

This Service Bulletin is a supplement to Service Manual, Group 38 Instrumentation VNL, VNM.

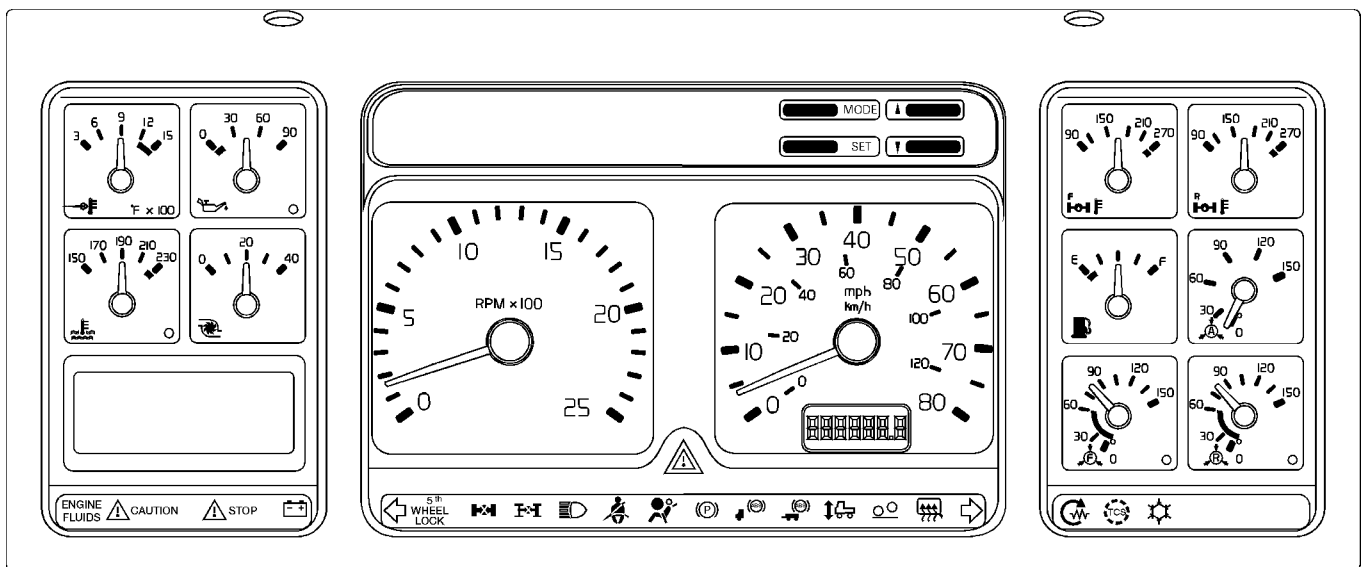
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Group
38

Supp. Page
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Instrumentation
Gauge Replacement
VNM, VNL

Gauge Replacement



W3000787

This service bulletin provides the latest information regarding servicing and replacement of gauges on instrument clusters for the VNL, VNM series vehicles. Procedures for the replacement of these gauges apply only to VN Series instrument clusters that are no longer under warranty protection.

While an instrument cluster is under warranty protection, **ONLY** the cluster gauges on the right side are allowed to be removed and replaced. **Attempts to remove and replace individual gauges on the left and center modules during the warranty period will void the cluster warranty.**

For additional information regarding VNL, VNM Instrumentation, refer to the following publications: PV776-TSP23762/1, *Instrumentation VNL, VNM*; PV776-TSP130751/1, *Instrumentation Troubleshooting Supplement* and PV776-TSP24947/1, *Gauge Accuracy & Troubleshooting*.

General

General Cautions



CAUTION

When servicing or troubleshooting, do not leave the cluster face-down for more than 15 minutes, or damage to the gauges may occur. Gauge oil may run out of the front of the gauge faces and make the gauges inaccurate.



CAUTION

Welding on trucks can damage the vehicle electrical system/components from the voltage and current spikes that normally occur when welding. It is preferable to avoid welding on an assembled truck, but if welding must be done on any structure on or in contact with the vehicle, disconnect the electrical connectors at the rear of the instrument cluster.

Cleaning the Housing and Front Panel Glass

To clean the housing and front panel glass, use a soft, non-abrasive cloth and a mild soap-and-water solution.

Preventing Electrostatic Discharge (ESD)



CAUTION

To prevent electrostatic discharge (ESD), which may damage the sensitive electronic components in the instrument cluster, a wrist grounding strap must be used when working on electronic equipment such as the instrument cluster. Failure to use a wrist strap may result in permanent damage to the printed circuit boards in the instrument cluster. To use the wrist strap in a vehicle, attach the alligator clip to the nearest electrical ground such as a metal mounting screw, a ground terminal or preferably a ground stud.



CAUTION

To prevent electrostatic discharge (ESD), which may damage the sensitive electronic components in the instrument cluster, make sure the workbench has an anti-static mat which is grounded to the nearest electrical outlet when working on the instrument cluster. Failure to use an anti-static mat may result in permanent damage to the printed circuit boards in the instrument cluster. When working at the anti-static workbench, always keep a wrist strap connected to the anti-static mat.

Human skin can hold more than 1000 volts of static electricity. Although getting a static shock is annoying, it is not dangerous because there is so little energy stored by clothing. But when dealing with circuits designed to sense differences smaller than 1 volt, electrostatic discharge can be a subtle but destructive problem. Circuit boards mounted in the instrument cluster or in modules mounted elsewhere may not fail immediately after being hit with a static discharge. Rather they may work for a while, then fail for no apparent reason. The culprit then is often the normal warming up and cooling down process of the module, engine or cab interior.

Grounding straps and anti-static mats are available for minimal cost from electronic supply stores. Grounding straps consist of a wrist strap, a coiled extension wire and an alligator clip. Be sure to purchase one with a long enough extension wire to allow freedom of movement.

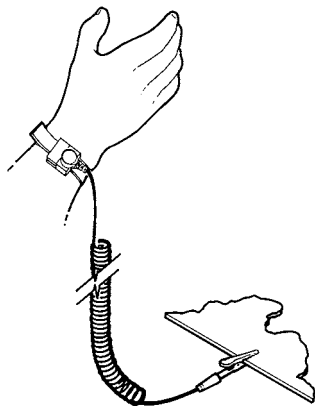
An anti-static wrist strap is available from Kent-Moore (see *Tools* section of this supplement). Call 1-800-328-6657.

An anti-static mat is also available from Kent-Moore (see *Tools* section of this supplement).

Tools

Special equipment

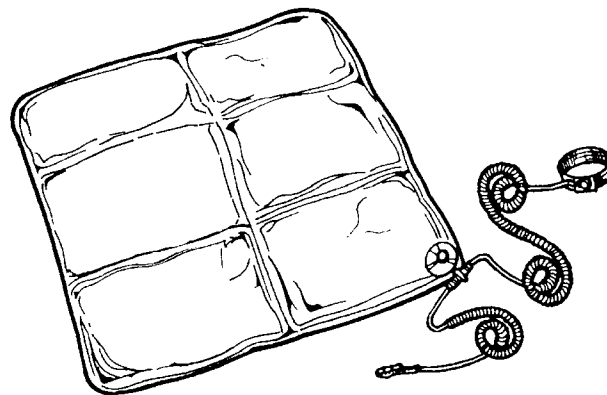
The following items are required for work on the instrument cluster. They can be ordered as shown below.



W3000572

ESD Wrist Strap

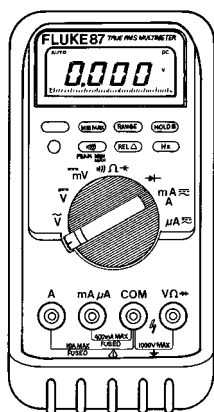
Use a wrist strap when servicing the instrument cluster inside the vehicle. Use a wrist strap and anti-static mat when working on the cluster at a workbench. Several different wrist straps are available from Kent-Moore at 1-800-328-6657.



W3000704

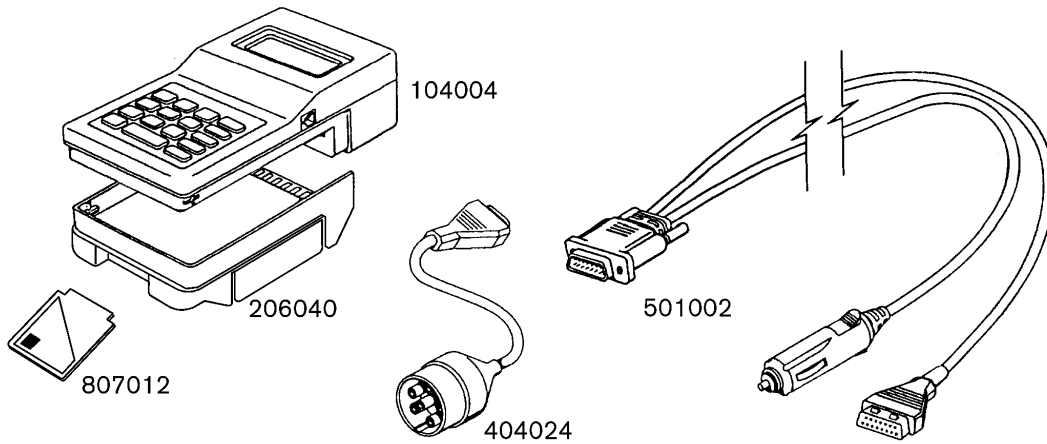
Type 8501 Static Dissipative Grounding Kit
Available from Kent-Moore (P/N J-42444)
at 1-800-328-6657.

The kit shown includes both a wrist strap and anti-static mat. Use both when working on the instrument cluster at a workbench.



W2001014

Fluke 87 Digital Multi-meter (DMM)
Available from Kent-Moore (P/N J-39200)
at 1-800-328-6657.



W0001506

Volvo Engine

Pro-Link 9000

The Pro-Link 9000¹ with the VOLVO PCMCIA card is available from MPSI. Call 1-800-242-MPSI.

P/N 206040 Multi-Protocol Cartridge (MPC)

P/N 203031 PMCCIA (Application Card) for

P/N 104004 Pro-Link 9000

P/N 404024 6-pin Deutsch Connector

P/N 501002 Power/Data Cable

¹Pro-Link is a registered trademark of MPSI.

Service Procedures

Important: Attempts to service or replace individual gauges on the left and center modules during the warranty period will void the cluster warranty. Instead, the whole unit should be exchanged. ONLY when a trained technician is repopulating a replacement instrument cluster may the cluster be opened during the warranty period.



CAUTION

To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, do the following:

Use a wrist grounding strap and an anti-static mat when working on the instrument cluster.

Work in a clean environment.

Do not place the cluster on a metal table or any metal surface while servicing.

Failure to do the above can result in permanent damage to the printed circuit boards in the instrument cluster.

Odometer Setting (After Cluster Replacement)

The odometer and hourmeter values are stored in the cluster. Whenever a new cluster is installed, these values must be updated to reflect the mileage and engine hours of the vehicle in which the cluster is installed. This is done using the MPSI Pro-link 9000 tool with the Volvo card.

To reset either of these readings, follow the Pro-link menus to the *Reprogram EEPROM* menu, then select either the Odometer or Hourmeter Total. Change to the appropriate total.

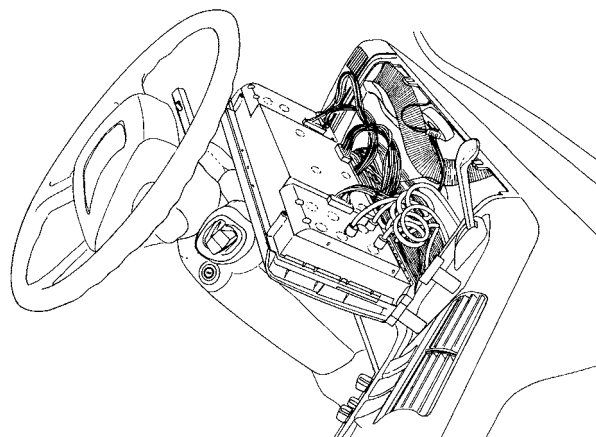
Note: Reprogramming the Odometer or Hourmeter is a password-protected function.

Instrument Cluster Light Bulb Replacement

Removal

1
Make certain the vehicle ignition is **OFF** before beginning this procedure.

2



W3000842

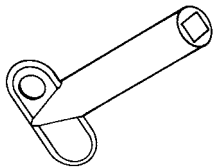


CAUTION

When servicing or troubleshooting, do not leave the cluster face-down for more than 15 minutes, or damage to the gauges may occur. Gauge oil can run out the front of the gauge faces and make the gauges inaccurate.

Adjust the steering column back where possible. Remove the two screws at the top of the instrument cluster and lay the cluster face-down on the steering column so that the bulbs are accessible.

3



W3000642

CAUTION

Use only the Volvo bulb removal tool, P/N 1089953, to remove bulbs, or damage to the cluster may occur.

Insert removal tool, P/N 1089953, onto the bulb assembly. Rotate 1/4 turn and pull the bulb assembly out of the socket.

Installation

1
Insert the new bulb assembly into the removal tool, P/N 1089953. Insert the assembly into cluster socket and rotate 1/4 turn.

Bulb Removal Tool
P/N 1089953

2
Replace the instrument cluster in the dash and tighten the 2 screws at the top of the cluster. Torque to 2 ± 0.3 Nm (17.5 ± 2.5 in-lb).

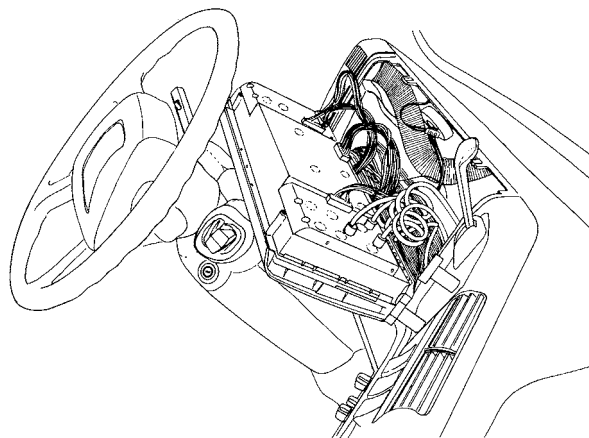
2 ± 0.3 Nm
(17.5 ± 2.5 in-lb)

Combined Instrument Cluster Replacement (Including Diagnostics)

Removal

1
Make certain the vehicle ignition is **OFF** before beginning this procedure.

2



W3000842

CAUTION

When servicing or troubleshooting, do not leave the cluster face-down for more than 15 minutes, or damage to the gauges may occur. Gauge oil can run out the front of the gauge faces and make the gauges inaccurate.

Adjust the steering column back where possible. Remove the two screws at the top of the instrument cluster and lay the cluster face-down on the steering column.

3
Cut the tie wraps fastening the wiring harness to the back of the cluster for stress relief on the connectors.

4



Never disconnect an air system component unless all system pressure has been depleted. Failure to deplete system pressure before disconnecting hoses or components may result in them separating violently and causing serious bodily injury.

Bleed all pressure from the vehicle air system. Disconnect the electrical and air connectors from the back of the cluster, and remove the cluster from the vehicle.

Installation

1

Connect electrical connectors and air lines at the back of the instrument cluster. For stress relief on the connectors, tie wrap the wiring to the back of the instrument cluster. Failure to tie wrap the wiring may cause intermittent electrical connections.

2

Install the instrument cluster in dash and tighten the 2 screws at the top of the cluster. Torque to 2 ± 0.3 Nm (17.5 ± 2.5 in-lb).

2 ± 0.3 Nm
(17.5 ± 2.5 in-lb)

Cluster Gauge Replacement (Right Side)

Removal

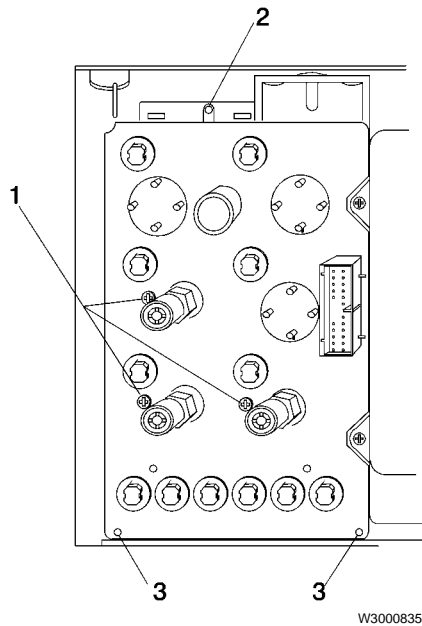
1



To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, use a wrist grounding strap and an anti-static mat when working on the instrument cluster. Failure to do so can result in permanent damage to the printed circuit boards in the instrument cluster. Do not place the cluster on a metal table or any metal surface while servicing.

Remove cluster from vehicle (see "Combined Instrument Cluster Replacement (Including Diagnostics)" page 6). Place cluster on anti-static mat. The anti-static mat must be grounded to the nearest electrical outlet. When working at the anti-static workbench, always keep a wrist strap connected to the anti-static mat.

2



1) Gauge mounting screws — do not remove at this time

2) Top cover screw location

3) Bottom cover screw location

Right printed circuit board (PCB) with cover removed

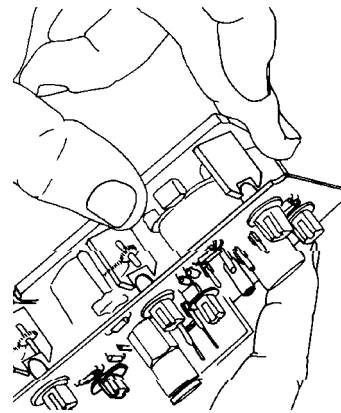
Remove the Phillips screw at the top of the right rear cover, and the two at the bottom, then lift off the cover.

Note: Do not remove any of the three Phillips screws in the board at this time. They secure the air pressure gauges to the board.

3

Lift out the Right Circuit Board assembly, with gauges.

4



W3002493

CAUTION

To avoid damaging the gauge, do not push on the needle when removing the gauge. Pushing on the needle can make the gauge inaccurate.

Air pressure gauges only: These are each secured by one Phillips screw. Remove the screw, pull the gauge out of the board and disconnect the 2-pin LED connector.

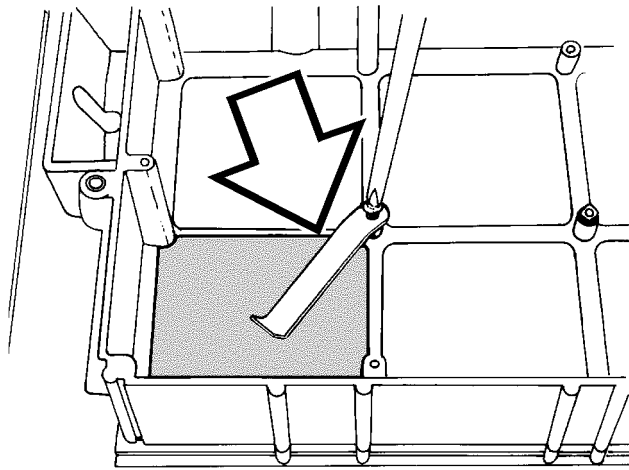
Other gauges: Gauges are held tightly by their pin sockets. To remove, grasp the side of the gauge face plate with your thumb; place your 2nd and 3rd fingers underneath the face plate (see illustration). Carefully rock the gauge from side to side while applying upward pressure until the gauge pins are free of the board sockets.

Gauge blanks: Remove the gauge blank by pulling the blank support upward until the pins are free of the board sockets, and lifting the blank from the face of the instrument cluster.

Note: Early production models may have gauge blanks held in place with a metal clip and a screw.

Removing a gauge blank

5



W3002511

Note: Early production models may have gauge blanks as shown in the illustration. If replacing any blank, use the newer gauge blank support assembly shown in the Installation procedure.

When adding a gauge blank, remove the gauge or gauge blank to be replaced.

Installation

1



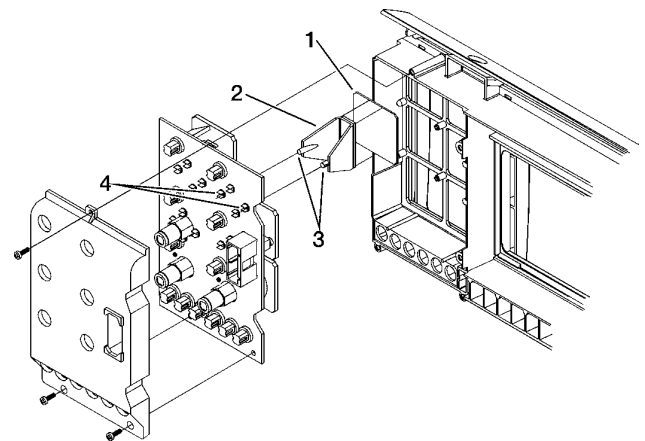
To avoid damaging the gauge, do not push on the needle when installing the gauge. Pushing on the needle can make the gauge inaccurate.

Install the replacement gauge by grasping the opposite corners of the gauge face plate and pushing the gauge pins into the socket onto the circuit board. Do not push on the needle. (For gauge blanks, see the following steps.) It is correctly installed when its face plate is flush with the other gauges' face plates.

Air pressure gauges only: Connect the 2-pin connector into the board (it is not polarity-sensitive, so it can go in either way) and secure the gauge to the board with a self-tapping Phillips screw.

Adding gauge blanks

2



W3000820

Note: If replacing any blank, use the newer gauge blank support assembly shown in the illustration.

- 1) Gauge Blank
- 2) Blank Support Assembly
- 3) Pins
- 4) Terminals

Install the new blank (1) into the cluster housing. Install the blank support (2) in the PC board into the terminals (4) where the gauge was removed.

3

If the right module contains one or more gauge blanks: Remove all gauges except the Front and Rear Air Pressure gauges. Place these gauges into their locations in the housing before replacing the Right Circuit Board assembly.

4

Place the Right Circuit Board assembly into the housing, making sure all gauge pins are lined up with their terminals on the circuit board.

5

Place the cover over the board assembly and secure with three machine screws.

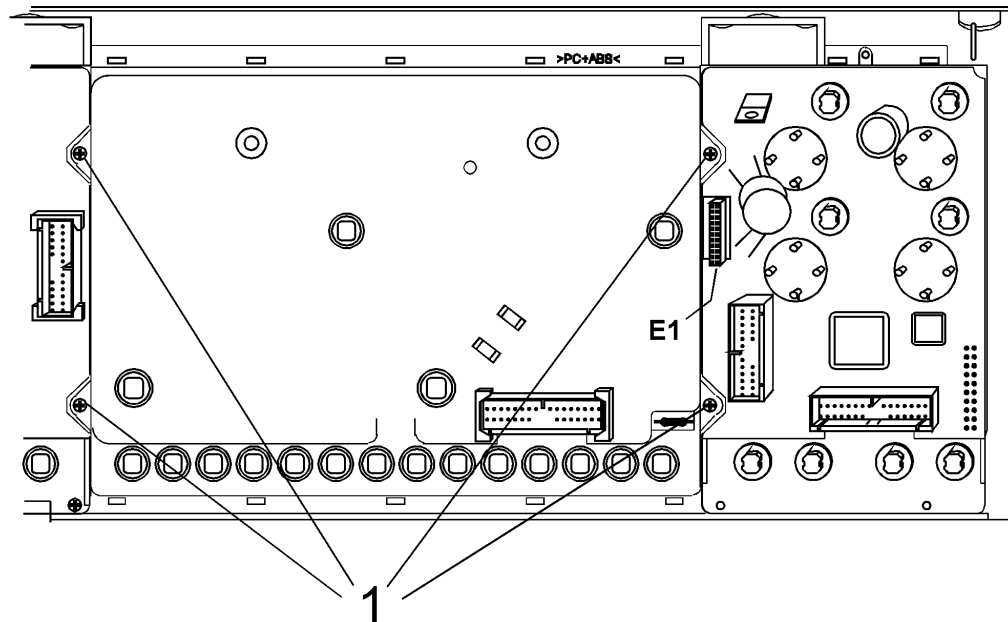
6

Install the cluster into the dash (see "Combined Instrument Cluster Replacement (Including Diagnostics)" page 6).

7

Important: If installing a gauge blank into the Engine Oil Pressure or Turbo Boost Pressure gauges, use the Pro-Link 9000 with the VOLVO card to enable the gauge which is being added, or to disable the gauge which is being removed.

Gauge Cluster Center Module Replacement



W3000739

1) Center Module screw locations


Removal

1

Important: Attempts to remove and replace individual gauges on the left and center modules during the warranty period will void the cluster warranty. Instead, the whole unit should be exchanged. ONLY when a trained technician is repopulating a replacement instrument cluster may the cluster be opened during the warranty period.

Remove cluster from vehicle (see "Combined Instrument Cluster Replacement (Including Diagnostics)" page 6). Place cluster on anti-static mat. The anti-static mat must be grounded to the nearest electrical outlet. When working at your anti-static workbench, always keep your wrist strap connected to the anti-static mat. Do not place the cluster on a metal table or any metal surface while servicing.

2

 CAUTION
To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, use a wrist grounding strap and an anti-static mat when working on the instrument cluster. Failure to do so can result in permanent damage to the cluster.

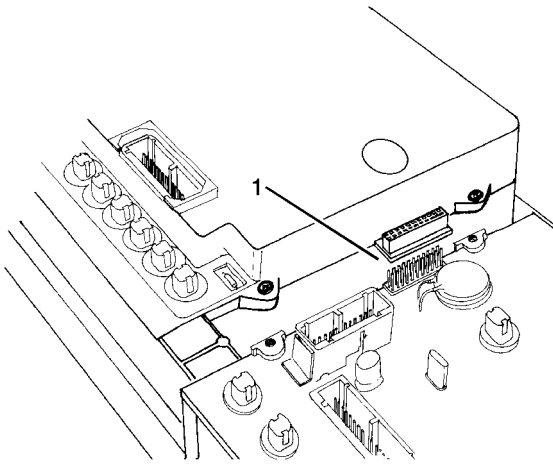
3

Remove the Phillips screws at the top of the left rear cover, and the two at the bottom, then lift the left rear cover from the cluster.

4

Remove the four Phillips cover screws.

5



W3000845

1) Connector E1



CAUTION

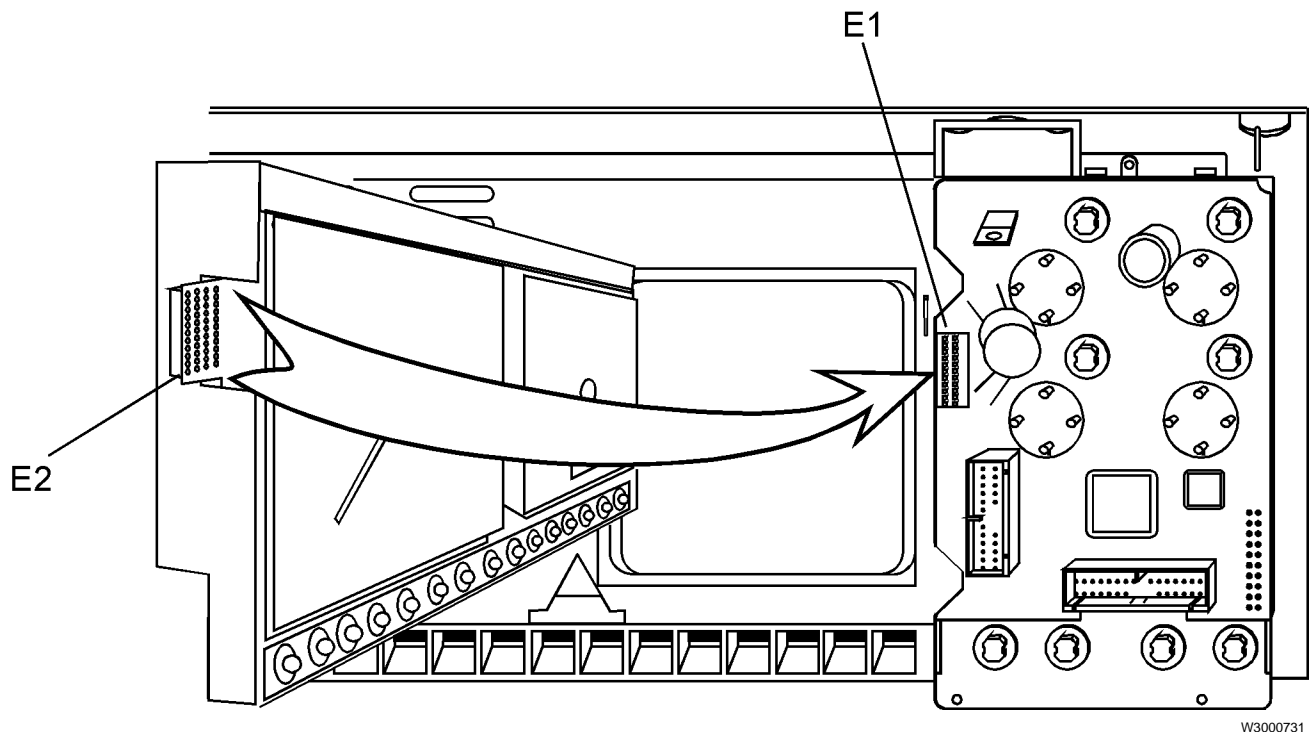
Do not bend the printed circuit board. Bending the board can result in damage to the board or components.

Grasp the top and bottom of connector E1 (over the Left Circuit Board) with your thumb and forefinger. Rock the Center Module from top to bottom while pulling up to unseat E1.

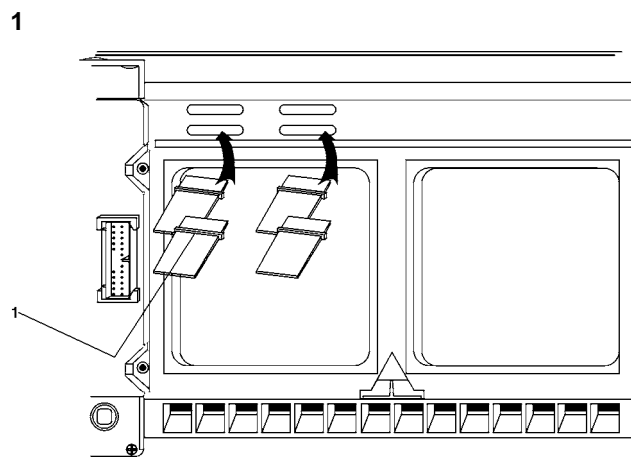
6

Remove the Center Module by lifting it off of the cluster.

Installation



W3000731



W3000846

1) Button extensions

Before reinstalling the Center Module, make sure that all four plastic button extensions are installed in the top of the housing (the short ends stick out the front of the housing).

2
To reinstall the Center Module, line up connector E1 pins with connector E2 holes on the Center Circuit Board, then carefully seat E2 while lowering the Center Module into the housing.

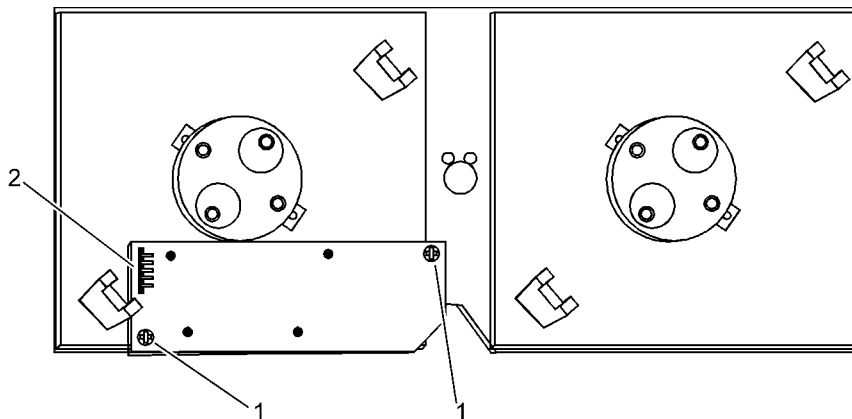
3
Verify that all E1 pins are in connector E2 holes, then use your thumb to fully seat E2 onto the Left Circuit Board.

4
Secure the Center Module to the housing with four machine screws.

5
Reinstall the left rear cover, and secure it with the three Phillips screws.

Tachometer, Speedometer and Odometer Replacement

Removal



W3002517

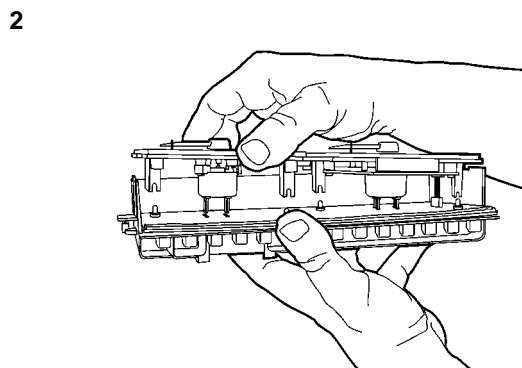
- 1 Odometer Mounting Screws
- 2 5-pin Connector

1
Important: Attempts to remove and replace individual gauges on the left and center modules during the warranty period will void the cluster warranty. Instead, the whole unit should be exchanged. ONLY when a trained technician is repopulating a replacement instrument cluster may the cluster be opened during the warranty period.

⚠ CAUTION

To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, use a wrist grounding strap and an anti-static mat when working on the instrument cluster. Failure to do so can result in permanent damage to the printed circuit boards in the instrument cluster. Do not place the cluster on a metal table or any metal surface while servicing.

Remove Center Module (see "Gauge Cluster Center Module Replacement" page 11).



W3002502

⚠ CAUTION

To avoid damaging the gauges, do not pull on the needle when removing the gauge assembly. Pulling on the needle can make the gauges inaccurate.

The gauge assembly is held tightly by pin sockets. To remove, grasp the bottom of the tach/speedo assembly with your thumb; place your 2nd and 3rd fingers underneath the face plate at the top edge of the gauge assembly. Carefully rock the assembly from top to bottom while applying upward pressure until the gauge pins are free of the board sockets.

3
 To remove the Odometer Display assembly, remove the two Phillips screws which secure it to the rear of the speedometer.

Installation

1

Reinstall the Odometer Display with the two Phillips screws, attaching it to the rear of the speedometer.

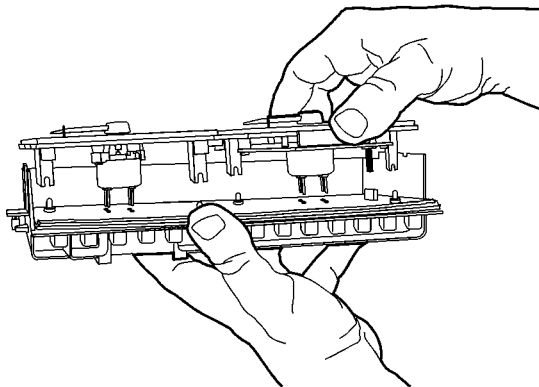
2



To avoid damaging the gauges, do not push on the needle when installing the gauge assembly. Pushing on the needle can make the gauges inaccurate.

Reinstall the tach/speedo assembly by starting the 5-pin connector into the holes in the Center Module.

3



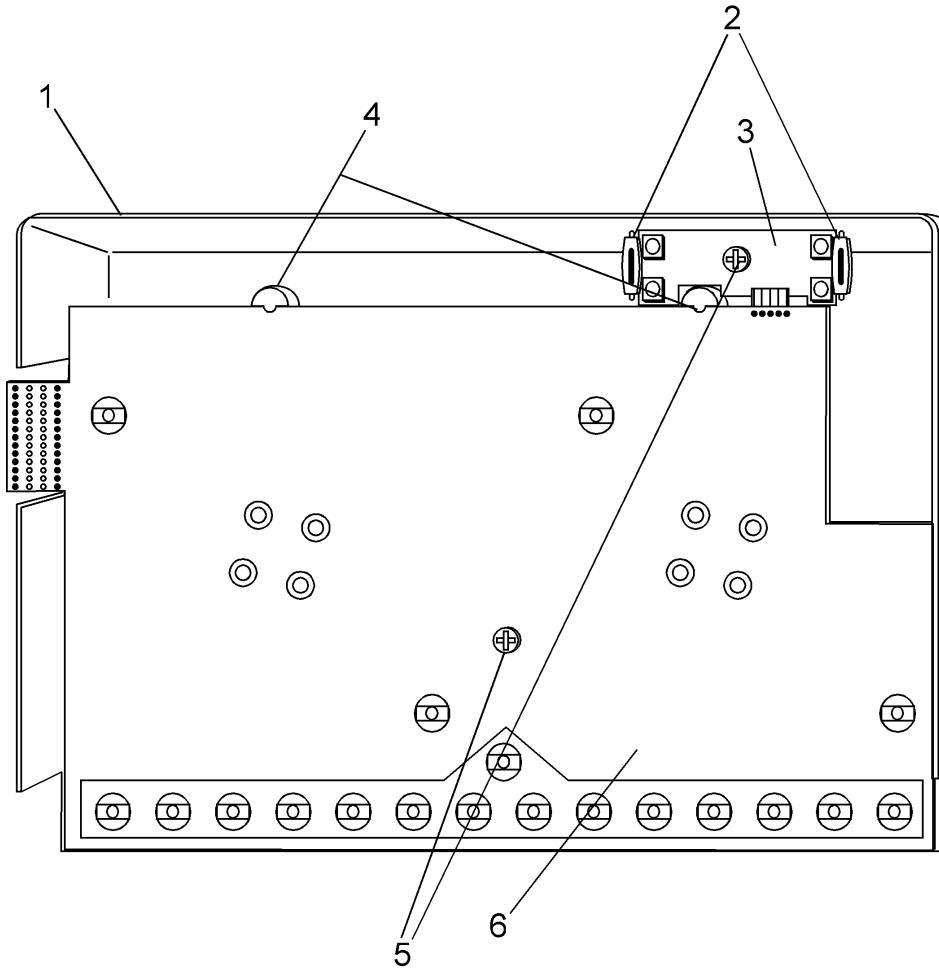
W3002503

When all five pins are inserted into the Center Circuit Board, seat the tach/speedo gauge pins while guiding the tabs on the sides of the gauges into the notches on the housing. The tach/speedo assembly is correctly installed when it is flush with the rear of the Center Board.

4

Reinstall the Center Module (see "Gauge Cluster Center Module Replacement" page 11).

Gauge Cluster Circuit Board Replacement



W3000733

- 1 Center Module Rear Cover
- 2 Rubber Bumpers
- 3 Switch Board
- 4 Retaining Tabs
- 5 Phillips Screws
- 6 Center Circuit Board

CAUTION

To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, use a wrist grounding strap and an anti-static mat when working on the instrument cluster. Failure to do so can result in permanent damage to the cluster.

2 Remove the tachometer and speedometer. See “Tachometer, Speedometer and Odometer Replacement” page 14.

3 Remove the two rubber bumpers attached to each end of the switch board.


Note: Do not discard the rubber bumpers. These will be needed for replacement.

Removal

1 Remove Center Module. See “Gauge Cluster Center Module Replacement” page 11.

4 Remove the Phillips screw near the center of the Center Circuit Board, and the Phillips screw at the center of the Switch Board assembly.

5

 CAUTION
Do not bend the printed circuit board. Bending the board can result in damage to the board or components.


Lift the bottom edge of the Center Circuit Board, one inch from the rear cover. Pull the Center Circuit Board down to clear the two small retaining tabs at the top of the board. One of the tabs is between the Center Circuit Board and the Switch Board.

6

Lift the two boards up and out as an assembly.

Installation

1

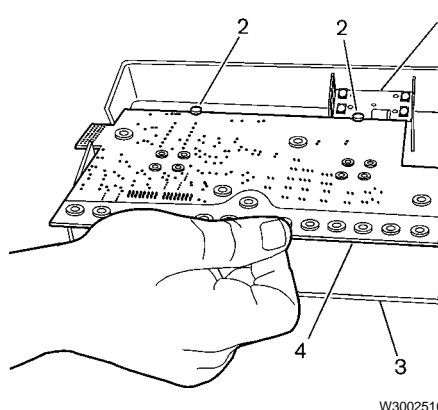
 CAUTION
Do not bend the printed circuit board. Bending the board can result in damage to the board or components.

Place the Center Circuit Board with attached Switch Board into the rear cover.

2

Lift the bottom of the Center Circuit Board away from the cover about two inches.

3



- 1 Switch Board
- 2 Retaining Tabs
- 3 Rear Center Module Cover
- 4 Center Circuit Board

With the Switch Board seated, position the top edge of the Center Circuit Board under the two plastic retaining tabs in the rear cover.

4

Seat the Center Circuit Board into the connector in the housing (the connector may be a tight squeeze past the housing). The board is fully connected when the top edge is under the retaining tabs and the bottom is flush with the bottom edge of the rear cover.

5

Reinstall the Phillips screws at the center of the Circuit Board, and at the Switch Board assembly.

6

Reinstall the rubber bumpers over each side of the Switch Board assembly.

7

Reinstall the tachometer and speedometer gauges. See "Tachometer, Speedometer and Odometer Replacement" page 14.

8

Reinstall the Center Module. See "Gauge Cluster Center Module Replacement" page 11.

Cluster Gauge Replacement (Left Side)

Important: Attempts to remove and replace individual gauges on the *left and center modules* during the warranty period will void the cluster warranty. Instead, the whole unit may be exchanged. ONLY when a trained technician is repopulating a replacement instrument cluster may the cluster be opened during the warranty period.

Removal

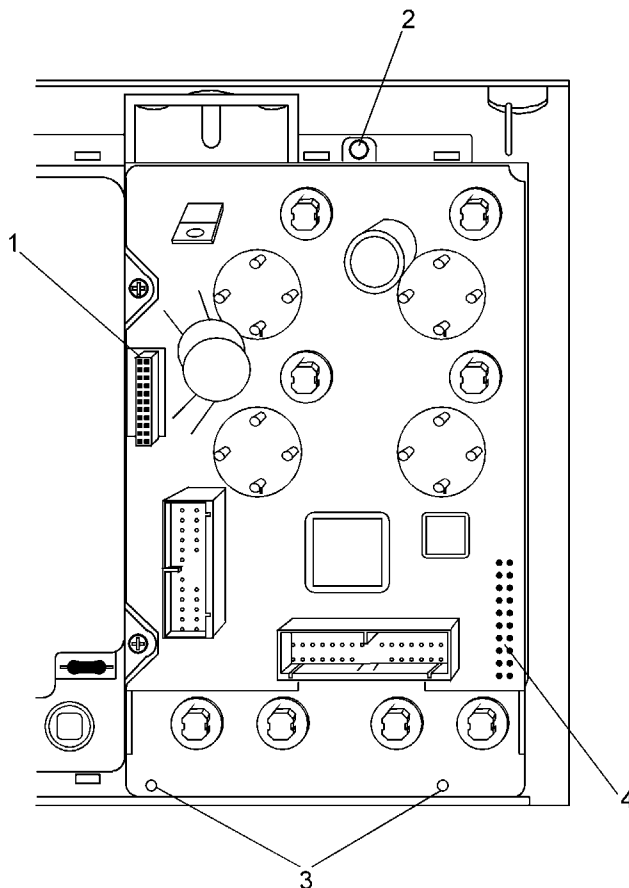
1

CAUTION

To prevent electrostatic discharge (ESD), which can damage the sensitive electronic components in the instrument cluster, use a wrist grounding strap and an anti-static mat when working on the instrument cluster. Failure to do so can result in permanent damage to the printed circuit boards in the instrument cluster.

Remove cluster from vehicle (see "Combined Instrument Cluster Replacement (Including Diagnostics)" page 6). Place cluster on anti-static mat. The anti-static mat must be grounded to the nearest electrical outlet. When working at the anti-static workbench, always keep a wrist strap connected to the anti-static mat. Do not place the cluster on a metal table or any metal surface while servicing.

2



W3000734

- 1) Connector E2 (part of the center circuit board)
- 2) Top cover screw location
- 3) Bottom cover screw location
- 4) Connector E4 to Graphic Display board underneath

Remove the Phillips screw at the top of the left rear cover, and the two at the bottom, then lift off the cover.

Note: Connector E2 is part of the Center Circuit Board.

3

! CAUTION

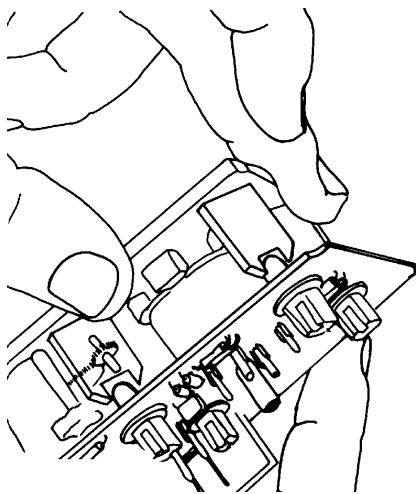
Do not bend the printed circuit board. Bending the board can result in damage to the board or components.

The Center Circuit Board connector E2 is holding the Left Circuit Board assembly in at this point, so you will have to remove the Center Module before continuing (see "Gauge Cluster Center Module Replacement" page 11).

4

Carefully lift out the Left Circuit Board assembly by lifting straight up. It is attached to the Graphic Display board below at connector E4.

5



W3000991

Fig. 1: Correct Gauge Removal

! CAUTION

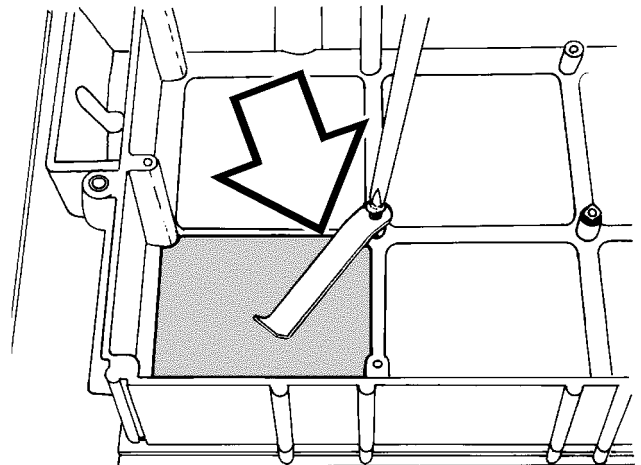
To avoid damaging the gauge, do not push on the needle when removing the gauge. Pushing on the needle can make the gauge inaccurate.

Gauges and gauge blanks are held tightly by their pin sockets. To remove, grasp the side of the gauge face plate with your thumb; place your 2nd and 3rd fingers underneath the face plate (see illustration). Carefully rock the gauge from side to side while applying upward pressure until the gauge pins are free of the board sockets.

Note: Early production models may have gauge blanks held in place with a metal clip and a screw.

Removing a gauge blank

6



W3002511

Note: Early production models may have gauge blanks like the above. If replacing a blank, use the newer gauge blank support assembly shown in the Installation procedure.

When adding a gauge blank, remove the gauge or gauge blank to be replaced.

Installation

1

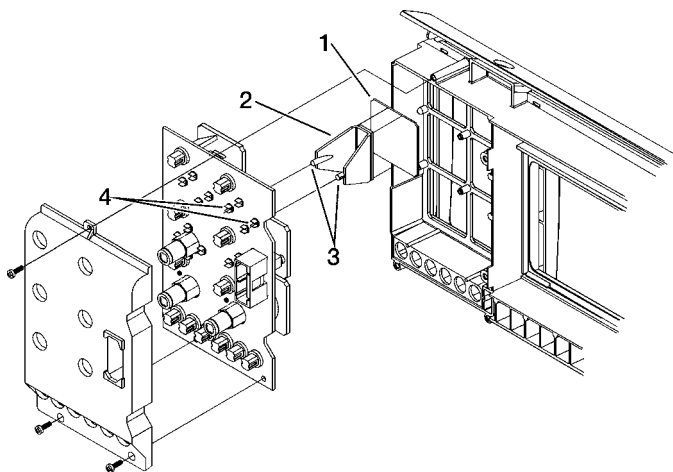


To avoid damaging the gauge, do not push on the needle when installing the gauge. Pushing on the needle can make the gauge inaccurate.

Install the replacement gauge by grasping the opposite corners of the gauge face plate and pushing the gauge pins into the socket onto the circuit board. Do not push on the needle. (For gauge blanks, see the following steps.) It is correctly installed when its face plate is flush with the other gauges' face plates.

Adding gauge blanks

2



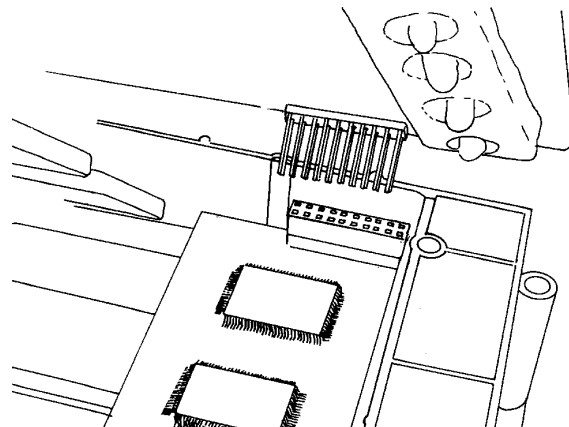
W3000820

Note: If replacing any blank, use the newer gauge blank support assembly shown in the illustration.

- 1) Gauge Blank
- 2) Blank Support Assembly
- 3) Pins
- 4) Terminals

Install the new blank (1) into the cluster housing. Install the blank support (2) in the PC board into the terminals (4) where the gauge was removed.

3



W3000750

Important! Before installing the Left Circuit Board assembly, check connector E4 pins and make sure they are all perfectly straight and parallel to each other.

4

If the left module contains one or more gauge blanks: Remove all gauges from the left module. Place these gauges into their locations in the housing before replacing the left module.

5

Place the Left Circuit Board assembly into the housing while lining up E4 pins into the Graphic Display connector.

6

Install the Center Module, paying particular attention to connector E1 on the Left Circuit Board assembly.

7

Install the left rear cover and secure it with three machine screws.

8

Install the cluster into the dash (see "Combined Instrument Cluster Replacement (Including Diagnostics)" page 6).

9

If installing a gauge blank into the Engine Oil Pressure or Turbo Boost Pressure gauges, use the Pro-Link 9000 with the VOLVO card to enable the gauge which is being added, or to disable the gauge which is being removed.

10

Important: If the Left Circuit Board has been replaced, update the odometer and hourmeter values to reflect the vehicle's actual mileage and engine hours. This is done with the Pro-Link 9000.