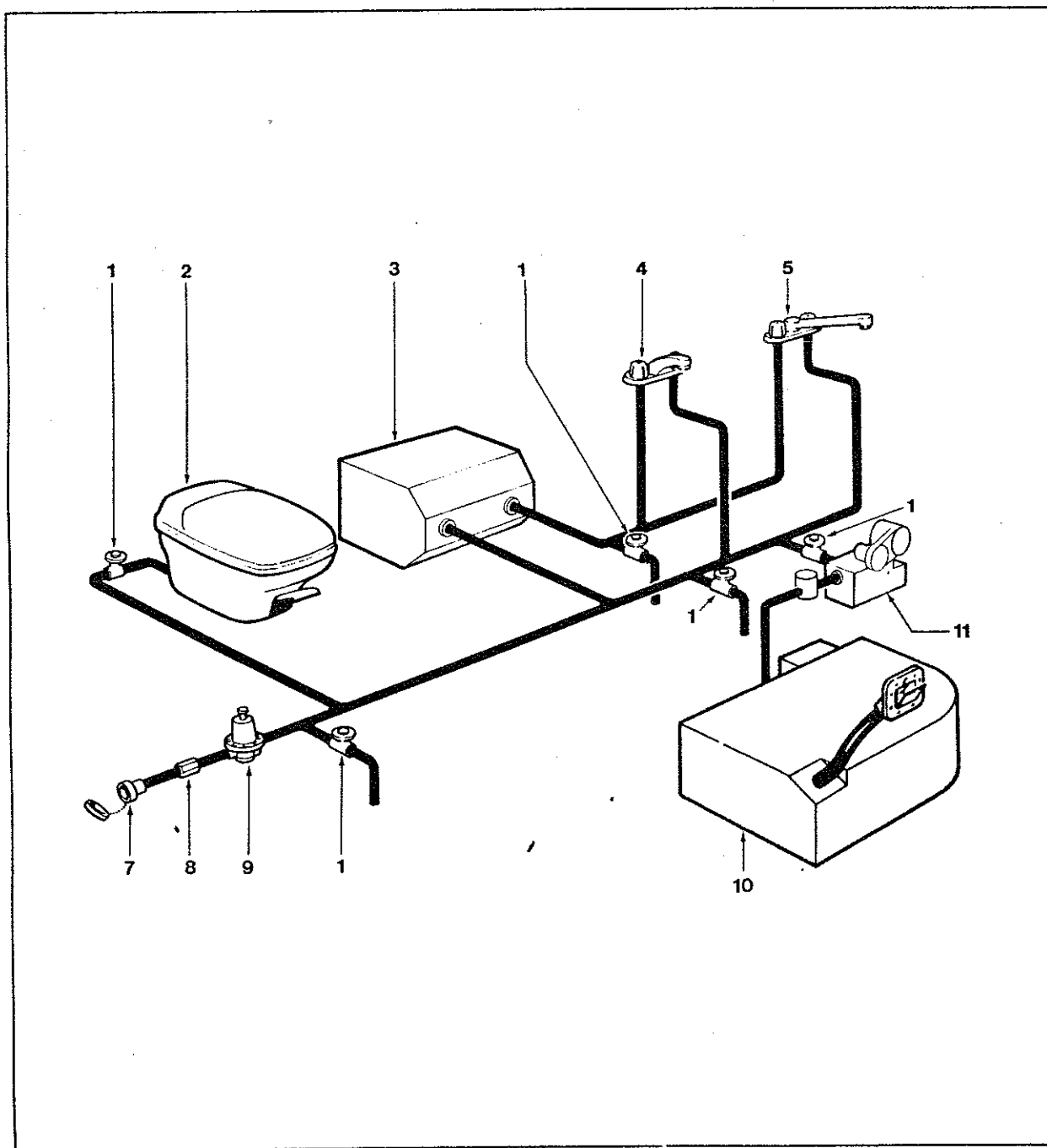


Water System

Basic Water Distribution System	4-2
Water Distribution System Tubing and Fittings	4-3
City Water Inlet	4-4
City Water Inlet Check Valve Removal/Replacement	4-4
City Water Pressure Regulator	
Removal/Replacement	4-4
Pressure Relief Valve Removal/(Replacement)	4-4
Water Fill Spout Removal/Replacement	4-4
Component Removal/Replacement	4-4
Faucet Assemblies, Galley and Galley Filter	4-5
Galley Faucet Removal/Replacement	4-5
Galley Faucet Disassembly/Assembly	4-6
Lavatory Faucet Assembly	4-6
Lavatory Faucet Removal/Replacement	4-7
Lavatory Faucet & Shower Mixing Valve	
Cartridge Removal	4-7
Shower Mixing Valve Removal/Replacement	4-7
Telephone Shower Assembly	4-8
Telephone Shower Service	4-8
Water Filter Assembly	4-8
Water Filter Cartridge Removal/Replacement	4-8
Water Filter Removal/Replacement	4-8
Water Pump Assembly	4-9
Water Pump Removal/Replacement	4-9
Operation	4-9
Trouble Shooting	4-9
Valve Replacement	4-10
Diaphragm and Connecting Rod Replacement	4-10
Pulsation Dampeners Replacement	4-10
Dry Tank Switch Replacement	4-10
Motor Replacement	4-10
Water Pump Filter Assembly	4-10
Water Pump Filter Removal/Replacement	4-10
Disassemble Pump Filter	4-10
Pressure Switch Replacement	4-10
Winterizing Procedure	4-11

Basic Water Distribution System



No.	Part No.	Description
1	600777	Shut Off Valve
2	600881	Toilet
3	690108	Water Heater
4	600075	Lavatory or Shower Faucet
5	600695	Galley Faucet
6	995218	Water Purifier (not shown)
7	600336	Water Inlet
8	600139	Check Valve
9	600309	Pressure Regulator
10	600616	Water Tank, 24'
	600752	Water Tank, 28' CB
	600904	Water Tank, 28" RB
11	600262	Water Pump

Figure 1.

Water Distribution System Tubing and Fittings



Elbow

600038 — 1/2 x 1/2
 600039 — 3/8 x 3/8
 600048 — 5/8 x 1/2
 600768 — 3/8 x 3/8



Coupling

600049 — 3/8 x 3/8
 600261 — 1/2 x 1/2
 600361 — 1/4 x 1/4
 600771 — 3/8 x 3/8

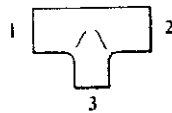


Reducer Coupler

600233 — 3/8 x 1/4
 600256 — 1/2 x 3/8
 600783 — 1/2 x 3/8



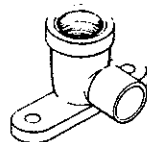
Female Adapter



Tee

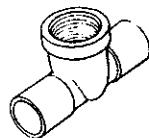
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600044 — 1/2 x 3/8 x 3/8
 600046 — 1/2 x 1/2 x 3/8
 600047 — 1/2 x 1/2 x 1/2
 600050 — 3/8 x 3/8 x 3/8
 600067 — 3/8 x 1/4 x 1/4
 600228 — 1/2 x 3/8 x 1/2
 600360 — 1/2 x 1/4 x 3/8
 600370 — 1/2 x 3/8 x 1/4
 600397 — 3/8 x 1/4 x 1/4
 600255 — 1/2" Sweat x 1/2" Thread
 600778 — 1/2 x 3/8 x 1/2
 600775 — 1/2 x 1/2 x 1/2



Elbow

600270 — 3/8 x 3/8 Barb
 600912 — 1/2 MPT x 1/2 Barb
 600913 — 3/8 MPT x 3/8 Barb



Tee Adapter

600257 — 1/2 x 1/2 x 1/2 FPT



Male Connector Adapter

600254 — 1/2 x 1/2
 600283 — 1/2 x 3/8
 600364 — 1/4 x 3/8



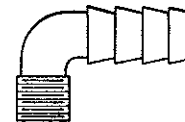
Hose Connector

600362 — 3/4 x 1/2



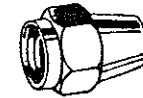
Nipple

600274 — 3/8 x 5/8 Barb
 600759 — 3/8 FF x 3/8 Barb



Elbow

600284 — 1/2 Drop



Flare nut

600001 — 5/8
 600036 — 1/2

City Water Inlet

City Water Inlet Check Valve Removal/Replacement

1. Unhook water supply.
2. Shut off pump switch.
3. Open faucet.
4. Open drain valve.
5. Use 2 wrenches. Hold 90° elbow with one and loosen flare nut with the other.
6. Remove screw from support clamp and remove clamp.
7. Thread check valve and 90° fitting from adapter.
8. Separate check valve from 90° fitting.
9. Reverse above to reinstall.
10. Use teflon thread tape on fitting and valve threads.

City Water Pressure Regulator Removal/Replacement

Start with above instructions for check valve removal, then proceed as follows:

1. Use back-up wrench on water feed line fitting and second wrench on regulator outlet casting. Thread valve out of fitting.

Reverse above to install. Use Teflon tape on threads.

Note: Pressure Regulator set at 32 to 38 PSI at 75 PSI line pressure.

Pressure Relief Valve Removal/Replacement

1. Use wrench on drain line flare nut with back-up wrench on pressure relief valve.
2. After line removal, place back-up wrench on water line sweat adapter and other wrench on pressure relief valve. Thread valve out of fitting.
3. Reverse for installation. Use Teflon tape on threads.

Water Fill Spout Removal/Replacement

1. Open sliding door under galley.
2. Loosen clamp and 1 1/2" Tygon tubing. Remove tubing from spout by pulling straight back towards you.
3. Loosen clamp on 1/4" ID plastic air vent hose and remove.
4. Move both to one side.
5. It will then be necessary to trim inside skin around fill spout to allow the removal and inserting of the new fill spout.
6. From the outside, drill out the 12 hard rivets with No. 30 drill. (Care should be taken not to enlarge holes.)
7. Remove fill spout and clean sealer off body.
8. Install new spout and rivet with hard bucking rivets.
9. Olympic rivets may be used if preferred.
10. Seal with Ten-X.

11. Using a section of vinyl covered aluminum approximately 10" square, pop rivet in place with white rivets.
12. Reinstall hose and water test.

Component Removal/Replacement

Plastic plumbing is used throughout the Motorhome. All fittings are secured with standard spring or screw type hose clamps. To remove or install any water system component, just loosen the appropriate clamps and separate the plastic line from the component fitting. To install, reverse this procedure.

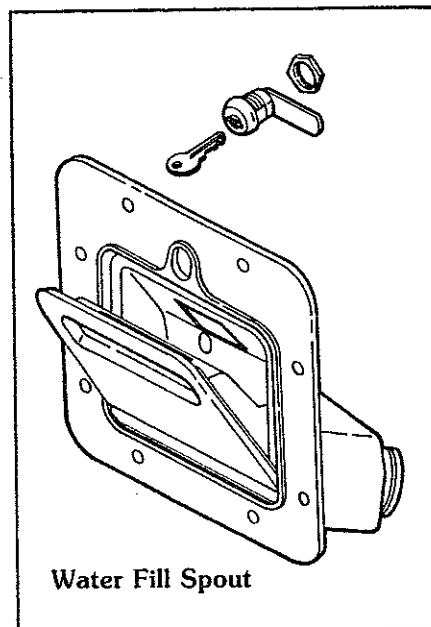
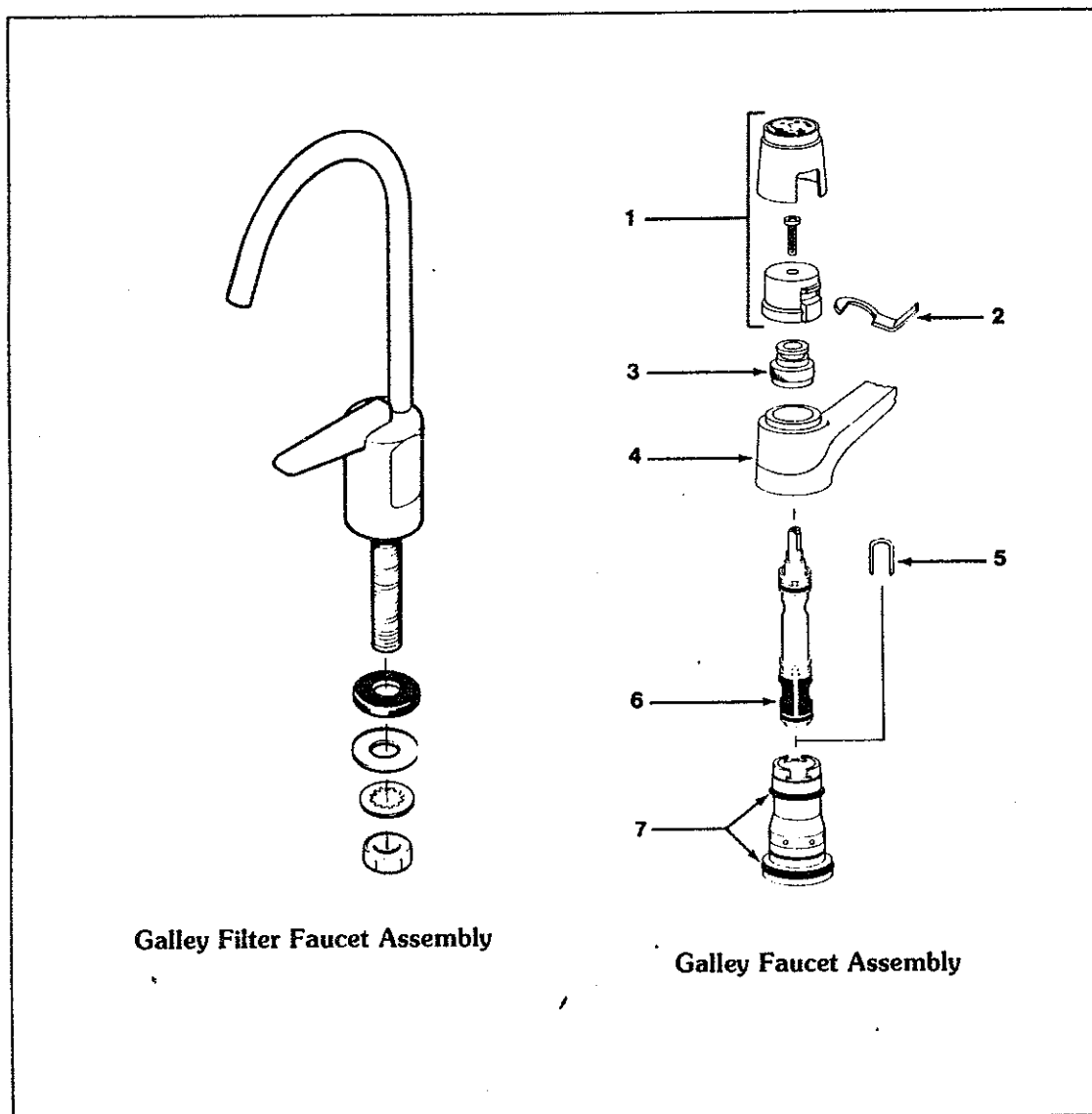


Figure 2.

Faucet Assemblies, Galley and Galley Filter



No.	Part No.	Description
	001030	Filter Faucet Assembly
	600667	Complete Assembly Moen Chateau 7631
1	092493	Handle Assembly Kit
	093296	Handle Cap
	013056	Handle Screw
	092313	Handle Body
2	092311	Handle Lever
3	092309	Retainer Pivot Nut
4	092397	Spout Assembly
5	001883	Retainer Clip
6	001201	Cartridge
7	000117	Spout Seal Kit

Galley Faucet Removal/Replacement

1. Shut off water supply.
2. Shut off pump switch.
3. Open galley faucet.
4. Open drain valves.
5. Loosen clamps holding plastic hot and cold lines to faucet pigtails.
6. Remove mounting nuts securing faucet to galley top.
7. Remove faucet.
8. Reverse above for reinstallation.

Figure 3.

Galley Faucet Disassembly/Assembly

To disassemble: (Need pliers and screwdriver.)

1. Turn "Off" both hot and cold water supplies and remove handle screw.
2. Pull handle down. Place screwdriver in screw hole and press down on cartridge stem. Lift and tilt handle housing off.
3. Remove pivot nut with pliers.
4. Lift and twist spout off.
5. Pry out retainer clip with screwdriver.
6. Grasp cartridge stem with pliers. Lift cartridge out.
7. To flush supply lines, turn on both hot and cold water supplies slowly.



To assemble:

1. With cartridge stem UP, insert cartridge and push DOWN by its ears.
2. Turn cartridge ears to front and back as shown.
3. Turn red (notched) flat of cartridge stem toward sink.
Note: For cross piping installations where supply piping is reversed, red (notched) flat faces BACK of sink.
4. Replace clip all the way.
5. Replace spout. Push down until it nearly touches the faucet escutcheon.

6. Screw on pivot nut. Do not cross thread. Tighten with pliers.
7. Press cartridge stem down. Holding handle UP, hook ring in handle housing into groove on sleeve.
8. Swing handle back and forth until it drops down into place.
9. Replace handle screw. Tighten securely.



To Flush the Installation:

1. Faucet body and supplies should be flushed under pressure to remove pipe chips or other foreign material that might clog faucet when in service. To do this, make sure the water supplies are "Off". Follow the detailed instructions below and disassemble the faucet. Turn on both hot and cold water supplies slowly, and thoroughly flush the installation. Reassemble faucet as shown in the instructions.

Note:

- a. If handle won't operate properly, you have not hooked handle ring into sleeve groove. (See Step 7.)
- b. If hot and cold reversed, red (notched) flat not toward sink. Remove handle assembly. Turn red (notched) edge of stem so it faces sink. (See Step c.)
- c. For proper water flow, aerator must be free of foreign particles. If flow is weak or irregular, unscrew aerator, clean and replace.

Lavatory Faucet Assembly

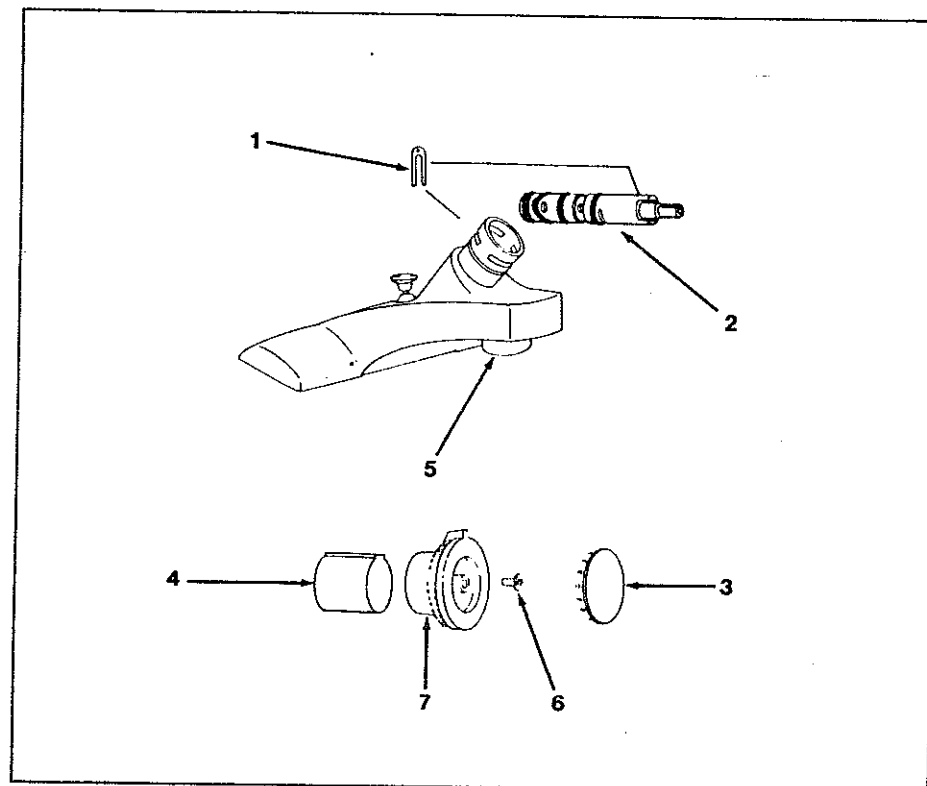


Figure 4.

No.	Part No.	Description
	600335	Complete Assembly Moen No. 4600
1	000883	Retainer Clip (Knob Handles)
2	001200	Valve Cartridge
3	001206	Handle Cover (Knob Handles)
4	001207	Stop Tube (Knob Handles)
5	001208	Aerator — Male Thread
6	001233	Handle Screw (Knob Handles)
7	001245	Handle Assembly (Knob Handles)
	010169	Attaching Hardware
	020700	Drinking Fountain

Shower Mixing Valve Assembly

Lavatory Faucet Removal/Replacement

1. Disconnect city water supply.
2. Shut off pump switch.
3. Open faucets.
4. Open drain valves (see page 4-11 for location).
5. Remove hose clamps holding plastic hot and cold water lines to copper pigtails on faucet. Remove lines.
6. Form lines from faucet so they are paralleled with one another.
7. Remove nuts and washers securing faucet in place.
8. Remove faucet by lifting it from its position.
9. To replace, reverse above procedure.
10. Check for leaks.

Lavatory Faucet & Shower Mixing Valve Cartridge Removal

Shut off water pressure for entire system.

DISASSEMBLE: Remove handle cover. Take out handle screw and remove handle and stop tube. Lift out retaining clip and pull the cartridge out of the body by the stem.

CAUTION: Reinsert cartridge by pushing it all the way into the body and until the front of the ears on the cartridge shell are flush and aligned with the body. Replace the retainer clip so that the legs straddle the cartridge ears and

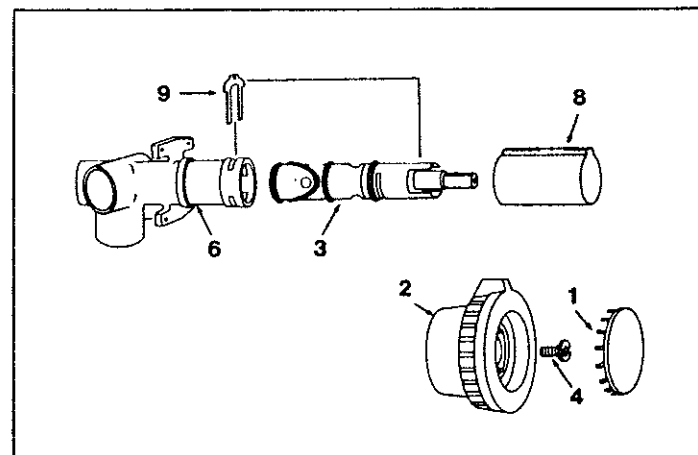


Figure 5.

slide down into the bottom slot in the body. This prevents the cartridge from rotating and locks it in the body. Reinstall stop tube and handle. Tighten handle screw securely, and replace the handle cover. The red flat on the stem must point UP when mounting the knob handle (down for lever handle).

If cold water is on left side and hot water is on right side (red flat pointed down), remove cartridge and reinstall 180°.

Shower Mixing Valve Removal/Replacement

1. Cover carpet and cover bottom of shower pan to protect them from damage.
2. Disconnect city water. Shut off water pump.
3. Open drain valves (see page 4-11 for location).
4. Open galley, lavatory and shower faucets and allow water to drain from lines.

5. Remove inspection hole cover from inside curbside wardrobe and remove hose clamps holding the lines attached to the shower faucet.

6. Pop out metal insert in control valve handle. Remove screw and pull knob off.

7. Remove screws in escutcheon plate.

8. Disconnect shower hose.

9. Wrap masking tape on chrome fitting so as not to scratch chrome.

10. Using wrench, remove fitting.

11. Mixing valve, shower outlet, tube and hot and cold feed line assemblies may then be removed through wardrobe inspection hole.

12. Replace by reversing above procedure.

Note: If existing hose clamps were destroyed in removal, they should be replaced with screw type clamps.

No.	Part No.	Description
	600337	Complete Assembly Moen No. 2620 (Full Bath)
1	000966	Handle Cover
2	001041	Handle
3	001200	Cartridge
4	001233	Handle Screw
	010097	Escutcheon (Not Shown)
5	000007	Valve Body
	000602	Escutcheon Screw (Not Shown)
6	010089	Stop Tube
7	000883	Retainer Clip

Telephone Shower Assembly

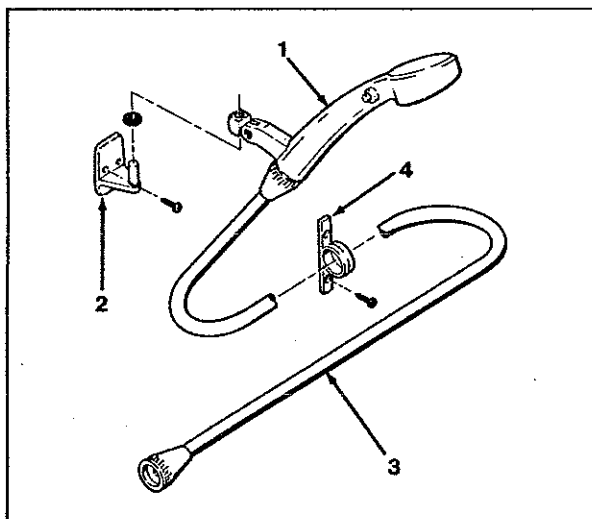


Figure 6.

No.	Part No.	Description
1	600070	Hand Shower W/Push Control
2	600725	Wall Bracket
3	600330	Hose/Gasket 59"
4	682297	Telephone Shower Ring

Telephone Shower Service

The services required on shower head are few in number and minor in nature.

1. The slotted faceplate occasionally becomes stopped up with calcium deposits and it will need to be removed and cleaned. Remove center screw and plate. Clean slots with brush. (In severe cases use muriatic acid.)
2. Head is replaced as a unit.
3. The valve located just behind spray plate in handle is a flow control valve and not a shutoff valve.

4. Hose is replaced as a unit.
5. Hose gaskets are replaced by removing chrome nuts at either end of hose and removing old gasket from inside nut.

Water Filter Cartridge Removal/Replacement

To remove used cartridge:

1. Shut off pump switch.
2. Place shallow pan under filter to catch surplus water.

3. Shut off water by lifting valve handle. Move counterclockwise as far as possible.
3. Turn colored ring all the way to the left. Ring will drop about 1/2".
4. Lift cartridge slightly and turn it further to the left until it can be disengaged.
5. Lower cartridge to disengage it from ring. Discard used cartridge.

To install new cartridge:

1. With colored ring in lowered position (turned all the way to the left) orient lug on cartridge without cutout under label on ring

Water Filter Assembly

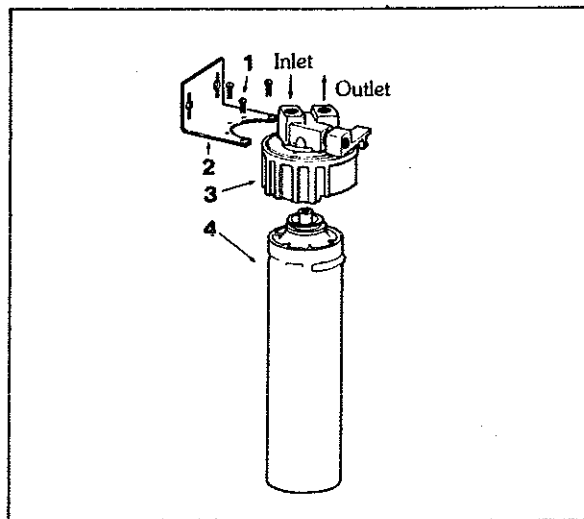


Figure 7.

No.	Part No.	Description
	600471	Complete assembly QC2-AC
1	003017	Screw #10-32 (3)
2	003016	Bracket
3	005273	Head QC2
4		Cartridge

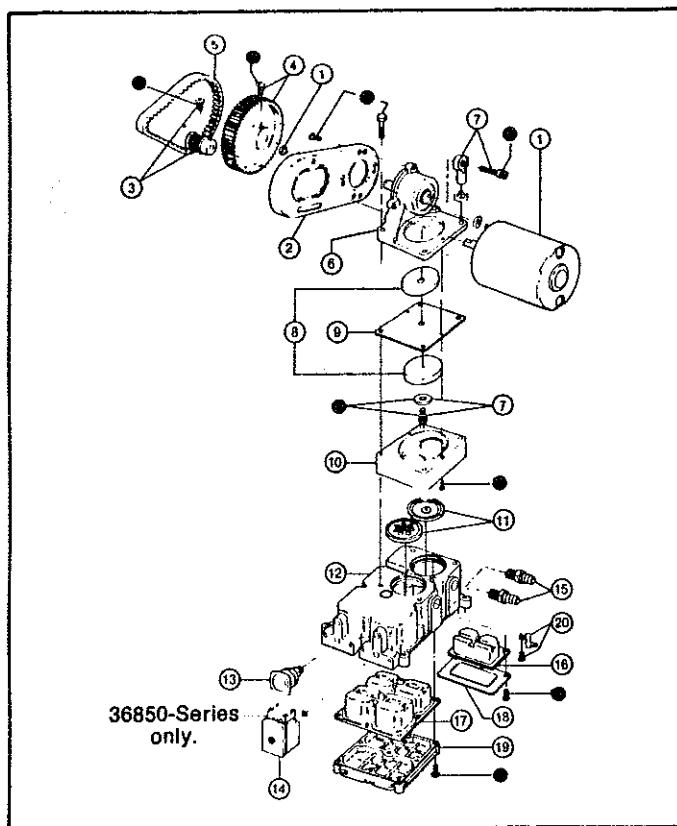
2. Insert cartridge straight up into ring as far as it will go. Holding colored ring steady, turn cartridge as far to the right as possible.
3. Then turn colored ring far to right to drive cartridge up into head.
4. To lock ring in place and turn water on, move valve handle down. Be sure handle leg engages ring locking-lug.
5. Turn pump switch on.

Note: Cartridge should be changed when flow of water on cold side of galley faucet becomes too slow for your convenience, or at least once a year.

Water Filter Removal/Replacement

1. Shut off water pump switch. (Place a pan under the filter assembly.)
2. Open galley door and disconnect water supply line.
3. Open bathtub faucet and galley faucet. Allow surplus water to drain.
4. Disconnect flare nut on intake side.
5. Disconnect flare nut on exhaust side.
6. Remove four screws holding the bracket to the galley panel, and remove the filter assembly.
7. To install reverse the removal procedures.

Water Pump Assembly



No.	Part No.	Description
1	030200	Motor Kit 12 Volt D.C.
2	034628	Motor Mount
3	037169	Small Pulley
4	037170	Large Pulley
5	030021	Belt
6	035506	Jack Shaft Assembly
7	037173	Connecting Rod Assembly
8	035503	Diaphragm Plates
9	030015	Diaphragm
10	035497	Retainer
11	030004	Valve Set (Inlet & Outlet)
12	562511	Base Assembly†
	562512	Base Assembly† for 36850-Series

No.	Part No.	Description
13	121000	Pressure Switch See Note 2
	121001	Pressure Switch See Note 3
14	035675	Dry Tank Switch
15	037176	Ports (Inlet & Outlet)
16	037177	Small Pulsation Dampener
17	037178	Pulsation Dampener
18	035628	Small Bottom Plate
19	035623	Bottom Plate
20	037180	Vibration Pad Kit
21	037165	Hardware Kit
	030122	Service Kit

Indicates Parts Supplied with Base Assembly.
 NOTE 2—Includes Switch and Conversion Kit to Mount New Style Switch Onto Older Style -J and -000 Pumps.
 NOTE 3—Direct Replacement Switch Only for -1000 Series Pumps.

Troubleshooting

PROBLEMS

1. Pump operates but no water flows through faucet.
2. Pump cycles on and off although all faucets are closed.
3. Pump operates roughly and has excessive noise and vibration.

CAUSES

- Low water level in tank.
- Water lines are clogged.
- Kink in water hose.
- Air leak in suction line.
- Dirty or hard-to-open in-line check valve.
- Defective pump check valve.
- Water leak in plumbing.
- Water leak in flush toilets.
- Internal leak in pump.
- Pump check valve not sealing.
- Flow through intake line is restricted, kink in hose.
- Pump mounted on flimsy board.
- Deformed or ruptured pulsation dampener in pump.
- Worn connecting rod bearing.
- Ice in pressure switch chamber.
- Clogged piping.
- No voltage to pump.
- Defective pressure switch.
- Empty water tank.
- Insufficient voltage to pump motor.
- Defective pressure switch.

Water Pump Removal/Replacement

1. Shut off water supply.
2. Shut off pump switch.
3. Disconnect plug on 12 volt wires at pump.
4. With screwdriver, loosen clamps on intake and discharge hoses at pump and remove hose. (Note which hose goes on each port.)
5. Remove four screws attaching pump to platform.
6. Remove pump by lifting clear of plumbing lines.

7. Replace by reversing above procedure.
8. Before water pump can be removed, it will be necessary to remove oven (center bath oven).

Operation

To start pump:

1. Check level of fresh water tank.
2. Be sure all valves and strainers are open.
3. Open all outlets and turn on power to pump.
4. Keep outlets open until all air is cleared from lines and then close outlets. Pump is ready for operation.
4. Pump fails to start when faucet is opened.
5. Pump fails to stop when faucets are closed.

Figure 8.

Valve Replacement

1. Remove four tie down screws. Lift jack shaft to expose valves.
2. Lift valves from pockets. Clean all foreign materials from valves and seats. Inspect rubber flappers for cuts.
3. Reinstall valves into same pockets, being sure rubber valve with small hole is UP on intake and rubber valve without the small hole is DOWN on discharge. CAUTION: Do not use valve with small hole in rubber on discharge side of pump.

Diaphragm and Connecting Rod Replacement

1. Remove four tie down screws, then lift jack shaft and attached diaphragm assembly from pump base.
2. Expose diaphragm by removing two diaphragm retainer screws and detaching retainer.
3. Remove diaphragm screw to separate diaphragm, plates and washer/spacer from connecting rod. Inspect diaphragm for cuts and ruptures.
4. Remove eccentric screw to separate connecting rod from jack shaft.
5. When reassembling, be sure to align diaphragm and connecting rod so that rod slips straight onto jack shaft and diaphragm rests squarely on diaphragm retainer.

Pulsation Dampeners Replacement

1. Remove nine screws from bottom cover and three screws from bottom plate.
2. Pull out rubber pulsation dampeners from base. Inspect for excessive deformation, ruptures and cuts.
3. When installing new large pulsation dampener, check that its metal screw sleeve-guide is positioned between center hole and screw-way in the base. Make sure that flanges of both pulsation dampeners are well-seated to effect a proper water and air seal.

Dry Tank Switch Replacement

1. Disconnect all wires from dry tank switch.
2. Remove switch front cover and two screws located at bottom of switch case. Pull switch from base.
3. When installing new switch, be sure metal spacer is assembled on switch and "O" ring is seated in pump base. Do not overtighten mounting screws.
4. Rewire per diagram.

Motor Replacement

1. Remove two motor nuts to separate motor.
2. Loosen set screw to remove small pulley from motor shaft.
3. When reassembling, adjust belt tension so belt between pulleys can be depressed $\frac{1}{4}$ " after motor nuts are tightened.

Water Pump Filter Assembly

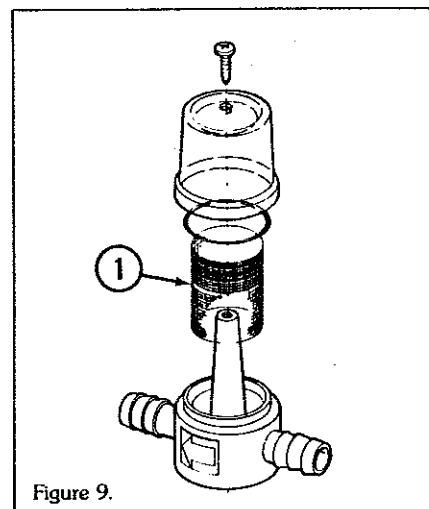


Figure 9.

No.	Part No.	Description
	600593	Complete Assembly
1	036138	Filter screen

Water Pump Filter Removal/Replacement

1. With screwdriver, loosen clamps on both hoses at filter.
2. Remove hoses.
3. Remove screws attaching filter to platform.
4. Remove filter.
5. Replace by reversing above procedure. Note that arrow on side of filter points in direction of flow.

Disassemble Pump Filter

1. Remove screw through top.
2. Pull top from base. Do not damage "O" ring seal.
3. Remove screen to clean or replace.

4. Lift "O" ring from its cavity.
5. Assemble by reversing above procedure.

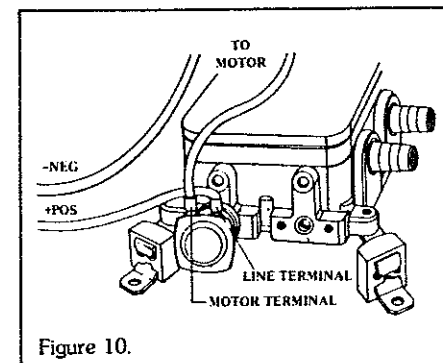


Figure 10.

Pressure Switch Replacement

1. Turn off power to pump and open faucet to relieve pressure from system.
2. Disconnect all wires from pressure switch.
3. Unscrew switch from base.
4. Thread new switch with "O" ring into pump base. Do not overtighten.
5. Rewire per wiring diagram.

Winterizing Procedure

1. Level the motorhome from side to side, and front to rear. Open all faucets.
2. Turn the water pump switch to the ON position to expel water from the storage tank.
3. Open all drain valves. On rear bath models, two are located in the rear trunk (roadside). On center bath models, one is located under the bed on the roadside, and three are under the galley sink. On all models one is located on the water heater accessible through the exterior access panel.
4. While the water is draining from the system, open and flush the toilet flushing valve. Depress hand spray lever while holding the spray head down inside the bowl. Depress hand spray thumb button and hold the spray head down inside the tub and drain all water from telephone shower head flexible hose. Unscrew the heads on both spray units and store.
5. After pump has removed all water from the storage tank, turn the pump switch OFF.
6. Remove exhaust hose from water pump.
7. Disconnect the water pump inlet connection, and with check valve removed, turn the pump by hand until all the water is expelled.
8. After the water has stopped running from the drain lines, apply air pressure at the city water inlet, be sure all drain valves and faucets are open. This will force any remaining water from the water heater and remove any water which may be trapped in low areas.
9. Pour a cup of antifreeze (Glycol) into the lavatory, sink, and tub drains to prevent freezing of water in traps.
10. Be sure to open the waste-holding tank drain valves and drain and flush the tanks thoroughly. (This is very important as the sewage in the tanks, if frozen, could seriously damage the tanks.)
11. Remove the lower portion of the water purifier, if your trailer is so equipped, and drain the purifier.

12. It is very important for optimum life of your battery to check it periodically and to keep it fully charged. This is especially true in winter months when the temperature may drop below freezing. Please refer to the battery section for more information on battery maintenance.
13. Remove any items (food, cosmetics, etc.) from trailer interior that might be damaged by freezing — or might damage the trailer if containers break.

For additional winterizing protection add a nontoxic antifreeze (approved for drinking water systems) to the water lines using the following procedure:

1. Reconnect all lines except the hose to the pump inlet port. Close all drain valves (see step No. 3).
2. Attach a length of hose to the pump inlet port. This piece of hose should be long enough for the free end to be inserted into and reach the bottom of the antifreeze container.

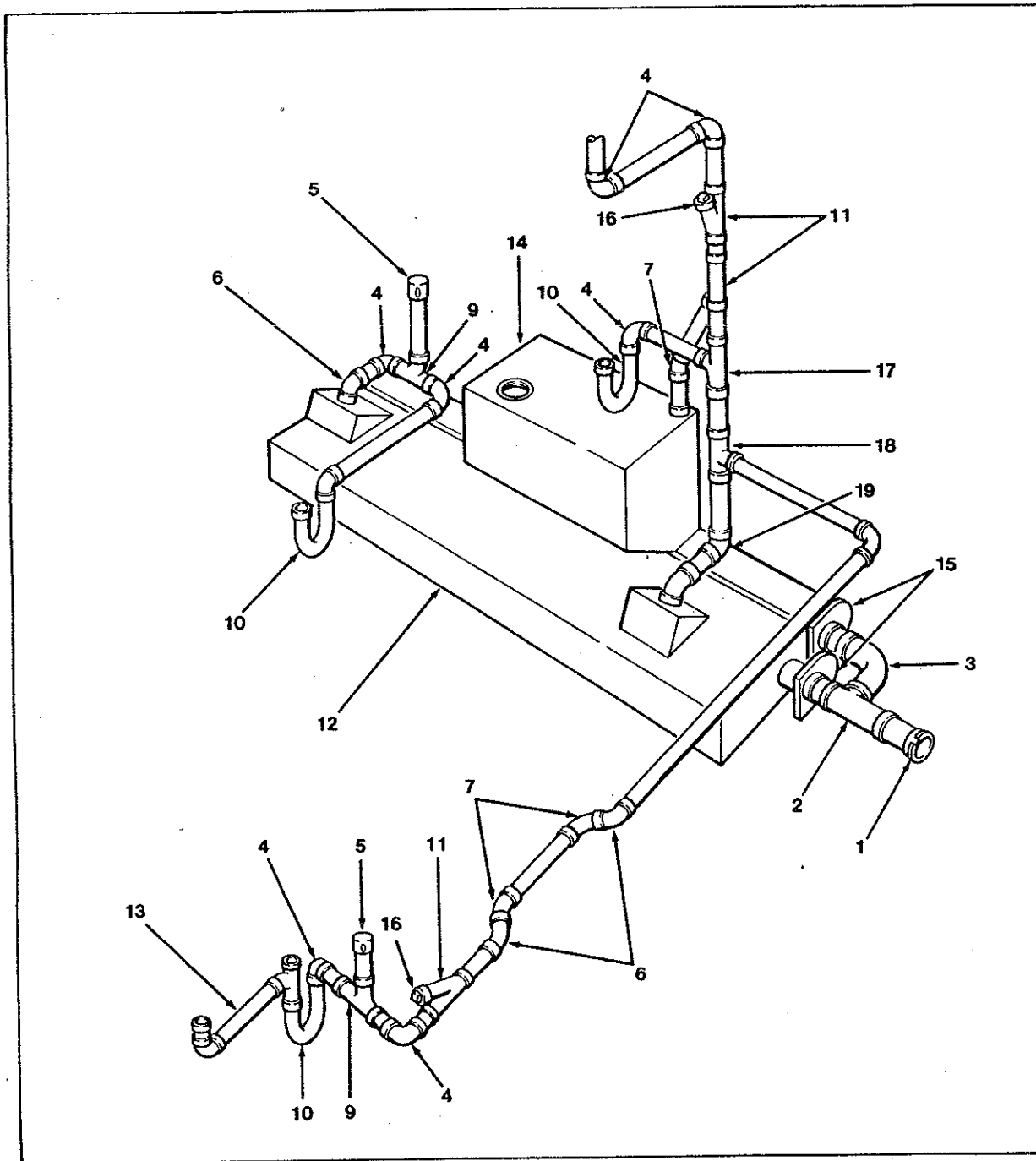
3. Dilute the antifreeze solution in accordance with the manufacturer's instructions.
4. Open all water faucets.
5. Insert hose length into the antifreeze container, turn the pump switch on, and run the water pump until the antifreeze solution fills all water lines and the water heater. Flush toilet, work hand spray while holding down in bowl. Work hand shower spray while holding down in tub.
6. Shut off the pump and close all faucets.
7. Disconnect the hose length from pump inlet fitting and reconnect water system inlet line.



Drainage System

Basic Drainage System (Rear Bath)	5-2
Basic Drainage System (Center Bath)	5-3
Drainage System Fittings - 2", 3" & Misc.	5-4
Drainage System Fittings - 1½"	5-5
Toilet Vacuum Breaker Assembly	5-6
Vacuum Breaker Assembly and Disassembly	5-6
Toilet Installation	5-6
Toilet Disassembly	5-7
Operating Instructions	5-7
Maintenance	5-7
Winterizing	5-7
Trouble Shooting	5-7
Termination Valve Removal/Replacement (Rear Bath)	5-8
Termination Valve Removal/Replacement (Center Bath-Main & Auxiliary Tanks)	5-8
Cleaning of Waste Tank	5-9

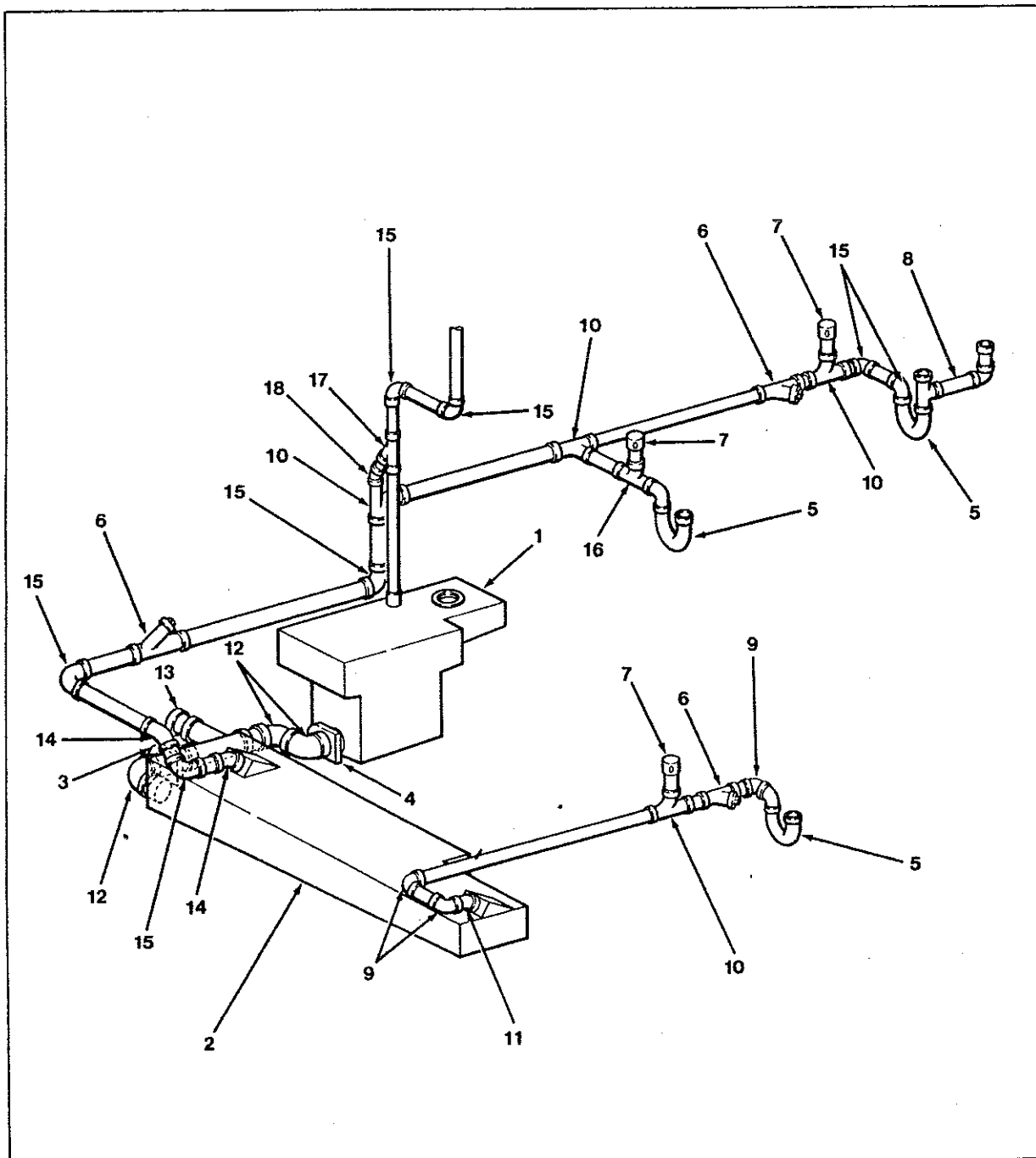
Basic Drainage System (Rear Bath)



No.	Part No.	Description
1	600222	Bayonet Ring and Cap
2	600930	Tee-3"
3	600820	Elbow-90° × 3" Street
4	600035	90° Ell
5	600538	V-200 Auto Vent
6	600027	45° Street Ell
7	600030	45° Ell
8	600822	P-Trap Adapter
9	600156	Sanitary Tee, Vent
10	600144	P-Trap
11	600141	45° Wye
12	601008	Auxiliary Holding Tank
13	600378	Continuous Waste Watco 100A
14	601007	Main Holding Tank
15		Dump Valve (see page 5-8)
16	600155	Plug-1½"
17	600147	San Tee 2 × 1½ × 1½
18	600432	San Tee 2 × 2 × 1½
19	600153	Elbow-90° × 2"
20	600624	Strainer Assy. (Not Shown)
21	500484	Probe Harness (Not Shown)

Figure 1.

Basic Drainage System (Center Bath)



No.	Part No.	Description
1	600548	Black Water Tank
2	501008	Gray Water Tank
3		Dump Valve (see page 5-8)
4		Dump Valve (see page 5-8)
5	600144	P-Trap
6	600141	Clean Out
7	600538	Auto Vent
8	600378	Continuous Waste
9	600035	90° Elbow, Long Sweep
10	600156	Sanitary Tee
11	600027	45° Elbow
12	600420	90° Elbow
13	600625	Hose Adapter and Cap
14	600657	Elbow, 45° Street, 2"
15	600153	90° Elbow, 2"
16	600260	Sanitary Tee
17	600094	45° Wye, 1½"
18	600030	45° Elbow

Figure 2.

Drainage System Fittings — 2", 3" & Misc.



45° Ell

600371 — 2"
600224 — 3"



90° Ell — Long Sweep

600153 — 2"
600183 — 3"



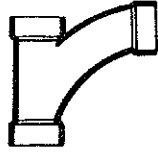
Sanitary Tee

600346 — 2" x 1-1/2" x 1-1/2"



Sanitary Tee

600260 — 2" x 2" x 1-1/2"
600147 — 2" x 1-1/2" x 1-1/2"
600930 — 3" x 3" x 3"



Tee Wye

600138 — 2" x 2" x 1-1/2"
600187 — 3"



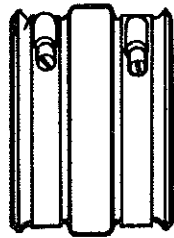
Reducing Bushing

600188 — 3" x 2"



Coupling

600253 — 3"



Calder Coupling

600289 — 3"



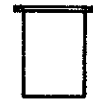
3-way Elbow

600866 — 3"



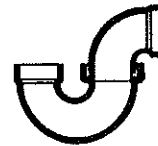
Strainer Adapter — Female

600143 — 1-1/2"



Tailpiece Flanged

600620 — 1-1/2" x 4"
600619 — 1-1/2" x 12"



“P” Trap

600144 — 1-1/2"



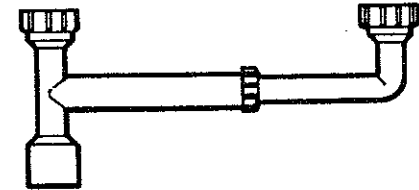
Plug — Cleanout

600155 — 1-1/2"



Auto Vent

600538 — 1-1/2"



Continuous Waste

600378 — 1-1/2"



Strainer Assembly

600621 — 1-1/2"
600624 (strainer only)

Drainage System Fittings — 1½"



Strainer Adapter — Swivel

600442 — 1-1/2"



Tray Plug Adapter

600625 — 1-1/2"



22-1/2° Ell

600116 — 1-1/2"



90° Ell — Vent

600033 — 1-1/2"



45° Ell

600030 — 1-1/2"



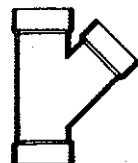
45° Wye — Combination & 1/8 Bend

600182 — 1-1/2"



Tee — Vent

600259 — 1-1/2"



45° Wye

600094 — 1-1/2"

600141 — 3"



45° Ell — Street

600027 — 1-1/2"

600657 — 2"



Tee — Sanitary

600156 — 1-1/2"

600432 — 2" x 2" x 1-1/2"



90° Ell — Long Sweep

600035 — 1-1/2"

Toilet Vacuum Breaker Assembly

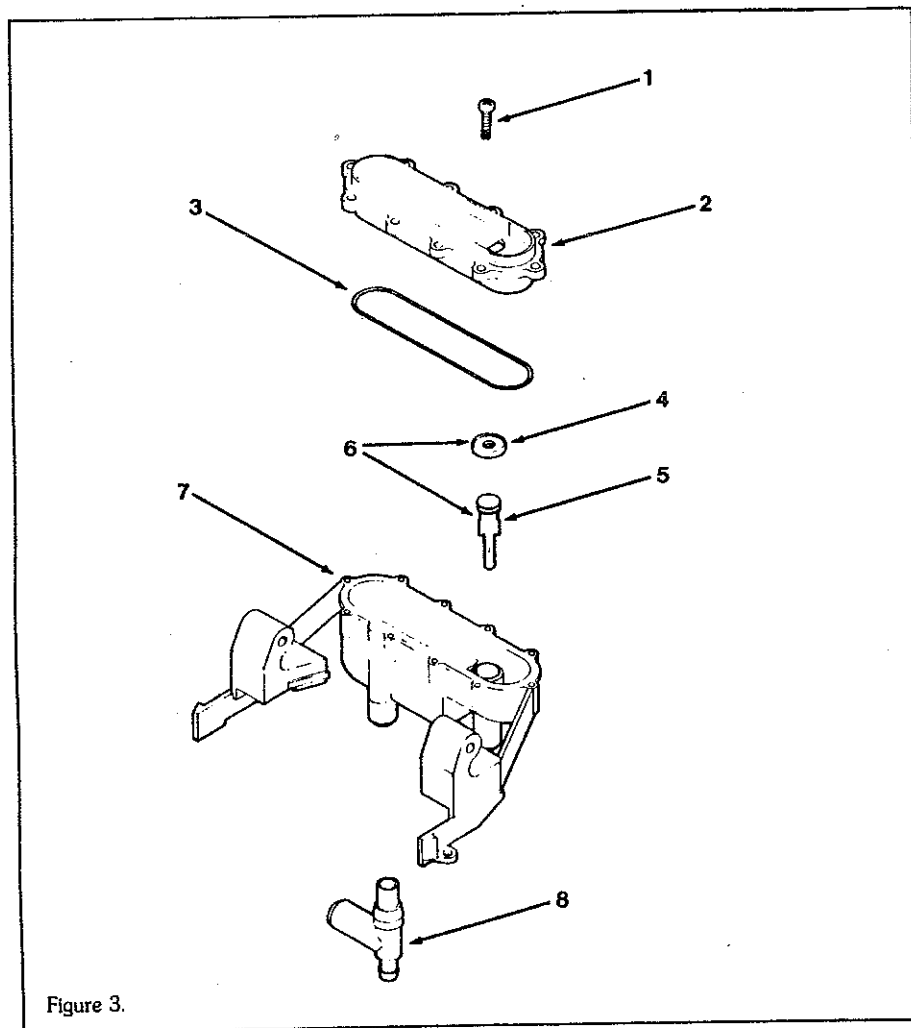


Figure 3.

No.	Part No.	Description
	008217	Vacuum Breaker Assembly
1	002536	Screw (10)
2	005972	Cover
3	008205	Seal
4	008203	Seal
5	008202	Float
6	008204	Float Assembly
7	005964	Housing
8	005959	Diverter

Vacuum Breaker Assembly and Disassembly

Remove vacuum breaker from toilet as described on page 5-7. Remove 10 screws holding the cover (05972) to the housing (05964). This exposes the vacuum breaker float (08202), float seal (08203) and cover seal (08205). The float is free in its chamber and is easily lifted or dumped out.

Note: When reassembling the unit make sure the housing is free of dirt and the raised collar, that the float seal sits on, is clean and free of burrs.

When the cover is reinstalled, it is important that the screws be turned backward until they jump; so that when they are tightened, they are in the original thread.

Toilet Installation

- Water Line Connection:**
Water line connections are $\frac{3}{8}$ " — 18 pipe thread using two wrenches. Turn pipe nipple or flare connector until finger-tight plus one turn. Do not overtighten. Do not solder metal fittings while they are connected to the plastic control valve.
- Closet Flange Seal:**
Place closet flange seal over the mechanism ring found on the under side of the toilet.
- Rear Bolt Nut:**
You assemble the rear closet bolt flange nut by reaching your right hand through the rear access hole (shown in Figure 4). The header points on the closet bolts will help start the nut. Tighten the nut until the base of the toilet contacts the floor.

Note: If the space around the toilet does not permit the above method, access to the rear nut can be gained by removing the access plug (shown in Figure 4). Plug is removed by pressing down on the plug's edge closest to the bowl. You assemble the rear closet bolt flange nut by reaching through the access hole with a socket, a universal and a 12" extension. The flange nut may be held in the socket with a small dab of sealer.

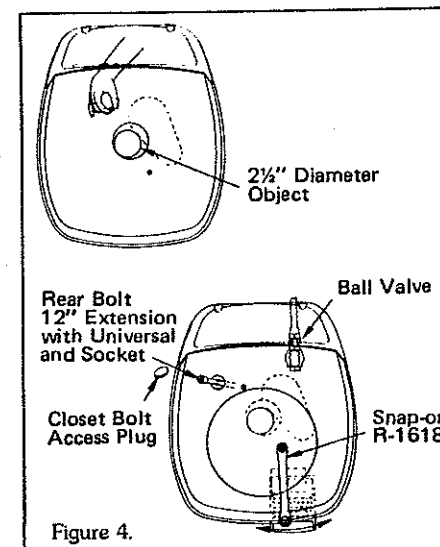


Figure 4.

- Front Bolt.**
 - Depress the pedal and insert a round object such as a soft drink bottle into the outlet located at the bottom of the bowl. Release the pedal slowly until the blade touches and holds the object. The object will hold a pedal down and provide access to the front flange bolt.
 - Assemble the front flange nut. Tighten nut until the base of the toilet contacts the floor. This stabilizes the toilet installation and provides an odor-tight seal to the closet flange.
- Remove by reversing above procedure.**
 - Cover floor area to protect from water damage.
 - Shut off water supply valve at rear of toilet.
 - Remove water supply line from back of toilet.
 - Lift toilet seat ring and remove plastic plug to gain access to rear flange bolt.

Toilet Disassembly

1. Removal of seat and cover:
Raise seat and cover; this will expose hinge pins. Remove "C" rings with a pair of pliers. Remove pins by pushing them toward the center of the toilet with a screwdriver.
2. Removal of vacuum breaker assembly:
Remove seat and cover. Turn toilet upside down. Remove water lines from vacuum breaker base. Pinch hose clamps with a pair of pliers and slide them up the water line. Pull water lines off. Remove 2 screws that hold vacuum breaker to toilet top.
3. Removal of valve mechanism assembly:
Turn toilet upside down. Remove the six screws that are now visible. Lift up mechanism to gain access to water lines hose clamps. Pinch hose clamps with a pair of pliers and slide them up the water line. Pull water lines off of mechanism.
4. Service and replacement of bowl subassembly:
Bowl subassembly may be serviced by removing the above 3 subassemblies.
5. Plastic water inlet valve removal:
The plastic water inlet valve can be removed without disassembly of the toilet. It is necessary to remove the toilet from the floor to remove this valve.

Remove the toilet from the floor and set it upside down on a padded bench. Using a 1/2" wrench, remove the 1/2" nut and the lock washer. Next, remove the two Phillips head screws. The water inlet valve can now be removed. Pull the valve free and pinch hose clamps with a pair of

pliers and slide it up the plastic tube. Then remove plastic tube from ball valve.

Note: When disconnecting the water line, be sure to brace the inlet valve with a wrench. Under no circumstances should the water connection be either tightened or loosened without a wrench bracing the inlet valve.

Operating Instructions

1. Directions for automatic flush and refill. Depress the foot pedal until the Micro Rinse completely cleanses the bowl, then release.
2. Directions for water control pedal. If you wish to add water into the bowl without flushing, depress the small, right hand pedal until desired water level is reached, then release.

Maintenance

If the bowl sealing blade does not operate freely after extended use, it may be restored to its original, smooth operating condition by applying a light film of silicone spray to the blade. To clean the toilet use Thetford Aqua Bowl or any other high grade, non-abrasive cleaner. Do not use highly concentrated or high acid content household cleaners. They may damage the rubber seals.

Winterizing

1. Draining method:
Completely drain the toilet water supply line. Leave any water supply line valves open. Depress right hand pedal and place a block of wood or other similar object between the pedals. This will hold the water control valve open and prevent any residual water from being trapped there when frozen.
2. Non-toxic anti-freeze method:
Use Recreational Anti-Freeze. Follow directions on the container.

Trouble Shooting

1. Symptom: Water keeps running into the bowl.
Cause: The blade in the bottom of the bowl is not closing completely, which in turn keeps the water control valve partially open. The groove into which the blade seats when completely closed is clogged with foreign material.
Cure: Insert the end of a coat hanger or similar object into the sealing groove and remove the foreign material. Avoid damaging the rubber seal while cleaning.
2. Symptom: Toilet leaks. There is water on the floor. Specify the symptom. Determine if water is leaking from:
 - a) The vacuum breaker.
 - b) The water control valve.
 - c) Bowl to mechanism seal (if this is the problem, the water would not stay in the bowl).
 - d) Closet flange base seal.Cure:
 - a) The vacuum breaker — if the vacuum breaker leaks when

flushing the toilet, replace the vacuum breaker.

- b) If the vacuum breaker leaks when the toilet is not in operation, replace the water control valve.
 - c) Leaks at the bowl to mechanism seal — remove mechanism, and replace mechanism seal.
 - d) Leaks at closet flange area — check front and rear closet flange nuts for tightness. If leak continues remove the toilet, check the closet flange height. The height should be between 1/4" and 7/16" above the floor. Adjust closet flange height accordingly and replace closet flange seal.
3. Symptom: Foot pedal operates harder than normal or the blade sticks.
Cure:
 - a) Apply a light film of Silicone spray to blade.
 - b) Check closet bolt tightness. If closet bolts are over tightened the mechanism may be distorted.
 4. Symptom: Bowl will not hold water; i.e., water leaks from bowl down into holding tank.
Cure: Using a bent screwdriver or similar object, scrape the groove in front of the mechanism blade. Generally, paper or other foreign material is lodged in this groove causing the leak.
Caution: Use care not to damage the blade seal; always make certain that the tool is under the lip of the seal, not above it.
The tool can easily be made by bending a coat hanger or screwdriver over about 7/8 of an inch.

Termination Valve Removal/Replacement (Rear Bath)

1. Make certain tanks are empty.
2. From under the roadside rear corner of the Motorhome, remove screws and rivets attaching plastic pan covering termination valves and collector pipe. Remove pan.
3. Remove drive pin from termination valve rod and extension rod. Place a heavy hammer behind rod to make it solid enough for drive pin removal.
4. Break drain line assembly by loosening the clamps on the calder couplings.
5. Remove four screws securing slide portion of termination valve (main tank). Loosen clamp at waste tank.
6. The termination valves are cemented to the drain fittings (to eliminate any possible leaking). Therefore it is necessary to use a hack saw and saw this in two as close to the valve as possible. After this is done, remove portion of valve still left in drain fitting with a hammer and screw driver. Sometimes you may find it necessary (and time saving) to replace the tee-wye fitting next to valve, rather than go through the above procedure.

7. Reverse above for reinstallation.

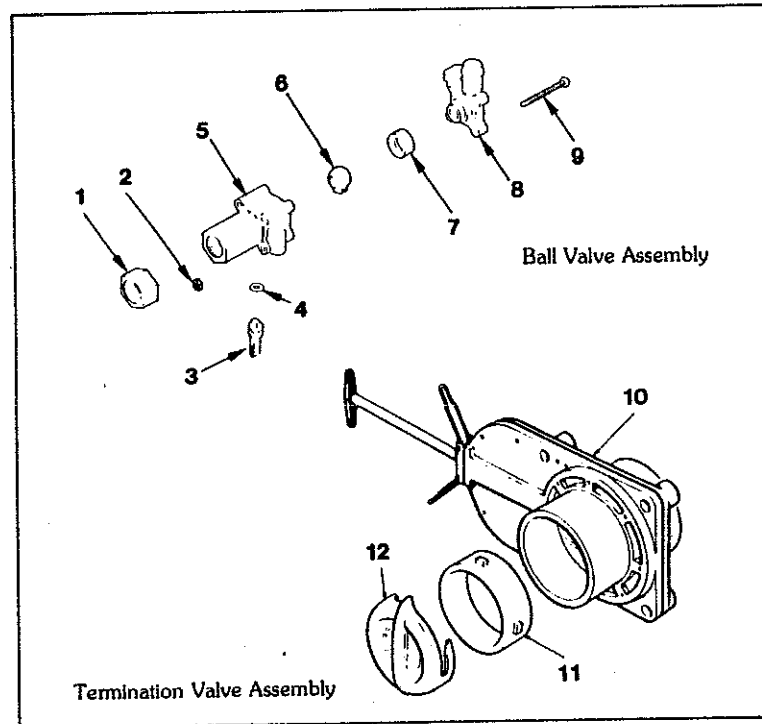


Figure 5.

Termination Valve Removal/Replacement (Center Bath - Main & Auxillary Tanks)

1. Make sure tanks are empty.
2. Remove screws attaching the upper edge of the rear underbelly wrap segment to the sub-frame side rail. This segment is hinged at the bottom and will drop down to provide access.
3. Support tank pan with a floor jack, then remove bolts attaching pan to chassis. Remove pan.
4. Remove drive pin from termination valve rod and extension rod. Place

a heavy hammer behind rod to make it solid enough for drive pin removal.

5. Break drain line assembly by loosening the 3-inch clamps on the 3-inch calder couplings.
6. Remove four screws securing slide portion of termination valve (main tank). Loosen clamp at waste tank.
7. The termination valves are cemented to the drain fittings (to eliminate any possible leaking).

No.	Part No.	Description
1	005962	Hex Cap
2	002784	Nut (4)
3	008030	Ball Stem
4	008213	Stem Seal
5	008025	Ball Valve Socket
6	008051	Ball
7	003665	Seal
8	008024	Ball Valve ELL
9	002783	Screw (4)
10	600398	Main Dump Valve Ass'y 2 x 6"
		Handle Ext. (Shower Bath)
	600402	Aux. Dump Valve Ass'y 2 x 9½"
		Handle Ext. (Shower Bath)
	600403	Aux. Dump Valve Ass'y
		2 x 2½" Handle Ext.
	600405	Main Dump Valve Ass'y 3 x 10½"
		Handle Exit. (Center Bath)
	600410	Aux. Dump Valve Ass'y 3 x 16"
		Handle Ext. (Center Bath)
	600401	Main & Aux. Dump Valve
		Ass'y 2H (Full Bath)
11	600222	Bayonet Ring and Cap
12	001664	Cap

8. Reverse above for reinstallation.

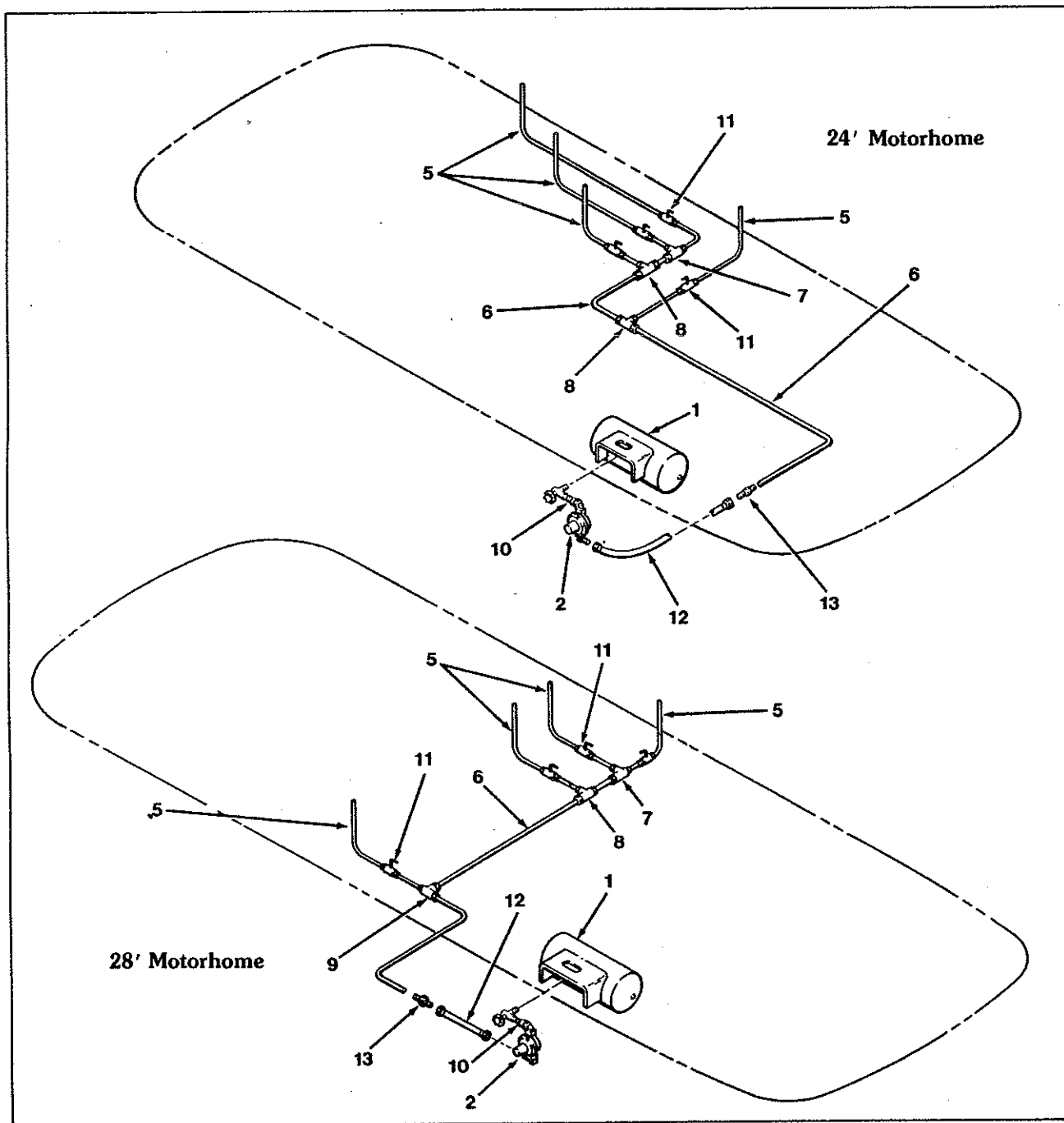
Cleaning of Waste Tank

1. Each time the tank is dumped, flush with clean water at least once. Shut valve after tank has been emptied and then fill tank with clean water and empty once again. This may be repeated more than once. In some instances this is not possible, such as at rallies.
2. This will keep septic tank probes clean and operable.
3. Keeps down odors.
4. Prevents built-up of solids.
5. Do not use facial or other similar tissues in holding tank as they have wet strength and do not dissolve easily. Toilet paper dissolves after a period of travel.
6. Detergents and bleaches should not be used as cleaning agents in the tank, because they remove lubricating oils and greases from the tank and valve.
7. Never use Anti-Freeze, (except type recommended for trailer systems), ammonias, alcohols, and acetones, because they may cause damage to the tank, valve parts, tank fittings, and drain hose.
8. For cleaning of tank, deodorizing, and winterizing . . . use only items sold and recommended by the Wally Byam stores.

LPG System

Basic LPG System	6-2
LPG Tank Removal/Replacement	6-3
Gas Regulator Removal/Replacement	6-3
LPG System Pressure Check	6-3
Copper Tube Flaring	6-3
LPG System Fittings	6-4

Basic L.P.G. System



No.	Part No.	Description
1	600751	LPG Tank
2	600666	Regulator
3	600010	Flare Nut $\frac{3}{8}$ "
4	600001	Flare Nut $\frac{5}{8}$ "
5	600008	Copper Tube $\frac{3}{8}$ "
6	600004	Copper Tube $\frac{5}{8}$ "
7	600003	$\frac{5}{8}$ x $\frac{3}{8}$ x $\frac{3}{8}$ " Tee
8	600000	$\frac{5}{8}$ x $\frac{3}{8}$ x $\frac{5}{8}$ " Tee
9	600281	$\frac{5}{8}$ x $\frac{5}{8}$ x $\frac{3}{8}$ " Tee
10	600800	Relief Valve and Extension
11	600012	Shut Off Valve
12	600931	LPG Hose
13	600096	Adapter

Figure 1.

LPG Tank Removal/Replacement

The LPG tank is located in a compartment beneath the sub-frame just forward of the main door. To gain access, unlock the compartment door, release the latches and let the door swing down.

1. Shut off main gas supply at the tank (see Fig. 1).
2. Remove the plastic protective cover from the regulator assembly and disconnect the flexible tubing from the regulator. Always use two wrenches when loosening or tightening a fitting, one to hold the fitting, one to turn the flare nut.
Note: The flexible tubing nut has a left hand thread and must be turned clockwise to loosen.
3. Disconnect the level gauge wire.
4. From the tank fitting support the tank with a floor jack and remove bolts and nuts attaching the tank mounting flanges (one to the front of the tank and two on the rear) to the chassis subframe brackets.
5. Carefully lower and remove the tank.

6. To install, reverse removal procedure.
7. Check all fittings for leaks by spraying with "snoop" and watching for bubbles.

Gas Regulator Removal/Replacement

1. Shut off main gas supply at the tank.
2. Remove the plastic protective cover from the regulator assembly.
3. Using two wrenches, one to hold the line fitting and one to turn the flare nut, disconnect the regulator from the flexible rubber line.
4. Disconnect the regulator from the tank fitting. Remove regulator.
5. To replace, reverse the removal procedures.

LPG System Pressure Check

Use a pressure gauge (Fisher, see Fig. No. 2).

This gauge is calibrated to read in "inches of water column pressure." It is a standard manometer reading and is colored red.

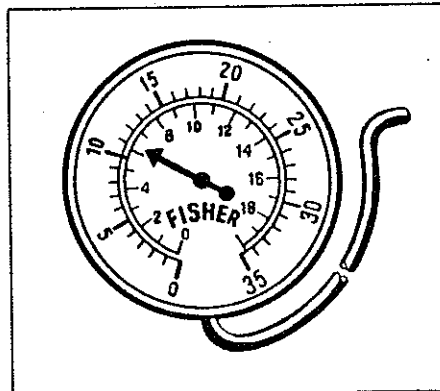


Figure 2.

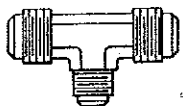
Take the test reading at one of the range burners.

1. Remove the burner assembly from the burner valve.
2. Insert the gauge hose onto the burner valve and turn valve on.
3. Test reading should be a minimum of 11 and a maximum of 12 inches of water column pressure. All appliances are made to operate at this pressure.
4. After any pressure adjustments shut off burner valve and remove tube from burner to allow pressure to bleed off. Then reinstall and check again as in step b.

Copper Tube Flaring

1. Tools required:
 - a. Tubing cutter
 - b. Two piece flaring tool
2. Using a pencil or scribe, mark the point on the tubing where the cut is to be made.
3. Slide the tubing along the "V" formed by the rollers of the cutting tool until the point marked in step 2 is directly under the cutting wheel.
4. Tighten the cutter clamp screw until the tubing is held firmly against the cutter wheel.
5. Rotate the tool completely around the tubing several times. The wheel should follow the direction of rotation, not lead it.
6. Tighten the clamp slightly and repeat step 5. Continue to tighten and rotate until the tubing is cut completely through.
7. After cutting, use the reamer on the tool to ream the inside of cut to the original I.D.
8. Slide the correct size flare nut on the tubing with the threaded portion and flare seat facing the cut end.
9. Insert the tubing in the correct opening of the flare tool clamping mandrel. Allow tubing to extend 1/32" above mandrel tapered seat.
10. Slide the flaring head over the mandrel with the clamp fingers on the underside and the flaring tip directly over the clamped end of the tubing. Slowly tighten the flaring tip as far as possible.
11. Loosen and remove flaring head, open clamp tool and remove flared pipe.

LPG System Fittings



Flare Tube Tee

600000 — $\frac{5}{8}$ x $\frac{3}{8}$ x $\frac{5}{8}$
 600003 — $\frac{5}{8}$ x $\frac{3}{8}$ x $\frac{3}{8}$
 683722 — $\frac{5}{8}$ x $\frac{5}{8}$ x $\frac{5}{8}$
 683721 — $\frac{5}{8}$ x $\frac{5}{8}$ x $\frac{5}{8}$
 600281 — $\frac{5}{8}$ x $\frac{5}{8}$ x $\frac{3}{8}$



Flare Tube Nut

600010 — $\frac{3}{8}$ short
 600098 — $\frac{3}{8}$ inverted flare
 600001 — $\frac{5}{8}$ flare



Flare Tube Nut

600001 — $\frac{5}{8}$
 600010 — $\frac{3}{8}$
 600036 — $\frac{1}{2}$
 600098 — inverted flare



Close Nipple

600293 — $\frac{1}{2}$ close



Hexagon Nipple



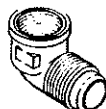
Flare Union

600238 — $\frac{3}{8}$ x $\frac{3}{8}$



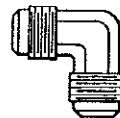
Adapter

600364 — $\frac{1}{2}$ x $\frac{1}{2}$
 600365 — $\frac{5}{8}$ x $\frac{1}{2}$



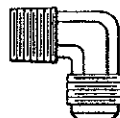
Adapter Elbow

600096 — $\frac{5}{8}$ x $\frac{1}{2}$



Elbow

600459 — $\frac{3}{8}$ NPT $\frac{3}{8}$ flare



Flare Elbow, Male

600048 — $\frac{5}{8}$ x $\frac{1}{2}$
 600051 — $\frac{3}{8}$ x $\frac{1}{4}$
 600082 — $\frac{5}{8}$ union
 601035 — $\frac{5}{8}$ brass
 600049 — $\frac{3}{8}$ MPT, brass

Electrical System

12 Volt Exterior	7-2	Bathroom Exhaust Fan Assembly	7-14	Break-in Procedure	7-28
Exterior Lighting System	7-2	Bathroom Exhaust Fan		Applying Load	7-28
12 Volt 1981 Diesel Chassis	7-2a	Removal/Replacement	7-14	Exercise	7-28
12 Volt Power Circuits	7-3	Auto-Skyliner II Motorized		Battery Charging	7-28
Univolt Interior Electrical System	7-3	TV Antenna (Excella)	7-15	High Operating Temperatures	7-29
Main Charge Line Power Source	7-3	Motorized TV Antenna Control Panel,		Low Operating Temperatures	7-29
Battery Power Source	7-3	Wiring Diagram	7-16	Extremely Dusty or Dirty	7-29
Univolt Testing	7-4	Antenna Operation	7-16	High Altitude Operation	7-29
Univolt Repair	7-4	Manual T.V. Antenna Assembly	7-17	Sequence of Operation	7-30
Univolt Removal	7-4	Worm Removal/Replacement	7-18	Engine Trouble Shooting	7-31
Battery Service	7-4	Drive Shaft Removal/Replacement	7-18	Maintenance	7-32
Locating Shorts and Opens	7-5	Manual T.V. Antenna (Skyliner)		Battery Care	7-32
Shorts	7-5	Removal/Replacement	7-18	Fuel Solenoid	7-32
Opens	7-5	Radio Antenna Assembly	7-18	Electric Fuel Pump	7-32
12 Volt Distribution Panel	7-6	Radio Antenna Installation	7-18	Air Cleaner Element	7-32
Branch Circuits	7-6	Radio Antenna Trimming	7-18	Spark Plugs	7-32
Univolt Converter	7-6	120 Volt Electrical Panel	7-19	Cooling System	7-32
Solid State Control Panel	7-7	Convenience Outlet and		Governor Linkage	7-32
Solid State Control System Panel		Polarity Light Assemblies	7-20	Out-of-Service Protection	7-33
Removal/Replacement	7-7	Polarity Light Removal/Replacement	7-20	Returning the Unit to Service	7-33
Water & Holding Tank Wiring Diagram	7-8	Trouble Shooting Polarity Light	7-20	Generator Maintenance	7-33
Water Tank, Main Holding Tank and		Ground Fault Circuit Interrupter (GFCI) ...	7-21	Brush Replacement	7-33
Auxiliary Holding Tank Level Gauges	7-8	Locating Shorts and Opens	7-22	Assembly Torques	7-34
Tank Probe	7-8	Shorts	7-22	Exhaust Spark Arrester	7-34
Operation	7-8	Opens	7-22	Periodic Maintenance Schedule	7-34
Maintenance	7-8	120 Volt Distribution System — 24 Ft.	7-23	Adjustments	7-34
Testing	7-9	120 Volt Distribution System —		Carburetor	7-34
Bedroom Lamp Assembly	7-9	28 Ft. (Center Bath)	7-24	Carburetor Adjustments	7-35
Bulb Replacement	7-9	120 Volt Distribution System —		Throttle Stop Screw	7-35
Ceiling Light Assembly	7-10	28 Ft. (Rear Bath)	7-25	Carburetor Float Adjustment	7-35
Bulb Removal/Replacement (Ceiling, Galley,		120 Volt Generator	7-26	Governor Adjustments	7-36
Lounge, and Vanity Lights)	7-10	Model Designation	7-26	Electric Choke	7-37
Lounge, Galley and Vanity		Specifications	7-27	Breaker Points and Ignition Timing	7-37
Light Assembly	7-11	Checks	7-27	Parts Information	7-37
Step Light and Bathroom		Exhaust	7-27	Running Replacement Parts List	7-37
Light Assemblies	7-12	Fuel System	7-27	Control Trouble Shooting	7-38
Step Light Assembly Bulb Replacement	7-12	Electrical AC Output	7-27	120 Volt Generator Wiring Diagram	7-39
Bathroom Light Bulb Replacement	7-12	Ventilation	7-27		
Range Exhaust Hood Assembly	7-13	Operation	7-28		
Filter Removal and Cleaning	7-13	Crankcase Oil	7-28		
Micro Switch Removal/Replacement	7-13	Recommended Fuel	7-28		
Fan Removal/Replacement	7-14	Starting	7-28		
Range Exhaust Hood Assembly		Stopping	7-28		
Removal/Replacement	7-14				

12 Volt Exterior

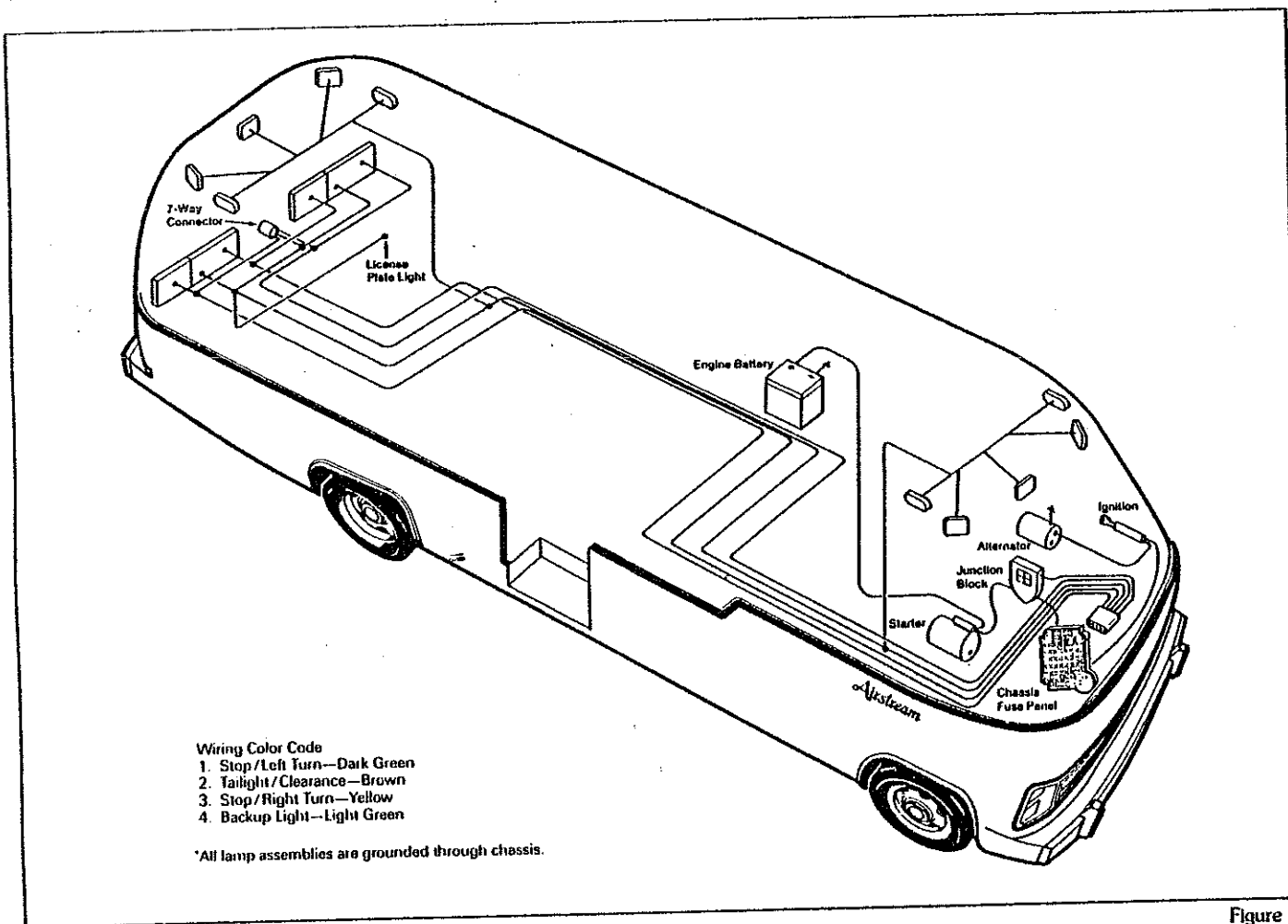


Figure 1.

The Airstream motorhome has three electrical systems:

1. Exterior Lighting System
2. Univolt (Interior Electrical System)
3. 120 Volt Electrical System

The exterior lighting system and univolt electrical system utilize a main low voltage harness assembly which is color

coded to assist in trouble shooting circuits. This harness consists of the exterior circuit, main charge line, branch circuits and component signal wires.

The 120 volt electrical system is separated from the low voltage circuits in order to conform to state, federal and Canadian codes.

Operation, trouble shooting and servicing of the three electrical systems are discussed in the following section. Wire diagrams for each model are included to identify circuit routing and color codes.

Exterior Lighting System

The state, federal and Canadian governments require motorhomes to be equipped with specific exterior lighting.

The Airstream exterior lighting system consists of exterior lamps and reflectors. Proper descriptions and identifications of each lamp, reflector and components are shown in Fig. 1.

The exterior electrical harness wires illustrated in Figure 1 are wrapped in the same harness as the univolt interior harness. This harness is routed from the motorhome 7-way connector, through the fuse panel, vertical on the curbside of front window and into the multidome area. The circuits branch out from the multidome area to the exterior lighting. All splices in the harness are crimped, soldered and taped to insure continuous circuits. All wires to components are color coded (See Fig. 1).

Each component has a "hot" wire and a ground return. The ground return is completed through the main ground circuit in the harness (white wire) or through the shell. Both the main ground return and the shell are electrically connected to the 12 volt distribution panel grounding bar.

Motorhomes manufactured for sale in Canada have a different color coding of functions.

The most common failure in the exterior electrical system is an open circuit. An open circuit is an interruption in the current flow which may be in either the wire to the component or in the ground return. Check the following areas for open circuits.

1. Light bulb (filament open)
2. Loose or corroded connections at lighting device

12 V - 1981 DIESEL CHASSIS

The installation of the diesel engine into the Chevrolet P-30 chassis has required Airstream to become involved in chassis wiring.

STARTING

Our first concern would be the starting circuit (Fig.1). When the ignition switch is closed two solenoids are activated. One is the solenoid on the starter and the other is the battery solenoid located in the underbelly compartment forward of the step well. When the battery solenoid is activated all three batteries provide power to the engine starter. When the ignition key is turned from the start position to "on" the battery solenoid opens.

With the key "on" and the engine running the auxiliary batteries are recharged through the battery isolator (Fig.1). In the "off" position both the battery isolator and battery solenoid are deactivated breaking all connections between the engine battery, and auxiliary batteries.

The glow plug circuit (Fig.2) is power through a solenoid mounted on a vertical post at the right rear of the engine. 12V power is supplied to one side of the solenoid and on to the dash switch. When the switch is closed it activates the solenoid sending current to the indicator light and on to the glow plugs.

The large terminal on the starter (Fig.3) acts as a major junction point in the 12V chassis wiring. One of the most important points to note on this terminal is the fusible link feeding power on to the head light switch. Chevrolet also had another fusible in their wiring harness to the starter. In our wiring this fusible link is disconnected from the starter and is used to feed the ammeter.

CHARGING

Both the alternator and voltage regulator are Isuzu components. A six way plug (Fig. 4) is on the voltage regulator. Three of the wires run to a three way plug connecting to the alternator and the three wires connect to the Chevrolet wiring harness.

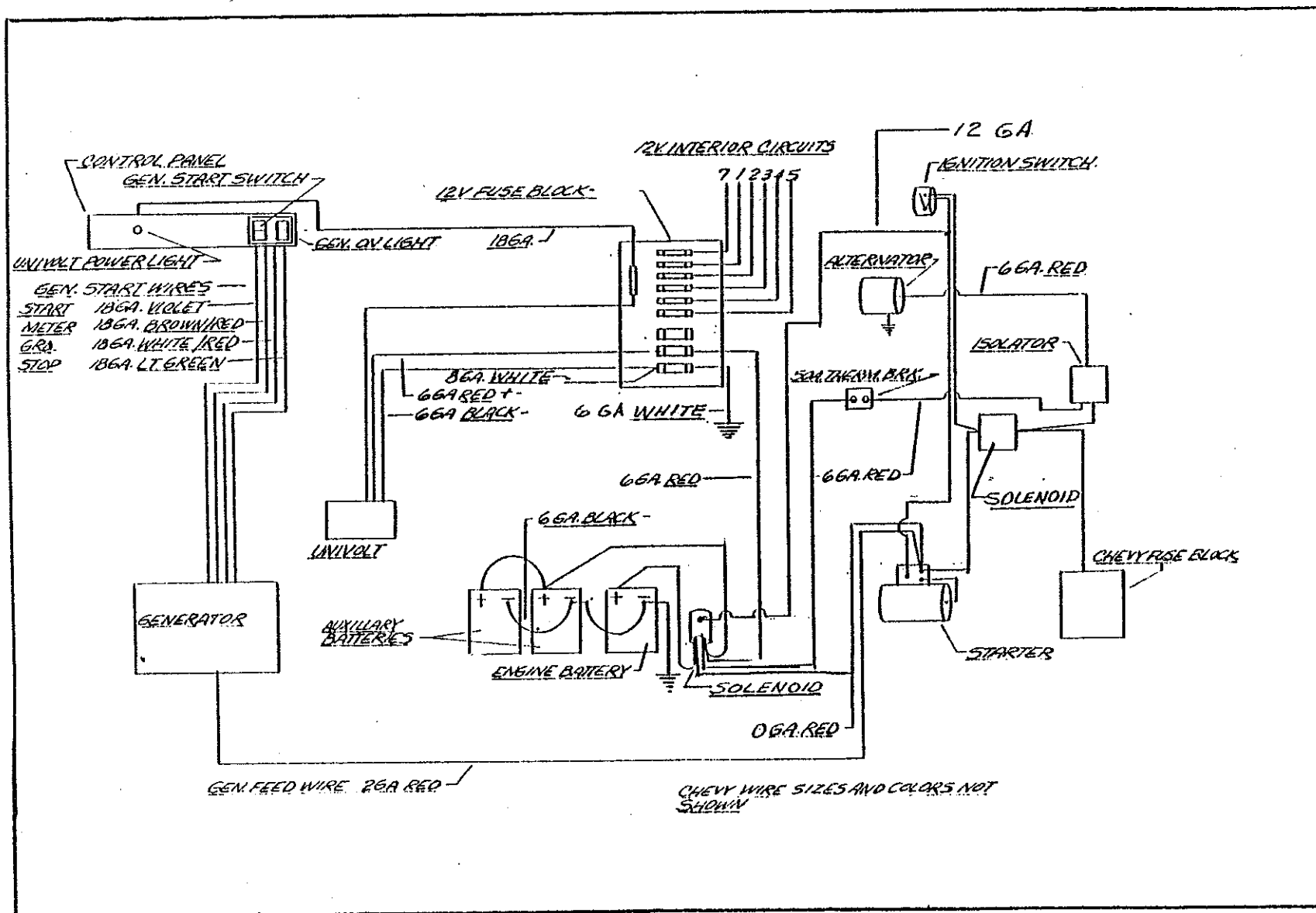
The ammeter current (Fig.5) comes from the main terminal on the starter, through a 12V circuit breaker next to the voltage regulator, then on to the dash. From the ammeter on the dash the current then goes to the fusible link at the starter location then on to the ignition circuit.

12V - 1981 GASOLINE

The 12V chassis wiring would be standard Chevrolet except for the dash mounted start assist circuit.

The start assist circuit (Fig.6) picks up the feed current from the #4 interior 12V circuit. When the button is depressed current is fed to the main battery solenoid (Fig.1) tying all three batteries together to provide more cranking power.

STARTING CIRCUIT



GLOW PLUG

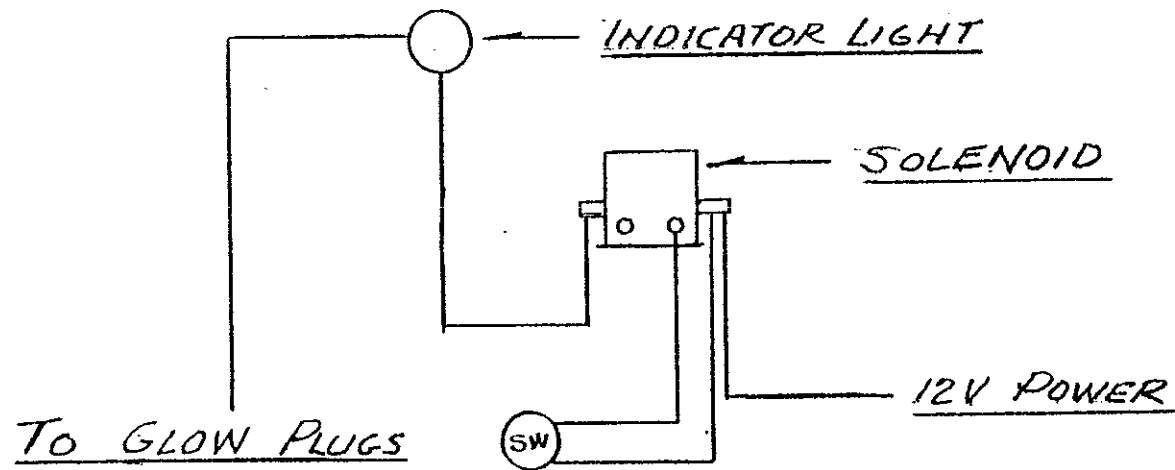


Figure 2

STARTING WIRING

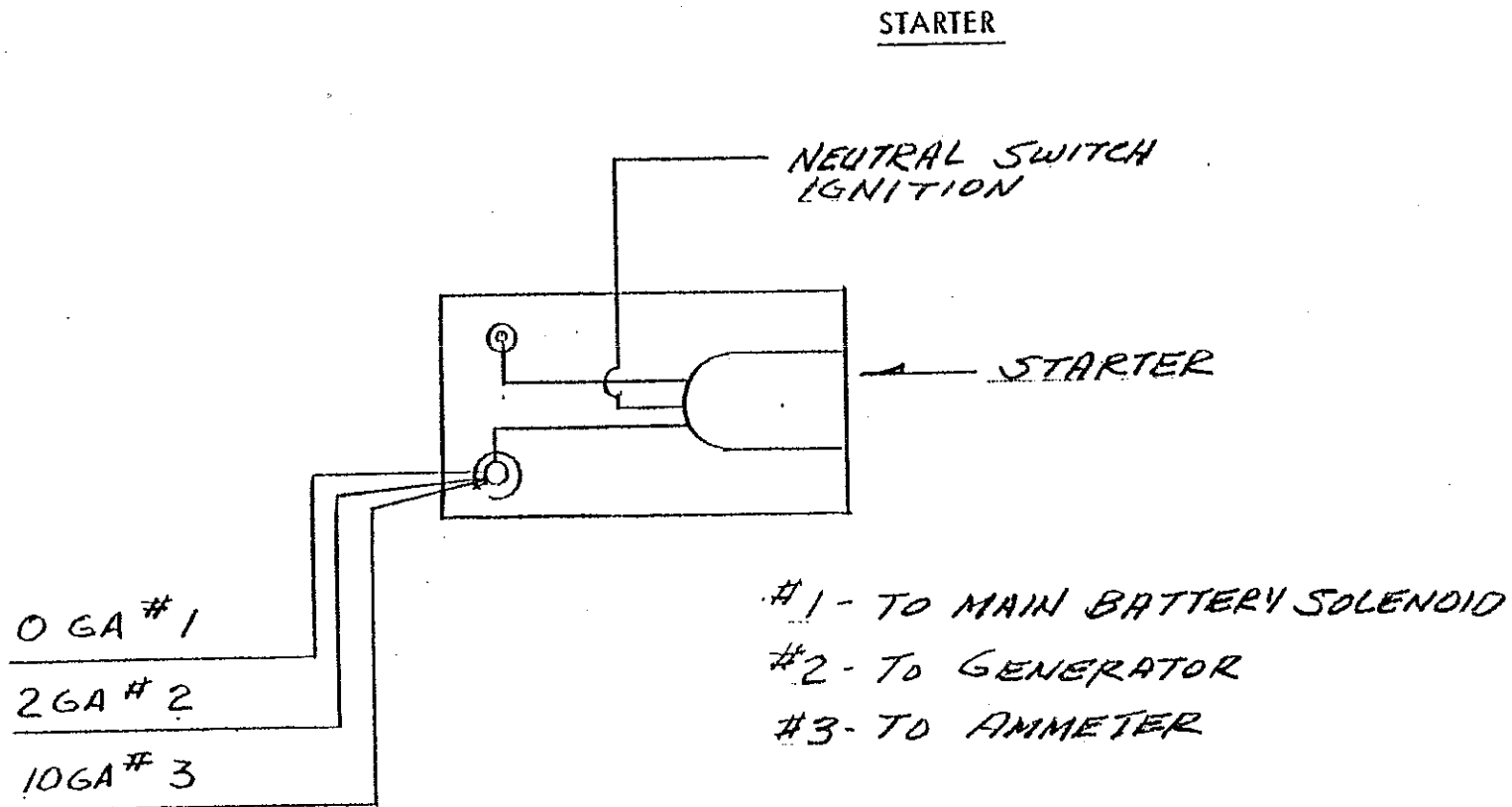


Figure 3

ALTERNATOR WIRING

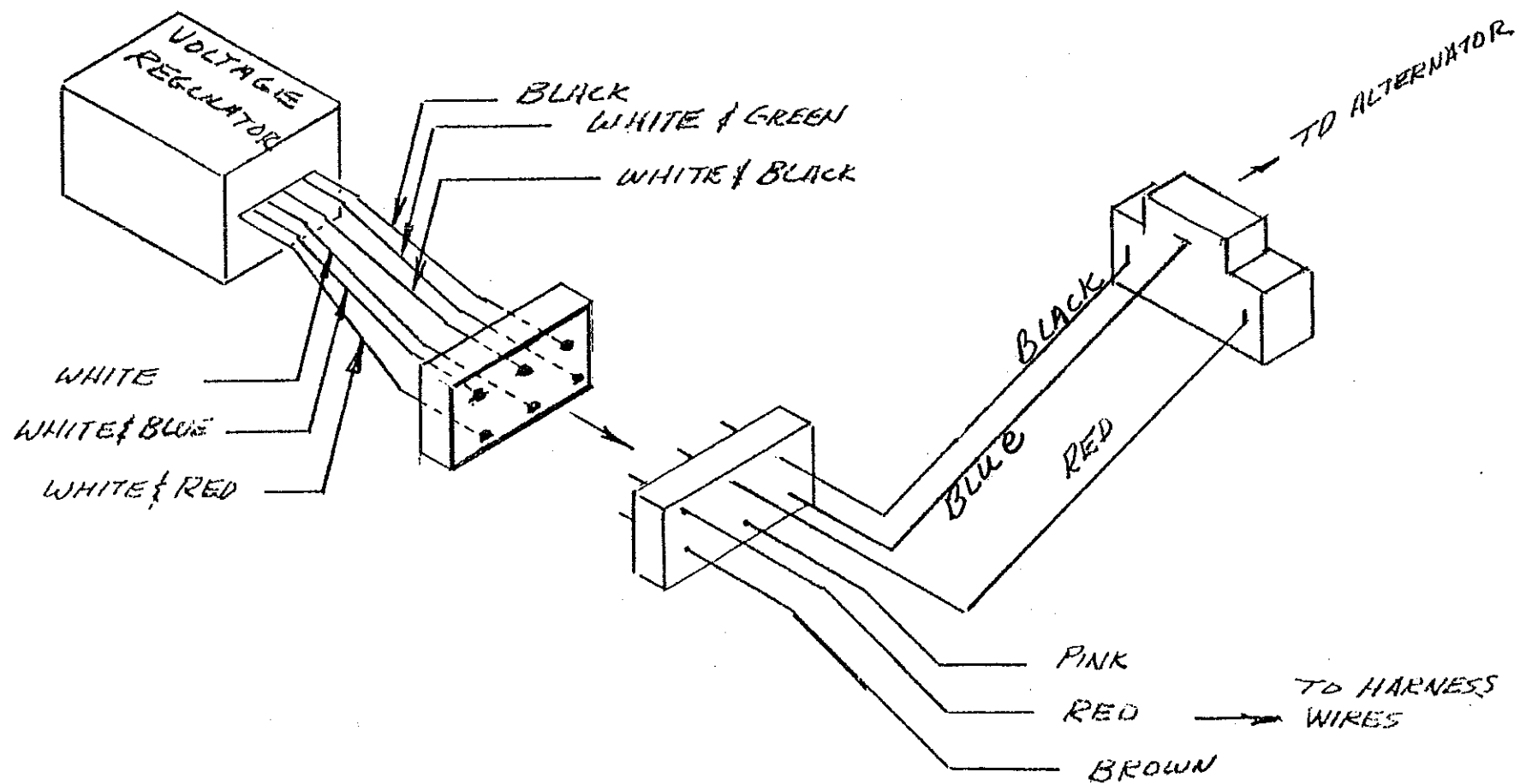


Figure 4

AMP METER CIRCUIT

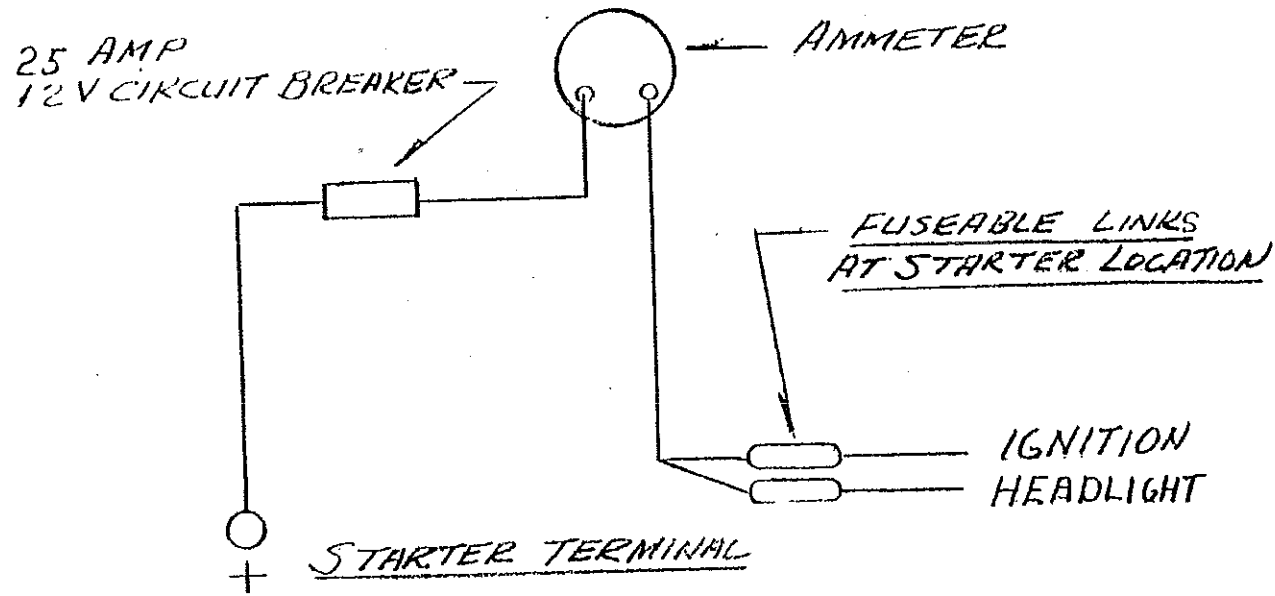


Figure 5

START ASSIST CIRCUIT

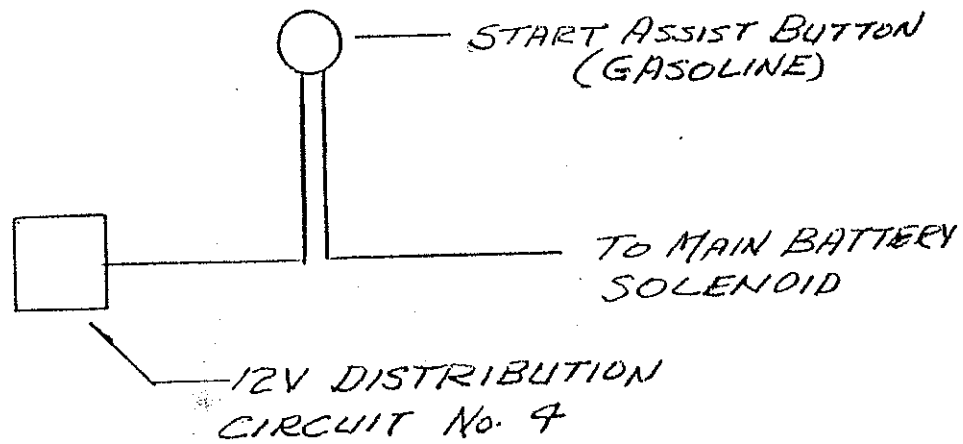


Figure 6

Univolt Interior Electrical System

3. Loose or corroded connections at 7-way connectors
4. Improper grounding at the lighting device

A continuity light or an ohmmeter will help you isolate the point of the "open" on the circuit.

Another cause of failure is a short circuit usually resulting in a blown fuse or cycling circuit breaker at the power source. A short is usually caused by the wire coming in contact with a sharp edge. The sharp edge wears the wire's insulation away until the "hot" wire shorts to ground.

12 Volt Power Circuits

The current in the univolt system is 12 volts direct current (12 VDC), negative grounded.

Power sources which supply 12 VDC current to the system are as follows:

1. Main Charge Line from Vehicle
2. Motorhome Battery (5)
3. Univolt Converter

The power sources above are all electrically connected to the 12 volt distribution fuse panel which distributes current to four interior branch circuits (See Fig. 2). The five circuits provide power to operate all 12 volt DC lights, pumps, motors and appliances.

Univolt Interior Electrical System

The univolt system is the interior low voltage electrical system which enables you to use the interior lights, fans, pumps and 12 volt appliances whether operating on self contained battery power or 120 volt city power.

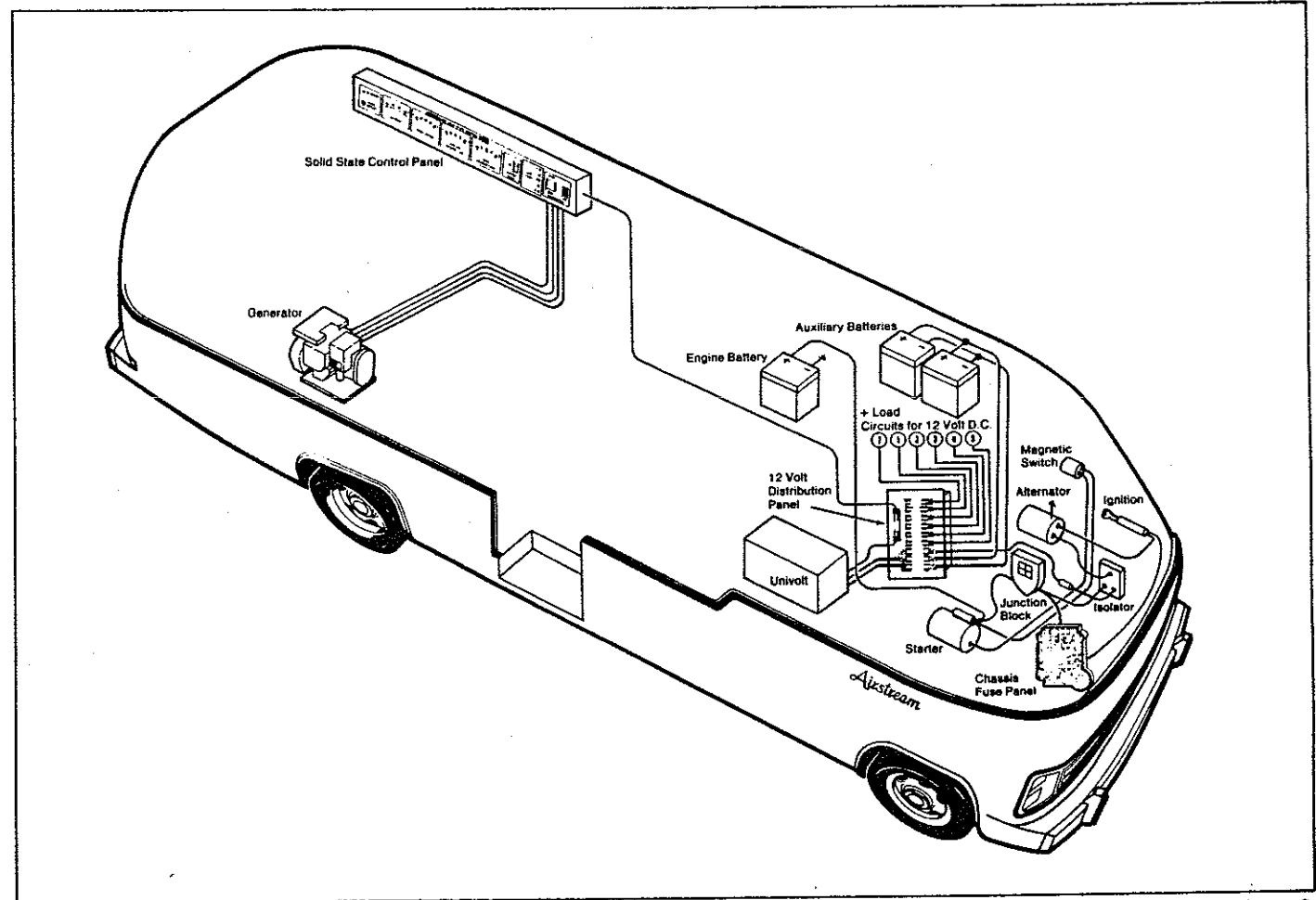


Figure 2.

Main Charge Line Power Source

The main line circuit completes the path of current from the vehicle's generator or alternator to the batteries as shown in Fig. 2. The purpose of this circuit is to charge the motorhome batteries.

Battery Power Source

The 12-volt motorhome batteries are connected in parallel to the Univolt system (see Fig. 2). They provide current to the interior lights, fans and 12-volt appliance when your motorhome is disconnected from city power or when an overload of interior lights and fans exists with city power connected.

Charging of batteries is provided by the vehicle's charging system or the "Univolt" converter.

Univolt Testing

The Univolt may be tested when installed in the motorhome with either the Newmark tester or the Triad tester.

The Newmark tester should be set on the Zener position only. The Triad tester has only one position.

1. Confirm 120 volt power is going into Univolt.
2. Remove all fuses from remote fuse panel.
3. Connect black lead of tester to terminal marked "ammeter red only." (Any one of the four terminals on the negative side of univolt may be used.)
4. Connect the red lead or tester to any fuse clip on the fuse panel.
5. The voltage must be within 13.8 and 14.2 volts. (The meter of the tester should be calibrated periodically.)
6. If Univolt is not within these voltages, replace it.

Univolt Repair

The case cover to the univolt must not be removed. (There is high voltage within the case which is dangerous.) The Univolt should be returned to Airstream for repair.

Univolt Removal

1. Disconnect power cord for 120 volt supply.
2. Switch circuit breakers to off position.
3. Remove screws securing Univolt cover, remove cover.

4. Disconnect lead-in wires running from Univolt assembly to 12 volt distribution panel.
5. Remove four screws mounting the Univolt assembly to the floor.
6. Remove the Univolt assembly.
7. To install, reverse the removal procedures.

Battery Service

A safe level of charge for your battery is a specific gravity reading of 1.225. A fully charged battery has a specific gravity of 1.250 to 1.280. Always use a hydrometer which has a temperature correction scale. Maintain a clean battery top and check terminals and cables for tightness and cleanliness. A dirty battery will dissipate its charge through surface contamination. Clean battery top with a damp cloth and dry thoroughly. The terminals should be tight and free of corrosion. To clean terminals, neutralize with a solution of baking soda, rinse in clear water, and dry. To insure maximum battery capacity on both charge and discharge, the battery terminals and the inside portion of the cable connector should be scraped or brushed until both of these surfaces are shiny bright. The cable connectors should then be reconnected to the battery and tightened. The complete assembly, battery post and cable connector should be coated with a heavy bodied mineral grease or petroleum jelly. Important: Reconnect the battery cables to the correct posts. The black cable should be connected to the negative (-) post and the red cable to the positive (+) post.

Add water to cells as necessary. On Delco batteries the "Delco Eye" in the

center of each cap will glow when water is needed. All other batteries except those that are permanently sealed must be inspected periodically by removing each cap and checking fluid level. Do not fill battery above lower ring. As the battery is charged, the electrolyte expands, causing an overfilled battery to spill acid through the vents. Permanently sealed batteries (those with no filler caps) need no checking or filling.

1. How to Use a Hydrometer

- a) Squeeze the soft rubber bulb and insert the nozzle in the cell. Release the bulb slowly, drawing electrolyte up into the barrel.
- b) Adjust the electrolyte level in the barrel so that the float rides free of the bottom but is not striking the top.
- c) Hold the hydrometer in vertical position, making sure that the float moves freely. Now read the scale at the level of the electrolyte in the barrel.
- d) Return Electrolyte to the cell from which it was removed.

Note: Handle hydrometer carefully in making tests — guard against drops of acid falling on person, clothing or motorhome. After completing test, flush hydrometer with clean water.

2. How to Use a Voltmeter

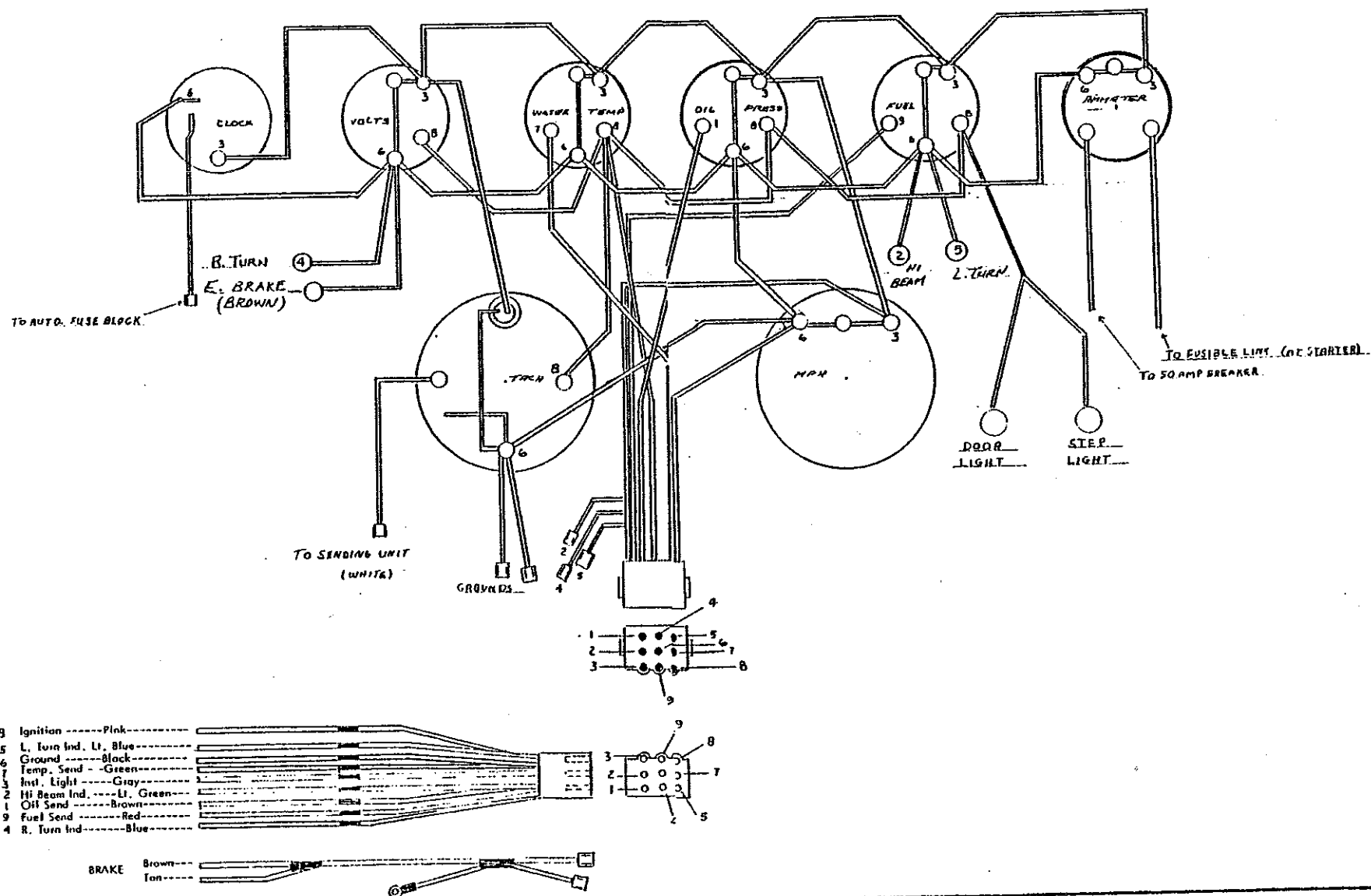
Open circuit voltmeters, designed for testing storage batteries, have scale ranges suitable for reading individual cell voltages.

Readings are obtained by pressing the prod points firmly into the post or cell connectors across each cell and observing the position of the

voltmeter needle with respect to the scale. The proper polarity must be observed, i.e., the rigid prod (positive) attached to the meter makes contact with the positive post; the prod on the flexible lead (negative) contacts a negative post. Note that a cell connector must be regarded as positive when testing one cell, and negative when testing adjoining cell. (The cell connector connects the positive post of one cell with the negative post of an adjoining cell.)

Some batteries are made with buried cell connectors, i.e., they are covered with sealing compound. Voltage readings of batteries constructed in this manner are obtained by pressing the prod points through the sealing compound and contacting the cell connectors. After the test is made, the pierced sealing compound should be pressed back in place.

Caution: It is not recommended that a voltmeter be used to test batteries with buried connectors, unless the user is certain of the location of the proper cell connectors. Some 12-volt batteries have complex cell arrangements, making it difficult for the inexperienced to locate the proper connectors. If, through error, the voltmeter contacts two or more cells, possible damage will occur.



VOLTMETER TESTS

For greater accuracy, these tests should be made on a battery that has not been charged (by the generator or otherwise) for 16 hours. If the battery has been charged, the headlights or similar electrical load should be turned on for 2 to 3 minutes, after which a reasonably good test may be made. With lights and all electrical accessories "off", read the voltage off each cell and record the readings.

INTERPRETATION OF TEST RESULT

Condition:

If the difference between the highest and lowest cell is .05 volts or more, the battery is nearing the end of its useful life and should be replaced. However, if the highest cell reads less than 2.04 volts, the test for condition is questionable. Recharge the battery and make the test again.

Examples:

Readings: 2.07; 2.06; 2.05; Condition: OK

Readings: 2.09; 2.02; 2.08; Condition: Worn-out

State of Charge:

Compare the voltage readings with the following:

State of Charge	Voltage Reading
100	2.10
75	2.07
50	2.04
25	2.01

Example:

Readings: 2.03; 2.04; 2.03;
Half charged

Locating Shorts and Opens

The key in locating shorts and opens is isolation. The first step is to isolate circuit with the short or open and then isolate the section of the circuit with the fault. Once the section is identified, the specific problem can be located. The cause may be a loose or corroded connection, cut wire, worn insulation, defective component, etc. The following paragraphs describe methods of isolating shorts and opens. There are several other approaches that may be used; however, these may be used as a guide.

Shorts

1. Locate circuit which has short by noting fuse blown.
2. Remove fuses and open all switches, and check for continuity between (+) 12 volt wire of shorted circuit and ground. (If it cannot be determined if switch is in open position, remove lead from switch.) Continuity to ground indicates there is a short.
3. Remove leads of shorted circuits from univolt and components one at a time. After disconnecting each component, check continuity of the +12 volt wire to ground. If there is no continuity, the short is in the component removed. If continuity still exists, continue with steps below.
4. Inspect leads carefully where they pass through the skin or near sharp edges.
5. Note objects attached to skin after manufacturing. The mounting screws or rivets may be causing the short.

6. Remove multidome to expose main body of harness. Inspect harness for cause of short, such as rivets or screws in harness or evidence of drilling.
7. If short cannot be found, cut circuit into sections, checking each section for continuity. Short can be isolated by this method.
8. Examples of shorts are:
 - a) The (+) 12 volt wire contacting (-) negative wire or grounded surface.
 - b) Internal short in a 12 volt component or appliance.

Opens

1. Check all components on circuit which have opens. If all components are without power, begin to look for open on distribution panel.
2. Check for voltage on each side of the fuse. Sometimes a fuse has an open even though it is visually good. Check for tightness of fuse clip to fuse.
3. After inspecting all accessible wire on circuit for opens, remove multidome. Remove tape and inspect splices for poor connection.
4. A continuity light is a useful tool in locating an open. Each section of circuit can be checked for continuity. By a process of elimination the open may be found.

5. Examples of open are:

- a) Wire is cut.
- b) Connector falls off component's terminal.
- c) Loose or corroded connection.
- d) Contacts in switch do not touch.

12 Volt Distribution Panel

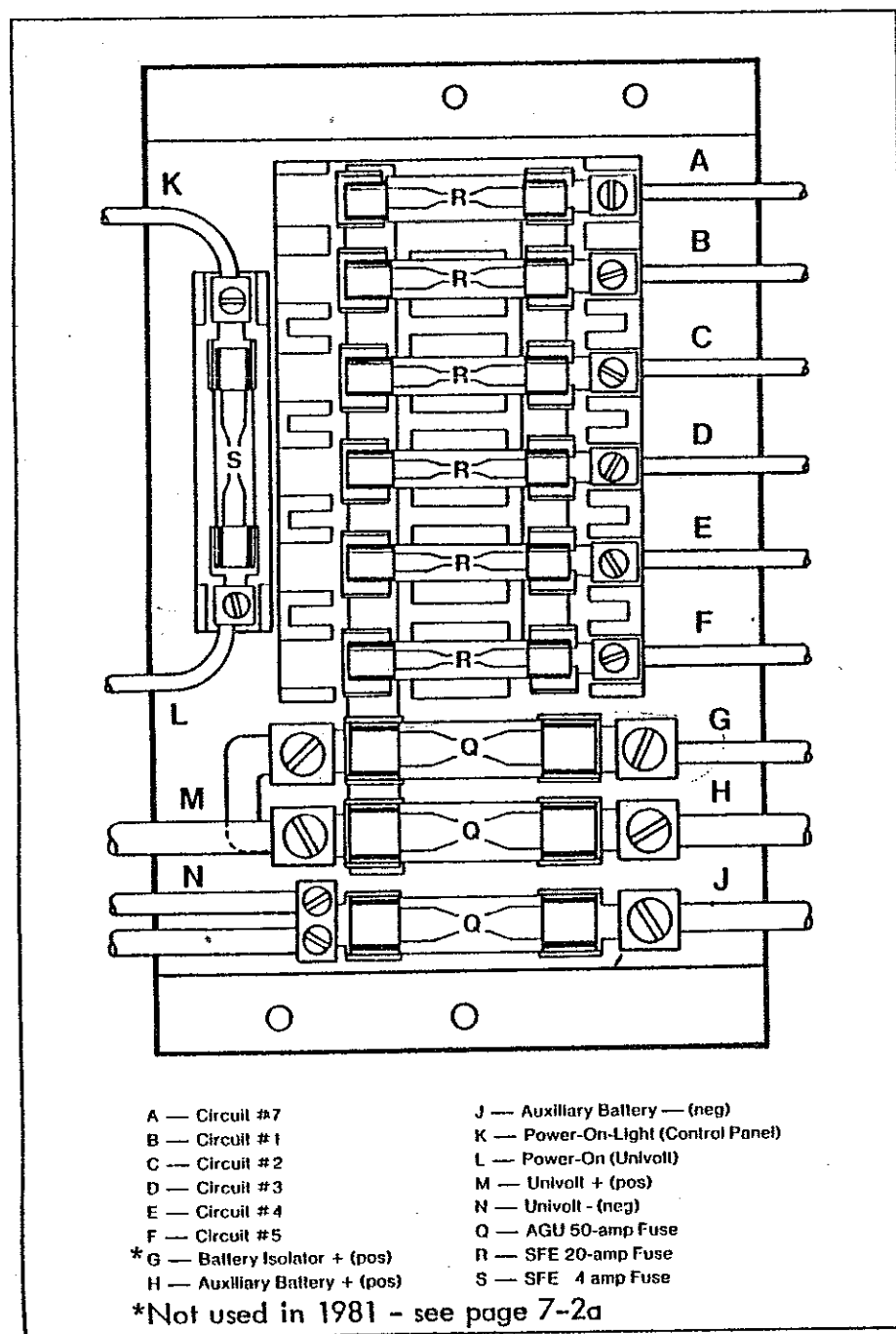


Figure 3.

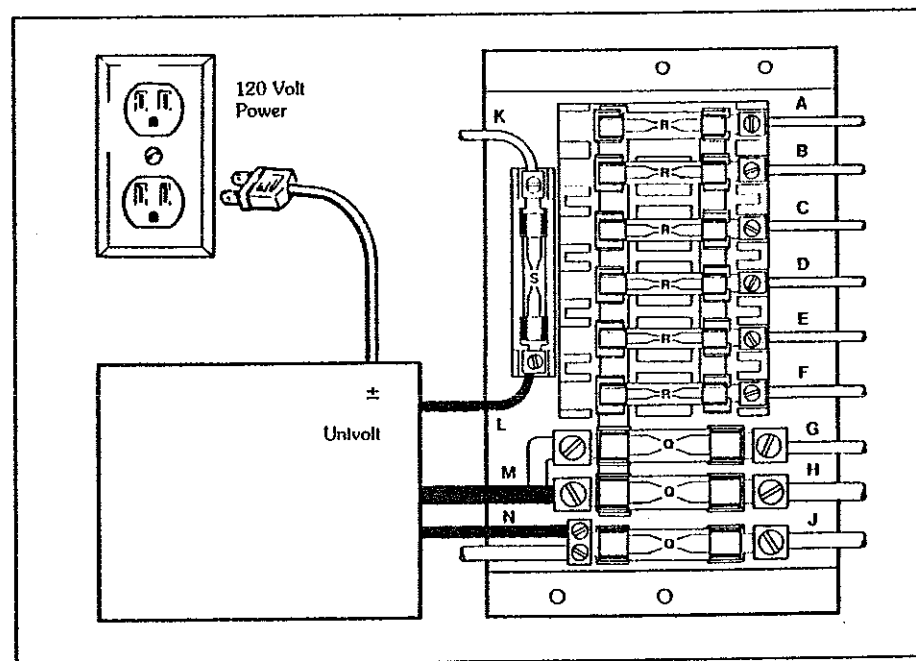


Figure 4.

12 Volt Distribution Fuse Panel

All connections of wires to the fuse panel must be clean and tight.

Prior to replacing fuses make sure inside surfaces of fuse clips are clean and squeeze clip to provide adequate tension against the fuse. Dirt or inadequate clip tension will produce a greater resistance resulting in heat and voltage drop.

Branch Circuits

The five interior branch circuits distribute 12 volt D.C. power from the univolt's remote fuse panel to the interior lights, fans, water pump and other 12 volt appliances. Each circuit is protected by a 20 amp fuse in the remote fuse panel.

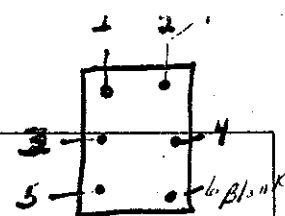
Univolt Converter

The univolt converter transforms 120 volt alternating current (A.C.) into 12 volt nominal direct current (D.C.). This provides power to charge the motorhome battery and to operate the 12 volt interior lighting, fans and appliances.

The converter is energized when the motorhome is hooked up to 120 volt city power, or utilizing 120 volt generator power.

Fig. 4 illustrates the converter's power source, converter and remote fuse panel.

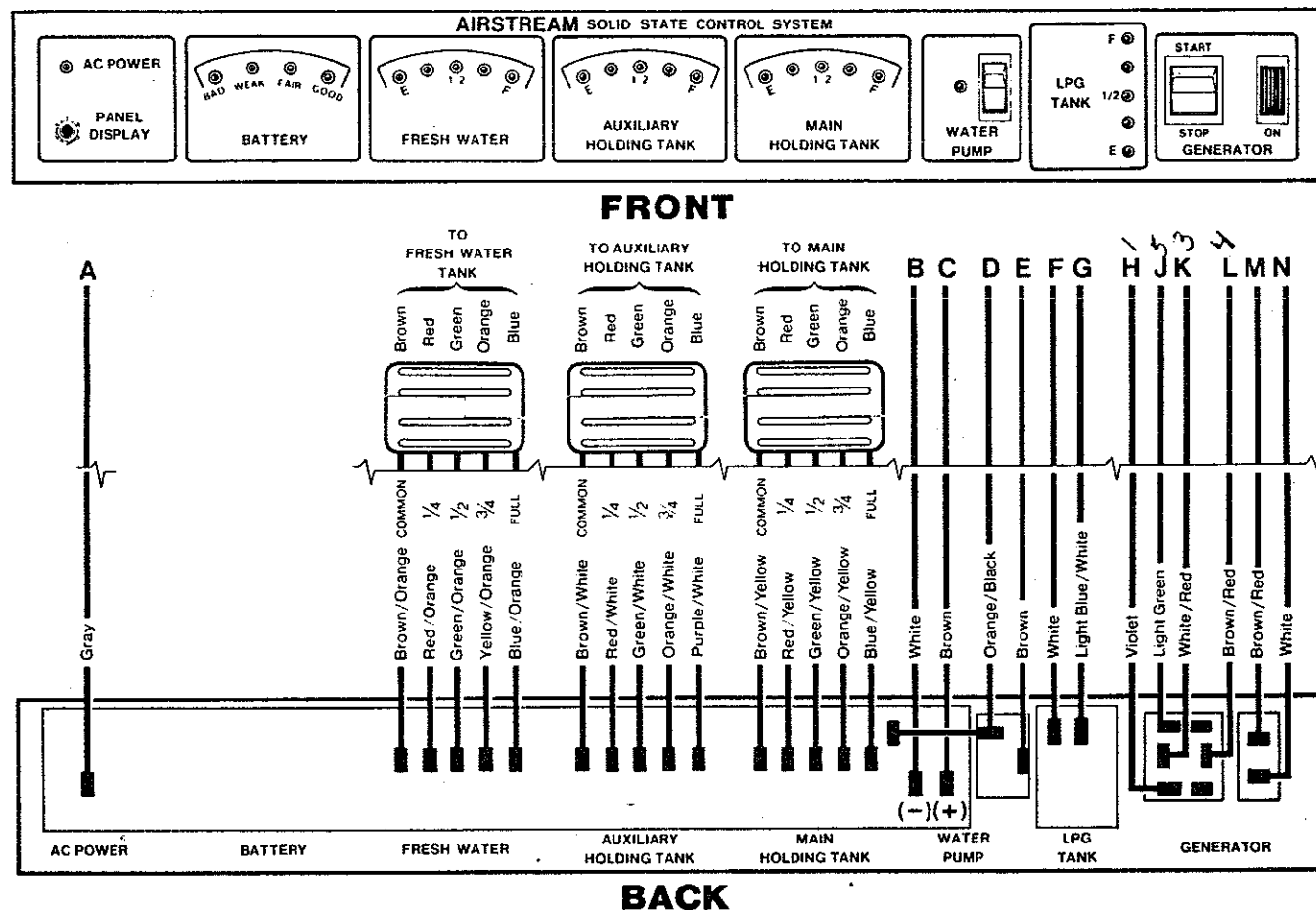
Solid State Control Panel



No.	Part No.	Description
1	500485	Control Panel
2	510051	Wire Harness Adapter

Solid State Control System Panel Removal/Replacement

1. Disconnect 120 volt inlet.
2. Disconnect batteries.
3. Remove screws attaching control panel to range exhaust hood.
4. Lift control panel up to clear lower extrusion, pull out to expose wire connections.
5. Disconnect all wires from back of panel, remove control panel.
6. For installation, reverse removal procedures.



A — Power On Light
B — Ground
C — Generator Start Switch
D — Lamp and Running Meter

E — Start
F — Ground
G — Stop
H — (+) Positive

J — Ignition Ground
K — (-) Negative
L — Not Used
M — 12V Positive

N — Ground

Figure 5.

Water and Holding Tank Wiring Diagram

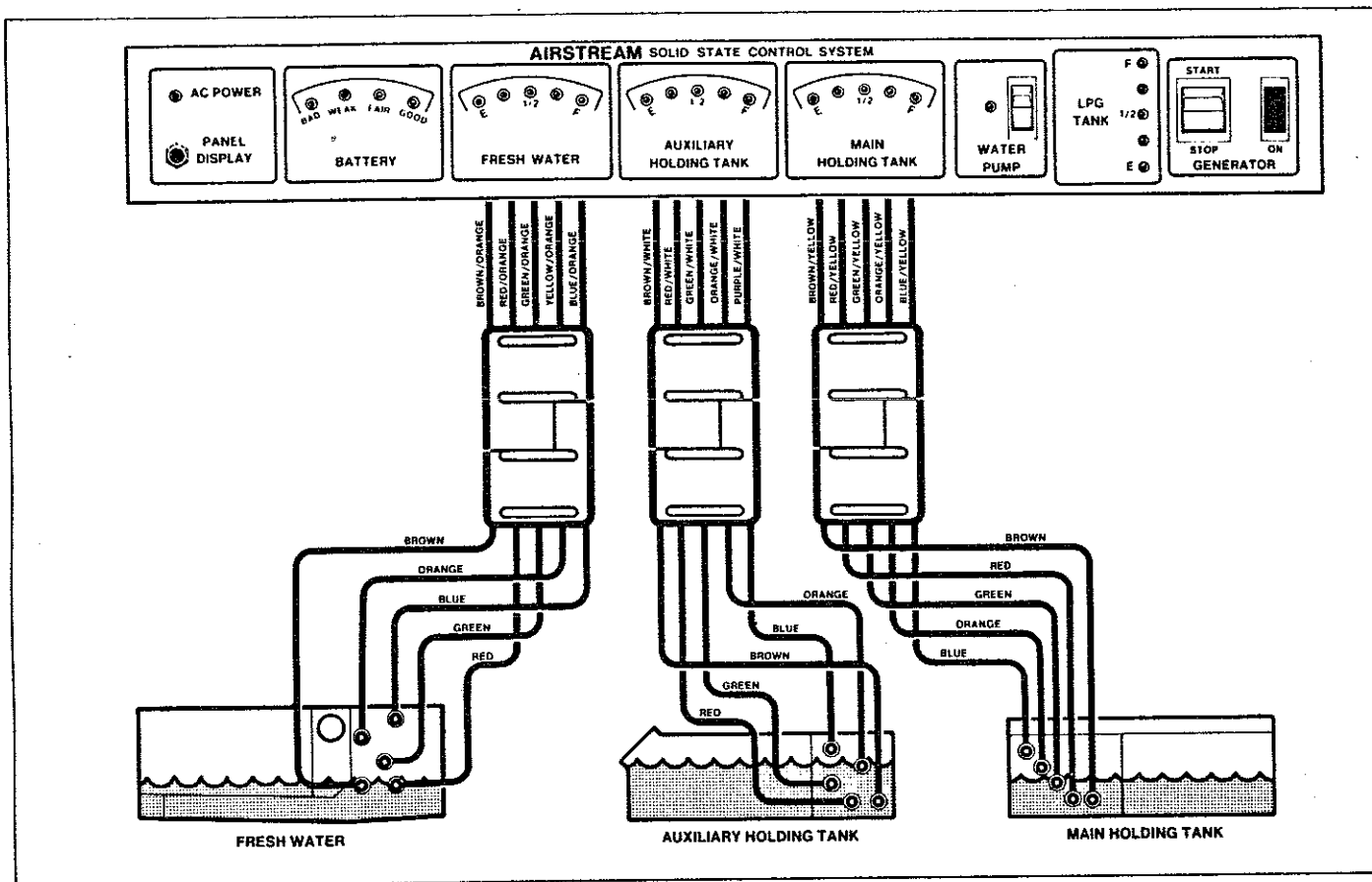


Figure 6.

Water Tank, Main Holding Tank and Auxiliary Holding Tank Level Gauges

1. The lights indicate the amount of liquid in their respective tank (see Fig. 7).
2. Fig. 6 illustrates the amount of liquid in the tanks for each of the five positions.

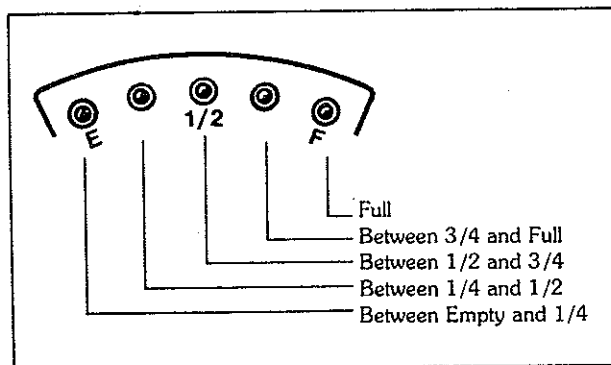


Figure 7.

Tank Probe

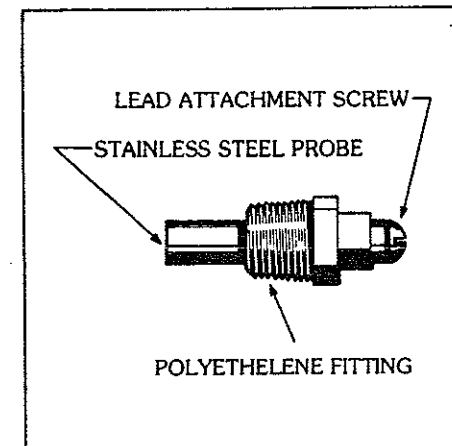


Figure 8.

Operation

1. Each tank has one common probe and four additional probes at specific levels in the tank.
2. The stainless steel pin of the probe is exposed to the interior of the tank.
3. Continuity of the level indicator circuitry is completed when the liquid contacts both the common probe and the probe set at the specific level. Probes are placed at the $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full level.

Maintenance

1. Accumulations of oxides, dirt, etc., may build up on the probe pins thus increasing the resistance between the common probe and level probes. However, excessive resistance will require the probe to be removed and cleaned, or replaced with a new probe.
2. The waste tank probes are located adjacent to the slide valve except in the L.Y. main holding tank where the probes are accessible from the

Bedroom Lamp Assembly

interior of the bathroom wardrobe. The water tank probes are adjacent to the water inlet and drain fittings.

3. The probe assemblies may be removed by rotating the probe assembly counterclockwise. The probe body has a square head for an open end wrench.

Testing

1. Drain tank completely.
2. With tanks empty, push display button. If any of the lights light up, the problem is a dirty or defective probe. Remove probe and clean or replace as necessary.
3. If none of the lights light up when the display button is pushed, check the display lights as follows:
 - a) Connect a wire from the common probe (brown lead) to the empty probe (red lead). If the empty light lights up when the display button is pressed, the circuit and lights are okay.
 - b) Repeat this procedure for each probe circuit. If any light fails to light up, check the wire leading to the control panel for shorts or opens. Repair or replace as necessary.
 - c) If the problem is in the control panel, replace the entire panel.

Bulb Replacement

1. Remove screws attaching lens top, remove top.
2. Lift up lamp base casting and reflective bat.
3. Pull defective bulb from plastic base, replace.

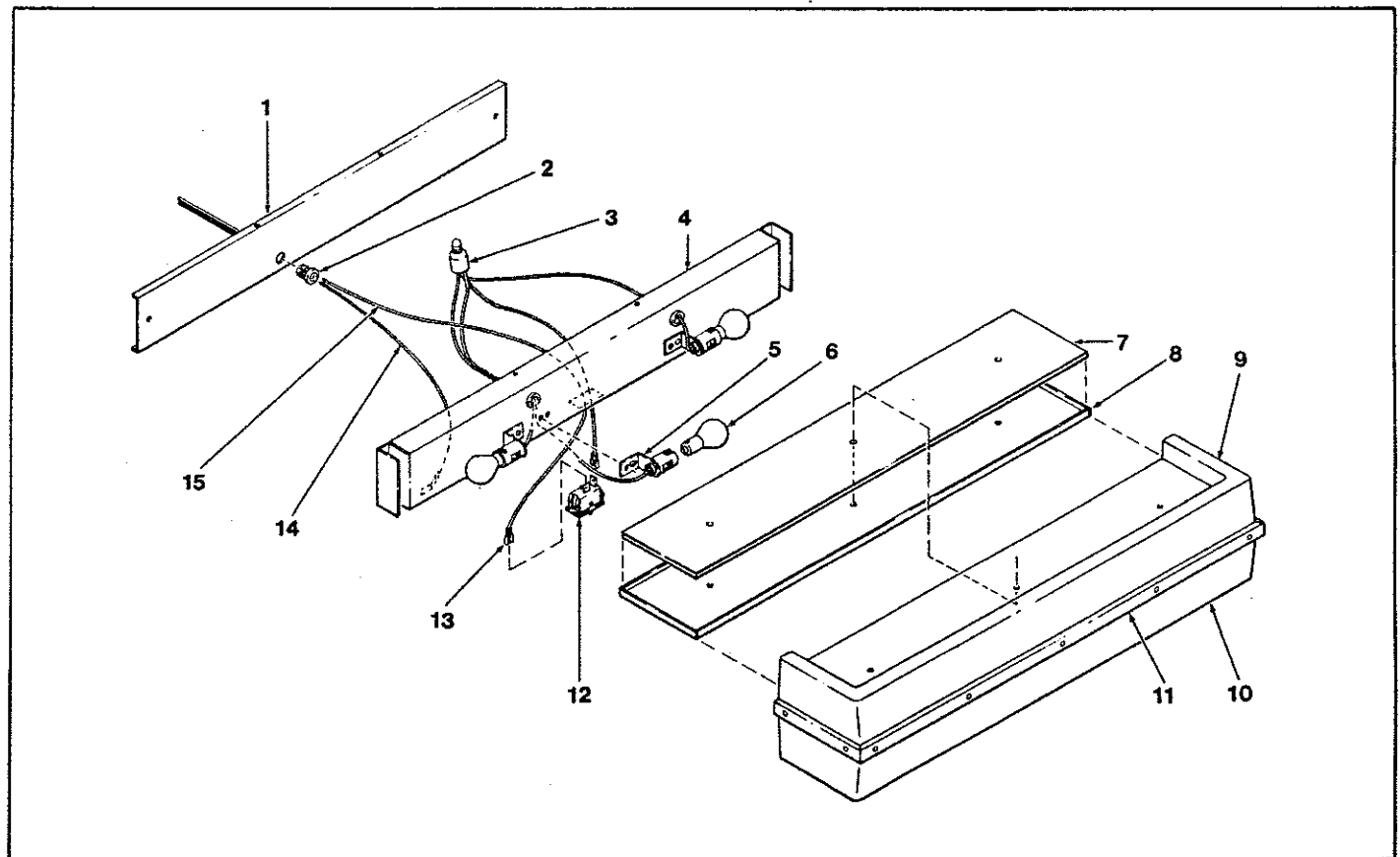


Figure 9.

No.	Part No.	Description
	500536	Bed Light Assembly
	952179	Bed Light Lens Assembly
1	410335	Mounting Plate
2	380019	Bushing
3	500487	Nylon Splice
4	410334	Housing
5	500519	Lampholder
6	510445	Lamp — No. 1141
7	201491	Insulation
8	101924	Reflector Plate
9	200692	Bed Light Lens, Top
10	200700	Bed Light Lens, Bottom
11	100855	Extrusion

No.	Part No.	Description
12	500018	Switch
13	500032	Connector
14	510454	Wire, White
15	510456	Wire, Black

Miscellaneous Fasteners

330113	Pop Rivet
320016	Screw 8 x 1/2" (White)
320082	Tapping Screw No. 4 x 5/8"
330003	Pop Rivet
300006	Washer

Ceiling Light Assembly

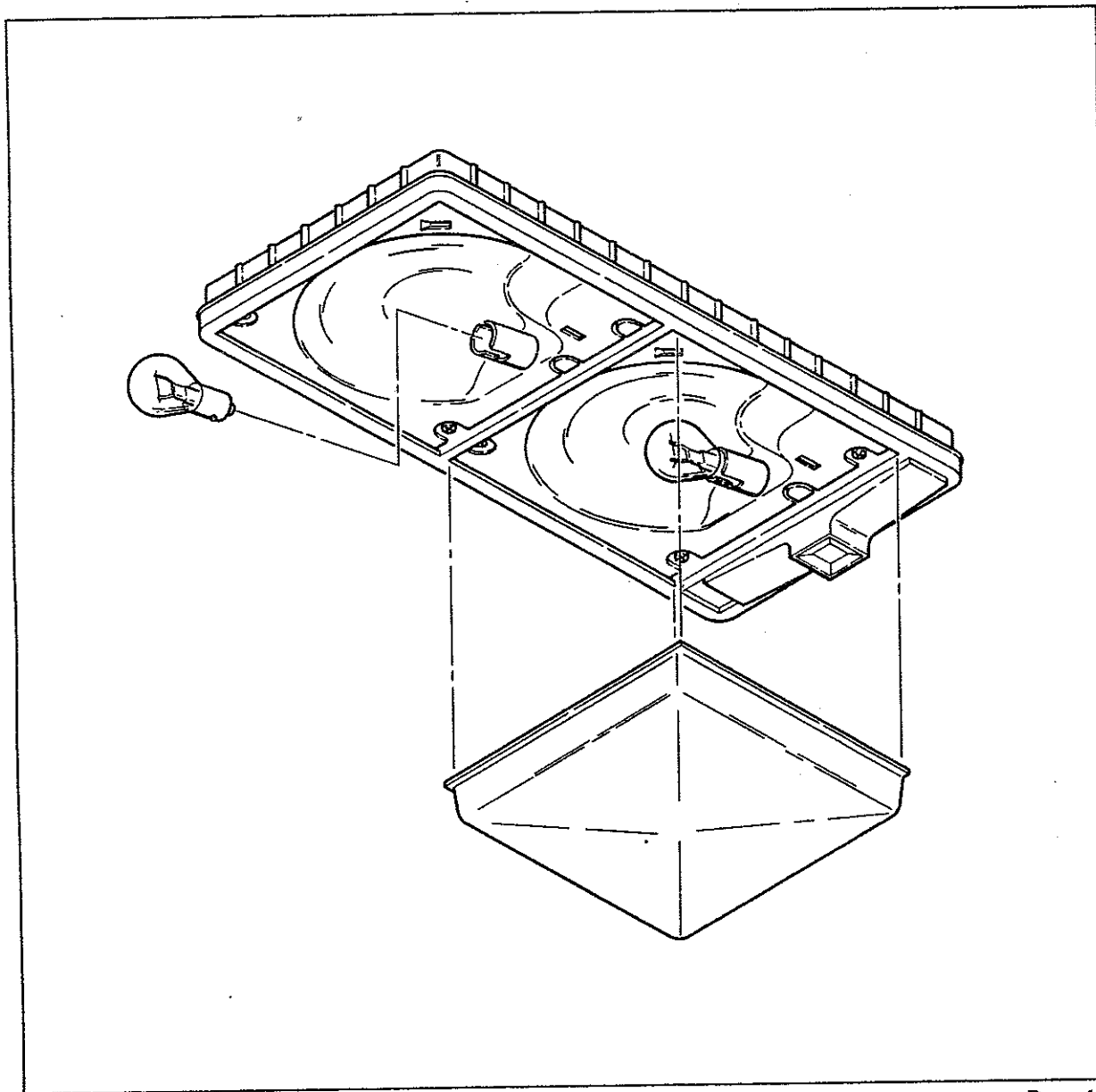


Figure 10.

Part No.	Description
500540	Ceiling Light Assembly

Bulb Removal/Replacement (Ceiling, Galley, Lounge, and Vanity Light)

1. Carefully depress lens and snap out of lamp housing.
2. Remove bulb by pressing in and turning counterclockwise approximately $\frac{1}{4}$ turn.
3. Remove bulb.

Lounge, Galley and Vanity Light Assembly

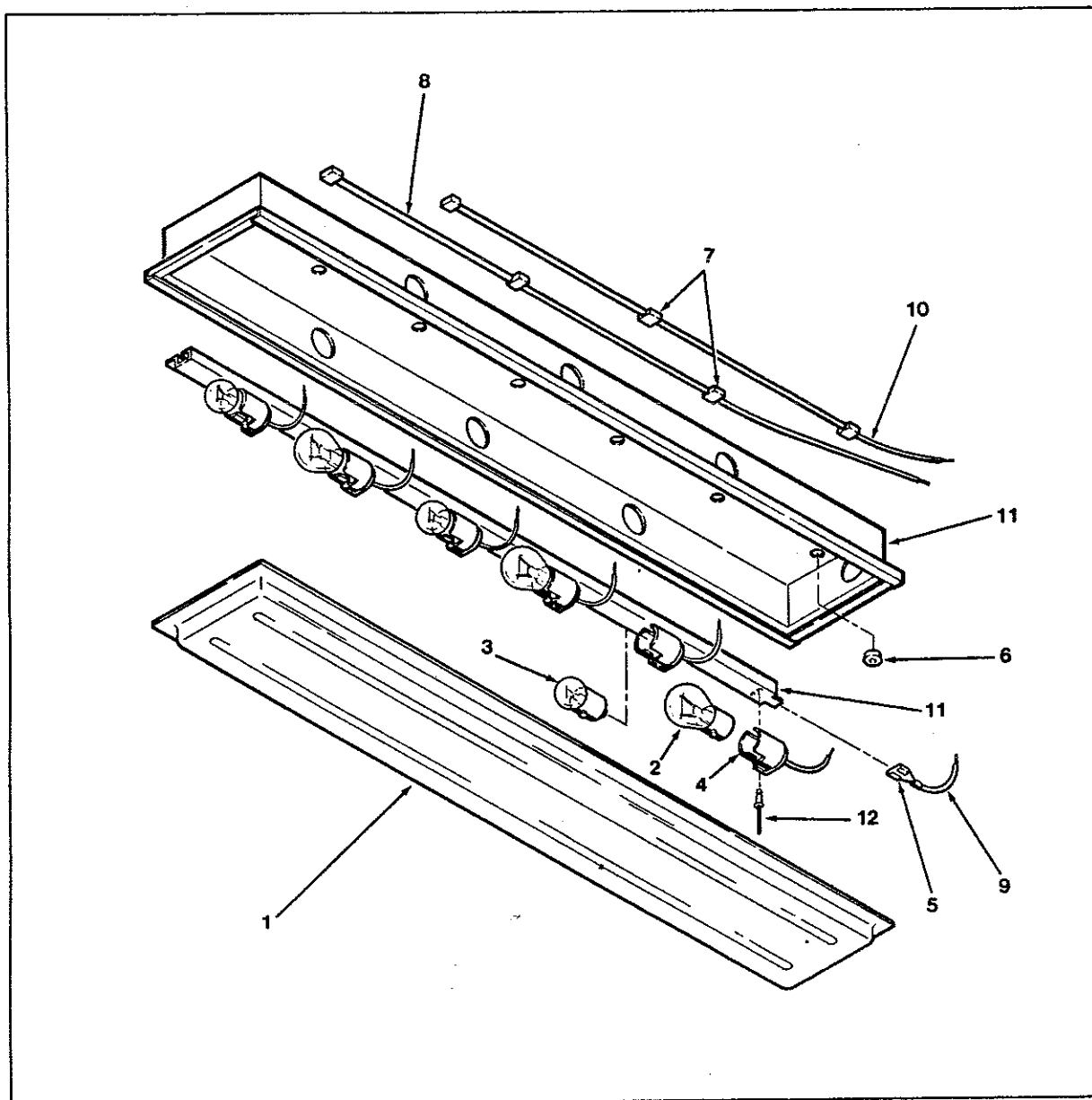


Figure 11.

No.	Part No.	Description
	500539	Lounge, Galley and Vanity Light (Short)
	500537	Lounge, Galley and Vanity Light (Long)
1	201422	Lens
2	510445	Lamp Bulb
3	510121	Lamp Bulb, 12 Volt
4	500492	Lampholder
5	500032	Connector
6	380019	Bushing
7	510482	Connector
8	510369	Wire, #12, Black
9	510370	Wire, #12, White
10	510368	Wire, #12, Red
11	410342	Housing
12	330113	Rivet

Step Light and Bathroom Light Assemblies

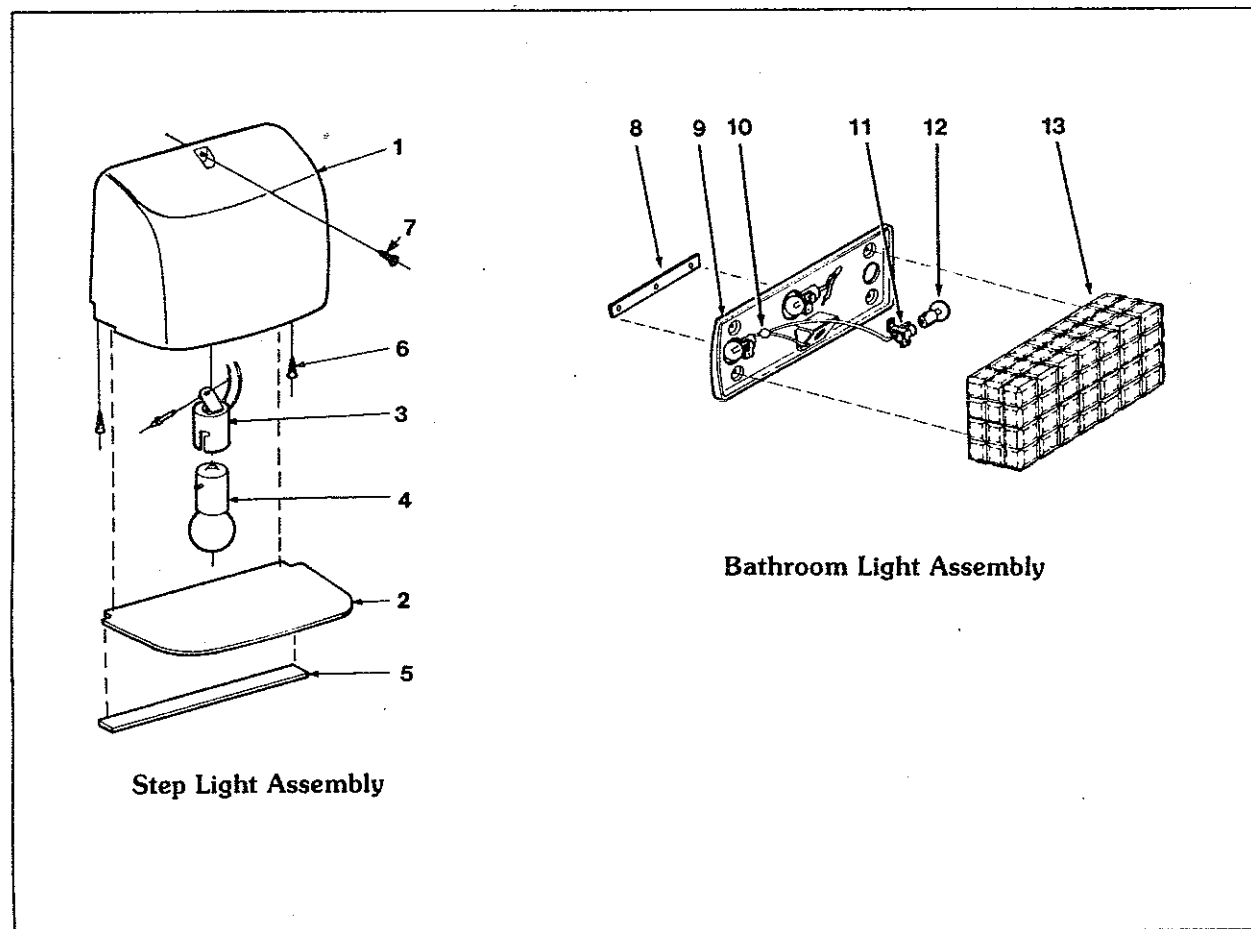


Figure 12.

Step Light Assembly Bulb Replacement

1. Remove two screws which retain light housing to main door jamb's eyebrow.
2. Remove screw which secures rear of housing to exterior skin.
3. Lift housing and slide lens out.
4. Replace bulb.
5. Prior to re-assembly, seal around wire at hole in skin.

Bathroom Light Bulb Replacement

1. Unscrew knob from switch shaft.
2. Unscrew knurled ring from switch collar.
3. Remove Lens.
4. Apply slight inward pressure on bulb while turning slightly in a counterclockwise direction. Remove bulb.
5. Reverse procedure to install new bulb.

No.	Part No.	Description
	500067	Step Light Assembly
1	101323	Casting, Step Light
2	201185	Lens, Step Light
3	500093	Lamp Socket W/Bracket No. 10-08
4	500029	Bulb, 1141
5	365010	Foamstick — 6 $\frac{1}{8}$ "
6	320038	Screw No. 6 x $\frac{1}{2}$ " P.H. Phillips
7	380225	Screw No. 6 x $\frac{3}{4}$ Stainless Steel
	500549	Bathroom Light Assembly (U.S.)
8	101387	Ground Strap
9	410361	Plastic Base
10	510274	"Scotch Lock" No. 560
11	500519	Lamp Socket Assembly
12	500335	Bulb, 25w-12 volt
13	201361	Bathlight Lens
14	500081	Switch, #574T White (Not Shown)

Range Exhaust Hood Assembly

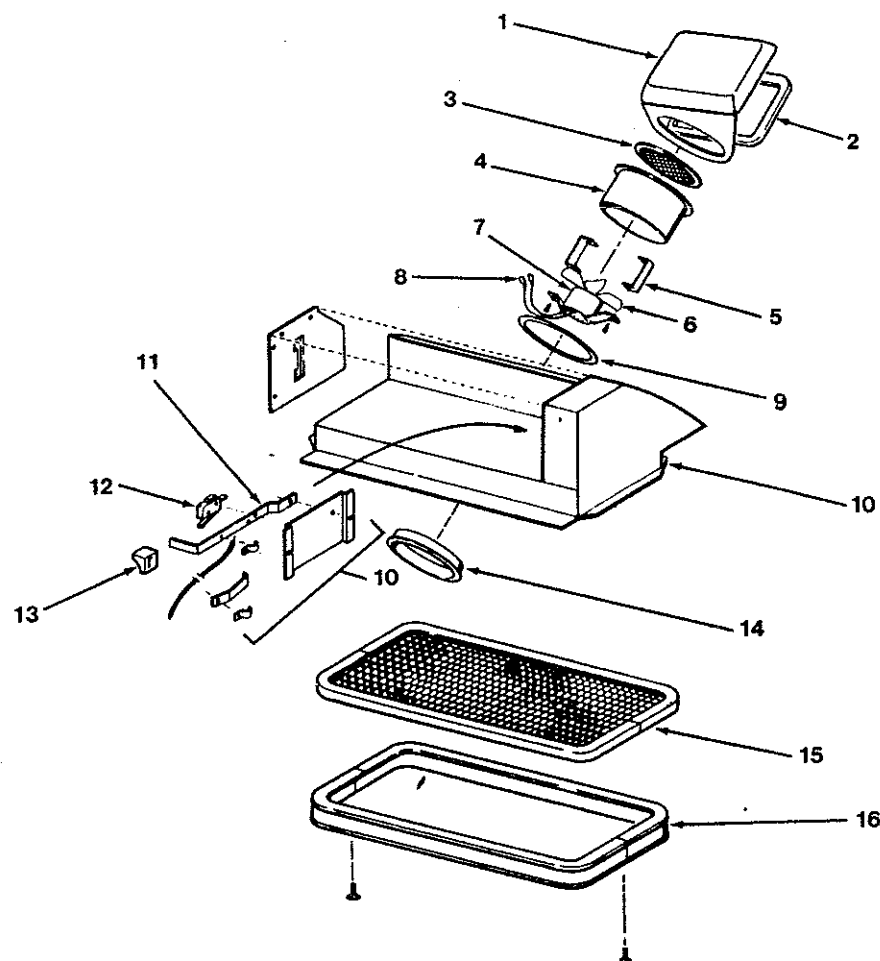


Figure 13.

No.	Part No.	Description
	994191	Range Exhaust Fan
1	510156	Vent Shroud
2	365004	Gasket, Vinyl Foam Tape
3	380630	Screen
4	380631	Fan Shroud
5	510228	Motor Bracket
6	610231	7 In. Fan Blade
7	600060	Fan Motor
8	380239	Bullet Terminal 51372
9	510233	Foam Tape Ring
10	690121	Range Exhaust Hood Assembly
11	380240	Vent Linkage Assembly
12	510232	Fan Motor Switch
13	201070	Knob, Exhaust Hood
14	100043	Flange
15	690112	Filter
16	200634	Trim ring Assembly

Filter Removal and Cleaning

1. Remove screws which secure trim ring and filter to underside of galley rooflocker.
2. Remove trim ring and filter. (NOTE: If filter is secured with pop rivets, it will be necessary to drill the rivets out. It will not be necessary to re-rivet for installation).
3. Clean filter by soaking in soapy water and rinse thoroughly. Allow to air dry.
4. Reverse procedure for installation.

Micro Switch Removal/Replacement

1. Remove filter.
2. Disconnect quick disconnect connectors from micro switch.
3. Remove screws which secure switch to brackets.

Bathroom Exhaust Fan Assembly

4. Remove switch.
5. After reinstalling switch, adjust leaf of switch to "close" when shutter is near fully opened position.
6. Reverse procedure for installation.

Fan Removal/Replacement

1. Remove filter.
2. Open shutter.
3. Remove screws securing fan bracket to vent's shroud.
4. Lower fan assembly.
5. Reverse procedure for installation.

Range Exhaust Hood Assembly Removal/ Replacement

1. Remove filter and disconnect flexible cable.
2. Remove screws and /or rivets attaching exhaust hood to floor of galley rooflocker and side skin of motorhome.
3. Remove exhaust hood assembly from rooflocker.
4. Disconnect (quick disconnect) micro switch wires at harness.
5. Reverse procedure for installation.

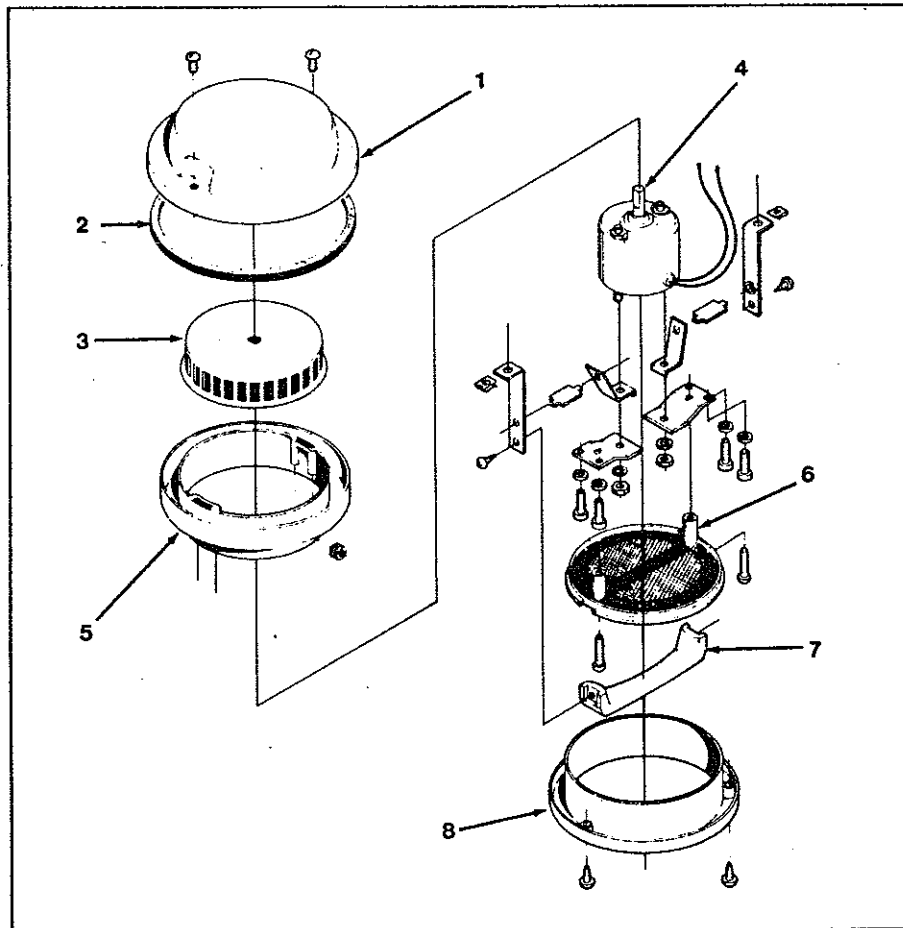


Figure 14.

No.	Part No.	Description
1	A-350-1B	Cover Assembly (Includes Gaskets)
2	A-PH-5-C	Gasket Assembly
3	A-GA-500-108-1	Blower Wheel Assembly
4	A-40000-475 A-40000-900	Motor Assembly Motor Assembly (Model CB-358-BCSA)

No.	Part No.
5	A-350-2B
6	A-350-3B
7	A-350-10B
8	A-350-4B

Bathroom Exhaust Fan Removal/Replacement

1. Working from the outside top of motorhome, remove the screws holding the fan protective cap, and remove the cap.
2. Remove the 6 screws securing the fan flange to the outer skin.
3. Pull the fan out to the extent of the wiring harness and unplug the harness.
4. Remove the fan assembly.
5. To install, reverse the removal procedures.

Description
Ring Body Assembly
Grille Assembly
Handle Assembly
Trim Ring Assembly

Auto-Skyliner II Motorized TV Antenna (Excella)

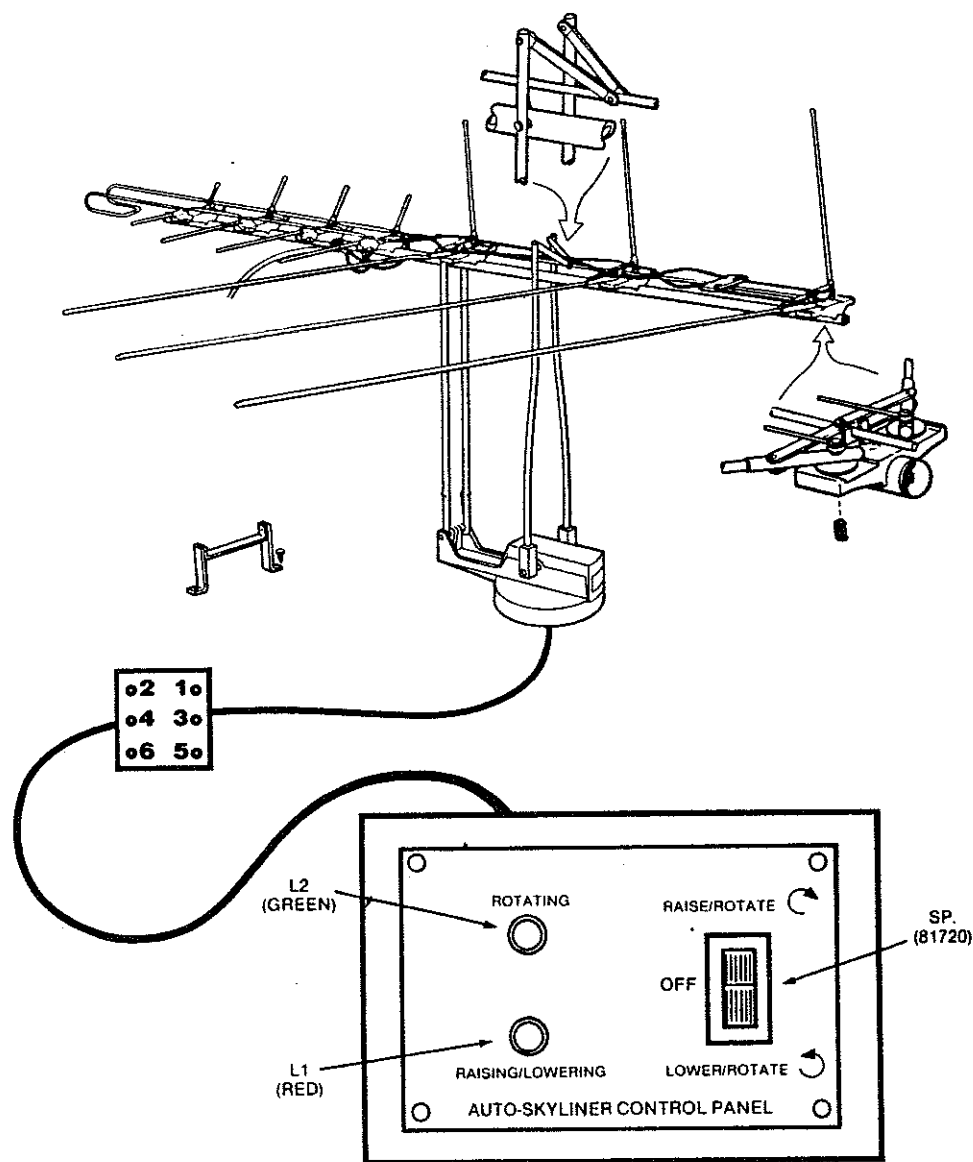


Figure 15.

This antenna is an advanced electrically operated version of the well-known hand operated Skyliner.

A single 12-volt motor raises, turns and lowers the antenna as selected on a remote control panel.

The control panel (Fig. 15) located on the interior wall of your motorhome contains a "center off" rocker switch (81720), red lens assembly (81725) and green lens assembly (81724). Located on the rear of the panel are the two lamps (81723), wire harness (12531) with 6-pin connector (81719) for connection to the control cable (12533). Also provided is a black wire for 12-volt positive and a white wire for 12-volt negative/ground connections.

The base unit assembly (Fig. 18 and Fig. 19) contains a "fixed base" (10799) rivetted to a rectangular base plate (10824) and a "rotate base" (10800) which carries the four legs supporting the antenna head.

The fixed base is shown in Fig. 18, less the rectangular base plate, to reveal the motor (12530) with suppressor chokes (10501), rotate limit switch (S3) and 6-pin connector (81719) for connection to the control cable.

The rotate base is shown in Fig. 19 without the weather cover (10823) to show the "Raised indicator switch" (S1) and "lower limit switch" (S2). The motor drive gear and delrin bevel gear (12466) are also visible.

Motorized TV Antenna Control Panel, Wiring Diagram

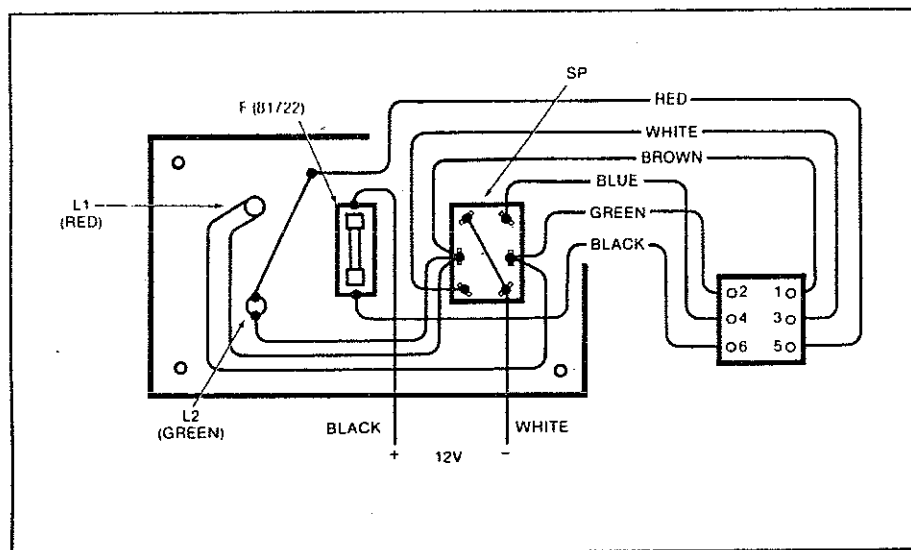


Figure 16.

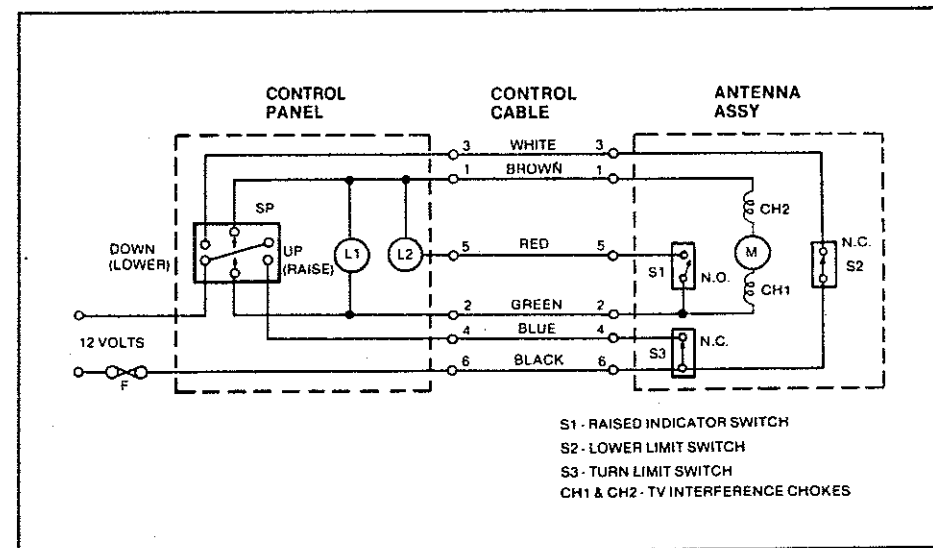


Figure 17.

Antenna Operation

With the control panel switch (SP) (Fig. 15) in the center position, the unit is OFF.

Moving the switch to the UP (RAISE) position applies 12 volts to the motor and red lamp L1 via switch S3. When the antenna is fully raised, switch S1 will close applying 12 volts to the green lamp L2. At the same time the bevel gear (12466) is stopped mechanically to prevent further raising motion. The motor will continue to run, both lamps will be on and the unit will turn until the turn limit switch S3 opens, thus shutting off the motor and both lamps.

Note that during the turning operation the switch (SP) may be operated UP or DOWN alternately to turn or return the antenna for best TV reception. The unit may be shut off at any time by placing the switch in the center OFF position.

Moving switch (SP) to the DOWN (LOWER) position applies reverse 12 volts to the motor and to the lamps via switches S1 and S2. The antenna will return to the point at which the turn operation started and then begin to lower automatically. At this point switch S1 will open causing lamp L2 to go out. Lowering will continue until lower limit switch S2 opens. When this point is reached the circuit will be broken and the motor and lamp L1 will shut off.

The antenna will now be resting on the travel support (12593) and ready for travel.

Caution: During installation and use of the Skyliner Antenna, make sure legs or head cannot accidentally come into contact with any power line.

Contact with power lines could result in serious injury or death.

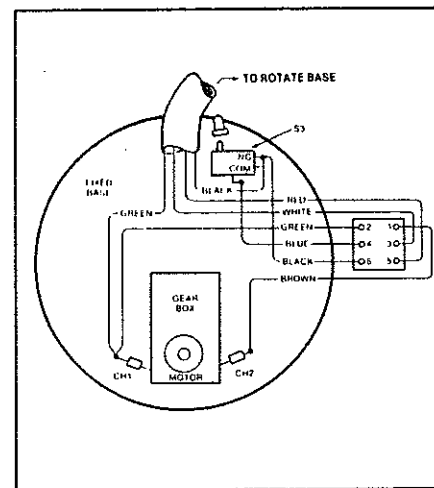


Figure 18.

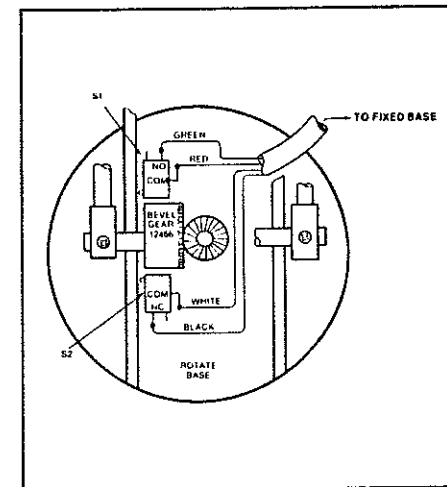
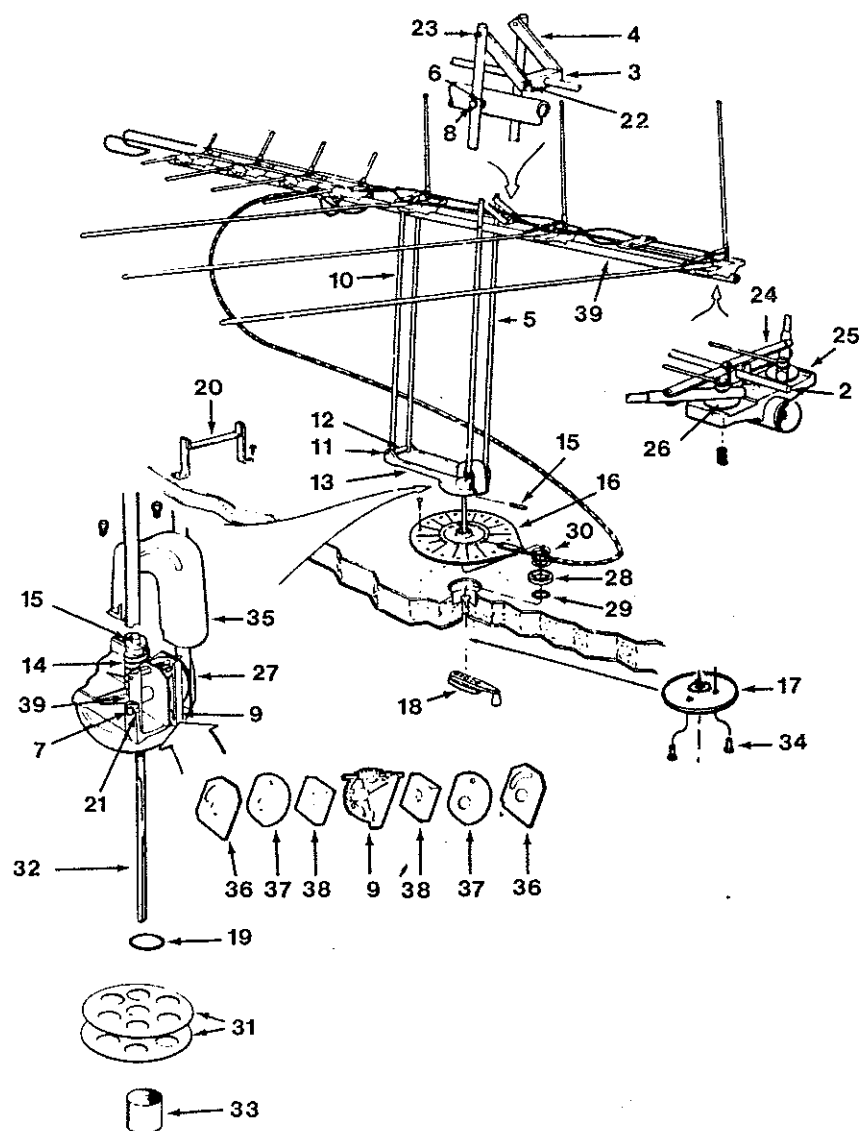


Figure 19.

Manual T.V. Antenna Assembly



No.	Part No.	Description
1	010286	Boom
2	010287	Operating Tube
3	010288	Block, Tube to Link
4	010289	Operating Link
5	010291	Drive Leg
6	010292	Bushing, Leg to Boom
7	010293	Drive Axle
8	080307	Rivet, Leg to Boom
9	010294	Worm Gear
10	010295	Idler Leg
11	010296	Idler Axle
12	010297	Spacer
13	010298	Base
14	010300	Worm
15	080405	Spring Pin
16	010299	Base Plate
17	010302	Ceiling Plate
18	010739	Operating Crank
19	080904	"O" Ring (3/4)
	080903	"O" Ring
20	010305	Travel Support
21	080004	Lock Ring (5/16)
	080005	Lock Ring (1/4)
	080207	Worm Washer (Not Shown)
22	080311	Link to Block Rivet
23	080309	Link to Leg Rivet
24	010314	Dipole Link
25	010282	Insulator Block
26	080200	Nylon Washer
27	010512	Drive Pin
28	010316	Retainer
29	010317	Snap Ring
30	010318	Spring
31	010581	Nylon Disc
32	010442	Drive Shaft
33	010829	Red Cap Lug
34	081007	Screw (For Item #17)
35	011077	Cover
36	011078	Side Closure
37	011079	Rotating Closure
38	011080	Spacer
39	010665	Head (Includes 10291 and 10295)

Figure 20.

Radio Antenna Assembly

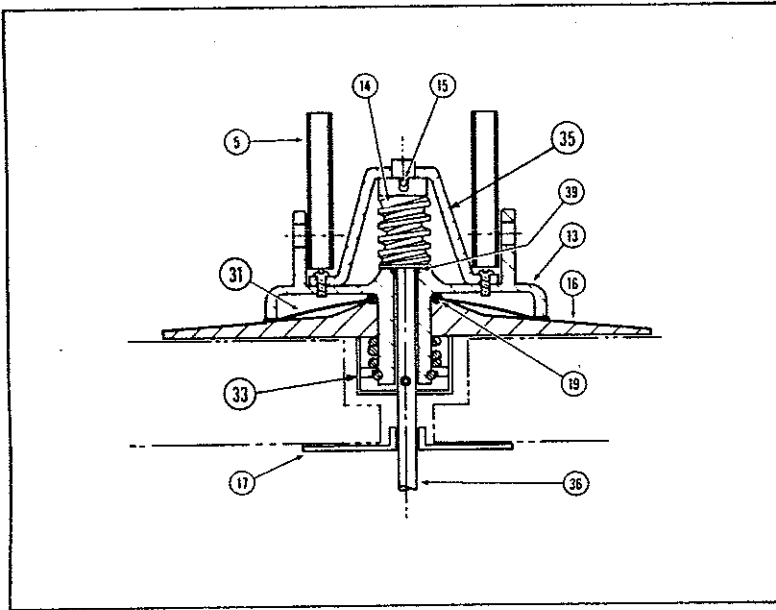


Figure 21.

Worm Removal/Replacement

1. Punch out pin item 15.(Figure 21)
2. Pull down shaft item 36 with twisting motion.
3. Remove worm and replace.

Note: Do not displace "O" ring item 39.

4. Replace shaft item 36 after lubricating it with light grease. Use twisting motion to avoid damage to "O" ring item.
5. Replace pin item 15.

Drive Shaft Removal/Replacement

1. Punch out pin.
2. Pull down shaft with twisting motion.

3. Replace shaft after lubricating it with light grease. Use twisting motion to avoid damage to "O" ring.
4. Replace pin.

Manual T.V. Antenna (Skyliner)

Removal/Replacement

1. Loosen Allen screw on handle (inside). Pull handle down and off.
2. Remove antenna wires from T.V. antenna (roof).
3. Drill out rivets from antenna base (roof).
4. Pull antenna up and remove for repair or replacement.

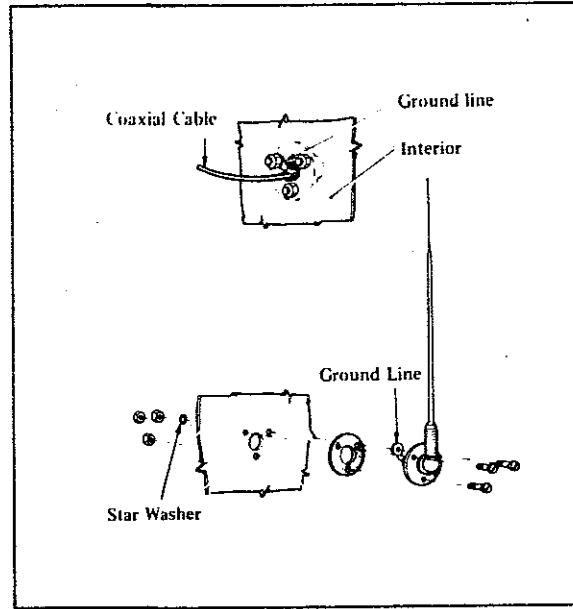


Figure 22.

Radio Antenna Installation

1. Location of antenna should be made on road side. (See Fig. 22.)
2. Use metal backing plate of antenna base as a template to mark mounting holes onto panel. Be sure to look at antenna mounting base for proper alignment.
3. Slide drape from location on inside and using a No. 30 drill, center drill bit in the 1" mounting hole and drill through both exterior and interior shell.
4. Using this as a center location, cut a 4" square hole in interior skin only. Use metal snips.
5. Through exterior shell, drill center hole with a 1" hole saw. Using a No. 11 drill bit, drill the (3) mounting screw holes.

6. Place the (3) mounting bolts in antenna base. Install rubber gasket and fit into mounting holes.
7. Hold in position while a second person installs the metal backing plate washers and nuts through the 4" square hole. A star washer should be used to insure proper grounding.
8. Remove the (2) mounting screws from the Central Control Panel and pull out from end liner.
9. Fish radio antenna lead-in wire from 4" square cut-out area to the Central Control Panel area. The "A" hole can be cut for lead-in to enter into front roof locker mounting area.
10. Attach lead-in wire to antenna.
11. Using a 5" square piece of inside vinyl metal, place over inside 4" square cut-out area and attach in place with a rivet in each corner.
12. Return drape to its original position.

Note: When repairs are needed for a factory installed unit, it will be necessary to cut the 4" square hole as in Step 4, to gain access to the lead-in wire.

Radio Antenna Trimming

Tune in AM dial to 1400 Hz where maximum noise level should be obtained. Then antenna is properly adjusted.

120 Volt Electrical Panel

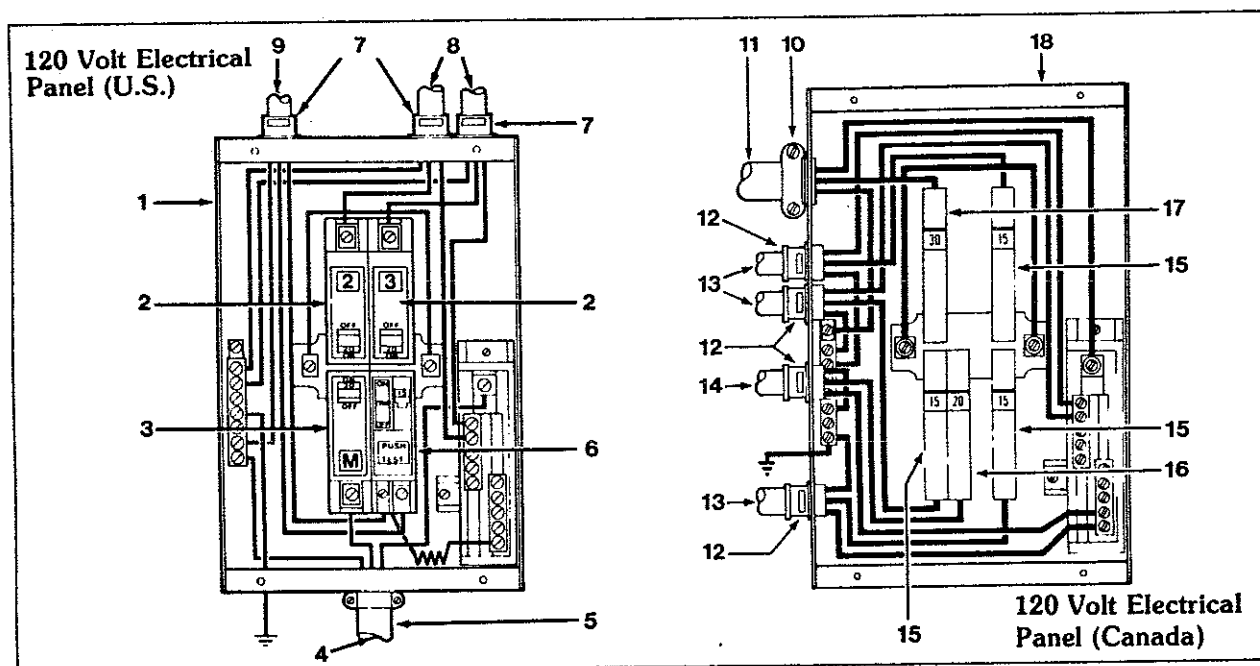


Figure 23.

No.	Part No.	Description
1	510189	Breaker box G.E. TL 410 ST
2	500019	Breaker TQL 1120 20 amp
3	510190	Breaker TQL 1130 30 amp main
4	500003	Power supply cord
5	500013	Clamp Romex 3/4"
6	510094	Ground fault breaker THQL 1115 GF 15 amp
7	500064	Romex clamp T&B 3300
8	500040	Romex
9	510147	Romex

No.	Part No.	Description
10	500013	Clamp Romex 3/4"
11	510002	Power supply cord romex N.M.D.7
12	500064	Romex clamp T&B 3300
13	510004	Romex N.M.D.7
14	510003	Romex N.M.D.7
15	500183	Breaker THQP 115 15 amp
16	500182	Breaker THQP 120 20 amp
17	500181	Breaker THQP 130 30 amp main
18	510189	Breaker box G.E. T.L. 410 S.T.

Convenience Outlet and Polarity Light Assemblies

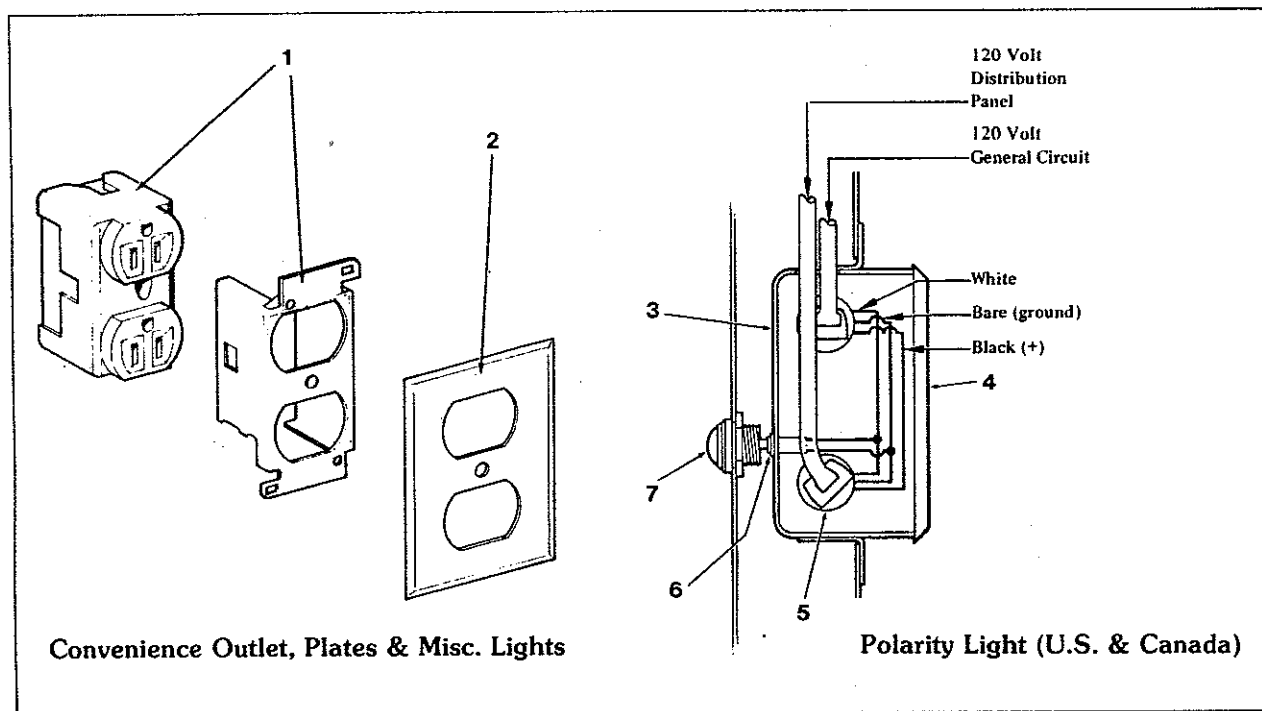


Figure 24.

Polarity Light Removal/Replacement

1. On rear bath models the polarity light lens is located on the roadside exterior at the rear.
2. On center bath models the polarity light lens is located on the roadside exterior just back of center.
3. The polarity light and exterior lens can be removed by removing nut from the threaded portion attached to the rear of the lens. To gain access to this nut it is necessary to remove junction box in front of it.

Note: Make sure 110V line is disconnected and generator is shut off before servicing polarity light.

Trouble Shooting Polarity Light

If the polarity light comes on regardless of which way the two pronged plug is inserted, or if it fails to come on at all under these conditions, first check the following:

1. That there is 120 volt power to the motorhome.
2. The polarity of the power source is correct (there should not be a voltage difference between the common (white wire) and the ground (green wire).
3. The 120 volt romex wires are installed to components and receptacles with the correct polarity (black wire to the copper colored terminal, white wire to the white terminal and the green wire to green screw or ground).

4. The ground is complete.
5. The polarity light is good.

If after the above have been checked and the condition still exists, the possible causes are listed below.

1. If the light stays on, there may be a partial short between the hot wire (black) and the common wire (white) or a partial short between the hot wire (black) and the ground (green, bare or shell). A partial short

is a short which does not pass enough current to trip the circuit breaker.

2. If the light will not come on with reverse polarity between the power cord's cap and power supply, the common wire (white) may be in contact with the ground (green wire, bare wire or shell). This condition exists only if motorhome is not properly grounded and shell is "hot."

No.	Part No.	Description
1	500503	Receptacle, duplex - ivory
2	500026	Cover, 120V (inside)
		Items not shown
	500018	Rocker switch - ivory S.P.S.T. "Galley Light"
	500431	Rocker switch - ivory S.P.S.T. "Step Light"
	500432	Rocker switch - ivory S.P.S.T. "Flood Light"
	500434	Rocker switch - ivory S.P.S.T. "Exhaust Fan"
	500435	Rocker switch - ivory D.P.D.T. "Bath Light"
	510025	T.V. 12 volt outlet assembly
	510137	Swivel light - living room
	510132	Access door light with bracket
	500116	Receptacle, 20 amp. (Micro wave oven)
	500116	Receptacle, single out (refrigerator and Univolt)
	500122	Cover, single outlet
	510122	Cover, outlet box (exterior)
	500169	Housing - outlet box (exterior)

3	500010	Box, outlet No. 106 AB½ (U.S.)
	510049	Box, outlet No. 7662 (Canada)
4	500009	Cover, box, outlet, plain No.58C1(U.S.)
5	500064	Romex clamp T&B 3300
6	500011	Neon pilot light
7	500065	Clear lens cap

Ground Fault Circuit Interrupter (GFCI)

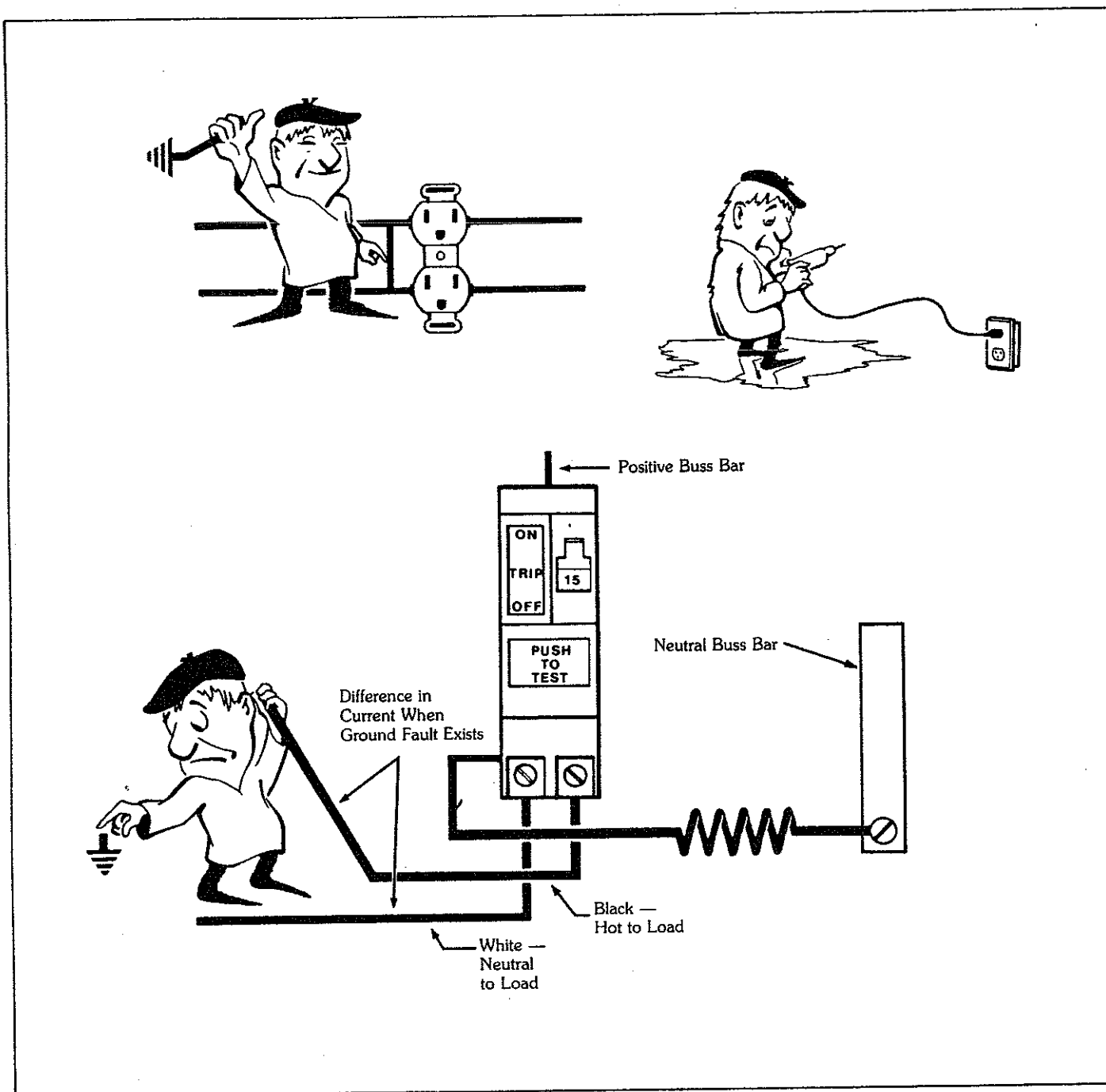


Figure 25.

Many states require R.V.'s which are sold in their state and which have exterior 120 volt receptacles to have a ground fault circuit interrupter. Units manufactured for sale in these states have type THQL 15 amp GFCI breakers installed on the general circuit, since the exterior breaker is on this circuit. This breaker replaced the standard TQL-15 amp breaker.

When properly installed, the GFCI Circuit Breaker provides reliable overload and short circuit protection PLUS protection from Ground Faults that might result from contact with a "HOT" load wire and ground.

Important Note — The GFCI Circuit Breaker will NOT reduce shock hazard if contact is made between a "HOT" Load Wire and a Neutral Wire or 2 "HOT" Load Wires.

Each GFCI Circuit Breaker is calibrated to trip with a ground current of 5 milliamperes or more. Since most persons can feel as little as 2 milliamperes, a distinct shock may be felt if the need for protection exists. However, the shock should be of such short duration that the effects will be reduced to less than the normally dangerous level. However, persons with acute heart problems or other conditions that can make a person particularly susceptible to electric shock, may still be seriously injured.

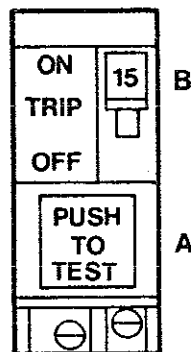
While the GFCI Circuit Breaker affords a high degree of protection, there is no substitute for the knowledge that electricity can be dangerous when carelessly handled or used without reasonable caution.

Warning: The GFCI Circuit Breaker provides protection only to the circuit to which it is connected. It does NOT provide protection to any other circuit.

OCCUPANT: MAKE THIS TEST EACH MONTH AND RECORD THE DATE ON THE CHART

1. With handle B in "ON" position, press PUSH TO TEST button A.
2. Handle B should move to TRIP position, indicating that GFCI Breaker has opened the circuit.
3. To restore power, move handle B to "OFF" and then to "ON".

Important — If handle B does not move to TRIP position when test button is pressed, the GFCI Breaker Protection is not complete. If this happens, replace GFCI Breaker.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1976												
1977												
1978												

Figure 26.

Locating Shorts and Opens

The key in locating shorts and opens is isolation. The first step is to isolate the circuit with the short or open. The second step is to then isolate the section of the circuit with the fault. Once the section is identified, the specific problem can be located. The cause may be a loose or corroded connection, cut wire, worn insulation, defective component, etc. The following procedure is one method for isolating shorts and opens.

Shorts

1. Isolate the circuit which has the short by noting which circuit breaker has tripped.
2. Disconnect the power inlet cord from the power source.

3. Using the 120 volt schematic as a reference, disconnect outlet boxes one at a time starting at the box furthest from the distribution panel. After disconnecting each box check for continuity between the black wire and ground or common (white) wire, on the distribution panel side of the circuit. When a continuity light or OHM meter indicates no continuity, the short is either in the receptacle just removed or the section of Romex wire between this receptacle and the previous receptacle removed.

4. Examples of a short are:

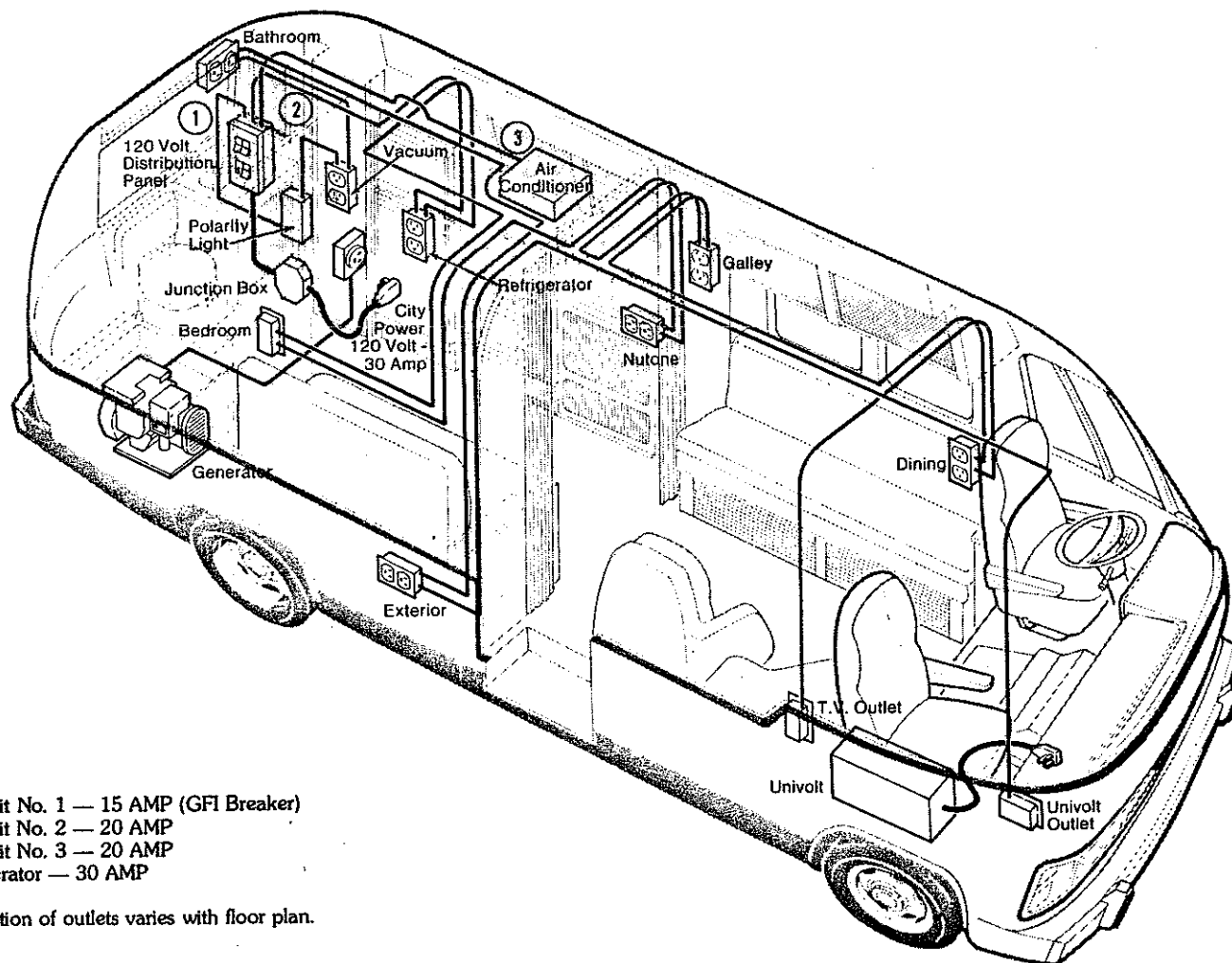
- a) The black wire of the 120 volt system contacting the white wire, bare wire or grounded surface.
- b) An internal short in a 120 volt appliance.

Any damaged wire must be replaced. The National Electrical Code does not permit splicing 120 volt wiring outside an outlet box or junction box. Also, the wire must not be exposed to an area such as a sharp metal edge, which may damage the wire.

Opens

1. Check all receptacles and components for voltage on the circuit which has the open.
2. If all receptacles and components of the circuit are without power, begin to look for open in the distribution panel.
3. Inspect for loose or corroded connections and a faulty circuit breaker.
4. Check for power on both ends of circuit breaker. If there is no power on the inlet side of circuit breaker, the open is between the power cord's male connector and the distribution panel.
5. The open can be isolated by noting the outlets which do not have power. Example: If the bath outlet in the rear bath model has power, and the converter has no power, the open is between the bath outlet and converter outlet.
6. Examples of an open are:
 - a) Loose or corroded connections.
 - b) A wire disconnected from a terminal.
 - c) Contacts in the circuit breaker which do not make contact.
 - d) A broken wire.

120 Volt Distribution System — 24 Ft.



Circuit No. 1 — 15 AMP (GFI Breaker)

Circuit No. 2 — 20 AMP

Circuit No. 3 — 20 AMP

Generator — 30 AMP

Location of outlets varies with floor plan.

Figure 27.

120 Volt Distribution System — 28 Ft. (Center Bath)

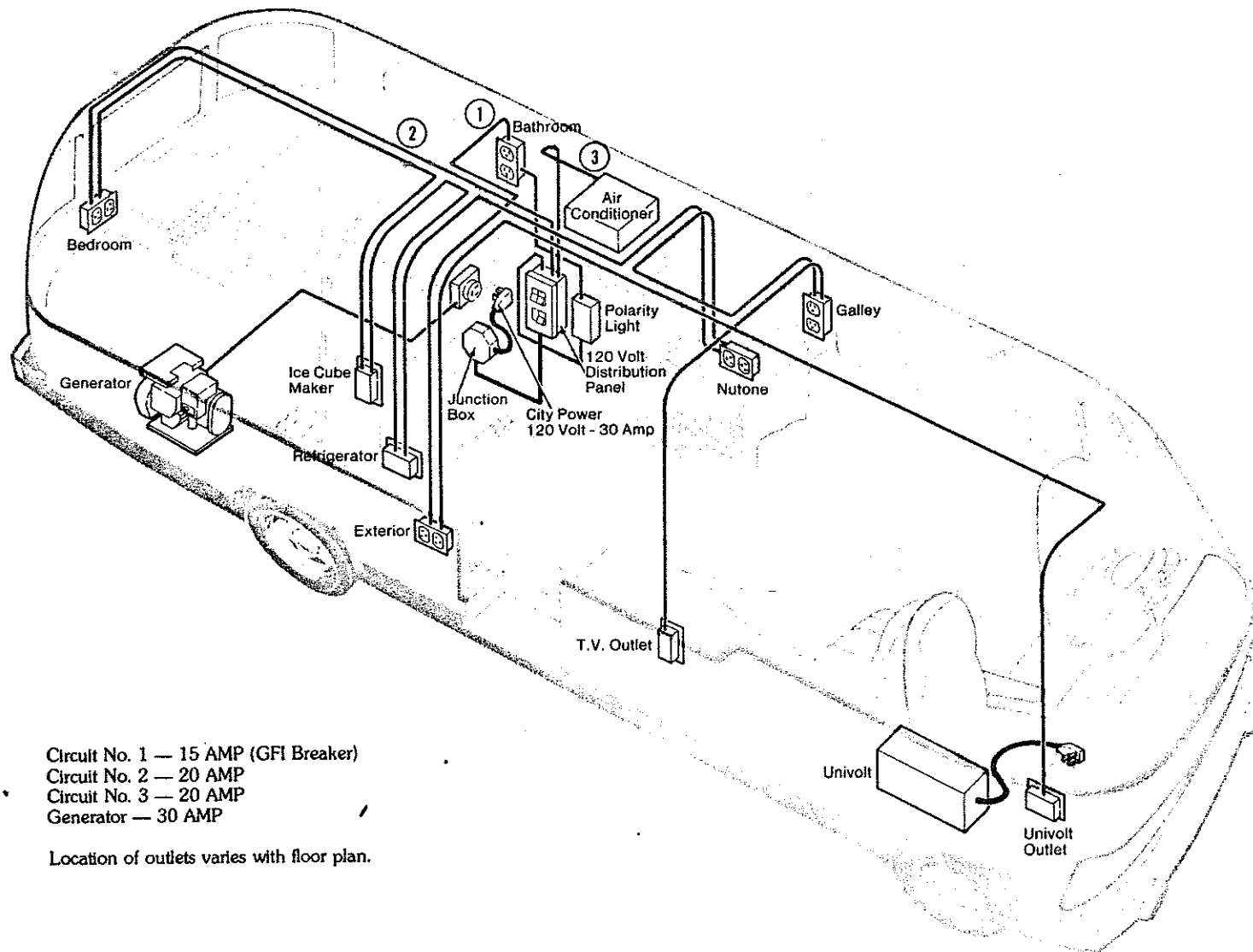


Figure 28.

120 Volt Distribution System — 28 Ft. (Rear Bath)

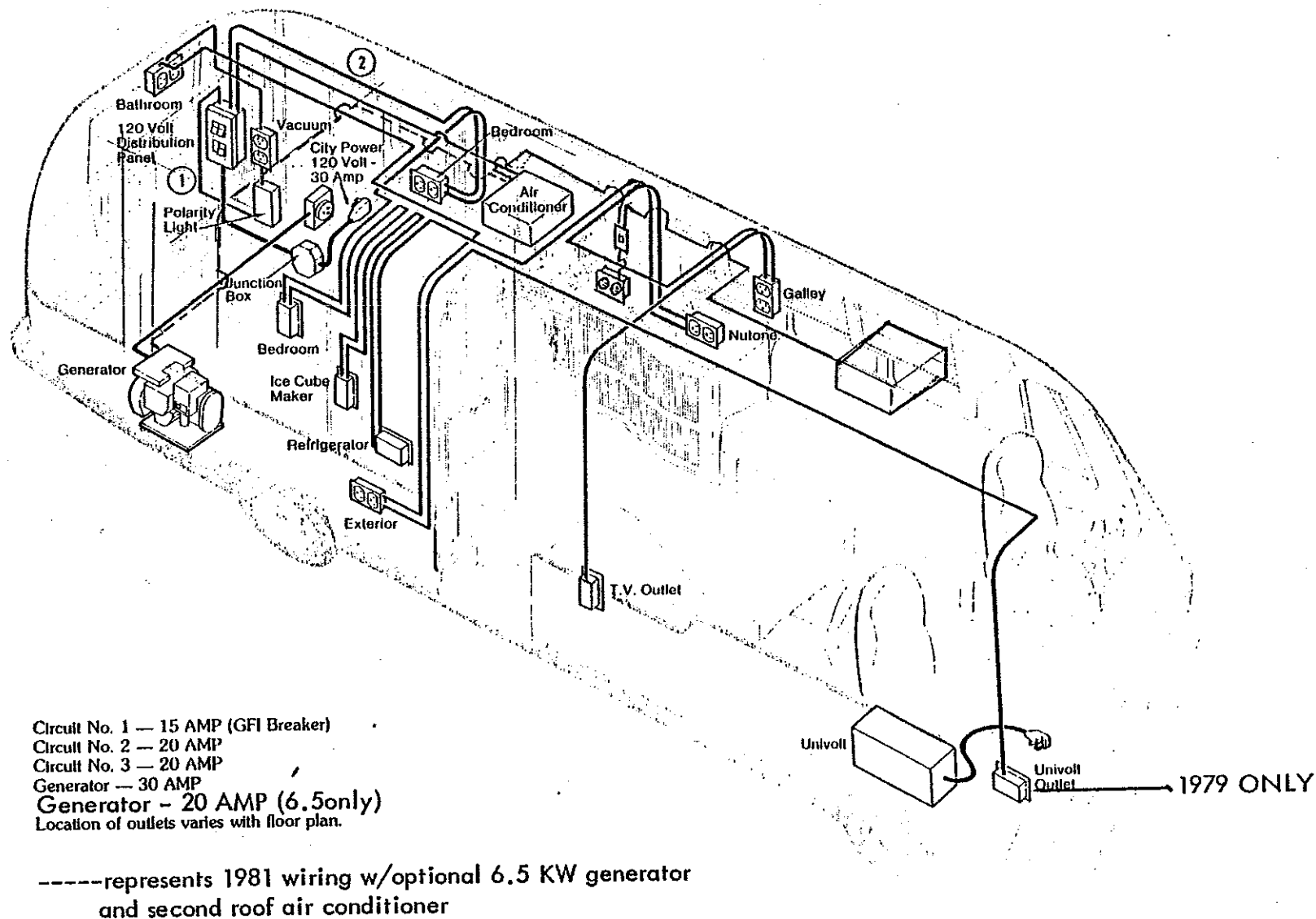


Figure 29.

120 Volt Generator

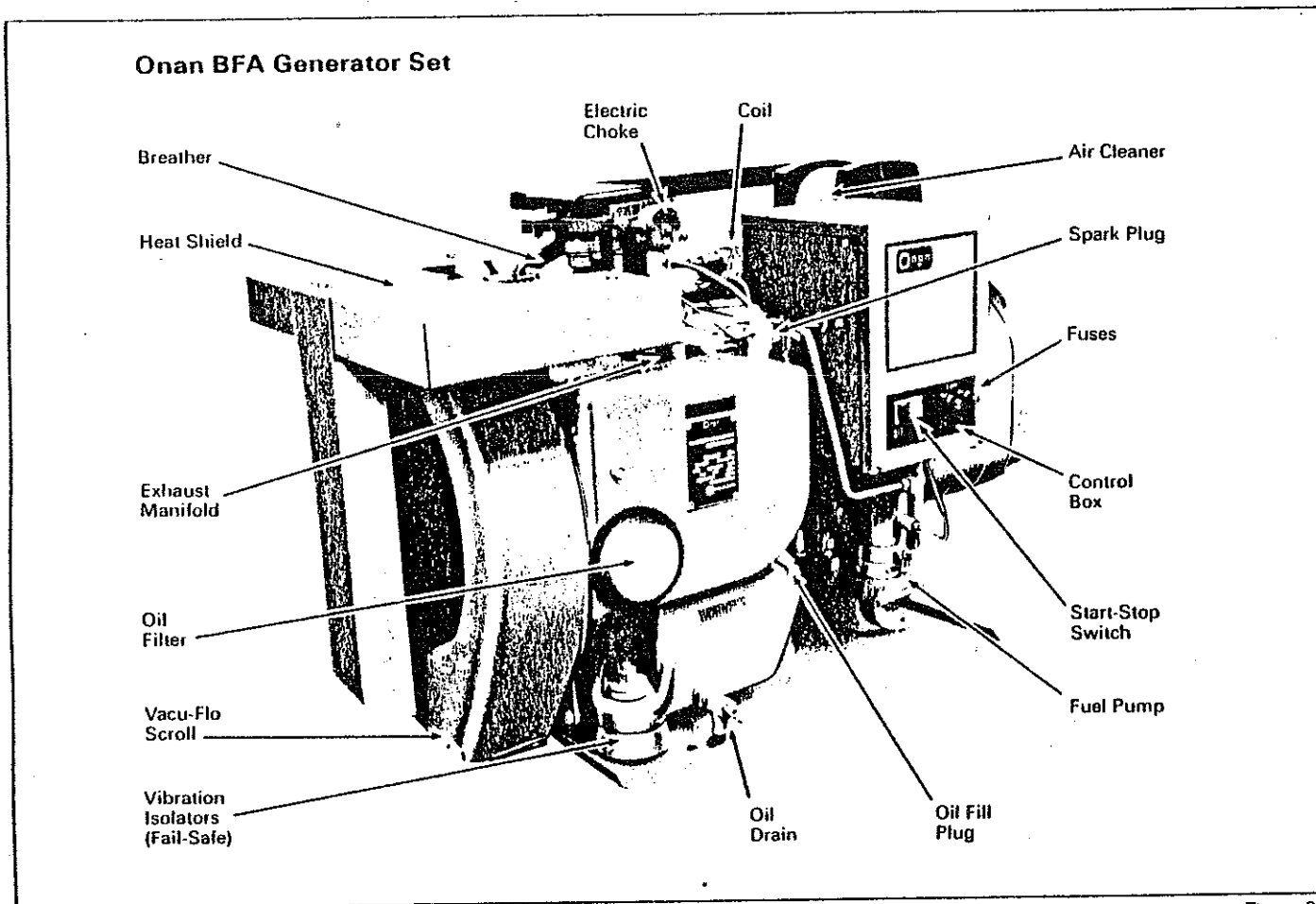


Figure 30.

This section contains operation and other information to properly maintain, service, and make adjustments on the BFA generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important part of repair is diagnosis, a troubleshooting chart is included.

Throughout the section, engine end of

the generator set is the front. Left and right sides are determined when facing the engine (front) end.

When contacting an Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate (see *Model Designation* following). This information is necessary to identify one generator set among the many types manufactured by Onan.

Onan electric sets are given a complete running test under various load conditions and are thoroughly checked before leaving the factory. Check a new unit thoroughly for any damage that may have occurred during the shipping. Tighten loose parts, replace missing parts and repair any damage before operating the unit.

Model Designation

The following typical model number is broken down into code segments used by Onan.

4.0	BFA	—	1	R	16000	A
1	2		3	4	5	6

1. Indicates kilowatt rating.
2. Series identification.
3. Number 3 is the voltage code for 120 volts single phase.
4. Method of starting: R-remote electric starting.
5. Factory code for designating optional equipment, if any.
6. Specification letter which advances when the factory makes production modification.

Specifications

GENERAL 4.0

Nominal Dimensions of Set

Height	20.30 (516 mm)
Width	18.00 (457 mm)
Length	29.90 (759 mm)
Weight	232 lbs. (105 kg)

ENGINE DETAILS

Manufacturer	Onan
Number of Cylinders	Two
Displacement (cubic inches)	43.30 (713 cm ³)
Cylinder Bore	3.25 in. (82.55 mm)
Piston Stroke	2.62 in. (66.68 mm)
Compressions Ratio	7.0:1
Engine Speed	1800 RPM
Engine Design	Four Cycle, Air Cooled, L-Head Horizontally Opposed
Starting System	Exciter Cranking (Generator)

GENERATOR DETAILS

Manufacturer	Onan
Design	Revolving Armature, Four Pole, 1800 RPM
Rating (in Watts)	4000 Watts (4 kW)
Voltage	120
Current Rating	33.3 amperes
120 Volt	33.3 amperes
Phase	Single
Wire	2 Wire
Output Rating	Unity Power Factor
Cranking Current	75 amps

CAPACITIES AND REQUIREMENTS

Oil Capacity	4 qts. (3.79 litres)
Recommended Battery	
Electric Start	12 Volt 74 amp/Hr (266.40 kC)
Battery Charge Rate	
Fixed	1-1½ amps
Ventilation Requirements (Total)	80 sq. in. (516 cm ²)

TUNE-UP SPECIFICATIONS

Spark Plug Gap025 in (0.64 mm)
Breaker Point Gap (cold setting)021 (0.53 mm)
Ignition Timing Reference (cold setting)	21° BTC
Valve Tappet Adjustment (engine cold)	
Intake003 in. (0.08 mm)
Exhaust010 in. (0.25 mm)

* Add ½ inch for UL/CSA listed model.

metric equivalents follow in parentheses after the U.S.
customary units of measure

GENERAL 6.5

Nominal Dimensions of Set

Height	19.50 in. (495 mm)
Width	20.00 in. (508 mm)
Length	33.37 in. (848 mm)
Weight	305 lbs. (138 kg)

ENGINE DETAILS

Manufacturer	Onan
Number of Cylinders	Two
Displacement (cubic inches)	60 in ³ (983 cm ³)
Cylinder Bore	3-9/16 in. (90.49 mm)
Piston Stroke	3 in. (76.20 mm)
Compression Ratio	7.0 to 1
Engine Speed	1800 rpm
Engine Design	Four Cycle, Air Cooled, L-Head Horizontally Opposed

Starting System	Exciter Cranking (Generator)
Ignition	Battery
Recommended Fuel	Gasoline (Lead Free or Regular)
Average Fuel Consumption	
(at rated load & speed)	1.30 Gallons per Hour (4.92 L)

GENERATOR DETAILS

Manufacturer	Onan
Design	Revolving Armature, Four Pole, 1800 rpm
Rating (in watts 60 Hertz)	6,500 (6.5 kW)
Voltage	120 or 120/240
Current Rating (amperes)	
120 Volt	54.2 Amperes
240 Volt	27.1 Amperes
Phase	Single
Wire	4 Wire Reconnectible
Output Rating	Unity Power Factor
Cranking Current	100 Amperes (Nominal)

CAPACITIES AND REQUIREMENTS

Oil Capacity	3 U.S. Quarts (2.8 lit)
Recommended Battery	12 Volt 74 Amp/Hr (266.40 kC)
Battery Charge Rate (Fixed)	1-1/2 Amperes
Ventilation Requirements (Total)	sq. in. (774 cm ²)

TUNE-UP SPECIFICATIONS

Spark Plug Gap025 in. (0.64 mm)
Breaker Point Gap (Cold Setting)016 in. (0.41 mm)
Ignition Timing Reference (Cold Setting)	20° BTC
Valve Tappet Clearance	
Intake003 in. (.076 mm)
Exhaust012 in. (0.30 mm)
Cylinder Head Bolt Torque	18 lb. ft. (24.40 N•m)

Checks

A daily inspection of the generator should include the following:

Exhaust

Check for leaks around manifolds, gaskets, and welds. Make sure exhaust lines are not heating surrounding areas excessively. If so, have corrected immediately. Remember EXHAUST GASES CONTAIN DEADLY CARBON MONOXIDE. Be sure all holes to the inside of RV from set compartment are sealed to prevent poisonous exhaust gases from entering vehicles.

Caution: All exhaust shielding supplied with generator set **MUST** be properly installed to prevent overheating of compartment walls or the possibility of fire.

Fuel System

With set running, check for leaks. Raw fuel will cause fumes which could EXPLODE. Check around carburetor and fuel pump inlets. Make sure fuel lines are not rubbing against anything which could cause breakage.

Electrical AC Output

Two AC leads, M1 (hot) and M2 (ground), terminate in generator junction box. These wires should be connected to distribution box with multi-strand wire enclosed in a flexible conduit. Check all wires (to and from the generator set) for fraying and loose connections.

Battery Connections: Battery positive (+) connection connects to start solenoid. Battery negative connects to location on rear of generator. Check terminals on set and battery for clean and tight connections.

Caution: Do NOT use maintenance free, unvented batteries with this

generator set. Malfunction of the starting-charging system can produce high charging currents, causing excessive gassing. An unvented battery can build up sufficient pressure to explode.

Onan recommends using a separate battery for operation of the generator set in addition to the regular vehicle starting battery. Refer to individual installation guide or T-012 for additional information on battery sharing.

Grounding: Generator must be effectively bonded to recreational vehicle chassis.

Vehicle chassis (frame) ground and the battery and generator set ground should all be electrically connected to be at 0 ground potential. All Onan units are designed for negative ground application.

Caution: Mount the battery in a separate compartment from the set or any spark-producing device to prevent fire or explosion.

Ventilation

The biggest enemy of electric generating sets installed in motor homes is excessive heat. Make sure the set's air inlet and outlet are not plugged with dust, dirt, bugs, leaves or anything that could restrict cooling air.

Caution: Do not disconnect battery cables from battery while generator set is cranking or running; sparks may cause an explosion.

Important: Certain states (particularly California) have state ordinances pertaining to the type and usage of exhaust muffler/spark arresters on internal combustion engines or engine driven equipment when used in a recreational vehicle such as electric generating sets. Be sure installation meets all Federal, State and local codes. Failure to pro-

vide and maintain a spark arrester may be in violation of the law.

Caution: Engine Exhaust Gas (Carbon Monoxide) Is Deadly!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- Dizziness
- Intense Headache
- Weakness and Sleepiness
- Vomiting
- Muscular Twitching
- Throbbing in Temples

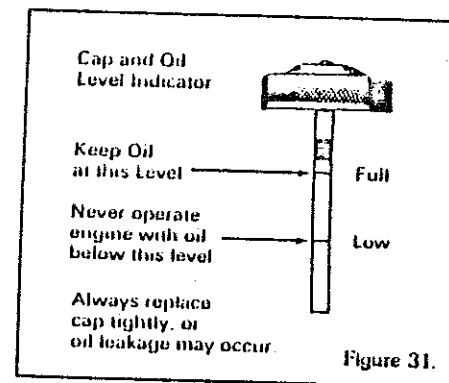
If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

Operation

Before Starting Crankcase Oil

Oil capacity of the BFA generator set is 4 U.S. quarts (3.79 lit). Fill the crankcase until the oil reaches the "FULL" mark on the oil level indicator (Figure 31). DO NOT OVERFILL.



Use a good quality, heavy duty oil with the API (American Petroleum Institute) designation SE or SE/CC (gasoline operation only). If this oil is not available, SD or SD/CC designated oil can be used.

Check oil level daily and change oil every 100 normal operating hours. See Figure 32 for location of oil drain. If operating in extremely dusty or dirty conditions, the oil might have to be changed sooner. When adding oil between changes, use the same brand as in the crankcase. Various brands of oil might not be compatible when mixed.

Caution: Do NOT check oil while the generator set is operating. Hot oil could cause burns by blowing out of oil fill tube due to crankcase pressure.

Airstream recommends using 10W-40 as the best multigrade oil to cover the widest range of temperatures.

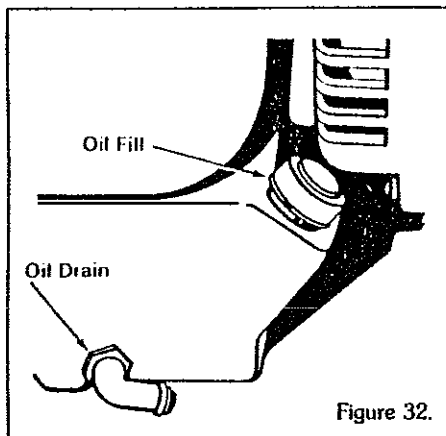


Figure 32.

Recommended Fuel

Use clean, fresh, unleaded or regular grade gasoline. Do not use highly leaded premium fuels. Using unleaded gasoline results in less maintenance.

Use regular gasoline for the first 25 hours to allow the rings to seat well for best performance. Then use unleaded gasoline thereafter.

If regular gasoline is used continually, carbon and lead deposits must be removed from the cylinder heads as required because of engine power loss. Unleaded gasoline may be used safely after lead deposits have been removed.

Starting

Push the start-stop switch to the start position. Release the switch when engine starts. If engine fails to start, inhibitor oil used at the factory may have fouled the spark plugs. Remove the plugs, clean in a suitable solvent, dry thoroughly and re-install. Heavy exhaust smoke when the engine is first started is normal and caused by the inhibitor oil.

Stopping

Push the start-stop switch to the stop position and hold until unit stops completely.

Break-in Procedure

Controlled break-in with the proper oil and a conscientiously applied maintenance program will help to assure satisfactory service from your Onan electric generating set. Break-in as follows:

1. One half hour at $\frac{1}{2}$ load (with one air conditioner) and approximately 500 watts additional load.
2. One half hour at $\frac{3}{4}$ load (with two air conditioners) and approximately 1000 watts additional load or one air conditioner and approximately 2000 watts additional load.
3. Change crankcase oil after the first 50 hours of operation.

Applying Load

If practical, allow set to warm up before connecting a heavy load. Continuous generator overloading may cause high operating temperatures that can damage the windings. Keep the load within nameplate rating.

Exercise

Infrequent use results in hard starting. Operate the generator set one 30-minute period each week. Run longer if battery needs charging. Exercising for one long period each week is better than several short periods.

Battery Charging

The battery charge rate is controlled by a fixed value resistor that allows a trickle charge rate of 1-1½ amps under all conditions.

High Operating Temperatures

1. See that nothing obstructs air flow to and from the set.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.
3. Keep ignition timing properly adjusted.

Low Operating Temperatures

1. Use correct SAE oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move vehicle to a warm location.
2. Use fresh gasoline. Protect against moisture condensation. Below 0°F (-18°C), adjust carburetor main jet for a slightly richer fuel mixture.
3. Keep ignition system clean, properly adjusted and batteries in a well charged condition.
4. Partially restrict cool airflow, but use care to avoid overheating.

Extremely Dusty or Dirty

1. Keep unit clean. Keep cooling surfaces clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and gasoline in dust-tight containers.
5. Keep governor linkage clean.
6. Clean generator brushes, slip rings, and commutator, do not remove normal dark brown film. Do not polish.

High Altitude Operation

For operation at altitudes of 2500 feet (775 m) above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to the ADJUSTMENTS section). Maximum power will be reduced approximately four percent for each 1000 feet (310 m) above sea level after the first 1000 feet.

Power Requirements for Appliances

Appliance or Tool	Approximate Running Wattage
Refrigerator	600-1000
Electric broom	200-500
Coffee percolator	550-700
Electric frying pan	1000-1350
Hair dryer	350-500
Electric stove (per element)	350-1000
Electric iron	500-1200
Radio	50-200
Electric water heater	1000-1500
Space heater	1000-1500
Electric blanket	50-200
Television	200-600
Electric drill	250-750
Battery charger	Up to 800
Electric water pump	500-600
Air Conditioner	1400-2200
Converter	300-350

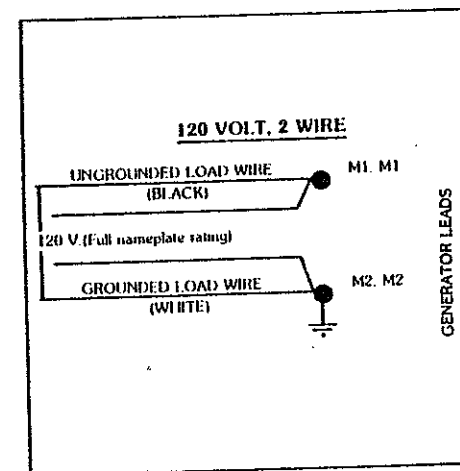
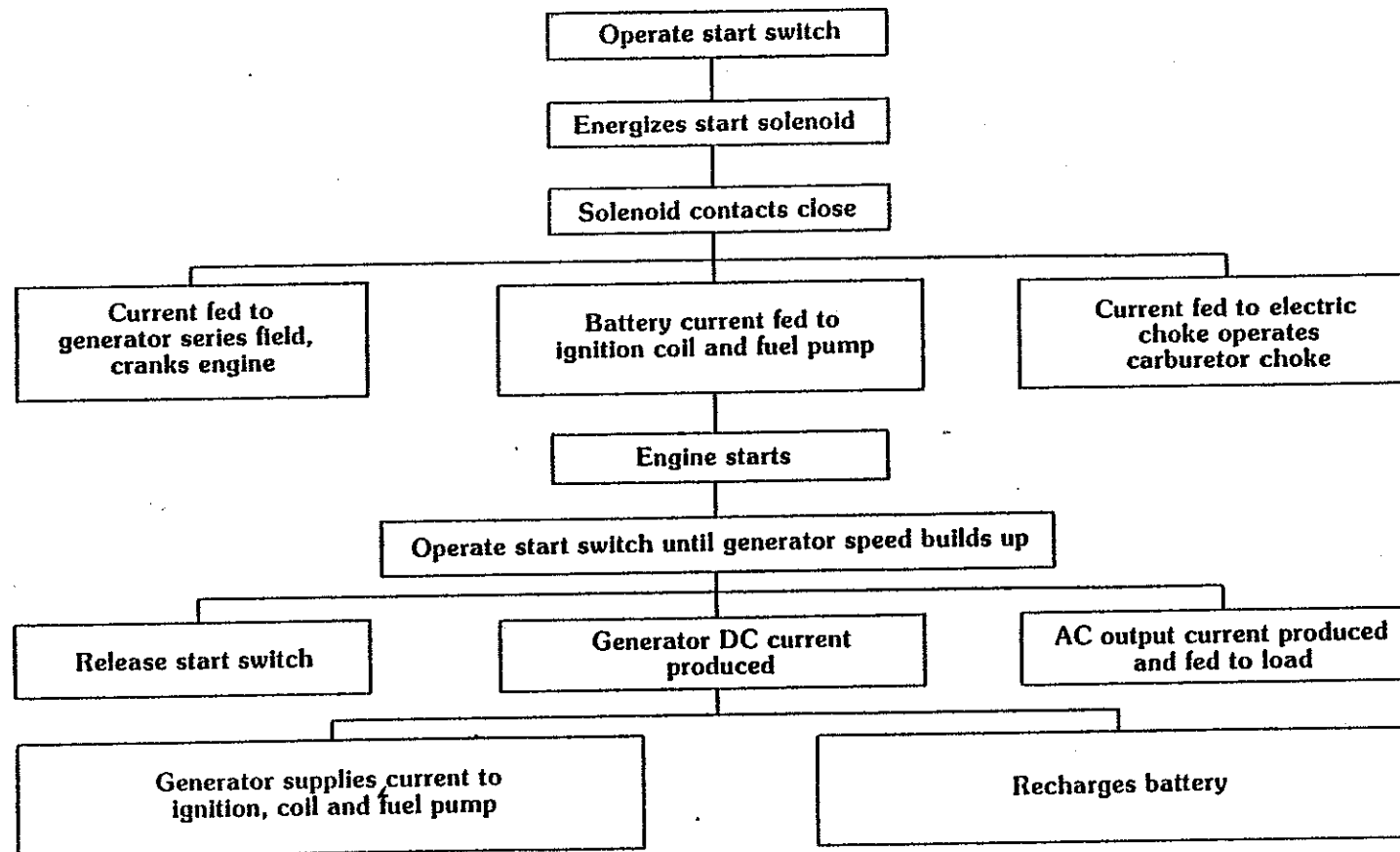


Figure 33.

Sequence of Operation



This chart shows the operation sequence of the BFA electric generating set.

Engine Troubleshooting

	Backfire at Carburetor	Black Exhaust	Blue Exhaust	Burned Valves	Connecting Rod Wear	Cranks Slowly	Cylinder Wear	Engine Stops	Failure to Start	Governor Hunting	High Oil Pressure	Low Oil Pressure	Loss of Coolant (Water Cooled)	Misfiring	Overheating (Air Cooled)	Overheating (Water Cooled)	Piston Wear	Ring Compression	Sticking Valves
STARTING SYSTEM																			
Loose or Corroded Battery Connection																			
Low or Discharged Battery																			
Faulty Starter																			
Faulty Start Solenoid																			
IGNITION SYSTEM																			
Ignition Timing Wrong																			
Wrong Spark Plug Gap																			
Worn Points or Improper Gap Setting																			
Bad Ignition Coil or Condenser																			
Faulty Spark Plug Wires																			
FUEL SYSTEM																			
Out of Fuel — Check																			
Lean Fuel Mixture — Readjust																			
Rich Fuel Mixture or Choke Stuck																			
Engine Flooded																			
Poor Quality Fuel																			
Dirty Carburetor																			
Dirty Air Cleaner																			
Dirty Fuel Filter																			
Defective Fuel Pump																			
INTERNAL ENGINE																			
Wrong Valve Clearance																			
Broken Valve Spring																			
Valve or Valve Seal Leaking																			
Piston Rings Worn or Broken																			
Wrong Bearing Clearance																			
COOLING SYSTEM (AIR COOLED)																			
Poor Air Circulation																			
Dirty or Oily Cooling Fins																			
Blown Head Gasket																			
COOLING SYSTEM (WATER COOLED)																			
Insufficient Coolant																			
Faulty Thermostat																			
Worn Water Pump or Pump Seal																			
Water Passages Restricted																			
Defective Gaskets																			
Blown Head Gasket																			
LUBRICATION SYSTEM																			
Defective Oil Gauge																			
Relief Valve Stuck																			
Faulty Oil Pump																			
Dirty Oil or Filter																			
Oil Too Light or Diluted																			
Oil Level Low																			
Oil Too Heavy																			
Dirty Crankcase Breather Valve																			
THROTTLE AND GOVERNOR																			
Linkage Out of Adjustment																			
Linkage Worn or Disconnected																			
Governor Spring Sensitivity Too Great																			
Linkage Binding																			

Maintenance

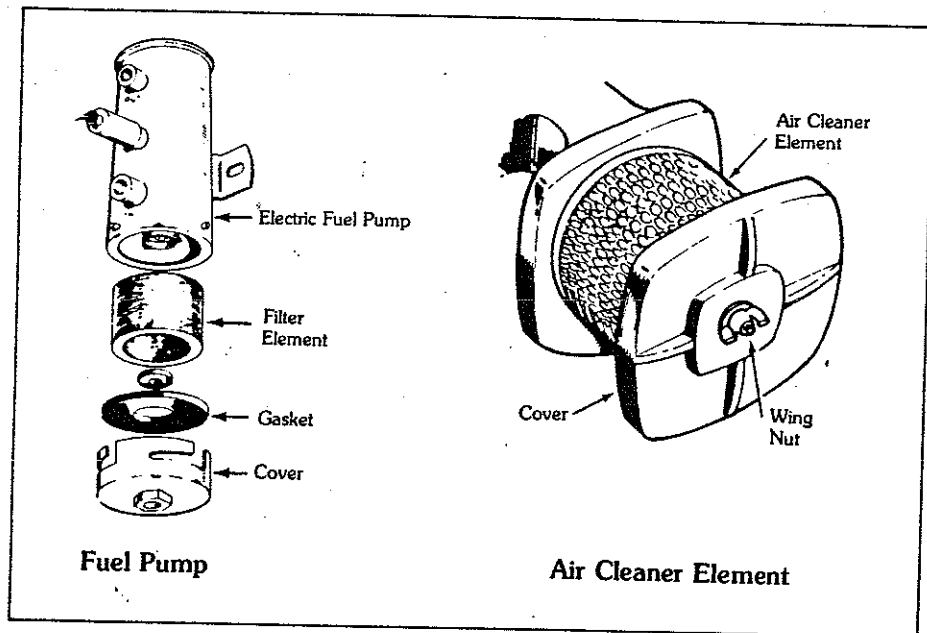


Figure 34.

Battery Care

To increase battery life, the operator can perform a number of routine checks and some preventive maintenance.

1. Keep the battery case clean and dry.
2. Make sure the battery cable connections are clean and tight. Use a terminal puller when removing cables for any reason.
3. Coat the battery terminals with a mineral grease or petroleum jelly to reduce corrosion and oxidation.
4. Identify each battery cable to be positive or negative before making any connection. Always connect the ground (negative) cable last.
5. Maintain the electrolyte level by adding water (drinking quality or better) as needed for filling to split level marker. (The water ingredient of the electrolyte evaporates, but the sulphuric acid ingredient re-

mains. Therefore, add water, not electrolyte.

6. Avoid overcharging when recharging. Stop the boost charge when the specific gravity is 1.260 and the electrolyte is 80°F (26.7°C).

Fuel Solenoid

Evaporative control systems on late model motor homes require a positive fuel shutoff valve to prevent the generator set from flooding when not in use. It connects to the fuel pump terminal.

Electric Fuel Pump

Service of the fuel pump is limited to cleaning the filter. Every 100 hours, drain the fuel pump and check the filter element. Turn the hex nut on the base of the pump to gain access to the filter element. If the element appears dirty, replace it. Be sure to replace gaskets when reassembling. (Figure 34)

Air Cleaner Element

Check and clean element at least every 100 hours. Loosen wing nut to remove. Clean by tapping base lightly on a flat surface. Replace element at least every 200 operating hours; clean or replace more often in dusty conditions. See Figure 34.

Spark Plugs

Replace spark plugs every 100 hours or at least once a year. A badly leaded plug will cause misfiring, poor operation or stopping when a load is applied.

- Black deposits indicate a rich mixture.
- Wet plug indicates misfiring.
- Badly or frequently fouled plug indicates the need for a major tune-up.

Each time the spark plugs are removed, inspect, clean and regap (Figure 35). If the plug looks discolored or has fouled, replace it.

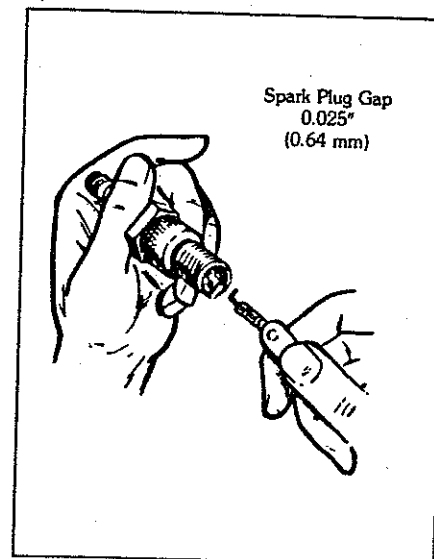


Figure 35.

Cooling System

The generator set is cooled by a flywheel blower fan which pulls air over the cylinders and cooling fins. The air path is directed by sheet metal shrouds and plates. These shrouds and plates must always be installed properly so unit does not overheat.

Check and clean (if necessary) the cooling fins at least every 200 hours of operation. Remove any dust, dirt or oil which may have accumulated. Check compartment air inlet and generator set air outlet for buildup of dirt, chaff, etc.

Governor Linkage

The linkage must be able to move freely through its entire travel. Every 50 hours of operation, clean the joints and lubricate as shown in Figure 36. Also inspect the linkage for binding, excessive slack and wear.

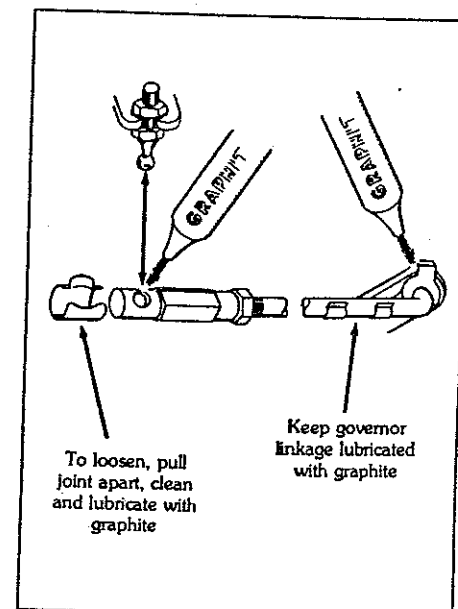


Figure 36.

Out-of-service Protection

Protect a generator set that will be out of service for more than 30 days from damage caused by rust or corrosion. Use the following procedure to properly protect the set.

1. Run the generator set with at least a 50% load until thoroughly warm (usually about 1 hour).
2. Turn off fuel supply and allow the engine to run out of fuel. Also operate the choke manually as the engine stops to help drain the carburetor completely.
3. Drain the oil from oil base while engine is still warm. Replace the oil filter if so equipped. Replace drain plug and refill. Attach a warning tag stating type and viscosity of oil used.
4. Remove spark plugs. Pour 1 ounce of rust inhibitor oil (or SAE #10) into each cylinder. (Spray cans work well for this application). Turn engine over by hand at least 2 complete revolutions. Replace the spark plugs.
5. Replace the air cleaner at least on an annual basis.
6. Plug the exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
7. Clean and oil all exposed engine parts including carburetor and governor linkage.
8. Wipe generator brushes, slip rings, housing, etc. Do not apply any lubricant or preservative.
9. Remove the battery and store in a cool dry place. Coat the battery terminals and cable connections with vasoline or grease to prevent any corrosion. Recharge the bat-

tery at least monthly or maintain with a trickle type battery charger.

10. Provide a suitable cover if the unit is exposed to the elements.

Returning The Unit To Service

1. Remove the cover and all protective wrapping. Wipe the oil film off all exposed engine parts. Remove the plug from the exhaust outlet.
2. Visually inspect the unit for any damage. Check to be sure the carburetor and governor linkage are free. Remove the generator end bell band and check to be sure the brushes work freely in their holders.
3. Check the tag to ensure oil of the proper brand and grade has been installed. Check the oil level.
4. Install the battery (be sure battery is fully charged), observing proper polarity. Ground is negative.
5. Remove spark plugs, clean and gap. Turn the engine over by hand several times. Reinstall spark plugs.
6. Turn on fuel, disconnect electric fuel pump lead and electric fuel solenoid shut-off lead if unit is so equipped. Jumper the fuel pump and electric fuel solenoid shut-off leads to the battery to prime the unit. Reconnect the leads.
7. Remove all load and start the generator set at the unit. Initial start may be slow due to oil or rust inhibitor in the cylinders. Excessive smoke and rough operation will occur until the oil or rust inhibitor is burned off.

8. Apply a 50% load after the set runs smooth. Allow the generator set to warm up (1 hour) with the load connected. Check speed and voltage.
9. Unit is now ready for service.

Generator Maintenance

The generator normally needs little care other than a periodic check of the brushes, commutator and collector rings. If a major repair job on the generator should become necessary, have the equipment checked by a competent electrician who is thoroughly familiar with the operation of electric generator equipment.

Brush Replacement

Install new brushes when the old ones are worn to the dimensions shown in Figure 39. Remove the end bell band to expose the brush holders. Remove the three screws holding each brush holder in place (Figure 37). Remove the old brushes and clean the holders so the new brushes can move easily in their holders. Install the new brushes in the same manner as the old ones. Always use the correct brush as listed in the **PARTS INFORMATION SECTION**. Never substitute a brush which may appear to be the same for it may have different characteristics. New brushes are shaped to fit and seldom need sanding to seat properly. If some brush sparking occurs after replacing brushes, run the set under a light load until the brushes wear to a good seat.

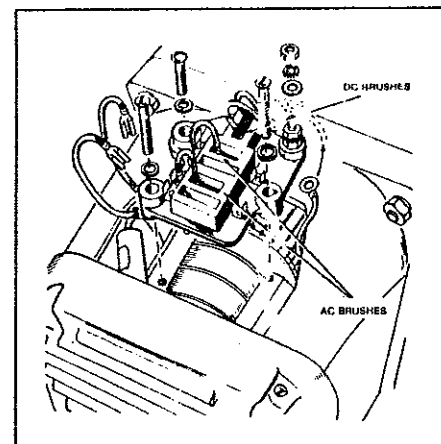


Figure 37.

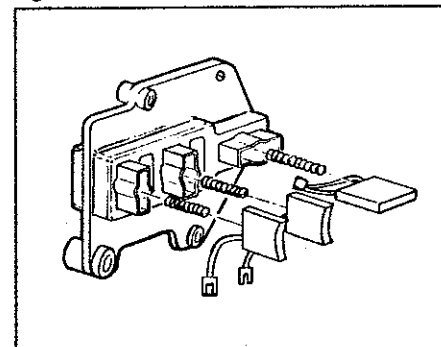


Figure 38.

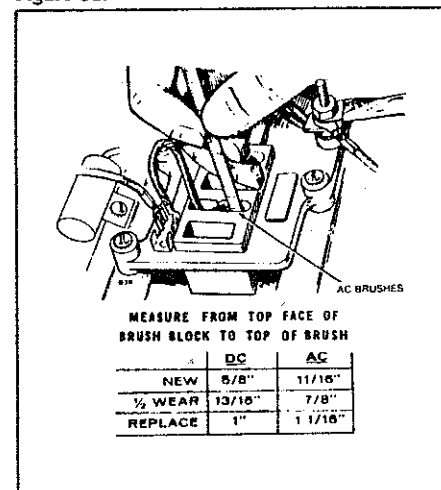


Figure 39.

Collector rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright newly machined appearing surface. Ordinary cleaning with a dry, lint free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove slight roughness.

Assembly Torques

Bolt Torque	Ft.-lb.
Gearcase Cover	8-10
Cylinder Head Stud Nuts (Cold)	17-19
Rear Bearing Plate Screws ...	25-28
Connecting Rod Bolt	27-29
Flywheel Cap Screw	35-40
Other 5/16" Cylinder Block Stud and Nuts	8-10
Oil Base Mounting Screws ...	18-23
Manifold Mounting Screws ...	18-23
Oil Pump	7-9
Exhaust Manifold	18-23

Exhaust Spark Arrester

Exhaust spark arresters are necessary for SAFE OPERATION. All require periodic clean-out (every 50 to 100 operating hours) to maintain maximum efficiency. Some state and federal parks require them.

To clean spark arrester remove pipe plug in bottom of muffler. Run set for 5 minutes. Replace plug.

Periodic Maintenance Schedule

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the crankcase oil, the filters, etc. frequently until the proper service time

periods can be established.

For any abnormalities in operation, unusual noises from engine or accessories, loss of power, overheating, etc., contact your nearest authorized Onan dealer.

Caution: Always allow generator set to cool off before performing any maintenance or installation work on the set. Working on a hot set could cause severe burns.

Service These Items	After Each Cycle of Indicated Hours				
	8	50	100	200	400
General Inspection	X1				
Check Oil Lever	X				
Check Battery Electrolyte Level		X			
Change Crankcase Oil			X2		
Check Air Cleaner			X2		
Check Spark Plugs			X4		
Check Breaker Points			X3		
Clean Cooling Fins				X2	
Change Oil Filter				X2	
Replace Breaker Points				X4	
Clean Crankcase Breather				X	
Replace Air Cleaner				X2	
Remove Carbon Deposits from Heads				X	
Adjust Tappets					X
Replace Fuel Filter					X4
Clean Carburetor					X
Check Generator Brushes (Replace if Necessary)	As Required				

- X1 — With set running, visually and audibly check exhaust system for leaks.
 X2 — Perform more often in extremely dusty conditions.
 X3 — Replace if necessary.
 X4 — Replace annually or prior to storage.

Adjustments

Satisfactory generator set performance depends on correct adjustments. If trouble develops, follow an orderly procedure to determine the cause before making changes in adjustments. Refer to *ENGINE TROUBLESHOOTING* and *PERIODIC SERVICE GUIDES* for additional help.

Carburetor

The NH "RV" generator set carburetor has two mixture adjustments, an idle mixture which affects operation mainly at no load and a main (power) adjustment which affects operation at maximum load (Figure 40). If your generator set has a "hunting" (sudden surges and drops in speed) condition at no load or full load and cannot be corrected by carburetor adjustments, check governor, linkage and adjustment (see *Governor Adjustments*). A hunting condition at no load can usually be corrected by an idle mixture adjustment.

Caution: When determining fuel mixture settings, never force the fuel mixture adjustment needles against their seats (damages the seats and needles).

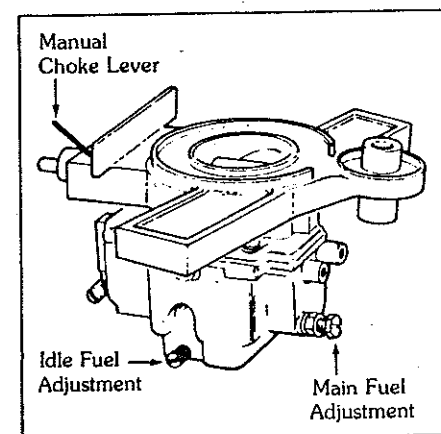


Figure 40.

Carburetor Adjustments

Start generator set and allow it to warm up for at least 10 minutes before making any adjustments. Remove all AC loads and connect a plug-in type AC voltmeter into one of the receptacles in the coach. When procedure below calls for full load, turn on appliances or use an Onan load test panel. The first two adjustments are made with the set not running. Turn unit off — proceed as follows:

1. Turn idle mixture screw out (counterclockwise) $\frac{1}{2}$ to $\frac{3}{4}$ turn from seated position.
2. Turn main mixture screw $1\frac{1}{4}$ to $1\frac{1}{2}$ turns out (counterclockwise) from seated position.
3. Start set and adjust governor spring setting so engine speed is 1860 RPM at no load (62 hertz or 130 volts).
4. Hold back governor arm so that throttle lever rests on throttle stop screw. Adjust idle stop screw to 1500 RPM (50 hertz or 100 volts). Release governor arm.
5. Adjust idle mixture screw to highest RPM or voltage. Readjust governor spring setting so engine speed is 1860 RPM at no load (62 hertz or 130 volts).
6. Apply full load to generator and adjust main mixture screw to highest RPM or voltage. Readjust governor spring setting so engine speed is 1770 RPM at full load (59 hertz or 110 volts).
7. Remove and add load several times to check for a governor hunting condition. Readjust governor spring setting if required.

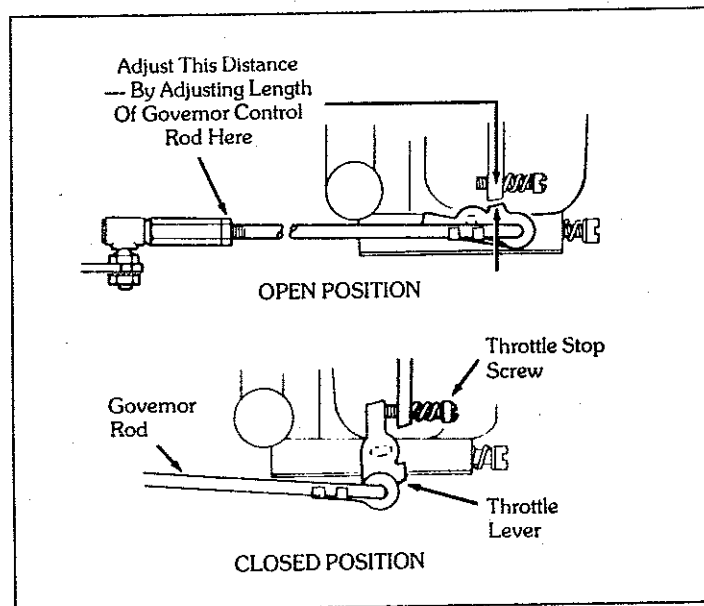


Figure 41.

Throttle Stop Screw

The throttle stop screw is located on the base of the carburetor (opposite side from main power adjustment needle) near the crankcase breather valve. It must be adjusted to obtain 56 hertz at no load with the throttle closed as far as possible (throttle shaft lever touching adjustment screw). See Figure 41.

Carburetor Float Adjustment

1. Normal operational seldom requires any adjustment of the float level. Disconnect throttle control, choke leads, air cleaner inlet hose and fuel line from carburetor.
2. Remove the four bolts that hold the intake manifold assembly in place and remove the complete carburetor and intake manifold assembly as one unit. Then remove car-

buretor from intake manifold for easier handling when checking float level.

3. Remove the four Phillips head screws on the top of the carburetor and lift it off.
4. Invert the carburetor and check the float setting (see Figure 42). The float should have a 0.07 ± 0.02 inch (1.8 ± 0.5 mm) clearance from the machined mating surface (without gasket). Bend the float tab as required.
5. If it is necessary to reset the float level, loosen the screw near float valve axle (pin) and bend the float arm near float valve axle (pin) to position float flush with top edge of carburetor float bowl. See Figure 42.

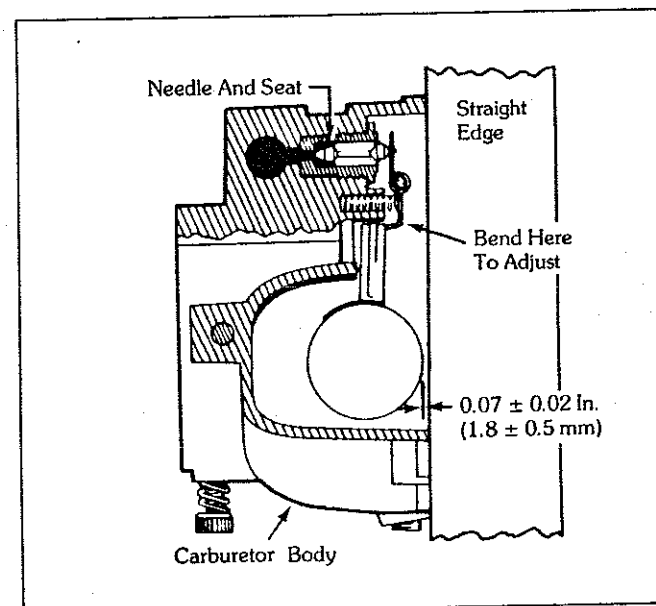


Figure 42.

Caution: If float adjustment is necessary, be careful not to lose the buoyancy spring or the tension spring on the viton tip float needle and seat assembly.

6. Reassemble carburetor and reinstall carburetor on intake manifold assembly and then replace complete assembly on the engine.
7. Check carburetor for proper operation.

Governor Adjustments

If carburetor and the following governor adjustments have already been made and the governor action is still erratic, replace the governor spring (Figure 43) with a new one and readjust the governor. Springs lose their calibrated tension through fatigue after long usage.

Before making governor adjustments, run the unit about 15 minutes under light load to reach normal operating temperature. (If governor is completely out of adjustment, make a preliminary adjustment at no load to first attain a safe voltage operating range).

Engine speed determines the output voltage and current frequency of the generator. By increasing the engine speed, generator voltage and frequency are increased, and by decreasing the engine speed, generator voltage and frequency are decreased. An accurate voltmeter or frequency meter (preferably both) should be connected to the generator output in order to correctly adjust the governor. A small speed drop not noticeable without instruments will result in an objectionable voltage drop. The engine speed can be checked with a tachometer.

A binding in the bearings of the governor shaft, in the ball joint, or in the carburetor throttle assembly will cause erratic governor action or alternate increase and decrease in speed (hunting). A lean carburetor adjustment may also cause hunting. Springs of all kinds have a tendency to lose their calibrated tension through fatigue after long usage. If all governor and carburetor adjustments are properly made, and the governor action is still erratic, replacing the spring with a new one and resetting the adjustments will usually correct the trouble.

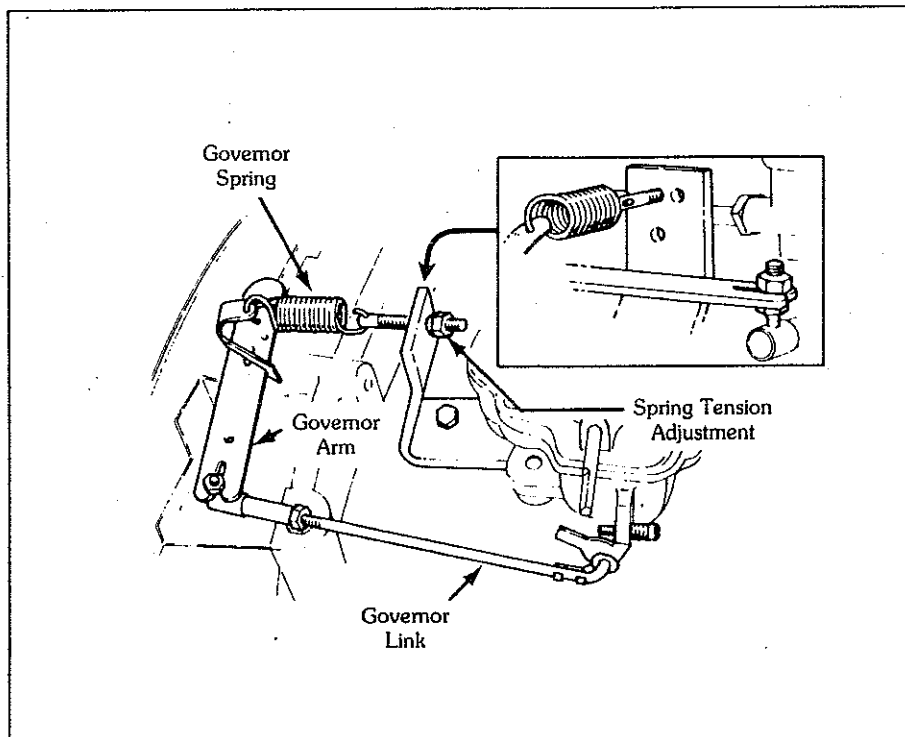


Figure 43.

1. Adjust the carburetor idle needle with no load connected.
2. Adjust the carburetor main jet for the best fuel mixture while operating the set with a full rated load connected.
3. Adjust the length of the governor linkage and check linkage and throttle shaft for binding or excessive looseness.
4. Adjust the governor spring tension for rated speed at no load operation.
5. Adjust the governor sensitivity.
6. Recheck the speed adjustment.
7. Set the carburetor throttle stop screw.

Linkage: The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft assembly is adjusted by rotating the ball joint. Adjust this length so that with the engine stopped and tension on the governor spring, the stop on the throttle shaft assembly almost touches the throttle stop screw housing on side of carburetor (one more turn of governor ball joint would allow throttle shaft linkage to rest against stop screw housing). See Figure 41.

Speed Adjustment: With the warmed-up unit operating at no load, adjust the tension of the governor spring. Refer to

Voltage Chart For Checking Governor Regulation	120 Volt 1 Phase 2 Wire
Maximum No-Load Voltage	132
Minimum Full-Load Voltage	108
Speed Chart For Checking Governor Regulation	
Maximum No-Load Speed (RPM) Hertz (Current Frequency)	1890 63
Minimum Full-Load Speed (RPM) Hertz	1770 59

the Voltage Chart and the Speed Chart. Turn the speed adjusting nut to obtain a voltage and speed reading within the limits shown.

Sensitivity Adjustment: Refer to the Governor Adjustment illustration, and to the Voltage and Speed Charts. Check the voltage and speed, first with no load connected and again with a full load. Adjust the sensitivity to give the closest regulation (least speed and voltage difference between no load and full load) without causing a hunting condition.

To increase sensitivity (closer regulation), shift the spring toward the governor shaft.

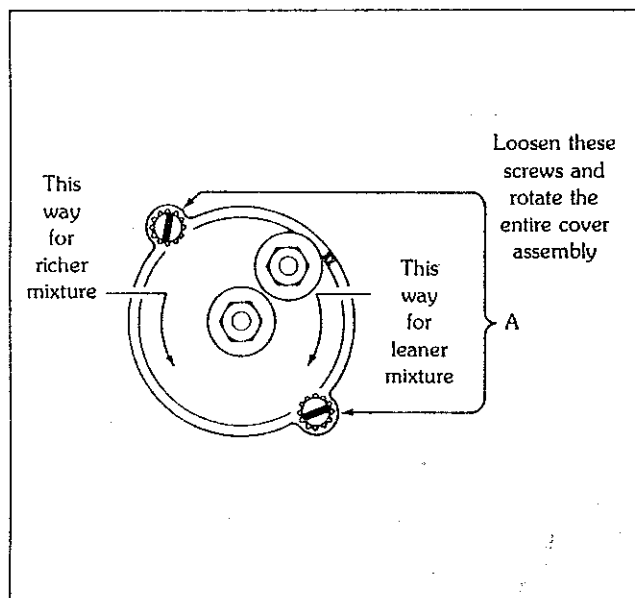


Figure 44.

Electric Choke

If extremes in starting temperatures require a readjustment of the choke, loosen slightly the two cover retaining screws. See Figure 44. For less choking action, turn the cover assembly a few degrees in a clockwise direction. For more choking action, turn counter-clockwise. Retighten the cover screws. Choke may be closed manually if desired to adjust choke settings or for troubleshooting purposes.

Average Choke Setting	
Ambient Temp (F°)	Choke Opening
58 (14°C)	closed
66 (19°C)	¼ open
72 (22°C)	½ open
76 (24°C)	¾ open
82 (28°C)	open

If the engine starts and runs roughly after a minute or two of operation, the choke is set too rich. If the engine starts, and assuming that fuel, ignition and compression are adequate, but the engine sputters or stops before it warms up, the choke is set too lean.

Breaker Points And Ignition Timing

The correct point gap setting is .016 cold (0.41 mm) and should be adjusted as follows:

1. Remove cover by loosening screw and lift off.
2. To set the point gap turn the engine crankshaft with rotation until the maximum breaker point gap is obtained.

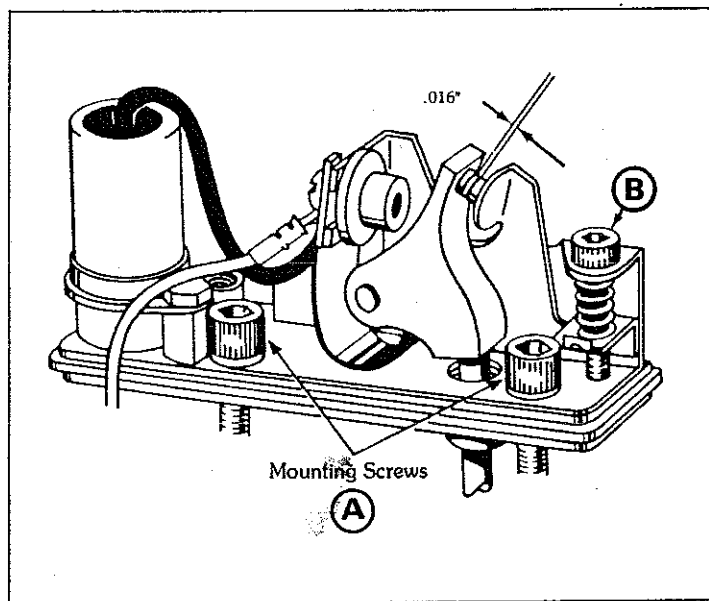


Figure 45.

Parts Information

The following Running Replacement parts list consists of external items which may require replacement due to normal wear and service and can usually be installed by the operator.

Running Replacement Parts List

Part No.	Description
140-0495	Air Cleaner Element
167-0237	Spark Plug
160-1183	Breaker Points
312-0196	Condensor (Breaker Points)
122-0406	Oil Filter
321-0174	Fuses for Control (2 each)

3. Using an allen head wrench, adjust set screw (B) for .016 (0.41 mm). Measure point gap with a flat thickness gauge.

Make sure feeler gauge is clean and free of any grease, oil or dirt. See Figure 45.

The timing is adjusted during initial engine assembly and is fixed by the point gap adjustment. No other adjustment or alignment is necessary. A .016 point gap is equivalent to approximately 20° BTC.

4. Replace point box cover.

The ignition adjustments should be made with the engine in a static condition and cold.

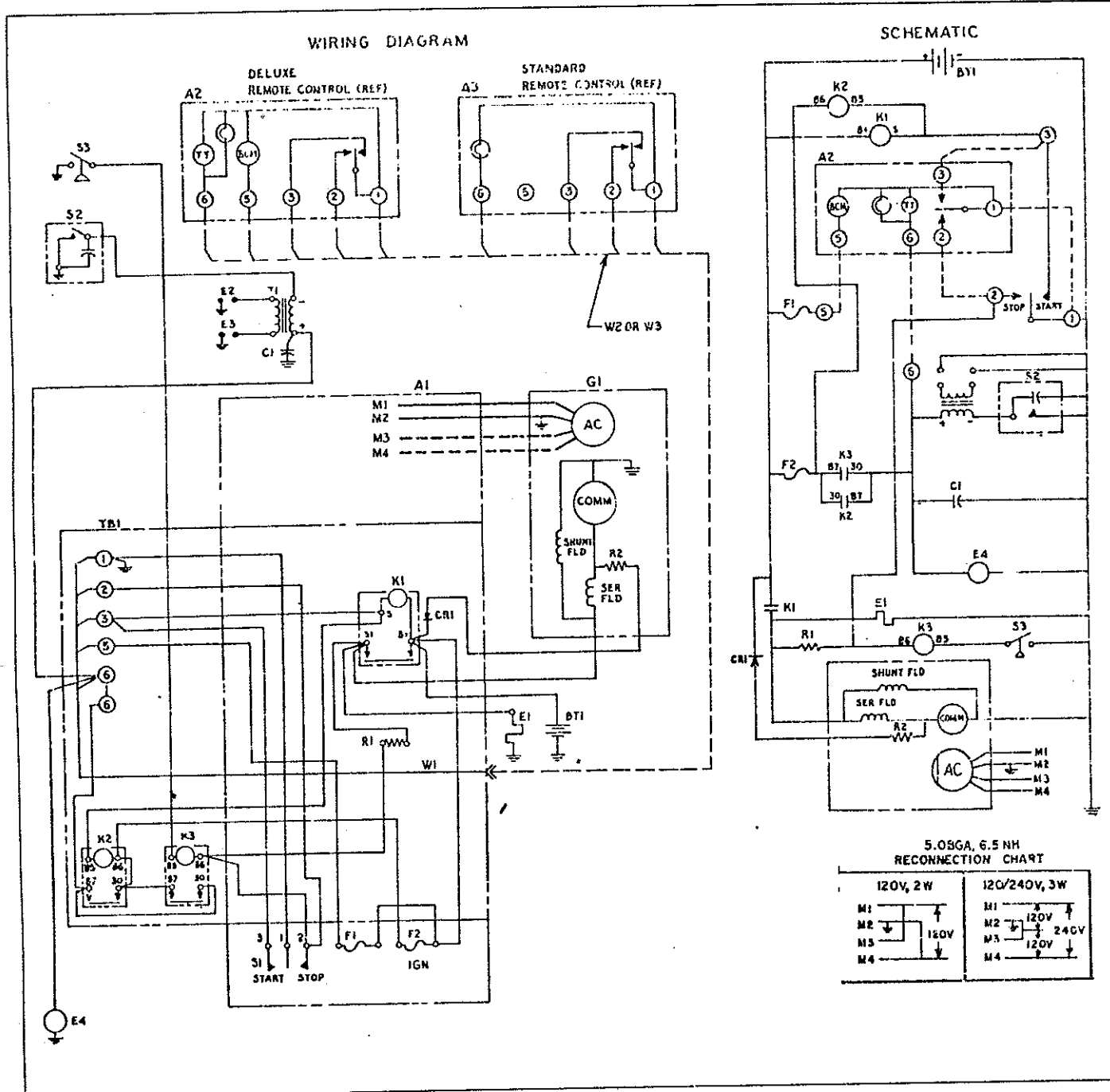
Control Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
FAILS TO CRANK	<ol style="list-style-type: none"> 1. Bad Battery Connection 2. Low Battery 3. Faulty Start Solenoid (K1) 4. Faulty Start Switch 	<ol style="list-style-type: none"> 1. Clean and tighten all battery and cable connections. 2A. Check specific gravity. Recharge or replace battery if necessary. 2B. Reverse current diode (CR1) may be shorted or open causing a drain on the battery. R2 may be open. 3. Push start switch. Check start solenoid "S1" terminal voltage to ground. When battery voltage at start solenoid "B+" terminal is present, battery voltage should also appear at "S1" terminal; if not, replace start solenoid. 4. Replace. Jumper solenoid (S1) terminal to ground. If solenoid does not energize replace switch.
CRANKS SLOWLY	<ol style="list-style-type: none"> 1. Bad Battery Connection 2. Low Battery 	<ol style="list-style-type: none"> 1. See 1 above (FAILS TO CRANK) 2. See 2 above (FAILS TO CRANK)
CRANKS BUT WON'T START	<ol style="list-style-type: none"> 1. Blown Fuse (F2) 2. Faulty Fuel Solenoid Or Fuel Pump On later models, fuel solenoid is an integral part of fuel pump. 3. Faulty Ignition 4. Inoperative Choke 5. Faulty Crank Ignition Relay (K2) 	<ol style="list-style-type: none"> 1. Replace fuse (F2) on control. 2. Fuel solenoid must open during cranking and running. Check by removing steel line from carburetor and crank engine. If fuel solenoid is open, fuel will pulsate out of this line. If it does not, the fuel solenoid and fuel pump must be checked separately to determine defective part. Caution: Use extreme care for this test. Direct fuel flow into a suitable container and make sure area is well ventilated to prevent accumulation of gasoline fumes. 3. Check to see if points open and close during cranking. If they do not open and close, adjust and set points. Plug and plug wires must be in good condition. Voltage at ignition coil negative terminal (-) must alternate from +12 volts to zero volts as points open and close during engine cranking. 4. With engine not running, check choke vane movement by pushing choke lever arm. Choke must be in closed position with cold engine, and must be free to move against bi-metal spring. As engine warms up, bi-metal spring relaxes and allows choke vane to open fully. The lever will pulsate as engine warms up. See ADJUSTMENT section. 5. Check voltage from relay terminal "4" to ground while cranking unit. Battery voltage should appear at this terminal. If not, check for voltage at relay terminals "1" and "2". If battery voltage is present at terminals 1 and 2, but not at 4, replace relay. If not voltage appears at terminals 1 and 2 on relay while cranking, check wiring between start solenoid (K1) and crank ignition relay (K2).

Control Troubleshooting (Cont.)

PROBLEM	PROBABLE CAUSE	REMEDY
UNIT STARTS. BUT STOPS IMMEDIATELY AFTER RELEASING START SWITCH S1	<ol style="list-style-type: none"> 1. Resistor R1 may be open. 2. Run Ignition Relay K3. 3. Low Oil Level 4. S3 Low oil pressure switch may be defective. 	<ol style="list-style-type: none"> 1. Check voltage on both sides of R1. With set running voltage should be 24-32 volts DC. 2. Check voltage on both sides of K3. Should be 12 volts. 3. Check oil level. If low or empty, refill to proper level. 4. Check S3. Switch should close with set running at 10 lbs. minimum oil pressure.
UNITS RUNS THEN SURGES	<ol style="list-style-type: none"> 1. Low Oil Level 	<ol style="list-style-type: none"> 1. See 1 above
UNITS RUNS BUT SURGES	<ol style="list-style-type: none"> 1. Stuck Choke 2. Governor Not Adjusted Properly 	<ol style="list-style-type: none"> 1. See 5 above (CRANKS BUT WON'T START) 2. Readjust governor.
UNITS STOPS	<ol style="list-style-type: none"> 1. Faulty Ignition 2. Out of Fuel 3. Low Oil Level 	<ol style="list-style-type: none"> 1. See 3 above (CRANKS BUT WON'T START) 2. Refill fuel tank. 3. See 1 above
REMOTE RUNNING TIME METER OR GENERATOR LAMP INOPERATIVE	<ol style="list-style-type: none"> 1. Blown Fuse (F1) 	<ol style="list-style-type: none"> 1. Replace F1 fuse on control.

120 Volt Generator Wiring Diagram



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|-------|--|
| A1 | Control Assembly |
| S1 | Start-Stop Switch |
| F1,F2 | Fuse (5-amp, 32 volt) |
| K1 | Start Solenoid |
| S2 | Breaker Points Assy. |
| S3 | Low Oil Pressure Switch |
| E1 | Onan Choke |
| E4 | Electric Fuel Pump |
| T1 | Ignition Coil |
| K2 | Crank Ignition Relay |
| K3 | Ignition Run Relay |
| G1 | Generator |
| R1 | Battery Charging Resistor
(Fixed Value) |
| BT1 | 12 Volt Battery |
| E2,E3 | Spark Plugs |
| CR1 | Reverse Current Diode
(Prevents Battery
Discharge When Unit
Is Shut Down) |
| A2 | Deluxe Remote Control |
| A3 | Standard Remote Control |

Figure 46.