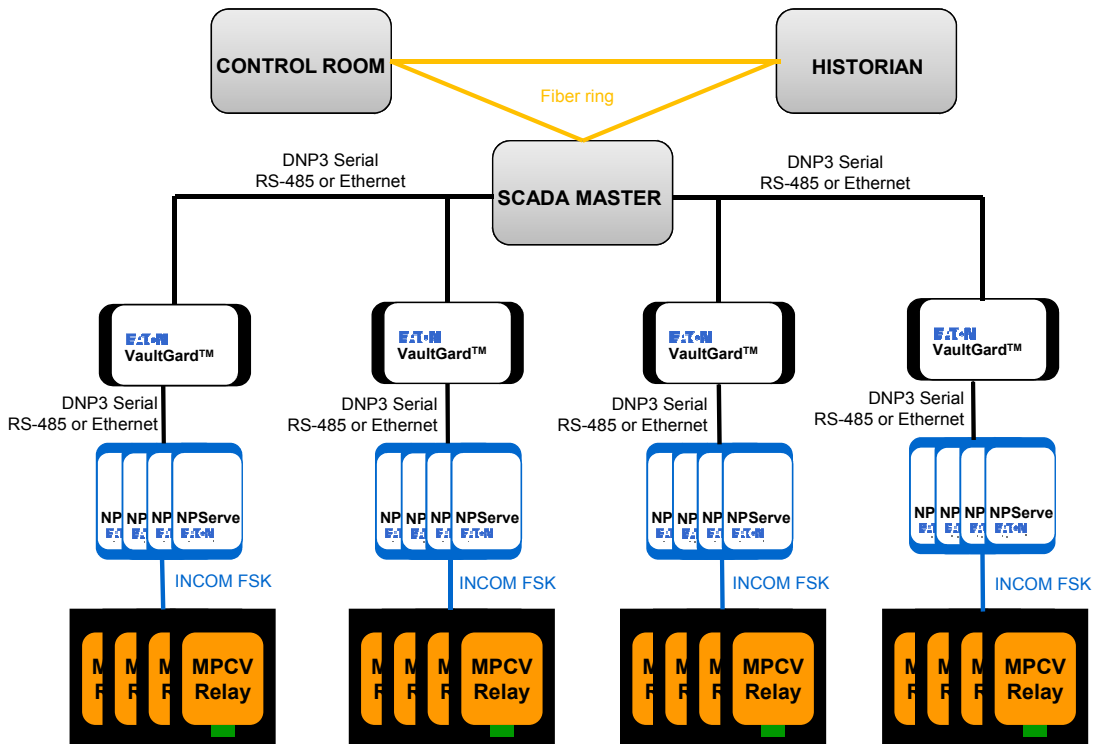
NPServe – Analog and digital input control module

NPServe is a 1:1 data gathering device (1 NPServe per 1 network protector/transformer). The NPServe has the ability of communicating gathered data via both DNP and INCOM for control of all connected devices on a built-in web page. When used for collecting vault and equipment data it can also be used to communicate with the CM52 network protector for a single point of concentrated data that can be taken back to the VaultGard.

It has the following features:

- 6 Analog Inputs
- 8 Digital Inputs
- (2) 120VAC dry contact control relays
- 240VAC dry contact control relays

See NPServe Brochure PA024002EN for additional details.



HTES - High thermal event system

The HTES is designed for plug and play installation that offers immediate high thermal monitoring that can be used with almost any digital sensor. In the event of a vault fire, Eaton’s High Thermal Event System (HTES) minimizes damage by drawing inputs from various heat sensors in the vault and using the data to trip and isolate up to (6) six network protectors, high-side switches, transformers involved in the thermal event.

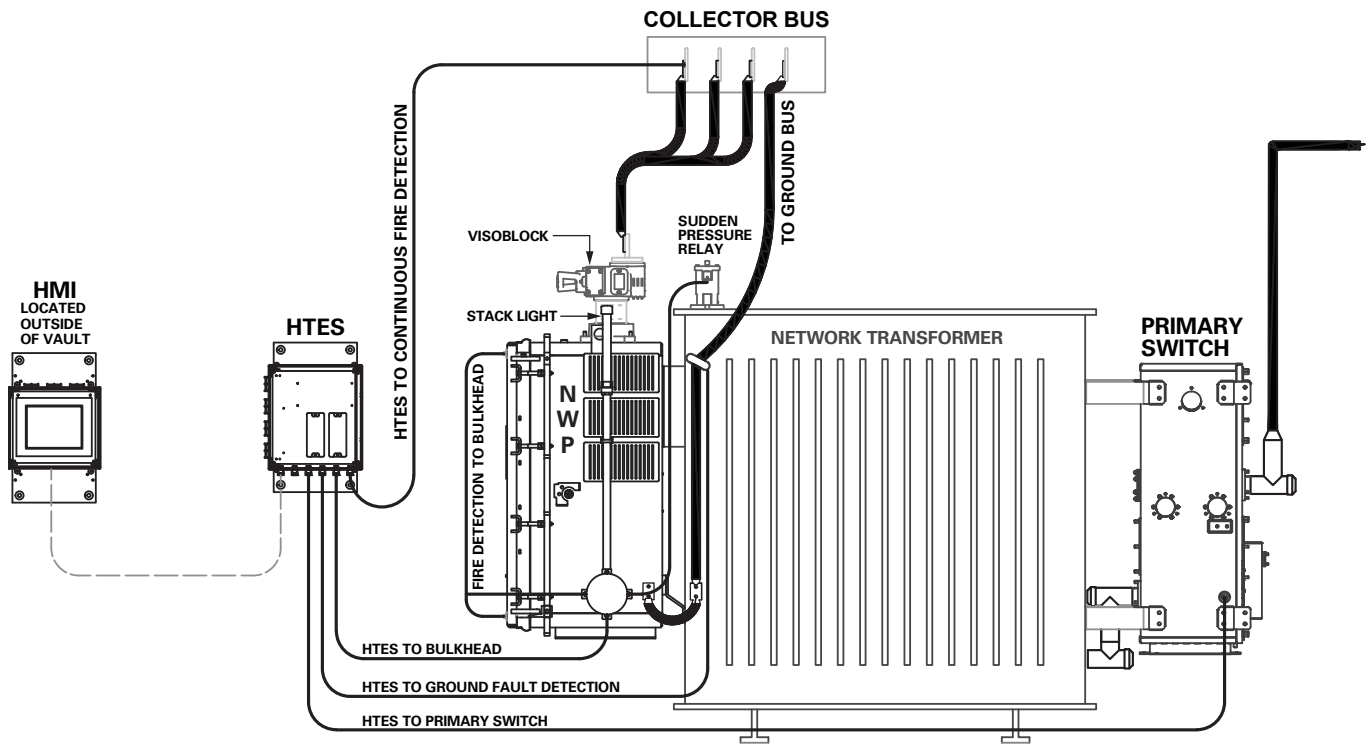
The HTES system seamlessly integrates with the CM52 network protector network protector and Eaton’s VisoVac medium-voltage three-position fault interrupter. Equipment can be controlled locally with the use of HMI and remotely through VaultGard via DNP3.0.

Controllable functions include:

HTES:

- Enable/Disable system alarm test
- Binary Output 1,2,3,4,5,6 (User Defined)
- Enable/Disable/Reset CFD Alarm
- Enable/Disable/Reset GND Alarm
- Reset Sudden Pressure alarm (at each transformer).
- Reset Thermal Sensor alarm (at each protector)
- Open/Close/Reset MVI-1,MVI-2, MVI-3, MVI-4, MVI-5, MVI-6
- Set/Clear Block Open NP-1, NP-2, NP-3, NP-4, NP-5, NP-6
- Enable/Disable HTES

See High Thermal Event System catalog CA024001EN for more details.



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Printed in USA
Publication No. CA024006EN /
CSSC-1805-5554
May 2019

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