

# GAUGE INSTALLATION INSTRUCTIONS

• AMMETER

• WATER/OIL TEMPERATURE

• OIL /AIR PRESSURE

## AMMETER

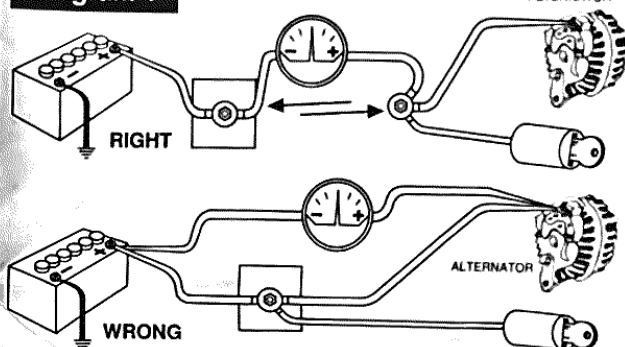
An ammeter measures the amperage (volume of electricity) passing through it. The goal of installation is to reroute all the power through the ammeter (Diagram 1) that drains or charges the battery, except the power needed to operate the starter motor. When the vehicle is operating above idle speed, the ammeter should be indicating "0", or a slight charge condition, which shows a balance of charging and drain on the battery.

**Read all precautions and installation instructions carefully before proceeding with any installation work as the potential for electrical damage or fire exists if an ammeter is improperly connected.**

### Precautions

1. Never ground either of the connection posts for the ammeter.
2. Always use a wire size that is rated to handle an electrical load equal to or greater than the manufacturer's specified output of your alternator/generator.
3. Never connect the ammeter into the circuit between the battery and the starter/solenoid.
4. Good electrical connections are important for maintaining gauge accuracy and avoiding heat buildup in the wiring.

Diagram 1



## INSTALLATION

As the many different vehicles that have been produced have minor differences in the routing and connection points of their charging systems, it is not possible to provide specific information for each vehicle. The eight drawings of Diagram 2 cover the relevant connection points of virtually every charging system in modern vehicles. You will need to determine which drawing matches your system. If you have difficulty in locating any of these connection points refer to a wiring diagram in an owner/service manual or contact your local dealer/auto electrical repair shop for assistance.

The following connection points are represented in the drawings of Diagram 2:

B - Battery: the positive terminal

S - Starter/Solenoid: the main power wire to the battery (largest wire)

A - Alternator/Generator: the main power wire to the battery (largest wire at alternator) and, in Drawings 1 & 5, the wire from the ignition/accessories

I - Ignition/Accessory: the main power wire, which receives power regardless of ignition key position

Z - Junction: in Drawings 4 & 8, where "I" connects into the circuit

**Note:** The circuit from the battery (B) to alternator (A) or starter (S) to alternator (A) may also contain a junction block, horn relay or headlight relay, which is not shown. One of these is likely to be connection "Z" in Drawings 4 & 8. These locations are often handy connections that you can disconnect and then attach the ammeter wires to.

1. After you have identified which BEFORE Drawing represents your charging system, observe the corresponding AFTER Drawing which indicates how to connect the ammeter into your charging system.
2. Find a convenient location in the circuit from the battery to the alternator (Drawings 1 - 4) or the starter to the alternator circuit (Drawings 5 - 8) where you can break the circuit by unbolting a connection. In Drawings 4 & 8, this should be at Connection "Z".
3. If your system matches Drawings 2, 3 or 6, disconnect the Ignition/Accessory (I) wire at "B" or "S".
4. Choose a wire size from the table that is a large enough gauge (larger size wire has a smaller gauge number) to handle the maximum rated

output of your vehicle's alternator/generator. Obtain two lengths of this size wire that are each long enough to go from the location that was chosen in Step 2, to the ammeter's mounting location at the dashboard. Attach closed-eye type connectors (Diagram 3), to each end of both wires.

5. At the location you chose in Step 2, disconnect all the wires at the connection except the wire going to the battery.
6. Connect an end of one of the wires you obtained in Step 4 to all the wires you disconnected in Step 5.
7. Connect an end of the remaining wire from Step 4 to the connection in Step 5 that still has the battery wire attached to it.
8. If your system matches Drawings 2, 3 or 6, connect the wire you disconnected in Step 3 to the wires already connected in Step 6. Use an additional piece of similar sized wire to join these wires, if necessary.
9. Insulate all connections and use a suitable method to fasten down the wires in Step 6 and 8.
10. Route the two ammeter wires to the mounting location for the ammeter. Insulate the opening in the firewall they pass through.
11. Mount the gauge and attach the remaining end of the wire from Step 6 to the ammeter connection post marked with a "+" sign. Follow the sequence of washer-wire-nut shown in Diagram 3.
12. Attach the remaining end of the wire from Step 7 to the ammeter connection post marked with a "-" sign, again following Diagram 3.
13. Reconnect the battery ground cable. As you do, watch for sparks and check if the wiring you worked with is getting warm. If either condition is noted, IMMEDIATELY disconnect the battery ground cable and read the Troubleshooting section.

## TROUBLESHOOTING

1. If, when you reconnected the battery ground cable, you noticed sparks or any of the wiring getting warm, check that all connections are properly located, and insulated from ground.
2. With the vehicle not running and the battery reconnected, turn on the headlights' high beam and observe the ammeter. The gauge should show a drain (-) condition. If a charge (+) condition is shown, reverse the wires on the "+" and "-" posts on the back of the ammeter. If the ammeter shows no change, the circuit from Ignition/Accessory (I) has not been properly included in the connections to the "+" side of the gauge.

Diagram 2

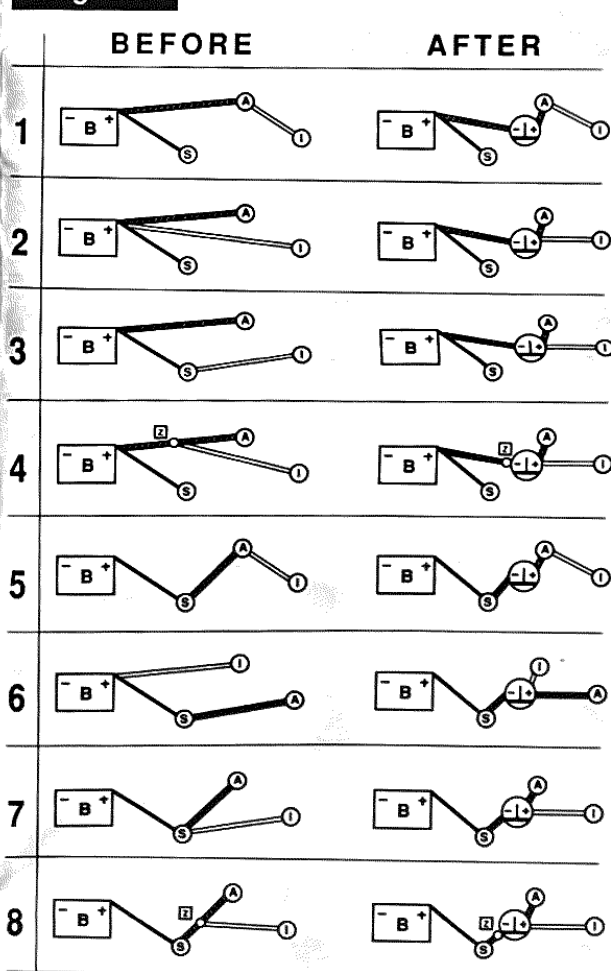
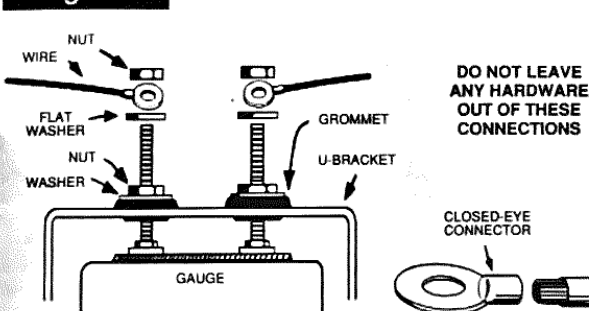


Diagram 3



WIRE SIZE	MAX. AMP. RATING
12	25
10	40
8	65
6	95
4	125

# WATER/OIL TEMPERATURE

**Warning:** If your car is microprocessor (computer) controlled or has an electric cooling fan, refer to the box titled MICROPROCESSOR CONTROLLED ENGINES.

Temperature gauges measure the temperature of any liquid their sender tip is submerged in.

## PRECAUTIONS

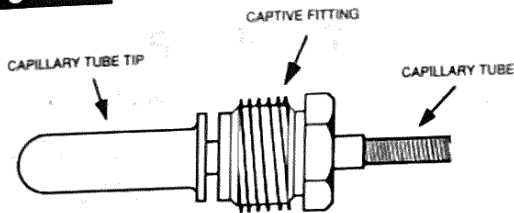
1. A temperature gauge requires that its sender tip have a circulating flow around it to give an accurate reading. For this reason, a T-fitting cannot be used because it has no circulation therefore the original warning light sender cannot be operated off the same location. An additional location may be available on the cylinder head, intake manifold, or thermostat housing but caution should be used in that these locations may have different average temperatures than the original warning light sender location.
2. Do not over tighten the fittings or sender, particularly for mechanical gauges. The threads are designed to strip before the engine component can be damaged. The fittings use tapered self-sealing threads and do not require extreme force to seal properly.
3. Do not use sealing tapes or compounds on electrical senders as this will disturb their grounding connection to the engine resulting in false low readings.

4. Take caution when uncoiling and routing the mechanical gauge's capillary tubing that you do not bend it too sharply or flex it too often. Any break in the inner tube will make the gauge nonrepairable. A replacement service is available only at the factory service center.
5. Always install the adapter fitting into the engine first and then tighten the captive fitting (Diagram 4) on the capillary tube to avoid twisting the tubing.
6. Never install the captive fitting on the capillary tube directly into the engine without an adapter, as a proper seal will not be formed.

## INSTALLATION

**Note:** If you are planning to use both an oil temperature gauge and an oil pressure gauge, some modifications may be necessary as there is only one available hole for both senders. Since the temperature gauge cannot use a T-fitting, it is suggested that you install the oil temperature sender into the oil pressure warning light sender location in the engine block. Then obtain an adapter used for oil coolers which will give you an additional outlet for oil pressure.

Diagram 4



### For Mechanical Gauges:

1. Drain the fluid level in the system to below the sender's mounting location which is normally the factory's warning light sender location.
2. Route the capillary tubing through the mounting hole for the gauge and then through the firewall, protecting the tubing from rough edges. Form at least one 3" or larger loop of tubing as it comes through the firewall and route the remainder to the sender mounting locations.
3. Remove the warning light sender and install the proper adapter fitting into the engine block. If the proper adapter fitting was not included with

the gauge, obtain the necessary (NPT threads) adapter set.

4. Insert the capillary tube tip into the adapter's hole and then tighten, with moderate pressure only, the captive fitting (Diagram 4) into the adapter. Do not over tighten. Sealing tape or compound may be used on either connection.
5. Complete the mounting of the gauge.
6. Refill the fluid level to its normal level.
7. Start the engine and observe the fitting connections for leaks and the gauge for proper operation.

# OIL/AIR PRESSURE

**WARNING:** If your car is microprocessor (computer) controlled or has an electric cooling fan refer to the box titled MICROPROCESSOR CONTROLLED ENGINES.

Pressure gauges can measure the pressure present in a system utilizing air or liquids.

## PRECAUTIONS

1. Check the owner's or service manual, or your local dealer, to be sure that the normal pressures during cold-start and fully-warmed operation for your engine or air system are within the gauge's range.
2. Be sure the tubing kit for the mechanical gauge is long enough for your application.
3. Follow the instructions carefully. A leak that goes unnoticed may lead to serious engine damage.
4. Do not use sealing tapes or compounds on electrical senders. This will disturb their grounding connection to the engine/system, resulting in false low readings.
5. Be careful not to crimp the tubing while unrolling it. Do not use any section of tubing with a crimp or kink in it. If the nylon tubing is a little awkward to use because of being rolled, heat it in boiling water and let the tubing cool while it is unrolled.

## INSTALLATION

**Note:** If you are planning to install an oil temperature gauge as well as an oil pressure gauge, read the **Note** under INSTALLATION in WATER/OIL TEMPERATURE instructions.

### For Mechanical Gauges:

1. If you are monitoring a fluid system, drain the fluid level to a level below the warning light sender location.
2. Remove the warning light sender from the engine and install the engine fitting in the same location. If an adapter is required, first install the adapter (not included) and then the engine fitting.
3. Uncoil a few feet of tubing and slide the hex nut and ferrule over the end of the tubing as in Diagram 5. Insert the tubing into the engine fitting, and then tighten the hex nut into the engine fitting.
4. Optional T-Fitting (Diagram 6) — Install the nipple into the T-fitting and tighten the other end of the nipple into the warning light sender location. Install an adapter fitting first if needed. In one of the two remaining openings in the T-fitting, insert the engine fitting and then follow Step 3 to connect the pressure tubing. Insert the warning light sender into the remaining T-fitting opening. Install an adapter fitting first, if needed.
5. If the gauge has a 1/8" NPT fitting on the back (Diagram 7), install the hex nut adapter to it.
6. Route the remaining tubing through the firewall to the gauge mounting location. Leave at least one 3" or longer loop in the tubing before it enters the firewall and protect the tubing from rough edges of the firewall's hole.
7. Repeat Step 3 to attach the tubing to the gauge.
8. Complete the mounting of the gauge.
9. Refill the fluid level, if drained, to its normal level.
10. Start the engine and observe the fitting connections for leaks and the gauge for proper operation.

Diagram 5

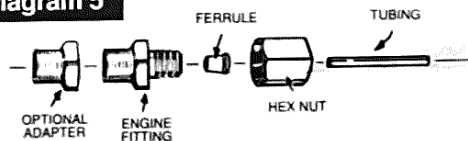


Diagram 6

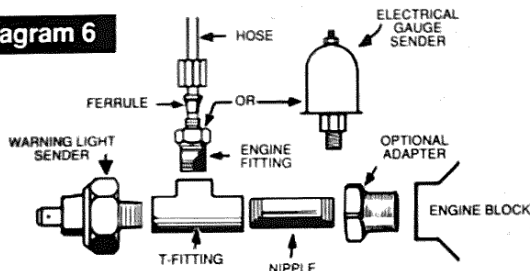
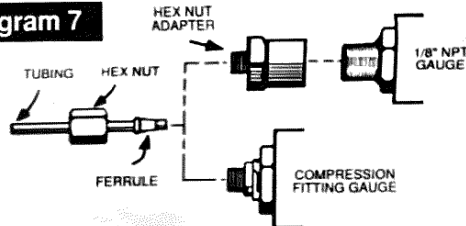


Diagram 7



# MICROPROCESSOR-CONTROLLED ENGINES

Many newer vehicles employ microprocessors that control most of the engine and electrical functions. Microprocessors are very sensitive electrical components. Before installing any aftermarket equipment consult the vehicle's manufacturer or shop manual to make certain that no damage will result.

Some of these newer vehicles use electric cooling fans or microprocessor engine controls that depend on readings from the original equipment

sending units for correct operation. If your vehicle is one of these you CANNOT replace the sender(s) with any other. You can add an additional oil pressure sender with a "Tee Adapter Kit" but the only possible way to install a non OEM water temperature sender is to install the new sender in a different location, retaining the OEM unit in its original location. Check with the vehicle's manufacturer or dealer to see if this is possible.