

CHAPTER 1

GENERAL INFORMATION AND SPECIFICATIONS

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**BOOK 86
VOLUME 10
CHAPTER 1**

GENERAL INFORMATION AND SPECIFICATIONS

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A: DOOR5086A

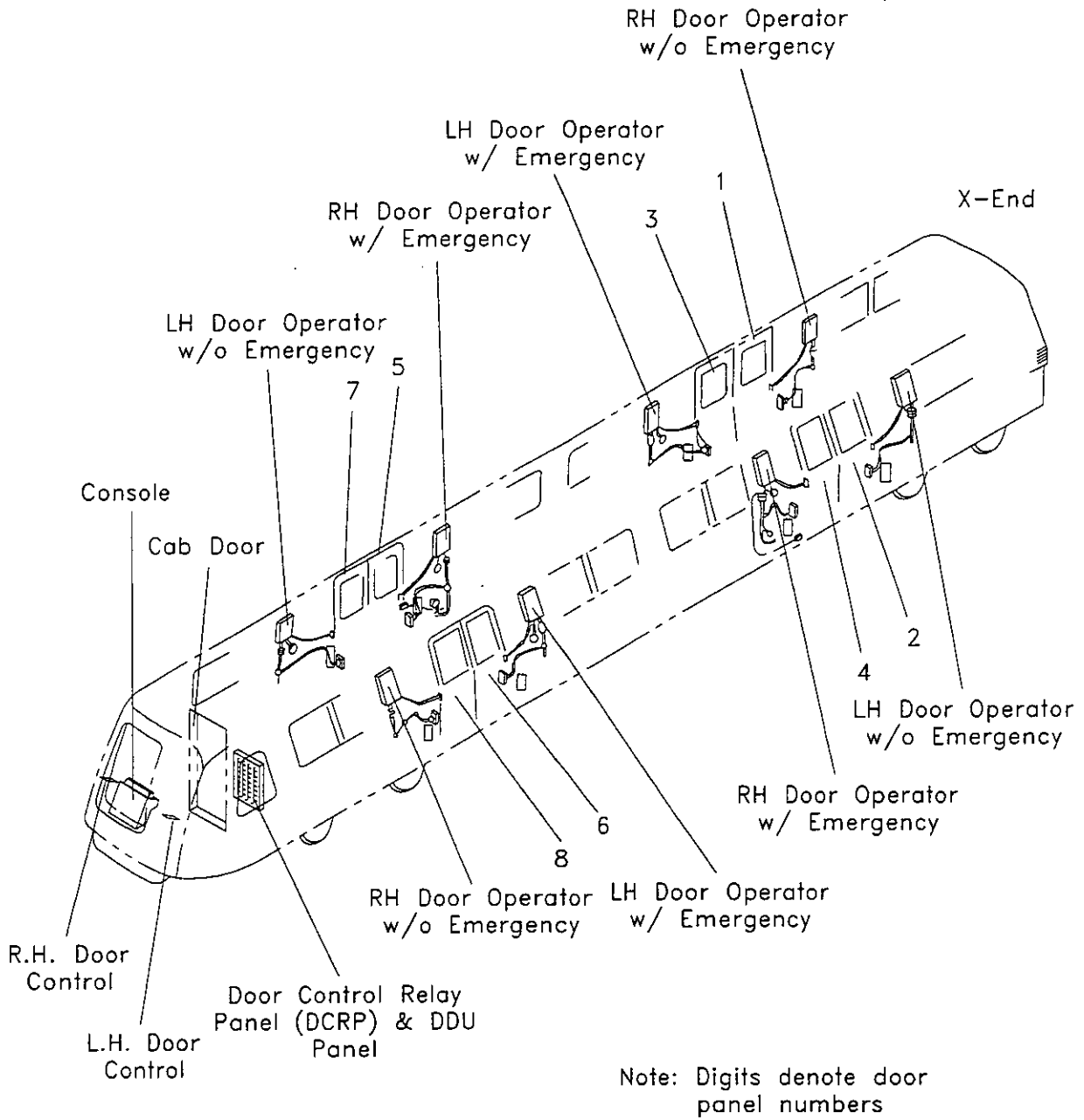


Figure 1-0-1. Doors Overview

CHAPTER 1
GENERAL INFORMATION AND SPECIFICATIONS

1-1

GENERAL INFORMATION

1-1-1 TYPES AND LOCATION OF DOORS

See Figure 1-1-1. The A2/B2 cars have five types of doors:

- four side-door assemblies (sliding doors with bi-parting leaves, types LH and RH);
- two end doors (sliding door with bi-parting leaves, X-end and Y-end on B2 cars, X-end only on A2 cars); and
- one cab door (single swinging type, Y-end on A2 car only).

A. Side Sliding Door and Threshold Assemblies

Refer to Figure 1-1-2. The leaves of the four side-door assemblies are identically constructed. Facing the doors from the inside of the car, the leaf on the right side is identified as right-hand (RH), and the leaf on the left is the left-hand (LH). Each leaf has a window in the upper half and can be completely retracted into a door pocket in the vehicle structure. The door leaves are contoured to match the outline of the car body. A weather proof arrangement of seals and threshold complete the appearance of the door units. The door operating system opens and closes the side doors (see subsection 1-1-2).

B. X-End and Y-End Sliding Doors

Refer to Figure 1-1-3. The X-end and Y-end sliding doors are non-contoured doors with windows. These doors retract manually into door pockets to allow passengers to move from one car to the next. The end sliding doors have two leaves. Using the hand grip to open either leaf by sliding it into its pocket causes the other leaf to open. When the hand grip of the X-end or Y-end sliding doors is released, the doors close automatically.

C. Cab Door

The cab door is a hollow structure assembled with an inner and outer skin bonded to internal channeling. The door is of all aluminum construction. The door swings toward the passenger section on a 75-inch piano-type hinge attached to the left-hand side of the door frame and door. The cab door latch is opened with the standard car key from the passenger side. A manually-operated latch handle is used for opening from the cab side.

1-1-2 LEFT AND RIGHT DOOR CONTROL PANELS

When a consist is in automatic mode, the opening and closing of the doors is controlled from central control. The operator can use the door control panels in the A2 car control cab to override the open or closed commands from central control. When in road manual or yard manual operation, opening and closing the passenger doors is controlled from the door control panels. Each A2 car has two door control panels. Figure 1-1-4 shows the location of the left and right door control panels in the A2 car cab. One panel is mounted to the right of the operators console and controls the opening and closing of the operator side (right side) doors. Figure 1-1-5 shows the right side door operators panel.

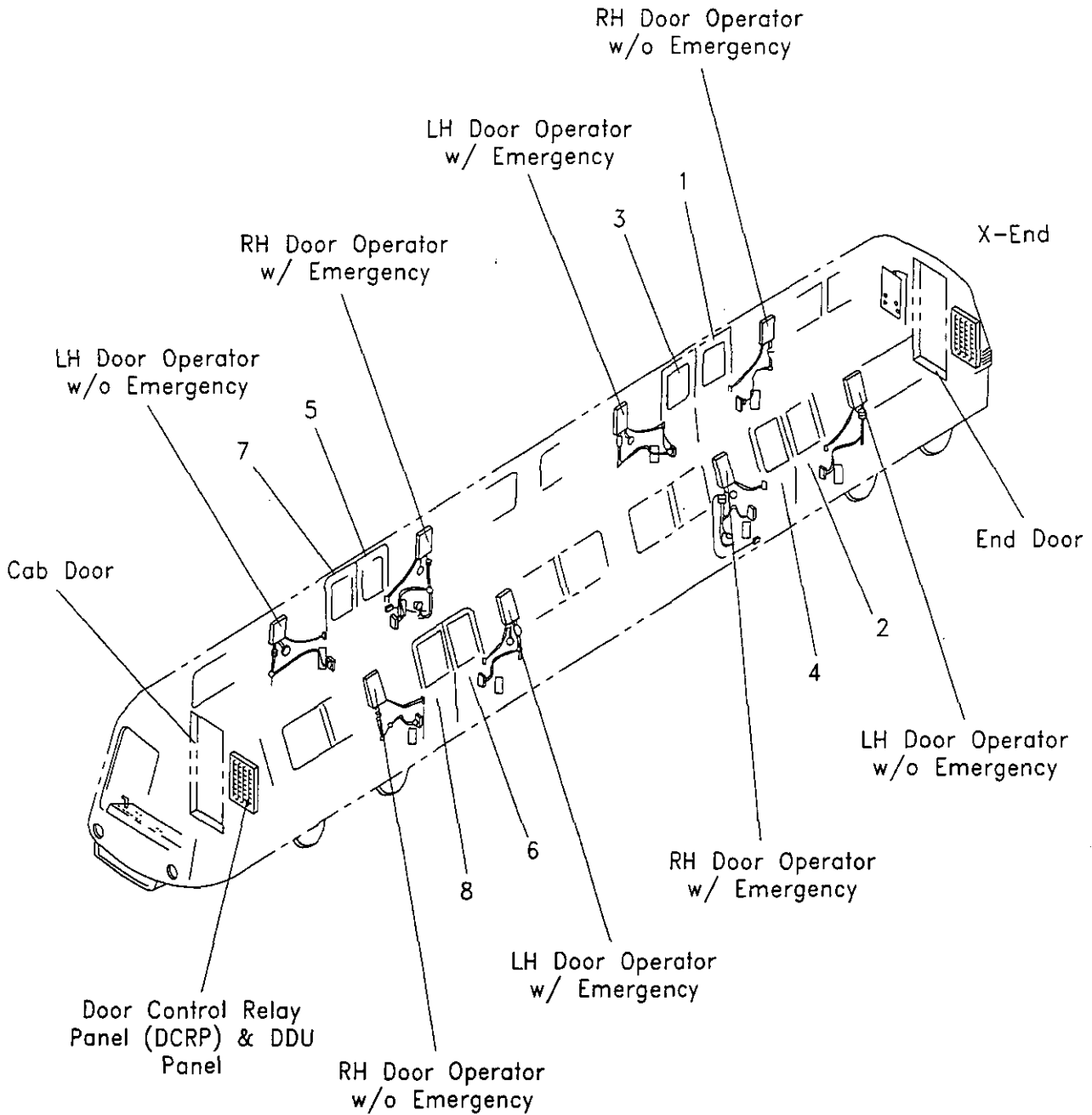


Figure 1-1-1. Door Locations

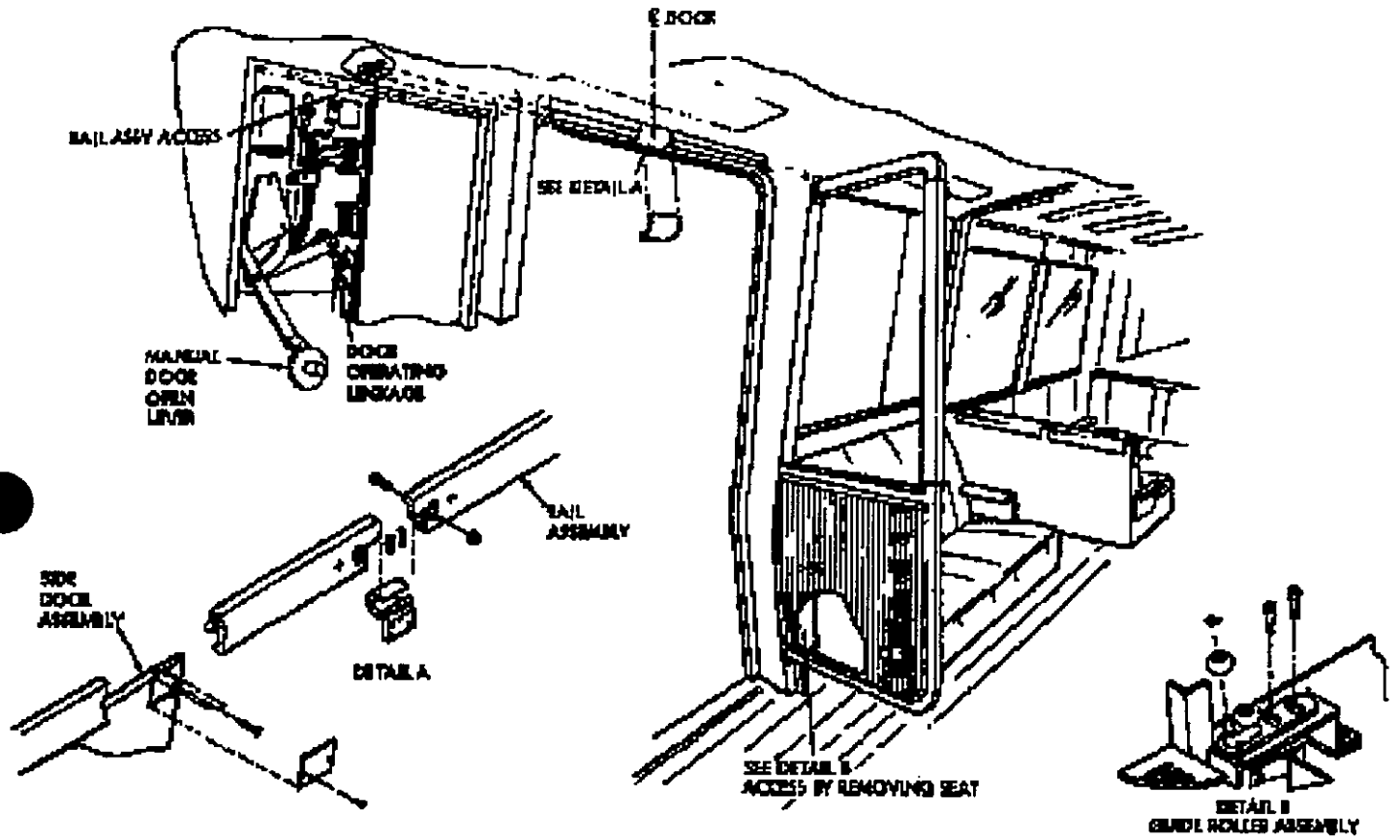


Figure 1-1-2. Side Doors

A: DOOR5084A

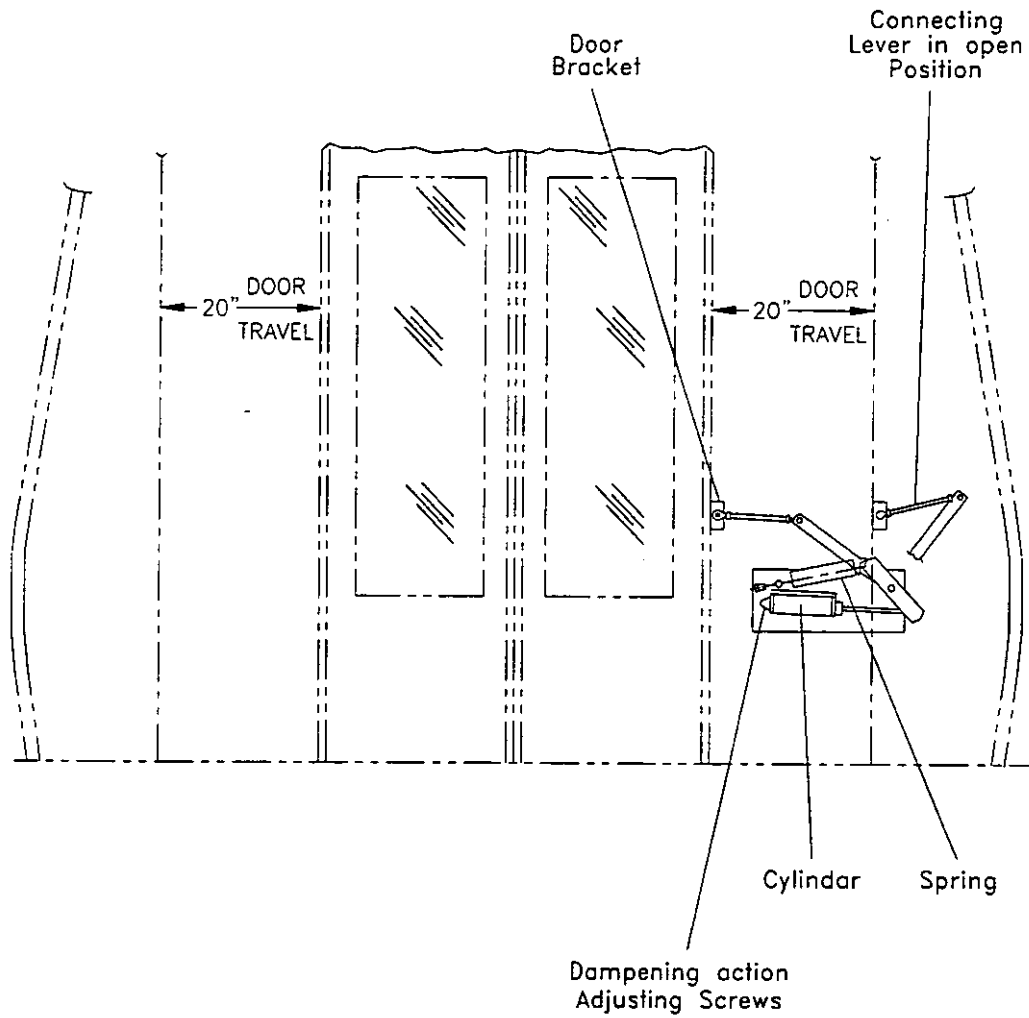


Figure 1-1-3. End Doors

A: DOOR5068

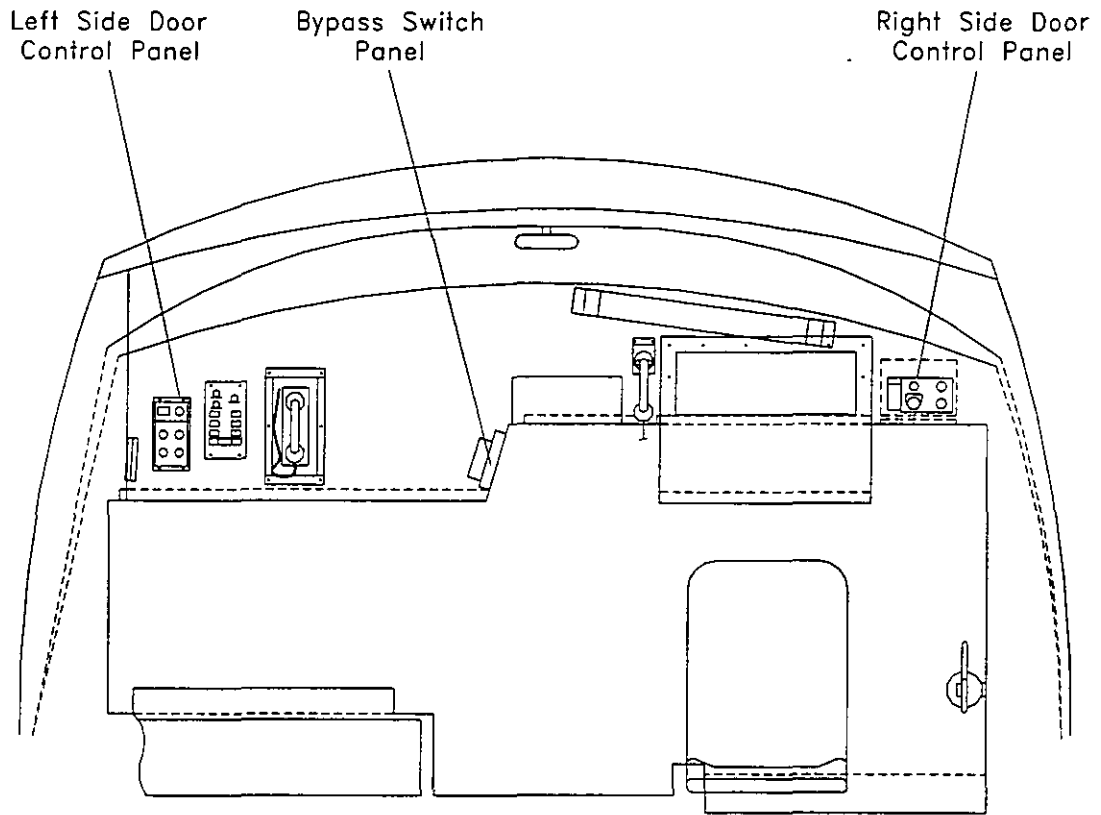


Figure 1-1-4. A2 Car Control Cab

A: OCMP5026

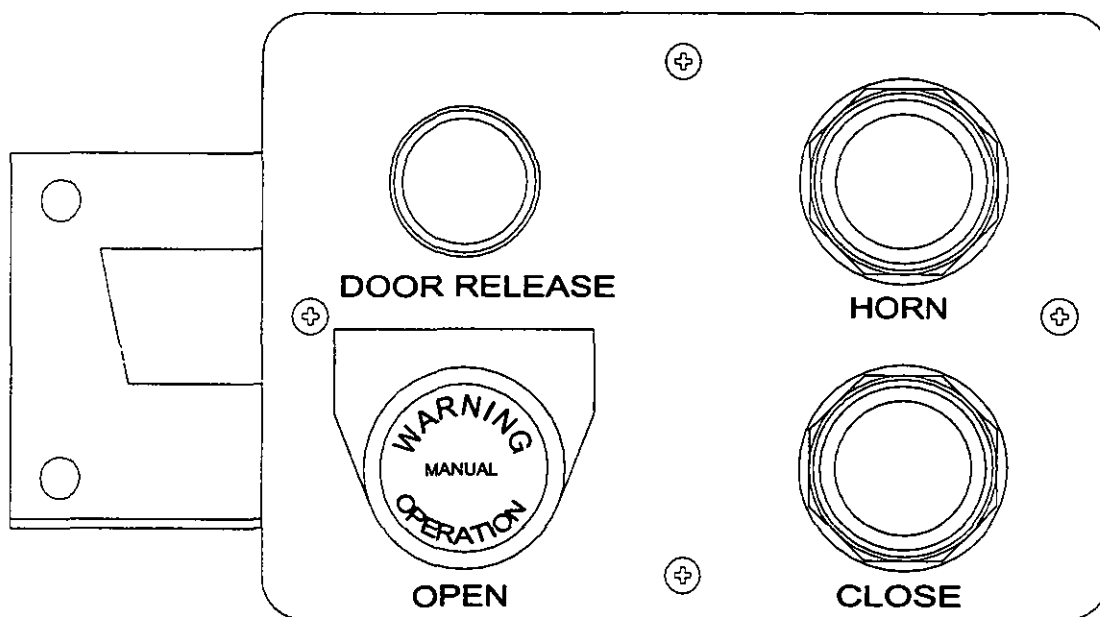


Figure 1-1-5. Right Side Door Control Panel

The other control panel is mounted on the cab auxiliary equipment locker and controls the opening and closing of the non-operator side (left side) doors. Figure 1-1-6 shows the left side door operator's panel. The right side door control panel contains three pushbuttons and one lamp. The left side door control panel contains four pushbuttons and two lamps. The following paragraphs describe each component on the door control panels.

A. Door Release (Amber)

This indicating lamp on both door operator panels illuminates to annunciate that the door closing release signal has been received from central control. Illumination is delayed several seconds to allow time for automated door close announcement to be made via PA system.

B. Open (Blue)

This momentary contact pushbutton on both door operator panels is guarded by a spring loaded cover with a warning decal. When depressed, this pushbutton commands the opening of all doors on that side in yard manual mode. This control also opens the doors in road and automatic mode if a door open signal is presented from the ATO system.

C. Horn (Black)

With the car or consist in yard manual mode, depressing this momentary contact pushbutton on either door control panel causes the electronic horn to produce a beeping sound. With the car or consist in automatic or road manual mode, depressing this momentary contact pushbutton causes the horn to produce a steady tone sound.

D. Close (Blue)

This is a shrouded, momentary contact pushbutton on both door control panels. When depressed, it commands all doors on that side of the car to close.

E. Stop (Red)

This pushbutton is on the left side door control panel. When it is depressed and latched, the propulsion system is disabled, regardless of control mode, and open loop brakes is commanded.

F. Ready/Run (Amber)

This indicator, on the left side door control panel, illuminates when the car or consist is not in an open loop braking condition.

1-1-3

DOOR OPERATING SYSTEM

The door operators in Figures 1-1-7 are electro-mechanical devices that open and close the side doors. There is one door operator per door leaf, located as shown in Figure 1-1-1. The door operators actuate extension arms that open or close the corresponding door leaf upon receipt of an electrical signal sent by the car operator. In an emergency, doors 3, 4, 5, and 6 can be opened manually, from inside the car, by an emergency lever on the door operator. (The door operators for doors 1, 2, 7, and 8 do not have emergency levers.) If the normal door closing system fails, a cutout system establishes an electrical path for the door operating signals.

A: OCMP5027

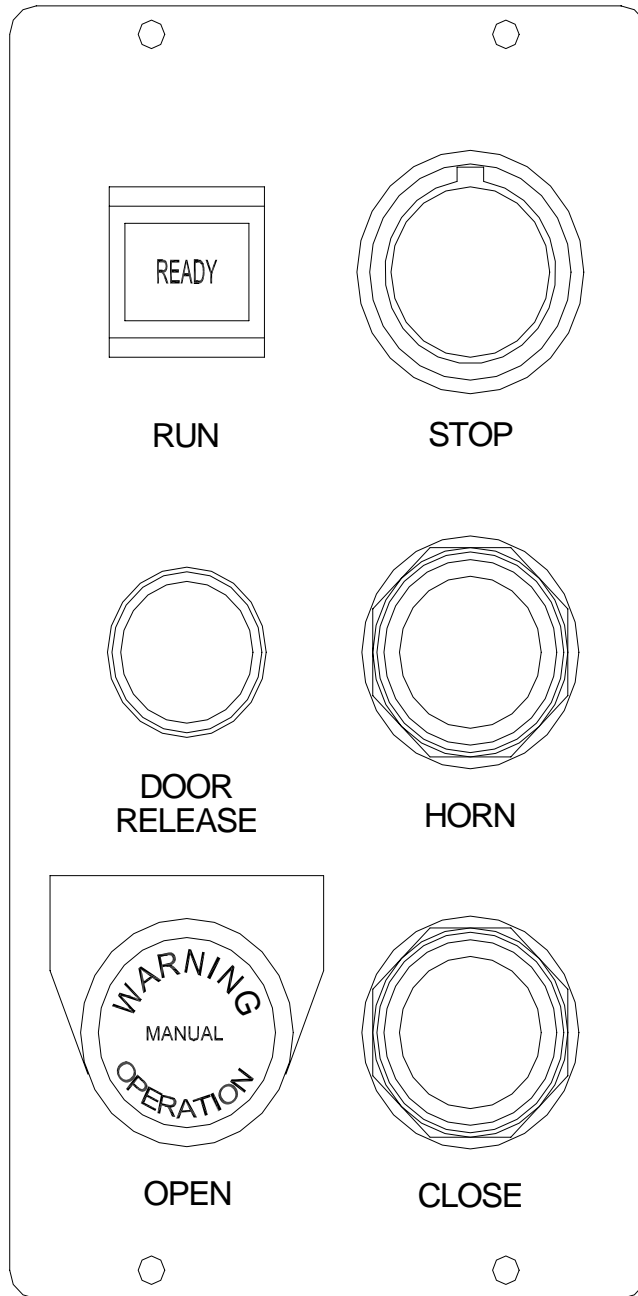
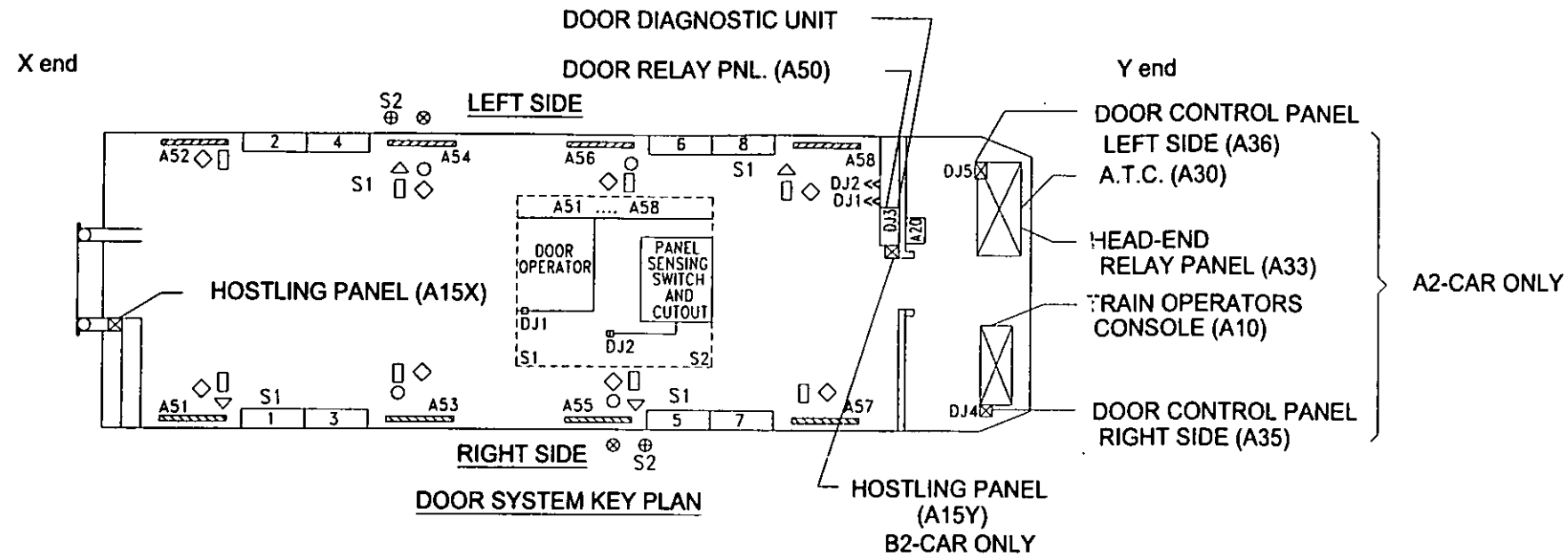


Figure 1-1-6. Left Side Door Control Panel

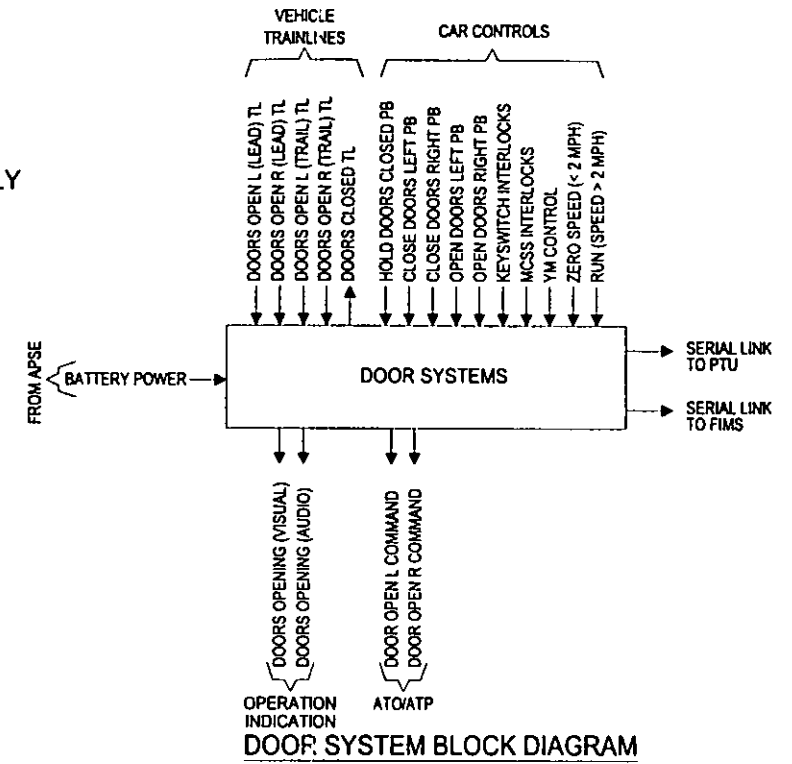


CUTOUT SWITCH MODES	CUTOUT SWITCH POSITIONS				
	C01	CO-2NC	CO-2NO	CO-3NC	CO-3NO
NORMAL	X	X	O	X	O
INTERMEDIATE FOR CLOSING MAN.	O	X	O	X	O
LOCK	O	O	X	O	X

X- CONTACT MADE
O- CONTACT OPEN

SYMBOLS

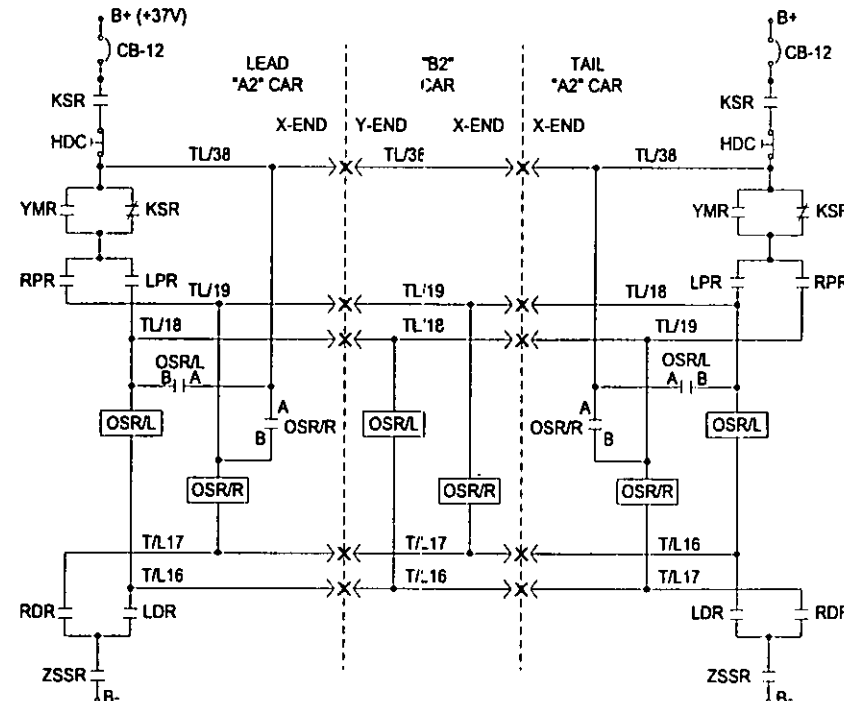
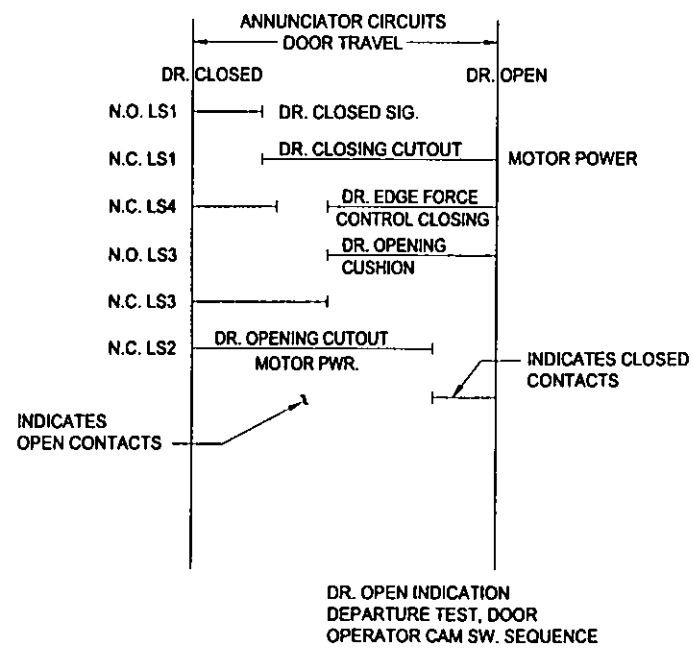
- ▨ - DOOR OPERATOR
- △ - LOCAL CONTROL KEY SWITCH INSIDE
- ⊕ - LOCAL CONTROL KEY SWITCH OUTSIDE
- - EMERGENCY SWITCH
- - CUTOUT
- ⊗ - EMERGENCY
- ◇ - DOOR WARNING & LOCAL STATUS LIGHT



LEGEND

- CO - CUTOUT SWITCH (1 THRU 4)
- DCR - DOOR CLOSE RELAY
- DCSR - DOOR CLOSED SUMMARY RELAY
- EMS - EMERGENCY DOOR OPEN SWITCH
- FIMS - FAULT INDICATION AND MONITORING SYSTEM
- HDC - HOLD DOOR CLOSED BUTTON
- KSR - KEY SWITCH RELAY
- LCR - LOCAL CONTROL RELAY
- LDR - LEFT DOOR OPEN RELAY (TRAINLINE)
- LPR - LEFT PLATFORM RELAY
- LS - LIMIT SWITCH (1 THRU 4)
- MCR - MOTOR CONTROL RELAY
- MPR - MOTOR POWER RELAY
- OSR - OPEN SIGNAL RELAY
- PSR - PANEL SENSING RELAY
- PSS - PANEL SENSING SWITCH
- RDR - RIGHT DOOR OPEN RELAY (TRAINLINE)
- RPR - RIGHT PLATFORM RELAY
- RR - RUN RELAY (>2MPH)
- SS - SERVICE SWITCH
- SR-L - SLAVE RELAY LEFT
- SR-R - SLAVE RELAY RIGHT
- TDR - TIME DELAY RELAY
- ZSSR - ZERO SPEED RELAY (<2 MPH)

CUTOUT SWITCH CONTACT ARRANGEMENT



TRAINLINE DIAGRAM

Figure 1-1-7. A2/B2 Car Layout Showing Location of Side Door, Door Operator, and Indicator

The door operator, control, and system signaling circuits operate from the car 36.5 Vdc (nominal) battery supply. The door system functions in a single car or in a group of cars connected to form a consist through the use of various trainline circuits.

A. Door Operators

The door operator (including motor, speed control resistors, limit switches, and integral linkages) provides a smooth door operating movement. See Figure 1-1-8. The door operators are factory adjusted to provide the required door opening and closing speeds and door edge closing forces. However, the door operator opening and closing speeds and torque control may be adjusted by sliding-tap speed control resistors. The door operator circuitry also inserts a hold-open resistor in series with the B+ feed to keep the doors in an open position after they have been opened. This hold-open feature prevents the door panels from sliding closed due to the force of gravity when the car is set on an incline and the doors are open. Each door operator motor is protected against thermal overload by a temperature-actuated cutout switch that automatically resets when cooled.

The mechanical design of the door operator linkage provides over-center locking when the door panel is closed. This prevents the door panel from being opened manually unless the over-center lock is released, either electrically through rotation of the door operator motor, or mechanically through action of the emergency lever. The emergency lever is an integral part of door operators 3, 4, 5, and 6, and permits that door panel to be opened manually in an emergency.

The door operator also includes a reduction gearbox driven by a small series-type dc motor. The reduction gearbox has reversible or back-drive gears and permits the door panel to be opened manually if an emergency exit is required.

The emergency levers on door operators are accessible after the access panel in the car body interior is opened. Actuating the emergency lever also opens the emergency switch (EMS) to shut off electrical power during an emergency opening. Each door operator circuit includes a service switch (SS) that allows the door operator function to be electrically disconnected for servicing.

B. Door Obstruction Circuit

The door system circuitry includes a timing circuit that automatically interrupts the motor circuit if a door panel (or panels) is obstructed during the closing cycle. The timing circuit automatically turns off the power to the door operators and attempts to close them in 6.5 second timing intervals until the panels are completely closed.

C. Extension Arm Assemblies

Four right-hand and four left-hand extension arm assemblies per car connect the door operators to the door panels. A mounting bracket, part of each extension arm assembly, secures the assembly connecting rod to the rear edge of the door panel.

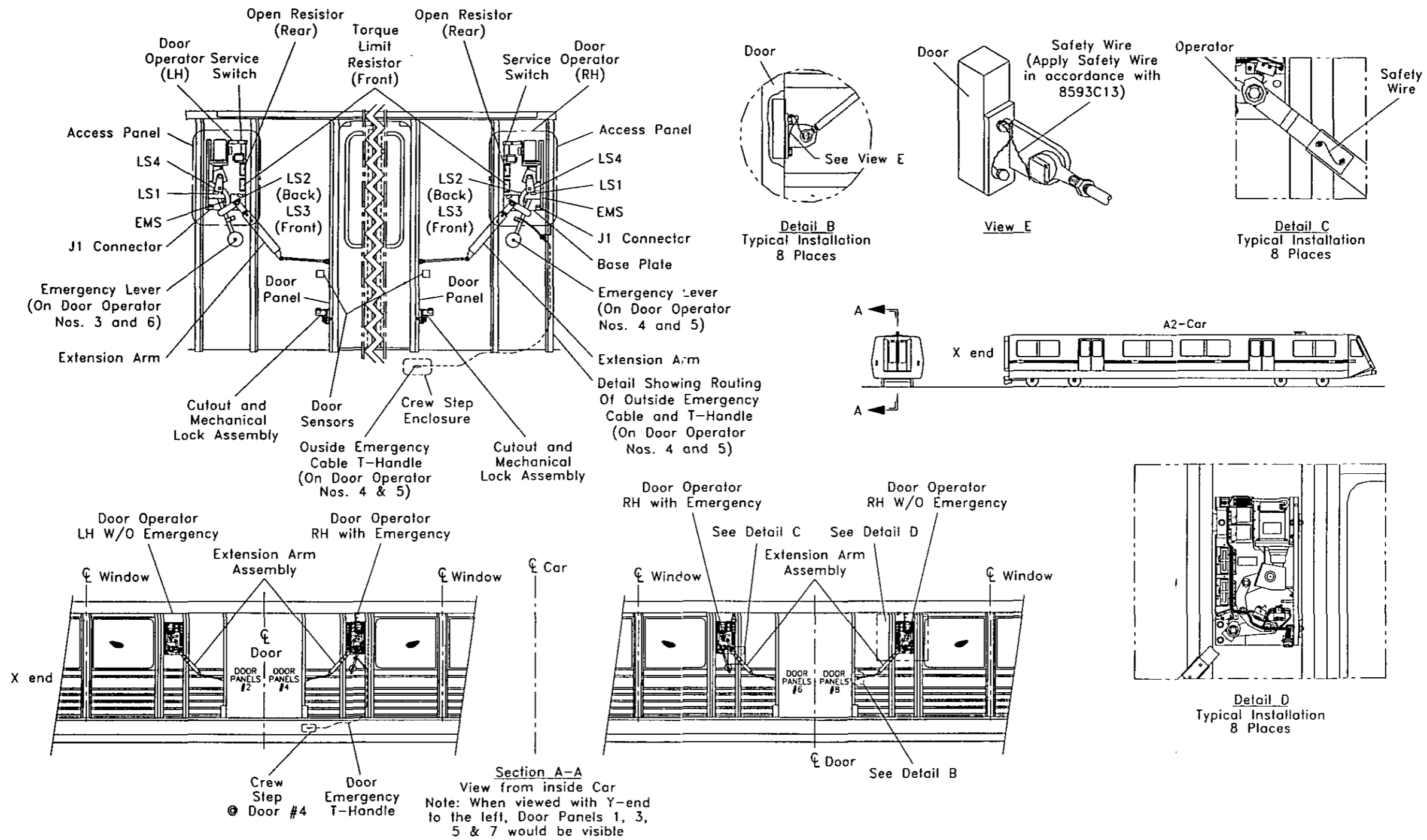


Figure 1-1-8. Arrangement of Door Linkages in Car

The extension arm is secured to the door operator multiplying lever arm via a bolted joint and is safety wired.

D. Emergency Handle and Release Cable Assembly (Outside)

Each car has two outside emergency release cable assemblies. On the right side of the car, the emergency handle and cable are attached to door operator 5. On the left side of the car, the emergency handle and cable are attached to door operator 4. The cable attaches to the door operator emergency lever. The other end of the cable terminates at a T-handle located in the crew steps at doors 4 and 5. The emergency release cables allow access to the car without activating crew switches.

E. Crew Switch (Inside/Outside)

There is a crew switch for local control inside the car at each door opening, and outside the car at door panels 4 (left side) and 5 (right side). Operation of the crew switch opens or closes the doors. The three-position crew switch is a momentary-action type. Turning the key 45° clockwise opens the door, while turning the key 45° counterclockwise closes the door. The key can be removed from the crew switch only from the center (insert) position. The key may be removed leaving the doors either open or closed.

F. Cutout and Mechanical Lock Assembly

The cutout and mechanical lock assembly is mounted on the car door post behind an access panel and is a right-hand or left-hand configuration to suit the location. The lock mechanism adjacent to each door panel can be used if a malfunction occurs at that door panel. When actuated, the mechanical lock bar is positioned across the door opening area at the back edge of the panel, preventing an out-of-service door panel from being opened manually. The electrical portion of the right hand door lock assembly includes a cutout switch. When placed in the locked position, this switch opens the power feed circuit to that door operator and electrically bypasses and completes the operator signal circuits. This prevents interruption of the train annunciator, summary, and signal circuits because of a door malfunction within a specific car.

G. Panel Sensor Switch (PSS)

The PSS is a normally-open (NO) relay which is actuated into its closed mode when the closing door panel passes a proximity sensor. This sensor is not actuated when the doors are obstructed. The PSS relay switches, on all doors on either side of the car, are connected in series with the coil of the door close summary relay (DCSR) to provide a continuity path, allowing application of traction power. Refer to Book 86, Volume 1 for door operating controls location, operation sequence, and emergency door operating instructions.

H. Door Control Relay Panel and Door Diagnostic Unit (Figure 1-1-9)

There is one door control relay and diagnostic unit in each car. The assembly consists of a door control relay panel (DCRP) printed circuit board assembly and door diagnostic unit (DDU) printed circuit board assembly mounted on a baseplate. Figure 1-1-7 shows the location of these boards.

The relay panel printed circuit board assembly houses the time delay module (TDR) and the following safety relays:

- DCSR-L,
- DCSR-R,
- OSR-R,
- OSR-L,
- 4 LCRs,
- RR,
- MPRO, and
- MPRR.

The DDU printed circuit board assembly is comprised of a CPU board and an I/O board, which includes a 9-pin, D-type connector. This connector provides an RS-232 interface, which connects the portable test unit (PTU) to the DDU.

The door diagnostic unit is a microprocessor operated assembly which monitors the operation of the car door system. It interfaces with the door control subsystem through the door control relay panel internal harness.

The DDU continuously monitors the operation of the door controls and records and preserves operational data. It processes door status data to determine when a fault occurs and stores that data also. Operational and fault data are stored in separate non-volatile memories which can hold 500 events each. The memory contents may be retrieved and examined, using the PTU and a laptop computer through a serial interface. (See subsection 1.1.2.1.) Battery backup ensures that the memories are maintained for up to 300 days, even when external power is removed from the DDU.

The DDU also reports operational failures to the car fault information monitoring system (FIMS) computer through an RS-422 link.

There are four LED indicators on the DDU panel—POWER APPLIED (red), UNIT ACTIVE (flashing red), DOORS CLOSED (green), and FAULT STORED (red).

A dc power supply mounted on the printed circuit board assembly converts consist battery power from 36.5 Vdc nominal to the levels necessary for the DDU. The DDU inputs and outputs contain protection which eliminates power failure to the vehicle and prevents affecting the operation of the relay panel or door operators.

The DDU is entirely passive with regard to door and vehicle safety. It cannot affect the operation of the doors either directly or as a result of any single point failure.

I. Portable Test Unit (PTU)

The PTU for the DDU is a Microsoft Windows® 3.1 compatible application providing a diagnostic and exercising interface to the DDU. The application runs on a laptop computer and is used to test, monitor, and troubleshoot the door subsystem of the vehicle.

The PTU connects to the DDU through a standard commercial RS-232C null modem cable to the 9-pin D-type connector on the DDU interface board, which forms the RS-232 port.

The PTU software program communicates with the embedded software in the DDU. The PTU software performs the following functions:

1. user identification input and recording;
2. downloading and saving recorded information from the DDU;
3. displaying and defining the downloaded information;
4. deleting information downloaded from the DDU;
5. initiating built-in testing of the DDU;
6. receiving and displaying the results of built-in testing of the DDU and indication of failed LRUs;
7. controlling operation of the door system;
8. receiving and displaying states of door system devices during test;
9. receiving software version from the DDU;
10. receiving checksum from flash memory from DDU;
11. transferring variable values to the DDU; and
12. verifying proper vehicle type for mode of software operation.

The DDU is installed on the A2, B2, and converted A2/B2 cars.

Access of the functions listed above is through point-and-click with pull-down menus as appropriate, or through keyboard commands, as in most Windows applications. Help screens are also available on all aspects of PTU use.

The PTU establishes communications with the DDU on connection. This is indicated by the appearance of a screen request for operator identification. (Communications failure is indicated by a screen message stating the fact.) The operator then enters an identification number and follows screen instructions to select and perform the required function.

Where the function is downloading the DDU fault and/or status logs, the data includes the car number, the time (Pacific Standard Time) and the date of each entry in the status or fault log. In addition to reporting any operational error, the fault data allows the PTU to identify the LRU which may be defective, thus causing the fault. The PTU can be used to clear and reset the DDU data logs and to update the DDU car number, time, and date settings. Refer to Chapter 2 for full details.

Where the selected function is testing or exercising the door operating system, the PTU causes the DDU to generate command signals to the door relay panel, operating the system. To accomplish this, connect the PTU umbilical key to DJ3 on

the DDU. For full details of the procedure, see chapter 2. The power for the output driver circuits of the DDU is routed through the PTU umbilical key.

Table 1-1-1. Door Control Relays

Circuit 5	Relay	Location
DCSR-L	Door close summary	Left side
DCSR-R	Door close summary	Right side
LCR 1	Local control	Door panels 1 and 3
LCR 2	Local control	Door panels 2 and 4
LCR 5	Local control	Door panels 5 and 7
LCR 6	Local control	Door panels 6 and 8
OSR-L	Open signal	Left side
OSR-R	Open signal	Right
RR	Run	
TDR	Time delay*	
MPRO	Motor power relay override (local control)	All
MPRR	Motor power relay reset (local control)	All
* Repeat cycle timer, OFF 3 seconds, ON 3 or 3.5 seconds,		

1-1-4 END DOORS

A. Door Check Assembly (Figure 1-1-10)

Each car's pneumatic door check assembly, located at the X and Y-end car door (X-end only on A2 cars), provides push-to-open, spring-close operation of the car end door panels. The assembly consists of a pneumatic check (air cylinder), lever and connecting rod assembly, baseplate, extension spring, and bracket assembly. The air cylinder consists of a cylinder capped on each end, a piston, and a piston rod. One cylinder cap has a bearing pivot on a stationary pin. The other cap has a hole through which the piston rod passes and attaches to a lever assembly. The pivot end cylinder cap has a regulating screw to adjust the amount of dampening action of the door panels.

B. Door Opening Force

The force required by a passenger to open the inside end door is adjustable. This force diminishes as the door panels are opened. To hold the door fully open, a passenger needs to apply approximately 26 pounds (maximum) of pressure.

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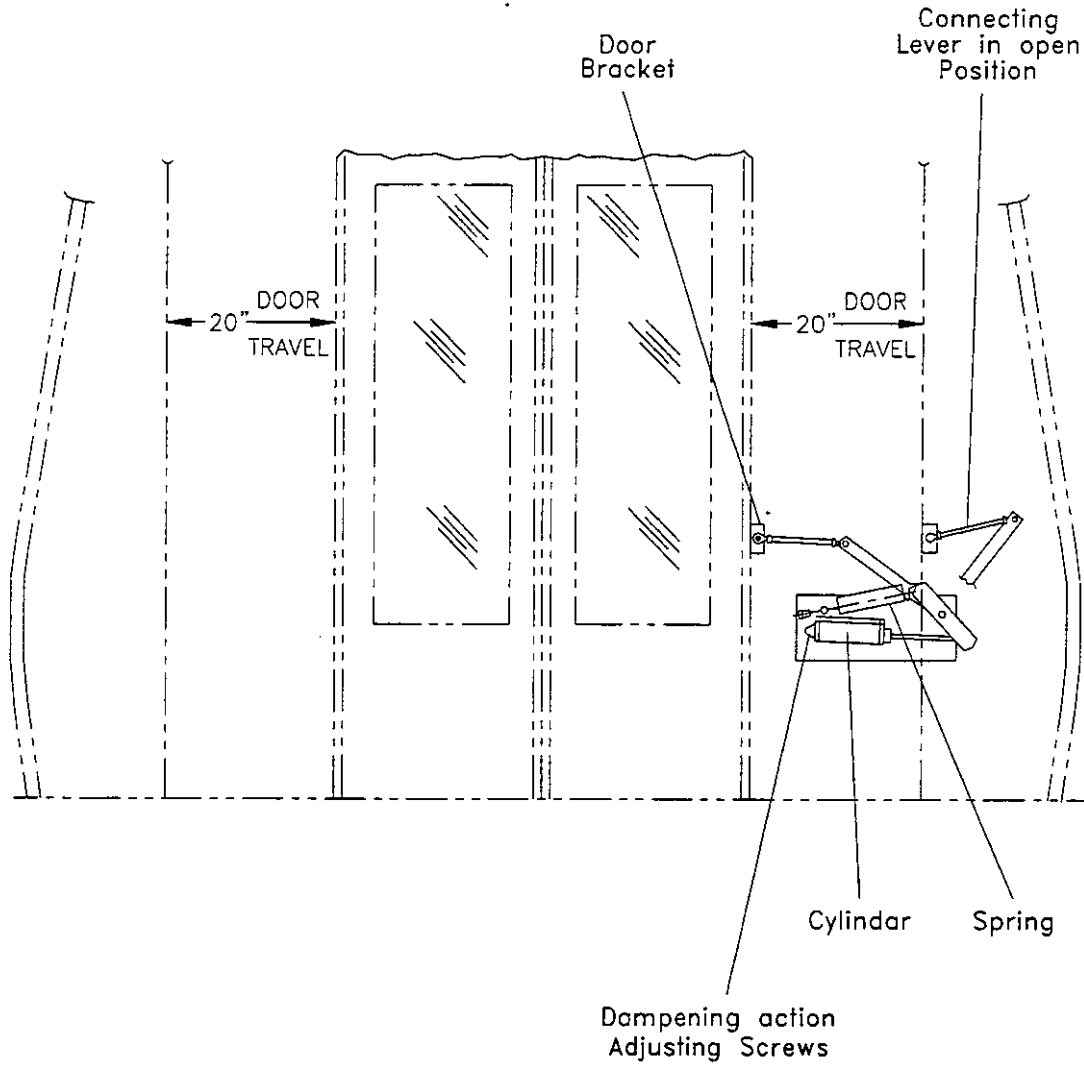


Figure 1-1-10. X-End Door Check Assembly (Location)

SPECIFICATIONS

The side door operator consists of a reduction gearbox driven by a high-torque, series-wound, 36.5 Vdc (nominal) motor. This assembly is installed in the door pocket area complete with speed control resistors, motor control relay and motor power relay, service switch, and limit switches. The emergency lever is an integral part of door operators 3, 4, 5, and 6, and permits the subject operator to be opened manually in an emergency. The emergency switch is actuated by manually moving the emergency lever to the OPEN position, which opens the door panel. Components of the complete door operator assembly are mounted on a steel base plate. The door operator weighs approximately 50 pounds and is secured to the car mounting structure by five ½ inch mounting bolts. Electrical wiring connections are made to the door operator at a 19-pin Veam male receptacle connector, bracket-mounted to the door operator base plate.

1-2-1 DOOR CONTROL SYSTEM

The door operating and signaling system operates from the car 36.5 Vdc (nominal) battery supply. Table 1-2-1 lists system specifications.

The door operators feature right-hand and left-hand application, one door operator for each door panel in the car. There are four right-hand and four left-hand door operators per car. The door operators open or close each door panel by an extension arm assembly of left-hand or right-hand configuration. Table 1-2-2 through Table 1-2-6 give specifications for the various doors. Figure 1-1-1 shows the location of the various doors.

Table 1-2-1. Door Control System Specifications

Door operator type	Electro-mechanical
Nominal system voltage	36.5 Vdc
Operating voltage range	23 to 42 Vdc
Door panel travel	27 inches
Total door opening	54 inches
Door opening speed	1.5 +0, -0.5 seconds (adjustable)
Door closing speed	2.0 to 2.5 seconds (adjustable)
Door closing force at mid stroke	18.5 ± 2 pounds(nominal, stalled)
Emergency door opening	Manual operator release on door panels 3,4, 5 and 6. Outside emergency handle and cable on door operators 4 and 5.
Door static friction	5.0 pounds (nominal)
Door to operator linkage	Self-aligning bearings with adjustable length connecting rods.

1-2-2 MOTOR SPECIFICATIONS

The door operator motor is identical for left and right-hand door operators. Refer to Table 1-2-2 for motor specifications. An integral temperature-actuated, cutout switch protects the door operator motor against thermal overload. The switch automatically opens the B+ feed if an excessive internal temperature rise occurs. Refer to Table 1-2-3 through Table 1-2-6 for specifications of the other door.

Table 1-2-2. Motor Specifications

Type	Series-wound, dc
Nominal	36 Vdc
Minimum voltage	24 Vdc
Maximum voltage	48 Vdc
RPM	Varies with load and voltage (800 rpm at rated shaft load)
Maximum stall current	6.5 A at 36 Vdc (120°F field temperature)
Installation	Class B
Dielectric test	1250 Vrms, 60 Hz/1 s
Overload protection	Automatic reset thermal cutout switch
Connections	Made to 12 inch lead and fanning strip assembly
Lubrication	Permanent (sealed bearings)
Shaft type	0.875 inch long pinion, 9 teeth, 20 diameter pitch
Brush type	Carbon, pigtail with anti-rotation device
Housing	Totally enclosed with two removable commutator inspection plugs. Flange type mounting.

Table 1-2-3. Side Door

Types	101 and 102
Materials	5754-H Aluminum alloy
Height	76-5/16 inches
Width per leaf	27-15/16 inches
Thickness	1 inches
Weight per leaf	90.75 pounds
Travel	54 inches (27 per leaf)
Required closing force	15 to 30 pounds
Window - Material class II tinted tempered glass - Dimensions	37-15/16 x 19-7/16 x 5/16 inches

Table 1-2-4. End Door Specifications

Types	101 and 102
Material	5754-H 24 aluminum alloy
Height	75-1/2 inches
Width per leaf	23-3/8 inches
Thickness	1 inches
Weight per leaf	71.55 pounds
Travel	20 inches per leaf
Width of opening	
Required opening force	26 pounds
Window with anti-vandal film on both sides - Material class III clear layered glass - Dimensions	

Table 1-2-5. Cab Door Specifications

Type	
Material	5754-H24 aluminum alloy
Height	76-1/2 inch
Width	29-7/16 inch
Thickness	1-1/8 inch
Weight	71.1 pounds
Travel	29-15/16
Window with anti-vandal film on both sides - Material class III clear layered glass - Dimensions	48-15/16 X 18-3/32 inch

1-2-3

DOOR DIAGNOSTIC UNIT

The DDU, consisting of an assembly of two printed circuit boards, is mounted on a common base plate with the door control relay panel.

Table 1-2-6. DDU Specifications

Nominal voltage	36.5 Vdc
Operating range	24 to 41 Vdc at battery 22 to 40.5 Vdc at unit
Ripple	Voltage and current, less than 3 percent peak to peak
Polarity	Negative ground, isolated chassis
Operating temperature	20°F to 158°F

Table 1-2-6. DDU Specifications

Storage temperature	-20°F to 158°F
Humidity	35 to 100 percent
pH	4.0
Chlorine content	13.9 micrograms per cubic meter maximum
Memory size	Two memories, 500 entries each (default size)
Indicators	POWER APPLIED (red), UNIT ACTIVE (flashing red), DOORS CLOSED (green) and FAULT STORED (red).
Data transfer (to test equipment)	Via RS-232 null modem data link, three wire configuration
Data transfer speed	19200 baud

ACRONYMS AND ABBREVIATIONS

Table 1-3-1 is a list of acronyms and abbreviations used in the various volumes of Book 86 of the BART Rolling Stock Department Maintenance Procedures. In addition to this list, section 7-0-2 contains a glossary of special terms and abbreviations used in the data pages for the Illustrated Parts Catalog.

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
A	amps
A2	rehabilitated A car
AAR	Association of American Railroads
AC	air conditioning
ac	alternating current
ACCB	air comfort control breaker
ACCR	air compressor control relay
ACDBS	ac dead battery start
ACFM	actual cubic feet per minute
ACJ	air compressor jack
ACM	air compressor motor
ACMB	air compressor motor breaker
ACMS	air compressor motor start
ACP	air pressure control switch
ACPR	AC power relay
ACR	auxiliary control relay
ADA	American Disabilities Act
ADJ	adjust or adjuster
AGC	automatic gain control
Ah	ampere hour
A.I.	analog input
AIMB	auxiliary inverter motor blower
ALR	annunciator light relay
Alum.	aluminum
AMBAS	ambient air sensor assembly
amps	amperes
AMS	aircraft material specifications
AN	Army-Navy

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ANN COM	annunciator common
ANN	annunciator
ANSI	American National Standard Institute
A.O.	analog output
APBTU	automated power bench test unit
APC	air compressor pressure control
APSE	auxiliary power supply equipment
APSEF	auxiliary line fuse
AR	annunciation relay, annunciator relay
A/R	as required
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
ATC	automatic train control
ATO	automatic train operation
ATP	automatic train protection
ATS	automatic train supervision
AUTO	automatic
AUX	auxiliary
AUX ANN	auxiliary annunciator
AWG	American wire gage
AWS	American Welding Society
AX	A car, X end
AXR	auxiliaries relay
AY	A car, Y end
B2	rehabilitated B car
BART	Bay Area Rapid Transit
BAT	battery
BC	braking contactor, brake contactor
BCU	brake control unit
BG	battery ground
BIST	built-in self-test

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
BITE	built-in test equipment
BK	brake
BPMB	brake pump motor breaker
BPSV	bypass solenoid valve contactor
BRKR	breaker
BRNG MTG	bearing mounting
BSN	BART stock number
BTU	bench test unit
BX	B car, X end
BY	B car, Y end
C (°C)	degrees Centigrade
C.C.	current collector
CB	circuit breaker
cc	cubic centimeter
CCP	car control panel
CCU	communication control unit
CFMB	condenser fan motor breaker
CFM	condenser fan motor
cfm	cubic feet per minute
CFOL	condenser fan overload
Chk	check
CHM	cab heater motor
CHMB	cab heater motor blower
CMOS	complementary metal-oxide semiconductor
CMS	condenser fan motor starter
CO	cutout switch
COB	convenience outlet breaker
COM	common
comm	communications
comp.	compressor
Conn.	connect
CPU	central processing unit

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
CS	current sensing
CSHR	current sensor heater return
CTRL	control
cu.ft.	cubic feet
cu. in.	cubic inch
DAC	data access card
DB	dynamic brake
dBA	decibels adjusted
dBm	decibels relative to one milliwatt
DBFB	dynamic brake feedback
DBS	dead battery start
DC	door closed
dc	direct current
DCB	door closed brake
DCR	door closed relay
DCRP	door control relay panel
DCS-L	door closed summary left
DCS-R	door closed summary right
DCSR	door close summary relay
DCSR-L	door close summary relay left
DCSR-R	door close summary relay right
DDE	dynamic data exchange
DDU	door diagnostic unit
DE	door emergency
Decel	deceleration
DF	freewheeling diode
DI	door interlock
D.I.	digital in
DIP	dual in-line packages
DIR	direction
DL	door left
DLL	dynamic link library

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
DNY	diode negative Y-inverter
DO	door open
D.O.	digital out
DOB	door open brake
DOSR	door operating summary relay
DPDT	double pole double throw
DPR	dual port RAM
DPY	diode positive Y-inverter
DRCR	door release control relay
DRTR	door release timing relay
DTS	digital test subsystem
DVAM	digital voice announcement module
DVM	digital volt meter
DYN BR	dynamic brake
EBC	evaporator blower contactor
EBM	evaporator blower motor
EBOL	evaporator blower overload
ECOM	electronic communications
ECU	electronic control unit
EH	electro-hydraulic
EHU	electro-hydraulic unit
EHUBX	electro-hydraulic unit breaker, X-end
EHUBY	electro-hydraulic unit breaker, Y-end
EJC	electrical joint compound
elec.	electric
EM	emergency relay
EMB	evaporator fan motor breaker
EMI	electromagnetic interference
EvFMS	evaporator fan motor starter
EMS	emergency relay door open switch
EPC	emergency power contactor
EPROM	electrically programmable read only memory

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ESD	electrostatic discharge
ESDC	emergency stop door control
ESNA	Elastic Stop Nut Corporation of America
ETL	exterior trouble light
EVAL	evaluation
EXT	external
F (°F)	degrees Fahrenheit
FBEU	friction brake electronics unit
FIFO	first in first out
FIMS	fault indication and monitoring system
FITS	fault isolation tool set
FR BR ANN	friction brake annunciator
ft.lbs.	foot-pounds
ft.lb.	foot pound
gal.	gallon
GDB	gate driver board
GDBF	gate driver board faults
GND	ground
GPIO	general purpose interface bus
gpm	gallons per minute
GR	green
GUI	graphical user interface
HBTU	hydraulic bench test unit
HC	heating contactor
HDLR	headlight relay
HERP	head end relay panel
hex	hexadecimal
HP	high pressure
hp	horsepower
HPS	high pressure switch
hrs	hours
HV	high voltage

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
HVAC	heating, ventilation, and air conditioning
Hz	hertz
IBTU	integrated bench test unit
IC	integrated circuit
ICB	intermediate charge breaker
Id	identification
ID	inside diameter
IEEE	Institute of Electrical and Electronic Engineers
IGBT	insulated gate bipolar transistor
in.lb.	inch-pound
IND	indicator
INT	intercom
I/O	input/output
IR	infrared
iRMK	Intel real-time multitasking kernel
ISA	industry standard architecture
ISO	International Standard Organization
ISR	inverter start relay
ITA	interchangeable test adapter
IV	intermediate voltage
IVPS	intermediate voltage power supply
K	Kelvin
k	kilo
kHz	kiloHertz
km/h	kilometers per hour
KS	key switch
KSI	inside key switch
KSO	outside key switch
KSR	key switch relay
kVA	kilovolt amps
kW	kilowatt
L	liter

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
lb	pound
LBRC	low battery voltage relay coil
lbs	pounds
LC	inductance-capacitance
LCB	logic circuit breaker
LCD	liquid crystal display
LCR	local control relay
LDR	left door open relay
LED	light emitting diode
lg	long
LH	left hand
LL	lower limit
LP	low pressure
LPR	left platform relay
LPT	low pressure transducer
LRU	line replaceable unit
LS	line switch
LSB	line switch box
LSH	low section height
LT	light test
LUC	lay-up contactor
LV	low voltage
LVCB	low voltage circuit breaker
LVPS	low voltage power supply
LW/SS	load weigh and speed sensor
M	motor
man	manual
max.	maximum
MCR	motor control relay
MCSS	master control selector switch
megohms	mega-ohms
MEK	methyl ethyl ketone

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
mH	milliHertz
MHz	megaHertz
MIC	microphone
min.	minute
mm	millimeter
MMI	man-machine interface
MOV	metal oxide varistor
MPH	miles per hour
mphps	miles per hour per second
MPR	motor power relay
MPRO	motor power relay override
MPRR	motor power relay reset
MS	military standard
ms	millisecond
mV	millivolt
N/A	not applicable
NC	normally closed
NO	normally open
NEMA	National Electrical Manufacturer's Association
Nm	Newton meters
nom.	nominal
NPT	national pipe thread
OCC	operations control center
O.D.	output devices
OD	outside diameter
OLR	overload relay
Op.	operational
OSHA	Occupational Safety and Health Administration
OSR	open signal relay
OSR-L	open signal relay left
OSR-R	open signal relay right
PA	public address

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
PAACA	public address amplifier controller version A
PAACB	public address amplifier controller version B
PB	parking brake
PBMB	propulsion blower motor breaker
PBV	park brake valve
PC	printed circuit
PCB	printed circuit board
PERF	performance
PF	power factor
Ph.	phase
P/N	part number
PPG	Pittsburgh Plate & Glass
press.	pressure
PROP ANN	propulsion annunciator
PROP	propulsion
PS	position sensors
psi	pounds per square inch
psig	pounds per square inch gage
PSR	panel sensing relay
PSS	panel sensor switch
PST	Pacific standard time
PTT	push to talk
PTU	portable test unit
PTUIU	portable test unit interface unit
PVB	polyvinyl butyral
PVC	polyvinyl chloride
PWB	printed wiring boards
PWM	pulse width modulated
QD	quick disconnect
QR	quick release
R	resistor
RAS	return air sensor

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
RAM	random access memory
R/C	resistive/capacitive
RCC	refrigeration compressor contactor
RCOL	refrigerant compressor overload
RD	damping resistor
RDR	right door open relay
ref.	reference
Reg	regulator
REL	release
req'd	required
RFI	radio frequency interference
RH	right hand
RGC	rail gap contactor
RIU	remote intercom unit
RLS	release
RMS	root mean square
RMSH	reliability, maintainability, safety, and human factors
ROM	read only memory
rpm	revolutions per minute
RPR	right platform relay
RR	run relay
RTD	resistance temperature device
RTOS	real time operating system
s	second
SAE	Society of Automotive Engineers
SC	system controller
SCC	serial communication controller
SCS	suspension bag pressure switch
SCV	solenoid control valve
sec	second
SHLD	shield
SIG	signal

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
SPC	shop power contactor
SPCB	shop power circuit breaker
SPDT	single pole double throw
spec	specification
SPFB	shop power feed breaker
SPK	speaker
S.R.	slave relay
SR	shield relay
SRU	secondary replaceable unit
SS	service switch
SSR	solid state relays
SW	switch
Sysadmin	system administration (IBTU login option)
TCU	temperature control unit
TDL	transducer line
TDR	time delay relay
TEV	thermal expansion valve
TH	turret head
TIR	total indicator reading
TL	trainline
TLS	trainline switch
TPINV	three phase inverter
TR	transducer return
Trans	transmission
TT	to talk
TT-PA	to talk-public address
TYP, typ	typical
UART	universal asynchronous receiver/transmitter
μF , μF	microFarad
μH , μH	micorHertz
UL	upper limit
UNC	unified national course

Table 1-3-1. List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
UTIL	utilities
UUT	unit under test
UV	ultraviolet
V	volt
Vac	volts alternating current
Vdc	volts direct current
VOM	volt ohm meter
Vrms	voltage root mean square
VTVM	vacuum tube voltmeter
WABCO	Westinghouse Air Brake Company
WABD	Westinghouse Air Brake Division
W.C.	water column
YM	yard manual
ZIF	zero insertion force
ZSSR	zero speed slave relay
ZSR	zero switch relay
"	inch (should occur only in drawings)
'	foot (should occur only in drawings)