



1993

Mustang



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Electrical & Vacuum Troubleshooting Manual

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**1989 Mustang Electrical & Vacuum
Trouble-Shooting Manual (EVTM)
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Tell us about yourself

Are you a: Ford Trained Technician Independent Technician Customer
 Other _____

1. Which section of the EVTVM do you use most frequently?

Schematics Diagnostics Component Location Information

2. How often do you refer to this Ford Service Publication?

For all electrical problems
 For about 75% of electrical problems
 Fewer than 25% of electrical problems

3. Do the component location descriptions provide enough detail?

Yes No

Suggestions: _____

4. Would you prefer to have the electrical information for one vehicle, in one publication (separate electrical publications for each vehicle)?

Yes No

5. Are connector views and corresponding information helpful when diagnosing electrical problems?

Yes No

6. Would you like to include more component switch test information?

Yes No

7. Do you read the "How to Use this Manual" and "How to Find the Electrical Problems" sections of this manual?

Yes No

What additional information would be helpful? _____

8. Rate the purpose for using the location index. (5 is high, 1 is low)

Connectors Splices Part Numbers Grounds

9. Are the full view, more comprehensive illustrations (located just prior to the Location Index) a helpful tool?

Yes No

Comment: _____

10. Please rate the overall effectiveness of the revised radio schematics and diagnostics.

Good Fair Poor

11. How helpful are the "equivalent circuits" of electrical components, as shown on schematics, when troubleshooting electrical circuits?

Good Fair Poor

Comments: _____



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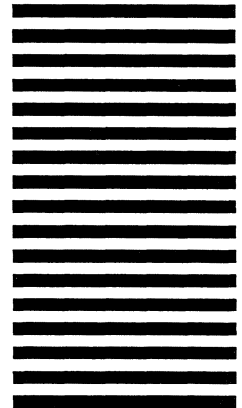


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ELECTRICAL AND VACUUM TROUBLESHOOTING MANUAL

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FORD PARTS and SERVICE DIVISION

Quality is Job 1

Ford Parts and Service Division has developed a new format for the 1993 Mustang EVT. Our goal is to provide accurate and timely electrical and vacuum service information.

1993 EVT FEATURES

- **"CIRCUIT OPERATION"** descriptions (CELL 7) that explain how each circuit works. These descriptions are designed to be used in conjunction with the Electrical Schematic.
- **Schematic pages** now contain **COMPONENT LOCATION** references to full-view illustrations.
- **"COMPONENT TESTING"** procedures (CELL 149) that tell the user how to perform diagnostic tests on various circuits.
- **Connector End Views** are now located at the end of individual cells and are shown for connectors with five or more cavities; for connectors with ten or more cavities, a circuit function chart is provided.
- **NOTES, CAUTIONS and WARNINGS** that contain important safety information.
- Full view **"COMPONENT LOCATION VIEWS"** (CELL 151) to help locate on-vehicle components.
- Circuit voltages have been added to schematic pages to help simplify troubleshooting. Starting with this edition of the EVT nonessential troubleshooting hints have been deleted.
- **Cellular Pagination:** A specific section (or cell) in all EVTs is numbered by cell and starts with page 1. For example: **"HOW TO USE THIS MANUAL"** is CELL 2 and begins with page 2-1.

ned for all electrical connectors. "C" numbers are listed in
"LOCATION INDEX" (CELL 152).

ORDERING INFORMATION

Information about how to order additional copies of this publication or other Ford publications may be obtained by writing to Helm Incorporated at the address shown below or by calling 1-800-782-4356. Other publications available include:

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- Service Specification Books
- Car/Truck Wiring Diagrams
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IMPORTANT SAFETY NOTICE

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the personal safety of the individual doing the work. This Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.



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2-1 HOW TO USE THIS MANUAL

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The purpose of this manual is to show electrical and vacuum circuits in a clear and simple fashion to make troubleshooting easier. **NOTES, CAUTIONS** and **WARNINGS** containing important information appear in boxes on text pages.

- **NOTES** describe how switches and other components operate to help complete a particular procedure.
- **CAUTIONS** provide information that could prevent making an error that may damage the vehicle.
- **WARNINGS** provide information to prevent personal injury.

The **WARNINGS** list on page 2-2 contains general warnings to follow when servicing a vehicle.

Components that work together are shown together. All electrical components used in a specific system are shown on one diagram. The circuit breaker or fuse is shown at the top of the page. All wires, connectors, components and splices are shown in the flow of current to ground at the bottom of the page. If a component is used in several different systems, it is shown in several places. For example, the Main Light Switch is electrically a part of many systems and is repeated on many pages.

In some cases, a component may seem (by its name) to belong to a system where it has no electrical connection. For example, Radio Illumination is electrically part of Instrument Illumination, but because it has no electrical connection, it is not

are reverse-text blocks located next to each component and connector and refer the user to the appropriate illustration page and zone.

Schematic pages now contain circuit voltages to help simplify troubleshooting hints. 12V is used to imply battery voltage on a component connector terminal, and 0V is used to show that there should be continuity to ground on that particular terminal. Conditional voltages such as "12V with the ignition switch in RUN" will also be provided. Troubleshooting hints that can't be simplified with circuit voltages will be shown at the end of each cell.

Connector face information specific to a certain cell is now found at the end of that cell. A Connector Face Reference List is provided to locate connector faces that are shown in different cells. Component connectors with five or more terminals are illustrated. Component Connectors with 10 or more terminals are accompanied by a pinout chart that lists the function of all circuitry associated with that component.

"**CIRCUIT OPERATION**" (Cell 7) contains descriptions of **HOW THE CIRCUIT WORKS** for each system as well as references to the appropriate diagnostic section of the Service Manual. The beginning of each section has a reverse-text block identifying the page on which the corresponding schematic appears.

"**GROUNDINGS**" (Cell 10) contains ground circuitry shown in complete detail. This information is useful for checking interconnections of the ground circuits of different systems.

"**POWER DISTRIBUTION**" (Cell 13) contains power distribution circuitry shown in complete detail. This section displays how the various fuses are powered and, in turn, how each system is powered.

"**COMPONENT TESTING**" (Cell 149) contains testing procedures for various switches. This information includes schematics, component terminal locations and step-by-step procedures.

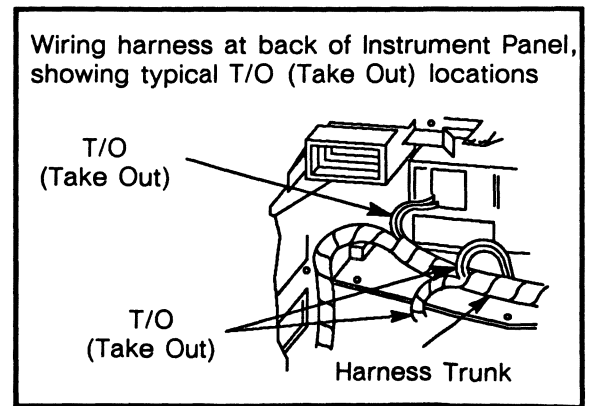
"**COMPONENT LOCATION VIEWS**" (Cell 151) contains full-view illustrations which show the location of all components and connectors in the vehicle.

The "**LOCATION INDEX**" (Cell 152) provides the base part numbers, locations, connector face references and illustration references for all components, connectors, splices and grounds.

HELPFUL REMINDERS

Before using the EVTM for troubleshooting, refer to these **HELPFUL REMINDERS**:

1. The abbreviation T/O, for take out, used in the Location Index (Cell 152), refers to the point at which a group of wires branch off the harness trunk. Refer to the wiring harness illustration.



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HELPFUL REMINDERS (CONTINUED)

- If a connector serves the same purpose in two separate versions (e.g., EFI/Carb), but is physically different, two connector numbers are used. However, if a connector serves the same purpose in two separate versions (e.g., EFI/Carb) and is physically the same, but the wire colors are different, only *one* connector number is used. If the same physical connector is used more than once, then more than *one* connector number is used.
- Wiring schematics provide a picture of how and under what conditions the circuit is powered, of the current path to circuit components, and of how a circuit is grounded. Each circuit component is named (underlined titles). Wire and connector colors are listed (standard Ford color abbreviations are used):

COLOR ABBREVIATIONS

BL	Blue	N	Natural
BK	Black	O	Orange
BR	Brown	PK	Pink
DB	Dark Blue	P	Purple
DG	Dark Green	R	Red
GN	Green	T	Tan
GY	Gray	W	White
LB	Light Blue	Y	Yellow
	Light Green		

- When reporting Vehicle Repair Location Codes to Ford Parts and Service Division, refer to Cell 160 (beginning on page 160-1). Note: Do *not* use the illustrations in Cell 151 (beginning on page 151-1) for reporting Vehicle Repair Location Codes.

5. WARNINGS

- Always wear safety glasses for eye protection.*
- Use safety stands whenever a procedure requires being under a vehicle.*
- Be sure that the Ignition Switch is always in the OFF position, unless otherwise required by the procedure.*
- Set the park brake when working on any vehicle. An automatic transmission should be in PARK. A manual transmission should be in NEUTRAL.*
- Operate the engine only in a well-ventilated area to avoid danger of carbon monoxide.*
- Keep away from moving parts, especially the fan and belts, when the engine is running.*
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.*
- Do not allow flame or sparks near the battery. Gases are always present in and around the battery cell. An explosion could occur.*
- Do not smoke.*
- To avoid injury, always remove rings, watches, loose hanging jewelry and loose clothing.*

HOW TO FIND ELECTRICAL CONCERNS

TROUBLESHOOTING STEPS

These six steps present an orderly method of troubleshooting.

Step 1. Verify the concern.

- Operate the complete system to check the accuracy and completeness of the customer's complaint.

Step 2. Narrow the concern.

- Using the EVT, narrow down the possible causes and locations of the concern to pinpoint the exact cause.
- Read the description of *How the Circuit Works* and study the wiring schematic. You should then know enough about the circuit operation to determine where to check for the trouble. Further information can be found by referring to the Service Manual pages listed after *How the Circuit Works*.

Step 3. Test the cause.

- Use electrical test procedures to find the specific cause of the symptoms.
- The component location reference bars and the pictures will help you find components. The Location Index (at the end of the manual) gives component location information for connectors, diodes, resistors, splices and grounds.

Step 4. Verify the cause.

- Confirm that you have found the correct cause by connecting jumper wires and/or temporarily installing a known good component and operating the circuit.

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with two basic color wire.

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2-3 HOW TO USE THIS MANUAL

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HOW TO FIND ELECTRICAL CONCERNS

Step 5. Make the repair.

- Repair or replace the inoperative component.

Step 6. Verify the repair.

- Operate the system as in Step 1 and check that your repair has removed all symptoms without creating any new symptoms.

Some engine circuits may need special test equipment and special procedures. See the *Service Manual* and other service books for details. You will find the circuits in this manual to be helpful with those special test procedures.

TROUBLESHOOTING TOOLS

JUMPER WIRE

This is a test lead used to connect two points of a circuit. A Jumper Wire can bypass an open to complete a circuit.

WARNING

Never use a jumper wire across loads (motors, etc.) connected between hot and ground. This direct battery short may cause injury or fire.

VOLTMETER

A DC Voltmeter measures circuit voltage. Connect negative (- or black) lead to ground, positive (+ or red) lead to the voltage measurement point.

OHMMETER

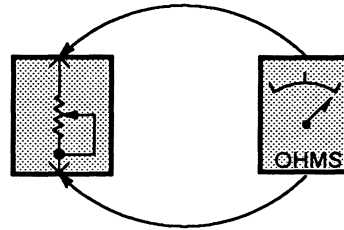


Figure 1—Resistance Check

An Ohmmeter shows the resistance between two connected points (Figure 1).

TEST LAMP

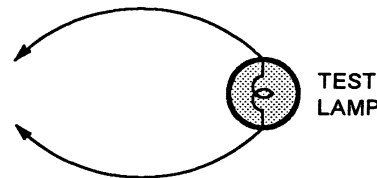


Figure 2—Test Lamp

A Test Light is a 12-volt bulb with two test leads (Figure 2).

Uses: Voltage Check, Short Check.

SELF-POWERED TEST LAMP

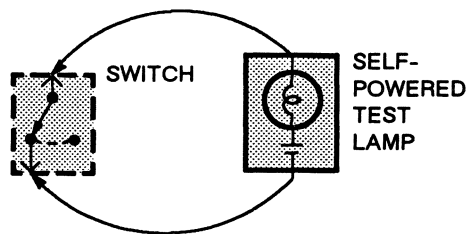


Figure 3—Continuity Check

The Self-Powered Test Lamp is a bulb, battery and set of test leads wired in series (Figure 3). When connected to two points of a continuous circuit, the bulb glows.

Uses: Continuity Check, Ground Check.

CAUTION

When using a self-powered test lamp or ohmmeter, be sure power is off in circuit during testing. Hot circuits can cause equipment damage and false readings.

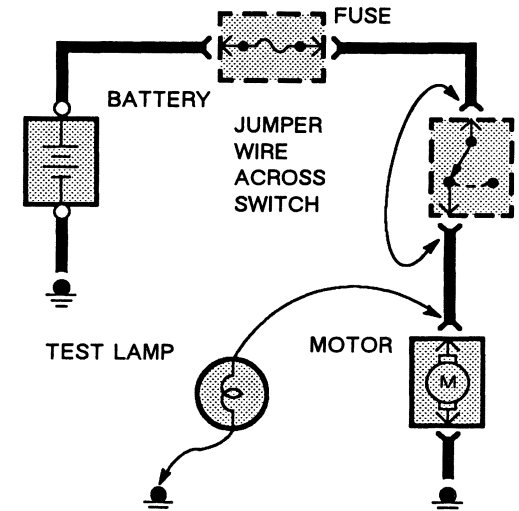


Figure 4—Switch Circuit Check and Voltage Check

In an inoperative circuit with a switch in series with the load, jumper the terminals of the switch to power the load. If jumpering the terminals powers the circuit, the switch is inoperative (Figure 4).

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HOW TO FIND ELECTRICAL CONCERNS (CONTINUED)

CONTINUITY CHECK (Locating open circuits)

Connect one lead of Self-Powered Test Lamp or Ohmmeter to each end of circuit (Figure 3). Lamp will glow if circuit is closed. Switches and fuses can be checked in the same way.

VOLTAGE CHECK

Connect one lead of test lamp to a known good ground or the negative (-) battery terminal. Test for voltage by touching the other lead to the test point. Bulb goes on when the test point has voltage (Figure 4).

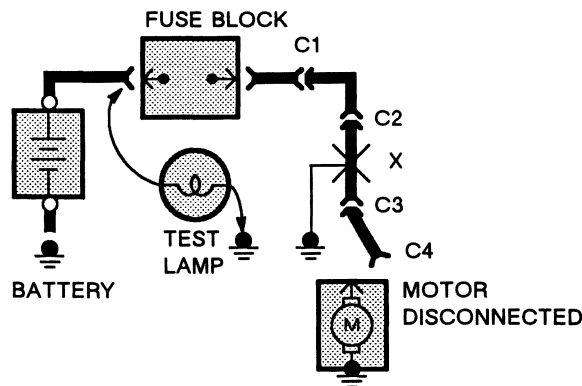


Figure 5—Short Check

A fuse that repeatedly blows is usually caused by a short to ground. It's important to be able to locate such a short quickly (Figure

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- Motors: disconnect motor connector (Connector C4 in Figure 5).
 - Lights: remove bulbs.
3. Turn Ignition Switch to RUN (if necessary) to power fuse.
 4. Connect one Test Lamp lead to hot end of blown fuse. Connect other lead to ground. Bulb should glow, showing power to fuse. *(This step is just a check to be sure you have power to the circuit.)*
 5. Disconnect the test lamp lead that is connected to ground, and reconnect it to the load side of the fuse at the connector of the disconnected component. (In Figure 5, connect the test lamp lead to connector C4.)
 - If the Test Lamp is off, the short is in the disconnected component.
 - If the Test Lamp goes on, the short is in the wiring. You must find the short by disconnecting the circuit connectors, one at a time, until the Test Lamp goes out. For example, in Figure 5 with a ground at X, the bulb goes out when C1 or C2 is disconnected, but not after disconnecting C3. This means the short is between C2 and C3.

Turn on power to the circuit. Perform a Voltage Check between the suspected inoperative ground and the frame. Any indicated voltage means that the ground is inoperative (Figure 6).

Turn off power to the circuit. Connect one lead of a Self-Powered Test Lamp or Ohmmeter to the wire in question and the other lead to a known ground. If the bulb glows, the circuit ground is OK (Figure 6).

The circuit schematics in this manual make it easy to identify common points in circuits. This knowledge can help narrow the concern to a specific area. For example, if several circuits fail at the same time, check for a common power or ground connection (see *Power Distribution or Grounds*). If part of a circuit fails, check the connections between the part that works and the part that doesn't work.

For example, if the lo beam headlamps work, but the high beams and the indicator lamp don't work, then power and ground paths must be good. Since the dimmer switch is the component that switches this power to the high beam lights and indicator, it is most likely the cause of failure.

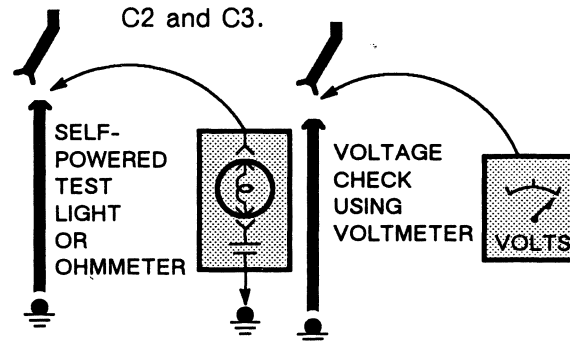


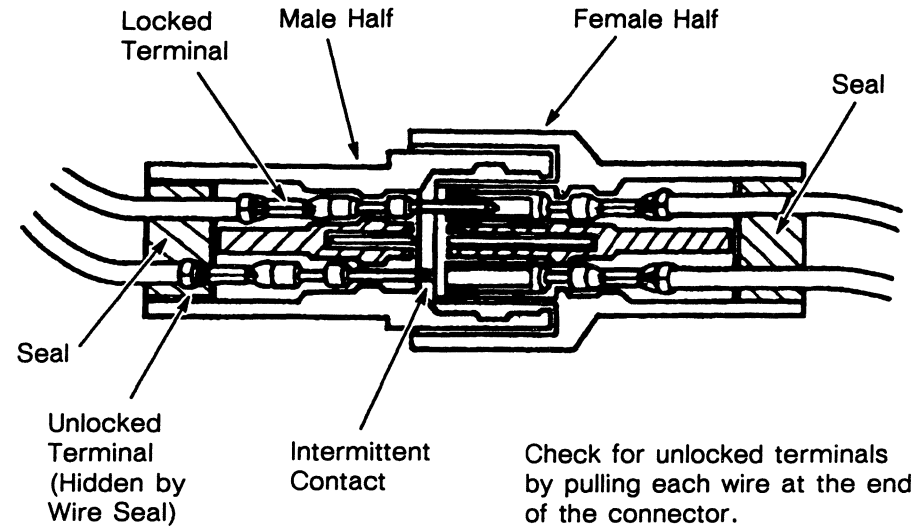
Figure 6—Ground Check

2-5 HOW TO USE THIS MANUAL

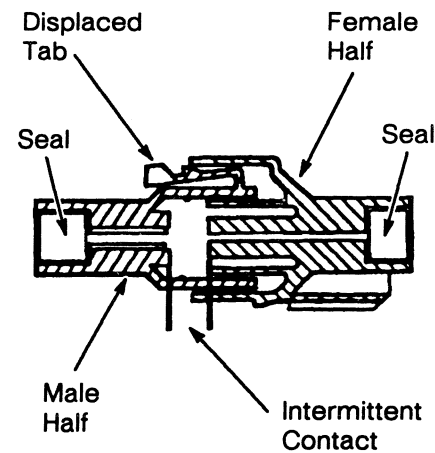
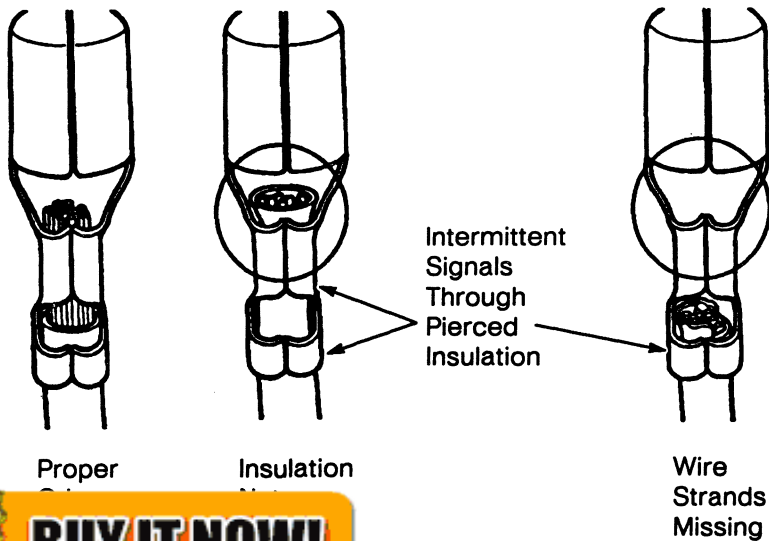
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TROUBLESHOOTING WIRING HARNESS AND CONNECTOR HIDDEN CONCERNS

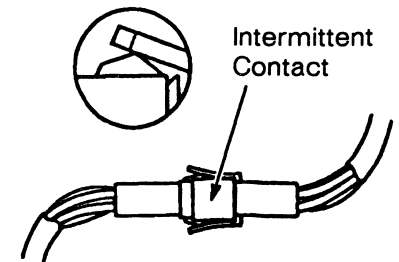
The following illustrations are known examples of wiring harnesses, splices and connectors that will create intermittent electrical concerns. The concerns are hidden and can only be discovered by a physical evaluation as shown in each illustration.



TERMINAL NOT PROPERLY SEATED



Lock may be displaced into an unlocked position; pull on the connector to verify the lock.



Type A

Type B

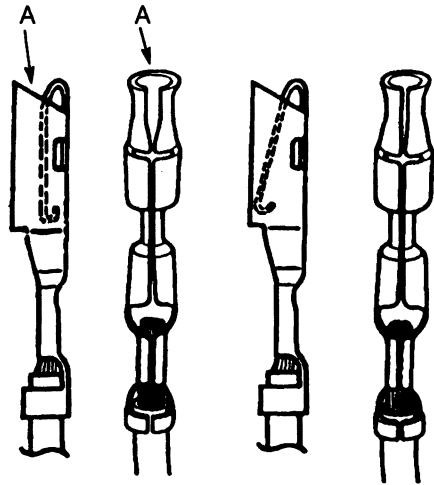
PARTIALLY MATED CONNECTORS

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ATION STRIPPING



Enlarged

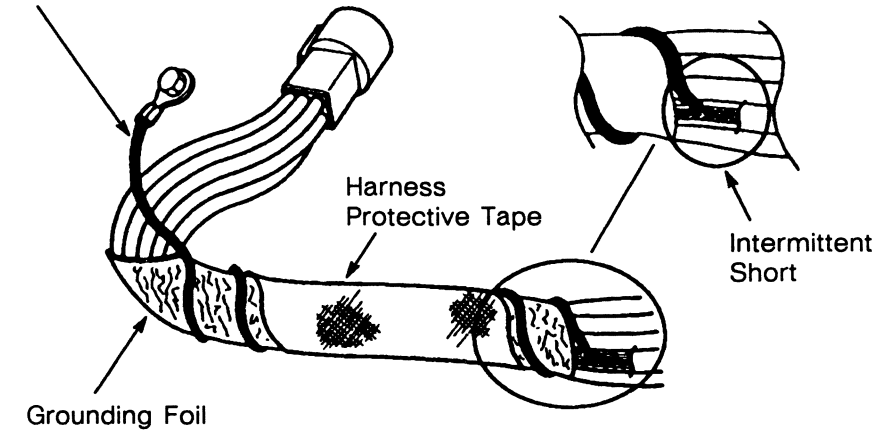
Normal

Any probe entering the terminal may enlarge the contact spring opening creating an intermittent signal. Insert the correct mating terminal (Location A) from the service kit and feel for a loose fit.

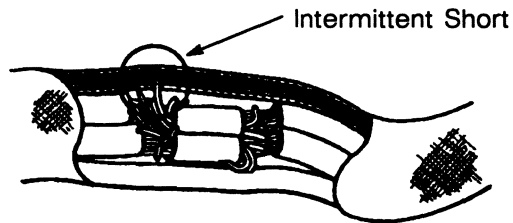
DEFORMED (ENLARGED) FEMALE TERMINALS

Solder Coated Wire to Ground

Solder coated wire pierced through the insulation of another circuit.



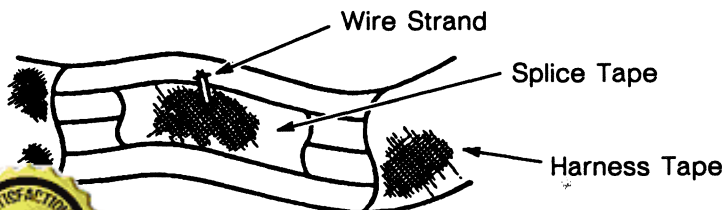
ELECTRICAL SHORT INSIDE THE HARNESS



Splice Tape Removed

Intermittent Short

Operate the system and flex the harness at splice location noted in Section 152.



Wire Strand

Splice Tape

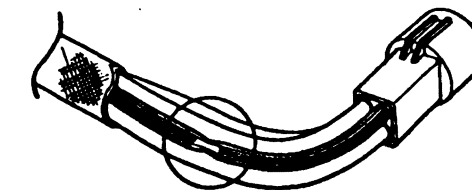
Harness Tape

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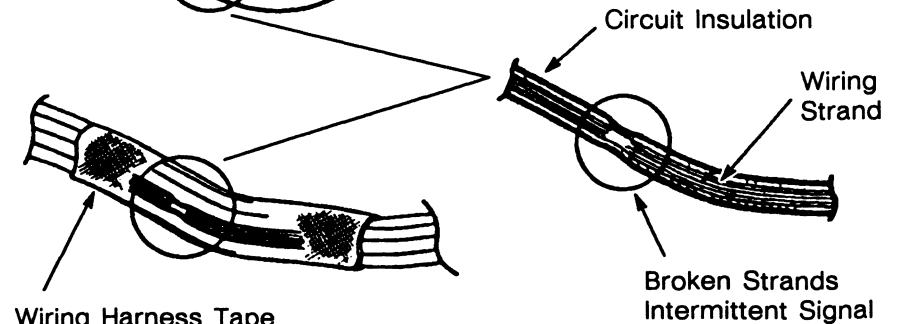
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WITHIN THE HARNESS



Wiring Harness Tape

Remove the tape and flex/feel each circuit for a reduction in diameter at break.



Circuit Insulation

Wiring Strand

Broken Strands Intermittent Signal

BROKEN WIRE STRANDS IN HARNESS

2-7 HOW TO USE THIS MANUAL

1993 MUSTANG

HOW TO FIND THE VACUUM CONCERNS

These six steps present an orderly method of troubleshooting.

Step 1. Verify the concern.

- Operate the system and observe all symptoms to check the accuracy and completeness of the customer's complaint.

Step 2. Narrow the concern.

- Narrow down the possible causes and locations of the concern to pinpoint the exact cause.

Step 3. Test the cause.

- Use test procedures to find the specific cause of the symptoms.

Step 4. Verify the cause.

- Confirm that you have found the right cause by operating the parts of the circuit you think are good.

Step 5. Make the repair.

- Repair or replace the inoperative component.

Step 6. Verify the repair.

- Operate the system as in Step 1. Check that your repair has removed all symptoms without creating any new symptoms.

NOTE: Vacuum system problems fall into three groups.

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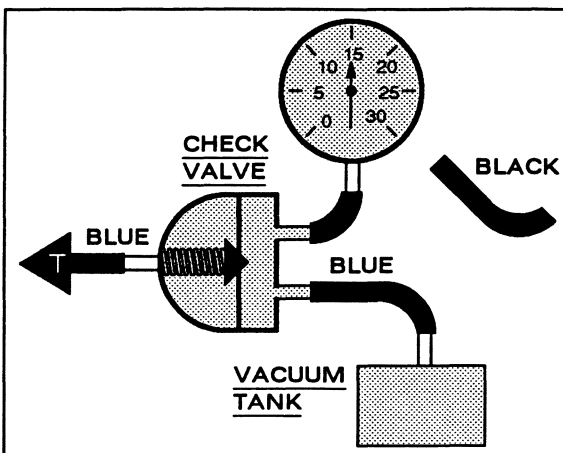


Figure 1 - System Supply Test

Vacuum Supply Test

1. Connect Vacuum Tester to system side of Check Valve (Figure 1).
2. Start engine. Gauge should show approximately 15 inches of vacuum.
3. Turn off engine, and observe gauge:
 - If vacuum holds, supply OK.
 - If vacuum fails, replace Check Valve or Tank.

Leak Test

1. Connect Vacuum Gauge and Vacuum Pump (Figure 2) to system hose in place of tank.
2. Open valve and start pump. Operate control in all modes.
3. Listen for hiss and observe gauge.

NOTE: Hissing is normal at Function Control when changing modes.

If system hisses or loses vacuum, find system leak as follows:

1. Turn on Vacuum Pump and check vacuum build-up.
2. Stop pump; vacuum should drop.
3. Clamp supply hoses with needlenose pliers, one at a time, until vacuum stops dropping (Figure 2).
4. Check vacuum schematic to find components in that line.
5. Clamp hoses through circuit to find leak.

Component Test

1. Connect Vacuum Tester to component.
2. Pump Vacuum Tester. Check that all components operate correctly and vacuum holds.
3. Replace component if vacuum does not hold.

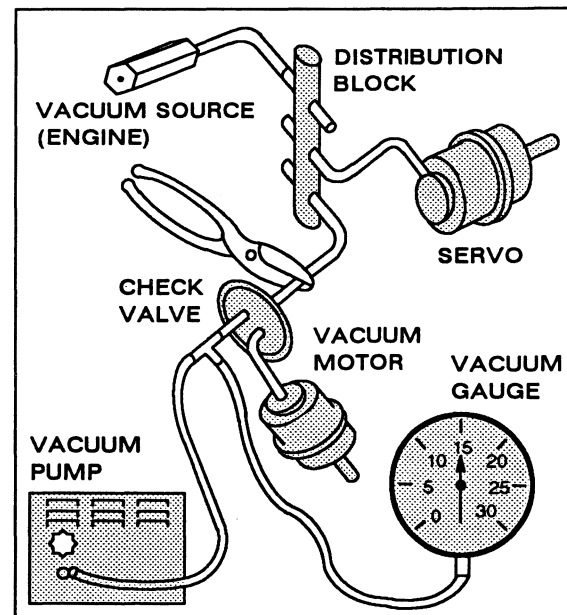


Figure 2 - Testing For Leaks In Typical Vacuum System

HOW TO USE THIS MANUAL 2-8

1993 MUSTANG

SAE J1930 NOMENCLATURE STANDARDS

Certain Ford component names have been changed in this EVTm to conform to Society of Automotive Engineers (SAE) directive J1930.

SAE J1930 standardizes automotive component names for all vehicle manufacturers.

A table lists new 1993 SAE J1930 component names and the obsolete 1992 component names.

1993 MUSTANG COMPONENT NAMES	1992 MUSTANG COMPONENT NAMES
Barometric Pressure (BARO) Sensor	Barometric Absolute Pressure (BAP) Sensor
Brake On/Off (BOO) Switch	Stop Lamp Switch
Canister Purge (CANP) Solenoid	Canister Purge Solenoid
Clutch Pedal Position (CPP) Switch #1	(2.5L) Clutch Pedal Switch (5.0L) Clutch Engage Switch (CES)
Clutch Pedal Position (CCP) Switch #2	Clutch Switch
Constant Control Relay Module	Integrated Relay Control Module
Crankshaft Position (CKP) Sensor	Crankshaft Position Sensor
Data Link Connector (DLC) C198	VIP Test Connector C198
Data Link Connector (DLC) C199	VIP Test Connector C199
Heated Oxygen Sensor (HO2S)	Heated Exhaust Gas Oxygen (HEGO) Sensor
Idle Air Control (IAC) Valve	Idle Air Bypass Valve
Ignition Control Module (ICM)	Distributorless Ignition System (DIS) Module
Ignition Control Module (ICM)	TFI Ignition Module
Inertia Fuel Shut-off Switch	Inertia Switch
Intake Air Temperature (IAT) Sensor	Air Charge Temperature (ACT) Sensor
Left Heated Oxygen Sensor (HO2S)	Left Heated Exhaust Gas Oxygen (HEGO) Sensor
Park/Neutral Position Switch	Neutral Gear Switch (NGS)
Park/Neutral Position Switch	Backup/Neutral Safety Switch
PCM Power Relay	EEC Power Relay
Power Steering Pressure (PSP) Switch	Power Steering Pressure Switch
Powertrain Control Module (PCM)	Electronic Engine Control (EEC) Module
Right Heated Oxygen Sensor (HO2S)	Right Heated Exhaust Gas Oxygen (HEGO) Sensor
Thermactor Air Bypass (TAB) Solenoid	Thermactor Air Bypass (TAB) Solenoid
Thermactor Air Diverter (TAD) Solenoid	Thermactor Air Diverter (TAD) Solenoid
Clutch Interrupt Switch	Clutch Interrupt Switch
Throttle Position Sensor	Throttle Position Sensor

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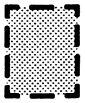
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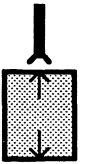
2-9 HOW TO USE THIS MANUAL

1993 MUSTANG

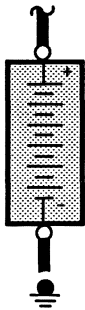
ELECTRICAL SYMBOLS



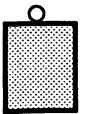
DASHED COMPONENT BOX
ONLY PART OF THE COMPONENT IS SHOWN ON THE PAGE; THE COMPONENT IS SHOWN COMPLETE IN ANOTHER LOCATION



COMPONENT WITH CONNECTORS



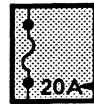
BATTERY



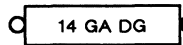
SCREW TERMINAL ON COMPONENT

SOLID STATE

SEALED ELECTRONIC COMPONENT
ANY CIRCUITRY SHOWN INSIDE THE BOX IS A FUNCTIONAL EQUIVALENT ONLY



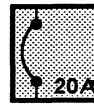
FUSE
CURRENT RATING



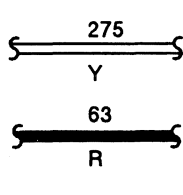
FUSIBLE LINK
WIRE SIZE AND COLOR



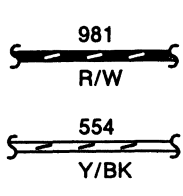
MAXI-FUSE or FUSIBLE LINK CARTRIDGE
CURRENT RATING



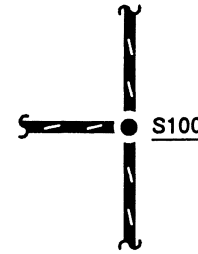
CIRCUIT BREAKER
CURRENT RATING



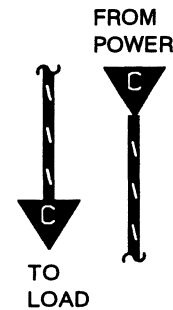
SOLID WIRES



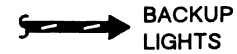
STRIPED WIRES



SPLICE OR CRIMP TERMINAL

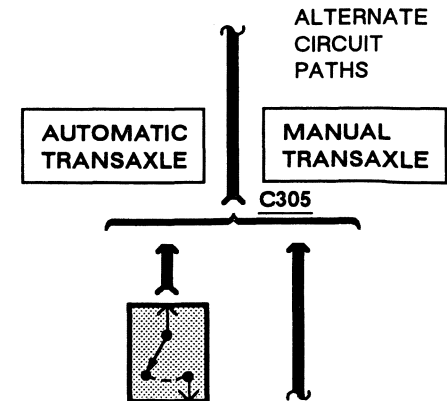


"CUT" WIRES REFERENCED BETWEEN PAGES
ARROWS SHOW CURRENT FLOW FROM POWER TO GROUND



BACKUP LIGHTS

"REFERENCE" WIRES
COMPLETE WIRING SHOWN ON ANOTHER PAGE

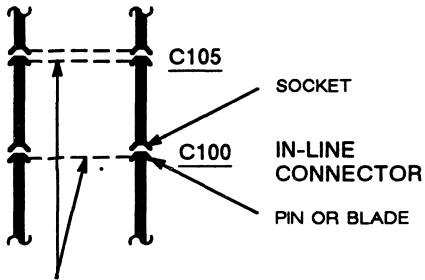


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ELECTRICAL SYMBOLS

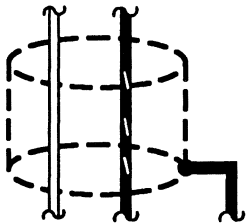


SINGLE OR DOUBLE DASHED LINE INDICATES THAT WIRE ON LEFT ALSO PASSES THROUGH THE SAME CONNECTOR

SEE GROUNDS
PAGES 10-1,
10-2



DASHED WIRE CIRCUITRY IS NOT SHOWN IN COMPLETE DETAIL, BUT IS COMPLETE ON ANOTHER PAGE



SHIELD WIRES ARE COVERED BY A SHIELD

FIELD COIL

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MOTOR



HEATING ELEMENT



THERMISTOR



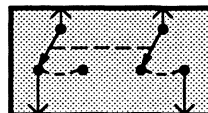
RHEOSTAT OR POTENTIOMETER



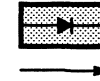
SOLENOID



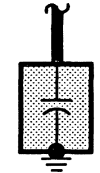
SWITCH



GANGED SWITCHES CONTACTS MOVE AT THE SAME TIME



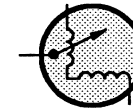
DIODES CURRENT FLOWS IN DIRECTION OF ARROW ONLY



CAPACITOR



TRANSISTOR



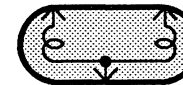
GAUGE



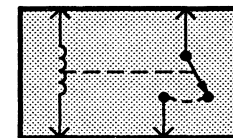
LIGHT EMITTING DIODE (LED)



LIGHT BULB



DUAL FILAMENT LIGHT BULB



RELAY CONTACTS CHANGE POSITION WITH CURRENT THROUGH COIL

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2-11 HOW TO USE THIS MANUAL

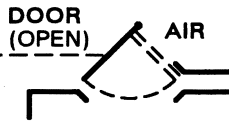
1993 MUSTANG

VACUUM SYMBOLS

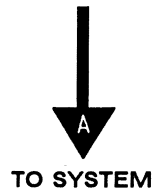
"T" JUNCTION



VACUUM MOTOR (WITH VACUUM)



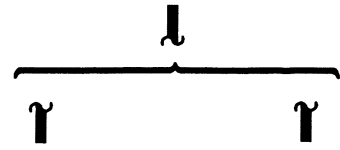
VACUUM ON VACUUM MOTOR PULLS DOOR OPEN TO LET AIR PASS THROUGH



TO SYSTEM

"CUT" HOSES REFERENCED BETWEEN PAGES
ARROW SHOWS FROM MANIFOLD FITTING TO COMPONENT

FROM VACUUM DISTRIBUTION



ALTERNATE VACUUM PATHS

NOTE

Other vacuum symbols used on vacuum system diagrams are fully explained on those pages.

DOUBLE DIAPHRAGM MOTOR

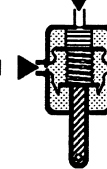
NO VACUUM



NO VACUUM

VACUUM

NO VACUUM



VACUUM

VACUUM



VACUUM MOTOR OPERATION

SINGLE DIAPHRAGM MOTOR

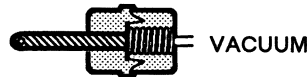
NO VACUUM



VACUUM



SERVO MOTOR



Some vacuum motors, such as the Servo Motor in the Speed Control, can position the actuating arm at any position between fully extended and fully retracted. The Servo is operated by a control valve that applies varying amounts of vacuum to the motor. The higher the vacuum level, the greater the retraction of the motor arm. Servo Motors work nearly the same way as two-position motors, except for the way the vacuum is applied. Servo Motors are generally larger and provide a calibrated control.

A double diaphragm motor has three positions (it is actually two motors in one housing). When the top port gets vacuum, the shaft pulls halfway in. When both ports get vacuum, the shaft pulls all the way in.

Vacuum motors operate like electrical so-mechanically pushing or pulling a When vac-ed all the

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7-1 CIRCUIT OPERATION

1993 MUSTANG

SECTION 10

GROUNDS

HOW THE CIRCUIT WORKS

The ground circuits show how many different systems may share a common ground point.

While all of the ground circuits shown are shown complete, additional ground circuits may exist in the vehicle. Any ground circuit not shown in Cell 10 is shown complete in the appropriate system schematic.

All wires are 57 (BK) unless otherwise noted.

SECTION 12

CHARGING SYSTEM

HOW THE CIRCUIT WORKS

The Alternator is belt-driven by the engine. Field current is supplied from the Integral Alternator Regulator (IAR), mounted on the rear of the Alternator, to the rotating field of the Alternator, through two brushes and two slip rings.

The Alternator produces power in the form of alternating current. The alternating current is rectified to direct current by six diodes. The Alternator Regulator automatically adjusts the Alternator field current to maintain the Alternator output voltage within prescribed limits to correctly charge the Battery. The Alternator is self-current limiting.

The regulator voltage control circuit is turned on when the Ignition Switch is in START or RUN and voltage is applied to Regulator terminal I through a resistor in parallel with the Charge Indicator. When the Ignition Switch is OFF, the control circuit is turned OFF and no field current flows to the Alternator.

The Charge Indicator is connected across the terminals of a 500-ohm resistor in the Instrument Cluster. Current passes through the Indicator when the Ignition Switch is in START or RUN and there is no voltage at terminal S. When voltage at terminal S rises to a preset value, the regulator switching circuits stop the

flow of current into terminal I and the indicator turns OFF.

System voltage is "sensed" at Regulator terminal A. The regulator switching circuits turn the warning indicator ON to indicate a system fault if terminal A voltage is excessively high or low or if the voltage at terminal S is below a preset value.

A Fuse Link is included in the charging system wiring on all models. The Fuse Link prevents damage to the wiring harness and Alternator if the wiring harness should become grounded or if a booster battery is improperly connected to the charging system.

For further diagnostic information, refer to Section 14-00 of the Service Manual.

SECTION 13

The circuits shown also indicate whether a particular fuse, circuit breaker or fuse link receives power directly from the Battery or through the Ignition Switch contacts.

show how
through
link.

SECTION 13 (cont'd)

For further diagnostic information, refer to Section 18-01 of the Service Manual.

SECTION 20

STARTING SYSTEM

HOW THE CIRCUIT WORKS

The Battery, Starter Motor, Starter Relay and Ignition Switch make up the Starting System. On vehicles with automatic transmis-

sions, the Park/Neutral Position Switch must be closed (PARK or NEUTRAL) to operate the Starter Motor. On vehicles with manual transmissions, the Starter Clutch Pedal Position (SCPP) Switch must be closed (clutch fully depressed) to operate the Starter Motor.

Turning the Ignition Switch to START sends current through the Starter Relay coil and the relay operates. Current from the Battery then flows directly through the Starter Relay to the Starter Motor to start the engine.

For further diagnostic information, refer to Section 03-06 of the Service Manual.

SECTION 21

IGNITION SYSTEM

HOW THE CIRCUIT WORKS

DISTRIBUTION IGNITION (DI) SYSTEM (5.0L)

The Distributor Ignition (DI) System contains an Ignition Control Module (ICM), which is mounted on the side of the Distributor.

When the engine is cranking or running:

- The pickup in the Distributor provides the signal input through the Ignition Control

Module (ICM) to the Powertrain Control Module (PCM), which returns a signal to the Ignition Control Module (ICM). The Ignition Control Module switches current on and off in the primary circuit of the ignition coil, according to the signal from the Powertrain Control Module (PCM).

- Each interruption of primary current makes the Ignition Coil secondary circuit

produce an open circuit high-voltage pulse of up to 40,000 volts.

High-voltage pulses are transmitted to the Distributor, which sends them to fire the spark plugs.

Two signal circuits, 395 (GY/O) and 929 (PK), are connected between the Ignition Control Module (ICM) and the Powertrain Control Module (PCM).

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7-3 CIRCUIT OPERATION

1993 MUSTANG

SECTION 21 (cont'd)

HOW THE CIRCUIT WORKS

Electronic Ignition (EI) System (2.3L)

In the Electronic Ignition (EI) System, all engine timing and spark distribution is handled electronically with no moving parts. This system has fewer parts that require replacement, and it provides a more accurately timed spark. During basic operation, the Powertrain Control Module (PCM) determines the ignition timing required by the engine, and the Ignition Control Module (ICM) determines which ignition coil to fire.

The Crankshaft Position (CKP) Sensor is a dual Hall-effect magnetic switch actuated by the dual vane cup on the crankshaft pulley hub assembly. This sensor generates two separate signals, PIP (profile ignition pick-up) and CID (cylinder identification).

The PIP signal provides base timing and RPM information, while the CID signal is used to synchronize the ignition coils. Initial timing (base timing) is set at 10 degrees BTDC and is not adjustable.

Two ignition coil packs are used for the 2.3L dual spark plug engine. The two ignition coil packs are triggered by the Ignition Control Module (ICM) and are timed by the Powertrain Control Module (PCM). Each coil pack contains two separate ignition coils for a total of four ignition coils. Each ignition coil fires two spark plugs simultaneously, one spark plug on the compression stroke and one on the exhaust stroke.

stroke uses very little of the ignition coil's stored energy; the majority of the ignition coil's energy is used by the spark plug on the compression stroke. Since these two spark plugs are connected in series, the firing voltage of one spark plug will be negative with respect to ground, while the other will be positive with respect to ground.

The main function of the Ignition Control Module (ICM) is to switch between ignition coils and to trigger the coils to spark. The Ignition Control Module (ICM) receives the PIP and CID signals from the Crankshaft Position (CKP) Sensor, and the SPOUT (spark out) signal from the Powertrain Control Module (PCM). During normal operation, PIP is passed on to the Powertrain Control Module (PCM) and provides base timing and RPM information. The CID signal provides the Ignition Control Module (ICM) with the information required to switch between the coils for cylinders 1 and 4 and the coils for cylinders 2 and 3. The SPOUT signal (from the Powertrain Control Module [PCM]) contains the optimum spark timing and dwell time information. The dwell time is controlled or varied by varying the duty cycle (duration) of the SPOUT signal. This feature is called CCD (computer controlled dwell). Therefore, with the proper inputs of PIP, CID and SPOUT, the Ignition Control Module (ICM) turns the ignition coils on and off in the proper sequence for spark control.

During some EI System faults, the failure-mode-effects-management (FMEM) portion of

the Ignition Control Module (ICM) will maintain vehicle operation. If the Ignition Control Module (ICM) does not receive the SPOUT input, it will automatically turn the ignition coils on and off using the PIP signal. However, this will result in fixed spark timing (ten degrees BTDC) and a fixed dwell time (no CCD). If the Ignition Control Module (ICM) does not receive the CID input, random coil synchronization will be attempted by the module. Therefore, several start attempts may be required to start the engine.

Dual Plug Inhibit (DPI) is a function of Powertrain Control Module (PCM) that is used when the vehicle is being started. During engine cranking, below 20°F (-7°C), the Powertrain Control Module (PCM) will only fire the spark plugs on the right hand side of the engine. When the engine has started, the Powertrain Control Module (PCM) will send a signal to the Ignition Control Module (ICM) to start normal dual plug operation.

Ignition Diagnostic Monitor

The Ignition Diagnostic Monitor (IDM) is a function of the Ignition Control Module (ICM). The Ignition Control Module (ICM) sends information on system failures to the Powertrain Control Module (PCM), which stores the information for diagnostic self test. The IDM signal also is used to drive the vehicle instrument tachometer and test tachometer for system diagnosis.

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SECTION 21 (cont'd)

For further diagnostic information, refer to the Powertrain Control/Emissions Diagnosis Manual.

SECTION 23

ELECTRONIC ENGINE CONTROL (2.3 EFI)

HOW THE CIRCUIT WORKS

The Electronic Engine Control System uses a Powertrain Control Module (PCM) to control fuel flow, exhaust gas recirculation (EGR), ignition system functions, evaporative emission, idle speed, A/C cutout, and engine cooling.

Fuel Flow

The 2.3L Multiport Fuel Injection System (MFI) is classified as a multi-point, pulse time, fuel injection system. A metered amount of fuel is injected into each cylinder in accordance with engine demand. The PCM Module determines the required fuel flow rate from various engine sensors.

The Fuel Pump supplies fuel under pressure to the Fuel Injectors. When the Ignition Switch is turned to RUN or START, voltage is applied to the Fuel Pump from the Constant Control Relay Module through the Inertia Fuel Shut-off Switch. The Inertia Fuel Shut-off Switch is a safety device which cuts off voltage to the Fuel Pump in the event of a collision. Once the Iner-

tia Fuel Shut-off Switch opens, it must be reset manually.

NOTE: If the engine does not operate after a collision, it may be that the Inertia Fuel Shut-off Switch has opened. To reset the switch, put your finger through the hole in front of the trunk trim line and push down on the plunger.

WARNING

If you see or smell gasoline, do not reset the Inertia Fuel Shut-off Switch.

Exhaust Gas Recirculation (EGR)

The EGR Vacuum Regulator controls the EGR valve movement. The PCM Module receives data from various sensors and also checks the existing valve position through the EGR Valve Position Sensor. The PCM Module calculates if the present EGR flow should be increased, maintained or decreased, and determines how to operate the EGR Valve to control emissions.

Canister Purge

The carbon canister collects fuel vapors from the fuel tank to be burned later in the engine. The Canister Purge (CANP) Solenoid is controlled by the PCM Module. When the PCM Module grounds the Canister Purge (CANP) Solenoid, the vapors are released to the engine for burning.

Ignition

The PCM System has a special Electronic Ignition (EI) System that has no centrifugal or vacuum advance mechanisms. Instead, all ignition timing is controlled by the PCM Module.

Powertrain Control Module (PCM) Inputs

The Powertrain Control Module (PCM) uses information from various sensors to determine engine operating conditions.

Mass Air Flow (MAF) Sensor

The Mass Air Flow (MAF) Sensor directly measures the mass of the air flowing into the engine. The sensor output is used by the PCM Module to calculate the injector pulse width for proper air/fuel ratio.

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7-5 CIRCUIT OPERATION

1993 MUSTANG

SECTION 23 (cont'd)

A4LD Transmission

The A4LD Transmission is an electronically controlled four speed automatic transmission. The Powertrain Control Module (PCM) uses inputs from various sensors to control the operation of the A4LD Transmission.

The A4LD Transmission has self-test capabilities much like those in other electronic control systems.

The Constant Control Relay Module (CCRM) supplies power to the PCM and PCM system related components. When the Ignition Switch is turned to RUN or START, voltage is applied to the 3-4 Shift Solenoid and the Torque Converter Clutch (TCC) Solenoid.

The Throttle Position (TP) Sensor is a potentiometer. The sensor output is a DC voltage that varies with throttle angle. By monitoring the TP Sensor output and other sensors, the PCM calculates the proper transmission line pressure, shift scheduling, and Torque Converter Clutch.

The Profile Ignition Pickup (PIP) signal is produced by Electronic Ignition (EI). It sends RPM and Crankshaft position information to the PCM to determine shift scheduling and torque converter operation.

The 3-4 Shift Solenoid provides gear selection of third and fourth gears by controlling the pressure to the shift valves.

Control by shifting the converter clutch control valve to apply or release the torque converter clutch.

The Vehicle Speed Sensor generates an AC signal that is proportional to vehicle speed.

The PCM uses this speed signal and other inputs to determine the shift scheduling and converter clutch control.

The Brake On/Off (BOO) Switch is used to prevent converter clutch operation when the brake has been depressed.

This input is ignored if the Throttle Position Sensor indicates more than one third throttle position.

The Engine Coolant Temperature Sensor is a thermistor in which resistance decreases as engine coolant temperature increases. The PCM measures the voltage drop across the Engine Coolant Temperature Sensor and uses this information to help calculate fuel delivery, spark timing and EGR control and clutch converter operation.

Idle Air Control (IAC) Valve

The Idle Air Control (IAC) Valve controls engine idle speed by regulating the amount of air allowed to pass around the throttle plates. This permits the PCM Module to make idle speed corrections to prevent engine stall during cold engine warm-ups as engine load changes.

Barometric Pressure (BARO)

The Barometric Pressure (BARO) Sensor measures the barometric pressure and provides this information as a variable frequency signal to the PCM Module.

Throttle Position (TP) Sensor

The Throttle Position (TP) Sensor is a potentiometer. The sensor output is a DC voltage that varies with throttle plate angle. By monitoring the Throttle Position (TP) Sensor output, the PCM Module calculates fuel delivery requirements based on driver demand and assists automatic transmission operation.

Heated Oxygen Sensor (HO2S)

The Heated Oxygen Sensor (HO2S) provides a voltage for regulating the air/fuel ratio to the PCM Module by sensing the oxygen content of the exhaust gases. Too much oxygen indicates a lean mixture, while too little oxygen indicates a rich mixture.

Power Steering Pressure (PSP) Switch

The Power Steering Pressure (PSP) Switch is used to indicate increased engine load to the PCM Module. The switch will signal increased engine load to the PCM Module when power steering fluid pressure increases (when the steering is turned from lock to lock). The PCM Module will then increase engine idle speed to prevent engine stall.

Torque Converter Clutch (TCC) Solenoid Control

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SECTION 23 (cont'd)

Engine Coolant Temperature (ECT) Sensor

The Engine Coolant Temperature (ECT) Sensor is a thermistor whose resistance decreases as engine coolant temperature increases and increases as engine coolant temperature decreases (Negative Temperature Coefficient). The PCM Module measures the voltage drop across the Engine Coolant Temperature (ECT) Sensor and uses this information to calculate fuel delivery, spark timing, EGR and automatic transmission operation.

Intake Air Temperature (IAT) Sensor

The Intake Air Temperature (IAT) Sensor is a thermistor whose resistance decreases as manifold air temperature increases and increases as manifold air temperature decreases (Negative Temperature Coefficient). The PCM Module measures the voltage drop across the Intake Air Temperature (IAT) Sensor and uses this information to calculate fuel delivery, spark timing and EGR control.

Vehicle Speed Sensor (VSS)

The Vehicle Speed Sensor (VSS) generates an AC signal that is proportional to vehicle speed. The AC signal is sent to the PCM Module and is used for engine management and automatic transmission operation.

Constant Control Relay Module (CCRM)

The Constant Control Relay Module (CCRM) supplies power to the A/C Clutch, Electric Cooling Fan, Fuel Pump and PCM Module. Their functions are integrated into the module.

For further diagnostic information, refer to the Powertrain Control/Emissions Diagnosis Manual.

SECTION 24

ELECTRONIC ENGINE CONTROL (5.0L)

HOW THE CIRCUIT WORKS

The Electronic Engine Control System uses a Powertrain Control Module (PCM) to control fuel flow, exhaust gas recirculation (EGR), ignition system functions, evaporative emission, idle speed, A/C cutout, and air management.

Fuel Flow

Fuel injectors, mounted in the intake manifold at the intake port, meter the flow of fuel into the engine. The PCM Module fires the in-

Fuel is supplied to the engine by an in-tank Electric Fuel Pump. When the Ignition Switch is turned to the RUN position, voltage is applied to the Fuel Pump Relay Coil. The Coil is grounded by the PCM Module and the relay contacts close. Voltage is now applied to the Fuel Pump.

When the Fuel Pump Relay is grounded by the PCM Module and the Inertia Fuel Shut-off Switch is closed, power is supplied to the Fuel Pump. Fuel flow is produced by the Fuel Pump, and fuel pressure is built up in the fuel delivery system. Fuel pressure is controlled by a fuel pressure regulator.

NOTE: If the engine does not operate after a collision, it may be that the Inertia Fuel Shut-off Switch has opened. To reset the switch, put your finger through the hole in front of the trunk trim line and push down on the plunger.

WARNING

If you see or smell gasoline, do not reset the Inertia Fuel Shut-off Switch.

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7-7 CIRCUIT OPERATION

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SECTION 24 (cont'd)

Ignition

The PCM Module receives engine crankshaft position and engine rpm information from the Ignition Control Module (ICM) through the PIP signal line (circuit 395). Using this information and other information received from various sensors, the PCM Module controls ignition timing through the spark output (SPOUT) signal (circuit 929). The SPOUT signal informs the Ignition Control Module (ICM) when to collapse the ground on the primary circuit to allow the secondary circuit to fire the spark plugs.

Idle Air Control (IAC) Valve

The Idle Air Control (IAC) Valve controls engine idle speed by regulating the amount of air allowed to pass around the throttle plates. This permits the PCM Module to make idle speed corrections to prevent engine stall during cold engine warm ups as an engine load changes.

Exhaust Gas Recirculation (EGR)

The EGR System cools the combustion chambers in the engine to reduce the oxides of nitrogen emitted to the atmosphere. The PCM Module controls the EGR Vacuum Regulator Solenoid, which is normally closed.

When the Solenoid is energized, vacuum flows through the solenoid valve to the EGR valve. With vacuum applied to the EGR valve, the pintle opens and exhaust gas recirculates from the exhaust system back into the intake manifold.

EGR Valve Position Sensor indicates providing EGR valve

position. The PCM Module determines correct EGR valve position depending on engine operating conditions.

Canister Purge (CANP) System

The carbon canister collects fuel vapors from the fuel tank and stores them to be burned later in the engine. The PCM Module controls the Canister Purge (CANP) Solenoid and grounds the solenoid, releasing fuel vapors to be burned in the engine.

Secondary Air Injection System

The Secondary Air Injection System reduces the hydrocarbon and carbon monoxide content of the engine's exhaust gases. The system accomplishes this by pumping fresh air into the exhaust system, when necessary. The fresh air mixes with the hot exhaust gases, causing unburned fuel to burn.

Secondary Air can be injected into the exhaust manifolds, into the catalytic converter or vented to the atmosphere, depending on engine conditions sensed by the PCM Module.

During engine warm up, both the Secondary Air Injection Diverter (AIRD) Solenoid and the Secondary Air Injection Bypass (AIRB) Solenoid are energized. With both Solenoids energized, fresh air is pumped into the exhaust manifolds and unburned fuel burns in the exhaust pipes leading to the catalytic converter. This causes the converter to warm up quickly.

After the engine warms up, the Secondary Air Injection Diverter (AIRD) Solenoid is deenergized. With the Secondary Air Injection Bypass (AIRB) Solenoid energized and the Diverter

er Solenoid deenergized, fresh air is pumped into the catalytic converter.

Under some conditions both Solenoids are deenergized and air is not injected into the exhaust system. Instead, it is vented to the atmosphere.

Powertrain Control Module (PCM) Inputs

Various input devices determine engine operating conditions. The following inputs signal the PCM Module with specific information:

The Throttle Position (TP) Sensor is a potentiometer. The Sensor output is a DC voltage that varies with throttle plate angle. By monitoring the Throttle Position (TP) Sensor output, the PCM Module calculates fuel delivery requirements based on driver demand.

The Barometric Pressure (BARO) Sensor signals barometric pressure conditions (changes in altitude) with ignition key on and engine off, and updates this information during wide-open throttle conditions.

The A/C Signal is received from the A/C system and informs the PCM Module when the A/C clutch has been turned on. During periods of wide-open throttle acceleration, the A/C signal informs the PCM Module that the A/C Compressor must be turned off.

The Intake Air Temperature (IAT) Sensor is a thermistor in which resistance decreases as manifold air temperature increases (Negative Temperature Coefficient or NTC). The PCM Module detects the voltage drop across the Intake Air Temperature (IAT) Sensor and uses this information to help calculate fuel delivery.

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SECTION 24 (cont'd)

The Mass Air Flow (MAF) Sensor measures the amount of air flowing into the intake manifold. The Mass Air Flow (MAF) Sensor uses a thermistor to measure air temperature. The PCM Module detects the voltage drop across the thermistor as air passes around it and uses

this information to calculate fuel delivery, spark timing and EGR control.

The Engine Coolant Temperature (ECT) Sensor is a thermistor in which resistance decreases as engine coolant temperature decreases.

The PCM Module detects the voltage drop across the Engine Coolant Temperature (ECT) Sensor and uses this information to help calculate fuel delivery, spark timing and EGR control.

For further diagnostic information, refer to the Powertrain Control/Emissions Diagnosis Manual.

SECTION 31

SPEED CONTROL

HOW THE CIRCUIT WORKS

The Speed Control Amplifier controls vacuum to the Speed Control Servo Motor through the Modulating Valve. The Servo Motor moves the throttle through the Actuator cable.

To operate the Speed Control System, the engine must be running and vehicle speed must be greater than 30 mph. The system is turned on to standby mode by pressing the ON switch of the Steering Wheel Control Switch.

Pressing and releasing SET/ACCEL or COAST sends a command to maintain the present speed. This speed becomes the set speed. The Vehicle Speed Sensor (VSS) sends signals to the Speed Control Amplifier. These signals tell the amplifier to increase or

decrease the vacuum at the Servo Motor to keep the vehicle at the set speed.

Pressing and holding SET/ACCEL speeds up the car. The vehicle's speed increases as long as SET/ACCEL is depressed. Releasing SET/ACCEL gives the system a new set speed to maintain. Vehicle speed can also be increased by depressing the accelerator until the higher speed is reached, then depressing and releasing SET/ACCEL.

Pressing and holding COAST slows down the vehicle. The vehicle speed decreases as long as COAST is depressed. Releasing COAST gives the system a new set speed to maintain.

Pressing OFF turns off the system (grounds 151 [LB/BK] wire). The system is also turned off (power through 511 [LG] and the 810

[R/LG] wire) when the Ignition Switch is turned OFF. Depressing the brake pedal cancels the speed control. The Vacuum Dump Valve also operates when the brake pedal is depressed. This is a backup device to release the servo.

In vehicles with manual transmission, the Speed Control Amplifier monitors a ground reference input through the Clutch Pedal Position (CPP) Switch #2, the 810 (R/LG) wire and the Stop Lamp bulbs. When the clutch pedal is depressed, the ground circuit is open and the Speed Control System turns off.

When the system has been deactivated by depressing the brake or clutch pedal, the last set speed may be resumed by pressing RESUME. This feature will not work if OFF has been depressed or if car speed drops below 30 mph.

For further diagnostic information, refer to Section 10-03 of the Service Manual.



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7-9 CIRCUIT OPERATION

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SECTION 33

COOLING FANS

HOW THE CIRCUIT WORKS

The Cooling Fan System consists of a one-speed fan and an electric motor. The Electric

Cooling Fan operates only when the Ignition Switch is in RUN.

The Constant Control Relay Module and the Powertrain Control Module (PCM) control the Electric Cooling Fan.

The Electric Cooling Fan turns on when the engine temperature is higher than normal (on at 102°C, off at 99°C), or A/C is on and vehicle speed does not provide enough airflow (on at 52 mph or below, off at 45 mph).

For further diagnostic information, refer to Section 03-03 of the Service Manual.

SECTION 37

SHIFT LOCK

HOW THE CIRCUIT WORKS

With the Ignition Switch in RUN, the Shift Lock Actuator prevents the driver from shifting the automatic transmission out of PARK unless the brake pedal is depressed.

NOTE: If the gear selector cannot be shifted out of Park with the Ignition Switch in RUN and the brake pedal depressed, follow these steps:

- Turn Ignition Switch to OFF
- Move shift lever to NEUTRAL
- Start the engine
- Shift into DRIVE

For further diagnostic information, refer to Section 17-05 of the Service Manual.



SECTION 44

HORN/CIGAR LIGHTER HOW THE CIRCUIT WORKS

Horn

A Horn Switch is mounted in each of the upper steering wheel spokes. With a Horn Switch depressed, the Horn Relay is energized and

current flows from Fuse 16 through the Horn Relay contacts to the Low and High Pitch Horns. The horns sound.

Cigar Lighter

Voltage is applied, at all times, through Fuse 16 to the Cigar Lighter. When the Cigar

Lighter is depressed, the contacts close and current flows through the heating element to ground.

For further diagnostic information, refer to Sections 11-04 and 13-06 of the Service Manual.

SECTION 46

AIR BAG RESTRAINT SYSTEM HOW THE CIRCUIT WORKS

The Air Bag Restraint System consists of a driver air bag, an Air Bag Diagnostic Module and Crash Sensors.

Air Bag Diagnostic Module

The Air Bag Diagnostic Module contains a microcomputer that monitors electrical system components and connections. The assembly performs a self-check of the microcomputer's internal circuits and energizes the Air Bag Indicator lamp during prove out and whenever a fault occurs. Eleven different faults can be detected and translated into a coded lamp display. If certain faults occur, the system will be

disarmed by a firing disarm device built into the Diagnostic Module. If a system fault exists and the lamp is malfunctioning, an audible tone will be heard, indicating the need for service.

Sensors

The Sensor assembly is an electrical switch that reacts to impacts according to direction and force. It discriminates between impacts that require air bag inflation and impacts that do not require air bag inflation. When an impact occurs that requires air bag inflation, the sensor contacts close, completing the electrical circuit, and the system then operates.

Four crash sensors are mounted in the vehicle. At least two sensors, one safing, one

forward, must be activated to inflate the air bag.

Warning

Do not attempt to diagnose or troubleshoot air bag circuitry without consulting the shop manual. Improper troubleshooting could cause the air bag to fire inadvertently, causing injury.

For further diagnostic information, refer to Section 01-20 of the Service Manual.

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7-11 CIRCUIT OPERATION

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SECTION 53

HEATER

HOW THE CIRCUIT WORKS

Airflow

The heater assembly is a blend air system that receives outside air through the blower inlet, which is connected directly to an opening in the upper cowl. Outside air is drawn into the system from the cowl, through the blower inlet, into the blower housing. It is forced through and/or around the heater core, mixed, and then discharged through outlets in the discharged air duct to the floor area or through the defroster outlets and/or instrument panel registers, depending upon the type of climate control desired. Several doors determine the amount of air that goes through the heater core and the particular outlet(s) through which it discharges.

Off

When the Heater Function Selector Switch is in the OFF position:

- The outside-recirc door is at full vacuum. As a result, outside air is closed off and inside air is admitted to the system.
- The panel/defrost door and the floor/panel door are both at full vacuum, closing off the passages to the defrosters.
- The blend door position may be anywhere within the range of its cable travel from FULL HEAT to FULL COLD.

Vent

When the Heater Function Selector Switch is in the VENT position:

- The outside-recirc door, with no vacuum being applied, will block recirc air and admit outside air.
- The floor/panel door is at “no vacuum” to block airflow to the floor registers, and the panel/defrost door is at full vacuum, closing off airflow to the defrosters and airflow is directed through the system to the instrument panel registers.
- The temperature selector may be adjusted to heat the air, if desired.
- The Blower Motor is on.

Floor

When the Heater Function Selector Switch is in the FLOOR position:

- The outside-recirc door is in the “no vacuum” position to block recirc air and admit outside air.
- The panel/defrost door is in the “no vacuum” position to block air circulation to the panel registers.
- The floor/panel door is in the full vacuum position, which closes off all but a minimum of airflow to the defroster.
- The blend air door position will channel airflow so that a desired temperature level will be achieved.
- The Blower Motor is on.

Mix

When the Heater Function Selector Switch is in the MIX position:

- The outside-recirc air door and the panel/defrost door are in the “no vacuum” position.
- The floor/panel door is in the partial vacuum position, allowing airflow to the floor and defroster outlets.
- The Blower Motor is on.

Defrost

When the Heater Function Selector Switch is in the DEFROST position:

- The outside-recirc air door is in the “no vacuum” position to admit outside air.
- Both the floor/panel and the panel/defrost doors are in the “no vacuum” position so that most of the incoming air is directed to the defroster nozzles. There is a slight air bleed to the floor outlets.
- The temperature control knob setting will determine the amount of heat being introduced into the airflow.

Blower

With the Ignition Switch in RUN and the Heater Function Selector Switch (on the Heater Control Assembly) in any position except OFF, battery voltage is applied to the Blower Motor. With the Blower Motor Switch in LO, voltage flows through the Blower Motor and all three resistors; in M1, through two resistors; in M2, through one resistor; in HI, through no resistors. With the Heater Function Selector Switch in OFF, the Blower Motor does not run.



SECTION 53 (cont'd)

For further diagnostic information, refer to Section 12-02 of the Service Manual.

SECTION 54

AIR CONDITIONER/HEATER

HOW THE CIRCUIT WORKS

Blower

With the Ignition Switch in RUN, voltage is applied to the Blower Motor, through the A/C-Heater Control Assembly in all positions except off. In off, there is no power connection to the motor. With the Blower Motor Switch in HI, ground is connected to the motor for full speed operation. In the intermediate positions, one, two or three resistors are connected between

the motor and ground to control current and motor speed.

A/C-Heater

The A/C-Heater Control Assembly and Heater Function Selector Vacuum Valve operate together to control system vacuum and electrical operation. Vacuum motors operate doors to direct airflow. The A/C-Heater Control Assembly connects power to the Blower Motor and A/C Clutch Field Coil (5.0L), or Constant Control Relay Module (2.3L). For 2.3L engines, the A/C Clutch Field Coil is controlled by

a Constant Control Relay Module. This module is regulated by the PCM Module to turn off the A/C System during certain engine operating conditions. However, for 5.0L engines, the A/C Clutch Field Coil is controlled by WOT Cut-out Relay, which is energized by a signal from the PCM Module during WOT and other conditions such as high engine coolant temperatures and low or high engine speeds.

The Clutch Cycling Pressure Switch cuts off power to the A/C Clutch Field Coil when suction pressure drops to 24.5 PSI.

For further diagnostic information, refer to Sections 12-00 and 12-03 of the Service Manual.

SECTION 56

REAR WINDOW DEFROST

HOW THE CIRCUIT WORKS

With the Ignition Switch in RUN, the Rear Window Defrost Switch is powered through

Pressing the Rear Window Defrost Switch ON closes the contacts of the Rear Window Defrost Control Relay and starts the ten minute (approximate) timing cycle. Current now flows to the Rear Window Defrost Grid. When the Rear Window Defrost Switch is released from ON, the solid state circuitry keeps the defrost relay coil energized.

Pressing the Rear Window Defrost Switch OFF turns off the defrost relay. This removes power from the Rear Window Defrost circuit.

If the OFF switch is not pressed, power remains on until the time delay runs out. Then the coil turns off and removes power from the Rear Window Defrost Grid circuit.

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7-13 CIRCUIT OPERATION

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SECTION 56 (cont'd)

For further diagnostic information, refer to Section 01-11 of the Service Manual.

SECTION 60

INSTRUMENT CLUSTER

HOW THE CIRCUIT WORKS

Gauges

The Temperature, Oil Pressure, Fuel and Voltmeter Gauges in the Instrument Cluster are magnetic type gauges. A magnetic gauge consists of three primary coils, one of which is wound at a 90 degree angle to the other two. The coils form a magnetic field which varies in direction according to a variable sender resistor connected between two of the coils. A magnet, to which a shaft and pointer are attached, rotates to align with the magnetic field. This results in the gauge pointer being relative to the output of the sender.

Temperature Gauge

The Temperature Gauge connects to the Coolant Temperature Sender. The sender is a temperature-sensitive variable resistor. When coolant temperature is low, resistance is high; when coolant temperature is high, resistance is low.

Oil Pressure Gauge

The Oil Pressure Gauge connects to the Oil Pressure Sender. The sender is a pressure-sensitive variable resistor. When oil pressure is low, resistance is high; when oil pressure is high, resistance is low. For 2.3L only, the switch is a normally open Oil Pressure Switch.

(2.3L). For 5.0L only, the sender is a pressure-sensitive variable resistor. When oil pressure is low, resistance is high; when oil pressure is high, resistance is low. For 2.3L only, the switch is a normally open Oil Pressure Switch.

Fuel Gauge

The Fuel Gauge is connected to the Fuel Gauge Sender through the Slosh Module. The sender is a variable resistor connected to a float in the fuel tank. When fuel level is low, resistance is low; when fuel level is high, resistance is high. The Slosh Module provides a delay circuit to the Fuel Gauge to prevent the gauge from fluctuating excessively due to fuel movement in the tank.

Voltmeter

The Voltmeter measures battery voltage with the Ignition Switch in START or in RUN with the engine not running.

Tachometer

With the Ignition Switch in START or RUN, voltage is present at the Instrument Cluster through Fuse 18 and circuit 640 (R/Y). With the engine running, an intermittent ground signal (proportional to engine speed) is present through the Ignition Module. The Instrument

Cluster responds to these inputs by operating the Tachometer needle and indicating the engine's rpms.

Brake Indicator

The Brake Indicator lamp will glow with the Ignition Switch in START to check the warning system. The light will continue to glow if the park brake is not released or when the fluid level in the brake master cylinder reservoir is low.

Malfunction Indicator Lamp (MIL)

The Malfunction Indicator Lamp (MIL) will come on with the Ignition Switch in the RUN position prior to cranking, and will go out when the engine starts. If a fault develops in the EEC IV System, the PCM Module will ground the 658 (PK/LG) wire to the Malfunction Indicator Lamp (MIL) and this lamp will glow. If the fault is temporary, the PCM Module will unground the 658 (PK/LG) wire and the lamp will go out.

Check Oil Indicator

The CHECK OIL Indicator lights while the Ignition Switch is in the START position to test the bulb. During this time the Low Oil Level Relay uses an input from the Oil Level Switch to determine if the oil is low (switch grounded) or not low (switch not grounded).

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SECTION 60 (cont'd)

If the oil level is adequate, the Indicator will turn off when the Ignition Switch is released to the RUN position. If the oil level is low (approximately 1.4 liters [1.5 quarts] or less), the Relay will ground circuit 208 (GY) to turn on the lamp. The lamp remains on until the Ignition Switch is turned to the OFF position.

Check Low Coolant Indicator (5.0L)

The Low Coolant Switch, mounted on the recovery bottle, is used to illuminate the Low Coolant Indicator. Located in the instrument cluster, the Indicator informs the driver of a low coolant condition. When the ignition is turned to the START or RUN position, the CHECK COOLANT light illuminates for a couple of seconds and then turns OFF after the engine is started, which indicates adequate coolant fill.

The Low Coolant Indicator illuminates when the coolant level drops 2 inches below the FULL COLD mark, located on the side of the recovery bottle. When indicating a low coolant condition, the Low Coolant Indicator stays illuminated. The CHECK COOLANT light stays illuminated until the coolant is filled to the FULL HOT mark and the vehicle ignition is turned to the OFF position and then cycled back to START or RUN.

After the Ignition Switch is turned off, five minutes will pass before the Relay will take a new reading. This delay allows time for oil drainback to prevent false readings. If the engine is restarted during this 5 minute period, the last reading will be indicated.

Low Coolant Level

When the Ignition Switch is turned to the RUN position, the CHECK COOLANT light will illuminate for a couple of seconds and then turn off when the engine is started, indicating adequate coolant fill. If the coolant level in the recovery bottle is low (below the FULL COLD line when the engine is cold), the CHECK COOLANT light will illuminate, delay for about five seconds, then turn back on, indicating a low coolant condition. When indicating a low coolant condition, the CHECK COOLANT light will latch to the ON position. The CHECK COOLANT light will remain on until the coolant is filled to the FULL HOT line and the vehicle ignition is turned to the off position and then cycled back on.

For further diagnostic information, refer to Section 13-01 of the Service Manual.

SECTION 64

VEHICLE SPEED SENSOR (VSS)

HOW THE CIRCUIT WORKS

The Vehicle Speed Sensor (VSS) is a small signal generator that is turned by a gear inside

the transmission assembly. The Vehicle Speed Sensor (VSS) produces a signal that is proportional to vehicle road speed.

The Vehicle Speed Sensor (VSS) supplies this signal to the components that require ve-

hicle speed information including the Speed Control Amplifier (on Speed Control equipped vehicles) and Powertrain Control Module (PCM).

For further diagnostic information, refer to Section 17 (Test DP) in the Powertrain Control/Emissions Diagnosis Manual.



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7-15 CIRCUIT OPERATION

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SECTION 66

WARNING CHIME

HOW THE CIRCUIT WORKS

Key Warning

The Warning Chime sounds when the driver's door is open and the key is in the Ignition Switch, and keeps sounding until the door is closed or the key is removed. When the driver's door is open, power is supplied to the Warning Chime Module through circuit 159 (R/PK). When the key is in the ignition, ground is supplied to the Warning Chime Module through circuit 158 (BK/PK).

Fasten Belts

When the Ignition Switch is turned to the START or RUN position, power is supplied through circuit 640 (R/Y) to the Warning Chime Module, which supplies power through circuit 450 (DG/LG) to illuminate the Fasten Belts indicator for approximately six seconds.

If the driver's safety belt is not fastened, ground is supplied from the Seat Belt Switch through circuit 85 (BR/LB) to the Warning Chime Module and it sounds during the six sec-

onds that the Fasten Belts Indicator is illuminated.

Lights On

The Warning Chime will sound when opening the driver's door with the Main Light Switch in PARK or HEAD, until the door is closed or the Headlamps are turned OFF. When the driver's door is open, power is supplied through circuit 159 (R/PK) to the Warning Chime Module. When the Main Light Switch is in PARK or HEAD, power is supplied through circuit 14 (BR) to the Warning Chime Module.

For further diagnostic information, refer to Section 13-09 of the Service Manual.

SECTION 71

INSTRUMENT ILLUMINATION

HOW THE CIRCUIT WORKS

Voltage is applied, at all times, to the Main Light Switch through Fuse 4. When the Main

Light Switch is set to PARK or HEAD, voltage is applied through Fuse 13 to the Instrument Illumination Lamps. The Instrument Panel Dimming Rheostat adjusts the voltage applied to the Instrument Illumination Lamps.

For further diagnostic information, refer to Section 13-01 of the Service Manual.

SECTION 81

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the driver
al wipe.

With the wipers in the interval position, wipers are spaced two to ten seconds apart.

The Interval Wiper/Washer Switch has a momentary Washer Switch, a four-position

Wiper Switch and a Variable Resistor which sets interval time.

SECTION 81 (cont'd)

Washer Operation

Pushing the wiper/washer control knob sends current from Fuse 2 through the Washer Switch to the Washer Pump.

LO/Hi Speed Wiper Operation

When the Wiper Switch is in the LO or HI position, section A of the Wiper Switch powers the interval override input so that the Electronic Switch and the Governor Relay are pulled in continuously. Wiper Motor current then flows through Fuse 2 and the energized Governor Relay contacts to the L terminal of the Wiper Motor. Power is applied to the H terminal of the Wiper Motor through section B of the Wiper Switch for HI speed operation.

Interval Wiper Operation

During interval operation, the wipers make single wipes at lo speed separated by a variable length pause.

When first switched to INT position, section B of the Wiper Switch activates the Interval Timer. The Interval Timer momentarily closes the Electronic Switch, energizing the Governor Relay. Current flows to the Wiper Motor L terminal through the contacts of the energized Governor Relay. Ground is connected to terminal C of the Wiper Motor.

As the Wiper Motor turns, the Wiper Motor Switch changes from the grounded PARK posi-

tion contact, which is not powered, and the Wiper Motor stops. After a pause (controlled by the variable resistor), the Interval Timer pulls in the Governor Relay to start another wipe.

When parking is complete, the Wiper Motor is braked to a stop by shunting the L and C terminals through the Wiper Motor Switch. Braking takes place when the Wiper Motor Switch moves to the PARK position. The Wiper Motor L terminal is connected to terminal C through the PARK contact of the Wiper Motor Switch and the deenergized contact of the Governor Relay.

For further diagnostic information, refer to Section 01-16 of the Service Manual.

SECTION 85

HEADLAMPS

HOW THE CIRCUIT WORKS

Power to operate the Headlamps flows through the Main Light Switch and the Dimmer

Switch. When the Dimmer Switch lever is pulled partway toward the driver, the Flash-to-pass Switch closes, providing power to the Hi Beam Headlamps from Fuse 10.

For further diagnostic information, refer to Section 17-01 of the Service Manual.

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SECTION 86

FOG LAMPS

HOW THE CIRCUIT WORKS

With the Lo Beam Headlamps on, voltage is applied through Fuse 15 to the Fog Lamp Switch. With the Fog Lamp Switch on, voltage is applied to the Fog Lamps to turn them on.

For further diagnostic information, refer to Section 17-01 of the Service Manual.

SECTION 89

COURTESY LAMPS

HOW THE CIRCUIT WORKS

Voltage is applied, at all times, through Fuse 8 to the Instrument Panel Dimming Rheo-

stat, Courtesy Lamp Switches and other switches for individual lamps.

If the Instrument Panel Dimming Rheostat knob is turned fully ON, or if a Courtesy Lamp

Switch is closed, current flows through the Dome Lamp.

For further diagnostic information, refer to Section 17-02 of the Service Manual.

SECTION 90

TURN/STOP/HAZARD LAMPS

HOW THE CIRCUIT WORKS

Turn Signals

With the Ignition Switch in RUN, voltage is applied to the Hazard Warning Switch and the

When the Multi-function Switch is in the LEFT turn or RIGHT turn position, voltage is applied to either the Left or Right Turn Lamps.

Hazard Flasher

Voltage is applied to the Turn Lamps through Fuse 1 and the Hazard Flasher when the Hazard Switch is in the HAZARD position.

Stop Lamps

Voltage is applied to the Stop Lamps through Fuse 1 when the Brake On/Off (BOO) Switch is closed.



SECTION 90 (cont'd)

For further diagnostic information, refer to Section 17-01 of the Service Manual.

SECTION 92

EXTERIOR LAMPS

HOW THE CIRCUIT WORKS

When the Main Light Switch is turned to PARK or HEAD, battery voltage is applied

through Fuse 4 to the Park, Side Marker and License Lamps. All of these lamps are permanently grounded and light up whenever voltage is applied.

For further diagnostic information, refer to Section 17-01 of the Service Manual.

SECTION 93

BACKUP LAMPS

HOW THE CIRCUIT WORKS

With the Ignition Switch in RUN, voltage is applied from Fuse 5 to the Backup Lamp Switch (Manual) or to the Park/Neutral Position Switch (Automatic). With the Backup Lamp Switch or the Park/Neutral Position Switch closed, voltage is applied to the Backup Lamps.

For further diagnostic information, refer to Section 17-01 of the Service Manual.



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7-19 CIRCUIT OPERATION

1993 MUSTANG

SECTION 97

DAYTIME RUNNING LAMPS (CANADIAN VEHICLES ONLY)

HOW THE CIRCUIT WORKS

The Daytime Running Lamps (DRL) System operates the vehicle's Hi Beam Headlamps at reduced power during the daytime to make the vehicle more visible to other drivers.

With the Ignition Switch in RUN, the park brake released, and the Headlamps turned OFF, the DRL Module outputs a pulsing voltage at pin 8 to operate the Hi Beam Headlamps at reduced intensity. When the DRL System is operating, the Hi Beam Indicator is not illuminated.

Applying the park brake or turning on the Headlamps disables the DRL System. Applying the park brake grounds pin 6 of the DRL Module. Turning on the Headlamps in the lo beam position supplies battery voltage to pin 7 of the module (and removes the ground input that the DRL Module senses through the Lo Beam Headlamps). Turning on the Headlamps in the hi beam position applies 12 volts to pin 8 of the DRL Module.

The diode shown inside the DRL Module prevents low brake fluid level from disabling the DRL System.

The DRL System is used only on vehicles sold in Canada.

NOTE:

The headlamps may flicker during engine start-up and shut-down on DRL-equipped vehicles if the A/C-Heater Blower Motor is turned ON. This is a normal condition.

Also, during Lo Beam Headlamp operation on a DRL-equipped vehicle, the Hi Beam Indicator will not illuminate when using the flash-to-pass feature.

For further diagnostic information, refer to Section 17-01 of the Service Manual.

SECTION 100

POWER WINDOWS

HOW THE CIRCUIT WORKS

The Window Control Switch in each door sends current through the Window Motor in one direction for UP and the opposite direction for DN.

The current causes the Window Motor to rotate in a clockwise or counterclockwise direction to raise or lower the window.

wires are contacts.

When the DN switch is pushed, power flows to the DN Motor lead. The UP lead acts as ground.

When the UP switch is pushed, power flows to the UP Motor lead. The DN lead acts as ground.

The 2-door and 3-door Power Window Systems are protected by Circuit Breaker 14, which is hot with the Ignition Switch in ACC or RUN position.

The Convertible System is protected by the Window Safety Relay and In-Line Circuit Break-

er. The relay (and the windows) operates in ACC or RUN only.

Each motor assembly also has a circuit breaker to cut off power if a switch is held too long in the UP or DN position.

The Convertible System has a Window Lock Switch which cuts power to the passenger window switches. This allows only the driver to operate the windows from the Master Window Control Switch.

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SECTION 100 (cont'd)

For further diagnostic information, refer to Section 01-11 of the Service Manual.

SECTION 102

CONVERTIBLE TOP HOW THE CIRCUIT WORKS

With the Ignition Switch in RUN, voltage is available through Fuse 5 to the Convertible Top Switch. When the RAISE side of the switch is

depressed, voltage is applied through the switch to energize the Raise Relay. Voltage is then applied through Fuse Link C, Fuse 12 and the Raise Relay contact to the Convertible Top Motor.

When the LOWER side of the switch is depressed, the Lower Relay is energized. Voltage from Fuse Link C is then applied through Fuse 12 and the Lower Relay contacts to the Convertible Top Motor.

For further diagnostic information, refer to Section 01-17 of the Service Manual.

SECTION 110

POWER DOOR LOCKS HOW THE CIRCUIT WORKS

The Power Door Locks are powered through the In-line Circuit Breaker.

The Left and Right Door Lock Switches are on the door armrests. When at rest, all switches are at ground position.

When either switch is pressed to LOCK, voltage is applied to both Lock Motors, which

are grounded by the normally closed UNLOCK contacts.

To unlock, either switch is pressed to UNLOCK. Voltage is applied in the opposite direction through all the motors, and grounds through the normally closed LOCK contacts.

For further diagnostic information, refer to Section 01-14 of the Service Manual.



7-21 CIRCUIT OPERATION

1993 MUSTANG

SECTION 113

TRUNK LID RELEASE

HOW THE CIRCUIT WORKS

With the Ignition Switch in ACC or RUN and the Trunk Lid/Hatchback Release Switch de-

pressed, voltage is applied to the Trunk Lid Release Solenoid or the Hatchback Release Solenoid to unlatch the trunk lid or hatchback.

For further diagnostic information, refer to Section 01-14 of the Service Manual.

SECTION 120

POWER SEATS

HOW THE CIRCUIT WORKS

The Driver's Seat Motor Assembly has two reversible motors within the same housing. The Seat Control Switch determines the direction of current flow through the motors. The di-

rection of current flow determines the direction of motor rotation.

A circuit breaker protects each motor when power is supplied to a stalled motor. The motor can stall from either mechanical failure or running to the limit of travel.

The FWD/RWD Motor drives the seat forward and backward.

The Height Motor drives the seat up and down.

The motors are grounded when the switches are at rest.

For further diagnostic information, refer to Section 01-10 of the Service Manual.

SECTION 122

POWER LUMBAR SEATS

HOW THE CIRCUIT WORKS

The In-line Circuit Breaker is hot at all times and applies voltage to the Left and Right Power Lumbar Seat Switches.

The cushion shape of the Lumbar Seat changes when the Power Lumbar Seat Switch is operated. Operating the switch in one direction causes the compressor to inflate the bladder; operating the switch in the other direction causes the bleeder valve to deflate the bladder.

For further diagnostic information, refer to Section 01-10 of the Service Manual.



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SECTION 124

POWER MIRRORS

HOW THE CIRCUIT WORKS

Each Power Mirror is equipped with two motors operated by a single rocker-type control

switch. The joystick control switch directs current to the motors. By reversing current flow, each motor operates in two directions, creating both left and right (horizontal) and up and down (vertical) movement.

The Left and Right Mirror Switch connects the control to either the Left or Right Power Mirror.

For further diagnostic information, refer to Section 01-09 of the Service Manual.

SECTION 130

RADIO

HOW THE CIRCUIT WORKS

With the Ignition Switch in ACC or RUN, voltage is applied through Fuse 11 to operate the Radio.

Fuse 8 applies voltage to the Radio, at all times, to power the memory-related functions, which retain clock and station pre-set information with the Radio turned off.

The Radio display brightness is controlled by the Instrument Panel Dimming Rheostat. When the park or headlamps are turned on, a variable voltage is applied to the Radio from the Instrument Panel Dimming Rheostat through the 19 (LB/R) wire to dim the display.

Premium Sound

The Premium Sound System feature incorporates a Radio with cassette deck and a four-channel Amplifier. Voltage is applied to the Amplifier from Fuse 11 through the 137 (Y/BK)

wire when the ignition is in RUN or ACC. Voltage is also applied to the Amplifier through the 689 (DB) wire to signal the Amplifier when the Radio is turned on. The Amplifier is grounded through the Radio and 694 (R) wire.

The Radio provides an audio signal for each channel through the 278 (P/W), 279 (W/R), 281 (W), 277 (LB/BK) and 280 (LG) circuits. The Amplifier processes the audio signal provided by the Radio and supplies it to the individual speakers.

For further diagnostic information, refer to Section 15 of the Service Manual and the Radio Diagnosis Manual.

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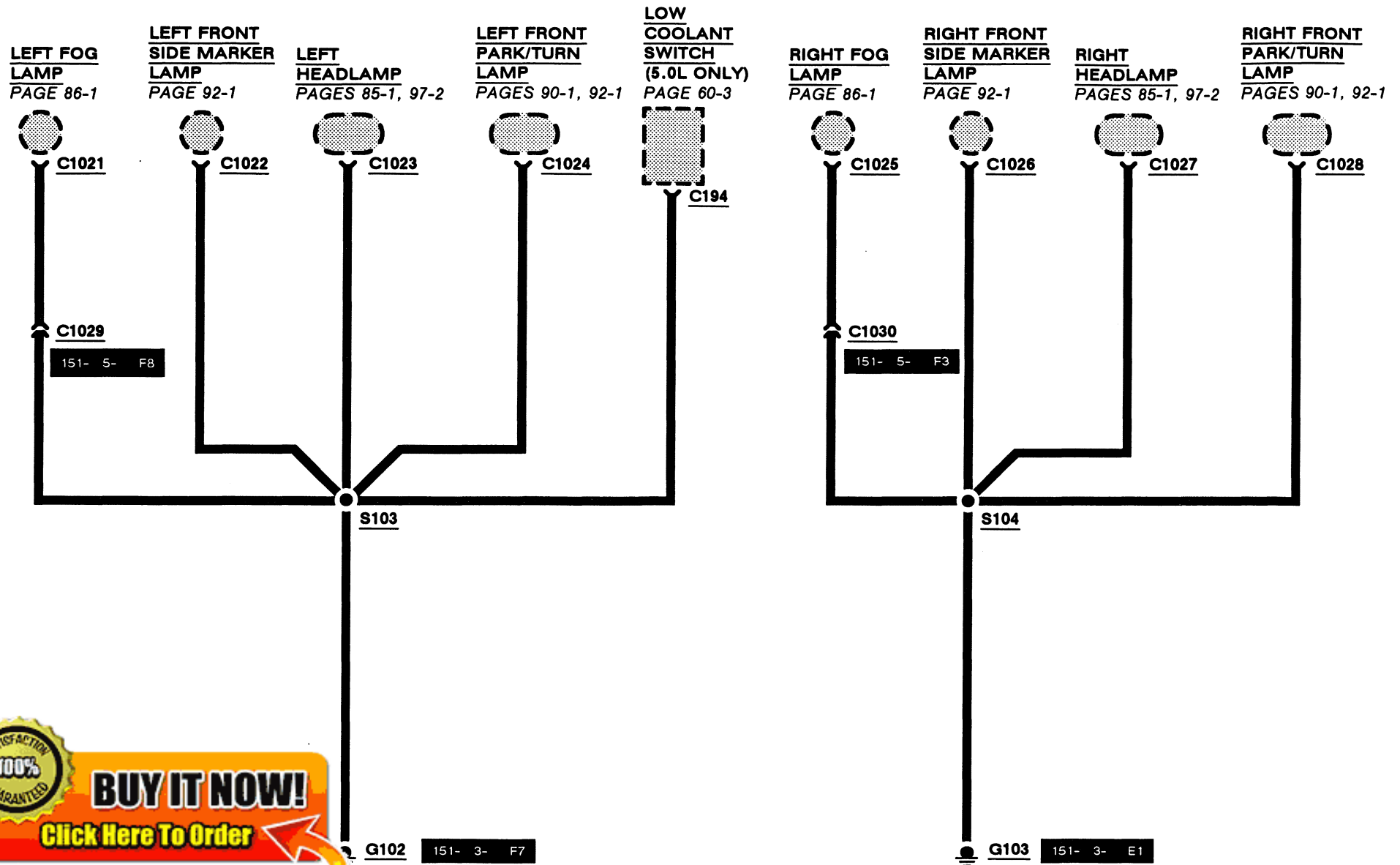
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10-1 GROUNDING

1993 MUSTANG

For Circuit Operation, refer to page 7-1.

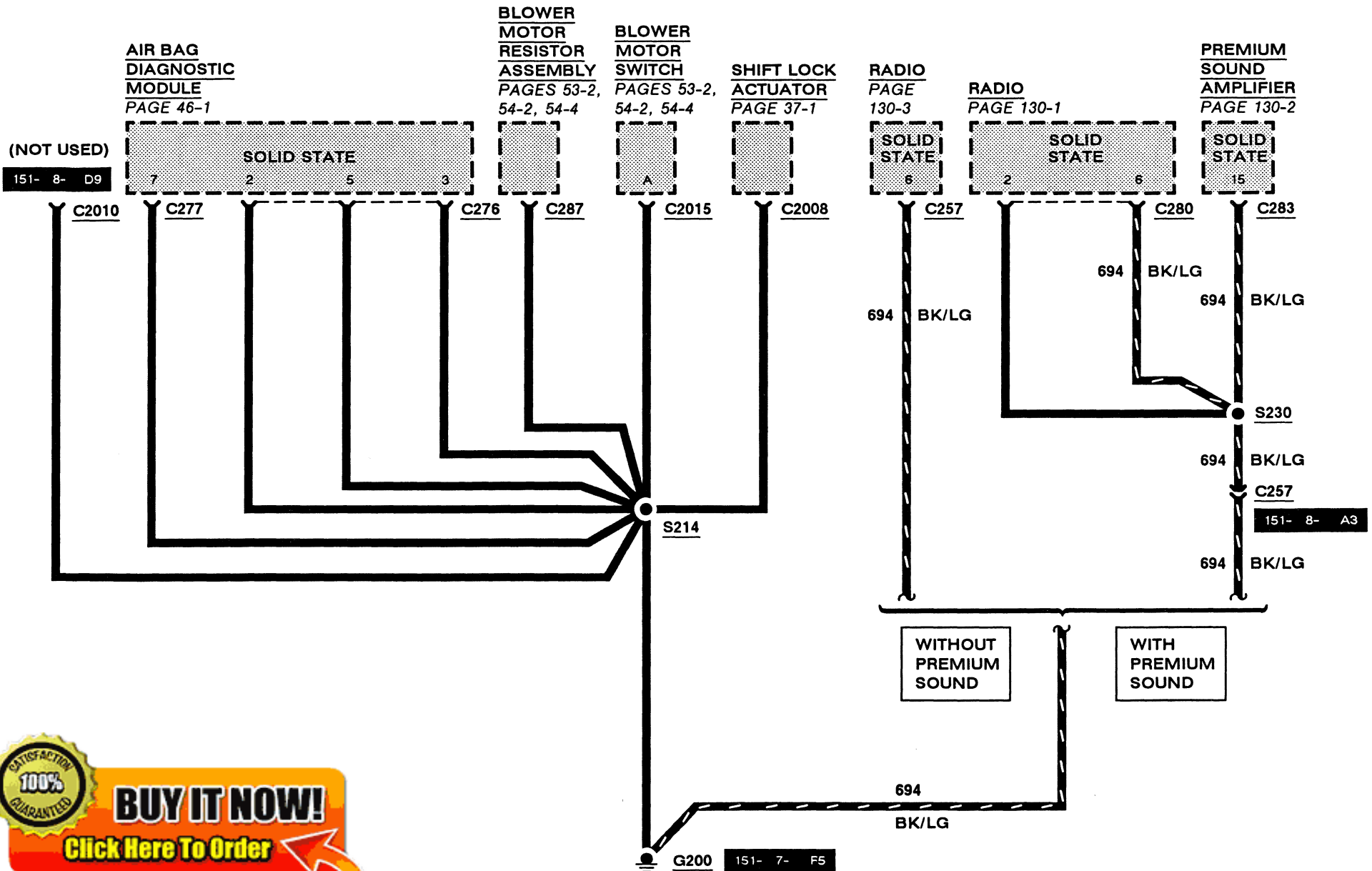


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5.0L

LEFT HEATED OXYGEN SENSOR (HO2S)
PAGE 24-1

RIGHT HEATED OXYGEN SENSOR (HO2S)
PAGE 24-1

A/C CLUTCH DIODE
PAGE 54-4

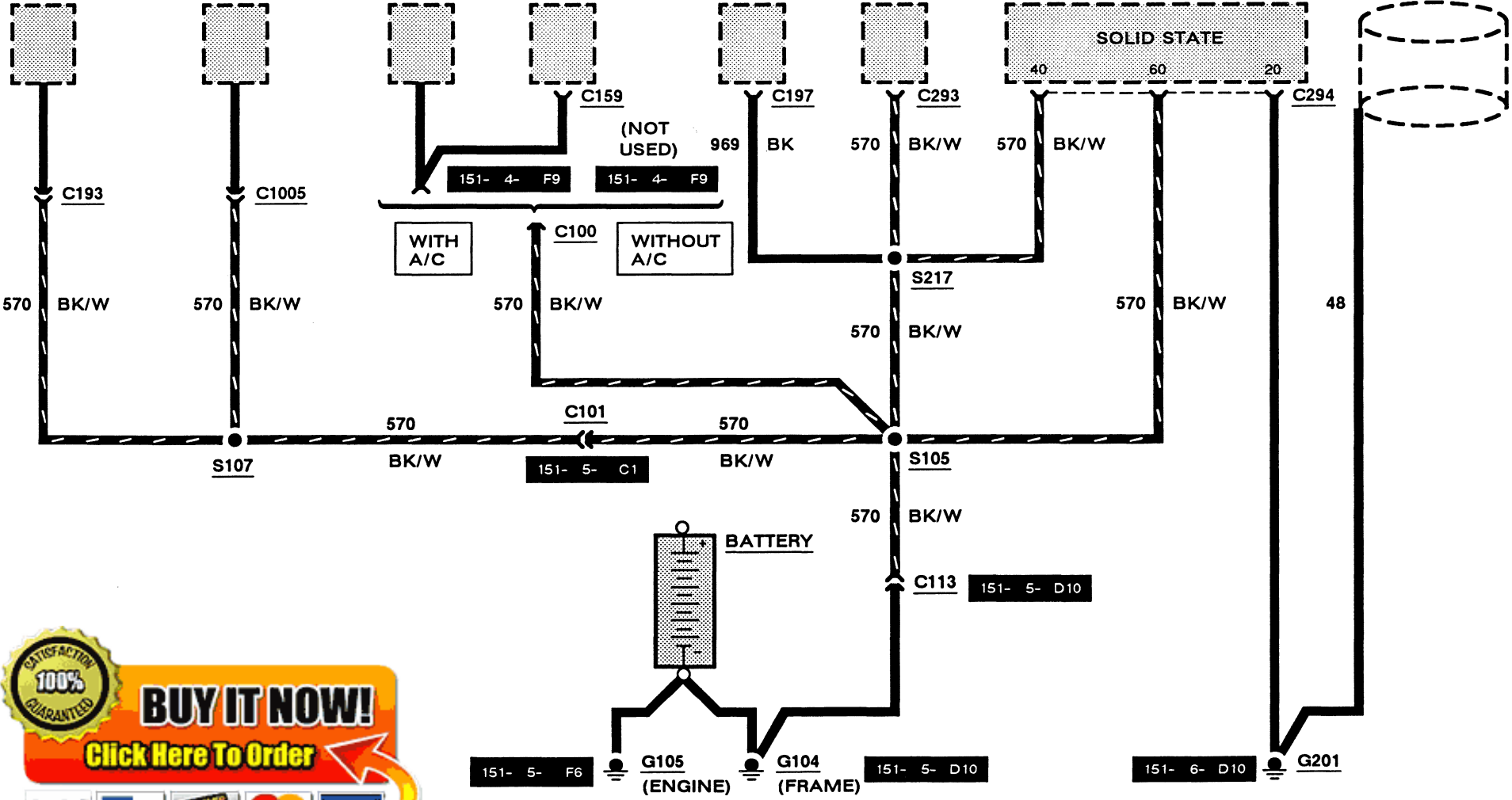
A/C CLUTCH FIELD COIL
PAGE 54-4

MASS AIR FLOW (MAF) SENSOR
PAGE 24-1

PCM POWER RELAY
PAGE 24-1

POWERTRAIN CONTROL MODULE (PCM)
PAGES 24-1, 24-2

IGNITION SHIELD
PAGE 21-3



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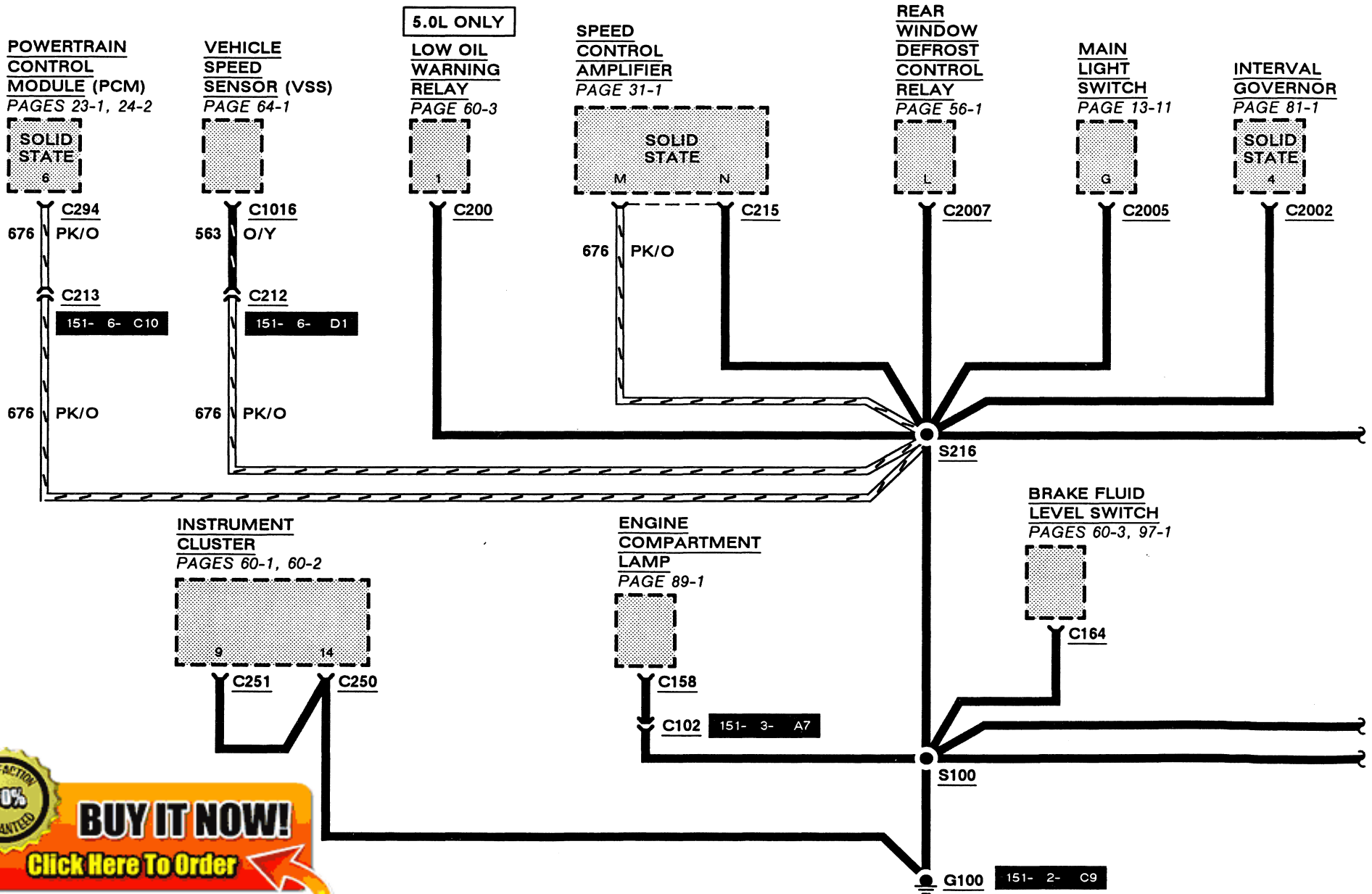
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10-5 GROUNDS

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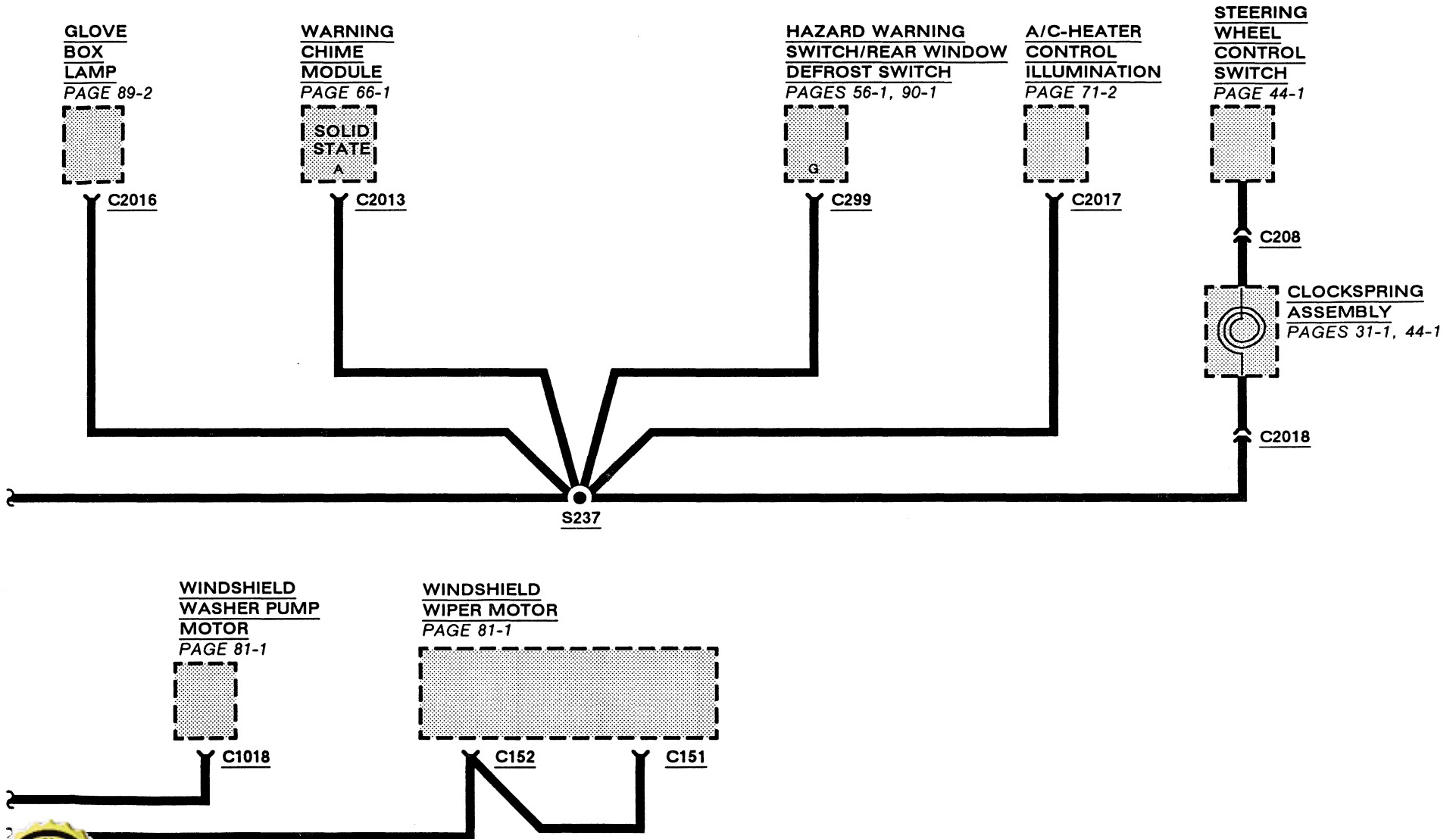


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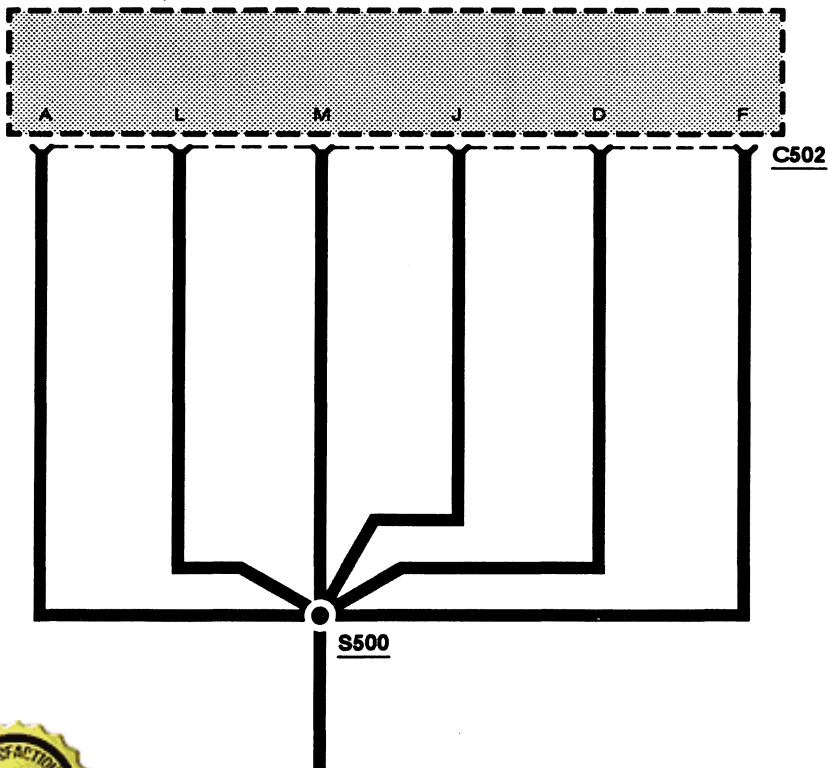
10-7 GROUNDS

1993 MUSTANG

2 AND 3 DOOR

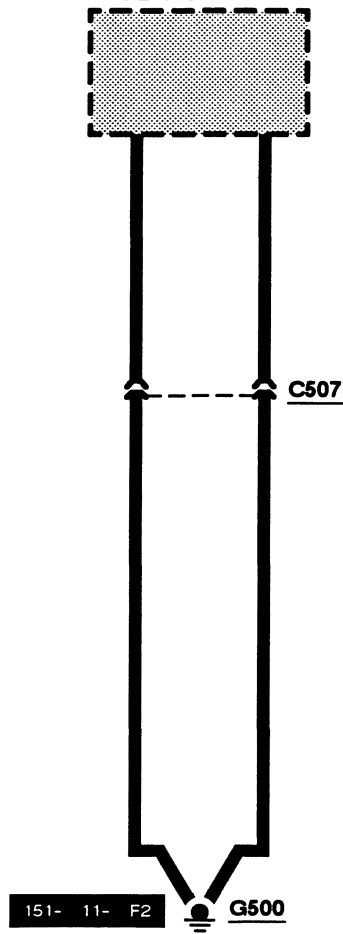
WITH POWER WINDOWS

**MASTER WINDOW/
DOOR LOCK
CONTROL SWITCH**
PAGES 100-3, 110-1



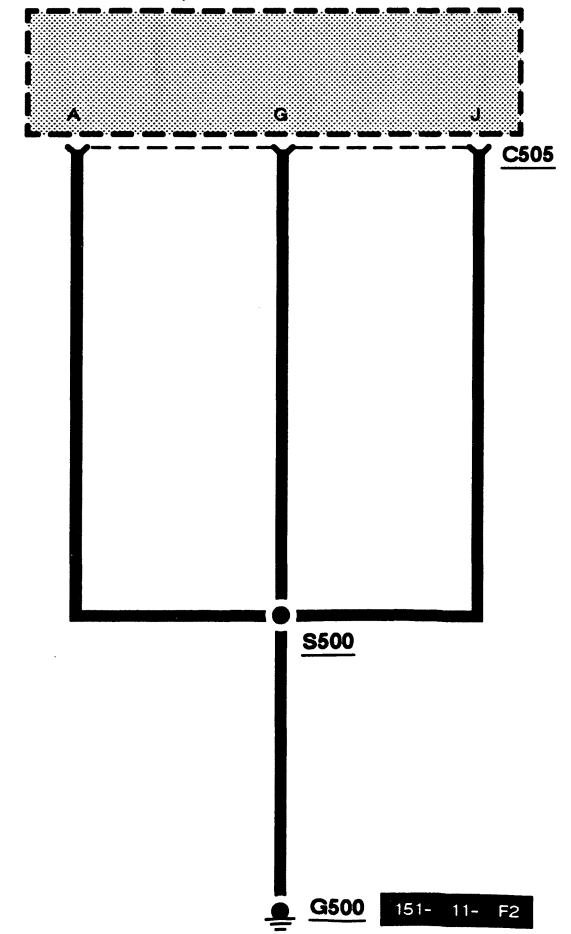
WITHOUT POWER WINDOWS

**LEFT DOOR
LOCK SWITCH**
PAGE 110-2



CONVERTIBLE

**MASTER WINDOW/
DOOR LOCK
CONTROL SWITCH**
PAGES 100-1, 110-3

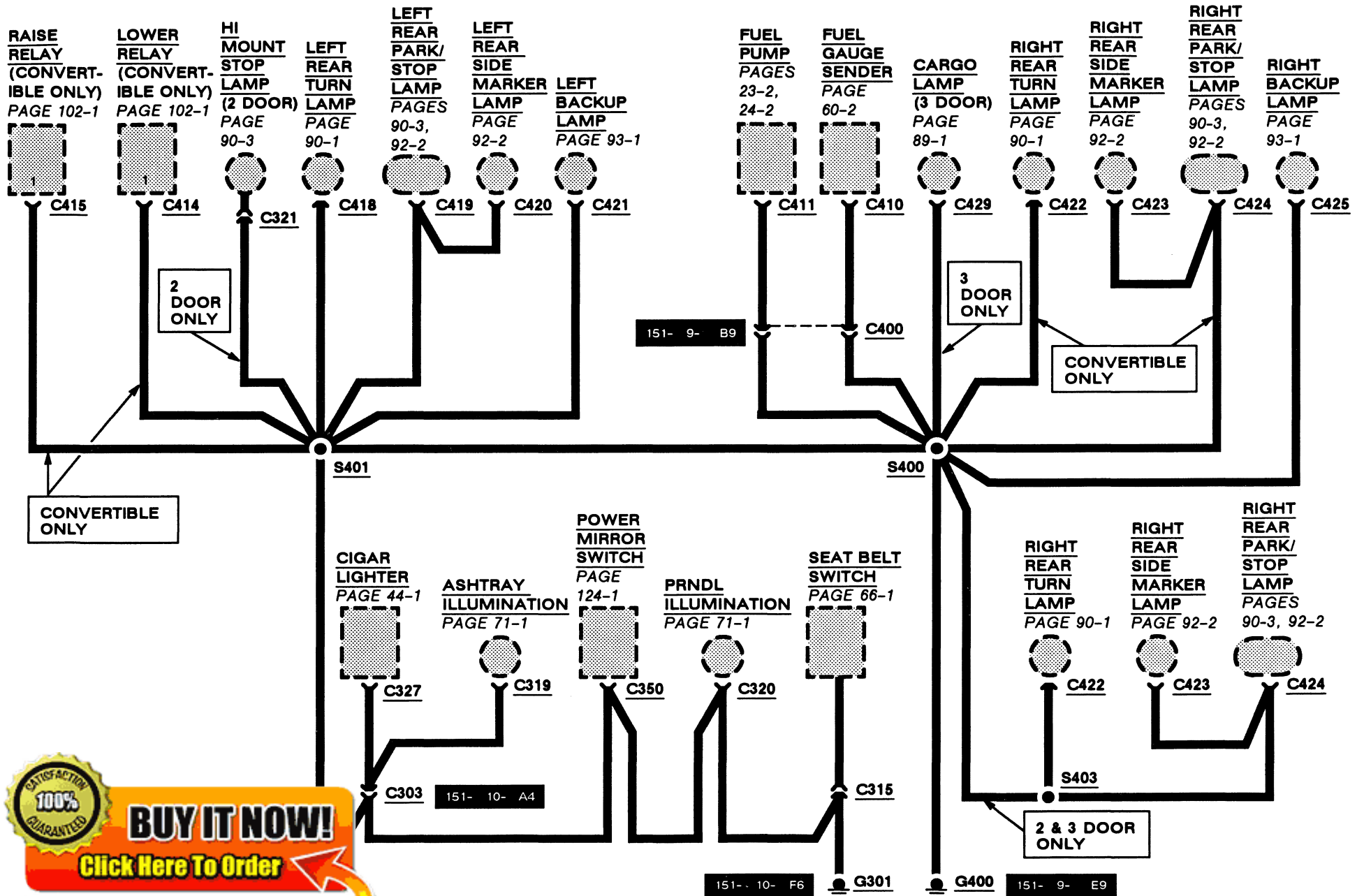


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11- F2



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10-9 GROUND

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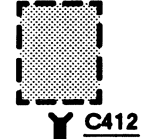
LEFT
LICENSE
LAMP
PAGE 92-1



RIGHT
LICENSE
LAMP
PAGE 92-1



HATCHBACK
RELEASE
SOLENOID
(3 DOOR)
PAGE 113-1



HI
MOUNT
STOP LAMP
(3 DOOR AND
CONVERTIBLE)
PAGE 90-3



3 DOOR
ONLY

151- 12- F7

C401

13- F6

G402

S402

G401 151- 9- F7

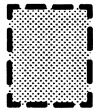
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DRIVER'S SEAT CONTROL SWITCH
PAGE 120-1



C302

LEFT POWER LUMBAR COMPRESSOR MOTOR
PAGE 122-1



C307

LEFT POWER LUMBAR COMPRESSOR MOTOR
PAGE 122-1

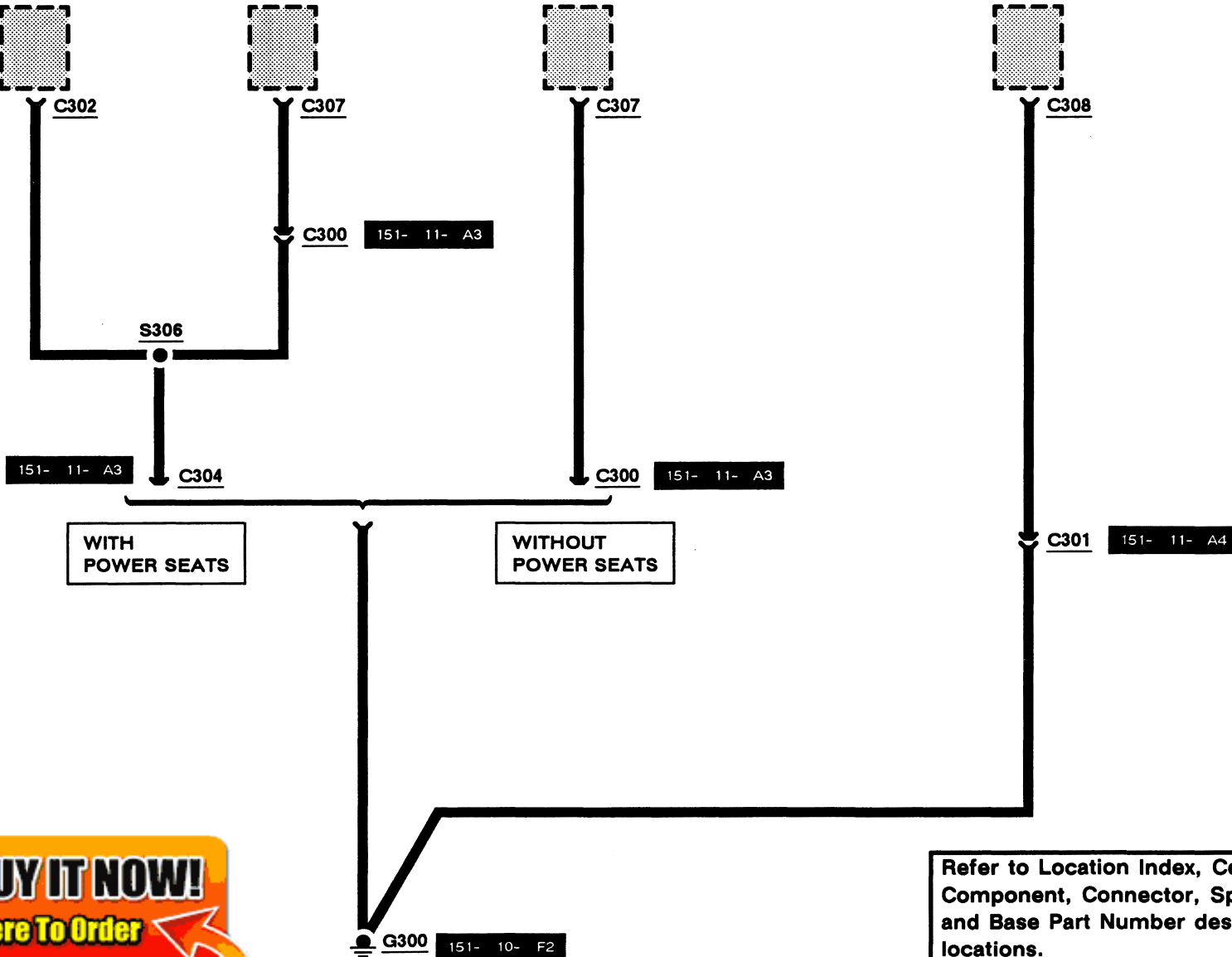


C307

RIGHT POWER LUMBAR COMPRESSOR MOTOR
PAGE 122-1



C308



WITH POWER SEATS

WITHOUT POWER SEATS

Refer to Location Index, Cell 152, for Component, Connector, Splice, Ground and Base Part Number descriptions and locations.

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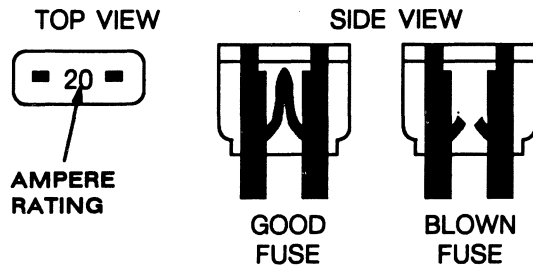
11-1 CIRCUIT PROTECTION/FUSE PANEL

1993 MUSTANG

CIRCUIT PROTECTION DEVICES

Electrical circuits on this vehicle may be protected by fuses, fusible links, maxi-fuse cartridges, circuit breakers, or a combination of these devices.

BLADE TYPE FUSE



Blade type fuses have a transparent plastic housing. To check a fuse, pull it from the fuse panel and look at the fuse element through the housing. Always replace a blown fuse with a new fuse that has the same ampere rating.

The ampere rating of a blade type fuse can also be determined by following the color code shown here:

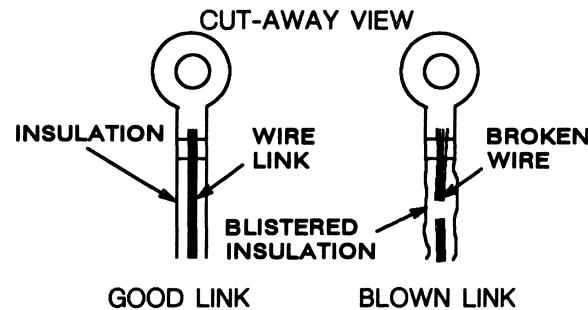
BLADE FUSE COLOR CODING	
AMPERE RATING	HOUSING COLOR
4	Pink
5	Tan
10	Red
15	Light Blue
20	Light Green

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FUSIBLE LINK



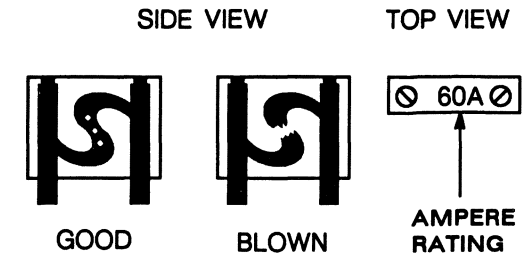
Fusible links are short lengths of wire that are smaller in diameter than the wires they are protecting. Fusible link wire is covered with a special thick, non-flammable insulation. An overload condition causes the insulation to blister. If the overload condition continues, the wire link will melt. To check a fusible link, look for blistered insulation. If the insulation is okay, pull lightly on the wire; if the fusible link stretches, the wire has melted.

When replacing fusible links, first cut the protected wire where it is connected to the fusible link. Then, tightly crimp or solder the new link to the protected wire.

Fusible links are often identified by color coding of the insulation, as shown here:

FUSIBLE LINK COLOR CODING	
WIRE LINK SIZE	INSULATION COLOR
20 GA	Blue
18 GA	Brown or Red
16 GA	Black or Orange
14 GA	Green
12 GA	Gray

MAXI-FUSE CARTRIDGE



Maxi-fuse cartridges have a transparent colored plastic housing. To check a maxi-fuse cartridge, look at the fuse element through the side of the housing.

To replace a maxi-fuse cartridge, pull it from the fuse box or panel. Always replace a blown maxi-fuse cartridge with a new one having the same ampere rating.

The ampere rating of a maxi-fuse cartridge can also be determined by following the color code shown here:

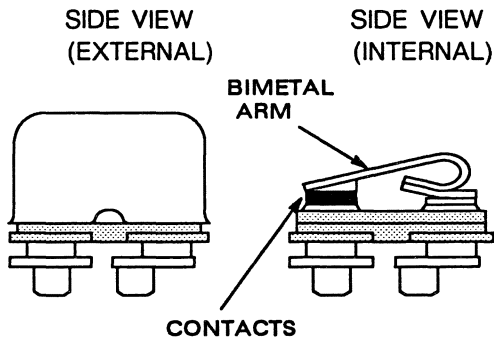
FUSIBLE LINK CARTRIDGE COLOR CODING	
AMPERE RATING	HOUSING COLOR
30	Light Green
40	Amber
50	Red
60	Blue

CIRCUIT BREAKER

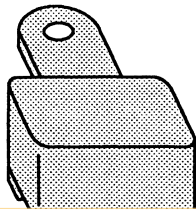
Some circuits are protected by circuit breakers (abbreviated "c. b." in fuse chart). They can be Fuse Panel mounted or in-line. Like fuses, they are rated in amperes.

Each circuit breaker conducts current through an arm made of two types of metal bonded together (bimetal arm). If the arm starts to carry too much current, it heats up. As one metal expands faster than the other the arm bends, opening the contacts. Current flow is broken. A circuit breaker can be the cycling or non-cycling type.

FUSE PANEL MOUNTED CYCLING TYPE

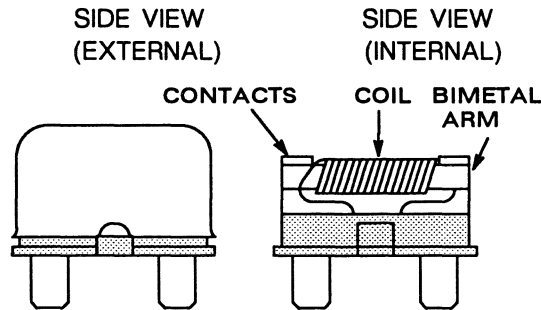


IN-LINE MOUNTED CYCLING TYPE

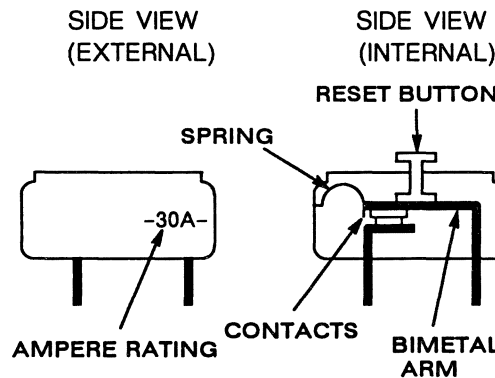


In the cycling type, the bimetal arm cools and straightens out. This cycle repeats as long as the overcurrent exists and power is applied.

FUSE PANEL MOUNTED NON-CYCLING TYPE



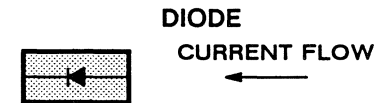
FUSE PANEL MOUNTED MANUAL RESET TYPE



Two types of non-cycling circuit breakers are used; one is reset by removing power from the circuit, and the other is reset by depressing a reset button.

In the first type, there is a coil wrapped around the bimetal arm. When an overcurrent exists and the contacts open, a small current passes through the coil. This current through the coil is not enough to operate a load, but it does heat up both the coil and the bimetal arm. This keeps the arm in the open position until power is removed.

In the second type, a spring pushes the bimetal arm down and holds the contacts together. When an overcurrent condition exists and the bimetal arm heats up, the bimetal arm bends enough to overcome the spring and the contacts snap open. The contacts stay open until the reset button is pushed and the contacts snap together again.



Diodes are electrical devices that permit current to flow in one direction only. The current flows in the direction indicated by the arrow.

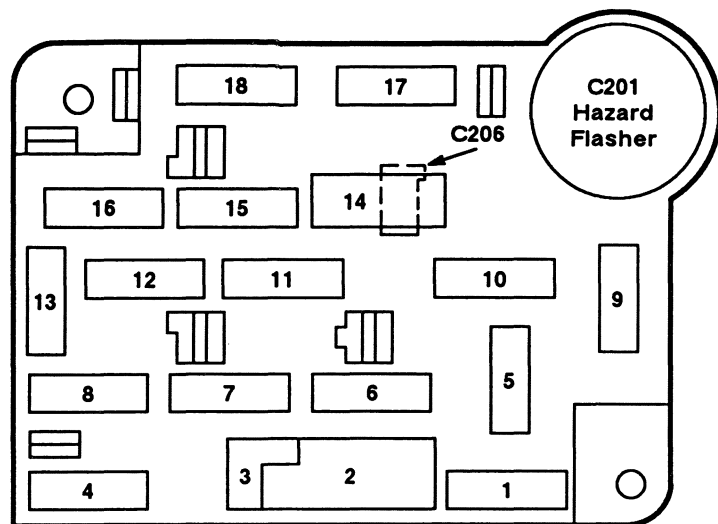
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11-3 CIRCUIT PROTECTION/FUSE PANEL

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Fuse Value Amps	Color Code
4	Pink
5	Tan
10	Red
15	Light Blue
20	Yellow
25	Natural
30	Light Green

Power Distribution

The Alternator and Battery are connected together at the Starter Relay hot terminal. Other circuits originate at the Starter Relay hot terminal and are protected by fuse links. Low power circuits are also protected by fuses.

Fuse Position	Amps	Circuits Protected
1	15	Turn/Stop/Hazard Lamps, Speed Control, Shift Lock
2	15	Interval Wiper/Washer
3	—	(Not Used)
4	15	Exterior Lamps, Instrument Illumination, Warning Chime
5	15	Turn Signals, Backup Lamps, Rear Window Defrost, Convertible Top, Daytime Running Lamps (DRL), Shift Lock
6	20	Instrument Illumination, A/C-Heater, Trunk Lid Release, Speed Control
7	15	Air Bag Restraint System
8	15	Courtesy Lamps, Radio, Warning Chime, Power Mirror
9	30	A/C-Heater
10	20	Flash-to-Pass, Daytime Running Lamps (DRL)
11	15	Radio
12	15	Convertible Top
13	5	Instrument Illumination
14	20 c.b.	Power Windows
15	15	Fog Lamps
16	20	Cigar Lighter, Horn
17	20	Premium Sound Amplifier
18	15	Instrument Cluster, Air Bag Restraint System, Warning Chime, Low Oil Level Warning Relay


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...amp Switch are powered at all 12 and 16. The other fuses are ... or the Main Light Switch.

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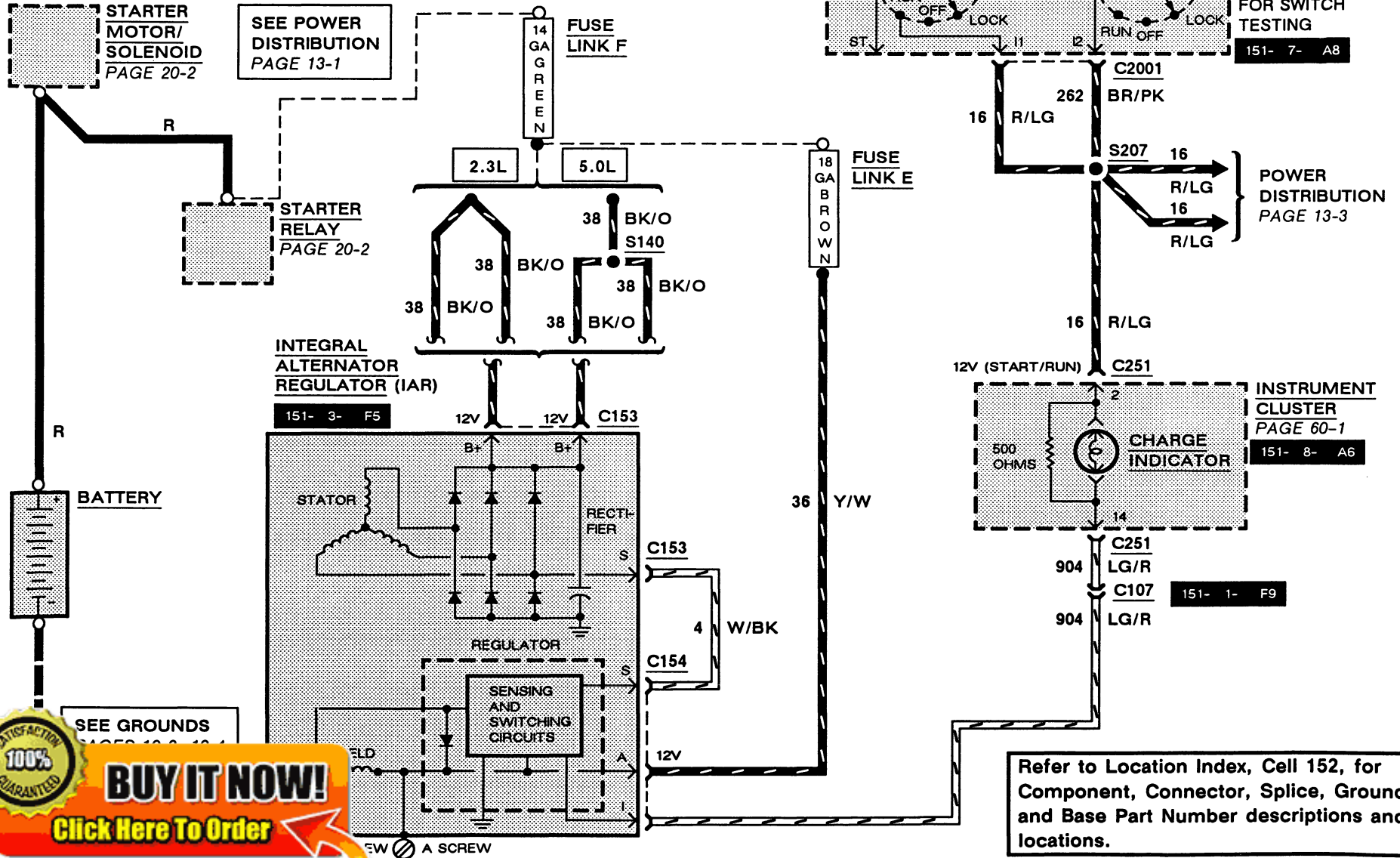
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12-1 CHARGING SYSTEM

1993 MUSTANG

For Circuit Operation, refer to page 7-1. For diagnostic information, refer to Section 14-00 of the Service Manual.



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COMPONENT LOCATION VIEWS 151-12

1993 MUSTANG

1 2 3 4 5 6 7 8 9 10

A A

B B

C C

D D

E E

F F

19B113 RADIO AMPLIFIER
HARNES-TO C257
AND C258

C320
PRNDL
ILLUMINATION

C2006
PARK BRAKE
SWITCH

C301

C607
RIGHT DOOR
SPEAKER

19B113 RADIO AMPLIFIER
HARNES-TO C282, C283
PREMIUM SOUND
AMPLIFIER

C322
RIGHT POWER LUMBAR
SEAT SWITCH

C432
REAR WINDOW
DEFROST
GRIP

C324
RIGHT
REAR SPEAKER

C433
REAR WINDOW
DEFROST GRID

C326, C327
CIGAR LIGHTER
CONNECTORS

G302

G300

C412
HATCHBACK RELEASE
SOLENOID

C307
LEFT POWER LUMBAR
COMPRESSOR MOTOR

C416
REAR COURTESY
LAMP SWITCH

C508
LEFT DOOR SPEAKER

C429
CARGO LAMP

C304

DRIVER'S
SEAT
MOTOR
ASSEMBLY

C400
TO C410 FUEL GAUGE
SENDER AND C411
FUEL PUMP

C302

C323

C305

C300
(WITH
POWER
SEATS)

REAR
CRASH
SENSOR

C309

G301

C308
RIGHT POWER
LUMBAR
COMPRESSOR
MOTOR

C325
LEFT
REAR
SPEAKER

C407

C401

C408

G401

C413
INERTIA FUEL
SHUTOFF SWITCH

G400

DO NOT
T
ON

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FRONT OF VEHICLE

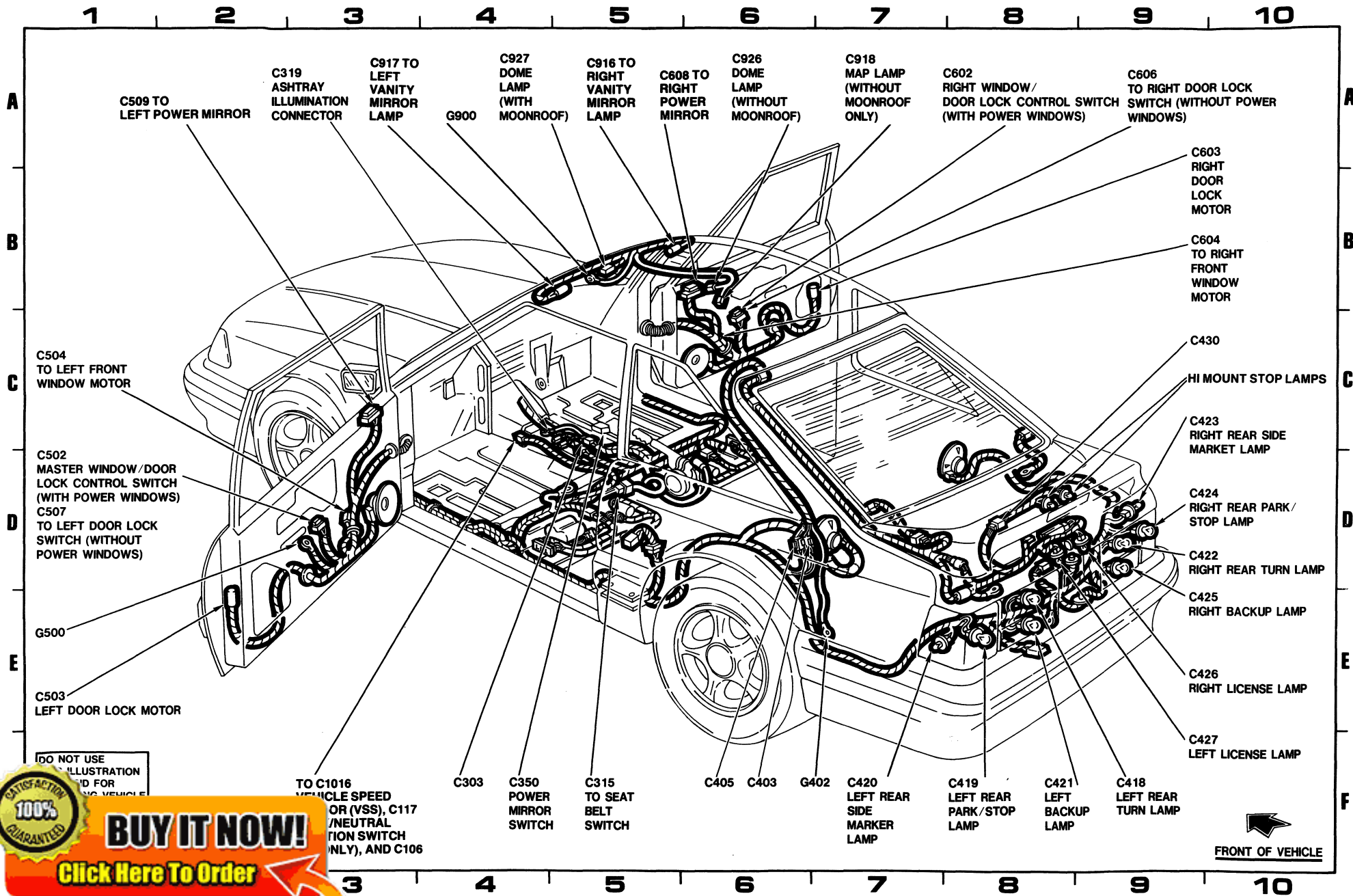
4 5 6 7 8 9 10

FULL BODY VIEW (3 DOOR)(1 of 2)



151-13 COMPONENT LOCATION VIEWS

1993 MUSTANG



FULL BODY VIEW (3 DOOR) (2 of 2)



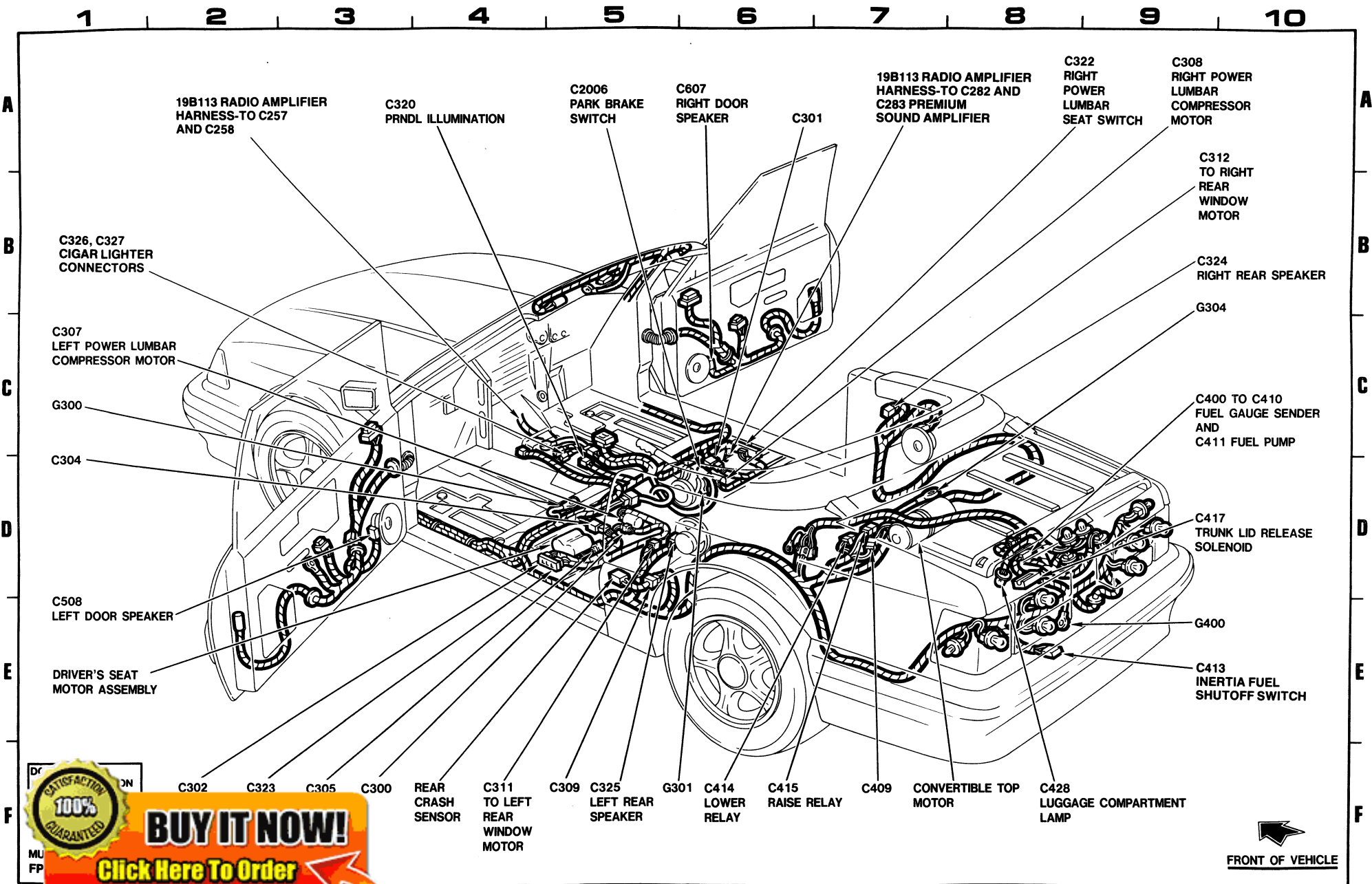
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COMPONENT LOCATION VIEWS 151-14

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19B113 RADIO AMPLIFIER HARNESS-TO C257 AND C258

C320 PRNDL ILLUMINATION

C2006 PARK BRAKE SWITCH

C607 RIGHT DOOR SPEAKER

C301

19B113 RADIO AMPLIFIER HARNESS-TO C282 AND C283 PREMIUM SOUND AMPLIFIER

C322 RIGHT POWER LUMBAR SEAT SWITCH

C308 RIGHT POWER LUMBAR COMPRESSOR MOTOR

C312 TO RIGHT REAR WINDOW MOTOR

C324 RIGHT REAR SPEAKER

G304

C400 TO C410 FUEL GAUGE SENDER AND C411 FUEL PUMP

C417 TRUNK LID RELEASE SOLENOID

G400

C413 INERTIA FUEL SHUTOFF SWITCH

C326, C327 CIGAR LIGHTER CONNECTORS

C307 LEFT POWER LUMBAR COMPRESSOR MOTOR

G300

C304

C508 LEFT DOOR SPEAKER

DRIVER'S SEAT MOTOR ASSEMBLY

C302

C323

C305

C300

REAR CRASH SENSOR

C311 TO LEFT REAR WINDOW MOTOR

C309

C325 LEFT REAR SPEAKER

G301

C414 LOWER RELAY

C415 RAISE RELAY

C409

CONVERTIBLE TOP MOTOR

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
A4LD Transmission	7005	Under center of car, on transmission	C157	151- 2- A5	
A/C Clutch Diode (2.3L)	14A604	RH side of engine compartment, taped to engine harness		151- 3- C1	
A/C Clutch Diode (5.0L)	14A604	LH side of engine compartment, taped to air conditioner jumper harness		151- 4- F6	
A/C Clutch Field Coil (2.3L)	19703	Lower RH front of engine, part of A/C compressor assembly	C159	151- 3- D1	
A/C Clutch Field Coil (5.0L)	19703	Top LH front of engine, part of A/C compressor assembly	C159	151- 4- F5	
A/C-Heater Control Assembly	19980	Center of I/P	C285	151- 7- F2	
A/C-Heater Control Illumination	18549/19980	Center of I/P, on A/C-heater control assembly	C2017	151- 7- A3	
Air Bag Diagnostic Module	14B056	Behind lower center of I/P	C276, 277	151- 8- E1	46-3
Ashtray Illumination	15055	Center console, in ashtray	C319	151-10- C1	
Backup Lamp Switch	15520	LH side of manual transmission	C161	*	
Backup Lamps	13465	Rear of car, on respective sides	C421, C425	151-11- F8	
Barometric Pressure (BARO) Sensor (2.3L)	12B583	Top center of safety wall	C163	151- 1- A6	
Barometric Pressure (BARO) Sensor (5.0L)	12B583	Top center of safety wall	C163	151- 4- A5	
Blower Motor	19805	Behind RH side of I/P, in A/C-heater plenum	C286	151- 7- B1	
Blower Motor Resistor Assembly	19A706	Behind RH side of I/P, in A/C-heater plenum	C287	151- 7- C1	
Blower Motor Switch	19A642	Center of I/P	C2015	151- 7- A4	
Brake Fluid Level Switch (2.3L)	2L414	LH rear of engine compartment, on brake fluid reservoir	C164	151- 3- B9	
Brake Fluid Level Switch (5.0L)	2L414	LH rear of engine compartment, on brake fluid reservoir	C164	151- 5- A8	
	13480	Behind LH side of I/P, on brake pedal support	C2011	151- 7- F4	



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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Canister Purge (CANP) Solenoid (2.3L)	9C915	RH side of engine compartment, forward of shock tower	C1032	151- 1- C1	
Canister Purge (CANP) Solenoid (5.0L)	9C915	Lower RH front of engine compartment	C1032	151- 5- E1	
Cargo Lamp	13776	Center rear of cargo area	C429	151-12- D9	
Center Line Crash Sensor (2.3L)	14B006	Top center of upper radiator support	C166	151- 2- F5	
Center Line Crash Sensor (5.0L)	14B006	Top center of upper radiator support	C166	151- 5- F5	
Cigar Lighter	15052	Center console, in ashtray	C326, C327 ..	151-10- C1	
Clockspring Assembly	14A664	In top of steering column, below steering wheel	C2010, C2018	151- 8- D9	
Clutch Cycling Pressure Switch (2.3L)	19E561	RH rear corner of engine compartment, on A/C accumulator	C167	151- 3- A2	
Clutch Cycling Pressure Switch (5.0L)	19E561	RH rear corner of engine compartment, on A/C accumulator	C167	151- 4- A2	
Clutch Pedal Position (CPP) Switch #1	11A152	Behind LH side of I/P, on clutch pedal support	C290	151- 7- A6	
Clutch Pedal Position (CPP) Switch #2	9A837	Behind LH side of I/P, on clutch pedal support	C291	151- 7- F6	
Clutch Pedal Position (CPP) Switch #2 Jumper	9D821	Behind center of I/P, on I/P support brace	C291	151- 7- F6	
Constant Control Relay Module	12B581	Mounted on side of RH front strut tower	C192	151- 3- A1 33-3
Convertible Top Motor	533A00	Behind top center of rear seat	C409	151-14- F7	
Convertible Top Switch	13A350	Top LH side of I/P, right of instrument cluster	C2023	151- 7- A7	
Coolant Temperature Sender (2.3L) ..	10884	LH rear of engine, below oil pressure switch	C168	151- 3- A6	
Coolant Temperature Sender (5.0L) ..	10884	Top LH front of engine, LH side of distributor	C168	151- 4- A5	
Crank Position (CKP) Sensor	6C315	Center front of engine, near timing chain cover	C111, C112 ..	151- 1- F5 21-5

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Data Link Connector (DLC) C198 (2.3L)	14489	LH rear of engine compartment, mounted on rear of strut tower	C198	151- 2- A9	23-6
Data Link Connector (DLC) C198 (5.0L)	14489	LH rear of engine compartment, mounted on rear of strut tower	C198	151- 5-B10	24-7
Data Link Connector (DLC) C199 (2.3L)	14489	LH rear of engine compartment, mounted on rear of strut tower	C199	151- 2- A9	23-6
Data Link Connector (DLC) C199 (5.0L)	14489	LH rear of engine compartment, mounted on rear of strut tower	C199	151- 5-B10	24-7
Daytime Running Lamps (DRL) Module (2.3L)	15A272	In front of LH front fender, below horns	C170	151- 3- E9	97-3
Daytime Running Lamps (DRL) Module (5.0L)	15A272	In front of LH front fender, below horns	C170	151- 4- E9	97-3
Distributor	12127	Top front of engine		151- 4- F3	
Dome Lamp (With Moonroof)	13776	Center of windshield header	C927	151- 9- A1	
Dome Lamp (Without Moonroof)	13776	Center of roof	C926	151- 9- A5	
Driver's Seat Control Switch		LH side of LH front seat	C302	151-11- F4	120- 2
Driver's Seat Motor Assembly		Under LH front seat	C305	151-11- F5	120- 2
DRL Shorting Connector (2.3L)	14A624	In front of LH front fender, below horns	C170	151- 3- E9	
DRL Shorting Connector (5.0L)	14A624	In front of LH front fender, below horns	C170	151- 4- E9	
EGR Vacuum Regulator Solenoid (2.3L)	9J472	RH rear of engine compartment, on rear of strut tower	C171	151- 1- B1	
EGR Vacuum Regulator Solenoid (5.0L)	9J459	RH rear of engine compartment, on rear of strut tower	C171	151- 5- A2	
Valve Position Sensor (2.3L)	9G428	Top LH rear of engine, on rear of intake manifold	C172	151- 1- A8	
	9G428	Top RH rear of engine, on rear of intake manifold	C172	151- 4- A3	



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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Electric Cooling Fan	8K621	Center front of engine compartment, behind radiator	C173	151- 3- F4	
Engine Compartment Lamp	15702	Underside of engine compartment hood	C158	151- 3- A9	
Engine Coolant Temperature (ECT) Sensor (2.3L)	12A648	RH rear of engine, below throttle body	C174	151- 1- A3	
Engine Coolant Temperature (ECT) Sensor (5.0L)	12A648	Top RH front of engine, RH side of fuel injector No. 1	C174	151- 4- E1	
Engine Indicator Diode	14A604	Behind LH side of I/P, taped in main harness, near speed control amplifier		151- 8- F8	
Fog Lamp Switch	11654	Top LH side of I/P, left of instrument cluster	C298	151- 7- B9	
Fog Lamps	15200	Lower front of car, on respective sides	C1021, C1025	151- 5- F7	
Front Park/Turn Lamps	13200	Front of car, on respective sides	C1024, C1028	151- 3- F8	
Front Side Marker Lamps	15A424	Front of respective front fenders	C1022, C1026	151- 3- F9	
Fuel Gauge Sender	9H307	Below rear of car, top LH side of fuel tank	C410	151- 9- B9	
Fuel Injectors (2.3L)	9F593	Top of each cylinder	C178, C179 C180, C181	151- 1- F4	
Fuel Injectors (5.0L)	9F593	Top of each cylinder	C178, C179 C181, C182 C183, C184 C185	151- 4- B9	
Fuel Pump	9350	Below rear of car, top RH side of fuel tank	C411	151- 9- B9	
Fuel Pump Relay	14N089	RH side of engine compartment, on lower front of wheel well	C103	151- 5- D1	24-7
Fuse Link A (2.3L)	14526	Front of LH fender apron, at starter relay		151- 3- D9	
Fuse Link A (5.0L)	14526	Front of LH fender apron, at starter relay		151- 4- D9	
Fuse Link B (2.3L)	14526	Front of LH fender apron, at starter relay		151- 3- D9	
Fuse Link B (5.0L)	14526	Front of LH fender apron, at starter relay		151- 4- D9	
	14526	Front of LH fender apron, at starter relay		151- 3- D9	
	14526	Front of LH fender apron, at starter relay		151- 4- D9	
	14526	Front of LH fender apron, at starter relay		151- 4- D9	

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Fuse Link E (2.3L)	14526	LH side of engine compartment, taped to dash panel to headlamp junction harness, behind battery		151- 3-	F6
Fuse Link E (5.0L)	14526	LH side of engine compartment, behind battery		151- 4-	F9
Fuse Link F (2.3L)	14526	Front of LH fender apron, at starter relay		151- 3-	D9
Fuse Link F (5.0L)	14526	Front of LH fender apron, at starter relay		151- 4-	D9
Fuse Link G (2.3L)	14526	Front of LH fender apron, at starter relay		151- 3-	C9
Fuse Link G (5.0L)	14526	Front of LH fender apron, at starter relay		151- 4-	D9
Fuse Link H	14526	Front of LH fender apron, at starter relay		151- 3-	C9
Fuse Link J	14526	Front of LH fender apron, at starter relay		151- 3-	C9
Fuse Link K (2.3L)	14526	RH rear corner of engine compartment, taped to engine harness		151- 2-	B1
Fuse Link K (5.0L)	14526	RH rear corner of engine compartment, taped to engine harness		151- 4-	A1
Fuse Link N (2.3L)	14526	LH rear corner of engine compartment, taped to main harness		151- 2-	A9
Fuse Link N (5.0L)	14526	LH rear corner of engine compartment, taped in main harness		151- 4-	B9
Fuse Panel	14A067	Behind LH side of I/P, left of steering column	C206	151- 7-	E9
Glove Box Lamp	14413	RH side of I/P, in glove box	C2016	151- 8-	B1
Hatchback Release Solenoid	14030	Center rear of hatchback, near latch assembly	C412	151-12-	C9
Hazard Flasher	13350	Behind LH side of I/P, on fuse panel	C201	151- 7-	F8
Hazard Warning Switch	13A350	Top LH side of I/P, RH side of instrument cluster	C299	151- 7-	A6
Headlamps	13005	Front of car, on respective sides	C1023, C1027	151- 3-	F9
Oxygen Sensor (HO2S)	9F472	Lower RH rear of engine, in exhaust manifold	C186	151- 1-	C1
	18549	Center of I/P	C285	151- 7-	F2
	13A613	Center of rear package tray	C321	151-10-	E9

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Hi Mount Stop Lamps (3 Door)	13A613	In center of rear spoiler	C430	151-13- C9	
Hi Mount Stop Lamps (Convertible) ..	13A613	Center rear of trunk lid	C431	151-15- A9	
Horn Relay	13853	Behind RH center of I/P, above warning chime module	C187	151- 7- A3	44-2
Horns (2.3L)	13A803	In front of LH front fender, near windshield washer fluid reservoir	C188, C189 ..	151- 2- E9	
Horns (5.0L)	13A803	In front of LH front fender, near windshield washer fluid reservoir	C188, C189 ..	151- 5-E10	
Idle Air Control (IAC) Valve (2.3L) ...	9F715	Top rear of engine, above valve cover	C190	151- 1- A5	
Idle Air Control (IAC) Valve (5.0L) ...	9F715	Top RH side of engine, forward of throttle body	C190	151- 4- C1	
Ignition Coil	12029	LH side of engine compartment, on front of strut tower	C191	151- 5-C10	
Ignition Control Module (ICM) (2.3L) ..	12A199	Top LH front of engine, forward of intake manifold	C155, C156 ..	151- 2- A2	21-5
Ignition Control Module (ICM) (5.0L) ..	12A297	Center front of engine, on LH side of distributor	C155, C156 ..	151- 4- F4	21-5
Ignition Key Warning Switch	11A127	Top RH side of steering column, part of ignition lock cylinder	C2026	151- 7- A9	
Ignition Suppression Resistor	14A601	LH rear corner of engine compartment, taped to engine harness		151- 4- A8	
Ignition Switch	11572	Top RH side of steering column	C2001	151- 7- A8	13-12
In-line Circuit Breaker (2.3L)	14A065	Front of LH fender apron, on starter relay		151- 3- B9	
In-line Circuit Breaker (5.0L)	14A065	Front of LH fender apron, on starter relay		151- 4- C9	
Inertia Fuel Shut-off Switch	9341	Lower LH center rear of trunk	C413	151- 9- E9	
Instrument Cluster	10849	Top LH side of I/P	C250, C251 ..	151- 8- A6	60-4
Instrument Panel Dimming Rheostat ..	11691	LH side of I/P, left of steering column	C2022	151- 8- C9	
Intake Air Temperature (IAT) Sensor ..	12A697	RH side of engine compartment, on air cleaner assembly	C160	151- 1- E1	

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Intake Air Temperature (IAT) Sensor (5.0L)	12A697	Top LH front of engine, behind coolant temperature sender	C160	151- 4- F8	
Integral Alternator Regulator (IAR) (2.3L)	10300/10346 ...	Top LH front of engine	C153, C154 ...	151- 3- F5 12-2
Integral Alternator Regulator (IAR) (5.0L)	10300/10346 ...	RH front of engine	C153, C154 ...	151- 4- F2 12-2
Interval Governor	6C625	Behind LH side of I/P, LH side of steering column brace	C2002	151- 8- F9 81-2
Left Dash Speaker	18808	Behind top LH corner of I/P	C2025	151- 8- B9	
Left Door Lock Motor	218A42	In rear of LH front door	C503	151-11- E1	
Left Door Lock Switch	14A509	Center of LH front door, on armrest	C507	151-11- E1 110- 5
Left Door Speaker	18808	In lower front of LH front door	C508	151-10- D1	
Left Forward Crash Sensor (2.3L)	14B005	LH side of upper radiator support, behind headlamp	C177	151- 2- F8	
Left Forward Crash Sensor (5.0L)	14B005	LH side of upper radiator support, behind headlamp	C177	151- 5- F8	
Left Front Courtesy Lamp Switch	13713	In front of LH front door jamb	C297	151- 6- F5	
Left Front Window Motor	23394	In lower front of LH front door	C504	151-11- F3	
Left Heated Oxygen Sensor (HO2S) ..	9F472	Lower LH rear of engine, in exhaust manifold	C193	151- 5- A6	
Left Power Lumbar Compressor Motor	65530	Under RH side of LH front seat	C307	151-10- F4	
Left Power Lumbar Seat Switch	14C715	On LH side of LH front seat	C323	151-10- F3	
Left Power Mirror	17682	Top front of LH front door	C509	151-11- C1	
Left Rear Speaker (2 Door)	18971	LH side of rear package tray	C325	151-10- F8	
Left Rear Speaker (3 Door)	18932	LH front of cargo area	C325	151-12- F6	
Left Rear Speaker (Convertible)	18971	Front of LH rear quarter panel, in trim panel	C325	151-14- F5	
Left Rear Window Motor	23394	In front of LH rear quarter panel	C311	151-14- F4	
Left Side Vanity Mirror (Convertible) ..	17A679	At LH vanity mirror	C917	151- 9- C1	
Left Trunk Lid Lock (Convertible)	13550	Center rear of trunk lid	C426, C427 ...	151-11- E9	
Left Trunk Lid Lock (Hatchback)	13550	Center rear of hatchback	C426, C427 ...	151-13- E9	

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Low Coolant Switch	10D968	LH front of engine compartment, in coolant reservoir	C194	151- 4- F9	
Low Oil Level Sensor	6C624	Lower LH rear of engine, on side of oil pan	C195	151- 5- A6	
Low Oil Warning Relay	6C625	Behind LH side of I/P, LH side of steering column brace	C200	151- 8- D9	60-5
Lower Relay	9345	Behind top center of rear seat, LH side of convertible top motor	C414	151-14- F6	102- 2
Luggage Compartment Lamp (2 Door)	19B516	Center rear of trunk lid	C428	151- 9- D9	
Luggage Compartment Lamp (Convertible)	19B516	LH rear of trunk lid	C428	151-14- F8	
Main Light Switch	11654	Top LH side of I/P, LH side of instrument cluster	C2005	151- 7- B9	13-12
Map Lamp (2 And 3 Door)	13776	Center of roof	C918	151- 9- A7	
Map Lamp (Convertible)	13776	Center of windshield header	C900	151-15- A4	
Mass Air Flow (MAF) Sensor (2.3L)	12B579	RH side of engine compartment, on rear of air cleaner assembly	C197	151- 1- D1	
Mass Air Flow (MAF) Sensor (5.0L)	12B579	RH side of engine compartment, on air intake assembly	C197	151- 4- D1	
Master Window/Door Lock Control Switch (2 And 3 Door)	14A509	Center of LH front door, on armrest	C502	151-11- D1	100- 4
Master Window/Door Lock Control Switch (Convertible)	14A509	Center of front LH door, on armrest	C505	151-15- C1	100- 4
Multi-function Switch	13K359	Inside top of steering column	C268, C269 C270	151- 8- A8	90-4
Octane Adjust Shorting Bar	14A464	RH rear of engine compartment	C1000	151- 2- A4	
Oil Pressure Sender	9D290	Lower LH front of engine, above oil filter	C1001	151- 5- F6	
Oil Pressure Sender	9278	LH rear of engine, below valve cover	C1002	151- 3- A5	
Oil Pressure Sender	15852	Below rear of center console, on RH rear of park brake lever assembly	C2006	151-10- F6	

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Park/Neutral Position Switch (Automatic)	7A247	LH side of automatic transmission	C162	*	
Park/Neutral Position Switch (Manual)	7A247	Top front of manual transmission	C117	151-11- B1	
PCM Power Relay	12A646	Behind RH cowl panel, on bracket, above powertrain control module (PCM)	C293	151- 6- A6	24-8
Power Mirror Switch	17B676	On center console	C350	151- 9- D1	124- 2
Power Steering Pressure (PSP) Switch	3N824	Lower LH side of engine, near power steering pump	C1003	151- 1- F7	
Powertrain Control Module (PCM) (2.3L)	12A650	Behind RH cowl panel	C294	151- 6- F7	23-5
Powertrain Control Module (PCM) (5.0L)	12A650	Behind RH cowl panel	C294	151- 6- F7	24-6
Premium Sound Amplifier	18B849	Below RH front seat	C282, C283	151-10- A7	130- 5
Primary Coil (RH)	12029	Top RH side of engine, right of valve cover	C1004	151- 2- C1	
PRNDL Illumination	15A808	Center console, near gearshift lever	C320	151-10- E1	
Radio (With Premium Sound)	18806	Center of I/P	C280, C281	151- 8- F4	130- 4
Radio (Without Premium Sound)	18806	Center of I/P	C257, C258	151- 8- F4	130- 4
Radio Noise Capacitor	18801	Top RH front of engine, near secondary coil (LH)	C1006	151- 2- F4	
Raise Relay	9345	Behind top center of rear seat, LH side of convertible top motor	C415	151-14- F6	102- 2
Rear Courtesy Lamp Switch	13713	Center rear of hatchback	C416	151-12- D9	
Rear Crash Sensor	14B007	In lower front of LH rear quarter panel	C309	151- 9- F3	46-3
Rear Park/Stop Lamps	13465	Rear of car, on respective sides	C419, C424	151-11- C9	
Rear Side Marker Lamps	13465	Rear of car, on respective sides	C420, C423	151-11- C9	
Rear Turn Lamps	13465	Rear of car, on respective sides	C418, C422	151-11- F9	
Rear Window Defrost Control Relay	18C641	Behind LH side of I/P, on RH side of fuse panel	C2007	151- 7- E9	56-2
Rear Window Defrost Grid	42006	Inside rear window	C432, C433	151- 9- A8	
Rear Window Defrost Switch	13A350	Top LH side of I/P, right of instrument cluster	C2020	151- 7- A7	

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<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Right Dash Speaker	18808	Behind top RH corner of I/P	C2024	151- 8- A2	
Right Door Lock Motor	218A42	In rear of RH front door	C603	151-11- B9	
Right Door Lock Switch	14A265	Center of RH front door, on armrest	C606	151-11- A8	110- 5
Right Door Speaker	18808	Lower front of RH front door	C607	151-10- A5	
Right Forward Crash Sensor (2.3L)	14B004	RH side of upper radiator support, behind headlamp	C176	151- 2- F3	
Right Forward Crash Sensor (5.0L)	14B004	RH side of upper radiator support, behind headlamp	C176	151- 5- F2	
Right Front Courtesy Lamp Switch	13713	In front of RH front door jamb	C296	151- 6-C10	
Right Front Window Motor	23394	In lower front of RH front door	C604	151-11- B9	
Right Heated Oxygen Sensor (HO2S)	9F472	Lower RH rear of engine, in exhaust manifold	C1005	151- 5- A4	
Right Power Lumbar Compressor Motor	65530	Under LH side of RH front seat	C308	151-10- B9	
Right Power Lumbar Seat Switch	14C715	On RH side of RH front seat	C322	151-10- B9	
Right Power Mirror	17682	Top front of RH front door	C608	151-11- A5	
Right Rear Speaker (2 Door)	18971	RH side of rear package tray	C324	151-10- D9	
Right Rear Speaker (3 Door)	18932	RH front of cargo area	C324	151-12- A9	
Right Rear Speaker (Convertible)	18971	Front of RH rear quarter panel, in trim panel	C324	151-14- B9	
Right Rear Window Motor	23394	In front of RH rear quarter panel	C312	151-14- A9	
Right Vanity Mirror Lamp	17A679	At RH vanity mirror	C916	151- 9- A3	
Right Window/Door Lock Control Switch	14A265	Center of RH front door, on armrest	C602	151-11- A6	100- 5
Seat Belt Switch	10B924	Inside LH front seat belt buckle assembly	C315	151-10- A4	
Secondary Air Injection Bypass (AIRB) Solenoid	95448	RH rear of engine compartment, on rear of strut tower	C1013	151- 5- B1	
Secondary Air Injection Diverter Solenoid	95448	RH rear of engine compartment, on rear of strut tower	C1014	151- 5- A1	

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152-11 LOCATION INDEX

1993 MUSTANG

<u>Component</u>	<u>Base Part No.</u>	<u>Location</u>	<u>Connector</u>	<u>Page Zone</u>	<u>Connector Page</u>
Secondary Coil (LH)	12029	Top RH front of engine, right of valve cover	C1007	151- 2- E1	
Shift Lock Actuator	3F719	Top RH side of steering column, near ignition switch	C2008	151- 8- A7	
Speed Control Amplifier	9D843	Behind LH side of I/P, near top of cowl panel	C214, C215	151- 7- F7	31-3
Speed Control Servo (2.3L)	9C735	In rear of LH front fender		151- 3- A9	31-3
Speed Control Servo (5.0L)	9C735	In rear of LH front fender		151- 4- A9	31-3
SPOUT Check Connector C1009 (2.3L)	14A464	Top LH front of engine, near ignition control module (ICM)	C1009	151- 2- E9	
SPOUT Check Connector C1009 (5.0L)	14A464	LH front of engine, taped to engine harness, near distributor	C1009	151- 4- F5	
Starter Clutch Pedal Position (SCPP) Switch	11A152	Behind LH side of I/P, on clutch pedal support	C288	151- 7- A5	
Starter Motor/Solenoid (2.3L)	11001	Lower RH rear of engine		151- 3- A4	
Starter Motor/Solenoid (5.0L)	11001	Lower RH rear of engine		151- 4- C1	
Starter Relay (2.3L)	11450	Front of LH fender apron		151- 3- C9	
Starter Relay (5.0L)	11450	Front of LH fender apron		151- 4- C9	
Steering Column Air Bag	043B13	In center of steering wheel	C2009	151- 6- F6	
Steering Wheel Control Switch	9C888	Center of steering wheel	C208	151- 6- A5	
Tachometer Service Connector C1001	14A624	LH front of engine, near ignition control module (ICM)	C1001	151- 2- A6	
Throttle Position (TP) Sensor (2.3L)	9B989	Top rear of engine, on throttle body	C1031	151- 1- A5	
Throttle Position (TP) Sensor (5.0L)	9B989	Top RH side of engine, on rear of throttle body	C1015	151- 5- A3	
Trunk Lid Release Solenoid (2 Door)	14030	Center rear of trunk lid, near latch assembly	C417	151- 9- C9	
Lid Release Solenoid	14030	Center rear of trunk lid, near latch assembly	C417	151-14- D9	
h	19B514	RH side of I/P, in glove box	C2019	151- 7- A1	

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LOCATION INDEX 152-28

1993 MUSTANG

<u>Splice</u>	<u>Location</u>
S600 (With Power Windows)	Window regulator right front door harness, near T/O to right window/door lock control switch
S600 (Without Power Windows)	Right front door lock harness, near T/O to C606
S601 (With Power Windows)	Window regulator right front door harness, near T/O to right window/door lock control switch
S601 (Without Power Windows)	Right front door lock harness, near T/O to C606

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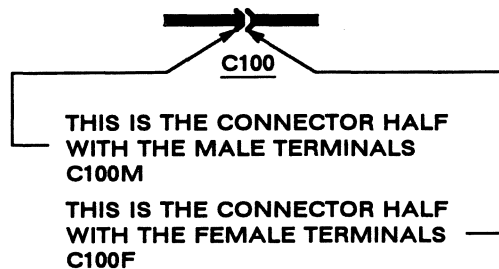
153-1 HARNESS CAUSAL PART NUMBER

1993 MUSTANG

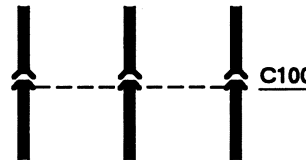
HOW TO IDENTIFY A BASIC HARNESS NUMBER BY USING A "C" NUMBER

Understand these symbols before you use the following listing:

THIS MEANS A HARNESS CONNECTION

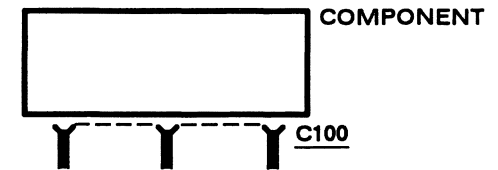


THE DASHED LINE MEANS THAT ALL OF THESE TERMINALS ARE IN THE SAME CONNECTION



THE UPPER FEMALE TERMINALS ARE IN C100F;
THE LOWER MALE TERMINALS ARE IN C100M

THIS MEANS A COMPONENT CONNECTION



THE F AND M IS NOT USED WITH THE "C" NUMBER

Identify the basic harness part number by:

1. If the problem is in a connector, find the connector "C" number in the EVTM schematics. Then locate the "C" number in the following listing and read the basic harness part number.
2. If the problem is **not** in a connector (such as a short or broken wire), then choose a connector **located on the same harness** that has the problem. Identify the "C" number of that connector. Locate the "C" number in the following listing and read the basic part number of the harness that has the problem.

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HARNES CAUSAL PART NUMBER 153-2

1993 MUSTANG

<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>
C100 (F)	12A581	C154	14290	C183	9D930	C1016	7E443
C100 (M)	14A666	C155	12A690	C184	9D930	C1018	14401
C100 (M)	19D887	C156	12A690	C185	9D930	C1019	14401
C101 (F)	12A690	C157	12A690	C186	12A581	C1020	12A581
C101 (M)	12A581	C158	15A702	C187	14401	C1021	P.I.A.
C102 (F)	15A702	C159	19D887	C188	14290	C1022	14290
C102 (M)	14401	C160 (2.3L)	12A581	C189	14290	C1023	14290
C103	12A581	C160 (5.0L)	9D930	C190 (2.3L)	12A690	C1024	14290
C104 (F)	9D930	C161	15525	C190 (5.0L)	9D930	C1025	P.I.A.
C104 (M)	12A581	C162	7C078	C191	12A581	C1026	14290
C105 (F)	12A690	C163	12A581	C192	12A581	C1027	14290
C105 (M)	12A581	C164	14401	C193	12A690	C1028	14290
C106 (F) (Automatic)	7C078	C165	9D930	C194	14290	C1029	14290
C106 (F) (Manual)	15525	C166 (F)	P.I.A.	C195	12A690	C1030	14290
C106 (M)	7E443	C166 (M)	12A581	C197	12A581	C1031	12A581
C107 (F)	14290	C167	12A581	C198	12A581	C1032	12A581
C107 (M)	14401	C168 (2.3L)	12A690	C199	12A581	C200	14401
C108 (F)	14290	C168 (5.0L)	9D930	C1000	12A581	C201	14401
C108 (M)	14401	C170	14401	C1001	9D930	C203 (F)	14405
C110 (F) (2.3L)	12A690	C171	12A581	C1002	12A690	C203 (M)	14401
C110 (F) (5.0L)	12A581	C172	9D930	C1003	12A581	C204 (F)	14A200
C110 (M)	14401	C173	12A581	C1004	12A690	C204 (M)	14401
C111	12A690	C174 (2.3L)	12A581	C1005	12A690	C205 (F)	14401
C112	12A690	C174 (5.0L)	9D930	C1006	12A690	C205 (M)	14334
C113	12A581	C176 (F)	P.I.A.	C1007	12A690	C206	14401
C117	7E443	C176 (M)	12A581	C1008	P.I.A.	C207 (F)	14405
C118 (F)	9D930	C177 (F)	P.I.A.	C1009 (2.3L)	12A690	C207 (M)	14401
C118 (M)	12A581	C177 (M)	14401	C1009 (5.0L)	12A581	C208	P.I.A.
C119	9D930	C178	9D930	C1011	12A690	C212 (F)	7E443
C120	12A581	C179	9D930	C1012	12A581	C212 (M)	14401
C121	12A581	C180	9D930	C1013	12A581	C213 (F)	14401
C122	12A581	C181	9D930	C1014	12A581	C213 (M)	12A581
C123	12A581	C182	9D930	C1015	9D930	C214	P.I.A.

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153-3 HARNESS CAUSAL PART NUMBER

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<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>
C215	14401	C228 (F) (With		C270	14401	C2012	14401
C216 (F)	14401	Power Windows)	14630	C276	14401	C2013	14401
C216 (M)	12A581	C228 (F) (Without		C277	14401	C2014	14A200
C217 (F)	14401	Power Windows And Door		C280	19B113	C2015	14401
C217 (M)	14405	Locks)	19A044	C281	19B113	C2016	14401
C221 (F) (Without		C228 (M)	14401	C282	19B113	C2017	14401
Power Windows)	14025	C229 (F)	14631	C283	19B113	C2018	14401
C221 (F) (With		C229 (M)	14405	C285	14401	C2019	14401
Power Windows)	14631	C230 (F) (Without		C286	14401	C2020	14401
C221 (M)	14A200	Power Windows)	14025	C287	14401	C2022	14401
C222 (F) (Without		C230 (F) (With		C288	14401	C2023	14401
Power Windows)	14024	Power Windows)	14631	C289	14401	C2024	14401
C222 (F) (With		C230 (F) (Without		C290	14401	C2025	14401
Power Windows)	14630	Power Windows And		C291	14401	C2026	14401
C222 (M)	14A200	Door Locks)	19A044	C293	12A581	C300 (F) (Without	
C224 (F)	14631	C230 (M)	14405	C294	12A581	Power Seats)	14B084
C224 (M)	14A200	C231 (F) (Without		C296	14334	C300 (F) (With	
C225 (F)	14A200	Power Windows)	14024	C297	14405	Power Seats)	14B723
C225 (M)	14631	C231 (F) (With		C298	14401	C300 (M)	14405
C227 (F) (Without		Power Windows)	14630	C299	14401	C301 (F)	14B084
Power Windows)	14025	C231 (M)	14405	C2001	14401	C301 (M)	14405
C227 (F) (With		C250	14401	C2002	14401	C302	14B723
Power Windows)	14631	C251	14401	C2005	14401	C303 (F)	14A318
C227 (F) (Without		C257 (F)	14401	C2006	14405	C303 (M)	14405
Power Windows And		C257 (M)	19B113	C2007	14401	C304 (F)	14B723
Door Locks)	19A044	C258 (F)	14401	C2008	14401	C304 (M)	14405
C227 (M)	14401	C258 (M)	19B113	C2009	P.I.A.	C305	14B723
C228 (F) (Without		C268	14401	C2010	14401	C307	14B084
Power Windows)	14024	C269	14401	C2011	14401	C308	14B084

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HARNESS CAUSAL PART NUMBER 153-4

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<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>	<u>Connector Number</u>	<u>Wire Assembly</u>
C309 (F)	P.I.A.	C410	9A340	C507	14025
C309 (M)	14405	C411	9A340	C508 (Without	
C311	14405	C412	13412	Power Windows)	14025
C312	14405	C413	14405	C508 (With	
C315	14405	C414	14405	Power Windows)	14631
C319	14A318	C415	14405	C509 (Without	
C320	14405	C416	13412	Power Windows)	14025
C321 (F)	14405	C417	19B516	C509 (With	
C321 (M)	P.I.A.	C418	14405	Power Windows)	14631
C322	14B084	C419	14405	C602	14630
C323	14B084	C420	14405	C603 (Without	
C324	14405	C421	14405	Power Windows)	14024
C325	14405	C422	14405	C603 (With	
C326	14A318	C423	14405	Power Windows)	14630
C327	14A318	C424	14405	C604	14630
C350	14405	C425	14405	C606	14024
C400 (F)	14405	C426	13412	C607 (Without	
C400 (M)	9A340	C426	19B516	Power Windows)	14024
C401 (F)	13B440	C427	13412	C607 (With	
C401 (M)	13412	C427	19B516	Power Windows)	14630
C403 (F)	13B440	C428	19B516	C608 (Without	
C403 (F)	19B516	C429	14405	Power Windows)	14024
C403 (M)	14405	C430	13412	C608 (With	
C405 (F)	13B440	C431	19B516	Power Windows)	14630
C405 (F)	19B516	C432	18C618	C900	14334
C405 (M)	14405	C433	18C619	C916	14334
C406 (F)	18C618	C502	14631	C916	14335
C406 (M)	14405	C503 (Without		C917	14334
C406 (M)	13B440	Power Windows)	14025	C917	14335
C406 (M)	13B440	C503 (Without		C918	14335
C406 (M)	13B440	Power Windows)	14631	C926	14335
C406 (M)	13B440	C504	14631	C927	14334
C406 (M)	13B440	C505	14631		



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160-1 VEHICLE REPAIR LOCATION CODES

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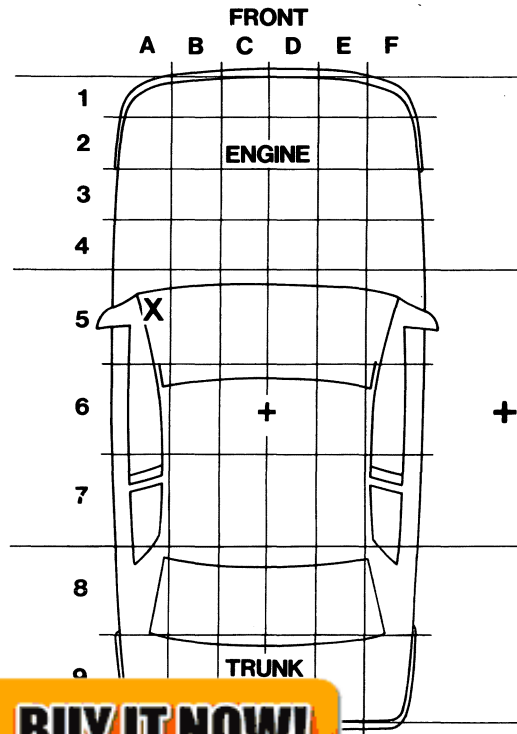
VEHICLE REPAIR LOCATION CODES

TO PINPOINT THE ACTUAL VEHICLE LOCATION OF A REPAIR, THE VEHICLE REPAIR LOCATION CODE IS REQUIRED.

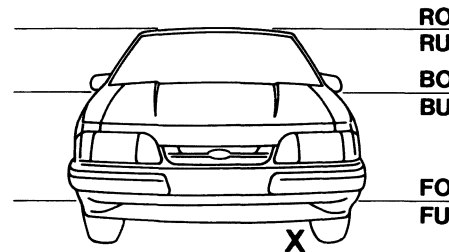
FOR EXAMPLE, AN "X" HAS BEEN PLACED IN THE QUADRANT OF THE VEHICLE DIAGRAMS INDICATING THE LOCATION OF THE REPAIR. SEE DIAGRAMS.

LOCATION CODE, FOR THE EXAMPLE IS: A5/FU —
(UNDER THE FLOOR OF DRIVER'S LEFT FOOT.)

FRONT/REAR DIRECTION

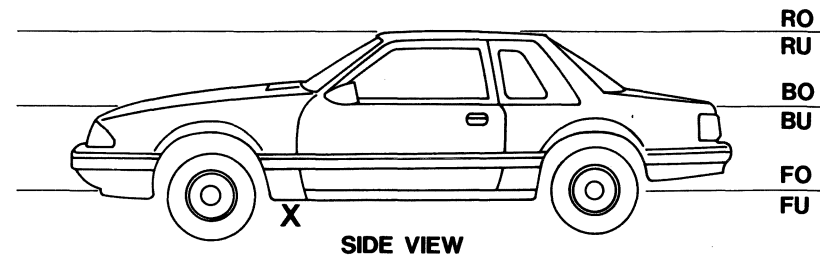


OVER/UNDER DIRECTION



- R = ROOF LINE
- RO = ROOF OVER
- RU = ROOF UNDER
- B = BELT LINE
- BO = BELT OVER
- BU = BELT UNDER
- F = FLOOR PAN
- FO = FLOOR OVER
- FU = FLOOR UNDER

+ CENTER OF VEHICLE



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