

CODE 3 Installation and Operation Instructions


Switch Node MATRIX[®] Enabled

IMPORTANT! Read all instructions before installing and using. Installer: This manual must be delivered to the end user.



WARNING!

Failure to install or use this product according to manufacturer's recommendations may result in property damage, serious injury, and/or death to those you are seeking to protect!

 **Do not install and/or operate this safety product unless you have read and understood the safety information contained in this manual.**

1. Proper installation combined with operator training in the use, care, and maintenance of emergency warning devices are essential to ensure the safety of emergency personnel and the public.
2. Emergency warning devices often require high electrical voltages and/or currents. Exercise caution when working with live electrical connections.
3. This product must be properly grounded. Inadequate grounding and/or shorting of electrical connections can cause high current arcing, which can cause personal injury and/or severe vehicle damage, including fire.
4. Proper placement and installation is vital to the performance of this warning device. Install this product so that output performance of the system is maximized and the controls are placed within convenient reach of the operator so that they can operate the system without losing eye contact with the roadway.
5. Do not install this product or route any wires in the deployment area of an air bag. Equipment mounted or located in an air bag deployment area may reduce the effectiveness of the air bag or become a projectile that could cause serious personal injury or death. Refer to the vehicle owner's manual for the air bag deployment area. It is the responsibility of the user/operator to determine a suitable mounting location ensuring the safety of all passengers inside the vehicle particularly avoiding areas of potential head impact.
6. It is the responsibility of the vehicle operator to ensure daily that all features of this product work correctly. In use, the vehicle operator should ensure the projection of the warning signal is not blocked by vehicle components (i.e., open trunks or compartment doors), people, vehicles or other obstructions.
7. The use of this or any other warning device does not ensure all drivers can or will observe or react to an emergency warning signal. Never take the right-of-way for granted. It is the vehicle operator's responsibility to be sure they can proceed safely before entering an intersection, drive against traffic, respond at a high rate of speed, or walk on or around traffic lanes.
8. This equipment is intended for use by authorized personnel only. The user is responsible for understanding and obeying all laws regarding emergency warning devices. Therefore, the user should check all applicable city, state, and federal laws and regulations. The manufacturer assumes no liability for any loss resulting from the use of this warning device.

Specifications:

Size:	6.93" X 3.13" X 1.19"
Weight:	0.84lbs
Input Voltage:	12-24 VDC
Output Current:	6A Max; 3A RMS each output 60A Max; 45A RMS total @ 65C 60A Max; 27A RMS total @ 85C
Fusing Requirement:	See Table 1
Matrix Connectivity:	Two Wire CAN
Operating Temperature:	-40°C to 85°C -40°F to 185°F

Unpacking and Pre-Installation:

Carefully remove the product and place it on a flat surface. Examine the unit for transit damage and locate all parts. If damage is found or parts are missing, contact the transit company or Code 3. Do not use damaged or broken parts. Ensure the product voltage is compatible with the planned installation.

Installation and Mounting:

Before proceeding with installation, plan all wiring and cable routing. Mount on flat surface using at least 2 points of mounting, and ensure that wires/power cables are not pulling on product. Do not mount product face down on labels/indicator window. Ensure that no metal edge, or conductive points are pressing on the potted (bottom) side of the product. Pick a location to mount product that is away from vehicle exhaust, coolant lines or other items that get hot.



CAUTION!
When drilling into any vehicle surface, make sure that the area is free from any electrical wires, fuel lines, vehicle upholstery, etc. that could be damaged.

Recommended mounting hardware #8-#10.
Maximum mounting torque, 35 in-lbs using #10-32 hardware with flange nut or washer on flat surface.
Different hardware or mounting will affect max torque limits.

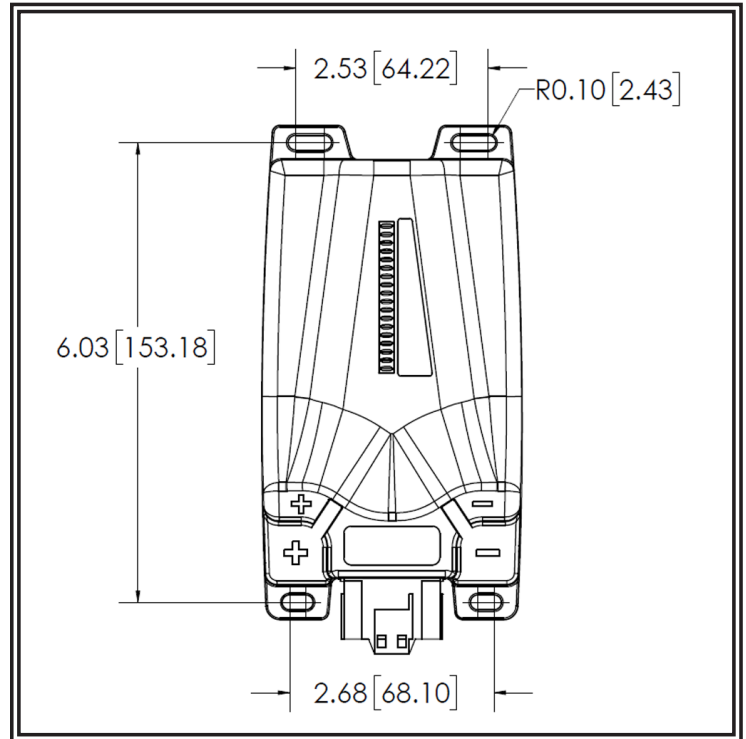


Figure 1

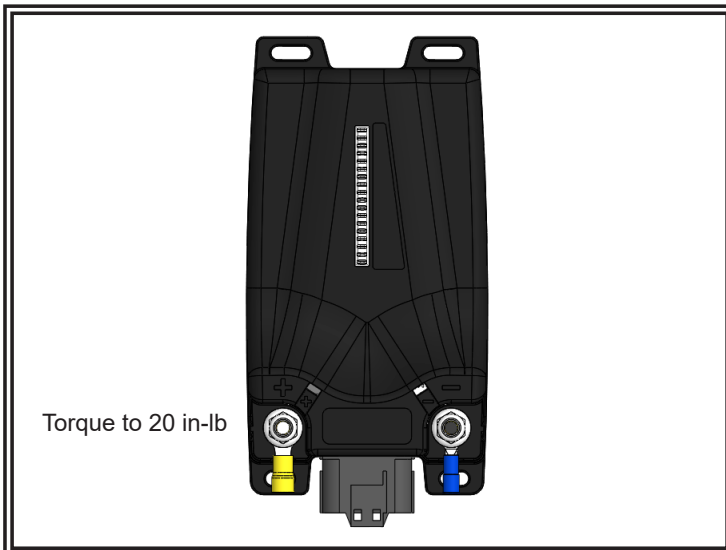


Figure 2

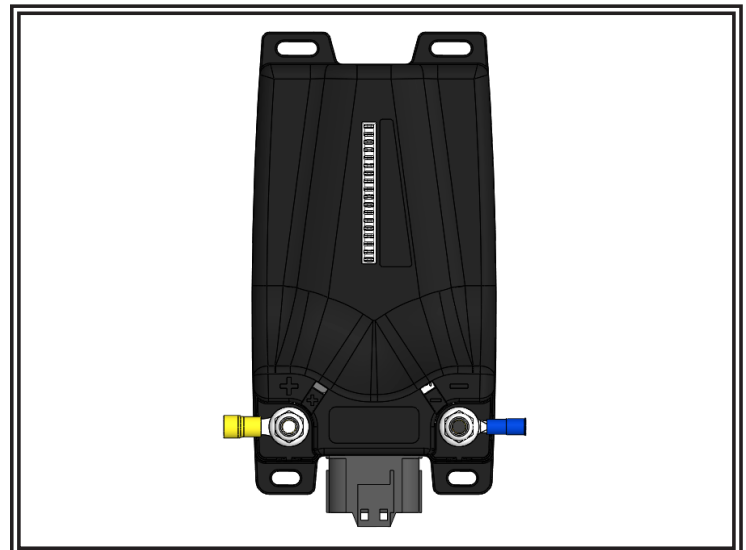


Figure 3

Wiring Instructions:

Using the appropriate ring terminal, connect a 14 AWG (min.) ground wire from a 12-24 VDC supply to the ground lug of the Switch Node (torque to 20 in-lb). It is not necessary to use a heavier gauge ground wire because most of the output current from the device does not return through the ground lug. Then, using the appropriate ring terminal, connect power wire (see Table 1 for size) from the same supply to the power lug of the Switch Node (torque to 20 in-lb). Install a fast blow, ATC style fuse in-line (see Table 1 for size). **Please note that the fuse holder selected by the installer must also be rated by its manufacturer to meet or exceed the corresponding fuse ampacity across the operating temperature.** See Figure 4 for details.

All Matrix compatible devices must also connect back to a central node, such as the Serial Interface Box or Z3 Serial Siren, to establish serial communication with the larger network. In this case, the Switch Node utilizes a bare wire, twisted pair. Connect the Yellow and Blue wires from the output harness to the central node as shown. See Figure 4 for details.

- Notes:**
1. Larger wires and tight connections will provide longer service life for components. For high current wires it is highly recommended that terminal blocks or soldered connections be used with shrink tubing to protect the connections. Do not use insulation displacement connectors (e.g., 3M Scotchlock type connectors).
 2. Route wiring using grommets and sealant when passing through compartment walls. Minimize the number of splices to reduce voltage drop. All wiring should conform to the minimum wire size and other recommendations of the manufacturer and be protected from moving parts and hot surfaces. Looms, grommets, cable ties, and similar installation hardware should be used to anchor and protect all wiring.
 3. Fuses or circuit breakers should be located as close to the power takeoff points as possible and properly sized to protect the wiring and devices.
 4. Particular attention should be paid to the location and method of making electrical connections and splices to protect these points from corrosion and loss of conductivity.
 5. Ground termination should only be made to substantial chassis components, preferably directly to the vehicle battery.
 6. Circuit breakers are very sensitive to high temperatures and will "false trip" when mounted in hot environments or operated close to their capacity.

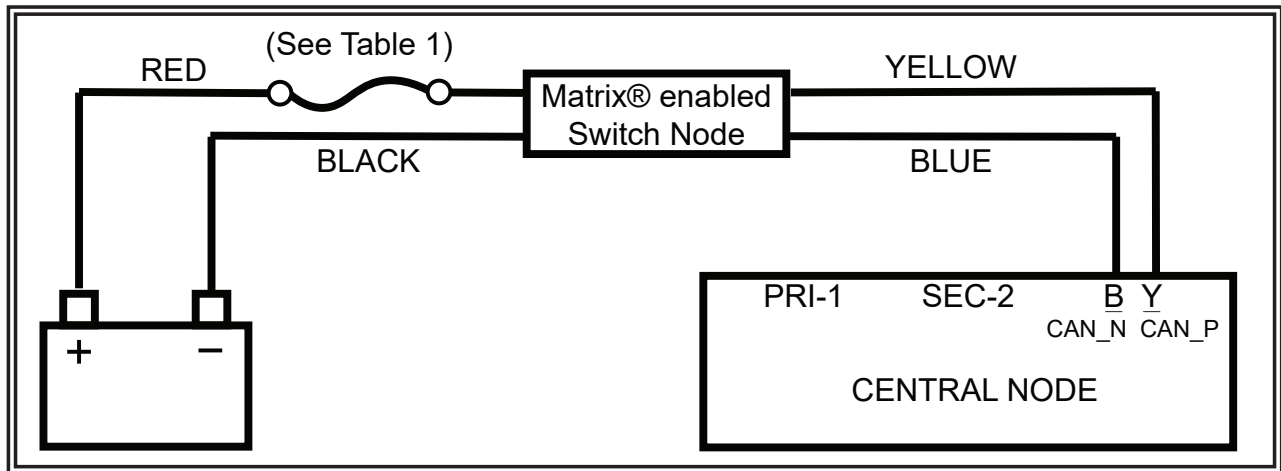


Figure 4

Please note, all unused output wires from the Switch Node should be tied off and electrically isolated. This is to prevent accidental contact with either power or ground.

Power Wire (+)	Fuse Rating (Max.)	Current (RMS)	Ground Wire (-)
8 AWG	60 A	45 A	14 AWG
10 AWG	50 A	35 A	14 AWG
12 AWG	40 A	25 A	14 AWG

Device Functionality:



Figure 5

TABLE 2 - INDICATOR LED	
LABEL	DESCRIPTION
1	OUTPUT 1 ACTIVE
2	OUTPUT 2 ACTIVE
3	OUTPUT 3 ACTIVE
4	OUTPUT 4 ACTIVE
5	OUTPUT 5 ACTIVE
6	OUTPUT 6 ACTIVE
7	OUTPUT 7 ACTIVE
8	OUTPUT 8 ACTIVE
9	OUTPUT 9 ACTIVE
10	OUTPUT 10 ACTIVE
11	OUTPUT 11 ACTIVE
12	OUTPUT 12 ACTIVE
13	OUTPUT 13 ACTIVE
14	OUTPUT 14 ACTIVE
15	OUTPUT 15 ACTIVE
16	OUTPUT 16 ACTIVE
STATUS	POWER ON: 10x FLASH / 4 SECONDS BOOTLOADER: 5x FLASH / SECOND AWAKE: 1 FLASH / 2 SECONDS ASLEEP: 30mSEC FLASH / CAN MESSAGE DEVICE MODE: TBD (FUTURE)
FAULT	POWER ON: 10x FLASH / 4 SECONDS OVER VOLTAGE: STEADY ON SHORT CIRCUIT: STEADY ON

TABLE 3 - OUTPUT HARNESS		
COLOR	DESCRIPTION	INDIVIDUAL RATING
BLUE W/ WHITE	OUTPUT 1	6A MAX / 3A RMS
BLUE W/ BLACK	OUTPUT 2	6A MAX / 3A RMS
WHITE	OUTPUT 3	6A MAX / 3A RMS
WHITE W/ BLACK	OUTPUT 4	6A MAX / 3A RMS
RED W/ WHITE	OUTPUT 5	6A MAX / 3A RMS
RED W/ BLACK	OUTPUT 6	6A MAX / 3A RMS
ORANGE W/ WHITE	OUTPUT 7	6A MAX / 3A RMS
ORANGE	OUTPUT 8	6A MAX / 3A RMS
YELLOW W/ WHITE	OUTPUT 9	6A MAX / 3A RMS
YELLOW W/ BLACK	OUTPUT 10	6A MAX / 3A RMS
BLACK W/ WHITE	OUTPUT 11	6A MAX / 3A RMS
BLACK W/ YELLOW	OUTPUT 12	6A MAX / 3A RMS
GREEN	OUTPUT 13	6A MAX / 3A RMS
GREEN W/ BLACK	OUTPUT 14	6A MAX / 3A RMS
PURPLE W/ WHITE	OUTPUT 15	6A MAX / 3A RMS
PURPLE	OUTPUT 16	6A MAX / 3A RMS

Flash Patterns:

Flash Pattern Table					
"Flash Pattern #"	Description	FPM	SAE Compliant Timing	CA T13 Compliant Timing	Duty Cycle
1	Single	75	YES	YES	44%
2	Double	75	YES	YES	43%
3	Triple	75	YES	YES	42%
4	Quad	75	YES	YES	42%
5	Quint	75	YES	YES	43%
6	Triple Pop	75	YES	YES	42%
7	Quad Pop	75	YES	YES	43%
8	Single	150	YES	-	44%
9	Double	150	YES	-	41%
10	Triple	150	YES	-	41%
11	Quad	150	YES	-	38%
12	Quint	150	YES	-	35%
13	Triple Pop	150	YES	-	38%
14	Quad Pop	150	YES	-	35%
15	Single	375	-	-	44%
16	NFPA Quad	75	YES	YES	43%

Feature Descriptions:

Load Rating: The installer must ensure that both the individual output current ratings, as well as the overall current ratings, are not exceeded. If either of these two ratings are exceeded during normal operation, one or more outputs may report a short circuit event and cease to function. Also, please note that the overall current ratings are reduced when the ambient temperature exceeds 65C. See Specifications for further detail.

Flashing Outputs: Outputs configured to be flashing are typically connected to directional light modules. These are identified in the Matrix software as either Single or Dual wire output types and are able to be configured with a dim setting. Flashing outputs CANNOT be “ganged”, or wired together to drive loads which exceed the individual output current ratings.

Load Management: Outputs configured to be non-flashing can be connected to a wide variety of products, whether lighting or otherwise. These are identified in the Matrix software as Load Management outputs and are NOT able to be configured with a dim or flash pattern setting. When using a Load Management output setting, the outputs involved CAN be “ganged”, or wired together to drive loads which exceed the individual output current ratings. For example, (4) individual outputs may be wired together to drive a load which pulls (4) x 6A Max, or 24 Max. Please note, however, that the RMS current must still be followed. So then (4) x 3A RMS yields 12A RMS. Please also note that only wire color pairs may be configured in this way. See the Matrix software for a list of available wire color combinations.

Short Circuit: In the event of a short circuit event, the output(s) involved will cease to function. The FAULT LED will be illuminated, and the affected output LEDs will not illuminate. The only way to recover from this event is to power cycle the Switch Node, after checking all output wiring for defects and / or shorted loads downstream.

Capacitive Loading: Certain output loads, such as directional light modules, may have capacitors inside them which draw a very large, peak inrush current at turn on. As more and more directional light modules are connected to the switch node, there comes a point where the vehicle supply cannot quickly provide the inrush current which the lights demand. So these recommended counts are provided to help installers avoid nuisance short circuit faults. Individual circumstances may vary, however, based upon a number of factors. When in doubt, use a larger power wire, up to 8AWG.

TABLE 4 - 12V SYSTEM			
	Total # of Light Modules		
Lights per Output	≤ 25	≤ 32	≤ 48
	≤ 5	≤ 4	≤ 3

TABLE 5 - 24V SYSTEM			
	Total # of Light Modules		
Lights per Output	-	≤ 18	≤ 32
	-	≤ 3	≤ 2

Hot Start: If the Switch Node is physically power cycled when it's internal temperature exceeds 70C (158F), the outputs which are configured to be flashing may be deliberately dimmed. This is to prevent the risk of potential thermal runaway during a hot start. However, once the Switch Node cools down below 70C internal for the first time, it will resume normal output intensity thereafter. Flashing outputs will only be dimmed when the overall RMS current or temperature rating has been exceeded.

Sleep: When the configured sleep timer in the central node expires, the Switch Node goes to sleep along with the rest of the system. This is in order to reduce power drawn from the vehicle battery. During this time, the Switch Node STATUS LED will flash briefly, but only upon receipt of a recurring status message from the central node. All other Switch Node functions will not available until the central node resumes normal operation, in response to its ignition wire input.

Troubleshooting:

Problem	Possible Cause(s)	Comments / Response
No Power	Faulty wiring	Ensure power and ground connections to the product are secured. Remove and reconnect the power wire to the vehicle battery.
	Input Voltage	The product is equipped with an over voltage lockout circuit. During a sustained overvoltage event, the Product inside will maintain communication with the rest of the Matrix network, but disable power out to the output harness. Look for the solid amber FAULT LED. Ensure that input voltage does not exceed the specified range for your particular product. When overvoltage occurs, the input must temporarily drop ~1V below the maximum limit in order to resume normal operation.
	Blown fuse	The product may have blown an upstream fuse. Check and replace fuse if necessary.
No Communication	Sleep State	An ignition wire input is first required to bring the central node out of a sleep state. From that point, the central node controls the status of all other Matrix compatible devices, including the Switch Node. If the product is active, you should see a flashing green STATUS LED inside the Switch Node housing. See the installation manual of the customer selected central node for further troubleshooting of the ignition input. See the Table 2 for more information on the STATUS LED.
	Connectivity	Ensure that the bare wire, twisted pair cable is securely connected back to a central node. Ensure that the proper polarity of the pair is followed, i.e. the blue and yellow wires are connected to B / Y or CAN_P / _N
Bad Output	No Response	<p>Ensure that the desired output has been configured properly in the Matrix Software.</p> <p>Ensure that the system state is not overriding the desired output. For example, if the output is configured to turn off when the system is in Park Kill, verify that your vehicle is not in Park.</p> <p>Ensure that the corresponding Output LED is illuminated inside the switch node housing, when active. Ensure that the output wiring is free of damage and securely connected to the output load.</p>
	Short Circuit	In the event of an output short circuit, the amber FAULT LED will be illuminated. A quick way to determine which outputs are affected is to push a configuration to the switch node which turns on all outputs. The affected Output LEDs will not turn on. Ensure that those particular output wires are free of damage and securely connected to their output loads. Then check continuity from those particular output loads to ground. Also, ensure that the capacitive loading of the affected outputs is not excessive. For example, review the recommended directional light module count per output as described in Device Functionality → Capacitive Loading.

Warranty:

Manufacturer Limited Warranty Policy:

Manufacturer warrants that on the date of purchase this product will conform to Manufacturer's specifications for this product (which are available from the Manufacturer upon request). This Limited Warranty extends for Sixty (60) months from the date of purchase.

DAMAGE TO PARTS OR PRODUCTS RESULTING FROM TAMPERING, ACCIDENT, ABUSE, MISUSE, NEGLIGENCE, UNAPPROVED MODIFICATIONS, FIRE OR OTHER HAZARD; IMPROPER INSTALLATION OR OPERATION; OR NOT BEING MAINTAINED IN ACCORDANCE WITH THE MAINTENANCE PROCEDURES SET FORTH IN MANUFACTURER'S INSTALLATION AND OPERATING INSTRUCTIONS VOIDS THIS LIMITED WARRANTY.

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MANUFACTURER'S SOLE LIABILITY AND BUYER'S EXCLUSIVE REMEDY IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR UNDER ANY OTHER THEORY AGAINST MANUFACTURER REGARDING THE PRODUCT AND ITS USE SHALL BE, AT MANUFACTURER'S DISCRETION, THE REPLACEMENT OR REPAIR OF THE PRODUCT, OR THE REFUND OF THE PURCHASE PRICE PAID BY BUYER FOR NON-CONFORMING PRODUCT. IN NO EVENT SHALL MANUFACTURER'S LIABILITY ARISING OUT OF THIS LIMITED WARRANTY OR ANY OTHER CLAIM RELATED TO THE MANUFACTURER'S PRODUCTS EXCEED THE AMOUNT PAID FOR THE PRODUCT BY BUYER AT THE TIME OF THE ORIGINAL PURCHASE. IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR LOST PROFITS, THE COST OF SUBSTITUTE EQUIPMENT OR LABOR, PROPERTY DAMAGE, OR OTHER SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES BASED UPON ANY CLAIM FOR BREACH OF CONTRACT, IMPROPER INSTALLATION, NEGLIGENCE, OR OTHER CLAIM, EVEN IF MANUFACTURER OR A MANUFACTURER'S REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. MANUFACTURER SHALL HAVE NO FURTHER OBLIGATION OR LIABILITY WITH RESPECT TO THE PRODUCT OR ITS SALE, OPERATION AND USE, AND MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES THE ASSUMPTION OF ANY OTHER OBLIGATION OR LIABILITY IN CONNECTION WITH SUCH PRODUCT.

This Limited Warranty defines specific legal rights. You may have other legal rights which vary from jurisdiction to jurisdiction. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages.

Product Returns:

If a product must be returned for repair or replacement*, please contact our factory to obtain a Return Goods Authorization Number (RGA number) before you ship the product to Code 3®, Inc. Write the RGA number clearly on the package near the mailing label. Be sure you use sufficient packing materials to avoid damage to the product being returned while in transit.

*Code 3®, Inc. reserves the right to repair or replace at its discretion. Code 3®, Inc. assumes no responsibility or liability for expenses incurred for the removal and /or reinstallation of products requiring service and/or repair.; nor for the packaging, handling, and shipping; nor for the handling of products returned to sender after the service has been rendered.



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