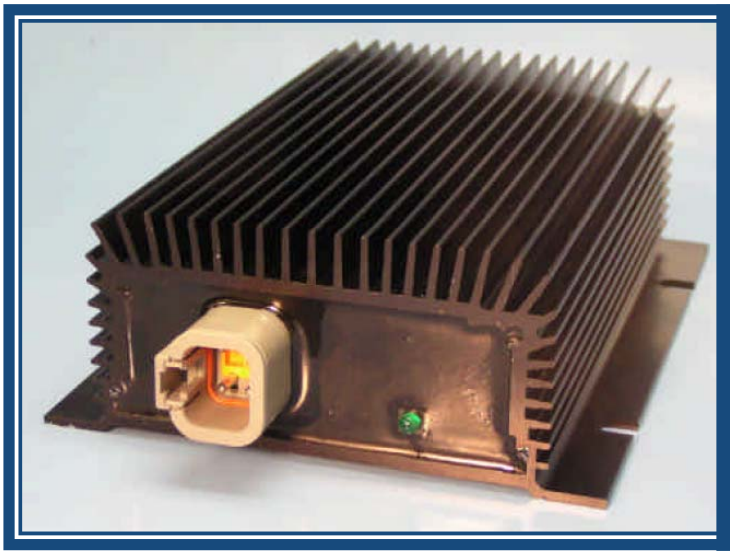
PURKEYS
FLEET ELECTRIC

TRAIL CHARGER with EXTENDER Retrofit From Existing Single Pole or Dual Pole System

284587-01 Version 1.04 06/07/2011



Owners Manual

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

TC WITH EXTENDER RETRO FROM S.P. or D.P.

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 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 **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.

TC WITH EXTENDER RETRO FROM S.P. or D.P.

INSTALLATION INSTRUCTIONS

Step 1: Mount the Trail Charger on the back of the 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)

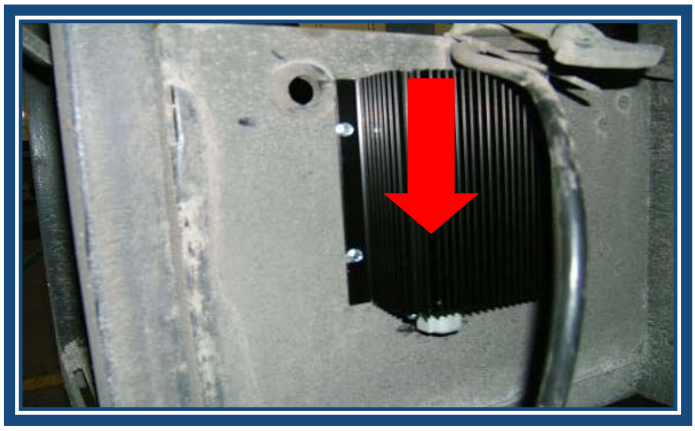


Figure 1

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

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

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

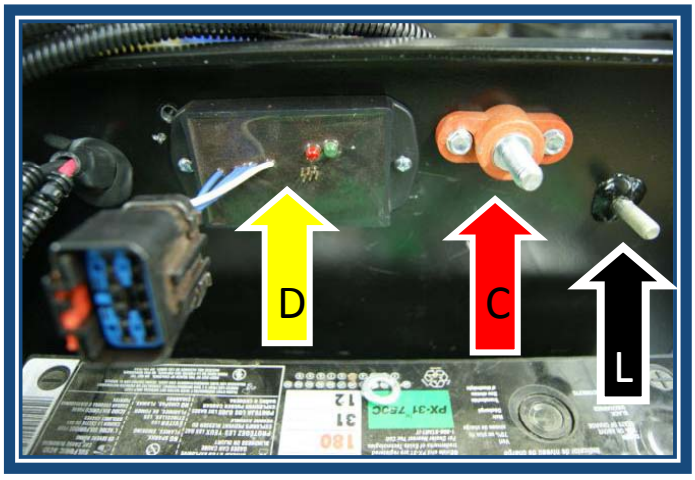


Figure 2

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

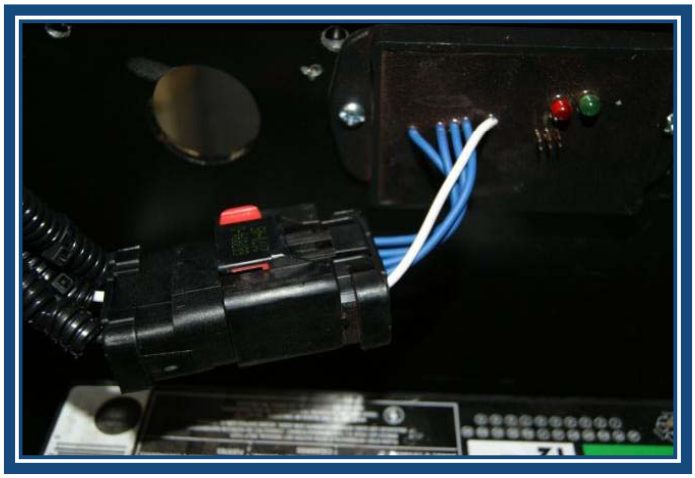


Figure 3

TC WITH EXTENDER RETRO FROM S.P. or D.P.

INSTALLATION INSTRUCTIONS

Step 4:
Route the following wires (the Deutsch pins go to the outside) out of the battery box through the hole in the back next to where the Trail Charger was previously mounted. (The wire #'s are in reference to the diagram on page 10.) (See Figure 4)
- 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"

Note: All wires routed through the battery box should be protected with a rubber grommet or dome nut.

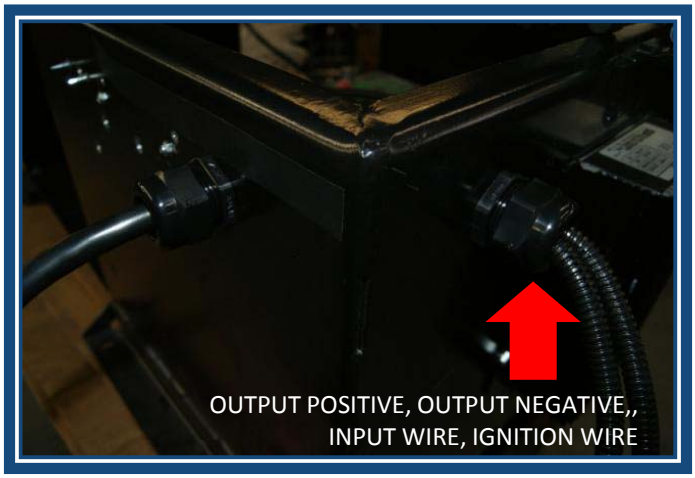


Figure 4

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 #6 from TC (routed in previous step)

Locate the existing positive cable coming from the single or dual pole receptacle where it is connected to the liftgate battery. Remove the cable from the liftgate battery positive and connect it to the insulated junction stud. 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)

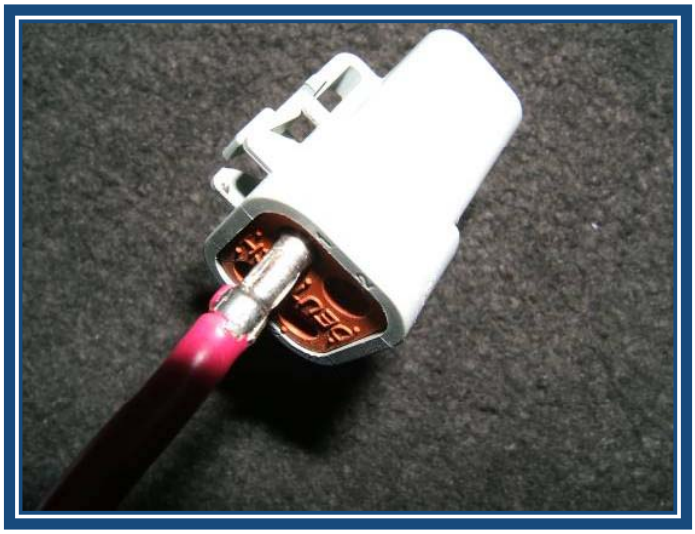


Figure 6

TC WITH EXTENDER RETRO FROM S.P. or D.P.

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)

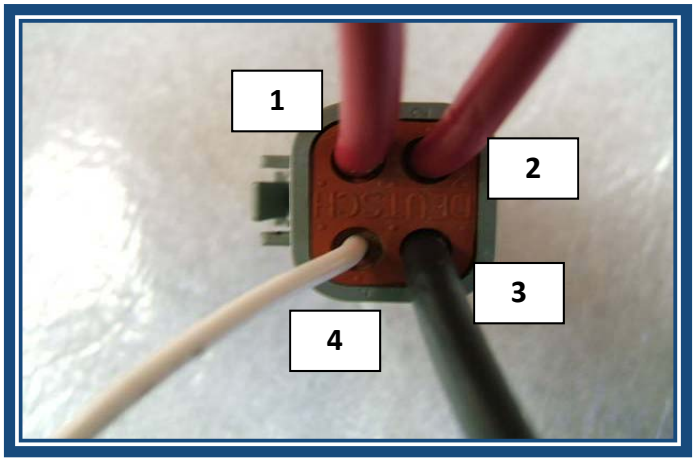


Figure 7

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)

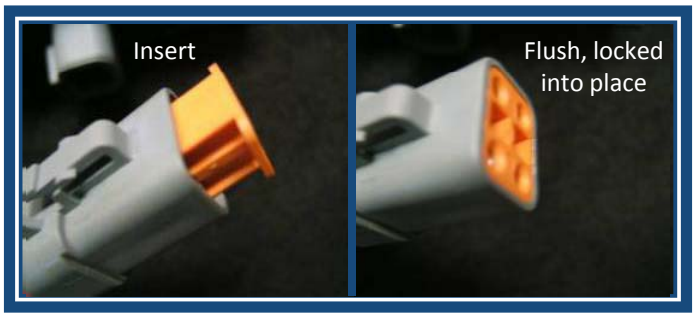


Figure 8

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

Figure 9

TC WITH EXTENDER RETRO FROM S.P. or D.P.

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)

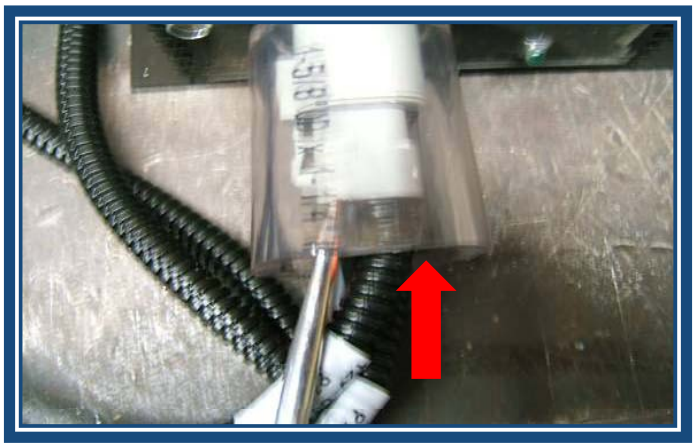


Figure 10

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

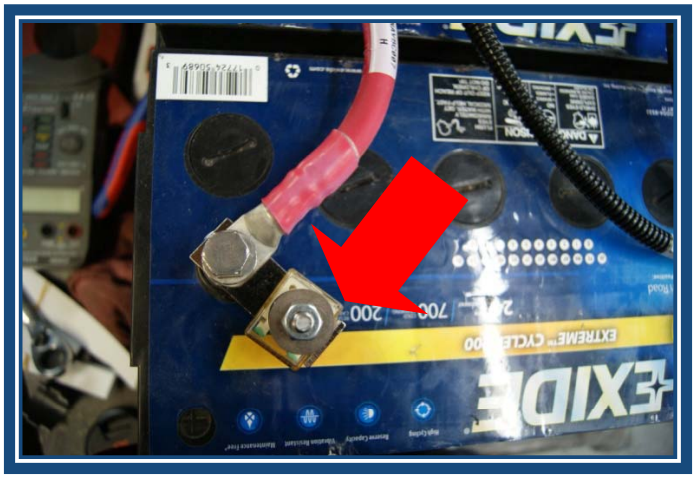


Figure 11

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 (-)) and the extender ground wire (Lift Gate Battery (-)) to the liftgate battery negative post.

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

Figure 12

TC WITH EXTENDER RETRO FROM S.P. or D.P.

INSTALLATION INSTRUCTIONS

Step 19: Connect a tractor to the trailer via the dual pole receptacle and check operation of the Trail Charger. The Trail Charger's green LED light should be illuminated. The Extender module should have both red and green LED lights illuminated.

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

Step 20: 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 19)

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

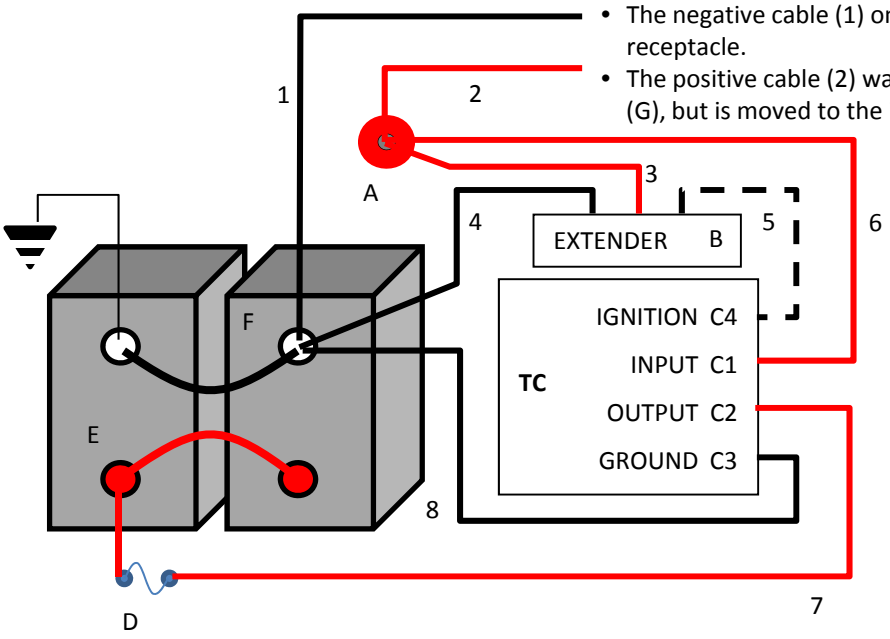
Figure 19

TC WITH EXTENDER RETRO FROM S.P. or D.P.

WIRING DIAGRAM

These cables are the existing cables on the trailer that run from the single or dual pole receptacle from the front of the trailer.

- The negative cable (1) only exists if the trailer is equipped with a dual pole receptacle.
- The positive cable (2) was previously connected to the liftgate battery positive (G), but is moved to the insulated junction stud (C) for this application.



A. Junction Stud
B. Extender Module
C. TrailCharger
    1. Input
    2. Output
    3. Ground
    4. Ignition
D. 30 Amp Fuse Cube
E. Liftgate Battery Positive
F. Liftgate Battery Negative

	Wire	Connection 1	Connection 2	Color
1.	Ground Wire (Main Harness)	Dual Pole Negative	Liftgate Battery Negative	Black
2.	Positive Wire (Main Harness)	Dual Pole 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	WireExtender 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

TC WITH EXTENDER RETRO FROM S.P. or D.P.

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 13.

2. Turn input power on to the Trail Charger. The dual pole cord must be connected from the tractor to the dual pole receptacle on the trailer or have a dual pole cord connected to a battery on a mobile cart. The tractor needs to be running or the mobile cart needs to have a charger connected and turned on and the 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) _____

TROUBLESHOOTING GUIDE

4. Remove the harness plug from the Trail Charger. (See Figure 1) Check the voltage reading at the input pin (C1) and the liftgate battery negative (H). This should be the same as the source voltage. (i.e. battery source at front of trailer, positive and negative of dual pole or single pole positive and frame ground.

   Source Voltage:_____ (C1) Pin Voltage:_____

   If the source voltage and the voltage at (C1) are not the same, check for the following:

   A. Check Voltage between (A) and (F). 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 (A) and the single or dual pole positive post in the nose box, and continue to step B.

   B. Check Voltage between (C1) to (F). 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 (A) and (C1).

5. Verify that the voltage reading between the insulated junction stud (A) and the liftgate battery negative (F) 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 (B) and the insulated junction stud (A) is not damaged, broken, or pinched. Also verify that the black wire between the Extender module (B) and the liftgate battery negative (F) 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 (C4) and battery ground (F). This should read within one volt of the battery voltage between (A) and (F). If yes, module is operating and green and red LED lights should be on. If the LED lights are not on and there is no voltage at (C4) and (F), remove the red lead from the module that attached to the battery positive (E) 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 (C3) and the liftgate battery positive (E). This should be the same as battery voltage. If yes, continue to step 7. If no, repair the lead from pin (C3) to liftgate battery negative (F).

TROUBLESHOOTING GUIDE

7. With the harness plug removed, check the voltage reading between the output pin (C2) and the liftgate battery negative (F). This should be the same as battery voltage. If yes, continue to step 8. If no, check the 30 amp fuse cube (D). If the fuse is blown, repair the circuit and replace the fuse cube (D). If the voltage reading between the output pin (C2) and the liftgate battery negative (F) is still not the same as battery voltage, repair the lead from the output pin (C2) to the liftgate battery positive (E).

8. Check the voltage between the liftgate battery negative (F) and the dual pole receptacle negative or the frame ground if trailer is only equipped with a single pole receptacle. The meter should read zero. If not zero, repair the ground wire between the liftgate battery negative (F) and the dual pole receptacle negative or the frame ground if trailer is only equipped with a single pole receptacle.

9. Reconnect the harness plug back into the Trail Charger.

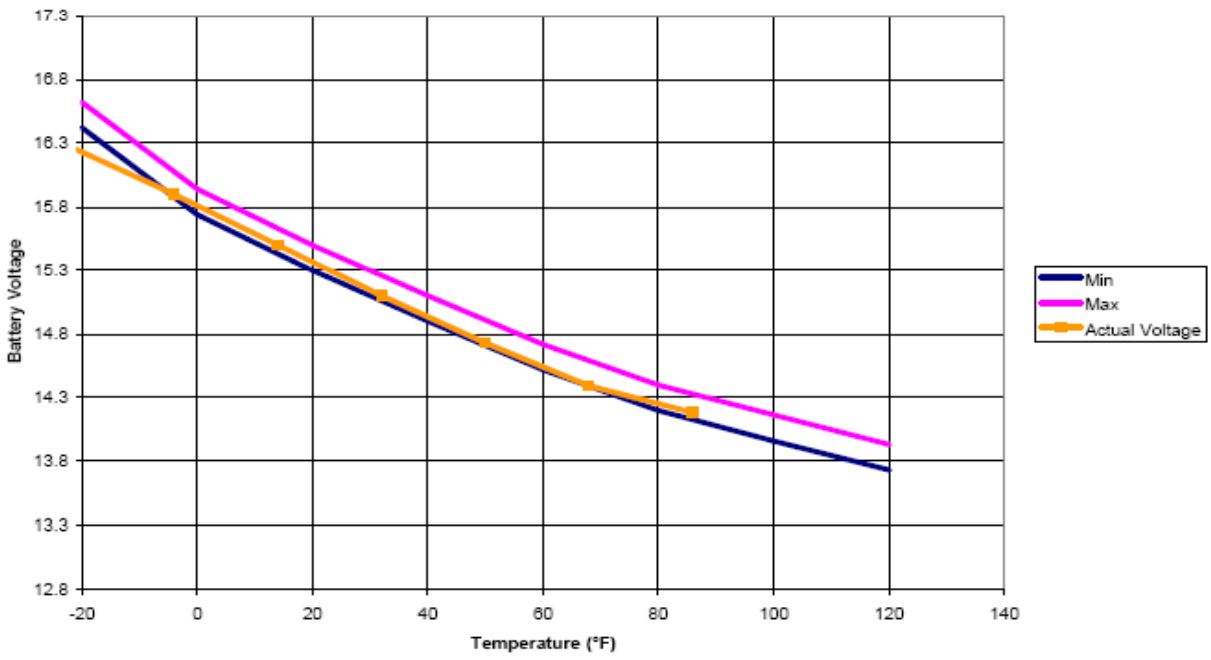
10. Hook a clip-on ammeter around the output cable between the output pin (C2) on the Trail Charger plug and the liftgate battery positive (E) then check the voltage with a voltmeter between (E) and (F). See figure 3.

    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 voltag



TROUBLESHOOTING GUIDE

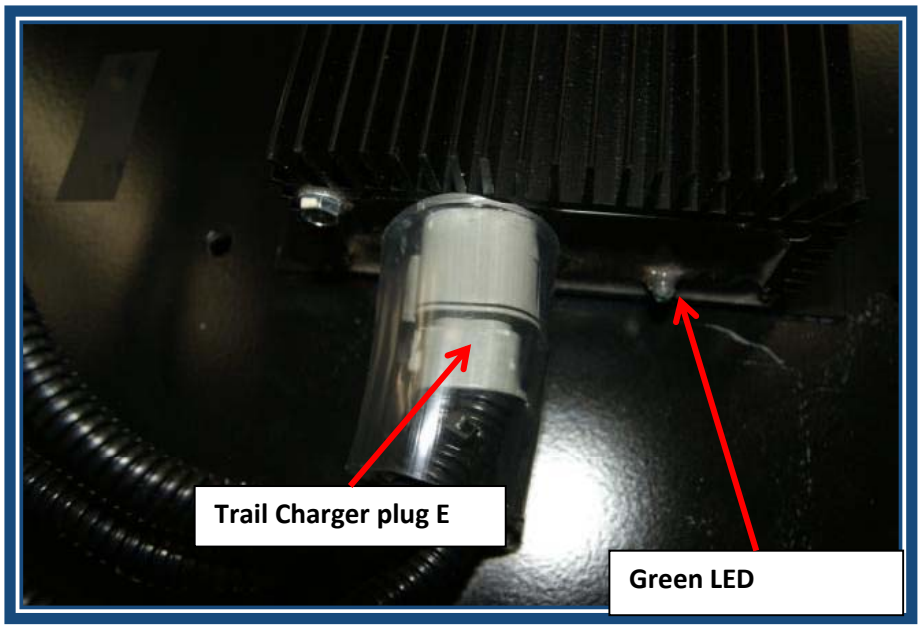


Figure 1

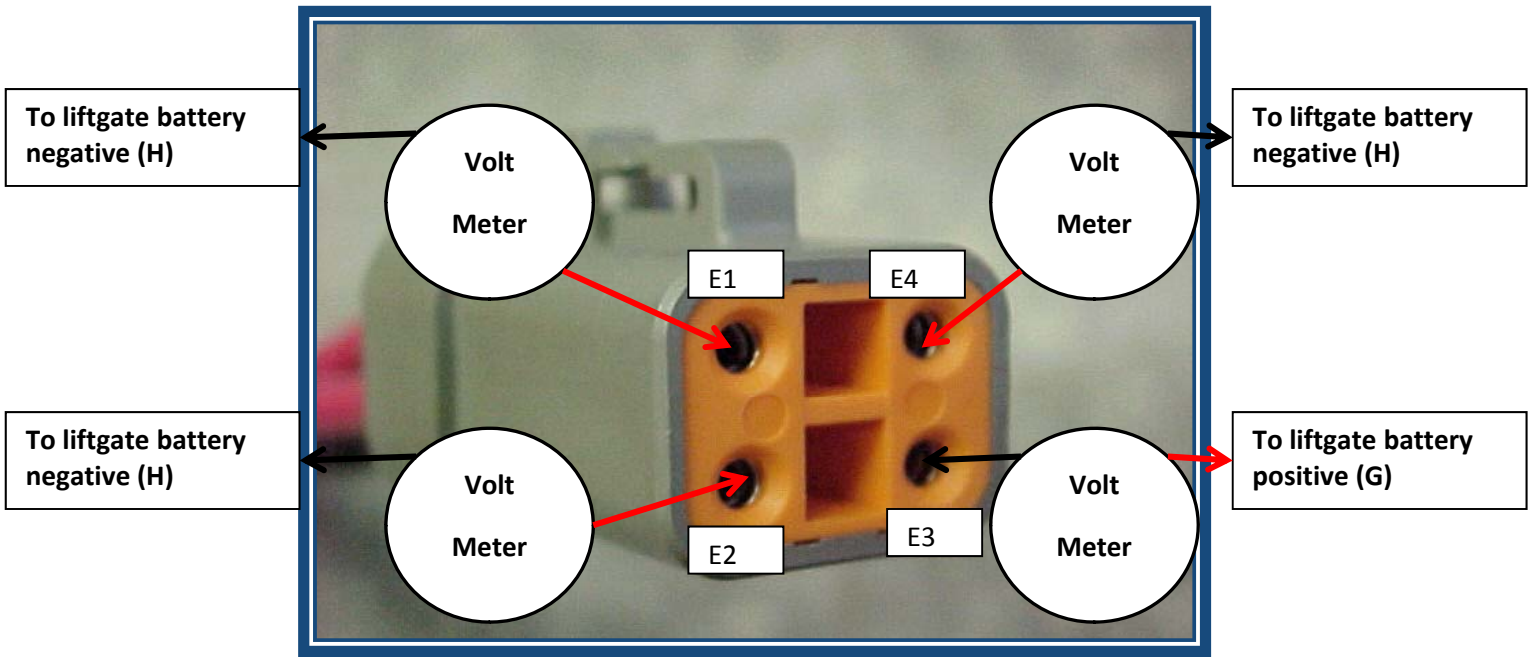


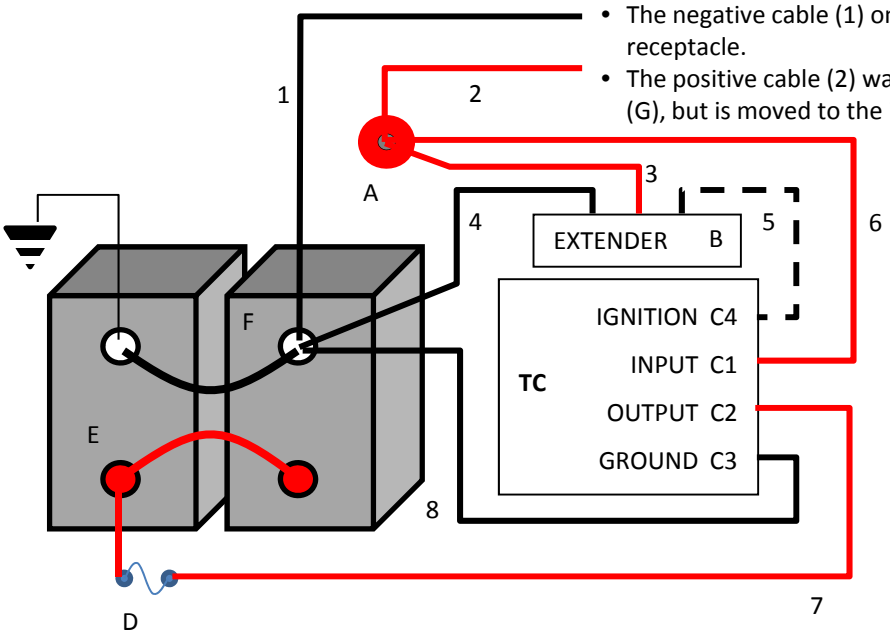
Figure 2

TC WITH EXTENDER RETRO FROM S.P. or D.P.

TROUBLESHOOTING GUIDE

These cables are the existing cables on the trailer that run from the single or dual pole receptacle from the front of the trailer.

- The negative cable (1) only exists if the trailer is equipped with a dual pole receptacle.
- The positive cable (2) was previously connected to the liftgate battery positive (G), but is moved to the insulated junction stud (C) for this application.



A. Junction Stud
B. Extender Module
C. TrailCharger
    1. Input
    2. Output
    3. Ground
    4. Ignition
D. 30 Amp Fuse Cube
E. Liftgate Battery Positive
F. Liftgate Battery Negative

TC WITH EXTENDER RETRO FROM S.P. or D.P.

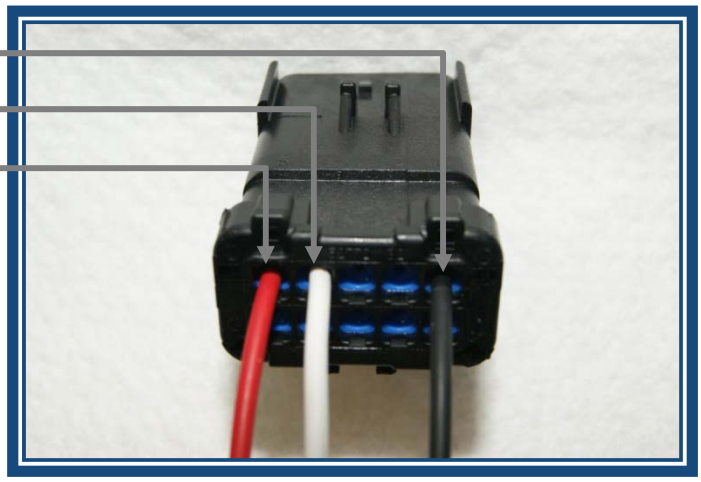
EXTENDER MODULE INFORMATION

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.

TC WITH EXTENDER RETRO FROM S.P. or D.P.

PARTS BREAKDOWN

284587-01			COMPLETE KIT (TC, Extender, Retro Harness, Bag Kit, Cover)	
	Complete Kit Contents:			Qty
	906484-01	TRAIL CHARGER		1
	284552-01	TC EXTENDER COMPLETE MODULE WITH HARNESS		1
	267522-01	TRAIL CHARGER COVER		
	284588-01	MOD5 SINGLE OR DUAL POLE RETRO BAG KIT		1
		Bag Kit Contents:		Qty
		906874-01	10GA 30" TRAIL CHARGER OUTPUT WIRE	1
		906875-01	10GA 30" TRAIL CHARGER GROUND WIRE	1
		907108-01	MOD5 INPUT HARNESS FOR SINGLE OR DUAL POLE	1
		906873-01	SECONDARY LOCK	1
		907015-01	DEUTSCH PLUG	1
		906881-01	RED 3/8 JUNCTION STUD	1
		906877-01	1-1/4" CLEAR ID TUBING, 0.17 ft	1
		906878-01	SINGLE FUSE CUBE BRACKET	1
		906879-01	CF NUT FOR FUSE CUBE BRACKET	1
		906880-01	FUSE CUBE,30AMP	1
		906882-01	RED RUBBER BOOT	1
		284556-01	TRAIL CHARGER HARDWARE BAG KIT	1
			Hardware Bag Kit Contents:	Qty
			** 5/8” Nylon Clamps	12
			** ¼ X 20 Nylon lock nut	8
			** ¼” Flat washers	8
			** ¼ X 20 ¾” bolts	8
			** #12 X 1 ½” Hex tek screws	1
			** #12 X ¾” 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

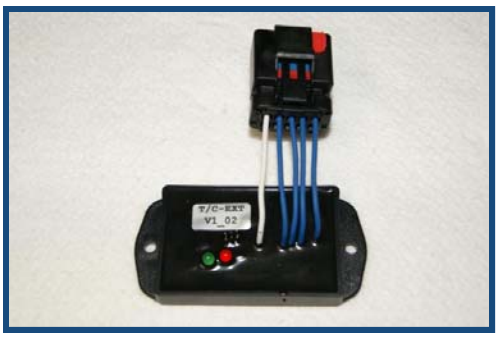
* Items not available separately, must Mod 5 Single or Dual Pole Retro Bag Kit (284588-01).

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

TC WITH EXTENDER RETRO FROM S.P. or D.P.

284587-01

906484-01



284552-01

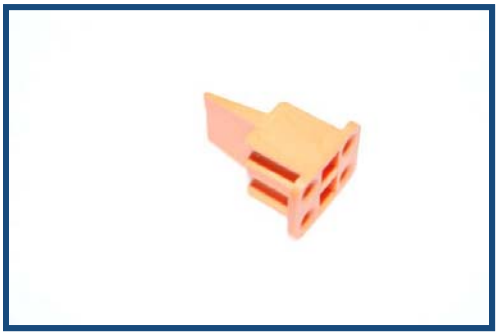
267522-01

284588-01

906874-01

906875-01

907108-01



906873-01

907015-01

906881-01

906877-01

TC WITH EXTENDER RETRO FROM S.P. or D.P.

906878-01

906879-01

906880-01

906882-01

284556-01

5/8” Nylon Clamps

¼” x 20 Nylon Lock Nut

¼” Flat Washer

¼” x 20 x ¾” Bolts

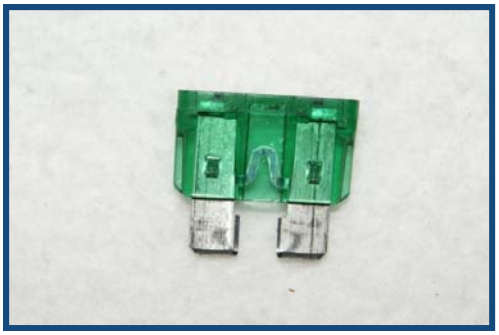
#12 x 1 ½” Hex Tek Screws

#12 x ¾” Hex Tek Screws

#10 x 1” Hex Tek Screws

TC WITH EXTENDER RETRO FROM S.P. or D.P.

3/8” x 16 Jam Nut



907095

907096