Using the PST-2000
with
Peterbilt Trucks

Document Number
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DIXSON

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Revision Table

Revision	Date	Description
	12/08/99	Initial release
-A	01/26/00	Additions and enhancements: Sections 1, 7, 14, 15; Figures 1, 2; Tables 1, 2.
-B	6/19/00	Table 2, change 260° to 250°.

1 Introduction

This guide explains how to use the PST-2000 (Product Support Tool) to test, troubleshoot, and check the accuracy of AMETEK Dixson gauges installed in Peterbilt trucks.

Note - You must read and follow the test procedures in this document to successfully test a gauge. Failure to do so may cause you to reject properly functioning gauges.

2 Care and Cleaning

The PST-2000 is a precision instrument and is designed for trouble-free operation in a normal vehicle repair environment. It will operate between 14 and 122 degrees Fahrenheit and is spill-resistant.

Use only a soft cloth and a mild, non-abrasive soap to clean the PST-2000. Do not use gasoline, alcohol, or solvents because they will damage the instrument and void its warranty. Always return the tool to its carrying case when not in use.

3 Warranty

AMETEK Dixson warrants the PST-2000 to be free from manufacturing and material defects for one year from the date of sale to the end-user. To obtain service, call the AMETEK Dixson Product Support Department and ask for instructions and a Returned Material Authorization (RMA).

4 PST-2000 Kit Contents

Part Name	Part Number
PST-2000, complete kit	00041131
PST-2000, tester only	243-12833
Carrying Case	243-14028
Standard Input Cable, 700/900 Series Speedo/Tach	180-12837
Input Cable, Cigarette Lighter Socket Adapter	180-12848
Input Cable, External Power Supply	180-12847
Optional Input Cable, AC Adapter to 12 VDC	240-12915
Optional Input Cable, AC Adapter to 24 VDC	240-12916
Standard Output Cable, Speedo/Tach/Trip Odo	180-12838
Standard Output Cable, Temperature, Ammeter, Pyrometer	180-12839
Alternate Output Cable, 500 Series	180-12846

Table 1 *PST-2000 Spare Parts*

You may order replacement parts or optional equipment by calling the AMETEK Dixson Sales Department at (970) 244-1241.

5 Description

The PST-2000 is designed to help test and troubleshoot the vehicle instrument system by simulating the information normally fed to the gauges from the gauge sensors and sender units. The unit receives power from an input cable that plugs into the speedometer or tachometer harness connector. Optional input cables for bench testing are available that derive their power from a cigarette lighter socket, an external power source, or an AC/DC adapter. The output cables plug into the gauges to be tested.

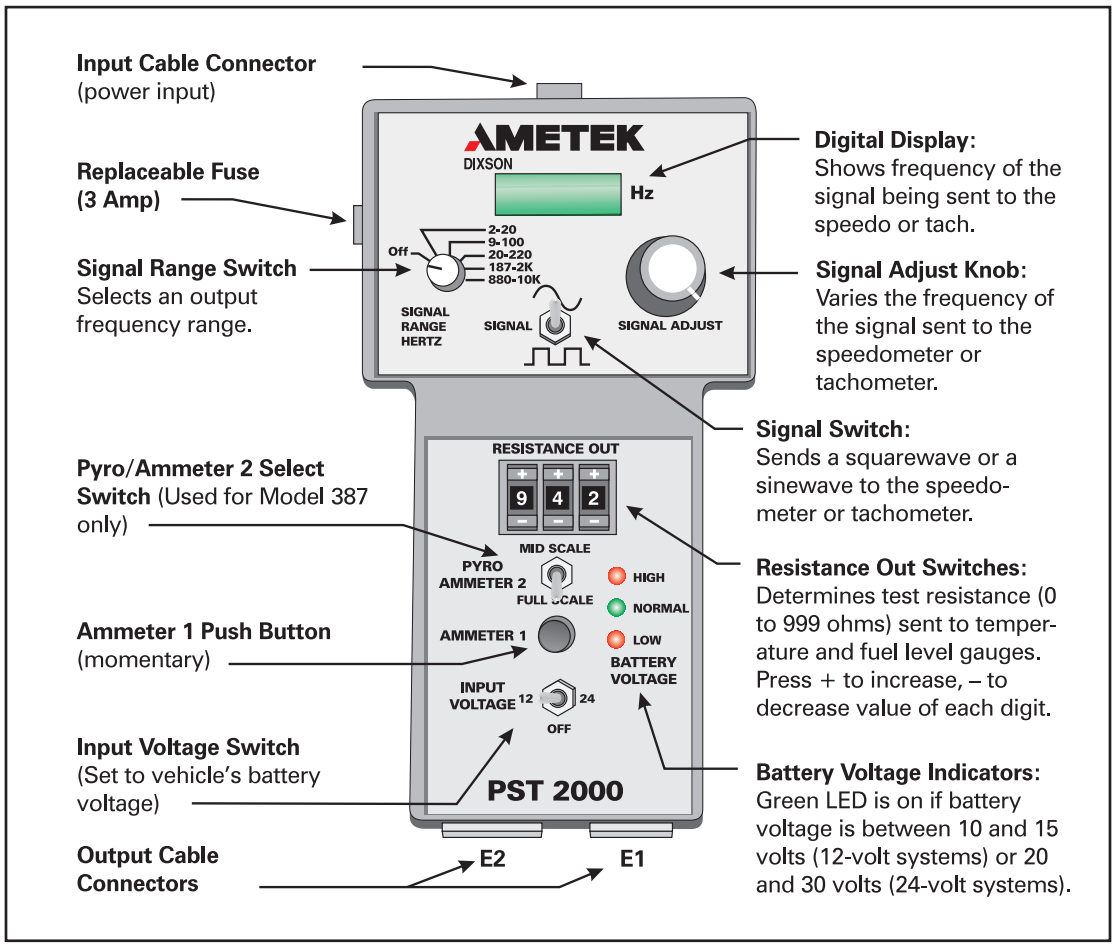

Figure 1 *PST-2000 Controls*

The tool lets you vary the frequency of pulses sent to the speedometer, tachometer, or trip odometer. You vary the output frequency as stated in the procedures and observe the speedometer or tachometer reading.

The tool also contains a variable resistance source to test temperature and fuel level gauges, and current and millivolt signals to test ammeters and pyrometer gauges. The variable resistance source may also be used when specified by other testing procedures by using the alligator clips on the standard output cable.

6 Connecting the PST-2000

The PST-2000 comes with a standard input cable that provides power to the tool, and two standard output cables that send signals to the gauges. Optional input and output cables are available. The cables are connected as shown in Figure 2.

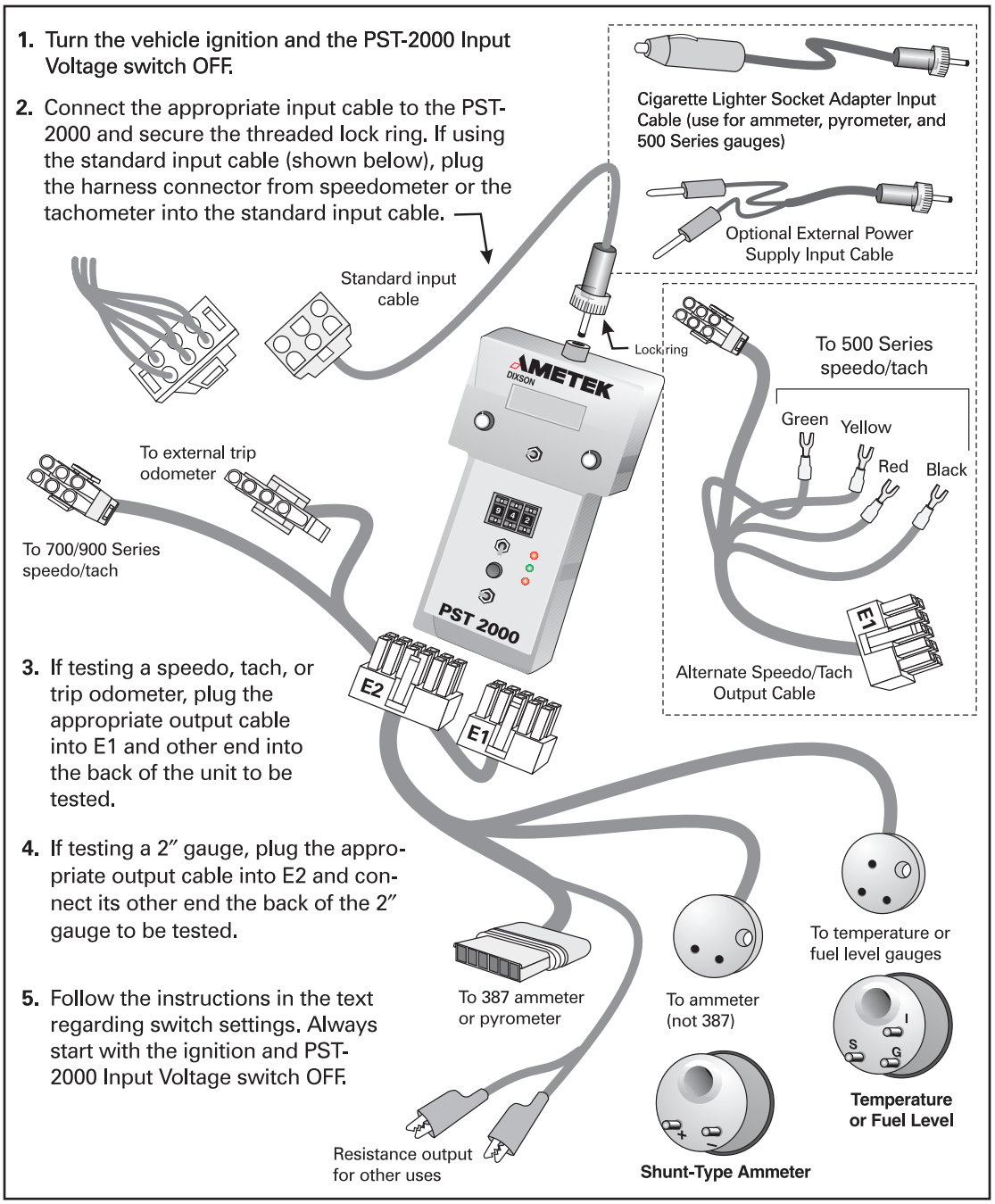

Figure 2 *Connecting the PST-2000*

7 General Test Procedure

Use the following table to find the section for the gauge you wish to test.

If, after testing according to the appropriate procedure, the gauge does not function as described, replace it. If the gauge is functioning properly and is accurate, refer to the appropriate AMETEK Dixson Product Information Note (PIN) for troubleshooting tips.

To test this gauge,	See Section:	PIN #:	Quick Gauge Identification
500 Series Speedometer 700 Series Speedometer	8	072-40283	500: metal housing 700: white plastic housing
500 Series 100-MPH Speedometer	9	n/a	Metal housing
900 Series Speedometer	10	072-40283	Blue plastic housing
500 Series Tachometer 700 Series Tachometer	11	072-40284	500: metal housing 700: white plastic housing
900 Series Tachometer	12	072-40284	Blue plastic housing
700 Series External Trip Odometer	13	072-40242	
Fuel and Temperature Gauges	14	072-40289	
Ammeter (shunt type)	15	072-40288	
Model 387 Ammeter or Pyrometer	16	n/a	

Notes - You can obtain the Accuracy Tables and Product Information Notes referred to in this document by calling our Product Support Department or by downloading them from our website at www.ametekdixson.com.
The PST-2000 cannot test voltmeter gauges. See AMETEK Dixson Product Information Note 072-40287 for information about troubleshooting voltmeter gauges.

Important!

The PST-2000 cannot calibrate gauges. Do not set the tool to a particular frequency or resistance value and then check the pointer position. Instead, use the tool to position the pointer as directed in the procedure, note the value indicated on the tool and verify it falls within the given frequency range listed in the Accuracy Table referenced by that procedure.

When using the tool to position the pointer to full scale, the frequency displayed on the tool corresponds to the values given in the Accuracy Tables called out in these procedures and not with other calibration charts and booklets.

8 500/700 Series Speedometer

500 Series speedometers have a metal housing and a 4-pin barrier strip connector. The 700 Series speedometers have a white plastic housing and a connector plug, and are the most commonly installed instruments in Peterbilt trucks. Each series requires different tester settings and uses different switch settings.

Notes - If the full scale value on your 500 Series speedometer is 100 mph, read Section 9 before continuing this procedure.

The PST-2000 will not test 500 Series speedometers with sender-generator inputs.

1. Connect the PST-2000 as described in Figure 2. Use the cigarette lighter socket adapter for 500-Series speedometers.
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Set the Signal switch as follows:
   a. Speedometers with magnetic sensor or sender generator inputs: Up (sine wave).
   b. Speedometers with Engine ECU inputs: down (square wave).
5. Note which switches on the back of the speedometer are closed (on), then verify they are completely closed by using a sharp, pointed object such as a scribe.
6. Write down which switches are closed (on) and locate this switch combination in the "Switches Closed" column of Accuracy Table 072-40316.
7. Check the speedometer's accuracy at 80 mph as follows:
   a. Read across the row that contains your speedometer's switch combination to the column headed "Hertz @ 80 MPH" to obtain the 80 mph input frequency value.

b. Set the Signal Range knob to the correct range based on the 80 mph frequency value you just found. (For most speedometers, this will be 187 to 2k.) This simulates the frequency input from the vehicle's speed sensor.

c. Adjust the Signal Adjust knob until the speedometer pointer indicates 80 mph.

d. After a 5-second stabilization time, the displayed value should be within the values given in the column headed "Range, 80 MPH" for your switch setting.

8. Check the accuracy at 20 mph as previously described, but use the values in the "Hertz @ 20 MPH" and "Range, 20 MPH" columns, and adjust the Signal Adjust knob to position the pointer at 20.

9. Check the accuracy at 60 mph as previously described, but use the values in the "Hertz @ 60 MPH" and "Range, 60 MPH" columns, and adjust the Signal Adjust knob to position the pointer at 60.

Note - The pointers on the 500 Series products are adjustable. If the pointer position is not accurate, use the Signal Adjust knob until the display reads as close to the middle of the "Range, 60 MPH" column for your switch setting, then adjust the adjustment screw on the back of the unit to position the pointer at 60. Recheck the accuracy at 20 and 80.

10. Verify the odometer and built-in trip odometer (if applicable) are advancing properly by adjusting the Signal Adjust knob until the pointer reads 60 mph. The odometers should then advance one mile every 59 to 61 seconds.

The following example will help you understand the procedure:

You have a 700 Series speedometer and switches S2, S4, S8, S9, and S10 are on (closed). After looking up that switch combination in the "Switches Closed" column of Accuracy Table 072-40316 and reading across to the "Hertz @ 80 Mph" column, your find that your frequency value is "583". You would then set the Signal Range knob on the PST-2000 to the 880–10k range and adjust the Signal Adjust knob to position the pointer at 80 mph. If the speedometer is accurate at 80 mph, the PST-2000 will display between 571 and 594 as given in the "Range, 80 MPH" column.

9 500 Series 100-MPH Speedometer

The 500 Series 100-mph speedometer is similar to the other 500 Series speedometers. Use the procedure in Section 8 to test, but use Accuracy Table 072-40318 instead of 072-40316, and substitute "100" wherever "80" occurs in the procedure.

10 900 Series Speedometer

900 Series speedometers can be identified by their blue plastic housing.

1. Connect the PST-2000 as described in Figure 2.
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.

3. Turn the ignition on.

   a. If the green Battery Voltage LED is on, continue this procedure.

   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.

   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

   Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Set the Signal switch down (square wave).
5. Note which switches on the back of the speedometer are closed (on), then verify they are completely closed by using a sharp, pointed object such as a scribe.
6. Write down which switches are closed (on) and locate this switch combination in the "Switches Closed" column of Accuracy Table 072-40314.
7. Check the speedometer's accuracy at 50 mph as follows:

   a. Read across the row that contains your speedometer's switch combination to the column headed "Hertz @ 50 MPH" to obtain the 50 mph input frequency value.

   b. Set the Signal Range knob to the correct range based on the 50 mph frequency value you just found. (For most speedometers, this will be 187 to 2k.) This simulates the frequency input from the vehicle's speed sensor.

   c. Adjust the Signal Adjust knob until the speedometer pointer indicates 50 mph.

   d. After a 5-second stabilization time, the displayed value should be within the values given in the column headed "Range, 50 MPH" for your switch setting.
8. Check the accuracy at 25 mph as previously described, but use the values in the "Hertz @ 25 MPH" and "Range, 25 MPH" columns, and adjust the Signal Adjust knob to position the pointer at 25.
9. Check the accuracy at 80 (or 85) mph as previously described, but use the values in the "Hertz @ 80 MPH" and "Range, 80 MPH" columns (or "Hertz @ 85 MPH" and "Range, 85 MPH" columns), and adjust the Signal Adjust knob to position the pointer at 80 (or 85).
10. Verify the odometer and built-in trip odometer (if applicable) are advancing properly by adjusting the Signal Adjust knob until the pointer reads 60 mph. The odometers should then advance one mile every 59 to 61 seconds.

The following example will help you understand the procedure:

Your speedometer's switches S1, S3, S5, and S8 are on (closed). After looking up that switch combination in the "Switches Closed" column of Accuracy Table 072-40314

and reading across to the "Hertz @ 50 MPH" column, your find that your frequency value is "1456". You would then set the Signal Range knob on the PST-2000 to the 187–2k range and adjust the Signal Adjust knob to position the pointer at 50 mph. If the speedometer is accurate at 50 mph, the PST-2000 will display between 1409 and 1502 as given in the "Range, 50 MPH" column.

11 500/700 Series Tachometer

500 Series tachometers have a metal housing and a 4-pin barrier strip connector. The 700 Series tachometers have a white plastic housing and a connector plug, and are the most commonly installed instruments in Peterbilt trucks. Each series requires different tester settings and uses different switch settings.

Note - The PST-2000 will not test coil-driven or alternator-driven tachometers.

1. Connect the PST-2000 as described in Figure 2 (500 Series use cigarette lighter socket adapter).
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Set the Signal switch up (sine wave). If the tachometer is driven by electronic engine signals, set the switch down (square wave).
5. Note which switches on the back of the tachometer are closed (on), then verify they are completely closed by using a sharp, pointed object such as a scribe.
6. Write down which switches are closed (on) and locate this switch combination in the "Switches Closed" column of Accuracy Table 072-40317.
7. Check the tachometer's accuracy at full scale as follows:
   a. Read across the row that contains your tachometer's switch combination to the column headed "Full Scale Hertz" to obtain the full scale input frequency value.
   b. Set the Signal Range knob to the correct range based on the full scale frequency value you just found. (For most tachometers, this will be 880 to

10k.) This simulates the frequency signal from the vehicle's engine speed sensor.

c. Adjust the Signal Adjust knob until the tachometer pointer indicates 3000 rpm.

d. After a 5-second stabilization time, the displayed value should be within the values given in the column headed "Full Scale Range" for your switch setting.

8. Check the accuracy at 1500 rpm as previously described, but use the values in the "Half Scale Hertz" and "Half Scale Range" columns, and adjust the Signal Adjust knob to position the pointer at 1500.
9. Verify the hourmeter (if applicable) is advancing properly. The tenths wheel should advance every 6 seconds while power is applied.

The following example will help you understand the procedure:

Your tachometer's switches S1, S3, and S5 are on (closed). After looking up that switch combination in the "Switches Closed" column of Accuracy Table 072-40317 and reading across to the "Full Scale Hertz" column, your find that your frequency value is "4350". You would then set the Signal Range knob on the PST-2000 to the 880–10k range and adjust the Signal Adjust knob to position the pointer at 3000 rpm. If the tachometer is accurate at full scale, the PST-2000 will display between 4263 and 4437 as given in the Full Scale Range column.

12 900 Series Tachometer

900 Series tachometers can be identified by their blue plastic housing.

1. Connect the PST-2000 as described in Figure 2.
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.

   a. If the green Battery Voltage LED is on, continue this procedure.

   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.

   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Set the Signal switch down (square wave).
5. Note which switches on the back of the tachometer are closed (on), then verify they are completely closed by using a sharp, pointed object such as a scribe.

6. Write down which switches are closed (on) and locate this switch combination in the "Switches Closed" column of Accuracy Table 072-40315.
7. Check the tachometer's accuracy at full scale as follows:
   a. Read across the row that contains your tachometer's switch combination to the column headed "Full Scale Hertz" to obtain the full scale input frequency value.
   b. Set the Signal Range knob to the correct range based on the full scale frequency value you just found. (For most tachometers, this will be 880 to 10k.) This simulates the frequency signal from the vehicle's engine speed sensor.
   c. Adjust the Signal Adjust knob to position the pointer to your tachometer's full scale reading (2400 or 3000 rpm). If your full scale reading is 3500, position the pointer to 3000 rpm.
   d. After a 5-second stabilization time, the displayed value should be within the values given in the column headed "Full Scale Range" for your switch setting.
8. Check the accuracy at half scale (1200 or 1500 rpm) as previously described, but use the values in the "Half Scale Hertz" and "Half Scale Range", and adjust the Signal Knob to position the pointer at 1200 or 1500. If your full scale reading is 3500, position the pointer to 1500 rpm.
9. Verify the hourmeter (if applicable) is advancing properly. The tenths wheel should advance every 6 seconds while power is applied.

The following example will help you understand the procedure:

Your tachometer's switches S1, S3, and S5 are on (closed). After looking up that switch combination in the "Switches Closed" column of Accuracy Table 072-40315 and reading across to the "Full Scale Hertz" column, your find that your frequency value is "8400". You would then set the Signal Range knob on the PST-2000 to the 880–10k range and adjust the Signal Adjust knob to position the pointer at 3000 rpm. If the tachometer is accurate at full scale, the PST-2000 will display between 8232 and 8568 as given in the Full Scale Range column.

13 700 Series External Trip Odometer

1. Connect the PST-2000 as described in Figure 2.
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Set the Signal switch down (square wave) and the Signal Range knob to the 2-20 position.
5. Turn the Signal Adjust knob fully counter-clockwise and then slowly clockwise until the trip odometer begins to increment. Do not exceed 10 Hertz on the display or the trip odometer may stop working.
6. If the trip odometer display is incrementing and the backlighting is on, the device is working.
7. To test accuracy, reconnect the trip odometer to the vehicle's harness and test the system as a whole by testing the speedometer as described in Section 8. The trip odometer should advance one mile for every mile the speedometer's odometer advances. Do not interrupt power during the test or accuracy will be affected.

14 Fuel Level and Temperature Gauges

1. Unplug the gauge to be tested and connect the PST-2000 as described in Figure 2.
2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. Configure the PST-2000 Resistance Out switches until the gauge pointer aligns with the gauge test point value given in the following table for the type of gauge you are testing.
5. **Important! Tap the gauge while adjusting the switches to accurately align the pointer.**
6. Compare the value showing on the Resistance Out switches to the values in the Resistance Out Range column in Table 2.
   a. If the switch value does not fall within the range in the Resistance Out Range column, or if the gauge does not function as described, replace it.
   b. If the gauge is functioning properly, refer to AMETEK Dixson Product Information Note 072-40286 (Troubleshooting Fuel Gauges) for troubleshooting tips.

Scale Plate Type	Gauge Test Point	Resistance Out Range
100° to 250° F	150° 200°	173 to 199 ohms 75 to 93 ohms
100° to 300° F	200° 300°	93 to 113 ohms 34 to 48 ohms
Fuel Level	Full (F) Empty (E)	26 to 40 ohms 220 to 260 ohms

Table 2 *Resistance Out Values*

The following example will help you understand this procedure:

The scale plate on a suspect temperature gauge reads from 100 to 300 degrees Fahrenheit. You connect the PST-2000 to the gauge and configure the Resistance Out switches to position the pointer to 200 degrees after tapping the gauge. If the gauge is accurate, the value showing on the Resistance Out switches will be between 93 and 113 ohms.

15 Ammeter (Shunt Type)

Most ammeters in Peterbilt vehicles are shunt-type. If you want to test the ammeter in a Model 387 vehicle, go to Section 16; otherwise, continue with this section.

1. Unplug the gauge to be tested and connect the PST-2000 as described in Figure 2.

   Note - Two types of gauges are available, one with larger diameter terminals. The connector will only fit the gauge with the smaller terminals. Do not force the larger diameter terminal into the connector.

2. Turn the PST-2000 Input Voltage switch to either 12 volts or 24 volts, whatever is appropriate for your vehicle.
3. Turn the ignition on.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.

   Note - If using an AC/DC adapter input cable, the High LED may light when no gauge is connected to the tester. Disregard this indication.

4. When you press and release the Ammeter 1 button, the ammeter's pointer should go momentarily to full scale (60, 100, or 120 amperes, depending upon the gauge) and then return to 0.

Note - To prevent internal overheating, the Ammeter 1 button will not respond until 6 to 10 seconds have elapsed since the last time it was pressed.

16 Model 387 Ammeter or Pyrometer

Use this procedure only if you are testing an ammeter or pyrometer in a Peterbilt Model 387 vehicle.

1. Turn the ignition off and disconnect the 6-pin connector from the Interface Module. The Interface Module is located beneath the cab on the driver's side.
2. Set the PST-2000 Input Voltage switch off (center position) and obtain power for the tester by using the cigarette lighter socket adapter cable.
3. Connect the 6-pin output cable from the PST-2000 to the Interface Module.
4. Turn the vehicle ignition on.
5. Set the PST-2000 Input Voltage switch to the correct voltage for the vehicle.
   a. If the green Battery Voltage LED is on, continue this procedure.
   b. If one of the red LEDs is on, the Input Voltage switch may not be set to the vehicle's battery voltage, or the battery voltage is too high or too low.
   c. If no LED is on, the PST-2000 fuse may be blown, the PST-2000 or its input cable may be defective, or you may have a bad power connection. Recheck your connections.
6. Place the Pyro/Ammeter 2 switch up (MID SCALE).
   a. If testing an ammeter, the ammeter pointer should read 0.
   b. If testing a pyrometer, the pyrometer pointer should read about 750 degrees or mid-scale.
7. Place the Pyro/Ammeter 2 switch down (FULL SCALE).
   a. If testing an ammeter, the ammeter pointer should indicate about 120 amperes or full scale.
   b. If testing a pyrometer, the pyrometer pointer should read about 1500 degrees or full scale.
8. If the gauge is inaccurate or does not function as described, either the gauge or the Interface Module is defective. If the gauge is functioning properly, the problem is elsewhere in the instrumentation or vehicle. In either case, troubleshoot the instrumentation by following the procedures in AMETEK Dixson 387 Instrument Service Manual #072-40245B or later.

END OF DOCUMENT