

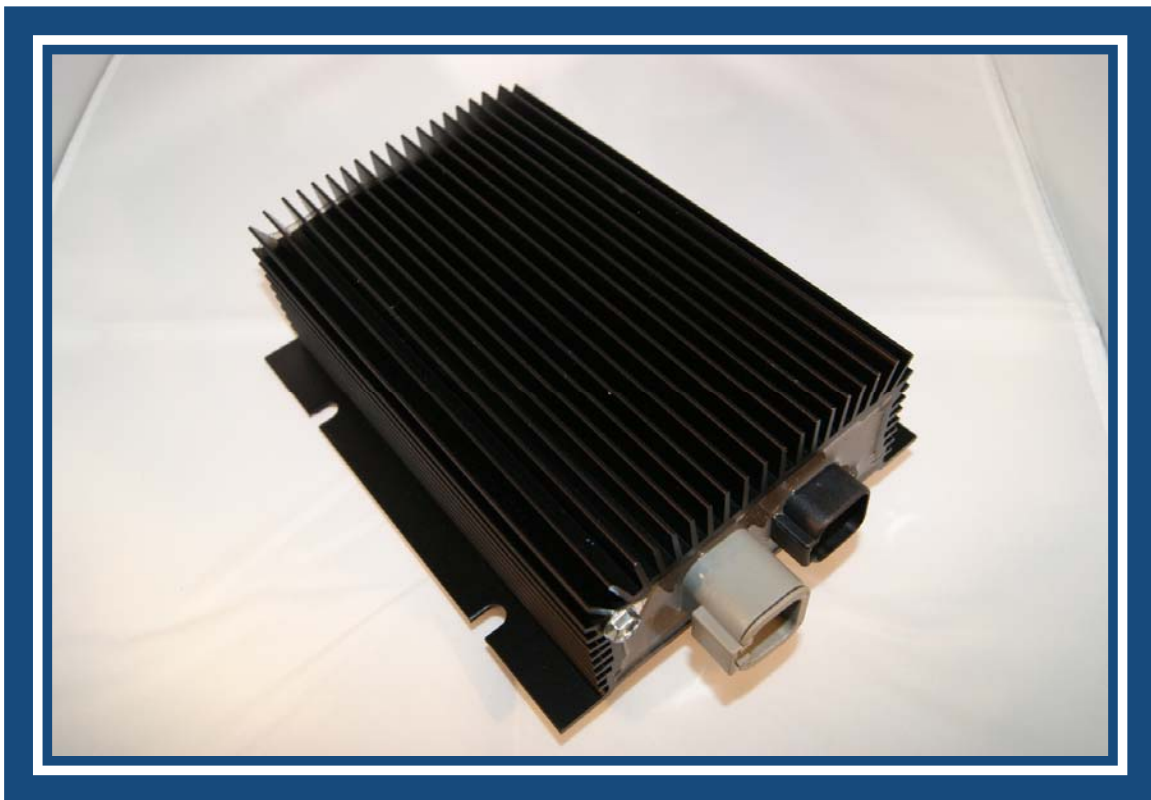


## Trail Charger with Lockout

283040-01

Version 1.04

07/05/2011



### Owners Manual

- Operation
- Installation
- Wiring Diagram
- Troubleshooting
- Parts Breakdown

## TRAIL CHARGER WITH LOCKOUT

### GENERAL OPERATION

#### PROBLEM

On applications where liftgate batteries are mounted a long distance from the primary vehicle's electrical system, voltage drop will occur. The longer the distance and the smaller the cables that connect the two battery systems, the greater the voltage drop. To charge these liftgate batteries, the correct voltage must be applied to these batteries. Without the necessary voltage (electrical pressure) to push current through the liftgate batteries for recharging, no recharging can occur. To charge a group 31 flooded cell battery at 0 degrees F, voltages of 15 volts are necessary. The same battery pack at 80 degrees F might only require 14.0 volts. The heavy duty commercial vehicle alternator is normally set at 14.0 volts and flat compensated. The typical vehicle's battery pack is maintained at approximately 13.5 volts. The difference occurs because of the voltage drop between the battery and the alternator. With this fact in mind, the starting voltage for the liftgate batteries is 13.5 volts.

The circuit to charge the liftgate batteries includes the cables from the vehicle's battery box to the dual pole receptacle at the back of the tractor, the dual pole cable from the tractor to the trailer, the receptacle at the front of the trailer, and the cable that connects to the liftgate batteries. The total length of this can be well over 60 feet. All of this length and connections (including fuses) create voltage drop in the system. While the total circuit resistance of this circuit is constant, as the current load increases, the voltage drop also increases. It is impossible to have the correct level of voltage at the liftgate batteries. This reduced voltage results in a battery pack that is not maintained at a proper state of charge which results in shortened battery life, less operating time and possible damage to the liftgate motor.

#### SOLUTION

**TRAIL CHARGER** – Eliminates the above problem by amplifying (boosting) any input voltage (9 to 14) to the correct voltage necessary to charge and maintain the liftgate batteries. This input voltage can be obtained through the 7-way auxiliary pin, which now allows the liftgate batteries to be charged when connected to any tractor with no dual pole connection necessary. This increased voltage will allow the batteries to be charged and maintained at a higher state of charge so that they provide the energy necessary to do whatever job they are designed for, even in the toughest environments. The Trail Charger also will not let the liftgate batteries back feed to the tractor's battery pack.

The Trail Charger with Lockouts has a shutdown mode of operation:

- **Shutdown Mode:** This mode is enabled when the lock out pin is active. In this mode the charger output is shutdown and will not charge an external battery. This mode has the highest priority and over-rides all other modes. ***This feature is used when the TC is powered off of the aux circuit. A lead is connected to the stop light circuit to the six pin connector of the TC with LO's. When the brakes are applied the TC with LO's turns off so that the trailer's BS system gets full available power. When the brakes are released the TC turns back on.***

## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 1:** Mount the Trail Charger on the back of the battery box using the supplied self-drilling sheet metal screws. (See Figure 1) The Trail Charger should be mounted about 1 ½" down from the top and just to the right of the grommet. The unit must also be mounted with the plug pointed down (6 o'clock). Note: Be sure that the screws will not interfere with the batteries in the box.

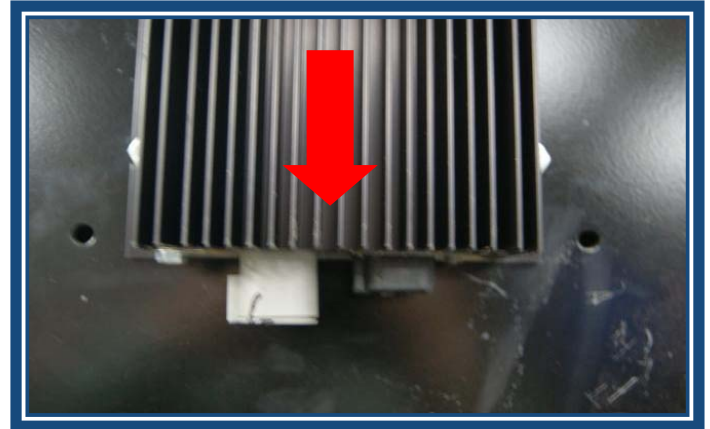


Figure 1

**Step 2:** Route the main harness into the battery box through the hole in the side of the battery box. **All wires routed through the battery box should be protected with a rubber grommet or dome nut.**

Route the following wires (the Deutsch pins go to the outside) out of the battery box through the hole in the back next to the Trail Charger. (See Figure 2)

- Yellow wire "D", labeled "Ignition Pin #4"
- Red wire "A", labeled "12V Input Pin #1"
- Red wire "E", labeled "12V Output Pin #2"
- Black wire "F", labeled "GRND Pin #3"
- Blue wire "B", labeled "Lockout Input"

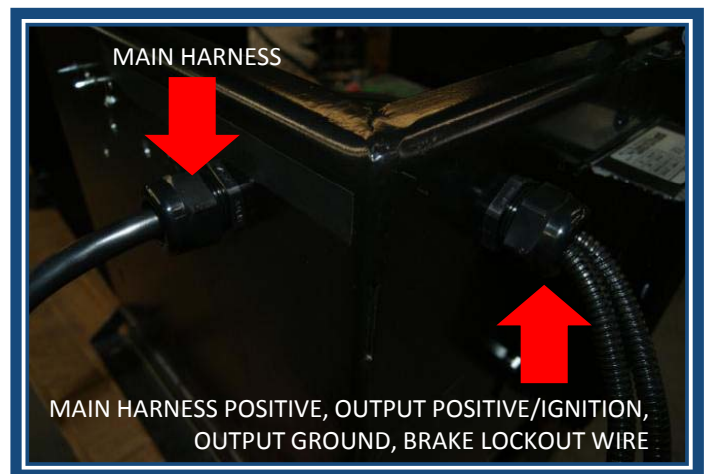


Figure 2

**Step 3:** Once the wires are routed properly the Trail Charger input and ignition wires can be inserted into the Deutsch connector body. The input (red) wire will slide into the #1 position. The ignition (yellow) wire will slide into the #4 position. (See Figure 3)



Figure 3

# TRAIL CHARGER WITH LOCKOUT

## INSTALLATION INSTRUCTIONS

**Step 4:** The positive (red) output wire will slide into the #2 position. The negative (black) output wire will slide into the #3 position.

(See Figure 4)

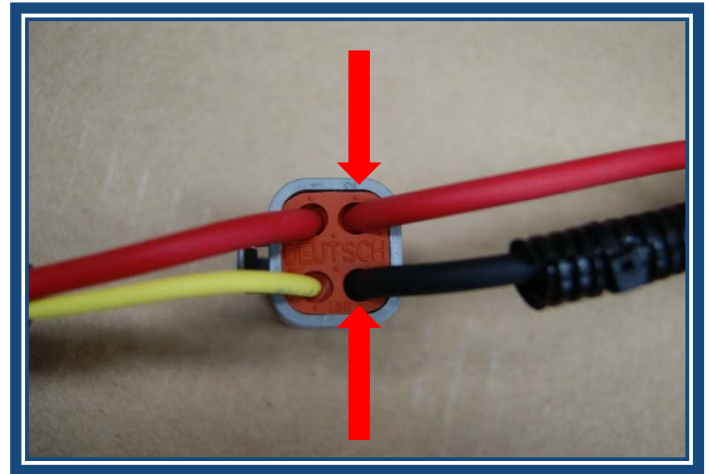


Figure 4

**Step 5:** Verify all the wires are in their correct positions and locked in place. (See Figure 5)

- Figure 5-1: Red 10 AWG 12 Volt input power of the main harness.
- Figure 5-2: Red 10 AWG Trail Charger output power to liftgate battery's positive (+).
- Figure 5-3: Black 10 AWG Trail Charger output ground to liftgate battery's negative (-).
- Figure 5-4: Yellow 14 AWG ignition input of the main harness.

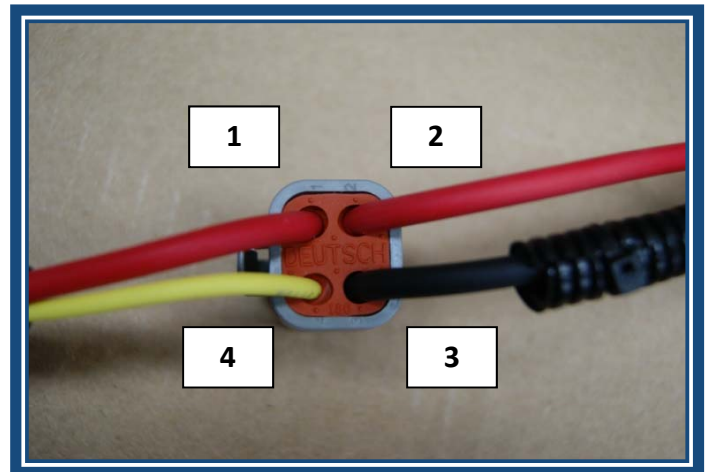


Figure 5

**Step 6:** Once both wires are inserted into the connector the orange lock can be inserted. (See Figure 6)

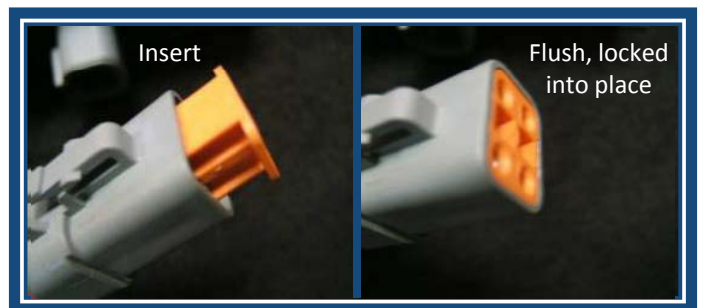


Figure 6

## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 7:** Insert the brake circuit wire into the 6 way Deutsch connector in the #2 position. The other positions should already have plugs inserted into the empty holes to help prevent corrosion and contamination. (See Figure 7)



Figure 7

**Step 8:** Once the wire is inserted into the connector the orange lock can be inserted. Make sure that the lock is properly seated. (See Figure 8)

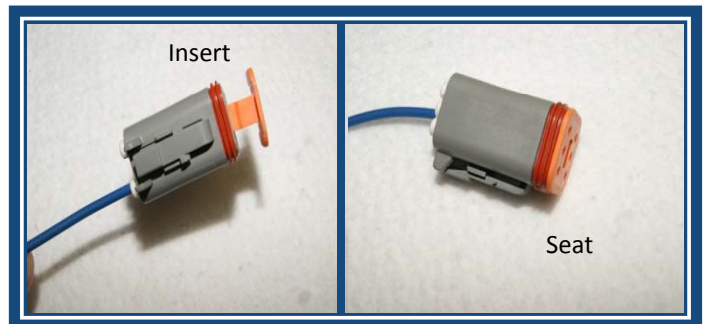


Figure 8

**Step 9:** Slide the included clear tubing over the connectors on the Trail Charger. This will help prevent water and contaminants from entering the electrical connections. (See Figure 9)



Figure 9



## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 10:** The harness plugs may now be inserted into the Trail Charger. Push the 4 wire connector into the tubing and into the appropriate socket on the Trail Charger. Push the 6 wire connector into the tubing and into the appropriate socket on the Trail Charger. It may be necessary to use a screwdriver to make sure the plugs are properly seated. (See Figure 10)



Figure 10

**Step 11:** The last connections can now be made at the liftgate batteries. First install the fuse cube assembly on one of the liftgate positive battery terminals. (See Figure 11)

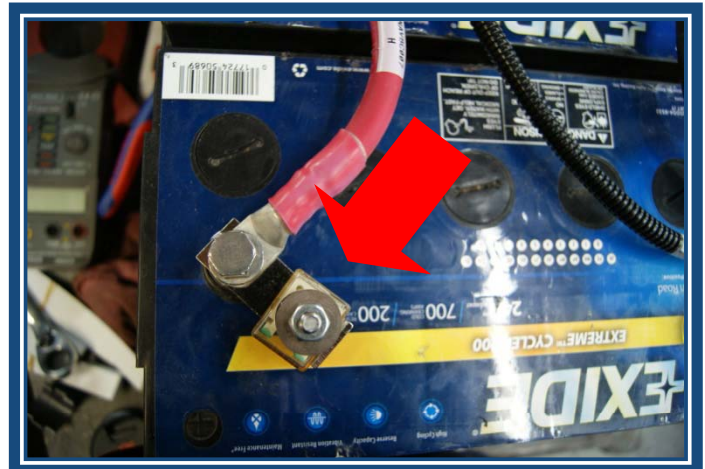


Figure 11

**Step 12:** The red 10 AWG Trail Charger output positive wire labeled "liftgate positive" can now be connected to the fuse cube assembly. Remove the insulated nut, install the wire and reinstall the nut.

The black Trail Charger output ground wire should be connected to the negative post of the opposite battery as shown. (See Figure 12)

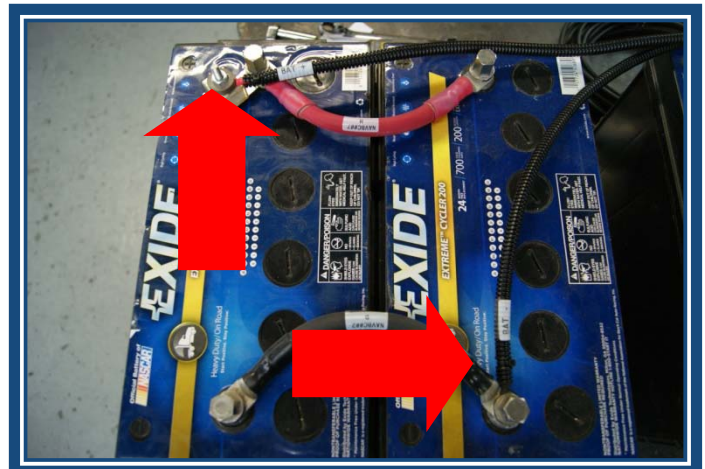


Figure 12

## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 13:** Once the Trail Charger is mounted the main harness can be routed to the front of the trailer utilizing the factory channels up to the fifth wheel plate and then through the electrical/air line tubes the rest of the way to the front of the trailer. (See Figure 13)



Figure 13

**Step 14:** Route the main harness out the front of the trailer. Make sure the cable is protected from chaffing. (See Figure 14)



Figure 14

**Step 15:** Now route the three wires (red 10 AWG, black 10 AWG and blue 16 AWG) into the 7 way nose box. Cover with conduit and secure with a wire tie. (See Figure 15)

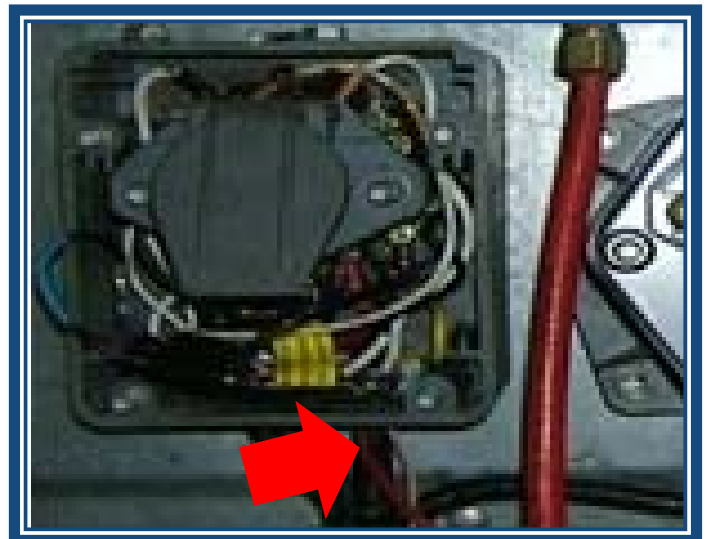


Figure 15

## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 16:** Route the black 10 AWG wire to the ground screw in the 7 way box. Cut to length and slide a piece of the black heat shrink over the wire. Now crimp and solder a #10 eyelet on the wire and apply heat to the heat shrink. Once properly terminated remove the nut and add this wire to the ground stud. (See Figure 16)

**NOTE:** It is strongly suggest that these wires be labeled due to the color difference from the standard.

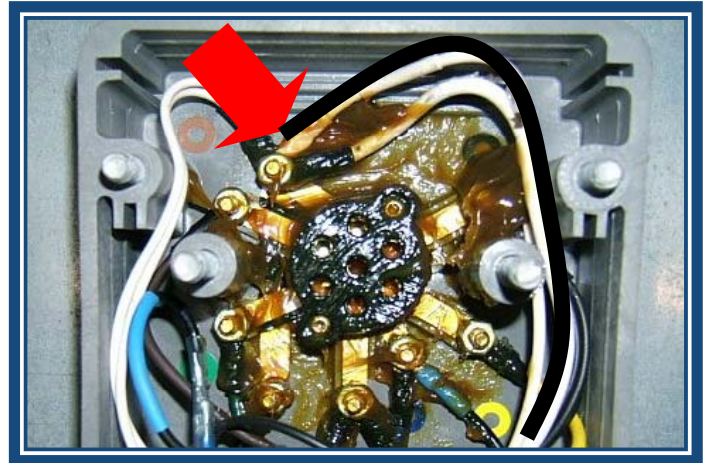


Figure 16

**Step 17:** Now the red 10 AWG wire can be cut to length and connected using the fuse holder with the orange leads (30 amp fuse). Slide a piece of the red heat shrink over the wire and crimp and solder the two wires together and cover with the heat shrink, then apply heat. Once connected remove the nut for the AUX/ABS stud and add this wire, then retighten the nut to spec. (See Figure 17)

**NOTE:** We strongly suggest that these wires be labeled due to the color difference from the standard.



Figure 17

**Step 18:** Cut the blue 16 AWG wire and connect to the black fuse holder with black leads (2 amp fuse). Slide a piece of red heat shrink over the blue wire, crimp and solder the two wires together, cover with the heat shrink and apply heat. Once connected remove the nut for the brake/stop stud and add this wire, retighten to spec. (See Figure 18)

**NOTE:** We strongly suggest that these wires be labeled due to the color difference from the standard.



Figure 18



## TRAIL CHARGER WITH LOCKOUT

### INSTALLATION INSTRUCTIONS

**Step 19:** The front of the trailer is now finished. Reinstall the 7 way nose box cover, cover any exposed wires with conduit and secure with wire ties. (See Figure 19)

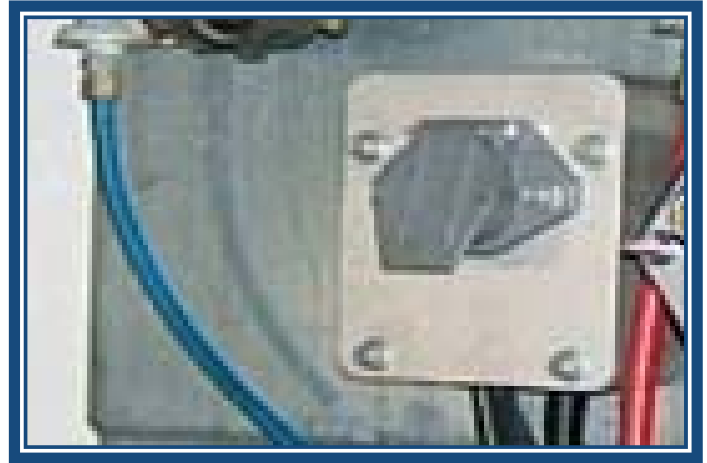


Figure 19

**Step 20:** Installation is now complete, connect a tractor to the trailer via the 7-way receptacle, turn the key on and check operation of Trail Charger. The Trail Charger's green LED light should be illuminated. Measure the liftgate battery voltage, should be near 14.0 volts. Check the brake lockout function by verifying that the green LED on the Trail Charger flashes slowly when the brakes are applied. When the brakes are released, the LED should go back to solid.

**Step 21:** Now the metal cover can be installed to further protect the Trail Charger from physical damage and road splash. Use four self drilling screws (provided) to attach the cover to the battery box. Check the back side of the mounting location to ensure that nothing will be damaged during installation. (See Figure 20)

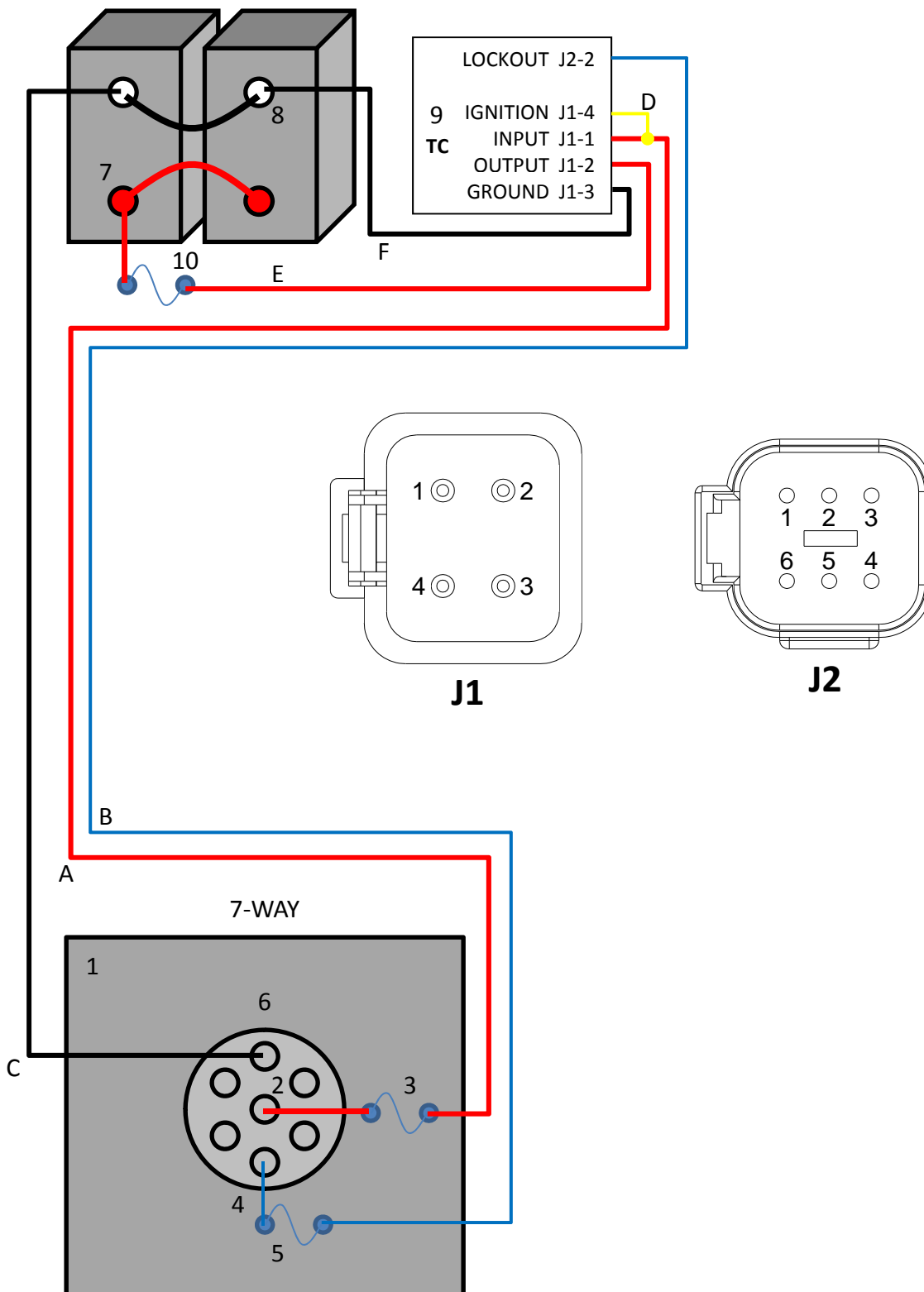
**Note:** Make sure that the harness has a drip loop for the water to run down away from the Trail Charger.



Figure 20

# TRAIL CHARGER WITH LOCKOUT

## WIRING DIAGRAM



## TRAIL CHARGER WITH LOCKOUT

### WIRING DIAGRAM LEGEND

#### Components

1. 7-Way Connector
2. 7-Way Aux Pin
3. 30 Amp Fuse
4. 7-Way Brake Circuit
5. 5 Amp Fuse
6. 7-Way Ground Circuit
7. Liftgate Battery Positive
8. Liftgate Battery Negative
9. Trail Charger
  - J1-1 Input from 7-way aux pin
  - J1-2 Output to liftgate battery positive
  - J1-3 Ground to liftgate battery negative
  - J1-4 Ignition spliced from input wire from 7-way aux pin
  - J2-1 Not used in this application
  - J2-2 Brake circuit sense from 7-way brake circuit
  - J2-3 Not used in this application
  - J2-4 Not used in this application
  - J2-5 Not used in this application
  - J2-6 Not used in this application
10. 30 Amp Fuse

	<u>Connection 1</u>	<u>Connection 2</u>	<u>Color</u>
A.	7-Way Aux Pin	Trail Charger Input J1-1	Red
B.	7-Way Brake Circuit	Trail Charger Lockout J2-2	Blue
C.	7-Way Ground	Liftgate Battery Negative	Black
D.	Input Wire (Splice)	Trail Charger Ignition	Yellow
E.	Trail Charger Output	Liftgate Battery Positive	Red
F.	Trail Charger Ground	Liftgate Battery Negative	Black

# TRAIL CHARGER WITH LOCKOUT

## TROUBLESHOOTING GUIDE

**Before beginning the troubleshooting procedures, the liftgate batteries need to be 12.4 volts or higher and test good.**

Disconnect and test the liftgate batteries.

	Battery 1	Battery 2	Battery 3	Battery 4
Rated CCA	_____	_____	_____	_____
Rated RC	_____	_____	_____	_____
Open Circuit Voltage	_____	_____	_____	_____
Test Results	_____	_____	_____	_____
Tester Used	_____	_____	_____	_____

**Note:** All batteries must pass load test or be replaced before proceeding.

### LED indications:

The STATUS LED will indicate several different conditions of the Trail Charger with Lockouts. This is accomplished by the use of a Bi-Color LED that will indicate with either a solid color or a blinking color at three different blink rates. (See table below):

RATE	TIMING
Slow	1 second on, 1 second off
Medium	½ second on, ½ second off
High	¼ on, ¼ off

Definition of indications are found below:

LED off	Module off, ignition or input voltage not present	Fault: n/a
	Input Command Shutdown: n/a	Input Command Reduce: n/a
LED, Red, high blink	FAULT, any on the fault list below	Fault: Any
	Input Command Shutdown: n/a	Input Command Reduce: n/a
LED, Green, medium blink	SHUTDOWN mode (Pg. 14)	Fault: None
	Input Command Shutdown: ON	Input Command Reduce: n/a
LED, Green, slow blink	Reduce power mode, charging (Pg. 14)	Fault: None
	Input Command Shutdown: OFF	Input Command Reduce: ON
LED, Green, solid	Charging or Charged ( <b>Working Properly</b> )	Fault: None
	Input Command Shutdown: OFF	Input Command Reduce: OFF

A RED LED blinking at a high rate indicates one of the following fault conditions exist:

- Input over-voltage limit. (T/S procedure pg. 13)
- Input under-voltage limit. (T/S procedure pg. 13)
- Output over-voltage limit. (T/S procedure pg. 13)
- Output over-current limit / Output FET's over thermal limits. (T/S procedure pg. 14)

A fast blinking RED from any fault indication has a higher priority than all other indications if the ignition is on.



## TRAIL CHARGER WITH LOCKOUT

### TROUBLESHOOTING GUIDE

#### A. Checking for INPUT under voltage condition – High Rate Blinking Red LED

1. Plug in a know good power source into the trailer, this can be a tractor or portable battery source.
2. With the Trail Charger operating, test the voltage at the TC pin #1 and TC pin #3. The voltage must be over 9.0 volts. If yes, proceed to step B. If no, record the reading and move to the next step.  
Voltage reading: \_\_\_\_\_.
3. Test the voltage at the aux. pin of the 7-way nose box at the front of the trailer. Note the voltage and amount of current flowing and record. Voltage: \_\_\_\_\_ Amps: \_\_\_\_\_
4. Subtract the voltage reading in step 2 from the reading in step 3 and compare to the chart referencing the amp reading in step 3.
  1. At 20 amps the allowable voltage drop is 3.0 volts.
  2. At 15 amps the allowable voltage drop is 2.25 volts.
  3. At 10 amps the allowable voltage drop is 1.5 volts.
  4. At 5 amps the allowable voltage drop is .75 volts.
5. If higher than allowed, repair the wiring from the nose box to the Trail Charger.

**Note:** The trailer wiring could be find and the problem is in the power source (tractor and 7-way cord) which should also be tested per TMC's RP-137.

#### B. Checking for INPUT over voltage condition – High Rate Blinking Red LED

1. Plug in a know good power source into the trailer, this can be a tractor or portable battery source.
2. With the Trail Charger operating, test the voltage at the TC pin #1 and TC pin #3. If the voltage is over 16.7 volts, your voltage source is defective (overcharging) and needs to be either repaired or replaced.

#### C. Checking for OUTPUT over voltage condition – High Rate Blinking Red LED

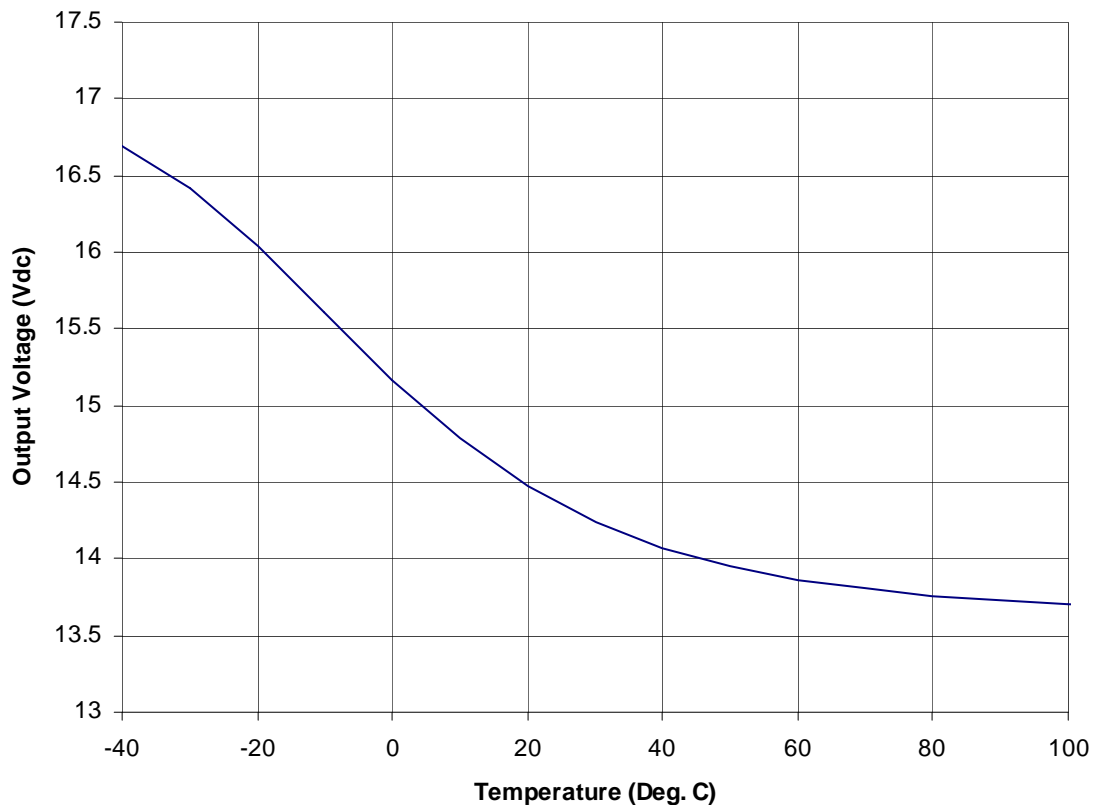
1. Plug in a know good power source into the trailer, this can be a tractor or portable battery source.
2. With the Trail Charger operating, test the voltage at the TC pin #1 and TC pin #3. Also record the ambient temperature the battery box has been subjected to in the last 24 hours.  
Voltage reading: \_\_\_\_\_ Ambient Temperature: \_\_\_\_\_
3. Compare the voltage and ambient temperature recorded in step 2 to the chart below. The voltage and temperature from step 2 should be near the curve on the chart. Note: If a trailer is moved that has sat outside for a day that has been subjected to 0 degrees F temperature into the shop it could take the batteries more than 24 hours to warm up to the shop temperature. When making the comparison, base it on the temperature the trailer has been subjected to before moving the trailer into the shop.

**Note:** Before replacing the Trail Charger it is suggested that each of the liftgate batteries be tested individually or that the system be tested with known good batteries that have been charged and tested. Defective or severely discharged batteries can impact the test results.

## TRAIL CHARGER WITH LOCKOUT

### TROUBLESHOOTING GUIDE

#### Temperature Compensation



- D. Checking for over current condition and/or FET over the thermal limits – High Rate Blinking Red LED
1. Plug in a know good power source into the trailer, this can be a tractor or portable battery source.
  2. With the Trail Charger operating, place a clip on ammeter around the wire from TC pin #2 to the liftgate battery positive. Measure and record the amps. Amps: \_\_\_\_\_
    1. The amps should not exceed 23 amps.

**Note:** Before replacing the Trail Charger it is suggested that each of the liftgate batteries be tested individually or that the system be tested with known good batteries that have been charged and tested. Defective or severely discharged batteries can impact the test results.



## TRAIL CHARGER WITH LOCKOUT

## TROUBLESHOOTING GUIDE

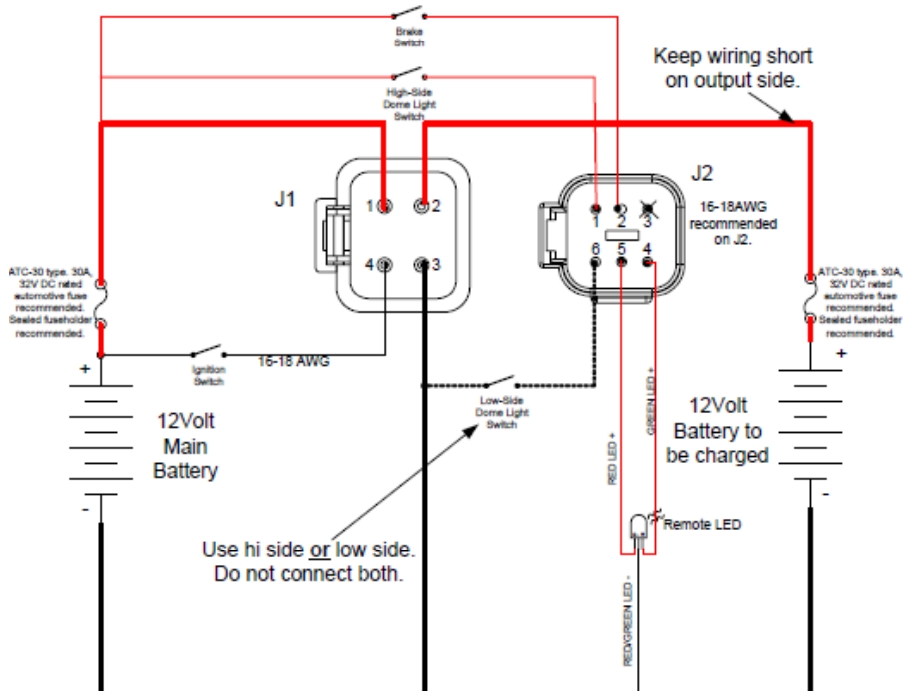
## Checking the shut down mode – Medium Rate Blinking Green LED

1. Plug in a known good power source into the trailer, that can be a tractor or portable battery source.
2. With the Trail Charger operating, unplug the six pin connector from the Trail Charger. The green LED should stop blinking.
3. If it does not stop blinking then the Trail Charger is defective and needs to be replaced.
4. If it does stop blinking then pin #2 from the six pin plug on the Trail Charger needs to be checked for voltage.
5. If pin #2 has more than 3.0 volts the Trail Charger will turn off and have a medium rate blinking green LED. Normally the brake circuit is connected to this circuit. When the brakes are off, you should see 0.0 volts should be at pin #2. When the brakes are applied, you should see battery voltage. Repair the circuit as needed.

## Checking the reduced power mode – Slow Rate Blinking Green LED

1. Plug in a know good power source into the trailer, this can be a tractor or portable battery source.
2. With the Trail Charger operating, unplug the six pin connector from the Trail Charger. The green LED should stop blinking.
3. If it does not stop blinking then the Trail Charger is defective and needs to be replaced.
4. If it does stop blinking then pin #1 from the six pin plug on the Trail Charger needs to be checked for voltage. This should have a reading of 0.0 volts. If voltage is present then make the necessary repairs.
5. If the green LED does stop blinking then pin #6 should be checked for voltage. Any voltage under 5.0 volts will cause the green LED to blink slowly.

**Note:** This circuit is only used when the interior lights are connected.



# TRAIL CHARGER WITH LOCKOUT

## PARTS BREAKDOWN

283040-01		COMPLETE KIT (TC, Harness, Bag Kit, Cover)	
<b>Complete Kit Contents:</b>			Qty
906849-01	TRAIL CHARGER WITH LOCK OUT		1
283041	53FT MOD3 TRAIL CHARGER HARNESS		1
267522-01	TRAIL CHARGER COVER		1
284570-01	53FT TRAIL CHARGER MOD 6 BAG KIT		1
<b>Bag Kit Contents:</b>			Qty
906874-01	10GA 30" TRAIL CHARGER OUTPUT WIRE		1
906875-01	10GA 30" TRAIL CHARGER GROUND WIRE		1
907104-01	30AMP FUSE HOLDER ASSEMBLY		1
907105-01	2 AMP MINI FUSE HOLDER ASSEMBLY		1
906873-01	SECONDARY LOCK		1
907015-01	DEUTSCH PLUG		1
907089-01	6 WAY SQUARE CONNECTOR		1
907090-01	6 WAY SQUARE LOCK		1
906877-01	1-1/4" CLEAR ID TUBING, 0.17 ft		2
906878-01	SINGLE FUSE CUBE BRACKET		1
906879-01	CF NUT FOR FUSE CUBE BRACKET		1
906880-01	FUSE CUBE, 30AMP		1
*	1/4" RED HEAT SHRINK, 2 inches long		2
*	1/4" BLACK HEAT SHRINK, 1 inch long		1
*	12-10GA #10 EYELET		1
*	3 23/32" SMALL ZIP TIES		14
*	3/4" BLACK HEAT SHRINK, 3 inches long		1
284556-01	TRAIL CHARGER HARDWARE BAG KIT		1
<b>Hardware Bag Kit Contents:</b>			Qty
**	5/8" Nylon Clamps		12
**	1/4 X 20 Nylon lock nut		8
**	1/4" Flat washers		8
**	1/4 X 20 3/4" bolts		8
**	#12 X 1 1/2" Hex tek screws		1
**	#12 X 3/4" Hex tek screws		10
**	#10 X 1" Hex tek screws		5
**	3/8 X 16 jam nut		1
<b>REPLACEMENT ITEMS</b>			Qty
907095	30AMP ATC FUSE		1
907102-01	2 AMP ATM MINI FUSE		1

\* Items not available separately, must order 53 ft Trail Charger Mod 6 Bag Kit (284570-01).

\*\* Items not available separately, must order Trail Charger Hardware Bag Kit (284556-01).



## TRAIL CHARGER WITH LOCKOUT



283040-01



283041



267522-01



906849-01



284570-01



906874-01



906875-01



907104-01 (Includes 30 Amp Fuse)



907105-01



906873-01



907015-01



907089-01 (With Unused Hole Plugs)

## TRAIL CHARGER WITH LOCKOUT



907090-01



906877-01



906878-01



906879-01



906880-01



1/4" Red Heat Shrink



1/4" Black Heat Shrink



12-10 Ga. #10 Eyelet



Small Zip-Ties



3/4" Black Heat Shrink



284556-01



5/8" Nylon Clamps

## TRAIL CHARGER WITH LOCKOUT



1/4" x 20 Nylon Lock Nut



1/4" Flat Washer



1/4" x 20 x 3/4" Bolts



#12 x 1 1/2" Hex Tek Screws



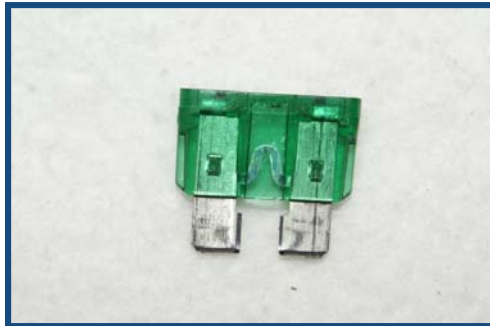
#12 x 3/4" Hex Tek Screws



#10 x 1" Hex Tek Screws



3/8" x 16 Jam Nut



907095



907102-01