VOLVO
Volvo Trucks North America, Inc.
Greensboro, NC USA

Service Bulletin Trucks

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General Safety Practices
Electrical and Electronics
VN, VHD

General Safety Practices

The following information covers General Safety Practices for components included in group 3, Electrical and Electronics systems.

There is no substitute for common sense and careful practices in the workplace. Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, or other bodily injury or death.

This information contains general safety precautions and guidelines that must be followed to reduce risk to personal safety. Special safety precautions are listed in specific procedures when they apply.

Read and understand all of the safety precautions and guidelines before performing any repair.

Contents:

General Safety Practices

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

DANGER

Exhaust gases contain carbon monoxide. When testing a vehicle with the engine running, conduct the test outdoors or use a properly vented exhaust hose. Prolonged or excessive exposure may cause serious illness or death.

DANGER

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

WARNING

When disconnecting battery cables, disconnect the ground (negative) cable first to prevent personal injury from electrical shock.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with debris or fluids.

WARNING

If a vehicle is to be operated with test equipment connected, precautions must be taken to ensure that all equipment and related components are securely attached to prevent movement and interference which could result in personal injuries.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Clean up fuel spills immediately. Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

WARNING

Do not work near the fan with the engine running or the ignition in the ON position. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured.

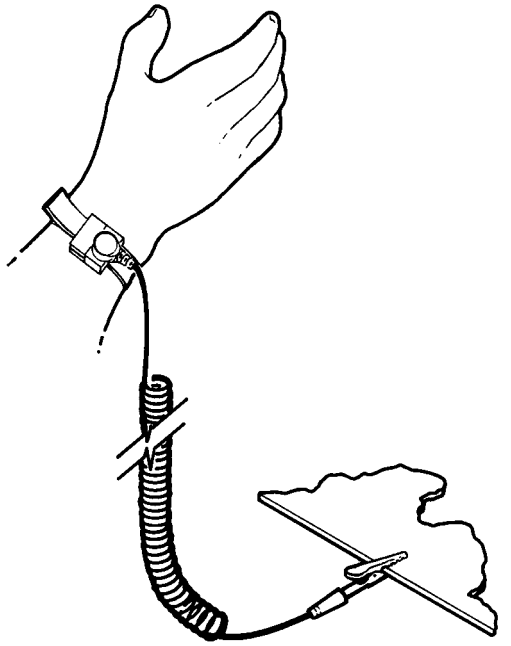
CAUTION

Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electrical components. Failure to de-energize circuits may result in electronic equipment damage.

Preventing Electrostatic Discharge (ESD)

CAUTION

A wrist grounding strap must be worn when working on electronic equipment such as the instrument cluster. This is to prevent electrostatic discharge (ESD), which can damage electronic components. To use the wrist strap in a vehicle, attach the alligator clip to the nearest electrical ground such as a metal mounting screw, a ground terminal or preferably a ground stud.



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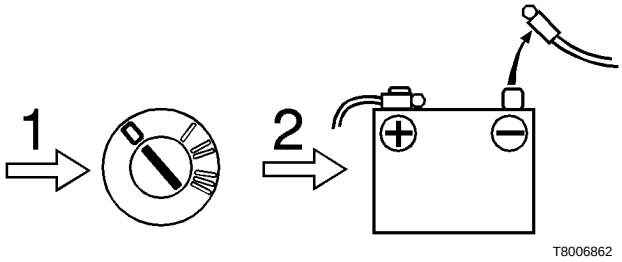
Human skin can hold more than 1000 volts of static electricity. Although getting a static shock is annoying, it is not dangerous because there is so little energy stored by clothing. But when dealing with circuits designed to sense differences smaller than 1 volt, electrostatic discharge can be a subtle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

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

Disconnecting/Connecting the Battery

DANGER

Personal injury risk. Make sure that no one is inside the cab when connecting the battery. Otherwise, serious personal injury could occur due to possible deployment of the airbag.



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WARNING

Always wear eye protection when working around batteries to prevent the risk of personal injury due to explosion or contact with surfuric acid.

WARNING

Batteries may contain explosive gases. When servicing batteries do not smoke or work near sparks or flames, in order to avoid the risk of an explosion and personal injury.

CAUTION

When disconnecting the battery, disconnect any ground cables connected to the battery (such as engine ECU, satellite system, etc.). Disconnect those grounds ***first*** to avoid damaging electrical components.

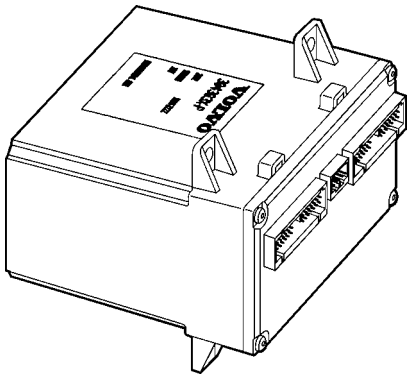
ECUs (Electronic Control Units)

ECUs consist of sophisticated electronics that can be permanently damaged if not treated properly.

To prevent serious damage to ECUs, please follow these important guidelines:

CAUTION

Before beginning a procedure in which the battery must be disconnected, turn the ignition OFF and disconnect any ground cables connected to the battery (such as engine ECU, satellite system, etc.). Disconnect those grounds ***first*** to avoid damaging electrical components. Then disconnect battery negative and positive terminals (disconnect the ground terminal first).



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Vehicle ECU

Wire Troubleshooting and Repair

Continual electrical problems may be the result of incomplete or inadequate diagnosis and improper repairs. Unless the root cause of a problem is determined, it will fail again, i.e., a blown fuse will blow again unless the cause of the overload is located. Make every effort to determine the root cause of a failure.

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Data Link Wiring

When troubleshooting,

- Never pierce wiring insulation with test probes.
- Do not pierce through seals on water-resistant connectors.
- Never insert test probes into connectors. The probes may spread the terminals and cause intermittent faults.

WARNING

Improper repair or modification of wiring can result in the failure of the vehicle's electronic systems, a short circuit, and personal injury from a fire.

CAUTION

Follow Volvo's instructions on "Data Link Troubleshooting and Repair" in group 371 if repairs are needed to wires 406 (yellow), 407 (green) or 408 (shielded). These wires carry the high-speed communications between the electronic systems in the vehicle.

CAUTION

Follow Volvo's instructions on "Data Link Troubleshooting and Repair" in group 371 if repairs are needed to data link wiring (wires 400 or 401). These wires are used for the transmission of data for diagnostic messages and gauges. Improper repair can cause these functions to fail.

CAUTION

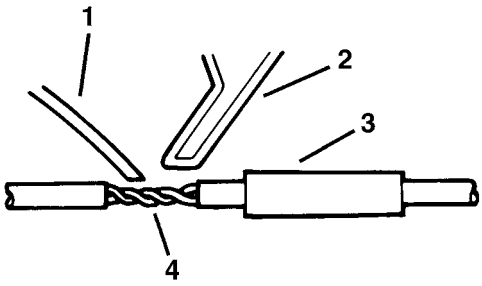
If a circuit must be added to the electrical system, and it will carry high currents or frequencies, route it in a location AWAY from wires 400 and 401 to prevent mutual inductance from interfering with data link functions.

Wire Splicing

Note: Wiring terminal and connector repair requires the use of proper terminals (Packard, JAE, etc.) and specialized tools. The following procedures are for general wiring repairs only.

Should splicing be necessary, follow these guidelines:

- When possible, replace a damaged wire rather than repairing it. If this is not possible, solder or splice the wires and use heat-shrink tubing with sealant over the splice.
- For crimp and seal repairs, splice or terminal connections with heat-shrink covering are recommended. If non-heat shrink connectors are used, a separate piece of heat-shrink tubing must be used to seal the connection.
- When replacing wires use the correct wire size. Never replace a wire with one of a smaller size or replace a fusible link with a wire of a larger size. Secure each harness or wire in place to prevent chafing or damage to the insulation due to vibration.
- For solder repairs, do not use acid core solder. When soldering wiring always use rosin flux solder to bond the splice. Use sealant-shrink tubing to cover all splices or bare wires.
- It is very important when soldering electrical terminals to obtain a good soldered joint. Use a quality soldering iron such as a Weller Model 440D or equivalent. A good quality soldering iron will offer dual heat in a medium range (145/210 watts). Use Kester alloy SN60, Flux-44 Rosin, 0.80 mm (0.032 in.) maximum diameter or equivalent.



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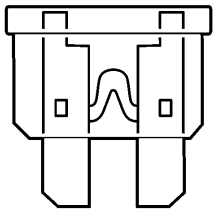
Wire splicing

1 Solder
2 Soldering iron
3 Heat shrink tubing with sealant
4 Wires twisted

Circuit Protection

Any change done to the existing vehicle wiring should only be done with extreme caution and a study of the vehicle electrical system. Changes must be clearly thought out and the effect on the system must be considered to ensure that adequate circuit protection will be provided and that undesirable current paths are not created.



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WARNING

Failure to use proper circuit protection devices in the vehicle can result in damage to the vehicle and its components. Replace blown fuses only with fuses of the same rating. Replace fusible links only with proper replacement parts of the exact gauge and length. Failure to use proper circuit protection could overload the circuit, causing damage to the vehicle and a possible fire, and personal injury.

All circuits must be protected (whether standard or added) by a circuit breaker or fuse. In many cases it is recommended that one be added to the base electrical system by the body builder or installer. When additional loads are added to the standard vehicle protected circuit, you must ensure that the total current draw on that protected vehicle circuit is less than 80% of the base vehicle fuse rating or less than 100% of standard vehicle circuit breaker rating. It should be noted that a calculation of total current draw is the sum of the base vehicle circuit requirement plus the total of the add-on component current requirement. This can be measured by the use of an ammeter.

Increasing the rated capacity of a factory installed fuse or circuit breaker is prohibited. The total load should not exceed the rated capacity of any limiting devices, such as switches and relays for that circuit.

If the total electrical load to be added to the circuit exceeds the value of the circuit protection, or the value of its limiting components, those items cannot be added directly to the circuit.

Using Diagnostic Tools (VCADS Pro)

DANGER

When operating the vehicle on streets and highways during data collecting procedures, it is mandatory to have a second person drive while a technician collects the data. Failure to do so may cause a collision, which can result in serious injury or death.

DANGER

If placing a vehicle with TCS (Traction Control System) on jacks when servicing, the TCS must be disabled. If the TCS is not disabled and one of the wheels starts to spin, the TCS will compensate and the vehicle may come off the jack and may cause serious personal injury or death.

Note: Before servicing the vehicle, disable the TCS by disconnecting the harness at the TCS control valve.

DANGER

Make sure that all equipment and personnel are clear of the engine and all moving components while tests are in progress. Failure to do so may result in component or equipment damage, personal injury, or death.

CAUTION

Incorrectly set parameters could adversely affect vehicle or component operation.

CAUTION

Unapproved programs or software MUST NEVER be installed in the VCADS Pro computer. Other software may jeopardize the functions in VCADS Pro. Changing the settings without being advised by Volvo or Service Manuals can also cause problems. The BIOS setup MUST NOT be changed.

Welding

⚠ WARNING

Use a welding face mask to protect eyes and face and welding gloves to protect the hands when welding. Failure to follow these recommendations may result in personal injury to the eyes or skin.

⚠ CAUTION

Welding on trucks can damage the vehicle electrical system/components due to the voltage and current spikes that normally occur when welding. It is preferable to avoid welding on an assembled truck, but if any structure on or in contact with the vehicle must be welded, follow these recommendations:

⚠ CAUTION

If there are other ground cables connected to the battery (such as engine ECU, satellite system, etc.), disconnect those grounds first, then remove the main battery ground cable. Electronic modules may be damaged when additional grounds are connected/disconnected without the main battery ground connected. Disconnect the main battery ground last.

⚠ CAUTION

Do not weld on the engine or engine components. Welding on the engine or components mounted on the engine can cause serious damage to the engine ECU.

- Before welding on the vehicle, disconnect power to the component being welded.
- Disconnect both the positive (+) and negative (-) battery cables. Disconnect the negative cable first. Reconnect the positive cable first. Vehicles equipped with battery “quick disconnect” must still have the cables removed directly at the battery.
- Disconnect engine/starter ground from the chassis. This connection is located outside the left hand frame rail in the engine compartment. Disconnect the power harness and vehicle interface harness at the engine Electronic Control Unit (ECU).
- If vehicles are equipped with systems that have their own Electronic Control Units (ECUs), such as ABS Brakes, Vehicle ECU, or instrument cluster, disconnect each control unit at each electrical connection. This “opens” the circuit and will prevent transient voltage from reaching one ECU to another.
- Attach the welder ground cable as close to the weld as possible (no more than 2 feet from the part being welded).
- Do not connect the welder ground cable to the engine ECU or the ECU cooling plate.
- Welding cables should not be allowed to lay on/near or cross over any electrical wiring or electronic component during the welding procedure.
- After the welding process has been completed and the welded parts have cooled, inspect wiring and components for possible shorts or damage which would allow the possibility of drawing excessive currents or cause short circuits when the batteries are reconnected.