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MC-9 MAINTENANCE MANUAL

SECTION 3
BODY

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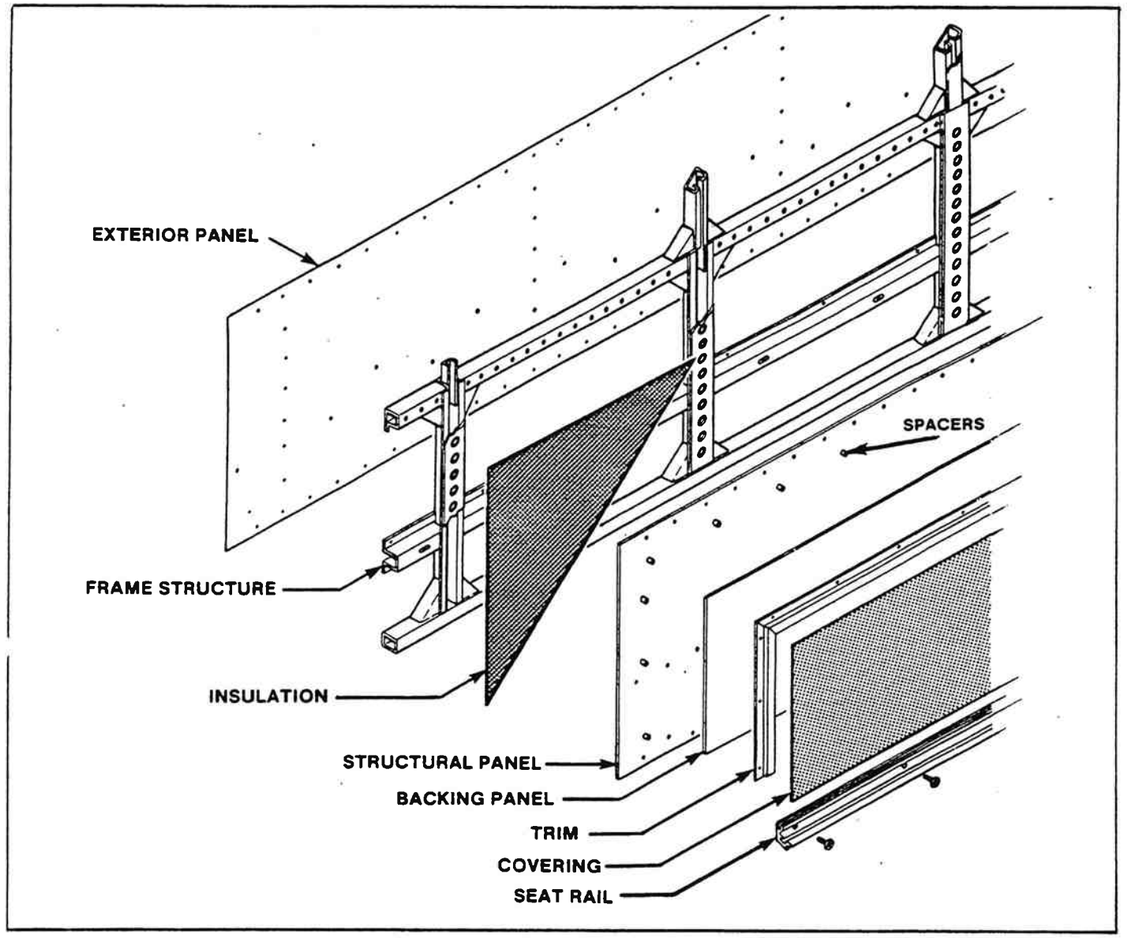

Figure 3-1. Sidewall Construction.

COACH BODY

BODY PANELS

The MC-9 coach uses a welded, single-piece monocoque frame. Below the belt rail 16 and 18 gauge stainless steel is used while the upper body is framed in high tensile, low alloy steel, primed before installation. Front body panels are 24 gauge (.6 mm) stainless steel with a 20 gauge (1 mm) stainless steel trim panel provided between the headlights. Removable stainless steel iron moldings are used under the windshields providing access to the windshield wipers and door control. All side panels below the floor line are 24 gauge (.6 mm) stainless steel fluted on 4" (102 mm) centers. See figure 3-1.

The exterior center roof and sidewall panels immediately below the passenger windows are high tensile .064" (1.6 mm) prestressed primed and painted aluminum. The interior has aluminum alloy panels riveted to the frame with one panel used to provide a continuous airway for the heated or cooled air from the main ducts. The rear panel above the floor line is 24 gauge (.6 mm) smooth stainless steel and the lower panels on the service doors are beaded 24 gauge (.6 mm) stainless steel. Condensation drain tubes are provided within the frame.

The front roof cap and the rear crown panel are ⅛" (3.17 mm) thick molded fiberglass and incorporate molded indentations for lamps. Main roof panels are .051" (1.29 mm) high tensile aluminum prestretched on installation and riveted in place.

All exterior panels are riveted securely to the frame members. Dissimilar metals are separated by mastic tape or mylar tape. Roof and sidewall panels are insulated with 2" (51 mm) medium density, fiberglass, compressed during application of interior panels, with joints sealed with aluminum pigmented mastic. Sidewall insulation is contained in waterproof envelopes. High density fiberglass with an asbestos blanket is used for insulation and sound-deadening at the rear bulkhead. A double floor construction over the axles is filled with insulating material to reduce the transfer of heat and noise to the inside of the coach.

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MOLDINGS

Extruded aluminum drip moldings extend along the sides of the coach above the window line. Exterior trim moldings are attached to the body to cover the horizontal rivet lines at both sash and belt lines while black painted aluminum moldings cover the window posts. Stainless steel screws and nylon washers are used to eliminate the contact of dissimilar metals to prevent corrosion of the moldings.

BAGGAGE COMPARTMENTS

Three full-width, underfloor compartments are provided between front and rear drive axles. Total capacity is 300 cubic feet (8.5 cubic meters), with a clear 33" x 54½" (840 mm x 1380 mm) opening provided to each compartment on both sides of the coach. All compartment doors are full sealed, Pantograph, vertical lift type, and each has a flush mounted breakaway-type latch handle with provision for padlock and customs seals. All doors are interchangeable.

BUMPERS

The standard rear bumper is made of 12" (305 mm) wide, extruded, hard alloy anodized aluminum, back-ribbed for maximum strength. An optional energy absorbing rear bumper may be installed in place of the standard rear bumper. The front bumper is hinged at the top for easy access to the spare tire compartment. The rear bumper is easily removed for access to the engine compartment. Extruded anodized aluminum corner bumperettes are mounted on rubber cushion pads at all four corners of coach and extruded aluminum rub rails extend along each side of the coach to offer maximum protection to lower body panels from baggage carts and vehicles. Molded rubber fenders are installed at front wheelhousings and the rear wheelhousings are trimmed with anodized aluminum bars. Three-piece fenders can be installed at the rear housings as optional equipment. Front and rear wheel splash aprons are optional. For coach dimensions, see figure 3-2.

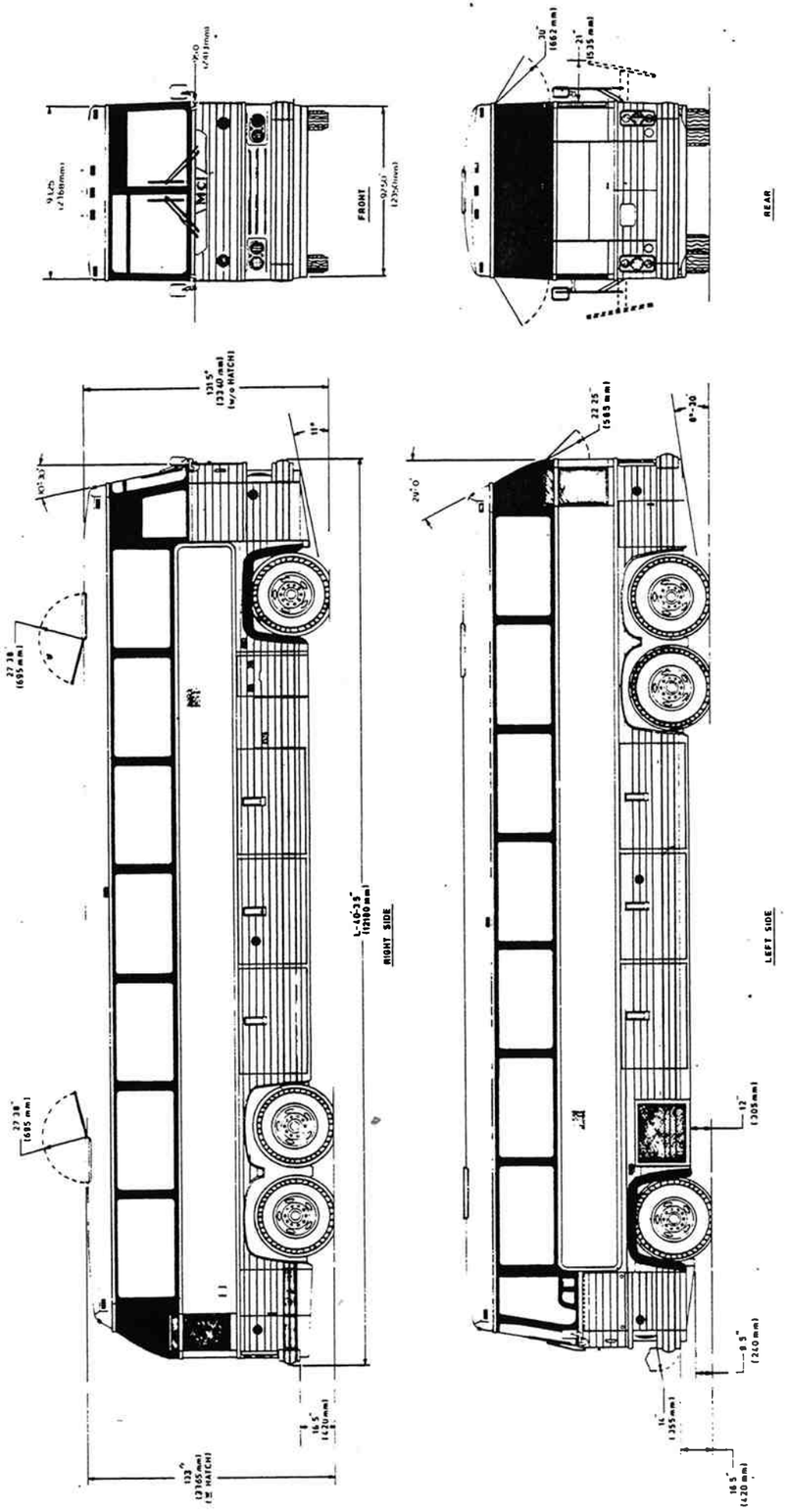

Figure 3-2. MC-9 Dimensional Chart.

INTERIOR

The driver's floor, front entrance area and front aisle are all at the same level. The floor is ½" (13 mm) thick 5-ply waterproof fir plywood. The floor is securely attached to the underframe with elevator bolts and self-tapping, countersunk screws and all joints are sealed with mastic. The underside of the floor is treated with fire retardant paint and the top is sanded and covered with a heavy duty, quality rubber. The following are used: 5/16" (8 mm) ribbed, metal backed stepwell tread plates; 3/16" (5 mm) ribbed entrance area and ramped aisle area (no metal back); ⅛" (3 mm) smooth driver's area; ⅛" (3 mm) smooth center aisle; ⅛" (3 mm) smooth under seats.

The seats are securely fastened with high tensile tee-bolts in a high strength aluminum alloy track on the wall and a stainless steel track in the floor which are securely welded to the coach frame. Tracks are flush to top of floor covering.

Vinyl clad aluminum alloy luggage racks are mounted in extruded clear anodized aluminum alloy channels. The aisle side extrusion incorporates tracked passenger reading lights and a continuous length ribbon switch for the passenger chime system. The wall side extrusion incorporates an indirect interior lighting system. Transverse strips on the interior surface of the parcel rack prevents shifting of parcels. Front of parcel racks have end caps in color matched, self-skinned urethane foam. The parcel rack hangers are formed stainless steel.

The ceiling at the extreme front and the rear window area is color impregnated, fiberglass reinforced plastic, molded panels while the main ceiling area is vinyl clad aluminum. Vinyl and aluminum moldings cover panel joints. Lower side wall trim below windows is melamine paneling.

COMPARTMENT DOORS

SURGE TANK FILLER DOOR

The surge tank filler door is located on the right hand side of the coach at the rear above the radiator compartment. The door is front hinged, piano type and is spring loaded in the closed position.

FRONT SERVICE DOOR

A left front service door below the driver's floor is front hinged, held closed by two quarter-turn Dzus fasteners. Access is provided to the accessory and air ride tank, charging valve, steering components, windshield washer and horns.

CONDENSER COMPARTMENT DOOR

The condenser compartment door is front hinged, piano type and is held closed by quarter-turn Dzus fasteners. A rod type prop automatically holds the condenser door when fully opened. Access is provided to condenser fan and motor, receiver tank and other air conditioning components.

BATTERY COMPARTMENT DOOR

The battery compartment door is top hinged and held closed by an over-center spring loaded latch. A prop rod holds the door open while providing access to batteries, air conditioning filter and battery disconnect switch.

ELECTRICAL JUNCTION PANEL SERVICE DOOR

The electrical junction panel service door is located below the driver's window. It is top hinged and held closed by two quarter-turn Dzus fasteners. A prop rod holds the door open.

ENGINE SERVICE DOORS - REAR

The rear engine compartment service doors are side hinged. A flush-mounted paddle handle latch is installed on right door which overlaps the edge of the left door. Prop rods are provided on both doors to hold the open position.

BLOWER COMPARTMENT DOOR

The blower compartment door is top hinged and held closed by two spring loaded latches. A prop rod automatically holds door when fully opened. Access is provided to blower gear box, sight glass, blower fans and scrolls, and blower pulley.

FUEL TANK FILLER DOOR

The fuel tank filler door is front hinged with dual over-center springs to securely hold door both opened and closed. Provision is made in the body paneling for access to the fuel tank assembly and drain plug if removal is necessary. This panel is retained at the top by two bolts and at the bottom by a pin.

RIGHT REAR SIDE SERVICE DOOR

The right rear side service door is front hinged with upper and lower brackets. To open turn handle counterclockwise. Access is provided to the chemical tank and waste water tank drain valves, air conditioning compressor, switches, solenoids, trailing axle air dump valve and left bank of engine.

LEFT REAR SIDE SERVICE DOOR

The left rear side service door is front hinged with upper and lower brackets. To open turn handle counterclockwise. Access is provided to the rear junction box components, alternator, air cleaners and right bank of engine.

EXTERIOR MAINTENANCE

Regular washing to remove accumulated dust and dirt is recommended. This is all that is required on the exterior stainless steel panels below the windows. The panel caps between the windows are anodized aluminum. Avoid the use of alkaline cleaners on aluminum parts as they will attack and corrode aluminum just as iron and steel will rust. Use only a mild detergent and a soft brush. Abrasive cleaners, polish or steel wool should not be used as they will remove the protective coating and may scratch and discolor the finish.

CORROSION PREVENTION

Preventive maintenance is a key factor in avoiding corrosion and must be considered as part of the regular service intervals.

The entire underside of the coach is sprayed with a heavy application of asphalt base undercoating. Also, all fasteners are corrosion resistant.

The type of operating environment a coach is exposed to determines the amount of dirt and corrosion that it will accumulate over any given operating period. Corrosion is one of the most costly factors of part failure and abbreviated part life. It is, however, an item that can be controlled when it is conscientiously looked for and the proper steps taken within a reasonable amount of time.

Certain areas of the coach are more vulnerable to corrosion than others and it is these areas that should be addressed. For example, the rear baggage compartment bulkhead in the rear wheelhousing area should be examined regularly for corrosion. This location contains many key components: relay valve, suspension air filter, dry air tank, inversion valve, parking brake, pressure regulator, and numerous other valves and fittings. Other areas include the front wheelhousing area, spare tire compartment, front left side service area, and engine compartment.

Road splash will affect undercarriage, sides of coach, fresh air intakes, condenser coil and engine compartment. These areas must be thoroughly cleaned to remove "dirt packs" from flanges, channel and ledges. These places accumulate dirt and salt and hold it in direct contact with steel and aluminum surfaces. Use an understructure high pressure spray as part of a regular wash. Damaged undercoating or paint should be promptly repaired before corrosion can start.

Frequency of wash periods depends on operating conditions. During periods of exposure to salt daily washing as described above is necessary.

If underbody parts show evidence of rust or corrosion, treat as follows:

1. Clean. Remove dirt, grease and oil, by solvent washing.
2. Remove corrosion as well as all loose deadener coating by sanding with wire brush or with other means.

CAUTION: Sandblasting can be used for cleaning bulkheads, brackets and other structural members. However, if should not be used for exterior side paneling. Extreme care should be taken not to sandblast excessively.

After removing all corrosion, correct priming, painting and undercoating must be applied to prevent further damage.

ROUTINE CLEANING

Wash and rinse water should be free of solids. It is especially important to assure that recirculating systems are properly designed, maintained and monitored for efficiency. In all cases suppliers of recirculating systems should provide assurance that their equipment and techniques will function satisfatorily with Lucite® windows.

Two types of detergent are necessary for optimum washing efficiency. A solvent-based dissolving type of detergent should be used with the prewash spray. A highly lubricating type of detergent should be used with brushes.

In each case, the detergent manufacturer should be consulted regarding recommendations on concentration. Additionally, the water/detergent mixture should be 90°F to 110°F to improve cleaning efficiency.

Most high quality detergents contain sequestering agents and are effective in water of up to eight grains hardness. This does, of course, depend heavily on the particular detergent and its concentration. If the detergent does not contain sequestering agents, water should be softened to four grains hardness or less for effective detergent action. In all cases, the detergent supplier should be contacted for recommendations on detergent and soft water requirements.

A good, high pressure water spray prewash is vital to remove as much grit and grime as possible before brushing. Detergent may or may not be employed with the prewash. If detergent is used, follow the recommendations above, allowing enough time for the detergent to soften the grime before other washing steps. If detergent is not used in this step, please follow the directions under "Detergent Prewash" below. For alternative washer arrangements, please see figure 3-3.

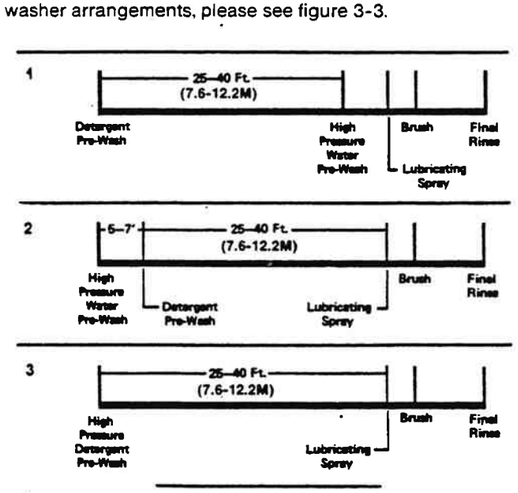

Figure 3-3. Washing Equipment Schematic.

DETERGENT PREWASH

In cases where the initial prewash spray does not contain detergent, we recommend that a small additional spray arm be installed to cover the window area only. This arm should be located far enough from the prewash spray so that its effect is not diluted by additional water (probably 5-7 feet [1.5-2.1 m]). Alternatively, this could be located in front of the main prewash station if sufficient distance can be provided so as to allow the detergent time to act (25 to 40 feet at 1-2 MPH [7.6-12.2 m at 1.6-3.2 km/h]). Where possible, warm water (90°-110°F [32°-43°C]) should be used with detergent.

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FILAMENT

Like the washer, a wide variety of filaments can be employed for washing. Although expensive and hard to get, Tampico fiber is one of the best. Filament having a high wax content (i.e., certain polyethylenes) should be avoided since the wax deposits on windows and painted surfaces. Polypropylene is normally satisfactory and may be flagged for optimum performance.

Synthetic filament is normally supplied as an "X" cross-sectional shape. Since this type of cross-section can trap grit against the side, it is recommended that filament of a round or circular cross-sectional shape be used. Filament suppliers make round filament available upon request.

Brush pressure (see below) and amount of filament in contact with the coach are the two factors most damaging to windows of Lucite SAR and to painted coach surfaces. It is most important that no more than six inches of filament overlap the bus side as the brush turns. The less filament in contact with Lucite SAR, the better the guard against scratches during cleaning. It may be necessary to provide a soft roller or wheel guide on the brush arm to prevent over-engagement of bus and brush.

BRUSH PRESSURE

Normally, the amount of filament in contact with the window and brush pressure are directly proportional to one another. As brush pressure is lowered, the amount of filament in contact with the window is less. Total pressure should be as low as possible. Again, the wheel concept outlined above can be used to prevent excessive brush contact.

Many washers, particularly those with "wrap-around" features, are deisgned with more than one set of side brushes. Since abrasion occurs when brushes contact the coach, it is important to minimize exposure of the windows to brushing. Therefore, it is recommended that one set of brushes be deactivated from the side washing function.

Where two sets of side brushes are deemed necessary, it is especially important that they be properly adjusted and maintained to minimize abrasion potential.

LUBRICATING SPRAY AT BRUSH/WINDOW INTERFACE

Spray in this area must effectively lubricate the brush/coach interface. Since this is the point of greatest mechanical agitation (and, therefore, greatest potential for scratching), lubrication at this point is essential. We recommend installation of a spray line to provide lubrication directly at the brush/coach interface rather than wet the bus or brush independently. A high lubrication detergent should be used along with warm water. If desired, this spray line can be used for the window area only.

RINSE SPRAY

Many washers already include a rinse spray to clean grit from the brush. This should be retained and its position optimized to do the most effective job. The final rinse should be a high pressure, high volume (with emphasis on the high volume) rinse with a minimum delivery of 125 GPM (473 l/minute).

VEHICLE SPEED

Speed of the coach through the prewash, wash and rinse should be one to two MPH (1.6-3.2 KPH). The bus should never be stopped while in contact with the brushes.

CLEANING LUCITE® WINDOWS

Conventional techniques may be used to clean Lucite® S-A-R. However, care should be taken to use a clean, soft (unsized) cloth. The surface of the window should be wetted with the cleaning solution before wiping. When oily surface contamination is present, the cleaning solution may not wet the surface thoroughly until it is rubbed with the cloth.

Household cleaners which have been tested and found effective in cleaning Lucite® S-A-R include Easy-Off, Windex, Glass Plus, Top Job, Mr. Clean and Fantastik. Industrial cleaners effective on the acrylic windows are Neleco Subway Soil Solvent (Neleco Products, Inc.) and C-1102 Alkaline Cleaner (DuBois Chemicals).

To remove paint, ink marks and graffiti which are resistant to household cleaners, use a soft cloth saturated with isopropanol or an aliphatic hydrocarbon solvent. Do not use abrasive cleaners. Avoid using razor blades or other sharp instruments which might gouge the surface.

Two commercially available anti-static cleaners which effectively clean Lucite® S-A-R windows and reduce the tendency for static charge build-up are "Like-Magic" Type NI-5, Merchandise Presentations, Inc., 3960 Merritt Avenue, New York, NY 10466 and "Trend" Antistat Cleaner, Dawn Products, P.O. Box 24, Englewood, Colorado 80110. Follow the manufacturers' instructions when using the antistatic cleaners.

REPAIR

The following information concerns acrylic windows which have been damaged byen lightly coated with conventional automobile paste wax and polished with an electrically operated buffing pad. Do not use a cleaner/polish (wax) since the fine abrasives in such compounds will scratch the surface of the window.

When buffing, speed and pressure are critical factors. The acrylic must not be overheated; the buffing wheel should be kept in constant motion across the window surface to prevent overheating.

Deeper or wider scratches may be made less offensive by applying acrylic lacquer directly on the scratch. Such a coating may be based on EVALCITE® 2041 acrylic resin. Solvents should be toluene and xylene in a 75/25 blend, although this ratio may be changed to adjust drying time.

WARNING: Toluene and xylene are hazardous materials. Read and follow all precautions on containers. Use of a proper respirator is recommended to avoid breathing vapors. Adequate ventilation should be provided. Protect eyes and skin from contact with these solvents.

The prepared lacquer may be applied with an artist's paint brush (natural bristle only) or from a glass (not plastic) syringe. For assistance in preparing such a lacquer, you may want to contact a local paint company.

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For deep scratches and gouges, the window surface must be removed and the substrate repaired for the most effective repair. Such procedures have not been developed by the manufacturer.

For all lacquer-repaired acrylic windows, the repaired area will exhibit less abrasion resistance than the surrounding surface area.

Lucite® and Evalcite® are trademarks of the DuPont Company.

LIFTING AND TOWING

TMC/MCI has available an I-beam frame assembly which can be used for lifting and towing. The dolly (part No. 20-300) is recommended whenever a coach is to be towed with the front wheels off the ground. It is shown in Figure 3-4.

CAUTION: The following procedure explains the use of the dolly developed for use by authorized and experienced tow truck operators to lift and tow only the affected coach models. This tool and procedure are NOT approved for any other coach models or applications. Prior coach models have not been approved for lifting and towing.

Also, this procedure explains only the recommended method to attach the tool to the coach. It does not attempt to explain or instruct personnel in all conceivable proper methods and details for safe lifting and towing of buses. TMC and MCI recommend that this tool and procedure be used only by tow truck operators authorized and experienced in towing intercity coaches.

TMC/MCI cannot be responsible for the improper use of this equipment by inexperienced or unauthorized individuals.

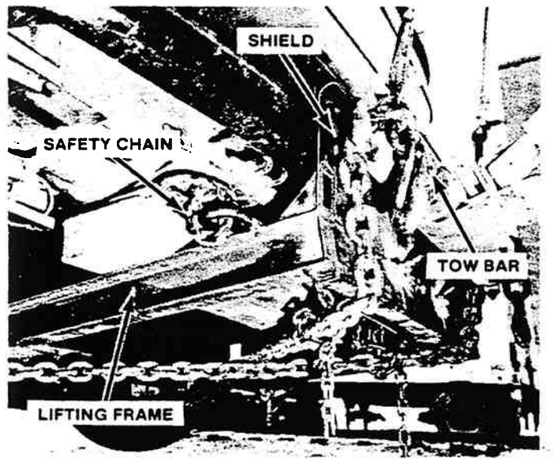


Figure 3-4. Lift Dolly Chain Placement.

To use the frame, you will need to have a hardwood plank for placement between the coach undercarriage and the lifting tool. See figure 3-5. The dimensions of the plank are minimum 4" high × 8" wide × 60" long.

LIFTING PROCEDURE

Read the entire procedure before starting step 1.

1. Remove both drive axle shafts to prevent transmission damage.

2. On three-axle coaches, shut off the trailing axle air valves. They are located inside the right engine side compartment.

3. If the coach engine will not be operating during the tow, attach an external air pressure line, from the tow truck, to the emergency air fill valve in the front service compartment under the driver's floor. The air pressure must be a minimum of 75 psi, and the line should be attached with a clip-on air chuck affixed to the air line.

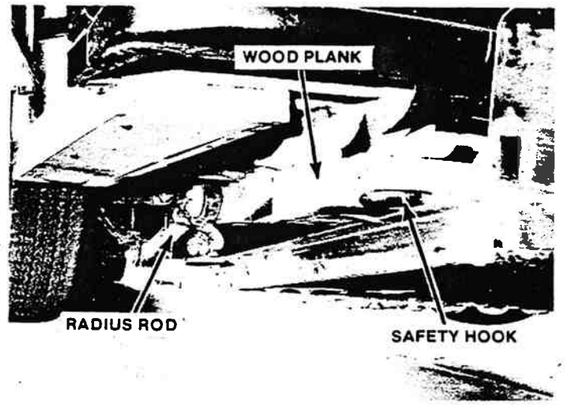


Figure 3-5. Dolly and Plank Position.

CAUTION: Do not tow the coach without external air pressure applied to the emergency air fill if the coach engine will not be operated. Without brake system air pressure, the brakes may apply automatically if system air pressure falls to approximately 40 psi.

4. Spread the tow truck lifting chains under the front area of the coach in an "X" configuration. Approximately two feet of the end of the typical tow truck chain should extend out from under the coach, past the bumper.

5. Roll the lift frame under the coach (over the chains) until the front shield is below, and slightly in front of, the coach bumper. The frame must be laterally centered under the coach center line.

6. Raise the rear of the lift frame until it contacts the coach undercarriage near the front of the radius rods. Support the rear of the frame in this position.

7. As shown in figure 3-5, wrap the tow chains around the radius rods in the following manner:

a. Bring each chain up through the "D" ring on the lift frame.

b. Wrap the chain around the radius rod from inside to outside.

c. Secure the hook onto the chain, as tight as possible, on the radius rod.

8. Place the hardwood plank on the frame so that when the frame is raised, the plank will contact the tow hooks or eye support area on the coach. If the bus has a retractable step, keep the plank approximately 4" away from the step.

9. Raise the front of the lift frame and locate the shield in front of, and tight against, the bumper. Support the frame in this position. Locate the plank directly under the coach tow eye support.

10. At opposite corners from each radius rod, bring the tow chains up the front of the frame shield and around the lift bar on the tow truck.

CAUTION: Take precautions to eliminate the slack from the chains under the frame before lifting the coach. This will ensure the truck tow bar does not "ride up" over the shield and against the front of the coach.

11. Check that the plank is in proper location against the coach tow eyes. Carefully raise the coach front with the tow truck winch.

12. Place two safety chains at the front of the lift frame as follows:

a. Route each chain down through the tow hook on the coach frame.

b. Bring the chain down the outside, and up through the safety hook on the lift frame.

c. Secure the hook onto the chain to provide a tight attachment.

13. Bring the free end of each safety chain across to the opposite lifting chain. Tighten by using a chain tensioner to eliminate all slack. Make sure the safety chains are tight to prevent side-slip of the lift frame under the coach.

14. Observe the normal precautions including, but not limited to, the ones listed below when towing the coach:

a. Make sure the park brake is released before towing.

b. Do not allow passengers inside the coach during towing.

c. Do not exceed a prudent, safe towing speed. Be aware of changing conditions.

d. Avoid "tight" turning. Accelerate and decelerate slowly, with caution.

e. After approximately two miles towing, check and retighten the safety chains as necessary.

TOWING WITHOUT LIFTING COACH

NOTE: When towing without lifting the coach, use only a tow truck equipped with a standard tow bar and related equipment. All other means of towing are unauthorized.

1. Disconnect both drive axle shafts to prevent damage to the transmission.

2. Operate the coach engine during the tow to maintain brake system air pressure. If the engine cannot be operated, attach an external air pressure line, from the tow truck, to the emergency fill valve in the service compartment under the driver's floor. The air pressure must be 75 psi min., and the line should be attached with a clip-on air chuck affixed to the air line.

3. Position the tow truck so that the truck's tow bar contacts the front bumper of the coach.

4. Attach the tow truck chains in the coach tow eyes and take up all slack.

5. Attach safety chains as applicable.

6. Observe the normal towing precautions including, but not limited to, the ones listed below when towing the coach:

a. Make sure the park brake is released before towing.

b. Do not allow passengers in the coach during towing.

c. Do not exceed a prudent, safe towing speed. Be aware of changing conditions.

d. Avoid "tight" turning. Accelerate and decelerate slowly, with caution.

e. After approximately two miles towing, check and retighten the safety and tow chains as necessary.

COACH JACKING POINTS

When it is necessary to raise the vehicle by using jacks under body members instead of under axles, care should be taken to ensure that pressure is applied only at the points indicated in Figures 3-6 and 3-7; otherwise. distortion or damage may occur to body sections.

CAUTION: On either automatic or manual transmission the drive axle shafts must be removed when being towed to avoid possibility of damage to transmission.

Remove stud nuts and washers retaining axle shafts, rap center of axle shaft flange sharply to loosen dowels and pull out axle shaft. Plug axle tube to prevent oil loss.

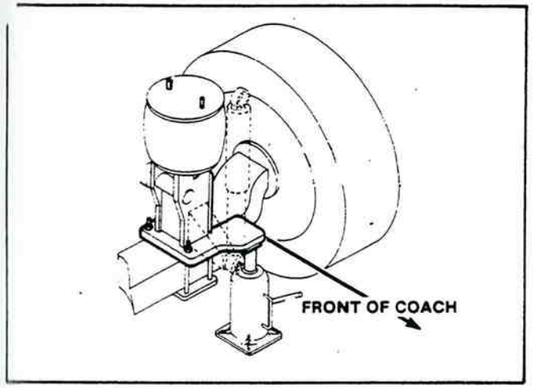


Figure 3-6. Front Jacking Points.

BODY REPAIRS

WELDING

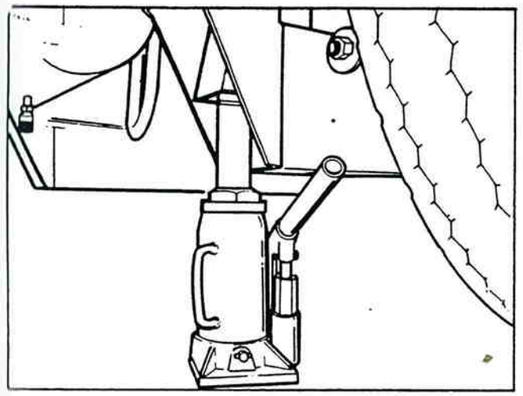
NOTE: Refer to the welding caution in the introductory pages of this manual before starting any welding operation.

The entire frame structure is a welded design. Self-contained suspension bogies for the front and rear are jig welded to ensure proper alignment of the main radius rod attaching points.

All the lower parts of the framework, from the main floor to the skirt rail, are manufactured from stainless steel. This prevents rust and corrosion from occurring on the frame members due to moisture and road salts. The repair of these sections can be carried out in the conventional manner.

The following welding rods should be used when making welding repairs to the body structure:

APPLICATION	DIAM.	A.W.S.
SS to SS or Corten, Light Gauge	3/32" (2.4 mm)	No. 308
SS to SS or Corten, Heavy Gauge	1/8"-5/32" (3.2-4.0 mm)	No. 308
Corten to Corten Light Gauge	3/32"-1/8" (2.4-3.2 mm)	No. 6011
Corten to Corten Heavy Gauge	3/32"-5/32" (2.4-4.0 mm)	No. 7018
Air Beam Reservoirs Heavy Plate Sections	5/32" (4.0 mm)	No. 7018



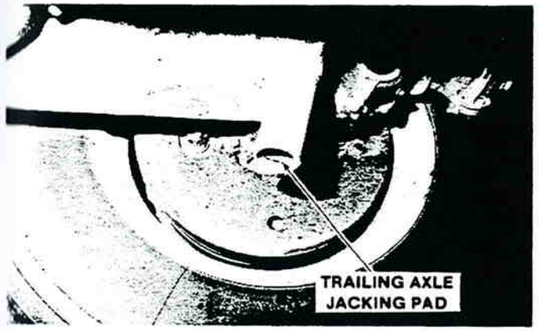


Figure 3-7. Rear Jacking Points.

RIVETING

There are a number of types of rivets used in the manufacture of the coach and a general classification of these types follows:

6053-T6 — used on side paneling, where strength is required and the rivet can be reached for bucking.

1200 F — used on baggage doors - strength not too critical and can be reached for squeezing.

AD-43-BS — U.S.M.C. "Pop" rivets on all other inaccessible points or accessible places where ease of installation is required.

Cherry and Cherry Monobolt — used where strength is required and the rivet is not readily reached for bucking.

Hand-type guns for pulling up cherry rivets and lazy tongs for Imex and "Pop" are available for repair work. Contact Service Parts department for information.

Repairing and replacement of body parts will require removal of rivets. Aluminum rivets can be removed by cutting off the rivet head with a sharp chisel, or by drilling out the rivet with a drill slightly smaller than the body of the rivet. On a rivet with a large head, first cut a groove across the center of the rivet head with a cape chisel, then cut off with a flat chisel. When drilling out pop rivets, always push out the stem first.