

## FORD

### All Models

### DESCRIPTION & OPERATION

**Ammeter Gauge** — Gauge senses the direction and rate of flow of electrical current to or from the battery indicating whether the battery is being charged or discharged.

A shunt-type ammeter is used for Bronco and "E" and "F" Series vehicles. Ammeters are non-adjustable and must be replaced as a unit.

**Fuel Gauge** — Gauge pointer is operated by current flow heating a wire-wound bi-metal strip in gauge. Current flow is controlled by a variable resistor float type sending unit in the fuel tank. As the amount of fuel decreases, more resistance is placed in the circuit, allowing less current flow and heat at the bi-metal strip, causing the pointer to move a shorter distance.

**Instrument Voltage Regulator** — IVR is used in conjunction with all gauges (exc. ammeter). It controls and maintains an average pulsating value of five volts at gauge. A suppression choke is connected in series between printed circuit and IVR to prevent radio interference.

**Oil Pressure Gauge** — Oil pressure gauge circuit consists of an IVR, oil pressure gauge and a pressure-operated sending unit. As oil pressure increases, resistance in sending unit decreases causing an increase in current flow and gauge pointer movement.

**Oil Pressure Indicator Light** — The light is connected between the oil pressure switch unit on the engine and the coil terminal of the ignition switch. The light should come on when the ignition switch is first turned to the "R" or "RUN" position. It should go out after engine is started, indicating oil pressure has reached a safe value. The light should also come on any time pressure drops below a safe level.

**Temperature Gauge** — System consists of a variable resistance type sending unit and a gauge. As coolant temperature increases, resistance in sending unit decreases allowing an increase of current flow and gauge pointer movement. It is possible, under certain driving conditions, for pointer to read at the top of the normal band and still have coolant temperature within limits.

## TESTING

### GAUGES

**Oil Pressure Indicator Light** — Turn on ignition switch, but do not start engine. The light should come on. Start engine and light should go out within seconds. To test oil pressure switch, turn ignition switch to "ON", but do not start engine. Indicator light should come on. If not, disconnect wire from oil pressure switch terminal and touch to ground. If light now comes on, oil pressure switch is defective. If light does not come on, check for bad bulb or open circuits to bulb.

**Oil Pressure Gauge** — 1) Disconnect connector from oil pressure sender unit and connect to matching terminals on tester (Rotunda 21-0015 or equivalent). Attach tester ground

wire to vehicle frame. Turn vehicle ignition switch to "ACCESSORY" position.

2) Turn tester switch to IVR Check position. A flashing light indicates IVR and wiring are functional. Turn tester switch to either High or Low position. The center line of gauge pointer should be within the oil pressure white band of tester. If center of pointer registers in white band after 2 minutes, system is operating properly and oil pressure sending unit must be replaced.

3) If pointer center line falls outside low band, replace gauge. If outside high band, replace IVR and repeat test. If still outside high band, replace gauge and reinstall original IVR.

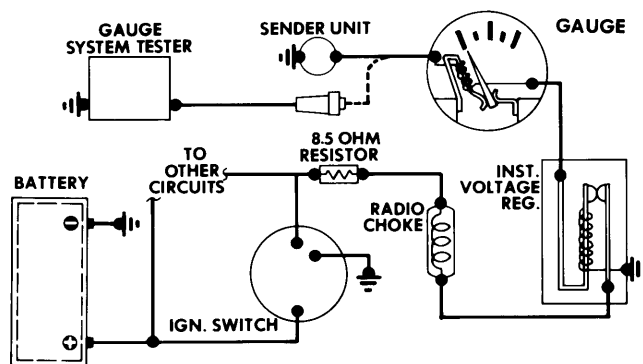


Fig. 1 Testing IVR, Fuel, Oil or Temperature Gauge

**Ammeter** — 1) Turn headlights on; engine off. Meter pointer should move toward the "D" or discharge side of the gauge. If no pointer movement is noted, check rear of meter housing for loose connections, printed circuit connections and multiple connector at printed circuit.

2) If connections are good, replace ammeter. Should ammeter pointer move toward "C" with lights on and engine off, ammeter connections are reversed.

**Fuel Level Gauge** — 1) Using proper tester (Rotunda Instrument Gauge System Tester Model 21-0015 or equivalent), test fuel level gauge with instrument voltage regulator (IVR). Disconnect connector from fuel sender and attach to tester. Turn ignition switch to "ACCESSORY" position.

2) Set tester switch to IVR Check position. If light flashes on and off, the IVR and wiring are functional. If IVR Check light is on steady, check IVR ground screw. If ground screw is secure, replace IVR. If IVR Check light does not come on, check for open circuit in gauge and/or circuit wiring.

3) With tester switch in either High or Low position, center line of gauge pointer should be within "F" or "E" white band of tester. If so, fuel indicating system is working properly and replacement of fuel sender is necessary. If pointer is outside the

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"E" white band, replace fuel gauge. If outside "F" white band, replace IVR and retest. If still outside, replace fuel gauge and reinstall original IVR.

**Temperature Gauge** — 1) Disconnect connector from temperature sender and connect to tester (Rotunda 21-0015 or equivalent). Attach other tester lead to ground on vehicle. Turn vehicle ignition switch to "ACCESSORY" position.

2) Turn tester switch to IVR Check position. A flashing light indicates IVR and wiring are functional. Place tester switch in either high or low position. Center line of pointer should be within white temperature level test band, indicating system is operating properly and that sender unit requires replacement. If center line is outside high white band, replace IVR and retest. If outside low white band, replace gauge and retest.

**NOTE** — If system still does not perform properly, check engine coolant level, proper operation of thermostat and fan belt tension.

## REMOVAL & INSTALLATION

### SPEEDOMETERS & GAUGES

**All Models** — Instrument cluster must be removed to allow any repair or replacement of speedometer or gauges.

### INSTRUMENT CLUSTER

**"E" Models** — 1) Disconnect battery ground, remove seven screws retaining cluster to instrument panel. Position cluster part way out of panel for access to rear of cluster. At back of cluster, disconnect speedometer cable.

**NOTE** — It may be necessary to remove 2 steering column shroud to panel retaining screws. Loosen bolts attaching column to Band C support to provide additional clearance for cluster removal. In some cases, it may prove necessary to remove speedometer cable at the transmission, pulling cable through cowl.

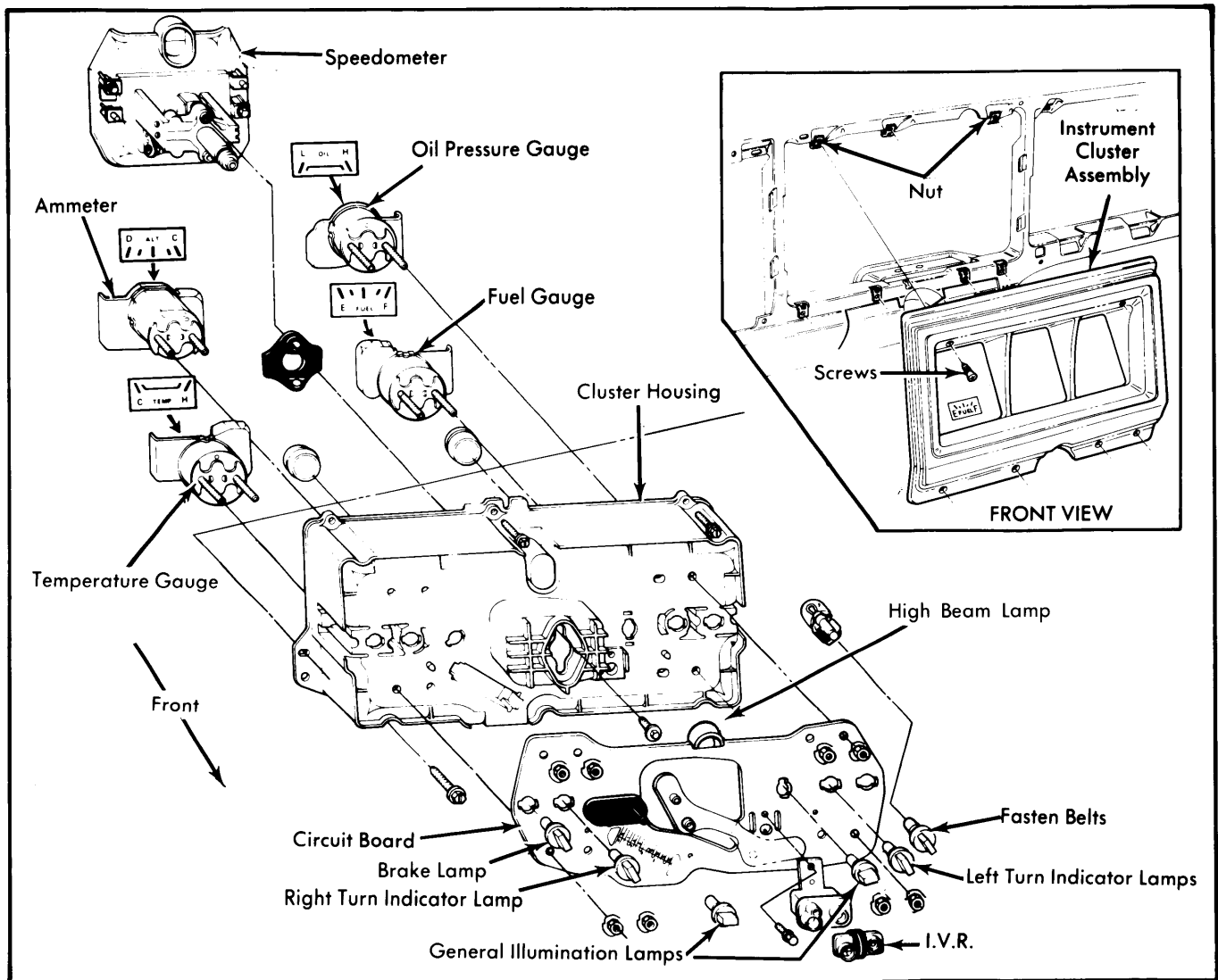


Fig. 2 Exploded View of "E" Models Instrument Cluster

## FORD (Cont.)

2) Disconnect multiple feed plug from printed circuit board and remove the cluster assembly from instrument panel.

3) To install, reverse removal procedure while noting the following: Apply approximately  $\frac{3}{16}$ " diameter ball of suitable silicone lubricant in drive hole of speedometer head.

**"F" Models & Bronco** — 1) Disconnect battery ground cable. Pull knobs from radio shafts (if equipped), fuel gauge switch knob, heater control knobs and wiper/washer knob. Use a hook tool to release each knob lock tab. Remove knob and shaft from light switch.

2) Remove steering column shroud. On automatic transmission vehicles remove loop on selector indicator cable assembly from retainer pin. Remove bracket screw from cable bracket and slide bracket out of slot in tube.

3) Remove cluster trim cover and 4 cluster attaching screws. Disconnect speedometer cable, wire connector from printed circuit and 4x4 indicator light (if equipped). Remove instrument cluster. To install, reverse removal procedure.

## INSTRUMENT VOLTAGE REGULATOR & PRINTED CIRCUIT

**All Models** — 1) Remove instrument panel cluster. Disconnect (snap off) printed circuit connector buttons from instrument voltage regulator.

2) Disconnect multiple feed plug and remove the one attaching screw, then remove the IVR from cluster assembly. Remove gauge retaining nuts, light bulbs, and printed circuit board from cluster.

3) To install, reverse removal procedure while noting the following: Printed circuit board must be carefully positioned to back of cluster and engaged with the plastic locating pins.

## HEADLIGHT SWITCH

**All Models** — Disconnect battery ground cable. On "F" and Bronco models, remove knob from switch shaft, remove center finish panel and remove switch from back side of instrument panel. On "E" models, remove knob and shaft by pressing the knob release button on switch housing, with knob in full "ON" position. Pull knob and shaft out of switch, unscrew mounting nut, remove bezel and switch and then remove wiring connector. To install, reverse removal procedure.

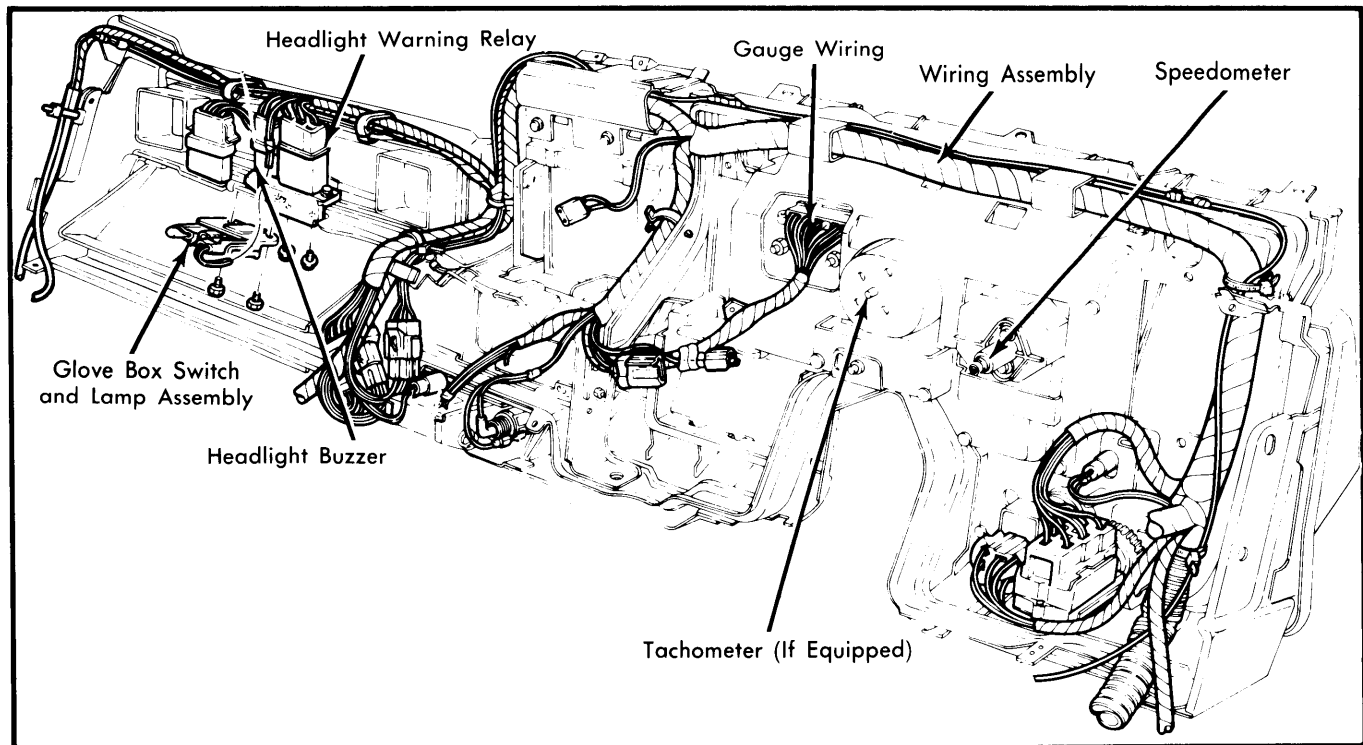


Fig. 3 Exploded View of "F" Models & Bronco Instrument Cluster (Back View)