TRUCK SERVICE MANUAL

Body Builder Electrical Data Book

Truck Model: 3200
Truck Model: 4100
Truck Model: 4200
Truck Model: 4300
Truck Model: 4400
Truck Model: 7300
Truck Model: 7400
Truck Model: 7500
Truck Model: 7600
Truck Model: 7700
Truck Model: 8500
Truck Model: 8600

S08300, Formerly PBB-73000B

08/10/2005

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FOREWORD

Contents — In this manual, International® Truck and Engine Corporation provides information about its different products to assist those who wish to modify these products for individual applications. International does not recommend or approve any firm nor make any judgements on the quality of the work performed by a particular firm. Individuals who use the services of a body builder must satisfy themselves as to the quality of the work.

The party installing a body, a fifth wheel, any other equipment, or making any modifications to complete the vehicle for delivery and make it road-ready is responsible to see that the completed vehicle complies with all applicable certification procedures and safety standards, as may be set forth in Federal, State, and local statutes, rules and regulations.

Specifications, descriptions and illustrative material in this literature are as accurate as known at time of publication but are subject to change without notice. Illustrations are not always to scale and may include optional equipment and accessories but may not include all standard equipment.

In addition to this Body Builder Electrical Data Book, publication CT-471, Body Builder Data, may be required. The CT-471 - Body Builder Data is a set of booklets which includes a General Information Body Builder Data booklet for information about the International® Truck and Engine product line; model series Body Builder Data booklets which contain information related to the features and specifications for each of their respective models; Component Body Builder Data booklet containing information for components which have common application in two or more truck series and any supplemental Body Builder Data booklets containing information for components which have common application in two or more truck series.

INTRODUCTION

DISCLAIMER: INTERNATIONAL DOES NOT TAKE ANY RESPONSIBILITY FOR CUSTOMER OR BODY BUILDER WIRING.

NOTE – After-market installed wiring for engine speed control must comply with the following guidelines:

1. Sealed switches and connectors must be used for switches and connections that are exposed to the weather or to salt spray emanating from the vehicle's tires.
2. Route and clip wiring to minimize chafing and exposure to weather. Use conduit, loom, and/or tape to achieve this.
3. Fuse all power leads as close to the power source as possible. Remember fuses protect the wiring - size fuses accordingly.
4. All ground connections that will be made to the frame or body must be connected to clean bare metal. Remove all dirt, paint, grease and rust that would insulate the terminal from ground. After connecting the ground, seal the connection with a good quality grease or surface sealant to protect the connection from corrosion.
5. Spliced wires should be twisted together and soldered. Use a heat shrink tube with a meltable inner wall to seal the connection. Do not expose splices to the weather.

WARNING – To avoid serious personal injury, possible death, or damage to the vehicle, make sure the transmission is in neutral, parking brake is set, and the wheels are blocked before undertaking service procedures. In addition, turn off the engine when you leave the vehicle. Never leave the vehicle unattended with the engine running.

WARNING – To avoid personal injury, possible death, or damage to the vehicle when adding electrical features, disconnect batteries. Reconnect batteries when installation is complete.

- **Whenever disconnecting battery terminals, always disconnect the ground terminal first. When reconnecting, always connect the ground terminal last.**
- **To prevent injury to the eyes, face, limbs and body, it is imperative that lighted materials, flames or sparks be kept away from the vent openings of the battery. The gas mixture in the battery cells, which escapes through the vents, could ignite and/or cause an explosion. This is particularly true when jumper cables are being used.**
- **In addition, inhaling of gas produced by the normal operation of the battery could result in partial or permanent damage to the respiratory system.**
- **Always wear eye protection when working around batteries. Do not attempt to jump-start a vehicle having a frozen battery because the battery may explode. If a frozen battery is suspected, examine all fill vents on the battery. If ice can be seen, do not attempt to start with jumper cables as long as the battery remains frozen. Thaw out the battery and recharge.**
- **Do not check battery condition by shorting (flashing) across terminals.**
- **Failure to observe these instructions could result in personal injury and/or damage to the vehicle.**

Battery cable terminals must be clean and tight. Use hot water and common baking soda for removing terminal corrosion and for cleaning the top of the battery. Brighten the contact surface with steel wool, apply a light coat of lubricant sealing grease such as Fleetrite ® 472141-C1 or equivalent and reassemble. Be sure the terminals are clamped tightly and that the battery is clamped securely in place.

When working around the terminals and battery, use extra care to avoid shorting. A good practice is to insulate pliers and screwdrivers.

Contents - In this Body Builder Electrical Data Book, International® Truck and Engine Corporation provides information about its different electrical features to assist those who wish to modify these products for individual applications. This information is intended for use by properly trained, professional technicians who have the equipment, tools, safety instructions, and know-how to perform the modifications properly and safely. International does not recommend or approve any firm nor make any judgements on the quality of the work performed by a particular firm. Individuals who use the services of a body builder must satisfy themselves as to the quality of the work.

The party installing a body, a fifth wheel, any other equipment, or making any modifications to complete the vehicle for delivery and make it road-ready is responsible to see that the completed vehicle complies with all applicable certification procedures and safety standards, as may be set forth in Federal, State, and local statues, rules and regulations.

Specifications, descriptions and illustrative material in this literature are as accurate as known at time of publication but are subject to change without notice. Illustrations are not always to scale and may include optional equipment and accessories but may not include all standard equipment.

SAFETY INFORMATION

IMPORTANT – Read the following before starting the service procedure.

You must follow your company safety procedures when you service or repair equipment. Be sure to understand all of the procedures and instructions before you begin work on the unit.

International uses the following types of notations to give warning of possible safety problems and to give information that will prevent damage to the equipment being serviced or repaired.

WARNING – A warning indicates procedures that must be followed exactly. Personal injury or possible death, along with damage to the vehicle, can occur if the procedure is not followed.

CAUTION – A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur.

NOTE – A note indicates an operation, procedure or instruction that is important for correct service.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required can cause injury to service personnel or damage to vehicle components.

Group

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1. DESCRIPTION

International vehicle electrical systems are becoming increasingly complex with the addition of electronic engine and transmission controls, electronically driven instrument gauges, and anti-lock brake systems to name a few. While most systems still operate on battery voltage (12 volts), some systems operate at as high as 107 volts (electronic fuel injection) and as low as five (5) volts (electronic engine controls).

International publishes Electrical Circuit Diagram Manuals for all its models. Body builders and installers should refer to these manuals before connecting body lights and accessories to the vehicle electrical system to assure that circuits chosen are both appropriate and not overloaded. Modifications not defined in the circuit diagram book are **not** to be made to the vehicle electrical/electronic control systems without first contacting International for assistance at its Tech Central Department, telephone 1-800-336-4500.

2. ELECTRICAL ABBREVIATIONS

Table 1 Electrical Abbreviations

ABS	Antilock Brake System
A or AMP	Ampere
BOC	Back of Cab
ECU	Electronic Control Unit
ECM	Engine Control Module
ESC	Electrical System Controller
FET	Field Effect Transistor
FR	Front
GA	Gauge
GND	Ground
HVAC	Heater, Ventilation, Air Conditioner
HYD	Hydraulic
IGN	Ignition
IP	Instrument Panel
PDC	Power Distribution Center
RESCM	Remote Engine Speed Control Module
ROF	Rear of Frame
RPM	Remote Power Module
RR	Rear
SW	Switch
TEM	Truck Equipment Manufacturer
VSS	Vehicle Speed Sensor

3. COLOR CODE SYSTEM FOR INTERNATIONAL® TRUCK

Table 2 Color Code System

Color	Description
Red	Alternator/Battery Feeds
Pink	Ignition Feeds
Light Blue	Accessory Feeds
Yellow	Headlight System (Daytime Running Lights, Fog, Hi-beam, Etc.); Data Link J1939 (+)
Dark Blue	Interior Lights (Dome, Panel, Etc.); Data Link J1708 (+)
Brown	Exterior Lights (Tail, Marker, Clearance, Etc.)
Orange	Exterior Lights (Turn, Back-up, Etc.)
Gray	Engine / Chassis Systems (Fuel Solenoid, Horn, Etc.); Data Link J1708 (-)
Tan	Engine / Chassis Monitoring Systems (Gauges)
Green	Data Link J1939 (-)
Light Green	Driver Aid Systems (Windshield Washer, Heater, Etc.)
Violet	Engine Controls - Electronic
White	Ground
Black	Battery Ground Cables or Computer Data Link Systems
NOTE: The wiring in multiple conductor jacketed cable does not follow the above color code system. See the electrical circuit diagram manual for specific colors and circuit numbers used with each system. Use only “GXL", “SXL" or “TXL" insulated wire. Crimp and solder all connections.	

4. RECOMMENDED CIRCUIT PROTECTION

Table 3 Recommended Circuit Protection

Wire Gauge	Protective Device Size	Maximum Current (Amps)
18 Ga	10 AMP Fuse/ Circuit Breaker	8 A
16 Ga	15 AMP Fuse/ Circuit Breaker	12 A
14 Ga	20 AMP Fuse/ Circuit Breaker	16 A
12 Ga	25 AMP Fuse/ Circuit Breaker	20 A
10 Ga	30 AMP Fuse/ Circuit Breaker	24 A
8 Ga	12 Gauge Fusible Link	80 A
6 Ga	10 Gauge Fusible Link	108 A
4 Ga	2–12 Gauge Fusible Link	160 A

CAUTION – Wire gauge is designed to match fuse / circuit breaker rating. Do not increase the size of a circuit breaker or fuse. To do so could cause wiring to overheat and burn.

5. CIRCUIT PROTECTION DEVICES

The information in this section applies to all models except the 3200, 4200, 4300, 4400, and 7000.

Table 4 Circuit Protection Devices

Size	Circuit Breakers	Part Number	Color
7.5 A	Type III — Manual Reset	3536177C1	Brown
10 A	Type III — Manual Reset	3536178C1	Red
15 A	Type III — Manual Reset	3536179C1	Blue
20 A	Type III — Manual Reset	3536180C1	Yellow
25 A	Type III — Manual Reset	3536181C1	White
30 A	Type III — Manual Reset	3536182C1	Green
Size	**Fuses**	**Part Number**	**Color**
5 A	MINI — SAE J2077	3534208C1	Tan
7.5 A	MINI — SAE J2077	3546109C1	Brown
10 A	MINI — SAE J2077	3534209C1	Red
15 A	MINI — SAE J2077	3534210C1	Blue
20 A	MINI — SAE J2077	3534211C1	Yellow
25 A	MINI — SAE J2077	3534212C1	Natural
30 A	MINI — SAE J2077	3534213C1	Green

Circuit breakers and fuses can be installed in the chassis wiring using the following in-line connectors:

- 1676841C91 - Inline socket & cable for circuit breaker/fuse (20 A Maximum)
- 1682115C91 - Inline socket & cable for circuit breaker/fuse (30 A Maximum)

Table 5

Size	Devices	Part Number	Color
20 A	Autofuse	131224C1	Yellow
20 A	Circuit Breaker — Type III	3529688C1	
30 A	Autofuse	571691C1	Green
30 A	Circuit Breaker — Type III	3529690C1	

6. ELECTRICAL COMPONENTS COMMONLY USED BY EQUIPMENT INSTALLERS

The information in this section applies to all models except the 3200, 4200, 4300, 4400, and 7000.

Table 6

1000, 3000, 5000, 9000 Conventional	Type
At Fuse Block	
1666118C1	Terminal, Fuse Block (18/20 Gauge)
0557374C1	Terminal, Fuse Block (14/16 Gauge)
0557375C1	Terminal, Fuse Block (10/12 Gauge)
At Tail Lights	
589390C1	Seal, Wire - (Blue) .165-.138 O.D. Cable (12-14 Gauge)
589391C1	Seal, Wire - (Gray) .137-.111 O.D. Cable (14-16 Gauge)
1652325C1	Seal, Wire - (Lt Gn) .110-.080 O.D. Cable (16-20 Gauge)
1661375C2	Body Connector, 5-Way Male
1661377C1	Terminal, Female - 14/16 Gauge
1661376C1	Lock, 5-Way Male Connector
1677851C1	Body Connector, 5-Way Female
1671609C1	Terminal, Male - 14/16 Gauge
1677914C1	Lock, 5-Way Female Connector
587579C1	Sealing Plug (For Empty Connector Cavities)

NOTE – Any unused circuit cavities must be plugged with sealing plugs provided with chassis harness.

Connectors 9900 and 9910

Connectors 9900 and 9910 have their mating connectors attached filled with cavity plugs. To use connectors, remove cavity plugs and use the following:

Table 7

Terminals	**Wire Gauge**
2033912C1	12, 14
2033911C1	16, 18, 20
Cavity Seals	**Wire Gauge**
0589390C1	12
0589391C1	14
1652325C1	16, 18, 20
Mating Connector Part Nos.	
4450A Connector	2039312C91

9900 Lock	2039342C1
4460A Connector	1686834C1
9910 Lock	1671608C1

7. STANDARD TERMINALS AND SPLICES

Standard Terminals

1. Cut the cable just before the insulation wings on the terminal.
2. Remove the insulation being careful not to cut any of the wire strands.
3. Position cable in the new terminal.
4. Hand crimp the core wings first, then the insulation wings.

   NOTE – Always use the recommended crimp tool for each terminal. A detailed crimp chart is included in the repair kit.

5. Solder all hand crimped terminals and electrically check for continuity.

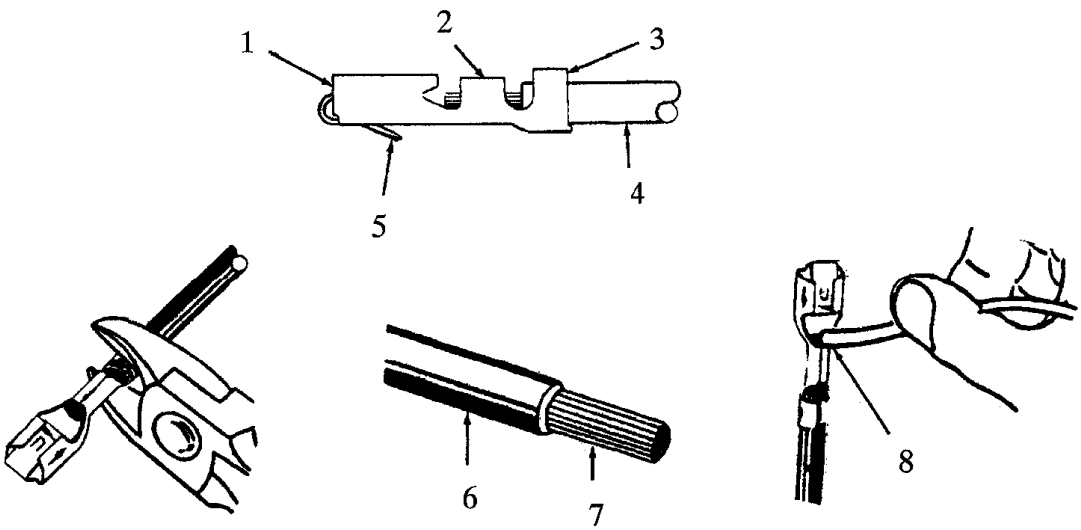


Figure 1 Standard Terminal

1. MATING END
2. CORE WINGS
3. INSULATION WINGS
4. CABLE
5. LOCK TANG
6. INSULATION
7. WIRE STRANDS
8. SOLDER

8. SPLICE INSPECTION

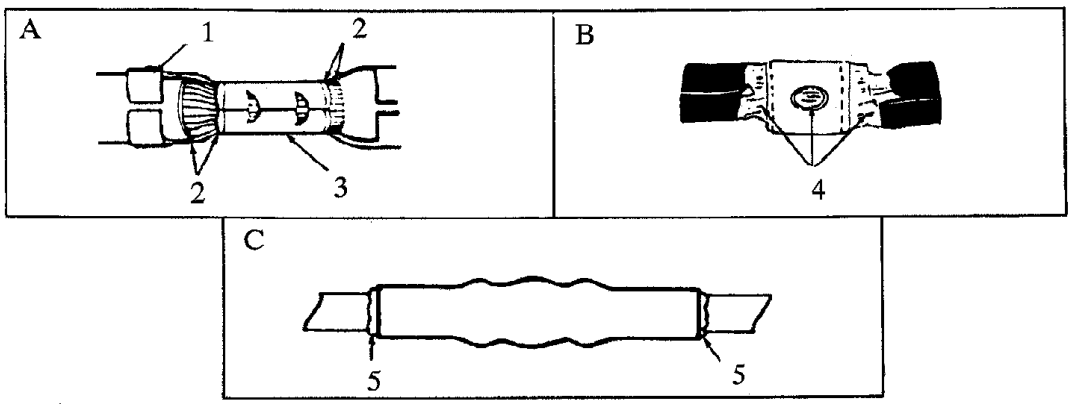


Figure 2 Splice Inspection

A. TERMINAL APPLICATION
B. SOLDER APPLICATION
C. CRIMP AND SEAL HEAT APPLICATION
1. INSULATION CRIMP
2. WIRE STRANDS VISIBLE IN THIS AREA
3. CORE CRIMP
4. GOOD SOLDER APPLICATION
5. EVIDENCE OF GLUE

9. SPLICE CLIP INSTALLATION

NOTE – A new clip must be located a minimum of 1.5 inches (40 mm) from a connector, sleeve or another clip.

1. Cut off the old clip or bad section of wire.
2. Remove the insulation being careful not to cut any of the wire strands.
3. Install the proper clip on the wire strands.
4. Hand crimp the clip until securely fastened.
5. Solder the clip and electrically check for continuity.
6. Cover the entire splice with splice tape. Extend the tape onto the insulation on both sides of the splice(s).

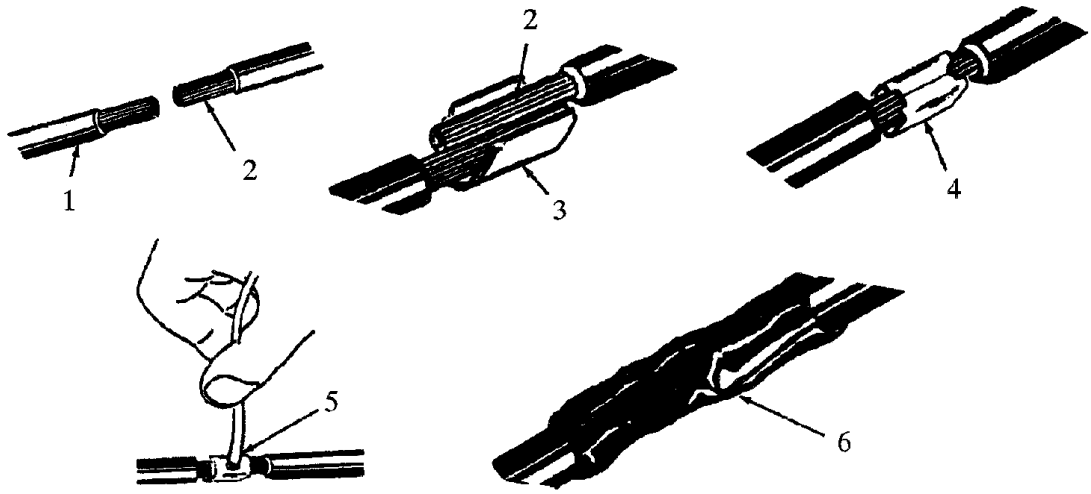


Figure 3 Splice Clip Installation

1. INSULATION
2. WIRE STRANDS
3. CLIP (POSITIONED CORRECTLY)
4. CRIMPED CORRECTLY
5. SOLDER
6. TAPE

10. CRIMP AND SEAL SPLICE SLEEVE INSTALLATION

NOTE – A new sleeve must be located a minimum of 1.5 inches (40 mm) from a connector, clip or another sleeve.

1. Cut off the old sleeve or bad section of the wire.
2. Remove insulation being careful not to cut any of the wire strands.
3. Install the proper sleeve on the wire strands, making sure the ends of the wire hit the stop.
4. Hand crimp to the sleeve. Gently tug on the wire to make sure that they are secure.

   NOTE – Always use the recommended crimp tool for each sleeve. A detailed crimp chart is included in the Repair Kit.

   CAUTION – Use appropriate heat gun. Do not use a match or open flame to heat the sleeve seal.

5. Electrically check the sleeve and wire cable for continuity.

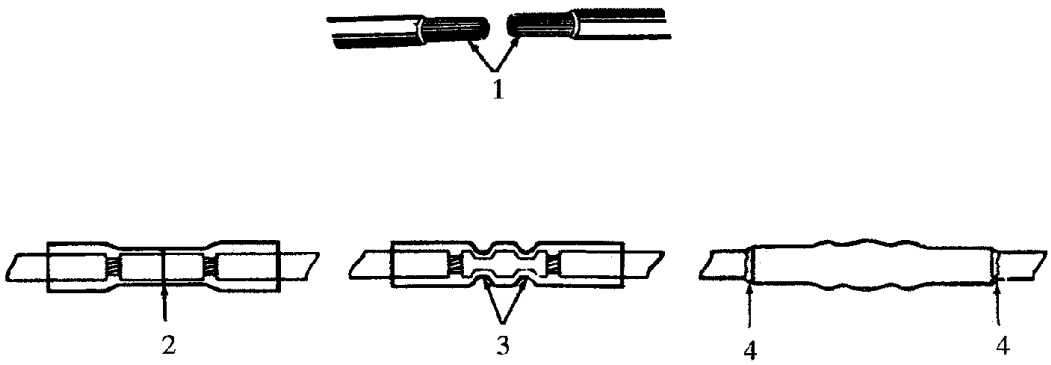


Figure 4 Crimp and Seal Splice Sleeve Installation

1. WIRE STRANDS
2. WIRE STOP
3. CRIMP CONNECTOR
4. EVIDENCE OF GLUE

11. DATA LINK REPAIR

11.1. J1708

Repairs to damaged J1708 circuits should be accomplished using similar types of wiring. Splices should be crimped and soldered. Insure the twist in the wire pair is maintained and individual wires are covered with heat shrink.

11.2. J1939/11 SHIELDED ONLY

Repairs to damaged J1939 circuits should be accomplished using identical types of wiring. Splices should be crimped, soldered and covered with heat shrink. Insure the twist in the wire pair is maintained and that any wire bundles in the engine compartment are shielded and covered with heat shrink.

11.3. WIRE REPAIR

This instruction addresses termination and splicing of J1939 wire.

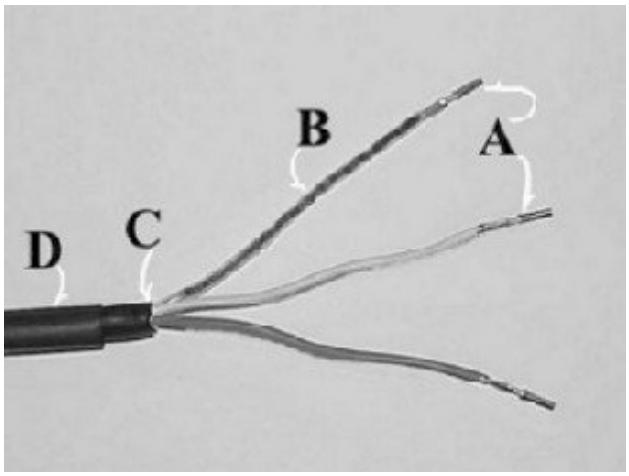


Figure 5 Preparation of J1939 Wire for Connection

1. Strip back (view C) outer shield 3 1/8 in. (76 mm).
2. Strip (view A) green wire and yellow wire 1/4 in. (6.35 mm) being careful not to cut individual strands.
3. Re-twist all three wires if they have separated.
4. Sleeve drain wire (view B) may be soldered to aid in sleeving.
5. Install terminals on green and yellow wire ends, and crimp.
6. The 1/4" heat shrink tube (view D) will be shrunk later after the wires have been inserted into the crimp connector.

12. WIRE SPLICING

Shielded Wire

1. Strip wire ends 1/4 inch.
2. Re-twist any loose wires.

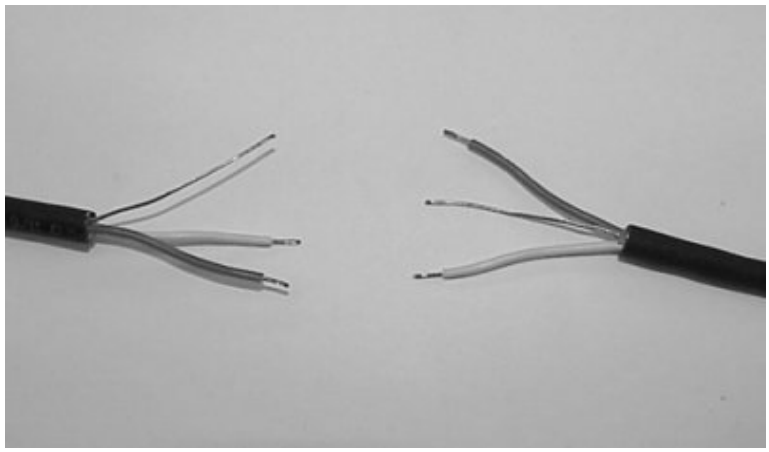


Figure 6 Re-Twist Any Loose Wires

3. Slide 2-inch pieces of heat shrink tube over wire for later use.

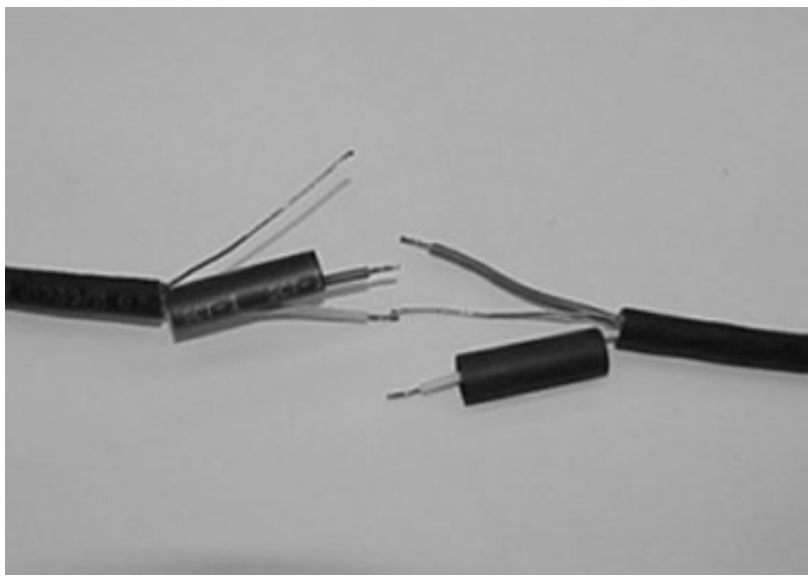


Figure 7 Put Heat Shrink Tube Over Each Wire

4. Insert ends of wires into splice joint and crimp.

5. Solder the wires and crimp joint together.

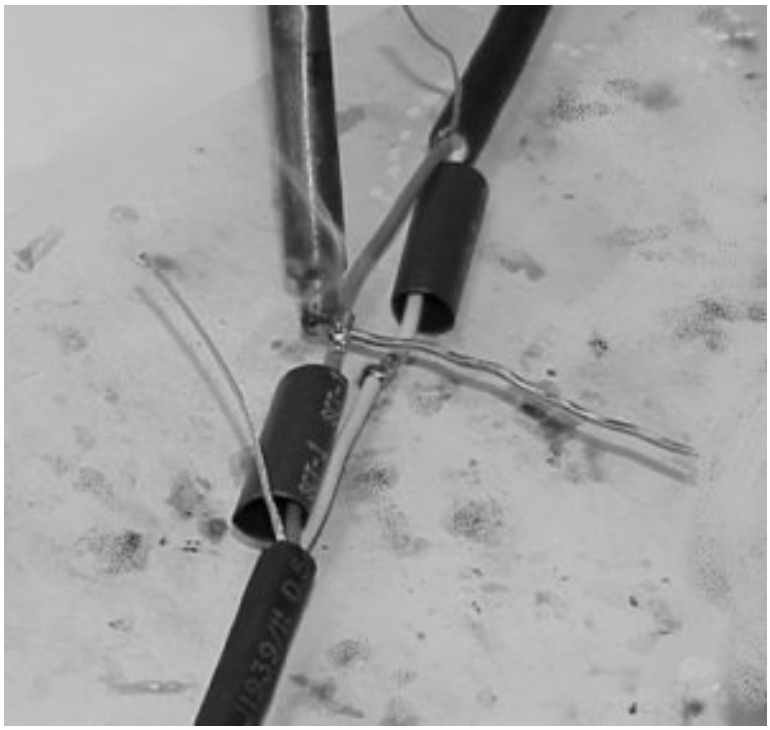


Figure 8 Solder Wires Together

6. Center heat shrink tube over splice and shrink.

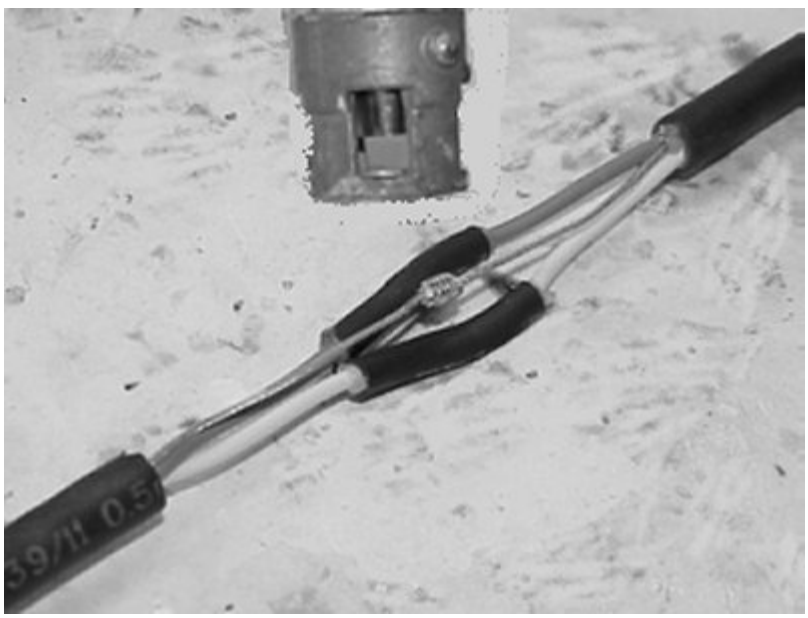


Figure 9 Center Heat Shrink Tube Over Splice

7. Wrap wires with foil tape. Maintain at least 1/2 wrap overlap.

Figure 10 Center Heat Shrink Tube Over Cable

8. Center heat shrink tube over the splice and shrink.

Figure 11 Center Heat Shrink Tube Over Cable

Non-Shield Wire

1. Strip wire ends 1/4 inch.

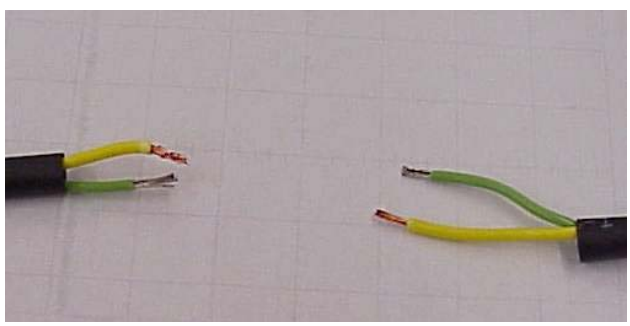


Figure 12

2. Re-twist any loose wire strands.

3. Slide 2 inch pieces of heat shrink tube over wire for later use.

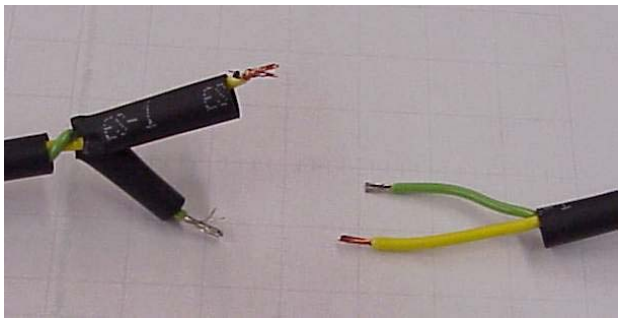


Figure 13

4. Insert ends of wires into splice joint and crimp.

5. Solder the wires and crimp joint together.

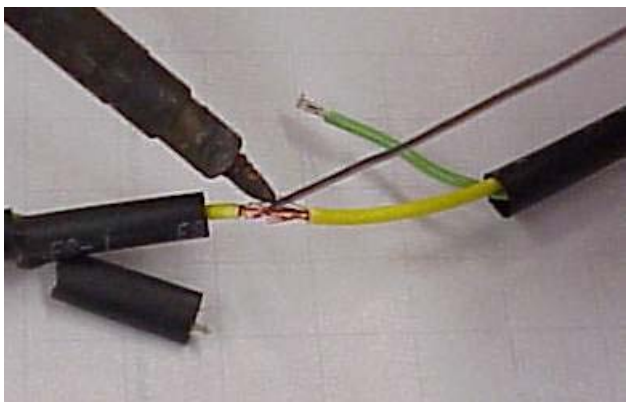


Figure 14

6. Center heat shrink tube over splice and shrink.

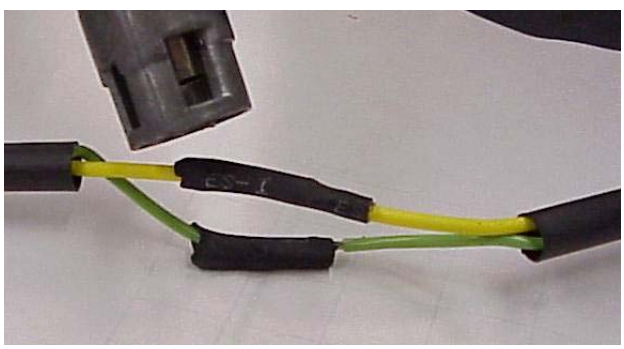


Figure 15

7. Wrap wires with electrical tape or heat shrink tubing. Maintain at least 1/2 wrap overlap.

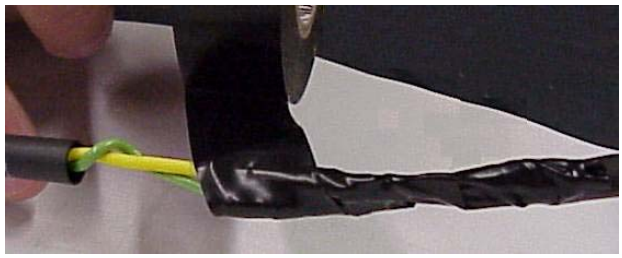


Figure 16

8. Once electrical tape or heat shrink tubing is in place, there should be no exposed wires.

Figure 17

14. J1939 HIGH SPEED DATA LINK CABLE (SAE J1939/11) - PRIOR TO JANUARY 2002

The information in this section applies to all 3200, 4200, 4300, 4400, and 7000 models.

Performing the proper repairs or modifications of the cable is critical to the integrity and performance of the vehicle systems. (For repair procedure see Electrical Troubleshooting Guide - S08250 or Data Link Repair in this manual.) This information based on SAE J1939/15 and TMC RP 142.

These instructions are intended for modifications that meet the SAE spec; i.e., no internal resistor. When extending the backbone the proper materials must be used. The data link cable consists of a twisted pair of insulated wires, covered by a metallized foil shield, a drain wire and all are covered by an insulating jacket. The data link cable must meet the SAE - specified characteristic impedance of 120 ohms. Never splice regular automotive type wire such as GXL, SXL, TXL into the data link cable. Use data link cable furnished by Raychem, part number 2021D0309.

The backbone is the main part of the cable. This is terminated at each end with a resistor. When adding a device the backbone must be extended. This is done by removing the resistor from the “Y" connector, inserting the backbone extension, then plugging the resistor and the device into the extension.

Parts required for extending backbone:

Table 8 Parts Required for Extending Backbone

Part	International Number
Y Connector	3537130C1
Resistor Cap	3537129C1
Male J1939 Connector	3537127C1
Female J1939 Terminal	3537131C1
Cavity Plug	3537132C1
Female J1939 Connector	3537128C1
Male J1939 Terminal	1659963C1

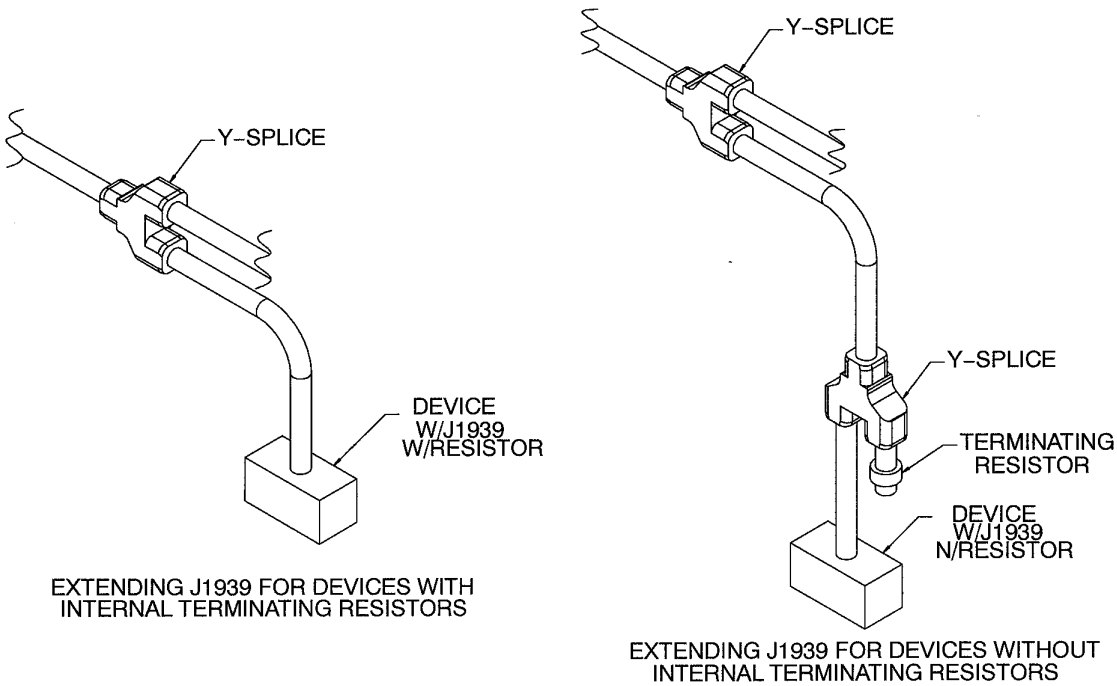


Figure 18 Extending J1939

15. J1939 HIGH SPEED DATA LINK CABLE (SAE J1939/15) - BEGINNING JANUARY 2002

The information in this section applies to all 3200, 4200, 4300, 4400, and 7000 models.

Performing the proper repairs or modifications of the cable is critical to the integrity and performance of the vehicle systems. (For repair procedure see Electrical Troubleshooting Guide - S08250 or Data Link Repair in this manual.) This information based on SAE J1939/15 and TMC RP 142.

These instructions are intended for modifications that meet the SAE spec; i.e., no internal resistor. When extending the backbone the proper materials must be used. The data link cable consists of a twisted pair of insulated wires and are covered by an insulating jacket. The data link cable must meet the SAE - specified

characteristic impedance of 120 ohms. Never splice regular automotive type wire such as GXL, SXL, TXL into the data link cable. Use data link cable furnished by Raychem, part number 2021D0309.

The backbone is the main part of the cable. This is terminated at each end with a 120 ohm resistor. When adding a device the backbone must be extended. This is done by removing the resistor, inserting the backbone extension, then plugging the resistor and the device into the extension.

The International® high performance vehicle will always have a power train J1939 system. This is for key operations that come from the factory direct. A second J1939 system is put in place for body builders and will be referred to as body builder J1939. Circuit diagrams are shown in chapter 9 of the Circuit Diagram Book (S08250) under Remote Power Units, Solenoid Packs, Remote Engine Speed Controller.

15.1. J1939

J1939 is a high speed serial communications data link. The system requires two resistor caps. the first resistor cap for body builder J1939 currently starts in the engine compartment. the second resistor cap ends where the last module is placed. the wire between these two resistors is called the backbone. The backbone cannot be longer than 131.2 feet (40m). A module can tap into the backbone. This point is called the Node. The distance between two nodes can not be less than 3.9 inches (0.1m). The cable length from the node to the module cannot be longer than 9.8 feet (3m).

With the research of the robustness of the J1939-15 lite (unshielded) International removed the shield from their high performance vehicle in January 2002. Mixing of the shielded (J1939-11) and unshielded (J1939-15) is not recommended.

15.2. ADDING BODY BUILDER J1939, POWER AND GROUND TO A HIGH PERFORMANCE TRUCK

Without any body builder J1939: Ask service parts for “Adding body builder J1939 data link"

Most of the software information is processed in the Electronic System Controller (ESC). Therefore the J1939 wires must be connected to the ESC. The Green wire, that contains a circuit number 5 and (-) in diagram books, is connected to ESC gray connector 4004 pin 35. The Yellow wire, also known as circuit number 5 (+) in the circuit diagram books, is connected to ESC Gray connector 4004 pin 34. Insert Red wire in the fuse block into cavity F2-F3. the power wire J14M in F2-E3 should already be there. Add a 5 amp fuse between F2-F3 and F2-E3. Ground wire J11-GQR needs to go onto the ground stud labeled 4005 in the diagram book located near Power Distribution Center (PDC).

CAUTION – While working on connector 4004 a strap lock will be removed. Failure to replace this will cause premature connector and wiring failure.

Continue to route with current dash harness to center chassis harness. This will route under the PDC and end at center chassis connection located near the PDC. It may be easier to follow the center chassis harness from under the cab and see where it connects to the dash harness in engine compartment. After installing the 6 way connector, refer to the circuit diagram book connector 4410.

15.3. VEHICLES EQUIPPED WITH BODY BUILDER J1939 DATA LINK

You have either added the body builder J1939 or it is already there in the dash (engine compartment). You need to decide what needs to be added to the chassis section.

The body builder data link is located under the hood near the steering shaft assembly, just below the PDC. Depending upon the level of sophistication desired, adding the components listed below can be performed by simply removing the terminating resistor cap located near the PDC and then adding the additional harness to extend the J1939 body builder data link. Complete the installation by connecting additional International designed Remote Power Modules (RPM) or remote Air Solenoid Modules.

J1939 cable - International part number 3572112R1

Resistor cap 3519178C91 for 3 way connector that mates to 1667741C1

Resistor cap 3544372C91 for 6 way connector that mates to control modules.

16. SUPPRESSION

International® strongly recommends these electromagnetic devices be electrically suppressed, when adding electromagnetic devices such as relays, magnetic switches, and solenoids.

Unsuppressed electromagnetic devices can generate large voltage spikes which are conducted into the vehicle electrical system. These voltage spikes may adversely affect customer added electronic devices and in some instances may affect International installed electronic components.

When installing electromagnetic devices, specify suppressed units. If suppressed units are not available, diode suppression may be added as shown below:

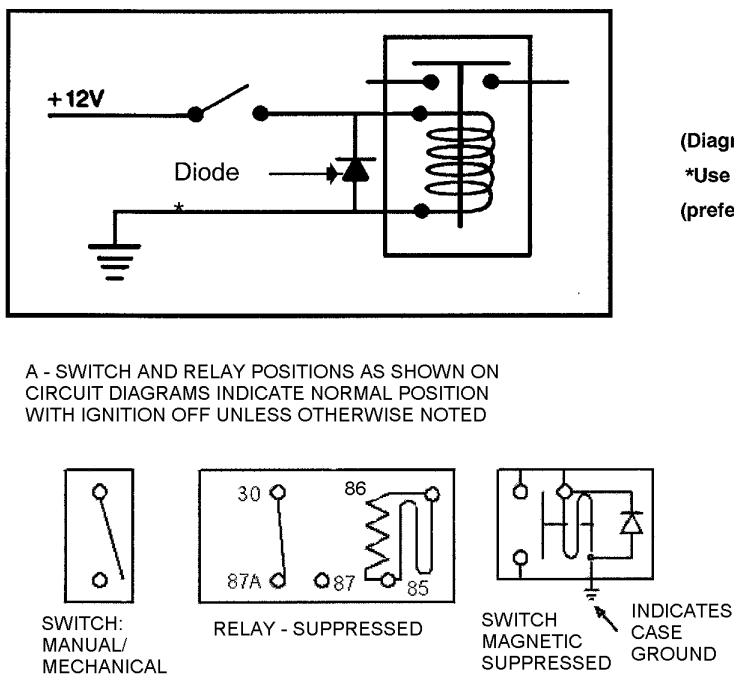


Figure 19 Adding Diode Suppression

The following suppressed relays and magnetic switches are available from International.

Table 9 Suppressed Relays and Magnetic Switches

Part Number	Description
2012557C1	Relay - Continuous Duty (Suppressed) SPDT 25 amp. (Not Sealed) - **Item A**
3505300C1	Relay - Continuous Duty (Suppressed) SPDT 25 amp (Sealed) - **Item B**
1691520C91	Magnetic Switch - Continuous Duty (Suppressed) 100 amp.
1693479C91	Magnetic Switch - Intermittent Duty (Suppressed) 100 amp.
3519350C1	Micro Relay — SPDT (Suppressed), NO — 20 Amp, NC — 10 Amp

Item A Requires:

- 1 - 593385C1 - body
- 1 - 593387C1 - lock
- 2 - 1661709C1 terminal
- 3 - 1661710C1 terminal

Item B Requires: (A/R = As Required)

- 1 - 3512331C91 - Body
- A/R - 2039343C1 - terminal (16/18 GA)
- A/R - 1652325C1 - cable seal (16/18 GA)
- A/R - 2039344C1 - terminal (14/12 GA)
- A/R - 589390C1 - cable seal (14/12 GA)
- 1 - 3515185C1 - lock
- 1 - 587579C1 - sealing plug (if needed)

17. WELDING INFORMATION

Whenever electric welding is done on any part of the vehicle, it is not necessary to disconnect the International® electronic modules in the cab such as the Electrical System Controller, Remote Power Module and the Instrument Cluster. The welder's ground must be connected as close to the weld as possible. If vehicle is equipped with an International Engine, disconnect both the positive (+) and the negative (-) battery cables including the **electronic power feeds** prior to electric welding. If it is necessary to weld close to an electronic component, it is recommended that the component be temporarily removed.

Consult manufacturers instructions for all other electronic modules such as: Allison Transmission, Eaton Auto Shift Transmission, Bendix ABS, Wabco ABS, Cummins Engine, Caterpillar Engine, Detroit Diesel Engine.

18. ROUTING GUIDELINES

- Any hosing, tubing, battery cable, wiring or electrical harness must not rub on a sharp edge. However, due to the high abrasion resistance of synflex tubing, it is permissible for synflex tubing to make contact with the lower edge of the frame rail flange when the tubing is making the transition from the outside to down and under the rail. This does not mean that proper clearance or the need for protective wrap is not needed when synflex line contacts sharp edges or threaded fasteners.
- Any hosing, tubing, battery cable, wiring or electrical harness must not rub or make contact with a hot surface. There should be 5" minimum clearance from the exhaust depending on the situation. The further back from the turbo, the less clearance required.
- Nothing should rub or make contact with the copper compressor discharge tubing other than the clamp(s) that support it.
- All hosing, tubing, battery cables or electrical harnesses should be supported at least every 18" to 20".
- Straplocks used to directly clamp or support battery cables or main engine wiring harnesses must be no less than 7/16" in width.
- Straplocks are not to be used on any bulk hose materials (heater hoses, make-up lines, etc.).

19. ELECTRICAL DOS AND DON'TS

The information in this section applies to all 3200, 4200, 4300, 4400, and 7000 models.

Table 10 Electrical Dos and Don'ts

ITEM	DO	DON'T
Accessory (power taps with key in "Accessory" mode)	a) Connect to accessory relay output in the inside cab fuse block; circuit A12B or b) Connect to optional Body Accessory relay located in the PDC, circuit R3-5.	Connect to key switch accessory output.
Battery - Clean (unfused) power and maxi-fused power feeds and ground connection points	a) Use any unused Maxi-fuse position outside Power Distribution Center or b) Use inline Maxi-holder from Mega-fuse unfused side.	a) Exceed additional 45 amps b) Exceed 3 ring terminals total on Maxi-fuse stud.
Ground	Ground additional electrical loads (customer supplied devices) to chassis or ground studs located on the dash panel.	Ground to vehicle batteries for additional loads.
Ground — with ammeter	Ground to frame or dash ground stud to allow for ammeter to register current.	Ground directly to batteries for meter signal.
Ignition (power taps with key in "Ignition")	a) Connect to the ignition relay output in the inside cab fuse block; circuit A13AH or b) Connect to the ignition relay output outside the cab PDC; circuit J13CW.	Connect circuits directly to key switch ignition circuits.
Start (power taps with key in "Start")	Connect to the starter relay input circuit J17 at the outside fuse block.	Connect circuits directly to the key switch start circuits.
Electrical System Controller (access to pinouts of discrete circuits)	Connect to ESC outputs only.	a) Exceed ESC outputs amperage refer to ESC section b) Connect to signal inputs of the ESC.
Electric City Horn	a) Connect to circuit J85AA (Dash), M85E (Forward chassis) and M85J (Horn jumper) or b) Only use suppressed type horn assembly.	Connect to Electric City Horn circuit without a diode for protection.
Air Horn (or Air Horn Accommodation)	Connect air line to output side of the solenoid pack controlled through Electrical System Controller.	Connect to input side of air switch electrical circuit.
CB Radio (or CB Accommodation)	Use power connector 2303 and CB antenna connector 2306 at CB opening in overhead console with optional code 08RCB.	Exceed 10 amps.
Radio installation for customer aftermarket radio accommodation	a) Connect to pigtail (A13B) owner/operator ignition feed b) Use a relay if load exceeds 5 amps.	Exceed 5 amps.

Table 10 Electrical Dos and Don'ts (cont.)

ITEM	DO	DON'T
Cruise / Stationary Throttle via Remote Throttle module and via hardwire for remote hook-up	Inline six engines without optional code 12VVW - Add circuit to Pins 37, 36, 32, and 31 of Engine ECM Connector 6007 depending on desired function; for 4200 with out optional code 12VYC - Add circuits to Pin X3-19, X3-20, X3-21, and X3-14 of the ECM connector depending on desired function Refer to 12VVW or 12VYC Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters for vehicles equipped with these optional codes or the remote engine speed control module.	Connect to the ESC Cruise Control Input circuits.
Engine Oil Pressure warning for remote panel display	Inline six engines without optional code 12VVW - Add circuit to Pin 54 of Engine ECM Connector 6007; for 4200 optional is unavailable; Refer to 12VVW or 12VYC Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters for vehicles equipped with these optional codes. Install discrete oil pressure sensor or tap signal off the ATA or public J1939 Data Link.	Connect directly to oil pressure sensor circuit.
Vehicle Speed output with Manual Transmission for optional feature control; i.e., sand spreader	Inline six engines without optional code 12VVW - Add circuit to Pin 58 of Engine ECM Connector 6007. For 4200 without optional code 12VYC — Add circuit to Pin 17 of Engine ECM2 Connector 6020; provides 30,000 pulse/mile output for speed. Use an isolated Dual wound sensor with manual transmission. Refer to Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters for vehicles equipped with 12VVW or 12VYC optional codes.	a) Connect into the speedometer sensor circuit on the engine. b) Wire into Speed sensor circuit on transmission. Use sensors in parallel with existing output speed sensor it will cause VSS Diagnostic Trouble Code DTC to set.
Vehicle Speed output with Automatic Transmission for optional feature control; i.e., sand spreader	Inline six engines without optional code 12VVW - Add circuit to Pin 58 of Engine ECM Connector 6007; For 4200 without optional code 12VYC — Add circuit to Pin 17 of Engine ECM2 Connector 6020; provides 30,000 pulse/mile output for speed. Refer to Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters for vehicles equipped with 12VVW or 12VYC optional codes. Allison Transmission utilizes a variable frequency pulse generated by Transmission ECU for vehicle speed information refer to Allison service information, with optional codes 13WTA or 13 WTE Connector 7205, cavity F; L92 # 167 Allison MD; Connector 7306, cavity H; L92 # 122 LCT 2000/2400.	a) Connect into the speedometer sensor circuit on the engine.

Table 10 Electrical Dos and Don'ts (cont.)

ITEM	DO	DON'T
Tachometer Signal Output for remote panel display	Inline six engines without optional code 12VVW - Add circuit to Pin 59 of Engine ECM Connector 6007; for 4200 without optional code 12VYC - Add circuit to Pin 11 of Engine ECM2 Connector 6020; provides a 12/pulse/eng rpm* Refer to Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters for vehicles equipped with 12VVW or 12VY Optional codes.	Connect into the tachometer sensor circuits on the engine.
Engine Coolant Temperature Gauge Output Signal for remote panel display	Install discrete Engine Coolant Temperature sensor. Refer to Component Information Diamond Logic™ Controller Engine Control Features and Programmable Parameters. Refer to ATA Data Link or public J1939 support Information.	Connect into Engine Coolant Temperature sensor circuits.
Alternator warning light output circuit for remote panel display	Connect wire to alternator warning light output terminal and connect the other side of the warning light circuit to ignition feed.	Connect warning light circuit to ground circuit.
Low Air warning signal for remote panel display	a) Tap into air line with additional sensor or b) Refer to public J1939 Data Link information to extract Air PSI signal.	Connect into electrical Low Air sensor circuits.
Park Brake Warning Output Signal for circuit interlock features installed	a) Tap into air line with additional switch for vehicles with air brakes or b) Connect into ESC circuit pin 4; Connector 1600 with a ground active signal Air or Hydraulic brake vehicles.	a) Connect into existing air park brake switch electrical circuit b) Exceed 200 ma total.*
Trans Warning Output signal for remote panel display	Connect wire to to ECU circuit 115 for WTC III and circuit 125 for LCT 2000/24000 transmission models. Circuit goes open to ground to actuate a remote mounted light. An external relay is required if current is .05 Amps or greater.	a) Splice into the transmission harness for signal uses b) Utilize this signal for vehicle shutdown system.
Transmission Interface (Body Builder Connections)	See PBB-43100, 4300, 4400 Models : Medium Conventional Body Builder Diagrams and PBB-50100, 7000 Series Model Medium & Heavy Conventional Body Builder Diagrams.	Splice into the transmission harness for signal uses.
Back Up Lights	Connect into body builder Connectors 4450; Cavity E circuit 71 or connect into tail light harness Connector 9303 Refer to Body Builder Connections and circuit diagrams.	Exceed 6 Amps total circuit
Clearance / Marker Lights	Connect into body builder Connector 4450; Cavity D circuit 58 or connect into tail light harness Connector 9303 Refer to Body Builder Connections and circuit diagrams.	Exceed 20 Amps total circuits.

Table 10 Electrical Dos and Don'ts (cont.)

ITEM	DO	DON'T
Dome Light	a) Connect into ESC Connector 1601; Pin C for output circuit b) Theater Dimming must be turned off in the ESC.	Connect into any door switch circuit. Exceed 10 Amps total circuit.
Fog Light	a) Connect into ESC Connector 4007; Pin A for the Fog Light output circuit. b) Fog Light accommodation must be added to the ESC.	Connect into fog light switch circuit. Exceed 15 Amps.
Headlights (including Plow Lights without Plow Light option)	Connect into Plow Light 7-way Harness connector provided with optional code 08THJ.	Connect into head light switch circuit. Exceed 20 Amps total circuit.
Panel Lights	Connect into panel lamp Buss Connector 1002 located behind the instrument panel left of the interior fuse panel.	Connect into panel dimmer switch circuit or Panel light adapter circuit A62N. Exceed 5 Amps.
Stop Lights	Connect into body builder Connector (4450 cavity B and C; circuits 56 left/ 57 right combined) (4460 cavity A and B; circuits 56 left /57 right separate) or connect into tail light harness Connector 9303. Refer to Body Builder Connections and circuit diagrams.	Connect into the stop light switch circuit at the brake pedal. Exceed 8 amps total.
Tail Lights	Connect into body builder Connector 4450; Cavity A circuits 68 or connect into tail light harness Connector 9303. Refer to Body Builder Connections and circuit diagrams.	Exceed 20 Amps Total Circuit.
Turn Signals	Connect to body builder connector (4450 cavity B and C; circuits 56 left/ 57 right combined) (4460 cavity A and B; circuits 56 left/ 57 right separate).	Connect to the input side of the turn signal switch or the electrical system controller circuit inputs. Exceed 8 amps total circuit.
Work Light	a) Connect into ESC connector 4007 PIN F Work Light Output circuit b) Work lamp accommodation must be programmed into the ESC.	Exceed 10 Amps.
Remote Power Module Connection	Connect to body builder connectors at the Remote Power Module (J3- output circuits and J4- remote inputs). Refer to Remote Power Module Section.	Exceed 20 amps per channel output with a maximum 80 amps total draw per module.

Table 10 Electrical Dos and Don'ts (cont.)

ITEM	DO	DON'T
Remote mounted Fuel Level (Low Fuel Warning)	Install additional fuel sender. Extract fuel gauge data from the Public J1939 data link.	Connect to fuel level gauge sender circuit or short existing fuel sending unit to chassis ground.
HVAC Interrupt (A/C compressor clutch & Blower fan interrupts)	Add a secondary A/C Evaporator to cool remote areas by tapping into the refrigerant lines with the authorized hoses. Use only the standard HVAC Control for controlling the A/C system.	Connect into HVAC A/C clutch circuit between the ESC and the A/C compressor clutch for purposes of controlling the A/C system. Connect to the high side of the pressure transducer or either of the A/C system thermistors.
Clutch switch	Install additional switch.	Connect into the clutch switch or circuit.
Brake Switch	a) Connect to the ESC connector 4004 Pin 21 active ground output circuit ESC must be programmed with the Separate Stop Feature. b) Install additional switch.	Connect into the brake switch or circuit.

20. HOW DO I - GENERAL INFORMATION

The International parts system is set up to give part information that is specific to a particular vehicle as built, including all optional features that were ordered. If a feature is to be added after the vehicle was built, provide the dealer with the vehicle VIN number and the feature code to be added. The dealer will contact "Parts Spec" to obtain a listing of parts required for that feature.

The circuits provided for the feature will be what are referred to as "overlay circuits" and are to be layered on and taped to existing harnesses. In some cases, a total harness may be provided. The harness may include standard wiring circuits.

The body builder will have to refer to the circuit diagram book for connector cavity information. If the decision is made to build the overlays locally, part numbers of the terminals can be found in the back of the circuit diagram book (Connector Composites section).

All hardware associated with a specific feature code, switches, brackets, etc. will be provided. The body builder must decide which parts are to be ordered – it is not required that all parts for a code be ordered. Generally, except for a few features, there are no "kits" available, hence, detailed instructions are not provided, and this section will cover some basic direction.

If a feature is not available on a specific model, a parts list will not be provided.

Some features will require reprogramming of the ESC. If unsure, contact the dealer. If reprogramming is required, the vehicle must be returned to the dealer.

If the body builder adds a feature, they must assume full responsibility for proper operation of that feature.

International parts purchased from a dealer carry a one-year, unlimited mileage warranty. Other than the one year parts warranty, International assumes no warranty for body builder installed components or the labor to repair the body builder added feature if it is determined that the failure is not OEM related.

Table of Contents

1. MULTIPLEXING ARCHITECTURE

The electrical system on these vehicles has been significantly redesigned. Unlike the electrical systems on previous models, which utilized point-to-point wiring for all input signals and output loads, this system uses multiplex technology to provide control and communication between major functional areas of the vehicle. Multiplexing simply means, communicating multiple pieces of information via a single twisted pair of wires (called the data link) without requiring a wire for each piece of information. This information could be gauge information such as engine oil pressure, or switch information that controls vehicle functions such as headlamps.

The electrical system relies on a collection of electronic circuit modules and software to perform vehicle functions instead of implementing similar features using complex wire harness designs with electromechanical relays and switches. These electronic module components are connected together by data links. The data links can be thought of as computer networks that allow the electronic components on the vehicle to communicate with one another.

The concept of multiplexing is not new since data links for communicating between engine controllers, the instrument cluster and the diagnostic connector have been used for several years.

The goal of multiplexing is to reduce cab harness wiring and to simplify circuits. This is accomplished by using a low current data link for communicating between cab switches, the Electrical System Controller and the Instrument Cluster. Other data links in the vehicle allow other electrical controllers, the ESC and the Instrument Cluster to communicate with each other.

2. DATA LINKS

International's multiplexing uses two types of data links, J1708 and J1939. The J1708 data link is often referred to as ATA and J1939 is often referred to as CAN. These two types are utilized in four separate data links on the vehicle.

- **Power Train data link – J1939**

  This data link provides a path for communication between the engine controller, transmission controller, antilock brake system (ABS) controller, pyrometer ammeter module (PAM), Electrical System Controller (ESC), auxiliary gauge switch pack (AGSP) and the electronic gauge cluster (EGC). It also provides for programming and diagnostic functions.

- **Body Builder data link – J1939**

  This data link provides a path for communication between the remote power module(s), remote PTO, air solenoid 7 pack(s) and the ESC.

- **Switch data link – J1708**

  This J1708 data link provides a path for communication between the center panel switch packs, door pods and ESC.

- **ATA data link – J1708**

  This is the same J1708 data link (sometimes referred to as ATA) that has been used in the past. This data link is used almost exclusively for communicating with the engine diagnostic and programming tool to identify engine electrical system problems or program desired settings controlled by the engine ECM.

3. ELECTRICAL SYSTEM CONTROLLER (ESC)

The heart of the multiplex system is the Electrical System Controller (ESC).

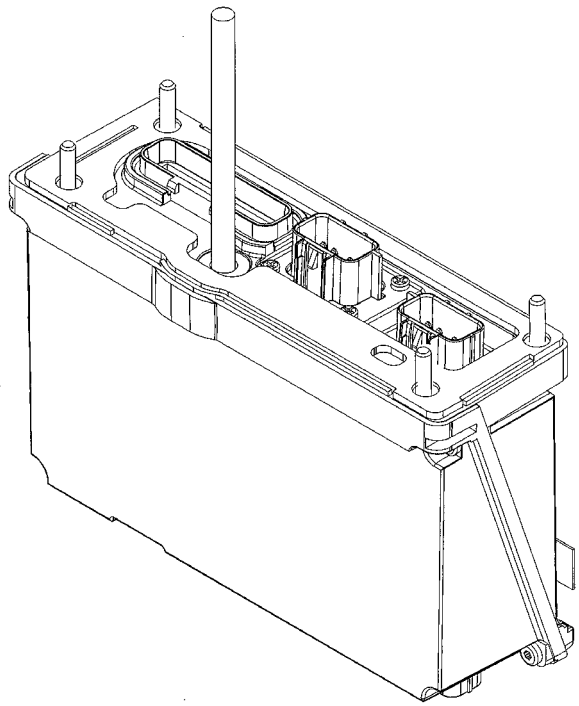


Figure 20

The ESC communicates with the switch packs on the switch data link, controllers from other features on the power train data link and remote power modules on the body builder data link. It also receives input from various sensors and hard wire inputs throughout the truck. The ESC converts these inputs, in accordance with the programmed “rules”, into data to be transmitted on the data links. It is also the power source for circuits that feed the components, controlled by the multiplexed switches, inside and outside of the cab. The primary vehicle software programming resides in the ESC.

4. REMOTE POWER MODULE (RPM)

Remote Power Modules provide a method of distributing and controlling power to various device loads on the vehicle, outside the cab, without running high current wires from in-cab switches to the loads or splicing into existing wiring.

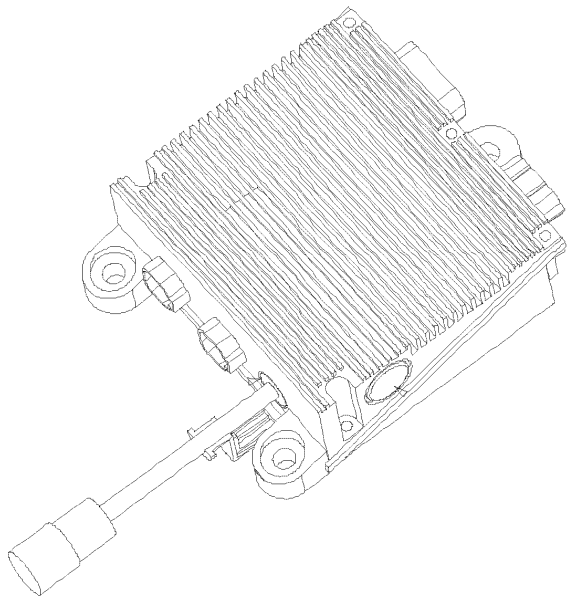


Figure 21

The RPM is connected to the Electrical System Controller (ESC) via the Body Builder J1939 data link (the ESC is capable of controlling up to three RPM's on the vehicle). The only wires connected to the RPM are battery power for driving the loads, the data link cable and connections to the load devices being operated by the RPM. Power is fed to the RPM through a fusible link to the battery source. Each RPM has 6 independently controllable, 20 Amp outputs (80 maximum per RPM) with virtual (software programmable) fusing similar to the ESC. If higher current capacity is needed, two outputs can be paralleled or the RPM can control a high current relay while still maintaining logic and diagnostic capability without having to wire to the inside of the cab.

Because the RPM is connected to the ESC via the data link, it also serves as an "integration gateway" to the ESC and the vehicle electrical system. Six inputs on each RPM allow information from body accessories to be communicated to the ESC and processed for interlocks, operator information/warning, etc. These inputs also allow the Body Builder to add body-mounted switches to turn on or off the same electrical devices controlled by in-cab switches.

Additional information concerning the use and installation of RPM's is contained in the applicable Feature sections that follow (see 60AAA / 60AAB in particular for detailed data on RPM connectors/pin functions, wiring and mounting).

The following is an example of how a vehicle electrical system might be configured.

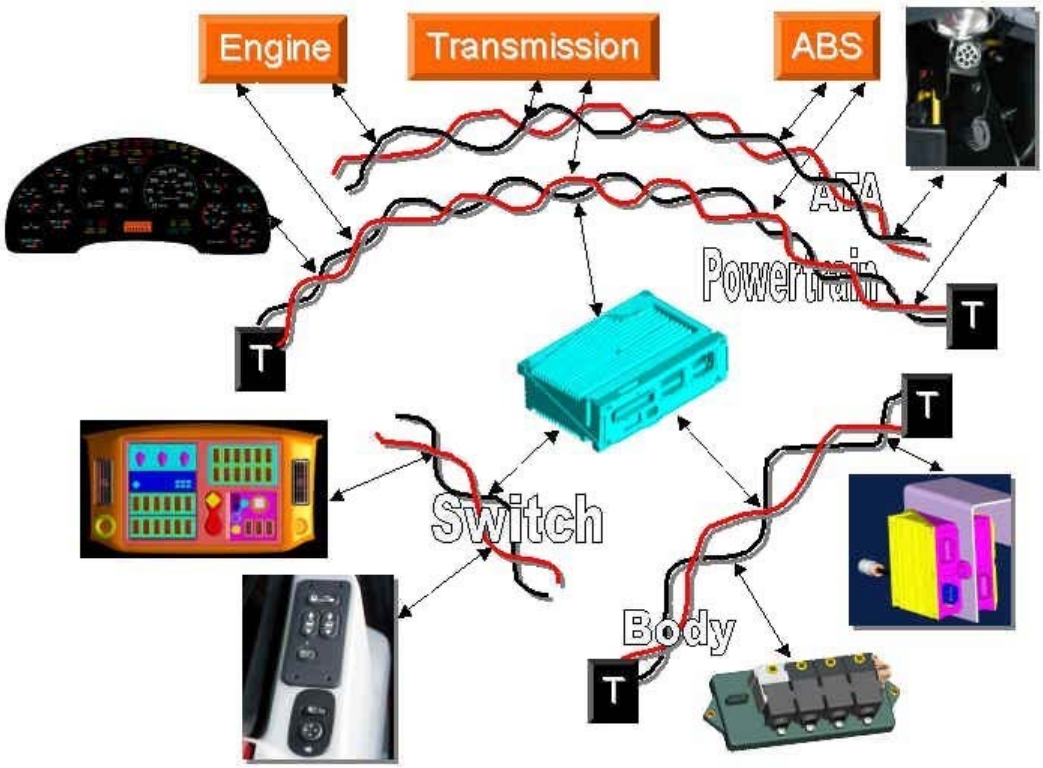


Figure 22

The International® Diamond Logic™ electrical system, along with ICAP™ and the new Diamond Logic™ Builder software, provide the body builder with an unprecedented flexibility in adding and customizing the electrical features on a vehicle.

Table of Contents

1. GENERAL

The following section provides you with basic information of how to integrate TEM's electrical systems with the vehicle electrical system. This section includes feature descriptions, programming information and sales codes where applicable. Also included is a description of how the feature works and in some cases what the feature can be used for.

If the vehicle was not ordered with the desired feature, this section covers basic information on how to add a feature to the vehicle.

An Index of Feature Codes covered in this section is included in the Table below.

Before proceeding, review the Introduction information.

Table 11 Feature Code Index

Feature Code	Description	Section	Page
04SBL	Optional Aux. Air Pressure Gauge - Hydraulic Chassis	Gauge Cluster - Optional Gauges	04SBL(See 04SBL — Instrument Cluster – Adding Gauges, page 95)
08518	Cigar Lighter	Fused Battery Connections Inside Cab	08518(See Fused Battery Connections Inside Cab — 08518, 08718, 08WCK, page 88)
08585	Auxiliary Toggle Switch for Fog or Driving Lights	Lights - Fog/ Driving Lights	08585(See 08585, 08WPL, 08WPM, 08WLM, and 08WLN, page 142)
08718	Power Source, Cigar Type Receptacle	Fused Battery Connections Inside Cab	08718(See Fused Battery Connections Inside Cab — 08518, 08718, 08WCK, page 88)
08HAA	Body Builder Wiring, End of Frame Without Connector	Lights - Stop/Turn/Tail	08HAA(See 08HAA — Body Builder Wiring At End Of Frame, page 126)
08HAB	Body Builder Wiring, Back of Cab With Connector	Lights - Stop/Turn/Tail	08HAB(See 08HAB and 08HAE — Body Builder Wiring, page 130)
08HAE	Body Builder Wiring, End of Frame With Connector	Lights - Stop/Turn/Tail	08HAE(See 08HAB and 08HAE — Body Builder Wiring, page 130)
08HAG	Electric Brake Accommodation Package for Separate Stop/Turn, End of Frame	Electric Trailer Brakes/Lights	08HAG(See 08HAG and 08HAH — Electric Trailer Brakes, page 198)
08HAH	Electric Brake Accommodation Package for Combined Stop/Turn, End of Frame	Electric Trailer Brakes/Lights	08HAH(See 08HAG and 08HAH — Electric Trailer Brakes, page 198)
08NAA	Extending Frame and Taillight Harnesses	Lights - Stop/Turn/Tail	08NAA(See 08NAA — Extending Tail Light Harnesses, page 135)
08RBK	CB Radio Antennas	CB and 2-Way Radio Connections Inside Cab	08RBK(See 08RCB and 08RBK — CB Radios, page 90)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
08RCB	CB Radio Accommodation Package	CB and 2-Way Radio Connections Inside Cab	08RCB(See 08RCB and 08RBK — CB Radios, page 90)
08REA	2-Way Radio Accommodation Package	CB and 2-Way Radio Connections Inside Cab	08REA(See 08REA and 08RGA – 2-Way Radio, page 92)
08RGA	2-Way Radio Accommodation Package	CB and 2-Way Radio Connections Inside Cab	08RGA(See 08REA and 08RGA – 2-Way Radio, page 92)
08SAJ	In Cab Switch Controls for Body Accessories, 2 RPM's (BOC)/12 Switches	In Cab Switch Controls for Body Accessories Using Remote Power Modules	08SAJ(See Remote Power Modules (RPM), page 323)
08THJ	Auxiliary Harness for Front Plow Lights	Lights - Auxiliary Front Lights	08THJ(See 08THJ — Auxiliary Harness, page 159)
08THN	Hazard Lights Override Stop Lights	Lights - Hazards Lights Override Stop Lights	08THN(See 08THN, page 173)
08THV	Front Harness for Guidepost Lights	Lights - Auxiliary Front Lights	08THV(See 08THV — Front Guide Post Lights, page 167)
08TKK	Trailer Auxiliary Feed Circuit	Fused Battery Connections Outside Cab	08TKK(See 08TKK — Trailer Auxiliary Circuit, page 85)
08TME	7 Way Trailer Socket at End of Frame	Lights - Trailer Sockets	08TME(See 08TME and 08TMG – 7-Way Trailer Socket At End Of Frame, page 138)
08TMG	7 Way Trailer Socket at End of Frame	Lights - Trailer Sockets	08TMG(See 08TME and 08TMG – 7-Way Trailer Socket At End Of Frame, page 138)
08TMH	Switched Power to Cab Roof	Lights - Other External Lighting	08TMH(See 08TMH — Switched Power to Cab Roof, page 169)
08WAD	Battery Disconnect Switch	Battery, Ignition and Accessory Taps - Battery Disconnect Switch	08WAD(See 08WAD, 08WCS, 08WHX and 08WHY — Battery Disconnect Switch, page 78)
08WCK	Power Source, 2 Post Terminal Type	Fused Battery Connections Inside Cab	08WCK(See Fused Battery Connections Inside Cab — 08518, 08718, 08WCK, page 88)
08WCS	Battery Disconnect Switch	Battery, Ignition and Accessory Taps - Battery Disconnect Switch	08WCS(See 08WAD, 08WCS, 08WHX and 08WHY — Battery Disconnect Switch, page 78)
08WEB	Extending Frame and Taillight Harnesses	Lights - Stop/Turn/Tail	08WEB(See 08WEB — Center Chassis Extension Harness, page 137)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
08WGA	Remote Air Solenoids	Remote Air Solenoid Modules	08WGA(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WGB	Remote Air Solenoids	Remote Air Solenoid Modules	08WGB(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WGC	Remote Air Solenoids	Remote Air Solenoid Modules	08WGC(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WGD	Remote Air Solenoids	Remote Air Solenoid Modules	08WGD(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WGL	Windshield Wiper Speed Control	Cab Features	08WGL(See 08WGL — Windshield Wiper Speed Control, page 428)
08WGP	Remote Air Solenoids	Remote Air Solenoid Modules	08WGP(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WGR	Remote Air Solenoids	Remote Air Solenoid Modules	08WGR(See 08WGA, 08WGB, 08WGC, 08WGD, 08WGP and 08WGR — TEM Air Solenoids, page 415)
08WHX	Battery Disconnect Switch	Battery Disconnect Switch	08WHX(See 08WAD, 08WCS, 08WHX and 08WHY — Battery Disconnect Switch, page 78)
08WHY	Battery Disconnect Switch	Battery Disconnect Switch	08WHY(See 08WAD, 08WCS, 08WHX and 08WHY — Battery Disconnect Switch, page 78)
08WHZ	Fused Battery Connections Outside Cab	Battery, Ignition and Accessory Taps - Battery Disconnect Switch	08WHZ(See 08WHZ — Body Power Feeds, page 81)
08WJA	Special 200 Amp Max Lift Gate Power Source	High Current In Cab Switch Controls For Body Accessories	08WJA(See 08WJA, 08WJB — Power Source For Lift Gate, page 392)
08WJB	Power Source For Customer Lift Gate	High Current In Cab Switch Controls For Body Accessories	08WJB(See 08WJA, 08WJB — Power Source For Lift Gate, page 392)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
08WLL	Pedestal Mounted Work Light	Lights - Work Light/Aux Rear Light	08WLL(See 08WLL (Tractor) and 08WMA (Straight Truck), page 152)
08WLM	Fog Lights (Peterson) - Amber, Oval - 4000 Series	Lights - Fog/Driving Lights	08WLM(See 08585, 08WPL, 08WPM, 08WLM, and 08WLN, page 142)
08WLN	Fog Lights (Peterson) - Clear, Oval - 4000 Series	Lights - Fog/Driving Lights	08WLN(See 08585, 08WPL, 08WPM, 08WLM, and 08WLN, page 142)
08WMA	Work Light Accommodation Package - Customer Supplied Light or Aux. Application	Lights - Work Light/Aux Rear Light	08WMA(See 08WLL (Tractor) and 08WMA (Straight Truck), page 152)
08WPK	Courtesy Lights	Lights - In Cab Lighting	
08WPL	Fog Lights - Amber, Oval - 4000 Series	Lights - Fog/Driving Lights	08WPL(See 08585, 08WPL, 08WPM, 08WLM, and 08WLN, page 142)
08WPM	Fog Lights - Clear, Oval - 4000 Series	Lights - Fog/Driving Lights	08WPM(See 08585, 08WPL, 08WPM, 08WLM, and 08WLN, page 142)
08WPZ	Test Exterior Lamps Except Back-Ups	Lights — Exterior Lamp Test	08WPZ(See 08WPZ — Test Exterior Lamps Except Back Ups, page 177)
08WRB	Headlights On With Wipers	Lights — On With Wipers	08WRB(See 08WRB — Headlights On With Wipers, page 179)
08WSK	In Cab Switch Controls for Body Accessories, 1 RPM (EOF)/6 Switches	In Cab Switch Controls for Body Accessories Using Remote Power Modules	08WSK(See Remote Power Modules (RPM), page 323)
08WSM	In Cab Switch Controls for Body Accessories, 1 RPM (BOC)/6 Switches	In Cab Switch Controls for Body Accessories Using Remote Power Modules	08WSM(See Remote Power Modules (RPM), page 323)
08WTJ	In Cab Switch Controls for Body Accessories, 1 RPM (EOF)/6 Switches	In Cab Switch Controls for Body Accessories Using Remote Power Modules	08WTJ(See 08WTJ — Switch Body Circuits Frame MTG Rear, page 371)
08XBK	Auxiliary 40 Amp Circuit, Switch Controlled	High current In Cab Switch Controls for Body Accessories	08XBK(See 08XBK — Auxiliary 40 Amp Circuit, Switch Controlled, page 390)
12VXY	Remote Mounted Engine Speed Control	Remote Engine Speed Control	12VXY(See 12VXY — Remote Mounted Engine Control, page 203)
13WTA	Allison Spare Input/Output for General Truck, Utility, Refuse, Dump, Bus and Pickup & Delivery	Automatic Transmission Interfaces	13WTA(See Automatic Transmission Interfaces, page 183)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
13WTB	Allison Spare Input/Output for Dump/Construction with Two-Speed Axle or Auxiliary Transmission	Automatic Transmission Interfaces	13WTB(See Automatic Transmission Interfaces, page 183)
13WTE	Allison Spare Input/Output for Fire Truck/ Emergency Vehicles	Automatic Transmission Interfaces	13WTE(See Automatic Transmission Interfaces, page 183)
13WTK	Allison Spare Input/Output for Sewer Evacuator	Automatic Transmission Interfaces	13WTK(See Automatic Transmission Interfaces, page 183)
13WTL	Allison Spare Input/Output for Refuse With Automatic Neutral for PTO	Automatic Transmission Interfaces	13WTL(See Automatic Transmission Interfaces, page 183)
13XAA	Dash Mounted PTO Control for Customer Provided Clutched Electric Over Air PTO	PTO	13XAA(See 13XAA — PTO Control, page 271)
16HGG	Optional Engine Oil Temperature Gauge	Gauge Cluster - Optional Gauges	16HGG(See 16HGG — Instrument Cluster – Adding Gauges, page 99)
16HGH	Optional Allison Transmission Oil Temperature Gauge	Gauge Cluster - Optional Gauges	16HGH(See 16HGH — Instrument Cluster – Adding Gauges, page 103)
16HGJ	Optional Manual Transmission Oil Temperature Gauge	Gauge Cluster - Optional Gauges	16HGJ(See 16HGJ — Instrument Cluster – Adding Gauges, page 108)
16HGL	Optional Rear Axle Oil Temperature Gauge	Gauge Cluster - Optional Gauges	16HGL(See 16HGL — Instrument Cluster – Adding Gauges, page 113)
16HGN	Optional Air Application Gauge	Gauge Cluster - Optional Gauges	16HGN(See 16HGN — Instrument Cluster – Adding Gauges, page 119)
16HKA	Optional IP Cluster display — Omit fault codes	Gauge Cluster - Optional Gauges	16HKA(See 16HKA — Instrument Cluster – Omit Fault Codes, page 123)
16WJU	Power Windows/Locks (2)	Power Windows/Locks, Remote Keyless Entry	16WJU(See 16WJU, 16WJV and 16WKZ — Electric Windows, Remote Lock and Unlock, and Use of the Aux Feature, page 191)
16WJV	Power Windows/Locks (4)	Power Windows/Locks, Remote Keyless Entry	16WJV(See 16WJU, 16WJV and 16WKZ — Electric Windows, Remote Lock and Unlock, and Use of the Aux Feature, page 191)
16WKZ	Remote Keyless Entry & Use of Aux Feature	Power Windows/Locks, Remote Keyless Entry	16WKZ(See 16WJU, 16WJV and 16WKZ — Electric Windows, Remote Lock and Unlock, and Use of the Aux Feature, page 191)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
16WLM	PTO Hourmeter for Customer Supplied PTO	PTO	16WLM(See 16WLM — PTO Hourmeter, page 279)
60AAA	Remote Power Module (1) With 6-Switch Pack	In Cab Switch Controls for Body Accessories Using Remote Power Modules	60AAA(See 60AAA (One), 60AAB (Two) — Remote Power Modules (RPM), page 356)
60AAB	Remote Power Modules (2) With 6-Switch Packs (2)	In Cab Switch Controls for Body Accessories Using Remote Power Modules	60AAB(See 60AAA (One), 60AAB (Two) — Remote Power Modules (RPM), page 356)
60ABA	Cable Shift PTO Accommodation Package	PTO	60ABA(See 60ABA – PTO Accommodation Cable Shift, page 208)
60ABB	Lectra-Shift PTO Accommodation Package	PTO	60ABB(See 60ABB – PTO Accommodation Muncie® Powerflex™ Lectra-Shift, page 214)
60ABC	Remote Start/Stop	Remote Start/Stop	60ABC(See 60ABC — Remote Start/Stop, page 304)
60ABD	Remote Start/Stop With Emergency Pump Accommodation	Remote Start/Stop	60ABD(See 60ABD — Remote Start/Stop with Emergency Pump, page 306)
60ABE	Electric Over Hydraulic PTO Accommodation Package	PTO	60ABE(See 60ABE — PTO Accommodation for Electric over Hydraulic PTO, page 231)
60ABK	Electric Over Air (Non-Clutched) PTO Accommodation Package	PTO	60ABK(See 60ABK — PTO Accommodation Electric over Air Non-Clutched, page 244)
60ABL	Electric Over Air (Clutched) PTO Accommodation Package	PTO	60ABL(See 60ABL — PTO Accommodation Electric Over Air Clutched, page 258)
60ACE	In Cab Switch Controls for High Current (40A) Body Accessories	High current In Cab Switch Controls for Body Accessories	60ACE(See 60ACE — Dual Output Latched Switch 40 Amps, page 387)
60ACG	In Cab Switch Control (1) With Vehicle Speed Interlock for Body Accessories	Interlocked Switch Controls for Body Accessories	60ACG(See 60ACG — One Interlocked Latched Switch Disengage at 30 MPH, page 400)
60ACH	In Cab Switch Controls (2) With Vehicle Speed Interlock for Body Accessories	Interlocked Switch Controls for Body Accessories	60ACH(See 60ACH — Two Interlocked Latched Switch Disengage at 30 MPH, page 406)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
60ACS	In Cab/External Switch Control (1) for Body Accessories	In Cab & External (3 way) Controls for Body Accessories	60ACS(See 60ACS — One Momentary Rocker Switch / Remote Switch Capability, page 373)
60ACT	In Cab/External Switch Controls (2) for Body Accessories	In Cab & External (3 way) Controls for Body Accessories	60ACT(See 60ACT — Two Momentary Rocker Switches/ Remote Switch Capability, page 377)
60ACU	In Cab/External Switch Controls (3) for Body Accessories	In Cab & External (3 way) Controls for Body Accessories	60ACU(See 60ACU — Three Momentary Rocker Switches/ Remote Switch Capability, page 381)
60ACW	Body Integration Input/Output Expansion Harness	Electrical System Controller (ESC)	60ACW(See 60ACW — Body Integration, I/O Expansion Harness, page 63)
60AJA	Throttle Control Accommodation for Single Customer Mounted External Engine Speed Control Switch - Recovery Applications	Remote Throttle	60AJA(See 60AJA — Remote Throttle Control Interlocked to Park Brake Applied — Recovery Only, page 281)
60AJC	Special Gauge Cluster Indicators and Alarms (Gate Open and Rear Alert) for Refuse Applications	Special Gauge Cluster Indicators and Alarms	60AJC(See 60AJC — Two Indicator Lights and Audible Alarms Programmable Mode for Various Switch Actions (Waste Solution), page 309)
60AJD	Special Gauge Cluster Indicators and Alarms (Boom Not Stowed and Outriggers Not Stowed) for Utility Applications	Special Gauge Cluster Indicators and Alarms	60AJD(See 60AJD — Body Integrated, Indicator Lights (Utility Solutions), page 315)
60AJE	Throttle Control Accommodation for Single Customer Mounted External Engine Speed Control Switch - General Purpose	Remote Throttle	60AJE(See 60AJE — Remote Throttle Control Interlocked to Park Brake Applied, page 285)
60AJG	Throttle Control Accommodation for Single Customer Mounted External Engine Speed Control Switch - Utility Applications	Remote Throttle	60AJG(See 60AJG — Remote Throttle Control Programmable Mode for Various Switch Actions, page 291)
60AJH	Remote Throttle Control for Dual Function Engine Running/Emergency Power Engine Off	Remote Throttle	60AJH(See 60AJH — Remote Throttle Control for Dual Function Engine Running / Emergency Power Engine Off, page 296)

Table 11 Feature Code Index (cont.)

Feature Code	Description	Section	Page
60AJJ	Remote Throttle Control for Customer mounted Momentary Switch - Refuse Applications	Remote Throttle	60AJJ(See 60AJJ — Remote Throttle Control Interlocked to Park Brake Applied — Refuse, page 300)
60AJK	Body Integration, Indicator Lights	Special Gauge Cluster Indicators and Alarms	60AJK(See 60AJK — Dump Box Indicator Lights And Alarm, page 319)
None	Lights On With Wipers	Lights - Lights On With Wipers	Lights On With Wipers(See Lights On With Wipers (LOWW) / Day Time Running Lights (DTRL), page 175)
None	Day Time Running Lights	Lights - Daytime Running Lights	Day Time Running Lights(See Lights On With Wipers (LOWW) / Day Time Running Lights (DTRL), page 175)
Standard	Park Brake Set Connection	ESC	Park Brake Set Connection(See Park, Dome and Brake (Stop Lamp) ESC Connections, page 66)
Standard	Brake Applied Connection	ESC	Brake Applied Connection(See Park, Dome and Brake (Stop Lamp) ESC Connections, page 66)
Standard	Dome Light Tap	ESC	Dome Light Tap(See Park, Dome and Brake (Stop Lamp) ESC Connections, page 66)

2. ELECTRICAL SYSTEM CONTROLLER (ESC)

2.1. ELECTRICAL SYSTEM CONTROLLER (3200, 4200, 4300, 4400, 7000 MODELS)

At the center of the Diamond Logic™ Electrical System is the Electrical System Controller (ESC). The ESC is an electronic module that provides multiple analog and switched input/output interfaces to monitor vehicle sensors and control vehicle functions through solid state switches, relay driver outputs and serial data communications. Serial data links connected to the ESC include:

- A Drivetrain J1939 data link to communicate information between the engine, transmission, ABS, the ESC and the instrument panel.
- A Switch Data Link for communicating switch status between the rocker switch assemblies (in the instrument panel and the switches in the door pods) and the ESC.
- A Body Builder Data Link to interface optional input/output modules with the ESC.

The ESC is located under the instrument panel on the driver's side and is attached to the cab dash panel. It has connections to the dash harness in the engine compartment and to the instrument panel harness inside the cab. The ESC receives battery power from the maxi-fuse block and ignition power from the instrument panel harness.

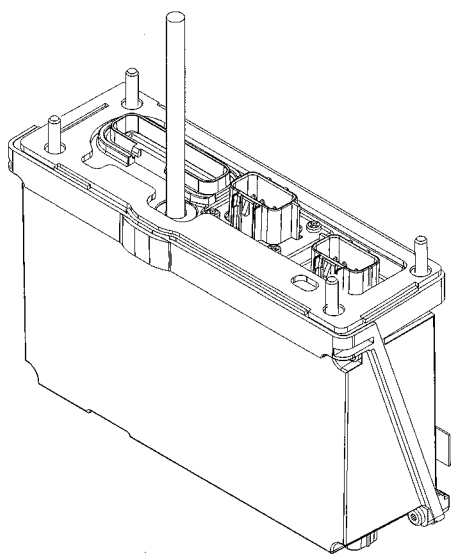


Figure 23 Electrical System Controller

NOTE – Pin 3 of the cab 36-way connector (1600) and pin 26 of the chassis 36-way connector (4004) are the Zero Volt Reference for various sensors on the vehicle and should NEVER have battery voltage applied to them. Doing so will permanently damage the ESC. Do not connect other ground signals to the Zero Volt Reference.

Standard Interface Signals

The ESC provides standard interface signals for Park Brake Set, Dome Light and Brake Applied. These interface signals are described at the end of this section.

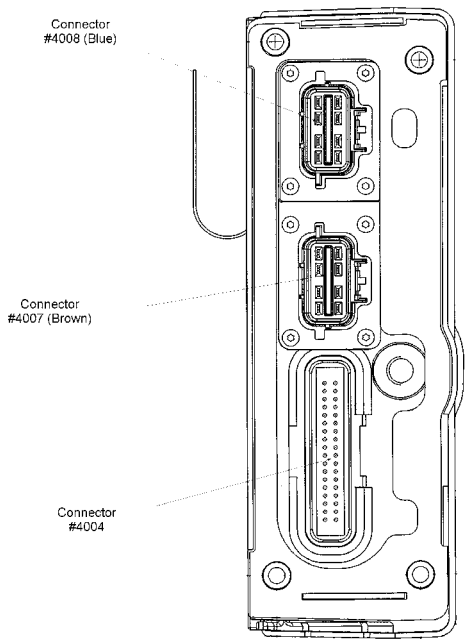


Figure 24 Engine Compartment View

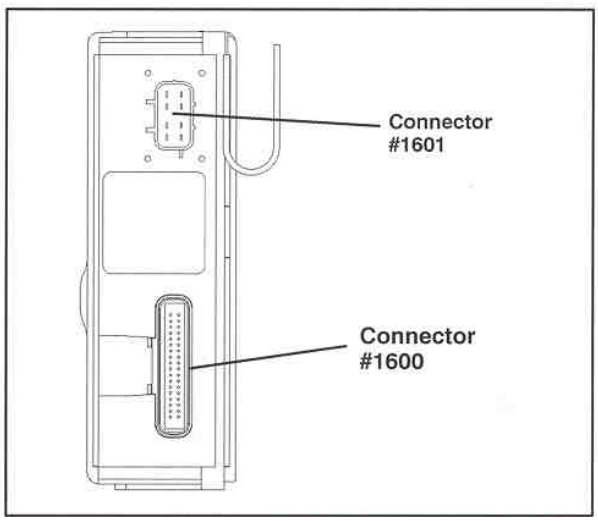
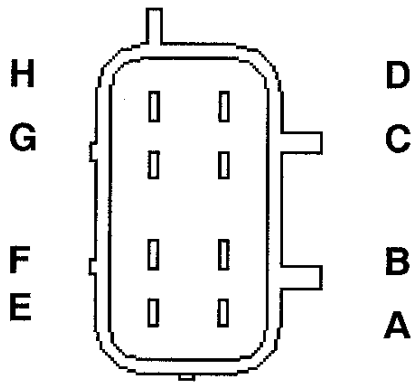


Figure 25 Inside Cab View

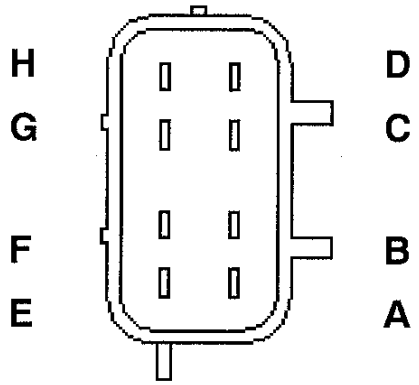
ESC Module Connectors

Table 12



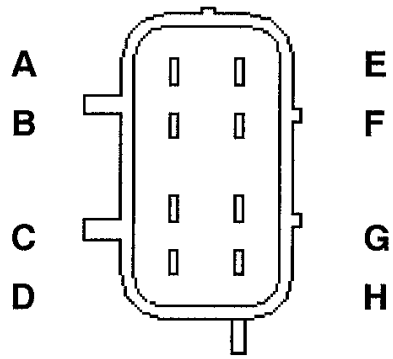
#4007 Brown Front End Output		Engine Side Bottom 8–Way Connector
Pin	Source	Description
A	20 amp FET	Fog Lamps/ Plow Lights
B	10 amp FET	Right Front Turn Signal
C	10 amp FET	Left Front Turn Signal
D	20 amp FET	Headlamp, Low Beam
E	10 amp FET	Horn, Electric
F	10 amp FET	Work Lamp
G	20 amp FET	Headlamp, High Beam
H	15 amp FET	Park/ Marker Lamps

Table 13



#4008 Blue Chassis Output		Engine Side Top 8–Way Connector
Pin	Source	Description
A	10 amp FET	Solenoid Valve Power
B	10 amp FET	Right Rear Turn Lamp
C	10 amp FET	Left Rear Turn Lamp
D	– – – –	Hyd. Pump Monitor
E	– – – –	Not used
F	15 amp FET	Windshield Wiper Power
G	10 amp FET	AC Compressor Clutch
H	– – – –	Not used

Table 14



#1601 Brown Inside Cab Output		Inside Cab 8–Way Connector
Pin	Source	Description
A	Relay Driver	Various
B	Ground	Ground
C	10 amp FET	Dome Lamps
D	20 amp FET	Fog Lamps/ Plow Lights
E	Relay Driver	Various
F	10 amp FET	Work Lamps
G	20 amp FET	Mirror Heaters
H	15 amp FET	Park/ Marker Lamps

Module Connector #1600 Inside The Cab

WARNING: NO CONNECTIONS OR SPLICES ARE ALLOWABLE ON ANY SIGNALS THAT ARE HIGHLIGHTED IN BOLD ITALIC BELOW.

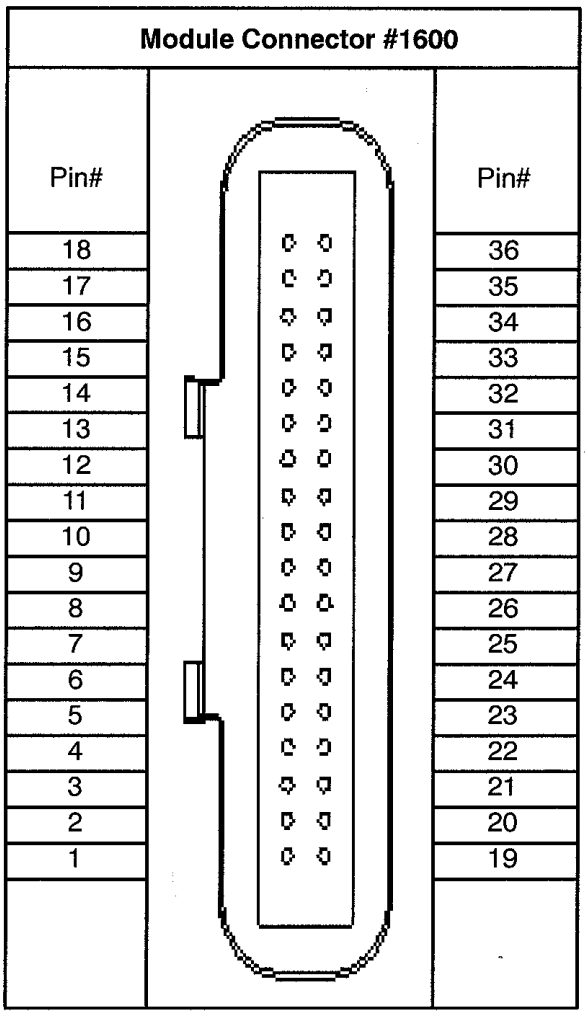


Figure 26 Inside Cab Mating View

Table 15

#1600 In-Cab		Air Chassis		Hydraulic Chassis	
36–Way Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
1	Chassis Ground	Connect to Ground Stud	Connect to Ground Stud	Connect to Ground Stud	Connect to Ground Stud
2	***Input (12v Active)***	***Accessory Key Switch***	***Accessory Key Switch***	***Accessory Key Switch***	***Accessory Key Switch***
3	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***
4	Output (Gnd Active)	Park Brake	Park Brake	Park Brake	Park Brake
5	Input (Gnd Active)	Air Horn Switch Signal	Air Horn Switch Signal	Air Horn Switch Signal	Air Horn Switch Signal
6	Output (Gnd Active)	Trans. Park Interlock	Not used	Trans. Park Interlock	Not used
7	***Input (Gnd Active)***	***A/C Request***	***A/C Request***	***A/C Request***	***A/C Request***
8	***Input (Gnd Active)***	***HVAC Diagnostic***	***HVAC Diagnostic***	***HVAC Diagnostic***	***HVAC Diagnostic***
9	Input (Gnd Active)	Not used	Not used	Not used	Not used
10	***Input (Gnd Active)***	***Cruise Control Switches***	***Cruise Control Switches***	***Cruise Control Switches***	***Cruise Control Switches***
11	Output (Gnd Active)	Not used	Not used	Not used	Not used
12	***Input (12v Active)***	***Ignition Key Switch***	***Ignition Key Switch***	***Ignition Key Switch***	***Ignition Key Switch***
13	***Input (Gnd Active)***	***Electric Horn Switch***	***Electric Horn Switch***	***Electric Horn Switch***	***Electric Horn Switch***
14	***Input (12v Active)***	***Headlight Enable***	***Headlight Enable***	***Headlight Enable***	***Headlight Enable***
15	***Input***	***Primary Air Pressure Sensor***	***Primary Air Pressure Sensor***	***Auxiliary Air Pressure Sensor***	***Auxiliary Air Pressure Sensor***
16*	Input	***Secondary Air Pressure Sensor***	***Secondary Air Pressure Sensor***	Secondary Air Sensor	Secondary Air Sensor
17	Input (Gnd Active)	Not used	Clutch Switch Input	Not used	Clutch Switch Input
18	***Input (Gnd Active)***	***Right Turn Signal Switch***	***Right Turn Signal Switch***	***Right Turn Signal Switch***	***Right Turn Signal Switch***

#1600 In-Cab		Air Chassis		Hydraulic Chassis	
36–Way Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
19	***Input (Gnd Active)***	***Left Turn Signal Switch***	***Left Turn Signal Switch***	***Left Turn Signal Switch***	***Left Turn Signal Switch***
20	***Input (Gnd Active)***	***High Beam Switch***	***High Beam Switch***	***High Beam Switch***	***High Beam Switch***
21	***Input (Gnd Active)***	***Flash to Pass Switch***	***Flash to Pass Switch***	***Flash to Pass Switch***	***Flash to Pass Switch***
22	***Input (Gnd Active)***	***Wiper_0 Switch***	***Wiper_0 Switch***	***Wiper_0 Switch***	***Wiper_0 Switch***
23	***Input (Gnd Active)***	***Wiper_1 Switch***	***Wiper_1 Switch***	***Wiper_1 Switch***	***Wiper_1 Switch***
24	***Input (Gnd Active)***	***Wiper_2 Switch***	***Wiper_2 Switch***	***Wiper_2 Switch***	***Wiper_2 Switch***
25	***Input (Gnd Active)***	***Door Switches***	***Door Switches***	***Door Switches***	***Door Switches***
26	Input (Gnd Active)	Spare Input	Spare Input	Spare Input	Spare Input
27	***Output (5 v, 100m Amp)***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***
28	***Input (Gnd Active)***	***Windshield Wash Switch***	***Windshield Wash Switch***	***Windshield Wash Switch***	***Windshield Wash Switch***
29	***Switch Data Link + 1708***	***Switch Data Link +***	***Switch Data Link +***	***Switch Data Link +***	***Switch Data Link +***
30	***Switch Data Link – 1708***	***Switch Data Link –***	***Switch Data Link –***	***Switch Data Link –***	***Switch Data Link –***
31	Input (Gnd Active)	Spare Input	Spare Input	Spare Input	Spare Input
32	***Input (Gnd Active)***	***Park Brake Switch***	***Park Brake Switch***	***Park Brake Switch***	***Park Brake Switch***
33	***Input (Gnd Active)***	***Brake Analog Switch***	***Brake Analog Switch***	***Brake Switch***	***Brake Switch***
34	Drive Train J1939+	Drive Train J1939+	Drive Train J1939+	Drive Train J1939+	Drive Train J1939+
35	Drive Train J1939–	Drive Train J1939–	Drive Train J1939–	Drive Train J1939–	Drive Train J1939–

#1600 In-Cab		Air Chassis		Hydraulic Chassis	
36–Way Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
36	Drive Train J1939 Shield	Drive Train J1939 Shield	Drive Train J1939 Shield	Drive Train J1939 Shield	Drive Train J1939 Shield

* The circuit attached to this pin should NOT have additional connections or splices added on an air chassis.

Note: All outputs will handle up to a 500 mAmp load unless stated otherwise.

Note: Circuits labeled “Gnd Active", “12v Active", or “5v Active” are open circuit until active.

No connections or splices are allowable on any signals that are highlighted in bold italic.

Module Connector #4004 Outside The Cab

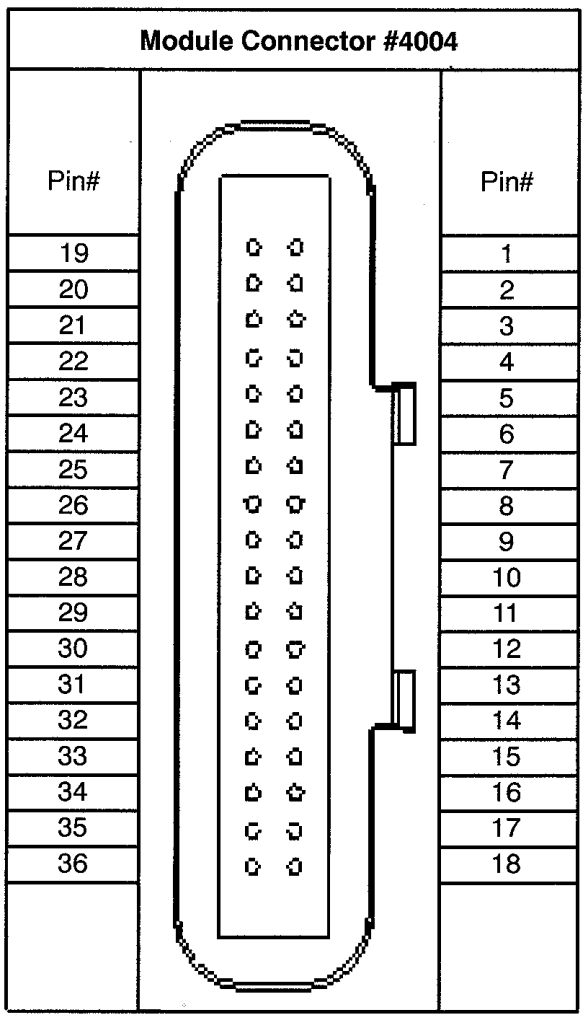


Figure 27 Outside Cab Mating View

Table 16

#4004 Chassis		Air Chassis		Hydraulic Chassis	
Harness Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
1	***Input***	***RR Axle Oil Temp. Sensor***	***RR Axle Oil Temp. Sensor***	***RR Axle Oil Temp. Sensor***	***RR Axle Oil Temp. Sensor***
2	***Input***	***FR Axle Oil Temp. Sensor***	***FR Axle Oil Temp. Sensor***	***Not used***	***Not used***
3	***Input***	***PTO Hour Meter***	***PTO Hour Meter OR Manual Transmission Oil Temp***	***PTO Hour Meter***	***PTO Hour Meter OR Manual Transmission Oil Temp***
4	***Input***	**Fuel Level #2 Sensor**	**Fuel Level #2 Sensor**	**Fuel Level #2 Sensor**	**Fuel Level #2 Sensor**
5	***Input***	***Fuel Level #1 Sensor***	***Fuel Level #1 Sensor***	***Fuel Level #1 Sensor***	***Fuel Level #1 Sensor***
6	***Input***	***AC Outlet Temp. Sensor***	***AC Outlet Temp. Sensor***	***AC Outlet Temp. Sensor***	***AC Outlet Temp. Sensor***
7	***Input***	***AC Inlet Temp. Sensor***	***AC Inlet Temp. Sensor***	***AC Inlet Temp. Sensor***	***AC Inlet Temp. Sensor***
8	***Input***	***HVAC High Side Xducer***	***HVAC High Side Xducer***	***HVAC High Side Xducer***	***HVAC High Side Xducer***
9	Input (Gnd Active)	Not used	Not used	Not used	Not used
10	Input (Gnd Active)	Reverse Gear Monitor for Lift Axle (7000 Series)	Reverse Gear Monitor for Lift Axle (7000 Series)	Not used	Not used
11	***Input (12v Active)***	***Water in Fuel Warn Light***	***Water in Fuel Warn Light***	***Water in Fuel Warn Light***	***Water in Fuel Warn Light***
12	***Input (Gnd Active)***	***Low Washer Fluid W/L***	***Low Washer Fluid W/L***	***Low Washer Fluid W/L***	***Low Washer Fluid W/L***
13	***Input (12v Active)***	***Brake Application Air***	***Brake Application Air***	***ABS Drive Axle Event***	***ABS Drive Axle Event***
14	***Input (Gnd Active)***	***Fuel Filter Plugged W/L***	***Fuel Filter Plugged W/L***	***Fuel Filter Plugged W/L***	***Fuel Filter Plugged W/L***
15	***Input (12v Active)***	***Neutral Switch***	***Neutral Switch***	***Neutral Switch***	***Neutral Switch***
16	***Input (Gnd Active)***	***Park Brake Status***	***Park Brake Status***	***Park Brake Status***	***Park Brake Status***
17	Output (Gnd Active)	Trailer Marker Relay	Trailer Marker Relay	Trailer Marker Relay	Trailer Marker Relay

#4004 Chassis		Air Chassis		Hydraulic Chassis	
Harness Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
18	Input (Gnd Active)	Not used	Not used	Not used	Not used
19	Output (Gnd Active)	AutoNeutral Relay/ PRNDL Interlock	Not used	AutoNeutral Relay/ PRNDL Interlock	Not used
20	Output (Gnd Active)	Wiper Relay High	Wiper Relay High	Wiper Relay High	Wiper Relay High
21	Output (Gnd Active)	Separate Stop Relay	Separate Stop Relay	Separate Stop Relay	Separate Stop Relay
22	Output (Gnd Active)	4 Pack Solenoid Chan 3	4 Pack Solenoid Chan 3	4 Pack Solenoid Chan 3	4 Pack Solenoid Chan 3
23	Output (Gnd Active)	Lift Axle 1 (7000 Series)	Lift Axle 1 (7000 Series)	***ABS Warning Lamp/ Test***	***ABS Warning Lamp/ Test***
24	Output (Gnd Active)	4 Pack Solenoid Chan 2	4 Pack Solenoid Chan 2	4 Pack Solenoid Chan 2	4 Pack Solenoid Chan 2
25	Output (1 Amp) (12v Active)	Fuel Transfer Pump	Fuel Transfer Pump	Fuel Transfer Pump	Fuel Transfer Pump
26	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***	***Zero Volt Reference***
27	***Output (5 v, 100 mAmp)***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***	***Sensor 5 Vdc Out***
28*	Output (1 Amp) (12v Active)	Not used	Not used	***Hydromax Cont. High***	***Hydromax Cont. High***
29	Output (Gnd Active)	Wiper Speed Low	Wiper Speed Low	Wiper Speed Low	Wiper Speed Low
30	Output (Gnd Active)	4 Pack Solenoid Chan 4	4 Pack Solenoid Chan 4	4 Pack Solenoid Chan 4	4 Pack Solenoid Chan 4
31	Output (Gnd Active)	4 Pack Solenoid Chan 1	4 Pack Solenoid Chan 1	4 Pack Solenoid Chan 1	4 Pack Solenoid Chan 1
32	Output (Gnd Active)	Lift Axle 2 (7000 Series)	Lift Axle 2 (7000 Series)	Not used	Not used
33	***Input (Gnd Active)***	***Brake Analog Switch***	***Brake Analog Switch***	***Brake Analog Switch***	***Brake Analog Switch***
34	Body Data Link +	Body Link J1939+	Body Link J1939+	Body Link J1939+	Body Link J1939+
35	Body Data Link –	Body Link J1939–	Body Link J1939–	Body Link J1939–	Body Link J1939–

#4004 Chassis		Air Chassis		Hydraulic Chassis	
Harness Connector		Pin Description		Pin Description	
Pin	Type	Automatic Transmission	Manual Transmission	Automatic Transmission	Manual Transmission
36	Body Data Link Shield	Body Link J1939 Shield	Body Link J1939 Shield	Body Link J1939 Shield	Body Link J1939 Shield

* The circuit attached to this pin should NOT have additional connections or splices added on a hydraulic chassis.

Note: All outputs will handle up to a 500 mAmp load unless stated otherwise.

Note: Circuits labeled “Gnd Active", “12v Active", or “5v Active” are open circuit until active.

No connections or splices are allowable on any signals that are highlighted in bold italic.

2.2. 60ACW — BODY INTEGRATION, I/O EXPANSION HARNESS

FEATURE CODE DESCRIPTION:

BODY INTG, I/O EXPANSION HARNESS (for Diamond Logic Builder Only) includes a harness with five blunt cut wires routed on lower left of instrument panel. Two ground active inputs and two (0.5 Amp) relay driver outputs are provided.

FEATURE / BODY FUNCTION:

This feature is an Input/Output expansion feature for Diamond Logic Builder to be utilized by Body Builders. This expansion feature provides the following: (2) digital inputs and (2) relay driver outputs to the ESC. Inputs, (2) relay driver outputs and (1) zero-volt reference (ZVR) on the ESC as well as an expansion overlay harness that is part of the Instrument Panel (IP) harness. The expansion overlay harness grants access to these inputs, outputs and ZVR by providing blunt cut wires that are strapped to the main IP harness trunk near the J1939 diagnostic connector on the interior of the cab. The overlay harness was designed to be long enough to allow the wires to be inserted into the 48–way passthru connector if desired.

Description of each digital input:

- Ground active inputs,

Digital Input 1: pin 26 of ESC connector #1600

Digital Input 2: pin 31 of ESC connector #1600

Refer to #1600 connector pinout for pinout description.

Description of each relay driver output:

- 0.5 Amp relay driver output,

NOTE – The following pins are NOT assigned with 595283. Digital Logic must be used to assign these pins.

Relay Driver Output 1: pin A of ESC connector #1601

Relay Driver Output 2: pin E of ESC connector #1601

Refer to #1601 connector pinout for pinout description.

Description of ZVR:

- Allows for the return of D.C. current from an external sensor or switch.

CAUTION – Do not connect any additional electrical loads to ZVR. Adding non-approved electrical loads may adversely affect total electrical operation.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

Software Feature Codes that MUST be added: 595283

Software Feature Codes that MUST be removed: NONE

There are no customer or body builder programmable features associated with this feature.

WIRING INFORMATION:

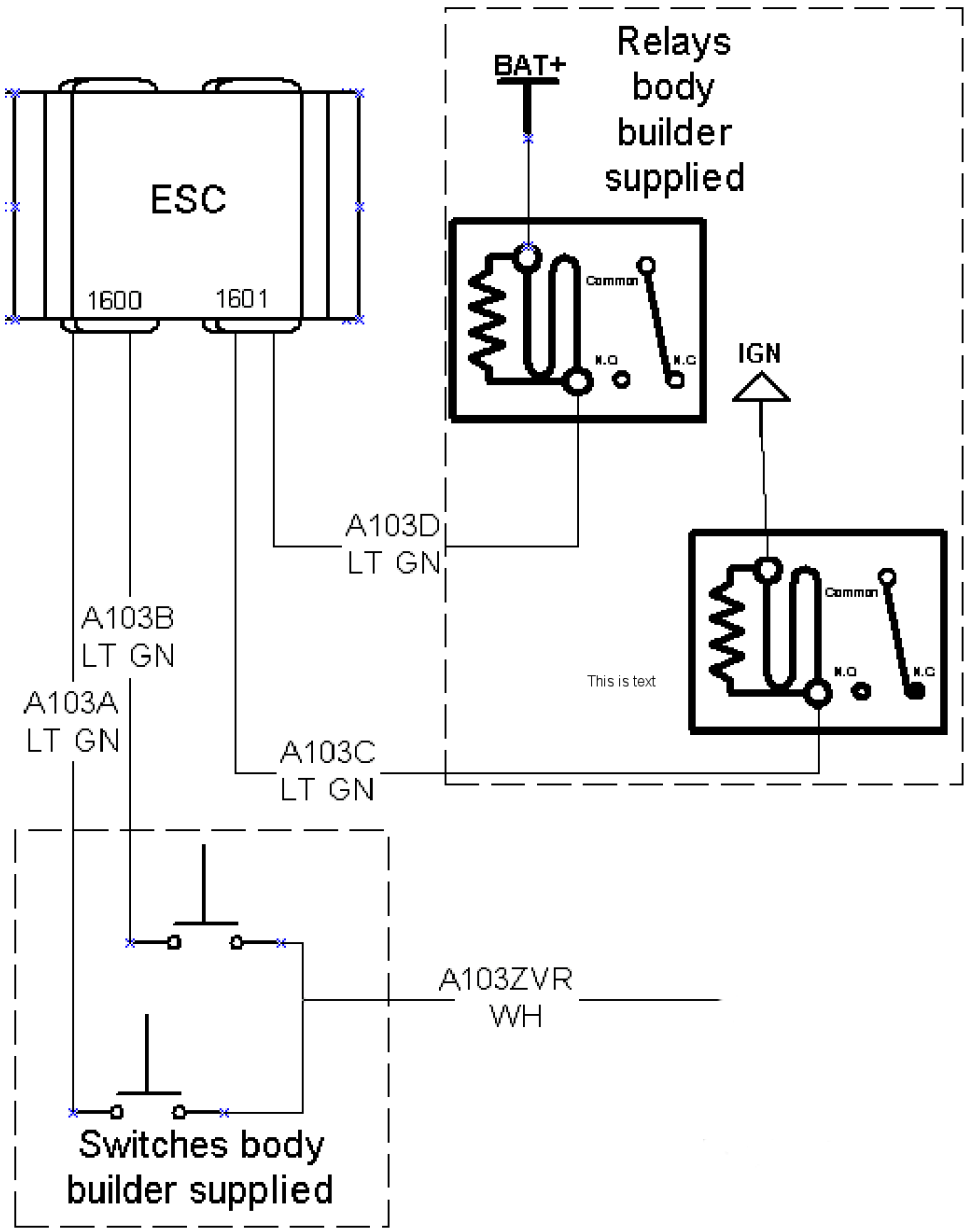


Figure 28 Circuit example for 060ACW

TESTING:

Use Diamond Logic™ Builder software to program and test drivers and inputs.

HOW DO I ADD THIS FEATURE:

Connect wiring harness to ESC and switches or relays as shown in Example Circuit. Customer is responsible for proper connectors to ESC and switches or relays.

Use Diamond Logic™ Builder software to program and test drivers and inputs.

2.3. PARK, DOME AND BRAKE (STOP LAMP) ESC CONNECTIONS

Part of General Electrical System Code (08000)

FEATURE CODE DESCRIPTION:

ELECTRICAL SYSTEM 12-Volt, Standard Equipment

FEATURE / BODY FUNCTION:

International provides location to obtain a “Park Brake Set” and with some features a “Brake Applied” signal is available.

CAUTION – Care must be taken when splicing into the dome lamp circuit; do not splice into the door switch circuits. The door switch circuits go to the ESC and do not function the same as vehicles less ESC.

CAUTION – If a stop lamp circuit is required do not splice into the circuits that go to the brake switches (air or hydraulic). Circuits that come from the, low current, brake switches must not be altered, any attempt to alter will result in system trouble.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

Software Feature Codes that MUST be added: 595014, 595015, 595021, and 595024

Software Feature Codes that MAY be added: 595137 and **595162**

Software Feature Codes that MUST be removed: NONE

** Feature Code 595162 automatically sets the rear chassis light parameters that are set at 0.5 Amp to 0 Amp. This feature code is primarily used for customers with LED style lights. This is done because LED style lights operate at less than 0.5 amps, therefore, if the open and low current parameters were still set to 0.5 amps, the system would register a fault code, even if the lights were operating correctly.

CHASSIS LIGHT PARAMETERS

By turning the **Stop_Override_Hazard_Enabled** parameter ON, the stoplights will always override the hazard lights.

If the current in the Left Rear turn signal circuit falls below the level set by the **LT_RR_Turn_Lo_Current** parameter, the ESC will register a fault code.

If the current in the Left Rear light circuit exceeds the level set by the **LT_RR_Turn_Hi_Current** parameter, the ESC will shut off the circuit and register a fault code.

The **LT_RR_Turn_OC_Current** parameter should be left at its factory default of zero.

If the current in the Right Rear turn signal circuit falls below the level set by the **RT_RR_Turn_Lo_Current** parameter, the ESC will register a fault code.

If the current in the Right Rear light circuit exceeds the level set by the **RT_RR_Turn_Hi_Current** parameter, the ESC will shut off the circuit and register a fault code.

The **RT_RR_Turn_OC_Current** parameter should be left at its factory default of zero.

If the current in the Left Front turn signal circuit falls below the level set by the **LT_FT_Turn_Lo_Current** parameter, the ESC will register a fault code.

If the current in the Left Front light circuit exceeds the level set by the **LT_FT_Turn_Hi_Current** parameter, the ESC will shut off the circuit and register a fault code.

The **LT_FT_Turn_OC_Current** parameter should be left at its factory default of zero.

If the current in the Right Front turn signal circuit falls below the level set by the **RT_FT_Turn_Lo_Current** parameter, the ESC will register a fault code.

If the current in the Right Front light circuit exceeds the level set by the **RT_FT_Turn_Hi_Current** parameter, the ESC will shut off the circuit and register a fault code.

The **RT_FT_Turn_OC_Current** parameter should be left at its factory default of zero.

Table 17

Parameter	ID	Description	Default	Units	Min	Max	Step
Stop_ Override_ Hazard_ Enabled	562	Enable/ disable stoplights override hazard lights. A value of 1 enables and a value of 0 disables the feature.	ON	No_ Units	NA	NA	NA
LT_RR_ Turn_Lo_ Current	1904	Left Rear Turn Signal Low Current Detection Level (Amps)	0.5	A	0	10	0.1
LT_RR_ Turn_Hi_ Current	1905	Left Rear Turn Signal High Current Detection Level (Amps)	10	A	0	10	0.1
LT_RR_ Turn_OC_ Current	1906	Left Rear Turn Signal Open Circuit Detection Level (Amps)	0.5	A	0	10	0.1
RT_RR_ Turn_Lo_ Current	1907	Right Rear Turn Signal Low Current Detection Level (Amps)	0.5	A	0	10	0.1
RT_RR_ Turn_Hi_ Current	1908	Right Rear Turn Signal High Current Detection Level (Amps)	10	A	0	10	0.1
RT_RR_ Turn_OC_ Current	1909	Right Rear Turn Signal Open Circuit Detection Level (Amps)	0.5	A	0	10	0.1

Parameter	ID	Description	Default	Units	Min	Max	Step
LT_FT_ Turn_Lo_ Current	1910	Left Front Turn Signal Low Current Detection Level (Amps)	0.5	A	0	10	0.1
LT_FT_ Turn_Hi_ Current	1911	Left Front Turn Signal High Current Detection Level (Amps)	10	A	0	10	0.1
LT_FT_ Turn_OC_ Current	1912	Left Front Turn Signal Open Circuit Detection Level (Amps)	0.5	A	0	10	0.1
RT_FT_ Turn_Lo_ Current	1913	Right Front Turn Signal Low Current Detection Level (Amps)	0.5	A	0	10	0.1
RT_FT_ Turn_Hi_ Current	1914	Right Front Turn Signal High Current Detection Level (Amps)	10	A	0	10	0.1
RT_FT_ Turn_OC_ Current	1915	Right Front Turn Signal Open Circuit Detection Level (Amps)	0.5	A	0	10	0.1

DOME LIGHT PARAMETERS

If the **Dome_Light_Dim_Enable** parameter is turned ON, the dome light dimming feature is enabled.

The **Dome_Light_Dim_Step_Size** parameter sets the percentage that the light will be reduced for each 20-millisecond loop.

The **Dome_Light_PWM_Percent_Level** parameter is the programmable percentage of maximum voltage that dome light will be pulling when it is waiting to dim.

The **Dome_Light_Wait_Time** parameter sets the amount of time after the door is shut, that the dome light stays at the voltage set by Dome_Light_PWM_Percent_Level, before dimming at the rate set by Dome_Light_Dim_Step_Size.

If the current in the dome light circuit falls below the level set by the **Dome_Light_Lo_Current** parameter, the ESC will register a fault code.

If the current in the dome light circuit exceeds the level set by the **Dome_Light_Hi_Current** parameter, the ESC will shut off the circuit and register a fault code.

The **Dome_Light_OC_Current** parameter should be left at its factory default of zero.

The **Dome_Light_Key_Off_Timeout** parameter sets the amount of time that the dome light will remain on after the truck is turned off and the door is left open.

Table 18

Parameter	ID	Description	Default	Units	Min	Max	Step
Dome_ Light_Dim_ Enable	177	Enable/ disable dome light theatre dimming. A value of 1 enables and a value of 0 disables the dimming feature.	ON	No_ Units	NA	NA	NA
Dome_ Light_Dim_ Step_Size	178	The size (in percentages) that the Dome_Light_ Req should be stepped down each loop.	1	Percent	1	10	1
Dome_ Light_PWM_ Percent_ Level	179	The level at which the dome light should be set at while it is waiting to dim.	80	Percent	10	100	5
Dome_ Light_Wait_ Time	182	This is the amount of time the dome light should wait before dimming.	20	s	1	6000	10
Dome_ Light_Lo_ Current	1895	Dome Light Low Current Detection Level (Amps)	0	A	0	10	0.1
Dome_ Light_Hi_ Current	1896	Dome Light High Current Detection Level (Amps)	10	A	0	10	0.1
Dome_ Light_OC_ Current	1897	Dome Light Open Circuit Detection Level (Amps)	0	A	0	10	0.1
Dome_ Light_Key_ Off_ Timeout	2213	The amount of time that the dome light will remain on after the truck is turned off and the door is left open.	10	min	1	120	1

WIRING INFORMATION:

Park Brake Applied Signal

Pin 4 of Connector #1600 is switched to ground when the park brake is applied. This pin is rated for a maximum load current of 0.5 Amp. This pin can be connected to a relay coil to activate a relay for park brake interlock. To use pin, remove cavity plug from connector and insert a wire and terminal.

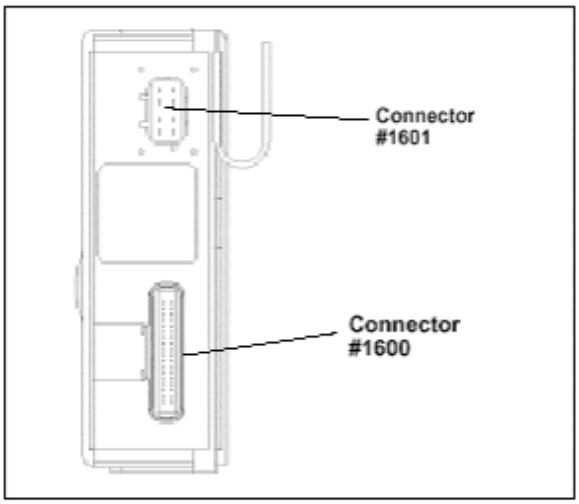


Figure 29 Terminal P/N 3517243C1 – 18 gauge

Service Brake Applied Signal

If the vehicle is equipped with a feature designed for trailers with separate stop and turn, see section “Trailer Socket/Body Builders Wiring”, a stop circuit is available.

Splice into circuit 70 after the fuse. Note there is no access inside the cab; if required, circuit will have to be routed through dash.

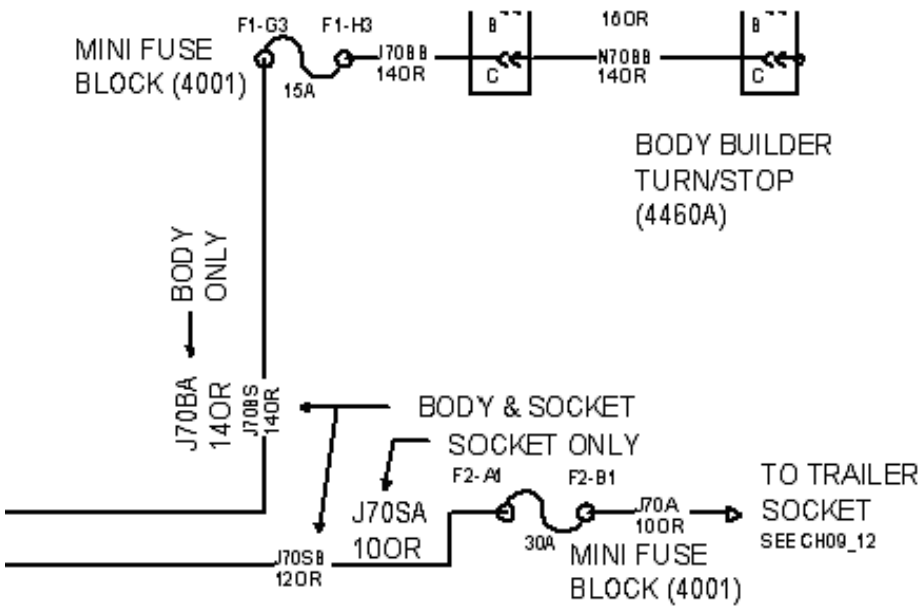


Figure 30

If the vehicle was not ordered with a feature providing a separate stop circuit, see “How Do I Add” in section 9 for information.

Dome Lamps

Dome lamps are controlled by the ESC. After the door is shut, the dome lamps stay on of 20 seconds at 80% voltage, a slight dimming of the lamp can be observed. After the 20 seconds, the lamps will dim then go out, “Theater Dimming”. The ESC can be programmed by the dealer to go out as soon as the door is closed.

The dome circuit is fused internal to the ESC at 10 amp. If vehicle has courtesy lights, do not exceed 5 amp additional load. If vehicle does not have courtesy lights, do not exceed 8 amp additional load.

In order for Body Builders to use the dome light circuit, they must splice into the wire coming from Pin C on the Brown ESC output connector (#1601). Correct splicing techniques (shown in section 1 of this book) should be used so that splicing is done safely and effectively.

If additional loads are required, use a relay. If a relay is added, “Theater Dimming” must be turned off to prevent relay chatter.

See the circuit diagram below for available circuits for dome light operation. These circuits are A63E, A63M (if equipped with courtesy lights), C63C and D63C. The maximum current draw for the dome lamp system is 10 amps.

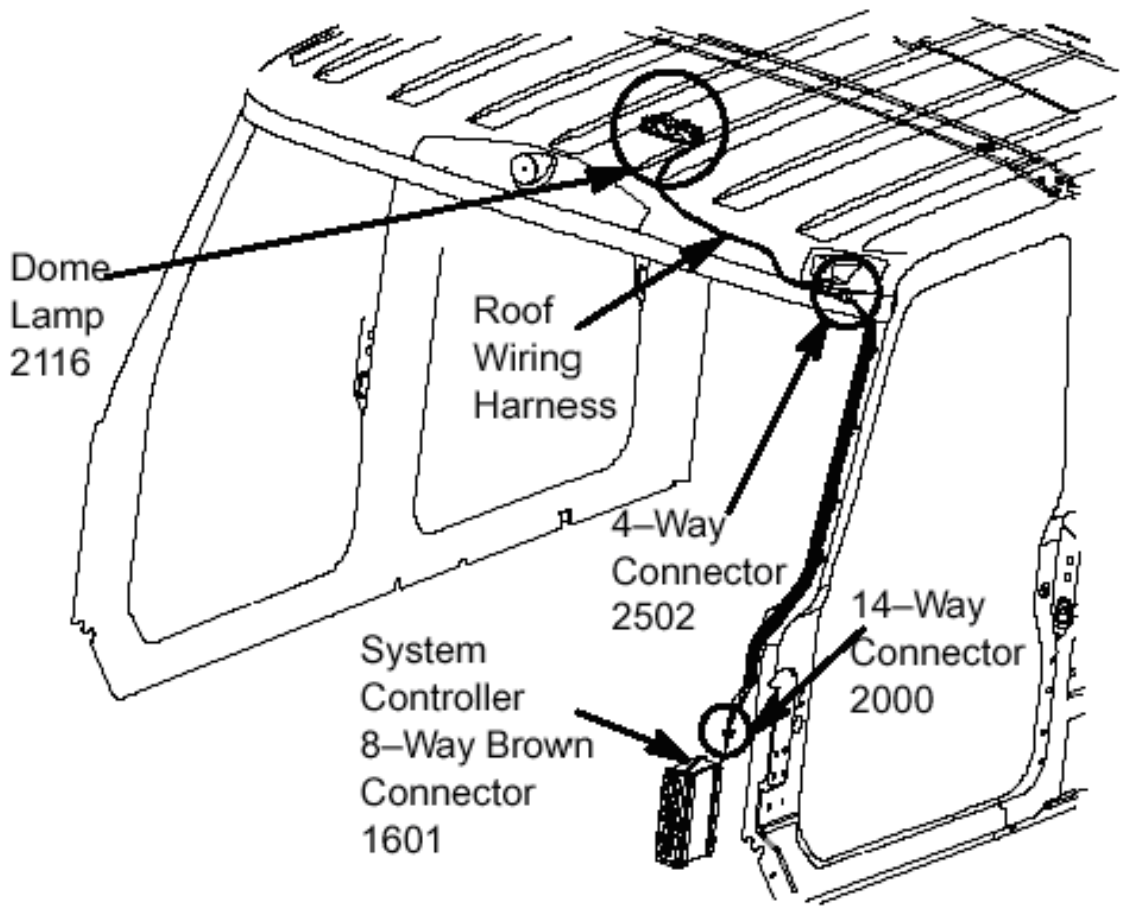


Figure 31 Dome Light Wiring

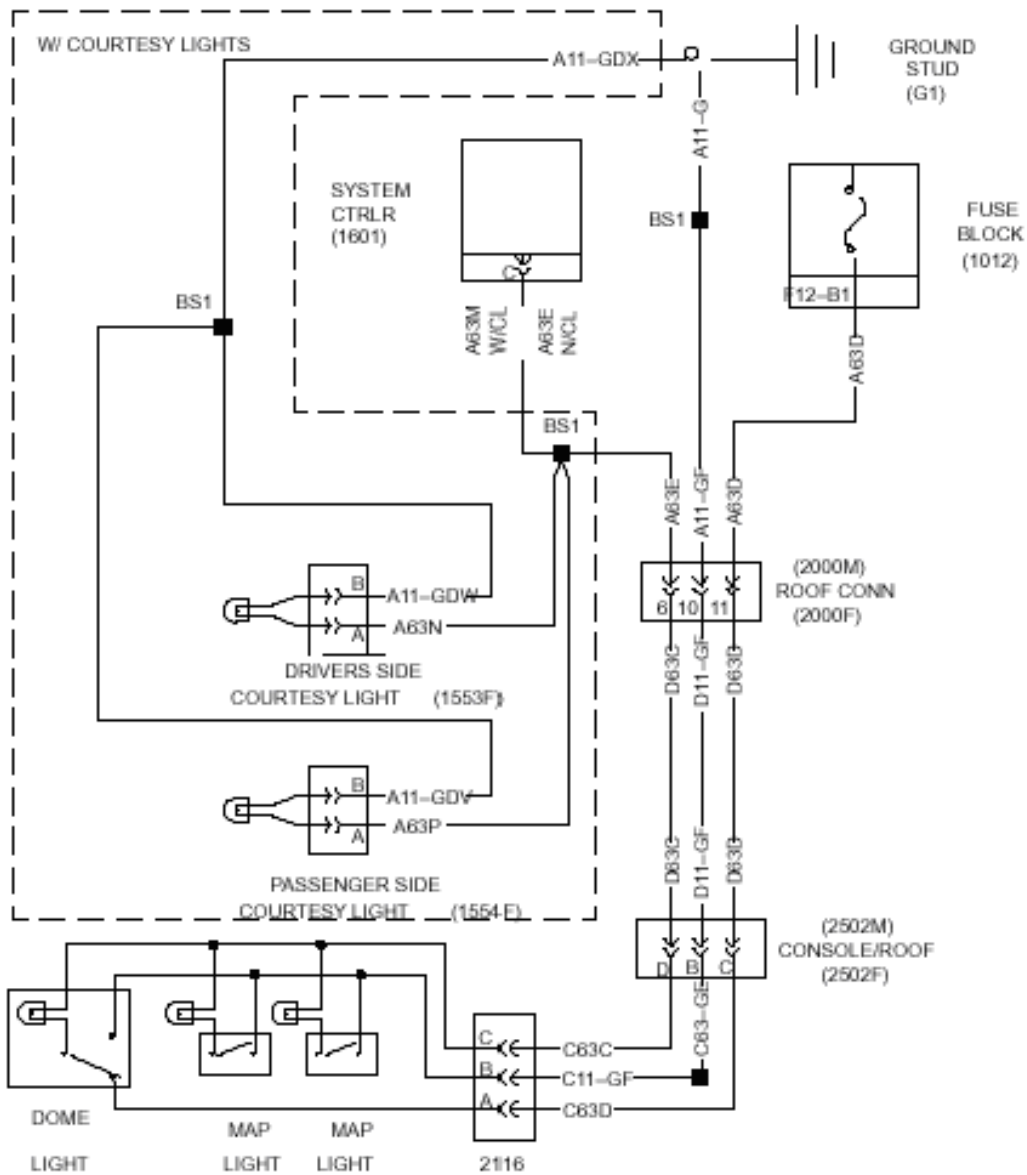


Figure 32 Dome Light Circuit Diagram

TESTING:

If parameters are changed in the Diamond Logic™ Builder software or ICAP, verify that the desired functionality is obtained.

3. BATTERY, IGNITION AND ACCESSORY TAPS

3.1. STANDARD BATTERY AND IGNITION TAPS

FEATURE CODE DESCRIPTION:

None, see radio and power source connections and fused battery connection sections for additional information.

FEATURE / BODY FUNCTION:

Battery, ignition and accessory taps allow the customer to obtain battery ignition and accessory power from various locations on the vehicle to operate various bodybuilder or after-market accessories such as lights, motors, heaters, cell phones, computers, etc.

NOTE – When adding any circuit, be sure to protect the circuit being added – see the General Electric section for circuit protection information.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

Battery Connections

Location 1: Exterior Battery Tap In Battery Box. Attach to battery post using ring terminals. Circuits should not be connected to the battery if vehicle is equipped with sealed battery terminals.

NOTE – Do not use starter stud for battery power, as extra terminals may cause nut to loosen.

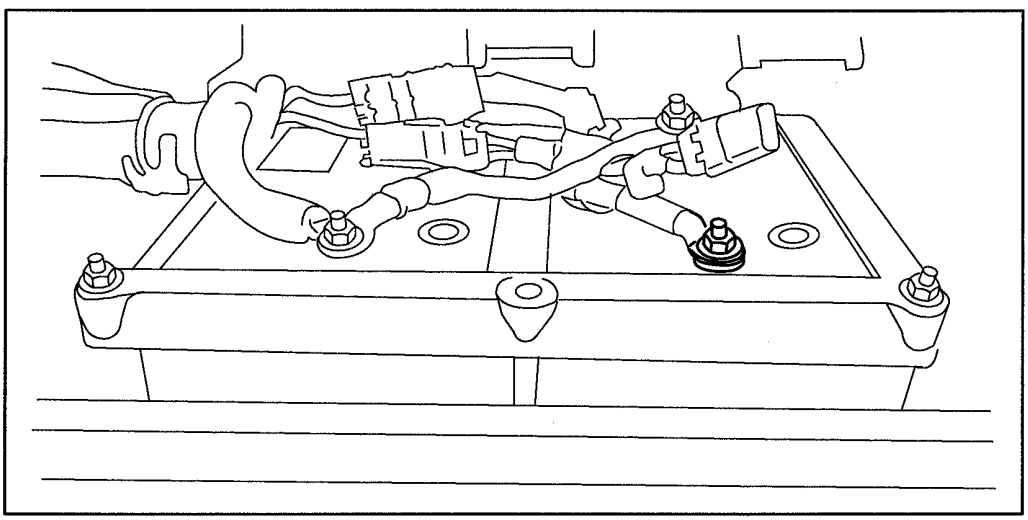


Figure 33 Location 1: Exterior Battery Tap In Battery Box

Location 2 : Exterior Battery Tap Driver's Side Engine Compartment Mega-Fuse Assembly

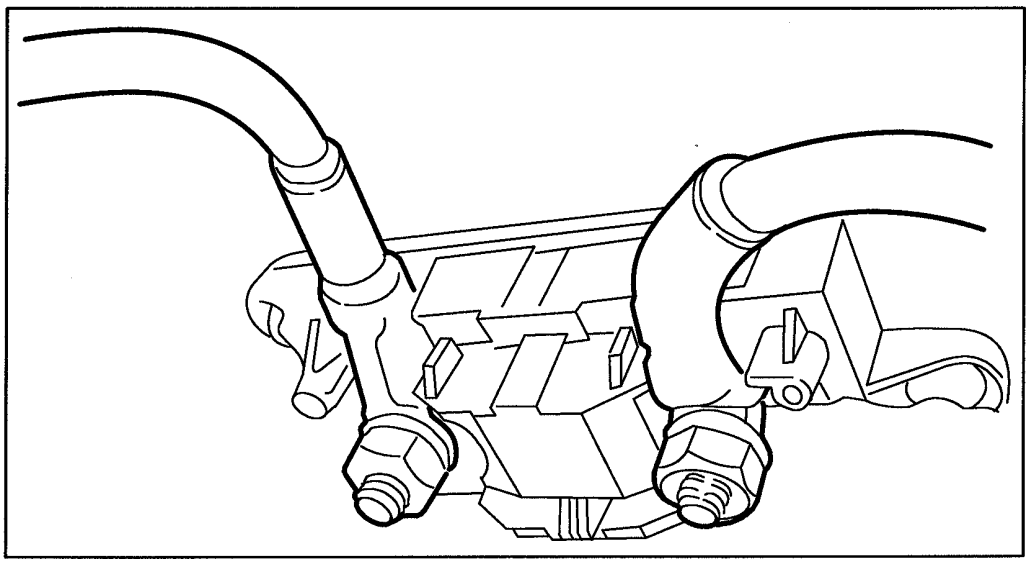


Figure 34 Location 2 : Exterior Battery Tap Driver's Side Engine Compartment PDC

Location 3: Located by inside fuse panel, circuit A14G, (red circuit)

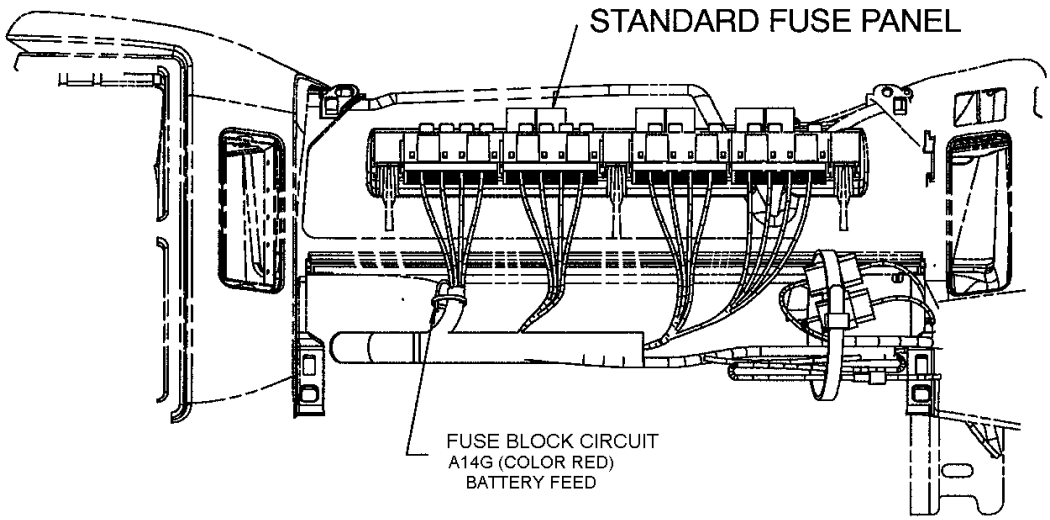


Figure 35 Location 3

Table 19 Battery Feed Connection Points

Circuit Number	Max. Current (Amps)	Terminal Size	Nut Torque	Special Instructions	Description	Location
A14G	15	—	—	A	Pigtail at Fuse Block	Inside Cab Passenger Side
—	20	5/16	12 Nm / 9 lbf-ft	—	Mega-Fuse Stud, Fused Side*	Outside Dash Panel Driver's Side
—	—	3/8	15 Nm / 11 lbf-ft	B	Positive Battery Terminal*	Battery Box

* Additional "in-line" fuse of appropriate size must be added for circuit being added. Fuse should be located close to power source.

Special Instructions

A. Pigtail circuit protected by a 15-amp fuse in fuse block. A relay is required if the battery load exceeds 15 amps.

B. Circuits should not be connected to the battery if vehicle is equipped with sealed battery terminals.

NOTE: Do not use starter stud for battery power, as extra terminals may cause nut to loosen.

Connecting to Ignition System

Location 1: Located by inside fuse panel

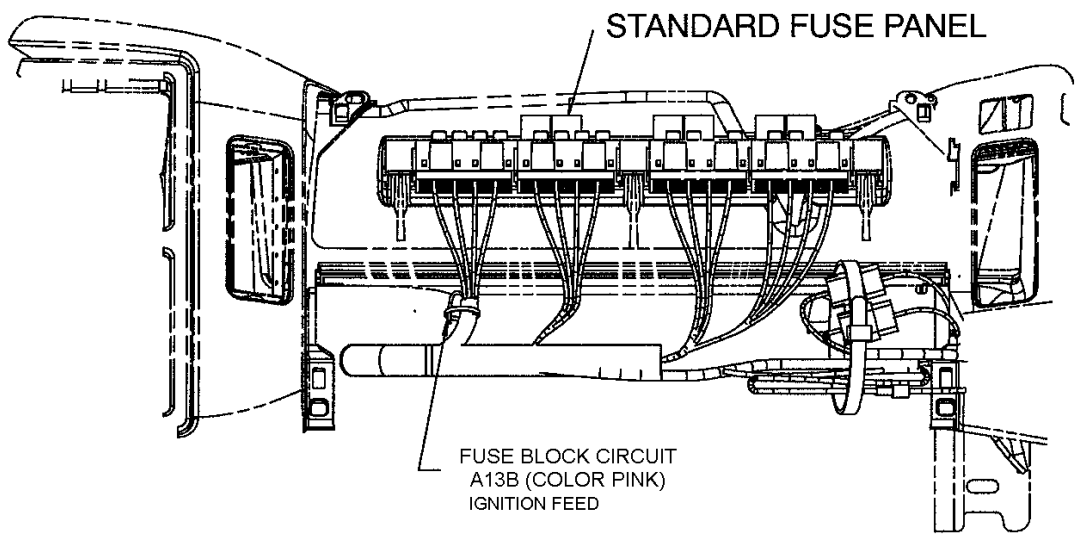


Figure 36 Passenger Side PDC

Table 20

Circuit Number	Color	Max. Current (Amps)	Special Instructions	Description	Location
A13B	Pink	5	A	Pigtail protected by 5 amp fuse	Inside Cab Passenger Side
Special Instructions A. A relay is required if the accessory load exceeds 5 amps.					

Location 2: Located in the PDC, power distribution center, under the hood

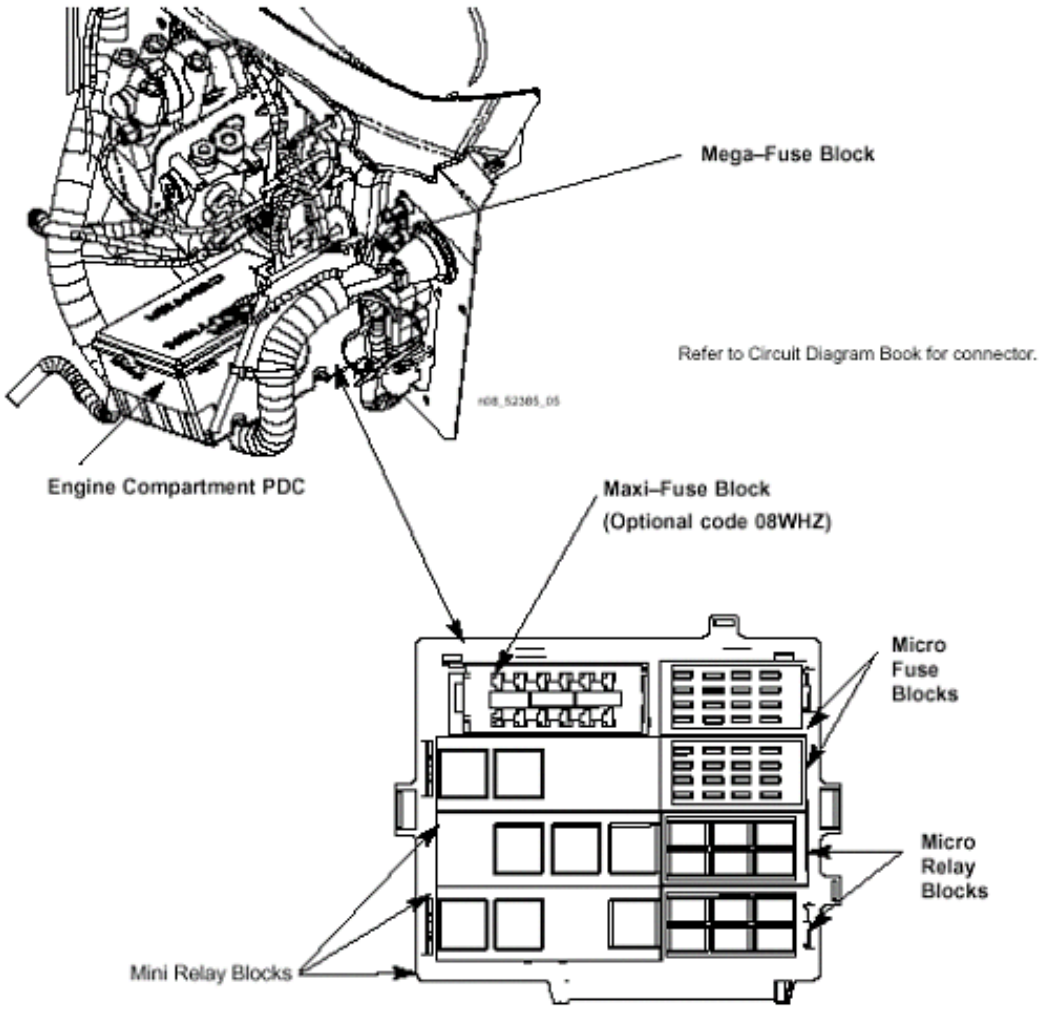


Figure 37

On most vehicles, there are unused ignition bussed fuse locations in the PDC. These can be used for low current ignition loads provided that the total ignition load in the PDC does not exceed the 40A rating for the ISO cube ignition relay. For Relay and Fuse descriptions, see the product graphic located on the inside of the PDC cover.

To add circuits to the Maxi Fuse Block, the block must first be removed. The Maxi fuse block is held in with three snaps. In some cases, the Micro Fuse block, Micro Relay Blocks and the Mini Relay blocks will have to be removed.

To remove the other blocks, remove sliding harness entrance door, spread out side of PDC to unlatch Micro Fuse and Relay blocks. Slide out Mini Relay blocks Note, if blocks are too tight, using a 3/16 square bar insert into square hole in bottom of PDC and tap blocks loose.

Fuse terminal part numbers

18 gauge – 3515517c1

16 gauge – 3573312c1

14 gauge – 3516158c1

12 gauge – 3516158c1

TESTING:

- For Battery taps, test to see that battery voltage is present at all times.
- For Accessory taps, test to see that battery voltage is present when the ignition key is in “Accessory” or “Ignition” key states
- For Ignition taps, test to see that battery voltage is present when the ignition key is in “Ignition” key state.

3.2. 08WAD, 08WCS, 08WHX AND 08WHY — BATTERY DISCONNECT SWITCH

FEATURE CODE DESCRIPTION:

08WAD – BATTERY DISCONNECT SWITCH {Joseph Pollak} Lever Operated

08WCS – BATTERY DISCONNECT SWITCH {Joseph Pollak 51-315} Positive Type, Lever Operated, Mounted on Cab Floor

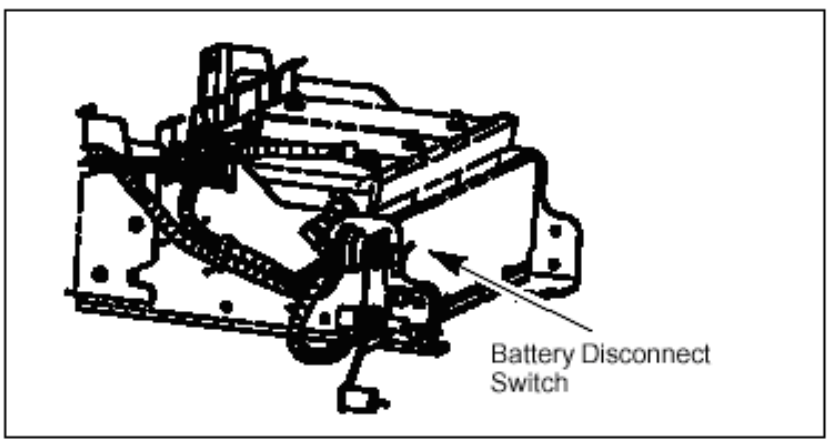
08WHX – BATTERY DISCONNECT SWITCH {Pollak 51-316} Locking, Key Operated, Positive Type, Mounted on Battery Box

08WHY – BATTERY DISCONNECT SWITCH {Joseph Pollak 51-316} Positive Type, Locking, Key Operated, Mounted on Cab Floor

FEATURE / BODY FUNCTION:

The disconnect switch is used to shut down the entire battery fed electrical system. When a vehicle is not going to be used for several days or longer, this switch will shut off the system so that the electrical components on the vehicle, if left on, do not drain the batteries of their charge. Customers have the choice between a key or lever operated battery disconnect switch.

NOTE – The disconnect switch should never be used to shut off the engine as there is a possibility of the alternator generating a high positive voltage spike which may result in electrical damage.



BATTERY DISCONNECT SWITCH – CODE 08WAD

Figure 38

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

No additional wiring is necessary if the vehicle is ordered from International with the sales feature codes listed above.

TESTING:

1. Close switch.

2. Verify that the vehicle is providing 12-14 Volts to the starter motor.
3. Verify vehicle will start.
4. Turn engine off.
5. Open disconnect switch.
6. Verify vehicle systems do not have any electrical power.

HOW DO I ADD THIS FEATURE:

The disconnect switch cannot be put into the battery ground cable as was previously done. The electronic modules will provide a ground path around the master disconnect switch if this is tried. The engine and transmission modules must always be connected to the batteries, even when the master disconnect switch is opened. Separate power and ground circuits are provided on each vehicle to the engine and transmission electronics. To install a master disconnect switch, break into the positive battery cable, or use OEM cables, going from the batteries to the cranking motor and insert disconnect switch into that circuit, as shown in Figure 1. Insure that adequate electrical insulation is used between the positive battery cable, the switch mounting, and the surrounding area. Place boots or covers over the disconnect switch studs to protect the batteries and cables from accidental shorting. Do not disturb the direct connections from the battery to the engine or transmission electronics. To reduce corrosion, dielectric grease should cover eyelets and studs.

CAUTION – Make sure that batteries are disconnected prior to performing any electrical work.

If a non-OEM switch is to be used, make sure it is designed to handle at least 1,000 amp (intermittent duty)

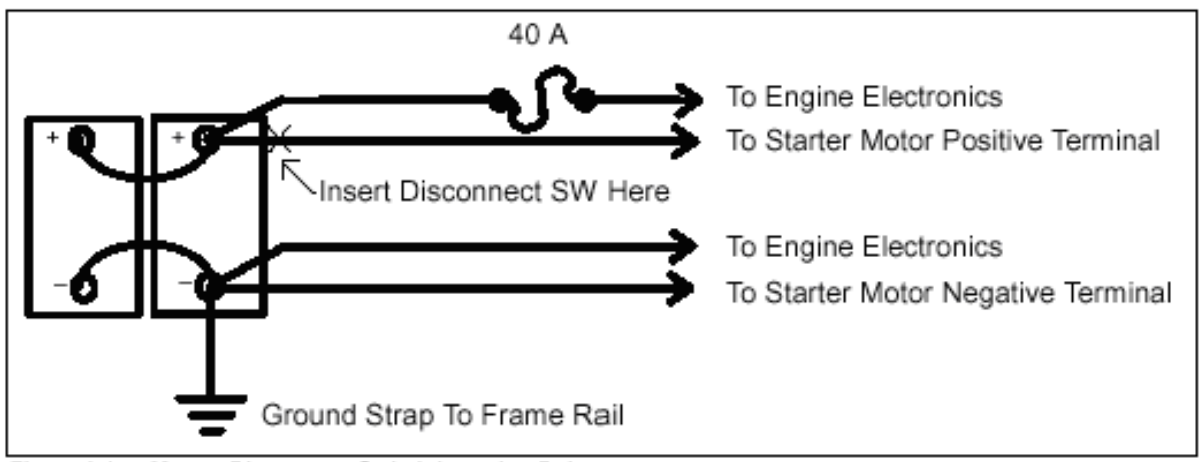


Figure 39 Installation Circuit For Battery Disconnect Switch

NOTE – If there is more than one positive cable, eyelet terminals will have to be stacked on the switch stud. Some installations may not have ground strap to rail – if none exists, there is no need to add one.

4. GROUND CONNECTIONS

FEATURE CODE DESCRIPTION: NONE

FEATURE / BODY FUNCTION:

Locations for connecting to the vehicle ground have been provided both inside and outside the cab. The table below lists the connection points along with information about each point. For a complete diagram of Ground connections, circuit numbers, connector and terminal part numbers, see vehicle circuit diagram book.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

In addition to the negative battery post, the following locations are recommended for grounding.

Table 21 Battery Feed Connection Points

Max. Additional Current	Terminal Size	Nut Torque	Description	Location
30 Amps	5/16	27 Nm / 20 lbf-ft	Pass Thru Stud G1	Inside and Outside Cab Driver's Side
30 Amps	5/16	27 Nm / 20 lbf-ft	Pass Thru Stud G2	Inside and Outside Cab Driver's Side
—	3/8	46 Nm / 34 lbf-ft	Frame Rail	Frame Rail

NOTE – Do not use starter stud for grounding, as extra terminals may cause nut to loosen. See Ground Installation Instructions and Corrosion Protection Treatment.

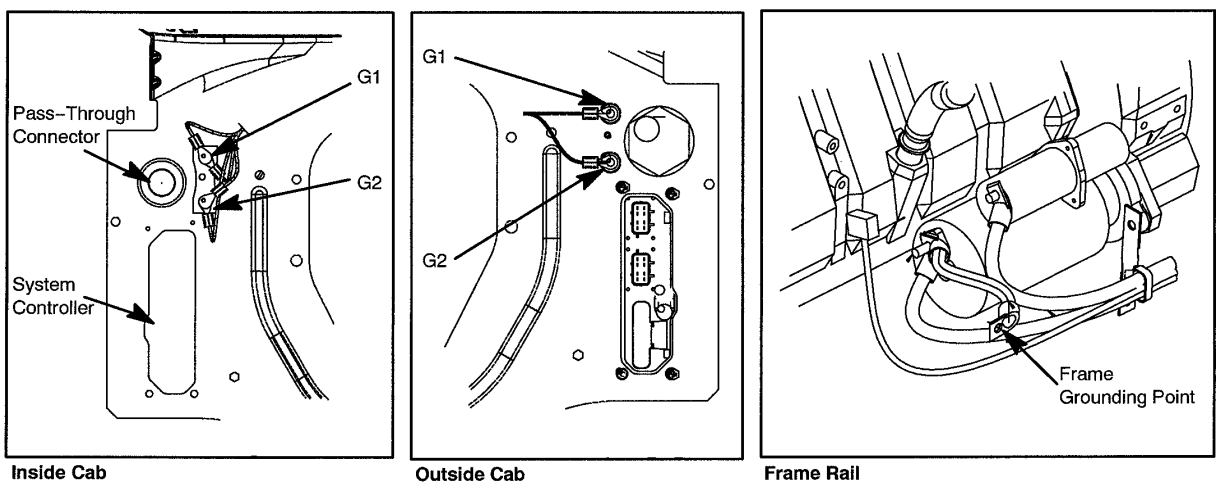


Figure 40 Ground Connections

TESTING:

Test ground circuit to determine that the ground circuit is closed.

5. FUSED BATTERY CONNECTIONS OUTSIDE CAB

5.1. 08WHZ — BODY POWER FEEDS

Refer to the Circuit Diagram in S08285, Chapter 2, page 3.

FEATURE CODE DESCRIPTION:

08WHZ -FUSE PANEL {Packard MP 800} Maxi Fuse; Mounted in Power Distribution Center Under Hood

FEATURE / BODY FUNCTION:

This feature provides up to six-fused battery feed points for body builder use. The circuits may be fused per body builder requirements. The fuse block is standard if optional features such as Lectra – Shift, PTO and 40-amp power feed are ordered.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

To add circuits to the Maxi Fuse Block, the PDC fuse /relay block must first be removed. The Maxi fuse block is held in with three snaps.

To remove the other blocks, remove sliding harness entrance door, spread out side of PDC to unlatch Micro Fuse and Relay blocks. Slide out Mini Relay blocks Note, if blocks are too tight, using a 3/16 square bar insert into square hole in bottom of PDC and tap blocks loose.

Table 22 Fuse Terminal Part Numbers

10 Gauge Wire	3515522C1
8 Gauge Wire	3516157C1
Lock	3515520C1

When selecting fuse size/cable gauge refer to the Recommended Circuit Protection of the General Electric section of the Body Builders Book.

Table 23

Maxi Fuse P/Ns	Rating
3534200c1	20
3534201c1	25
3534202c1	30
3534203c1	35
3534204c1	40
3534205c1	50
3525615c1	60
3534206c1	70
3534207c1	80

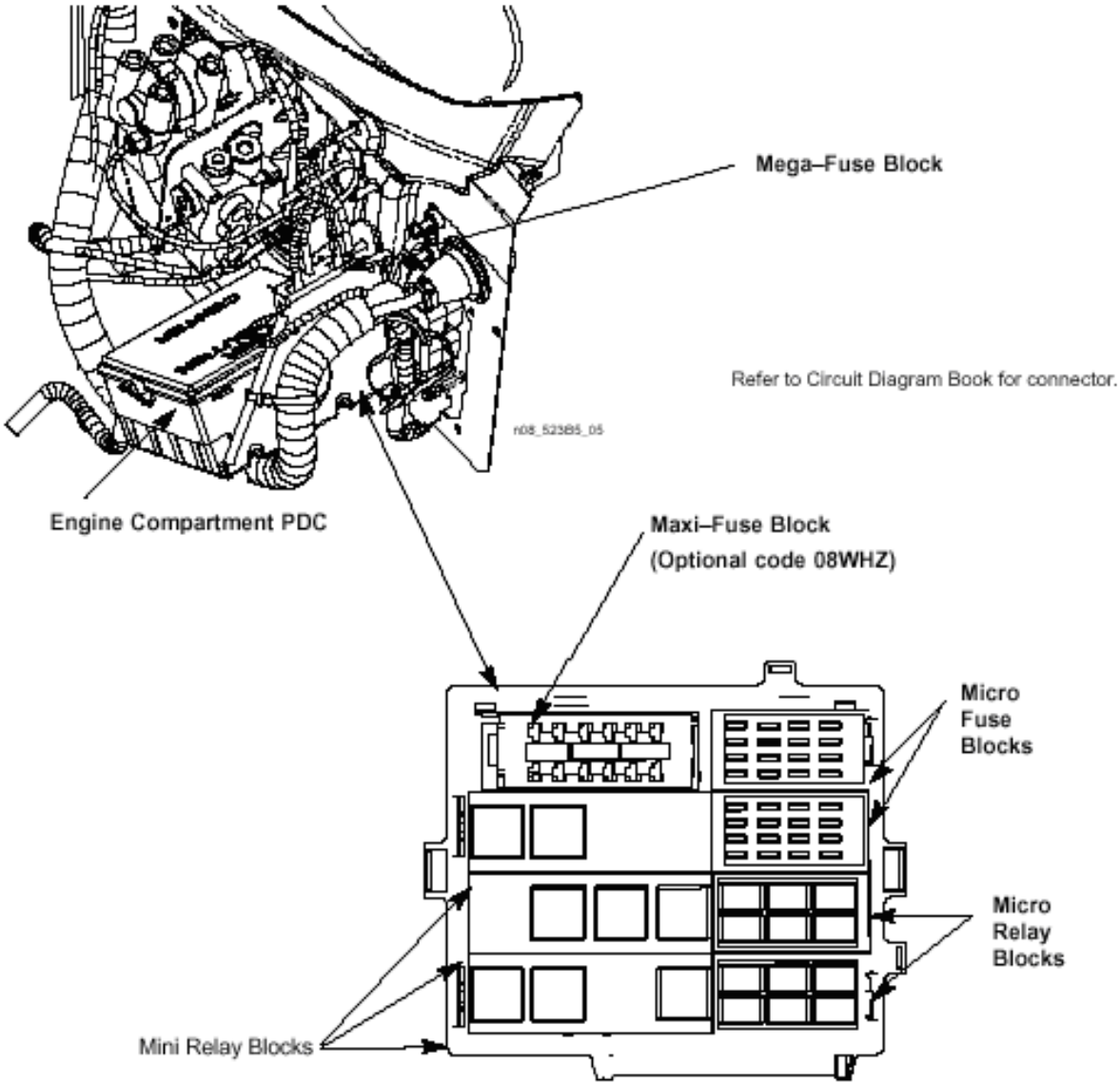


Figure 41

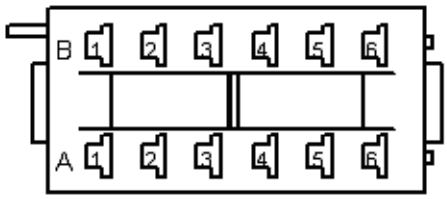
NOTE – When adding a circuit, note that it is battery fed and the TEM will have to add appropriate switches/relays, etc. If the electrical load is left on, it will result in discharged batteries.

HOW DO I ADD THIS FEATURE:

If the vehicle is not equipped with the fuse block shown below, one can be ordered from the dealer.

The TEM will have to fabricate a 6-gauge jumper to go from the mega fuse to the maxi fuse block. The maxi fuse block requires a ¼ “ eyelet and the mega fuse requires a 5/16” eyelet.

(LOCATED IN POWER DISTRIBUTION CENTER)



CONNECTOR - 3545997C1
LOCK - 3515520C1
BOLT - 22728R1
WASHER - 178474
NUT - 9413992

Figure 42

NOTE – Identify the fuse function on the chart on the bottom of the PDC lid.

5.2. 08TKK — TRAILER AUXILIARY CIRCUIT

Refer to the Circuit Diagram in S08285, Chapter 9, page 27.

FEATURE CODE DESCRIPTION:

08TKK - FUSE PANEL {Packard MP 800} Maxi Fuse and relay; Mounted in Power Distribution Center Under Hood

FEATURE / BODY FUNCTION:

This feature provides a thirty (30) amp fused circuit that is ignition controlled. The trailer Auxiliary circuit will provide a blunt cut wire with heat shrink at the end of the frame with the Electric Trailer Brake wiring. The customer will need to supply and install the appropriate trailer socket assembly for their application.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

08HAG **OR** 08HAH Electric Trailer Brake/Lights (Customer cannot use both)

WIRING INFORMATION:

This feature will provide a 10 gauge Orange wire located at the end of the frame with the Electric Trailer Brake wires. The wire will be labeled 72EB.

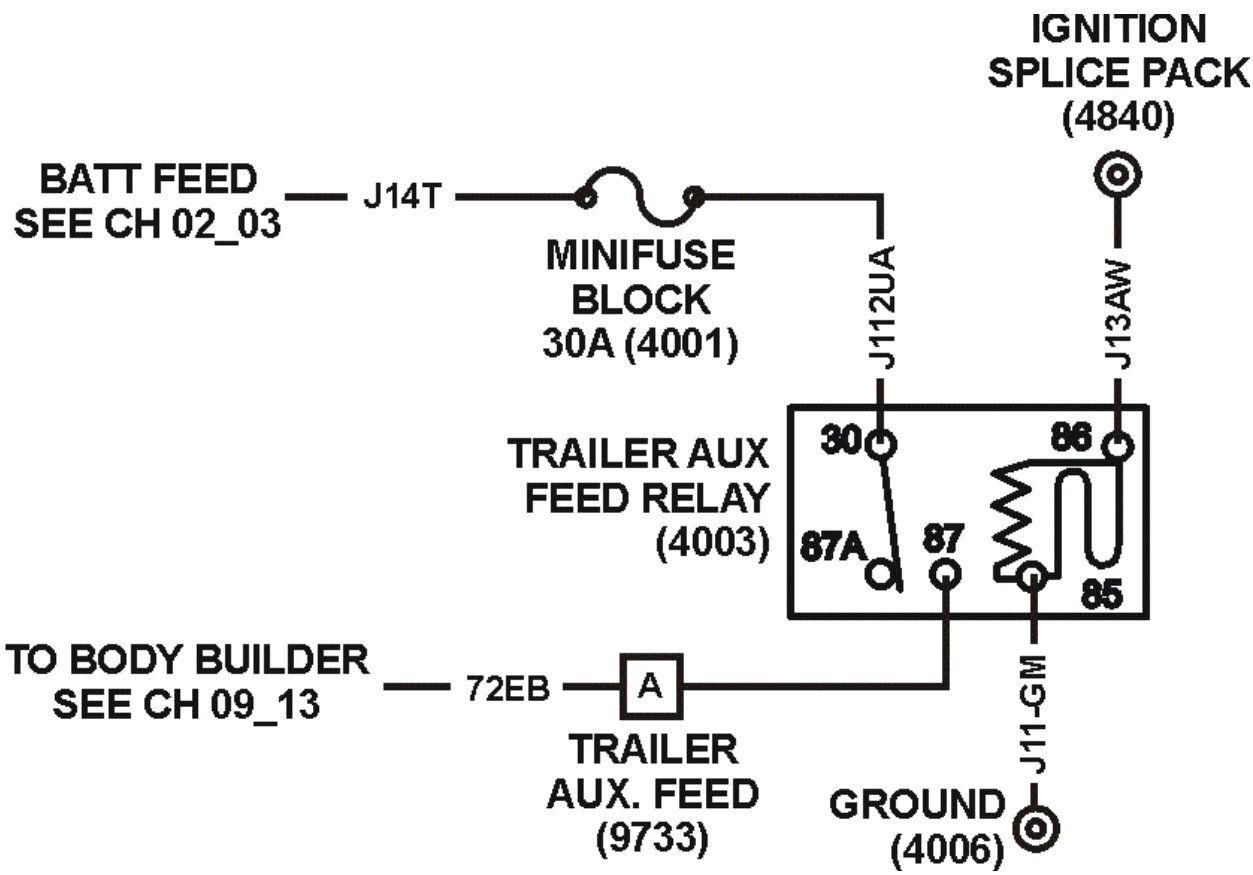


Figure 43 Trailer Auxiliary Circuit

Table 24 Part Numbers

10 Gauge Wire	3515522C1
30 Amp Maxi Fuse	3534202C1

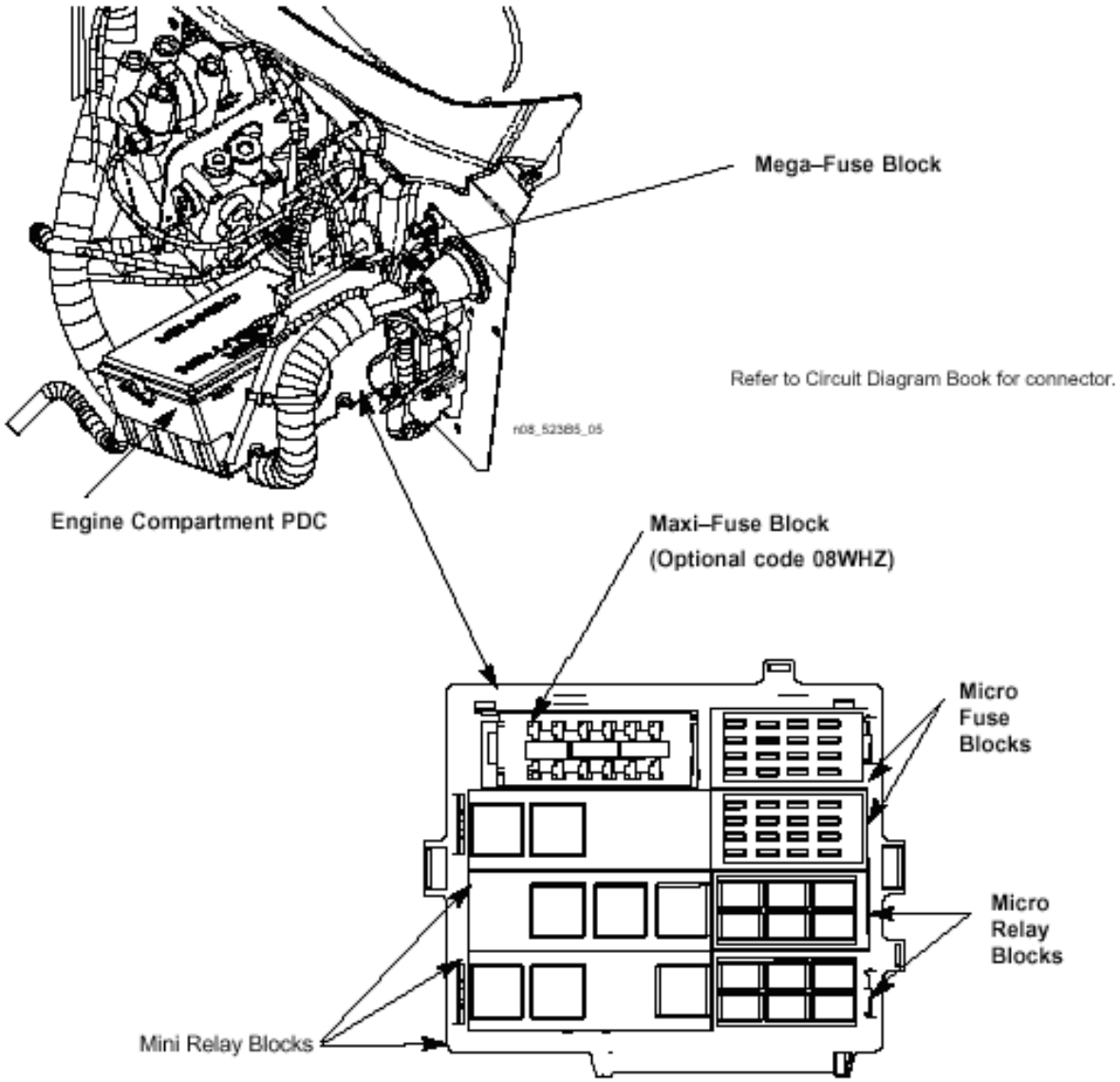


Figure 44

TESTING:

1. Make proper trailer connections.
2. Turn key on.
3. Verify that the Orange wire marked R72EB has battery voltage.

HOW DO I ADD THIS FEATURE:

If the vehicle is not equipped with the fuse block shown below, one can be ordered from the dealer.

The TEM will have to fabricate a 6-gauge jumper to go from the mega fuse to the maxi fuse block. The maxi fuse block requires a ¼ “ eyelet and the mega fuse requires a 5/16” eyelet.

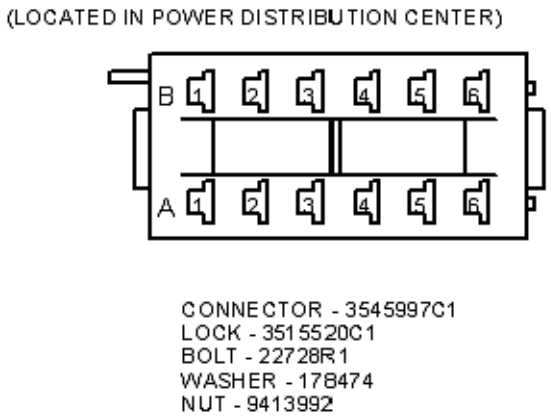


Figure 45

NOTE – Identify the fuse function on the chart on the bottom of the PDC lid.

1. Locate a vacant ISO relay location in Power Distribution Center, under hood.
2. Supply **Ignition** power to Pin-5 of relay location.
3. Supply Ground to Pin-2 of relay location.
4. Supply fused (30 amp) battery power to Pin-1 of relay location.
5. Connect 10 gauge wire to Pin-4 of relay location.
6. Route 10 gauge wire with dash harness to center chassis harness. Continue to route wire with chassis harness to end of frame.
7. Install relay and fuse.
8. Verify that wire at end of frame has battery voltage with key on, and is open with the key off.

6. FUSED BATTERY CONNECTIONS INSIDE CAB — 08518, 08718, 08WCK

Refer to the Circuit Diagram in S08285, Chapter 3, page 1.

FEATURE CODE DESCRIPTION:

08518 – CIGAR LIGHTER

08718 – POWER SOURCE Cigar Type Receptacle Without Plug and Cord

08WCK – POWER SOURCE, TERMINAL TYPE 2-Post

FEATURE / BODY FUNCTION:

08518 – Provides cigar lighter.

08718 - This option provides a power source for customers who wish to use CB radios, hand held spotlights or trouble lights, or other accessories that plug into the power socket receptacle for 12-Volt power.

08WCK – Customers often desire the ability to power 12-volt accessories with the truck's electrical system. This option provides a power source for items equipped to receive power from post-type terminals.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

Locations for connecting to the vehicle Ignition have been provided. The table below lists the connection point along with information about that point. For a complete diagram of the Ignition system and for connector and terminal part numbers, see vehicle circuit diagram book.

Table 25 Vehicle Ignition Connections

Feature Code	Max. Current (Amps)	Power Feed	Description
008WCK	20	Battery	Power Source, Two Post Type
008718	20	Battery	Power Source (Cigar-Type Receptacle)
008518	15	Battery	Cigar Lighter (provides customer with a 15 amp. battery supply)

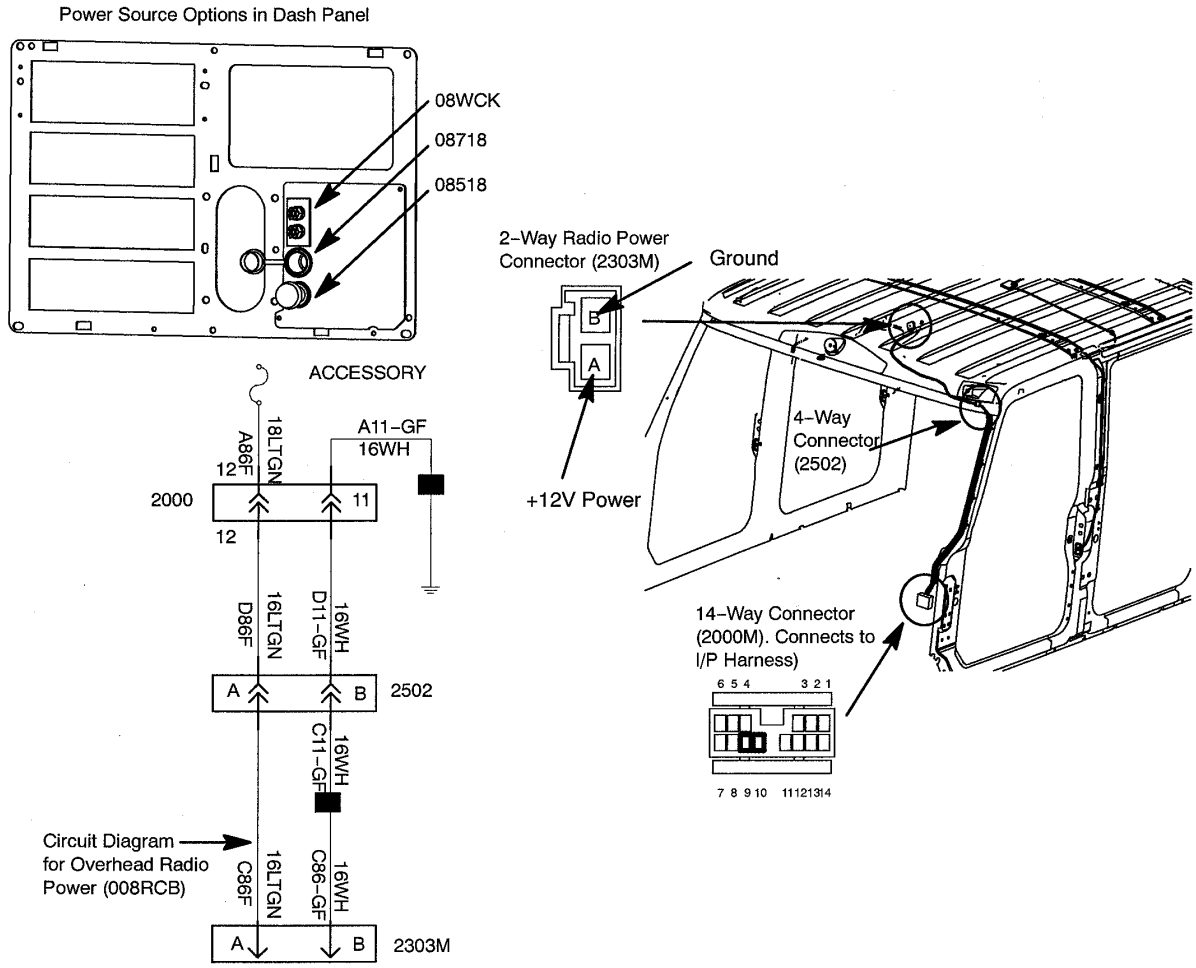


Figure 46 Radio and Power Source Connections

TESTING: To test these circuits, refer to the above chart and verify that battery voltage is present in the correct key-state for each respective feature.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without one of the desired features, they can be installed in the field. Refer to the section “How Do I” General Information section of the body builders book for information on obtaining required parts. The same parts that are used in the OEM installation are available (cables, components, etc.). Also, refer to the circuit diagram that applies to your vehicle to aid in the installation.

7. CB AND 2–WAY RADIO CONNECTIONS INSIDE CAB

7.1. 08RCB AND 08RBK — CB RADIOS

Refer to the Circuit Diagram in S08285, Chapter 3, page 2.

FEATURE CODE DESCRIPTION:

08RCB – CB RADIO Accommodation Package; Header Mounted; Feeds From Accessory Side of Ignition Switch; Includes Power Source and Two Antennas Bases With Wiring

08RBK – CB ANTENNA (2) {Pana-Pacific} Full Wave; 4.0’ Length Includes “International” Name on Top

FEATURE / BODY FUNCTION:

08RCB - When installing a CB radio, this feature provides the power circuits required for hook-up. This accommodation package includes a 10 amp accessory power and ground connector, dual CB antenna cables routed from the mirror to the cab overhead header opening, and two CB antenna mounts located at the top of each mirror. A strap is also provided in the header to mount the customer supplied CB radio. The CB antennas are not provided with this code. If the two antennas are desired, an additional feature code 08RBK must be ordered.

08RBK – Provides two 4’ long CB antennas.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

Locations for connecting to the vehicle Ignition have been provided. The table below lists the connection point along with information about that point. For a complete diagram of the Ignition system and for connector and terminal part numbers, see vehicle circuit diagram book.

Table 26

Feature Code	Max. Current (Amps)	Power Feed	Description
008RCB	10	Accessory	CB Radio Accommodation Package (Includes 2 Antenna Bases and Cable)

The mating connector for the CB connector is 1661196C1 and terminal 1661209C1 (16 ga.)

TESTING:

• To test these circuits, refer to the above chart and verify that battery voltage is present in the correct key-state for each respective feature.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without one of the desired features, they can be installed in the field. Refer to the section “How Do I” General Information section of the body builders book for information on obtaining required parts. The same parts that are used in the OEM installation are available (cables, components, etc.). Also, refer to the circuit diagram that applies to your vehicle to aid in the installation.

7.2. 08REA AND 08RGA – 2-WAY RADIO

Refer to the Circuit Diagram in S08285, Chapter 3, page 10.

FEATURE CODE DESCRIPTION:

08REA – 2-WAY RADIO Wiring Effects; Wiring With 20 Amp Fuse Protection, Includes Ignition Wire With 5 Amp Fuse, Wire Ends Heat Shrink and 10’ Coil Taped to Base Harness

08RGA – 2-WAY RADIO Wiring Effects; Wiring With 20 Amp Fuse Protection, Includes Ignition Wire With 5 Amp Fuse, Wire Ends Heat Shrink and Routed to Center of Header Console in Cab

FEATURE / BODY FUNCTION:

08REA – Feature code 08REA provides a fused 20 amp battery feed power wire, ground wire and fused 5 amp ignition feed for applications requiring two–way radio communications such as local municipal government units or state DOT highway maintenance vehicles. The three wires are taped to the main cab harness.

08RGA – Feature code 08RGA provides a fused 20 amp battery feed power wire, ground wire and fused 5 amp ignition feed for applications requiring two–way radio communications such as local municipal government units or state DOT highway maintenance vehicles. The three wires are located in the center of the header console in the cab.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS: NONE

WIRING INFORMATION:

Locations for connecting to the vehicle Ignition have been provided. The table below lists the connection point along with information about that point. For a complete diagram of the Ignition system and for connector and terminal part numbers, see vehicle circuit diagram book.

Table 27

Feature Code	Max. Current (Amps)	Power Feed	Description
008REA	20	Battery	Power feed to two-way radio
	5	Ignition	Ignition feed to two-way radio
008RGA	20	Battery	Power feed to two-way radio
	5	Ignition	Ignition feed to two-way radio

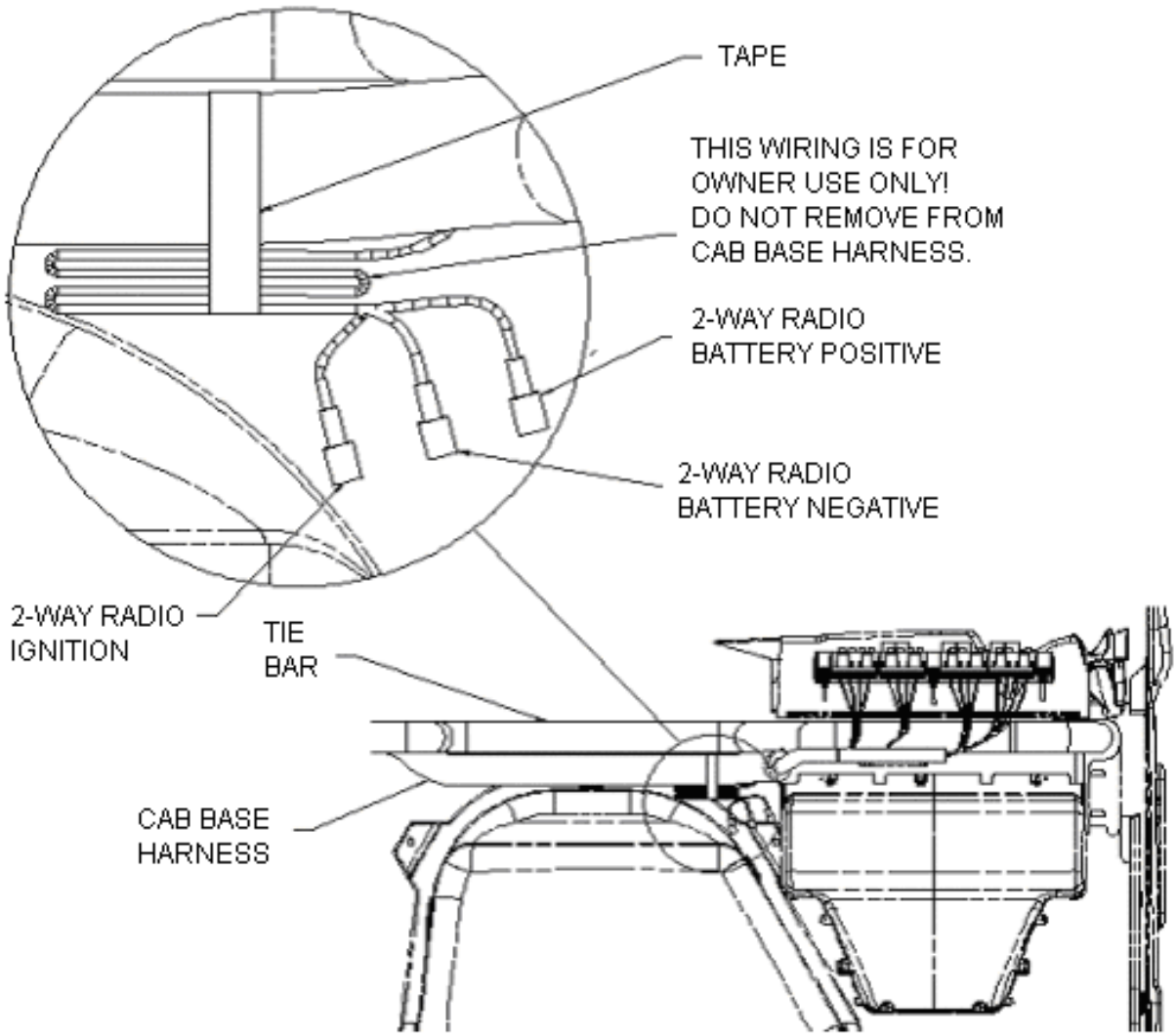


Figure 47

08REA and 08RGA provide radio power and ground directly from the battery to minimize electrical noise on the line.

The cable is coiled up under the instrument panel as shown above in 08REA, and is of sufficient length to route to the back of the Travelcrew cab.

The wiring is located in the center of the header console in the cab for 08RGA.

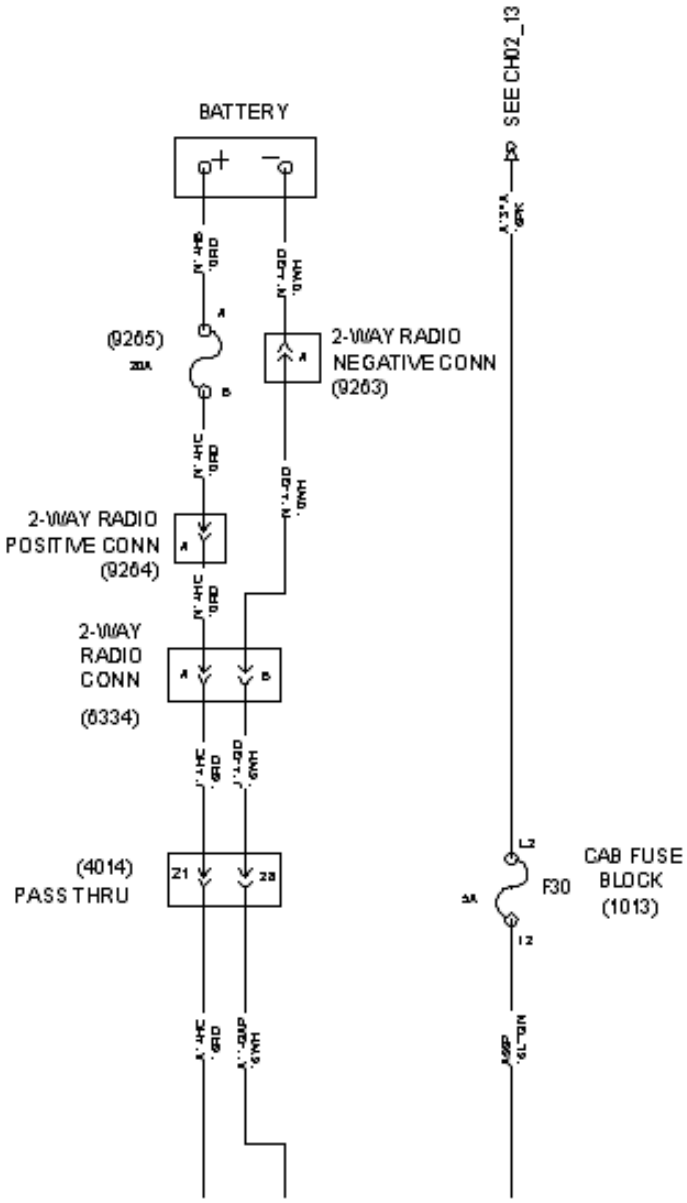


Figure 48

TESTING:

• To test these circuits, refer to the above chart and verify that battery voltage is present in the correct key-state for each respective feature.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without one of the desired features, they can be installed in the field. Refer to the section “How Do I” General Information section of the body builders book for information on obtaining required parts. The same parts that are used in the OEM installation are available (cables, components, etc.). Also, refer to the circuit diagram that applies to your vehicle to aid in the installation.

8. GAUGE CLUSTER — OPTIONAL GAUGES

8.1. 04SBL — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

04SBL - AIR COMPRESSOR {Bendix Tu-Flo 550} 13.2 CFM Capacity; and Tank for Air Source on Hydraulic Chassis

FEATURE / BODY FUNCTION:

04SBL – Provides system air pressure when an air compressor is ordered with a hydraulic brake vehicle.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

04SBL (Auxiliary Air gauge): 595007

The **Aux_Air_Press_Alrm_Ty_Param** parameter defines the number of beeps associated with the Auxiliary air pressure gauge alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Aux_Air_Press_Filter_Param** parameter sets the Auxiliary air gauge update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Aux_Air_Press_Max_WL** parameter sets the maximum point for auxiliary air in-gauge warning light. When the auxiliary air pressure rises above this set parameter, the warning light in the gauge will illuminate.

The **Aux_Air_Press_Min_WL** parameter sets the minimum point for auxiliary air in-gauge warning light. When the auxiliary air pressure falls below this set parameter, the warning light in the gauge will illuminate.

Table 28

Parameter	ID	Description	Default	Units	Min	Max	Step
Aux_Air_ Press_Alrm_ Ty_Param	107	Auxiliary air pressure gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	255	No_ Units	255	255	25
Aux_Air_ Press_Filter_ Param	108	Auxiliary air gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1

Parameter	ID	Description	Default	Units	Min	Max	Step
Aux_Air_ Press_Max_ WL	1963	Maximum threshold for auxiliary air in-gauge warning light	150	psig	0	150	1
Aux_Air_ Press_Min_ WL	1964	Minimum threshold for auxilliary air in-gauge warning light	72	psig	0	150	1

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic-liquid crystal display)

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible)

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 29 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Auxiliary Air Pressure Gauge	3533899C1	3533900C1

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12

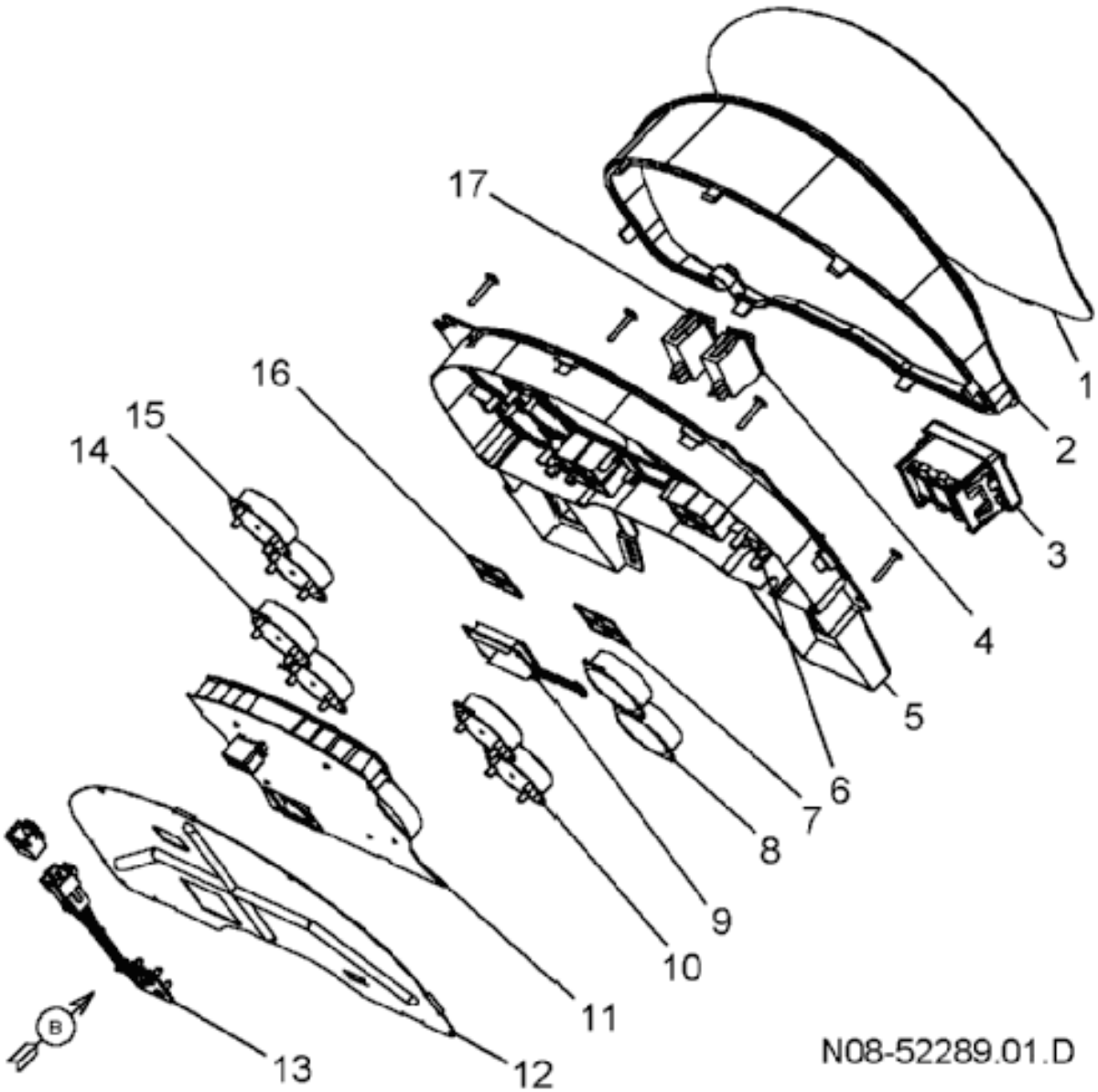


Figure 49

Remove the filler plug from desired gauge location, see view below

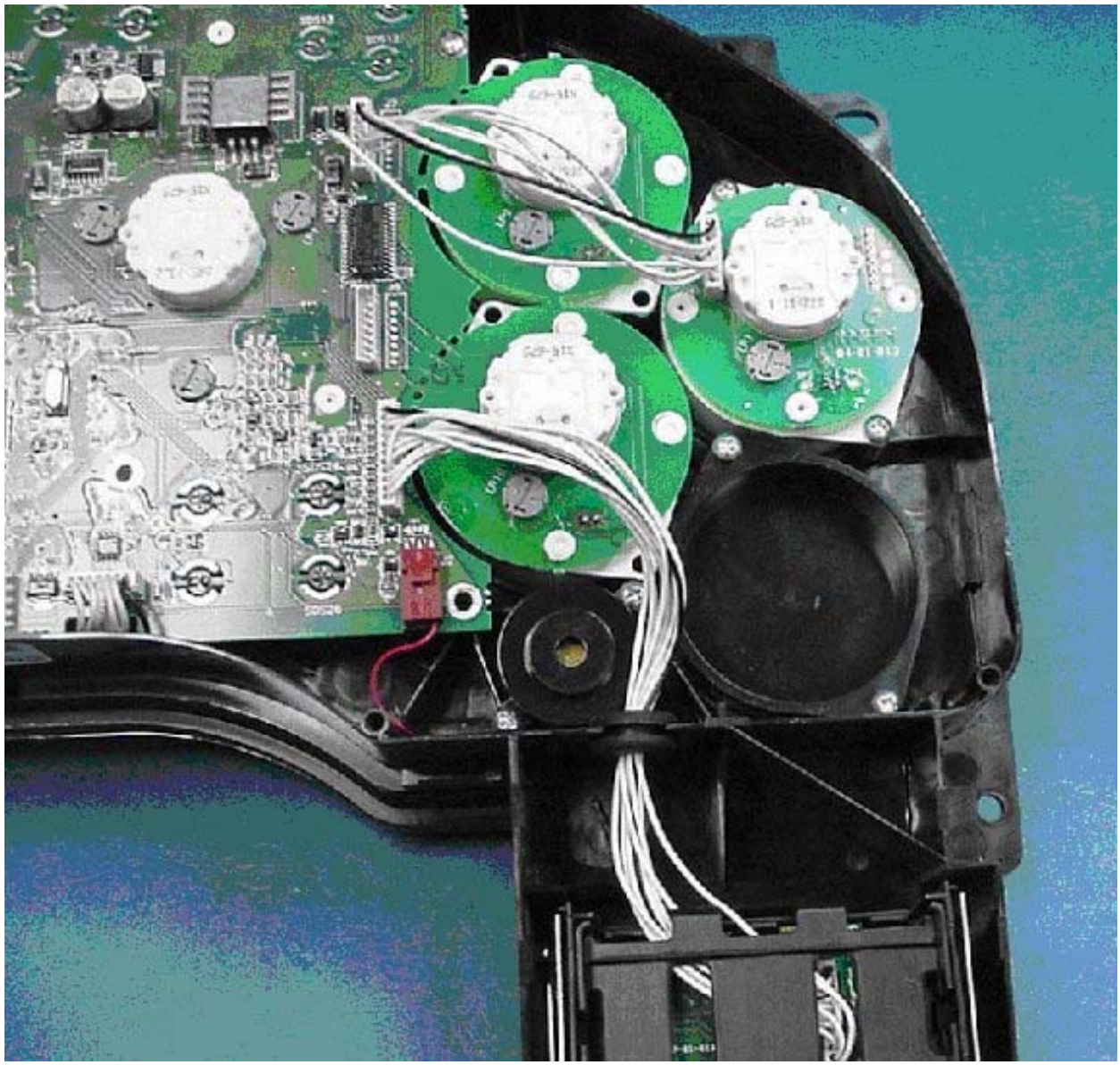


Figure 50 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.2. 16HGG — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

16HGG – GAUGE, OIL TEMP, ENGINE

FEATURE / BODY FUNCTION:

16HGG – Provides engine oil temperature to the vehicle operator.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HGG (Engine Oil Temperature): 595097 **OR** 595254 (Customer cannot use both)

** Software Feature Code 595097 is used to read engine oil temperature off the datalink.

** Software Feature Code 595254 is used to read engine oil temperature from a hard-wired analog sensor.

The **Eng_Oil_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the Engine oil temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Eng_Oil_Temp_Filter_Param** parameter sets the engine oil temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Eng_Oil_Temp_Max_WL** parameter sets the maximum point for engine oil temperature in-gauge warning light. When the oil temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Eng_Oil_Temp_Min_WL** parameter sets the minimum point for engine oil temperature in-gauge warning light. When the oil temperature falls below this set parameter, the warning light in the gauge will illuminate.

Table 30

Parameter	ID	Description	Default	Units	Min	Max	Step
Eng_Oil_ Temp_Alrm_ Ty_Param	218	Engine oil temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Eng_Oil_ Temp_Filter _Param	219	Engine oil temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1

Parameter	ID	Description	Default	Units	Min	Max	Step
Eng_Oil_ Temp_ Max_WL	1949	Maximum set point for engine oil temperature in-gauge warning light	230	F	100	300	0.03
Eng_Oil_ Temp_ Min_WL	1950	Minimum set point for engine oil temperature in-gauge warning light	100	F	100	300	0.03

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic- liquid crystal display)

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible)

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 31 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Engine Oil Temperature Gauge	3533886C1	3533895C1

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12

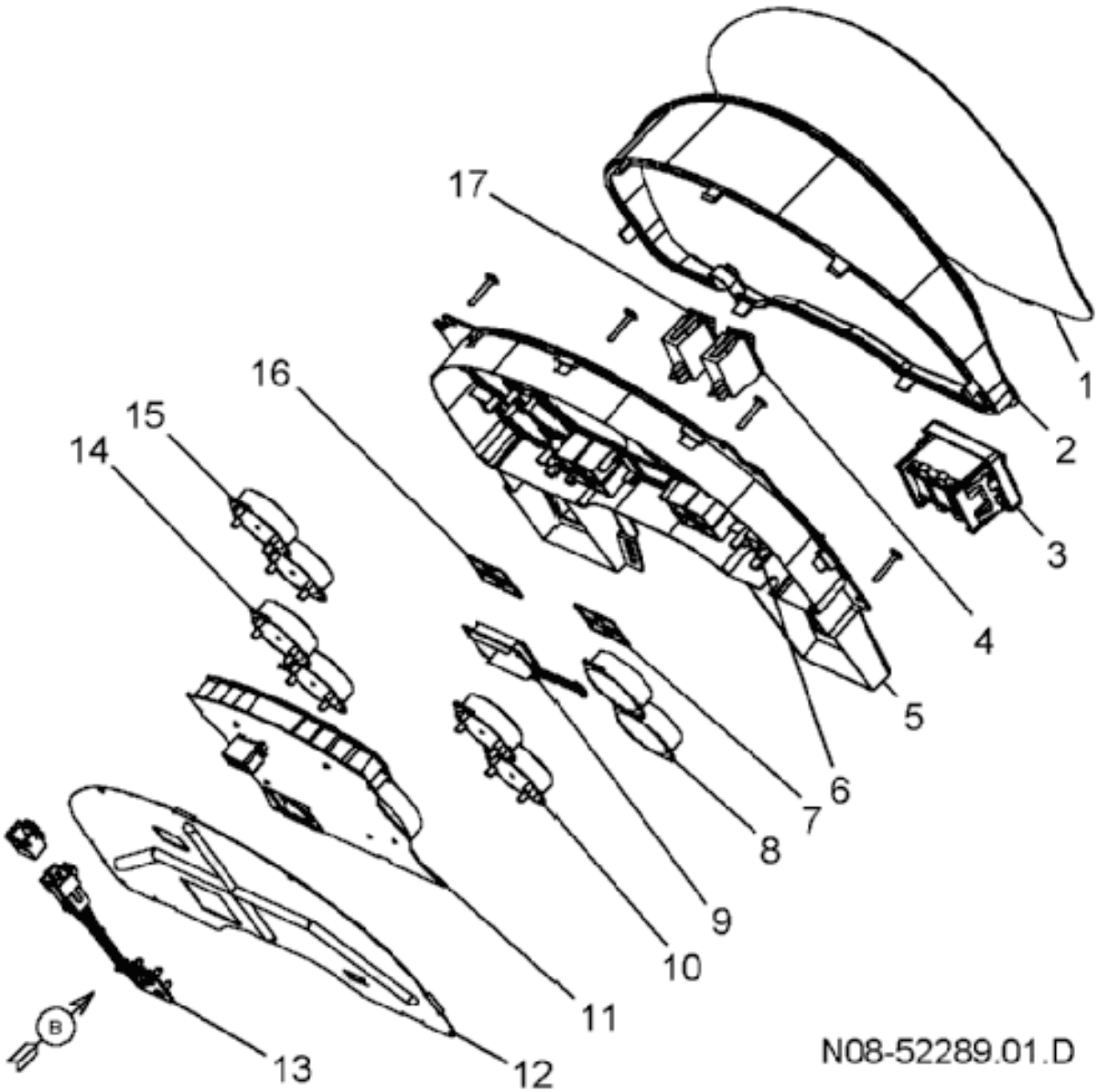


Figure 51

Remove the filler plug from desired gauge location, see view below.

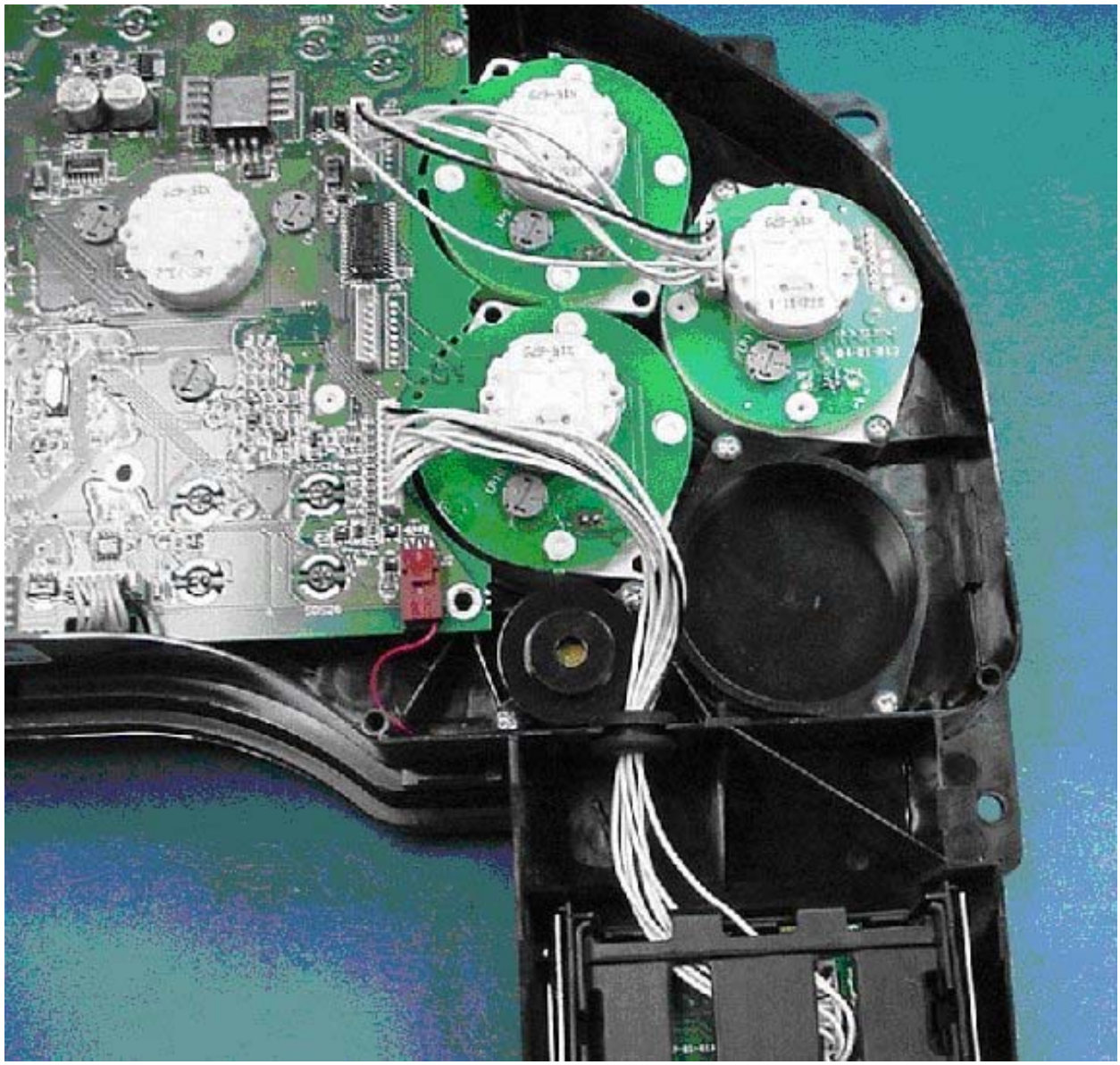


Figure 52 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.3. 16HGH — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

16HGH – GAUGE, OIL TEMP, ALLISON TRAN

FEATURE / BODY FUNCTION:

16HGH – Provides Allison transmission fluid temperature information to the vehicle operator.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HGH (Allison Transmission Oil Temperature gauge): 595060

The **Trans_Oil_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the Transmission oil temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Trans_Oil_Temp_Filter_Param** parameter sets the Transmission oil temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Trans_Oil_Temp_Max_WL** parameter sets the maximum point for Transmission oil temperature in-gauge warning light. When the oil temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Trans_Oil_Temp_Min_WL** parameter sets the minimum point for Transmission oil temperature in-gauge warning light. When the oil temperature falls below this set parameter, the warning light in the gauge will illuminate.

Table 32

Parameter	ID	Description	Default	Units	Min	Max	Step
Trans_Oil_ Temp_Alrm_ Ty_Param	587	Transmission oil temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Trans_Oil_ Temp_ Filter_Param	589	Transmission oil temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1

Parameter	ID	Description	Default	Units	Min	Max	Step
Trans_Oil_ Temp_ Max_WL	1959	Maximum set point for transmission oil temperature in-gauge warning light	250	F	100	400	0.03
Trans_Oil_ Temp_ Min_WL	1960	Minimum set point for transmission oil temperature in-gauge warning light	100	F	100	400	0.03

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic- liquid crystal display).

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible).

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer.

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster.

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 33 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Transmission Oil Temperature Gauge	3533885C1	3533894C1

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12

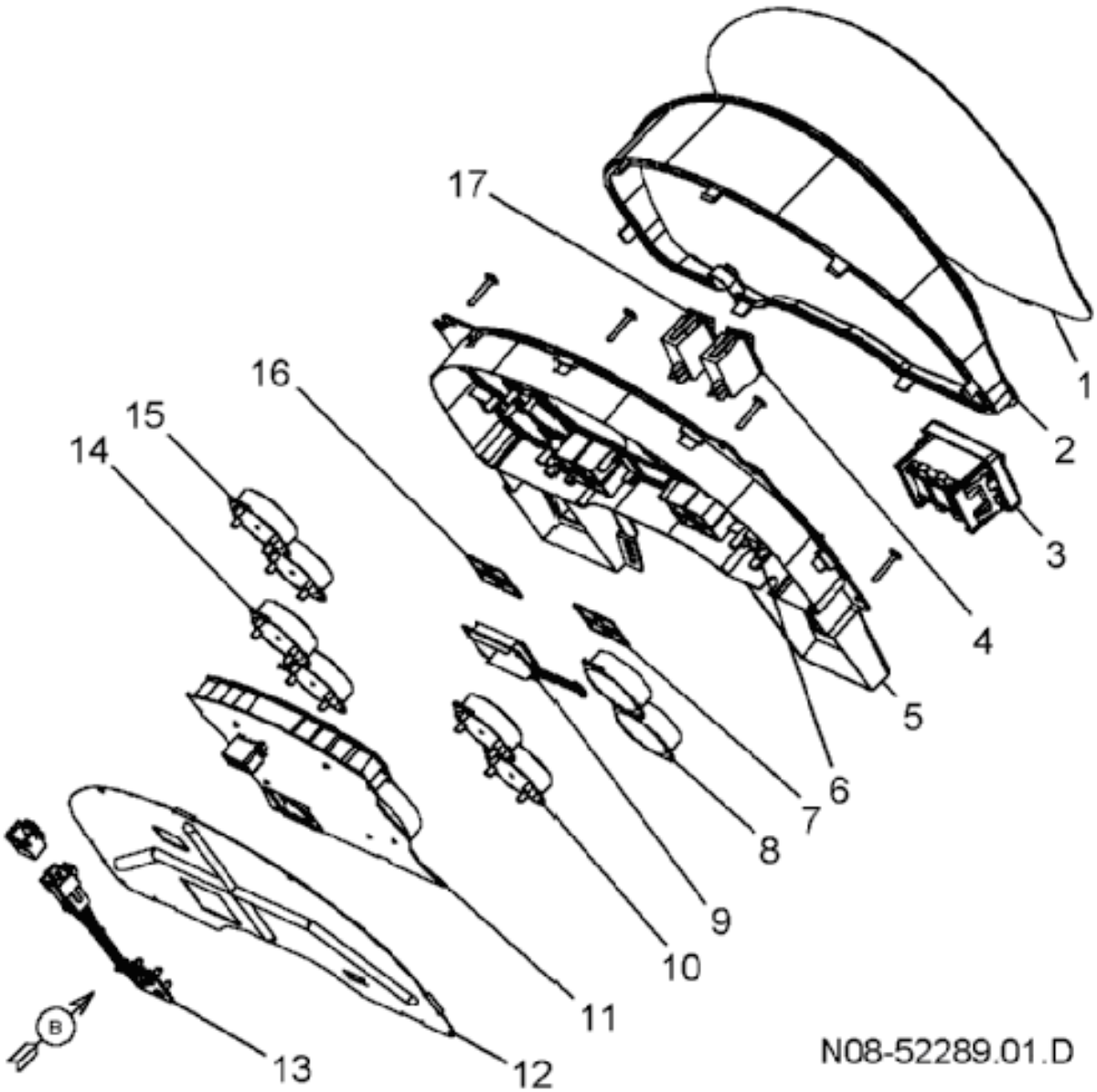


Figure 53

Remove the filler plug from desired gauge location, see view below

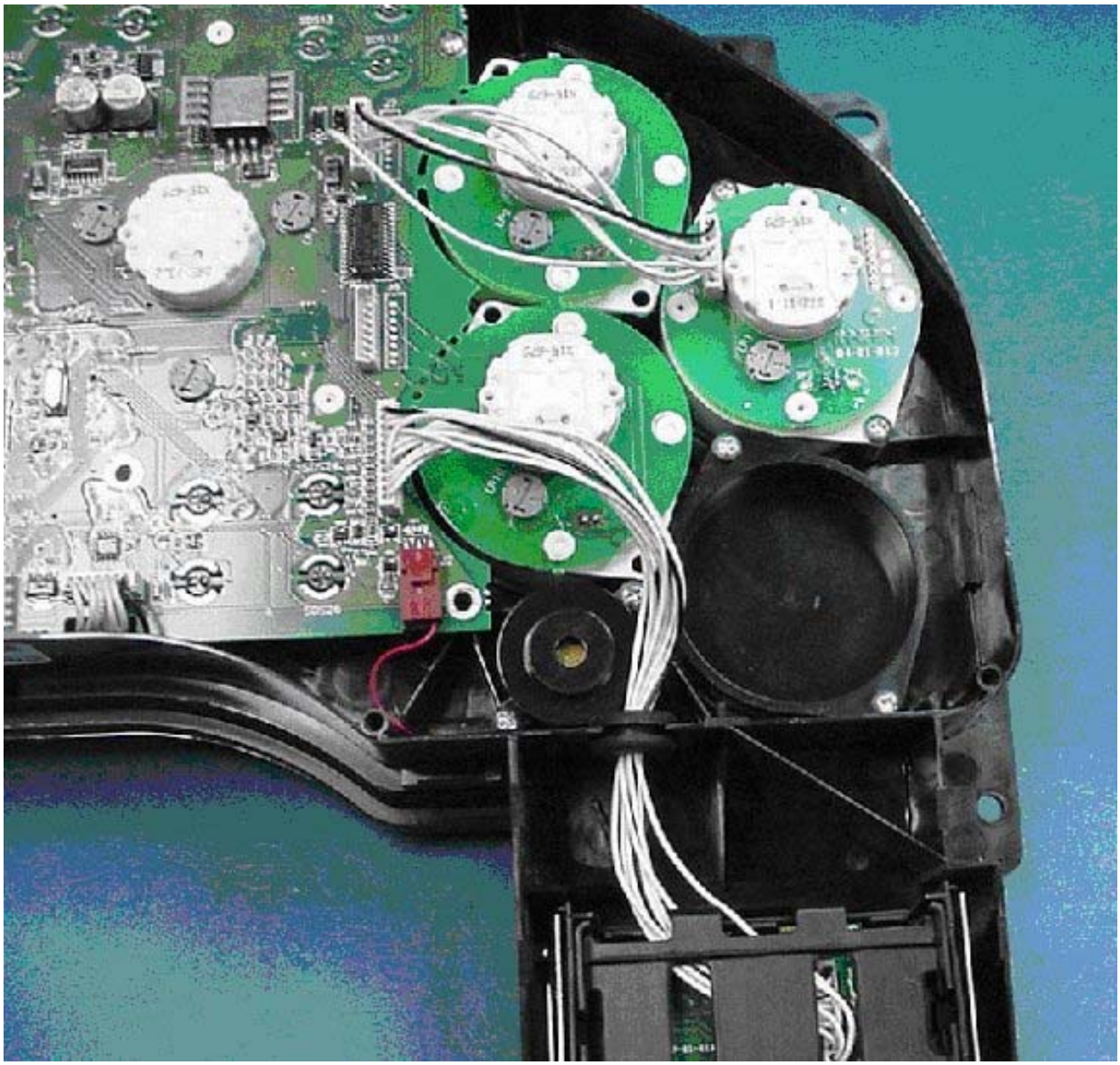


Figure 54 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.4. 16HGJ — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

16HGJ – GAUGE, OIL TEMP, MANUAL TRAN

FEATURE / BODY FUNCTION:

16HGJ – Provides manual transmission oil temperature to the vehicle operator. Manual transmissions should not be operated at temperatures above 250 °F (120 °C).

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HGJ (Oil Temperature gauge on a manual transmission): 595145

The **Trans_Oil_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the Transmission oil temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Trans_Oil_Temp_Filter_Param** parameter sets the Transmission oil temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Trans_Oil_Temp_Max_WL** parameter sets the maximum point for Transmission oil temperature in-gauge warning light. When the oil temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Trans_Oil_Temp_Min_WL** parameter sets the minimum point for Transmission oil temperature in-gauge warning light. When the oil temperature falls below this set parameter, the warning light in the gauge will illuminate.

Table 34

Parameter	ID	Description	Default	Units	Min	Max	Step
Trans_Oil_ Temp_Alrm_ Ty_Param	587	Transmission oil temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Trans_Oil_ Temp_ Filter_Param	589	Transmission oil temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1

Parameter	ID	Description	Default	Units	Min	Max	Step
Trans_Oil_ Temp_ Max_WL	1959	Maximum set point for transmission oil temperature in-gauge warning light	250	F	100	400	0.03
Trans_Oil_ Temp_ Min_WL	1960	Minimum set point for transmission oil temperature in-gauge warning light	100	F	100	400	0.03

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic- liquid crystal display).

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible).

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer.

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster.

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 35 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Transmission Oil Temperature Gauge	3533885C1	3533894C1

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12.

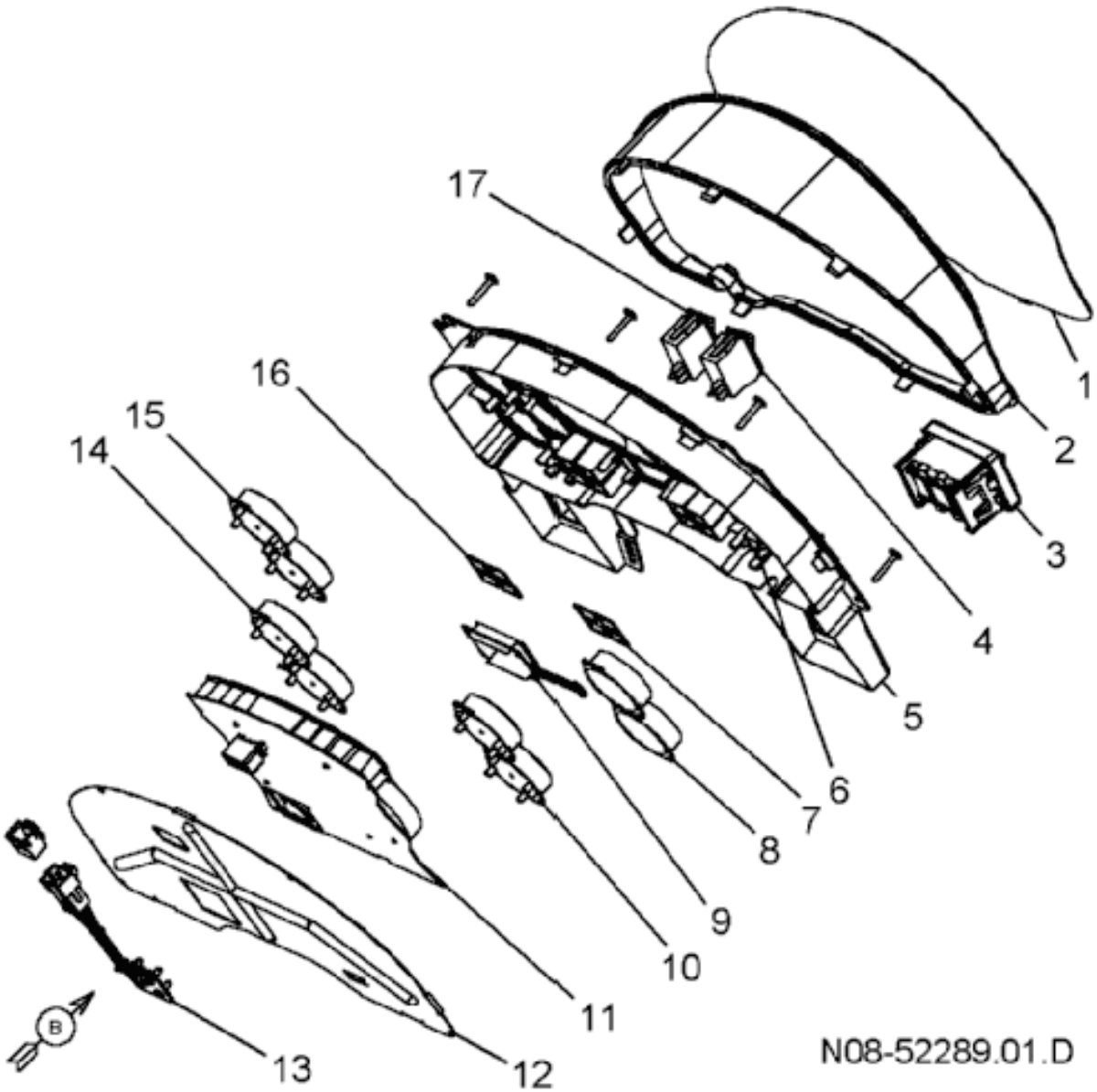


Figure 55

Remove the filler plug from desired gauge location, see view below.

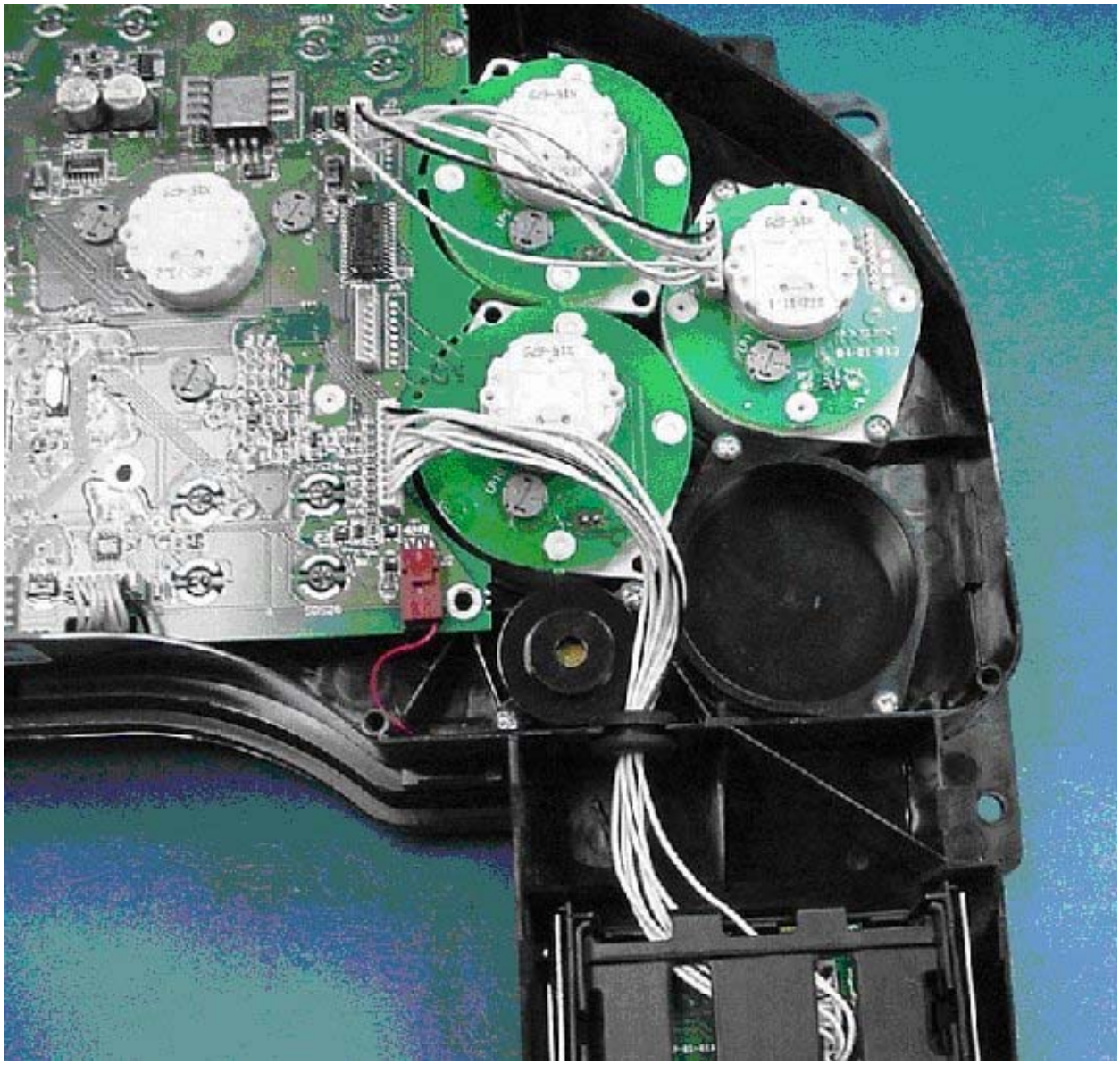


Figure 56 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.5. 16HGL — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

16HGL – GAUGE, OIL TEMP, REAR AXLE

FEATURE / BODY FUNCTION:

16HGL – Provides rear axle operating information to the vehicle operator. Rear axle temperature should not exceed 240 °F (115 °C).

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HGL (Rear Axle Temperature): 595086 **OR** 595087 (Customer cannot use both)

** Software Feature Code 595086 is used to read Rear-rear axle temperature AND Forward-rear axle temperature.

** Software Feature Code 595087 is used to read just Rear-rear axle temperature.

→ **595086 (Rear-rear and Forward-rear Axle Temperature)**

The **Fwd_RR_Axle_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the forward rear axle temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Fwd_RR_Axle_Temp_Filter_Param** parameter sets the forward rear axle temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Rear_RR_Axle_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the rear rear axle temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Rear_RR_Axle_Temp_Filter_Param** parameter sets the rear rear axle temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Rear_RR_Axle_Temp_Max_WL** parameter sets the maximum point for Rear rear axle temperature in-gauge warning light. When the Rear rear axle temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Rear_RR_Axle_Temp_Min_WL** parameter sets the minimum point for Rear rear axle temperature in-gauge warning light. When the Rear rear axle temperature falls below this set parameter, the warning light in the gauge will illuminate.

The **Fwd_RR_Axle_Temp_Max_WL** parameter sets the maximum point for Forward rear axle temperature in-gauge warning light. When the Forward rear axle temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Fwd_RR_Axle_Temp_Min_WL** parameter sets the minimum point for Forward rear axle temperature in-gauge warning light. When the Forward rear axle temperature falls below this set parameter, the warning light in the gauge will illuminate.

Table 36

Parameter	ID	Description	Default	Units	Min	Max	Step
Fwd_RR_ Axle_Temp_ Alrm_Ty_ Param	276	Forward rear axle temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Fwd_RR_ Axle_Temp_ Filter_Param	277	Forward rear axle temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1
Rear_RR_ Axle_Temp_ Alrm_Ty_ Param	518	Rear rear axle temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Rear_RR_ Axle_Temp_ Filter_Param	519	Rear rear axle temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1
Rear_RR_ Axle_Temp_ Max_WL	1969	Maximum set point for rear rear axle temperature in-gauge warning light	230	F	100	300	1
Rear_RR_ Axle_Temp_ Min_WL	1970	Minimum set point for rear rear axle temperature in-gauge warning light	100	F	100	300	1
Fwd_RR_ Axle_Temp_ Max_WL	1971	Maximum set point for forward rear axle temperature in-gauge warning light	230	F	100	300	1
Fwd_RR_ Axle_Temp_ Min_WL	1972	Minimum set point for forward rear axle temperature in-gauge warning light	100	F	100	300	1

→ **595087 (Just Rear-Rear Axle Temperature)**

The **Rear_RR_Axle_Temp_Alrm_Ty_Param** parameter defines the number of beeps associated with the rear rear axle temperature alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Rear_RR_Axle_Temp_Filter_Param** parameter sets the rear rear axle temperature update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Rear_RR_Axle_Temp_Max_WL** parameter sets the maximum point for Rear rear axle temperature in-gauge warning light. When the Rear rear axle temperature rises above this set parameter, the warning light in the gauge will illuminate.

The **Rear_RR_Axle_Temp_Min_WL** parameter sets the minimum point for Rear rear axle temperature in-gauge warning light. When the Rear rear axle temperature falls below this set parameter, the warning light in the gauge will illuminate.

Table 37

Parameter	ID	Description	Default	Units	Min	Max	Step
Rear_RR_ Axle_Temp_ Alrm_Ty_ Param	518	Rear rear axle temperature gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	25	No_ Units	0	255	25
Rear_RR_ Axle_Temp_ Filter_Param	519	Rear rear axle temperature gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1
Rear_RR_ Axle_Temp_ Max_WL	1969	Maximum set point for rear rear axle temperature in-gauge warning light	230	F	100	300	1
Rear_RR_ Axle_Temp_ Min_WL	1970	Minimum set point for rear rear axle temperature in-gauge warning light	100	F	100	300	1

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic- liquid crystal display)

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible)

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 38 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Rear-rear Axle Oil Temperature Gauge	3533890C1	3533897C1
Forward-rear Axle Oil Temperature Gauge	3533891C1	3533898C1

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12.

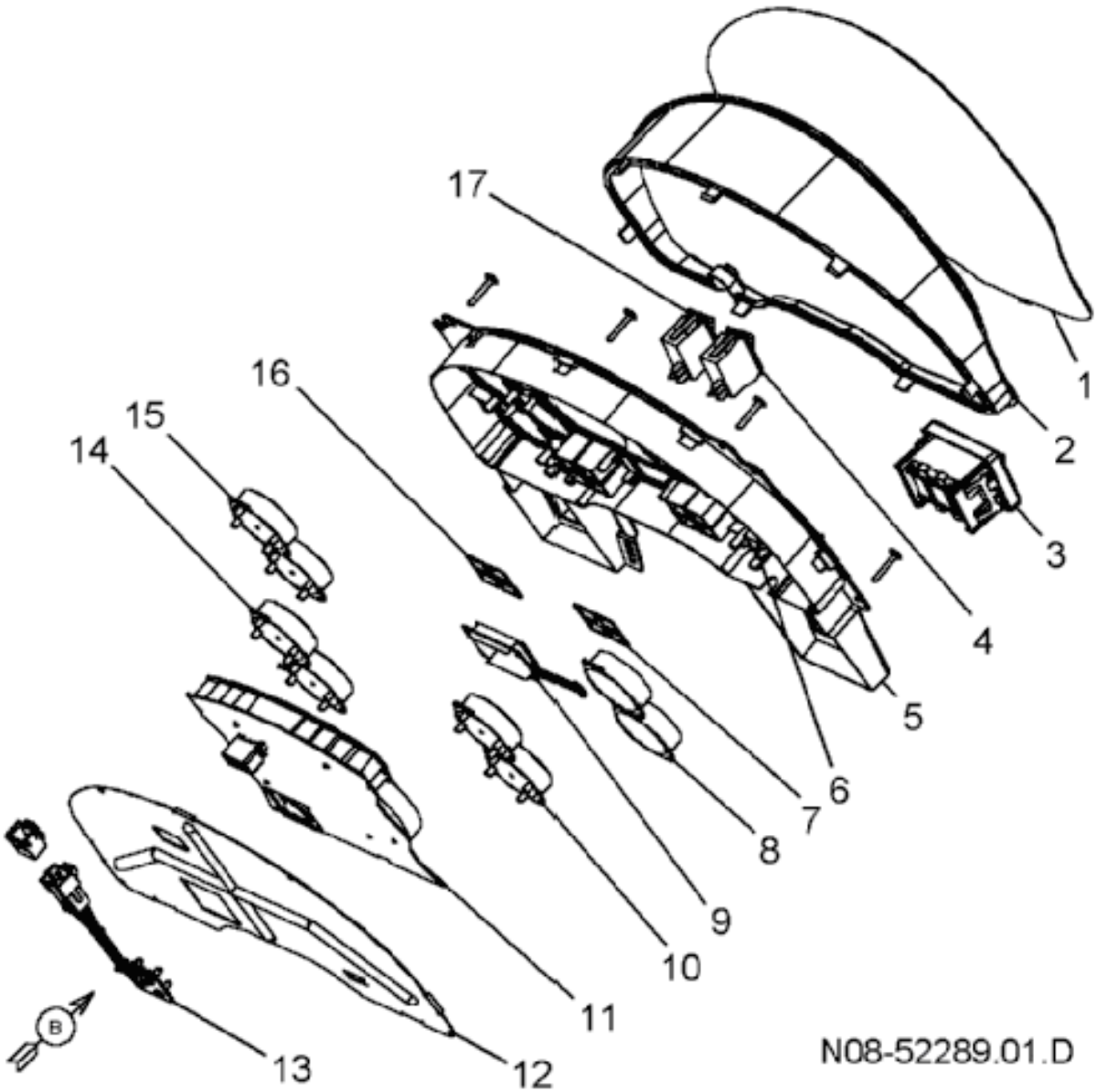


Figure 57

Remove the filler plug from desired gauge location, see view below.

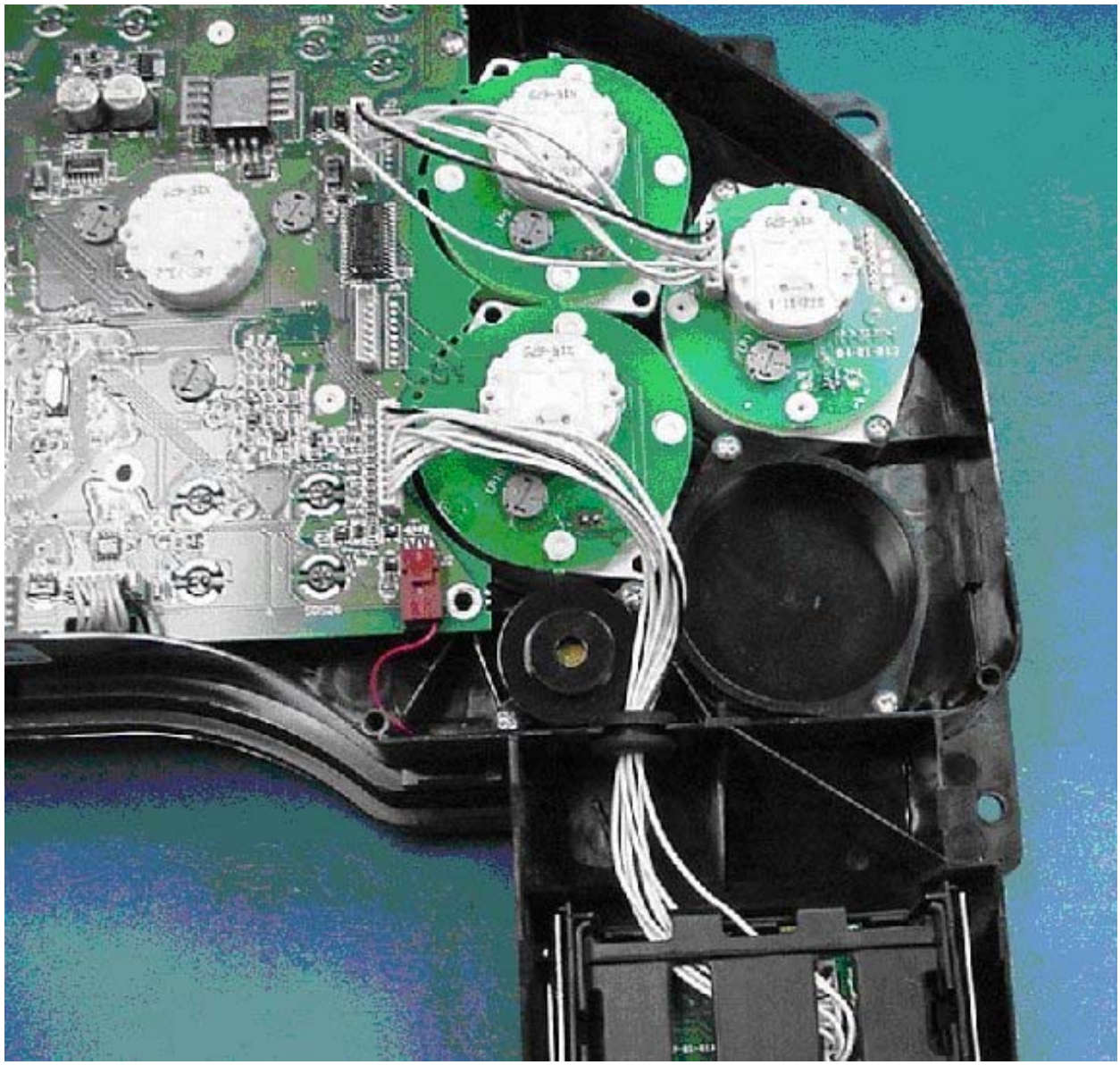


Figure 58 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.6. 16HGN — INSTRUMENT CLUSTER – ADDING GAUGES

FEATURE CODE DESCRIPTION:

16HGN – GAUGE, AIR APPLICATION

FEATURE / BODY FUNCTION:

16HGN – This feature gives a visual read-out of the amount of pressure being applied to the brake pedal.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HGN (Air application gauge): 595150

The **Brake_App_Alrm_Ty_Param** parameter defines the number of beeps associated with the Brake application gauge alarm. The number of beeps is the value entered divided by 5. A value of 255 is continuous beeping.

The **Brake_App_Filter_Param** parameter sets the Brake application gauge update rate. The higher the number is, the faster the update rate. 255 is the fastest update rate available, and 1 is the slowest update rate available.

The **Brake_App_Max_WL** parameter sets the maximum point for the brake application in-gauge warning light. When the brake pressure rises above this set parameter, the warning light in the gauge will illuminate.

The **Brake_App_Min_WL** parameter sets the minimum point for brake application in-gauge warning light. When brake pressure falls below this set parameter, the warning light in the gauge will illuminate.

Table 39

Parameter	ID	Description	Default	Units	Min	Max	Step
Brake_App_ Alrm_Ty_ Param	127	Brake application gauge alarm type. The number of "beeps" is the value of this parameter divided by 5, 255 is a continuous tone.	0	No_ Units	0	255	25
Brake_App_ Filter_Param	128	Brake application gauge update rate. A value of 1 is the slowest and 255 is the fastest update rate.	255	No_ Units	1	255	1
Brake_App_ Max_WL	1979	Maximum set point for brake application in-gauge warning light	150	psig	0	150	0.5
Brake_App_ Min_WL	1980	Minimum set point for brake application in-gauge warning light	0	psig	0	150	0.5

WIRING INFORMATION:

The standard cluster includes:

ODOMETER DISPLAY: Miles, Trip Miles, Engine Hours, Trip Hours, Fault Code Readout (Odometer, trip odometer and fault code readout electronic- liquid crystal display)

WARNING SYSTEM: Low Fuel, Low Oil Pressure, High Engine Coolant Temp, and Low Battery Voltage (Visual and Audible)

GAUGE CLUSTER GAUGES (6): Engine Oil Pressure (Electronic), Water Temperature (Electronic), Fuel (Electronic), Tachometer (Electronic), Voltmeter, Speedometer

GAUGE, AIR PRESSURE: Air 1 and Air 2 Gauges; Located in Instrument Cluster

TESTING:

Use INTUNE or the Diamond Logic™ Builder software to steer each gauge to test values.

HOW DO I ADD THESE FEATURES:

If the vehicle was ordered without a desired gauge, one or more can be added. Proper programming indicating final gauge location and feature code must be done before the gauge will function. Refer to the section “How Do I” General Information section of the body builders book for information on how to obtain gauge, circuits and sensor P/N’s.

Table 40 Optional Gauge Part Numbers

Optional Gauges	ENGLISH Part Number	METRIC Part Number
Air Application Gauge	3533887C1	~

Always refer to the circuit diagram manual for information.

A. Remove EGC shroud from instrument panel.
B. Remove four screws which hold the EGC in place.
C. Tilt the EGC forward to gain access to the back of the EGC.
D. Remove the 12-way connector from the center of the EGC.
E. Remove any additional connectors from the EGC.

Installation of the gauge cluster is the reverse of the removal procedure.

Remove the back cover from the EGC – Item 12

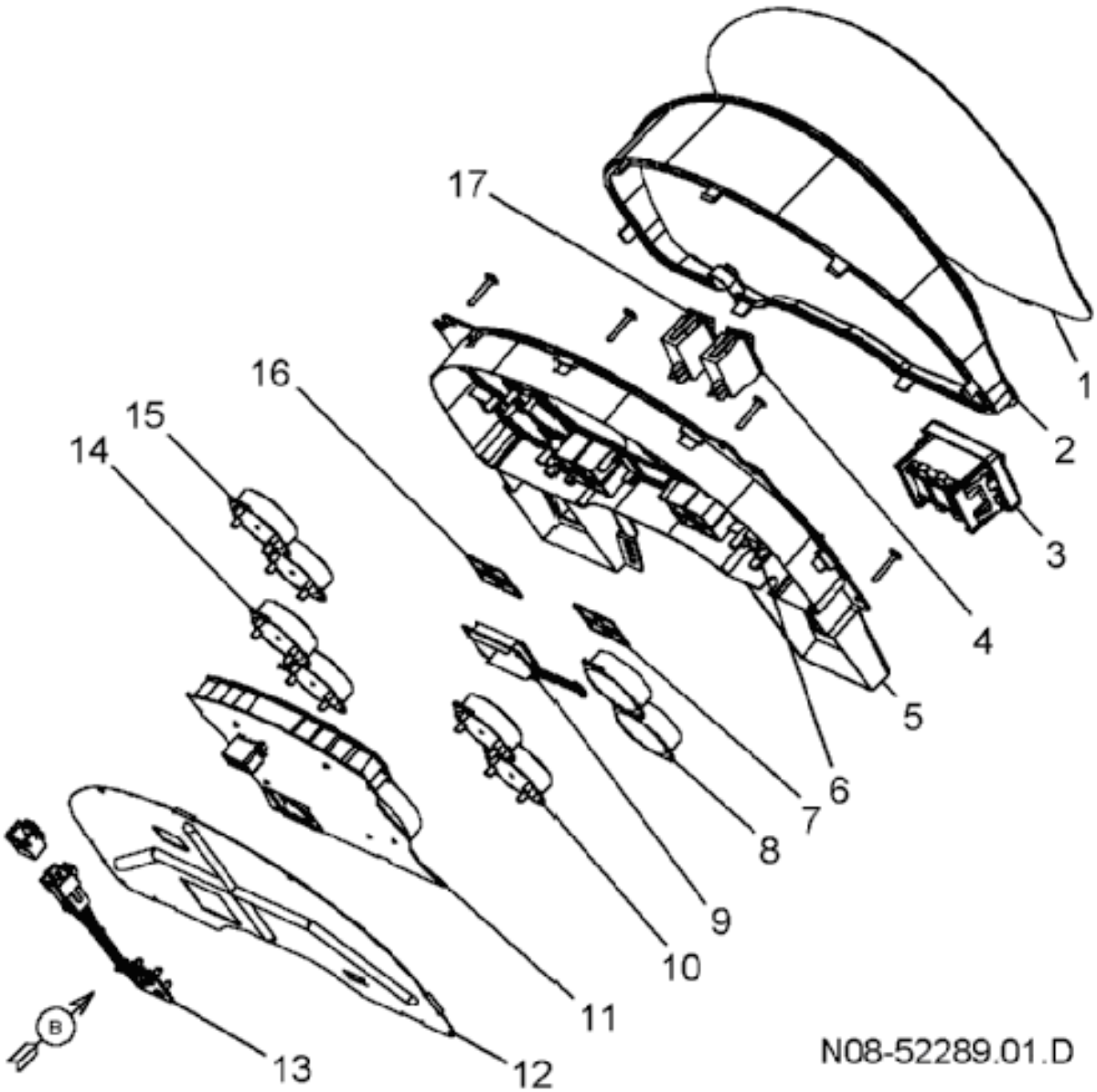


Figure 59

Remove the filler plug from desired gauge location, see view below.

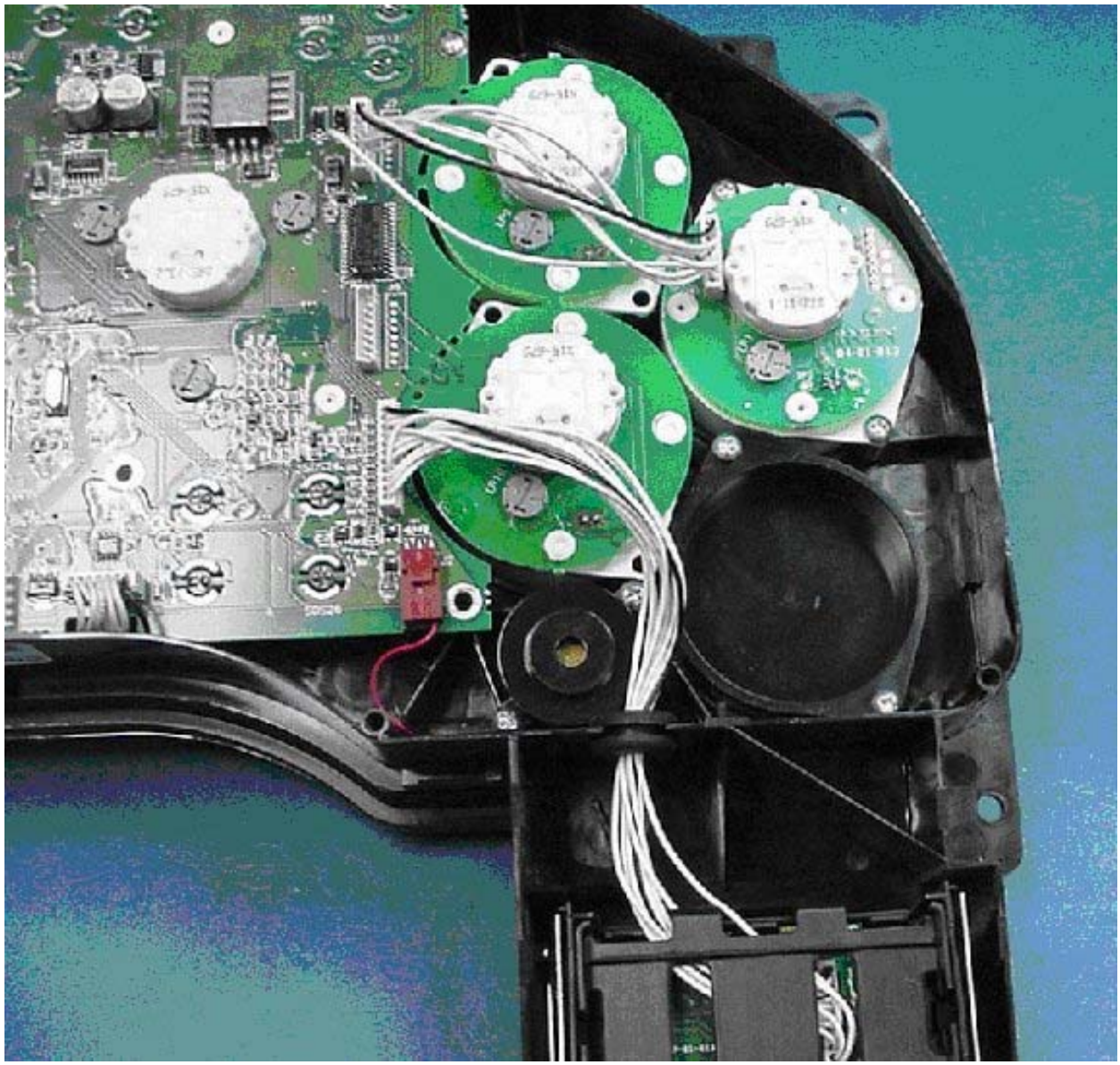


Figure 60 Back of Electronic Gauge Cluster

Install gauge in open space and attach jumper. Note if the additional gauge is being added to the upper position, the jumper must connect to the upper connector.

8.7. 16HKA — INSTRUMENT CLUSTER – OMIT FAULT CODES

FEATURE CODE DESCRIPTION:

16HKA – IP CLUSTER DISPLAY — Omit display of fault codes in instrument cluster and disable blink codes, requires service tool to retrieve and view fault codes.

FEATURE / BODY FUNCTION:

Optional feature that removes the ability to read fault codes inside the vehicle, using the cluster's LCD display. No hardware change is needed. This is a software configurable feature.

SOFTWARE FEATURE CODES / PROGRAMMABLE PARAMETERS:

16HKA (IP Cluster Display Omit Fault Codes): 595298

WIRING INFORMATION:

No additional wiring is needed.

TESTING:

1. Set Park Brake
2. Press and hold Cruise On switch and Cruise Resume switch
3. Odometer should **NOT** display "NO FAULTS" or a number of FAULTS.

HOW DO I ADD THESE FEATURES:

Select software feature code 595282 using ICAP or the Diamond Logic™ Builder software (See Local Dealer)