

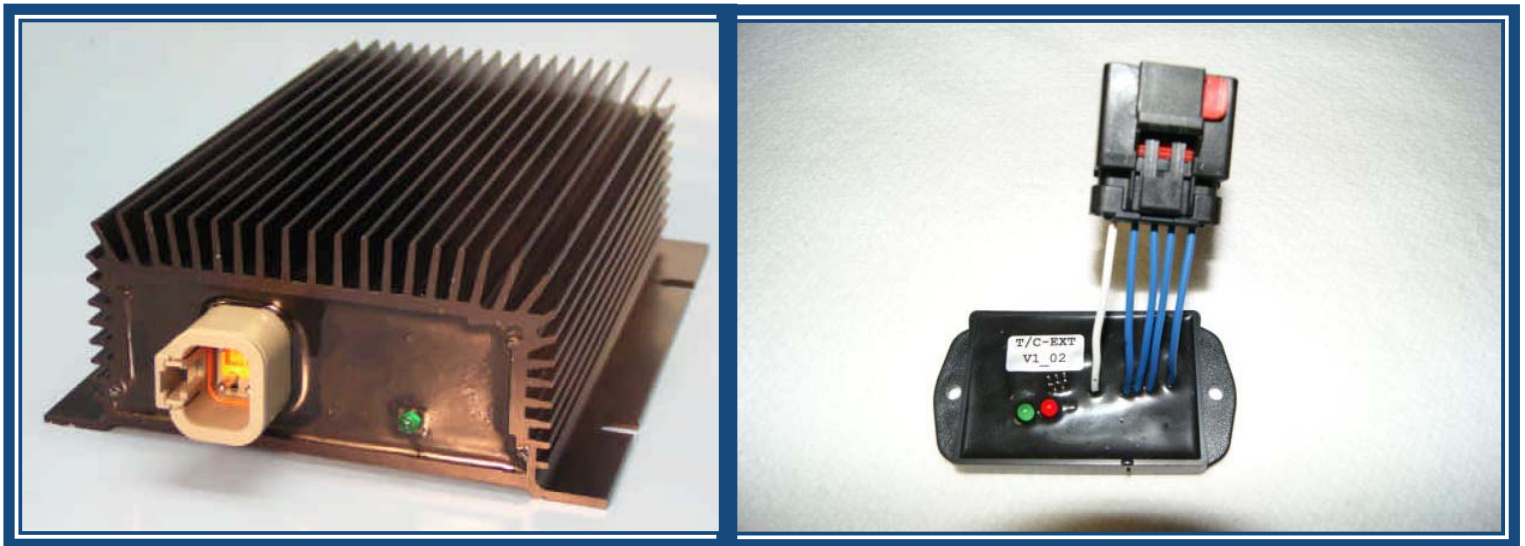


# TRAIL CHARGER with EXTENDER - Straight Truck Application

284550-01

Version 1.04

06/07/2011



## Owners Manual

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

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

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### 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 alternator to the truck's batteries, and the cables from the truck's batteries to the liftgate batteries. The total length of the cables 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 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 truck's battery pack.

The **EXTENDER** allows for the Trail Charger to continue to operate after the tractor is turned off for up to 30 minutes. It runs for the first five minutes and then shuts down for five seconds. It then measures the tractor batteries voltage with no load. If the tractor batteries are still over 12.2 volts, the Extender turns the Trail Charger back on for another five minutes and then starts the cycle over again. This allows for more charging time of the liftgate batteries without impacting the ability to start the tractor.

**NOTE:** If a vehicle is not already equipped with an auxiliary battery box one must be purchased in order for this system to work. The cost of the additional battery box and batteries is not included in the price of this kit.

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step 1:** Mount the Trail Charger on the back of the liftgate battery box using the supplied self-drilling sheet metal screws. Check the back side of the mounting location to ensure that nothing will be damaged during installation. 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). (See Figure 1)

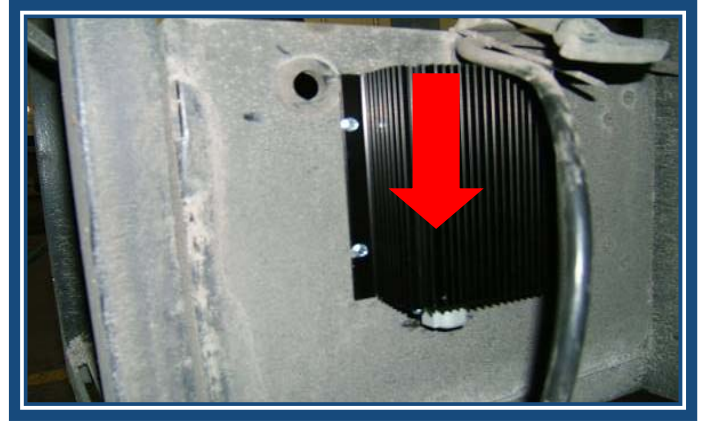


Figure 1

**Step 2:** Mount the included insulated stud (C) to the inside of the liftgate battery box using the supplied hardware.

Mount the Extender Module (D) to the inside of the liftgate battery box using the supplied hardware.

These should be mounted near the liftgate battery box ground stud (L) as shown in the picture to the right. (See Figure 2)

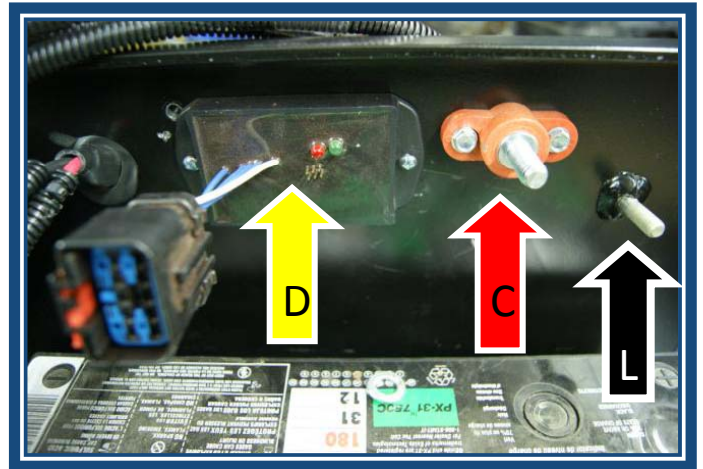


Figure 2

**Step 3:** Connect the Extender harness to the Extender using the 10 pin plug and receptacle. (See Figure 3)

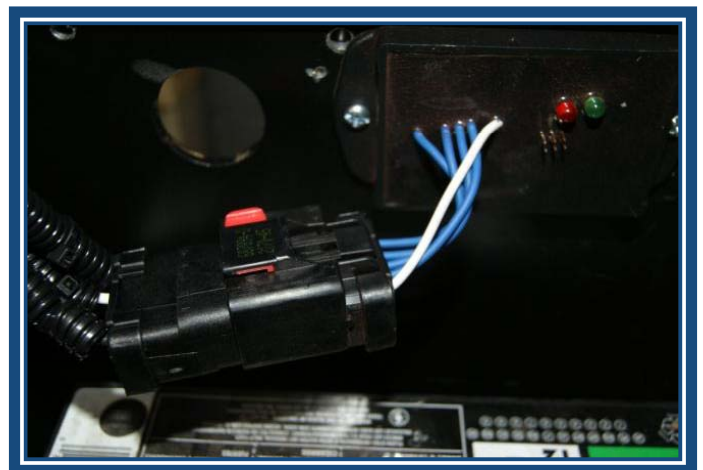


Figure 3

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step 4:** Route the main harness into the liftgate 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.** (See Figure 4)

Route the following wires (the Deutsch pins go to the outside) out of the liftgate battery box through the hole in the back next to the Trail Charger . (The wire #'s are in reference to the diagram on page 10.)

- White wire #5, labeled "Ignition Pin #4"
- Red wire #6, labeled "12V Input Pin #1"
- Red wire #7, labeled "12V Output Pin #2"
- Black wire #8, labeled "GRND Pin #3"

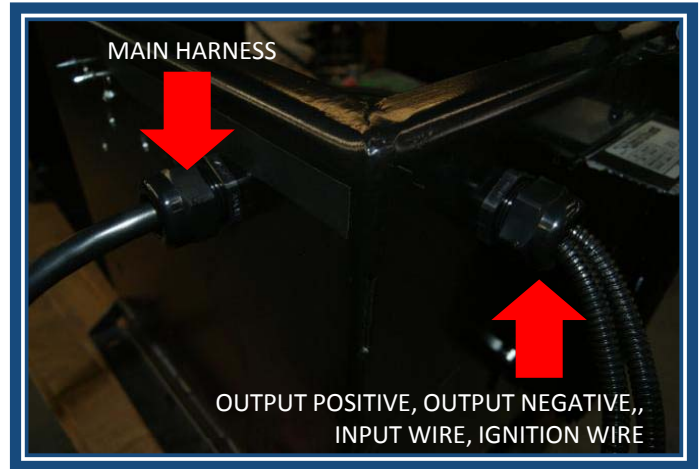


Figure 4

**Step 5:** Connect the following wires to the red insulated junction stud. These are all labeled "Junction Stud".

- Red wire #3 from module
  - Red wire #2 from the dual pole (+)
  - Red wire #6 from TC (routed in previous step)
- Install the nut and tighten properly. (See Figure 5)



Figure 5

**Step 6:** Locate the Deutsch connector from the bag kit and insert the wires into the correct positions.

- Insert the input wire (12V Input Pin #1) into the #1 position on the connector.
- Insert the output positive wire (12V Output Pin #2) into the #2 position on the connector.
- Insert the output ground wire (Ground Pin #3) into the #3 position on the connector.
- Insert the ignition wire (Ignition Pin #4) from the extender module into the #4 position on the connector. (See Figure 6)



Figure 6



## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step 7:** Verify that the wires are inserted into the connector correctly, in the correct position, and locked into place. (See Figure 7)

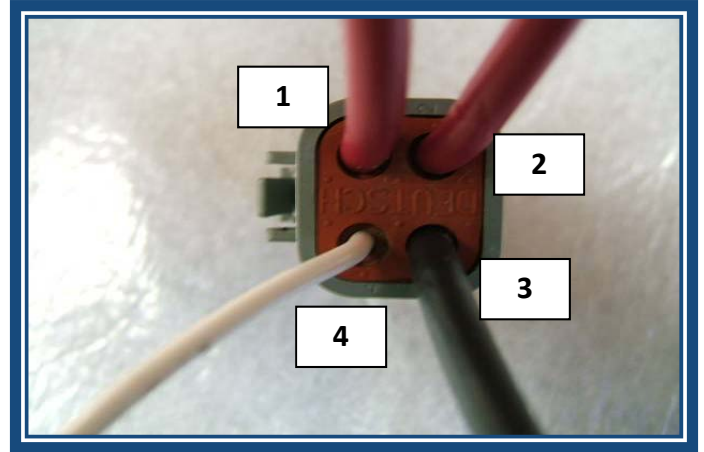


Figure 7

**Step 8:** Locate the orange lock from the bag kit and insert into the Deutsch connector. Make sure that the lock is pushed in flush with the end of the connector and locked into place. (See Figure 8)

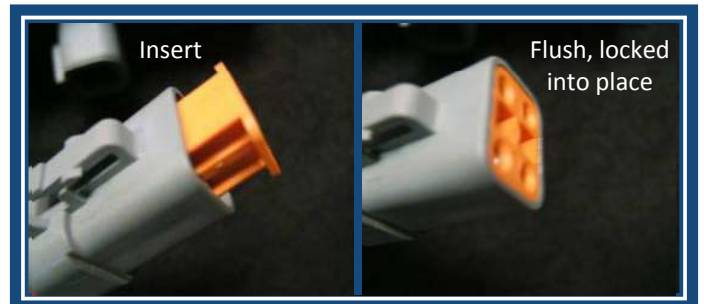


Figure 8

**Step 9:** Slide the included clear tubing over the J1 connector (4 pin) on the Trail Charger. This will help prevent water and contaminants from entering the electrical connection. (See Figure 9)



Figure 9

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step 10:** Connect the Deutsch connector to the Trail Charger. It may be necessary to use a screwdriver to make sure it is properly seated. (See Figure 10)

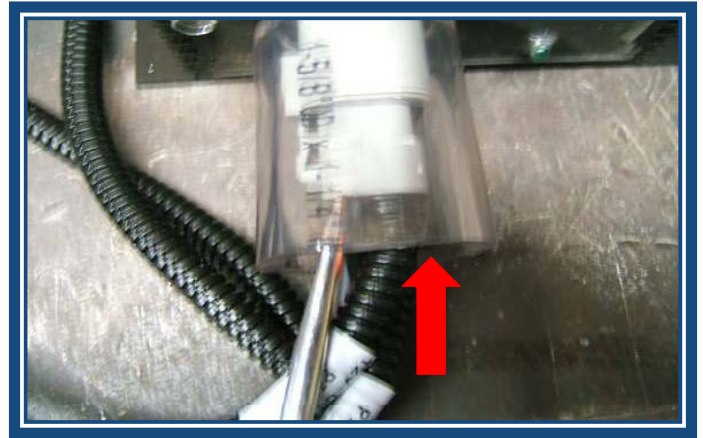


Figure 10

**Step 11:** Install the fuse cube assembly to the positive post of battery A in the liftgate battery box. (See Figure 11)

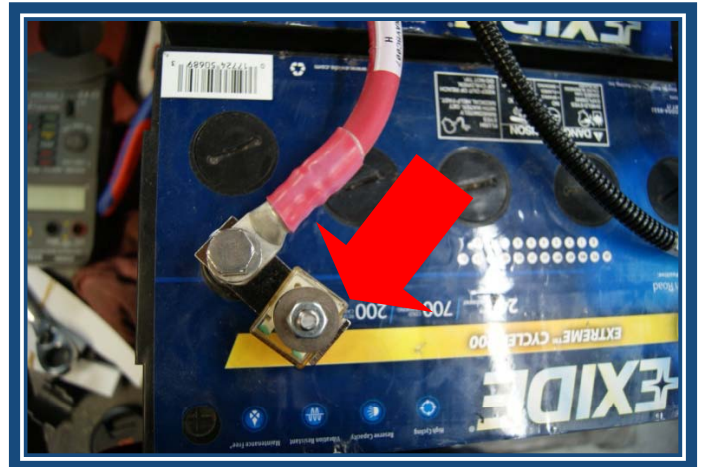


Figure 11

**Step 12:** Attach the output positive wire (Lift Gate Battery (+)) to the top of the fuse cube using the insulated fuse cube nut.

Attach the output ground wire (Lift Gate Battery (-)), the extender ground wire (Lift Gate Battery (-)), and the main harness ground wire (Lift Gate Battery (-)) to the negative post of battery B.

**Please note:** The positive connection and the negative connection should be done on opposite batteries. (See Figure 12)



Figure 12

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step 13:** Route the main power harness from inside the liftgate battery box to the tractor battery box. Make sure the harness is secured with wire ties and not routed through any areas that could cause chaffing or damage to the harness. Once the harness is routed, cut the harness to length. Be sure to leave enough to be able to strip the outer jacket off and have enough wire to make all the electrical connections. (See Figure 13)

**Note:** When routing into the tractor battery box, make sure the wires are protected with a rubber grommet or dome nut.

**Step 14:** Install the fuse cube assembly to the positive post of battery 1 in the tractor battery box. (See Figure 14)



Figure 13

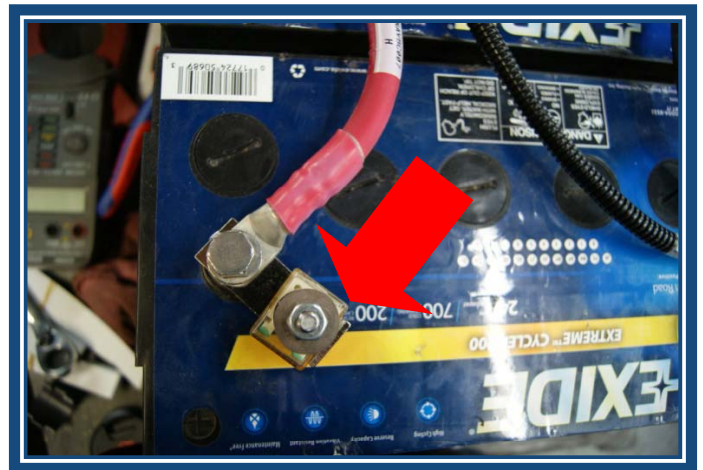


Figure 14

**Step 15:** Install the 3/8" cable end to the red wire by stripping about 1/4" of the insulation off of the wire. Next slide the piece of red heat shrink on the wire, then crimp and solder the 3/8" eyelet onto the end of the wire. Slide the heat shrink over the connection and apply heat. Connect the wire to the fuse cube assembly and tighten the nut properly. (See Figure 15)

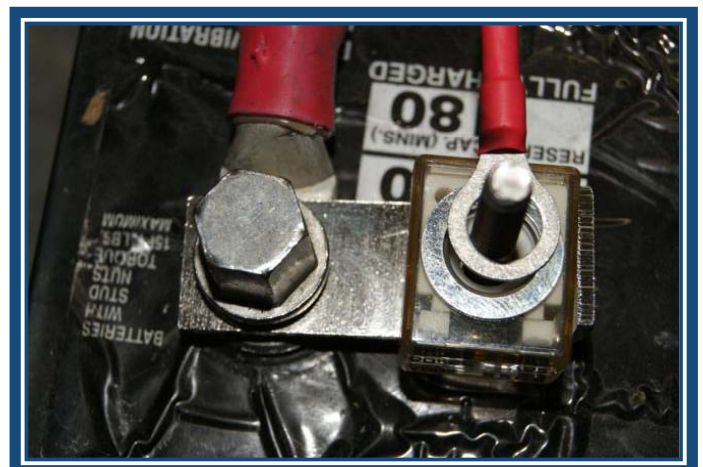


Figure 15



## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### INSTALLATION INSTRUCTIONS

**Step: 16:** Install the 3/8" cable end to the black wire by stripping about 1/4" of the insulation off of the wire. Next slide the piece of black heat shrink on the wire, then crimp and solder the 3/8" eyelet onto the end of the wire. Slide the heat shrink over the connection and apply heat. Connect the wire to the tractor battery negative post and tighten the nut properly. (See Figure 16)

**Note:** Connect the ground wire to the battery opposite to where the positive wire was connected.



Figure 16

**Step 17:** The Trail Charger's green LED light should be illuminated. The Extender module should have both red and green LED lights illuminated. (See Figure 17)

**Note:** Tractor needs to be running and the system voltage needs to be approximately 14.0 volts.



Figure 17

**Step 18:** 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 18)

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

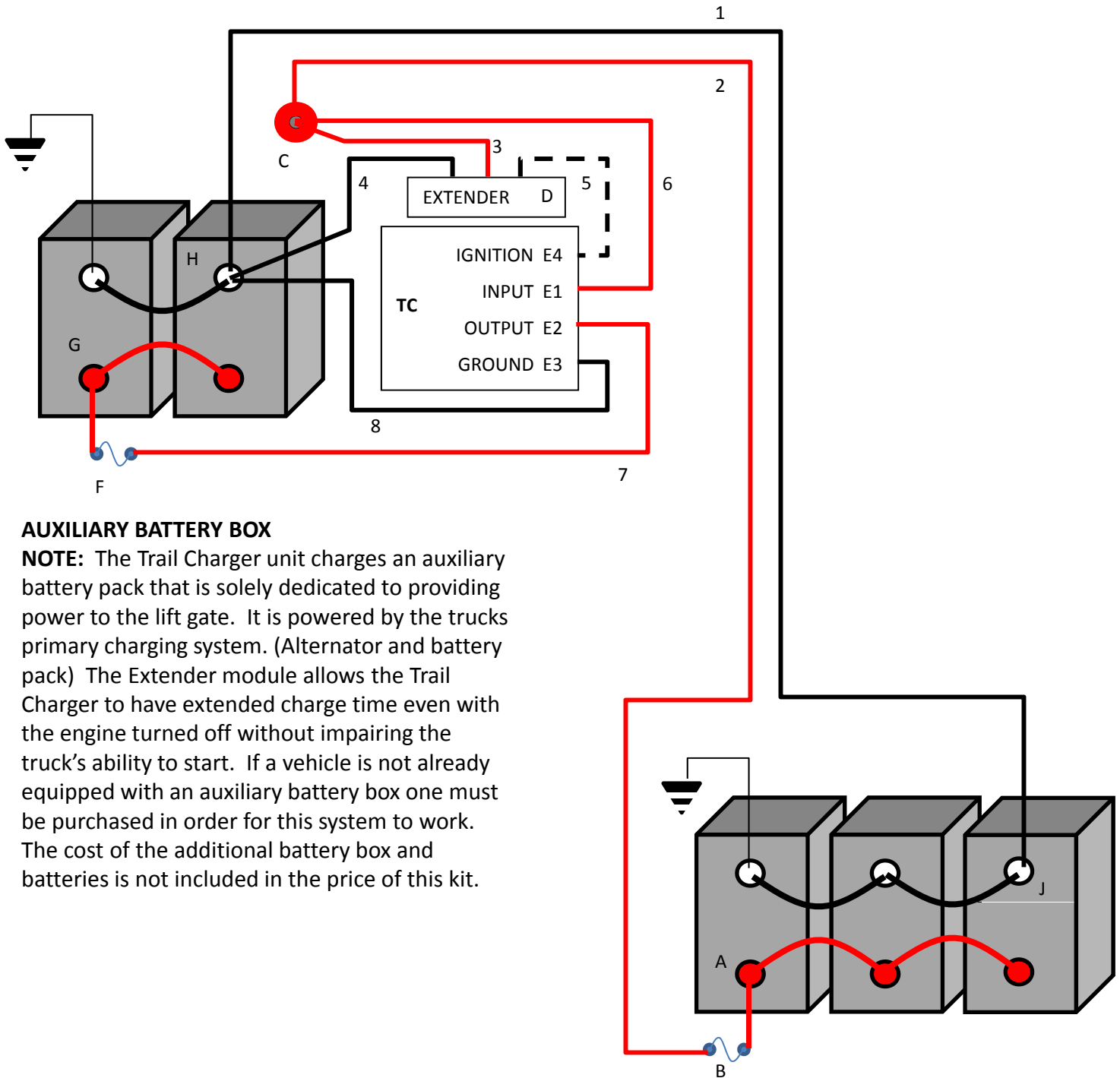


Figure 18



# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## WIRING DIAGRAM



### AUXILIARY BATTERY BOX

**NOTE:** The Trail Charger unit charges an auxiliary battery pack that is solely dedicated to providing power to the lift gate. It is powered by the trucks primary charging system. (Alternator and battery pack) The Extender module allows the Trail Charger to have extended charge time even with the engine turned off without impairing the truck's ability to start. If a vehicle is not already equipped with an auxiliary battery box one must be purchased in order for this system to work. The cost of the additional battery box and batteries is not included in the price of this kit.

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### WIRING DIAGRAM

#### Components

- A. Truck Battery Positive
- B. Fuse Cube, 30 Amp
- C. Junction Stud
- D. Extender Module
- E. Trail Charger
  - 1. Input
  - 2. Output
  - 3. Ground
  - 4. Ignition
- F. Fuse Cube, 30 Amp
- G. Liftgate Battery Positive
- H. Liftgate Battery Negative
- J. Truck Battery Negative

<u>Wire</u>	<u>Connection 1</u>	<u>Connection 2</u>	<u>Color</u>
1. Ground Wire (Main Harness)	Truck Battery Negative	Liftgate Battery Negative	Black
2. Positive Wire (Main Harness)	Truck Battery Positive	Insulated Junction Stud	Red
3. Extender Positive Sense Wire	Extender Module	Insulated Junction Stud	Red
4. Extender Ground Wire	Extender Module	Liftgate Battery Negative	Black
5. Extender Ignition Wire	Extender Module	Trail Charger Ignition #4	White
6. Input Wire to Trail Charger	Insulated Junction Stud	Trail Charger Input #1	Red
7. Output Positive Wire	Trail Charger Output #3	Liftgate Battery Positive	Red
8. Output Negative Wire	Trail Charger Ground #4	Liftgate Battery Negative	Black

# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## TROUBLESHOOTING GUIDE

1. 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.

**Note:** For steps 2 through 11 refer to the wiring diagram on page 15.

2. Turn input power on to the Trail Charger. The truck needs to be running and the truck battery voltage must be in the 13.8 to 14.2 volt range.

3. Is the green LED on the Trail Charger illuminated ? (yes or no) \_\_\_\_\_  
 If yes move to step 9 . If no go to step 4.

**Note:** If the liftgate batteries are completely charged the Trail Charger might not turn on. To ensure this is not the case run the lift one complete cycle.

Did the green light turn on? (yes or no) \_\_\_\_\_



## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

### TROUBLESHOOTING GUIDE

4. Remove the harness plug from the Trail Charger. (See Figure 1) Check the voltage reading at the input pin (E1) and the liftgate battery negative (H). This should be the same as the truck battery voltage. (i.e. voltage between positive (A) and negative (J))

Tractor Battery Voltage: \_\_\_\_\_

(E1) Pin Voltage: \_\_\_\_\_

If the tractor battery voltage and the voltage at (E1) are not the same, check for the following:

- A. Check the fuse cube (B) at the truck batteries. If the fuse is blown, repair the circuit and replace the fuse. Recheck the voltage between (E1) and (H) as in step 4. This should be the same as the battery voltage. If yes, skip to step 5. If no, continue to step B.
  - B. Check Voltage between (C) and (H). This should be the same as the battery voltage. If yes, continue to step C. If no, repair the wire between the red insulated stud (C) and the fuse (B) and continue to step C.
  - C. Check Voltage between (E1) and (H). This should be the same as the battery voltage. If yes, skip to step 5. If no, repair the wire between the red insulated stud (C) and (E1) and continue to step D.
  - D. Check the ground circuit by checking the voltage between (H) and (J). This should be zero volts. If yes, continue to step 5. If no, repair the wire between (H) and (J) then continue to step 5.
5. Verify that the voltage reading between the insulated junction stud (C) and the liftgate battery negative (H) is greater than 13.3 volts (engine must be running) before continuing to the next step.
- A. The red light on the module should be on. If yes, continue to step B. If no, verify that the red wire between the module (D) and the insulated junction stud (C) is not damaged, broken, or pinched. Also verify that the black wire between the module (D) and the liftgate battery negative (H) is not damaged, broken, or pinched. If there are no damaged wires, replace the module and then start over at the beginning of step 5.
  - B. With the harness plug removed, check the voltage reading between the ignition pin (E4) and the liftgate battery ground (H). This should read within one volt of the battery voltage between (C) and (H). If yes, module is operating and the green and red LED lights should be on. If the LED lights are not on and there is no voltage between (E4) and (H), remove the red lead from the module that attached to the battery positive (G) and then reattach. Both LED lights should turn on for one second and then turn off. This means the module has power. Ensure the red and black leads are on the correct battery terminal. If yes and the LED lights do not come on, replace the module and then start over at the beginning of step 5.
6. With the harness plug removed, check the voltage reading between the ground pin (E3) and the liftgate battery positive (G). This should be the same as battery voltage. If yes, continue to step 7. If no, repair the lead from pin (E3) to liftgate battery negative (H).

# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## TROUBLESHOOTING GUIDE

7. With the harness plug removed, check the voltage reading between the output pin (E2) and the liftgate battery negative (H). This should be the same as battery voltage. If yes, continue to step 8. If no, check the 30 amp fuse cube (F). If the fuse is blown, repair the circuit and replace the fuse cube (F). If the voltage reading between the output pin (E2) and the liftgate battery negative (H) is still not the same as battery voltage, repair the lead from the output pin (E2) to the liftgate battery positive (G).
8. Check the voltage between the liftgate battery negative (H) and the truck battery negative (J). The meter should read zero. If not zero, repair the ground wire between (H) and (J).
9. Reconnect the harness plug back into the Trail Charger.
10. Hook a clip-on ammeter around the output cable between the output pin (E2) on the Trail Charger plug and the liftgate battery positive (G) then check the voltage with a voltmeter between (G) and (H). See figure 3.

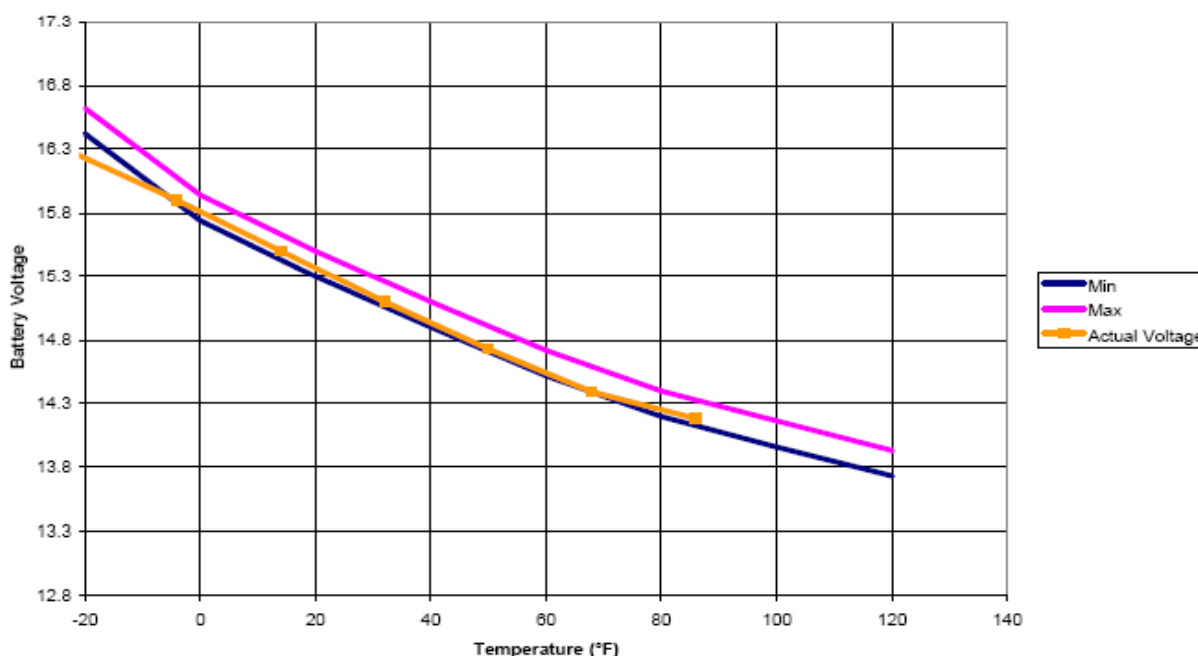
Record the readings \_\_\_\_\_volts \_\_\_\_\_amps \_\_\_\_\_temp

Allow the unit to operate for five to ten minutes and retest.

Record the readings \_\_\_\_\_volts \_\_\_\_\_amps \_\_\_\_\_temp

11. What is the ambient temperature of the liftgate batteries? \_\_\_\_\_F

Note: In cold weather, the voltage may increase up to 15.0 volts. See chart below for recommended charging voltages vs. temperature.



# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## TROUBLESHOOTING GUIDE



Figure 1

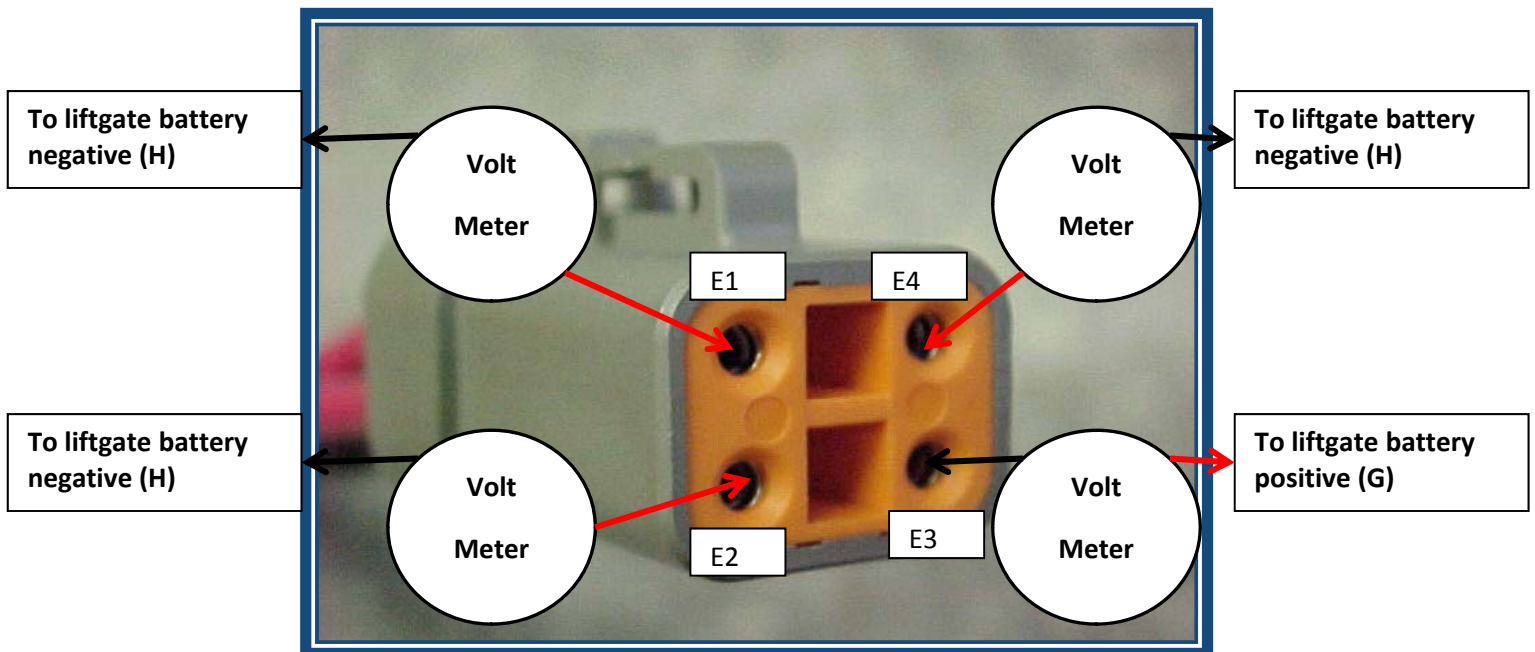
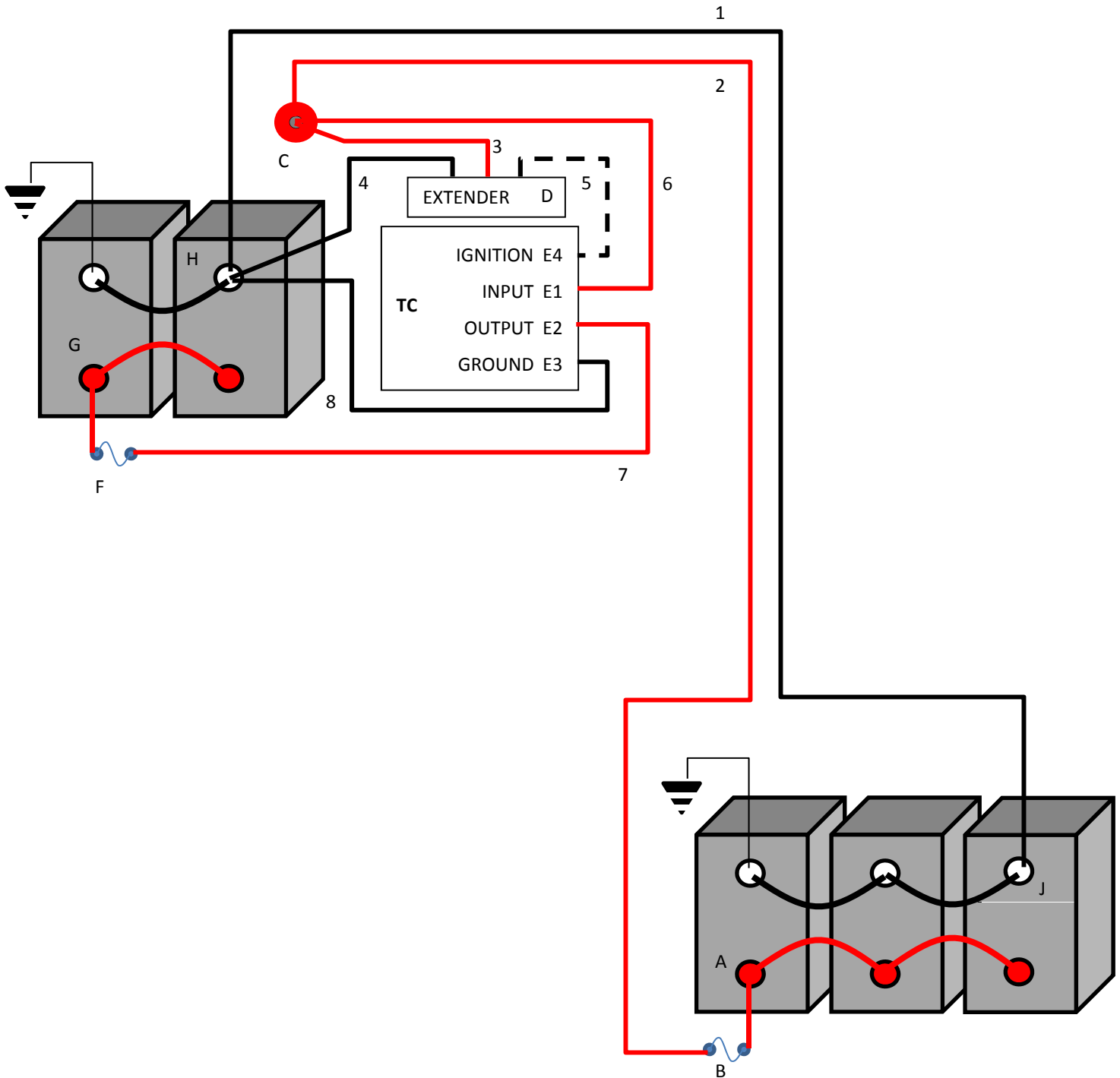


Figure 2



# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## TROUBLESHOOTING GUIDE



## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

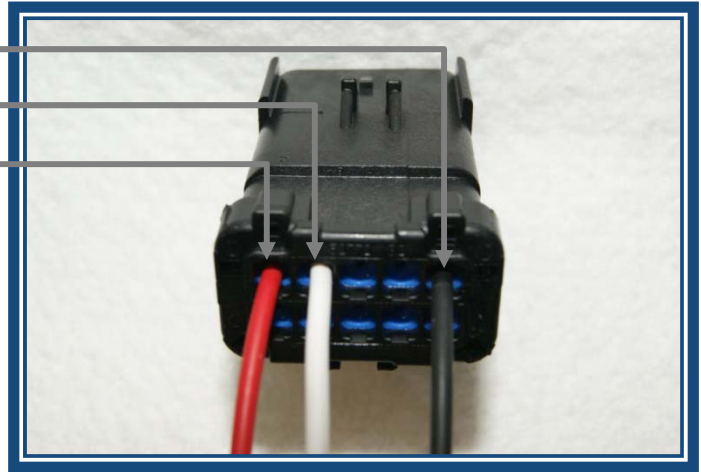
### EXTENDER MODULE INFORMATION

#### 10 Pin Connector

To liftgate battery negative (H)

To Trail Charger ignition pin (E4)

To red junction stud (C)



#### STARTUP State

Both LED's turn on for 1 second and then turn off, then it goes to the OFF State.

#### OFF State

Green LED off.

Red LED off.

Output is off.

In this state the module is in low power mode and draws less than 1mA of current.

If the dual pole voltage rises to over 13.3 volts then it goes to the RUNNING State.

#### RUNNING State

Green LED on.

Red LED on.

Output is on.

If the dual pole voltage drops below 13.3 volts then it goes to the TIMING State.

#### TIMING State

Green LED off.

Red LED on.

Output is on.

If the dual pole voltage drops below 11.0 volts then it goes to the OFF State.

If the dual pole voltage rises to over 13.3 volts then it goes to the RUNNING State.

If it has been in the TIMING State for 30 minutes then it goes to the OFF State.

Every five minutes it turns off the output for 5 seconds and then measures the dual pole voltage, if the dual pole voltage is under 12.2 volts then it goes to the OFF State.

# T.C. WITH EXTENDER – STRAIGHT TRUCK APP.

## PARTS BREAKDOWN

284550-01 COMPLETE KIT (TC, Extender, Harness, Bag Kit, Cover)		
<b>Complete Kit Contents:</b>		<b>Qty</b>
906484-01	TRAIL CHARGER	1
284552-01	TC EXTENDER COMPLETE MODULE WITH HARNESS	1
906871-01	25FT MOD5 TRAIL CHARGER STRAIGHT TRUCK HARNESS	1
267522-01	TRAIL CHARGER COVER	1
284554-01	25FT MOD5 TRAIL CHARGER STRAIGHT TRUCK BAG KIT	1
<b>Bag Kit Contents:</b>		<b>Qty</b>
906874-01	10GA 30" TRAIL CHARGER OUTPUT WIRE	1
906875-01	10GA 30" TRAIL CHARGER GROUND WIRE	1
906876-01	10GA 24" TRAIL CHARGER JUNCTION STUD TO INPUT WIRE	1
906873-01	SECONDARY LOCK	1
907015-01	DEUTSCH PLUG	1
906877-01	1-1/4" CLEAR ID TUBING, 0.17 ft.	1
906878-01	SINGLE FUSE CUBE BRACKET	2
906879-01	CF NUT FOR FUSE CUBE BRACKET	2
906880-01	FUSE CUBE,30AMP	2
906881-01	RED 3/8 JUNCTION STUD	1
906882-01	RED RUBBER BOOT	1
*	1/4" RED HEAT SHRINK, 1 inch long	1
*	1/4" BLACK HEAT SHRINK, 1 inch long	1
*	12-10GA 3/8" EYELET	2
*	3 23/32" SMALL ZIP TIES	12
*	3/4" BLACK HEAT SHRINK, 3 inches long	1
284556-01	TRAIL CHARGER HARDWARE BAG KIT	1
<b>Hardware Bag Kit Contents:</b>		<b>Qty</b>
**	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

REPLACEMENT ITEMS		Qty
907095	30AMP ATC FUSE	1
907096	2 AMP ATC FUSE	1

\* Items not available separately, must order 25 ft Trail Charger Straight Truck Bag Kit (284554-01).

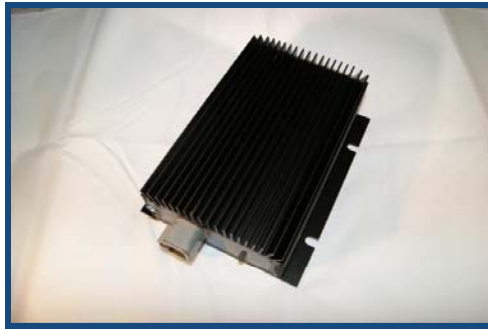
\*\* Items not available separately, must order Trail Charger Hardware Bag Kit (284556-01).



## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.



284550-01



906484-01



284552-01



906871-01



267522-01



284554-01



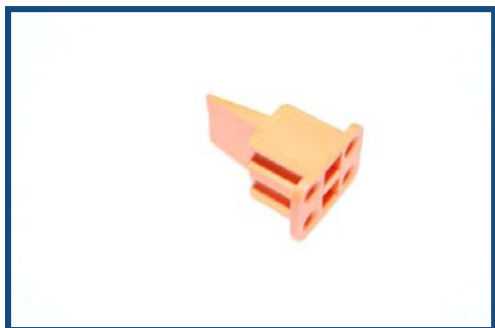
906874-01



906875-01



906876-01



906873-01



907015-01



906877-01

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.



906878-01 (Qty: 2)



906879-01 (Qty: 2)



906880-01 (Qty: 2)



906881-01



906882-01



1/4" Red Heat Shrink



1/4" Black Heat Shrink



12-10 Ga. 3/8" Eyelet (Qty: 2)



Small Zip-Ties (Qty: 12)



3/4" Black Heat Shrink



284556-01



5/8" Nylon Clamps (Qty: 12)

## T.C. WITH EXTENDER – STRAIGHT TRUCK APP.



1/4" x 20 Nylon Lock Nut (Qty: 8)



1/4" Flat Washer (Qty: 8)



1/4" x 20 x 3/4" Bolts (Qty: 8)



#12 x 1 1/2" Hex Tek Screws



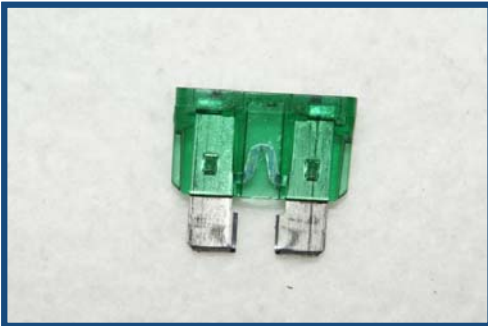
#12 x 3/4" Hex Tek Screws (Qty: 10)



#10 x 1" Hex Tek Screws (Qty: 5)



3/8" x 16 Jam Nut



907095



907096