2000
ELECTRICAL WIRING
MANUAL

SLF 200

Part # J600046

2000
SLF 200
ELECTRICAL WIRING MANUAL

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.

Printed In U.S.A. 02/00

2000
SLF 200
BODY & CHASSIS
TABLE of CONTENTS

Description

The 12 volt electrical system is wired NEGATIVE ground and current is delivered by two 12 volt batteries and 24 volt alternator. Routine maintenance and any fault finding and correction should only be carried out by a skilled automotive electrical engineer as it is highly probable that permanent damage may be done by tampering with the equipment.

Precautions

The following precautions are by no means fully comprehensive and must be observed when working on the electrical system and when driving:

1. Never connect a battery into the system without checking for current polarity and correct voltage.
2. Never disconnect any electrical lead without first stopping the alternator and turning all switches to the OFF position.
3. Always identify a lead to the correct terminal before it is removed to ensure correct reconnection.
4. Never flash connections to check for current flow.
5. Always isolate the battery cables when using a battery charger.
6. Always disconnect the battery before connecting test instruments (except voltmeter) or before replacing any unit or wiring.

Electric Arc Welding

In the event of a vehicle requiring any form of electrical welding to be carried out the following precautions must be taken.

1. Turn off the vehicle battery master switch.
2. Disconnect the main positive and negative leads at the batteries.
3. Remove the B-VE lead from the alternator or the fast fuse if fitted.
4. Remove the NG28 cable from the alternator (this cable can provide a negative route from the rear junction terminal block) which in turn is connected to the chassis if ECUS.

If the engine control unit is disconnected, the throttle potentiometer may need recalibrating.

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.

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.

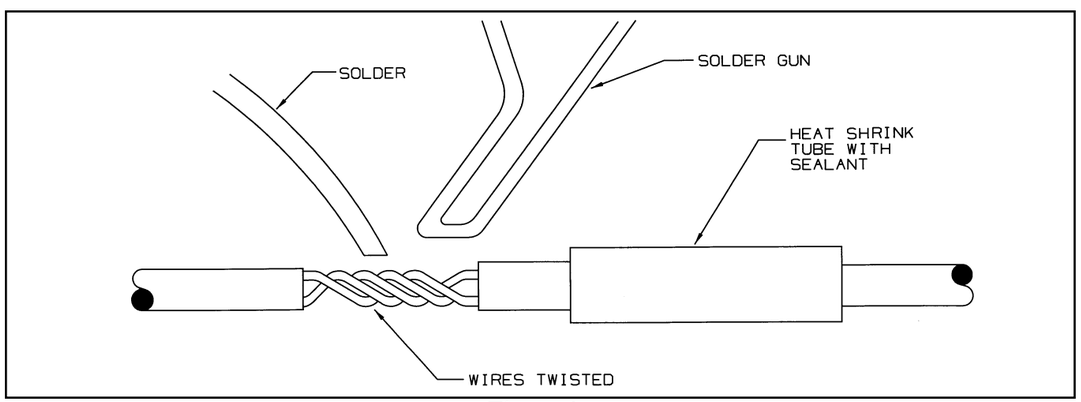

Figure 1

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 a manual reset 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 Master fuse for the 24 volt system and a 125 amp Master fuse for the 12 volt system are located on the battery box. This will protect the electrical system from damage that may occur from a major short in any area not protected by a fuse or circuit breaker.

   In the event the Master fuse should blow, 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.

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 multimeter 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.

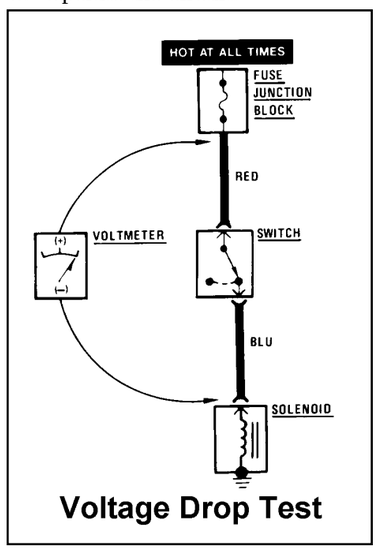

Figure 2

4. The multimeter 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.

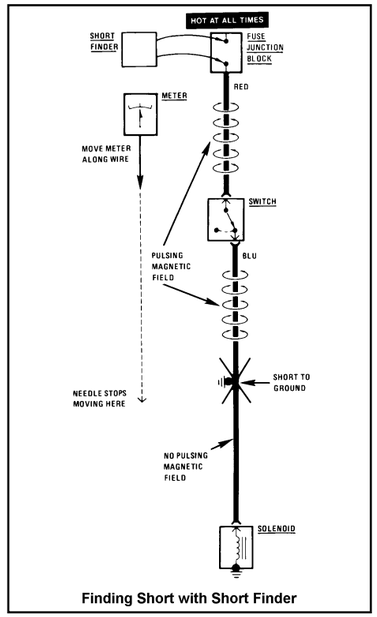

Figure 3

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.**

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/Multimeter:
Use of a test light is not recommended. It is better to use a multimeter to check for voltage. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present. A multimeter is better suited to check both 12 volt and 24 volt systems found on the SLF 200.

A multimeter 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.**

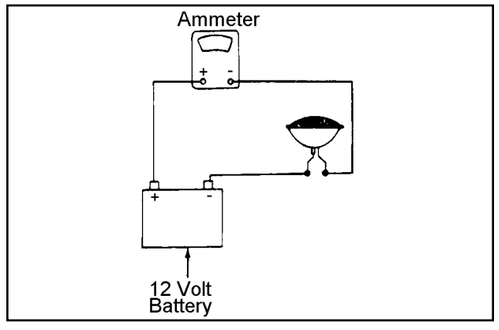

Figure 4

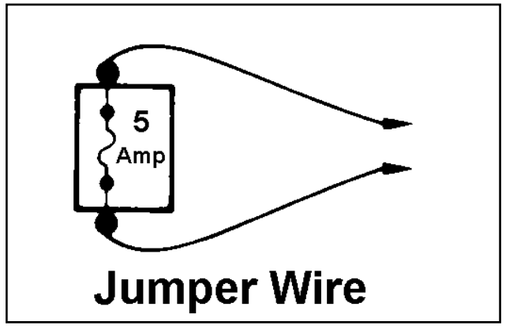

Figure 5

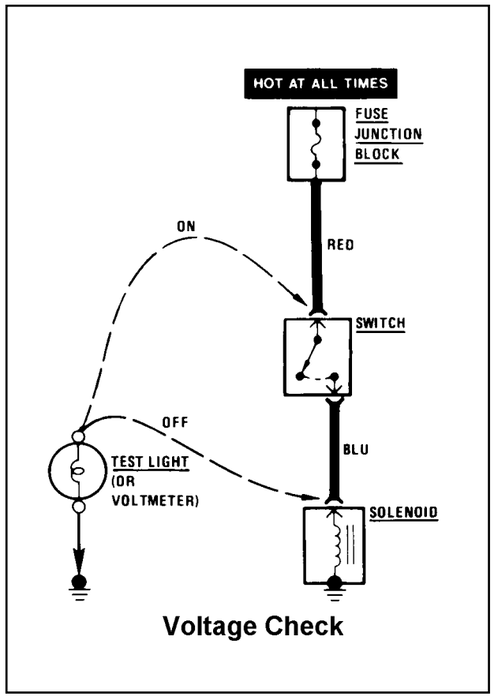

Figure 6

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 multimeter to a known good ground. Be sure it is the multimeter's negative lead that you have connected to ground.
2. Connect the other lead of the multimeter to a selected test point (connector or terminal).
3. 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.**

Preliminary Checks

Check all connections within the charging system. Inspect alternator drive belt for signs of splitting or wear. Renew if required.

Test 1: Battery Test

Using a high discharge tester, check that the battery is at least 70% charged. The fill battery test procedure is outlined in Section 1.

Test 2: Drive Belt Tension

See Engine Systems.

The alternator will not charge the battery if the drive belt is slipping. If the belt is worn or oily, it should be replaced with a premium grade type. A check should be kept on the automatic belt tensioning system.

Test 3: Connections

Ensure that all loads are in position and that all connections are clean and tight.

Test 4: Checking Voltage Drop In Charging Circuit

Use a multimeter to check for high resistance in the charging circuit.

1. Connect a multimeter (V1) between the battery insulated terminal and the alternator main output terminal. See **Figure 7.**
2. Switch on the vehicle lighting load headlamps on main beam). Start and run engine at approx. 3,000 rev/min. The multimeter reading should not exceed 0.5V.
3. Transfer the multimeter connections (V2) to the battery ground terminal and the alternator body, or "-" terminal.
4. Start and run the engine as in 2. The multimeter reading should not exceed 0.25V.If the readings are higher, then there is high resistance in the circuit which must be located and rectified.

Test 5: Checking Voltage Regulator Setting

Before checking regulator, it is essential that a battery in a well charged condition fitted to the vehicle.

1. Disconnect the battery ground cable.
2. Connect an ammeter between the starter solenoid terminal and the alternator main output cable. Connect a multimeter across the battery terminals. See **Figure 8.**
3. Reconnect battery ground cable.
4. Start and run the engine at approx. 2,000 rev/min until the ammeter reading is less than 10 amperes.

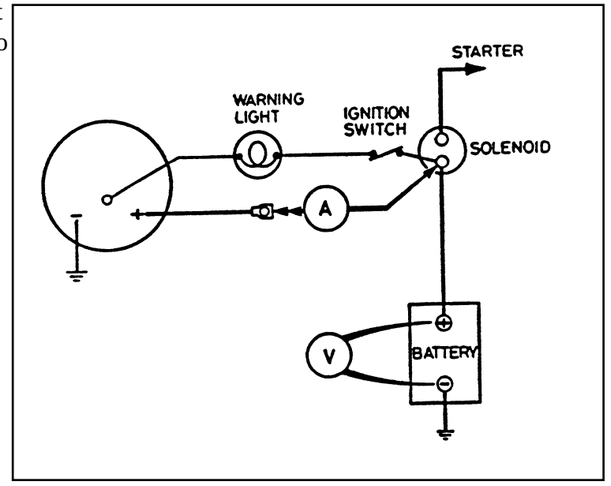

Figure 7

The multimeter reading should be within the limits 27.1 - 28.1. If the reading is unstable or outside the specified limits, the voltage regulator is faulty and should be replaced.

Setting Electronic Speedometer

1. Rotate the driveshaft to locate the bolt with the highest point, possibly a corner.
2. Adjust the sensor to give a 1mm gap at this point.

   This will ensure the other three bolts are within the 3mm working distance.

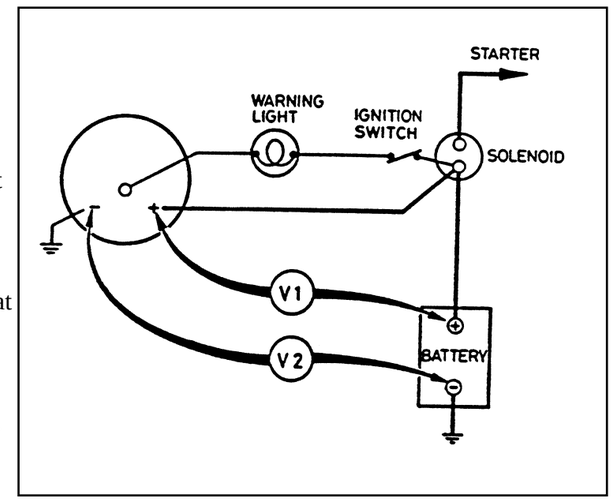

Figure 8

2000
Electrical Wiring
Manual

Thomas Built Buses, Inc.
1408 Courtesy Road
Post Office Box 2450
High Point, NC 27261
(336) 889-4871

Thomas Dennis Co., LLC
6012 High Point Road
Greensboro, NC 27407
(336) 454-3484