SAFETY PRECAUTIONS

Batteries contain SULFURIC ACID. They may also contain EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES in each cell at all times. Therefore, the first section of this manual is devoted to safety precautions to be followed when working around batteries. Safety precautions will be mentioned throughout the manual whenever they are applicable.

HANDLING BATTERY ACID

When working with acid, such as filling batteries, wear a face shield. If many batteries are handled, protective clothing is advisable. Use extreme care to avoid spilling or splashing electrolyte (which is dilute sulfuric acid) as it can destroy clothing and burn the skin. When handling a plastic eased battery, excessive pressure placed on the end walls could cause electrolyte to spew through the vents. Therefore, always use a battery carrier to lift these batteries or lift them with your hands placed at opposite corners. If electrolyte is spilled or splashed on clothing or the body, it should be neutralized immediately and then rinsed with clean water. A solution of baking soda, or household ammonia, and water may be used as a neutralizer.

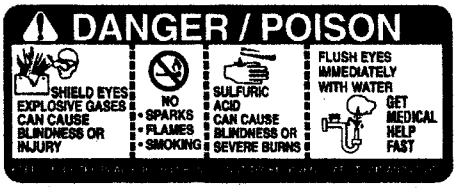
Electrolyte splashed into the eyes is extremely dangerous. If this should happen, force the eye open and flood it with cool, clean water for approximately fifteen minutes. A doctor should be called immediately when the accident occurs and "on-the-spot" medical attention given if possible. If a doctor cannot come to the scene of the accident immediately, follow his instructions concerning actions to take. Do not add eye drops or other medication unless advised to do so by the doctor. Do not place a battery or acid within the reach of children. If acid (electrolyte) is taken internally drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately.

If electrolyte is spilled or splashed on any surface of the car, it should be neutralized and rinsed with clean water.

If it becomes necessary to prepare electrolyte of a desired specific gravity, always pour the concentrated acid slowly into the water; not the water into the acid, Heat is generated when acid is mixed with water. Add small amounts of acid slowly while stirring. Allow to cool if noticeable heat develops. Except for lead or lead lined containers, use nonmetallic receptacles and/or funnels. Do not store acid in excessively warm locations or in direct sunlight.

DANGER OF EXPLODING BATTERY

BATTERIES EXPEL EXPLOSIVE GASES. KEEP SPARKS, FLAMES, BURNING CIGARETTES,OR OTHER IGNITION SOURCES AWAY AT ALL TIMES. ALWAYS WEAR SAFETY GOGGLES AND A FACE SHIELD WHEN WORKING NEAR BATTERIES.



No one should work near a battery, either in a vehicle or on the bench, unless they know and observe the safety precautions described in this manual. They should be familiar with the procedures to be used if they attempt to charge or test a battery or jumpstart an engine. The manufacturers instructions must be followed when any equipment such as a battery charger or tester is used.

Hydrogen and oxygen gases are produced during normal battery operation. These gases escape through the battery vents and may form an explosive atmosphere around the battery if ventilation is poor. Explosive gases may continue to be present in and around the battery for several hours after it has been charged. The use of vent caps having a flame barrier feature has increased; and while such vent caps are designed

to inhibit ignition of gases within the battery by external ignition sources, it is advisable to keep sparks, flames or other ignition sources well away from the battery. Anyone in the vicinity of the battery when it explodes could receive injuries, including eye injury from flying pieces of the case or cover or acid thrown from the battery. Always wear safety goggles and a face shield when working near a battery. Never lean over it during charging, testing or "jump starting" operations. Do not break "live" circuits at the terminals of batteries because a spark invariably occurs at the point where a "live" circuit is broken. Make certain the charger cable clamps or booster leads are clean and making good connections. A poor connection can cause an electrical arc which could ignite the gas mixture and explode the battery.

Be careful that tools or other metallic objects do not fall across the terminal which is not grounded and any adjacent metallic part of the vehicle which is grounded. Do not smoke when working under the hood of a car or near a battery. Never strike a match or bring any other flame in the vicinity of the battery.

CHARGING A BATTERY

The room or compartment in which the battery is being charged should be well ventilated. Do not put a battery on charge unless you are wearing safety goggles and a face shield. It must be assumed that explosive mixtures of hydrogen gas are present within the battery cells at all times. Even a battery standing idle generates small quantities of hydrogen due to the self-discharge action. This gas collects in the cells and can be exploded by a torch, match flame, lighted cigarette, sparks from loose connections or metal tools making contact between the terminals and the ungrounded terminal and adjacent metal parts which are grounded.

Since vent cap designs having flame barrier features are not easily distinguished from other style vent caps, it is recommended that vent caps be left on the battery during charging. As a further precaution, place a wet cloth over the battery and vent caps. Since flame arresters are used in most modern vent cap designs to reduce the possibility of the battery being exploded by an external spark, this safety feature could be bypassed by removal of the vent caps. Whether such vent caps are present or not, always shield eyes when working around the battery and follow the precautions covered here.

Do not charge a battery unless you are thoroughly familiar with the step by step procedure to use. Follow the manufacturer's instructions on the charger. If the instructions are no longer legible and you do not have literature containing the instructions, obtain them from the manufacturer of the charger. Never use a charger without instructions.

Turn the charge rate switch and timer to the "OFF" position before connecting the leads to the battery. Next, connect the charger leads to the battery terminals, red positive (+) lead to positive terminal and black negative (-) lead to negative terminal. If the battery is in the car, connect the negative lead to the engine block if the car has a negative ground (negative battery terminal is connected to ground). Connect the

positive lead to ground if the car has a "positive ground" (now rarely occurs). "Rock" the charger lead clamps to make certain a good connection has been made. Set the electric timer to the desired charging time. Now, turn on the charger and slowly increase the charging rate until the desired ampere value is reached. Do not charge in the red zone. If smoke or dense vapor comes from the battery, shut off the charger and reject the battery. If violent gassing or spewing of electrolyte occurs, reduce or temporarily halt the charging.

Never touch the charger leads when the charger is "ON". This could break a connection at the battery terminal, creating a spark which could ignite the explosive gases in the battery. Never break a "live" circuit at the battery terminals for the same reason. Always turn the charger "off" before removing a charger lead from the battery.

When charging or testing a side terminal battery out of a vehicle, always use side terminal charging and testing posts which have been designed for this purpose.