Section 6
PLUMBING

WINTERIZING WATER SYSTEM

Refer to Figure 6-1.

To protect the water system against damage from freezing, thoroughly drain water system. This includes draining water lines, water tank, hot water heater and holding tank.

1. Open both hot and cold water faucets and all other water outlets. After the lines have drained blow out as much water as possible with air pressure. Blow-out plugs are available for this purpose.
2. Open drain line on water tank.
3. Drain and flush holding tank.
4. Open drain line on hot water heater. Leave drain plug or petcock open after draining if a by-pass kit is used.

NOTE: It is recommended that a by-pass kit be installed on hot water heater. Both manual and electric kits are available. The by-pass eliminates the need of filling hot water heater with anti freeze during winterizing operations to reduce the amount of anti-freeze needed.

NOTE: Directions for installing by-pass are included with by-pass kit and are also described in the following section.

5. Turn off all open water faucets, and close drain on cold water tank and holding tank.
6. Add recreational vehicle Non-Toxic anti-freeze solution to cold water tank. Anti-freeze protects to 50° below zero.

WARNING: Non-Toxic anti-freeze is designed for winter storage use only!! It is not intended to be used as an additive to the water system for drinking or any other use. Therefore, thoroughly drain and water flush the water system before using. Do not use this type of anti-freeze in automotive cooling system radiators.

7. Turn on demand pump and pressurize water system.
8. Starting with the further most faucet from the cold water tank, open each faucet and allow anti-freeze to flow until pink color appears. Repeat this procedure at each fresh water outlet.
9. Flush toilet several times and activate the holding tank dump valve to insure complete anti-freeze protection of the waste system.
10. At outside city water fill, release pressure on poppet valve with small screw driver and allow anti-freeze to flow out until pink color appears.
11. Add 1 to 2 cups of anti-freeze to each trap, bathtub and shower.
12. When water system is to be used thoroughly flush system with fresh water for 15 to 20 minutes until all traces of the pink color anti-freeze disappear.

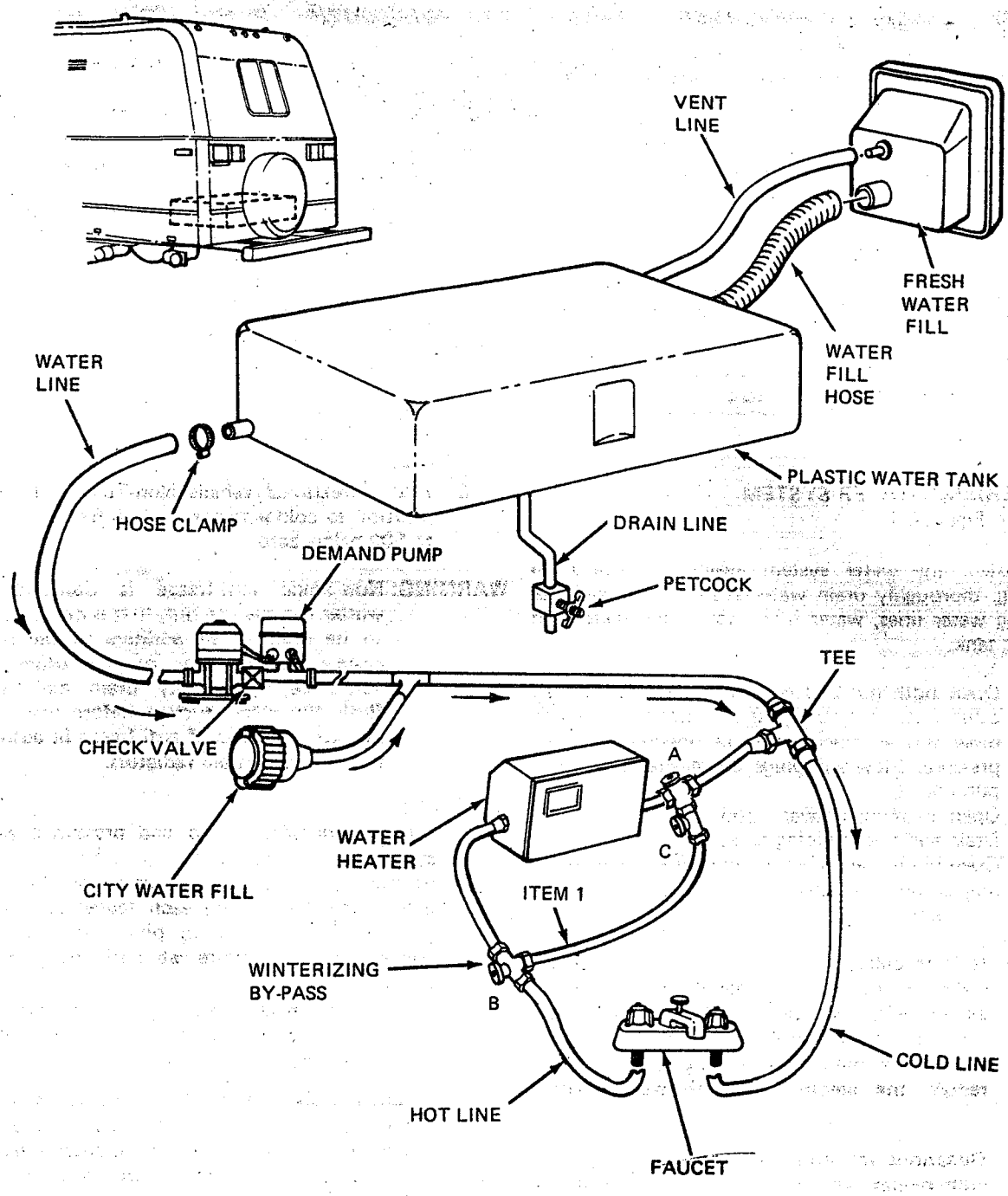


FIGURE 6-1 Plastic tank (demand type)

WATER LINES

All water line repairs can be made with polybutylene tubing rated at 100 psi and 180°F. This material must meet requirements of ASTM D 3309 specification.

Two methods are recommended for repair: 1. Use of a nut, ring and seal kit or 2. use of standard flaring methods as those used with regular copper tubing.

WATER LINE REPLACEMENT (NUT AND RING KIT)

Refer to Figure 6-2.

1. Depressurize water system. Disconnect from city water supply, shut off demand pump, air compressor and open faucets. Drain water system if necessary.

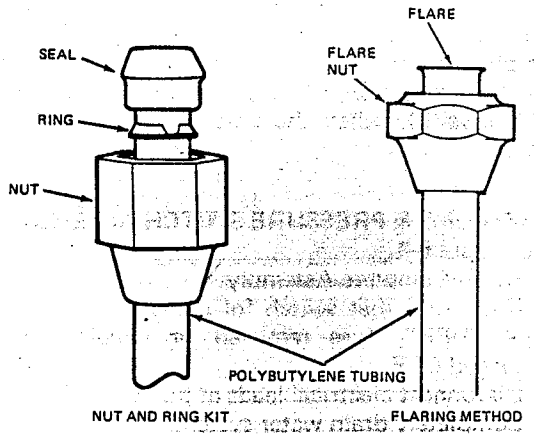


FIGURE 6-2 Flare type fitting assembly

2. Unscrew flare nuts connecting damaged or leaking tubing and remove.
3. Cut new tubing to length using plastic tubing cutter or knife. Make a sharp scoring cut around complete tube surface. Keep cut square or perpendicular to tube.
4. Snap tube apart. Improperly cut or scored tube will bend and not snap apart.
5. From the nut, ring and seal kit, slip plastic nut onto tubing – small end of nut first.
6. Slip metal ring on tubing. Ring contains prongs which should be facing away from nut. Ring should be placed on tube approximately 1/4 in. from cut end.
7. Snap seal on tube end with the rounded end of seal facing away from nut. Make sure seal is flush with tubing end.
8. Run nut up to seal.
9. Engage nut into fitting end of water line.
10. Hand tighten until nut makes a squeaking sound.
11. Give nut one additional turn with wrench, pliers or similar tool.
12. Fill water system, pressurize and check for leaks.

NOTE: **Nut, ring and seal kits can also be used with brass fittings and standard compression fittings and can be connected to galvanized, copper and CPVC systems.**

WATER LINE REPLACEMENT (FLARING METHOD)

Refer to Figure 6-2.

1. Depressurize water system. Disconnect from city water supply, shut off demand pump, air compressor and open faucets. Drain water system if necessary.
2. Unscrew flare nuts connecting damaged or leaking tubing and remove.
3. Cut new tubing to length, install flare nuts, and flare the tubing. Plastic water lines must be flared with special flaring tool.
4. Re-install tubing.
5. Fill water system, pressurize and check for leaks.

DRAIN LINES

All sanitary and drain lines are made of ABS plastic pipe. This material can be obtained from plumbing supply stores. All permanent joints between fittings and pipe are made using ABS pipe cement. Removable fittings, utilizing compression seals to prevent leakage, can also be used. When repair is required on bonded lines, the section to be repaired must be cut away and a new section installed with a union or by adhesive bonded couplings and pipe.

FRESH WATER TANKS

Refer to Figure 6-1.

Water tanks are placed in various positions in the vehicles. Locate the fresh water fill on the outside of the unit. The water tank will be located under the seat adjacent to the outside fill location.

DEMAND TYPE – PLASTIC TANK

Refer to Figure 6-1.

Removal and Replacement

1. Turn off demand pump.
2. Remove appropriate seat.

3. Drain tank by opening pet cock on bottom.
4. Remove hose clamp from water line.
5. Remove water line, fill and vent hose.
6. Remove tank.
7. Remove drain line and all fittings from tank.
8. Re-install tank by reversing steps 1 through 7.
9. Fill tank and check for leaks.

WATER AND HOLDING TANK CAPACITY INDICATOR

Refer to Figure 6-3.

Removal

1. Turn off 12V power supply to motor home and disconnect battery cables to positive terminals on both batteries.
2. Unscrew front indicator panel from unit.
3. Remove indicator panel assembly.
4. Unless wiring is defective, it is not necessary to pull old wiring out. Remove wire nuts from probe. Unscrew probe from water tank or holding tank.

Replacement

1. Install new probes into water and holding tank.
2. Make new wiring connections according to color codes.
3. Connect electrical leads to printed circuit.
4. Screw indicator panel assembly in place.
5. Turn on 12V power supply.
6. Check system for proper operation.

INDICATOR CONTROL PANEL

1. Unsnap panel from tank capacity indicator assembly.
2. Disconnect leads to push buttons.
3. Mark leads for easy reassembly.
4. Install new panel reversing steps 1 and 2.

WATER TANK PROBE

Refer to Figure 6-3.

See procedure under water and holding tank indicator in this section.

WATER SUPPLY

DEMAND PUMP SYSTEM

Refer to figure 6-4.

This system operates on a demand basis and consists of a demand pump and a plastic water tank. The demand pump operates when water is used and pumps water to the fixtures. A check valve is located directly ahead of the pump to prevent water flow into the plastic tank when the water system is connected to city water. A pressure switch is connected to the pump output water line. When a water fixture valve is opened the pressure in the output line drops, turning on the pump and supplying water to the plumbing fixtures. A check valve in the city water fill stops the flow of the water out of the vehicle when the unit is not connected to city water.

DEMAND PUMP & PRESSURE SWITCH ASSEMBLY

Refer to Figure 6-4.

Removal – Complete Assembly

1. Make sure that switch for demand water pump is "OFF", fuse removed or circuit breaker turned OFF.
2. Disconnect electrical leads at pump.
3. Completely drain water system.

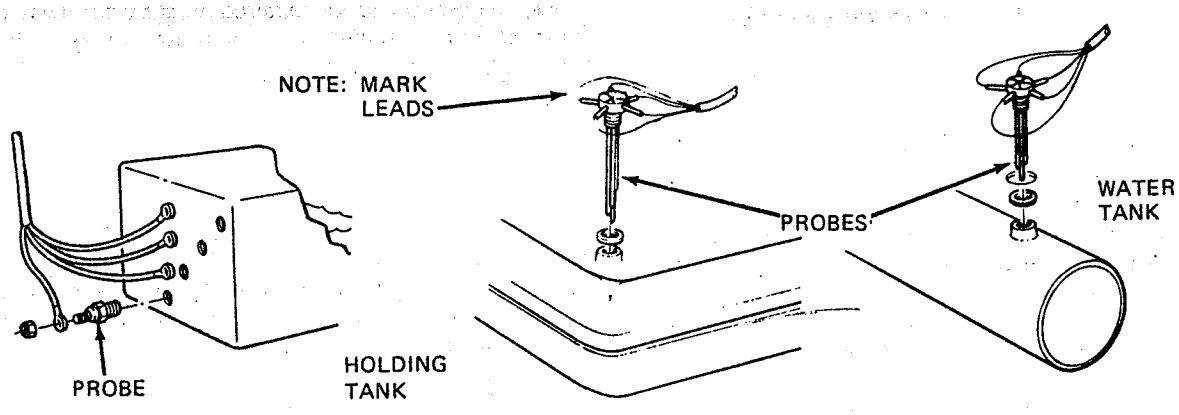


FIGURE 6-3 Water and holding tank indicators

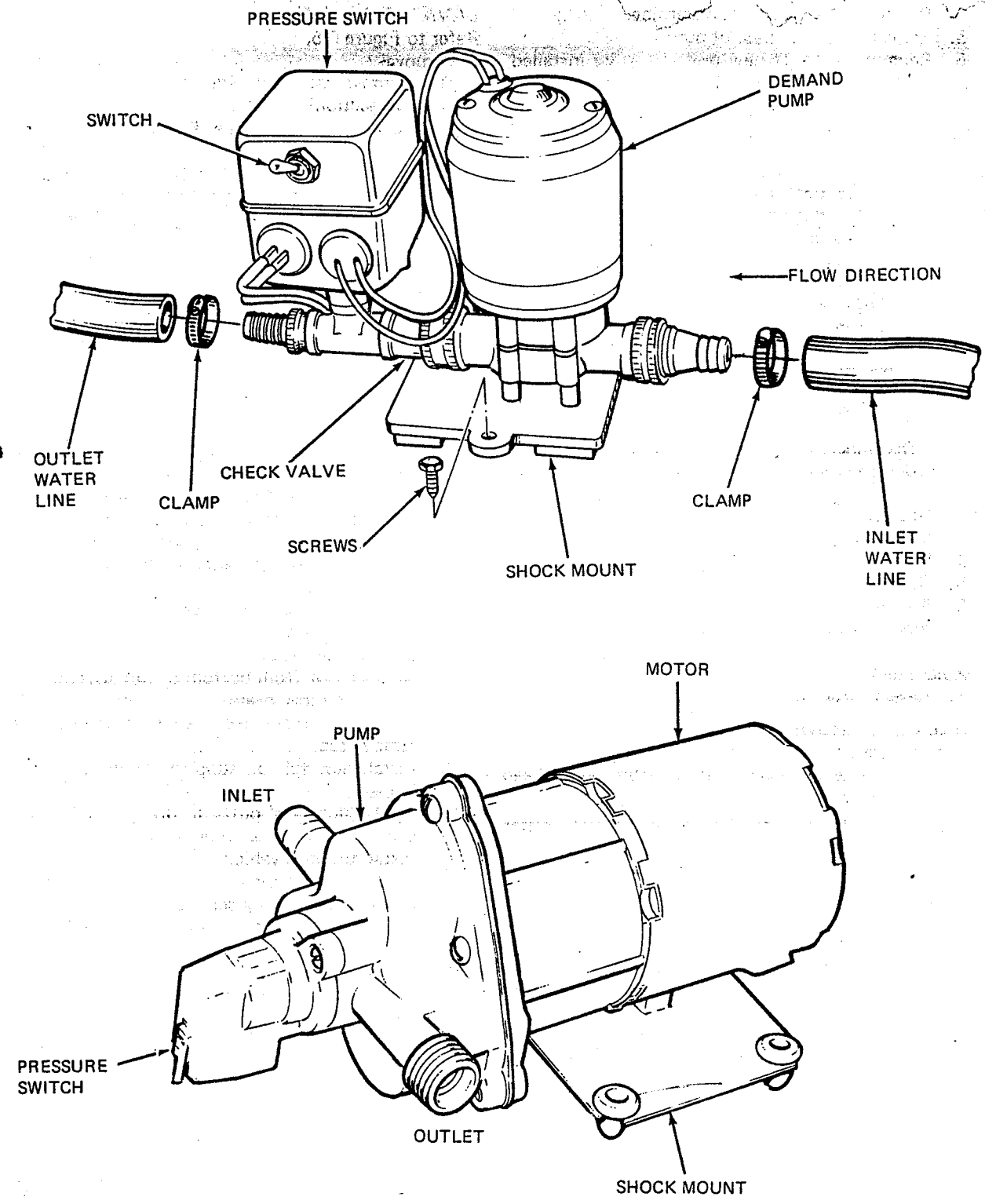


FIGURE 6-4 Demand pumps

4. Remove inlet and outlet water line.
5. Remove screws at base of pump.
6. Remove pump. If new pump is to be installed, water line fittings may be removed and reused.

Replacement
1. Reverse removal procedure.

NOTE: If water does not flow within 30 seconds, turn off electrical supply to pump and check for water in supply tank, air leaks on intake side of the pump and pump rotation direction.

FAUCET REMOVAL (SINK OR WALL MOUNT)

Refer to Figure 6-5.

Removal
1. Remove paneling or inspection plate to provide access to wall mount faucets.
2. Depressurize water system.

NOTE: Disconnect from city water supply. Shut off demand pump or compressor and open faucets.

3. Unscrew 2 flare nuts from hot and cold water lines at faucet assembly.
4. Remove faucet jam nuts and washers.
5. Remove faucet assembly.
6. Remove phone head shower assembly on bathroom fixture.

Replacement
1. Reverse procedure.

PHONE HEAD SHOWER

Refer to Figure 6-6.
1. Unscrew water line swivel nut from phone head shower.
2. Attach phone head shower to flexible water supply line with swivel nut.

KITCHEN SINK

Refer to Figure 6-7.
1. Remove drawers to expose P-trap.
2. Remove P-trap by unscrewing 2 slip nuts.
3. Remove sink clamps.
4. Remove sink.
5. Remove sink drain and tail piece.
6. Apply plumbers' putty around drain openings and install sink drain. Secure with nut on underside of sink.
7. Apply ribbon sealer under lip of new sink and install into opening and secure with clamps from bottom side.
8. Reinstall drain tail piece and P-trap. Remove excess putty and sealer and test for leaks.

LAVATORY BASIN

Refer to Figure 6-5.

Removal
1. Remove faucet if required (see faucet removal this section).
2. Remove P-trap. (See P-trap removal in this section.)
3. Remove drain from bottom of basin by removing jam nut and lifting drain out of basin.
4. Remove screws holding basin to wall and cabinet base and remove basin.

Replacement
1. Reverse removal procedure. Use plumbers' putty to seal drain to lavatory.
2. Check for leaks.

TUB REMOVAL

Refer to Figure 6-8.
1. Tubs are constructed with a vertical lip on 3 sides. In some units the wall panels will overlap the tub lip. In these instances use a saber saw and make a vertical cut around the three sides adjacent to the wall panel. In units where molding is used to secure tub, remove screws attaching moldings.
2. From under vehicle loosen P-trap nuts at drain and remove trap.
3. Lift out bath tub.
4. Remove nut from bottom of tub attaching drain to tub. Remove drain.
5. Cut away foam from support structure and remove tub.
6. Install new tub on support structure and foam in place.
7. Apply plumbers' putty to drain, install into tub and secure with clamp nut.
8. Install tub into vehicle.
9. Apply silicone sealer to moldings, install moldings and secure with screws.
10. From under vehicle, reinstall trap on tub drain pipe and tighten in place.
11. Remove excess sealer and putty, fill tub and check for leakage around drain from beneath vehicle.

SHOWER PAN

Replacement

Refer to Figure 6-8.
1. Remove toilet stool (see toilet stool removal above).
2. Remove screws attaching closet flange to floor through shower pan.

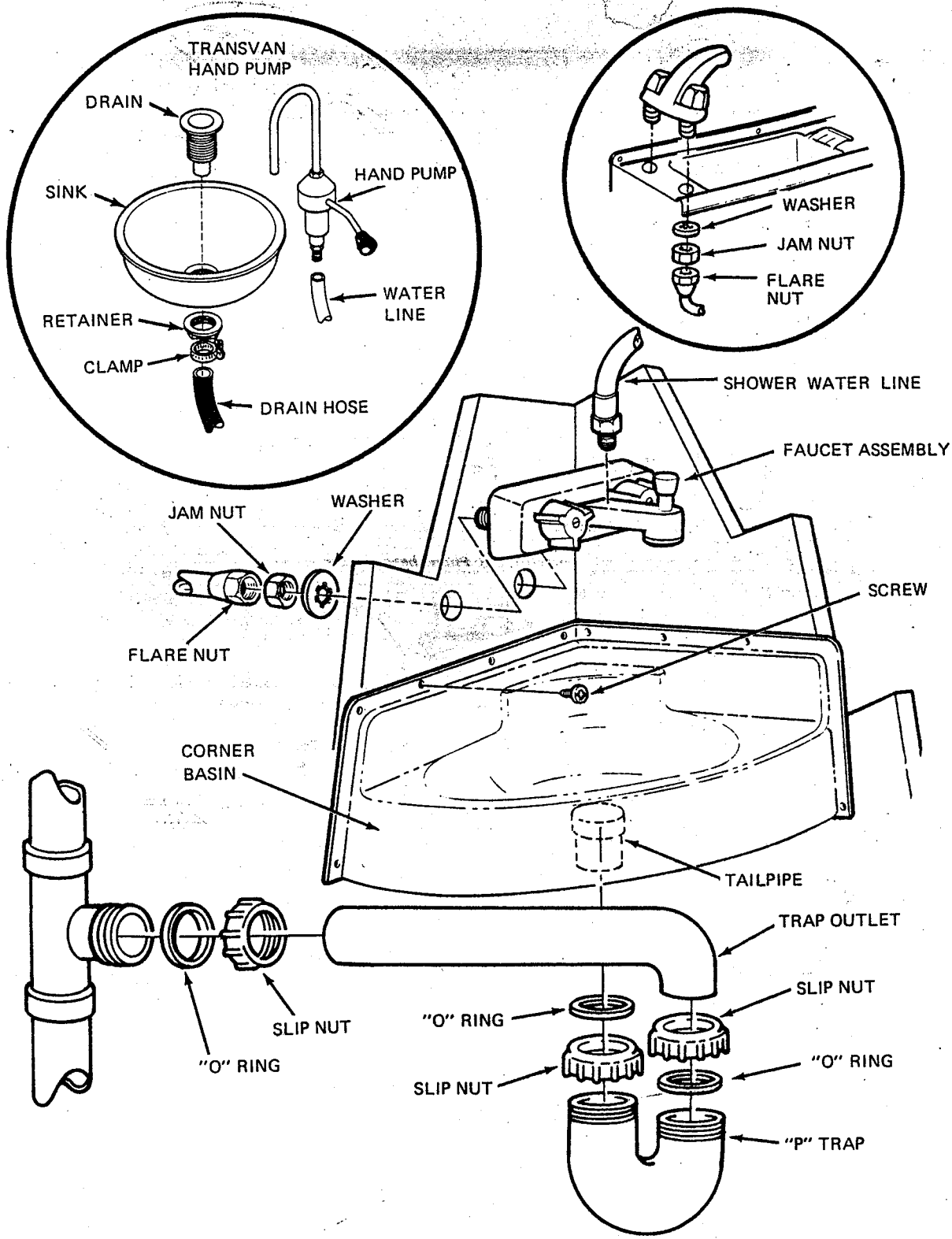


FIGURE 6-5 Faucet removal (sink or wall mount)

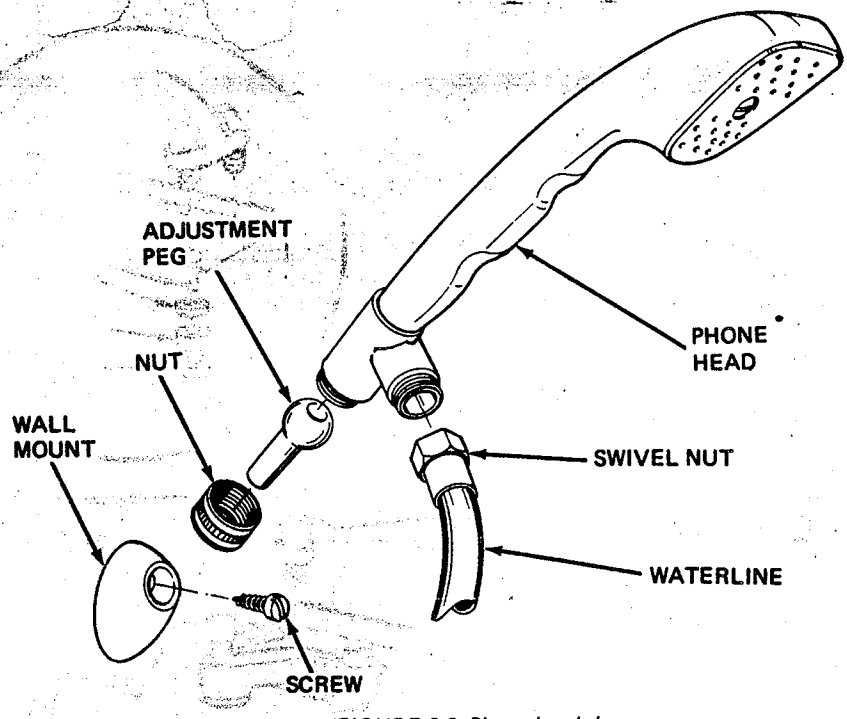


FIGURE 6-6 Phone head shower

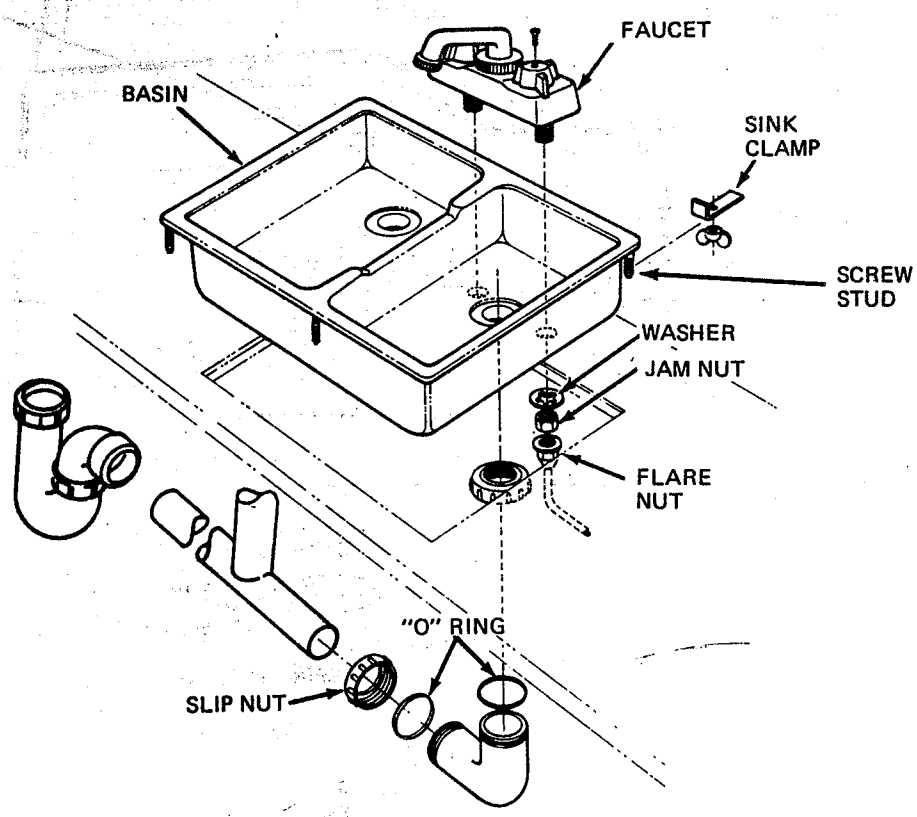


FIGURE 6-7 Kitchen sink

3. Unscrew closet flange assembly from holding tank.
4. Shower pans are constructed with a vertical lip on 3 sides. In some units the wall panel overlaps the pan lip. In these instances use a saber saw and make a vertical cut through the pan around the three sides adjacent to the wall panel. In units where molding is used to secure tub, remove screws attaching molding.
5. From under vehicle loosen P-trap nuts at drain and remove trap.
6. Remove shower pan.
7. Remove drain by unscrewing clamp nut.
8. Remove old sealer from closet flange and moldings and apply new sealer.
9. Apply plumbers' putty to drain flange and install in replacement shower pan.
10. Install shower pan by sliding drain into trap opening.
11. Reverse steps 5 through 2 above.
12. Apply silicone sealer to screws securing closet flange to floor.
13. Install toilet.
14. Remove excess sealer, plug drain, fill shower pan with water and check for leakage around drain from beneath vehicle.

P-TRAP

Refer to Figures 6-7, 6-9.

Removal

1. Disconnect P-trap by loosening 2 slip nuts.
2. Slide P-trap down and remove.

Replacement

1. Reverse procedure.

TOILET STOOL

Refer to Figure 6-9.

Omit steps 1 & 2 if unit is not electric recirculating type.

1. Turn off circuit breaker supplying voltage to toilet.
2. Remove two screws attaching switch assembly to toilet. Lift up assembly and disconnect supply wires. Mark wires for polarity to insure proper reinstallation. Replace switch assembly and re-install 2 screws.
3. Depressurize water system, shut off demand pump or air compressor, disconnect city water supply.
4. Loosen flare nut and remove water supply line from water valve.
5. Remove nuts and washers securing stool to floor or shower pan.
6. Remove stool.

Replacement

1. Check rubber gasket in flange seal and replace if necessary.
2. Reverse steps 5 through 1, then check for proper operation.

HOLDING TANK

Refer to Figure 6-10.

Removal

1. Empty and flush holding tank.
2. Remove toilet stool. (See stool removal this section.)
3. Remove floor flange and 3-inch nipple by removing appropriate screws and unscrewing from holding tank.
4. Remove lower body side metal by removing screws on bottom edge of metal. Remove metal panel by pulling downward. If inspection holes are not cut out of bottom belly pan, cut holes where needed to give accessibility to fittings.
5. From under motor home, remove foam insulation around holding tank.
6. Remove bolts from metal retainers holding tank to floor frame, and any straps supporting dump lines and valves.
7. If fittings are threaded, loosen compression nuts. If fittings are bonded, cut with hacksaw as close to tank as possible.
8. If required, pry holding tank from insulation foam.

NOTE: On polypropylene holding tanks, the drain pipes are held in place with a soft grommet. Drain pipe will slide out of grommet without the need for cutting.

Dump valve assembly is held in place with a hose clamp. Cutting and bonding is not required.

Replacement

1. Using removed tank as a guide, measure and mark hole locations on new tank.
2. Cut holes in new tank with hole saw.
3. Cement 3" nipple flange and "O" ring adapters into tank as required. Using pipe and couplers cut necessary pieces to reconnect existing piping and cement into place.

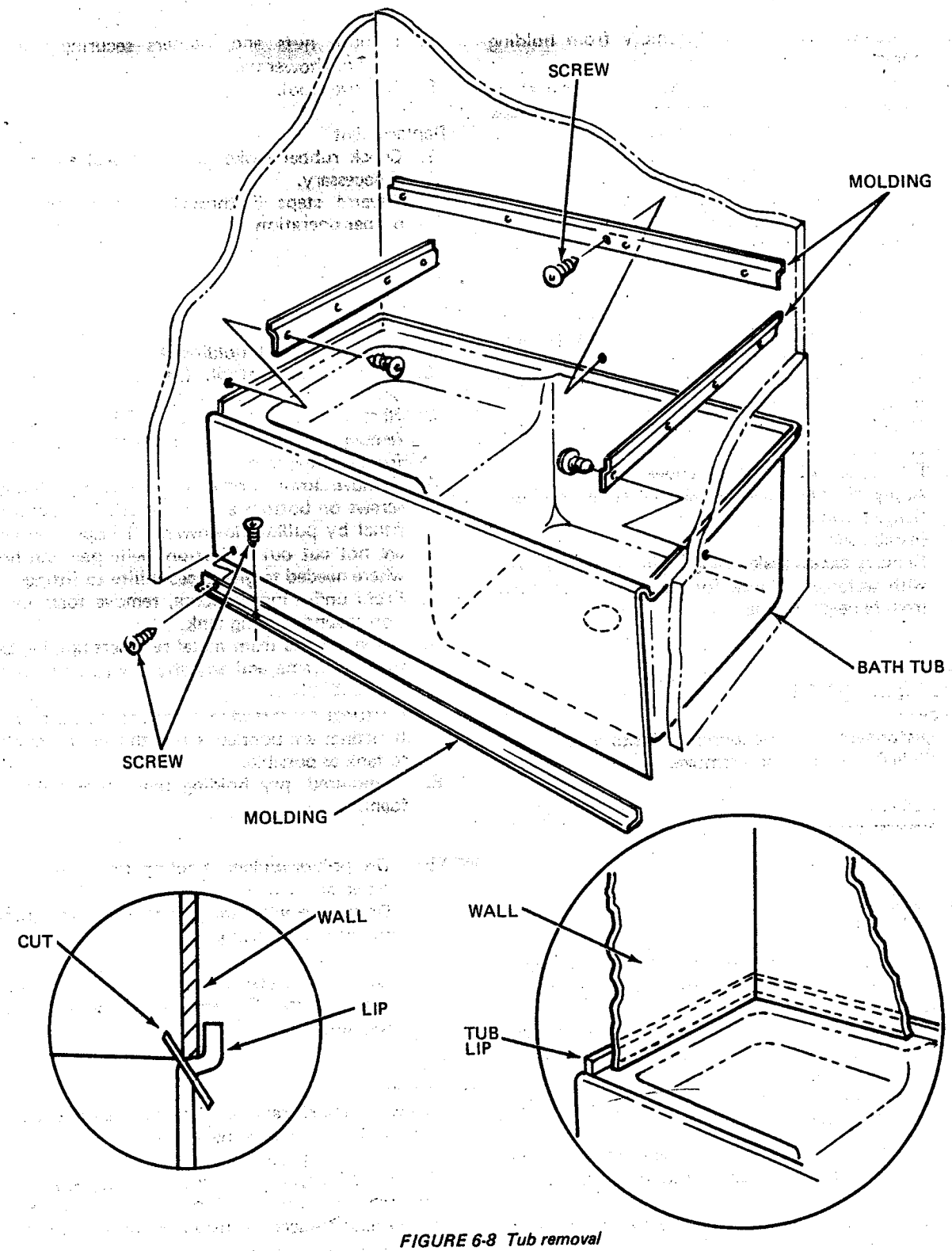


FIGURE 6-8 Tub removal

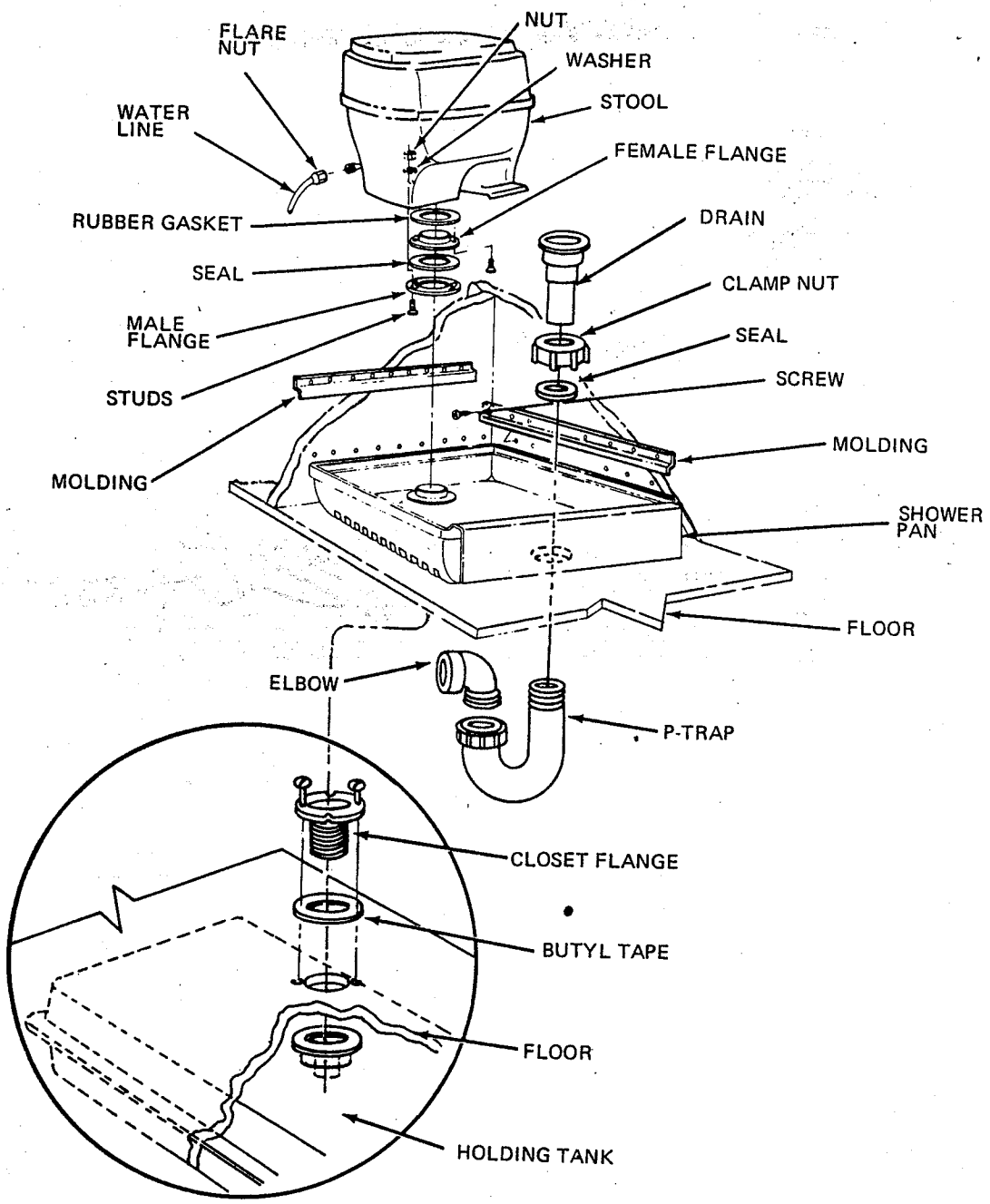
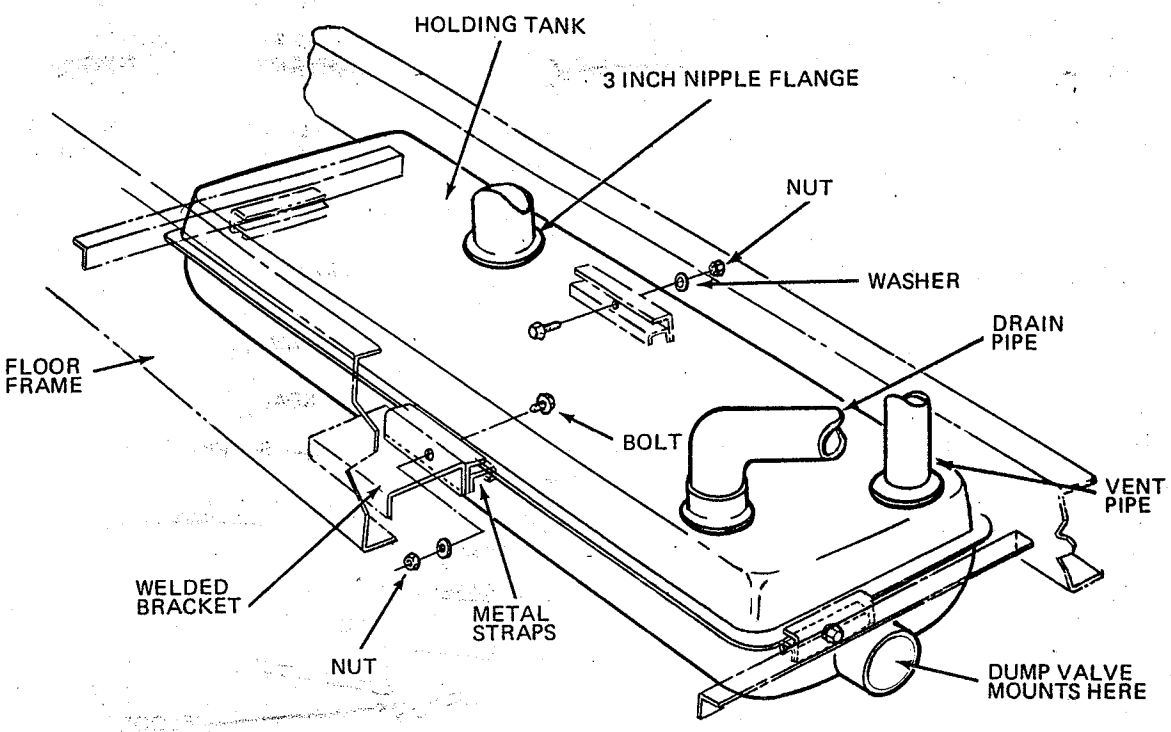


FIGURE 6-9 Toilet stool



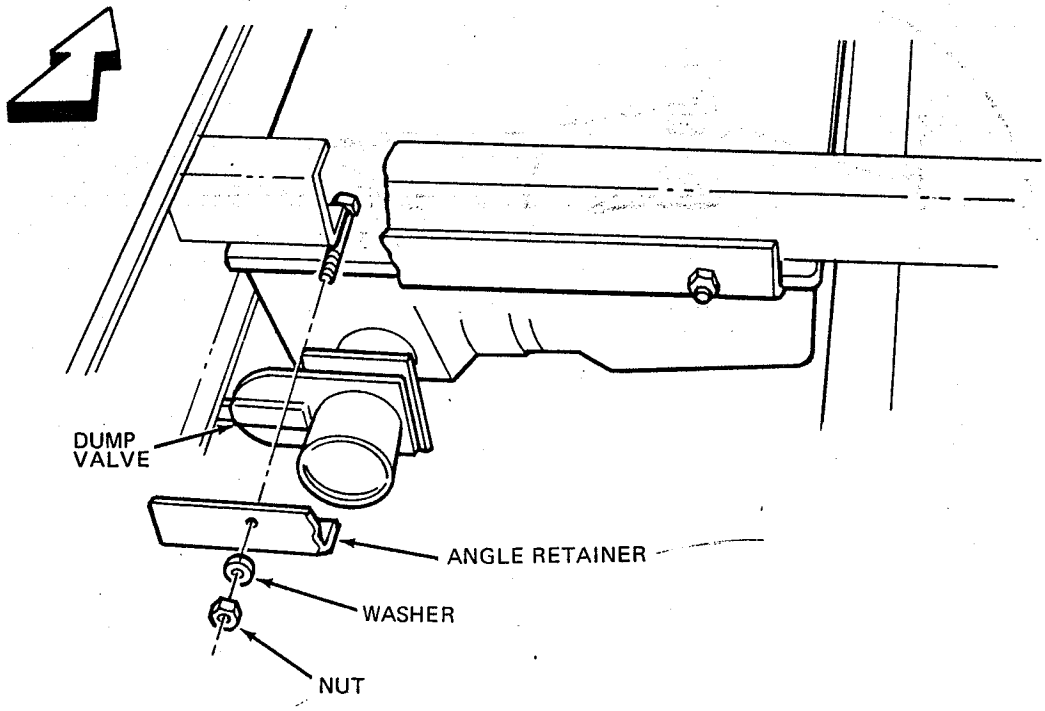


FIGURE 6-10 Holding tank

4. With 2 men, one holding each end of the tank, raise the tank into position.
5. Place jack or other support under tank to hold in position and re-attach tank retainers.
6. Cement new dump valve in place with ABS plastic pipe cement.
7. Re-attach dump line support straps.
8. Apply Butyl tape to bottom side of closet flange assembly. Install 3-inch nipple and closet flange assembly into tank.
9. Secure flange to floor of vehicle with screws and apply silicone sealer to screw heads.
10. Allow ABS cement to dry for minimum of 1 hour. Provide temporary support or blocking of dump line so that pressure of test water will not push dump line from tank. After waiting one hour and with jack or supports still in position, fill holding tank to floor level and check for leaks.
11. Drain tank, remove supports.
12. Install stool. (See stool this section.)
13. Refoam and undercoat.

NOTE: 24 hour adhesive curing time is required before holding tank can be placed in operation.

HOLDING TANK PROBE

Refer to Figure 6-3, 9-15.
See procedure under water and holding tank indicator in this section.

HOLDING TANK GATE DUMP VALVE

Refer to Figures 6-10 and 6-11.

1. Empty and flush holding tank.
2. Remove 4 bolts holding gate valve to holding tank flange.
3. Remove gate valve slide assembly.
4. Replace with new slide (kit) and new "O" rings.
5. Replace bolts and tighten until secure. DO NOT OVER TIGHTEN.

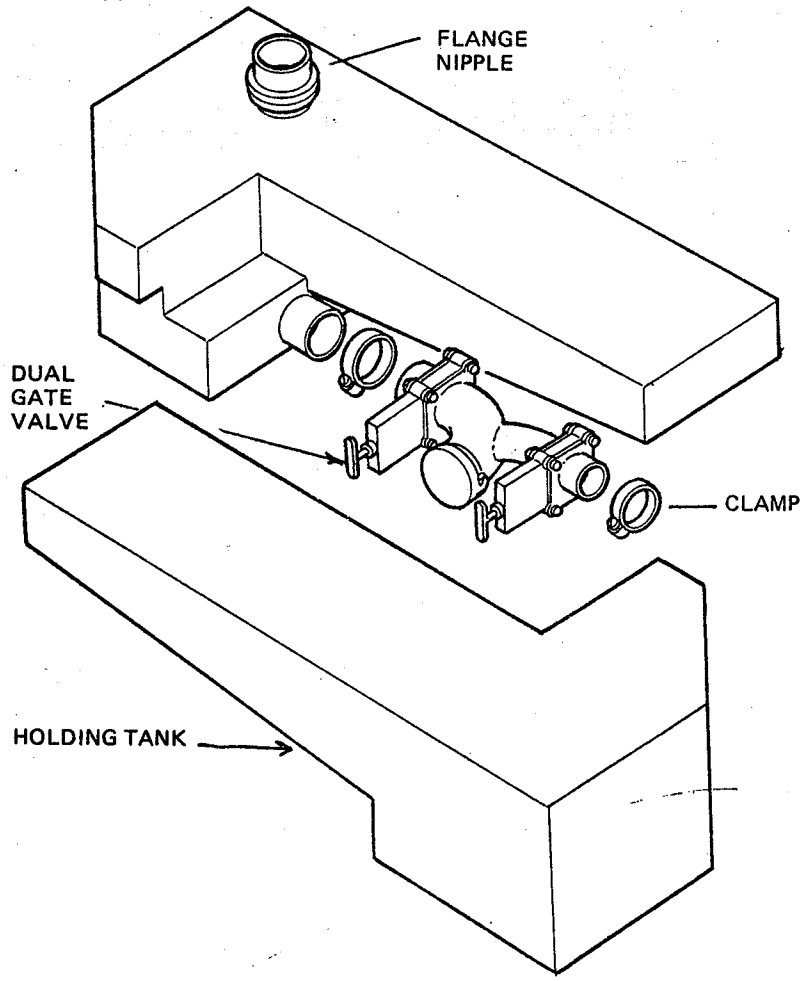


FIGURE 6-11 Dual holding tank & gate valve