1998
ELECTRICAL WIRING MANUAL

CONVENTIONAL

Part #85410254

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This manual should be kept in a convenient place for ready reference.

All information, illustrations, and specifications contained in this manual are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

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1998 CONVENTIONAL
TABLE of CONTENTS

1998 CONVENTIONAL
TABLE of CONTENTS

General Recommendations - Maintenance and Repair

The following comments may be helpful in avoiding some of the most common problems experienced over the life of the bus.

1. Shorts in Cables and Harnesses:
   Cables that chafe of dangle will eventually wear through the insulation and result in a short. This can also cause terminals to loosen at their terminal point. Many times a mounting clip is removed to permit access to another component or to service that particular harness/cable. ALWAYS reinstall the mounting clips to their original position.
2. Corrosion in Sockets and Terminals:
   This can be a serious problem on units operating on streets and highways using salt and sodium chloride products.

   The use of an anti-corrosive sealant, such as Graffo 116 to coat exposed connectors, switches, and ground terminals, is very helpful in deterring corrosion in such areas.

   The use of a dielectric grease to coat the base and sockets of bulbs will deter the formation of corrosion in lamps exposed to road contaminants. It, also, reduces road shock in the bulb filaments.

3. Circuit Resistance:
   Circuit resistance is usually caused by loose terminals at the point of termination, improper crimping of replacement terminals onto the wire, and unprofessional splicing of two wires together.

   Practically all replacement terminals require a special tool to insure a complete, secure bond of the terminal and the wire. If the proper crimping tool is not available, the terminal should be soldered to the wire, using a rosin flux solder. Always cover the end of the terminal with a one inch piece of heat shrink tubing to prevent the entrance of water, salt, etc.

   Twisting the wires together is acceptable only if the union is then soldered with rosin flux solder, and covered with a heat shrink tubing extending one inch on each side of the union. Butt splices are also common in such a repair. Again, cover the splice with heat shrink tubing.

   Wiring left improperly sealed will corrode, and the corrosion can wick up the entire length of the wire. **Figure 1** is an example of the proper way to splice two wires together.

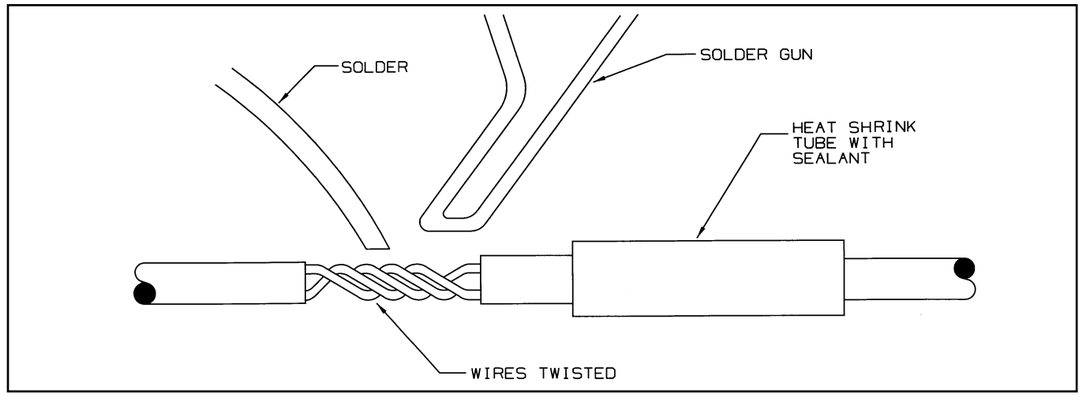

Figure 1

4. Overloaded Circuits:
   Additional electrical components should not be added to existing circuits. There is room for additional circuit breakers on the side electrical panel, if additional options are added in the field.

5. Proper Diagnosis:
   Thorough diagnosis is a must to eliminate repeat failures in the electrical system. Determining the cause of a particular failure not only solves the problem on the unit involved, but it may be helpful in preventing failures on other similar units in the fleet.

   In the event a particular circuit breaker continues to trip, even though no short is found, it would be wise to check the circuit flow on that circuit and compare it to the rating of the circuit breaker. The circuit breaker. The circuit breaker may be tripping below its rating, or the current draw may be in excess of the breaking rating.

   To check current draw on any given circuit, connect an ammeter in series between the circuit and a battery terminal. Energize the circuit and read the amps registered on the ammeter.

System Protection from Short Circuits

The electrical system has three means of protection from damage due to a short circuit in the total system:

1. Each circuit is protected by an automatic resetting circuit breaker. In some instances a circuit breaker may accommodate more than one circuit; however, in no case would the combined load be in excess of the rating of the circuit breaker if all the circuits were energized at the same time. In the event such a circuit breaker is tripping all the time it will be necessary to check out each circuit using that circuit breaker.

2. A 150 amp manual-reset Master circuit breaker is located on the front electrical panel of the MVP-EF, and on the rear electrical panel of the MVP-ER, ER-Transit, CL960 and TL960. This will protect the electrical system from damage that may occur from a major short in any area not protected by a fuse or automatic circuit breaker. This circuit breaker must be manually reset in the event it trips. When the breaker trips, the small RED button will depress. To reset it, move the small black lever located on the left side of the breaker back against the body of the breaker. When the electrical system has to be taken out of service to make other repairs, the master breaker can be tripped by depressing the small RED button in the center of the breaker.

   In the event the Master breaker should trip more than once, the cause MUST be determined before placing the bus back in service.

3. In the unlikely event a battery cable should short out against a chassis component, the 2 AWG engine-to-chassis ground cable will fail. This cable is attached to the engine block on the right side and is connected to the right frame rail.

   In addition to the above precautions to minimize damage from an electrical fire, the insulation on all wiring is of a crosslink polyethylene composition which will not maintain combustion once the copper core of the wire cools. The same applies to convoluted tubing used to protect harnesses and tubing from chafing and the elements.

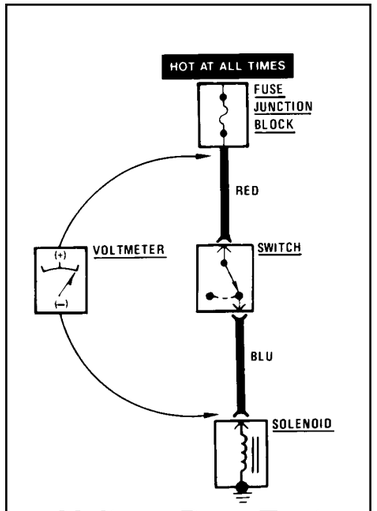

Figure 2

Testing for Voltage Drop

This test checks for voltage being lost along a wire, or through a connection or switch. See **Figure 2.**

1. Connect the positive lead of a voltmeter to the end of the wire (or to the side of the connection or switch) which is closest to the battery.
2. Connect the negative lead to the other end of the wire (or the other side of the connection or switch).
3. Operate the circuit.
4. The voltmeter will show the difference in voltage between the two points. A difference (or drop) of more than one volt indicates a problem.

Testing for Short to Ground

1. Remove the blown fuse, leaving the battery connected.
2. Connect the short finder across the fuse terminals.
3. Close all switches in series with the circuit you are troubleshooting.
4. Operate the short finder. The short finder will pulse current to the short. This creates a pulsing magnetic field surrounding the circuit wiring between the fuse junction block and the short.
5. Beginning at the fuse junction block, slowly move the short finder meter along the circuit wiring. The meter will show current pulses through sheet metal and body trim.

As long as the meter is between the fuse junction block and the short, the needle will move with each current pulse. When you have moved the meter past the point of the short, the needle will stop moving. Examine the wiring in that area for the short to ground. See **Figure 3.**

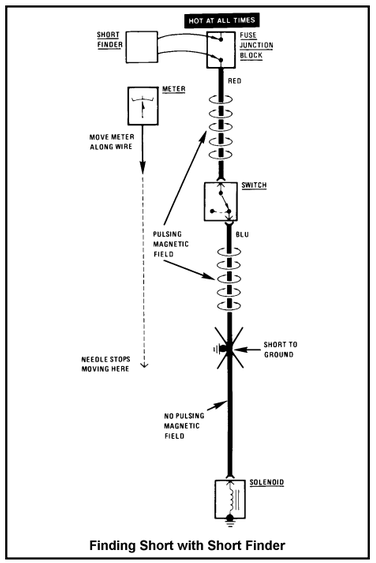

Figure 3

Checking Current Draw

1. Connected in series IN a circuit according to polarity.
2. Measures current flow.
3. Used in a closed circuit. See **Figure 4.**

Troubleshooting Tools

Electrical troubleshooting requires the use of common electrical test equipment.

Test Light/Voltmeter:
Use a test light to check for voltage. A Test Light is made up of a 12-volt light bulb with a repair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. When the bulb goes on, there is voltage at the point being tested.

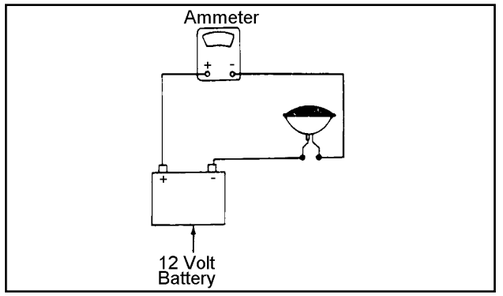

Figure 4

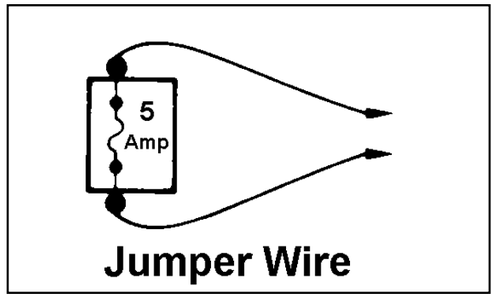

Figure 5

A voltmeter can be used instead of a test light. While a test light shows whether or not voltage is present, a voltmeter indicates how much voltage is present.

Never use a test light on circuits that contain solid state components, since damage to these components may result.

Jumper Wire:
A jumper wire is made up of an in-line fuse holder connected to a set of test leads. It should have a five ampere fuse. Use it for bypassing open circuits. Never use a jumper wire across any load (motors, etc.). This direct battery short will blow the fuse. See **Figure 5.**

Short Finder:
Short Finders are available to locate hidden shorts to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

Troubleshooting Tests

Test for Voltage:

1. Connect one lead of a test light to a known good ground. If you are using a voltmeter, be sure it is the voltmeter's negative lead that you have connected to ground.
2. Connect the other lead of the test light or voltmeter to a selected test point (connector or terminal).
3. If the test light glows, there is voltage present. If you are using a voltmeter, note the voltage reading. It should be within one of measured battery voltage. A loss of more than one volt indicates a problem. See **Figure 6.**

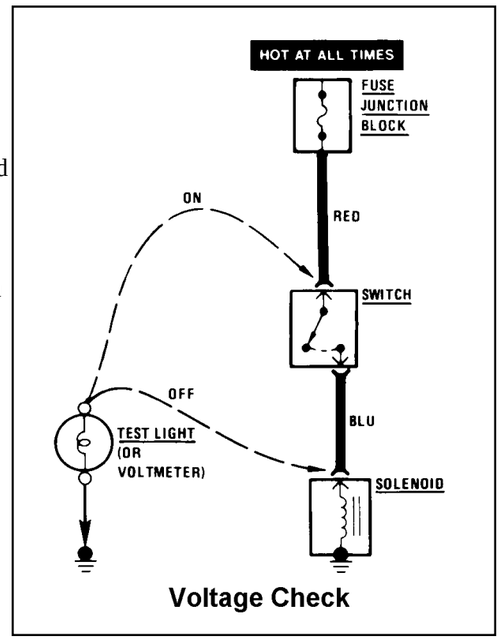

Figure 6

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Electrical Wiring
Manual

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