

VEC Customer Application Guide and Notes					
Title:		Manufacturer Engineering Guide to Eaton Vehicle Electrical Center			
Written By:		Kerri Moore			
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 <i>Powering Business Worldwide</i> CPCD-TRANSPORTATION TUALATIN, OR		Application notes for new / prospective users of the Eaton Vehicle Electrical Centers (VEC/ssVEC, DVEC/ssDVEC) Note – this document covers the Eaton Vehicle Electrical Centers, but information contained herein is not complete nor does it completely represent the Eaton VEC products.			
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Rev. #	Revision Description			Date	Appr.
6	Release to Production (this document augments previous VEC Product specification documents)			12/19/06	KXM
7a	Updates to mounting, product recommendations, application guide updates, added definitions			5/12/09	MCM
A	Updates drawing views in section 6, add ssVEC (31S), ssDVEC (32S), photos, generic part number, etc. CO-0540219			04/02/25	A.L

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VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

1.0 GENERAL OVERVIEW

The Vehicle Electrical Center (VEC Family) is a state-of-the-art electrical distribution module for DC-powered vehicles. The VEC uses a patented programmable 3-D matrix technology (Figures 1 and 2) that can be modified to satisfy a wide range of applications within a short period of time for most applications. Typically, there is no tooling cost to implement a new or revised design. This grid system fits into compact 4" x 4" (VEC/ssVEC) or 4" x 8" (DVEC/ssDVEC) housing. The Series 31000 & 31S (VEC/ssVEC) uses a single set of grids (Figure 1), whereas the Series 320000 & 32S Dual Vehicle Electrical Center (DVEC/ssDVEC) uses a double grid (Figure 2) system for larger applications.

The VEC Family offer uniform component terminal spacing that accepts standard 2.8mm wide terminals on 8.1mm centerline spacing. Component density is optimized on the VEC to match the many commonly available devices including mini fuses, mini circuit breakers, relays, diodes, resistors, and other devices with ISO 280 footprint.

There are several input and output connection options with the VEC. Input power connections can be made with either M8 or 8.0mm blade terminals. Standard ring terminals are used with the stud inputs, while the 8.0mm terminals mate with Aptiv Packard 800 series Metri-Pack terminals. The VEC can hold up to 2 studs or 4 blade terminals, while the DVEC can hold up to twice that amount. The output power connections are made with 2.8mm blade terminals, which mate with Aptiv Packard 280 Series Metri-pack terminals. There are up to thirty-two output connections on the VEC/ssVEC, while there are up to 64 output connections on the DVEC/ssDVEC. All wire terminals are easily installed into color-coded and keyed Eaton manufactured input and output connectors. The connectors snap in and out of the VEC module instantly for plug-in simplicity and significant labor savings.

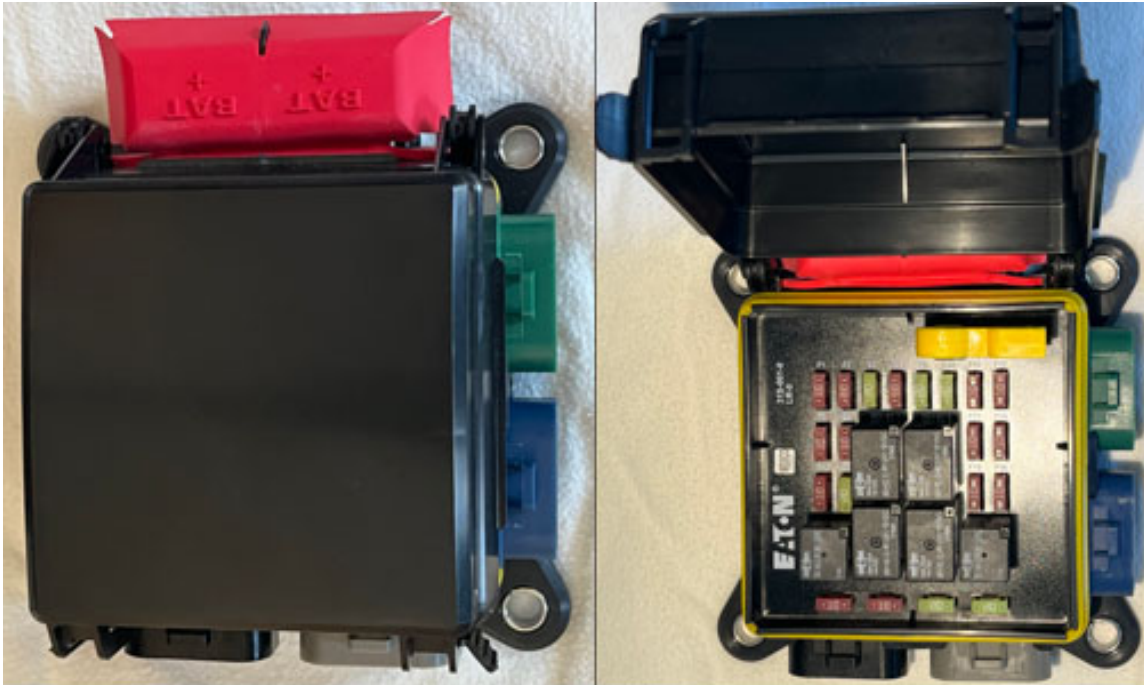
The 31S/32S series has standard external mounting feet, while the 31 series VEC offers either internal or external mounting holes. Covers are included on all series. The 31000 series can be used with either a solid cover with gasket installed, or a vented cover without a gasket.

The 31S/32S series is IP66 rated for environments where the VEC would see exposure to moisture and the 31000 and 32000 series are for interior mount.

If you are looking for a rapid design turnaround of your electrical system's power distribution module that is both economical and versatile, the Eaton Vehicle Electrical Center is for you.

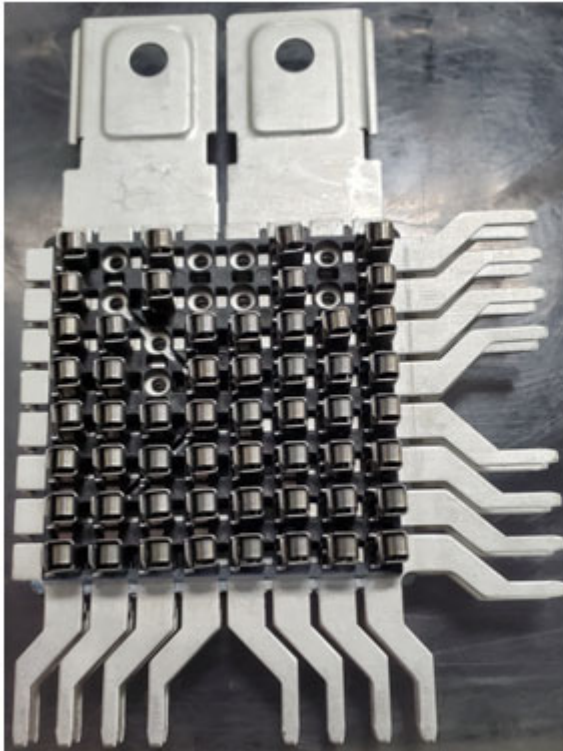
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ssVEC

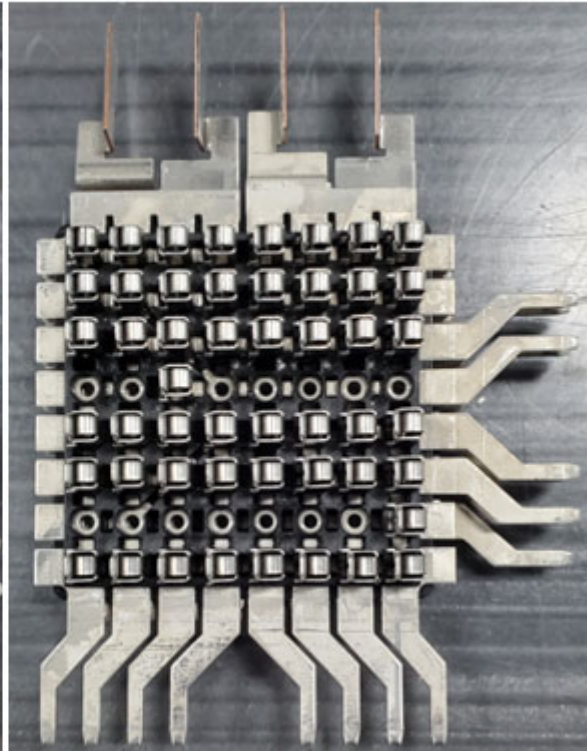


ssVEC Grid Assembly (Figure 1)

For M8 Stud Inputs



For 8.0mm Blade Inputs



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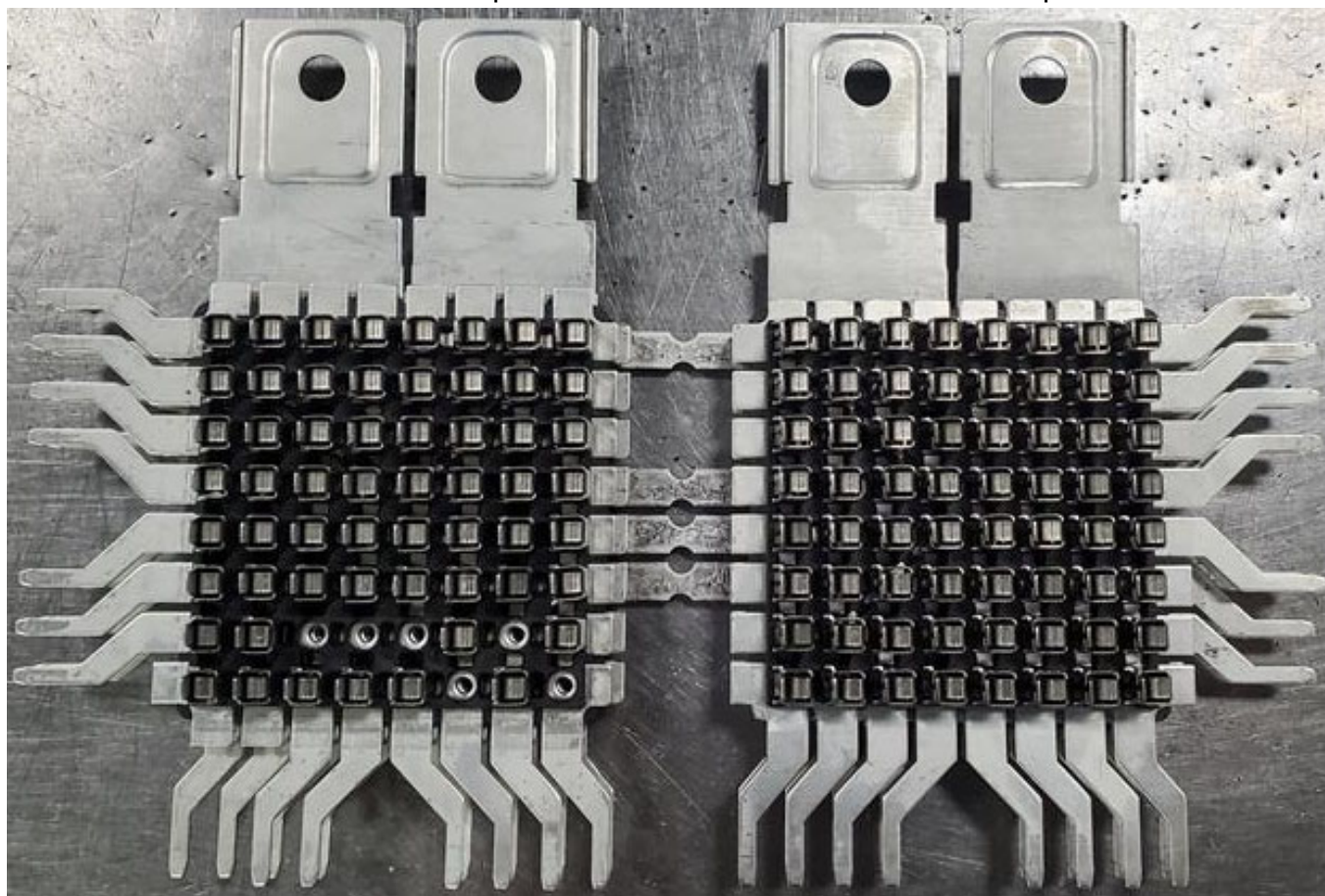
ssDVEC



ssDVEC Grid Assembly (Figure 2)

For M8 Stud Inputs

For M8 Stud Inputs



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2.0 FEATURES AND BENEFITS

2.1 FEATURES

- Programmable – Standard designs require no tooling charges.
- Fast prototype/production turnaround
- Advanced design flexibility
- High amperage capability - 31000/31S: 200 amps max; 32000/32S: 400A max.
- High component density - 31000/31S: 32 components (fuses) max; 32000/32S: 64 (fuses) max. (*Design dependent*)
- Compact size – 31000/31S: 4" X 4" footprint; 32000/32S: 4"x8" footprint.
- Robust design – UL-Rated 94 V-0 thermoplastic housings withstand impacts, dust, and temperature extremes.
- Keyed and color-coded connectors
- Tang and tangless terminal options for the output connectors
- Sealed and non-sealed connector options
- Uses standard 2.8mm terminal blades for output connectors. Input connections can use either standard 8.0mm blade terminals, M8 studs.
- External buss bar available on stud input versions.
- Cover options: Vented (31000 series only,) and gasket (All VEC) solid cover options
- Inside cover labels (32000 series)
- Laser Etching inside, outside, or both (31000/31S series) and outside only (32S series)
- Labels or Laser Etching include custom markings

2.2 BENEFITS

- Extremely cost effective on an installed cost basis
- Eliminates external jumpers and splices in the wire harness
- No up-front tooling required to accommodate circuitry and components
- Fast track programmability and production capability
- "Plug-and-play" installation improves wire management
- Compact units save valuable space in vehicle
- Custom add-on solutions available

3.0 APPLICATIONS

3.1 VEHICLES

- Class 5-8 trucks. (i.e., over-the-road, cement mixers, garbage trucks, delivery trucks, tow trucks)
- Buses. (i.e., school buses, motor coaches, shuttle buses)
- Recreational Vehicles. (i.e., motor homes)
- Emergency Vehicles. (i.e., fire trucks, airport crash vehicles, ambulances)
- Construction/Farm Equipment. (i.e., backhoes, loaders, cranes, trenchers, tractors, field sprayers, combines)
- Marine. (i.e., personal, and commercial watercraft)
- Specialty Cars. (i.e., limited edition, customized production cars, electric vehicles, hot rods)
- Specialty Vehicles. (i.e., forklifts, airplane service vehicles, street sweepers)

3.2 APPLICATIONS

- Main Power Distribution Module
- Auxiliary Power Distribution Module
- Engine Controller
- Transmission Controller
- ABS Brake System Control Module
- Other Add-On Applications

VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

4.0 SPECIFICATIONS

4.1 HOUSING AND CONNECTORS:

- UL-rated 94V-0 Thermoplastic; Housing is black; connectors are color-coded. Internal grid is tin-plated copper.
- -40°C (-40°F) to 125°C (260°F)
- Dust proof VEC (31000) & DVEC (32000 series)
- IP 66 ¹ Sealed ssVEC (31S) & ssDVEC (32S series)

4.2 TOTAL INPUT CAPACITY:

- 31000/31S series VEC: 200 amps Max; 32000/32S series DVEC: 400 amps Max

4.3 INPUT TERMINAL RATING:

- Accepts industry standard 8.0mm blade terminals, each rated at 60 amps Maximum
- M8 or M6 input studs, each rated at 100 amps Maximum

4.4 OUTPUT TERMINAL RATING:

- Accepts industry standard 2.8mm blade terminals
- 30 amps per terminal Maximum, 100 amps MAX per output connector

4.5 RECOMMENDED WIRE SIZE:

- Input Wires (unsealed) - #8-18 AWG
- Input Wires (sealed) - #8 AWG
- Output Wires (sealed and unsealed) - #10-22 AWG

4.6 TOP LEVEL PLUG-IN COMPONENTS:

- 30 amp Maximum device rating
- Industry standard 280 footprint

4.7 MOUNTING TORQUE RATING:

- VEC: 30 in-lb (3.4Nm) Maximum
- DVEC: 24 in-lb (2.7Nm) Maximum
- ssVEC/ssDVEC: 300 in-lb (33.8Nm) Maximum with compression limiters

4.8 INPUT STUD TORQUE RATING:

- Recommended 10-12 ft-lb (13.5Nm-16.3Nm), 18 ft-lb (24.4 Nm) Maximum

¹ IP (Ingress Protection Rating as defined by the IEC – publication # 60529 – see Reference section at the end for more explanation)

VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

5.0 MOUNTING SPECIFICATIONS

5.1 MOUNTING OVERVIEW:

The VEC is a complex product, and the mounting / location of this product needs to be taken into effect at the early stages of systems design. The Manufacturer Engineering team should interact with Eaton Application Engineering and share details of the vehicle environment which include:

Location on vehicle

Assess the following conditions which will impact the VEC at the mounting location which include:

Temperature

Vibration

Shock

Chemical exposure (including salts)

Exposure to moisture

Mounting orientation

Accessibility to the cover / plug in components

Strain relief / harness connection paths

Mounting points /hardware

Storage / mounting of the VEC prior to final assembly on vehicle e.g.:

If the VEC is assembled to a chassis and subsequently exposed to rain, snow, etc., then a watertight protective cover should be securely attached to the VEC in such a way that it would prevent moisture from entering into the interior of the VEC.

If there is belief that the planned mounting / location of the VEC would result that the VEC could be see sufficient moisture which would cause the VEC to become immersed in or filled with water, then special measures ensure that this does not happen should be followed. This may mean using the Eaton Severe Service ssVEC or placing the VEC in a protective cover / location.

5.2 LOCATION & ENVIRONMENTAL REQUIREMENTS

Environment free of exposure to moisture is optimal. If not possible then great care should be given to the VEC mounting.

- If in harsh environment, protective shield is recommended.
- The VEC is in an environment within its ambient temperature range.
 - Safe temperature range for all VEC is -40°C to $+85^{\circ}\text{C}$.
- The ssVEC/ssDVEC has been designed and validated to a level of IP66.
 - Realize that this module has a lid that allows servicing of the plug-in components.
 - To maintain high IP rating, the unit must remain with the cover securely attached. Any damage to the housing or removal of the cover degrades the protection of the housing and may lead to eventual failure of the module if exposed to moisture or other contaminants.
- Sound engineering practice dictates placement of the VEC in a location that minimizes environmental impact and temperature extremes.

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5.3 ORIENTATION

- The optimal / recommended mounting orientation for all VEC is horizontal. Shown in Figure 3.

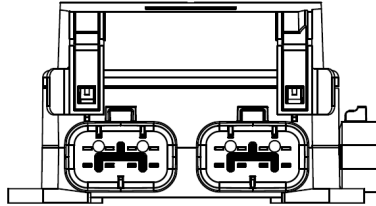


Figure 3. Recommended Mounting Orientation

- If horizontal mounting is not an option for the application, it is recommended that the VEC be mounted at an angle 0-90° from horizontal (Figure 4.). It is NOT recommended to mount the VEC at an angle greater than 90° from horizontal due to drainage issues (Figure 5.). Eaton also recommends mounting the unit with connector facing down (Figure 6). This will prevent any water that the VEC may be exposed to from collecting in sealed connectors. (Figure 7.)
- The VEC should not be mounted upside-down.

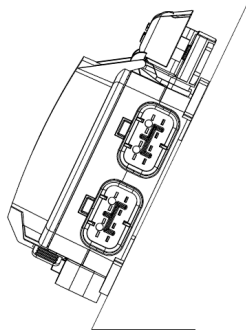


Figure 4. Recommended Mounting - Less than 90°

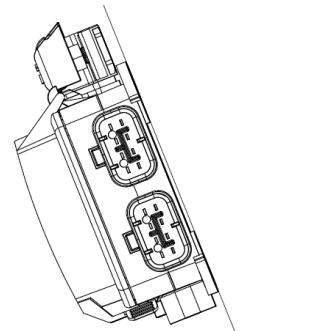


Figure 5. NOT Recommended - Greater than 90°

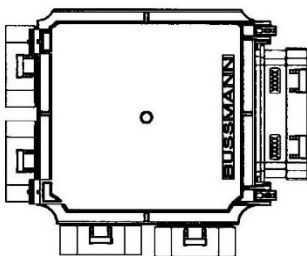


Figure 6. Recommended - No connectors on bottom

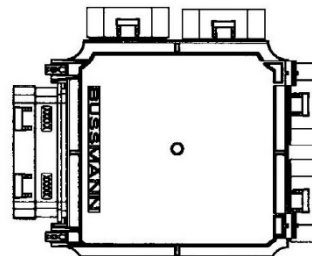


Figure 7. Not Recommended - Connectors on bottom

Figures 4 & 5 are very important respective of exterior mounting of ssVEC/ssDVEC where ssVEC/ssDVEC could see moisture – moisture could collect inside the connectors and result in product performance issues, corrosion, etc.

When selecting the mounting location, ensure the following mechanical requirements are respected:

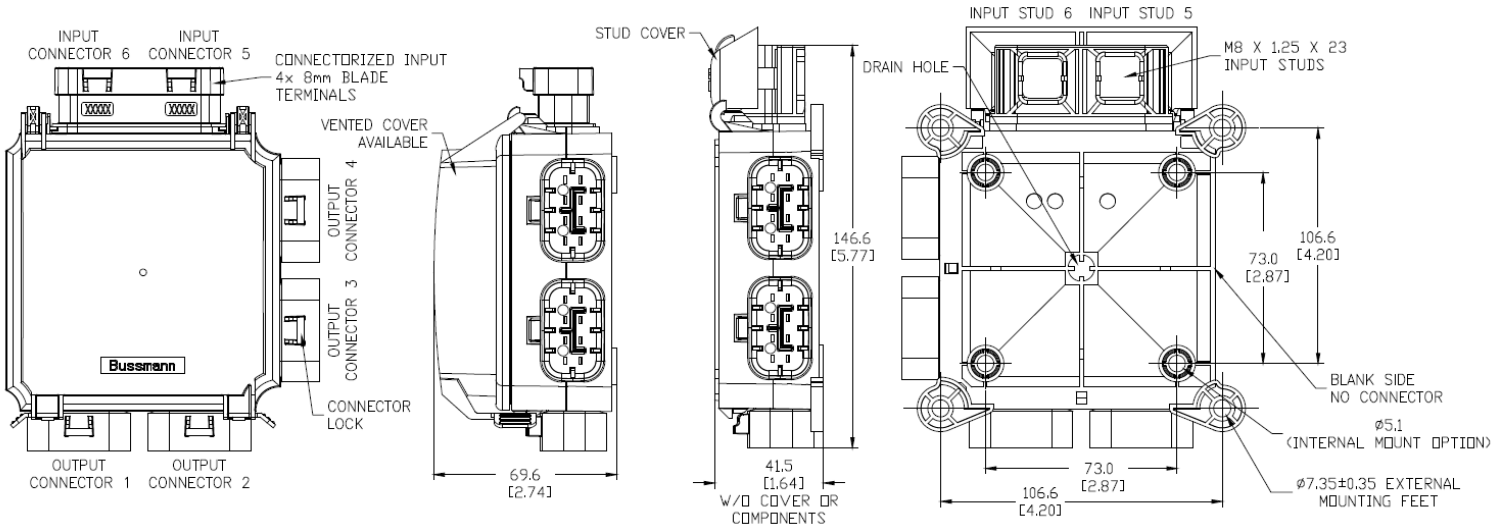
- It is highly recommended that it be mounted in locations that are not routinely exposed to direct and routine water sprays. Wherever possible, the VEC should be placed in covered, shielded, interior locations on a vehicle.
- The VEC and its connectors are shielded from harsh impact, debris, etc., and is not designed for other mechanical purposes other than that of a power distribution module.
- Mount the VEC harnesses with sufficient strain relief and adequate bend radius.
- The VEC cover can be fully opened.

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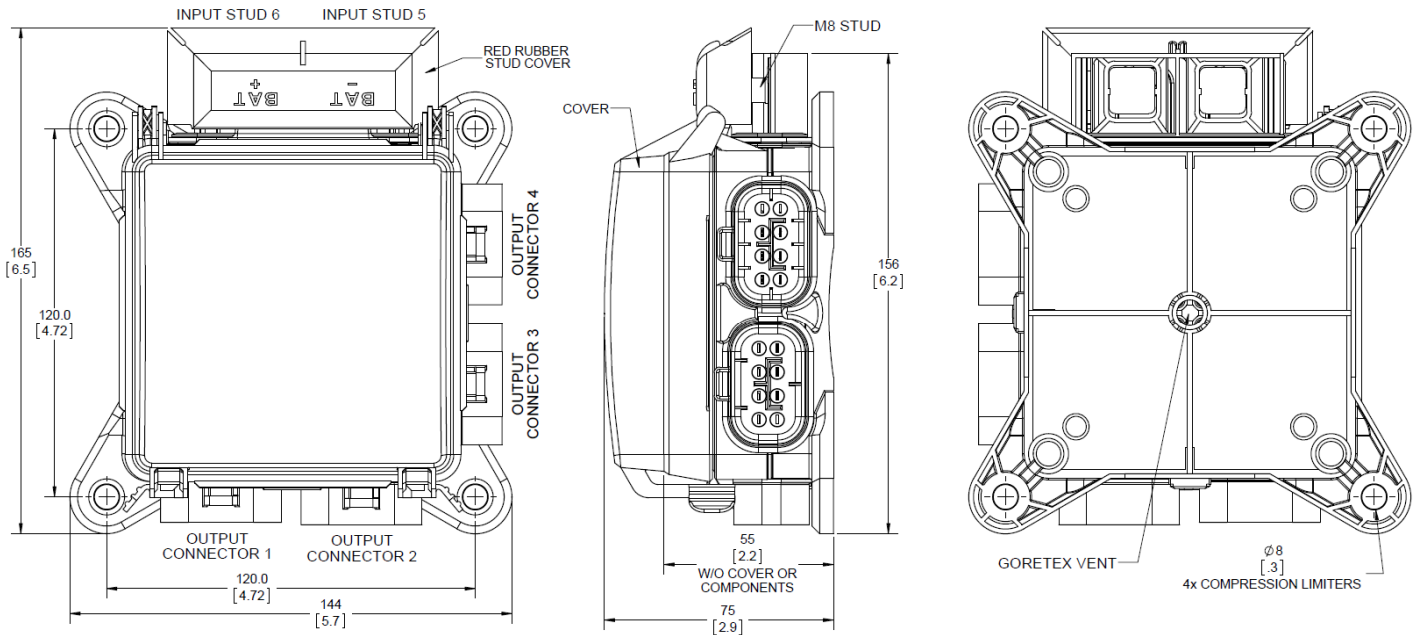
- The VEC mounting location / orientation should facilitate easy servicing of the plug-in power distribution components (fuses, relays, etc.)
- Consider operator's view of the VEC labels when mounting unit.

6.0 VEC/ssVEC/DVEC/ssDVEC/mVEC

VEC DIMENSIONS

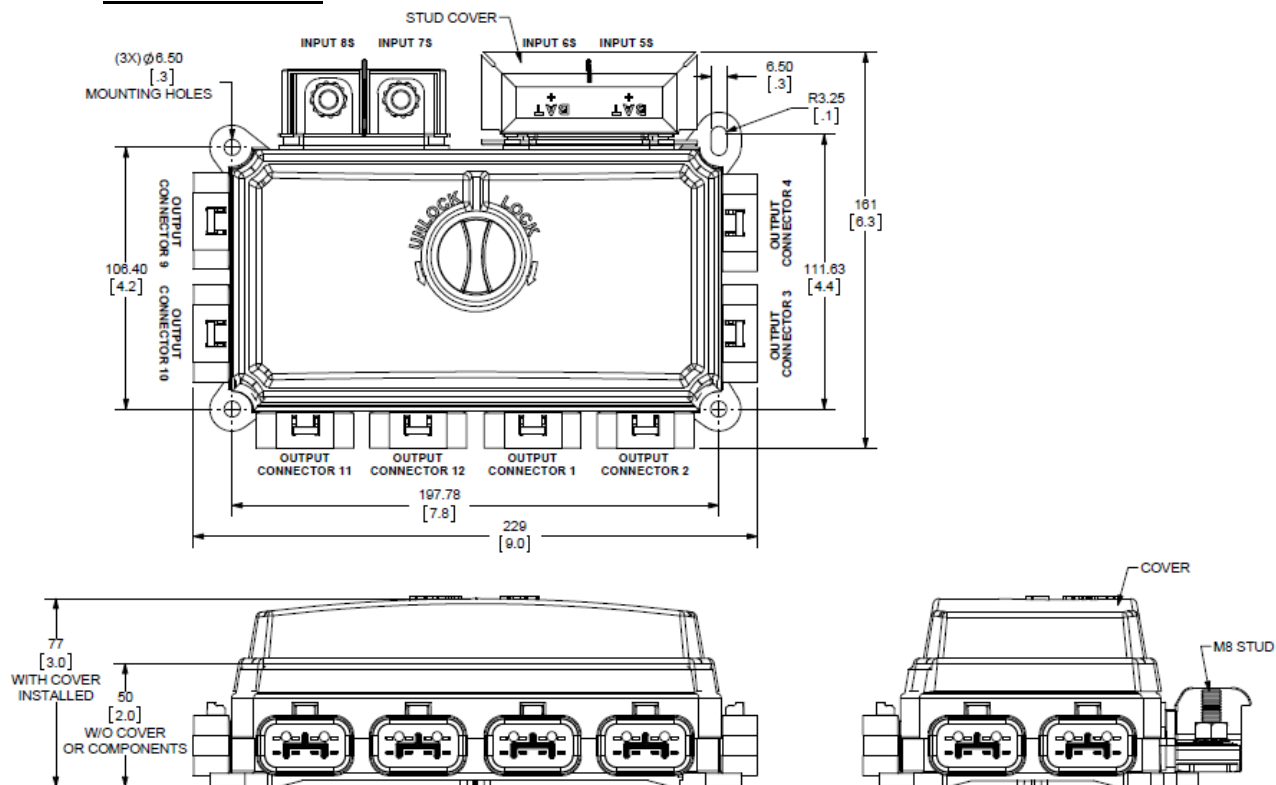


ssVEC DIMENSIONS

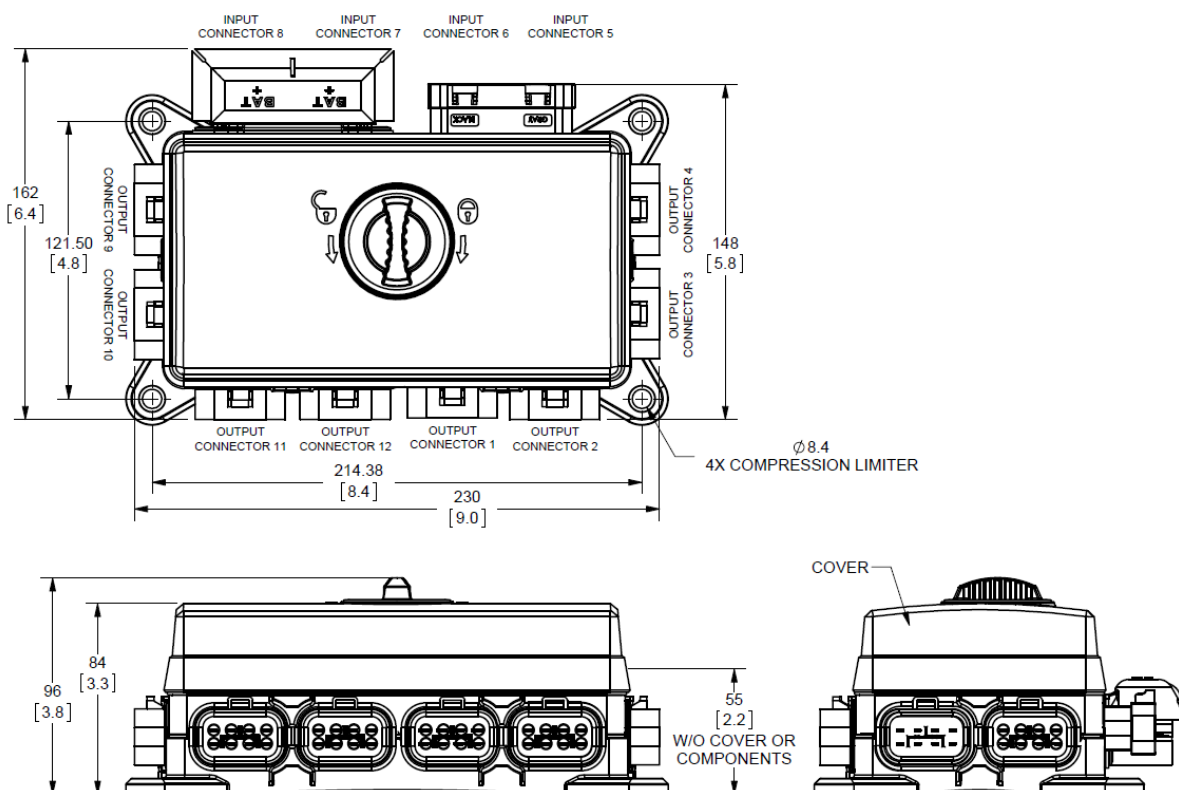


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DVEC DIMENSIONS

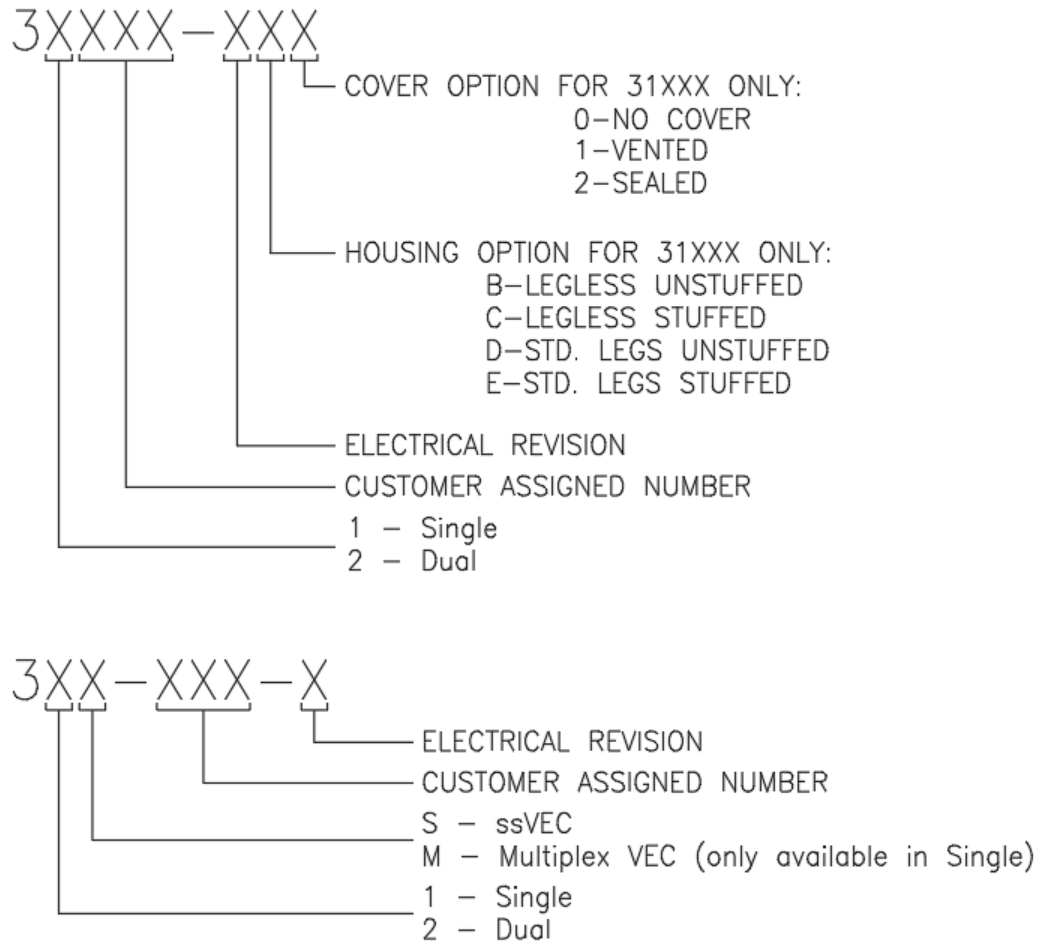


ssDVEC DIMENSIONS



VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

7.0 PART NUMBERING SCHEMES



Eaton Generic Part Numbers

31S-000-0 (8 Relays/8 Fuses)

31S-001-0 (6 Relays/16 Fuses)

31S-002-0 (8 Relays/16 Fuses)

31S-003-0 (29 Fuses)

31S-004-0 (8 Relays/8 Fuses)

32S-300-0 (16 Fused Relays)

32S-301-0 (58 Fuses)

32S-302-0 (14 Relays/24 Fuses)

31M-000-2 (8 Relays/16 Fuses, 12V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

31M-300-0 (12 Relays/8 Fuses, 12V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

31M-327-0 (4 Relays/23 Fuses, 12V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

31M-328-0 (4 Relays/23 Fuses, 24V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

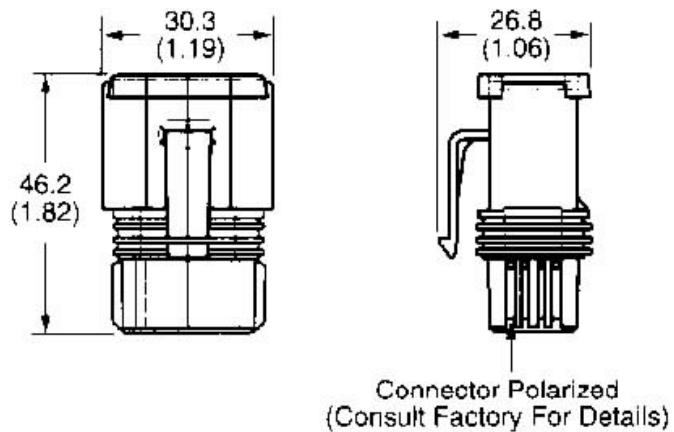
31M-329-0 (8 Relays/16 Fuses, 24V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

31M-330-0 (12 Relays/8 Fuses, 24V), (Consult factory for mVEC User Guide **31M-XXX-X(X)UM_B**)

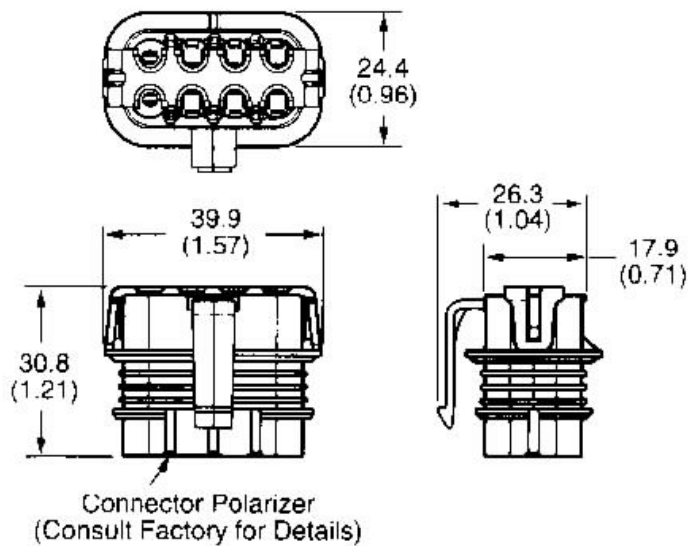
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8.0 CONNECTOR DIMENSIONS

6.1 INPUT CONNECTOR



6.2 OUTPUT CONNECTOR



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9.0 CONNECTOR & CONNECTOR ACCESSORIES

9.1 MALE INPUT CONNECTOR (800 SERIES)

32004-X X

SEALING OPTION
1 = Non-sealed 2 = Sealed

PART COLOR
A = Black B = Gray

9.2 INPUT CONNECTOR – TERMINAL POSITION ASSURANCE (TPA)

32004-TPX

SEALING OPTION
1 = For Use with Non-Sealed Terminals
2 = For Use with Sealed Terminals

9.3 INPUT CONNECTOR – CONNECTOR POSITION ASSURANCE (CPA)

32004-CP

9.4 MALE OUTPUT CONNECTOR (280 SERIES)

32006-X X X

SEALING OPTIONS
1 = Non-sealed 2 = Sealed

CONNECTOR CAVITY CONFIGURATION
1 = For Use with Tangless Wire Terminals
2 = For Use with Tanged Wire Terminals
P = Plugged

PART COLOR
A = Black E = Yellow J=Neutral (only available with –JP2 option.)
B = Gray F = Red
C = Green G = Orange
D = Blue H = Brown

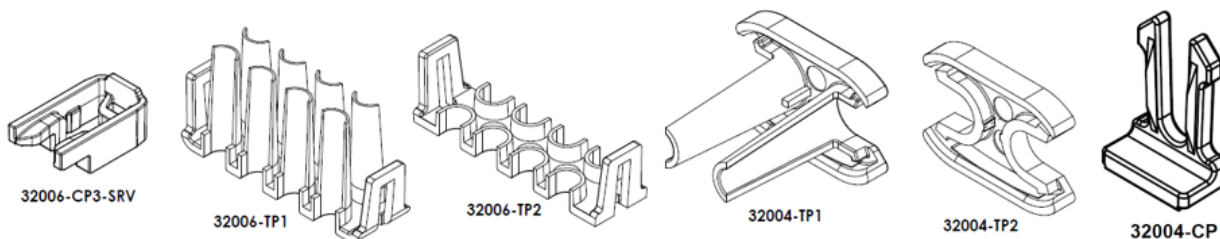
9.5 OUTPUT CONNECTOR – TERMINAL POSITION ASSURANCE (TPA)

32006-TPX

SEALING OPTION
1 = For Use with Non-sealed Terminals
2 = For Use with Sealed Terminals

9.6 OUTPUT CONNECTOR – CONNECTOR POSITION ASSURANCE (CPA)

32006-CP3-SRV



VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

10.0 MATING TERMINAL REFERENCE CHART

The chart below is for reference only and is subject to changes by Aptiv Packard. Aptiv Packard part numbers are shown.

PART NUMBERS	TERMINALS DESCRIPTION	CABLE RANGE (mm sq)	GAUGE
12110843	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	.35-.50	22-20
12110844	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	.80-1.0	18-16
12129424	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	1.0-2.0	16-14
12110842	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	2.0-3.0	14-12
12129663	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	3.0	12
12129425	280 ser. Metri-Pack Unsealed Female Terminal - Tangless	5.0	10
12110846	280 ser. Metri-Pack Sealed Female Terminal - Tangless	.35-.50	22-20
12110847	280 ser. Metri-Pack Sealed Female Terminal - Tangless	.80-1.0	18-16
12129409	280 ser. Metri-Pack Sealed Female Terminal - Tangless	1.0-2.0	16-14
12110845	280 ser. Metri-Pack Sealed Female Terminal - Tangless	2.0-3.0	14-12
12110853	280 ser. Metri-Pack Sealed Female Terminal - Tangless	3.0-5.0	12-10
12052217	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	.35-.50	22-20
12034046	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	.50-.80	20-18
12066214	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	1.0-2.0	16-14
12129494	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	2.0-3.0	14-12
12059284	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	3.0	12
12015858	280 ser. Metri-Pack Unsealed Female Terminal - w/Tang	3.0-5.0	12-10
12084201	280 ser. Metri-Pack Sealed Female Terminal - w/Tang	.35-.50	22-20
12077411	280 ser. Metri-Pack Sealed Female Terminal - w/Tang	.50-.80	20-18
12077412	280 ser. Metri-Pack Sealed Female Terminal - w/Tang	1.0-2.0	16-14
12129493	280 ser. Metri-Pack Sealed Female Terminal - w/Tang	2.0-3.0	14-12
12077413	280 ser. Metri-Pack Sealed Female Terminal - w/Tang	3.0	12
12065915	800 ser. Metri-Pack Unsealed Female Terminal - w/spring	.80-1.0	18-16
12065916	800 ser. Metri-Pack Unsealed Female Terminal - w/spring	2.0-3.0	14-12
12110127	800 ser. Metri-Pack Unsealed Female Terminal - w/spring	5.0	10
12146942	800 ser. Metri-Pack Unsealed Female Terminal - w/spring	8.0	8
12092445	800 ser. Metri-Pack Unsealed Female Terminal - w/spring	8.0	8
12129383	800 ser. Metri-Pack Sealed Female Terminal	8.0	8
12065905	800 ser. Metri-Pack Spring (Note: Spring must be assembled to 12129383 terminal)		
PART NUMBERS	SEALS DESCRIPTION/COLOR/TYPE	CABLE DIA.	
12015193	280 ser. Metri-Pack cable seal/Blue/Straight	3.45-4.30	
12010293	280 ser. Metri-Pack cable seal/Light Gray/Straight	2.81-3.49	
12015323	280 ser. Metri-Pack cable seal/Green/Ribbed	2.03-2.85	
12041351	280 ser. Metri-Pack cable seal/Tan/Straight	2.03-2.42	
12089679	280 ser. Metri-Pack cable seal/Purple/Ribbed	1.60-2.15	
12015899	280 ser. Metri-Pack cable seal/Dark Red/Ribbed	1.29-1.70	
12129381	800 ser. Metri-Pack cable seal	4.54-4.70	
PART NUMBERS	CAVITY PLUGS		
12010300	280 Metri-Pack Cavity plug for 32006-XX Connector		
PART NUMBER	TERMINAL REMOVAL TOOL		
12094429	280 & 800 Ser. Metri-Pack Female Terminal Removal Tool		

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11.0 AVAILABLE PLUG-IN COMPONENTS/DEVICES

TYPE OF COMPONENT	EATON P/N
1A Mini Fuse	BK-ATM-1
2A Mini Fuse	BK-ATM-2
3A Mini Fuse	BK-ATM-3
4A Mini Fuse	BK-ATM-4
5A Mini Fuse	BK-ATM-5
7.5A Mini Fuse	BK-ATM-7-1-2
10A Mini Fuse	BK-ATM-10
15A Mini Fuse	BK-ATM-15
20A Mini Fuse	BK-ATM-20
25A Mini Fuse	BK-ATM-25
30A Mini Fuse	BK-ATM-30
7.5A Type I Mini Circuit Breaker	21175-00
10A Type I Mini Circuit Breaker	21110-00
15A Type I Mini Circuit Breaker	21115-00
20A Type I Mini Circuit Breaker	21120-00
25A Type I Mini Circuit Breaker	21125-00
30A Type I Mini Circuit Breaker	21130-00
7.5A Type II Mini Circuit Breaker	21275-00
10A Type II Mini Circuit Breaker	21210-00
15A Type II Mini Circuit Breaker	21215-00
20A Type II Mini Circuit Breaker	21220-00
25A Type II Mini Circuit Breaker	21225-00
30A Type II Mini Circuit Breaker	21230-00
8A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22308-200
10A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22310-200
15A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22315-200
20A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22320-200
25A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22325-200
30A Type III ATC Circuit Breaker (8.1mm Centerline 280)	22330-200
3A Diode	22D03-200
6A Diode	22903-6V
Transorb	22901-1-5
Resistors (68Ω, 100Ω, 120Ω, 200Ω, 1kΩ, 1.5kΩ, 2kΩ) Consult for availability	22902-XXX
12V Flux Tight Micro Relay (5-pin) - 35A NO / 20A NC	B120-7016-SRV
12V Flux Tight Mini Relay (5-pin) - 50A NO / 30A NC	B120-7017-SRV
12V Flux Tight Micro Relay (4-pin) - 20A NO	B120-7022-SRV
24V Flux Tight Micro Relay (5-pin) - 15A NO / 10A NC	B120-7018-SRV
24V Flux Tight Mini Relay (5-pin) - 20A NO / 15A NC	B120-7019-SRV
24V Flux Tight Micro Relay (4-pin) - 15A NO	B120-7026-SRV

STANDARD RELAY (SONG CHUAN/HONGFA) USED UNLESS OTHERWISE SPECIFIED.

VEHICLE ELECTRICAL CENTER PRODUCT APPLICATION GUIDE

12.0 SAMPLE LAYOUTS

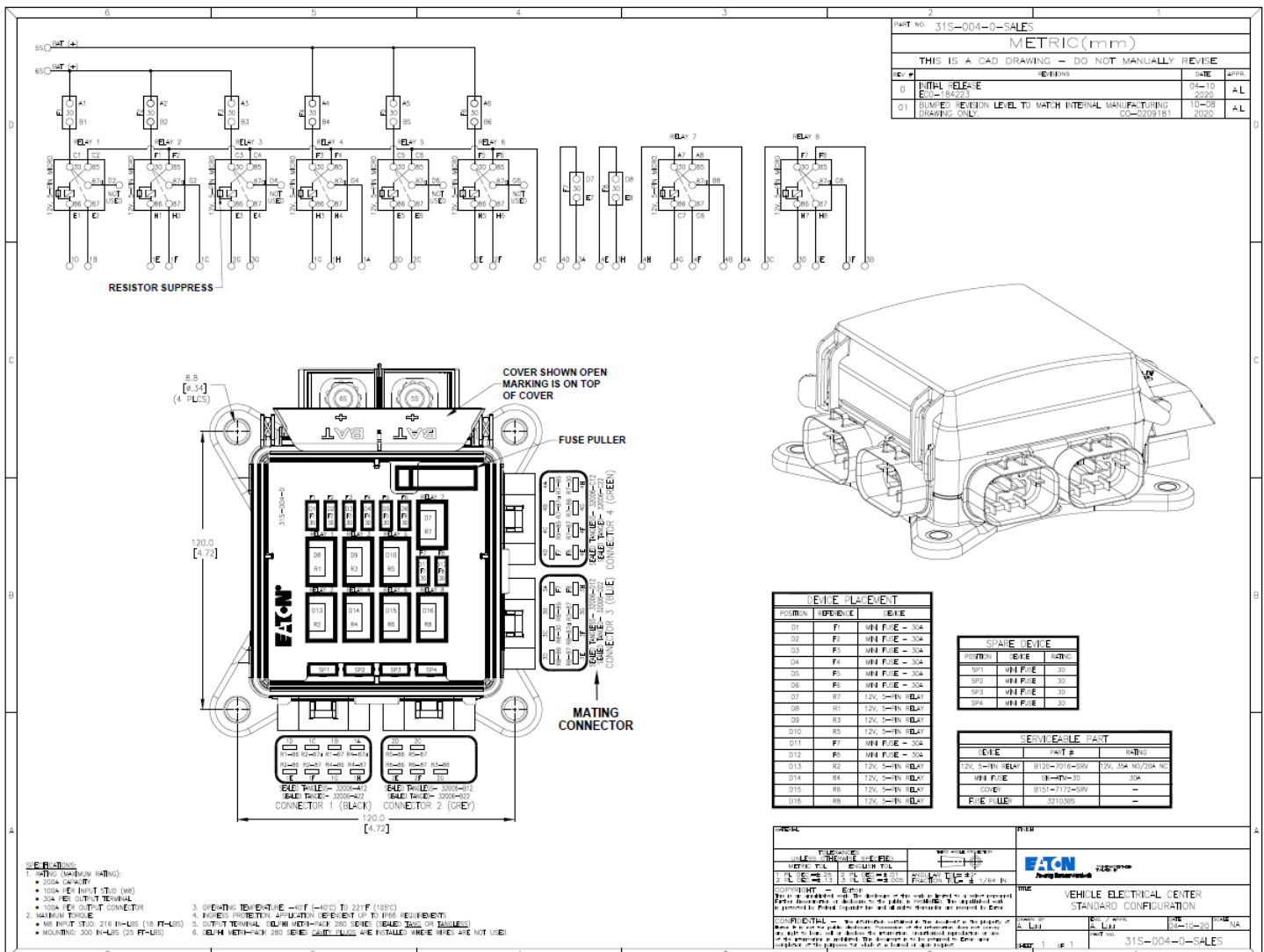
When you go through the process of designing in a VEC onto your vehicle, Eaton will provide you with two key documents:

- 1) the VEC Schematic design document – shows the logical representation of the circuits, components, and connection points to the VEC.
- 2) The VEC Layout document – shows how devices will be seated onto the surface of the VEC, as well as the harness connection point information. Additionally, any custom marking will be provided to you in this document include etching on the cover.

This document can be used to determine how to connect to the VEC – e.g., provided to a harness manufacturer as sufficient information to connect to the VEC.

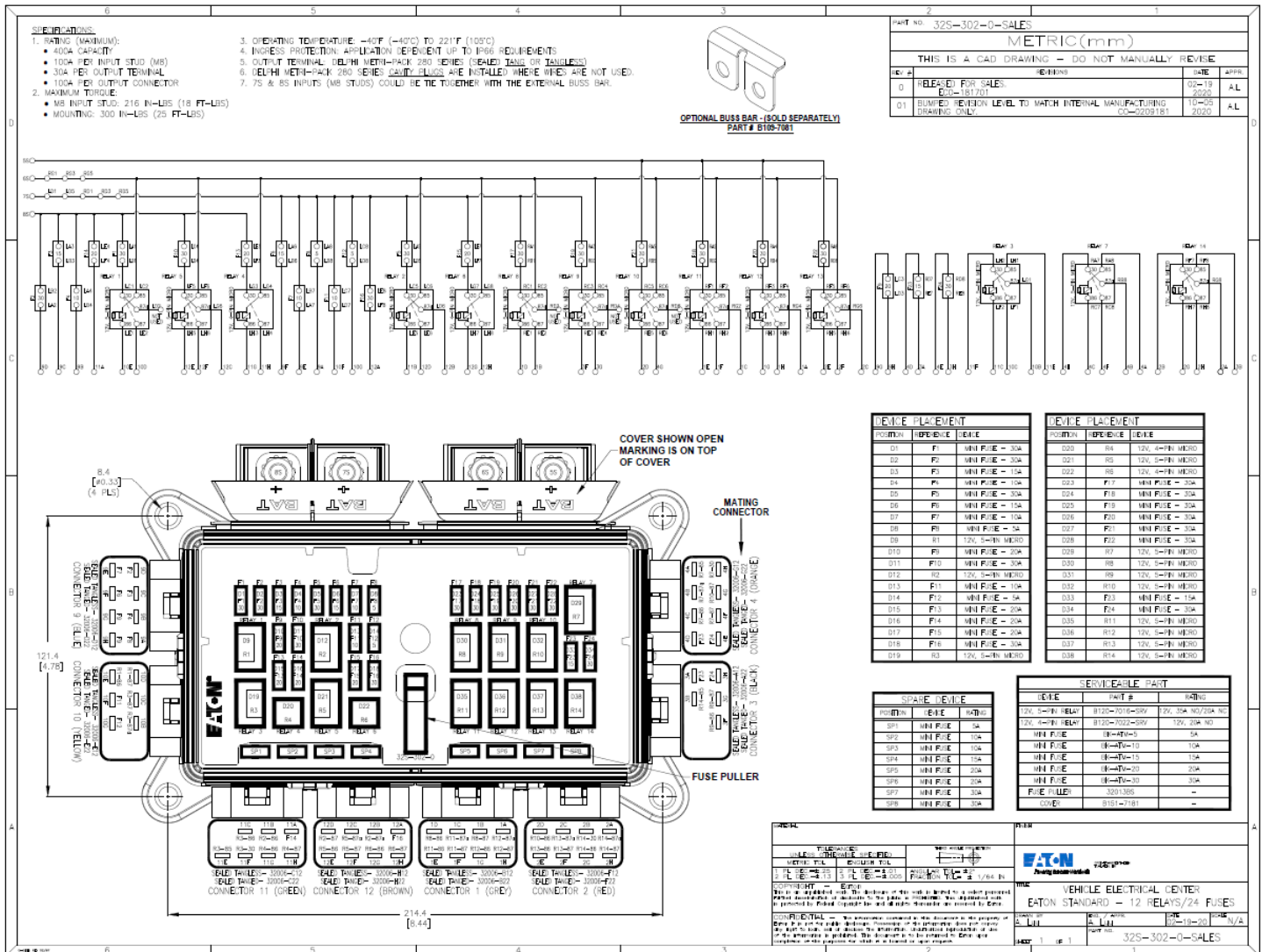
The following sections 11.1 - 11.3 show examples of the VEC customer documentation. Each unique VEC part number - design gets a set of custom prints. A custom design needs to be signed off - formally accepted by Eaton customer before the product is manufactured.

12.1 ssVEC LAYOUT



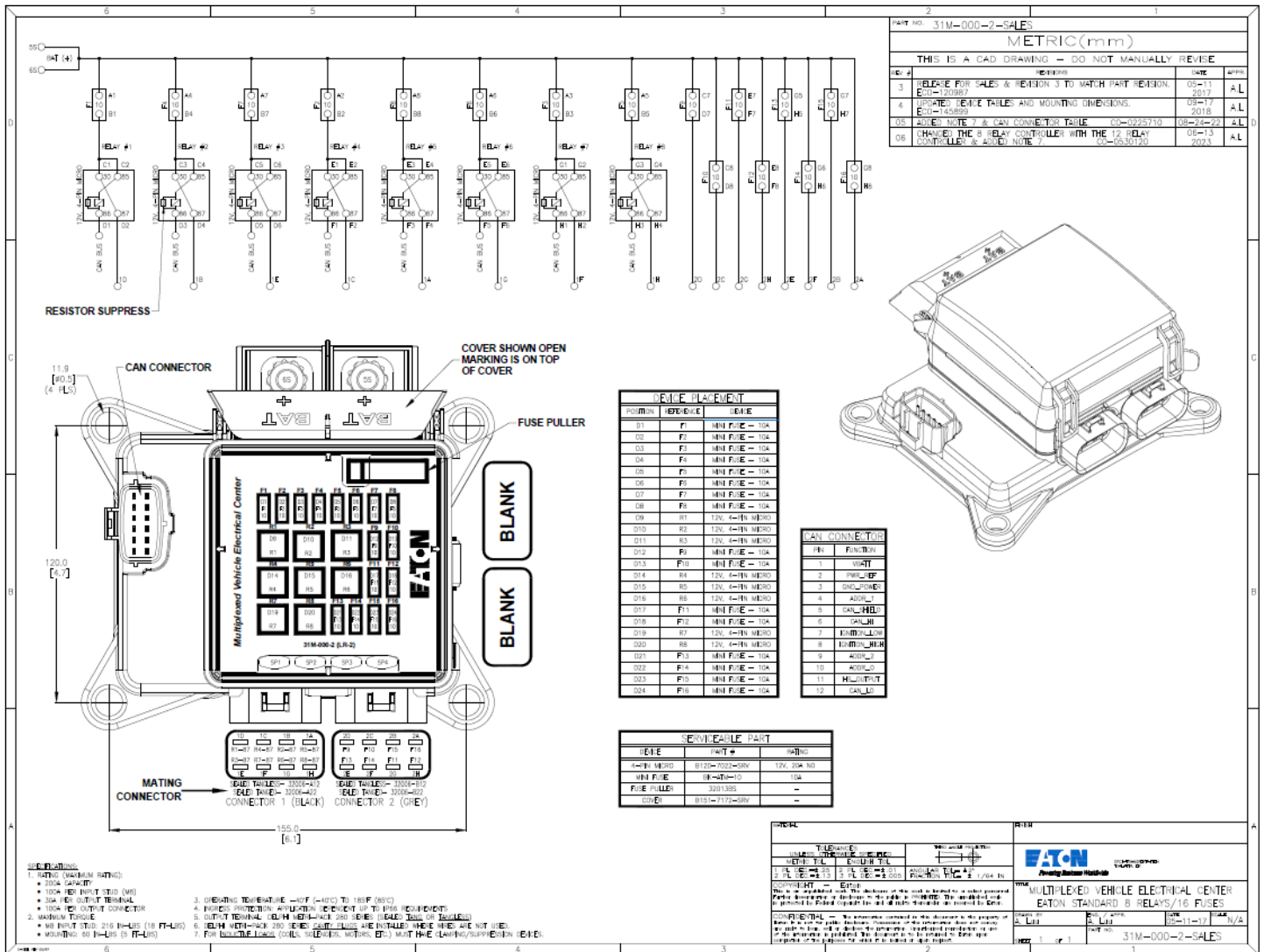
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12.2 ssDVEC LAYOUT



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12.3 mVEC LAYOUT (Consult factory for mVEC User Guide 31M-XXX-X(X)UM_B)



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13.0 TESTS

Each VEC manufactured by Eaton is electrically tested to ensure that they match the prints and that they are electrically operational to their electrical design.

Validation Testing: To ensure robust designs, Eaton VECs (VEC, ssVEC, DVEC & ssDVEC) were subjected to product validation tests. Listed below is a summary of testing that the VEC product has been subjected to, which includes the following tests:

13.1 ELECTRICAL

- Maximum temp rise at rated current: 60°C (140°F)
- Insulation resistance: > 10M Ω @ 500 Vdc
- Dielectric voltage withstands: > 500 Vdc

13.2 MECHANICAL

- Component insertion-withdrawal: 53N (11.9lb) maximum
- Recommended mounting torque: 2.7 $\pm$ 0.5 Nm (24in-lb) maximum
- Cover hinge durability: 1000 cycles opening-closing
- Connector durability: 50 cycles mate-unmated
- Vibration test: random and sinusoidal
- Mechanical shock

13.3 ENVIRONMENTAL

- 1008 Hour elevated temperature test @ 125°C (260°F)
- Thermal shock @ -55°C (-55°F) and 125°C (260°F)
- 24 Hour accelerated aging with temperature and humidity
- Automotive chemical resistance
- 200-hour salt fog exposure
- Water splash test
- 24-hour dust exposure



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14.0 CUSTOMER APPLICATION INFORMATION FORM

Vehicle Electrical Center - Customer Application Form Powering Business Worldwide	
PROTOTYPE #: (supplied by CPCD App Engr.) Customer: Customer Contact: Customer Phone #: Customer Email:	PRODUCTION #: (supplied by CPCD App Engr.) Date: Customer P/N: Anticipated Volumes: ☐ Per Year ☐ Per Month Date Layout/Prints are needed: Date prototypes are needed: # of prototype that are required: Production start date: Product Platform/Application:
Please contact your CPCD Account Manager or Application Engineer for any required VEC information, such as connectors, terminals, available components, options, etc.	
PHYSICAL REQUIREMENTS 1. Describe the location and type of environment in which the VEC will be mounted. Attention should be given to the mounting / environment. Unit should be mounted horizontally, or as close to the horizontal position as possible and protected from splashing. Consult factory for any questions. DETAILED EXPLANATION HERE:	
2. What is the system voltage? ☐ 12VDC ☐ 24VDC 3. Are circuit breakers used? If yes, then what type? ☐ Type I (12VDC only) ☐ Type II (12VDC only) ☐ Type III resettable button (12VDC/24VDC) 4. Is compression limiter needed on the mounting feet (ssVEC only)? ☐ No Compression Limiters (default) ☐ Stainless Compression Limiters 5. How is the VEC to be supplied? ☐ STUFFED/COMPONENTS INSTALLED ☐ UNSTUFFED/WITHOUT COMPONENTS 6. Which VEC is required? ☐ Fully Sealed - includes Gortex Vent (IP65) ☐ Standard (IP65) 7. Is marking required? ☐ Inside Cover (VEC, ssVEC) ☐ OUTSIDE COVER (All) ☐ BOTH (VEC, ssVEC) 8. Are there any special markings and/or color requirements for the label(s)? If customer logos are needed, please provide .dxf file to CPCD.	
EXPLANATION HERE:	
CUSTOMER SCHEMATIC MUST BE SUPPLIED AT TIME OF APPLICATION SUBMISSION TO CPCD. DESIGN WILL NOT BE STARTED UNTIL COMPLETED APPLICATION & SCHEMATIC ARE RECEIVED. PRINT MUST SHOW REQUIRED COMPONENTS AND AMPERAGE RATINGS. 1. If any of the input/outputs need to be grouped together, please indicate the groupings on the above supplied schematic.	
QUALITY/TEST REQUIREMENTS ☐ NO ☐ YES - SPECS/REQUIREMENTS TO BE SUPPLIED BY CUSTOMER AT TIME OF APPLICATION SUBMITTAL 1. Is a PPAP/ISIR req'd for prototypes or production parts? If so, what level? Any special PPAP requirements: Customer Quality Contact Name: Phone #: Email: Mailing Address:	
CUSTOMER APPROVAL Customer is required to sign off on prints supplied by Eaton prior to prototype or production orders. <input style="margin-right: 10px;" type="checkbox"/> YES I have read the Eaton VEC Customer Application Guide and understand the conditions / my manufacturer responsibilities stated in the VEC Guide	
Signature: Name (print): Date: Title:	
Send this completed form & customer schematics to email (albertluu@eaton.com) or to the Sales Account Manager.	

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15.0 DESIGN PROCESS

- 15.1** VEC application form is completed and submitted to eMobility LV Application Engineer or Account Manager. Customer schematic **MUST** be included.
- 15.2** Design request is entered in eMobility LV design queue.
- 15.3** Schematic is created in Eaton's linear format (See pages 11-12 for examples) and a layout is created. It is then sent to customer for review/approval.
 - 15.3.1 Standard VEC layout lead time 1-2 weeks
 - 15.3.2 Lead times are dependent on design complexity, size, and current design queue.
 - 15.3.3 Sales Account Manager should be notified for any priorities.
- 15.4** Once layout is approved, it must be signed and dated by customer. It is then sent back to eMobility LV Applications Engineering.
- 15.5** Prototype orders may be submitted to Sales Account Manager after design approval is received or to Application Engineer.
 - 15.5.1 Prototype order is submitted to Inside Sales.
 - 15.5.2 Prototype print packages are created and sent to manufacturing.
 - 15.5.3 Standard lead time for prototypes is 12-14 weeks. (Dependent on current queue)
- 15.6** When customer is ready for production, a production number will be assigned, and production SALES drawing will be to the customer for final review and approval. The production part number will be release into manufacturing.
 - 15.6.1 PPAP request info must be submitted at time of production order (if required). All contact info is required at this time.
 - 15.6.2 VEC/ssVEC is shipped in multiples of 12 per box.
 - 15.6.3 DVEC/ssDVEC is shipped in multiples of 6 per box.
 - 15.6.4 Standard lead time for NEW production orders is 10-12 weeks.

16.0 DEFINITIONS AND TERMINOLOGY

- **CPA** – Connector Position Assurance, a device that prevents the accidental pull-out of a male connector from the VEC-DVEC.
- **Dielectric** – Frequently called an insulator that allows low current to pass under high voltage.
- **Resistance** – Opposition to the flow of electrical current (measured in ohms)
- **TPA** – Terminal Position Assurance, a device that prevents the accidental pull-out of wire terminals from the male input and-or output connectors.
- **VEC** – Series 31000 Vehicle Electrical Center, Eaton's state-of-the-art automotive power distribution module. Sometimes the word 'VEC' is used to refer to any VEC, even if it is a Dual VEC, ssVEC, or ssDVEC.
- **DVEC** – Series 320000 Dual Vehicle Electrical Center, offers twice the capacity of the VEC.
- **ssVEC/ssDVEC** – Severe Service Vehicle Electrical Center. Electrically this is the same as a 31000/32000 series VEC but differs from the base VEC because the housing has silicon gaskets placed everywhere plastic meets plastic or metal meets plastic. The entire housing is much more watertight than a 31000.
- **mVEC** – multiplexed Vehicle Electrical Center – The same as the ssVEC (sealed) but also has a CAN networking layer (J1939 compatible) placed inside the VEC.
- **Input Connector** – refers to a connectorized point on the VEC that is typically used as a power input connection point. Depending upon the specific VEC schematic design, a VEC input connector may be used as an output connector. VEC input connection points are keyed and color specific (Black/Grey).
- **Output Connector** – refers to an 8 position VEC 'output' connection point used on the VEC. Depending upon the specific VEC schematic design, a VEC output connector may be used as an input connection point for specific circuits. VEC input connection points are keyed and color specific (Black, Grey, Blue, Green, Red, Yellow, Orange & Brown).

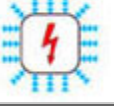
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- **IP Rating** – Many manufacturers including Eaton establish an “IP Rating” based on benchmark testing of parts.

IP Rating (IP XY)

First number X - protection against ingress of solid objects

Second number Y - protection against ingress of water

0		no protection	0		no protection
1		protection against objects larger than 50 mm diameter	1		vertical dripping water
2		protection against objects larger than 12.5 mm diameter	2		dripping water, 15° tilted
3		protection against objects larger than 2.5 mm diameter	3		spraying water
4		protection against objects larger than 1.0 mm diameter	4		splash water
5		protection against dust (limited ingress, not harmful)	5		water jets
6		protection against dust (dust-tight, no ingress)	6		powerful water jets
			7		temporary immersion (test 1 m, 30 min.)
			8		continuous immersion (test to be agreed, but exceeding no. 7)