Troubleshooting the Alternator and Forklift Charging Circuit

Note: The following instructions listed below consist of general information for troubleshooting the alternator and forklift charging circuit. Refer to the Original Equipment Manufacturer’s service manual for specific information pertaining to your forklift.

Many times alternator operation or non-operation is a symptom of other system problems. Please use the troubleshooting and voltage drop tests below to pin point the problem before replacing the alternator.

- If the alternator is not performing, it is important to resolve any additional forklift side problem(s) in the charging circuit that may have effected the alternator. Such as battery, cables, and other components in the alternator circuit.
- Identifying the customer’s true alternator charging problem is important to prevent unnecessary alternator replacement.

Troubleshoot the system with the following questions and actions:

NOTE: Battery must be fully charged before troubleshooting

1. The alternator does not charge? If the alternator does not charge, verify proper battery state of charge, alternator inputs, voltage regulator operation and inputs battery & ground cable condition and pulley/belt condition.
   - Is the battery fully charged and in good condition? Perform Step 1 as shown on page 3
   - With Key ON/Engine OFF does the alternator/charge light come on?
     If not check the following items:
     a. Alternator indicator light. Must be correct size and operational.
     b. Voltage Regulator. On many applications the light is controlled by the external voltage regulator.
     c. Voltage regulator to alternator harness. All wires and connectors must be clean and in good condition.
   - Are other alternator inputs correct? Perform Step 4 as shown on page 3.
     If voltage is not present on “F” terminal, check voltage regulator, regulator harness and regulator ground connections.
   - Are the battery cables and terminals in good condition? Perform Step 2 & 3 as shown on page 3.
     A small resistance in either the positive or ground circuit can reduce the charging output significantly. Check the alternator mounting surfaces, these are part of the ground circuit.
   - Is the pulley and belt correct? Verify that the correct belt and belt tension is used on the forklift. A slipping belt will cause a no charge or undercharge during times of heavy electrical demand.

2. The alternator undercharges? If the alternator undercharges or the forklift voltage is always low. Check battery condition, battery and ground cable condition, excessive system demands and pulley/belt condition.
   - Is the battery fully charged and in good condition? Perform Step 1 as shown on page 3
   - Are the battery cables and terminals in good condition? Perform Step 2 & 3 as shown on page 3. A small resistance in either the positive or ground circuit can reduce the charging output significantly. Check the alternator mounting surfaces, these are part of the ground circuit.
   - Is there some forklift system or accessory demanding excessive amperage? If you experience frequent alternator or battery failure you may have a forklift system that is demanding excessive amperage. At idle, forklift loads may exceed the slow speed output capabilities of the alternator. Since most lift equipment is operated at slow speeds for short periods of time it is important that electrical systems/components only draw the amperage for which they were designed. As the forklift ages, fan motors, relays and other components will draw more amperage then when they were new.
     Demand Test:
     a. Start the forklift
     b. Attach voltmeter to battery. Record battery voltage.
     c. Switched components or systems. Turn on the component to be tested. Note the battery voltage.
     If the battery voltage:
     1. Drops dramatically, the circuit or component is faulty. Repair circuit or replace component.
     2. Momentary drop and then return to previous battery voltage. Circuit or component is OK, the alternator is functioning properly.
3. Voltage drops and does not return to noted voltage. Alternator is not operating correctly or demand on the alternator is too high.
d. Components that are not switched. Note the battery voltage. Unplug one component at time and note the battery voltage. Plug the component back in and go to the next component. Note the changes in system voltage as you do this. When you unplug a component and system voltage changes dramatically. Troubleshoot this component or circuit.

NOTE: For those components or circuits that are difficult to get to or are hidden you can uplug the fuse for that circuit at the fuse box. Again watching for changes in system voltage. When you see a rise in system voltage when the circuit is unplugged suspect that circuit or component as demanding excessive amperage.

It is important to remember that a alternator only produces a maximum of 20% - 30% of its full output at slow speeds. Once you exceed this output you are drawing from the battery. If the excessive draw is not repaired you will continue to damage alternators and batteries.

- Is the pulley and belt correct? Verify that the correct belt and belt tension is used on the forklift. A slipping belt will cause a no charge or undercharge during times of heavy electrical demand.

3. The alternator overcharges? If the alternator overcharges or the forklift voltage is extremely high. Check battery condition, battery and ground cable condition and check alternator inputs.

- Is the battery fully charged and in good condition? **Perform Step 1 as shown on page 3**

- Are the battery cables and terminals in good condition? **Perform Step 2 & 3 as shown on page 3.** A small resistance in either the positive or ground circuit can effect the voltage regulator operation. Check the alternator mounting surfaces, these are part of the ground circuit.

- Are other alternator inputs correct? **Perform Step 4 as shown on page 3.** If voltage is not present on “F” terminal, check voltage regulator, regulator harness and regulator ground connections.

- Are Voltage regulator inputs correct? Check voltage regulator for correct inputs (this will vary depending upon application). Check voltage regulator wires, connections and grounds. They must be clean and in good condition.

4. Is there a parasitic draw?

- Is there a draw on battery when the forklift is turned off?
  a. KeyOFF/Engine OFF
  b. Unhook the negative battery cable from the battery.
  c. Place a test light between the negative battery cable and the negative post on the battery.
  d. Does the light glow?
    - Bright light --- A component or circuit is turned on. Find this component or circuit and repair or replace.
    - Very dim light --- This is OK. Sometimes components with memory devices such as clocks, radios and alarms will draw a very small amount of current when the system is off. If you do not have any such devices system troubleshooting may be required.
    - No light --- Forklift has no current draws on the system.

When troubleshooting a parasitic draw unplug components or remove fuses until the test light goes out.

NOTE: Parasitic draws can keep the forklift battery in a state of low charge. This is damaging to both the battery and the alternator. It is important to eliminate parasitic draws if found on the forklift.

5. Mechanical Conditions?

- What is the alternator belt condition? A damaged or improperly adjusted alternator belt can cause no charge, undercharge and damage to the alternator bearings. Always follow the forklift manufacturers specifications for belt routing and adjustment.
- What is the condition of the alternator mount and adjustment bracket? Damaged or worn mounting surfaces and adjustment brackets can physically break and/or damage alternator frames. On many forklifts the ground circuit is supplied to alternator thru the alternator housing, mount surface and adjustment bracket. If these surfaces are damaged or worn alternator operation may be affected.
- Is there external contamination? Alternators subject to leaking oil, coolant and hydraulic fluids can exhibit various problems. Contamination to the brush/slipring interface can cause erratic charging, no charging, undercharging and overcharging. Greases and oils can effect the grounding of the alternator and its operation. Excessive power washing can contaminate bearings and force the grease out of bearing seals. Always keep fluids from leaking on the alternator and never direct power washer spray directly into the alternator.
*** All steps must be done with a fully charged battery. The engine must be running and an electrical load applied to the system (lights, etc). An Analog Voltmeter is recommended but a Digital Voltmeter will work ***

**Charging System Test Steps**

**Step 1**
Record voltage at the battery while cranking the engine.

\[ \text{Volts} \]

Stop
If the battery has **less than 10 volts** while cranking, the battery is bad.

**Step 2**
Record the voltage drop at the alternator Battery connection with the alternator loaded.

\[ \text{Volts} \]

Stop
If the voltage reading is **over .2 volts**, Repair: the battery cable and all connections; connections must be cleaned and repaired.

**Step 3**
Record the voltage drop at the alternator ground connection with the alternator loaded.

\[ \text{Volts} \]

Stop
If the voltage reading is **over .2 volts**, Repair: ground cable and all connections; connections must be cleaned and repaired.

**Step 4**
Key ON/Engine OFF. Unplug alternator harness Check for voltage on “F” terminal of forklift harness.

“F” \[ \text{Volts} \]

Stop
If the voltage reading is **under 12 volts**, Repair: Voltage regulator, wire condition from regulator to alternator and all connections must be cleaned and repaired.

**Step 5**
Key OFF/Engine OFF. Remove negative battery cable. Place a test light between cable end and negative battery post.

Light ON \[ \]
Light OFF \[ \]

If the light is on, Repair: Check for parasitic draw by unplugging components and removing fuses until light goes out.

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When Testing at the battery, test on the battery post not on the battery cable end or connection.