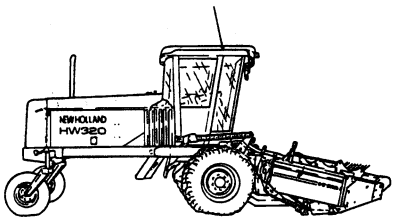
Please cut where indicated and insert the label into the plastic pocket on the spine of the binder.



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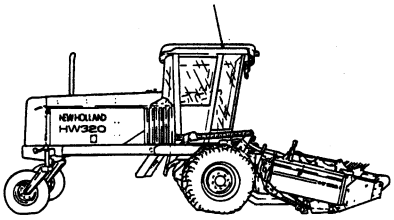

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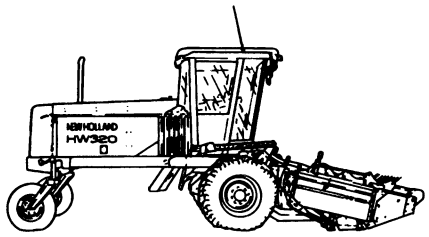

NEW HOLLAND

HW300
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Section 1 - Electrical System

REPAIR MANUAL

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HW300, HW320, HW340 REPAIR MANUAL CONTENTS

SECTION 1
ELECTRICAL SYSTEMS

CONTENTS

INTRODUCTION

This section covers the electrical systems of the HW300, HW320 and the HW340 windrowers. The section is divided into parts along with a table of contents and an index. The parts are organized as follows:

- Introduction
- General Electrical
- Electrical System Components
- Wiring Harnesses and Connectors
- Windrower Electronic System
- Air-conditioning Electrical System
- Lighting Electrical Systems
- Engine Electrical Systems
- Charging Electrical System
- Electrohydraulic Electrical Systems
- Miscellaneous Circuits
- Wiring Diagrams
- Electrical System Labor Guide

NOTE: When reference is made to "right" or "left" in this section, it means right or left as viewed by the operator sitting in the cab, facing away from the engine.

GENERAL TROUBLESHOOTING

Review the "General Electrical" portion of this section, which explains the operation of the electrical components found in many circuits. A test procedure is provided for the components.

Before attempting to troubleshoot a circuit, become familiar with the electrical schematics, current flow, and the operation of the electrical components in the circuit.

Operate the windrower and observe the symptom(s) of the problem. Match the symptom(s) observed to the main headings listed in the troubleshooting charts.

Find the heading that describes the symptom(s) observed then follow the step-by-step instructions until the problem is corrected.

This section has a description of each electrical circuit, a schematic of the circuit, and diagnostic test procedures based on the symptom(s) demonstrated by the fault.

All test procedures are based on the assumption that all mechanical items such as filters, oil pressures, etc., have been checked and verified and that the problem is electrical not mechanical.

Prepare the machine for the test by following the pretest instructions. Perform the test and observe the results. Perform the indicated corrective action. Continue through the test procedure until the problem is corrected, then return the system to an operational condition (replace shields, etc.).

GENERAL ELECTRICAL

DEFINITION OF TERMS

ALTERNATING CURRENT (AC) - A flow of electrons that reverses its direction of flow at regular intervals in a conductor. An alternating voltage always accompanies an alternating current.

ALTERNATOR - An electrical device that is similar to a DC generator but produces an alternating current and voltage. An electrical component (usually a diode rectifier device) is required to change the AC generated to the DC output used in most farm equipment.

AMMETER - An instrument that measures the flow of electrical current in amperes. Ammeters are connected in series with the circuit to be tested.

AMPERE (AMP) - A unit of measure of the flow of current in a circuit.

CIRCUIT - A defined path through various electrical components through which electrical current can flow from a higher voltage potential, through the various components, to a lower voltage potential. Closing a circuit completes the path and allows current to flow. Opening a circuit breaks the path and current will not flow.

CIRCUIT BREAKER - A device to protect an electrical component from current overloads. When current exceeds a certain value the breaker will open the circuit. Some breakers remain open until reset and must be reset manually. Others reset automatically when the overload is removed. All the circuit breakers on the HW windrowers reset automatically.

COLD RATING - A measure of a battery's current output at low temperature, usually zero degrees F. This output is often measured in Cold Cranking Amps (CCA).

CONTINUITY - Unbroken path through an electrical circuit through which electrical current can flow.

CURRENT - The flow of electricity through an electrical component. Current is measured in amperes.

DIODE - An electrical device that will allow current to pass through itself in one direction only, similar to the function of a check valve in a hydraulic system.

DIRECT CURRENT (DC) - A flow of electrons moving in the same direction along a conductor from a point of high voltage potential to one of lower voltage potential.

FUSE - A device used to protect electrical components from excessive current flow. Fuses have an element that melts when heated by too much current flowing through the fuse.

OHM - The standard unit for measuring the resistance to the flow of electrical current.

OHMMETER - An instrument for measuring the electrical resistance in an electrical component or circuit. Do not connect an ohmmeter to components or circuits that have a voltage potential present. Ohmmeters can be used to check continuity as well as resistance.

OPEN CIRCUIT - A circuit that is broken so that the flow of current through the circuit is interrupted.

RELAY - An electrical device that can open or close electrical contacts when the control coil of the relay is electrically energized or de-energized by applying or removing voltage. Relays have "control" and "load" circuits that may be separated or interconnected. Relays are used mainly to open and close circuits from a remote location or to switch the path of current flow.

RESISTANCE - The resistance to the flow of current in an electrical component. Resistance is measured in ohms.

SHORT CIRCUIT - A path in an electrical circuit or component that allows the current to be diverted to a lower voltage potential before the current has completed its intended path through the electrical circuit or component. This usually occurs when a point in the circuit is contacting ground potential such as the frame of a vehicle.

SOLENOID - An electrical coil used to produce a magnetic field to attract or repel an iron armature usually to actuate a mechanical device.

SPECIFIC GRAVITY - A measure of the weight of a substance relative to the weight of water. Measuring the specific gravity in a battery measures the percentage of sulfuric acid in the cell and indicates the amount of electrical charge in the cell. Specific gravity can be measured with a hydrometer.

SWITCH - An electrical device used to open or close an electrical circuit, or change the path of current in an electrical circuit.

VOLT - A unit used to define the amount of electrical potential or force driving current through an electrical circuit. A voltage potential difference is necessary to produce a flow of current in an electrical circuit or component. The voltage potential in an electrical circuit or component is similar to pressure in a hydraulic system.

VOLTMETER - An instrument for measuring the electrical potential difference that is present across two points of an electrical circuit or component. Voltmeters are connected to points that are electrically (in) parallel to the circuit or component where the voltage potential difference is to be measured.

ELECTRICAL SYSTEM COMPONENTS

MOMENTARY SWITCHES

Momentary switches open or close circuits only for the period that they are pressed. These switches return to a neutral position when released.

CIRCUIT BREAKERS

Circuit breakers, like fuses, interrupt an electrical circuit to protect wires and electrical parts from damage when an overload or short circuit occurs. Circuit breakers differ from fuses in that they may be reset or reset themselves after tripping. Fuses are destroyed when they blow and must be replaced.

Circuit breakers of different sizes or ratings are used on the HW windrowers depending on the circuit application. Some of the circuit breakers are located in the main electrical panel. Others are located nearer the circuit they are to protect. All the circuit breakers used on the HW windrowers are of the auto-reset type. When the short or overload is removed, the breaker will reset and complete the circuit again.

Location of Circuit Breakers

There are five circuit breakers on the windrowers. Three are in the main panel under the left engine door. They are the key main circuit breaker, 1, the preheat circuit breaker, 2, and the seat/service light circuit breaker, 3. The breakers for the windshield wiper and the A/C control are in the cab roof.

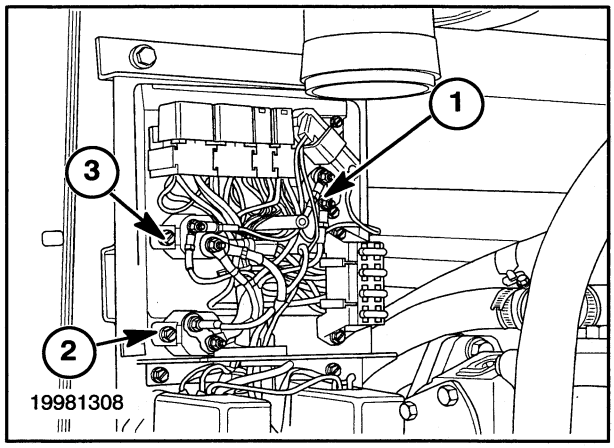


Figure 1-1

FUSES

Fuses contain a wire or strip of metal that melts when excessive current flows through them breaking the electrical circuit. Like circuit breakers, they also protect electrical parts from damage caused by current overload. Fuses cannot be reset. They must be replaced when they blow. Use the correct size fuse, as specified, for the circuits. Do not use higher rated or slow-blow fuses as this could cause damage to components.

The main electrical panel is located on the left side of the engine compartment behind the fuel tank. It contains 20 amp fuses, 1, for the following circuits:

- Work lights
- Road lights
- A/C power
- EIC-unswitched power

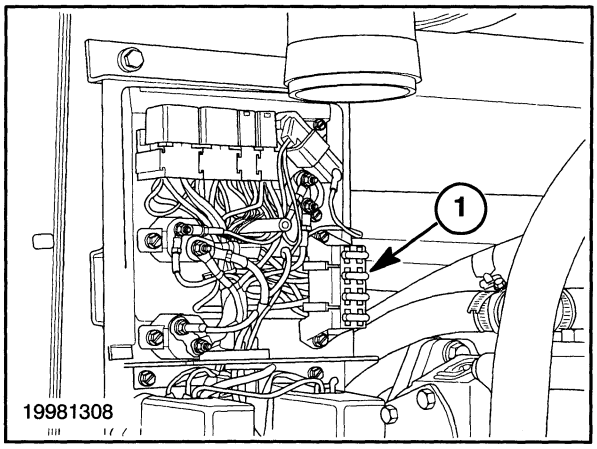


Figure 1-2

A second fuse panel, 1, is located in the cab in the right side console.

To reach the fuses in the console, loosen the two retaining knobs and swing the cover up. This panel contains the fuses for the following circuits:

EIC-switched power	10A
PTO (Header drive)	5A
Rotary screen	4A
Start	5A
Preheat	5A
Cigar lighter	10A
Accessories	5A
Hydraulic control	10A

The fuses used are SAE automotive-type fuses. Purchase replacement fuses from the New Holland Parts System to be sure to use the correct type of fuse.

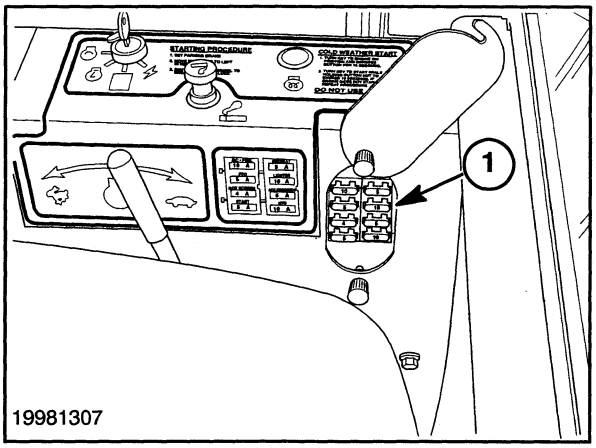


Figure 1-3

DIODES

Diodes act as rectifiers permitting electrical current to flow through them in one direction but not the other. Diodes are used to prevent arcing at the contact points of relays and momentary switches. The windrower header tilt down solenoid has a diode in the circuit and there is a diode in the header soft lower circuit. Diodes are also used in the alternator to change the alternating current to direct current.

Diodes can fail in either an open condition, in which no current passes in either direction, or a closed condition in which current flows in both directions. Failure usually occurs because of an overload or a short circuit.

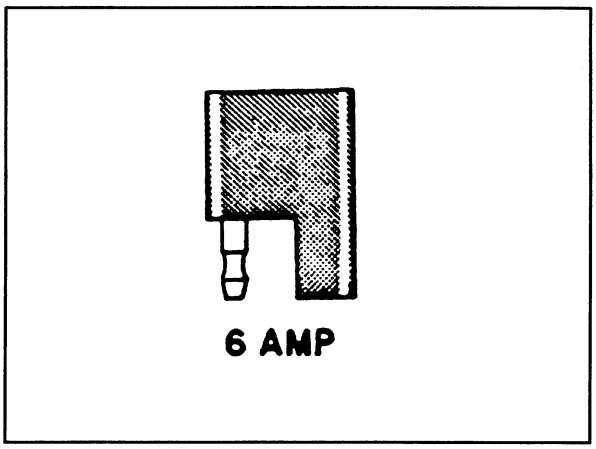


Figure 1-4

CAUTION: DO NOT SHORT WIRES TO GROUND TO DETERMINE IF VOLTAGE IS PRESENT (SPARK TEST). THIS WILL CAUSE DIODES TO FAIL.

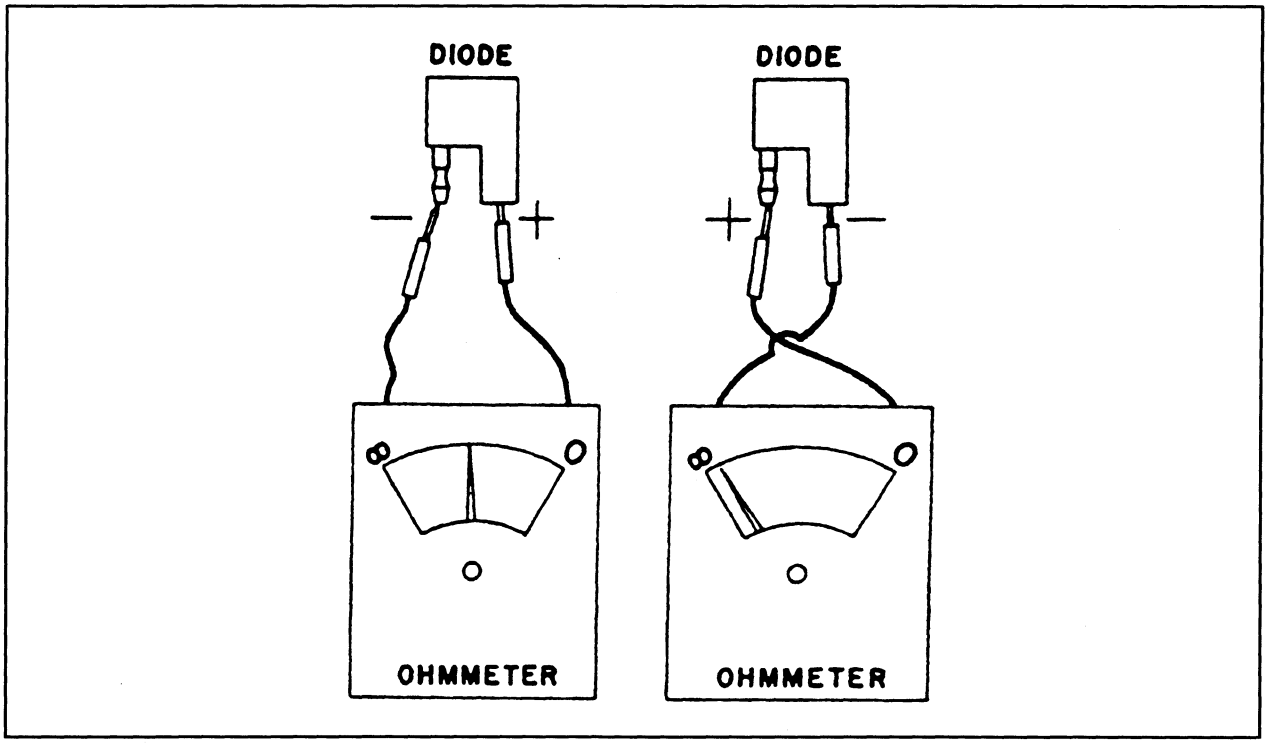


Figure 1-5

Diode Test Procedure

To test a diode, use a digital multimeter (DMM) set to the diode test function. Remove the diode and connect the leads to the diode. Check the reading, then reverse the leads. In one direction, forward, the DMM should indicate 0.5 volts. When the test leads are reversed, the DMM should display "OL". If the two readings are 0.0 volts or "OL", the diode is defective and should be discarded. If a DMM is not available, use an ohmmeter set to the R X 100 scale. Remove the diode and connect the ohmmeter test leads to the ends of the diode. Measure the resistance, then reverse the test leads. In one direction the ohmmeter should show an open circuit (no needle deflection). When the test leads are reversed, the ohmmeter should show about half scale deflection. If the two readings are the same, the diode is defective. Replace it. If an ohmmeter is not available, substitute a known good diode or one from a working circuit for a suspected defective diode to check the circuit.

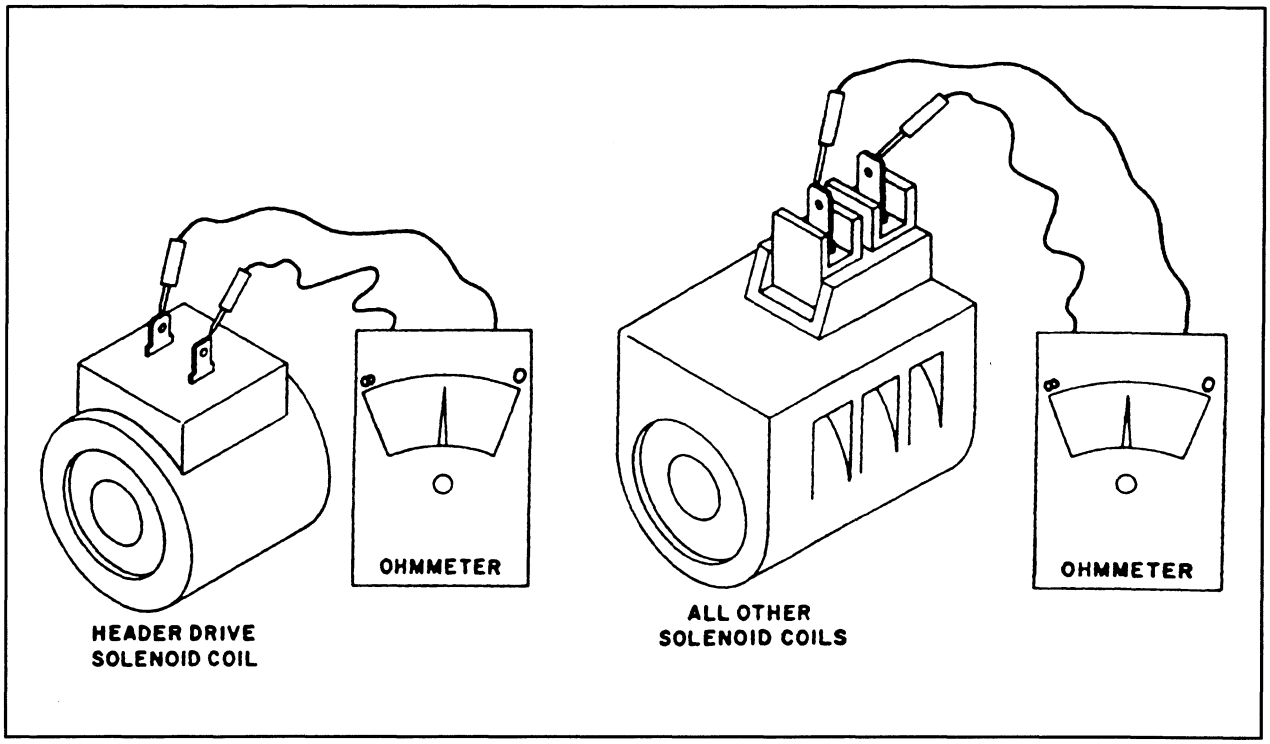


Figure 1-6

ELECTRO-HYDRAULIC SOLENOID COILS

Solenoids are used to convert electricity into mechanical force. A solenoid is a cylindrical coil of wire constructed so that when electric current is passed through the wire, a magnetic field is produced. The magnetic field draws a core of iron into it when energized. The movement of the metal core is used to open or close valves or for other mechanical functions. Two different styles of coils are used to activate the various solenoids used on the windrower.

One style coil is used on the electrohydraulic manifold solenoids.

All the coils used on the hydraulic manifolds are the same and can be interchanged.

A different style coil is used in the header drive speed control. They are integrated into the speed control module.

Electro-Hydraulic Coil Test Procedure

To test a coil, remove the wire(s) from the coil and attach an ohmmeter as shown. The coil resistance should measure between 5 and 10 ohms.

SOLENOID VALVE OPERATION

An easy way to check if a solenoid valve is being energized is to place an iron object at the solenoid coil cover and activate the solenoid valve by pressing the appropriate switch. If current is flowing through solenoid, the solenoid will become magnetic and attract the iron object.

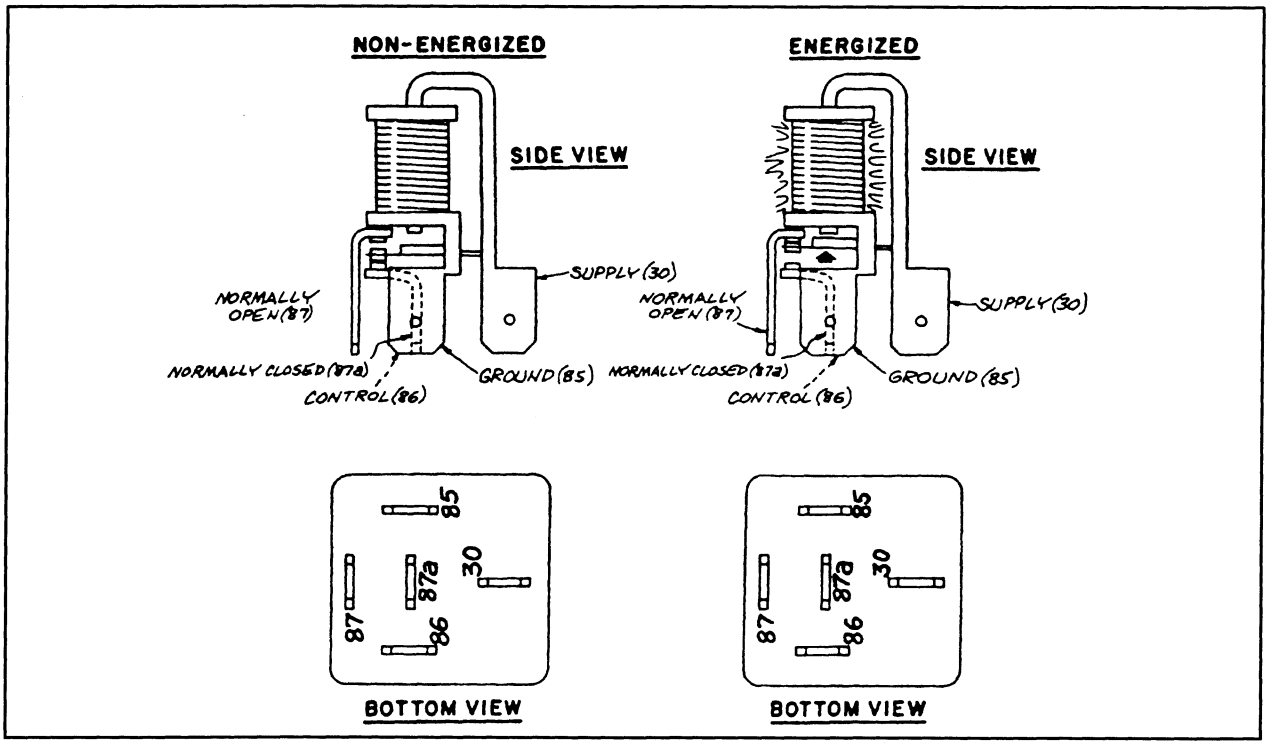


Figure 1-7

RELAYS

Relays are switches that use low voltage or low current to open or close switches carrying higher current. Relays are used to control the flow of current to various electrical circuits. A relay can control two different circuits by directing current to one circuit when the relay is not energized and to another when it is energized. The windrower electrical system uses three different sizes of relays. All three relays operate the same way.

The start relay and the preheat relay (if equipped) carry heavy current and thus are larger than the relays for the other circuits. They are mounted on the main electrical panel in the engine compartment. Each of these relays has its own cover. The start relay is on the left.

Following is a description of the operation of the larger type cubical relay (20 to 30 amps). The smaller relay operates in exactly the same manner except the terminals are numbered differently. The corresponding terminal numbers for the smaller relays are shown in parentheses. If there is any doubt about the terminals, check the circuit diagram molded into the relay case.

Energizing or de-energizing the solenoid coil opens or closes the relay. Current through the coil causes the core to move in one direction. When the current is stopped, a spring returns the core to its original position. Terminals #86 (1) and #85 (2) are connected to a coil in the relay. The coil determines whether current flows from terminal #30 (3) to #87 (5) or from #30 (3) to #87A (4). When there is no current flow to the coil, the circuit between terminal #30 (3) and #87A (4) is complete. They are the "normally closed" contacts.

When voltage is applied to terminal #86 (1), current goes through the coil to ground at the #85 (2) terminal, and the coil is energized. The energized coil pulls the latch up opening the #30 (3) and #87A (4) circuit while the circuit between terminals #30 (3) and #87 (5) is completed. The #30 (3) to #87 (4) circuit is the "normally open" circuit. Current will only flow between terminals #30 (3) and #87 (5) or terminals #30 (3) and #87A (4), but never through both at the same time.

To remove a relay, pull it from the relay socket. Since the relay terminals fit tightly in the relay socket, it may be necessary to pry relays out with a small screwdriver. When doing so, be sure not to touch any of the terminals with the screwdriver.

Before installing a relay in a socket, check the terminals on the relay to be sure they are not bent or broken.

Relay Locations

On windrowers up to serial number 620760, there are six relays. An additional relay is on the HW340 windrower serial number 620761 and above. This relay is in the engine fuel solenoid circuit. It is mounted in the right console behind the fuse holder. All the relays except the fuel solenoid relay are mounted in the main electrical panel under the left engine door. The start relay, 1, and the optional preheat relay, 2, are mounted at the bottom of the panel. The others are mounted at the top, 3.

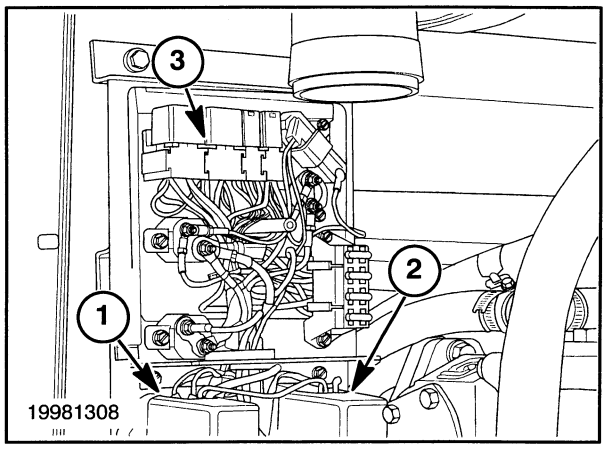


Figure 1-8

Relay Test Procedure

To check a relay, use an ohmmeter and:

1. Check for continuity between terminals #30 and #87 (terminals 3 and 5 on the smaller relay.) There should be no complete circuit.
2. Apply 12 volts to the #86 terminal and ground the #85 terminal (terminals 1 and 2 on the smaller relay). The coil should energize.
3. Check for continuity between the #30 and #87 terminals (3 and 5 on the smaller relay) with the coil energized. There now should be complete circuit. If the relay does not operate when these tests are performed, replace it.

WELDING ON THE MACHINE

WARNING: IF WELDING MUST BE PERFORMED ON THE WINDROWER, EITHER ON THE WINDROWER ITSELF OR THE ATTACHED HEADER, THE BATTERY GROUND STRAP, 1, MUST BE DISCONNECTED OR DAMAGE TO THE ELECTRONIC INSTRUMENT CLUSTER MONITORING SYSTEM MAY RESULT.

REINSTALL THE BATTERY GROUND STRAP WHEN WELDING IS COMPLETE.

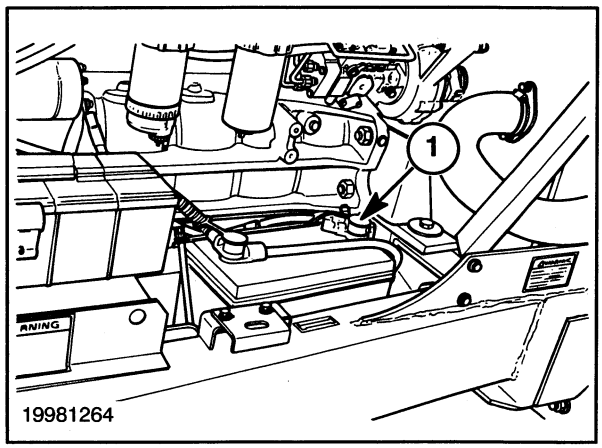


Figure 1-9

WIRING HARNESSES AND CONNECTORS

WIRES

The electrical wiring is routed around the windrower through wiring harnesses. Each wire in a harness has a two-letter identifier on it that designates the harness as follows:

Identifier	Harness
FM	Main
CM	Console
CA	Cab
EN	Engine
AC	Air conditioning controls
HA	Handle
HM	Header flashers
HS	Header speed
SC	Steering column
WP	Wiper

Red wires carry unswitched current and have a direct connection to the battery.

Black wires are ground wires.

On the wiring diagrams each wire is identified by the harness, wire number, color and wire size.

Example:

FM88-DK BR-16 is a wire in the main harness, wire number 88, colored dark brown, 16 wire gauge.

Wire color codes are as follows:

Identifier	Color
R	Red
B	Black
DK BL	Dark blue
LT BL	Light blue
GY	Gray
DK GN	Dark green
LT GN	Light green
W	White
O	Orange
PK	Pink
PU	Purple
T	Tan
DK BR	Dark brown
Y	Yellow

When the wire has a second color stripe, the colors are separated by a slash.

Example:

FM171-B/R-16 is a black wire with a red stripe.

HARNESS CONNECTORS

Harnesses are joined with multi-pin connectors as follows:

Connector	(No. of pins)	Harnesses joined and main use	Location
C001	28	Console to WES console module (top)	Right console
C002	24	Console to WES console module (bottom)	Right console
C012	23	Console to main - WES signal and driver functions	Under cab floor (front)
C004	21	Console to main - WES signal and driver functions	Under cab floor (center)
C005	19	Console to main - Power functions	Under cab floor (rear)
C003	9 (Round)	Main to engine	Right side of engine compartment
C010	9 (Square)	Console to cab	Inside right console
C009	8	Handle to console	Inside right console
C032	6	Cab to radio	In cab roof
CO24	3	Header (Speed) to main frame	Front center
C047	3	Header (flashing lights) to main frame	Front center
C030	6	Main frame to steering column	Below steering column

GROUND POINTS

Several specific points on the windrower for attaching ground wires. These are:

Battery grounds	Ground strap on frame on right side of engine
Ground point "A"	Left rear main frame
Ground point "B"	Right rear cab mount
Ground point "C"	Right side cab ceiling
Ground point "D"	Under console access panel at rear bolt
Ground point "E"	Right rear main frame
Ground point "F"	Center of front cab frame at ceiling

WINDROWER ELECTRONIC SYSTEM

INTRODUCTION

The Windrower Electronic System (WES) consists of the console module, 1, a display module, 2, and a warning module, 3. The console module is mounted in the right hand console next to the window. The warning and display modules are mounted on the steering column. The WES monitors critical engine data, provides safety interlocks in the starting and hydraulic systems and warns the operator of a problem. It receives data from the sensors on the windrower and displays information to the operator concerning the engine, header and hydraulic system. The WES generates signals to control hydraulic valves, turn signals, brake lights and the fuel solenoid. Also, the WES exercises closed loop control over the disc and sickle crop cutting mechanisms.

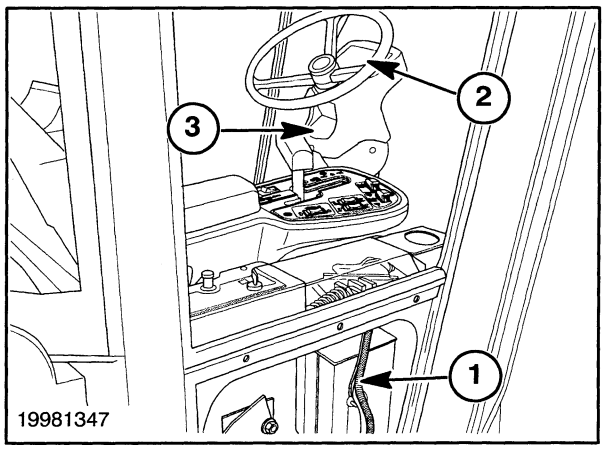


Figure 1-10

The WES retains some information in non-volatile memory. Data stored in non-volatile memory will remain in the WES even though all power has been removed from the WES. A configuration menu maintained in non-volatile memory in the WES allows the operator to customize certain items. This menu also provides access to simple diagnostics, a fault/warning history accumulator and engine hour display and modification. Various functions may be displayed for monitoring by the operator.

Software diagnostic tools are integrated in the WES to aid in testing certain input and output circuits and switches. See the Configuration Menu section following for instructions for use of these functions.

The console module is electrically connected to two physically separate sub-modules. These are:

- A display module, 1, which is mounted on the steering column above the steering wheel. Information is shown on this module as two lines of text.
- A warning module, 2, is mounted below the steering wheel on the steering column. The warning module contains a touch pad to operate the display and operate turn signals and four-way flashers. It also contains an audible alarm equipped with volume control. The display controls are located to the left and right of the audible alarm on the warning module and consist of a switch, 3, represented by an open book icon located to the left of the alarm and a switch, 4, represented by a drawing of a human hand located to the right of the alarm. During normal operation, the "open book" switch is used to change operating modes (manual/automatic, HW340 disc cutter only). The "hand" switch selects what is shown in the bottom row of the display. In the configuration mode, these two switches enable an operator to select certain parameters for setup.
- A switch located on the front of the FNR lever selects the parameter shown in the top line of the display.

The warning module also contains the audible alarm, 5, the flasher switch, 6, and the left and right turn signal switches, 7, and 8.

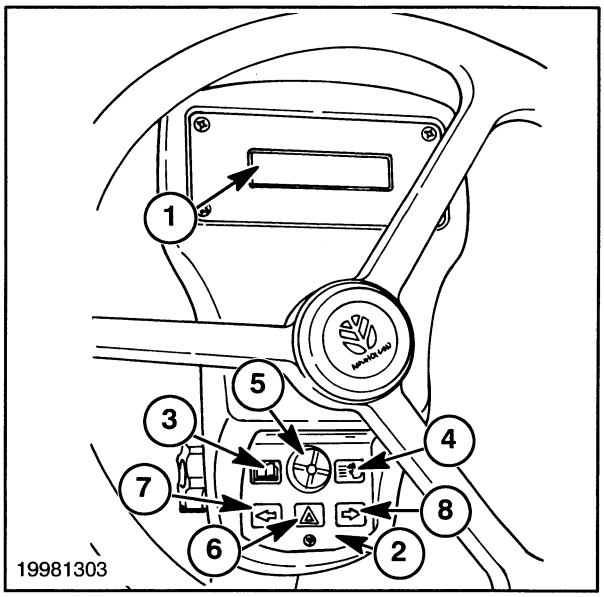


Figure 1-11

CONFIGURATION MENU

To configure the WES, bring up the configuration menu by pressing the "open book" switch and the "hand" switch on the warning module, and, while holding both, turning the ignition from OFF to ON. After a brief initialization period, "CONFIGURE" appears in the top line of the display. When the switches are released, the first configuration item will appear in the top line of the display.

There are thirteen configuration items. They are selected sequentially by pressing the "open book" switch. In general, values that can be assigned to an item are displayed in the bottom line of the display. They are selected or changed by pressing the "hand" switch. The new values are stored when the ignition key is turned OFF.

The following configuration items are available:

1. **UNITS ENGL/MET** (Choices: English/Metric)

   Engine oil pressure: PSI/kPa

   Ground speed: MPH/KPH

   Engine coolant temperature: Fahrenheit/Celsius

2. **HEADER TYPE** (Choices: FLOAT/ NON-FLOAT)
3. **CUTTER TYPE** (Choices: Disc/Sickle)

   Models HW300 and HW320 support only the sickle bar cutter.

   Model HW340 supports both sickle bar and disc cutters.

4. **LANGUAGE** (Choices: English, Spanish, French)
5. **MODEL NUMBER** (Choices: HW300, HW320, HW340)

   If HW320 or HW300 is selected, (3) above, automatically changes to sickle bar.

WARNING: ENGINE MUST BE TURNED OFF WHEN USING THESE DIAGNOSTIC FEATURES. EXERCISE CARE WHEN THESE FEATURES ARE IN USE. MAKE SURE THAT ALL PERSONNEL ARE CLEAR OF THE HEADER AND OTHER MACHINE COMPONENTS THAT COULD SUDDENLY MOVE WHEN OUTPUTS ARE ACTIVATED, EVEN IF THE ENGINE IS TURNED OFF.

6. **DIAG: INPUTS** (Input Diagnostic)

   Use this menu item for troubleshooting input functions to the console module. The console switches (except for forward tilt, trim cylinder extend and open book), the work light switch, and sensor switches are supported. All analog inputs are supported. To check switch operation, press the switch while in this mode. The bottom line will beep and show the switch name and the state on or off as a one or zero. Whenever an input signal changes, the display will identify the input that was changed and show the value of the input. ("1" for on and "0" for off) for switched inputs; 0% to 100% for analog inputs.) Switched input changes will cause the audible alarm to "beep" and the hazard lights to flash.

   Analog input changes (fuel gauge, engine oil pressure, coolant temperature) will cause the controller to beep when the input passes near the electrical center of the sensor signal range. Some of the switched sensor inputs are "debounced" for several seconds. On these inputs there will be a response delay when the state changes. Shorting these inputs will cause the WES to beep and identify the input on the bottom line of the display and the hazard lights will flash.

7. **DIAG: OUTPUTS** (Output Diagnostic)

   Use this menu item to diagnose problems relating to outputs from the WES. When in this mode the WES can deliver voltage to each output so it can be tested. The engine must be off to use this menu item.

   All of the outputs driven by the WES except "Header Lower" are supported. The output state (ON/OFF) and output identification are displayed. The "hand" switch selects the output and the right turn signal switch toggles the state. Output states are "0" (OFF) (voltage approximately zero) and "1" (ON) (voltage at some higher level). Because the solenoids controlling the hydraulic pump on

the HW340 cannot withstand the full battery voltage, less than six volts DC is supplied to the header forward and header reverse outputs.

If an output is shorted, the WES will make no attempt to cut power at that output. However, the driver internal to the WES is self-protected and removes output voltage when the driver overheats from too much current. The output voltage is restored when the driver cools.

8. **ENGINE HOURS**

   This item allows modification of the engine hours clock. When this item is selected, pressing the right turn signal selects the digit to be changed. The selected digit blinks. The "hand" switch changes the value. The new value will be stored in the non-volatile memory when the ignition key is turned off.

9. **HEADER HOURS**

   This item allows modification of the header hours clock. When this item is selected, pressing the right turn signal selects the digit to be changed. The selected digit blinks. The "hand" switch changes the value. The new value will be stored in the non-volatile memory when the ignition key is turned off.

10. **FAULT HISTORY**

    This item allows examination of the fault/warning history of the windrower sensors and outputs. Information is tabulated on the state of each sensor and output. Type of fault/warning, number of occurrences, and engine hours at the last event are saved. The "hand" switch selects a description of the fault or warning. The bottom text line will display the number of occurrences of the fault and the engine hours at the last occurrence when the right turn signal is pressed. All of the history information can be cleared by using the initialization turn-off method with a value of 10 displayed at power off (see menu item 13).

11. **REV LEVEL** - Displayed as 8-digit software part number, production rev. level (letter), test rev. level (number).

    This is the number of the software release.

12. **HEADER TEST**

    On the HW340, when the header drive switch is turned ON, the header can be turned slowly in the forward or reverse direction for special purposes, such as bleeding air from the hydraulic system. Increase or decrease the speed by pressing the header speed increase/decrease switch. In order to allow engine start, the fuel solenoid is activated whenever either the header drive switch or the header reverse switch is turned on. The fuel solenoid will be turned off whenever this menu item is exited or the ignition key is turned off.

13. **INITIALIZE**

    (Special item, reserved for engineering development, manufacturing and service personnel.)

    When operating the initialization, the display is set to a value by pressing the "hand" switch when the ignition key is turned off. Each value code corresponds to a result as follows:

Displayed value at power off	Result
20	WES memory cleared, engine and header hours set to zero, faults cleared, mode to automatic, units and language display to English, top and bottom test lines to show engine oil pressure, model number set to HW340 and cutter type set to disc.
19	WES memory cleared, engine and header hours set to zero, faults cleared, units and language display to English, top and bottom test lines to show engine oil pressure, model number set to HW320 and cutter type set to sickle.
18	WES memory cleared, engine and header hours set to zero, faults cleared, units and language display to English, top and bottom test lines to show engine oil pressure, model number set to HW300 and cutter type set to sickle.
10	WES fault/warning history cleared.
0	Normal operation - no changes

Normal Operation

The WES is powered up by turning the ignition switch to ON. A brief "wake up" display of the windrower model number and cutter type is accompanied by a short beep from the audible alarm. When the windrower is ready for operation, the two-line text display will show the operation menu items last displayed at power off.

Header operation:

To operate the header in the forward direction, the turn-on requirements are:

- Operator in seat
- Header not turning
- Engine speed greater than 500 RPM (HW300/HW320)
- Engine speed greater than 1300 RPM (HW340)
- Header drive switch turned from OFF to ON

When these requirements are met, the WES will drive the header speed to slowly increase until a value is reached approximating the speed of operation when the key was last turned off.

To operate the header in the reverse direction, the turn-on requirements are:

- Operator in seat
- Header not turning
- Header drive switch OFF
- Header reverse switch toggled on

Whenever the operator leaves the cab seat with the header drive switch on and the header turning, the WES will emit a short beep and display a count period of four seconds. When the timer reaches zero, the WES will cut power to the header even if the operator is reseated. The header cannot be moved in either a forward or reverse direction. The header can be restarted after the following sequence:

1. The header stops turning.
2. The operator is reseated.
3. The header drive switch is turned from OFF to ON.

System Monitoring

During normal operation the WES monitors:

Sensor	Sensor Warning Condition
Air Filter Switch	Air filter clogged for one second
Hydraulic Oil Pressure Switch	Charge pressure low for three seconds*
Hydraulic Oil Level	Level low for four seconds
Hydraulic Oil Temperature switch	Oil temperature high for one second
Engine Oil Pressure Sender	Engine oil pressure less than 15 PSI*
Engine Coolant Temperature Sender	Engine coolant greater than 99° C (210° F)*

* If the warning condition exists for greater than 30 seconds, the WES will cut power to the fuel solenoid and shut off the engine. While the fault exists, the top line of the display will show seconds to engine cut off with a warning to the operator to stop the engine. The bottom line on the display identifies the fault condition. The engine may be restarted but if the fault continues, the engine will stop again after 30 seconds.

Additionally, the WES sends signals to and monitors the condition of the following outputs:

- Right turn signal
- Left turn signal
- Fuel solenoid
- Header lift solenoid
- Header lower solenoid
- Hydraulic master solenoid
- Header drive forward
- Header drive reverse
- Work lights
- Left and right brake lights

If an output fault occurs, a message identifying the fault will appear on the bottom line of the display. The WES will immediately cut power to the faulted output to protect the WES. Either a short or open load can generate an output fault.

To cancel fault messages, press the FNR display select switch or the bottom row switch on the warning module. If the condition recurs, a message will again be displayed.

During normal operation, each text line of the display can be set to show one of the following:

- Engine Oil Pressure (PSI or kPa)
- Engine Coolant Temperature (Degrees C or F)
- Battery Voltage (To nearest tenth volt)
- Ground Speed (MPH or KPH)
- Header Speed (RPM or Strokes/min.)
- Engine RPM
- Fuel Level
- Engine Hours (To nearest tenth)

To select the item to be displayed in the top line, push the button on the front of the FNR lever.

Press the switch to the right of the audible alarm on the warning module (hand symbol) to select the item on the bottom line.

At power up, the WES will display the items last displayed at power-off. The WES non-volatile memory retains this information which will not change even if the battery is disconnected.

When either a top line or a bottom line is selected, a sequence identification number is displayed to the left of the item for reference purposes. This number will disappear after about two seconds.

The WES will emit a short beep and display the message "SIT IN SEAT" whenever an attempt is made to start the header in either forward or reverse if the operator is not in the seat.

The WES will emit a short beep and display the message "NOT IN NEUTRAL" whenever an attempt is made to start the windrower if the transmission is not in neutral.

On the HW340, the WES will emit a short beep and display "INCREASE ENG RPM" if an attempt is made to start the header with the engine speed below 1300 RPM.

On start up, the WES will not respond to sensors until the following conditions are met:

1. The ignition key is returned from the START position to the ON position for eight seconds;

   or,

2. Engine oil pressure is greater than 13 PSI;

   and, engine speed is greater than 500 RPM.

For each engine on/off cycle, the WES will warn the operator ONE time that the fuel is low. The visual text warning "LOW FUEL" and audible warning will be present for about five seconds.

The 2355 disc cutter may be operated on the HW340 in either the automatic or manual mode.

In the automatic mode, the operator selects a "target" header speed and the WES controls the header pump flow to maintain that target speed. The WES will continue to maintain header speed to compensate for changes in engine speed and crop conditions, unless engine speed drops below 1300 RPM. When the engine speed drops below the 1300 RPM threshold, the WES discontinues making header speed corrections until engine speed is raised above 1300 RPM.

In the manual mode, the pump displacement is set to a specific value and leader speed will increase and decrease with engine speed.

During normal operation, pressing and releasing the "open book" symbol will display the current mode for three seconds on the bottom line of the text display.

Display the alternate mode by pressing and releasing the switch again. To change the mode, press and hold the switch down until the display shows the text that was there before the switch was pressed. The new mode will be verified in the display for three seconds when the switch is released. The header must be off to change the mode.

In operation, change header speed in the manual mode by successively pressing and releasing the increase/decrease rocker switch on the control console. The header speed may range from 1600 RPM to 3100 RPM. Push the header speed increase/decrease button to display the target speed momentarily in the bottom line text of the display.

For the sickle bar cutter, header speed for the HW340 is fixed at about 1800 SPM, and the mode is automatic.

WINDROWER ELECTRONIC SYSTEM POWER CIRCUITS

WES POWER

The battery supplies power to the WES control module, 1, through one switched circuit and one unswitched circuit. The unswitched circuit is a direct connection to the battery and powers memory retention when the key is off. The switched power is turned on and off with the key switch. The WES will not light up unless the key is turned to "on" closing the switched power circuit. The console module is mounted in the right hand console. To gain access to the console module, remove the plate below the window on the outside of the cab.

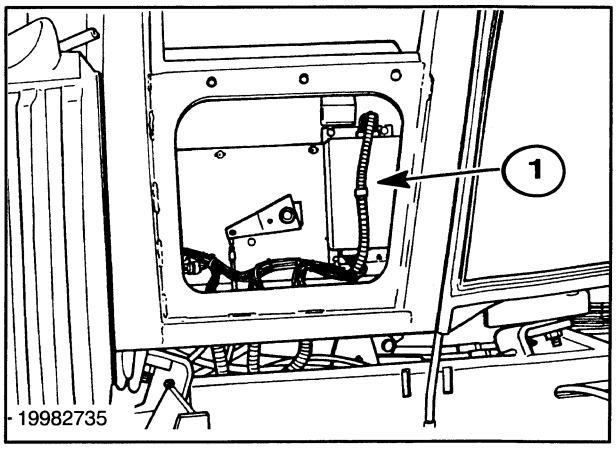
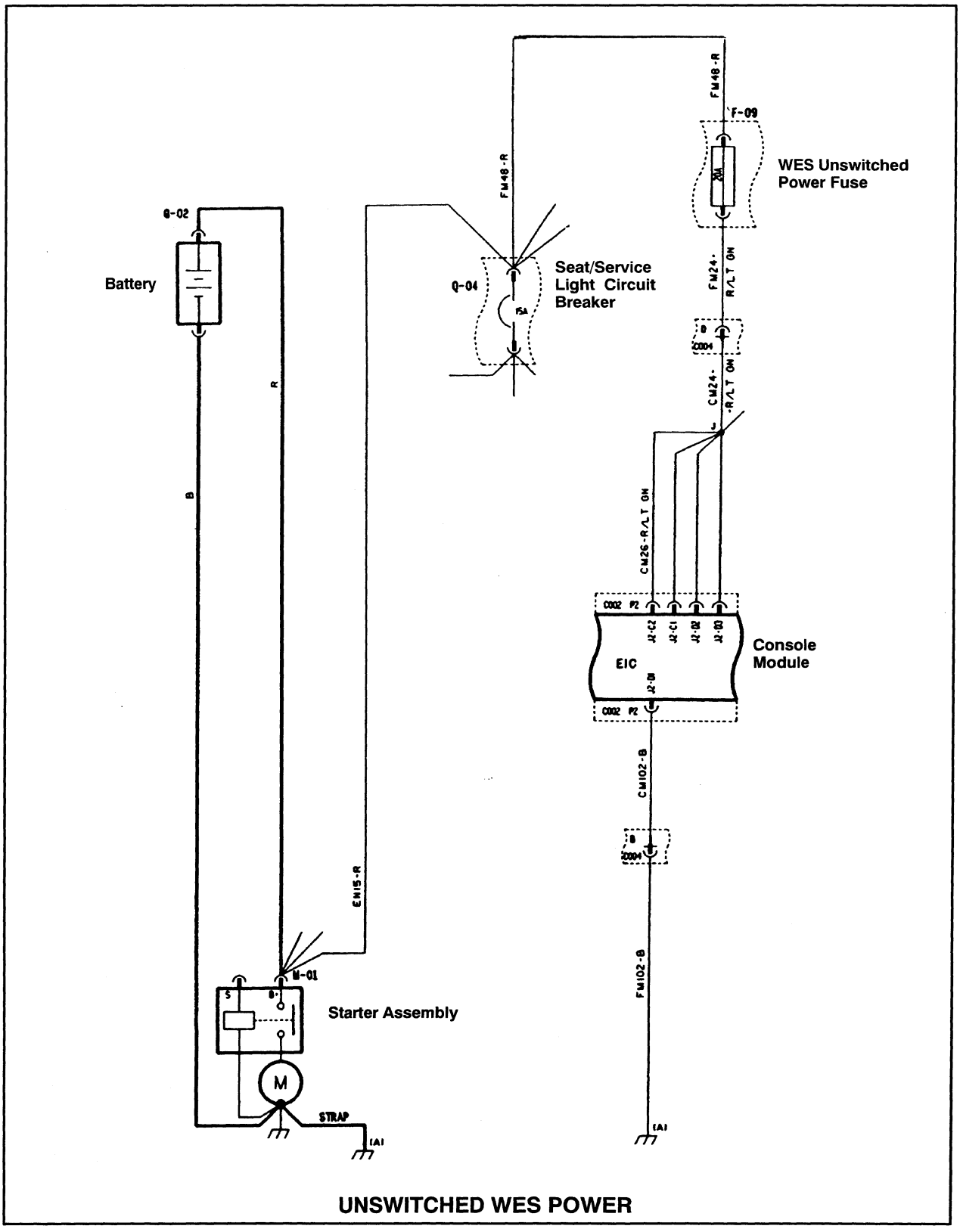


Figure 1-12

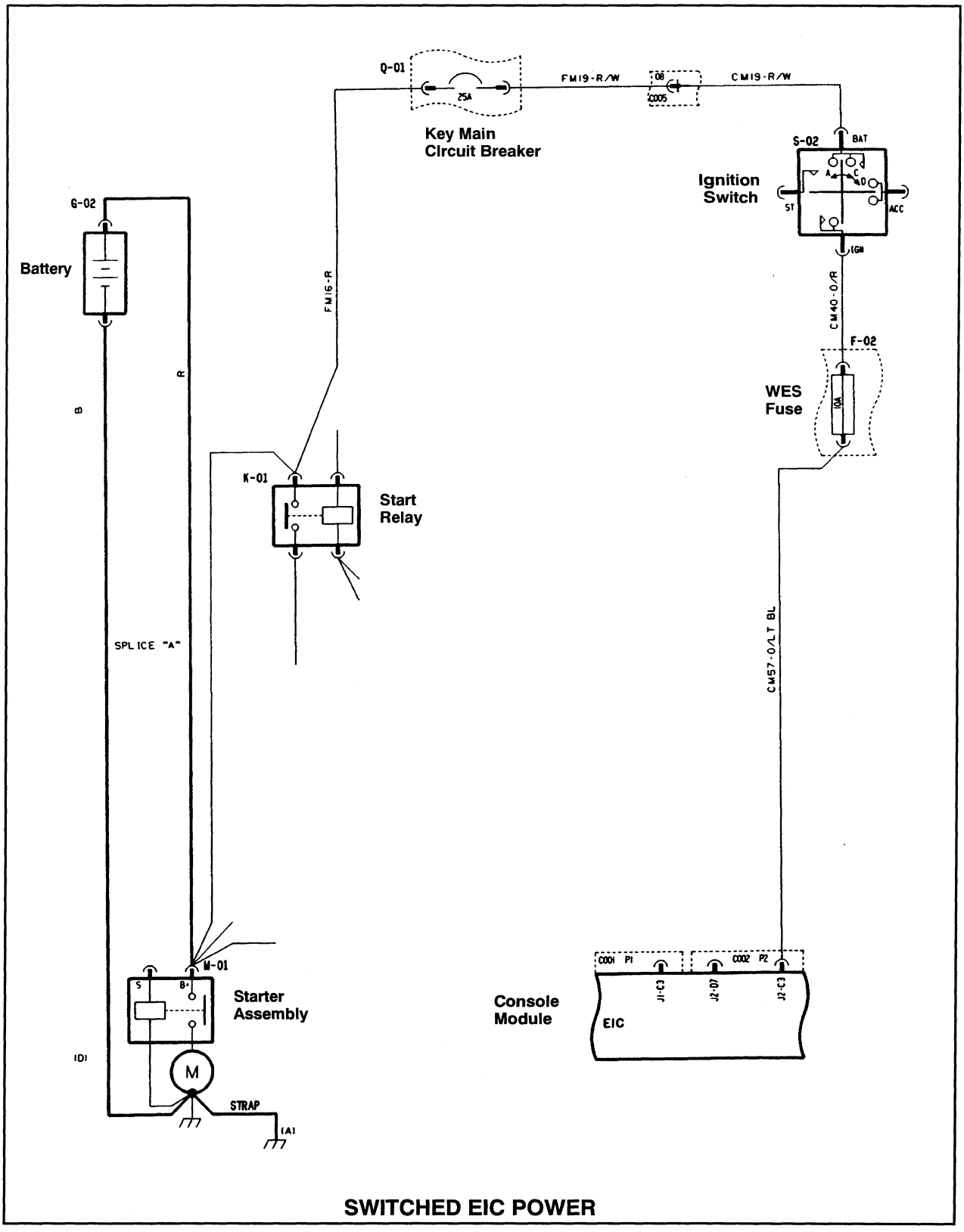


UNSWITCHED WES POWER

Figure 1-13

UNSWITCHED WES POWER

The unswitched power supplies power for most of the circuits powered by the WES. The circuit path for the main unswitched power from the battery is through the R battery cable to the starter. From there it follows through the R wire to the 15-amp seat adjust circuit breaker terminal. The circuit continues to the 20-amp WES unswitched fuse, F-09, into the console module at C1, C2, D2 and D3 at connector C002 (bottom connector of the console module).



SWITCHED EIC POWER

Figure 1-14

SWITCHED WES POWER

The circuit path from the battery is through the R battery cable to the start relay. From there the path is through the R wire to the start relay to the 25-amp key main circuit breaker, Q-01. From the circuit breaker, the path continues to the key switch "BAT" terminal.

When the key switch is turned on, current flows from the "IGN" terminal of the key switch through the O/R wire in the cab main wire harness to the console module through the WES fuse, F-02, on the main electrical panel. The power for the fuel solenoid supplied by the WES is derived from this source.

Troubleshooting

Before attempting to troubleshoot a problem, review the information under the "General Troubleshooting" heading at the beginning of this section along with the material in the "General Electrical" portion of this section.

Operate the machine and observe the problem. Follow the systematic step-by-step instructions in the chart to locate and correct the problem. Follow all the instructions carefully.

WES Lights Up But Most Circuits Do Not Function (Unswitched Power Failure)

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Key switch off.	Check 20 A fuse (F-09) in the main electrical panel in the left side engine compartment behind fuel tank.	Blown fuse. Good fuse.	Replace. Go to next step.
2.	Uncouple the middle connector in the floor of the right console under the cab (C004).	Check continuity of FM102-B at pin B to ground.	No continuity. Continuity.	Open circuit or poor connection in FM102 between C004 and ground point "A". Check ground point "A" for proper connection. Repair. Go to next step.
3.	Reconnect C004. Disconnect C002 from the bottom of the console module.	Check continuity of CM102-B at pin D of C002 plug to ground.	No continuity. Continuity.	Open circuit or faulty connection in CM102-B between C004 and C002. Repair. Go to next step.
4.	Same as step 3.	Check for voltage at C1 (CM25), C2 (CM26), D2 (CM197), and D3 (CM198) (all R/LT GN) in C002.	Battery voltage at all locations. Low or no voltage at any of the locations.	Console module defective. Replace. Go to next step.
5.	Reconnect C002. Uncouple the middle connector under the floor of the right console, C004.	Check for voltage at D (FM24-R/LT GN) of C004.	Battery voltage. Low or no voltage.	Open circuit or poor connection in CM24-R/LT GN between C004 and C002. Repair. Go to next step.
6.	Reconnect C004. Remove 20 A WES fuse (F-09) in main electrical panel.	Check for voltage of FM48-R at the fuse holder.	Battery voltage. Low or no voltage.	Open circuit or faulty connection in FM24-R/LT GN between fuse holder and C004. Repair. Go to next step.
7.	Reinstall 20 A fuse.	Check for voltage at the 15 A seat/service light circuit breaker (Q-04) in main electrical panel.	Battery voltage. Low or no voltage.	Open circuit or faulty connection in FM48-R between the 15A circuit breaker and 20A fuse. Repair. Open circuit or faulty connection in EN15-R between 15A circuit breaker and starter.