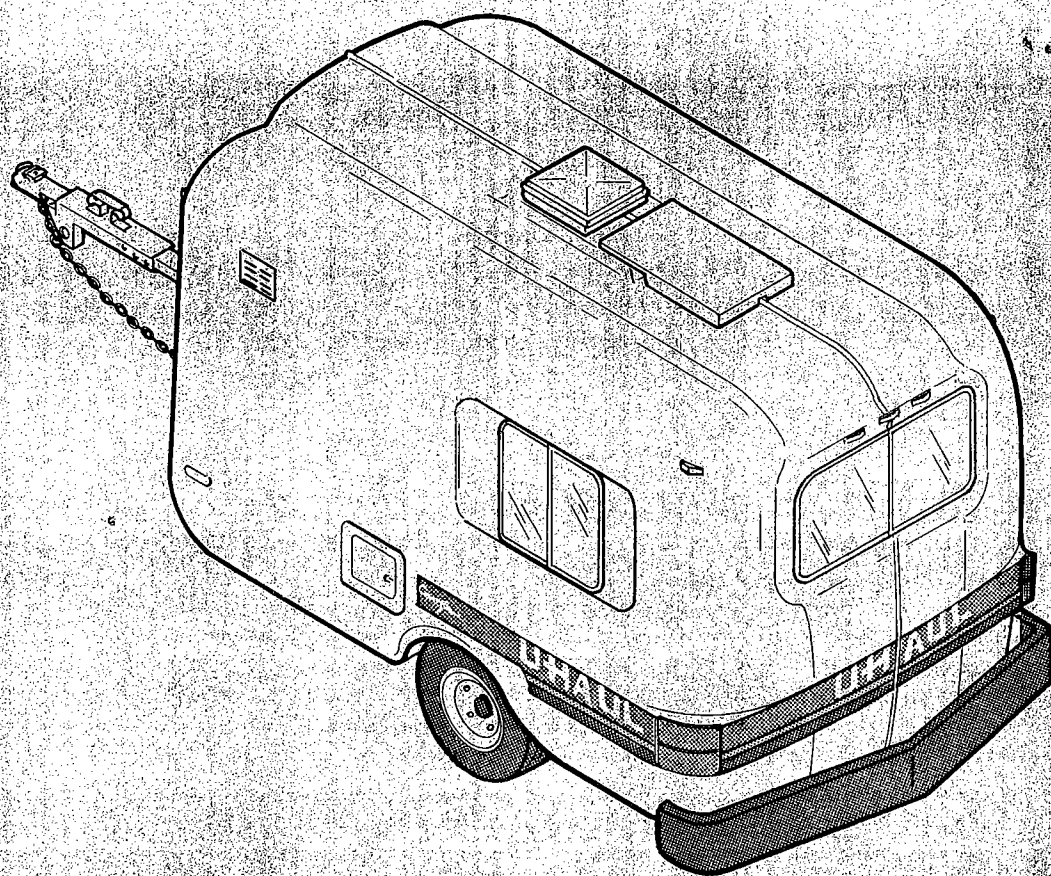


ILLUSTRATED PARTS BREAKDOWN

CAMPER TRAILER



U-HAUL

MOVING & STORAGE

AUGUST 1985

Primary Service Objective

TO PROVIDE BETTER AND BETTER PRODUCTS
TO MORE AND MORE PEOPLE
AT A LOWER AND LOWER COST



PRODUCT GUIDE

1. SAFETY
2. UTILITY VALUE
3. DURABILITY
4. REPAIRABILITY
5. ADVERTISABILITY
6. DISTRIBUTABILITY
7. COST
8. APPEARANCE

U-HAUL CAMPER TRAILER REPAIR MANUAL

INTRODUCTION

The U-Haul Camper Trailer Repair Manual is the basic guide for the repair of the U-Haul Camper Trailer.

Read this manual carefully. Review it frequently. The information in this manual can increase the efficiency of the shop operation and help to ensure that all camper trailers are repaired in the most effective and economical manner possible.

U-Haul manuals are updated periodically to provide shops with current repair information. Between updates, technical newsletters are issued by the U-Haul Technical Center to keep you informed of equipment modifications, repair problems and corrective measures. Attach these publications to the manual until an updated manual is received.

When repair situations are encountered which are not covered by the procedures in this manual, base repair decisions on past experience, established U-Haul repair policies, and sound economic judgment. The U-Haul Technical Center will provide any additional information and assistance needed. If you have any improvements or additions which can be suggested concerning this manual, contact the U-Haul Technical Center. All U-Haul System members can benefit from shared knowledge and experience.

Product improvement is an on-going process and any improvements developed will be passed on to the field as they occur. Procedures for updating existing models to the latest design are included in this manual.

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U-HAUL CAMPER TRAILER REPAIR MANUAL

GENERAL INFORMATION

REPAIR REPORTING

Report all Camper Trailer (CT) repairs using the non-flat rated operation numbers listed under group 8 in the U-Haul Trailer/S.R.I. Flat Rate Manual.

INSPECTION STANDARDS

Inspect all parts, fixtures and appliances according to the checklist in figure 1. This includes appearance and decals as shown in this manual. ALL U-Haul Camper Trailers must have a **MANOMETER TEST** before being released to the rental market. (See Appendix A for manometer test procedure.)

If there is any doubt concerning the safety or operation of any part or appliance in the CT it must be repaired before being returned to the rental market.

CLEANLINESS

Understand the importance of having an RV rental unit that is totally clean. The customer will be living in the unit for a period of time and expects everything to be spic and span. Each state or province may have regulations concerning the cleanliness and health requirements for rental units. Check with your local government.

Item	Yes	No
ICE BOX		
STOVE/OVEN (CLEAN AND WORKING)		
WATER PUMP		
COOLER		
SINK (CLEAN AND WORKING)		
UPHOLSTERY		
FIRE EXTINGUISHER		
FLOOR CARPETS (CLEAN)		
KEYS (QUANTITY)		
WINDOWS		
CARPET RUNNER (CLEAN)		
ENTRANCE MAT		
TABLES		
LIGHTS (INTERIOR)		
CABINET KNOBS/LOCKS		
PORTA-POTTY (CLEAN)		
FURNACE		
CONVENIENCE KIT		
WATER HOSES		
WATER PRESSURE REGULATOR		
SMOKE DETECTOR		
WATER TANK FILLED		
A/C ADAPTER		
RUNNING LIGHTS		
BRAKE LIGHTS		
TAIL LIGHTS		
TURN SIGNALS		
LP TANK FILLED		
TIRE PRESSURE		
HUBCAPS		
SPARE TIRE/COVER		
MANOMETER TEST		

Figure 1. Inspection Checklist

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CAMPER TRAILER MODIFICATIONS

REPAIR STANDARDS

The design improvement in the LP system, the new design coupler and the window waterproofing procedures are to be performed any time a CT is found without them and before the trailer is released to the rental market.

The other improvements listed are to be performed whenever a CT is in a shop for repair.

LP GAS LINE MODIFICATION

Gas Line Kit, Propane CT (P/N 46174-002), is available through U-Haul Order Processing Order Point B.

1. Prime and paint furnace access cover with Wimbledon white enamel. Paint stand-off brackets with black enamel.
2. Apply pipe dope (supplied in the kit) to MALE THREADS ONLY and assemble pipes and fittings as shown in figure 2. Protect the flare connections with caps (or old flare fitting nuts and tape) during assembly and installation.

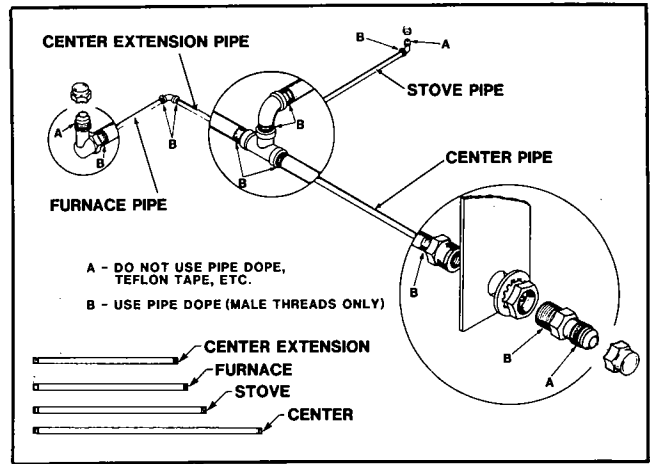


Figure 2. LP Gas Pipe Assembly

WARNING

DO NOT APPLY PIPE DOPE TO THE THREE FLARE CONNECTIONS. TO DO SO COULD CAUSE LP GAS LEAKAGE RESULTING IN INJURY OR DEATH.

3. Assemble stand-off brackets and pipe brackets on piping according to the directions and measurements in figure 3.

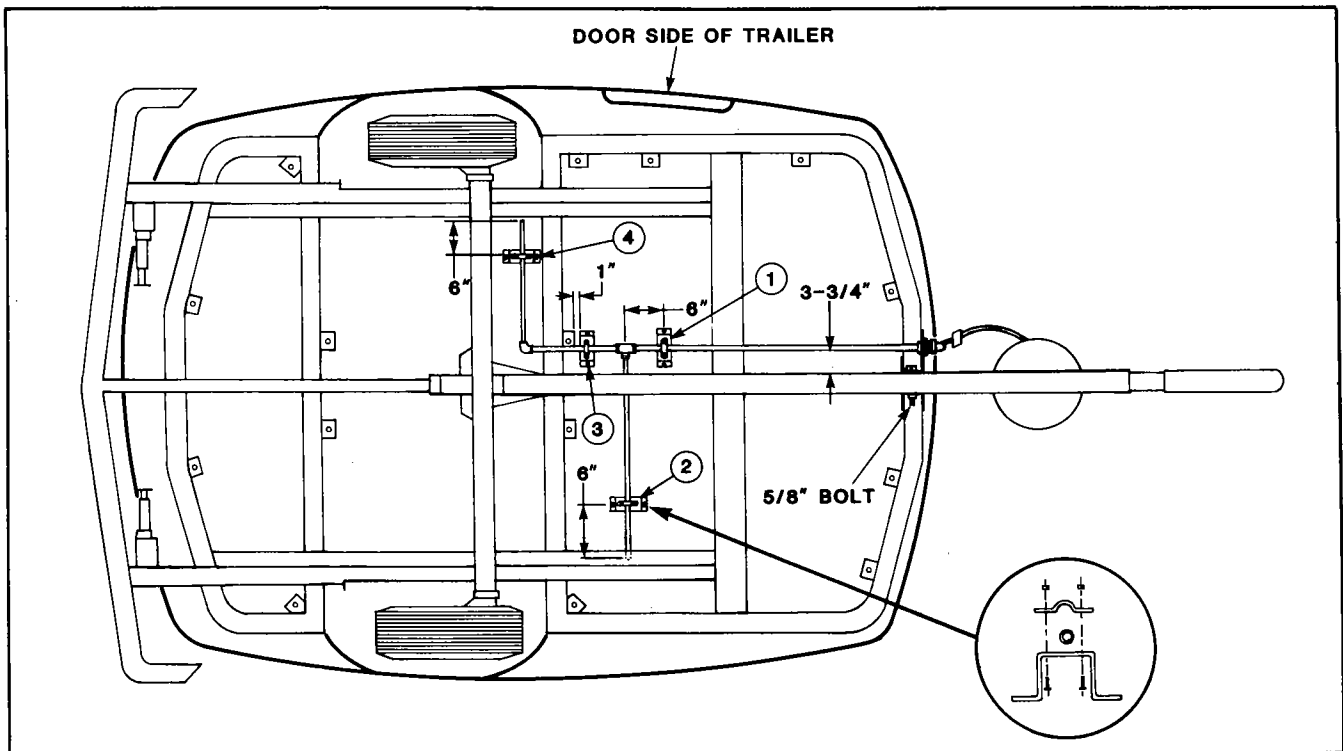


Figure 3. Standoff Brackets

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4. Shut off LP gas at bottle main valve. Light one stove burner to burn off LP gas trapped in lines.
5. At trailer tongue, separate rubber LP hose and 90° elbow from frame-mounted bulkhead fitting. Remove bulkhead fitting.
6. Cut LP lines above fittings where they come down through the floor. Remove LP line clamps and pull out the entire system.
7. Replace $\frac{5}{8}$ -inch bolt and nut at tongue/frame connection (figure 2) with the $\frac{5}{8}$ -inch bolt/washer/nut supplied in kit. Torque to 100 ft-lb.
8. Drill a 1-inch hole in the frame bulkhead (figure 4) with a hole saw.

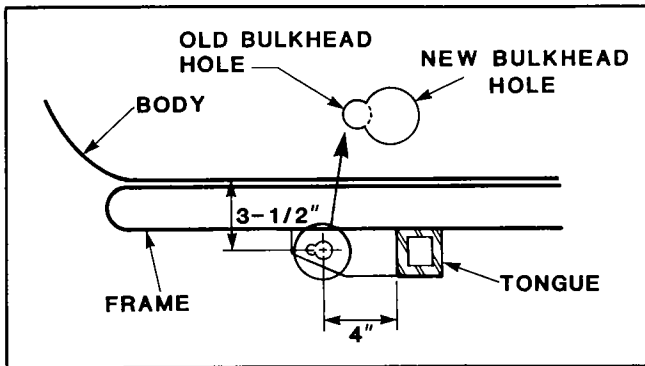


Figure 4. New Bulkhead Fitting Holes

9. Remove threshold strip and carpet.
 10. Measure from the camper floor to the furnace inlet line fitting. Measure from the front edge of the furnace enclosure to the center of the inlet line fitting. Using these measurements, mark a location on the outside of the furnace enclosure. Center a copy of the LP gas line modification template (Appendix B) to the wall at this location. Drill the four pilot holes indicated on the template. Be careful not to drill into the furnace.
- NOTE:** If a plywood support was used under the furnace, center the access hole on the inlet fitting. If a 2 x 4 was used as a support, cut the hole to the edge of the 2 x 4. Do not cut into the 2 x 4.
11. Using the four pilot holes, drill four 2-inch holes. Mark around the outside of these four holes as indicated on the template and cut a 6-inch x 6-inch access hole in furnace

enclosure side wall (figure 5). Be careful not to cut into furnace. Remove burrs in fiberglass edge with a file.

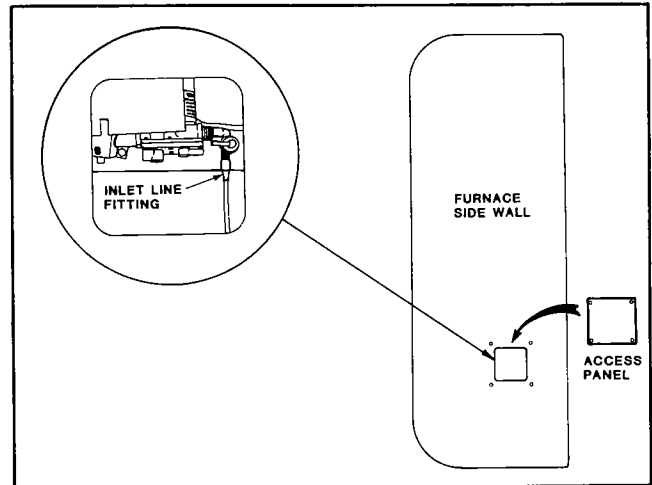


Figure 5. Furnace Access Hole and Inlet Fitting

12. Separate LP line from furnace at line inlet fitting. Pull line up through floor and discard line and grommet. (See figure 5.)
13. Remove center screw holding stove top, remove top and separate LP line from stove at line inlet fitting (figure 6). Remove stove.

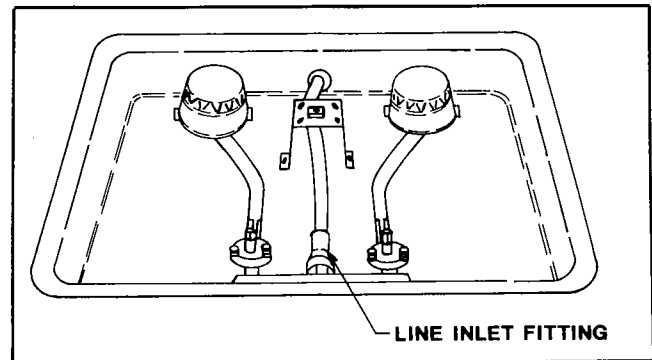


Figure 6. Stove

14. Remove and save screws and clips holding LP line inside cabinet. Pull line up through floor and discard line and grommet.
15. Measure and mark for one 2-inch vent hole under the furnace (figure 7).

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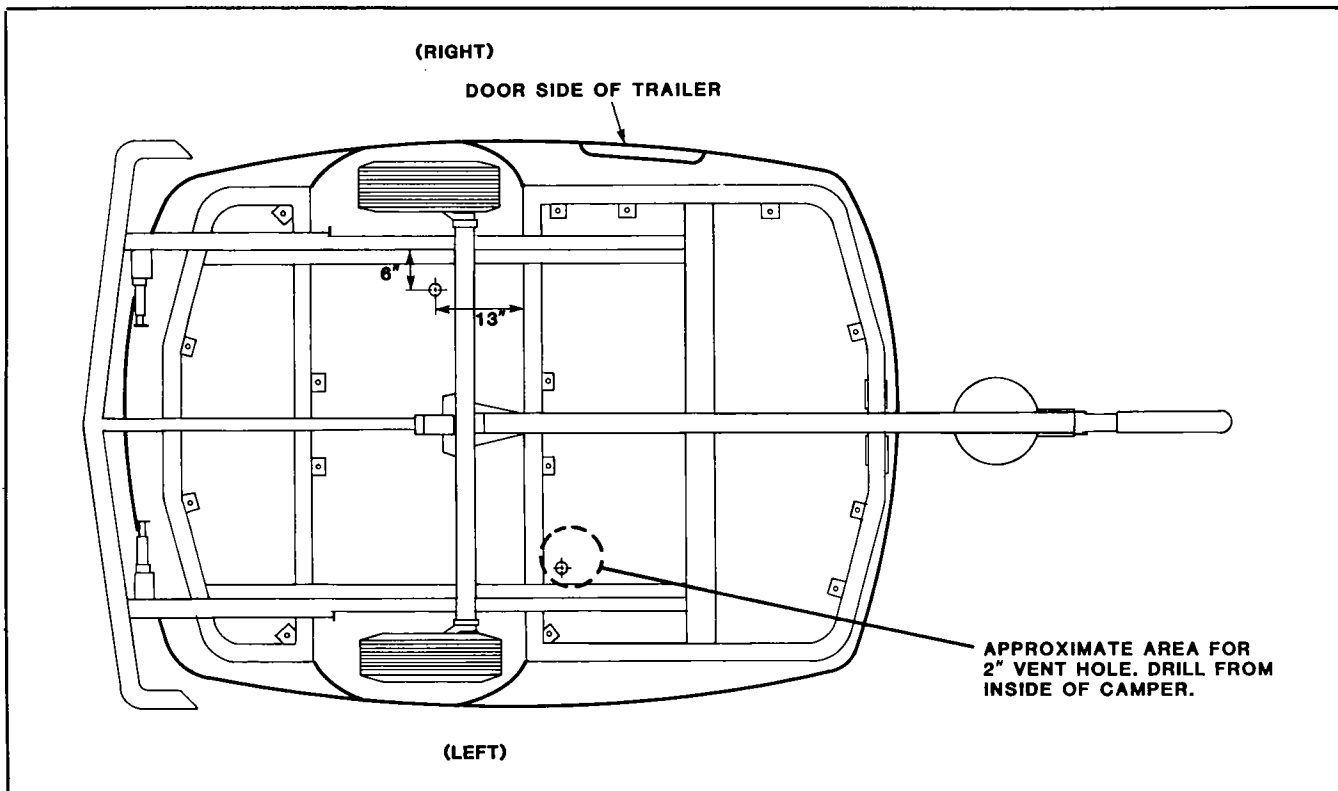


Figure 7. Vent Hole Locations

16. Remove gland nut and lock washer from bulkhead fitting. Move iron pipe system into position by first sliding stove extension over tongue then inserting bulkhead fitting through the 1-inch hole in frame bulkhead. Install lock washer and gland nut finger-tight.
 17. Hold pipe system and brackets in position against bottom of trailer keeping center pipe 3- $\frac{3}{4}$ inches from tongue (figure 2). Mark for drilling directly above both plugged flare fittings.
- NOTE:** It may be necessary to move electrical wiring out of the way at this point. Remove clips and/or bolts and separate wire connectors.
18. Loosen gland nut at bulkhead fitting and move system slightly to the side. Drill $\frac{1}{4}$ -inch pilot holes up through the floor at two marked locations.
 19. From underneath, using the pilot hole as a guide, drill a 2-inch hole up through the floor under furnace. Also drill a 2-inch hole at the location marked in step #15.
 20. Because the frame rail interferes with drilling the stove hole from underneath, drill the stove-side 2-inch hole DOWN through the floor using the pilot hole as a guide. Measure 4 inches straight back from this hole and drill another hole down through the floor (stove vent hole).
 21. Move pipe system back into place (parallel to and 3- $\frac{3}{4}$ inches from tongue) and tighten gland nut finger-tight.
 22. Position stand-off bracket #3 one inch from frame mount (figure 3). Using bracket as a template, drill two $\frac{1}{4}$ -inch mounting holes up through floor. Push two special elevator bolts down through floor and bracket and secure bracket with washers and $\frac{1}{4}$ -20 lock-nuts.
 23. Position remaining stand-off brackets according to dimensions in figure 3, adjusting system so that the flare connections are directly below the 2-inch holes, and secure brackets as in step #21.

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24. Tighten gland nut on bulkhead fitting using one wrench to hold and another to tighten. Attach regulator hose/fitting to bulkhead fitting and position so that rubber hose lays snugly against trailer center seam.

WARNING

DO NOT USE PIPE DOPE, TEFLON TAPE OR GREASE ON FLARE CONNECTIONS. TO DO SO COULD CAUSE A GAS LEAK, RESULTING IN INJURY OR DEATH. ASSEMBLE "DRY" AND TIGHTEN.

25. Make sure grommets are on lower ends of the new copper lines and thread lines down through the 2-inch holes in the floor. Replace stove. Using one wrench to hold and another to tighten, tighten both flare fittings inside the trailer (stove and furnace). Secure copper line under stove with clips along the ice box mounting.
26. Under the trailer, install pre-drilled floor plate onto grommet (figure 8). Remove protective end caps from brass fittings and install lower ends of copper lines on brass fittings. Make sure copper line does not touch edge of hole.

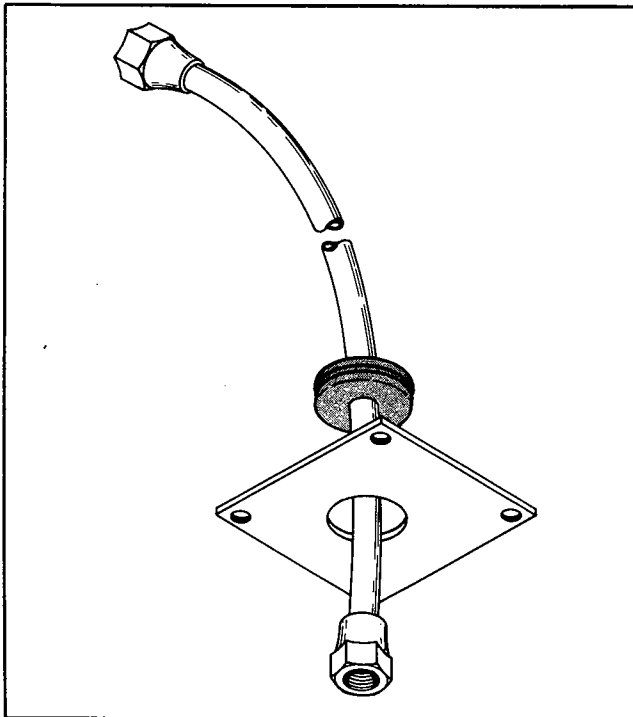


Figure 8. Copper Line, Grommet and Floor Plate

WARNING

DO NOT USE PIPE DOPE, TEFLON TAPE OR GREASE ON FLARE CONNECTIONS. TO DO SO COULD CAUSE A GAS LEAK RESULTING IN INJURY OR DEATH. ASSEMBLE "DRY" AND TIGHTEN FITTINGS.

27. Perform manometer test, Appendix A.
28. Measure and mark one inch out from each side of furnace access hole (figure 5). Use these marks to position access panel. Using the panel as a template, drill four ¼-inch mounting holes. Push nylon inserts into holes and screw access panel onto wall.
29. Run a bead of caulking on upper surface of floor plate and slide plate up to cover 2-inch hole. Secure plate with four screws.
30. Silicone putty the inside surface of the vent holes to protect the exposed wood. Install vent covers from the top by pressing them down into holes while the silicone is still wet.
31. Cover bottom of old copper line hole in floor with masking tape and fill hole with silicone caulking. Fill old screw holes (the ones that held the copper line clips under trailer) with silicone caulking.
32. Fill the new 2-inch line holes with silicone caulking to a level slightly higher than floor level.
33. Reconnect and secure electrical wiring (if it was necessary to move it).
34. To allow for future removal of LP regulator, lift up bunk bed and drill two 2-inch access holes through the front inner wall and plug with plastic caps. Determine location of holes by measuring outside from bottom edge of window-to-regulator and from center-seam-to-regulator (figure 9) and transferring these measurements to the inside of trailer.

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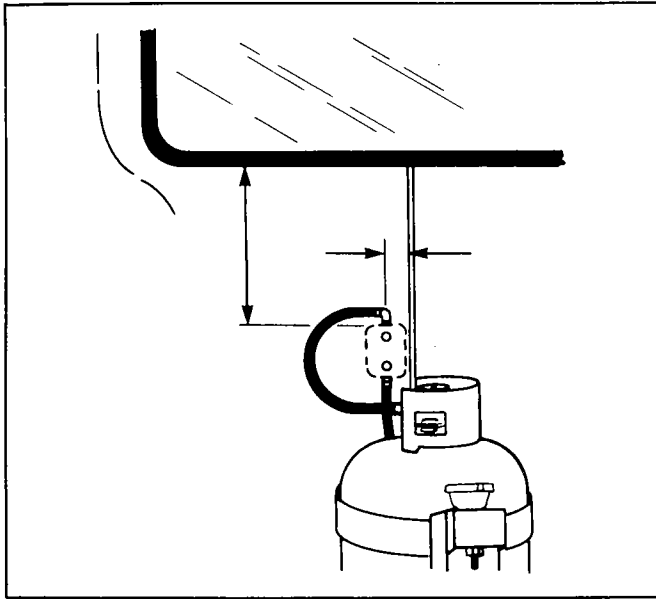


Figure 9. Measurements for LP Regulator Access Holes

35. Replace carpet and threshold strip.

COUPLER - New Design

A new coupler, P/N 41576-028 was introduced in 1985 for replacement use on the U-Haul Camper Trailer and is to be installed in place of the existing coupler.

If the existing coupler is in good condition it may be used for replacement on other equipment using that design.

1. Remove the handwheel assembly from the coupler.
2. Remove the coupler housing from the tongue. Save the capscrews and washers for reuse.
3. Install the new coupler using new locknuts and the existing capscrews and flat washers. Replace damaged or worn fasteners. Torque the locknuts to 85 ft-lb.
4. Reinstall the handwheel assembly in the new coupler.

DOOR HINGES - 1984 Models

The hinge fasteners in early model CTs were inadequate and new fasteners were introduced during production. Only high grade fasteners are to be used for this modification. *Do Not* use substitutes.

1. Remove and discard screws #1 and #2 from both door hinges (figure 10).

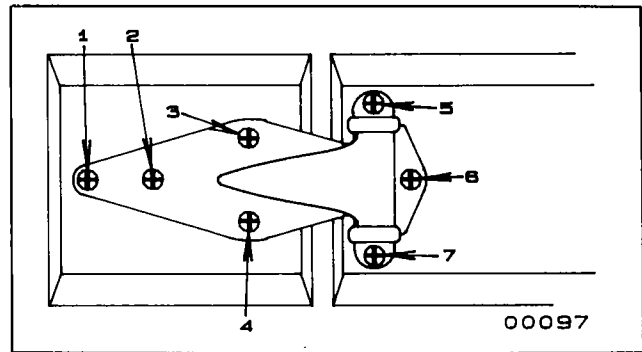


Figure 10. Hinge Screw and Pin Identification

2. From the outside, using an extra-long #10 or 3/16 drill bit, line drill through the screw holes, outer wall, and plywood support and inner wall (figure 11).

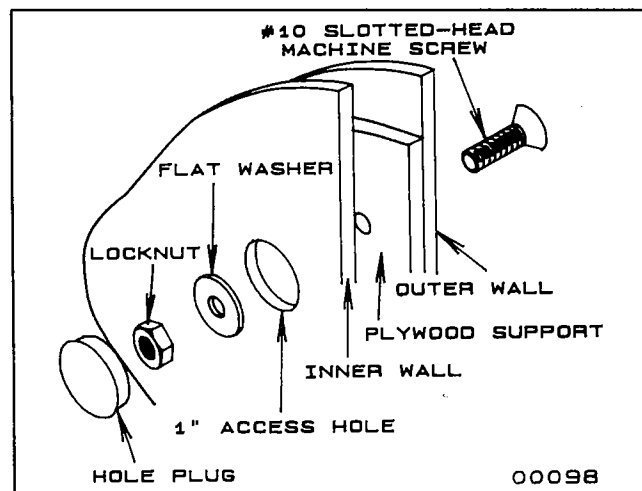


Figure 11. Access Hole and New Hinge Fastener

3. From the inside, using the holes just drilled as pilot holes, cut 1-inch access holes through the inner wall of the door with a hole saw (figure 11).
4. Install a 2-inch machine screw with flat washer and locknut in the #1 holes and a 2-1/4 machine screw with flat washer and locknut in the #2 holes.
5. Cover access holes with plastic hole plugs.
6. Remove and discard screw #6 from both body hinges (figure 10).
7. Repeat steps 2 through 5 using 2-1/4 screws. (There is no inner wall at the lower body hinge. Access is from under the front seat

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board.) If necessary, to provide adequate clearance for the locknuts and washers, countersink the plywood reinforcement with the hole saw.

8. Remove and discard screws #5 and #7 from both hinges. Repeat steps 2 through 5.
9. Replace screws #3 and #4 with #10 wood screws.
10. Check both hinge pins to be sure they are installed pointing downward.

WINDOW WATERPROOFING

Improved weather seals for the door and side windows were introduced during 1984 production. These new seals must be installed to ensure water leakage does not occur.

CAUTION

Remove curtains and seat cushions to protect them from dirt and sealant material.

1. Remove rubber strip from sliding window track at bottom of door window, both side windows and rear window (figure 12).

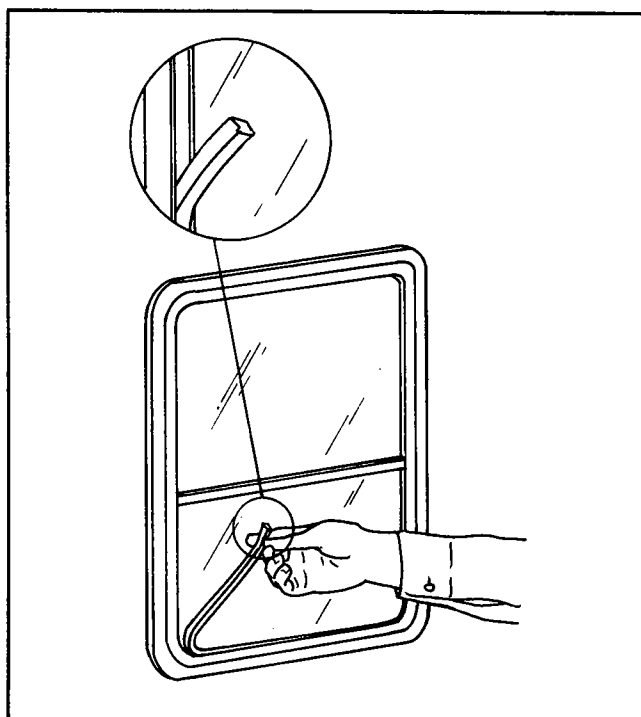


Figure 12. Rubber Strip

2. Cut new vinyl rubber inserts to correct length for each window as you go.
3. Install the new rubber insert in the window track with the flaps towards the window (figure 13).

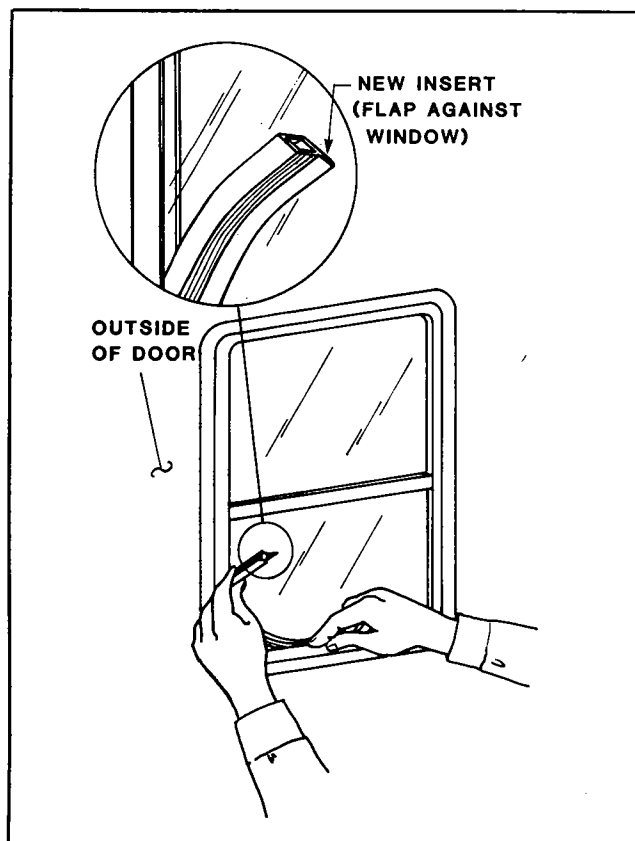


Figure 13. Rubber Insert

NOTE: Press rubber insert into place with your fingers, using care not to stretch the rubber. The insert should fit snugly at both ends.

4. Using a modified cotter pin extractor (proto P/N 2306), (as shown in the Hand Truck Repair Manual) unlace the window seal from the inside (figure 14). (Do not perform this procedure on the rear window.)

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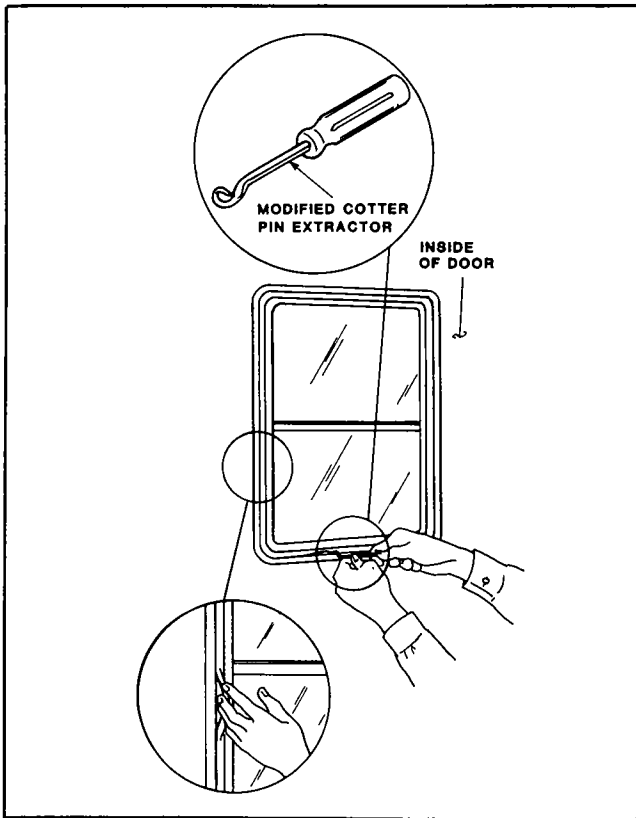


Figure 14. Window Seal

5. Using a tube of 3M windshield sealer (3M Automotive P/N 08511 5 oz. tube), run a bead down in the groove under the lip of the seal next to the window frame as shown (figure 15).

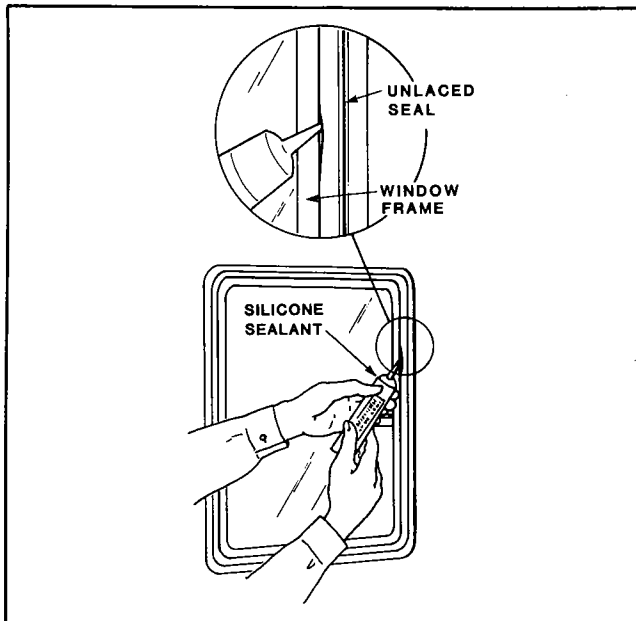


Figure 15. Window Frame Seal

6. Use the modified cotter pin extractor to re-lace the seal (tuck the flap back in) as shown in figure 16. Be careful not to tuck the flap in too far as it will leak. The surface seam should be smooth when properly laced.

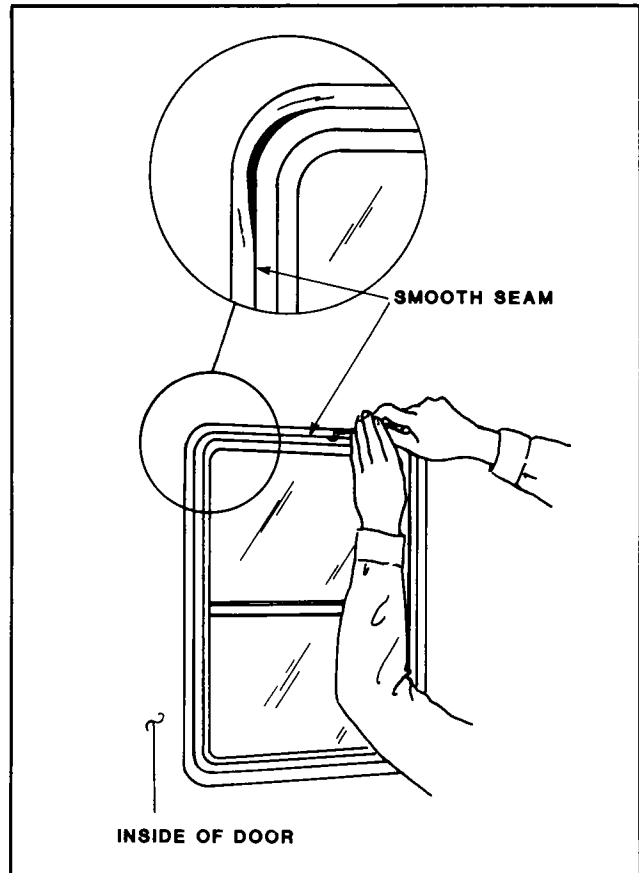


Figure 16. Lacing Window

7. For the "emergency exit" window, pull on the red tag to remove the rubber key insert (figure 17).
8. Run a bead of sealant down in the bottom of the groove. Reinstall the rubber key with the red tag at the bottom of the window.
9. Wipe off excess sealant with mineral spirits.

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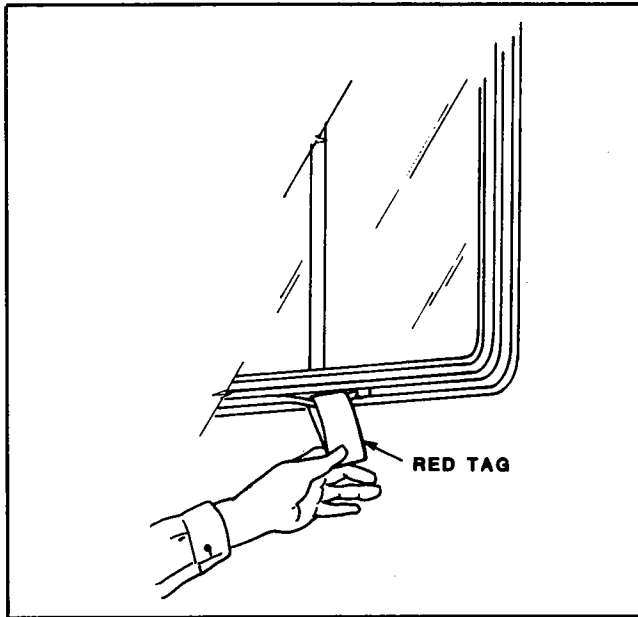


Figure 17. Rubber Key Insert

10. Apply a small amount of 3M adhesive (3M Automotive P/N 08001 5 oz. tube) to the tips of the drain hole covers (part number 21989-007) and insert them into the drain holes at the bottom of the windows, including the rear window (figure 18). Make sure the opening is down.

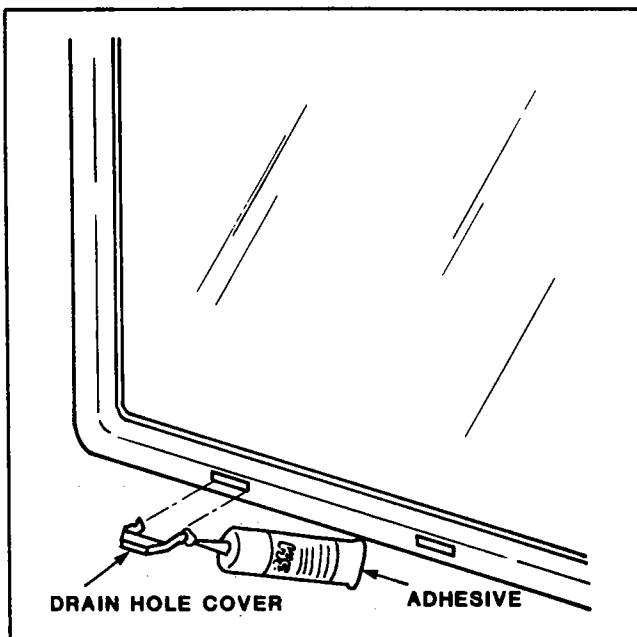


Figure 18. Drain Hole Cover Installation

BATTERY TESTER

To help determine the state of charge on the CT battery, a battery tester/gauge P/N 52351-001 was introduced late in 1984.

1. Position the battery tester mounting template (Appendix C) at bottom of fire extinguisher and mark centers for four 1-1/4-inch holes.
2. Drill holes (figure 19).

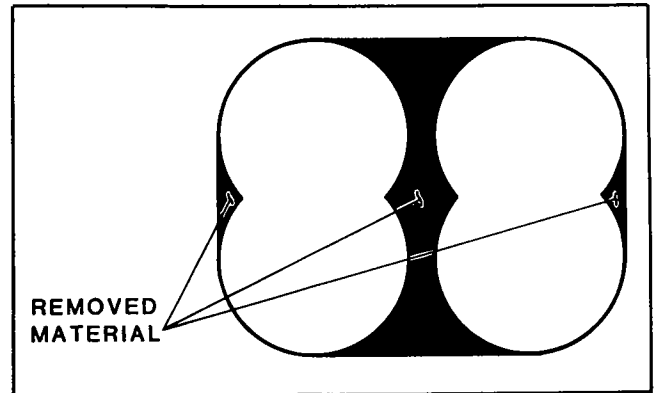


Figure 19. Hole Pattern

3. Remove the wood adjoining the holes as shown in figure 19 to create a rectangular opening with rounded edges.
4. Position Battery tester (part number 52351-001) in opening and mark location of four mounting holes .
5. Drill mounting holes with a #10 drill bit.
6. Route SJO 18-2 wire (P/N 10032-013) from battery tester opening to converter. Hot glue wire to the wall (figure 20) using a repair type hot glue gun (may be purchased locally). Be sure to keep wire away from furnace exhaust vent.

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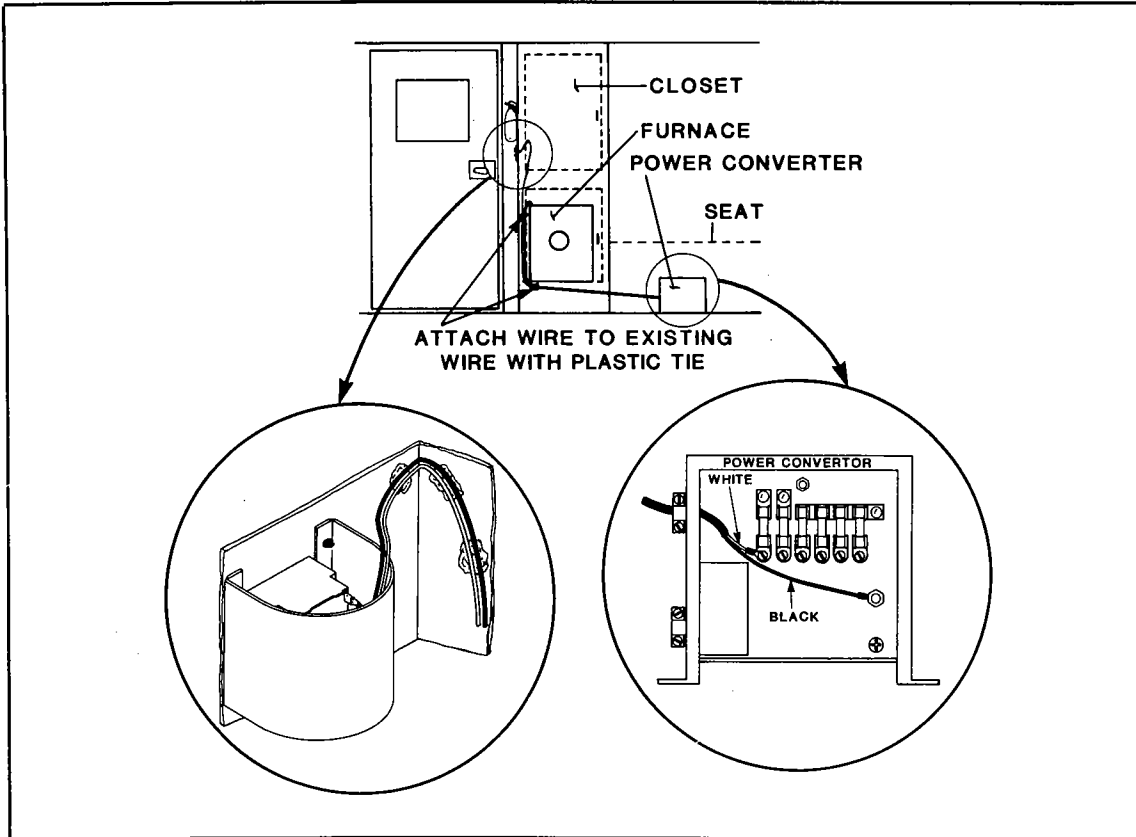


Figure 20. Battery Tester Wiring

7. Mark and drill four holes in a Fuse Cover (P/N 34651-004) using battery tester holes as a template (figure 21).

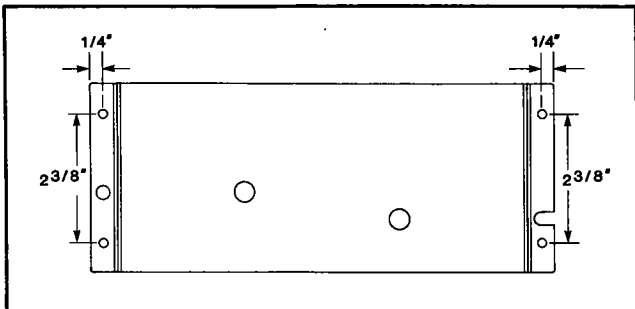


Figure 21. Fuse Cover Holes

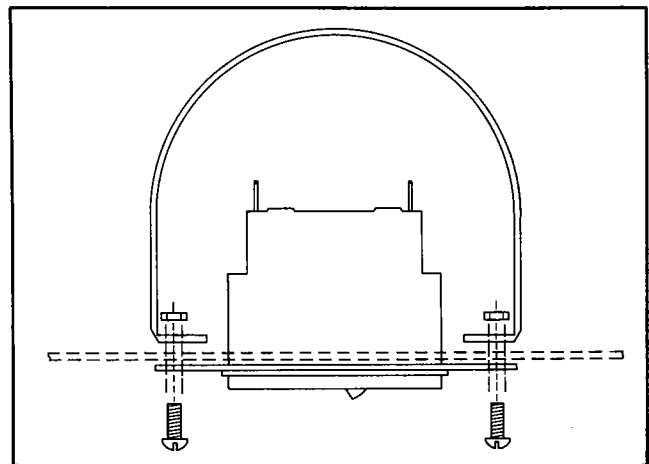


Figure 22. Tester Mounting

8. Bolt tester and fuse cover to the wall (figure 22) with four #10 screws and locknuts.

9. Attach black SJO 18-2 wire to white wire of battery tester and white SJO 18-2 wire to black wire of battery tester.

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- Center decal (part number 38687-006) ¼-inch above battery tester.

TONGUE JACK

During 1984 production a new tongue jack with a wheel was introduced for use on the CT. The addition of a wheel to the tongue jack makes the CT much easier to move around when not hooked up to a tow vehicle. (Figure 23.)

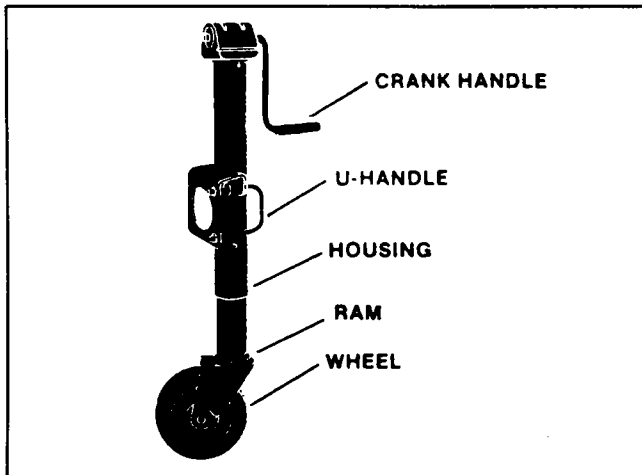


Figure 23. New Tongue Jack

- Remove coupler housing from the tongue. Save the capscrews, and washers for reuse.
- Remove the tongue/jack stand from the tongue with a cutting torch. Use care not to damage the tongue.
- Grind the old welds smooth using an air grinder.
- Measure 12 inches back from the front of the tongue and clamp jack mounting bracket P/N 21905-012 in position. Weld as shown (figure 24).

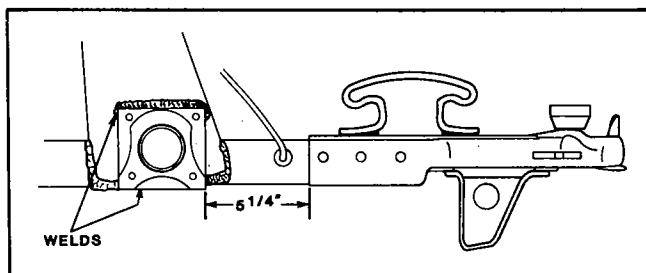


Figure 24. Jack Plate Location

- Wire brush, chip, prime and paint the mounting bracket and welded areas.

- Place tongue jack on mounting bracket and install retaining ring.

COMPARTMENT LINERS

Liners for the cabinet and storage compartments were added in 1984. The liners improve appearance and make the areas much easier to keep clean.

Liners for the storage compartments under the seats are not secured with fasteners and are easily removed for emptying and cleaning.

- Hold the cabinet liners in place and line drill #8 holes through both the liner and the cabinet where the indents are located on the liner flanges (figure 25).

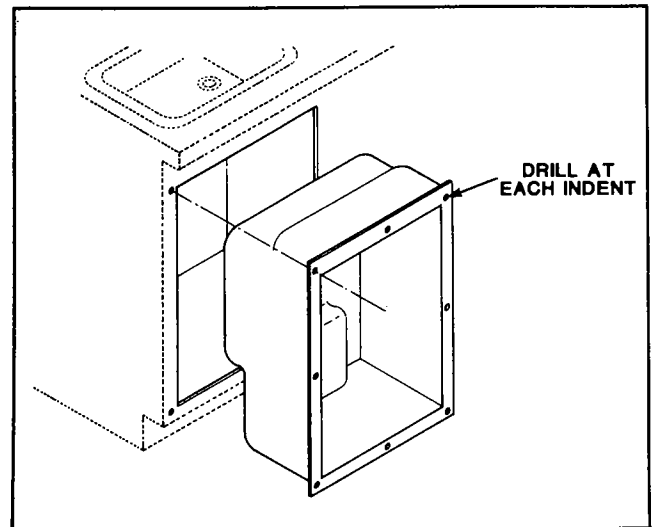


Figure 25. Cabinet Liner

- Remove the liner and enlarge the holes in the cabinet face with a 19/64-inch drill bit.
- Place nylon inserts in holes drilled in cabinet face and install the liner with #8 OVH x ½ self tapping screws.
- Install a new threaded latch P/N 21851-016.

EVAPORATIVE COOLER INSTALLATION

- Remove vent assembly (figure 26).

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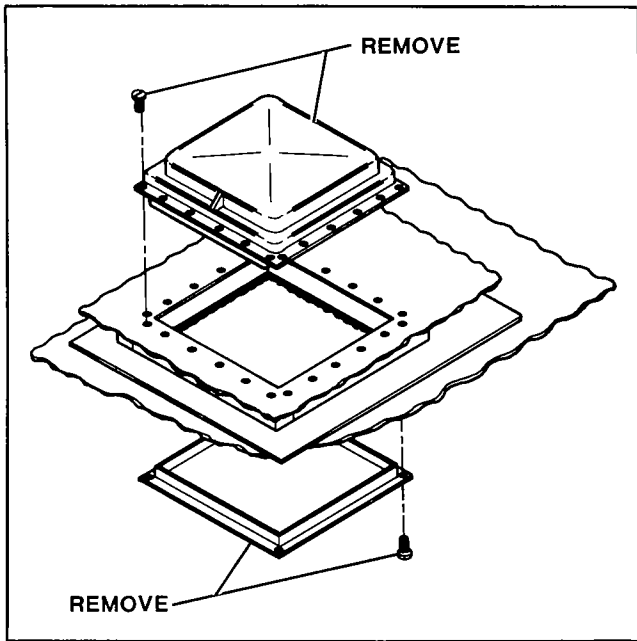


Figure 26. Vent Assembly

2. Apply silicon caulking (P/N 10711-016) on top surface of trailer along edges of vent opening.
3. Install adhesive weatherstrips (provided with cooler) as shown in figure 27.

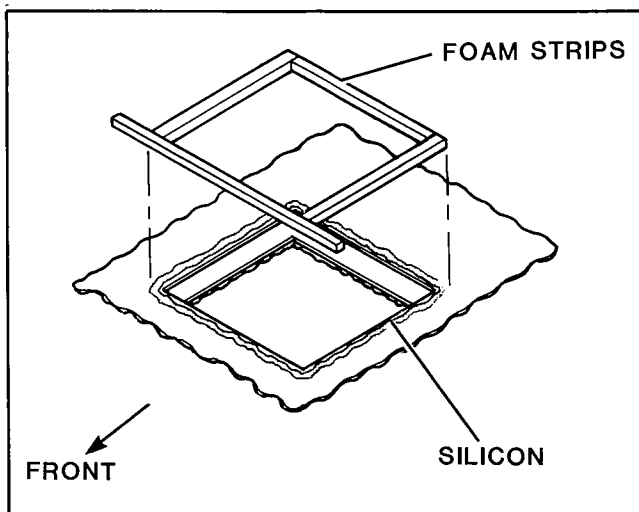


Figure 27. Weatherstrips

4. Install the cooler on the roof. (Rear of cooler should face front of trailer.)
5. Drill two 1/2-inch holes at the locations shown in figure 28.

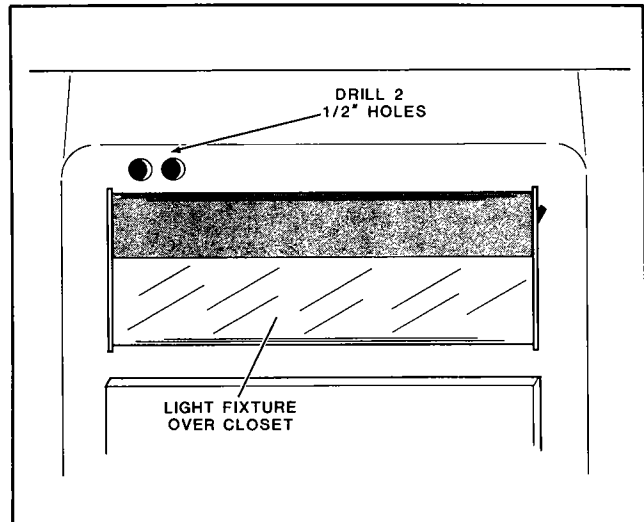


Figure 28. Hole Locations

6. Cut a notch in the cooler cover, to allow water lines and wires free passage (figure 29).

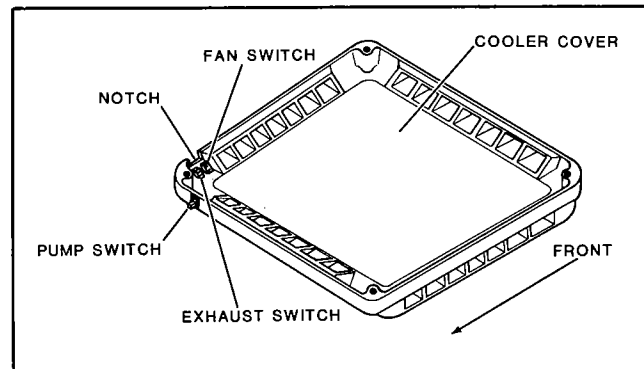


Figure 29. Cooler Cover Notch

7. Connect wiring (figure 30).
8. Route the yellow wire, the white wire and the water lines through the left-hand hole above the closet light.
9. Connect the water line to the cooler (line is supplied with cooler).
10. Route the yellow and white wires and water line through the cavity above the trailer door. Be sure the ends are accessible in the front seat compartment.

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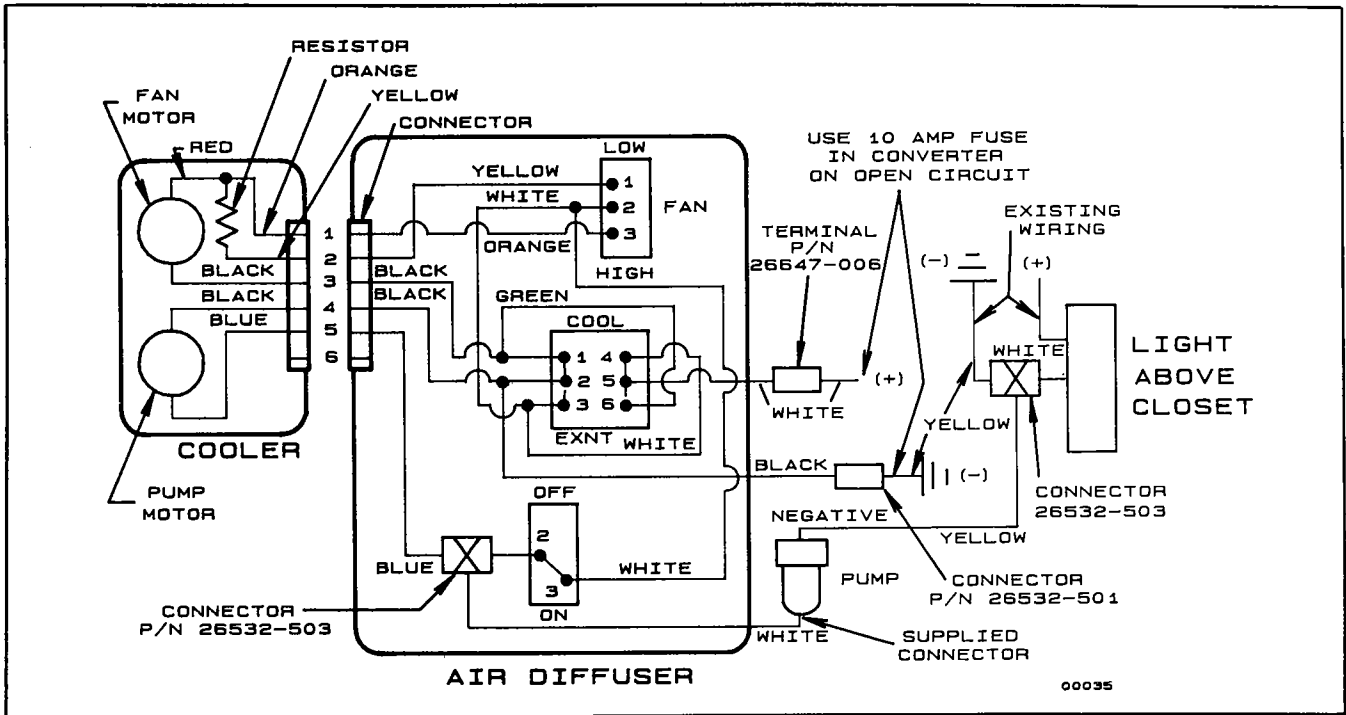


Figure 30. Wiring

11. Route the shielded two-conductor wire through the right-hand hole above closet light and through the closet cavity to the rear seat compartment. Be sure wire will reach converter with slack to spare.
12. Using the water tank as template, mark locations for installation of two 1x2x4 wood blocks (figure 31). Remove tank and laminate blocks in place .
13. Drill a 1/4-inch hole through left wall of seat compartment and install cap screw, washer, and insulated clip as shown in figure 31.
14. Install insulated clip and nut on threads of existing eyebolt.
15. Install the water pump as shown in figure 32.
16. Connect wiring to pump (figure 32).

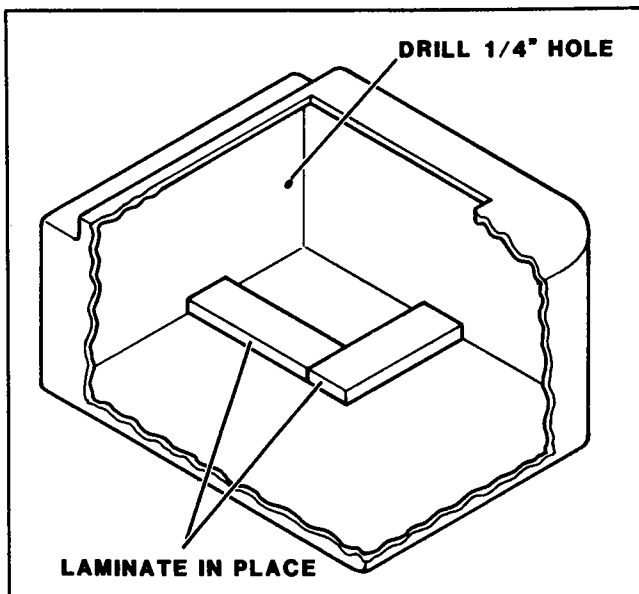


Figure 31. Tank Installation

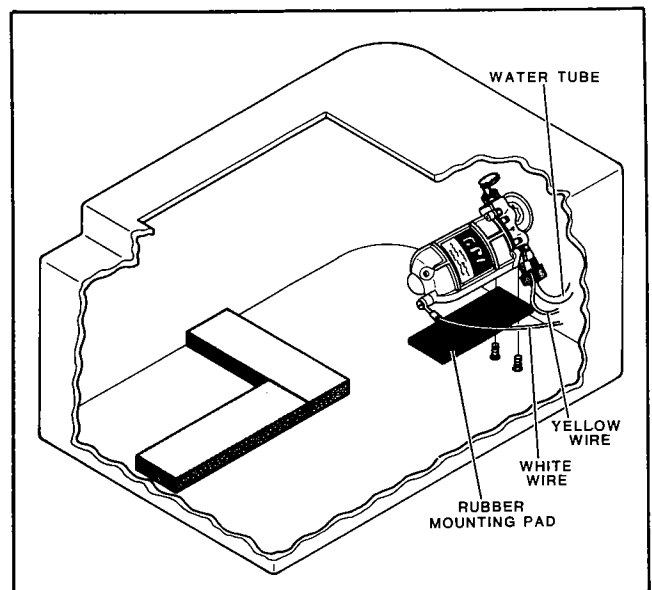


Figure 32. Pump Installation

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17. Connect wiring to converter (figure 33).

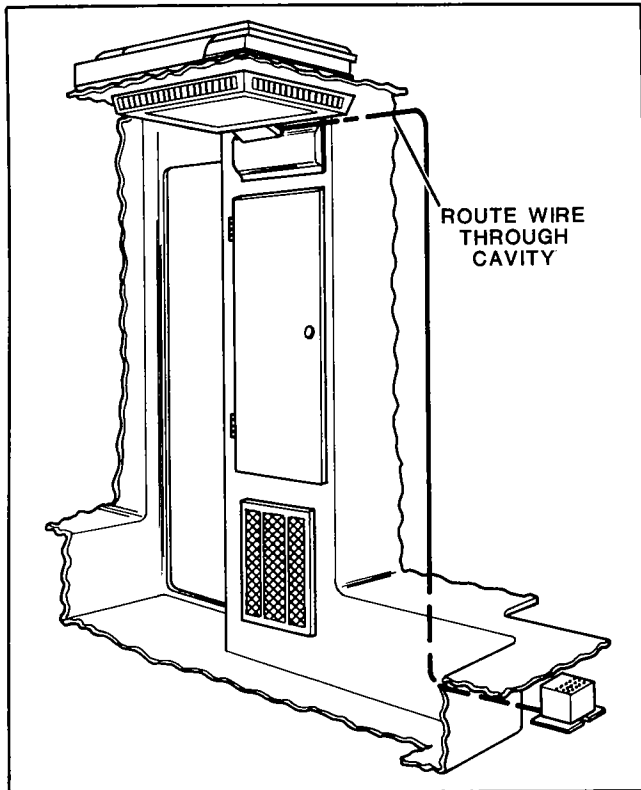


Figure 33. Converter Wiring

18. Fill tank with water and run the cooler. Look for leaks. The pump should stop running when the float (on roof) is full.

19. Hot glue wiring cover in place (figure 34). Hot glue loose wires to closet wall.

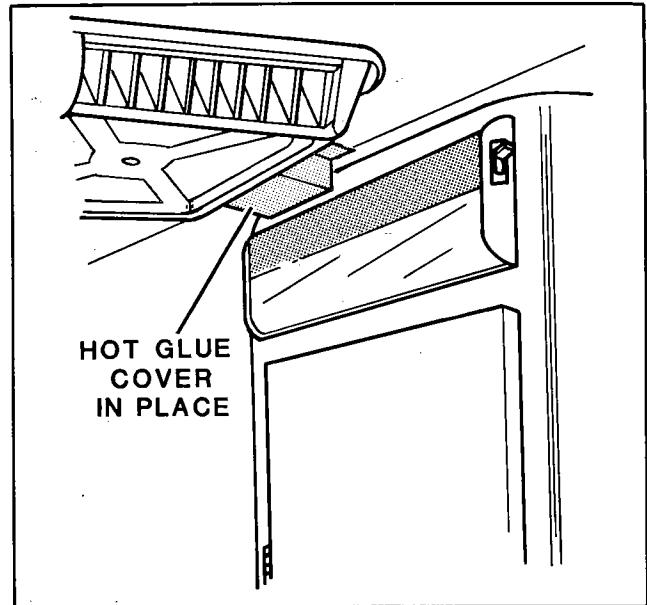


Figure 34. Wire Cover Installation

20. Spray water on the roof of the camper. Check for water leakage inside the camper around the evaporative cooler.

GENERAL REPAIR

U-Haul Camper Trailers must be brought up to U-Haul standards before being released for rental. Proper repairs are important to safety and reliability of performance to the customer.

WIRING REPAIR

The U-Haul Camper Trailer is equipped with two separate electrical systems; an exterior system for the tail/stop lights and running lights and an internal system for operating the appliances and interior lighting.

Inspect all wiring to make certain that connections are secure and wiring is in good condition. The exposed wiring at the front of the camper is especially susceptible to weathering and accidental damage.

INTERIOR ELECTRICAL SYSTEM (12V)

The U-Haul Camper Trailer appliances operate

on 12 volts. There are two primary sources and one secondary source.

The primary sources are a 12-volt deep-cycle battery and a 120-volt, 30-amp converter which, when plugged into a 120-volt source, provides a 120-volt supply inside the camper, a 12-volt supply to the camper appliances and charges the battery.

The secondary source is a solar panel installed on the roof of the CT. This solar panel acts only as a trickle charger for the battery and is only intended to keep sulphation down when the trailer is on the lot. *It will not keep the battery at full charge or recharge a low battery.*

If the battery in the CT becomes severely discharged, it will have to be recharged for at least 72 hours. This can be done with the battery in the camper by plugging the 120 volt shore cord into a standard outlet or with a standard battery charger outside the camper.

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If a standard battery charger is used it must be set at a very low rate of charge. The CT *deep cycle* batteries must be charged slowly.

BATTERY SERVICE

NOTE:The battery is located under the rear seat panel of the camper.

1. Remove the seat cushion and lift the seat panel out of the way.
2. Remove the battery box cover by unhooking the retaining straps on each side.
3. Inspect the connections and cables. Clean as needed.
4. Check electrolyte level. Add *distilled water only* as needed.
5. If battery is covered with corrosion, remove it from the battery box and thoroughly clean it outside the trailer.

120-VOLT WIRING

The 120-volt receptacle box was incorrectly wired in some early production models of the U-Haul CT. This must be corrected to allow the circuit breaker and the Ground Fault Circuit Interrupter (GFCI) to work.

1. Remove the receptacle box/cover from the side of the over-the-sink cabinet (figure 35).

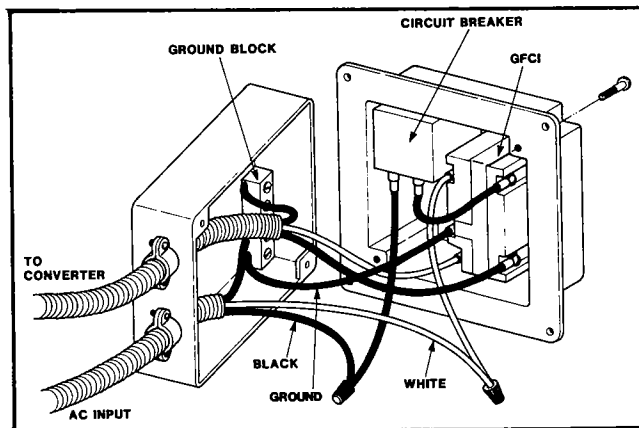


Figure 35. Camper Trailer Receptacle Wiring

2. Check for proper wiring sequence.
3. Reinstall receptacle box and place a Safety Certification Sticker above the faceplate to show that this trailer is correctly wired.

LP GAS REGULATOR REPLACEMENT

Use only a two-step regulator because it will

provide more consistent outlet pressure than a single stage model, and is much less likely to experience freezing at the orifice.

Never try to adjust a regulator. If a regulator does not maintain between 9-½ and 13 inches of water column pressure, replace it.

WARNING

INCORRECT ADJUSTMENT MAY CAUSE THE INTERNAL VALVE TO BE WEDGED IN A POSITION FROM WHICH IT CAN EASILY BE DISLODGED BY ROAD VIBRATION. THIS MAY RESULT IN GAS LEAKS WHICH MAY CAUSE INJURY OR LOSS OF LIFE.

Access to the fasteners holding the regulator is under the front bunk bed. If access holes are not already installed, do the following.

1. On the outside of the camper, measure from the bottom edge of the regulator and from the center seam to the center line of the regulator (figure 36).

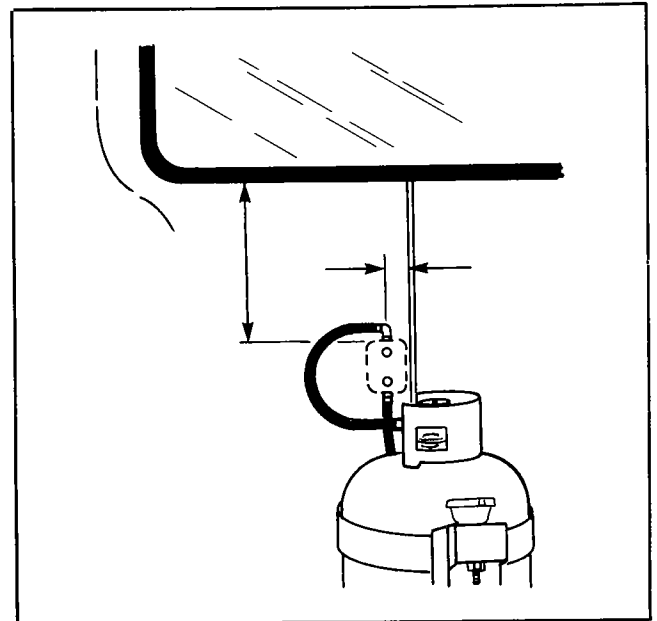


Figure 36. Measurements for LP Regulator Access Holes - External

2. Raise the front bunk and secure in place.
3. Transfer the measurements from the front to the inner front wall (figure 37).

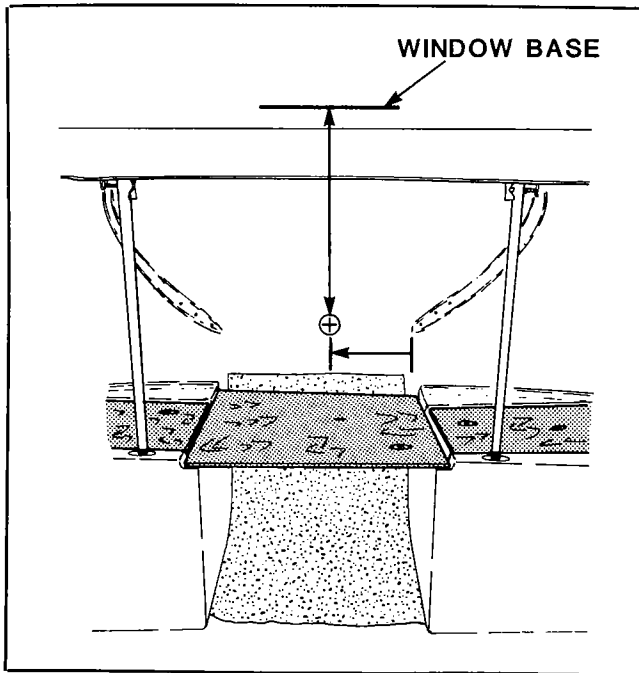


Figure 37. Measurement for LP Regulator Access Holes - Internal

- Cut a 2-inch hole in the inner wall with a hole saw (figure 38).

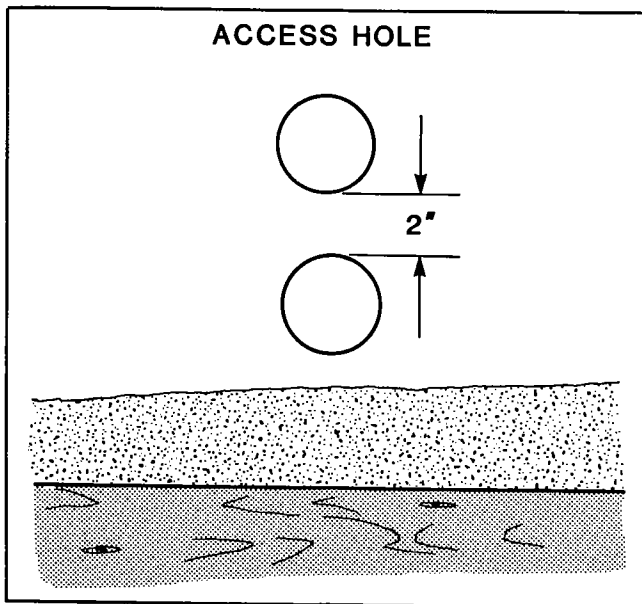


Figure 38. LP Regulator Access Holes

- Measure 2 inches down from the bottom edge of this hole and cut another 2-inch hole.
- The fasteners securing the regulator may now be removed as necessary.
- When repairs are completed, install black plastic hole plugs (figure 39).

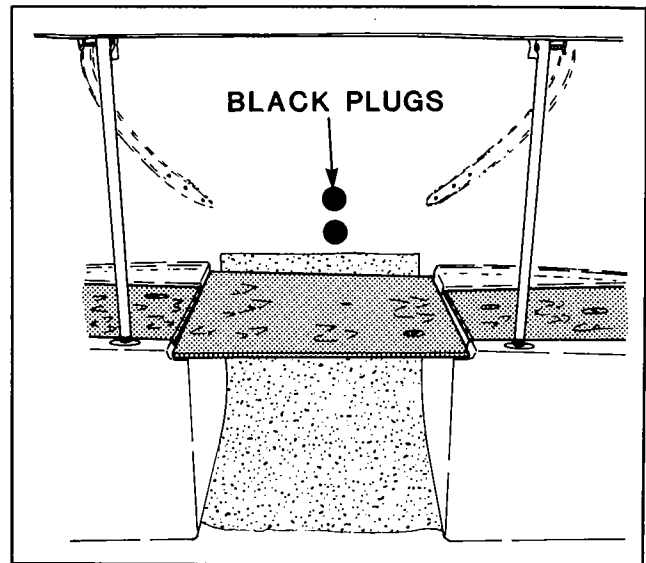


Figure 39. Black Plastic Hole Plugs

DOOR HINGE REPLACEMENT

The door hinge was changed for 1985 production. The new hinge is interchangeable with minor adjustments. Please refer to the Illustrated Parts Breakdown for the correct part number.

- Remove broken hinge and discard. Save fasteners for reuse.
- Align holes #3, #4, #5, & #6 of the new hinge with the existing holes in the camper door and body and reinstall the fasteners securely, (figure 40).

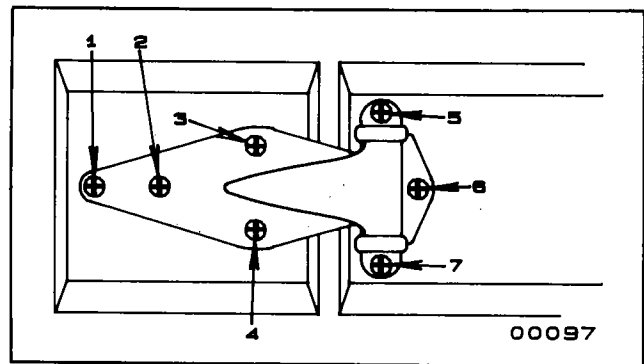


Figure 40. Hinge Screw and Pin Identification

- Using a #10 drill bit, line drill holes #1, #2, and #7. Reinstall the fasteners and replace all body plugs on the interior of the camper (figure 41).

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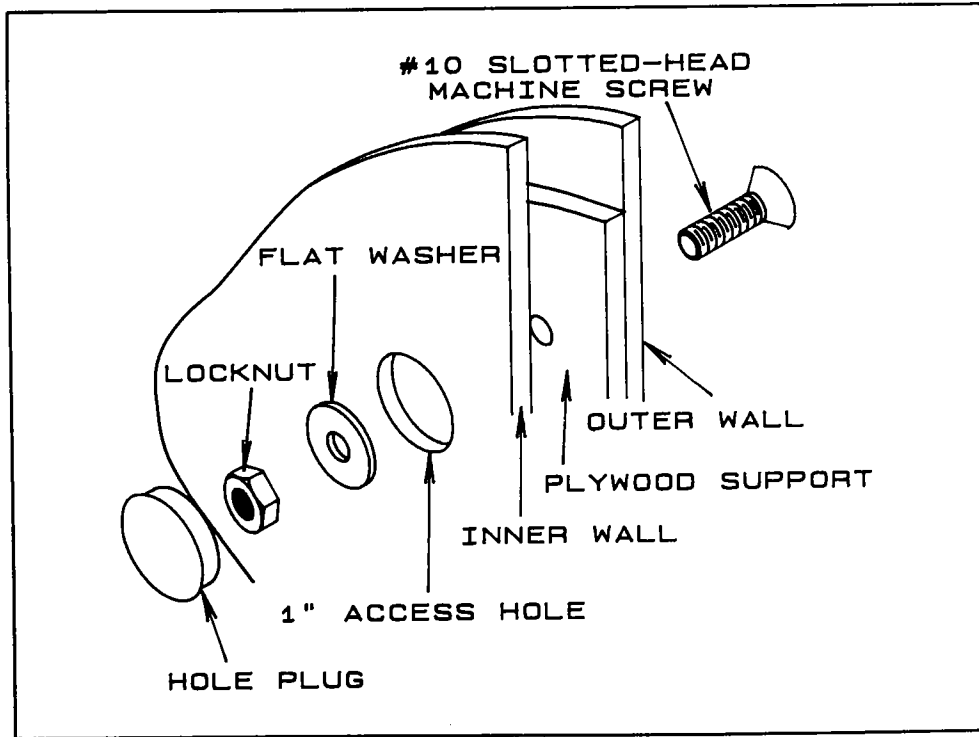


Figure 41. Access Hole and New Hinge Fastener

WINDOW INSTALLATION

Use the following parts:

P/N	DESCRIPTION	QTY
21806-003	WINDOW, Sta front	1
21807-003	WINDOW, 14 x 19-½ w/screen	1
21807-004	WINDOW, 18-½ x 24 w/screen RH	1
21807-005	WINDOW, 18-½ x 24 w/screen LH	1
21807-006	WINDOW, 18-½ x 41-½ w/screen	1

The modified cotter pin extractor (proto P/N 2306), shown in the Hand Truck Repair Manual and Special Tools Catalog, can be used in place of the handle and curved bit to lace windows.

FRONT AND REAR WINDOW INSTALLATION

1. Remove window unit by removing securing screws and pushing out on unit from inside of camper.
2. Caulk around frame of window unit completely using black silicone sealant (3M Automotive P/N 08511 - 5 oz. tube). Apply heavy bead around corners which are typical trouble spots for leakage (figure 42).

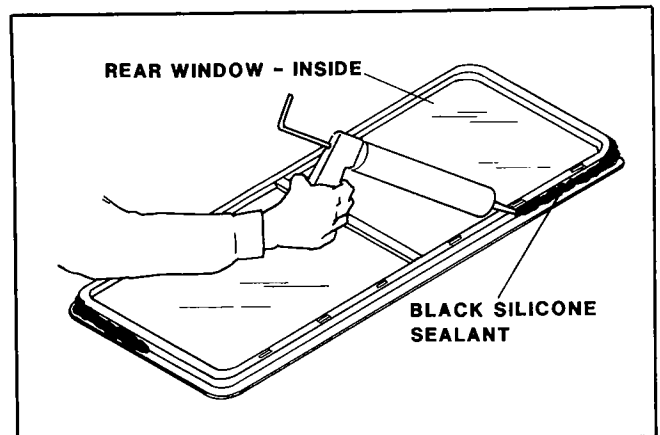


Figure 42. Applying Silicone Sealant to Front or Rear Window Frame

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3. Install window unit from outside (U-HAUL NOT TO BE SOLD stamp on outside window frame goes to the bottom on all windows).
4. While one person holds window from outside, another secures mounting frame on the inside (frame seam and window seam should be on the same side).
5. Put in mounting screws starting on the opposite side from seam and work around window. Make sure screws go into window unit groove.
6. Apply a small amount of 3M adhesive (3M Automotive P/N 08008 5 oz. tube) to the tips of the drain hole covers and insert them into the drain holes at the bottom of the rear window (figure 43). Make sure the opening is down.

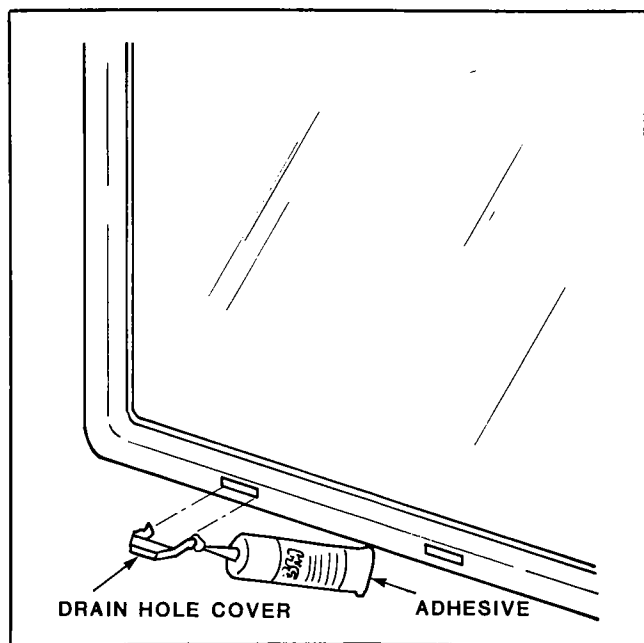


Figure 43. Drain Hole Cover Installation

DOOR AND SIDE WINDOW INSTALLATION

1. Remove window.
2. Reinstall rubber gasket in window hole on camper (large flat side faces out). The seam should be to the rear of each window hole, centered an equal distance from top and bottom. Place a small amount of silicone sealant at the seam where the two edges meet.
3. Using a mixture of soap and water, soap the U-channel groove of the window gasket for easy installation.
4. From the inside, slide window unit into the U-channel. Draw gasket lip over the window unit edge (figure 44). Use the window installation tool with the curved bit (part number FB-12).

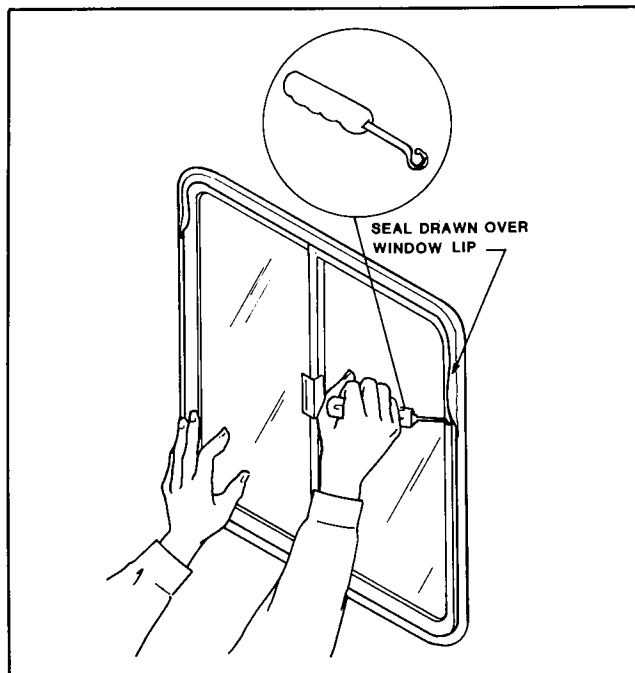


Figure 44. Installing Window in U-Channel of Rubber Gasket

5. Insert nozzle of silicone sealant applicator between U-channel and window edge and apply evenly around entire unit (figure 45).

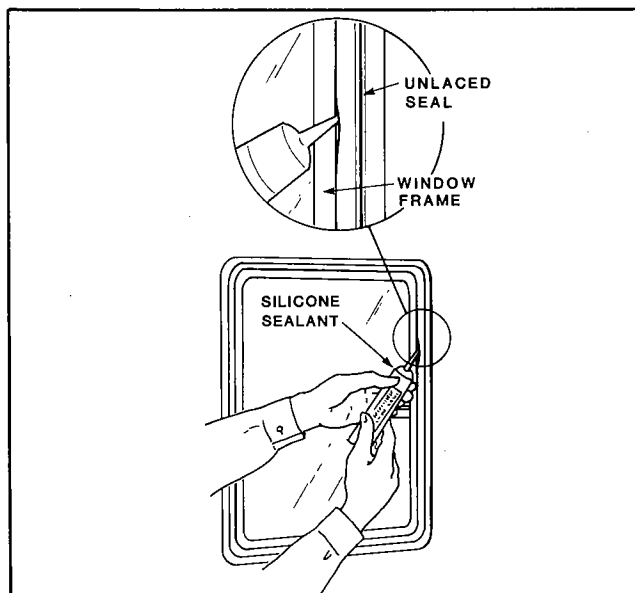


Figure 45. Sealing Around Window

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6. Lace window by inserting end of installation tool in groove and working completely around window until properly seated. The surface seam should be smooth when properly laced (figure 46).

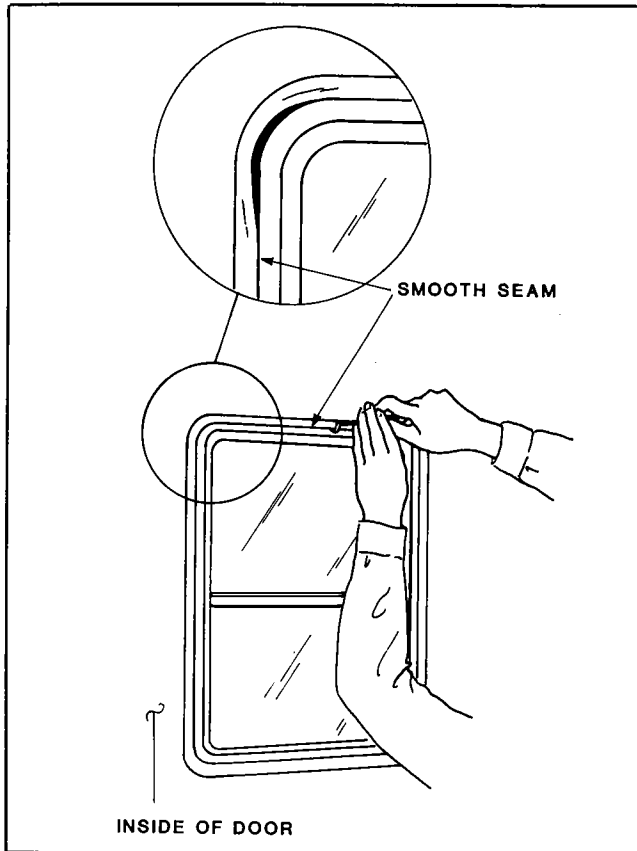


Figure 46. Lacing Window

NOTE: Step #6 is not done on emergency knock-out window.

7. Apply a small amount of 3M adhesive to the tips of the drain hole covers and insert them into the drain holes at the bottom of the windows as needed. Make sure the opening is down.

INSTALLING PULLOUT KEY ON EMERGENCY WINDOW

1. Starting at top center of emergency window insert end of rubber key in groove using rubber key installation tool. When bottom center of window is reached, slide red pull tag on and finish installing key. The ends should meet at the top (figure 47).

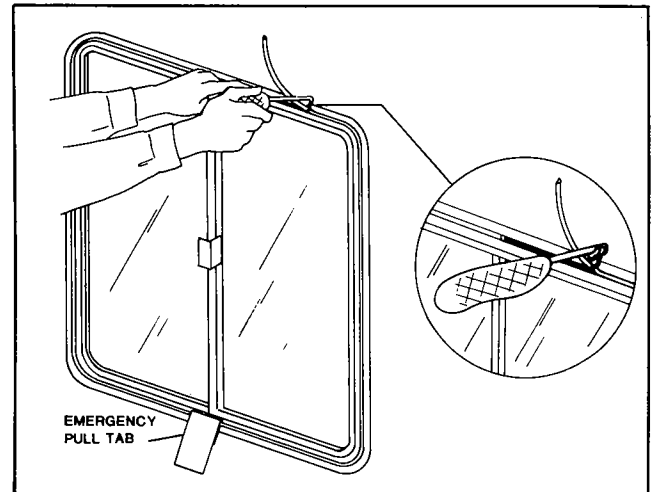


Figure 47. Rubber Key Installation

TESTING FOR LEAKS AROUND SEAL

1. After adhesive dries, direct a stream of water over windows and check inside for leaks.
2. Unlace window and reseal if necessary.
3. Excess window sealant can be easily removed with a razor blade and mineral spirits after drying.

FIBERGLASS REPAIR

Most minor fiberglass damage can be repaired by a qualified shop repair person using locally available kits or with other materials as listed below.

NOTE: When fiberglass repairs cannot be done with economy and effectiveness by a qualified shop repair person, sublet the repair locally.

Use the following materials: -
(for minor damages)

Bondo Resin and Jelly Kit - from Checker Auto Supply

Fiberglass Repair Kit #765-1281 (8 sq ft) - from NAPA

Fiberglass Repair Kit #765-1280 (4 sq ft) - from NAPA

Fiberglass Resin #765-1285 (1 Qt) - from NAPA

Purchase these materials for larger jobs if needed (quantities as required - materials have limited shelf life):

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Resin
Cabosil
Mills Fiber 1/32
M.E.K. Catalyst
302 Fiberglass Mat
Fiberglass Cloth
Acetone
Styrene
Correct Color of Paint.

PAINT, APPEARANCE AND DECALS

Painted surfaces on the U-Haul Camper Trailer are to receive new paint as necessary to ensure protection of the surface. Decals are to be replaced as necessary to ensure their readability.

For additional information on painting and decal removal and replacement procedures, refer to the Trailer Paint, Appearance and Decal manual.

PAINTING

Although painting is done both to protect the surfaces and to improve appearance, mere

beautification does not justify repainting. If the paint is evenly oxidized and is still protecting the surfaces, do not repaint. When repainting is needed, all rust, moisture, dust, chipped paint and oil must be removed prior to application of the paint.

Pay particular attention to proper surface preparation to get the maximum life out of the paint.

Thoroughly mask all areas which are not to receive paint.

DECAL PLACEMENT

External decal placement is shown in figure 48 and internal placement is shown in figure 49. Part numbers and decal descriptions are listed following each figure.

DECAL REPLACEMENT

Replace decals when they show severe checking, when they are no longer readable and after repainting.

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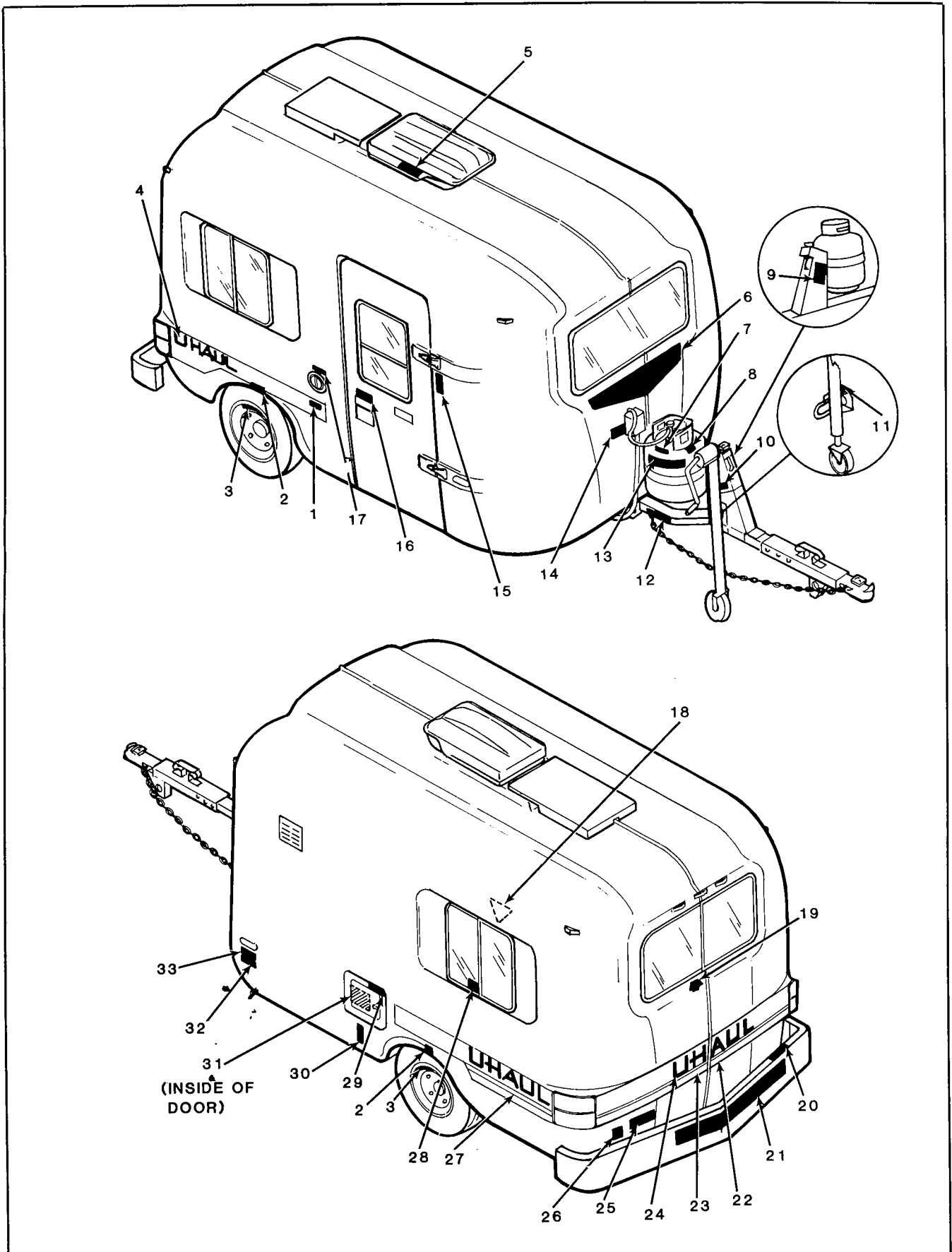


Figure 48. Exterior Decal Placement

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ITEM NO.	PART NUMBER	DECAL DESCRIPTION	QTY.
EXTERIOR			
1	38621-013	Property of U-Haul	1
2	38653-045	Tire pressure 45	2
3	38676-033	Lug nut torque	2
4	38734-012	U-Haul Camper RH	1
5	38661-053	Clearance warning	2
6	38788-014	Adventure	1
7	38651-031	Fill LP 80% capacity	1
8	38811-037	Front	1
9	38686-087	Refill LP gas cylinder	1
10	38665-015	Shutoff LP tank warning	1
11	38673-029	Jack instructions	1
12	10271-024	PAINT, Wimbledon white aerosol to: stenciling fleet number (not a decal)	AR
13	38663-141	Flammable compressed gas warning	1
14	38677-100	LP gas system warning	1
15	38626-001	Sticker, Safety certification (not a decal)	1
16	38664-014	Passenger instructions	1
17	38665-014	Hot vent - Do not touch	1
18	38686-089	Emergency exit (inside)	1
19	38666-018	Hotline	1
20	38841-015	Jack operation	1
21	38772-022	One-way and local rentals	1
22	38881-037	Striped RH	1
23	38881-038	Striped LH	1
24	38634-025	U-Haul	1
25	10271-023	PAINT, Black enamel bulk (not a decal)	AR
26	38621-018	Vehicle ID numberU-Haul	1
27	38734-013	U-Haul camper LH	1
28	38666-020	Side window emergency exit (inside)	1
29	38676-033	Lug nut torque	2
30	38653-045	Tire pressure 45	2
31	38648-080	Water/electric plug information	1
32	38686-040	Waste water drain	1
33	38648-061	Water/electric plug information (inside)	1
34	38626-023	Safety standards	1
35	38649-022	Designed by	1

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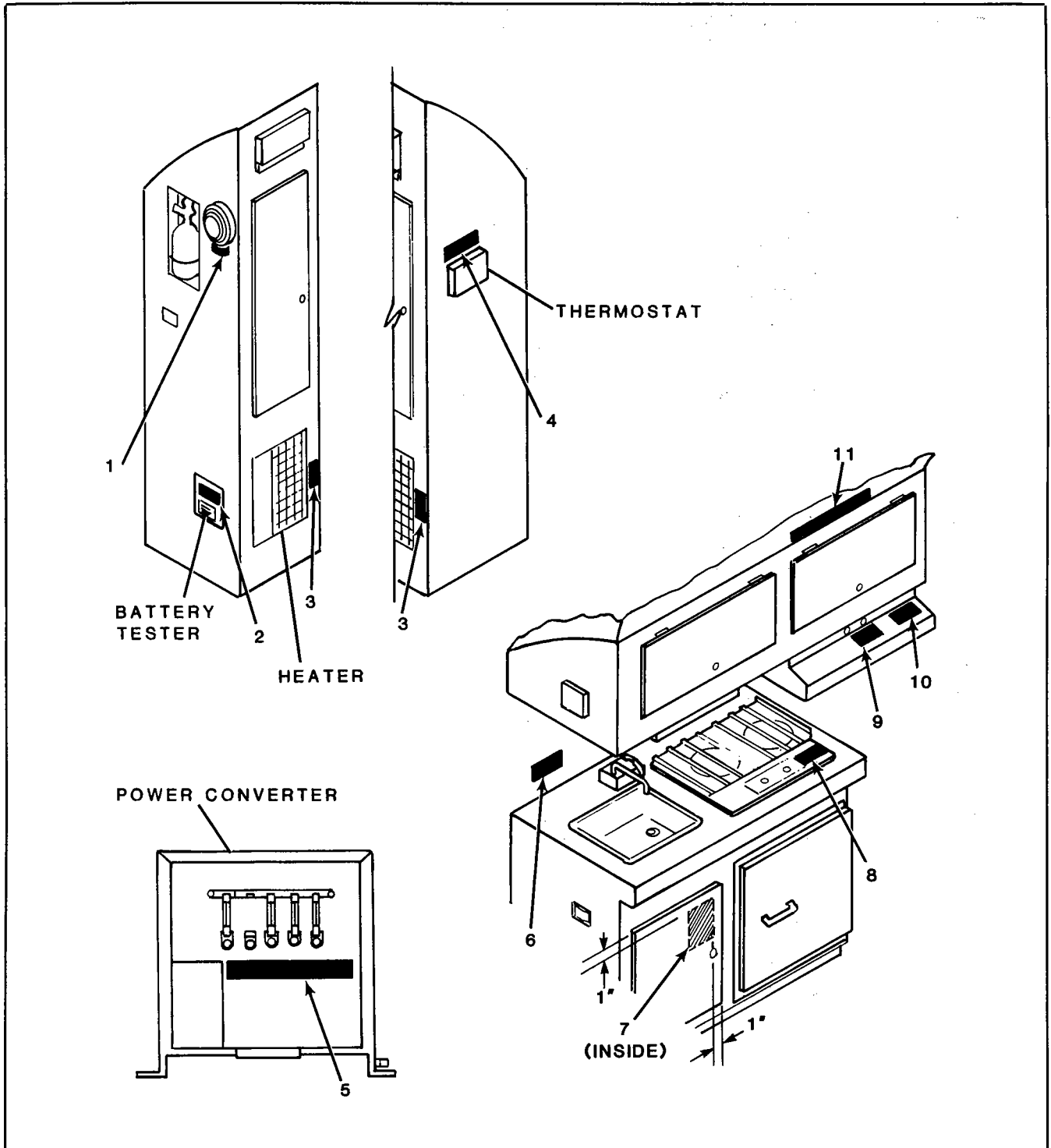


Figure 49 Internal Decal Placement

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ITEM NO.	PART NUMBER	DECAL DESCRIPTION	QTY.
		INTERIOR	
1	38687-009	Test smoke detector warning	1
2	38687-006	U-Haul personnel service plug connection	1
3	38663-073	Caution hot	1
4	38677-077	Furnace instructions	1
5	38648-094	Fuse identification	1
6	38677-097	Dispense water	1
7	38623-009	Sticker, Equipment ID	1
8	38677-112	Burner operation	1
9	38666-027	LP gas emergency	1
10	38665-021	Cooking stove safety instructions	1
11	38677-098	Evaporative cooler instructions	1

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FURNACE REPAIR

Check for correct operation:

1. Set thermostat to OFF position.
2. Remove furnace front panel. Turn gas valve control of OFF position (figure 50). Wait 5 minutes.

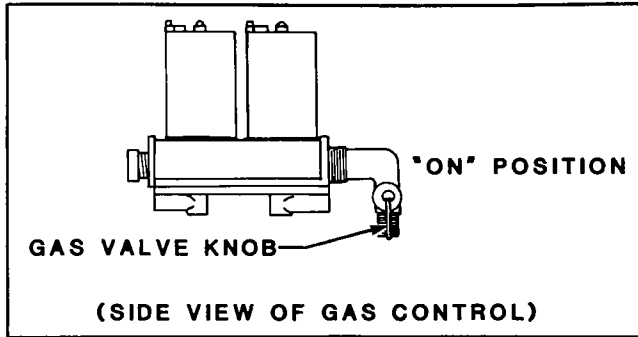


Figure 50. Gas Valve Control

3. Turn gas valve control to full ON position.

NOTE: Never attempt to operate the unit with valve partially open. It must always be in the fully ON or the fully OFF position.

4. Replace front panel and set thermostat higher than ambient temperature.
5. Allow 15 seconds for burner to ignite. If burner does not light, turn thermostat off, wait 5 seconds and reset to ON position.
6. If unit does not ignite after three attempts, turn gas valve and thermostat off. Refer to Service Procedures.

DIRECT SPARK IGNITION SYSTEM

To ignite the furnace it is necessary only to set the thermostat. The thermostat provides power through the blower relay to the fan motor and once there is a sufficient amount of air blowing through the unit, the sail switch closes, sending power to the ignitor. The ignitor opens the main burner gas valve and provides the ignition spark. Electronic flame sensing circuitry in the ignitor detects the presence of a flame at the main burner. If the burner fails to light within 15 seconds, the system will shut down.

PM SERVICE

- Ensure integrity of gas system by performing a manometer test after every rental. (See Appendix A.)

- Make sure controls are kept clean of dust.
- Inspect main burner for soot accumulation. Clean (vacuum) if necessary.
- Inspect vents to make sure there are no leaks.
- The main burner flame should be checked regularly to be sure the flame is blue. A yellow flame will cause the formation of soot (figure 51).

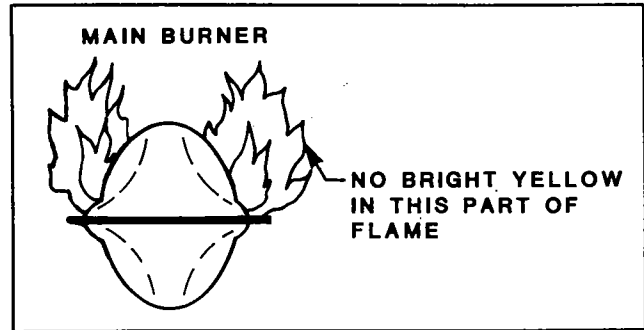


Figure 51. Main Burner Flame

FURNACE TROUBLESHOOTING

BLOWER RUNS, NO IGNITION SPARK

1. Check for voltage across terminals L1 and GND on control module (figure 52). If voltage is present, check if system has gone into a lockout by resetting thermostat. If no voltage is present, check for open sail switch or limit switch. Check wires and connections.

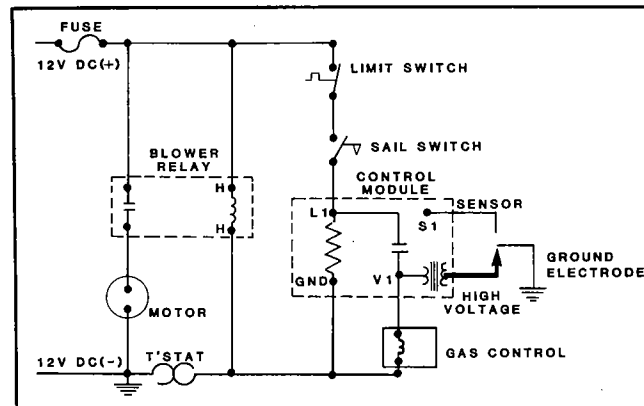


Figure 52. Circuit Schematic for DuoTherm Series 6100 Furnace

2. Malfunctioning Sail Switch - Be sure the air switch is moving far enough to close its contacts. Insufficient blower speed might be due to low voltage. If the switch does close but the gas valve does not open, replace the sail switch.

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3. Check for spark at electrodes during the first five seconds of the cycle. Check electrode setting (figure 53). Readjust if necessary. Remove any carbon deposits on electrode tip.

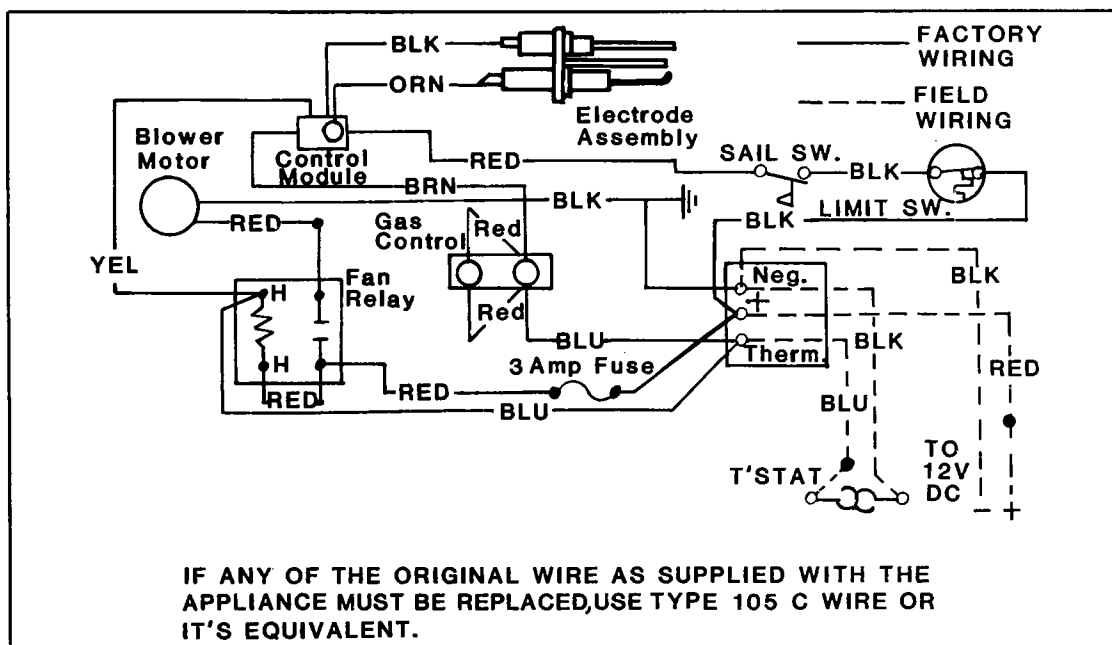


Figure 53. Wiring Diagram

- If there is no spark, check control module for high voltage output. Disconnect high voltage lead from module and temporarily connect another insulated wire to the module. Hold the end of this wire $\frac{1}{8}$ inch from the furnace casing and start the ignition cycle. If no spark is present, replace the control module.
- If there is spark during this check, it indicates a short to ground in the high voltage wire or electrode. Check the high voltage wire for breaks. Check the electrode insulators for cracks. Check electrode settings (figure 54).

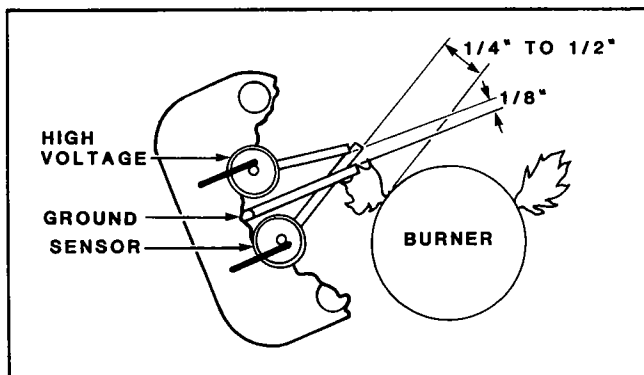


Figure 54. Electrode Settings

BLOWER RUNS, SPARK GOOD, NO MAIN BURNER

1. Make sure manual shut-off valve at heater is open.
2. Check for voltage across gas control terminals (DO NOT check from terminals to ground) during the first five seconds of ignition cycle. If no voltage is present when the sail switch closes, replace control module.
3. If voltage is present at gas control, check to make sure gas control is opening. Several methods can be used for checking the operation of the gas control. If the unit is being checked on a test bench, a strong gas smell can be noticed at the exhaust vent indicating that gas is flowing through the control. On units with General, Robertshaw or Fenwall controls, a gas pressure check can be made at the pressure tap on the control. Pressure will be indicated only when the control opens.

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4. The Essex control has a pressure tap which shows inlet pressure only. To check this control, attach a manometer to the pressure tap, open the manual gas valve on the pressure regulator (next to the gas control), then close the valve. Set the thermostat to start the ignition cycle and observe the manometer. If the valve opens, the pressure will drop to zero.
5. If the gas control does not open with voltage applied to the terminals, replace the control.

BLOWER RUNS, SPARK GOOD, CONTROL OPENS, NO MAIN BURNER

1. Recheck electrode adjustment. Spark must be located across the high voltage and ground electrodes only (not to burner, heat chamber, etc.). Model 900 Series must spark to tip of pilot hood.
2. Check gas control outlet, burner pipe, and main orifice for restrictions. Check burner ports for corrosion or restrictions which would prevent gas flow to spark area. On 900 models check pilot burner for restrictions in the hood or orifice.
3. Check gas pressure at pressure tap gas control. Pressure should be 10-11 inches water column.
4. Carefully check heat chamber for loose gaskets or other openings which would allow air from the circulating blower to enter the heat chamber and prevent gas from reaching the spark.

LOCKOUT OCCURS AFTER BURNER LIGHTS

1. After the burner ignites, the control module applies a voltage to the sensor. If there is flame present in the gap between the sensor and ground, a small electrical current flows across this gap. The control module senses this current flow and if the current is more than five microamps the control module will allow ignition to continue. But if the current is less than five microamps, the control module will shut down the ignition system within seven seconds.
2. The amount of current flow in the sensor circuit is directly related to the type and amount of flame present in this gap between

sensor and ground. By measuring this current it can be determined whether the control module is operating properly or that the sensor is located in the correct position in relation to the flame.

CHECKING MICROAMPS

1. To properly check out a Fenwall DSI System, the current in the sensor unit must be measured using a DC microamp meter with a 0-50 microamp scale. The best kinds of meters come in a case and have leads attached. A milliamp meter will not read current this low. 1 milliamps = 1,000 microamps.
2. To use a microamp meter, connect it in series with the sensor circuit.
3. The microamp reading must be taken when the heater is installed in the coach, with all the ductwork attached, using the coach power supply and gas supply. This is necessary because the reading can be affected by voltage, blower speed, vents being attached, or even combustion air temperature.
4. If the sensor is being adjusted on the workbench, try to get the highest possible reading then recheck the reading after the furnace is installed to make sure it is still high enough (minimum 5 microamps). The higher the microamp current is, the less chance there is of lockout occurring.
5. If ignition lockout occurs in 7 seconds or less, check the following:
 - a. Sensor shorted to ground. Remove sensor lead wire and check with an ohmmeter. If short is indicated, readjust sensor electrode and check insulators for cracks. Replace electrode set if necessary.
 - b. Check sensor wire lead for continuity and for shorts to ground. Make sure wire lead is not pinched between any metal parts which could cause a break in the wire insulation.
 - c. Check PC board connector at control module for good connections. Remove connector and clean board terminals. If control module uses individual quick-connect terminals check each terminal for tight connections.

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- d. Check for proper grounding of the burner to furnace casing. Also, check for proper grounding of the power supply which is connected to the GND terminal of the ignition module. On 12v DC systems, this lead must be negative polarity. Clean and tighten ground connections if necessary.
 - e. Check microamp reading in sensor circuit. If reading stays above 5 microamps while lockout occurs, replace control module.
6. If lockout occurs after 7 seconds from beginning of ignition cycle, it indicates that the sensor is passing a border line current signal to the control module. A microamp check will show a fluctuating reading with periods of operation below 5 microamps. In almost all cases this is due to improper location of the sensor electrode. Resetting the sensor according to figure 54 will give the best readings on most units. In some cases a higher reading can be obtained by adjusting the sensor slightly different than shown. As long as the microamp reading consistently stays above the minimum reading for the entire cycle, no further adjustment should be necessary.
7. If lockout occurs only occasionally, it may be difficult to diagnose properly. Most intermittent problems can be solved by checking these items:
- a. Air leak in combustion system. Both inlet and exhaust portions of the vent system must be properly connected to the heater. Check all connections in the combustion system, gaskets, air ducts, etc.
 - b. Carbon build-up on electrodes. This can be caused by an improper air/gas mixture or incorrect gas pressure which can often be traced to moisture or other impurities in the gas supply.

A complete cleanup of the gas system is required if moisture is present. Disconnect gas piping from all appliances and tank regulator and blow out with dry compressed air. Add a drying agent (methyl alcohol) to the gas bottles to avoid future problems.
 - c. Changes in gas pressure. When properly adjusted, the tank regulator should hold

line pressure at 11-14 inches water column. This pressure should not vary more than ½-inch water column when the heater comes on. If line pressure drops more than this it indicates an undersized or defective regulator, liquid fuel getting into the regulator, moisture in the gas supply or a restriction in the supply line.

- d. If the line pressure goes above the adjusted setting, it indicates a defective regulator or liquid fuel getting into the regulator. Either of these conditions could be dangerous if pressure continues to build in the system. If regulator does not hold with all appliances shut off, replace it. Make sure gas bottles are not overfilled, allowing liquid fuel to enter the regulator.

ERRATIC BLOWER OPERATION

A loose terminal or a defective relay may cause the blower motor to cycle off while the thermostat is calling for heat.

AMPERAGE DRAW WITH THERMOSTAT OFF

1. Incorrect wiring at the terminal block. If the thermostat and 12v wires are reversed, the blower motor will start up as soon as the thermostat is turned on and will shut off as soon as the thermostat turns off. The necessary delay time will not be present.
2. Check for an internal short to ground in the control and the blower motor. Disconnect all wiring and check for continuity to ground with an ohmmeter.

INTERNAL PRESSURE REGULATORS

All DuoTherm heaters currently being produced have gas pressure regulators either ahead of the control or as an integral part of the control. General and Robertshaw control regulators are adjustable; Fenwall and Essex are not.

SPARKING AFTER BURNER IGNITION

In some cases the high voltage spark will continue during main burner ignition. This continued sparking is not harmful and will not damage the control module.

If this sparking is objectionable it can be lessened or eliminated by proper adjustment of both the sensor electrode and the high voltage elec-

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trode. If either of these electrode tips are not immersed in the burner flame properly, the sparking can continue.

BURNER CYCLING ON AND OFF

This condition does not indicate a problem with the ignition system but rather an interruption of power coming to the control module. Check for:

1. Limit switch opening due to excess temperature in the furnace. Check for blocked or restricted discharge ducts.
2. Short cycling thermostat. Thermostat should be located where it will not be exposed to warm air from a register or any other source of heat as this will cause the thermostat to open before the room air temperature reaches the set temperature.

REMOVING FURNACE

1. Remove furnace front panel by pulling straight out.
2. Disconnect wiring.
3. Make sure gas supply is shut off at the tank and disconnect gas line.
4. Remove the screws holding the unit to the cabinet (figure 55).

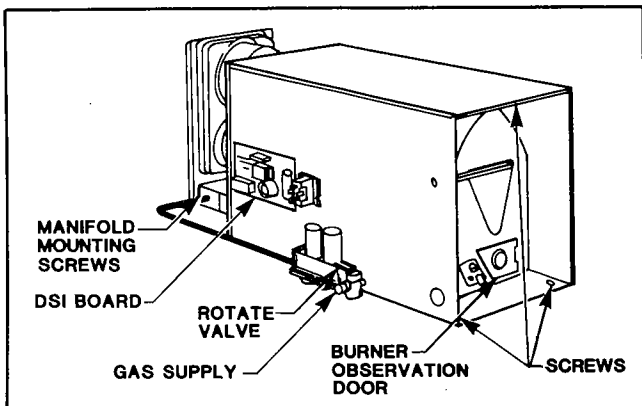


Figure 55. Furnace

5. Remove the outside vent cap screws and remove the vent assembly.
6. Pull furnace out.

REMOVING GAS VALVE AND BURNER

1. Remove the nuts holding the burner observation door and remove the door (figure 55).

2. Rotate the ratchet clip holding the burner in place until tabs are accessible. Compress the tabs and slip off the burner mounting pin (figure 56).

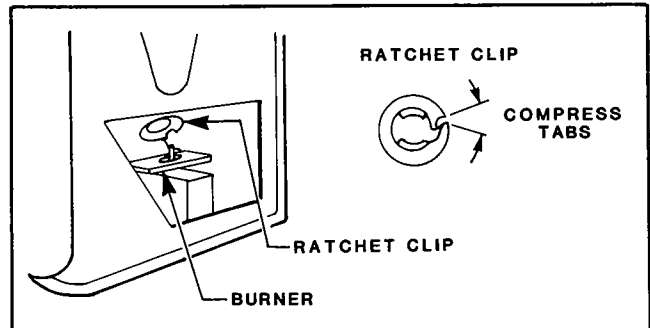


Figure 56. Burner Clip

3. Raise the burner off the mounting pin and remove.
4. To remove the gas valve, remove manifold from furnace. Set the manifold in a vise to remove the gas valve.

REPLACING BURNER

1. Center burner over orifice. Slide outer end of burner assembly over the burner mounting pin.
2. Slide ratchet clip over mounting pin until it is firmly seated against the burner.
3. Replace the observation door.

THERMOSTAT ADJUSTMENT

Improper adjustment of the thermostat heat anticipator will result in abnormally long or short heating cycles.

If an adjustment is necessary, move the pointer to a higher setting for a longer "ON" cycle or to a lower setting for a shorter cycle.

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APPENDIX A

MANOMETER TEST

CAUTION

The Low Pressure Test Gauge, Manometer, P/N 64411-002, is a delicate instrument and can be easily damaged. To determine whether or not the gauge is working properly perform this simple test: Pinch and roll the tubing up from the free end until the needle reaches 5 inches water column. Hold the tube carefully, so as not increase or decrease the pressure. If the needle starts dropping, the gauge is bad. Under no circumstances should any moisture be allowed to get into the gauge, i.e., don't blow into the tube.

1. Make sure ALL gas valves and pilots on ALL appliances are shut off (stove & furnace).
2. Remove or lift up stove top as applicable.
3. Remove screw holding burner in stove pan and remove burner.
4. Attach manometer tube tightly on the burner feeder tube (figure A-1) and open that burner valve to the high position.

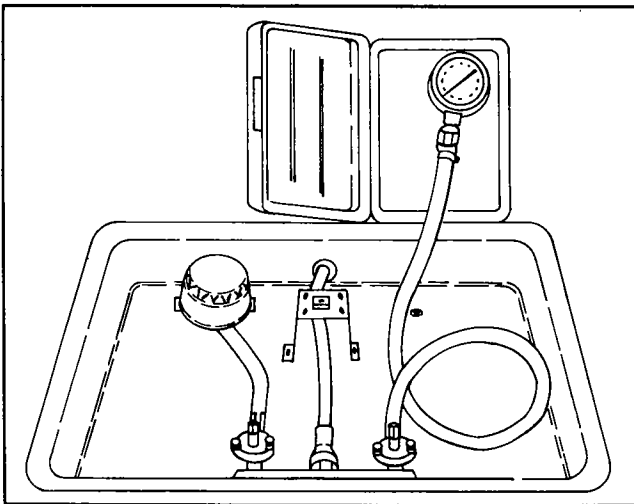


Figure A-1. Manometer Hook-Up

5. Pressurize the system by opening the main LP valve at the tank momentarily, then close tightly.

NOTE: LP tank valves are the dual seal type and must be fully opened or fully closed. Anything in between will cause the valve to leak.

6. Note reading on gauge. Gauge should read 11 to 13.2 inches of water column (depending on temperature, altitude and humidity)

and remain steady. If the reading does not remain steady, discontinue testing and refer to FURNACE TROUBLESHOOTING.

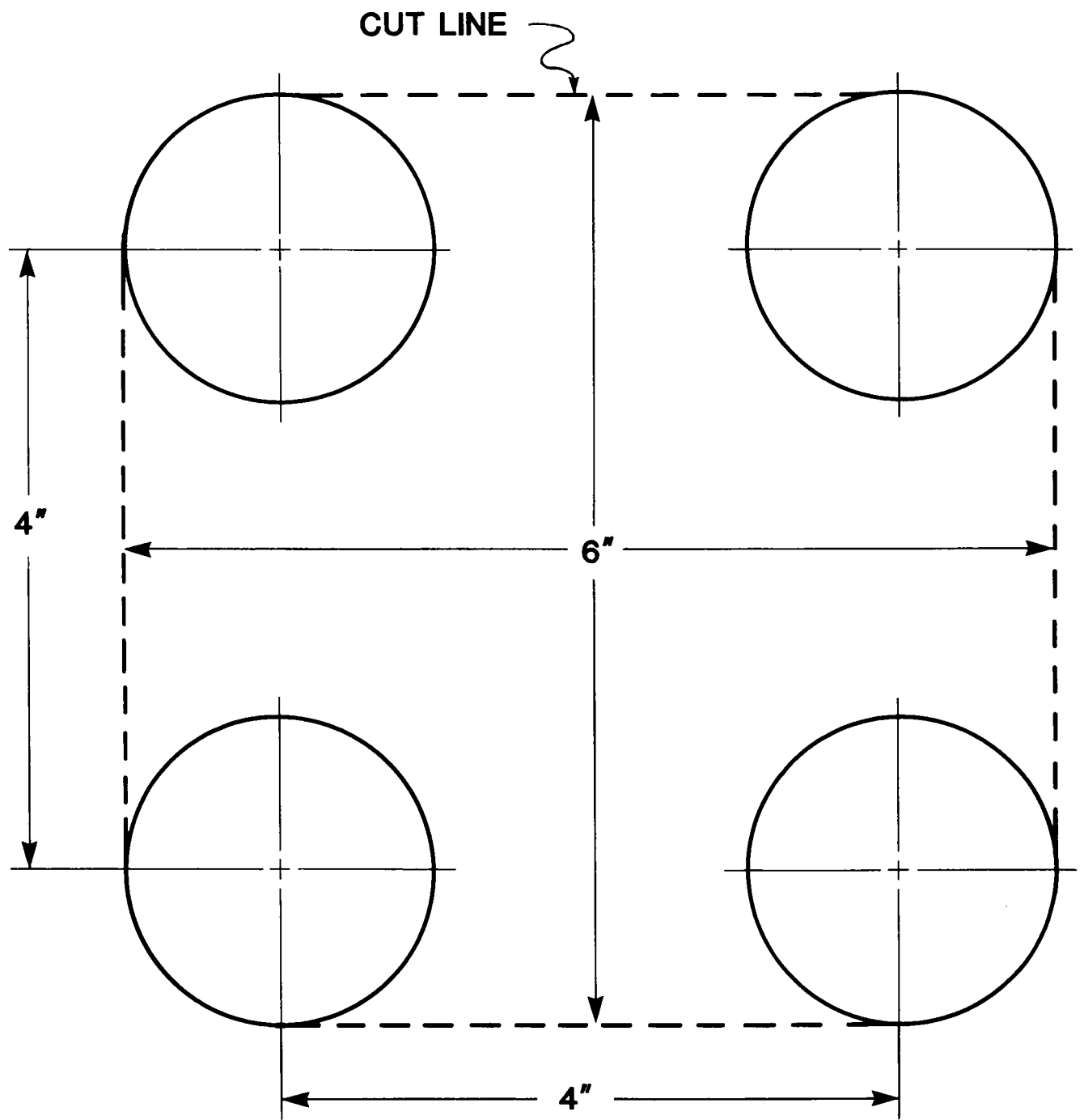
7. Bleed the pressure down by opening the other burner valve and lighting that burner. Watch the gauge and shut off lit burner when pressure drops to between 8 and 10 inches. (Pressure might rise slightly due to warming of LP vapor in lines.) If pressure doesn't drop, discontinue testing and refer to the troubleshooting guide. Write down the time and exact pressure reading.

NOTE: When checking system for leaks, start at source (LP tank) and work outward towards each appliance in turn. After checking main tank valve, turn that valve on. Leave all other valves off throughout checking procedure.

8. Do not disturb the LP system/test gauge for at least 10 minutes.
9. After 10 minutes, read the gauge again. The pressure should have remained constant. If not, consult the troubleshooting guide.
10. Shut the test gauge burner valve completely off. Turn the main valve completely on. Wait ten minutes and read the gauge again. The gauge should not read any higher. If it does, that burner valve is defective.
11. Turn the test gauge burner valve back on. The gauge should again read 11 inches water column.
12. The test is now completed. Turn off the test burner valve, remove test gauge, replace the burner and screw and turn off the LP at the main valve.

APPENDIX B

LP GAS LINE MODIFICATION TEMPLATE



ACTUAL SIZE
TEMPLATE

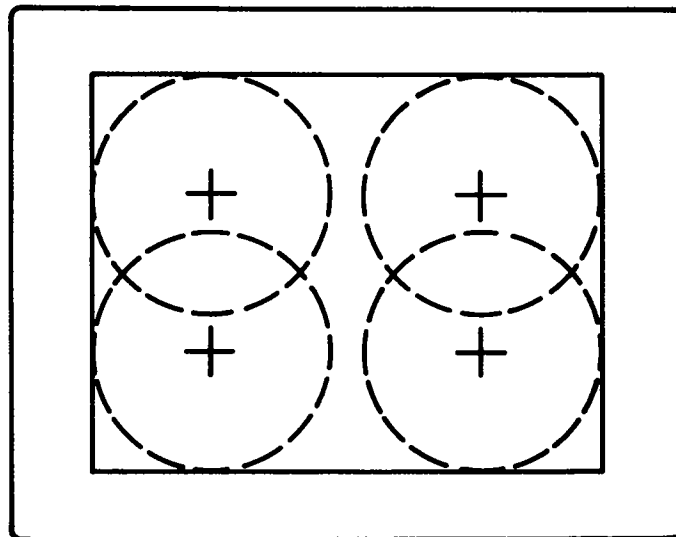
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APPENDIX C

BATTERY TESTER MOUNTING TEMPLATE



↑
**POSITION THIS LINE AT
BOTTOM OF FIRE EXTINGUISHER**



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