

AC TRANSER SWITCH For EMERGENCY VEHICLES

(Version 1.1)

Manufactured by:

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WARNING:

This product is designed to be installed and serviced **ONLY** by a qualified automotive electrician. Improper installation of this device can create a potentially **FATAL** shock hazard for maintenance staff, ambulance crews and even patients.

DO NOT attempt to install or service this product unless you are qualified to handle **LIVE HIGH VOLTAGE** circuits.

This product is sold incomplete and requires the purchase of residential type circuit breakers, a DC to AC inverter and ground-fault interrupter (GFCI) house current outlets in order to operate safely.

BACKGROUND

In North America most ambulances are now manufactured with diesel engines. To operate these engines in cold climates, many EMS agencies plug their vehicles into “shorelines” when the vehicle is parked at their garage. This allows the use of a “block heater” to keep the engine warm during downtime. This also allows the use of house current (120 volt-alternating current) appliances to be used in the rear of the vehicle.

There is an electronic product called an “Inverter” which converts the battery voltage of a truck (12 volts-direct current) to house current (120 volts-alternating current)

Historically, these inverters were large, heavy and expensive. In recent years, however, due to advances in electronics, inverters have become compact, lightweight, and inexpensive.

In order to be properly installed, and comply with the K-standard for ambulance construction, a part called a “transfer switch” is required to switch between the house current of the shoreline and the inverter.

The TRS-1 transfer switch is designed to ease the installation of the entire house current system.

FEATURES

- A) Compact design: only 4-3/4 inches x 4-3/4 inches x 2-1/8th inches (15cmx15cmx6cm)
- B) Lightweight: 1-3/4 pounds (800 grams)
- C) Low Current Consumption: approx. 1/5 of an ampere when activated, approx. 1/100th of ampere in idle mode
- D) Simple Installation: Barrier strip connections
- E) Totally automatic: requires only one switch to activate
- F) Output for LED indicator of shoreline connection
- G) Maintenance Free: for years of reliable service
- H) Built In Surge Suppression: protection from “load dump”
- I) Five-Year Limited Warranty

THEORY OF OPERATION

The TRS-1 transfer switch automatically detects if the shoreline is connected. In order for the transfer switch to activate, two conditions must be met. First, the shoreline must be pulled out, and second, a crewmember must turn on a switch requesting inverter power. If the shoreline is still connected, the transfer switch detects this and prevents the transfer switch from operating.

SAFETY ISSUES

Inside the TRS-1 is a small part called an OPTO-ISOLATOR. The function of this part is to separate the high voltage AC from the low voltage DC in the vehicle. In addition, the mechanical relays are designed with this separation in mind. There is no electrical connection between the AC and DC sections. The switch control input and the LED output are on the DC side of the circuit and are safe to handle.

INSTALLATION REQUIREMENTS

A) This product is for use only in 12-volt vehicles and 120-volt house current systems. **DO NOT** apply any other voltages to this system. If you have other voltage requirements, contact Delta Vehicle Systems for more information.

B) This part **MUST** be installed in a locked cabinet to prevent attempted repair by unqualified personnel. See page 2 for safety warning.

C) The NTEA-AMD standard 009 (S7-2) states, "ONLY **STRANDED COPPER CONDUCTORS SHALL BE USED**". **Do not use solid wire to install this product.**

D) The federal K-standard requires a label near the "Inverter On" switch that states: "WHEN OPERATING THE 115 VOLT AC SYSTEM, ALL UNNECESSARY DC ELECTRICAL LOADS SHALL BE TURNED OFF".

E) This system requires the installation of a DC panel switch. The K-standard requires the switch be placed on the driver's control panel, or the EMT's control panel. It must also display a red light when on. The input to this switch is electronically buffered and only conducts approximately 1/30th of an amp when on. It is non-inductive, needing no "fly back" diode. It is also totally isolated from the AC voltage. Any SPST switch (Carlingswitch, Eaton, etc.) will be suitable.

F) For safety and regulatory reasons, a Ground Fault Current Interrupter outlet is required. Only one is needed since it protects any standard outlets that are installed downstream.

G) This system has a provision for an LED indicator on the dashboard to indicate that the shoreline is plugged in and operating. A 12-volt LED module is required. This part is readily available in several colors from various manufacturers. Some end users may prefer a continuous green light and others may prefer a flashing red light. A readily available part for this application is Radio Shack #276-271 (green). Be careful to check the polarity since LED's must be wired properly to operate. If you wish to skip this feature, simply leave J1-7 disconnected.

H) The transfer switch is rated to a maximum of 15 amps on the house current.

I) The TRS-1 has an IEC standard inlet commonly used on computers and similar appliances. An IEC cable is plugged into the TRS-1 and the other standard plug side is plugged into the inverter. This is quick, simple and eliminates any possibility of miswriting. An IEC cord is usually rated at 10 amps. Do not attach an inverter larger than 1.2KW (continuous).

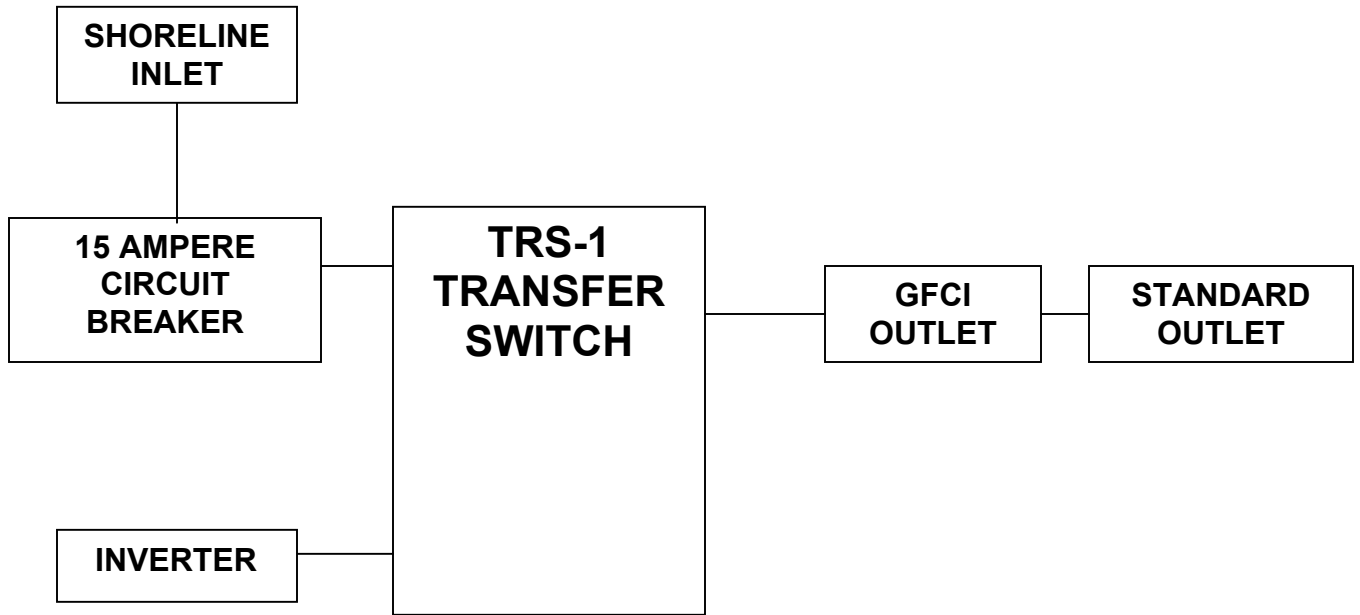
J) The TRS-1 should be firmly attached to the inside of the electrical cabinet, using sheet metal screws.

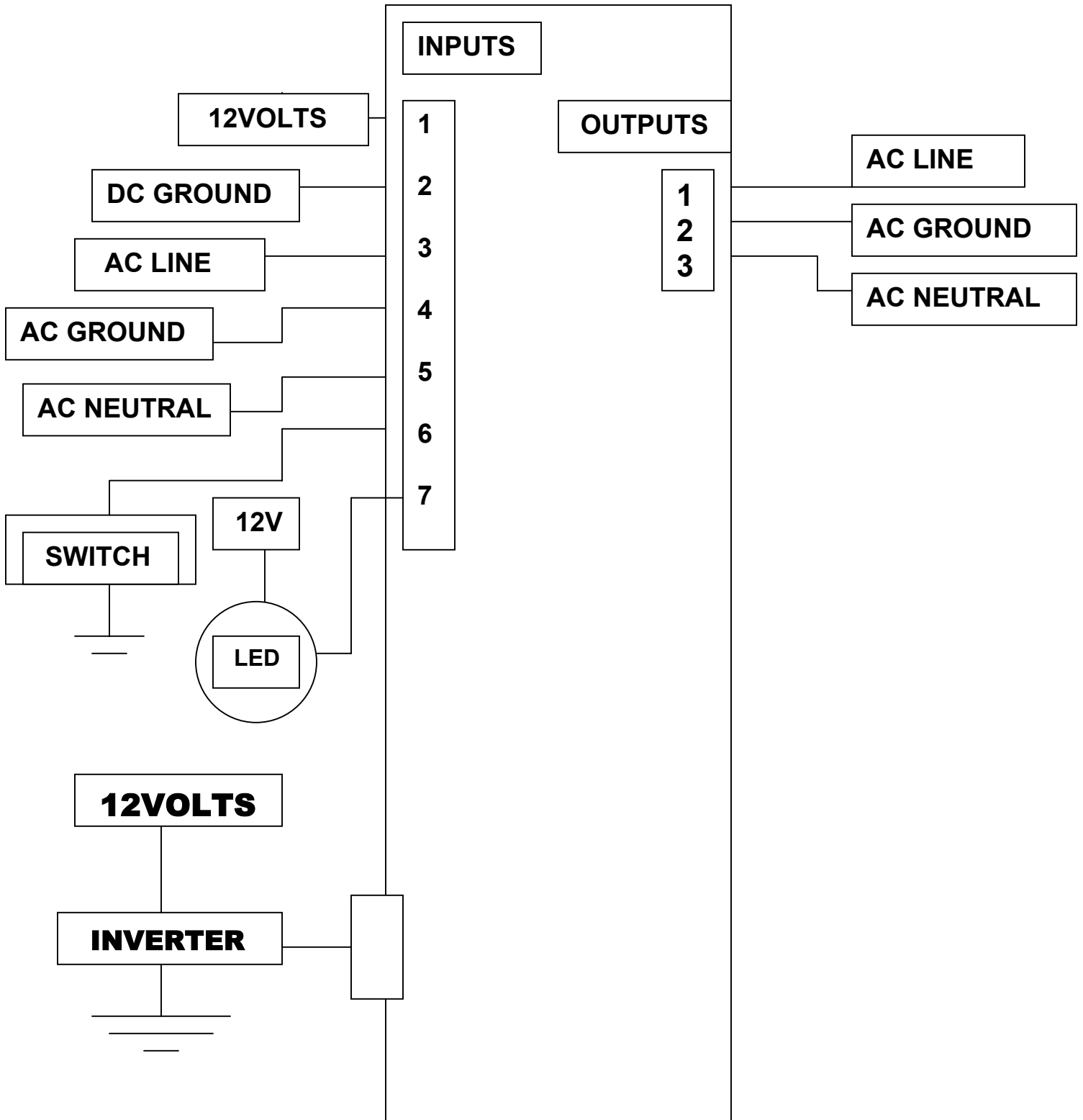
K) Some education of ambulance crews is needed to explain how the use of inverters is not "free" and should be done carefully.

REQUIRED PARTS

For proper installation of the TRS-1, you will need to purchase the following:

- A) One 15 ampere 2 pole magnetic circuit breaker and housing.
- B) One Ground Fault Current Interrupter Outlet
- C) One Standard Wall Outlet
- D) One Low Voltage DC switch (Carlingswitch or equivalent)
- E) An IEC power cable (the type used on computers, etc.)
- F) Appropriate stranded hook-up cable.
- G) 12 volt LED module for "shoreline" indicator on dashboard (optional)

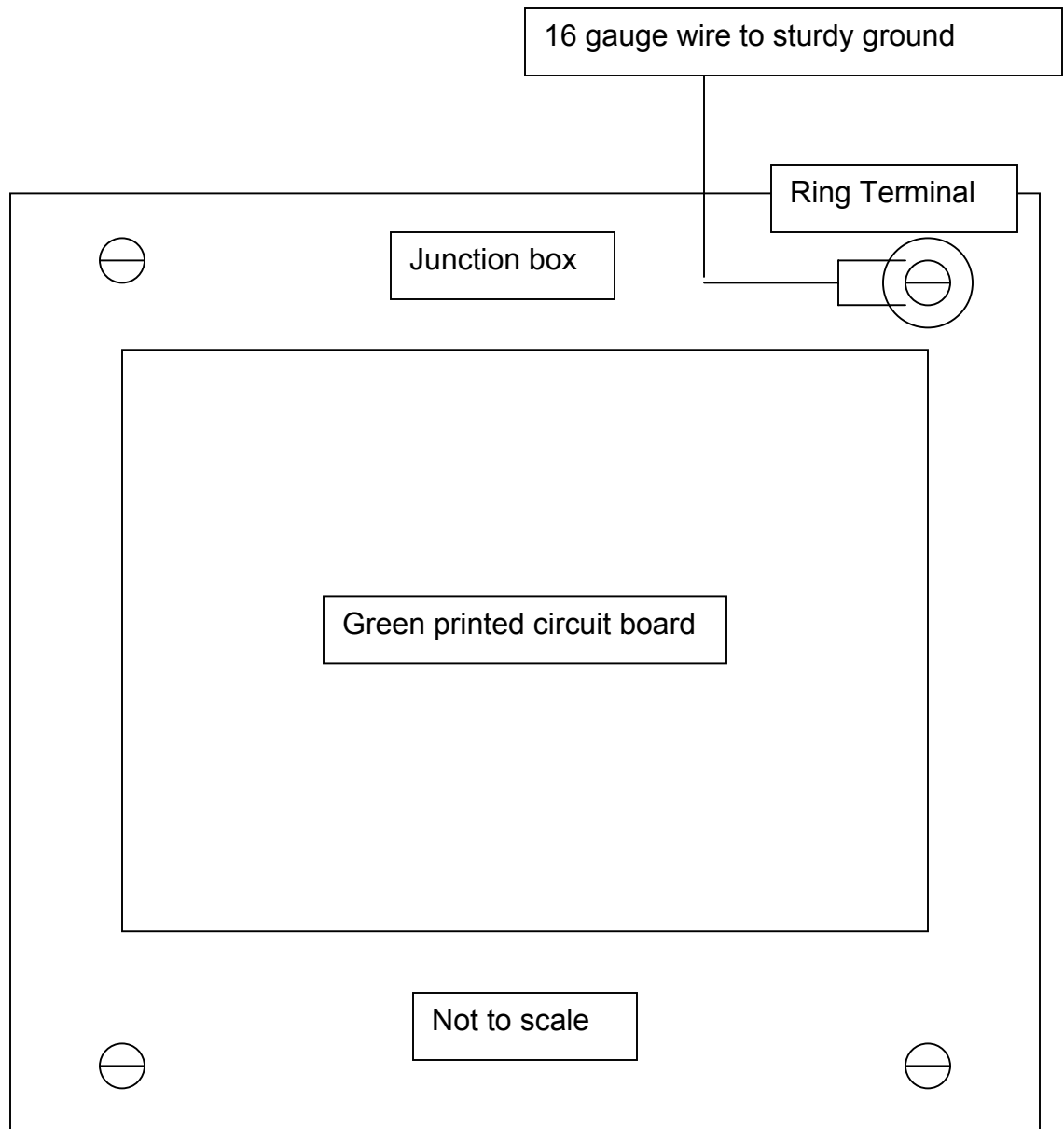


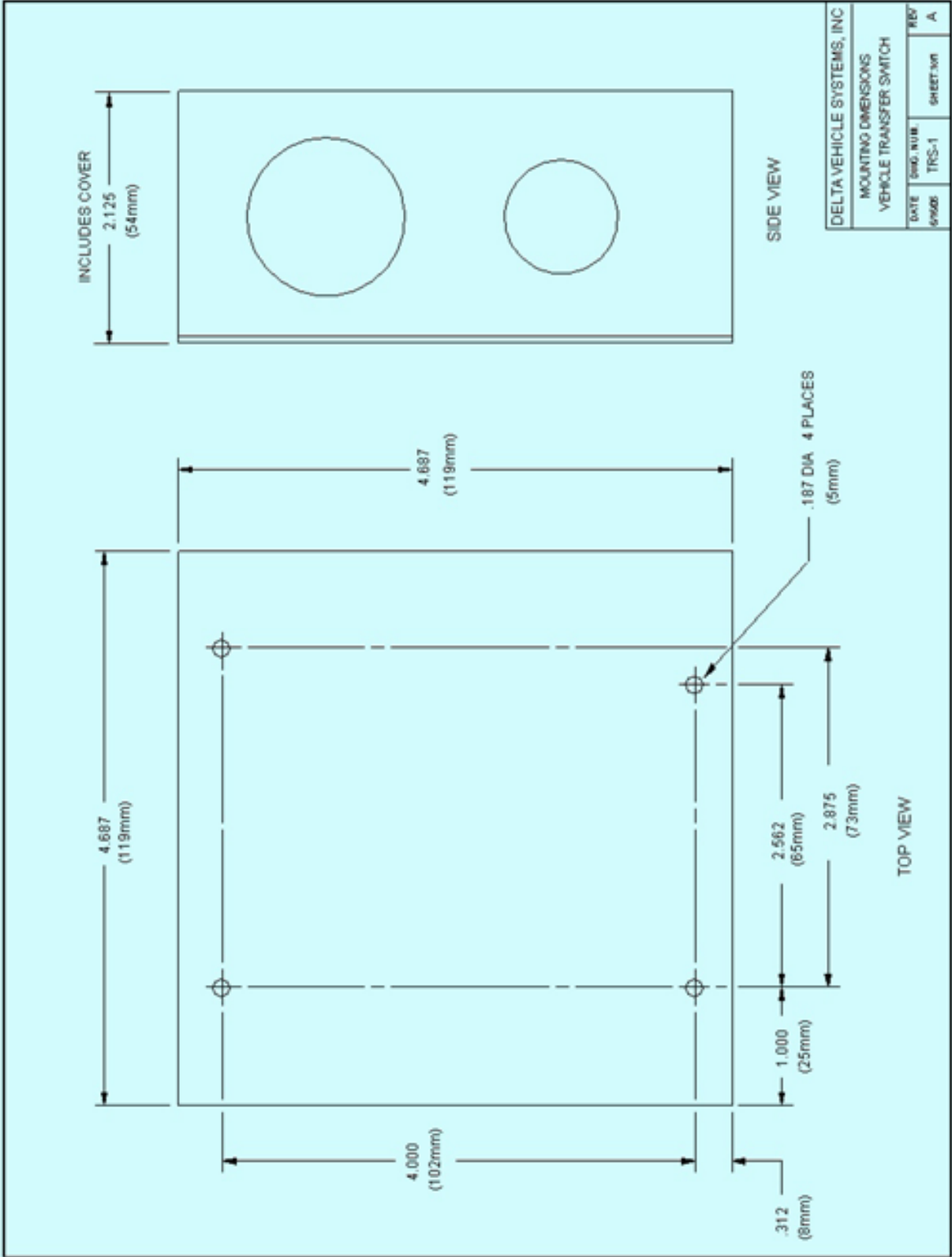


JUNCTION BOX GROUNDING

For safety reasons, the galvanized steel junction box must be grounded to the vehicle electrical system. This must be done because in the unlikely event that the LINE wire should come loose from J1 and come into contact with the junction box, the box would be "LIVE" and create a shock hazard. If this were to occur with the box properly grounded, the circuit breaker would trip and protect anyone touching the box. This can be done at any of the four corners mounting holes, using a ring terminal. A minimum of 16 gauge-stranded wire is required.

See diagram below:





DELTA VEHICLE SYSTEMS, INC			
MOUNTING DIMENSIONS			
VEHICLE TRANSFER SWITCH			
DATE	DRG. NUM	TRG-1	SHEET NO
6/9/88			A

WIRING CRITERIA

According to the K-standard, all wiring carrying 15 amps should be wired in 14-gauge wire. As mentioned before, this must be STRANDED wire. The connectors for the controls switch and the LED display are very low current and can be as low as 20-gauge.

REGULATORY ISSUES

The use of inverters is addressed in several documents. The first is the federal K-standard. In order to be fully compliant with this document, the inverter must have a minimum capacity of 750 watts. Of course, if the ambulance buyer does not need a strict K-ambulance, a smaller inverter may be suitable for their application. The second is AMD 009. Please read these two documents carefully

OPERATING INSTRUCTIONS

Once installed, the house current system is very simple to operate. When the shoreline is connected, the outlets in the rear of the vehicle are live. When the shoreline plug is removed, a crewmember turns on the "INVERTER ON" switch and then the inverter powers the outlets.

LIMITED WARRANTY

The TRS-1 Transfer switch is warranted by DELTA VEHICLE SYSTEMS for a period of 5 years from the date of installation by the ambulance builder. During that period, DELTA VEHICLE SYSTEMS will repair or replace, at its option, any defective parts necessary to return the unit to original operating condition. This warranty excludes any damage caused by fire, accident, abuse or unauthorized repair. No responsibility is assumed for any incidental or consequential damage resulting from the use of this product. Delta Vehicle Systems reserves the right to improve specifications without notice.