Intermec

Installation Guide

CV60 Vehicle Power Supply

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Patent: This product is protected by one or more patents.

Before You Begin

This section provides you with safety information, technical support information, and sources for additional product information.

Safety Summary

Your safety is extremely important. Read and follow all warnings and cautions in this document before handling and operating Intermec equipment. You can be seriously injured, and equipment and data can be damaged if you do not follow the safety warnings and cautions.

Do not repair or adjust alone

Do not repair or adjust energized equipment alone under any circumstances. Someone capable of providing first aid must always be present for your safety.

First aid

Always obtain first aid or medical attention immediately after an injury. Never neglect an injury, no matter how slight it seems.

Resuscitation

Begin resuscitation immediately if someone is injured and stops breathing. Any delay could result in death. To work on or near high voltage, you should be familiar with approved industrial first aid methods.

Energized equipment

Never work on energized equipment unless authorized by a responsible authority. Energized electrical equipment is dangerous. Electrical shock from energized equipment can cause death. If you must perform authorized emergency work on energized equipment, be sure that you comply strictly with approved safety regulations.

Safety Icons

This section explains how to identify and understand dangers, warnings, cautions, and notes that are in this manual. You may also see icons that tell you when to follow ESD procedures and when to take special precautions for handling optical parts.

A warning alerts you of an operating procedure, practice, condition, or statement that must be strictly observed to avoid death or serious injury to the persons working on the equipment.

Avertissement: Un avertissement vous avertit d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour éviter l'occurrence de mort ou de blessures graves aux personnes manupulant l'équipement.

A caution alerts you to an operating procedure, practice, condition, or statement that must be strictly observed to prevent equipment damage or destruction, or corruption or loss of data.

Attention: Une précaution vous avertit d'une procédure de fonctionnement, d'une méthode, d'un état ou d'un rapport qui doit être strictement respecté pour empêcher l'endommagement ou la destruction de l'équipement, ou l'altération ou la perte de données.

Global Services and Support

Warranty Information

To understand the warranty for your Intermec product, visit the Intermec web site at http://www.intermec.com, click Support, and then click Warranty.

Disclaimer of warranties: The sample code included in this document is presented for reference only. The code does not necessarily represent complete, tested programs. The code is provided "as is with all faults." All warranties are expressly disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.

Web Support

Visit the Intermec web site at http://www.intermec.com to download many of our current manuals in PDF format. To order printed versions of the Intermec manuals, contact your local Intermec representative or distributor.

Visit the Intermec technical knowledge base (Knowledge Central) at http://intermec.custhelp.com to review technical information or to request technical support for your Intermec product.

Telephone Support

These services are available from Intermec Technologies Corporation.

Service	Description	Call 1-800-755-5505 and choose this option
Factory Repair and On-site Repair	Request a return authorization number for authorized service center repair, or request an on-site repair technician.	1
Technical Support	Get technical support on your Intermec product.	2
Service Contract Status	Inquire about an existing contract, renew a contract, or ask invoicing questions.	3
Schedule Site Surveys or Installations	Schedule a site survey, or request a product or system installation.	4
Ordering Products	Talk to sales administration, place an order, or check the status of your order.	5

Who Should Read this Manual?

This guide provides you with information about the features of the CV60 DC-DC Converter, and how to install, configure, operate, and troubleshoot it.

Before you install and configure the CV60 DC-DC Converter, you should be a trained service person or one familiar with fork-lift truck service and maintenance.

Related Documents

Document Title	Part Number
CV60 QuickStart Guide	962-054-072B
CV60 User Manual	961-054-033A
Mobile DC-DC Uninterruptible Power Supply	962-000-030A

The Intermec web site at http://www.intermec.com contains many of our documents that you can download in PDF format.

To order printed versions of the Intermec manuals, contact your local Intermec representative or distributor.

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1 Introduction

This chapter describes installation practices and unique components in the kits.

Installation Guidelines

The installer should be familiar with the brands and models of equipment where this kit is installed. They should also be trained and experienced in vehicle electrical systems.

Installer must follow these guidelines and the installation procedures precisely to ensure a safe and reliable installation.

About the CV60 DC Power Supply Kits

The CV60 DC power supply kits include these items:

- Power supply
- Power supply input cable, 2.44 m (8 ft)
- Fused power cable, 46 cm (18 in)
- #10 terminal ring
- 3AB, 20A/250V fuses (2)
- Insulated quick-connect tabs (2)

High-input voltage kit (P/N 203-665-001) (P/N 203-665-002). Although this kit accepts input voltages from 15 to 96 VDC (typically from electric-powered vehicles that have a nominal battery voltage of 24, 36, 48, 72, or 80 volts), it is recommended only for use at input voltages above 60VDC.

For inputs from 6-60VDC - we recommend using kit P/N 203-669-001.

The high-input voltage kit has a 2-pin, keyed connector and contains these specific items:

- Power supply (P/N 851-041-002)
- Power supply output cable (P/N M2A-F1100-XX)
- Power supply output cable (P/N M2A-F1400-XX Y-cable for heater)

Note:Verify that you have the correct power supply and power supply input cable for your vehicle before you proceed with the installation.

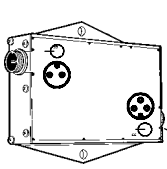
Considerations

Note: This document assumes that you have already installed the CV60 on your vehicle.

The power supply shall be mounted to the vehicle chassis ground, or connected (electrically) via external wire to the vehicle chassis. Chassis ground to the computer or other equipment is then established via the power supply output cable.

Since the power supply will produce heat, it is advisable to mount it on a minimum of 130-160 square inches (approximately one square foot or more) of metallic surface. This location *should not* be in the vicinity of sources of vehicle-generated heat. *Use only the hardware supplied in the kit to mount the power supply, do not use sheet metal screws.*

A green light-emitting diode (LED), located near the output connector on the power supply, will be lit whenever voltage is supplied to the output power cable.



P/N 851-041-002 15-96V, 3.5A

Input Power Cable

Note: The input power cable may be shortened as needed. It *should NOT* be extended under any circumstances. Keep the cable as short as possible. Extra cable picks up noise, adds power loss and is prone to snagging on equipment.

The input power cable is approximately 9 feet long. One end has a 4-pin connector, the other has a 2-pin connector. *By cutting off the unneeded connector, a single cable can meet either low or high voltage input range power supply requirements. The cut end is then terminated for connection to the vehicle power source.*

Inline Fuse

A snap-twist inline fuse holder is furnished as part of this kit. It must be connected as close as possible (electrically and physically) to the vehicle power source. It provides short-circuit protection for the entire input power cable and the power supply input. The fuse holder contains a 3AB, 20 ampere 250 Vdc fuse. Should it fail, diagnose the problem and correct it, then replace with exactly the same size and type fuse.

Output Power Cable

Note: Ensure that you have the correct CV60 power cable for your type of location.

Output power cables are approximately 6 feet long and have a durable 3-pin connector to mate with the power supply. The connector on the far end of the cable is specific to the computer. These connectors have heavy duty metal housings and enhanced strain relief to provide added reliability in the mobile environment.

Configuration Chart

Use the configuation chart on the following pages as a guide for your vehicle installation.

Cable and Power Supply Chart

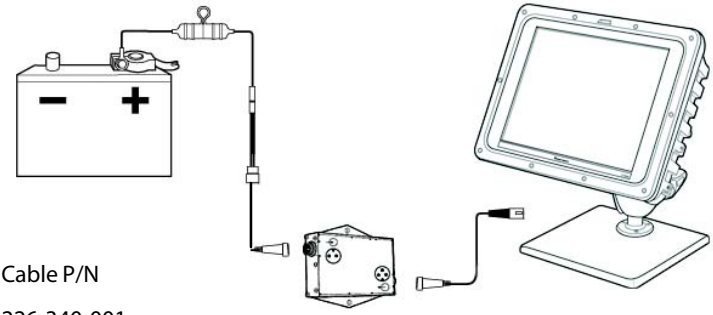
Truck Voltage	Power Supply	EMEA Filter	Input Cable	Output Cable	Heater
60-96V	851-041-002	NA			No
60-96V	851-041-002(2)	NA	2 Input Cables	M2AF1400	Yes
Note: For heater use, 2 power cables to battery, 2 filters/2 fuses, etc. are required (12V systems). EMEA filter required for installation in Europe, Middle East, and Africa.					

Use the chart below as a guide for your vehicle installation with the UPS (PN 851-059-002) and power supply.

UPS Cable and Power Supply Chart

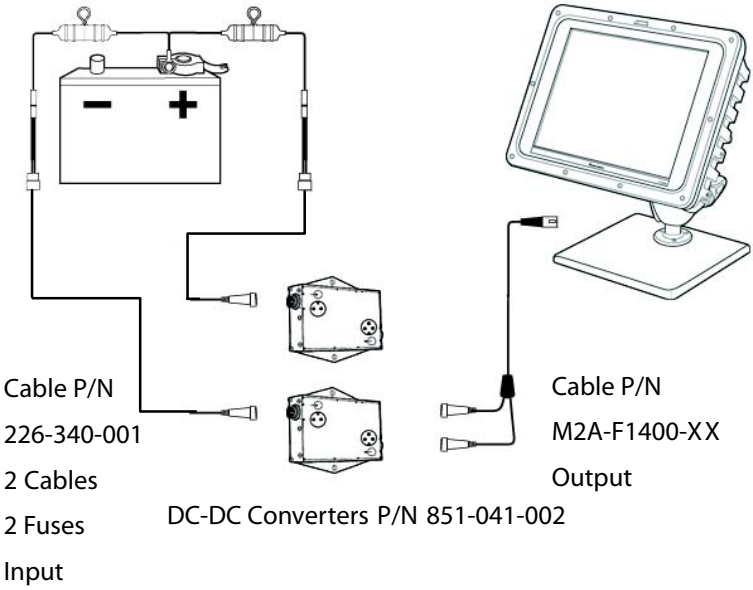
DC-DC	UPS	Use Cable:
041	851-059-002	226-340-002 (no ferrite needed)

New Installations



High Voltage Option - No Heater

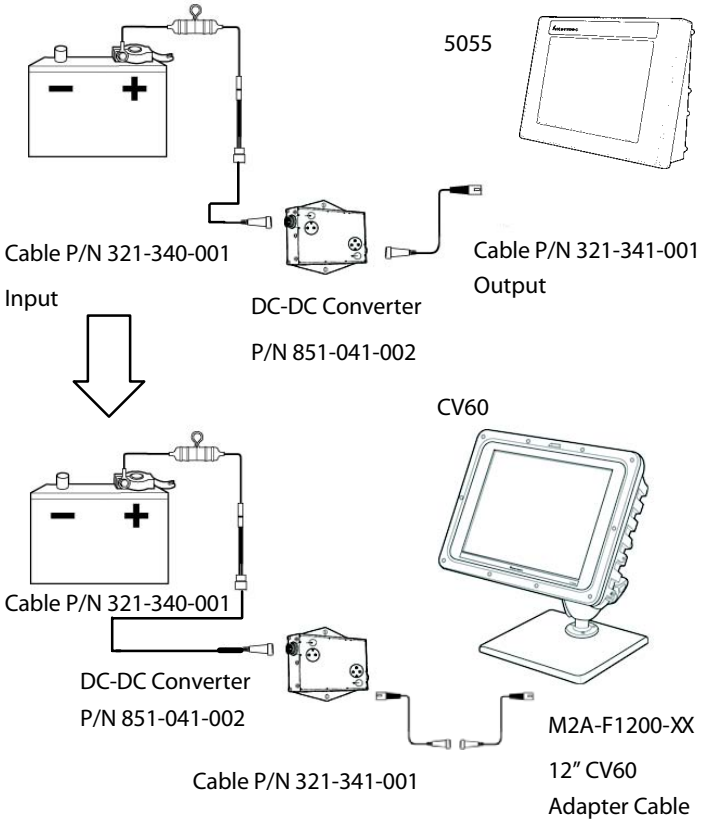
Material	Description
203-665-001	Kit, DC/DC Convtr, 15-96V Vehicle, No HTR
203-685-001	Installation Kit, Vehicle Power Supply
851-041-002	DC/DC converter 15-96 Vin/12VDC out
M2A-F1100-XX	Cable, 3 pin Female to 5 pin Female, 72”
589162-001	CNTNR CDB, 8.25 x 6.125 x 4.00
962-054-076	Installation Guide



High Voltage Option - Heater

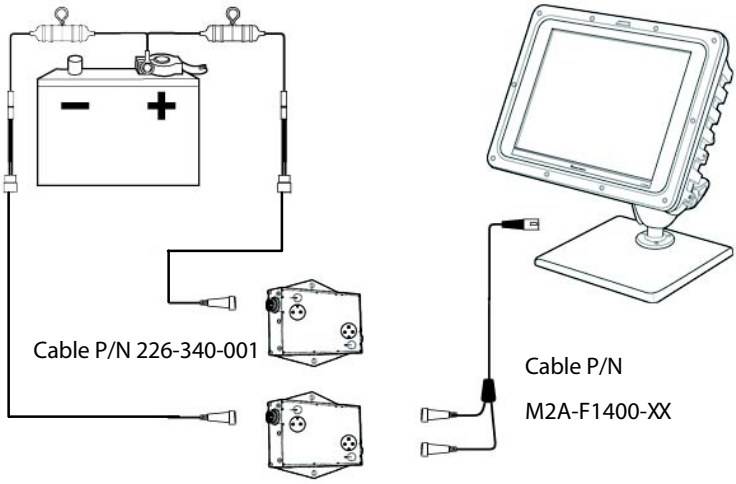
Material	Description
203-665-002	Kit, DC/DC Convtr, 15-96V Vehicle, w/HTR
203-685-001	Installation Kit, Vehicle Power Supply
851-041-002	DC/DC Converter 15-96VIN/12VOUT SDC106A
M2A-F1400-XX	Cable, 3pin/3pin to 5-pin Y-Cable
589162-001	CNTNR CDB, 8.25 x 6.125 x 4.00
962-054-076	Installation Guide

Existing Installations - 5055 to CV60 Upgrade (use 851-070-001 for inputs less than 60VDC)



External Cable Filter and Cable EMEA only - No Heater

Material	Description
203-671-001	Kit,5055 Upgrade to CV60, No HTR
M2A-F1200-XX	Cable, 3-Pin Male to 5-Pin Female Adapter 12"
962-054-076	Installation Guide



DC-DC Converter P/N 851-041-002

High Voltage Option - Heater

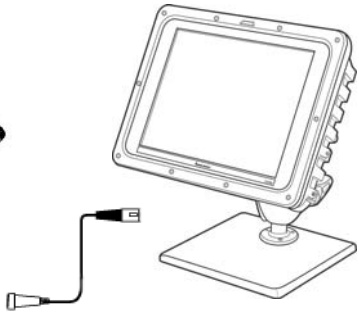
Material	Description
203-672-001	Kit, 5055 Upgrade, High 15-96V w/HTR
203-685-001	Installation Kit, Vehicle Power Supply
851-041-002	DC/DC Converter, 15-96 VDC IN, 12VDC OUT
M2A-F1400-XX	Cable, 3-pin to 5-pin Y-cable
589162-001	CNTNR CDB, 8.25 x 6.125 x 4.00
962-054-076	Installation Guide

AC Power Cord, US

P/N
321-054-001

Wall Charger

P/N
852-042-002



M2A-F1200-XX

12" Adapter Cable

AC Desk Option

Material	Description
203-670-001	Kit, CV60 AC Wall Charger -US & Int'l
852-042-002	AC Wall Charger-US & Int'l
M2A-F1200-00	Cable, 3-Pin Male to 5-Pin Female Adapter 12"
589162-001	CNTNR CDB, 8.25 x 6.125 x 4.00
962-054-076	Installation Guide

2 Installation Procedures

This chapter outlines mechanical and electrical installation instructions.

About this Installation

Follow the instruction procedures as closely as possible while keeping the following in mind:

- Power supply must be securely mounted.
- Mounting surface must be sturdy.
- Mounting surface must be able to sink power supply heat.
- Fuse must be close to vehicle power source.
- Keep cables as short as possible, and secure them at least every 18 inches.

Installation Summary

Installation consists of five primary steps, which should be carried out in the following order:

1. Connect the input cable to the power supply.
2. Mechanically install the power supply.
3. Route and secure the power cable.
4. Shorten cable as appropriate, then crimp the fuse holder to the joined RED and BLACK wires (positive). Crimp a terminal ring to the joined WHITE and GREEN wires (negative). Insulate as intructed.
5. Make final connections to the vehicle power source.

Tools Required

- Common hand tools (screwdriver, pliers, etc.)
- Heat gun for heat shrink tubing
- Wire crimping and stripping tool
- Electric drill, drill bits

Before You Start

Warning

Equipment failure or damage will result if the vehicle power source voltage does not fall within the input voltage rating of the power supply furnished to you.

Power Supplies

Read the nomenclature on the power supply and verify that the input voltage rating is correct for the vehicle you will be installing it in.

See Chapter 1 *"Introduction"* for identifying information.

Connect Power Input Cable

Only one of the input connectors will fit the power supply:

1. Mate the corresponding cable connector to the power supply connector.
2. Slide the cable connector *IN* as far as it will go.
3. Turn the cable connector collar clockwise to secure it.
4. Clamp the ferrite beard onto the input cable near the power supply. Make sure tabs are fully engaged.
5. Cut cable at the *unused* cable connector.
6. *Discard the unused connector.*

Mount the Power Supply

The input power cable is approximately 9 feet long and can be shortened as needed. **It must NOT be extended under any circumstances.** The output power cable is approximately 6 feet and *cannot be shortened*. You must take these lengths and the intended location of your electronic equipment into consideration when choosing a mounting location for the power supply.

The mounting surface location must provide 130-160 square inches of metallic surface to sink heat generated by the power supply. This metallic mounting surface must be connected to the vehicle chassis electrically. In rare instances, you may have to fabricate a flexible wire or braid to bond the mounting surface to vehicle chassis ground.

Appropriate hardware is furnished in this installation kit for mounting the power supply. Use mounting Method A in situations where you can easily access the back side of the mounting location to install a lock nut and washer.

Use Method B where the back side of the mounting location is inaccessible. Note that this method requires that the mounting plate be thick enough to accept and retain sufficient thread to provide a secure and reliable mechanical installation.

Method A:

1. Mark and center punch the two mounting holes locations.
2. Use a 1/4-inch drill bit to make the two mounting holes.
3. Use 1/4” hex bolts with flat washers and locking nuts to install the power supply.

Method B:

1. Mark and center punch the two mounting hole locations.
2. Use a #7 drill bit to make the mounting holes.
3. Use a 1/4-20 tap to thread the mounting holes.
4. Place a lockwasher on each bolt.
5. Insert the bolt/lockwasher assemblies through the power supply holes and into the threaded mounting holes.

Power Cable Installation

Follow these guidelines and other instructions closely when installing power cables.

Completely install power cables *before* making connections to equipment.

Route the power cables from the general area where the power supply will be mounted.

Use a snap-in bushing (requires a 9/16” hole) if the power cable passes through a firewall or other sheet metal.

Make sure that cable routing does not interfere with other equipment or vehicle controls.

Make sure that cable routing does not invite damage to the cable.

Secure the cables at least every 18 inches thoughout the cable run: use adjustable clamps (see the last page in this chapter) or wire-tie to existing vehicle cable runs.

Warning

Warning: If this installation will be on a gas-powered vehicle, you MUST install either an On/Off switch (minimum 15A dc rating such as ITW part number 163-900-034) or an automatic shut off device in series with the in-line fuse holder. Charge Guard, Inc. 400 Highland Avenue, Altoona, PA 16602 (814-941-4100) manufactures a CHARGE GUARD™ device for this purpose.

Power Cable Connections

The fuse holder from the input power cable must be connected as close (physically and electrically) as possible to the *positive side* of the vehicle power source. The remaining colored wires must be connected to the negative side of the vehicle power source. *In this installation, the shield wire must be connected to the vehicle chassis.*

Instructions are not included for connecting to various possible vehicle power sources. It is assumed that the trained professional install is knowledgeable on the brands and models of vehicles he or she is working with. Both large (3/8 inch) and smaller terminal rings are provided to accomodate most installation needs.

This kit contains additional bolts, nuts, and washers in the event you will connect the input power cable directly to a vehicle battery. The intended use for these parts is detailed in the instructions that follow.

Cable Termination

You must cut the cable to length, cut off a portion of the outer cable jacket and strip the individual wire ends of the cable as instructed. Heat shrink tubing is furnished in this kit and *must be slipped onto the cable or wires before terminating them*.

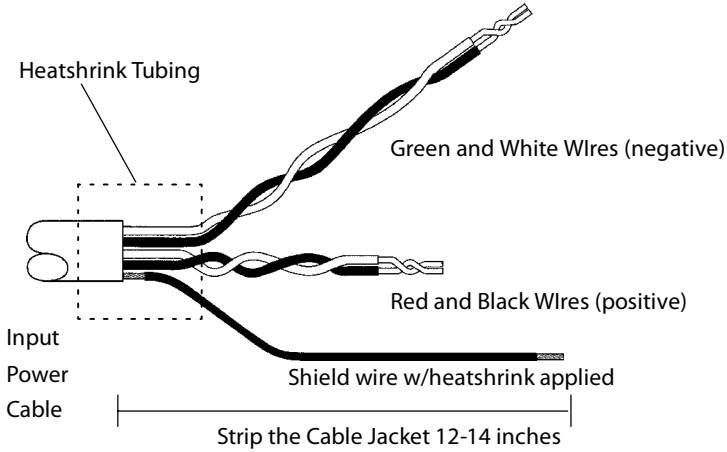
Then, you must install the fuse holder in series with the positive wires and install a terminal ring on the negative wires.

Finally, you must mechanically complete the connections to the vehicle power source or battery and electrically connect the shield wire to vehicle chassis ground using a self-tapping screw and flat washer.

Cut and Strip Power Cable

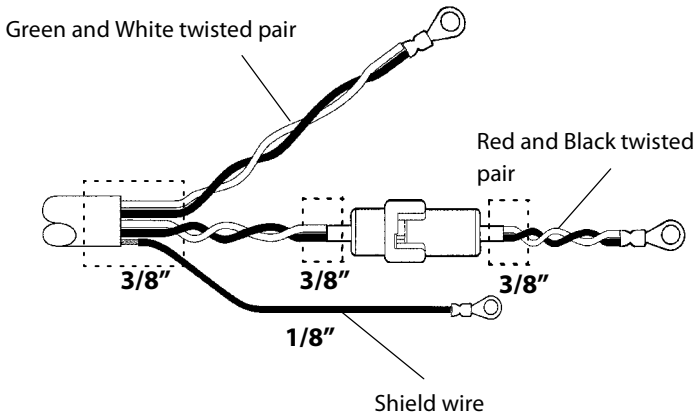
1. Cut the power cable near the power source or battery.
2. Strip the cable jacket back 12-14 inches.
3. Slide heat shrink tubing over cable jacket.
4. Strip 1/4” of insulation from individual wires.
5. Twist the white and green (negative) wires together.
6. Twist the red and black (positive) wires together.
7. Twist the shield wire and slide the 1/8” heat shrink tubing onto it.

Note: See Note on page 20 when installing on gas powered vehicles.



Heat Shrink Tubing

This kit contains a 6-inch length of 3/8 inch heat shrink tubing which you will cut into three pieces, and a 12 inch length of 1/8 inch heat shrink tubing for the shield wire. Tubing must be in place before terminating wire ends. Crimp terminal rings and fuse holder ends, then position all heat shrink tubing in the locations shown. Use a heat gun to shrink tubing.



Heatshrink locations

Prepare the Cable Ends

Both large (3/8 inch) and smaller (#10) terminal rings are provided for your selection and use in the following steps. A small (#10) terminal should be crimped to the shield wire and then fastened to vehicle chassis ground.

1. Crimp a terminal ring onto the white-green twisted pair (negative) of wires.
2. Cut the red-black twisted pair (positive) of wires at the midpoint. Strip exposed ends.
3. Position short lengths of heat shrink tubing as indicated in illustration on page 26.
4. Crimp the fuse holder to the positive wires from the cable.
5. Shorten the remaining positive wires (pigtail) if desired and position a short length of heat shrink tubing onto this pigtail.
6. Crimp this positive pigtail to the fuse holder.
7. Securely crimp a terminal ring to the end of the positive pigtail from the fuse holder.
8. Slide heat shrink over crimps, shrink with heat gun.

Power Source Connections

The next few pages show you the intended purpose of nuts. bolts, and washers that are included in this kit if you will be connecting the power cable directly to a vehicle battery.

Additional hardware is *not provided* in this kit for connecting the power cable to other vehicle power sources. Refer to the manufacturer's technical manual for the vehicle if necessary.

Direct Battery Connections

Connection to Side-mounted Battery Terminals

1. Remove both terminal screws from the vehicle battery.
2. Screw a 3/8" nut as far as it will go onto a 3/8" x 1-1/2" bolt furnished in the kit.
3. Slip a 3/8" washer onto the bolt.
4. Slide the positive (fuse holder red wire) terminal ring onto the positive battery bolt.
5. Slip a second 3/8" washer onto that bolt.

6 Slide the vehicle *positive* battery cable onto the bolt.

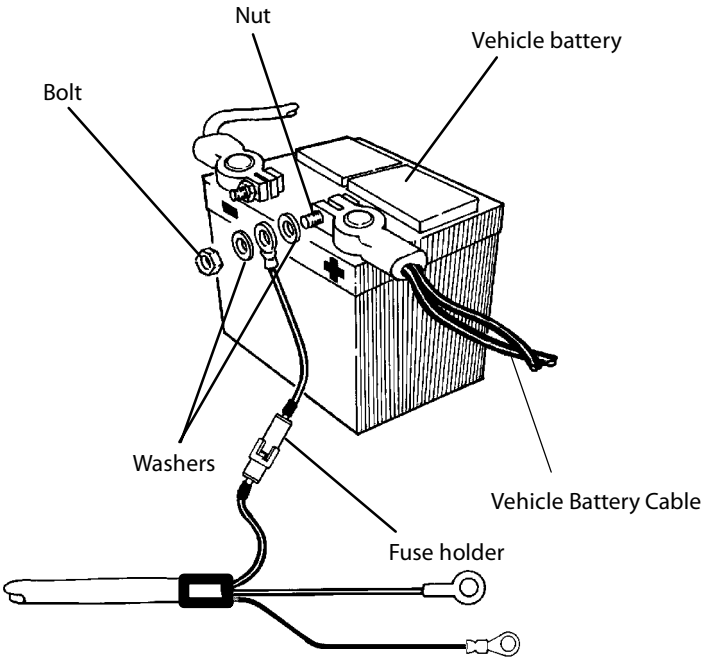
7 Thread the bolt assembly (steps 1-6, above) into the positive battery terminal. Tighten the bolt until it bottoms out but **do not overtighten** the bolt.

8 Tighten the nut securely against the washers and cables.

9 Use a self-tapping screw and flat washer to connect shield wire to vehicle chassis ground.

Repeat steps 2 through 8 for the negative wire (white-green pair) from the input power cable, connecting the wire to the negative (-) battery terminal.

Note: See note on page 20 when installing on gas powered vehicles.

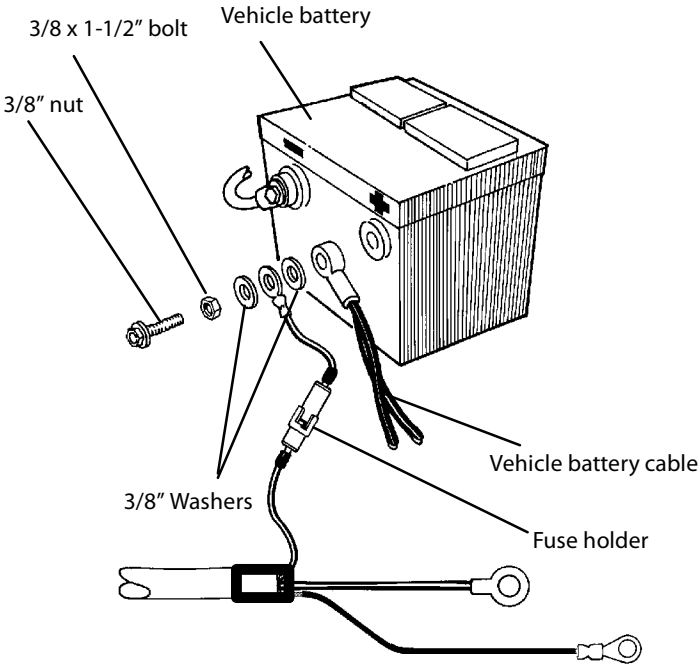


Top Mount Battery Terminals

Connection to Top-mounted Terminals

1. Remove the bolts from the vehicle battery terminals.
2. Replace those bolts with 3/8” x 1-1/2” bolts and nuts from the installation kit. Tighten the nuts.
3. Slip a 3/8” washer onto the end of each bolt.
4. Slide the positive (fuse holder red wire) terminal ring onto the positive battery bolt.
5. Slip a second 3/8” washer onto that bolt.
6. Thread a second 3/8” nut onto that bolt. Tighten the nut.
7. Use a self-tapping screw and a flat washer to connect shield wire to vehicle chassis ground.

Repeat steps 3 through 6 for the negative wire (white-green pair) from the input power cable, connecting the wire to the negative (-) battery terminal.

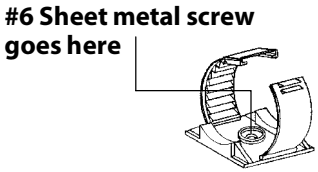


Side Mount Battery Terminals

Note: See note on page 20 when installing on gas powered vehicles.

Cable Clamps

Secure the cables every 18 inches using locking wire ties or adjustable cable clamps. Remove the paper backing from a clamp and stick the clamp in place while drilling a pilot hole with a #26 drill bit. Use #6 sheet metal screws to permanently hold clamps in place.



Cable Clamp

Final Connections

Once the computer, dock, or other device is mechanically installed, you can connect the output power cable between the power supply output and the device. Connectors are keyed and operate the same as the input power connector:

1. Mate the cable connector to the power supply and to the device connectors.
2. Slide the cable connector *IN* as far as it will go.
3. Turn the cable connector collar *clockwise* to secure it.

Note: Refer to Chapter 3, *"Troubleshooting Information,"* for power fault diagnostic information.

3 Troubleshooting Information

This chapter contains troubleshooting information and connector pin outs.

Procedures

Three basic procedures within this chapter identify and correct most power supply problems you may encounter during installation. Connector pin-out information is also furnished for your convenience.

Recommended diagnostic procedures are listed below and in general, should be followed in the order given. The Troubleshooting Charts will instruct you when to use a particular method.

Basic Diagnostic Procedures

1 Inspection

2 Voltage and Continuity Measurements

3 Component Substitution

Inspection

Power Supply

The power supply has a green light-emitting diode (LED) indicator near the output connector. This LED is lit whenever 12Vdc is present at the output connector. Anytime you suspect a power failure, check to see if the LED is lighted. If this LED *is lighted* and you suspect a power failure, the failure is either in the output cable or further down from it.

If the LED is not lit, the power supply is not producing 12 Vdc output power. In this case a fault can exist anywhere in the system.

Cables, Connections

Visually inspect all cable connectors and connections to the vehicle power source. Any obvious faults should be corrected. Use your hands to wiggle cable connectors to ensure they are not loose or disconnected. Again, correct any faults before proceeding.

Fuse

Open the twist-lock fuse holder and remove the fuse for a continuity test. If you substitute a new fuse and it also blows, the most likely causes would be a shorted or miswired input cable, or faulty or (incorrect) power supply.

Electrical Measurements

Voltage

Connector pinout information is provided to allow you to measure voltage at the input power cable and at either end of the power output cable.

Continuity

Caution

Caution: Cables MUST be disconnected at both ends before conducting continuity tests.

Thorough continuity testing takes longer than either substitution or taking voltage measurements. An ohmmeter is sufficient to diagnose simple opens or shorts.

If fuses blow sporadically, or power supply shut down occurs at random, you may want to use a megohmmeter to check cables for high-resistance shorts between wires or between a wire and the cable shield.

Substitution

Advantages

Component substitution is the most expedient and certain troubleshooting technique. It is especially valuable when trying to resolve intermittent problems.

Disadvantages

You must either have spare parts (power supply and both cables in this instance) or be prepared to "borrow" components from another working installation.

When to Substitute

Follow the guidelines in the *Troubleshooting* chart that follows, substituting only when directed to do so.

If an installation suffers intermittent input power fuse failures, or if the power supply shuts down without good cause, do not hesitate to substitute a known good power supply.

Troubleshooting Charts

The following troubleshooting chart assumes that your computer or other equipment does not work and that the problem is caused by the power supply or its associated cables. Follow the procedures in the tables in the order they are shown for maximum troublshooting efficiency.

Power Supply Reset

Where the troubleshooting chart tells you to "reset the power supply" you must disconnect the input power cable for 10 seconds, then reconnect it. The power supply has automatic over-voltage, over-current, over-temperature, and short circuit protection and must be reset by disabling input power whenever any of these faults activates that protection.

Power Failure Troubleshooting Chart 1

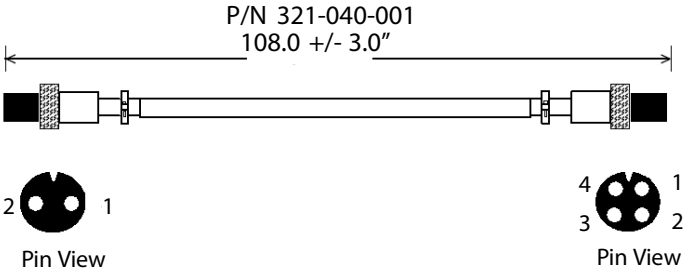
Observe	Result	Meaning	Remedy
LED	Lit	Power supply is working	Test or substitute output power cable.
LED	NOT Lit	No output from power supply	Reset the power supply
LED	NOT Lit	No output from power supply	Disconnect power output cable, *then reset the power supply.*
LED	Lit (now)	Power supply is working.	Substitute power output cable.

Power Failure Troubleshooting Chart 2(assumes steps in chart above have been followed).

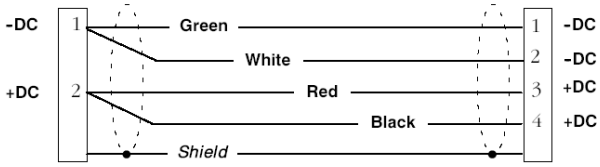
Observe	Result	Meaning	Test or Remedy
LED	NOT Lit	No output from power supply	Test for input voltage.
Voltage	Normal	Power supply not working.	Replace power supply.
Voltage	NOT present	No input power to the power supply.	Replace inline fuse if voltage is NOT present at connector.
			Replace input power cable if input voltage is still not present at connector.

Power Supply Pinouts

Connector	Negative	Positive	Case *chassis is gnd*
Input Power Connector (HV)	Pin 1	Pin 2	NC
Output Power Connector	Pin 3	Pin 2	Pin 1



Note: During installation, you will cut and discard one of these cable connectors.



Note: The cables in the installation kit may contain alternate wire colors. Refer to the chart below for the wire color equivalent.

Wire Color		Alternate Color
Green	→	Blue
White	→	Gray
Red	→	Brown
Black	→	Red

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