



## **Basic Trouble Shooting Motor & Solenoid for Equalizer Hydraulic Pumps**

### **Uni-Directional Pumps 12 VDC**

### **Equalizer Pump Numbers 2015, 2017, 1551, 1531, 2016, 2142, 1636**

These uni-directional (motor only runs one direction) units can be identified as having one motor solenoid. The trouble shooting for these motors and solenoids are basically the same, regardless of the application.

**Troubleshooting:** Locate the two large terminals on the motor solenoid. Using a screw driver or pliers- short together the two large terminals.

If the motor does not run, then there is one or more of the three below possibilities

1. There not enough power (12VDC positive) to the battery terminal on the motor solenoid to make the motor run. Measure for voltage at the battery cable terminal on the solenoid using a digital multi-meter. The voltage should be battery voltage (12.5 VDC). When shorting the terminals as above, the voltage should not fall below 11.0 VDC. If the voltage is low, check the battery condition and the supply cable and its connections. Replace or repair as needed. Depending on the pump and motor combination -up to 160 Amperes @ a minimum of 10.5 VDC may be required to run the motor. The power and ground connections to these units should be a minimum 4 gauge cable and may need to be larger if the run is over 12 feet. Check the owner's manual for specific recommendations.
2. There is a poor or no ground (12 VDC negative) to the motor. On most of these units the motor grounds through the case to the port plate (center section of pump). The port plate will have a grounding stud that should have a heavy wire or cable, grounding the pump assembly back to the battery or the frame. Some motors will have a ground stud at the end of the motor, which should have a heavy cable connected back to the pump ground stud. If a frame ground is being used, check the connection from the negative side of the battery to the frame.
3. The motor is defective. You will need to check the motor chart for the proper motor for these units.

If the motor does run (when terminals are shorted) then there is one or more of the below three possibilities.

1. The solenoid is not receiving voltage to the “exciter” terminal. This is one of the two small terminals on the motor solenoid. Generally this terminal will have a blue wire attached to it. Using a digital meter measure for voltage applied to it when an extend command and retract command is given from the switch or control panel. There should be a minimum of 10.5 VDC applied to it when attempting operation.
2. The solenoid is not grounded: The other small terminal should have a wire that goes to the pump ground stud.
3. The solenoid is defective. Order part # 1444 from Equalizer Systems.

Note: A quick tip that can check items 1, 2, & 3. Using a short piece of wire, apply 12 VDC positive from the battery terminal on the motor solenoid to the small terminal (blue wire) on the motor solenoid. If the solenoid pulls in and the motor runs -both the motor and solenoid are good. Check the control circuit for issues.

The above trouble shooting procedures will work on any Equalizer Systems Uni-directional system- including those using SPX or Fenner units (except for those using the Fenner Smart Start Solenoid). The stated wire colors may vary on these units.

There are many different motors used on the above units. It is required that the numbers from the pump be provided or checked against the motor chart to determine the proper motor. If numbers are not available, send a photo to equalizer for identification. All of these units will use solenoid # 1444 except for SPX units with the smart start which use #7055

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## **Bi-Directional Pumps 12VDC** **Equalizer Pump Numbers 2390, 2532, 2542**

These bi-directional units control the direction of hydraulic cylinders (extend or retract) by the direction that the motor turns (clockwise or counter-clockwise). These units can be identified as having two motor solenoids. They are 3.7 inches in diameter- wound field motors and have two power input studs located in the side of the case. One of these studs is for extend the other is for retract. The ground for the motor is through the case.

### **Trouble Shooting**

**No Run Extend:** Locate the two large terminals on the motor solenoid that has a blue wire attached to one of the small terminals. This is the extend solenoid. Using a screw driver or pliers short together the two large terminals on this solenoid. The motor should run.

**No Run Retract:** Locate the two large terminals on the motor solenoid that has a Green wire (there are some single function jack units on trailers that this wire will be black) attached to one of the small terminals. This is the retract solenoid. Using a screw driver or pliers, short together the two large terminals on this solenoid. The motor should run.

If the motor does not run then there is one or more of the three below possibilities.

1. There not enough power (12VDC positive) to the battery terminal(s) on the motor solenoid(s) to make the motor run. Measure for voltage using a digital multi-meter. This power should come from the vehicle battery. Locate the cable and its connections replace or repair as needed. Depending on the pump and motor combination up to 160 Amperes @ a minimum of 10.5 VDC may be required to run the motor. The power and ground feed to these units should be a minimum 4 gauge cable.
2. There is a poor or no Ground (12 VDC negative) to the motor. On these units the motor grounds thru the case to the pump port plate (center section of pump). The port plate will have a grounding stud that should have a heavy wire or cable grounding the pump assembly back to the battery or the frame. If a frame ground is being used check the connection from the negative side of the battery to the frame.
3. The motor is defective. Order motor # 2605.

If the motor does run (when terminals are shorted) then there is one or more of the below three possibilities.

1. The solenoid(s) is not receiving voltage to the “exciter” terminal(s). This is one of the two small terminals on the motor solenoid. Generally the extend terminal will have a blue wire attached to it and the retract terminal will have a green wire to it. Using a digital multi-meter, measure for voltage applied to the blue or green when an extend command or retract command is given from the switch or control panel. There should be a minimum of 10.5 VDC applied to the blue or green wires when attempting operation.
2. The solenoid is not grounded: The other small terminal on the solenoid(s) should have a wire that goes to the pump ground stud.
3. The Solenoid is Defective. Order part # 1444 from Equalizer Systems.

Note: A quick tip that can check items 1, 2, & 3. Using a short piece of wire, apply 12 VDC positive from the battery terminal on the motor solenoid to the small terminal (blue wire for extend, green wire for retract) on the motor solenoid(s). If the solenoid pulls in and the motor runs- both the motor and solenoid are good. Check the control switch or control circuit for the issue. This is done by measuring for voltage at the blue wire for extend, or the green wire for retract when trying to operate from the control switch. The measured voltage should be a minimum of 10.5 VDC. If there is no voltage or low voltage, check the control circuit.

On bi-directional pumps, the motor could be good in one direction but not the other. It is best to test it both ways.

Pump 2390, 2532, & 2542:

Motor part #2605

Solenoid part #1444 (of which there are two)

## **Bi-Directional Pumps 12VDC**

### **Equalizer Pump Numbers 2727, 2754 Using 70 amp Cole Hearse Relays (These were used only on trailer jacks)**

Bi-directional pump units control the direction of hydraulic cylinder(s) (extend or retract) by the direction that the motor turns (clockwise or counterclockwise). These motors are polarity reversing with permanent magnet fields. The motor direction is controlled by switching polarity to the two terminals at the end of the motor. Do not attempt to “jump” or short the relays on these units for testing- As a dead short to ground could occur and damage the relays and the wiring. The use of a volt meter is required for testing. Power and ground may be applied directly to the motor terminals for testing only if the leads from the relays (2) are disconnected from the motor terminals. One of the relays is energized for extend- the other one is for retract.

#### **Trouble Shooting**

**No Motor Run in Either Direction (Extend or Retract):** Using a digital multi-meter, measure for voltage across the two motor terminals at the end of the motor when pressing the switch to extend and retract. There should be at least 10.5 VDC measured. If voltage is good then the motor is defective. If voltage is low then there is a power supply issue- such as; a weak battery, poor connections from the battery to the relays, or poor connections from the relays to the motor. If there is no voltage then the battery is dead- or the wiring connections from the battery to the relays is defective- or the relays are defective- or the control switch(s), harness is defective.

**Motor Runs in Only One Direction (Extend or Retract):** This will be a defective relay- or poor connections to one of the relays- or an issue with the switch and harness assembly. Use a volt meter and measure for voltage at the exciter terminal on each of the relays to determine if the issue is a relay- or the switch or harness. One of the relays will have a small green wire feeding it. This is the retract relay. The green wire should have voltage applied to it when pressing the switch to retract the jack. If there is voltage present and the relay will not ‘click’ on, then the relay is most likely defective. If the jack won’t extend, perform the same test for other the other relay. The extend relay exciter wire is probably white with a black trace. If there is no voltage on one or both of the exciter wires when trying to operate it, then the plug connector or the switch and harness may have an issue.

#### **Power Supply for This Unit:**

- The positive wire is a heavy red wire- Minimum 10 gauge
- The negative is a heavy black wire- Minimum 10 gauge
- The power should come from the vehicle battery
- If the run is longer than 6 feet, larger gauge wiring should be used
- If power is run thru a circuit breaker or fuse -it must be a minimum 60 Amperes
- Depending on the pump and motor combination up to 60 Amperes @ a minimum of 10.5 VDC may be required to run the motor

Pump 2727 & 2754:

Motor part #2751

Relay part #2735 (of which there are two)

## **Bi-Directional Pumps 12VDC**

### **Equalizer Pump Numbers 2727, 2754, 3040, 3041, 3043 Using Reversing Contactor**

These bi-directional units control the direction of hydraulic cylinder(s) (extend or retract) by the direction that the motor turns (clockwise or counterclockwise). These motors are polarity reversing with permanent magnet fields. The motor direction is controlled by switching polarity to the two terminals at the end of the motor. Do not attempt to “jump” or short the relays on these units for testing- As a dead short to ground could occur and damage the relays and the wiring. The use of a volt meter is required for testing. Power and ground may be applied directly to the motor terminals for testing only if the leads from the contactor are disconnected from the motor terminals.

#### **Trouble Shooting**

**No Motor Run in Either Direction (Extend or Retract):** Using a digital volt meter measure for voltage across the two motor terminals at the end of the motor when pressing the switch to extend and retract. There should be at least 10.5 VDC measured. If voltage is good then the motor is defective. If voltage is low then there is a power supply issue such as a weak battery or poor connections from the battery to the contactor or from the contactor to the motor. If there is no voltage measure for voltage across the plus terminal and the negative terminal on the contactor. Voltage should be 12.5 VDC (battery voltage) if there is no voltage or low voltage then the battery is dead or the wiring connections from the battery to the contactor are defective. If there is good voltage at the terminals (positive and negative) then the contactor is defective or the contactor is not receiving exciter voltage to the green wire (retract) or the blue wire (extend) or the exciter ground (black center spade terminal) is defective.

**The Motor Only Runs One Direction:** Check for voltage at the green exciter wire on the contactor when pressing a retract switch. Check for voltage at the blue exciter wire on the contactor when pressing a extend switch. If there is voltage (at least 10.5 VDC) and the contactor won't “click” in and make the motor run, then the contactor is defective. If there is no voltage to the blue wire when pressing an extend switch or no voltage to the green wire when pressing a retract switch, there is an issue with the control circuit.

Pump 2727, 2754, 3040, 3041, & 3043:

Motor part #2751

Contactor part #2994

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## General Items for All Types of Pumps

- There not enough power (12VDC positive) to the battery terminal(s) on the motor solenoid(s) to make the motor run. Measure for voltage using a digital multi-meter. This power should come from the vehicle battery. Locate the cable and its connections replace or repair as needed. Depending on the pump and motor combination up to 160 Amperes @ a minimum of 10.5 VDC may be required to run the motor.
- There is a poor or no ground (12 VDC negative) to the motor. On most of these units the motor grounds through the case to the pump port plate (center section). The port plate will have a grounding stud that should have a heavy wire or cable grounding the pump assembly back to the battery or the frame. Some of these units are reversing polarity and the ground is done through one of the motor terminals. If a frame ground is being used to ground the pump (or the contactor or relays), check the connection from the negative side of the battery to the frame.
- Exciter voltage: all of these units employ a solenoid or contactor or relays that switch (turn on) power to the motor. If these solenoid(s) or contactor or relays are not receiving exciter voltage from the control circuit, the motor will not run until this is corrected. For Auto-Level systems see trouble shooting guide for Auto-Level.

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Over the years of running a mobile RV repair service, having a dedicated place to access service manuals for all the different appliances and components found on RVs was something that I always had a desire to create.

I hope this resource makes your RV repairs easier, as it has mine, but please be careful and follow proper safety practices when attempting to repair your own RV.

If in doubt, please consult with a professional RV technician!



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