



# Cooper Bussmann Transportation Products



Eaton and Cooper united.  
**Energizing a world  
that demands more.**

Discover today's Eaton.

### Powering business worldwide

As a global diversified power management company, we help customers worldwide manage the power needed for buildings, aircraft, trucks, cars, machinery and businesses.

Eaton's innovative technologies help customers manage electrical, hydraulic and mechanical power more reliably, efficiently, safely and sustainably.



*Powering Business Worldwide*





## We deliver:

- **Electrical solutions** that use less energy, improve power reliability and make the places we live and work safer and more comfortable
- **Hydraulic and electrical solutions** that enable machines to deliver more productivity without wasting power
- **Aerospace solutions** that make aircraft lighter, safer and less costly to operate, and help airports operate more efficiently
- **Vehicle drivetrain and powertrain solutions** that deliver more power to cars, trucks and buses, while reducing fuel consumption and emissions

We provide integrated solutions that help make energy, in all its forms, more practical and accessible.

With 2012 sales of \$16.3 billion, Eaton has approximately 103,000 employees around the world and sells products in more than 175 countries.



## Eaton's electrical business

### Eaton is a global leader with expertise in:

- Power distribution and circuit protection
- Backup power protection
- Solutions for harsh and hazardous environments
- Lighting and security
- Structural solutions and wiring devices
- Control and automation
- Engineering services

Eaton is positioned through its global solutions to answer today's most critical electrical power management challenges. With 100 years of electrical experience behind us, we're energized by the challenge of powering up a world that demands twice as much energy as today. We're anticipating needs, engineering products, and creating solutions to energize our markets today and in the future.

We are dedicated to ensuring that reliable, efficient and safe power is available when it's needed most.

[Eaton.com](http://Eaton.com)

# Table of Contents



## Introduction to Cooper Bussmann Transportation Products 5

## Conversion, Conditioning, Distribution, Management & Controls 6

Converters/Equalizers.....	8
Trail Charger.....	10
DC Current Sensor.....	11
Separators/Interconnects.....	12
Multi-Battery Isolators.....	14
Multi-Battery Isolator Application Guide.....	16
Power Management.....	18
Solid State Flashers.....	20
Daytime Running Light Controls.....	22

## Power Distribution 24

Multiplexed Vehicle Electrical Centers .....	26
Severe Service Dual Vehicle Electrical Center.....	28
Severe Service Vehicle Electrical Center.....	30
Series 32000 Vehicle Electrical Center.....	32
Series 31000 Vehicle Electrical Center.....	34
Vehicle Electrical Center Connectors.....	36
VEC Electrical Components.....	37
Series 15400 RFRM Rear-fed Fuse & Relay Module.....	38
Series 15310 60-Position RTMR.....	39
Series 15300 RTMR.....	41
Series LMG Bolt-in Fuse Holder for Multiple AMG Fuses.....	43
Series LMI Bolt-in Fuse Holder for Single or Multiple AMI Fuses.....	44
Series 15710 Rear Terminal ATC Fuse Panel.....	46
Series 15600 ATC Blade Type Fuse Panels.....	47
Series 37700 PRM/PFM.....	48

HMG Fuseholder.....	50
FMG Fuseholder.....	51
CFH-XXX Connector Fuse Holder.....	52
Inline Fuse Holders.....	53
GB3000-XX: Pass-Thru Distribution Block.....	54
Single Stud Type Junction Blocks.....	55
Multiple Stud Type Junction Blocks.....	56
Power Distribution Notes.....	57

## Circuit Protection 58

Basic Overcurrent Technology .....	58
easyID™ Illuminating Blade Fuses & Fuse Holders.....	60
MINI Blade Fuses.....	62
Series 21X Mini Circuit Breakers.....	63
ATC® Blade Fuses.....	64
Series 22X Circuit Breakers.....	65
Series 227 ATC Circuit Breakers (low profile).....	66
MAXI® Blade Fuses.....	67
Series 19X MAXI Circuit Breakers.....	68
Series 3200 Insertion/Extraction Tool.....	69
Series 12X Shortstop Circuit Breakers.....	70
Series 25X Mid-range Circuit Breaker.....	71
Series 18X Hi-Amp Circuit Breaker.....	72
Series 187 Marine Rated Circuit Breaker (MRCB).....	73
AMI Series.....	74
AMG Series.....	75
Marine Rated Battery Fuse.....	76
Series 15250 Battery Disconnect Switch.....	78
Circuit Protection Notes.....	79

Cooper Bussmann circuit protection solutions comply with major industrial standards and agency requirements such as: BS, IEC, DIN, UL, NEMA, SAE, CSA, CE, C-UL, etc. and are manufactured at facilities that are ISO 9000 certified. This catalog is intended to present product data and provide technical information that will help the end user with design application. Cooper Bussmann reserves the right, without notice, to change design or construction of any products and to discontinue or limit distribution of any products. Cooper Bussmann also reserves the right to change or update, without notice, any technical information contained in this catalog. Once a product has been selected, it should be tested by the user in all possible applications. Further, Cooper Bussmann takes no responsibility for errors or omissions contained in this catalog, or for misapplication of any Cooper Bussmann product. Extensive product information is available in the Cooper Bussmann product data sheets available online at [www.cooperbussmann.com](http://www.cooperbussmann.com).

## Your Trusted Partner For Electrical Power Chain Safety, Efficiency, Reliability and Control

### In a worldwide transportation marketplace Cooper Bussmann is your leading source for safe and reliable electrical power and machine control solutions

We're experts on the effects of cold and heat, vibration, high moisture, harsh chemicals and transient power fluctuations. We know vehicle power and control systems from the smallest to largest platforms, and will partner with you to develop reliable products and systems.

With combined industry history and experience reaching back more than 90 years, the engineering strength and proven track record of the Cooper Bussmann®, Sure Power and OMNEX Control Systems brands provide you the ability to accelerate product development in "smart" systems and create innovative, industry-leading solutions. These solutions range from straightforward products from our catalog all the way to next generation systems that will create efficiencies not yet realized.

### The Cooper Bussmann mission is to respond completely and uniquely to OEM requirements for vehicle electronic products and control solutions that require cost reduction and customization

We are committed to continuous new product development and offer you a competitive advantage through partnership R&D expertise and a technology portfolio that minimizes excessive tooling and time required to produce OEM-specific solutions.

Cooper Bussmann, a division of Cooper Industries, has a global manufacturing footprint. Our facilities are ISO 9000-2001 and TS16949 certified to meet the highest quality and environmental standards.





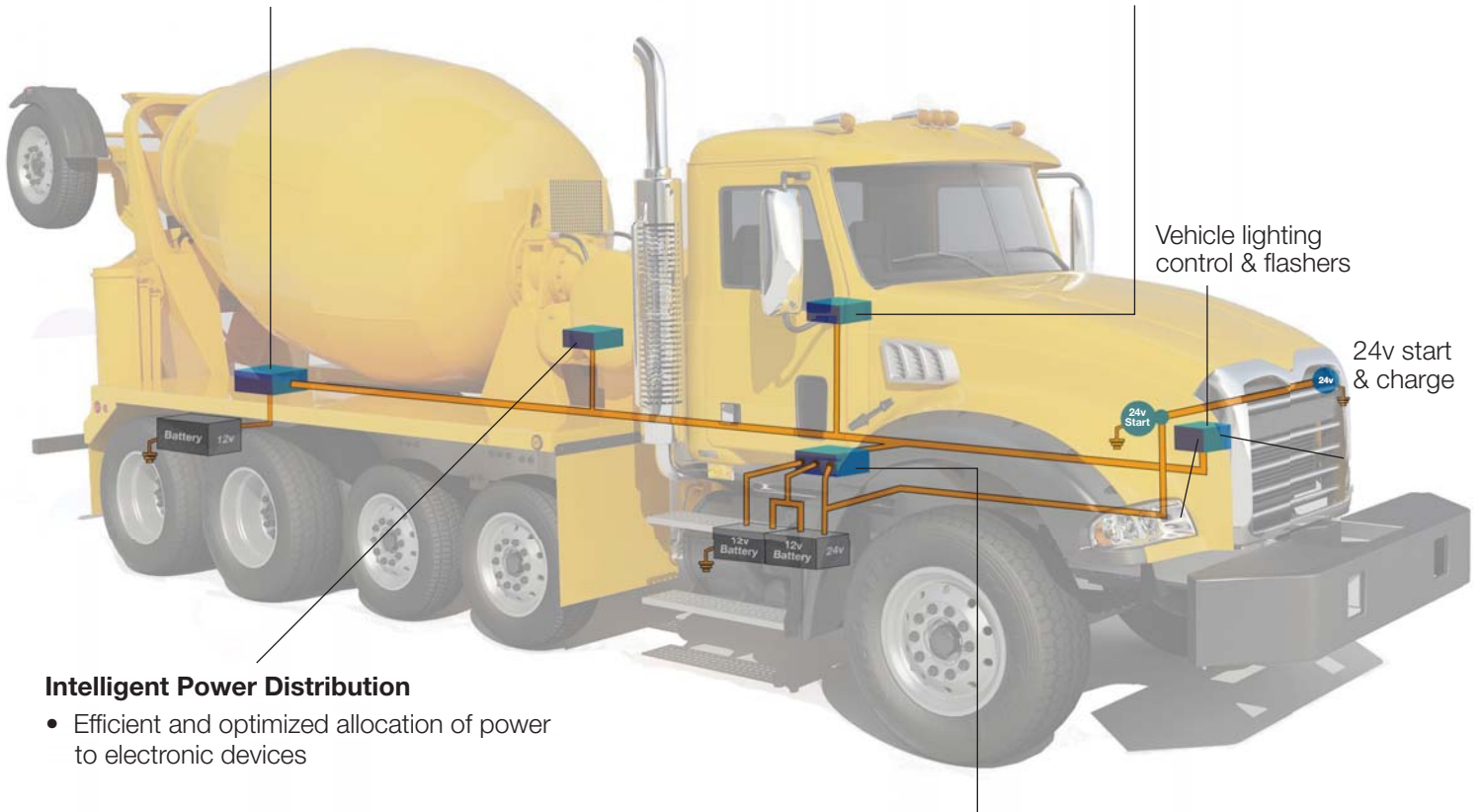
## Off-the-shelf and custom-designed solid-state products for power conditioning, distribution, conversion and management, and control of on-vehicle electrical systems

### Smart Remote Battery Charging/Isolation

- More efficient and reliable than mechanical or solenoid systems

### Low Voltage Disconnection

- Intelligent power management and battery rundown protection



### Intelligent Power Distribution

- Efficient and optimized allocation of power to electronic devices

### Battery Equalization & DC-DC Voltage Conversion

- Maintain a balanced battery system by prioritizing multi-voltage charging

CAN (J1939)  
interfaces

**Power Conversion / Power Management Page**

Converters/Equalizers.....8

Trail Charger.....10

DC Current Sensor..... 11

Separators/Interconnects.....12

Multi-Battery Isolators.....14

Multi-Battery Isolator Application Guide..... 16

Power Management..... 18

Solid-State Flashers.....20

Daytime Running Light Controls..... 22



**Broad Range of Isolator Current Capacities**

- 25A through 350A

**Wide Converter Input Voltage Range**

- 9Vdc to 96Vdc negative ground

**Low Voltage Disconnect**

- Ranging from 9Vdc to 25Vdc

**Versatile Battery Separators**

- Work with any type of 12Vdc or 24Vdc negative ground charging system, 300A or less

**Other Accessories**

- Solid state flashers (12Vdc and 24Vdc)
- Daytime running lights (CMVSS-108, CAN/CSA=D603-88, Type 2; FMVSS-108)

**EMI/EMC Profiling**

- SAE, ISO, E mark, CE and Military Standards

**Solid-State Power Switching & Distribution**

- Up to 300A



## Design Features

- Low standby current drain - typically 5mA or less
- -40°C to +85°C operating temperature at full current-derated at higher temperatures
- Thermally protected for over temperature conditions
- Short-circuit and overcurrent protected
- Reverse polarity protected
- Overvoltage/low voltage protected
- Stand off up to 100Vdc
- RoHS compliant units available with select Converters and Equalizers
- Loss of ground protected
- EMI/EMC Compliance - Models designed to meet specific customer, SAE, ISO, E mark, CE or military standards
- Operating input voltage range from 9V-96Vdc negative ground
- Shock and vibration resistant
- Environmentally sealed (IP67 equivalent) models available
- Typical efficiency of 94%
- Units can be paralleled for greater output capacity



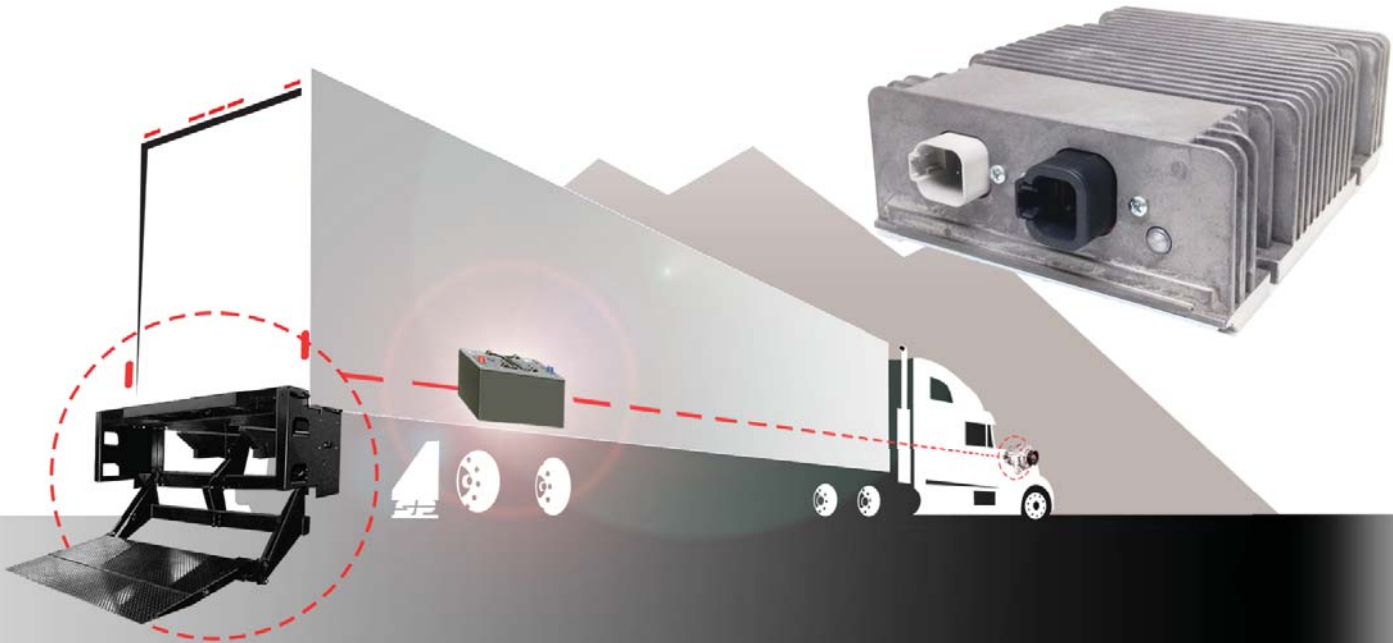
## Pure Reliable Power

**Sure Power Industries offers an expanded line of DC-DC Converters and Battery Equalizers from low to high output current capabilities (5 amps to 100 amps). Sure Power is setting the pace when it comes to the growing demands for dual voltage applications**

The Sure Power Battery Equalizer maintains battery balance or “equalization” in a predominantly 24V system that requires 12V power. The Sure Power Battery Equalizer can deliver up to 100 amps of continuous 12V current for practically any 12V load ranging from fare boxes, destination boards, two way radios, and transmission controls, to engine controls and lighting. Sure Power DC-DC Converters continue to provide regulated power directly to accessory or main loads. Sure Power offers DC-DC Converters producing up to 40 amps at 24V from a 12V source and up to 100 amps at 12V from a 24V source. Sure Power offers a wide variety of features and multiple levels of protection.

MODEL	VOLTAGE INPUT	VOLTAGE OUTPUT	OUTPUT CURRENT	FUNCTION	DESIGN FEATURES
12010X00	12	24	10	Converter/Equalizer	Switched Output
12025X00	12	24	25	Converter/Equalizer	Switched Output/Available Offset Output
12040X10	12	24	40	Converter/Equalizer	Switched Output w/ Offset Output
12055C0	12	24	55	Converter	12V or 24V Selectable Input
21005C10	24	12	5	Converter	IP 67, RoHS, Switched & Unswitched Output
21010C10	24	12	7.5	Converter	IP 67, RoHS, Switched & Unswitched Output
21012C10	24	12	12	Converter	IP 67, RoHS, Switched & Unswitched Output
21015C10	24	12	15	Converter	IP 67, RoHS, Switched & Unswitched Output
21020C10	24	12	20	Converter	IP 67, RoHS, Switched & Unswitched Output
21030X10	24	12	30	Converter/Equalizer	IP 67, Switched & Unswitched Output
52X04	24	12	40	Converter/Equalizer	High Current Converter/Equalizer
21060X00	24	12	60	Converter/Equalizer	IP 67, High Current Converter/Equalizer
21080X00	24	12	80	Converter/Equalizer	IP 67, High Current Converter/Equalizer
21100X00	24	12	100	Converter/Equalizer	IP 67, High Current Converter/Equalizer
11020C11	9-14	14	20	Voltage Conditioner/Trail Charger	IP 67, Temperature Compensated
11020CL1	9-14	14	20	Trail Charger	Lockouts, IP 67, Temperature Compensated
11050C00	9-14	14	50	Trail Charger	Temperature Compensated
41020C10	28-70	113.5	20	Converter	IP 67, Switched Output/Unswitched 12V Output
71030i	57-124	13.5	30	Converter	Isolated Output/Unswitched 12V Output

## Do the Math, Give Yourself a Lift



## About the Trail Charger

The Sure Power Trail Charger allows the operator to charge a remote battery bank at a regulated 14V. This approach eliminates voltage loss due to long wire lengths. The Trail Charger is designed to provide a regulated 14Vdc at a full 20 AMP or 50 AMP charging rate. The Trail Charger charges the lift gate batteries at the voltage they need in order to take a charge, working to keep the batteries in a charged state ready for your next lift. The Trail Charger also eliminates or reduces the need for additional cables (except for 11050C00 or if dual pole cable is required for application).

### Introduction to the Trail Charger

All three models of the Sure Power Trail Charger act like a voltage amplifier, similar to how a stereo amplifier increases sound output, a Trail Charger amplifies voltage. Think of it as a booster that compensates for the voltage drop in the wiring to the lift gate batteries. With the Model 11020C11, 11020CL1 and 11050C00, the level of amplification depends on the outside temperature. Batteries require higher voltage at lower temperatures. The Trail Charger automatically raises and lowers the voltage to optimize the charge to the auxiliary battery bank.

Model	11020C11 11020CL1	11050C00
Amps output	20A	50A
Lift Gate Motor Draw	175A	175A
Seconds of Lift Run Time	25 Seconds	25 Seconds
Amp Hours Used	1.2A/Hours	1.2A/Hours
Lift During Daily Operations	100	100
Total Amp/Hours used During Day	120A/Hours	120A/Hours
Total Run Time Required to fully charge the battery(s)	8 Hours	3 Hours
Voltage Regulation	Temp. Compensated	Temp. Compensated
IP67 Sealed	YES	NO

### Trail Charger with Lock Outs

The model 11020CL1 monitors the brake light signal and turns the trail charger off when the brakes are activated. The model 11020CL1 can also monitor the trailer dome lamps and when the dome lamps are on the Trail Charger, reduces the maximum output current to 10 amps.

## Current Events



## About the DC Current Sensor

The Sure Power DCCS DC Current Sensors are a family of devices used to measure the current flow in a wire.

The DCCS50 and DCCS100 models provide differential outputs intended to be directly connected to an analog meter movement. The DCCS45 models provide single-ended outputs intended to be used with electronic instrumentation. All models measure bi-polar currents.

### Theory of Operation

The Current Sensor is based on a Hall-effect sensor IC. This sensor measures changes in the magnetic field created by current flow in the wire passing through the aperture. This non-contact measurement eliminates isolation and thermal issues that exist when using conventional resistive sensors.

MODEL	CURRENT RANGE	SENSOR OUTPUT
<b>DCCS50-100</b>	± 100 Amps	± 50 mV
<b>DCCS50-200</b>	± 200 Amps	± 50 mV
<b>DCCS50-300</b>	± 300 Amps	± 50 mV
<b>DCCS100-100</b>	± 100 Amps	± 100 mV
<b>DCCS100-200</b>	± 200 Amps	± 100 mV
<b>DCCS100-300</b>	± 300 Amps	± 100 mV
<b>DCCS45-200</b>	± 200 Amps	0.5 to 4.5V
<b>DCCS45-300</b>	± 300 Amps	0.5 to 4.5V



# Separators/Interconnects



## Features

### Simple Installation

Connects to primary battery, auxiliary battery and ground. Absolutely no system modifications are necessary. Models 1314/1315 work with any type of 12V negative ground charging system 100 amps or less. 310X models work with negative ground 12V or 24V charging systems up to 300Amps.

### Multiple Battery Charging

The Battery Separator allows multiple batteries to be charged from one charging source (usually, but not necessarily, an alternator). When the batteries are not being charged, the Battery Separator separates or isolates the batteries.

### Prioritized Charging

The Battery Separator waits until the battery connected to the active charging source reaches approximately 13.2V (26.4V) before paralleling and charging the remaining batteries. The system disconnects at approximately 12.8V (25.6V).

### Prevents Charging System Overload

If the current requirements are greater than the charging source can produce, the Battery Separator will automatically separate the batteries, thus directing all available charge current to the battery directly connected to the charging source. The system will then reset and re-attempt charging the auxiliary battery. A time delay prevents false switching.

### Start Assist Feature

An optional input from the key switch or a manual switch will program the Battery Separator to parallel the batteries during starting. This feature will only engage if the auxiliary battery has sufficient power available to assist in starting.

### Universally Suited

For mounting on tow vehicle or towable.

### Voltage Spikes

generated by the coil of the solenoid are absorbed by protective circuitry built into the Battery Separator.

## Smart Charge Priority Systems |

The Battery Separator is designed for use in multi-battery applications as a solenoid priority system to protect the chassis charging system from excessive loading while allowing auxiliary batteries to be charged. The Battery Separator has two basic operational characteristics.

### Assist In Engine Starting

When the starter is activated the Battery Separator compares the voltage of both battery banks. If the starting battery is lower than the auxiliary battery bank, the Battery Separator will engage, allowing the auxiliary battery bank to aid in vehicle starting. The start signal must be at least three volts for this operation to occur.

### Protect The Charging System

Once the engine has started, the Battery Separator monitors the chassis battery and charging system. When the charging system reaches 13.2 volts (26.4V), indicating a charged main battery and functioning charging system, the Battery Separator will engage, connecting the auxiliary battery bank to the vehicle charging system. If the drain on the charging system by the auxiliary battery bank reduces the system voltage below 12.8 volts (25.6V), the Battery Separator will disconnect the auxiliary battery bank, thus protecting the chassis charging system. The process is repeated until the charging system is turned off.

A delay function has been incorporated in the control circuit to prevent the Battery Separator from reacting to momentary voltage fluctuations and chattering.

The priorities are to assist in engine starting, if required, and to protect the charging system from excessive power drain.

### Battery Separator - The Smart Solenoid

MODEL	INPUT	CURRENT	DESCRIPTION
1314A	12V	100A	Battery Separator, Uni-Directional w/ Aux Start
1314-200	12V	200A	Battery Separator, Uni-Directional w/ Aux Start
1315A	12V	100A	Battery Separator, Bi-Directional w/ Aux Start
1315-200	12V	200A	Battery Separator, Bi-Directional w/ Aux Start
1318A	24V	100A	Battery Separator, Uni-Directional
1319A	24V	100A	Battery Separator, Bi-Directional
3103	24V	300A	Interconnect/Controller
3105	12V	300A	Interconnect/Controller
3106	12V / 24V	300A	Battery Disconnect
3113	12V/24V	300A	Dual Voltage
3115	12V	300A	Interconnect/Controller

# Multi-Battery Isolators



## Sure Power Multi-Battery Isolators

- Eliminate multi-battery drain when two or more battery banks are in a charging system.
- Perform as well or better than existing factory installed components.
- Designed to exceed OEM specifications.
- Solid-State Electronics... Isolates each battery circuit and allows each battery to discharge and charge according to its own needs.
- The original, not an imitation! The Battery Isolator was invented by Sure Power in 1959.
- More efficient and reliable than mechanical or solenoid systems.
- The most comprehensive line of Battery Isolators on the market. Isolators are available for most application needs.



## Why You Need to Isolate Your Batteries

Many vehicles and other types of equipment have multiple batteries: one to start the engine and others to power accessories. To understand the problem of multi-battery drain and how a Sure Power Battery Isolator prevents it, think of electricity as water. Electrical current is equal to the flow of water and voltage is equal to the pressure. The alternator pumps current (water) into the batteries (storage tanks). The current then flows through the wires (pipes) to the accessories. It is important to think of batteries as storage tanks. If a fully charged battery is connected directly parallel with a discharged or empty battery, the voltage pressure in the full battery will force its current into the empty battery until the current stored in both batteries reaches a common level. The discharged battery will always rob power from a charged battery. So, no matter how many batteries you have on your vehicle, the accessories connected to one will draw power from the other batteries in the circuit. This is the problem of multi-battery drain. And if it is allowed to continue unchecked, it can leave you stuck with dead batteries and an engine that will not start... all when you least expect it.

### Solenoids

One of the “so-called” solutions for multi-battery drain is nothing more than a solenoid; a switch that disconnects batteries one from another. With a solenoid, there is no multi-battery drain while the batteries are disconnected. But, the second the solenoid reconnects the batteries, the drained battery robs power from the starting battery. That isn't all that happens. This sudden, violent transfer of energy from one battery to another has been known to damage batteries or shorten their life, overheat wires and connections, and worst of all, cause fires. The Solenoid Is No Solution For Multi-battery Drain!

### The Solenoid Is Not A Substitute For A Sure Power Battery Isolator

### The Solution

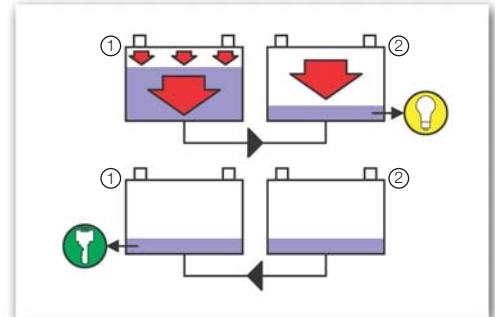
To eliminate the multi-battery drain problem, a Sure Power Isolator acts as a check valve between the batteries, preventing current from flowing from one battery to another. Each battery is isolated and acts as an independent power source. So no matter how drained your accessory batteries become, they will never drain power from the battery you're depending on to start your engine. When the current is used from battery #2, the check valve (diode) stops current flow from battery #1. When the alternator is charging, current can only flow in one direction, from the alternator to the batteries. Each battery then determines the amount of current which flows into it by its own state of charge based on the voltage regulator setting. With this system, the alternator is protected, the batteries are protected and your family or passengers are protected. The balanced circuit electronic Isolator is absolutely the only way that proper isolation and control can be accomplished, solving every multi-battery problem.

### Engineering Excellence

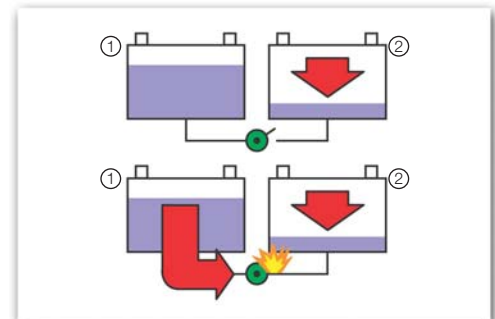
An Isolator is a simple and safe device. But, if it isn't properly engineered, it can fail and cause the entire electrical system to also fail. Sure Power Isolators are engineered with a SAFETY MARGIN competitor models cannot match. From the quality heat sink to the finest electrical components and materials, Sure Power enables you to install the best!

### The Original

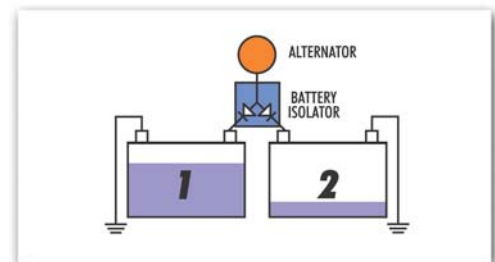
Sure Power Industries invented and has been producing Isolators since 1959. We build the finest isolator products on the market for 6 through 48 volt systems, with one or two charging systems, 2 or 3 battery banks, and current capacities of 25 through 350 amps. Our Isolators are standard equipment on many boats, ships, RVs, trucks, police, fire, emergency vehicles, industrial equipment and military vehicles.



Accessories connected to battery #2 rob power from battery #1, your starting battery, leaving you with two dead batteries when you least expect it.



Solenoids don't prevent multi-battery drain, only delay it. In fact, the current surge that occurs when the batteries are reconnected has been known to cause major electrical system damage.



A Battery Isolator acts as a check valve (through two diode legs), one on each line. Both batteries receive current from the alternator and the voltage will equalize throughout the system while the alternator is in operation.

# Multi-Battery Isolator Application Guide

	MODEL	CURRENT	INPUT	OUTPUT
<b>GROUP 1</b>	122	25A	1	2
	702	70A	1	2
	703	70A	1	3
	704	70A	1	4
	2702	70A	2	2
	2703	70A	2	3
	952	95A	1	2
	1202	120A	1	2
	1203	120A	1	3
	3202	120A	2	2
	3203	120A	2	3
	1302	130A	1	2
	1602	160A	1	2
	1603	160A	1	3
	2002	200A	1	2
	2402	240A	1	2
	2403	240A	1	3
	3002	300A	1	2
	3003	300A	1	3
	3303	95/160A	2	3
3603	120/160A	2	3	
31822	160A	1	2	
31922	240A	1	2	
<b>GROUP 2</b>	9523A	95A	1	2
	12023A	120A	1	2
	12033A	120A	1	3
	13023A	130A	1	2
	13033A	130A	1	3
	16023A	160A	1	2
	16033A	160A	1	3
	24023A	240A	1	2
	32033A	120A	2	3
	<b>GROUP 3</b>	2703R	70A	2
3203R		120A	2	3
952R		95A	1	2
702R		70A	1	2
<b>GROUP 4</b>	If the alternator is not compatible with battery isolators a Battery Separator would be the next alternative. Alternators with internal voltage sensing, e.g. some Mitsubishi and Hitachi, or single wire self-exciting Delco/Delphi alternators, some Honda's and some selected imports.			
<b>SPECIAL APPLICATIONS*</b>	31322	60A	1	2
	122P	25A	2	1
	702P	70A	2	1
	1602P	160A	2	1
	31622P	160A	2	1
	92061	300/160A	2	1

\*Please contact Technical Support at Cooper Bussmann for special application isolators for proper application.

## The Original and Still the Best

### VEHICLE APPLICATIONS

1

<b>General Motors (Delcotron/Delphi)</b>	Except Delcotron/Delphi CS Series alternators (CS used on most 1985 and newer GM vehicles)
<b>Ford</b>	Up to 1998
<b>Chrysler</b>	All models, all years including Nippondenso externally regulated alternators
<b>Jeep</b>	Equipped with Nippondenso externally regulated alternators
<b>Japanese Imports</b>	With alternators using external voltage regulator or external sensing
<b>Motorola</b>	Load Handler Series or 8EM Remote Sense Series

2

<b>General Motors (Delcotron/Delphi)</b>	Equipped with Delcotron/Delphi CS series alternators (most 1985-1993) or CS 130-D Series alternators (most 1993 and newer)
<b>Jeep</b>	Vehicles equipped with Delcotron/Delphi CS Series alternator (most 1985-1980)
<b>Toyota, Honda, &amp; Some Imports</b>	1985 and newer equipped with Nippondenso alternator with internal regulators or alternators with an "S" (sense) terminal
<b>Ford</b>	Many 1998 and newer

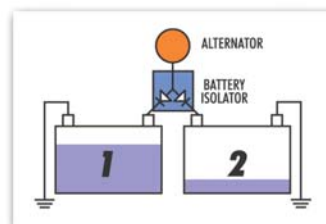
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<b>Motorola</b>	Other than Load Handler Series
<b>Bosch</b>	Requiring regulator sensing
<b>Many European Style Alternators</b>	Requiring regulator sensing

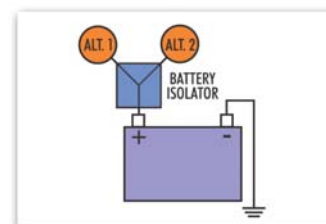
4

2005 and newer General Motors applications using the Delphi alternators (may also be labeled Bosch) with two pin terminal connectors will not work with Battery Isolators: use Battery Separator. **NOTE: Dodge Sprinter classified under Group 4**

Schottky Isolator ISO/Start  
Positive ground isolators can be used as charging source combiners



Typical Isolator Application



Typical Combiner Application

Go to [www.surepower.com](http://www.surepower.com) for application and installation instructions





## Special Design Features

- Automatically disconnects non-critical loads from the battery(ies) to prevent excessive battery discharge
- Automatically reconnects loads if vehicle is started or battery is recharged
- Start Signal Input override to prevent the loads from disconnecting during starting
- Manual override for connecting or disconnecting during emergencies
- Selectable Pre-set models available ranging from 9.0V to 25.0V
- Audible or visual alarm output activates 1 minute before disconnect
- Maximum load current, models up to 300 amps and thermally protected
- 100% Solid-State logic and switching circuitry on most models
- Fully protected
- Low standby current

## Intelligent Battery Saving Devices

The Sure Power 13000 family of Low Voltage Disconnects (LVD) is a 100% solid-state electronic protection module which disconnects predetermined auxiliary loads from the starting battery bank to ensure enough power is left in the batteries for starting. A micro-controller senses battery voltage. During normal operation when the battery is sufficiently charged, the LVD connects the loads. Once the battery voltage reaches the shut-off set point, the auxiliary loads are automatically disconnected from the battery(ies) preventing further battery drain. Sure Power has taken steps to prevent false triggering from transient conditions. The LVD will automatically reconnect the loads once the battery reaches 13.0V, or if the starter input or the manual override input is activated.

For low standby current drain, the LVDs consist of 100% solid-state circuitry which uses 8mA or less support current (certain systems use a solid-state control with a relay or solenoid for load switching which draws as much as 300 to 750mA to keep the loads connected). This will reduce the usable power from the battery as much as 22 to 54 amp hours over a three-day weekend just to support the disconnect.

Additional features include up to a 120 second turn off delay, 1 second turn on delay, an alarm output, optional start override, optional manual override, short-circuit protection, overcurrent protection, transient suppression, thermal (over temperature) protection, and ambient temperature operation of -40°C to +85°C.

The Sure Power family of LVDs is ideally suited for applications such as Class 8 heavy-duty trucking sleeper cab loads. It is adaptable to existing 3+1 systems or ideal for 3+0 or 4+0 systems since it does not require differing or special types of batteries. All batteries can be tied together in one common bank. Other applications include marine cabin loads, RV accessories and other devices requiring prioritized load switching.

The Sure Power 3100 family of Low Voltage Disconnects incorporates the same level of sophisticated control, but uses a heavy-duty bi-stable relay for switching much higher current.

MODEL	DISCONNECT VOLTAGE	CURRENT	DESCRIPTION
1001	Adjustable 11.1V to 12.5V	NA	Low Battery Alarm
130512	Adjustable 9.0V to 12.15V	20A	Low Voltage Switch
133121070	12.1V	70A	Solid-State Low Voltage Disconnect, $V_{in}$ and $V_{out}$
133123070	12.3V	70A	Connections with Deutsch Connectors
137121100	12.1V	100A	
137123050	12.3V	50A	Solid-State Low Voltage Disconnect, Connections with 8mm Studs
137123100	12.3V	100A	
1381180706	11.8V	70A	CAN Capable / 6 Gauge Wire
1381180708	11.8V	70A	CAN Capable / 8 Gauge Wire
3103	25V	300A	24v Low Voltage Disconnect
3104/3105	12.3V	300A	12v Low Voltage Disconnect
3108		300A	24v Disconnect W/ 1hr Disconnect

# Solid State Flashers



## Special Design Features

- Sure Power offers a wide variety of fully solid-state 24V and 12V flashers for heavy-duty, off-highway, truck and commercial applications.
- The family of Sure Power flashers has been designed, tested and manufactured to outperform all other flashers on the market. Independent testing, along with extended use of these flashers in the harshest environments, has proven the durability and reliability of Sure Power's family of flashers to be unsurpassed.
- This 100% solid-state, completely environmentally sealed family of flashers is designed to surpass the toughest OEM and SAE specifications, and provide a fully featured and fully protected dependable operation.

## Tough and Dependable

Power Management

Solid State Flashers



### More Flash...for Less

The 1421 Flasher is a smaller, lighter, 100% solid-state two-wire turn signal flasher with less footprint than its predecessor. The turn signal indicators connected to the unit will flash on and off at a rate and duty cycle controlled by the unit. The rate and duty cycle are independent of the number and type of turn signal indicators. The flasher can operate any number of both incandescent and LED based turn signal indicators as long as the load current does not exceed 25A and the load is greater than the minimum load requirements. (Contact Sure Power regarding minimum load requirements for LED compatibility.)

MODEL	OPERATING VOLTAGE	CURRENT	DESCRIPTION
1421	12V	25A	Solid-state 2-wire Hazard/Turn Signal Flasher Meets SAE J1690



### Truck, Bus & Commercial

Used by many of the world's leading truck and chassis manufacturers, this family of products has proven to provide one of the industry's most reliable and dependable flasher operations. Independent life cycle testing failed to find a failure before the test was terminated at over 42 million flashes. Is it any wonder that both OEMs and fleets are using these to provide dependable flasher operation and peace of mind?

MODEL	OPERATING VOLTAGE	CURRENT	DESCRIPTION
1415	12V	25A	Solid-State 2-wire Hazard/Turn Signal Flasher
1417	12V	38A	Solid-State 2-wire Hazard/Turn Signal Flasher
1419	12V	25A	Solid-State 3-wire Remote Mount Hazard/Turn Signal Flasher
1419S	12V	25A	Solid-State 3-wire flasher with Audible Tone
1425	24V	25A	Solid State 2-wire Hazard/Turn Signal Flasher
1425MB	24V	25A	Solid-State 2-wire Hazard/Turn Signal Flasher w/ Mounting Bracket



### Heavy-Duty Off-Highway

Sure Power Industries supplies the world's leading manufacturers of heavy-duty equipment with the industry's most durable and reliable flashers. Capable of connecting to either 12V or 24V systems, these 100% solid-state units are completely environmentally sealed and encapsulated as well as being shock and vibration resistant. Sure Power is continually designing new models, including both North American and European versions.

MODEL	OPERATING VOLTAGE	CURRENT	DESCRIPTION
1410	12V or 24V	12.6A	Solid-State 2-wire Remote Mount Hazard/Turn Signal Flasher
1412	12V or 24V	12.6A	Solid-State with Deutsch 3-Pin Connector



# Daytime Running Light Controls



## Sure Power DRL Controls

### Automatically

turns on low-beam head lamps or DRL lamps at a reduced voltage and significantly enhances vehicle safety

### Simple

to install these readily adapt to existing electrical systems

### Safe

protected against all failure modes, including loss of ground, overcurrent and short-circuit conditions

### Reliable

not affected by radio or electromagnetic interference

### Features

- 100% solid-state
- Environmentally splashproof or sealed depending on model
- Reduced power operation, thus minimizing early lamp failure and minimized electrical load
- Low failure possibility, reduces vehicle down possibilities

### Quality

- Superior provision of Daytime Running Light Controls, complies with CMVSS-108; CAN/CSA=D603-88, Type 2; FMVSS-108
- Designed per SAE J1211, J1455

## Reliable Operation, Increased Safety

**Sure Power Daytime Running Light Controls adapt to existing systems**, being designed to operate headlamps in the low-beam circuit at reduced power while vehicle is in operation. The Sure Power family of Daytime Running Light Controls automatically activate when the ignition is turned on. However parking brake release or other methods of activation are also possible.

FEATURE	SURE POWER LINEAR APPROACH	PULSE WIDTH MODULATION*	SERIES PARALLEL*
Designed to eliminate radiated or conducted interference	<b>YES</b>	<b>NO.</b> May affect AM-FM or communications radios, on-board computers, engine & transmission controls.	<b>YES</b>
Simple wiring change	<b>YES</b>	<b>NO.</b> Splicing is required	<b>NO.</b> Extensive wiring required.
Protected against loss of ground	<b>YES</b>	<b>NO.</b> Major damage to module can occur.	<b>NO.</b> Loss of ground may result in loss of headlamps
Protected against loss over current	<b>YES (electronic)</b>	<b>YES.</b> Some models	<b>NO.</b> Unless fuse added.
Protected against short-circuit	<b>YES</b>	<b>YES.</b> Some models	<b>NO.</b> Unless fuse added.
Both lamps protected against extinguishing when (1) filament fails	<b>YES</b>	<b>YES</b>	<b>NO</b>
Fully solid-state	<b>YES</b>	<b>YES</b>	<b>NO</b>
Low voltage protected	<b>YES</b>	<b>NO</b>	<b>NO</b>
Fail-safe operation	<b>YES</b>	<b>YES</b>	<b>NO</b>
Protected against control failure which results in loss of both headlamps	<b>YES</b>	<b>YES</b>	<b>NO</b>

\*Features and protection levels of these devices may vary by manufacturer

MODEL	INPUT	OUTPUT	DIMENSIONS
1323	12V	85% of input	4.5"L x 3.0"W x 2.15"H
1323F	12V	85% of input	4.5"L x 3.0"W x 2.15"H
1325F	12V	85% of input	4.5"L x 3.1"W x 2.35"H
1327	12V	12.5V w/turn signal logic	4.5"L x 3.1"W x 2.35"H

# Power Distribution & Circuit Protection

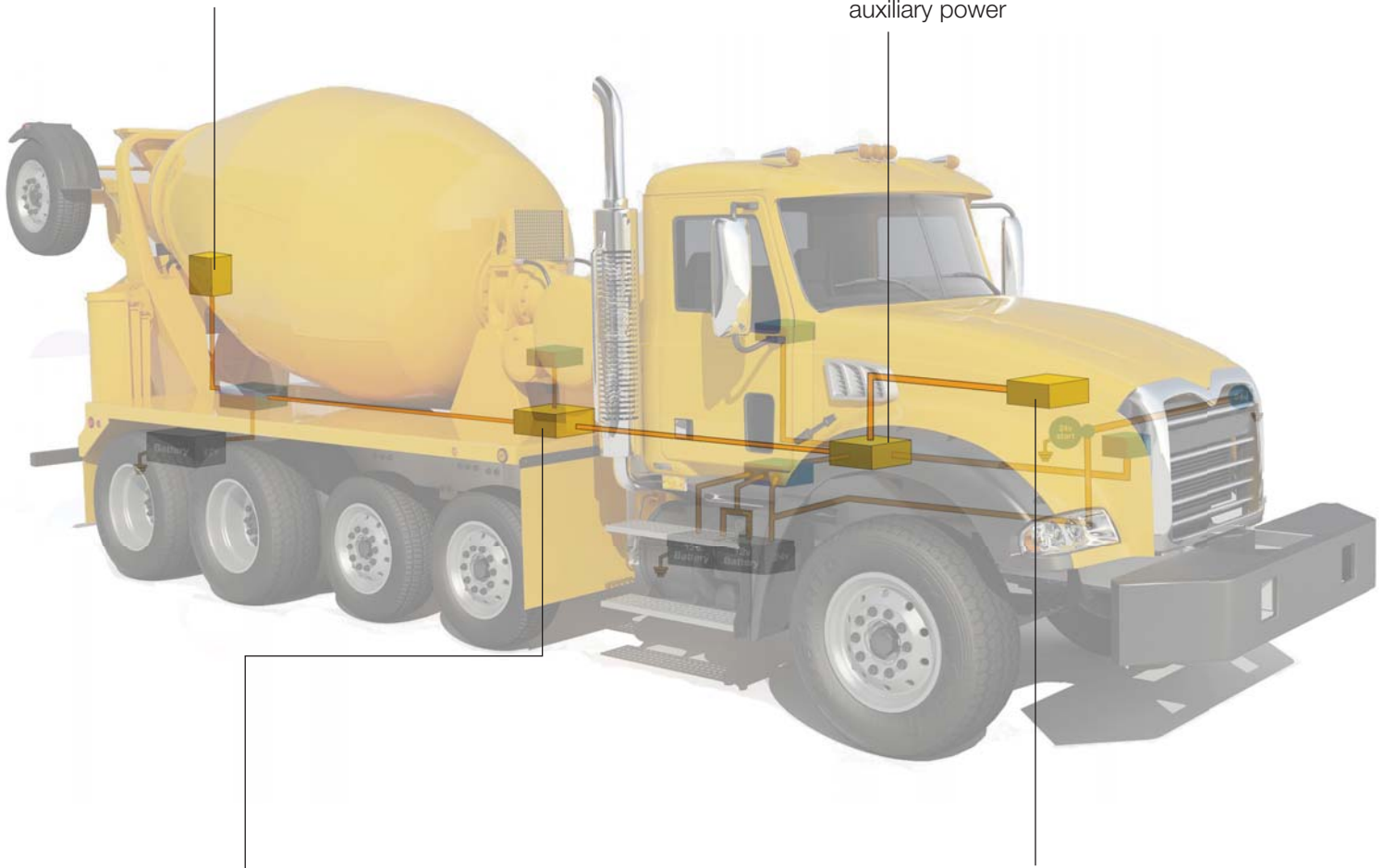
Off-the-shelf and custom-designed products that provide and protect vehicle power distribution

## Electronic Device Protection

- Fuses, circuit breakers and junction blocks

## Power Distribution Modules

- Customized distribution of main and auxiliary power



## CAN (J1939) Bus Interface

- Integrate power management to control systems

## Electrical Systems Protection

- Non-fused current disconnection between the battery and electrical system load

## Custom Solutions for Power Distribution Page

VEC	Multiplexed Vehicle Electrical Center.....	26
	Severe Service Dual Vehicle Electrical Center.....	28
	Severe Service Vehicle Electrical Center.....	30
	Series 32000 Vehicle Electrical Centers.....	32
	Series 31000 Vehicle Electrical Centers.....	34
	Vehicle Electrical Center Connectors.....	36
PDM	VEC Electrical Components.....	37
	Series 15400 RFRM Rear-fed Fuse & Relay Module.....	38
	Series 15310 60-Position RTMR.....	39
Fuse Panels	Series 15300 RTMR.....	40
	Series LMG Bolt-in Fuse Holder for Multiple AMG Fuses.....	42
	LMI Bolt-in Fuse Holder for Single or Multiple AMI Fuses.....	44
	Series 15710 Rear Terminal ATC Fuse Panel.....	46
Fuse Holders	Series 15600 ATC Blade-Type Fuse Panels.....	47
	Series 37700 PRM/PFM.....	48
	HMG Fuseholder.....	50
	FMG Fuseholder.....	51
	CFH-XXX Connector Fuse Holder.....	52
Junction Blocks	Inline Fuseholders.....	53
	GB3000-XX: Pass-through Distribution Block.....	54
	Single Stud Type Junction Blocks.....	55
	Multiple Stud Type Junction Blocks.....	56
	Power Distribution Notes.....	57



## Circuit Protection Page

easyID™ Illuminating Blade Fuses & Fuse Holders.....	60
MINI Blade Fuses.....	62
Series 21X Mini Circuit Breakers.....	63
ATC® Blade Fuses.....	64
Series 22X Circuit Breakers.....	65
Series 227 ATC Circuit Breakers (low profile).....	66
MAXI® Blade Fuses.....	67
Series 19X MAXI® Circuit Breakers.....	68
Series 3200 Insertion/Extraction Tool.....	69
Series 12X Shortstop Circuit Breakers.....	70
Series 25X Mid-Range Circuit Breaker.....	71
Series 18X Hi-Amp Circuit Breaker.....	72
Series 187 Marine Rated Circuit Breaker (MRCB).....	73
AMI Series.....	74
AMG Series.....	75
Marine Rated Battery Fuse.....	76
Series 15250.....	78
Circuit Protection Notes.....	79

### High Power Ratings

- Circuit protection up to 500A
- Interrupt rating up to 10kA
- Power distribution modules up to 400A
- Voltage ratings to 48Vdc and beyond

### Multiplexing Capability

- J1939 Interface
- Solid State Option

### Flexible Configurations

- Delphi™ / AMP™ terminal connections
- 1-32 Position fuse blocks

### Rugged Construction and Serviceable Design

- IP66 ingress protection
- High temperature/humidity/vibration resistance

### Ignition Protected Options

- Per SAE J1171

### Agency Compliant

- SAE / ISO / ABYC / UL / CE / CSA



# 31M Series Multiplexed Power Distribution Module



## Multiplexed Vehicle Electrical Center (mVEC)

The multiplexed Vehicle Electrical Center (mVEC) offers economical CAN Network oversight for high power circuits in vehicle power distribution. Manufactured as a hardened and weather tight module, the mVEC is rated at 200 Amps. The mVEC may be configured to provide various OEM circuit protection and switching functions, using industry standard fuses, relays and breakers, with the status and control of each circuit accessible through J1939 CAN open messages. The mVEC is based on proven and patented technology and is suited for the most demanding transportation vehicle applications.

**High Power:** The mVEC uses patented Cooper Bussmann VEC 'power grid' technology, ideal for high current circuits and Sure Power networking electronics. Each mVEC is rated at 200 Amps, with individual outputs rated up to 30A, and a maximum of 32 outputs possible with the mVEC. 12 and 24 volt systems are supported.

**Rugged:** Waterproof to high pressure spraying (IP66). The mVEC is designed and manufactured with robust features such as a heavy-duty housing, silicon and Gortex gasketing, and protective conformal coated electronics, to operate in demanding vehicle environments such as those found in construction, agriculture, heavy truck, bus, RV, marine and specialty vehicle markets.

**Flexible:** The mVEC is offered in various standard and customized versions, with custom versions being configured to OEM wiring requirements. The two standard mVEC configurations include the 8-relay 31M-000-2 and the 12-relay 31M-300-0. The mVEC accepts relays, fuses, circuit breakers, resistors, diodes, etc. based on the industry standard 2.8mm footprint.

**Basic Features:** The mVEC acts as a slave module on a J1939 network, communicating via the vehicle data bus with the master controller. The mVEC functions as a node in an existing vehicle J1939 multiplexing network. The mVEC controls relays via direction of J1939 CAN bus and reports status of relays and fuses each second to the J1939 CAN bus, indicating any blown fuse or failed relay. The mVEC supports both 12V and/or 24V electrical requirements. The mVEC is capable of custom designs with differing configurations of relays, fuses, circuit breakers, etc. per customer requirements.

# 31M Series Multiplexed Power Distribution Module

## Specifications

**Capacity:** 200 Amps maximum rating, 30 Amps per output pin, Maximum of 12 relays and/or 32 fuses, or various combinations thereof (unique design configurations may be required)

**Materials:** Housing and connector cavities: 94V0 rated thermoplastic  
Internal power grid: tin-plated copper  
CAN circuit board: conformally coated

**Operating Temperature Ratings:** -40°C to 85° C

**Ingress Protection:** IP66 compliant

**Foot Torque Rating:** 60 in-lbs w/out compression limiters, 200 to 300 in-lbs with compression limiters.

**Connections: Output:** Standard Cooper Bussmann VEC connectors

- 8-way, colored/keyed, sealed connectors
- 30A max per terminal
- 100A max per connector
- Accepts Packard Metri-Pack 280 Series terminals (tanged/tangless)

## Specifications (Cont)

### Input:

- Studded input option: supports two M8 input power studs for DC power into the VEC power grid (100A max per stud)
- Connectorized: accepts up to 2 Cooper Bussmann 32004 VEC connectors (2 terminal, colored/keyed, sealed connectors)
- 60A max per terminal, providing power to the VEC Power Grid; uses Packard 800 series terminals

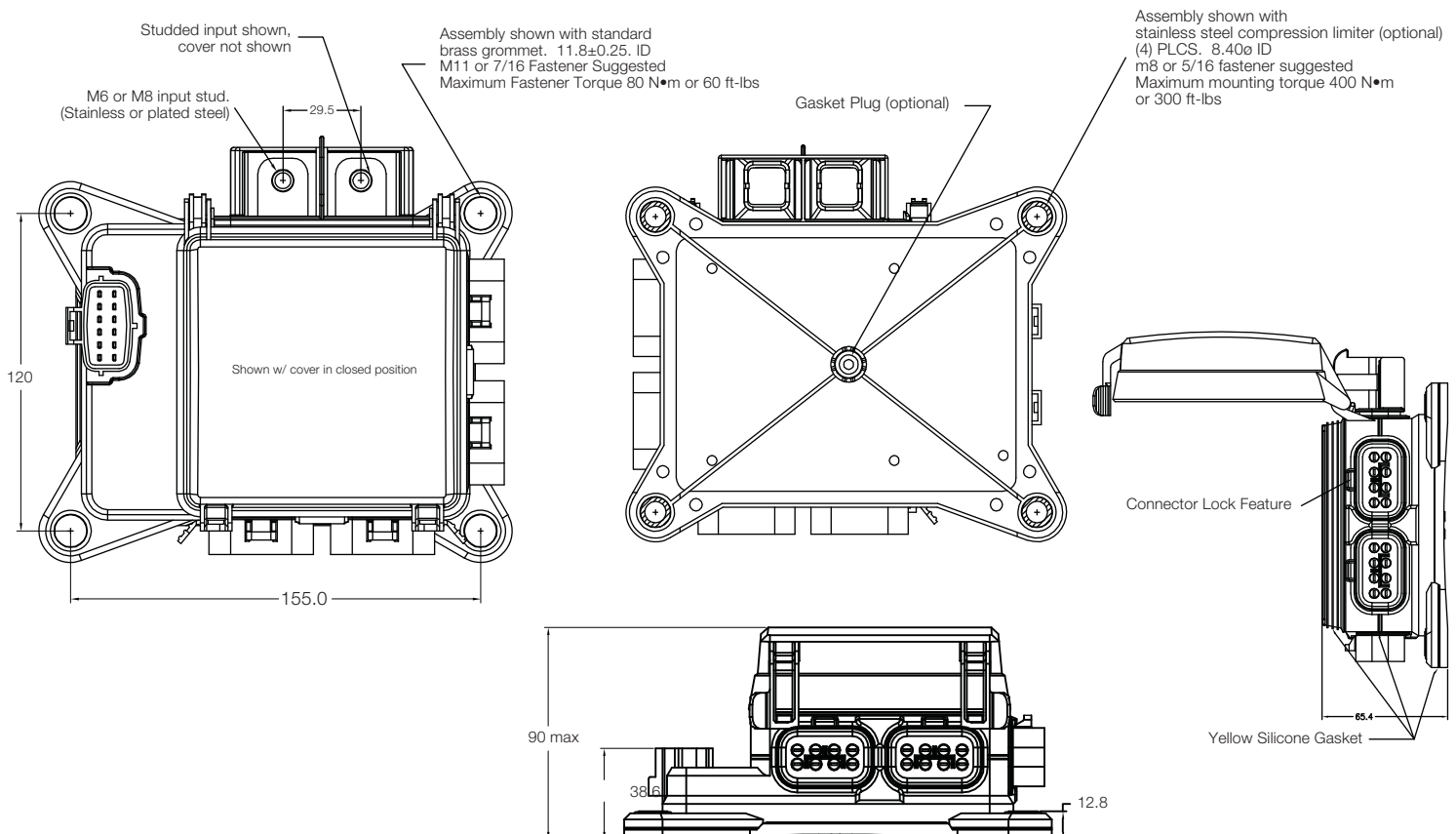
### CAN:

- Uses AMP SSC 12-position sealed connector
- CAN connector provides CAN signaling, power, ground, addressing, auxiliary relay control, and reserve connections to mVEC 'smart' layer

## Options

1. Mounting: compression limiters on mounting feet
2. Labeling to customer specifications
3. Stuffed (with/without components including, but not limited to: fuses, relays, diodes, circuit breakers, fuse puller)
4. Customized circuit layouts, standard and custom CAN messages
5. Cover marking: laser etching inside, outside, or both

## Dimensions - mm(in)



# 32S Series Severe Service Power Distribution Module

Power Distribution

VEC

ssDVEC



## Severe Service Dual Vehicle Electrical Center (ssDVEC)

Introducing the ruggedized version of the Cooper Bussmann Dual Vehicle Electrical Center, the 'Severe Service' DVEC (ssDVEC). This version of the DVEC features unequalled performance in power distribution in an IP66 compliant enclosure. The ssDVEC is capable of operating in various environments such as those with high vibration and moisture, up to direct high pressure spray. The ssDVEC provides efficient and compact power distribution for OEMs with demanding applications in the transportation industry including construction, agriculture, heavy trucks, bus, marine and specialty vehicles.

As with all DVECs, the ssDVEC uses the patented Cooper Bussmann 'power grid' technology easily programmable to accommodate various OEM wiring requirements.

Cooper Bussmann DVECs all feature a unique color-coded and keyed connector system, and accepts common plug-in fuses, relays, circuit breakers, resistors, diodes, etc., based on the industry standard 2.8mm footprint.

Additionally the ssDVEC has these new features:

- Durable plastic housing featuring a Gortex vent
- Internal silicone gasketing between all seams and plastic to terminal interfaces
- Internal spare fuse holder and socket for fuse extraction tool

# 32S Series Severe Service Power Distribution Module

## Specifications

**Capacity:** 400 Amps maximum rating; 30 Amps per output pin, and 100 amps per output connector; Maximum of 24 relays and/or 64 fuses, or various combinations thereof (unique design configurations may be required)

**Materials:** Housing and connector cavities: 94V0 rated thermoplastic  
Internal power grid: tin-plated copper

**Operating Temperature Ratings:** -40°C to 105° C

**Ingress Protection:** IP66 compliant

**Foot Torque Rating:** 200 to 300 in-lbs with standard compression limiters

**Connections:** *Output:* Standard Cooper Bussmann VEC connectors

- 8-way, colored/keyed, sealed connectors
- 30A max per terminal
- 100A max per connector
- Accepts Packard Metri-Pack 280 Series terminals (tanged/tangless)

## Specifications (Cont)

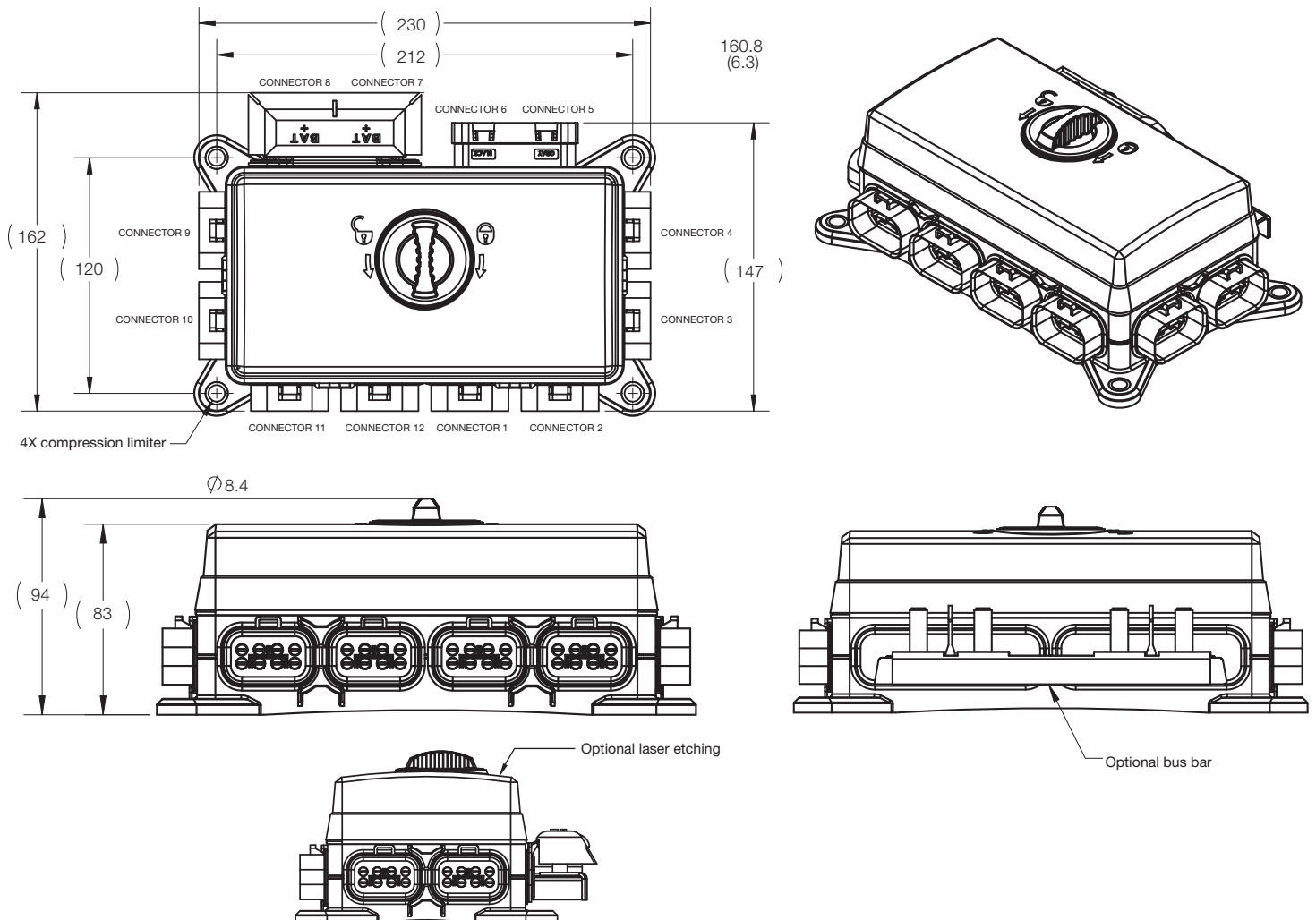
### Input:

- Studded input option: supports two M8 input power studs for DC power into the VEC power grid (100A max per stud)
- Connectorized: accepts up to 4 Cooper Bussmann 32004 VEC connectors (2 terminal, colored/keyed, sealed connectors)
- 60A max per terminal, providing power to the VEC Power Grid; uses Packard 800 series terminals

## Options

1. Labeling to customer specifications
2. Stuffed (with/without components including, but not limited to: fuses, relays, diodes, circuit breakers, fuse puller)
3. Customized circuit layouts
4. Power Connector
5. Cover marking: laser etching outside

## Dimensions - (mm)





# 31S Series Severe Service Power Distribution Module

Power Distribution

VEC

ssVEC



## Severe Service Vehicle Electrical Center (ssVEC)

Introducing the ruggedized version of the Cooper Bussmann Vehicle Electrical Center, the 'Severe Service' VEC (ssVEC). This version of the VEC features unequalled performance in power distribution in an IP66 compliant enclosure. The ssVEC is capable of operating in various environments such as those with high vibration and moisture, up to direct high pressure spray. The ssVEC provides efficient and compact power distribution for OEMs with demanding applications in the transportation industry including construction, agriculture, heavy trucks, bus, marine and specialty vehicles.

As with all VECs, the ssVEC uses the patented Cooper Bussmann 'power grid' technology that is easily programmed to accommodate various OEM wiring requirements.

Cooper Bussmann VECs all feature a unique color coded and keyed connector system, and accepts common plug-in fuses, relays, circuit breakers, resistors, diodes, etc., based on the industry standard 2.8mm footprint.

Additionally the ssVEC has these new features:

- Durable plastic housing featuring multiple venting configurations including a Gortex vent
- Internal silicone gasketing between all seams and plastic to terminal interfaces
- Internal spare fuse holder and socket for fuse extraction tool

The ssVEC features various custom design versions (differing relay, fuse, breaker, etc. configurations) supporting 12V and 24V electrical systems (or combinations thereof).

# 31S Series Severe Service Power Distribution Module

## Specifications

**Capacity:** 200 amps maximum; 30 amps per output connection, maximum 32 fuses /12 relays (size dependent) or various combinations thereof (diverse design configurations supported)

**Materials:** Housing and connector cavities: 94V0 rated thermoplastic  
Internal power grid: tin-plated copper  
Internal gaskets stud input covers: silicone

**Operating Temperature Ratings:** -40°C to 105°C (operating).

**Ingress Protection:** Application dependant up to IP66 equivalent (direct high pressure spray)

**Maximum Torque Rating:** 200 to 300 in-lbs with standard compression limiters, 24 in-lbs without compression limiter.

**Connections:** **Output:** Standard Cooper Bussmann VEC connectors

- 8-way, colored/keyed, sealed connectors
- 30A max per terminal
- 100A max per connector
- Accepts Packard Metri-Pack 280 Series terminals (tanged/tangless)

## Specifications (Cont)

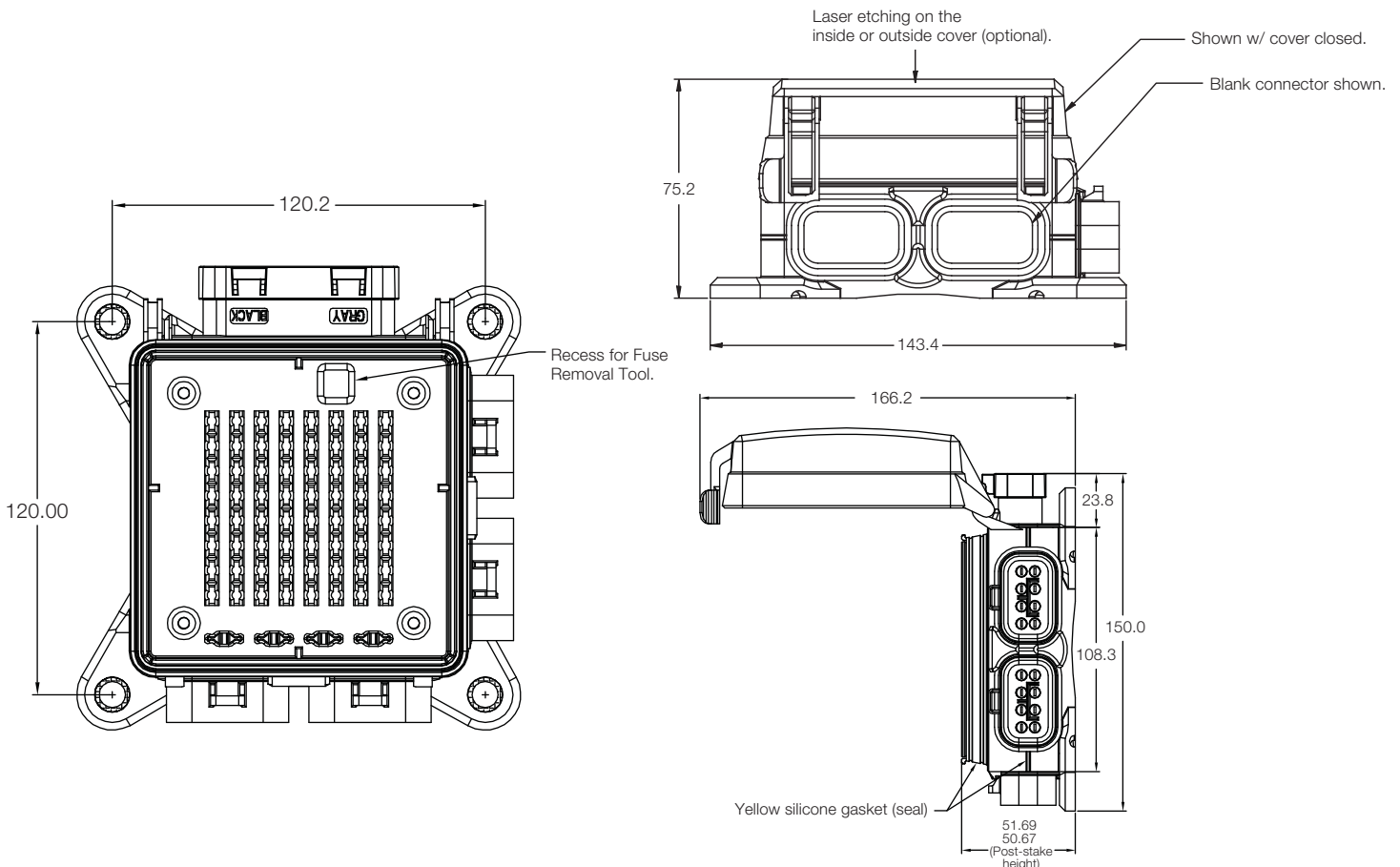
### Input:

- Studded input option: supports two M8 input power studs for DC power into the VEC power grid (100A max per stud)
- Connectorized: accepts up to 2 Cooper Bussmann 32004 VEC connectors (2 terminal, colored/keyed, sealed connectors)
- 60A max per terminal, providing power to the VEC Power Grid; uses Packard 800 series terminals

## Options

1. Compression limiters on mounting feet
2. Labeling to customer specifications
3. Stuffed (with/without components including, but not limited to: fuses, relays, diodes, circuit breakers, fuse puller)
4. Customized circuit layouts
5. Power connector
6. Cover marking: laser etching inside, outside, or both

## Dimensions - mm

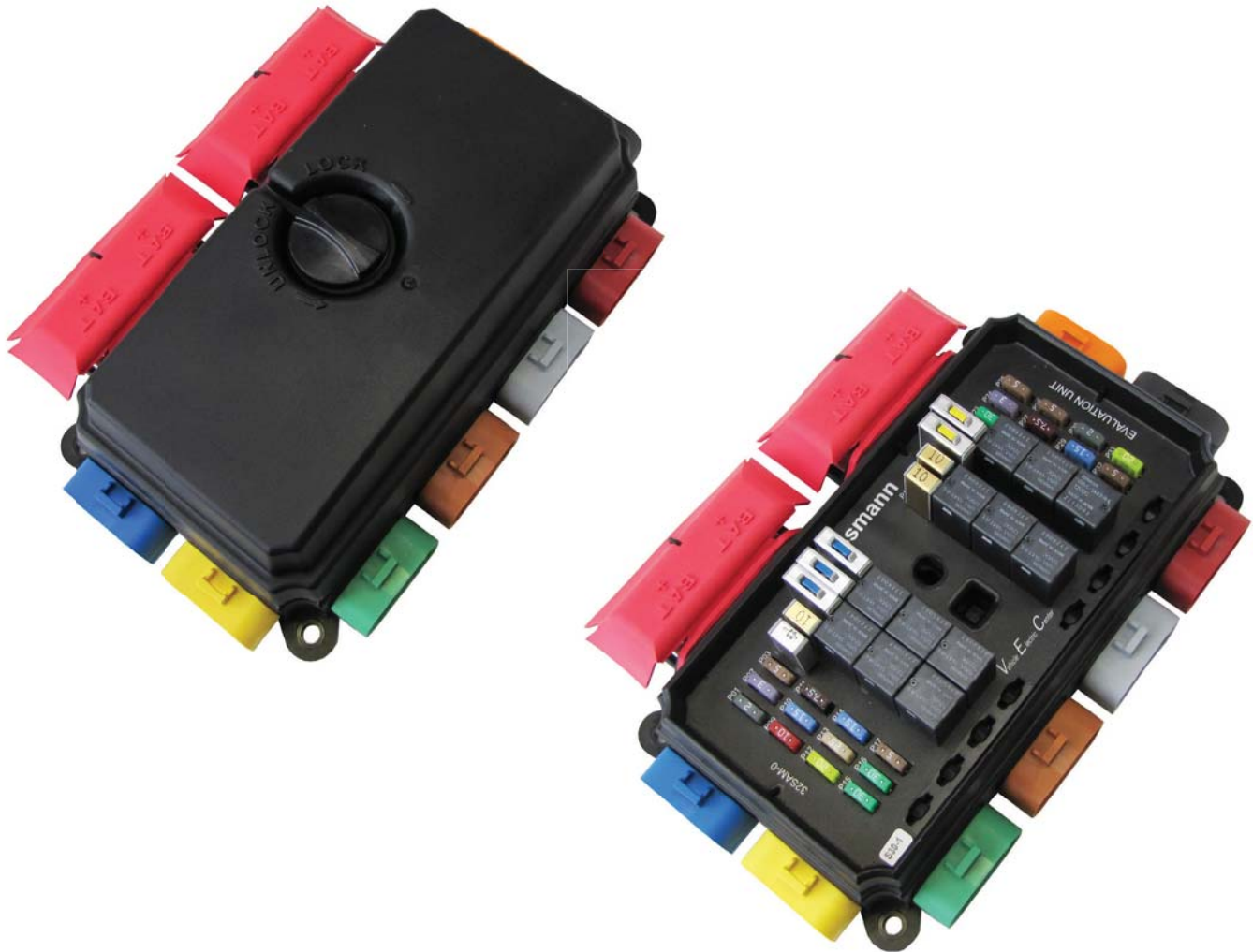


# Series 32000 Vehicle Electrical Centers

Power Distribution

VEC

DVEC



## Series 32000 Vehicle Electrical Centers

The Cooper Bussmann Dual Vehicle Electrical Center (DVEC) is a widely used transportation industry power distribution module. The DVEC uses patented programmable 3D matrix technologies that can be easily modified to accommodate changes to an electrical system. These can be customized for each specific electrical system, but require no tooling for implementation.

The DVEC accepts automotive components including fuses, relays, circuit breakers, diodes, and other devices that have 2.8mm wide terminals on 8.1mm centerline spacing. (See page 37 for additional available components.) The larger size of the DVEC (approximately 8"x4") provides for high component density. VECs provide either 8.0mm bladed inputs or M8/M6 stud inputs. The VEC can accommodate up to 4 input connectors - 8 bladed inputs or 4 studs - and 8 output connectors with up to 16 outputs each (64 total).

The DVEC is ideal for distributed main power as well as auxiliary "add-on" applications. Current DVEC applications include Class 3-8 trucks, buses, chassis and RV, Con-Ag equipment, marine specialty vehicles, and automotive power distribution systems.

The customizable design of the DVEC enables it to incorporate many different devices and multiple design variations. Splices in the harness can also be eliminated by internally programming them into the grid matrix. The inputs (connector or stud) and outputs (connector) of the DVEC are color-coded and keyed, and provide quick installation. This makes the module easy to service. The largest benefit of these modules are the reduced lead times and zero tooling cost.

# Series 32000 Vehicle Electrical Centers

## Specifications

**Input Terminal Rating:** 8.0mm blade terminals (60A max per terminal); M8/M6 input studs (100A max per terminal). 400A max total for DVEC.

**Output Terminal Rating:** 2.8mm blade terminals (30A max per terminal).

**Output Connector Rating:** 100A max per connector

**Materials:** Housing and connector cavities: thermoplastic  
Internal power grid: tin-plated copper

**Operating Temperature Ratings:** -40°F (-40°C) to 260°F (125°C)

**Ingress Protection:** IP55

**Mounting Torque Rating:** 24 in-lbs (2.7N•m) max.

**Termination:** Delphi Packard Metri-Pack® 280 Series terminals (sealed/unsealed & tanged/tangless).\* Delphi Packard 280 Series cavity plugs are installed where wires are not used.\* Accepts #10-22 AWG wire sizes.

## Options

**Cover:** Solid domed cover with gasket (VEC/DVEC), or no cover.

**Cover Label:** Inside cover, or none provided.

**Input Style:** 8.0mm blade terminals or studs (M8/M6).

**Mounting:** External feet with mounting holes (VEC/DVEC)

**Components:** Fuse, breaker, relay, etc. installation to be specified by customer.

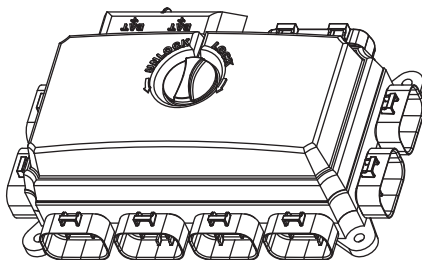
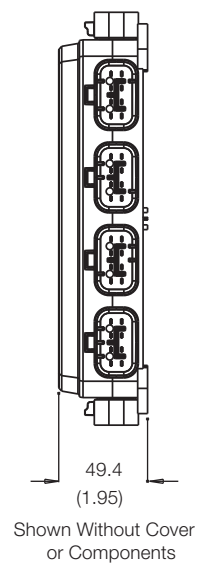
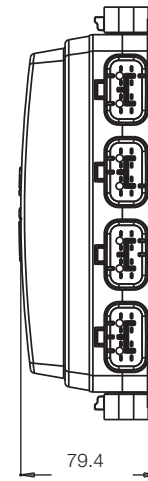
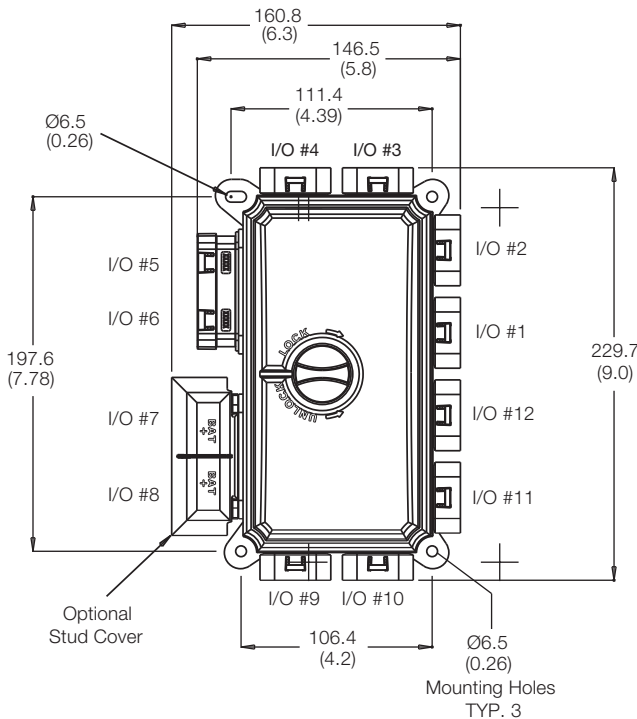
**Severe Service:** Added environmental protection available (see pg 28 & severe service DVEC). Consult factory.

**Fuse/breaker Extraction Tool:** See page 69.

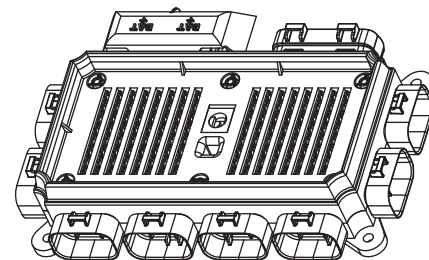
\*Electrical terminals, cable seals & cavity plugs are NOT supplied by Cooper Bussmann.

**Each design is customer specific. Consult your sales rep today for your application.**

## Dimensions - mm(in)



Version with cover



Version without cover



# Series 31000 Vehicle Electrical Centers



## Series 31000 Vehicle Electrical Centers

The Cooper Bussmann Single Vehicle Electrical Center (VEC) is a widely used transportation industry power distribution module. The VEC uses patented programmable 3D matrix technologies that can be easily modified to accommodate changes to an electrical system. These can be customized for each specific electrical system, but require no tooling for implementation.

The VEC accepts automotive components including fuses, relays, circuit breakers, diodes, and other devices that have 2.8mm wide terminals on 8.1mm centerline spacing. (See page 37 for additional available components.) The compact size of the VEC (about 4"x4") provide for high component density. VECs provide either 8.0mm bladed inputs or M8/M6 stud inputs. The VEC can accommodate up to 2 input connectors - 4 bladed inputs or 2 studs - and 4 output connectors with up to 8 outputs each (32 total). (Some designs may limit the number of connectors available for use.)

The VEC is ideal for distributed main power as well as auxiliary "add-on" applications. Current VEC applications include Class 3-8 trucks, buses, chassis and RV, Con-Ag equipment, marine specialty vehicles, and automotive power distribution systems.

The customizable designs of the VEC enable them to incorporate many different devices and multiple design variations. Splices in the harness can also be eliminated by internally programming them into the grid matrix. The inputs (connector or stud) and outputs (connector) of the VEC are color-coded and keyed, and provide quick installation. This makes the module easy to service. The largest benefit of these modules are the reduced lead times and zero tooling cost.

# Series 31000 Vehicle Electrical Centers

## Specifications

**Input Terminal Rating:** 8.0mm blade terminals (60A max per terminal); M8/M6 input studs (100A max per terminal). 200A max total for VEC

**Output Terminal Rating:** 2.8mm blade terminals (30A max per terminal).

**Output Connector Rating:** 100A max per connector

**Materials:** Housing and connector cavities: thermoplastic  
Internal power grid: tin-plated copper

**Operating Temperature Ratings:** -40°F (-40°C) to 260°F (125°C)

**Ingress Protection:** IP55

**Mounting Torque Rating:** 24 in-lbs (2.7N•m) max.

**Termination:** Delphi Packard Metri-Pack® 280 Series terminals (sealed/unsealed & tanged/tangless) or AMP® terminals.\* Delphi Packard 280 Series cavity plugs are installed where wires are not used.\* Accepts #10-22 AWG wire sizes.

## Options

**Cover:** Vented (VEC), Solid domed cover with gasket or no cover.

**Cover Marking:** Laser etching inside, outside, or both

**Input Style:** 8.0mm blade terminals or studs (M8/M6).

**Mounting:** External feet with mounting holes or internal mounting holes.

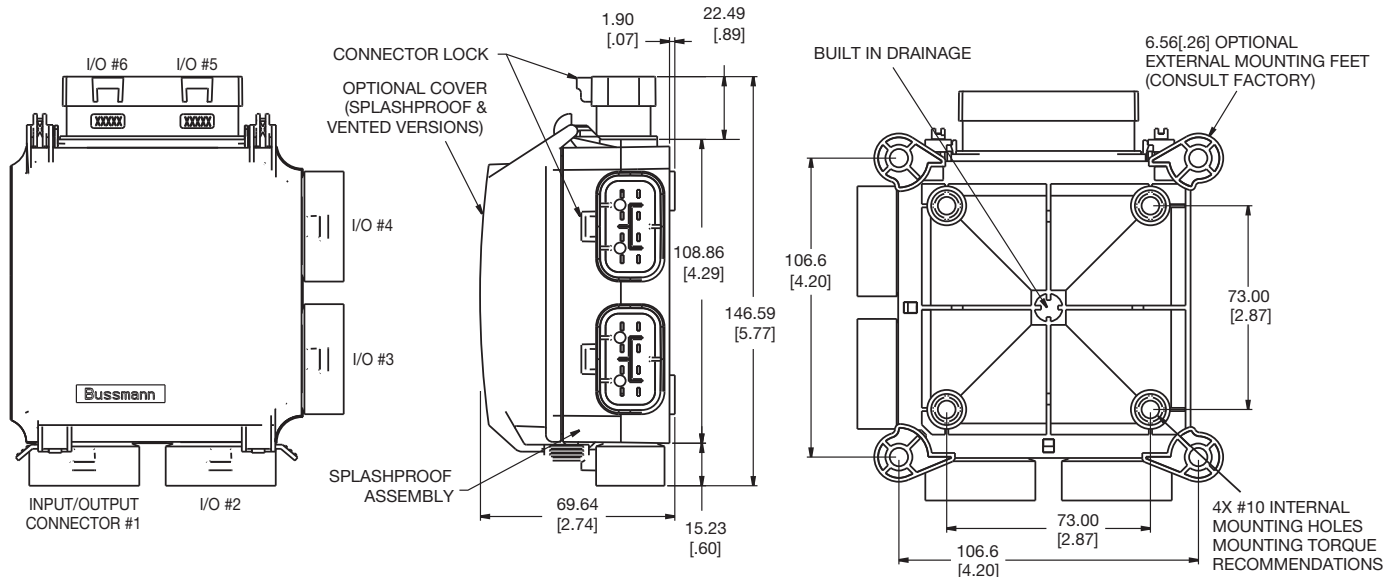
**Components:** Fuse, breaker, relay, etc. installation to be specified by customer.

**Severe Service:** Added environmental protection available (see pg 30 & severe service VEC). Consult factory.

**Fuse/breaker Extraction Tool:** See page 69.

\*Electrical terminals, cable seals & cavity plugs are NOT supplied by Cooper Bussmann.  
**Each design is customer specific. Consult your sales rep today for your application.**

## Dimensions - mm(in)

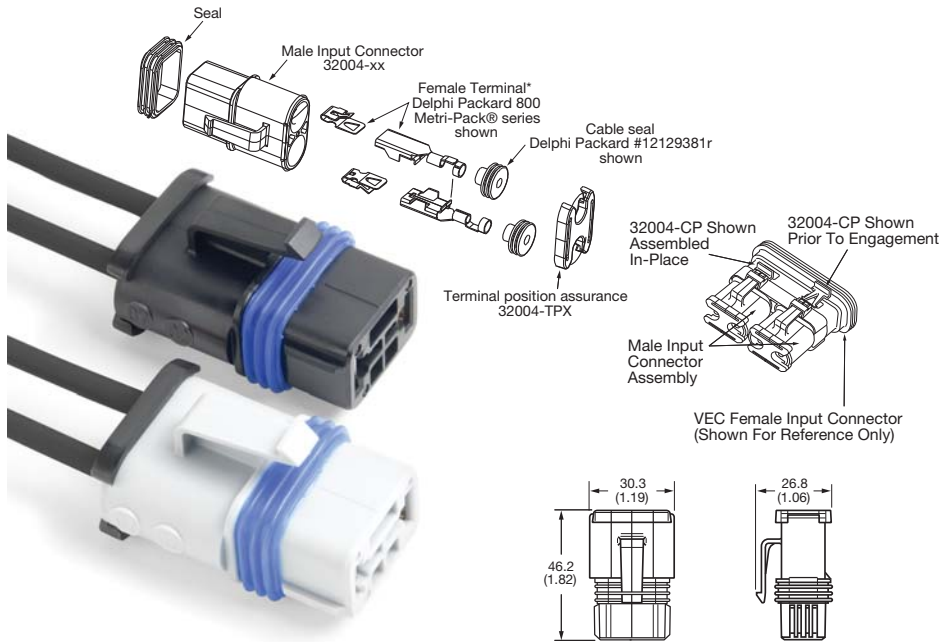


Standard VEC shown with vented cover

# Vehicle Electrical Center Connectors

## Dimensions - mm(in)

**32004-XX Power Connector** (Dims. shown are for reference only. Consult factory for latest prints)



(Dims. shown are for reference only. Consult factory for latest prints)

### MALE INPUT CONNECTOR

#### 32004 - X X

- Sealed / Non-Sealed Configuration
  - 1 = Non-Sealed Version
  - 2 = Sealed Version
- Color of Part
  - A = Black
  - B = Gray

### TERMINAL POSITION ASSURANCE

#### 32004 - TPX

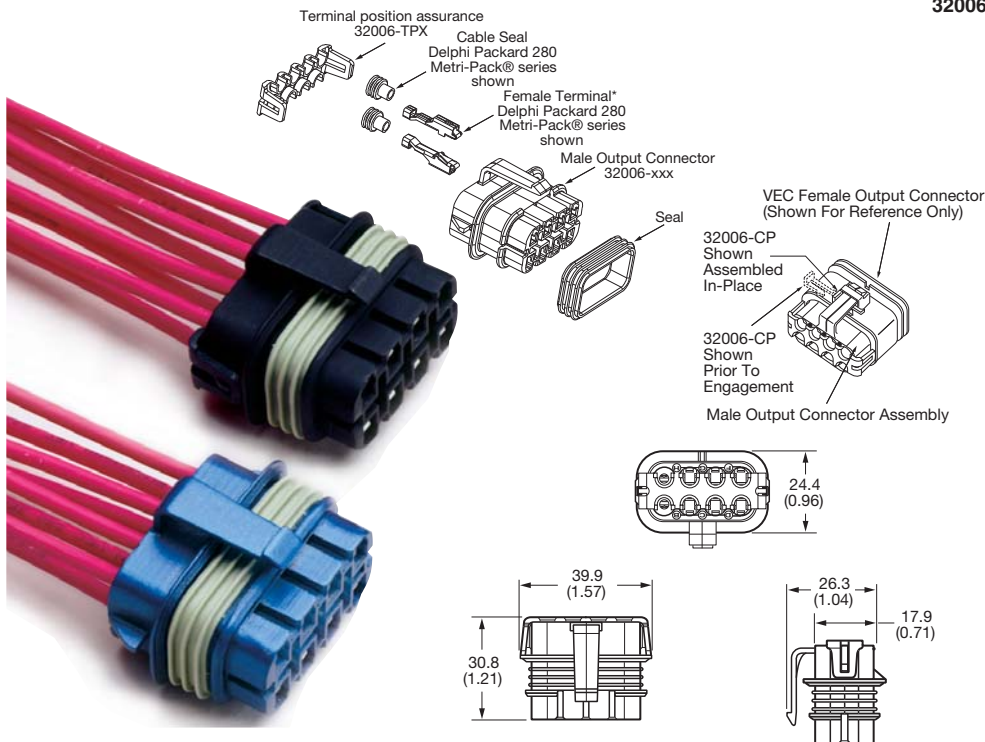
- Sealed / Non-Sealed Configuration
  - 1 = Non-Sealed Version
  - 2 = Sealed Version

### CONNECTOR POSITION ASSURANCE

#### 32004 - CP (Ship in Bulk)

**Note:** Terminals and Terminal Seal Components are not provided with connectors. Available from Delphi Packard. Contact factory for part list and terminal removal tool. Sealed connector option includes outer body seal.

**32006-XXX Output Connector** (Dims. shown are for reference only. Consult factory for latest prints)



(Dims. shown are for reference only. Consult factory for latest prints)

### MALE OUTPUT CONNECTOR

#### 32006 - X X X

- Sealed / Non-Sealed Configuration
  - 1 = Non-Sealed Version
  - 2 = Sealed Version
- Connector Cavity Configuration
  - 1 = Tang-less Female Connector (Delphi 280)
  - 2 = with Tang Female Connector (Delphi 280)
  - P = all cavities plugged
- Color of Part
 

A = Black	E = Yellow
B = Gray	F = Red
C = Green	G = Orange
D = Blue	H = Brown
J = Neutral (only available for -JP2 option)	

### TERMINAL POSITION ASSURANCE

#### 32006 - TPX

- Sealed / Non-Sealed Configuration
  - 1 = Non-Sealed Version
  - 2 = Sealed Version

### CONNECTOR POSITION ASSURANCE

#### 32006 - CP (Ship in Bulk)

**Note:** Terminals and Terminal Seal Components are not provided with connectors, but are available from Delphi Packard. Contact factory for part list and terminal removal tool. Sealed connector option includes outer body seal.

## Series 229 Diode, Resistor, and Transorb

### Specifications

**Ratings:** Consult factory for available ratings and part numbers

**Materials:** Grey 94V0 thermoplastic housing with metal cover.

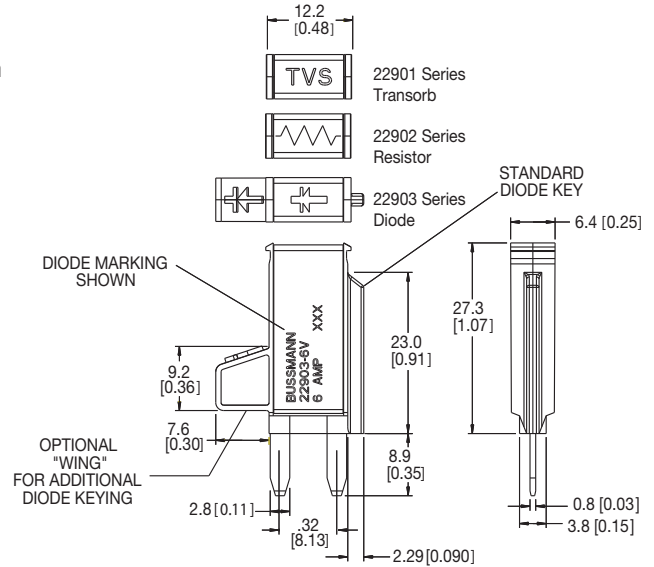
**Termination Type:** Compatible with 280 Type fuse blocks using 8.1mm centerline.

**Diode Key Feature:** Standard key denotes installation direction. Extended key available for error-proof installation in VEC.



### Dimensions - mm(in)

(Dims. shown are for reference only. Consult factory for latest prints)



**Relays** (Only Available for VEC, DVEC, RFRM, or RTMR Applications.)

### Specifications

**Types:** 5-pin mini-relay, 12Vdc & 24Vdc  
5-pin micro-relay, 12Vdc & 24Vdc  
4-pin mini-micro relay, 12Vdc

Consult Factory for available amperage ratings

**Termination Type:** Compatible with 280 Type fuse blocks using 8.1mm centerline.

Sealed versions of some relays also available.



## VEC Accessories

### DVEC Cover Tether

Tether available for use with Series 32000 DVEC cover. Consult factory.



### Series 32011BS (Input Connector Cap) & Series 32012BS (Output Connector Cap)

Connector caps can be assembled to the mating VEC harness connectors (Series 32004 & 32006) when not in use.



### Series B109-7031 (for use with Series 32000 DVEC)

External bus bar can be used with the Dual VEC to bus together studded power inputs.



# Series 15400 RFRM Rear-fed Fuse & Relay Module



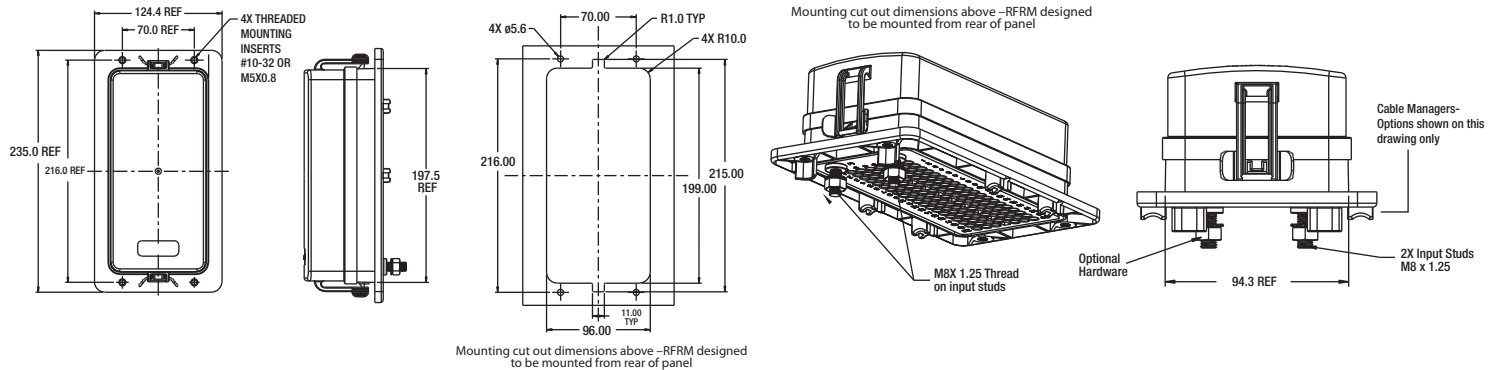
Cooper Bussmann Transportation Products now offers a main power distribution module capable of operating in harsh environment applications. Based on the industry standard 2.8mm (mini) footprint, the RFRM can accept plug-in fuses, relays, circuit breakers, resistors and diodes to meet numerous power management requirements. The RFRM is available with multiple internal bussing options, accommodating various OEM wiring requirements.

## Specifications

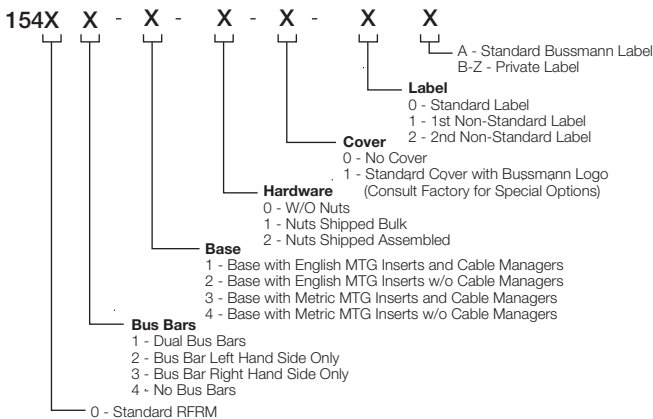
- Material:** UL-Rated 94V0 thermoplastic, plated copper bus bar, silicone rubber gasket, EPDM – internal tether
- Power Ratings:** Nominal 12Vdc and 24Vdc systems, 100A per bus bar, 200A Max
- Temperature Rating:** -40° C to 85° C
- Ingress Protection:** IP66 (with use of cover and seal) <sup>1</sup>
- Plug-in Capacity:** Up to 10 micro relays and a combination of 40 fuses/circuit breakers (8.1mm CL)
- Mounting:** #10-32 or M5 x 0.8 available, 24 in-lbs max  
Orientation mounting application intended for horizontal to vertical <sup>2</sup>
- Electrical Connectors:** Output cavities (holes in back)
- Wire Size:** Accepts #12-22 AWG wire sizes <sup>3</sup>
- Terminals:** Delphi Packard 280 Series Metri-Pack® sealed/tang style terminals
- Cavity Plugs:** Delphi Packard 280 Series cavity plug (where output wires are not used) Input Studs (for bussed version): M8 x 1.25 thread, 70 in-lbs max

- Notes:**
1. Ingress Protection rating has been validated with approved panel mounting applications. Consult factory for testing procedures.
  2. Consult factory for any other mounting orientation.
  3. Cooper Bussmann does not supply wires, wire terminals, terminal seals, or cavity plugs.  
- Consult factory for options including custom labels and replacement accessories.

## Dimension - mm



## Part Numbering System



## Notes

1. Internal tether accessory not shown – it is included with Cover Option 1.
2. Photograph above shows RFRM with optional yellow fuse puller tool. Yellow Fuse Puller (part #32013BS) tool sold separately.
3. Photograph above shows RFRM 'stuffed' with components such as fuses and relays. RFRMs are sold without components.
4. Under side of RFRM has the wire harness position labeling details molded into the part.

# Series 15310 60-Position RTMR



## Non-Bussed Rear Terminal Mini Fuse & Relay

Cooper Bussmann Transportation Products offers a power distribution module called the 60-Position Rear Terminal Mini-Fuse and Relay panel (15310 Series.) The 15310 offers the same benefits as the standard Cooper Bussmann RTMR, however, it has a higher component density. There are 60 open cavity positions versus the 50 maximum positions of the standard RTMR. This allows you to install more fuses, breakers, diodes or relays without increasing any outer dimensions! The unit is non-bussed to allow you to place components anywhere within the block. This makes the 15310 suitable for virtually any application in marine, construction, agriculture, heavy trucking, and specialty vehicle industries. With cover, cable seals and cavity plugs installed, the 15310 is a weather tight enclosure (IP66) for power distribution. (The 15310 uses the same covers and mounting as the standard RTMR.)

### RTMR Product Features

**Blade Terminals:** Accepts ATM (mini) blade fuses, circuit breakers as well as other components such as relays, diodes, flashers, etc. with 2.8mm blades on 8.1mm centerline spacing

**Mounting:** #10-32 or M5 Threaded inserts; 24 in-lbs (2.7N•m) max torque

**Material:** Housing and cover: black thermoplastic

**Labels:** Component location IDs molded on top of housing; custom laser etching inside, outside, or both.

**Ratings:** 30A max per terminal; 12/24Vdc

**Temperature Rating:** -40°C (-40°F) to 125°C (260°F) (rating on PDM only)

**Ingress Protection Rating:** IP66-IEC 529 (valid when properly installed with cover, cable seals and cavity plugs.)

**Electrical Connections:** Output cavities (holes in back of unit):

**Wire Size:** #12-#20 AWG

**Terminals:** Tyco AMP® MCP2.8 Series

20-16 AWG (0.50-1.00mm<sup>2</sup>): Terminal #1-968855-1 Seal #828904-1

14-12 AWG (1.50-2.50mm<sup>2</sup>): Terminal #1-968857-1 Seal #828905-1

**Cavity Plugs:** Tyco AMP® MCP2.8 Series #828922-1 (where output wires are not used)

### Notes:

1. Cooper Bussmann does NOT supply wires, wire terminals, terminal seals or cavity plugs.
2. Mounting brackets offered for surface mounts.
3. Consult factory for options including custom labels and replacement accessories.
4. 15310 series uses Tyco terminals vs. Delphi as commonly used with our standard RTMR series

### Part Numbering System

Series	Mounting Option	Cover Options	Marking Options
15310	□ 1 - #10-32 threaded insert 2 - M5 threaded insert	□ 0 - No Cover 1 - Fuse Cover 2 - Relay/CB Cover	( □ ) Consult factory for custom marking options

### Mounting Brackets

**B028**

**7012**

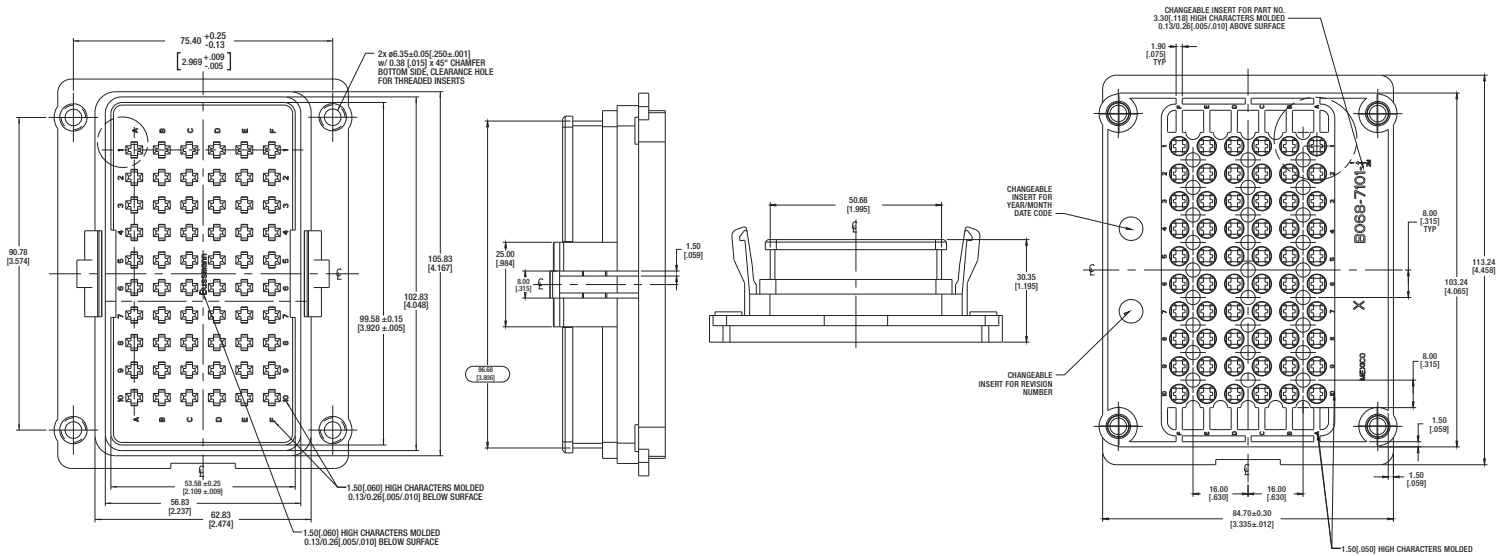
### Material

O - Plated steel  
P - Stainless steel

### Latch Position Assurance

**15300 - LP**

### Dimensions - mm(in)



# Series 15300 RTMR



## Rear Terminal Mini Fuse & Relay

The Rear Terminal Mini Fuse and Relay panel (RTMR) provides efficient power distribution in a rugged compact form for applications in marine, construction, agriculture, heavy trucking, specialty vehicles, etc. This innovative product offers a weather tight enclosure (IP66) for various MINI (2.8mm) blade components when cover, cable seals, and cavity plugs are installed. It is available with various degrees of internal electrical bussing. Additionally, custom labels and multiple hardware configurations are available to solve any application need.

### Specifications

**Input Terminal Rating:** M6 input studs on bussed/partially bussed inputs: 80A max input on bussed fuse side, 80A max input on bussed relay side.

**Output Terminal Rating:** 2.8mm blade terminals (30A max per terminal)

**Temperature Rating:** -40°C (-40°F) to 125°C (260°F) (rating on PDM only)

**Materials:** Black thermoplastic housing; Tin-plated copper internal bussing; Bright nickel-plated brass studs (on bussed versions).

**Termination:** Delphi Packard Metri-Pack® 280 Series terminals (sealed/**tangless**). \* Delphi Packard 280 Series cavity plugs are installed where wires are not used. \* Accepts #12-22 AWG wire sizes.

\*Electrical terminals, cable seals & cavity plugs are NOT supplied by Cooper Bussmann

**Torque Rating:** 50 in-lbs (5.5N•m) max.

**Mounting Torque Rating:** #10-32 or M5 threaded inserts; 24 in-lbs (2.7N•m) max torque.

**Ingress Protection Rating:** IP66-IEC 60529 (Valid when properly installed with cover, sealed terminals, and cavity plugs.)

### Options

**End Caps:** Protective silicone end caps available for studded versions.

**Mounting:** Mounting brackets available for surface-mounting RTMR. (See page 41.)

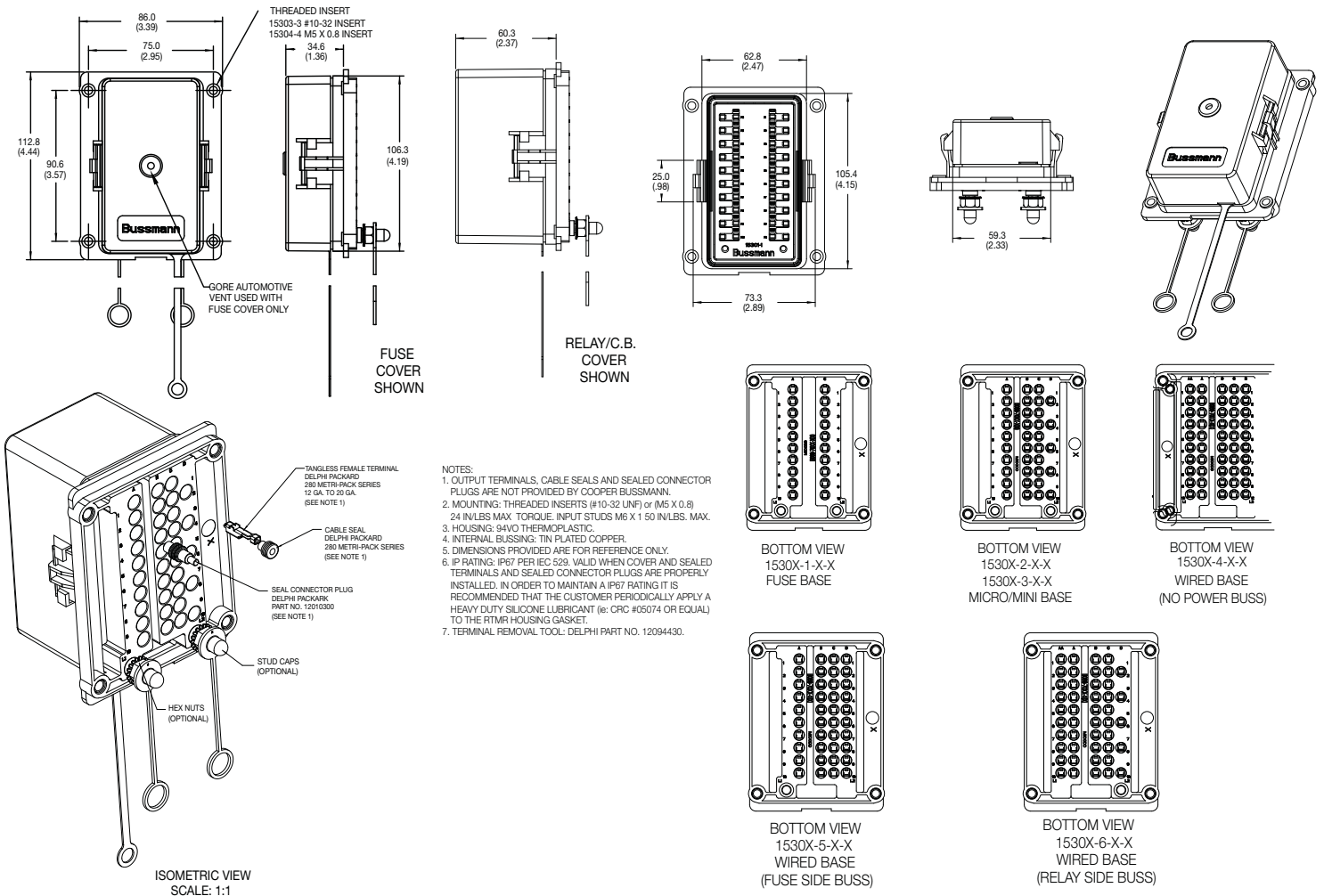
**Labels:** Consult factory for custom label options.

**Replacement Accessories:** Consult factory for available service parts.

**Cover Marking:** Laser etching on inside, outside, or both

# Series 15300 RTMR

Dimensions - mm(in) (Dims. shown are for reference only. Consult factory for latest prints)



## Part Numbering System

Series	Mounting	Base Options	Hardware Options	Cover Options	Marking Options
1530	-				
	3 - #10-32 Insert (English) 4 - M5x0.8 Insert (Metric)	1 - Fuse/C.B. Base (For 20 Fuses/C.B.) 2 - Micro Relay Base (For 5 Micro Relays W/ 10 Fuses/C.B.) 3 - Mini Relay Base (For 3 Mini Relays W/10 Fuses/C.B.) 4 - Wired Base (Non Bussed) (No Input Studs) (For Fuses/C.B. And Relays) 5 - Wired Base (Input Stud Fuse Side Only) (For Fuses/C.B. And Relays) 6 - Wired Base (Input Stud Relay Side Only) (For Fuses/C.B. And Relays) *Input stud bussed to pin 86 on relay	0 - No Nuts 1 - Nuts (Shipped Bulk) 2 - Nuts (Shipped Assembled) 3 - Stud Caps (Shipped Bulk) 4 - Stud Caps (Shipped Assembled) 5 - Nuts And Stud Caps (Shipped Bulk) 6 - Nuts And Stud Caps (Shipped Assembled)	0 - No Cover 3 - Fuse Cover 4 - Relay/c.b. Cover	Special Labels Consult Factory

RTMR Stud End Cap  
**B066 - 7008**

Mounting Brackets  
**B028 7012 -**

Material  
 O - Plated steel  
 P - Stainless steel

Latch Position Assurance  
**15300 - LP**



# Series LMG Bolt-in Fuse Holder for Multiple AMG Fuses



## Power Distribution Module

Cooper Bussmann Transportation Products now offers a heavy power distribution module called the LMG (a.k.a. “Big Block”). The LMG is used for main branch primary fusing and accepts multiple (2, 3, or 5) industry standard AMG fuses. Using a common input bus bar, the LMG requires just one input connection to power all fuses.

The Big Block provides efficient power distribution suitable for many “under the hood” applications such as:

- Marine
- Construction
- Agriculture
- Heavy Trucking
- Bus
- Specialty Vehicles

**Sizing:** 2, 3 and 5 positions available

**Ratings:** Maximum total combined rating is 300A continuous\*

**Temperature:** -40°C (-40°F) to 85°C (185°F)

**Termination:**  $\frac{5}{16}$ ”-18 or M8 studs, nuts, and lockwashers for fuse and surface mountings

**Torques:** Mounting: 100 in-lbs (11.3N•m) max; Power input/output: 120 in-lbs (13.6N•m) max

**Material:** Housing: Black UL-Rated 94V0 thermoplastic  
Cover: Red EPDM cover for protection from accidental shorts  
Studs: Plated steel

\*Based on numerous variations possible between # of LMG poles, fuses selected, input wiring, and output wiring, all applications should be tested by the installer to verify the product meets their requirements. Housing must not exceed 130 degrees C.

**Specifications**

**Hardware/Options**

**Fuse:** LMGs may be supplied with various fuse configurations (if fuses selected, then input side of fuses torqued to specification at Cooper Bussmann factory - custom part number)

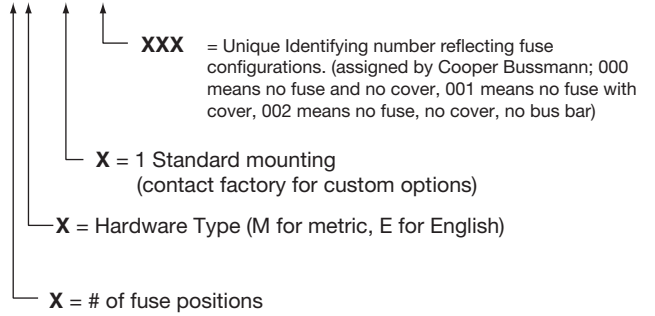
**Bus-bar:** Sized to LMG (2,3,5) plated copper power stud hardware only applies to output side of fuse. Supply side of fuses torqued to spec at factory by default (English/metric available)

**Mounting Hardware:** Installed or in bulk (English/metric available)

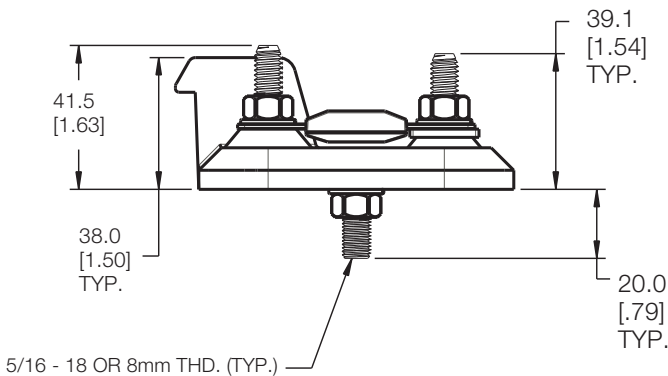
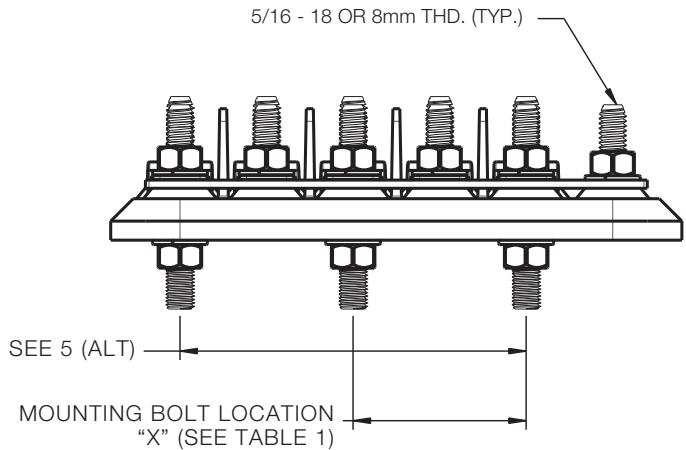
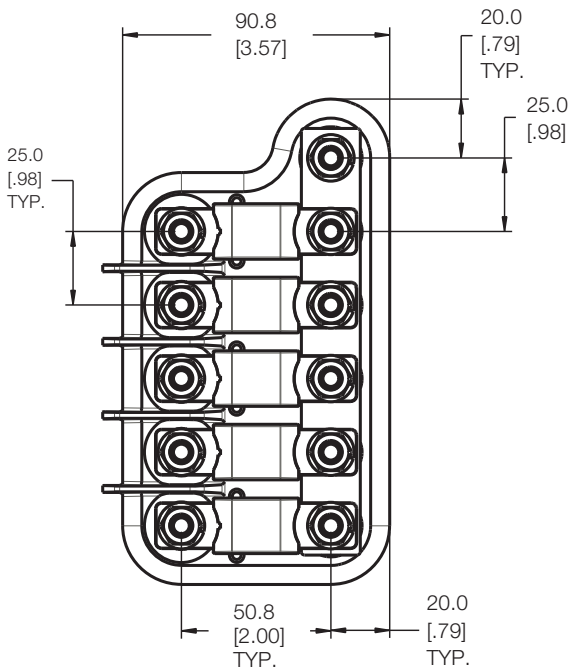
**Cover:** Installed, in bulk, or no cover. Also available in hard cover.

**Part Numbering System**

**LMG XX - X - XXX**

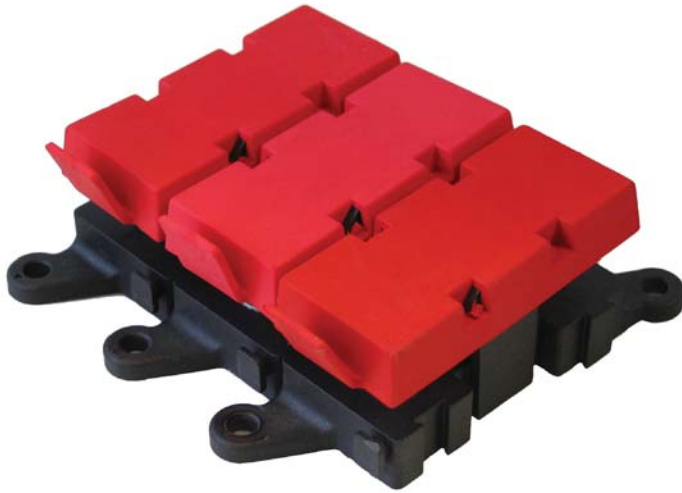


**Dimensions - mm(in)**



POLE	"X" MM
2	25
3	50
5	50
5 (ALT)	100

# LMI Bolt-in Fuse Holder for Single or Multiple AMI Fuses



## Power Distribution Module

Cooper Bussmann Transportation Products now offers a heavy duty fuse panel called the LMI "Little Block". The LMI is used for main branch primary fusing and accepts multiple (up to six) industry standard AMI fuses. Sold by component or assembled, the LMI uses a common input bus bar for assemblies of two or more fuses.

The LMI provides efficient power distribution suitable for many "under the hood" applications such as:

- **Marine**
- **Construction**
- **Agriculture**
- **Heavy Trucking**
- **Bus**
- **Specialty Vehicles**

### Specifications

**Sizing:** One Fuse Module per AMI fuse

One input module and bus bar required per LMI2 – LMI7 assembly  
Maximum of seven modules per assembly

**Ratings:** Maximum total combined rating is 400 amps continuous\*

**Temperature:** -40°C (-40°F) to 85°C (185°F)

**Termination:** Input Module: Stainless Steel M8 or  $\frac{5}{16}$ -18 stud and keps nut  
Fuse Module: Stainless Steel M5 or #10-32 studs and keps nuts

**Torques:** Mounting: 22 in-lbs (2.5 N•m)

Fuse Module: 39.8 in-lbs (4.5N•M)

Input Module: 75 in-lbs (8.5N•M)

**Material:** Housing: HTN black UL-rated 94V0 thermoplastic material

Cover: Red EPDM/Santoprene cover for protection from accidental shorts

Studs: Stainless Steel

\* Based on numerous variations possible between numbers of poles used, fuses selected, input wiring, and output wiring, all applications should be tested by installer to verify the product meets their requirements.

## Part Numbering System

LMI X -X -X -X(XXXXXX)

Up to 7 digit sequence representing each module in assembly, from left to right, with Busbar in the front/bottom, uses below code:

- 0 -- Fuse Module w/o Fuse (i.e. empty fuse module)
- 1 -- Input Module
- A -- Fuse Module w/30a AMI Fuse
- B -- Fuse Module w/40a AMI Fuse
- C -- Fuse Module w/50a AMI Fuse
- D -- Fuse Module w/60a AMI Fuse
- F -- Fuse Module w/70a AMI Fuse
- G -- Fuse Module w/80a AMI Fuse
- H -- Fuse Module w/100a AMI Fuse
- I -- Fuse Module w/125a AMI Fuse
- J -- Fuse Module w/150a AMI Fuse
- K -- Fuse Module w/175a AMI Fuse
- L -- Fuse Module w/200a AMI Fuse

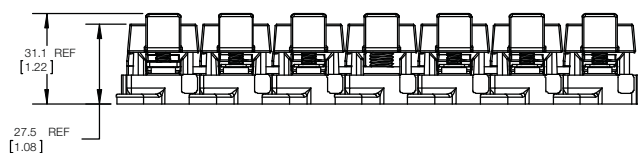
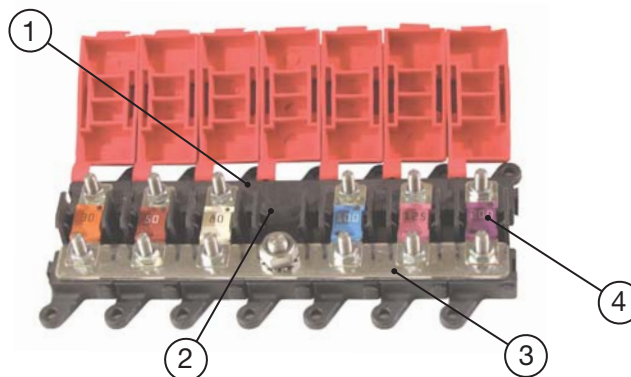
**HARDWARE OPTION:**

- 0 -- No Hardware (For individual components only)
- 1 -- SS Keps Nut In Bulk (For individual components only)
- 2 -- SS Keps Nut Installed (Only for assembled LMI2-LMI7)

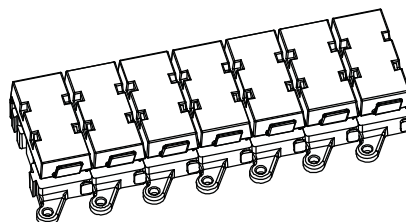
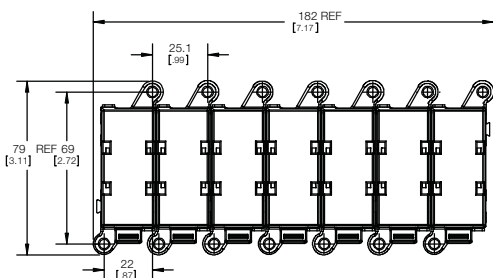
**Stud Option:**

- E -- English
- M -- Metric

1 -7 [Number of total modules (fuse modules and/or input modules); 7 Max]



LMI7



ITEM	DESCRIPTION
1	LMI FUSE MODULE
2	LMI INPUT MODULE
3	BUSBAR
4	AMI FUSE

## Notes

1. All modules (input or fuse holder) will match same units in a given assembly, either all metric or all English as specified.
2. "E" Represents "10-32" stud for fuse module and "5/16-18" for input module. "M" represents M5 stud for fuse module and M8x1.25 size for input module.
3. The largest an LMI should be is 7 modules total; 6 fuse modules and one input module. At most, 7 positions can be shown in suffix -X(XXXXXX).
4. Cooper Bussmann does not recommend more than 6 fuse modules being connected together (with one input module). **The input module should be located in the center of the assembly.**
5. Bus bars are included for all assemblies greater than or equal to an LMI2.
6. Based on numerous variations possible between numbers of poles used, fuses selected, input wiring, and output wiring, all applications should be tested by installer to verify the product meets their requirements.
7. All modules come with covers.
8. When ordering individual LMI modules for assembly by the customer, bus bars can be individually ordered using part # B109-7046-2/3/4/5/6/7, with the last digit representing the number of total modules that the bus bar will connect.
9. When ordering LMI1 with fuse and/or nuts, both fuse and nuts will ship in bulk.
10. To order assembled units, the minimum order quantity is 100 units.
11. Attach all wire cables with the ring terminals in direct contact with the fuse or bus bar.



# Series 15710 Rear Terminal ATC® Fuse Panel

Power Distribution

Fuse Panels

Series 15710



The Rear Terminal ATC® Fuse Panel (RTA) is a rear-fed panel with high component retention, which makes it an ideal choice for high vibration environments including construction, agriculture, bus, RV, heavy trucking equipment, etc. It is available in multiple lengths and internal bussing configurations. This allows for up to three separate power input circuits and 32 individual output circuits.

## Specifications

**Input Terminal Rating:** 1/4-20 stud; Quick-connect terminals provided on middle bus (Series 15713). 200A max total input for unit.

**Output Terminal Rating:** 30A max load per circuit.

**Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** Black thermoplastic.

**Termination:** Delphi Packard Pack-Con® Series 3 & 5.\* Input Wire Size: #4-6 AWG Output Wire Size: #10-16 AWG

**Torque Rating:** 50 in-lbs (5.6N•m) max.

**Mounting Torque Rating:** #10-32 threaded inserts, 24 in-lbs (2.7N•m) max torque.

## Options

**Positions:** 8-32 Circuits available.

**Split Power:** Single, dual, or triple bus options

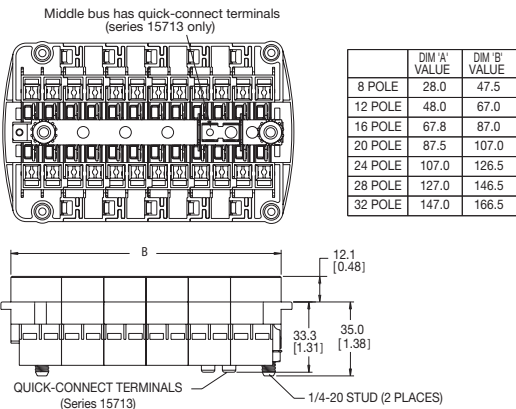
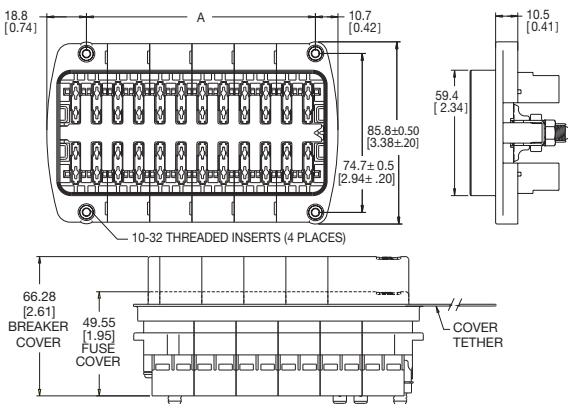
**Cover:** Splash-resistant covers available. Short cover for fuses only, and taller cover for use with circuit breakers

**Locks:** Secondary locks available for securing of output terminals (#15710-TP). (Comes in multiples of 8 positions. Must order multiple strips to cover length of selected RTA.)

**Tools:** Output terminal removal tool (#HT15710-01). Secondary lock removal tool (#HT15710-02).

\*Electrical Terminals are NOT supplied by Cooper Bussmann.

## Dimensions - mm(in)



## Part Numbering System

Series	No. of Positions	Hardware Options	Cover Option	Marking Option
1	08-32			
1571	Left Side 06-28 / Right Side 04-28 (max. tot 32) (increments of 4)			
2	Total Pos 14-32 / Left Side 06-24 (max. total of 32) (increments of 4)			
3				
1 - Single Stud, Single Supply Circuit		0 - W/O nuts	0 - No cover	A-Standard (consult factory for special marking)
2 - Double Stud, Split Supply Circuit		1 - Nuts shipped bulk	1 - w/ fuse cover	
3 - Triple Buss, Split Supply Circuit		2 - Nuts assembled	2 - w/ CB cover	

# Series 15600 ATC® Blade-Type Fuse Panels



The 15600 ATC® fuse panel is a compact, yet rugged, power distribution module. It is available in a single or dual internal buss electrical configuration featuring an optional ground pad terminal strip. The 15600 fuse panel is surface mounted, uses convenient quick-connect terminals, and is recommended as a supplemental power distribution module. It can be used to accompany main PDMs such as the Cooper Bussmann 31000/32000 Series VEC/DVEC, 15710 Series RTA, and the 1540X Series RFRM.

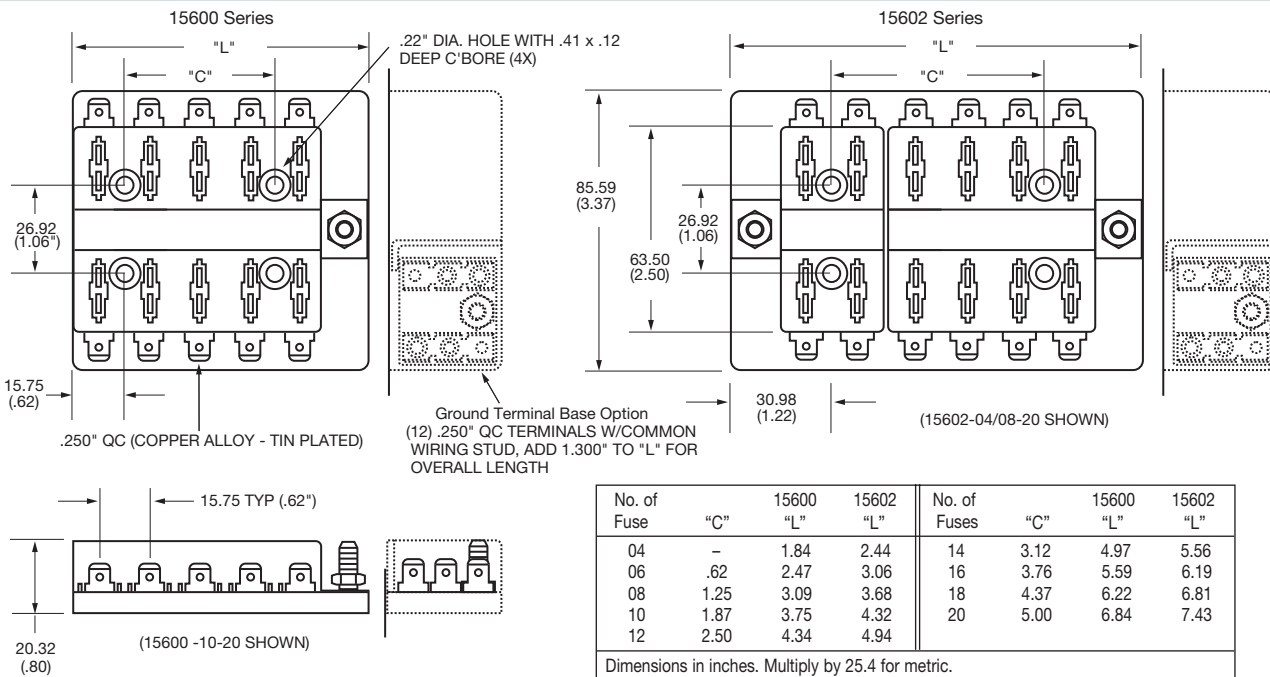
## Specifications

- Input Terminal Rating:** #10-32 Threaded studs (100A max).
- Output Terminal Rating:** 30A Max per circuit.
- Temperature Rating:** -20°F (0°C) to 150°F (65°C).
- Materials:** Black thermoplastic.
- Termination:** .250" x .032" quick-connect terminals. Ground terminal pad option available. Input wire size: #4-6 AWG. Output wire size: #12-16 AWG.
- Torque Rating:** 20 in-lbs (2.25N•m) max.
- Mounting Torque Rating:** 8 in-lbs (0.9N•m) max.

## Options

- Positions:** 4-20 circuits available.
- Split Power:** Single or dual buss options.

## Dimensions - mm(in)



## Part Numbering System

Series	No. of Fuses &/or Circuit Breaker Positions	Hardware Options	Ground Terminal Base
0	—	—	—
1560	04-20	—	—
2	—	—	—
0 - Single Stud, Single Supply Circuit	Left Side Right Side	0 - W/O nuts	0 - None
2 - Double Stud, Split Supply Circuits	04-16 04-16 (max. combination of 20)	1 - Nuts shipped bulk	1 - Include Ground Pad
		2 - Nuts assembled	

# Series 37700 PRM/PFM

Power Distribution

Fuse Holders

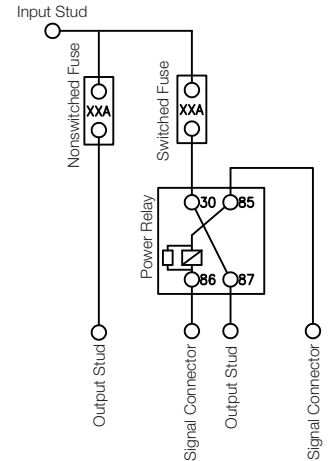
PRM / PFM



## Power Fuse Module & Power Relay Module

Cooper Bussmann offers a sealed Power Relay Module (PRM) along with an accompanying Power Fuse Module (PFM). These compact power distribution modules are designed for high current applications, and are suitable for placement in extreme moisture and high vibration environments. The PRM contains a 70A relay and two female fuse positions. One of these fuses protects the relay and the other is a single-circuit inline fuse. The PFM contains only two fuses - each a separate circuit. A silicone seal and removable cover offer a weather-tight enclosure for the fuse positions. PRMs/PFMs also feature rugged M8 power input studs. Multiple units may be connected together via a custom buss bar, or can be bussed to any of the Cooper Bussmann PDMs (i.e., 31000/32000 Series VEC/DVEC, 15300 Series RTMR, etc.)

### PRM Wiring



### Specifications

**PRM Rating:** 70A, 12Vdc steady-state relay; 24Vdc relay also available. Relay protection fuse: up to 60A; Nonswitched inline fuse: up to 60A.

**PFM Rating:** Each inline fuse rated up to 60A. **Temperature Rating:** -40°F (-40°C) to 185°F (85°C).

**Materials:** UL-Rated 94V0 thermoplastic (excluding cover); silicone seal; tin-plated copper terminals; plated steel studs.

**Input Termination:** M8 threaded stud. PRM Switching/trigger signal: Delphi Packard Metri-Pack® 150 Series; AMPSEAL® 16.\*

**Output Termination Option:** Cooper Bussmann Series 32004 sealed connector (see page 36); Accepts Delphi Packard 800 series terminals.\* Two M6 threaded studs.

**Torque Rating:** Input stud: 144 in-lbs (16.3N•m) max.; Output stud: 48 in-lbs (5.4N•m) max.

**Mounting Torque Rating:** 48 in-lbs (5.4N•m) max.

**Ingress Protection Rating:** IP66 (excluding stud connections)

**Compliances:** SAE 31171 (ignition protected)

### Options

**Mounting:** Counter rotation feature (CRF) available to prevent rotation on single bolt installations.

**Bussing:** Custom bussing available for joining multiple PRMs/PFMs. options also available for bussing PRMs/PFMs to other Cooper Bussmann power distribution modules.

**Accessories:** Buss bar, stud caps, separators, service components. Consult factory for details.

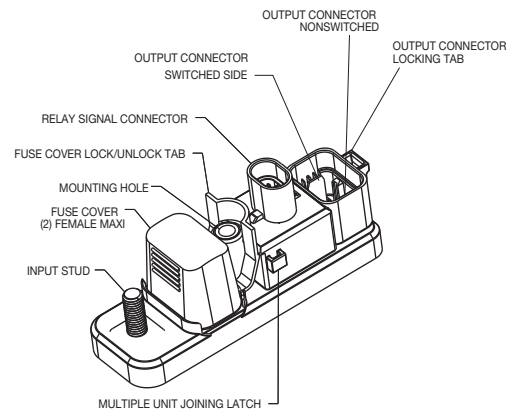
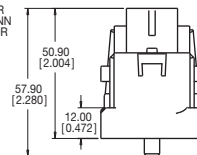
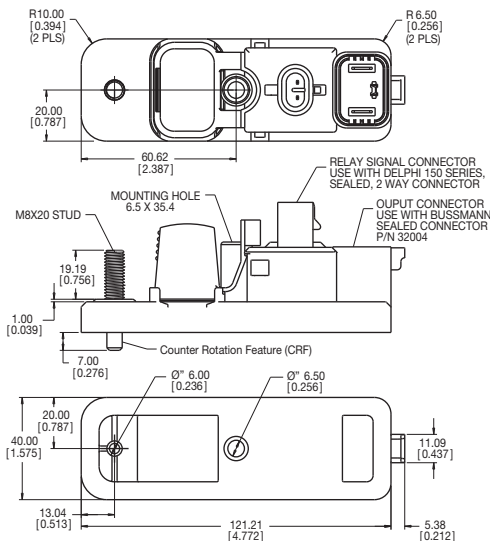
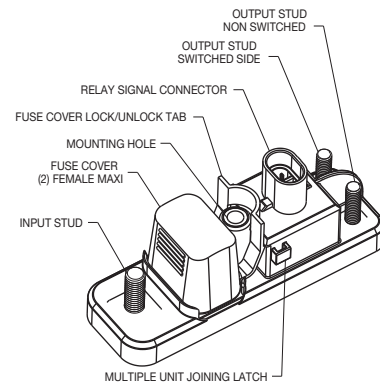
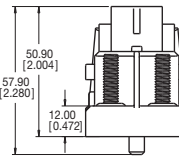
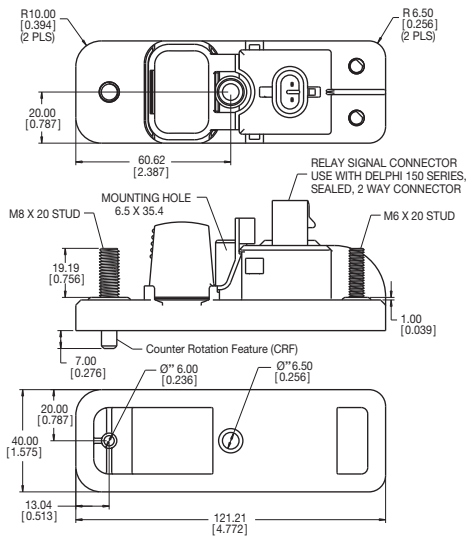
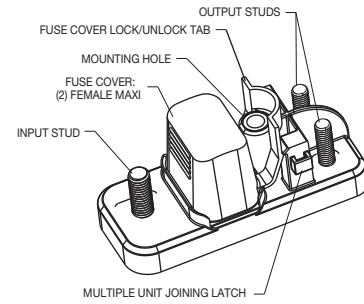
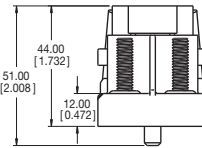
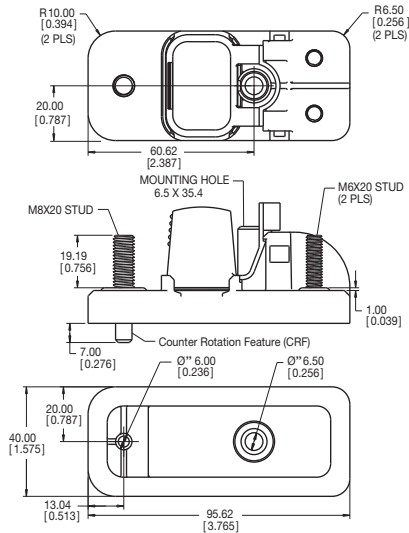
**Signal Connectors:** Delphi- PN# 12052641 (Black) & 12052644 (Grey)  
AMP- PN# 776427-1 (Red), 776427-2 (Grey), 776427-3 (Yellow) & 776427-4 (Green).

\*Electrical terminals are NOT supplied by Cooper Bussmann.

### Part Numbering System

Series/ Module Type	Output/Signal Connector Type	Signal Key (PRM only)	Output Key	Nonswitched Fuse	Switched Fuse	Cover Option	Hardware Option	Private Label
3 7 7 0 1	1	N						
PFM								
3 7 7 0 2								
12V PRM								
3 7 7 0 3								
24V PRM	*1 - Stud/Delphi 2 - Connector/Delphi 3 - Stud/AMP® 4 - Connector/AMP®	A - Black (Delphi only) B - Grey (AMP® or Delphi) C - Green (AMP® only) F - Red (AMP® only) Y - Yellow (AMP® only)	N - Stud Output (no key) A - Black B - Grey	0 - None 2 - 20 amps 3 - 30 amps 4 - 40 amps 5 - 50 amps 6 - 60 amps	0 - None 2 - 20 amps 3 - 30 amps 4 - 40 amps 5 - 50 amps 6 - 60 amps	0 - No cover 1 - Cover (bulk) 2 - Cover (installed)	0 - None 1 - Nuts (bulk) 2 - Nuts (installed) 3 - CRF 4 - CRF, nuts (bulk) 5 - CRF, nuts (installed)	X - Consult Factory

## Dimensions - mm(in) (Dims, shown are for reference only. Consult factory for latest prints)





# HMG Fuse Holder

## Automotive Bolt-In Fuse Holder for the AMG Fuse



The HMG fuse holder accepts industry standard AMG fuses for primary fusing applications. The narrow rugged body makes it ideal for demanding environments such as 'under the hood' locations in construction, agriculture, heavy trucking and specialty vehicle applications.

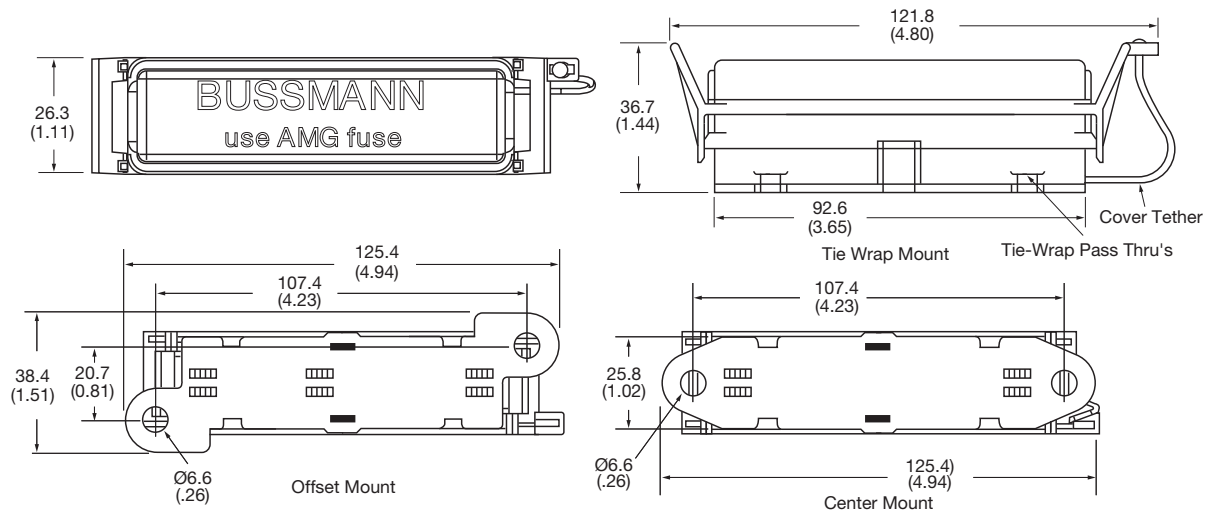
### Specifications

**Rating:** For use with AMG fuses from 100-300A. (see pg 77 for AMG fuse)  
**Temperature Rating:** -40°F (-40°C) to 260°F (125°C)  
**Materials:** Black thermoplastic with zinc-plated steel studs  
**Termination:** M8 or 5/16-18 threaded studs and hex nuts for fuse mounting.  
 Wire sizes: #8 AWG – 1/0  
**Torque Rating:** 150 in-lbs (17N•m) max  
**Mounting Torque Rating:** Optional mounting hole patterns, 44 in-lbs (5N•m) max

### Features

- Side-stackable
- Bottom side insulated from mounting panel
- Splash resistant cover

**Dimensions - mm(in)** (Dims.shown are for reference only. Consult factory for latest prints)



### Part Numbering System

Series	Base	Hardware	Style
H M G	□	□	□
	1 - Tie wrap mount 2 - Offset mounted	1 - 5/16-18 Studs w/nuts installed 2 - 5/16-18 Studs w/nuts bulk 3 - 5/16-18 Studs w/o nuts 4 - M8 x 1.25 studs w/nuts installed 5 - M8 x 1.25 studs w/nuts bulk 6 - M8 x 1.25 studs w/o nuts	0 - No cover 1 - Cover installed 2 - Cover bulk

## Full Access Automotive Bolt-In Fuse Holder for the AMG Fuse



The FMG fuse holder accepts industry standard AMG fuses for primary fusing applications. The FMG is offered with a tough elastomer cover for fuse protection, yet allows for cable input from various orientations. This fuse holder cover is available in multiple colors and lengths. Similar to the Cooper Bussmann HMG holder, the FMG is well suited for demanding environments such as 'under the hood' locations in construction, agriculture, heavy trucking and specialty vehicle applications.

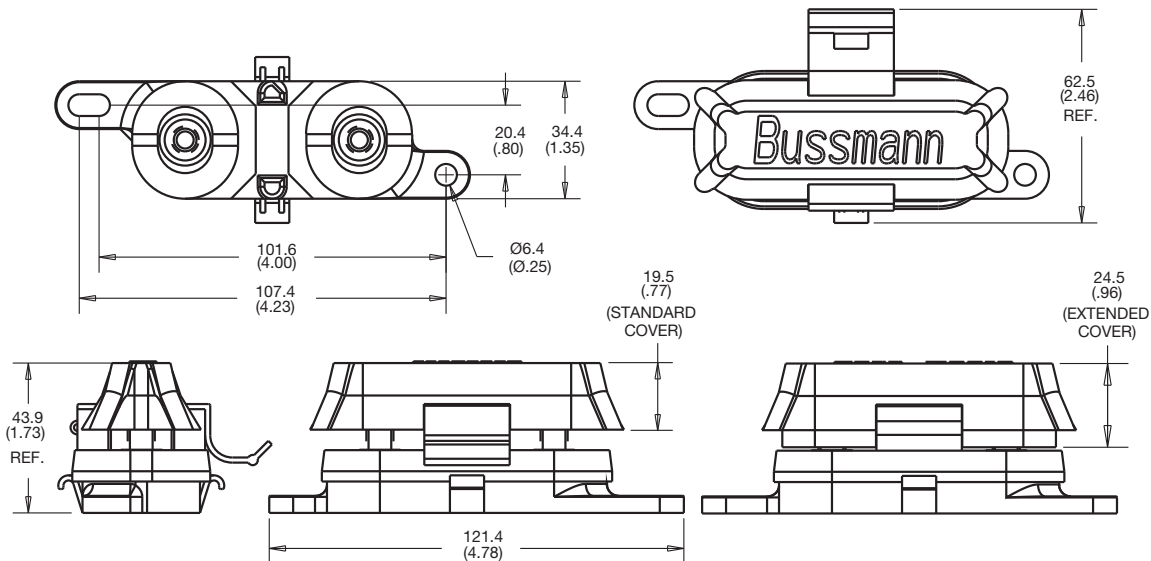
### Specifications

- Rating:** For use with AMG fuses from 100-500A. (see page 77 for AMG fuse)
- Temperature Rating:** -40°F (-40°C) to 260°F (125°C)
- Materials:** Black thermoplastic with zinc-plated steel studs; thermoplastic elastomer cover (available in black or red, in normal or extended length)
- Termination:** M8 or 5/16-18 threaded studs and hex nuts for fuse mounting
- Wire sizes:** #8 AWG - 1/0
- Torque Rating:** 120 in-lbs (13.5N•m) max
- Mounting Torque Rating:** 1/4-20 screws with washers (recommended), 44 in-lbs (5N•m) max

### Features

Full access for cables. Can be routed to studs from nearly every direction.

### Dimensions - mm(in)



### Part Numbering System

#### Series



#### Base



- 1 - M8 studs
- 2 - 5/16-18 studs
- 3 - M8x1.25 Stainless studs
- 4 - 5/16-18 UNC Stainless studs

#### Hardware



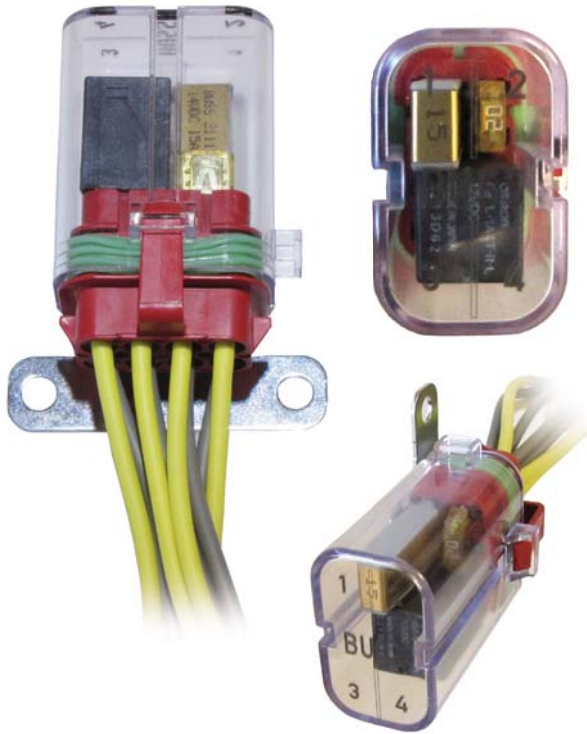
- 0 - No hardware installed
- 1 - Nuts installed
- 2 - Nuts bulk
- 3 - Stainless Nuts & Lockwashers installed
- 4 - Stainless Nuts & Lockwashers shipped bulk

#### Cover



- 0 - No cover
- 1 - Cover (black) installed
- 2 - Cover (black) bulk
- 4 - Cover (red) installed
- 5 - Cover (red) bulk
- 6 - Extended Cover (black) installed
- 7 - Extended Cover (black) bulk
- 8 - Extended Cover (red) installed
- 9 - Extended Cover (red) bulk

# CFH-XXX Connector Fuse Holder



The Connector Fuse Holder (CFH-XXX) is a small easy-to-use power distribution module which can hold up to four 280-footprint protective devices. Designed to hold relays, circuit breakers, fuses, diodes, resistors, and/or transorbs, the CFH-XXX is ready to support all of your small or last minute power distribution requirements. Options include color of connector, length of cover, and type of bracket. Tested to IP66 for ingress protection, this product can be installed wherever required to eliminate excess wiring.

## Specifications

**Temperature Rating:** -40°C TO +125°C

**Material:** **Cover:** 94V0 Clear polycarbonate

**Connector:** 94V0 Thermoplastic

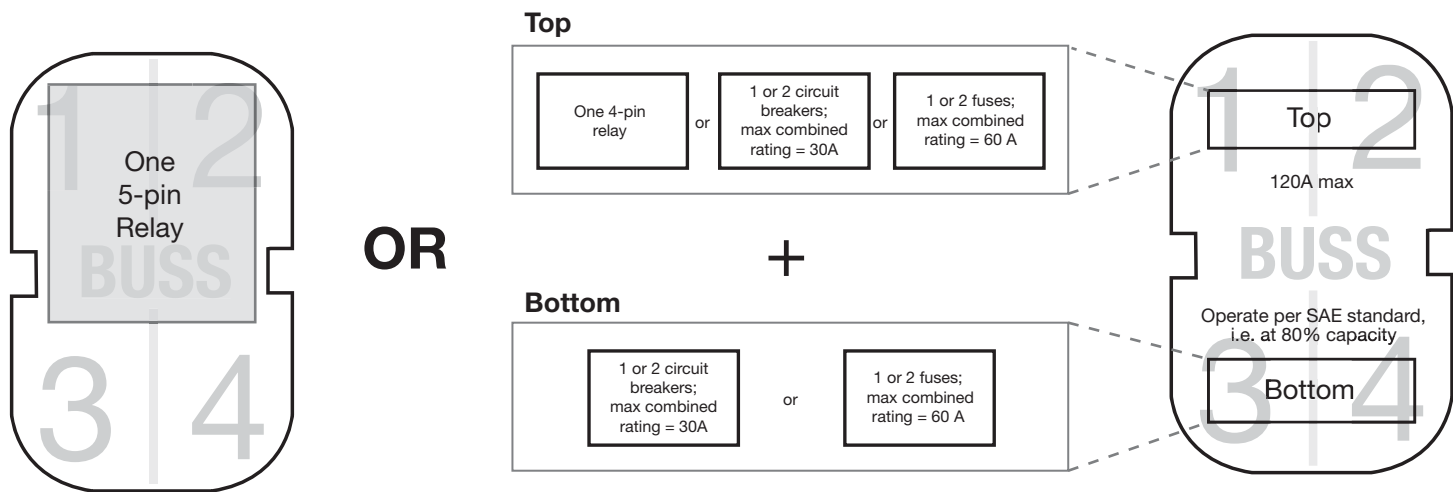
**Brackets:** Side and end – zinc plated steel w/ chromate finish

**Pin:** Zytel FR7025 94V0 plastic

**Servicable Parts:** Cover: B151-7184-S (Short) or B151-7184-L (Long)  
 Brackets: B028-7013 (side bracket); B028-7015 (end bracket); B028-7016 (pin bracket)

**Max Amperage:** The CFH is limited to a total of 100 amps maximum rating when designed under SAE guidelines. A “Maximum Amperage Guideline” diagram is shown below for clarification, with the understanding that each application should be verified prior to use.

## Max Amperage Guidelines



## Part Numbering System

<b>CFH</b>	-	<b>Color</b>	<b>Cover Option</b>	<b>Bracket Option</b>
<b>C</b>		<b>A</b> - Black	<b>L</b> - Long	<b>S</b> - Side
<b>F</b>		<b>B</b> - Gray	<b>S</b> - Short	<b>E</b> - End
<b>H</b>		<b>C</b> - Green		<b>P</b> - Pin
		<b>D</b> - Blue		
		<b>E</b> - Yellow		
		<b>F</b> - Red		
		<b>G</b> - Orange		
		<b>H</b> - Brown		

## Notes

Terminals, seals, and plugs are not included. Connector uses Delphi-Packard Metri-Pack 280 Series Metri-Pack sealed/Tang style terminals, seals, and plugs.

## Inline Fuse Holders for Blade-Type Fuses

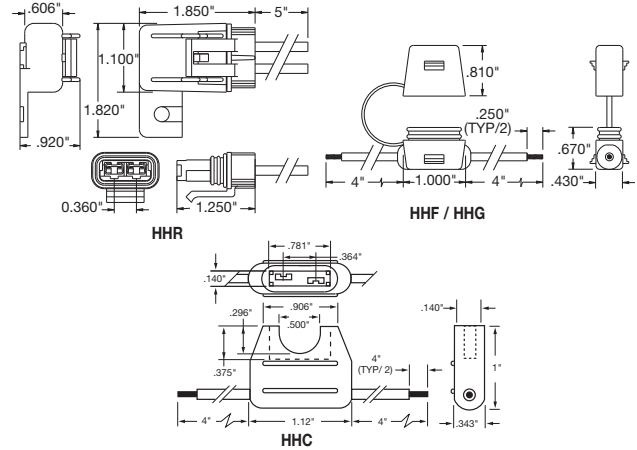
### HHC, HHD, HHF, HHG, HHR and HHS (For ATC® Fuse)

#### Inline Fuse Holders for ATC® Blade-Type Fuses

**Rating:** 32V, See table for max. amp.  
 "Write-in" space for circuit identification on HHC holder.  
 Plastic cover fits only HHD holder. HHR holder has a locking cover and mounting hole. HHS is a self-stripping holder.



#### Dimensions - in



Multiply by 25.4 for metric. (Dims. Shown are for reference only. Contact factory for latest prints)

#### ATC® Blade Type Holder

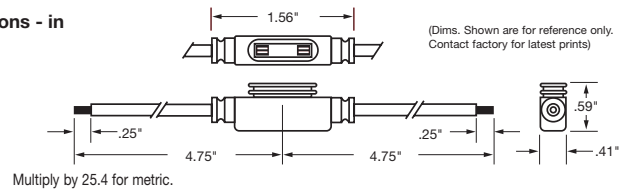
Catalog No.	Description	Fuse Size	Electrical Connection
HHC	Yellow fuseholder (body only)	1-20A	# AWG lead black wire
HHF	Black fuseholder w/cover	1-20A	#16 AWG lead yellow wire
HHG	Black fuseholder w/cover	1-30A	#12 AWG lead yellow wire
HHR	Flak waterproof fuseholder w/locking cover & mounting hole	1-30A	#12 AWG lead orange wire 5" length
HHS	Blue Fuse holder	1-20A	Self-stripping; accepts #18-#14 AWG copper wire only

### HHL and HHM (For ATM Fuse)

In-Line Fuseholders for ATM MINI® Fuses.  
**Rating:** 32V, See table for max. amp.  
 Body material withstands high temps. Protective cover has removable straps.



#### Dimensions - in



Multiply by 25.4 for metric.

#### MINI Fuse Blade Type Holder

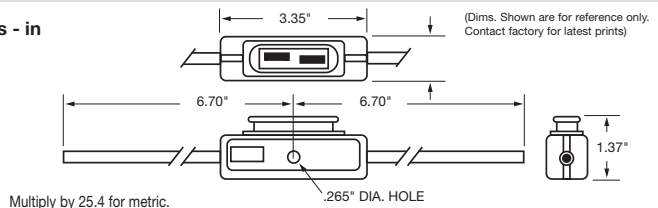
Catalog No.	Description	Fuse Size	Electrical Connection
HHL	Fuseholder w/cover	2-20A	#16 AWG lead black wire; 4" length
HHL-B	Body only		
HHM	Fuseholder w/cover	2-30A	#12 AWG lead red wire; 4" length
HHM-B	Body only		
HHM-C	Cover only		

### HHX (For MAXI® Fuse)

In-Line Fuseholder for MAXI™ Fuses.  
**Rating:** 32V, 60A Max. Firewall mounting hole permits two or more holders to be mounted together. Cover comes with a removable strap.



#### Dimensions - in



Multiply by 25.4 for metric.

#### MAXI® Fuse Blade Type Holder

Catalog No.	Description	Fuse Size	Electrical Connection
HHX	Fuseholder w/cover	20-60 amps	#6 AWG lead wire; 5" length
HHX-B	Body only		
HHX-C	Cover only		



# GB3000-XX: Pass-Thru Distribution Block

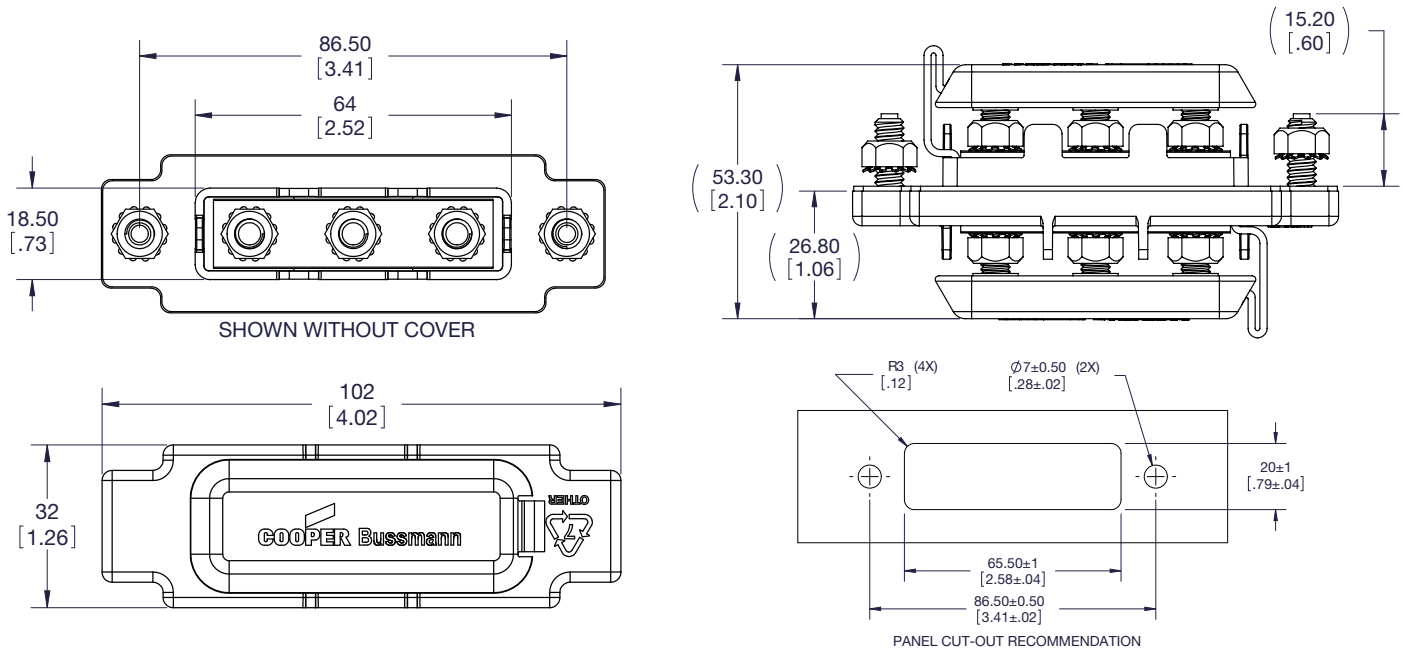


The GB3000-XX Pass-thru Distribution Block allows one ground or power device to meet multiple ground/power requirements in both the cab and engine compartment of your vehicle. Using high quality materials, this capable unit provides three pass-thru M6 studs for easy cable attachment in both locations. Installation is easy, as the two outside M6 studs are solely designed to securely attach the unit permanently. A gasket is included for ingress protection. Designed to meet all your ground/power needs, the GB3000-XX provides robust connections, eliminates the need to stack cables and reduces associated warranty claims based on affiliated problems. The GB3000-XX also provides power distribution suitable for many feed thru applications in marine, construction, agriculture, bus, military, RV and specialty vehicles.

## Specifications

- Current:** 200A Max
- Temperature Rating:** -40°C to +85°C
- Torque:** M6 Stud 50 in-lbs (5.6 N•m) max  
M6 Mounting 50 in-lbs (5.6 N•m) max
- Termination:** M6 nuts
- Material:** *Housing:* Black UL-rated 94V0 thermoplastic  
*Cover:* Black or red santoprene cover (rated 94V0) for protection from accidental shorts
- Current Carrying Studs:* Zinc-plated brass
- Mounting Studs:* Stainless steel
- Gasket:* Black santoprene gasket rated 94V0
- RoHS Compliant:* Yes
- Servicable Parts:** *Cover:* B151-7192  
*Busbar:* B109-7050

## Dimensions - mm(in)



## Part Numbering System

<b>GB3000</b> 0 - Ground Block 1 - Pass Thru Block	- Option 0 - No Nut 1 - Nuts in Bulk	[ ] Cover Color R - Red Cover B - Black Cover	( [ ] ) Marking Options Consult factory for special labels
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# Single Stud Type Junction Blocks

## Specifications

**Applications:** Heavy-duty ground or power connection points in AC or DC circuits. Feed thru or stand alone mount options available for transformers, communication and computer power sections along with various vehicle electrical systems.

**Mounting Torque Rating:** 48 in-lbs (5.4N•m) max.

## Features

Modular design offers design and manufacturing flexibility.

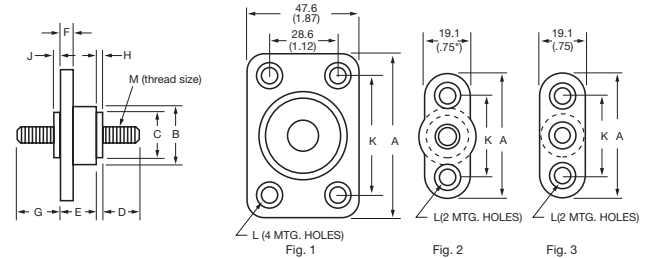
## Suggested Max. Termination Ratings

Thread/Stud Size	Amperages
#10	50 amps
#1/4 & M6	100 amps
#5/16	200 amps
#3/8	250 amps
#1/2	400 amps



(Dims. shown are for reference only. Consult factory for latest prints)

## Dimensions - mm(in)



Part	Fig.	A	B	C	D	E	F	G	H	J	K	L	M	Max. Torque (in-lbs)	Material	Color
C1925*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	1/2-13	300	Thermoplastic / Zinc-plated Brass	Red
C1925B*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	1/2-13	300	Thermoplastic / Zinc-plated Brass	Black
C1925-1*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	1/2-13	300	Thermoplastic / Tin-plated Brass	Red
C1925-1B*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	1/2-13	300	Thermoplastic / Tin-plated Brass	Black
C1925-2*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	3/8-16	150	Thermoplastic / Tin-plated Brass	Red
C1925-2B*	1	2.75 (69.8)	1.5 (38.1)	1.25 (31.7)	1.25 (31.7)	1.12 (28.6)	.37 (9.5)	1.12 (28.6)	.19 (4.8)	.19 (4.8)	2.0 (50.8)	.22 dia. w/.44 dia. C'bore x .16 deep	3/8-16	150	Thermoplastic / Tin-plated Brass	Black
C1933	1	2.75 (69.8)	1.44 (36.6)	1.25 (31.7)	1.5 (38.1)	1.12 (28.6)	.37 (9.5)	None	.19 (4.8)	None	2.0 (50.8)	.22 dia.	1/2-13	300	Thermoplastic / Zinc-plated Brass	Black
C1933-1	1	2.75 (69.8)	1.44 (36.3)	1.25 (31.7)	1.5 (38.1)	1.12 (28.6)	.37 (9.5)	None	.19 (4.8)	None	2.0 (50.8)	.22 dia.	5/16-18	75	Thermoplastic / Zinc-plated Brass	Black
C1938*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.87 (22.2)	.69 (17.5)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	200	Thermoplastic / Zinc-plated Brass	Black
C1938R*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.87 (22.2)	.69 (17.5)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	200	Thermoplastic / Zinc-plated Brass	Red
C1938-1*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.87 (22.2)	.69 (17.5)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	5/16-18	100	Thermoplastic / Tin-plated Brass	Black
C1938-1R*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.87 (22.2)	.69 (17.5)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	5/16-18	100	Thermoplastic / Tin-plated Brass	Red
C2791*	3	2.06 (52.4)	.69 (17.5)	.44 (11.2)	.62 (15.9)	.69 (17.5)	.31 (7.9)	.69 (17.5)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	1/4-20	30	Thermoplastic / Zinc-plated Brass	Black
C2791-R*	3	2.06 (52.4)	.69 (17.5)	.44 (11.2)	.62 (15.9)	.69 (17.5)	.31 (7.9)	.69 (17.5)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	1/4-20	30	Thermoplastic / Zinc-plated Brass	Red
C2909*	3	2.06 (52.4)	.69 (17.5)	.44 (11.2)	.62 (15.9)	1.0 (25.4)	.31 (7.9)	.69 (17.5)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	10-32	24	Thermoplastic / Zinc-plated Brass	Black
C2909-1*	3	2.06 (52.4)	.69 (17.5)	.44 (11.2)	.62 (15.9)	1.0 (25.4)	.31 (7.9)	.69 (17.5)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	1/4-20	30	Thermoplastic / Zinc-plated Brass	Black
C4044*	2	2.06 (52.4)	.87 (22.2)	.62 (15.9)	.62 (15.9)	1.12 (28.6)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Zinc-plated Brass	Black
C4044-1*	2	2.06 (52.4)	.87 (22.2)	.62 (15.9)	.62 (15.9)	1.12 (28.6)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Tin-plated Brass	Black
C4044-1R*	2	2.06 (52.4)	.87 (22.2)	.62 (15.9)	.62 (15.9)	1.12 (28.6)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Tin-plated Brass	Red
C5898*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.87 (22.2)	.69 (17.5)	.31 (7.9)	.94 (23.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Zinc-plated Brass	Red
C6344-2	2	2.06 (52.4)	.87 (22.2)	.62 (15.9)	.62 (15.9)	1.12 (28.6)	.31 (7.9)	None	.06 (1.6)	None	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	1/2-20	150	Thermoplastic / Zinc-plated Steel	Black
C7018*	3	2.06 (52.4)	.69 (17.5)	.44 (11.2)	.47 (11.9)	.69 (17.5)	.31 (7.9)	.53 (13.5)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	M6	55	Thermoplastic / Zinc-plated Steel	Black
C7020*	2	2.06 (52.4)	.94 (23.8)	.69 (17.5)	.88 (22.2)	.69 (17.5)	.31 (8.0)	1.25 (31.8)	.06 (1.6)	.06 (1.6)	1.31 (33.3)	.22 dia. w/.41 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Zinc-plated Brass	Red
JB3816-2	2	2.12 (54.0)	.98 (24.9)	.62 (15.9)	.87 (22.2)	.69 (17.5)	.31 (7.9)	None	.06 (1.6)	None	1.37 (34.9)	.22 dia. w/.37 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Zinc-plated Steel	Black
JB3816-3	2	2.12 (54.0)	.98 (24.9)	.62 (15.9)	.87 (22.2)	.69 (17.5)	.31 (7.9)	None	.06 (1.6)	None	1.37 (34.9)	.22 dia. w/.37 dia. C'bore x .14 deep	3/8-16	150	Thermoplastic / Zinc-plated Steel	Red

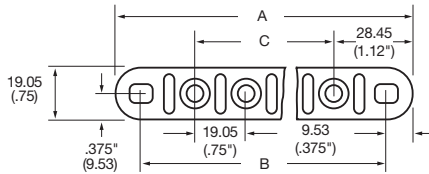
\*Feed-thru Options - Nuts & washers; consult factory.

# Multiple Stud Type Junction Blocks (Non Feed-Thru)

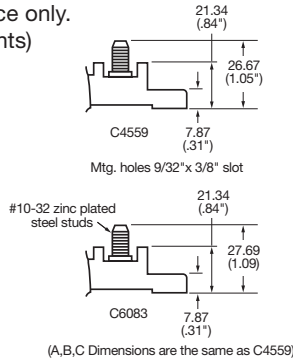
## Series C4559 & C6083



**Dimensions - mm(in)** (Dims. shown are for reference only. Consult factory for latest prints)



Other series available with .750" centers:



(A,B,C Dimensions are the same as C4559)

### Specifications

**Rating:** 30A, 600V  
**Temperature Rating:** 250°F (120°C)  
**Materials:** Black thermoplastic with zinc-plated steel studs  
**Termination:** #10-24 Threaded studs on .750" centers. Studs feature a "dog point" to guide nut onto thread  
**Torque Rating:** 25 in-lbs (2.8N•m) max  
**Mounting Torque Rating:** 24 in-lbs (2.7N•m) max

### Options

**Positions:** 2-16 positions available.

### Features

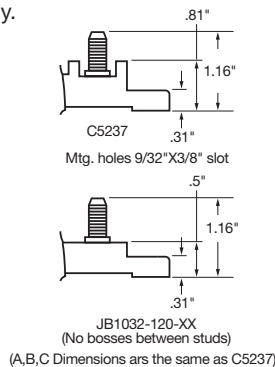
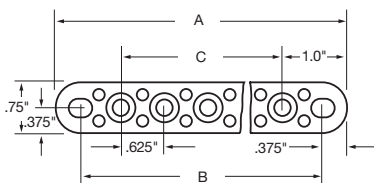
Numbers and arrows molded on top of barriers indicate terminals.  
**Compliances:** E248514; UL/CSA; CE Certified

Part No.	A	B	C
C4559-2	3.00 (76.2)	2.25 (57.1)	0.75 (19.0)
C4559-3	3.75 (95.2)	3.00 (76.2)	1.50 (38.1)
C4559-4	4.50 (114.3)	3.75 (95.2)	2.25 (57.1)
C4559-5	5.25 (133.3)	4.50 (114.3)	3.00 (76.2)
C4559-6	6.00 (152.4)	5.25 (133.3)	3.75 (95.2)
C4559-7	6.75 (171.4)	6.00 (152.4)	4.50 (114.3)
C4559-8	7.50 (190.5)	6.75 (171.4)	5.25 (133.3)
C4559-9	8.25 (209.5)	7.50 (190.5)	6.00 (152.4)
C4559-10	9.00 (228.6)	8.25 (209.5)	6.75 (171.4)
C4559-11	9.75 (247.6)	9.00 (228.6)	7.50 (190.5)
C4559-12	10.50 (266.7)	9.75 (247.6)	8.25 (209.5)
C4559-13	11.25 (285.7)	10.50 (266.7)	9.00 (228.6)
C4559-14	12.00 (308.4)	11.25 (285.7)	9.75 (247.6)
C4559-15	12.75 (323.8)	12.00 (308.4)	10.50 (266.7)
C4559-16	13.50 (342.9)	12.75 (323.8)	11.25 (285.7)

## Series C5237 & JB1032



**Dimensions - in** (Dims. shown are for reference only. Consult factory for latest prints)



(A,B,C Dimensions are the same as C5237)

### Specifications

**Rating:** UL: 30A, 300V; CSA: 30A, 600V  
**Temperature Rating:** 250°F (120°C)  
**Materials:** Black thermoplastic with yellow zinc-plated brass studs  
**Termination:** #10-32 Threaded studs on .625" centers. Studs feature a "dog point" to guide nut onto thread  
**Torque Rating:** 25 in-lbs (2.8N•m) max  
**Mounting Torque Rating:** 24 in-lbs (2.7N•m) max

### Options

**Positions:** 1-15 positions available

### Features

Numbers and arrows molded on top of barriers indicate terminals.  
**Compliances:** UL/CSA; CE Certified

Part No.	A	B	C
C5237-1	2.00 (50.8)	1.25 (31.7)	-
C5237-2	2.62 (66.7)	1.87 (47.5)	.625 (15.9)
C5237-3	3.25 (82.5)	2.50 (63.4)	1.25 (31.7)
C5237-4	3.87 (98.4)	3.12 (79.4)	1.87 (47.5)
C5237-5	4.50 (114.3)	3.75 (95.2)	2.50 (63.4)
C5237-6	5.12 (130.8)	4.37 (111.1)	3.12 (79.4)
C5237-7	5.75 (146.0)	5.00 (127.0)	3.75 (95.2)
C5237-8	6.37 (161.9)	5.62 (142.9)	4.37 (111.1)
C5237-9	7.00 (177.8)	6.25 (158.7)	5.00 (127.0)
C5237-10	7.62 (193.7)	6.87 (174.6)	5.62 (142.9)
C5237-11	8.25 (209.5)	7.50 (190.5)	6.25 (158.7)
C5237-12	8.87 (225.4)	8.12 (206.4)	6.87 (174.6)
C5237-13	9.50 (241.3)	8.75 (222.2)	7.50 (190.5)
C5237-14	10.12 (257.2)	9.37 (238.1)	8.12 (206.4)
C5237-15	10.75 (273.0)	10.00 (254.0)	8.75 (222.2)





# Basic Overcurrent Technology

Overcurrent devices may serve several purposes in electrical circuits:

- To protect components, equipment, and associated wiring from the effects of electric circuit overloads and/or short-circuits.
- To isolate branch circuits from the main power supply once an overload or short circuit has occurred. Fuses and circuit breakers are commonly selected as the preferred overcurrent device.

## Options

An overcurrent device is constructed to react in a prescribed fashion to varying levels of electrical current, where at pre-determined levels, the device provides interruption of the current flow through it. Any current that exceeds the ampere rating of the fuse or circuit breaker is an overcurrent. Overcurrents are generally classified as either short circuits or overloads and are defined as follows:

**Short-circuit** - a current that greatly exceeds the rating of the device. It is caused when a malfunction or accident creates a break in the normal path allowing electricity to flow directly to ground or another phase. This shorter current path bypasses the resistance offered by the circuit components and the load connected in the normal current path. In this situation there is little resistance to impede the current and the current will build to a level where the heat generated can cause insulation damage and/or equipment breakdown.

**Overload** - an overcurrent that is within the normal current path. Overloads occur when the current exceeds the value for which the equipment or associated wiring is rated. This typically occurs when too many devices are connected to the circuit or when a device connected to the circuit malfunctions. Overloads are also caused by harmless temporary surge currents; such as when motors are started. These overload currents are normal, usually brief in duration, and have no harmful effect on the circuit components. (It is important that protective devices do not react to such overloads.) Sustained overloads, however, may slowly cause overheating of the wiring and the components. Provided the overload is of sufficient magnitude and duration to activate the device, the circuit protection device shall open before the overload induces system component failures.

## Selecting Overcurrent Protection

During normal conditions, an overcurrent protection device must carry the current without nuisance openings. However, when an overload or short circuit occurs the device interrupts the overcurrent and withstands the voltage across the device. To properly select an overcurrent device the following items must be carefully considered:

- **Voltage Rating** - represents the maximum system voltage present in the circuit in which the overcurrent device is installed. The system voltage should not exceed this value for proper operation of the device during an overcurrent event.
- **Current Rating** - the amperage value marked on the circuit protection

device. The circuit protection device is designed to handle this value under steady operating conditions and at room ambient temperatures. Since field applications often deliver loading conditions and ambient temperatures that vary from ideal nominal settings, it is recommended that circuit designers select device ratings above the nominal circuit current continuous load to prevent nuisance trips. Additionally, the continuous current flowing through the overcurrent protective device should not be more than 80% of the current rating.

- **Characteristics of Equipment to be Protected** - during the operation of protected equipment, system current can significantly vary. This is particularly evident when motor or other inductive loads in the circuit cause large current surges during start-up. Circuit protection designers should be aware of these surges and/or in-rush characteristics and select the overcurrent protection devices accordingly.

- **Available Short-Circuit Current** - during a fault or short circuit condition the fuse or circuit breaker may see a large amount of current. Large DC battery supplies and high current rated electric distribution buses often have this potential for severe short circuits. In these situations, the circuit protection device should have an interrupting rating that is equal to or less than the short circuit current that can be delivered.

- **Ambient Temperature** - the time it takes to interrupt the current is dependent upon the ambient current temperature characteristics. Ambient temperature refers to the temperature of the air immediately surrounding the circuit protection device. The ambient temperature around the fuse or circuit breaker can be appreciably different than the outside room or larger enclosure containing the device. This can occur when the device is contained in a tight area or it is mounted in or near a heat-producing component such as a transformer or resistor. When selecting a fuse or circuit breaker at ambient temperatures significantly different from the stated nominal temperature, the circuit designer should adjust the selected overcurrent protection rating based on the published temperature re-rating curves.

## Overcurrent Protection Devices

Two categories of overcurrent devices are available.

### Fuses

The key component of a fuse is the "element", a short piece of metallic wire or link made of a material with a relatively low and predictable melting point. Fuses are current-sensitive devices and the resistance is so low that they simply act as a conductor. Circuit protection is provided when the fuse element melts and interrupts an overcurrent. The key criteria used to judge the performance of a fuse is the time-versus-current characteristic curve. This curve can be used to match the fuse with the load. Fuses may be preferred when fast response to a short circuit condition is required or when high available short circuit currents occur. Fuse characteristic curves can be used to carefully size the device to a critical or special application.

## Thermal Circuit Breakers

The basic components of a thermal circuit breaker are the thermal alloy element, electrical contacts, and the terminals for external connections. When an overload occurs, heat is generated as the current flows through the thermal alloy element causing it to deflect and separate the electrical contacts, interrupting current flow. An important parameter used to judge the performance of a thermal circuit breaker is the time-versus-current characteristic curve, which is similar to that of a fuse. A thermal circuit breaker is generally not a one-event type device as is a fuse. The resettable features of circuit breakers are often found attractive for use in electrical circuits where non-resetting interruption of current flow is undesirable. ***It is important to note that cycle life of a thermal circuit breaker is impacted both by the operational characteristic of the circuit breaker as well as the relative magnitude and duration of overcurrents or short circuits that the device experiences.*** There are different operational characteristics of **Cooper Bussmann** thermal circuit breakers, which are described below.

### Circuit Breaker Operational Characteristics

Four different methods for reset are generally available:

**Type I (automatic reset):** the circuit breaker trips and resets in response to the overcurrent condition in a repetitive fashion. This version should be used in applications that provide for other self-limiting or non-resettable means (such as after a main fuse, main manual-reset circuit breaker, or momentary switch). These devices, while automatic in reset function, are not designed for long-term cycling conditions in applications where operator awareness of circuit fault or serviceability access is limited, leading to unsatisfactory failure events. Refer to SAE J553 or J1625 for additional details.

**Type II (modified reset):** the circuit breaker contains an additional resistive component that enables the device to have only brief trip and reset activity and then afterwards maintains an open circuit condition (except for a low milliamp draw through the resistor). Requires minimum voltage/current to maintain open circuit - see standards for details SAEJ553.

**Type III (manual reset):** the circuit breaker will trip in response to an overcurrent condition after which a reset button or lever extends externally to indicate that the breaker has tripped and is in a non-conducting state. The trip indicator button or lever must be manually activated to return the device to normal operation.

**Type III (switchable):** same as the manual Type III manual reset with the additional feature of allowing the user to open the circuit using an externally accessible trip mechanism.

## Circuit Breaker Application Notes

**Circuit Breaker Performance** - Cooper Bussmann thermal circuit breakers are designed to conform to relevant industry standards (refer to individual models for standard references). There are specific performance aspects that may not always make circuit breakers suitable for certain applications, especially in circuits that are incapable of providing enough current to operate the circuit breaker in a timely manner relative to the associated components and wiring. It is of utmost importance that the circuit designer investigates components that have finite overload capabilities which are below the time-current levels to initiate timely circuit breaker activation.

**Evaluation** - Design-in situations require that the user considers all application conditions and conducts operational testing to establish the correctness of ampere/voltage rating as well as overload protection suitability. Further review of industry standards is advised to understand all performance aspects that affect usage.

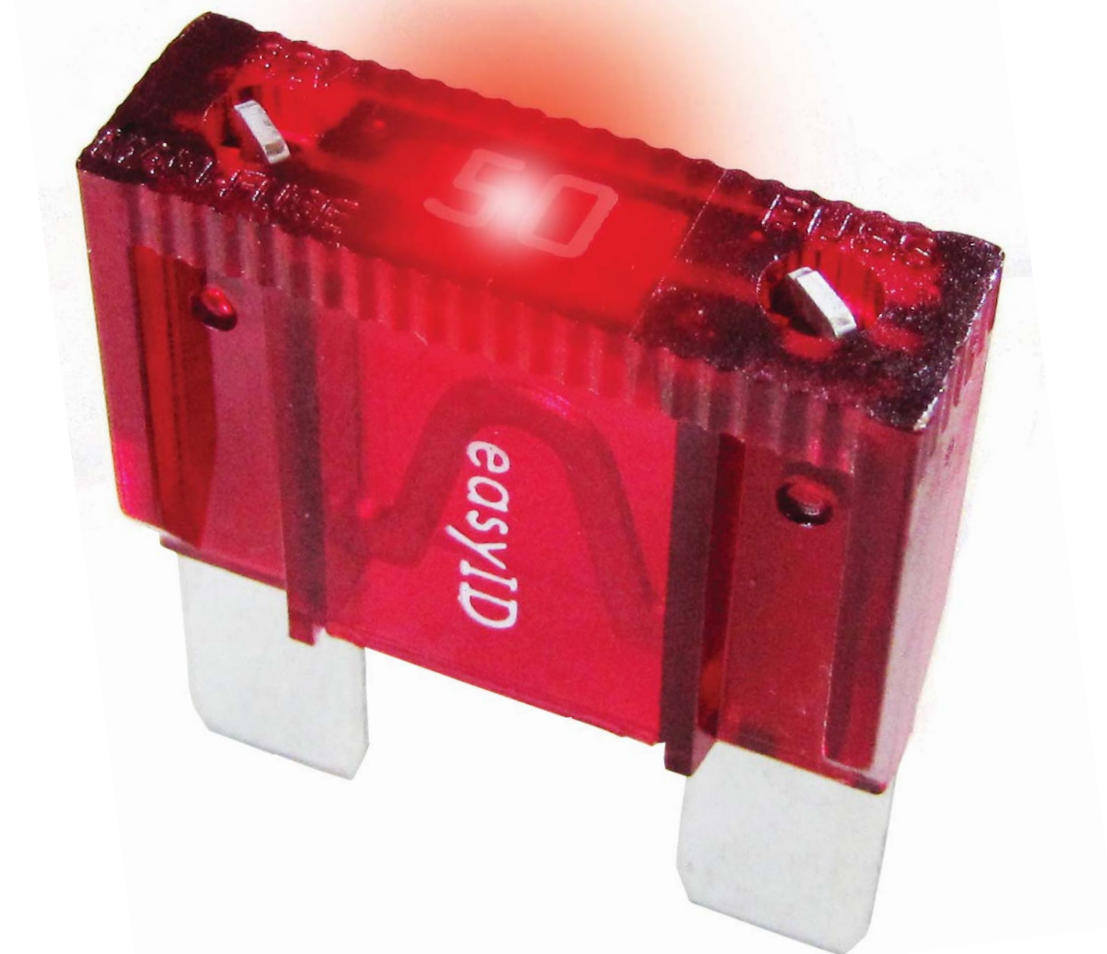
**Wiring Considerations** - Additional evaluation of circuit conditions is essential to achieve proper matching of wire sizes to the current load conditions anticipated under normal operating conditions, and estimated abnormal operating conditions when overloads could occur. Thermal circuit breakers and fuses introduce some level of resistance to the current path where installed. These factors should also be considered when choosing wire, both in gauge as well as in temperature rating of insulation.

**Installation Environment** - Thermal circuit breakers are produced in various configurations. Installation environmental conditions need to be considered and compared to the capability of the particular product of choice. Not all circuit breaker designs are suitable for harsh conditions, such as may be encountered underhood or external cavities.

# easyID™ Illuminating Blade Fuses & Fuse Holders

Circuit Protection

easyID™



## Finding Open Blade Fuses Is Now as easyID™

With the New Family of Cooper Bussmann® easyID™ Illuminating Blade Fuses and Fuse Holders

Now, a drop-in replacement is available for low-voltage applications up to 100 amps that can benefit from open fuse indication. The Cooper Bussmann line of easyID™ illuminating blade fuses and holders use Light Emitting Diode (LED) technology to show that a fuse has opened, making them easy to spot in fuse panels tucked up under darkdashboards.

### Popular Sizes and Ratings

The ATM (3-30A), ATC® (3-40A) and Maxi® (20-100A) cover the most common replacement fuse needs.

### Inline Fuse Holders

Illuminating fuse holders with easyID™ use regular ATM and ATC blade fuses and feature a red LED that glows when the fuse opens.

### Universal Color Coding

The ATM, ATC® and Maxi® fuses all use the same universal color-coding as traditional non-illuminating fuses, making it easier to match up an indicating replacement for an open fuse.

### Value Packs, Assortment and Service Kits

Provide popular packaging options to maximize retail sales. See next page for details.

# easyID™ Illuminating Blade Fuses & Fuse Holders

## easyID™ ATM Illuminating Blade Fuses

Following on the popularity and wide application of ATM fuses for late-model OEM vehicles, the easy ID illuminating ATM fuse line is available in popular ATM amp ratings with packaging that's designed for easy retail selling.

### ATM-ID-SK Service Kit

Contains six each of 5, 10, 15, 20, 25 and 30 amp easy ID illuminating ATM fuses. Ideal for fleet maintenance departments.



Part No.	Amp Rating	Color
BK-ATM-3ID	3	Violet
BK-ATM-5ID	5	Tan
BK-ATM-7-1-2ID	7.5	Brown
BK-ATM-10ID	10	Red
BK-ATM-15ID	15	Lt. Blue
BK-ATM-20ID	20	Yellow
BK-ATM-25ID	25	Natural
BK-ATM-30ID	30	Green

## easyID™ ATC Illuminating Blade Fuses

Introduced in the late '70s, ATC blade fuses are widely used by automotive OEMs. With a large installed base, the Cooper Bussmann® ATC easy ID illuminating fuse line has great selling potential with popular ATC amp ratings in packaging that's designed for easy retail selling.

### ATC-ID-SK Service Kit

Contains seven each of 5, 10, 15, 20, 25 and 30 amp easy ID illuminating ATC fuses. Ideal for fleet maintenance departments.



Part No.	Amp Rating	Color
BK-ATC-3ID	3	Violet
BK-ATC-5ID	5	Tan
BK-ATC-7-1-2ID	7.5	Brown
BK-ATC-10ID	10	Red
BK-ATC-15ID	15	Lt. Blue
BK-ATC-20ID	20	Yellow
BK-ATC-30ID	30	Green
BK-ATC-40ID	40	Amber

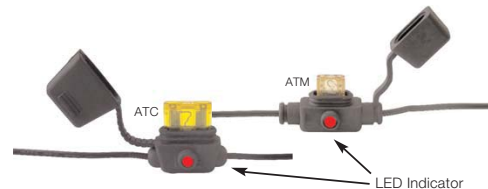
## easyID™ Maxi® (MAX) Illuminating Blade Fuses

Used for protecting circuits in wiring harnesses (usually found under the hood, in a fuse panel or supplementary panel near the battery) Maxi Fuses are finding increased popularity in domestic cars and some import models. Current OEM applications range up to 60 amps, but some aftermarket accessories (such as high-end stereos) require protection up to 80 amps. The Cooper Bussmann® easy ID Maxi illuminating fuse line is a sure seller for the high amp circuit protection market.



## easyID™ Illuminating Holders for Blade Fuses

Now customers have a way to get open fuse indication when adding circuits with easy ID illuminating inline fuse holders for ATM and ATC blade fuses. Attractive blister backs increase impulse sales.



Fuse Type	Part No.	Max Volts / Amps	Lead-wire	Description
ATM	ATM-FHID	32V/20A	2x4" #16	Inline fuse holder with protective cap and open fuse illuminating LED
ATC	ATC-FHID	32V/20A	2x4" #16	Inline fuse holder with protective cap and open fuse illuminating LED

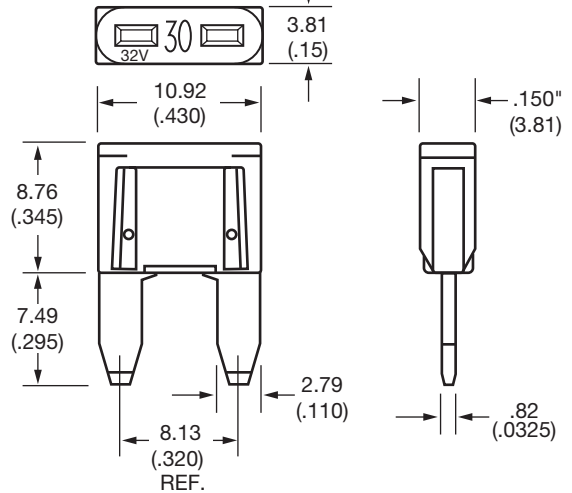


# MINI Blade Fuses



## Dimensions - mm(in)

(Dims. Shown are for reference only. Contact factory for latest prints)



### ATM Mini - Fuse

Fast-Acting

### Specifications

- Current Rating:** 2-30A
- Voltage Rating:** 32Vdc
- Interrupt Rating:** 1000A @ 32Vdc
- Housing Material:** UL-Rated 94V0 thermoplastic
- Terminal Material:** Silver-plated zinc alloy
- Temperature Rating:** -40°C to 120°C
- Marking:** Amperage marking is OCR compliant
- Compliances:** UL-Listed; SAE J2077; ISO 8820-3; SAE J1171 (Ignition protected)

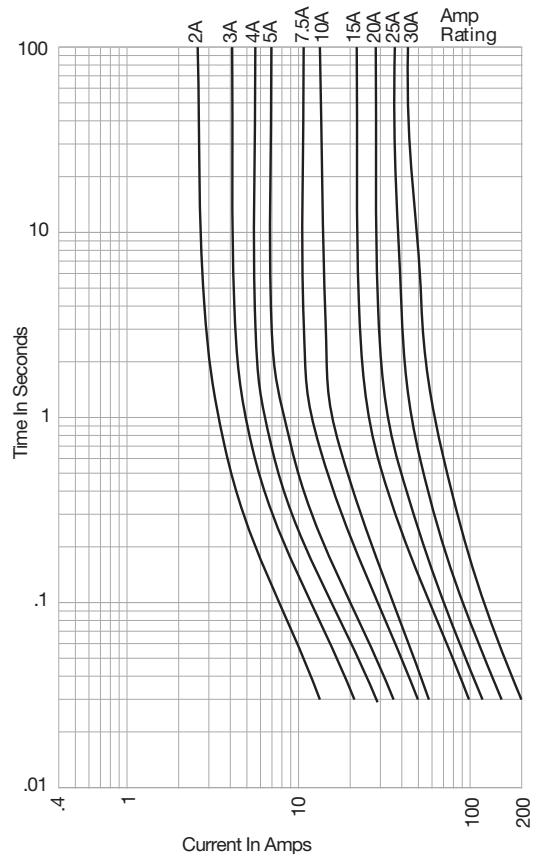
Consult factory for higher voltage fuses.

### Mini Fuse Puller - Part Number 32002



See page 69 for more information.

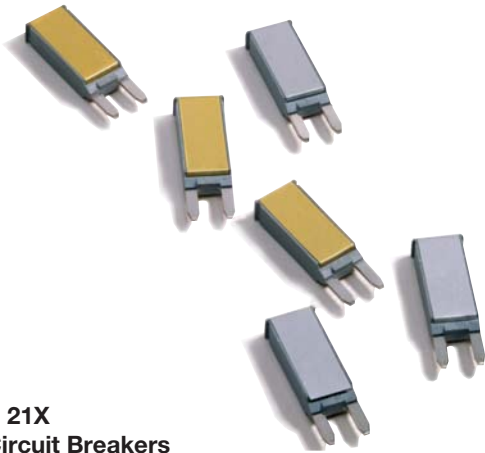
### Time Current Curves



### Color Coding and Amp Ratings

Part No.	Amp Rating	Color
BK-ATM-2	2	Gray
BK-ATM-3	3	Violet
BK-ATM-4	4	Pink
BK-ATM-5	5	Tan
BK-ATM-7.5	7.5	Brown
BK-ATM-10	10	Red
BK-ATM-15	15	Lt. Blue
BK-ATM-20	20	Yellow
BK-ATM-25	25	Natural
BK-ATM-30	30	Green

# Series 21X Mini Circuit Breakers



**Series 21X  
Mini Circuit Breakers**  
Auto and Modified Reset

## Specifications

### Single Pole Thermal Type Breakers

**Rating:** 5-30A; 14Vdc

**Interrupt Rating:** 150A @ 14Vdc (5-10A versions); 225A @ 14Vdc (15A version); 300A @ 14Vdc (20A version); 450A @ 14Vdc (25-30A versions)

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)

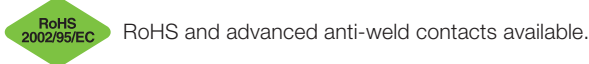
**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** Grey UL-Rated 94V0 thermoplastic housing with metal cover: gold (Type I) or silver (Type II)

**Marking:** Standard marking includes amp/voltage ratings, part number, and date code. OCR marking is available.

**Termination:** Compatible with 280 Type fuse blocks using 0.32in. (8.1mm) centerline spacing

**Compliances:** SAE J553 Type I and Type II Circuit Breakers



## Mini Fuse Puller - Part Number 32002



See page 69 for more information.

## Part Numbering System

### Series



211 - Type I, 14VDC  
212 - Type II, 14VDC

### Rating



05 - 5 amps  
75 - 7.5 amps  
10 - 10 amps  
15 - 15 amps  
20 - 20 amps  
25 - 25 amps  
30 - 30 amps

-

### Marking



00 - Std. Marking  
(Consult Factory for Special Marking Options)

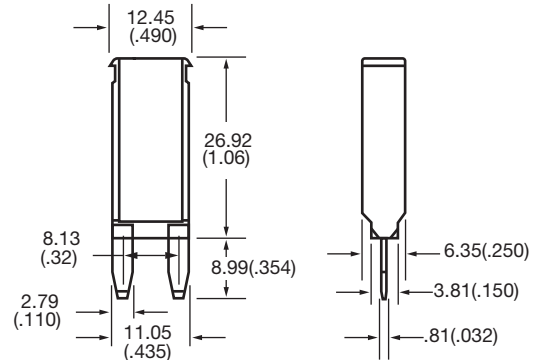
### Special Options



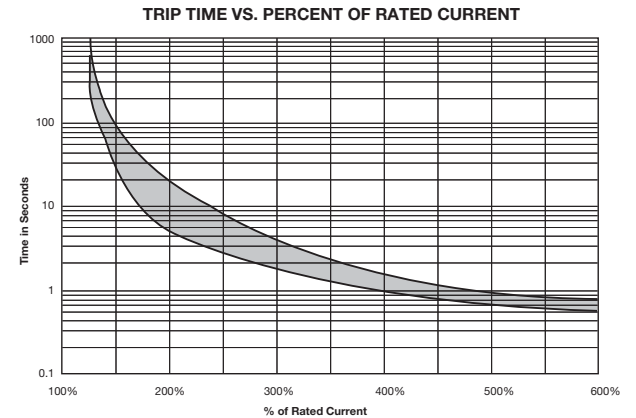
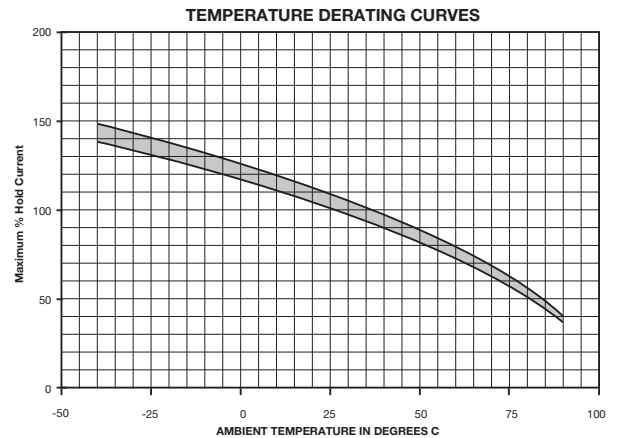
(Consult Factory for Special Options)

## Dimensions - mm(in)

(Dims. Shown are for reference only. Contact factory for latest prints)



## Temperature Derating / Time Current Curves



# ATC® Blade Fuses



## ATC® Blade - Type Fuse

Fast-Acting

### Specifications

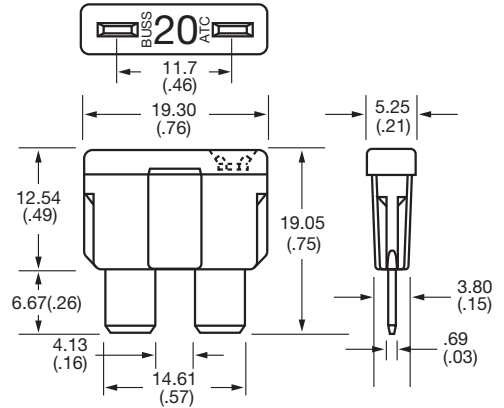
- Current Rating:** 1-40A
- Voltage Rating:** 32Vdc
- Interrupt Rating:** 1000A @ 32Vdc
- Housing Material:** UL-Rated 94V0 thermoplastic
- Terminal Material:** Tin-plated zinc alloy
- Temperature Rating:** -60°C to 110°C
- Marking:** Amperage marking is OCR compliant.
- Compliances:** UL-Recognized (3-40A); SAE J1284; ISO 8820-3; SAE J1171 (Ignition Protection)

Consult factory for higher voltage fuses.

### Color Coding and Amp Ratings

Part No.	Amp Rating	Color
BK-ATC-1	1	Black
BK-ATC-2	2	Gray
BK-ATC-3	3	Violet
BK-ATC-4	4	Pink
BK-ATC-5	5	Tan
BK-ATC-7.5	7.5	Brown
BK-ATC-10	10	Red
BK-ATC-15	15	Lt. Blue
BK-ATC-20	20	Yellow
BK-ATC-25	25	Clear
BK-ATC-30	30	Green
BK-ATC-40	40	Amber

### Dimensions - mm(in) (Dims. Shown are for reference only. Contact factory for latest prints)

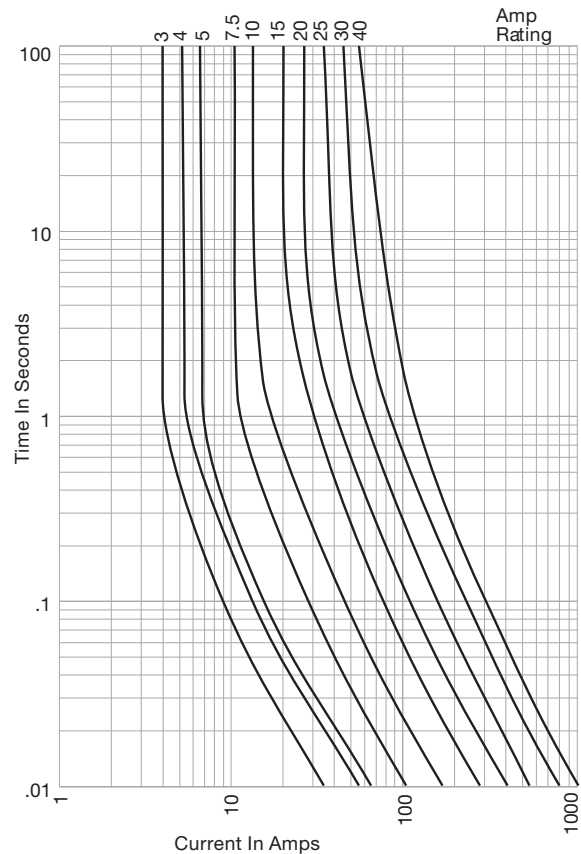


### Mini Fuse Puller - Part Number 32002

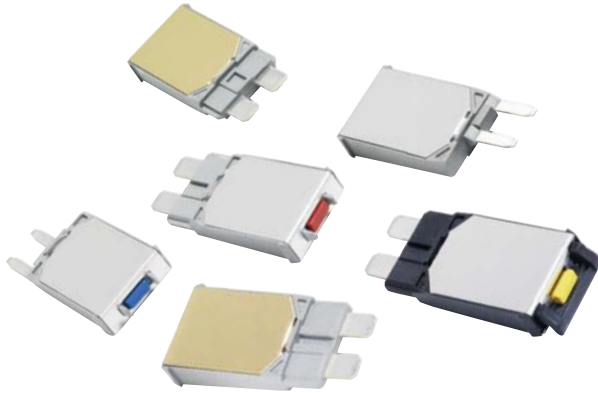


See page 69 for more information.

### Time Current Curves



# Series 22X Circuit Breakers



## ATC® Circuit Breakers

Auto, Modified, & Manual Reset

## Specifications

### Single Pole Thermal Type Breakers

**Rating:** 5-30A, 14Vdc; 28Vdc (Series 223 & 226).

**Interrupt Rating:** 150A @ 14Vdc (5-10A versions); 225A @ 14Vdc (15A version); 300A @ 14Vdc (20A version); 450A @ 14Vdc (25-30A versions).

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C).

**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C).

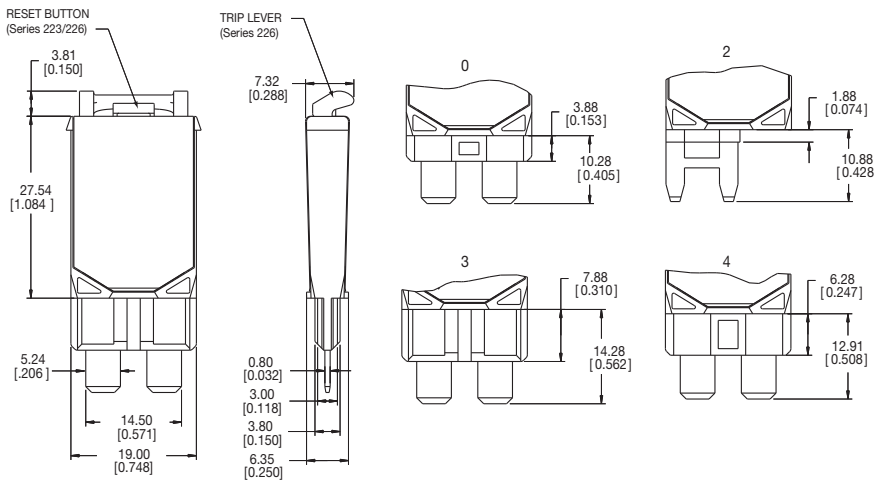
**Materials:** UL-Rated 94V0 thermoplastic housing with gold metal cover (Type I) or silver metal cover (Type II & III).

**Marking:** Standard marking includes amp/volt ratings, part number, and date code. Type III reset buttons are color-coded to amperage ratings. Push-to-trip option is available on manual reset version. OCR marking is available.

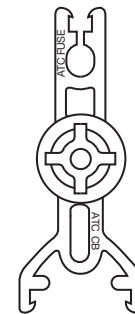
**Termination:** Compatible with 280 Type or ATC® fuse blocks.

**Compliances:** SAE J553, SAE J1171 (ignition protection)

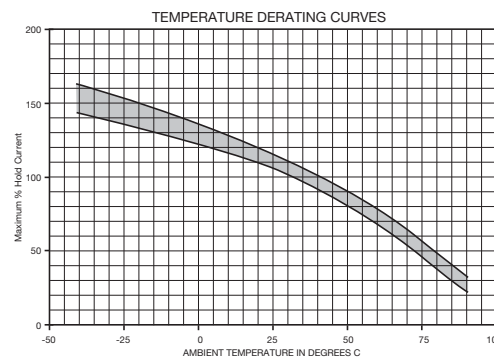
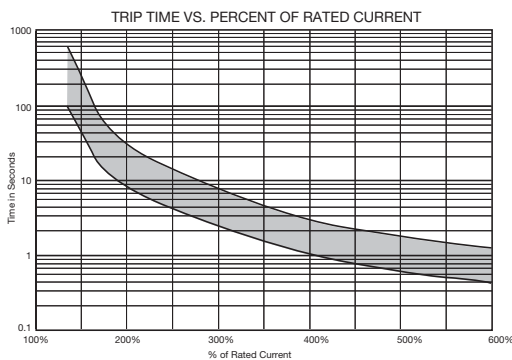
## Dimensions - mm(in) (Dims. Shown are for reference only. Contact factory for latest prints)



## Fuse Puller - Part Number 32003



See page 69 for more information.



## Part Numbering System

### Series



221 - Type I, 14VDC  
 222 - Type II, 14VDC  
 223 - Type III, 24VDC  
 226 - Type III w/Push-to-trip option, 24VDC

Consult factory for terminal option availability.

### Rating



05 - amps [LT. Brown (Tan)]\*  
 7.5 - 7.5 amps [Brown]\*  
 10 - 10 amps [Red]\*  
 15 - 15 amps [Blue]\*  
 20 - 20 amps [Yellow]\*  
 25 - 25 amps [White]\*  
 30 - 30 amps [Green]\*

\*Reset Button Color (223 & 226 only).

### Terminal



0 - ATC® Fuse, 4mm Insertion Depth  
 2 - 8.1mm Centerline 280 (MINI)  
 3 - ATC® Fuse, Delphi Packard Autofuse Block (e.g. 12004943)  
 4 - ATC® Fuse, Blocks with Raised Shrouds, 6.4mm Insertion Depth

### Marking



00 - Std. Marking  
 (Consult factory for special marking options)



# Series 227 ATC® Circuit Breakers (low profile)

## ATC® Circuit Breakers

Manual Reset

### Specifications

#### Single Pole Thermal Type Breakers

**Rating:** 5-30A, 28Vdc

**Interrupt Rating:** 2000A @ 28Vdc

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)

**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** UL-Rated 94V0 thermoplastic body. Tin-plated copper alloy terminals

**Marking:** Cover is color-coded to amperage ratings

**Termination:** 5.2mm wide blades compatible with ATC® type fuse blocks

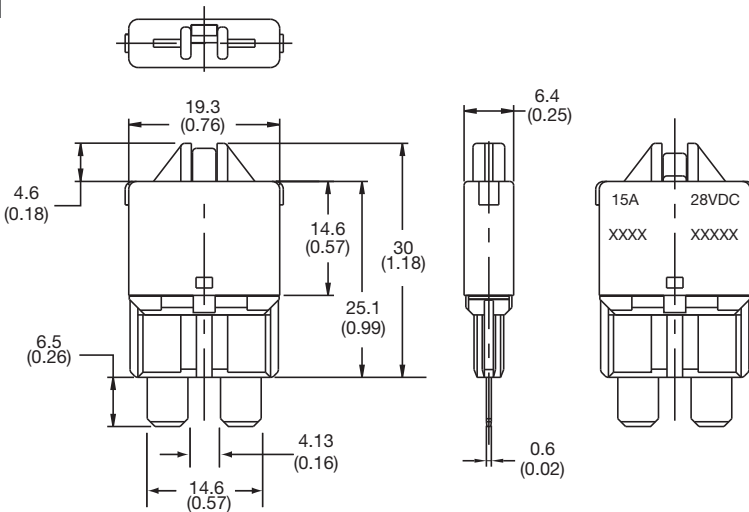
**Compliances:** SAEJ553; SAEJ1171 (ignition protected)

Consult factory for time characteristic curves

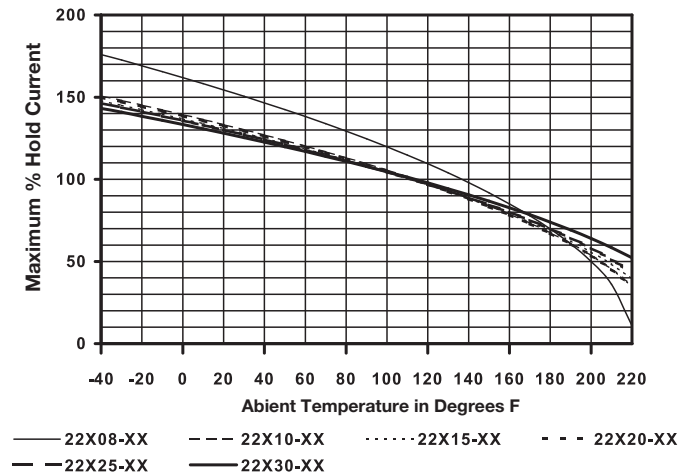


### Dimensions - mm(in)

(Dims. Shown are for reference only. Contact factory for latest prints)



### Temperature Derating Curves



### Part Numbering System

#### Series

227

#### Rating

□□

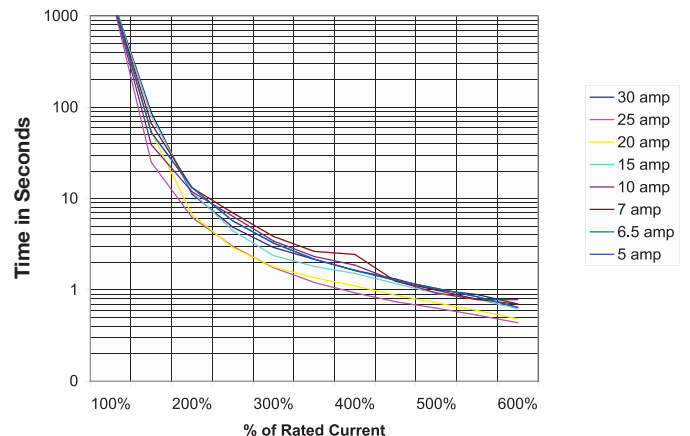
#### Marking

— 00

05 – 5 amps [LT. Brown (Tan)]  
 06 – 6 amps [Moss Green]  
 75 – 7.5 amps [Brown]  
 10 – 10 amps [Red]  
 15 – 15 amps [Blue]  
 20 – 20 amps [Yellow]  
 25 – 25 amps [White]  
 30 – 30 amps [Green]

00-Std. Marking  
 (Consult factory for special marking.)

### Trip Time vs. Percent of Rated Current





**MAXI® - Fuse**  
Fast Acting

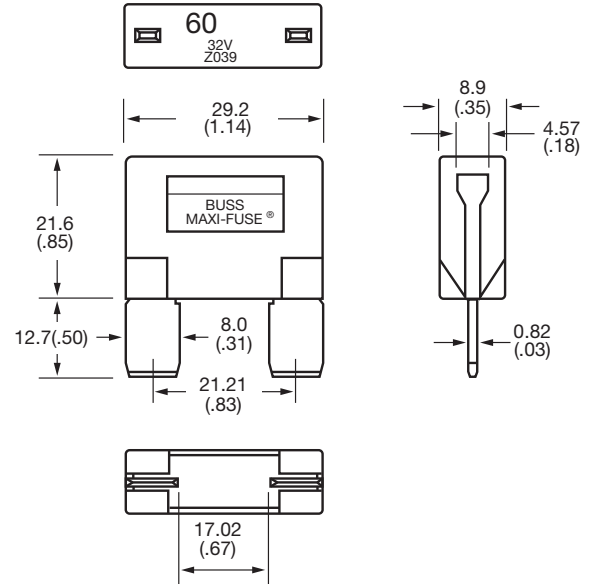
### Specifications

- Current Rating:** 20-80A
- Voltage Rating:** 32Vdc
- Interrupt Rating:** 1000A @ 32Vdc
- Housing Material:** UL-Rated 94V0 thermoplastic
- Terminal Material:** Silver-plated zinc alloy
- Temperature Rating:** -40°C to 120°C
- Marking:** Amperage marking is OCR compliant
- Compliances:** SAE J1888, ISO 8820-3, SAE J1171 (ignition protected)

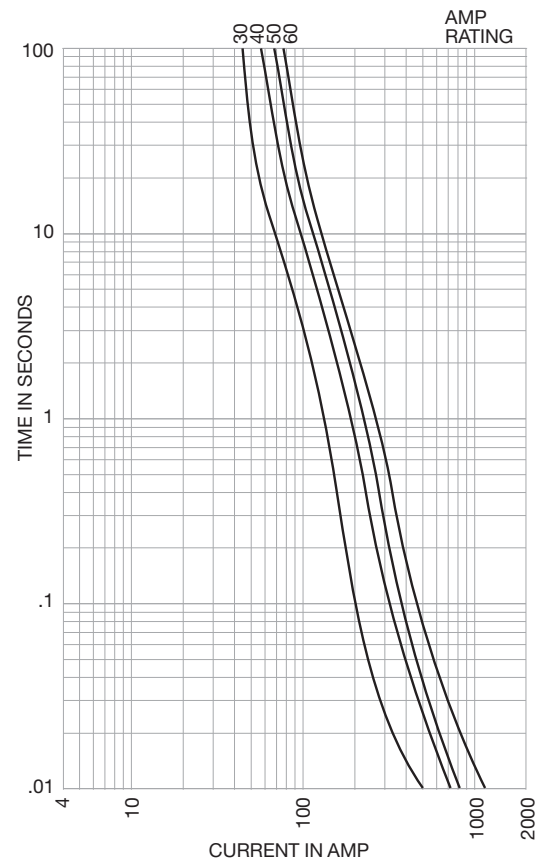
### Color Coding and Amp Ratings

Part No.	Amp Rating	Color
BK-MAX-20	20	Yellow
BK-MAX-30	30	Green
BK-MAX-40	40	Orange
BK-MAX-50	50	Red
BK-MAX-60	60	Blue
BK-MAX-70	70	Tan
BK-MAX-80	80	Neutral

### Dimensions - mm(in) (Dims. Shown are for reference only. Contact factory for latest prints)



### Time-Current Curves



# Series 19X MAXI® Circuit Breakers

Circuit Protection

19X MAXI® Circuit Breaker



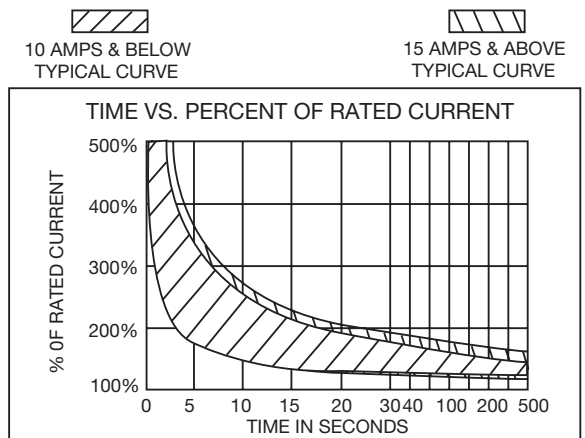
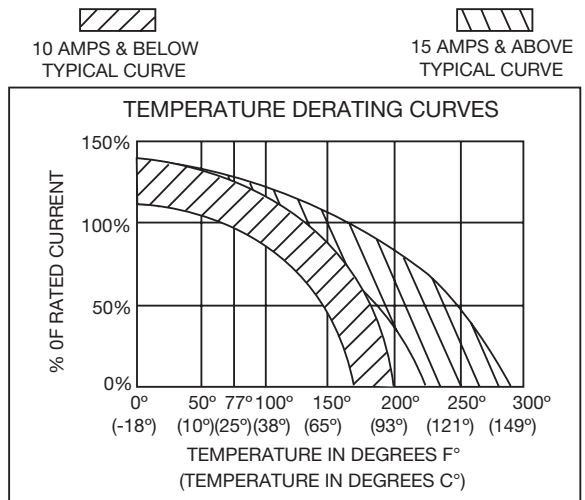
## Series 19X MAXI® Circuit Breakers

Auto, Manual & Modified Reset

### Specifications

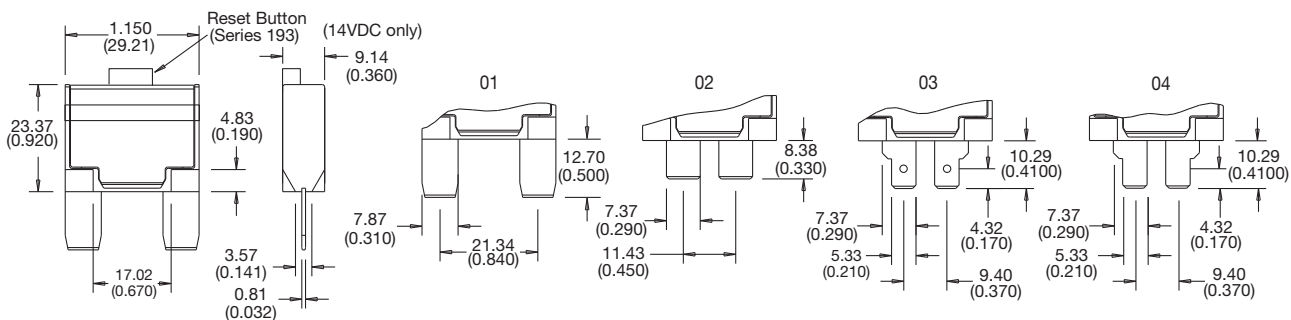
#### Single Pole Thermal Type Breakers

**Rating:** 8-50A; 14Vdc; 28Vdc (Series 193, 194, & 195)  
**Interrupt Rating:** 150A @ 14Vdc (8-10A versions); 225A @ 14Vdc (15A version); 300A @ 14Vdc (20A version); 450A @ 14Vdc (25-30A versions); 600A @ 4Vdc (35-40A versions); 750A @ 14Vdc (50A version)  
**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)  
**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)  
**Materials:** Grey UL-Rated 94V0 thermoplastic  
**Termination:** Compatible with fuse blocks accepting MAXI® or ATC® blade fuses  
**Compliances:** SAE J553, SAE J1171 (ignition protected)



### Dimensions - in(mm) (Dims. Shown are for reference only. Contact factory for latest prints)

### Terminal Options



### Part Numbering System

Series	Rating	Terminal	Cover	Marking
191	08 - 8 amps	01 - MAXI®	M - Metal*	(Consult factory for special markings.)
192	10 - 10 amps	02 - Wide ATC®		
193	15 - 15 amps	03 - Long ATC® (w/dimple)		
194	20 - 20 amps	04 - Long ATC® (no dimple)		
195	25 - 25 amps			
	30 - 30 amps			
	35 - 35 amps			
	40 - 40 amps			
	50 - 50 amps (191, 193, 194 only)			

# Series 3200 Insertion/Extraction Tool



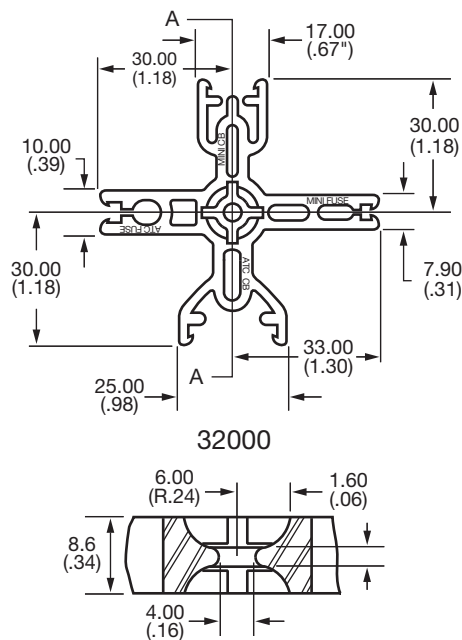
## Series 3200

Automotive Fuse and Circuit Breaker Insertion/Extraction Tool.

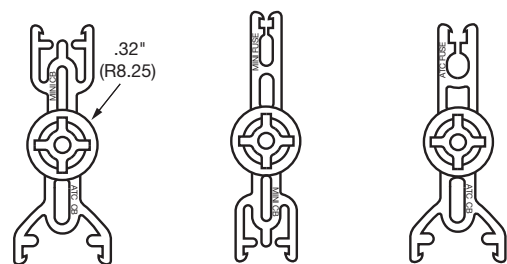
### Features/benefits

- **Custom Configurable Design**  
Get only the extractors you need
- **Common Platform for any Style**  
Eliminates design changes when protection requirements change
- **Center Snap-Lock Mounting Hole**  
Easy mounting using simple split-ball snap-lock post
- **Positive Stop Locking Action**  
Tight grip allows devices to be removed and inserted
- **High Temperature Resilient Nylon 6/6 (105°C)**

**Dimensions - mm(in)** (Dims. Shown are for reference only. Contact factory for latest prints)



SECTION A-A



32001

32002

32003

### Part Numbering System

#### Series

**3200**

#### Configuration

**□**

Top	Right	Bottom	Left
0 - MINI CB	MINI FUSE	ATC® CB	ATC® FUSE
1 - MINI CB	BLANK	ATC® CB	BLANK
2 - MINI CB	BLANK	MINI FUSE	BLANK
3 - ATC® CB	BLANK	ATC® FUSE	BLANK

# Series 32013

## Series 32013

Automotive fuse and circuit breaker insertion/extraction tool (to be used with Series 32000 Dual Vehicle Electrical Center).

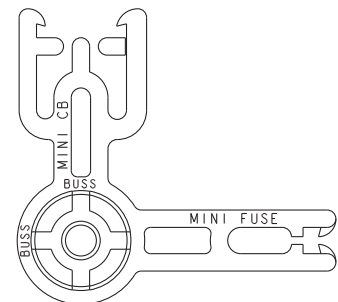
### Features/Benefits

- **Positive Stop Locking Action**  
Tight grip allows devices to be removed and inserted.
- **High Temperature Resilient Nylon 6/6 (105°C)**

### Part Numbering System

#### Series

**32013**



# Series 12X Shortstop Circuit Breakers

## Auto, Manual & Modified Reset Circuit Breakers

### Specifications

#### Single Pole Thermal Type Breakers

**Applications:** Battery chargers, trucks, buses, RVs, trolling motors, etc

**Rating:** 5-50A, 14Vdc; 28Vdc (Series 123, 124, & 125)

**Interrupt Rating:** Main Circuit Protection: 1.5kA @ 12Vdc (Series 123 w/plastic cover);

**Branch Circuit Protection:** 2.5kA @ 12Vdc (Series 121 & 124 -01 sealed & Series 123 w/plastic cover)

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)

**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** Black UL-Rated thermoplastic body (thermoset for Type II body & buttons). Cover is grey thermoplastic or steel-Type I gold, Type II silver

**Marking:** Custom marking available. Consult factory for options

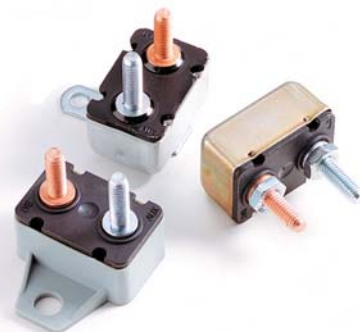
**Termination:** #10-32 thread and quick-connect options available

**Torque Rating:** 24 in-lbs (2.7N•m) max

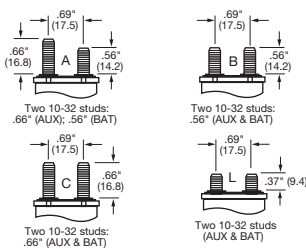
**Mounting Torque Rating:** Plastic cover - 15 in-lbs (1.7N•m); Metal cover - 30 in-lbs (3.4N•m)

**Ingress Protection Rating:** IP66 On plastic cover version only (except for terminals)

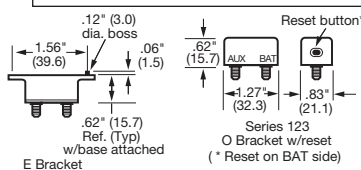
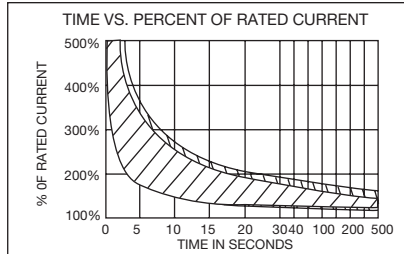
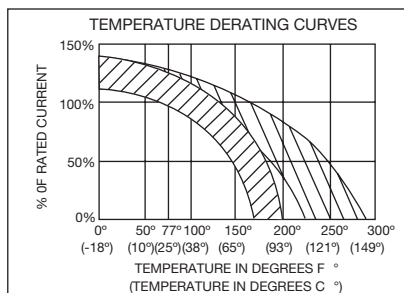
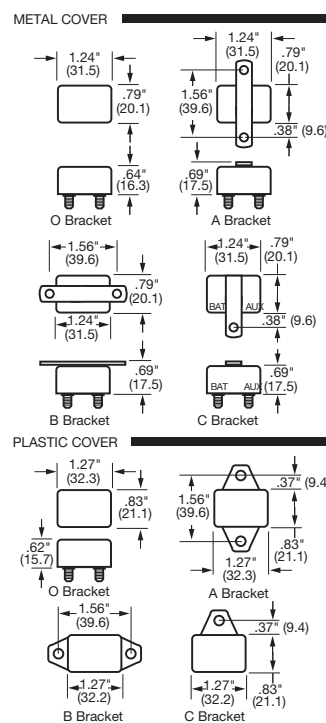
**Compliances:** SAE J553; SAE J1171 (ignition protected)



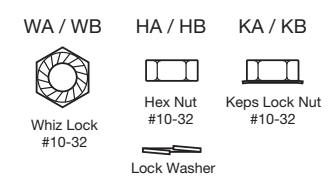
### Terminal Options



### Cover & Bracket Options



### Hardware



### Part Numbering System

Series	Terminal	Rating	Bracket	Mtg. Holes	Cover*	Options	Hardware
1 2 3							
121 - Type I, 12 VDC	A - Two 10-32 studs; .66 (Aux), .56 (Bat)	05 - 5 amps 08 - 8 amps	0 - No bracket A - Bracket	0 - No bracket 1 - .140 dia. 2 - .196 dia.	M - Metal* P - Plastic*	01 - Waterproof (metal covers only) 02 - Splashproof (optional on metal covers - add 02 suffix; std. on plastic covers - omit 02 suffix.)	WA - Whiz-lock nut assembled WB - Whiz-lock nut bulk
122 - Type II, 12 VDC	B - Two 10-32 studs; .56 (Aux & Bat)	12 - 12 amps	C - Bracket	3 - .237 dia. (metal only)			HA - Nut & lock washer assembled
123 - Type III, 24 VDC	C - Two 10-32 studs; .66 (Aux & Bat)	15 - 15 amps 20 - 20 amps	E - Bracket (plastic only)	4 - .265 dia. (plastic only)			HB - Nut & lock washer bulk
124 - Type I, 24 VDC	***D - Two .250 QC; (Aux & Bat)	25 - 25 amps 30 - 30 amps		5 - .228 dia. (plastic only)			KA - Keps lock nut assembled
125 - Type II, 24 VDC	**H - One 10-32 stud .56 (Bat), Double .250 QC (Aux)	35 - 35 amps 40 - 40 amps 50 - 50 amps		6 - .221 dia. (metal only)			KB - Keps lock nut bulk
	L - Two 10-32 studs; .37 (Aux & Bat)						

\*Series 123 available in plastic cover only. Series 122 & 125 available in metal cover only. \*\*40A maximum \*\*\*30A maximum



# Series 25X Mid-Range Circuit Breakers

## Auto, Manual & Modified Reset Circuit Breakers

### Specifications

#### Single Pole Thermal Type Breakers

**Applications:** This unit is external ignition protected and weatherproof. It is typically used in DC power systems in marine applications (as a main or branch circuit breaker), truck, bus and RV systems, add-on protection for accessories, etc

**Rating:** 10-50A, 32Vdc

**Interrupt Rating:** Circuit Protection (2.5kA) per ABYC E-11

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)

**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** Black UL-rated 94V0 thermoset plastic body. Cover, lever, and button are UL Rated 94V0 thermoplastic. Cover has a black thermoplastic elastomer overmold

**Marking:** Standard marking includes amp/volt ratings, part numbers, and "SAE Type B"

**Termination:** #10-32 Threaded studs

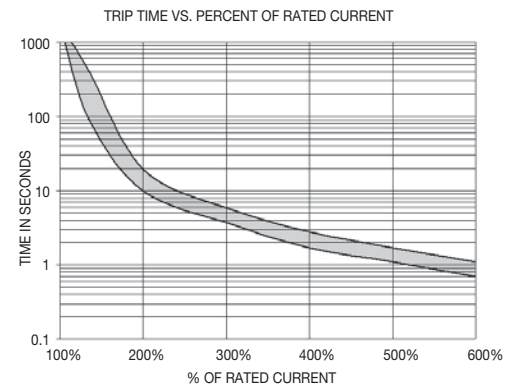
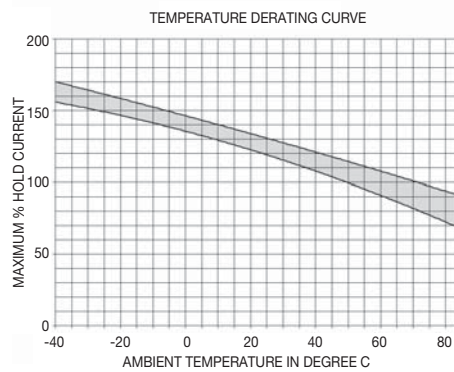
**Torque Rating:** 24 in-lbs (2.7N•m) max

**Mounting Torque Rating:** Panel mount with either #8-32 threaded inserts or #10 clearance holes. 18 in-lbs (2.0N•m) max

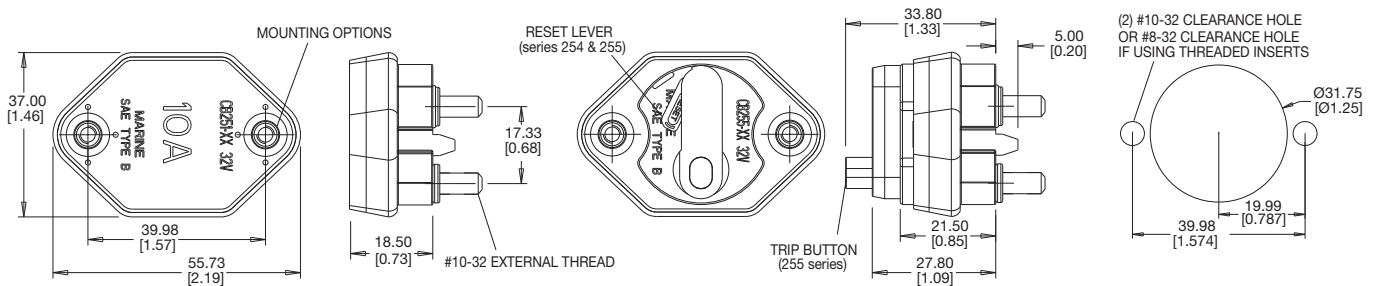
**Ingress Protection Rating:** IP66

**Features / Options:** Series 254 & 255 have a unique reset mechanism which provides a visual indication of tripped condition. Series 255 also features a push-to-trip option

**Compliances:** SAE J553; ABYC E-11; SAE J1171 (ignition protected)



### Dimensions - mm(in) (Dims. shown are for reference only. Consult factory for latest prints)



### Part Numbering System

#### Series



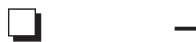
251 - Type I, 32V  
 254 - Type III, 32V  
 255 - Type III w/push-to-trip option, 32V

#### Rating



10 - 10 amps  
 15 - 15 amps  
 20 - 20 amps  
 25 - 25 amps  
 30 - 30 amps  
 35 - 35 amps  
 40 - 40 amps  
 50 - 50 amps

#### Mounting Holes



A - Thru-hole Insert (#10 Clearance)  
 B - #8-32 Threaded Inserts

#### Hardware



0 - No nuts  
 1 - Nuts Installed  
 2 - Nuts bulk

# Series 18X Hi-Amp Circuit Breaker



## Auto, Manual & Switchable Reset Circuit Breakers

### Specifications

#### Single Pole Thermal Type Breakers

**Applications:** Typically used in auxiliary and accessory circuits in truck, bus, RVs and marine systems. Others include battery chargers and DC audio systems. Series 181, 184 & 185 are sealed for engine compartment and bilge area applications.

**Rating:** 25-150A, 30Vdc; 42Vdc Nom (Series 184 & 185)

**Interrupt Rating:** 3000A @ 30Vdc

**Operating Temperature Rating:** -40°C to +85°C

**Storage Temperature Rating:** -30°F (-34°C) to 300°F (149°C)

**Materials:** Black UL-rated 94V0 thermoset plastic. Thermoplastic elastomer stud insulators are provided on covered units with F-style (surface-mount) bases

**Marking:** Standard marking includes amp ratings and part numbers. Custom markings also available.

**Termination:** 1/4-28 threaded studs

**Torque Rating:** 50 in-lbs (5.6N•m) max

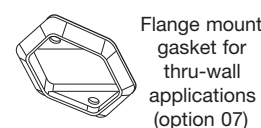
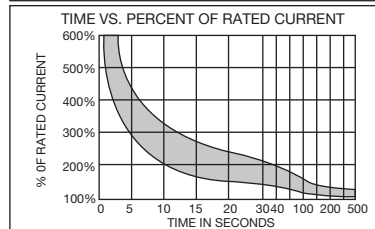
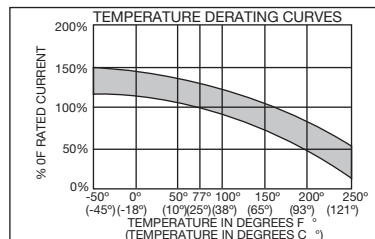
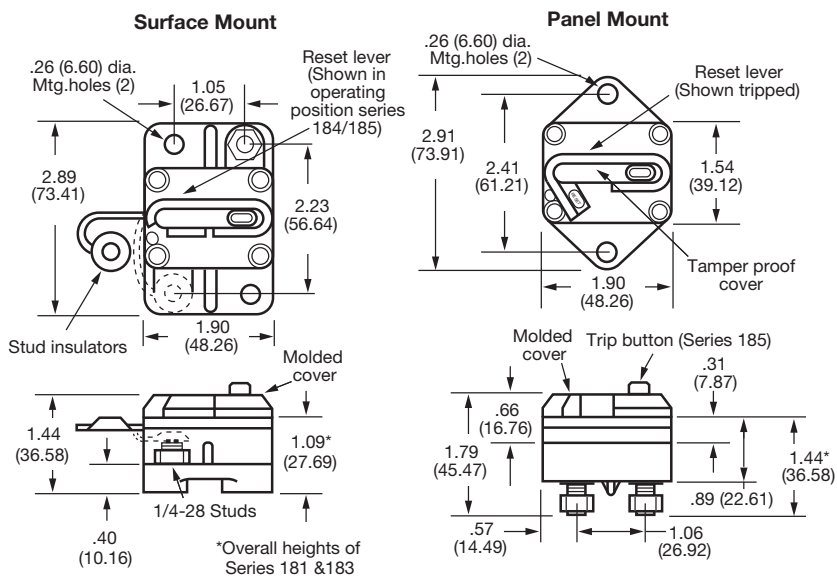
**Mounting Torque Rating:** Panel or surface-mount options; 50 in-lbs (5.6N•m) max. Threaded insert option has a max torque of 25 in-lbs (2.8N•m).

**Ingress Protection Rating:** IP67

**Features / Options:** Series 184 & 185 have a unique reset mechanism which provides visual indication of tripped condition. Series 185 also features a push-to-trip option

**Compliances:** SAE J1625; ABYC E-11; CE; SAE J1171 (ignition protected)

### Dimensions - in(mm) (Dims. shown are for reference only. Consult factory for latest prints)



### Part Numbering System

Series	Rating	Mounting	Terminal Hdwr.	Marking
1 8				
181 - Type I, 30V	025 - 25 amps	F - Surface Mount	00 - Ship w/o nuts	0 - Blank cover
183 - Type I*, 30V	030 - 30 amps	P - Panel Mount	01 - Sems nuts installed	1 - Standard Marking; Part Number, Amp Rating
184 - Type III, 42V	035 - 35 amps		02 - Sems nuts shipped bulk	181, 184, 185 Series - Top Surface
185 - Type III-PTT, 42V	040 - 40 amps		03 - Stainless Steel Std. nuts & washers installed	183 Series - Side Surface
	050 - 50 amps		04 - Stainless Steel Std. nuts & washers shipped bulk	S - Standard Ignition Protected Marking
	060 - 60 amps		07 - Flange gasket & Sems nuts installed (Panel Mount Only)	(Consult factory for special markings.)
	070 - 70 amps		08 - Threaded insert and Sems nuts installed	
	080 - 80 amps		12 - Stainless steel nuts and lockwashers installed	
	090 - 90 amps		13 - Stainless steel Sems nut installed	
*183 Available in Panel Mount Only (Coverless)	100 - 100 amps			
	110 - 110 amps			
	120 - 120 amps			
	135 - 135 amps			
	150 - 150 amps			

# Series 187 Marine Rated Circuit Breaker (MRCB)



## Manual Reset Circuit Breakers With Switch Function

### Specifications

#### Single Pole Thermal Type Breakers

**Applications:** Typically used in DC power systems in marine applications (as a main or branch circuit breaker), truck and bus systems, RV systems, add-on protection for accessories, lift gates, etc. This unit is external ignition protected and weatherproof.

**Rating:** 25-200A, 48Vdc

**Interrupt Rating:** Main Breaker Protection Interrupt Rating (5,000A@ 14Vdc, 3,000A@ 28Vdc and 1,500A@ 48Vdc).

**Operating Temperature Rating:** -40°F (-40°C) to 185°F (85°C)

**Storage Temperature Rating:** -40°F (-40°C) to 260°F (125°C)

**Materials:** Black UL-rated 94V0 thermoset plastic body. Cover and lever are UL-rated 94V0 thermoplastic

**Marking:** Standard marking includes amp/volt ratings. Custom markings also available

**Termination:** 5/16-18 threaded studs

**Torque Rating:** 75 in-lbs (8.5N•m) max

**Mounting Torque Rating:** Panel or surface-mount options; 50 in-lbs (5.6 N•m) max

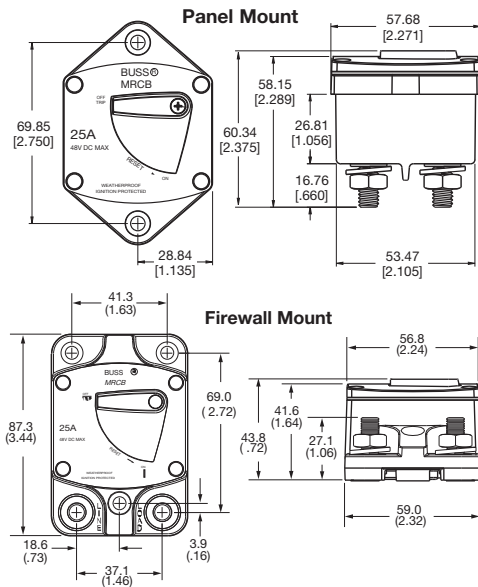
**Ingress Protection Rating:** IP66

**Features / Options:** A manual reset circuit breaker with On-Off switch capability

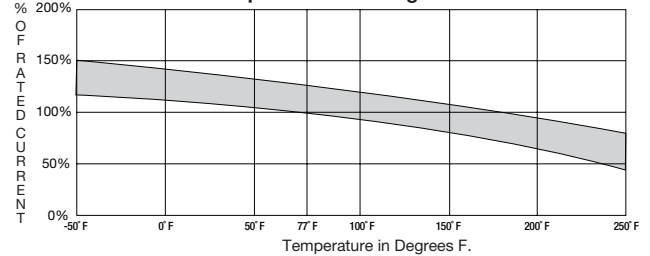
**Compliances:** ABYC E-11; CE; SAE J1171 (ignition protected)

Consult factory for time characteristic curves.

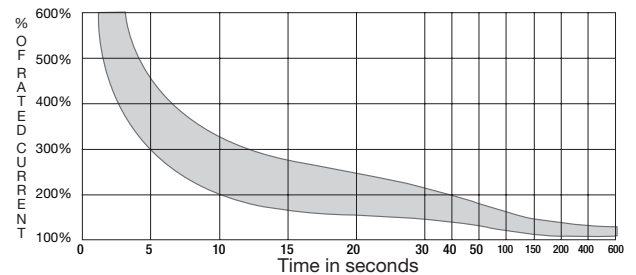
### Dimensions - mm(in) (Dims. shown are for reference only. Consult factory for latest prints)



### Temperature Derating Curves



### Time vs Percent of Rated Current



### Part Numbering System

#### Series

187

187 - Manual Reset - Switching Style Circuit Breaker

#### Rating

025

- 025 - 25 amps
- 030 - 30 amps
- 035 - 35 amps
- 040 - 40 amps
- 050 - 50 amps
- 060 - 60 amps
- 070 - 70 amps
- 080 - 80 amps
- 100 - 100 amps
- 110 - 110 amps
- 120 - 120 amps
- 135 - 135 amps
- 150 - 150 amps
- 200 - 200 amps

#### Mounting

F

- F - Surface mount
- P - Panel mount

#### Hardware

00

- 00 - No hardware
- 03 - Stainless nuts & lockwashers - installed on studs
- 04 - Stainless nuts & lockwashers - supplied bulk packed

#### Marking

1

- 1 - Standard marking; Part Number, Amp Rating
- (Consult factory for special marking options.)

# AMI Series



## Bolt In Automotive Fuses

### Specifications

**Applications:** Power distribution protection for automotive systems. Fuse holder shown on right.

**Current Rating:** 30-200A

**Voltage Rating:** 32Vdc

**Interrupt Rating:** 2000A @ 32Vdc; 5000A@ 16Vdc

**Housing Material:** UL-rated 94V0 thermoplastic

**Terminal Material:** Tin-plated brass

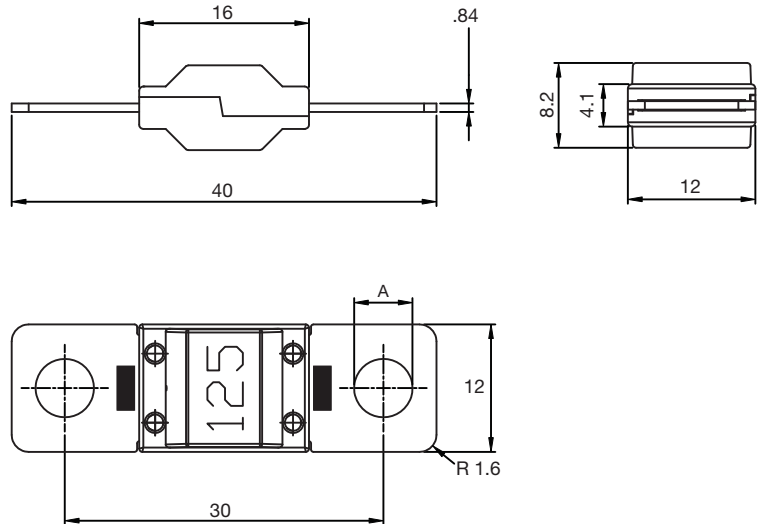
**Mounting:** Max torque of 35 in-lbs (4N•m)

**Marking:** Color-coded housings for each amperage

**Compliances:** SAE J1171 (ignition protected); ISO 8820-5

### Dimensions - mm

(Dims. shown are for reference only. Consult factory for latest prints)



	≤125A	>125A
A	Hole for a bolt diameter of M5 and/or M6	Hole for a bolt diameter of M6

### Holders



LMI3-M-2-A1L  
(Available for up to 6 fuses)



IFH-AMI-M5 (or M6)  
(Single Fuse Only)

### Time-Current Specifications

% OF RATING	30A ..... 125A		150A ..... 200A	
	Min.	Max.	Min.	Max.
75%	--	--	360.000s	∞
100%	360.000s	∞	--	--
110%	14.400s	∞	--	--
150%	90s	3.600s	--	--
200%	3s	100s	1s	15s
300%	0.3	3s	--	--
350%	--	--	0.3s	5s
500%	0.1	1s	--	--
600%	--	--	0.1s	1s

### Part Numbering System

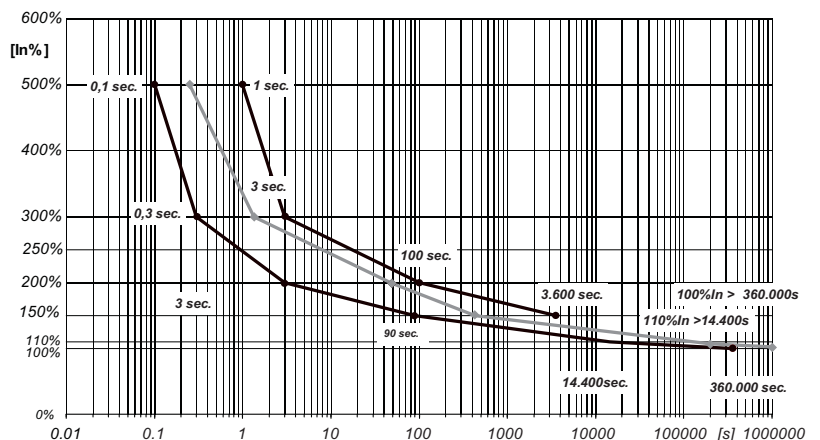
#### Series

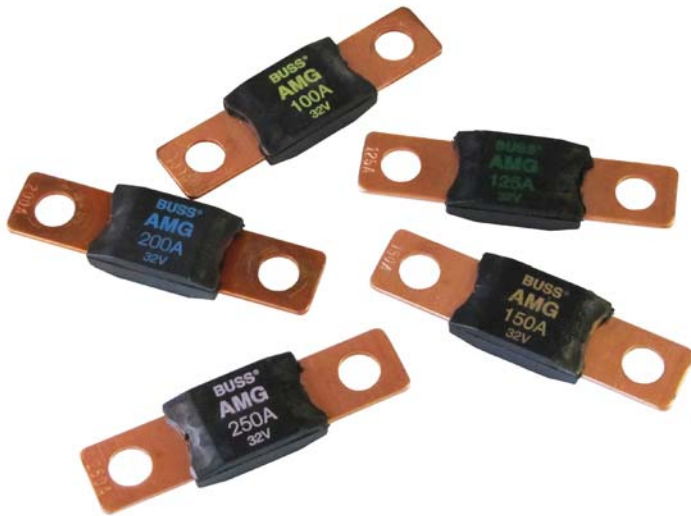


#### Rating

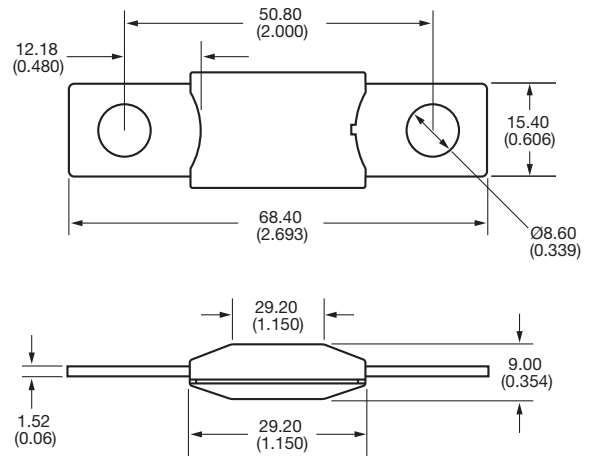
- 030 - 30 amps (orange)
- 040 - 40 amps (green)
- 050 - 50 amps (red)
- 060 - 60 amps (yellow)
- 070 - 70 amps (brown)
- 080 - 80 amps (white)
- 100 - 100 amps (blue)
- 125 - 125 amps (pink)
- 150 - 150 amps (gray)
- 175 - 175 amps (light brown)
- 200 - 200 amps (violet)

### Time-Current Curve





## Dimensions - mm(in)



## Bolt In Automotive Fuses

**Applications:** For high current applications. Use with Cooper Bussmann HMG or FMG fuseholders. (See pages 48-49.)

**Current Rating:** 100-300A.

**Voltage Rating:** 32Vdc\*

**Interrupt Rating:** 1,000A @ 32Vdc

**Housing Material:** UL-rated 94V0 thermoplastic

**Terminal Material:** Copper

**Mounting:** M8 or 5/16-18 or less studs on 2.00 in (50.8mm) centers  
Max torque of 8.1 to 9.6 ft-lbs (12 ±1N•m)

**Marking:** Color-coded amperage ratings

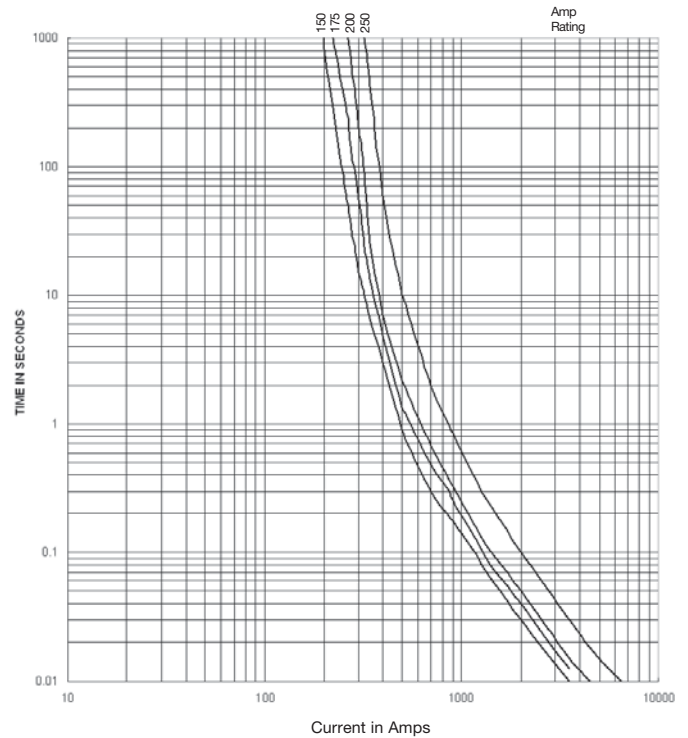
Compliances: SAE J1171 (ignition protected), ISO 8820-5

\*Consult factory for higher voltage fuses.

## Time-Current Specifications

% of Rating	80A-250A		300A-500A	
	Min.	Max.	Min.	Max.
75%	--	--	4 hrs	∞
100%	4 hrs	∞	--	--
135%	120s	1800s	--	--
200%	1s	15s	1s	15s
350%	0.3s	5s	0.5s	5s
600%	0.1s	1s	0.1s	1s

## Time-Current Curves



## Part Numbering System

### Series

**B** **K** - **A** **M** **G**

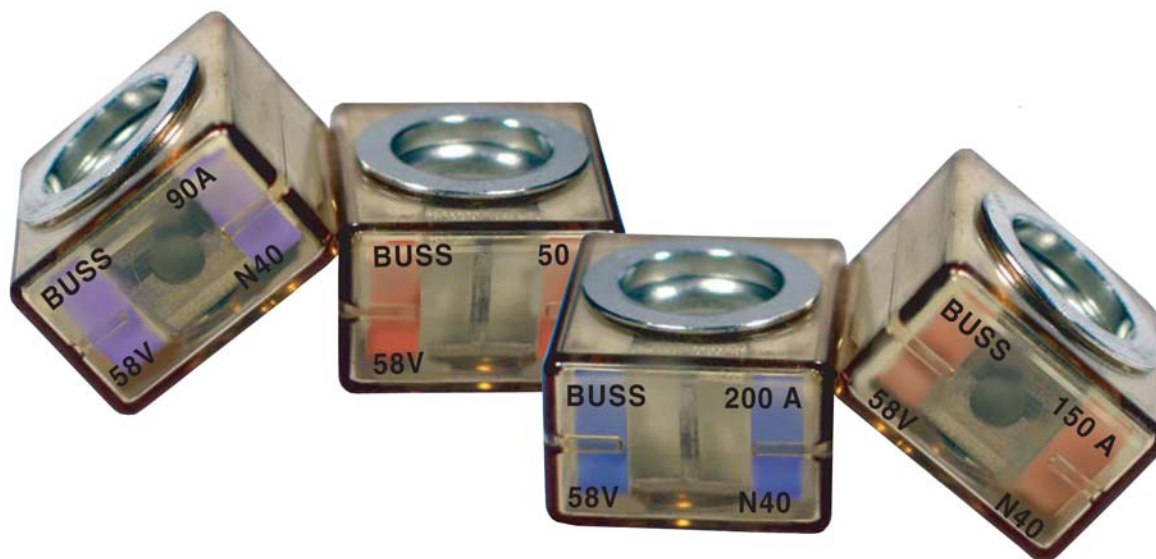
### Rating

**□** **□** **□**

- 100 - 100 amps
- 125 - 125 amps
- 150 - 150 amps
- 175 - 175 amps
- 200 - 200 amps
- 225 - 225 amps
- 250 - 250 amps
- 300 - 300 amps
- 400 - 400 amps
- 500 - 500 amps



# Marine Rated Battery Fuse



## About MRBF-XXX Series Marine Rated Battery Fuse

Designed for the most demanding environment to provide high current protection for the tightest space constraints. Suitable for main and auxiliary circuit protection such as alternator outputs, starter motor inputs and accessory circuits. The breaking capacity meets the requirements of conventional vehicle batteries and 12V, 24V and 42V electrical networks.

### Operating Times

Rating	100%	135%	200%	350%	600%
30A - 300A	> 100 h	Max 900 sec	max. 60s	min. 0.1s	max. 1 s
					< 0.2s

### Specifications

**Applications:** Full range circuit protection for automotive and marine applications. Break in capacity meets the requirements of conventional vehicle batteries and 42V electrical networks

**Voltage Rating:** 58Vdc Maximum

**Amperage Rating:** 30A - 300A

**Ingress Protection:** IP66

**Ignition Protected:** Per SAEJ1117

**Interrupt Rating:**

10000 AMP @ 14Vdc

5000 AMP @ 32Vdc

2000 AMP @ 58Vdc

Color Coded (see next page)

**Torque Rating:** Maximum 12 N•m (106 in-lbs)

**Material:**

Body - Ceramic

Housing & Cover: UL-rated 94V0 Thermoplastic

Ring Terminals - Tin Plated

**Compliances:** ISO 8820-6

### CF Cover



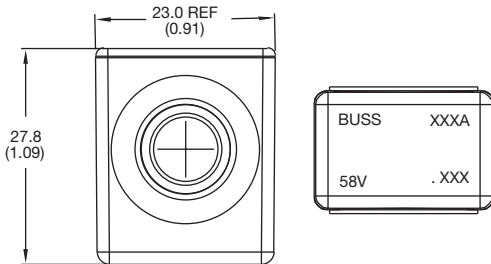
### CF Bar



# Marine Rated Battery Fuse

## MRBF Dimensions - mm(in)

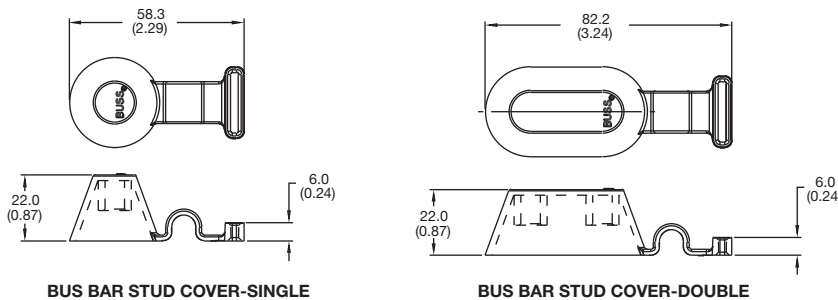
## Part Numbering System



### Fuse Amperages MRBF - X X X

- 030 - 30 AMPS [ LT GREEN ]
- 040 - 40 AMPS [ LT BLUE ]
- 050 - 50 AMPS [ RED ]
- 060 - 60 AMPS [ GOLD ]
- 075 - 75 AMPS [ BROWN ]
- 080 - 80 AMPS [ LIME ]
- 090 - 90 AMPS [ PURPLE ]
- 100 - 100 AMPS [ YELLOW ]
- 125 - 125 AMPS [ GREEN ]
- 150 - 150 AMPS [ ORANGE ]
- 175 - 175 AMPS [ WHITE ]
- 200 - 200 AMPS [ BLUE ]
- 225 - 225 AMPS [ TAN ]
- 250 - 250 AMPS [ PINK ]
- 300 - 300 AMPS [ GREY ]

## CF Cover Dimensions - mm(in)

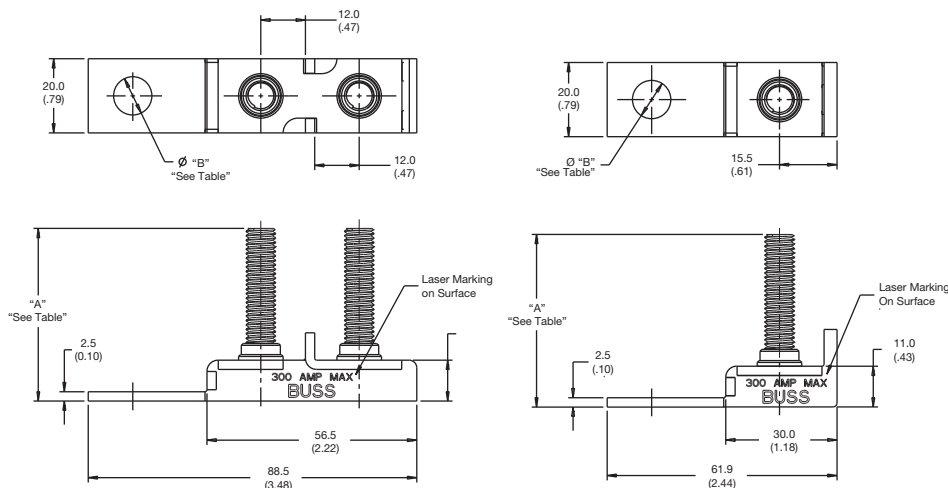


Material and Finish Table		
Part Number	MATERIAL	COLOR
CFCOVER-XB	SANTOPRENE	BLACK
CFCOVER-XR	SANTOPRENE	RED

### CFCOVER-XX

- Cover Color
- B - Black
- R - Red
- Stud
- 1 - Single Stud
- 2 - Double Stud

## CF Bar Dimensions - mm(in)



### Table:

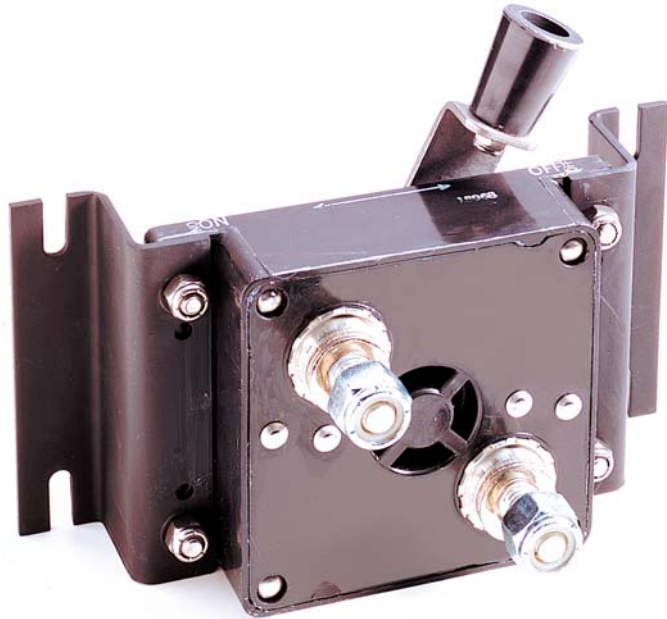
Part #	DIM. "A"	DIM. Ø "B"
CFBAR1 - 250SP	44.5 [1.75]	10.3 [0.405]
CFBAR1 - M8XSP	46.5 [1.83]	10.3 [0.405]
CFBAR1 - 250BP	44.5 [1.75]	13.5 [0.531]
CFBAR1 - M8XBP	46.5 [1.83]	13.5 [0.531]
CFBAR2 - 250SP	44.5 [1.75]	10.3 [0.405]
CFBAR2 - M8XSP	46.5 [1.83]	10.3 [0.405]
CFBAR2 - 250BP	44.5 [1.75]	13.5 [0.531]
CFBAR2 - M8XBP	46.5 [1.83]	13.5 [0.531]

### CFBARX - XXXXP

- S - 3/8" Mounting Hole
- B - 1/2" Mounting Hole
- 250 - 1/4-20 stud
- M8X - M8 stud
- 1 - Single Stud
- 2 - Double Stud

# Series 15250

## Battery Disconnect Switch



### Specifications

**Applications:** A non-fused current interrupt disconnect designed for opening the circuit between a battery and the complete electrical load of a battery-powered system.

**Rating:** 400A continuous, 50Vac/Vdc. Vehicle cranking and max. surge currents to 2000A (based on 20% duty cycle with ON times of 5 seconds max.).

**Temperature Rating:** -40°F (-40°C) to 150°F (65°C).

**Termination:** 1/2-13 Copper alloy stud.

**Torque Rating:** 420 in-lbs (47.5N•m) max.

**Mounting Torque Rating:** With mounting brackets: 48 in-lbs (5.4N•m) max; without mounting brackets: 10 in-lbs (1.1N•m) max.

### Options

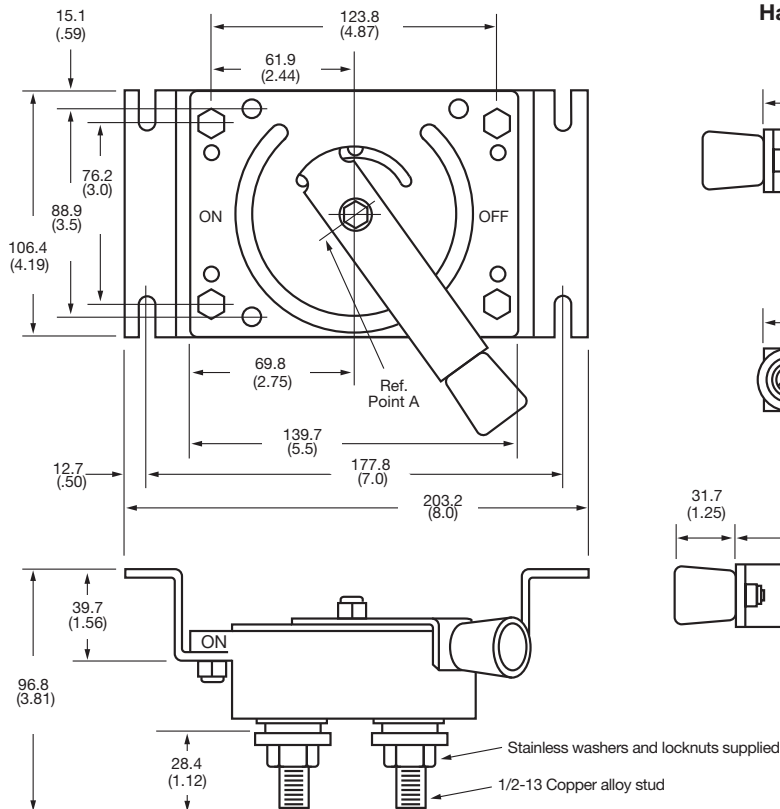
**Handles:** Three handle styles available.

**Other:** Lubricant-filled body with silicone sealant.

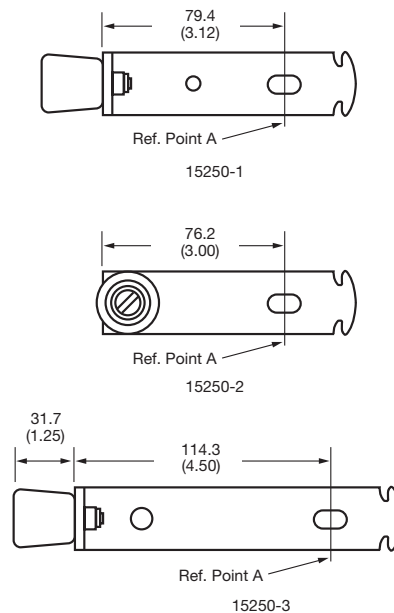
### Part Numbering System

Series	Handle Option	Bracket Option	Lubricant w/Sealant
15250	□	□	LR
	1	B - Bracket	(Grease Filled)
	2		
	3		

**Dimensions - mm(in) (15250-1b Shown)** (Dims. shown are for reference only. Consult factory for latest prints)



### Handle Variations







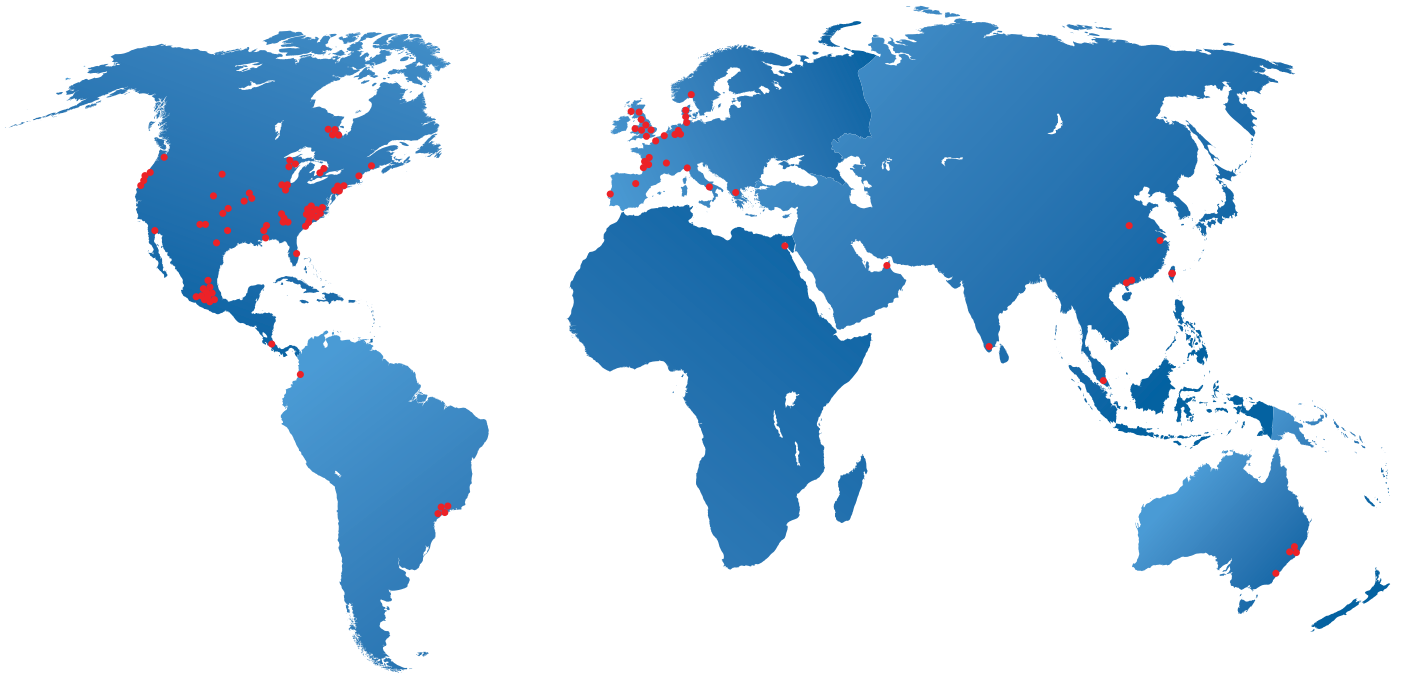
### Power Management

Cooper Bussmann  
Sure Power  
10955 SW Avery St  
Tualatin, OR 97062  
Tel: 800-845-6269  
Fax: 503-692-9091  
Tech Support: 503.612.7103

### Power Distribution Circuit Protection

Cooper Bussmann  
Transportation Products  
10955 SW Avery St  
Tualatin, OR 97062  
Tel: 800-845-6269  
Fax: 503-692-9091  
Tech Support: 847.956.5558

Visit us online at [www.cooperbussmann.com](http://www.cooperbussmann.com)



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