

Installation Instructions

Bendix[®] ET-S[™] & ET-S2[™] Potentiometer Kit for DDC[®] Bendix[®] ET-S[™] & ET-S2[™] Position Sensor Kit for Caterpillar[®] Bendix[®] ET[™], ET-2[™], ET-S[™], and ET-S2[™] Potentiometer/Switch Kit for Cummins[®]



FIGURE 1 - ELECTRONIC TREADLES

GENERAL SAFETY GUIDELINES WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:

- ▲ Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.
- ▲ Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. 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.
- ▲ 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.
- ▲If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix[®] AD-IS[®] air dryer system, a Bendix[®] DRM[™] dryer reservoir module, or a Bendix[®] AD-9si[®] air dryer, be sure to drain the purge reservoir.
- ▲ Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- ▲ Never exceed manufacturer's recommended pressures.
- ▲ Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.
- ▲ Use only genuine Bendix[®] brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
- ▲ Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.
- ▲ Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- ▲ For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.
- ▲ The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a vehicle equipped with a Bendix[®] Wingman[®] system.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.

REMOVAL

- 1. Park the vehicle on a level surface and block the wheels.
- 2. Drain the air pressure from all of the vehicle reservoirs.
- Unplug the cable assembly at the opposite end of the potentiometer. Disconnect the cable by lifting the lock tab and pulling the connector until it disengages.
- 4. The following instructions are written under the pretense that removal of the electronic throttle from the vehicle is necessary, for proper servicing. If removal is not necessary disregard all references made to the removal and installation of the electronic treadle assembly.

DISASSEMBLY

 Remove the electronic treadle from the vehicle and set aside the mounting hardware for reassembly. Clamp the mounting plate (see Figure 1) in a vise. Important: Do not clamp the assembly by the treadle actuator body or base since over-clamping may cause distortion to the casting. Remove the two screws (2) that secure the potentiometer (1) to the actuator base. The potentiometer (1) can then be lifted away from the drive shaft. Note the routing of the wire harness before removing the potentiometer.

CLEANING AND INSPECTION

- 1. Use a suitable solvent to clean all metal parts (note that mineral spirits may damage paint finish).
- 2. Inspect the mounting plate for severe corrosion, pitting, or cracks. Replace as necessary. Superficial corrosion and/or pitting is acceptable.
- 3. Inspect the cable assembly for loose or frayed wires, physical damage, or any contaminants on the connectors. Replace as necessary.



FIGURE 2 - POTENTIOMETER AND POSITION SENSOR IDENTIFICATION

ASSEMBLY

Refer to Figure 1 throughout assembly procedure.

Note: Do not disassemble the actuator. Replace the electronic treadle if there is any binding or soft pedal actuation.

Note: For Bendix[®] $ET-S^{T}$ and $ET-S^{T}$ treadles the connector should face toward the dashboard when the electronic treadle is installed.

- 1. Securely clamp the treadle mounting plate.
- 2. (a) For Detroit Diesel[®] Potentiometers: Aligning the drive slot, the potentiometer (1) engages the drive tang at the end of the drive shaft. Rotate the potentiometer clockwise until the first set of mounting holes align. Secure using two screws (2) and torque to 25 (±5) in-lbs.

(b) For Caterpillar[®] Position Sensor: Aligning the drive slot, the position sensor (1) engages the drive tang at the end of the drive shaft. Rotate the potentiometer clockwise until the first set of mounting holes align. Secure using two screws (2) and torque to 20 (\pm 2) in-lbs.

(c) **For Cummins**[®] **Potentiometers**: The Cummins potentiometer (1) has an integral idle validation switch. It also has a set voltage value marked on the cover which needs to be used to properly install the potentiometer.

Connect the adapter harness by plugging it into the potentiometer and pushing it in until the lock tab snaps into place. Route the adapter wire harness in the same direction as the harness that was removed and secure the adapter harness to the wire harness clip on the treadle base. Take care to prevent the harness from interfering with the motion of the treadle. *Refer to Figure 5.*

Align the drive slot in the potentiometer (1) to engage with the drive tang at the end of the drive shaft. Next, rotate the potentiometer clockwise until the hole in the metal sleeve matches the mounting holes on the actuator base. Using the screws (2) provided, loosely secure the potentiometer in place, but do not tighten.

Connect a voltmeter to pins 3 (APS output) and 4 (APS ground) as shown in Figure 5 and read the set voltage value marked on the potentiometer. Rotate the potentiometer until the voltmeter reads the same voltage as shown on the potentiometer within \pm .02 volts. Next, screw and lock the potentiometer in place. Torque to 25 (\pm 5) in-lbs. The sleeves lock into the body of the potentiometer for easy removal and reassembly.

3. Perform the following Operational Test before installing the electronic treadle.



FIGURE 3 - ELECTRICAL TEST SCHEMATIC FOR THE DETROIT DIESEL® CONNECTOR



FIGURE 4 - ELECTRICAL TEST SCHEMATIC FOR THE CATERPILLAR® CONNECTOR

	Detroit Diesel	Caterpillar	Cummins
Closed Throttle (Open)	7—18%	10—20%	5—17%
Open Throttle (Full)	74—90%	75—90%	70—81%

TABLE 1 - OUTPUT VOLTAGE, AS A PERCENTAGE OF SUPPLY VOLTAGE

OPERATIONAL TEST

- 1. Check that the mounting plate is securely attached to a smooth, flat surface in such a way that does not twist the unit.
- Connect the potentiometer to the volt meter and power supply as shown in Figures 3, 4 or 5, depending on the model. *Note:* Power supply can be a 12.0 VDC vehicle battery in good condition and with known voltage output. For the Cummins sensor the power supply should not exceed 5.0 VDC.



FIGURE 5 - ELECTRICAL TEST SCHEMATIC FOR THE CUMMINS® CONNECTOR

- 3. Verify that the closed throttle (idle) output voltage, as a percentage of supply voltage, is within the limits listed in Table 1. 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).
- 4. 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 9.0 to 11.8 volts (75–90% of supplied voltage).
- Make five full applications and record idle position voltage each time. Verify that idle position voltages recorded do not vary by more than 0.4% (For example, for a 12.0 volt supply, if there is any variation, the difference between the high and low readings should not exceed 0.048 volts).

If the electronic treadle 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.

INSTALLATION

- 1. Install the assembled electronic treadle on the vehicle. Use the mounting hardware set aside during disassembly. Torque to 85–110 in-lbs.
- 2. Reconnect the cable connector by plugging it into the potentiometer's integral connector and pushing until the lock tab snaps into place.
- 3. For Cummins potentiometers, connect the cable connector by plugging it into the adapter harness and pushing it in until the lock tab snaps into place. Secure any extra wiring away from the pedals and other vehicle controls.



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