

Electrical

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Electrical System

The Airstream trailer 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 utilizes 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. (Refer to pg 2-11 for brake electrical system).

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 travel trailers to be equipped with specific exterior lighting.

The Airstream exterior lighting system consists of exterior lamps and reflectors, electrical harness circuits and a trailer to car connector. Proper descriptions and identifications of each lamp, reflector and components are shown in Fig. 2.

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 trailer's 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. 2)

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 of the trailer. Both the main ground return and the shell are electrically connected to the 12 volt distribution panel grounding bar.

Trailers manufactured for sale in Canada have a different color coding of functions as shown in Fig. 4

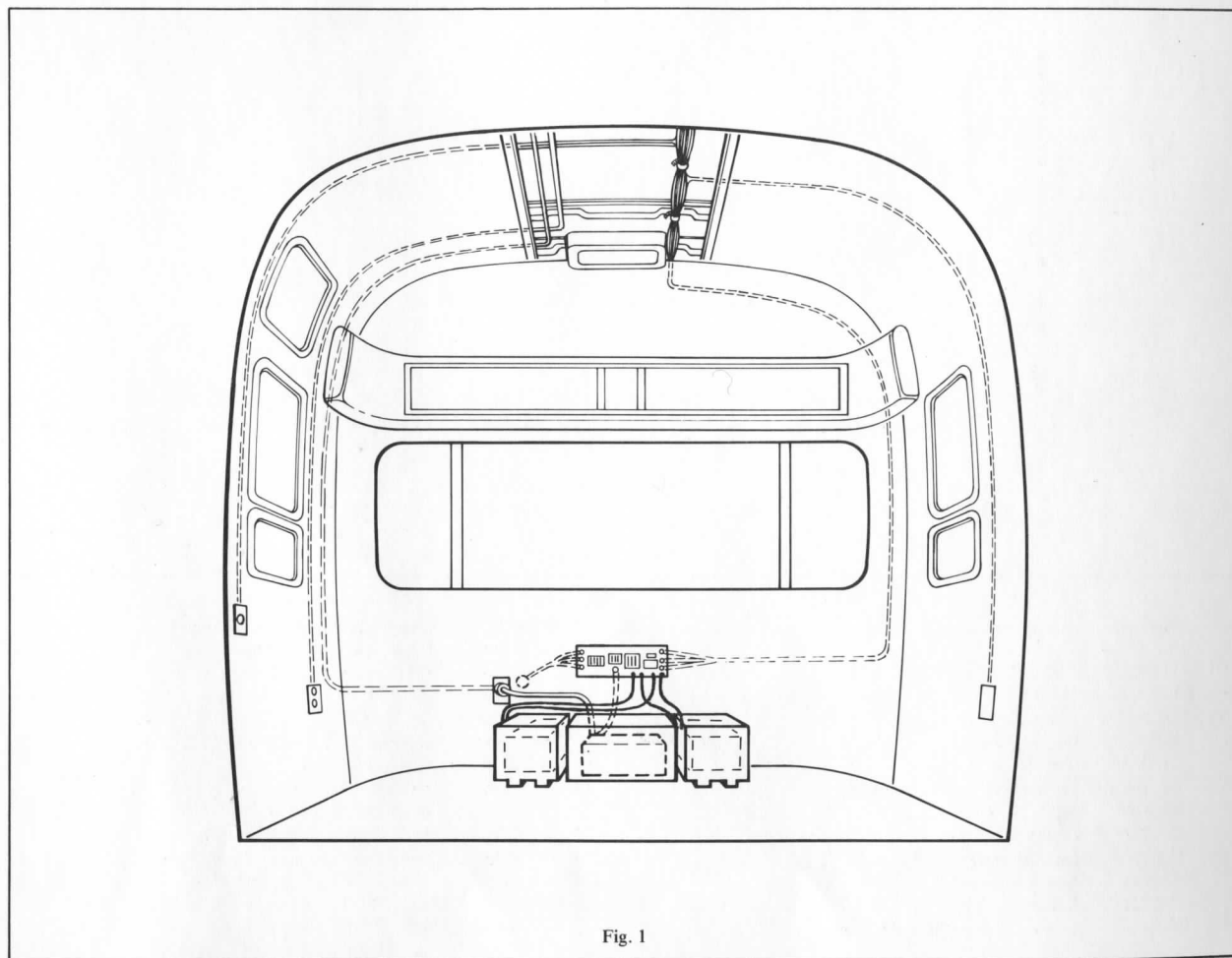
The most common failure in the exterior electrical system is an open circuit. An open circuit is an interruption in the current flow which may be in either the wire to the component or in the ground return. Check the following areas for open circuits:

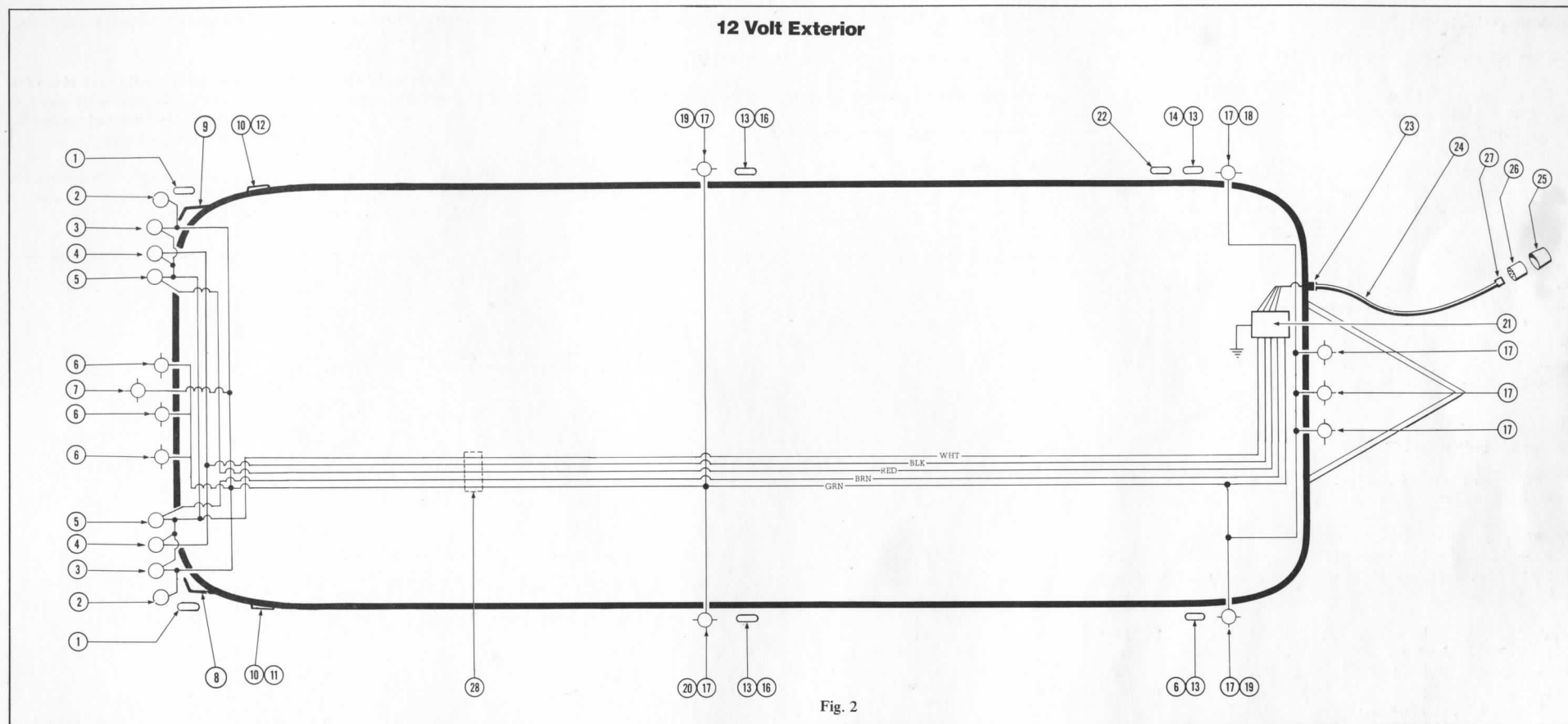
1. Light bulb (filament open)
2. Loose or corroded connections at lighting device
3. Loose or corroded connections at 7-way connectors
4. Improper grounding at the lighting device

A continuity light or an ohm meter 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.

Another example of a short is in the 7-way connector: if a terminal screw in the 7-way connector becomes loose, the wire connector may come in contact with another terminal causing a short.





No.	Part No.	Description	No.	Part No.	Description	No.	Part No.	Description
1	510105	Reflector – red	7	500053	Lamp – license plate (and bracket)	20	101187	Base (No. 13) – intermediate
2	510104	Lamp – red	8	101200	Bezel – taillight – curbside	21	952091	Panel – 12 volt distribution
3	510160	Lamp assembly – tail	9	101201	Bezel – taillight – roadside	22	994029	Monitor – tail light
	510162	Lens – red	10	510204	Reflector – red	23	510177	Connector socket – 7 way
	380226	Gasket	11	101185	Base (No. 11) – curbside rear reflector	24	952028	Cable – 7 way conn.
4	510161	Lamp assembly – back up	12	101186	Base (No. 12) – roadside rear reflector	25	380276	Boot – 7 way conn.
	510163	Lens – clear	13	500096	Reflector – amber	26	510177	Connector socket – 7 way
	380226	Gasket	14	101181	Base (No. 5) – roadside	27	500007	Connector plug – 7 way
5	510161	Lamp assembly – stop, turn	15	101182	Base (No. 6) – curbside	28	500247	Land yacht wiring harness
	510162	Lens – red	16	101163	Base (No. 14) – intermediate reflector		500248	International wiring harness
	380226	Gasket	17	510112	Lamp – amber, comb. front clearance – side marker front identification			Not shown
6	510111	Lamp – red, rear identification	18	101177	Base (No. 1) – roadside	200290		12 Volt distribution panel cover – ABS
			19	101178	Base (No. 2) – curbside	200289		7-way connector cover

7 Way Connector Socket (U.S.)

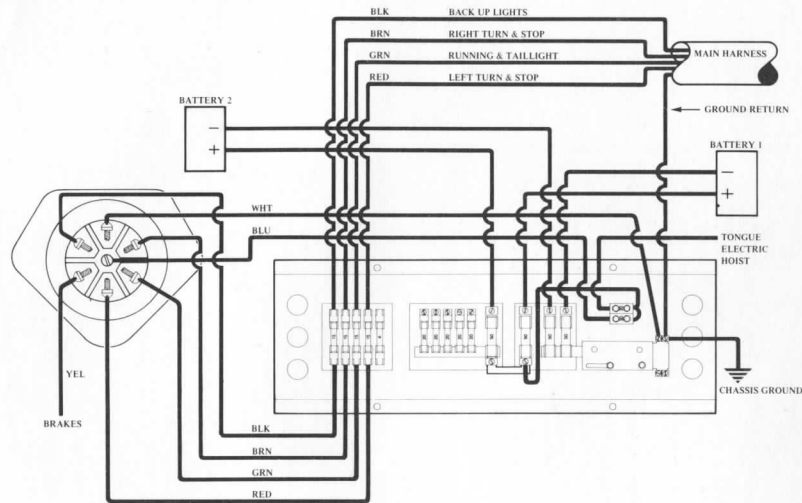


Fig. 3

7 Way Connector Socket (Canada)

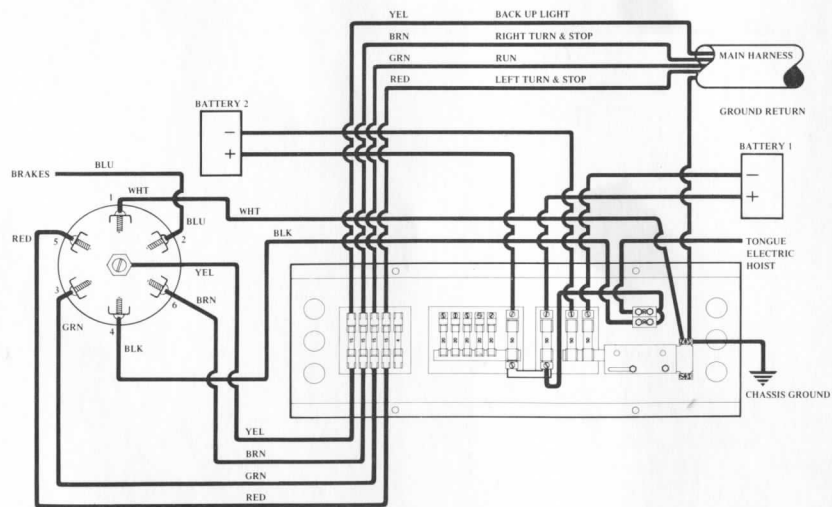
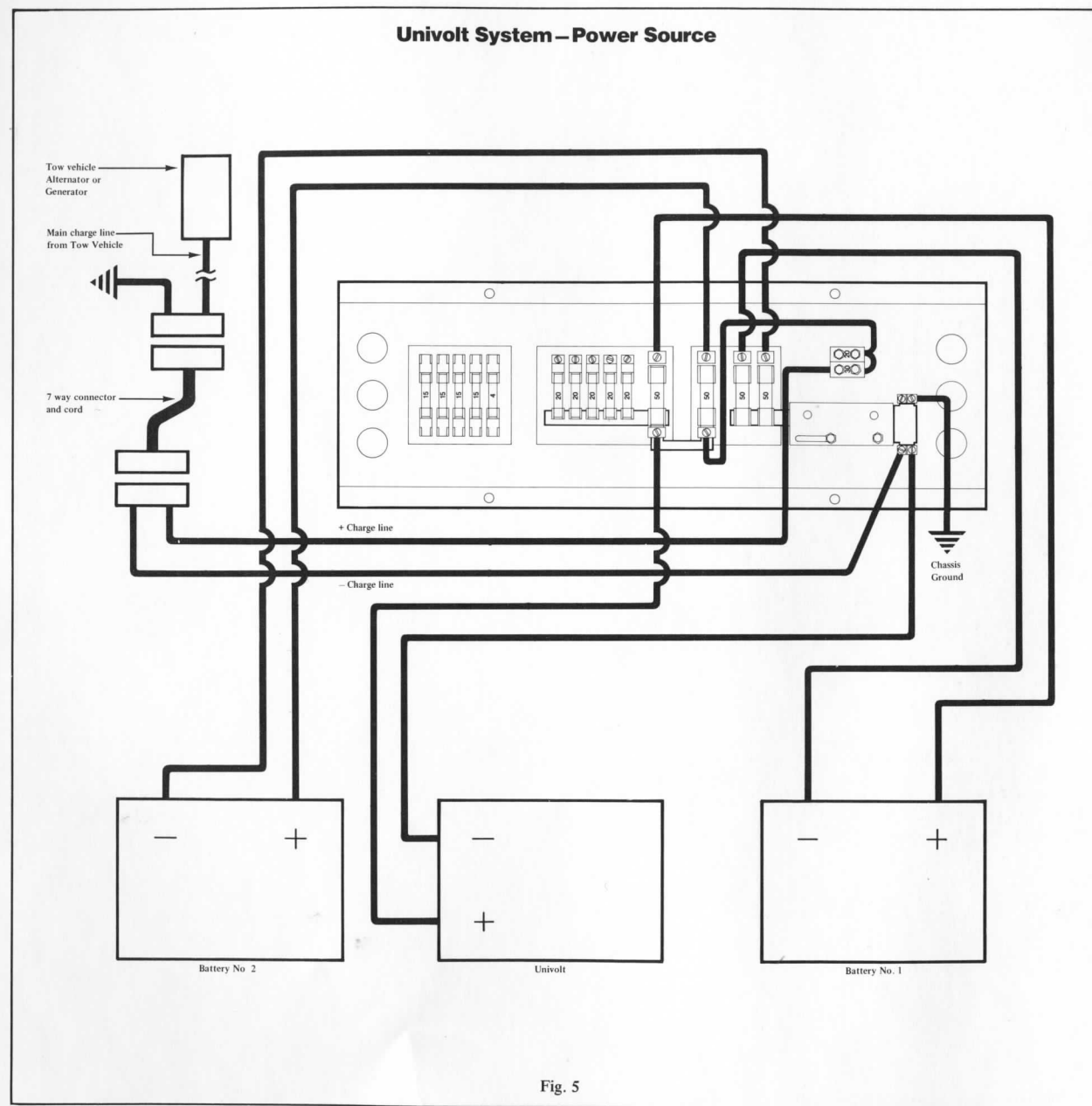


Fig. 4



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.

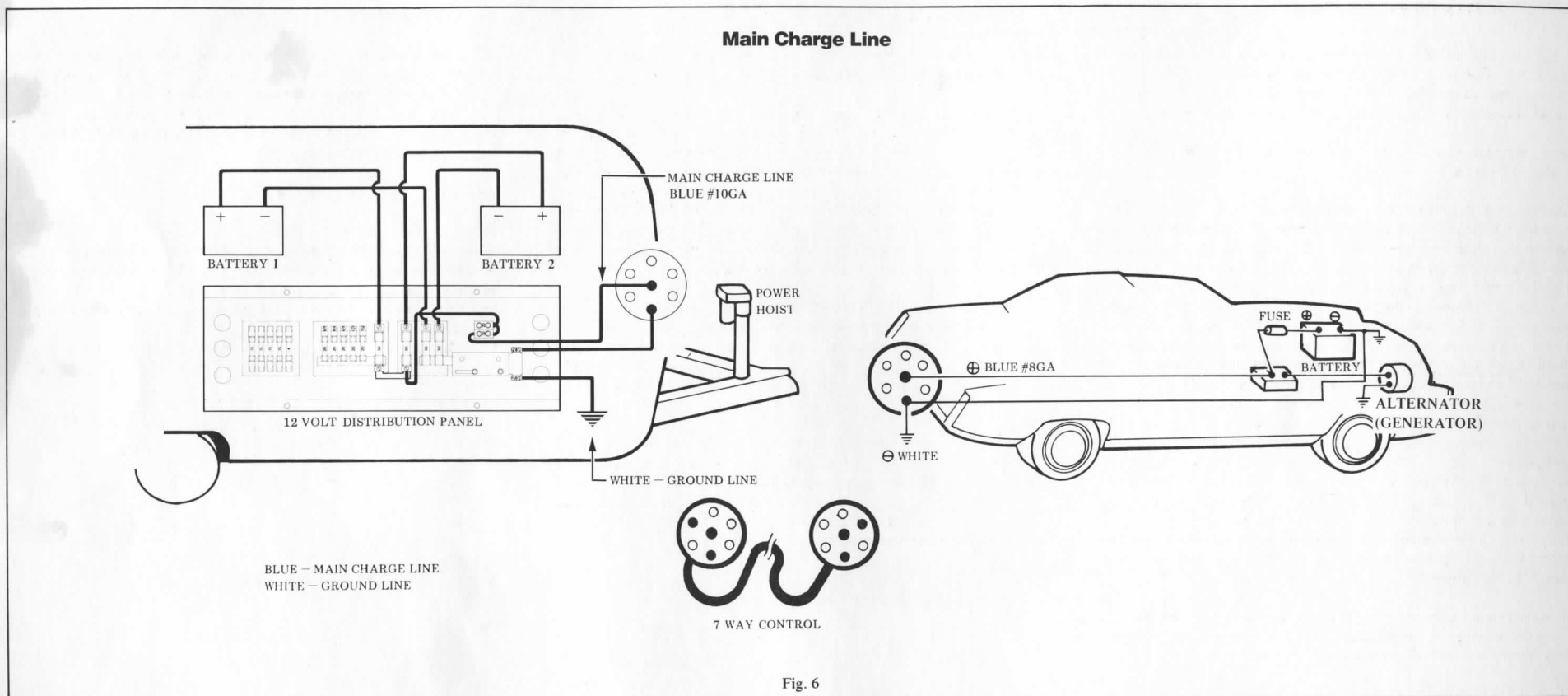
12 Volt Power Circuits

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:

- A. Main Charge Line from Tow Vehicle
- B. Trailer Battery (5)
- C. 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. 8). The five circuits provide power to operate all 12 volt DC lights, pumps, motors and appliances.



Main Charge Line Power Source (From Tow Vehicle)

The main line circuit completes the path of current from the tow vehicle's generator or alternator to the trailer's battery as shown in fig. 6. The purpose of this circuit is to charge the trailer's battery.

In order to minimize voltage drop the tow vehicle's wire size should be No. 8 AWG or equivalent. If the tow vehicle charge line is smaller, a greater voltage drop will exist which will increase towing time necessary to charge the trailer battery(s).

Trailer Battery Power Source

The 12 volt trailer battery is connected in parallel to the Univolt system (see Fig. 6). It provides current to the interior lights, fans and 12 volt appliance when your trailer is disconnected from city power or when an overload of interior lights and fans exist with city power connected.

Charging of the battery is provided by the tow vehicles charging system or the "Univolt" converter.

A safe level of charge 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. Important: Reconnect the battery cables to the correct battery posts. For example, if negative ground, the black cable should be connected to the negative (-) post and the red cable to the (+) post. The polarity may be determined by inspecting the battery post which is grounded on the tow vehicle, since it must always match the trailer. For example, if negative pole of the tow vehicle is grounded, the polarity of the trailer battery is negative ground.

Add water to cells as necessary. Do not fill battery above lower ring. As the battery is charged, the electrolyte expands, causing an overflowed battery to spill acid through the vents.

1. How to Use a Hydrometer

- Squeeze the soft rubber bulb and insert the nozzle in the cell. Release the bulb slowly, drawing electrolyte up into the barrel.
- Adjust the electrolyte level in the barrel so that the float rides free of the bottom but is not striking the top.
- 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.
- 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 car. 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 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 greatest 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 of 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; 2.06; Condition: OK

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

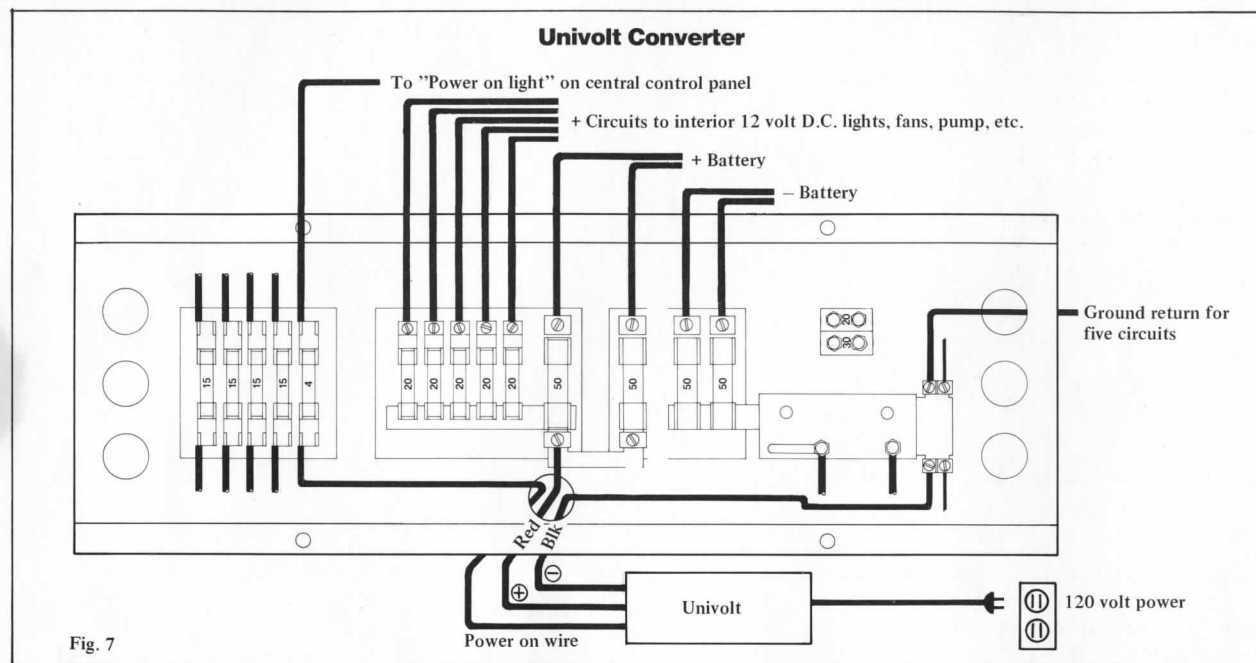
State of Charge:

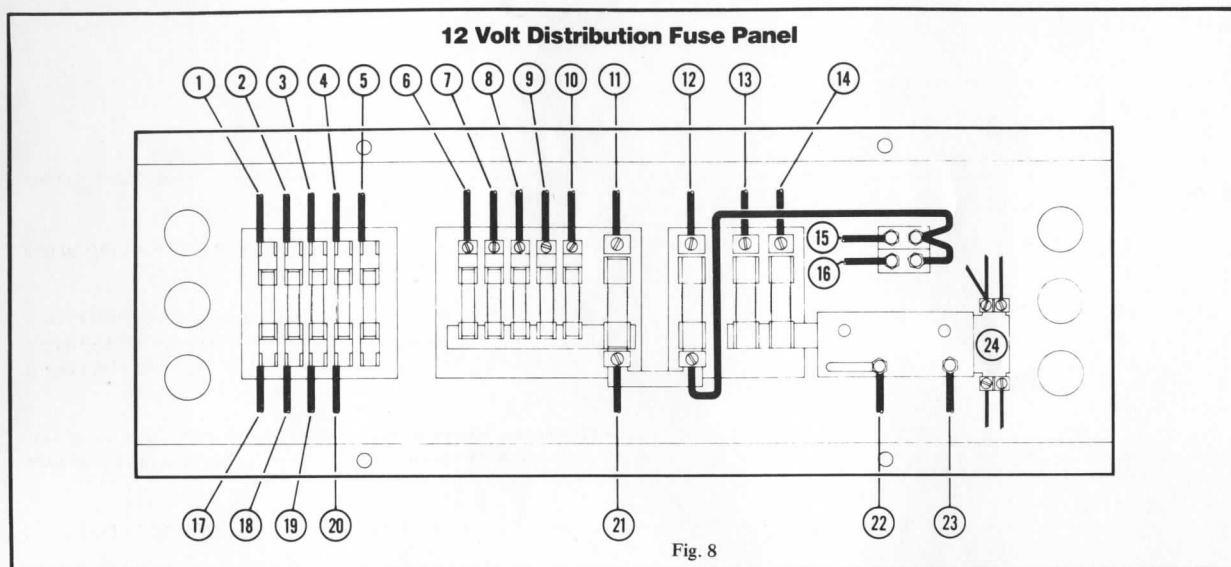
Compare the voltage readings with the following:

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.





No. Description

- 1 Back up light, Blk
- 2 Right turn and stop light, Brn
- 3 Clearance and tail light, Grn
- 4 Left turn and stop light, Red
- 5 Power-on light, Gray
- 6 Circuit No. 1, Pur
- 7 Circuit No. 2, Yel
- 8 Circuit No. 3, Pink
- 9 Circuit No. 4, Brn
- 10 Circuit No. 5, Blue
- 11 Battery No. 1, positive
- 12 Battery No. 2, positive
- 13 Battery No. 1, negative
- 14 Battery No. 2, negative
- 15 Hoist, Org
- 16 Main 12 volt charge, Blue
- 17 Back up light, Blk
- 18 Right turn and stop light, Brn
- 19 Clearance and tail light, Grn
- 20 Left turn and stop light, Red
- 21 Univolt positive
- 22 Ammeter, Blk/Red
- 23 Ammeter, Blk/Red
- 24 All ground wires, Wht

**12 Volt Distribution Fuse Panel
(Remote 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.

Figures 9 - 12 are branch circuit schematics illustrating color coding, routing and identifies components on each circuit.

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 has open. 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.

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 Electrical (21 Ft.)

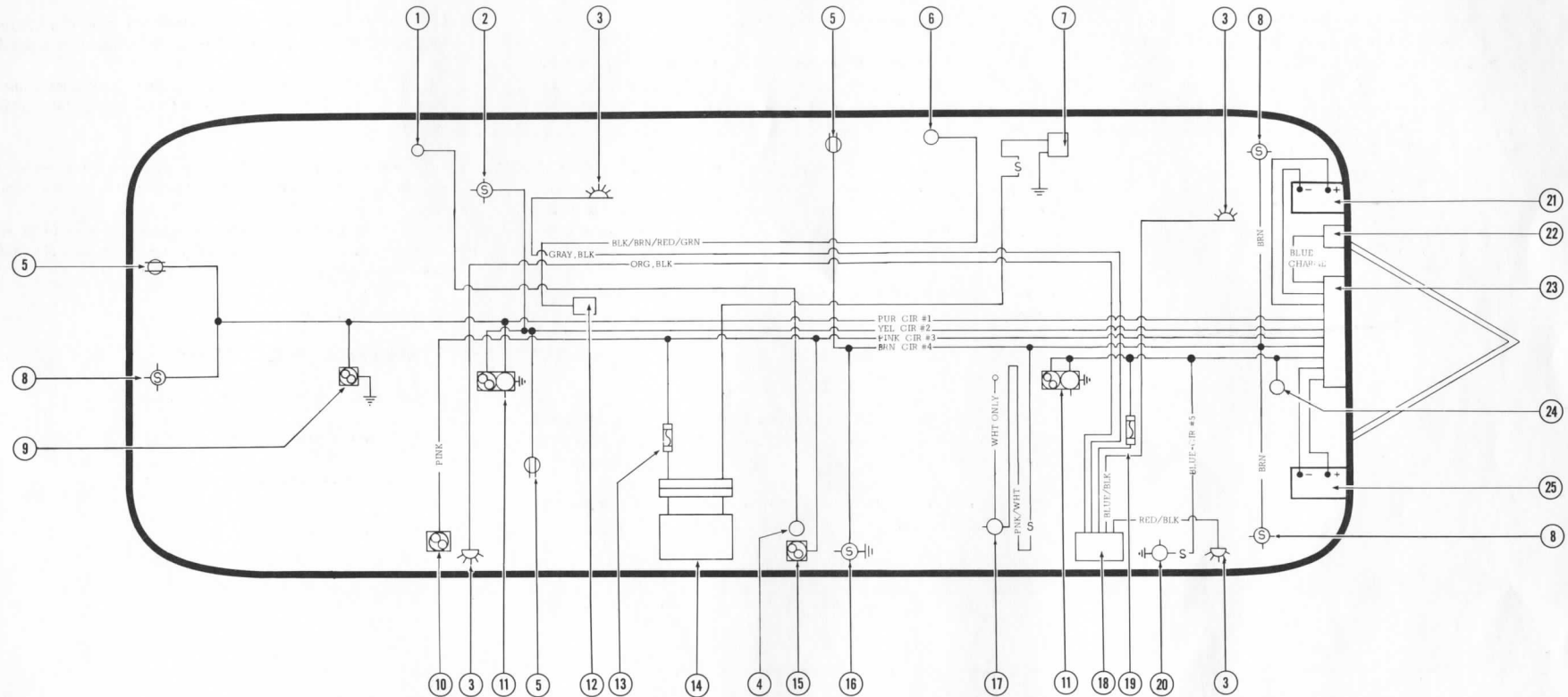


Fig. 9

No. Description

- 1 Furnace control
- 2 Vanity light
- 3 Speaker
- 4 Furnace thermostat relay
- 5 12 volt outlet
- 6 Air conditioner/heater control
- 7 Water pump
- 8 Light

- 9 Bathroom exhaust fan
- 10 Range exhaust fan
- 11 Ceiling fan and light
- 12 Air conditioner
- 13 12 volt 15 amp fuse
- 14 Central control panel
- 15 Furnace fan
- 16 Galley roof locker light
- 17 Step light

- 18 Radio/stereo
- 19 12 volt 10 amp fuse
- 20 Flood light
- 21 Battery No. 2
- 22 7 way connector plug
- 23 12 volt distribution panel
- 24 Digital clock
- 25 Battery No. 1

12 Volt Electrical (23 & 25 Ft. Shower Bath)

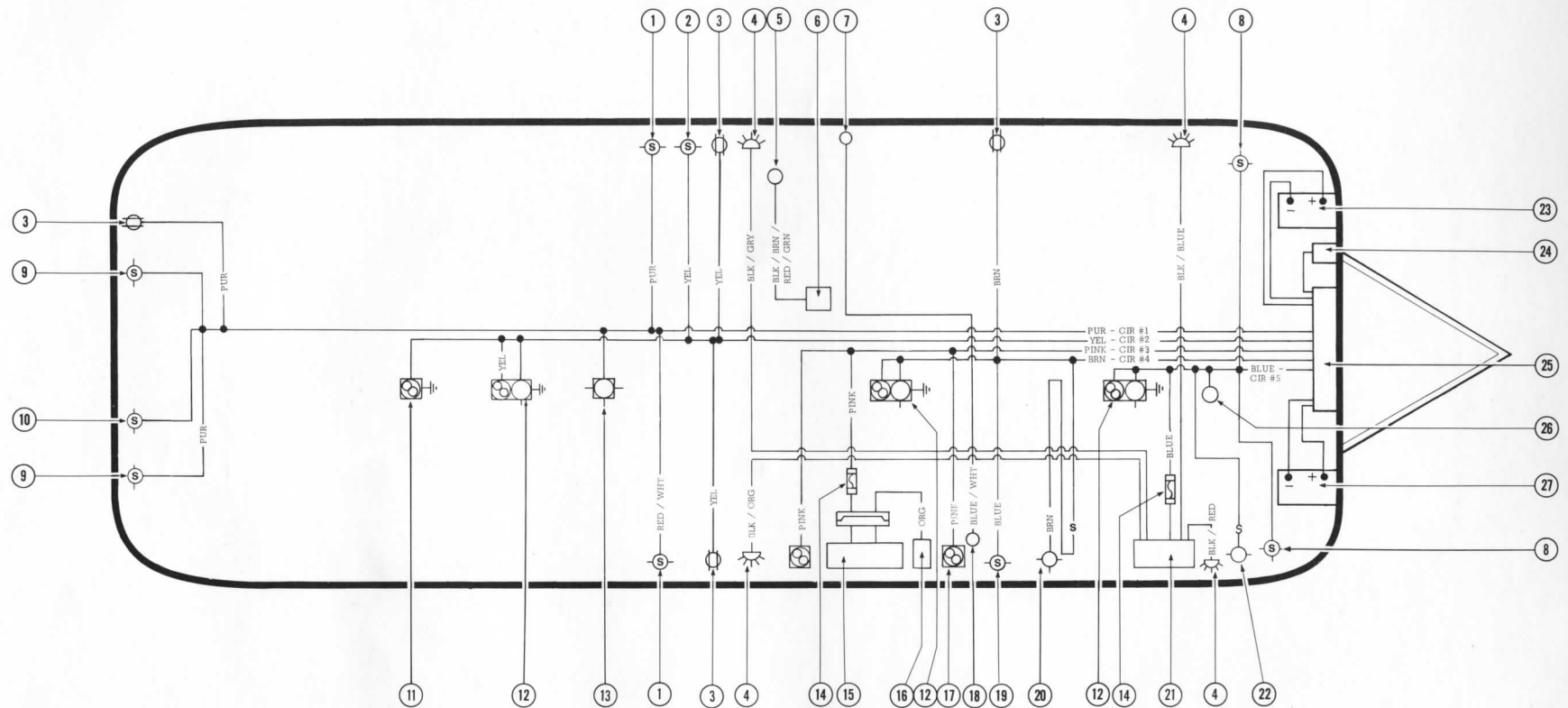


Fig. 10

No.	Description	No.	Description	No.	Description
1	Compartment light	9	Bathroom light	19	Galley roof locker light
2	Bed shelf lighter vanity	10	Trunk light	20	Step light
3	12 volt outlet	11	Bathroom exhaust fan	21	Radio/stereo
4	Speaker	12	Ceiling fan & light	22	Flood light
5	Air conditioner/heater control	13	Ceiling light	23	Battery No. 2
6	Air conditioner	14	12 volt 15 amp fuse	24	7 way connector plug
7	Furnace control	15	Central control panel	25	12 volt distribution panel
8	Roof locker light	16	Water pump	26	Digital clock
		17	Furnace fan	27	Battery No. 1
		18	Furnace thermostat relay		

12Volt Electrical (25-31 Ft. Full Bath)

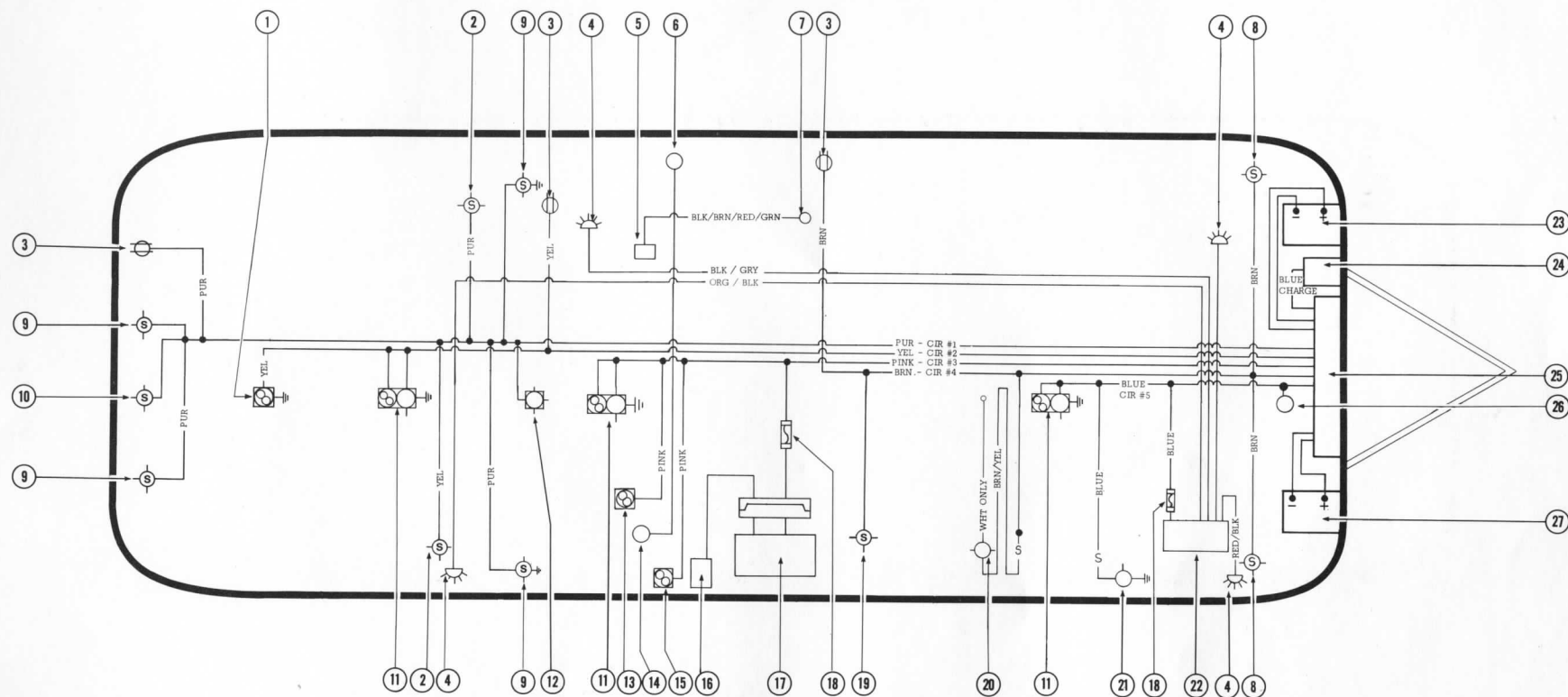


Fig. 11

No. Description

1	Bath exhaust fan	10	Trunk light	21	Flood light
2	Compartment light	11	Ceiling vent & light	22	Radio/stereo
3	12 volt outlet	12	Ceiling light	23	Battery No. 2
4	Speaker	13	Galley exhaust fan	24	7 way connector plug
5	Air conditioner	14	Furnace thermostat relay	25	12 volt distribution panel
6	Furnace control	15	Furnace	26	Digital clock
7	Air conditioner control	16	Water pump	27	Battery No. 1
8	Roof locker light	17	Central control panel		
9	Bathroom light	18	12 volt 15 amp fuse		
		19	Galley roof locker light		
		20	Step light		

12 Volt Electrical (29 & 31 Ft. Center Bath)

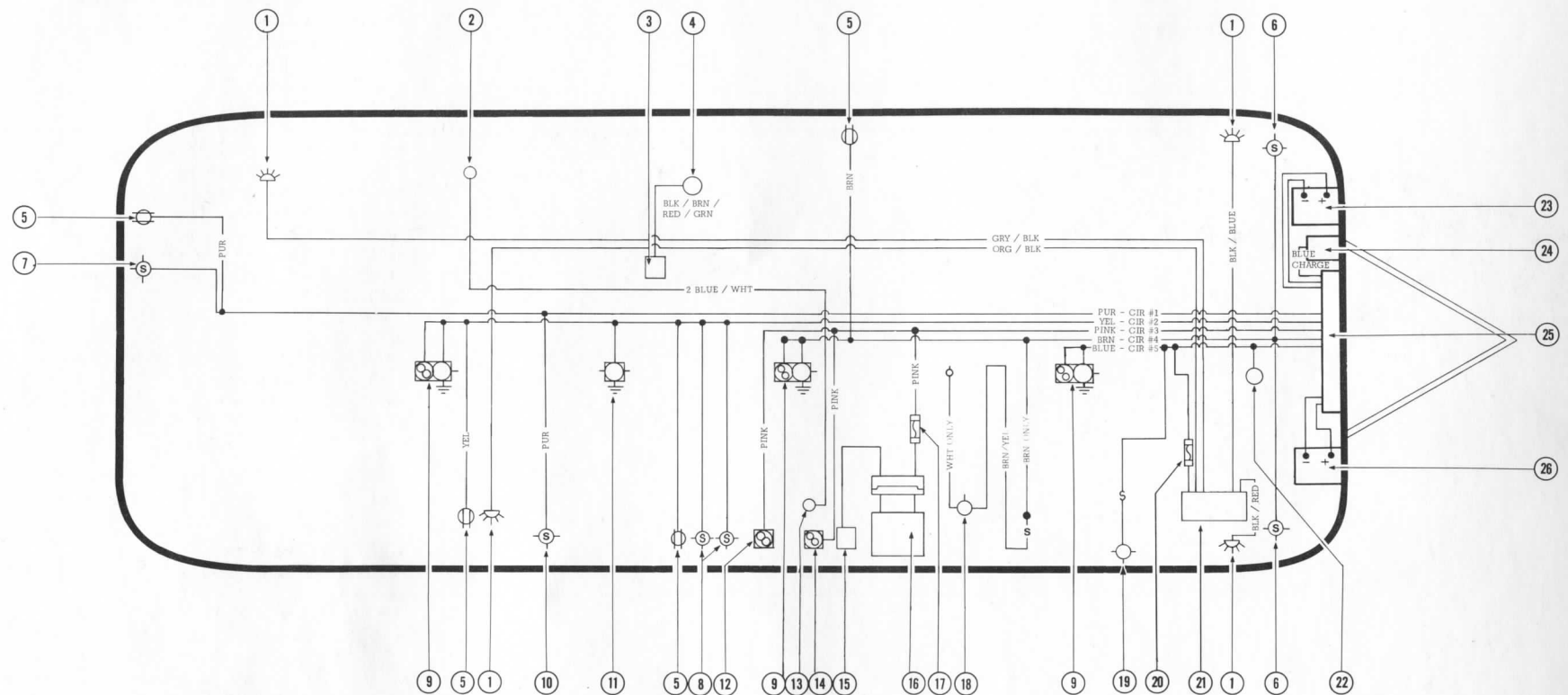


Fig. 12

No.	Description	No.	Description	No.	Description
1	Speaker	10	Compartment light	21	Radio/stereo
2	Furnace control	11	Bathroom exhaust fan	22	Digital clock
3	Air conditioner/heater	12	Range exhaust fan	23	Battery No. 2
4	Air conditioner control	13	Furnace thermostat relay	24	7 way connector plug
5	12 volt outlet	14	Furnace fan	25	12 volt distribution panel
6	Roof locker light	15	Water pump	26	Battery No. 1
7	Bed light	16	Central control panel		
8	Bath light	17	12 volt 15 amp fuse		
9	Ceiling vent & light	18	Step light		
		19	Flood light		
		20	12 volt 10 amp fuse		

Central Control Panel Assembly

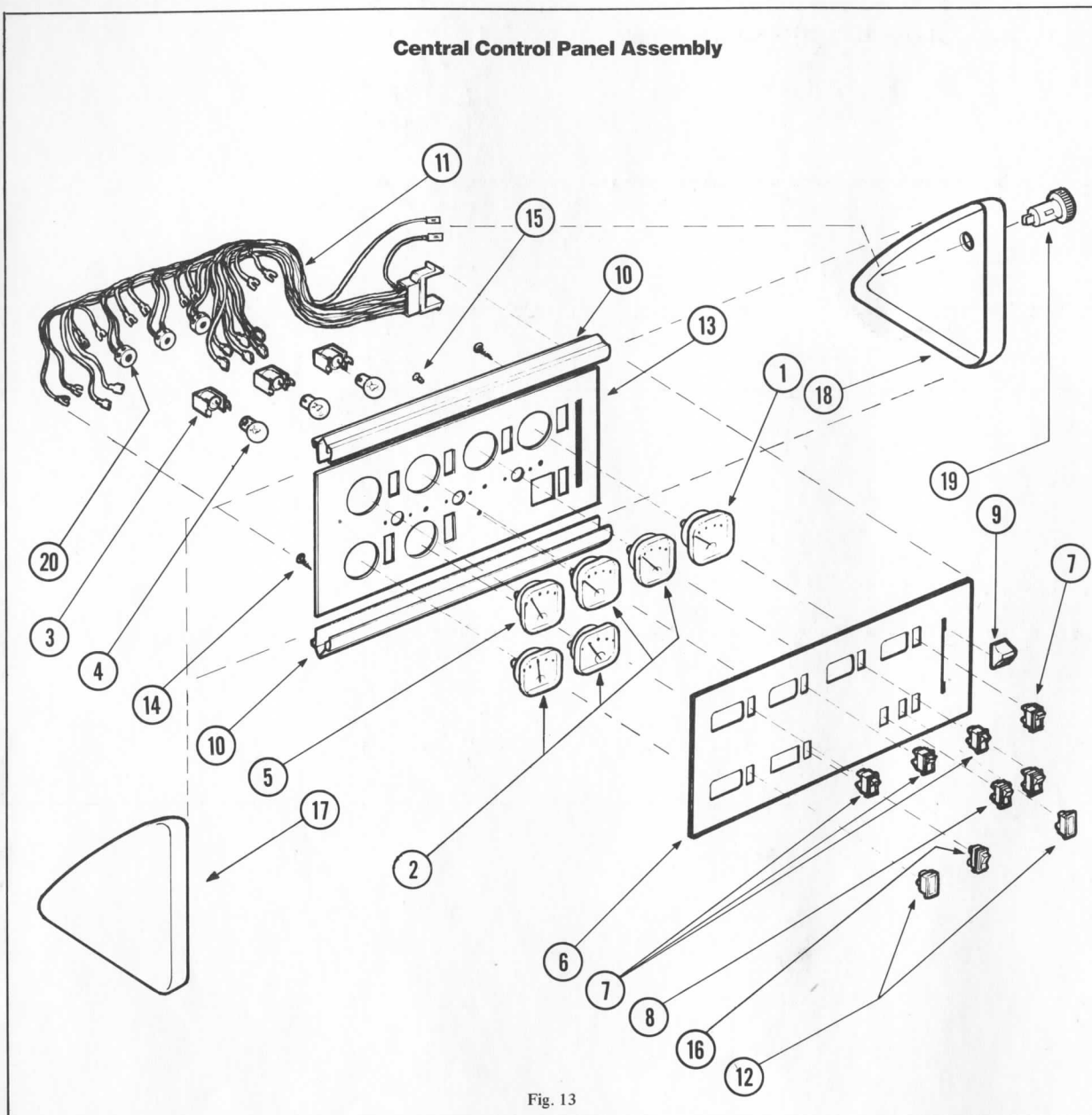


Fig. 13

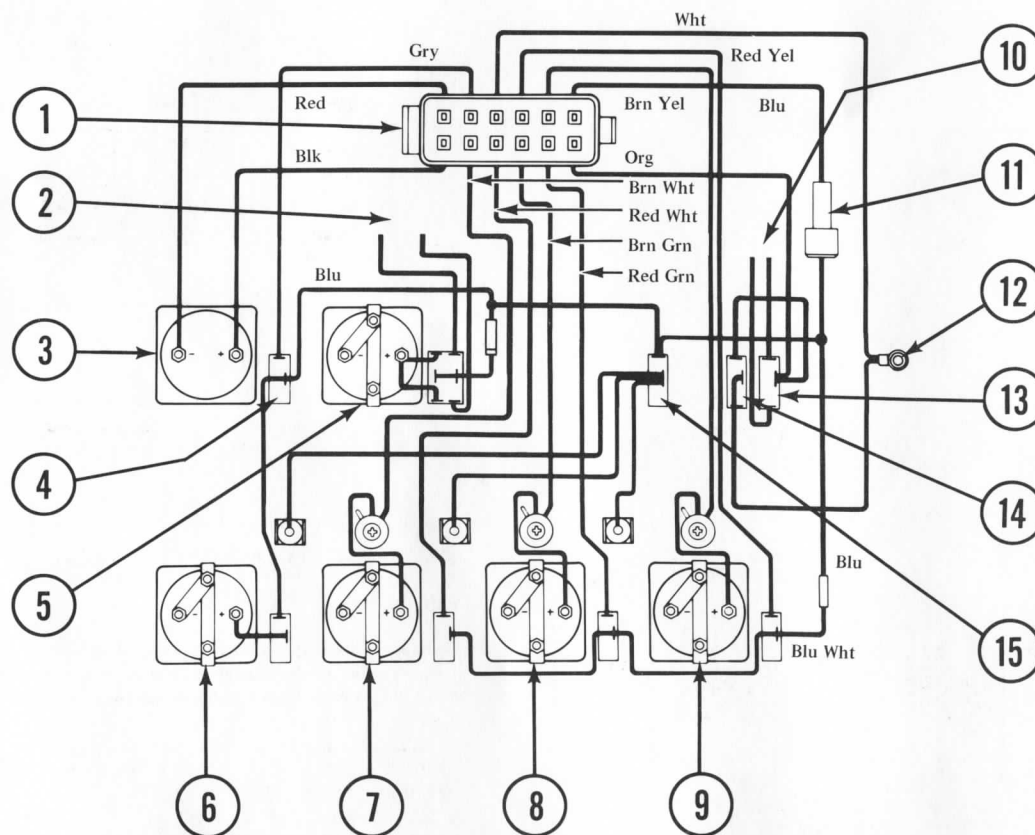
No.	Part No.	Description
	500146	Control panel assembly (U.S.)
	500297	Control panel assembly (Canada)
1	500139	Ammeter
2	500140	Liquid level meter
3	510081	Bulb socket and bracket
4	510082	Bulb No. 53
5	500141	Battery check meter
6	510152	Control panel plate
7	510083	SPST momentary on switch
8	500018	SPST on-off switch
9	201070	Exhaust hood knob
10	100148	Aluminum extrusion
11	510154	Wire harness
	510237	Wire harness with LPG adaptor
12	510080	Indicator light (power on & water pump)
13	101218	Aluminum
14	320006	Screw No. 8 x 3/4"
15	330003	Rivet
16	510264	LPG tank switch DPDT (Excella only)
17	201323	End cap left side
18	201274	End cap right side
19	500134	Fuse holder HKP HH
20	500319	Variable Resistor

Central Control Panel Removal and Replacement

The central control panel located in the galley rooflocker, monitors the battery voltage (battery check), current flowing in and out of battery (ammeter), 120 volt power on (power on light) and liquid levels in the water tank, main holding tank and auxiliary holding tank. The Excella model also includes an L.P.G. level gauge.

1. Remove range exhaust filter (See p. 8-29)
2. Remove four pop rivets and/or screws securing mounting bracket to range exhaust housing.
3. Remove screw and/or pop rivet securing side panel to right side of control panel. Remove wires from fuse.
4. Remove range exhaust handle knob by pulling straight off.
5. Unplug wiring harness.
6. Remove control panel.
7. Reverse procedure for reinstallation.

Central Control Panel Schematic



No.	Description
1	Connector, 12 pm
2	Wires to LPG tanks (Excella only)
3	Ammeter
4	Indicator light – power on
5	LPG tank gauge (Excella only)
6	Battery condition meter
7	Water tank meter
8	Auxiliary holding tank meter
9	Main holding tank meter
10	Wires to water pump
11	Fuse holder
12	Ground wire to panel
13	Water pump switch
14	Indicator light – water pump
15	Panel light

Fig. 14

Water and Holding Tank Wiring Diagram

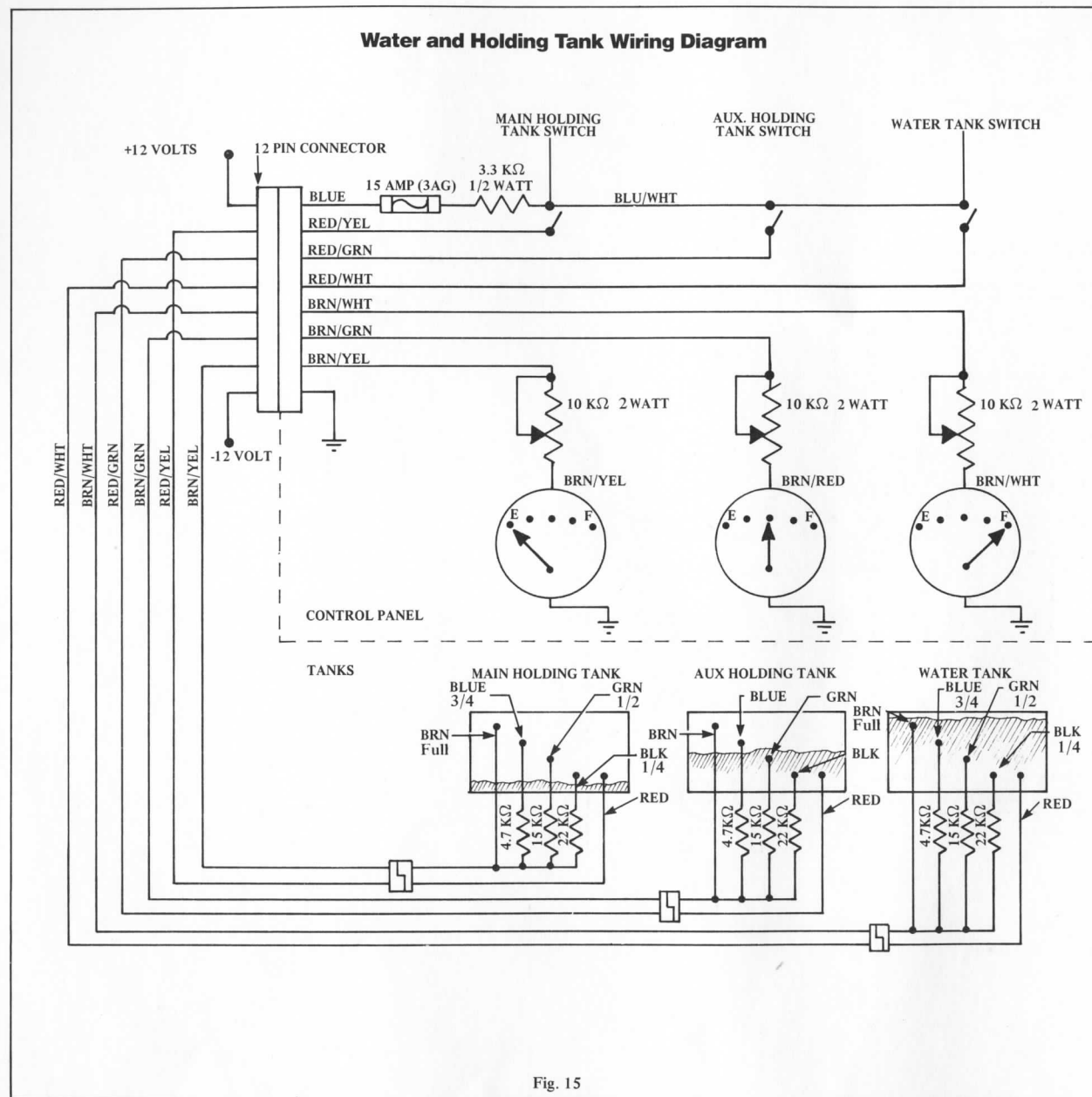


Fig. 15

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

Operation

1. The gauges indicate the amount of liquid in their respective tank. The gauges will indicate in one of five positions when the appropriate rocker switch is pressed.

The needle position may be slightly off the indicated mark due to varying voltage in the Univolt system. With a partially discharged trailer battery the needle would be to the left of dot. A higher voltage would move the needle to the right of the dot. Under these conditions the correct tank level is indicated by the closest dot.

2. Fig. 15 illustrates the amount of liquid in the tanks for each of the five needle positions.

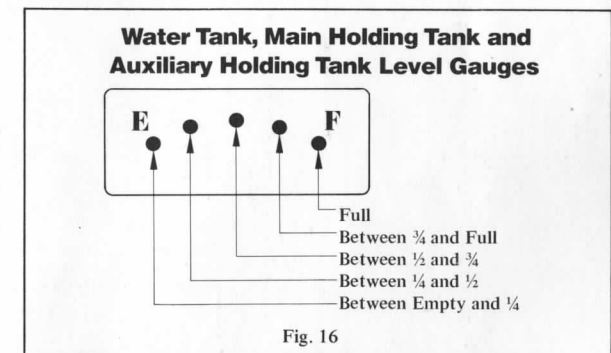


Fig. 16

Water Tank and Holding Tank Gauges

Calibration

1. Periodic recalibration of meters may be necessary. This is due to corrosion, dirt, oxides or mineral deposits on tank probes or the use of very pure water, as from a mountain stream.

2. To recalibrate gauge, connect to city power. Fill the respective tank with water to its maximum capacity. Press switch adjacent to gauge and align gauge needle to the middle of the full dot by turning the adjustment screw. This screw is located in a hole directly below the meter. A non-metallic narrow-bladed screwdriver should be used since the meter is sensitive to a magnetized screwdriver. If a magnetic screwdriver must be used, check gauge needle position after screwdriver is removed from calibration hole.

3. If proper calibration is not obtained, refer to trouble shooting chart for possible causes and remedy.

Principle of Operation

The circuit wires in the tank monitoring system are part of the interior harness assembly. Fig. 15 illustrates the color coding and wire routing for the tank monitoring system.

Each holding and water tank probe and central panel level indicator system is identical. Each system consists of a momentary-on rocker switch, a probe-resistance set, a variable resistor, and a meter.

Each holding and water tank probe and control panel level indicator system is identical. Each system consists of a momentary-on rocker switch, a probe/resistance set, a variable resistor, and a meter.

1. The momentary-on switch, when pressed, completes the circuit to the common probe of the tank being tested.
2. The probe/resistance set for each tank consists of a common probe and probes at the 1/4 level, 3/4 level and full level. The 1/4, 1/2 and 3/4 level probes each have a resistor in series and each are in parallel to each other and to the full level probe. See chart for resistor color codes.
3. The liquid in the tank completes the electrical circuit between the common probe and the other submerged probes. There is no current flow between the rocker switch and the gauge when the liquid is below the 1/4 probe. As the liquid covers subsequent higher level probes, the resistance between the rocker switch and gauges decrease thus increasing the current flow. The increased current flow positions the gauge needle to the next highest indicator mark.
4. Examples of three of the five positions are shown in Fig. 15 In the main holding tank example, the liquid level is below the 1/4 level probe. No current can flow between the common probe and other probes. Therefore, the gauge needle remains on empty.
5. In the auxiliary tank example, the liquid level completes the electrical path between the common probe and the 1/4 level probe and between the common probe and 1/2 level probe. This places two resistors in parallel, decreasing the resistance, thus increasing the current. The increased current increases the gauge needle position.
6. In the example shown on the water tank, all probes are submerged. The path of least resistance is between the common probe and full level probe. The decreased resistance results in increased current and the gauge needle deflection to the full mark.

Testing

The control panel's circuit may be tested independent from the tank's probe system. This may be completed in the trailer or on the bench.

1. Disconnect the 12 pin connector.
2. Connect +12 volt and -12 volt leads to the pins of the blue and white

wires respectively. Care must be taken to prevent contact to adjacent pins.

3. Place a 2.2 K Ω resistor between the pin to the rocker and the pin to the variable resistor of tank to be tested. The 2.2 K Ω resistor simulates the liquid resistance in the tank.
(Example: When checking the auxiliary holding tank, place resistor across pin of the brown/green wire and the red/green wire.)
4. The needle should indicate full. The variable resistor may have to be calibrated. If the gauge does not indicate full, see trouble shooting chart for possible cause and remedy.

Removal of Components

1. The switches are removed by compressing the switch retention tabs. This is accomplished with a screwdriver or pliers from the back side of the panel. The switch can then be pushed out the forward side of the panel.
2. In order to replace the variable resistor and level indicator gauges, the plastic face plate must be removed.
 - a. Remove wire harness leads from switches and power on light.
 - b. Remove top horizontal extrusion by drilling out two "pop" rivets from rear of panel.
 - c. Lift face plate with switches attached from lower extrusion.
3. The gauges can now be removed by removing mounting bracket from rear of panel.
4. The variable resistors are secured with bent-over tabs which must be straightened for resistor's removal.

Switch Removal and Replacement

1. Remove control panel for access to back side of panel.
2. Remove wires from switch.
3. Depress switch's retaining flanges towards body of switch and push switch out the front of the panel.

Ammeter, Battery Condition and Fluid Level Meter Removal and Replacement

1. Remove control panel for access to back side.
2. Remove wires from gauge.
3. Remove nuts on back side of meter
4. Push meter out front of panel.

Resistor Color Codes

RESISTORS

Color	1st Digit	2nd Digit	Multiplier
Black	0	0	1
Brown	1	1	10
Red	2	2	100
Orange	3	3	1,000
Yellow	4	4	10,000
Green	5	5	100,000
Blue	6	6	1,000,000
Violet	7	7	10,000,000
Gray	8	8	100,000,000
White	9	9	—
Gold	—	—	.1
Silver	—	—	.01

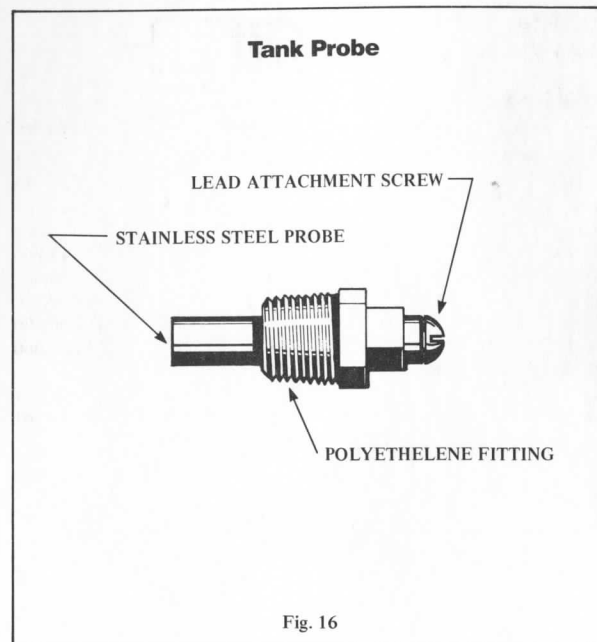
Tolerance Gold $\pm 5\%$ Silver $\pm 10\%$ No band $\pm 20\%$

Example:

Yel, Brn, Red = 4,700 = 4.7K Ω 4.7 K Ω
 Brn, Grn, Org = 15,000 = 15K Ω 15 K Ω
 Red, Red, Org = 22,000 = 22 K Ω

Formulas

Ohm's Law (DC Circuits) E = Voltage in Volts I = Current in Amperes P = Power in Watts R = Resistance in Ohms			
Unknown Value	Formulas		
E	E = IR	E = $\frac{P}{I}$	E = PR
I	I = $\frac{E}{R}$	I = $\frac{P}{E}$	I = $\frac{P}{R}$
P	P = EI	P = $\frac{E^2}{R}$	P = I ² R
R	R = $\frac{E}{I}$	R = $\frac{E^2}{P}$	R = $\frac{P}{I^2}$
Series R ₁ = R ₁ + R ₂ + R ₃ ... etc.			
Parallel R ₁ = $\frac{1}{\frac{1}{R} + \frac{1}{R} + \frac{1}{R} \dots \text{etc.}}$			
Two resistors in parallel R ₁ = $\frac{R_1 R_2}{R_1 + R_2}$			



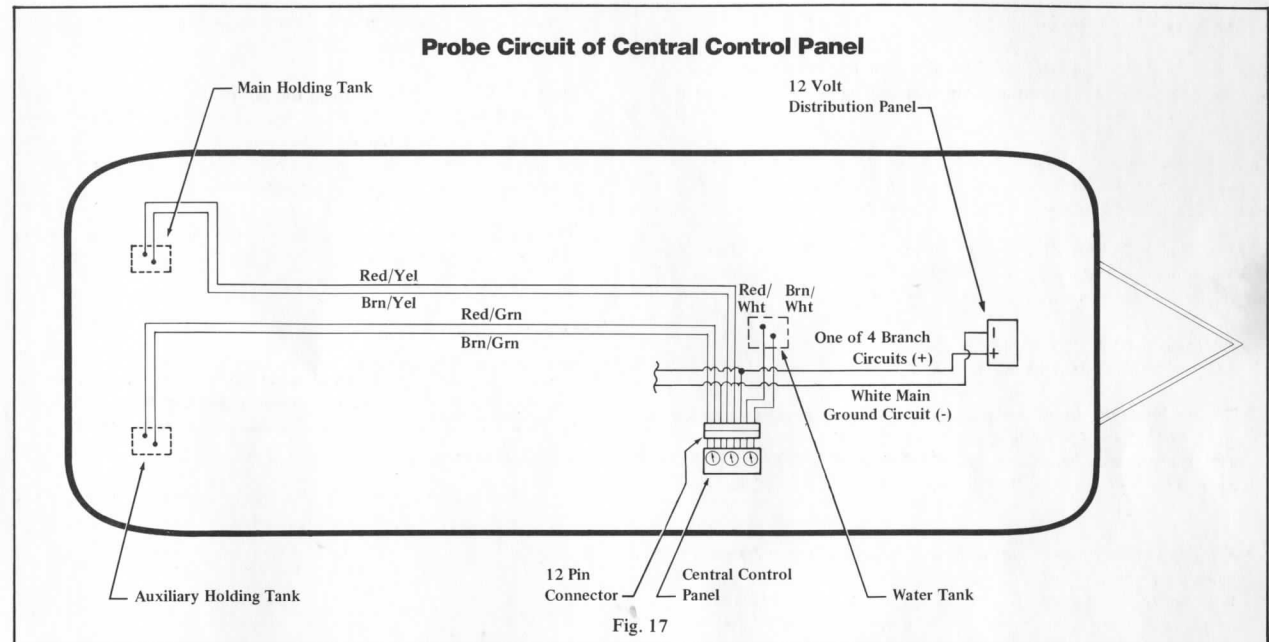
Tank Probe

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 1/4, 1/2, 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. The variable resistor in the control panel can be recalibrated to compensate for some increased resistance. 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 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 counter clockwise. The probe body has a square head for an open end wrench.

Testing

1. First isolate the problem to either the probe area or the control panel circuitry.
 - a. Disconnect the tank probe assembly at the molded connector.
 - b. Place a 2.2 K Ω resistor across the pin and socket of the trailer's half connector.
 - c. Press rocker switch and observe reading.
2. If reading is on full mark or can be calibrated to full mark, the control panel circuitry is within specification, thus indicating the problem is in the probe area.

3. Check continuity and resistance values for a possible open.

4. Refer to wiring diagram (Fig. 17) to insure each lead is connected to the proper probe.

L.P.G. Tank Gauge of Central Control Panel (Excella)

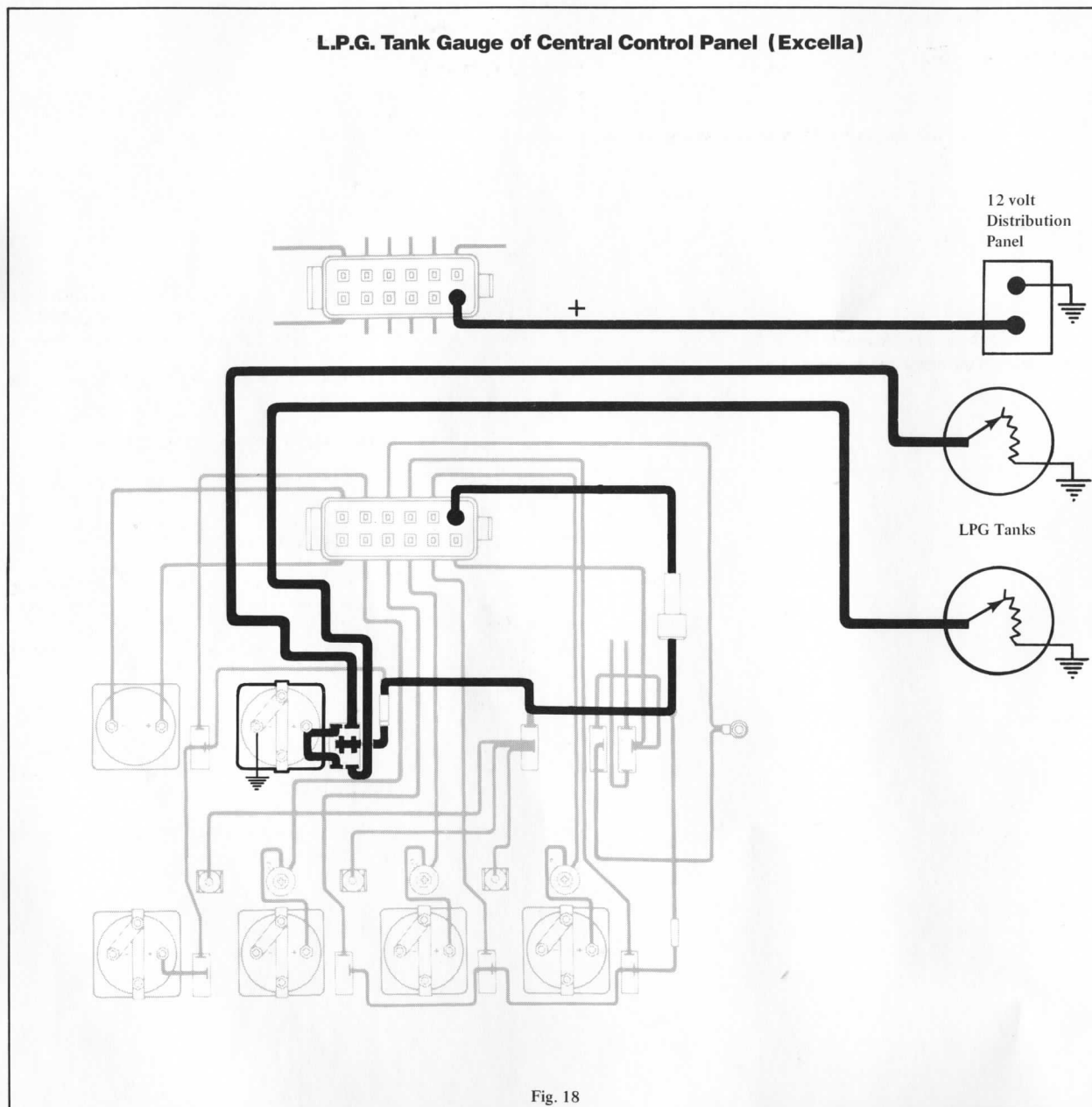


Fig. 18

L.P.G. Gauge (Excella)

The L.P.G. gauge indicates the amount of liquid in each tank.

Operation

1. To check the level, move the tank selector switch toward the tank to be tested. The switch is located on the end shell under the front window behind the L.P.G. tanks.
2. Press the test switch, located on the Central Control Panel, and read the amount of liquid in the tank.

This gauge will indicate any quantity between empty and full. It is calibrated at the factory and needs no further adjustment.

Removal

Removal of L.P.G. gauge is identical to removal of the level indicator gauges explained in "Removal of Component" paragraph of the "Water and Holding Tank Gauge Section."

Troubleshooting

1. Before you do anything else, first check for defective wiring or grounds as this is the most common cause of gauge failures. Inspect all wiring and terminals. Also look for corrosion on tank ground connection. (Check tightness of gauge mounting screws.)
2. If pointer in receiver does not move when switch is turned on, check to see that current is actually being carried from the switch to the Right Hand Terminal on the receiver. Also, check to see that paint or corrosion does not prevent the receiver case from making proper ground. If pointer still does not move, receiver is defective and must be replaced.
3. If pointer swings to extreme right hand side of dial, check connection from Left Hand Terminal on receiver to Terminal on sender. Also, check to see that the gauge head of sender capsule is properly grounded. **CAUTION:** Do not allow pointer to remain at extreme right, without all the circuit resistance functioning, a receiver coil may burn out in a few moments. If the pointer does not properly position itself, the sender coil may be burned out or wiper contact point may not be making contact with the resistance coil. Short across from sender Terminal to the sender capsule bezel and pointer should return to empty. If it does, then the trouble is in the sender capsule and it should be replaced.
4. However, if the pointer still does not return to empty, grounding may not be complete from the Left Hand Terminal on the receiver. To be sure, ground this terminal directly to the ground. If pointer still does not return to empty, the receiver has an open circuit and the receiver must be replaced.
5. If receiving meter is not accurate with sender capsule, check the receiver to be sure it is the correct voltage.

Ammeter Circuit of Central Control Panel

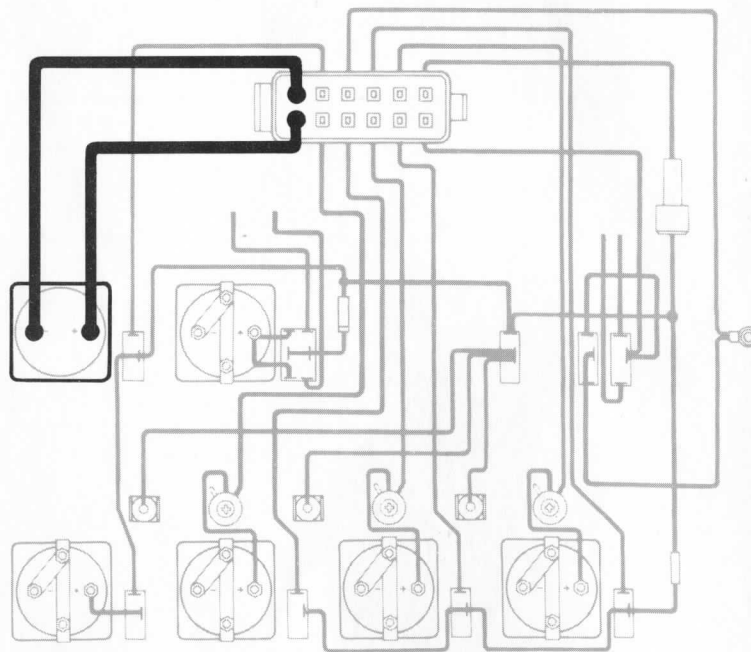
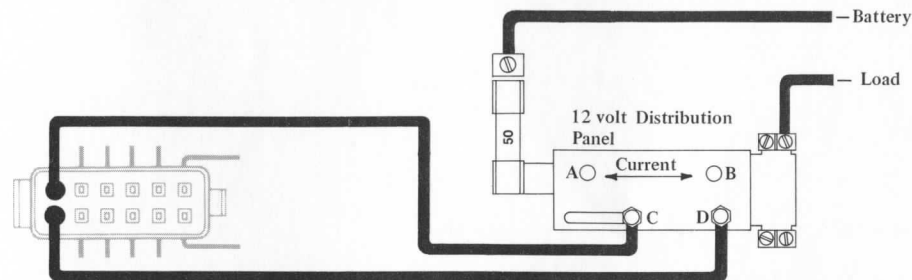


Fig. 19

Ammeter

Operation

1. The ammeter gauge indicates the amount of current flowing into or out of the battery or batteries.
2. Fig. 19 illustrates the ammeter circuit. It consists of the ammeter located in the control panel and an ammeter shunt leaf in the remote 12 volt distribution panel.

Calibration

The ammeter is factory adjusted and should not require adjustment. If necessary, the top end of the scale may be adjusted by relocating stud C in the slot of the ammeter shunt. There is no zero adjustment of the meter.

1. In order to calibrate, place a test ammeter in the positive lead between the battery and the converter.
2. Turn on components in the trailer not exceeding 50 amps.
3. Adjust stud C until the control panel's ammeter indicates the same amount of current as the test meter.

Principle of Operation

All current flowing into or out of the battery must flow through terminals A and B on the shunt leaf. This current flow causes a potential (voltage) difference between studs C and D of the shunt leaf. The voltage difference is placed across the studs of the ammeter gauge in the control panel via the black and red wire, resulting in meter needle deflection.

Removal

Removal of ammeter gauge is identical to removal of level indicator gauges explained in the "Removal of Components" paragraph of "Water and Holding Tank Level Gauge" section.

NOTE: Ammeter DOES NOT indicate condition of battery.

Power On Light Circuit of Central Control Panel

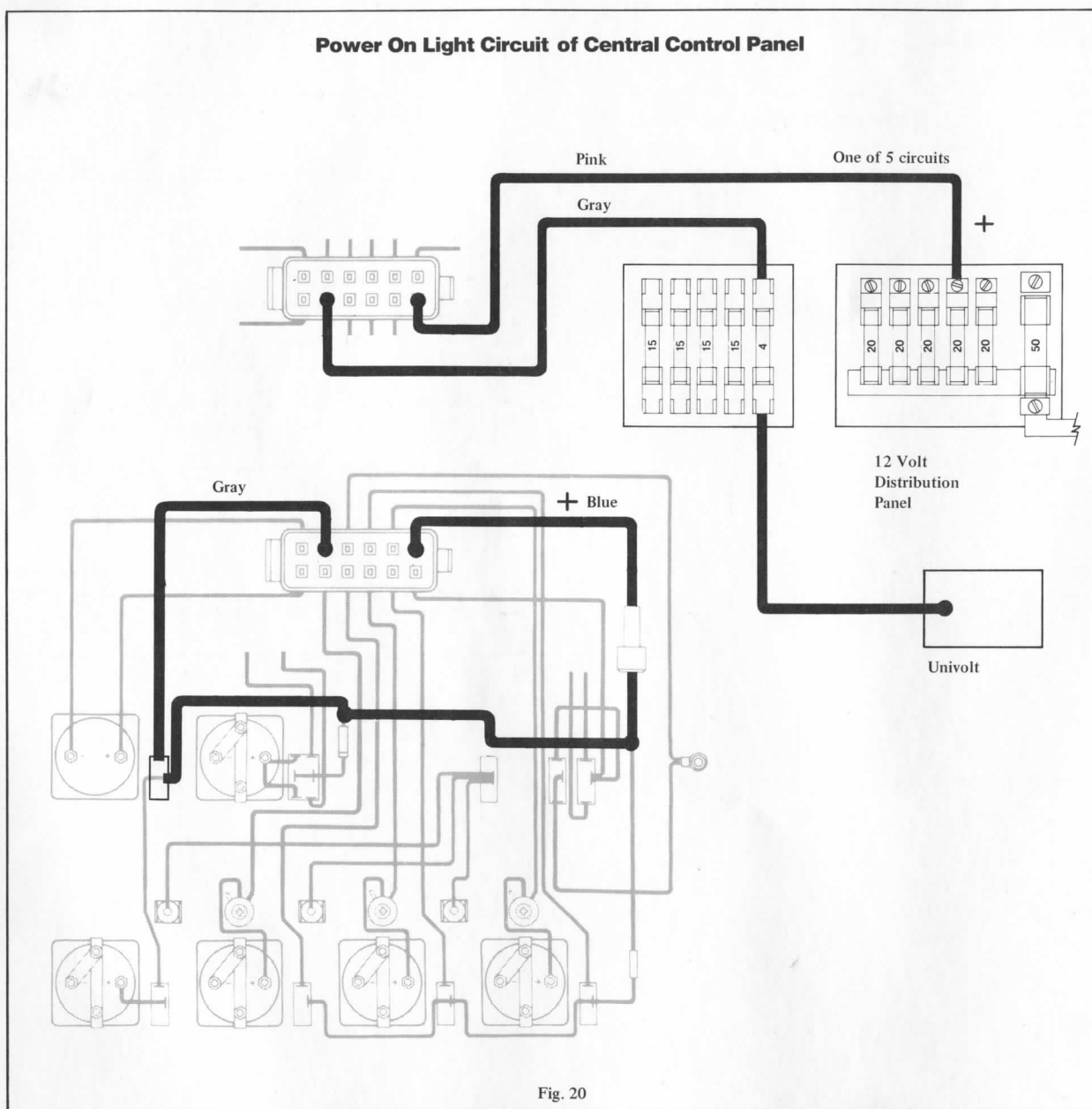


Fig. 20

Power On Operation

The power on light located in the control panel will glow only when the 120 volt city power is connected. One lead of the lamp is connected to the 12 volt (+) positive lead of the control panel. The other lamp lead is connected to the Univolt converter through the remote 120 volt distribution panel.

The circuit is completed to ground only when the converter is on. Since the converter is on only when city power is connected, the power on lamp will be on only when city power is connected.

Removal

The power on light is removed by compressing the light base retention tabs accessible from the rear of the panel. The lamp may then be pushed out the front.

Water Pump Switch and Light

Operation

The on-off switch is in series with the power source to the water pump. The indicator light is in parallel with the water pump circuit. When the switch is depressed to the on position, +12 volts should be present at the pump and the light adjacent to switch should be illuminated.

Removal

Both the water pump switch and water pump lamp are removed by compressing the retention tabs on their bases, accessible from the rear of the panel. They can then be pushed out the front.

Battery Check Meter

The battery check meter is a voltmeter which indicates the voltage in the 12 volt circuit. The purpose of this meter is to measure the voltage of the battery indicating the state of charge, not the Univolt voltage, therefore, the 120 volt city power must not be connected.

Operation

The voltmeter, which is connected in parallel with the 12 volt circuitry is operated by pressing the momentary-on rocker switch.

Removal

Removal of battery condition gauge is identical to removal of the level indicator gauges explained in "Removal of Component" paragraph of the "Water and Holding Tank Level Gauge Section".

Central Control Panel—Trouble Shooting

1. PROBLEM: NEEDLE OF LEVEL INDICATOR GAUGE REMAINS ON EMPTY POSITION

POSSIBLE CAUSE	REMEDY
Fuse Blown	Replace fuse and repair short if it exists.
Open Circuit. There should be continuity between switch and variable resistor with full tank.	Locate poor connection; cut wire and repair (also see probe shooting).
Defective Rocker Switch. There should be continuity between the two terminals of switch when in closed position.	Replace switch.
Defective Gauge. Place gauge, variable resistor and 5.5 K Ω resistor in series and check with +12 volt power source.	Replace gauge.
Probe covered with excessive amount of waste or oxides. Check for continuity between probes.	Remove and clean, or replace probes.
Defective variable resistor. Check for continuity across terminals of resistor. Check resistance between minimum and maximum position (0 – 10K Ω). Maximum resistance should be between 9K Ω and 11K Ω (10K Ω $\pm$ 10%).	Replace variable resistor.
Terminals of the variable resistor contacting (shorted) to control panels frame.	Place electrical insulation between terminals and frame.

2. PROBLEM: NEEDLE OF LEVEL INDICATOR GAUGE DOES NOT LINE UP WITH ONE OR MORE DOTS

POSSIBLE CAUSE	REMEDY
Out of calibration.	Calibrate (p.8-21)
Defective variable resistor (see problem No. 1 above).	Replace variable resistor.
Open circuit on one or more probe leads. Check for continuity.	Repair open or replace probe lead set.
One or more probes covered with excessive amounts of waste or oxides. Check for continuity between probes.	Remove and clean, or replace probes.

Slide valve metallic surface contacting chassis.

High resistance in line. Use ohm meter to locate resistance.

3. PROBLEM: NEEDLE OF WASTE TANK INDICATOR GAUGE DEFLECTS WHEN OTHER WASTE TANK'S ROCKER SWITCH IS DE-PRESSED.

POSSIBLE CAUSE	REMEDY
Both waste tanks slide valves are open and drain cap on. The liquid between tanks provide path for current from common probe of one tank to probes of other tank.	Close dump valve

4. PROBLEM: AMMETER DOES NOT INDICATE

POSSIBLE CAUSE	REMEDY
Defective ammeter.	Replace meter.
Open circuit between shunt leaf in Univolt and meter. Check continuity.	Repair open.
Ammeter shunt leaf is bypassed by incorrect wire hook-up at remote 12 volt distribution panel.	Rewire per Fig.8
Fuse(s) blown in ammeter leads adjacent to remote 120 volt distribution panel.	Replace fuse(s).

5. BATTERY CHECK METER DOES NOT INDICATE

POSSIBLE CAUSE	REMEDY
Rocker switch is defective. There should be continuity between the two terminals of switch when in closed position.	Replace switch
Open circuit. Check continuity to ground and leads to power source.	Repair open.
Defective meter.	Replace meter.
Fuse blown at control panel.	Replace fuse and repair short if it exists.

Reposition slide valve for clearance or place insulator between valve and chassis.

Tighten connection or replace wire or component with high resistance.

6. POWER ON BULB WILL NOT GLOW

POSSIBLE CAUSE	REMEDY
Lamp is defective. Remove leads and check with +12 volt and -12 volt leads.	Replace lamp assembly.
Fuse located in 12 volt distribution panel.	Replace fuse and repair short if it exists.
Univolt's internal circuitry defective. Place 12 volt test bulb across power on terminal of Univolt and + (positive) 12 volt terminal in Univolt. The lamp should glow only when converter is energized with 120 volt power.	Replace Univolt.

7. WATER PUMP LIGHT DOES NOT GLOW WHEN ROCKER SWITCH IS PRESSED

POSSIBLE CAUSE	REMEDY
Switch is defective. There should be continuity between the two terminals with switch in closed position.	Replace switch.
Fuse located in control panel is blown.	Replace fuse and repair short if it exists
Open circuit. Check circuit with continuity meter.	Tighten connection, replace cut wire or component.

Round Light Assembly

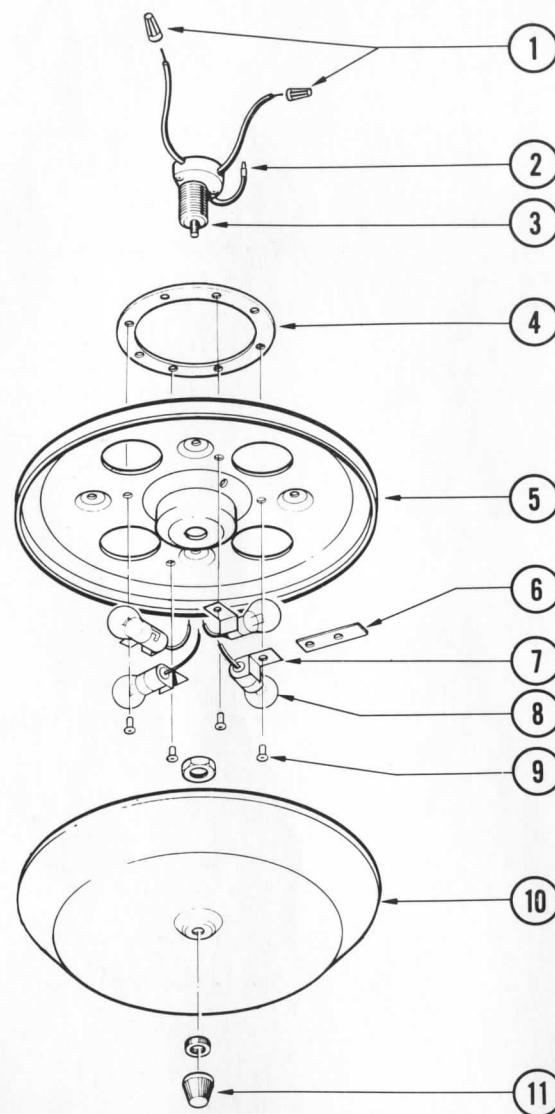


Fig. 21

No.	Part No.	Description
1	500032	Connector, quick
2	600031	Bullet terminal
3	500063	Switch, 3 position
4	101415	Aluminum .032 x 4-3/8 diameter
5	200038	Base, ceiling light
6	100001	Ground strap, aluminum .032 x 1/2" x 1-5/8"
7	500030	Standard base socket w/pig tail
8	500029	Lamp No. 93
9	330020	Rivet
10	200039	Lens, ceiling light
11	380060	Knob, light

Combination Ceiling Light & Vent Assembly

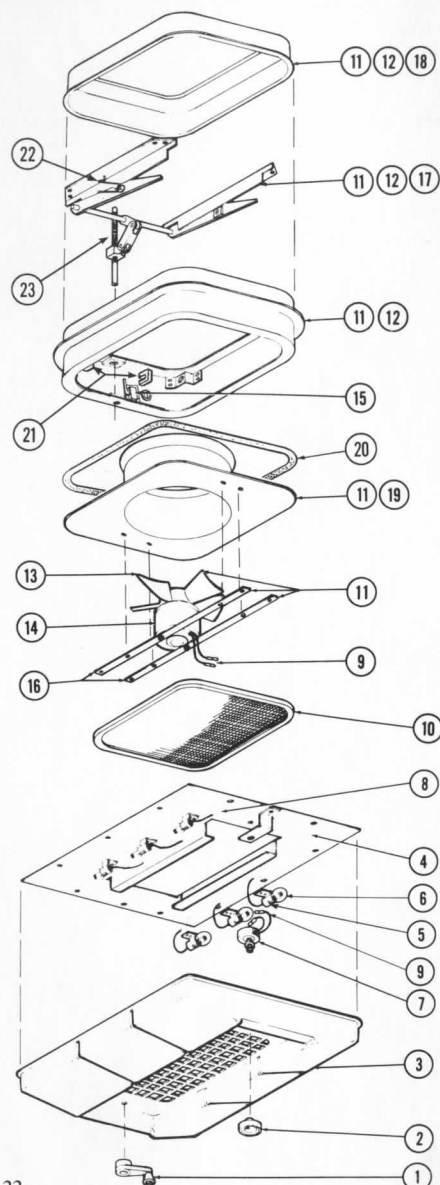


Fig. 22

No.	Part No.	Description
1	510233	Fan crank
2	380306	Knob, light
3	201154	Ceiling light shade
4	510118	Reflector plate assembly with screen
5	500030	Lamp socket
6	500029	Bulb 1141-IF (frosted)
7	510195	Switch, 3 pos.
8	500039	Splice, amp No. 324067
9	500031	Terminal, bullet
10	101129	Screen assembly
11	380232	Vent w/fan motor
12	380233	Vent w.o./fan motor
13	510227	Fan blade
14	510228	Fan motor (U.S.)
	510295	Fan motor (Canada)
15	510229	Fan switch
16	510230	Fan mounting
17	510231	Vent linkage assembly
18	101173	Vent cover
	101176	Vent cover solardome
19	510232	Vent shroud
20	365006	Gasket, vinyl foam tape
21	380638	Support blocks
22	380639	Spring, vent mechanism
23	380640	Elevator screw

Ceiling Light Shade Removal

1. Remove light switch knob by pulling down.
2. Remove nut on switch's shank.
3. Remove screw from vent handle and remove handle.
4. Remove four screws located at edge of center grill.
5. Lower shade.

Bulb Replacement

1. Remove shade to expose bulb and socket assemblies.
2. Apply slight pressure on bulb toward socket and turn counter-clockwise approximately 1/8 turn. Release pressure on bulb and remove bulb.
3. Reverse procedure for installing bulbs.

Light Switch Replacement

1. Remove shade.
2. Remove nut which secures switch to bracket.
3. Cut wires from switch to lamp sockets.
4. Cut and strip leads of new switch and splice to lamp socket leads.

Reflector Plate Replacement

1. Remove shade.
2. Remove 5 screws that secure reflector plate to multidome.
3. Disconnect light leads from harness at the quick disconnect connectors.
4. Lower plate assembly.

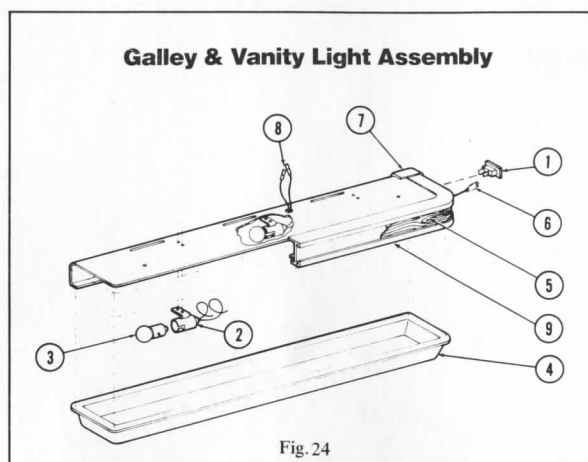
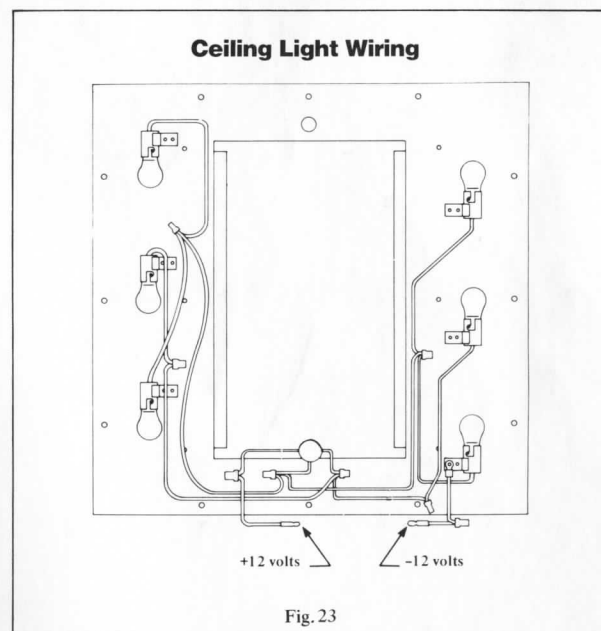
Ceiling Fan Replacement

1. Remove shade.
2. Remove reflector.
3. Remove rivets which secure fan bracket to vent flange.
4. Lower fan motor and shroud assembly.

5. Disconnect fan's wire leads from micro switch and harness at quick disconnect connectors.
6. Remove brackets and fan blade from motor.
7. Reverse steps for re-installation.

Micro Switch Replacement

1. Remove shade, reflector plate and fan/shroud assembly.
2. Remove two oval head screws on body of micro switch which secure it to vent frame.
3. After installing new micro switch, adjust switch's leaf by bending. Fan switch should "close" when vent crank is approximately $\frac{1}{2}$ revolution from full open position.

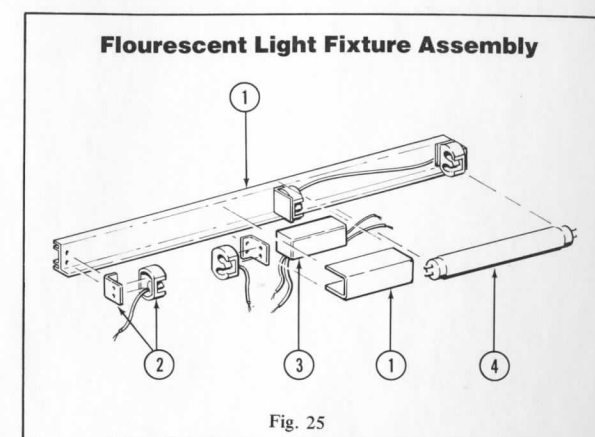


No.	Part No.	Description
	510156	Galley Light Assembly
	510157	Vanity Light Assembly
1	500018	Switch, rocker (white) on-off S.P.S.T. - vanity
2	500030	Lamp socket w/pigtail
3	500029	Lamp 1141
4	200016	Lens
5	*	Laminate .020 - galley
	*	Laminate .020 - vanity
6	500032	Quick connect femme No. 3000 H19AB
7	200003	End cap
8	600031	Terminal, bullet
9	101033	Extrusion - vanity
	100043	Extrusion - galley

*For part numbers of all laminates see page 4-2

Galley & Vanity Light Bulb Replacement

1. Remove screws located at rear of light, both ends.
2. Depress lens in order to snap out of housing.
3. Replace bulb.



No.	Part No.	Description
	952047	Fluorescent light fixture assembly
1	101212	Aluminum base and ballast cover
2	510296	Electrical connector
3	510191	Ballast
4	510142	15 watt fluorescent bulb

Bed Light Assembly

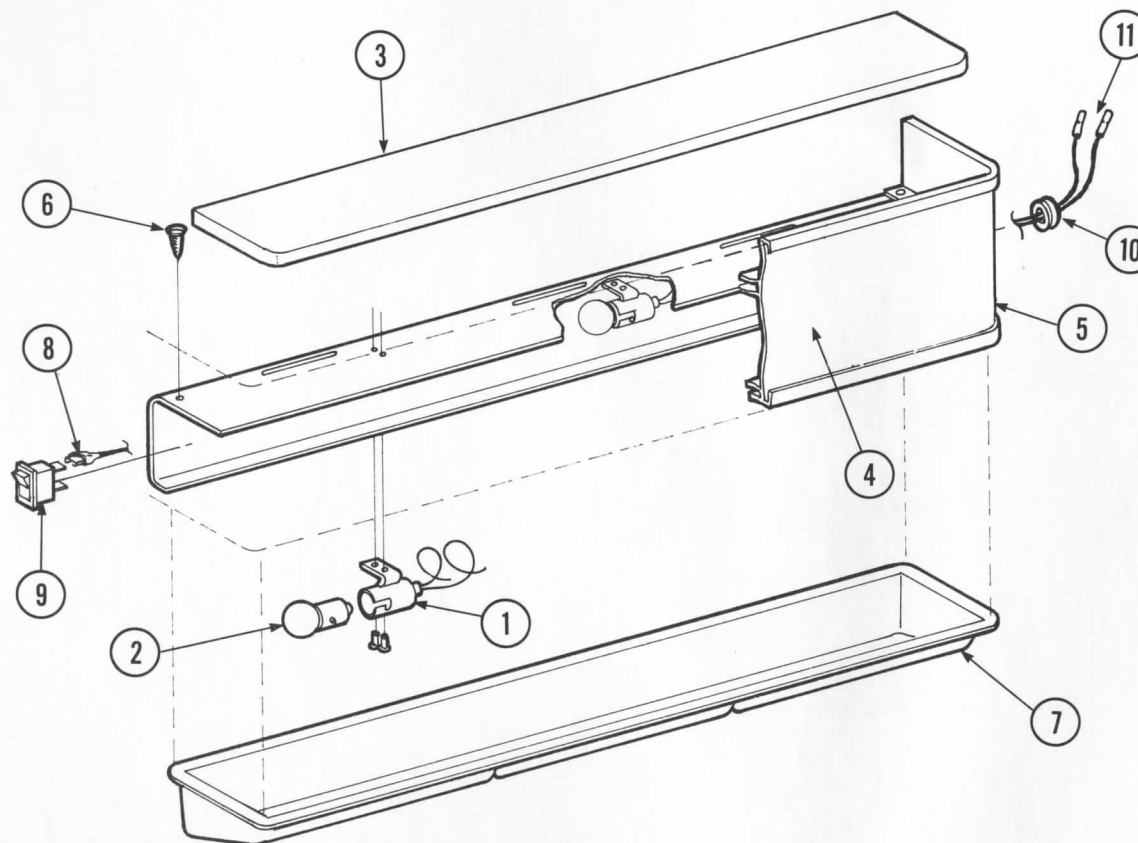


Fig. 26

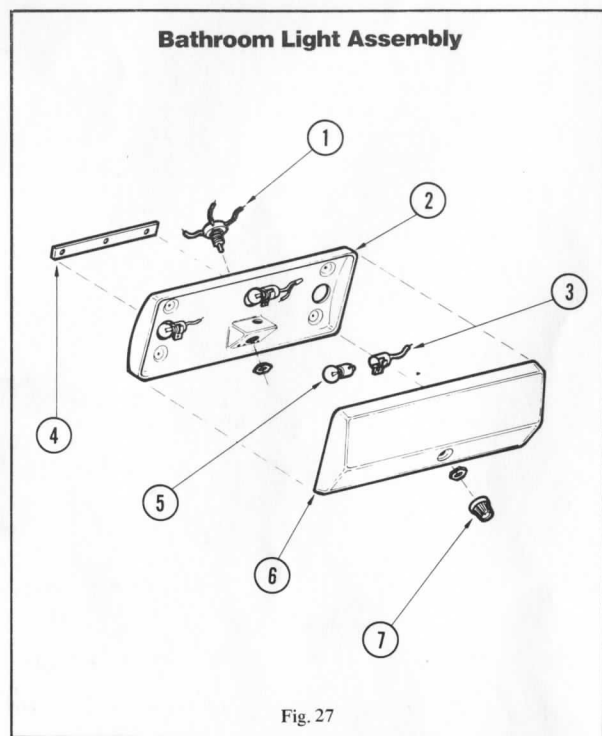
No.	Part No.	Description
	952037	Bed light assembly (curbside)
	952040	Bed light assembly (roadside)
1	500030	Lamp socket
2	500029	Lamp No. 1141
3	*	Laminate 4MM
4	101241	Extrusion alum. shelf light
5	*	Laminate .020
6	320024	Screws No. 8 x 3/4 P.H.
7	200016	Lens
8	500032	Quick connect female terminal
9	500018	Switch, rocker (wht.) On-Off 26-000-100
10	380019	Grommet, Heyco — SB-375
11	600031	Terminal, bullet

*For part numbers of all laminates see page 4-2

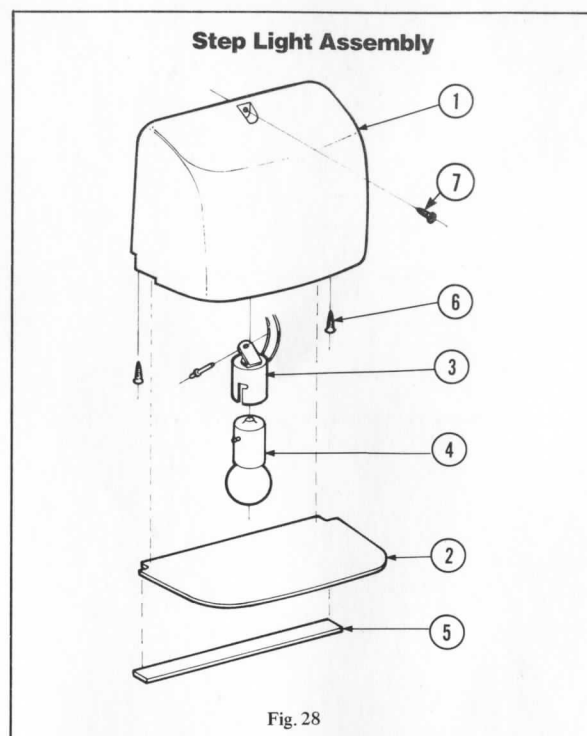
Bulb Replacement

1. Remove screws located on top of the shelf at both ends.
2. Slide right housing approximately 1/2 inch away from partition.
3. Depress lens in order to snap out of housing.
4. Replace bulb.

NOTE: International Center Bath double bed reading light not shown, Part No. 510106



No.	Part No.	Description
	500027	Bathroom light assembly
1	510021	Switch, 3 pos.
2	200041	Base
3	500030	Lamp socket with pigtail
4	—	Ground strap
5	510184	Bulb, GE No. 93
6	200043	Lens
7	380060	Knob



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 — 6-1/8"
6	320038	Screw No. 6 x 1/2" P.H. Phillips
7	380225	Screw No. 6 x 3/4 stainless steel

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.

Range Exhaust Hood Assembly

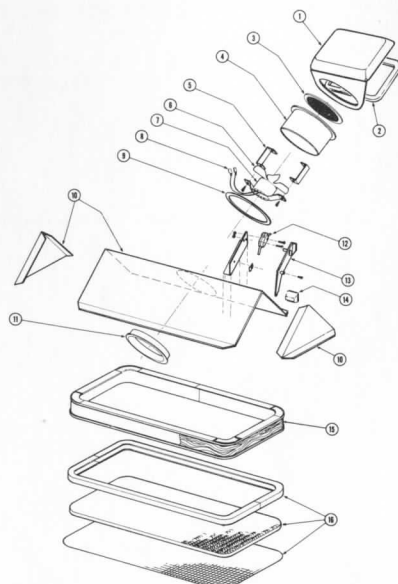


Fig. 29

No.	Part No.	Description
1	510156	Vent shroud
2	365004	Gasket, vinyl foam tape
3	380630	Screen
4	380631	Fan shroud
5	510228	Motor bracket
6	510231	7 in. fan blade
7	600060	Fan motor
8	380239	Bullet terminal 51372
9	510233	Foam tape ring
10	690024	Hood housing
11	100043	Flange
12	510232	Fan motor switch
13	380240	Vent linkage assembly
14	201070	Knob, exhaust hood
15	510227	Vinyl laminate trim piece
16	690083	Filter assembly

Filter Removal and Cleaning

1. Remove two screws which secure filter assembly to housing.
2. Lower filter.
3. Clean filter by soaking in soapy water and rinse with hose. Air dry.
4. Reverse procedure for installation.

Micro Switch Removal and Replacement

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

1. Remove filter.
2. Remove screws securing housing to underside of roof locker.
3. Lower vent assembly.
4. Disconnect quick disconnect connectors at harness.
5. Reverse procedure for installation.

Digital Clock Trouble Shooting

1. DISPLAYS DO NOT APPEAR

POSSIBLE CAUSE	REMEDY
Low or no power	Check trailer and clock leads for power
Dirty switches	Turn clock switch on and off 10-20 times to clean contacts.

2. DISPLAYS ERRATIC OR SKIP WHEN SETTING

POSSIBLE CAUSE	REMEDY
Dirty switches	Press switch back and forth to clean contacts

3. DISPLAYS CONTINUALLY COUNTING EVEN WHEN SWITCH IS NOT DEPRESSED

POSSIBLE CAUSE	REMEDY
Switch stuck externally	Check to make sure faceplate is not rubbing on switch

Switch stuck internally	Press switch back and forth
-------------------------	-----------------------------

4. CLOCK DOES NOT KEEP TIME WHEN DISPLAY IS TURNED OFF

POSSIBLE CAUSE	REMEDY
Low or no power	See A-1. Have batteries been disconnected at any time without other power available? Any split second loss of power will void previous time set and correct time must be re-set.

5. DISPLAYS NOT BRIGHT

POSSIBLE CAUSE	REMEDY
Low power	Check battery level. Check for loose connections.

Vacuum Cleaner Assembly

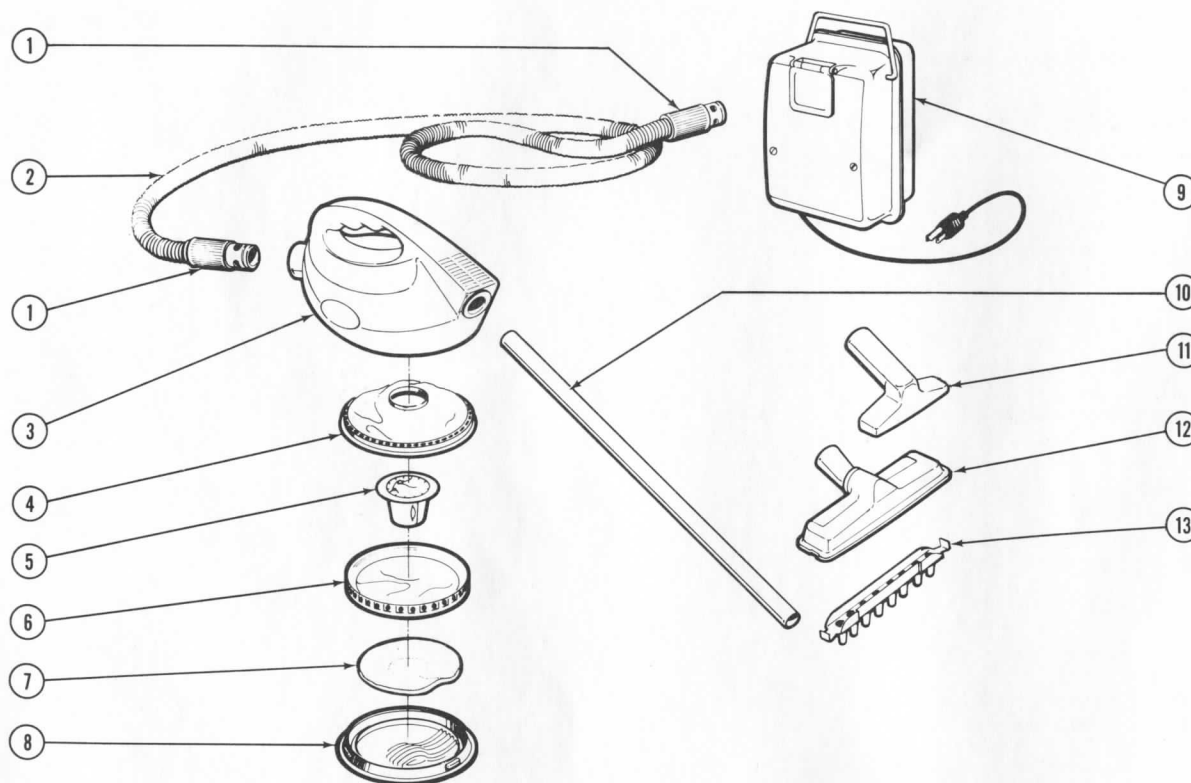


Fig. 30

No.	Part No.	Description
—	690037	Complete assembly — vacuum cleaner & kit
1	1-577	Hose end
2	1-578	Hose, 20 ft.
3	1-396	Dust bubble housing
4	1-392	Upper cloth filter
5		Disposable paper filter
6	1-387	Lower cloth filter
7	1-386	Foam secondary filter
8	1-389	Dust bubble lid
9	1-499P	Power pack assembly
10	1-596	Wand
11	1-591	Upholstery tool
12	1-588	Rug tool
13	1-593	Shag tool

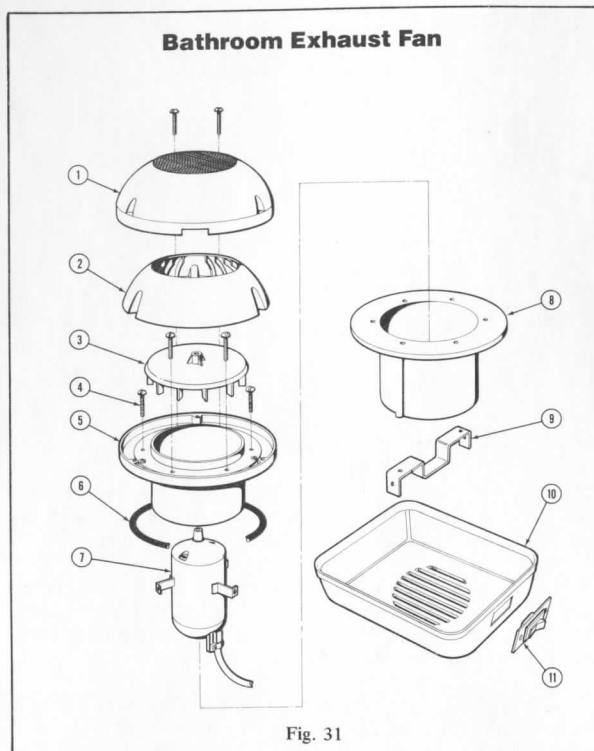
Vacuum Cleaner Operation

To start the unit, raise the flap on the outlet and insert the hose with a slight twist. Make sure the dust bubble is connected to the hose before using. To stop the unit, simply remove the hose from its outlet.

To open and empty the dust bubble, hold it over a trash container and twist the lower lid carefully. Tap the two halves to release any dirt trapped on the filters. The dust bubble can also be rinsed out after removing both upper and lower filters.

To remove the filters, remove the lid and grasp the large outer red ring in the upper half of the bubble. Pull it gently toward you until free. Lift out the small inner red ring from the center of the bubble. Remove the lid filter ring by pulling gently. To reposition the filters reverse this procedure. When properly positioned, the large outer red ring should rotate freely on the flange.

Do not disassemble the power pack for repairs, it must be serviced by the manufacturer.



No. Part No. Description

1	490 2002-00/7	Ventilator cover
2	490 2031-00/6	Air guide
3	490 2033-00/2	Fan
4	729 5342-42/7	Screw RxS B8 x 12 — acid proof steel
5	490 2030-00/8	Motor frame
6	490 2026-00/6	Packing
7	960 5101-00/6	Motor, 12V
8	101482	Fan spacer
9	101483	Mounting bracket
10	201327	Interior cover
11	380 0329-00/9	Rocker Switch

Bathroom Exhaust Fan Removal and Replacement

1. Working from the outside top of trailer, remove the 3 screws holding the stainless steel fan protective cap, and remove the cap.
2. Remove the 6 screws securing the fan flange to the outer skin of the trailer.
3. Pull the fan out to the extent of the wiring harness and unplug the harness.
4. Remove the fan assembly. The fan inner protective shroud is now loose and may also be removed if necessary.
5. To install, reverse the removal procedures.

Entertainment Center (Electrical)

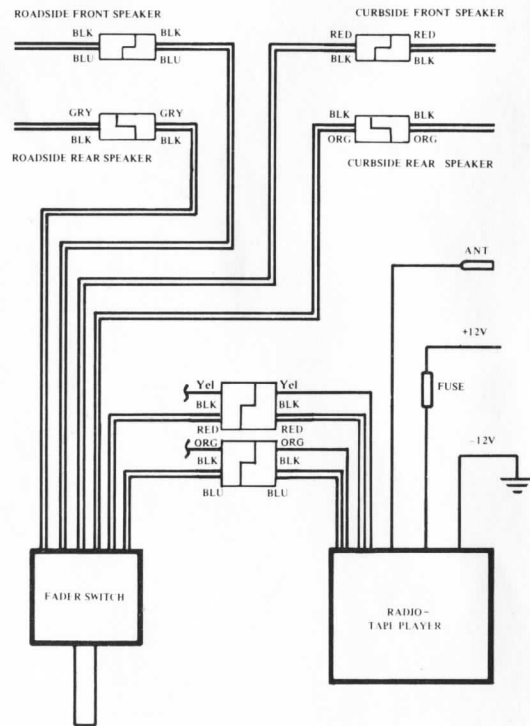


Fig. 32

Entertainment Center Removal and Replacement

1. Open the entertainment center door and tilt forward as far as possible.
2. Reach inside and release door latch so the center can fold all the way down.
3. Disconnect electrical connections.
4. Remove screws mounting entertainment center to door.
5. Remove entertainment center.
6. To install, reverse removal procedures.

Fader Switch Removal and Replacement

1. Remove cabinet side to gain access to back of fader switch.
2. Unplug harness.
3. Remove knob.
4. Remove nut.
5. Remove fader switch.
6. Reverse procedure for reinstallation.

Face Plate (Plastic) Removal and Replacement

1. Remove knobs and nuts from switches.
2. Face plate is flexible and can be bowed sufficiently to remove from extruded aluminum top and bottom trim.
3. Reverse procedure for reinstallation.

Radio Antenna Installation

1. Location of antenna should be made on road side 5" from edge of window frame and 5" up from bottom of window. (See Fig. No. 33.)
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 "d", to gain access to the lead-in wire.

Radio Antenna Trimming

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

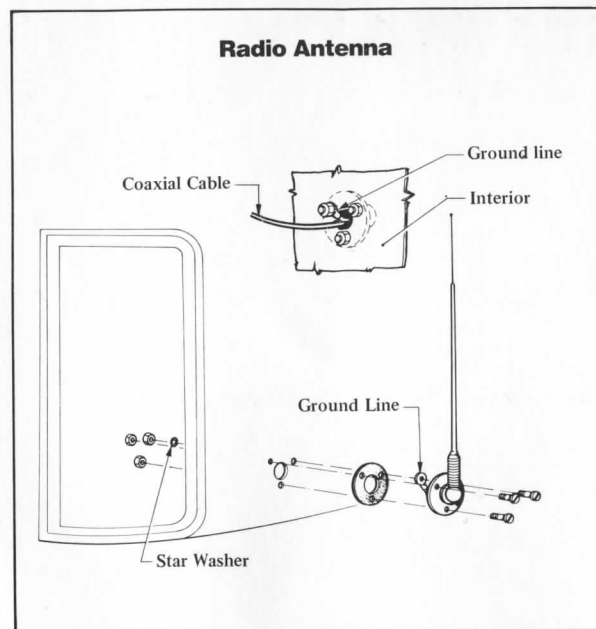


Fig.33

Radio Antenna

No.	Part No.	Description
1	500076	Radio antenna w/lead

Optional Component Wire Location

OPTIONAL COMPONENT	CURBSIDE FRONT SPEAKER FWD. STA. O	ROADSIDE FRONT SPEAKER FWD. STA. O	ROADSIDE REAR SPEAKER AFT OF STA. O	CURBSIDE REAR SPEAKER AFT OF STA. O	CURBSIDE FLOODLIGHT FWD. STA. O	CURBSIDE FLOODLIGHT SWITCH FWD. STA. O	AIR CONDITIONER SEE PAGE 119 AFT OF STA. O	ROADSIDE AIR CONDITIONER THE MOST AFT OF STA. O	REAR CEILING FAN AFT OF STA. O	CENTER CEILING FAN AFT OF STA. O	FRONT CEILING FAN AFT OF STA. O	12 VOLT OUTLET BEDROOM AFT OF STA. O	STEPLIGHT AFT OF STA. O	CURBSIDE STEPLIGHT SWITCH AFT OF STA. O	DIGITAL CLOCK FWD. OF STA. O	BATH EXHAUST FAN AFT OF STA. O
21 FT. "D"	15 47	15 47	96 55	128 55	6 51	5 46	73½ C.L.	41 69	109 C.L.	Not Avail.	20 C.L.	52 RS 55	36½ 69	22 39	24 60	138 (3) —
23 FT. "T"	15 47	15 47	134 58	134 58	6 51	5 46	96 C.L.	18 69	135 C.L.	59 C.L.	7 C.L.	107 RS 37	36 69	22½ 39	24 60	162 (3) —
23 FT. "D"	15 47	15 47	134 58	134 58	6 51	5 46	96 C.L.	18 69	135 C.L.	59 C.L.	7 C.L.	107 RS 37	36 69	22½ 39	24 60	162 (3) —
25 FT. "T"	15 47	15 47	145 55	145 55	6 51	5 46	106 C.L.	31 69	144 C.L.	67 C.L.	7 C.L.	122 RS 38	36½ 69	21 39	27 60	185 (3) —
25 FT. "D"	15 47	15 47	115 55	159 55	6 51	5 46	106 C.L.	28 69	144 C.L.	67 C.L.	7 C.L.	131 RS 38	36½ 69	21 39	27 60	185 (3) —
25-2 "T"	12 46	12 46	80 57	126 58	6 50	4 46	101 C.L.	72 66	160 C.L.	67½ C.L.	12 C.L.	80 RS 50	22 68	39 39	27 60	192 (3) —
27 FT. "T"	15 47	15 47	125 55	133 55	6 52	4 48	101 C.L.	48 56	180 C.L.	67½ C.L.	81½ C.L.	143 RS 37	36½ 69	22 39	26 60	198 (3) —
27 FT. "D"	15 47	15 47	132 56	170 56	6 51	4 46	101 C.L.	80 56	180 C.L.	67½ C.L.	8½ C.L.	147 RS 32	36½ 69	22 39	26 60	198 (3) —
29 FT. "T"	15 47	15 47	138 55	138 55	6 51	5 46	101 C.L.	82 56	202 C.L.	65 C.L.	6 C.L.	149 RS 37	36½ 69	21 24	24 60	222 (3) —
29 FT. "D"	15 47	15 47	201 55	156 55	6 51	5 46	118 C.L.	104 56	202 C.L.	83 C.L.	7 C.L.	170 RS 38	52½ 69	34 40	24 60	222 (3) —
31 FT. "T"	15 47	15 47	201 55	201 55	6 51	5 46	113 C.L.	106 56	227 C.L.	81 C.L.	7 C.L.	171 RS 38	52½ 69	35 40	24 60	246 (3) —
31 FT. "D"	15 47	15 47	157 55	201 55	6 51	5 46	113 C.L.	106 56	227 C.L.	81 C.L.	7 C.L.	171 RS 38	52½ 69	35 40	24 60	246 (3) —
29 FT. "T" CB	15 47	15 47	234 52	234 52	6 51	5 46	102 C.L.	80 56	174 C.L.	65 C.L.	6½ C.L.	51 55	39 69	22 39	26 60	173 (4) —
29 FT. "D" CB	10 51	10 51	234 51	234 51	6 51	5 46	102 C.L.	79 56	204 C.L.	65 C.L.	6½ C.L.	51 47	39 69	22 39	24 60	173 (4) —
31 FT. "T" CB	10 51	10 51	258 51	258 51	6 51	5 46	121 C.L.	104 56	228 C.L.	84 C.L.	8½ C.L.	74 47	55 69	34 39	24 60	197 (4) —
31 FT. "D" CB	15 47	15 47	250 52	258 52	6 51	5 46	121 C.L.	104 56	228 C.L.	84 C.L.	8½ C.L.	74 55	55 69	34 39	26 60	197 (4) —

FROM
STATION
"O"
HEIGHT
FROM
FLOOR

1. DIMENSIONS SPECIFIED ARE DRILL POINTS FOR WIRE LOCATION.
2. TERMINAL LOCATIONS IN CEILING ON TRAILER CENTERLINE (C.L.)

3. DIMENSIONS ARE 4" ROADSIDE OF C.L.
4. DIMENSIONS ARE 21" CURBSIDE OF C.L.

Manual T.V. Antenna Assembly

Antenna head

Trailer front

Fig. 34

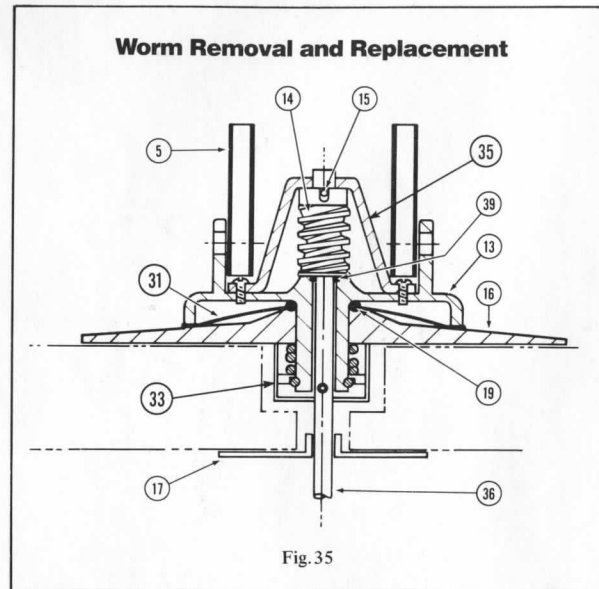


Fig. 35

Worm Removal and Replacement

1. Punch out pin item 15.
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 and 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 and 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.

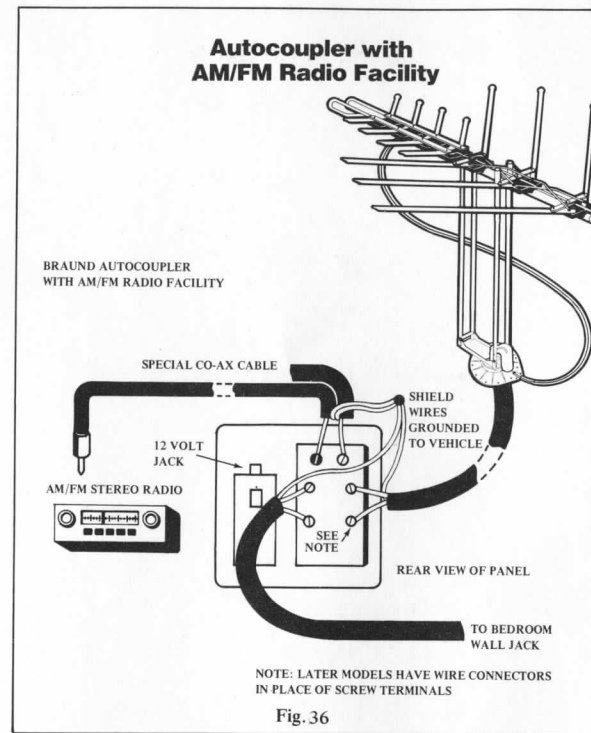


Fig. 36

Autocoupler

When a TV antenna is used to supply signals to more than one TV wall jack, it is necessary to provide a "coupler" which will isolate one jack from the other. Without the coupler there can be almost complete loss of signals on certain channels at the first wall jack.

The Autocoupler panel provides this coupler system, and in addition, AM and FM signals received by the TV antenna are separated and delivered to the AM and FM stereo receiver via a special cable (Fig. 36). When receiving AM, the antenna should be raised, but it need not be rotated. On FM, however, the antenna is directional (as for TV), and should be rotated for the best FM reception.

A TV set may be used at the same time as FM stereo radio without mutual interference, but AM reception with a TV set operating at the same time is not recommended due to interference produced by the TV set on the AM band. There may be some converter interference on AM when weak AM stations are being received with the vehicle plugged into the 115 volt 60 cycle supply.

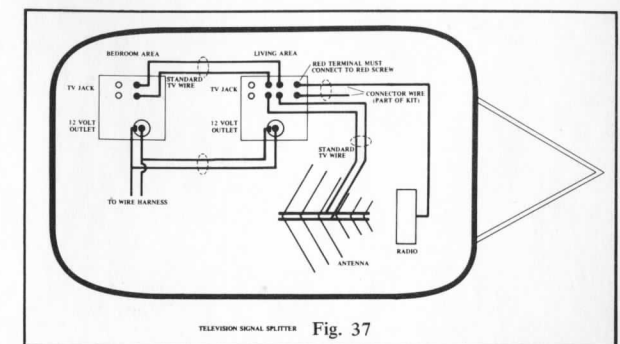


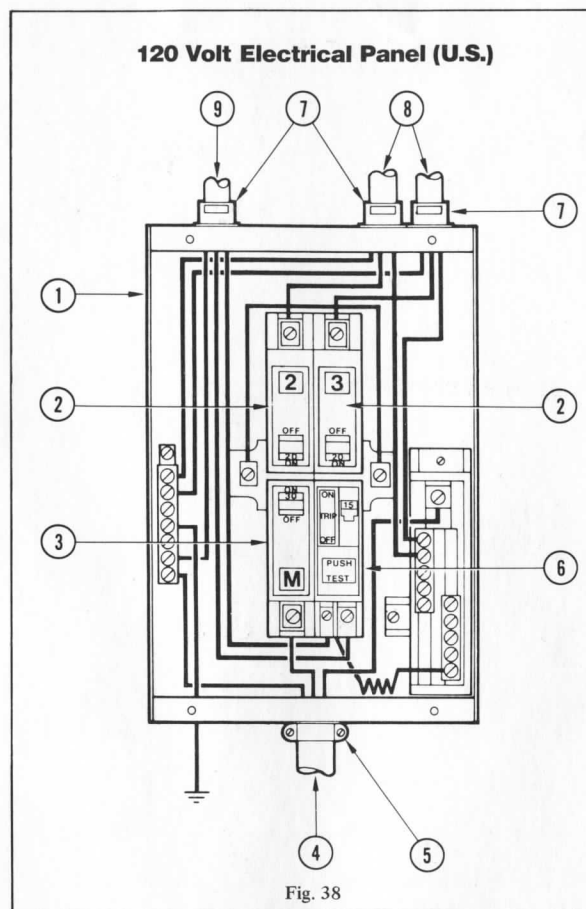
Fig. 37

120 Volt Distribution System

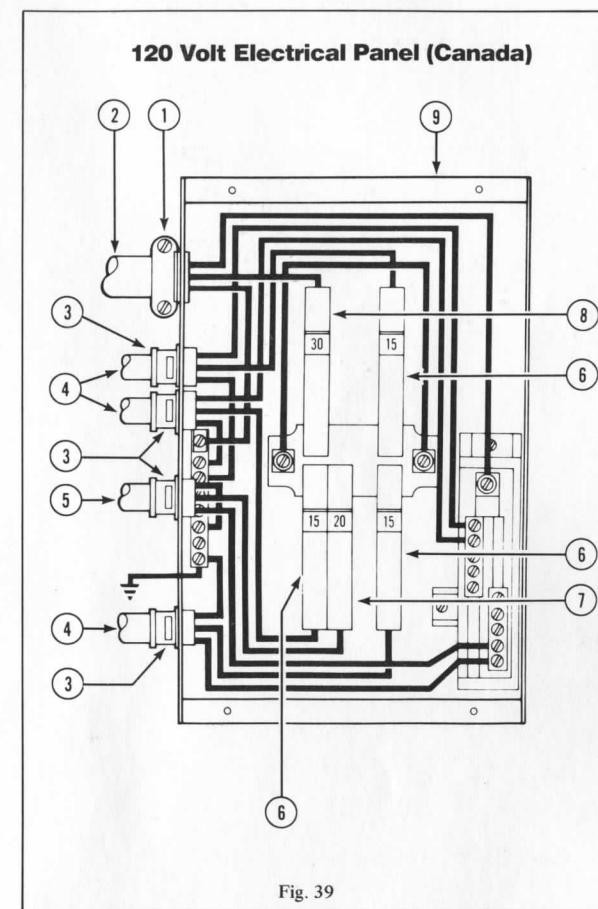
The 120 volt electrical system provides power to operate the air conditioner Univolt Convertor and 120 volt receptacles for portable appliance. The power is carried through the 120 volt city power flexible cord to the 120 volt distribution panel and then is distributed to each appliance or receptacle.

All wire, components and wiring methods conform to federal, state and Canadian requirements.

United States and Canadian requirements vary in type of components, approved listing agencies and wiring methods. Therefore, there are special trailers manufactured for Canadian sales. Fig.38 illustrates the proper wiring for 120 volt distribution panels for U.S. trailers and Fig. 39 illustrates panels for Canadian trailers. Fig.43 through Fig.46 and Fig. 47 through Fig.50 illustrate 120 volt wire routing for trailers built for United States and Canada respectively.



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	510010	Clamp Romex 3/8"
8	500040	Romex
9	510147	Romex



No.	Part No.	Description
1	500013	Clamp romex 3/4"
2	510002	Power supply cord romex N.M.D. 7
3	510010	Clamp romex 3/8"
4	510004	Romex N.M.D. 7
5	510003	Romex N.M.D. 7
6	500183	Breaker THQP 115 15 amp
7	500182	Breaker THQP 120 20 amp
8	500181	Breaker THQP 130 30 amp main
9	510189	Breaker box G.E. T.L. 410 S.T.

Convenience Outlet, Plates & Misc. Lights

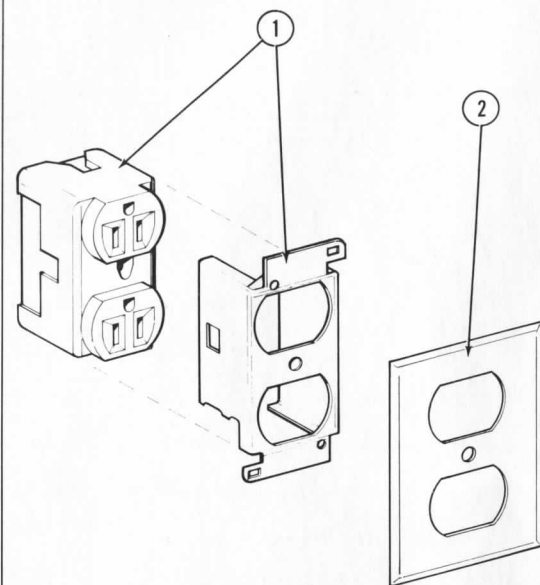


Fig. 40

No.	Part No.	Description
1	500116	Receptacle, duplex - ivory
2	500026	Cover, 120V (inside)
Items Not Shown		
	500018	Rocker switch - ivory S.P.S.T.
	510025	T.V. 12 volt outlet ass'y
	510137	Swivel light - living room
	510132	Access door light with bracket
	510138	Rocker switch - ivory S.P.D.T.
	500116	Receptacle, 20 amp. (Micro wave oven)
	500116	Receptacle, single outlet (refrigerator & Univolt)
	500122	Cover, single outlet
	510122	Cover - outlet box (exterior)
	500169	Housing-outlet box (exterior)

Polarity Light (U.S. & Canada)

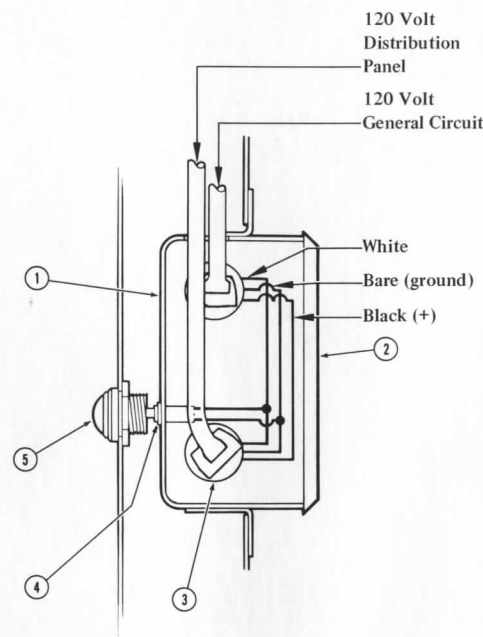


Fig. 41

No.	Part No.	Description
1	500010	Box, outlet No. 106 AB½ (U.S.)
	510049	Box, outlet No. 7662 (Canada)
2	500009	Cover, box, outlet, plain No. 58C1 (U.S.)
	510223	Cover, box, outlet
3	500064	Romex clamp T&B 3300
4	500011	Neon pilot light
5	50065	Clear lens cap

Polarity Light Removal and Replacement

1. On shower bath models the polarity light lens is located on the exterior of the trailer at the rear end, lower left corner.
2. On full and center bath models the polarity lens is located on the exterior of the trailer left rear side near the water heater access door.
3. The polarity light 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 the junction box in front of it, on both Land Yacht and International models.
4. To replace the polarity light and not the above lens this same electrical junction box must be removed to gain access for removal and replacement on both Land Yacht and International models.

Trouble Shooting Polarity Light

The first step in trouble shooting a polarity light which stays on with correct polarity or will not come on with reverse polarity is to insure the following conditions have been met.

1. There is 120 volt power in the trailer.
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 the component 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 the above conditions have been met 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 trailer is not properly grounded and shell is "hot."

Ground Fault Circuit Interrupter (GFCI)

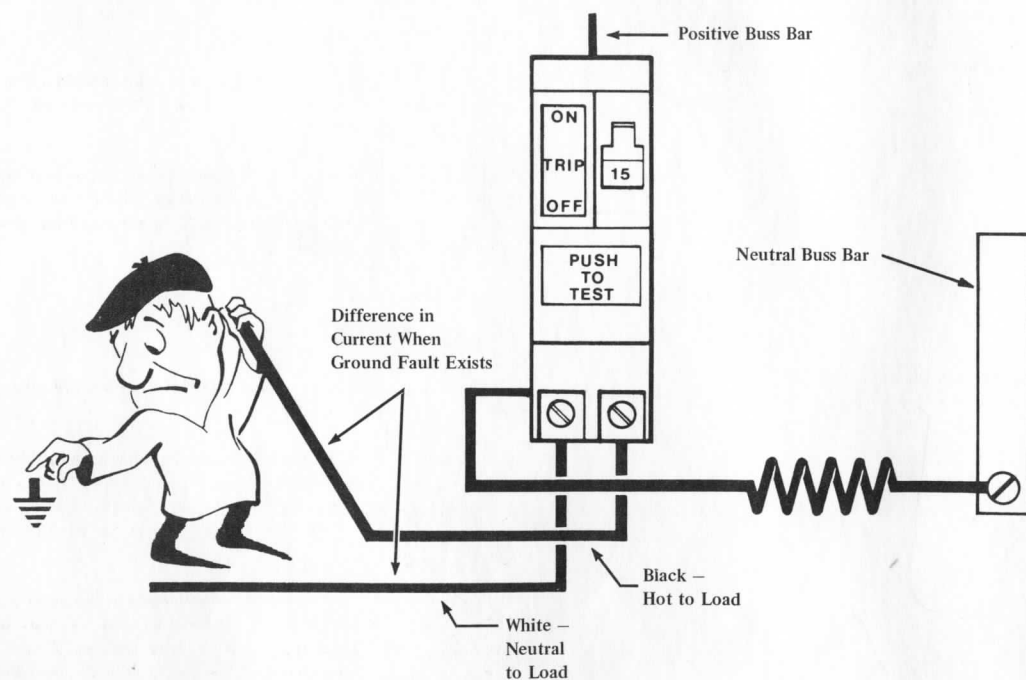


Fig. 42

Ground Fault Circuit Interrupter (GFCI)

Many states require trailers which are sold in their state and which have exterior 120 volt receptacles to have a ground fault circuit interrupter. Trailers 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.

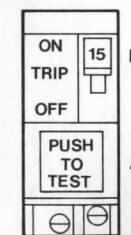
While the GFCI Circuit Breaker affords a high degree of protection, there is no substitute for the knowledge that electricity can be dangerous when carelessly handled or used without reasonable caution.

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												

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

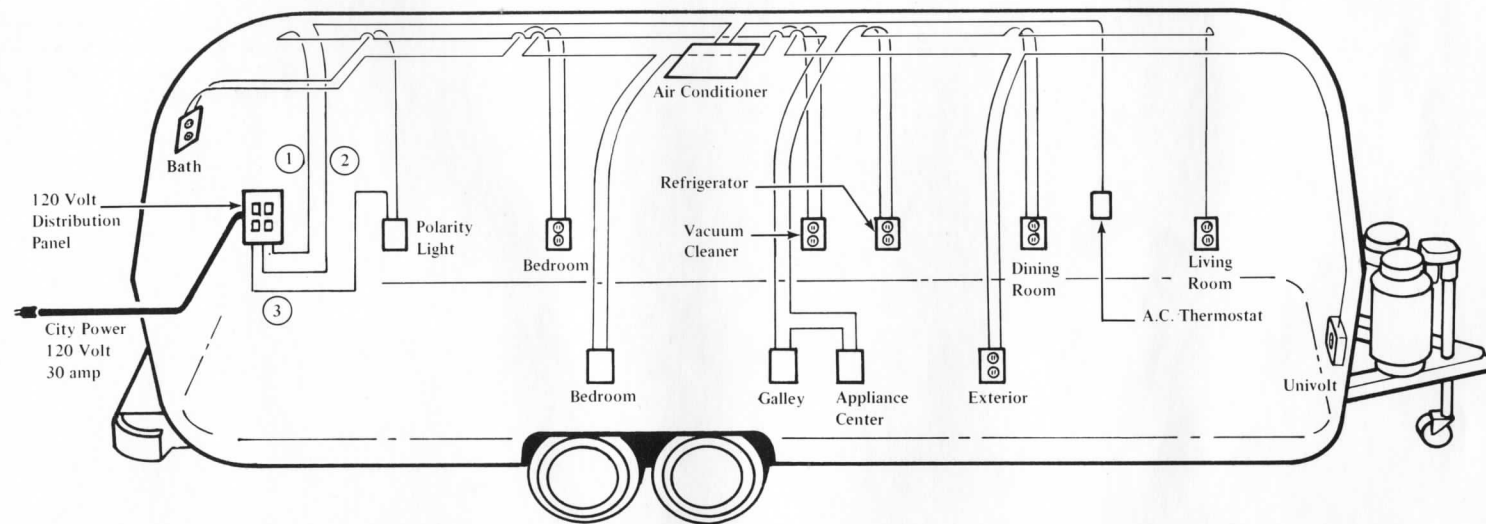
1. Isolate circuit which has short by noting circuit breaker which has tripped.
2. Disconnect power inlet cord from power source.
3. Using the 120 volt schematic as reference, disconnect outlet boxes one at a time starting at box furthest from distribution panel. After disconnecting each box check for continuity between black wire and ground or common (white) wire, on the distribution panel side of the circuit. When the 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.

The section of 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 area which may damage wire.

Opens

1. Check all receptacles and components for voltage on circuit which has 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 possible circuit breaker failure.
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. Wire disconnected from a terminal
 - c. Contacts in circuit breaker do not make contact.
 - d. Broken wire.

Typical 120 Volt Distribution System



- ① Appliance Circuit 20 amp
- ② Air Conditioner 20 amp
- ③ General Circuit 15 amp

120 Volt Electrical – U.S. (21 Ft.)

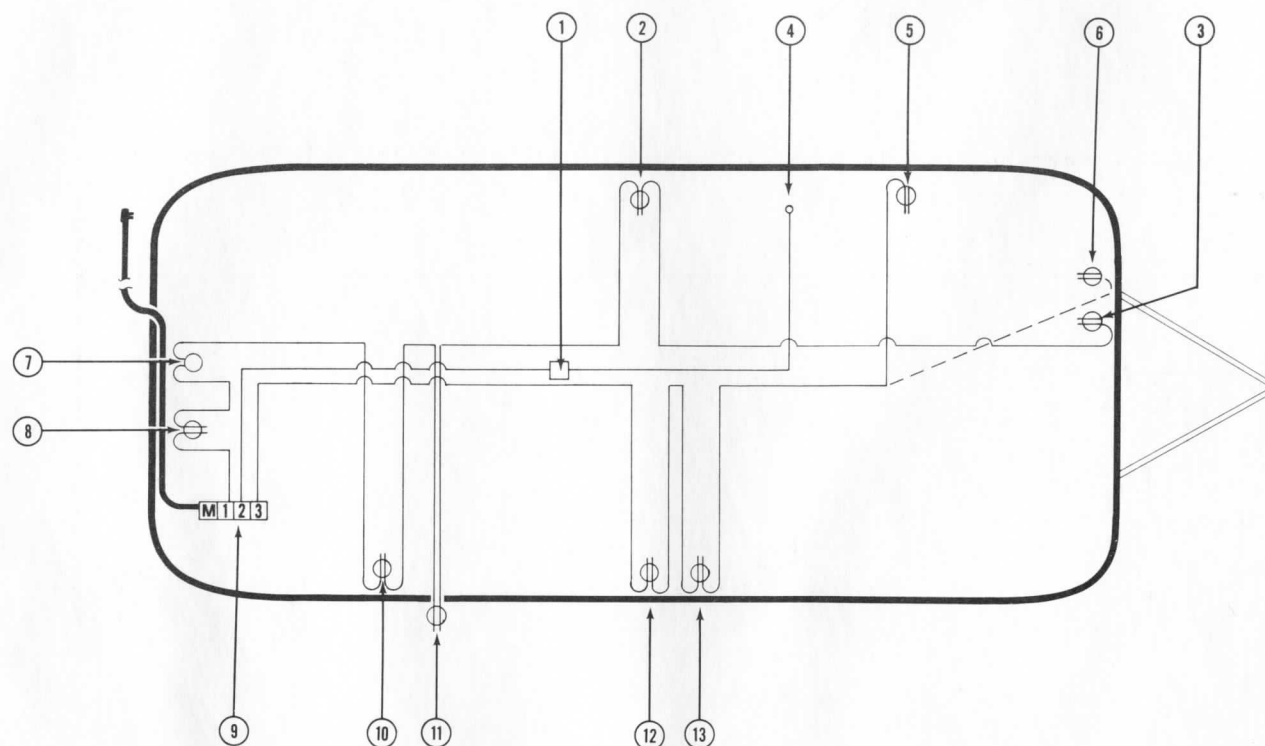


Fig. 43

No.	Description	No.	Description
1	Air conditioner – optional	11	Exterior outlet
2	Bedroom outlet	12	Galley outlet
3	Univolt	13	Refrigerator outlet
4	Air conditioner control – optional		
5	Dining outlet		
6	Dinette outlet – optional		
7	Polarity warning light		
8	Bathroom outlet		
9	120 volt distribution panel		
10	Vacuum cleaner		

120 Volt Electrical – U.S. (23 & 25 Ft.)

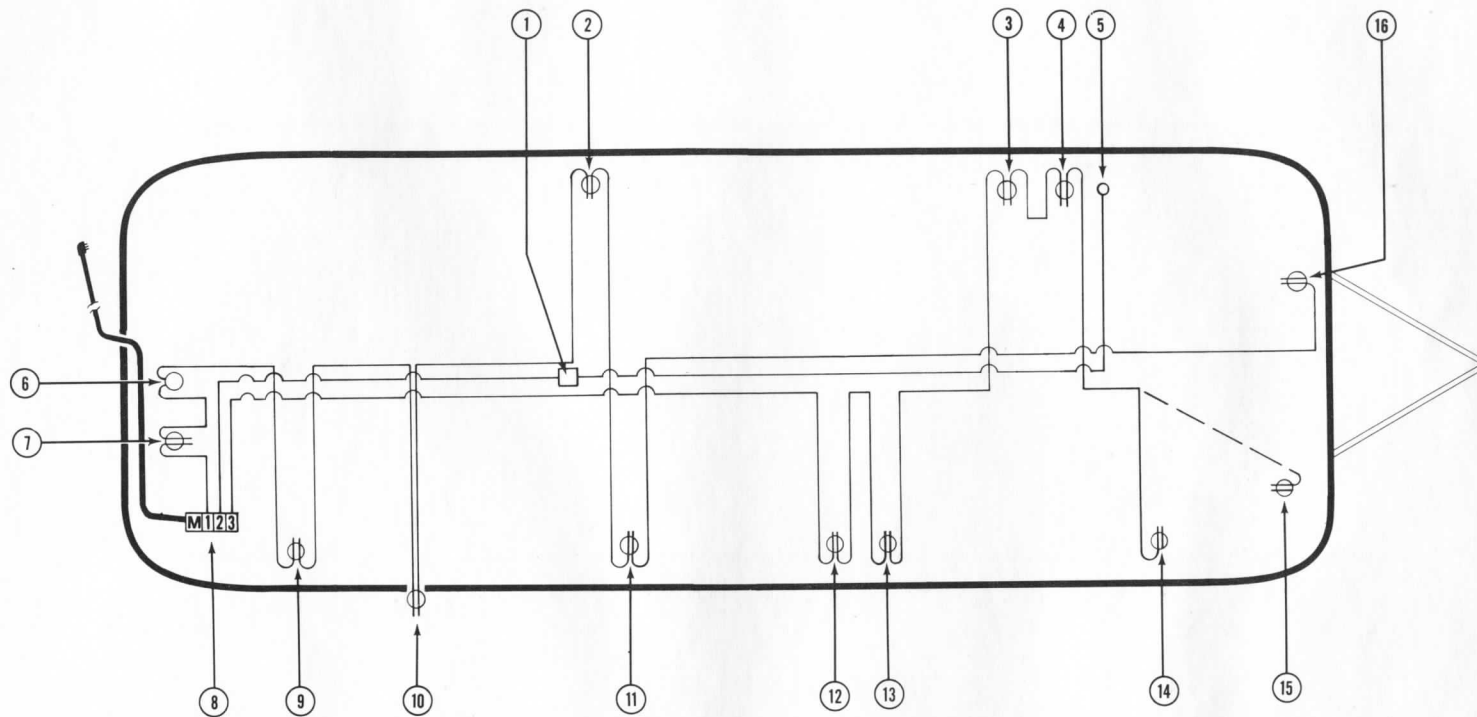


Fig. 44

No.	Description	No.	Description
1	Air conditioner – optional	10	Exterior outlet – steel box
2	Bedroom outlet	11	Bedroom outlet
3	Nutone – optional	12	Refrigerator outlet – steel box
4	Galley top outlet	13	Counter top and TV outlet
5	Air conditioner control - optional	14	Dining outlet
6	Polarity warning light	15	Dining outlet – optional
7	Bathroom outlet	16	Univolt
8	120 Volt distribution panel		
9	Vacuum cleaner		

120 Volt Electrical – U.S. (27, 29, 31 Ft. Full Bath)

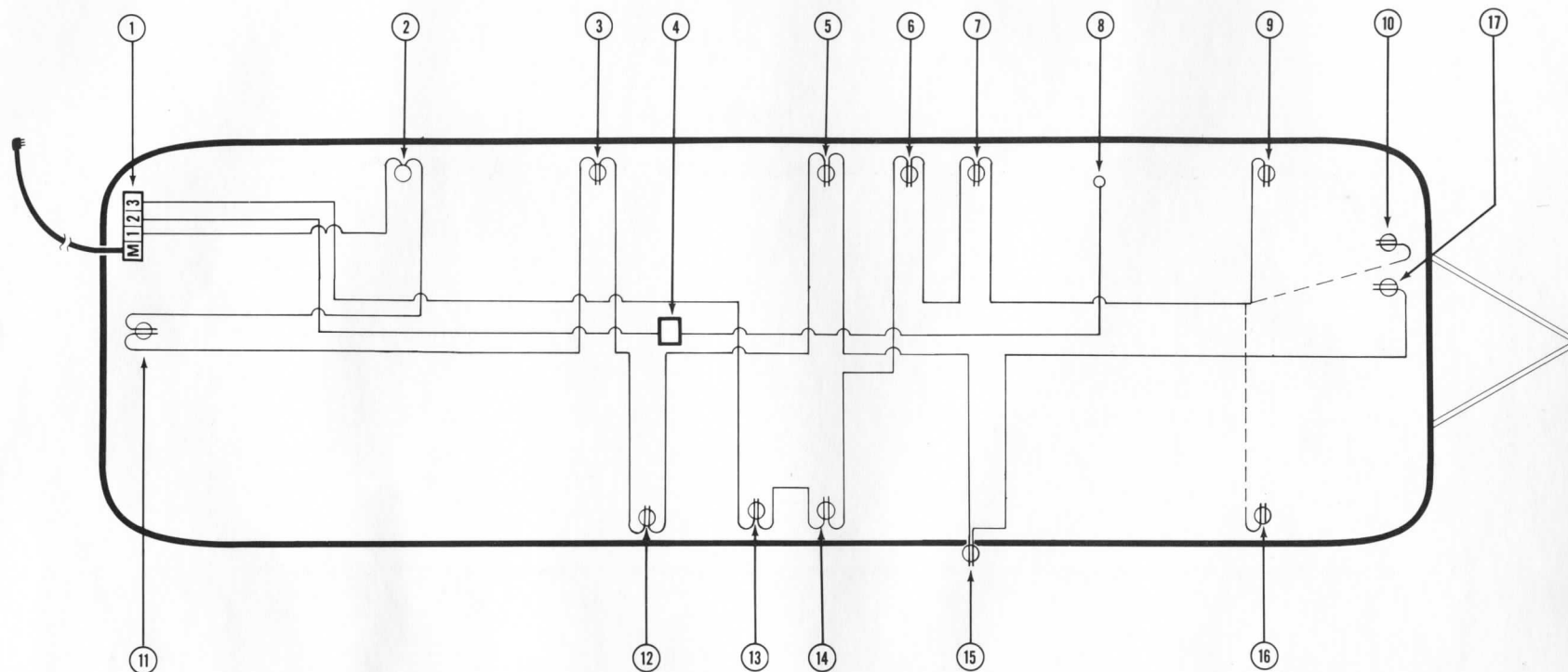


Fig. 45

No.	Description		
1	120 volt distribution panel	8	Air conditioner control - optional
2	Polarity warning light	9	Living room outlet
3	Bedroom outlet	10	Dining outlet - optional
4	Air conditioner - optional	11	Bathroom outlet
5	Vacuum cleaner	12	Bedroom outlet
6	Refrigerator outlet - steel box	13	Galley outlet
7	Dining outlet or refrigerator top	14	Nutone - optional
		15	Exterior outlet - steel box
		16	L front lounge outlet - optional
		17	Univolt

120 Volt Electrical – U.S. (29 & 31 Ft. Center Bath)

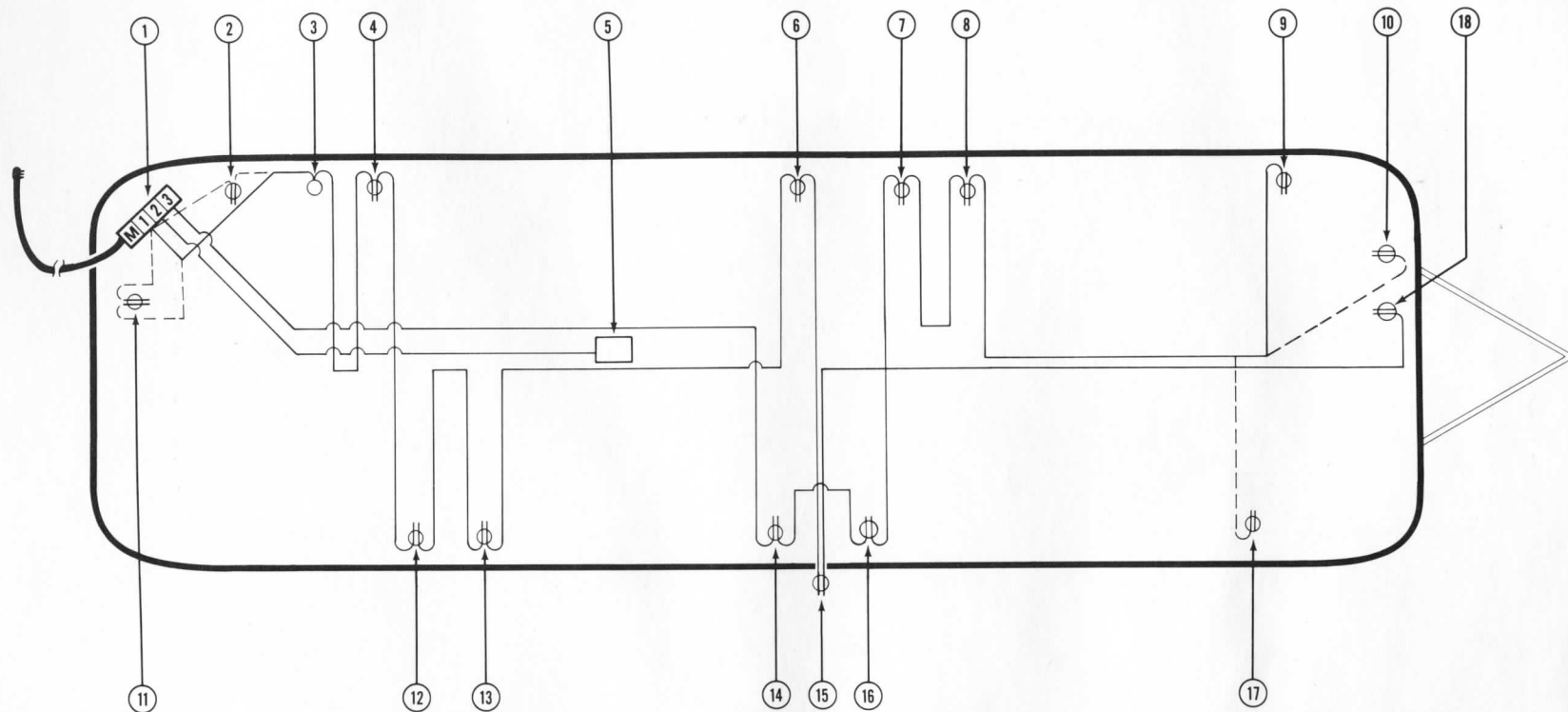


Fig. 46

No.	Description		
1	120 volt distribution panel	9	Front lounge outlet
2	Credenza outlet – 27 D only	10	Dining outlet – optional
3	Polarity warning light	11	Bedroom outlet – 29 T, 31 T
4	Bedroom outlet – 29 D, 31 D, Excella D	12	Bedroom outlet
5	Air conditioner – optional	13	Bathroom outlet
6	Vacuum cleaner	14	Galley outlet
7	Refrigerator outlet	15	Exterior outlet – steel box
8	Credenza outlet	16	Nutone – optional
		17	L front lounge – optional
		18	Univolt

120 Volt Electrical – Canada (21 Ft.)

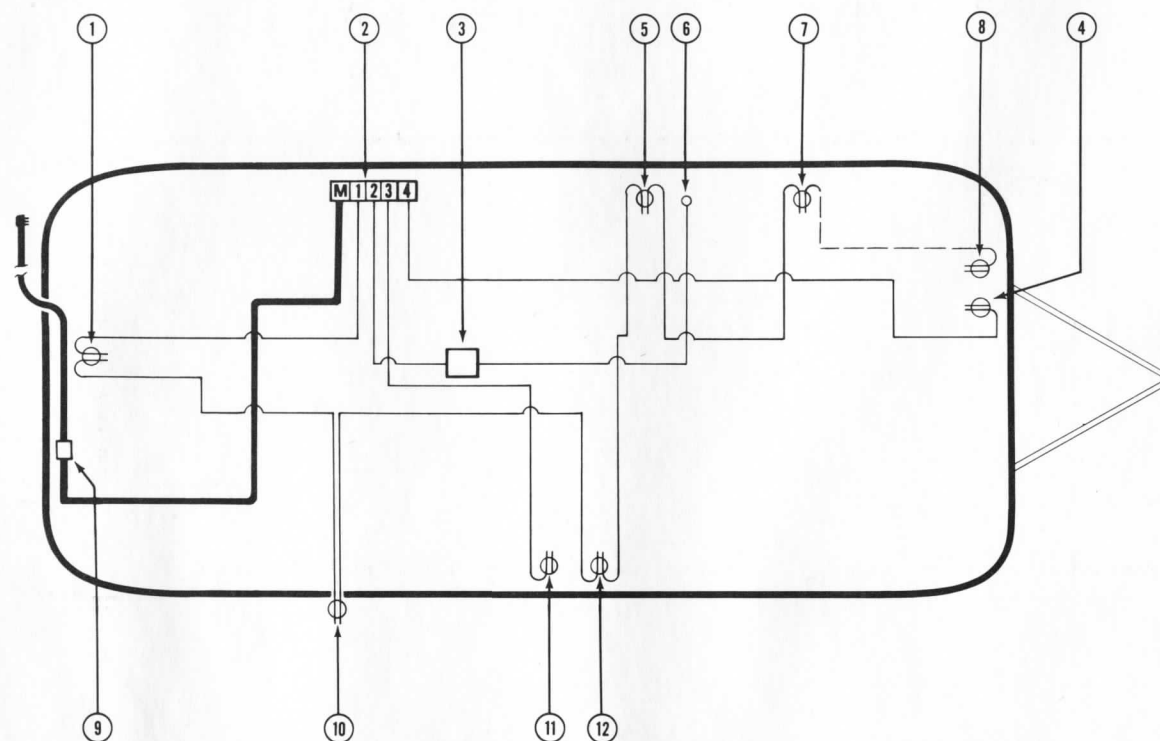


Fig. 47

No.	Description	No.	Description
1	Polarity warning light	9	Junction box
2	120 volt distribution panel	10	Exterior outlet
3	Air conditioner – optional	11	Galley outlet
4	Univolt	12	Refrigerator outlet
5	Bed outlet		
6	Air conditioner control - optional		
7	Dining outlet		
8	Dining outlet - optional		

120 Volt Electrical – Canada (23 & 25 Ft.)

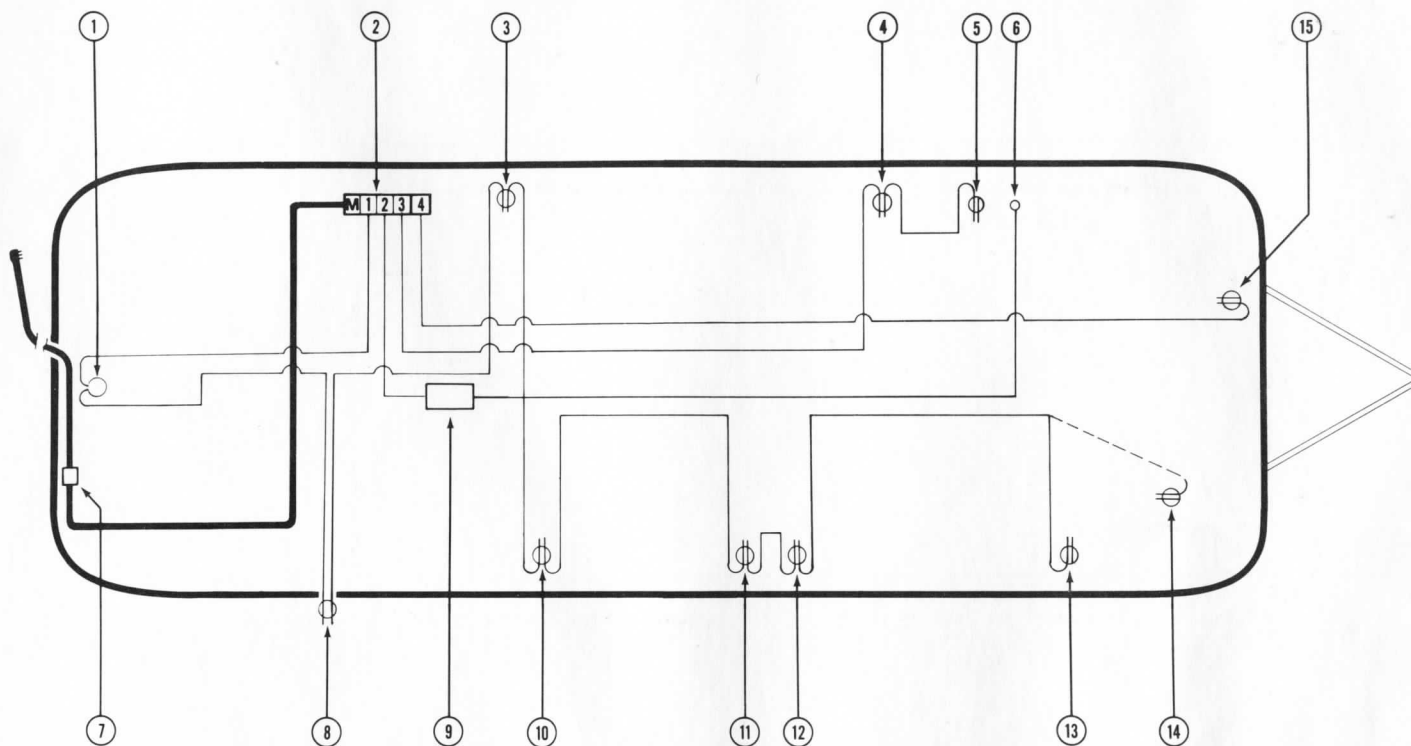


Fig. 48

No.	Description	No.	Description
1	Polarity warning light	9	Air conditioner
2	120 volt distribution panel	10	Bedroom
3	Vanity outlet	11	Refrigerator outlet – steel box
4	Nutone – optional	12	Refrigerator top outlet
5	Galley outlet	13	Dining outlet
6	Air conditioner control	14	Dining outlet – optional
7	Junction box	15	Univolt
8	Exterior outlet		

120 Volt Electrical – Canada (27, 29, 31 Ft. Full Bath)

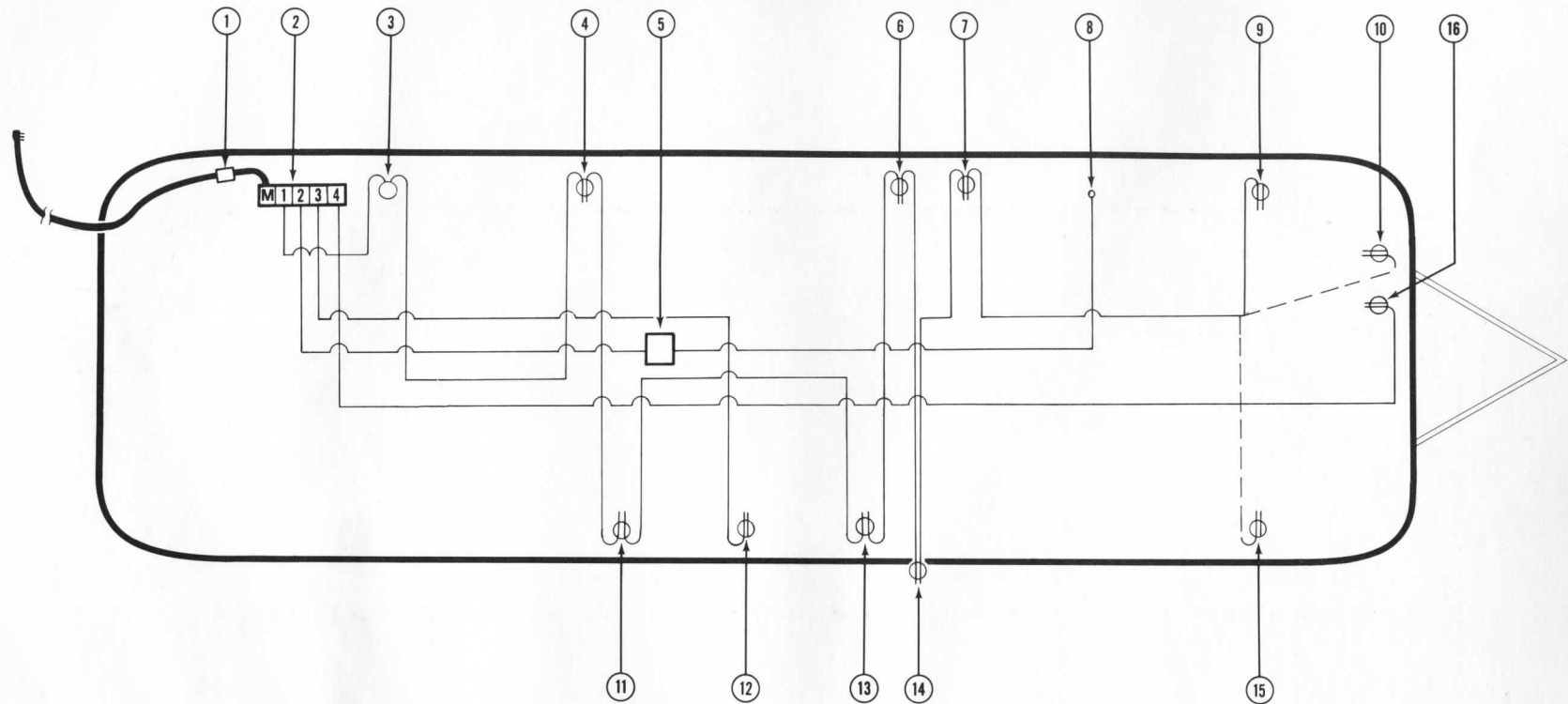


Fig. 49

No.	Description		
1	Junction box	11	Bedroom outlet
2	120 volt distribution panel	12	Galley outlet
3	Polarity warning light	13	Nutone – optional
4	Vanity outlet	14	Exterior outlet
5	Air conditioner	15	L front lounge – outlet
6	Refrigerator outlet	16	Univolt
7	Dining outlet		
8	Air conditioner control – optional		
9	Living room outlet		
10	Dining outlet – optional		

120 Volt Electrical – Canada (29, 31 Ft. Center Bath)

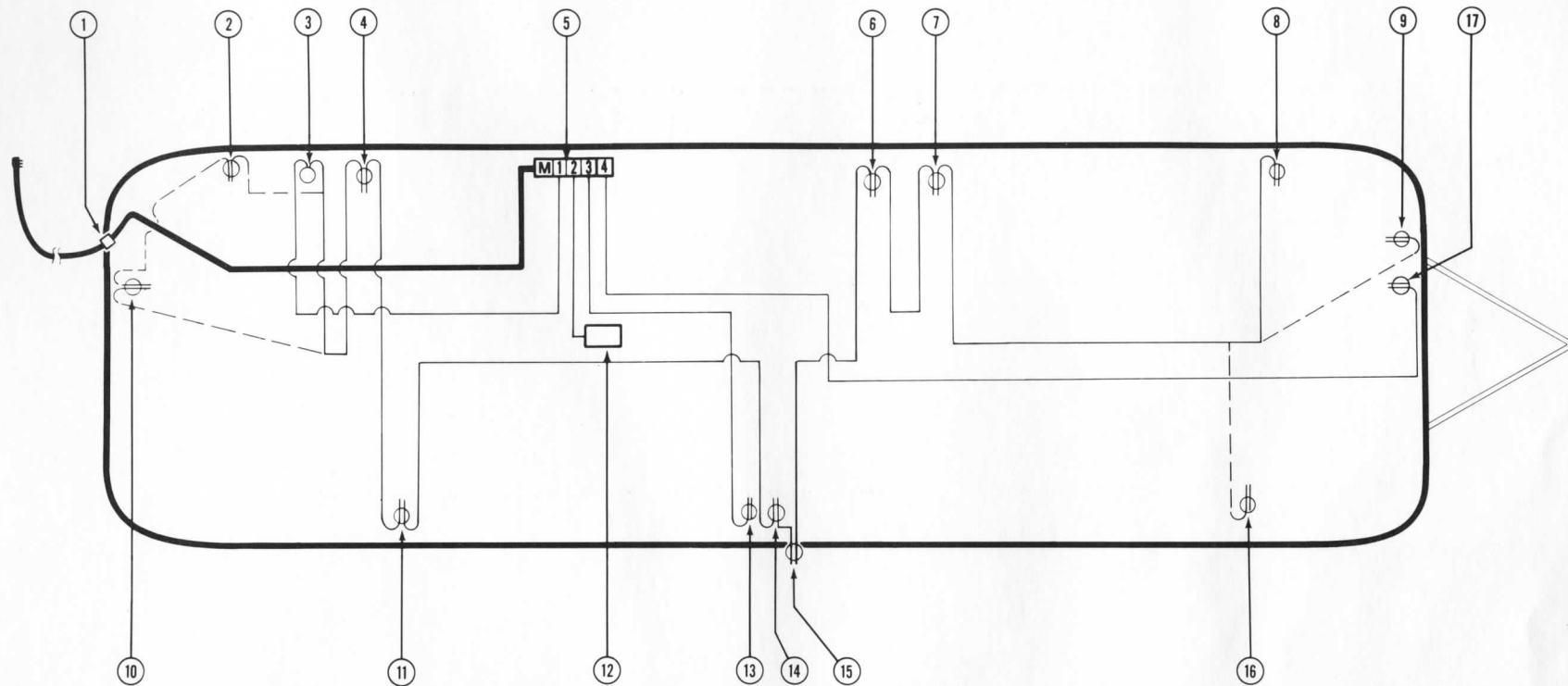


Fig. 50

No.	Description		
1	Junction box	8	Front lounge outlet
2	Credenza outlet – 27 D	9	Dining outlet – optional
3	Polarity warning light	10	Bedroom outlet – 29 T, 31 T
4	Bedroom outlet – 29 D, 31 D	11	Bedroom outlet
5	120 volt distribution panel	12	Air conditioner
6	Refrigerator outlet	13	Galley outlet
7	Credenza outlet	14	Nutone – optional
		15	Exterior outlet
		16	L front lounge outlet – optional
		17	Univolt