

# PURKEYS

A MISSION CRITICAL ELECTRONICS BRAND

## LIFTGATE CHARGING SYSTEM DOUBLE CHECK™

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### USER GUIDE





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## GENERAL INFORMATION

The Purkeys Liftgate Charging System Double Check™ (Double Check) is a tool used to test, troubleshoot, or diagnose problems in both the power source (i.e. tractor) and the liftgate charging system on the trailer itself (i.e. Purkeys Direct™ and Select™ liftgate charging systems).

This system is user-friendly and will allow you to use any available vehicle as a power source. With it, you can test the entire system from tractor to DC/DC converter in approximately 15 minutes.

Once a proper power source is established, it is simple to test the liftgate charging system. The Double Check tool comes in a case that contains all the components and adapters you will need to test your trucks/trailers, with the exception of a multimeter and amp clamp, which your shop should have.

Here are pictures and descriptions of the most crucial parts and adapters you will need to test your system:



Liftgate Double Check display box



20 amp applied load



Input adapter with alligator clips  
(connects to power source)



Input adapter for the 7-way  
(connects to power source)

# LIFTGATE DOUBLE CHECK USER GUIDE



DC/DC inverter harness



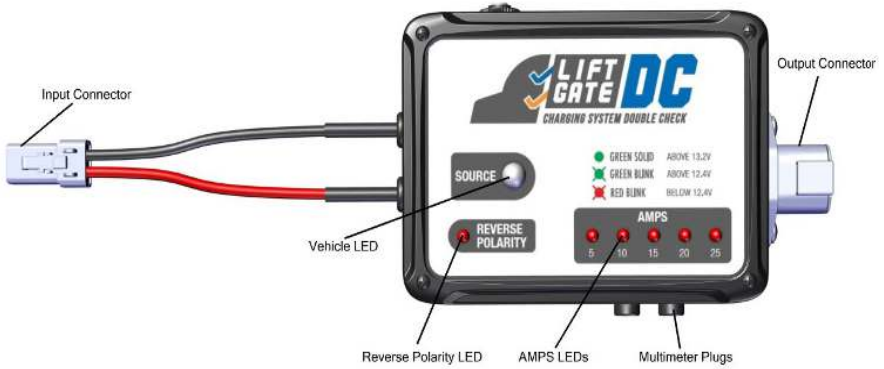
7-way output adapter



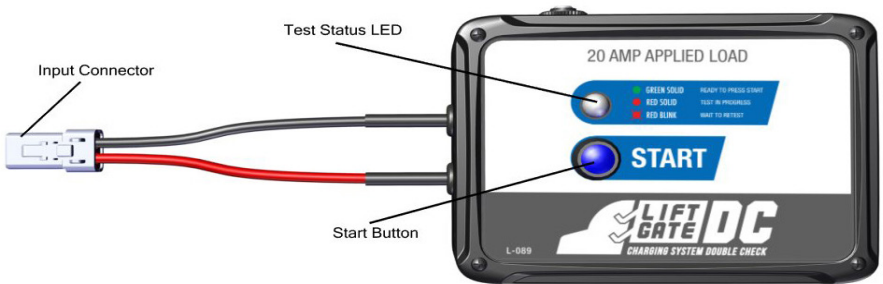
Multimeter, leads, and amp clamp: NOT included in kit



## DOUBLE CHECK DIAGRAM



## 20 AMP APPLIED LOAD TESTER DIAGRAM



# LIFTGATE DOUBLE CHECK USER GUIDE

## OPERATING INSTRUCTIONS

### CONNECTING TO THE POWER SOURCE

The Double Check can use any available vehicle as a power source (i.e. car, tractor), as long as the vehicle has a 12 V battery and an alternator. However, if a tractor is being used as the source, it is critical that you ensure that no part of the tractor is touching the trailer—it cannot be coupled with, or even touching, the trailer—as the 5th wheel ground path will cause inaccurate test results.



The 20 Amp Applied Load Tester is used to test the power source. It is crucial to test the source while under a load to ensure it can provide the proper voltage needed. Do not assume the vehicle is an adequate source, as a faulty source may cause a misdiagnosis of the liftgate charging system due to an inadequate power source.

When using the 20 Amp Applied Load, connect the tool to the Double Check and the power source and make sure the vehicle is running. The Test Status LED on the 20 Amp Applied Load Tester will turn on. See Table 1 for LED indications.

Table 1: 20 Amp Applied Load Tester LED Status

LED	STATUS
Solid Green	Applied Load is ready to test power source
Solid Red	Source is being tested
Blinking Red	Applied Load is resetting

## TESTING THE POWER SOURCE

Step 1: Select a vehicle to be used as the power source and determine the power source and determine the appropriate input adapter:

- Battery input adapter
- 7-way adapter (if testing with a 7-way cord, see section Testing the Source Vehicle with a 7-Way Cord)
- Dual pole adapter
- Dual pole female adapter
- Single pole adapter
- Single pole female adapter



Step 2: Connect the 20 Amp Load Tester to the output side of the Double Check test display box.



Step 3: Connect the multimeter leads to the ports on the bottom of the Double Check test display box and to your multimeter.





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Step 4: Connect the 7-way input adapter to the Double Check to test the power source (i.e. tractor).



Step 5: Move to the rear of the tractor and remove the 7-way cable from the receptacle and plug the 7-way input adapter into the tractor.



Step 6: After connecting the adapter, turn the multimeter to “VOLTS DC” and start the tractor. If the tractor is functioning correctly, the large LED on the 20 amp applied load test box will illuminate solid green and the voltmeter should read above 13.2 volts. Record the voltage.



**IMPORTANT NOTE:** If the large LED on the test box is not solid green, or if the voltmeter reads below 13.2 volts, the voltage output is not sufficient and further tractor diagnosis is required.

Step 7: Press the START button on the 20 amp applied load test box. The display box LED will be solid red to show there is a 20 amp draw on the tractor and the voltmeter should read higher than 12.0 volts. Record the loaded voltage.



**IMPORTANT NOTE:** If the voltmeter reads below 12.0 volts, the power source is not sufficient and further tractor diagnosis is required.

Step 8: If the tractor has passed up to this point, move on to the next test.

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## TESTING THE 7-WAY CABLE

The next step is to test the 7-way cable by pulling a 20 amp load through the 7-way and tractor to prove that sufficient current can pass through the tractor's 7-way cable to the trailer.

Step 1: Remove the 7-way adapter from the tractor, plug the 7-way cord back into the tractor's receptacle, and connect the other end of the 7-way cord into the Double Check test box adapter receptacle.



Step 2: Start the tractor and record the unloaded voltage reading from the voltmeter. If the tractor and 7-way are working correctly, you should see a reading of 13.2 volts or higher.

If the large LED is not green, or if the voltmeter shows less than 13.2 volts, check for a blown fuse in the tractor or proceed to the next step to test for a faulty 7-way cord.

Step 3: Press the start button on the 20 amp load box and read the loaded voltage on the voltmeter. If the voltmeter reads less than 11 volts while loaded at 20 amp, the 7-way cable is bad.

If the 7-way cable has passed up to this point, then both the tractor and the 7-way cable are good.

## TESTING THE LIFTGATE CHARGING SYSTEM

The next step is to test the liftgate charging system. This test will allow you to isolate the failed component that is not allowing the batteries to charge.

Note that if the LEDs on the Direct or Select controller do not turn on, you will need to check the 2 amp fuse located on the charging plate inside the liftgate battery box.

If the LEDs on the Direct or Select controller alternate between green and red, there is insufficient power from the power source vehicle or the wiring (the previous tests will have identified any issues with this).

Step 1: Select the correct input adapter for the power source being used.



Step 2: The multimeter will also be used during this test, so connect the volt leads to the Double Check.



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NOTE: This test is not tractor dependent, but it MUST have an adequate power source to test. Examples of acceptable power sources include:

- shop trucks,
- forklifts,
- switchers,
- and/or test carts supported by a battery charger.

If a tractor is not going to be used as the power source for testing, you will use the alligator clip input adapter shown below.



To supply power, the alligator clips of the input adapter are connected directly to the battery of any running engine or battery charger supported test cart. If you are using a battery charger on a test cart, it should be set at a 10 amp charge.

Step 3: Connect the 7-way output adapter from the Double Check to the trailer nosebox receptacle.



NOTE: You should now see a reading on the Double Check's graduated scale of amps from 5-25 amps. The amperage displayed will vary based on the state of the liftgate batteries. With fully-charged batteries, the DC/DC inverter only requires a few amps to maintain the batteries. In the case the batteries are low or weak, the DC/DC converter requires much greater amperage as it tries to bring the batteries up to full charge.



Once the trailer is connected and the system is loaded, the voltmeter should read above 11 volts.

**IMPORTANT:** If the red AMPS LEDs show no current flow, and the voltmeter is **BELOW** 11 volts, you have an issue with the power source.

If the LEDs show no current flow, but the voltmeter shows **ABOVE** 11 volts, there is an issue in the trailer charging system and you should refer to the appropriate trouble tree at the end of this guide.

Step 4: If the battery voltage is slowly increasing up to 13.2 volts as the amps commanded from the converter are decreasing, then the system is functioning properly and no further investigation is needed.

If the batteries are fully charged and only 5 amps or less are being commanded from the converter, you can cycle the liftgate one or two times while watching the Double Check and voltmeter to ensure that the system is topping the batteries back off.

If no current flow is seen, and you have proper source power, make sure all fuses are intact. This includes the 30 amp fuses in the indicator box on the nose of the trailer and the 2 amp fuse in the battery box. If all fuses are in good working order, continue to the next step of testing the DC/DC converter.

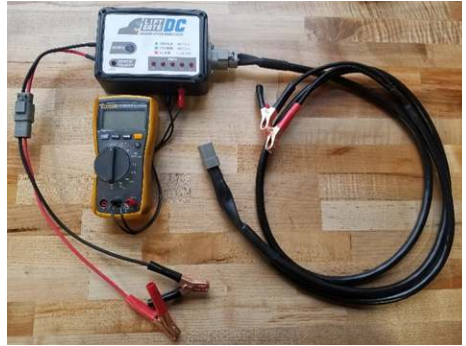
**IMPORTANT:** This test does not replace a battery load test. You should still inspect and test batteries as needed or on a PM level.

# LIFTGATE DOUBLE CHECK USER GUIDE

## TESTING THE DC/DC CONVERTER IN THE BATTERY BOX

This step is not required unless a fault was found. If no current flow was observed during the previous test, and all fuses are in good working order, you will now isolate and test the DC/DC converter.

Step 1: Connect the alligator clip input adapter and the DC/DC converter adapter harness to the Double Check. (The end with the alligator clips and male connector will connect to the battery box and the long end of the adapter connects to the Double Check).



Step 2: Connect the alligator clips input adapter to any of the previously described power sources.

Step 3: Connect the alligator clips on the output harness to the liftgate batteries.

Unplug the DC/DC converter plug and, in its place, connect the adapter harness to the inverter. In the example picture, we have connected the ground clamp to the ground stud inside the battery box. If this stud does not provide an ample ground, it may be necessary to adjust the converter mounting plate inside the box so the ground clamp can be attached to the negative terminal on the battery.



The green light on the converter should be illuminated. On the Double Check and voltmeter, you should see an AMPS reading in relation to the state of the batteries.

With the charger set to 10 amps, the voltage on the meter should continue to increase as the amperage commanded by the DC/DC converter decreases. If, like the previous step, the batteries are at or near full charge, operating the liftgate should trigger a response from the converter to command higher amperage to top off the batteries.

In the event that you have a proper power source, but the converter is not functioning, the converter has gone bad and should be replaced.

If the converter functions correctly during this test, but it was not functioning correctly from the nosebox, there is an issue with the main harness or Aux circuit that needs to be repaired/replaced.

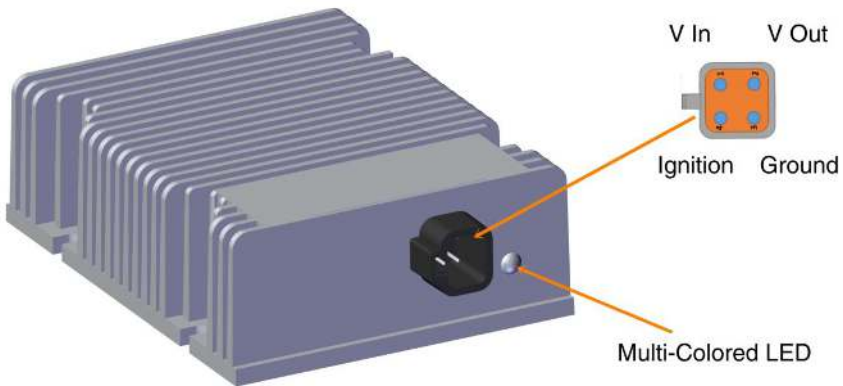
Always ensure that all connections in the system are “tight and bright” to minimize resistance. It is also important to repeat the test if the DC/DC converter was replaced to ensure that the charging problems have been fixed and that the system is now functioning properly.



# LIFTGATE DOUBLE CHECK USER GUIDE

## DC/DC CONVERTER INFORMATION & DIAGNOSTICS

The image below shows the LED lights on the DC/DC converter. A rapid flashing red LED on the converter is normal if the trailer is disconnected from a running truck. It will continue to flash for a short period of time. A rapid flashing red LED is only a fault if the trailer is connected to a running truck.



LED STATUS	CONDITION	ACTION NEEDED
Solid Green	DC/DC converter is on.	Ensure circuit protection on output side is in working order.
Rapid Flashing Red	DC/DC converter has a fault.	Determine the fault.
No Light	No voltage.	Determine the fault.

Note: It is possible to have a green light on a faulty converter; we have seen this problem during check lane troubleshooting. The converter may be properly supplied with power, but have insufficient output, or none at all, to charge the batteries. This can be observed while testing the converter by noting the amperage being used to charge the batteries. In this case you would see proper source voltage on the multimeter, but no current flow to the batteries. If cycling the liftgate has no effect on the amps being required by the converter, then you have proven that the converter has failed. This test should be replicated with the new converter to ensure it is functioning properly. Furthermore, this second test confirms that the failed part was properly isolated and replaced.

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## DOUBLE CHECK TEST CART: OPTIONAL (EXAMPLE)

Although not required in order to use the Double Check, some shops prefer to outfit a test cart to support the use of the Double Check tool. It can make the job of troubleshooting the system easier by providing a work space for testing as well as eliminating the need to work from the ground or balanced behind the tractor.

This section shows an example cart, but the configuration may vary, depending on the particular needs of your shop. Some shops have an extension harness and a power supply harness that can be used with the test cart. On this example cart, the power supply harness is wired into the cart.



Example 1: The power supply plug is wired to the top tray of the test cart for convenience.



Example 2: These wires go to the top tray to supply the Double Check with source power.



Example 3: A compact battery charger and a standard truck battery are securely fastened to the bottom shelf of the test cart. The battery charger and power supply connections are both connected below the terminals, allowing the use of gator clips, if needed.



Example 4: The connector in the top tray of the test cart is used to supply the Double Check tool with source power.



Example 5: For this cart, the shop made an extension harness (not included) that is used with the 7-way input adapter, allowing it to reach the Double Check tool set up on the test cart.

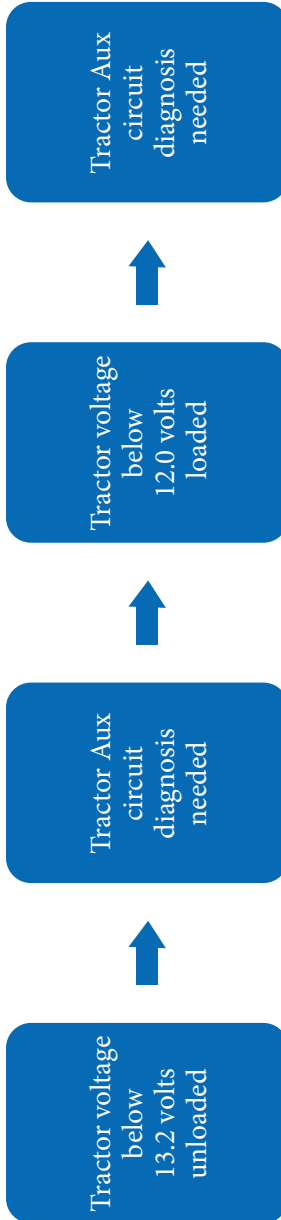


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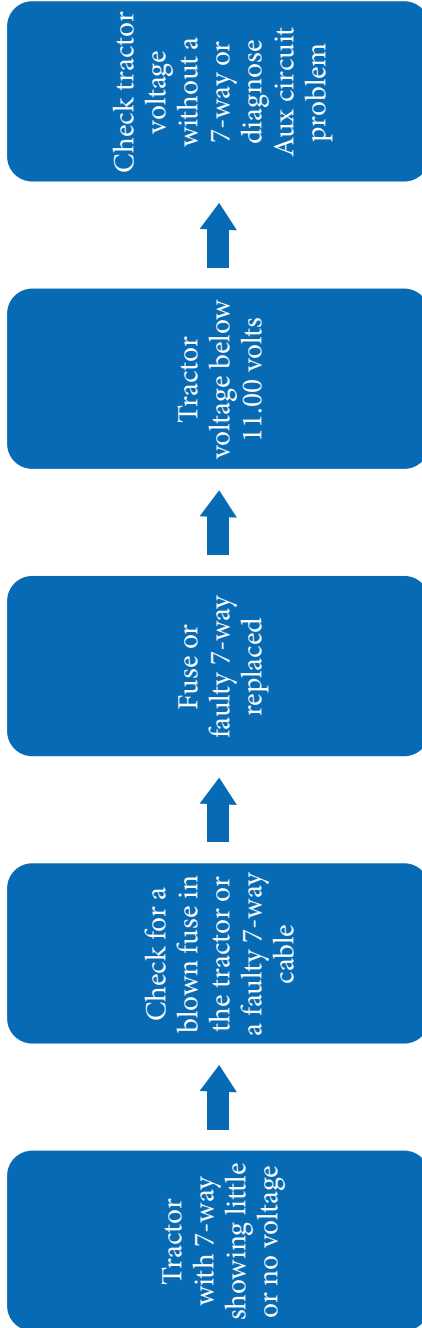
## DOUBLE CHECK TROUBLESHOOTING SUMMARY

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### TRACTOR WITHOUT 7-WAY

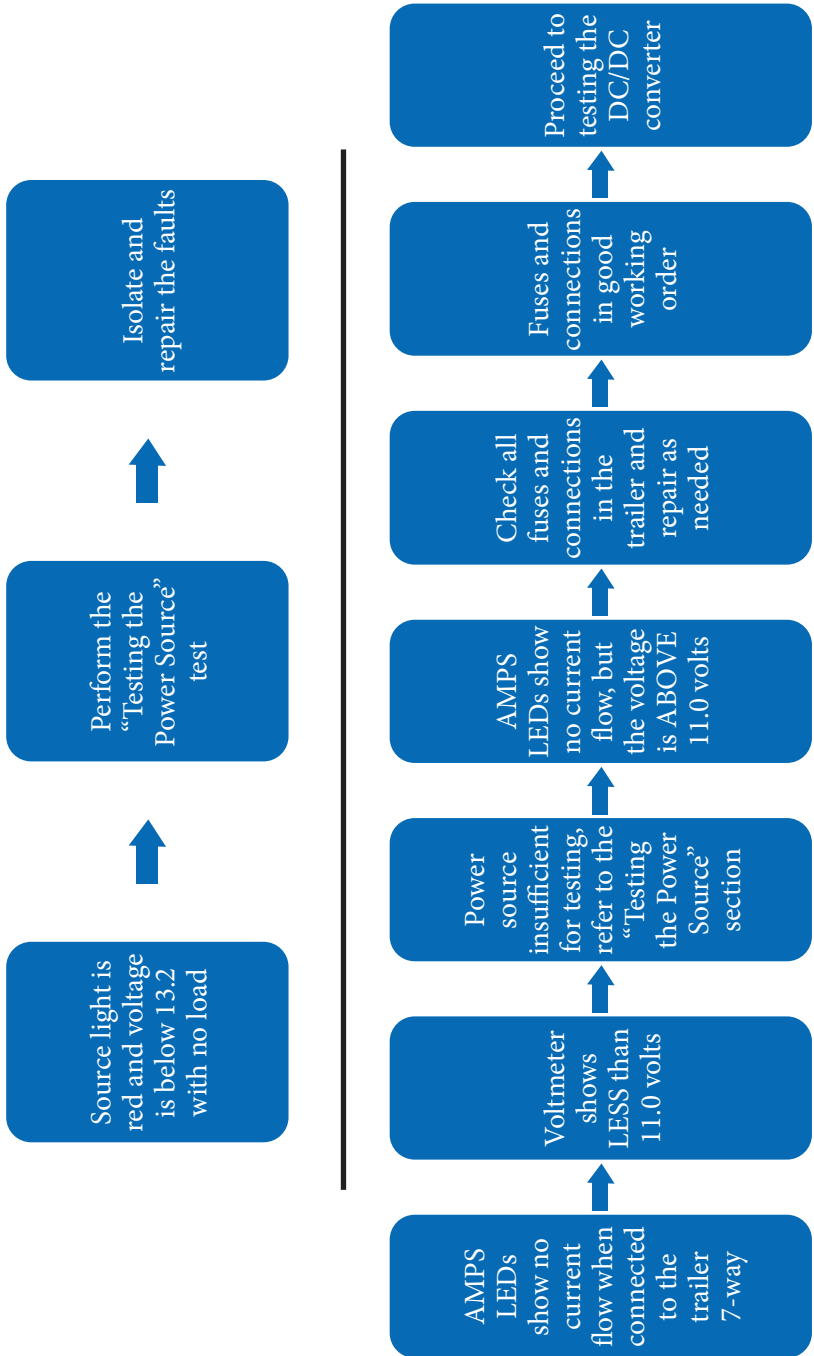


## TRACTOR WITH 7-WAY

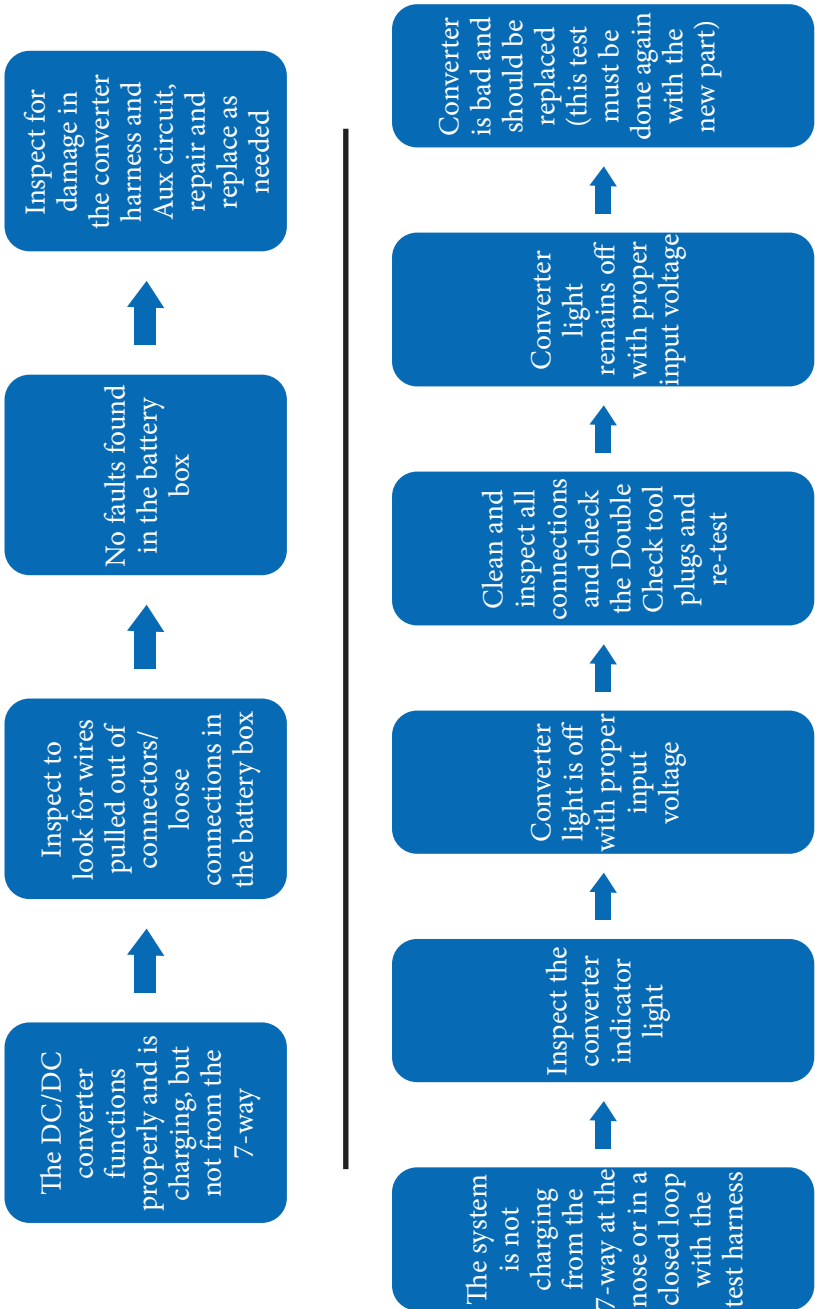


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## TESTING THE LIFTGATE CHARGING SYSTEM



## TESTING THE DC/DC CONVERTER





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## PART LIST

Part # TF-009

Tester, Liftgate Charging System  
(LGDC)

(Included in DC-100, DC-200,  
DC-300)



Part # TF-012

20 Amp Applied Load

(Included in DC-100, DC-200,  
DC-300)



Part # H-00415

External Voltmeter Leads

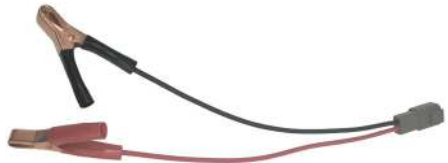
(Included in DC-100, DC-200,  
DC-300)



Part # H-00412

Harness, Battery Input Adapter

(Included in DC-100, DC-200,  
DC-300)



Part # H-00409

Harness, 7-Way Input Adapter

(Included in DC-200, DC-300)



Part # H-00410

Harness, Dual Pole Input Adapter

(Included in DC-100, DC-300)



Part # H-00467

Harness, Dual Pole Female Input Adapter

(Included in DC-100, DC-300)



Part # H-00411

Harness, Single Pole Input Adapter

(Included in DC-300)



Part # H-00470

Harness, Single Pole Female Input Adapter

(Included in DC-300)



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Part # H-00342

Harness, 7-Way Output Adapter

(Included in DC-200, DC-300)



Part # H-00343

Harness, Dual Pole Output Adapter

(Included in DC-100, DC-300)



Part # H-00340

Harness, Single Pole Output Adapter

(Included in DC-300)



Part # H-00407

Harness, DC/DC Converter Output Adapter

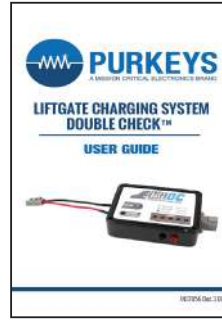
(Included in DC-100, DC-200, DC-300)



Part # INST056

Guide, User

(Included in DC-100, DC-200,  
DC-300)



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## NOTES

## LIMITED COMMERCIAL WARRANTY POLICY

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MCE Purkeys FE, LLC (hereafter “Purkeys”), warrants each product to be free of defects in material or workmanship under normal use and service. This warranty is for the benefit of Original Equipment Manufacturers, Dealers, Warehouse Distributors, Fleets, or other End Users (hereafter “Customers”) and covers products manufactured by Purkeys and sold new to Customers either directly by Purkeys or by its authorized dealers, distributors, or agents. The length of the Warranty Period is 36 months.

The warranty period commences on the in-service or install date and is not transferable. Failure to provide the in-service or install date on the warranty claim form will cause the warranty period to begin on the date the part was manufactured, or date of sale recorded on the original sales invoice, whichever is earlier.

A completed warranty claim form should accompany all parts submitted to Purkeys for consideration for repair or replacement under warranty. The submitted claim form should contain all of the information required. Lack of a properly or fully completed claim form will result in delay or denial of warranty claim. Claims must be submitted no later than 30 days after part is removed.

This warranty does not apply if, in sole judgement of Purkeys, the product has been damaged or subjected to accident, faulty repair, improper adjustment, improper installation or wiring, neglect, misuse, or alteration or if the product failure is caused by defects in peripheral vehicle components or components attached to the Product or failure of a part not manufactured by Purkeys.

This warranty shall not apply if any Purkeys product is used for a purpose for which it is not designed or is in any way altered without the specific prior written consent of Purkeys. ANY product alleged by a Customer to be defective must be inspected by Purkeys as a part of the warranty claims process in order to confirm that the part has failed as a result of a defect in material or workmanship.

Transportation for products and parts submitted to Purkeys for warranty consideration must be prepaid by Customer. Repaired or replaced products and or components will be returned to Customer pre-paid by Customer or “freight collect” to the address provided by Customer in the warranty claim form. No charge will be made for labor or material in effecting such repairs.

The Warranty provided by Purkeys hereunder is specifically limited to repair or replacement of the Product as Purkeys deems most appropriate in its sole discretion. Purkeys neither assumes nor authorizes any other person to assume on its behalf any other warranty or liabilities in connection with Purkeys products. The Warranty does not apply to fuses or other “consumable” or maintenance items which are or may be a part of any Purkeys product.

**THIS WARRANTY DOES NOT APPLY TO LOSS OF VEHICLE OR EQUIPMENT, LOSS OF TIME, INCONVENIENCE, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES. PURKEYS SPECIFICALLY DISCLAIMS AND SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES arising out of or from the use of Purkeys products by the Customer.**

**THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, INCLUDING COMMON LAW WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, AND ANY OTHER EXPRESS OR IMPLIED WARRANTIES. ALL OTHER SUCH WARRANTIES ARE SPECIFICALLY DISCLAIMED.**

This Limited Commercial Warranty supersedes all previous Warranty Policies issued by Purkeys and any of its suppliers.

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***WATT Keeps You Trucking***