



Installation Instructions

ET-S INSTALLATION KIT

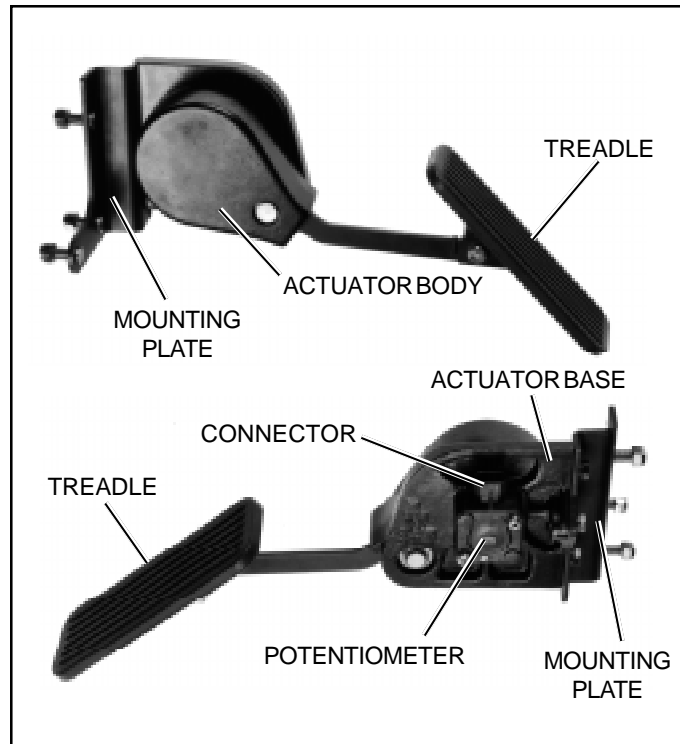


FIGURE 1 - ET-S ELECTRONIC TREADLE

IMPORTANT! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed at all times.

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.
2. Stop the engine when working around the vehicle.
3. If the vehicle is equipped with air brakes, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle.
4. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in manner that removes all electrical power from the vehicle.
5. When working in the engine compartment the engine should be shut off. Where circumstances require that the engine be in operation, **EXTREME CAUTION** should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.

6. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
7. Never exceed recommended pressures and always wear safety glasses.
8. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
9. Use only genuine Bendix replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, etc. should be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.
10. Components with stripped threads or damaged parts should be replaced rather than repaired. Repairs requiring machining or welding should not be attempted unless specifically approved and stated by the vehicle or component manufacturer.
11. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.

	DETROIT DIESEL	CATERPILLAR	CUMMINS
CLOSED THROTTLE (OPEN)	7 - 18%	10 - 20%	5 - 17%
OPEN THROTTLE (FULL)	74 - 90%	75 - 90%	70 - 81%

FIGURE 2 - ET-S OUTPUT VOLTAGE, AS A PERCENTAGE OF SUPPLY VOLTAGE

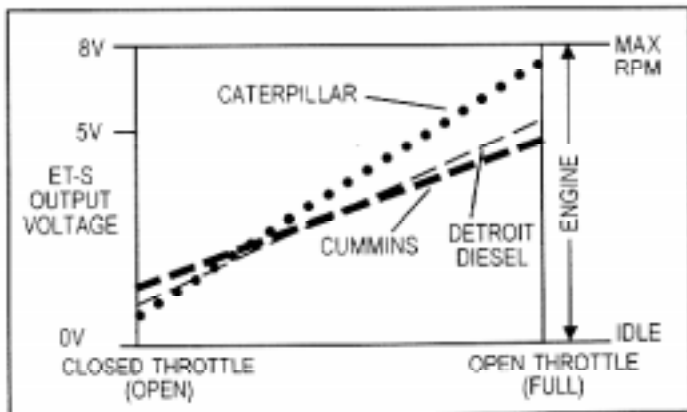


FIGURE 3 - ET-S OUTPUT VOLTAGE

DESCRIPTION

The ET-S is an engine compartment bulkhead mounted electronic treadle. On electronically controlled diesel engines, the ET-S fulfills the same function as a conventional mechanical throttle. However, rather than transmitting a mechanical force to the engine governor, the ET-S controls engine speed by supplying a variable electrical voltage to the engine's electronic controller.

The main components of the ET-S are: a mounting plate, suspended treadle, potentiometer (variable resistor), actuator body and base. The selected potentiometer, chosen for a specific engine application, provides the electrical link to the engine control system.

OPERATION

The ET-S provides smooth, graduated throttle control through the function of its potentiometer (variable resistor). The drive shaft of the Cam Follower Assembly transfers any movement of the treadle to the potentiometer. As the potentiometer rotates, its resistance changes. This way, the potentiometer can react to the driver's request for engine power through the ET-S treadle by changing resistance. The resulting change of voltage is sensed by the electronic engine controller.

The ET-S receives its supply voltage from the engine control unit. If the driver does not request engine power, the treadle is in the idle position. This condition is also referred to as "Closed Throttle." In this state, the potentiometer returns the minimum percentage of supply voltage to the engine control unit (see Figure 2).

As the driver depresses the treadle, the ET-S output voltage increases (see Figure 3). The potentiometer allows an increased amount of its supply voltage to return to the engine control unit, which in turn increases the engine's speed.

In the full, or "Open Throttle" position, the driver has depressed the ET-S treadle to its furthest possible point. This is the state of least potentiometer resistance. The ET-S returns the maximum percentage of supply voltage to the engine control unit (see Figure 2).

Please note that the internal mechanism of the ET-S is not field-serviceable and therefore individual parts or parts kits are not available for these components. Disassembly may lead to ET-S malfunction.

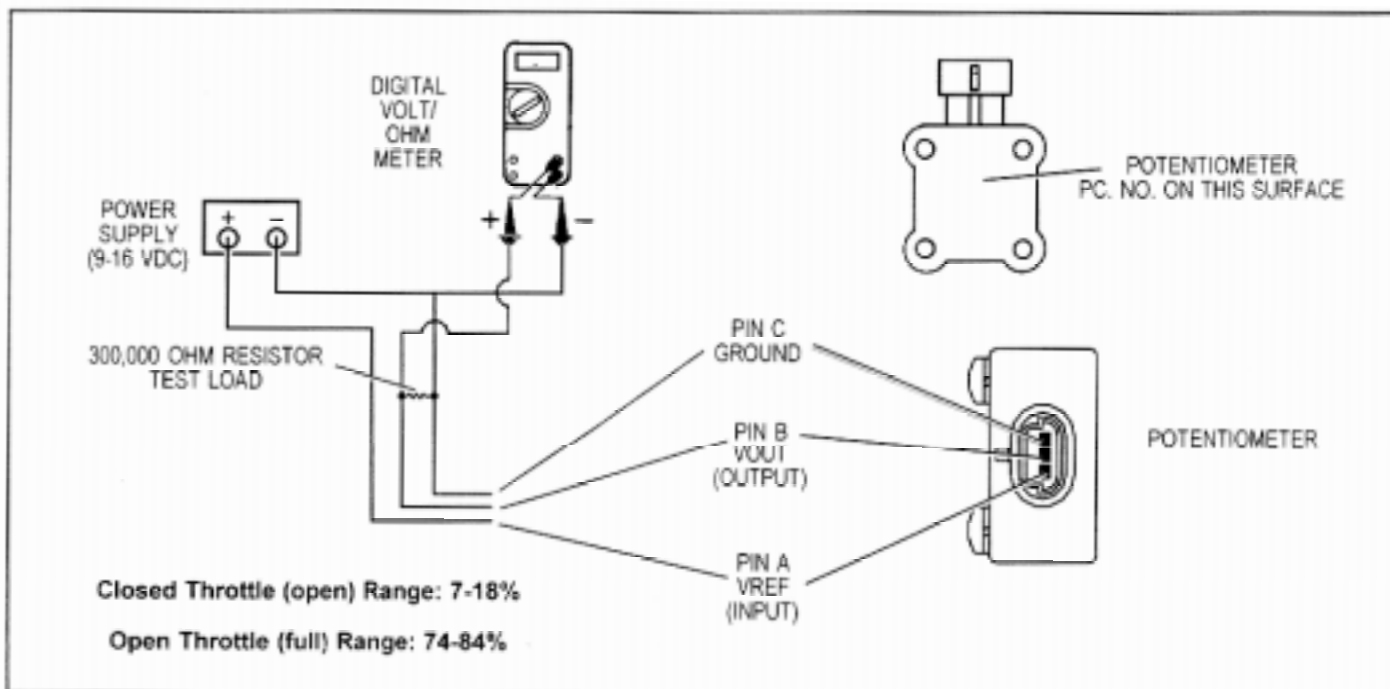


FIGURE 4 - ET-S ELECTRICAL TEST SCHEMATIC FOR THE DETROIT DIESEL CONNECTOR

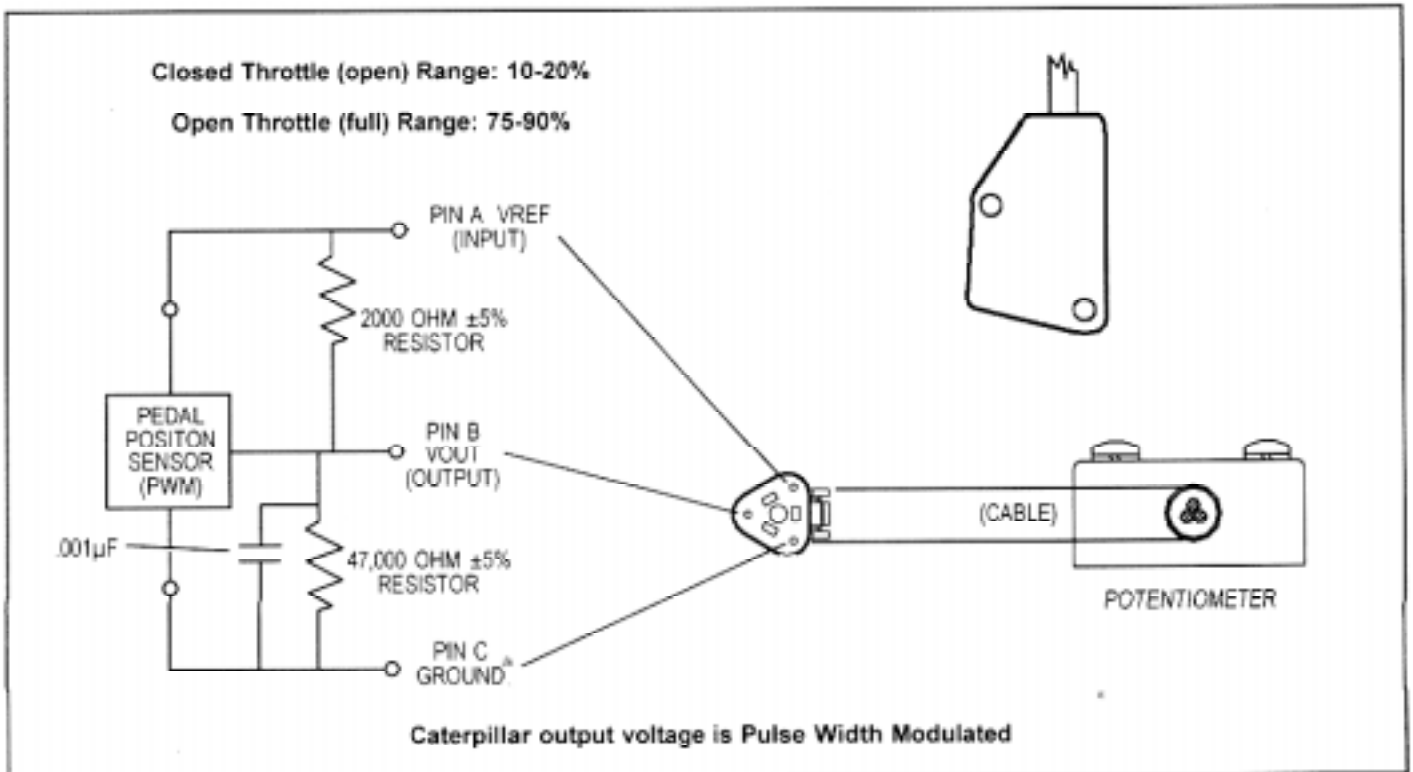


FIGURE 5 - ET-S ELECTRICAL TEST SCHEMATIC FOR THE CATERPILLAR CONNECTOR

INSTALLATION

1. Securely clamp the treadle Mounting Plate (6).
2. **Perform the following Operational Test** before installing the ET-S:

OPERATIONAL TEST

- [Note for Cummins potentiometers only: The optimum output & switch points should be achieved when the idle voltage equals the set voltage written on the potentiometer.]
- a. Check that the ET-S Mounting Plate is securely attached to a smooth, flat surface in such a way that does not twist the unit.

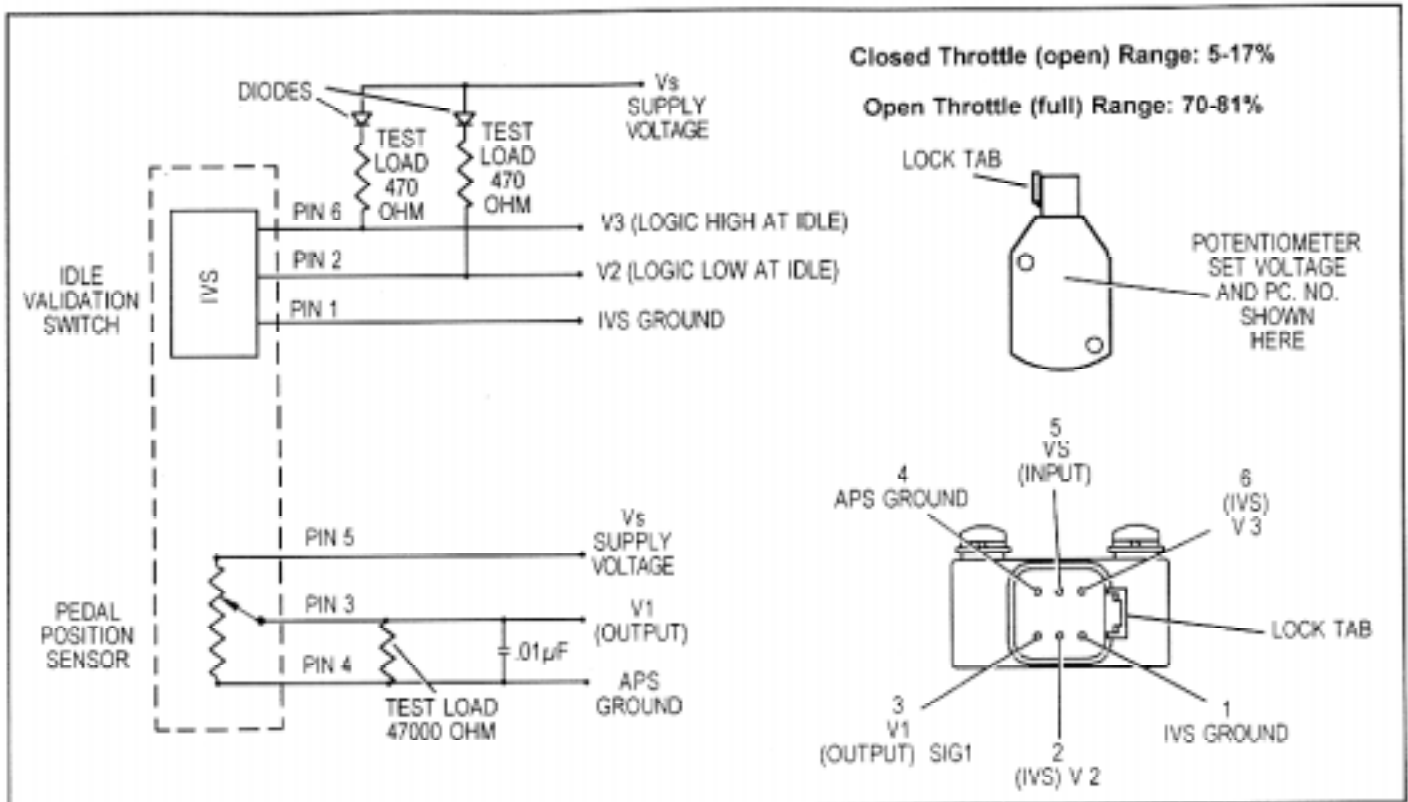


FIGURE 6 - FT-S ELECTRICAL TEST SCHEMATIC FOR THE CUMMINS CONNECTOR

- b. Connect the Potentiometer to the volt meter and power supply as shown in Figures 4, 5, or 6, depending on the model. **Note:** The power supply can be a 12 VDC vehicle battery in good condition and with known voltage output.
- c. Verify that the closed throttle (idle) output voltage, as a percentage of supply voltage, is within the limits listed in Figure 2. For example, with a supply voltage of 12.0 volts, for the Caterpillar Potentiometer in its closed throttle position, read between 1.2 to 2.4 volts (10%-20% of supplied voltage).
- d. Depress the Treadle to its full throttle position. The output voltage, as a percentage of supply voltage, should be within the limits listed in Figure 2. For example, with a supply voltage of 12.0 volts, for the Caterpillar Potentiometer in its open throttle position, read between 9 to 11.8 volts (75-90% of supplied voltage).
- e. Make five full applications and record idle position voltage each time. Verify that the idle position voltages recorded do not vary by more than .4% (For example, for a 12.0 volt supply, if there is any variation, the difference between the high and low readings should not exceed .048 volts).

If the ET-S fails to function within its specified ranges, it should be repaired or replaced with a new or genuine Bendix remanufactured unit, available at any authorized parts outlet.

3. Make sure the ET-S has smooth, even treadle movement.
4. Using the mounting hardware, install the assembled ET-S on the vehicle. Torque to between 85 and 110 lb. in.
5. Reconnect the cable connector by plugging it into the potentiometer's integral connector and pushing until the lock tab snaps into place.

