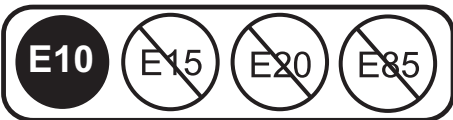




EFI Troubleshooting

ARIENS
THE KING OF SNOW



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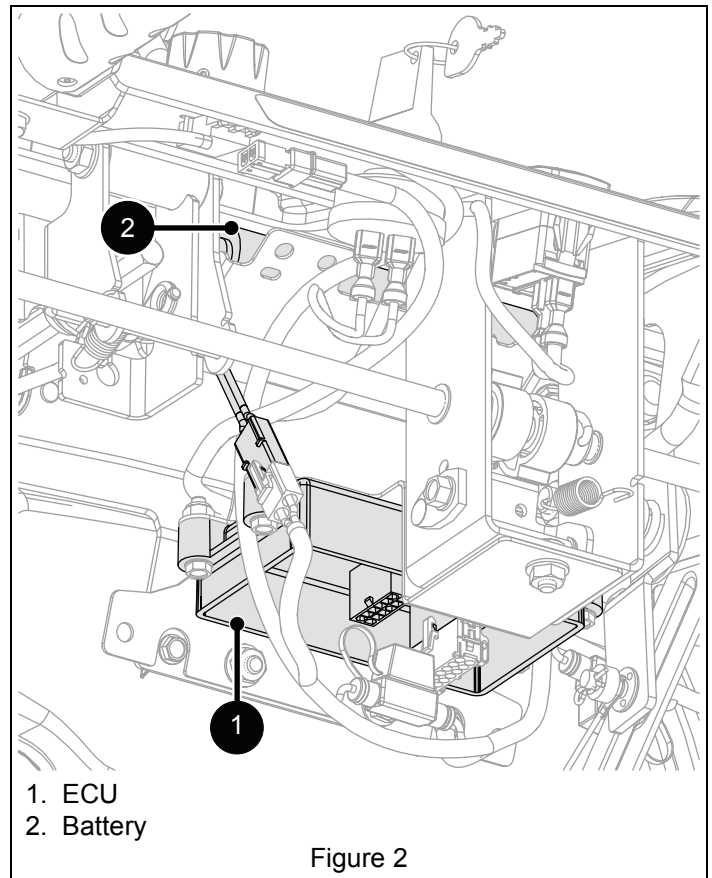
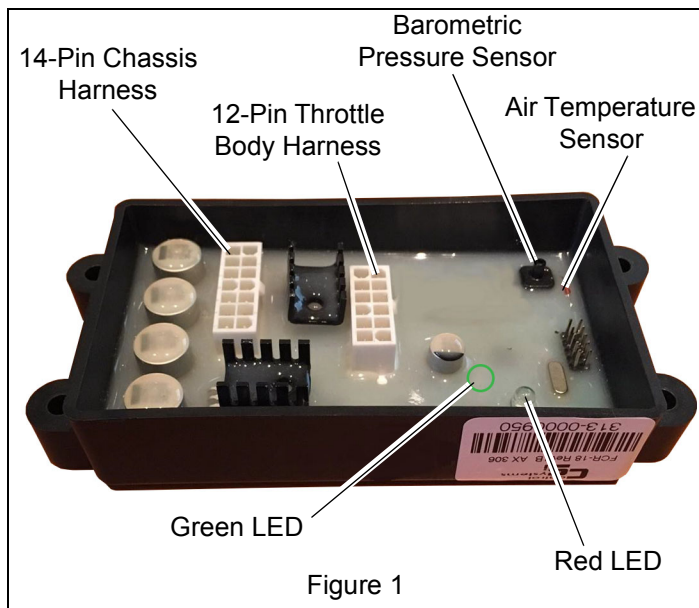
EFI REPLACEMENT COMPONENTS

See Figures 1, 2 and 3.

Ariens recommends using only genuine Ariens replacement parts on this unit. Using unauthorized parts may adversely affect the performance, durability or safety of this unit and may void the warranty. Click the **Parts Diagrams by Parts Radar** link at www.ariensco.com for replacement part numbers of the items listed below:

- ECU
 - Barometric Pressure Sensor
 - Air Temperature Sensor
- Throttle Body Assembly
 - Throttle Plate Servo Motor
 - Fuel Injector
 - Fuel Pressure Sensor
 - Engine Temperature Sensor
- Battery
- Fuel Pump
- Inline Fuel Filter

IMPORTANT: Replacement part sub components are not available as individual parts.



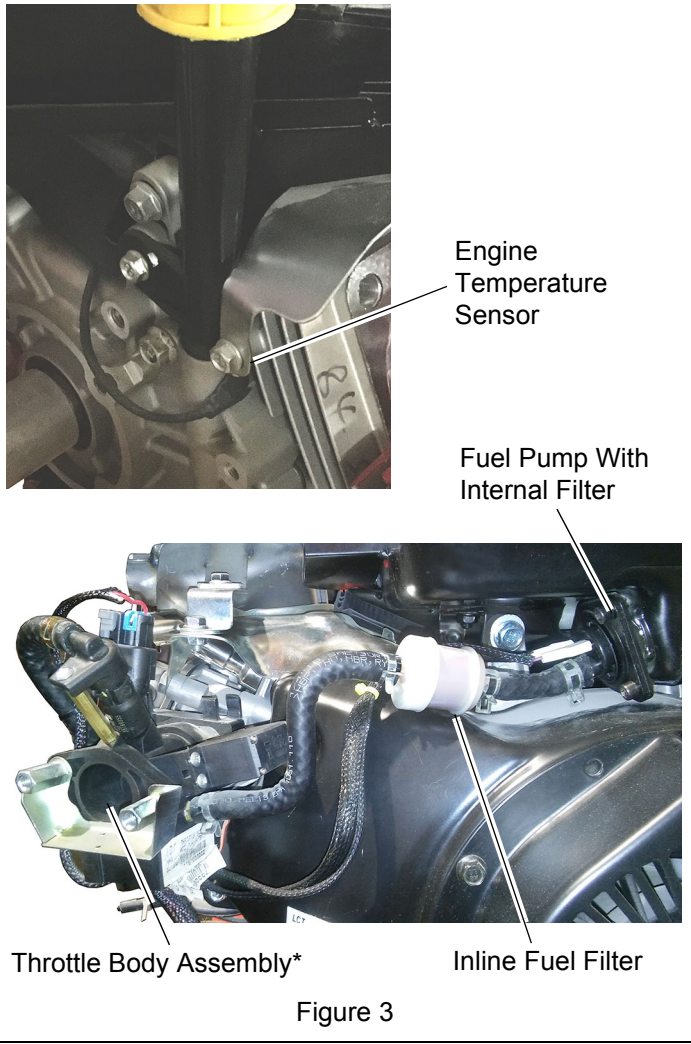


Figure 3

*Throttle body assembly consists of fuel injector, fuel pressure sensor and servo-operated throttle plate. See Figure 4.

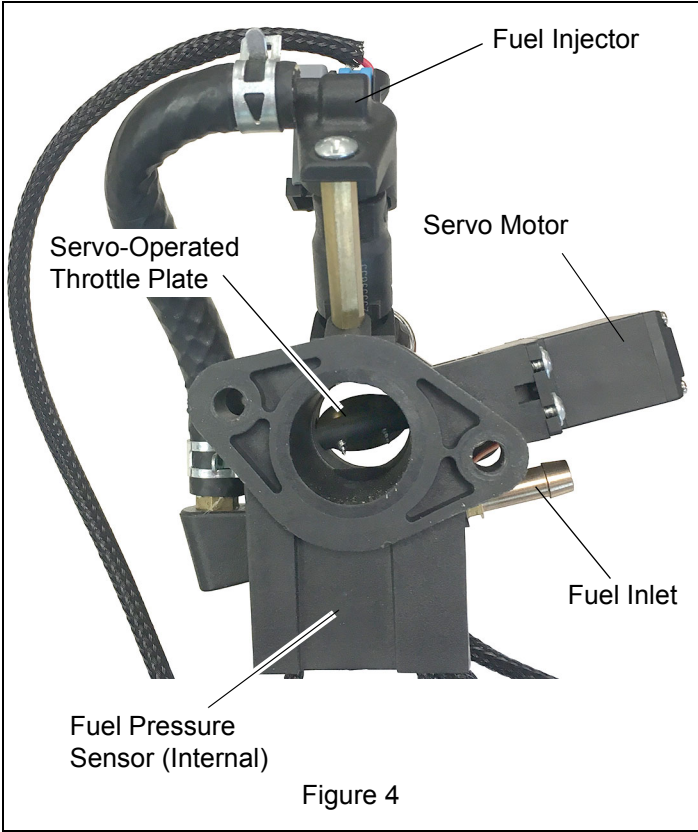


Figure 4

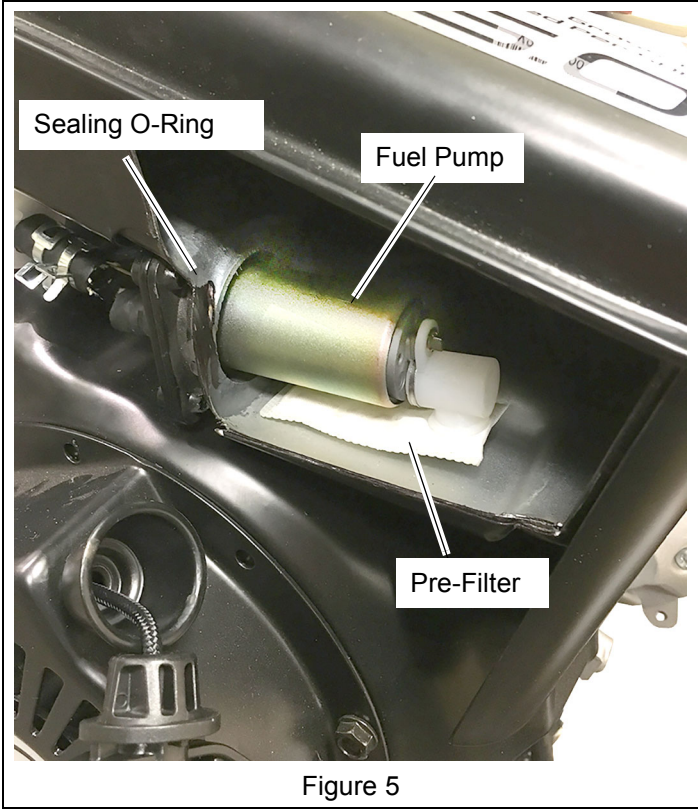


Figure 5

EFI TROUBLE CODE IDENTIFICATION

Trouble Code	Problem	Correction
16	Low Battery Voltage	Check charging system and battery.
21	Barometer Pressure Sensor Failure	Replace ECU.
22	Engine Temperature Sensor Failure	Check engine temperature sensor and wiring.
23	EFI System Cannot Sustain Desired RPM	Disconnect, reconnect and inspect wire harness connections from the engine to the ECU.
27	Low Fuel Pressure	Check fuel level.
28	High Battery Voltage	Check charging systems.
Green LED is Constant (not blinking)	Low Battery Voltage or Faulty ECU	Check battery voltage. If voltage is 7.2 V DC – 8.4 V DC, replace ECU. If battery measures lower than 7.2 V DC, charge battery.
LEDs are dim.	Low Battery Voltage	Check battery voltage and charging system. Battery should measure 7.2 V DC – 8.4 V DC.
No LEDs Illuminated	No Battery Voltage	Check battery voltage and charging system. Battery should measure 7.2 V DC – 8.4 V DC.

CHECKING TROUBLE CODES

The blinking red LED light on the ECU displays trouble codes. Its sequence indicates a particular system malfunction by blinking as many times as the first digit of a trouble code, pausing, and then blinking as many times as the second digit of a trouble code.

For example, the red LED will indicate low fuel pressure (27) by blinking twice, pausing, and blinking seven more times.

IMPORTANT: More than one trouble code may be present.

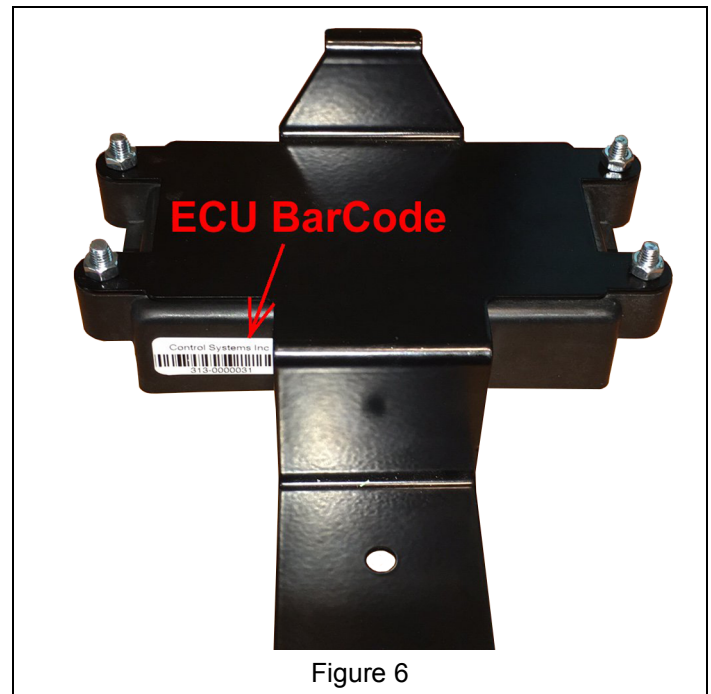
IMPORTANT: DO NOT mistake a constant red (non-blinking) LED for a trouble code. Red LED will illuminate when the ignition switch is turned to the “ON” position and the fuel pump is pressurizing, which may last for up to 30 seconds.

A blinking green LED indicates the ECU processor is operating correctly, even if a sub-component of the ECU (e.g.: barometric pressure sensor) has failed. A constant illuminated green (not blinking) LED indicates the ECU may be experiencing a low battery voltage condition or need replacement. See *EFI Trouble Code Identification* on page 3.

Visually inspect the red LED to verify trouble codes.

To read trouble codes more easily, place a mirror under the ECU to view LED reflection.

IMPORTANT: If no trouble code is present, but engine is not operating normally, See *Diagnostics for Non-Trouble Codes* on page 7.



TROUBLE CODE DIAGNOSTICS

NOTICE: Before performing diagnostic tasks, be aware of the screw on the bottom of the throttle body that adjusts the servo offset. The servo offset calibrates the throttle body at the factory using a flow bench and should NEVER be touched. If it is tampered with, the engine will run poorly and void the warranty. See Figure 7.

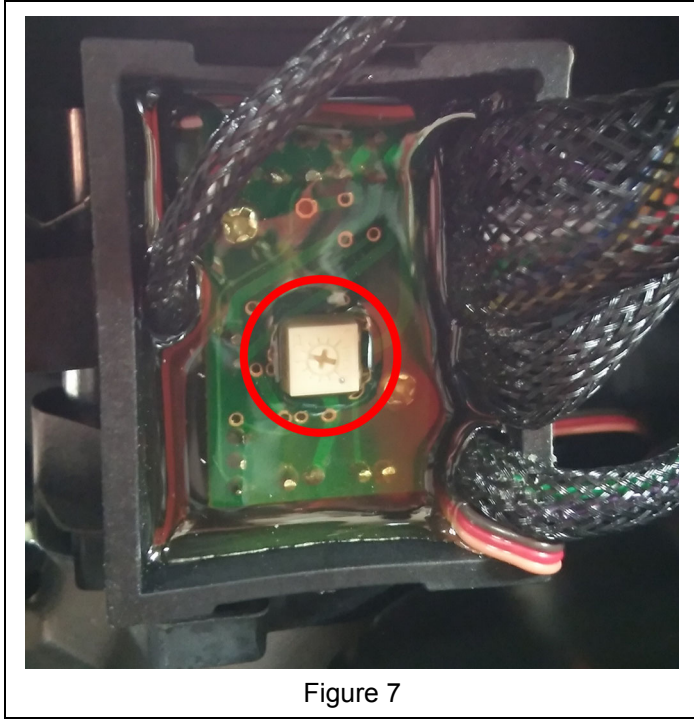


Figure 7

Code 16: Low Battery Voltage

1. Charge the battery. Refer to Operator's Manual.
2. Start the engine. Refer to Operator's Manual.
3. Check charging system at the battery.
 - a. With a multi-meter set to volts DC, back probe the battery terminals. At full throttle (3600 RPM), the reading should be 7.5 V DC – 8.4 V DC.

If voltage measures less than 7.5 V DC, check charging system at the engine. Advance to step 5.

IMPORTANT: If the engine is cold, it is normal for the engine speed to be 100 RPM – 200 RPM higher until operating temperature is reached.

4. Stop the engine. Refer to Operator's Manual.
 - b. Check the battery. With the engine off, the battery voltage should be 7.2 V DC – 8.4 V DC. See Figure 8.

If voltage measures less than 7.2 V DC after charging, replace battery.

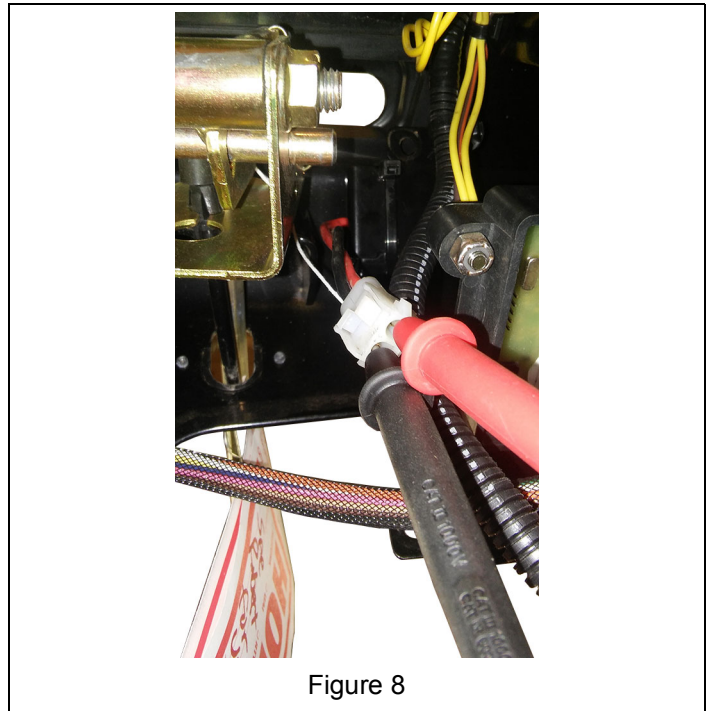


Figure 8

5. Back probe the engine stator output connector. See Figure 9.
 - a. Start the engine. Refer to Operator's Manual.
 - b. At full throttle (3600 RPM), the stator output MUST be 11.5 V AC – 14 V AC.

If AC voltage measure less than 11.5 V AC, remove flywheel and replace stator.

If stator output is within range and battery is not charging, check ECU wiring for damage. Replace ECU if necessary.

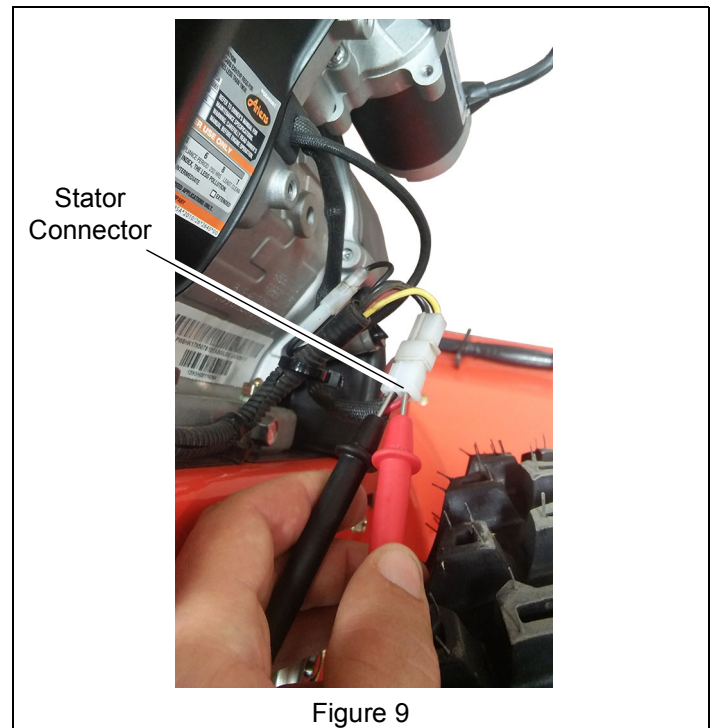


Figure 9

Code 21: Barometer Sensor

See Figure 1.

This trouble code indicates the barometric pressure sensor has failed. When the barometric sensor fails, the engine will not adjust to altitude changes, but will continue to operate at a default altitude of 800 feet above sea level.

Engine may continue to operate with a failed barometric pressure sensor, but may not operate at optimal performance. If barometric pressure sensor fails, replace ECU.

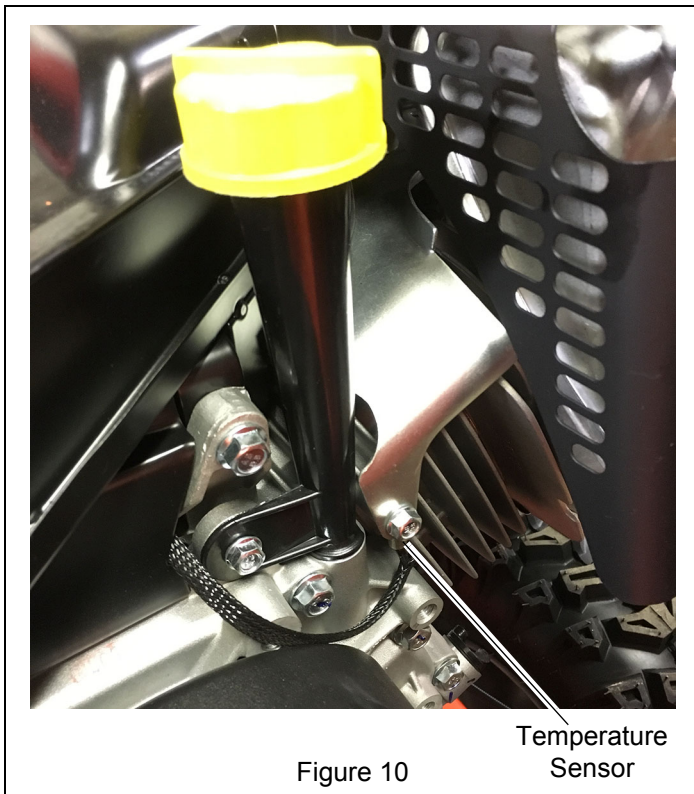
Code 22: Engine Temperature Sensor

See Figure 1.

If the sensor is damaged or has failed, the engine may not run smoothly because the ECU cannot adjust for engine temperature changes.

The temperature sensor and engine components can be visually inspected for engine temperature issues:

1. Check engine cooling fan and engine cooling fins for debris or damage.
2. Check the temperature sensor wiring from the throttle body to the mounting boss on the side of the cylinder. Make sure connection is secure. See Figure 10.



3. Check wiring and connection from the throttle body to the ECU for damage.

If no damage is visible, replace throttle body assembly.

Code 23: EFI System Cannot Sustain Desired RPM

The ECU reads the RPM through the alternator. If a faulty connection exists, the ECU will not read the RPM correctly.

1. Start engine.
2. Check AC voltage of the alternator by back probing the wire harness connector at the engine. Voltage should read 11.5 V AC – 14 V AC. If voltage is within specification record the voltage and move to step 3.
 - a. If voltage is not to specification, inspect wires to connectors. If wires are disconnected, repair or replace wire harness.
 - b. If connections are in good condition, disconnect and reconnect wire harness and recheck voltage. Voltage should read 11.5 V AC – 14 V AC.
 - c. If low or no voltage exists, remove the flywheel and inspect the alternator ground wire contact. If ground wire is corroded, repair alternator. If ground contact is in good condition, replace alternator.
3. Check voltage of the black and gray wires to the 14-pin connector at the ECU. Record the voltage here and compare to reading from step 2.
 - a. If voltage drop of 1 V AC or greater is observed, inspect wire connections for a disconnected or corroded connection. If wires are disconnected or corroded, repair or replace wire harness.
 - b. If connections are in good condition, disconnect and reconnect harness and recheck for voltage drop. Voltage should read 11.5 V AC – 14 V AC.
 - c. If voltage drop of 1.0 V AC or higher is still present, replace wire harness(es).
4. If voltage is within specification and less than 1 VDC voltage drop from alternator to ECU, and trouble code still appears or the engine is still not performing optimally, replace ECU.

Code 27: Low Fuel Pressure

Low fuel pressure is usually a result of an empty fuel tank, but could also be from a clogged fuel filter or faulty fuel pump.

Attempt engine start and check for trouble code re-occurrence after each of the following steps. Refer to Operator's Manual for engine starting instructions.

1. Check fuel level and fill fuel tank completely if not already full.
2. Check fuel lines to ensure there are no leaks or kinks.
3. Check inline fuel filter for debris and blockage. See Figure 11.



CAUTION: AVOID INJURY. Fuel lines are pressurized; wear safety glasses.

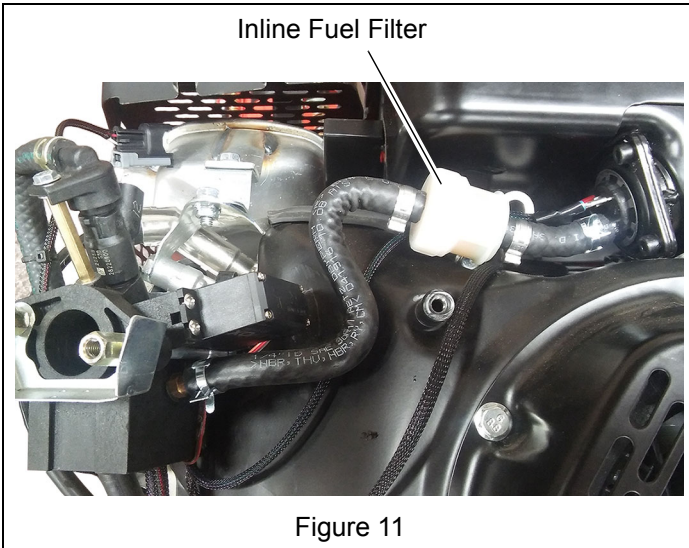


Figure 11

4. Check fuel pump wiring to ensure it is connected correctly. See Figure 12.

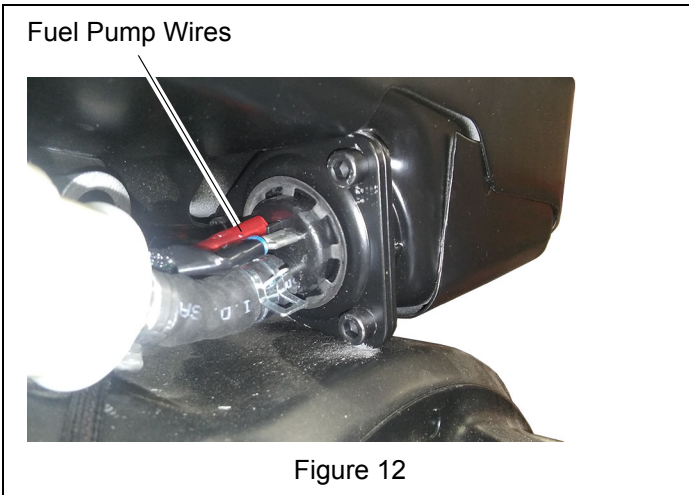


Figure 12

See Figure 13.

5. Remove the fuel pump wires, turn ignition key to the ON position and measure the fuel pump voltage. Voltage output should measure 7.2 V DC – 8.4 V DC.

NOTICE: Disconnecting wires from fuel pump incorrectly can cause damage to the fuel pump. To disconnect fuel pump wires, carefully compress the center tab of the connector and gently pull the connector away from the fuel pump.

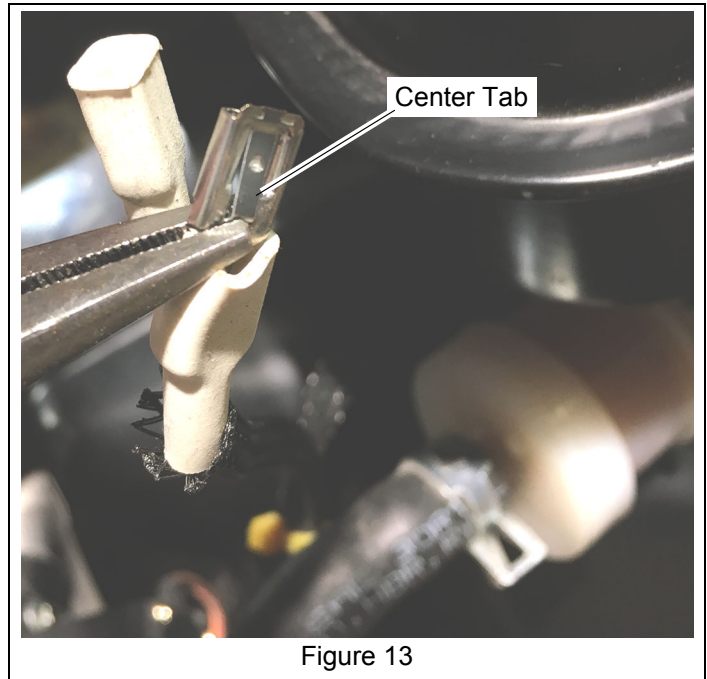


Figure 13

IMPORTANT: Fuel pump voltage **MUST** be measured within 30 seconds of the ignition switch being turned to the ON position. See Figure 14.

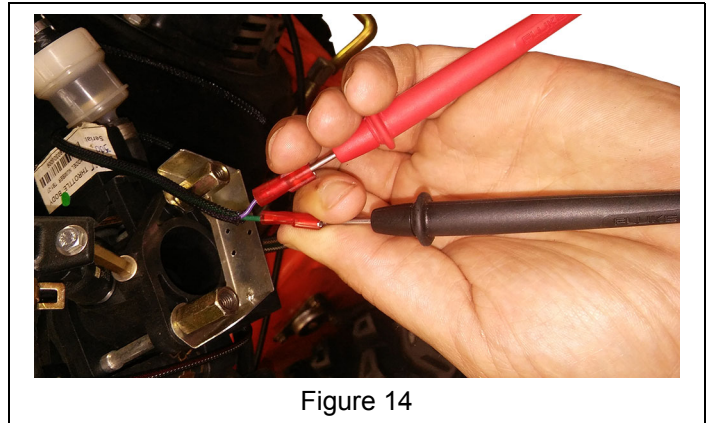


Figure 14

If voltage measures less than 7.2 V DC, check the battery voltage by probing the green wire on the ECU 12-pin connector. See Figure 15.

- If low voltage or no voltage is present, replace the ECU.
- If voltage is present, inspect the green wire between the 12-pin connector and throttle body for a pinched or broken wire. If the wire has no damage, replace the throttle body assembly.
- If voltage measures 7.2 V DC – 8.4 V DC, turn ignition key to OFF position, reconnect fuel pump wires and turn key back to ON position. Fuel pump should make a “humming” noise.

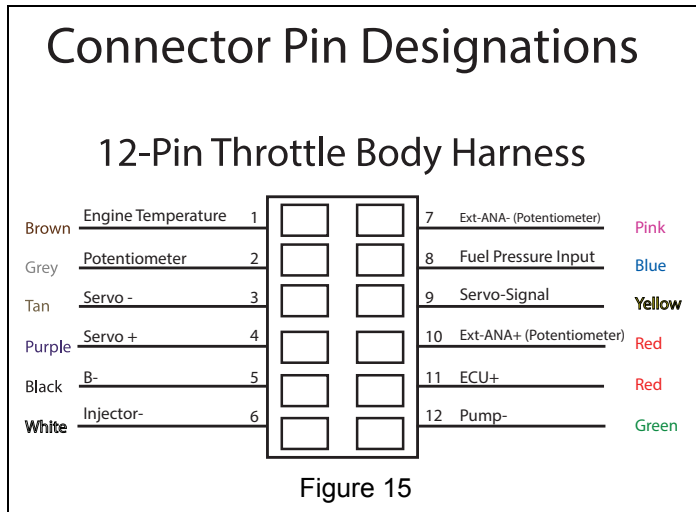
If fuel pump is silent, the pump may have failed. Check fuel pump:

1. Drain fuel from fuel system and tank. See *Draining Fuel System* in unit Service Manual

2. Remove pump from tank.
3. Reconnect pump wires.
4. Turn the ignition key to the ON position and listen for a “humming” noise.

If fuel pump is silent, replace fuel pump.

If voltage is within range and fuel pump is operating normally, the fuel pressure sensor is defective. Replace the throttle body assembly. See Figure 20.



Code 28: High Battery Voltage

This trouble code will activate if ECU detects a higher voltage from the stator.

1. Start the engine. Refer to Operator’s Manual.
2. Set a multi-meter to V AC and probe the red and black stator connector wire. The output should be 11.5 V AC – 14 V AC at full throttle (3600 RPM).

If stator output measures over 14 V AC, replace stator. If output is within range, advance to step 3. See Figure 9.

IMPORTANT: If the engine is cold, it is normal for the engine speed to be 100 RPM – 200 RPM higher until operating temperature is reached.

3. Set a multi-meter to V DC and probe the battery connector at the battery terminals. With the engine running at full throttle (3600 RPM), the output should be 7.2 V DC – 8.4 V DC.

If DC output is higher than 8.4 V DC, replace ECU. See Figure 8.

If DC output is within range and red trouble code persists, replace ECU.

DIAGNOSTICS FOR NON-TROUBLE CODES

IMPORTANT: The following conditions and diagnostic procedures apply to EFI components only.

Engine Starts and Loses Power

If the engine starts and loses power immediately, this is usually an indication that the ECU does not detect an RPM signal. The RPM signal is generated by the stator, which also powers the hand warmers, headlight and charges the ECU battery.

Common causes for RPM signal failure may be due to a disconnected engine wire harness or a ground short in the AC output wire from the stator to the ECU. Other possible causes may include an ECU or engine-charging system failure.

1. Check wire harness connection to the ECU.
 - a. With the ignition key in the off position, check the wire harness connections to the ECU. If connections are secure, disconnect the 12-pin and 14-pin connections to the ECU and inspect connectors for bad connections or burn marks.
 - b. Check that all wire terminals are snug in their connectors. If connections appear to be good, reconnect wire harness and start engine to check if issue is still present. If bad connection is present, replace wire harness.
 - c. If issue is still present, advance to next step.
2. Check the ECU.
 - a. Disconnect wire harness from ECU and test with a new ECU to verify the original ECU is not cause for malfunction. If malfunction is not resolved with a new ECU, reconnect wire harness to original ECU and continue diagnostics.
3. Back probe the engine stator output connector. See Figure 9.
 - a. Start the engine. Refer to Operator’s Manual.
 - b. At full throttle (3600 RPM), the stator output MUST be 11.5 V AC – 14 V AC.

If AC voltage measures less than 11.5 V AC, remove flywheel and replace stator.

Engine No-Start Condition

If the engine does not start, check for system power.

1. Check EFI battery fuse.
2. Check spark plug.
 - a. Stop engine, remove key and wait for all moving parts to stop and for hot parts to cool.
 - b. Disconnect the spark plug wire and remove debris from the spark plug area.
 - c. Remove spark plug.
 - d. Inspect the spark plug. Spark plug gap MUST be 0.7 mm – 0.8 mm (0.027" – 0.030"). Replace if the electrodes are worn, fouled, or if the insulator is cracked or chipped.
 - e. Position spark plug against engine block and pull

recoil starter handle to check for spark. If no spark is present, replace spark plug.

- f. Reinstall spark plug and finger tighten. Turn an additional 1/4 turn after spark plug is seated.
 - g. Reinstall spark plug wire and make sure it is correctly positioned onto the spark plug.
3. Check the battery. Battery should have 7.2 V DC – 8.4 V DC, depending on when the battery was most recently charged. Extremely low voltage could prevent the ECU from triggering a trouble code and result in a no-start condition. If battery has low voltage, connect battery charger to battery. Also check the inline fuse on the battery cable.

If battery measures below specification after charging, replace battery.

4. Check wire harness connection to the ECU.
 - a. With the ignition key in the off position, check the wire harness connections to the ECU. If connections are secure, disconnect the 12-pin and 14-pin connections to the ECU and inspect connectors for bad connections or burn marks.
 - b. Check that all wire terminals are snug in their connectors. If connections appear to be good, reconnect wire harness and start engine to check if issue is still present. If bad connection is present, replace wire harness.
 - c. If issue is still present, advance to next step.
5. Check the ECU.
 - a. Disconnect wire harness from ECU and test with a new ECU to verify the original ECU is not cause for malfunction. If malfunction is not resolved with a new ECU, reconnect wire harness to original ECU and continue diagnostics.
6. Check the ECU status. With battery voltage between 7.2 V DC – 8.4 V DC, check if the green ECU status light is blinking at a consistent rate.

IMPORTANT: If battery measures below 7.2 V DC, ECU LEDs may appear dim or will not illuminate red or green LEDs. If green LED is constant, (not-blinking) see *EFI Trouble Code Identification* on page 3.

7. Check fuel pump output.
 - a. Remove the heater box.
 - b. Check voltage at fuel pump. See *Code 27: Low Fuel Pressure* on page 5 for voltage readings.
 - c. Remove fuel hose from fuel pump outlet and attach a suitable length of fuel hose to the fuel pump outlet that can safely reach a clearly marked fuel container.
 - d. With battery voltage between 7.2 V DC – 8.4 V DC, turn the key to the ON position for 10 seconds to pump fuel into the container. Fuel should measure approximately 160 mL (5 oz.).

If fuel amount measures less than 160 mL, remove the fuel pump and check the pre-filter for blockage. If filter is clean, replace fuel pump. See Figure 16.

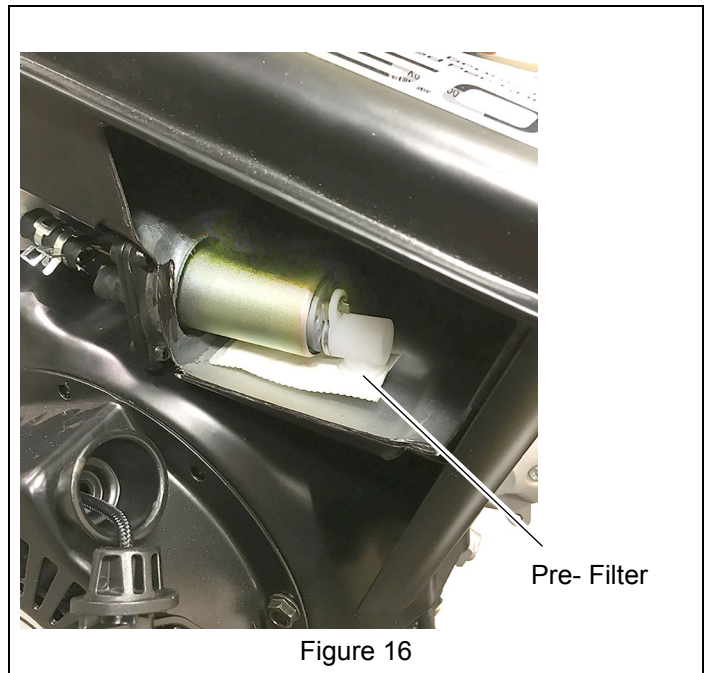


Figure 16

IMPORTANT: If replacing fuel pump, wet the fuel system:

- a. Fill fuel tank full.
- b. Cycle ignition key to the ON position, then to the OFF position. Repeat.

IMPORTANT: Cycling the ignition key multiple times may inject excessive amounts of fuel into the throttle body and “flood” the engine. A flooded engine may require more starting attempts than normal.

8. Remove connector to the injector.
 - a. Move gray slide upward until it stops. Gently compress gray slide and remove connector. See Figure 17.

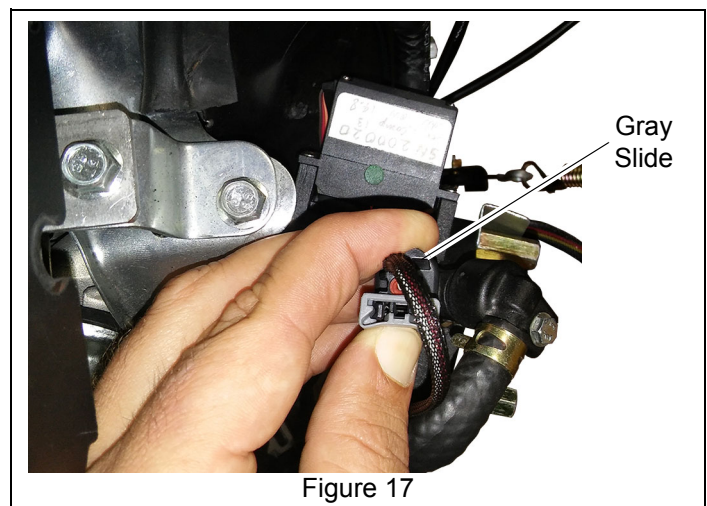
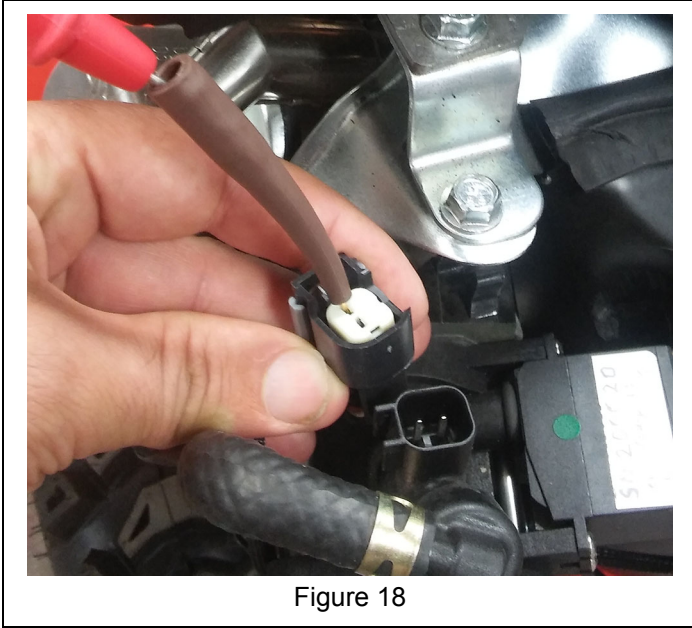


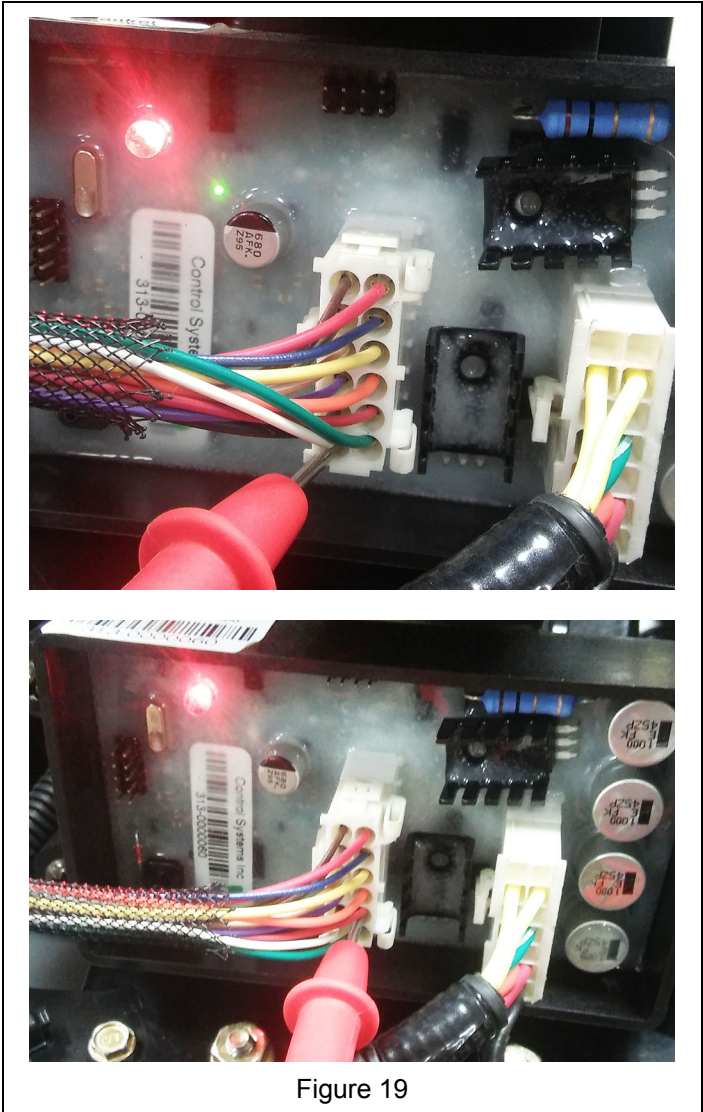
Figure 17

- b. Set a multi-meter to V DC and probe each terminal with the red probe and contact the black probe against the engine block. With the ignition key in the ON position, each terminal should measure 7.2 V DC – 8.4 V DC. See Figure 18.

If voltage is within range and the fuel injector is not operating correctly with the key in the ON position, replace throttle body assembly.



- c. If no voltage is present at the injector, check battery voltage by probing the red and white wires on the 12-pin ECU connector with the red probe and contact the black probe against the engine block. With the ignition key in the ON position, each terminal should measure 7.2 V DC – 8.4 V DC. See Figure 19.



If no voltage is present at the ECU, replace ECU. If voltage is present at the ECU, check wires for kinks or damage. If damage is present repair wires if possible, or replace throttle body. See Figure 20.



Figure 20

Surging Run Condition

1. Check wire harness connection to the ECU.
 - a. With the ignition key in the off position, check the wire harness connections to the ECU. If connections are secure, disconnect the 12-pin and 14-pin connections to the ECU and inspect connectors for bad connections or burn marks.
 - b. Check that all wire terminals are snug in their connectors. If connections appear to be good, reconnect wire harness and start engine to check if issue is still present. If bad connection is present, replace wire harness.
 - c. If issue is still present, advance to next step.
2. Check the ECU.
 - a. Disconnect wire harness from ECU and test with a new ECU to verify the original ECU is not cause for malfunction. If malfunction is not resolved with a new ECU, reconnect wire harness to original ECU and continue diagnostics.

If the AC output wire from the engine charging system is damaged, it may cause an intermittent short. This will result in erratic running such as the engine over revving or “popping” through the exhaust.

3. Check the engine wiring and wiring under the handlebar to verify that it is not damaged.

4. With an inline spark tester, check ignition for intermittent spark.
5. Check fuel pump output.
 - a. Remove the heater box.
 - b. Check voltage at fuel pump. See *Code 27: Low Fuel Pressure* on page 5 for voltage readings.
 - c. Remove fuel hose from fuel pump outlet and attach a suitable length of fuel hose to the fuel pump outlet that can safely reach a clearly marked fuel container.
 - d. With battery voltage between 7.2 V DC – 8.4 V DC, turn the key to the ON position for 10 seconds to pump fuel into the container. Fuel should measure approximately 160 mL (5 oz.).

If fuel amount measures less than 160 mL, remove the fuel pump and check the pre-filter for blockage. If filter is clean, replace fuel pump. See Figure 16. If fuel pump output is to specification, replace the ignition coil.

Engine Speed Does Not Change

If engine speed does not change when using the potentiometer (throttle control), check the following:

1. Set a multi-meter to ohms (Ω) and measure the potentiometer resistance. See Figure 21 and Figure 22.
 - a. Unplug the 14-pin connector from the ECU.
 - b. Position the red probe on the terminal of the red wire at the potentiometer (Pin 5 in Figure 21) and the black probe on the terminal of the green / white wire.

The potentiometer output should measure approximately $0 \Omega - 5000 \Omega$.

If ohm reading measures close to 0Ω at full throttle and close to 5000Ω at low-idle, potentiometer is operating normally. If ohm reading stays constant at either position, replace potentiometer.

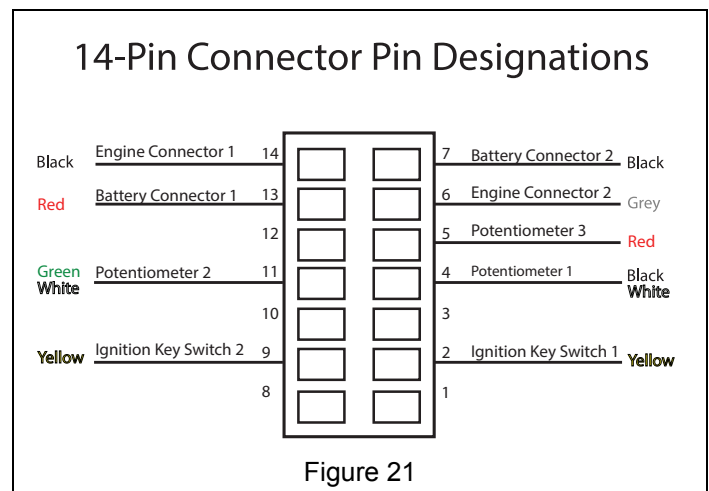


Figure 21

2. With a multi-meter, measure the V DC of the red wire.
 - a. With engine off, reconnect the 14-pin connector to the ECU.
 - b. Position the red probe on the terminal of the red wire at the potentiometer (Pin 5 in Figure 21). Also

see Figure 22.

- c. Position the black probe on the engine block.
- d. Turn ignition key to ON position.
- e. Turn the potentiometer from low-idle to full throttle.

Voltage to the red wire should measure 4.90 V DC – 5.0 V DC at both low-idle and full throttle positions.

Verify system ground by moving black probe to blk/wht wire (pin 4) while key is on. Compare to previous voltage readings. Any drop in voltage is likely a ground issue.

If voltage measures less than 4.9 VDC and battery input on pins 7 & 13 is to spec, replace ECU.

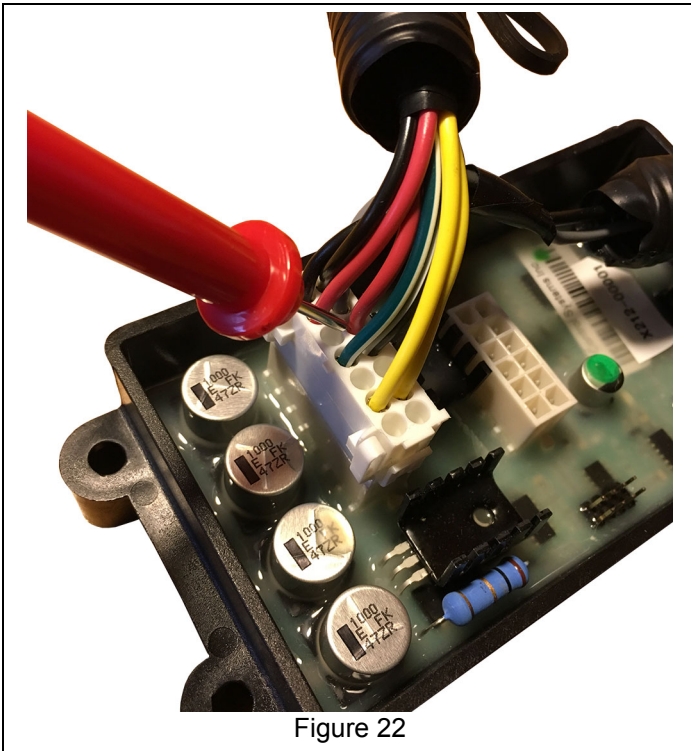


Figure 22

3. With a multi-meter, measure the V DC of the green / white wire. See Figure 23.
 - a. With engine off, position the red probe on the terminal of the green / white wire.
 - b. Position the black probe on the engine block.
 - c. Turn ignition key to ON position.
 - d. Turn the potentiometer from low-idle to full throttle.

Voltage to the green / white wire should measure close to 0.01 V DC at low-idle and close to 5.0 V DC at full throttle.

If voltage does not vary between low-idle and full throttle, there is an open connection in the harness. Replace the harness.

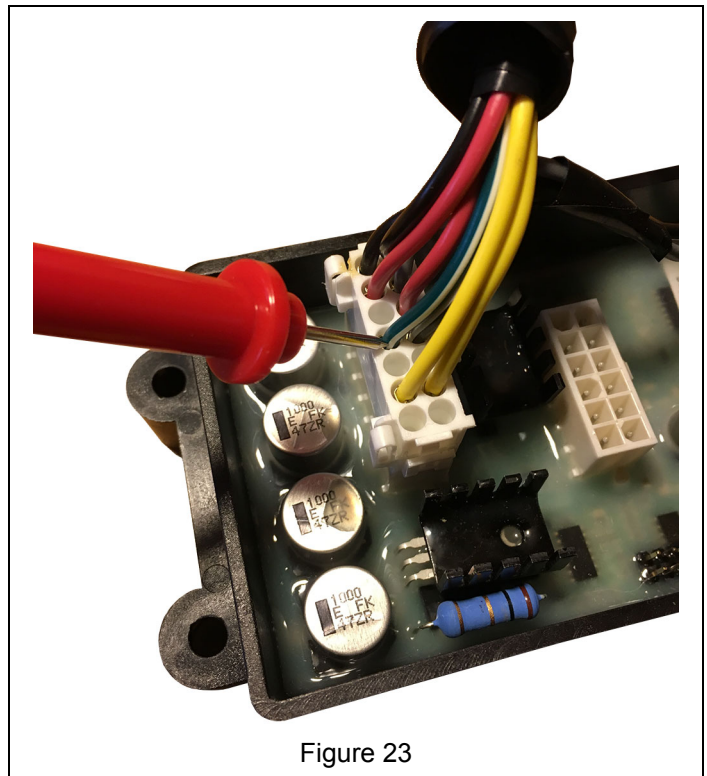


Figure 23

Fluttering Servo Motor

If the throttle plate in the throttle body flutters continuously when the key is in the ON position, check the following:

1. Wire harness connection to the ECU.
 - a. With the ignition key in the off position, disconnect the wire harness from the ECU and inspect connection at the tan, purple and yellow wires on the 12-pin connector. See Figure 15. If connection is faulty, repair, if possible. If repair cannot be completed, replace the throttle body.
 - b. If connection is good, a faulty connection exists in the throttle body or servo motor. Replace the throttle body.



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WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

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