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MAINTENANCE TRAINING MANUAL

FOR

Superliner

PASSENGER CARS

Pullman Standard
Division of Pullman Incorporated
Chicago, Illinois 60628

JULY 15, 1977

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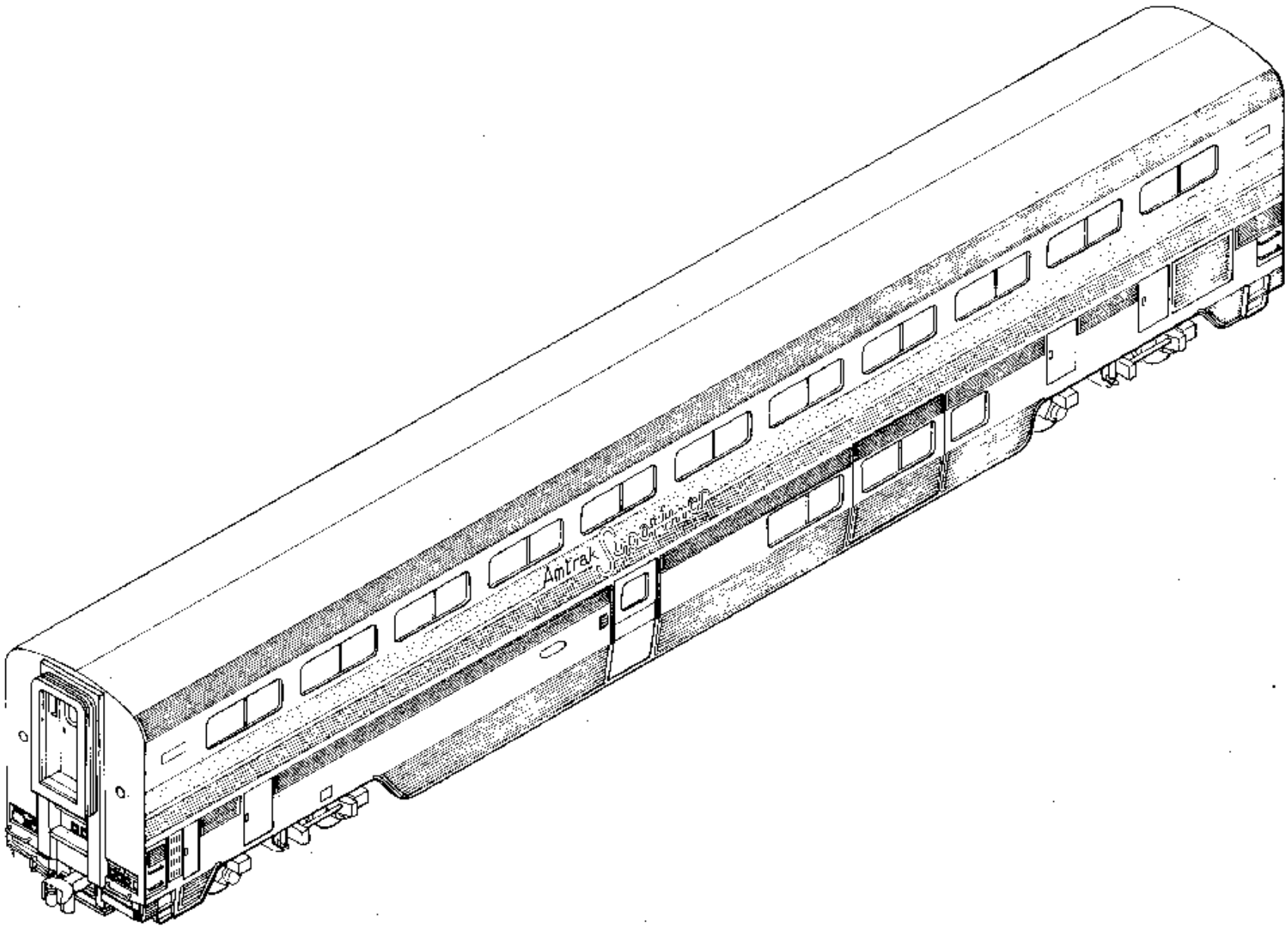

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SECTION 1

INTRODUCTION

1.1 GENERAL

The purpose of this Maintenance Training Manual is to assist in the understanding of the AMTRAK Superliner Passenger Car operation and maintenance. These high speed locomotive hauled cars are built by Pullman-Standard and are capable of operation at speeds of up to 100 mph on all AMTRAK lines with appropriate clearances.

There are three types of car configurations covered by this manual. They are the coach, dining and sleeping cars. The car structural shell is made of stainless steel and is basically standard for all three configurations.

The cars are coupled together to form a train consisting of the new bi-level cars of various configurations. Passenger entrance to the cars is through side entrances located on the lower level at the center of the cars. On the dining car, passenger access to the car is through the car-to-car passage on the upper level only. On all other bi-level type of cars the side doors are used by the passenger to enter the car from the exterior as well as go to .the upper level by using the stairway adjacent to the center vestibule area. Passage from car to car can be accomplished on all cars only on the upper level.

The bi-level cars are designed to operate individually with power for the cars supplied by the locomotive auxiliary power unit. This unit delivers 480 volts, 3-phase, 60 Hertz ac that is distributed to the cars through trainlines and intercar jumpers. Transformers in each car reduce the primary power to proper voltages for car subsystem electrical components. In addition to the primary power, each car has a battery which delivers a nominal voltage of 64 volts.

Other subsystems on the bi-level car are the heating, ventilation and air conditioning, communication system, water system, door system, truck and brake system. Miscellaneous car body items are installed in the cars to meet the different configuration requirements.

The following sections in this manual will provide AMTRAK personnel with general information on the operation and maintenance of the subsystems of the cars. When used in conjunction with the Maintenance Training program, it will present an overview of the three car configurations.

For more detailed maintenance and repair information, refer to the Running Maintenance and Servicing Manual or the Heavy Repair Maintenance Manual for these cars.

1.2 CAR EXTERIOR ARRANGEMENT

The car shells for the three configurations covered by this manual are basically standard.They are constructed of stainless steel, with the exception of the end underframe. The exterior skin is formed in corrugations for strength and appearance.

In the window areas, flat formed panels are used and contain the red, white and blue AMTRAK color scheme. (See figure 1-1.)

1.2.1 ENTRANCE DOORS

Station entrance to the bi-level cars is through center doors on both sides of the car. These doors open inward into a vestibule area. On the dining car these doors are not used for passenger entrance or exit.

Additional car entrances are through passageways located at the "A" and "B" end of the upper level. These walkways are enclosed by a diaphragm for passenger comfort during car-to-car passage. A sliding door is provided at each end. These doors are operated by two touch plates on each side for hand or foot activation of the door operator. The doors are arranged so that they are normally opened for 15 seconds. The doors may be locked for passenger protection at either end when the car is either the lead or trailing car.

1.2.2 ACCESS DOORS

There are a number of access areas located on the exterior of the car. The equipment compartment access doors are on the left side of the car. They are hinged to swing outward and have door latching that is operable from the outside. The access doors permit removal, replacement and service functions of all equipment components.

The utility room access doors are located on both sides of the car. There are two doors for the room that swing outward and latch in a fully open position. The doors have locks which are operable from the outside by the standard AMTRAK coach key. The space is used to store checked baggage on the coach and sleeping cars. On the dining car, the utility room is used to house the components necessary for food service.

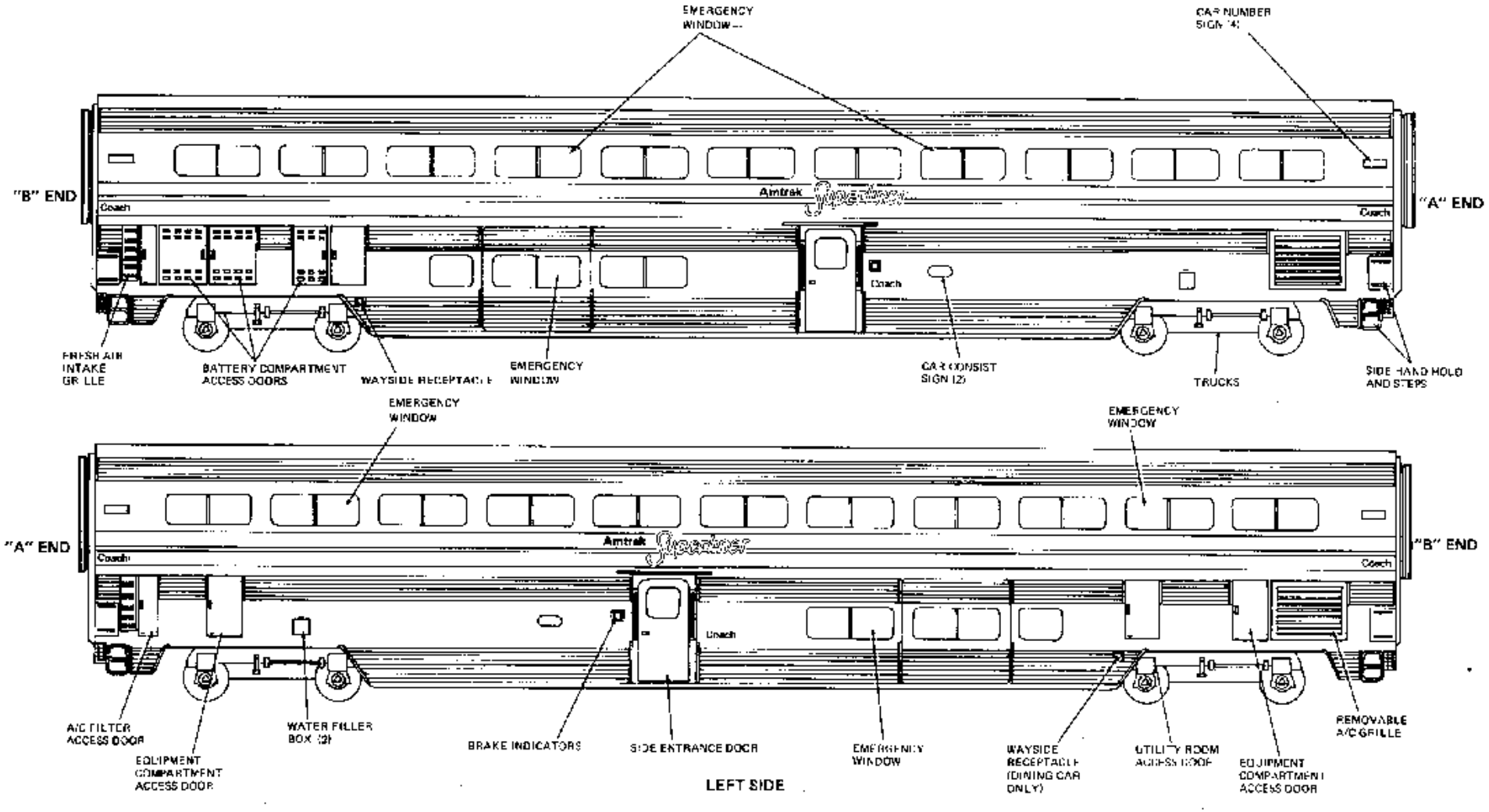


Figure 1-1. AMTRAK Superliner Car Exterior Arrangement

An air conditioning filter access door is located on both sides of the car. It provides access to disposable filters for fresh and recirculated air. Access is with the standard AMTRAK coach key.

1.2.3 INDICATION LIGHTS

A three light brake indicator light is installed on the outside of each car at a point near the centerline. This light indicates the condition of the brakes and electro-pneumatic magnetic valves on that car. The light colors are amber for "applied," green for "released" and white for "test indication." They are of sufficient brightness so that, in normal sunlight they are visible for a distance of 600 feet. This light also indicates handbrake status by lighting the "applied" light when the handbrake is on.

The "test indication" light indicates that the car has made its individual response to a locomotive initiated electric trainline magnetic valve brake application or brake release signal.

Two red marker lights are located on each end of each car. (See figure 1-2.) These marker lights operate on the D.C. circuit.

A body end light is located on each end of the car. These lights are used to illuminate the walkway between cars.

1.2.4 SAFETY APPLIANCES

The safety appliances are installed at passageways, side door and side ends of the cars. They consist of handholds, steps and safety bars. The handholds are located at the side entrance doors, both sides of each body end door, and the side ends. Side sill steps are provided on all four corners of the car directly below the side end handholds. End steps are located at the "A" and "B" end on either side of the coupler.

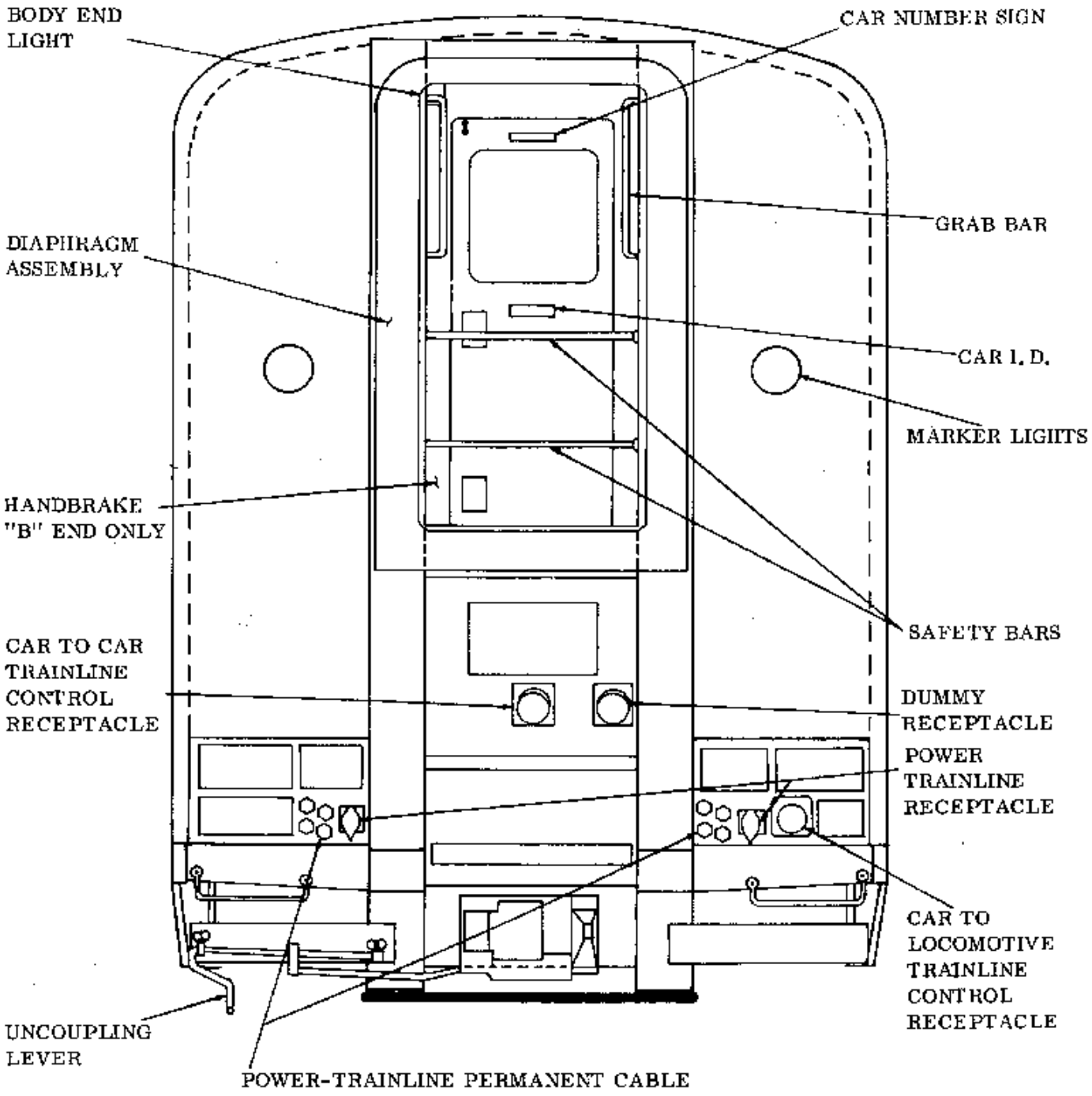


Figure 1-2. Exterior View of "A" and "B" End

At each end of each car are two (2) hinged transverse safety bars that are used when the car is in the leading or trail position on a train. When extended, they form a horizontal barrier across the end of the car at the height of 2 feet and 4 feet above the floor. It is manually lowered into position and positioned by a locking receptacle which prevents disengagement, except by manual operation.

The two (2) handholds at the side entrance and body end doors assist passengers entering the car or going from car-to-car through the walkway.

1.2.5 INTERCAR CONNECTION

A type H tightlock coupler is provided at each end of the car and is fitted for manual coupling and uncoupling. (See figure 1-2.) Uncoupling from ground level is accomplished by an uncoupling lever located at the left side of the car, when facing the car. Trainline connections are made through receptacles at both ends of the car. Separate jumper cables are used to interconnect cars and for looping circuits. The red receptacle is for power, the blue for communication and control and the white for the dummy communication and control.

The power trainline receptacle is used to handle the 480 volt, three phase, 60 Hertz power from the locomotive. Jumper plugs for this receptacle are equipped with three power points and three shorter control points. When any jumper is disconnected, the shorter control points break contact first, opening a contactor in the 480 volt supply in the locomotive. This prevents disconnecting the power points under load.

Intercar communication, control and looping circuits are trainlined through a 27 point jumper at each end of the car. Two 27-point receptacles are located at each end of the car at the centerline. One is a dummy receptacle. A third receptacle is for connection to the locomotive. (See figure 1-2.)

When not in use the loose end of the jumper from the car-to-car trainline control receptacle is plugged into the dummy receptacle. This completes a loop control circuit at the far end of the train. The loop relay is energized arid establishes the battery source and continuity for trainlining brake application and release lights. Brake pipe and main reservoir trainline pneumatic coupling is made manually with hose connections at each end of each car. The connections to the trainline permanent cable receptacles are made with AAR standard connectors which are prominently identified.

1.2.6 TRUCKS AND BRAKES

The car's two (2) trucks each have two (2) axles with outboard mounted 6-1/2" x 12" roller bearings and 36" diameter multiple wear wheels. Each axle has two (2) inboard mounted brake discs.

The truck frames are of welded steel construction and of "H" configuration. The primary suspension is through individually dampened coil springs. The axles are kept in proper orientation by leaf spring guides.

The secondary suspension consists of a spring plank, suspended from the truck frame by four (4) swing links and two air springs. The truck bolster is supported on the spring plank by the air springs. The secondary suspension is independently dampened both vertically and laterally.

The torsion bar arrangement between the truck bolster and frame is used in the initial regulation of the car and in service controls carbody roll.

The truck-to-carbody connection is a locking type center pin.

1.2.7 MISCELLANEOUS CAR EXTERIOR ITEMS

The side entrance doors are manually operated and are hinged to open inward to the vestibule area. The side entrance doors are equipped with locking mechanisms directly below the spring return door handle and are locked or unlocked with a standard AMTRAK coach key (the dining car side entrance doors are equipped with individually assigned high security locking mechanism instead of the standard coach key mechanism).

To replenish the potable and sanitary water supplies, a water filler box is located on each side of the car. The fill connection consists of the female hose connection with a spring loaded cap that closes on removal of the hose to protect the fill connection. At each filler box is a valve marked "AIR" and "FILL." When the valve is turned to the "FILL" position, the trainlined compressed air is cut off, the air pressurizing the water storage tank is vented and the water fill line is opened. As the storage tanks are filled, water flows through the vent line and from an open sight drain to indicate the tanks are filled. With the valve turned to the "AIR" position the water supply system is shut off and the trainline compressed air maintains a pressure of 35 psi on the water supply system. This is reduced to 20 psi before the water enters the passenger compartment.

On the dining car, a wayside receptacle is located on each side of the car. The receptacle provides power to the dining car food preservation circuits during layover when the locomotive auxiliary power is not available. This prevents spoilage to refrigerated food stores.

The car number sign identifies the car, to enable record keeping for maintenance purposes while the car consist signs help passengers in locating a car in a train consist.

All side windows are of the double glazed breather type sash units that can be removed from the inside of the car without removing the sash frames. Each window unit has an outer tinted safety glass pane 1/4 inch thick and an inner pane of 1/4 inch thick Lexan separated by a 1/4 inch air space. The window panes are mounted in a sash unit secured with rubber in an aluminum frame and mounted to the carbody structure. Each car has six side emergency escape sash units; four on the upper level with two on each side and evenly distributed along the length of the car in a staggered fashion. Two are located in the lower level passenger area, one on each side and staggered longitudinally (the dining car lower level does not have windows). These window units are similar in appearance to the other side windows, except that they are provided with two emergency pull handles to disengage the window seal, thereby enabling the window to be pulled into the car for passenger exit in an emergency.

All body end and interior doors have a single glazed fixed sash that is mounted directly in the door with a rubber glazing and requires no sash frame.

The side entrance vestibule doors have a hinged double glazed breather type sash that is similar in construction to the side windows.

All interior doors through which passenger access to a passenger compartment may be gained, except toilet and stairway enclosure doors, have windows that are readily replaced from the passenger compartment side if abutting a passageway or vestibule or from the side facing the larger passenger compartment if both sides abut passenger areas.

1.3 CAR INTERIOR ARRANGEMENT

One basic car structure arrangement has been made for the coach, dining and sleeping cars. (See figures 1-3, 1-4 and 1-5.) The following paragraphs describe the three (3) different cars.

1.3.1 COACH CAR

The coach car has a total seating capacity of 77 passengers with a seating distribution of 62 passenger seats on the upper level and 15 passenger seats on the lower level. (See figure 1-6.) The lower level area is divided into two passenger areas, seating and toilet facilities. The "A" end contains four unisex toilets, a women's lounge having a separate women's toilet, a handicapped person toilet and a linen closet.The "B" end contains passenger seating for 15, including a handicapped person seat.

The vestibule area contains two (2) carpeted carry-on luggage shelves, a wheel chair ramp storage area, fire extinguisher and emergency tools, conductor's emergency brake valve, electric locker, water station, a buzzer/indicator panel located in the ceiling and the stairway leading to the upper level. Separation between the vestibule and passenger areas is accomplished through the use of a pneumatically operated sliding vestibule interior door.

The upper level area contains only passenger seating with a water cooler, water station and fire extinguisher located on the "B" side of the stairs. An alcove adjacent to the stairway is used to accommodate opposing passenger traffic in the aisle. A conductor's emergency brake valve, trash container and. car consist signs are located at each end of the car. A handbrake is located within a pocket in the transverse walkway area on the "B" end (outside the end door).

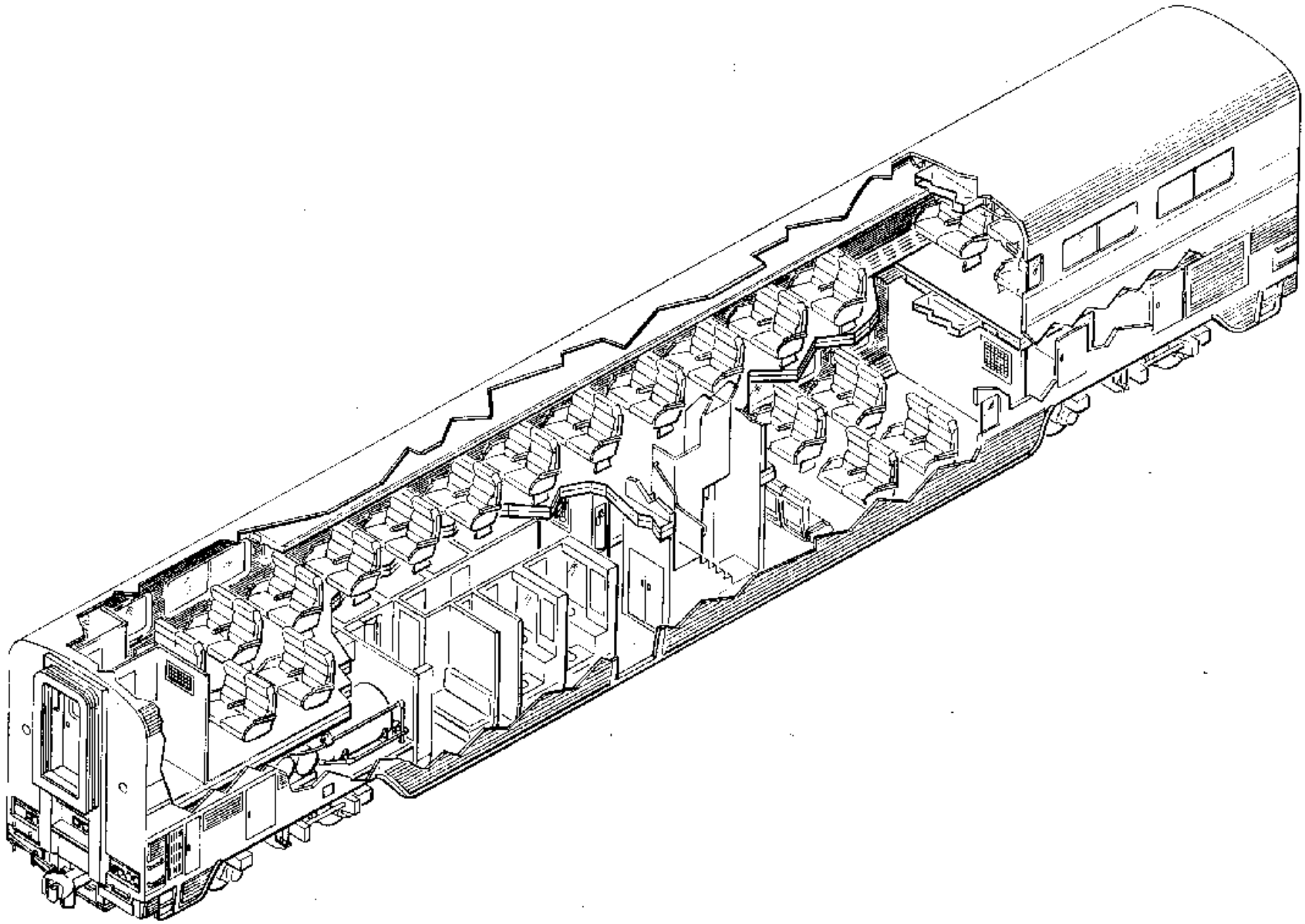


Figure 1-3. AMTRAK Coach Car Interior

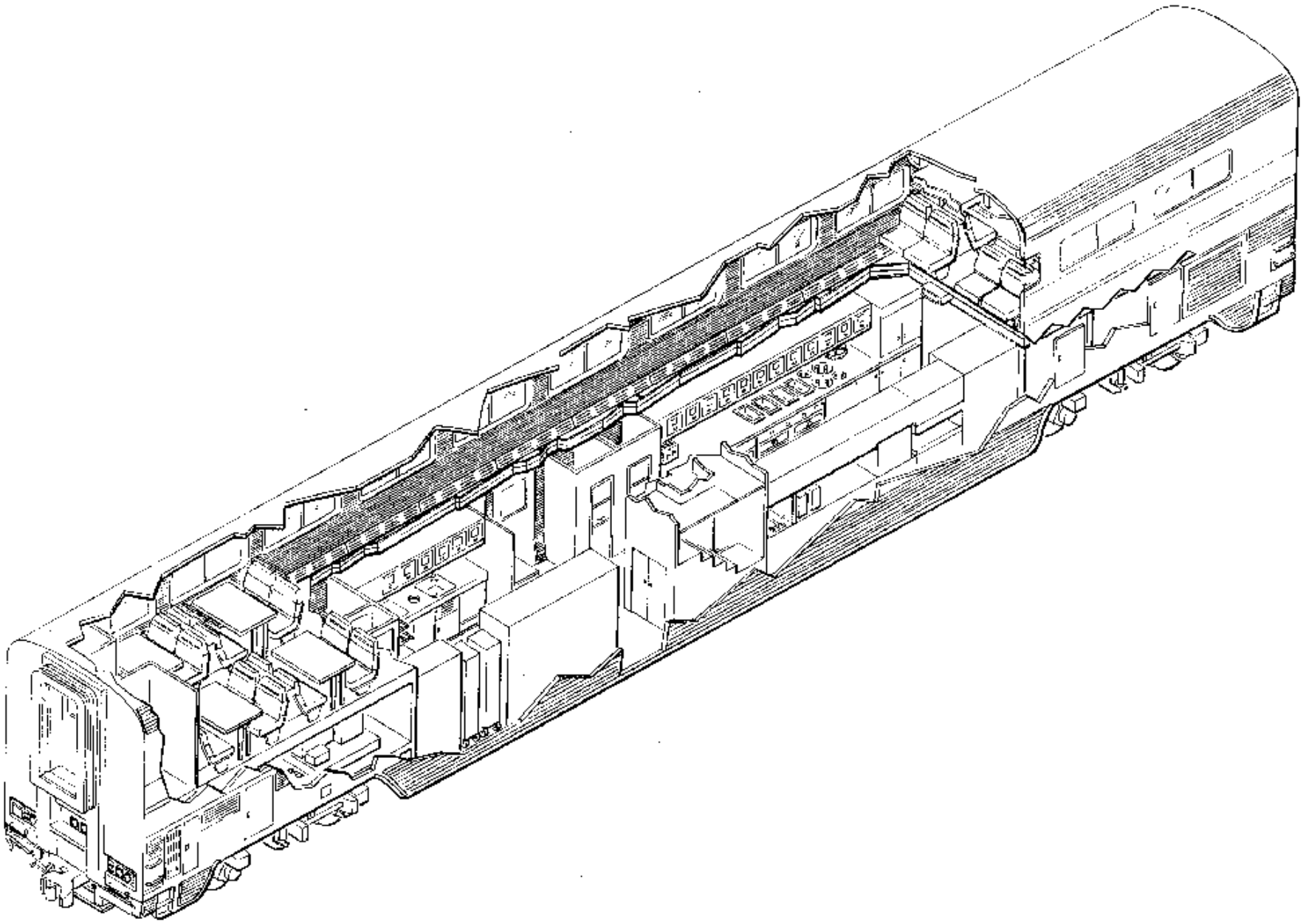


Figure 1-4. AMTRAK Dining Car Arrangement

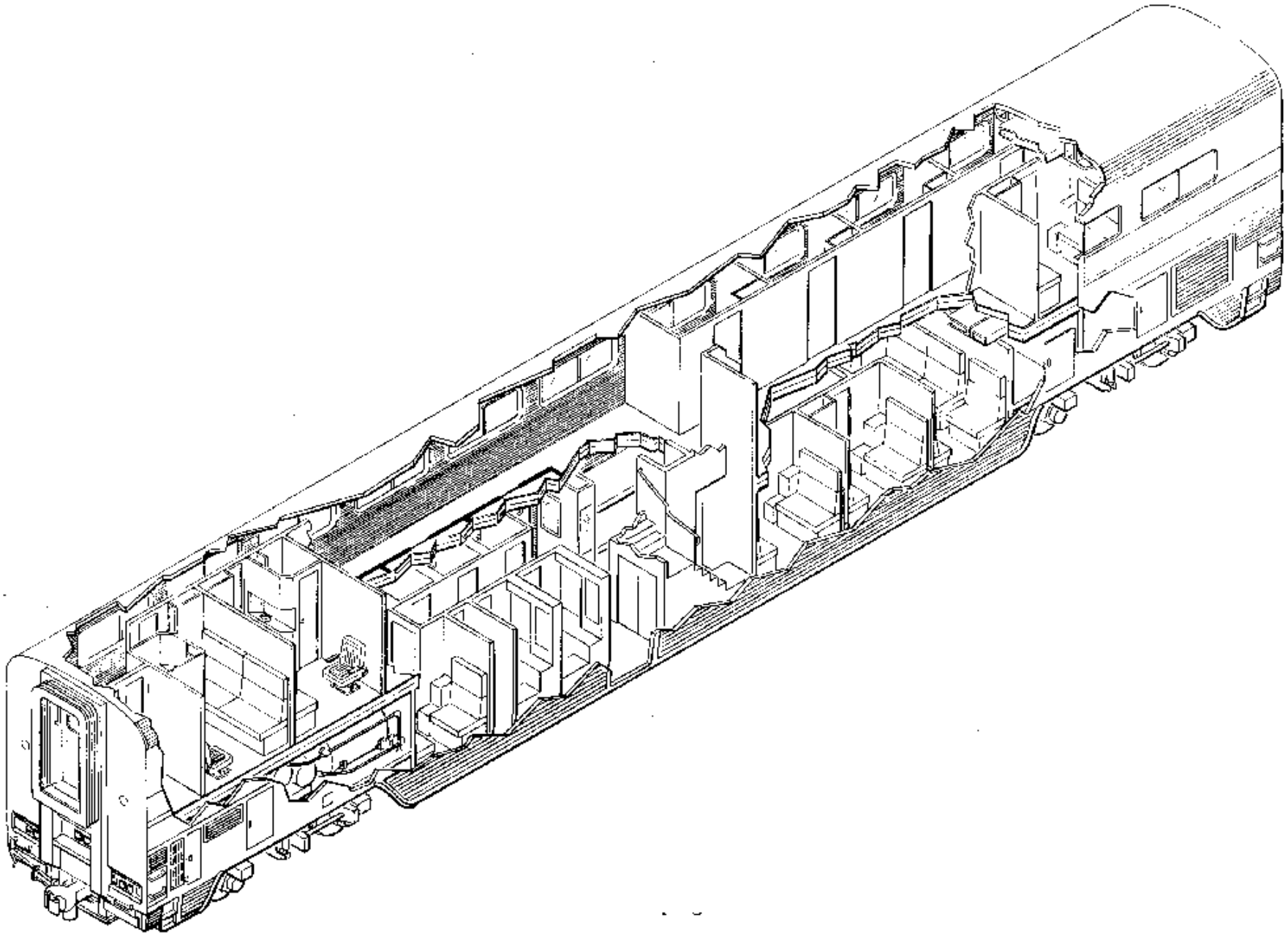


Figure 1-5. AMTRAK Sleeping Car Arrangement

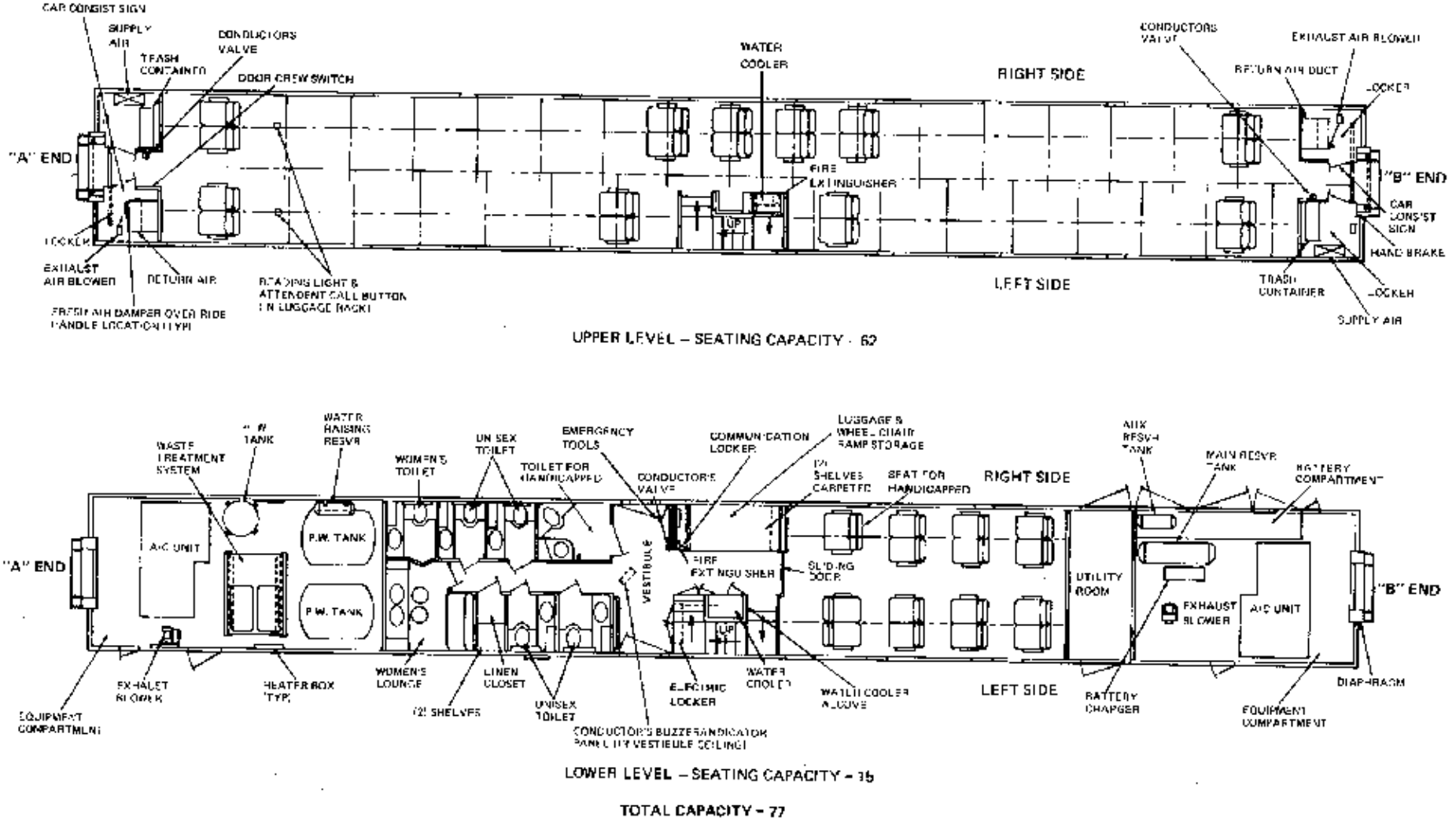


Figure 1-6. Coach Car Interior Arrangement (Sheet 1 of 2)

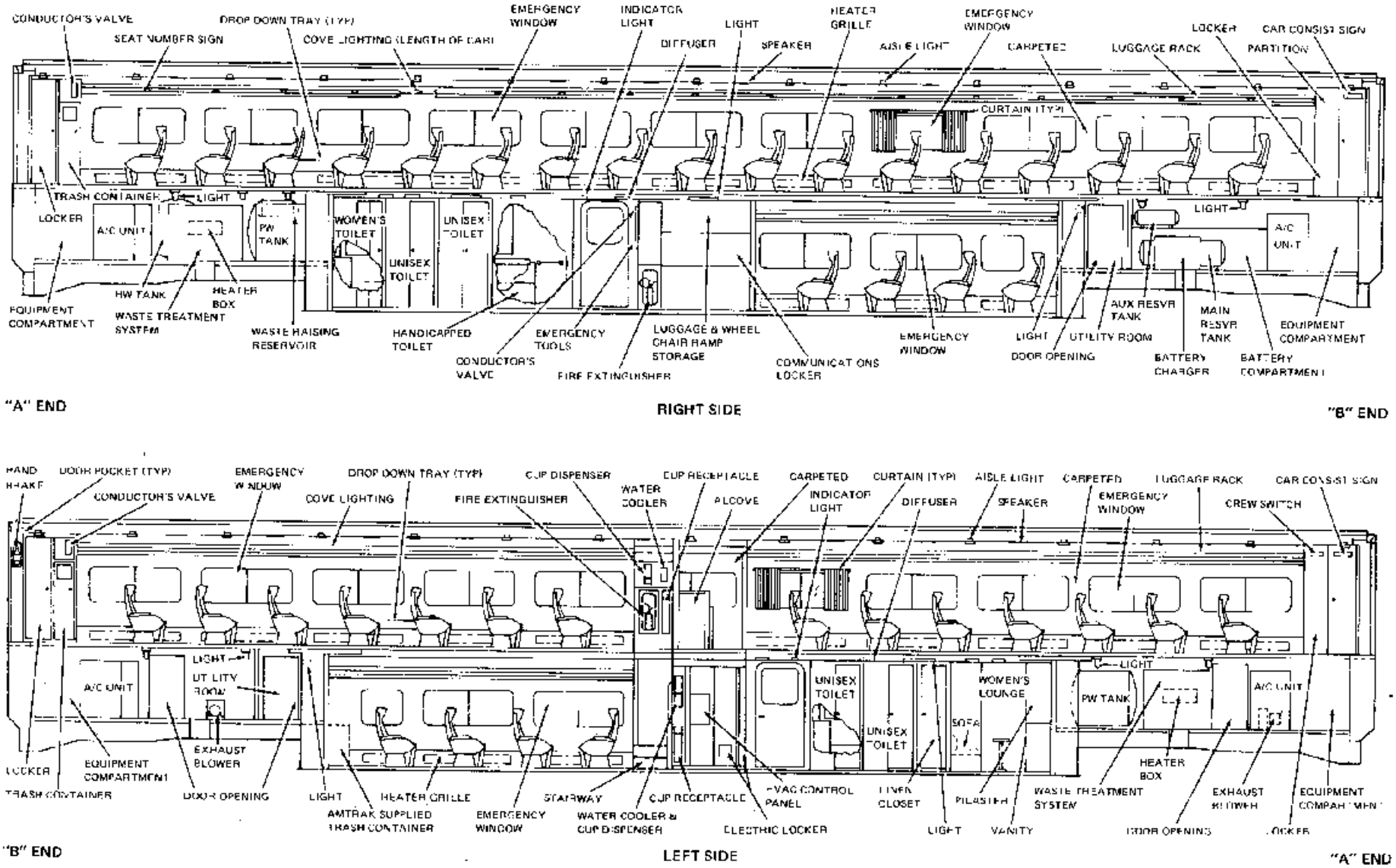


Figure 1-6. Coach Car Interior Arrangement (Sheet 2 of 2)

Passage between cars can only be accomplished from the upper level through a protective elastomeric foam diaghragm and walkway. Exit and entrance is made by the touch plate operated pneumatic sliding end doors.

Above the seating areas is a continuous luggage storage rack that has two reading lights and an attendant call button for each two passengers. Lights and speakers are alternately spaced in the ceiling through the center length of the car. Conditioned air is diffused through the ceiling ducts and returned through the return air grilles at the end of the passenger area. There is a separate fan and duct arrangement for the exhaust air system.

An equipment compartment is located on either end of the car with access only from the outside. The equipment compartment on the "A" end houses an air conditioning unit, hot water tank, two 250 gallon potable water storage tanks, a water raising pressure reservoir, heater box, exhaust blower and a waste treatment system. The equipment compartment on the "B" end houses an air conditioning unit, main and auxiliary reservoir air storage tanks, a battery charger and an exhaust blower. The batteries are accessible by opening its compartment doors. A utility room also located on the "B" end is used for storage.

1.3.2 DINING CAR

The dining car has facilities for handling 72 passengers at a sitting. (See figure 1-7.) All seating is located on the upper level and arranged in tables of four in booth-type fashion on each side of the Maitre d' station. The maitre d' station contains facilities for loading and unloading the dumbwaiters, soup warmers, refrigerator, sink, ice well, fire

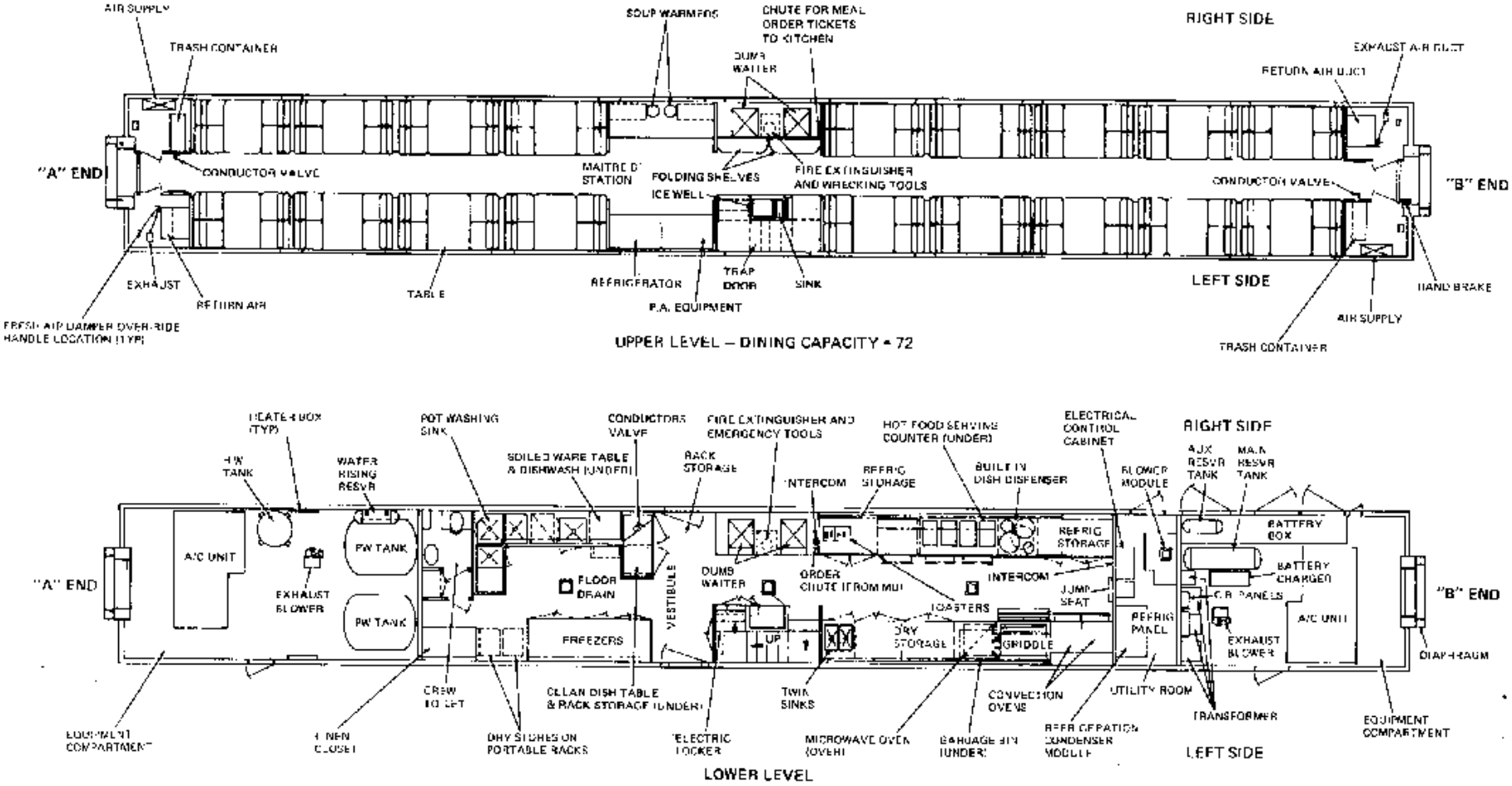


Figure 1-7. Dining Car Interior Arrangement (Sheet 1 of 2)

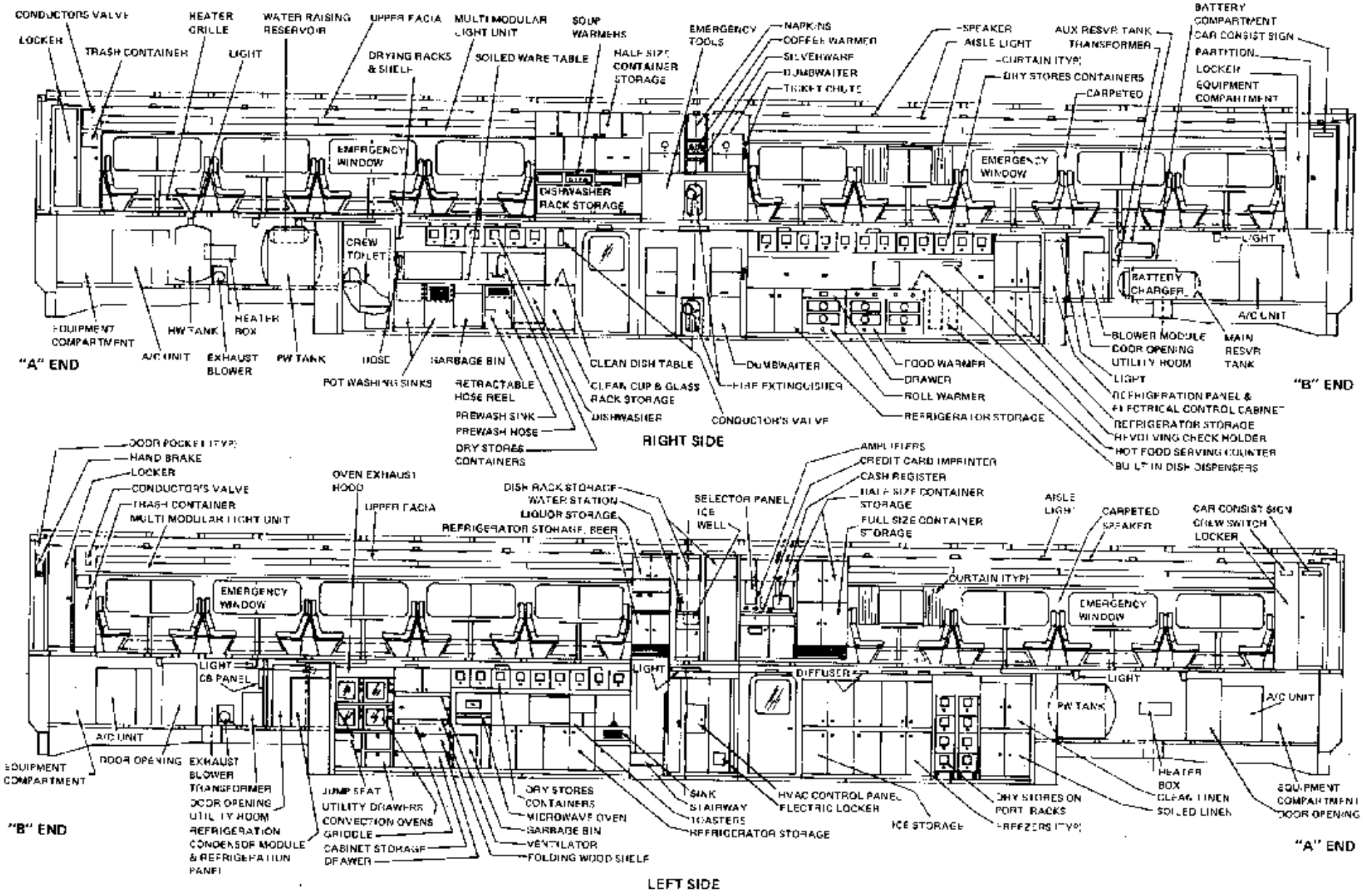


Figure 1-7. Dining Car Interior Arrangement (Sheet 2 of 2)

extinguisher and emergency tools, a chute for sending meal order tickets to the food preparation center (lower level) and a trap door that can be lowered over the stairway connecting both levels.

Passenger entrance and exit to the dining car can only be made from the upper level via the pneumatically operated sliding end doors at either end of the car.

Conductor's emergency brake valves, and trash containers are located on each end of the car on the upper level. A handbrake is located within a pocket in the transverse walkway area on the "B" end of the upper level. Lighting fixtures and speakers are alternately spaced in the ceiling through the center length of the upper level.

The lower level is comprised of the entire food preparation center and consists of sinks, freezers, dishwashers, refrigerators, food storage facilities, toasters, roll warmer, griddle, microwave oven, convection ovens, two dumbwaiters (one for fresh food and the other for dirty dishes), dish dispenser, linen closet and a crew toilet.

The vestibule area of the food preparation center contains the electric locker, safety equipment, the two dumbwaiters, and a conductor's emergency brake valve.

An equipment compartment is located on either end of the car with access only from the outside. The equipment compartment on the "A" end houses an air conditioning unit, hot water tank, two 250 gallon potable water storage tanks, a water raising air pressure reservoir, heater boxes and an exhaust blower. The equipment compartment on the "B" end houses an air conditioning unit, main and auxiliary reservoir air storage tanks, battery charger, exhaust blower, power transformers and a circuit breaker panel. The battery is accessible from the outside of the car by opening its compartment doors.

The utility room, located on the "B" end, houses a -kitchen area circuit breaker panel, refrigeration control panel and the refrigeration condenser module. Access is available from the outside of the car through a swing-open door. A fresh air damper is mounted on the left side louvered door.

1.3.3 SLEEPING CAR

The sleeping car can accommodate a total of 44 passengers with 30 berths available on the upper level and 14 berths on the lower level. (See figure 1-8.) On the "A" end side of the upper level are five deluxe rooms that can accommodate two passengers in each room. These rooms are accessible from a two foot aisle on the right side of the train. Each room is equipped with individual toilet facilities, an overhead fluorescent light fixture with an emergency light, reading lights, an air supply controllable by a manually adjustable damper which restricts the flow of air into the room, convenience outlet (those convenience outlets located near water facilities are GFI protected) and entertainment controls.

The "B" end of the upper level has ten economy size rooms that can accommodate two passengers in each room. These rooms contain two facing seats that convert into a lower bunk. The upper berth is hinged on the side and is lowered for use. Each room has a closet with mirrors located near the closet. These rooms are equipped with three reading lights, a convenience outlet, an overhead light fixture having an emergency light, entertainment controls and an air supply controllable by a manually adjustable damper. All windows have drapes that can be closed for sleeping. Entrance to these rooms is accomplished from a center aisle.

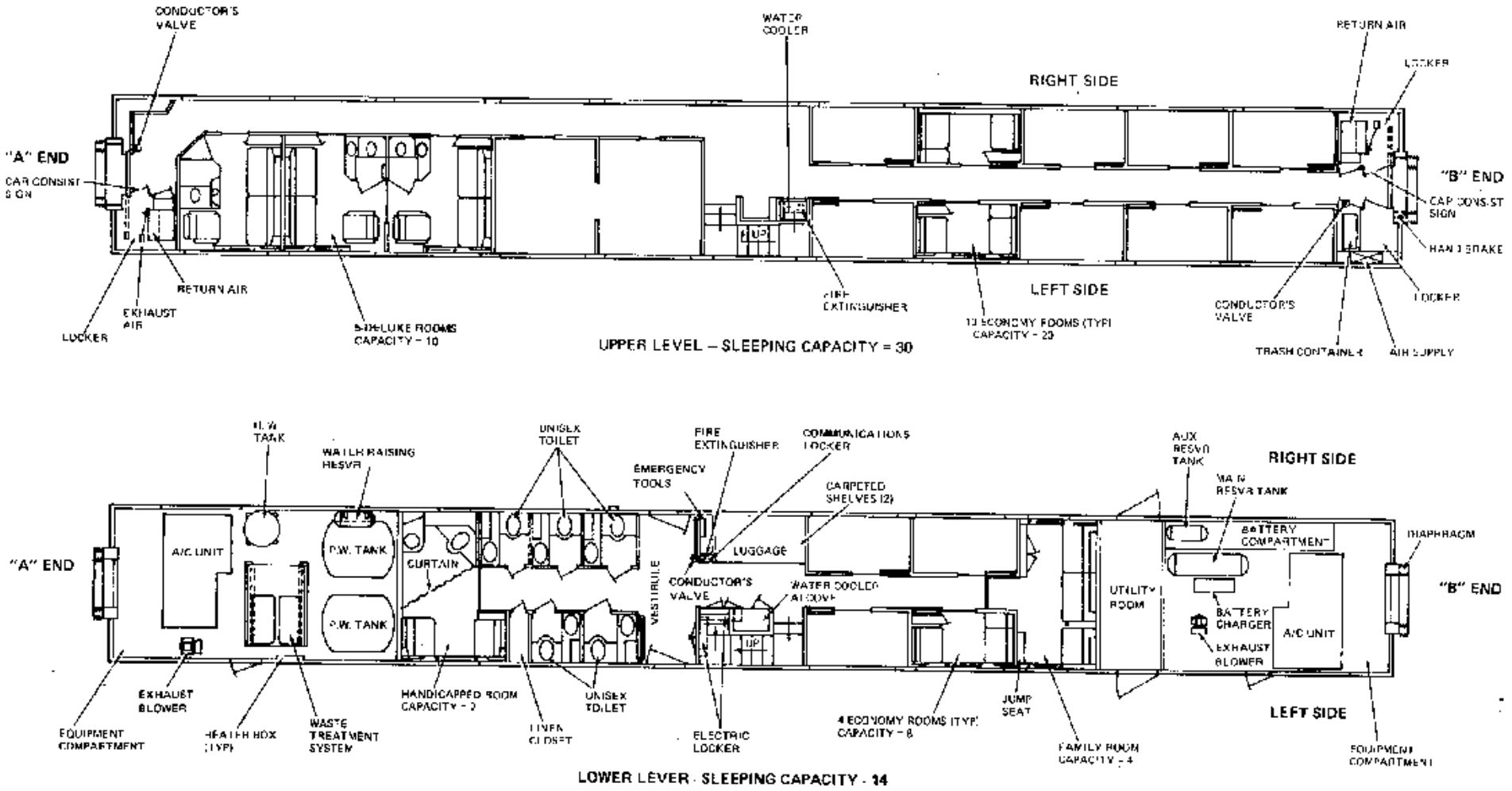


Figure 1-8. Sleeping Car Interior Arrangement (Sheet 1 of 2)

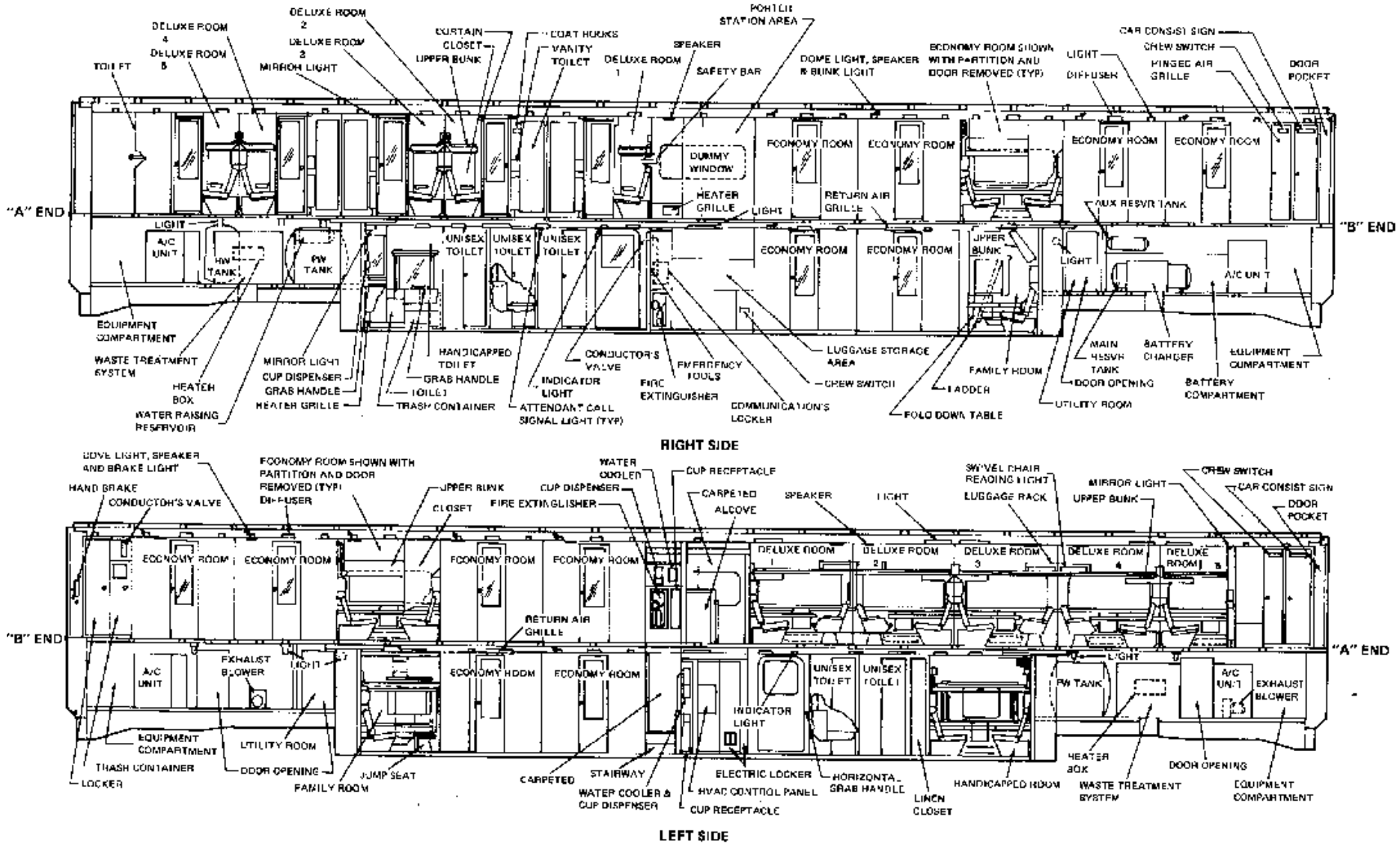


Figure 1-8. Sleeping Car Interior Arrangement (Sheet 2 of 2)

The vestibule area on the upper level contains a water cooler, a water station, fire extinguisher and an alcove to accommodate opposing passenger traffic in the aisle.

Conductor's emergency brake valves, car consist signs and trash containers are located on each end of the car on the upper level. A handbrake is located within a pocket in the transverse walkway area on the "B" end of the upper level. Lighting fixtures and speakers are alternately spaced throughout the aisle and vestibule areas. Passenger entrance to and exit from the sleeping car can be accomplished from the upper level through the use of pneumatically operated sliding end doors as well as vestibule side doors (manually operated).

The "A" side area of the lower level contains five unisex toilets, a linen closet and a handicapped person room that can accommodate two passengers. This room is transverse having a complete toilet facility with grab bars and separated from the living quarters by a curtain. The arrangement of the living quarters is similar to the economy room except that grab bars are strategically located.

The "B" side area of the lower level contains four economy rooms that can accommodate two passengers each and a family room. The family room is a transverse room at the rear of the "B" end. The family room is equipped with a transverse sofa type seat that converts into a lower berth. The cross partition above this seat is equipped with a hinged upper berth. A seat extension converts into a step arrangement for access to the upper berth.A child's upper bunk is hinged and folded down for use. A ladder is provided for access to this bunk. The room is equipped with five reading lights, a ceiling light with an emergency light and a clothes closet.

Each room is equipped with a public address and entertainment system, and an attendant call button.

The vestibule area, equipment compartments and the utility room of the sleeping car are similar to the coach car. Entrance to the sleeping car is made from the side entrance vestibule area.

1.4 LEADING PARTICULARS

The following data describes the physical makeup of each car configuration. Since the car shell dimensions are the same for all configurations only one listing is presented.

CAR SHELL DATA

Car Length Over Couplers	85 ft.
Truck Centers	59 ft. 6 in.
Car Width	10 ft. 2-1/2 in.
Car Height	16 ft. 2 in.
Car Weight (Shell)	126, 000 lbs.

Vertical Clearance Inside of Car	
Upper Level	6 ft. 6-1/2 in. min.
Lower Level	6 ft. 6-1/2 in. min.
Vestibule Area	6 ft. 6-1/2 in. min.
Door Openings	6 ft. 6-1/2 in. min.
Clear Width Openings	
Side Door	36 in.
End Door	30 in.
Stairway to Upper Level	24 in.
Trucks	2 (two axle)
Truck Wheelbase	8 ft. 6 in.

CAR PASSENGER CAPACITY

	COACH	DINING	SLEEPING
Upper Level	62	72	30
Lower Level	15	N/A	14

AUXILIARY CAR EQUIPMENT

Equipment Compartment	All Cars
Utility Room	All Cars
Electric Locker	All Cars
Sanitation System	All Cars
Luggage Storage (Carry-on)	Coach and Sleeping Cars
Food Preparation Center	Dining Car
Fire Extinguisher	All Cars
Dumbwaiters	Dining Car
Water System	All Cars
Communication System	All Cars
Air Conditioning and Heating System	All Cars
Door System	All Cars
Pneumatic System	All Cars

SECTION 2

EQUIPMENT DESCRIPTION

2.1 GENERAL

The following is a brief description of the major systems of the AMTRAK Superliner Passenger Car. The various systems are located throughout the car with some variation for the different configurations. External power and pneumatic pressure is trainlined from the locomotive. These units in the locomotive are not covered in this manual.

2.2 ELECTRICAL POWER SYSTEM

Power for the cars is supplied by the locomotive auxiliary power unit which delivers 480 volt, 3 phase, 60 Hertz AC. A seven car train will draw 800 kw at 80% power factor. The power is distributed to the cars through trainlines and intercar jumpers. Transformers in each car supply proper voltages for car sub-system electrical components and systems. In addition to the primary power system, each car has a battery which delivers a nominal voltage of 64 volts.

2.2.1 MAIN POWER DISTRIBUTION

On-board systems are powered from a 480 volt, 3 phase, 60 Hertz power source on the locomotive. This 480 volt source is used to power the air conditioning system, the car heating systems and the water heater directly. All other car systems use lower voltages and the 480 volt power is transformed to the various voltages to power these

systems. The power distribution system employs four power trainline jumper assemblies for transmission of power from the locomotive or power car to the train and for power transmission between cars. Each jumper assembly consists of three single-conductor cables used for the 480 volt power and one 3-conductor cable which is used for the locomotive power safety interlock system.

Four sets of three single-conductor cables are used for 480 volt power transmission through each car, attached to the end of each car. Near the center of the car, the power cables from both car ends enter the power trainline box and connect to buss bars. These buss bars are used to tap power for the car systems. This power is connected to the individual car systems through the main supply 480 volt circuit breaker, located in the electric locker.

AMTRAK locomotives for this service are equipped with a power safety-interlock circuit. This circuit requires that all trainline power cable assemblies be in place and the adjacent power receptacles on the last car be interconnected before power can be applied to the trainline. The jumper assembly plugs are equipped with three power points and three shorter control points. When any jumper is disconnected, the shorter control points break contact first, which causes a contactor in the 480 volt supply on the locomotive to open. This arrangement permits the power contacts in the jumper assembly plug to be disconnected under load and prevent the possibility of injury to servicing personnel.

It is recommended that an added safety step should be taken by opening the circuit breaker in the locomotive before pulling the cables.

2.2.2 COVE LIGHTING

Main car lighting is provided by continuous cove lights on both sides of the car. The cove lights are located above the luggage rack and provide indirect illumination of the ceiling, baggage area and side wall.

Each cove light fixture contains 120 volt fluorescent tubes. Single fluorescent cove lights on both levels are operational on 72 volts dc. The cove lights are controlled by circuit breakers in the electric locker. (Upper level A. C. cove lights, upper level D. C. cove lights, lower level A. C. cove light and lower level D. C. cove lights.)

2.2.3 120 VOLT CIRCUITS

Power for the 120 volt circuits is derived from the 480/120 volt transformers.

The 120 volt circuit provides power for the following:

Exhaust Fans: One located in each equipment compartment

End Door Threshold Heaters: One located on each end of the car on the upper level

Water Cooler: One located on upper level (water stations at both levels, none in dining car)

Vestibule Passageway Body End and Stairway Cove Lights: Fluorescent lighting fixtures located in noted areas

Upper and Lower Level Cove Lights: Fluorescent lighting fixtures dispersed in cars and controlled by circuit breakers located in electric locker

Single Receptacles: Seventeen single receptacles are provided in the car. One is provided in each toilet for passenger use with the balance located inside the car for car cleaning purposes

Toilet Lights: A fluorescent fixture is provided in each toilet room. Power is supplied to the toilet light ballast through a circuit breaker in the electric locker

Toilet Flush: Power is provided for the toilet flush mechanism.

Reading lights are provided over each seat. The reading lights are powered by 28-volts. Power for these lights is provided by a 480/28 VAC transformer and is zoned by circuit breakers in the electric locker. Individual operation of each light is done at the individual fixture.

Strip heaters are provided in the end door thresholds to prevent against freeze-up of water during cold weather. The heaters are automatically activated by an outside thermostat when the temperature drops below 40˚F.

There are two exhaust fans per car; these are energized whenever 120 volt power is available, the exhaust fan circuit breaker is closed, and the HVAC system selector switch is placed in the "NORMAL" position.

2.2.4 HOT WATER HEATER CIRCUITS

Two (2) 480 volt immersion type water heaters are provided in the 80 gallon hot water tank in the equipment compartment with water temperature governed by an adjustable thermostat. One heater is interlocked with the sewage system to conserve power when the vacuum pump or transfer pump of the macerator are on (individual or both).

2.2.5 DC LIGHTING CIRCUITS

When the 480 volt ac supply is available, the do circuits are powered by the low voltage power supply. The battery charger system supplies power for charging the 127 amp-hour 64 volt battery. During periods of 480 volt supply interruption, the do loads will be supplied by the battery.

The do loads are divided into two groups as follows:

Primary Circuits:
- Emergency Lights
- Marker Lights
- Brake Indication Lights
- Stair Lights
- Aisle Lights #2
- Communication System

Secondary Circuits:
- Interior Vestibule and End Door Control
- Cove Lights
- Wheel-Slide
- On-Board Surveillance System

Under normal battery charger operation, power is supplied in common to the primary and secondary circuits. Under battery operation, if the voltage level falls below 52 volts, the secondary circuits are disconnected from the battery.

The primary circuits comprise:

Emergency Lights: Four emergency lights are provided; one in each toilet light fixture, one for each recessed ceiling light, and one for each passageway body end light

Marker Lights: Two red marker lights are located on each end of the car. Local control is provided by a switch in the electric locker

Stair Lights: Each stairway is illuminated with three incandescent lamps

Aisle Lights: Upper level lights and lower level lights are provided along the center line of the ceiling for illumination of the aisle. A switch in the electric locker controls the aisle lights

Communication System. Public address and intercom capability for routine or emergency messages to passengers and/or crew, including attendant call system for summoning attendants.

2.2.6 CAR HEATING AND AIR CONDITIONING

Car heating is provided by a combination of panel-type floor heat and overhead heat. The overhead heaters are part of the air conditioning evaporator units. Both the floor heaters and overhead heaters operate from the main 480 volt supply.

The passenger and toilet area are heated by two continuous rows of panel-type floor heat. The top of the heater guards have holes to permit the discharge of hot air in order to heat the floor area. In addition, hot air discharges through holes below the window area.

The overhead heaters are used for tempering the fresh air. An automatically operated fresh air damper is provided at both fresh air intake openings. These fresh air dampers are used to limit the fresh air intake, and should be closed at ambient below 15^0F, and above 100^0F.

Two air conditioning units are located in the equipment compartment of each car. Overhead ducts distribute conditioned air over the full length of the car. If one unit should fail, the second will provide partial cooling.

2.2.7 INDICATING CIRCUITS

Local BRAKE APPLIED and RELEASED lights and one TEST INDICATION light are provided on both sides of the exterior. When the brake cylinder pressure to both trucks drops to 10 psi or less, and the handbrake is released, a green BRAKE RELEASED light will be energized on each side of the car. A BRAKE APPLIED amber light is energized when the brake cylinder pressure rises above 25 psi, or the handbrake is applied.

A BRAKE APPLIED trainline signal is transmitted to the locomotive when all cars indicate a brake applied condition. The BRAKE RELEASE trainline, in addition to checking the status of the car air brakes, also monitors the handbrakes. Before a brake release signal is received by the locomotive, all air brakes and handbrakes must be in a released condition.

A white ELECTRO-PNEUMATIC SYSTEM FUNCTION CHECK light indicates whether the E-P magnet valve on each car is operating properly. It is ON if the application magnet valve is energized to apply the brakes, OFF when the release magnetic valve is energized to release the brakes.

2.3 HEATING, VENTILATION AND AIR CONDITIONING

There are two 10 ton capacity cooling units on each bi-level car. The units are located in the equipment compartments at the ends of the cars on the lower level. Each unit consists of an integral evaporator-condenser-compressor unit, centrifugal evaporator blower fan, and electric heaters.

2.3.1 HEATING

The bi-level cars are electrically heated by a multi-stage solid state controlled system using a combination of overhead and floor heat. The electric heaters operate on 480 volt, 3 phase, 60 Hertz ac trainline power, and controls operate on 120 volt, 60 Hertz ac power. The fully automatic system is capable of providing an inside temperature of 72^0F.

The overhead heat is provided in the passenger areas, toilets and vestibule by electric heaters supplied as a part of the air conditioning evaporators. The heaters are arranged to operate in two stages and are located on the downstream side of the cooling coils. Heater staging is proportioned to provide the best possible operation during the reheat and the regular heating cycle. Automatic two-position fresh air dampers controls the intake of fresh air.

A strip type floor heater is provided in the passenger areas, in the toilets, equipment compartments and utility room. They are mounted behind stainless steel heater guards along the side walls at the floor.

The cars are also equipped with a layover heating system, operating on the necessary stages of floor heat only.

2.3.2 VENTILATION

Ventilation of the car is accomplished by "pull through" blower fans supplied as part of the evaporator unit. Fresh air enters through grilles on opposite sides of the car at the both ends, passes through the fresh air damper stainless steel ducts, and into a plenum chamber. It then passes through combined fresh and recirculated air filters into the evaporator assembly at both ends of the car.

The air conditioning blower fans pull the mixed air through the cooling and heating coils and push the conditioned air into both ends of the upper and lower main air ducts. The main air ducts are arranged so that a proportionate supply of conditioned air from each unit is delivered to the conditioned space in the upper level. With this arrangement in case of a shutdown of one unit, air from the remaining unit will be distributed to this space. The main air distribution duct on the upper level (excluding the sleeping car) is constructed with a diagonal splitter running the entire length so that a separate duct is provided for each blower.

2.3.3 AIR CONDITIONING

The air conditioning responds to signals from the temperature control system, which automatically controls the operation of the complete air conditioning system. Each air conditioning unit employs four stages of cooling to accommodate the system operating modes. These stages of control are a function of outside ambient temperature and return air temperature.

In the full cooling mode, the total output of the compressor is distributed to both refrigerant circuits of the evaporator coil. In the 67 percent partial cooling mode, a modulating liquid solenoid valve is activated that cuts off all flow to one circuit of the evaporator coil. In addition a pressure regulated unloading valve is activated, if required, to further reduce the refrigerant flow to the remaining half of the evaporator coil. For the 33 percent partial cooling mode, the amount of refrigerant reaching the single evaporator circuit is reduced by the activation of an electric solenoid-operated compressor unloading valve. The cool-reheat (dehumidification) mode utilizes the same configuration as the previous mode, except that first -stage heating is activated to reheat the partially cooled air.

2.4 DOOR CONTROL SYSTEMS

The bi-level cars have both pneumatically and manually operated doors. Vestibule interior doors and the body end doors are operated by pneumatic door engines while the side entrance doors are operated manually.

The body end doors are located on the upper level. The sliding doors are operated by two touch plates on each side for hand and foot actuation of the door operator.

2.5 COMMUNICATION SYSTEM

The AMTRAK bi-level cars are equipped with a public address, intercom, tape player and a radio receiver. The P. A. equipment permits announcements from the train crew to the passengers. These announcements can be made to the entire train or to only an individual car. The intercom provides private two-way communication between the locomotive and train crew and between members of the train crew. A tape player is available in some of the car configurations. It will play a four program tape into all coupled cars in which the system is turned on.

The bi-level cars (except dining cars) have an attendant call button system. The call buttons are located above each pair of passenger seats, in the lower stairway landing, the toilet rooms, the women's lounge, and sleeping rooms.

2.5.1 PUBLIC ADDRESS AND INTERCOM

The Public Address and Intercom System permits a train crew member to make announcements to the passengers in the entire train or, at his option, in only the car in which he is located, and permits the engineman or conductor to page the train crew or to make announcements by the use of speakers mounted in the passenger areas of each car. It also permits private two-way intercommunication between any two control panels - car-to-car or locomotive-to-car.

A communication control panel is provided in each car in the lower level vestibule. Access to the Communication Panel is with the AMTRAK standard coach key. A three position function selector switch is marked MUSIC, PA and IC. The MUSIC position permits sound from a tape deck or radio receiver to be broadcast in the car. The PA position is used for paging or announcements. The handset is equipped with a push-to-talk switchbar.

With the area selector switch in the LOCAL position the PA system will page only in the car from which the announcement is being made. In the TRAIN position, the announcement will be broadcast throughout the train. The area switch should normally be in the TRAIN position.

Depressing the CAB SIG button will sound a buzzer in the locomotive cab, this buzzer will sound as long as the button is depressed. With the selector switch in IC, private conversation may be carried on with any other handset location.

In the dining cars, the control panel handset may be used for communications (intercom) with the lower level (kitchen) intercom stations.

Loudspeakers are located in the toilet rooms, sleeping rooms and vestibules as well as within the coach, dining or kitchen areas. The loudspeaker in the vestibule from which an announcement is being made is automatically cut out to reduce feedback problems.

2.5.2 TAPE PLAYER AND RADIO RECEIVER

Provisions are made for a tape player and a radio receiver to be located in the train. They are connected to the Public Address trainline and is so wired that announcements will override the music. In dining cars and sleeping rooms, one of three (3) channels may be selected for passengers. In addition, local entertainment (live music, T. V. or movie audio) in the diner car can be selected.

2.5.3 ATTENDANT CALL SYSTEM

All cars (except dining cars) have an attendant call button system. Call buttons are located above each pair of passenger seats, in the lower stairway landings, toilet rooms, sleeping roomettes, and the women's lounge. When used, a two-note chime is broadcast over the public address system of only the car in which it is activated. In those cases where an attendant is not on duty in a car, the call system can be trainlined to activate the chime and announciator of an adjacent car.

The annunciator, located adjacent to the stairway on the lower level, indicates whether the call was initiated from the upper level passenger area, lower level passenger area, women's lounge and toilet rooms, or an adjacent car. All passenger seating areas have a small yellow light within the call button that illuminates when the call button is depressed. Pushing in the call button will clear the yellow light and annunicator.

2.6 WATER SYSTEM

Each car is provided with a pressurized cold water system where the water is stored in two 250 gallon tanks for a total storage capacity of 500 gallons. These storage tanks are located in equipment compartment at the "A" end of the car and are constructed of stain-

less steel. In addition there is a 80 gallon hot water tank having two (2) separate thermostatically controlled electric immersion type heaters and a low water cutoff probe. All flush water service lines are isolated from the potable water source by a back flow preventer.

An electro-mechanical water cooler is located in the upper level stairway alcove on the coach and sleeping cars with a faucet and cup dispenser/disposal unit located on each level of the car in the water station alcove area. Waste water from the water cooler is trapped into a line that is discharged directly to the tracks. Hot and cold water branch lines are run to each toilet facility wash basin valves while cold water is run to the toilet for flushing.

The water system has a fill point on each side of the car. A three-way valve at each fill point allows the trainline compressed air to be cut off while refilling the water storage tanks. Discharge from the relief pipeline is through an open sight drain at each fill point. This discharge indicates that the potable water storage tanks are full.

2.6.1 SANITATION SYSTEM

In keeping with present environmental regulations, each car has an on-board sanitary sewage system for passengers with the exception of the dining car (no sanitation facilities are on the dining car except for a crew toilet, located on the lower level, that is a complete self-contained unit).

After a toilet is flushed, the hopper containing the sewage is rinsed and cleared of all waste by a vacuum line and vacuum pump. The sewage and flush water is then moved to a collection tank that is common to all toilets and located in the equipment compartment at the "A" end of the car. The sewage is reduced to a liquid effluent in the macerator unit. The effluent is released onto the roadbed when the train is traveling at a minimum speed of 25 mph.

The flush water is obtained from the cold water storage tanks and is isolated from the potable water by a backflow preventer while the compressed air is obtained from the trainlined air system.

Heaters are located at the lavatory and water station drains to protect against freeze-up during cold weather. These heaters are automatically activated when the outside ambient temperature drops below 40^0F. Control and protection is accomplished by a circuit breaker located in the electric locker and the antifreeze circuits of the HVAC system. Also, the water system is protected by mechanical type automatic dump valves.

2.7 TRUCKS AND BRAKES

Each car is equipped with two four-wheel, roller bearing trucks with a primary and secondary suspension system. The primary suspension consists of a nest of two coil springs which support the truck frame on the wheelsets. The springs sit on elastomeric pads, which help to prevent transmission of wheel/track-generated noise through the truck frame.

The secondary suspension supports the car body on the air spring supported truck bolster. The truck contains auxiliary air spring reservoirs, which increase the effective volume of each air spring and lower the secondary suspension natural frequency as well as provide some vertical damping. Elastomeric lateral stops give a gradual lateral resistance to lateral movement of the bolster.

A leveling valve on each truck adjusts the air pressure to compensate for varying loads and maintains the car body within a specified floor height.

An electro-pneumatic air brake system is provided on all cars. It consists of two brake discs mounted on each axle. Each disc is braked by an individual pneumatically operated brake cylinder.

Normal control of braking is through electrical trainline circuits, which apply and release the brakes at each car by means of magnetic valves which vent and recharge the brake pipe line.

In addition to the brake pipe line, a main reservoir equalizing line is provided on each car. It supplies main reservoir air (130-150 psi) from the locomotive to each car for rapid charging of the brake system, as well as to provide air for auxiliary systems. A relay valve supplies and maintains the brake pipe line to a pressure of 110 psi.

SECTION 3

ELECTRICAL POWER SYSTEM

3.1 PRIMARY AND BATTERY POWER

Primary power for all bi-level types of cars is 480 volt, 3 phase, 60 Hertz supplied from alternators on the locomotive. A maximum of 800 kw at 80 percent power factor can be drawn from a locomotive's auxiliary power unit for a 7-car train consist. The voltage drop caused by resistance of the power trainlines at the extreme end of a consist of 7 cars does not exceed 17 volts phase-to-phase under maximum load and with equal distribution of the load among the cars. Maximum load would occur, for example, when starting up cold cars with ambient temperature of -30^0 F, all lights on, etc.

Each car is equipped with a 64 volt storage battery. The battery is used if primary power is interrupted.

Headend Power and Jumpers

The electric power for the bi-level cars is supplied from the alternators on the Amtrak locomotive through the intercar jumpers and the 480 VAC power trainlines of each car. There is also a 64 volt (nominal) storage battery on each car.

480 Vac Trainline

The 480 volt 3 phase power is trainlined from car to car through four (4) 3-phase jumper cables. At each side at both ends of the car, there is a permanently attached 3 phase power jumper cable and a power receptacle. The power jumper cable plugs into the mating receptacle on the adjoining car. ' At the rear of the end car in the consist the power jumper is looped back and plugged into the adjacent power receptacle. The power receptacles are color coded red.

Power Jumper

Each power jumper consists of three power conductors and three smaller control wires. The power jumper plugs have three power pins and three shorter control pins. When any power jumper is disconnected, the shorter control pins break contact first. This opens a contactor in the 480 volt supply in the locomotive and prevents the power points from disconnecting under load and remaining "hot" when disconnected.

27 Pin Connectors

Intercar communications, control and loop circuits are trainlined through one 27 point jumper at each end of the car. There are two 27 point control receptacles at each end of the car. One near the centerline of the car below the end door is for trainlining car to car. The other 27 point receptacle, located adjacent to the power receptacle at the corner of the car, is used to trainline car to locomotive. These 27 point receptacles are color coded blue.

Dummy Receptacle

In addition, there is a dummy 27 point receptacle located adjacent to the car to car receptacle below the end door.

The dummy receptacle has only one active pin "TB2" - 20A. When a jumper is connected from the 27 point car to car receptacle, at the rear of the last car, to the adjacent dummy receptacle, the circuit is completed to energize the loop relay.

Major System Voltages

480 VAC, 3 Phase

The 480 VAC power enters the individual cars by a conduit which connects the undercar 480 VAC junction box to the electric locker.The cables are connected to the main power breaker of the car CB #41 (located on the circuit breaker panel) in the electric locker. The line side of this breaker feeds two rows of breakers for the different 480 VAC systems.

120 VAC, 28 VAC, 3 Phase

The 9 KVA (120 VAC) and 3 KVA (28 VAC) transformers are also located in the electric locker of each car. The transformers supply reduced voltage for control circuits and the lighting system. The 28 VAC is intended for use by the passengers, such as the passenger controlled reading lamps and attendant call buttons.

The 480/120 VAC transformer is a single, three-phase, two winding, "WYE" connected transformer, having sufficient capacity to supply the required 120 VAC services on the car.

The 480/28 VAC transformer is a single, three-phase, two winding, "WYE" connected, dry-type transformer, having sufficient capacity to supply the required 28 VAC services on the car.

72 VDC (& 64 VDC Storage Battery)

The complete auxiliary power supply system located in the equipment room consists of a 50 cell battery, a battery charger and low voltage power supply.

The 50 cell battery is made up of ten 5 cell block batteries which will deliver 32 amperes for a minimum of 2 hours at 0^0F electrolyte temperature down to 1. 04 VPC (volts per cell).

The battery charger and the low voltage power supply are housed in the same enclosure.

The battery charger section of the BC/LVPS is a 3 phase controlled rectifier which recharges the battery off line during normal operation. Switching from float to high rate charging is done automatically when the charger operates in current limit for 16 seconds. After the battery reaches a high rate voltage level (dependent on temperature) and after an additional 2. 25 hours of constant current charging (33A) the charger returns to float charging.

The low voltage power supply is an unregulated supply, consisting of a 3 phase transformer, six diode bridge, inductor and a capacitor, which provides a filtered output to the load during normal operation.

The BC/LVPS also provides control of the load shed relay and the power switching device.

The load shed relay is an external device located in the auxiliary relay panel, in the electric locker which will disconnect all but emergency loads connected to the BC/LVPS when the battery voltage falls to 52 volts.

The power switching device is a contactor within the BC/LVPS which will transfer the load from the LVPS to the battery when the output of the LVPS falls to 62 volts.

208 VAC (line to line) 30, 120 VAC (line to neutral)

The dining cars have an additional transformer which supplies 208 volt 3 phase A. C. and 120 volt single phase A. C. to operate the food service appliances. Also, the dining cars are equipped to accept 220 volt, 3 phase, 60 hz wayside power. Another transformer in the car's standby power circuit reduces the 220 volt wayside power to 208 volts A. C. to operate the food preservation equipment. The dining cars are the only cars equipped to accept wayside power.

The dining car 75 KVA food service transformer consists of three single phase transformers wired into Delta primary and WYE secondary. The transformers operate from the 480 volt, 3 phase, 60 hertz power supply and furnish 208 VAC line to line, 3 phase, and 120 VAC line to neutral, single phase, 4 wire power system to the food service equipment.

All Voltages

The various Amtrak bi-level cars are ungrounded. The frames of all resiliently mounted electrical apparatus operating on 120 VAC or greater are grounded to the carbody as safety grounds.

The line side of CB12, the low voltage power supply output breaker, wire TB- is connected to the carbody frame in the electric locker making the 72 volt D. C. system a two wire grounded system.

All load circuits are controlled and protected by circuit breakers. Except as noted all breakers are in the electric locker.

The Operating Voltages of the Major Systems and Equipment
480 VAC, 3 Phase

Air conditioning compressor/condenser units

Air conditioning evaporator blower motors

B end equipment room heat

Floor and overhead heat

Hot water heater elements

Waste Treatment System

Low voltage power supply/battery charger system

9 KVA, 120 VAC transformer

3 KVA, 28 VAC transformer

Dumbwaiter station

Attendant station (provision only)

Food service transformers

75 KVA, A - 208 VAC transformer

208 VAC/120 VAC (Dining Car only)

220 VAC/208 VAC Wayside Transformer

Refrigerator Units

Freezer Units

Utility Room ambient controls

Microwave and convection ovens

Dishwasher

Toaster Coffee Maker

Dish warmer

Hot Food Counter

Food warmer Griddle

120 VAC, 3 Phase

Fluorescent lighting in all ceiling and cove (A. C.) fixtures

Stairway area toilet room, body end lights, vestibule, consist sign, etc.

Convenience outlets (A. C. receptacles)

End door threshold heaters Exhaust fans

Controls for HVAC and hot water systems

Water cooler

Maitre d' area

Refrigerators

Soup and Coffee warmers

28 VAC 3 Phase

Signs (no smoking, cafe directional)

Passenger reading and incident lights

Attendant call system

A. C. aisle lights

72 VDC

Communication system

Brake indication

Marker lights

Stair lights

Emergency lights

D. C. level aisle lights

Those systems which are load shed:

Door control and door operate system

Wheelslide

Upper level cove lights

Lower level cove lights

Women's lounge ceiling light

Equipment room ceiling lights

Electric locker and utility room lights

On board surveillance system (provisions only)

3.1.1 SWITCH AND BREAKER PANELS GENERAL ARRANGEMENT

The main circuit breaker and switch panel is located in the electric locker for easy accessibility and reduced wiring (See figure 3-1). The main circuit breaker and switch panel consist of the power supply breaker section, the lighting and control breaker section, and the selector and lighting control switch panel.

The 480 volt breakers are located in such a manner as to minimize possible accidental misuse. The circuit breakers are mounted to a panel made of laminated phenolic.

The main circuit breaker panel is arranged so as to be easily accessible for any connections and designed with a dead front to prevent an operator from coming in contact with live parts when operating switches or circuit breakers. All switches and breakers are provided with a name clearly identifying the circuit which each one controls.

All breakers indicate "ON' with the toggle UP and "OFF" with the toggle

DOWN.

The base panel structure is designed for all types of cars and is modified by adding or subtracting breakers and switches.

The wayside power circuit breaker of the dining cars are located in the "B" end equipment room near the wayside power transformer.,

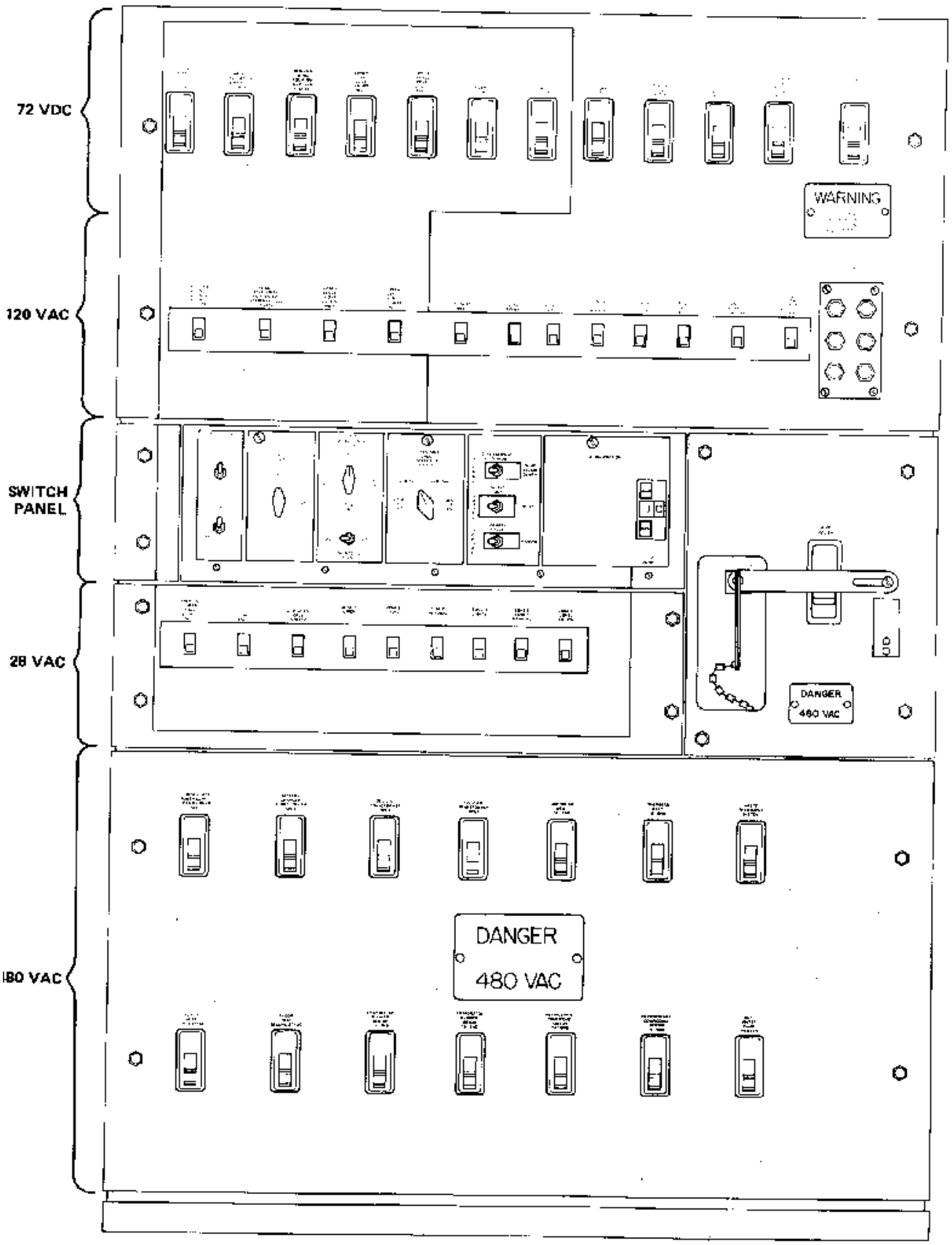


Figure 3-1. Electric Locker, Circuit Breaker Panel

The battery disconnect breaker is located in the battery charger/low voltage power supply enclosure in the "B" end equipment room. A sign is placed on the electric locker circuit breaker panel, indicating the battery disconnect breaker location.

The food service equipment and food preservation equipment circuit breakers of the dining cars are located in the Food Service Equipment Power Distribution Panel. This panel is located near the "B" end utility room bulkhead wall.

480 Volt Breakers

Breakers for 480 volts are of the toggle action indicating type, or approved equivalent. Breakers are the type of high shock resistant design suitable for railway service with an interrupting rating of at least 14, 000 amps r. m. s. on 480 volts AC.

28, 120 and 208/120 Volt Breakers and Switches

Switches for the 28 and 120 volts are of the toggle action type, or approved equivalent. The 28, 120, and 208/120 volt breakers are an approved type of high shock resistant design suitable for railway service with an interrupting rating of at least:

a) 10, 000 amperes RMS at 28 VAC for the 28 volt breakers

b) 10, 000 amperes RMS at 120 VAC for the 120 volt breakers

c) 10, 000 amperes RMS at 120/240 VAC for the 208/120 volt breakers

72 and 64 Volt Breakers

All 72 and 64 Volt D. C battery circuits requiring overload protection are provided with circuit breaker switches with magnetic and thermal type trips and shall clearly show "ON' and "OFF". The breakers are an approved type of high shock resistant design suitable for rail service with an interrupting rating of at least 5, 000 amperes at 125 VDC.

Power Supply Breaker Panel Location and Physical Description

The power supply breaker panel consist of the 480 volt breakers. The power supply breaker panel is part of the main circuit breaker panel located in the electric locker. A lighting and control breaker panel consist of 28 volt, 120 volt, and 72 volt breakers.

The lighting and control breaker panel is part of the main circuit breaker panel located in the electric locker.

A selector and lighting control switch panel is part of the main circuit breaker panel located in the electric locker.

The main circuit breaker and selector switch panel is so arranged that the lighting switches and the lighting circuit breakers are grouped together, except special area switches such as counter lights in kitchens or Maitre d' areas.

Battery Breaker Panel

The battery breaker is located in the battery charger/low voltage power supply enclosure in the "B" end equipment room.

Dining Car

This distribution center consists of one panel. The panel contains the following circuit breakers provided by the carbuilder

240 VAC BREAKERS

Misc. Food Service Equipment (2)

Food Preservation Equipment (1)

Individual Equipment (21)

Wayside Power Panel

The Wayside Power Panel contains the automatic transfer apparatus and accessories which, when actuated by either of the two standby plugs transfers the operation of the food preservation equipment of the dining cars from normal head end power to standby power. The Wayside Power Panel is located in the "B" end equipment room near the wayside power transformer. This panel contains a 240 VAC transfer power circuit breaker and is located only on the dining car.

Convenience Outlets

The convenience outlets are distributed over the three phases of the power supply, with three (3) ground fault interruption receptacles per car (three circuits) for the sleeping cars, which will cover all the convenience outlets, and one (1) ground fault interruption receptacle per car (one circuit) for the coach and sleeping cars, which will cover the convenience outlets in the toilet and passenger areas only.

3. 2 COACH ELECTRICAL POWER SYSTEM

The electrical power system in the coach car consists of three parts as follows:

- Distribution of 480 volt, 3 phase, 60 Hertz primary trainline power
- Distribution of reduced ac power
- Distribution of dc power

Each of these parts is discussed separately.

3.2. 1 DISTRIBUTION OF PRIMARY POWER

The primary power trainline voltage of 480 volts ac is used directly in the coach (figure 3-2) by the following equipments:

a. Air conditioning compressor and condenser motors

b. Evaporator blower motors

c. Hot water tank heaters

d. Floor and overhead heat

e. Waste treatment system

f. Battery charger and low voltage (72 volts dc) power supply

The 480 volt, 3 phase, 60 Hertz power trainlines are connected to a 3-phase 150A MAIN POWER circuit breaker, which in turn is connected to 3-phase (10A, 15A, 30A and 40A) individual circuit breakers associated with the equipments and transformers receiving the primary power directly. These circuit breakers are located on the breaker panels located in the electric locker.

3.2.2 DISTRIBUTION OF REDUCED AC POWER

The 480 volt ac primary power is reduced by two separate transformers to 120 volt, 3-phase, 60 Hertz and 28 volt, 3-phase, 60 Hertz levels, respectively. The 120 volt ac outputs of the 480V-to-120V transformer are used by the following equipments:

a. Drain heaters

b. Exhaust fans

c. Water cooler

d. End door threshold heater

e. Vestibule, passageway body and stairway cove lights

f . Upper and lower level cove lights

g. Toilet and Women's Lounge mirror lights

h. AC receptacles (3 zones)

i . Hot water heater control, F/A (fresh air) damper and HVAC controls

j . Shunt trip fuses and no-voltage relay (NVR)

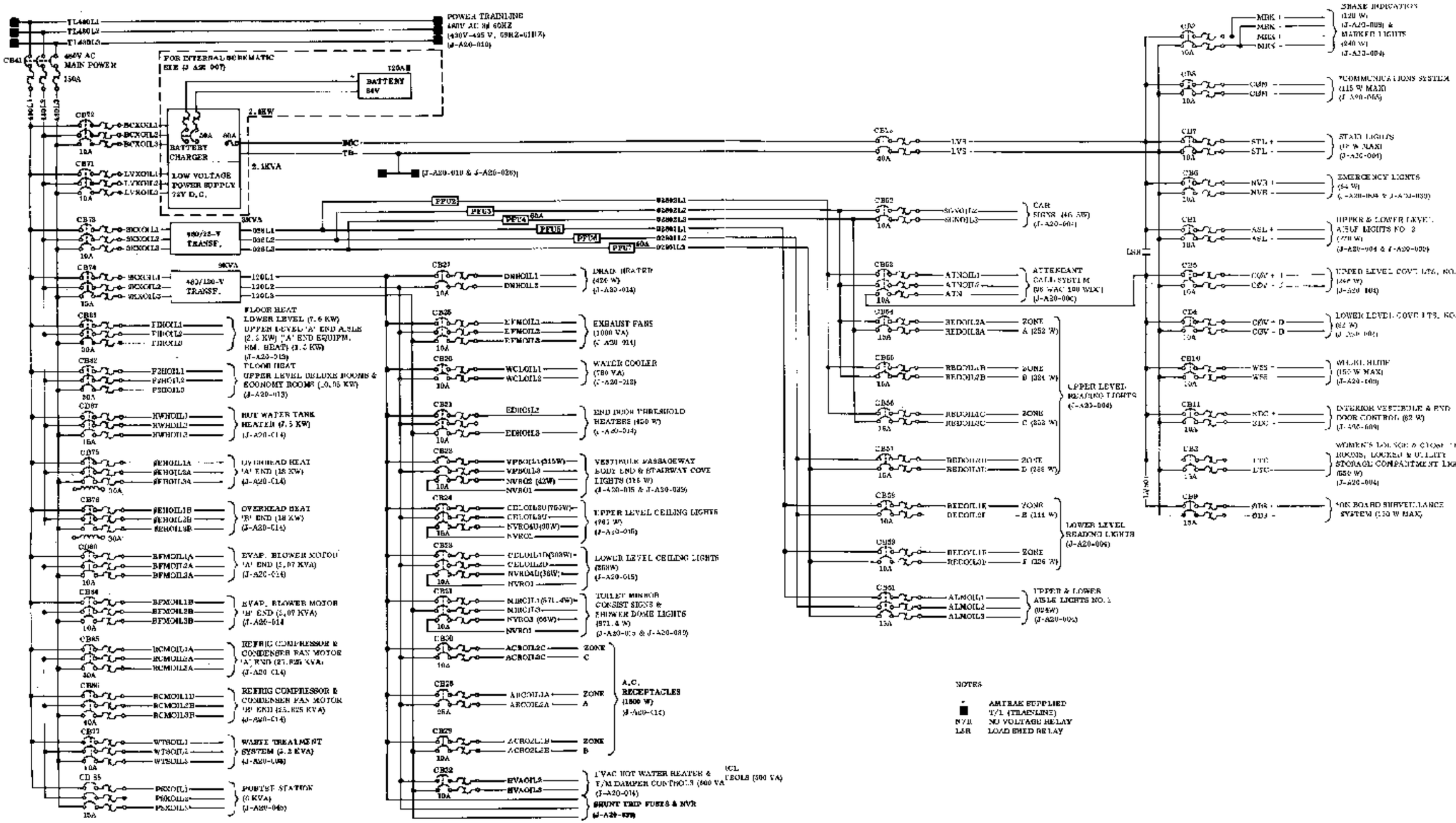


Figure 3-2. Coach Power Distribution Diagram (J-A3-001)

The 28 volt ac outputs of the 480V-to-28V transformer are used by the following equipments:

a. Car signs

b. Attendant call system

c. Upper and lower level reading lights

d. Upper and lower level aisle lights No. 1

The individual outputs of the 480V-to-28V transformer includes 60A fuses to facilitate reduced wiring size on the circuit breaker panel. All .120 volt and 28 volt ac inputs to the individual equipments are protected by individual circuit breakers. These circuit breakers are located on circuit breaker panels in the electric locker.

3.2.3 GENERATION AND DISTRIBUTION OF DC POWER

Direct current power at a nominal level of 72 volts is developed by an Auxiliary Power System. This system consists of the following:

a. 50 cell nickel-cadmium storage battery

b. Battery charger

c. Low voltage power supply

d. Battery temperature sensor and load shed relay

The auxiliary power system produces a nominal 72 volts do output. This output is passed through a 60 amp fuse (in LVPS, "B" end equipment room) and a 40A circuit breaker and distributed to individual equipments through separate circuit breakers.

These equipments are:

- Brake indication and marker lights
- Communications system
- Stair lights
- Emergency lights (via NVR contacts if 120 VAC power is lost)
- Upper and lower level aisle lights No. 2
- Upper and lower cove lights No. 2
- Wheel slide brake control
- Interior vestibule and end door control
- Women's lounge and closet, equipment rooms, locker, and utility storage compartment lights
- On-board surveillance system (optional)

As shown in figure 3-2, the negative do line from the battery charger is connected to a trainline. This is a communication and control trainline to which the negative battery line of each car in the train is connected. The negative battery line is grounded to the car body at the circuit breaker panel in the electric locker. A loop control circuit uses this trainlined battery negative line to establish the battery source and circuit continuity for trainlining brake application and release lights. The loop control circuit is completed by jumpering the communication and control trainline receptacle and dummy receptacle together at the end of the train farthest from the locomotive.

The low voltage power supply contains a power switching device which transfers the load from the low voltage power supply to the battery when the output of the low voltage power supply falls below 62 volts. Also, a load shed relay (LSR) is controlled by battery level sensing circuits in the battery charger. It is energized when the battery level falls to 52 volts. When energized, the LSR disconnects all but the following emergency loads:

Brake indication and marker lights

Communication system

Stair lights Emergency lights

Upper and lower level aisle lights No. 2

The 50 cell battery is formed by 10 NIFE M405-5 block batteries. The battery delivers 32A for a minimum of 2 hours at 0° F electrolyte temperature down to 1. 04 volts DC. The battery is located on the right side of the "B" end equipment compartment. It is accessible from outside the car through removable access doors and can readily be removed through these doors.

The battery charger and low voltage power supply (BC/LVPS) are housed in a floor mounted enclosure in the "B" end equipment compartment. This enclosure is 20 inches high, 32-9/16 inches long and 12-1/2 inches deep. The enclosure is finished with a white epoxy textured paint which provides a durable exterior surface finish and aids maintenance in dimly lit areas. Access is through removable top and front panels. Captive hardware is used on the front cover. A reset switch; failure indicator, charger output current meter and an LVPS ON indicator are mounted on the front panel (figure 3-3).

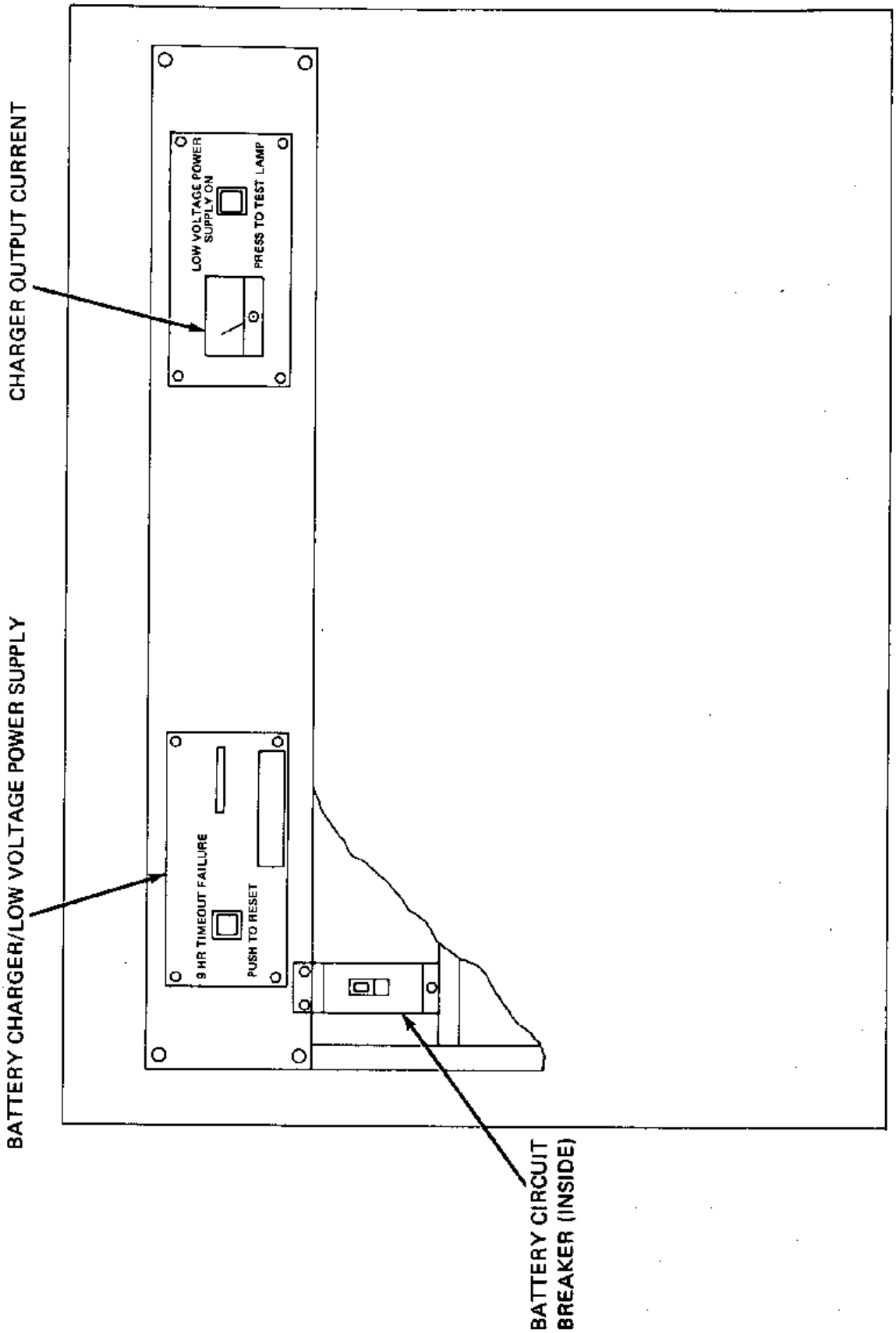


Figure 3-3. Battery Charger and Low Voltage Power Supply, Front Panel

The output of the battery charger to the battery is protected by a 50 amp circuit breaker located in the battery charger enclosure.

The battery charger portion of the BC/LVPS is a 3 phase full wave bridge rectifier which has adjustable float, high rate and current limit points. The float and high rate voltages are compensated for temperature variations in the battery compartment of -18 to 55^0 C. The battery charger recharges the battery off-line during normal operation and switching from float to high rate charging is done automatically when the charger operates in current limit for 16 seconds. After the battery reaches a high rate voltage level dependent on temperature and after an additional 2. 25 hours of constant charging (33A) the charger returns to float charging.

The low voltage power supply is an unregulated supply, consisting of a 3 phase transformer, six diode bridge, inductor and a capacitor, which provides a filtered output to the load during normal operation.

The BC/LVPS also provides control of the load shed relay, power switching device, temperature compensation, recharge time and excessive recharge time failure indicators. The load shed relay is an external device which will disconnect all but emergency loads connected to the BC/LVPS when the battery voltage falls to 52 volts.

The power switching device is a contactor within the BC/LVPS which will transfer the load from the LVPS to the battery when the output of the LVPS falls to 62 volts. Both float and high rate voltage temperature compensation circuits are fail safe. That is, if an open circuit occurs between the BC/LVPS and the temperature sensor in the battery compartment, the output voltage of the battery charger will be a minimum.

Two solid state timers are used to control high rate recharge time and to reduce the output current of the battery charger to 5 amperes if the charger operates in current limit for more than 9 hours. At the same time, the front panel and remote indicators are lighted. Pressing the RESET push button will return the charger to normal operation once the malfunction has been corrected.

The battery, battery charger, low voltage power supply and control circuits specifications are as follows:

Battery

Type: M405-5 10 Blocks
Capacity: 129 AH

Battery Charger

Type: 3 Phase, full wave bridge
Input: 480 Volts ac, 3 Phase, 60 Hertz, 30

Float Output Voltage:	72. 0 @	25° C
	67. 0 @	55° C
	80. 4 @	-18° C
High Rate Voltage Points:	79. 0 @	25° C
	74. 0 @	55° C
	90. 0 @	-18° C
Output Current:	30 Amps	
Current Limit:	33 Amps	

Operating Temperature Range: -18° C to 55° C

Low Voltage Power Supply

Type: 3 Phase-Transformer Rectifier-6 Diode Bridge

Input: 480 Volts ac, 3 Phase, 60 Hertz, 30

Output Voltage with 30 Amp Load and 480 Volt ac Input: 72 Volts dc

Output Current: 30 Amp Nominal

40 Amp Maximum

Ripple Voltage: 2 Volts Peak-to-Peak @ 30 Amps

Regulation: Unregulated

Control Circuits

Load Shed and Transfer Relay Circuit

Drop Out Voltage: Adjustable 47-75 Volts dc

Pick Up Voltage: Fixed at 10 volts above drop out voltage

Contactor Coil: 72 Volts dc @ 0. 56 Amps

Contacts: 100 Amps @ 48 Volts dc

Timer Circuit

High Rate Delay: 16 Seconds

Recharge Time: Additional 2. 25 hours of constant current (33A) charging after the high rate voltage point is reached.

Time Out Failure Time: 9. 1 Hours

3.3 SLEEPING CAR ELECTRICAL POWER SYSTEM

The sleeping car electrical power system (figure 3-4) is almost identical to that of the coach, described in paragraph 3. 2. The differences are in the number of equipments receiving power.

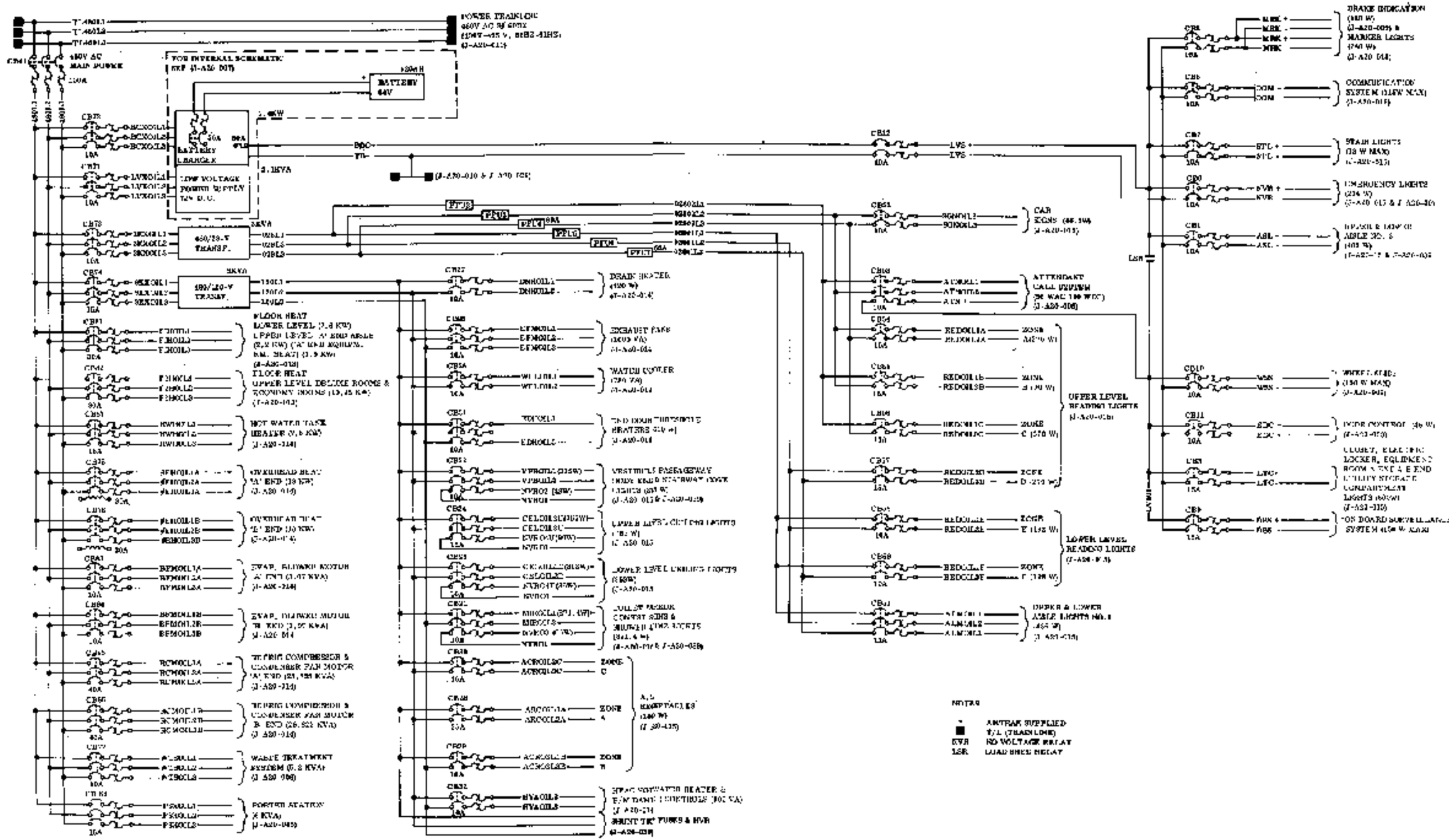


Figure 3-4. Sleeping Car Electrical Power Distribution (J-A3-002)

3.4 DINING CAR ELECTRICAL POWER SYSTEM

The dining car electrical power system (figure 3-5) is also almost identical to that of the coach. The differences are in the food service equipment installed in the diner.

Two AAR 220 volt, 3 phase, 60 Hertz standby receptacles are provided. This receptacle can be used to apply power for refrigerators and freezers when perishables are aboard a standing car and locomotive power is not available or desirable. Primary trainline power is distributed to the food and preservation equipment through a 480V-to-208V transformer and a food preservation power switching circuit (figure 3-6). The 220 volt wayside power is distributed to the food preservation equipment through a 220V-to-208V transformer and the food preservation power switching circuit. This food service power distribution circuit contains two relays which connect the appropriate power source to the food service and preservation equipments while opening the circuit to the other power source. This prevents the circuit being completed to one power source while the other source is connected. For example, with power supplied from the locomotive, the MC relay is energized and the SC relay is deenergized. The MC contacts close and locomotive primary power is applied to the food preservation equipment. If wayside primary power is applied while locomotive primary power is being used, the opened MC (AUX) contacts prevent the energizing of the SC relay. The locomotive primary power must be removed to permit the MC relay to deenergize. The deenergize condition of the MC relay permits the SC relay to energize and complete the circuit path to the wayside power receptacle.

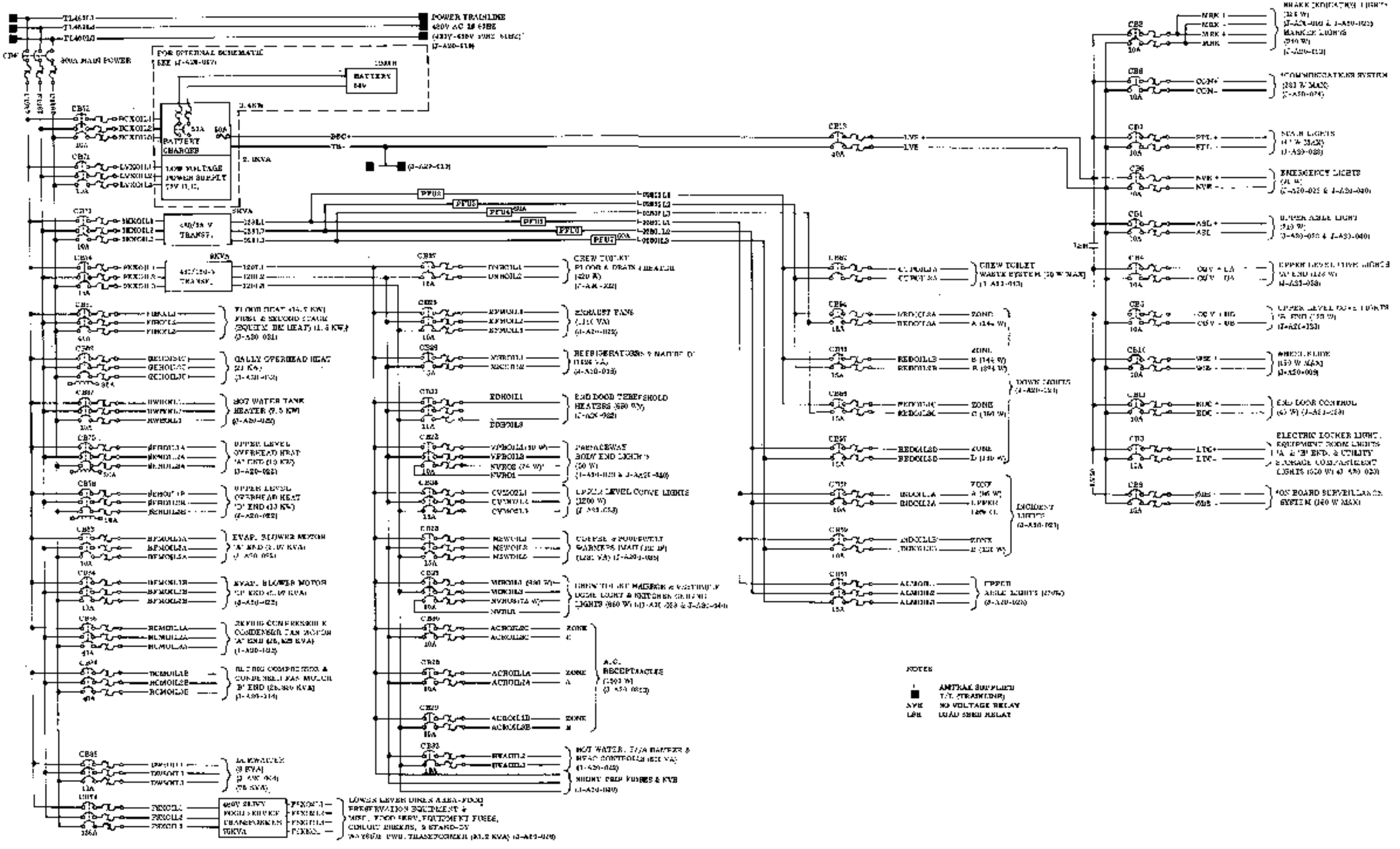


Figure 3-5. Dining Car Electrical Power Distribution (J-A3-004)

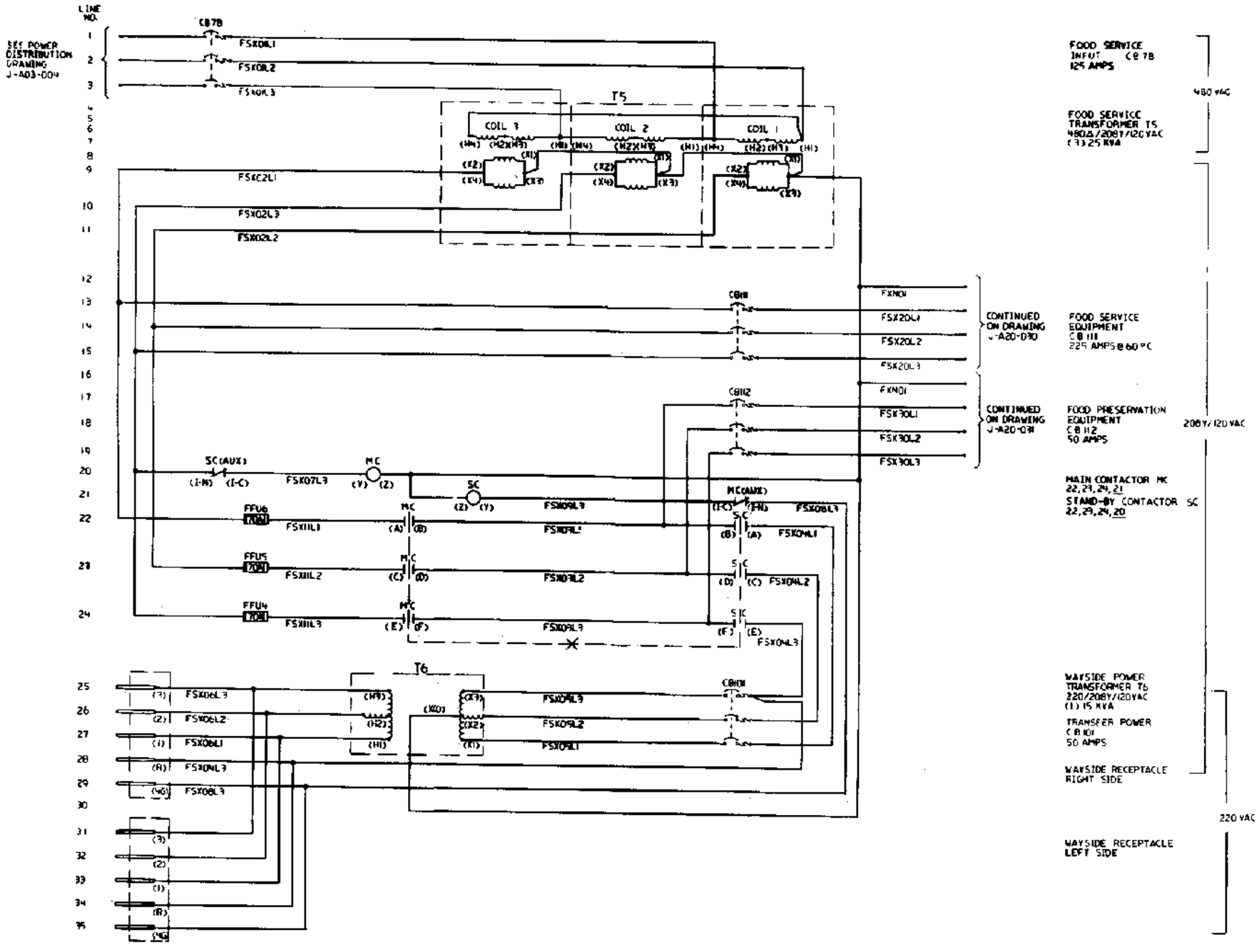


Figure 3-6. Food Preservation Power Switching Circuit Schematic (J-A20-028)

SECTION 4

LIGHTING SYSTEM

4.1 GENERAL

Comfortable and adequate lighting is provided in every area of each type of car. In addition to providing illumination, the lighting installations are also used to accommodate some of the sound system speakers, attendant call system switches and lamps and ventilation system ducts.

4.2 COACH LIGHTING SYSTEM

The coach lighting system provides adequate and comfortable lighting in each compartment of the car. The coach consists of the following areas and compartments where specific types of lighting fixtures are installed (figure 4-1):

a. Overall passenger area

b. Center aisle area

c. Passenger seat area d. Steps

e. End areas

f. Toilets and women's lounge

g. Vestibule area

h. Equipment compartments and utility room

i. Illuminated signs

j. Exterior marker lights

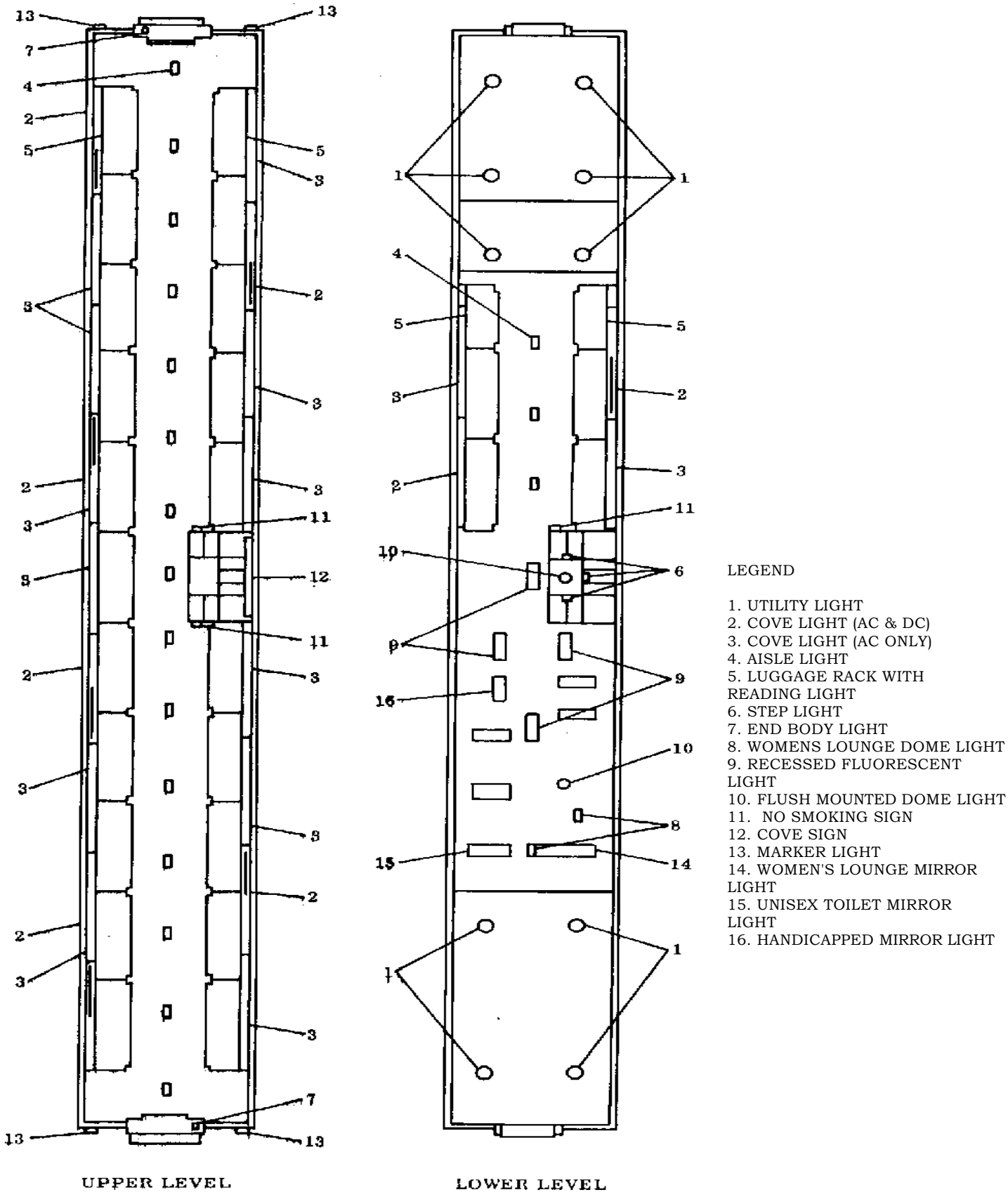


Figure 4-1. Coach Lighting System, Installation Arrangement

4.2.1 OVERALL PASSENGER AREA

The coach passenger seating area is provided with an overall arrangement of background cove lighting. This lighting is provided by a series of Cove Light Assemblies mounted along both sides of the car above the passenger seats about a foot below the ceiling of both the upper and lower levels (2 and 3, figure 4-1). Relative to each passenger seat, the Cove Light Assemblies are installed as shown in figure 4-2.

The Cove Light Assembly provides general indirect illumination of the passenger area and also provides illumination for the luggage racks over the seats. There are several configurations of the cove light. Basic differences between the configurations include number of lamps, size, ballasts used, and mounting methods. The cove light is comprised of a door assembly (or closure kit) and a housing assembly. The door assembly provides for easy access to the lamps for relamping. A closure kit is used on some configurations in lieu of the door assembly. The housing assembly houses the ballasts, sockets, lamps, and electrical wiring.

In the coach, some of the Cove Lighting Assemblies contain fluorescent lamps which are powered by 120 volts ac only (3, figure 4-1) and the remainder each contains one fluorescent lamp powered by 120 volts ac and one powered by 72 volts dc (2, figure 4-1).All of the cove lighting circuits are protected by circuit breakers (figure 3-1). These circuit breakers are mounted on the lighting and control breaker section of the circuit breaker panel which is installed in the electrical locker. The lighting level is controlled by these circuit breakers.

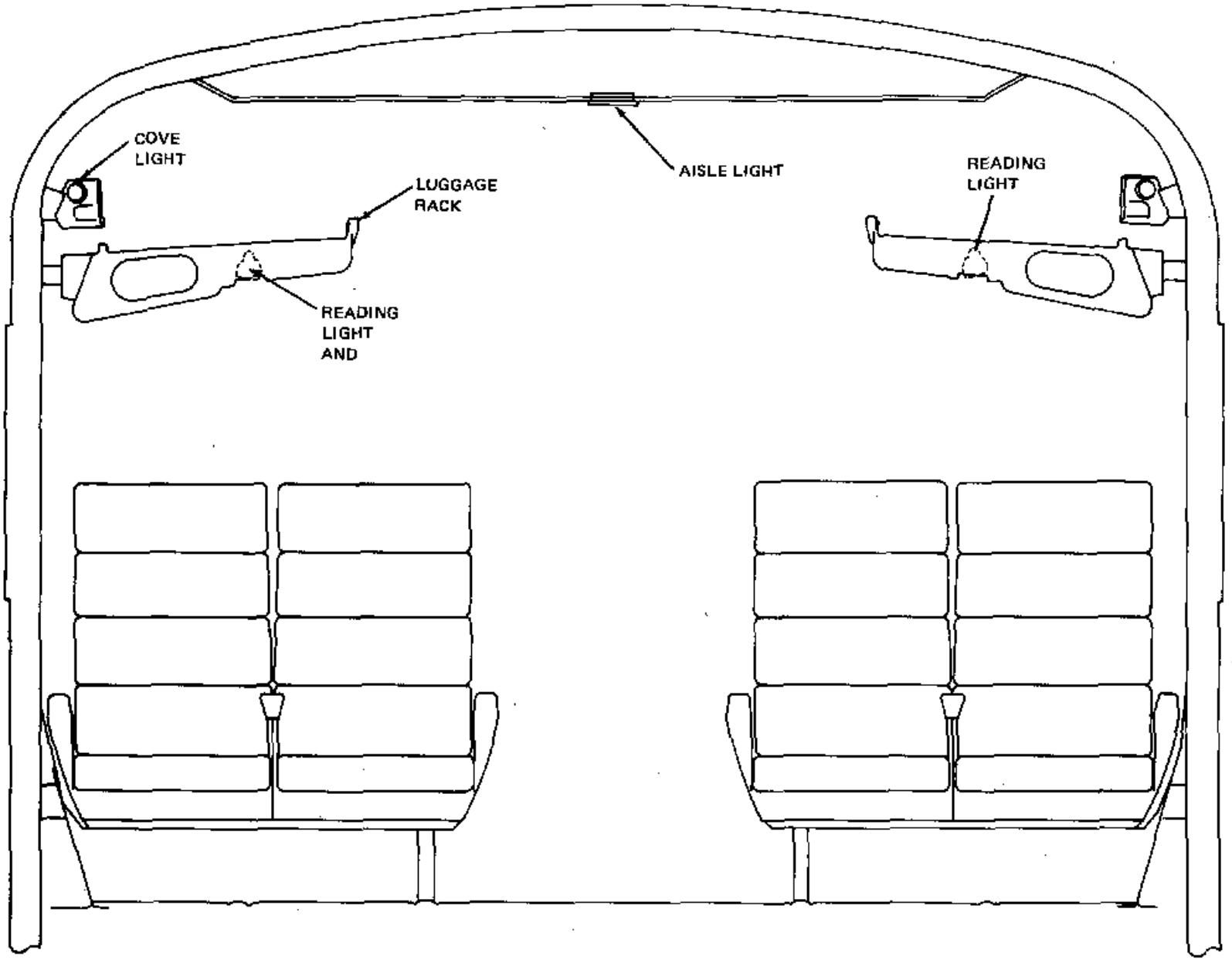


Figure 4-2. Bi-Level Coach, Cross Section View

Circuits of the electrical system (figure 3-1) apply 120 volts ac to the ballasts in the cove light assemblies. They also apply 72 volts dc to those cove light assemblies (2, figure 4-1) which also contain an inverter that powers a fluorescent lamp. These assemblies which can operate from do power are used for emergency lighting when the primary trainline power is removed as explained in paragraph 3. 2. 3.

4.2.2 AISLE AREA

As indicated in figure 4-1, 15 individual aisle light assemblies (4) are installed in the center of the upper level ceiling and three in the center of the lower level ceiling. The aisle lights are thereby suitably located to illuminate the floor of the passenger center aisle (figure 4-2).

Aisle light assembly consists of a cover assembly and housing assembly. The cover assembly is comprised of a lens retainer and baffle assembly and the assembly mounting hardware. The housing assembly contains two lamp sockets, electrical wiring, and a housing weld assembly. The aisle light utilizes a 15S11/3DC, 75 volt lamp and a 2232, 28 volt lamp.

Circuit breakers on the lighting and control breaker panel protect and control the aisle lights. Twenty-eight volts ac is provided through car wiring to illuminate the 28 volt lamp, which is normally used. Direct current at a nominal voltage of 72 volts dc supplies the other lamp, which is used for emergency purposes. The emergency light is controlled by relays located in the car circuits as described in paragraph 3. 2. 3. When normal source power is interrupted, the emergency light circuit is energized directly from the car battery.

4.2.3 PASSENGER SEAT AREA

At each passenger seat a reading light assembly is installed as part of the luggage rack assembly (5, figure 4-1) above the seat (figure 4-2). The reading light assembly consists of two housing assemblies, two lens cap assemblies, electrical wiring and mounting tray. An attendant call switch is also included, which includes a yellow light. Each reading light contains a pivot tab which allows positioning of the light.

The luggage rack assembly, in addition to holding luggage, houses the reading light assembly, contains the exhaust air duct with inlets, and displays seat numbers. The luggage rack consists of a light trough assembly, intermediate assembly and wire harness assembly.

The reading light assembly is protected by circuit breakers on the lighting and control breaker panel and controlled by individually operated switches at each light. The attendant call switch is used to activate a two-note chime. The call switch also activates an annunciator which indicates the area of the car from where the call originated. The switch routes 28 volts from the communications system. Twenty-eight volts is also routed through car wiring and the luggage rack to illuminate the reading lights. Two lights, wired in parallel, are provided in each reading light assembly.

4.2.4 STEPS

The steps in the coach are illuminated by three step light assemblies (6, figure 4-1).The step light consists of a cover assembly and housing assembly. The cover assembly contains a glass lens and is affixed to the housing assembly with tamperproof closing screws. The lamp socket is mounted in the housing assembly. A 6S6, 75-volt lamp is used with the fixture.

A circuit breaker on the lighting and control breaker section of the circuit breaker panel protect and control the step light. Direct current at a nominal voltage of 72 volts supplies the incandescent lamp.

4.2.5 END AREAS

The upper level of the "A" and "B" ends of the car are illuminated by a separate body end light assembly (7, figure 4-1). The body end light assembly consists of a cover assembly and a housing assembly. The lens is mounted in the cover and held in place by retainer clips. Tamperproof closing screws allow easy access for relamping. The housing assembly contains the lamp sockets. A 120-volt lamp (A19-25W) and a 60-volt emergency lamp (6S6) are utilized with the fixture.

Circuit breakers on the lighting and control breaker panel protect and control the body end light. Car circuits provide 120 volts to the lamp socket. Direct current at a nominal voltage of 64 volts supplies the emergency lamp. The emergency light is controlled by relays located in the car circuits. When normal source power is interrupted, the emergency light circuit is energized directly from the car battery.

4.2.6 WOMEN'S LOUNGE

A women's lounge dome light assembly (8, figure 4-1) and a mirror light are installed in the ceiling of the women's lounge. The dome light is comprised of a housing assembly and a door assembly. The housing assembly accommodates the lamp socket and electrical wiring. Two (2) closing screens are captive in the door and allow easy access for relamping (75 volt - A19-50W lamp) . The mirror light contains four (4) fluorescent lamps and an emergency incandescent lamp.

A circuit breaker on the lighting control breaker panel section of the circuit breaker panel protects and the fluorescent lights (ballast input power is 120 VAC).
A nominal voltage of 64 VDC supplies the emergency lamp when normal source power is interrupted. Emergency light circuit are energized directly from the car battery.

4.2.7 TOILETS

Each unisex and handicapped toilet has a mirror light which contains two (2) fluorescent light lamps and a 60 VDC emergency incandescent lamp.

4.2.8 VESTIBULE AREA

The vestibule area including the lounge and toilet aisle is illuminated by four recessed fluorescent light assemblies mounted in the lower level ceiling (9, figure 4-1). The recessed fluorescent light fixture is composed of a door assembly and housing assembly. The door assembly contains the plastic lens and is hinged to the housing assembly. This arrangement provides easy access for relamping. The housing assembly contains a ballast, the lamp sockets, and the electrical wiring. One emergency incandescent lamp and two fluorescent lamps are used with the fixture.

Circuit breakers on the lighting and control breaker panel protect and control the recessed fluorescent lights. The ballast input power is 120 volts ac. The ballast output voltage to illuminate the fluorescent lamps. Direct current at a nominal voltage of 64 volts supplies the emergency lamp. The emergency light is controlled by the NVR relay in the car circuits. When normal (120 VAC) source power is interrupted, the emergency light circuit is energized directly from the car battery.

4.2.9 EQUIPMENT COMPARTMENTS, UTILITY ROOM, CLOSET AND ELECTRICAL LOCKER

The "A" and "B" end lower level equipment compartments and lower level utility room are illuminated by utility lights (1, figure 4-1). The lower level closet and electrical locker are illuminated by flush mounted dome lights (10, figure 4-1). The utility light consists of a condulet and a clear plastic globe. A 50A19/RS, 75-volt lamp is required for use in the fixture. The condulet contains a porcelain socket which includes screw terminals.

A circuit breaker on the lighting and control breaker panel protects the utility light circuits. Local wall switches control the utility lights. Direct current at a nominal voltage of 72 volts supplies the utility lights. The utility light is connected directly to car wiring.

The flush mounted dome light is comprised of a housing assembly and a cover assembly. The housing assembly accommodates the lamp socket and electrical wiring. A single closing screw is captive in the cover ring. The cover ring is hinged to allow easy access for relamping. A 75-volt A19-50W lamp is used with the fixture.

A circuit breaker on the lighting and control breaker panel protects and controls the dome light. Direct current at a nominal voltage of 72 volts supplies the dome light.

4.2.10 ILLUMINATED SIGNS

Three NO SMOKING signs are installed in the coach passenger seating areas (11, figure 4-1). One each in the upper level forward and rear seating areas and one in the lower level seating area. A cove sign is also installed in the upper level over the stairwell (12, figure 4-1).

The NO SMOKING sign consists of a cover assembly and housing assembly. The cover assembly contains a polycarbonate lens. Closing screws on the cover are tamperproof. The housing assembly accommodates the electrical wiring and the lamp socket. A 30-volt lamp-is used with the fixture. The no smoking sign displays the words "NO SMOKING" when illuminated and includes a corresponding symbol. When not illuminated, the sign appears blank.

A circuit breaker on the lighting and control breaker panel protects the no smoking sign circuits. The sign is controlled by a selector switch on the selector and lighting control switch panel. Twenty-eight volts is provided through car wiring to illuminate the sign.
The cove sign provides exit, toilet and cafe directional information.

The sign is comprised of three panel assemblies and a housing assembly. Each panel assembly contains the appropriate sign panel and a mounting edge rail. The housing assembly accommodates the lamp sockets and electrical wiring. Two F20T12 fluorescent lamps,

six No. 301 incandescent lamps, and one emergency incandescent lamp, 6S6-60V are used with the fixture.

The illuminated sign circuits are protected and controlled by circuit breakers on the lighting and control breaker panel. Selector switches, on the selector and lighting switch panel, selects the end of the cafe and NO SMOKING signs to be illuminated. Car circuits provide 120 volts ac to the ballast. The ballast provides output voltage to illuminate the fluorescent lamps. Twenty-eight volts ac is provided through car wiring to illuminate the six No. 301 incandescent lamps. Direct current at a nominal voltage of 64 volts supplies the emergency lamp. The emergency light is controlled by the NVR relay located in the car circuits. When normal source power (120 VAC) is interrupted, the emergency light circuit is energized directly from. the car battery.

4.2.11 EXTERIOR MARKER LIGHTS

Two marker lights (13, figure 4-1) are provided at each end of each car. A 60-watt sealed beam, 38-volt, red marker lamp is used with each marker light. The marker light consists of a cover, housing subassembly, and electrical wiring.

The marker light is protected by a circuit breaker on the lighting and control breaker panel. A selector switch on the selector and lighting control switch panel selects the marker lights on either end of the car for the last car in the train consist. Marker lights operate on the do circuit. Seventy-two volts is provided from the do supply to voltage dropping resistors which reduce the voltage to the marker lights to 38 volts dc nominal.

4.2.12 EXTERIOR CAR NUMBER SIGN

The exterior car number sign consists of four (4) 120V GG1224 incandescent lamps. To adjust the number sign, first insert a pencil or similar round object in the latch hole while pressing in on the latch and pulling gently at the cover, then it will swing open. With the door open, the now visible numbers are adjusted by using the knob on top of the sign.

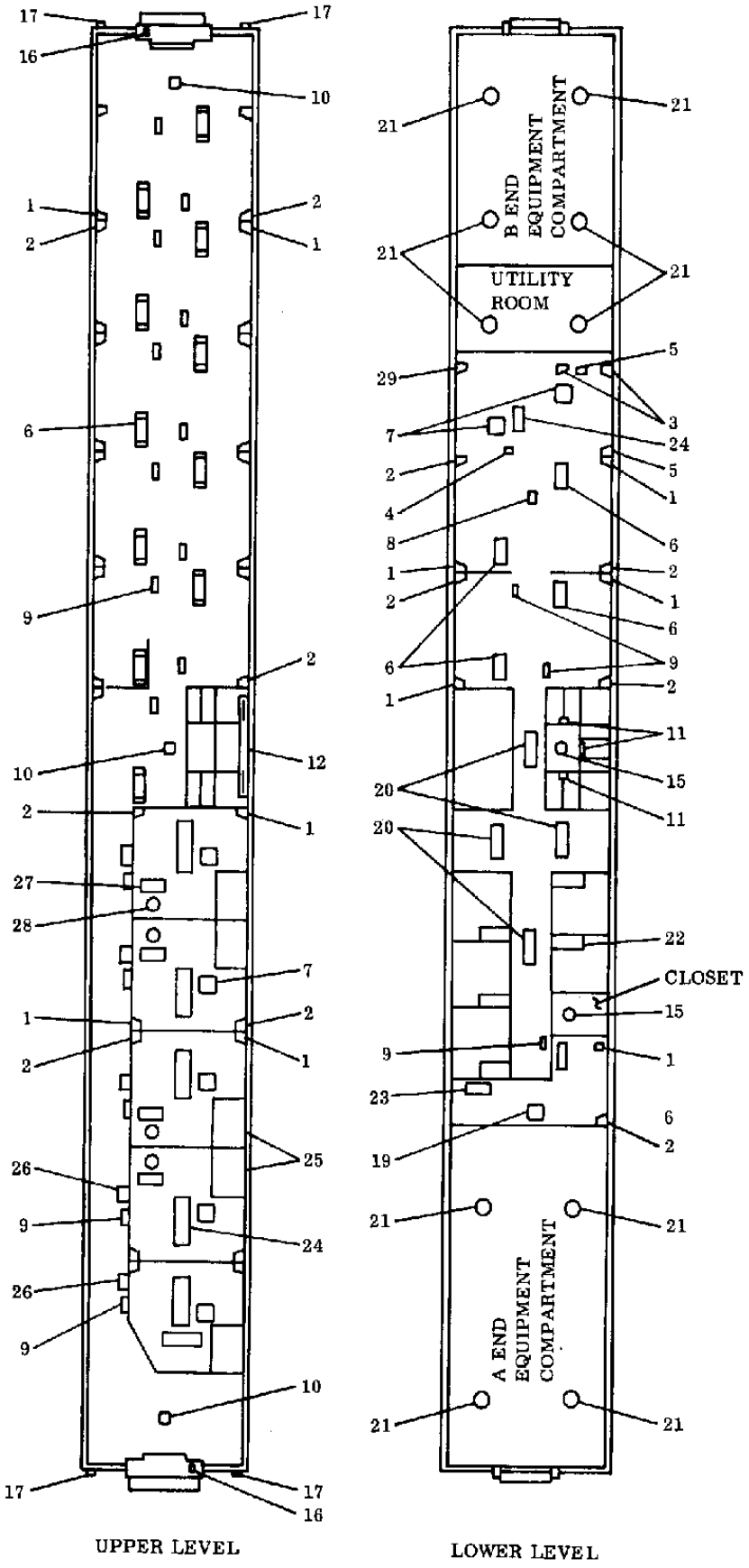
4.2.13 BRAKE INDICATOR LIGHTS

Each bi-level car has mounted on each exterior side (near the exterior vestibule door) a three light assembly. The upper light is equipped with an AMBER lens and when activated by brake application signals indicate BRAKE APPLIED. The middle light is equipped with a GREEN lens and when activated by brake release signals indicates BRAKE RELEASE. The lower light is equipped with a WHITE lens and when activated by brake test signals indicates BRAKE TEST. Lamps used in the brake indicating light are of the 75V DC, 30511DC incandescent lamp type.

4.3 SLEEPING CAR LIGHTING SYSTEM

The sleeping car lighting system provides adequate and comfortable lighting in each compartment and area of the car. The sleeping car consists of the following compartments and areas where specific types of lighting fixtures are installed (figure 4-3):

a. Sleeping compartments
b. Aisle areas
c. Steps
d. End areas



LEGEND

INDEX NO.	NAME
1	PASSENGER SERVICE UNIT TYPE A
2	PASSENGER SERVICE UNIT TYPE B
3	PASSENGER SERVICE UNIT TYPE C
4	PASSENGER SERVICE UNIT TYPE E
5	PASSENGER SERVICE UNIT TYPE F
6	COMPARTMENT LIGHT
7	COMPARTMENT LIGHT
8	AISLE LIGHT TYPE A
9	AISLE LIGHT TYPE B
10	AISLE LIGHT TYPE C
11	STEP LIGHT
12	COVE SIGN
15	FLUSH DOME LIGHT
16	BODY END LIGHT
17	RED MARKER LIGHT
19	WOMEN'S LOUNGE DOME LIGHT
20	RECESSED FLUORESCENT LIGHT
21	UTILITY ROOM
22	UNISEX TOILET MIRROR LIGHT
23	HANDICAPPED MIRROR LIGHT
24	RECESSED FLUORESCENT LIGHT
25	LUGGAGE RACK
26	AISLE LIGHT TYPE D
27	DELUXE ROOM MIRROR LIGHT
28	SHOWER LIGHT
29	PASSENGER SERVICE UNIT TYPE F'

Figure 4-3. Sleeping Car, Lighting System Installation Arrangement

e. Toilets
f. Vestibule area
g. Equipment compartments, electrical locker and utility room
h. Illuminated signs
i. Exterior marker lights

4.3.1 SLEEPING CAR COMPARTMENTS

Each of the four types of sleeping compartments is provided with the required types and numbers of light fixtures to adequately and comfortably illuminate the compartment. These fixtures contain switches, permitting the passenger to control the lights as well as entertainment system speakers and the attendant call system. Some fixtures also incorporate a 120 volt ac convenience outlet.

4.3.1.1 Economy Sleeping Compartment

Each economy sleeping compartment contains two types of seat-corner mounted passenger service units and a ceiling-mounted compartment light (1 and 2, figure 4-3 and figure 4-4). There are six different configurations of the passenger service unit. Each unit consists of a front panel assembly and housing assembly. The Type A (0101858-001) also contains a reading light and associated on/off switch, a volume/channel selector switch which works in conjunction with the communication and entertainment system, an illuminated compartment light switch, and an attendant call switch. The compartment light switch turns on the compartment ceiling light. One position of the switch is for normal lighting and another position is for a blue night light. The attendant call switch sounds the attendant's call chimes and lights a small indicating light on the aisle side of each room's longitudinal partition.

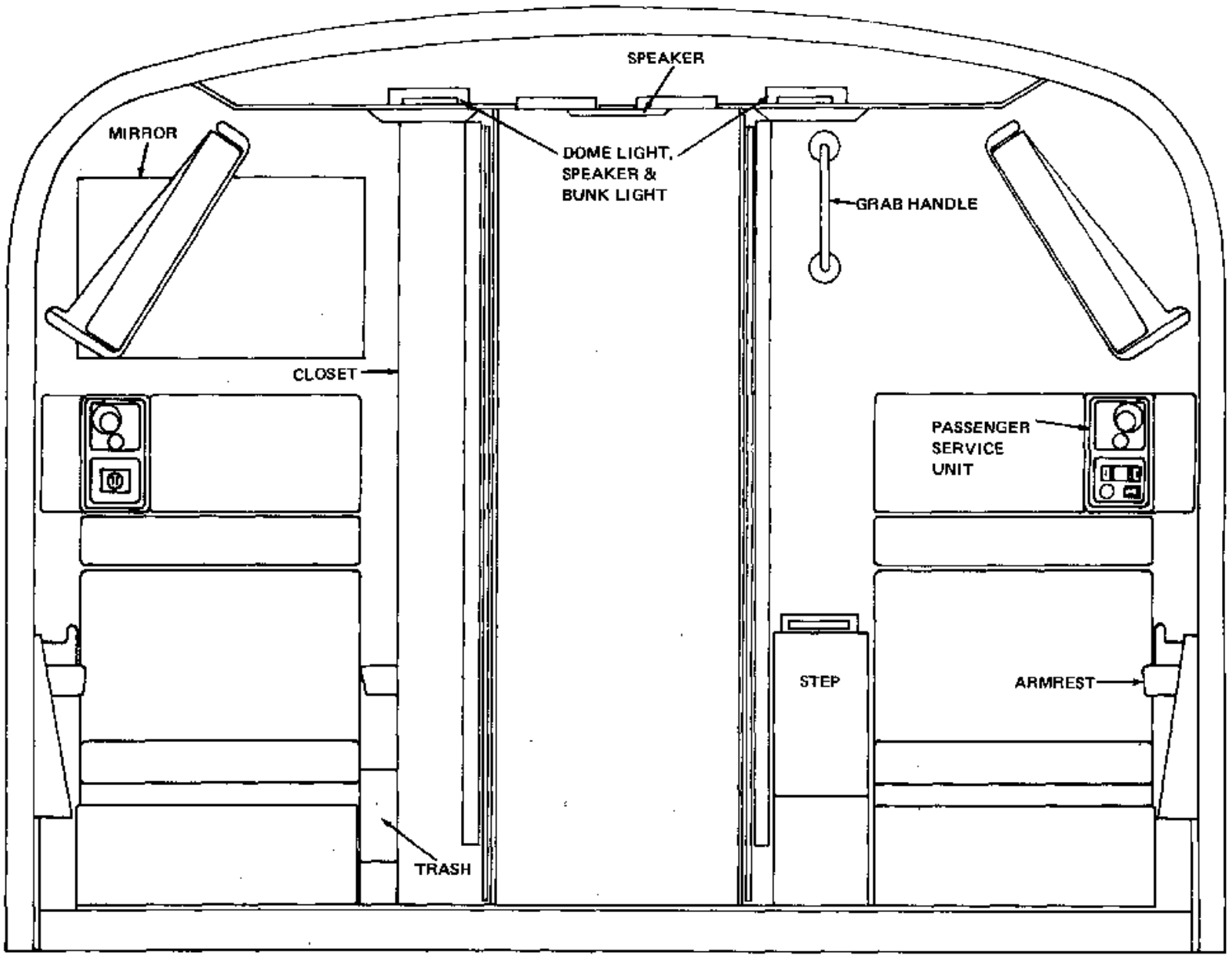


Figure 4-4. Economy Sleeping Room, Cross-Section View

The light will remain lit until the call switch is restored to 'normal position. A buzzer is also provided with the switch which allows the attendant to ring a room. The Type B contains a reading light and associated on/off switch, a convenience outlet, and a temperature control knob. The Type C and Type F contain only the reading light and its associated on/off switch. The difference between the two units concerns the means of mounting. The Type F contains a reading light and its associated on/off switch and a temperature control knob. The Type E is similar to the Type A except that a convenience outlet is provided in place of the reading light and its associated switch.

The compartment light provides a dome light, blue night light, emergency light, reading light, and speaker box assembly. A compartment light switch, located on the passenger service unit, controls the dome light and night light. The reading light is controlled by a switch located near the unit. A pivot tab is provided for adjustment of the reading light. A speaker is provided for use in conjunction with the communication and entertainment system. A volume/channel selector switch is located on the passenger service unit. The compartment light is comprised of a housing subassembly, socket plate assembly, two door assemblies, a speaker box assembly and a mounting frame assembly. The housing subassembly accommodates the reading light and the associated electrical wiring. The socket plate assembly mounts the dome light, night light, and emergency light sockets. The door assemblies protect the speaker box assembly and lighting circuits. The mounting frame assembly provides a means of mounting the various assemblies.

4-73

The dome light, night light, and reading light are protected by circuit breakers on the lighting and control breaker panel. The dome light and night light are controlled by a switch on the passenger service unit. Both lights are powered by 120 volts ac. The reading light is controlled by a switch near the light. Twenty eight volts is provided through car wiring to illuminate the reading light. Direct current at a nominal voltage of 64 volts supplies the emergency lamp. The emergency light is controlled by relays located in the car circuits. When normal source power is interrupted, the emergency light circuit is energized directly from the car battery. The speaker box assembly is wired through car wiring to the entertainment system. A channel can be selected and the volume controlled from the passenger service unit. For further information concerning the speaker box assembly, refer to the car entertainment system maintenance manual.

The car circuits which distribute power to the lighting fixtures are protected by appropriate circuit breakers on the circuit breaker panel in the electrical locker. The power required for each lamp and switch in the passenger service units and compartment lights are:

a. Passenger Service Unit:

1.	Attendant call switch	28 volts ac
2.	Reading light	28 volts ac
3.	Compartment light switch	120 volts ac
4.	Volume/channel select assembly	Refer to Car Entertainment 72 VAC System Maintenance Manual
5.	Convenience outlet	120 volts ac
6.	Room Temperature control knob	72 volts dc

b. Compartment Light:

1.	Dome light	120 volts ac
2.	Reading light	28 volts ac
3.	Emergency lamp	64 volts dc

4.3.1.2 Deluxe Sleeping Compartment

The deluxe sleeping compartment contains the following:

Two (2) Passenger Service Units (A & B).

One (1) recessed fluorescent light which contains two (2) F20-T12/DWW lamps, a 6 watt blue incandescent lamp and a 60 V do incandescent emergency lamp.

One (1) bunk reading light which contains a 28V ac incandescent lamp. One (1) mirror light containing a F14-T12/WW fluorescent lamp.

One (1) shower light containing a 120 VDC, 50 A/RS incandescent lamp and a 60V do incandescent emergency lamp.

One (1) 28V ac incandescent lamp in the luggage rack which is used as a reading light for the swivel chair.

4.3.1.3 Family Room

The family sleeping compartment contains the following:

Four (4) Passenger Service Units (F', F, C & E)

One (1) recessed fluorescent light which contains two (2) F20-T12-DWW fluorescent lamps, a 6 watt blue incandescent lamp and a 60V do incandescent emergency lamp.

Two (2) bunk lights which contain a 28V ac incandescent lamp.

4.3.1.4 Handicapped Room

The handicapped sleeping compartment contains the following: Two (2) passenger Service Units (A & B).

A women's lounge light (previously described) containing a 50 watt incandescent lamp.

Compartment light same as used in the economy room.

The dome light is the same as the women's lounge dome light described previously for the coach (para. 4.2.6).

4.3.2 AISLE AREAS

The sleeping car aisle areas are equipped with four different types of aisle lights. The upper level aisle areas contain three types of aisle lights (9, 10, and 26, figure 4-3): three type C aisle lights (10), 15 type B aisle lights (9) and 5 type D aisle lights (26). The lower level aisle in the economy sleeping compartment and family room area is equipped with three type B aisle lights (9) and one type A aisle light (8).

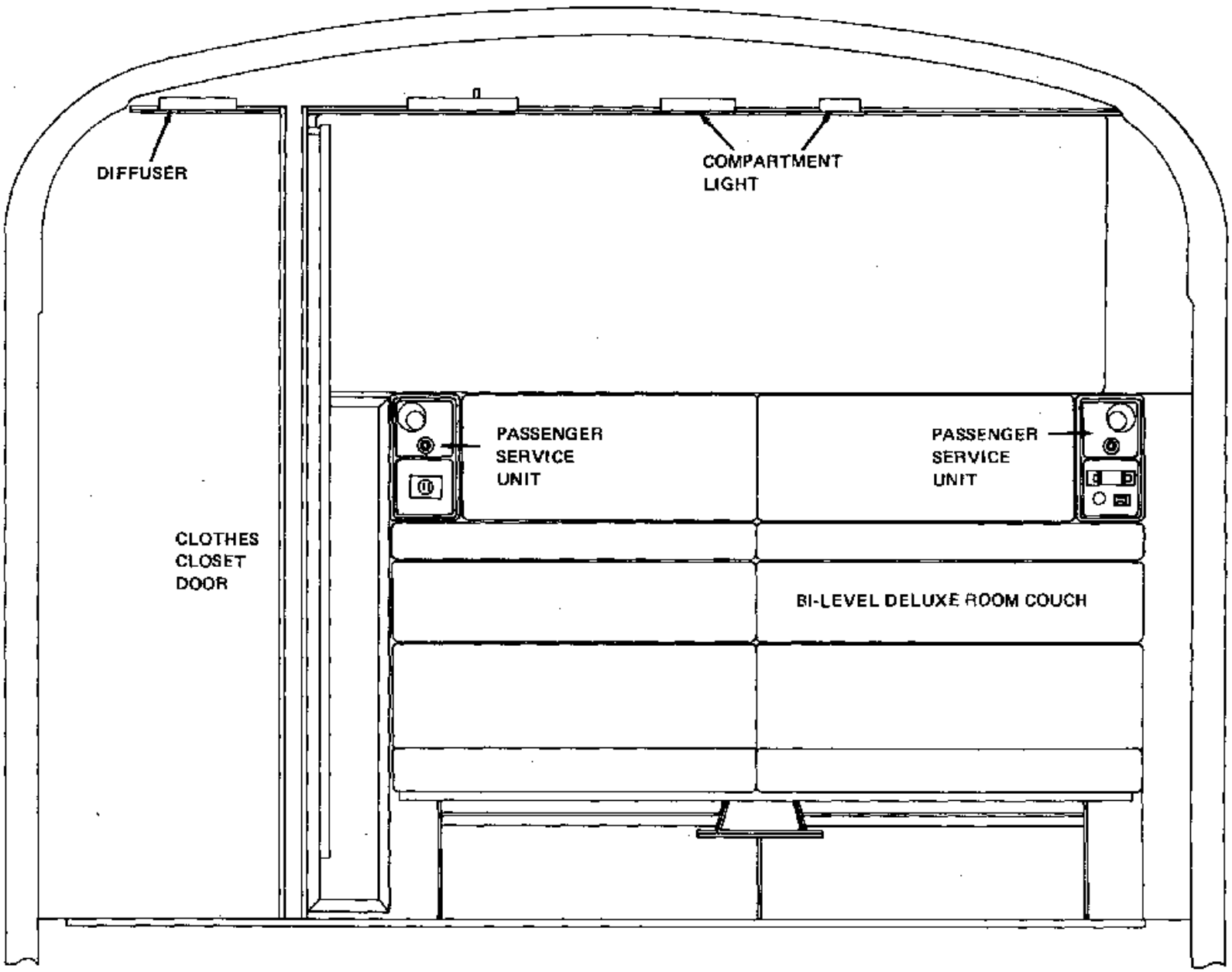


Figure 4-5. Deluxe Sleeping Compartments, Cross Section View

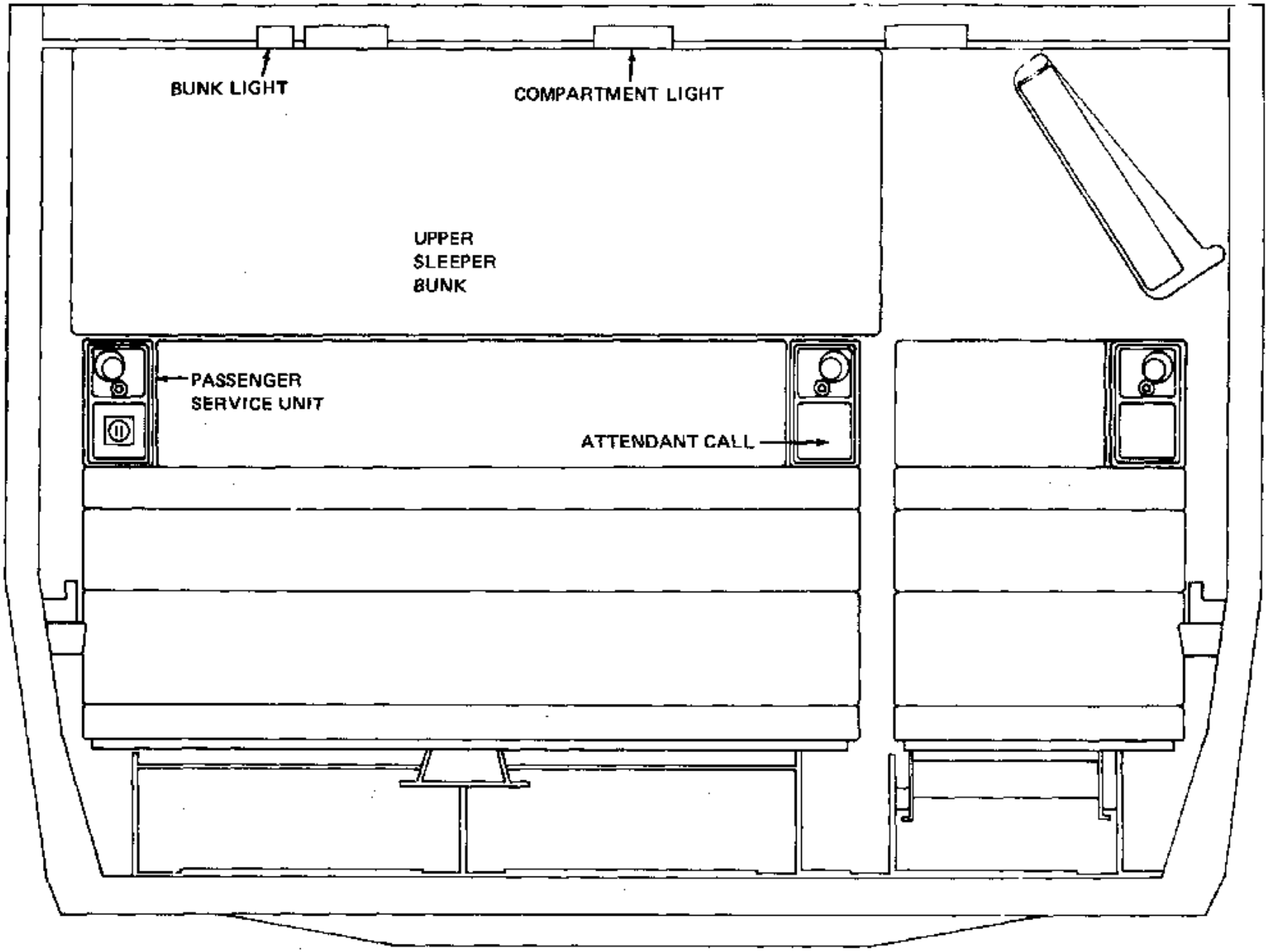


Figure 4-6. Family Room, Cross Section View

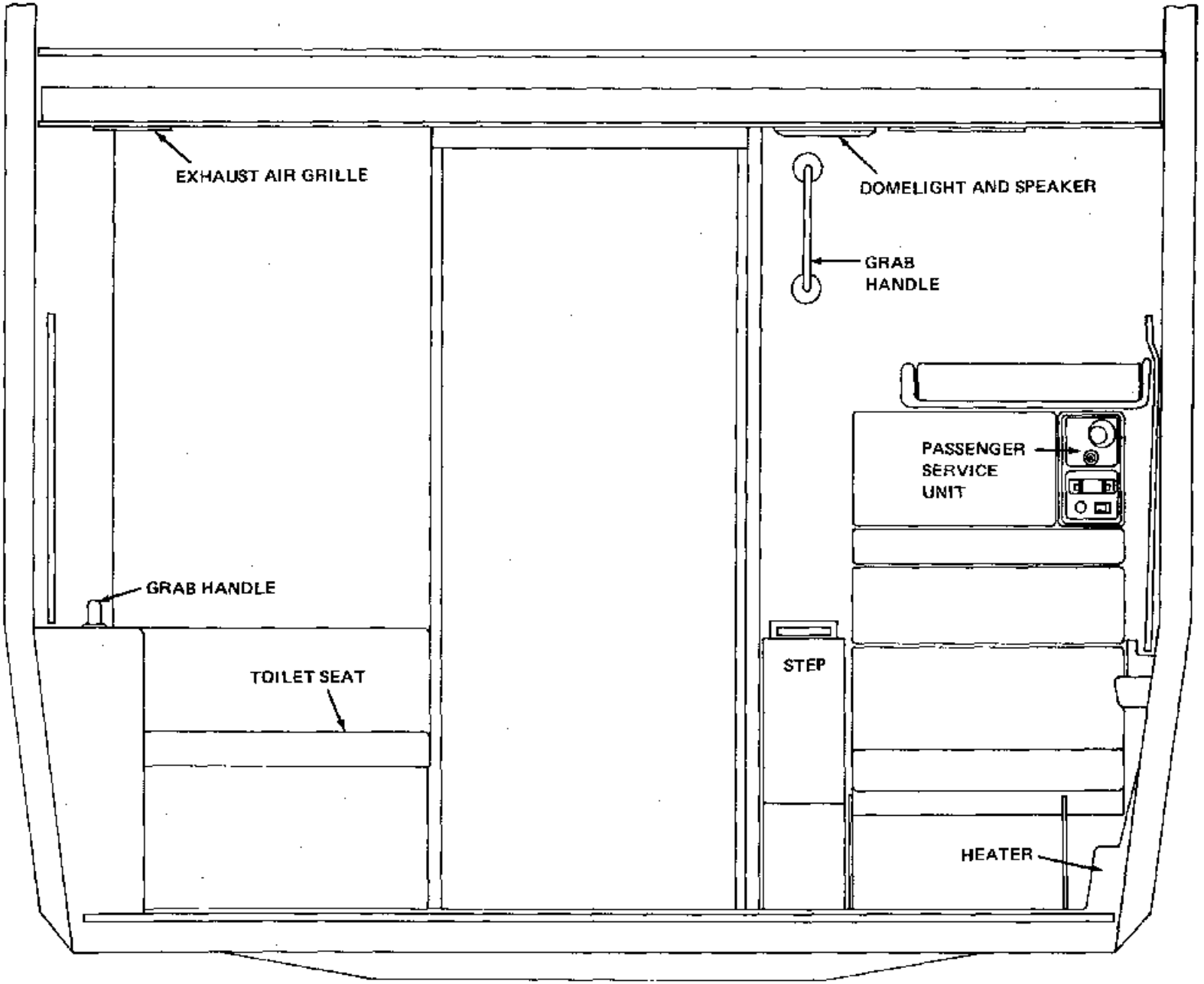


Figure 4-7. Sleeping Car Handicapped Room, Cross Section View

4.3.2.1 Aisle Light, Type A

The type A aisle light consists of a cover assembly and housing assembly. The cover assembly is comprised of a baffle, a glass lens and plastic lens, and the cover. The housing assembly contains two lamp sockets, an illuminated rocker switch, electrical wiring, and a housing weld assembly. The rocker switch functions as an attendant call light and buzzer switch. The aisle light utilizes a 15S11/3DC, 75 volt lamp and a 2232, 28 volt lamp.

The rocker switch is an attendant call light and is used to activate a buzzer in the roomette. Specific circuit breakers on the lighting and control breaker panel protect and control the aisle lights. Twenty-eight volts is provided through car wiring to illuminate the aisle light. Direct current at a nominal voltage of 72 volts supplies the emergency lamp. The emergency light is controlled by relays located in the car circuits. When normal source power is interrupted, the emergency light circuit is energized directly from the car battery.

4.3.2.2 Aisle Light, Type B

The type B aisle light consists of a cover assembly and housing assembly. The cover assembly is comprised of a lens retainer and baffle assembly and the assembly mounting hardware. The housing assembly contains two lamp sockets, electrical wiring, a housing weld assembly, and a switch housing subassembly. Three rocker switches are contained in the switch housing subassembly. The switches allow the attendant to buzz a particular room. The lights in the switch assemblies indicate from which room a call for an attendant originated.

Circuit breakers on the lighting and control breaker panel protect and control aisle lights. Twenty-eight volts is provided through car wiring to illuminate the aisle light. Direct current at a nominal voltage of 60 volts supplies the emergency lamp. The emergency light is controlled by relays located in the car circuits. When normal source power is interrupted, the emergency light circuit is energized directly from the car battery.

4.3.2.3 Aisle Light, Type C

The type C aisle light fixture is the same as that used in the coach car and described in paragraph 4.2.2.

4.3.2.4 Aisle Light Type D

Same as Type A except there is no rocker switch.

4.3.3 STEPS

The sleeping car steps are illuminated by three step lights (11, figure 4-3). The step lights are identical to those used in the coach car which are described in paragraph 4.2.4.

4.3.4 END AREAS

The "A" and "B" upper level end areas of the sleeping car are each illuminated by a body end light assembly (17, figure 4-3). The body end light assembly is identical to the body end light assembly used in the coach car and described in paragraph 4.2.5.

4.3.5 TOILETS The unisex toilets are the same as on the coach car.

4.3.6 VESTIBULE AREA

The sleeping car vestibule area on the lower level, which includes the aisle between the toilets, is illuminated by four recessed fluorescent light fixtures and one type B aisle light (20 and 9, figure 4-3). The recessed fluorescent light fixture is the same as that used in the coach car and described in paragraph 4.2.8. The type B aisle light is described in paragraph 4.3.2.2.

4.3.7 EQUIPMENT COMPARTMENTS, ELECTRICAL LOCKER AND UTILITY ROOM

The "A" and "B" end, lower level, equipment compartments and utility room are illuminated by utility lights (21, figure 4-3). The lower level closet and electrical locker are illuminated by flush mounted dome lights (15, figure 4-3). The utility light and flush mounted dome light fixtures are identical to those used in the coach car and described in paragraph 4.2.9.

4.3.8 ILLUMINATED SIGNS

A cove sign fixture (12, figure 4-3) is installed in the upper level over the stairs. This fixture is identical to that used in the coach car and described in paragraph 4.2.10.

4.3.9 EXTERIOR MARKER LIGHTS

Two red marker lamps are installed on the exterior of each end of the sleeping car. These are identical to those used on the coach car and described in paragraph 4.2.11.

4.3.10 EXTERIOR CAR SIGN Same as coach.

4.3.11 BRAKE INDICATOR LIGHT Same as coach car.

4.4 DINING CAR LIGHTING SYSTEM

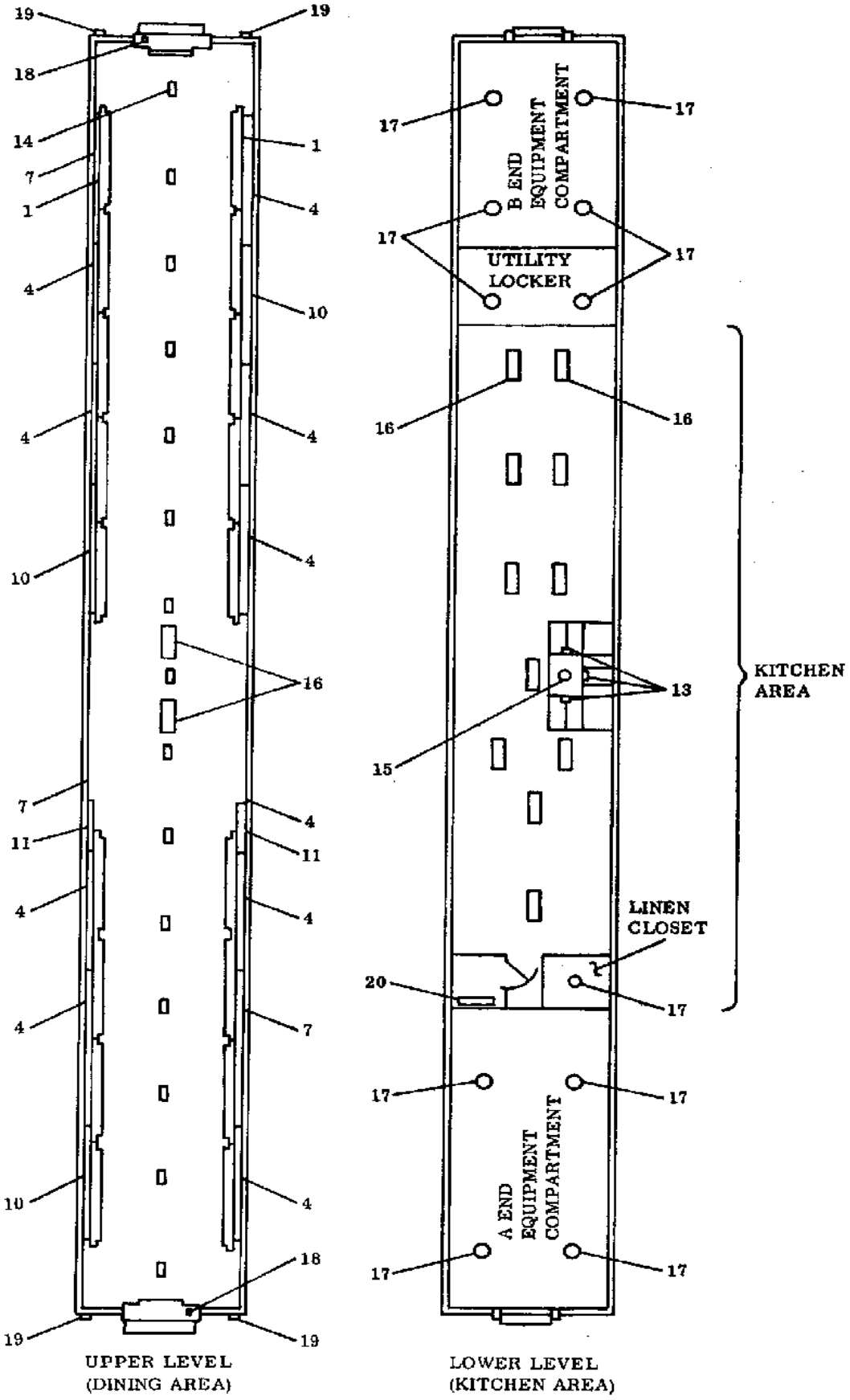
The dining car lighting system provides adequate and comfortable background and direct lighting in each area of the car. The dining car consists of the following areas (figure 4-8):

a. Dining area
b. Kitchen area
c. End areas
d. Equipment compartments, electrical locker and utility room
e. Exterior marker lights
f. Maitre d' area

The equipment compartments, electrical locker, utility room, steps, end areas and exterior marker lights are equipped with the same lighting fixtures used in the coach as described in paragraph 4.2.

4.4.1 DINING AREA

The dining area is illuminated in three ways. Background indirect lighting is provided by cove light units (4, 7, 10 and 11, figure 4-8) mounted in series along both sides of the dining area.



LEGEND

INDEX NO.	NAME
1	MULTIMODULAR LIGHT
4	COVE LIGHT
7	COVE LIGHT
10	COVE LIGHT
11	COVE LIGHT
13	STEP LIGHT
14	AISLE LIGHT
15	DOME LIGHT
16	RECESSED FLUORESCENT LIGHT
17	UTILITY LIGHT
18	BODY END LIGHT
19	RED MARKER LIGHT
20	MIRROR LIGHT

Figure 4-8. Dining Car Lighting System, Installation Arrangement

The floor of the dining area aisle is illuminated by a series of aisle lights (14) mounted in the ceiling. The aisle light fixture used is the same as that used in the coach and described in paragraph 4.2.2.

Each table in the dining area is illuminated by a multi-modular light fixture (1, figure 4-8) which is mounted adjacent to the cove lights above the tables. The multi-modular light unit contains an incident light assembly and a down light assembly. The light unit provides table lighting and is also used in conjunction with the ventilation system for return air flow. The multi-modular light unit is comprised of a door assembly and plenum assembly. The door assembly is carpeted and is sealed to allow air return to the ventilating system. The plenum assembly accommodates the incident light assembly, down light assembly, and the electrical wiring. The plenum assembly is also sealed to allow for exhaust air flow.

The down light assembly consists of two housing assemblies, two lens cap assemblies, electrical wiring, and a mounting tray. The housing assemblies contain the lamp sockets and reflectors. A pivot tab is also provided with each housing assembly to allow adjustment of the lights. The lens cap assemblies. provide light beam control. Two 28 volt lamps are used with the down light assembly.

The incident light assembly consists of a housing assembly, lamp sockets, electrical wiring, and mounting hardware. Two 28 volt lamps are used with the fixture. One lamp is coated orange and the other blue.

The multi-modular light unit circuits are protected and controlled by circuit breakers on the lighting and control circuit breaker panel in the electrical locker. Twenty-eight volts is provided through car wiring to illuminate the lamps.

4.4.2 KITCHEN AREA

The kitchen area is illuminated by recessed fluorescent lights installed in the ceiling (16, figure 4-3). The recessed fluorescent light fixture is the same as that used in the coach vestibule area and described in paragraph 4.2.8.

The linen closet in the kitchen area is illuminated by a flush mounted dome light (15, figure 4-3) identical to that used in the coach and described in paragraph 4.2.9.

4.4.3 MAITRE D' AREA

The Maitre d' area has two (2) recessed fluorescent light fixtures which contain two (2) F20 T12/WW lamps and a 72V do emergency incandescent lamp. The counter has a fluorescent lamp underneath the cabinets.

4.4.4 TOILET MIRROR LIGHTS

The mirror light is the same as the units used in the coach car unisex toilet.

4.4.5 BRAKE INDICATOR LIGHT

Same as the coach car.

SECTION 5

HEATING, VENTILATION AND AIR CONDITIONING

5.1 GENERAL

Each of the bi-level types of cars is equipped with an integrated heating, ventilating and air conditioning (HVAC) system. The cars are electrically heated using a combination of overhead and floor heat. Floor electric heaters operate on 480 volt, 3-phase, 60 Hertz primary trainline power, and heater controls operate on 120 volt, single-phase, 60 Hertz power provided by the car power distribution system. The overhead heater is built into each air conditioner unit and also uses 480 volt primary trainline power.

Ventilation of the car is accomplished by both the return air portion of the air conditioning system and a separate exhaust air system. (See figure 5-1.) Fresh air enters the car through two grilled openings. One opening is located on the left side at the "A" end equipment compartment and the other on the right side at the "B" end equipment compartment. The fresh air passes through stainless steel ducts and an electric-pneumatic controlled fresh air (F/A) damper into the air conditioner plenum chamber. Recirculated air from the car is also drawn into this chamber. The fresh air and recirculated air are drawn by a blower assembly in the air conditioner unit. The recirculated air is drawn by the blower assembly through an air filter, evaporator coil and multiple heating elements before being directed into the duct system of the car. The inlet air to the blower is a mixture of approximately 72 per cent recirculated air from within the car and 28 per cent fresh air from the outside. The blower operates at a speed of 1140 rpm and produces approximately 3000 C FM flow for all operating modes. The blower fan forces the mixed air into one end of the upper and lower level main air ducts from which it is discharged into the air conditioned sections of the car via a series of air diffusers.

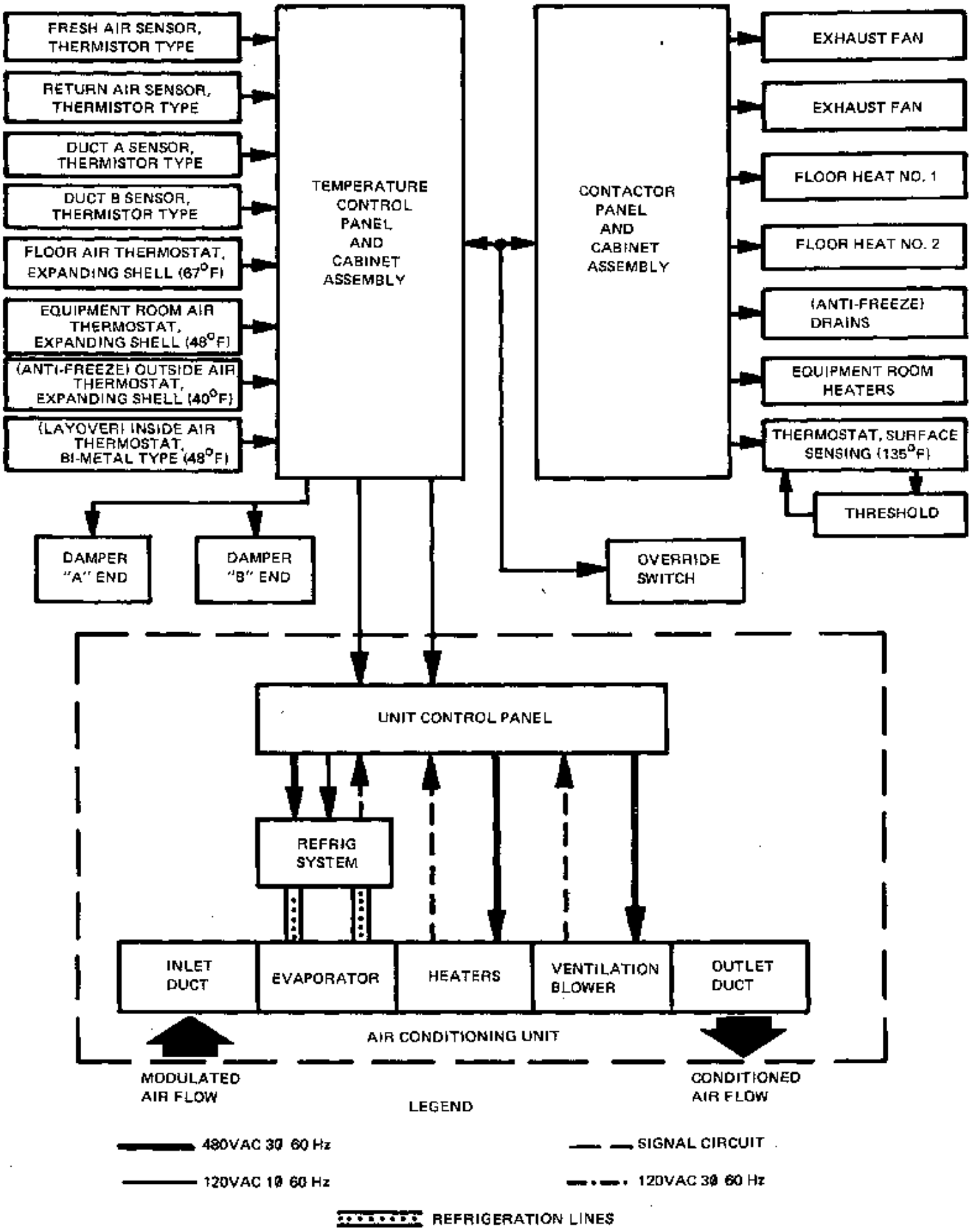


Figure 5-1. Air Conditioning System Block Diagram

A separate exhaust air system is also installed. Exhaust air ducts connect the upper and lower levels to two exhaust blowers. One blower is located in each end equipment compartment. Together the blowers remove air at the rate of 1200 CFM and direct the exhaust air flow into the equipment compartments and then overboard through openings in the floor. A portion of the exhaust air ducts are located above the toilets and contain an exhaust grill located in the ceiling above each toilet.

The air conditioning system provides a flow of completely conditioned air for passenger comfort during the operation of the cars throughout the climate range of AMTRAK routes in the western and mid-western United States.The air conditioning requirements of the cars are satisfied by the two air conditioner units, one in each end equipment compartment. Each air conditioner unit is an integrated, automatically controlled assembly that provides a modulated flow of heated, cooled and dehumidified air to the car air distribution ducts. This flow is delivered to air duct diffusers in the upper and lower level passenger compartments, vestibules and toilets. The distribution system is designed so that a proportionate amount of conditioned air from each air conditioner unit reaches these conditioned air spaces. In the event one unit becomes defective, the air from the remaining unit is delivered to all such spaces, thereby providing reduced ventilation or cooling.

5.2 AIR CONDITIONING UNIT

The major refrigeration components mounted within the enclosed air conditioning unit consists of a motor-compressor, condenser coil, condenser motor and fan, dual circuit evaporator coil, liquid receiver, shutoff valve, filter drier, sight glass, two solenoid valves, and two thermal expansion valves. See figure 5-2.

Note

Equipment consisting of the automatic control system and its associated temperature sensors and indicator lights is part of the air conditioning system, but not a part of the air conditioning units.

The ventilating and heating sections contain an inlet air filter, a ventilation blower and blower motor, and six heater elements with overheat protection. There is also an electrical control panel and a refrigeration servicing panel (with air purifier) located on one side of the unit for the interface and distribution of electrical circuits, and the mounting of controls, indicators, and test and servicing components.

When activated, the air conditioning units respond to signals from the air comfort control box, which remotely senses and automatically regulates the temperature and humidity within the appropriate areas of each car. The air comfort controls box also controls the operation of the floor heaters, exhaust blowers, motorized fresh air dampers, and the air conditioning system mode and failure lights.

5.2.1 VENTILATION

In operation, air is drawn by the blower assembly through an air filter, evaporator coil, and multiple heating elements before being directed into the duct system of the car. The inlet air to the blower is mixed, and consists of approximately 72 per cent recirculated air from within the car and 28 per cent fresh air from the outside. The blower operates at a speed of 1140 rpm and produces approximately 3000 CFM flow for all operating modes.

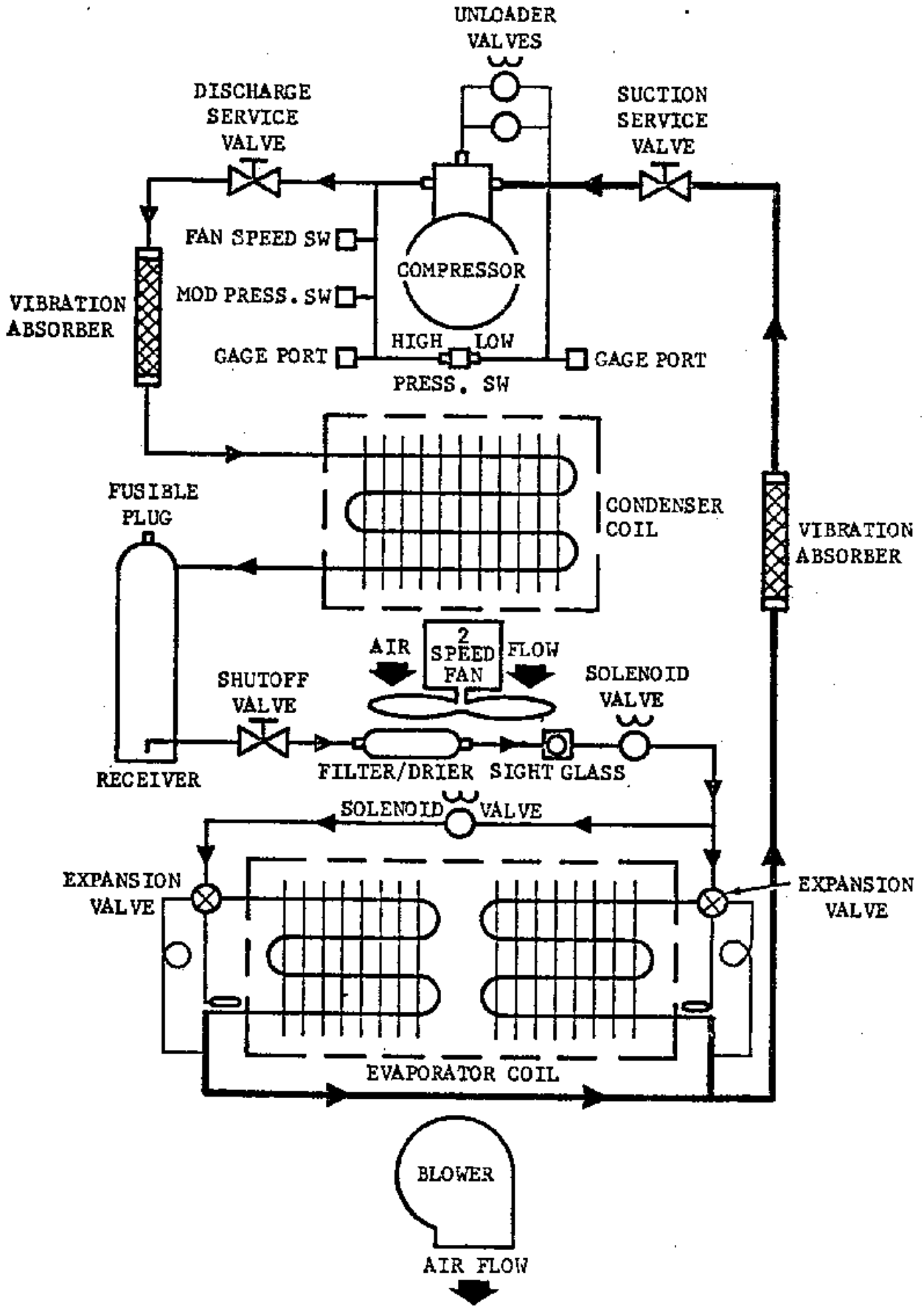


Figure 5-2. Air Conditioning Unit Refrigeration Schematic Diagram

Exhaust air ducts connect the upper and lower levels to two exhaust blowers located in the car equipment compartments. Together, these blowers remove air at the rate of 1200 CFM and direct the flow overboard through openings in the floor.

5.2.2 HEATING

An 18-kilowatt, two-stage heating system provides an evenly heated air flow throughout the conditioned air spaces of both car levels. Six kilowatts of power are produced for first stage heating, and 12 kilowatts added for second stage heating. System operation is automatically regulated from the air comfort control box.

Two methods are used to protect against heater over temperature conditions. The first is an air pressure switch that not only prevents or stops heater operation when the ventilation blower is not operating, but shuts down the total operation of the Air Conditioning Unit; the second is a high temperature sensing switch that reacts by electro-mechanically tripping the circuit breakers of the heater power circuit. Sensing switch activity occurs 30 to 45 seconds after the temperature reaches 260°F one half inch away from the heater elements. The switch automatically resets following its activation.

5.2.3 COOLING

The cooling system of the Air Conditioning Unit responds to signals from the air comfort control box, which automatically controls the operation of the complete Air Conditioning System. Each Air Conditioning Unit employs four stages of cooling to accommodate the system operating modes.

In the full cooling mode, the total output of the compressor is distributed to both refrigerant circuits of the evaporator coil. In the 67 per cent partial cooling mode, a modulating liquid solenoid valve is activated that cuts off all flow to one circuit of the evaporator coil. In addition a pressure regulated unloading valve is activated if required, to further reduce the refrigerant flow to the remaining half of the evaporator coil. For the 33 per cent partial cooling mode, the amount of refrigerant reaching the single evaporator circuit is reduced by the activation of an electric solenoid-operated compressor unloading valve. The cool-reheat (dehumidification) mode utilizes the same configuration as the previous mode, except that the first stage heating is activated to reheat the partially cooled air.

5.2.4 OPERATING MODES

The Air Conditioning System operates in a number of modes from full cooling to full heating, as illustrated in Table 5-1. This table, however, incorporates data pertinent only to cars in operation. Data for periods of car preheating, precooling, or layover is covered in the section on the air comfort control system.

The various operating modes require that certain Air Conditioning Unit subsystems be in operation, as listed below.

Full Cooling - Refrigeration system and ventilation blower (with neither unloader valve in operation and refrigerant flow to both evaporator circuits)

Table 5-1. Air Conditioning Unit Operating Modes

INSIDE AIR TEMPERATURE	COOLING USED	HEATING USED	MODE
Above 76°F	100%	None	Full Cooling
75^{0}F to 76^{0}F	67%	None	67% Partial Cooling
74 0 F to 75 0 F	33%	None	33% Partial Cooling,
73^F to 74^F	33%	First Stage (6 KW)	Cool-Reheat (Dehumidification)
72^{0}F to 73^F	None	None	Ventilation
72°F	None	First Stage (6 KW)	Partial Heating
72°F (and outside temperature +40° and lower)	None	Both Stages (18 KW)	Full Heating

67% Partial Cooling - Refrigeration system and ventilation blower (with suction-regulated valve in operation and refrigerant flow to one evaporator circuit)

33% Partial Cooling - Refrigeration system and ventilation blower (with suction-regulated and electric unloader valves in operation)

Cool-Reheat (Dehumidification) - Refrigeration system, first stage heating and ventilation blower (with suction-regulated and electric unloader valves in operation and refrigerant flow to one evaporator circuit)

Ventilation - Ventilation blower only

Partial Heating - First stage heating and ventilation blower

Full Heating - First and second stage heating and ventilation blower

5.2.5 ELECTRICAL CONTROL PANEL

A control panel located on the side of the Air Conditioning Unit provides a single location for the grouping of electrical control components and circuits. Car-to-unit interface for all power, control, and signal wiring enters at the top of the panel, and from there is distributed to the appropriate control and operating circuits of the unit. (See figure 5-3.)

5.2.6 REFRIGERATION SERVICING PANEL

Components and controls for refrigeration system test and servicing functions are mounted on the refrigeration servicing panel which is located on the side of the Air Conditioning Unit adjacent to the electrical control panel. Included are suction and discharge pressure gauges and test valves, a refrigerant sight glass, a high pressure switch which opens on pressure rise above 410 psig, a low pressure switch which opens on pressure drop below 10 psig, a pressure switch which allows the unit to operate with reduced capacity if extreme high head pressure (caused by a blocked or dirty condenser coil) develops, condenser fan speed control switch which (depending on prevailing ambient temperatures) operates the fan on high speed when the head pressure rises above 275 psig, or low speed when the head pressure drops below 230 psig. A shelf is also incorporated for the mounting and servicing of a purifier for treatment of the ventilation air. (See figure 5-3.)

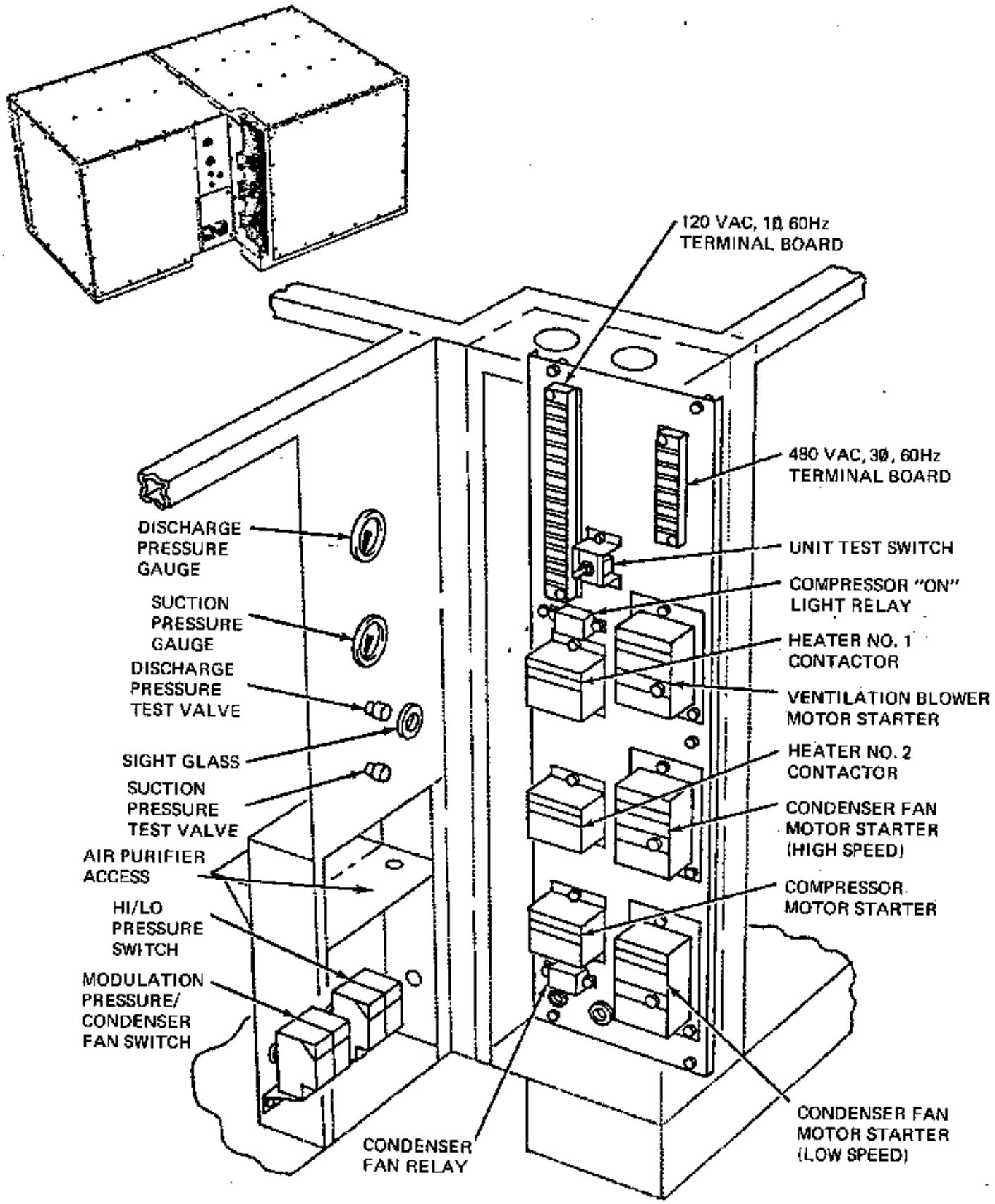


Figure 5-3. Air Conditioning Unit Control and Servicing Panels

5.3 AIR DISTRIBUTION

Ventilation of the cars is accomplished by blower fans which are an integral part of each A/C evaporator unit. Fresh air enters the car through intakes in the side of the car at both ends and into a plenum chamber where the fresh air is combined with recirculated air. (See figures 5-4, 5-5, and 5-6.)

The recirculated (return) air enters the return air ducts through grilles at each end of the passenger area.

The air distribution system is designed so that a proportionate supply of conditioned air from each A/C unit is delivered to the conditioned areas in the upper level. Thus, if one unit is shut down, air from the remaining unit will be distributed over the whole area.

The top and sides of the main ceiling air duct in the upper level are constructed of stainless steel. The bottom is formed by the ceiling panels. In coaches and dining cars, the main ceiling duct has a longitudinal splitter which forms a separate duct for each blower. A double slot type diffuser each side of the main duct in the sleeping cars have grilles which supply conditioned air to the individual rooms.

The ceiling duct in the lower passenger areas is similar in construction to the upper level ceiling ducts, except with no splitter.

In the toilet area, vestibule and adjacent passageway, the air ducts are located above the drop ceiling.

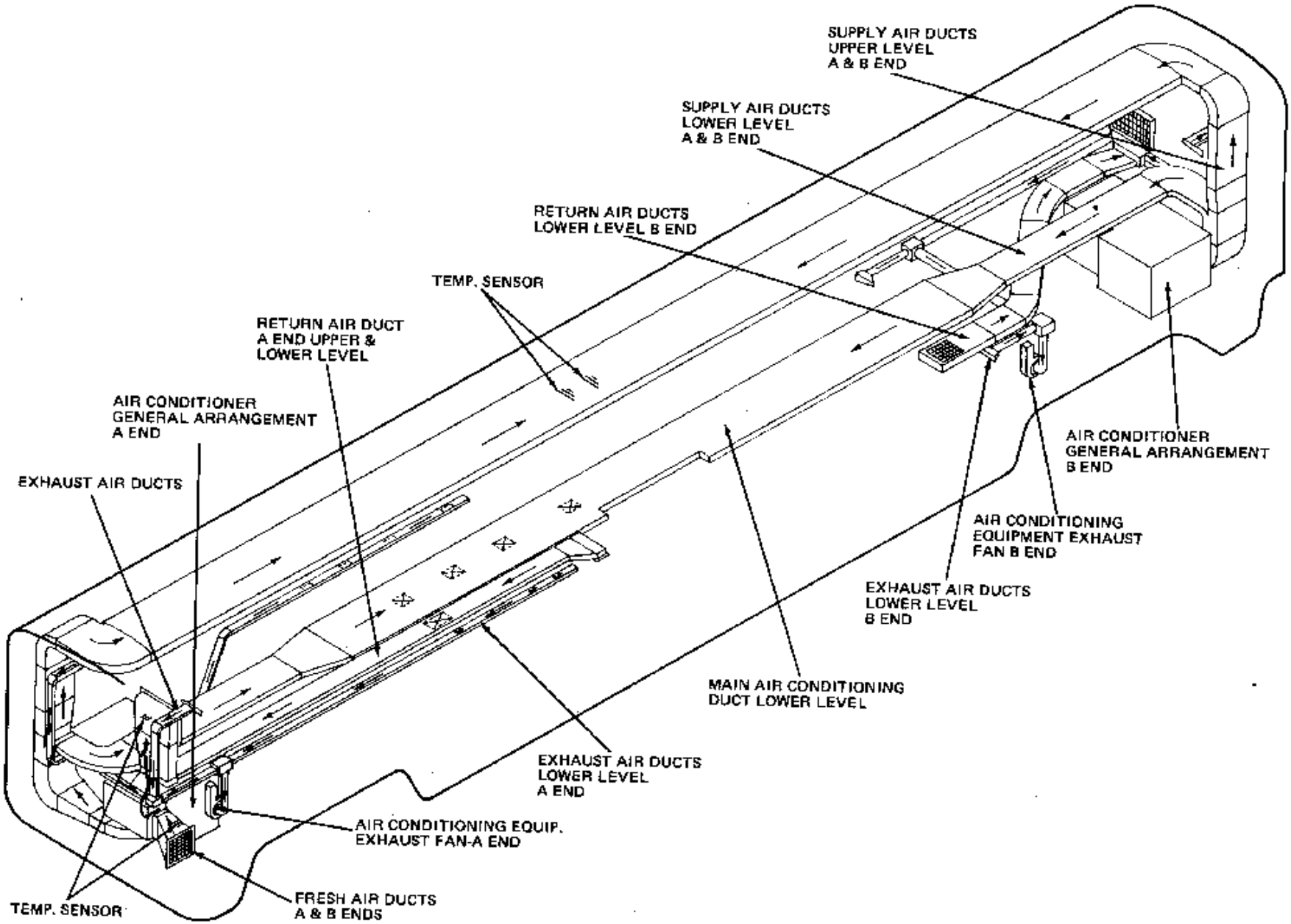


Figure 5-4. Air Distribution (Coach)

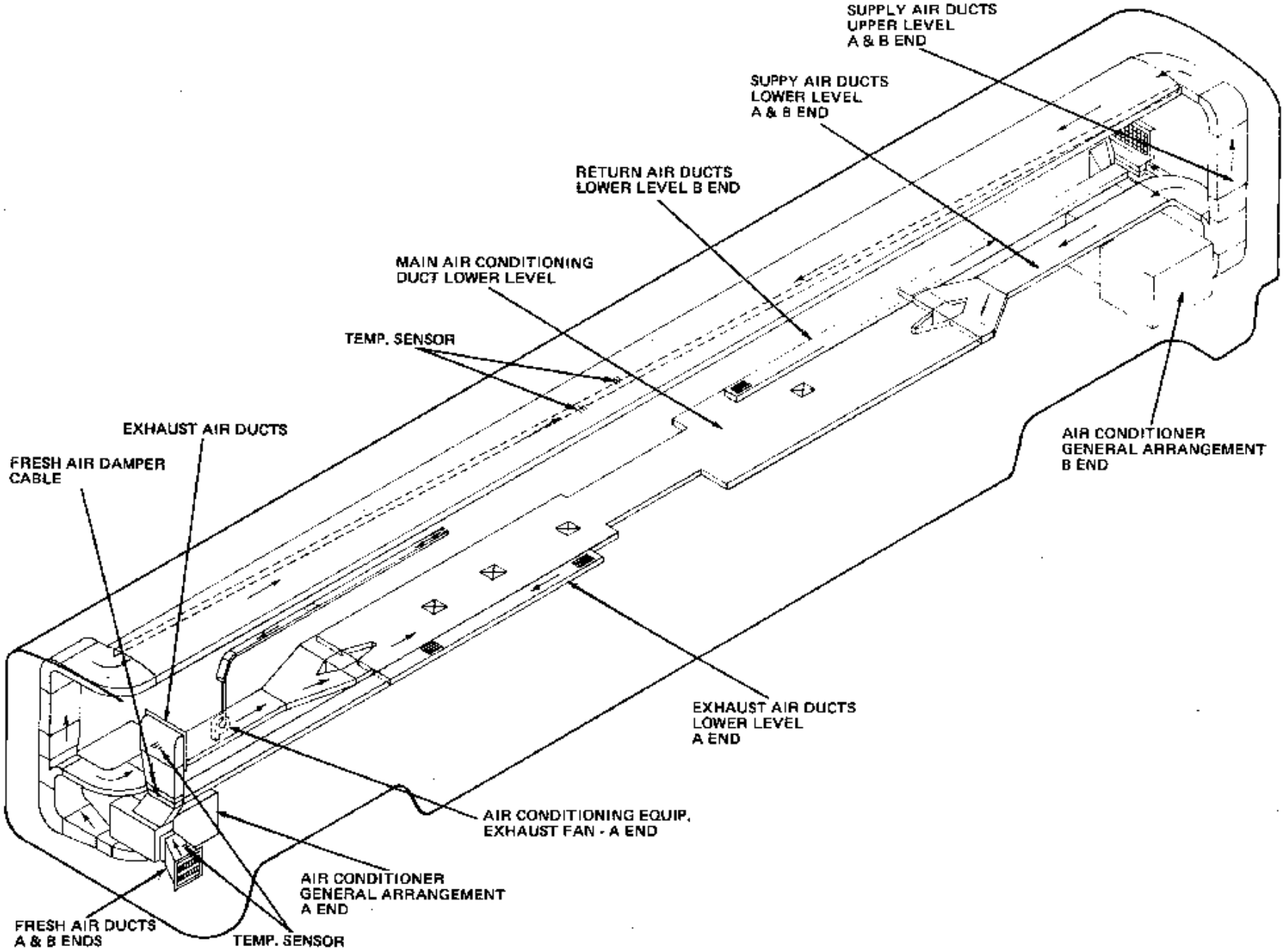


Figure 5-5. Air Distribution (Dining Car)

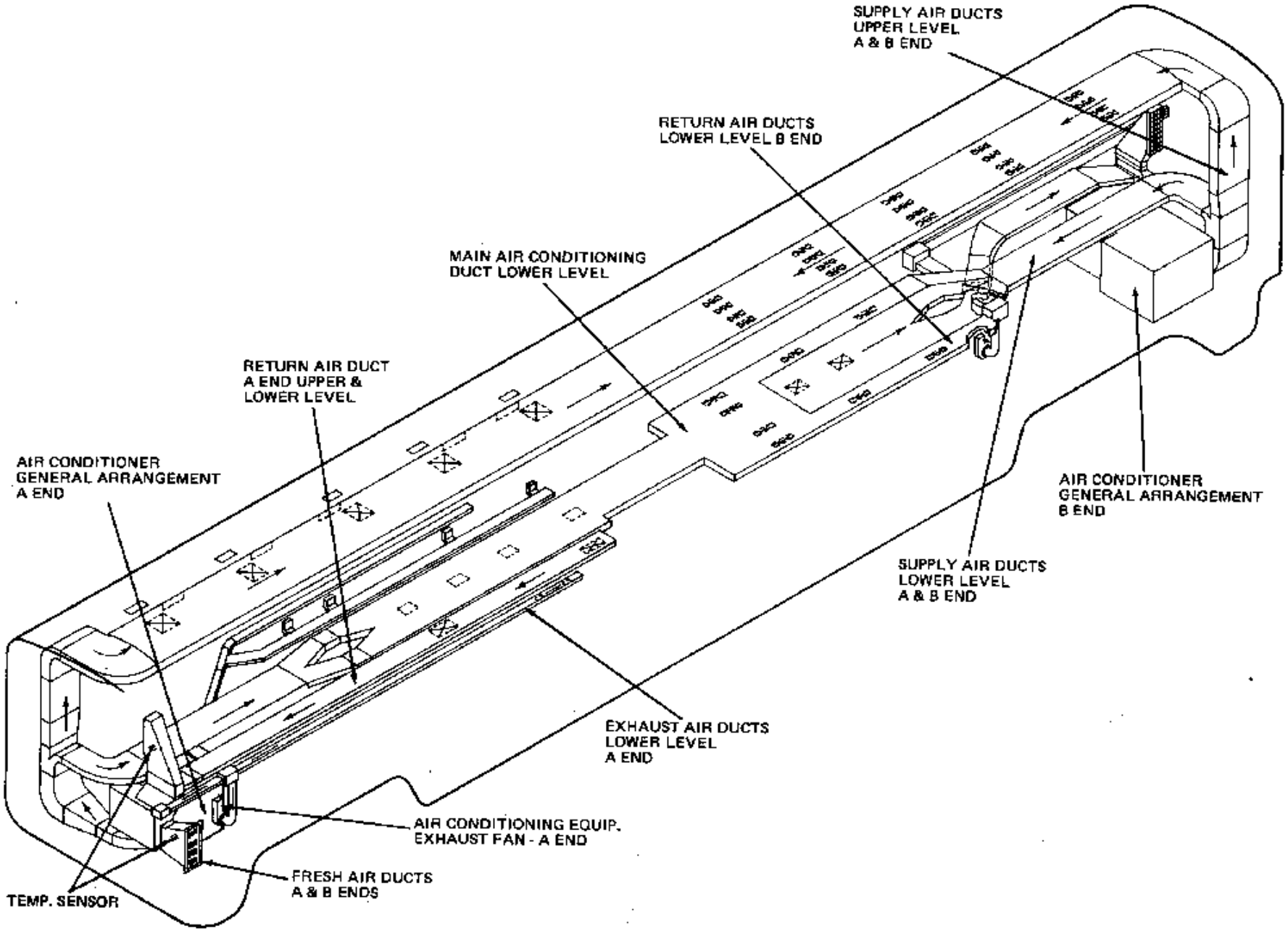


Figure 5-6. Air Distribution (Sleeping Car)

Each fresh air opening at both ends of the car has an automatic fresh air damper. The damper controls the intake of fresh air at ambient temperatures of +15* F or less and 103^{0}F or above. When the damper is open the fresh air intake per end of car is 850cfm, when closed 560cfm. The automatic damper operates in conjunction with and is controlled through the A/C system.

In the event of a malfunction of the automatic damper, there is a manually operated fresh air damper at each end of the car. If the automatic damper is not operating, red lights will show on the A/C control panel in the electric locker. Also, there will be a noticeable change in car temperature. The manual damper is operated through a cable in the broom closet.

There is a centrifugal type exhaust fan in each equipment room. The fan connected to exhaust air ducts, exhausts air from the passenger and toilet areas.

In the coaches, there is an exhaust air outlet in the underside of the luggage rack, above each pair of seats. The exhaust air duct is built into the rack framework.

The MMLU fixtures in the upper level of the dining cars have continuous slot type vents for the exhaust air. A 1050 cfm ventilator exhausts air from the lower level. The exhaust air outlet in the sleepers is located in the broom closet at the end of the car.

Each toilet room has an exhaust outlet and air duct in the ceiling. Air is exhausted from the toilet rooms at the rate of 65cfm.

The exhaust air* and the A/C condenser fans discharge through the floor of the equipment compartments.

Floor heat air is circulated by natural convection. The air enters the heater guards at the bottom, passes over the strip heaters and rises by convection, discharging through slots in the heater guard. In passenger areas having panel heat, a portion of the heated air discharges through slots in the heat guard and a portion flows upward through the space behind the side lining under the windows and discharges through holes in the window masks.

5.4 TEMPERATURE CONTROL PANEL

The temperature control system for the bi-level cars is designed for fully automatic operation once the proper circuit breakers have been set to "ON" and the selector control switch on the temperature control panel is set to "NORMAL". (See figure 5-7.) The car will also be maintained at a moderate inside temperature when the selector switch is set to "LAYOVER" and the system will be shut down when the switch is set to "OFF".

Temperature control circuitry is used to provide comfortable inside car temperatures for heating, cooling and for adding controlled amounts of outside fresh air to complement either process. The system also adds controlled amounts of heating (reheat) during the first cooling stage to help lower the relative humidity.

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*Exhaust blowers actually discharge upwards. Relief hole is in the floor. This conditions equipment room air at high ambients.

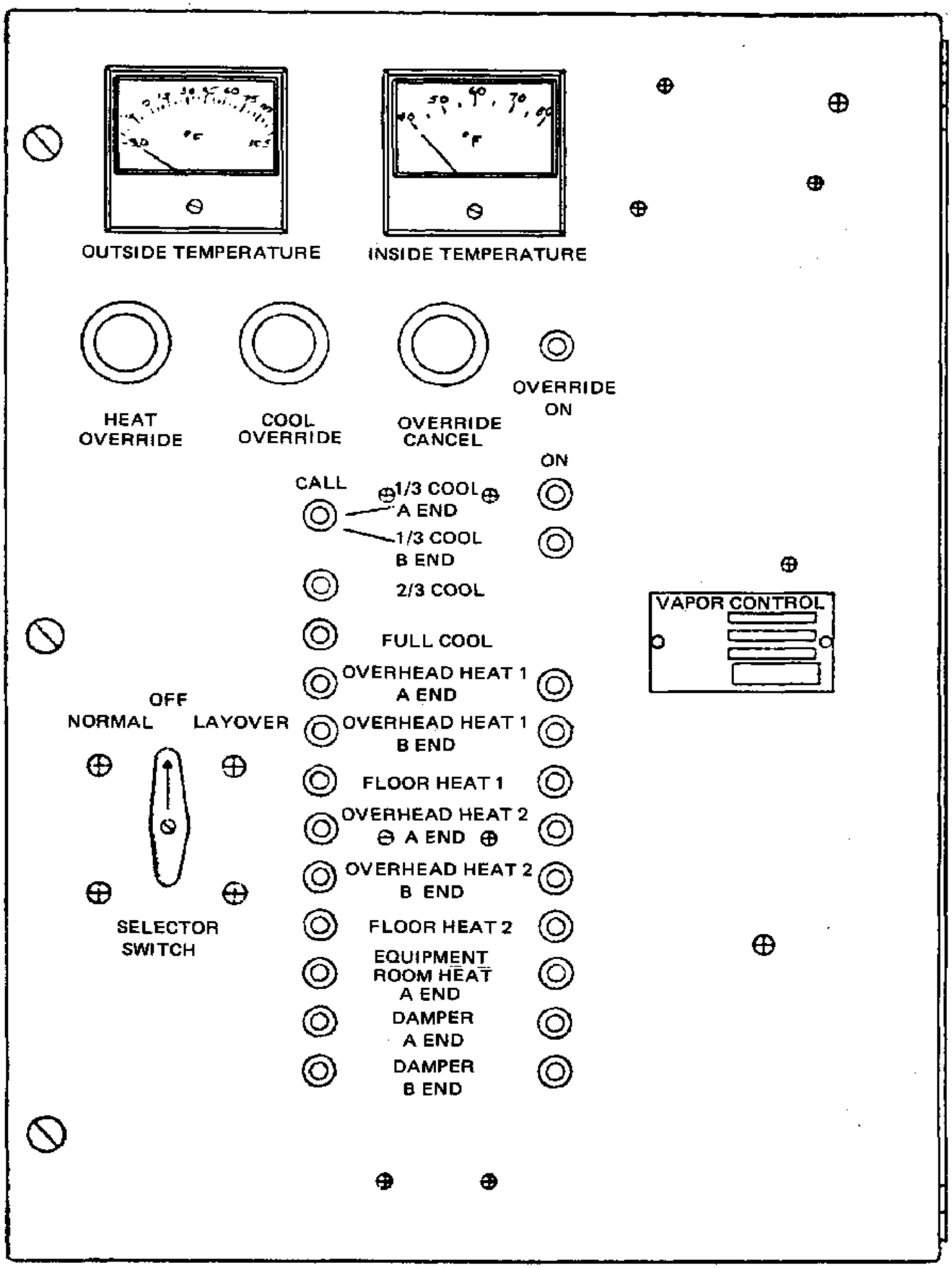


Figure 5-7. Temperature Control Panel, Front View

The two microammeters on the front panel of the temperature control panel indicates the inside and outside temperatures in degrees F. These temperatures are provided by fresh air and return air sensors that monitor the air temperature. Should the automatic controls be insufficient to maintain car temperatures at a comfortable level due to extreme outside conditions, an override system is available. By depressing either button, additional cooling or heating in excess of that which is supplied by automatic operation is provided. Once the desired temperature level is reached the override cancel button can be depressed to restore the system to normal operation. A red indicator lamp will alert the trainmen when the override is on.

A series of "call" and "on" lamps indicate when a particular heating or cooling system is operating or is calling for additional temperature control. Indicators that show the position of the damper is also included.

SECTION 6

DOOR CONTROL SYSTEM

6.1 GENERAL

The door control system equipment supplied for the AMTRAK bi-level cars is used to operate the upper level body end doors and the vestibule interior doors. Each door can be opened or closed by a crew key or press switches at its location. The doors are designed for passenger operation via the two press switches on each door panel.The inside key switches are provided for use by the crew, as a means of limiting or modifying passenger operation of the door.

The control components for the body end doors and vestibule interior doors are identical except for the crew key switches. The body end door crew switch provides a "Disarm" feature which is not included in the control circuitry for the vestibule interior doors.

6.2 DOOR SYSTEM OPERATION

To provide normal operation at each door location, each crew switch is set to its NORMAL position. With each crew switch set to NORMAL, each door panel can be opened by the passenger pressing the related press switch assembly (PPS or KPS). Each door closes automatically after a specific timing period which is determined by the adjustment of the related time delay relay (ETDR).

The system air supply is applied to the operator through the air cock and regulated by the operator's pressure regulator - to 70 psig. The air pressure is applied to the magnet valve (OMV) at the large cylinder end of the door ,engine and to the small cylinder of the door engine (through a flow control valve).

When the magnet valve is deenergized, it closes and the regulated pressure is applied to the small cylinder only. With air pressure applied to the small cylinder, the door operator output shaft rotates in the opening direction and the door panel opens. When the magnet valve is energized, it opens and the 70 psig pressure is applied to the large cylinder through a flow control valve. With air pressure applied to the large cylinder, the door operator output shaft rotates in the closing direction and the door panel closes.

When the operator reaches the closed position, the cam operated valve is actuated (opened). With the valve open, the air pressure is applied (unrestricted by the flow control valve) to the large cylinder. This unrestricted pressure provides a positive closing force against the door panel.

6.2.1 DOOR OPERATOR OPENING MODE

In order for a door panel to open, the operator magnet valve (OMV) must be deenergized. The system voltage is applied to each crew switch, therefore the availability of a DOOR OPEN signal is determined by the position of the crew switch. The crew switches and their contacts are listed below. The table shows the relationship between switch positions and contacts.

Table 6-1. Crew Switch Contacts and Positions

Crew Switch Contact	NORMAL	OPEN	DISARM
ESS1-N. O. (1)	OPEN	OPEN	CLOSED
ESS1-N. C. (2)	CLOSED	OPEN	CLOSED
ESS2-N. C. (1)	CLOSED	OPEN	

With the crew switch in the NORMAL position, the normally-closed contacts are closed and the system voltage is available at each press switch (PPS and KPS). The system voltage is also applied to the magnet valve (OMV) through the closed time delay relay (ETDR) contacts. The magnet valve is energized; therefore the door panel is closed.

When a press switch is actuated (pressed) the contacts close and the system voltage energizes the time delay relay (ETDR). When the relay energizes, its contacts transfer, breaking the circuit to the magnet valve. With the magnet valve deenergized, the door panel is driven open.

6.2.2 DOOR OPEN TIME DELAY

Once a door panel is open, the length of time that it remains open (before closing) is dependent upon the adjustment of the time delay relay. For this application, the time delay relay is initially set to provide a door open time of 15 seconds.

Note

The adjustment increments marked on the time delay relay are to show the relative point of adjustment and do not reflect actual seconds. The adjusted time delay must include the time required to open the door panel as well as the 15 second door open time.

6.2.3 DOOR OPERATOR CLOSING MODE

When the door operator magnet valve is energized, the operator output shaft rotates in the closing direction and the door panel closes. The magnet valve is energized when the door open time elapses and the time delay relay contacts return to their normal position. In their normal position, the ETDR contacts complete the circuit from the closed contacts of the crew switch to the magnet valve coil.

6.2.4 OBSTRUCTION SENSING FEATURE

If during the closing mode, the leading edge of a door panel meets an obstruction, the door panel will reverse its movement. When the panel reaches the open position it will remain open until the door open time has elapsed, the panel will then attempt to close. If the obstruction is not removed, the panel will continue to recycle.

When the door edge is deflected the resultant pressure is transferred to the sensitive edge switch (SES). The SES contacts close and the system voltage energizes the time delay relay. As described previously, when the time delay relay is energized, its contacts transfer and break the circuit from the crew switch to the magnet valve. When the magnet valve is deenergized, the door panel is driven open.

During normal operation, the sensitive edge feature is cutout when the door panel reaches the closed position. This is accomplished when the cam actuated switch (DLS) on the door operator is actuated. The DLS contacts open and the system voltage is not applied to the sensitive edge switch.

6.3 SYSTEM COMPONENTS

6.3.1 PNEUMATIC DOOR OPERATOR

The pneumatic door operator is a geared, differential type, air operated, electrically controlled assembly. It is designed to function from the car's nominal 72 vdc electrical supply and 140 psig compressed air supply.

The operator assembly includes an engine, which consists of two cylinders of different diameters joined together by an engine center. (See figure 6-1.) The engine center houses a gear and supports the engine on the baseplate. The piston assemblies include component parts attached to each end of a gear rack. The teeth in the rack mesh with those of the gear. The gear is attached to a shaft assembly, which in turn, is connected to the operator slide assembly.

Included on the operator assembly is a multiplying lever assembly which pivots from a fixed point on the baseplate. The lever is fitted with two nylon rollers. One of the lever rollers moves within the operator slide assembly while the other roller moves within the vertical door slide assembly mounted to the trailing'edge of the door panel.

With this arrangement, linear piston motion is translated into rotary motion of the gear shaft and slide assembly. With each stroke of the pistons, the gear rack turns the gear, shaft, slide assembly and multiplying lever, thus opening or closing the door panel.

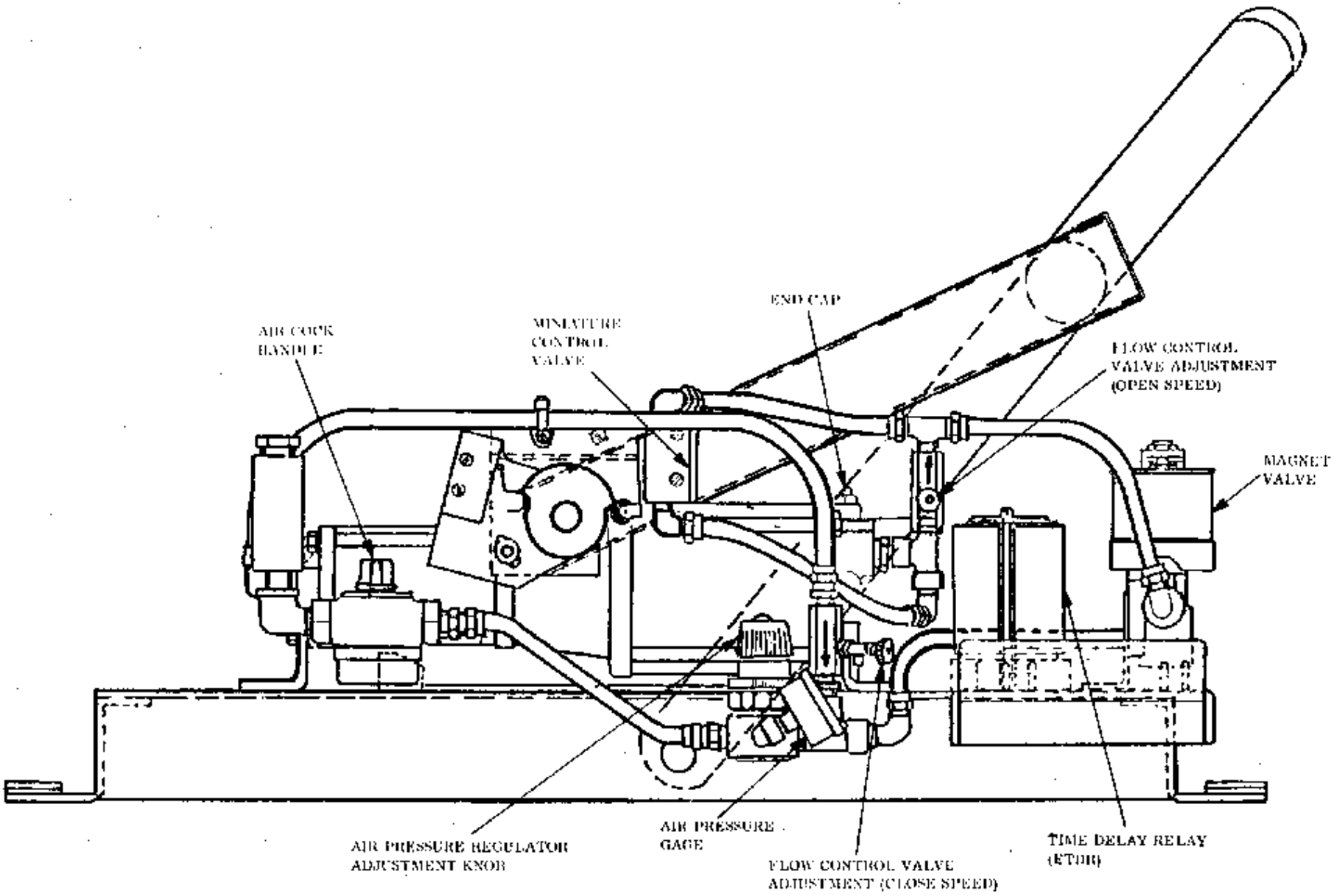


Figure 6-1. Pneumatic Door Operator

1. Air Cock Assembly. A rotary cutout air cock assembly is series connected with the air supply to the door operator. The air cock is an integral part of the door operator and is set to the open position during normal operation. When the air cock is set to the closed position, the air supply to the engine is cut off and the air present in the engine cylinders is vented to atmosphere.

2. Pressure Regulator. An adjustable, air pressure regulator is seriesconnected between the air cock assembly and the door operator. The regulator is an integral part of the operator and may be set to provide a desired output pressure at any point in the range between zero and 125 psig. Maximum supply pressure must not exceed 300 psig. In this application the air pressure regulator is initially set to provide door operator pressure at 70 psig.

3. Flow Control Valve. Two flow control valves are included as parts of the door operator. They are installed, one each in the air line to each cylinder of the engine assembly. The control valves provide adjustability for the door opening and closing speeds.

4. Miniature Control Valve. A mechanically actuated, miniature control valve is connected in the air line to the large cylinder of the engine assembly. The valve, when actuated, opens to apply more airflow to the cylinder.

5. Magnet Valve. A magnet valve is connected in the air line to the large cylinder of the engine assembly. The coil of the magnet valve assembly operates from the 72 vdc (nominal) power supply. As connected, the magnet valve exhausts the air from the large cylinder of the engine assembly when deenergized. This causes the door panel to open.

6. Time Delay Relay. A plug-in type, time delay relay is mounted on each door operator. The relay operates from the 72 vdc (nominal) power supply and provides a time delay on removal of voltage from terminal No. 5. The relay is adjustable from 5 to 25 seconds.

6.3.2 PRESS SWITCH ASSEMBLY

Two press switch assemblies are provided for each door panel. The switch assemblies are accessible to the passenger from either side of the door panel and are located for hand or foot actuation.

Each press switch assembly consists of a push button switch assembly mounted between two press plates. The press plates fit within a two-piece metal frame and are held apart by four compression springs. (See figure 6-2.)

A flexible, clear plastic weather seal is provided for each switch assembly. When the switch assembly is mounted, the sealed side faces the outside on body end doors and toward the vestibule on vestibule interior doors.

6.3.3 SENSITIVE DOOR EDGE ASSEMBLY

A sensitive door edge assembly is mounted to the leading edge of each door panel. The edge assembly includes an elastomeric door edge with a sealed chamber at the leading edge. A short length of PVC tubing is permanently cemented into the sealed chamber. The tubing is

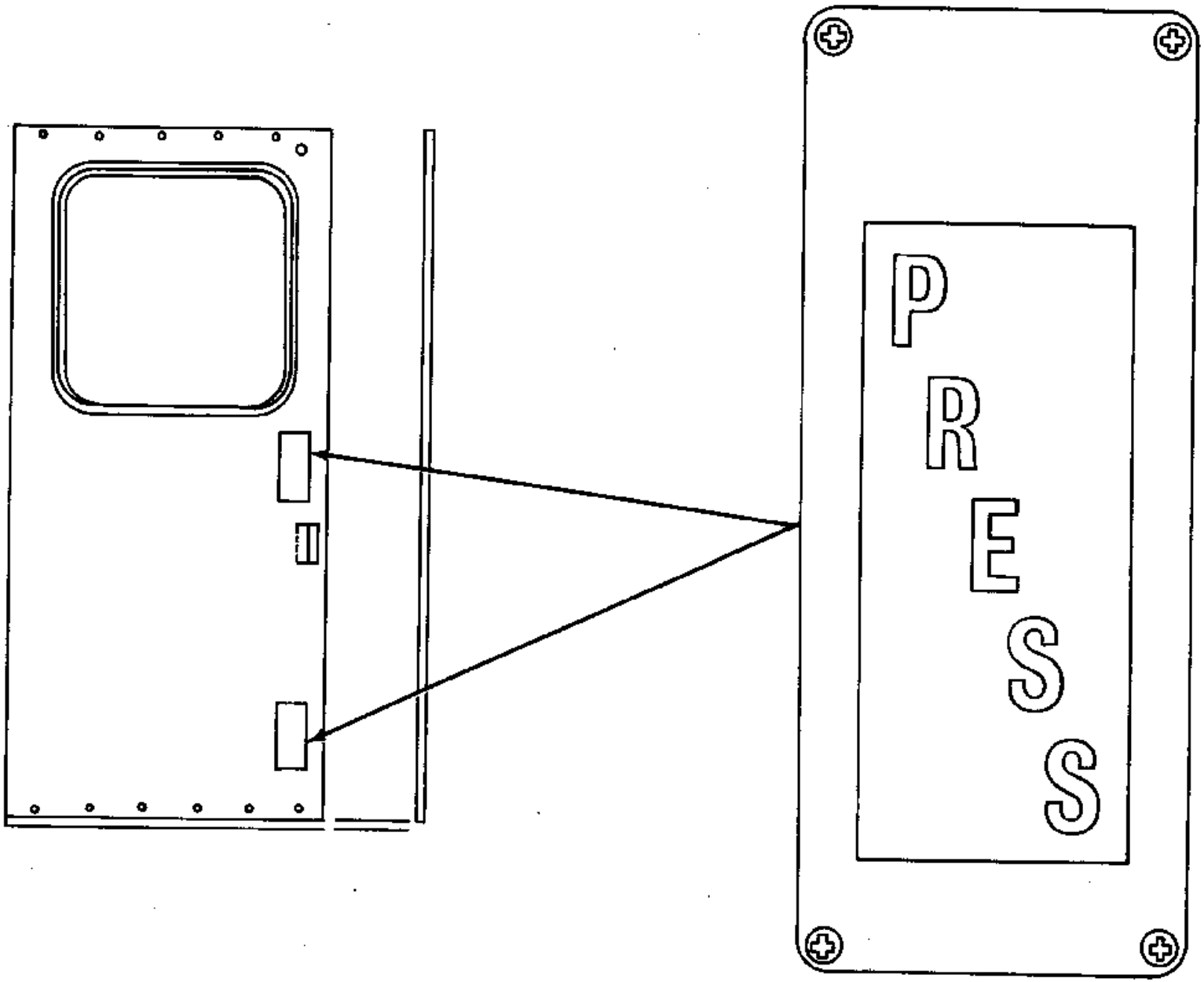


Figure 6-2. Press Switch

fitted with a small push-on connector for interconnecting the transfer tubing from the sensitive edge to the pressure wave switch.

PVC tubing is provided for each sensitive door edge assembly. The tubing is cut into 6 foot lengths. Each length is used as a transfer tube from a sensitive door edge to its pressure wave switch.

6.3.4 PRESSURE WAVE SWITCH

A pressure wave switch mounting bracket is applied to the plate provided on each door slide assembly. The pressure wave switch is attached by a clip provided on the mounting bracket.

When a leading door edge is struck during a door closing mode, a pressure wave is transmitted via the PVC tubing to the switch, causing its contacts to momentarily close. When this occurs, the door panel is cycled open. The pressure wave switch is factory set to operate at a pressure output as generated when the sensitive door edge is obstructed.

6.3.5 KEY SWITCH, INSIDE (BODY END DOORS)

One three-position key switch is provided for each upper level body end door. The key switch is actuated using the Standard Coach Key. The switch positions are OPEN, NORMAL (closed), and DISARM. When the switch is placed in the DISARM position, that door panel can not be activated by the passenger press switches. The key switch is designed so that the key can be removed in any position. (See figure 6-3.)

The key switch is a two-position switch assembly similar to the body end door key switch above. There is no DISARM position provided. (See figure 6-4.)

6.4 DOOR CONTROLS AND INDICATORS

6.4. 1 INSIDE KEY SWITCH OPERATION

The inside key switch for the body end doors has three positions (OPEN, NORMAL, DISARM) and is operated by the standard coach key. The key is removable from any of the positions.

When the switch is placed in the OPEN position, the door panel is driven open. The door panel will remain open until the switch is placed in the NORMAL or DISARM position. When the switch is placed in the NORMAL position, the door panel is driven closed. The door panel will remain closed until the switch is placed in the OPEN position or one of the press switches is actuated.

When the switch is placed in the DISARM position, the door panel is closed and can not be opened by passenger actuation of the press switches.

Note

The inside key switch for the vestibule interior doors has two positions (OPEN and NORMAL). The switch operation is like that described for the switch above except there is no DISARM position.

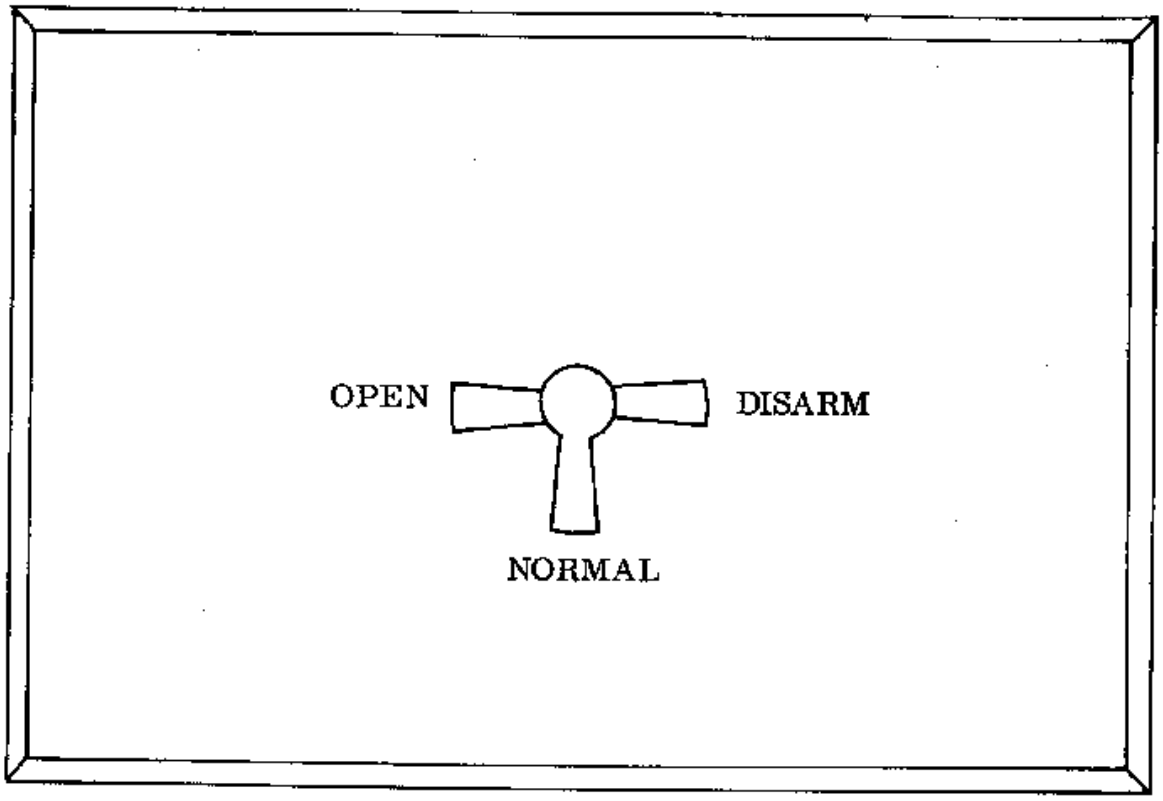


Figure 6-3. Key Switch, Body End Doors

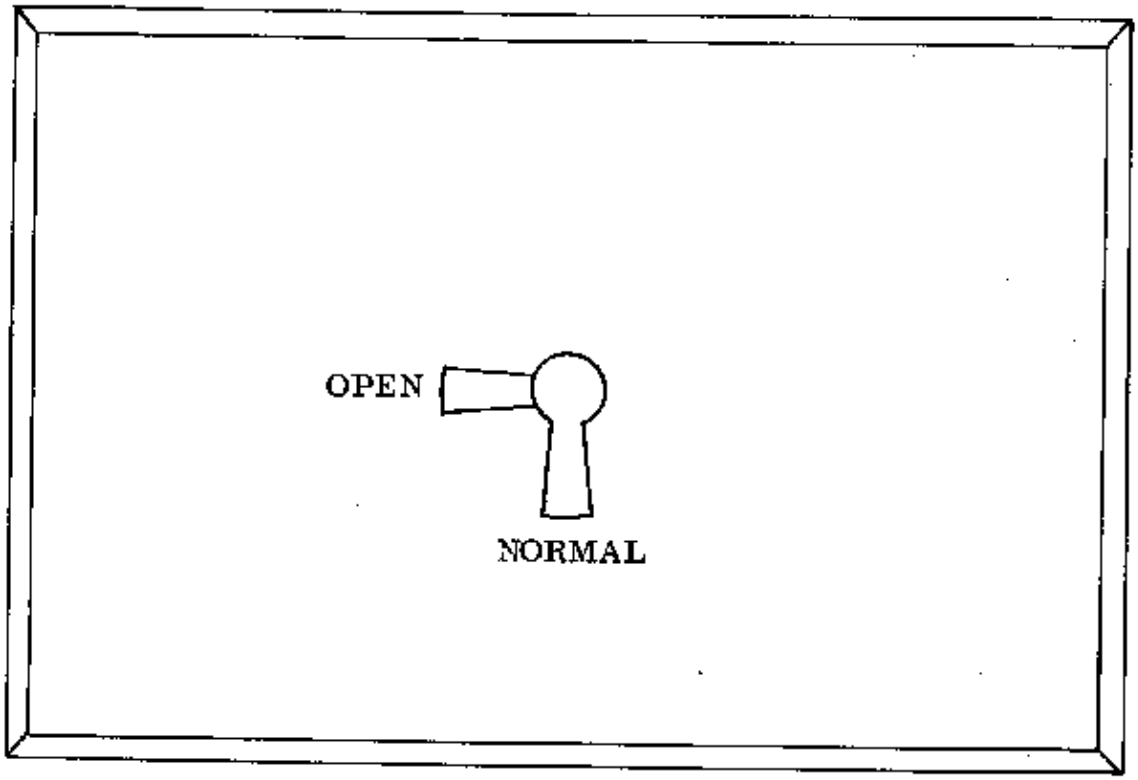


Figure. 6-4. Key Switch, Vestibule Interior Door

6.4.2 DOOR OPERATOR CONTROLS

1. Air Pressure Regulator. The air pressure to the operator is adjustable by turning the black adjustment knob on the pressure regulator, the air pressure to the operator can be varied.

   The air pressure to the operator is increased by turning the knob counter-clockwise and decreased by turning the knob clockwise. The adjustment knob has a set screw that should be loosened prior to adjusting the pressure regulator and tightened once an adjustment has been made.

   Note

   Adjust the pressure regulator such that 70 psig is indicated on the pressure gage.

2. Time Delay Relay. The length of time that the door panel remains open, after reaching the fully open position, is adjustable. The time delay relay (ETDR) on the door operator has a slotted adjustment screw for setting the time delay.

   The relay has an adjustable time delay of 15 ±10 seconds. The increments marked on the top of the relay are for relative positions and do not represent one second for each division.

To adjust the time delay, electrically open the door panel and measure the amount of time the door panel remains open after it has reached the fully open position. To increase the amount of time the door remains open, turn the adjustment screw towards the number "ten" mark on the relay. Turn the adjustment screw towards the "zero" mark to decrease the door open time.

Note

Time delay setting required to achieve the proper door open time is relative to the opening speed of the operator. The operator opening and closing speed should be adjusted prior to setting the time delay relay.

3. Door Operator Speed Control. The opening and closing speed of the door operator is adjustable. The closing speed has two points for adjustment; one on the top end cap of the large cylinder and the other on the flow control valve connected to the pressure regulator.The opening speed adjustment is on the flow control valve connected to the large cylinder.

   Each control valve has a knurled adjustment knob. The stem of the adjustment knob is held by a lock nut which should be loosened to make an adjustment and tightened when the adjustment is made. The end cap adjustment screw also has a lock nut which should be loosened to make an adjustment and tightened when the adjustment is made.

SECTION 7

COMMUNICATION SYSTEM

7.1 GENERAL

The AMTRAK bi-level cars are equipped with a communication system that features a public address, intercom and entertainment systems. The public address system is used to broadcast announcements from the communication control panel (figure 7-1) located in the Communication Locker in each vestibule and from the locomotive. These announcements may be trainlined to the whole train or localized to an individual car.

Through a paging call, a trainman may request intercom communication with any other trainman and carry on a private conversation without disturbing the music transmitted to the speakers. A trainman may also alert the engineer in the locomotive by pressing a signal button on the control unit which activates an audible alarm in the locomotive. A control unit in the locomotive permits locomotive personnel to respond to or initiate a paging call.

The dining and sleeping cars have dual 25-watt amplifiers to provide the desired audio levels. The sleeping car has a program selector module with speakers for each room. The dining car contains a program selector panel in the maitre d' station that provides for public address and intercom between cars, music control, a kitchen intercom and a chime to alert dining car personnel of an incoming call.

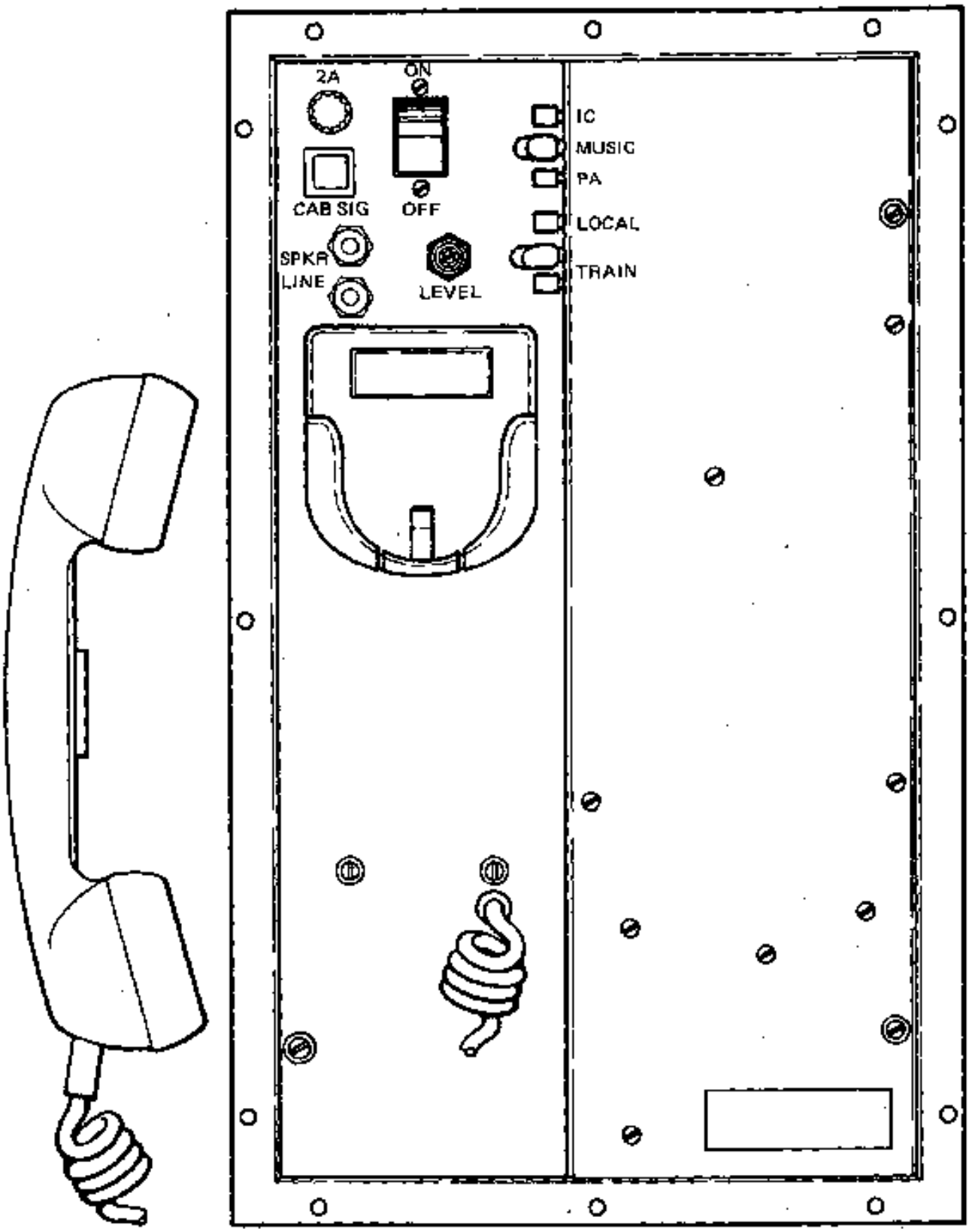


Figure 7-1. Communication Control Panel

The coach and sleeping cars have an attendant call button system. Call buttons are located above each pair of passenger seats in the coach car and on the passenger control unit in the sleeping compartments of the sleeping car. They are also located in the lower stairway landing, the toilet rooms and the women's lounge.

An annunciator located in the stairwell on the lower level will indicate whether the call originated from the upper level passenger area, lower level passenger area, the toilets and the women's lounge or an adjacent car. There is no annunciator on the upper level.

In all passenger areas there is a yellow light in the call button.The call button will sound a chime, activate the annunciator, and in passenger areas, illuminate the yellow light.

In cases where an attendant is not on duty in a car, the call system can be trainlined to activate the chime and annunciator in adjacent car. It can also be trainlined through a car so it will activate the system in a car one side or through the car, the trainlining is done with the selector switch in the electric locker.

7.2 PUBLIC ADDRESS SYSTEM

A trainman in any car may make a public address announcement or page a trainman in any other car by performing the following procedure:

- Check that the ON-OFF switch on the communications control panel is in the ON position.

- Place the TRAIN-LOCAL switch to the desired position. If it is desired that the public address announcement be limited to the car of the originator, the switch should be placed in the LOCAL position. For broadcasts throughout the train, the switch should be placed in the TRAIN position.
- Place IC-MUSIC-PA mode switch in the PA position.
- Lift handset off hook, press PTT button on the handset and speak into the mouthpiece.
- After the public address announcement has been completed, the trainman should return the mode switch to the MUSIC position, the TRAIN-LOCAL switch to the TRAIN position and replace the handset on the hook.

7.3 INTERCOM SYSTEM

If a trainman in any car wishes to carry on a conversation with a trainman in another car, he must first page the trainman over the public addre.ss system and then switch his mode switch to the IC position. Once the paged trainman moves his mode switch to the IC position and responds by lifting the handset, pressing the PTT button and speaking into the mouthpiece, the two trainmen can communicate with each other without interrupting the music transmitted to the speakers.

When a trainman wishes to signal the locomotive, he must place his mode switch in the PA position, remove the handset from the hook and press the PTT button. He must then press the CAB SIG button, which will sound an audible alarm in the car area. This alarm will sound as long as the trainman is depressing the CAB SIG button. The trainman should release the CAB SIG button, move his mode switch to the IC position and await the response from the locomotive cab.

7.4 ENTERTAINMENT SYSTEM

Eight (8) track tape deck in dining car.

7.5 ATTENDANT CALL SYSTEM

An attendant call system is provided on the AMTRAK bi-level cars (except dining cars). It enables the passengers to attract the attention of the car attendant, should they desire assistance. The attendant call system utilizes a two-note chime whose sound is broadcast over the public address system of only that car in which it is activated, unless train-lined. A button marked "PULL TO CALL" is used to activate the chime and an annunciator will indicate where the call was initiated from.

In those cars where an attendant is not on duty in a car, it is possible to trainline the call system to activate the chime and annunciator of an adjacent car. Trainlining is accomplished by setting the selector switch in the electric locker. It is also possible to trainline the system through a car, so that it may be activated on one side or through the car. There is no attendant call system on the dining car.

7.5.1 OPERATION

With the attendant call control switch in the NORMAL position all calls for assistance are from that car, unless trainlined from other cars. Call switches are located above passenger seats, in the stairwell, in the women's lounge and toilet and in the unisex and handicapped toilets of the coach car. See figures 7-2 and 7-3. When the PULL TO CALL button is pulled a chime will sound through the speakers on the upper and lower levels. The annunciator panel in the stairwell will indicate the origin of the call to the attendant. (See figure 7-4.) In addition, a yellow light will illuminate in the switch and outside the toilet or lounge facility if a toilet or lounge switch is pulled. The indicator outside the toilet or lounge will flash when the call switch is pulled. This enables the attendant to distinguish between an occupied facility and one where assistance is required. The yellow indicator light is extinguished by pushing the call button in.

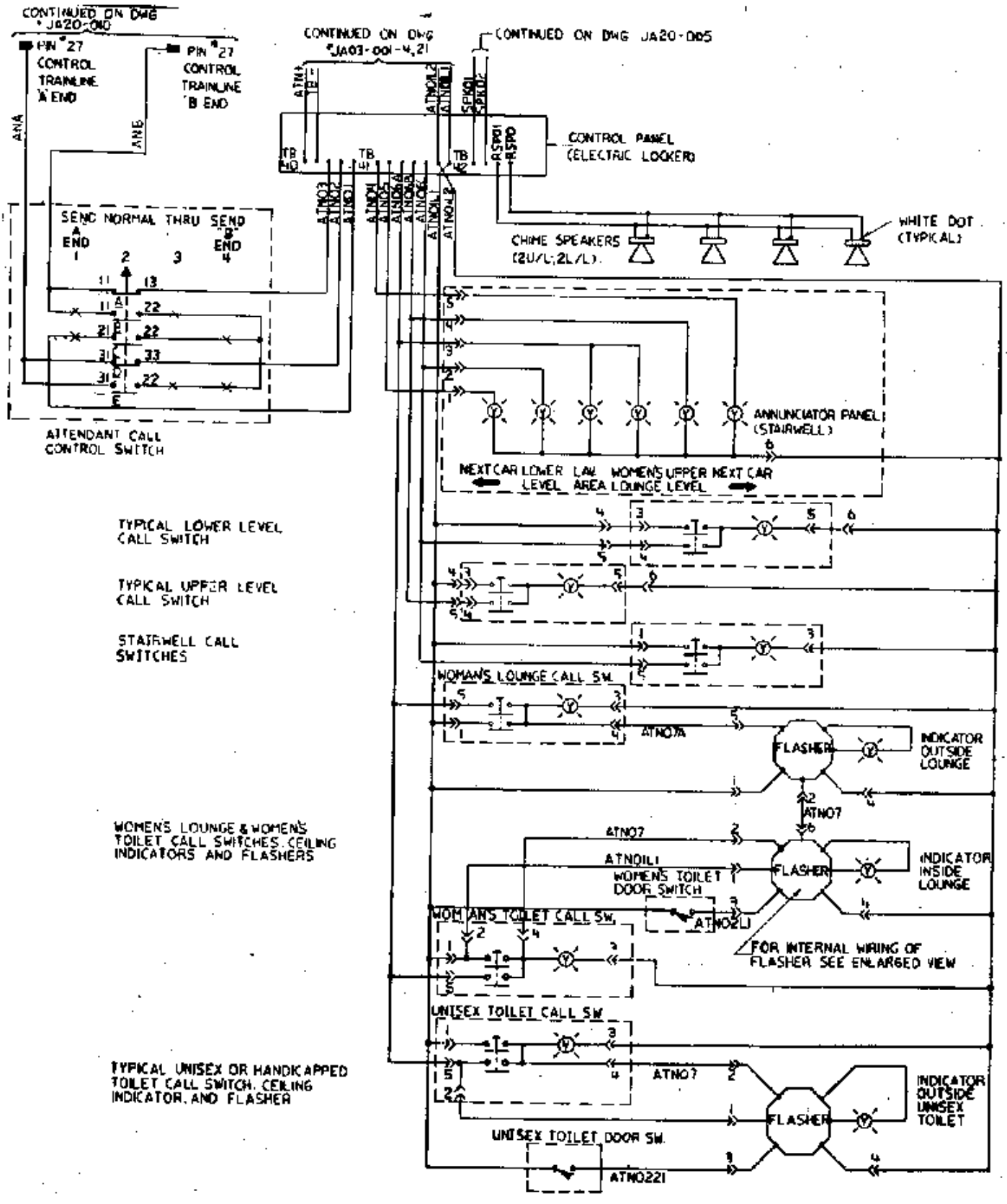


Figure 7-2. Attendant Call System, Coach Car

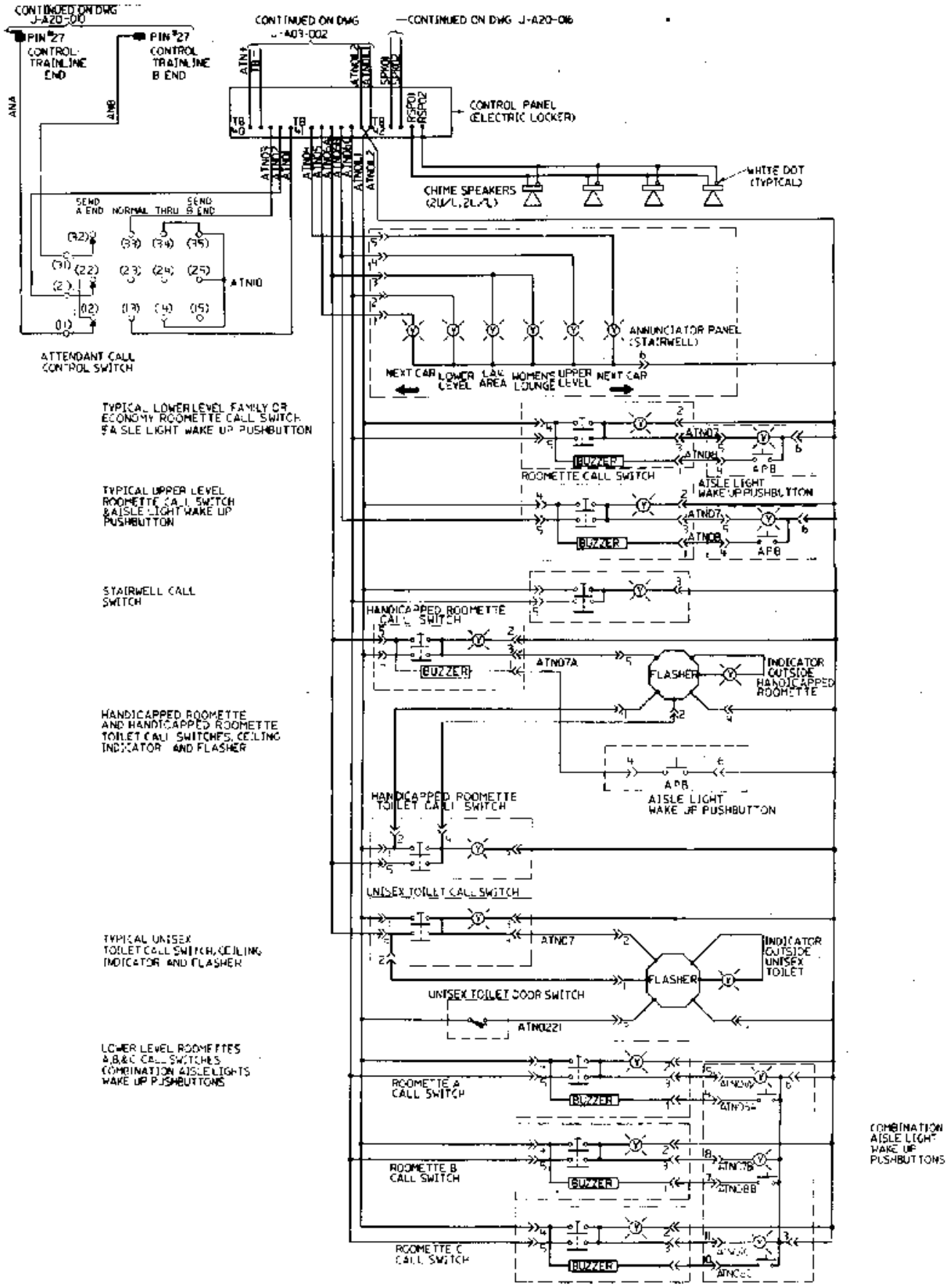


Figure 7-3. Attendant Call System, Sleeping Car

On the sleeping cars the attendant call system operates basically the same as the coach cars. The attendant call buttons are located on the passenger control unit in each sleeping compartment. When pulled a yellow aisle light is illuminated continuously to identify the compartment. The annunciator panel in the stairwell also identifies the origin of the call.

A wake up buzzer pushbutton installed in the aisle light fixtures is used to alert passengers inside the compartments who request the service.

With the attendant call control switch in the SEND A END or SEND B END positions, any call for an attendant in that car will be trainlined to the next car at the "A" or "B" end. In the THRU position, attendant calls are trainlined through the next car to another call station.

Figure 7-4. Annunciator Panel

SECTION 8

WATER SYSTEM

8.1 GENERAL

The water system for the AMTRAK bi-level car provides both potable and sanitary water supplies for the passengers and crew. Each car has a pressurized cold water system with two 250 gallon storage tanks. Hot water is supplied by an 80 gallon hot water heater located in the "A" end equipment compartment along with the 250 gallon tanks. (See figure 8-1.)

The water system has a fill point on each side of the car. A three-way valve at each fill point allows the trainline compressed air to be cut off while refilling the water storage tanks.

8.2 POTABLE WATER SYSTEM

The potable cold water is supplied from two 250 gallon stainless steel storage tanks located in the "A" end equipment compartment. (See figure 8-2.) This cold water is used to supply potable and sanitary water for the cars. Hot water is provided by an electrically heated (two heater element) tank that has a storage capacity of 80 gallons. The sanitary water service line is isolated from the potable water source by a back flow preventer. The entire water system is kept under pressure by an air pressurized water raising system.

8.2.1 WATER RAISING SYSTEM

The water raising system is used for raising water from the storage tanks and circulating it for use throughout the car. It utilizes compressed air from the trainlined car supply line which is fed through an adjustable reducing valve. (See figure 8-3.) The valve limits the air pressure to the water storage tanks to 35 psi and20 psi to delivery lines.A water raising air reservoir stores air for use in raising and circulating water. It also prevents loss of pressure due to a loss of main reservoir pressure.

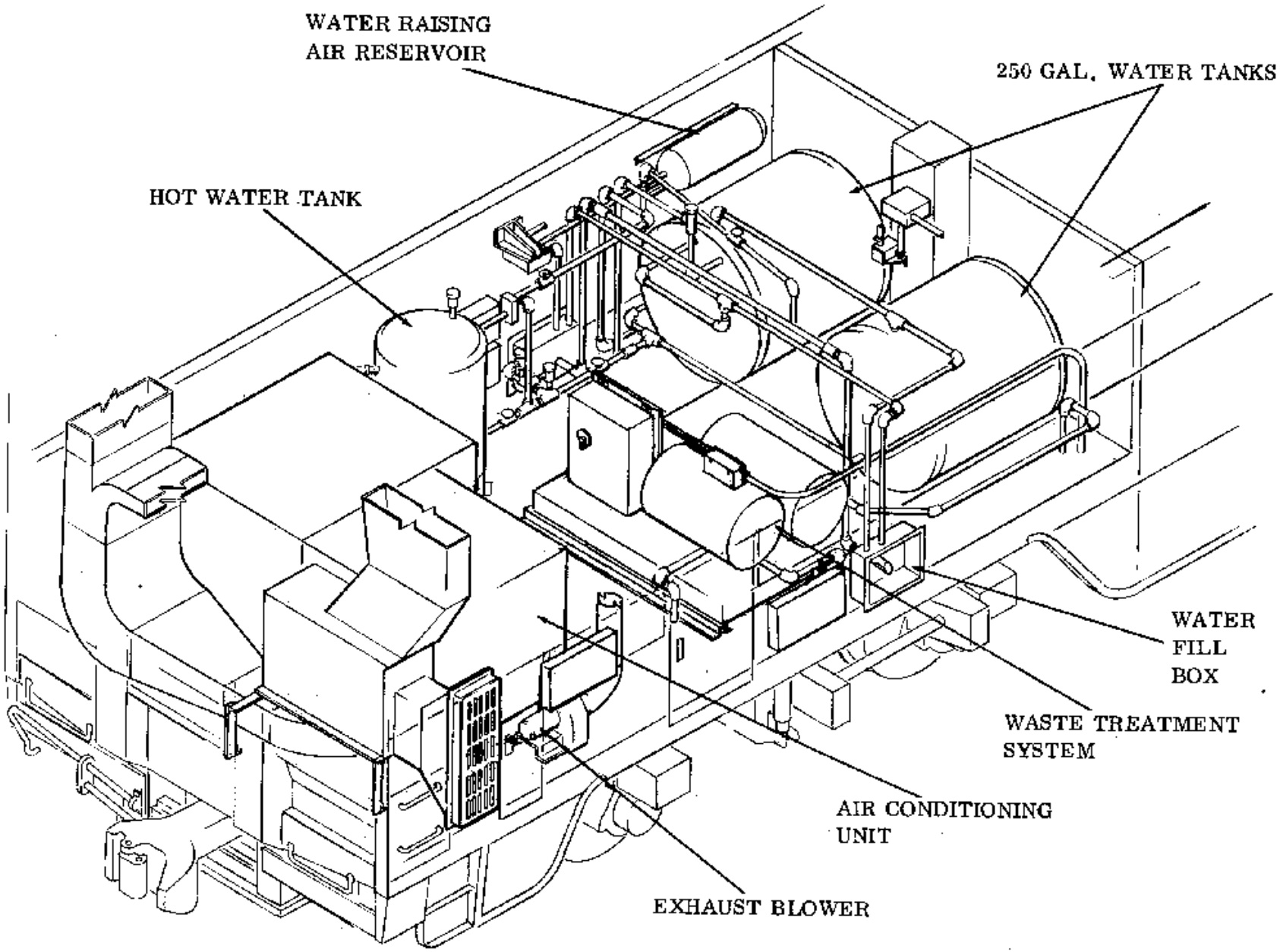


Figure 8-1. Equipment Room A-End - Coach & Sleeping Car

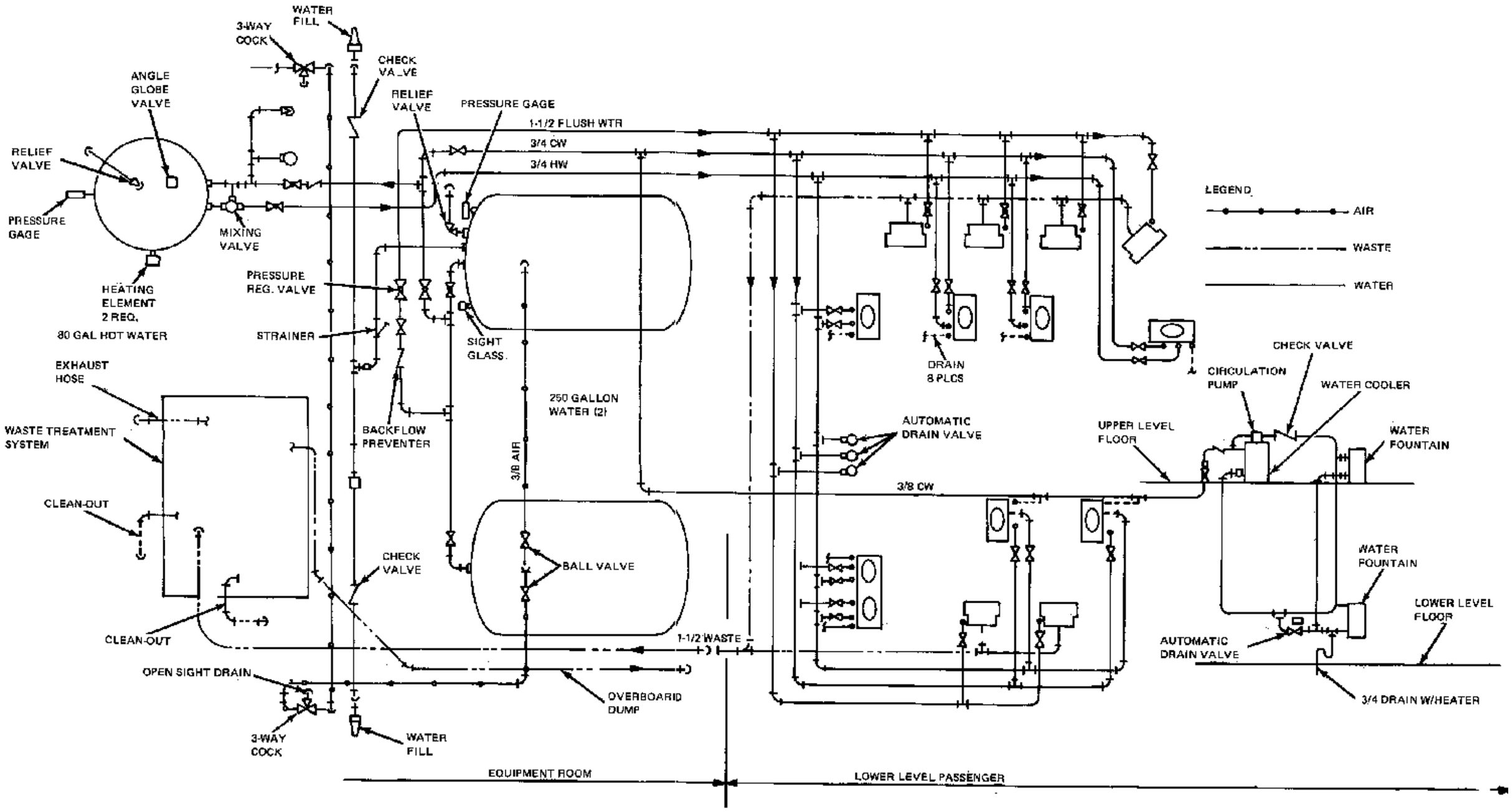


Figure 8-2. AMTRAK Bi-Level Water System (Coach)

An adjustable reducing valve prevents excessive air pressure in the water system . At each fill point there is a three-way cut-out cock that when turned to the "fill" position will cut off the trainlined compressed air.

When the three-way valve is turned to the "air" position the water supply is cut off and the water pressure builds up to 35 psig.

8.2.2 HOT WATER HEATER

The hot water storage tank is located in the "A" end equipment compartment and has a capacity of 80 gallons of water. It contains two (2) 3.75 KW electric immersion type water heater that operate on 480 volt, 3 phase, 60 Hertz. A mixing valve in the hot water discharge line is set to deliver approximately 118° F water to the system. A low water cutoff is installed to protect the heater system.

8.2.3 WATER COOLER

There is one water cooler installed on the coach and sleeping cars. It is located on the upper level of the car near the vestibule staircase. In the dining car a water spigot is located on the upper level.

8.2.4 LAVATORIES

The lavatories have hot and cold water lines run to each basin. The basins are trapped into a line that discharges wash water directly onto the tracks. Flushing water is from the cold water system and is isolated from the potable water by a back flow preventer. Drain heaters are located in water station and wash basin drains outlets to prevent ice clogging of discharge lines.

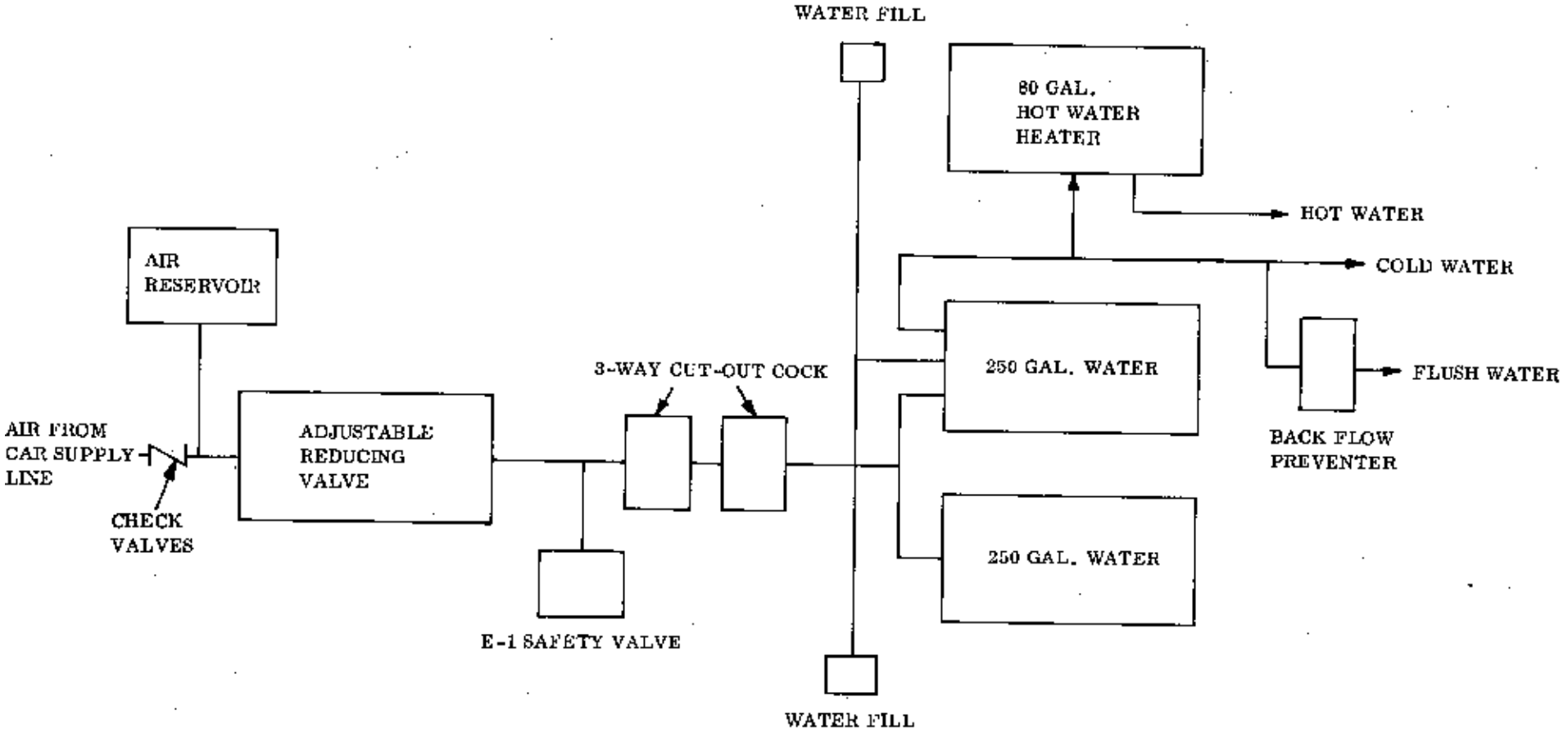


Figure 8-3. Water Raising System, Block Diagram

8.2.5 ANTI-FREEZE PROTECTION

Drain heaters are located in water station and wash basin drains outlets to prevent ice clogging of discharge lines. When the cars are off power the water system is protected against freezing by a mechanical dump valve that will automatically dump the system when the water temperature drops below 380F .

8.3 SANITARY WATER SYSTEM

The sanitary water system is used to provide flushing water to the toilets of the bi-level cars. The flushing water is supplied by the cold water lines and is pressurized at 20 psig by air from the trainlined compressed air system. (See figures 8-2 and 8-4.) This water is separated from the potable water by a back flow preventer. The toilets are activated through a flushing sequence by depressing a button. After the toilet is flushed, the hopper containing the sewage is cleansed. Sewage and flush water is then moved into a macerator unit by a vacuum system. The macerator is common to all toilets on the car (with the exception of the dining car which has a self contained system) and is located in the "A" end equipment compartment.

Sewage is forced through the macerator where it is reduced to a liquid effluent and discharged to the road bed. The effluent is released on to the road bed only when the train is travelling at a speed of 25 mph or faster as determined by truck speed sensors.

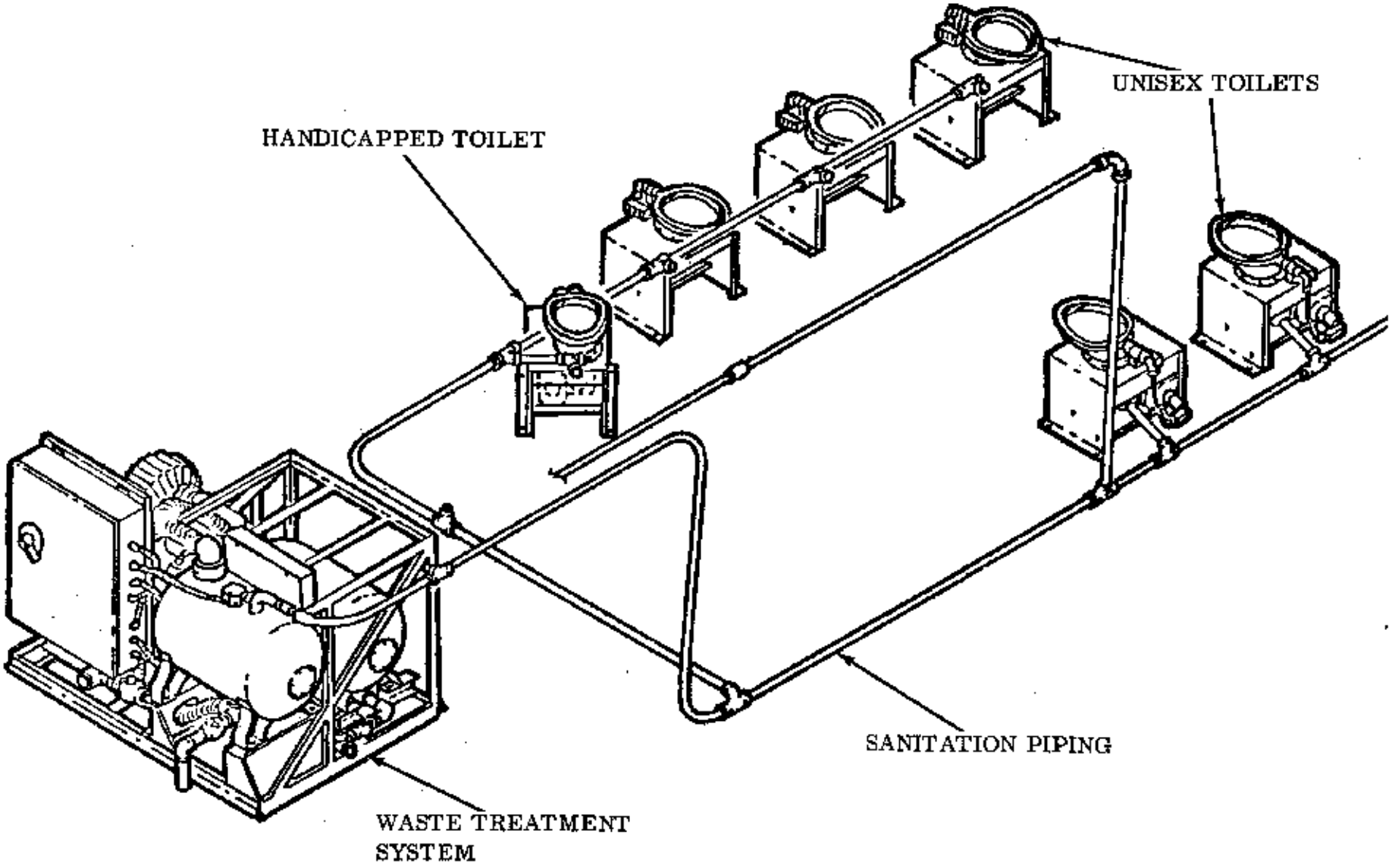


Figure 8-4. Waste Treatment System (Coach)

8.3. 1 WASTE TREATMENT SYSTEM

The waste treatment system has a toilet system that uses on-board potable water as the flushing medium. The system is not installed on the bi-level dining cars which has a crew toilet that is a self-contained unit.

Operation of the system is enabled by use of 480 volt, 3 phase, 60 Hertz electrical power, a water supply and a compressed air supply. The system employs vacuum to transfer waste from the toilets to the collection tank. A diagram of the collection and holding process is illustrated in figure 8-5 and is described as follows.

A flush cycle is initiated by pressing the toilet flush button in the lavatory compartment. Flushing controls are actuated to permit water flow through the flush valve into the toilet bowl. The duration of each flush cycle is 5 seconds and approximately one-half gallon of water is used. Simultaneous with the start of the flush cycle, the bowl drain valve opens to permit waste and water to leave the bowl. The air, together with the mixture of water and waste in the waste line, flows rapidly to the collection tank, due to the differential pressure produced by the vacuum pump.

The waste/water is held temporarily in the collection tank until sufficient volume has accumulated. When tank contents amount to approximately 22 gallons, a maceration cycle is automatically initiated to reduce the waste to a slurry as it is transferred from the collection tank to the holding tank. During the maceration cycle, the pump/macerator reduces particles of waste items. The waste slurry is retained in the holding tank for ten minutes or until the train achieves a speed of 25 mph. There is a manual "inhibit" button located in the electric locker which can be used to lockout the dumping operation when travelling through restricted zones .

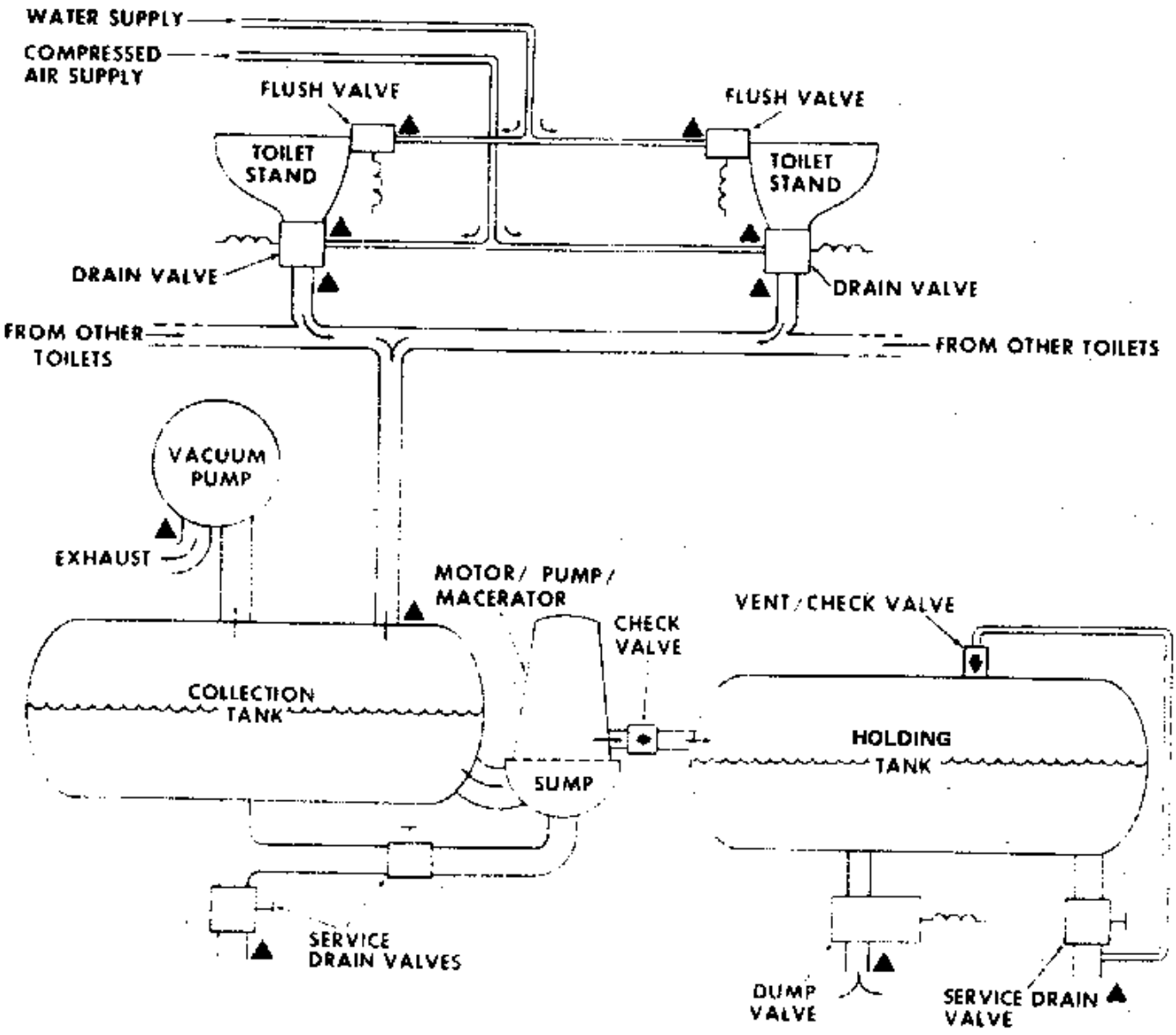


Figure 8-5. System and Toilets Flow Diagram

Under normal conditions, the waste is dumped automatically when commanded by the waste level in the collection tank. However, the disposal is inhibited if the car is stationary or where dumping is prohibited. A speed sensor is used to control the dump valve in this situation. This control prevents dump valve operation until the car attains a redetermined minimum speed.The controls also have provisions for manual switching to: (1) initiate an immediate dump followed by maceration of the batch in the collection tank; (2) establish a dump lockout for travel through zones with dumping restrictions and; (3) override the speed dump restriction to permit normal operation when stopped or below minimum speed.

The two-tank arrangement permits the use of the toilet system continuously without interruption. Waste can be collected in one tank while waste in the other tank is held for disposal. The transfer from one tank to the other is very rapid, permitting complete isolation of batches.

All valves and controls are electrical with the exception of: (1) the toilet drain valve which is electrically controlled but pneumatically actuated; and (2) the service drain valves which may be operated manually during system maintenance

8.3.1.1 System Components

The waste treatment system incorporates a collection tank, holding tank, pump/macerator, vacuum pump, treatment tank dump valve, level switch assembly,

level sensor assembly, drain valves and electrical control box. As illustrated in figure 8-6, all components are mounted on a frame which provides a centralized location for system installation.

Collection Tank - The collection tank receives all wastes transferred from the toilets. The total volume of the tank is 44 gallons. However, when tank contents reach the level of 22 gallons, the maceration process starts. An access cover (not normally removed) is located on one end of the tank to gain entry to the interior. On the other end, the collection tank liquid level sensor assembly is attached. Located on top of the tank are: (1) a waste inlet fitting which connects to the transfer line from the toilets; (2) a 4-inch port, for connection to the vacuum pump; and (3) a vacuum switch.

Located on the lower portion portion of the tank are: (1) a 3-1/2-inch flanged outlet which mates with the sump; (2) a magnetic plug which attracts ferrous objects; and (3) a 2-inch FPT fitting for connection to the tank drain valve and associated 2 inch drain plumbing.

The vacuum switch threads into the top of the collection tank. If the switch senses a lack of adequate vacuum between the toilet(s) and the collection tank, due to catastrophic leakage or non-operation of vacuum pump, the switch prevents flushing of the toilets.

Level Sensor Assembly - The level sensor assembly is comprised of three probes which extend through the mounting plate. They are connected to the electronic control unit module located inside the control box. The sensor mounting plate is attached to the end

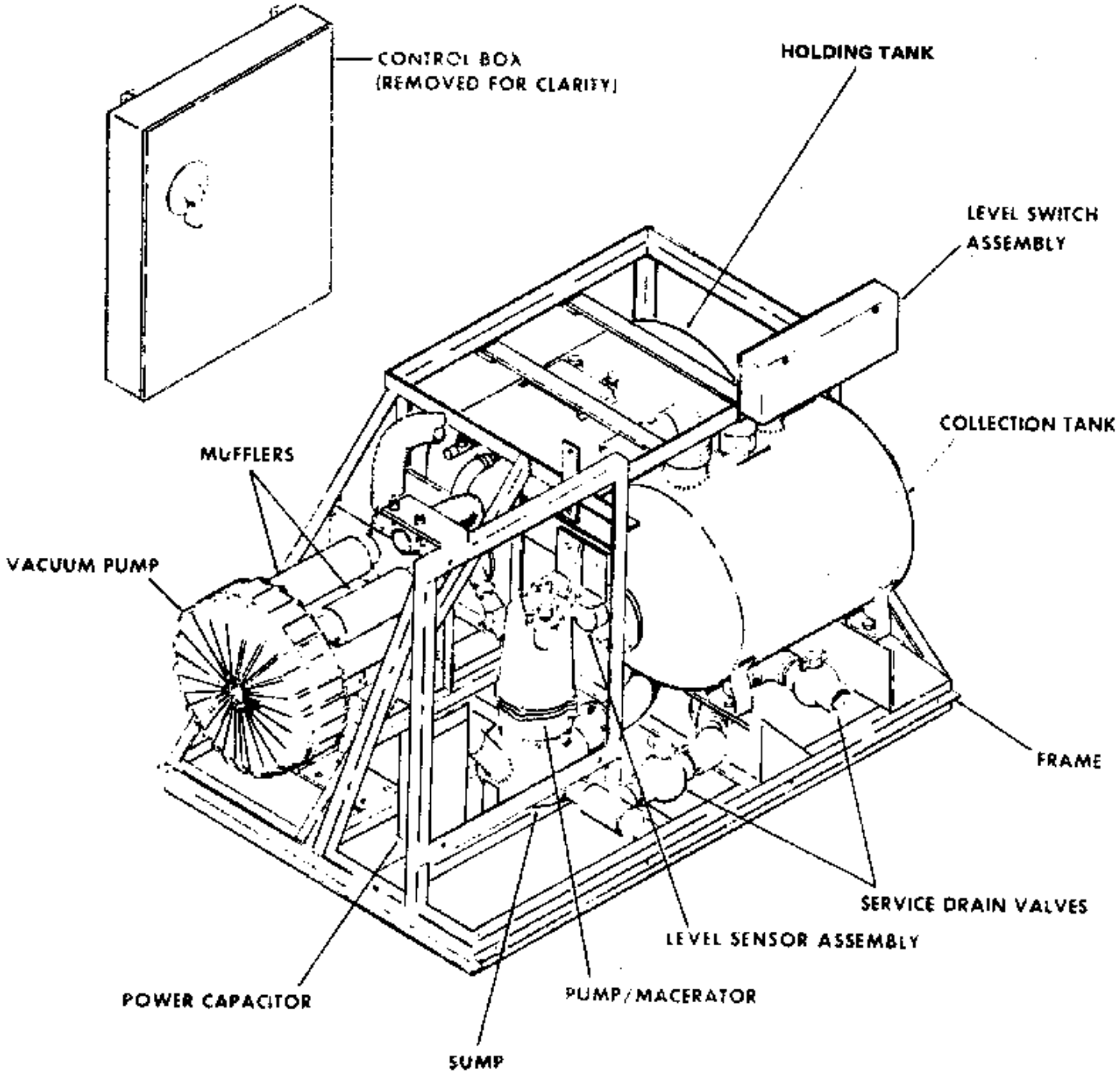


Figure 8-6. Waste System Components (Sheet 1 of 2)

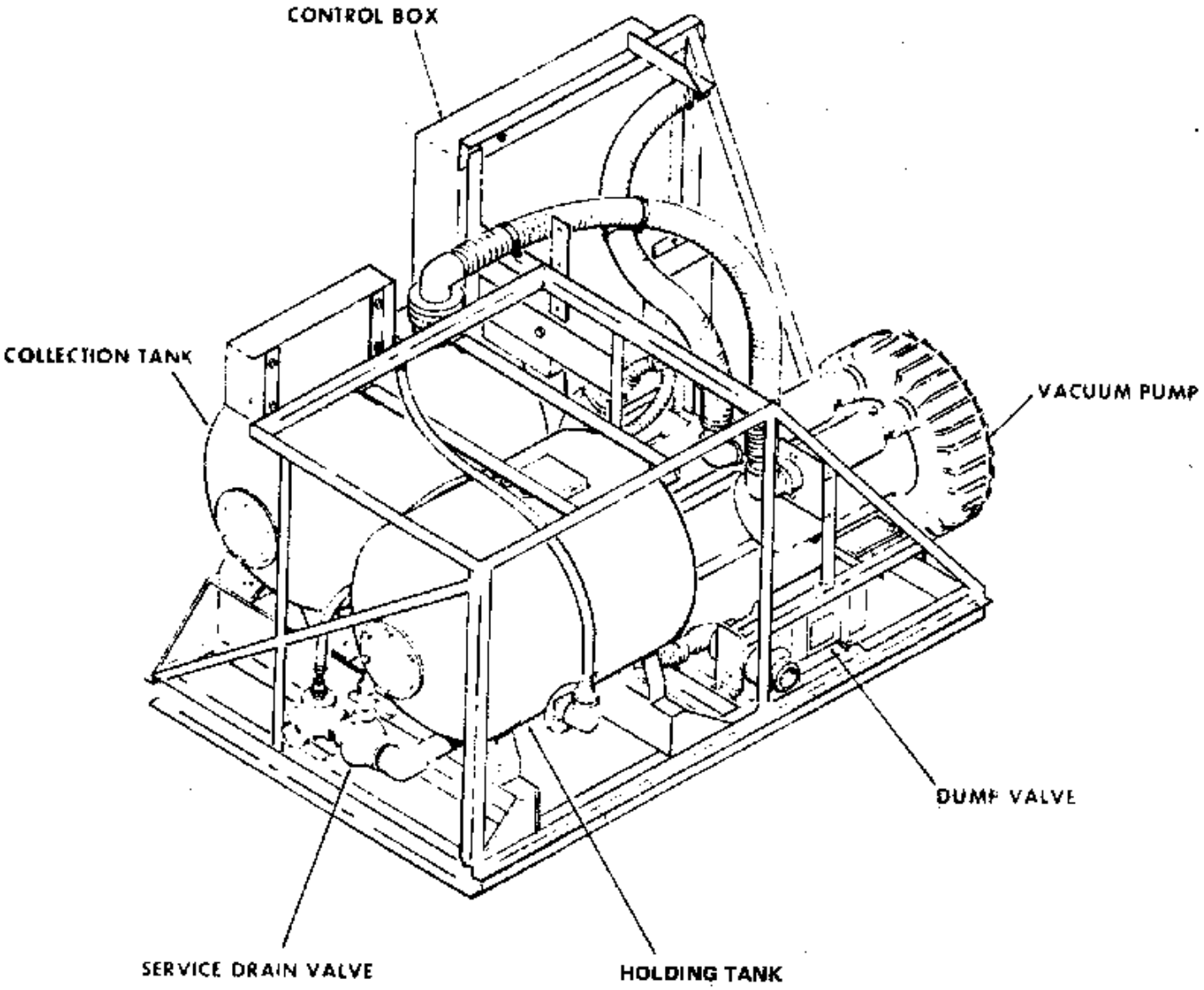


Figure 8-6. Waste System Components (Sheet 2 of 2)

of the collection tank. The three probes serve as electrodes to determine the level of contents in the collection tank.

The probes are located at two different levels to detect a low voltage pulse when conductive liquid is present for 1-1/2 seconds (to overcome effects of sloshing). When liquid contents of the collection tank amount to approximately 22 gallons, it will cover (contact) the lower two probes and a normal processing cycle will be initiated. The upper probe is provided to prevent toilets from flushing if the tank contents reach the level of approximately 26 gallons.

Vacuum Pump and Mufflers - The vacuum pump is driven by a 5 HP 480 volt, 3 phase motor. The pump operates for approximately 5 seconds each time a toilet is flushed. Connected to the collection tank by flexible ducting, the pump provides the air movement required to transfer waste from the toilets to the collection tank.

Two mufflers are employed with the vacuum pump. One is attached to the inlet port and the other to the exhaust port. The muffler connections are 2-inch FPT which mate with fittings of the associated ducting. Each muffler is attached to a bracket on the frame.

Sump - The sump connects the collection tank to the pump/macerator. It is located beneath the macerator and is mounted to the frame. The sump inlet flange is attached to the collection tank. A fitting on the side of the sump is connected to a manual drain valve and associated plumbing of the collection tank. Pump/Macerator and Check Valve - The pump/macerator (motor/pump/ macerator assembly), is a centrifugal pump incorporating a cutter assembly at the inlet. The macerator is driven by a 2 HP, 480 volt ac, 3 phase, 60

Hertz motor. During operation at a nominal flow of 50 GPM at 3 psi, waste from the collection tank is reduced to a slurry and is pumped through a check valve to the holding tank.

The check valve is installed to ensure liquid flow only in the direction to the holding tank during vacuum flushing. Installation of the check valve requires that the "hump" of the valve body be on top and that the arrow points to the holding tank.

Holding Tank - The holding tank receives waste from the pump/ macerator where it is retained for disposal. The tank is the same size as the collection tank and is mounted to the frame at each of its four legs. Also, like the collection tank, an access cover (not normally removed) is provided on each end to gain entry to the interior.

A vent line is located on top of the tank. On the bottom of the tank are: (1) an outlet which connects to the dump valve plumbing; (2) an elbow for connecting the manual drain plumbing; and (3) a fitting for attaching the air chamber assembly.

The air chamber assembly, mounted to the lower side of the holding tank, is connected by a flexible tube to the holding tank level switch in the level switch assembly. The switch prevents excess waste from being transferred from the collection tank when retention tank contents reach the 26 gallon level.

Holding Tank Dump Valve - The dump valve is an electrically actuated (120 volts ac), two-way ball valve. It dumps treated waste automatically when commanded by the waste level in the collection tank.

Level Switch Assembly - The liquid level switch assembly consists of an enclosure with hinged cover containing the "holding tank full" liquid level switch. The switch is connected to the 120 volt ac controls and is pressure actuated by an air column. It actuates when contents of the holding tank amount to 22 gallons.

Control Box Assembly - The control box contains the electrical distribution and control circuitry for system and toilet operation.

Inside the control box, the following components are located: (1) the waste system disconnect switch, to which 480 volt ac, 3 phase, 60 Hertz power source for the system and toilets is connected; (2) one motor starter/contactor each for the vacuum pump and the pump/macerator; the center contactor is not used at this time, (3) the transformer, which converts the 480 volt ac, 3 phase, 60 Hertz power to 120 volt ac, 1 phase, 60 Hertz power for the control circuit components and valves; (4) the liquid level sensor control unit; and (5) the control system.

The control system is powered by 120 volt single phase from the transformer and is mounted within a barrier inside the control box. It consists of the following: (1) the 10 amp circuit breaker; (2) the system program timer; (3) one terminal strip and; (4) the printed circuit board assembly, on which the toilet timers, the manual override relay and three terminal strips are mounted. The barrier is provided with a hinged cover which secures the toilet timers in place.

8.3.2 TOILET STAND ASSEMBLY

The toilet is composed of a stand, toilet bowl, trap, flush valve and drain valve (except the dining crew toilet which is a self contained system). See figure 8-7.

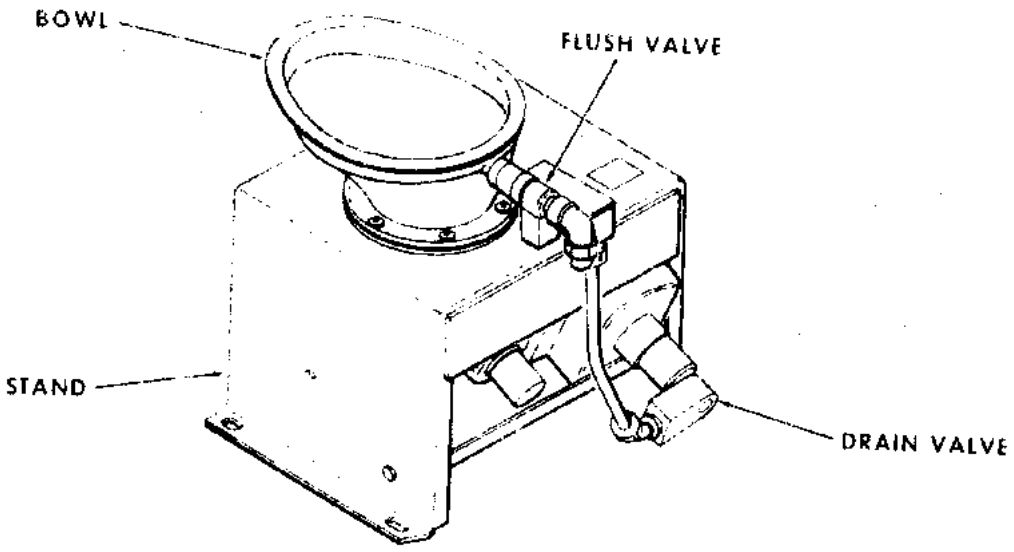


Figure 8-7. Toilet Components

The polished stainless steel bowl and trap are installed on top of the stand. Fasteners secure the assembly and a gasket provides a seal against leakage. A nozzle located at the upper rim of the bowl directs flush water in both directions around the bowl to clean the inner surface.

The trap is fabricated of cast aluminum and is teflon coated for proper cleansing.Its purpose is to prevent entry of large solid objects into the toilet drain which may cause an obstruction.

The solenoid operated flush valve permits the flow of flushing water into the toilet bowl when the flush button is pushed. The valve is mounted to the inlet tube at the rear of the bowl. Coupling is provided to interconnect with the pressure-regulated flushing water supply line.

Note

The flushing water system must have a regulated supply providing approximately 6 GPM at 9 psig pressure at the flush valve of each toilet.

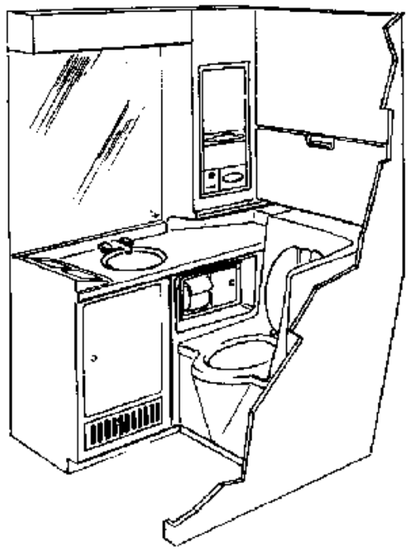
The toilet drain valve is a solenoid controlled, pneumatically actuated ball valve. It is located inside the toilet stand attached to the trap. The valve is provided with a 1-1/2 inch adapter tube for connection to the waste transfer line. An orifice is located on the valve body for connection to the compressed air system supply line.

Note

The compressed air system must have a regulated supply providing air pressure at 60-100 psig at the drain valve of each toilet. Also, the system requires that a safety interlock pressure switch (to provide open contacts when air pressure is lost) be installed and be electrically connected to the control box.

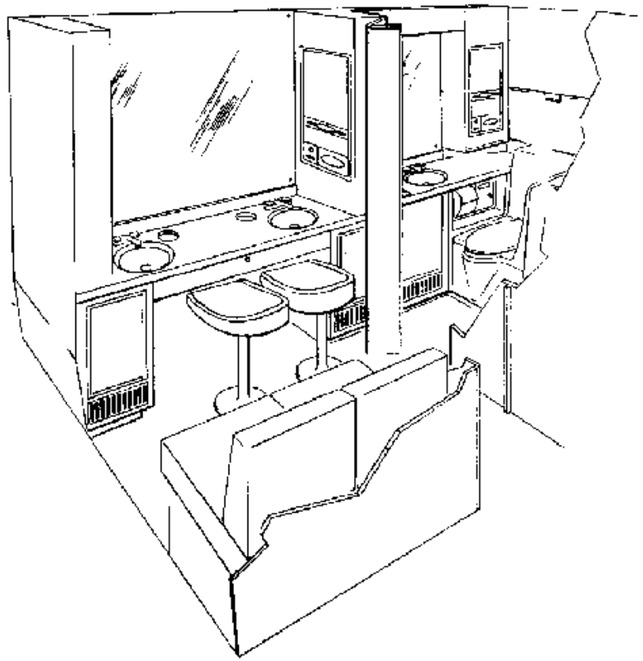
8.3.3. TOILET FACILITIES

Five various types of toilet room facilities have been installed in the coach, dining and sleeping bi-level areas. (See figure 8-8.) They are the unisex, handicapped persons, toilet and shower facility in the deluxe sleeper room, a women's lounge has a separate toilet room in the coach car and a crew's toilet facility in the lower level of the dining car.



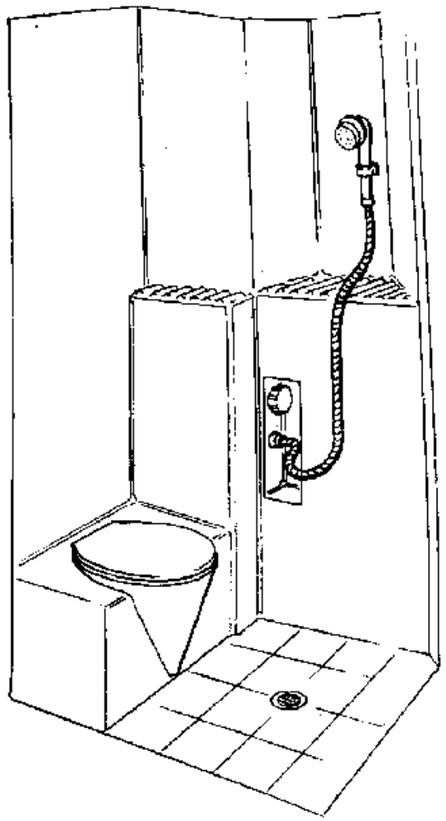
(a) Unisex

(b) Handicapped



(d) Women's Lounge

(e) Crew



(c) Deluxe Room

Figure 8-8. Toilet Room Facilities

Each toilet room is provided with a pressurized water system in order to operate the various plumbing fixtures.

The toilet room enclosures are made of a fibre glass reinforced plastic with stainless steel, having removable access panels for servicing. The toilet bowl is made of stainless steel and flush water cleaned with each flush. The toilet seats are made of a high-impact polystyrene plastic for durability.

The lavatory unit is comprised of an oval stainless steel bowl, a counter top and a backsplash surface area. One lavatory unit is located in each toilet room with the exception of the women's lounge area which has two.Each lavatory arrangement has a hot and cold water faucet with spring closing handles.

Each toilet facility, except as noted, contains the following accessory items.

- Ash tray
- Toilet paper holder
- Used razor blade disposal
- Sanitary napkin disposal (women's lounge only)
- Baby diaper disposal (except crew's toilet)
- Mirror, soap and towel dispenser combination
- Coat hooks
- Lounge sofa (women's lounge only)
- Vanity and chairs (women's lounge only)
- Infant changing table
- Convenience outlet (electric shaver use only)
- Shower facility (deluxe sleeper room only)

SECTION 9

TRUCK AND BRAKES

9.1 GENERAL

The AMTRAK bi-level cars are equipped with a two axle "H" frame truck (two (2) trucks per car) and an electrically actuated air brake system. The two trucks on each car are disc braked and have two inboard-mounted discs per axle. Each disc is braked by an individual penumatically operated brake cylinder.

The truck "H" frames are of welded steel construction. They utilize a primary and secondary suspension system for maximum passenger comfort and safety. The primary suspension is through individually damped coil springs. In addition, each axle box is longitudinally and laterally located from the truck frame by means of two leaf spring axle guiders. These guiders give virtually frictionless axle guiding, which results in greatly reduced noise, maintenance, and the precalibrated stiffeners of the bushings connecting the leaf guiders to the wheel sets allowing for optimum tracking of the axle when negotiating curves. The design of the primary suspension permits rapid wheel change-out and replacement of elastomeric bushings.

The secondary suspension consists of a spring plank supported by (from the truck frame) adjustable swing hangers. In turn, the spring plank supports two air springs onto which is mounted the truck bolster. The air spring suspension uses one levelling valve per truck and regulates the height of the car above the rail. Air for the suspension is obtained from the brake control unit.

On the bi-level car, side-to-side imbalance is catered for by adjustment of the torsion bar. The torsion bar, whose main function is to control body roll, is connected between the bolster and the truck frame cross girder.

The braking equipment for the bi-level cars is a two-pipe elect ro-pneumatic system. The cars are hauled by locomotives which have pneumatic control valves with provisions for electric trainline control actuation. This results in pneumatic brake applications that are electrically initiated or released simultaneously at each car of the train.

The main air high pressure reservoir is supplied from trainlined pressure through the car supply line. It receives air from the locomotive air compressor and maintains the supply reservoir at 130-150 psi. The supply reservoir, through the brake control unit, provides air to be utilized in the water raising system, auxiliaries, brake pipeline, and the truck levelling valves and truck air springs.

When the brake pipeline is pressurized, the brakes release and conversely when the brake pipeline is de-pressurized the brakes apply. When a brake application is initiated at the locomotive, the control unit responds to this brake pipe pressure reduction. The rate of reduction determines whether the required brake application is "Service" or "Emergency. "This reduction occurs essentially simultaneously on all cars when electro-pneumatic control is exercised. However, in the event of an electrical failure, the brake pipe pressure reduction initiated at the brake control valve at the locomotive will cause a pressure wave to be transmitted through the train, which results in a rapid, serial brake application to the end of the train.

Emergency brake applications can be initiated from the locomotive or from any of the three emergency vent valves via either of the two brake application valves on each of the cars. The control unit and reduction relay valve will respond on each car of the train, causing the train to stop at an emergency rate.

A reservoir, filled indirectly from the car supply line, supplies regulated air pressure to the car water tanks in the water raising system.

An electro-pneumatic wheel slide system is incorporated in the truck to take advantage of available adhesion, this minimizes stopping distance and increases wheel life.

9.2 TRUCKS

The trucks used on the bi-level car (figure 9-1) are of the outside bearing type, incorporating a welded frame, and swing links that incorporate the following features:

Adjustable swing links	- Adjusted to obtain correct spring plank height
Torsion bar	- Controls carbody roll
Hydraulic shock absorbers	- Damp the oscillations of the primary, and secondary and lateral suspension
Primary suspension	- Control wheel/rail interaction
	Primary suspension consists of a helical coil spring assembly. The wheel sets are located by leaf spring guiders
Secondary suspension	- Support car body and passenger weight Air springs
Car leveling system	- Maintains car in level position relative to the track.

The "B" end truck incorporates handbrake cables connected to two brake actuators, one per axle, to apply and release the handbrake.

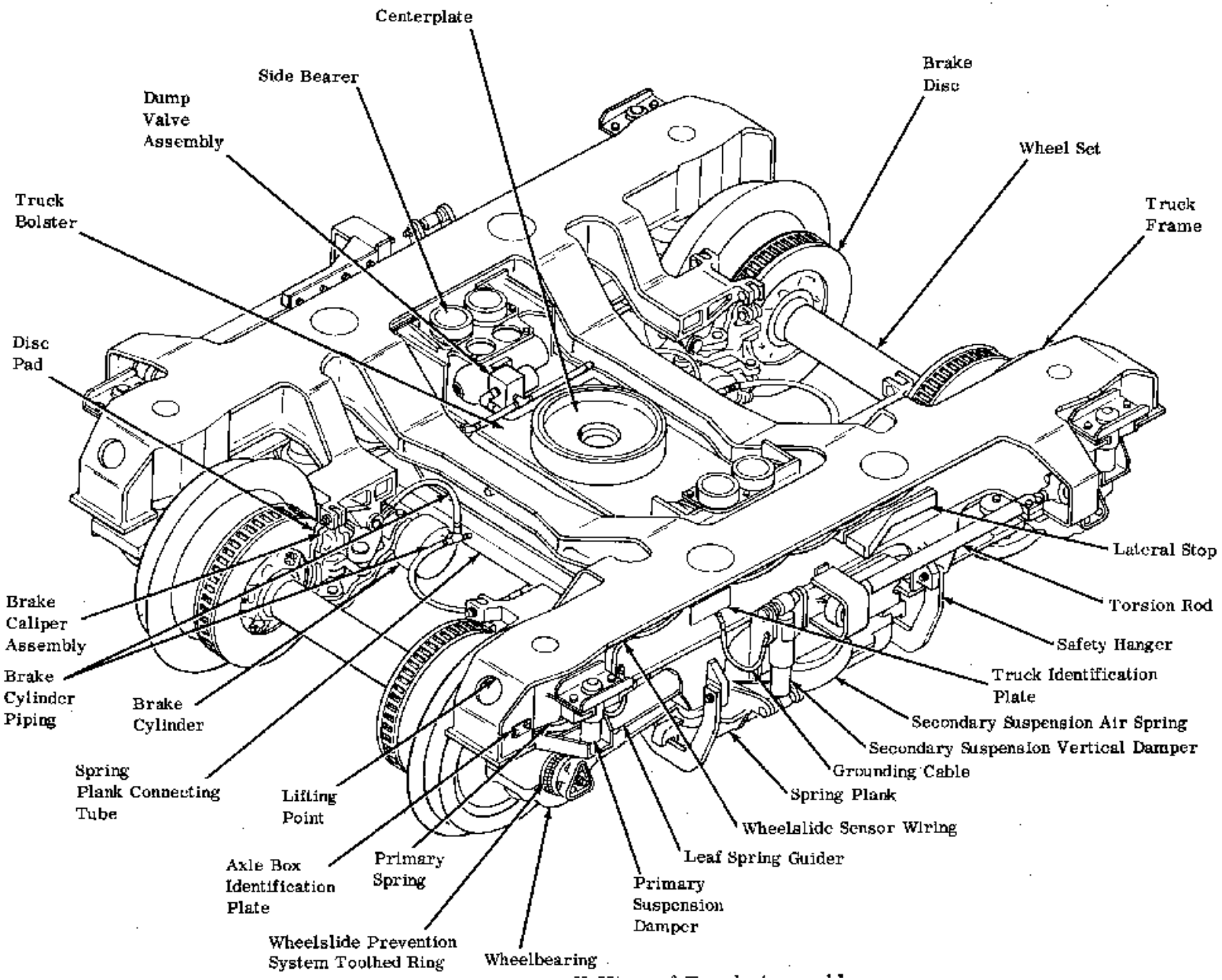


Figure 9-1. Overall View of Truck Assembly

9.2.1 LEVELING VALVES

There is one leveling valve per truck that detects variations in height of the air springs due to increased passenger load. It adds or exhausts air in the air springs to maintain the car body floor height. The leveling valve does not automatically compensate for reduction in floor height due to wheel wear or react to small-amplitude truck movement.

A choke and vented cut-out cock in the leveling valve air line to each truck prevents rapid air loss from the car in case of an air spring rupture.

9.2.2 AIR SPRINGS

The secondary suspension for the bi-level car is provided by a pair of air springs at each side of the truck bolster. Each pair of air springs is connected through damping orifices to a reservoir forming part of the suspension system. Orifice resistance to the transfer of air between the air spring and the reservoir provides vertical damping.

An auxiliary secondary suspension provided by steel springs supports the car body in case of air spring failure. This auxiliary system permits safe operation of the car.

9.3 BRAKES

The following is a description of the principal systems and operating components of the brake system in the AMTRAK bi-level car. Each bi-level car has a pneumatically controlled brake control system, with provisions for electric trainline control assist, which is capable of making service and emergency brake applications and releases. With this system, the pneumatic brake applications are electrically initiated or released simultaneously at each car in the train. In the event of electrical failure, the brake control system will function normally as a modern pneumatic system.

Service brake applications are controlled by the locomotive Engineer's brake valve. With the brake valve in the "release" position the brake pipe line is charged from the locomotive's main reservoir (130-150 psi) to a pressure of 110 psi. (See figure 9-2.)

When the brake valve is placed in a braking position (minimum service, full service, suppression, handle off, emergency) two separate braking functions are initiated:

a. The pressure in the brake pipe line is reduced all along the train in proportion to the amount of braking effort called for.

b. Simultaneously with the above the apply trainline energizes the apply magnet valve on each brake control unit, which initiates a simultaneous reduction in brake pipe pressure on each car.

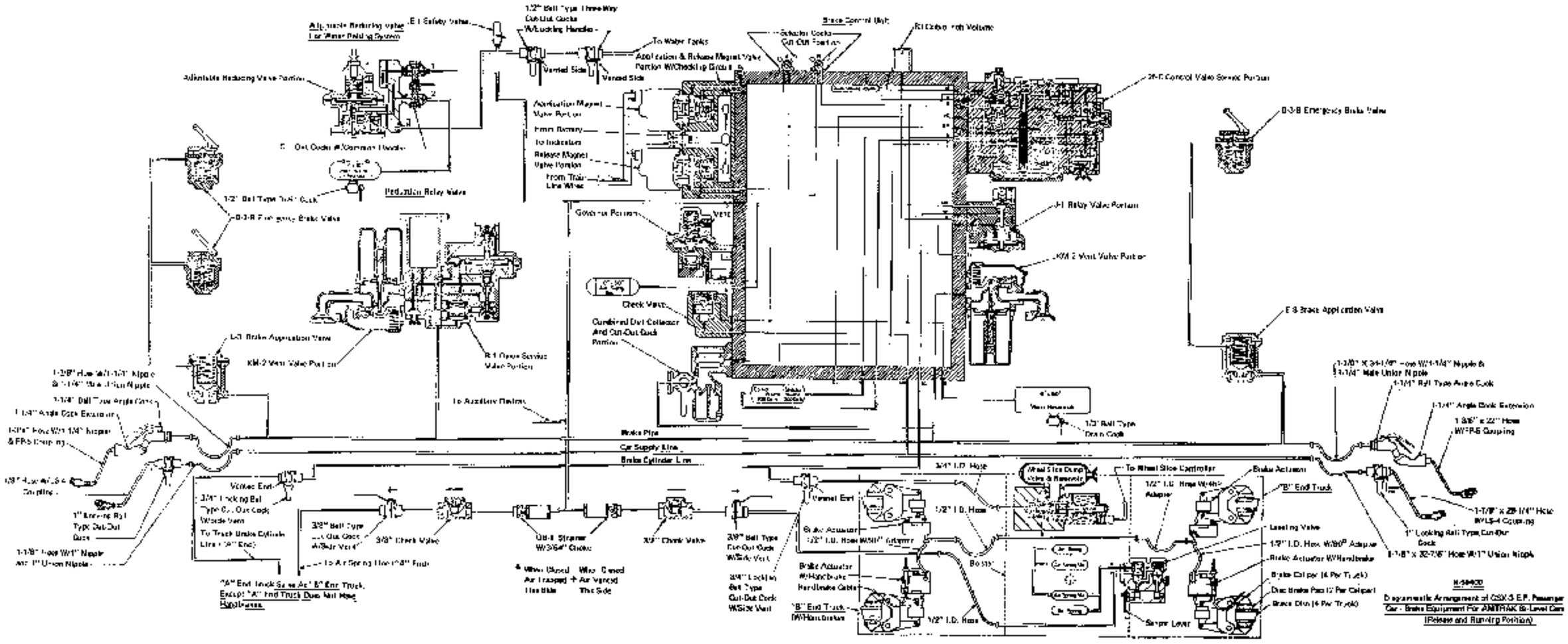


Figure 9-2. AMTRAK Bi-Level Electro-Pneumatic Brake System

The 26-C service control valve in the brake control unit (see figure 9-3) senses the amount of pressure reduction and vents air to the J1 relay valve at a pressure proportional to the reduction in brake pipe pressure. Upon activation by the air from the 26-C valve, the J1 relay valve takes air from the car's supply reservoir (130-150 psi), and increases its flow rate by allowing it to pass through a larger orifice, before directing it to the brake cylinder supply line (72 psi maximum service, 85 psi emergency).

When the Engineer's brake valve is placed in the "release" position the 26-C control valve vents its output to atmosphere, and the air from the J1 relay valve and from the brake cylinder line does likewise. Simultaneously, the release magnet valve is energized and allows air from the main reservoir line to charge the brake pipe line.

Failure of the electric assist feature results in the locomotive brake alone controlling the brake pipe air pressure, which leads to slower response times.

Leakage of air from the main reservoir line has no immediate effect on the braking system, and the brake pipe line remains fully charged. If the main reservoir line from the locomotive is disconnected,and, therefore, the brake pipe pressure is greater than the main reservoir pressure, a check. valve within the 26-C control valve allows air to flow from the brake pipe line to the car's supply reservoir. (When main reservoir line pressure is greater than brake pipe pressure no flow occurs.) After several brake applications the supply reservoir pressure reduces to that of the brake pipe line (110 psi fully charged).

If the main reservoir line pressure is very low, or has been disconnected, the electric assist function must be made inoperable, or the brakes will remain applied after an application. (Brake pipe is charged, through the release magnet valve, by the main reservoir line.)

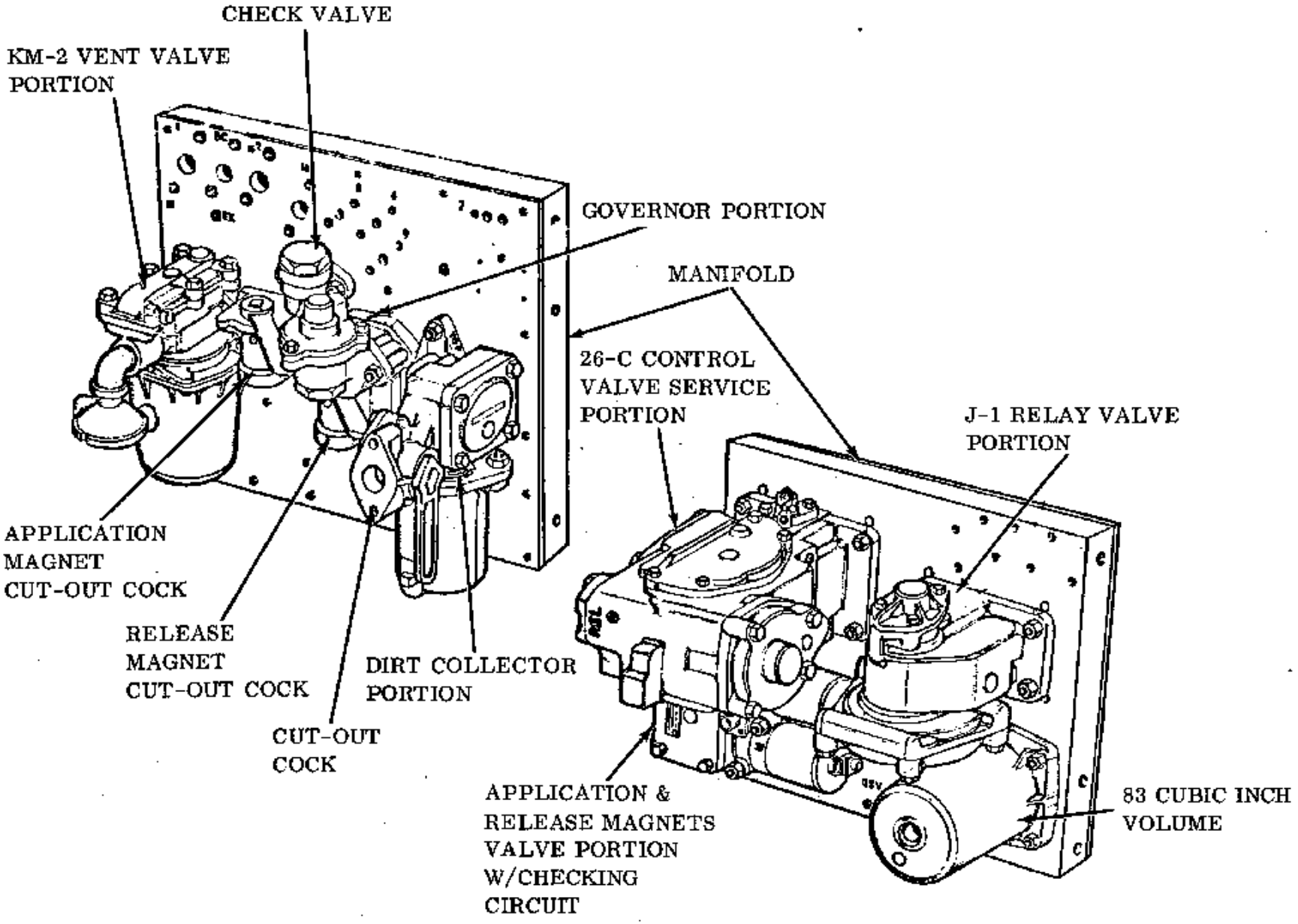


Figure 9-3. Brake Control Units

When the Engineer's brake valve is placed in the "emergency" position a vent valve within the brake valve initiates an emergency rate of pressure reduction in the brake pipe line, which causes the KM-2 vent valve's (2) on each car to connect directly to the brake pipe line. The KM-2 valves sense this emergency rate of brake pipe pressure reduction and vent the brake pipe air through a large orifice directly to atmosphere.

The electric assist function merely reduces brake pipe pressure by 20 psi to initiate a full service brake application during an emergency application.

An emergency brake application may also be initiated by the conductor's valve. The conductor's valve is connected to the brake pipe line through an E3 valve. The E3 valve basically consists of a spring-loaded piston, the pressure on either side of which is equalized by an interconnecting small orifice. When the conductor's valve is operated the pressure in the line connecting it to the E3 valve is vented to atmosphere. This sudden pressure reduction above the piston allows brake pipe pressure to raise the piston and expose an orifice connected directly to atmosphere. Brake pipe air vents directly to atmosphere at an emergency rate which, in turn, activates the KM-2 valves.

9.4 AUXILIARY AIR SUPPLY

All air supplying auxiliary devices is taken from the auxiliary supply reservoir. Before entering the auxiliary line the air flows through a governor valve which, when supply pressure falls below 80 psi, cuts off the air supplied to the auxiliary line.

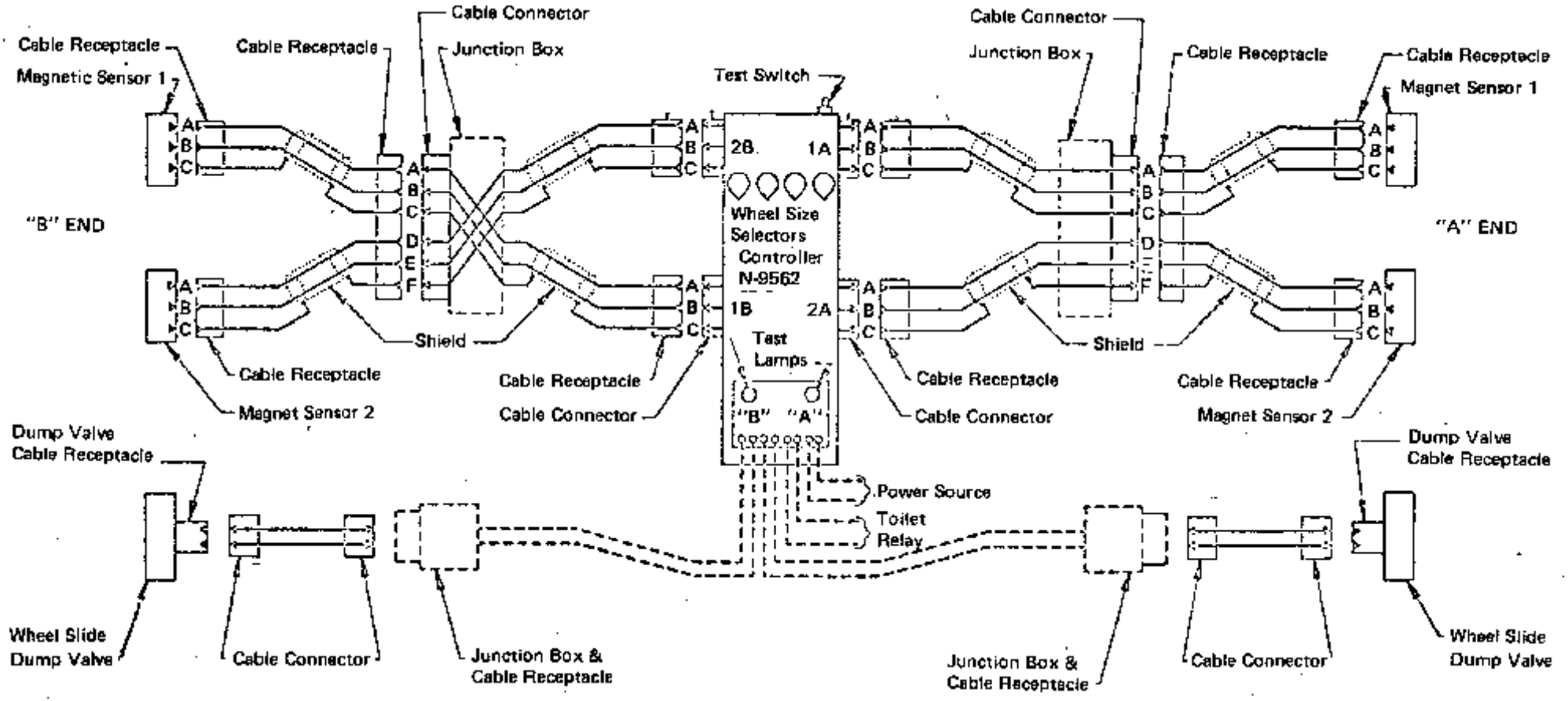
9.4.1 WHEEL SLIDE CONTROL SYSTEM

The wheel slide detection system receives and compares pulse counts supplied by each of the four magnetic sensors. If the pulse count between any pair of axles becomes sufficiently different, the wheel slide dump valve on the affected truck is energized and the brakes on that truck are released. When the wheels regain proper rational speed and return the pulse count to normal, the wheel slide dump valve is deenergized.

The system includes provision to prevent synchronous slip of all axles by monitoring the deceleration rate of one axle. If this rate exceeds a set value, brake pressure is released on that truck and the synchronism is broken. Also, a safety circuit will restore braking in the event that a dump valve is continuously energized for more than three (3) seconds. Compensation is provided to adjust the detector for wheel size variations due to wear.

The Electronic Wheel Slide Controller shown in figure 9-4 receives a signal pulse count from each Magnetic Sensor. It then compares the pulse count from one wheel with the pulse count of the other wheels.

If there is no wheel slide, these counts should always be the same, whereas if a wheel is sliding, there will be less counts from the sliding wheel than from those which are not sliding. The method of detecting which wheel is sliding is shown in figure 9-5.



NOTE: Controller located in electric locker.

Figure 9-4. Wheel Slide Control System, Wire Schematic

From figure 9-5 it can be seen that one wheel puts its pulses into a 60 counter, while that with which it is being compared puts its pulses into a 63 counter. These counters have the property that when the number of counts (60) is reached, a signal will appear at the counter output and this signal will stay on until the counter is reset by having a signal appear at its reset terminal. Note that the 60 counter sends its output to the reset terminal of both itself and the 63 counter. Therefore, if the wheels are revolving at the same speed, whether that speed be high or low, the 60 counter will "fill up, " make an output and turn both itself and the 63 counter back to zero. Resetting the counters back to zero turns off the output of counter 60 and allows the counting process to start over again. Thus, on a non-sliding car, the 60 counter will always count to 60 and start both over, count to 60 again.... start both over again and so on. However, in the event that the first axle slides, as soon as this axle is turning more slowly than the second axle, the 63 counter will fill and send its output to the wheel slide relay before the 60 counter can fill and start both over again.Of course, this detection system could only detect a slide on axle No. 1. Other detectors are connected between other axles in order to detect slides of these other axles, so that a total of four detectors like the one illustrated are required and these are present in the electronic system.

In the event of uneven wheel wear, there could be a time when the wheels on one truck would be significantly different in diameter from the wheels on another and as it is really a comparison of wheel travel that is being made, the sensitivity of the slide system might change. In order to guard against this, four 4-position counting switches are included on the electronics. Each of these switches has positions lettered A, B, C and D and a gage is supplied which in appearance is similar to a wheel inspector's rim thickness gage, except that instead of measuring rim thickness, it measures wheel tread diameter. This gage has corresponding letters A, B, C and D. When the car is in the wheel shop, and only at that time, after returned wheels are placed under the car, the inspector takes the gage, notes whether the wheels are in the A, B, C or D range individually, and then sets the corresponding switch to the position for each axle.

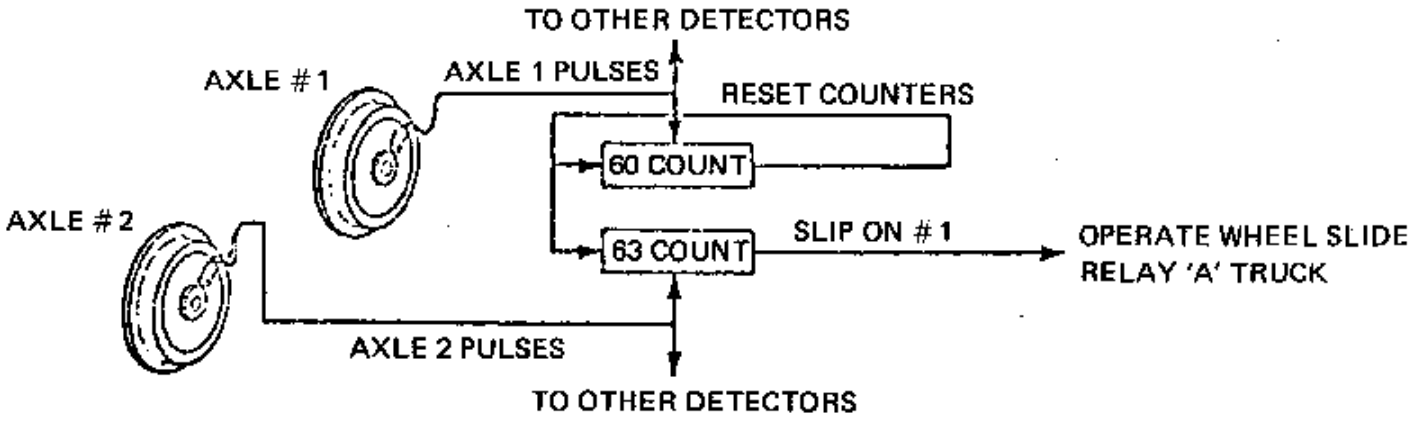


Figure 9-5. Electronic Wheel Slide Controller

Since this is a digital rather than an analog system, there is no necessity for calibration, meter reading, or fine tuning of any kind. Nor is it ever necessary to reset the calibration switches between wheel turnings, because the amount of wheel wear between wheel turnings is only 1/2" and the system will operate successfully with that much difference between wheels without the necessity to change compensating switch position. It is necessary to protect the dump valves from false energization. This is because if a failure of the wheel slide system energized the dump valve for an extended period of time, the braking on the car would be reduced by 50%. The protection system consists of a 3-second timer which begins timing whenever the dump valve is energized and will turn off the dump valve after 3 seconds. This timer will reset as soon as the dump valve signal is removed, thus remaining unaffected by temporary faults inthewheel slide system and at the same time not affecting dump valve performance on very bad rail, where the dump signal would be present for perhaps a second, then only briefly removed and reapplied for perhaps another second continually throughout the stop.

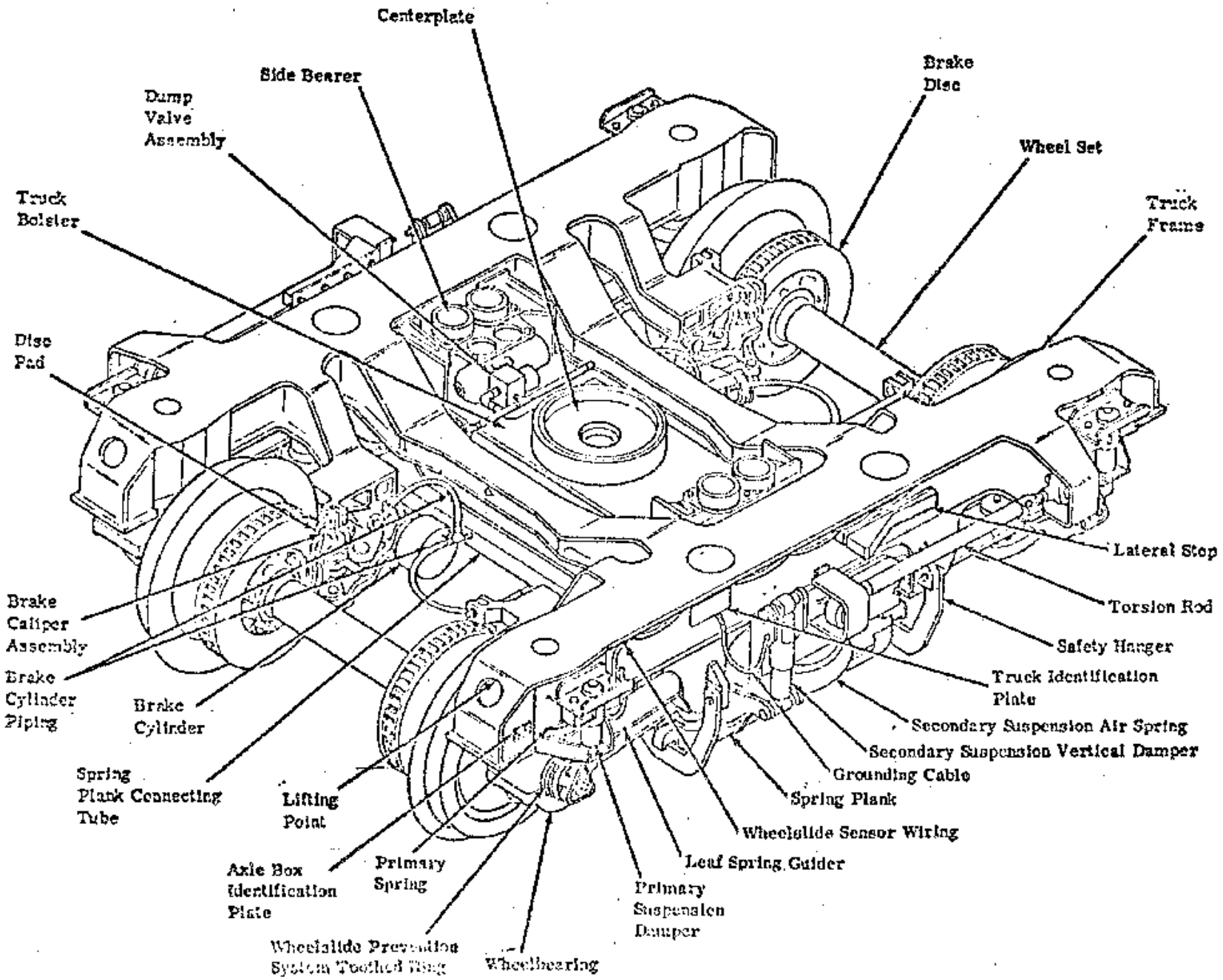
The system is also protected against synchronous slide by limiting the deceleration of one axle to 8 mphps. Thus, if the axle should attempt to decelerate synchronously in excess of that rate, the brake on the one axle would be removed, which would break the synchronism and permit the digital detection system to function in its normal manner.

9.4.2 WATER RAISING SYSTEM

Air flows from the auxiliary line to the water tanks through a pressure reducing valve (pressure reduced from 130-150 psi to 40 psi). This supply also feeds a buffer volume at 40 psi. The line contains a safety valve to prevent over pressurizing of the water tanks, and cut-out cocks for depressurizing the tanks when filling from either side of the car.

The air from the governor portion located on the brake control unit enters a port 1 on the adjustable reducing valve.
The valve limits the air pressure supplied to the water tank to a predetermined value somewhat below the controlled air pressure supplied to it. See figure 9-2. An outlet at port 2 goes to the water raising air reservoir. The reservoir is used to store air for use in water raising system. Another outlet is at port 3 which goes to the water tanks.

An E-1 safety valve prevents excessive air pressure in the system. The safety valve is set at about 5 pounds above the governor portion setting.



Overall View of Truck Assembly

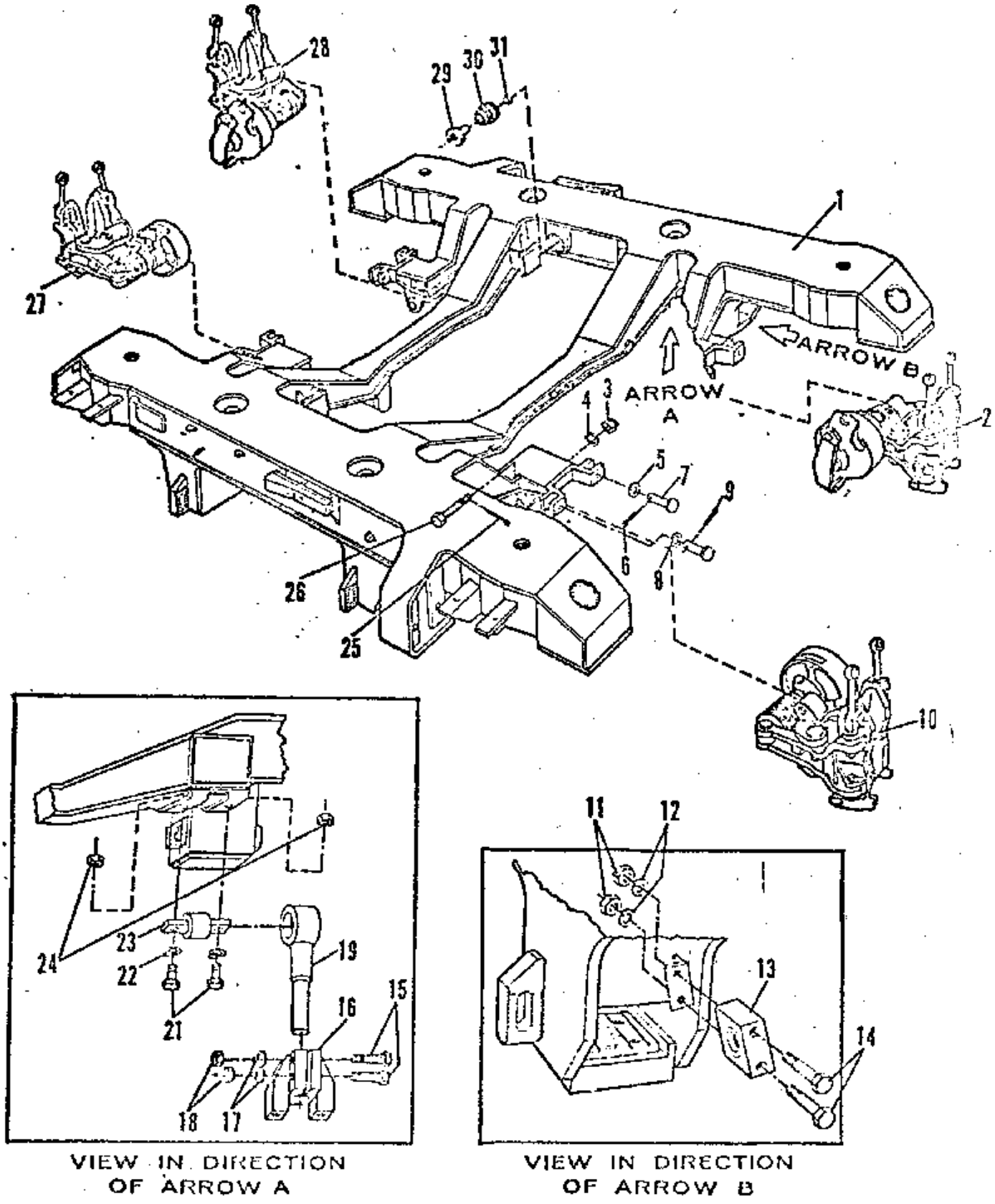


FIGURE 1

CALIPERS, TORSION BAR HANGERS, LATERAL STOPS, &
CABLE GUIDE ASSEMBLIES TO FRAME

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
1-1	705272	N-9584	Truck Frame, Complete (Weldment)	
1-2	705253	N-9577-1	Actuator, Brake, with Handbrake	1
1-3	753428	TE-130	Nut, Castle	4
1-4	753427	TE-129	Washer	4
1-5	753425	TE-127	Washer	4
1-6	8049	PR-53	Pin, Cotter, 3/16" Dia. x 1-1/2" Long	4
1-7	753424	TE-126	Pin	8
1-8	753425	TE-127	Washer	8
1-9	8049	PR-53	Pin, Cotter, 3/16" Dia. x 1-1/2" Long	4
1-10		N-9576	Actuator, Brake	1
1-11	96500	CR-633-A	5/16" - 18 Hex Nut	3
1-12	751554	MC-868	5/16" Lock Washer (Cad. Pl.)	8
1-13	753922	TE-209	Guide, Cable	4
1-14	751556	MC-869	Bolt, Hx.Hd.,5/16-18 x 2-3/4 Long (GR.5)	8
1-15	753393	TE-95	Screw, Hx.Hd. Cap, 1/2-13 UNC-2A x 3-1/2" Long (Cad. Pl.)	3
1-16	753695	TE-208	Head, Fork	4
1-17	753376	TE-78	Washer, Lock w-Tab, 1/2" Nom.	8
1-18	502365	CV-424	1/2-13 Hex Nut (Cad. Pl.)	8
1-19	753694	TE-207	Rod, Tie	4
1-21	753385	TE-87	Screw, Hx. Hd. Cap, 3/4"-10 UNC-2A x 2-1/2" Long (Cad. Pl.) (GR-5)	8
1-22	753374	TE-76	Washer, Lock w-Tab, 3/4" Nom.	8
1-23	753693	TE-706	Spheribloc	4
1-24	555414	DEC-115	3/4-10 Hex Nut	3
1-25	754335	TA-1801	5/32" x 1-1/2 Cotter Pin	4
1-26	753426	TE-128	Bolt, Shoulder	4
1-27		N-9573	Assembly, Caliper	1
1-28	705325	N-9577-2	Actuator, Brake w/Handbrake	1
1-29	753355	TE-57	Bumper, Plastic	4
1-30	753356	TE-58	Spring, Lateral Stop	4
1-31	753357	TE-59	Retainer, Bumper	4

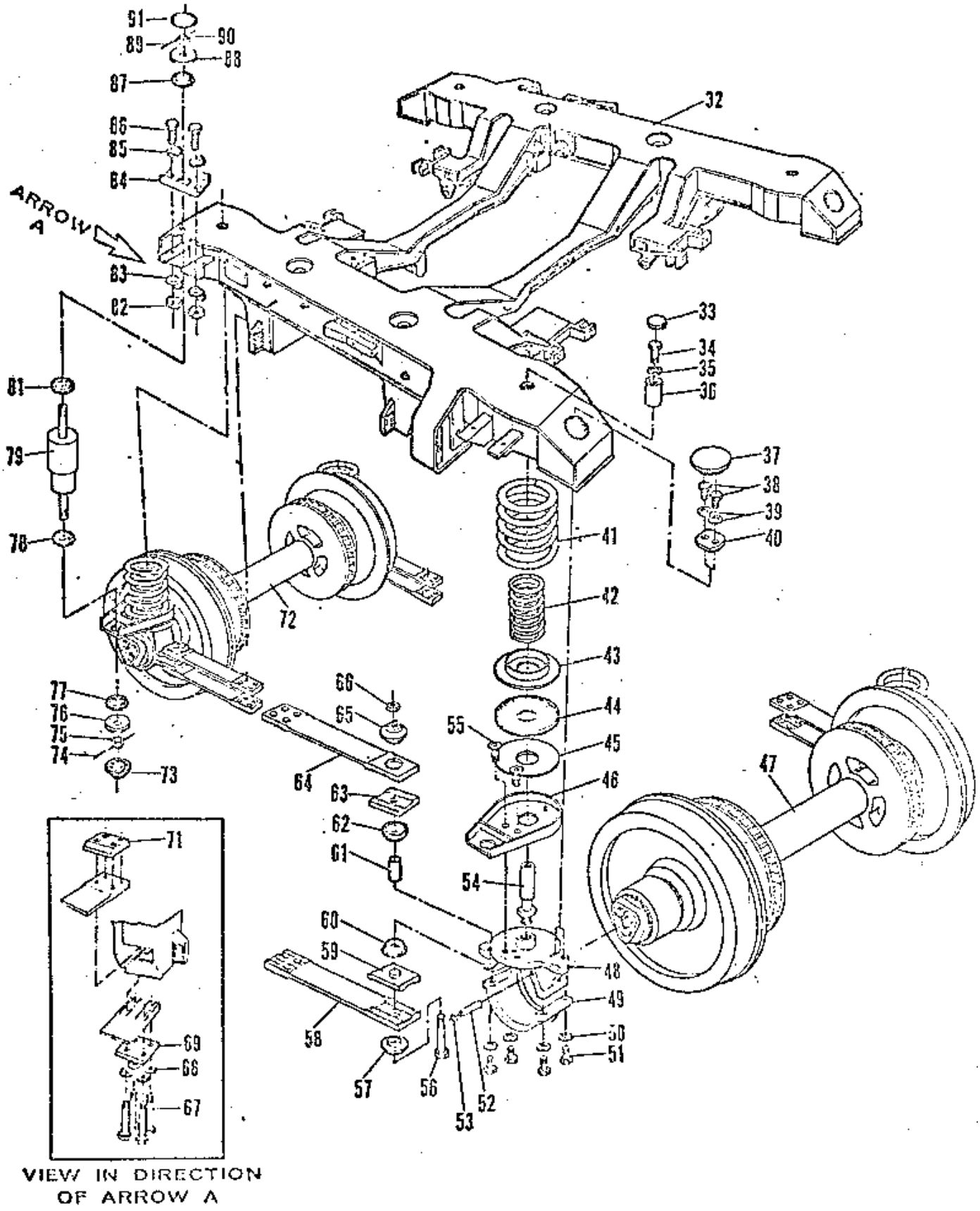


FIGURE 2
PRIMARY SUSPENSION ASSEMBLY TO FRAME

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
2-32	705272	N-9584	Truck Frame Complete (Weldment)	
2-33	753367	TE-69	Cap, Weather	4
2-34	753377	TE-79	Screw, Hx. Hd. Cap, 3/4"-10 (Cad.Pl.)(GR-5)	4
2-35	753477	TE-179	Washer, Lock, Belleville Type (A40)	4
2-36	753365	TE-67	Sleeve, Emergency Guiding Retainer	4
2-37	753368	TE-70	Cap, Weather	4
2-38	753391	TE-93	Screw, Hx.Hd. Cap, 3/4"-10 UNC-2A x 2" Long (Cad Pl.)	8
2-39	753374	TE-76	Washer, Lock, w/Tab, 3/4 Nom.	8
2-40	753366	TE-68	Retainer, Security Plate	4
2-41	753451	TE-153	Spring, Outer	4
2-42	753452	TE-154	Spring, Inner	4
2-43	753363	TE-65	Guide, Spring	4
2-44	753362	TE-64	Washer, Rubber	4
2-45	753361	TE-63	Shim	4
2-46	753360	TE-62	Bracket, Lower (Shock Absorber)	4
2-47	705225	N-9551	Axle Assembly (See Fig. 11) (Includes Index Nos.	4 *
2-48	753449	TE-151	Adapter, Bearing, Upper Left	4
2-49	753450	TE-152	Adapter, Bearing, Lower	4
2-50	514415	DEC-114	3/4" Standard Lock Washer	16
2-51	753385	TE-87	Screw, Hx.Hd. Cap, 3/4"-10 UNC - 2A x 2-1/2" Long (Cad.Pl.)(GR-5)	16
2-52	753216	TE-42	Heat Indicator (Smoke Type)	4
2-53	753217	TE-43	Ring, Retaining, Snap Type	4
2-54	753359	TE-61	Bolt, Emergency Guiding	4
2-55	753686	TE-200	Screw, Slotted Countersunk Flat Hd. 5/8" - 11 x 1-1/4" Long	8
2-56	753458	TE-160	Bolt, Tensioning	4
2-57	753456	TE-158	Plate, Retainer	4
2-58	753453	TE-155	Guide, Axle	4 *
2-59	753455	TE-157	Plate, Serrated	2
2-60	753454	TE-156	Bushing, Rubber	4
2-61	753688	TE-201	Bushing	4
2-62	753454	TE-156	Bushing, Rubber	4
2-63	753455	TE-157	Plate, Serrated	2
2-64	753453	TE-155	Guide, Axle	4 *
2-65	753457	TE-159	Plate, Retainer Nut	4
2-66	754364	TE-231	Nut, M 24 x 1.5	4
2-67	753463	TE-165	Bolt, Axle Guider, Special	16
2-68	753464	TE-166	Washer, Positive Lock, Special	16
2-69	753462	TE-164	Plate, Axle Guider	4
2-70	753453	TE-155	Guide, Axle	8
2-71	753461	TE-163	Plate, Thrust	4
2-72	705225	N-9551	Axle Assembly (See Fig. 11) (Includes Index Nos.	2 *
2-73		TE-184	Boot, Rubber	1
2-74	753499	TE-168	Cotter, 1/8" x 1-1/2" Long	1
2-75	753431	TE-183	Nut	1
2-76	753430	TE-182	Retainer	1
2-77	753479	TE-181	Grommet, Rubber	1

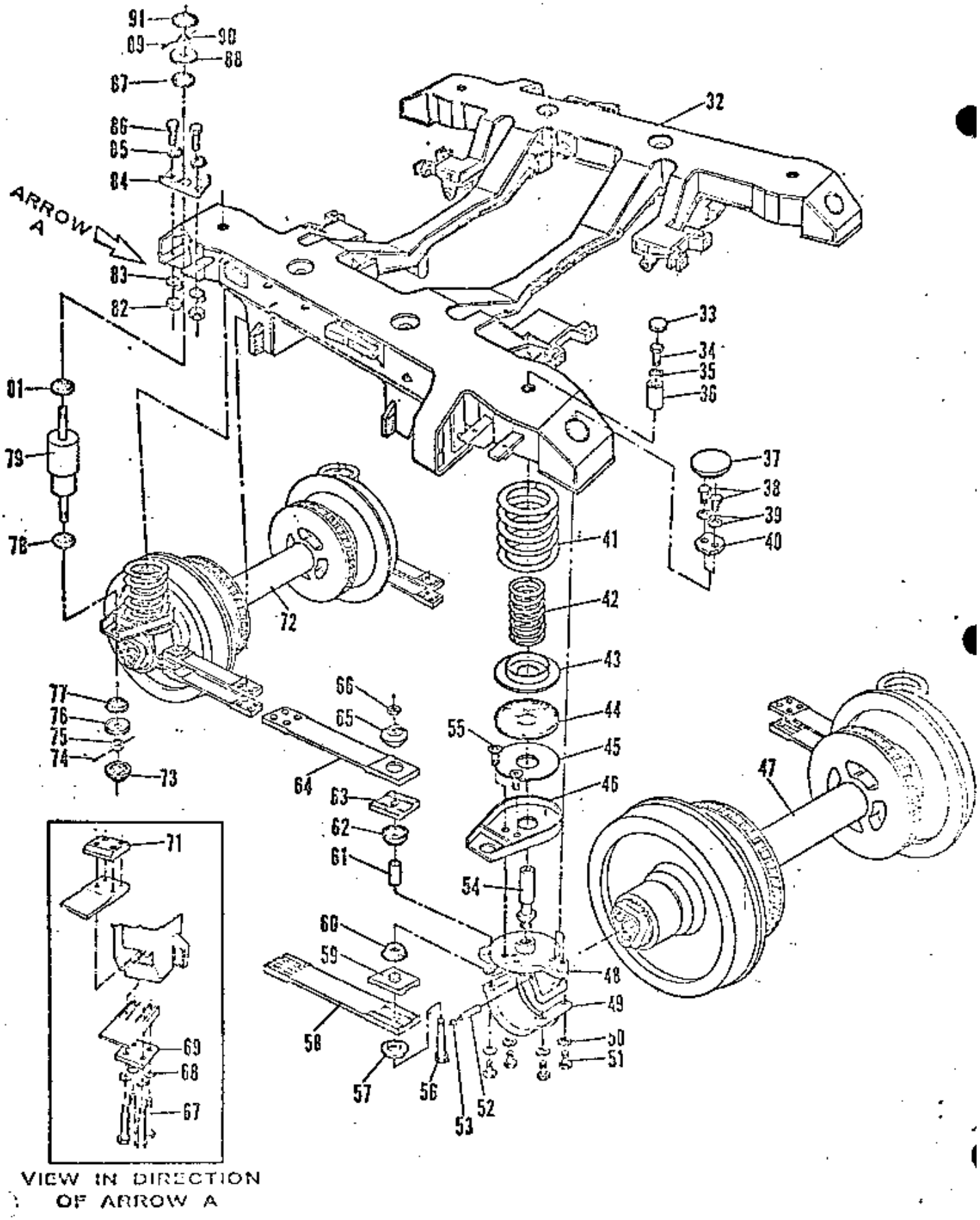


FIGURE 2
PRIMARY SUSPENSION AS ASSEMBLY TO FRAME
T-6

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
2-78	753479	TE-181	Grommet, Rubber	1
2-79	753478	TE-180	Shock Absorber, Less Fittings	1
2-81	753479	TE-181	Grommet, Rubber	1
2-82	502387	CR-1278	5/8" - 11 Hex Nut	8
2-83	754143	TE-216	Washer, Special Positive Lock, 5/8"	8
2-84	753364	TE-66	Bracket, Upper (Shock Absorber)	1
2-85	754143	TE-216	Washer, Special Positive Lock, 5/8"	8
2-86	753392	TE-94	Screw, Hx. Hd. Cap, 5/8 - 11 UNC -2A x 1-3/4" Long (Cad.Pl.)	8
2-87	753479	TE-181	Grommet, Rubber	1
2-88	753480	TE-182	Retainer	1
2-89	753499	TE-188	Cotter, 1/8" x 1-1/2" Long	1
2-90	753481	TE-183	Nut, Lock (Special)	1
2-91		TE-184	Boot, Rubber	1

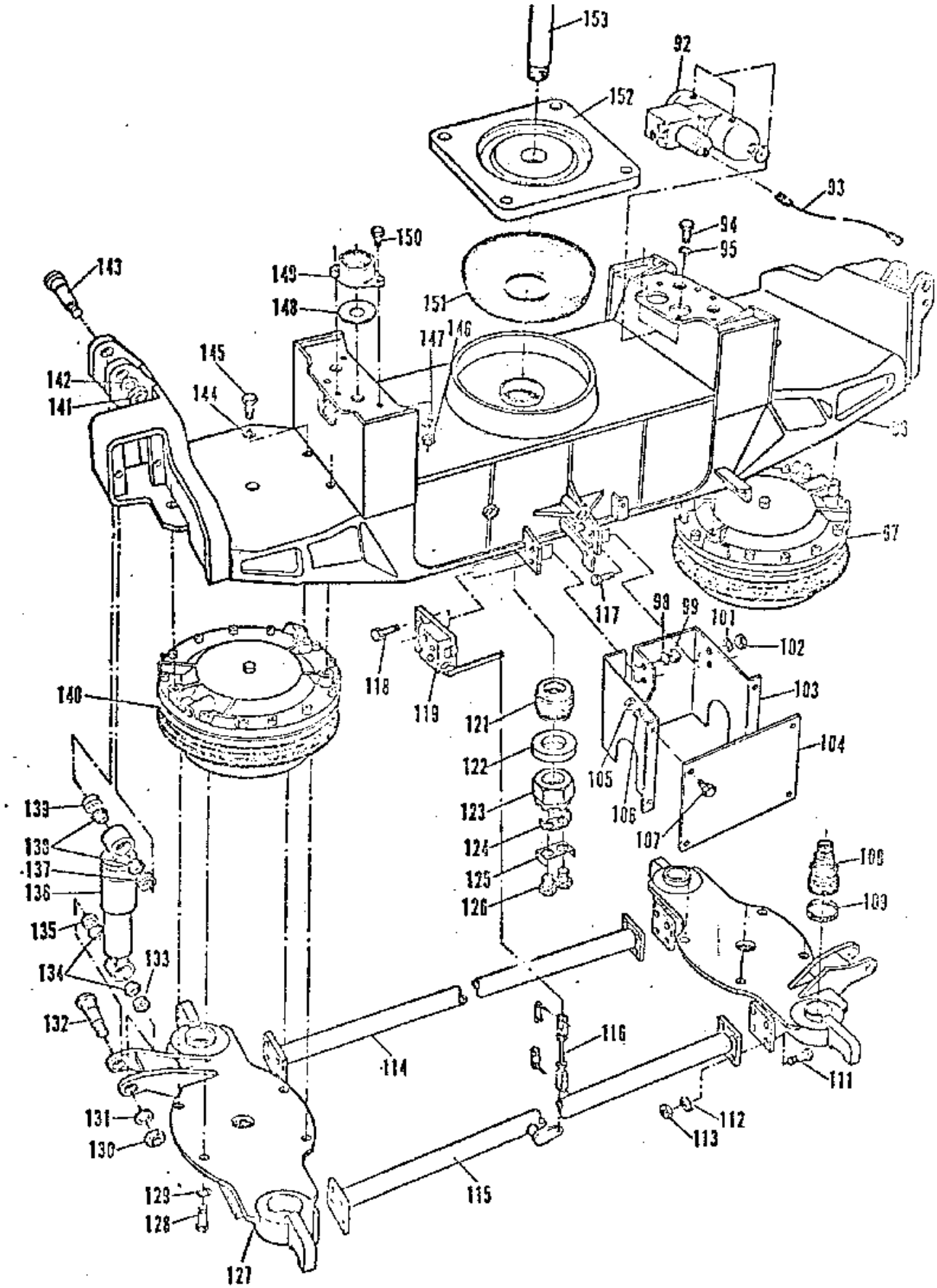


FIGURE 3
BOLSTER AND SPRING PLANK ASSEMBLY

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
3-92	705234	N-9559	Assembly, Reservoir and Dump Valve (Includes Index Nos. (See Fig. 15)	1
3-93	705297	N-9608	Assembly Cable (Includes Index Nos. (See Fig. 3)	1
3-94	5328	PG-356	1/2"-13 x 1" Hx. Hd. Cap Screw	4
3-95	15951	OC-289	1/2" Lock Washer	4
3-96	753369	TE-71	Weldment, Bolster	1
3-97	705291	N-9597	Assembly, Air Spring (Includes Index Nos. (See Fig. 10)	1
3-98	514276	CR-289	3/8" Lock Washer	2
3-99	502367	TA-2244	Nut, Hx. 3/8"-16	2
3-101	17173	CP-333	Lock Washer, 3/8"	2
3-102	1296	AV-224	3/8"-16 Hex Nut	2
3-103	753372	TE-210	Cover, Plate, Complete	1
3-104	753373	TE-211	Cap	1
3-106	9469	VV-82	Washer, Lock	4
3-107	41558	TA-1320	5/16"-18 x 3/4" Hx. Hd. Cap Screw	4
3-108	753370	TE-195	Bellows	4
3-109	753371	TE-196	Clamp Hose	4
3-110	753394	TE-96	Plank, Spring (Left)	2
3-111	753397	TE-99	Screw, Hx.Hd. Cap, 5/8-11 UNC-2A x 2" Long (Cad.Pl.)	16
3-112	753375	TE-77	Washer, Lock, w-Tab, 5/8" Nom.	16
3-113	502387	CR-1278	5/8"-11 Hex Nut	16
3-114	753395	TE-97	Rod, Connecting	1
3-115	753396	TE-98	Rod, Connecting w/ Bracket	1
3-116	705323	N-9600	Assembly, Rod	1
3-117				
3-118	562463	CV-1177	1/8" x 1-3/4" Screw	2
3-119	705322	N-9529	Valve, Leveling (see Fig. 16) (Includes Index Nos.	1
3-121	753319	TE-50	Bushing, Guide (Rubber)	1
3-122	753320	TE-51	Washer, Flat	1
3-123	753322	TE-53	Nut, Castle	1
3-124	753321	TE-52	Hoop, Safety	1
3-125	753553	TE-169	Washer, Lock w/Tabs (Special)	1
3-126	514274	VV-347	3/8-16 x 1" Hx.Hd. Cap Screw	2
3-127	753405	TE-167	Plank, Spring (Right)	1
3-128	526010	DC-1089	1/2-13 x 1-1/2 Hx.Hd. Cap Screw	4
3-129	514281	CR-1525	Lock Washer, 1/2 (Cad.Pl.)	4
3-130	753442	TE-144	Nut, Hx., 1" - 12 UNF - 2B	2
3-131	753441	TE-143	Washer	2
3-132	753440	TE-142	Pin	2
3-133	753439	TE-141	Washer	1
3-134			Washer, Rubber	2
3-135	753438	TE-140	Washer	1
3-136			Shock Absorber	
3-137	753439	TE-141	Washer	1
3-138			Washer, Rubber	2
3-139	753438	TE-140	Washer	1
3-140	705291	N-9597	Assembly, Air Spring	1
3-141	753442	TE-144	Nut, Hx., 1" - 12 UNF - 2B	2

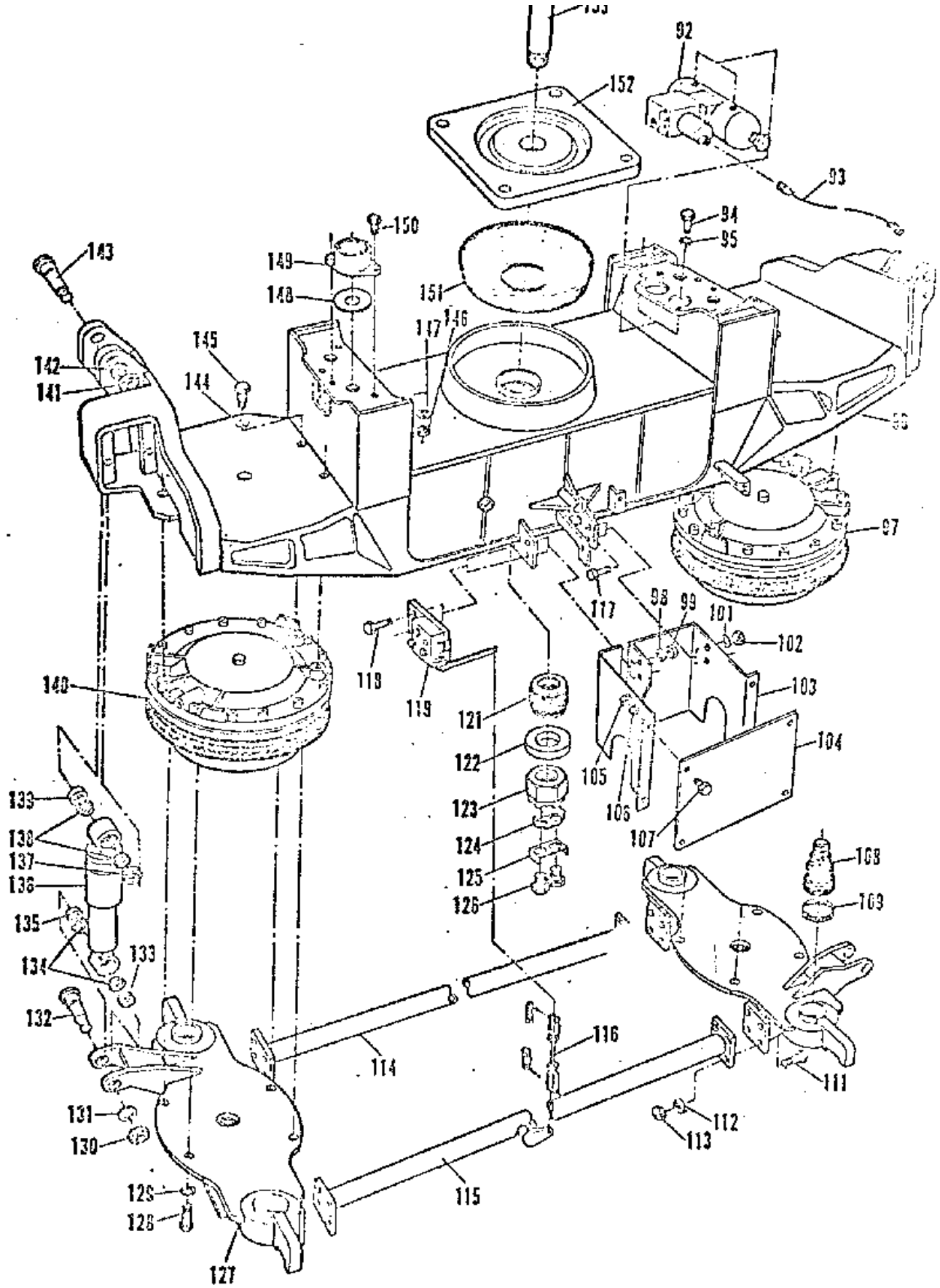


FIGURE 3
BOLSTER AND SPRING PLANK AS ASSEMBLY
T-10

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
3-142	753441	TE-143	Washer	2
3-143	753437	TE-139	Pin	2
3-144	514231	CR-1525	Lock, Washer, 1/2" (Cad.Pl.)	2
3-145	526010	OC-1039	1/2 x 1-1/2 Hx. Hd. Cap Screw	2
3-146	753433	TE-135	Nut, 7/16" - 14 UNC (Cad.Pl.)	8
3-147	754365	CR-290	Washer, Lock 7/16"	8
3-148	753434	TE-136	Shim	4
3-149	705319	N-9626	Elastic Side Bearing	4
3-150	753432	TE-134	Screw, Hx. Hd. Cap, 7/16" - 14 UNC - 2A x 1-3/4" Long (Cad.Pl.)	8
3-151	753318	TE-49	Liner, Centerplate	1
3-152	753311	TE-45	Centerplate, Upper	1
3-153	753220	TE-44	Pin, Center	1

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
4-154	753369	TE-71	Weldment, Bolster	1
4-155	753444	TE-147	Screw, Hx.Hd. Cap, 5/8"-11 UNC-2A x 2-1/4" Long	2
4-156	753036	TE-90	Bushing, Rubber	2
4-157	753033	TE-88	Bar, Torsion	1
4-158	753038	TE-90	Bushing, Rubber	2
4-159	753037	TE-89	Retainer	2
4-161	753374	TE-76	Washer, Lock, w/Tab, 3/4 Nom.	4
4-162	753390	TE-92	Screw, Hx. Hd. Cap, 3/4"-10 UNC-2A x 4-1/2" Long (Cad.Pl.)	4
4-163	753693	TE-206	Spheribloc	2
4-164	753435	TE-139	Block, Anchor	2
4-165	754176	TE-219	Washer, Lock, Modified	2
4-166	502337	CR-1278	5/8"-11" Hex Nut	2
4-167	705300	H-9614	Assembly, Lateral Guide Link	1
4-168	502337	CR-1278	5/8" - 11" Hex Nut	2
4-169	754176	TE-219	Washer, Lock Modified	2
4-170	753445	TE-147	Screw, Hx. Hd. Cap, 5/8"-11 UNC - 2A x 2-1/4" Long	2

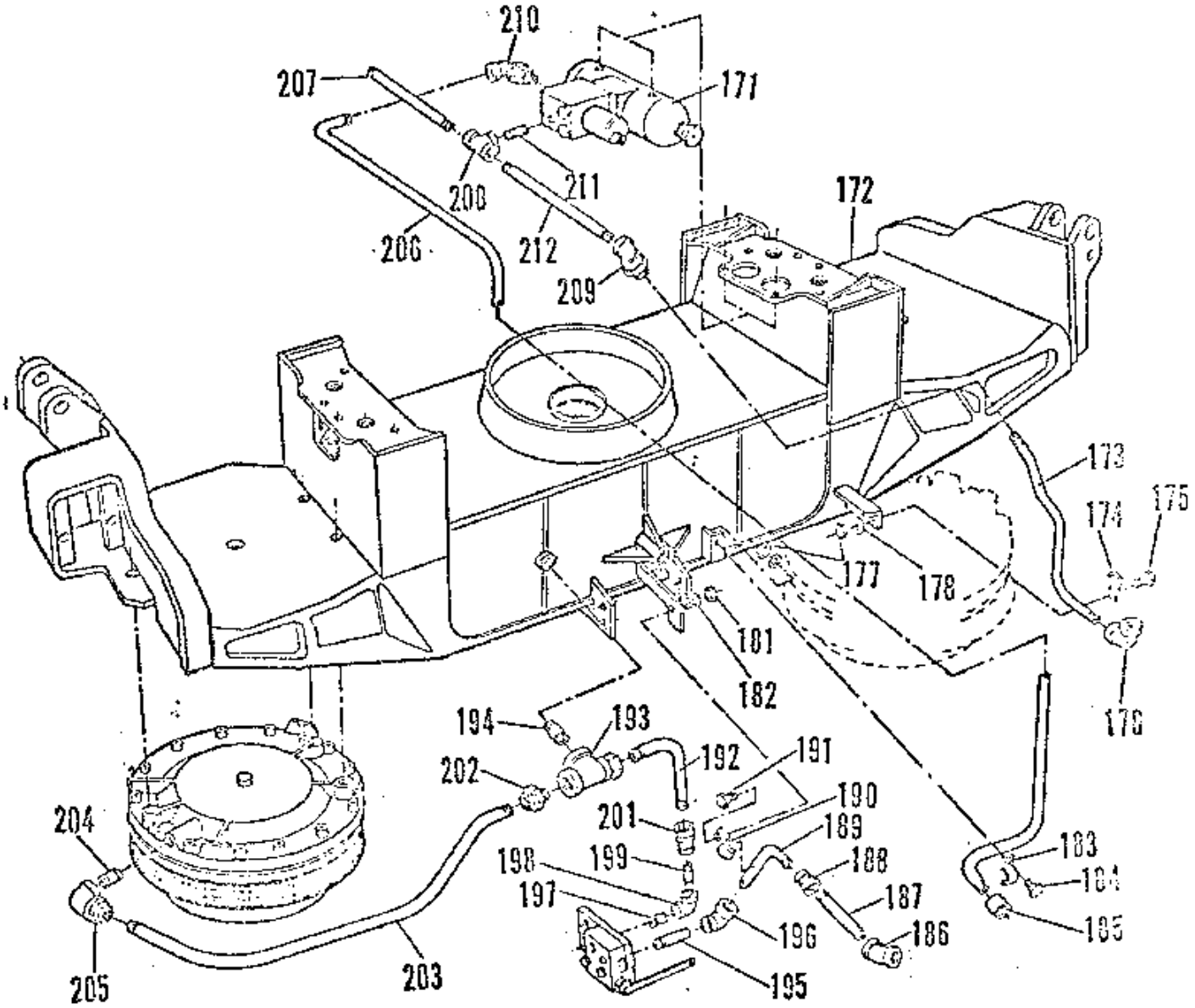


FIGURE: 6

BOLSTER PIPING AS VIEWED FROM "B" END OF T TRUCK

FIG. & INDEX	PART NO.	DRG. NO.	DESCRIPTION	NO. REQ.
5-171	705234	N-9559	Assembly, Reservoir and Dump Valve	
5-172	705275	N-9558	Bolster, Complete ("B" End)	
5-173	753470	TE-172	Pipe, 1/2" Formed	1
5-174	753472	TE-174	Clamp, 1/2" Pipe	1
5-175	7978	CC-174	3/8-16 x 1" Hx. Hd. Cap Screw	1
5-176	753503	PF-901	Elbow, 90°, 1/2 NPT	1
5-177	1236	AV-224	3/8 - 16 Hex Nut	2
5-178	514276	CR-269	3/8 Lock Washer	2
5-179	17173	CP-338	3/8 Lock Washer	1
5-181	1236	AV-224	3/8 - 16 Hex Nut	1
5-182	514276	CR-269	3/8 Lock Washer	1
5-183	753473	TE-175	Clamp, 3/4" Pipe	1
5-184	7978	CC-174	3/8"-16 x 1" Hx. Hd. Cap Screw	1
5-185	753495	PF-900	Coupling, Pipe 3/4"	1
5-186	754293	PF-929	Elbow, 45°, 1/2 NPT	1
5-187	754202	PF-928	Nipple, 1/2 Dia. x 4" Long	1
5-188	754152	PF-923	Coupling, 1/2 NPT x 3/8 NPT, Reducing	1
5-189	753557	TE-193	Pipe, 3/8" Formed, Special	1
5-190	753558	TE-194	Clamp, 3/4" Pipe	1
5-191	3210	EV-2129	Hx. Hd. Cap Screw, 3/8-16 x 1-1/4 Long	1
5-192	753556	TE-192	Pipe, 1/2" Formed	1
5-193	753559	PF-907	Tee, Reduced Run, 1" x 1/2" x 1"	1
5-194	754116	PF-918	Nipple, 1" Close	1
5-195	753553	PF-911	Nipple, 1/4" Dia. x 2-1/4" Long	1
5-196	754144	PF-919	Elbow, 90°, 3/8" NPT x 1/4 NPT Reducing	1
5-197	754145	PF-920	Nipple, 1/4" x 7/8 Long (Close)	1
5-198	750253	PF-796	1/4" 90° Elbow	1
5-199	754147	PF-922	Nipple, 1/4" x 1-1/2 Long	1
5-201	754146	PF-921	Coupling, 1/2 NPT x 1/4 NPT, Reducing	1
5-202	753561	PF-909	Union, 1" Male and Female	1
5-203	753554	TE-199	Pipe, 1" Formed Special	1
5-204	754116	PF-918	Nipple, 1" Close	1
5-205	753562	PF-910	Elbow, 1", 90° Union w/Female Union	1
5-206	753471	TE-173	Pipe, 3/4" Formed	1
5-207	753511	PF-903	Nipple, 1/2 Dia. x 9-1/2" Long	1
5-208	754335	PF-932	Tee, 1/2 NPT	1
5-209	753555	PF-905	Elbow, 1/2 90° Union w/Female Union	1
5-210	753563	PF-906	Elbow, 3/4" 90° Union, w/Male Union	1
5-211	754115	PF-917	Nipple, 1/2 x 1-1/2 Long	1
5-212	753564	PF-904	Nipple, 1/2" Dia. x 11" Long	1

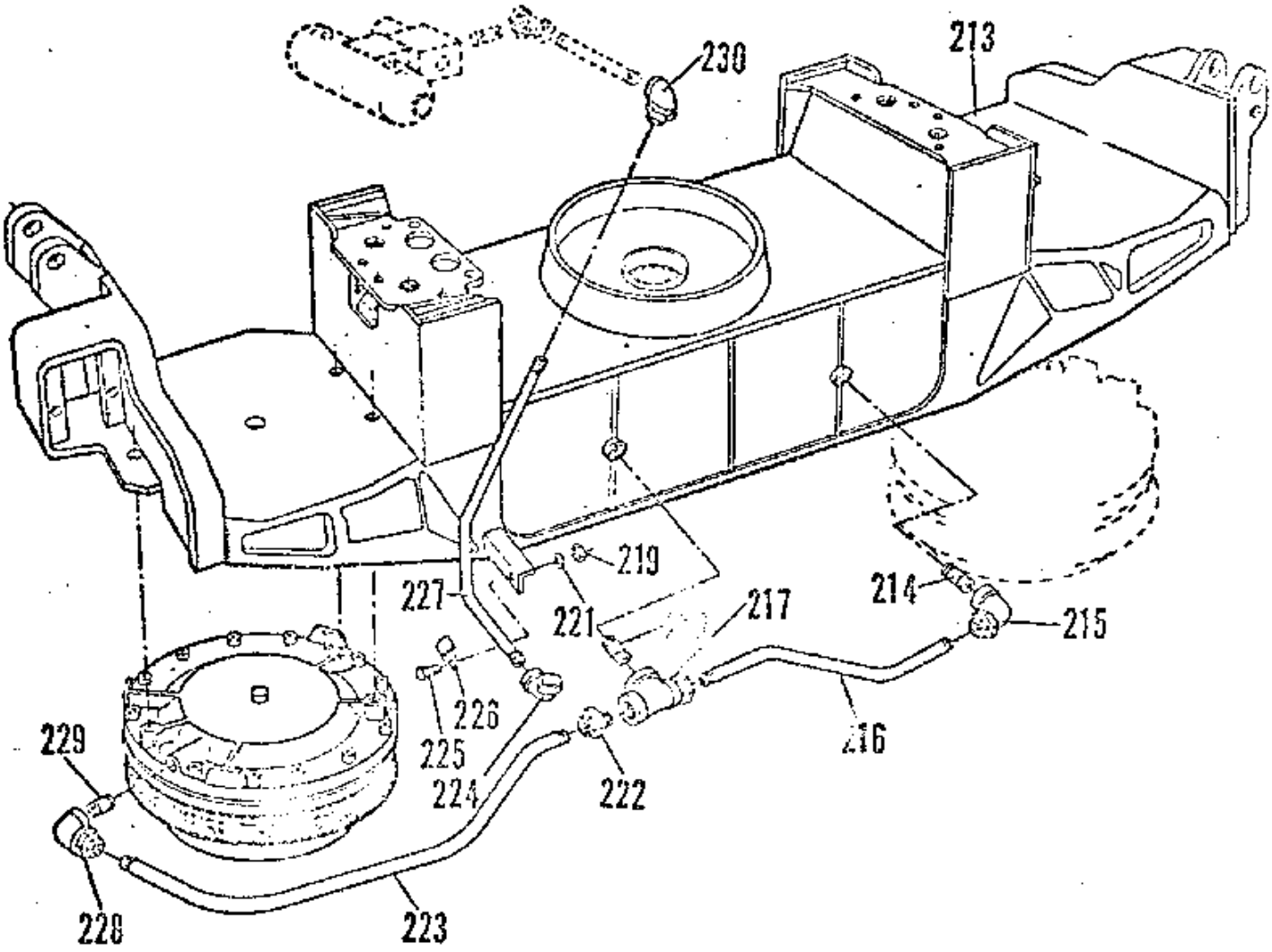


FIGURE 6

BOLSTER PIPING AS VIEWED FROM "A" END OF TRUCK

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
6-213			Bolster, Complete ("A" Lead)	
6-214	754116	PF-918	Nipple, 1" Close	1
6-215	753552	PF-910	Elbow, 1", 90° Union w/Female Union	1
6-216	753565	TE-191	Pipe, 1" Formed Special	1
6-217	753558	PF-899	1" Tee w/Female Union	1
6-218	754116	PF-918	Nipple, 1" Close	1
6-219	1296	AV-224	3/8-16 Hex Nut	1
6-221	514276	CR-269	3/8" Lock Washer	1
6-222	753561	PF-909	Union, 1" Male and Female	1
6-223	753564	TE-190	Pipe, 1" Formed Special	1
6-224	753559	PF-901	Elbow, 90°, 1/2 NPT	1
6-225	7978	OC-174	3/8 - 16 x 1" Hx.Hd. Cap Screw	1
6-226	753472	TE-174	Clamp, 1/2" Pipw	1
6-227	753413	TE-115	Pipe, 1/2" Formed	1
6-228	753562	PF-919	Elbow, 1" 90° Union w/Female Union	1
6-229	754116	PF-918	Nipple, 1" Close	1
6-230	753555	PF-905	Elbow, 1/2 90° Union, w/Female Union	1

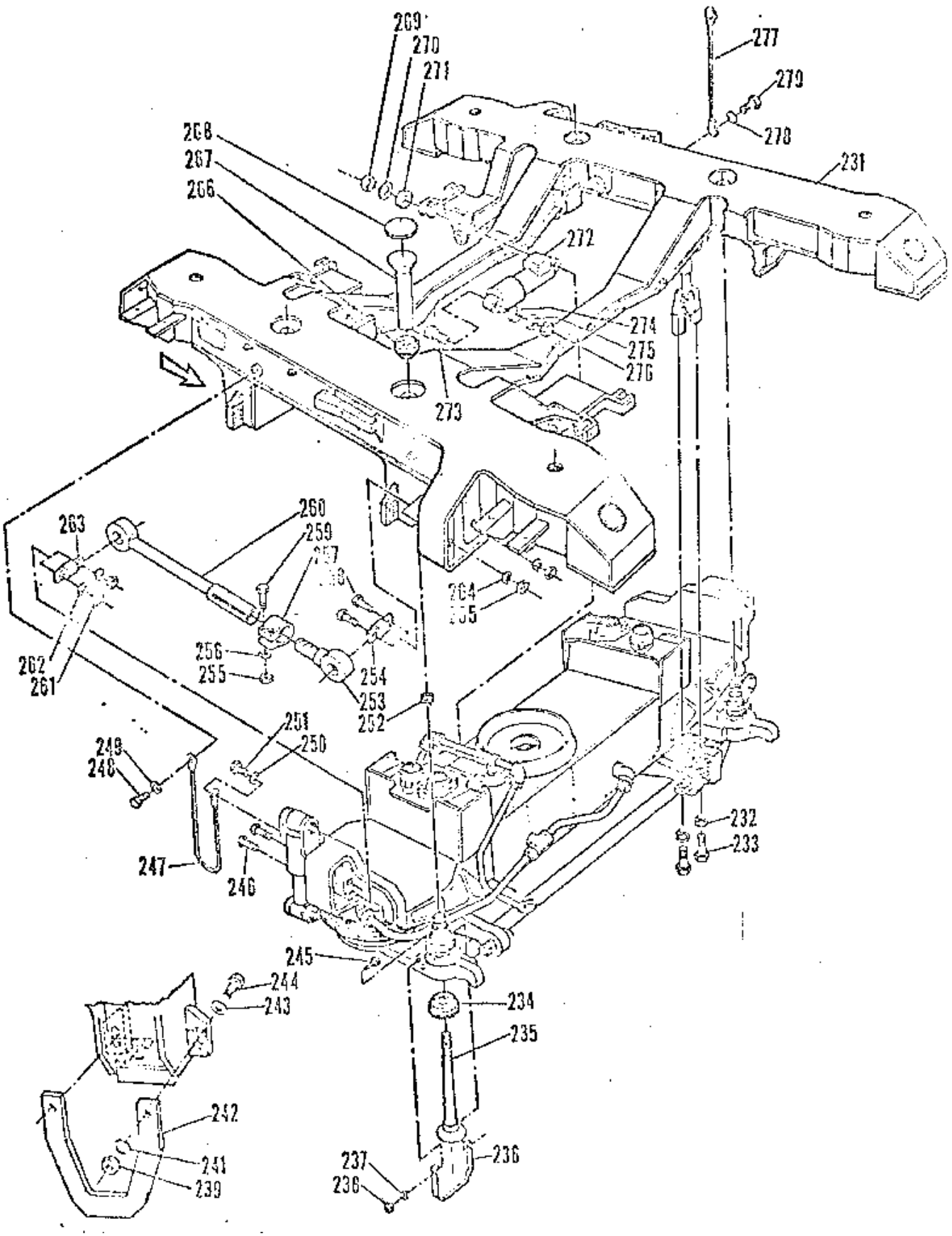


FIGURE 7
BOLSTER TO FRAME ASSEMBLY
T-17

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
7-231	705272	N-9334	Truck Frame, Complete (Weldment)	1
7-232	753374	TE-76	Washer, Lock, w/Tab, 3/4" Nom.	8
7-233	753385	TE-87	Screw, Hx. Hd. Cap, 3/4" - 10 UNC - 2A x 2-1/2 Long (Cad.Pl.)(GR-5)	8
7-234	753353	TE-55	Bearing, Swing Hanger	4
7-235	753446	TE-148	Bolt, Swing Hanger, Special	4
7-236	753470	TE-198	Stirrup, Safety	4
7-237	753374	TE-199	Washer, Lock w/Tab, 3/8" Nom.	8
7-238	502359	TA-2244	3/8" - 16 Hex Nut	8
7-239	92309	CP-847	3/4 - 10 Hex Nut	8
7-241	15985	TB-167	3/4" Lock Washer	8
7-242	753358	TE-60	Strap, Safety (Spring Plank)	8
7-243	753371	TE-73	Washer, 3/4" Nom. (Cad.Pl.)	8
7-244	753370	TE-72	Screw, Hx.Hd. Cap, 3/4" - 10 UNC - 2A x 3-1/2" Long	8
7-245	514274	VV-347	3/8" - 16 x 1" Screw	8
7-246	753385	TE-87	Screw, Hx.Hd.Cap 3/4" - 10 UNC - 2A x 2-1/2" Long (Cad.Pl.)(GR-5)	2
7-247		ME-476-4	Grounding Cable Assembly	2
7-248	753372	TE-74	Screw, Hx.Hd. Cap, 1/2" - 13 UNC 2A x 3/4" Long (Cad.Pl.)	1
7-249	514231	CR-1575	1/2" Lock Washer	1
7-250	514231	CR-1525	1/2" Lock Washer	1
7-251	753372	TE-74	Screw, Hx.Hd.Cap, 1/2" - 13 UNC 2A x 3/4" Long (Cad.Pl.)	1
7-252	753372	TE-197	Clamp, Hose	1
7-253	753362	TE-64	End, Male, Radius Rod	
7-254	753363	TE-65	Block, Anchor	
7-255	502365	CV-424	1/2 - 13 Hx. Nut	2
7-256	753376	TE-78	Washer, Lock w/Tab, 1/2" Nom.	2
7-257	753364	TE-66	Clamp	1
7-258	753385	TE-87	Screw, Hx.Hd. Cap, 3/4" - 10 UNC 2A x 2-1/2" Long (Cad.Pl.)(GR-5)	4
7-259	753393	TE-95	Screw, Hx.Hd. Cap, 1/2" - 13 UNC 2A x 3-1/2" Long (Cad.Pl.)	2
7-260	753361	TE-63	End, Female, Radius Rod	1
7-261	559414	DEC-115	3/4 - 10 Hex Nut	4
7-262	753374	TE-76	Washer, Lock, w/Tab, 3/4" Nom.	2
7-263	753363	TE-65	Block Anchor	1
7-264	753374	TE-76	Washer, Lock w/ Tab, 3/4 Nom.	2
7-265	559414	DEC-115	3/4 - 10 Hex Nut	2
7-266	753353	TE-55	Bearing, Swing Hanger	4
7-267	753447	TE-149	Nut, Swing Hanger, Special	4
7-268	753354	TE-56	Cap, Plug	4
7-269	753442	TE-144	Hex, Cap Nut, 1" - 12 UNF - 2B	1
7-270	753111	TE-143	Washer	1
7-271	753444	TE-146	Washer	1
7-272	705321	N-9528	Shock Absorber	1
7-273	753443	TE-145	Pin	1
7-274	753444	TE-146	Washer	1
7-275	753441	TE-143	Washer	1

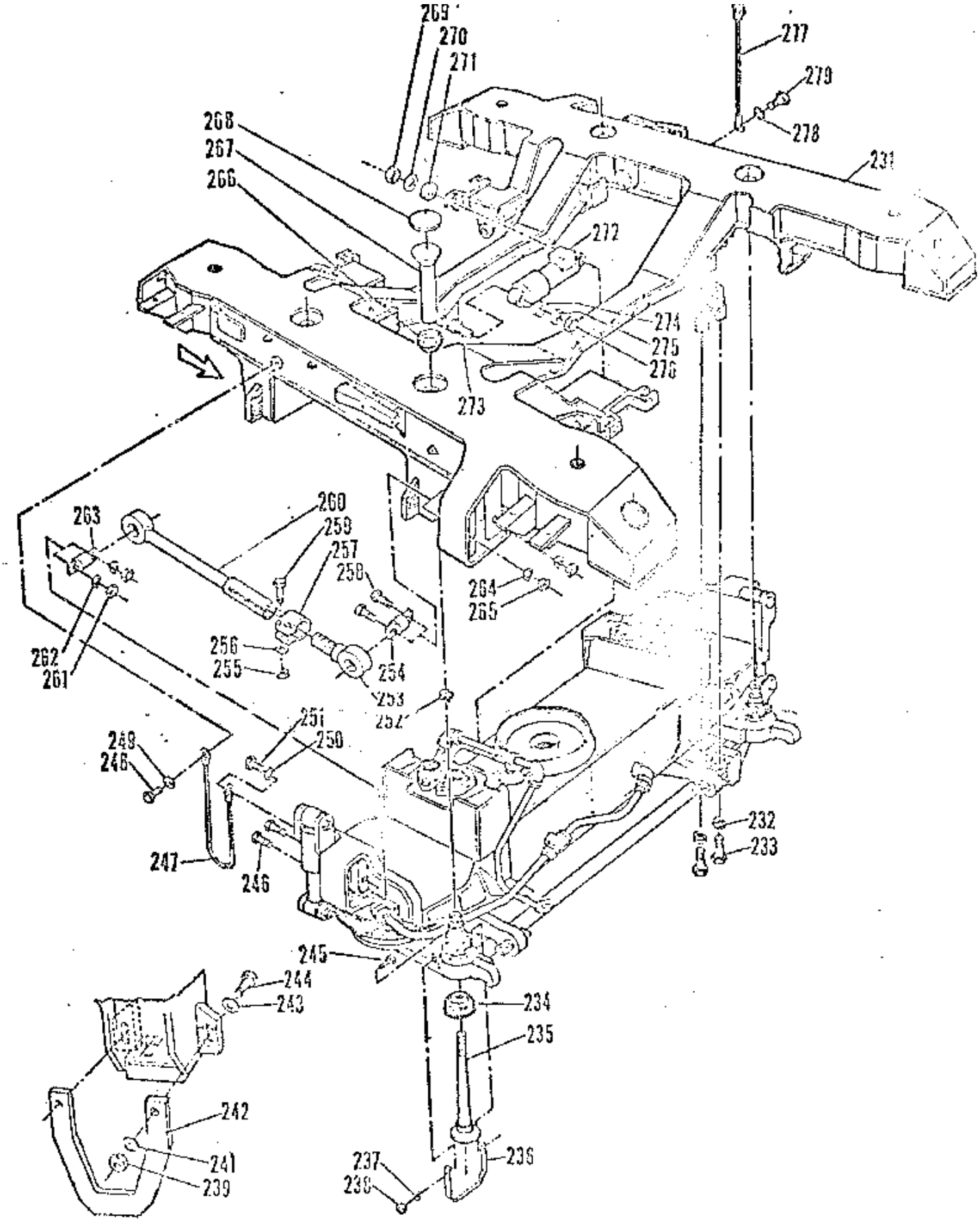


FIGURE 7
BOLSTER TO FRAME ASSEMBLY
T-19

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
7-276	753442	TE-144	Hex,. Cap Nut, 1" -12 UNF -2B	1
7-277	752920	ME-476-1	Grounding Cable Assembly	1
7-278	514281	CR-1525	1/2" Lock Washer	1
7-279	753372	TE-74	Screw, Hx.Hd. Cap, 1/2" -13, UNC -2A x 3/4" Long (Cad.Pl.)	1

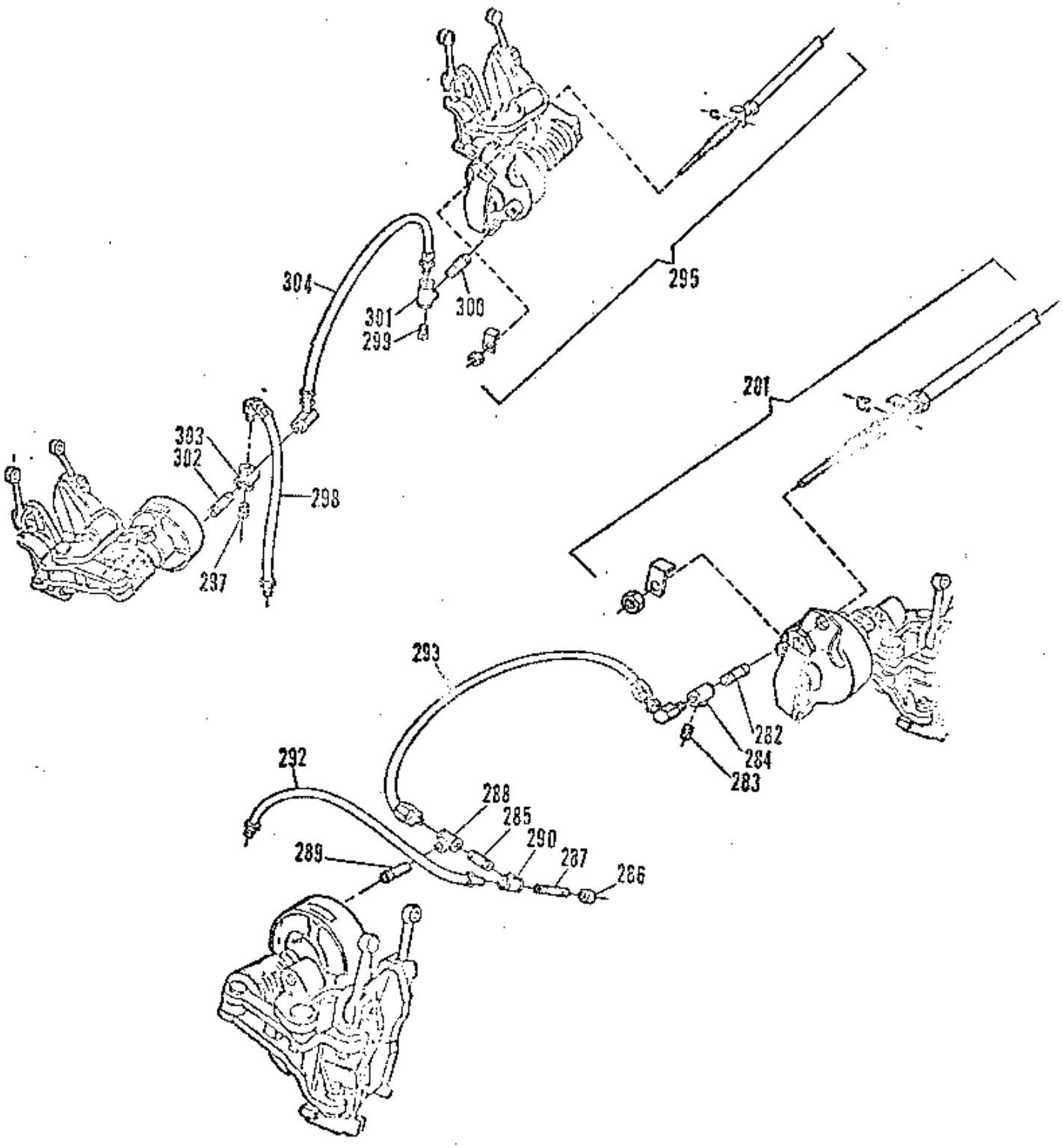


FIGURE 8
ACTUATOR PIPING AND HANDBRAKE CABLE
T-21

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
8-280	753138	TE-37	Retainer, Snap Ring	1
8-281		N-9660	Cable, Hand Brake	1
8-282	754115	PF-917	Nipple, 1/2" x 1-1/2" Long	1
8-283	33310	QT-32	1/2" Pipe Plug	1
8-284	754305	PF-932	Tee, 1/2 NPT	1
8-285	754115	PF-917	Nipple, 1/2" x 1-1/2" Long	1
8-286	754155	PF-924	Cap, 1/2" Pipe	1
8-287	753510	PF-902	Nipple, 1/2" x 3" Long	1
8-288	754305	PF-932	Tee, 1/2 NPT	1
8-289	754115	PF-917	Nipple, 1/2" x 1-1/2" Long	1
8-290	754305	PF-932	Tee, 1/2 NPT	1
8-291	754115	PF-917	Nipple, 1/2 x 1-1/2 Long	1
8-292	705217	N-9546	1/2" I.D. Hose with 1/2" Nipple and 1/2" Male Union Nipple	1
8-293	705372	N-9652	1/2" I.D. Hose with 1/2" Nipple with 90° Adapter	1
8-294	754305	PF-932	Tee, 1/2 NPT	1
8-295		N-9590	Cable, Hand Brake	1
8-297	33310	QT-32	1/2" Pipe Plug	1
8-298	705373	N-9653	1/2" I.D. Hose with 1/2" Nipple with 45° Adapter	1
8-299	33310	QT-32	1/2" Pipe Plug	1
8-300	754305	PF-932	Tee, 1/2 NPT	1
8-301	754115	PF-917	Nipple, 1/2 x 1-1/2 Long	1
8-302	754115	PF-917	Nipple, 1/2 x 1-1/2 Long	1
8-303	754[illegible]	PF-933	Cross, 1/2 NPT	1
8-304	705[illegible]	N-9552	1/2" I.D. Hose with 1/2 Nipp[illegible] with 90° Adapter	1

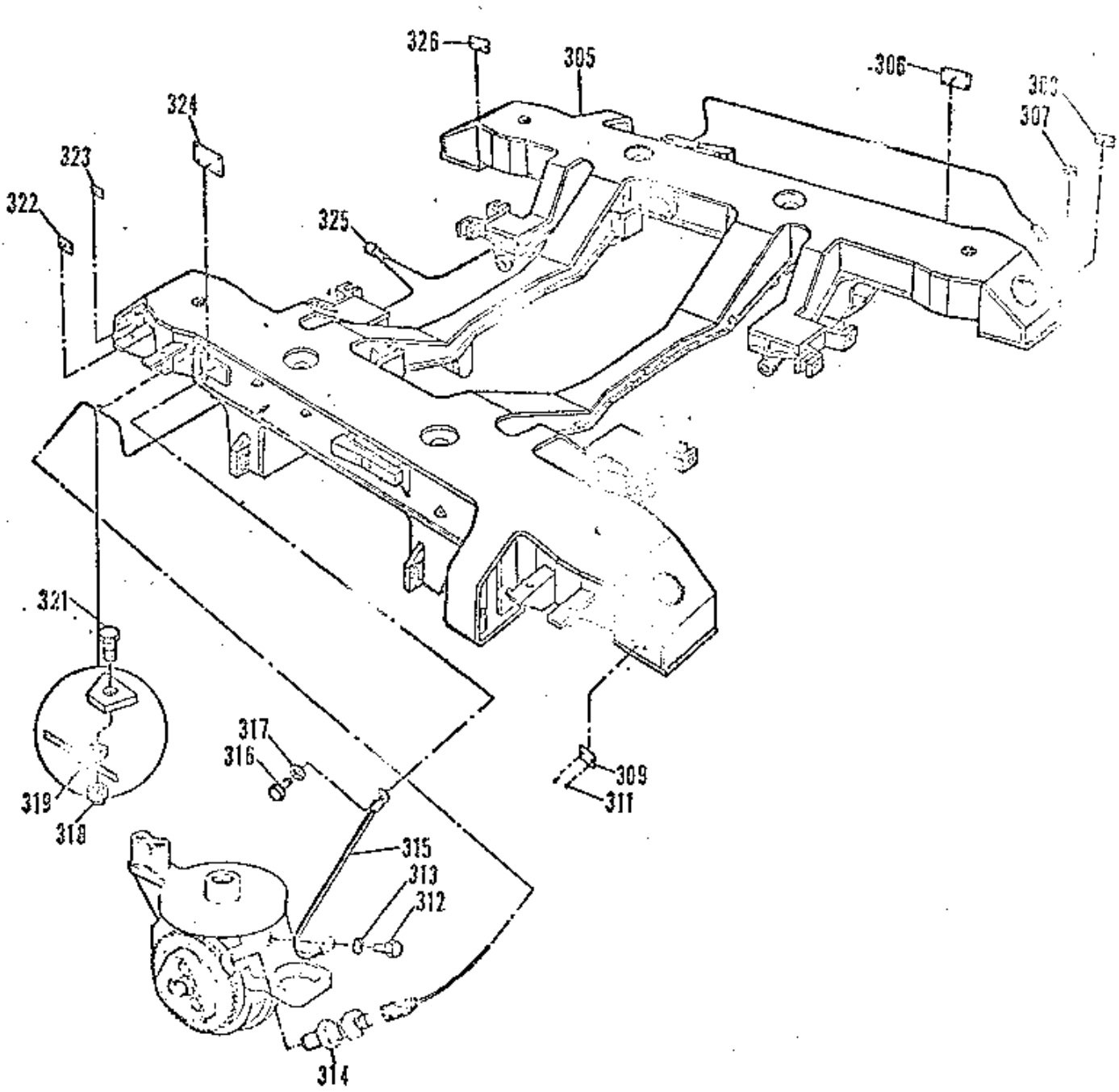


FIGURE 9

WHEELSLIP AND NAME PLATE DETAILS

T-23

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
9-305	705272	N-9584	Truck Frame, Complete (Weldment)	1
9-306	752927	TE-1	Plate, Classification	1
9-307	548430	EV-5334	Name Plate	1
9-308		TE-2	Plate, Number	1
9-309		TE-2	Plate, Number	1
9-311	753373	TE-75	Screw, Drive, #14 x 1/2" Nom.	16
9-312	753372	TE-74	Screw, Hx. Hd. Cap, 1/2" - 13 UNC - 2A x 3/4" Long (Cad.Pl.)	1
9-313	753376	TE-78	Washer, Lock, w/Tab, 1/2" Nom.	1
9-314	705283	N-9585	Assembly, Sensor Housing	1
9-315	752923	ME-476-4	Grounding Cable Assembly	2
9-316	753372	TE-74	Screw, Hx. Hd. Cap, 1/2" - 13 UNC - 2A x 3/4" Long (Cad.Pl.)	1
9-317	753376	TE-78	Washer, Lock, w/Tab, 1/2 Nom.	1
9-318	529514	CR-1267	#10-32 NF-3 Elastic Stop Nut	16
9-319	753475	TE-177	Clamp, Cable	16
9-321	752793	MC-1084	#10 - 32 x 3/4" Long Hx.Hd. Mach. Screw (Cad.Pl.)	16
9-322		TE-2	Plate, Number	1
9-323	548430	EV-5334	Name Plate	1
9-324	752927	TE-1	Plate, Classification	1
9-325	705231	N-9564	Cable Assembly	1
9-326		TE-2	Plate, Number	1

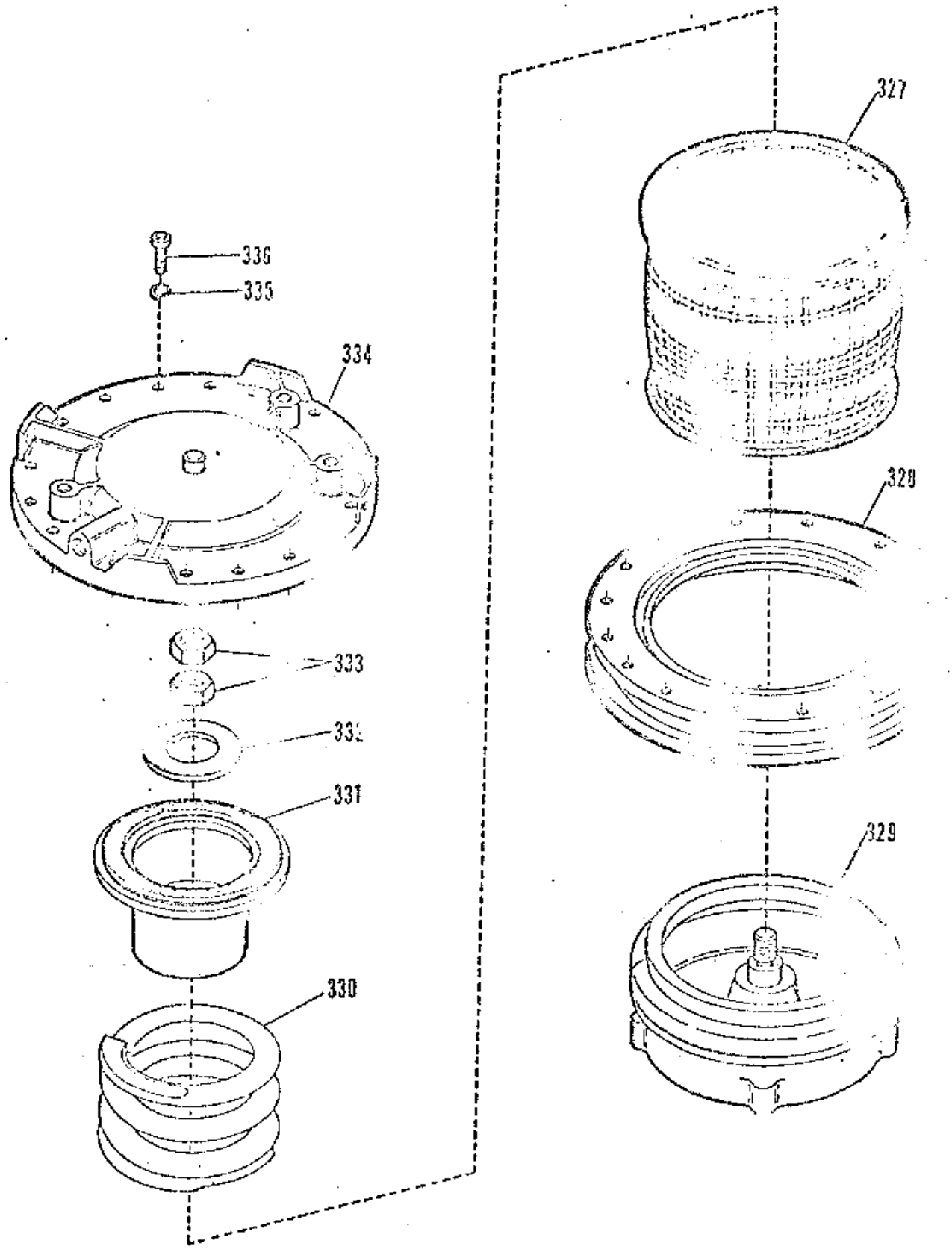
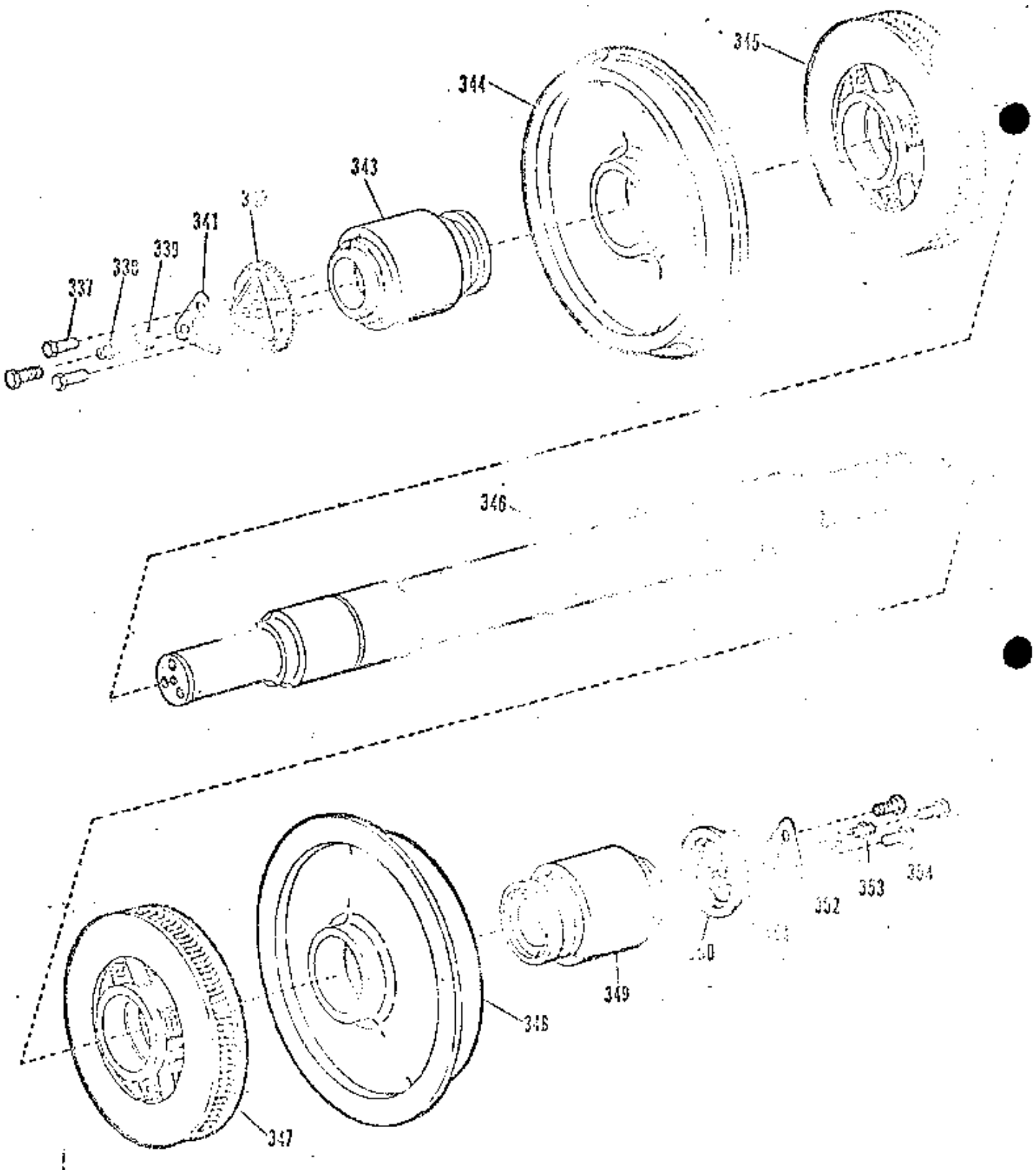


FIGURE 10
AIR SPRING DETAILS

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
10-327	753393	TE-100	Spring, Air Bag	1
10-328	753431	TE-103	Ring, Clamping	1
10-329	753399	TE-101	Air Spring Half, Lower	1
10-330	753403	TE-105	Spring, Auxiliary	1
10-331	753402	TE-104	Retainer	1
10-332	753404	TE-106	Washer	1
10-333	753405	TE-108	Nut, Hx. Jam	2
10-334	753409	TE-102	Air Spring Half, Upper	1
10-335	514501	CR-203	5/8" - 11 Lock Washer	10
10-336	753405	TE-107	Screw, Soc. Hd. Cap, 5/8" - 11 UNC - 2A	10



WHEEL AND AXLE DETAIL

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	NO. REQ.
11-337	752972	TE-12	Screw, 7/8" Cap	3
11-338	752970	TE-10	Fitting, 1/2" Lube	1
11-339	752971	TE-11	Bushing, Reducing	1
11-341	752973	TE-13	Plate, Locking	1
11-342	752960	TE-9	End Cap, Axle (with Teeth)	1
11-343	752964	TE-4-2	Assembly, Bearing and End Cap	1
11-344	752966	TE-14	Wheel, 36" (Passenger Car)	1
11-345	705224	N-9550	Assembly, Disc and Hub	1
11-346	752942	TE-3	Axle	1
11-347	705224	N-9550	Assembly, Disc and Hub	
11-348	752966	TE-14	Wheel, 36" (Passenger)	
11-349	752963	TE-4-1	Assembly, Bearing and End Cap	
11-350	752968	TE-8	End Cap, Axle (Plain)	1
11-351	752973	TE-13	Plate, Locking	1
11-352	752971	TE-11	Bushing, Reducing	1
11-353	752970	TE-10	Fitting, 1/2" Lube	1
11-354	752972	TE-12	Screw, 7/8" Cap	3

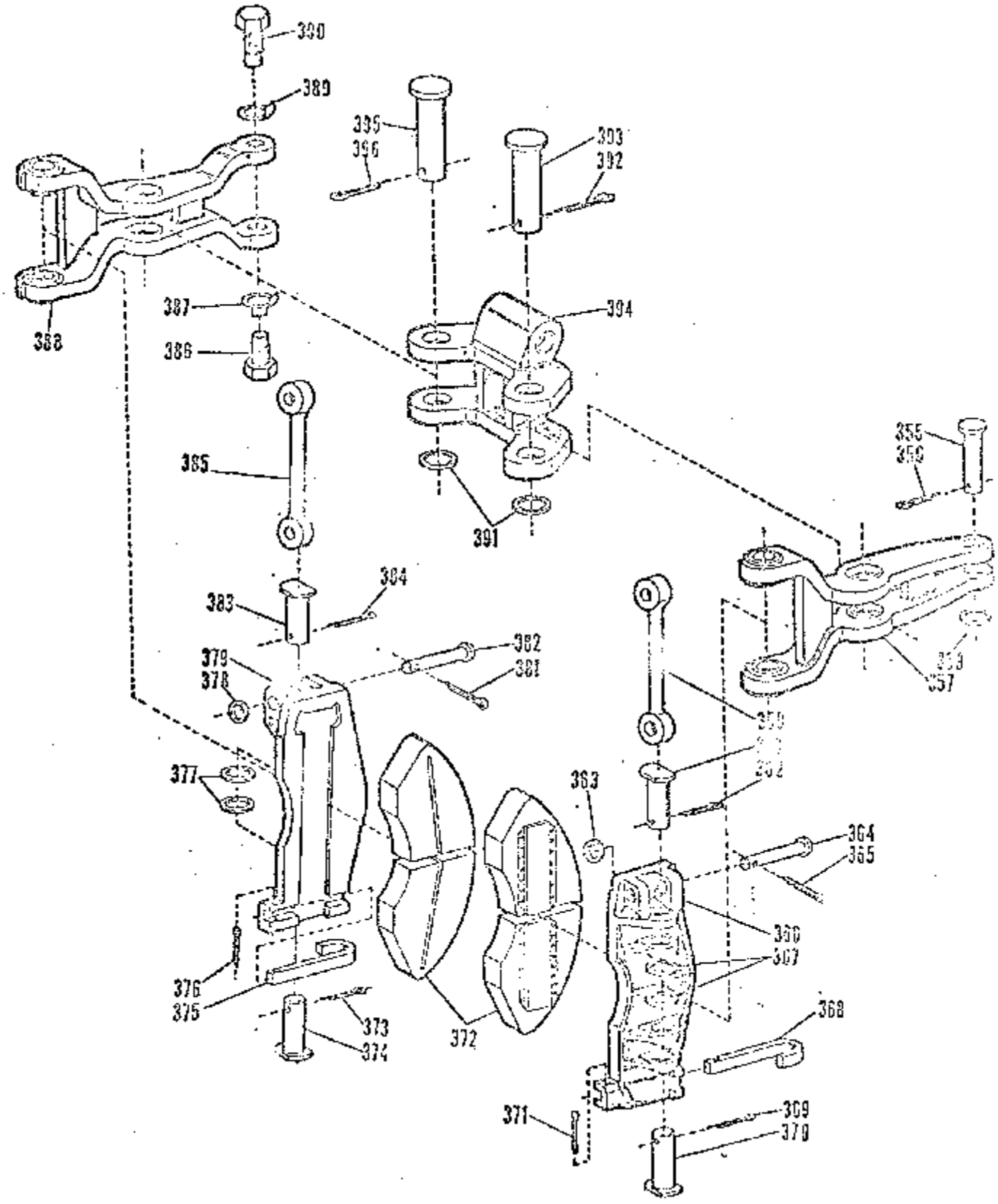


FIGURE 12
CALIPER ASEMBLY
T-30

FIG. & INDEX	PART NO.	DWG. NO.	DESCRIPTION	REQ.	
12-356	753419	TE-121	Pin, .945" Dia. x 3.740 x 3.46		
12-358	753421	TE-123	Pin, Cotter, 1/4" Dia. x 1-1/2" Long		
12-357	705316	N-[illegible]23	Assembly, Brake Lever	1	
12-358	753420	TE-122	Washer, .984 I.D. x 1.57 O.D. x .157 Thick (Cad.Pl.)	1	
12-359	753418	TE-120	Hanger	1	
12-361	753414	TE-116	Pin, .906 Dia. x 3.543 x 3.130	1	
12-362	8049	PR-53	3/16" x 1-1/2 Cotter	1	
12-363	753415	TE-117	Washer, .906 I.D. x 1.417 O.D. x .158 Thick (Cad.Pl.)	1	
12-364	753417	TE-119	Pin, .906 Dia. x 3.150 x 2.80	1	
12-365	8049	PR-53	3/16" x 1-1/2 Cotter	1	
12-366	753411	TE-113	Holder, Bk. Pad, Right	1	
12-367	753415	TE-117	Washer, .906 I.D. x 1.417 O.D. x .158 Thick (Cad.Pl.)	2	
12-368	753412	TE-114	Lock, Slide	1	
12-369	8049	PR-53	3/16 x 1-1/2 Cotter	1	
12-370	753414	TE-116	Pin, .906 Dia. x 3.543 x 3.130	1	
12-371	753416	[illegible]	[illegible]otter, 3/16" Dia. x 2-1/4" Long	1	
12-37[illegible]	753297	[illegible]	[illegible], Disc Brake, Com[illegible]		
12-37[illegible]	8049	PR-[illegible]	3/[illegible] 1-1/2 Cotter	1	
12-3[illegible]	753414	TE-[illegible]	Pin, .906 Dia. x 3.543 x 3.130	1	
12-3[illegible]	753412	TE-[illegible]	Lock, Slide	1	
12-[illegible]	753[illegible]	TE-11[illegible]	Pin, Cotter, [illegible]" Dia. x 2-1/4" Long	1	
[illegible]	75[illegible]	TE-117	Washer, .906 I.D. x 1.417 O.D. x .158 Thick (Cad.Pl.)	2	
[illegible]	75[illegible]	TE-117	Washer, .906 I.D. x 1.417 O.D. x .158 Thick (Cad.Pl.)	1	
[illegible]	75[illegible]	T[illegible]-112	Holder, Bk. Pad, Left	1	
[illegible]	[illegible]	[illegible]-53	3/16 x 1-[illegible] Cotter	1	
[illegible]32	753417	TE-119	Pin, .906 [illegible] x 3.150 x 2.80	1	
[illegible]33	753414	TE-116	Pin, .906 Dia. x 3.543 x 3.130	1	
[illegible]-364	8049	PR-53	3/16 x 1-1/2 Cotter	1	
12-365	753418	TE-120	Hanger	1	
12-366	753422	TE-124	Bolt, Hx.Hd., M 24 x 2 x 44 MM Lon[illegible] .Pl.)	1	
12-367	753423	TE-[illegible]	[illegible]sher, [illegible]ock, w/Tab	1	
12-368	705317	N-[illegible]	[illegible]ssembl[illegible] [illegible] Lever	1	
12-369	753423	TE-12[illegible]	[illegible]sher, [illegible] Tab	1	
12-390	753422	TE-124	Bolt, Hx.[illegible] 24 x 2 x 44 MM Long (Cad.Pl.)	1	
12-391	753408	TE-110	Washer, 1.[illegible] x 2.23 O.D. x .236 Thick (Cad.Pl.)	2	
12-392	753409	TE-111	Pin, Cotter, [illegible]" Dia. x 2-1/4 Long	1	
12-393	753407	TE-109	Pin, 1.57 Di[illegible] 7.09 x 6.65	1	
12-394	705318	N-5625	Assembly, C[illegible]er Bridge	1	
12-395	753407	TE-109	Pin, 157 Dia. [illegible].09 x 6.65	1	
12-396	753409	TE-111	Pin, Cotter, [illegible]6 Dia. x 2-1/4 Long	1	

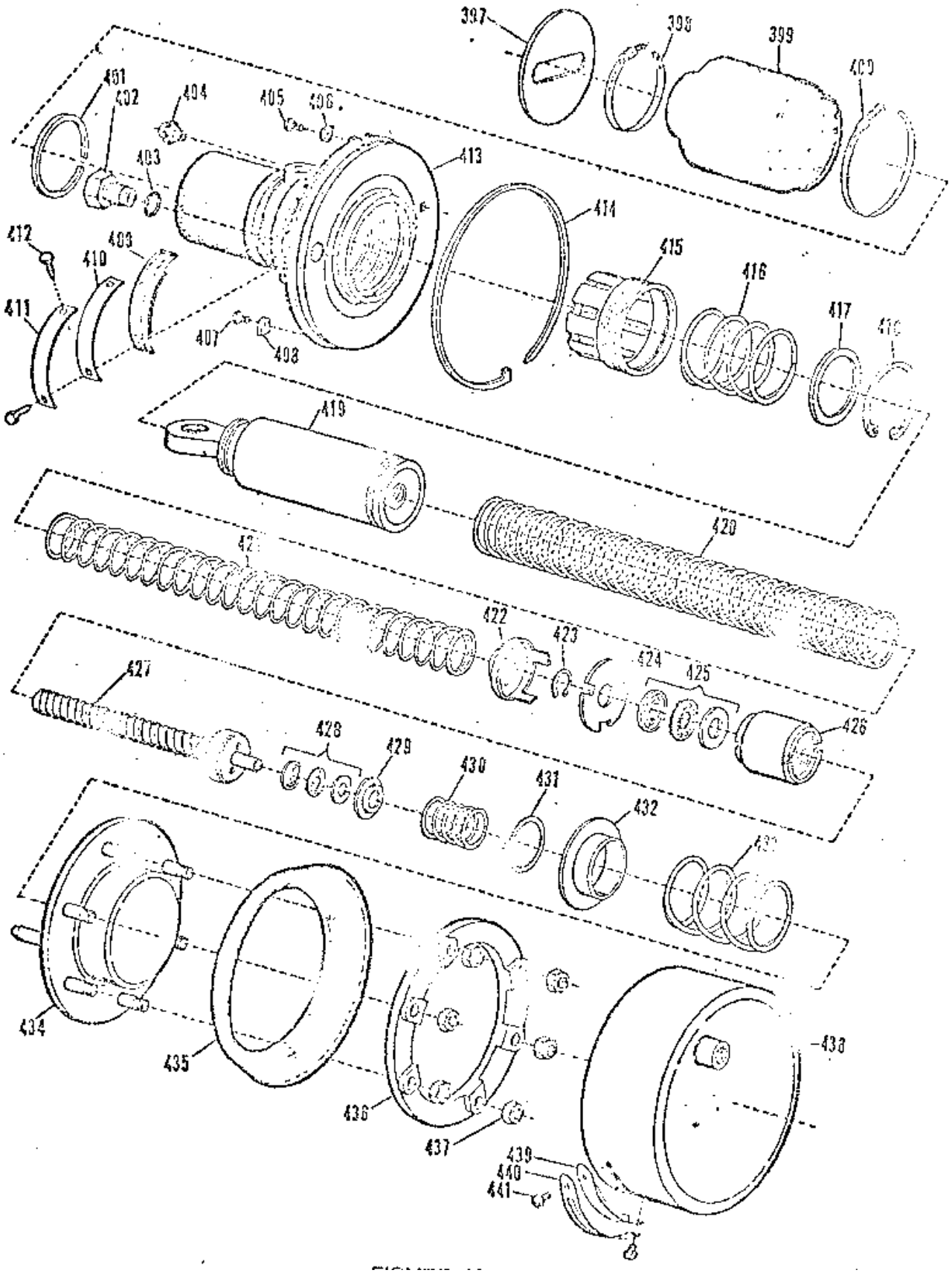


FIGURE 13
ACTUATOR WITHOUT HANDBRAKE
T-32

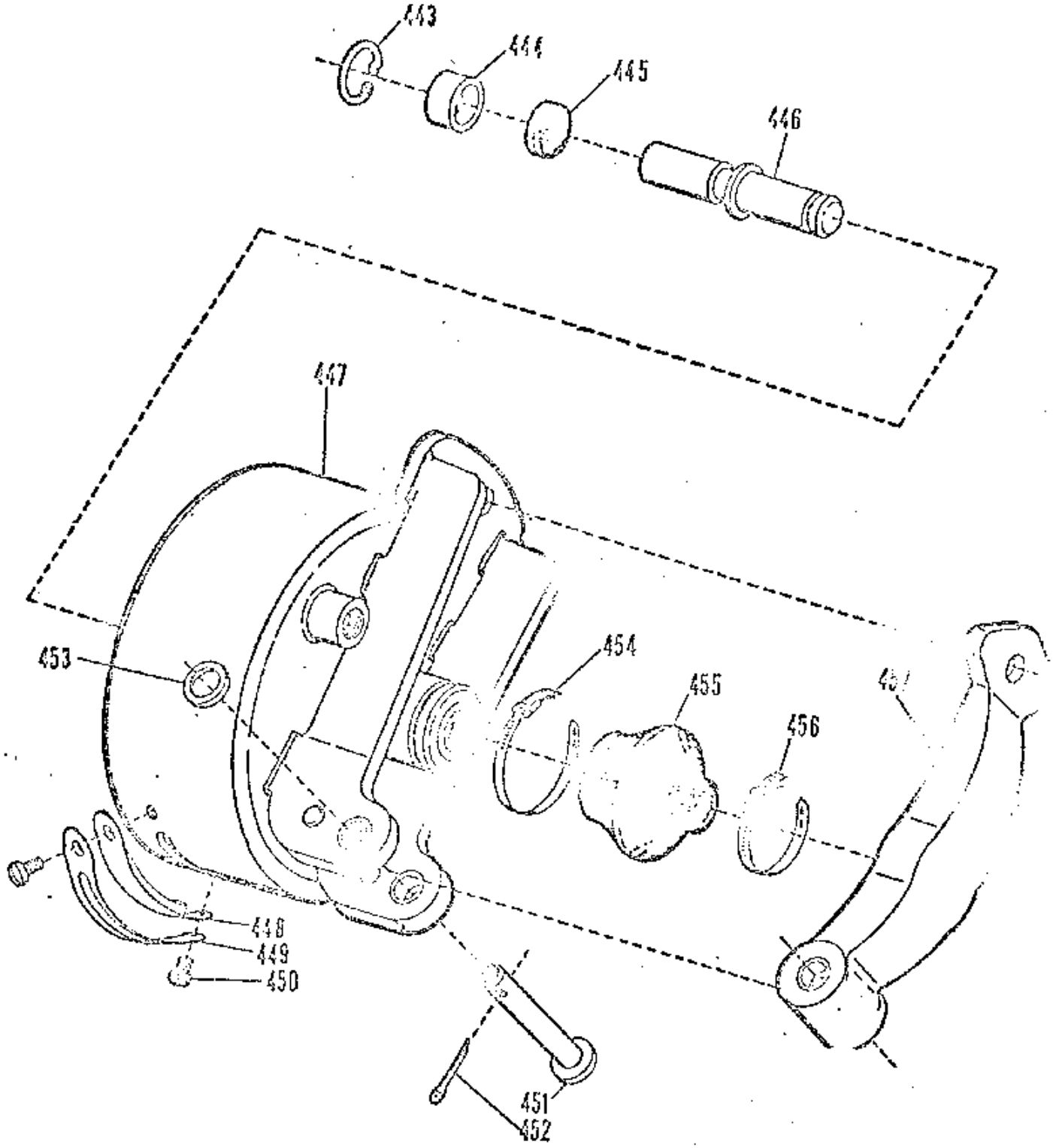


FIGURE 14
ACTUATOR WITH HANDBRAKE

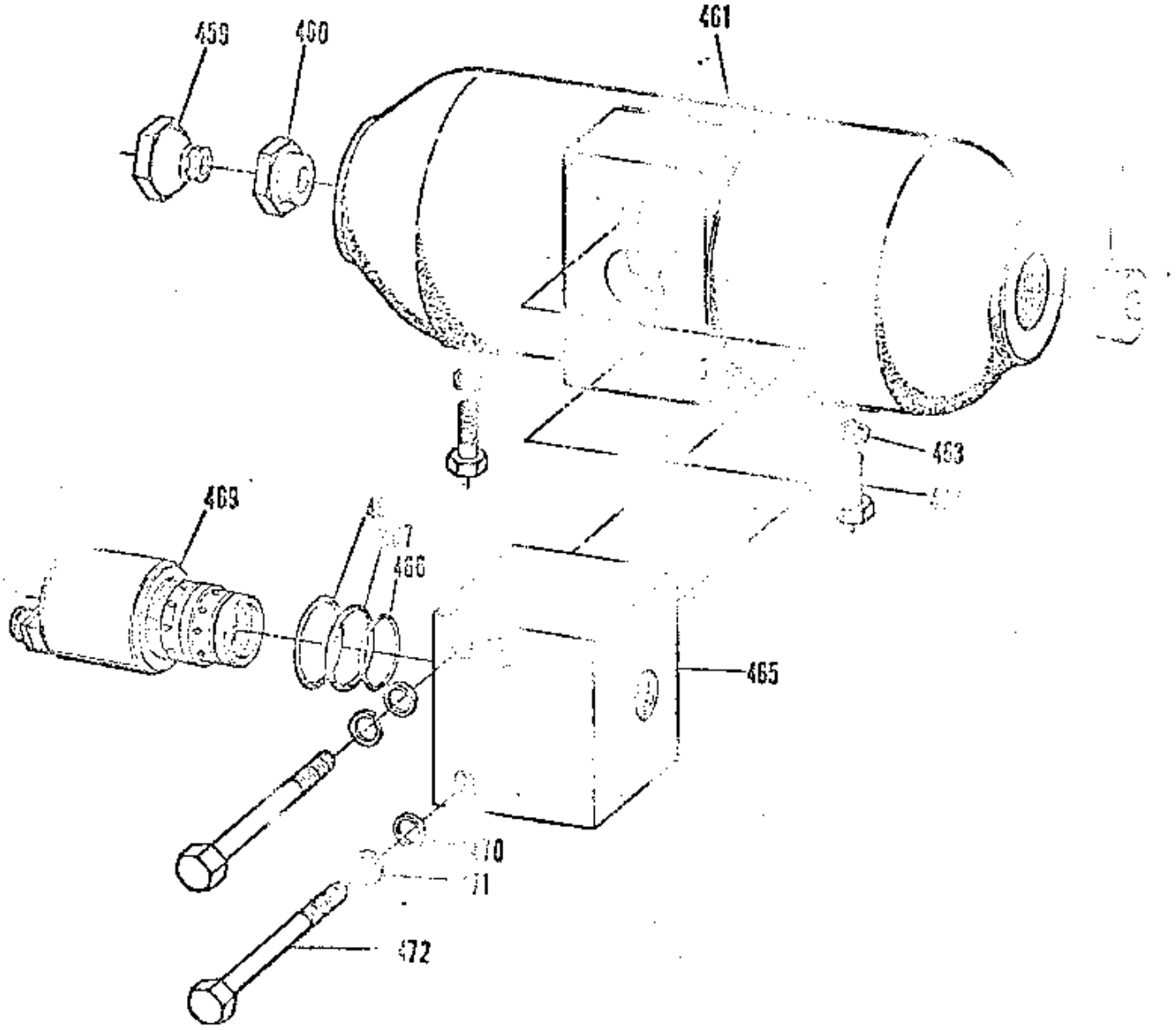


FIGURE 15

RESERVOIR AND DUMP VALVE ASSEMBLY

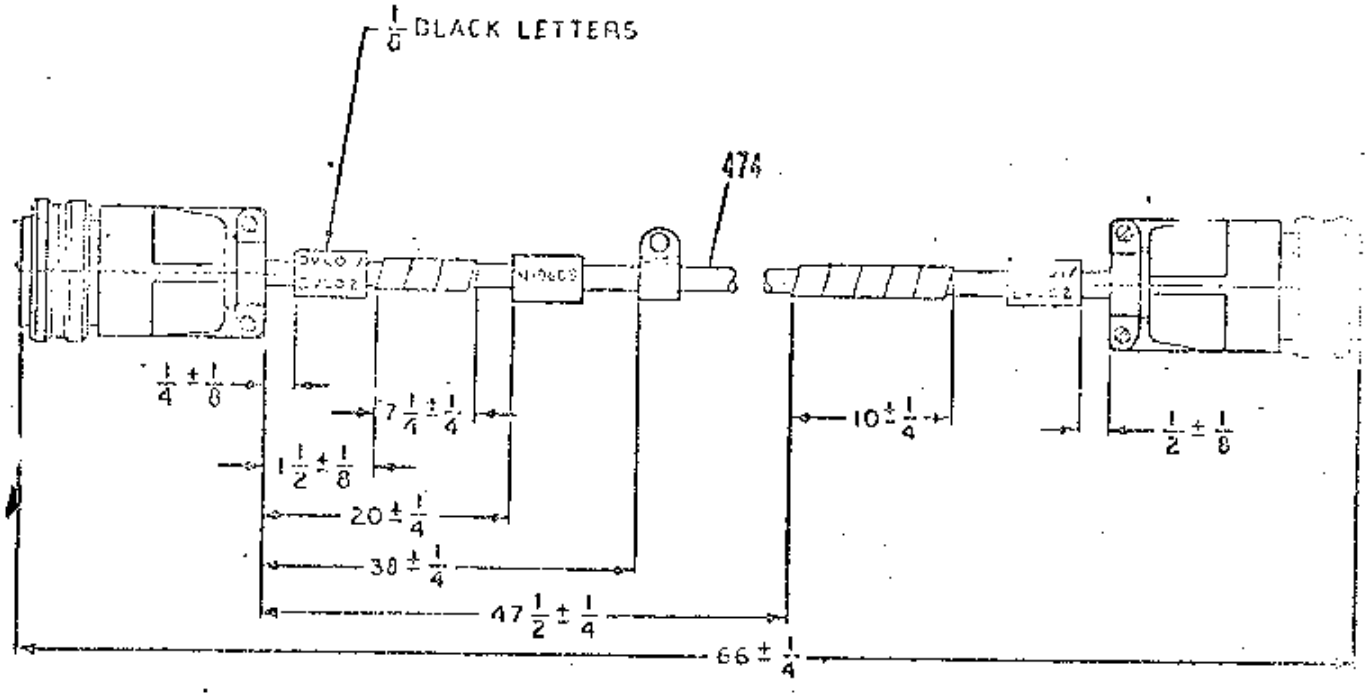


FIGURE 16

CABLE ASSEMBLY CAR BODY JUNCTION BOX TO DUMP VALVE

T-35

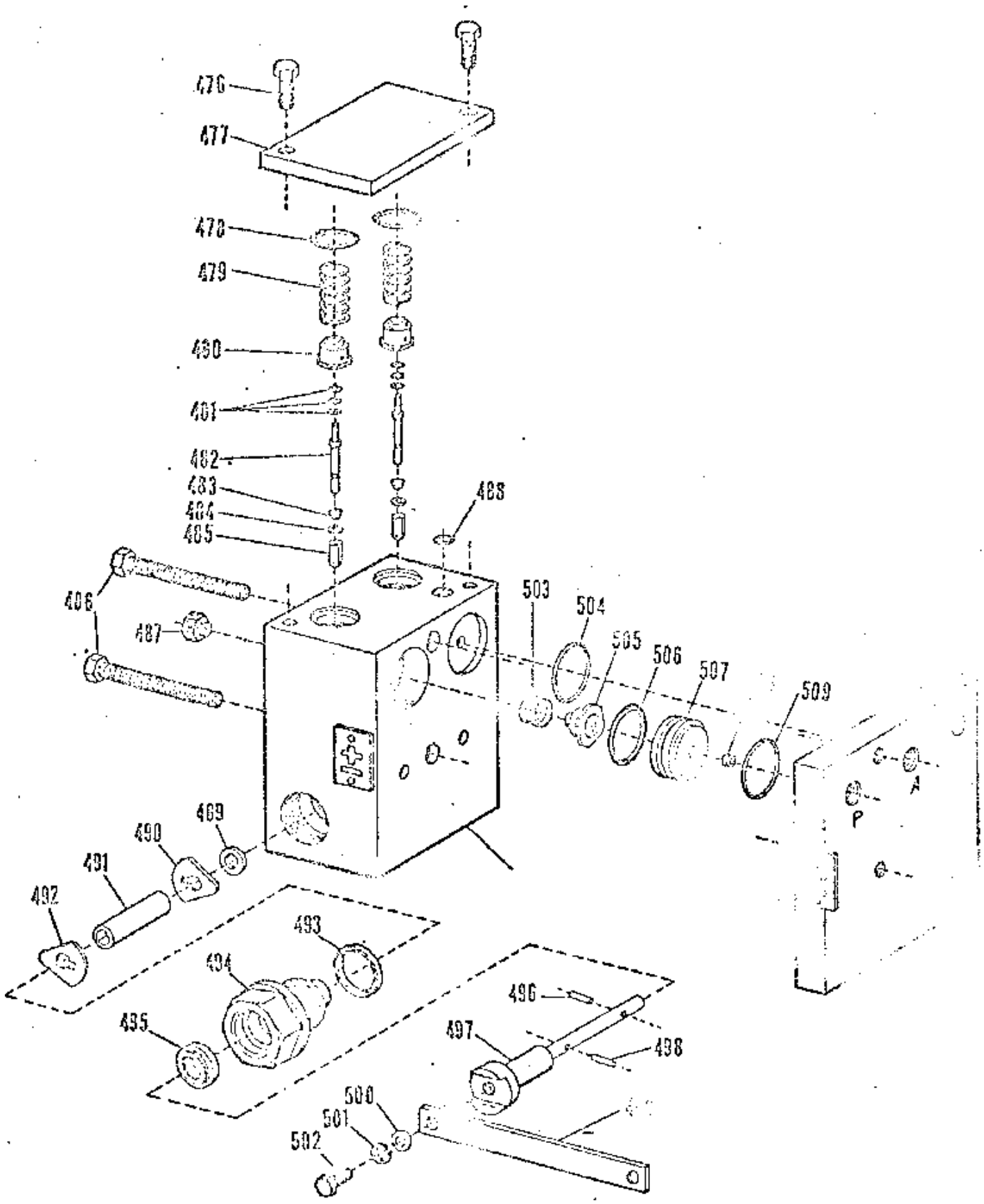


FIGURE 17
LEVELING VALVE ASSEMBLY
T-36