

LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

P2550

**RUNNING
MAINTENANCE
AND
SERVICE MANUAL**

**SECTION 14
COMMUNICATIONS**



LOS ANGELES COUNTY

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RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01
PART I
THEORY OF OPERATION
SECTION 14 - COMMUNICATIONS

SECTION 14

COMMUNICATIONS

PART I

THEORY OF OPERATION

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SECTION 14

COMMUNICATIONS

14-I-01 INTRODUCTION

This Section of the Running Maintenance and Service Manual is divided into three Parts:

- Part I: Theory of Operation
- Part II: Troubleshooting
- Part III: Maintenance

Each Paragraph is numbered accordingly, to avoid that paragraphs of the same Section, pertaining to a different Part, have the same number.

Part I - Theory of Operation

Part I gives a thorough overview of the System structure and operation, by means of descriptions, figures, photos, schematics, block diagrams and flow charts, together with references to other documents or Sections when needed.

Part II - Troubleshooting

It gives the Maintenance Technicians a path to troubleshoot the System in every condition by means of the available tools:

- The PTU, equipped with the specific SW program
- The IDU
- The Fault Isolation Table

The Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment, Tools & Special Tools

14-I-01.a LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

The Abbreviations, Acronyms and Symbols commonly used throughout this manual are given below with their related meaning.

Abbreviation	Meaning
Δ/Y	Triangle - Star Transformer
AADS.....	Automatic Announcement and Display System
AB.....	AnsaldoBreda
AC/DC	Alternate Current - Direct Current Converter
APS	Auxiliary Power Supply
ATP	Automatic Train Protection
BCU.....	Brake Control Unit
CB	Circuit Breaker
CCH.....	Communication control Head
CCI	Cab to Cab Intercom
CCU.....	Communication control Unit
CM.....	Coast Motoring
DC/AC	Direct Current - Alternate Current Converter
DC/DC	Direct Current - Direct Current Converter
EB.....	Emergency Brake
ECU.....	Electronic Control Unit (Brakes)
EDU.....	EMI Detector Unit
EXT	Exterior
FSB	Full Service Brake
GPS.....	Global Positioning System
GTW.....	Gateway
HRSB	High Rate Service Brake
HSCB	High Speed Circuit Breaker
HV	High Voltage
HVAC	Heating Ventilation & Air Conditioning
HVDS	High Voltage Distribution System
HW	Hardware
ICS	Integrated Circuits
ID.....	Identification (number)
IDU	Integrated Diagnostic Unit
INT.....	Interior
KO	Out of Service
LED	Light Emitting Diode
LH.....	Left Hand Side

Abbreviation	Meaning
LON.....	Local Operative Network
LRV.....	Light Rail Vehicle
LV.....	Low Voltage
LVDS.....	Low Voltage Distribution System
LVPD.....	Low Voltage Power Distribution
LVPS.....	Low Voltage Power Supply
M	Motoring
MBL.....	Metro Blue Line
MIC	Microphone
MTA	Metropolitan transportation Authority
MV.....	Medium Voltage
MVB	Multifunction Vehicle Bus
MVPD.....	Medium Voltage Power Distribution
OK.....	Working
PA	Public Announcement
PC	Printed Circuit
PGL.....	Pasadena Gold Line
PIC	Passenger Intercom
PIS	Passenger Information System
PTT	Push To Talk (Button)
PTU.....	Portable Test Unit
RH.....	Right Hand Side
ROC	Railway Operating Center
SB	Service Brake
SCEB	Slide Controlled Emergency Brake
SW	Software
TBS	To Be Supplied
TCMS.....	Train Control and Monitoring System
TCN.....	Train Communication Network
TCU.....	Traction control Unit
TWC.....	Train-to-Wayside Communication
WTB	Wired Train Bus

14-I-01.b LIST OF DEFINITIONS

The Definitions commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0	Empty car operating weight
AW1	Full seated load plus AW0
AW2	Standees at 4 persons per square meter plus AW1
AW3	Standees at 6 persons per square meter plus AW1
AW4	Standees at 8 persons per square meter plus AW1
Front door.....	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section

14-I-01.c LIST OF MEASUREMENT UNITS AND SYMBOLS

The Measurement Units commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
Ω.....	Ohm
°C.....	Celsius degree
°F.....	Fahrenheit degree
A.....	Ampere
ac.....	Alternate Current
dB.....	Decibel
dc.....	Direct Current
F.....	Farad
ft.....	Foot
H.....	Henry
Hz.....	Hertz
in.....	Inch
kg.....	Kilogram - approx 2.205 pounds
km.....	Kilometer - approx 0.621 miles
kN.....	Kilo-Newton - approx 224.809 pounds force
kVA.....	Kilo Volt Ampere
kW.....	Kilo Watt
m.....	Meter - approx 3.28 feet
Mm.....	Millimeter - approx 0.0394 inches
ms.....	Millisecond
Pa.....	Pascal
rms.....	Root Mean Square Voltage
rpm.....	Revolution per Minute
V.....	Voltage
Vin.....	Input Voltage
Vpp.....	Peak to Peak Voltage
W.....	Watt (Power)

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14-I-02 THEORY OF OPERATION

14-I-02.01 General Description of the System

The main functions that the system is capable of performing are listed below:

- Communications and Video surveillance:
 - Cab to cab communications
 - Cab operator to passenger's communications or automatic announcements.
via P.A. System
 - Communication between passengers and operator, on demand of passengers, in case of necessity
 - Passenger compartment video surveillance, with image recording
- Signs:
 - External visualization of destination station message
 - Internal visualization of next station and route messages
 - Visualization of information messages, manually edited by the operator
- Communication with the Way-Side:
 - Communications, by radio, from / to the ROC

The system has been developed in accordance with MTA P2550 requirements.
Its functionalities can be grouped into the following blocks:

Public Address

- Audio announcement:
 - Communications from operator
 - Communications from MTA Central Control
 - Automatic announcements
- Visual announcement:
 - Destination information
 - Next Station information
 - Route messages
 - Service or Custom message

Intercom

- Cab-to-Cab Intercom
- Passenger Intercom

Video Surveillance

- Image acquisition
- Image recording

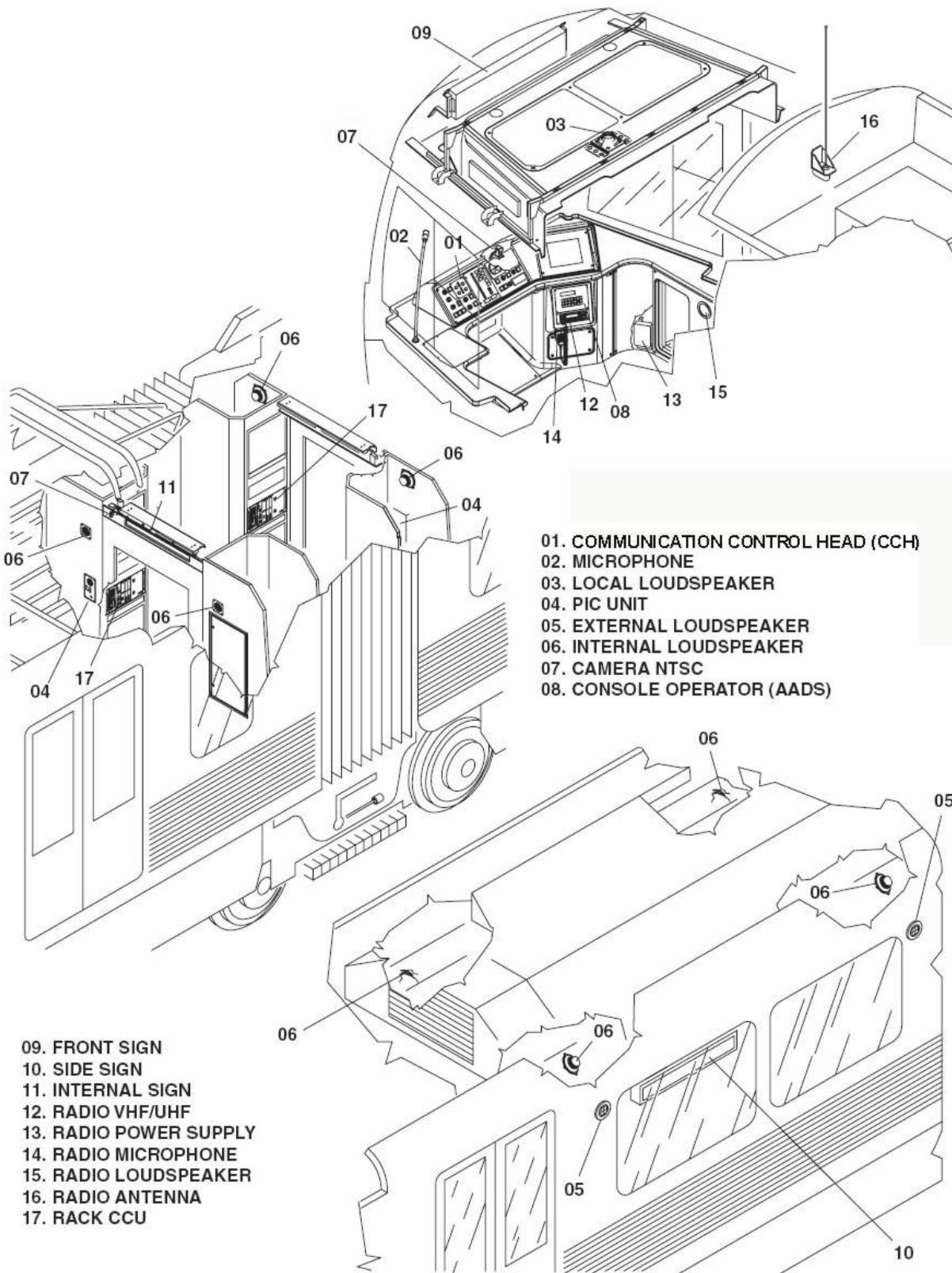


Figure 14-I-02.1 Communication System Components

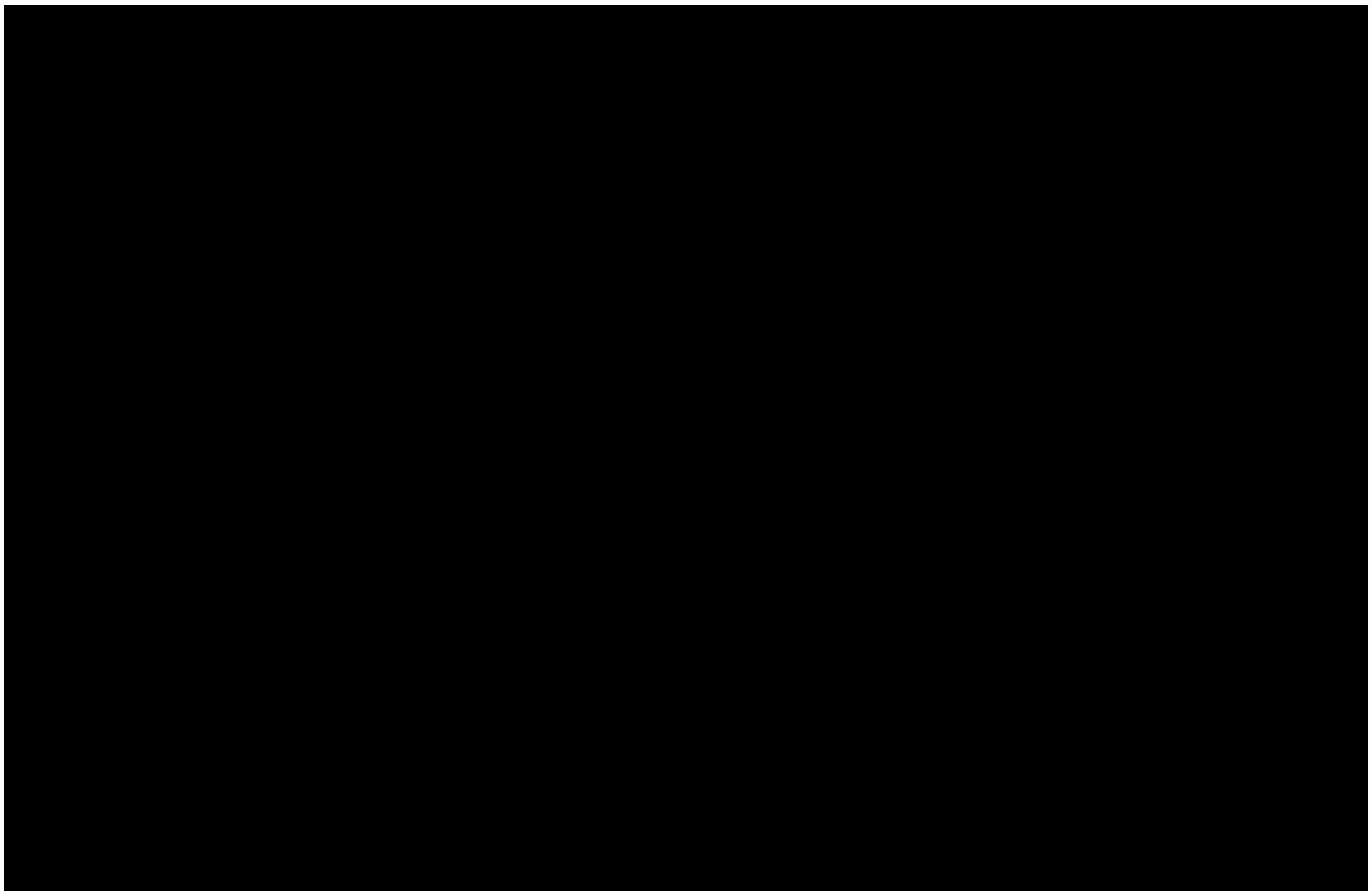


Figure 14-I-02.2 System-Vehicle Relationship

The Communication System is linked to the other Vehicle Systems through the LVDS Relay Logic and is also directly connected to the TCU (Propulsion system) through an RS 485 connection.

The Communication system acquires the CAB Enable signal from the Operator Console (LVDS). Thanks to this signal, the Communication System knows where the Vehicle/Train Consist is operated from.

In a Train Consist, the Communication Systems of coupled vehicles must communicate one with each other.

The Coupling signal tells the CCU (Communication Control Unit) of the relevant Communication System to enable the communications between the coupled vehicles.

When an emergency is detected, the Image Acquisition (refer to paragraph 14-I-02.02.03.01) recordings will be recorded on a protected partition of the hard drive for 15 minutes.

An Emergency is detected through the following four status signals:

- Emergency Door Loop;
- EB Push Button;
- SCEB;
- Passenger Intercom Activated (PIC).

The Door Status and the ZeroSpeed Signals are used to automatically switch the Next Station Signal to the next step.

ii. System-Equipment Relationship

The “Brain” of the Communication System is the CCU (Communication Control Unit) (refer to paragraph 14-I-02.03.01).

Each CCU (one per Body Section) is connected with the following peripherals, pertaining to the same body section:

- CCH Console and Microphone: for the communications of the Operator (refer to paragraph 14-I-02.03.02);
- PIC for Operator-Passenger communications (refer to paragraph 14-I-02.03.03); - AADS Alphanumeric console & Keyboard: to set the automatic announcements related to the trip (refer to paragraph 14-I-02.03.06);
- Radio: for radio communications with ROC (refer to paragraph 14-I-02.03.07);
- Video Cameras: to acquire images from inside and outside (refer to paragraph 14-I-02.03.05);
- Loudspeakers: for voice messages (refer to paragraph 14-I-02.03.04); - Signs: for visual messages (refer to paragraph 14-I-02.02.01.02);
- GPS: for train positioning (refer to paragraph 14-I-02.03.08).

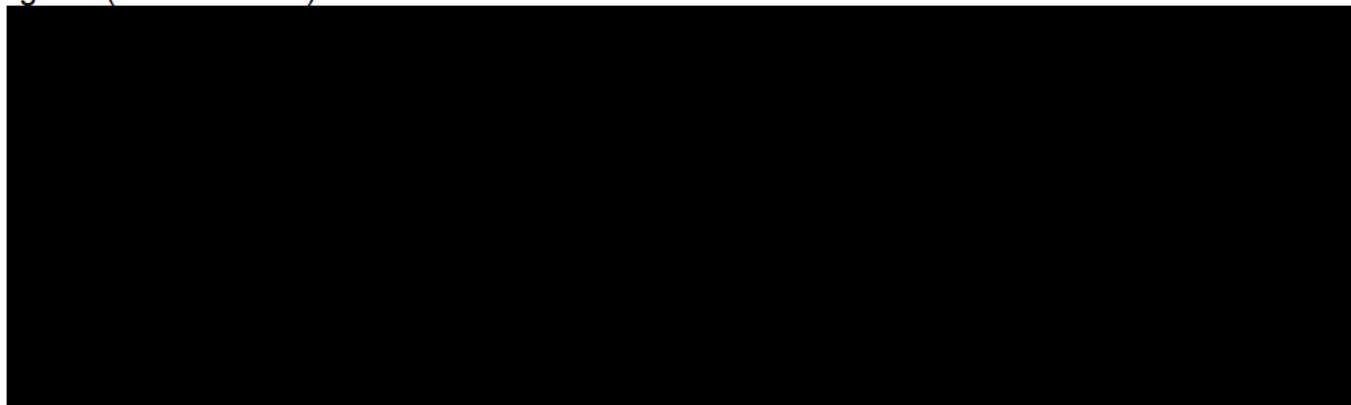
Figure 14-I-02.4 shows the Communication System components and the types of connection used in the Communication System for connecting the CCUs of the same vehicle (Ethernet) and the CCUs of coupled vehicles (RS485).

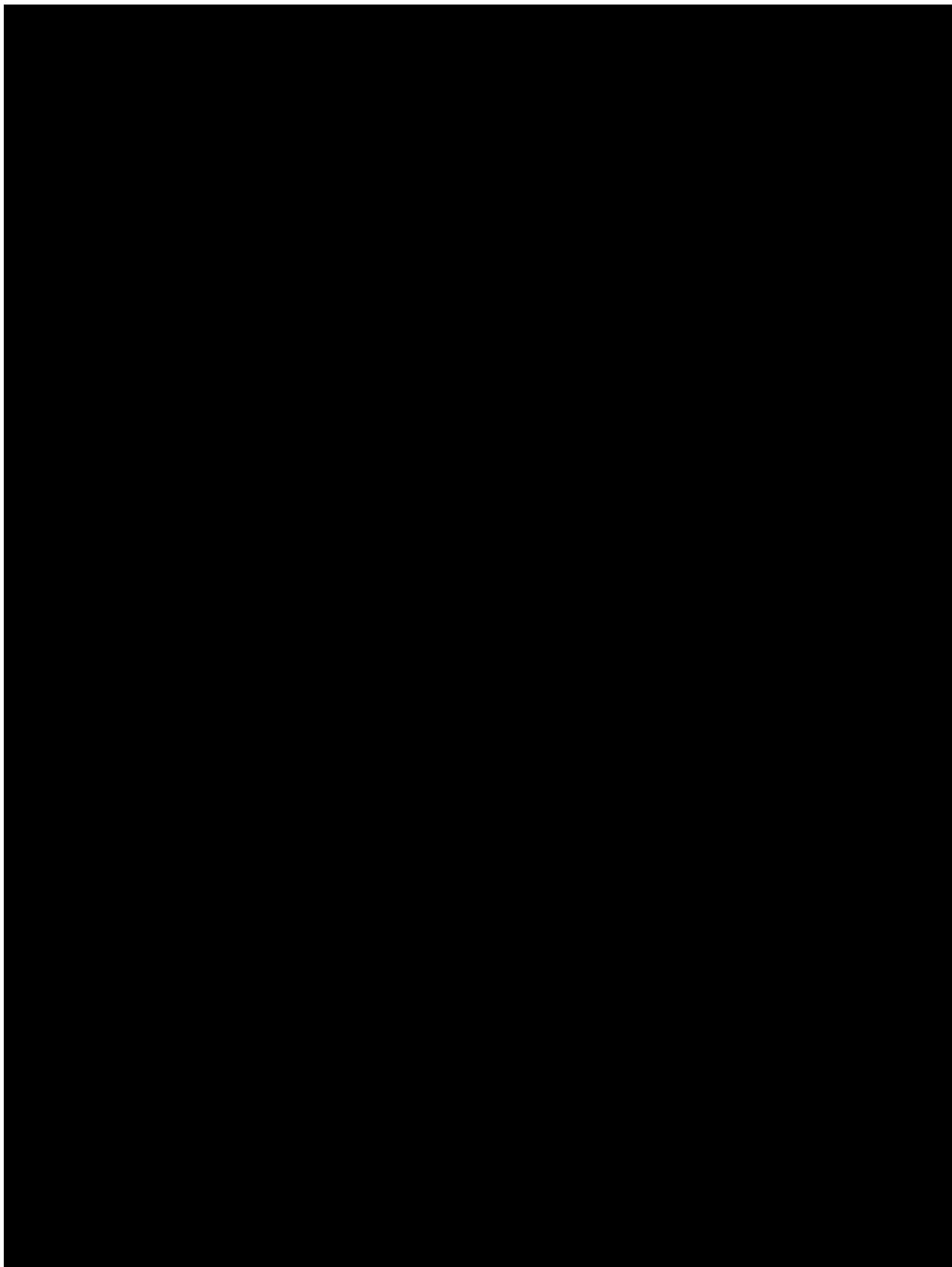
The CCU is connected with all its peripherals and with the relevant TCU (through an RS 485 connection).

It can be connected to the PTU through an RS 232 or an Ethernet connection.

All the CCUs of a Train Consist (up to eight, two per vehicle) are connected together. The two CCUs of the same vehicle are connected through their J2 and J3 connectors by means of two Ethernet cables.

The CCUs of coupled vehicles communicate through the Coupler using an RS 485 connection for digital signals (Connector J12) and four-pole shielded cable for analog signals (J4 Connector).





iii. System Performances and Characteristics

The main RS485 line connects all signs, the AADS and the CCH console to the CCU.

The Communication settings for this line are:

Baud rate: 9600 bps

Parity: none

Data bits: 8

Stop bits: 1

Communication type HALF DUPLEX

Messages exchanged through the RS485 connection are structured as follows:

Table 14-I-02.1 Main RS485 Message Structure

Byte position	Length (bytes)	Field code	Notes
0	1	STX	Identifies the beginning of each frame
1	1	ID_S	ID of the sender device
2	1	ID_D	ID of the destination device
3	1	CMD	Command ID
4	1	LEN	Number of data bytes eventually following. Its value can be 0 if the command has no data.
5	0..n	DATA	Data
5 + LEN	2	CRC	CRC (computation algorithm)

System Storage Devices:

The Hard Disk installed on the CCU board has a capacity of 40Gbytes.

- 1 Gigabyte FAT partition: It contains audio files, text files, system logs. It is not encrypted, and can be accessed by maintenance crew from the PTU through the Ethernet port to add, modify and/or delete files. The files are organized in directories;
- 2.5 Gigabyte RCB emergency video partition: it is a proprietary format which prevents unauthorized access from the exterior. It can be written only by system software and read by Public Net Safe program in order to examine and export video recordings;
- 36 Gigabyte RCB standard recording partition: it contains standard recordings and, like emergency RCB partition, it cannot be directly accessed.

The flash memory contains some initialization files only, since its storage space is much smaller than the hard disk, access is very slow, and this kind of devices is not good for continuous reading and writing operations.

At system startup, initialization files are read and stored in the system RAM, which offers extremely faster run time access.

14-I-02.02 System Operation

14-I-02.02.01 Public address

The public address feature is meant to provide route information and custom messages to passengers.

14-I-02.02.01.01 Audio Announcement

Audio announcements are managed by the PA system. Sources of the audio announcements are:

- Microphone, pre-amplified on the CCH
- Radio, pre-amplified on the CCH
- Pre-recorded messages stored on the CCU

All sources will be routed after conditioning to the selected PA amplifier with a standard level of 2 Vrms.

Power level can be separately adjusted between exterior and interior audio lines.

Maximum output power is 28 Watt per audio amplifier. Nominal audio line level is 100 Vrms.

a) Communications from the Operator

The operator can make announcements to the passengers by means of the cab gooseneck microphone (refer to Figure 14-I-02.5).

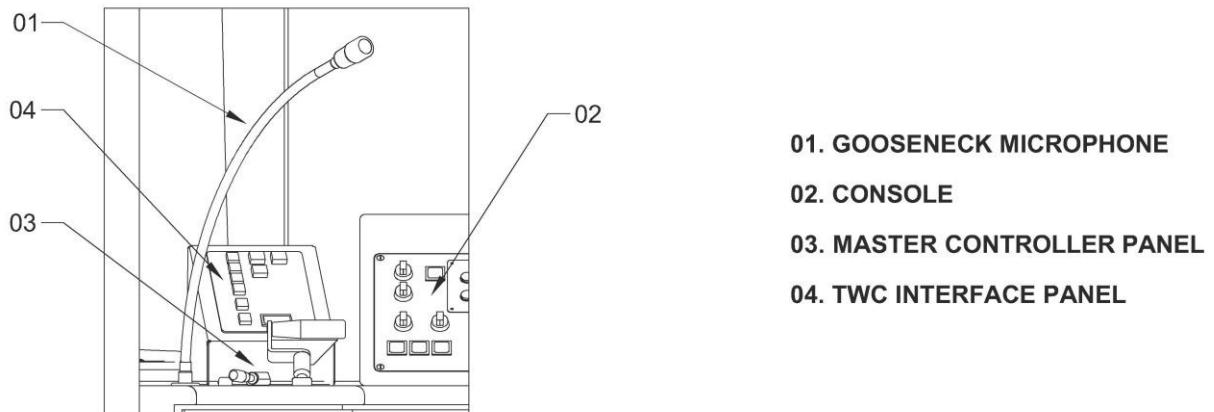


Figure 14-I-02.5 Gooseneck Microphone

To this purpose, the operator must select PA on the MODE selector and MIC on the RADIO/MIC selector on the CCH panel (refer to Figure 14-I-02.6), when the PTT button is pushed (refer to Figure 14-I-02.7), the communication is established and routed by the CCU to the speaker line selected on the CCH panel.

The communication is stopped when the PTT button is released.

To route the PA vocal announcement to the interior or exterior or both loudspeakers, the operator must select INT, EXT or ALL respectively, on the CCH speaker selector.



Figure 14-I-02.6 Communication Control Head - CCH

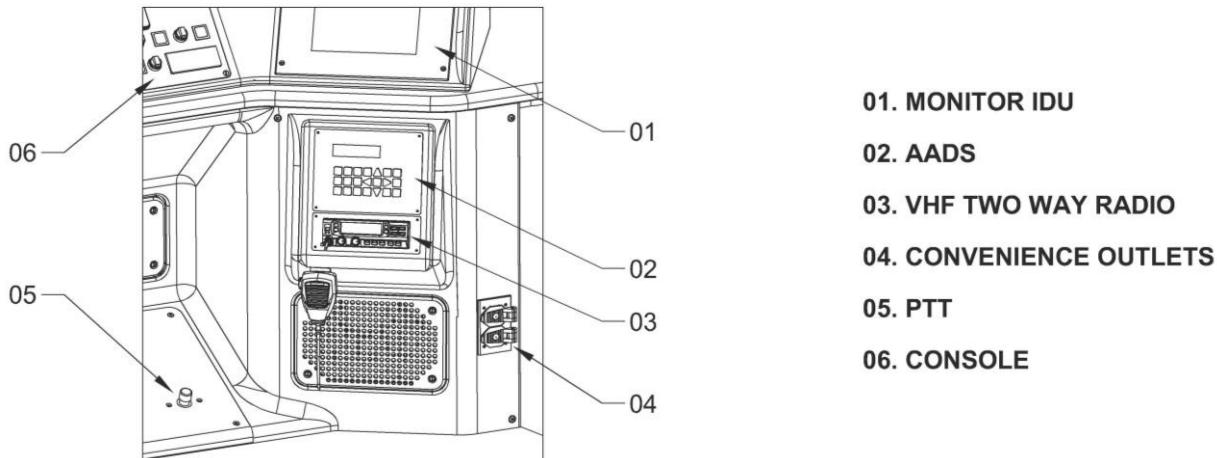


Figure 14-I-02.7 PTT Button

b) Communication from ROC

MTA Central Control (ROC) can make announcements to the passengers via radio.

To do that the operator must select PA on the MODE selector and RADIO on the RADIO/MIC selector on the CCH panel.

When a radio audio output signal is present the communication is established and routed by the CCU to the speaker line selected on the CCH panel.

c) Automatic Announcement

The PA system is capable of issuing automatic announcements by means of prerecorded audible messages of the stations for current route and service or custom messages.

The audible messages are stored in the CCU in MP3 format.

The AADS (refer to Figure 15-01.16) will allow the selection from a route list, service or custom messages list, input train ID number and input operator ID number.

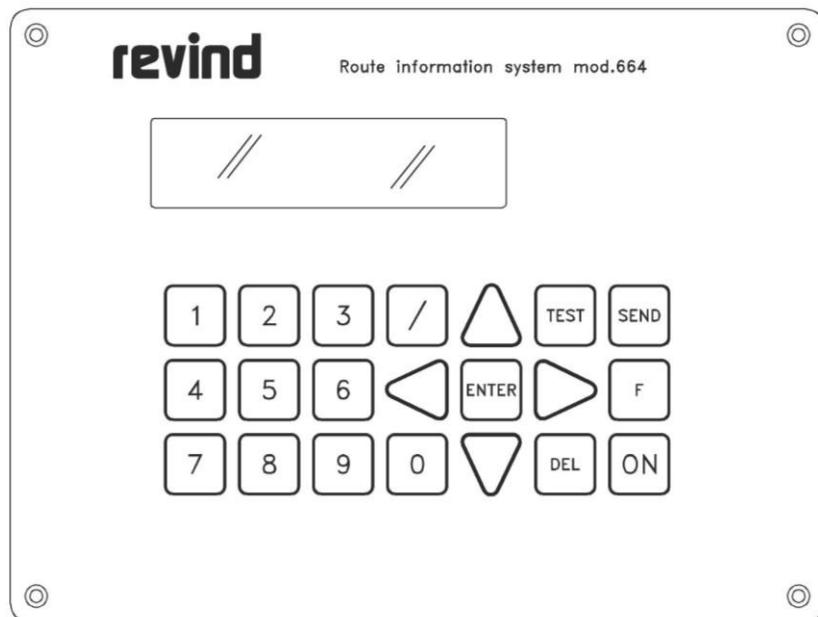


Figure 14-I-02.8 Automatic Announcement and Display System - AADS

14-I-02.02.01.02 Visual Announcement

The system is capable of showing station and destination messages and service or custom messages.

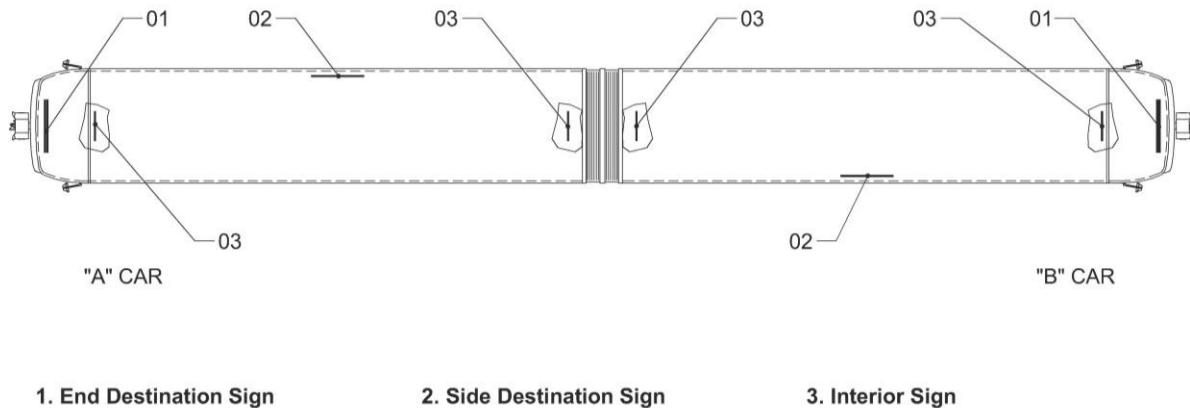


Figure 14-I-02.9 Destination Sign Location

a) Destination Information

When the route has been selected by the operator, the destination message will be displayed on the End Destination Signs and Side Destination Signs.

The destination message will change only when the operator selects another route.

The Side Destination Signs and End Destination Signs can display Public service messages and custom messages.

b) Next station information

When the route has been selected, as soon as the next station message is generated, the Interior Signs will display it.

Next station visual and audible messages are synchronized.

At every message change, a flashing message is activated to alert passengers that a new message has been displayed.

c) Route Messages

At start-up, the last stored route will be visualized on the display.

The operator may scroll the route list by means of the AADS UP/DOWN arrow keys and then select the desired route by pressing ENTER or by editing directly the two-digit ID number and pressing ENTER.

When a route has been selected, the next station is visualized on the display.

Each next station announcement shall be manually triggered by the operator by pressing SEND; the related audible message will automatically be routed to the interior loudspeakers.

The AADS display will then be prearranged with the destination message so that the operator may broadcast it when stopping at the station.

The destination audible message will automatically be routed to the exterior loudspeakers.

After the destination announcement has been broadcasted, the AADS display will be prearranged with the next station message for the next announcement.

Prearranged messages, stations and destination, may be skipped by means of the UP/DOWN arrow keys.

d) Service or Custom Messages.

When AADS is displaying service or custom messages, the operator may scroll them by means of the UP/DOWN arrow keys, announcement shall be manually triggered by the operator by pressing SEND.

14-I-02.02.02 Intercom

The intercom system is meant to allow the vocal communication between cabs and between passengers and the operator.

14-I-02.02.02.01 CAB to CAB Intercom

To initiate a CAB to CAB Intercom communication the operator must enable (Keyed On) the train cab, then select CCI on the MODE selector on the CCH panel and momentarily press the PTT button.

An alert tone will be generated in the other cab and CCI lamp will lit.

To answer, the operator in the called cab must select CCI on the MODE selector on the CCH panel and press the PTT button.

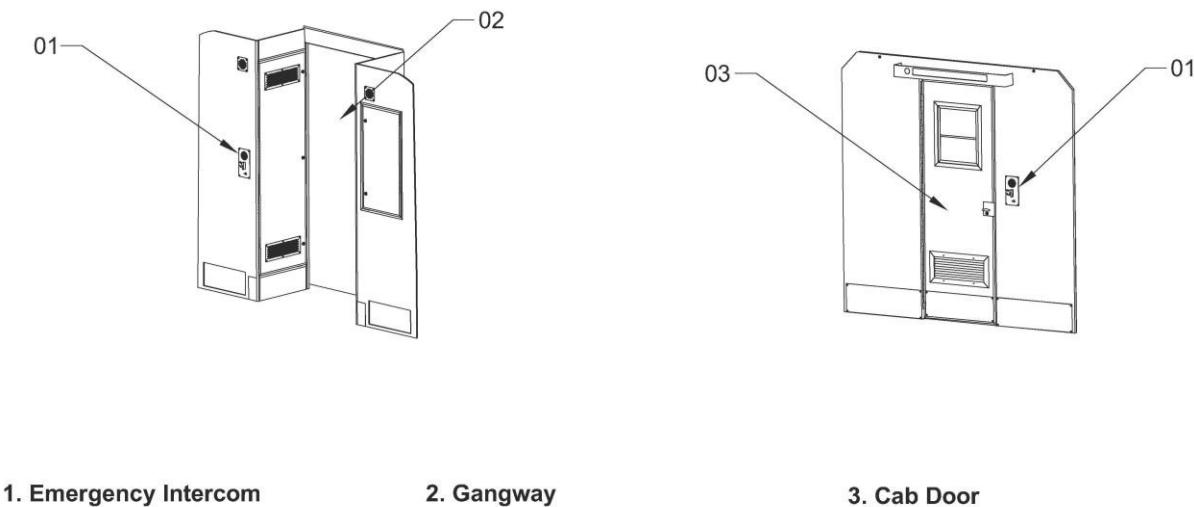
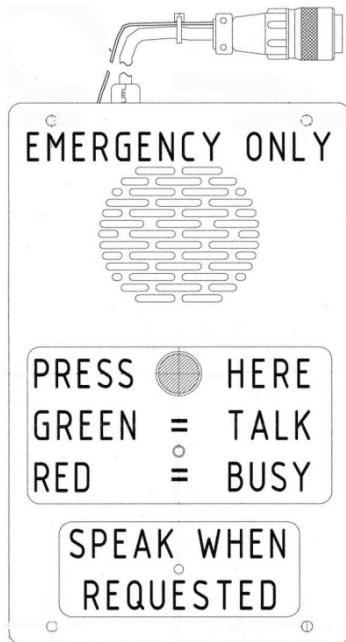
The communication is half duplex to avoid audio interferences in the cab.

When the PTT button is pushed, the microphone is connected to the line, when the PTT button is released, the microphone is disconnected and cab loudspeaker is connected.

To end the communication one of the interlocutors must press the “CLOSE COMMUNICATION” button on the CCH panel.

14-I-02.02.02.02 Passengers Intercom

Passengers can communicate with the operator by means of the PIC unit installed in the passenger compartment after enable (Keyed On) the train cab.

**Figure 14-I-02.10 Passenger Intercom Location****Figure 14-I-02.11 Passenger Intercom**

As soon as a passenger presses the “CALL OPERATOR” button, an alert tone is generated inside the active cab on the PIC unit and the PIC lamp switches on.

To enable communication and answer, the operator must select PIC on the MODE selector on the CCH panel and press the PTT button.

An engaged line signal is visualized by means of a LED on the PIC unit panel.

The passenger and the operator can only speak in turn.

The communication can be terminated by the operator by pressing the “CLOSE COMMUNICATION” button on the CCH panel.

14-I-02.02.03 Video Surveillance

The video surveillance function is carried out by means of video cameras installed in the passenger compartment (four, two in each car section) and (one) behind the windshield.

14-I-02.02.03.01 Image Acquisition

The CCU has images acquisition capabilities.

Cameras are connected to the CCU via a video line.

Images acquisition normally operates at 8 frames per second for both the passenger compartment and the cab.

14-I-02.02.03.02 Image Recording

Images are recorded on the removable hard disk with a circular buffering method which overwrites oldest images when disk space goes below a certain threshold.

Recording capacity will permit a minimum of 130 hours of continuous recording at 2-frame per second from each cameras.

Each image has the following text information overlaid:

- Camera ID;
- Date and time;
- Train ID.

14-I-02.02.04 Data Organization and Technical Requirements

The system can mainly deal with two kinds of information flow:

- direct vocal communication (P.A., cab-to-cab, Passenger Intercom)
- recorded visual and audio messages: station names (e.g.: "El Segundo"), generic messages used by the system to manage trip annunciations (e.g.: "Next station is", or "This is the last station") and public service messages (e.g.: "We remind passengers that smoking is not allowed... etc")

This organization of data allows the maximum system flexibility: each message is as short as possible, and when the playing of several messages in sequence is required, this can be obtained by means of associations contained in other text files, managed either by means of a simple text editor or by means of an external user-friendly application.

Messages are identified by a numeric code and stored in suitable directories on the hard disk. Service messages and generic messages are identified by different ranges of values and stored in different directories.

14-I-02.02.04.01 Trip Database Organization

The Trip Database is realized by means of text files, stored in the /trip directory of the Hard Disk, made up of several fields per line. Commas separate fields.

These files are:

- **stations.dat**: this file contains the list of all known stations, with information coded into 7 fields;
- **lines.dat**: this file contains the list of all known lines;
- **route.dat**: it is the list of all routes (a list of stations the train will reach) for all lines;
- **sequence.dat**: for each station, the default audio messages played are: chime and "next station is" + station name. Some station requires more messages to be played: e.g. "this is the end of green line", "all passengers please exit" etc. The system can deal with these requirements checking, for each station, if the station code is present in sequence.dat, and playing up to five more messages after the station name.
- **[route file name].trt**: it is the sequential list of all the stations which compose a route;
- **genmsg.dat**: this file contains the list of all known generic messages, which can be played in message sequences (e.g.: "This is the last station", "All passengers please exit" etc.);
- **srvmsg.dat**: this file contains the list of all known service message, which can be played when they are selected from the AADS (e.g.: "We remind passengers that smoking on the train is strictly forbidden"), or simply displayed (e.g.: "Out of service") or both (e.g. "Train service has been suspended");

14-I-02.02.04.02 Audio Database Organization

The system uses .wav audio files to play automatic audio announcement, service messages etc.

Audio software can manage two kinds of files, both in .wav format:

- 48 KHz, PCM standard, 16 bit, mono
- same format converted to IMA ADPCM standard, which takes only $\frac{1}{4}$ of the PCM space

To maximize system performance, all audio files are stored into RAM at boot time.

This ensures instant reaction to play commands issued by software, but uses a lot of system RAM, which is needed also by other processes.

To keep memory occupation as low as possible, IMA ADPCM standard is used for audio files, and comparison between PCM and IMA ADPCM shows no audible differences in system announcements.

14-I-02.02.04.03 System log files

Important system events like faults, alarm etc. are recorded in ASCII log files, stored in the Hard Disk in /System_logs directory.

At boot time, files in /System_logs directory are purged, and only the most recent 5 are kept. Names of log files uniquely identify the CCU, date and time they were created (e.g.: 2006-02-09_10-57-48__159706__2.log, where:

- 2006-02-09_10-57-48 is the system startup date and time
- 159706 is the CCU board serial #, as reported from maintenance program TestRackPC - see MN710-03.doc
- 2 is the CCU hardware SELECT key, as reported from maintenance program TestRackPC.

Each line of a record files contains the date and time the event took place, like in the following example:

```
2005-12-09 08:45:32 - System UP
2005-12-09 08:45:35 - STATUS for ID=4 [FRONT PANEL] set to FAULT
2005-12-09 08:45:36 - STATUS for ID=2 [INTERNAL PANEL 2] set to FAULT
2005-12-09 09:01:12 - STATUS for ID=2 [INTERNAL PANEL 2] set to FAULT
2005-12-09 09:04:39 - Start alarm - passenger intercom
```

14-I-02.03 System Components

The complete system (one vehicle) is made of the following items:

Communications and Video surveillance

- Two Communication Control Unit (CCU), one per Electronic Locker;
- Two Communication Control Head (CCH), one per Cab;
- Two microphones, one per Cab;
- Four PIC units, two per Body Section;
- Two cab loudspeakers, one per Cab;
- Eight exterior loudspeakers, four per Body Section;
- Twelve interior loudspeakers, six per Body Section;
- Six cameras, three per Body Section.

Signs:

- Two Automatic Announcements and Display System (AADS), one per Cab.
- Four announcement signs, two per vehicle.
- Two side destination signs, one per vehicle.
- Two end destination signs, one per vehicle.
- Communication With Ground
- Two TK-790 radios, one per Cab.
- Two radio power supplies, one per Cab.
- Two antennas, one per vehicle.
- Two radio loudspeakers, one per Cab.

Figure 14-I-02.12 shows the system block diagram.

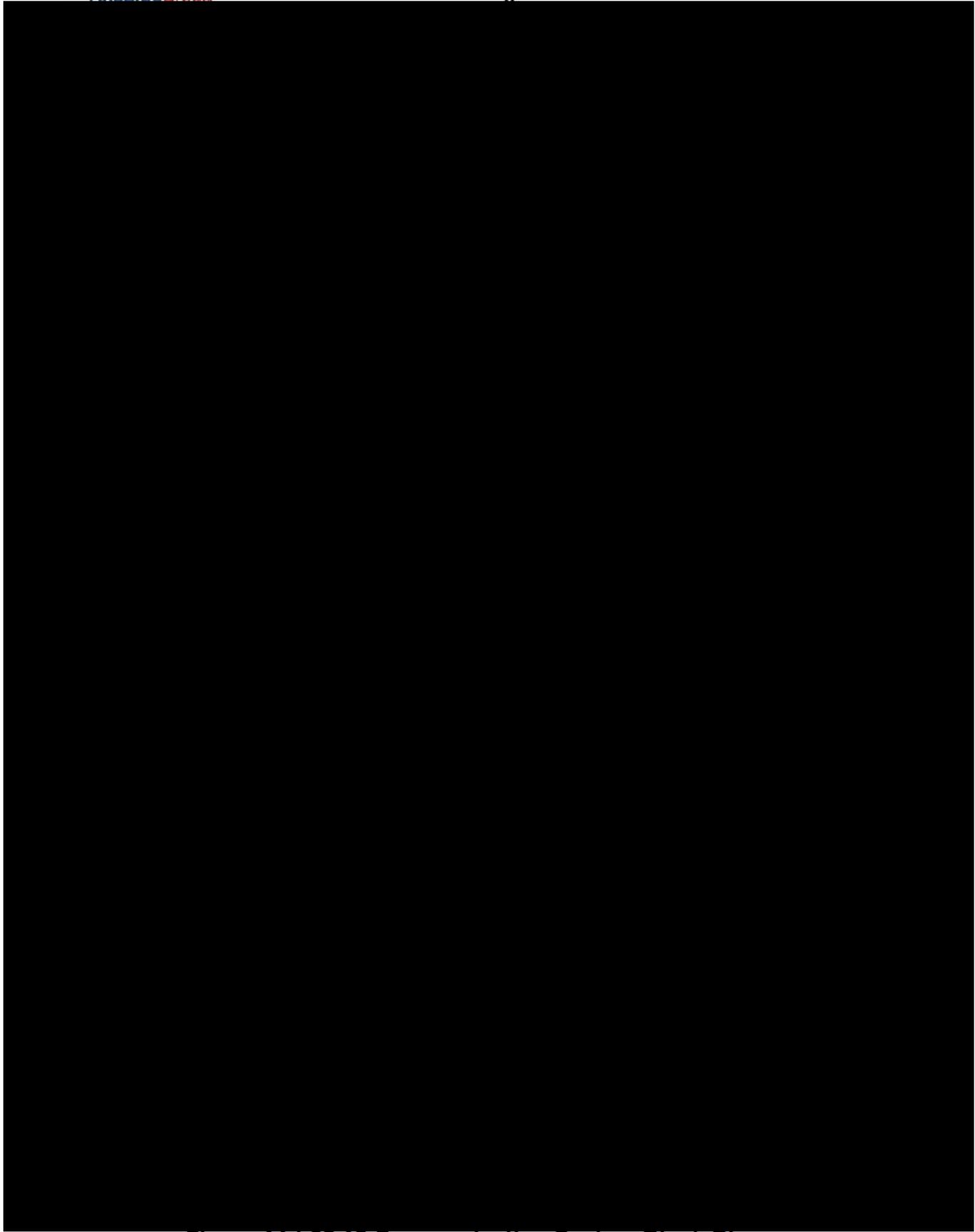


Figure 14-I-02.12 Communication System Block Diagram

14-I-02.03.01 Communication Control Unit (CCU)

A block diagram of the CCU is shown in Figure 14-I-02.13 below.

CCU is made up of a standard 19" rack (6U) fitted with the following boards:

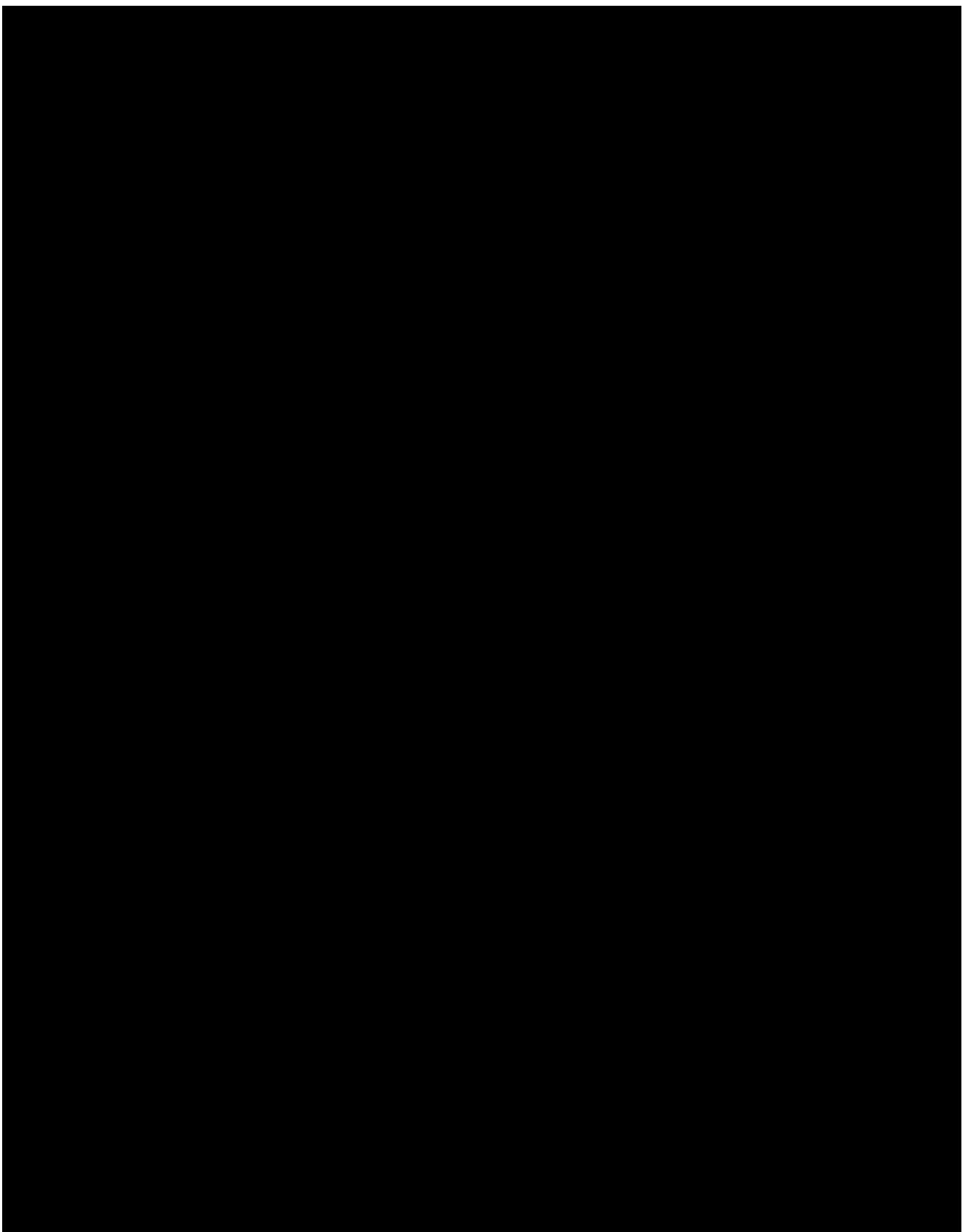
- DC/DC converter, supplying the main 24VDC voltage, +15 and -15VDC service voltages for the system.
- PA final amplifiers, giving the due audio signal amplification for the loudspeakers.
- Each amplifier has a volume control to adjust separately PA power output between interior and exterior loudspeakers.
- Audio router, giving all combinatorial commutation decoding for the communications management, and routing to the train audio interface PA and intercoms lines.

The Audio Router functional block diagram is shown in Figure 14-I-02.14.

The CPU board manages:

- Digital communication to other units in the same vehicle by means of the main RS485 serial line and analog signals.
- Digital communication to CCU of the other vehicle by means of Ethernet line.
- Signal acquisition from field: cab key switch, speed, coupled train and doors status.
- Digital communication to coupled train by means of the coupler RS485 serial line.
- Digital communication to TCU by means of the diagnostic RS485 serial line.
- Images acquisition and recording from security cameras.
- Audio synthesis for automatic announcements.
- Encoding and decoding of PA and Intercom audio signals for audio data exchange between vehicles.

This board is equipped with a 40 GByte removable hard disk.



14-I-02.03.02 Communication Control Head (CCH)



Figure 14-I-02.15 Communication Control Head (CCH)

The CCH is interfaced to the CCU by means of the main RS485 serial line and analog signals, to the microphone, to the radio, to the PTT switch and silent alarm switch.

It is made up of:

- PA Speaker selection: Internal / External / All;
- PA Audio Source selection (Mic/Radio);
- MODE selection: PA, Passenger Intercom, Cab-to-Cab;
- Cab Speaker volume regulation;
- Close Communications Button;
- Warning LEDs for passenger Intercom request, Cab-to-Cab request, Silent Alarm activation;
- LED bar for microphone input audio level verification.

The CCH manages:

- Operation mode selection between PA, PIC and CCI;
- PA source selection from radio and microphone;
- PA routing between loudspeakers: interior, exterior and all;
- Volume control for cab loudspeaker;
- Forwarding to the radio of the silent alarm request;
- Audio signal exchange with the CCU;
- PA level displayed by a VU audiometer;
- PIC and CCI request alert by related lamp and an audible tone on the cab loudspeaker.

14-I-02.03.03 Passenger Intercom Unit (PIC)

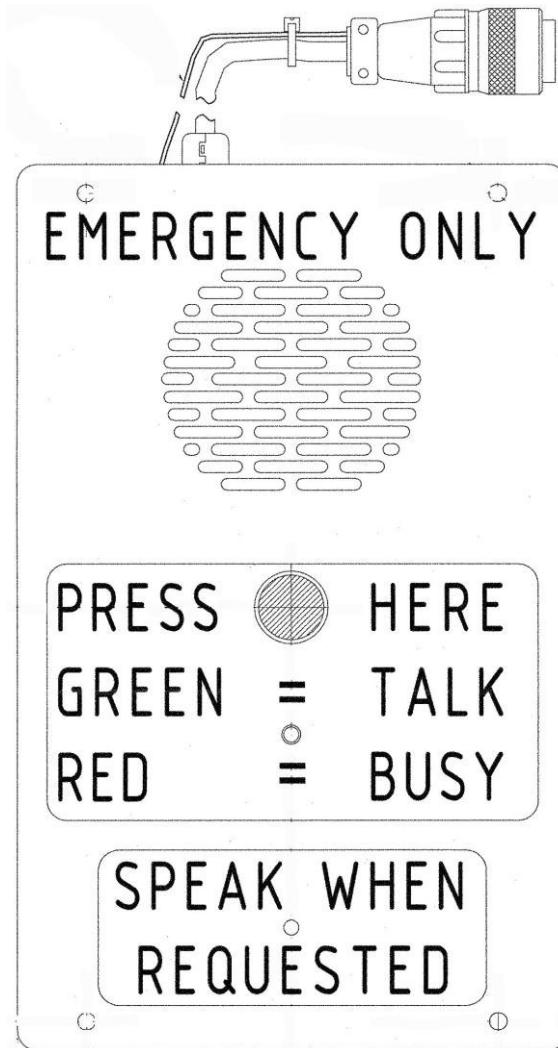


Figure 14-I-02.17 Passenger InterCom - PIC

Each Vehicle is equipped with four PICs, two per car body section.

The PIC unit is a Security Device and is interfaced to the CCU by means of audio and control signals. It manages:

- Intercom communications between passengers and the operator.

A functional block diagram of the PIC unit is shown in Figure 14-I-02.18.

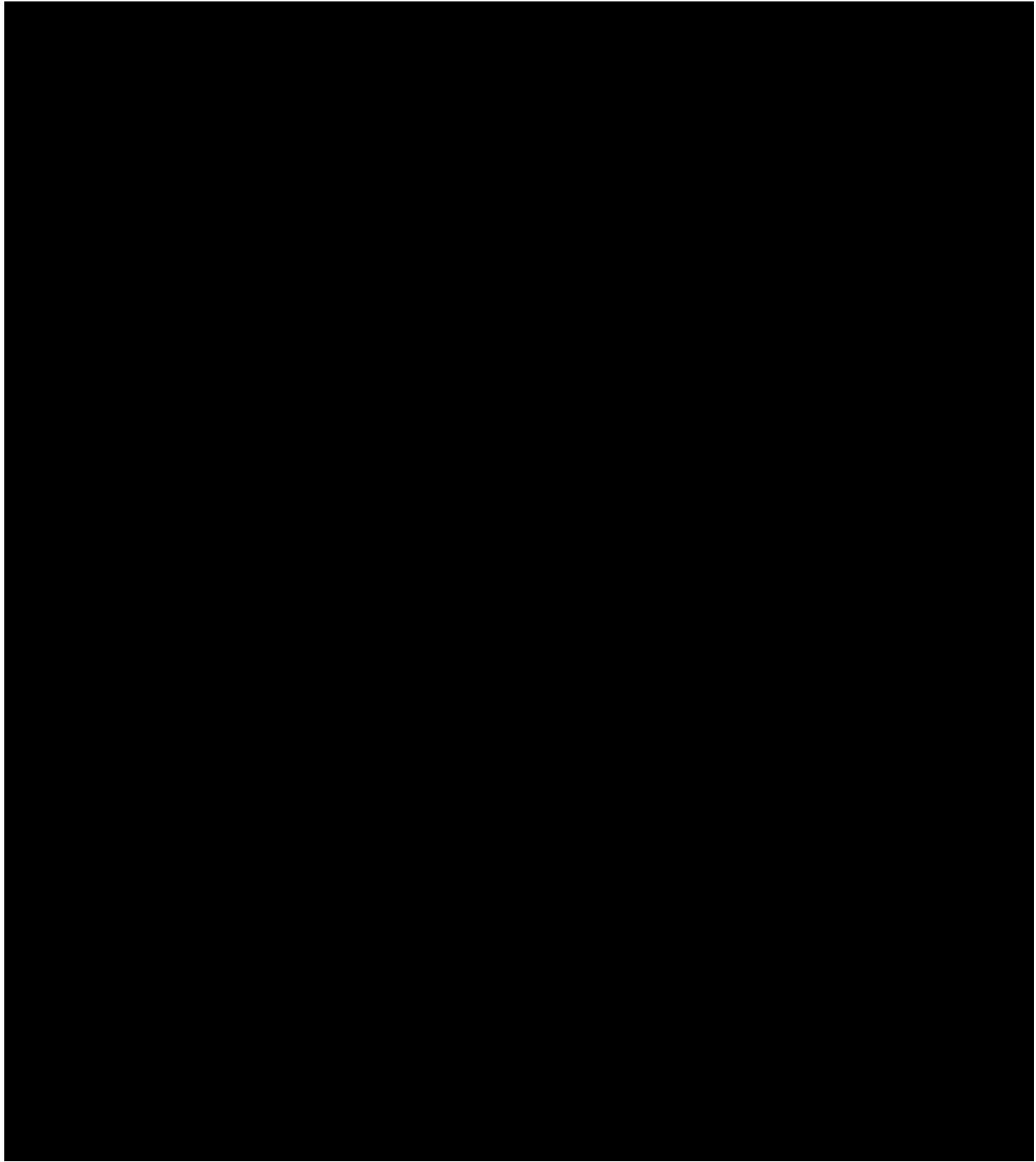


Figure 14-I-02.18 PIC Unit Functional Diagram

14-I-02.03.04 Loudspeakers

All loudspeakers, except the ones in the cabs, are interfaced to the CCU by means of the isolated 100 V audio lines.

Cab loudspeakers are directly driven from the audio router amplifier.

Interior loudspeakers have 4 taps for power adjustment: 0.25, 0.5, 1, 2 Watt.

External loudspeakers have 3 taps for power adjustment: 1.5, 3, 6 Watt.

14-I-02.03.05 Video Cameras

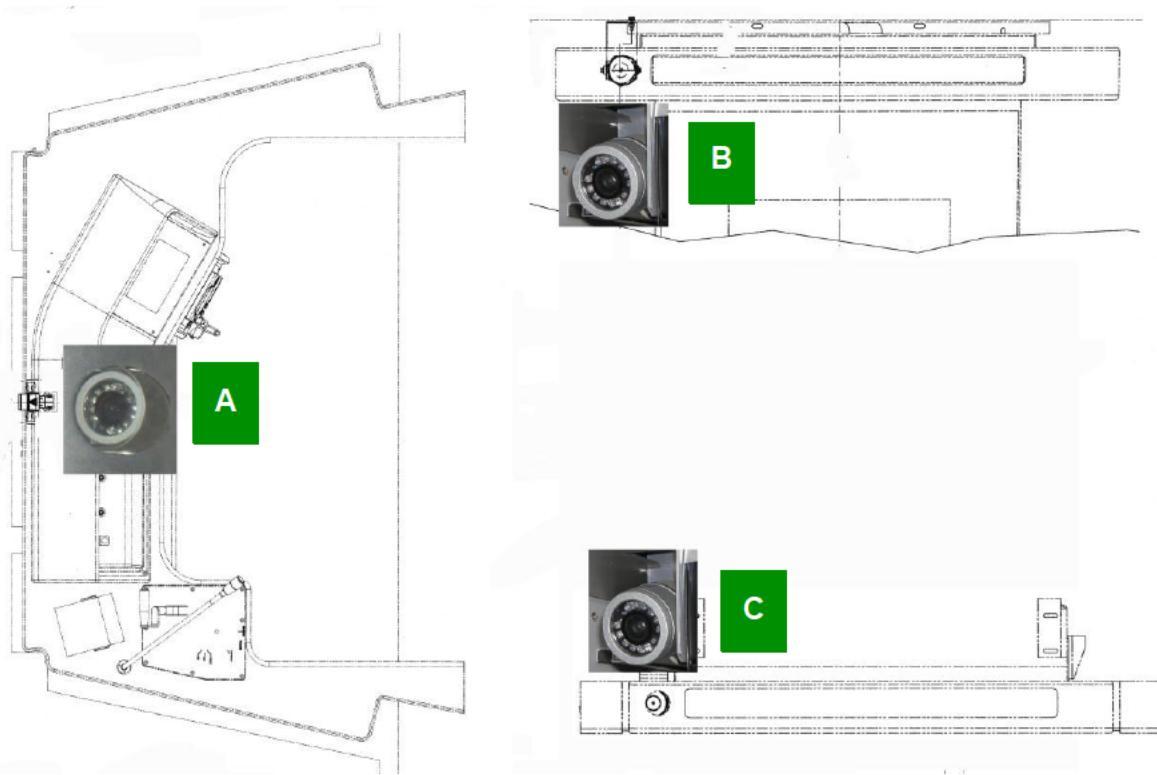


Figure 14-I-02.19 Video Cameras - Location

All cameras are interfaced to the CCU by means of the analog video out line.

Cameras can operate with an environment light down to 0.5 lux @ f=2.

The camera is equipped with a 1/3" CCD.

The CCD diagonal is 1/3" @ 8.5 mm and the aspect ratio is 4/3, therefore horizontal side is 6.8 mm and vertical side is 5.1 mm.

Three Cameras are installed in each Body Section:

- One (A) in the Operator cab, for the view from the cab to the tracks;
- One (B) over the cab door, for the view of the passenger compartment from the cab side;
- One (C) over the aisle, for the view from the aisle towards the cab.

14-I-02.03.06 Automatic Announcement and Display System (AADS)



Figure 14-I-02.20 AADS Photograph

AADS is interfaced with the CCU by means of the main RS485 serial line, it manages:

- Route selection and initialization;
- Station selection inside the current route;
- Service and custom messages selection;
- Train and operator ID input;

These operations are performed by means of a keyboard and an alphanumeric display (refer to Figure 14-I-02.20).

A functional block diagram of the AADS is shown in Figure 14-I-02.21 below.

All signs are interfaced to the CCU by means of the main RS485 serial line.

All signs are equipped with alphanumeric transreflective LCD. They are back-lit showing yellow fonts on a black background.

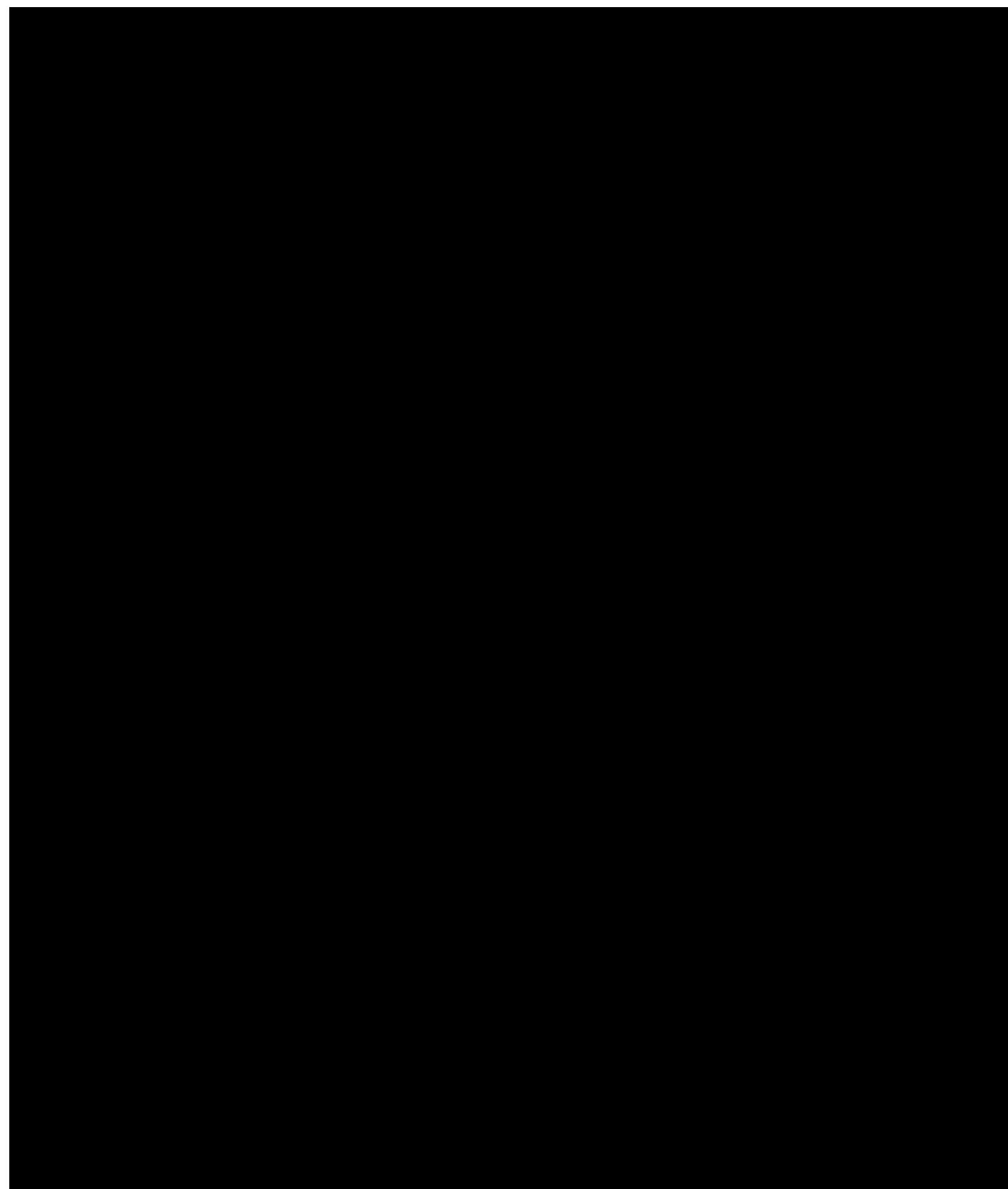
There are three types of signs:

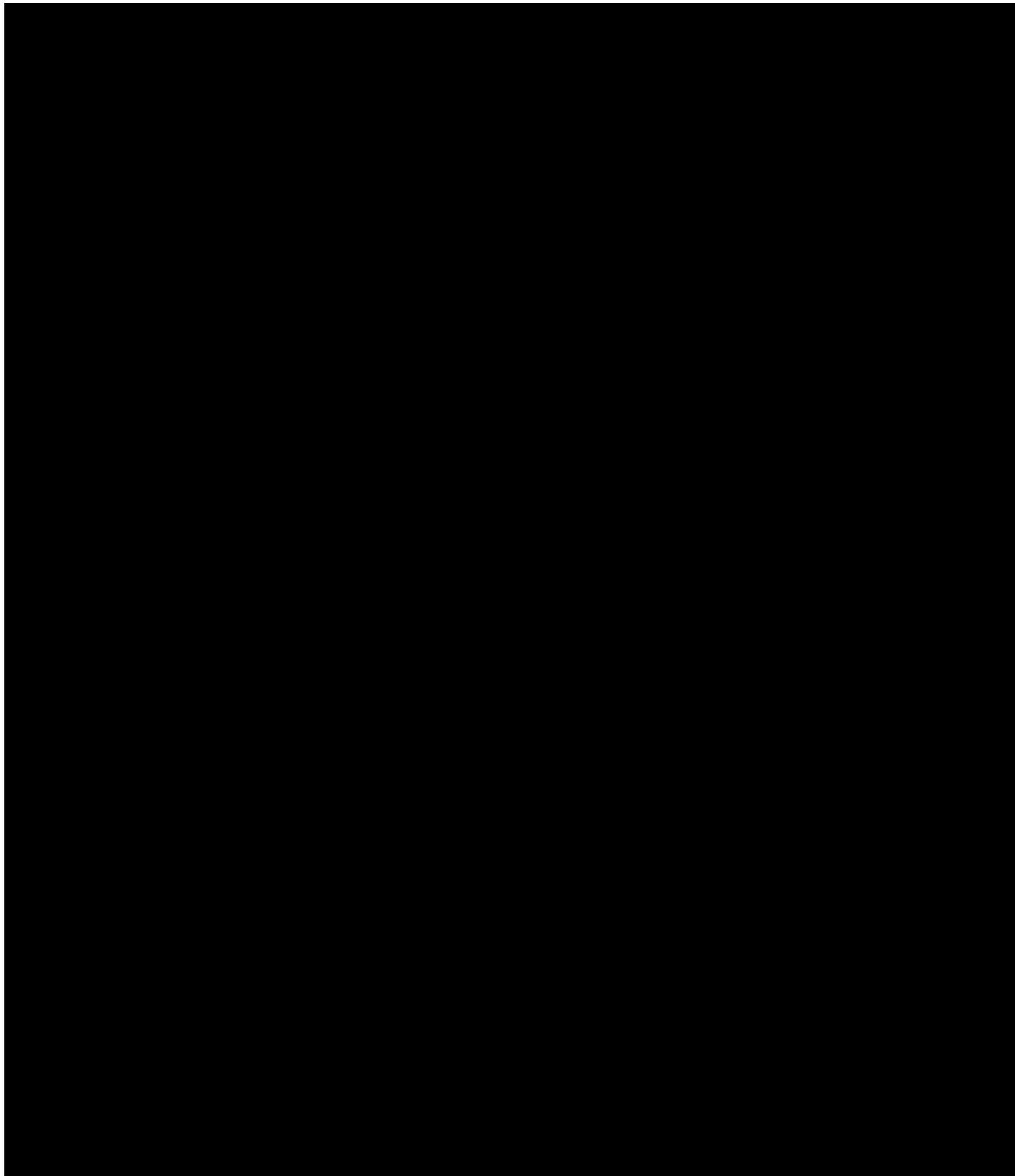
- End destination sign.
- Side destination sign.
- Announcement sign.

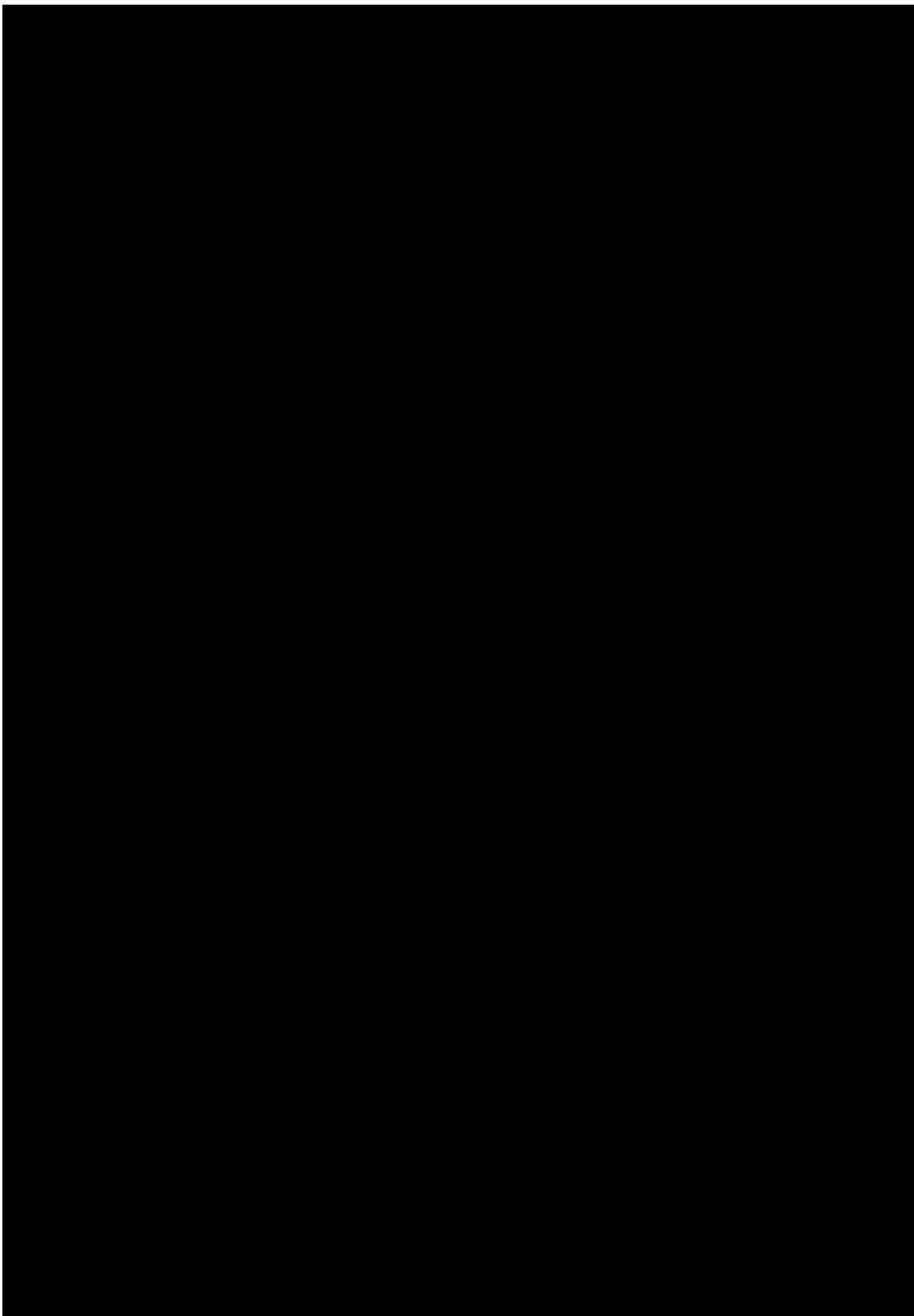
The messages displayed are:

- The final destination of the selected route on the End and Side destination signs.
- Next station and Public services messages on the announcement signs.

The functional block diagrams of all kind of signs are shown in the following (Figure 14-I-02.22, Figure 14-I-02.23 and Figure 14-I-02.24).







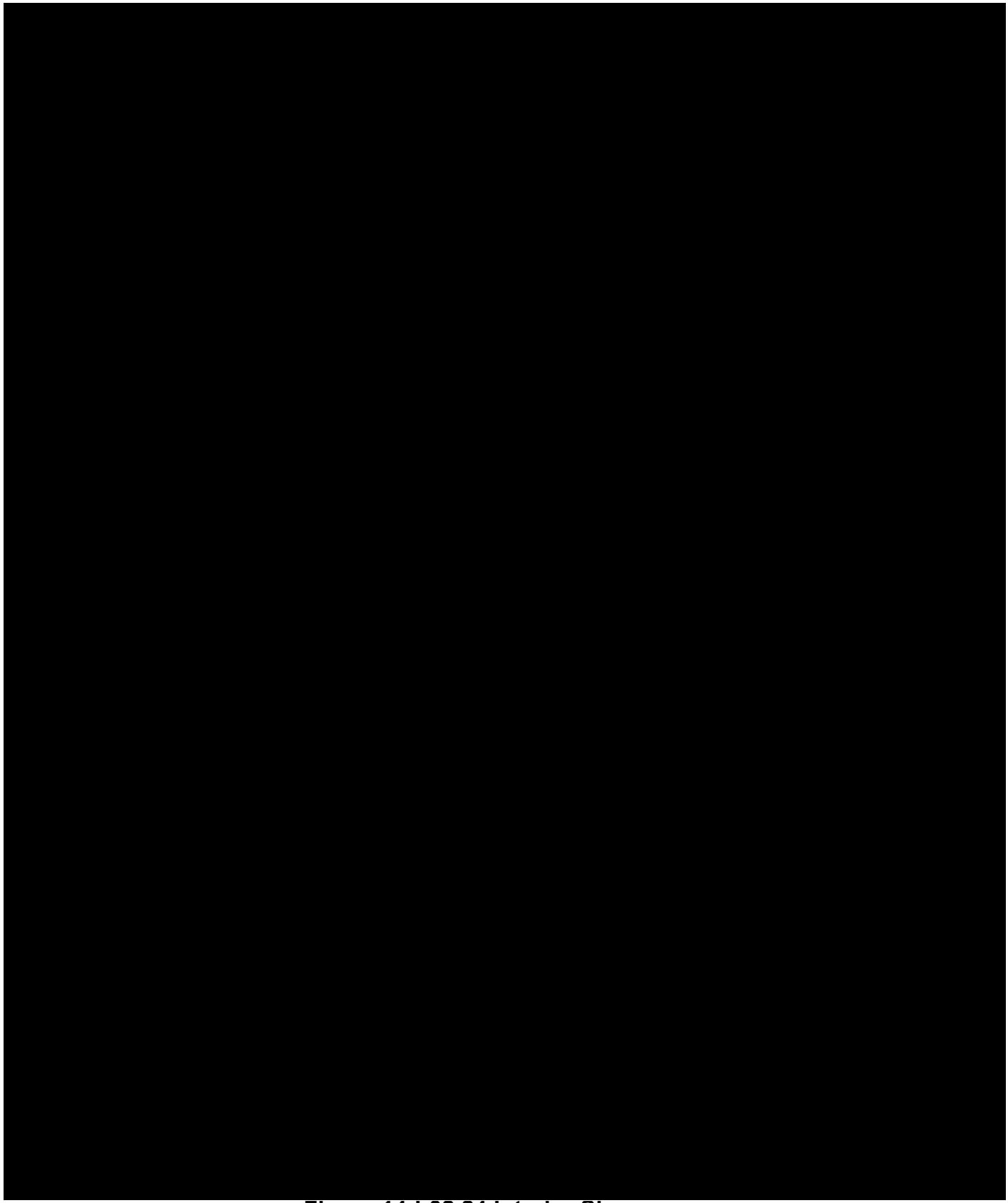


Figure 14-I-02.24 Interior Sign

14-I-02.03.06.01 Using the AADS - Menu Navigation and Selections

Many important functions of the PIS (Passenger Information System) are controlled through the AADS.

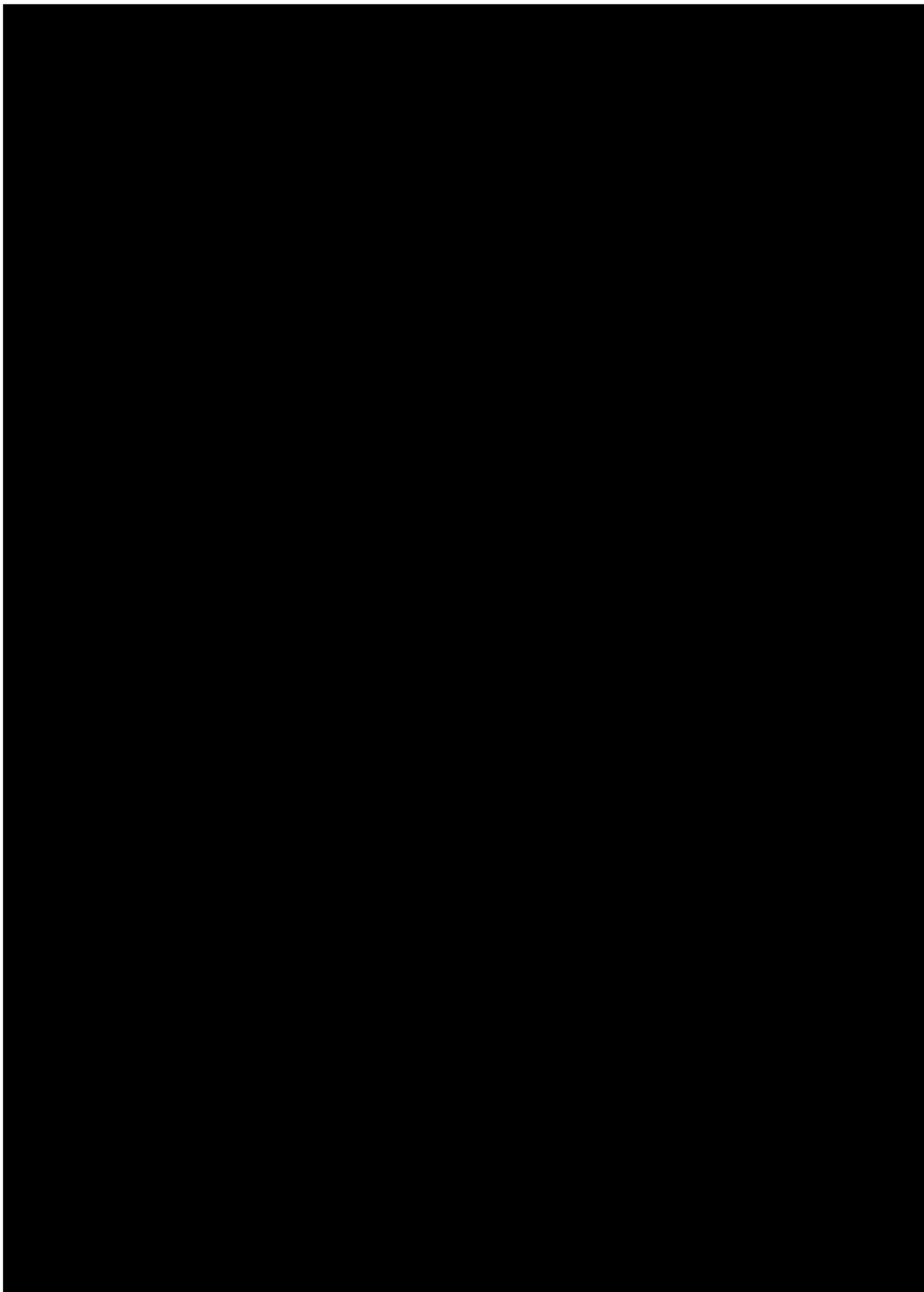
The navigation through the AADS menus is schematized in Figure 14-I-02.25 (without GPS) and Figure 14-I-02.26 (with GPS).

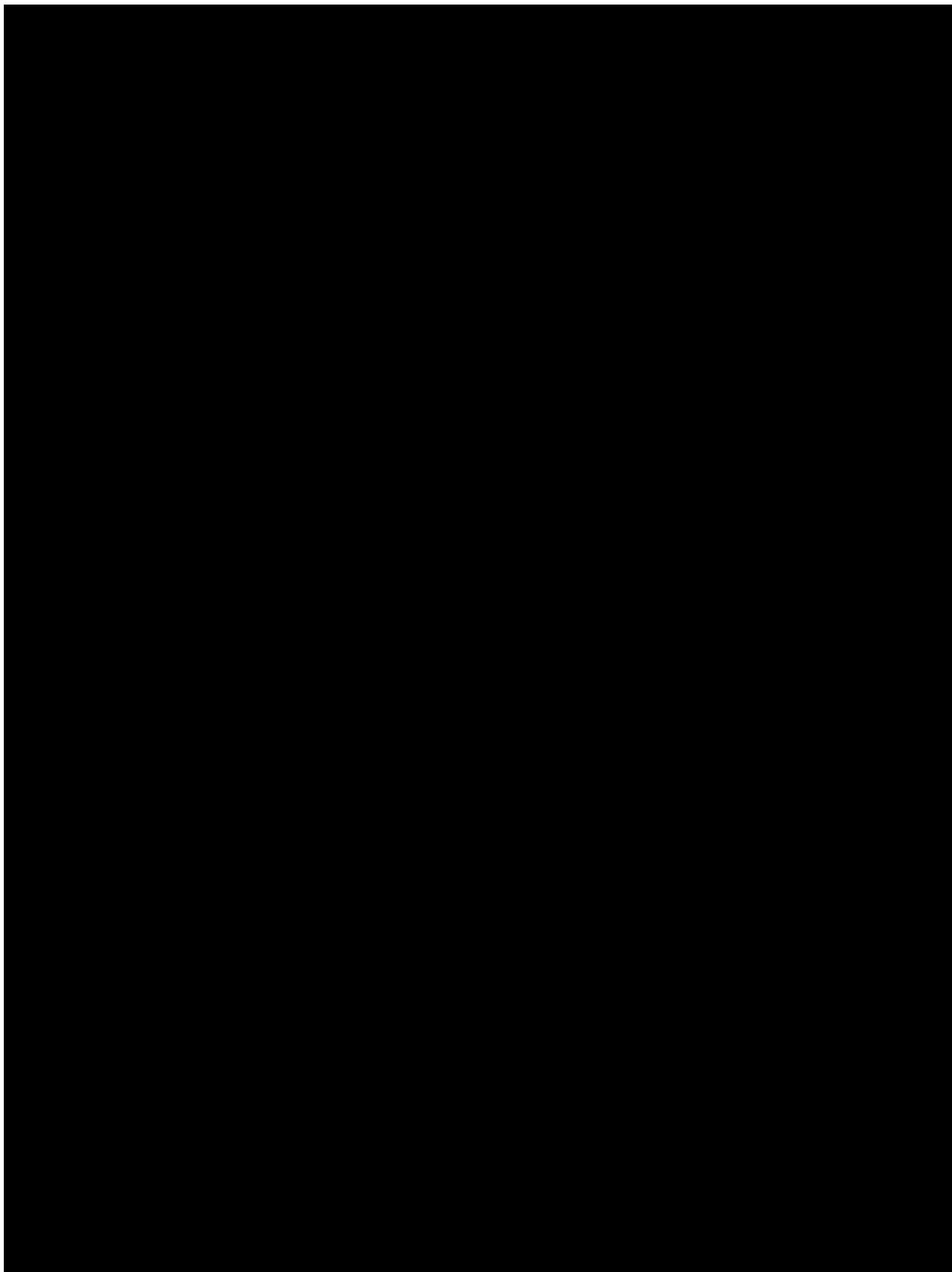
The following Table 14-I-02.2 help understanding how to use the AADS keys and the meaning of the displayed texts:

- The first line of the display specifies the current menu (“MAIN MENU”), the type of action required (“SEL END STATION”) or the message ready to be played (“NEXT STATION”)
- The second line normally is an item of a list (e.g.: list of stations, list of messages).
- Sometimes, the second line is used to input data (e.g.: Train ID or Operator ID)
- Sometimes the two lines are used to display an error message (e.g.: “*** ERROR ***” / “AUDIO BUSY”) or to confirm that a requested action is in progress (“Executing” / “Please wait”)

Table 14-I-02.2 AADS Keys

KEY	Meaning
<ENTER>	(when scrolling menus): Select the current menu option (when inserting data): Input completed (when scrolling list of data, such as stations): Select current data item (only when first line shows “THIS STATION”): Skip “THIS STATION” announcement and go directly to “DESTINATION” announcement)
<up arrow>	Scroll up the list of data displayed on the second line
<down arrow>	Scroll down the list of data displayed on the second line
<left arrow>	Return to previous menu level
</>	Return to MAIN MENU window
<SEND>	When AADS is displaying the “NEXT STATION” menu window, this will cause the current “next stop” visual and audio announcement to be played. When AADS is displaying “THIS STATION” menu, <Send> plays the opportune audio message and sets the menu to “DESTINATION” When AADS is displaying “DESTINATION”, <Send> plays the opportune message and leaves the same menu, until the train moves. If current window is “Service messages”, the selected message will be displayed on the internal signs and, if the corresponding audio file exists, the CCU will play a chime and then the audio file content according to the speaker selection knob on the CCH panel.
<F>	If AADS is displaying the “next station” menu window, <F> key toggles the “mute” function. The menu headline will display (M) to remind user that muting is active.
<ON>	(ONLY FOR MAINTENANCE OR TEST PURPOSES BY MAINTENANCE CREW - normally the shutdown function is automatic): Allows starting the shutdown procedure. Shutdown is used to turn off the PIS system during tests, to avoid file system corruption which may happen if power supply is simply turned off.





14-I-02.03.07 Radio Assembly

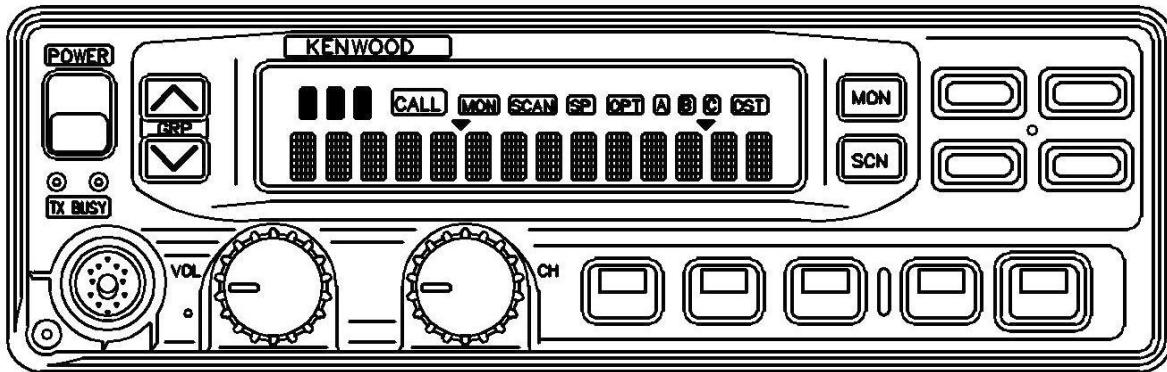


Figure 14-I-02.27 Radio Photograph

The radio TK-790 (refer to Figure 14-I-02.27) is a component produced by Kenwood and bought by the builder under MTA specifications.

The TK-790 radio is interfaced to the CCH by means of audio signal and control signals, it manages:

- Two-way communication between the operator and ROC.
- One way communication from ROC to the passengers by means of the PA system.
- Emergency calls activated by the silent alarm contact.

The radio power supply is a fully isolated DC/DC converter able to supply a nominal voltage of 13.6 Vdc and a maximum current of 25 Amp to the TK-790 radio.

The antenna is mounted on the vehicle roof and it is able to work in railway environment.

The loudspeaker is connected directly to the radio and is independent by the system amplifiers.

A functional block diagram of the Radio assembly is shown in Figure 14-I-02.28.

The Radio Antenna (18.3 inches high) is located on the vehicle roof above the Operator Cab, on both sides (refer to Figure 14-I-02.29).

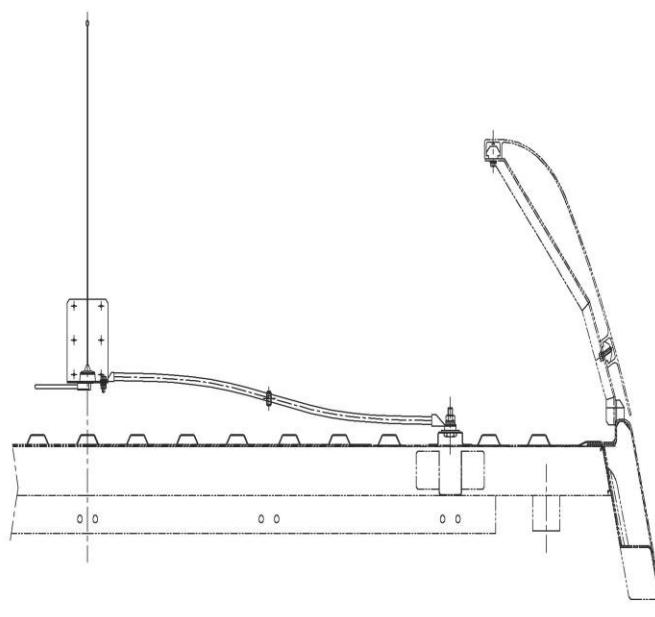
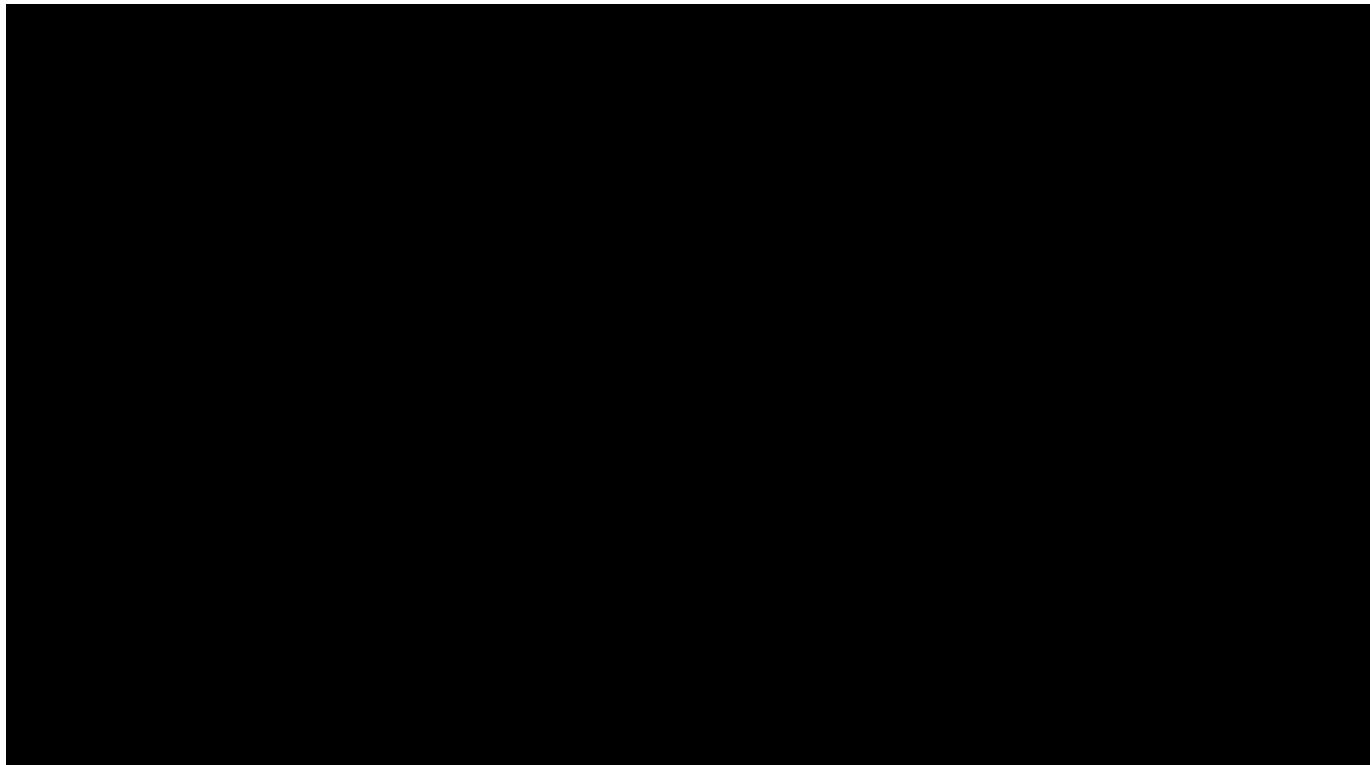


Figure 14-I-02.29 Radio Antenna

14-I-02.03.08 GPS System

The GPS (Global Positioning System) is a satellite navigation system which relies on a constellation of more than two dozen satellites broadcasting precise timing signals by radio to GPS receivers, allowing them to accurately determine their location in any weather, day or night, anywhere on Earth.

GPS also provides a precise time reference.

GPS has become a widely used aid to navigation worldwide, and a useful tool for mapmaking, land surveying, commerce, and scientific uses.

The PIS system uses the following information for trip control and time synchronization:

- Coordinates (expressed in X, Y, Z form)
- Time reference (year, month, day, hour, minutes, seconds).

The GPS is connected to the RS485 "A" line of the CCU.

The GPS Antenna (refer to Figure 14-I-02.30) is located above the ceiling of the Operator Cab in the A Body Section.

14-I-02.03.08.01 Trip Management with GPS

a) Data exchange between GPS, CCU, TCU.

When the GPS is active and reliable, CCU continuously transmits to TCU the coordinates of the current vehicle position (used for event log purposes) as well as information of date and time.

The PIS can't rely only on GPS data for trip management, because some areas can have a poor signal reception or even a complete lack of signal (tunnels, underground paths etc.).

To maintain a good trip management capability even when GPS is not available or reliable, the CCU receives the current vehicle speed from TCU.

Since the CCU knows, together with the coordinates of each station, also the distance between the different stations, it can evaluate the tram position using either the coordinates from GPS or the speed information from TCU.

This leads to several possible scenarios, described below.

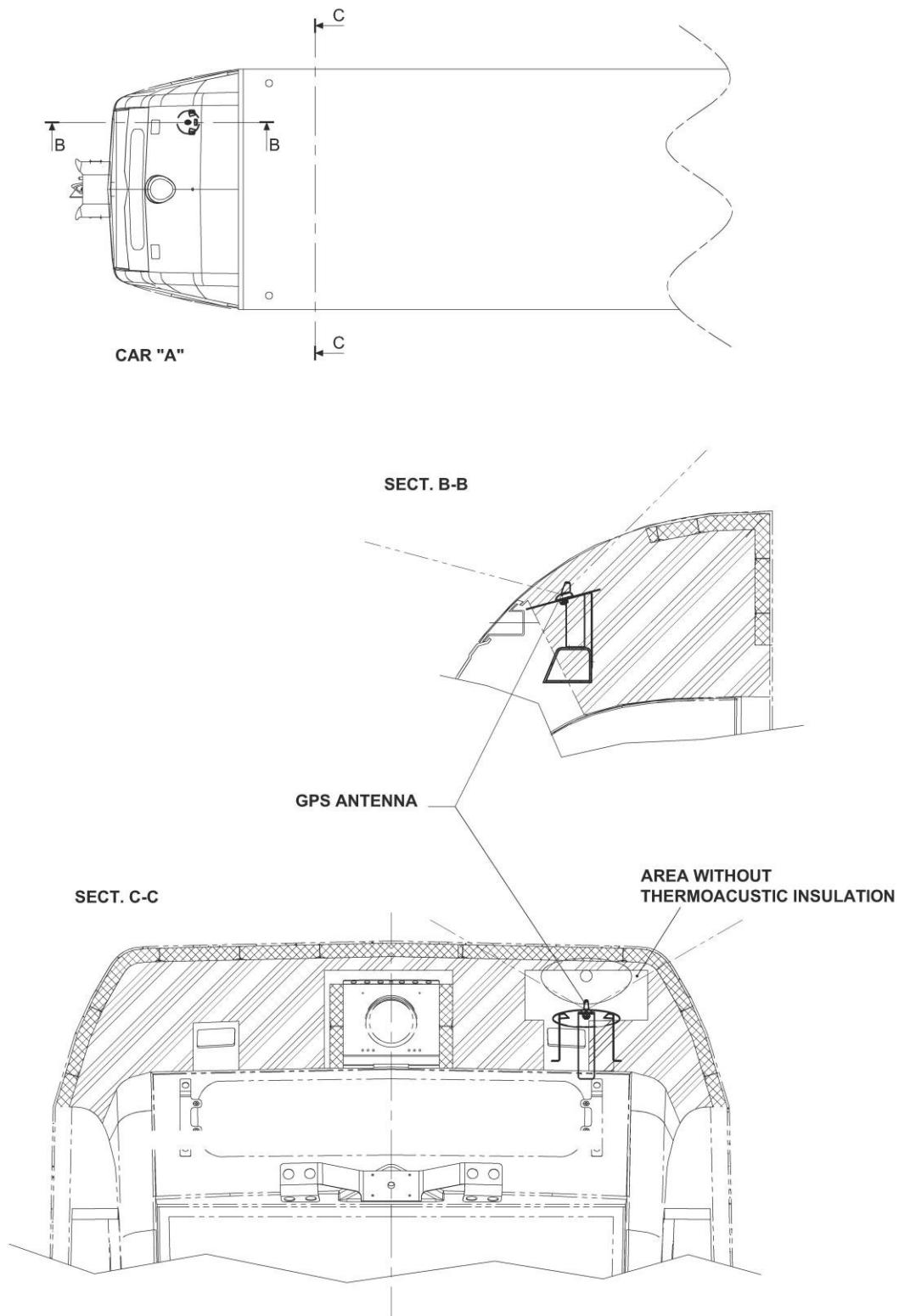


Figure 14-I-02.30 GPS Antenna

b) Information available to CCU for trip management

As seen above, CCU obtains data for trip management from GPS and / or TCU, in form of "dynamic" information:

- Coordinates
- Vehicle speed.
- CCU uses for GPS management other "static" information stored in the flash memory. For each LINE and ROUTE selected, CCU knows:
 - Foreseen sequence of stations
 - Coordinates of each station
 - Distance between stations
 - Platform length of each station
 - If each station is actually a foreseen stop or is temporarily suppressed

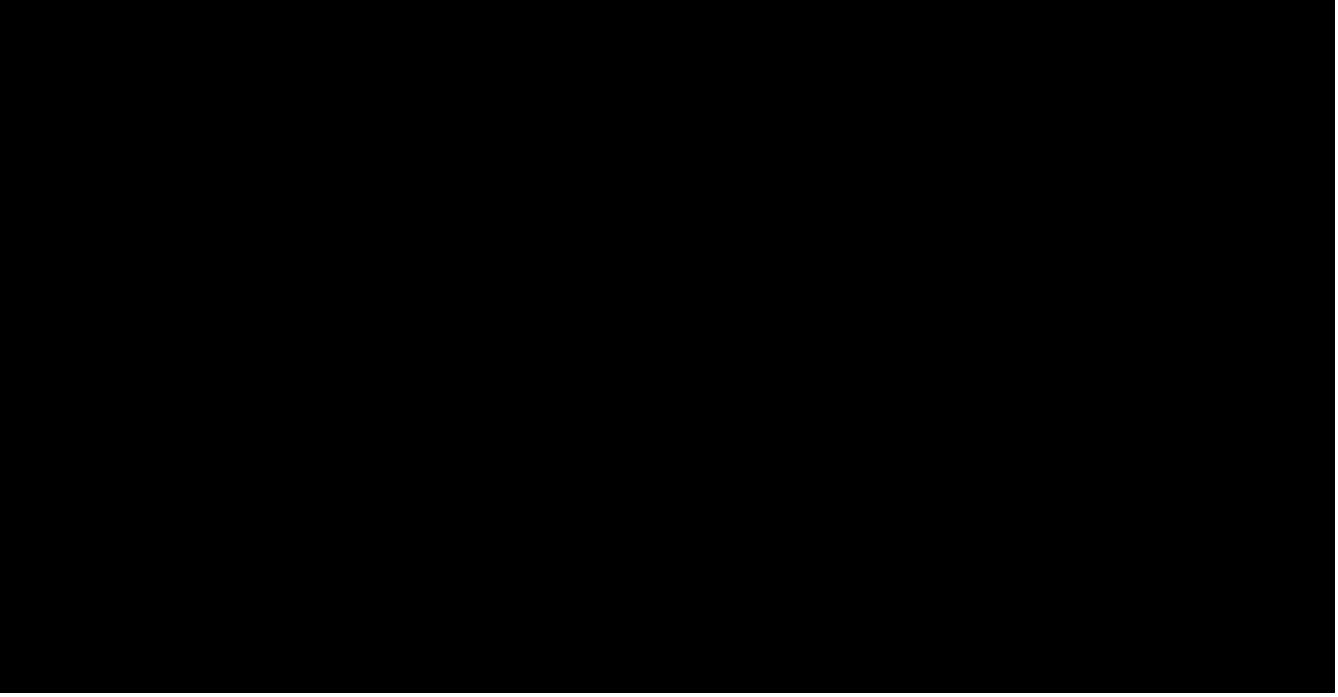
Trip management must consider several scenarios related to GPS fault and TCU fault: the following paragraphs detail how the system reacts to each condition.

c) Different scenarios for trip control activities

As it happens for the vehicle configuration without GPS and speed info from TCU, at system startup the driver must use AADS to:

1. Insert Train ID and Operator ID.
2. Select a LINE.
3. Select a ROUTE.
4. Choose the actual first and last station of the ROUTE if different from the normal ones.
5. Select the stations “disabled” (if any).

The subsequent operations differ in accordance with the possible scenarios.

- **GPS reliable:** automatic management
- 

In this case, from the point of view of trip management, the status of the TCU is not vital, since all required information come from GPS.

If TCU is available, however, speed info is used to keep the system ready to switch to semi-automatic management.

The main steps performed by CCU software in this case are:

1. Read coordinates from GPS.
2. Compare coordinates obtained from GPS with those of the foreseen next station, and compute the distance which separates the train from the next station.
3. Use data transmitted from TCU, if available, to compute the distance covered from the previous station. This will be used in case of GPS fault or lack of signal for switching to semi-automatic management.
4. If the distance is decreasing, when it reaches a predefined threshold, issue the audio message announcing the arrival at the station, and write the name of the station in the internal displays. If the distance is increasing, this means that the expected station has been skipped and the following station of the database becomes the expected next station.
5. When the train stops and opens the doors, the information of distance from previous station covered is reset.
6. When the train closes the doors and accelerates, after the distance from the previous station has reached another predefined threshold, the system issues the message "The next stop is..." to speakers and displays.

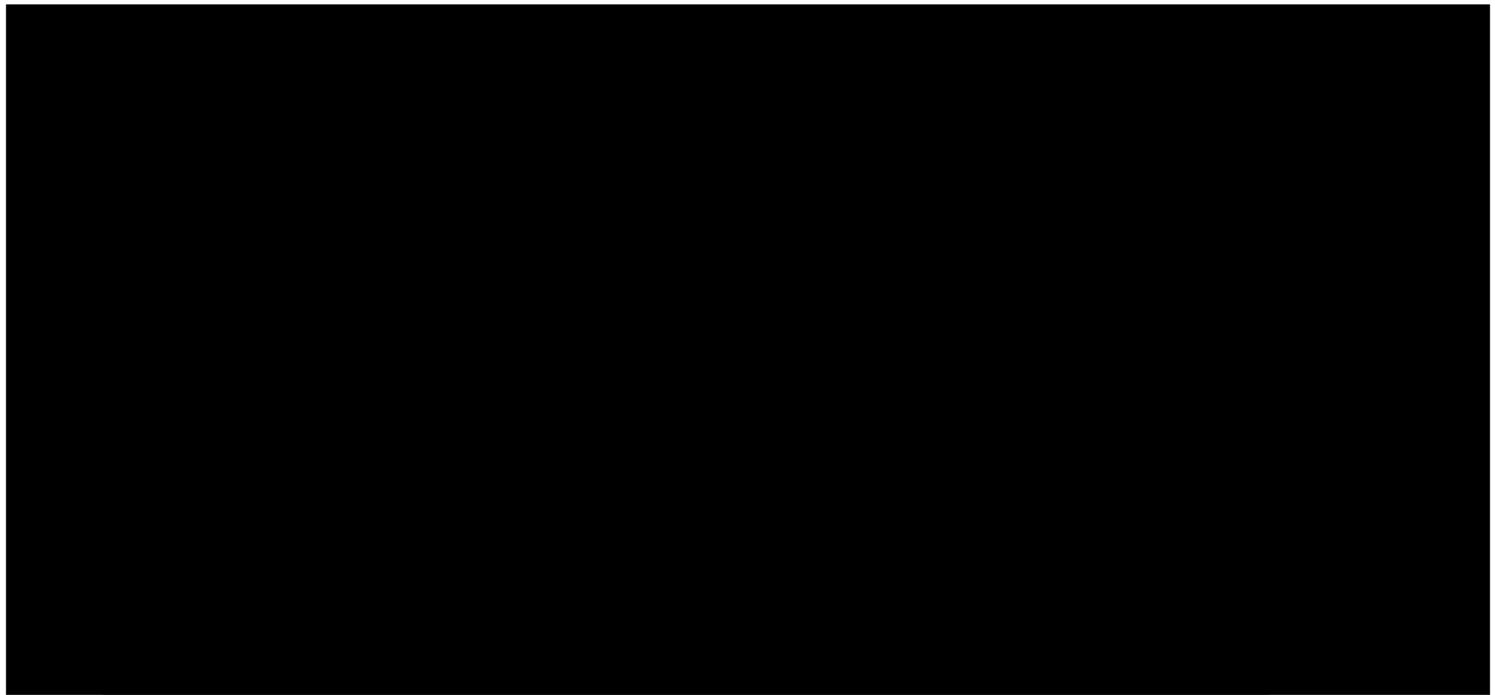


Figure 14-I-02.33 Semi-Automatic Management

In case GPS is out of order, or not reliable due to insufficient number of 'seen' satellites, the system will lack the information of coordinates, date and time.

Date and time are not vital, because they are known by the TCU, so TCU can supply CCU with those info as it already happens for trams without GPS.

The lack of coordinates doesn't allow the system to be aware of its actual position between two stations of the route, unless it uses the speed information from TCU.

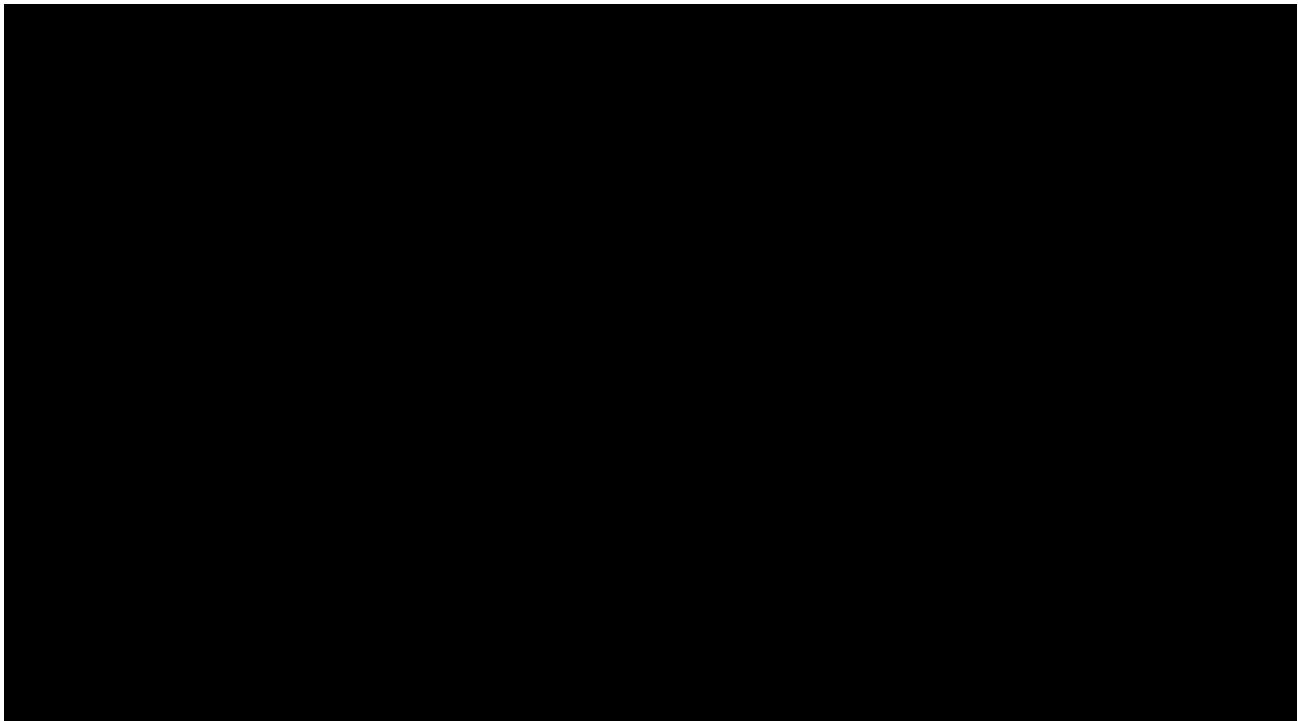
In this case, it is able to compute the distance covered in the time interval between two readings from TCU with the formula:

$$\text{Distance} = \text{reported speed} * \text{time interval between readings}$$

Opportunely trimming the time interval between two readings from TCU will increase the precision of the evaluation.

The main steps performed by CCU software in this case are:

1. Read speed from TCU.
2. Use datum to compute the distance covered from the previous station.
3. When the difference between the known distance between previous and next station reaches a predefined threshold, issue the audio message announcing the arrival at the station, and write the name of the station in the internal displays. If the evaluated distance becomes greater than the known distance, this means that the expected station has been skipped and the following station of the database becomes the expected next station.
4. When the train stops and opens the doors, the information of distance from previous station covered is reset.
5. When the train closes the doors and accelerates, after the distance from the previous station has reached another predefined threshold, the system issues the message "The next stop is..." to speakers and displays.



In this case, the trip management is completely manual.

After the initial input of Train ID, Operator ID, LINE selection, ROUTE selection and selection of active stations, the flow of operations follows the schema described in "AADS Menus - MANUAL mode functional schema".

The operator controls the emission of audio messages (only the announcement of destination is generated automatically after the "THIS STATION" message).

The system changes automatically the indication of "NEXT STATION" on the AADS display when train leaves each station after it has stopped.

- Time synchronization
- GPS active: The date and time information are given by GPS and shared between the two CCUs of the same vehicle by means of the Ethernet line. Each CCU, when polled by its TCU, sends the date and time info to the TCU itself.
- GPS not active: Normally, each rack receives the correct time info via TCU and, if necessary, regulates its internal clock. If one TCU fails, the time stamp is received via Ethernet from the second CPU. If both TCUs in one vehicle have a failure, the real-time clock in each CPU will give the time stamp.
- System restart

If the system, for any reason, has to be restarted in any point of the route, the operator must insert, as usual, Train ID and Operator ID, and select the correct LINE and ROUTE by means of the AADS.

Due to the need of operating with AADS, it is assumed that these operations will take place with the train stopped in one station.

To make system restart independent from GPS and TCU status, the operator, after selecting the ROUTE, must select the actual first station corresponding to the one in which the train is stationary.

d) Position Computation Algorithm

X, Y, Z coordinates allow an easy computation of the distance between two generic points P1 (x_1, y_1, z_1) and P2 (x_2, y_2, z_2), given by the formula:

$$\text{dist} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

e) GPS Information Stored Into Log Files

When an alarm condition is detected, the GPS coordinates, if GPS is working correctly, are added at the end of the alarm message recorded into system logs to allow identification of the vehicle location at the moment the alarm.

f) CCU Software Architecture, GPS task

The operating system on the CCU board allows preemptive multitasking.

The software is organized in tasks, and different tasks can share message queues and global variables to allow easy information exchange.

The task dealing with GPS data acquisition continuously polls the GPS and obtains coordinates, date and time.

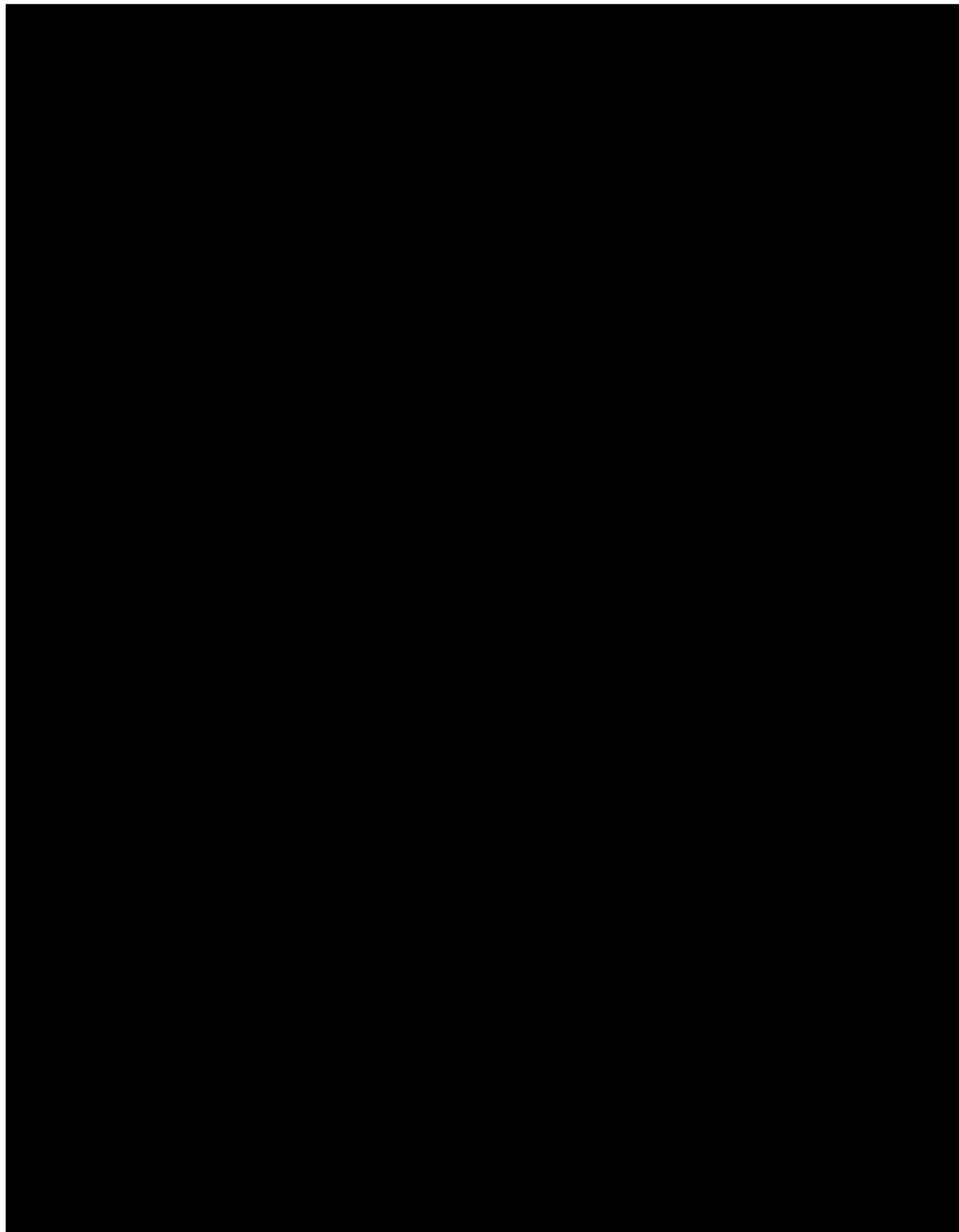
This information are stored in a shared memory area, and made available to other tasks through a so-called “semaphore” technique which prevents false acquisitions.

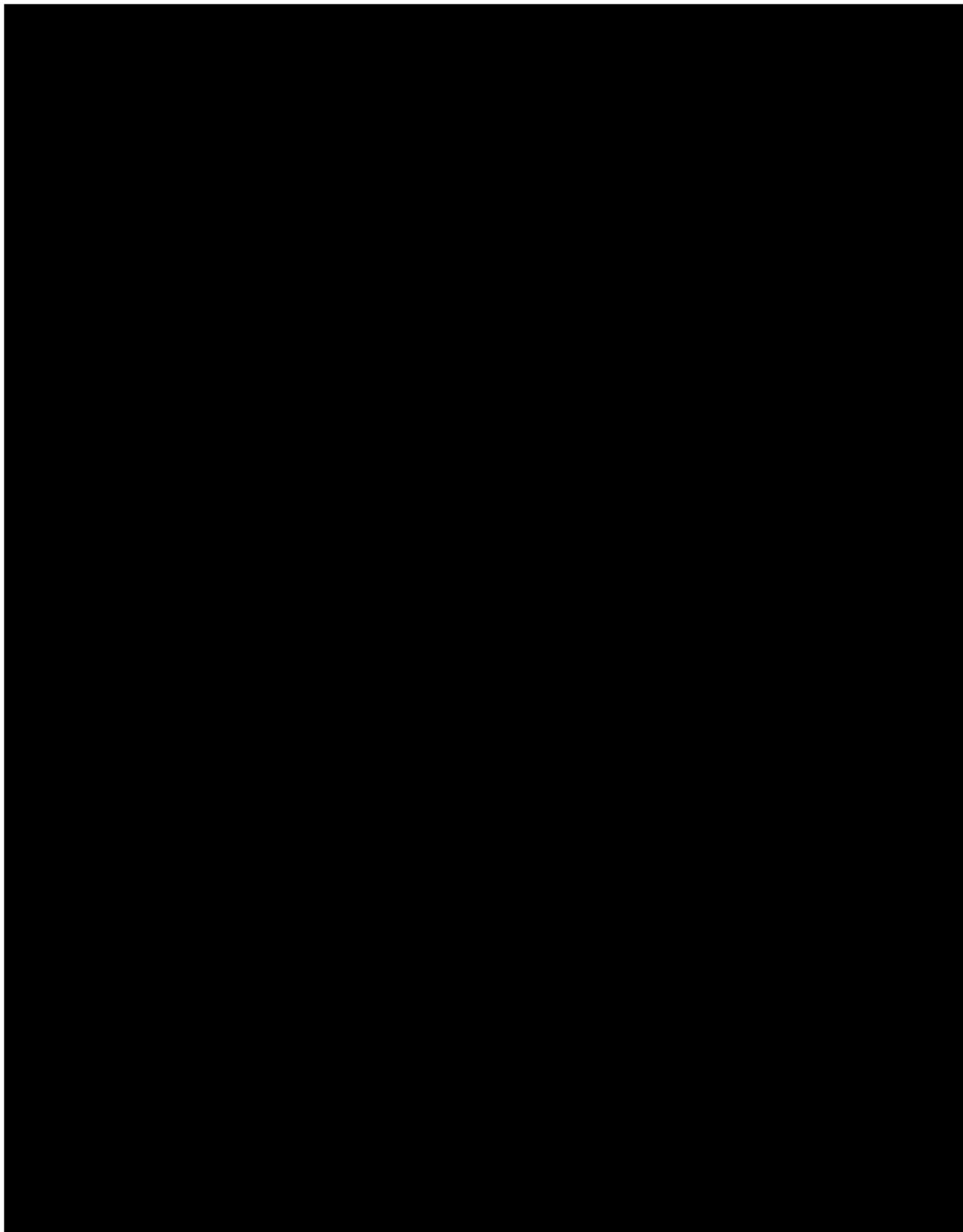
14-I-03 APPENDIX

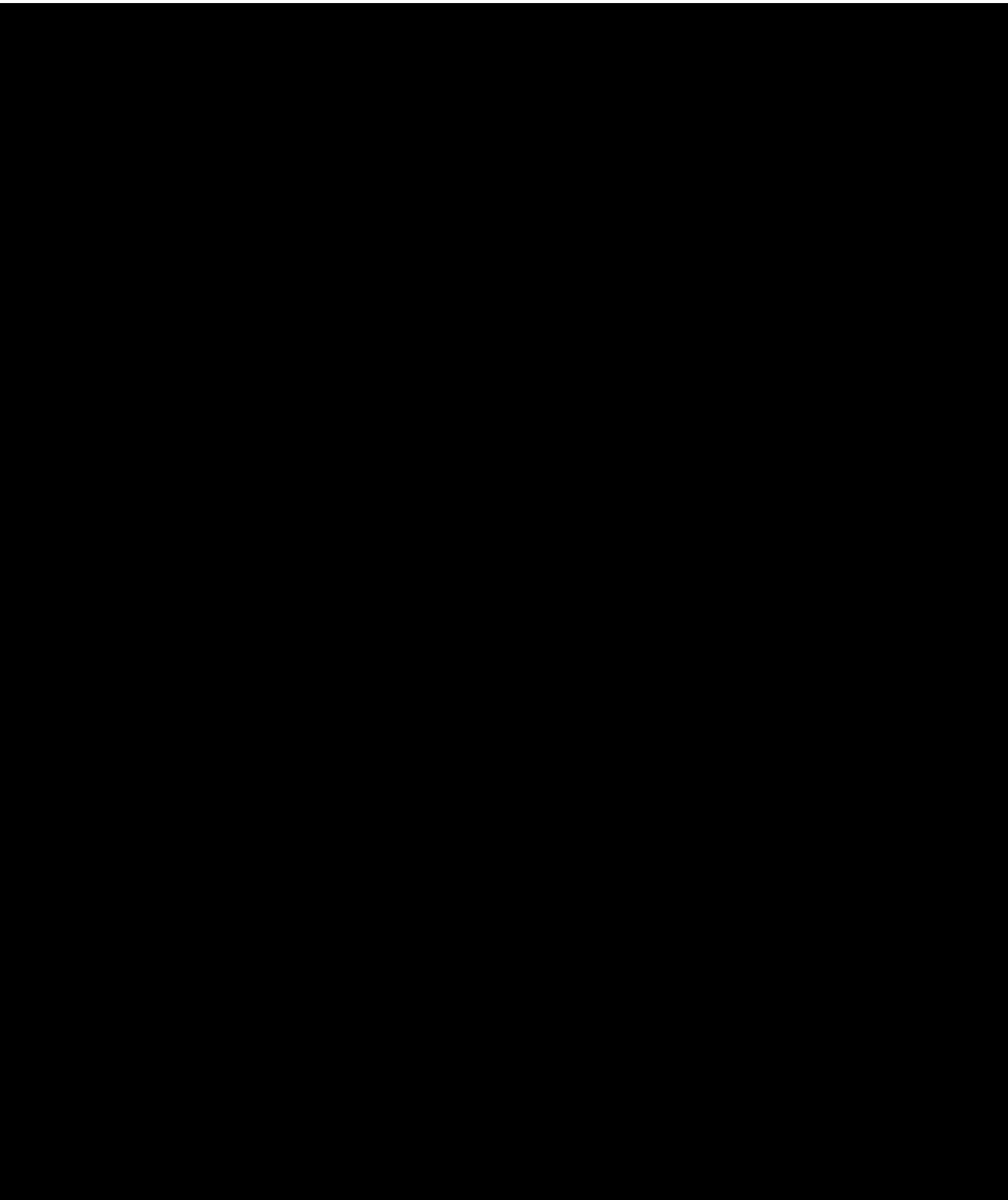
14-I-03.01 Ingress Protection Ratings (IP Codes)

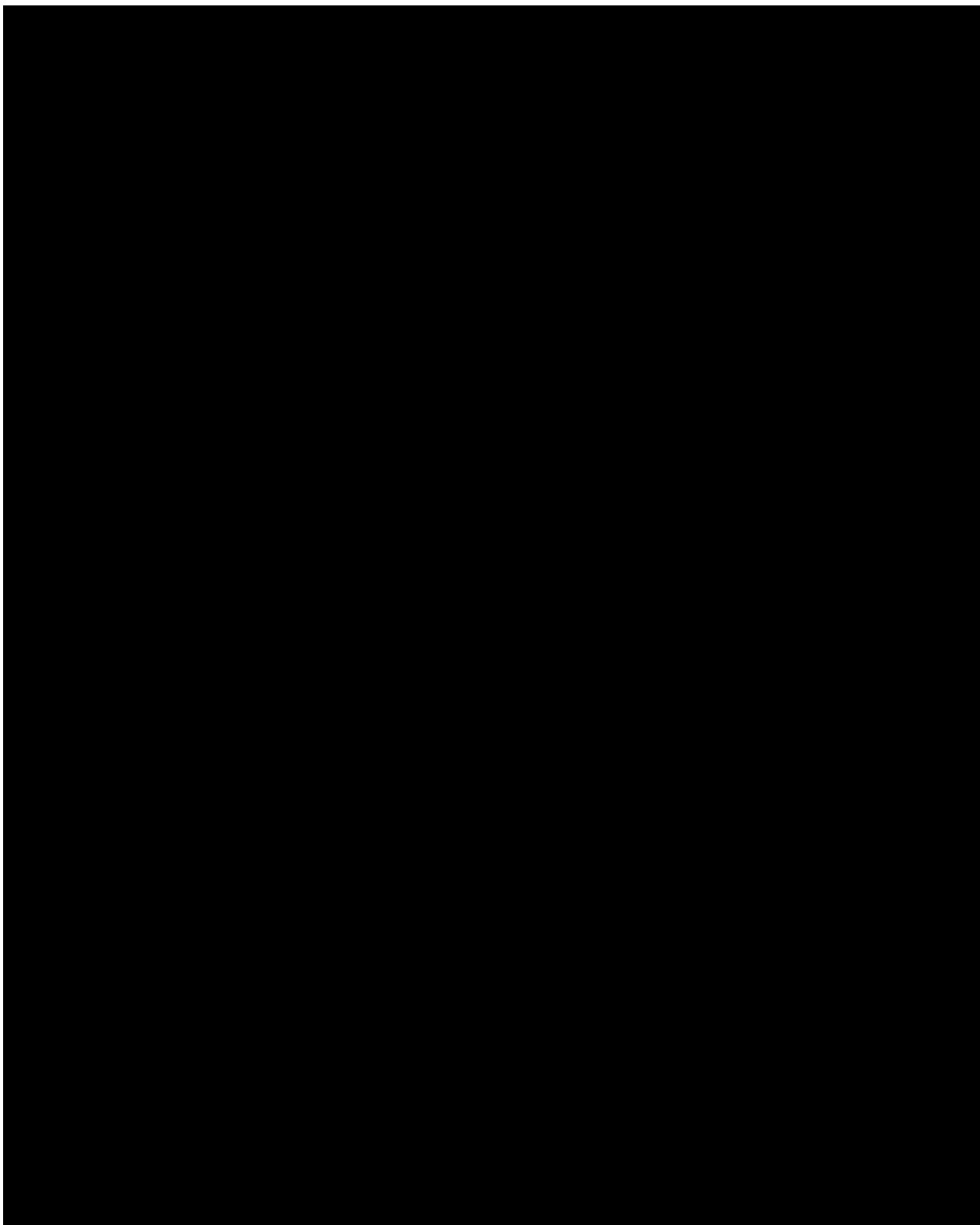
Table 14-I-03-1 Ingress Protection Ratings (IP Codes)

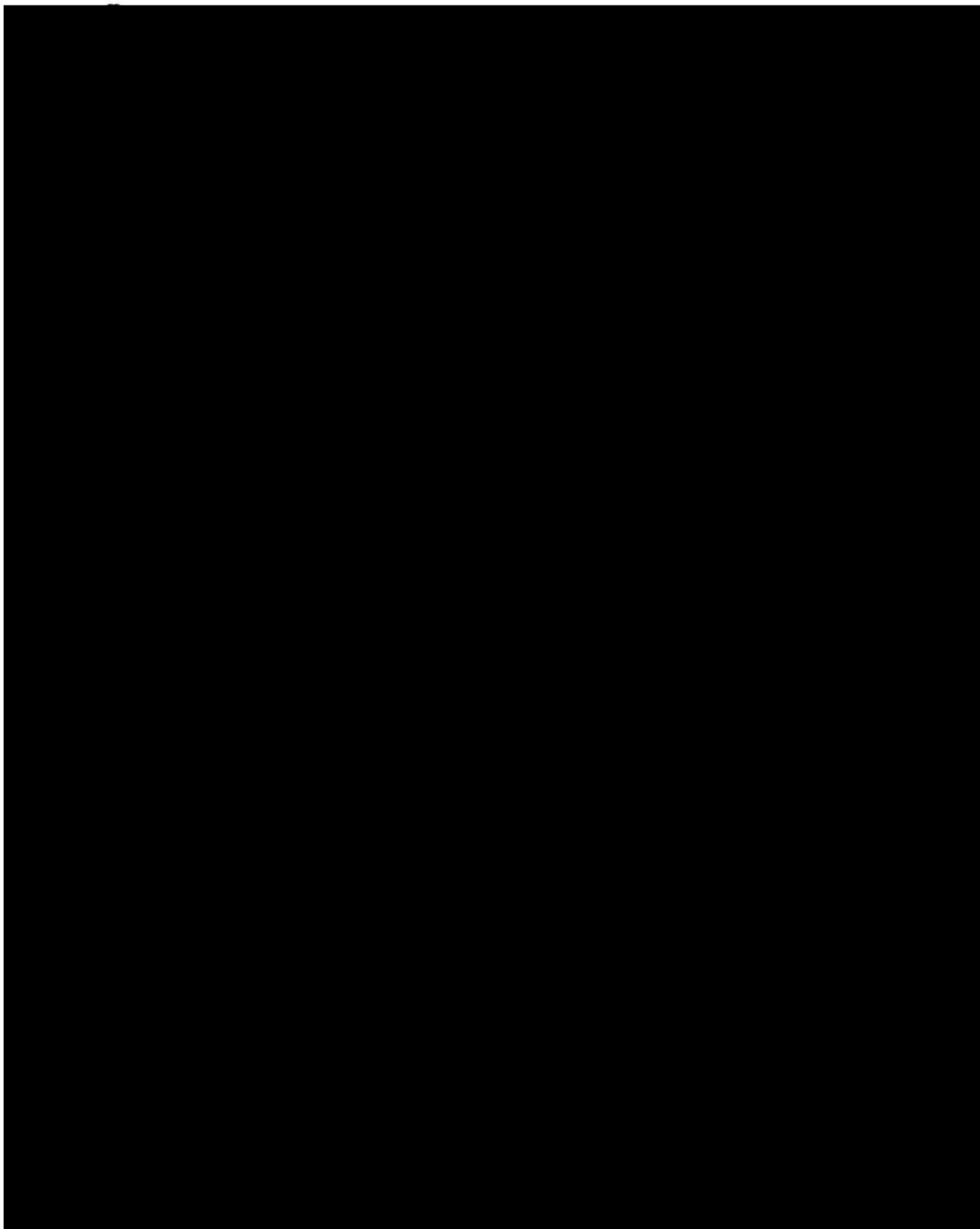
Ingress Protection Classification			
First Digit		Second Digit	
IP	Protection Provided	IP	Protection Provided
0	No Protection	0	No Protection
1	Protected against solid objects up to 50mm e.g. accidental touch by hands	1	Protected against vertically falling drops of water e.g. condensation
2	Protected against solid objects up to 12mm e.g. fingers	2	Protected against direct sprays of water up to 15 deg from the vertical
3	Protected against solid objects over 2.5mm e.g. tools	3	Protected against direct sprays of water up to 60 deg from the vertical
4	Protected against solid objects over 1mm e.g. wires	4	Protected against water sprayed from all directions - limited ingress permitted
5	Protected against dust - limited ingress (no harmful deposit)	5	Protected against low pressure jets of water from all directions - limited ingress permitted
6	Totally protected against dust	6	Protected against strong jets of water e.g. for use on shipdecks - limited ingress permitted
		7	Protected against the affects of immersion between 15cm and 1m
		8	Protected against long periods of immersion under pressure

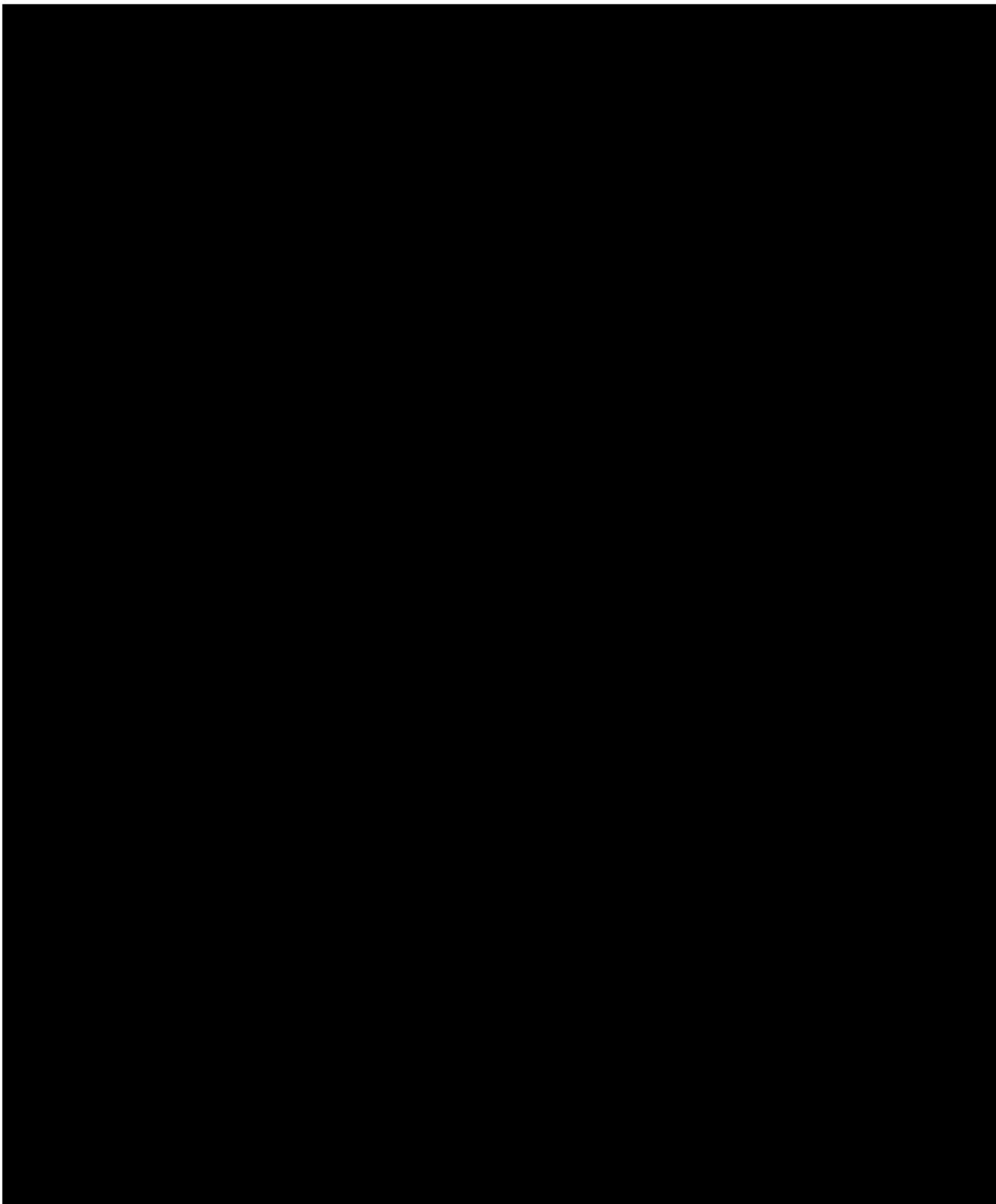


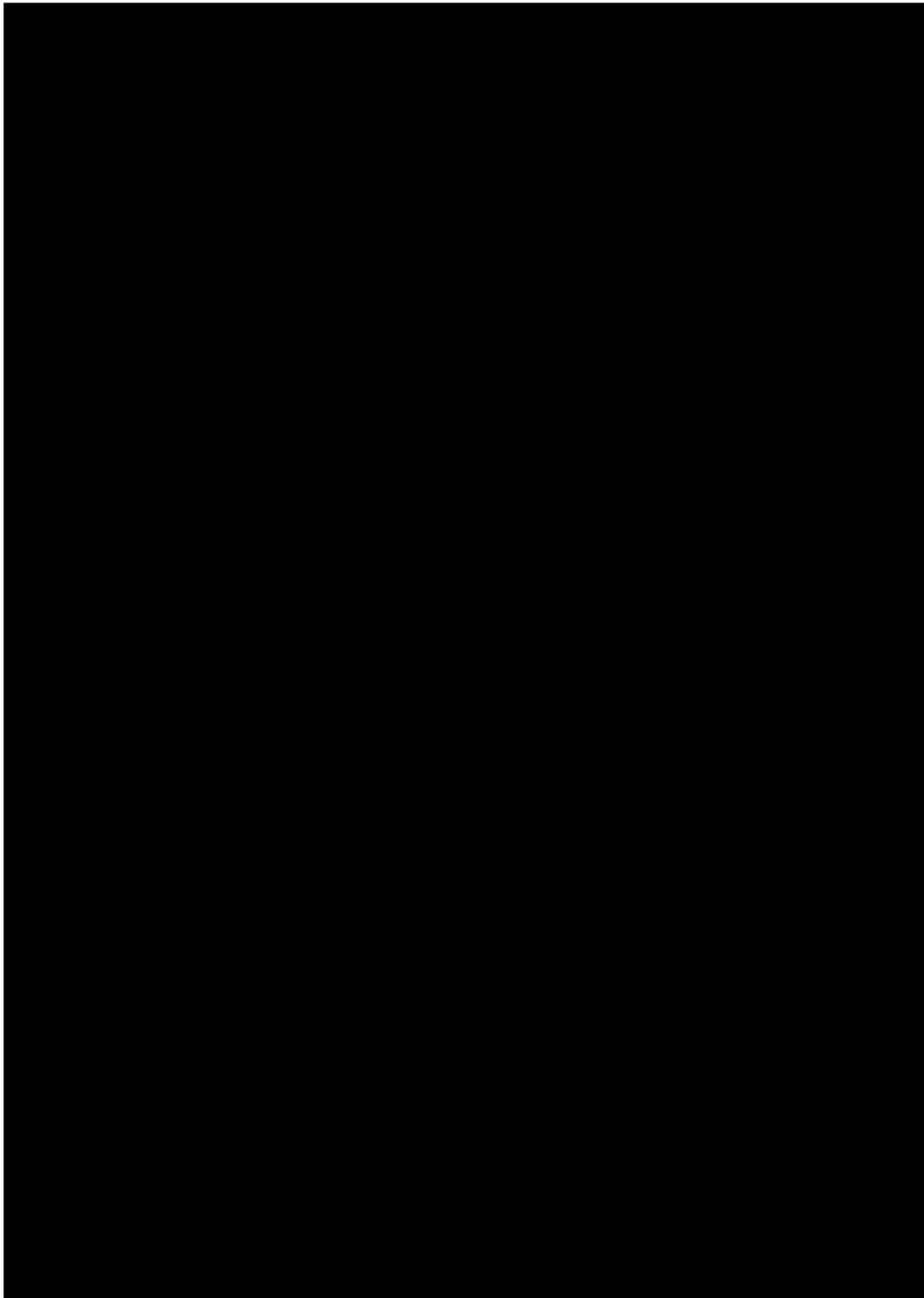












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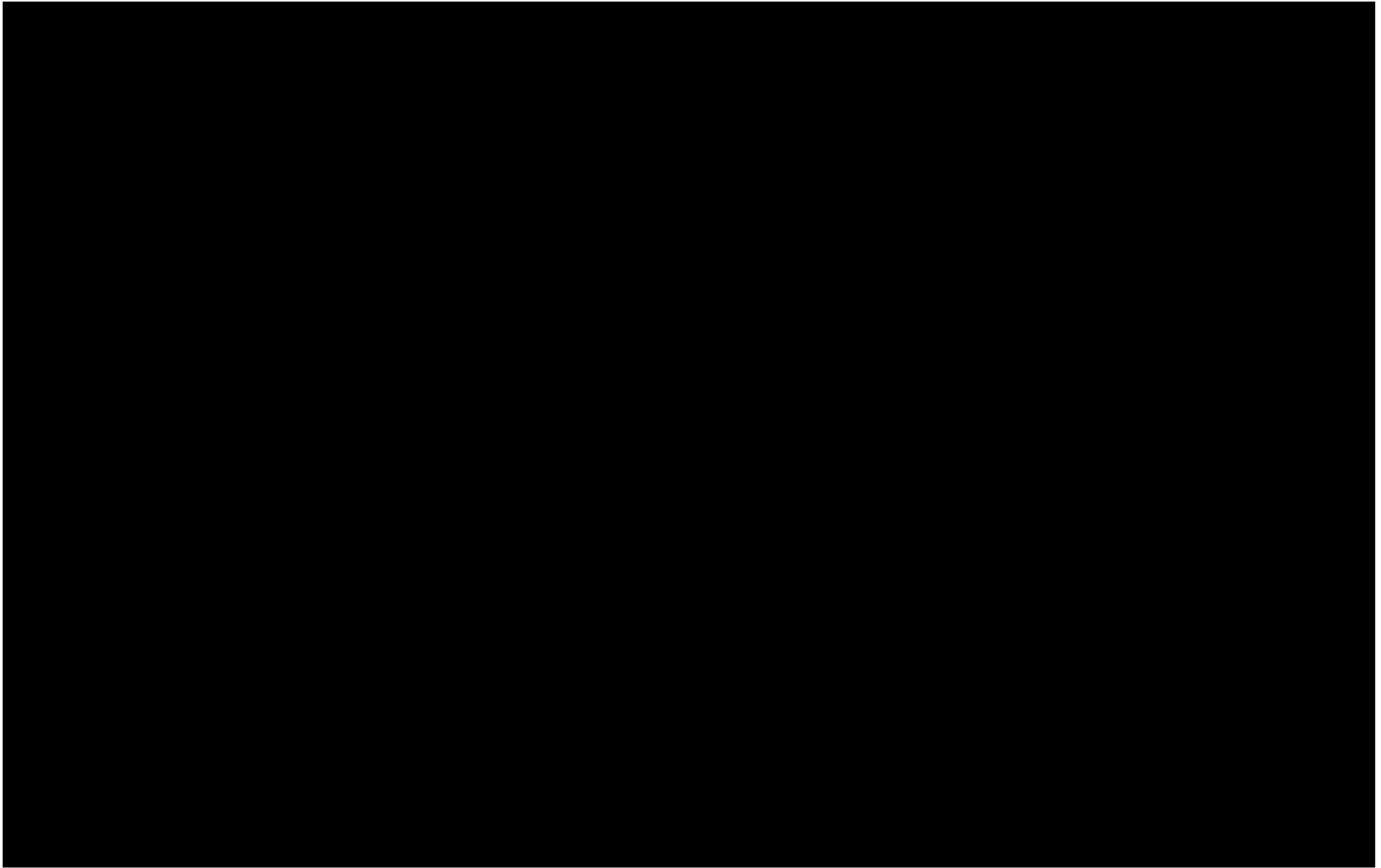


Table 14-I-03.3 Communication System Electrical Schematic - Car "A"

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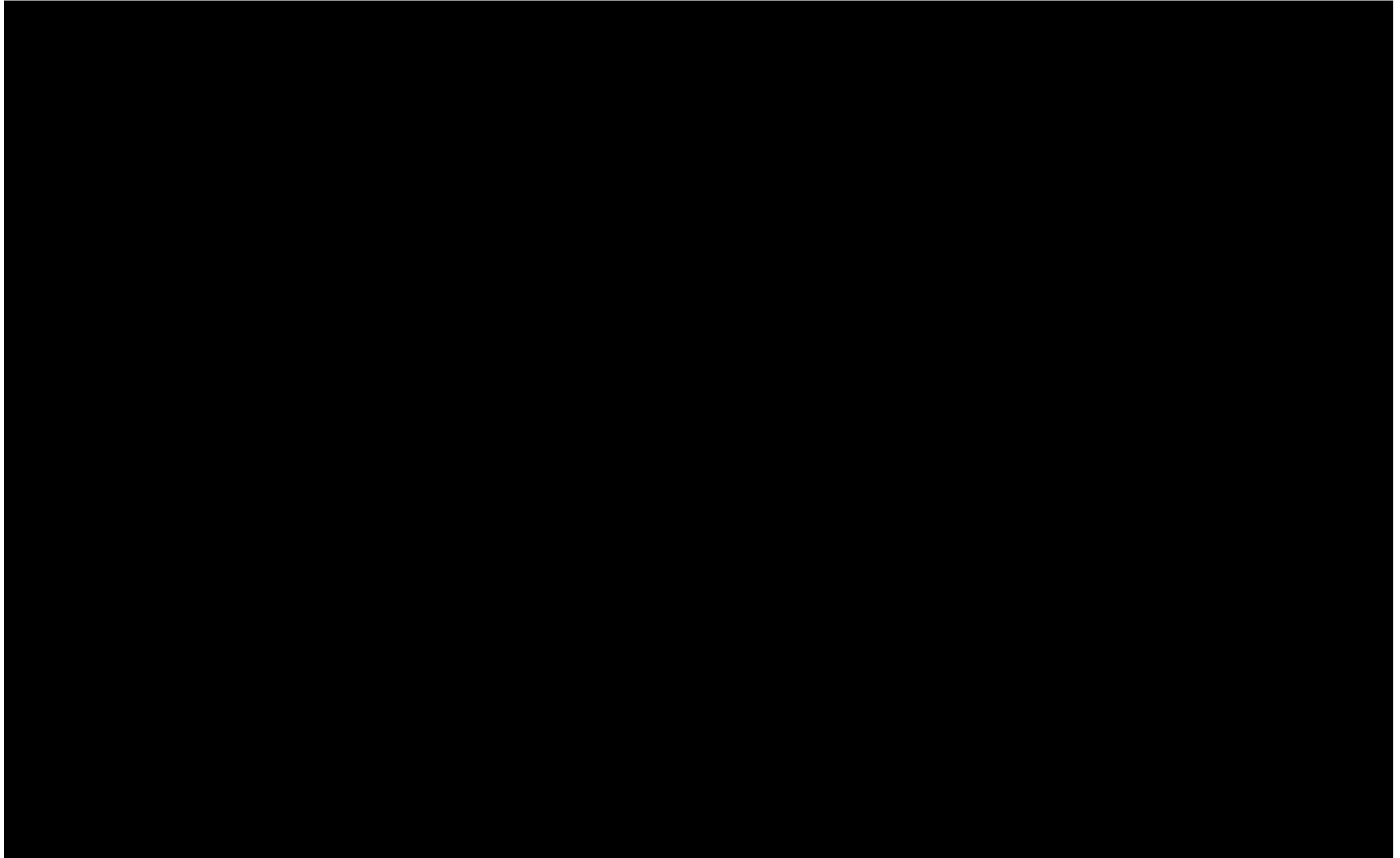


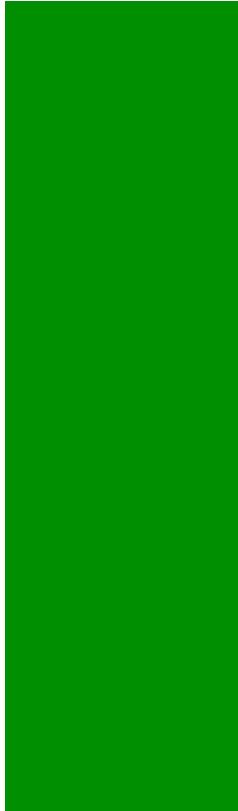
Table 14-I-03.4 Communication System Electrical Schematic - Car "B"

LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

P2550



RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01
PART II
TROUBLESHOOTING
SECTION 14 - COMMUNICATIONS



SECTION 14

COMMUNICATIONS

PART II

TROUBLESHOOTING

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SECTION 14

COMMUNICATIONS

14-II-01 INTRODUCTION

This Section of the Running Maintenance and Service Manual is divided into three Parts:

- Part I: Theory of Operation
- Part II: Troubleshooting
- Part III: Maintenance

Each Paragraph is numbered accordingly, to avoid that paragraphs of the same Section, pertaining to a different Part, have the same number.

Part I - Theory of Operation

Part I gives a thorough overview of the System structure and operation, by means of descriptions, figures, photos, schematics, block diagrams and flow charts, together with references to other documents or Sections when needed.

Part II - Troubleshooting

It gives the Maintenance Technicians a path to troubleshoot the System in every condition by means of the available tools:

- The PTU, equipped with the specific SW program;
- The IDU;
- The Fault Isolation Table.

The Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment, Tools & Special Tools

14-II-01.a LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

The Abbreviations, Acronyms and Symbols commonly used throughout this manual are given below with their related meaning.

Abbreviation	Meaning
Δ/Y.....	Triangle - Star Transformer
AADS.....	Automatic Announcement and Display System
AB.....	AnsaldoBreda
AC/DC.....	Alternate Current - Direct Current Converter
APS.....	Auxiliary Power Supply
ATP.....	Automatic Train Protection
BCU.....	Brake Control Unit
CB	Circuit Breaker
CCH	Communication control Head
CCI	Cab to Cab Intercom
CCU	Communication control Unit
CM.....	Coast Motoring
DC/AC.....	Direct Current - Alternate Current Converter
DC/DC.....	Direct Current - Direct Current Converter
EB.....	Emergency Brake
ECU.....	Electronic Control Unit (Brakes)
EDU.....	EMI Detector Unit
EXT	Exterior
FSB	Full Service Brake
GPS.....	Global Positioning System
GTW.....	Gateway
HRSB	High Rate Service Brake
HSCB	High Speed Circuit Breaker
HV	High Voltage
HVAC	Heating Ventilation & Air Conditioning
HVDS	High Voltage Distribution System
HW	Hardware
ICS	Integrated Circuits
ID.....	Identification (number)
IDU	Integrated Diagnostic Unit
INT.....	Interior
KO	Out of Service
LED	Light Emitting Diode
LH.....	Left Hand Side

Abbreviation	Meaning
LON.....	Local Operative Network
LRV	Light Rail Vehicle
LV.....	Low Voltage
LVDS.....	Low Voltage Distribution System
LVPD.....	Low Voltage Power Distribution
LVPS.....	Low Voltage Power Supply
M.....	Motoring
MBL.....	Metro Blue Line
MIC	Microphone
MTA	Metropolitan transportation Authority
MV.....	Medium Voltage
MVB	Multifunction Vehicle Bus
MVPD.....	Medium Voltage Power Distribution
OK.....	Working
PA	Public Announcement
PC	Printed Circuit
PGL.....	Pasadena Gold Line
PIC	Passenger Intercom
PIS	Passenger Information System
PTT	Push To Talk (Button)
PTU.....	Portable Test Unit
RH.....	Right Hand Side
ROC.....	Railway Operating Center
SB	Service Brake
SCEB	Slide Controlled Emergency Brake
SW	Software
TBS	To Be Supplied
TCMS.....	Train Control and Monitoring System
TCN.....	Train Communication Network
TCU.....	Traction control Unit
TWC.....	Train-to-Wayside Communication
WTB	Wired Train Bus

14-II-01.b LIST OF DEFINITIONS

The Definitions commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0.....	Empty car operating weight
AW1.....	Full seated load plus AW0
AW2.....	Standees at 4 persons per square meter plus AW1
AW3.....	Standees at 6 persons per square meter plus AW1
AW4.....	Standees at 8 persons per square meter plus AW1
Front door.....	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section

14-II-01.c LIST OF MEASUREMENT UNITS AND SYMBOLS

The Measurement Units commonly used throughout this manual are given below with their related meaning.

Definition	Meaning
Ω	Ohm
$^{\circ}\text{C}$	Celsius degree
$^{\circ}\text{F}$	Fahrenheit degree
A	Ampere
ac	Alternate Current
dB	Decibel
dc	Direct Current
F	Farad
ft	Foot
H	Henry
Hz	Hertz
in	Inch
kg	Kilogram - approx 2.205 pounds
km	Kilometer - approx 0.621 miles
kN	Kilo-Newton - approx 224.809 pounds force
kVA	Kilo Volt Ampere
kW	Kilo Watt
m	Meter - approx 3.28 feet
mm	Millimeter - approx 0.0394 inches
ms	Millisecond
Pa	Pascal
rms	Root Mean Square Voltage
rpm	Revolution per Minute
V	Voltage
V _{in}	Input Voltage
V _{pp}	Peak to Peak Voltage
W	Watt (Power)

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14-II-02 TROUBLESHOOTING

The tools available for troubleshooting the Communication System and its components are:

- The Communication Rack LEDs
- The IDU (Integrated Diagnostic Unit)
- The PTU (Portable Test Unit)

The IDU interface is made up by a display located in both vehicle cabs.

The IDU can be accessed in two Modes:

- Operating Mode, for the operators;
- Maintenance Mode, for maintenance personnel, accessible by means of a numeric password.

The Operating Mode provides few, essential information to help the operator start the troubleshooting or to pass the information on to the ROC (Railway Operating Center).

In Maintenance Mode the IDU can display more detailed information, thus giving the Maintenance personnel the possibility to troubleshoot more in depth and more accurately.

14-II-02.01 Troubleshooting with the LEDs on Device

The LEDs on the Communication Rack inn the Electronic Locker (A and B Body Section) and on the Radio can be a quick and easy way to check the status of the system.

The Communication Rack LEDs (refer to Figure 14-II-02-1) are:

- Ethernet “Activity” LEDs must blink (about 5lincks/sec.). Ethernet-B = middle LED, Ethernet-A = left LED;
- LEDs “PWR”: #1 must be green, #2 red;
- LEDs “LF”: must be switched off;
- POWER SUPPLY four green LEDs must be ON;
- FIN-PA “DC” LEDs: green when audio out to speakers (left FIN-PA = EXT, right FIN-PA = INT).

Radio:

Three LEDs labeled V_IN, ALARM, V_OUT allow easy monitoring of possible malfunctioning condition. V_IN and V_OUT ON in normal conditions.

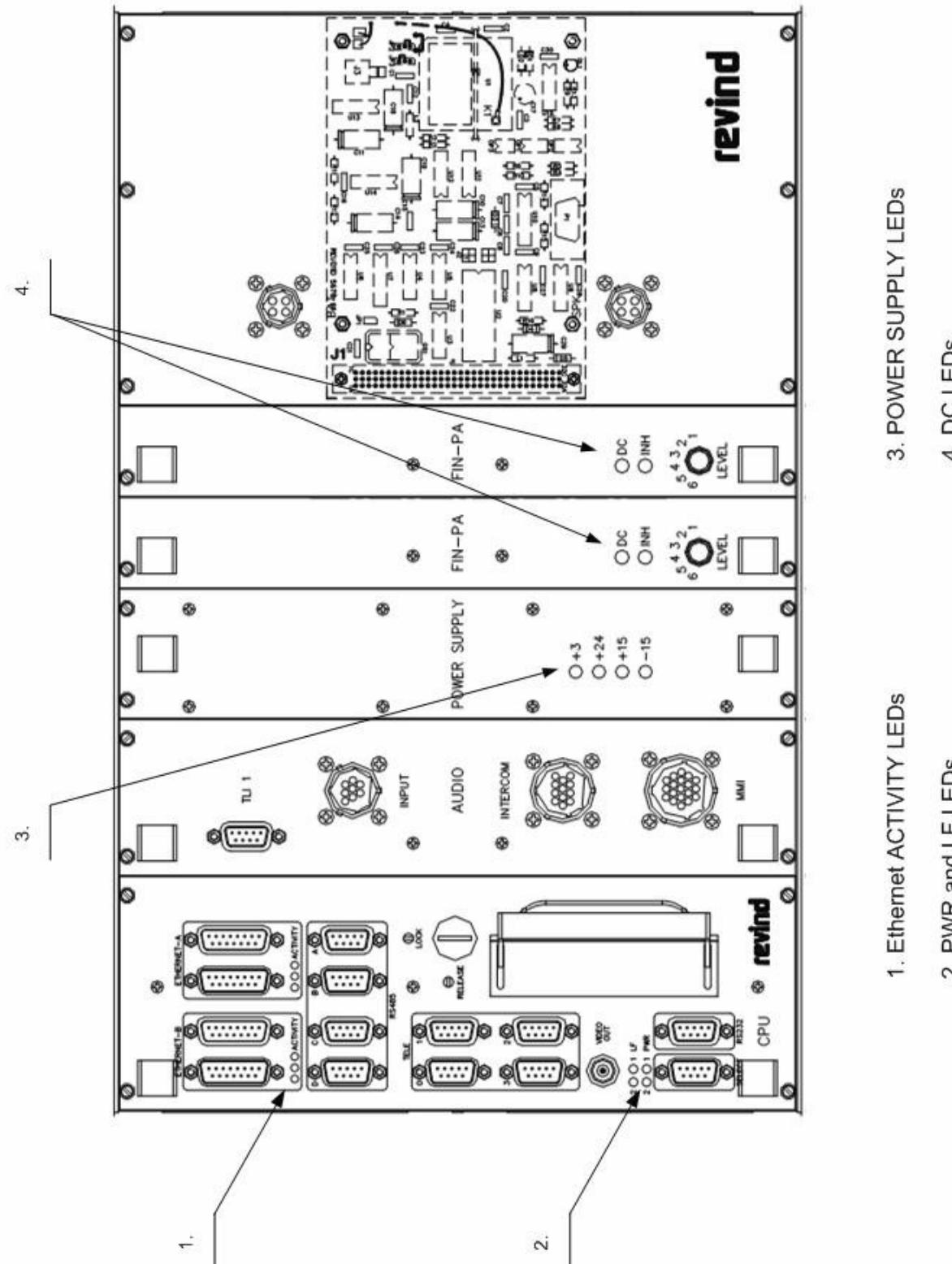


Figure 14-II-02-1 CCU Rack

14-II-02.02 Troubleshooting with the IDU

The Communication System is not directly connected to the LON (Local Operative Network) or the TCN (Train Communication Network).

The CCU is connected to the MVB bus through the relevant TCU (Traction Control Unit, Propulsion System) which works as an interface between the Communication System and the Network.

Each CCU sends the Signal Dataset (refer to Table 14-II-02.1) to the MVB (through the TCU). Thanks to this Dataset, all the IDUs can show the Communication System Status and, eventually, the Communication System faults.

Table 14-II-02.1 Communication System MVB Dataset

byte	bit	Signal	Scale	Description
0		DevConn		Devices connection status
0	0	IntPnl1Conn		Internal alphanumerical panel #1 connected
0	1	IntPnl2Conn		Internal alphanumerical panel #2 connected
0	2	SidePnlConn		Side alphanumerical panel connected
0	3	FrontPnlConn		Front alphanumerical panel connected
0	4	AADSConn		AADS console connected
0	5	CCHConn		CCH console connect
0	6	Cam1Conn		Camera #1 connected
0	7	Cam2Conn		Camera #2 connected
1	0	Cam3Conn		Camera #3 connected
1	1	PIC0Conn		PIC #0 connected
1	2	PIC1Conn		PIC #1 connected
1	3			
1	4			
1	5			
1	6			
1	7	RS485Conn		Communication Control unit connected (RS485)
2		DevActive		Devices active status
2	0	IntPnl1Active		Internal alphanumerical panel #1 is active
2	1	IntPnl2Active		Internal alphanumerical panel #2 is active
2	2	SidePnlActive		Side alphanumerical panel is active
2	3	FrontPnlActive		Front alphanumerical panel is active
2	4	AADSActive		AADS console is active

Table 14-II-02.1 Communication System MVB Dataset

byte	bit	Signal	Scale	Description
2	5	CCHActive		CCH console is active
2	6	Cam1Active		Camera #1 is active
2	7	Cam2Active		Camera #2 is active
3	0	Cam3Active		Camera #3 is active
3	1	HDAactive		Hard disk is active
3	2	PA1Active		P.A. amplifier #1 is active
3	3	PA2Active		P.A. amplifier #2 is active
3	4	ETH1Active		Ethernet bus #1 is active
3	5	ETH2Active		Ethernet bus #2 is active
3	6			Spare
3	7			Spare
4		HDUsed	0x00 = "<70%" 0x10 = "70 to 89%" 0x20 = "90 to 99%" 0x30 = "FULL"	Hard Disk Used space
5		FlashUsed	0x00 = "<70%" 0x10 = "70 to 89%" 0x20 = "90 to 99%" 0x30 = "FULL"	Flash Memory Used space
6		COMMajornumber		Software Release Number
7		COMMajornumber		Software Release Number
8		COMAlphaCode	1-26 = A-Z	Software Release Number
9		PICStatus		Status of two PICs connected to the CCU
9	0	PICASstatus		Status of Car A PIC communication \$00= PIC #0 e PIC#1 IDLE \$40= PIC #0 REQUEST \$c0= PIC #1 REQUEST \$41=PIC#0 IN PROGRESS \$c1=PIC#1 IN PROGRESS
16		X coordinate		GPS actual position
20		Y coordinate		GPS actual position
24		Z coordinate		GPS actual position
30		Life		Life Signal
31	6	Chk		Dataset is valid (1= Valid; 0,2,3 = Not Valid)

14-II-02.02.01 Communication System Status Screen

The Communication System Status Screen of the IDU shows the status of the Communication System in each car section of the train consist.

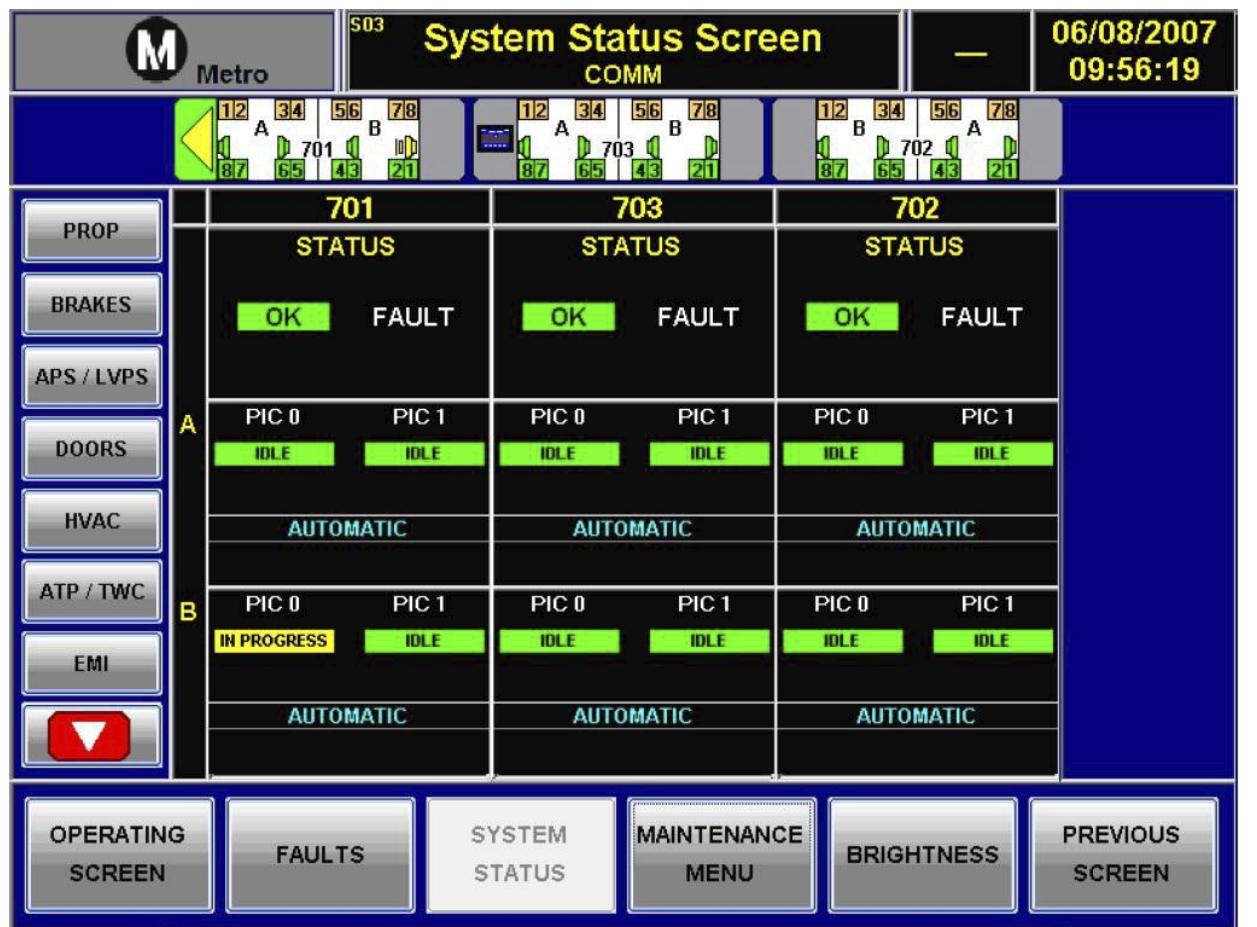


Figure 14-II-02-2 Communication System Status Screen (Operating Mode)

In Operating Mode (refer to Figure 14-II-02-2) the IDU shows:

- The Vehicle Communication System status
- OK;
- FAULT.
- The A and B Body Section PIC Status:
 - IDLE (green);
 - REQUEST (flashing green);
 - IN PROGRESS (Yellow).

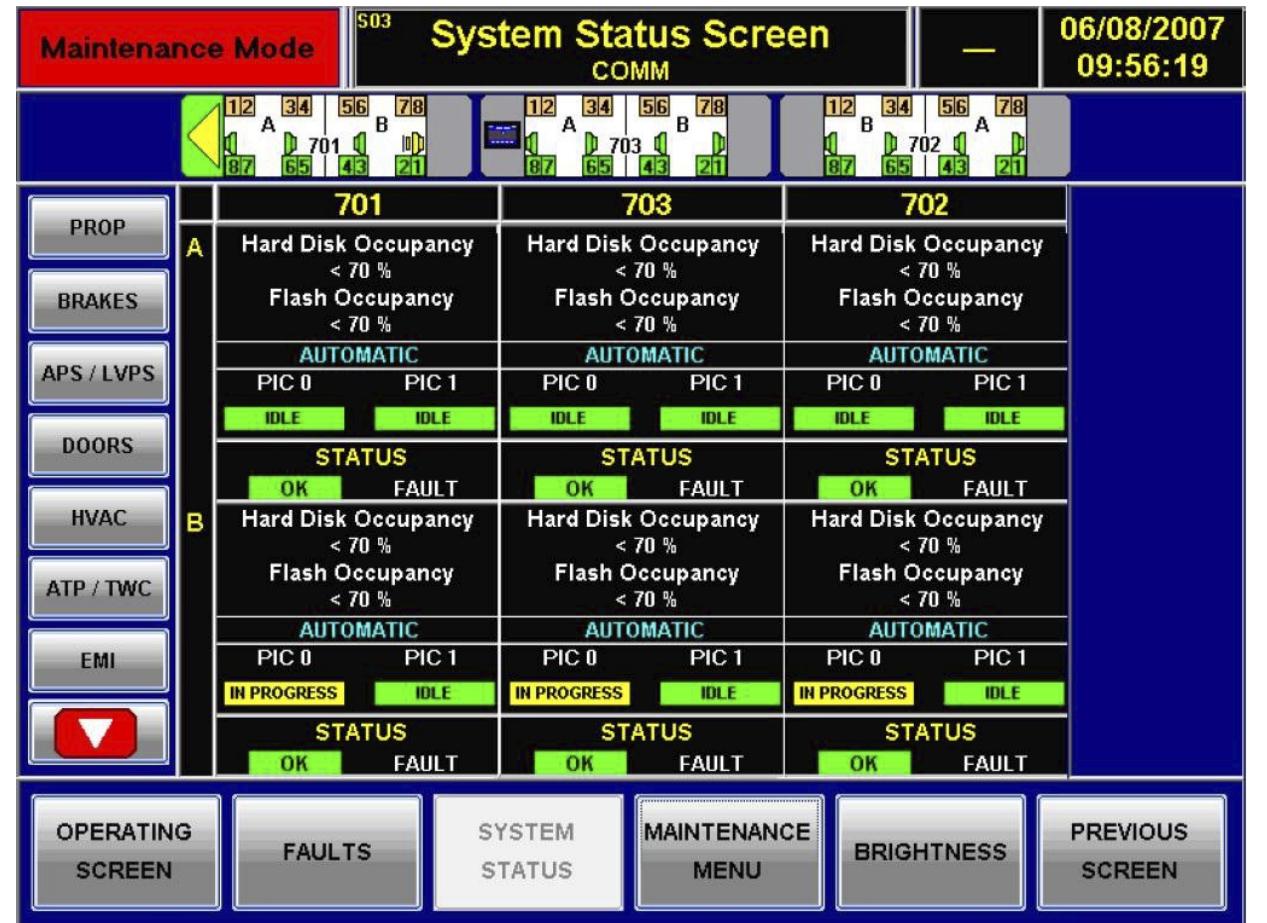


Figure 14-II-02-3 Communication System Status Screen (Maintenance Mode)

In Maintenance Mode (refer to Figure 14-II-02-3) the Communication System Status Screen shows the status of the system for each Body Section and, like in Operating Mode, the four PIC status of the vehicle.

This Screen shows also the Communication System Hard Disk Memory and Flash Memory Status. It can be:

- < 70%;
- 70%
- 90%
- 100% (red)
- Undefined (--)

14-II-02.02.02 IDU Fault List

By touching the “Faults” button, on the navigation bar, the “Faults” Screen pops up with the list of active faults in the Train System, with date and time of the occurrence. Through this screen the Maintenance personnel can detect a fault as soon as it occurs.

As soon as a fault occurs (fault “activated” - red characters), the Train Control and Monitoring System (TCMS - refer to Section 18) saves the “image” of the fault in a file of the “A” IDU memory (the B IDU has no memory) named “LogFile.dat”.

The system saves an image of the activated fault every 100 ms from 1 s before and 5 s after the activation.

The system saves a sample of the deactivated faults (green characters) once and with the information available at the time of the memorization.

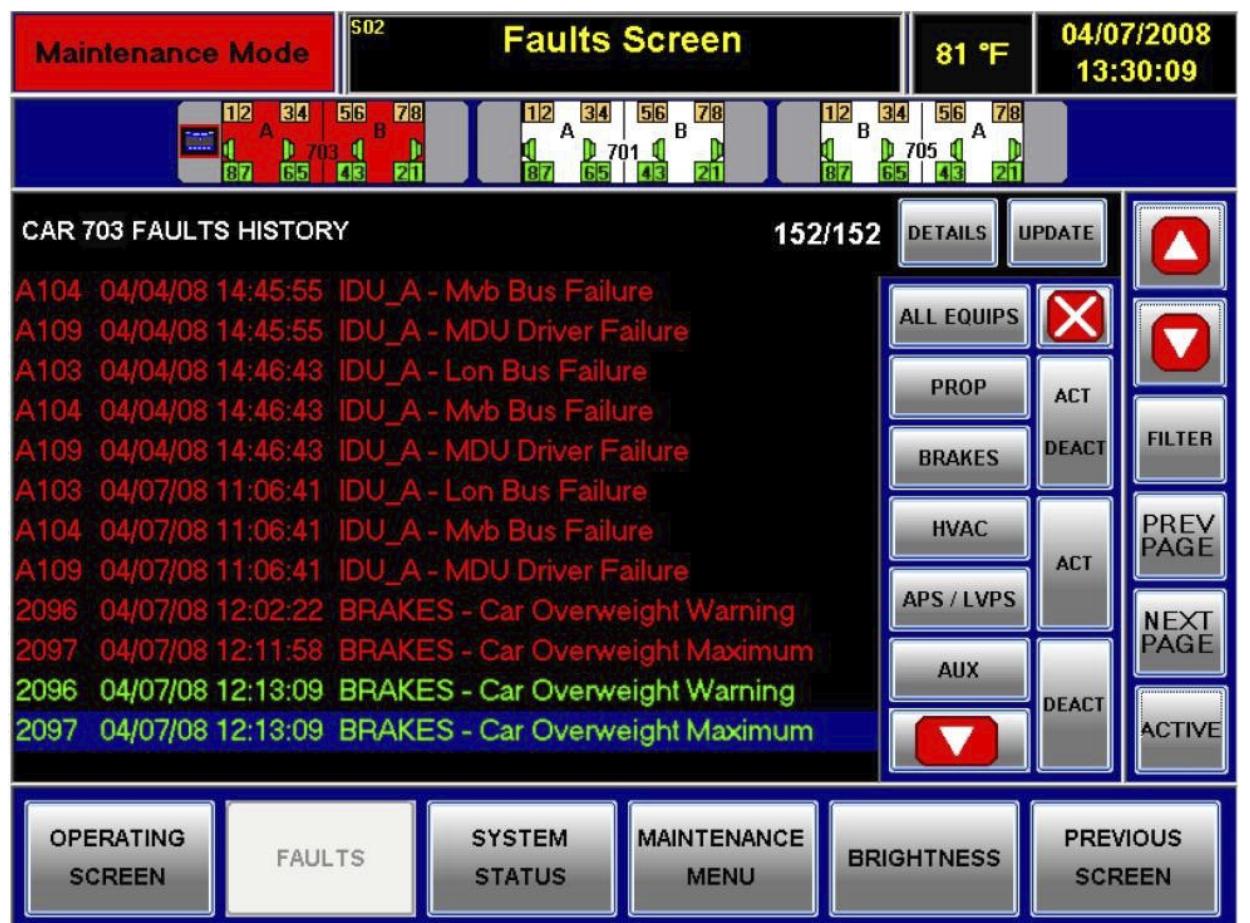


Figure 14-II-02-4 IDU Faults Screen

The “Complete Communication System IDU Fault List” refer to paragraph describes how to troubleshoot the Communication System using the IDU, both in Normal and in Maintenance Mode, for each fault type.

The suggested Maintenance Actions (troubleshooting procedures) are shown by pressing the “Details” Screen Button and are referred to the selected Fault shown on the IDU “Faults Screen”.

The Fault List can also be filtered by means of the system button (in this case, the COMM button).

14-II-02.03 Troubleshooting with the Portable Test Unit (PTU)

14-II-02.03.01 PTU Programs for the Communication System

The software programs that can be used with the PTU while connected to the Communications System are listed below:

- **Public Net Safe:** Public Net Safe (PNS) is the application used to view real-time images from the cameras installed on board of MTA vehicles, examine archive video recordings and modify settings of video recording software in order to allow proper reaction to alarm events.
- **Flip.exe:** Flip program is used to upload firmware to SIGNS, AADS and CCH.
- **Naming.exe:** Naming program manages the:
 - CCU IP address recognition;
 - CCU reset;
 - Main program upload to CCU;
 - Configuration file minor changes;
 - System log examination;
 - Manual Real Time Clock settings.
 - Log Messages for troubleshooting software bugs.
- **Slim.exe:** the Station and Lines Interactive Management program manages:
 - Lines;
 - Routes;
 - Stations;
 - Service messages, sequences of messages.
- **FTPExplorer:** FTP Explorer allows copying files to CCU (Flash Memory and Hard Disk), as well as deleting existing files and reading their content. It is used for Mass file transfer (audio and trip database,INI files).

Document “MN710-05” describes the “Public Net Safe” program.

Document “CL710-18” describes the “Flip”, “Naming” and “FTPExplorer” programs.

TestRackPC: the application TestRackPC has been developed for the Los Angeles PIS system to give maintenance crew and software developers a powerful monitoring and diagnostic instrument. Through it, several real-time information about the system can be displayed:

- CCU board serial number, CCU board ID, Software release, Ethernet role, current date and time of RTC, percentage of disk occupation (normal events and emergency);
- Status of many signals from field: cab key, coupling, speed, doors, emergency, Passenger Intercom devices etc;
- CCH settings and software release;
- Status of all devices connected to the CCU: displays, AADS, CCH, cameras, Hard Disk, audio amplifiers, Ethernet ports;
- Status (open/closed) of all relays controlling the flow of audio signals on the intercom and Public Address lines, or via Ethernet transmission;
- Logical status of audio system (Intercom and/or Public address activities in progress, automatic announcements in progress etc.);
- System faults (e.g.: Hard Disk safety key open);
- Train coupling: convoy configuration.

Document "MN710-03" describes the "TestRackPC" program.

14-II-02.04 Fault Isolation / Repair Tables

This paragraph lists the Communication System Fault Insulation/Repair Tables.

For Troubleshooting, these Tables must be used with a PTU. The PTU needed software is the following:

- Naming;
- TestRackPC;
- FTP Explorer;
- DebugConsole;
- SLIM.exe.

Fault: One or more devices do not switch up

Check 1: Cab switch panel

What can be observed	Possible causes	Actions
1. No LEDs (if any) or displays of the device are lit up.	1. Switches 13F01 (CCH, CCU, cameras), 13F02 (AADS and Radio), 13F03 (destination signs).	1. Turn switches ON. If problem persists, there could be problems in train 24V supply before the cab switch panel

Fault: **PIS does not work at all in one body. No PA, PIC or cab-to-cab activity take place from that body. PA or cab-to-cab started from the other body do not affect this one.**

Check 1: CCU LEDs, rack LEDs

What can be observed	Possible causes	Actions
1. All LEDs off	1. Rack connector "BAT" not properly set	1. Measure Vdc on the connector, Check wires and pins. Check cab main switches.
2. Some LED off on POWER SUPPLY panel	1. Rack board "POWER SUPPLY" faulty 2. If nothing changes, replace the power supply. 3. If problem remains, the electrical bus of the rack could be faulty. Replace the whole rack.	1. Extract one at a time each board from the rack. If extracting one board LEDs of POWER SUPPLY go green, replace the board.
3. CCU LED's "PWR" #1 or #2 are off	1. Faulty CCU or rack bus. 2. Power supply fault not detected by power supply LEDs	1. Replace CCU. 1. If problem remains, replace the power supply. 2. If not OK, replace the whole rack.
4. CCU LED "LF" is lit	1. Faulty CCU	1. Replace the CCU

If all CCUs and rack LEDs seem OK, the CCU might have failed the boot sequence or have a wrong program installed.

Check 2: CCU IP address and SW version by means of program Naming.exe

What can be observed	Possible causes	Actions
1. Nming.exe reads IP address = 0.0.0.0	1. LINKER cable still connected to "RS232" connector on CCU panel, with cable boot switch closed	1. Open cable switch or remove the cable from RS232 connector. Reboot the rack, e.g. unplugging "BAT" power connector for some seconds. Reconnect the "BAT" plug and wait for a couple of minutes. Refresh the reading of Naming.exe by means of button "Search all devices UDP broadcast". If IP address is still 0.0.0.0, replace CCU
1. IP address different from: 0.0.0.0 192.168.0.19 192.168.0.22	1. Wrong .tsk problem loaded or wrong hardware ID key connected to "SELECT" CCU front panel connector	1. Check the current CCU program version by means of program TestRackPC.exe. 2. Load the correct release of .tsk file by means of program Naming.exe 3. Check the ID key in accordance with electrical schemas and train body.

Fault: **PIS works fine in one body, but only when activities like PA, announcements, passenger intercom etc. are started from the same body.**

Activities started in the other half of the vehicle seem not to affect this body (e.g.: announcements are heard in the other half of the vehicle, not in this one)

Check 1: Ethernet connections between the two CCUs of the same vehicle.

Check 2: Software version stored in the CCU

What can be observed	Possible causes	Actions
1. The LEDs labeled "ACTIVITY" below the two ports of the CCU panel labeled "ETHERNET-A" and "ETHERNET-B" are either off or steady, or however they don't blink at the expected rate (about 5 blinks per second)	1. Ethernet cables not properly connected on one side. 2. Ethernet cables exchanged or connected to the wrong ETHERNET-x port	1. Check cables in accordance to schemas. Check cable integrity and connection.
2. Program TestRackPC shows intermittent malfunctioning of one or both Ethernet lines (from form "CCU Status Display", tab "Device Status", indicators "ETHERNET-A" and / or "ETHERNET-B")	1. Older hardware version of CCU board.	1. Extract CCU from the rack, and check the type of the connector of the hard disk. Documentation pictures show the difference between old-style and correct HD connectors.
3. None of the above	1. CCU software release could differ (Check by means of program TestRackPC, form "CCU Status Display", tab "Board properties", field "CCU software release")	1. Upload correct software by means of program Naming.exe

Fault: **PIS doesn't react at all to activities started on another coupled vehicle (e.g.: announcements are heard in the other vehicle, not in this one). When the other vehicles begin a P.A. activity, no green LEDs on FIN-PA boards of the PIS rack switch on, no relays produces a 'click' sound.**

PIS, however, is working fine in the considered vehicle.

Check 1: Is PIS aware of the presence of a vehicle connected? Run program TestRackPC, making sure the PTU is connected to RS232 port by means of the LINKER cable.

What can be observed	Possible causes	Actions
1. In TestRackPC form "CCU Status Display", tab "Field Signals", the indicator "COUP SWITCH" is red, with the right label stating "NO VEHICLES COUPLED"	1. Train coupling mechanism doesn't transmit to PIS digital input the signal of vehicles coupled.	1. Check with train wiring schematics the coupler and all related cables .
	2. "INPUT" connector on the "AUDIO" board of the CCU rack non properly connected, or cable problems	1. Check connector, pins, cable
2. The indicator "COUP SWITCH" is green, with the right label stating that a vehicle is coupled to that side, but the problem remains. From TestRackPC, form "CCU Status Display", tab "Train info", no vehicles appear to be coupled to this CCU	1. The RS485 cable connected to RS485 "B" port on the CCU board front panel doesn't ensure electrical continuity between the two coupled vehicles	1. Check RS485 connections and all the wiring between the two RS485 "B" ports of the adjacent coupled vehicles.

Fault: **PIS seem to react somehow to activities started from a coupled vehicle (e.g.: when beginning a P.A. activity on the other vehicle, FINPA power amplifiers green LEDs switch on), but no sound is heard through the speakers.**

PIS, however, is working fine in the considered vehicle.

Check 1: Transit of analog audio signals between the two coupled vehicles.

What can be observed	Possible causes	Actions
1. No audio received, but FIN-PA LEDs are ON and relays click. From TestRackPC, form "CCU Status Display", tab "Train info", a vehicle appears to be coupled to current CCU	1. Cable between the two "TLI 1" ports of the current CCU and the same port of the corresponding coupled CCU on the other vehicle may be faulty, or connected to the wrong port	1. Check the cable, connector pins, source and destination port

Fault: **AADS keeps displaying the startup message “Waiting conn / My ID 05” or seems frozen after a period of regular activity**

Check 1: Status of the RS485 “D” serial line which connects the CCU to AADS, CCH, signs. Run program TestRackPC and go to “CCU Status Display” form, “Device Status” tab, or Check errors reported by IDU.

What can be observed	Possible causes	Actions
1. One or more of the following peripherals: Internal Panel #1, Internal Panel #2, Side Panel, Front Panel, AADS, CCH have status reported as faulty (red square with horizontal black line)	1. RS485 “D” connector misplaced, serial cable short-circuited / broken	1. Check cable continuity, connector status, pins.
	2. One faulty peripheral prevents correct signal traffic on RS485 line.	1. Disconnect, one at a time, the peripherals most distant from the CCU (AADS, CCH), and Check each time if the status of other peripherals has changed. In case, replace the device

Check 2: Is program on CCU running correctly? CCU could have restarted because of a software bug. Run program FTP Explorer and connect to the CCU Hard Disk

What can be observed	Possible causes	Actions
1. Log files recorded have date and time which are part of the file name that prove a restart of the CCU after the expected system boot time	1. Software bugs	1. Read content of log files. Report to developers.

Fault: **One or more signs don't display trip or service messages info as Expected.**

Check 1: Status of the RS485 “D” serial line which connects the CCU to AADS, CCH, signs. Run program TestRackPC and go to “CCU Status Display” form, “Device Status” tab, or Check errors reported by IDU.

What can be observed	Possible causes	Actions
1. One or more of the following peripherals: Internal Panel #1, Internal Panel #2, Side Panel, Front Panel, AADS, CCH have status reported as faulty (red square with horizontal black line)	1. RS485 “D” connector misplaced, serial cable short-circuited / broken	1. Check cable continuity, connector status, pins.
	2. One faulty peripheral prevents correct signal traffic on RS485 line.	1. Disconnect, one at a time, the peripherals most distant from the CCU (AADS, CCH), and Check each time if the status of other peripherals has changed. In case, replace the device

Fault: No activity when operator presses the PTT button to make a PA or a cab-to-cab call.

Check 1: Correct settings for PA or CCI of CCH switches.

Check 2: Devices status. Run program TestRackPC, and go to "CCU Status Display" form, "Device Status" tab, or Check errors reported by IDU.

What can be observed	Possible causes	Actions
1. One or more of the following peripherals: Internal Panel #1, Internal Panel #2, Side Panel, Front Panel, AADS, CCH have status reported as faulty (red square with horizontal black line)	1. RS485 "D" connector misplaced, serial cable short-circuited / broken	1. Check cable continuity, connector status, pins.
	1. One faulty peripheral prevents correct signal traffic on RS485 line.	1. Disconnect, one at a time, the peripherals most distant from the CCU (AADS, CCH), and check each time if the status of other peripherals has changed. In case, replace the device

Check 3: CCH status, PTT connections, microphone, FIN-PA, speakers.

What can be observed	Possible causes	Actions
1. CCH is the only device which appears as faulty from TestRackPC program	1. CCH connector misplaced	1. Check connector, pins, cable
2. CCH is reported as OK, but the problem remains	1. Microphone not working or connector misplaced.	1. Check connector, cable. Replace microphone
3. CCH is OK, FIN-PA LEDs don't switch on when PTT is pressed	1. One FIN-PA is KO	1. Change settings of "SPEAKER" knob of CCH. Swap FIN-PAs. Replace FIN-PA in case.
4. CCH is OK, FIN-PA LEDs switch on, no sound through the speakers	1. "SPK" connector on CCU rack rightmost panel misplaced. Audio line to speakers faulty. Short circuit on audio speaker line	1. Check connector, pins, wires. Replace if necessary. Check speaker line for short-circuit points. Try disconnecting one speaker at a time.
	2. Audio amplifier faulty	1. Replace

Fault: PA announcements too loud, with significant high-pitch audio distortion.

Check 1: CCH hardware revision. Can be detected by revision number printed on the label. Current version is “Rev.5”, printed near the “DA710-13” item code. If revision number is older, replace CCH.

Check 2: If CCH revision is OK, try first connecting a new microphone. If problem remains, replace CCH.

Fault: During PA announcements, a rhythmic “tic-tic-tic” sound (about 2-3 “ticks” per second) may be heard in the speakers.

Check 1: CCH hardware revision. Can be detected by revision number printed on the label. Current version is “Rev.5”, printed near the “DA710-13” item code. If revision number is older, replace CCH.

Check 2: Older electrical schemas reported pin #8 of train connector inserted into RS485-D port of CCU panel.
The pin must not be connected. Check and, in case, remove the wire.

Check 3: If CCH revision is OK, replace the microphone.

Fault: PA or trip / service messages too low.

Check 1: Settings of amplifiers, speakers

What can be observed	Possible causes	Actions
1. Low volume concerns only PA announcements, not trip and service messages which are played at a convenient volume.	1. CCH not corresponding to latest hardware version. Can be detected by revision number printed on the label. Current version is "Rev.5", printed near the "DA710-13" item code. If revision number is older, replace CCH	1. If CCH revision is OK, try replacing CCH and microphone.
	2. Faulty microphone	1. Check also microphone connector, wiring etc.
2. Low volume concerns both PA and trip / service messages, but only for all external or all internal speakers of that train body.	1. Wrong setting of volume knob on FIN-PA power audio amplifier in the CCU rack	1. Set as appropriate
	2. Defective FIN-PA	1. Swap the two FIN-PAs or replace the FIN-PA corresponding to the internal or external speaker line, as appropriate
	3. Short circuit on the speakers audio line	1. Check the electrical connections and remove the short circuit. It can be useful to disconnect one speaker at a time and check if volume increases
3. Low volume concerns only some speakers, either internal or external	1. Wrong settings of speakers power selector.	1. Internal speakers have a "fast-on" connector which can be set to different levels of power. Set to the maximum (2 W) 2. External speakers have different color wires - check if properly selected
	2. Mechanical mounting wrong	1. Space between cone surface and output grid can be obstructed. Remove unwanted material. 2. Speaker can be misaligned with mounting hole - realign.

Fault: Output volume of cab speaker is too low

- Check 1: CCH volume knob.
- Check 2: Cab speaker must be a model without impedance transformer. Replace with the correct type.
- Check 3: If problem persists, check wirings, connectors etc. It may be necessary to replace the CCH.

Fault: Part of trip announcements messages is missing (e.g.: "The next stop is", then the name of the station is not played)

- Check 1: Presence of all required audio files in the Hard Disk database. Run FTP Explorer, making sure the PC is connected to the ETHERNET-B port by means of the Ethernet cable (see manual of Firmware Upload for cables schema), and compare content of the /Audio/Generic, /Audio/Service, /Audio/Stations folders with the same ones from the installation CD.
- Check 2: Drag and drop missing files from installation CD to destination directory.

Fault: Diagnostic program TestRackPC doesn't communicate with CCU or doesn't seem to work correctly.

- Check 1: LINKER cable, CCU functioning

What can be observed	Possible causes	Actions
1. The error counters visible from all tabs of "CCU Status Display" form show all "No-answer" responses	1. LINKER cable between PC serial port and CCU panel "RS232" connector misplaced or faulty	1. Check pins, cable, connector
	2. CCU previously restarted with LINKER cable inserted and switch on LINKER cable closed	1. Check by means of program Naming.exe if CPU has IP address = 0.0.0.0 If so, CPU has restarted in "boot mode" and doesn't answer polling from TestRackPC. Remove the LINKER cable or open the LINKER switch and restart the CCU by means of program Naming.exe
2. Some fields contain completely meaningless values or no values at all.	1. TestRackPC version wrong	1. Check version, must be 2.2 or greater. Install a more recent version if required.

Fault: Incorrect working of program PublicNetSafe (camera direct view, archive, alarm events)

Check 1: IP configuration, program settings

What can be observed	Possible causes	Actions
1. Program doesn't connect to cameras	1. Local IP Address not correctly set (see manual of Public Net Safe)	1. From PNS main menu select Tools à Options à Local IP Address and select the correct setting (e.g.: 192.168.0.123)
	2. PC net address not properly set	1. Set the PTU net address to fixed IP = 192.168.0.123, subnet mask = 255.255.255.0
2. During direct view from cameras, selecting different cameras from the treeview program results in a fault condition messages (a red dot symbol with "X" superimposed near to the camera symbol)	1. Temporary fault of connection between PTU and cameras. Doesn't affect recordings.	1. Select another camera, then return to the previous one. Vision now must be possible.
3. During direct view from cameras, a pop-up fault message appears superimposed to pictures. Right-click with the mouse on the area where images from the camera are displayed.	1. Overtemperature alarm threshold may be incorrect in .INI files	1. By means of program FTP Explorer, delete all existing files from CCU Flash Memory and replace them with the set included in PIS installation CD (see manual CL710-18.doc, FIRMWARE UPLOAD). Restart the CCU
4. Examining archives, recordings are not found in the time period expected	1. Wrong settings of Real Time Clock date and time with GPS present. This can be a software bug concerning wrong time zone detection or summer time computation.	1. By means of program TestRackPC check the reported Real Time Clock date and time (form "CCU Status Display", tab "Board Properties", field "Real Time Clock". If wrong, go to GPS section.)
	2. Wrong settings of Real Time Clock with GPS not present.	1. Set correct date and time by means of program Naming.exe
5. When an alarm condition is triggered (e.g.: an Intercom emergency call), archives don't show the dot identifying the event even if standard recordings are present	1. User is trying to examine events immediately after they happened. It takes the CCU about a couple of minutes to properly show marked events	1. Allow CCU time to record events

What can be observed	Possible causes	Actions
5. When an alarm condition is triggered (e.g.: an Intercom emergency call), archives don't show the dot identifying the event even if standard recordings are present(cont'd)	2. Some settings in the PNS initialization files are wrong	<p>2. By means of program FTP Explorer, delete all existing files from CCU Flash Memory and replace them with the set included in PIS installation CD (see manual CL710-18.doc, FIRMWARE UPLOAD). Restart the CCU. After restart, reload events (see manual MN710-05.doc, "Event definition - quick procedure")</p>
6. Direct view shows high-speed recording in progress without apparent reasons (no alarm events happened)	1. Wrong settings in initialization files	<p>1. By means of program FTP Explorer, delete all existing files from CCU Flash Memory and replace them with the set included in PIS installation CD (see manual CL710-18.doc, FIRMWARE UPLOAD). Restart the CCU. After restart, N710-05.doc, "Event definition - quick procedure"</p>
	2. An event actually happened, and system settings of recording high speed duration in file REV_CCU.ini ("AlarmFullSpeedDuration") don't allow speed reduction yet.	<p>1. By means of program FTP Explorer connect to CCU Hard Disk, directory "/Session_logs", select the most recent log file and open with right mouse button → Open. 2. Check if an event occurred in a time range consistent with the fact that high-speed recording is active.</p>
7. One or more cameras show a black image instead of the expected one	1. Connector(s) on CCU front panel ("TELE 0", "TELE 1", "TELE 2") misplaced	<p>1. Check position. 2. Check also pins and cable for possible short-circuits</p>
	2. Faulty camera	<p>1. Check, by means of program TestRackPC, form "CCU Status Display", tab "Device Status" the reported status of "TELE 0", "TELE 1", "TELE 2". 2. If faulty, check connectors (CCU side, camera side), pins, cables and, in case, replace the camera.</p>
	3. Wrong pin in train connector to CCU front panel ("TELE 0", "TELE 1", "TELE 2") - older schemas showed pin #7 connected to V_OUT camera wire, were corrected to pin #6	<p>1. Move the incorrect pin</p>

What can be observed	Possible causes	Actions
8. When PTU is connected to CCUs of different vehicles, in different time instants, Public Net Safe works fine in the first vehicle, but connection to cameras is refused in other vehicles	1. Even if the correct IP address of CCUs is the same (192.168.0.19, 192.168.0.22) for all vehicles, physical devices differ. This can prevent Public Net Safe from connecting.	1. Doubleclick the small icon on the bottom right part of the screen (application bar). The window that appears has two tabs, "General" and "Support". Select "Support" and click the "Restore" button. When operations are completed, try again camera selection from PNS

Fault: Incorrect working of programs which use Ethernet connection (from PC LAN port to ETHERNET-B connector of CCU panel, programs Naming.exe, DebugConsole, PublicNetSafe, FTP Explorer)

Check 1: Cable, PTU settings, CCU working, Firewall

What can be observed	Possible causes	Actions
1. Programs can't establish a connection and issue timeout error messages	1. PTU has incorrect IP settings	1. Set PTU IP address to fixed value 192.168.0.123, subnet mask 255.255.255.0
	2. Ethernet cable misplaced or defective	1. Check that Ethernet PTU cable is connected between PTU LAN port and port ETHERNET-B on CCU front panel. 2. Make sure cable is built according to schematics (see CL710-18.doc, ANNEX I - Cable schemas, paragraph "ETHERNET - RJ45 to DA15")
	3. CCU has wrong IP address due to wrong hardware ID key. Correct IP addresses are: for body A, 192.168.0.19 for body B, 192.168.0.22	1. Check in accordance with schematics that hardware ID key connected to "SELECT" port on CCU front panel is correct.
	4. CCU has wrong IP address because it has a wrong program on board	1. By means of program Naming.exe, Check the "Description" field. It must not contain any value which suggests test program version. Normally it contains a string like "FVS-2 SecurCam Ver.3.32-00-MTA" (can vary with versions > 3.3)

What can be observed	Possible causes	Actions
1. Programs can't establish a connection and issue timeout error messages (cont'd)	5. CCU has wrong IP address because of wrong .INI files in flash memory	<p>1. Follow steps described in CL710-18.doc, paragraph "UPLOADING FILES TO THE CCU", subparagraph "FIRST TIME ACTIVITY ON A NEW CCU: MINIMAL CONFIGURATION OF .INI FILES", to create a minimal system configuration that allows uploading of .INI files.</p> <p>2. Restart the CCU and, by means of program FTP Explorer.exe, upload all .INI files contained in installation CD, path="\Files to be uploaded to CCU\INI files and video settings", to the CCU Flash Memory</p>
	6. CCU has wrong IP address = 0.0.0.0 due to LINKER cable still connected to "RS232" connector on CCU panel, with cable boot switch closed	<p>1. Open cable switch or remove the cable from RS232 connector. Reboot the rack, e.g. unplugging "BAT" power connector for some seconds. Reconnect the "BAT" plug and wait for a couple of minutes. Refresh the reading of Naming.exe by means of button "Search all devices UDP broadcast". If IP address is still 0.0.0.0, replace CCU</p>
	7. (only for program Public Net Safe): Local IP Address not correctly set (see manual of Public Net Safe)	<p>1. From PNS main menu select Tools à Options à Local IP Address and select the correct setting (e.g.: 192.168.0.123)</p>
	8. Firewall settings prevent programs from connecting	<p>1. Try temporary disabling the firewall. If problem disappears, check that firewall settings allow, in the "Exceptions" area, programs:</p> <p>DebugConsole.exe FTP Explorer application Public Net Safe</p>

Fault: AADS displays an error message

Check 1: Hard Disk lock, correspondence between H.D and CCU

What can be observed	Possible causes	Actions
1. AADS display an error message of "DISK LOCK OPEN", while cab speaker plays a series of warning "DING" sounds.	1. Safety key of the Hard Disk of the CCU shown by AADS is open or, even if it seems to be close, the internal micro switch on the CCU main board is not correctly pressed by the lock key mechanism. This prevents video surveillance images from being recorded	1. Close the safety lock. If this is not enough, remove the CCU from the rack and check that the micro switch spline is correctly pressed when the key is turned fully clockwise. 2. Reboot CCUs
2. AADS display an error message of "DISK KO/MISSING", while cab speaker plays a series of warning "DING" sounds	1. The Hard Disk of the CCU displayed by AADS has been removed or is faulty. The rear connector of the Hard Disk or the flat cable to CCU board could be misplaced	1. Replace H.D. if missing. Check flat cable and connectors. 2. Reboot CCUs
3. AADS display an error message of "DISK TO FORMAT", while cab speaker plays a series of warning "DING" sounds	1. The Hard Disk originally contained in the CCU housing has been replaced by a different H.D. taken from another CCU. This is not allowed unless the new H.D. is formatted.	1. Replace the original Hard Disk or format the new one as described in the manual "FIRMWARE UPLOAD"

Fault: Radio doesn't switch on or doesn't transmit / receive correctly

Check 1: Power supply, antenna.

What can be observed	Possible causes	Actions
1. Radio doesn't switch on	1. Defective power supply, misplaced connectors, short-circuits, cab switch	1. Check power supply: LED "V_IN" shows if train voltage is present. If not, check cab switch 13F02. LEDs "V_IN" and "V_OUT" should be lit. 2. Disconnect the radio, to check if a fault in the radio creates a short circuit condition. If LEDs are OK, replace the radio, otherwise power supply is defective and must be replaced.
2. Radio doesn't receive / transmit correctly	1. Defective connection with antenna	1. Check cables and connectors. A test with a SWR-meter can help detecting excess of stationary waves.
3. Radio transmission can't be routed to CCU	1. Connection radio - CCH 1. System is not working properly	1. Check the cable that connects radio to CCH. 1. Refer to previous paragraphs for all symptoms of system faults.

Fault: Wrong GPS date and time information transmitted to train systems

Check 1: Time zone in .ini files

What can be observed	Possible causes	Actions
1. GPS is reported as ALIVE and field "Fix" displays "YES" in program TestRackPC.exe, form "CCU Status Display", tab "GPS", but CCU sends wrong date and time info to TCU and other train systems	1. Wrong time zone settings in initialization file REV_CCU.ini Edit by means of program Naming.exe, public net safe "TimeZone" should contain the difference between Greenwich prime meridian and L.A. meridian (-7)	1. Correct if different, save the file and restart CCU. 2. If the problem remains, it could be a software bug, contact developers.

Fault: When signs are switched on, instead of the start-up text (e.g.: REV. 00.23), a random series of pixels appears

Check 2: For some reasons, sign firmware could be corrupted. Try resetting the sign using the circuit breaker. If nothing changes, sign is defective and must be replaced.

Fault: GPS trip control not working, wrong trip announcements

Check 1: Data coming from GPS, by means of diagnostic program TestRackPC, form "CCU Status Display", tab "GPS".

What can be observed	Possible causes	Actions
1. GPS is reported as NOT ALIVE	1. Poor signal area, tunnels etc. In this case, the system relies on speed info transmitted by TCU. In the "GPS" screen, check "TCU data" panel, field "Status". If TCU is reported as DOWN, system management is completely manual through the AADS	1. Restore TCU.
	2. Same as above, but TCU is reported as UP	1. Check speed data transmitted by TCU from program TestRackPC against train actual speed. Check foreseen distance between stations by means of program SLIM.exe, in case correct data and re-create trip database files.
2. GPS is reported as ALIVE, but field "Fix" reports "NO"	1. Not enough satellites in sight, the GPS coordinates are not reliable. System relies on speed info transmitted by the TCU. Check TCU status. If TCU is reported as DOWN, system management is completely manual through the AADS	1. Restore TCU.
	2. Same as above, but TCU is reported as UP	1. Check speed data transmitted by TCU from program TestRackPC against train actual speed. 2. Check foreseen distance between stations by means of program SLIM.exe
3. GPS is reported as ALIVE, field "Fix" displays "YES"	1. Wrong coordinates of the different stations stored in the trip database.	1. Correct station coordinates (by means of program SLIM.exe). Actual coordinates may be detected run-time by means of TestRackPC, tab "GPS"

14-II-03 APPENDIX

14-II-03.01 IDU Fault List

14-II-03.01.01 Operating Mode

All faults related to the Communication System and monitored by the IDU, are listed in the IDU screen and described in the relevant Fault Charts.

The Operating Mode Fault Tables, listed below, include, for each fault, the relevant Operator Guide, which gives the Operator suggestions on how to overcome the fault.

The Operator Guide can be shown by touching the “Detail” button on the screen and is referred to the fault highlighted on the list.

Refer to Table 14-II-03.1 for Operating Mode Fault List.

Refer to Table 14-II-03.2 for Operating Mode Fault Details.

Refer to Table 14-II-03.4 for Operating Mode and Maintenance Mode Fault Relationship .

Table 14-II-03.1 Operating Mode Fault List

Code	Affected Subsystem	Description
7016	COMM	Panel Failure
7018	COMM	CCH console
7019	COMM	CameraFailure
7020	COMM	Hard Disk Failure
7021	COMM	Amplifier Failure
7022	COMM	Ethernet Bus Failure
7115	COMM_A	Power Supply Circuit Breaker Open
7215	COMM_B	Power Supply Circuit Breaker Open

Table 14-II-03.2 Operating Mode Fault Details

Fault #	Date	Time	Vehicle #	System	Description
7016	mm/dd/yy	hh:mm:ss	xxx	COMM	Panel Failure
Operator Guide Check train switches of signs power supply. Visual check of display and, where possible, cable connector.					

Fault #	Date	Time	Vehicle #	System	Description
7017	mm/dd/yy	hh:mm:ss	xxx	COMM	AADS console
Operator Guide Check train switches for power supply					

Fault #	Date	Time	Vehicle #	System	Description
7018	mm/dd/yy	hh:mm:ss	xxx	COMM	CCH console
Operator Guide None					

Fault #	Date	Time	Vehicle #	System	Description
7019	mm/dd/yy	hh:mm:ss	xxx	COMM	CameraFailure
Operator Guide Visual check of camera and connector					

Fault #	Date	Time	Vehicle #	System	Description
7020	mm/dd/yy	hh:mm:ss	xxx	COMM	Hard Disk Failure
Operator Guide Check on AADS which CCU is involved. Check closure. If disk is not missing, try restarting the system (reset involved CCU). To reset warning DINGs, press AADS key 0.					

Table 14-II-03.2 Operating Mode Fault Details (cont'd)

Fault #	Date	Time	Vehicle #	System	Description
7021	mm/dd/yy	hh:mm:ss	xxx	COMM	Amplifier Failure
Operator Guide Check board insertion.					

Fault #	Date	Time	Vehicle #	System	Description
7022	mm/dd/yy	hh:mm:ss	xxx	COMM	Ethernet Bus Failure
Operator Guide No intervention required					

Fault #	Date	Time	Vehicle #	System	Description
7115	mm/dd/yy	hh:mm:ss	xxx	COMM	Power Supply Circuit Breaker Open
7115	mm/dd/yy	hh:mm:ss	xxx	COMM	Power Supply Circuit Breaker Open
Operator Guide Check Power Supply circuit breaker 13F01 (Cab Panel Car A for COMM A - Cab Panel Car B for COMM B) and/or 13F02 (Cab Panel Car A for COMM A - Cab Panel Car B for COMM B) and/or Indicator Panels Power Supply circuit breaker (13F03 - Cab Panel Car A for COMM A - Cab Panel Car B for COMM B).					

14-II-03.01.02 Maintenance Mode

All faults related to the Communication System and monitored by the IDU in Maintenance Mode are listed in the following Fault Tables.

The Operator Guide pops up by touching the “Detail” button on the screen and is referred to the fault highlighted on the list.

Refer to Table 14-II-03.3 for Maintenance Mode Fault List.

Refer to Table 14-II-03.4 for Operating Mode and Maintenance Mode Fault Relationship.

Refer to Table 14-II-03.5 for Maintenance Mode Fault Details.

Table 14-II-03.3 Maintenance Mode Fault List

Code	Affected Subsystem	Description
7101	COMM_A	Internal panel #1 Failure
7102	COMM_A	Internal panel #2 Failure
7103	COMM_A	Side panel Failure
7104	COMM_A	Front panel Failure
7106	COMM_A	CCH console Failure
7107	COMM_A	Camera #0 Failure
7108	COMM_A	Camera #1 Failure
7109	COMM_A	Camera #2 Failure
7110	COMM_A	Hard Disk Failure
7111	COMM_A	P.A. amplifier #1 Failure
7112	COMM_A	P.A. amplifier #2 Failure
7113	COMM_A	Ethernet bus #1 Failure
7114	COMM_A	Ethernet bus #2 Failure
7115	COMM_A	Power Supply Circuit Breaker Open
7201	COMM_B	Internal panel #1 Failure
7202	COMM_B	Internal panel #2 Failure
7203	COMM_B	Side panel Failure
7204	COMM_B	Front panel Failure
7206	COMM_B	CCH console Failure
7207	COMM_B	Camera #0 Failure
7208	COMM_B	Camera #1 Failure
7209	COMM_B	Camera #2 Failure
7210	COMM_B	Hard Disk Failure
7211	COMM_B	P.A. amplifier #1 Failure

Table 14-II-03.3 Maintenance Mode Fault List (cont'd)

Code	Affected Subsystem	Description
7212	COMM_B	P.A. amplifier #2 Failure
7213	COMM_B	Ethernet bus #1 Failure
7214	COMM_B	Ethernet bus #2 Failure
7215	COMM_B	Power Supply Circuit Breaker Open

Table 14-II-03.4 Operating Mode and Maintenance Mode Fault Relationship

Operating Mode Fault Codes	Maintenance Mode Fault Codes							
7016	7101	7102	7103	7104	7201	7202	7203	7204
7018	7106	7206						
7019	7107	7108	7109	7207	7208	7209		
7020	7110	7210						
7021	7111	7112	7211	7212				
7022	7113	7114	7213	7214				
7115	7115							
7215	7215							

Table 14-II-03.5 Maintenance Mode Fault Details

Fault#	Date	Time	Vehicle#	System	Description
7101	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Internal panel #1 Failure
7201	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Internal panel #1 Failure

Operator Guide
Effect: Next station indications and text of service messages not displayed. Action: Deeper check of connector, cable, display. Try reloading firmware and/or resetting the sign using the circuit breaker. Replace display.

Fault#	Date	Time	Vehicle#	System	Description
7102	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Internal panel #2 Failure
7202	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Internal panel #2 Failure

Operator Guide
Effect: Next station indications and text of service messages not displayed. Action: Deeper check of connector, cable, display. Try reloading firmware and/or resetting the sign using the circuit breaker.. Replace display.

Fault#	Date	Time	Vehicle#	System	Description
7103	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Side panel Failure
7203	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Side panel Failure

Operator Guide
Effect: Destination not displayed. Service messages text (e.g.: OUT OF SERVICE) not displayed. Action: Deeper check of connector, cable, display. Try reloading firmware and/or resetting the sign using the circuit breaker. Replace display.

Fault#	Date	Time	Vehicle#	System	Description
7104	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Front panel Failure
7204	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Front panel Failure

Operator Guide
Effect: Destination not displayed. Service messages text (e.g.: OUT OF SERVICE) not displayed. Action: Deeper check of connector, cable, display. Try reloading firmware and/or resetting the sign using the circuit breaker. Replace display.

Fault#	Date	Time	Vehicle#	System	Description
7106	mm/dd/yy	hh:mm:ss	xxx	COMM_A	CCH console Failure
7206	mm/dd/yy	hh:mm:ss	xxx	COMM_B	CCH console Failure

Operator Guide
Effect: No audio communication from microphone (PA, Passenger Intercom, Cab-to-cab) or from radio. Action: Check cable, connector. Try reloading firmware. Try resetting the CCH by disconnecting it. Replace device.

Fault#	Date	Time	Vehicle#	System	Description
7107	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Camera #0 Failure
7207	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Camera #0 Failure

Operator Guide
Effect: No security recording possible. Action: Deeper check of connector, camera, cable. Try resetting the camera by disconnecting it. Replace device.

Fault#	Date	Time	Vehicle#	System	Description
7108	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Camera #1 Failure
7208	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Camera #1 Failure

Operator Guide
Effect: No security recording possible. Action: Deeper check of connector, camera, cable. Try resetting the camera by disconnecting it. Replace device.

Fault#	Date	Time	Vehicle#	System	Description
7109	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Camera #2 Failure
7209	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Camera #2 Failure

Operator Guide
Effect: No security recording possible. Action: Deeper check of connector, camera, cable. Try resetting the camera by disconnecting it. Replace device.

Fault#	Date	Time	Vehicle#	System	Description
7110	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Hard Disk Failure
7210	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Hard Disk Failure

Operator Guide
Effect: Safety key of the Hard Disk has been open, disk may be removed. Safety recordings not possible, system activity not possible. Action: If disk is present and doesn't seem damaged, remove CCU from rack and Check if the microswitch controlled by the lock key is working. Try formatting the Hard Disk before replacing a new one. Replace disk if missing or damaged. (WARNING: audio files, trip files etc. have to be reloaded).

Fault#	Date	Time	Vehicle#	System	Description
7111	mm/dd/yy	hh:mm:ss	xxx	COMM_A	P.A. amplifier #1 Failure
7211	mm/dd/yy	hh:mm:ss	xxx	COMM_B	P.A. amplifier #1 Failure

Operator Guide
Effect: No audio output on internal speakers. Action: Check board insertion. Replace boards

Fault#	Date	Time	Vehicle#	System	Description
7112	mm/dd/yy	hh:mm:ss	xxx	COMM_A	P.A. amplifier #2 Failure
7212	mm/dd/yy	hh:mm:ss	xxx	COMM_B	P.A. amplifier #2 Failure

Operator Guide
Effect: No audio output on external speakers. Action: Check board insertion. Replace boards

Fault#	Date	Time	Vehicle#	System	Description
7113	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Ethernet bus #1 Failure
7213	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Ethernet bus #1 Failure

Most of the time when this fault is present one of the CCU addresses is corrupted. Insert the following:
 Verify with the Naming SW that the CCU addresses are as follows;
 192.168.0.19 for the A - end CCU
 192.168.0.22 for the B - end CCU
 If not then reload .ini files to the affected CPU Flash Memory.

Operator Guide
 Check connector and cable. Replace CCU

Fault#	Date	Time	Vehicle#	System	Description
7114	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Ethernet bus #2 Failure
7214	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Ethernet bus #2 Failure

Most of the time when this fault is present one of the CCU addresses is corrupted. Insert the following:
 Verify with the Naming SW that the CCU addresses are as follows;
 192.168.0.19 for the A - end CCU
 192.168.0.22 for the B - end CCU
 If not then reload .ini files to the affected CPU Flash Memory.

Operator Guide
 Check connector and cable. Replace CCU

Fault#	Date	Time	Vehicle#	System	Description
7115	mm/dd/yy	hh:mm:ss	xxx	COMM_A	Power Supply Circuit Breaker Open
7215	mm/dd/yy	hh:mm:ss	xxx	COMM_B	Power Supply Circuit Breaker Open

Operator Guide
 Check Power Supply circuit breaker (13F01 - Cab Panel Car A for COMM A - Cab Panel Car B for COMM B) and/or Radio Transformer Power Supply circuit breaker (13F02 - Cab Panel Car A for COMM A - Cab Panel Car B for COMM B) and/or Indicator Panels Power Supply circuit breaker (13F03 - Cab Panel Car A for COMM A - Cab Panel Car B for COMM B).

LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

P2550



RUNNING MAINTENANCE
AND
SERVICE MANUAL

VOLUME M-01-I
PART III
MAINTENANCE
SECT 14 COMMUNICATIONS



SECTION 14

COMMUNICATIONS

PART III

MAINTENANCE

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SECTION 14

COMMUNICATIONS

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SECTION 14

COMMUNICATIONS

14-III-01 INTRODUCTION

The Communications Part III - Maintenance consists of:

- Preventive Maintenance
- Corrective Maintenance
- Consumable Materials
- Test Equipment & Special Tools

14-III-01.a List of Abbreviations, Acronyms & Symbols

The Abbreviations, Acronyms and Symbols commonly used throughout this Section are given below with their relevant meaning.

Abbreviation	Meaning
AADS	Automatic Announcement and Display System
AB	AnsaldoBreda
AC/DC	Alternate Current - Direct Current Converter
APS	Auxiliary Power Supply
ATP	Automatic Train Protection
ASSY	Assembly
BCU	Brake Control Unit
CB	Circuit Breaker
CCH	Communication Control Head
CCI	Cab to Cab Intercom
CCU	Communication Control Unit
CM	Coast Motoring
DC/AC	Direct Current - Alternate Current Converter
DC/DC	Direct Current - Direct Current Converter
EB	Emergency Brake
ECU	Electronic Control Unit (Brakes)
EDU	EMI Detector Unit
ELE	Electronic
EXT	Exterior
FSB	Full Service Brake
GPS	Global Positioning System
GTW	Gateway
H-CML	Heavy Consumable Material List
H-CMS	Heavy Corrective Maintenance Sheet
HRSB	High Rate Service Brake
HSCB	High Speed Circuit Breaker
HVAC	Heating Ventilation & Air Conditioning
HVDS	High Voltage Distribution System
HW	Hardware
ICS	Integrated Circuits
ID	Identification (number)
IDU	Integrated Diagnostic Unit
INT	Interior
KO	Out of Service
IPC	Illustrated Parts Catalog

(cont'd)

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Abbreviation	Meaning
LED	Light Emitting Diode
LH	Left Hand Side
LON	Local Operative Network
LRV	Light Railway Vehicle
LV	Low Voltage
LVDS	Low Voltage Distribution System
LVPD	Low Voltage Power Distribution
LVPS	Low Voltage Power Supply
M	Motoring
MBL	Metro Blue Line
MIC	Microphone
MTA	Metropolitan transportation Authority
MV	Medium Voltage
MVB	Multifunction Vehicle Bus
MVPD	Medium Voltage Power Distribution
OK	Working
PA	Public Announcement
PC	Printed Circuit
PGL	Pasadena Gold Line
PIC	Passenger Intercom
PIS	Passenger Information System
PTT	Push To Talk (Button)
PTU	Portable Test Unit
PS	Power Supply
PTU	Portable Test Unit
R-CML	Running Consumable Material List
R-CMS	Running Corrective Maintenance Sheet
RH	Right Hand Side
RMSM	Running Maintenance & Service Manual
ROC	Railway Operating Center
R-PMM	Running Preventive Maintenance Matrix
R-PMR	Running Preventive Maintenance Report
R-PMS	Running Preventive Maintenance Sheet
R-TESTL	Running Test Equipment & Special Tools List
SB	Service Brake
SCEB	Slide Controlled Emergency Brake
SCPM	Safety Critical Preventive Maintenance
SYS	System
SW	Software

(cont'd)

(cont'd)

Abbreviation	Meaning
TBD	To Be Defined
TBS	To Be Supplied
TCMS	Train Communication System
TCN.	Train Communication Network
TCU	Traction control Unit
TOC	Table Of Content
TTEM	Tools & Test Equipment Man
TWC	Train-to-Wayside Communicat
VAC	Voltage Alternate Current
VDC	Voltage Direct Current
WTB	Wired Train Bus
W/	With
W/O	Without
Δ/Y	Triangle - Star Transformer

14-III-01.b List of Definitions

The Definitions commonly used throughout this Section are given below with their relevant meaning.

Definition	Meaning
'A' body section	The section of an articulated vehicle containing the pantograph
'B' body section	The section of an articulated vehicle not containing the pantograph
AW0	Empty car operating weight
AW1	Full seated load plus AW0
AW2	Standees at 4 persons per square meter plus AW1
AW3	Standees at 6 persons per square meter plus AW1
AW4	Standees at 8 persons per square meter plus AW1
Front door	The door close to the Operator's Cab
Rear door	The door close to the Articulation Section
MC Handle	Master Controller Handle
"A" Cab (or Cab A)	Operator Cab in the A body section
"B" Cab (or Cab B)	Operator Cab in the B body section

14-III-01.c List of Measurement Units

The Measurement Units commonly used throughout this Section are given below with their relevant meaning.

Definition	Meaning
ft	Foot (Length)
gal	Gallon (Volume)
in	Inch (Length)
kg	Kilogram - approx 2.205 pounds (Weight)
km	Kilometer - approx 0.621 miles (Length)
lb	Pound (Weight)
lb-ft	Pound force (Force)
m	Meter - approx 3.28 feet (Length)
mm	Millimeter - approx 0.0394 inches (Length)
mph	Miles per hour (Velocity)
Km/h	Kilometers per hour (Velocity)
s	Seconds (Time)
V	Volt (Tension)
Vdc	Direct Voltage (Tension)
Vac	Alternate Voltage (Tension)
kVA	Kilo-Volt-Ampere (Power)
kW	Kilo-Watt (Power)
W	Watt (Power)
F	Farad (Capacity)
H	Henry (Inductance)
W	Ohm (Resistance)
°F	Fahrenheit (Temperature)
°C	Celsius (Temperature)
A	Ampere (Current)
Hz	Hertz (Frequency)
rpm	Revolution per Minute (Frequency)
N	Newton (Force)
Nm	Newton-Meter (Torque)
mphs	Mile Per Hour Per Second (Acceleration)

14-III-01.d References

Refer to Section 00 of this RMSM for details relevant to the following Topics:

Topic	Paragraph
<i>MANUAL PURPOSE</i>	00-02
<i>MANUAL ARRANGEMENT</i>	00-03
<i>MANUAL APPLICABILITY</i>	00-04
<i>ACQUISITION OF COPIES, REVISIONS AND CHANGES</i>	00-05
<i>TECHNICAL PUBLICATIONS DISCREPANCY REPORT</i>	00-06
<i>UPDATING</i>	00-07
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<i>Vehicle Hazard Areas</i>	00-12.01
<i>General Safety Precautions</i>	00-12.02
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<i>Safety & Environmental Precautions with Chemicals</i>	00-12.04
 GENERAL MAINTENANCE GUIDE	 00-13
<i>Hardware</i>	00-13.01
<i>Cable Ties (Tie Wraps)</i>	00-13.02
<i>Wiring</i>	00-13.03
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14-III-02 P2550 ANSALDOBREDA MAINTENANCE PLAN

The AB Preventive Maintenance Plan (PMP) has been designed in order to permit a 30-year Structural and Service Vehicle Life with the following basic assumptions:

- Yearly mileage: 120,000 Miles
- Motor and Trailer Truck removal: every 5 years. (600,000 Miles)

The AB Preventive Maintenance Plan (PMP) provides the Preventive Maintenance Tasks to be performed according the following Mileage Intervals:

Running Maintenance		Heavy Maintenance	
Daily			
10,000	Miles		
30,000	Miles	600,000	Miles
60,000	Miles	1,200,000	Miles
120,000	Miles	1,800,000	Miles

In accordance with the Preliminary Version of the AB Preventive Maintenance Plan, the Scheduled Maintenance Tasks for the entire Vehicle Life have been grouped into:

- Running Preventive Maintenance
- Heavy Preventive Maintenance

In accordance with the AB Corrective Maintenance Analysis, the Corrective Maintenance Tasks for the entire Vehicle Life have been grouped into:

- Running Corrective Maintenance
- Heavy Corrective Maintenance

14-III-03 RUNNING -PREVENTIVE MAINTENANCE

14-III-03.01 Running -Preventive Maintenance Matrixes (R-PMM)

The Communications Running - Preventive Maintenance Matrix (R-PMM) provides the Preventive Maintenance Plan of the Communications up to 120,000 Miles.

The Communications (R-PMM) is provided in two different arrangements as follows:

- **R-PMM Component Based**

It lists the Communications Running - Preventive Maintenance Tasks ordered by Subsystem /Assemblies / Component break down, followed by the PM Task Description and Scheduled Task Interval and linked to the relevant R-PM Sheet Code.

The R-PMM Component Based provides the Maintainer with the following data:

- SUBSYSTEM /ASSEMBLY/UNIT/COMPONENT
- TASK
- SCPM
- INSPECTION INTERVAL
- SHEET CODE

- **R-PMM Mileage Based**

It lists the Communications Running - Preventive Maintenance Tasks ordered by Scheduled Maintenance Interval and broken down into the related Subsystem /Assemblies/Component followed by the PM Task Description and Person Hours and linked to the relevant R-PM Sheet Code.

The R-PMM Mileage Based provides the Maintainer with the following data:

- INSPECTION INTERVAL
- SYSTEM/SUBSYSTEM /ASSEMBLY/UNIT/COMPONENT
- TASK
- SCPM
- PERSON HOURS
- SHEET CODE

The data listed in this Matrix are the same of those listed in the R-PMM Component Based with the exception of the PERSON HOURS.

14-III-03.01.01 Definitions

The following definitions are applicable to both types of R-PMM

Tasks

- Cleaning:** Methods and processes required (Step-By-Step Procedural Instructions) for cleaning specific parts or areas of the Vehicle.
- Inspection:** Preventive Maintenance procedures such as those required to ascertain the serviceability of a Part, Assembly, System or the specific interrelationship of Parts that perform a functional operation.
- Lubrication:** Provides component lubrication Instructions.
- Replacement** Provides the Components / Assemblies and Subassemblies removal & installation in a logical sequential order.
Maintenance procedures identified in this topic include Components that are replaced within a 4 hours window.
- Service:** Operation performed to replenish Sand, Windshield Wiper Washer Fluid, HVAC Coolant, Gear and Compressor Oil, and Vehicle Lubrication.
- Test:** Procedures and Parameters to evaluate the operational efficiency and integrity of a System /Subsystem/Component and the interrelationship of Parts performing functional operations.

14-III-03.01.02 Inspection Intervals

The Running - Preventive Maintenance Intervals for the P2550 LRV Fleet are scheduled as follows:

Daily	10,000 Miles	30,000 Miles	60,000 Miles	120,000 Miles
-------	--------------	--------------	--------------	---------------

The marker "●" in the INSPECTIONS INTERVAL column, indicates the periodicity of the corresponding Task.

14-III-03.01.03 Safety Critical Preventive Maintenance (SCPM) Tasks

The marker "✓" in the SCPM column, indicates that the corresponding Task is a Safety Critical Preventive Maintenance (SCPM) Task, as per the results of the Safety Analyses performed, on Vehicle Subsystems, according to Vehicle Specification.

14-III-03.01.04 Sheet Code

The Sheet Code column, indicates the reference to Running -Preventive Maintenance Sheet where the Procedure to be performed is described and illustrated.

**THE SHEET CODE IS THE EXPLICIT LINK BETWEEN
R-PM MATRIXES, R-PMR /JOB CARDS AND R-PM SHEETS**

Refer to Paragraph 14-III-03.03.01 for Running- Preventive Maintenance Sheet (R-PMS) Form for detailed explanation.

14-III-03.01.05 Person Hours

It indicates the time required to perform the corresponding Task with the basic assumption that the Vehicle is on an Inspection Pit or Stand Up Rail and the Consumables, Tools and Spare Parts needed to accomplish the Task are available at the Location of the Equipment to be maintained.

Refer to:

- Table 14-III-03.1 for Running - Preventive Maintenance Matrix (R-PMM)
(Component Based)
- Table 14-III-03.2 for Running - Preventive Maintenance Matrix (R-PMM)
(Mileage Based)

14-III-03.01.06 Running Preventive Maintenance Matrix (Component Based)

Table 14-III-03.1 Running Preventive Maintenance Matrix (Component Based)

SYSTEM 14		COMMUNICATIONS					SHEET CODE		
SUBSYSTEM ASSY/UNIT/COMPONENT	TASK	S	C	P	INSPECTION INTERVAL MILES				
		M	Daily	10K	30K	60K	120K		
-AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)									
--FRONT SIGNS									
---LAMPS	REPLACEMENT					•			
--SIDE SIGNS									
---LAMPS	REPLACEMENT					•			

14-III-03.01.07 Running Preventive Maintenance Matrix (Mileage Based)

Table 14-III-03.2 Running Preventive Maintenance Matrix (Mileage Based)

SYSTEM 14		COMMUNICATIONS			SHEET CODE
		S	C	P	
SUBSYSTEM	TASK	M			PERSON HOURS
120,000 MILES					
-AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)					
--FRONT SIGNS					
---LAMPS	REPLACEMENT			0.5	R-P-14-02-02-05/R-00
--SIDE SIGNS					
---LAMPS	REPLACEMENT			0.5	R-P-14-02-03-04/R-00

14-III-03.02 Running -Preventive Maintenance Reports (R-PMR/Job Cards)

This paragraph describes the contents of the Communications Running -Preventive Maintenance Reports (R-PMR/Job Cards) for the Running - Preventive Maintenance Tasks.

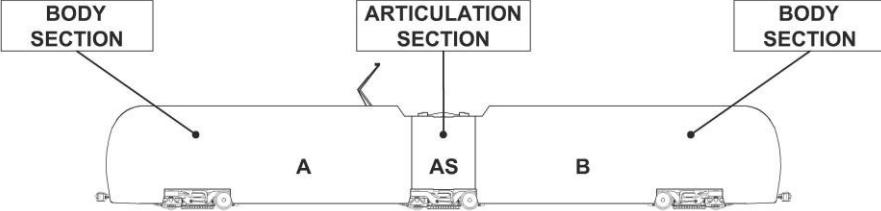
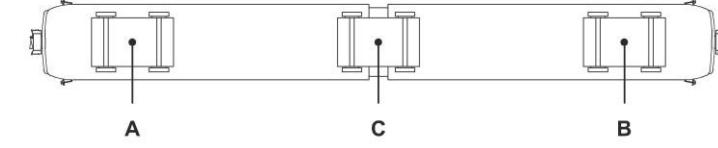
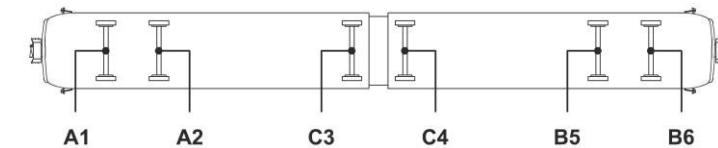
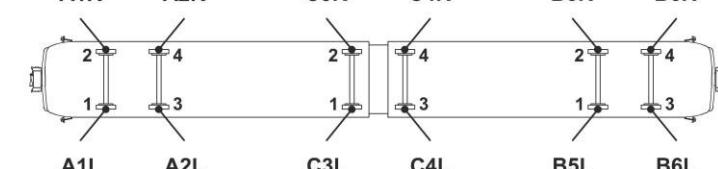
14-III-03.02.01 R-PMR/Job Card Form Content

The R-PMR/JOB CARDS are broken down into two main topics:

Specific Data and R-PM Data

Refer to Figure 14-III-03.1 for R-PMR/JOB CARD Form example

RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM		
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER		
ITEM #	TITLE	EXPLANATORY NOTE
1	VEHICLE #	This field indicates the Vehicle Identification Number.
2	DATE	This field indicates the Date on which the Vehicle entered the Maintenance Shop.
3	RUNNING HOURS	This field indicates the Vehicle Running Hours at the above Date.
4	MILES	This field indicates the Vehicle Running Miles at the above Date.
5	EMPLOYEE # & SIGNATURE	This Field indicates the Employee # & Signature of the Maintainer(s) that perform the referred Task(s).
6	STARTING DATE	This field indicates the Starting Date of the referred Task(s).
7	WORK HOURS	This field indicates the Work duration to perform the referred Task(s).
8	COMPLETION DATE	This field indicates the Completion Date of the referred Task(s).
9	DEFECT FOUND/COMMENTS	This field indicates the result of the Task(s) execution and/ or note related to any items of the maintained Equipment requiring Corrective Maintenance.
A	P2550 RUNNING PREVENTIVE MAINTENANCE REPORT SYSTEM (Maintenance Interval) JOB CARD	<p>This field provides R-PMR Title.</p> <p>The R-PM Maintenance Intervals are the following:</p> <p>Daily; 10,000 Miles; 30,000 Miles; 60,000 Miles; 120,000 Miles</p>
B	WORK AREA	<p>This column lists the On Vehicle Areas where the Equipment to be maintained is located</p> <p>The Work Areas are provided to optimize the jobs organization of the Preventive Maintenance tasks in order to:</p> <ul style="list-style-type: none"> 1- respect the Safety Precautions to be followed 2- complete the preparation and the availability of the Consumables, Tools and Spare Parts, needed to perform the referred Task. 3- respect the time (PERSON HOURS) established to perform the referred Task (with the basic assumption that the Vehicle is on an Inspection Pit or Stand Up Rail and the Consumables, Tools and Spare Parts are available at the location of the Equipment to be maintained.) <p>The On Vehicle Work Areas are the following:</p> <p>Exterior - Interior - Roof - Truck - Undercar - Vehicle (Vehicle as a whole).</p>

RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM		
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER		
ITEM #	TITLE	EXPLANATORY NOTE
C	ITEM	This column lists the Subsystem/Assembly, Unit, Component to be maintained
D	TASK	<p>This column lists the R-PM tasks to be performed for each Assembly/Unit/Component (i.e., Cleaning, Inspection, Test)</p> <p>The R-PM Tasks are the following:</p> <ul style="list-style-type: none"> - Cleaning - Inspection -Lubrication - - Replacement - Service- Test
E	LOCATION	<p>This column lists the On Board Vehicle Location of all Equipment to be maintained according to the following Location identification Codes</p>    

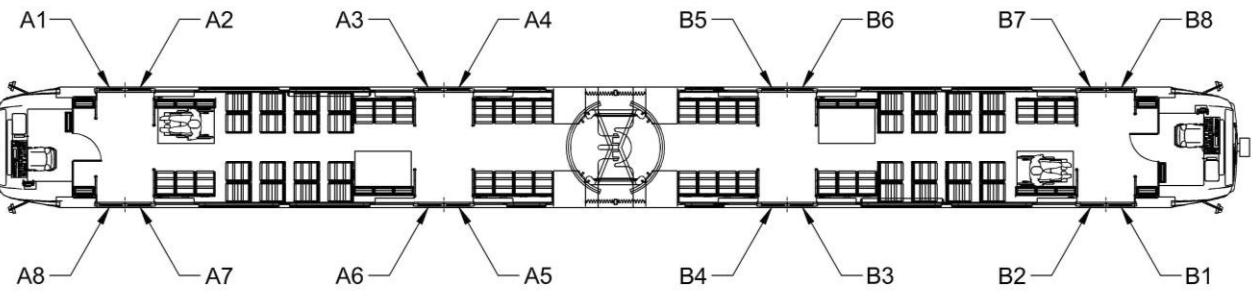
RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM		
SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER		
ITEM #	TITLE	
E (cont'd)	LOCATION (cont'd)	
EXPLANATORY NOTE		
 <p>CAR "A"</p> <p>CAR "B"</p>		
Door Numbering		
ITEM #	TITLE	EXPLANATORY NOTE
F	PM SHEET CODE	<p>This column lists the reference to Running-Preventive Maintenance Sheet where the Procedure to be performed is described and illustrated.</p> <p>Refer to Running-Preventive Maintenance Sheet (R-PMS) Form for detailed explanation.</p>
G	SHEETOF.....	This field indicates the progressive sheet page number of each R-PMR/JOB CARD

Figure 14-III-03.1 R-PMR/Job Card Form -Example

14-III-03.02.02 R-PMR/Job Card Sequence

The R-PMR/JOB CARDS provided in this Section are grouped according to the following sequence:

Daily 10,000 Miles 30,000 Miles 60,000 Miles 120,000 Miles

14-III-03.02.03 Running -Preventive Maintenance Cycle & R-PMR/Job Card Content

The Running -Preventive Maintenance Cycle and the relevant R-PMR/JOB CARD content are as follows:

MAINTENANCE INTERVAL	PMR /JOB CARD TITLE	PMR /Job Card CONTENT
DAILY	DAILY JOB CARD	<ul style="list-style-type: none"> • List of Assemblies/Components and related Tasks to be performed DAILY
10,000 Miles	10,000 MILES JOB CARD	<ul style="list-style-type: none"> • DAILY Job Card content + List of Assemblies/Components and related Tasks to be performed at 10,000 Miles
30,000 Miles	30,000 MILES JOB CARD	<ul style="list-style-type: none"> • DAILY Job Card content + 10,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at 30,000 Miles
60,000 Miles	60,000 MILES JOB CARD	<ul style="list-style-type: none"> • DAILY Job Card content + 10,000 Job Card content + 30,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at 60,000 Miles
120,000 MILES	120,000 MILES JOB CARD	<ul style="list-style-type: none"> • DAILY Job Card content + 10,000 Job Card content + 30,000 Job Card content + 60,000 Job Card content + List of Assemblies/Components and related Tasks to be performed at 120,000 Miles

14-III-03.02.04 R-PMR/Job Card Data Presentation Sequence

The Subsystems / Assemblies / Units / Components listed in the ITEMS column of each R-PMR/JOB CARD are grouped by Work Area and Vehicle Systems' and sequenced, in alphabetical order, in conjunction with their On Vehicle Locations and Tasks to be performed.

14-III-03.02.05 Running Preventive Maintenance Reports R-PMR/Job Cards

COMMUNICATIONS

Running - Preventive Maintenance Reports

R-PMR/JOB CARDS

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**COMMUNICATIONS
RUNNING PREVENTIVE MAINTENANCE REPORT
120,000 MILES JOB CARD**

VEHICLE #		DATE		RUNNING HOURS		MILES		SHEET 1 OF 1
-----------	--	------	--	---------------	--	-------	--	--------------

WORK AREA	SYSTEM	ITEM	TASK	LOCATION				PM SHEET CODE
				BODY SECT	TRUCK	AXLE	SIDE	
INTERIOR	AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	FRONT SIGNS LAMPS	REPLACEMENT	A				R-P-14-02-02-05/R-00
		SIDE SIGNS LAMPS	REPLACEMENT	A			RH	R-P-14-02-03-04/R-00
		FRONT SIGNS LAMPS	REPLACEMENT	B				R-P-14-02-02-05/R-00
		SIDE SIGNS LAMPS	REPLACEMENT	B			LH	R-P-14-02-03-04/R-00

DEFECT FOUND / COMMENTS

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14-III-03.03 Running -Preventive Maintenance Sheets (R-PMS)

Each R-PMS provides the following data consistent with Preventive Maintenance Plan (PMP), AB Design Documentation and Vehicle Systems Functional Tree:

- **R-PM Sheet Code**
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component** (Names)
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component** (Location)
- **Maintenance Interval** (Miles)
- **Maintenance Task**,
- **Man Hours**, needed to perform the Task
- **SPARE PARTS**, needed to perform the Task

Each R-PMS also provides:

- **SAFETY PRECAUTIONS**, to be followed to safely accomplish the Task
- **TOOLS**, including Special Tools and Test Equipment, needed to accomplish the Task
- **CONSUMABLES**, required to accomplish the Task and consistent with those used by MTA
- **PROCEDURE**, consisting of **Preliminary Operations** and **Procedural Steps**, to be followed while performing Maintenance Tasks.
- **Illustrations** and **Pictures** are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure.

14-III-03.03.01 Running- Preventive Maintenance Sheet (R-PMS) Form

The R-PMS Form (refer to Figure 14-III-03.2) consists of several fields containing the following data/ information:

RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form

ITEM #	TITLE	CONTENT	EXPLANATORY NOTES
1	Card code	Sheet code	<p>The Sheet Code is an alphanumerical code that identifies each R-PM Sheet.</p> <p>THE SHEET CODE IS THE EXPLICIT LINK BETWEEN R-PM MATRIXES, R-PMR /JOB CARDS AND R-PM SHEETS</p> <p>The Sheet Code consists of letters R-P followed by an 11 digit code number as follows:</p> <p>R-P-nn-mm-zz-ww/Y-kk</p> <p>R = Running P= Preventive</p> <p>nn may vary from 02 to 19, identifying the System/ Manual Section number.</p> <p>mm-zz-ww each one may vary from 00 to 99, according to AB System Functional Tree, allowing the identification of the Assembly/Unit/Component</p> <p>Y Maintenance Task Code. It may be one of the following:</p> <p>C=Cleaning I=Inspection L=Lubrication</p> <p>R=Replacement S=Service T=Test</p> <p>kk It may vary from 00 to 99.</p> <p>It is a progressive number allowing the explicit identification of RPMS when one of the following cases occur:</p> <ul style="list-style-type: none"> 1- same Maintenance Task pertaining to vehicle as a whole or to the same System/Subsystem/Assembly to be performed at same Maintenance Interval in different Vehicle Area (i.e Vehicle as a Whole DAILY Exterior /Interior INSPECTION) 2- same Maintenance Task pertaining to the same Assembly/Unit/Component to be performed at different Maintenance Intervals and for this reason consisting of different Maintenance Procedure
2	System	System name	This field indicates the System to which the Assembly/Unit/Component belongs.
3	Subsystem/ Assembly	Subsystem/ Assembly name	This field indicates the Subsystem/Assembly to which the Unit/Component belongs.
4	Unit	Unit name	This field indicates the Unit to which the Component belongs.
5	Component	Component name	This field indicates the Component the Maintenance Task is referring to.
6	Maintenance Task	Maintenanc e Task name	This field indicates the Maintenance Task to be performed.
7	Interval Miles	Number	This field indicates the maintenance Interval Miles. It may be DAILY, 10,000 Miles, 30,000 Miles, 60,000 Miles, 120,000 Miles

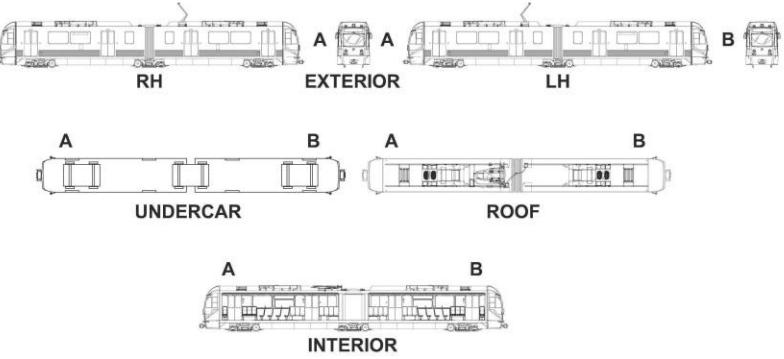
RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form (cont'd)			
ITEM #	TITLE	CONTENT	EXPLANATORY NOTES
8	Man Hours	Number	The Man Hour field indicates the time needed to perform the corresponding Maintenance Task, with the basic assumption that the Vehicle is staged on an Inspection Pit/Jacking tracks with the required Consumables, Tools and Materials Available.
9	Sheet	Pages numbering	This field indicates the progressive R-PMS sheet page number.
10	LOCATION	Illustration	This field indicates the On Board Location of the Equipment to be maintained The following Graphic Symbols are used for: Assembly/Unit/Component • for System/Subsystem/Vehicle as a Whole □
11	R	Letter	This field indicates that the Sheet pertains to Running Maintenance.
12	P	Letter	This field indicates that the Sheet pertains to Preventive Maintenance.
13	nn	Number	This field indicates the System/Manual Section number to which the Sheet pertains. It may vary from 01 to 19.
14	rr	Number	This field indicates the Sheet Revision number.
15	Page ##	Page ##	This field indicates the RMSM Section Page number.
16	-#	Number	This field indicates the RMSM Section Revision number.
17	SAFETY PRECAUTIONS	Text	This field presents the General and/or specific Safety Precautions to be followed to safely accomplish the relevant Maintenance Tasks.
18	TOOLS	Text	This field lists the description and the P/N of the Standard tools, Special Tools and Test Equipment needed to accomplish the Maintenance Task. Refer to the TTE Manual for the TE and Special Tools detailed descriptions and tools maintenance.
19	CONSUMABLES	Text	This field lists the Consumables Materials (consistent with those used by MTA with the related P/N.) needed to accomplish the Maintenance Task. Cleaning agents are included.
20	SPARE PARTS	Text	This field lists the Description and PN of Spare Parts (consistent with Illustrated Parts Catalog) needed to accomplish the Maintenance Task.
21	PROCEDURE	Text	The Procedure field provides Preliminary Operations and Procedural step by step Instructions to be followed while performing the Maintenance Task. Illustrations and Pictures are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure.

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P2550 PREVENTIVE MAINTENANCE SHEET

System:	Card Code:	1	
Subsystem/Assy:	Sheet:	x/z	9
Component:	Unit:		
Maintenance Task:	Man Hours:	4	
	Interval/Miles:	8	

LOCATION:



10

11

12

13

14

15

16

R P nn rr **M** Metro Page 011 Draft

**Figure 14-III-03.2 R-PMS Form
(Sheet 1 of 2)**

LACMTA P2550 LRV Running Maintenance and Servicing Manual - Section 01						
P2550 PREVENTIVE MAINTENANCE SHEET						
Card Code: R-P-nn-mm-zz-ww/Y-kk		Sheet: x/z				
System:	Subsystem/Assy:	Unit:				
Component:	Man Hours:					
Maintenance Task:	Interval/Miles:					
SAFETY PRECAUTIONS:						
17.						
18.						
19.						
20.						
21.						
TOOLS:						
CONSUMABLES:						
SPARE PARTS:						
PROCEDURE:						
PRELIMINARY OPERATIONS						
Page 01-2 Draft						
 Metro						
<table border="1"> <tr> <td>R</td> <td>P</td> <td>nn</td> <td>rr</td> </tr> </table>			R	P	nn	rr
R	P	nn	rr			

**Figure 14-III-03.2 R-PMS Form
(Sheet 2 of 2)**

14-III-03.02 How to Use the R-PM Sheets and R-PMR /Job Cards

To optimize the job organization, proceed as follows:

1. At Scheduled Preventive Maintenance Interval Expiration Date

- a) Use the relevant (Maintenance Interval) R-PMR/JOB CARD where the Subsystems/Assemblies/Units/Components, listed in the ITEMS column, are grouped by Work Area and Vehicle System and sequenced, in alphabetical order, in conjunction with their On Vehicle Location and Task to be performed.
- b) Select the Work Area and the System.
- c) Select the first Equipment listed in the ITEMS column and the Sheet Code listed in conjunction with the Task to be performed and gather the relevant Sheet.
- d) Read carefully the Sheet to fully understand the provided Data/Instructions.
- e) Carefully read:
 - The Safety Precautions to perform the Task safely;
 - The Preliminary Operations to set the Vehicle in safety conditions according to MTA Maintenance Shop Regulations;
 - The Tools, Consumables and Spare Parts listed in each Sheet which are needed to accomplish the Task, in order to have all of them available next to the location of the Equipment to be maintained before starting the activities.
- f) Fill the R-PMR/JOB CARD with the data required by the Maintainer at the start of the Maintenance Activities.

2. Task Execution

- a) Follow carefully the prescribed Safety Precautions and Maintenance Procedural Steps provided in the R-PM Sheet.
- b) Perform the Maintenance Task Procedure on the first Equipment(listed in the ITEMS column of the relevant R-PMR /JOB CARD) at its On Vehicle LOCATION. as indicated in the LOCATION column of the R-PMR /JOB CARD.
- c) Upon completing the Maintenance Task on the first Equipment, highlight (with a flag) its LOCATION field on the R-PMR / JOB CARD.
- d) Note Equipment Defect Found and / or your Comments on the End Page of the R-PMR / JOB CARD.
- e) Proceed to perform the same Task on the second (same) Equipment listed in the R-PMR / JOB CARD at its On Vehicle LOCATION, (different from the previous one) as indicated in the LOCATION column of the R-PMR /JOB CARD.
- f) Proceed as above to perform the same Task on every Equipment (to which the same Sheet Code refers) listed in the ITEMS column of the relevant (Maintenance Interval) R-PMR /JOB CARD.
- g) During Task execution, note any Areas / Items of the Assembly / Unit/ Component under Preventive Maintenance Process requiring Corrective Maintenance.
- h) Gather as much information about the Equipment as is practical to increase your Equipment knowledge (i.e.; knowledge about the malfunction in terms of correctly operating and incorrectly operating equipment processes).

3. At every Task Completion

- a) Follow carefully the prescribed Safety Precautions before restoring Electrical Power to Vehicle.
- b) Check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.
- c) Perform this check on the IDU "A" as follows:

NOTE: Through the IDU you can check if all Systems are exchanging data through the MVB or LonWorks Bus and the Trainlines Status.

The IDU Display also shows in real time the Status of all Vehicle Systems.

Reading the IDU Fault List it is possible to immediately detect a fault
Using the IDU in the Operating Mode the Fault Indications are generic,

Using the IDU in Maintenance Mode the same Fault has a detailed description.

For more in depth troubleshooting use the PTU connected to the relevant system that requires further troubleshooting.

1. On IDU "A" access to the Maintenance Menu first and then to the "Faults" Screen by selecting, in sequence, the relevant icons.
2. Check, On IDU "A" through the list of the Current Active Faults shown in the "Faults" Screen, for "Fault" Codes related to the Subsystem to which the maintained Equipment pertains.

Refer to Section 18 of RMSM for Fault Signals Details.

3. As per "Fault" Codes check results proceed as follows:

➤ **No Faults are listed in the "Faults" Screen**

- a) Key OFF the Vehicle.
- b) Record Service and Test results on the Defect Report Card for administrative and maintenance planning.
- c) Fill the R-PMR /JOB CARD with the data required from the Maintainer at the completion of the Maintenance Activities and include your comments.

➤ **Fault Codes are listed in the “Faults” Screen**

- a) Investigate/troubleshoot the Equipment previously maintained first and then the System/Subsystem/Assembly/Unit for Fault Probable Causes
- b) Gather as much information about the failure symptoms as is practical.
- c) Refer to Section 18 of RMSM for Fault Signals Details.
- d) Try to identify the malfunction in terms of correctly operating and incorrectly operating equipment processes.
- e) Identify which equipment signals or parameters will best help you to localize the failure.
- f) Identify the source of the problem.
- g) Repair or replace the defective component.
- h) Verify that the repair is effective in eliminating all of the failure symptoms.
- i) Evaluate whether or not the defective component was the root cause of the failure.
- j) Once the Fault Codes are not found in the “Faults” Screen perform steps from 3-a through 3-c (previous subparagraph **No Faults are listed in the “Faults” Screen**).

14-III-03.03.03 Running- Preventive Maintenance Sheet (R-PMS) List

The Communications Running- Preventive Maintenance Sheets (R-PMS) List is provided in the following pages.

The R-PM Sheets are listed by Subsystem / Assembly / Unit / Component and sequenced by Maintenance Interval in conjunction with their Sheet Codes and Tasks (including SCPM flag) to be performed.

Table 14-III-03.3 Running Preventive Maintenance Sheets List

SYSTEM 14		COMMUNICATIONS			
SUBSYSTEM/ ASSY	ASSY /UNIT/ COMPONENT	SCPM	TASK	MAINTEN. INTERVAL (MILES)	SHEET CODE
AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	FRONT SIGN LAMPS		REPLACEMENT	120,000	R-P-14-02-02-05/R-00
	SIDE SIGN LAMPS		REPLACEMENT	120,000	R-P-14-02-03-04/R-00

COMMUNICATIONS

Running - Preventive Maintenance Sheets

R-PMS

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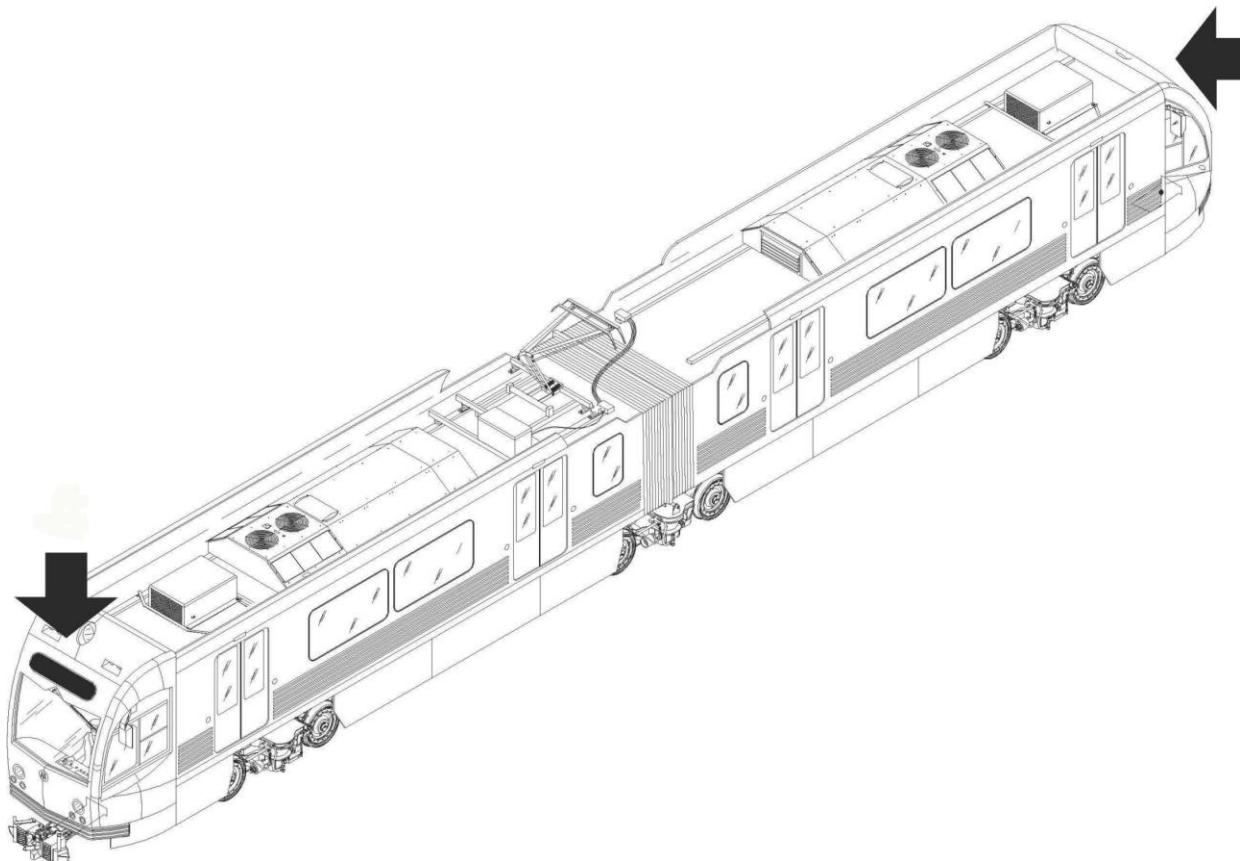
P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-02-05/R-00

System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: FRONT SIGN
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	Interval/Miles: 120,000

LOCATION:



P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-02-05/R-00

System:

COMMUNICATIONS

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND DISPLAY
SYSTEM (AADS)**

Component:

LAMP

Maintenance Task:

REPLACEMENT

Interval/Miles:

120,000

Sheet:

2/4

Unit:

FRONT SIGN

Man Hours:

0.5

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

**WARNING: WEAR HAND AND EYE PROTECTION WHEN HANGING LAMP TUBES TO PREVENT
INJURY FROM SHATTERED GLASS.**

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

Fluorescent Lamp 30 W Ø26mm L 895 mm Philips TLD 30W/54SLV PH1854 QTY =2

Fluorescent Lamp 18W Ø26mm L 589 mm Philips TLD 18W/54SLV PH1854 QTY =2

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-02-05/R-00

System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: FRONT SIGN
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	Interval/Miles: 120,000

PROCEDURE:

To perform the Task proceed as follows:

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the CB 13F03, SIGNS PROTECTION,(Cab CB Panel), to "OFF" position.

REPLACEMENT

To replace the Lamp, proceed as follows

1. Gain Access to the Front Sign from inside the Cab by opening the Cab Front Ceiling Panel.
2. Open the Sign Rear Cover by rotating the relevant Lock Fasts.
3. Gently support (do not apply pressure) the Lamp and depress the Lamp Retaining Button on one Lamp Holder until it clears the Lamp.
4. Do not rotate the Lamp, but carefully pull the Lamp End straight from the Lamp holder. Set Lamp aside to avoid breakage.
5. Ensure expired / damaged Lamp is disposed properly.
6. Install new Lamp by inserting one end of the Lamp into the Lamp Holder.
7. Do not rotate the Lamp. Carefully press the other end of the Lamp straight into the opposite Lamp Holder, past the Lamp Retaining Button.
8. Ensure both Lamp Holder Retaining Buttons are properly positioned over Lamp Ends.
9. Temporarily activate power to verify Lamp illumination.
- 10 Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts.
- 11 Close and secure the Cab Front Ceiling Panel.
- 12 Restore Power to the Signs.

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.
 Refer to **HOW TO USE THE R-PM SHEETS**(para 14-III-03-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-02-05/R-00

System:

COMMUNICATIONS

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND DISPLAY
SYSTEM (AADS)**

Component:

LAMP

Maintenance Task:

REPLACEMENT

Sheet:

4/4

Unit:

FRONT SIGN

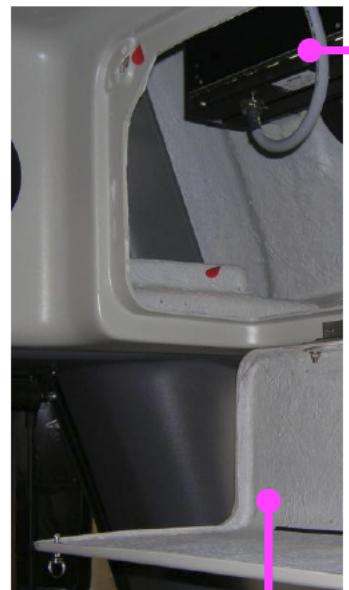
Man Hours:

0.5

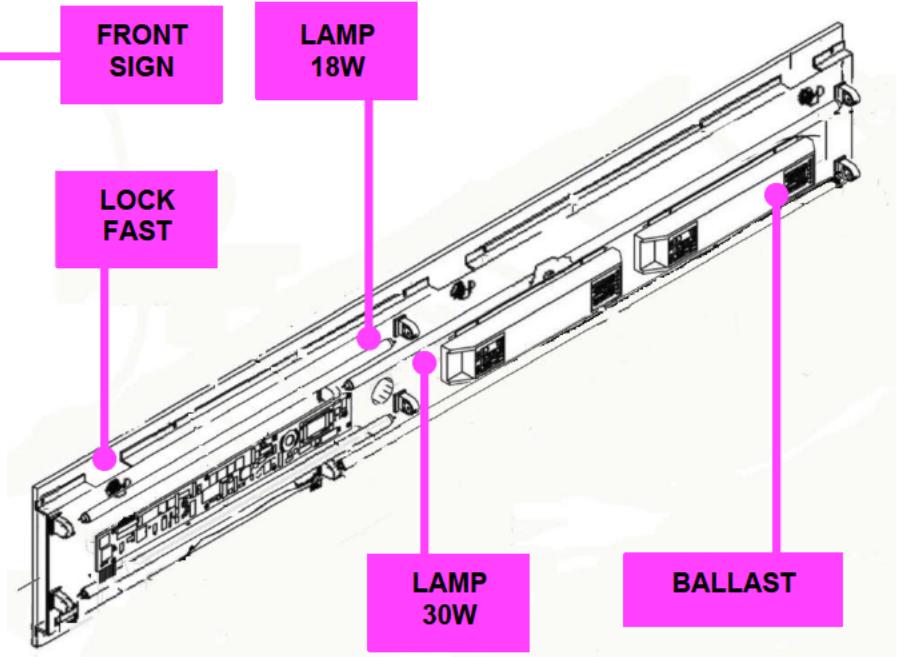
Interval/Miles:

120,000

PROCEDURE (CONT'D):



FRONT SIGN ACCESS



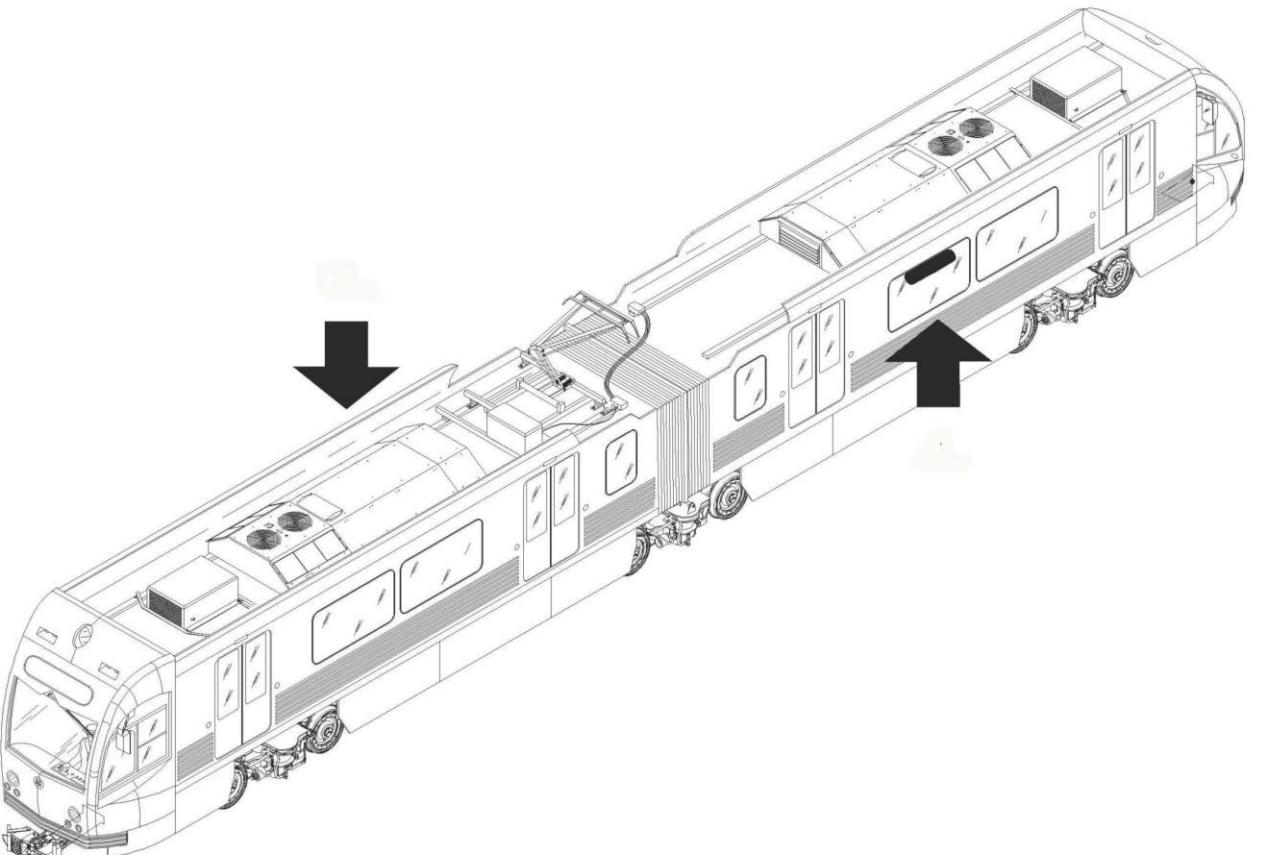
FRONT SIGN LAMP REPLACEMENT

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-03-04/R-00

System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIDE SIGN
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	Interval/Miles: 120,000

LOCATION:

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-03-04/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND DISPLAY
SYSTEM (AADS)**

Unit:

SIDE SIGN

Component:

LAMP

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

Interval/Miles:

120,000

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

**WARNING: WEAR HAND AND EYE PROTECTION WHEN HANGING LAMP TUBES TO PREVENT
INJURY FROM SHATTERED GLASS.**

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

Fluorescent Lamp 23W Ø26 mm L 970 mm Philips TLD 23W/54SLV PH2354 QTY =4

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-03-04/R-00

System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIDE SIGN
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	Interval/Miles: 120,000

PROCEDURE:

To perform the Task proceed as follows:

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the CB 13F03, SIGNS PROTECTION,(Cab CB Panel), to "OFF" position.

REPLACEMENT

To replace the Lamp, proceed as follows

1. Gain Access to the Side Sign from inside the Compartment by opening the Side Sign Cover Panel
2. Open the Sign Rear Cover by rotating the relevant Lock Fasts.
3. Gently support (do not apply pressure) the Lamp and depress the Lamp Retaining Button on one Lamp Holder until it clears the Lamp.
4. Do not rotate the Lamp, but carefully pull the Lamp End straight from the Lamp holder. Set Lamp aside to avoid breakage.
5. Ensure expired / damaged Lamp is disposed properly.
6. Install new Lamp by inserting one end of the Lamp into the Lamp Holder.
7. Do not rotate the Lamp. Carefully press the other end of the Lamp straight into the opposite Lamp Holder, past the Lamp Retaining Button.
8. Ensure both Lamp Holder Retaining Buttons are properly positioned over Lamp Ends
9. Temporarily activate power to verify Lamp illumination.
- 10 Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts.
- 11 Close and secure the Side Sign Cover Panel.
- 12 Restore Power to the Signs

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.
 Refer to **HOW TO USE THE R-PM SHEETS**(para 14-III-03-02 of this Section) and follow the prescriptions provided at Step 3 "**At every Task Completion.**"

P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

R-P-14-02-03-04/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIDE SIGN

Component:

LAMP

Man Hours:

0.5

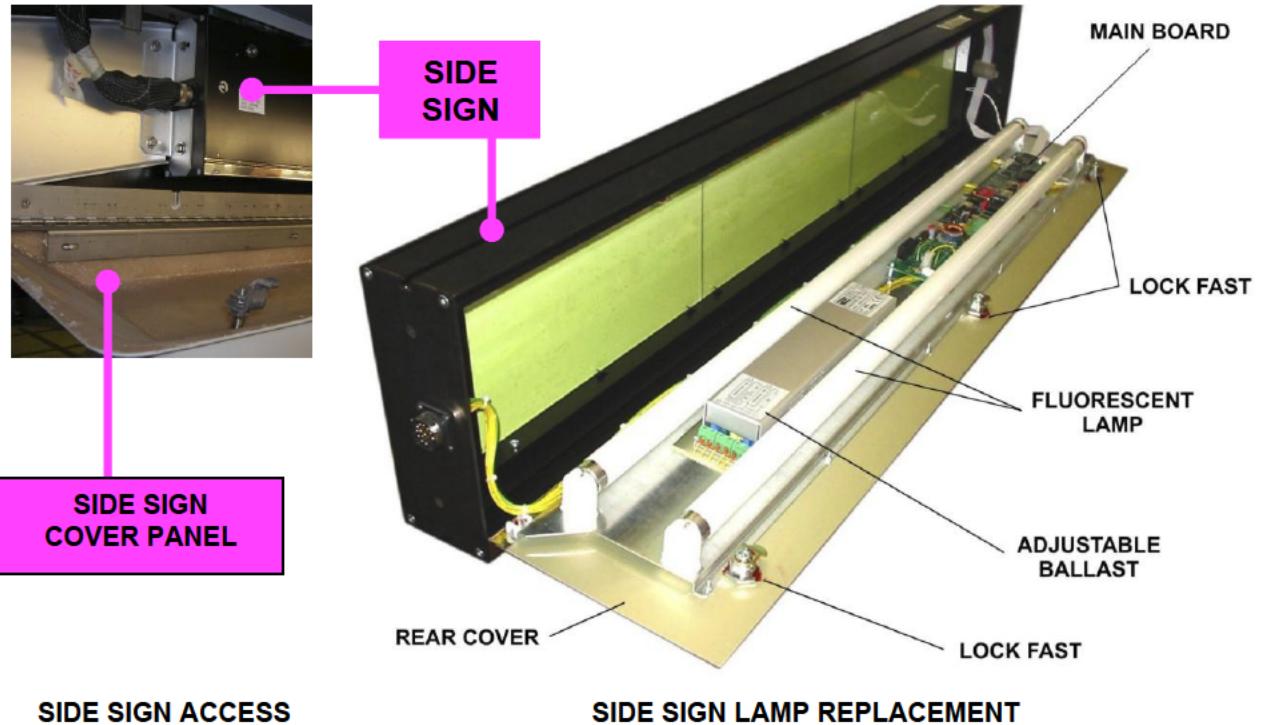
Maintenance Task:

REPLACEMENT

Interval/Miles:

120,000

PROCEDURE (CONT'D):



14-III-04 RUNNING -CORRECTIVE MAINTENANCE**14-III-04.01 Running -Corrective Maintenance Sheets (R-CMS)**

Each R-CMS provides the following data consistent with Corrective Maintenance Analysis (CMA), AB Design Documentation and Vehicle Systems Functional Tree:

- **R-CM Sheet Code**
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component** (Names) ·
- **SYSTEM, SUBSYSTEM /ASSEMBLY, UNIT, Component** (Location) ·

Maintenance Task,

The following definitions are applicable to the R-CM Tasks

Inspection: Maintenance procedures such as those required to ascertain the serviceability of a Part, Assembly, System or the specific interrelationship of Parts that perform a functional operation.

Leveling: Procedure to adjust the distance between the Vehicle Floor to the Top Of Rail and the designated Vehicle Height

Replacement: Provides the Components / Assemblies and Subassemblies removal & installation in a logical sequential order.

Re-Profiling: Provides the procedure to maintain the safe and proper "wheel profile".

Repair: Provides detailed procedures for the repair of a specific Equipment / Component

Service: Operation performed to replenish Sand, Windshield Wiper Washer Fluid, HVAC Coolant, Gear and Compressor Oil, and Vehicle Lubrication.

- **Man Hours**, needed to perform the Task
- **SPARE PARTS**, needed to perform the Task

Each R-CMS also provides:

- **SAFETY PRECAUTIONS**, to be followed to safely accomplish the Task
- **TOOLS**, including Special Tools and Test Equipment, needed to accomplish the Task
- **CONSUMABLES**, required to accomplish the Task and consistent with those used by MTA
- **PROCEDURE**, consisting of Preliminary Operations and Procedural Steps, to be followed while performing Maintenance Tasks.
- **Illustrations and Pictures** are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure.

Each R-CM Sheet refers to one Task and consists of several pages where Safety Precautions and Maintenance Instructions to perform safely the Task are provided by Procedural Steps in conjunction with Illustrations and Pictures.

14-III-04.01.01 Running- Corrective Maintenance Sheet (R-CMS) Form

The R-CMS Form (refer to Figure 14-III-04.1) consists of several fields containing the following data/ information:

RUNNING -CORRECTIVE MAINTENANCE SHEET (R-CMS) Form			
ITEM #	TITLE	CONTENT	EXPLANATORY NOTES
1	Card code	Sheet code	<p>The Sheet Code is an alphanumerical code that identifies each R-CM Sheet.</p> <p>THE SHEET CODE IS EXPLICIT</p> <p>The Sheet Code consists of letters R-C followed by an 11 digit code number as follows:</p> <p>R-C-nn-mm-zz-ww/Y-kk</p> <p>R = Running C = Corrective</p> <p>nn may vary from 02 to 19, identifying the System/ Manual Section number.</p> <p>mm-zz-ww each one may vary from 00 to 99, according to AB System Functional Tree, allowing the identification of the Assembly/Unit/Component</p> <p>Y Maintenance Task Code.</p> <p>It may be one of the following:</p> <p>I = Inspection LL =Leveling</p> <p>R = Replacement RP= Re-Profiling</p> <p>RR = Repair S = Service</p> <p>SP = Safety Precautions</p> <p>kk It may vary from 00 to 99. It is a progressive number allowing the explicit identification of R-CMS</p> <p>NOTE:</p> <p>The code R-C-nn-00-00-00-R-kk identifies a Typical Replacement Procedure</p> <p>The Typical Replacement Procedure is provided for the following items:</p> <p>Board, Circuit Breaker, Diode, Indicator Lamp, Main Contactor, Switch & Relays.</p>
2	System	System name	This field indicates the System to which the Assembly/Unit/Component belongs.
3	Subsystem/ Assembly	Subsystem/ Assembly name	This field indicates the Subsystem/Assembly to which the Unit/Component belongs.
4	Unit	Unit name	This field indicates the Unit to which the Component belongs.
5	Component	Component name	This field indicates the Component the Maintenance Task is referring to
6	Maintenance Task	Maintenance Task name	This field indicates the Maintenance Task to be performed.
7	Man Hours	Number	The Man Hour field indicates the time needed to perform the corresponding Maintenance Task. with the basic assumption that the Vehicle is staged on an Inspection Pit/Jacking tracks with the required Consumables, Tools and Materials available.

RUNNING -CORRECTIVE MAINTENANCE SHEET (R-CMS) Form (cont'd)			
ITEM #	TITLE	CONTENT	EXPLANATORY NOTES
8	Sheet	Pages numbering	This field indicates the progressive R-CMS sheet page number.
9	LOCATION	Illustration	This field indicates the On Board Location of the Equipment to be maintained The following Graphic Symbols are used for: Assembly/Unit/Component  for System/Subsystem/Vehicle as a Whole 
10	R	Letter	This field indicates that the Sheet pertains to Running Maintenance
11	C	Letter	This field indicates that the Sheet pertains to Corrective Maintenance
12	nn	Number	This field indicates the System/Manual Section number to which the Sheet pertains. It may vary from 01 to 19
13	rr	Number	This field indicates the Sheet Revision number
14	Page ##	Page ##	This field indicates the RMSM Section Page number
15	#	Number	This field indicates the RMSM Section Revision number
16	SAFETY PRECAUTIONS	Text	This field presents the General and/or specific Safety Precautions to be followed to accomplish safely the relevant Maintenance Tasks.
17	TOOLS	Text	This field lists the description and the P/N of the Standard tools, Special Tools and Test Equipment needed to accomplish the Maintenance Task. Refer to the TTE Manual for the TE and Special Tools detailed descriptions and tools maintenance.
18	CONSUMABLES	Text	This field lists the Consumables Materials (consistent with those used by MTA with the related P/N.) needed to accomplish the Maintenance Task. Cleaning agents are included
19	SPARE PARTS	Text	This field lists the Description and PN of Spare Parts (consistent with Illustrated Parts Catalog) needed to accomplish the Maintenance Task.
20	PROCEDURE	Text	The Procedure field provides Preliminary Operations and Procedural step by step Instructions to be followed while performing the Maintenance Task. Illustrations and Pictures are inserted in the text to facilitate the understanding of the topics and/or to explain step-by-step procedure.

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: **R-C-nn-mm-zz-ww/Y-kk**

System: **x/z**

Subsystem/Assy: Unit:

Component: Man Hours:

Maintenance Task:

LOCATION:

B RH EXTERIOR LH

A UNDERCAR B ROOF

A INTERIOR B

1 **2** **3** **4** **5** **6** **7** **8** **9** **10** **11** **12** **13** **14** **15**

10 **11** **12** **13** **14** **15**

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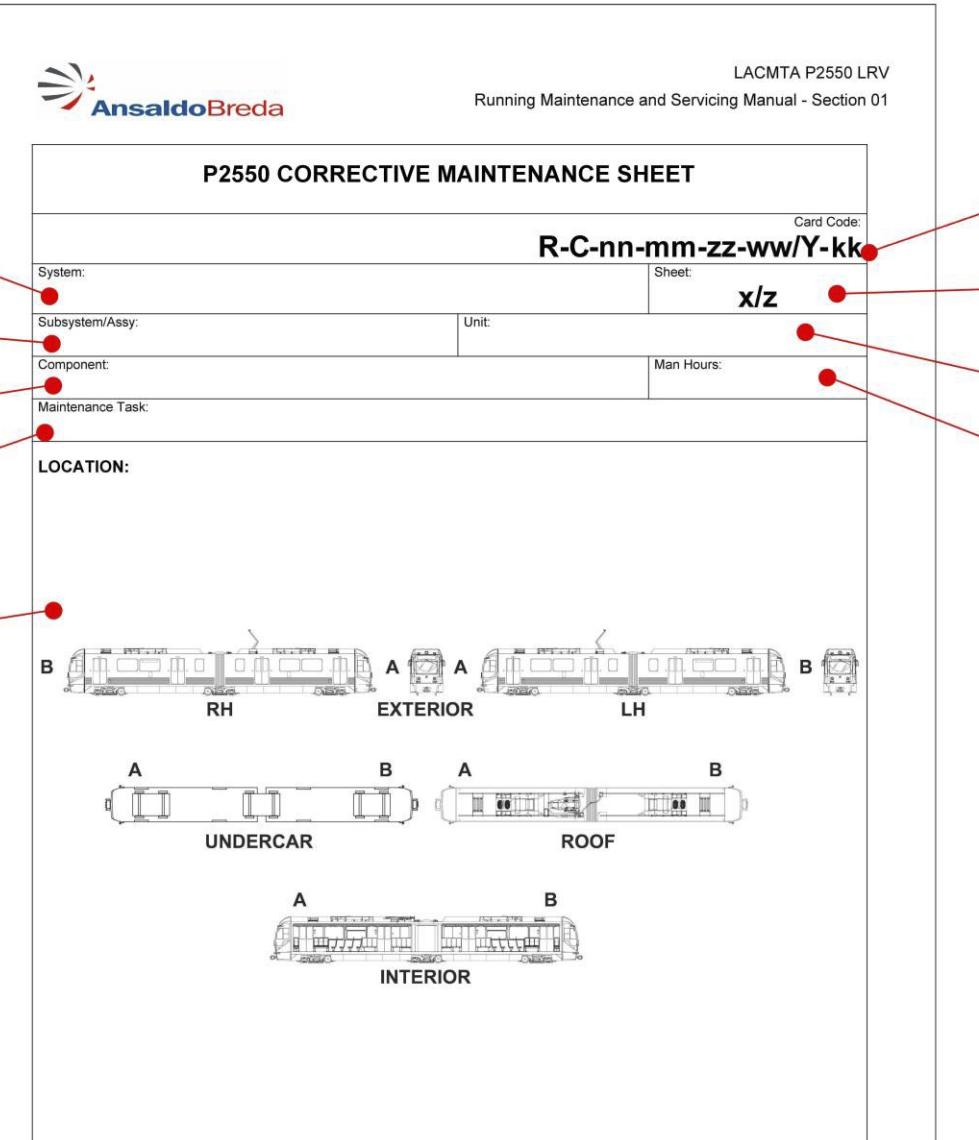


Figure 14-III-04.1 R-CMS Form
(Sheet 1 of 2)

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Running Maintenance and Servicing Manual - Section 01

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code: R-C-nn-mm-zz-ww/Y-kk	System:	Sheet: x/z
Subsystem/Assy:	Unit:	
Component:	Man Hours:	
Maintenance Task:		
SAFETY PRECAUTIONS:		
TOOLS:		
CONSUMABLES:		
SPARE PARTS:		
PROCEDURE:		
PRELIMINARY OPERATIONS		
20		

16
17
18
19
20

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R	C	nn	rr
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**Figure 14-III-04.1 R-CMS Form
(Sheet 2 of 2)**

14-III-04.01.02 How to Use the R-CM Sheets

To optimize the job organization it is suggested to proceed as follows:

1. Before Task Execution

- a) Carefully read the sheets to ensure that you fully understand all safety precautions, preliminary conditions required, warnings, notes & procedures that will be followed
Particularly read
 - The Safety Precautions to perform safely the Task
 - The Preliminary Operations to set the Vehicle in safety conditions according to MTA Maintenance Shop Regulations
 - The Tools, Consumables and Spare Parts listed in each Sheet that are needed to accomplish the Task and to have all of them available next the location of the Equipment to be maintained before starting the activities.

2. During Task Execution

- a) Follow accurately the prescribed Safety Precautions and Maintenance Procedural Steps
- b) Note any Areas/Items of the Assembly/Unit/Component under Corrective Maintenance Process requiring further Corrective Maintenance
- c) Gather as much information about the Equipment as is practical
(i.e. knowledge about the malfunction in terms of correctly operating and incorrectly operating equipment processes) to increase your equipment knowledge.

3. At every Task Completion

- a) Carefully follow the prescribed Safety Precautions before restoring the Electrical Power to Vehicle.
- b) Check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.
- c) It is suggested to perform this check on the IDU "A" as follows:

NOTE: Through the IDU you can check if all Systems are exchanging data by MVB or LonWorks Bus and the Trainlines Status.

The IDU Display also shows in real time the Status of all Vehicle Systems.

Reading the IDU Fault List it is possible to immediately detect a fault

Using the IDU in the Operating Mode the Fault Indications are generic

Using the IDU in Maintenance Mode the same Fault has a detailed description.

For more in depth troubleshooting use the PTU connected to the relevant system that requires further troubleshooting.

1. On IDU "A" access to the Maintenance Menu first and then to the "Faults" Screen by selecting, in sequence, the relevant icons
2. Check, On IDU "A" through the list of the Current Active Faults shown in the "Faults" Screen, for Fault Codes related to the Subsystem to which the maintained Equipment pertains.

Refer to Section 18 of RMSM for Fault Signals Details

3. As per "Fault" Codes check results proceed as follows:

Ø No Faults are listed in the "Faults" Screen

- a) Key OFF the Vehicle
- b) Record Service and Test results on the Defect Report Card for administrative and maintenance planning.

Ø Fault Codes are listed in the "Faults" Screen

- a) Investigate/troubleshoot the Equipment previously maintained first and then the System/Subsystem/Assembly/Unit for Fault Probable Causes
- b) Gather as much information about the failure symptoms as is practical.
Refer to Section 18 of RMSM for Fault Signals Details
- c) Try to identify the malfunction in terms of correctly operating and incorrectly operating equipment processes.
- d) Identify which equipment signals or parameters will best help you to localize the failure.
- e) Identify the source of the problem.
- f) Repair or replace the defective component.
- g) Verify that the repair is effective in eliminating all of the failure symptoms.
- h) Evaluate whether or not the defective component was the root cause of the failure.
- i) Once the Fault Codes are not found in the "Faults" Screen perform steps from 3-a through 3-b (previous subparagraph **No Faults are listed in the "Faults" Screen**)

14-III-04.01.03 Running- Corrective Maintenance Sheet (R-CMS) List

The Communications Running- Corrective Maintenance Sheets (R-CMS) List is provided in the following Table 14-III-04.1

The R-CM Sheets are listed by Subsystem / Assembly / Unit / Component and sequenced by Sheet Codes and Tasks to be performed

Table 14-III-04.1 Running Corrective Maintenance Sheets List

SYSTEM 14 COMMUNICATIONS				
SUBSYSTEM / ASSY	UNIT	COMPONENT	TASK	SHEET CODE
COMMUNICATIONS & VIDEO SURVEILLANCE		CIRCUIT BREAKER TYPE S280(TYPICAL)	REPLACEMENT	R-C-14-00-00-00/R-00
COMMUNICATIONS & VIDEO SURVEILLANCE		RELAY (TYPICAL)	REPLACEMENT	R-C-14-00-00-00/R-01
		SWITCH (TYPICAL)	REPLACEMENT	R-C-14-00-00-00/R-02
		RADIO CONTACTOR (TYPICAL)	REPLACEMENT	R-C-14-00-00-00/R-03
	COMMUNICATION CONTROL UNIT (CCU)		REPLACEMENT	R-C-14-01-01-00/R-00
	COMMUNICATION CONTROL HEAD(CCH)		REPLACEMENT	R-C-14-01-02-00/R-00
	GOOSENECK MICROPHONE		REPLACEMENT	R-C-14-01-03-00/R-00
	CAB LOUDSPEAKER		REPLACEMENT	R-C-14-01-04-00/R-00
	PASSENGER INTERCOM (PIC) UNIT		REPLACEMENT	R-C-14-01-05-00/R-00
	EXTERNAL LOUDSPEAKER		REPLACEMENT	R-C-14-01-06-00/R-00
	INTERNAL LOUDSPEAKER		REPLACEMENT	R-C-14-01-07-00/R-00
	VIDEO CAMERA		REPLACEMENT	R-C-14-01-08-00/R-00
AUTOMATIC ANNOUNCEMENT & DISPLAY SYSTEM (AADS)	CONSOLE OPERATOR (AADS)		REPLACEMENT	R-C-14-02-01-00/R-00
	SIGNS	MAIN BOARD	REPLACEMENT	R-C-14-02-02-01/R-00
		LAMP	REPLACEMENT	R-C-14-02-02-02/R-00
		BALLAST	REPLACEMENT	R-C-14-02-02-04/R-00
	INTERIOR SIGNS		REPLACEMENT	R-C-14-02-04-00/R-00
RADIO COMMUNICATIONS	TK 790 RADIO		REPLACEMENT	R-C-14-03-01-01/R-00
	TK 790 RADIO	LOUDSPEAKER	REPLACEMENT	R-C-14-03-01-02/R-00
		ANTENNA	REPLACEMENT	R-C-14-03-01-03/R-00
		POWER SUPPLY	REPLACEMENT	R-C-14-03-01-04/R-00

14-III-04.01.04 **Running- Corrective Maintenance Sheets (R-CMS)**

COMMUNICATIONS

Running - Corrective Maintenance Sheets

R-CMS

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P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Sheet:

1/8

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

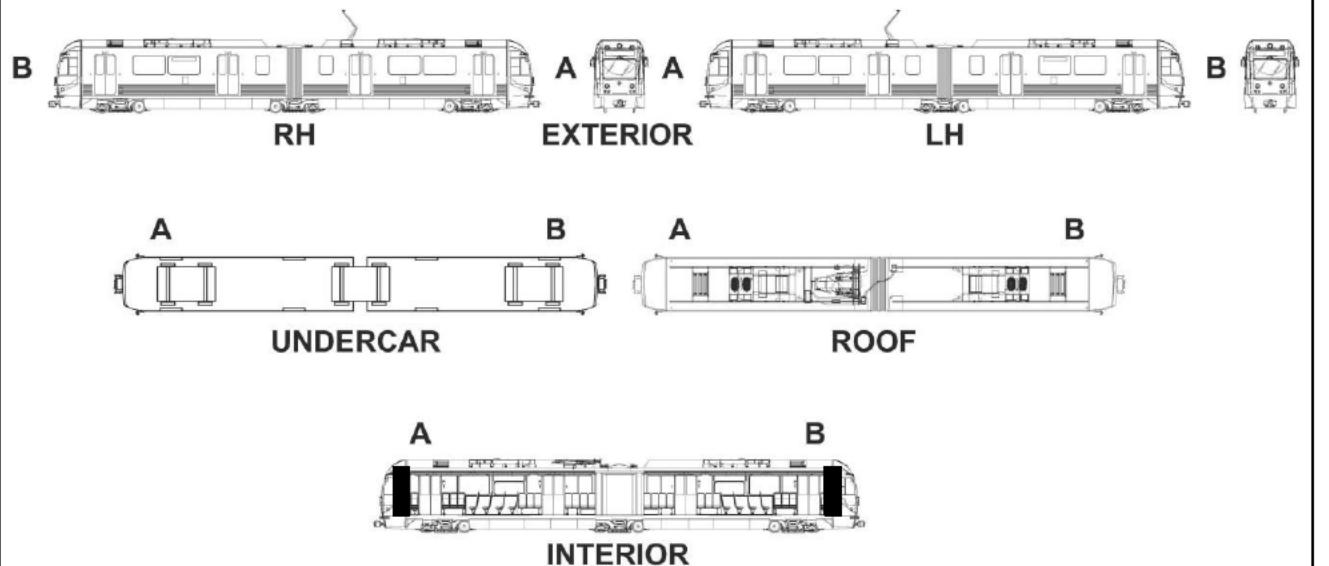
Component:

CIRCUIT BREAKER TYPE S280

Man Hours:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)**LOCATION:****APPLICABILITY:**

This Replacement procedure is applicable to the following Equipment:

TABLE 1 CIRCUIT BREAKERS IDENTIFICATION & LOCATIONS

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
13F01	COMMUNICATION SYSTEM PROTECTION	S281 C 10A	211EK22984B03	A - B	CAB -LV CB PANEL	LV	118
13F02	13K01 CCU PROTECTION	S281 C 25A	211EK22984B06	A - B	CAB -LV CB PANEL	LV	119
13F02	SIGNS PROTECTION	S281 C 20A	211EK22984B05	A - B	CAB -LV CB PANEL	LV	123

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Sheet:

2/8

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

CIRCUIT BREAKER TYPE S280

Man Hours:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE
REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Multimeter (Fluke 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Circuit Breakers Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-00-00-00/R-00	
System: COMMUNICATIONS	Sheet: 3/8
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: CIRCUIT BREAKER TYPE S280	Man Hours: 0.5
Maintenance Task: REPLACEMENT (TYPICAL)	
PROCEDURE:	
PRELIMINARY OPERATIONS	
Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:	
<ol style="list-style-type: none">1. Place the Vehicle in the Maintenance Shop.2. Set the Master Controller Handle to FSB position.3. Make sure that all Parking Brakes are applied (by checking on the IDU "Parking Brake A and B Not Released" and on Indicator Panel "A" "Park / Friction Brake" ON).4. Remove Electrical Power from Vehicle by lowering the Pantograph.5. Turn the Transfer Switch to OFF.6. Set the Pantograph Control Motor Switch (5F02 CB LV Locker "A" Section) to OFF.7. Lock out and tag out the Switch in accordance with all LACMTA Safety Rules, Regulations, Policies, and Procedures	
NOTE The tag must indicate the name of the person who removed Power. That person knows why the Power was removed and when it safe to restore it. Only the individual whose name appears on the tag or a person with his approval should remove the tag and restore Power.	
CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

CIRCUIT BREAKER TYPE S280

Maintenance Task:

REPLACEMENT (TYPICAL)

PROCEDURE (CONT'D):

REMOVAL

To perform the Task proceed as follows:

1. Locate the Circuit Breaker to be replaced according to the Label identification and the Location provided in the previous Table 1

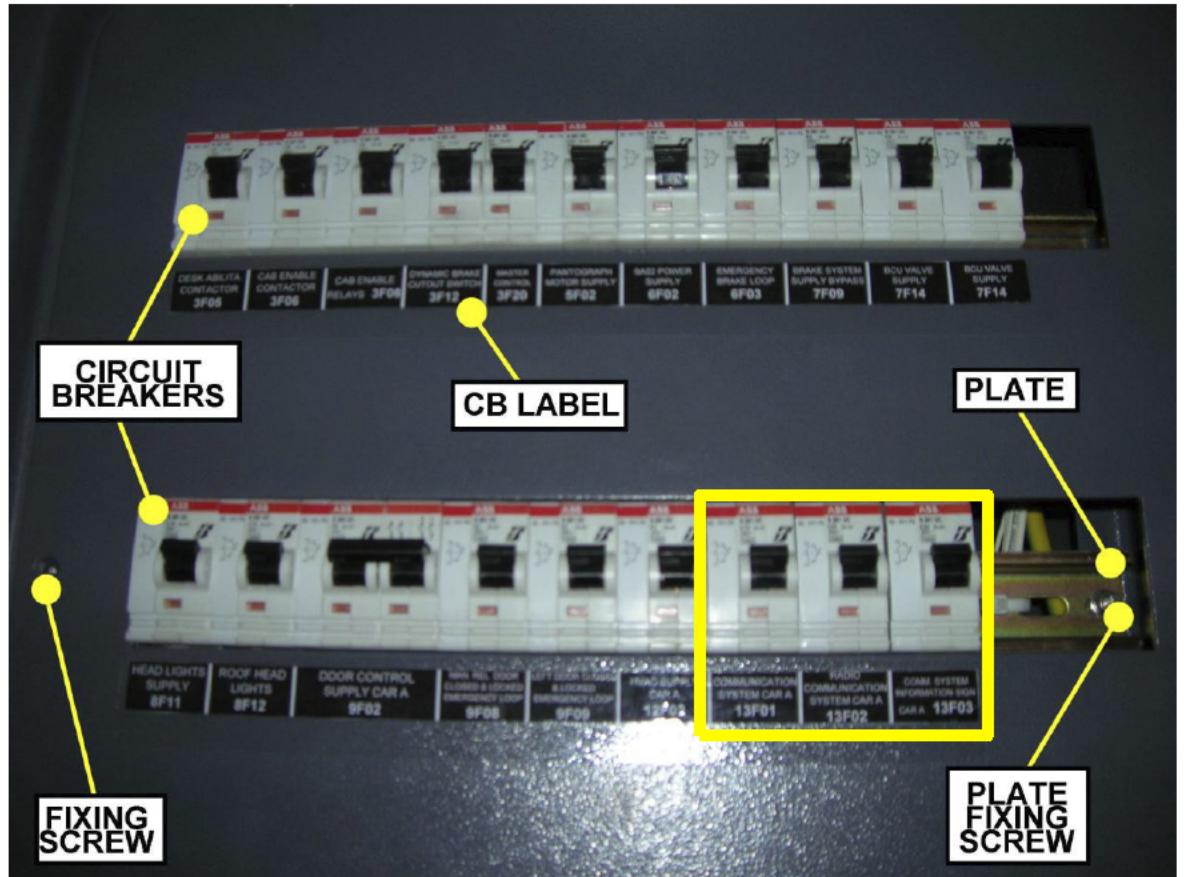


FIG 1 CAB LV CB PANEL

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Sheet:

5/8

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

CIRCUIT BREAKER TYPE S280

Man Hours:

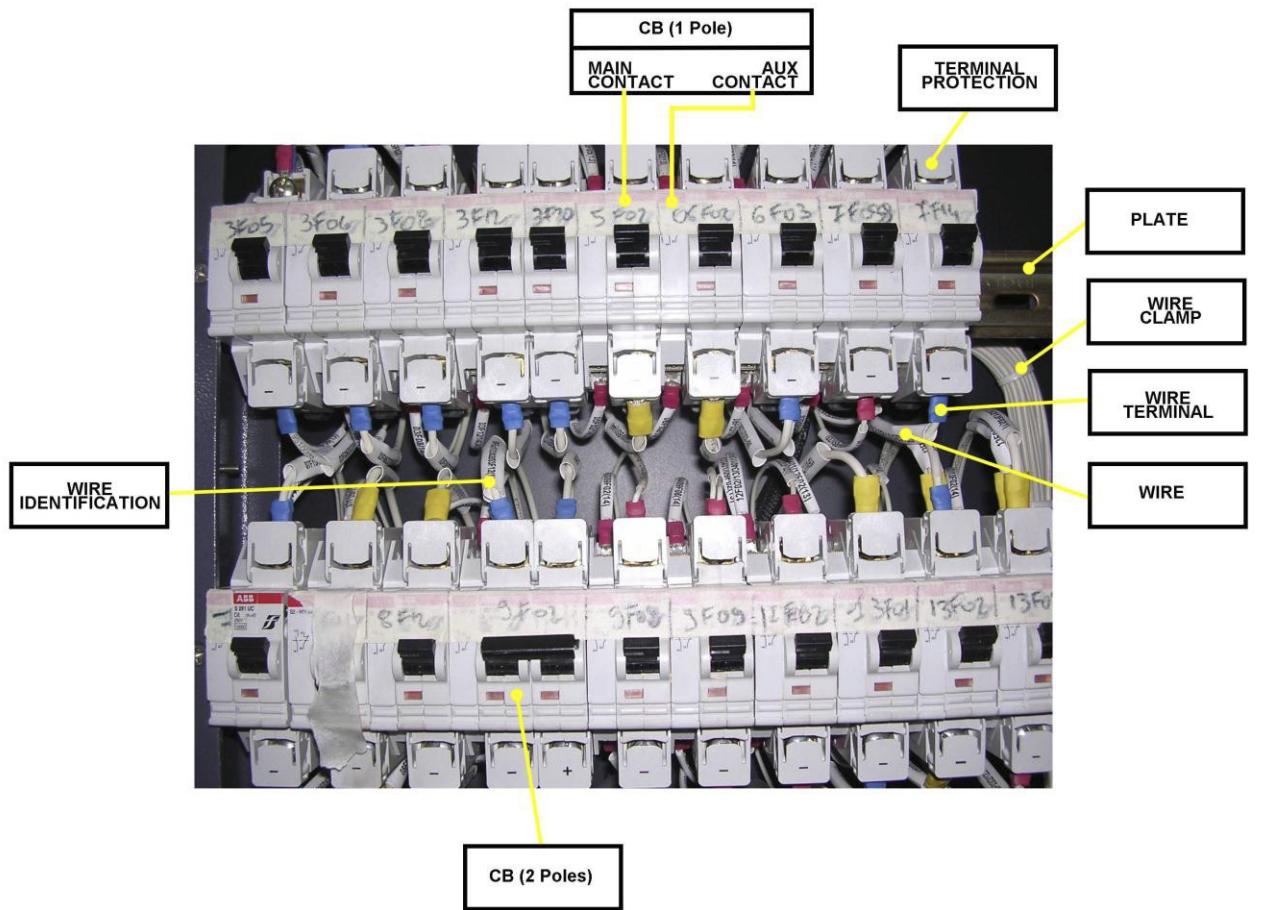
0.5

Maintenance Task:

REPLACEMENT (TYPICAL)**PROCEDURE:**

- 2 Remove the Circuit Breakers Front Panel by loosening relevant Fixing Screws.

Retain hardware for later use


FIGURE 2 -CIRCUIT BREAKERS FRONT PANEL REMOVED(TYPICAL)

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Sheet:

6/8

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

CIRCUIT BREAKER TYPE S280

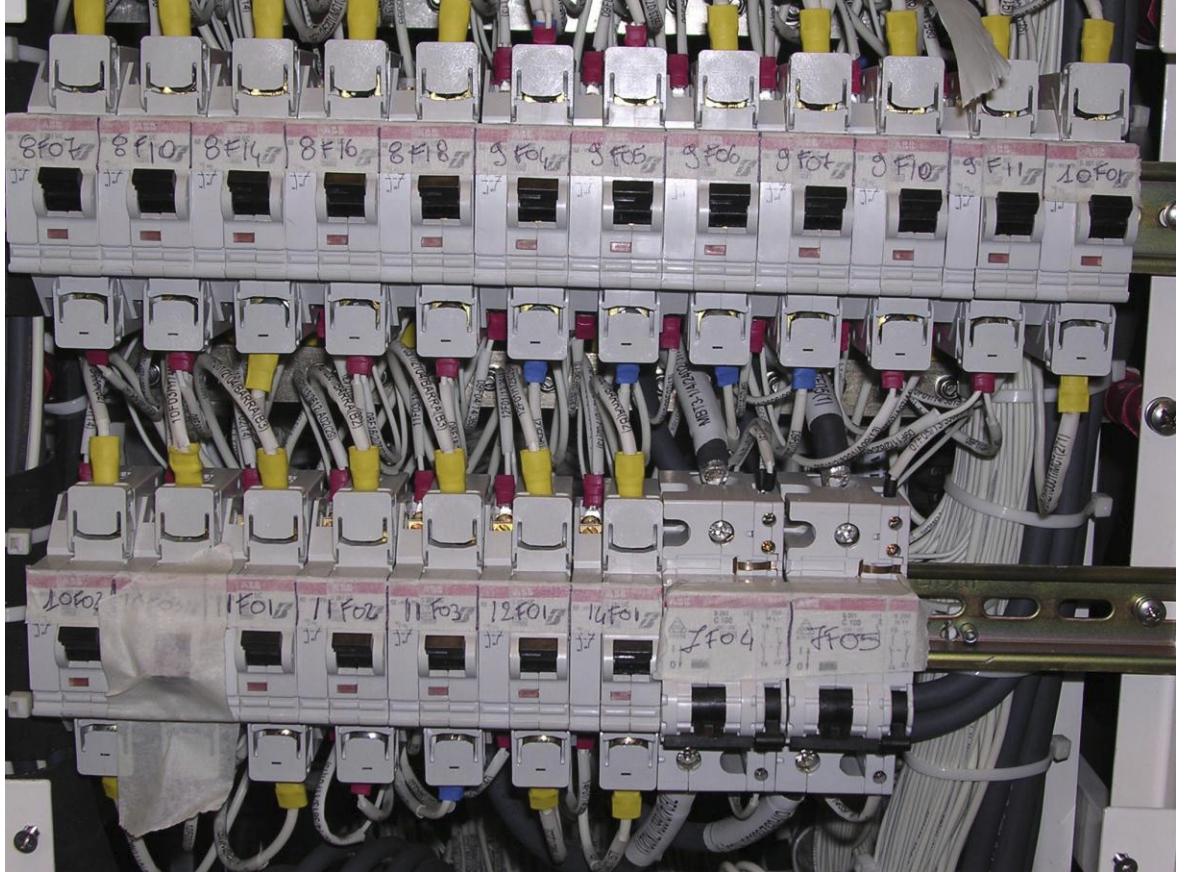
Unit:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)**PROCEDURE (CONT'D):**

- 3 Locate the Circuit Breaker to be replaced

**FIGURE 3 -CB INSTALLATION(TYPICAL)**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

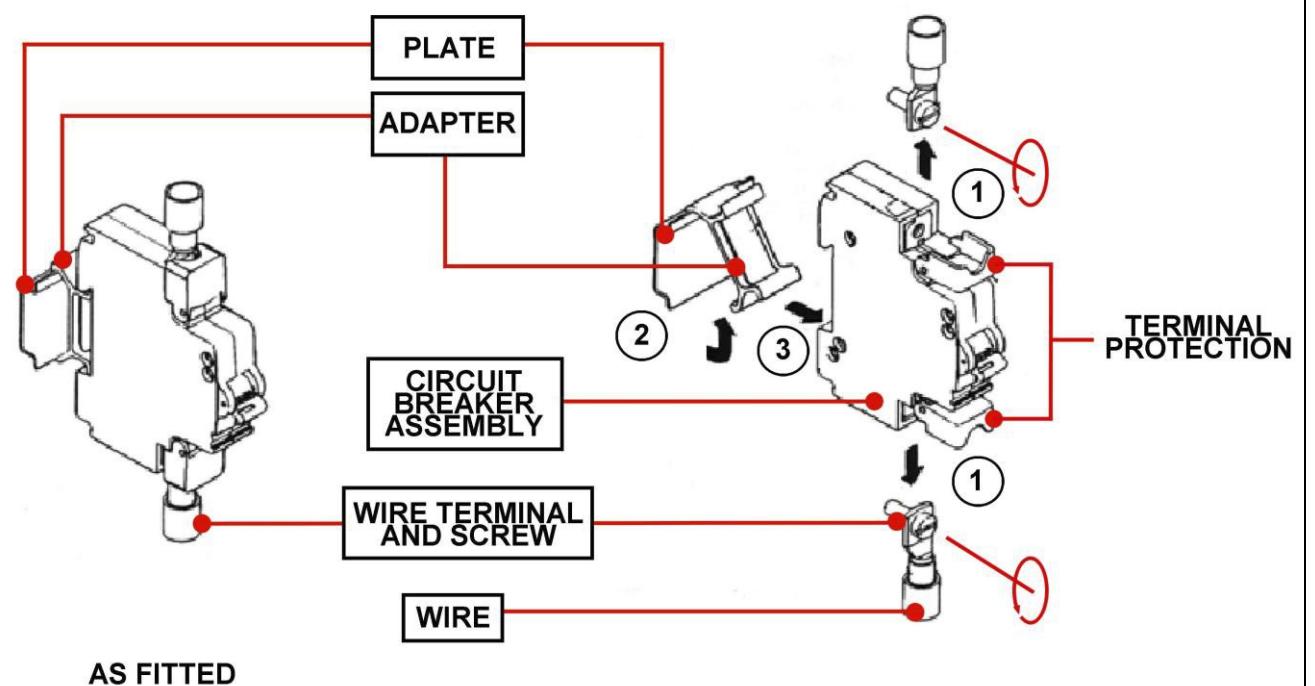
R-C-14-00-00-00/R-00

System: COMMUNICATIONS	Sheet: 7/8
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: CIRCUIT BREAKER TYPE S280	Man Hours: 0.5

Maintenance Task: REPLACEMENT (TYPICAL)

PROCEDURE:

- 4 Remove and discard the Circuit Breaker according to the Instructions provided in the following figure 4


FIGURE 4 -CB REMOVAL

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-00

System:

COMMUNICATIONS

Sheet:

8/8

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

CIRCUIT BREAKER TYPE S280

Unit:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)

PROCEDURE (CONT'D):

- 5 Install the Circuit Breaker according to the instructions provided in the following figure 5

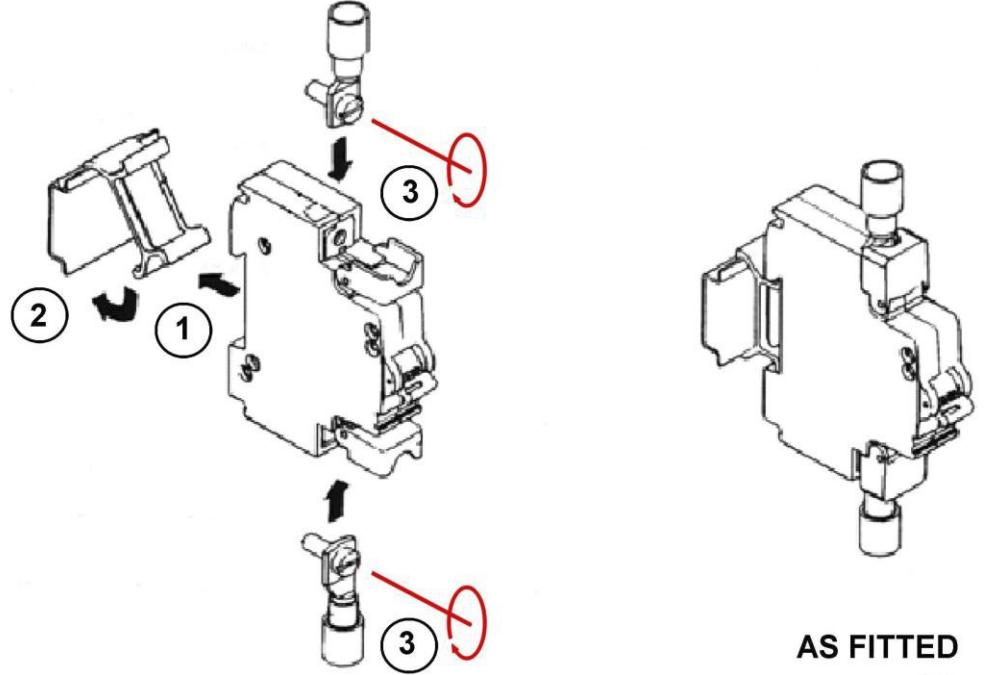
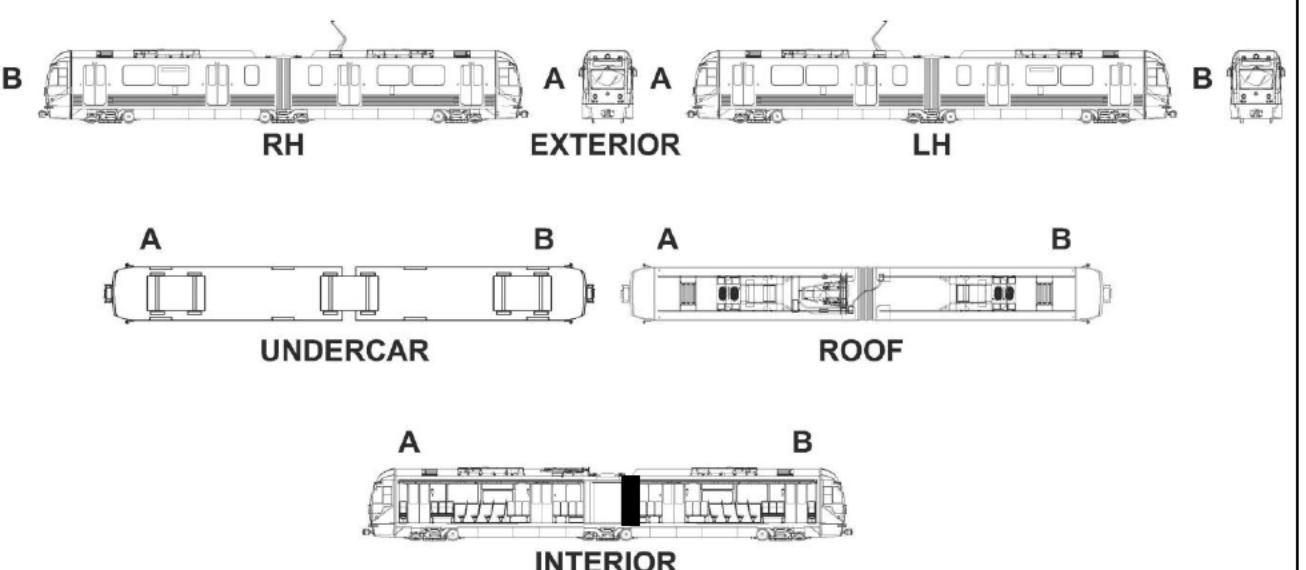


FIGURE 5 -CB INSTALLATION

- 6 Install the Circuit Breakers Front Panel and secure it by installing and tightening the relevant Fixing Screws.
 7 Restore Electrical Power
 8 Record Task Result on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS**(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."

P2550 CORRECTIVE MAINTENANCE SHEET							
Card Code: R-C-14-00-00-00/R-01							
System: COMMUNICATIONS				Sheet: 1/6			
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE				Unit:			
Component: RELAY				Man Hours: 0.5			
Maintenance Task: REPLACEMENT (TYPICAL)							
LOCATION							
							
APPLICABILITY:							
This Replacement procedure is applicable to the following Items:							
TABLE 1 RELAY IDENTIFICATION & LOCATIONS							
LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
13D01	CCU TIMER RELAY	2 CONTACTS	211VD00903B04	B	LV LOCKER	LV	118
13K01	CCU RELAY	2 CONTACTS	211VK01374B0802	B	LV LOCKER	LV	118

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-01

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

RELAY

Sheet:

2/6

Unit:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE
REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Standard Tools Kit

Multimeter (Fluke 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Relay Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-00-00-00/R-01	
System: COMMUNICATIONS	Sheet: 3/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: RELAY	Man Hours: 0.5
Maintenance Task: REPLACEMENT (TYPICAL)	
PROCEDURE:	
PRELIMINARY OPERATIONS	
Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:	
<ol style="list-style-type: none">1. Place the Vehicle in the Maintenance Shop.2. Set the Master Controller Handle to FSB position.3. Make sure that all Parking Brakes are applied (by checking on the IDU "Parking Brake A and B Not Released" and on Indicator Panel "A" "Park / Friction Brake" ON).4. Remove Electrical Power from Vehicle by lowering the Pantograph.5. Turn the Transfer Switch to OFF.6. Set the Pantograph Control Motor Switch (5F02 CB LV Locker "A" Section) to OFF.7. Lock out and tag out the Switch in accordance with all LACMTA Safety Rules, Regulations, Policies, and Procedures	
NOTE The tag must indicate the name of the person who removed Power.	
That person knows why the Power was removed and when it safe to restore it.	
Only the individual whose name appears on the tag or a person with his approval should remove the tag and restore Power.	
CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY CB LISTED IN THE PREVIOUS TABLE 1.	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-01

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

RELAY

Maintenance Task:

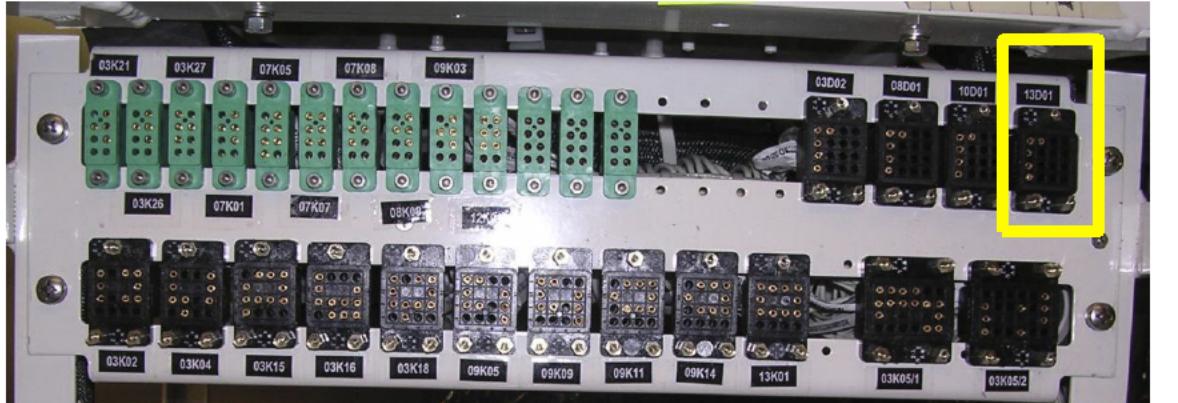
REPLACEMENT (TYPICAL)

PROCEDURE (CONT'D):

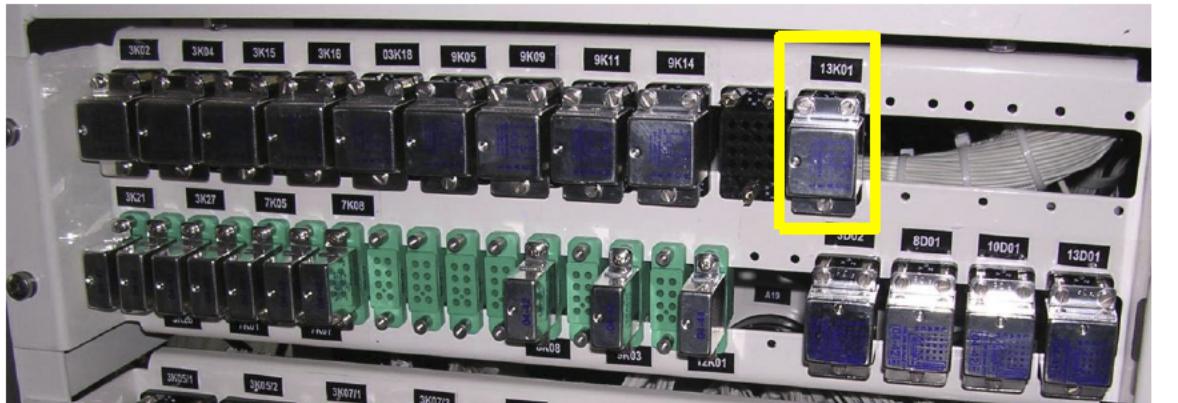
To perform the Task proceed as follows:

REMOVAL

1. Gain access to the Relays Rack installed in the "B" LV Lockers, by opening the relevant LV Locker Door using Maintenance Key.
2. Locate the Relay to be replaced.



13D01 RELAY



13K01 RELAY

FIGURE 1 - "B" LV LOCKER -RELAYS REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-00-00-00/R-01	
System: COMMUNICATIONS	Sheet: 5/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: RELAY	Man Hours: 0.5
Maintenance Task: REPLACEMENT (TYPICAL)	
PROCEDURE: REMOVAL(cont'd)	
<ol style="list-style-type: none">3. Loosen and remove the Self Locking Nuts & Washers fixing the Relay to the Rack. Retain them for later use.4. Slide out the Relay in order to gain access to the relevant Wiring and Terminals connections.5. Take note of Wiring Identification Labels and relevant positions on Relay Terminals.6. Disconnect the Wiring Cable from Relay Terminals.7. Remove and discard the Relay.	
INSTALLATION <ol style="list-style-type: none">1. Clean the Relay Seat using recommended Cleaner / Agent and lint-free rags.2. Check Relay Plate for installation / missing / loose Hardware.3. Torque, as per check result, to 15.2 ft-lb.4. Check Wires and Wire Terminals for signs of overheating.5. Connect the Wiring to the Relay Terminals according to their position and Identification Labels previously noted. Refer to the Functional Schematic Sheet listed in the previous Table 1 for complete Wiring Details.6. Torque the Wires Screw Terminals to 4 ft-*lb7. Install the Relay in its position.8. Install the Relay attaching Washers and Self Locking Nuts. Torque to 4 ft-*lb.9. Leave the LV Locker.10. Close and the LV locker Door using Maintenance Key.11. Restore Electrical Power.12. Record Task results on the Defect Report Card for administrative and maintenance planning.	
NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains. Refer to HOW TO USE THE R-CM SHEETS (para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 " At every Task Completion. "	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-01

System:

COMMUNICATIONS

Sheet:

6/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

RELAY

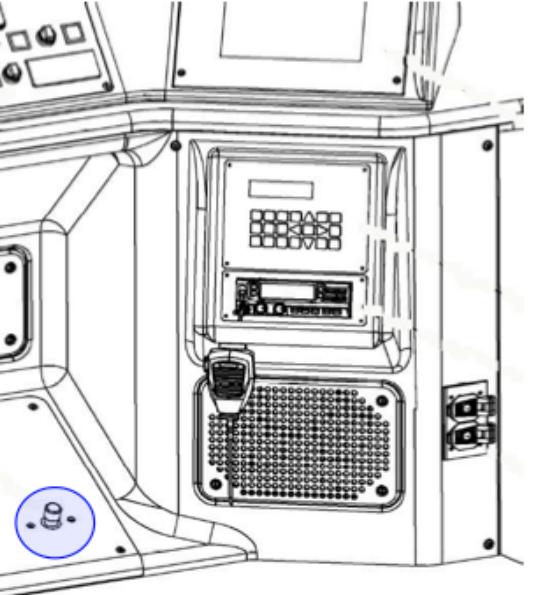
Man Hours:

0.5

Maintenance Task:

REPLACEMENT (TYPICAL)

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P2550 CORRECTIVE MAINTENANCE SHEET						
Card Code:						R-C-14-00-00-00/R-02
System:						Sheet:
COMMUNICATIONS						1/6
Subsystem/Assy:						Unit:
COMMUNICATIONS & VIDEO SURVEILLANCE						
Component:						Man Hours:
SWITCH						0.5
Maintenance Task:						
REPLACEMENT(TYPICAL)						
LOCATION:						
						
						
APPLICABILITY:						
This Replacement procedure is applicable to the following Item:						
TABLE 1 SWITCHES IDENTIFICATION & LOCATIONS						
LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS
						SCHEMATICS
13S01	FOOT SWITCH			A - B	UNDER CONSOLE FLOOR	LV 119 120

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-02

System:

COMMUNICATIONS

Sheet:

2/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

SWITCH

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE
REPLACEMENT OF ANY SWITCH LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Multimeter (Fluke 87 V/E) PN 4EB19

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Switches Identification & Locations

P2550 CORRECTIVE

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

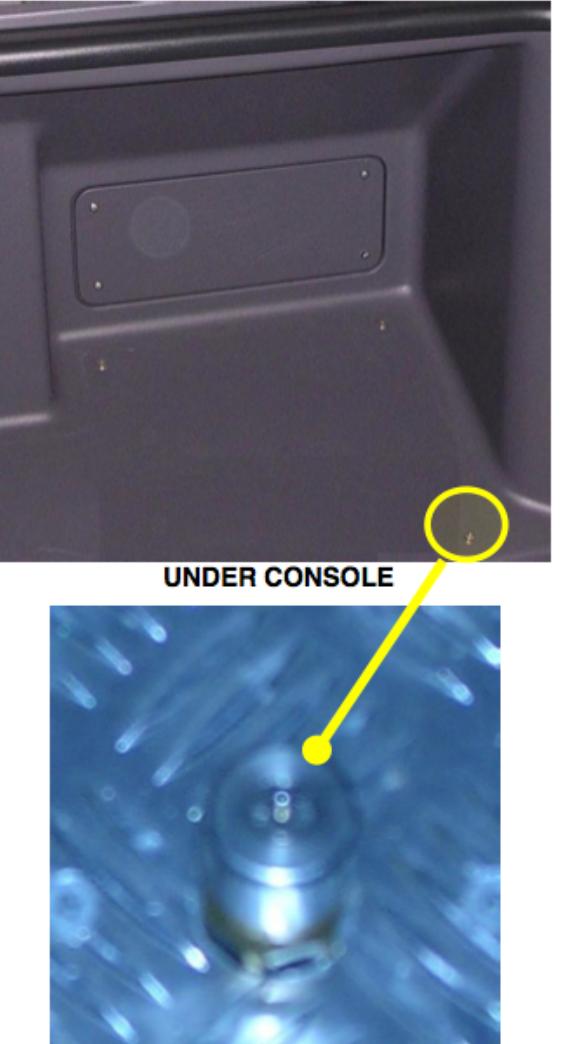
Component:

SWITCH

Maintenance Task:

REPLACEMENT

PROCEDURE:



**FIG 1 13S01 SWITCH
REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-02

System:

COMMUNICATIONS

Sheet:

4/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

SWITCH

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

PROCEDURE (CONT'D):

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:
 - CB 13F01, COMMUNICATION SYSTEM PROTECTION
 - CB 13F02, 13K01 PROTECTION
 - CB 13F03, SIGNS PROTECTION

REPLACEMENT

To perform the Switch Replacement proceed as follows:

1. Removal

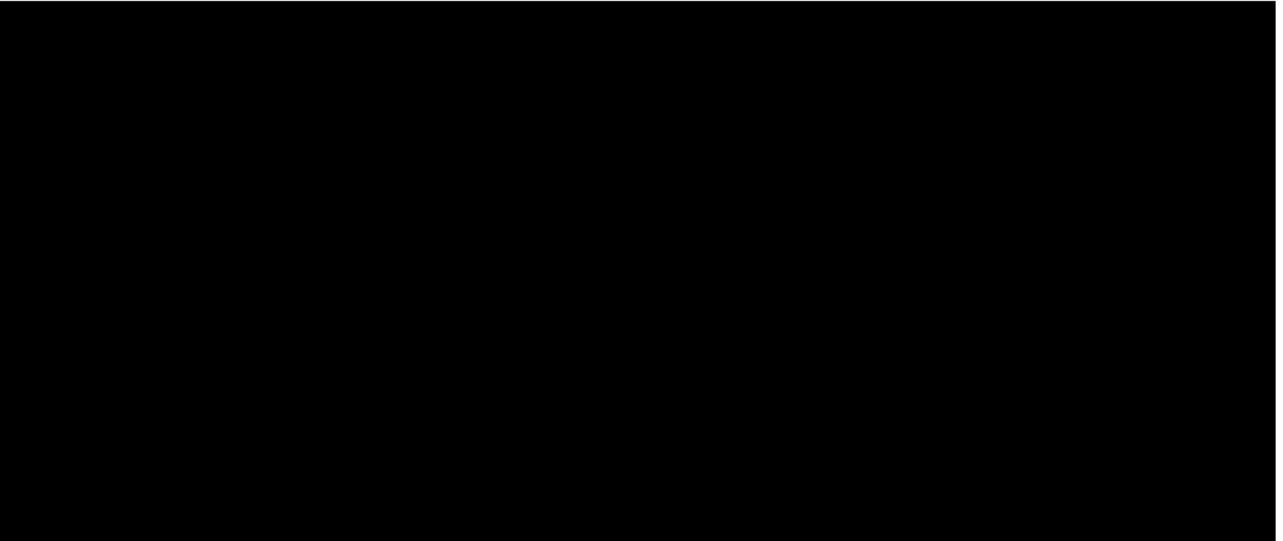
- a) Locate the 13S01 Foot PB to be removed.
 - b) Gain access to the Switch Body and its Electrical Connections by unscrewing and removing the relevant attaching hardware.
- NOTE:** It is advised to retain the attaching Hardware for later use.
- c) Note the Switch Body Wiring Identification Labels.
 - d) Disconnect the Switch Body electrical Connections.
 - e) Disengage the Switch Assy from its seat.
 - f) Remove the Switch Assy by pushing it from the rear toward the front of the Floor Panel.

2. Installation

- a) Install and engage on its seat the Switch Assy to be installed.
- b) Connect the Switch Body Electrical Connections according to the previously noted Wiring Identification Labels (Refer to Figure 2 for Switch Body Wiring Scheme or to LV Functional Schematic, Sheets 119 & 120 for complete Wiring Scheme).
- c) Key on the Vehicle and check that the "new" Switch work properly.
- d) Record Task results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS**(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "**At every Task Completion.**"

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-00-00-00/R-02	
System: COMMUNICATIONS	Sheet: 5/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: SWITCH	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
	
FIG 2 13S01 FOOT PUSBUTTON SCHEMATIC DIAGRAM	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-02

System:

COMMUNICATIONS

Sheet:

6/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

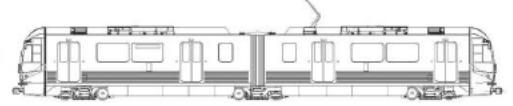
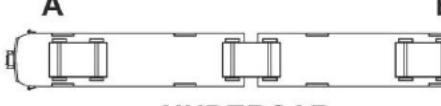
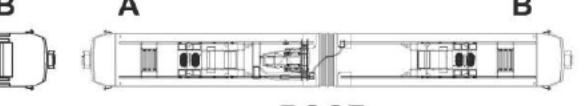
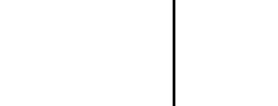
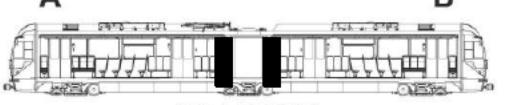
SWITCH

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**INTENTIONALLY
LEFT BLANK**

P2550 CORRECTIVE MAINTENANCE SHEET							
						Card Code: R-C-14-00-00-00/R-03	
System: COMMUNICATIONS			Sheet: 1/6				
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE			Unit:				
Component: RADIO CONTACTOR			Man Hours: 0.5				
Maintenance Task: REPLACEMENT							
LOCATION:							
B		A		A		B	
	RH		EXTERIOR		LH		
	A		B	A		B	
	UNDERCAR		ROOF				
	A		B				
	INTERIOR						
APPLICABILITY							
This Replacement procedure is applicable to the following Items:							
TABLE 1 CONTACTORS IDENTIFICATION & LOCATIONS							
LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
13K02	RADIO CONTACTOR	S163	211VK00212B	A-B	LV LOCKER	LV	119

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-03

System:

COMMUNICATIONS

Sheet:

2/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

Component:

RADIO CONTACTOR

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE
REPLACEMENT OF ANY CONTACTOR LISTED IN THE PREVIOUS TABLE 1

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

CRC 2000 Contact Cleaner

SPARE PARTS:

Refer to Table 1 Contactors Identification & Locations

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-00-00-00/R-03	
System: COMMUNICATIONS	Sheet: 3/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: RADIO CONTACTOR	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
PRELIMINARY OPERATIONS	
Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:	
<ol style="list-style-type: none">1. Place the Vehicle in the Maintenance Shop.2. Set the Master Controller Handle to FSB position.3. Make sure that all Parking Brakes are applied (by checking on the IDU "Parking Brake A and B Not Released" and on Indicator Panel "A" "Park / Friction Brake" ON).4. Remove Electrical Power from Vehicle by lowering the Pantograph.5. Turn the Transfer Switch to OFF.6. Set the Pantograph Control Motor Switch (5F02 CB LV Locker "A" Section) to OFF.7. Lock out and tag out the Switch in accordance with all LACMTA Safety Rules, Regulations, Policies, and Procedures.	
NOTE The tag must indicate the name of the person who removed Power. That person knows why the Power was removed and when it safe to restore it. Only the individual whose name appears on the tag or a person with his approval should remove the tag and restore Power.	
CAUTION: SWITCH OFF THE 3F01 CB (BATTERY BOX) BEFORE STARTING TO PERFORM THE REPLACEMENT OF ANY CONTACTOR LISTED IN THE PREVIOUS TABLE 1.	
REMOVAL	
To perform the Task proceed as follows:	
<ol style="list-style-type: none">1. Gain access to the Contactor to be replaced by opening the "A"/"B" LV Locker Door.	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-03

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

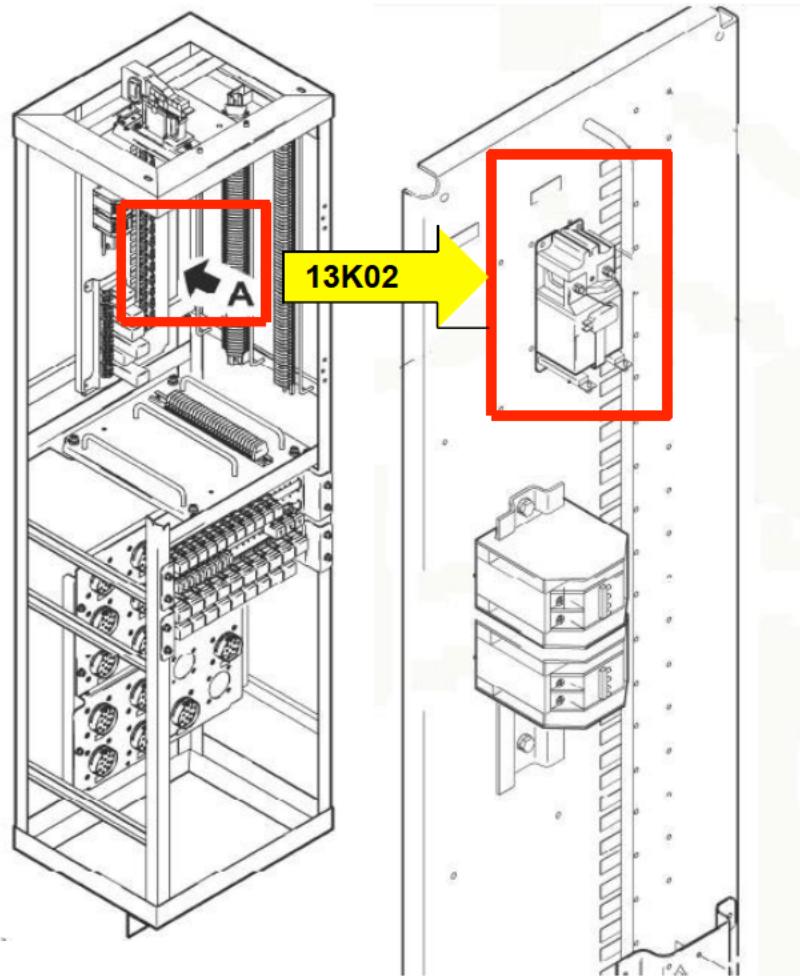
Component:

RADIO CONTACTOR

Maintenance Task:

REPLACEMENT**PROCEDURE (CONT'D):****REMOVAL**

2. Locate the Contactor to be replaced



**FIG 1 LV LOCKER
13K02 CONTACTOR LOCATION**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-03

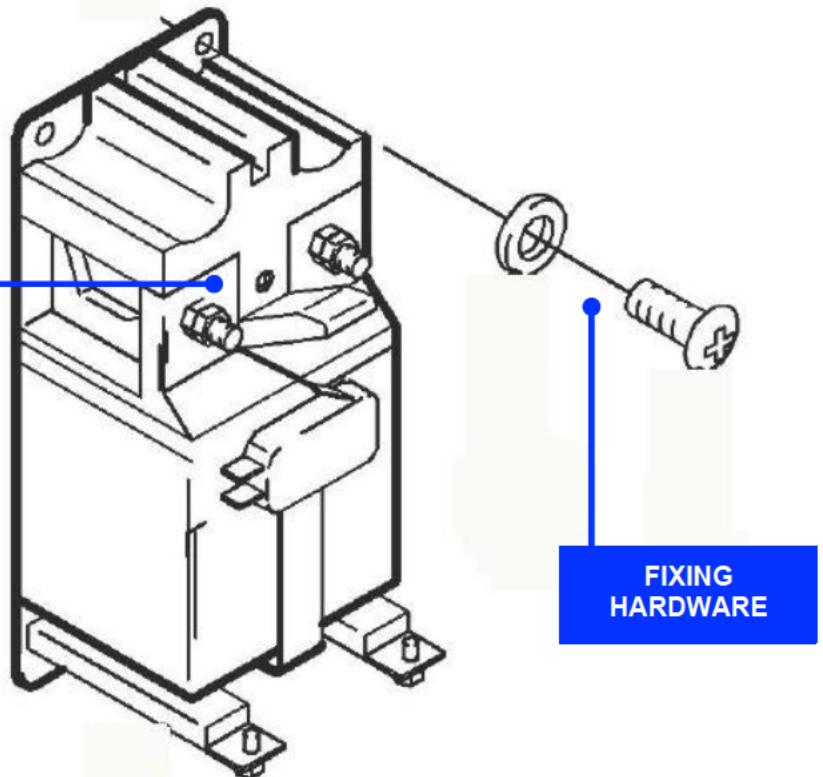
System: COMMUNICATIONS	Sheet: 5/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit:
Component: RADIO CONTACTOR	Man Hours: 0.5

Maintenance Task: REPLACEMENT

PROCEDURE: (CONT'D):

3. Disconnect Electrical Connections from the Contactor. Take note of the Wiring Identification Labels
4. Loosen and remove the Contactor Fixing Self Locking Nuts & Washers.

Retain them for later use.

**FIG 2 13K02 CONTACTOR REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-00-00-00/R-03

System:

COMMUNICATIONS

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Component:

RADIO CONTACTOR

Maintenance Task:

REPLACEMENT**PROCEDURE (CONT'D):****INSTALLATION**

To perform the Task proceed as follows:

1. Clean the Contactor Seat using recommended Cleaner / Agent and lint-free rags.
2. Check Wires and Wire Terminals for signs of overheating.
3. Connect the Wiring to the Contactor Terminals according to their position and Identification Labels previously noted.
4. Refer to the Functional Schematic Sheet listed in the previous Table 1 for complete Wiring Details.
5. Torque the Wires Screw Terminals to **4 ft-*lb**.
6. Install the Contactor in its position.
7. Install the Contactor attaching Washers and Self Locking Nuts. Torque to **4 ft-*lb**.
8. Leave the Task area by closing and locking the LV Locker Door.
9. Restore Electrical Power.

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS**(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 “**At every Task Completion.**”

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-01-00/R-00

System:

COMMUNICATIONS

Sheet:

1/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

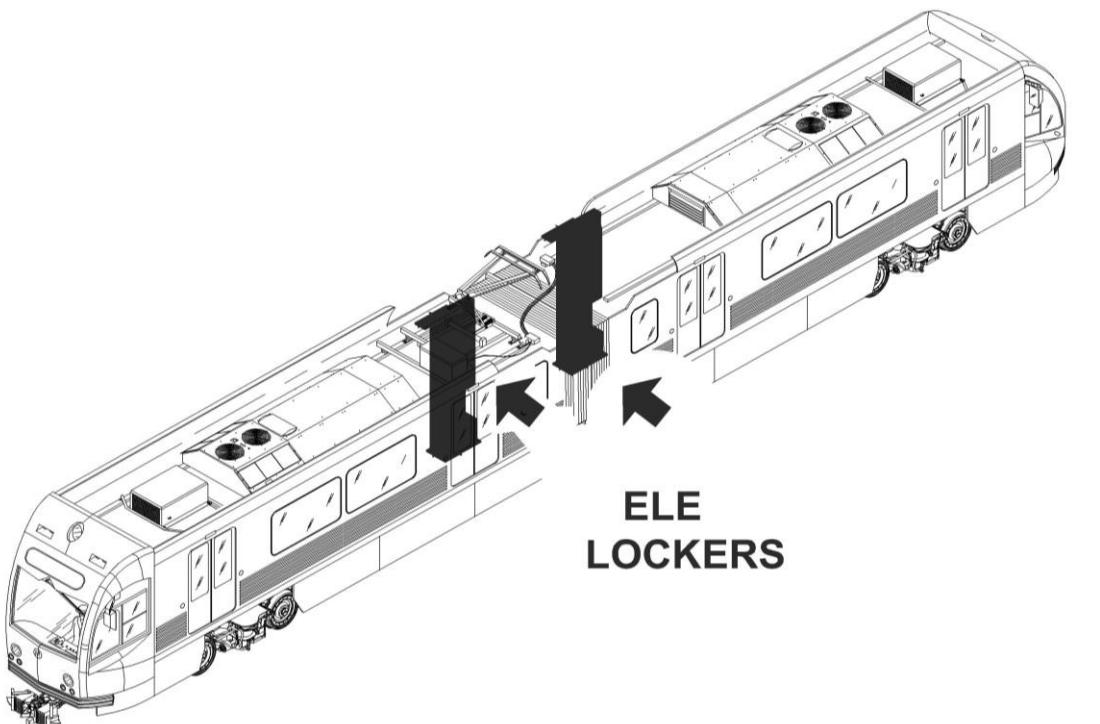
COMMUNICATION CONTROL UNIT (CCU)

Component:

Man Hours:

1

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-01-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

COMMUNICATION CONTROL UNIT (CCU)

Component:

Man Hours:

1

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: A TECHNICIAN HANDLING ELECTRONIC ASSEMBLIES AND COMPONENTS SHOULD WEAR A CONDUCTIVE WRIST STRAP WITH A GROUND WIRE CONNECTED EITHER TO EARTH OR CHASSIS (VEHICLE) GROUND.

CAUTION: NEVER TOUCH OR HANDLE THE PC BOARD BY ITS TRACES, CONNECTOR TEETH, OR COMPONENTS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Communication Control Unit (CCU) P/N: AA03EUZ (DA710-01)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-01-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: COMMUNICATION CONTROL UNIT (CCU)
Component:	Man Hours: 1
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> CB 13F01, COMMUNICATION SYSTEM PROTECTION, CB 13F02, 13K01 PROTECTION, CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows:</p> <ol style="list-style-type: none"> 1. Gain access to Communication Control Unit (CCU) by opening the relevant "A/B" Section ELE Locker door using Maintenance Key. 2. Locate the CCU. 3. Disconnect the CCU Connectors. 4. Loosen the relevant CCU Assy Fixing Screws. Retaining them for later use. 5. Carefully pull the CCU Assy out from Rack by sliding it out from the relevant Guide. Make it available for repair. <p>CAUTION: A TECHNICIAN HANDLING ELECTRONIC ASSEMBLIES AND COMPONENTS SHOULD WEAR A CONDUCTIVE WRIST STRAP WITH A GROUND WIRE CONNECTED EITHER TO EARTH OR CHASSIS (VEHICLE) GROUND.</p> <p>CAUTION: NEVER TOUCH OR HANDLE THE PC BOARD BY ITS TRACES, CONNECTOR TEETH, OR COMPONENTS.</p> <ol style="list-style-type: none"> 6. Vacuum Clean the CCU Assy lodging in the Rack. Use recommended agent to complete the cleaning. 7. Install the new CCU Assy by sliding it onto its Guide and pushing it firmly to seat into the receptacle. 8. Fix and secure the CCU Assy by tightening the relevant Fixing Screws. 9. Connect the CCU Connectors. 10. Close and lock ELE Locker Door. 11. Restore power to the System. 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning. <p>NOTE: At Task Completion it is recommended to check that the board(s) have the appropriate software if applicable. Make sure the Hard Drive has the correct setting and files and/or functions of the Subsystem to which the replaced Equipment pertains. Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-01-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

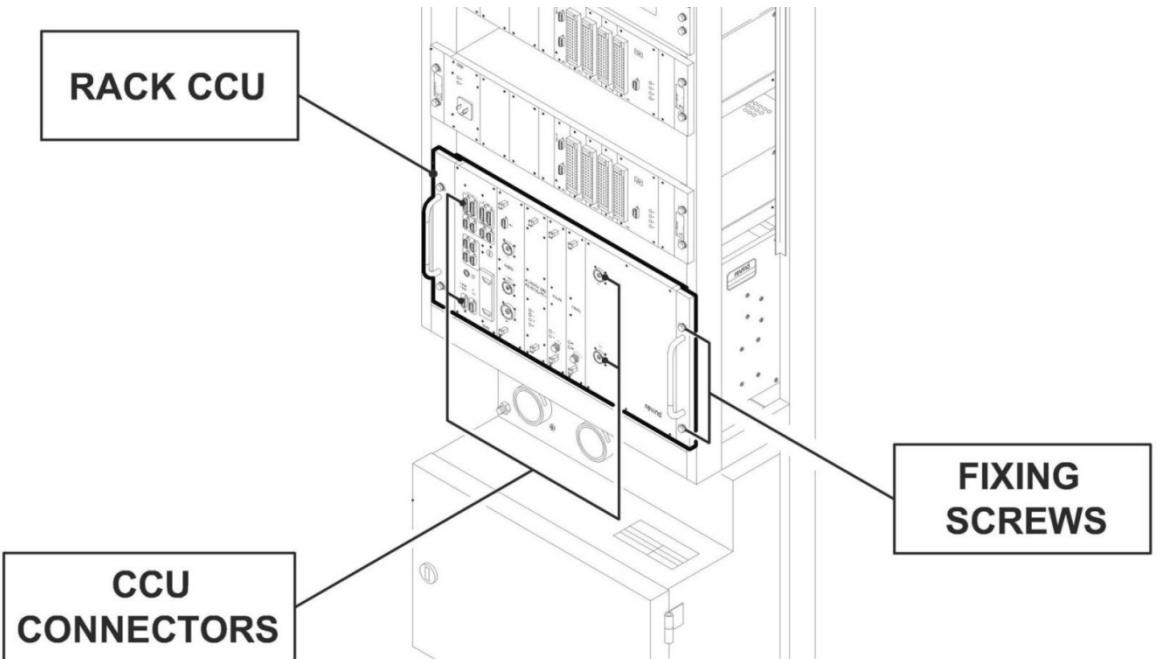
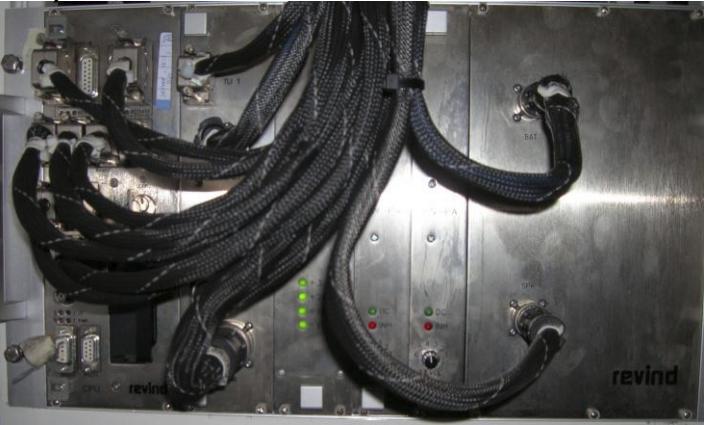
COMMUNICATION CONTROL UNIT (CCU)

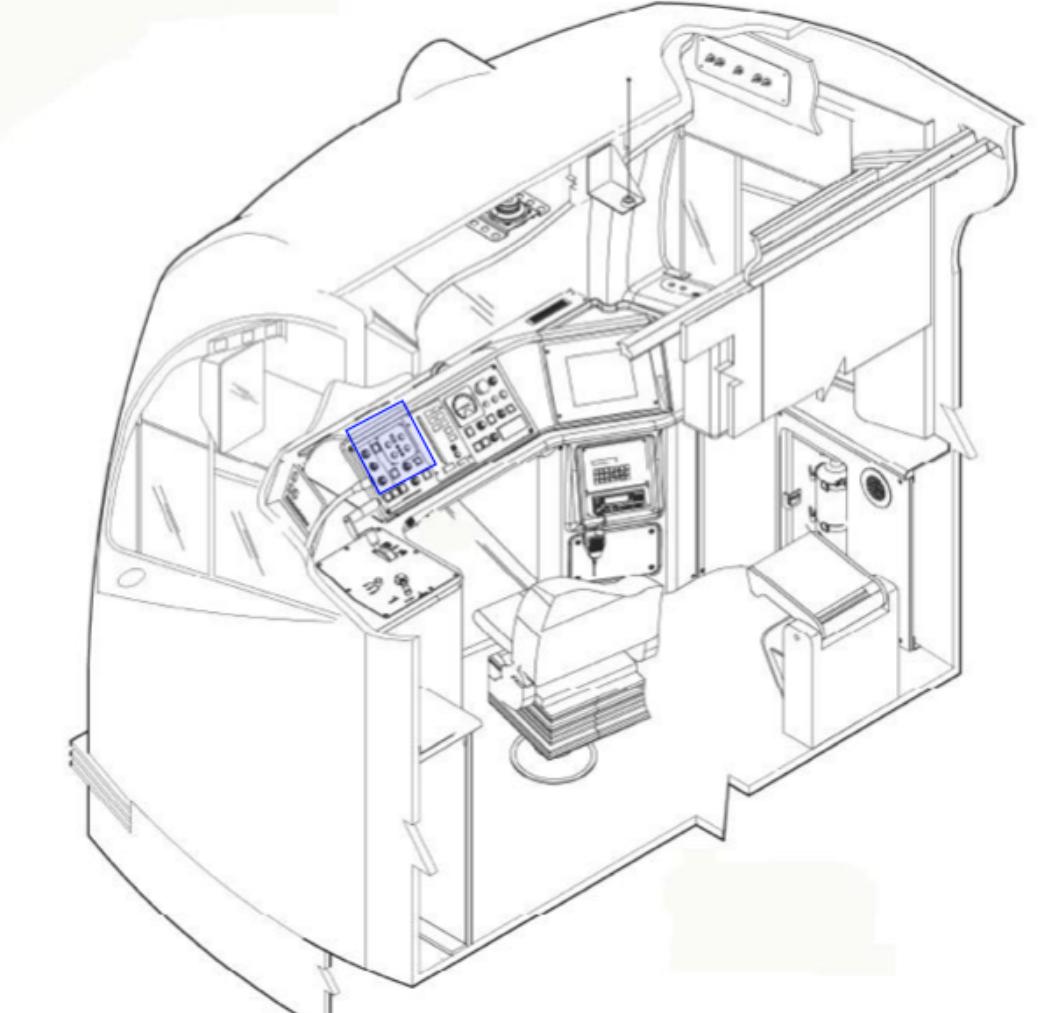
Component:

Man Hours:

1

Maintenance Task:

REPLACEMENT**PROCEDURE (CONT'D):****FIG 1 COMMUNICATION CONTROL UNIT REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-02-00/R-00	
System: COMMUNICATIONS	Sheet: 1/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: COMMUNICATION CONTROL HEAD (CCH)
Component:	Man Hours: 0.75
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-02-00/R-00

System:

COMMUNICATIONS

Sheet:

2/6

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

COMMUNICATION CONTROL HEAD (CCH)

Component:

Man Hours:

0.75

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Communication Control Head (CCH) P/N AA03EV9 (DA710-06)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-02-00/R-00	
System: COMMUNICATIONS	Sheet: 3/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: COMMUNICATION CONTROL HEAD (CCH)
Component:	Man Hours: 0.75
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows: (Refer to Figures 1 and 2):</p> <ol style="list-style-type: none"> 1. Gain access to Communication Control Head (CCH) on the Cab Console. 2. Remove the CCH Assy Fixing Screws. Retain them for later use. <p>CAUTION: A TECHNICIAN HANDLING ELECTRONIC ASSEMBLIES AND COMPONENTS SHOULD WEAR A CONDUCTIVE WRIST STRAP WITH A GROUND WIRE CONNECTED EITHER TO EARTH OR CHASSIS (VEHICLE) GROUND.</p> <ol style="list-style-type: none"> 3. Carefully lift the CCH Assy out of its Seat 4. Disconnect the CCH Connectors and remove the CCH. Make it available for repair. 5. Vacuum Clean the CCH Assy lodging. Use recommended agent to complete the cleaning. 6. Position the new CCH Assy onto the Driver Console and connect the CCH Connectors. 7. Carefully lower the CCH Assy into its Seat. 8. Fix and secure the CCH Assy by means of the relevant Fixing Screws. 9. Restore power to the System 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to make sure proper software version is update and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-02-00/R-00

System:

COMMUNICATIONS

Sheet:

4/6

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

COMMUNICATION CONTROL HEAD (CCH)

Component:

Man Hours:

0.75

Maintenance Task:

REPLACEMENT**PROCEDURE (CONT'D):**

FIGURE 1 - COMMUNICATION CONTROL HEAD (CCH) REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-02-00/R-00

System:

COMMUNICATIONS

Sheet:

5/6

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

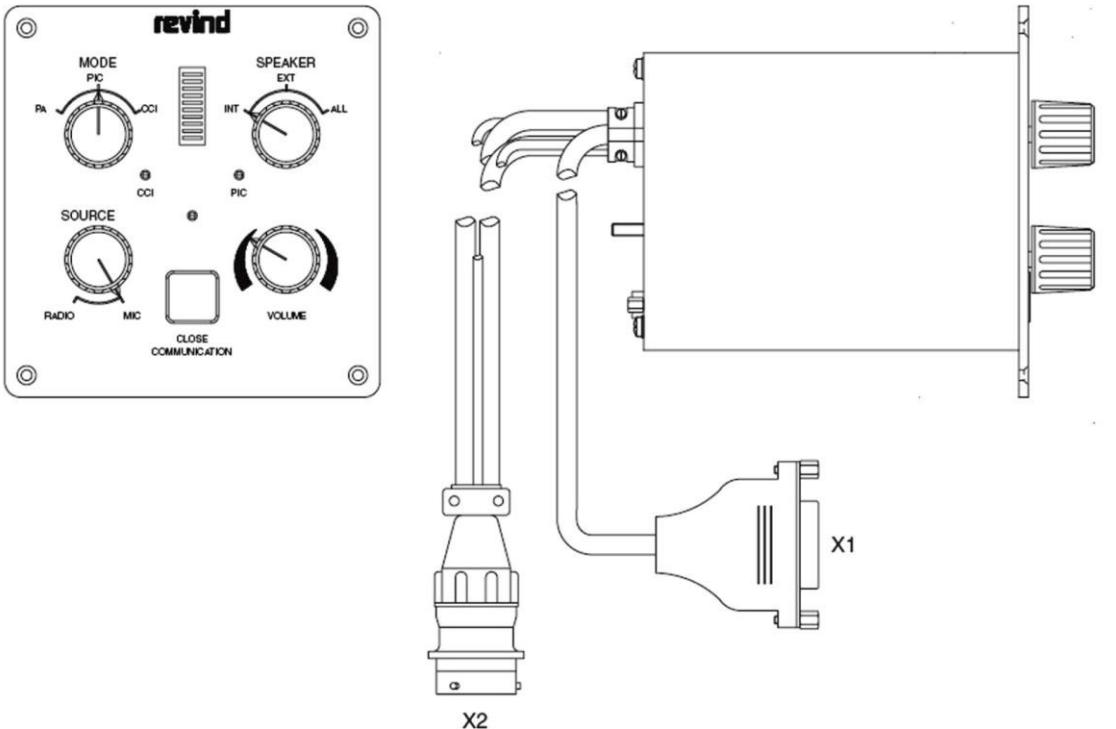
COMMUNICATION CONTROL HEAD (CCH)

Component:

Man Hours:

0.75

Maintenance Task:

REPLACEMENT**PROCEDURE (CONT'D):**
FIGURE 2 - COMMUNICATION CONTROL HEAD (CCH) COMPONENTS

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-02-00/R-00

System:

COMMUNICATIONS

Sheet:

6/6

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

COMMUNICATION CONTROL HEAD (CCH)

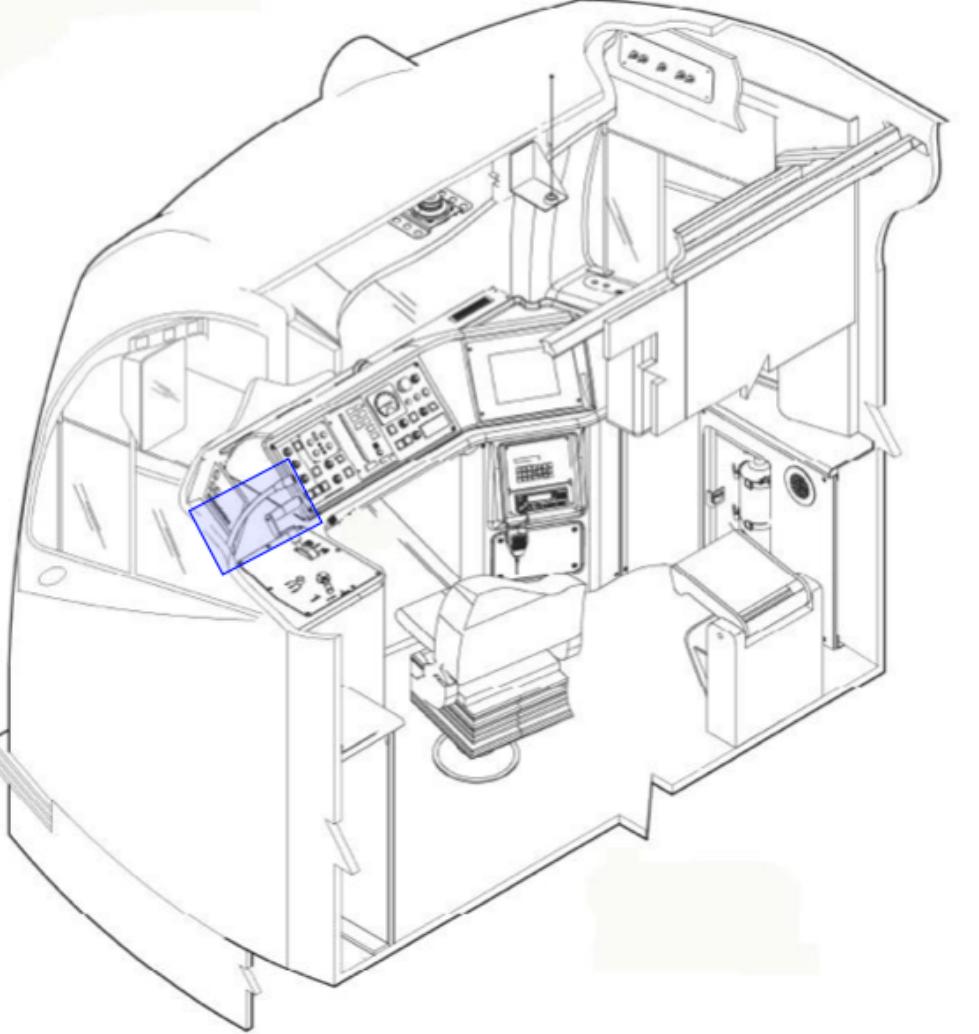
Component:

Man Hours:

0.75

Maintenance Task:

REPLACEMENT**INTENTIONALLY
LEFT BLANK**

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-03-00/R-00	
System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: GOOSENECK MICROPHONE
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-03-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

GOOSENECK MICROPHONE

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Gooseneck Microphone Assy P/N AA03LBW (DA710-18)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-03-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: GOOSENECK MICROPHONE
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows (Refer to Figure 1):</p> <ol style="list-style-type: none"> 1. Enter the Cab and locate the Gooseneck Microphone Assy (1). 2. Remove the Microphone Fixing Screws (2). Retain them for later use. 3. Carefully pull the Microphone Assy out of its Seat. 4. Disconnect the Microphone Assy Connector (3)and make the Microphone available for repair. 5. Vacuum Clean the Microphone Assy lodging. Use recommended agent to complete the cleaning 6. Position the new Microphone Assy (1) onto its Seat. 7. Connect the Microphone Assy Connector (3). 8. Fix and secure the Microphone Assy by means of the relevant fixing Screws (2). 9. Restore power to the System. 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning. <p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-03-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

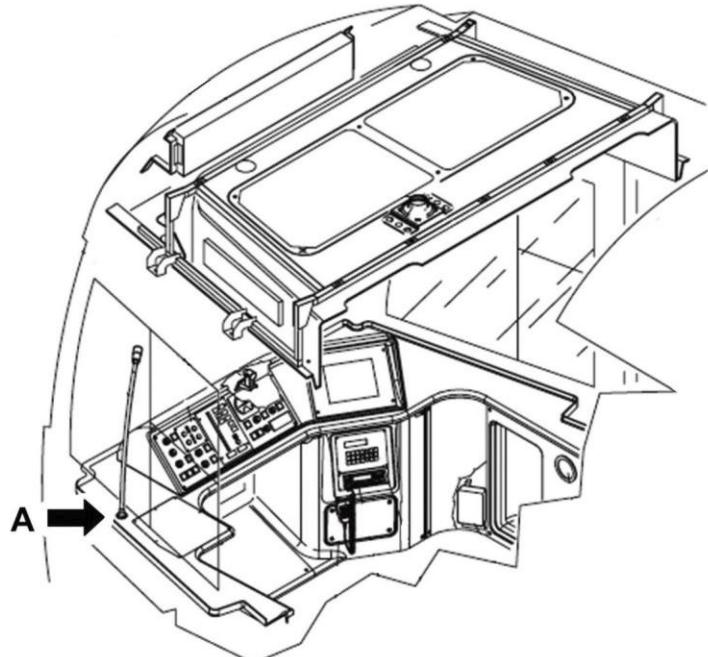
GOOSENECK MICROPHONE

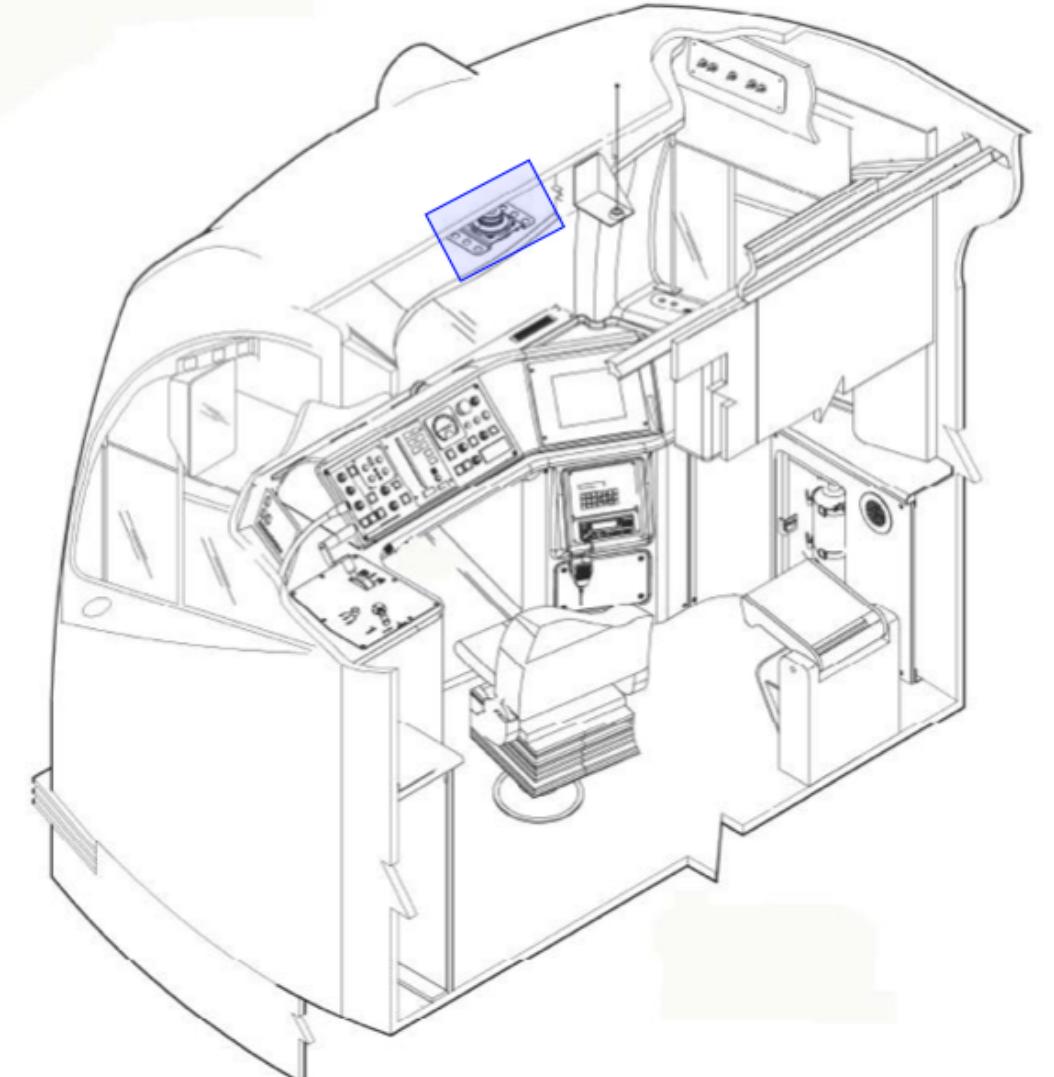
Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**PROCEDURE:****FIGURE 1 - GOOSENECK MICROPHONE ASSY REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-04-00/R-00	
System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: CAB LOUDSPEAKER
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-04-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

CAB LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Cab Loudspeaker P/N: AA01ZH (DA670-11)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-04-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: CAB LOUDSPEAKER
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows:</p> <ol style="list-style-type: none"> 1. Enter the Cab and locate the Loudspeaker (1) on the Cab Ceiling. 2. Gain access to the Loudspeaker by removing the Cab Ceiling Inspection Panel. 3. Remove the Loudspeaker Assy Fixing Screws (2) and Washers (3). Retain them for later use. 4. Carefully support the Loudspeaker Assy out of the Operator Cab Ceiling and disconnect the Connector. <p>NOTE: If damaged, remove the Mask (4) by removing the Fixing Screws (5).</p> <ol style="list-style-type: none"> 5. Make the Loudspeaker available for repair. 6. Vacuum clean the Loudspeaker Assy lodging. Use recommended agent to complete the cleaning 7. Position the Loudspeaker Assy (1) onto its Seat. 8. Connect the Loudspeaker Assy Connector. 9. Install the Local Loudspeaker Assy by means of the relevant fixing Screws (2) and Washers (3). <p>NOTE: If removed, install the Mask (4) and the Fixing Screws (5).</p> <ol style="list-style-type: none"> 10. Install and secure the Cab Ceiling Inspection Panel. 11. Restore Electrical Power to System. 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning. <p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-04-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

CAB LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

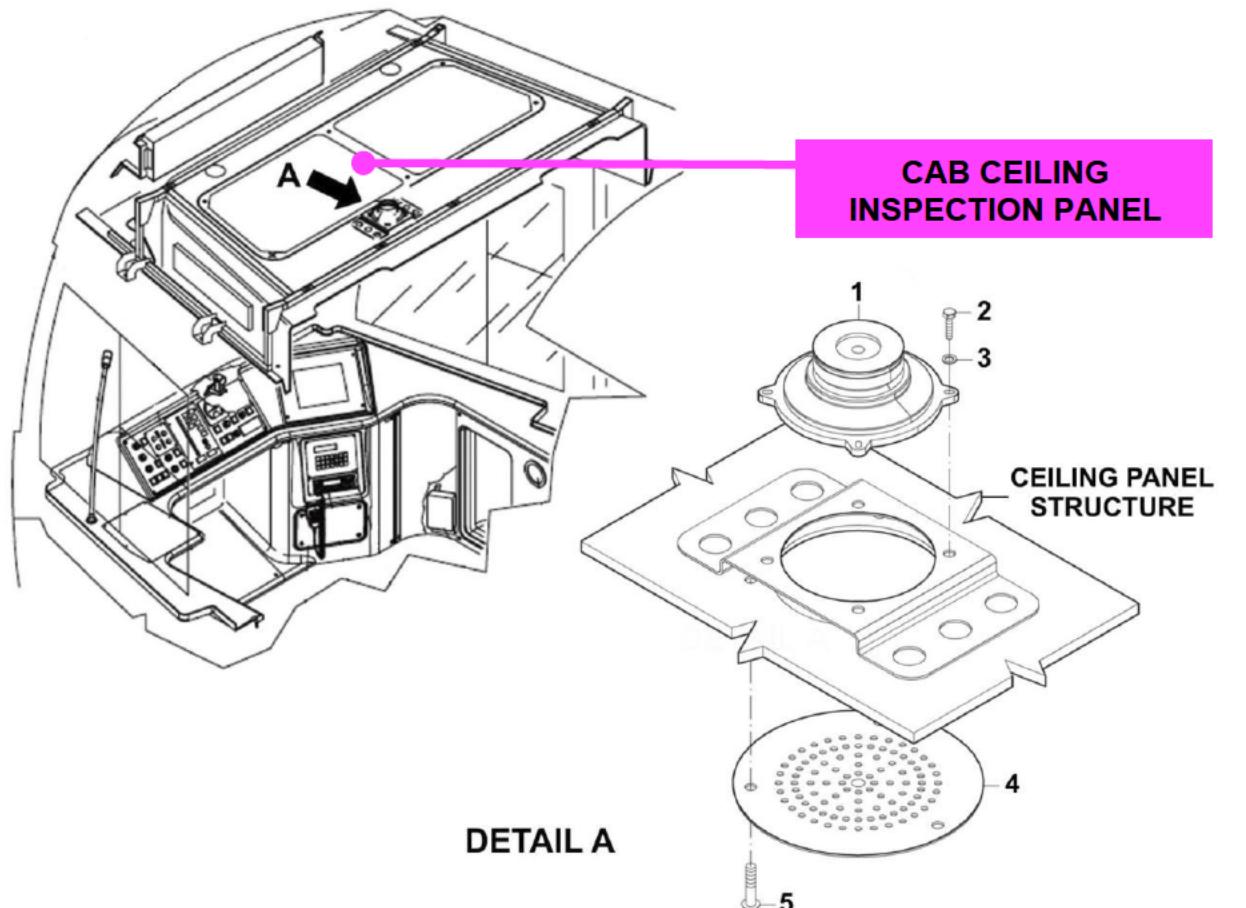
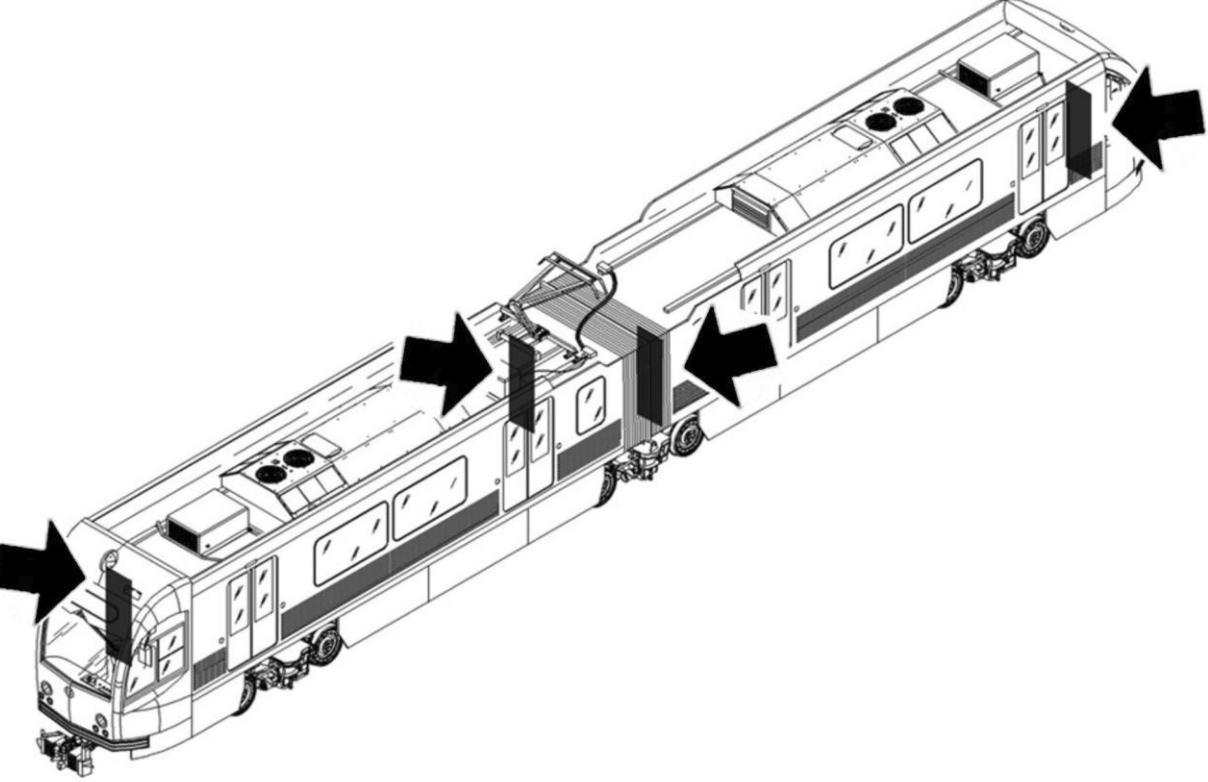
REPLACEMENT**PROCEDURE:**

FIGURE 1 - CAB LOUDSPEAKER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-05-00/R-00	
System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: PASSENGER INTERCOM(PIC)
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-05-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

PASSENGER INTERCOM(PIC)

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

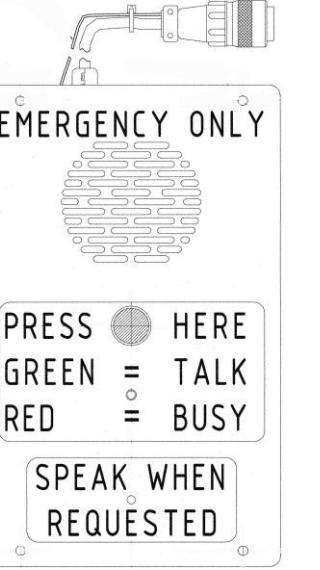
Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Passenger Intercom Unit (PIC) P/N: AA03EV3 (DA710-15)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-05-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: PASSENGER INTERCOM(PIC)
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows (Refer to Figure 1):</p> <ol style="list-style-type: none"> 1. Enter the Passenger Compartment and locate the PIC Unit(10) to be replaced 2. Remove the PIC Unit Fixing Hardware(30, 45, 40, 20) Retain them for later use. 3. Carefully pull the PIC Unit out from its Seat Make it available for repair. 4. Disconnect the PIC Unit Connector.(100, 110) 5. Vacuum Clean the PIC Unit lodging. Use recommended agent to complete the cleaning 6. Position the new PIC Unit onto its Seat. 7. Connect the PIC Unit Connector. 8. Install the PIC Unit by means of the relevant Fixing Hardware. 9. Restore Power to the System 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	



P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-05-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**COMMUNICATIONS &
VIDEO SURVEILLANCE**

Unit:

PASSENGER INTERCOM(PIC)

Component:

Man Hours:

0.5

Maintenance Task:

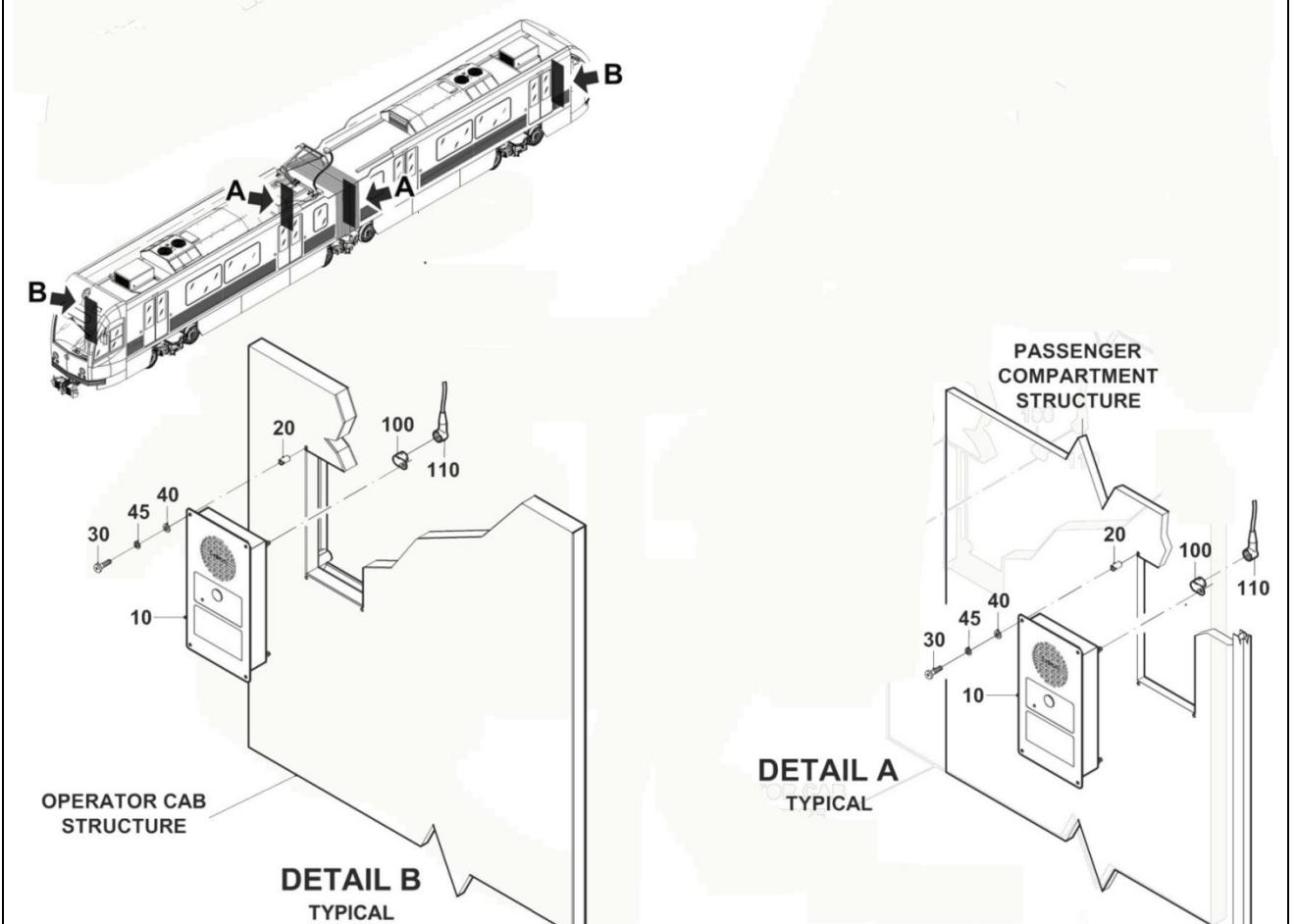
REPLACEMENT**PROCEDURE:**

FIGURE 1 - PIC UNIT REPLACEMENT

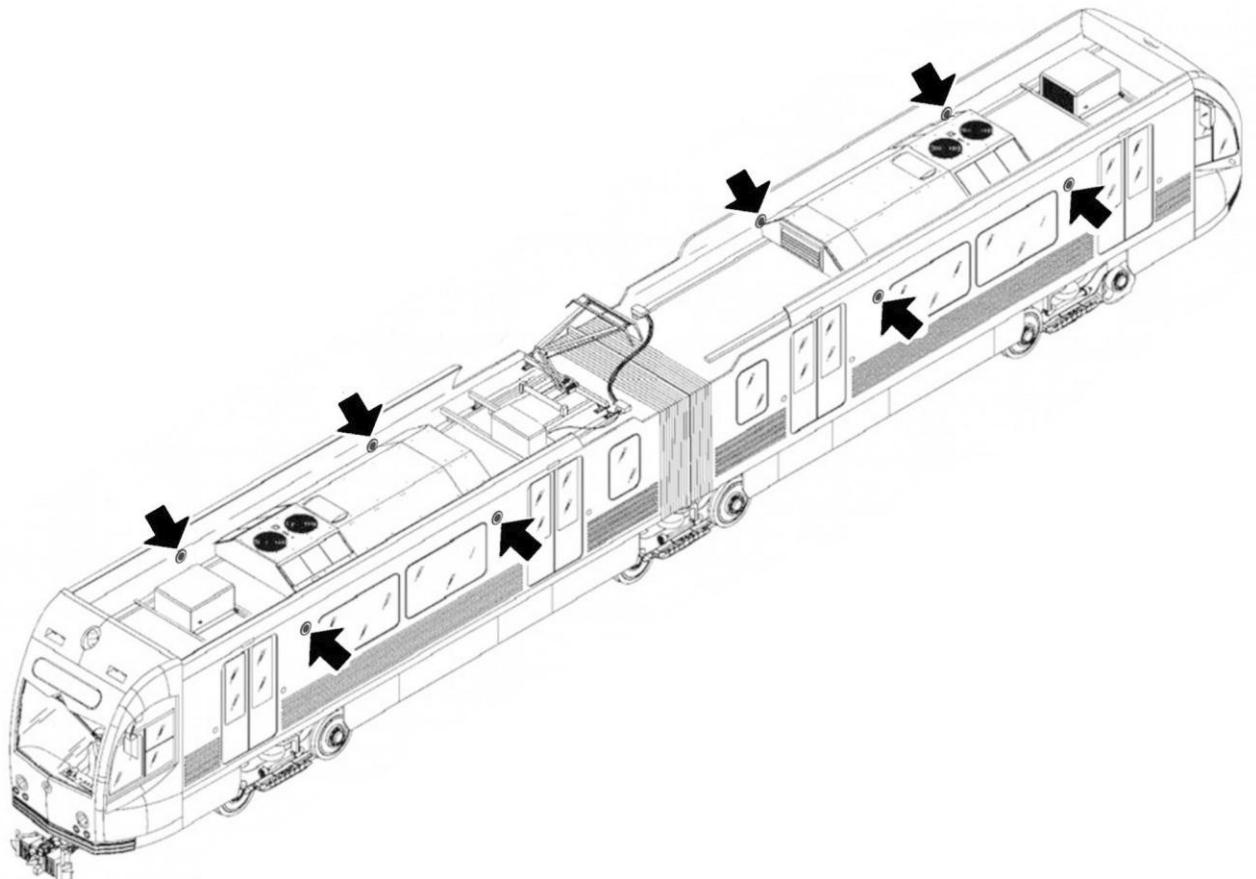
P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-06-00/R-00

System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: EXTERNAL LOUDSPEAKER
Component:	Man Hours: 0.5

Maintenance Task: REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-06-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

EXTERNAL LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

Adhesive Seal SIKAFLEX 221

SPARE PARTS:

External Loudspeaker Assy P/N: AA03EV5 (DA710-17)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-06-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: EXTERNAL LOUDSPEAKER
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE: PRELIMINARY OPERATIONS <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> CB 13F01, COMMUNICATION SYSTEM PROTECTION, CB 13F02, 13K01 PROTECTION, CB 13F03, SIGNS PROTECTION, 	
REPLACEMENT <p>To perform the Task proceed as follows (Refer to Figures 1& 2):</p> <ol style="list-style-type: none"> 1. Locate the Loudspeaker (1) to be removed. 2. Gain access to the Loudspeaker by open the relevant Ceiling Side Panel 3. Supporting the Loudspeaker, remove the Fixing Screws (3) and Washers (4, 5). Retain them for later use. 4. Carefully remove the Loudspeaker (1) with the Gasket (2). 5. Disconnect the Loudspeaker Connector. Make the Loudspeaker available for repair NOTE: If damaged, remove the Mask (4) by removing the Gasket (7), the Fixing Screws (8) and Washers (9, 10). 6. Vacuum clean the Loudspeaker lodging. Use recommended agent to complete the cleaning NOTE: If removed, install the Gasket (7), the Mask (6), and the Fixing Screws (8) and Washers (9, 10). 7. Apply SIKAFLEX 221 before positioning the Gasket (2) 8. Position the Gasket (2) and the new Loudspeaker (1) onto its Seat 9. Connect the Loudspeaker Connector. 10. Fix and secure the Loudspeaker by means of the relevant Fixing Screws (3) and Washers (4, 5). 11. Restore Power to the System 	
FINAL OPERATIONS <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains. Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion." 	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-06-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

EXTERNAL LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**PROCEDURE:**

FIGURE 1 - EXTERNAL LOUDSPEAKER VIEW FROM INSIDE

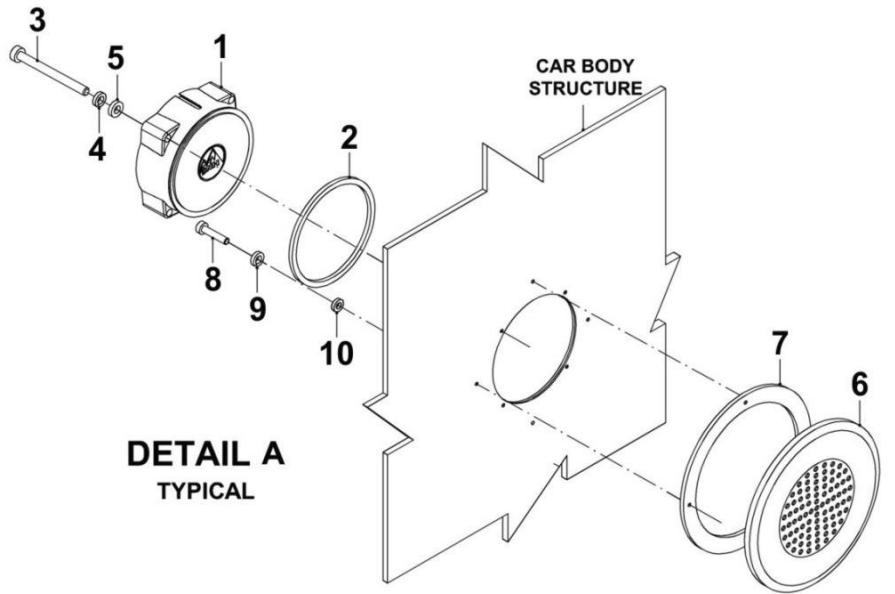
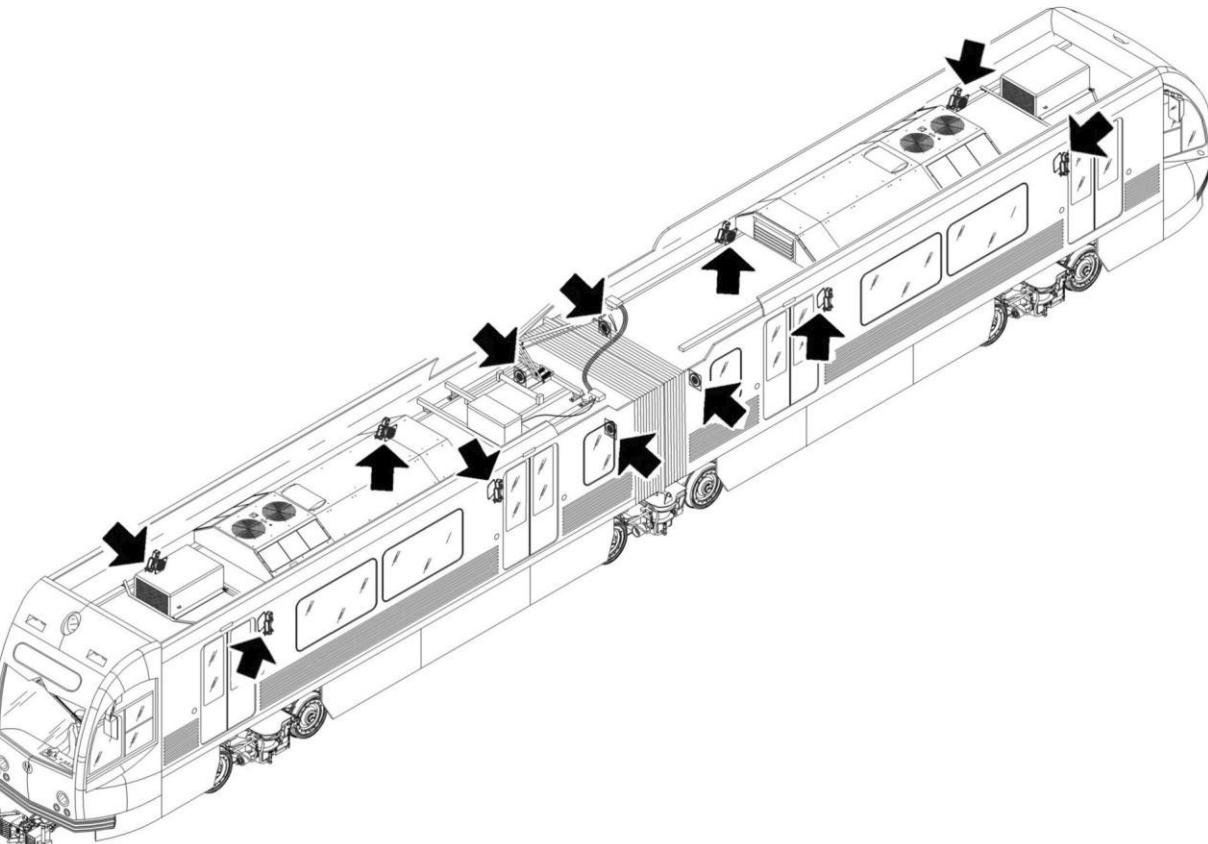


FIGURE 2 - EXTERNAL LOUDSPEAKER REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-07-00/R-00	
System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: INTERNAL LOUDSPEAKER
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-07-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

INTERNAL LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Internal Loudspeaker Assy P/N AA03EV4 (DA710-19)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-07-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: INTERNAL LOUDSPEAKER
Component:	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> CB 13F01, COMMUNICATION SYSTEM PROTECTION, CB 13F02, 13K01 PROTECTION, CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows (Refer to Figures 1& 2):</p> <ol style="list-style-type: none"> 1. Locate the Loudspeaker (1) to be removed. 2. Gain access to the Loudspeaker by opening the relevant Ceiling Side Panel 3. Supporting the Loudspeaker, remove the Fixing Screws (3) Washers (5,6) and Nuts (4) Retain them for later use. 4. Carefully remove the Loudspeaker (1) with the Gasket (2) 5. Disconnect the Loudspeaker Connector. Make the Loudspeaker available for repair NOTE: If damaged, remove the Mask (4) by removing the Gasket (7), the Fixing Screws (8) and Washers (9, 10). 6. Vacuum clean the Loudspeaker lodging. Use recommended agent to complete the cleaning NOTE If removed, install the Gasket (7), the Mask (6), and the Fixing Screws (8) and Washers (9, 10). 7. Position the Gasket (2) and the new Loudspeaker (1) onto its Seat 8. Connect the Loudspeaker Connector. 9. Fix and secure the Loudspeaker by means of the relevant Fixing Screws (3) and Washers (4, 5). 10. Restore Power to the System 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains. Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion." 	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-07-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**COMMUNICATIONS & VIDEO
SURVEILLANCE**

Unit:

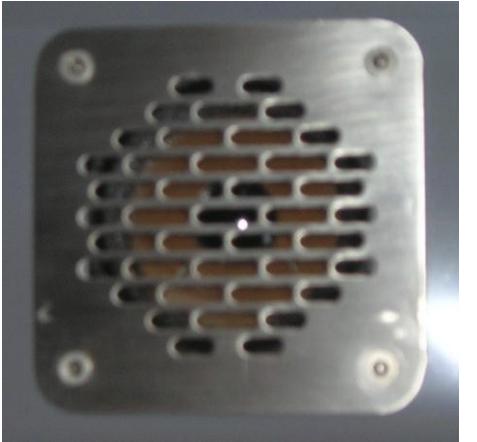
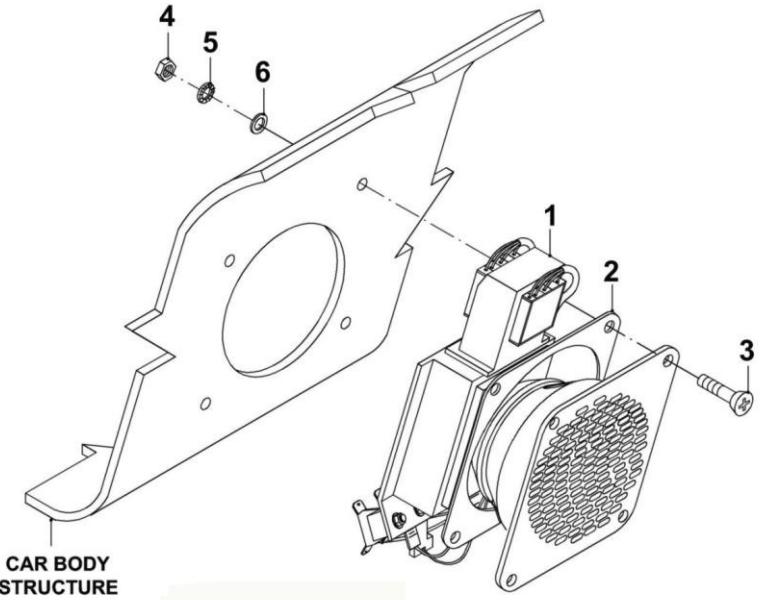
INTERNAL LOUDSPEAKER

Component:

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**PROCEDURE:****FIGURE 1 INTERNAL LOUDSPEAKER****FIGURE 2- INTERNAL LOUDSPEAKER REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-08-00/R-00

System:

COMMUNICATIONS

Sheet:

1/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

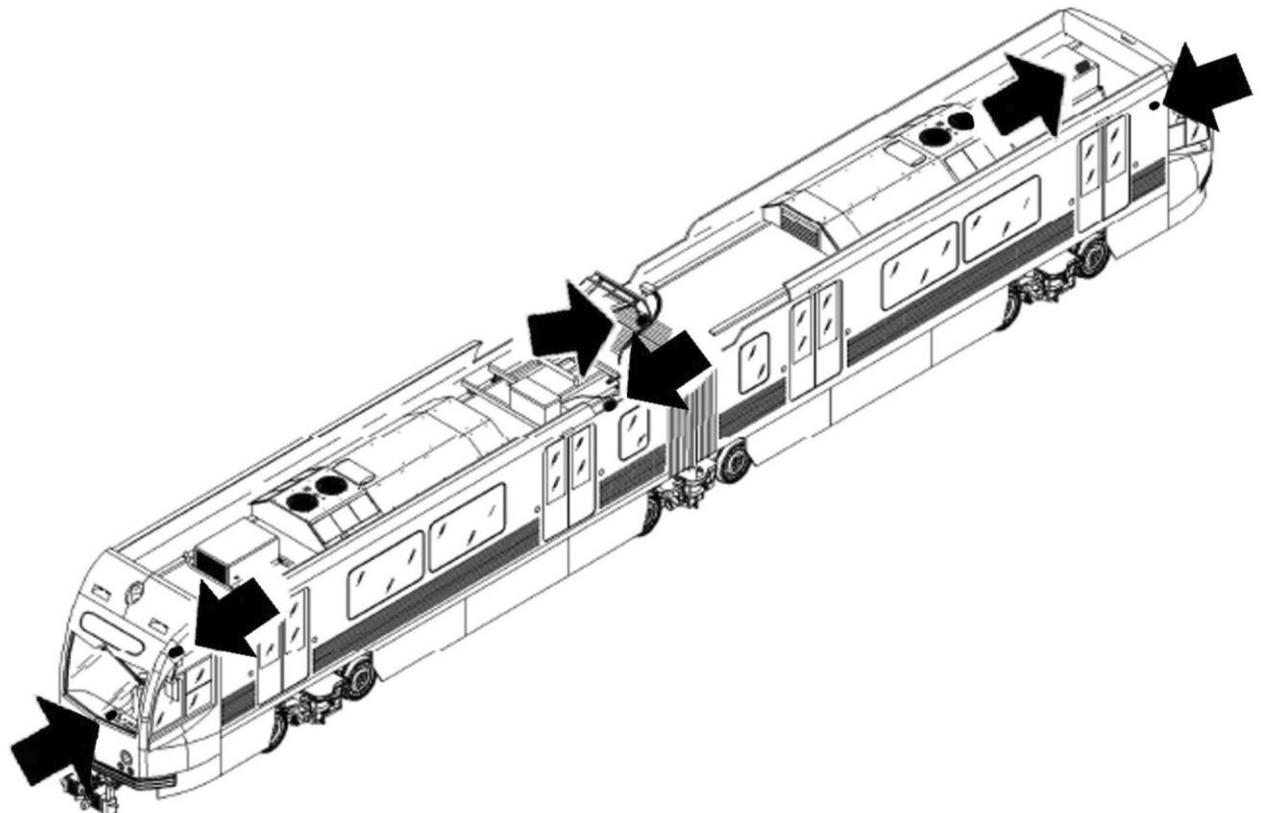
VIDEO CAMERA

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-08-00/R-00

System:

COMMUNICATIONS

Sheet:

2/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

VIDEO CAMERA

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Videocamera Assy P/N AA03EV7 (PM706-02)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-01-08-00/R-00	
System: COMMUNICATIONS	Sheet: 3/6
Subsystem/Assy: COMMUNICATIONS & VIDEO SURVEILLANCE	Unit: VIDEO CAMERA
Component:	Man Hours: 1.0
Maintenance Task: REPLACEMENT	
PROCEDURE:	
PRELIMINARY OPERATIONS	
<ol style="list-style-type: none">1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:<ul style="list-style-type: none">· CB 13F01, COMMUNICATION SYSTEM PROTECTION,· CB 13F02, 13K01 PROTECTION,· CB 13F03, SIGNS PROTECTION,	
REPLACEMENT	
To perform the Task proceed as follows (Refer to Figure 1& 2): <ol style="list-style-type: none">1. Locate the Video Camera (1) to be removed2. Support the Video Camera and remove the Fixing Screws (2) and Washers (3, 4). Retain them for later use.3. Carefully remove the Video Camera from the Support (5)4. Disconnect the Video Camera Connector. Make the Video Camera available for repair.5. Vacuum clean the Video Camera lodging. Use recommended agent to complete the cleaning6. Position the Video Camera (1) into the Support (5)7. Connect the relevant Connector.8. Fix and secure the Video Camera by means of the relevant Fixing Screws (2) and Washers (3, 4).9. Restore Power to the System	
FINAL OPERATIONS	
<ol style="list-style-type: none">1. Record Task Results on the Defect Report Card for administrative and maintenance planning	
<p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p>	
<p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-08-00/R-00

System:

COMMUNICATIONS

Sheet:

4/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

VIDEO CAMERA

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT

PROCEDURE:

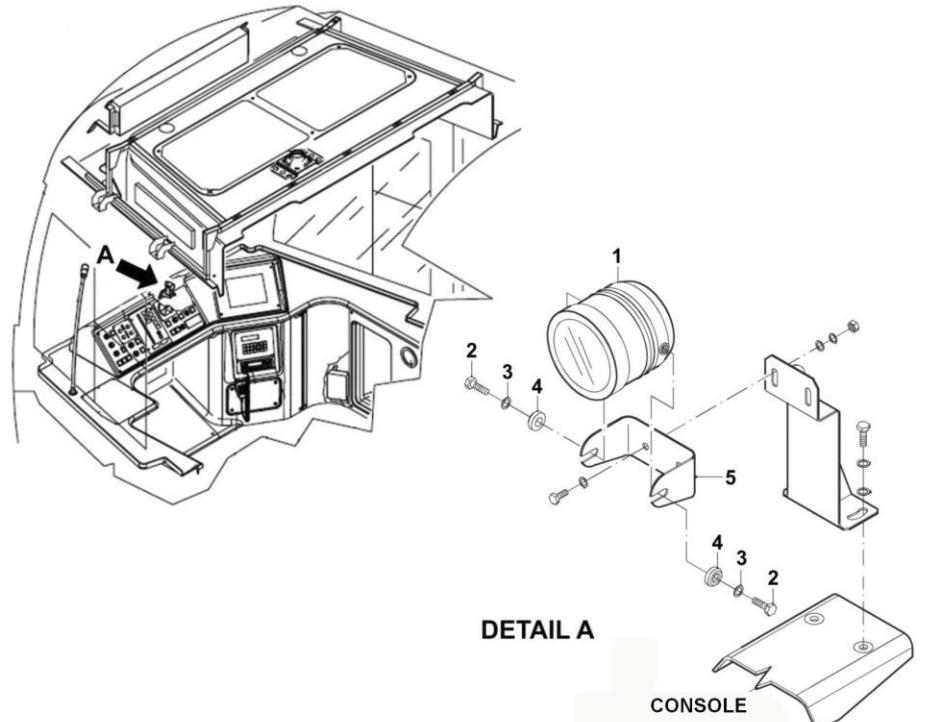


FIGURE 1 - CAB,VIDEO CAMERA REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-08-00/R-00

System:

COMMUNICATIONS

Sheet:

5/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

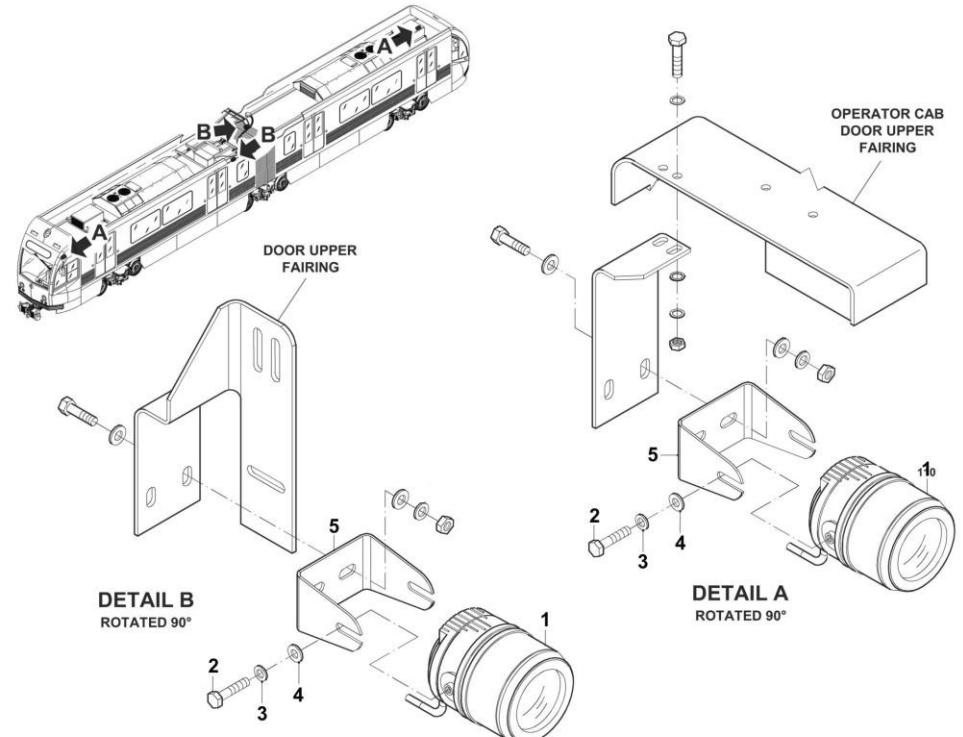
VIDEO CAMERA

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**PROCEDURE:**
FIGURE 2 - PASSENGER COMPARTMENT, VIDEO CAMERAS, REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-01-08-00/R-00

System:

COMMUNICATIONS

Sheet:

6/6

Subsystem/Assy:

COMMUNICATIONS & VIDEO SURVEILLANCE

Unit:

VIDEO CAMERA

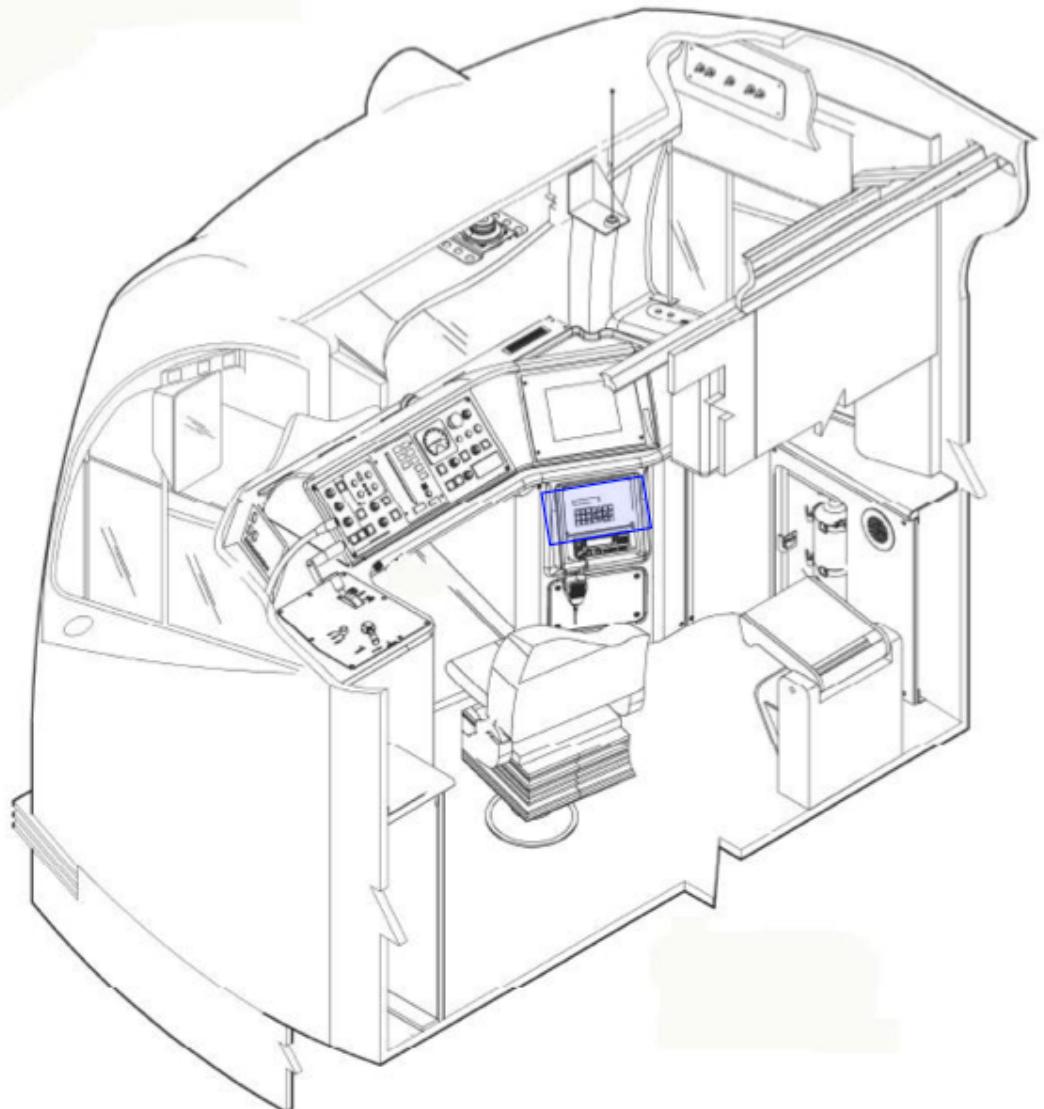
Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**INTENTIONALLY
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P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-01-00/R-00	
System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: CONSOLE OPERATOR (AADS)
Component:	Man Hours: 1
Maintenance Task: REPLACEMENT	
LOCATION:	
	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-01-00/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

CONSOLE OPERATOR (AADS)

Component:

Man Hours:

1

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Console Operator (AADS) P/N AA03EV8 (DA664-11)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-01-00/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: CONSOLE OPERATOR (AADS)
Component:	Man Hours: 1
Maintenance Task: REPLACEMENT	
PROCEDURE:	
<p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
<p>REPLACEMENT</p> <p>To perform the Task proceed as follows (Refer to Figure 1):</p> <ol style="list-style-type: none"> 1. Locate the Console Operator (AADS) Unit (1) on the Cab Console, under the IDU. 2. Remove the (AADS) Unit Fixing Screws (2). Retain them for later use. 3. Carefully pull the (AADS) Unit out from its Seat 4. Disconnect the (AADS) Unit Connectors. Make the (AADS) Unit available for repair. 5. Vacuum clean the (AADS) Unit lodging. Use recommended agent to complete the cleaning 6. Position the new (AADS) Unit onto its Seat. 7. Connect the (AADS) Unit Connectors 8. Fix and secure the (AADS) Unit by means of the relevant Fixing Screws (2). 9. Restore Power to the System 	
<p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to make sure proper software version is update and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-01-00/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**Unit:
CONSOLE OPERATOR (AADS)

Component:

Man Hours:

1

Maintenance Task:

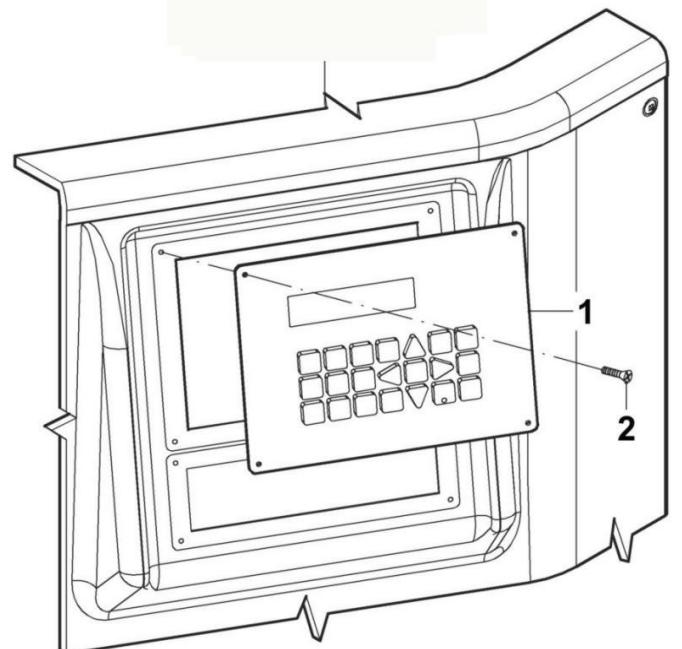
REPLACEMENT**PROCEDURE:**

FIGURE 1 - CONSOLE OPERATOR (AADS) REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-01/R-00

System:

COMMUNICATIONS

Sheet:

1/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

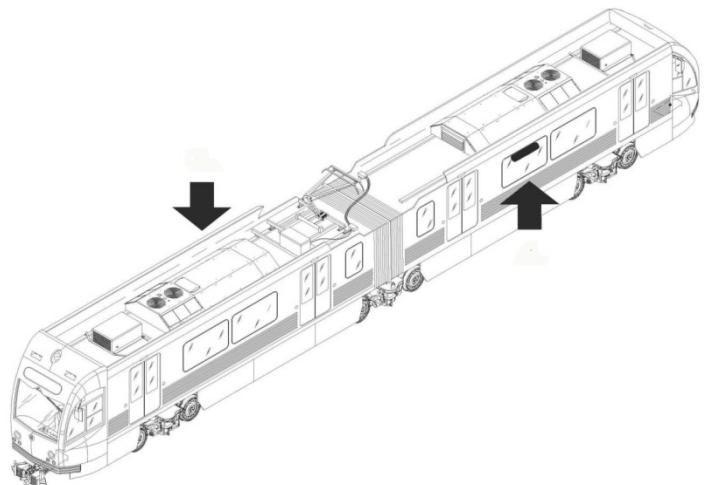
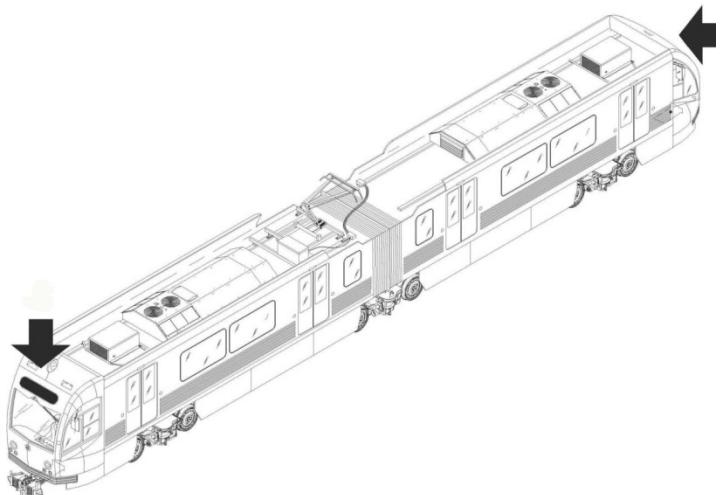
Component:

MAIN BOARD

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-01/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

MAIN BOARD

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: A TECHNICIAN HANDLING ELECTRONIC ASSEMBLIES AND COMPONENTS SHOULD WEAR A CONDUCTIVE WRIST STRAP WITH A GROUND WIRE CONNECTED EITHER TO EARTH OR CHASSIS (VEHICLE) GROUND.

CAUTION: NEVER TOUCH OR HANDLE THE PC BOARD BY ITS TRACES, CONNECTOR TEETH, OR COMPONENTS.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

N/A

SPARE PARTS:

Front Sign Main Board

P/N DG710-42

Side Sign Main Board

P/N: DG710-42

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-02-01/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIGNS
Component: MAIN BOARD	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE: <p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, <p>REPLACEMENT</p> <p>To replace the Main Board, proceed as follows Side Sign Cover Panel</p> <ol style="list-style-type: none"> 1. Locate the Front or Side Sign where is installed the Board to be replaced 2. Gain Access to: <ul style="list-style-type: none"> · the Front Sign from inside the Cab. by opening the Cab Front Ceiling Panel · the Side Sign from inside the Compartment. by opening the Side Sign Cover Panel 3. Open the Sign Rear Cover by rotating the relevant Lock Fasts. 4. Disconnect Board Connectors 5. Support the Board and remove the Board Fixing Hardware 6. Carefully remove the Board. Make it available for repair. 7. Position the new Board on the relevant Spacers. 8. Fix and secure the Board by means of the relevant Fixing hardware 9. Reconnect Board Connectors 10. Temporarily activate power to verify Board proper operations and Lamps illumination. 11. Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts. 12. Close and secure the Cab Front Ceiling Panel./ Side Sign Cover Panel 13. Restore Power to the Signs <p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to make sure proper software version is update and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-01/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

MAIN BOARD

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

PROCEDURE (CONT'D):

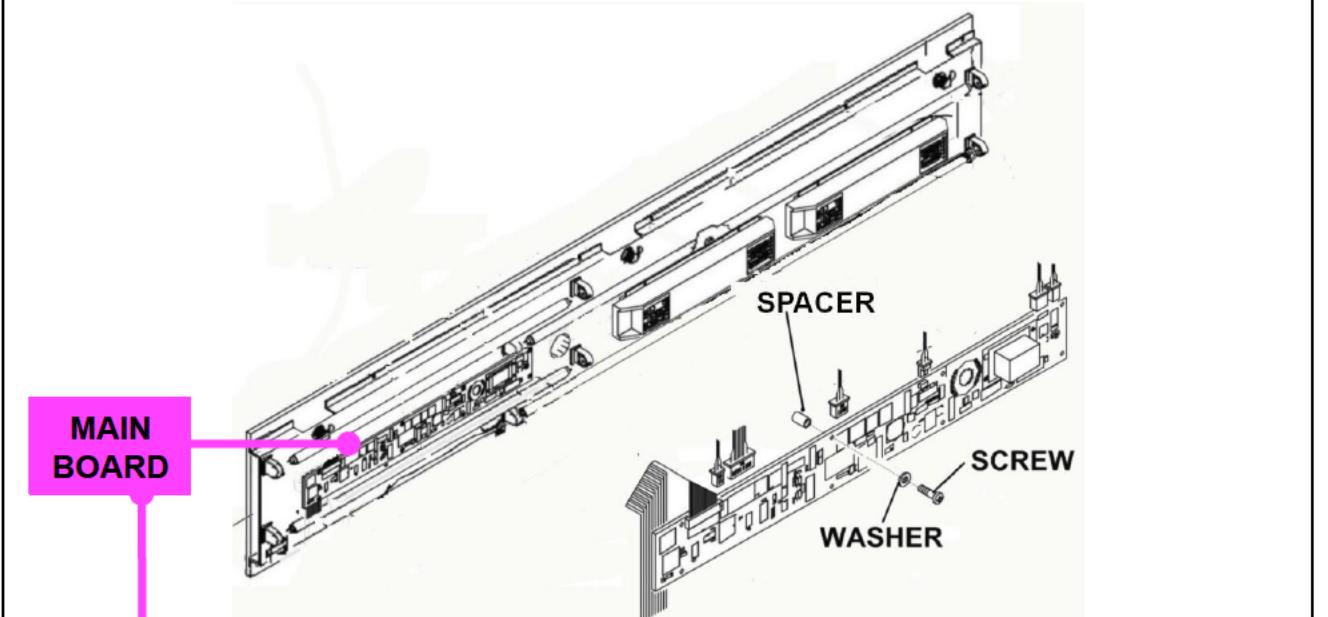


FIGURE 1 - FRONT SIGN MAIN BOARD REPLACEMENT

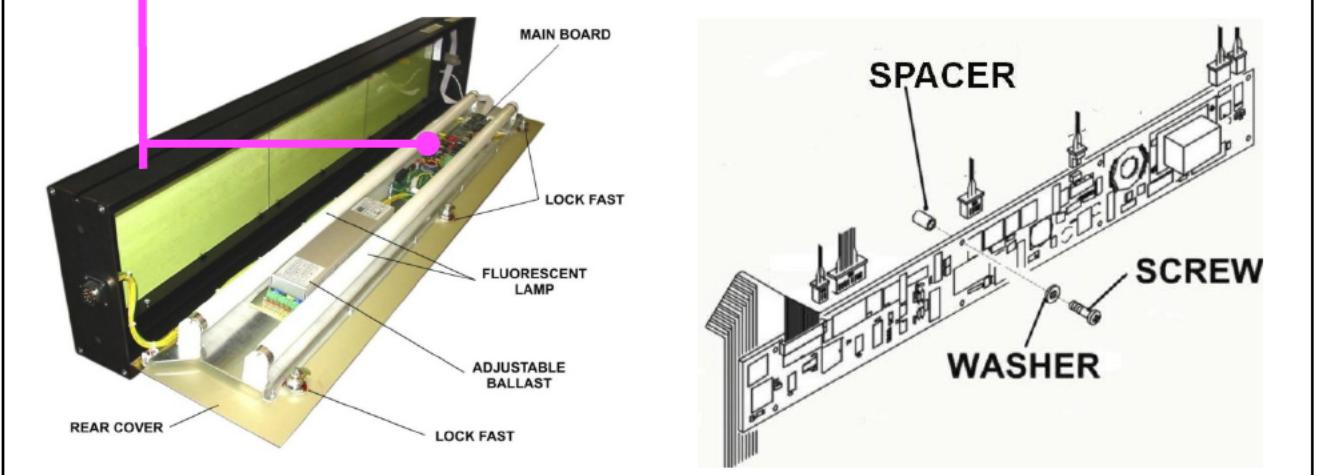


FIGURE 2 - SIDE SIGN MAIN BOARD REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-02/R-00

System:

COMMUNICATIONS

Sheet:

1/6

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

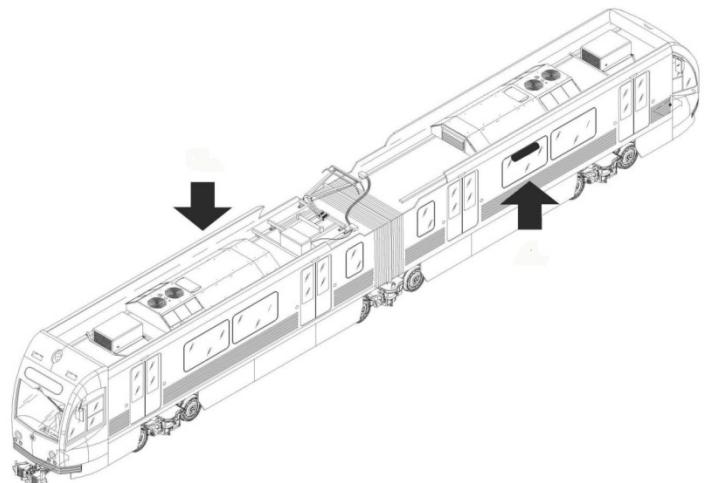
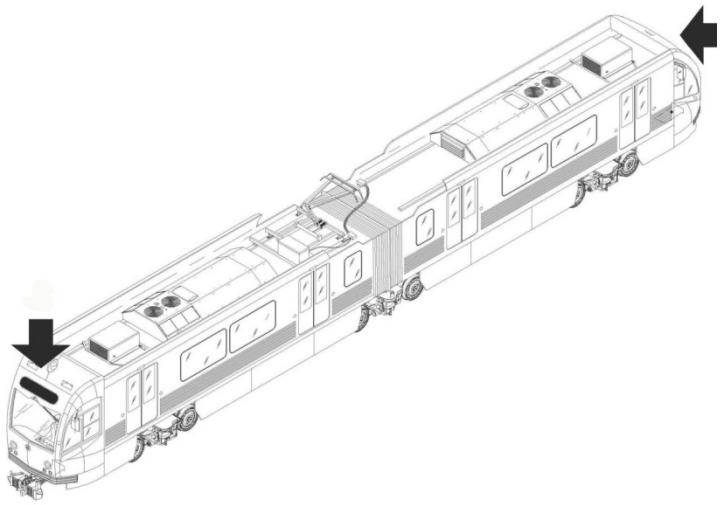
Component:

LAMP

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-02/R-00

System:

COMMUNICATIONS

Sheet:

2/6

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

LAMP

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

**WARNING: WEAR HAND AND EYE PROTECTION WHEN HANGING LAMP TUBES TO PREVENT
INJURY FROM SHATTERED GLASS.**

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

SPARE PARTS:

Front Sign Fluorescent Lamp 18W Ø26mm L 589mm Philips TLD 18W/54SLV PH1854 QTY =2

Front Sign Fluorescent Lamp 30W Ø26mm L 895mm Philips TLD 30W/54SLV PH3054 QTY =2

Side Sign Fluorescent LAMP 23W Ø26 mm L 970 mm Philips TLD 23W/54SLV PH2354 QTY =4

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-02-02/R-00	
System: COMMUNICATIONS	Sheet: 3/6
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIGNS
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE: To perform the Task proceed as follows:	
PRELIMINARY OPERATIONS	
1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none">· CB 13F01, COMMUNICATION SYSTEM PROTECTION,· CB 13F02, 13K01 PROTECTION,· CB 13F03, SIGNS PROTECTION,	
REPLACEMENT	
FRONT SIGNS	
To replace the Lamp, proceed as follows	
1. Gain Access to the Front Sign from inside the Cab. by opening the Cab Front Ceiling Panel 2. Open the Sign Rear Cover by rotating the relevant Lock Fasts. 3. Gently support (do not apply pressure) the Lamp and depress the Lamp Retaining Button on one Lamp Holder until it clears the Lamp. 4. Do not rotate the Lamp, but carefully pull the Lamp End straight from the Lamp holder. Set Lamp aside to avoid breakage. 5. Ensure expired / damaged Lamp is disposed properly. 6. Install new Lamp by inserting one end of the Lamp into the Lamp Holder. 7. Do not rotate the Lamp. Carefully press the other end of the Lamp straight into the opposite Lamp Holder, past the Lamp Retaining Button. 8. Ensure both Lamp Holder Retaining Buttons are properly positioned over Lamp Ends 9. Temporarily activate power to verify Lamp illumination. 10 Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts. 11 Close and secure the Cab Front Ceiling Panel. 12 Restore Power to the Signs.	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-02/R-00

System:

COMMUNICATIONS

Sheet:

4/6

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

LAMP

Man Hours:

0.5

Maintenance Task:

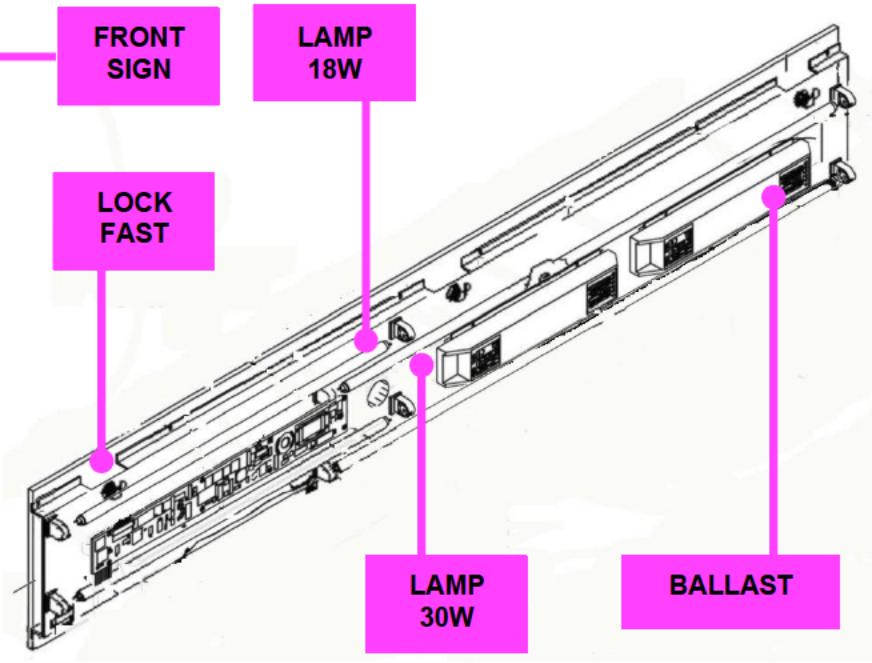
REPLACEMENT

PROCEDURE (CONT'D):

REPLACEMENT(CONT'D)



FRONT SIGN ACCESS



FRONT SIGN LAMP REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-02-02/R-00	
System: COMMUNICATIONS	Sheet: 5/6
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIGNS
Component: LAMP	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
PROCEDURE:	
REPLACEMENT(CONT'D)	
SIDE SIGNS	
To replace the Lamp, proceed as follows	
<ol style="list-style-type: none">1. Gain Access to the Side Sign from inside the Compartment. by opening the Side Sign Cover Panel.2. Open the Sign Rear Cover by rotating the relevant Lock Fasts.3. Gently support (do not apply pressure) the Lamp and depress the Lamp Retaining Button on one Lamp Holder until it clears the Lamp.4. Do not rotate the Lamp, but carefully pull the Lamp End straight from the Lamp holder. Set Lamp aside to avoid breakage.5. Ensure expired / damaged Lamp is disposed properly.6. Install new Lamp by inserting one end of the Lamp into the Lamp Holder.7. Do not rotate the Lamp. Carefully press the other end of the Lamp straight into the opposite Lamp Holder, past the Lamp Retaining Button.8. Ensure both Lamp Holder Retaining Buttons are properly positioned over Lamp Ends9. Temporarily activate power to verify Lamp illumination.10 Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts.11 Close and secure the Side Sign Cover Panel.12 Restore Power to the Signs.	
FINAL OPERATIONS	
<ol style="list-style-type: none">1. Record Task Results on the Defect Report Card for administrative and maintenance planning	
NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the maintained Equipment pertains.	
Refer to HOW TO USE THE R-PM SHEETS (para 14-III-03-03-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-02/R-00

System:

COMMUNICATIONS

Sheet:

6/6

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

LAMP

Man Hours:

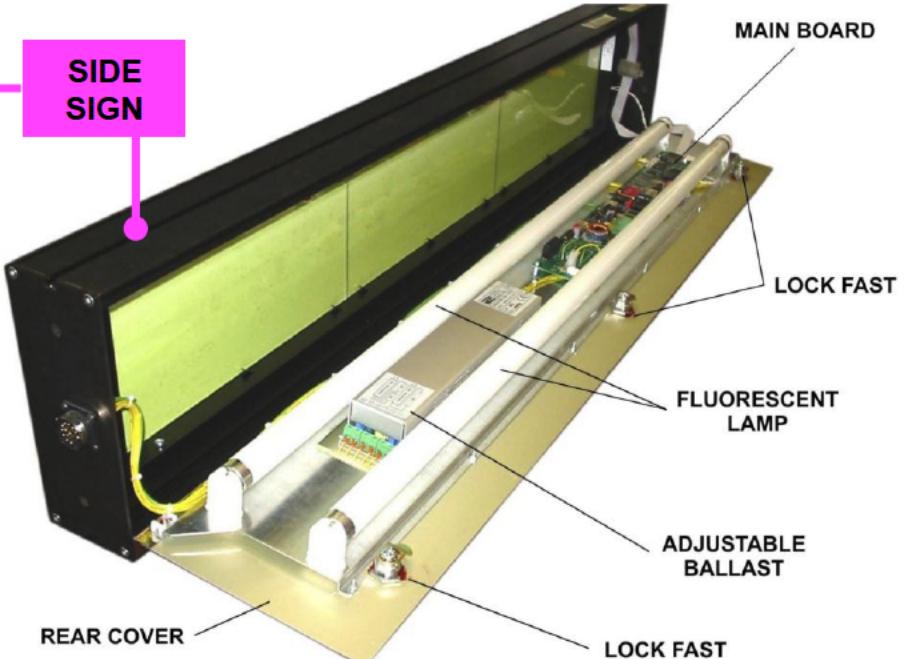
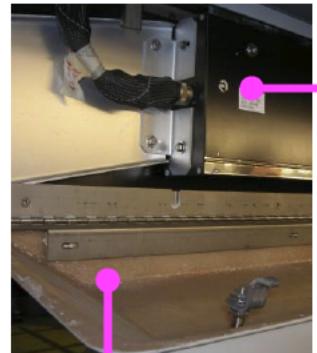
0.5

Maintenance Task:

REPLACEMENT

PROCEDURE (CONT'D):

REPLACEMENT(CONT'D)



P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-04/R-00

System:

COMMUNICATIONS

Sheet:

1/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

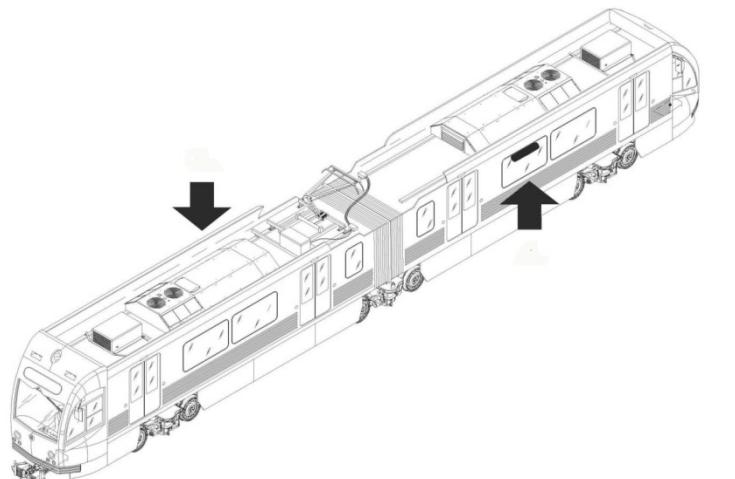
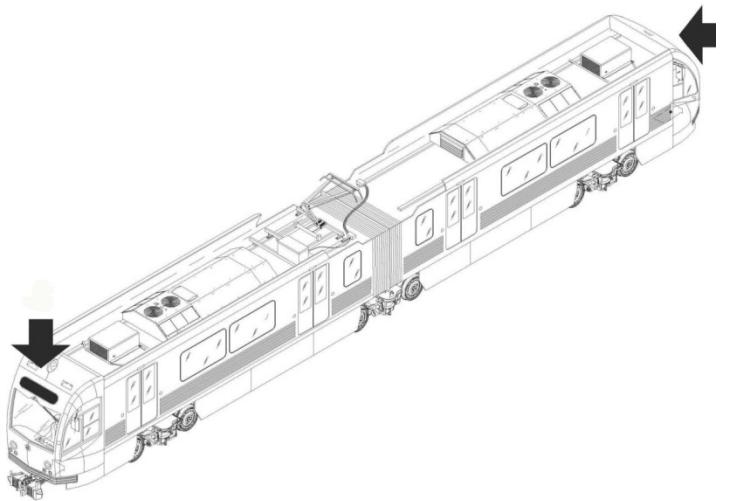
Component:

BALLAST

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-04/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

BALLAST

Man Hours:

1.0

Maintenance Task:

REPLACEMENT

SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

CAUTION: A TECHNICIAN HANDLING ELECTRONIC ASSEMBLIES AND COMPONENTS SHOULD WEAR A CONDUCTIVE WRIST STRAP WITH A GROUND WIRE CONNECTED EITHER TO EARTH OR CHASSIS (VEHICLE) GROUND.

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:

NA

SPARE PARTS:

Front Sign Adjustable Ballast 25/42V 80W	ROSSBAUER RB04.C8D AF1 QTY = 4
Side Sign Adjustable Ballast 25/42V 80W	ROSSBAUER RB04.C8D AF1 QTY = 2

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-02-04/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: SIGNS
Component: BALLAST	Man Hours: 1.0
Maintenance Task: REPLACEMENT	
PROCEDURE: <p>PRELIMINARY OPERATIONS</p> <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, <p>REPLACEMENT</p> <p>To replace the Ballast, proceed as follows Side Sign Cover Panel</p> <ol style="list-style-type: none"> 1. Locate the Front or Side Sign where is installed the Ballast to be replaced 2. Gain Access to: <ul style="list-style-type: none"> · the Front Sign from inside the Cab. by opening the Cab Front Ceiling Panel · the Side Sign from inside the Compartment. by opening the Side Sign Cover Panel 3. Open the Sign Rear Cover by rotating the relevant Lock Fasts. 4. Disconnect Ballast Connectors. 5. Support the Ballast and remove the Ballast Fixing Hardware. 6. Carefully remove the Ballast and discard it. 7. Position the new Ballast on the relevant Seat. 8. Fix and secure the Ballast by means of the relevant Fixing hardware 9. Reconnect Board Connectors. 10. Temporarily activate power to verify proper operations and Lamps illumination. 11. Close and secure the Sign Rear Cover by rotating the relevant Lock Fasts. 12. Close and secure the Cab Front Ceiling Panel./ Side Sign Cover Panel. 13. Restore Power to the Signs. <p>FINAL OPERATIONS</p> <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."</p>	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-02-04/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Unit:

SIGNS

Component:

BALLAST

Man Hours:

1.0

Maintenance Task:

REPLACEMENT

PROCEDURE (CONT'D):

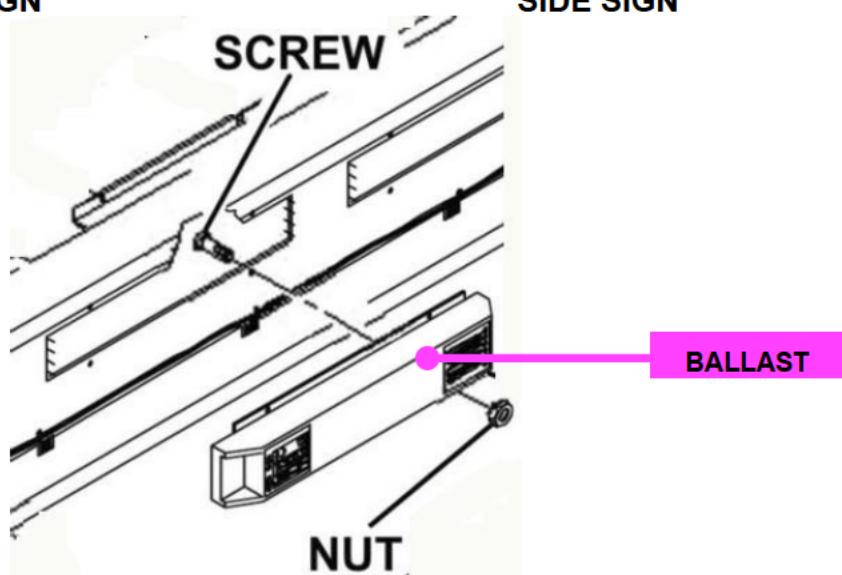
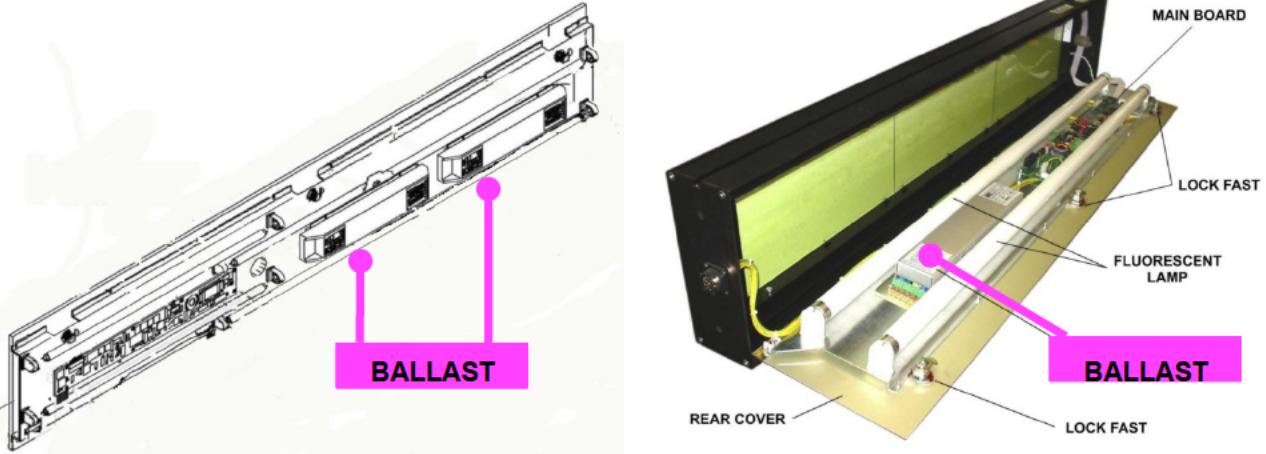


FIGURE 1 -SIGNS BALLAST REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-04-00/R-00

System:

COMMUNICATIONS

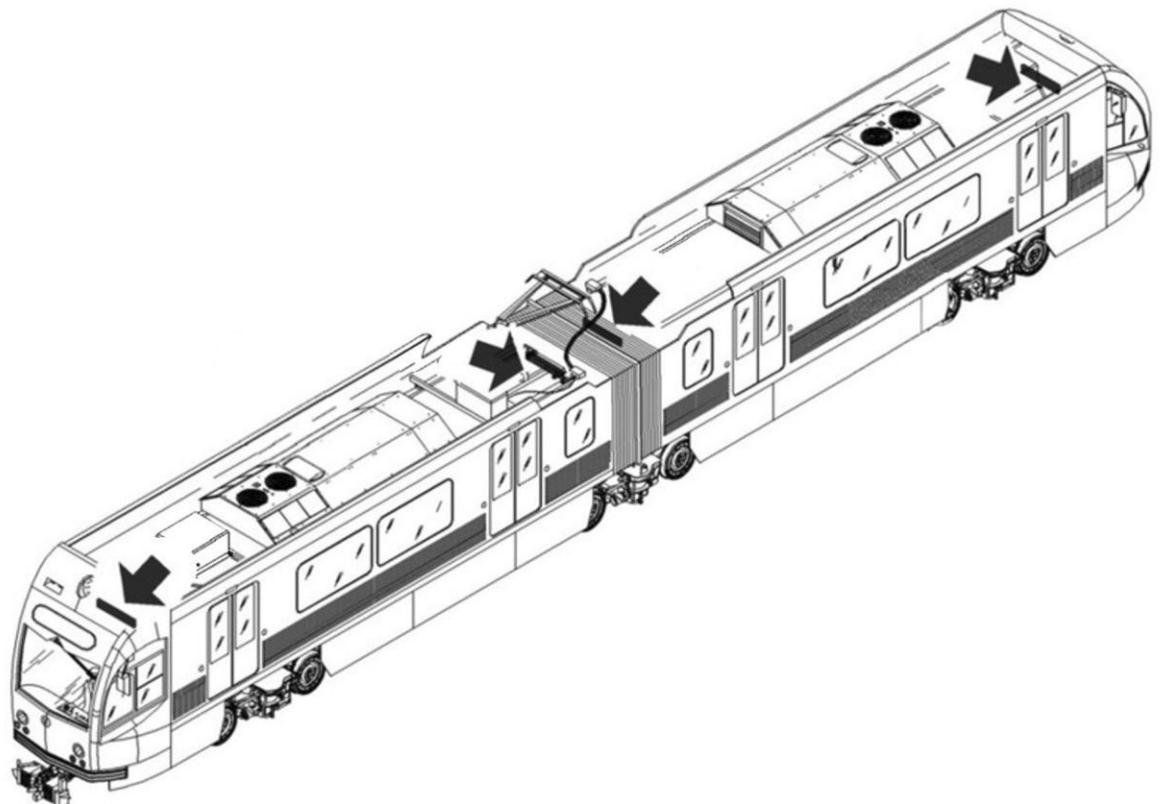
Sheet:

1/6**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**Unit:
INTERIOR SIGN

Component:

Man Hours:
1.0

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-04-00/R-00

System:

COMMUNICATIONS

Sheet:

2/6**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**Unit:
INTERIOR SIGN

Component:

Man Hours:
1.0

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

CONSUMABLES:**SPARE PARTS:**

Interior Sign Assy P/N AA03EV2 (DA710-13)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-04-00/R-00	
System: COMMUNICATIONS	Sheet: 3/6
AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: INTERIOR SIGN
Component:	Man Hours: 1.0
Maintenance Task: REPLACEMENT	
PROCEDURE:	
PRELIMINARY OPERATIONS	
<ol style="list-style-type: none">1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:<ul style="list-style-type: none">CB 13F01, COMMUNICATION SYSTEM PROTECTION,CB 13F02, 13K01 PROTECTION,CB 13F03, SIGNS PROTECTION,	
REPLACEMENT	
To perform the Task proceed as follows (Refer to Figures 1& 2): <ol style="list-style-type: none">1. Enter the Passenger Compartment and locate the Interior Sign to be replaced.2. Gain access to Interior Sign Assy attaching Hardware by removing its relevant Finishing Covers3. Support the Interior Sign Assy and remove the Fixing Hardware. Retain it for later use.4. Carefully remove the Interior Sign Assy from the relevant Supports5. Disconnect the Connectors. Make the Interior Sign Assy available for repair.6. Position the new Interior Sign Assy on the relevant Supports7. Connect the Connectors.8. Fix and secure the Interior Sign Assy by means of the relevant Fixing Hardware.9. Install and secure the Finishing Covers.10. Restore power to the System.	
FINAL OPERATIONS	
<ol style="list-style-type: none">1. Record Task Results on the Defect Report Card for administrative and maintenance planning	
NOTE: At Task Completion it is recommended to make sure proper software version is update and/or functions of the Subsystem to which the replaced Equipment pertains.	
Refer to HOW TO USE THE R-CM SHEETS (para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 " At every Task Completion. "	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-04-00/R-00

System:

COMMUNICATIONS**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Sheet:

4/6Unit:
INTERIOR SIGN

Component:

Man Hours:
1.0

Maintenance Task:

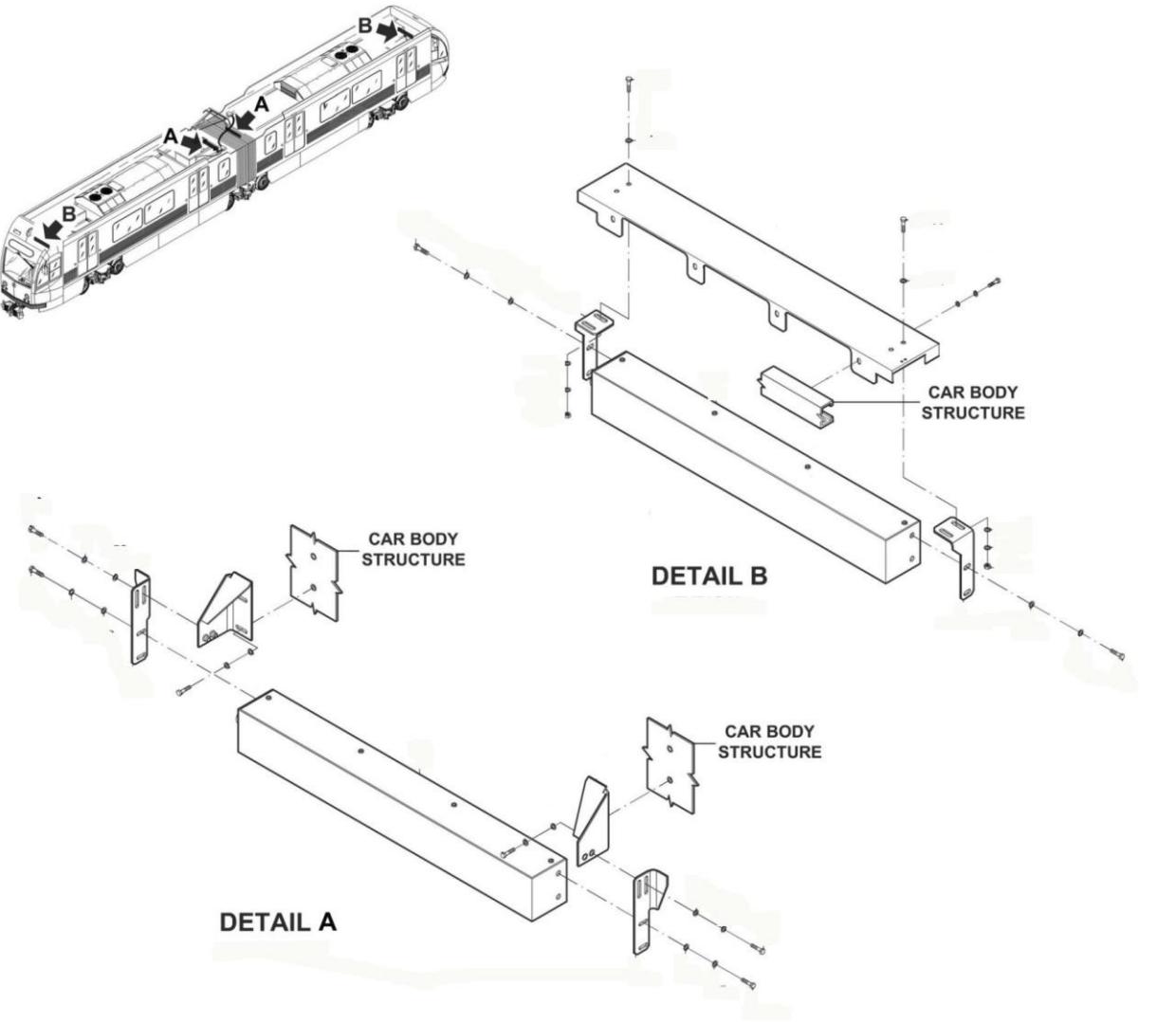
REPLACEMENT**PROCEDURE:**

INTERIOR SIGN INSTALLED ON THE CAB DIVIDING WALL



INTERIOR SIGN INSTALLED NEXT TO THE ART SECTION

FIG 1 INTERIOR SIGNS INSTALLATION

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-02-04-00/R-00	
System: COMMUNICATIONS	Sheet: 5/6
AUTOMATIC ANNOUNCEMENT AND DISPLAY SYSTEM (AADS)	Unit: INTERIOR SIGN
Component:	Man Hours: 1.0
Maintenance Task: REPLACEMENT	
PROCEDURE:	
	
FIGURE 2 - INTERIOR SIGNS REPLACEMENT	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-02-04-00/R-00

System:

COMMUNICATIONS**AUTOMATIC ANNOUNCEMENT AND
DISPLAY SYSTEM (AADS)**

Sheet:

6/6Unit:
INTERIOR SIGN

Component:

Man Hours:
1.0

Maintenance Task:

REPLACEMENT**INTENTIONALLY
LEFT BLANK**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

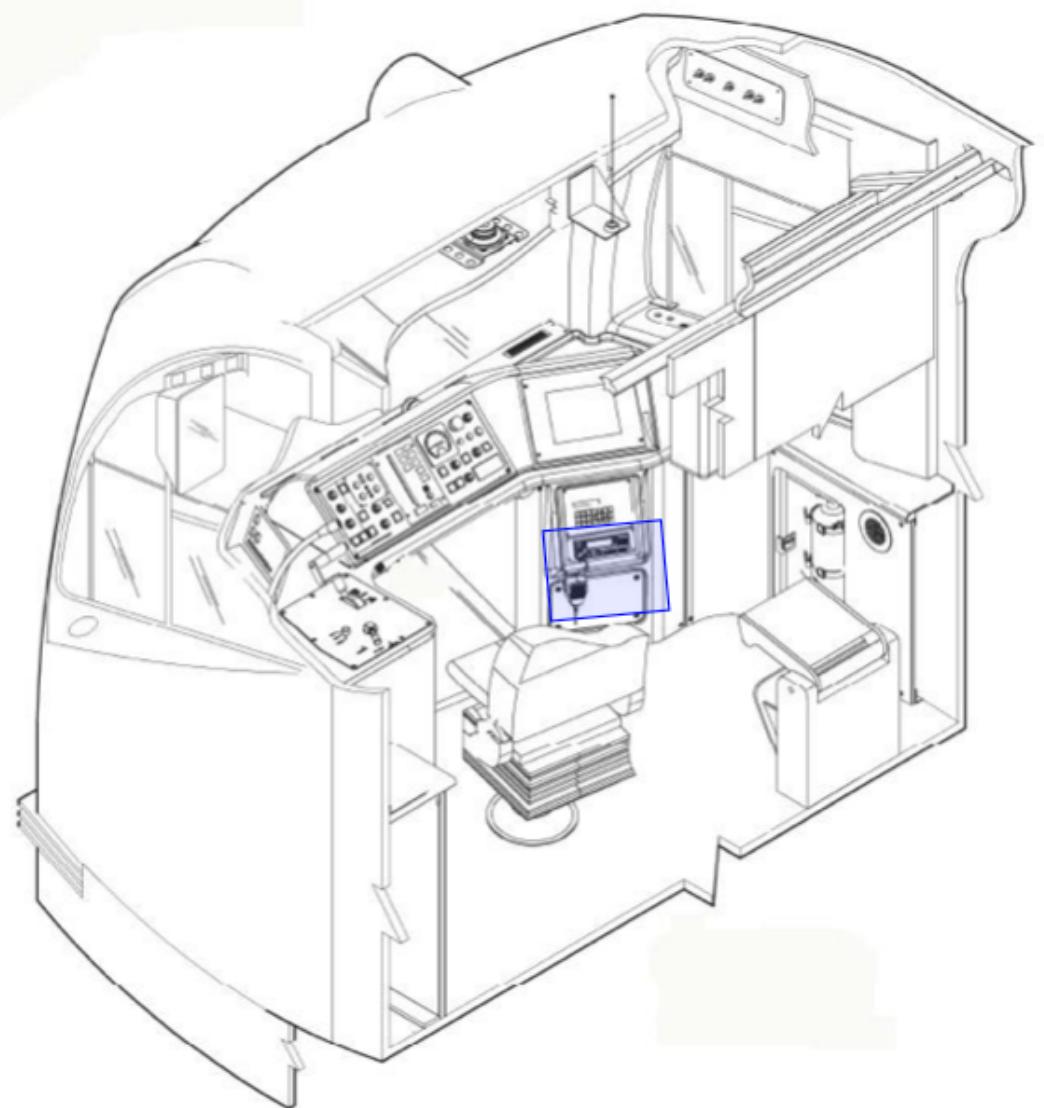
R-C-14-03-01-01/R-00

System: COMMUNICATIONS	Sheet: 1/4
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Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
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Component:	Man Hours: 1.0
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Maintenance Task: REPLACEMENT

LOCATION:

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-01/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Radio Assy P/N AA03EVA (PM710-19)

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-03-01-01/R-00	
System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component:	Man Hours: 1.0
Maintenance Task: REPLACEMENT	
PROCEDURE:	
PRELIMINARY OPERATIONS <ol style="list-style-type: none"> 1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations. 2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position. 3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position: <ul style="list-style-type: none"> · CB 13F01, COMMUNICATION SYSTEM PROTECTION, · CB 13F02, 13K01 PROTECTION, · CB 13F03, SIGNS PROTECTION, 	
REMOVAL <p>To perform the Task proceed as follows (Refer to Figure 1):</p> <ol style="list-style-type: none"> 1. Locate the Radio Unit (1) on the Cab Console under the AADS Unit. 2. Disconnect the Radio PTT Microphone from Radio Unit Front. 3. Remove the Radio Unit Bezel (8) by removing the Fixing Screws(9). 4. Remove the Frame Fixing Hardware (5,6,7) from Frame (4). 5. Remove the AADS unit to access the Fixing screws (2 screws on each side) on the side of the radio. Please update procedure accordingly. 6. Support the Radio Unit and remove the relevant Fixing Hardware. Retain it for later use. 7. Carefully slide out the Radio Unit from its Seat. 8. Disconnect the Radio Unit Connectors and make the Radio Unit available for Repair. 9. Vacuum clean the Radio Unit lodging. Use recommended agent to complete the cleaning. 10. Position the new Radio Unit onto its Seat. 11. Connect the Radio Unit Connectors. 12. Carefully slide in the Radio Unit to reach the proper installation position with respect to the Frame(4). 13. Fix and secure the Radio Unit to the Frame(4) by means of the relevant Fixing Hardware(2, 3). 14. Install and secure the Frame (4) by tightening the relevant Hardware (5,6,7). 15. Install and fix the Radio Unit Bezel(8) by tightening the Fixing Screws(9). 16. Reconnect the Radio PTT Microphone to Radio Unit Front. 17. Restore Power to the System. 	
FINAL OPERATIONS <ol style="list-style-type: none"> 1. Record Task Results on the Defect Report Card for administrative and maintenance planning <p>NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.</p> <p>Refer to HOW TO USE THE R-CM SHEETS (para 14-III-04-01-02 of this Section) and follow</p>	

the prescriptions provided at Step 3 "At every Task Completion."

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-01/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

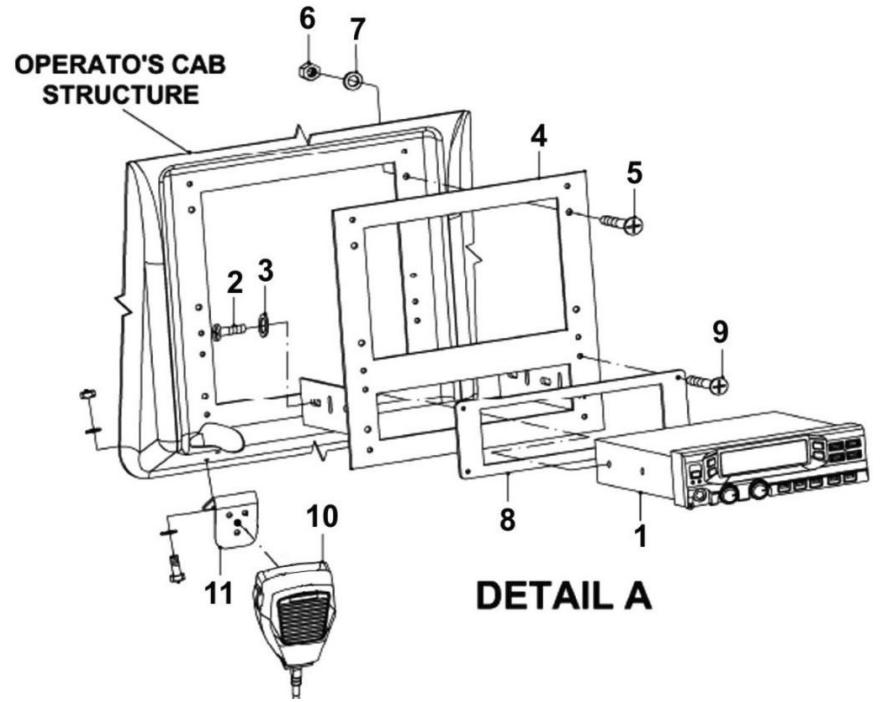
TK 790 RADIO

Component:

Man Hours:

1.0

Maintenance Task:

REPLACEMENT**PROCEDURE:**

TK 790 RADIO REPLACEMENT

P2550 CORRECTIVE MAINTENANCE SHEET

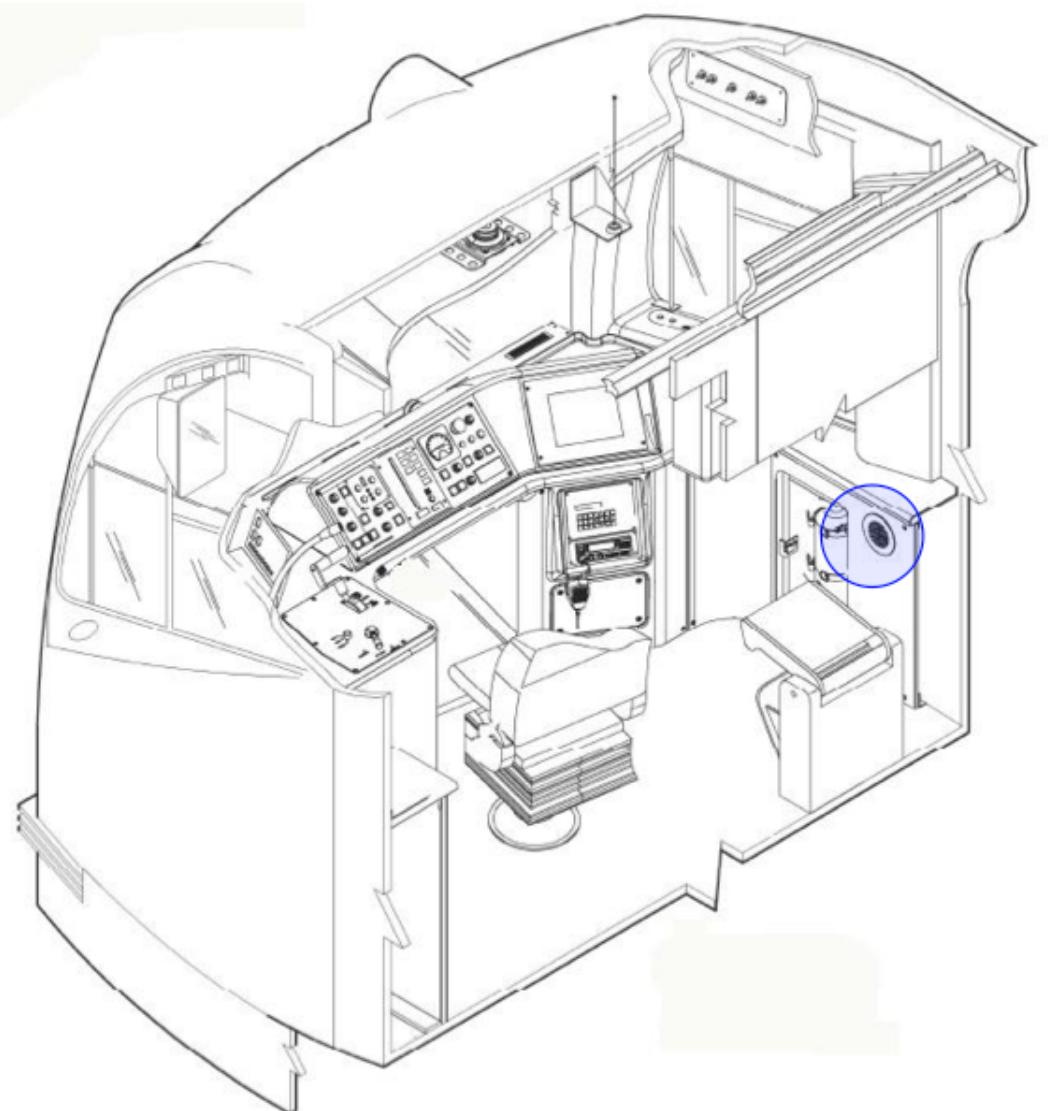
Card Code:

R-C-14-03-01-02/R-00

System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: LOUDSPEAKER	Man Hours: 0.5

Maintenance Task: REPLACEMENT

LOCATION:



P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-03-01-02/R-00	
System: COMMUNICATIONS	Sheet: 2/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: LOUDSPEAKER	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
SAFETY PRECAUTIONS:	
LACMTA Maintenance Shop Safety Rules & Regulations	
TOOLS:	
LACMTA Maintenance Shop Standard Tools Kit.	
Vacuum Cleaner	
CONSUMABLES:	
Industrial - Precision Cleaner M3 PN 147535.	
Dry Compressed Air for Electronic Equipment (commercial).	
SPARE PARTS:	
Radio Loudspeaker Assy P/N AA03RH9 (PM710-21)	

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-02/R-00

System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: LOUDSPEAKER	Man Hours: 0.5

Maintenance Task:

REPLACEMENT

PROCEDURE:

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:
 - CB 13F01, COMMUNICATION SYSTEM PROTECTION,
 - CB 13F02, 13K01 PROTECTION,
 - CB 13F03, SIGNS PROTECTION,

REPLACEMENT

To perform the Task proceed as follows (Refer to Figures 1& 2):

1. Locate the Radio Loudspeaker (18).
2. Gain access to the Radio Loudspeaker by removing the Extinguisher and the Console RH Lower Lining Panel.
3. Disconnect the Loudspeaker Connector.
4. Supporting the Radio Loudspeaker, remove the Fixing Screws (19) Washers (20) and Nuts (21) Retain them for later use.
5. Carefully remove the Radio Loudspeaker from Support(22). Make it available for repair.

NOTE: If damaged, remove the Loudspeaker Mask from Console RH Lower Lining Panel the by removing. the relevant Fixing Screws.

6. Vacuum clean the Loudspeaker lodging. Use recommended agent to complete the cleaning.
7. Position the new Radio Loudspeaker on the Support.
8. Fix and secure the Radio Loudspeaker by means of the relevant Fixing Hardware.
9. Connect the Loudspeaker Connector.
10. Reinstall the Console RH Lower Lining Panel.

NOTE If removed, install the Loudspeaker Mask on the Console RH Lower Lining Panel.

11. Reinstall the Extinguisher.
12. Restore Power to the System.

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.
Refer to **HOW TO USE THE R-CM SHEETS** (para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "**At every Task Completion.**"

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-02/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

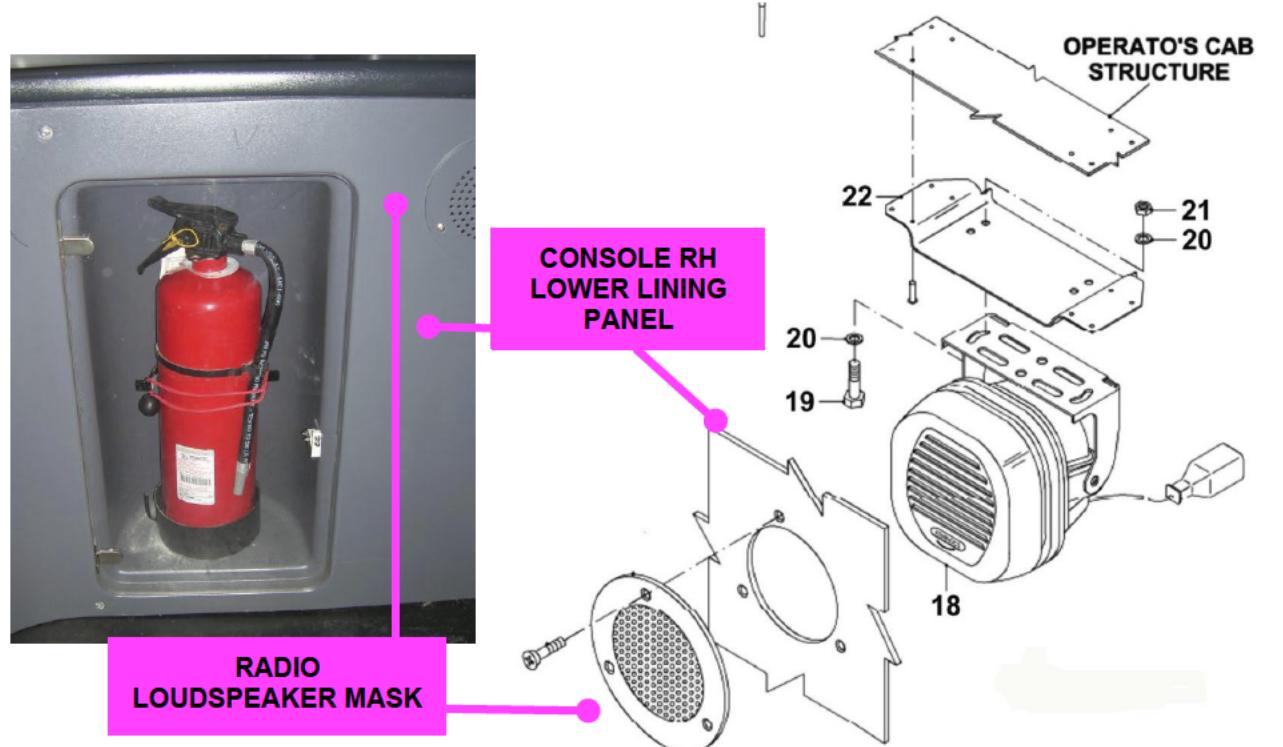
Component:

LOUDSPEAKER

Man Hours:

0.5

Maintenance Task:

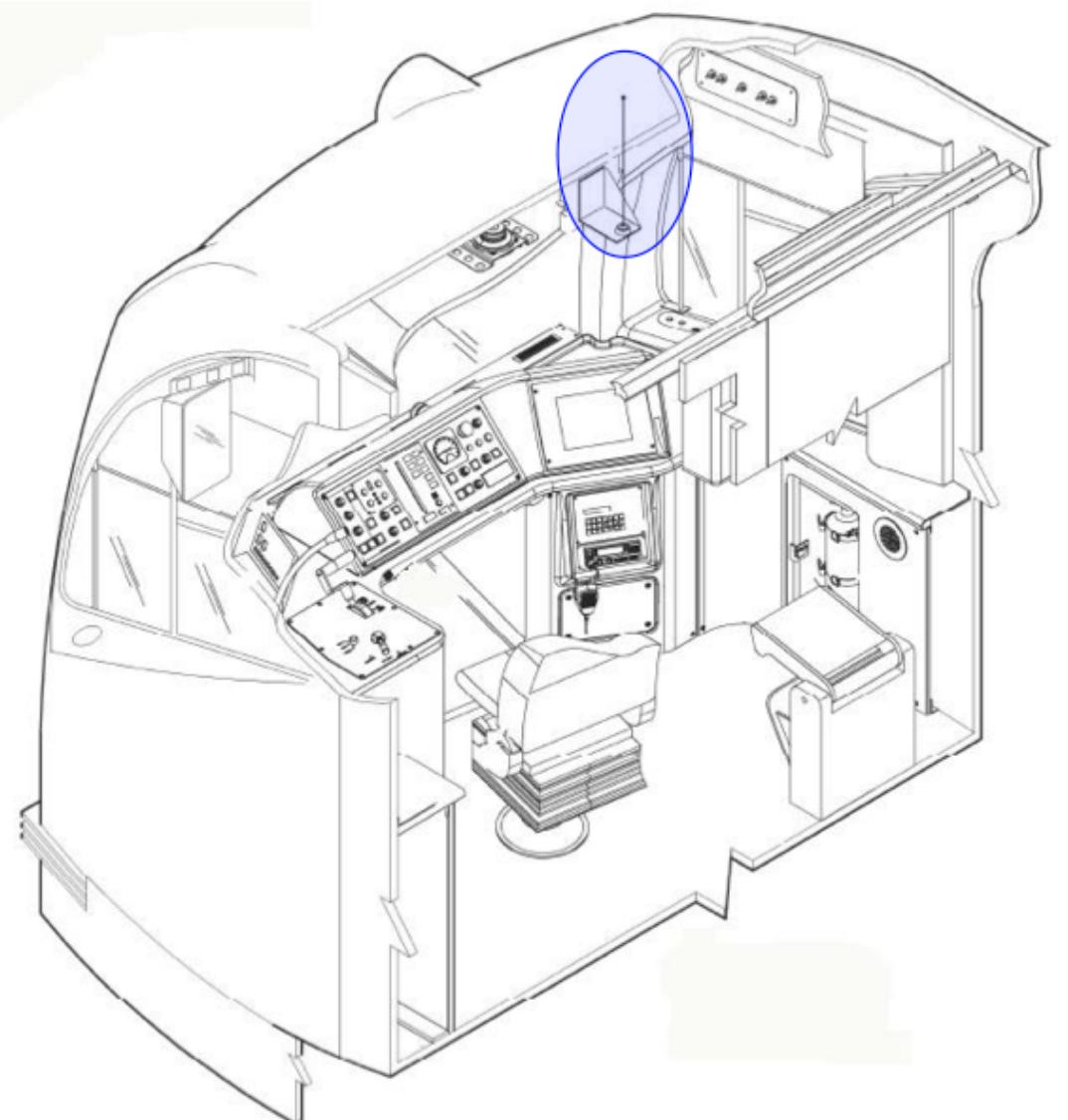
REPLACEMENT**PROCEDURE:****FIG 1 RADIO LOUDSPEAKER REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-03/R-00

System: COMMUNICATIONS	Sheet: 1/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: ANTENNA	Man Hours: 0.5

Maintenance Task:
REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET	
Card Code: R-C-14-03-01-03/R-00	
System: COMMUNICATIONS	Sheet: 2/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: ANTENNA	Man Hours: 0.5
Maintenance Task: REPLACEMENT	
SAFETY PRECAUTIONS:	
WARNING: BLUE FLAG THE VEHICLE IN ACCORDANCE WITH ALL LACMTA BLUE FLAG POLICIES, RULES, & PROCEDURES IN ORDER TO WARN THAT MAINTENANCE PERSONNEL ARE WORKING ON, UNDER, OR NEAR ROLLING EQUIPMENT.	
WARNING: APPLY WHEEL CHOCKS TO PREVENT THE VEHICLE FROM MOVING.	
WARNING: DANGER OF PERSONAL INJURY EXISTS DUE TO ELECTRICAL POWER.(750V) ENSURE PANTOGRAPH IS LOWERED, AND CATENARY POWER IS REMOVED AND ISOLATED PER LACMTA SAFETY RULES AND PROCEDURES. IF POSSIBLE, WORK SHOULD BE DONE IN AN AREA WITHOUT OVERHEAD CATENARY.	
WARNING: DANGER OF PERSONAL INJURY EXISTS DUE TO THE WORKING ON THE ROOF. FOLLOW SAFETY PROCEDURES FOR ACCESSING ROOF. ALWAYS WEAR SAFETY BELT TO ACCESS THE ROOF.	
TOOLS:	
LACMTA Maintenance Shop Standard Tools Kit	
CONSUMABLES:	
NA	
SPARE PARTS:	
Antenna, Radio	P/N AA03NWP (DA710-08)

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-03/R-00

System: COMMUNICATIONS	Sheet: 3/4
Subsystem/Assy: RADIO COMMUNICATIONS	Unit: TK 790 RADIO
Component: ANTENNA	Man Hours: 0.5

Maintenance Task:

REPLACEMENT

PROCEDURE:

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:
 - CB 13F01, COMMUNICATION SYSTEM PROTECTION,
 - CB 13F02, 13K01 PROTECTION,
 - CB 13F03, SIGNS PROTECTION,

REPLACEMENT

To perform the Task proceed as follows:

1. Access to Vehicle Roof according to MTA procedures.

**WARNING: DANGER OF PERSONAL INJURY EXISTS DUE TO THE WORKING ON THE ROOF. FOLLOW SAFETY PROCEDURES FOR ACCESSING ROOF.
ALWAYS WEAR SAFETY BELT TO ACCESS THE ROOF.**

2. Locate the Antenna (1) to be replaced (Refer to Figure 1).
3. Loosen the Lock Nut and, at the same time, rotate CCW the Antenna to remove it from its Base and from the Bushing to which is connected the Lead-In Cable.
4. Remove the Antenna, the Base and both Gaskets.
5. Discard the Antenna and both Gaskets.
6. Install new Gaskets and position the Base at its place.
7. Position the new Antenna (1) on the Base and into the Bushing in order to restore the connection with the Lead-In Cable.
8. Tighten the Lock Nut and, at the same time, rotate CW the Antenna to secure and fix it.

NOTE: The Length of the Antenna must be **18.3 inch** to have the right tune of 161 Hz.

9. Leave the Vehicle Roof according to MTA procedures.
10. Restore Power to the System.

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS**(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "**At every Task Completion.**"

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-03/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

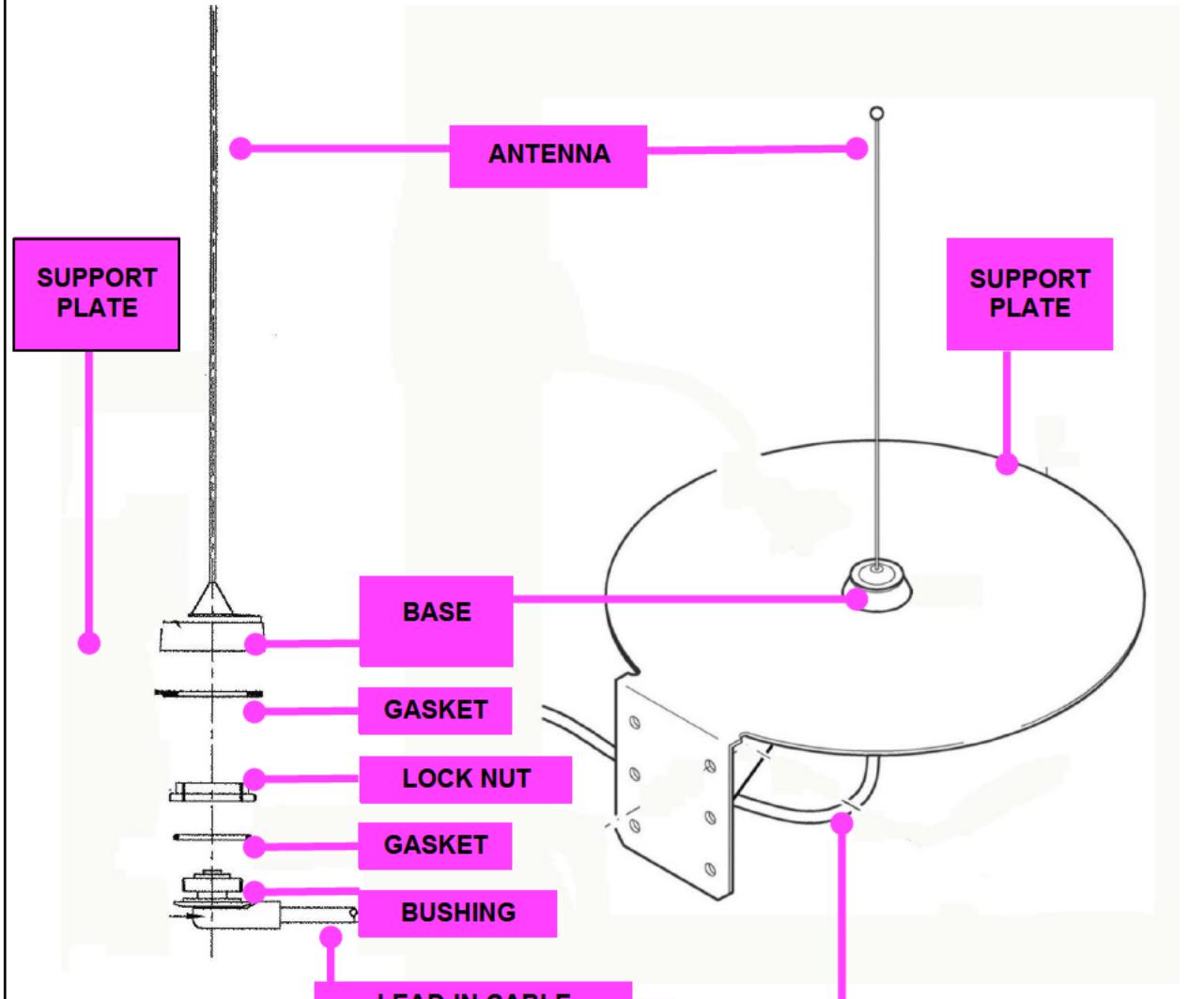
Component:

ANTENNA

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**PROCEDURE:****FIGURE 1 - RADIO ANTENNA REPLACEMENT**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-04/R-00

System:

COMMUNICATIONS

Sheet:

1/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

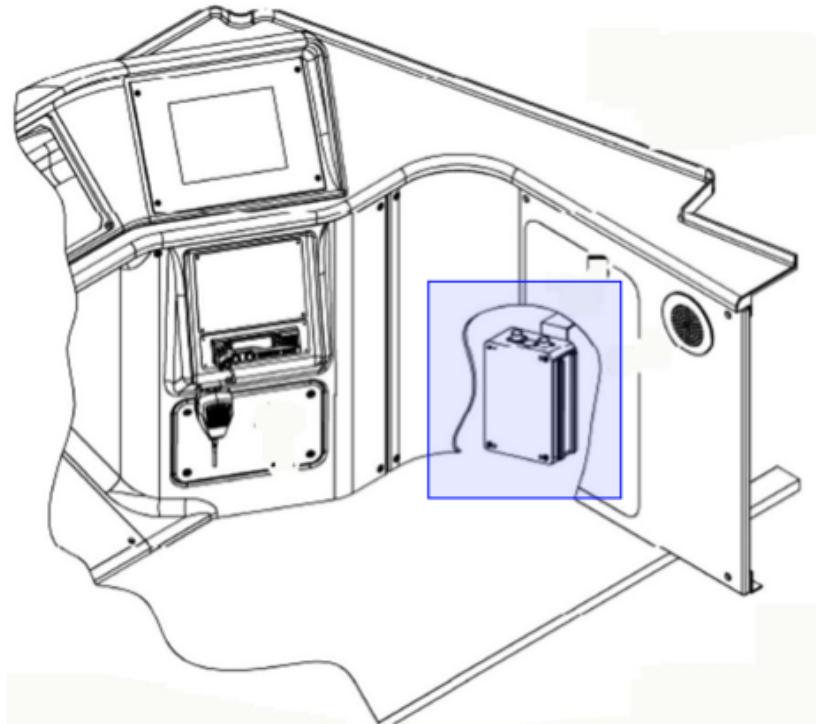
Component:

POWER SUPPLY

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**LOCATION:**

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-04/R-00

System:

COMMUNICATIONS

Sheet:

2/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

Component:

POWER SUPPLY

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**SAFETY PRECAUTIONS:**

LACMTA Maintenance Shop Safety Rules & Regulations

TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

CONSUMABLES:

Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

SPARE PARTS:

Radio Power Supply Assy P/N AA03EVB (DA710-04)

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-04/R-00

System:

COMMUNICATIONS

Sheet:

3/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

Component:

POWER SUPPLY

Man Hours:

0.5

Maintenance Task:

REPLACEMENT

PROCEDURE:

PRELIMINARY OPERATIONS

1. Set the vehicle in safety condition in accordance with LACMTA Maintenance Shop Regulations.
2. Set the Transfer Switch (located on the Operator's Console) to "OFF" Position.
3. Place the following Circuit Breakers, located on the Cab, CB Panel to "OFF" position:
 - CB 13F01, COMMUNICATION SYSTEM PROTECTION,
 - CB 13F02, 13K01 PROTECTION,
 - CB 13F03, SIGNS PROTECTION,

REPLACEMENT

To perform the Task proceed as follows (Refer to Figure 1):

1. Gain access to the Radio Power Supply (12) by removing the Extinguisher and the Console RH Lower Lining Panel.
2. Locate the Radio Power Supply (12).
3. Disconnect the Radio Power Supply Connectors.
4. Remove the Fixing Screws (13) Washers (14,15) and Nuts (16)
Retain them for later use.
5. Carefully remove the Radio Power Supply from Support(17). Make it available for repair.
6. Vacuum clean the Radio Power Supply lodging. Use recommended agent to complete the cleaning.
7. Position the new Radio Power Supply on the Support.
8. Fix and secure the Radio Power Supply by means of the relevant Fixing Hardware.
9. Connect the Radio Power Supply Connectors.
10. Reinstall the Console RH Lower Lining Panel.
11. Reinstall the Extinguisher.
12. Restore Power to the System.

FINAL OPERATIONS

1. Record Task Results on the Defect Report Card for administrative and maintenance planning.

NOTE: At Task Completion it is recommended to check the correct operation and/or functions of the Subsystem to which the replaced Equipment pertains.

Refer to **HOW TO USE THE R-CM SHEETS**(para 14-III-04-01-02 of this Section) and follow the prescriptions provided at Step 3 "At every Task Completion."

P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

R-C-14-03-01-04/R-00

System:

COMMUNICATIONS

Sheet:

4/4

Subsystem/Assy:

RADIO COMMUNICATIONS

Unit:

TK 790 RADIO

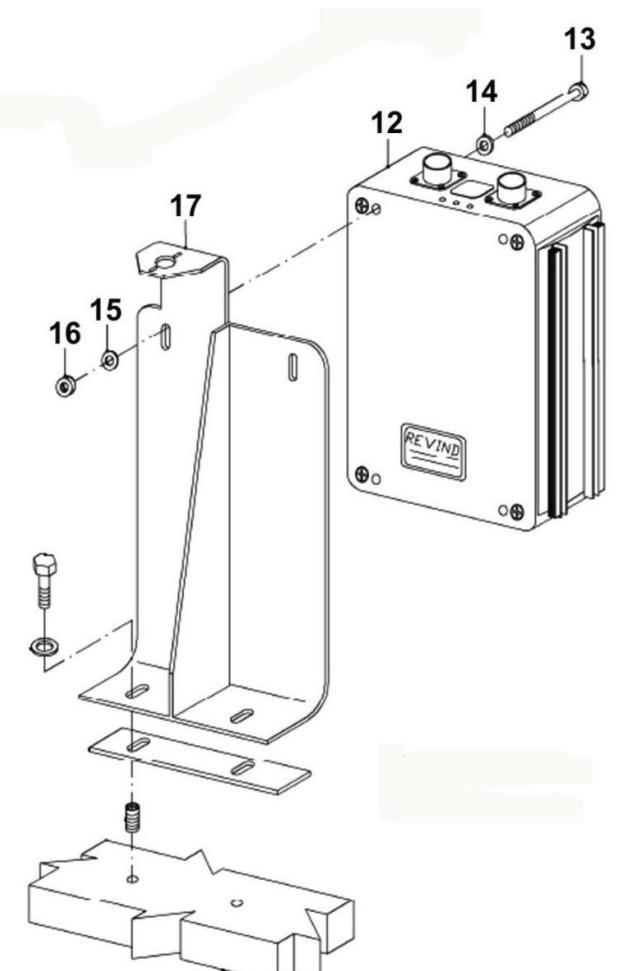
Component:

POWER SUPPLY

Man Hours:

0.5

Maintenance Task:

REPLACEMENT**PROCEDURE:****FIGURE 1 - RADIO POWER SUPPLY REPLACEMENT**

14-III-05 CONSUMABLE MATERIALS LIST (R-CML)

The Consumable Materials needed to accomplish the Communications Running Maintenance are listed, sequenced in alphabetical order, by SUBSYSTEM /ASSY -UNIT / COMPONENT, in the following Table 14-III-05.1.

Table 14-III-05.1 Running Maintenance Consumable Materials List (R-CML)

SYSTEM 14 COMMUNICATIONS			
SUBSYSTEM /ASSY - UNIT / COMPONENT	AGENT	PN	MTA PN
COMMUNICATIONS & VIDEO SURVEILLANCE	CRC Industrial - Precision Cleaner	M3 PN 147535	
	Dry Compressed Air for Electronic Equipment	(commercial)	
	Adhesive Seal SIKAFLEX 221	(commercial)	
AUTOMATIC ANNOUNCEMENT & DISPLAY SYSTEM (AADS)	Cleaner	(commercial)	

14-III-06 TEST EQUIPMENT & SPECIAL TOOLS LIST (R-TESTL)

The Tools and Test Equipment needed to accomplish the Communications Running Maintenance are listed, sequenced in alphabetical order, by SUBSYSTEM /ASSY -UNIT / COMPONENT, in the following Table 14-III-06.1.

Refer to "Tools and Test Equipment Manual" for Special Tools / Test Equipment Description and Maintenance.

Table 14-III-06.1 Running -Test Equipment & Special Tools List (R-TESTL)

SYSTEM 14		COMMUNICATIONS		
SUBSYSTEM /ASSY - UNIT / COMPONENT	LACMTA STANDARD TOOLS KIT	LACMTA WORKSHOP DEVICES	SPECIAL TOOL / TEST EQUIPMENT	PN
COMMUNICATIONS	X	Vacuum Cleaner	Sound Level Meter	3ZH88
			Multimeter (Fluke 87 V/E)	4EB19
			Equipment for Power Supply Module Test	DA617-04
			Resistivity Load for Fin-Pa Module Test	DA625-02
			Equipment for Fin-Pa Module Test	DA654-01
			Cable For Pis & Video Surveillance Test	KA710-07
			Cable For Microphone Test	SE710-09
			Cable Certifier (Type Lt 8600)	TBS 1
			Portable Test Unit(PTU) (DELL) With Specific SW Installed. Refer To Table 00-22.1 For SW List	TBS 2
			Linker Cable	TBS 3
			Testrackpc Cable	TBS 4