

ENGINE INSTRUMENTATION

1L

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GENERAL INFORMATION

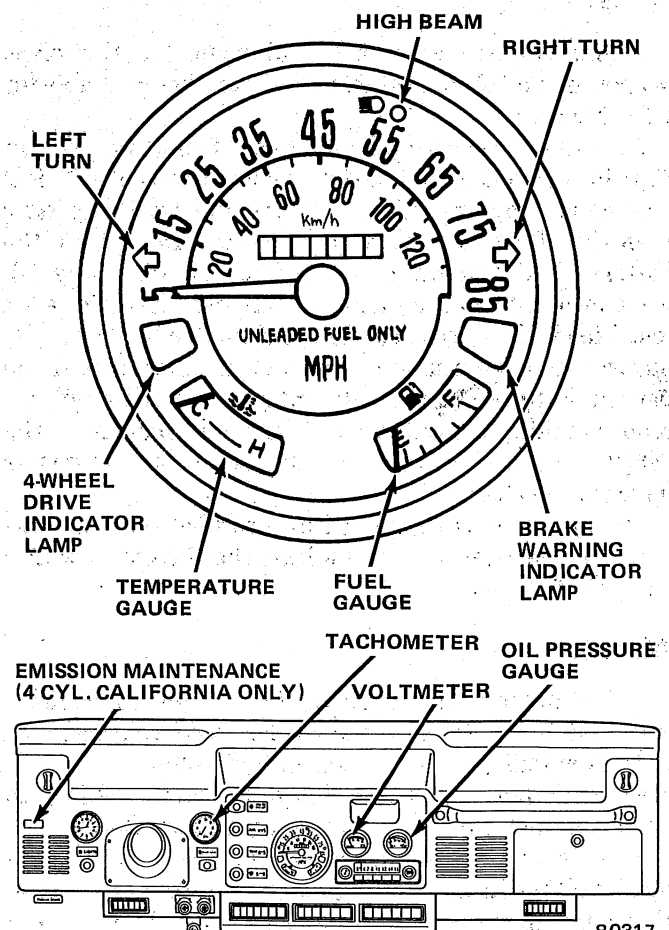
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GENERAL

This chapter is divided into three sections. The first section, General Information, contains descriptions of all instrumentation, theory of operation, test procedures and replacement procedures. The second section, Diagnosis and Repair Simplification (DARS) Charts, contains pictorial guides for diagnosing instrumentation malfunctions. The third section, Specifications, contains specifications, instrument cluster illustrations, instrument cluster and printed circuit board schematics and separate schematics for each gauge, meter and lamp circuit.

Engine instrumentation includes all instrument panel gauges, meters and lamps used to monitor the engine-related systems included in part one of this manual. Refer to Chapter 3C—Instrument Panels and Components for speedometer, odometer, clock, illumination lamps, turn signal indicator lamps and high beam indicator lamp. The instrumentation included in this chapter involves: ammeter, voltmeter, constant voltage regulator (CVR), fuel gauge, oil pressure gauge, tachometer, and coolant temperature gauge (figs. 1L-1 and 1L-2). These devices are all electrically operated.

NOTE: All reference pertaining to CJ vehicles includes Scrambler vehicles.



1L-2 ENGINE INSTRUMENTATION

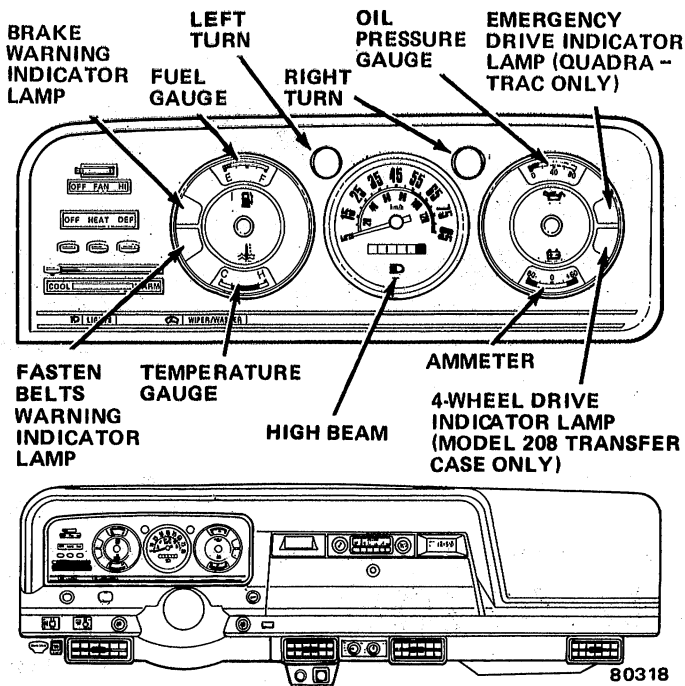


Fig. 1L-2 Cherokee-Wagoneer-Truck Instrumentation

OPERATION

Ammeter

Ammeters are standard equipment for Cherokee, Wagoneer and Truck vehicles. They are not available for CJ vehicles.

An ammeter is an instrument used to indicate current flow into or out of the battery. Whenever the electrical load caused by the vehicle electrical devices is greater than the alternator can supply, current flows from the battery, and the ammeter indicates a discharge (-). Whenever alternator output is greater than the electrical load, the excess current is available to charge the battery, and the ammeter indicates a charge (+). If the battery is fully charged, the integral voltage regulator reduces alternator output to supply only enough for the vehicle electrical load. When this occurs, the ammeter indicates no charge.

The ammeter is connected in series between the battery and the alternator to indicate the current flow into and out of the battery.

Voltmeter

A voltmeter is standard equipment for CJ vehicles only and is not available for other Jeep vehicles. The voltmeter indicates alternator output voltage. This provides an indication of the charging system's ability to maintain the battery in a charged condition. Continuous voltage indications in either the high or low red bands signify either improper regulation, a broken or slipping alternator drive belt, shorted alternator diode(s) or a defective battery. Low voltage indications in the green

band are normal at idle or after prolonged engine starter motor operation. Continuous voltage indications in the low green band with the engine above idle speed signify faulty alternator operation.

Constant Voltage Regulator (CVR)

Several vehicle gauges are designed to operate on low voltage. The constant voltage regulator (CVR) provides approximately 5 volts for this purpose. Battery voltage is supplied to the CVR. The CVR contains a small heating coil and thermostatically operated points. With battery voltage applied to the CVR, the points vibrate at a rate that produces an average of 5 volts for the gauges. The CVR is an integral part of the fuel gauge for CJ vehicles and the coolant temperature gauge for Cherokee, Wagoneer and Truck vehicles. An external circuit is used to apply the CVR voltage to the other gauges.

Fuel Gauge

Fuel gauges for all vehicles operate on regulated voltage provided by the constant voltage regulator (CVR). The fuel gauge system consists of a gauge, a variable-resistance sending unit located in the fuel tank, appropriate wiring and the CVR.

The gauge pointer is attached to a bimetallic coil that responds to temperature changes. A heating coil wrapped around the bimetallic coil provides heat that causes the bimetal to expand. Current flows from the sending unit in the fuel tank through the heating coil to the CVR (B +). The sending unit has high resistance at low fuel level and very low resistance at high fuel level.

Oil Pressure Gauge

An oil pressure gauge is standard equipment for all Jeep vehicles.

CJ Vehicles

The oil pressure gauge system consists of an electromagnetic-type gauge, a variable-resistance sending unit and appropriate wiring. Battery voltage is applied to the two coils in the gauge. One coil is connected directly to ground. The other coil is connected to the sending unit. The variable resistance in the sending unit is controlled by the oil pressure. Electromagnetic fields expand around both coils in the gauge. The pointer is influenced greater by the coil having the most current flow and the resulting more intense electromagnetic field.

Cherokee-Wagoneer-Truck

The oil pressure gauge system consists of a gauge, a variable-resistance sending unit, appropriate wiring and the constant voltage regulator (CVR). The gauge pointer is attached to a bimetallic strip that reacts to temperature changes. A heating coil wrapped around the bimetallic coil provides heat that causes the bimetal to

expand. Current flows from the sending unit (connected to the cylinder block) through the heating coil to the CVR (B +).

Tachometer

Tachometers are optional instruments available for CJ vehicles only.

Tachometers are wired in series between the ignition switch terminal and the ignition coil negative terminal. The current flow through the coil is turned on and off by the ignition system and the tachometer integrates the interruptions. The engine rpm is directly proportional to the integrated voltage amplitude.

Coolant Temperature Gauge

A coolant temperature gauge is standard equipment for all vehicles.

All temperature gauges operate on regulated voltage provided by the constant voltage regulator (CVR). The temperature gauge system consists of a gauge, a variable-resistance sending unit, appropriate wiring and the CVR.

The gauge pointer is attached to a bimetallic coil that reacts to temperature changes. A heating coil wrapped around the bimetallic coil provides heat that causes the bimetal to expand. Current flows from the sending unit (connected to the engine) through the heating coil to the CVR (B +). The sending unit has high resistance at low engine coolant temperature and very low resistance at high engine coolant temperature.

Emission Maintenance Indicator Lamp

The emission maintenance indicator lamp is used only with four-cylinder engine vehicles (CJ) manufactured for sale in California. This lamp is illuminated at 30,000 miles (48 280 km) to indicate required service for the oxygen sensor (C4 System). Refer to Maintenance—Chapter B and Exhaust Systems—Chapter 1K for additional information.

After performing the service, the emission maintenance switch must be reset by turning the reset screw on the switch body. The switch is located under the hood between the upper and lower speedometer cables on the left side of the dash panel. Turn the spring loaded reset screw approximately 1/4 turn counterclockwise to the reset detent position.

INSTRUMENTATION DIAGNOSIS

General

Improper operation of electrical gauges or meters can be usually traced to either faulty electrical wiring continuity (including printed circuit boards), improperly calibrated components or high resistance caused by loose or corroded connections.

A common diagnostic procedure is to bypass a suspected component, wire, printed circuit, or connection with a jumper wire. If the gauge or meter functions normally with the jumper wire installed, the problem usually is within the bypassed printed circuit, wire, connection or component.

Test Equipment

Several gauge tests require the use of Universal Gauge Tester J-24538. This instrument provides a wide range of variable resistance. If the tester is not available, a suitable substitute can be constructed with an accurate ohmmeter and a spare fuel gauge sending unit.

(1) Attach one ohmmeter test probe to sending unit terminal.

(2) Attach other ohmmeter test probe to sending unit ground wire.

(3) Refer to applicable Sending Unit Resistance (Ohms) chart for resistance values that apply to gauge being tested. Charts are included in Specifications. To calibrate, move float arm and mark appropriate resistance values on sending unit case.

(4) Remove ohmmeter probes. Attach jumper wire to sending unit terminal. Tester is now calibrated and ready for use.

Printed Circuit Board Test

The following procedure is used to locate suspected breaks or short circuits in the conducting foil.

(1) Remove instrument cluster from vehicle and remove all bulbs, gauges and meters. Refer to Instrument Cluster Replacement for procedure.

CAUTION: *When using ohmmeter, disconnect power from circuit being tested. Otherwise ohmmeter internal circuits will be destroyed.*

(2) Connect one ohmmeter test probe to applicable pin terminal for circuit to be tested. Trace each circuit from pin terminal to bulb, gauge or meter terminal in circuit with other test probe.

NOTE: *Set ohmmeter for the low resistance scale (0 to 10 ohms) and zero meter pointer.*

(3) Test for continuity at each uncoated position in circuit. Ohmmeter should indicate zero ohms at each position.

NOTE: *When circuit tracing, time can be saved by starting at the middle of the circuit. This will isolate circuit defects to one half of the circuit.*

(4) Trace circuit leading away from bulb or gauge terminal to ground terminal pin or ground screw.

(5) Connect one ohmmeter probe to ground terminal pin and other probe to cluster metal case. Ohmmeter should indicate zero ohms.

(6) Replace printed circuit board if ohmmeter indicates other than zero ohms on any test.

(7) Test for short circuits between circuits. With probe connected to applicable pin for circuit to be tested, move other probe to all other pin terminals on cluster. Ohmmeter should indicate infinite resistance between circuits.

Ammeter Diagnosis

The accuracy of an ammeter may be determined by comparing indications with those of a test ammeter of known accuracy.

(1) Turn ignition switch off.

(2) Disconnect battery positive cable from terminal on starter motor solenoid.

CAUTION: *Test ammeter must be an actual ammeter, not a voltmeter with a calibrated ammeter scale. Connecting a voltmeter in series will destroy its internal circuitry.*

(3) Connect test ammeter in series between solenoid terminal and disconnected cable.

(4) Turn ignition switch to On position. Do not start engine. Turn headlamps on. Turn heater blower motor to high speed.

(5) Compare current flow (amps) indication of test ammeter with that of ammeter installed in vehicle.

(6) Turn headlamps and heater blower motor off. Start engine and operate at high idle. Compare current flow (amps) indication of test ammeter with that of ammeter installed in vehicle.

(7) Replace ammeter if current flow (amps) indications of vehicle ammeter and test ammeter vary more than calibration tolerance listed in Specifications.

Voltmeter Diagnosis

(1) Connect test voltmeter of known accuracy across battery terminals.

(2) Turn ignition switch on.

(3) Compare voltage indication of test voltmeter with that of voltmeter installed in vehicle. Replace voltmeter if voltage indications vary more than calibration tolerance listed in Specifications.

Fuel Gauge Diagnosis

Movement of the fuel in the tank can occur when driving up or down hills, driving on rough surfaces or by rapid acceleration or sudden braking. Erratic up and down motion of the fuel gauge sending unit float may temporarily cause the fuel gauge pointer to fluctuate and indicate incorrectly. Ensure that all these possibilities are considered before suspecting an actual abnormal condition in the fuel level indicating system.

Abnormal conditions all result from variations of four basic malfunctions:

- pointer does not move,
- pointer moves but indicates a fuel level that does not correspond with the actual fuel level,
- pointer moves to the top of the scale and remains there,
- pointer pulsates.

Refer to DARS chart 1 for a systematic method of locating the causes of these abnormal conditions. Charts 2 and 3 provide additional procedures that should be used only as directed in chart 1.

Oil Pressure Gauge Diagnosis

An oil pressure gauge malfunction can result in any one of the following conditions:

- pointer does not move,
- pointer moves but indicates an oil pressure that does not correspond with the actual oil pressure,
- pointer moves to the top of the scale and remains there,
- pointer pulsates.

Refer to DARS chart 4 or 5 for a systematic method of locating the causes of these abnormal conditions.

Calibration Test

If an oil pressure gauge is suspected of indicating pressure that does not correspond with the actual oil pressure, perform a calibration test before performing electrical diagnosis procedures in DARS chart 4 (CJ) or 5 (Cherokee, Wagoneer and Truck).

(1) Remove oil pressure sending unit from cylinder block. Install T-fitting in cylinder block. Connect sending unit to T-fitting.

(2) Connect oil pressure test gauge to T-fitting.

(3) Start engine. Compare pressure indicated on vehicle gauge with that on test gauge. Conduct comparison at idle and at higher engine speeds. If both gauge indications are same (within 10 percent), vehicle gauge is acceptable. If gauge is not within specification, perform gauge test as outlined in DARS chart 4 or 5.

(4) After performing test, remove T-fitting, install sending unit and inspect for oil leaks.

Tachometer Diagnosis

Test the accuracy of a tachometer by comparing with rpm indications of a test tachometer of known accuracy. A service (TACH) terminal is located on the ignition coil connector for the test tachometer connection. Refer to Chapter 1G—Ignition Systems. Tachometers are not adjustable. Replace if defective.

NOTE: *Some test tachometers may not be compatible with the High Energy Ignition (HEI) System used with four-cylinder engines. Consult the manufacturer of the test tachometer if problems arise.*

Coolant Temperature Gauge Diagnosis

Before performing a coolant temperature gauge diagnosis, ensure the cooling system is functioning normally. Overheating can be caused by low coolant level, restrictions, loose or broken drive belt(s), defective water pump or incorrect ignition timing. Undercooling can be caused by a stuck thermostat (in open position). Consider these possibilities before suspecting an actual malfunction in the coolant temperature gauge system. A coolant temperature gauge malfunction can result in any one of the following conditions:

- pointer does not move,
- pointer moves but indicates a coolant temperature that does not correspond with the actual coolant temperature,
- pointer moves to the top of the scale and remains there,
- pointer pulsates.

Refer to DARS chart 6 for a systematic method of locating the causes of these abnormal conditions. Charts 2 and 3 provide additional procedures that should be used only as directed in chart 6.

INSTRUMENT CLUSTER REPLACEMENT

CJ Vehicles

Removal

- (1) Disconnect battery negative cable.
- (2) Disconnect speedometer cable from speedometer.
- (3) Remove four attaching nuts and pull cluster from mounting studs.
- (4) Note positions of all lamps. Note wire colors for reference during installation.
- (5) Remove gauge/meter wires and lamps.

Installation

- (1) Install gauge and meter wires and lamps in cluster.
- (2) Position cluster on mounting studs and install attaching nuts.
- (3) Connect speedometer cable.
- (4) Connect battery negative cable.
- (5) Reset clock, if equipped.

Cherokee-Wagoneer-Truck Vehicles

Removal

- (1) Disconnect battery negative cable.
- (2) Remove cluster retaining screws.
- (3) Disconnect speedometer cable at cluster.

(4) Disconnect cluster terminal pin plug by pulling straight off.

- (5) Disconnect four-terminal connector.
- (6) Identify and tag ammeter wires for installation reference. Disconnect ammeter wires.
- (7) Disconnect blower motor wire connector.
- (8) Disconnect vacuum hoses from heater control.

NOTE: Tag each hose according to its numbered location to ensure proper connection when installing cluster.

- (9) Remove heater control panel lamps.
- (10) Disconnect heater temperature control wire from lever.
- (11) Remove cluster assembly.

Installation

- (1) Connect wiring harness connectors and install lamps in heater control.
- (2) Connect heater temperature control wire to lever.
- (3) Connect vacuum hoses to heater control.
- (4) Connect cluster wire connectors.
- (5) Install ammeter wires at original locations. If wires are reversed, ammeter will indicate in reverse (i.e., discharge instead of charge). Ensure wire terminal nuts are tight, otherwise electrical system failure will result.
- (6) Connect speedometer cable.
- (7) Position cluster on instrument panel and install screws.
- (8) Connect battery negative cable.
- (9) Reset clock, if equipped.

GAUGE AND METER REPLACEMENT

Ammeter—Cherokee-Wagoneer-Truck Vehicles

- (1) Remove cluster.
- (2) Remove printed circuit board and gauge assembly from bezel.
- (3) Remove mask from oil pressure gauge and ammeter.

CAUTION: Use care to prevent scratching paint on mask.

- (4) Remove attaching nuts and remove ammeter.
- (5) Install replacement ammeter, connect wires and tighten nuts. If nuts are not properly tightened electrical failure will result.
- (6) Install mask and screws.
- (7) Install printed circuit board and gauge assembly on bezel.
- (8) Install cluster.
- (9) Start engine and observe ammeter for proper operation.

Voltmeter—CJ Vehicles

- (1) Disconnect illumination lamp and wire connectors. Note wire locations for installation reference.
- (2) Remove retaining nuts and bracket behind instrument panel.
- (3) Remove gauge from instrument panel.
- (4) Position replacement gauge in instrument panel opening.
- (5) Install bracket and nuts.
- (6) Connect wires to original locations and install lamp.
- (7) Start engine and observe voltmeter for proper operation.

Fuel Gauge—CJ Vehicles

- (1) Remove cluster.
- (2) Carefully uncrimp lip of outer bezel. Remove outer bezel, glass and glass retaining bezel.
- (3) Remove attaching screws from speedometer housing. Remove speedometer and face plate assembly.
- (4) Remove attaching nuts, insulator and fuel gauge.

NOTE: *It may be necessary to carefully move lamp guard aside.*

- (5) Install replacement fuel gauge, insulator and attaching nuts. Place toothed lockwasher on A-terminal. Ensure gauge is properly centered in face plate opening, then tighten nuts.
- (6) Inspect all lamp guards for correct position. Install speedometer and face plate assembly. Install attaching screws and washers.
- (7) Examine glass for fingerprints and debris. Clean as necessary.
- (8) Install glass, glass retaining bezel and outer bezel. Crimp outer bezel lip four places.
- (9) Install cluster.
- (10) With ignition switch On, observe fuel gauge for proper operation.

Fuel Gauge—Cherokee-Wagoneer-Truck Vehicles

- (1) Remove cluster.
- (2) Remove printed circuit board and gauge assembly from bezel.
- (3) Remove mask from fuel gauge and coolant temperature gauge.

CAUTION: *Use care to prevent scratching paint on mask.*

- (4) Remove attaching nuts and fuel gauge.
- (5) Install replacement fuel gauge and tighten nuts.
- (6) Install mask and screws.
- (7) Install printed circuit board and gauge assembly on bezel.

- (8) Install cluster.
- (9) With ignition switch On, observe fuel gauge for proper operation.

Oil Pressure Gauge—CJ Vehicles

- (1) Remove illumination lamp and disconnect wire connectors.
- (2) Remove retaining nuts and bracket behind instrument panel.
- (3) Remove gauge from instrument panel.
- (4) Position replacement gauge in instrument panel opening.
- (5) Install bracket and nuts.
- (6) Connect wire connectors and install lamp.
- (7) Start engine and observe oil pressure gauge for proper operation.

Oil Pressure Gauge—Cherokee-Wagoneer-Truck Vehicles

- (1) Remove cluster.
- (2) Remove printed circuit board and gauge assembly from bezel.
- (3) Remove mask from oil pressure gauge and ammeter.

CAUTION: *Use care to prevent scratching paint on mask.*

- (4) Remove attaching nuts and remove oil pressure gauge.
- (5) Install replacement oil pressure gauge and tighten nuts.
- (6) Install mask and screws.
- (7) Install printed circuit board and gauge assembly on bezel.
- (8) Install cluster.
- (9) Start engine and observe oil pressure gauge for proper operation.

Tachometer—CJ Vehicles

- (1) Disconnect following wire connectors.
 - (a) Black ground wire.
 - (b) Orange illumination lamp wire.
 - (c) Red and red with tracer wires (six-cylinder engines) or three-terminal connector (four-cylinder engines).
- (2) Remove screw and retaining cup.
- (3) Remove tachometer from instrument panel.

NOTE: *It is possible to start engine with tachometer removed. With jumper wire, connect harness wire connectors (that were originally connected to tachometer) together.*

- (4) Install replacement tachometer, cup and screw.
- (5) Connect wire connectors and ground wires.
- (6) Start engine and observe tachometer for proper operation.

Coolant Temperature Gauge—CJ Vehicles

- (1) Remove cluster.
- (2) Carefully uncrimp lip of outer bezel. Remove outer bezel, glass and glass retaining bezel.
- (3) Remove attaching screws from speedometer housing. Remove speedometer and face plate assembly.
- (4) Remove attaching nuts and remove insulator and coolant temperature gauge.

NOTE: *It may be necessary to carefully move lamp guard aside.*

- (5) Install replacement gauge, insulator and attaching nuts. Place toothed lockwasher on S-terminal. Ensure gauge is properly centered in face plate opening, then tighten nuts.
- (6) Inspect all lamp guards for correct position. Install speedometer and face plate assembly. Install attaching screws and washers.
- (7) Examine glass for fingerprints and debris. Clean as necessary.
- (8) Install glass, glass retaining bezel and outer bezel. Crimp outer bezel four places.
- (9) Install cluster.
- (10) Start engine and observe coolant temperature gauge for proper operation.

Coolant Temperature Gauge—Cherokee-Wagoneer-Truck Vehicles

- (1) Remove cluster.
- (2) Remove printed circuit board and gauge assembly from bezel.
- (3) Remove mask from fuel gauge and coolant temperature gauge.

CAUTION: *Use care to prevent scratching paint on mask.*

- (4) Remove attaching nuts and remove coolant temperature gauge.
- (5) Install replacement gauge and tighten nuts.
- (6) Install mask and screws.
- (7) Install printed circuit board and gauge assembly on bezel.
- (8) Install cluster.
- (9) Start engine and observe coolant temperature gauge for proper operation.

PRINTED CIRCUIT BOARD REPLACEMENT

Only Cherokee, Wagoneer and Truck vehicles are equipped with a printed circuit board. CJ vehicles have conventional wiring for all gauges, meters and cluster illumination lamps.

Removal

- (1) Remove instrument cluster.
- (2) Remove radio noise suppressor (connector strip if not equipped with radio).
- (3) Remove all illumination lamps from cluster. Turn counterclockwise to remove.
- (4) Remove printed circuit board and gauge/meter assembly.
- (5) Remove retaining nuts from ammeter and oil pressure gauge.
- (6) Lift ammeter, oil pressure gauge and plate out of cluster as assembly.
- (7) Remove retaining nuts from fuel and coolant temperature gauges. Remove large ground screw from printed circuit board above speedometer.
- (8) Remove speedometer, fuel gauge, and coolant temperature gauge as assembly.

Installation

- (1) Install printed circuit board. Ensure blue illumination lamp diffusers are correctly positioned. Install ground screw and gauge retaining nuts.
- (2) Install ammeter and oil pressure gauge assembly on circuit board. Ensure blue lamp diffuser is correctly positioned. Install retaining nuts. Stamped nuts are used for oil pressure gauge. Plain nuts and lockwashers are used for ammeter. Ensure ammeter wire terminal nuts are properly tightened, otherwise electrical failure will result.
- (3) Examine gauge lenses for fingerprints and debris. Clean as necessary.
- (4) Install printed circuit board and gauge assembly on bezel.
- (5) Install illumination lamps.
- (6) Install radio noise suppressor or connector strip.
- (7) Install cluster.
- (8) Start engine and observe all gauge, meters and lamps for proper operation.

CONSTANT VOLTAGE REGULATOR (CVR) REPLACEMENT

CJ Vehicles

The CVR is contained in the fuel gauge housing. If the CVR is defective, replace the fuel gauge. Refer to Fuel Gauge Replacement.

Cherokee-Wagoneer-Truck Vehicles

The CVR is contained in the coolant temperature gauge housing. If the CVR is defective, replace the coolant temperature gauge. Refer to Coolant Temperature Gauge Replacement.

DIAGNOSIS AND REPAIR SIMPLIFICATION (DARS) CHARTS

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| Coolant Temperature Gauge Not Functioning Properly | 1L-33 | Oil Pressure Gauge Not Functioning Properly | |
| Fuel Gauge Not Functioning Properly | 1L-9 | (Cherokee-Wagoner-Truck) | 1L-27 |
| Fuel Gauge and Coolant Temperature Gauge Both Malfunction | 1L-20 | Oil Pressure Gauge Not Functioning Properly (CJ) | 1L-22 |
| Gauge Fuse Blown | 1L-18 | | |

Note: Refer to Chapter A – General Information for details on how to use this DARS chart.

Chart 1

PROBLEM: FUEL GAUGE NOT FUNCTIONING PROPERLY

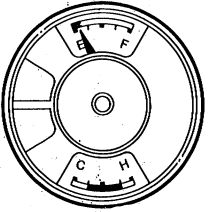

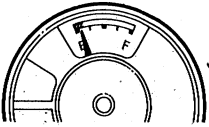
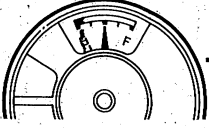
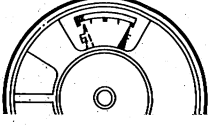


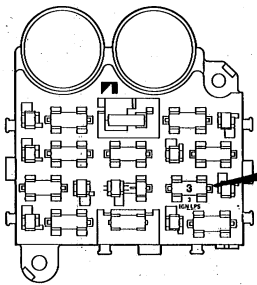




| STEP | SEQUENCE | RESULT |
|------|---|---|
| 1 | <p>● NOTE POSITION OF FUEL GAUGE POINTER</p>  <p>● TURN IGNITION SWITCH ON AND WAIT 2 MINUTES FOR GAUGE TO WARM UP</p>  <p>● OBSERVE POINTER</p> <p>POINTER DOES NOT MOVE</p>  <p>POINTER MOVES TO INCORRECT POSITION</p>  <p>POINTER MOVES TO MAXIMUM AND STAYS</p>  <p>POINTER PULSATES MORE THAN WIDTH OF POINTER</p>  <div data-bbox="183 756 662 1050" style="border: 1px solid black; padding: 5px;"> <p>BEFORE STARTING TEST:</p> <p><input checked="" type="checkbox"/> ENGINE MUST BE WARM</p> <p><input checked="" type="checkbox"/> FUEL TANK MUST BE NEITHER COMPLETELY FULL NOR COMPLETELY EMPTY</p> </div> <p>REPLACE CVR</p>  | <p>2</p> <p>20</p> <p>10</p> <p>STOP</p> |
| 2 |  <p>CHECK 3-AMP FUSE AT FUSE PANEL</p> <p>FUSE BLOWN</p>  <p>FUSE NOT BLOWN</p>  | <p>GO TO CHART 2 STEP 1</p> <p>3</p> |
| 3 | <p>OBSERVE TEMPERATURE GAUGE</p> <p>TEMPERATURE GAUGE POINTER DOES NOT MOVE</p>  <p>TEMPERATURE GAUGE POINTER INDICATES PROPERLY</p>  <p>CJ VEHICLES</p> <p>CHEROKEE WAGONEER TRUCK VEHICLES</p> | <p>GO TO CHART 3 STEP 1</p> <p>4</p> <p>7</p> |

Chart 1

STEP

SEQUENCE

RESULT

4

- REMOVE CLUSTER
- DO NOT DISCONNECT WIRES

CONNECT JUMPER WIRE BETWEEN CLUSTER CASE AND INSTRUMENT PANEL

CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION

CHECK FOR PRESENCE OF VOLTAGE AT GAUGE INPUT

OK
VOLTAGE NOT PRESENT

LOCATE AND REPAIR FAULT IN JUMPER STRAP

STOP

OK
VOLTAGE PRESENT

5

5

GROUND SENDING UNIT TERMINAL OF GAUGE

POINTER MOVES

POINTER DOES NOT MOVE

REPLACE GAUGE

STOP

6

6

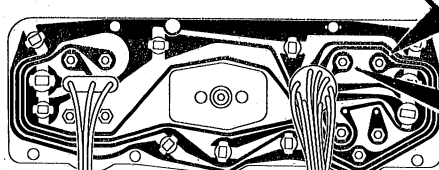





LOCATE AND REPAIR OPEN CIRCUIT IN SENDING UNIT WIRE

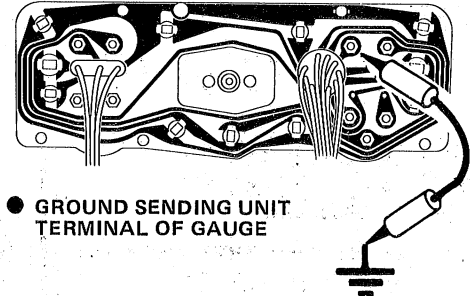





STOP

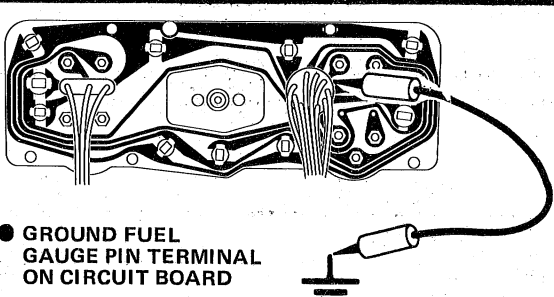
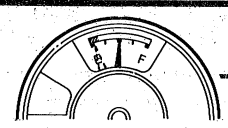


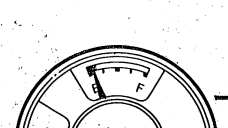


Chart 1 RESULT

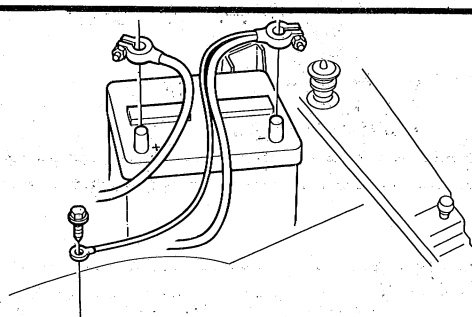




STEP


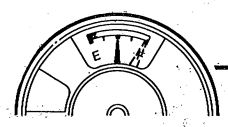

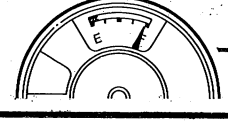

SEQUENCE

| | | | |
|---|---|---|---|
| 7 | <ul style="list-style-type: none"> ● REMOVE CLUSTER ● DO NOT DISCONNECT INSTRUMENT CLUSTER WIRING CONNECTOR  | <p>CHECK FOR PRESENCE OF VOLTAGE AT GAUGE INPUT</p> <p> →  → </p> <p>VOLTAGE NOT PRESENT → REPLACE CIRCUIT BOARD</p> | 8 |
| | | <p>CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION</p> <p> → </p> <p>VOLTAGE PRESENT</p> | |

| | | | |
|---|---|--|---|
| 8 | <ul style="list-style-type: none"> ● GROUND SENDING UNIT TERMINAL OF GAUGE  | <p> → </p> <p>POINTER MOVES → 9</p> | 9 |
| | | <p> →  → </p> <p>POINTER DOES NOT MOVE → REPLACE GAUGE</p> | |

| | | | |
|---|--|--|------|
| 9 | <ul style="list-style-type: none"> ● GROUND FUEL GAUGE PIN TERMINAL ON CIRCUIT BOARD  | <p> →  → </p> <p>POINTER MOVES → REPAIR OPEN CIRCUIT IN SENDING UNIT WIRE</p> | STOP |
| | | <p> →  → </p> <p>POINTER DOES NOT MOVE → REPLACE CIRCUIT BOARD</p> | |

| | | | |
|----|---|--|----|
| 10 | <ul style="list-style-type: none"> ✓ CHECK BATTERY GROUND CABLE ● BROKEN ● MISSING ● CORRODED ● SCREWS LOOSE, MISSING  | <p> → </p> <p>GROUND NOT OK → 11</p> | 11 |
| | | <p> → </p> <p>GROUND OK → 12</p> | |

| | | | |
|----|---|--|----|
| 11 | <ul style="list-style-type: none"> ✓ REPAIR GROUND  | <p> → </p> <p>POINTER DROPS FROM MAXIMUM → STOP</p> | 12 |
| | | <p> → </p> <p>POINTER REMAINS AT MAXIMUM → 12</p> | |

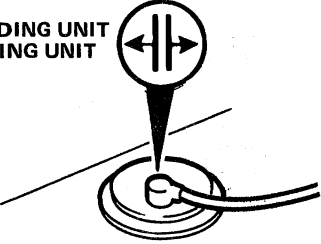
STEP

SEQUENCE


RESULT

12


DISCONNECT SENDING UNIT WIRE FROM SENDING UNIT



POINTER DROPS FROM MAXIMUM



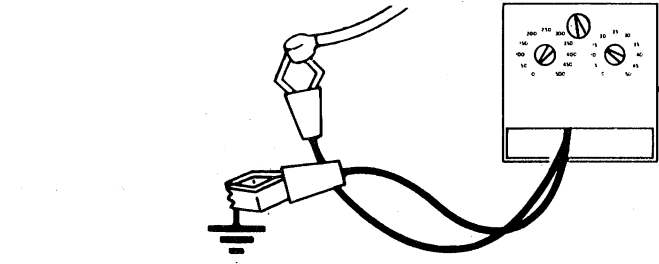
POINTER REMAINS AT MAXIMUM



13

17

13



CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART.

OBSERVE FUEL GAUGE INDICATION AT EACH OHM SETTING.

~~OK~~

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

14

OK

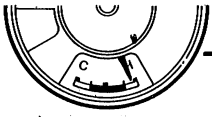
GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

15


14

● OBSERVE TEMPERATURE GAUGE

TEMPERATURE GAUGE POINTER IS AT MAXIMUM

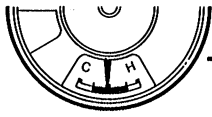


REPAIR CLUSTER GROUND OR REPLACE CVR




STOP

TEMPERATURE GAUGE POINTER INDICATES NORMALLY



REPLACE FUEL GAUGE



STOP

Chart 1 RESULT

STEP

SEQUENCE

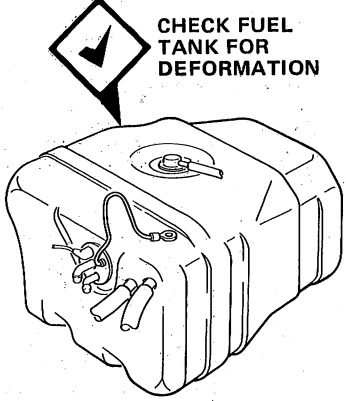

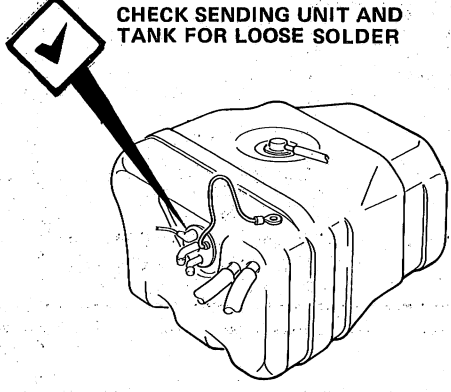


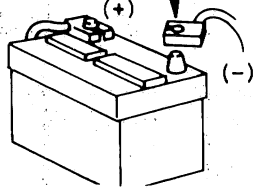
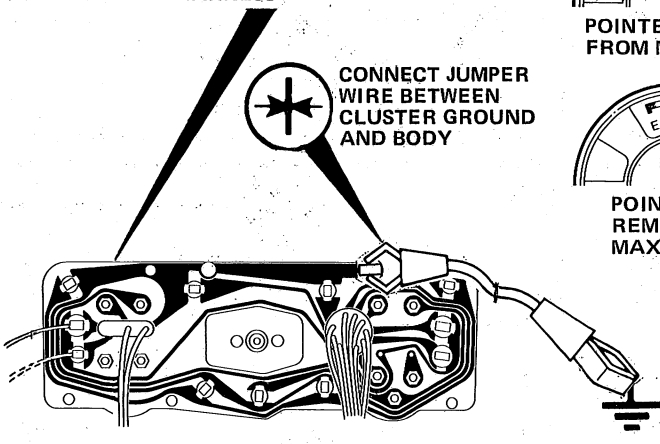

| | | |
|-----------|---|-------------------------|
| <p>15</p> | <p>CHECK FUEL TANK FOR DEFORMATION</p>  <p>OK FUEL TANK NOT DEFORMED</p> <p>OK FUEL TANK DEFORMED</p> <p> REPAIR OR REPLACE FUEL TANK</p> | <p>16</p> <p>STOP</p> |
| <p>16</p> | <p>CHECK SENDING UNIT AND TANK FOR LOOSE SOLDER</p>  <p>OK NO LOOSE SOLDER</p> <p>OK LOOSE SOLDER PRESENT</p> <p> REPLACE SENDING UNIT</p> <p> REMOVE LOOSE SOLDER</p> | <p>STOP</p> <p>STOP</p> |
| <p>17</p> | <p>DISCONNECT BATTERY NEGATIVE CABLE</p>  <p>REMOVE INSTRUMENT CLUSTER. DO NOT DISCONNECT WIRE HARNESS</p> <p>CONNECT JUMPER WIRE BETWEEN CLUSTER GROUND AND BODY</p>  <p>CONNECT BATTERY NEGATIVE CABLE</p> <p>POINTER DROPS FROM MAXIMUM</p> <p>POINTER REMAINS AT MAXIMUM</p> | <p>18</p> <p>19</p> |
| <p>18</p> | <p>REPAIR INSTRUMENT PANEL GROUND</p>  | <p>STOP</p> |

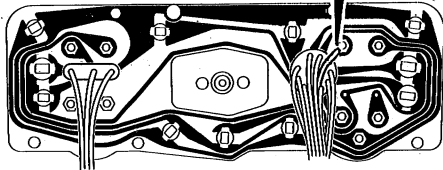
Chart 1
RESULT

STEP

SEQUENCE

19

DISCONNECT SENDING UNIT WIRE FROM CLUSTER



REPAIR OR REPLACE SENDING UNIT WIRE



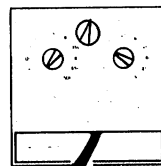
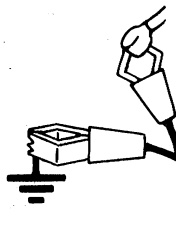
REPLACE GAUGE (CJ)



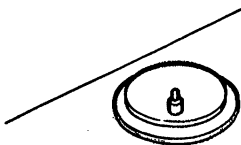
REPLACE CIRCUIT BOARD (CHEROKEE, WAGONEER, TRUCK)



20



CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE



- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE FUEL GAUGE INDICATION AT EACH OHM SETTING.



GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

21
CJ

22
CHEROKEE WAGONEER TRUCK



GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

REPLACE SENDING UNIT

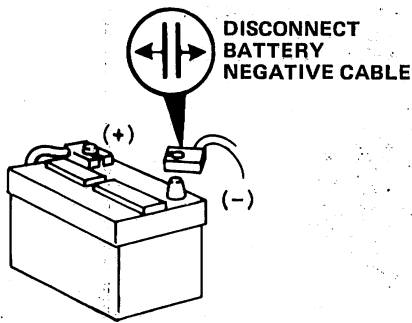


Chart 1 RESULT

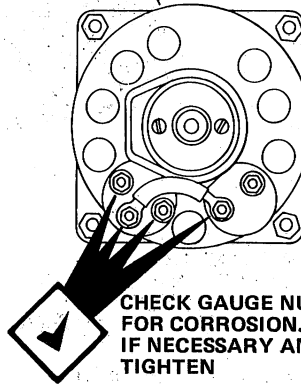
STEP

SEQUENCE

21



REMOVE INSTRUMENT CLUSTER AND DISCONNECT INSTRUMENT WIRES



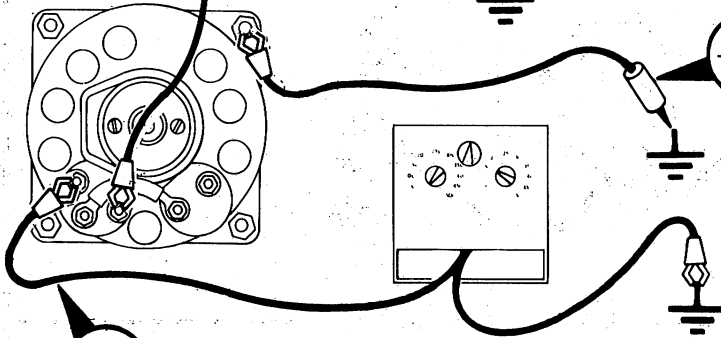
CONNECT JUMPER WIRE IN SERIES WITH 3 AMP FUSE BETWEEN BATTERY VOLTAGE AND GAUGE I-TERMINAL



CONNECT BATTERY NEGATIVE CABLE



CONNECT JUMPER WIRE FROM CLUSTER CASE TO GROUND



CONNECT ONE TESTER LEAD TO FUEL GAUGE SENDING UNIT TERMINAL AND OTHER LEAD TO GROUND



OK

GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING



REPLACE SENDING UNIT WIRE

STOP

OK

GAUGE INDICATIONS NOT OBTAINED AT EACH OHM SETTING

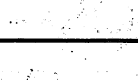
24

OK

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

ALL INDICATIONS HIGH OR ALL INDICATIONS LOW

SOME INDICATIONS HIGH OR LOW, SOME ACCURATE



REPLACE GAUGE

25

STOP

STEP

SEQUENCE

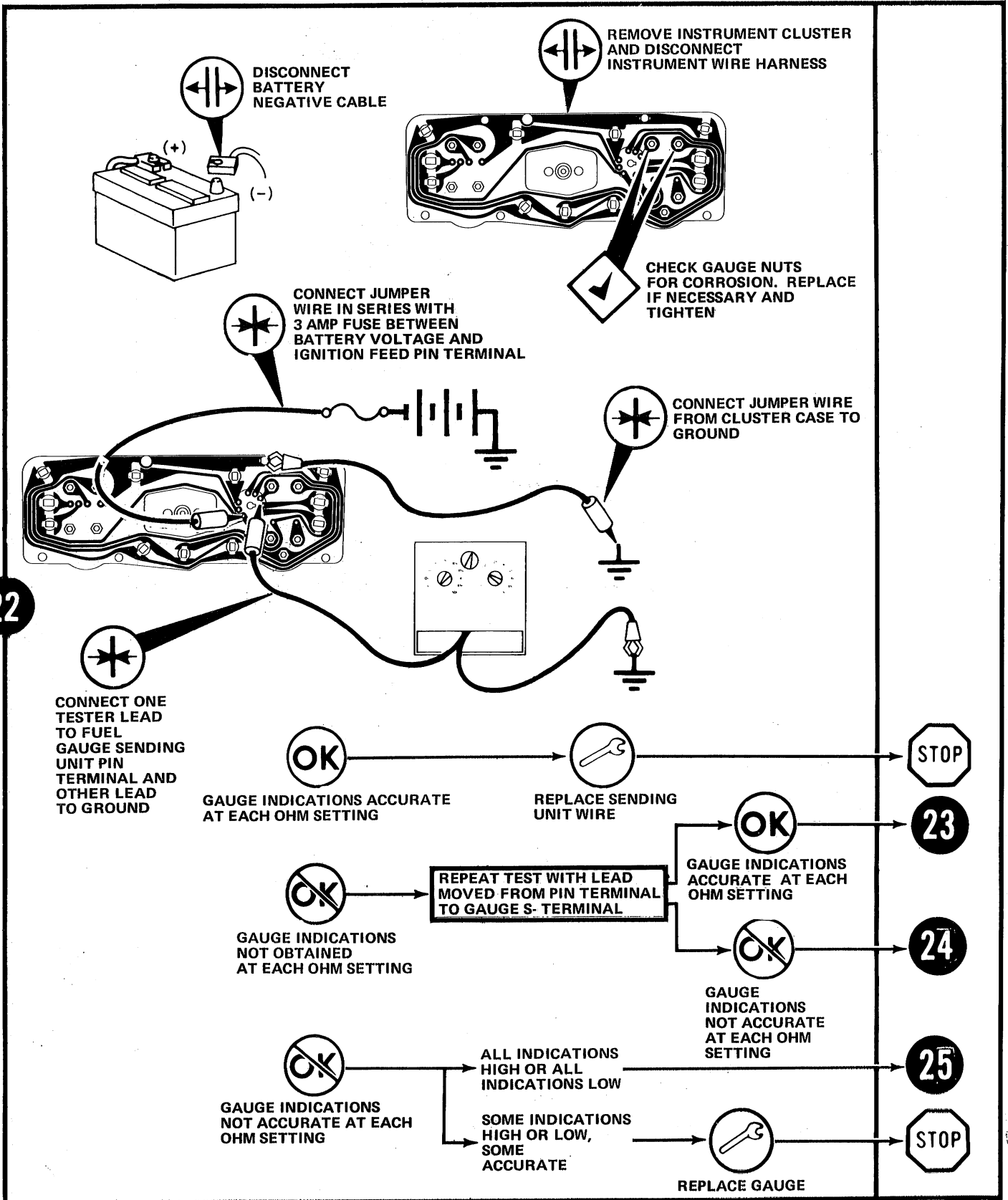
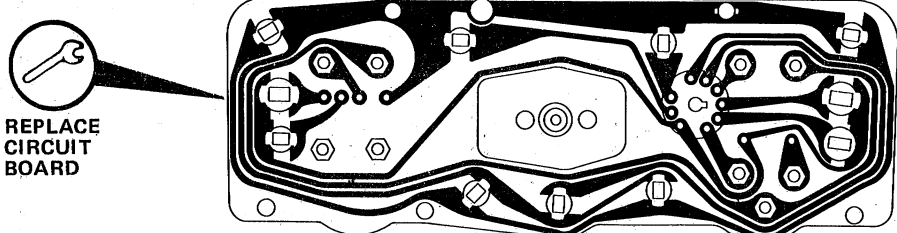

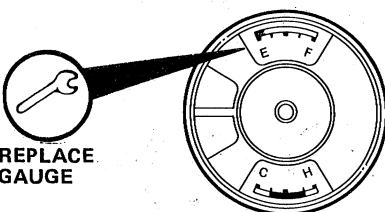

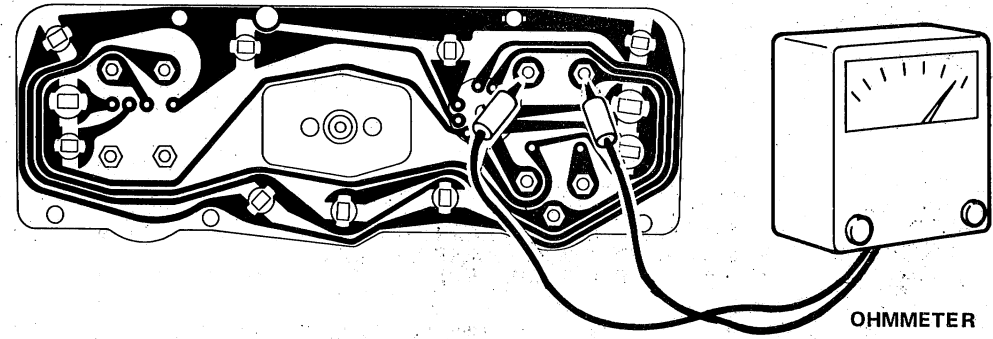










Chart 1

RESULT

STEP

SEQUENCE

| | | |
|------------------|---|--|
| <p>23</p> |  |  |
| <p>24</p> |  |  |
| <p>25</p> |  <p>  CONNECT OHMMETER LEADS TO GAUGE INPUT TERMINAL AND GAUGE SENDING UNIT TERMINAL </p> <p>  COMPARE OHMMETER INDICATIONS WITH VALUES LISTED IN GAUGE RESISTANCE CHART </p> <p>  GAUGE RESISTANCE CORRECT </p> <p>  REPLACE CVR </p> <p>  GAUGE RESISTANCE INCORRECT </p> <p>  REPLACE GAUGE </p> |   |

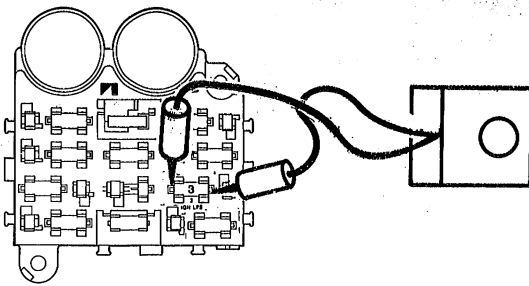
PROBLEM: GAUGE FUSE BLOWN

STEP

SEQUENCE

RESULT

1



CONNECT SHORT TESTER J-8681

OK → SHORT NOT INDICATED → **2**

OK (with slash) → SHORT INDICATED → **3**

2

✓ CHECK FOR INTERMITTENT SHORT

- RED IGNITION WIRE TO GAUGES

OK (with slash) → WRENCH → REPAIR AS NECESSARY → STOP

3

DISCONNECT BATTERY NEGATIVE CABLE

REMOVE INSTRUMENT CLUSTER

DISCONNECT INSTRUMENT WIRE HARNESS CONNECTOR FROM PRINTED CIRCUIT BOARD (CHEROKEE, WAGONEER, TRUCK) OR FROM GAUGES (CJ)

✓ CHECK FOR SHORT AT GAUGE FUSE

✱ CONNECT BATTERY NEGATIVE CABLE

OK (with slash) → SHORT INDICATED → **5**

OK (with slash) → CHEROKEE WAGONEER TRUCK → **6**

OK → SHORT NOT INDICATED → CJ → **7**

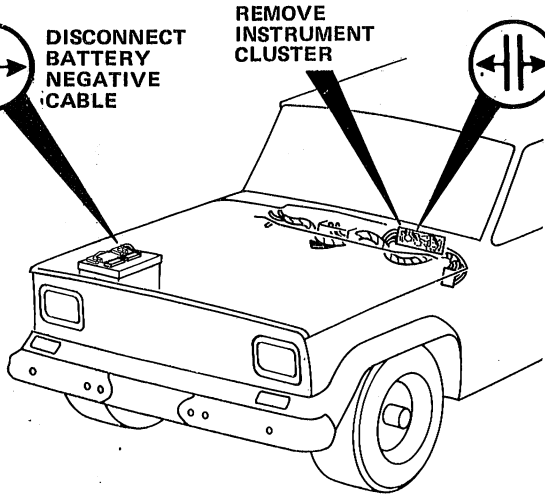


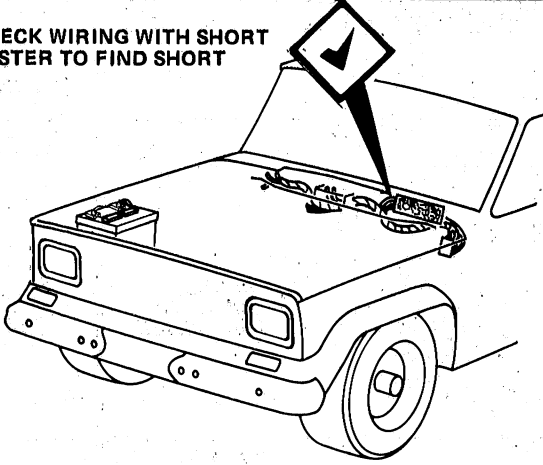
Chart 2 RESULT

STEP

SEQUENCE

4

CHECK WIRING WITH SHORT TESTER TO FIND SHORT

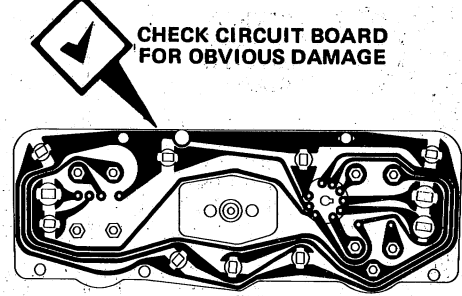


REPLACE SHORTED WIRE HARNESS

STOP

5

CHECK CIRCUIT BOARD FOR OBVIOUS DAMAGE



CIRCUIT BOARD NOT DAMAGED

REPLACE CVR

STOP

CIRCUIT BOARD DAMAGED

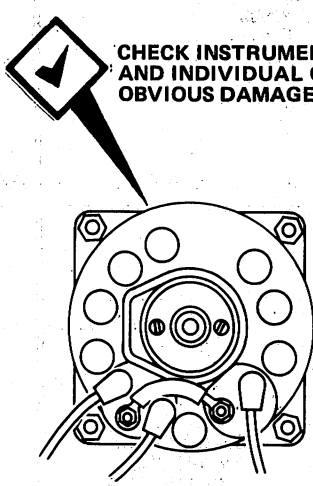
DETERMINE CAUSE OF DAMAGE: CVR OR GAUGE FAULTY

REPLACE CIRCUIT BOARD AND FAULTY COMPONENT

STOP

6

CHECK INSTRUMENT CLUSTER AND INDIVIDUAL GAUGES FOR OBVIOUS DAMAGE



DAMAGE NOT EVIDENT

REPLACE CVR

STOP

DAMAGE EVIDENT

REPLACE DAMAGED COMPONENT

STOP

PROBLEM: FUEL GAUGE AND COOLANT TEMPERATURE GAUGE BOTH MALFUNCTION (ALSO OIL PRESSURE GAUGE ON CHEROKEE, WAGONEER AND TRUCK)

Chart 3

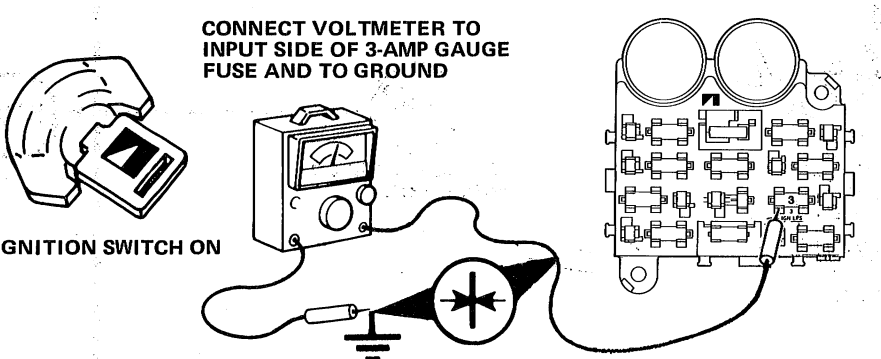
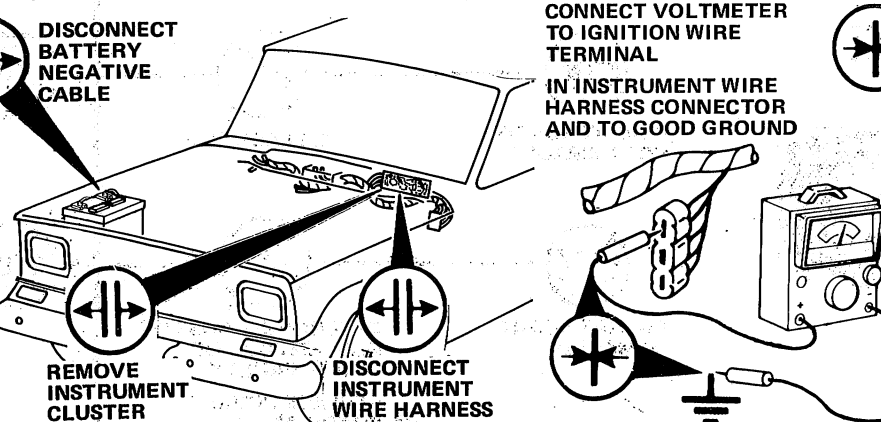
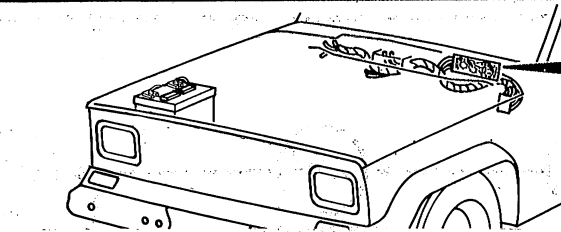
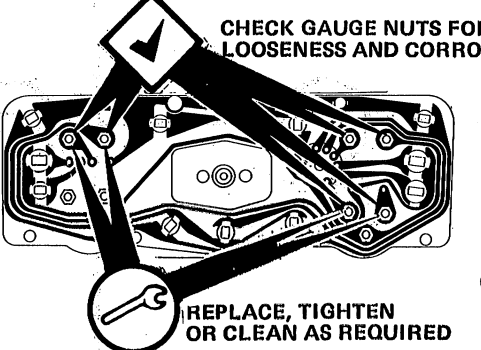
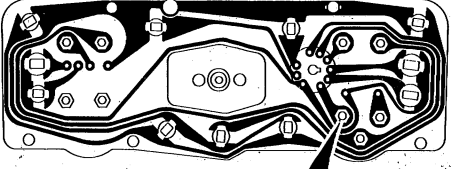








| STEP | SEQUENCE | RESULT |
|-----------------|--|--|
| <p>1</p> | <p>CONNECT VOLTMETER TO INPUT SIDE OF 3-AMP FUSE AND TO GROUND</p>  <p>TURN IGNITION SWITCH ON</p> | <p>RECORD VOLTMETER INDICATION → 2</p> |
| <p>2</p> | <p>DISCONNECT BATTERY NEGATIVE CABLE</p> <p>REMOVE INSTRUMENT CLUSTER</p> <p>DISCONNECT INSTRUMENT WIRE HARNESS CONNECTOR</p> <p>CONNECT VOLTMETER TO IGNITION WIRE TERMINAL IN INSTRUMENT WIRE HARNESS CONNECTOR AND TO GOOD GROUND</p> <p>CONNECT BATTERY NEGATIVE CABLE</p>  | <ul style="list-style-type: none"> ● VOLTMETER INDICATION DIFFERENT FROM STEP 1 → 3 ● VOLTMETER INDICATION SAME AS STEP 1 → 4 CHEROKEE WAGONEER TRUCK → 7 CJ → 7 |
| <p>3</p> | <p>REPAIR OR REPLACE INSTRUMENT PANEL WIRE HARNESS</p>  | <p>STOP</p> |
| <p>4</p> | <p>CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION</p> <p>REPLACE, TIGHTEN OR CLEAN AS REQUIRED</p> <p>CONNECT JUMPER WIRES AND VOLTMETER</p> <ul style="list-style-type: none"> ● JUMPER WIRE BETWEEN CLUSTER CASE AND GROUND ● JUMPER WIRE IN SERIES WITH 3-AMP FUSE BETWEEN BATTERY VOLTAGE SOURCE AND IGNITION FEED PIN TERMINAL ON CLUSTER ● VOLTMETER LEAD TO CVR INPUT TERMINAL ● VOLTMETER LEAD TO GROUND  | <ul style="list-style-type: none"> ● VOLTMETER INDICATION SAME AS STEP 1 → 5 ● VOLTMETER INDICATION DIFFERENT FROM STEP 1 → 6 |

Chart 3 RESULT

STEP

SEQUENCE

| | | |
|----------|--|--|
| <p>5</p> |  <p>REPLACE CVR (INTEGRAL WITH TEMPERATURE GAUGE)</p> |  |
| <p>6</p> |  <p>CHECK RADIO NOISE SUPPRESSOR OR CONNECTOR STRIP FOR PROPER ATTACHMENT</p> <p>USING SAME TEST SET-UP AS STEP 4, MOVE VOLTMETER CONNECTOR FROM CVR TERMINAL TO RADIO NOISE SUPPRESSOR OR CONNECTOR STRIP OUTPUT TERMINAL</p> | <p>VOLTMETER INDICATION SAME AS STEP 1 → 8</p> <p>VOLTMETER INDICATION DIFFERENT FROM STEP 1 → 9</p> |
| <p>7</p> |  <p>REPLACE CVR (INTEGRAL WITH FUEL GAUGE)</p> |  |
| <p>8</p> |  <p>REPLACE CIRCUIT BOARD</p> |  |
| <p>9</p> |  <p>REPLACE RADIO NOISE SUPPRESSOR OR CONNECTOR STRIP</p> |  |

PROBLEM: OIL PRESSURE GAUGE NOT FUNCTIONING PROPERLY (CJ)

STEP **SEQUENCE** **RESULT**

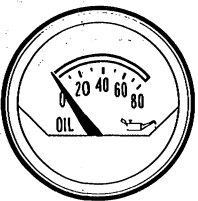
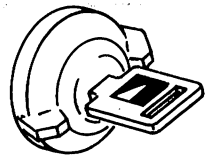
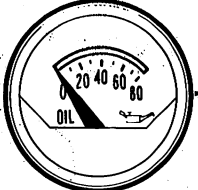
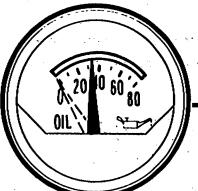
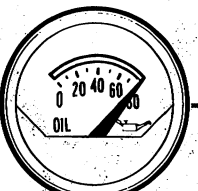

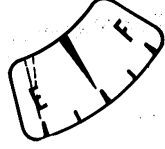
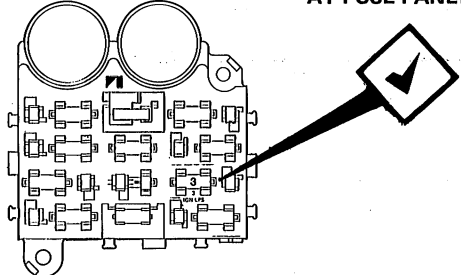



| | | |
|-----------------|---|--|
| <p>1</p> | <p>● NOTE POSITION OF OIL PRESSURE GAUGE POINTER ● START ENGINE</p>   <p>BEFORE STARTING TEST:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> OIL PAN MUST BE FILLED TO SPECIFICATION <input checked="" type="checkbox"/> FUEL TANK MUST BE NEITHER COMPLETELY FULL NOR COMPLETELY EMPTY <p>NOTE: Indicated Oil Pressure Observed from Driver's Seat</p> <p>● OBSERVE POINTER</p> <p>POINTER DOES NOT MOVE</p>  <p>POINTER MOVES TO INCORRECT POSITION</p>  <p>POINTER MOVES TO MAXIMUM AND STAYS</p>  | <p>2</p> <p>11</p> <p>6</p> |
| <p>2</p> | <p>● OBSERVE FUEL GAUGE</p> <p>FUEL GAUGE POINTER DOES NOT MOVE</p>  <p>FUEL GAUGE POINTER INDICATES PROPERLY</p>  | <p>3</p> <p>4</p> |
| <p>3</p> | <p>CHECK 3-AMP FUSE AT FUSE PANEL</p>  <p>FUSE BLOWN</p>  <p>FUSE NOT BLOWN</p>  <p>LOCATE AND REPAIR FAULT IN IGNITION SWITCH-TO-GAUGE CIRCUIT</p>  | <p>GO TO CHART 2 STEP 1</p> <p>STOP</p> |

Chart 4 RESULT

STEP

SEQUENCE

4

- REMOVE OIL PRESSURE GAUGE
- DO NOT DISCONNECT GAUGE WIRES

CHECK FOR PRESENCE OF VOLTAGE AT GAUGE I-TERMINAL

TURN IGNITION SWITCH ON

CONNECT JUMPER WIRE FROM GAUGE GROUND STUD TO GOOD BODY GROUND

VOLTAGE NOT PRESENT

VOLTAGE PRESENT

LOCATE AND REPAIR FAULT IN IGNITION SWITCH-TO-OIL PRESSURE GAUGE CIRCUIT

STOP

5

5

POINTER MOVES

POINTER DOES NOT MOVE

LOCATE AND REPAIR OPEN IN SENDING UNIT CIRCUIT

REPLACE GAUGE

STOP

STOP

6

CHECK BATTERY GROUND CABLE

- BROKEN
- MISSING
- CORRODED
- SCREW LOOSE, MISSING

GROUND NOT OK

GROUND OK

7


8

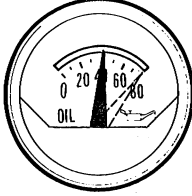
Chart 4
RESULT

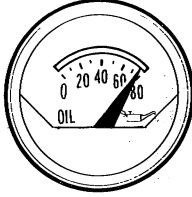
STEP

SEQUENCE


7

 REPAIR GROUND

 POINTER DROPS FROM MAXIMUM


 POINTER REMAINS AT MAXIMUM


START ENGINE

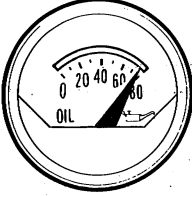
 STOP

8

8

 DISCONNECT SENDING UNIT WIRE

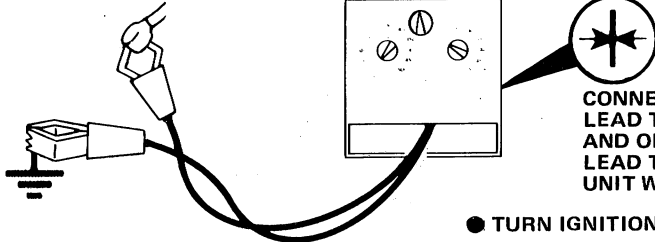
 POINTER DROPS FROM MAXIMUM

 POINTER REMAINS AT MAXIMUM




9

10

9

 CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE GAUGE INDICATION AT EACH OHM SETTING

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING  REPLACE GAUGE   STOP




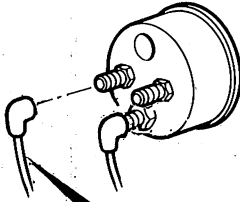
GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING  REPLACE SENDING UNIT   STOP

Chart 4 RESULT

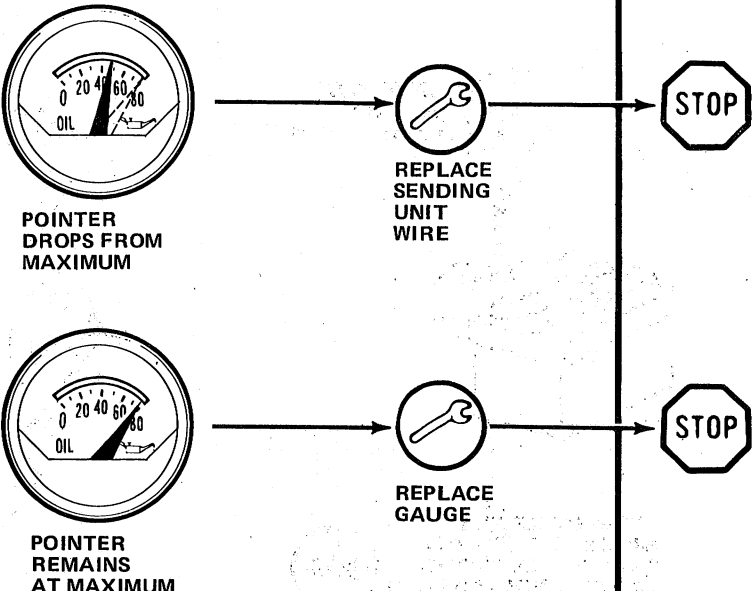
STEP

SEQUENCE

10



DISCONNECT SENDING UNIT WIRE FROM GAUGE



POINTER DROPS FROM MAXIMUM

REPLACE SENDING UNIT WIRE

STOP

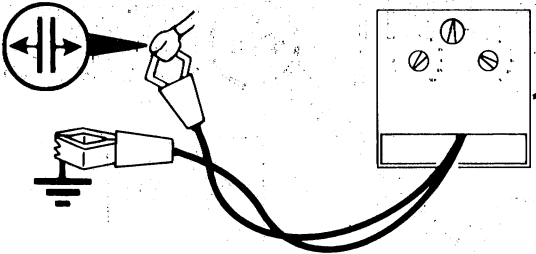
POINTER REMAINS AT MAXIMUM

REPLACE GAUGE

STOP

11

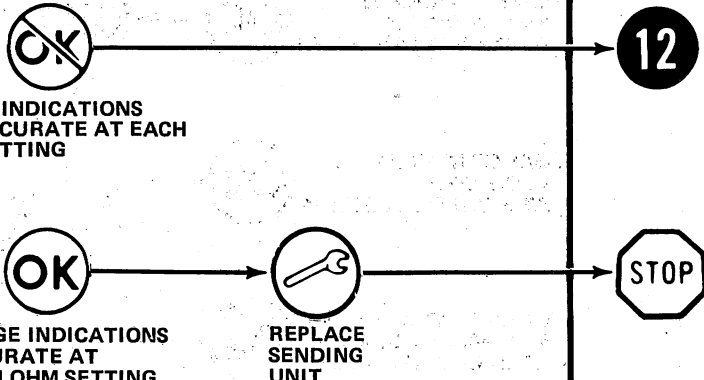
DISCONNECT SENDING UNIT WIRE



CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART.

OBSERVE GAUGE INDICATION AT EACH OHM SETTING.



GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

12

GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

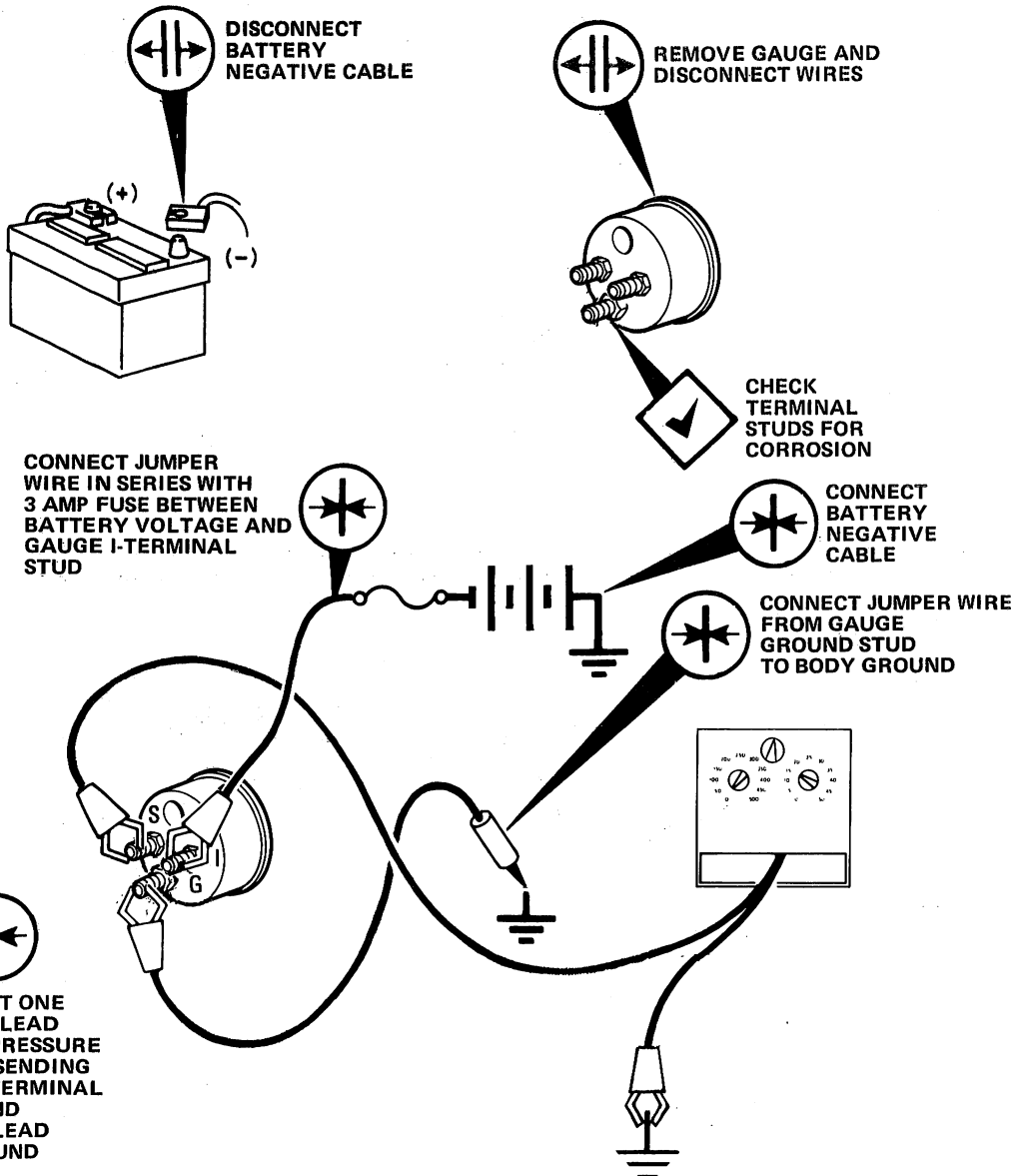
REPLACE SENDING UNIT

STOP

STEP

SEQUENCE

12



DISCONNECT BATTERY NEGATIVE CABLE

REMOVE GAUGE AND DISCONNECT WIRES

CONNECT JUMPER WIRE IN SERIES WITH 3 AMP FUSE BETWEEN BATTERY VOLTAGE AND GAUGE I-TERMINAL STUD

CHECK TERMINAL STUDS FOR CORROSION

CONNECT BATTERY NEGATIVE CABLE

CONNECT JUMPER WIRE FROM GAUGE GROUND STUD TO BODY GROUND

CONNECT ONE TESTER LEAD TO OIL PRESSURE GAUGE SENDING UNIT S-TERMINAL STUD AND OTHER LEAD TO GROUND

GAUGE INDICATIONS NOT OBTAINED AT EACH OHM SETTING



REPLACE SENDING UNIT WIRE



GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING



REPLACE WIRE TO "I" TERMINAL



GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING



REPLACE GAUGE



Chart 5

PROBLEM: OIL PRESSURE GAUGE NOT FUNCTIONING PROPERLY CHEROKEE, WAGONEER AND TRUCK

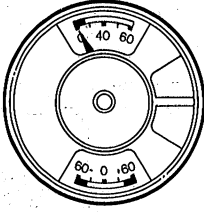

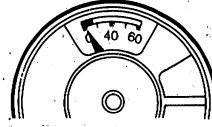
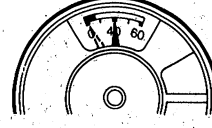

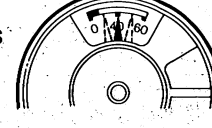
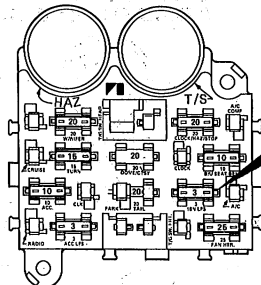
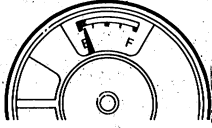
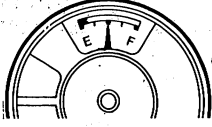
| STEP | SEQUENCE | RESULT |
|------|--|---|
| 1 | <p>● NOTE POSITION OF OIL PRESSURE GAUGE POINTER</p>  <p>● START ENGINE AND WAIT 2 MINUTES FOR GAUGE TO WARM UP</p>  <p>● OBSERVE POINTER</p> <p>POINTER DOES NOT MOVE</p>  <p>POINTER MOVES TO INACCURATE POSITION</p>  <p>POINTER MOVES TO MAXIMUM AND STAYS</p>  <p>POINTER PULSATES MORE THAN WIDTH OF POINTER</p>  <div data-bbox="203 756 690 1050" style="border: 1px solid black; padding: 5px;"> <p>BEFORE STARTING TEST:</p> <p><input checked="" type="checkbox"/> OIL PAN MUST BE FILLED TO SPECIFICATION</p> <p><input checked="" type="checkbox"/> FUEL TANK MUST BE NEITHER COMPLETELY FULL NOR COMPLETELY EMPTY</p> </div> <p>REPLACE CVR</p> | <p>2</p> <p>15</p> <p>7</p> <p>STOP</p> |
| 2 |  <p>CHECK 3-AMP FUSE AT FUSE PANEL</p> <p>FUSE BLOWN</p> <p>FUSE NOT BLOWN</p> | <p>GO TO CHART 2 STEP 1</p> <p>3</p> |
| 3 | <p>● OBSERVE FUEL GAUGE</p> <p>FUEL GAUGE POINTER DOES NOT MOVE</p>  <p>FUEL GAUGE POINTER INDICATES PROPERLY</p>  | <p>GO TO CHART 3 STEP 1</p> <p>4</p> |

Chart 5

STEP

SEQUENCE

RESULT

4

- REMOVE CLUSTER
- DO NOT DISCONNECT INSTRUMENT CLUSTER WIRING CONNECTOR
- CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION

CHECK FOR PRESENCE OF VOLTAGE AT GAUGE INPUT

CHECK FOR PRESENCE OF VOLTAGE AT GAUGE INPUT

CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION

VOLTAGE NOT PRESENT → **REPLACE CIRCUIT BOARD** → **STOP**

VOLTAGE PRESENT → **5**

5

GROUND SENDING UNIT TERMINAL OF GAUGE

POINTER MOVES → **6**

POINTER DOES NOT MOVE → **REPLACE GAUGE** → **STOP**

6

GROUND GAUGE PIN TERMINAL ON CIRCUIT BOARD

POINTER MOVES → **REPAIR OPEN CIRCUIT IN SENDING UNIT WIRE** → **STOP**

POINTER DOES NOT MOVE → **REPLACE CIRCUIT BOARD** → **STOP**

7

CHECK BATTERY GROUND CABLE

- BROKEN
- MISSING
- CORRODED
- SCREWS LOOSE, MISSING

CHECK BATTERY GROUND CABLE

GROUND NOT OK → **8**

GROUND OK → **9**

8

REPAIR GROUND

POINTER DROPS FROM MAXIMUM → **STOP**

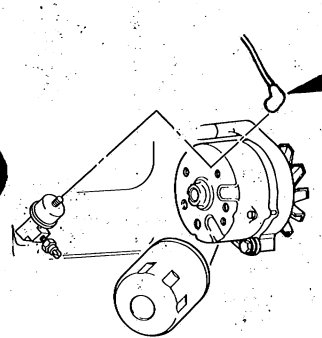
POINTER REMAINS AT MAXIMUM → **9**

Chart 5 RESULT


STEP

SEQUENCE


9



DISCONNECT SENDING UNIT WIRE FROM SENDING UNIT



POINTER DROPS FROM MAXIMUM

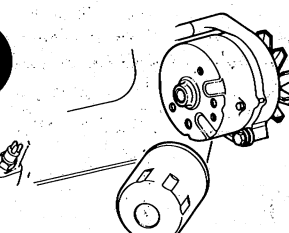
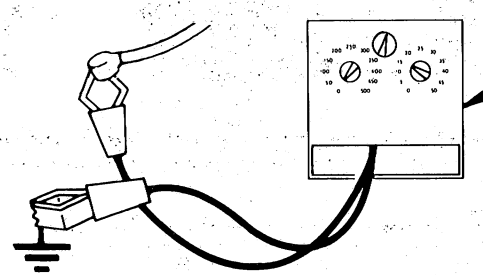


POINTER REMAINS AT MAXIMUM

10

12

10

CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE GAUGE INDICATION AT EACH OHM SETTING.

11

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING


REPLACE SENDING UNIT

STOP

11

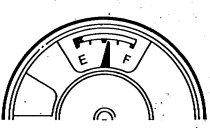
● OBSERVE FUEL GAUGE

FUEL GAUGE POINTER IS AT MAXIMUM



REPAIR CLUSTER GROUND OR REPLACE CVR (INTEGRAL WITH TEMPERATURE GAUGE)

FUEL GAUGE POINTER INDICATES NORMALLY



REPLACE OIL PRESSURE GAUGE

STOP

STOP

Chart 5

STEP

SEQUENCE

RESULT

12

DISCONNECT BATTERY NEGATIVE CABLE

REMOVE INSTRUMENT CLUSTER. DO NOT DISCONNECT WIRE HARNESS

CONNECT BATTERY NEGATIVE CABLE

CONNECT JUMPER WIRE BETWEEN CLUSTER GROUND AND BODY

13
POINTER DROPS FROM MAXIMUM

14
POINTER REMAINS AT MAXIMUM

13

REPAIR INSTRUMENT PANEL GROUND

STOP

14

DISCONNECT SENDING UNIT WIRE FROM CLUSTER

POINTER DROPS FROM MAXIMUM

REPAIR OR REPLACE SENDING UNIT WIRE

STOP

POINTER REMAINS AT MAXIMUM

REPLACE CIRCUIT BOARD

STOP

15

DISCONNECT SENDING UNIT WIRE

CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE FUEL GAUGE INDICATION AT EACH OHM SETTING.

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

OK

GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

REPLACE SENDING UNIT

STOP

16

Chart 5 RESULT

STEP

SEQUENCE

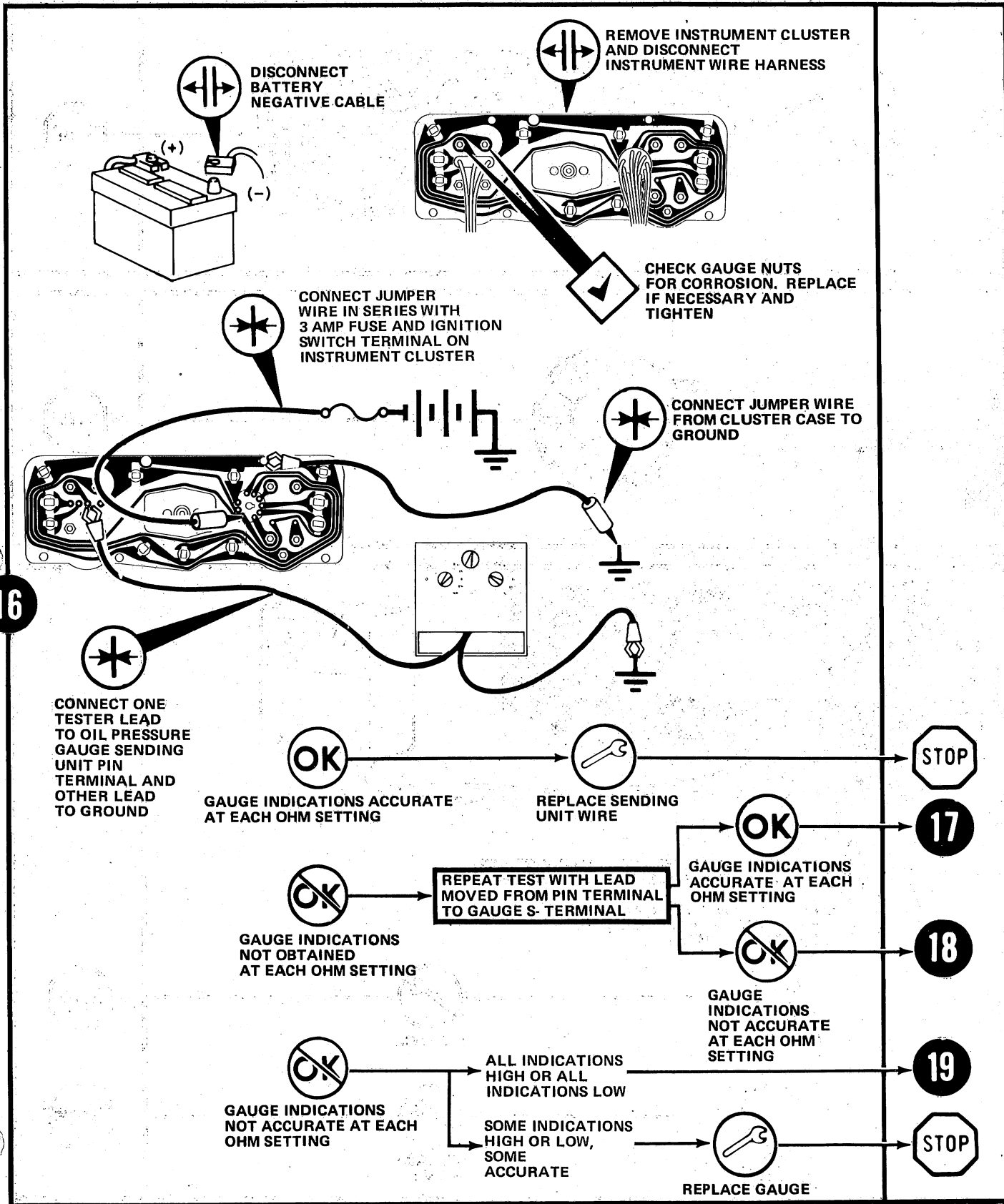



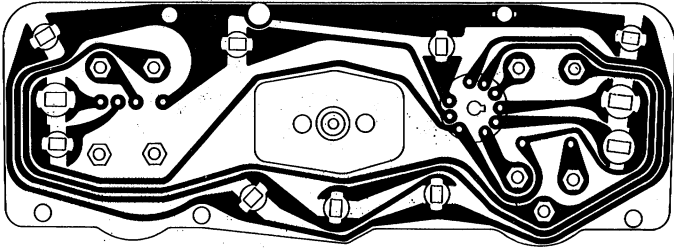
Chart 5
RESULT

STEP

SEQUENCE

17


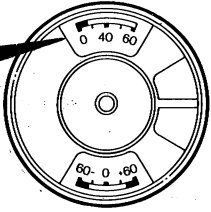
REPLACE CIRCUIT BOARD

STOP

18

REPLACE GAUGE

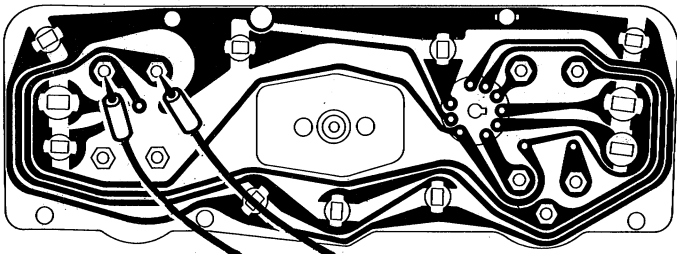
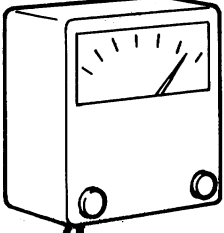



STOP

19

CONNECT OHMMETER LEADS TO GAUGE INPUT TERMINAL AND GAUGE SENDING UNIT TERMINAL

● COMPARE OHMMETER INDICATIONS WITH VALUES LISTED IN GAUGE RESISTANCE CHART

OHMMETER

OK
GAUGE RESISTANCE CORRECT

REPLACE CVR

STOP

~~OK~~
GAUGE RESISTANCE INCORRECT

REPLACE GAUGE

STOP

Chart 6

PROBLEM: COOLANT TEMPERATURE GAUGE NOT FUNCTIONING PROPERLY

STEP SEQUENCE RESULT

1

- NOTE POSITION OF COOLANT TEMPERATURE GAUGE POINTER
- TURN IGNITION SWITCH ON AND WAIT 2 MINUTES FOR GAUGE TO WARM UP
- OBSERVE POINTER

BEFORE STARTING TEST:

- ENGINE MUST BE WARM
- FUEL TANK MUST BE NEITHER COMPLETELY FULL NOR COMPLETELY EMPTY

POINTER DOES NOT MOVE → **2**

POINTER MOVES TO INACCURATE POSITION → **17**

POINTER MOVES TO MAXIMUM AND STAYS → **9**

POINTER PULSATES MORE THAN WIDTH OF POINTER → **REPLACE CVR** → **STOP**

2

CHECK 3-AMP FUSE AT FUSE PANEL

FUSE BLOWN → **GO TO CHART 2 STEP 1**

FUSE NOT BLOWN → **3**

3

- OBSERVE FUEL GAUGE

FUEL GAUGE POINTER DOES NOT MOVE → **GO TO CHART 3 STEP 1**

FUEL GAUGE POINTER INDICATES PROPERLY

- CJ MODELS → **4**
- CHEROKEE WAGONEER TRUCK MODELS → **6**

Chart 6 RESULT

STEP

SEQUENCE

4

- REMOVE CLUSTER
- DO NOT DISCONNECT INSTRUMENT WIRES

CONNECT JUMPER BETWEEN CLUSTER WIRE CASE AND INSTRUMENT PANEL

GROUND SENDING UNIT TERMINAL OF GAUGE

POINTER MOVES

POINTER DOES NOT MOVE

REPLACE GAUGE

5

STOP

5

LOCATE AND REPAIR OPEN CIRCUIT IN SENDING UNIT WIRE

STOP

- REMOVE CLUSTER
- DO NOT DISCONNECT INSTRUMENT CLUSTER WIRING CONNECTOR

CHECK GAUGE NUTS FOR LOOSENESS AND CORROSION

7

7

GROUND SENDING UNIT TERMINAL OF GAUGE

POINTER MOVES

POINTER DOES NOT MOVE

REPLACE GAUGE

8

STOP

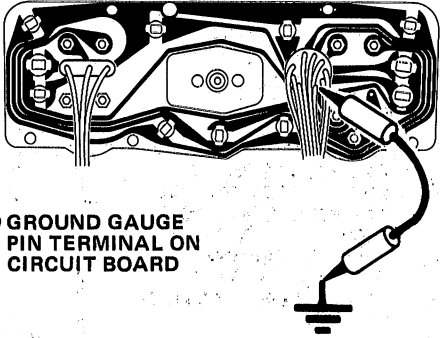
Chart 6

STEP



SEQUENCE



RESULT

8



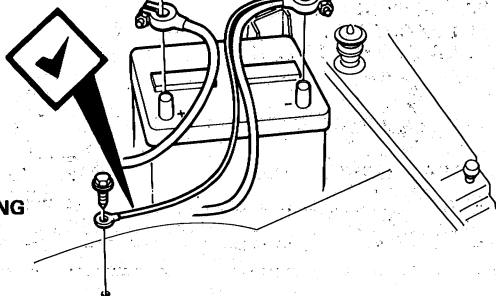
● GROUND GAUGE PIN TERMINAL ON CIRCUIT BOARD

POINTER MOVES →  REPAIR OPEN CIRCUIT IN SENDER WIRE → 


POINTER DOES NOT MOVE →  REPLACE CIRCUIT BOARD → 


9

CHECK BATTERY GROUND CABLE






- BROKEN
- MISSING
- CORRODED
- SCREWS LOOSE, MISSING

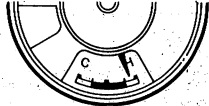
 GROUND NOT OK → **10**

 GROUND OK → **11**

10

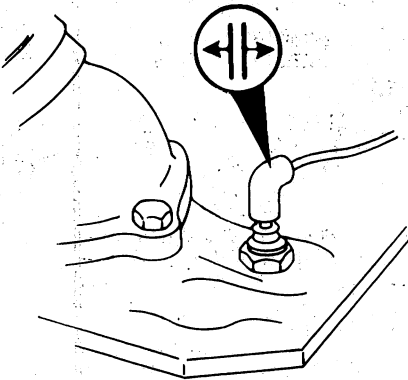
 REPAIR GROUND

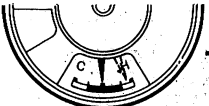
POINTER DROPS FROM MAXIMUM →  → 

POINTER REMAINS AT MAXIMUM →  → **11**

11

DISCONNECT SENDING UNIT WIRE FROM SENDING UNIT



POINTER DROPS FROM MAXIMUM →  → **12**

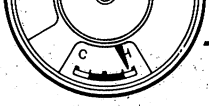
POINTER REMAINS AT MAXIMUM →  → **14**

Chart 6 RESULT

STEP

SEQUENCE

12

CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE

- TURN IGNITION SWITCH ON
- ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE GAUGE INDICATION AT EACH OHM SETTING.

OK (with a slash through it) → GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING → **13**

OK → GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING → → REPLACE SENDING UNIT → **STOP**

13

• OBSERVE FUEL GAUGE

FUEL GAUGE POINTER IS AT MAXIMUM → → REPAIR CLUSTER GROUND OR REPLACE CVR (INTEGRAL WITH TEMPERATURE GAUGE) → **STOP**

FUEL GAUGE POINTER INDICATES NORMALLY → → REPLACE TEMPERATURE GAUGE → **STOP**

14

DISCONNECT BATTERY NEGATIVE CABLE →

REMOVE INSTRUMENT CLUSTER. DO NOT DISCONNECT WIRE HARNESS →

CONNECT BATTERY NEGATIVE CABLE →

CONNECT JUMPER WIRE BETWEEN CLUSTER GROUND AND BODY →

POINTER DROPS FROM MAXIMUM → **15**



POINTER REMAINS AT MAXIMUM → **16**

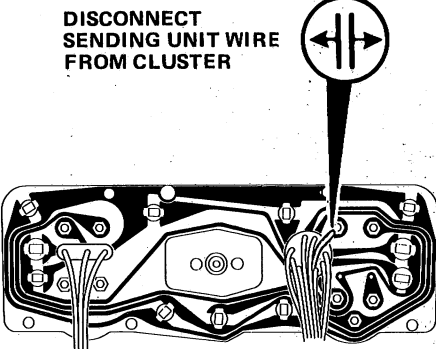
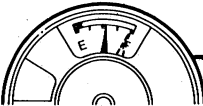







Chart 6

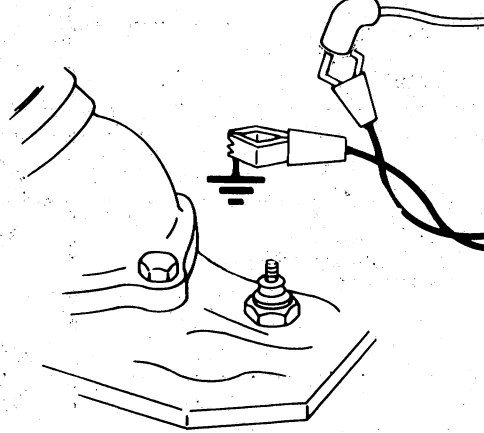







RESULT

STEP

SEQUENCE

| | | |
|-----------|--|---|
| 15 |  REPAIR INSTRUMENT PANEL GROUND |  |
|-----------|--|---|

| | | |
|-----------|--|--|
| 16 | <p>DISCONNECT SENDING UNIT WIRE FROM CLUSTER</p>  |  <p>POINTER DROPS FROM MAXIMUM</p>  <p>REPAIR OR REPLACE SENDING UNIT WIRE</p>  |
| | |  <p>POINTER REMAINS AT MAXIMUM</p> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;">  <p>REPLACE GAUGE (CJ)</p>  </div> <div style="display: flex; align-items: center;">  <p>REPLACE CIRCUIT BOARD (CHEROKEE, WAGONEER, TRUCK)</p>  </div> </div> |

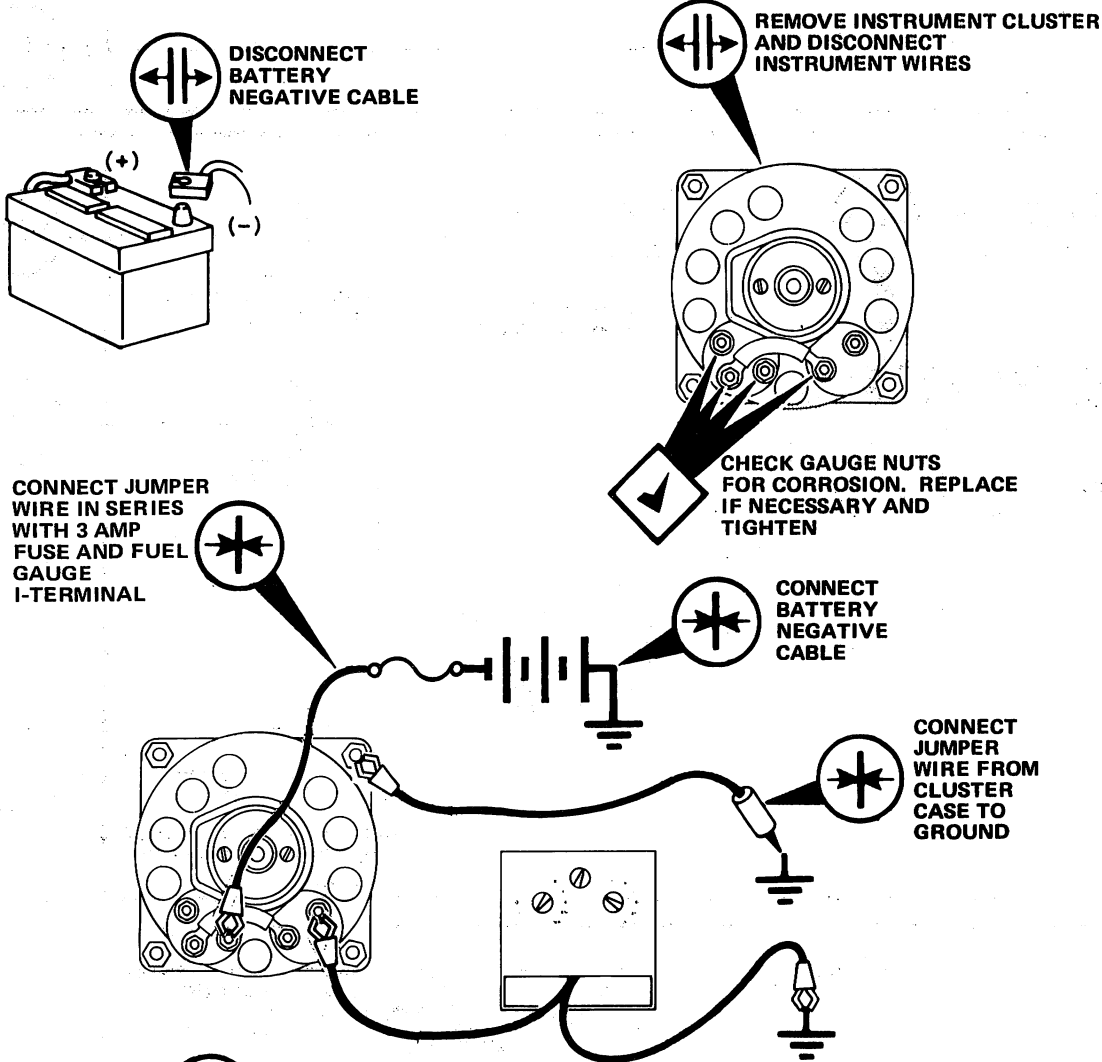
| | | |
|-----------|---|---|
| 17 |  | <p>CONNECT ONE TESTER LEAD TO GROUND AND ONE LEAD TO SENDING UNIT WIRE</p>  |
| | <ul style="list-style-type: none"> ● TURN IGNITION SWITCH ON ● ADJUST TESTER TO SELECT OHM VALUES LISTED IN SENDING UNIT RESISTANCE CHART. OBSERVE GAUGE INDICATION AT EACH OHM SETTING | <div style="display: flex; align-items: center; gap: 10px;">  <p>GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING</p> </div> <p style="margin-left: 20px;">CHEROKEE WAGONEER TRUCK</p> <div style="display: flex; align-items: center; gap: 10px;">  <p>GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING</p> </div>  <p>REPLACE SENDING UNIT</p>  |
| | | <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <p>CJ</p>  <p>18</p> </div> <div style="text-align: center;"> <p>CHEROKEE WAGONEER TRUCK</p>  <p>19</p> </div> </div> |

STEP

SEQUENCE

RESULT

18



DISCONNECT BATTERY NEGATIVE CABLE

REMOVE INSTRUMENT CLUSTER AND DISCONNECT INSTRUMENT WIRES

CONNECT JUMPER WIRE IN SERIES WITH 3 AMP FUSE AND FUEL GAUGE I-TERMINAL

CHECK GAUGE NUTS FOR CORROSION. REPLACE IF NECESSARY AND TIGHTEN

CONNECT BATTERY NEGATIVE CABLE

CONNECT JUMPER WIRE FROM CLUSTER CASE TO GROUND

CONNECT ONE TESTER LEAD TO TEMPERATURE GAUGE SENDING UNIT TERMINAL AND OTHER LEAD TO GROUND

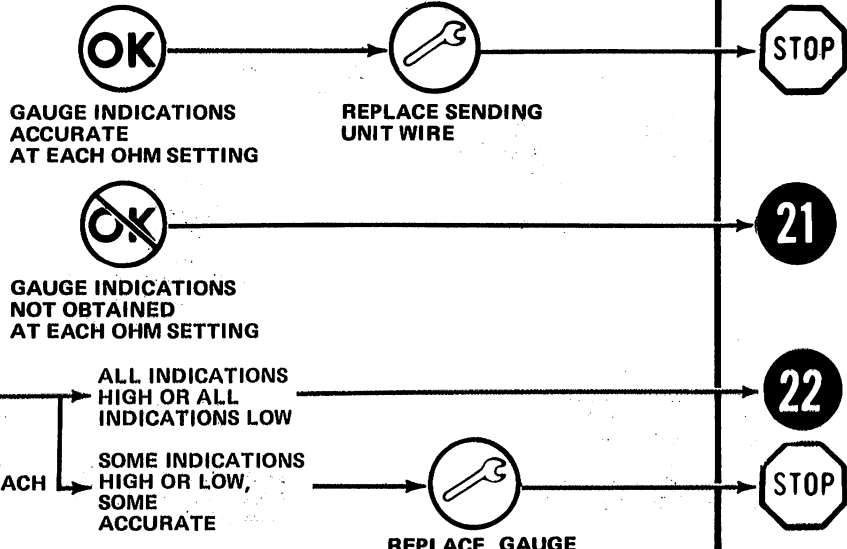
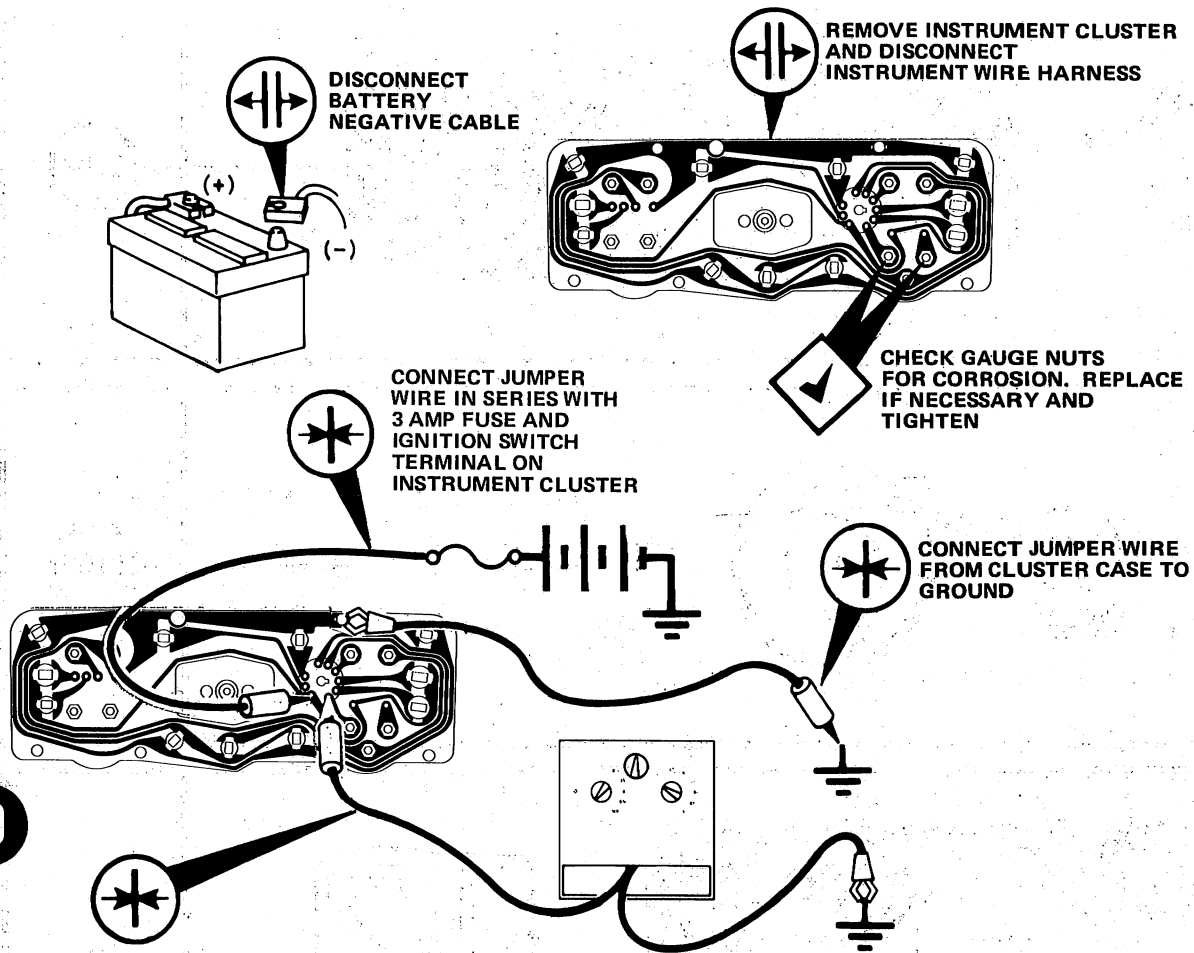


Chart 6 RESULT

STEP

SEQUENCE



19

CONNECT ONE TESTER LEAD TO TEMPERATURE GAUGE SENDING UNIT PIN TERMINAL AND OTHER LEAD TO GROUND

OK
GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

REPLACE SENDING UNIT WIRE

STOP

OK
GAUGE INDICATIONS NOT OBTAINED AT EACH OHM SETTING

REPEAT TEST WITH LEAD MOVED FROM PIN TERMINAL TO GAUGE S- TERMINAL

OK
GAUGE INDICATIONS ACCURATE AT EACH OHM SETTING

20

OK
GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

21

OK
GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

ALL INDICATIONS HIGH OR ALL INDICATIONS LOW

GAUGE INDICATIONS NOT ACCURATE AT EACH OHM SETTING

22

SOME INDICATIONS HIGH OR LOW, SOME ACCURATE

REPLACE GAUGE

STOP

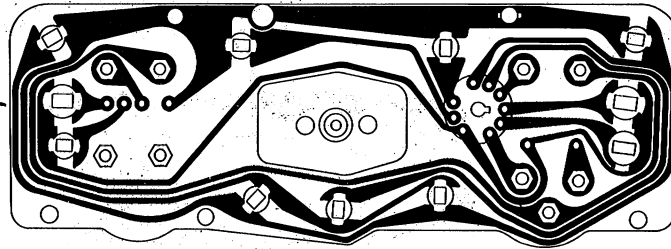
Chart 6
RESULT

STEP

SEQUENCE

20

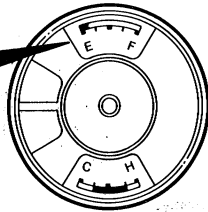
 REPLACE
CIRCUIT
BOARD





21

 REPLACE
GAUGE



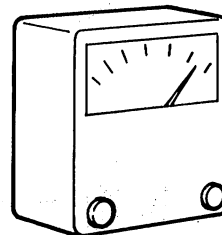
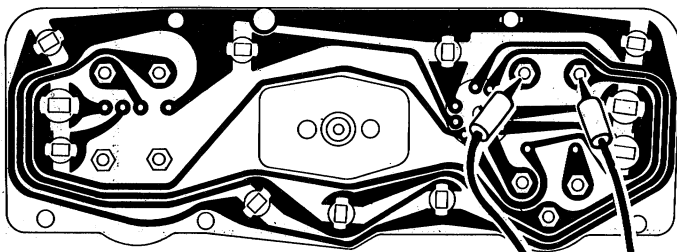


22



CONNECT OHMMETER LEADS TO GAUGE INPUT
TERMINAL AND GAUGE SENDING UNIT TERMINAL

- COMPARE OHMMETER RESISTANCE INDICATIONS
WITH VALUES LISTED IN GAUGE RESISTANCE
CHART



OHMMETER

 OK
GAUGE
RESISTANCE
CORRECT



REPLACE
CVR (INTEGRAL WITH
TEMPERATURE GAUGE)



 ~~OK~~
GAUGE
RESISTANCE
INCORRECT



REPLACE
GAUGE



SPECIFICATIONS

Schematics—Cherokee-Wagoner-Truck Vehicles 1L-46
Schematics—CJ Vehicles 1L-42

Page
Specifications—Cherokee-Wagoner-Truck Vehicles 1L-45
Specifications—CJ Vehicles 1L-41

SPECIFICATIONS—CJ VEHICLES**Fuel Gauge Sending Unit Resistance (Ohms)**

| | | |
|----|-----|----|
| E | 1/2 | F |
| 73 | 23 | 10 |

80670

Coolant Temperature Gauge Sending Unit Resistance (Ohms)

| | | | |
|----|-------------------|----------------------|---|
| C | BEGINNING OF BAND | END OF BAND ∇ | H |
| 73 | 36 | 13 | 9 |

80674

Fuel Gauge Resistance (Internal)

| TEST POINTS | OHMS |
|-------------|----------|
| S to Ground | 68 to 72 |
| S to I | 19 to 21 |
| S to A | 19 to 21 |
| I to A | ZERO |
| I to Ground | 49 to 51 |
| A to Ground | 49 to 51 |

80671

Tachometer Calibrations (RPM)

| ACTUAL | INDICATED |
|--------|--------------|
| 500 | 380 to 620 |
| 1500 | 1380 to 1620 |
| 4500 | 4330 to 4620 |

80675

Oil Pressure Gauge Sending Unit Resistance (Ohms)

| PSI | 0 | 20 | 40 | 60 | 80 |
|------|---------|---------|-------------|-------|-----------|
| OHMS | 234-246 | 149-157 | 100.5-105.5 | 65-69 | 32.5-34.5 |

80672

Coolant Temperature Gauge Resistance (Internal)

| | |
|--------|---------------|
| S to A | 19 to 21 ohms |
|--------|---------------|

80673

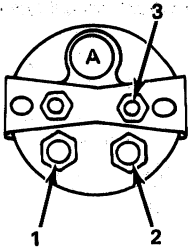
Voltmeter Calibrations (Volts)

| ACTUAL | INDICATED |
|--------|--------------|
| 12.4 | 11.7 to 12.3 |
| 14.4 | 13.8 to 14.2 |

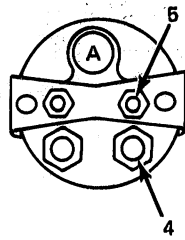
NOTE: Indicated Voltage Observed from Drivers Seat

80676

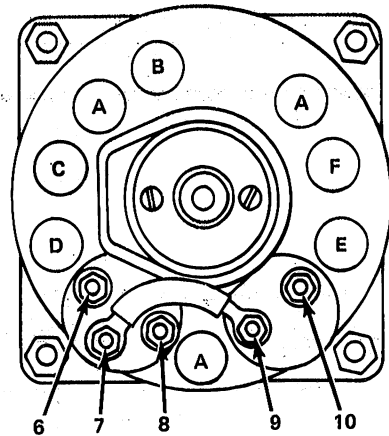
SCHMATICS—CJ VEHICLES



OIL PRESSURE GAUGE



VOLTMETER



FUEL GAUGE (WITH INTEGRAL CVR)

COOLANT TEMPERATURE GAUGE

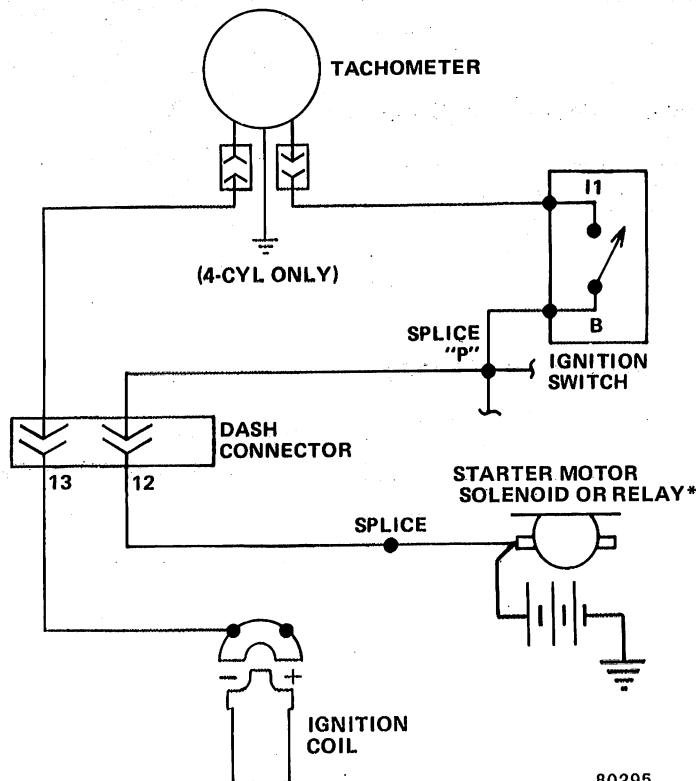
TERMINAL STUDS

1. OIL PRESSURE GAUGE S-TERMINAL
2. OIL PRESSURE GAUGE I-TERMINAL
3. OIL PRESSURE GAUGE GROUND
4. VOLTMETER +-TERMINAL
5. VOLTMETER GROUND
6. FUEL GAUGE S-TERMINAL
7. FUEL GAUGE A-TERMINAL
8. FUEL GAUGE I-TERMINAL
9. COOLANT TEMPERATURE GAUGE S-TERMINAL
10. COOLANT TEMPERATURE GAUGE A-TERMINAL

LAMPS

- A ILLUMINATION
- B HIGH BEAM
- C RIGHT TURN
- D FOUR-WHEEL DRIVE
- E BRAKE
- F LEFT TURN

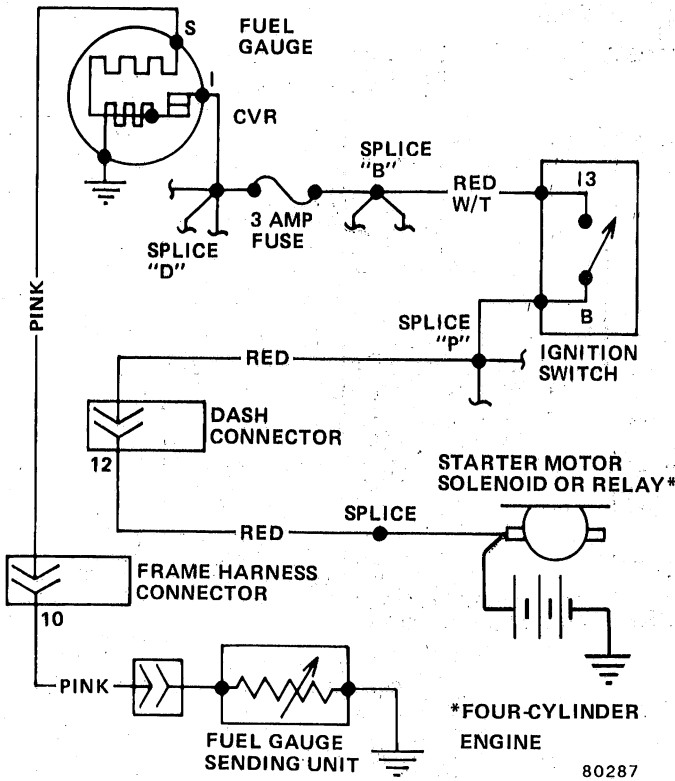
80125



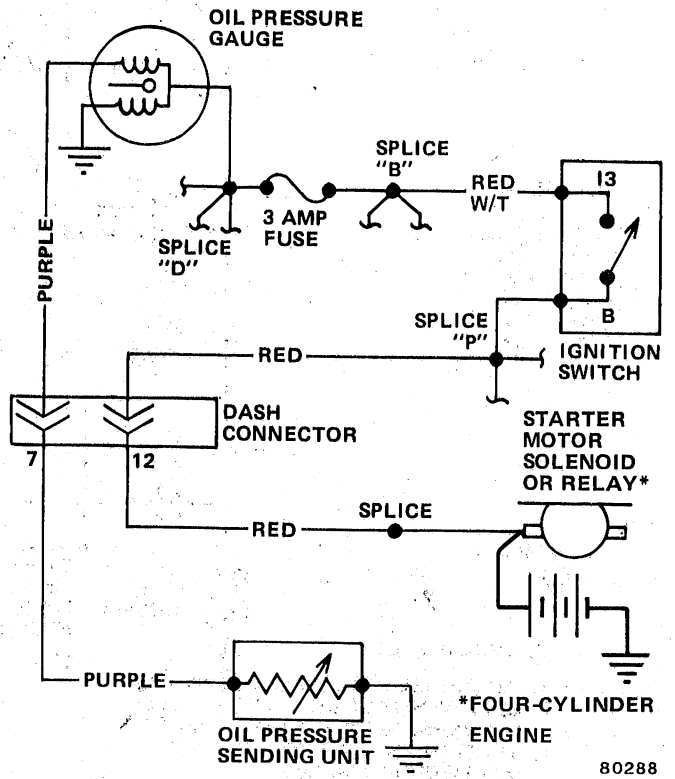
*FOUR-CYLINDER ENGINE

80295

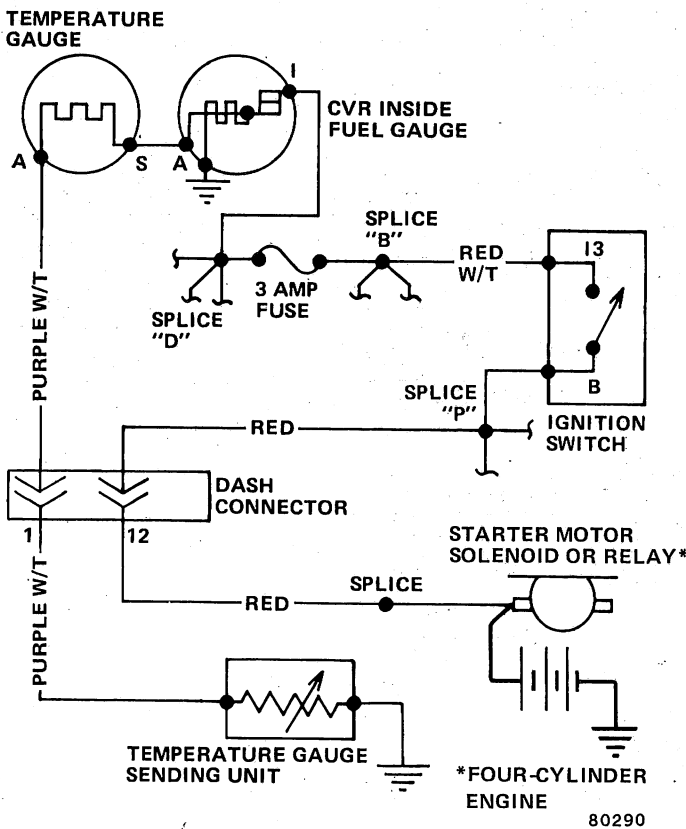
Tachometer Circuit—CJ (Typical)



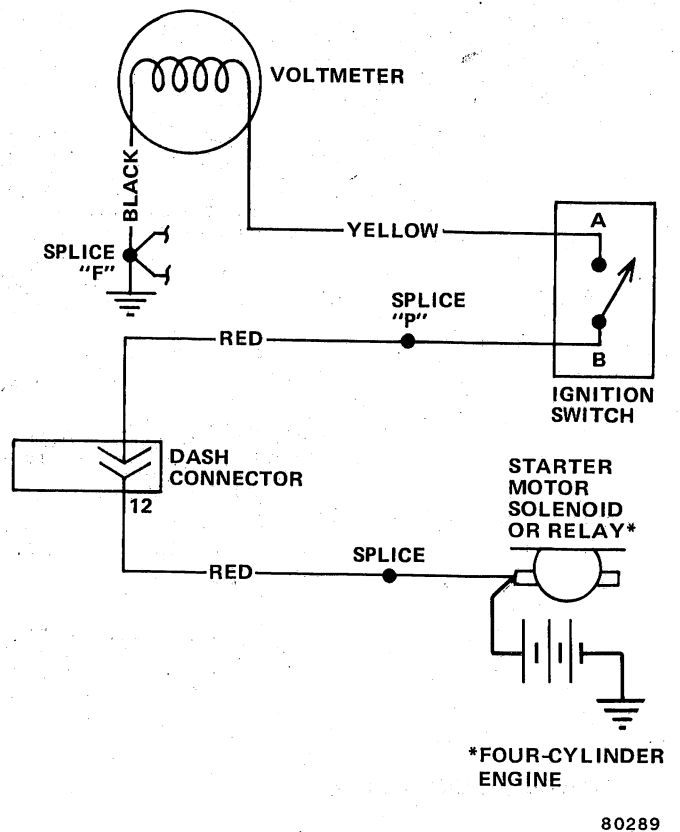
Fuel Gauge Circuit—CJ



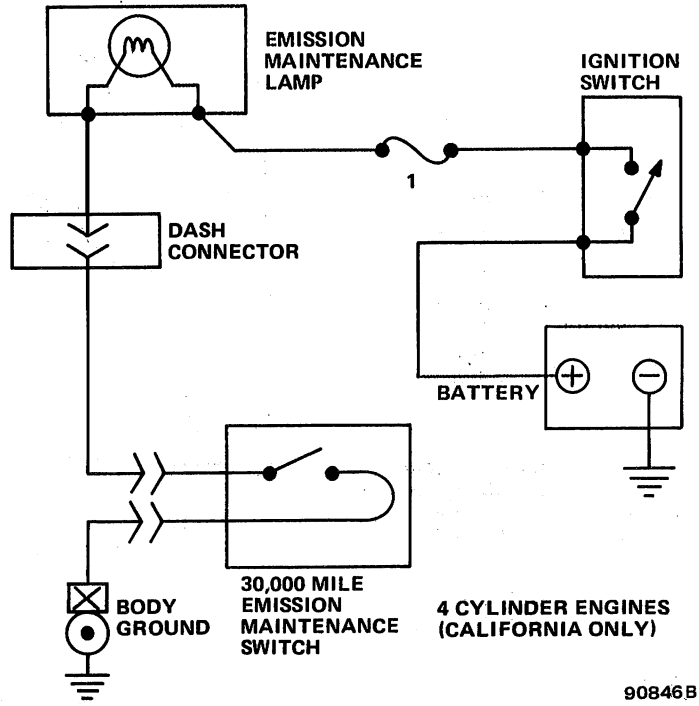
Oil Pressure Gauge Circuit—CJ



Coolant Temperature Gauge Circuit—CJ



Voltmeter Circuit—CJ



Emission Maintenance Indicator Lamp Circuit—CJ

SPECIFICATIONS—CHEROKEE-WAGONEER-TRUCK VEHICLES
Ammeter Calibrations

| ACTUAL | INDICATED |
|----------|------------------|
| -60 AMPS | -48 to -72 AMPS |
| 0 AMPS | 0± Pointer Width |
| +60 AMPS | +48 to +72 AMPS |

80677

Fuel Gauge Sending Unit Resistance (Ohms)

| E | 1/2 | F |
|----|-----|------|
| 61 | 23 | 10.3 |

80670

Fuel Gauge Resistance (Internal)

| | |
|--------|---------------|
| S to A | 19 to 21 ohms |
|--------|---------------|

80673

Oil Pressure Gauge Sending Unit Resistance (Ohms)

| PSI | 0 | 10 | 60 | 80 |
|------|-------|-------|-------|----------|
| OHMS | 69-77 | 35-38 | 13-15 | 9.5-10.5 |

80678

Coolant Temperature Gauge Sending Unit Resistance (Ohms)

| C | BEGINNING OF BAND | END OF BAND | H |
|----|-------------------|-------------|---|
| 73 | 36 | 13 | 9 |

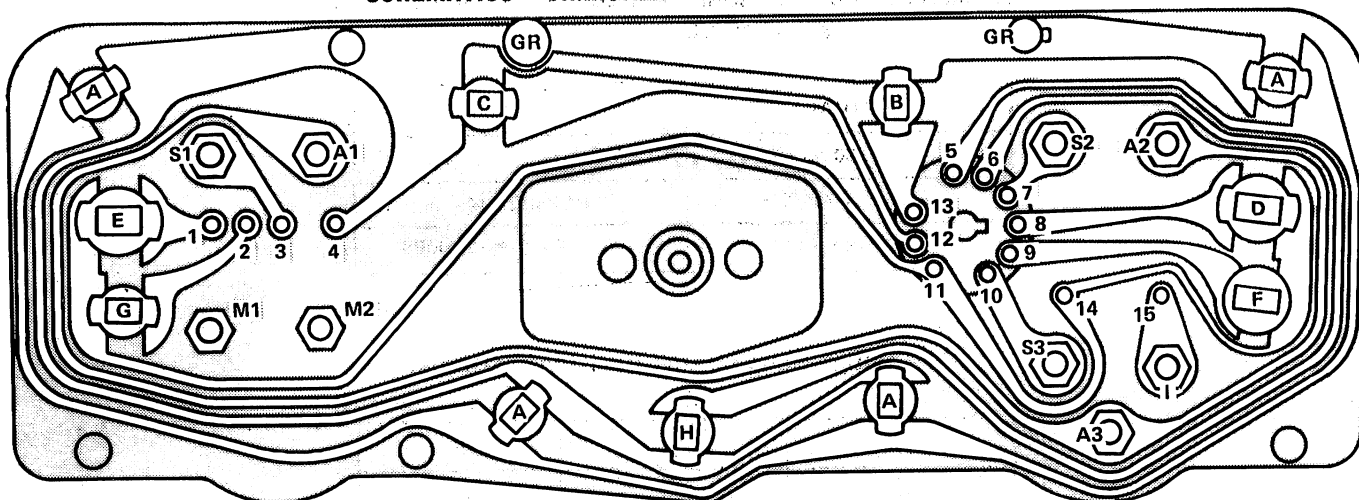
80674

Coolant Temperature Gauge Resistance (Internal)

| TEST POINTS | OHMS |
|-------------|----------|
| S to Ground | 68 to 72 |
| S to I | 19 to 21 |
| S to A | 19 to 21 |
| I to A | ZERO |
| I to Ground | 49 to 51 |
| A to Ground | 49 to 51 |

80671

SCHEMATICS—CHEROKEE-WAGONEER-TRUCK VEHICLES



PIN TERMINALS

1. EMERGENCY DRIVE *
2. 4-WHEEL DRIVE *
3. OIL PRESSURE GAUGE
4. GROUND
5. ILLUMINATION
6. HIGH BEAM
7. FUEL GAUGE
8. BRAKE
9. FASTEN BELTS
10. COOLANT TEMPERATURE GAUGE
11. IGNITION
12. LEFT TURN
13. RIGHT TURN
14. IGNITION SWITCH SIDE OF RADIO SUPPRESSION
15. RADIO SUPPRESSION TO CVR

LAMPS

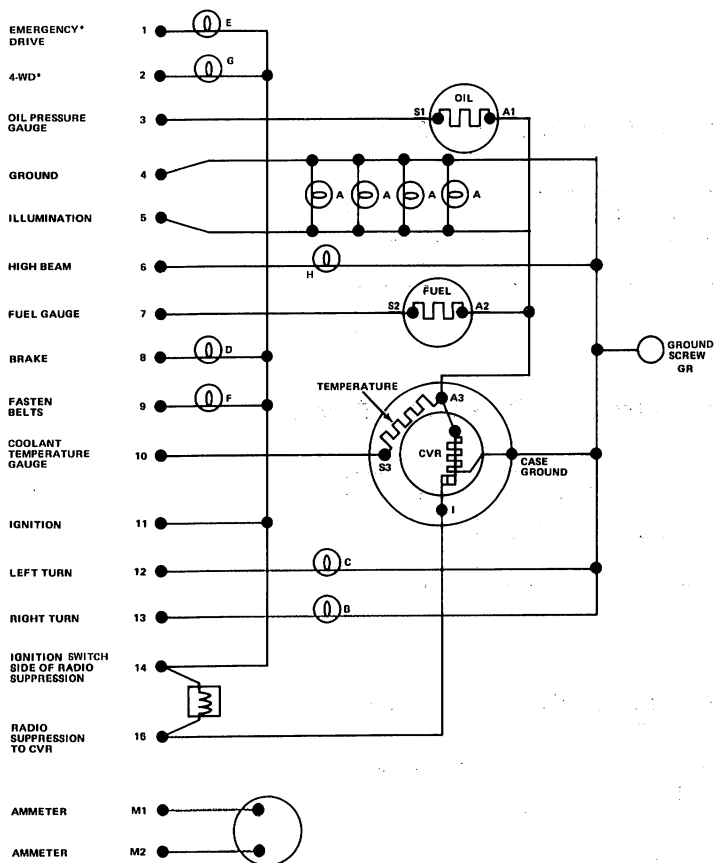
- A ILLUMINATION
- B RIGHT TURN INDICATOR
- C LEFT TURN INDICATOR
- D BRAKE INDICATOR
- E EMERGENCY DRIVE INDICATOR* (QUADRA-TRAC)
- F FASTEN BELT INDICATOR
- G 4-WD INDICATOR* (MODEL 208)
- H HIGH BEAM INDICATOR

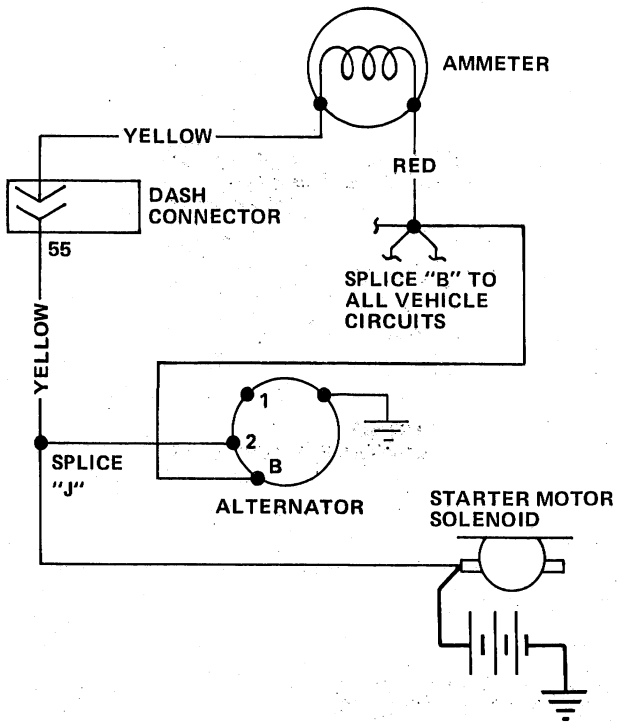
OTHER

- A1 OIL GAUGE A TERMINAL
- S1 OIL GAUGE S TERMINAL
- A2 FUEL GAUGE A TERMINAL
- S2 FUEL GAUGE S TERMINAL
- A3 TEMPERATURE GAUGE A TERMINAL
- S3 TEMPERATURE GAUGE S TERMINAL
- I CVR.I TERMINAL (CVR INSIDE TEMPERATURE GAUGE)
- M1 AMMETER STUD
- M2 AMMETER STUD
- GR GROUND SCREW

80127

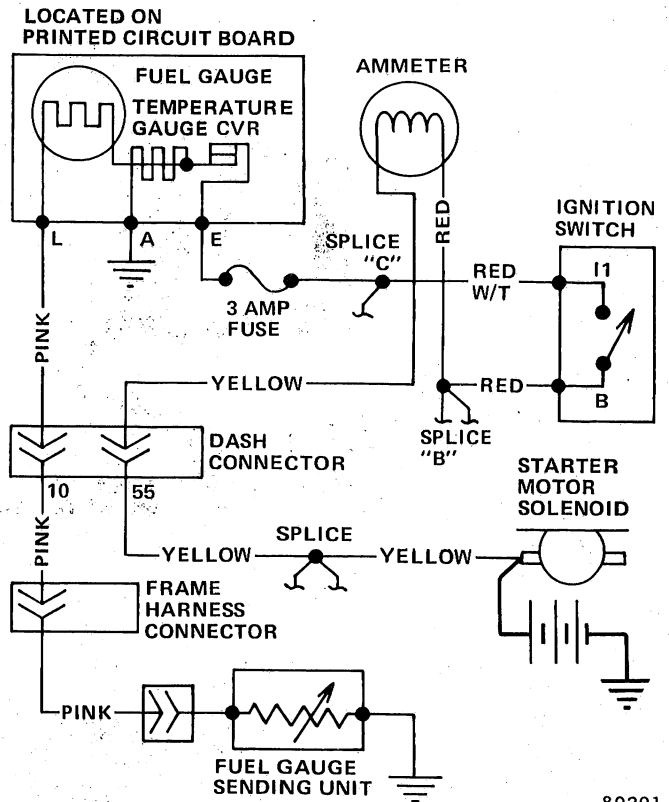
*Light used determined by type of transfer case installed. Lamp is plugged into applicable socket.





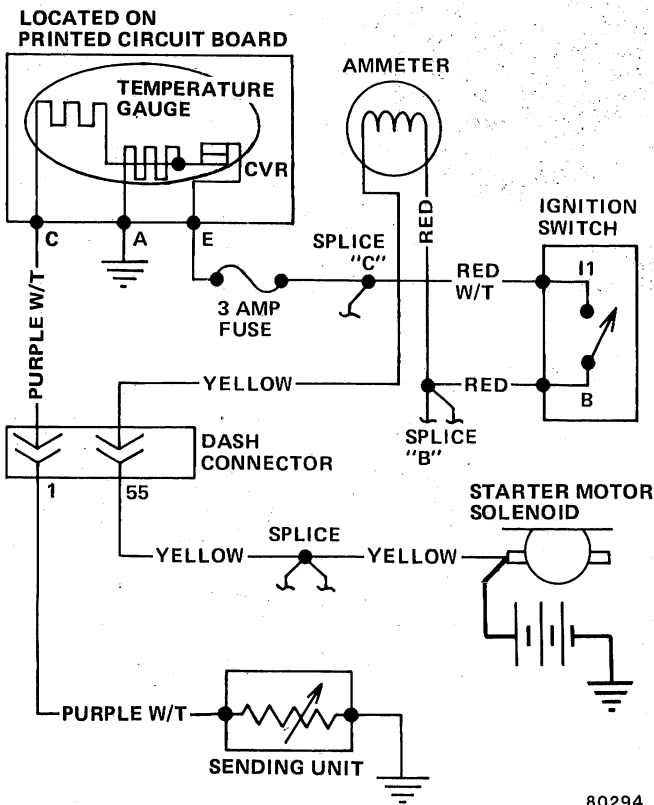
80293

Ammeter Circuit—Cherokee-Wagoneer-Truck



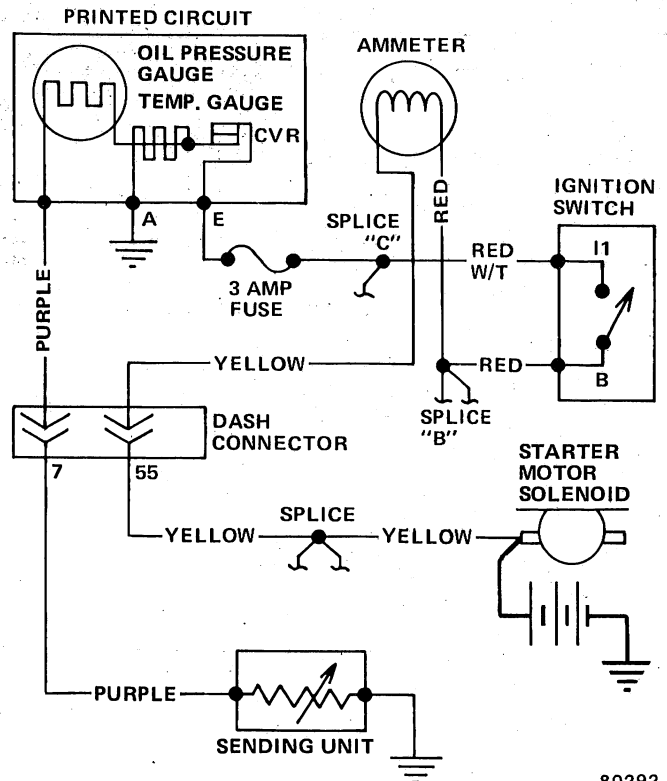
80291

Fuel Gauge Circuit—Cherokee-Wagoneer-Truck



80294

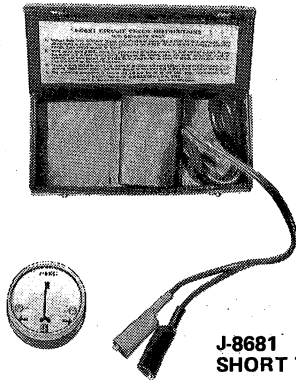
Coolant Temperature Gauge Circuit—Cherokee-Wagoneer-Truck



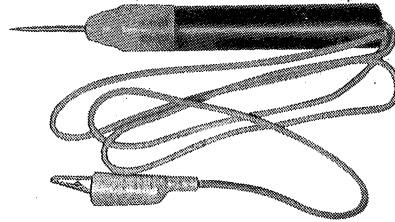
80292

Oil Pressure Gauge Circuit—Cherokee-Wagoneer-Truck

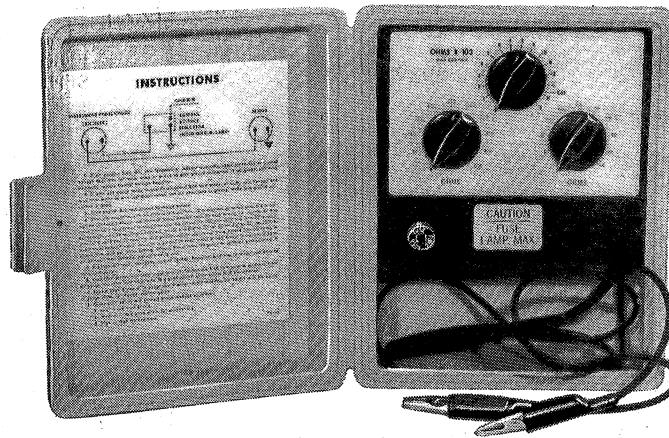
Tools



**J-8681
SHORT TESTER**



**J-21008
CONTINUITY TEST LAMP**



**J-24538
UNIVERSAL
GAUGE TESTER**