

LOS ANGELES COUNTY

METROPOLITAN TRANSPORTATION AUTHORITY

LIGHT RAIL VEHICLE

**P2550**

**RUNNING  
MAINTENANCE  
AND  
SERVICE MANUAL**

**SECTION 11  
BATTERY**



LOS ANGELES COUNTY

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LIGHT RAIL VEHICLE

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RUNNING MAINTENANCE  
AND  
SERVICE MANUAL

VOLUME M-01  
PART I  
THEORY OF OPERATION  
SECTION 11 - BATTERY



# **SECTION 11**

## **BATTERY**

### **PART I**

#### **THEORY OF OPERATION**

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# SECTION 11

## BATTERY

### 11-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.

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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
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- Test Equipment , Tools & Special Tools

**11-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.

<b>Abbreviation</b>	<b>Meaning</b>
APS .....	Auxiliary Power Supply
ATP .....	Automatic Train Protection
BCU.....	Brake Control Unit
C/L.....	Centerline
Cd.....	Cadmium
DC .....	Direct Current
HSCB .....	High Speed Circuit Breaker
HV .....	High Voltage
HVAC .....	Heating Ventilation & Air Conditioning
LH.....	Left Hand Side
LRV .....	Light Rail Vehicle
LV.....	Low Voltage
LVPD .....	Low Voltage Power Distribution
LVPS .....	Low Voltage Power Supply
MBL.....	Metro Blue Line
Ni.....	Nickel
PGL.....	Pasadena Gold Line
RH .....	Right Hand Side
T.S.....	Transfer Switch
TBS .....	To Be Supplied
TCU .....	Traction Control Unit
TCU_A.....	Traction Control Unit on the A body section
TCU_B.....	Traction Control Unit on the B body section
TWC .....	Train-to-Wayside Communication

**11-I-01.b LIST OF DEFINITIONS**

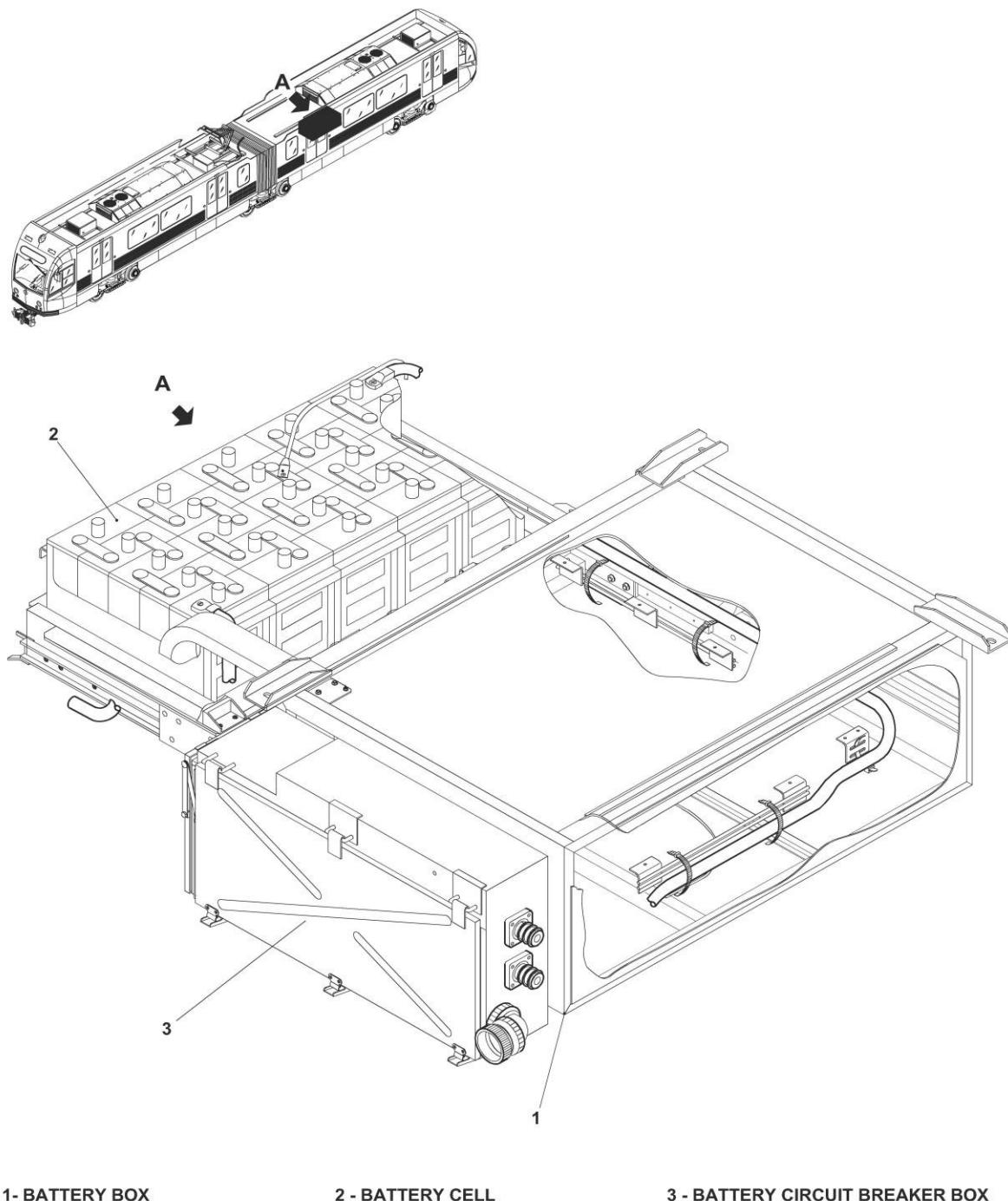
The Definitions commonly used throughout this manual are given below with their related meaning.

<b>Definition</b>	<b>Meaning</b>
'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

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

<b>Definition</b>	<b>Meaning</b>
$\Omega$ .....	Ohm
$^{\circ}\text{C}$ .....	Celsius degree
$^{\circ}\text{F}$ .....	Fahrenheit degree
A .....	Ampere
dc .....	Direct Current
ft .....	Foot
gal .....	Gallon
in .....	Inch
k $\Omega$ .....	Kilo Ohm
kg .....	Kilogram - approx 2.205 pounds
lb .....	Pound
m .....	Meter - approx 3.28 feet
mm .....	Millimeter - approx 0.0394 inches
ms .....	Millisecond
rms .....	Root Mean Square Voltage
rpm .....	Revolution per Minute
V .....	Voltage
V <sub>in</sub> .....	Input Voltage
W .....	Watt

**11-I-02 THEORY OF OPERATION****11-I-02.01 General Description of the System****Figure 11-I-02.1 Battery Box Assembly**

The vehicle is equipped with a Battery Box Assembly.

It is installed in the underframe of the 'B' Car Section and is designed to facilitate maintenance operations.

The Battery Box Assembly main components are:

- Battery Box
- Battery Cells (25 alkaline Ni - Cd type)
- Battery Circuit Breaker Box

The battery supplies the LV loads when the LVPS doesn't work or is disconnected.

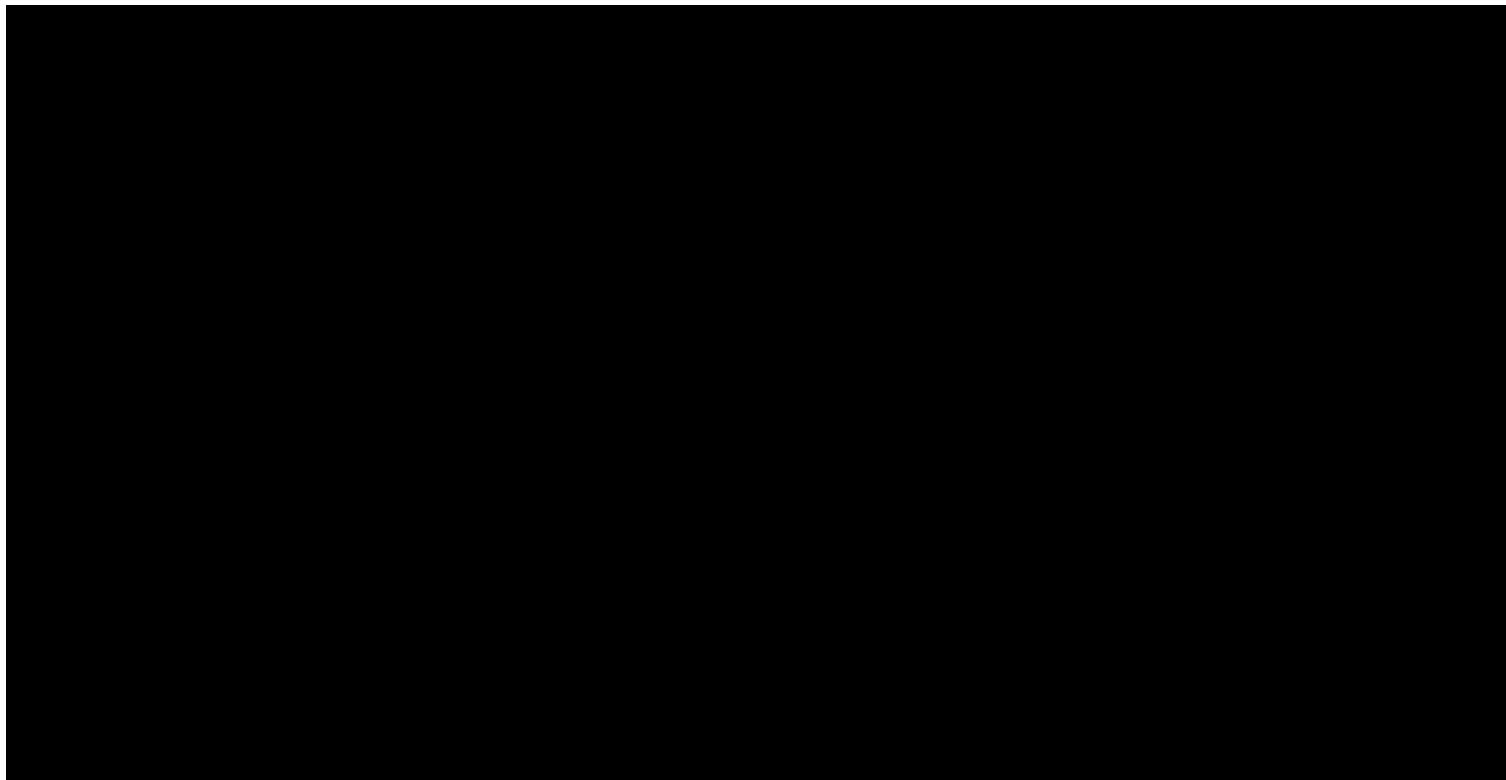
Figure 11-I-02.2 shows how the LV loads are supplied..

The Track Brakes are directly connected to the battery positive output.

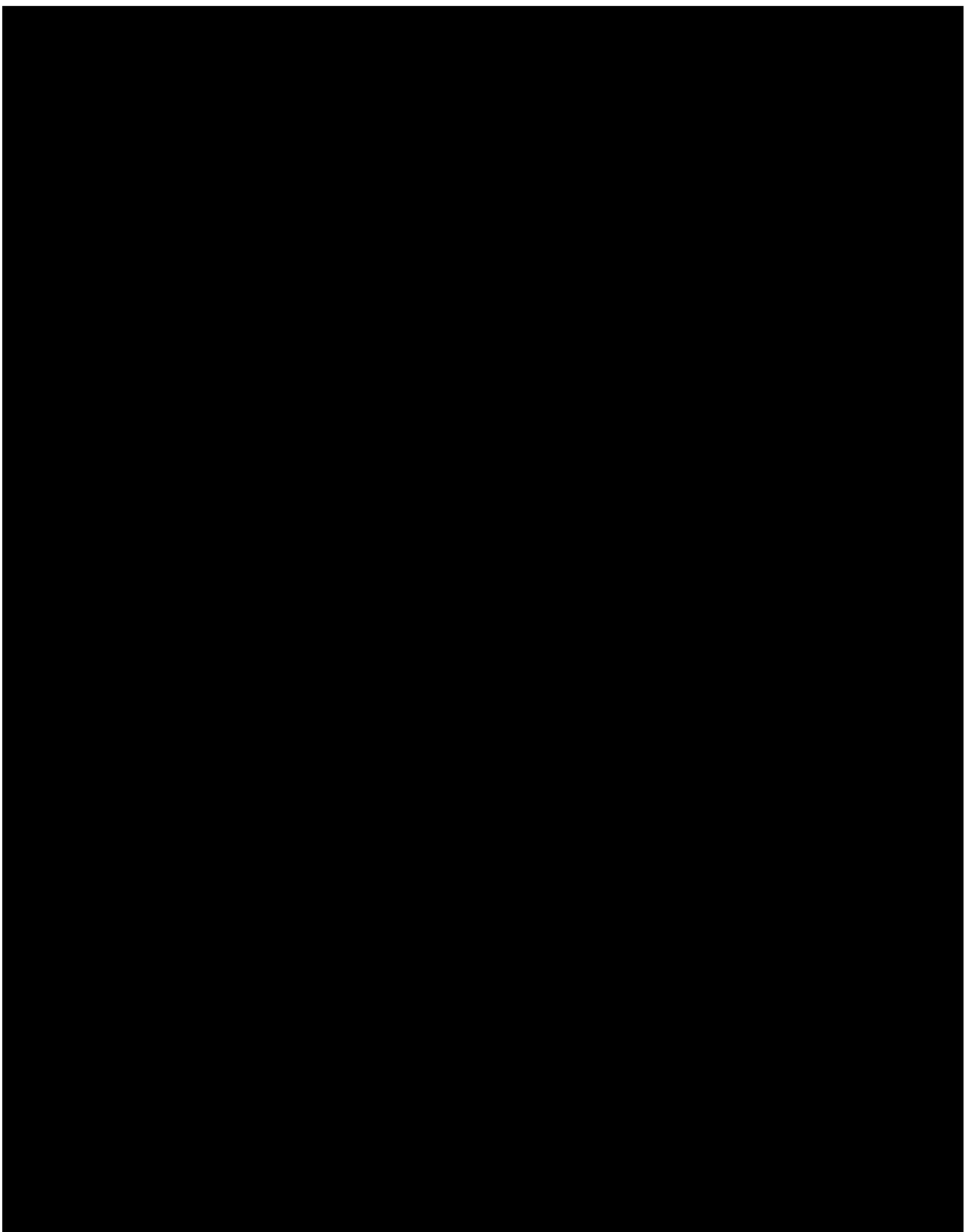
All other LV loads are connected to the battery through the LVPS system. In this way, even if the LVPS system is not working, the Track Brakes can be applied.

When the LVPS system is active, it recharges the battery through its +B connector. When the LVPS is not working, the battery supplies all the LV loads. (+B) and (+L) outputs are connected through a diode that permits current flow from the battery to the loads, but allows only the relevant LVPS to charge the battery.

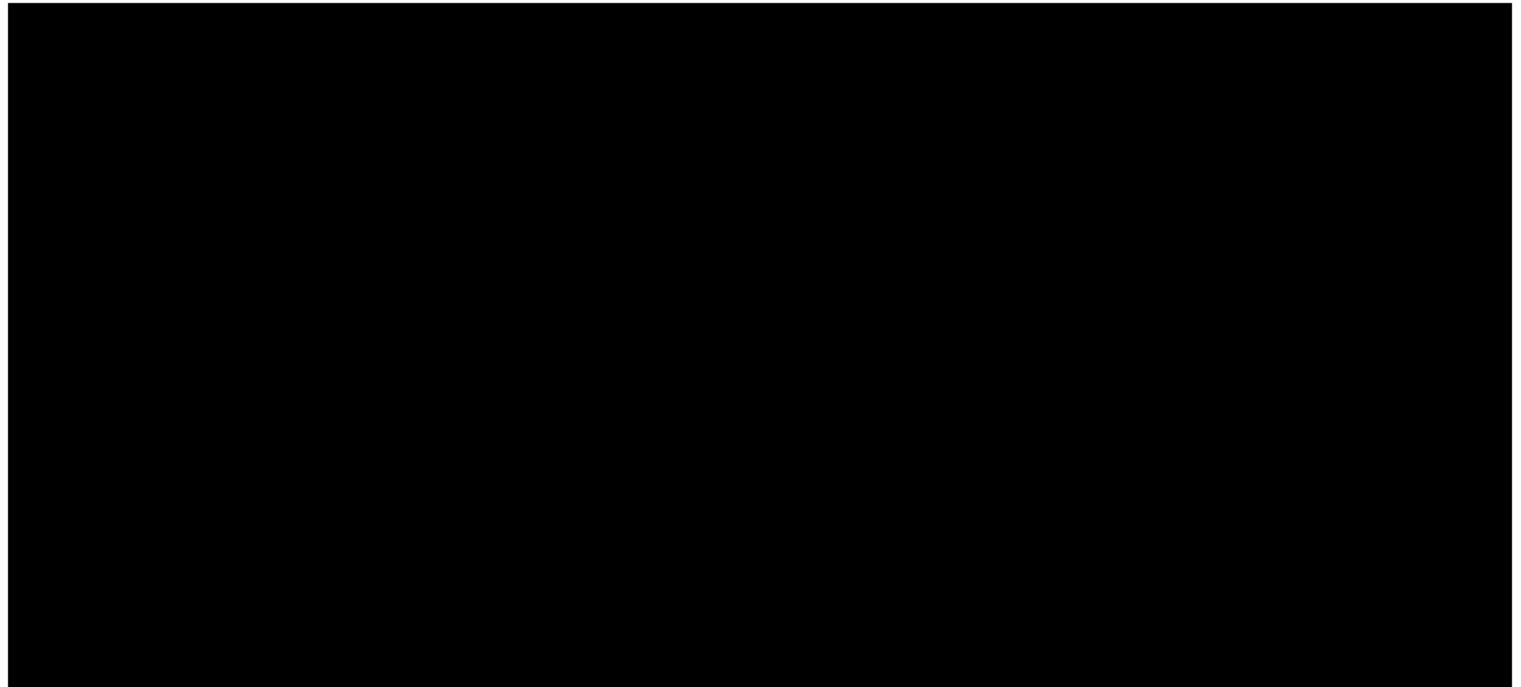
This diode avoids that the battery is charged by another LVPS.



**Figure 11-I-02.2 APS-LVPS Diode Function**



**Figure 11-I-02.3 LV System Architecture (#8 - 237VE06965C03)**



**Figure 11-I-02.4 System-Vehicle Relationship**

The Battery System most important function is to supply the Low Voltage Loads when the APS/LVPS is off (pantograph down and no supply from the shop power socket) or is not working.

Among the LV Loads, the following loads are supplied even with T.S. (Transfer Switch) in OFF position:

- Battery Contactor (Battery enabling, the Battery Contactor can also be supplied by another vehicle in the train consist)
- Front Doors
- Communication
- Emergency Lights

When the T.S. is ON the battery power allows raising the pantograph thus supplying the Propulsion System and the APS/LVPS System.

The Battery System is connected with (refer to Figure 11-I-02.4):

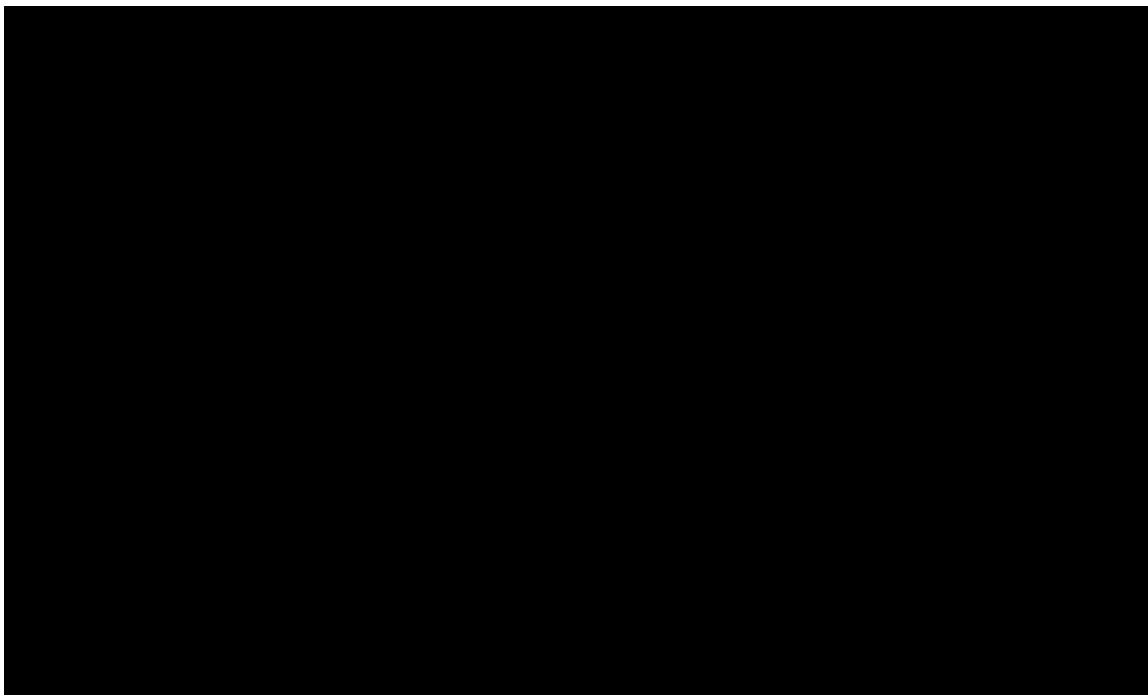
- The APS/LVPS System (The APS/LVPS charges the battery and through this the battery is connected with all LV loads)
- The HV Distribution System (the Battery metal parts are connected to the Ground System)
- The Propulsion System (the TCU\_B acquires the status of the contactor and circuit breakers)

- The IDU, shows the battery charge level and the circuit breaker contactors from the TCU\_B).
- The Braking System (Track Brakes are directly connected to the battery power line (+B)).

## ii. System - Component Relationship

The Battery is made up of three sub-systems (refer to Figure 11-I-02.5):

- Battery Box (holds the 25 Battery Cells)
- Battery Cells (the heart of the system, when charged they hold the energy needed to supply the vehicle LV loads)
- Battery Circuit Breaker Box (it contains all contactors and circuit breakers



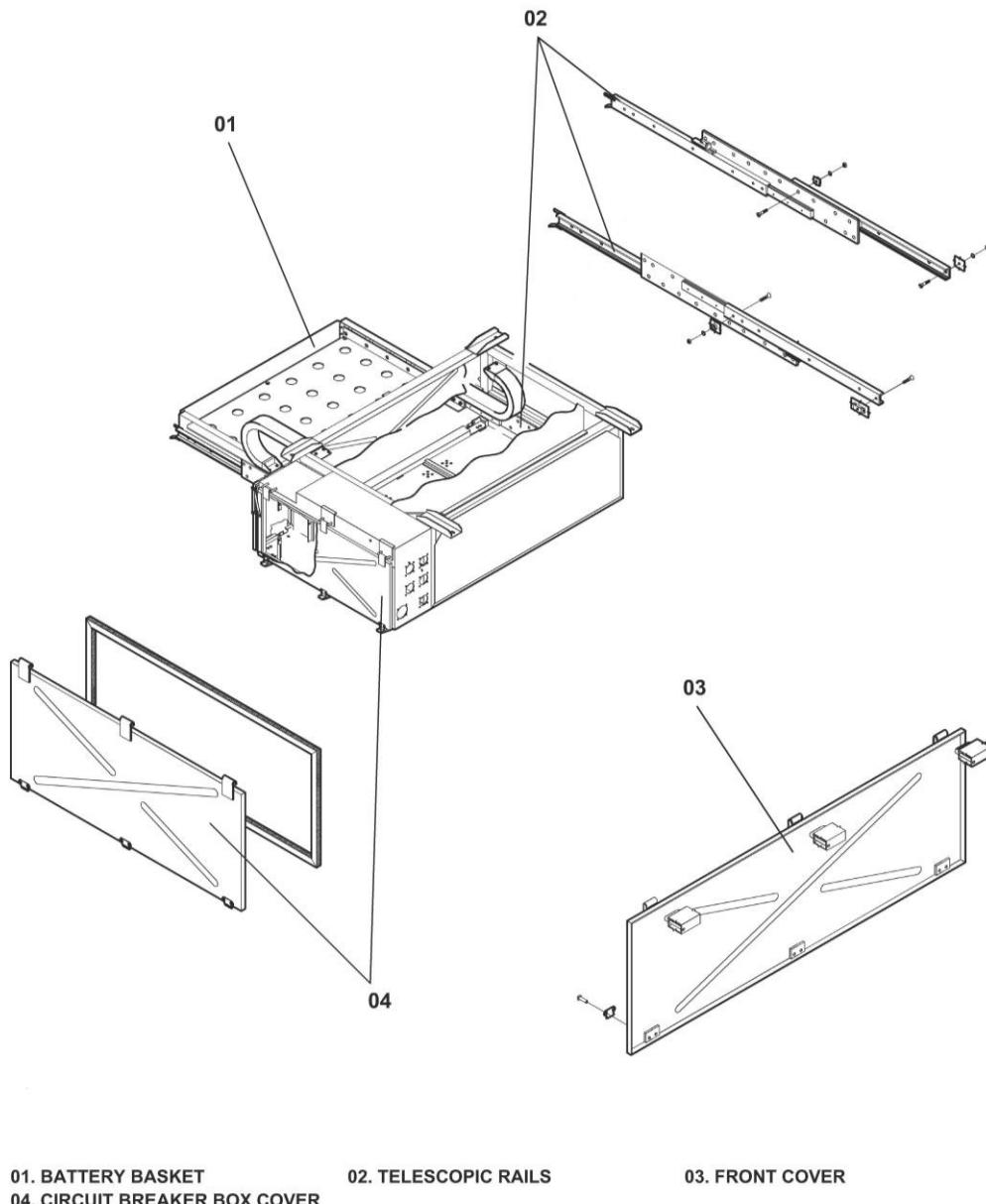
**Figure 11-I-02.5    System-Equipment Relationship**

## iii. System Performances

$V_{nom}$	30 Vdc (37.5Vdc when fully charged)
$V_{max}$	42 Vdc
$V_{min}$	25 Vdc
Nominal Capacity	300 Ah
Constant Power for 1h of use *	4750 W
Drop between the Battery and Load	$\approx 2$ V

## 11-I-02.02 Main System Components

### 11-I-02.02.01 Battery Box



01. BATTERY BASKET

04. CIRCUIT BREAKER BOX COVER

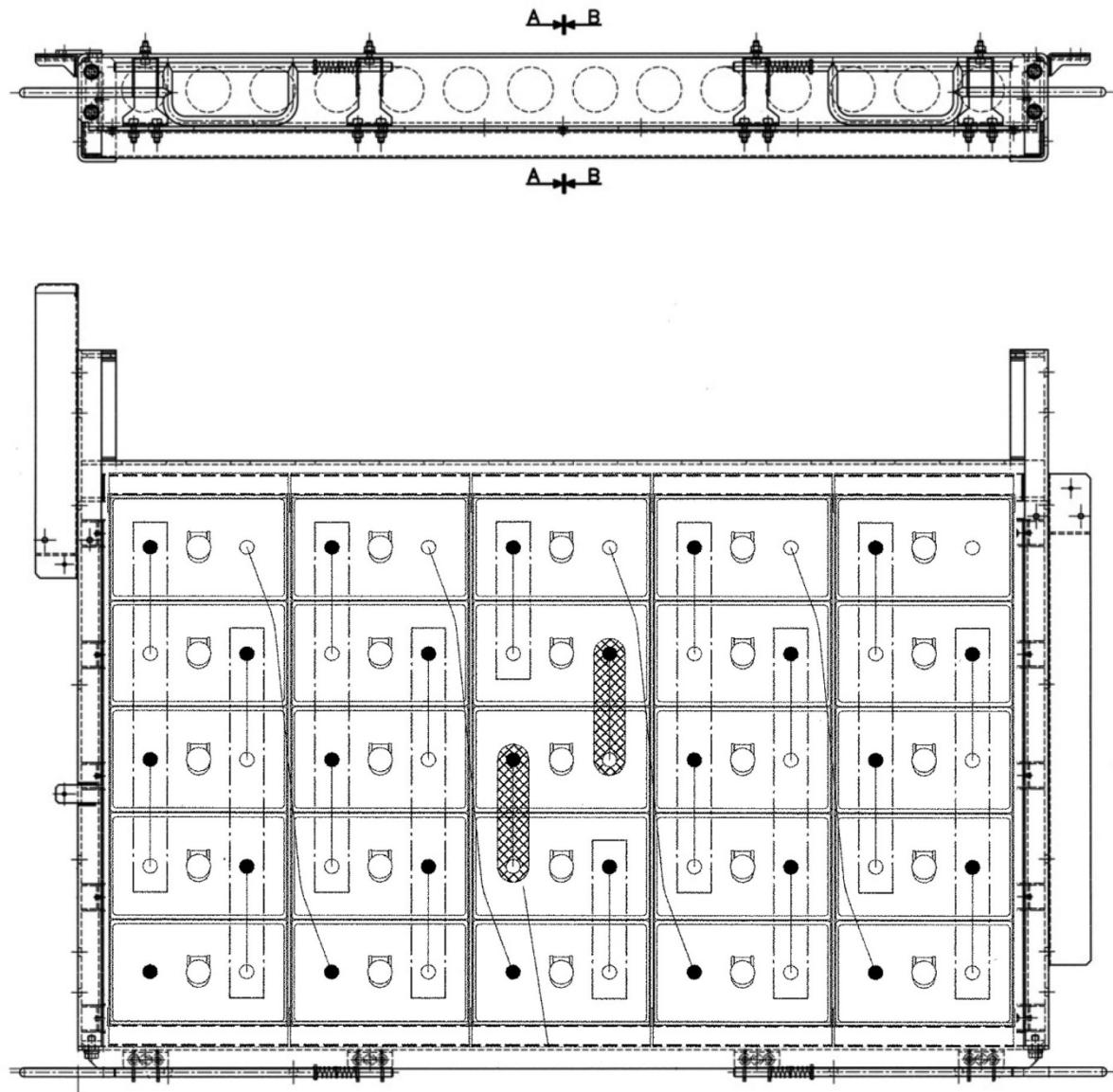
02. TELESCOPIC RAILS

03. FRONT COVER

**Figure 11-I-02.6 Battery Box**

The Battery Box holds the Battery Cells.

The Battery Cells are located inside a Battery Basket connected to the structure through a left and a right telescopic rails, that facilitate the operations of the tray.



**Figure 11-I-02.7 Battery Basket**

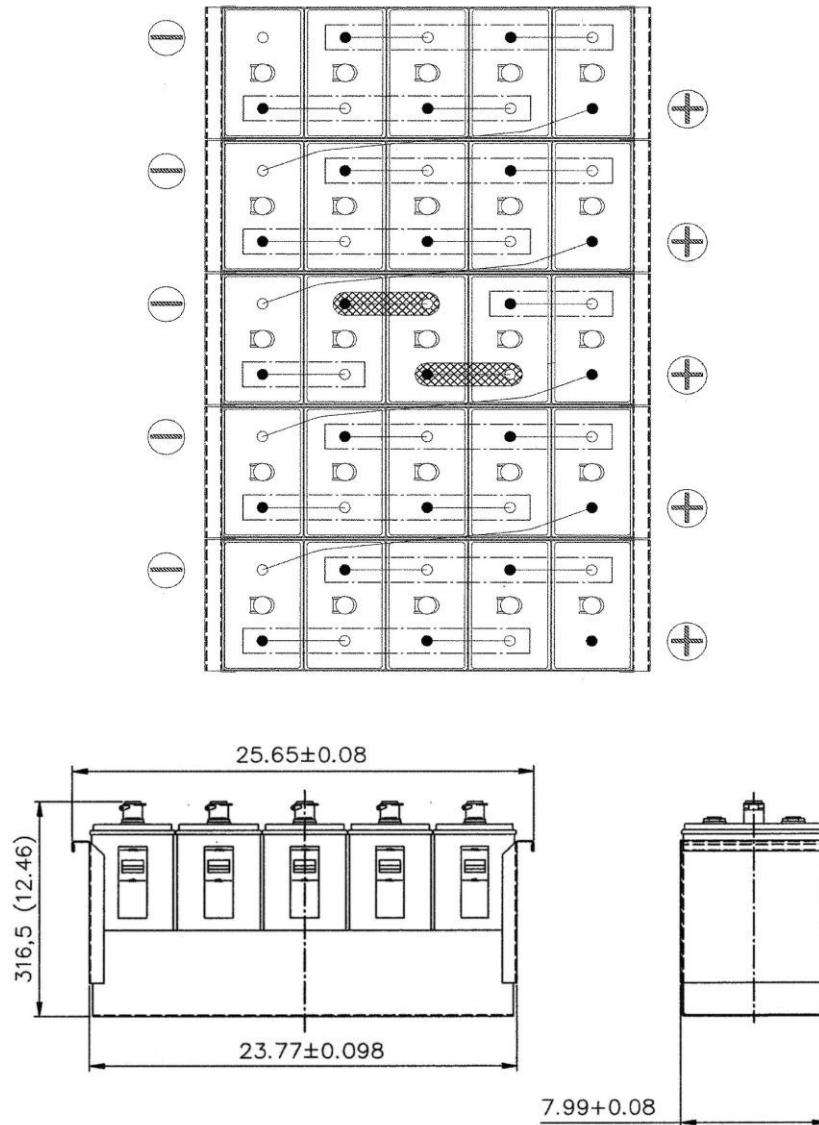
Ventilation is sufficient to prevent an explosive situation both during normal charging and also in the event that the battery becomes overheated or overcharged due to a failure in the battery charging circuitry.

### 11-I-02.02.02 Battery Cells

The Battery is made up of 25 alkaline Ni - Cd (Nickel - Cadmium) type Cells housed inside the battery basket (refer to Figure 11-I-02.8 - dimensions in mm).

It is divided into 5 Crates each one of which with 5 cells.

All cells are interconnected in series to produce the required nominal DC voltage (the connections are made with rigid connectors).



**Figure 11-I-02.8 Battery Cells**

Each Crate is designed to contain electrolyte liquid that may spill out of the battery. The cell case, jar, and cover are made of stainless steel.

Each cell has a MIN and a MAX level indicator that facilitates the level check from the outside.

Cell arrangement in the tray and the translucent cell cases permit a quick check of electrolyte levels through the filler holes.

Electrolyte can be replenished without removal of any equipment.

**NOTE:** Electrolyte capacity is sufficient to require adding water only during normal maintenance.

The Battery is equipped with two Thermal Sensors for monitoring the Battery Temperature in a range of -58,00°F to 150,00°F.

The Sensor's Signals is sent to the APS/LVPS logic.

The signal from 3B02 (battery C.B. trip temperature sensor) causes the battery circuit breaker to open if the battery temperature exceeds 150°F.

#### 11-I-02.02.02.01 Electric Characteristics

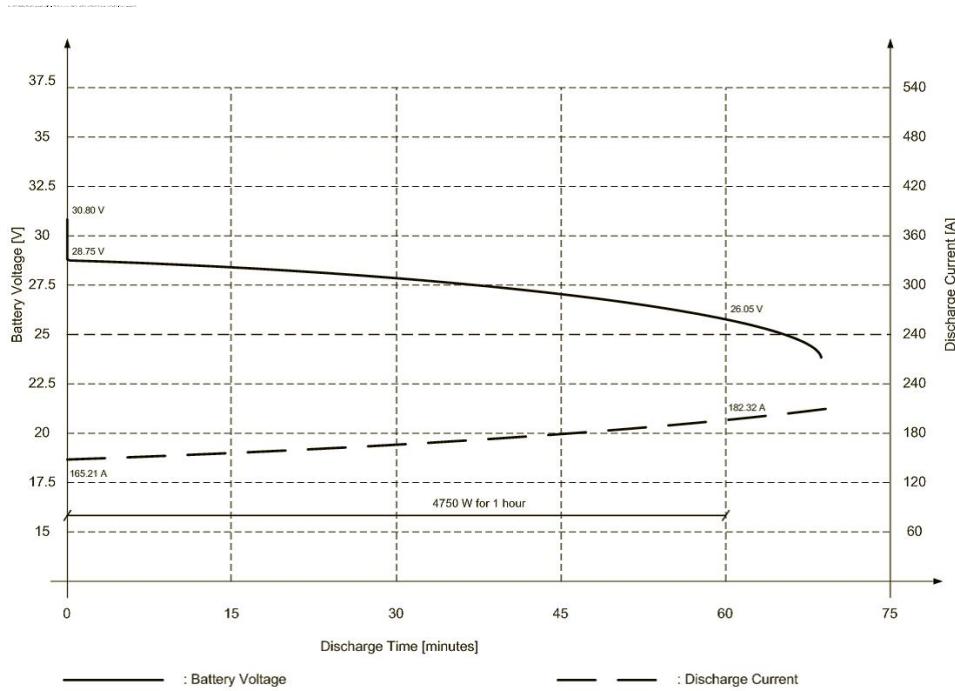
The set of 25 NiCd cells has 300 Ah of capacity.

The nominal cell voltage is 1.2Vdc for a battery voltage of  $1.2 \times 25 = 30$ Vdc.

The fully-charged battery voltage is the LVPS output: 37.5Vdc, in this situation the single cell is 1.5Vdc ( $37.5 / 25 = 1.5$ ).

Vnom	30 Vdc (37.5Vdc in full charged condition)
Vmax	42 Vdc
Vmin	25 Vdc
Nominal Capacity	300 Ah
Constant Power for 1h of use	4750 W (when 19.4°F)
Drop between the Battery and Load	≈2 V

A discharge rate beyond the rating of the battery does not permanently damage the cells nor reduce capacity.

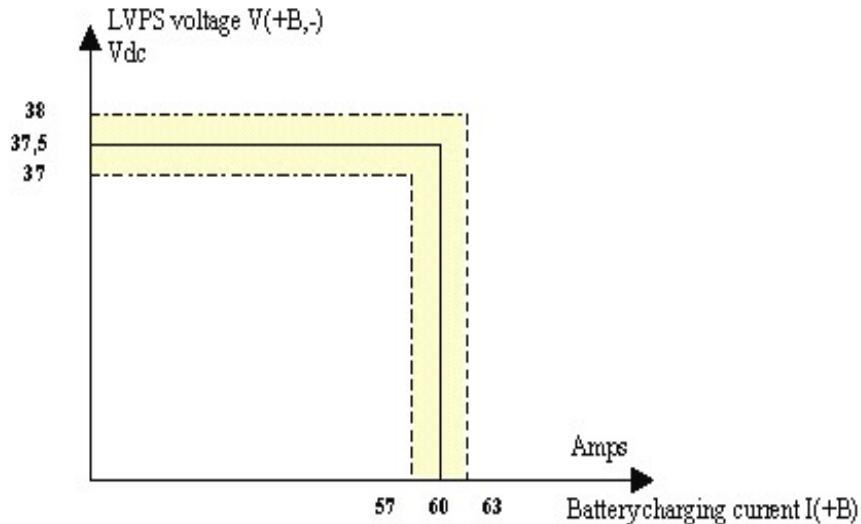


**Figure 11-I-02.9 Battery Discharge Time versus Voltage (19,40°F)**

#### 11-I-02.02.02.02 Battery Charge

The vehicle Battery is the primary LV load of the LVPS converter.

It is charged at a constant voltage and with current limited to the values indicated in Figure 11-I-02.10.



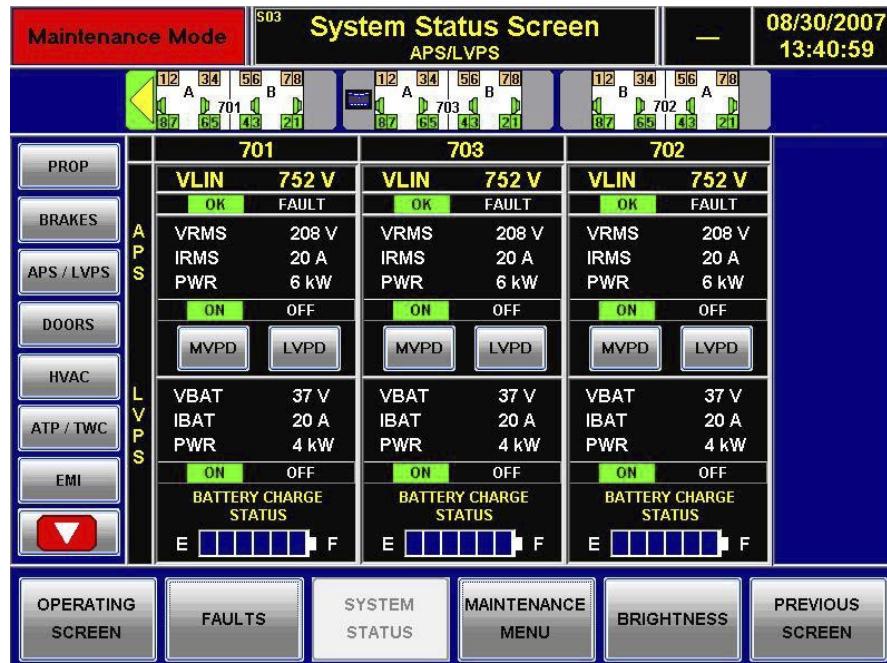
**Figure 11-I-02.10 LVPS battery charge Output Voltage/Current Curve**

The (+B) LVPS Output is constant ( $37.5 \pm 0.5$ ) Vdc, it is independent from the loads connected to the (+L) LVPS Output.

The Charging Voltage is shown by the IDU Operating Screen (refer to Figure 11-I-02.11) The battery charging status is displayed on the APS/LVPS System Status Screen (refer to Figure 11-I-02.12)



**Figure 11-I-02.11 IDU Operating Screen**



**Figure 11-I-02.12 APS-LVPS IDU System Status Screen**

### 11-I-02.02.03 Battery Circuit Breaker Box and Wiring

The Battery Circuit Breaker Box contains the electric components that allow the battery connections to the vehicle systems, as shown in Figure 11-I-02.13

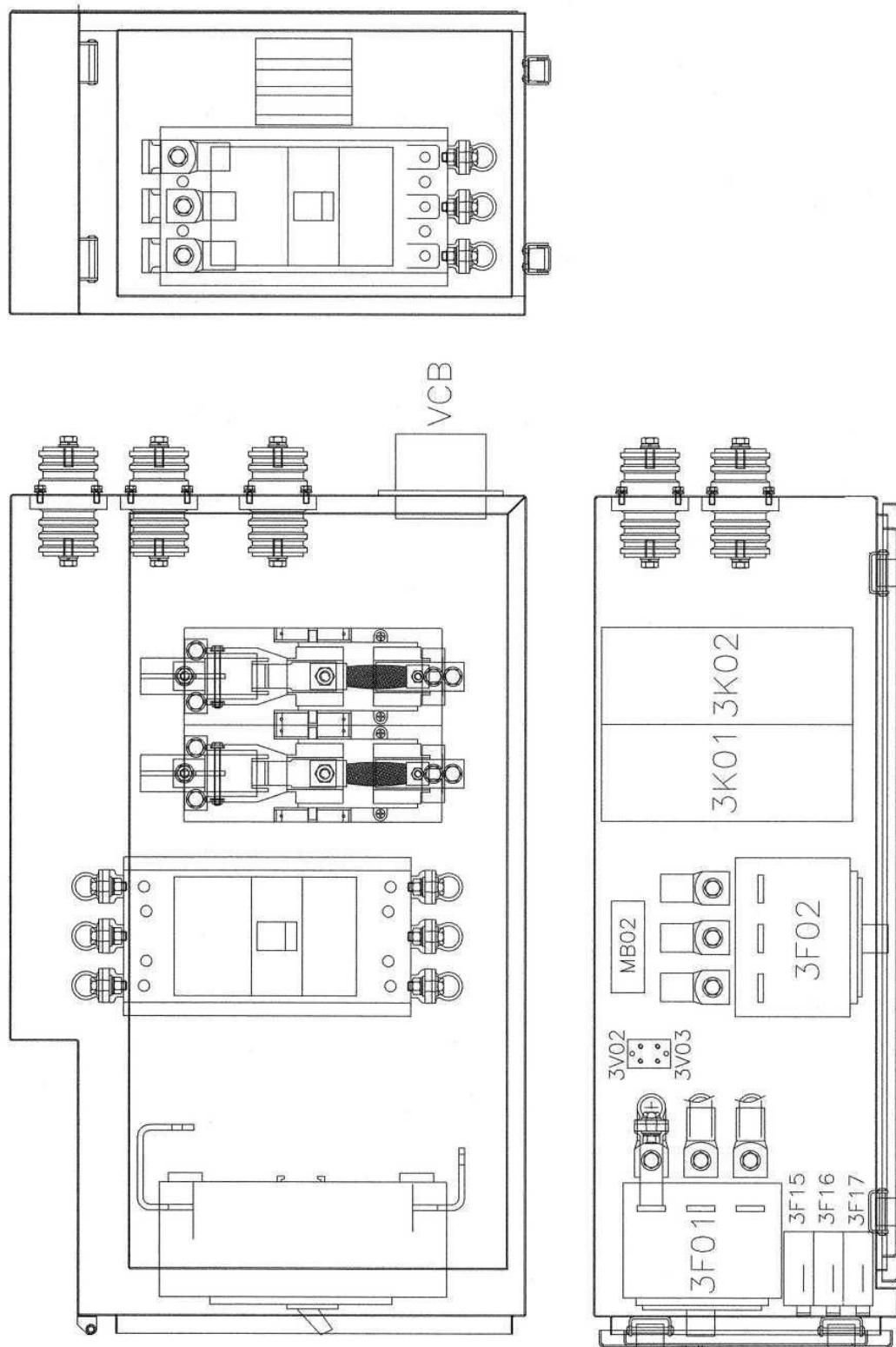


Figure 11-I-02.13 Battery Circuit Breaker Box

The Battery Circuit Breaker Box main components are listed in Table 11-I-02.1.

**Table 11-I-02.1 Battery Circuit Breaker Box Main Components**

3F01	Tripolar Battery Circuit Breaker ( $I_n=400A$ ) If open the battery is disconnected
3F02	Bipolar Battery Circuit Breaker ( $I_n=400A$ ) If open, all LV vehicle loads are disconnected. Only the following loads remain active: Track Brake, Battery Contactor, First Door, Communication, Emergency Lights.
3F15	Emergency Lighting Circuit Breaker
3F16	First Doors Units Circuit Breaker
3F17	Battery Contactor Circuit Breaker
3K01	Battery Contactor
3K20	Contactor + train Line
3V02	Block Diode
3V03	Block Diode
IS1	Connector (for battery supply from the (+B) LVPS connector)
IS2	Connector (for battery return path)
IS3	Connector (for train loads supply)
IS4	Connector (for vehicle loads supply)
IS5	Connector (for loads supply, from the (+L) LVPS connector)
MB02	Connection base
VCB	Connector (for contactor connections and for thermal sensor 3B01 signal)

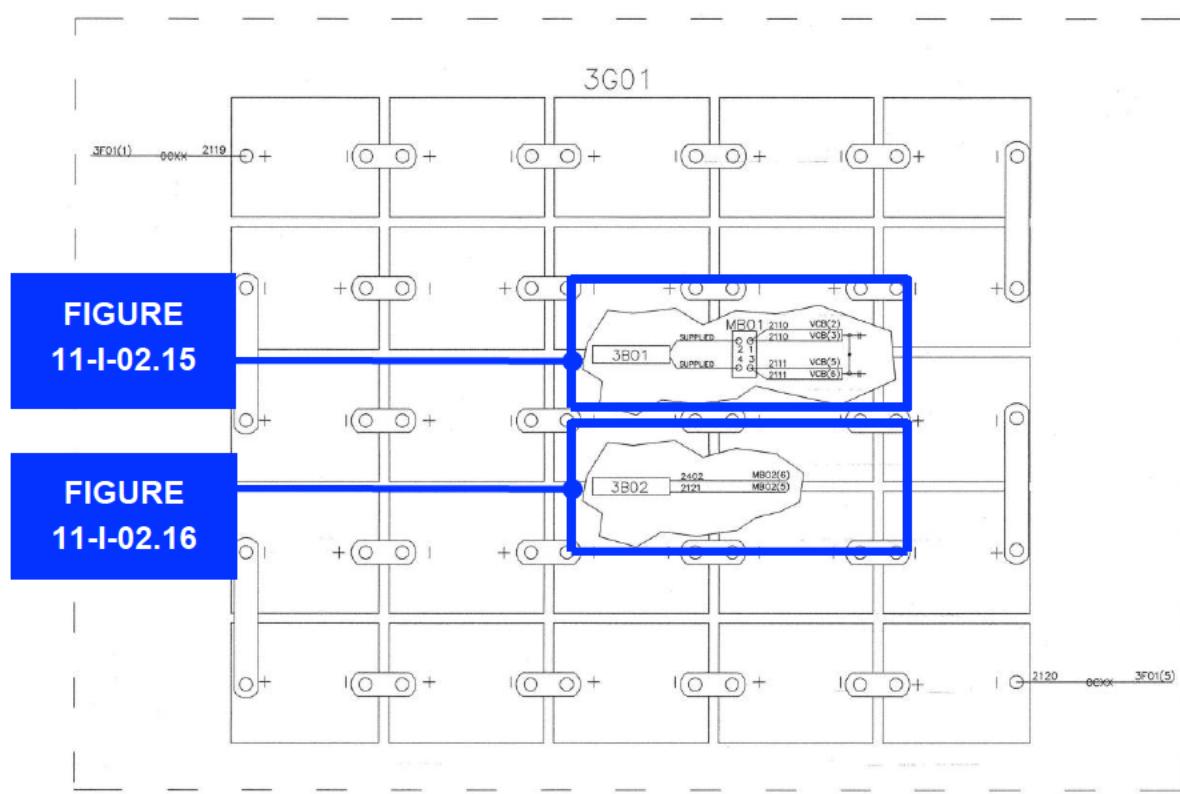
Figure 11-I-02.14 provides the Battery Top View with Battery and Thermal Sensors (3B01-3B02) wirings

Figures 11-I-02.15 and 11-I-02.16 provide respectively the Thermal Sensor 3B01 and 3B02 Location and Wiring details.

The Thermal Sensor 3B02 is identified as "Battery Trip Temperature Sensor CB".

The relevant technical characteristics are as follows:

Manufacturer	SENSATA (Texas Instruments)
Brand	KLIXON
Series/Model/	4344/176
Contacts Type	NO (Normally Open)
Operating Temperature (Closing)	150 °F (65.6 °C)
Differential	20 °F (11.1 °C)
Reset Temperature (Opening)	130 °F (54.4 °C)
Tolerance	±8 °F (4.4 °C)



**Figure 11-I-02.14 Topographic Battery Cells**

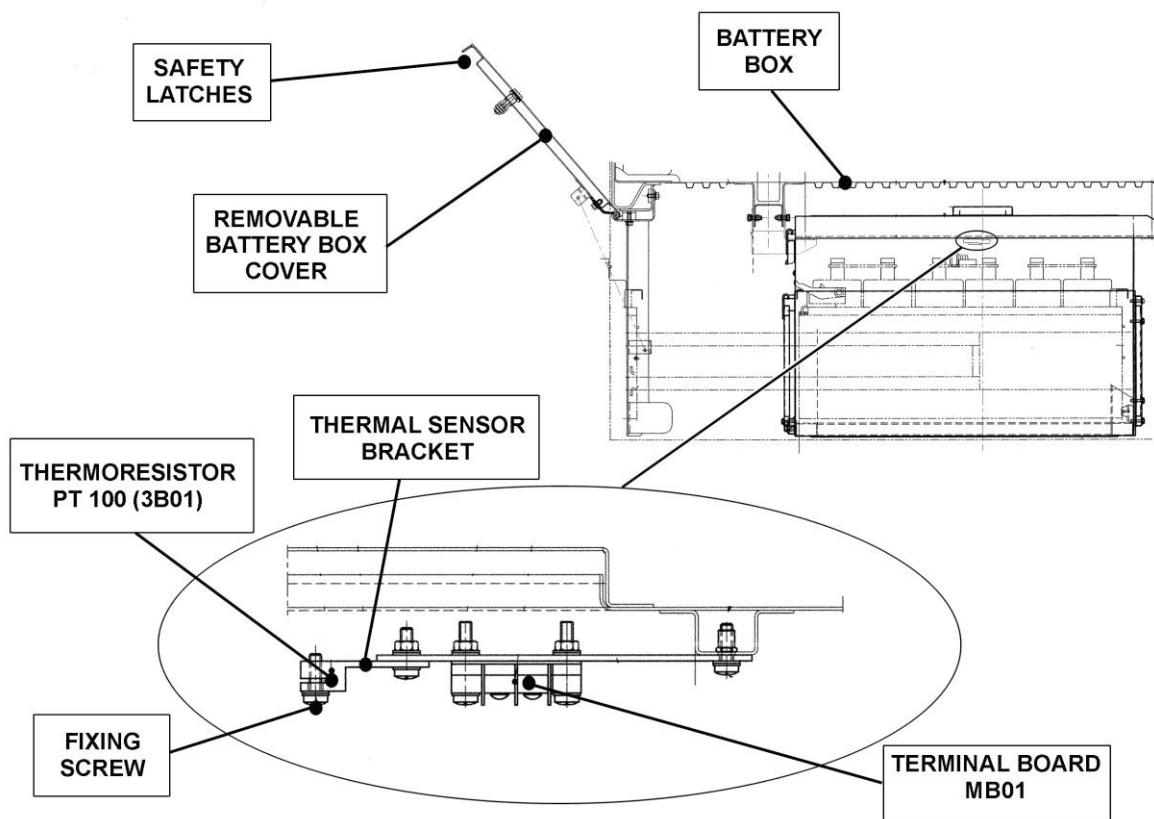
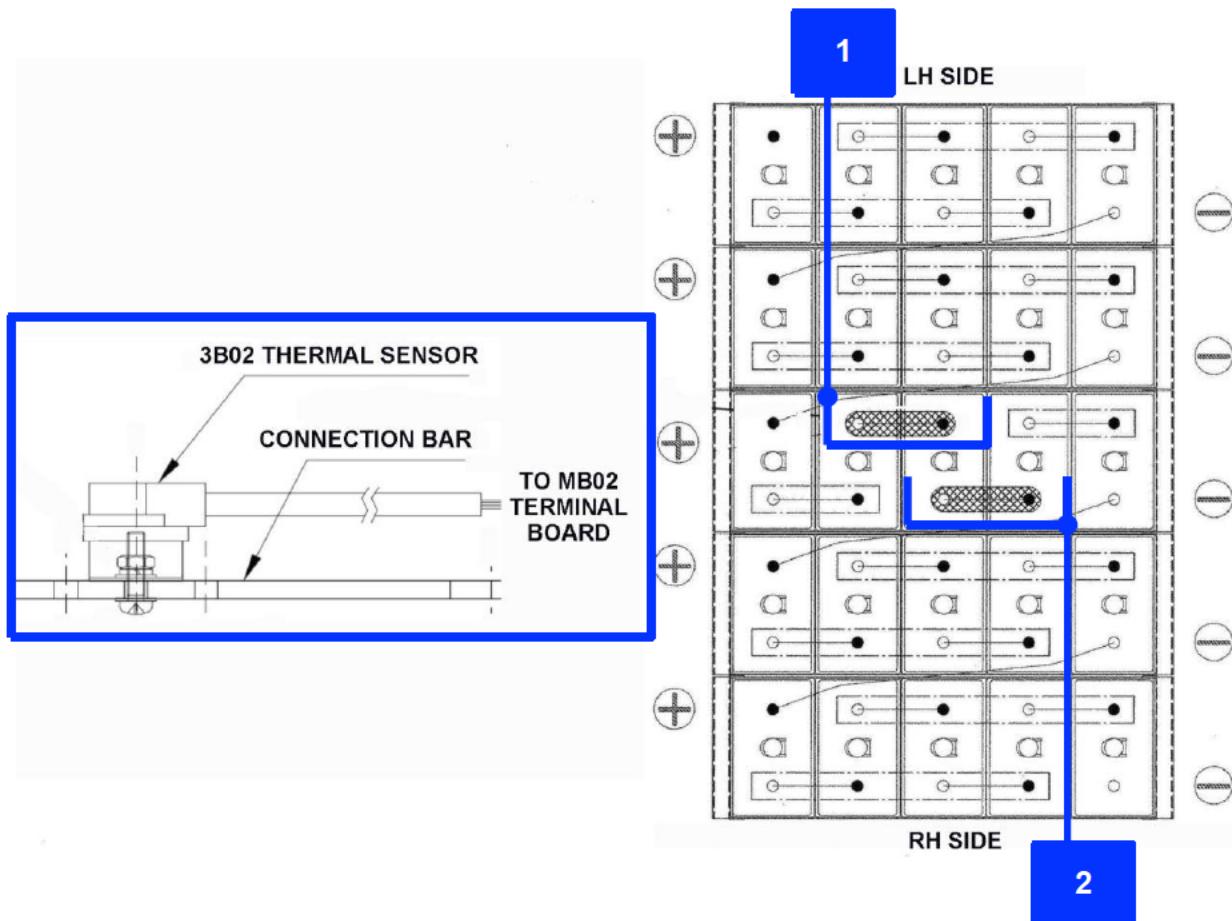


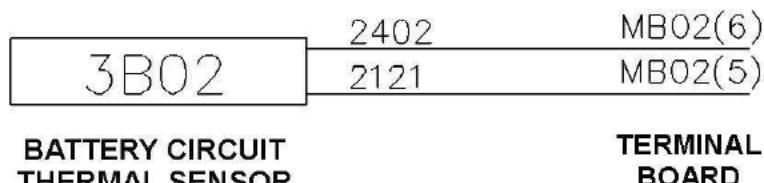
Figure 11-I-02.15 Thermal Sensor 3B01 - Location & Wiring



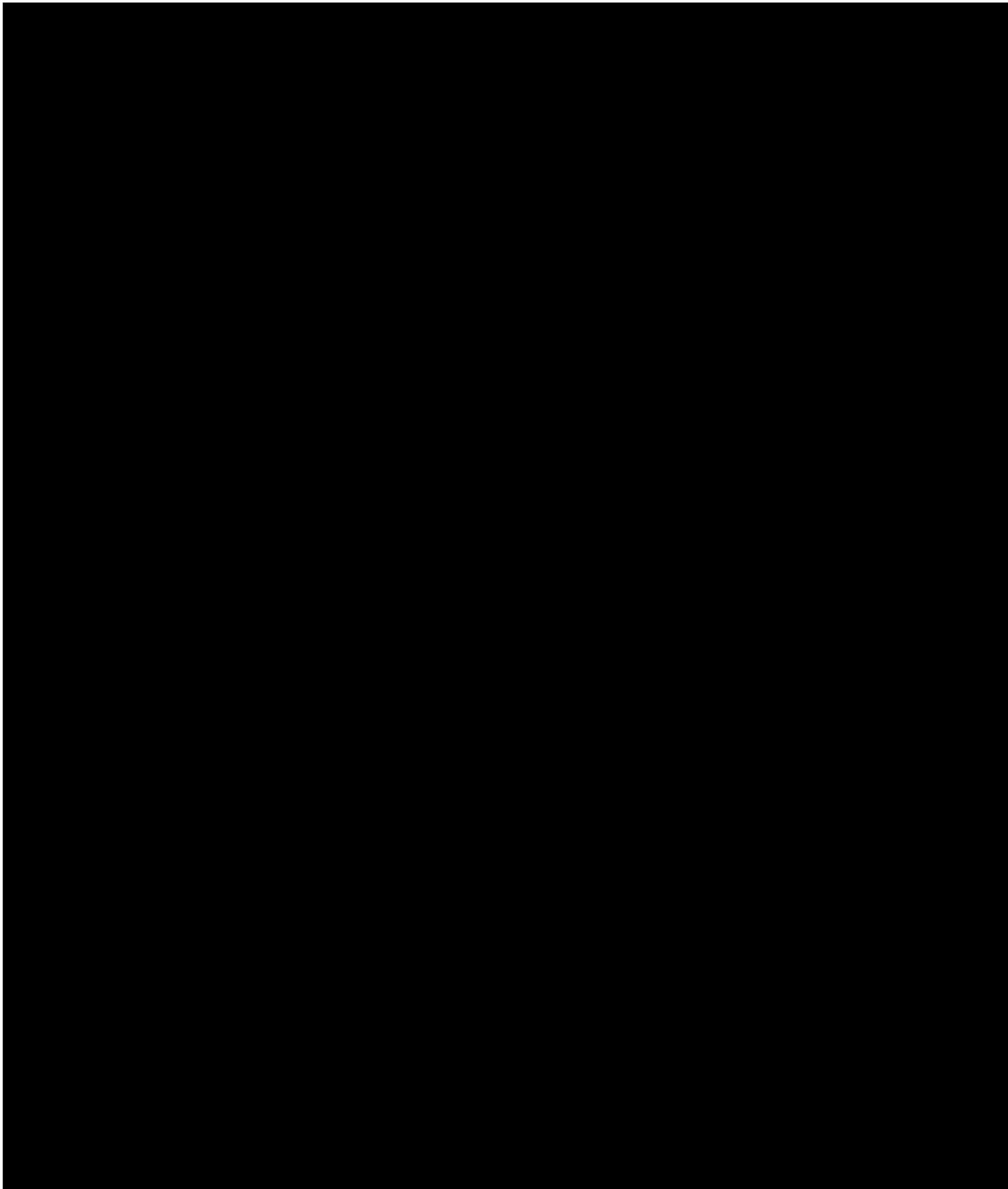
**NOTE:**

# 1 indicates the Location of the 3B02 Thermal Sensor with its Wiring routing from LH side.

# 2 indicates the Location of the 3B02 Thermal Sensor with its Wiring routing from RH side.



**Figure 11-I-02.16 Thermal Sensor 3B02 - Location & Wiring**



**Figure 11-I-02.17 Battery Box Topographic**

Table 11-I-02.2 shows the Battery cables used and the relevant labels, displayed in Figure 11-I-02.14 and Figure 11-I-02.17.

**Table 11-I-02.2 Cable Form**

Cable Symbol	Conductor Size	External Diameter (mm)	Color	Electric Insulation (V)	System
—OXXX—	AWG1	13.0	GREY	2,000	HV
—OLXX—	AWG2/0	18.0	GREY	2,000	HV
—OVC—	AWG4/0	19.0	GREY	2,000	HV
—OCXX—	262 MCM	22.0	GREY	2,000	HV
—OCL—	313 MCM	25.0	GREY	2,000	HV
—OL—	AWG1/0	15	BLACK	600	MV - LV
—XXV—	AWG3	10	GREY	600	MV - LV
—X—	AWG6	7.11	GREY	600	MV
—XVI—	AWG6	9.00	GREY	600	MV - LV
—VI—	AWG10	5.5	YELLOW	600	MV
—OOXX—	262 MCM	21.5	GREY	600	LV
	AWG16	3.7	WHITE	600	LV
—O/N—	AWG16	3.7	YELLOW/GREEN	600	ground
—O—	AWG12	4.2	BLUE	600	MV-LV
—O O/N—	AWG12	4.2	YELLOW/GREEN	600	ground
—O/-	AWG12	4	WHITE	600	LV
—/-	AWG16	3	WHITE	600	LV
—//—	AWG18	2	WHITE	600	LV
—IV—	AWG10	4.9	WHITE	600	LV
—VI—	AWG10	5.5	WHITE	600	LV
TW —X—	2 x AWG16	4.3	WHITE - RED	300-300	LV
—TW X—					
—○—	3 x AWG20 + SHIELD	4.5	BLACK	600	LV
—○+—	1 x AWG18 + SHIELD	3.0	BLACK	600	LV
—○  —	2 x AWG18 + SHIELD	5.0	BLACK	600	LV
—○   —	3 x AWG18 + SHIELD	5.3	BLACK	600	LV
—○o—	MVB (x4)	7.8	GREEN	300/500	LV
—○o—	RS485 (x2)	5.0	BLACK	300/500	LV
—○o—	WTB (x2)	8.5	BLACK	300/500	LV
—○v  —	ETHERNET 4x2xAWG24	6.8	GREY	500	LV

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VOLUME M-01  
PART II  
TROUBLESHOOTING  
SECTION 11 - BATTERY



# **SECTION 11**

**BATTERY**

**PART II**

**TROUBLESHOOTING**

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Cd.....	Cadmium
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HSCB .....	High Speed Circuit Breaker
HV .....	High Voltage
HVAC .....	Heating Ventilation & Air Conditioning
LH.....	Left Hand Side
LRV .....	Light Rail Vehicle
LV.....	Low Voltage
LVPD .....	Low Voltage Power Distribution
LVPS .....	Low Voltage Power Supply
MBL.....	Metro Blue Line
Ni.....	Nickel
PGL.....	Pasadena Gold Line
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T.S.....	Transfer Switch
TBS .....	To Be Supplied
TCU .....	Traction Control Unit
TCU_A.....	Traction Control Unit on the A body section
TCU_B.....	Traction Control Unit on the B body section
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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
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<b>Definition</b>	<b>Meaning</b>
$\Omega$ .....	Ohm
$^{\circ}\text{C}$ .....	Celsius degree
$^{\circ}\text{F}$ .....	Fahrenheit degree
A .....	Ampere
dc .....	Direct Current
ft .....	Foot
gal .....	Gallon
in .....	Inch
$\text{k}\Omega$ .....	Kilo Ohm
kg .....	Kilogram - approx 2.205 pounds
lb .....	Pound
m .....	Meter - approx 3.28 feet
mm .....	Millimeter - approx 0.0394 inches
ms .....	Millisecond
rms .....	Root Mean Square Voltage
rpm .....	Revolution per Minute
V .....	Voltage
Vin .....	Input Voltage
W .....	Watt

## 11-II-02 TROUBLESHOOTING

Troubleshooting the Battery can be carried out in two ways:

- With the IDU (refer to Section 18 for a more detailed description on its operation)
- With the Fault Isolation / Repair Tables

### 11-II-02.01 Troubleshooting with the IDU

The Operating Screen of the IDU shows the Battery Voltage.

The APS/LVPS System Status Screen (refer to Figure 11-II-02.1) shows the Battery Charge Status (E = Empty ; F = Full).

To access this screen, maintenance personnel must enter Maintenance Mode, select the "System Status" button on the Navigation Bar, then choose "APS/LVPS" from the menu at the left.

By means of the "LVPD" button, the Low Voltage Power Distribution Screen is accessed.

This screen shows the LVPD connectors whose status can be checked through the IDU (Open = Red ; Closed = Green) (refer to Figure 11-II-02.2).

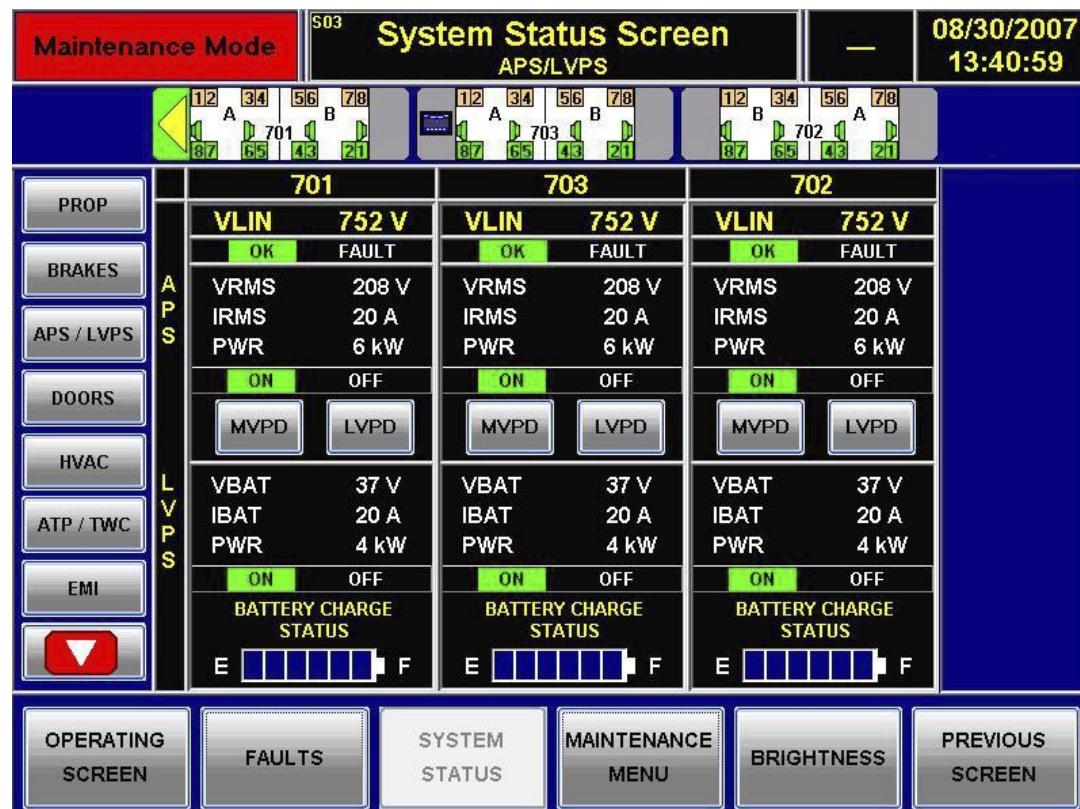
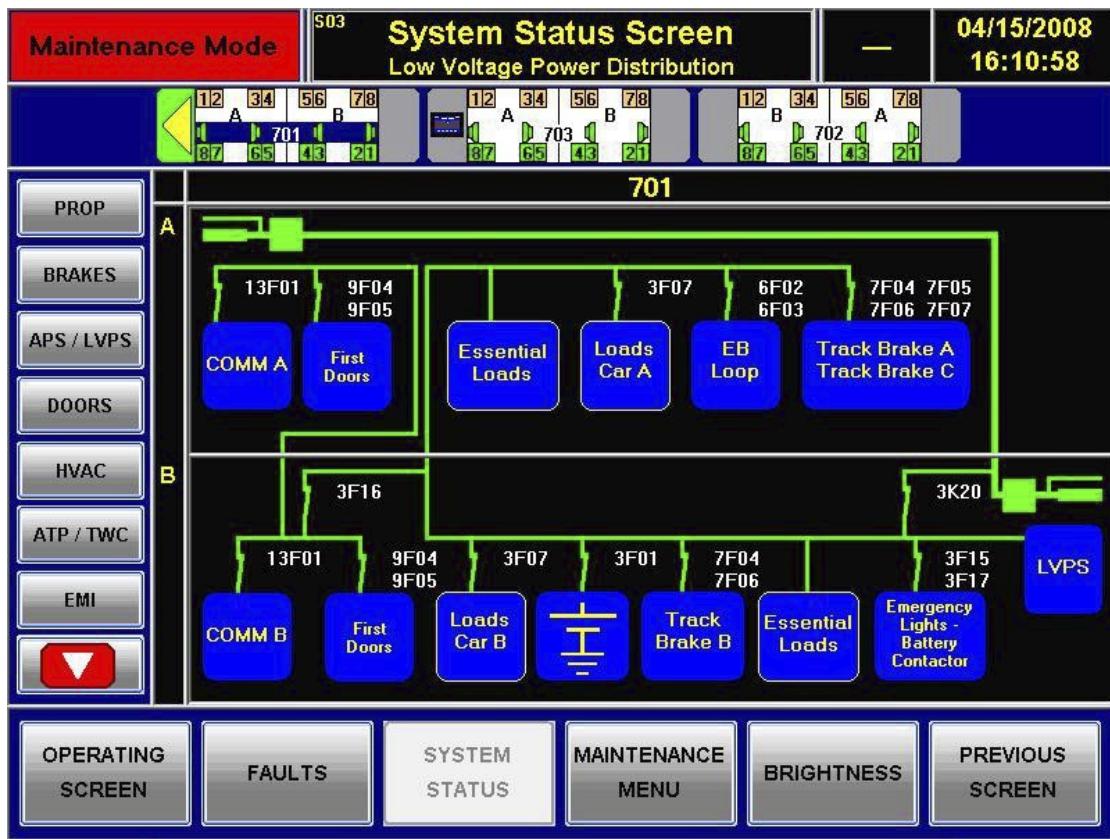


Figure 11-II-02.1 APS-LVPS System Status Screen



**Figure 11-II-02.2 LVPD System Status Screen**

The Battery Circuit Breaker Box contains the Circuit Breakers and Contacts listed in Table 11-II-02.1.

**Table 11-II-02.1 Battery Circuit Breakers Box Components**

3F01	Tripolar Battery Circuit Breaker ( $In=400A$ ) If open the battery is disconnected
3F02	Bipolar Battery Circuit Breaker ( $In=400A$ ) If open all the LV vehicle loads are disconnected, only the following loads remain active: track brake, battery contactor, first door, communication, emergency lights.
3F15	Emergency Lighting Circuit Breaker
3F16	First Doors Units Circuit Breaker
3F17	Battery Contactor Circuit Breaker
3K01	Battery Contactor
3K20	Contactor + train Line

The IDU monitors 3F01, 3F15, 3F16, 3F17 and 3K20 Circuit Breakers.

If any of these Circuit Breakers is not working properly, the Battery Circuit Breaker Box must be opened and all wire connections must be checked.

The other elements of the Battery are not checked by the IDU and they must be checked visually.

### 11-II-02.02 Fault Isolation / Repair Tables

**Table 11-II-02.2 Battery - Fault Isolation / Repair Table**

Malfunction Symptom	Probable Cause	Corrective Action
	1. Battery charged is Low (use the IDU to check the battery level).	1. Recharge battery on car prior to departure.
	2. Load(s) were left on overnight and LVPS was OFF.	1. check the loads that were left on and turn off. Recharge battery on car prior to departure.
	3. Ground leakage due to accumulations of dust and dirt on battery.	1. Clean and dry battery
1. Battery does not supply loads as required.	4. Electrolyte levels are below lower line (MIN) in battery cell(s) resulting in exposure of plates and active material.	1. Check electrolyte level of battery cells. Add distilled water to upper the line (max) on battery cell(s) that required it and recharge battery to attempt restoration.
	5. Leaking cell(s).	1. Replace leaking cell(s) and recharge battery.
	6. LVPS fault	1. Check LVPS fault from "Indicators Panel 'B'" or on the IDU. Refer to Section 10.
2. Erratic battery behavior	1. Loose connections inside the battery box or loose battery output cables leads.	1. Check the condition of all Battery connections

**Table 11-II-02.2 Battery - Fault Isolation / Repair Table**

<b>Malfunction Symptom</b>	<b>Probable Cause</b>	<b>Corrective Action</b>
2. Erratic battery behavior (cont'd)	2. Wrong polarity connections.	1. Check polarity connections and change them, as required.
	3. Battery contactors or Circuit Breakers open	1. Check the IDU, check the contact or close the CB.
	4. Cell(s) empty (no water)	1. If the cell(s) is empty because of leakage, replace them.
3. Excessive water consumption.	1. High charge voltage	1. Check the LVPS output voltage (use the IDU, Figure 11-II-02.1. Refer to Section 10).
	2. Excessive operating temperature	1. Check that temperature sensor in battery box is functioning and replace it if defective.
4. Little or no water consumption.	1. Low charge voltage.	1. Check the LVPS output voltage (use the IDU, Figure 11-II-02.1. Refer to Section 10).
	2. Shorted cell(s).	1. Perform individual cell voltage check and replace shorted cell(s).
5. Continuous heavy gassing.	1. Battery charger output from LVPS is providing a high rate of charge and does not return to float charge.	1. Check the LVPS output voltage (use the IDU, Figure 11-II-02.1. Refer to Section 10).

**LOS ANGELES COUNTY**

**METROPOLITAN TRANSPORTATION AUTHORITY**

**LIGHT RAIL VEHICLE**

**P2550**



**RUNNING MAINTENANCE  
AND  
SERVICE MANUAL**

**VOLUME M-01-A  
PART III  
MAINTENANCE  
SECT 11 BATTERY**





# **SECTION 11**

**BATTERY**

**PART III**

**MAINTENANCE**

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# SECTION 11

## BATTERY

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# SECTION 11

## BATTERY

### 11-III-01 INTRODUCTION

The “Battery” Part III - Maintenance consists of :

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

### **11-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.

<b>Abbreviation</b>	<b>Meaning</b>
AB	AnsaldoBreda
A/h	Ampere Per Hour
APS	Auxiliary Power Supply
ASSY	Assembly
ATP	Automatic Train Protection
BCU	Brake Control Unit
C/L	Centerline
Cd	Cadmium
DC	Direct Current
ELE	Electronic
H-CML	Heavy Consumable Material List
H-CMS	Heavy Corrective Maintenance Sheet
HSCB	High Speed Circuit Braker
HV	High Voltage
HVAC	Heating Ventilation & Air Conditioning
IDU	Integrated Diagnostic Unit
IPC	Illustrated Parts Catalog
LH	Left Hand Side
LRV	Light Railway Vehicle
LV	Low Voltage
LVDC	Low Voltage Direct Current
LPD	Low Voltage Power Distribution
LVPS	Low Voltage Power Supply
MBL	Metro Blue Line
Ni	Nickel
PGL	Pasadena Gold Line
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
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
SCPM	Safety Critical Preventive Maintenance
SYS	System

(Cont)

(Cont)

<b>Abbreviation</b>	<b>Meaning</b>
TBD	To Be Defined
TBS	To Be Supplied
TOC	Table Of Content
TTEM	Tools & Test Equipment Manual
VAC	Voltage Alternate Current
VDC	Voltage Direct Current
W/	With
W/O	Without

### **11-III-01.b List of Definitions**

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

<b>Definition</b>	<b>Meaning</b>
'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

### 11-III-01.c List of Measurement Units

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

<b>Definition</b>	<b>Meaning</b>	
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)
$\Omega$	Ohm	(Resistance)
$^{\circ}\text{F}$	Fahrenheit	(Temperature)
$^{\circ}\text{C}$	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)

### **11-III-01.d References**

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

<b>Topic</b>	<b>Paragraph</b>
<b>MANUAL PURPOSE</b>	00-02
<b>MANUAL ARRANGEMENT</b>	00-03
<b>MANUAL APPLICABILITY</b>	00-04
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## 11-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:

<b>Running Maintenance</b>		<b>Heavy Maintenance</b>	
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

## 11-III-03 RUNNING -PREVENTIVE MAINTENANCE

### 11-III-03.01 Running -Preventive Maintenance Matrixes (R-PMM)

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

The “Battery” (R-PMM) is provided in two different arrangements as follows:

- R-PMM Component Based

It lists the “ Battery “ 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 “ Battery “ 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.

### **11-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.

### **11-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.

### **11-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.

**11-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 11-III-03.03.01 for Running- Preventive Maintenance Sheet (R-PMS) Form for detailed explanation.

**11-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 11-III-03.1 for Running - Preventive Maintenance Matrix (R-PMM)  
(Component Based)
- Table 11-III-03.2 for Running - Preventive Maintenance Matrix (R-PMM)  
(Mileage Based)

**11-III-03.01.06      Running Preventive Maintenance Matrix (Component Based)**
**Table 11-III-03.1    Running Preventive Maintenance Matrix (Component Based)**

<b>SYSTEM 11 BATTERY</b>		<b>S C P M</b>	<b>INSPECTION INTERVAL MILES</b>					<b>SHEET CODE</b>	
<b>SUBSYSTEM ASSY/UNIT/COMPONENT</b>	<b>TASK</b>		Daily	10K	30K	60K	120K		
30V-300 A/h BATTERY	INSPECTION			•				R-P-11-06-00-00/I-00	
30V-300 A/h BATTERY	INSPECTION						•	R-P-11-06-00-00/I-01	

**11-III-03.01.07      Running Preventive Maintenance Matrix (Mileage Based)**
**Table 11-III-03.2    Running Preventive Maintenance Matrix (Mileage Based)**

<b>SYSTEM 11 BATTERY</b>		<b>S C P M</b>	<b>PERSON HOURS</b>		<b>SHEET CODE</b>
<b>SUBSYSTEM</b>	<b>TASK</b>				
<b>10,000 MILES</b>					
30V-300 A/h BATTERY	INSPECTION		0.5		R-P-11-06-00-00/I-00
<b>120,000 MILES</b>					
30V-300 A/h BATTERY	INSPECTION		0.5		R-P-11-06-00-00/I-01

### **11-III-03.02 Running -Preventive Maintenance Reports (R-PMR/Job Cards)**

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

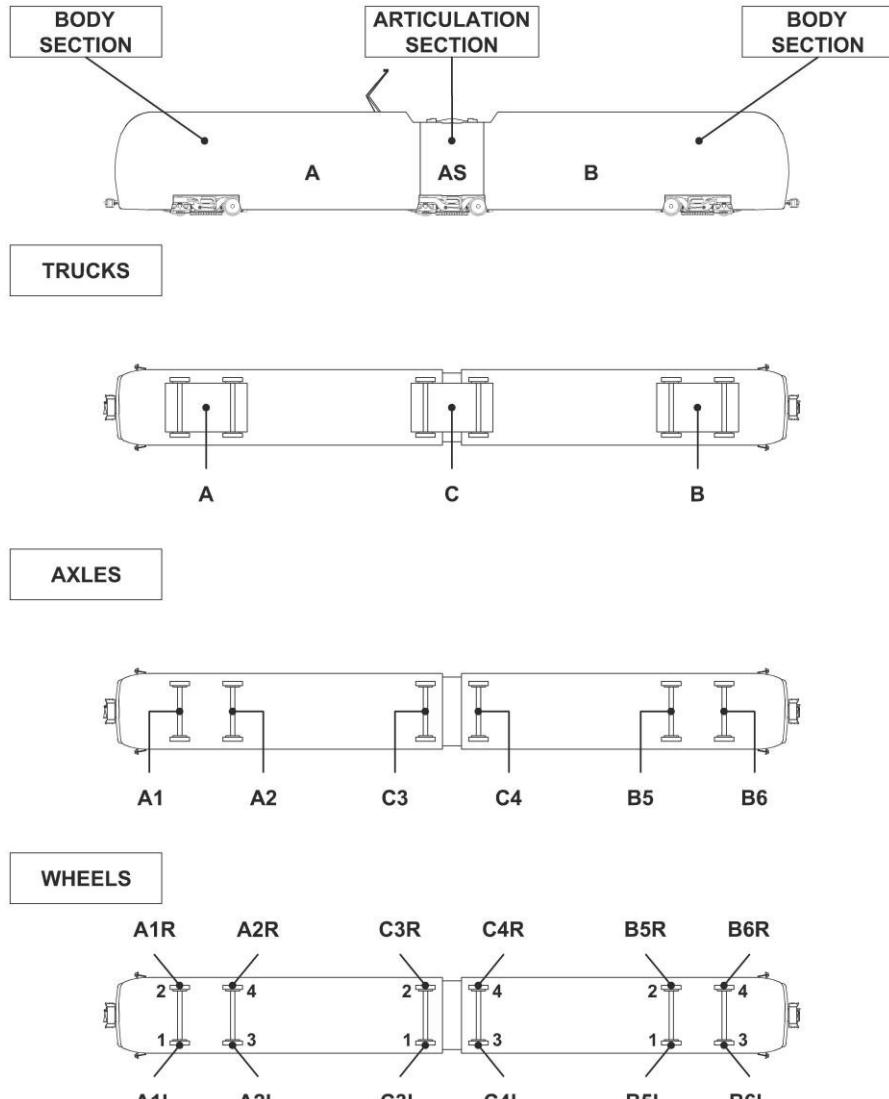
#### **11-III-03.02.01 R-PMR/Job Card Form Content**

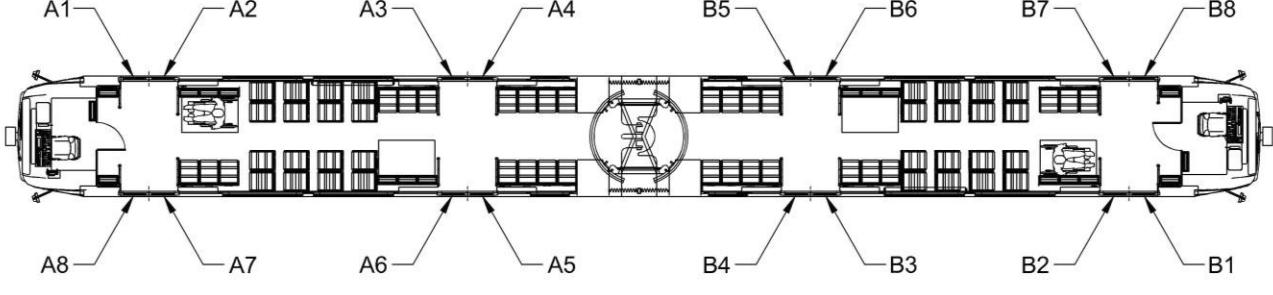
The R-PMR/JOB CARDS are broken down into two main topics:

Specific Data and R-PM Data

Refer to Figure 11-III-03.1 for R-PMR/JOB CARD Form example

<b>RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM</b>		
<b>SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER</b>		
<b>ITEM #</b>	<b>TITLE</b>	<b>EXPLANATORY NOTE</b>
<b>1</b>	<b>VEHICLE #</b>	This field indicates the Vehicle Identification Number
<b>2</b>	<b>DATE</b>	This field indicates the Date on which the Vehicle entered the Maintenance Shop
<b>3</b>	<b>RUNNING HOURS</b>	This field indicates the Vehicle Running Hours at the above Date
<b>4</b>	<b>MILES</b>	This field indicates the Vehicle Running Miles at the above Date.
<b>5</b>	<b>EMPLOYEE # &amp; SIGNATURE</b>	This Field indicates the Employee # & Signature of the Maintainer(s) that perform the referred Task(s)
<b>6</b>	<b>STARTING DATE</b>	This field indicates the Starting Date of the referred Task(s).
<b>7</b>	<b>WORK HOURS</b>	This field indicates the Work duration to perform the referred Task(s).
<b>8</b>	<b>COMPLETION DATE</b>	This field indicates the Completion Date of the referred Task(s).
<b>9</b>	<b>DEFECT FOUND/COMMENTS</b>	This field indicates the result of the Task (s) execution and/ or note related to any items of the maintained Equipment requiring Corrective Maintenance
<b>A</b>	<b>P2550 RUNNING PREVENTIVE MAINTENANCE REPORT SYSTEM (Maintenance Interval) JOB CARD</b>	This field provides R-PMR Title. The R-PM Maintenance Intervals are the following: Daily; 10,000 Miles; 30,000 Miles; 60,000 Miles; 120,000 Miles
<b>B</b>	<b>WORK AREA</b>	This column lists the On Vehicle Areas where the Equipment to be maintained is located The Work Areas are provided to optimize the jobs organization of the Preventive Maintenance tasks in order to: 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.) The On Vehicle Work Areas are the following: Exterior - Interior - Roof - Truck - Undercar - Vehicle (Vehicle as a whole)

<b>RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM</b>		
<b>SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER</b>		
<b>ITEM #</b>	<b>TITLE</b>	<b>EXPLANATORY NOTE</b>
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"> <li>- Cleaning - Inspection -Lubrication -</li> <li>- Replacement - Service- Test</li> </ul>
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>  <p><b>BODY SECTION</b></p> <p><b>ARTICULATION SECTION</b></p> <p><b>BODY SECTION</b></p> <p><b>TRUCKS</b></p> <p><b>AXLES</b></p> <p><b>WHEELS</b></p> <p>Axes and wheels are numbered as follows:</p> <ul style="list-style-type: none"> <li>Front Axle: A1 (Left), A2 (Right)</li> <li>Middle Axle: C3 (Left), C4 (Right)</li> <li>Rear Axle: B5 (Left), B6 (Right)</li> <li>Front Wheels: A1R (Top), A2R (Bottom)</li> <li>Middle Wheels: C3R (Top), C4R (Bottom)</li> <li>Rear Wheels: B5R (Top), B6R (Bottom)</li> <li>Front Left Wheels: A1L (Top), A2L (Bottom)</li> <li>Middle Left Wheels: C3L (Top), C4L (Bottom)</li> <li>Rear Left Wheels: B5L (Top), B6L (Bottom)</li> </ul>

<b>RUNNING PREVENTIVE MAINTENANCE REPORTS (R-PMR/JOB CARDS) FORM</b>		
<b>SPECIFIC DATA TO BE FILLED IN BY THE MAINTAINER</b>		
<b>ITEM #</b>	<b>TITLE</b>	
<b>E (cont'd)</b>	<b>LOCATION (cont'd)</b>	
<b>EXPLANATORY NOTE</b>		
 <p>CAR "A"</p> <p>CAR "B"</p>		
<b>Door Numbering</b>		
<b>ITEM #</b>	<b>TITLE</b>	<b>EXPLANATORY NOTE</b>
<b>F</b>	<b>PM SHEET CODE</b>	<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>
<b>G</b>	<b>SHEET ....OF.....</b>	This field indicates the progressive sheet page number of each R-PMR/JOB CARD

	<b>P2550</b> <b>RUNNING PREVENTIVE MAINTENANCE REPORT</b> <b>PROPULSION 30,000 MILES JOB CARD</b>						
<b>VEHICLE#</b> <b>DATE</b> / / <b>RUNNING HOURS</b> <b>MILES</b>		<b>SHEET 1 OF 2</b>					
WORK AREA	ITEM	TASK	LOCATION				PM SHEET CODE
			BODY SECTION	TRUCK	AXLE	SIDE	
ROOF	BRAKING RESISTOR	CLEANING	A				R-P-07-03-06-00/C-00
	BRAKING RESISTOR	CLEANING	B				R-P-07-03-06-00/C-00
TRUCK	GEARBOX	INSPECTION	A	A	A1		R-P-07-06-01-00/I-00
	GEARBOX	INSPECTION	A	A	A2		R-P-07-06-01-00/I-00
	GEARBOX	SERVICE	A	A	A1		R-P-07-06-01-00/S-00
	GEARBOX	SERVICE	A	A	A2		R-P-07-06-01-00/S-00
	GEARBOX	SERVICE	A	A1			R-P-07-06-01-00/S-01

	<b>P2550</b> <b>RUNNING PREVENTIVE MAINTENANCE REPORT</b> <b>PROPULSION 30,000 MILES JOB CARD</b>		
<b>VEHICLE#</b> <b>DATE</b> / / <b>RUNNING HOURS</b> <b>MILES</b>		<b>SHEET 2 OF 2</b>	
<b>DEFECT FOUND / COMMENTS</b>			
1	2	3	4
5			
6			
7			
8			
9			
<b>EMPLOYEE# &amp; SIGNATURE</b>		<b>STARTING DATE</b>	<b>WORK HOURS</b>
<b>COMPLETION DATE</b>			

### **Figure 11-III-03.1 R-PMR/Job Card Form -Example**

11-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

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

### 11-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.

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

## **BATTERY**

### **Running - Preventive Maintenance Reports**

### **R-PMR/JOB CARDS**

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**BATTERY  
RUNNING PREVENTIVE MAINTENANCE REPORT  
10,000 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	
UNDERCAR	BATTERY	30V -300 A/h BATTERY	INSPECTION	B				R-P-11-06-00-00/I-00

## DEFECT FOUND / COMMENTS

**INTENTIONALLY LEFT BLANK**

**BATTERY  
RUNNING PREVENTIVE MAINTENANCE REPORT  
30,000 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	
UNDERCAR	BATTERY	30V -300 A/h BATTERY	INSPECTION	B				R-P-11-06-00-00/I-00

## **DEFECT FOUND / COMMENTS**

**INTENTIONALLY LEFT BLANK**

**BATTERY  
RUNNING PREVENTIVE MAINTENANCE REPORT  
60,000 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	
UNDERCAR	BATTERY	30V -300 A/h BATTERY	INSPECTION	B				R-P-11-06-00-00/I-00

#### **DEFECT FOUND / COMMENTS**

## DELETION OF COMMENTS

**INTENTIONALLY LEFT BLANK**

**BATTERY  
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	
UNDERCAR	BATTERY	30V -300 A/h BATTERY	INSPECTION	B				R-P-11-06-00-00/I-00
		30V -300 A/h BATTERY	INSPECTION	B				R-P-11-06-00-00/I-01

## **DEFECT FOUND / COMMENTS**

**INTENTIONALLY LEFT BLANK**

### 11-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:

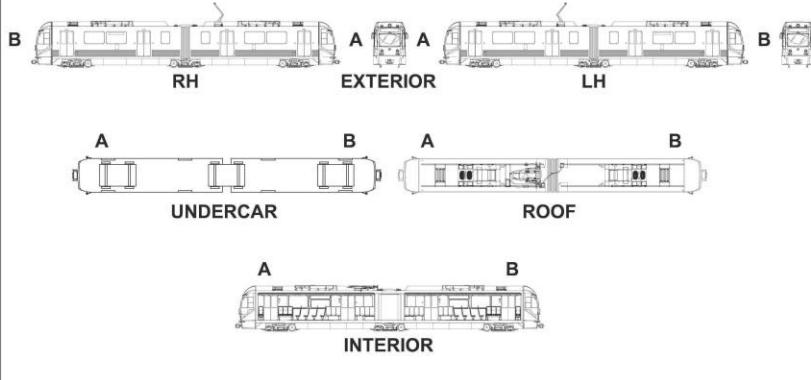
- **SAFETY PRECAUTIONS**, to be followed to safely accomplish the Task
- **TOOLS**, including Special Tools and Test Equipment, needed to accomplish the Task
- **CONSUMABLES**, required to accomplish the Task and consistent with those used by MTA
- **PROCEDURE**, consisting of **Preliminary Operations** 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

#### 11-III-03.01      Running- Preventive Maintenance Sheet (R-PMS) Form

The R-PMS Form (refer to Figure 11-III-03.2) consists of several fields containing the following data/ information:

<b>RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form</b>			
<b>ITEM #</b>	<b>TITLE</b>	<b>CONTENT</b>	<b>EXPLANATORY NOTES</b>
1	Card code	Sheet code	<p>The Sheet Code is an alphanumerical code that identifies each R-PM Sheet.</p> <p><b>THE SHEET CODE IS THE EXPLICIT LINK BETWEEN R-PM MATRIXES, R-PMR /JOB CARDS AND R-PM SHEETS</b></p> <p>The Sheet Code consists of letters R-P followed by an 11 digit code number as follows:</p> <p><b>R-P-nn-mm-zz-ww/Y-kk</b></p> <p><b>R</b> = Running      <b>P</b> = Preventive</p> <p><b>nn</b>      may vary from 02 to 19, identifying the System/ Manual Section number.</p> <p><b>mm-zz-ww</b>    each one may vary from 00 to 99, according to AB System Functional Tree, allowing the identification of the Assembly/Unit/Component</p> <p><b>Y</b>      Maintenance Task Code. It may be one of the following:</p> <p><b>C=Cleaning</b>      <b>I=Inspection</b>      <b>L=Lubrication</b></p> <p><b>R=Replacement</b>      <b>S=Service</b>      <b>T=Test</b></p> <p><b>kk</b>      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> <p>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)</p> <p>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</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	Interval Miles	Number	<p>This field indicates the maintenance Interval Miles.</p> <p>It may be DAILY, 10,000 Miles, 30,000 Miles, 60,000 Miles, 120,000 Miles</p>

<b>RUNNING -PREVENTIVE MAINTENANCE SHEET (RPMS) Form (cont'd)</b>			
<b>ITEM #</b>	<b>TITLE</b>	<b>CONTENT</b>	<b>EXPLANATORY NOTES</b>
8	<b>Man Hours</b>	<b>Number</b>	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	<b>Sheet</b>	<b>Pages numbering</b>	This field indicates the progressive R-PMS sheet page number.
10	<b>LOCATION</b>	<b>Illustration</b>	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	<b>R</b>	<b>Letter</b>	This field indicates that the Sheet pertains to Running Maintenance
12	<b>P</b>	<b>Letter</b>	This field indicates that the Sheet pertains to Preventive Maintenance
13	<b>nn</b>	<b>Number</b>	This field indicates the System/Manual Section number to which the Sheet pertains. It may vary from 01 to 19
14	<b>rr</b>	<b>Number</b>	This field indicates the Sheet Revision number
15	<b>Page ##</b>	<b>Page ##</b>	This field indicates the RMSM Section Page number
16	<b>-#</b>	<b>Number</b>	This field indicates the RMSM Section Revision number
17	<b>SAFETY PRECAUTIONS</b>	<b>Text</b>	This field presents the General and/or specific Safety Precautions to be followed to safely accomplish the relevant Maintenance Tasks.
18	<b>TOOLS</b>	<b>Text</b>	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	<b>CONSUMABLES</b>	<b>Text</b>	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	<b>SPARE PARTS</b>	<b>Text</b>	This field lists the Description and PN of Spare Parts (consistent with Illustrated Parts Catalog) needed to accomplish the Maintenance Task.
21	<b>PROCEDURE</b>	<b>Text</b>	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.

	LACMTA P2550 LRV Running Maintenance and Servicing Manual - Section 01
<b>P2550 PREVENTIVE MAINTENANCE SHEET</b>	
System: <span style="float: right;">Card Code: <b>R-P-nn-mm-zz-ww/Y-kk</b></span>	
Subsystem/Assy: <span style="float: right;">Sheet: <b>x/z</b></span>	
Component: <span style="float: right;">Man Hours:</span>	
Maintenance Task: <span style="float: right;">Interval/Miles:</span>	
<b>LOCATION:</b>	
	
<span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">1</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">2</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">3</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">4</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">5</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">6</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">7</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">8</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">9</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">10</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">11</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">12</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">13</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">14</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">15</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">16</span>	<span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">1</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">2</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">3</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">4</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">5</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">6</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">7</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">8</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">9</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">10</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">11</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">12</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">13</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">14</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">15</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">16</span>
<span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">R</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">P</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">nn</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">mm</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">zz</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">ww</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">Y</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">kk</span>	
<span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">M</span> <span style="font-size: small;">Metro</span>	
<span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">Page 011</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px 5px;">Draft</span>	

**Figure 11-III-03.2 R-PMS Form  
(Sheet 1 of 2)**

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

**Figure 11-III-03.2 R-PMS Form  
(Sheet 2 of 2)**

## 11-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”**)

#### **11-III-03.03.03      Running- Preventive Maintenance Sheet (R-PMS) List**

The “Battery” 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 11-III-03.3    Running Preventive Maintenance Sheets List**

<b>SYSTEM</b>		<b>11</b>	<b>BATTERY</b>		
<b>SUBSYSTEM/ ASSY</b>	<b>ASSY /UNIT/ COMPONENT</b>	<b>SCPM</b>	<b>TASK</b>	<b>MAINTEN. INTERVAL (MILES)</b>	<b>SHEET CODE</b>
30V-300 A/h BATTERY	30V-300 A/h BATTERY		INSPECTION	10,000	R-P-11-06-00-00/I-00
30V-300 A/h BATTERY	30V-300 A/h BATTERY		INSPECTION	120,000	R-P-11-06-00-00/I-01

**11-III-03.03.04      Running- Preventive Maintenance Sheets (R-PMS)**

## **BATTERY**

### **Running - Preventive Maintenance Sheets**

#### **R-PMS**

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## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**1/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

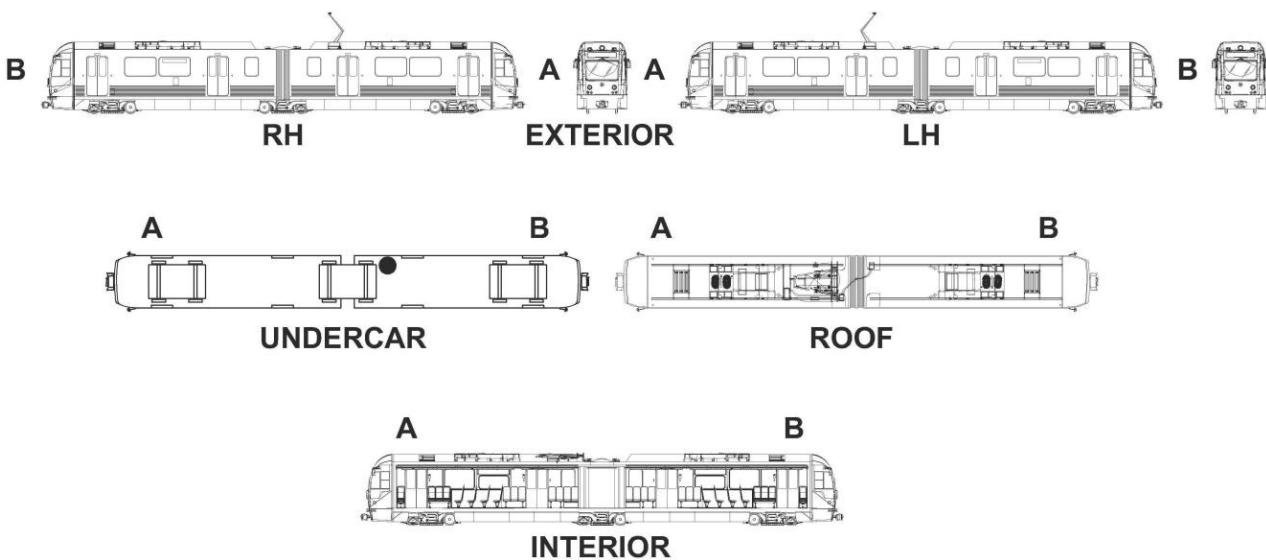
Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000****LOCATION:**

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**2/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000**

### **SAFETY PRECAUTIONS:**

- WARNING:** BATTERIES ARE TO BE MAINTAINED BY EXPERIENCED AND TRAINED PERSONNEL. ASSURE THAT PERSONNEL UNDERSTAND THE RISK OF WORKING WITH BATTERIES, AND ARE PREPARED AND EQUIPPED TO TAKE THE NECESSARY SAFETY PRECAUTIONS. THE FOLLOWING INSTRUCTIONS SHOULD BE UNDERSTOOD AND FOLLOWED. ASSURE THAT YOU HAVE THE NECESSARY EQUIPMENT FOR THE WORK, INCLUDING INSULATED TOOLS, RUBBER APRONS, SAFETY GOGGLES AND FACE PROTECTION.
- WARNING:** ALWAYS WEAR REQUIRED PROTECTIVE CLOTHING AND EYE PROTECTION (DUE TO EYE HAZARD) WHEN WORKING WITH BATTERIES. OBSERVE ALL APPLICABLE LACMTA SAFETY REGULATIONS.
- WARNING:** TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.
- WARNING:** EXPLOSION AND FIRE RISK; METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. AVOID SHORT-CIRCUITS BY NEVER PLACING FOREIGN OBJECTS OR TOOLS ON THE BATTERY. ENSURE ADEQUATE VENTILATION OF THE BATTERY ROOM, SO THAT EXPLOSIVE GASES PRODUCED DURING CHARGING ARE DRAWN OFF.
- WARNING:** HAVE EYE RINISING BOTTLE ON HAND. IF ELECTROLYTE SPLASHES INTO THE EYES OR ONTO THE SKIN, RINSE WITH PLENTY OF CLEAR WATER AND SEEK IMMEDIATE MEDICAL ADVICE. CLOTHING CONTAMINATED WITH ELECTROLYTE IS TO BE WASHED THOROUGHLY.
- WARNING:** ELECTROLYTE IS HIGHLY CORROSIVE. IN NORMAL OPERATION THERE IS NO POSSIBILITY OF CONTACT WITH THE ELECTROLYTE. ELECTROLYTE IS RELEASED ONLY IF THE CELL HOUSING IS DESTROYED.
- WARNING:** USE ONLY SUITABLE TOOLS AND MEASURING INSTRUMENTS. NiCd BATTERIES OR CELLS BELONG TO FLAMMABILITY CLASS E IF ELECTRICAL FIRES OCCUR, IT IS POSSIBLE THAT THE EQUIPMENT MAY BE LIVE! EXTINGUISHING WATER OR FOAM ARE IDEAL CONDUCTORS AND ELECTRIC SHOCKS MAY OCCUR. ELECTRICAL FIRES MUST BE FOUGHT WITH EXTINGUISHING POWDER OR CARBON DIOXIDE CO<sub>2</sub>.
- WARNING:** DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.

<b>P2550 PREVENTIVE MAINTENANCE SHEET</b>	
Card Code: <b>R-P-11-06-00-00/I-00</b>	
System: <b>BATTERY</b>	Sheet: <b>3/8</b>
Subsystem/Assy: <b>30V-300 A/h BATTERY</b>	Unit:
Component:	Man Hours: <b>0.5</b>
Maintenance Task: <b>INSPECTION</b>	Interval/Miles: <b>10,000</b>
<b>SAFETY PRECAUTIONS:</b>	
<b>WARNING:</b> BATTERIES ARE AN ELECTRICAL HAZARD. DO NOT BE COMPLACENT DUE TO THEIR STATIC APPEARANCE, METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. NEVER PLACE FOREIGN OBJECT OR TOOLS ON IT. SHORTING OF INDIVIDUAL CELLS WILL PRODUCE SEVERE ARCING WHICH CAN RESULT IN INJURY.	
<b>WARNING:</b> CELL ELECTROLYTE (LIQUID OR DRY) IS CAUSTIC, CORROSIVE, POTASSIUM HYDROXIDE. DO NOT ALLOW CONTACT WITH SKIN.	
<b>WARNING:</b> REMOVE ALL METAL CLOTHING PARTS AND JEWELRY (RINGS, BELT BUCKLES, WATCHES, CHAINS, ETC.) BEFORE BEGINNING WORK. PROPER DRESS FOR ELECTRICAL SHOCK AND CHEMICAL HAZARD REQUIRED.	
<b>WARNING:</b> DO NOT USE OR EXPOSE CELLS TO SULFURIC ACID. NEVER USE TOOLS OR EQUIPMENT PREVIOUSLY USED WITH SULFURIC ACID. INTRODUCTION OF SULFURIC ACID TO THE CELLS, EVEN IN MINUTE QUANTITIES, WILL DESTROY THE CELLS.	
<b>WARNING:</b> BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).	
<b>CAUTION:</b> A CLEAN BATTERY IS ABSOLUTELY ESSENTIAL TO AVOID AND PREVENT ACCIDENTS AND MATERIAL DAMAGE, ALSO TO MAXIMISE BATTERY LIFE AND AVAILABILITY. IT IS NECESSARY TO CLEAN CELL HOLDERS, TRAYS, RACKS AND INSULATOR IN ORDER TO MAINTAIN THE REQUIRED INSULATION OF THE CELLS FROM ONE ANOTHER, FROM EARTH, OR FROM EXTERNAL CONDUCTIVE PARTS. CLEANING ALSO PREVENTS DAMAGE FROM CORROSION AND LEAKAGE CURRENT.	
<b>CAUTION:</b> NEVER CLEAN BATTERY OR BATTERY CELLS IN GENERAL WITH SOLVENTS OR CLEANING AGENTS. USE WATER ONLY.	
<b>TOOLS:</b>	
LACMTA Maintenance Shop Standard Tools Kit Glass Pipet	
<b>CONSUMABLES:</b>	
Distilled Water (purity should be equivalent to IEC standard 993 execution 1989) Vaseline Gel or equivalent	
<b>SPARE PARTS:</b>	
N/A	

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**4/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

1. Place the Vehicle over the Pit (or Stand Up Rail).
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.

#### INSPECTION

This task consists in the Cells Electrolyte Level Check

To perform the Task, proceed as follows

(Refer to Figures 1 and 2):

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**5/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

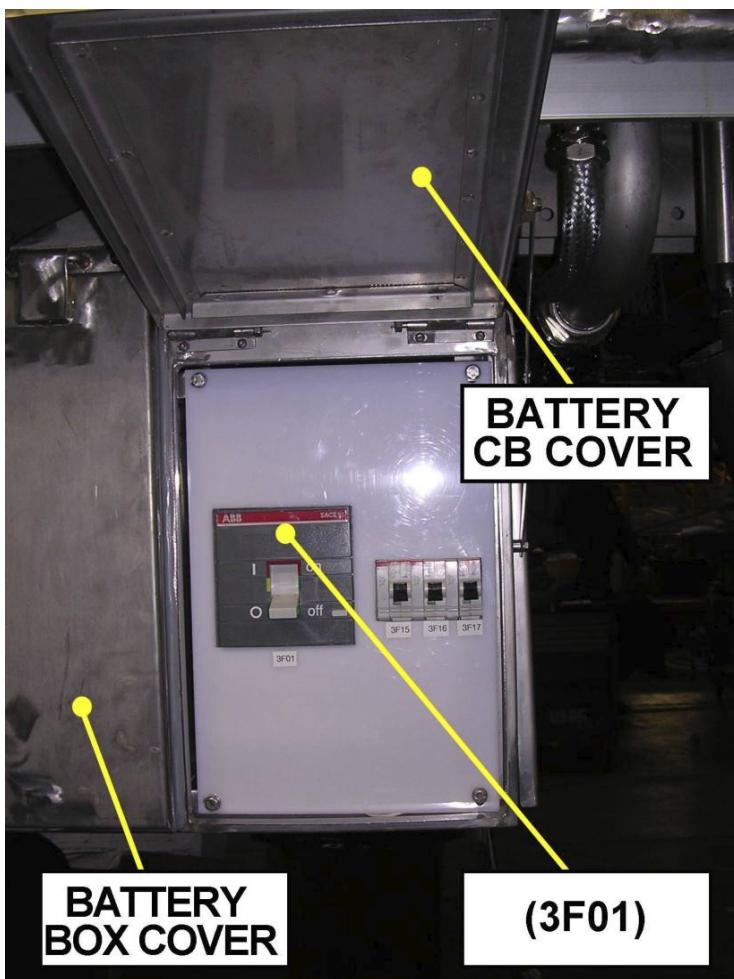
**INSPECTION**

Interval/Miles:

**10,000**

### PROCEDURE (CONT'D):

1. Remove Electrical Power by switching off the Battery Protection Circuit Breaker (3F01) located in the Battery Box (B Section Rh Side).



**Figure 1 - BATTERY PROTECTION CIRCUIT BREAKER (3F01)**

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**6/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000**

### PROCEDURE (CONT'D):

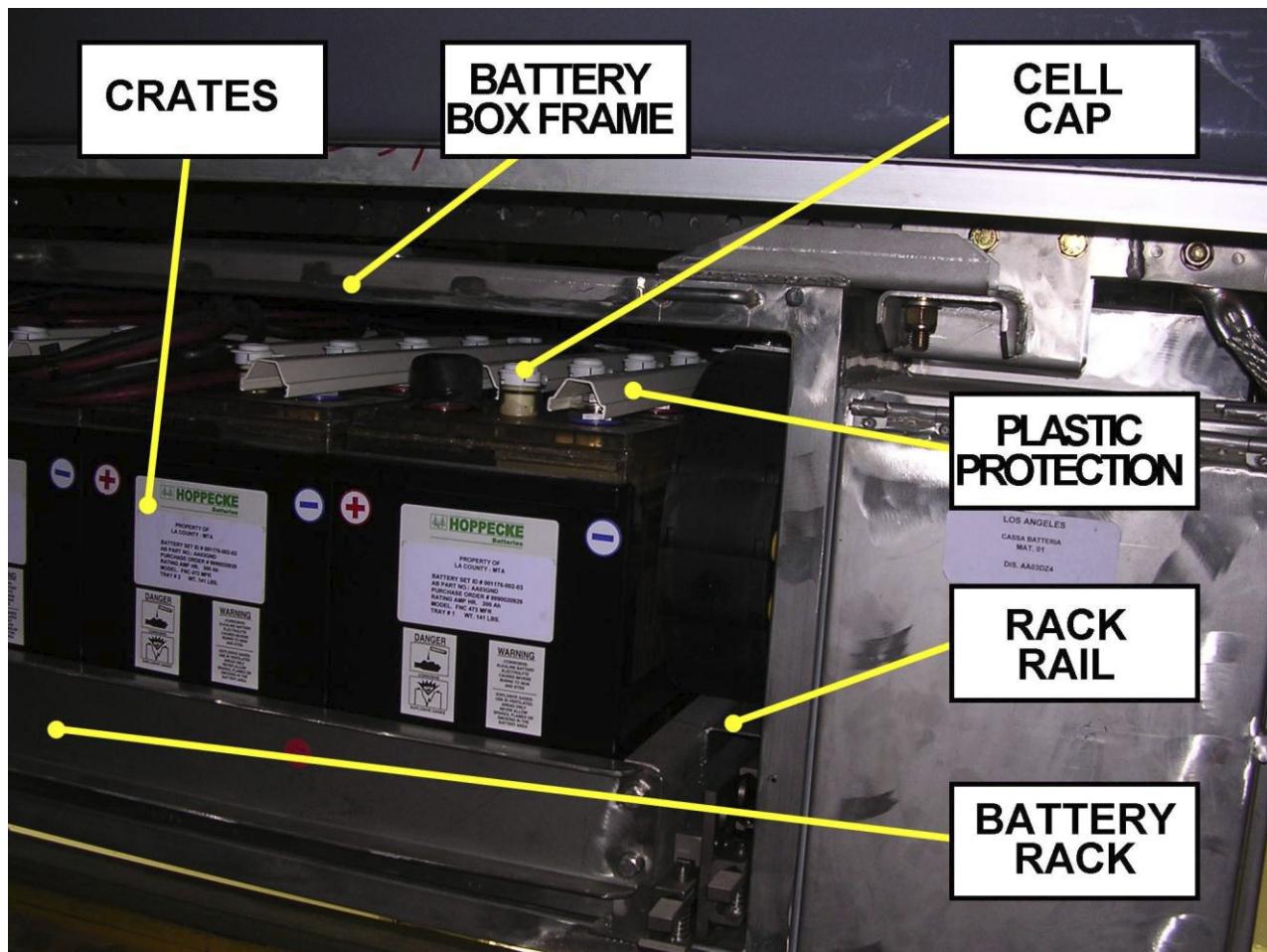


Figure 2 - BATTERY RACK & COMPONENTS

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**7/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000**

### PROCEDURE (CONT'D):

2. Unlock the Locking Device of Battery Rack and pull out the Battery.
3. Clean the Cells.
4. Open all Cell Caps.
5. Check Electrolyte Level of all Cells. using a Glass Pipet.
6. Check for any large difference in Electrolyte Level between Cells and record any discrepancies that you find.
7. Top up any Cell with recommended Distilled Water according to the following criteria.
  - a. If the level is below 10mm from the Max level mark, it should be topped up to the Max. mark.
8. Note any Areas/Items requiring Corrective Maintenance.
9. Stow the Battery and lock the Battery Rack with the Locking Device.
10. Carefully reinstall Battery Box Front Cover and lock it by engaging all Safety Latches.
11. Reinstate Electrical Power by switching Battery Protection Circuit Breaker (3F01).
12. Close Vehicle Skirt and lock it using the maintenance key.

**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 11-III-03-03-02 of this Section) and follow the prescriptions provided at Step 3 “**At every Task Completion.**”

**P2550 PREVENTIVE MAINTENANCE SHEET**

Card Code:

**R-P-11-06-00-00/I-00**

System:

**BATTERY**

Sheet:

**8/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**10,000****INTENTIONALLY LEFT  
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## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**1/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

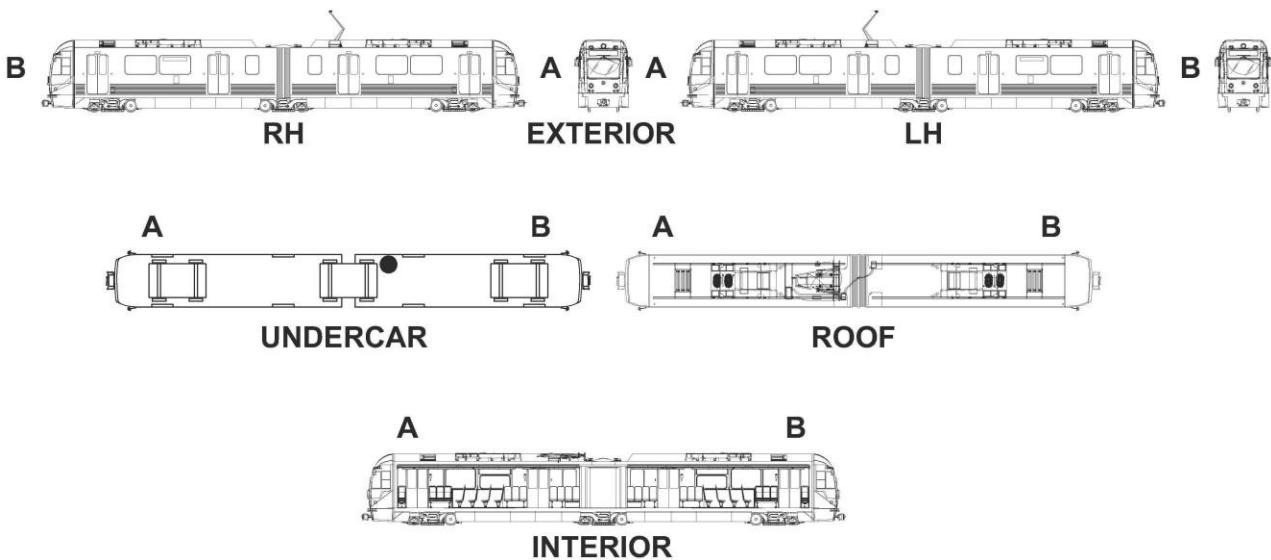
Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000****LOCATION:**

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**2/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### **SAFETY PRECAUTIONS:**

- WARNING:** BATTERIES ARE TO BE MAINTAINED BY EXPERIENCED AND TRAINED PERSONNEL. ASSURE THAT PERSONNEL UNDERSTAND THE RISK OF WORKING WITH BATTERIES, AND ARE PREPARED AND EQUIPPED TO TAKE THE NECESSARY SAFETY PRECAUTIONS. THE FOLLOWING INSTRUCTIONS SHOULD BE UNDERSTOOD AND FOLLOWED. ASSURE THAT YOU HAVE THE NECESSARY EQUIPMENT FOR THE WORK, INCLUDING INSULATED TOOLS, RUBBER APRONS, SAFETY GOGGLES AND FACE PROTECTION.
- WARNING:** ALWAYS WEAR REQUIRED PROTECTIVE CLOTHING AND EYE PROTECTION (DUE TO EYE HAZARD) WHEN WORKING WITH BATTERIES. OBSERVE ALL APPLICABLE LACMTA SAFETY REGULATIONS.
- WARNING:** TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.
- WARNING:** EXPLOSION AND FIRE RISK; METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. AVOID SHORT-CIRCUITS BY NEVER PLACING FOREIGN OBJECTS OR TOOLS ON THE BATTERY. ENSURE ADEQUATE VENTILATION OF THE BATTERY ROOM, SO THAT EXPLOSIVE GASES PRODUCED DURING CHARGING ARE DRAWN OFF.
- WARNING:** HAVE EYE RINSE BOTTLE ON HAND. IF ELECTROLYTE SPLASHES INTO THE EYES OR ONTO THE SKIN, RINSE WITH PLENTY OF CLEAR WATER AND SEEK IMMEDIATE MEDICAL ADVICE. CLOTHING CONTAMINATED WITH ELECTROLYTE IS TO BE WASHED THOROUGHLY.
- WARNING:** ELECTROLYTE IS HIGHLY CORROSIVE. IN NORMAL OPERATION THERE IS NO POSSIBILITY OF CONTACT WITH THE ELECTROLYTE. ELECTROLYTE IS RELEASED ONLY IF THE CELL HOUSING IS DESTROYED.
- WARNING:** USE ONLY SUITABLE TOOLS AND MEASURING INSTRUMENTS. NiCd BATTERIES OR CELLS BELONG TO FLAMMABILITY CLASS E IF ELECTRICAL FIRES OCCUR, IT IS POSSIBLE THAT THE EQUIPMENT MAY BE LIVE! EXTINGUISHING WATER OR FOAM ARE IDEAL CONDUCTORS AND ELECTRIC SHOCKS MAY OCCUR. ELECTRICAL FIRES MUST BE FOUGHT WITH EXTINGUISHING POWDER OR CARBON DIOXIDE CO<sub>2</sub>.
- WARNING:** DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

Sheet:

**BATTERY**
**3/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### SAFETY PRECAUTIONS:

- WARNING:** BATTERIES ARE AN ELECTRICAL HAZARD. DO NOT BE COMPLACENT DUE TO THEIR STATIC APPEARANCE, METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. NEVER PLACE FOREIGN OBJECT OR TOOLS ON IT. SHORTING OF INDIVIDUAL CELLS WILL PRODUCE SEVERE ARCING WHICH CAN RESULT IN INJURY.
- WARNING:** CELL ELECTROLYTE (LIQUID OR DRY) IS CAUSTIC, CORROSIVE, POTASSIUM HYDROXIDE. DO NOT ALLOW CONTACT WITH SKIN.
- WARNING:** REMOVE ALL METAL CLOTHING PARTS AND JEWELRY (RINGS, BELT BUCKLES, WATCHES, CHAINS, ETC.) BEFORE BEGINNING WORK. PROPER DRESS FOR ELECTRICAL SHOCK AND CHEMICAL HAZARD REQUIRED.
- WARNING:** DO NOT USE OR EXPOSE CELLS TO SULFURIC ACID. NEVER USE TOOLS OR EQUIPMENT PREVIOUSLY USED WITH SULFURIC ACID. INTRODUCTION OF SULFURIC ACID TO THE CELLS, EVEN IN MINUTE QUANTITIES, WILL DESTROY THE CELLS.
- WARNING:** BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).
- CAUTION:** A CLEAN BATTERY IS ABSOLUTELY ESSENTIAL TO AVOID AND PREVENT ACCIDENTS AND MATERIAL DAMAGE, ALSO TO MAXIMISE BATTERY LIFE AND AVAILABILITY. IT IS NECESSARY TO CLEAN CELL HOLDERS, TRAYS, RACKS AND INSULATOR IN ORDER TO MAINTAIN THE REQUIRED INSULATION OF THE CELLS FROM ONE ANOTHER, FROM EARTH, OR FROM EXTERNAL CONDUCTIVE PARTS. CLEANING ALSO PREVENTS DAMAGE FROM CORROSION AND LEAKAGE CURRENT.
- CAUTION:** NEVER CLEAN BATTERY OR BATTERY CELLS IN GENERAL WITH SOLVENTS OR CLEANING AGENTS. USE WATER ONLY.

### TOOLS:

LACMTA Maintenance Shop Standard Tools Kit

Glass Pipet

### CONSUMABLES:

Distilled Water (purity should be equivalent to IEC standard 993 execution 1989.)

Vaseline Gel

### SPARE PARTS:

N/A

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**4/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### **PROCEDURE:**

#### **PRELIMINARY OPERATIONS**

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

1. Place the Vehicle over the Pit (or Stand Up Rail).
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.

#### **INSPECTION**

This Task consists in the following Maintenance Activities:

1-Battery Inspection.

2-Battery Cleaning.

To perform the Task proceed as follows:

(Refer to Figures 1 and 2):

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**5/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### PROCEDURE (CONT'D):

1. Remove Electrical Power by switching off the Battery Protection Circuit Breaker (3F01) located in the Battery Circuit Breakers Box (B Section Rh Side).



Figure 1 - BATTERY PROTECTION CIRCUIT BREAKER (3F01)

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**6/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### PROCEDURE (CONT'D):

2. Unlock the Locking Device of Battery Rack and pull out the Battery.

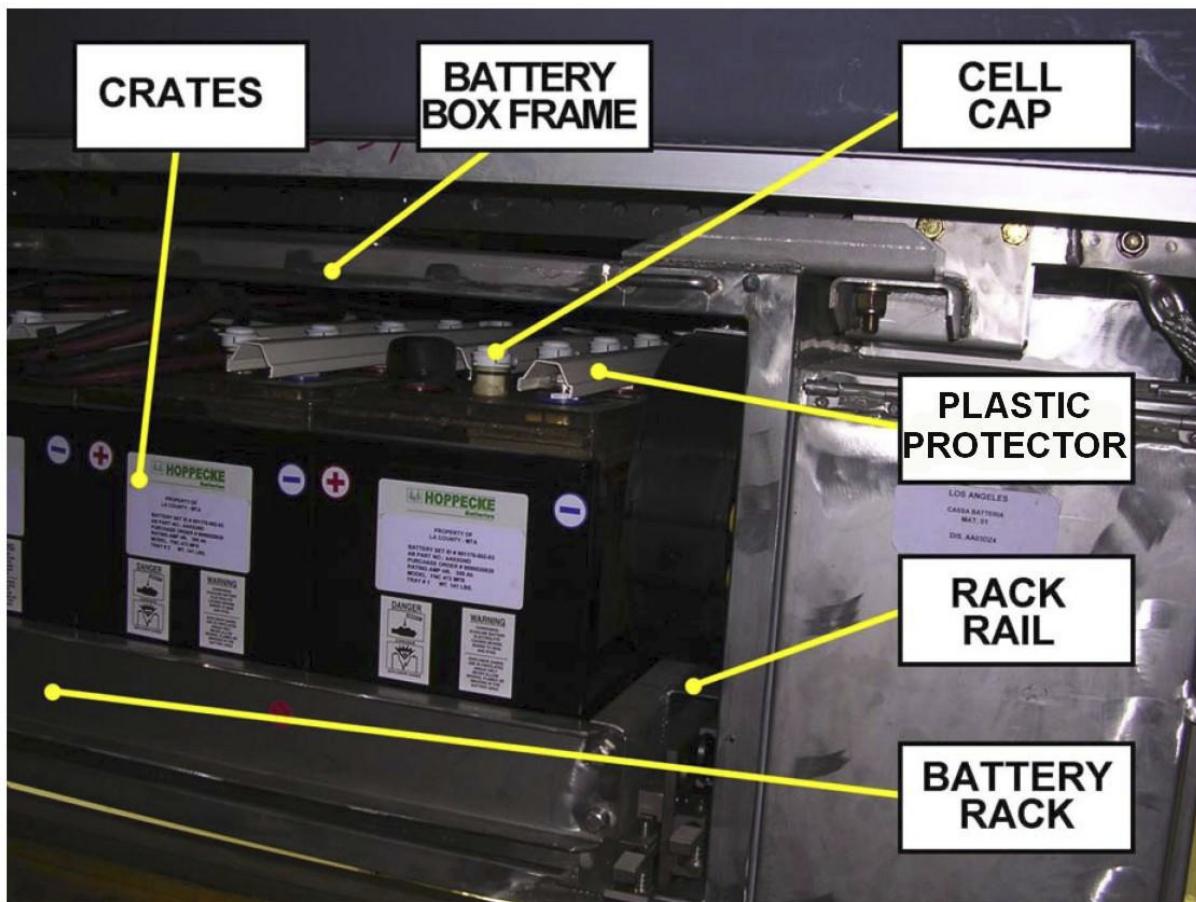


Figure 2 - BATTERY RACK & COMPONENTS

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**7/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

### PROCEDURE (CONT'D):

3. Open all Cell Caps.
4. Check Electrolyte Level of all Cells. using a Glass Pipet.
5. Remove the plastic Protectors that are on the Cell's Poles and Terminals Connections.
6. Visually inspect entire Battery and Cells.
7. Inspect overall condition and installation of Connector Bolts.
8. Check Battery Connections between Cells; clean and torque to **12 lb-ft**.
9. Check Cable for chafing. Replace as per check result.
10. Check Cable crimp at the end lugs for proper security.
11. Check the Screw Connectors Torque Values as follows:
12. Check for cells that have developed cracks (in Jar) or for cells that show signs of unusual shape or damage caused by excessive charging.
13. Note any Areas / Items requiring Corrective Maintenance.

## P2550 PREVENTIVE MAINTENANCE SHEET

Card Code:

**R-P-11-06-00-00/I-01**

System:

**BATTERY**

Sheet:

**8/8**

Subsystem/Assy:

**30V-300 A/h BATTERY**

Unit:

Component:

Man Hours:

**0.5**

Maintenance Task:

**INSPECTION**

Interval/Miles:

**120,000**

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

#### **CLEANING**

**CAUTION :** A CLEAN BATTERY IS ABSOLUTELY ESSENTIAL TO AVOID AND PREVENT ACCIDENTS AND MATERIAL DAMAGE, ALSO TO MAXIMISE BATTERY LIFE AND AVAILABILITY.

**CAUTION :** IT IS NECESSARY TO CLEAN CELL HOLDERS, TRAYS, RACKS AND INSULATOR IN ORDER TO MAINTAIN THE REQUIRED INSULATION OF THE CELLS FROM ONE ANOTHER, FROM EARTH, OR FROM EXTERNAL CONDUCTIVE PARTS. CLEANING ALSO PREVENTS DAMAGE FROM CORROSION AND LEAKAGE CURRENT.

**CAUTION:** NEVER CLEAN BATTERY OR BATTERY CELLS IN GENERAL WITH SOLVENTS OR CLEANING AGENTS. USE WATER ONLY.

1. Clean Cells with a plastic bristle brush and plain tap water. If necessary dry Cells with rags only.

**NOTE:** Use water to dissolve salt build-up (Potassium Carbonate) and scrape off after large accumulation of build-up. Rinse the cells, tops, jars and trays with water only.

**NOTE:** Any fluid which has entered the battery tray must be siphoned off, and disposed of in accordance with the regulations governing waste and residues.

2. Apply a light coat of Vaseline Gel on both Poles of each Cell.

3. Clean the lateral rails and lubricate them, lubricate also the springs.

4. Clean and reinstall the plastic Protectors on the Cell's Poles and Terminals Connections.

#### **FINAL OPERATIONS**

1. Stow the Battery and lock the Battery Rack with the Locking Device.

## 11-III-04 RUNNING -CORRECTIVE MAINTENANCE

### 11-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

<b>Inspection:</b>	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.
<b>Leveling:</b>	Procedure to adjust the distance between the Vehicle Floor to the Top Of Rail and the designated Vehicle Height
<b>Replacement:</b>	Provides the Components / Assemblies and Subassemblies removal & installation in a logical sequential order.
<b>Re-Profiling:</b>	Provides the procedure to maintain the safe and proper "wheel profile".
<b>Repair:</b>	Provides detailed procedures for the repair of a specific Equipment / Component
<b>Service:</b>	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.

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

The R-CMS Form (refer to Figure 11-III-04.1) consists of several fields containing the following data/ information:

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

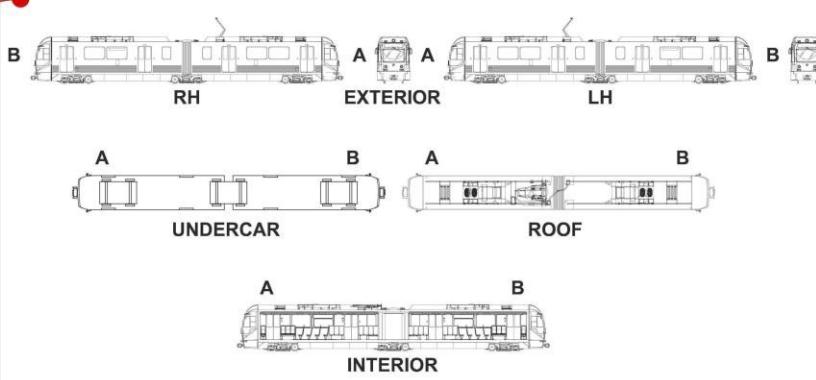
<b>RUNNING -CORRECTIVE MAINTENANCE SHEET (R-CMS) Form (cont'd)</b>			
<b>ITEM #</b>	<b>TITLE</b>	<b>CONTENT</b>	<b>EXPLANATORY NOTES</b>
8	Sheet	Pages numbering	This field indicates the progressive R-CMS sheet page number.
9	LOCATION	Illustration	This field indicates the On Board Location of the Equipment 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	<b>SAFETY PRECAUTIONS</b>	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.

LACMTA P2550 LRV  
Running Maintenance and Servicing Manual - Section 01

**P2550 CORRECTIVE MAINTENANCE SHEET**

System:	Sheet:	Card Code:
Subsystem/Assy:	Unit:	x/z
Component:	Man Hours:	
Maintenance Task:		
<b>LOCATION:</b>		

R-C-nn-mm-zz-ww/Y-kk



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

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

**M**<sub>Metro</sub>

Page 011 Draft

**Figure 11-III-04.1 R-CMS Form  
(Sheet 1 of 2)**

LACMTA P2550 LRV Running Maintenance and Servicing Manual - Section 01		 <b>AnsaldoBreda</b>				
<b>P2550 CORRECTIVE MAINTENANCE SHEET</b>						
Card Code: <b>R-C-nn-mm-zz-ww/Y-kk</b>						
System:	Sheet:	<b>x/z</b>				
Subsystem/Assy:	Unit:					
Component:	Man Hours:					
Maintenance Task:						
<b>SAFETY PRECAUTIONS:</b>						
16						
<b>TOOLS:</b>						
17						
<b>CONSUMABLES:</b>						
18						
<b>SPARE PARTS:</b>						
19						
<b>PROCEDURE:</b>						
PRELIMINARY OPERATIONS						
20						
Page 01-2 Draft						
						
<table border="1" style="margin-left: auto; margin-right: 0; border-collapse: collapse;"> <tr> <td style="width: 10px; height: 10px;"></td> </tr> </table>						

**Figure 11-III-04.1 R-CMS Form  
(Sheet 2 of 2)**

## 11-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
- b) 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:

➤ **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.

➤ **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"**)

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

The “Battery” Running- Corrective Maintenance Sheets (R-CMS) List is provided in the following

Table 11-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 11-III-04.1    Running Corrective Maintenance Sheets List**

<b>SYSTEM      11      BATTERY</b>				
<b>SUBSYSTEM / ASSY</b>	<b>UNIT</b>	<b>COMPONENT</b>	<b>TASK</b>	<b>SHEET CODE</b>
BATTERY CONTROL		RELAY	REPLACEMENT (TYPICAL)	R-C-11-00-00-00/R-01
BATTERY CONTROL	BATTERY TEMPERATURE SENSOR (3B01)	THERMORESISTOR PT 100	REPLACEMENT	R-C-11-01-00-00/R-00
BATTERY CONTROL		BATTERY TRIP TEMPERATURE SENSOR CB (3B02)	REPLACEMENT	R-C-11-02-00-00/R-00
BATTERY CONTROL		BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P	REPLACEMENT	R-C-11-03-00-00/R-00
BATTERY CONTROL		BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P	REPLACEMENT	R-C-11-04-00-00/R-00
BATTERY CONTROL	BATTERY CONTACTOR CB(3F17)	CB TYPE S 281 UNIPOLAR	REPLACEMENT	R-C-11-05-00-00/R-00
BATTERY (280 Ah)			REPLACEMENT	R-C-11-06-00-00/R-00
BATTERY CONTROL		BATTERY CONTACTOR (3K01)	REPLACEMENT	R-C-11-07-00-00/R-00

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

## **BATTERY**

**Running - Corrective Maintenance Sheets**

**R-CMS**

**INTENTIONALLY LEFT BLANK**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**1/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

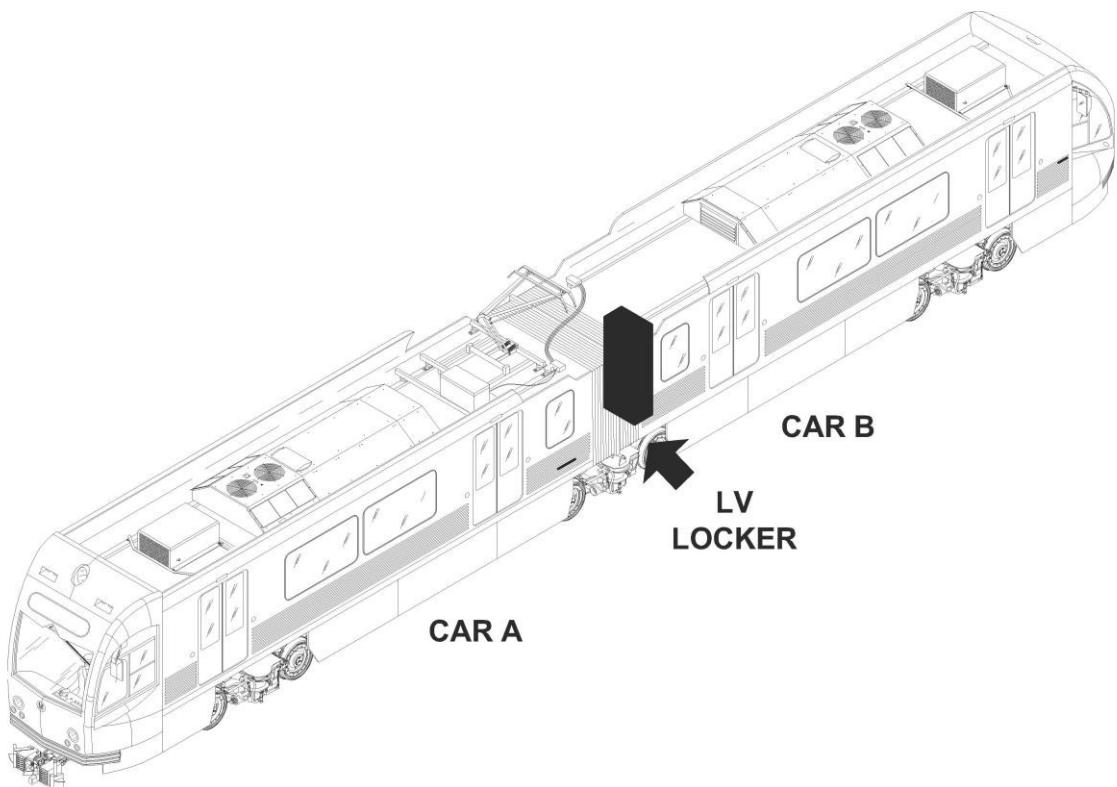
Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

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

This Replacement procedure is applicable to the followings Items

LABEL	DESCRIPTION	TYPE	P/N	CAR	LOCATION	FUNCTIONAL DIAGRAMS	
						SCHEMATICS	SHEET#
3K02	BATTERY CONTACTOR OPENING RELAY	2 CONTACTS	211VK01374B0802	B	LV LOCKER	LV	21
3K21	BATTERY CONTACTOR OPENING RELAY	4 CONTACTS	211VK01374B0801	B	LV LOCKER	LV	21

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**2/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT (TYPICAL)**

### SAFETY PRECAUTIONS:

LACMTA Maintenance Shop Safety Rules & Regulations

### TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

### CONSUMABLES:

CRC Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

### SPARE PARTS:

3K02	Battery Contactor Opening Relay	Type: 2 Contacts	PN	211VK01374B0802
3K21	Battery Contactor Opening Relay	Type: 4 Contacts	PN	211VK01374B0801

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**3/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT (TYPICAL)**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**4/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

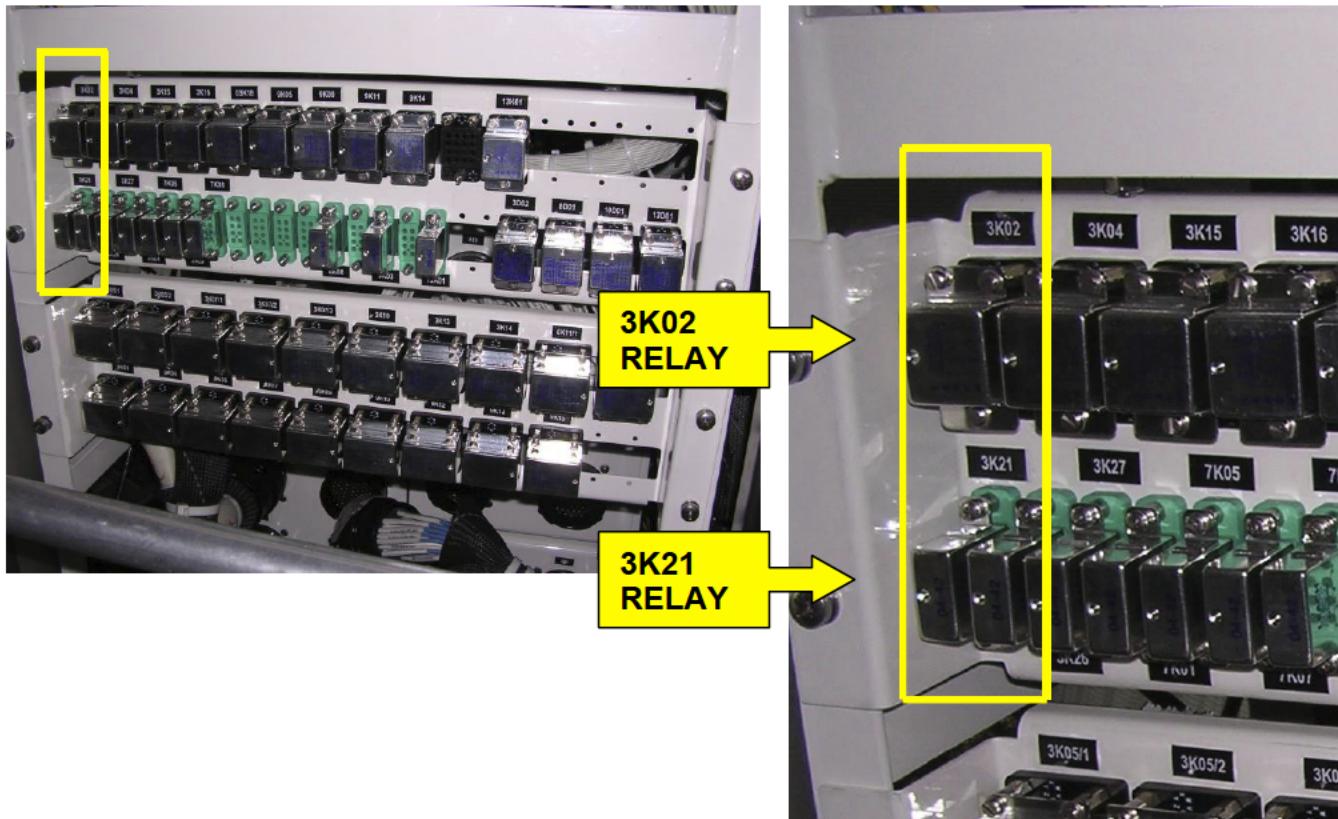
**REPLACEMENT (TYPICAL)**

### PROCEDURE (CONT'D):

To perform the Task proceed as follows:

#### REMOVAL

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



**Figure 1 - LV LOCKER -RELAYS LOCATION**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**5/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT (TYPICAL)**

### PROCEDURE:

#### REMOVAL (cont'd)

3. Loose 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 Color Codes and relevant positions on Relay Terminals.
6. Disconnect the Wiring Cable from Relay Terminals.
7. Remove and discard the Relay.

#### INSTALLATION

1. Connect the Wiring to the Relay Terminals according to their position and Color Codes previously noted.
2. Tighten as required.
3. Install the Relay in its position.
4. Install the Relay attaching Washers and Self Locking Nuts. Tighten as required.
5. Leave the LV Locker and close the LV locker Door using Maintenance Key.
6. Restore Electrical Power.
7. 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 11-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-11-00-00-00/R-01**

System:

**BATTERY**

Sheet:

**6/6**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**RELAY**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT (TYPICAL)****INTENTIONALLY  
LEFT BLANK**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/8**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

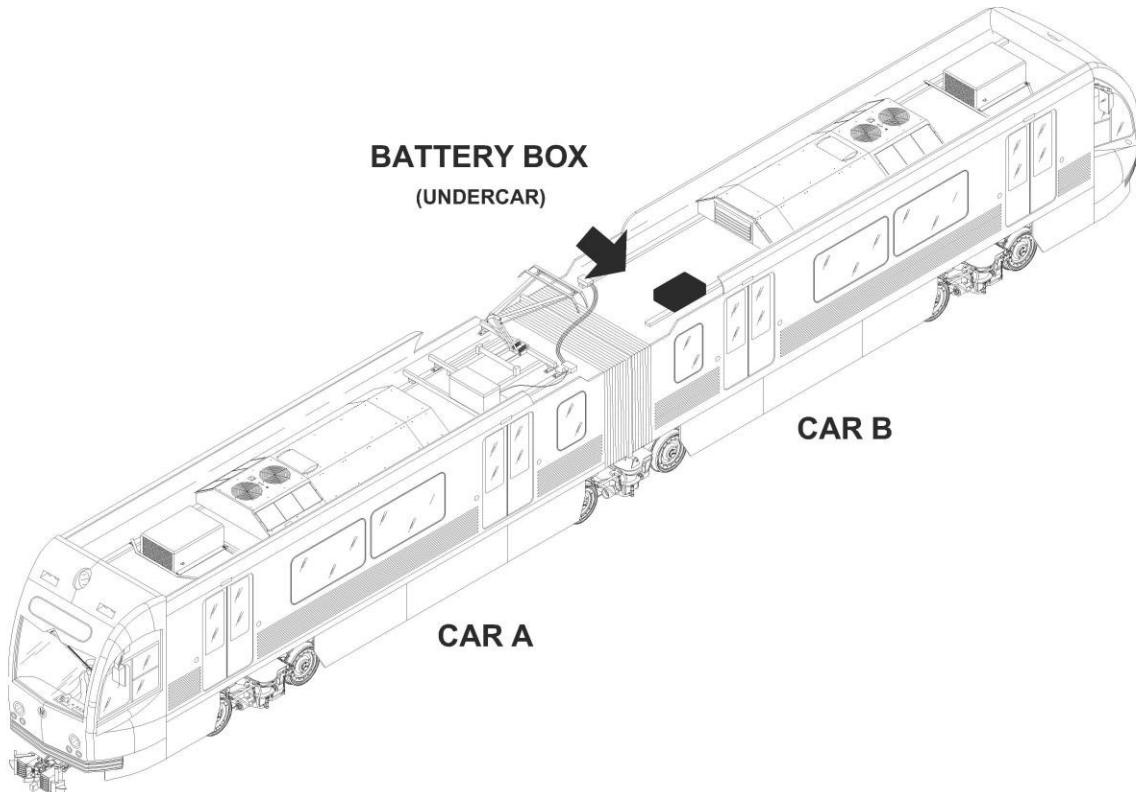
Component:

**THERMORESISTOR PT 100**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****LOCATION:**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/8**Subsystem/Assy:  
**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

Component:

**THERMORESISTOR PT 100**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****SAFETY PRECAUTIONS:**

**WARNING:** TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.

**WARNING:** ALWAYS WEAR REQUIRED PROTECTIVE CLOTHING AND EYE PROTECTION (DUE TO EYE HAZARD) WHEN WORKING WITH BATTERIES. OBSERVE ALL APPLICABLE LACMTA SAFETY REGULATIONS.

**WARNING:** EXPLOSION AND FIRE RISK; METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. AVOID SHORT-CIRCUITS BY NEVER PLACING FOREIGN OBJECTS OR TOOLS ON THE BATTERY. ENSURE ADEQUATE VENTILATION OF THE BATTERY ROOM, SO THAT EXPLOSIVE GASES PRODUCED DURING CHARGING ARE DRAWN OFF.

**WARNING:** HAVE EYE RINSING BOTTLE ON HAND. IF ELECTROLYTE SPLASHES INTO THE EYES OR ONTO THE SKIN, RINSE WITH PLENTY OF CLEAR WATER AND SEEK IMMEDIATE MEDICAL ADVICE. CLOTHING CONTAMINATED WITH ELECTROLYTE IS TO BE WASHED THOROUGHLY.

**WARNING:** ELECTROLYTE IS HIGHLY CORROSIVE. IN NORMAL OPERATION THERE IS NO POSSIBILITY OF CONTACT WITH THE ELECTROLYTE. ELECTROLYTE IS RELEASED ONLY IF THE CELL HOUSING IS DESTROYED.

**WARNING:** USE ONLY SUITABLE TOOLS AND MEASURING INSTRUMENTS. NiCd BATTERIES OR CELLS BELONG TO FLAMMABILITY CLASS E IF ELECTRICAL FIRES OCCUR, IT IS POSSIBLE THAT THE EQUIPMENT MAY BE LIVE! EXTINGUISHING WATER OR FOAM ARE IDEAL CONDUCTORS AND ELECTRIC SHOCKS MAY OCCUR. ELECTRICAL FIRES MUST BE FOUGHT WITH EXTINGUISHING POWDER OR CARBON DIOXIDE CO<sub>2</sub>.

**WARNING:** DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.

**WARNING:** BATTERIES ARE AN ELECTRICAL HAZARD. DO NOT BE COMPLACENT DUE TO THEIR STATIC APPEARANCE, METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. NEVER PLACE FOREIGN OBJECT OR TOOLS ON IT. SHORTING OF INDIVIDUAL CELLS WILL PRODUCE SEVERE ARCING WHICH CAN RESULT IN INJURY.

**WARNING:** CELL ELECTROLYTE (LIQUID OR DRY) IS CAUSTIC, CORROSIVE, POTASSIUM HYDROXIDE. DO NOT ALLOW CONTACT WITH SKIN.

<b>P2550 CORRECTIVE MAINTENANCE SHEET</b>	
Card Code:	<b>R-C-11-01-00-00/R-00</b>
System: <b>BATTERY</b>	Sheet: <b>3/8</b>
Subsystem/Assy: <b>BATTERY CONTROL</b>	Unit: <b>BATTERY TEMPERATURE SENSOR (3B01)</b>
Component: <b>THERMORESISTOR PT 100</b>	Man Hours: <b>1</b>
Maintenance Task: <b>REPLACEMENT</b>	
<b>SAFETY PRECAUTIONS:</b>	
<b>WARNING:</b> REMOVE ALL METAL CLOTHING PARTS AND JEWELRY (RINGS, BELT BUCKLES, WATCHES, CHAINS, ETC.) BEFORE BEGINNING WORK. PROPER DRESS FOR ELECTRICAL SHOCK AND CHEMICAL HAZARD REQUIRED.	
<b>WARNING:</b> DO NOT USE OR EXPOSE CELLS TO SULFURIC ACID. NEVER USE TOOLS OR EQUIPMENT PREVIOUSLY USED WITH SULFURIC ACID. INTRODUCTION OF SULFURIC ACID TO THE CELLS, EVEN IN MINUTE QUANTITIES, WILL DESTROY THE CELLS	
<b>WARNING:</b> BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).	
<b>CAUTION:</b> NEVER CLEAN BATTERY OR BATTERY CELLS IN GENERAL WITH SOLVENTS OR CLEANING AGENTS. USE WATER ONLY.	
<b>TOOLS:</b>	
LACMTA Maintenance Shop Standard Tools Kit	
<b>CONSUMABLES:</b>	
CRC Industrial - Precision Cleaner M3 PN 147535	
Dry Compressed Air for Electronic Equipment (commercial).	
<b>SPARE PARTS:</b>	
Thermoresistor PT 100	P/N: AA03V2D (211VR00252B)
Lock Washer	P/N: AA00WB3

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/8**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

Component:

**THERMORESISTOR PT 100**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:****PRELIMINARY OPERATIONS**

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/8**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

Component:

**THERMORESISTOR PT 100**

Man Hours:

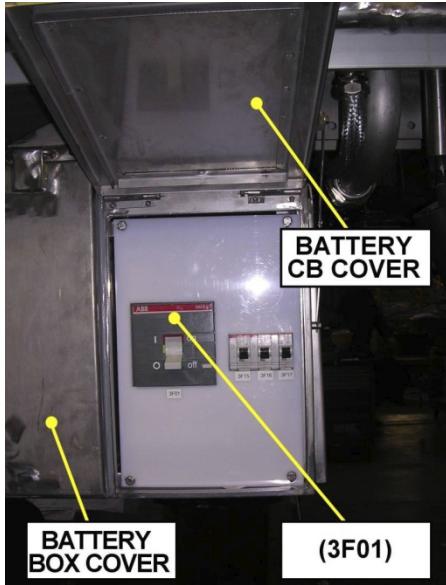
**1**

Maintenance Task:

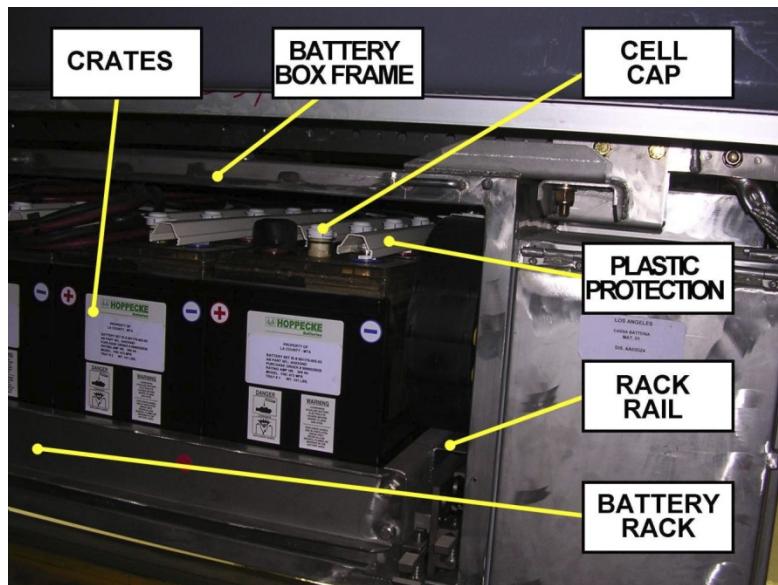
**REPLACEMENT****PROCEDURE:****REMOVAL** (Refer to Figures 1 through 4)

To perform the Task proceed as follows:

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery.
2. Remove Electrical Power by switching off the Battery Protection Circuit Breaker (3F01) located in the Battery Circuit Breakers Box (B Section Rh Side).
3. Gain access to the Battery Rack by disengaging Box Front Cover Safety Latches and by removing the Cover.
4. Unlock the Locking Device of Battery Rack.
5. Pull out the Battery.



**Figure 1 -**  
**BATTERY PROTECTION CIRCUIT**  
**BREAKER (3F01)**



**Figure 2 - BATTERY RACK & COMPONENTS**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/8**

Subsystem/Assy:

**BATTERY CONTROL**Unit: **BATTERY TEMPERATURE SENSOR (3B01)**

Component:

**THERMORESISTOR PT 100**

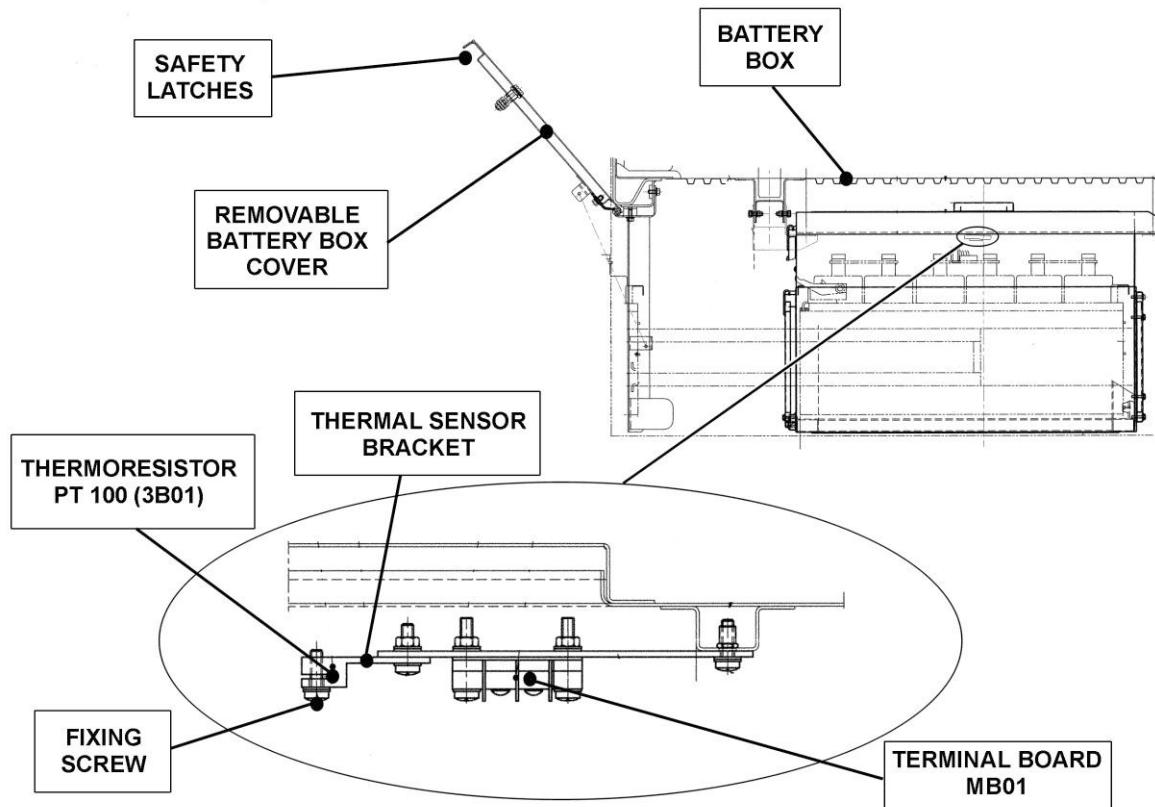
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:****REMOVAL (cont'd)**

6. Disconnect the Thermoresistor Wires by loosening the relevant Terminals on the MB01 Terminal Board.
7. Take note of Wiring Color Codes and relevant positions on Terminal Board.
8. Loose and remove the Thermoresistor Fixing Screw. Discard the relevant Lock Washer and retain the Screw with the Plain Washer for later use.
9. Remove the Thermoresistor PT 100 (3B01).

**Figure 3 - THERMORESISTOR PT 100 (3B01) - LOCATION**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/8**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

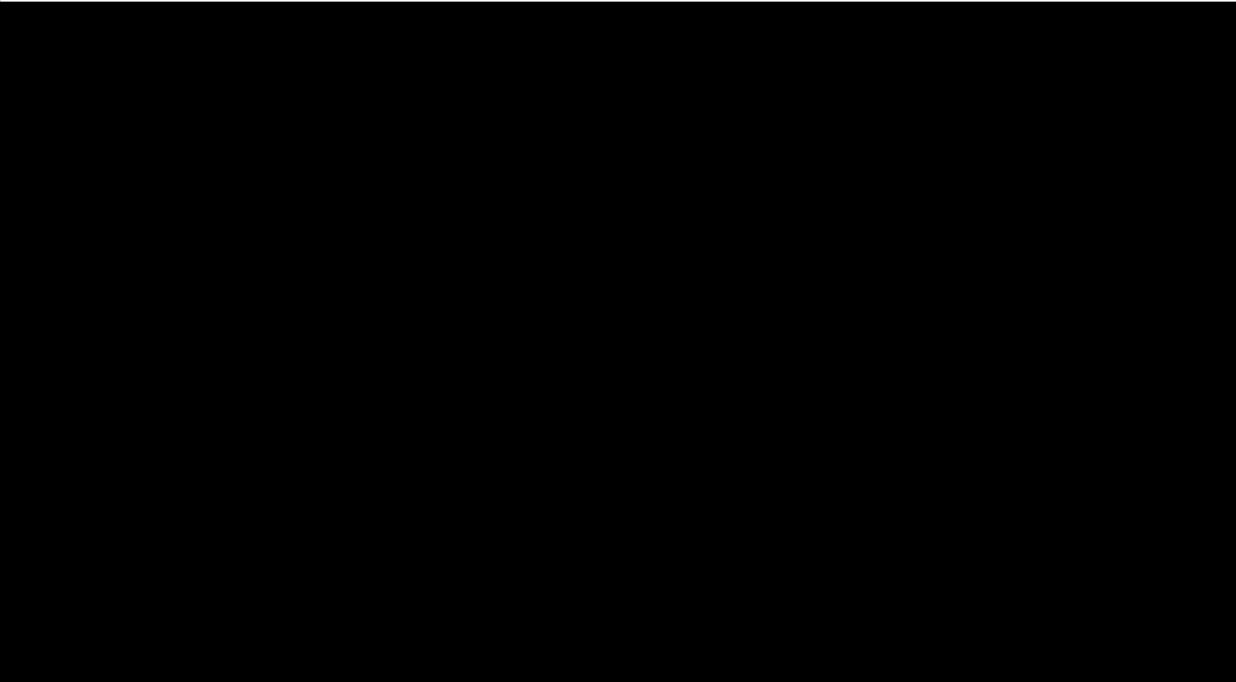
Component:

**THERMORESISTOR PT 100**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:****Figure 4 - THERMORESISTOR PT 100 (3B01) - WIRING SCHEME**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-01-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/8**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY TEMPERATURE SENSOR (3B01)**

Component:

**THERMORESISTOR PT 100**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:****INSTALLATION**

To perform the Task proceed as follows: (Refer to Figures 1 through 4)

1. Clean the Thermoresistor Seat into the Thermoresistor Bracket using recommended Cleaner / Agent and lint-free rags.
2. Check the Battery Box Interior for clean .Vacuum clean as per check result.
3. Check the Thermoresistor Bracket for secure installation / missing / loose Hardware. Tighten as per check result.
4. Check the MB01 Terminal Board for signs of overheating.Replace as per check result.
5. Check the Terminal Board for installation / missing / loose Hardware. Tighten as per check result.
6. Install the 3B01 Thermoresistor PT 100 as follows:
  - a. Position the Thermoresistor in the relevant Seat into the Thermoresistor Bracket
  - b. Install the Thermoresistor Fixing Screw with the relevant Plan Washer and the “new” Locking Washer. Torque to **4 lb ft**.
7. Connect the Thermoresistor Wiring to the relevant Terminals on the MB01 Terminal Board according to their positions and Color Codes previously noted .(Refer to Fig 4 for Wiring Scheme) Tighten as required.
8. Stow the Battery and lock the Battery Rack with the Locking Device.
9. Carefully reinstall Battery Box Front Cover and lock it by engaging all Safety Latches.
10. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01).
11. Close Vehicle Skirt and lock it using the Maintenance Key.
12. Restore Electrical Power to Vehicle.
13. On IDU "A" access to the Maintenance Menu first and then to "Fault" Screen by selecting, in sequence, the relevant Icons.
14. Check, through the List of the Current Active "Faults" shown in the "Fault" Screen, that the Fault Code relevant to Battery Box Temperature is not listed.
15. 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 11-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-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

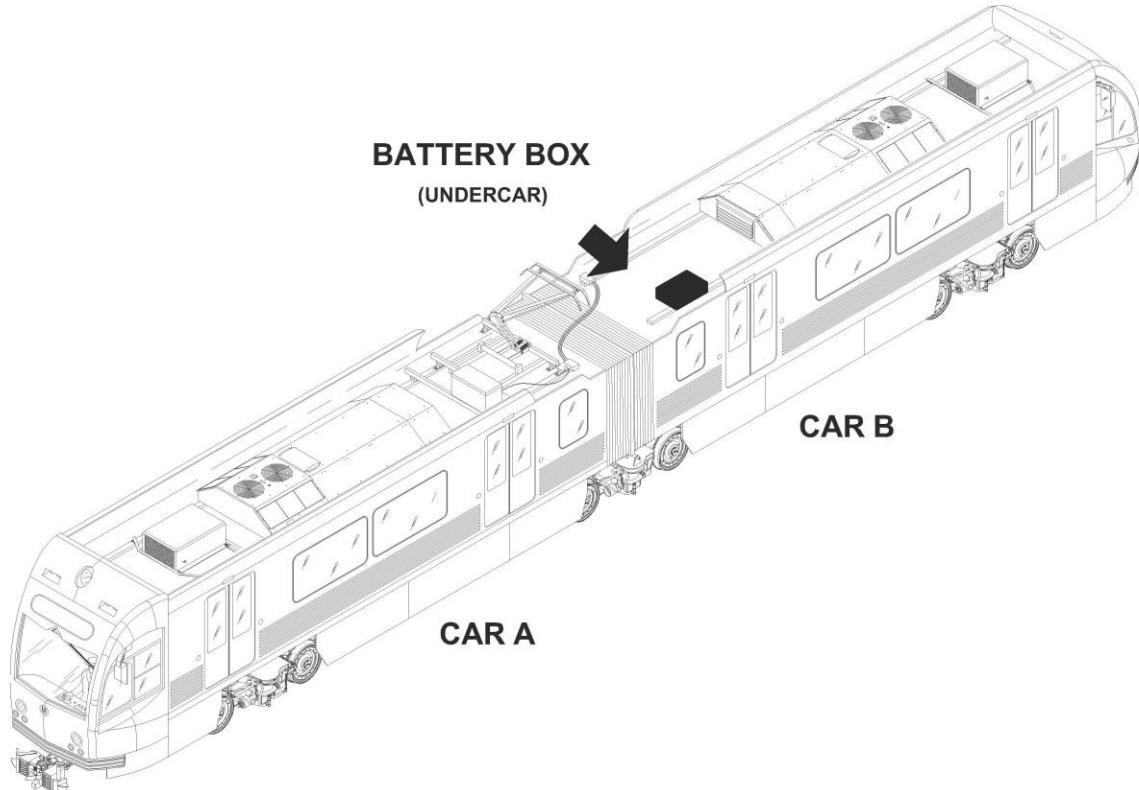
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

LOCATION:



## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### **SAFETY PRECAUTIONS:**

**WARNING: TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.**

**WARNING: ALWAYS WEAR REQUIRED PROTECTIVE CLOTHING AND EYE PROTECTION (DUE TO EYE HAZARD) WHEN WORKING WITH BATTERIES. OBSERVE ALL APPLICABLE LACMTA SAFETY REGULATIONS.**

**WARNING: EXPLOSION AND FIRE RISK; METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. AVOID SHORT-CIRCUITS BY NEVER PLACING FOREIGN OBJECTS OR TOOLS ON THE BATTERY. ENSURE ADEQUATE VENTILATION OF THE BATTERY ROOM, SO THAT EXPLOSIVE GASES PRODUCED DURING CHARGING ARE DRAWN OFF.**

**WARNING: HAVE EYE RINSING BOTTLE ON HAND. IF ELECTROLYTE SPLASHES INTO THE EYES OR ONTO THE SKIN, RINSE WITH PLENTY OF CLEAR WATER AND SEEK IMMEDIATE MEDICAL ADVICE. CLOTHING CONTAMINATED WITH ELECTROLYTE IS TO BE WASHED THOROUGHLY.**

**WARNING: ELECTROLYTE IS HIGHLY CORROSIVE. IN NORMAL OPERATION THERE IS NO POSSIBILITY OF CONTACT WITH THE ELECTROLYTE. ELECTROLYTE IS RELEASED ONLY IF THE CELL HOUSING IS DESTROYED.**

**WARNING: USE ONLY SUITABLE TOOLS AND MEASURING INSTRUMENTS. NiCd BATTERIES OR CELLS BELONG TO FLAMMABILITY CLASS E IF ELECTRICAL FIRES OCCUR, IT IS POSSIBLE THAT THE EQUIPMENT MAY BE LIVE! EXTINGUISHING WATER OR FOAM ARE IDEAL CONDUCTORS AND ELECTRIC SHOCKS MAY OCCUR. ELECTRICAL FIRES MUST BE FOUGHT WITH EXTINGUISHING POWDER OR CARBON DIOXIDE CO<sub>2</sub>.**

**WARNING: DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.**

**WARNING: BATTERIES ARE AN ELECTRICAL HAZARD. DO NOT BE COMPLACENT DUE TO THEIR STATIC APPEARANCE, METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE. NEVER PLACE FOREIGN OBJECT OR TOOLS ON IT. SHORTING OF INDIVIDUAL CELLS WILL PRODUCE SEVERE ARCING WHICH CAN RESULT IN INJURY.**

**WARNING: CELL ELECTROLYTE (LIQUID OR DRY) IS CAUSTIC, CORROSIVE, POTASSIUM HYDROXIDE. DO NOT ALLOW CONTACT WITH SKIN.**

<b>P2550 CORRECTIVE MAINTENANCE SHEET</b>				
Card Code:		<b>R-C-11-02-00-00/R-00</b>		
System: <b>BATTERY</b>	Sheet: <b>3/10</b>			
Subsystem/Assy: <b>BATTERY CONTROL</b>	Unit:			
Component: <b>BATTERY TRIP TEMPERATURE SENSOR CB (3B02)</b>	Man Hours: <b>1</b>			
Maintenance Task: <b>REPLACEMENT</b>				
<b>SAFETY PRECAUTIONS:</b>				
<p><b>WARNING:</b> REMOVE ALL METAL CLOTHING PARTS AND JEWELRY (RINGS, BELT BUCKLES, WATCHES, CHAINS, ETC.) BEFORE BEGINNING WORK. PROPER DRESS FOR ELECTRICAL SHOCK AND CHEMICAL HAZARD REQUIRED.</p> <p><b>WARNING:</b> DO NOT USE OR EXPOSE CELLS TO SULFURIC ACID. NEVER USE TOOLS OR EQUIPMENT PREVIOUSLY USED WITH SULFURIC ACID. INTRODUCTION OF SULFURIC ACID TO THE CELLS, EVEN IN MINUTE QUANTITIES, WILL DESTROY THE CELLS.</p> <p><b>WARNING:</b> BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).</p> <p><b>CAUTION:</b> NEVER CLEAN BATTERY OR BATTERY CELLS IN GENERAL WITH SOLVENTS OR CLEANING AGENTS. USE WATER ONLY.</p>				
<b>TOOLS:</b>				
LACMTA Maintenance Shop Standard Tools Kit				
<b>CONSUMABLES:</b>				
CRC Industrial - Precision Cleaner M3 PN 147535 Dry Compressed Air for Electronic Equipment (commercial).				
<b>SPARE PARTS:</b>				
Temperature Sensor CB (3B02) with relevant Wiring Type KLIXON 4344 176				

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:****PRELIMINARY OPERATIONS**

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

**1**

Maintenance Task:

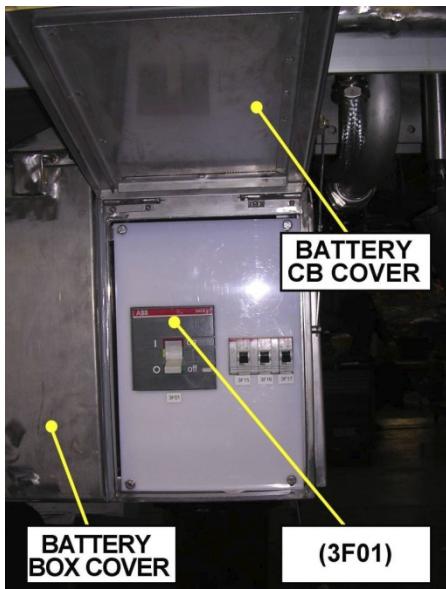
**REPLACEMENT**

### PROCEDURE:

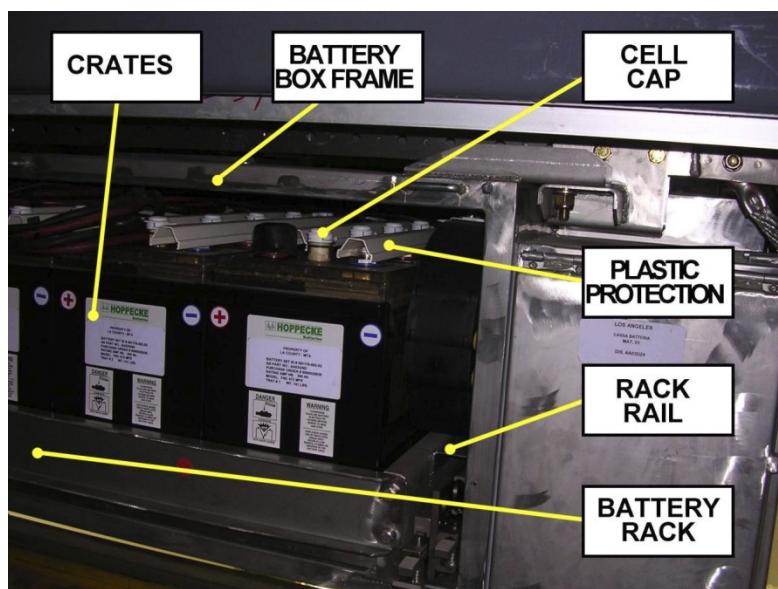
#### REMOVAL (Refer to Figures 1 through 5)

To perform the Task proceed as follows:

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery.
2. Remove Electrical Power by switching off the Battery Protection Circuit Breaker (3F01) located in the Battery Circuit Breakers Box (B Section Rh Side).
3. Gain access to the Battery Rack. by disengaging Box Front Cover Safety Latches and by removing the Cover.
4. Unlock the Locking Device of Battery Rack.
5. Pull out the Battery.



**Figure 1 -  
BATTERY PROTECTION CIRCUIT  
BREAKER (3F01)**



**Figure 2 - BATTERY RACK & COMPONENTS**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

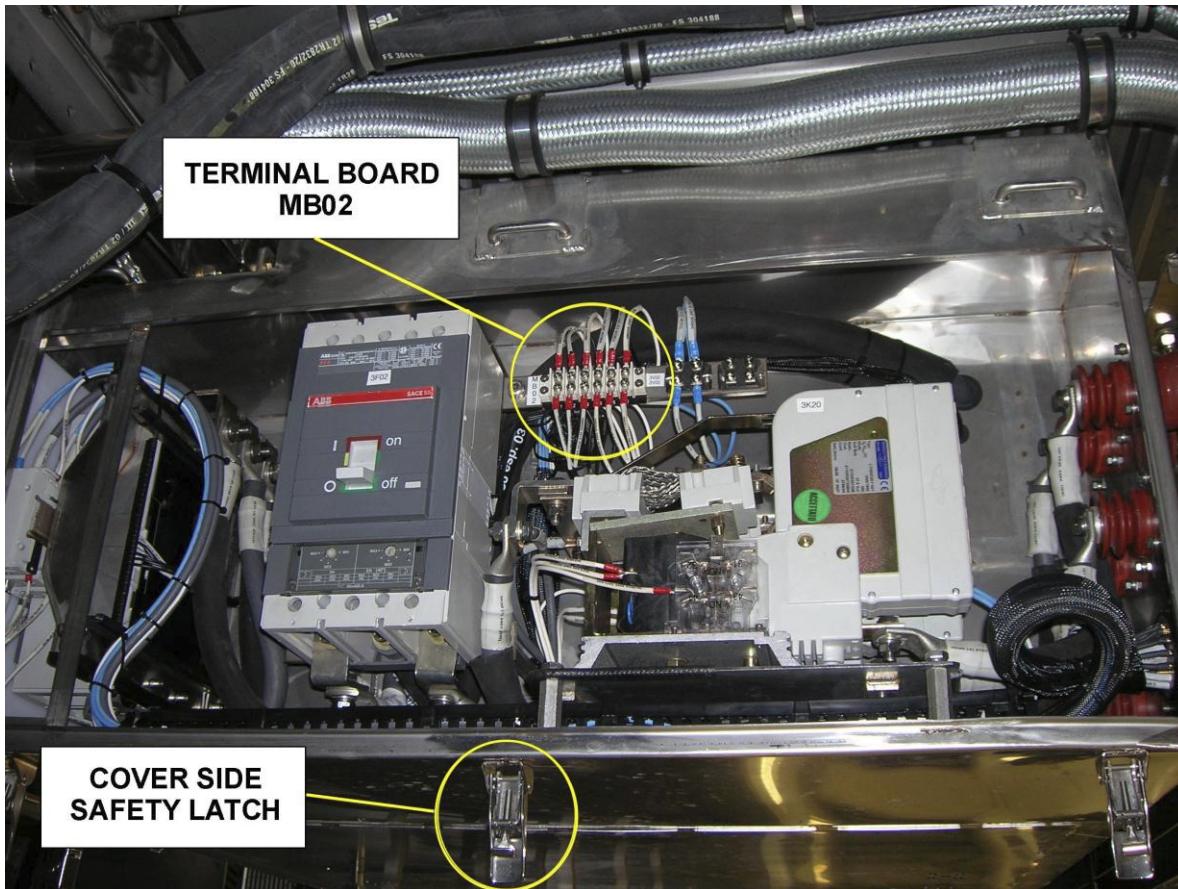
**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

6. Remove Battery Circuit Breakers Box Front and Side Covers disengaging the relevant Safety Latches.
7. Disconnect the Sensor Wires by loosening the relevant Terminals on the MB02 Terminal Board .



**Figure 3 - TERMINAL BOARD MB02 - LOCATION**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

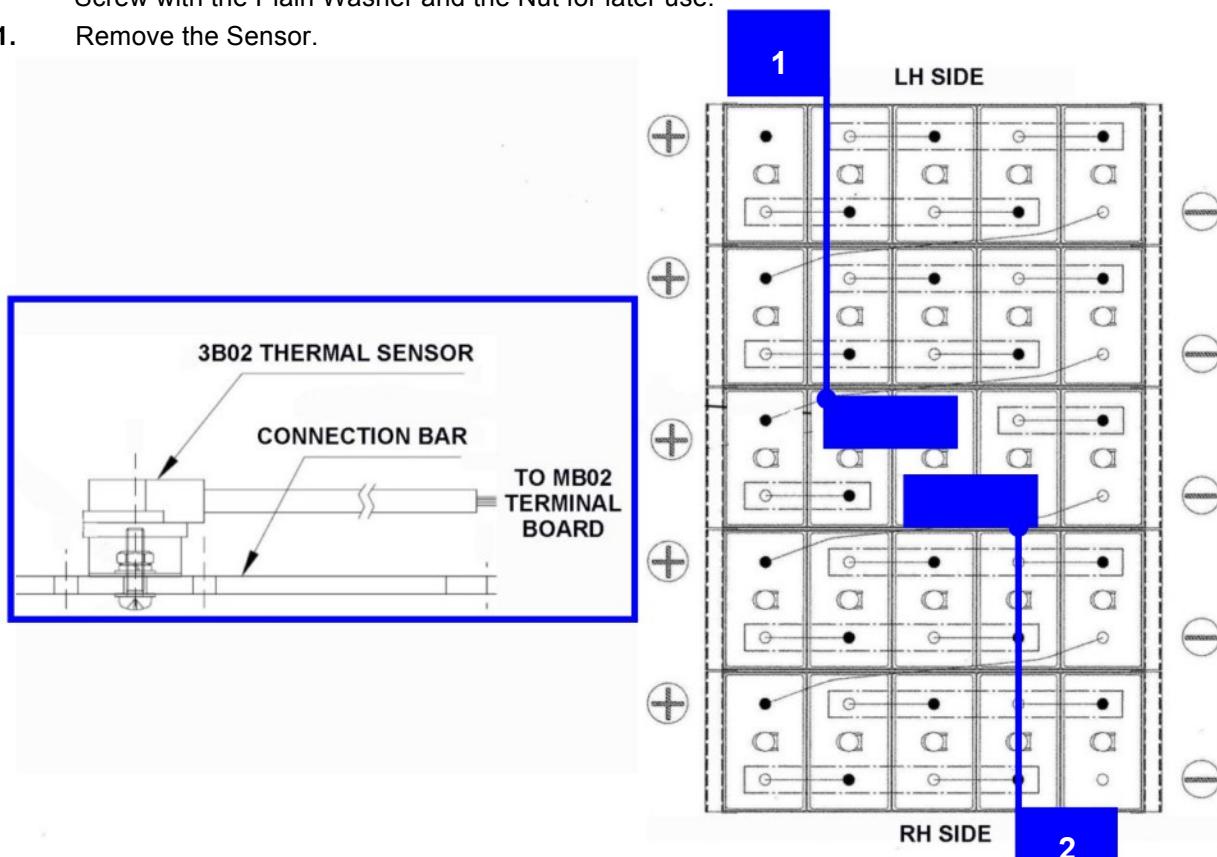
**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

8. Take note of Wiring Color Codes and relevant positions on Terminal Board.
9. Remove the Plastic Protectors relevant to Connection Bar.
10. Loose and remove the Sensor Fixing Hardware. Discard the relevant Lock Washer and retain the Screw with the Plain Washer and the Nut for later use.
11. Remove the Sensor.



# 1 indicates the Location of the 3B02 Thermal Sensor with its Wiring routing from LH side.

### NOTE:

# 2 indicates the Location of the 3B02 Thermal Sensor with its Wiring routing from RH side.

**Figure 4 -3B02 SENSOR - LOCATION**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

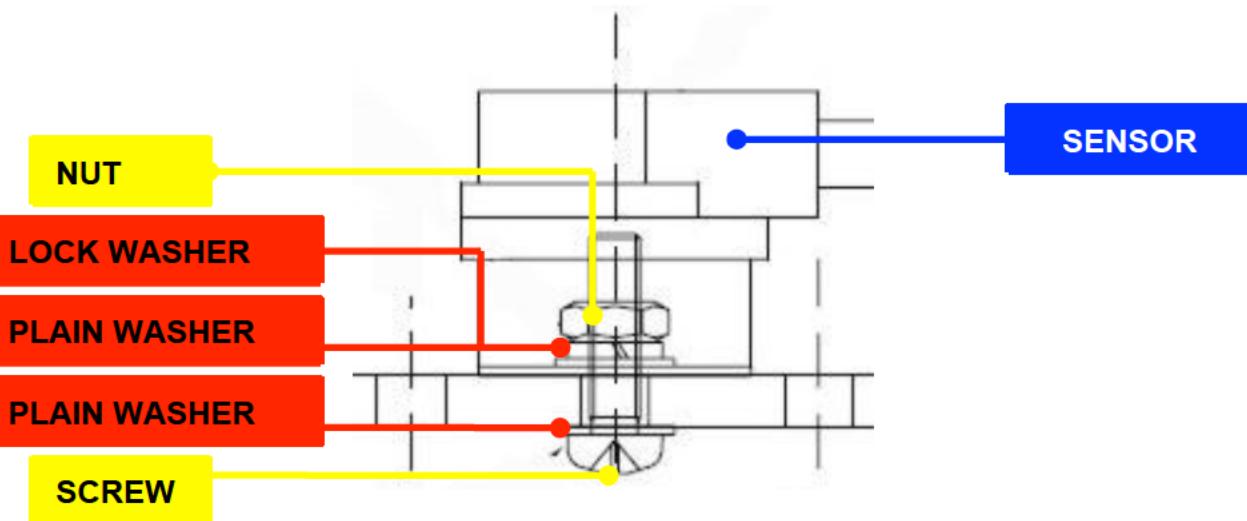
Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

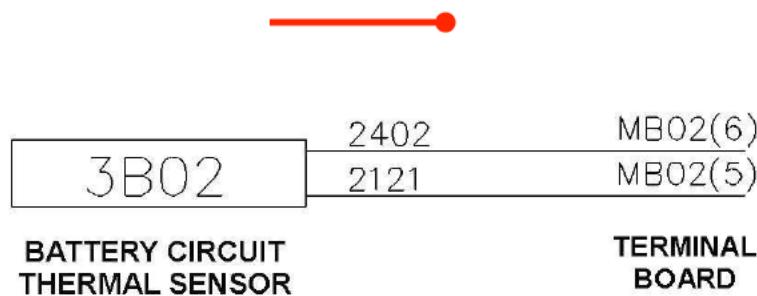
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE:**

**Figure 5 -3B02 SENSOR - FIXING HARDWARE DETAIL**



**Figure 6 - 3B02 SENSOR) - WIRING SCHEME**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

#### INSTALLATION

To perform the Task proceed as follows: (Refer to Figures 1 through 5)

1. Clean the Sensor Seat using recommended Cleaner / Agent and lint-free rags.
2. Check the Battery Box Interior for clean. Vacuum clean as per check result.
3. Check the Connection Bar for secure installation / missing / loose Hardware. Tighten as per check result to **18.4 ft lb (25Nm)**.
4. Check the Terminal Board for signs of overheating. Replace as per check result.
5. Check the Terminal Board for installation / missing / loose Hardware. Tighten as per check result.
6. Install the Sensor as follows:
  - a. Position the Sensor onto its Seat on the Connection Bar. .
    - b. Install the Sensor Fixing hardware with the relevant Plain Washer and the "new" Lock Washer. Torque to **0.3-0.4 lb ft. (05-06 Nm)**.

**NOTE:** The screws must be applied "bottom-up" in order to avoid contacts with the Battery elements

7. Connect the Sensor Wiring to the relevant Terminals on the MB02 Terminal Board according to their positions and Color Codes previously noted.(Refer to Fig 6 for Wiring Scheme) Tighten as required.
8. Install the Connection Bar Plastic Protector.
9. Stow the Battery and lock the Battery Rack with the Locking Device.
10. Carefully reinstall Battery Box Front and Side Covers and lock them by engaging all the Safety Latches.
11. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01).
12. Close Vehicle Skirt and lock it using the Maintenance Key.
13. Restore Electrical Power to Vehicle.
14. On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons.
15. Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the Fault Code relevant to Battery Circuit Temperature **is not listed**.
16. 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 11-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-11-02-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY TRIP TEMPERATURE SENSOR CB (3B02)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****INTENTIONALLY  
LEFT BLANK**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

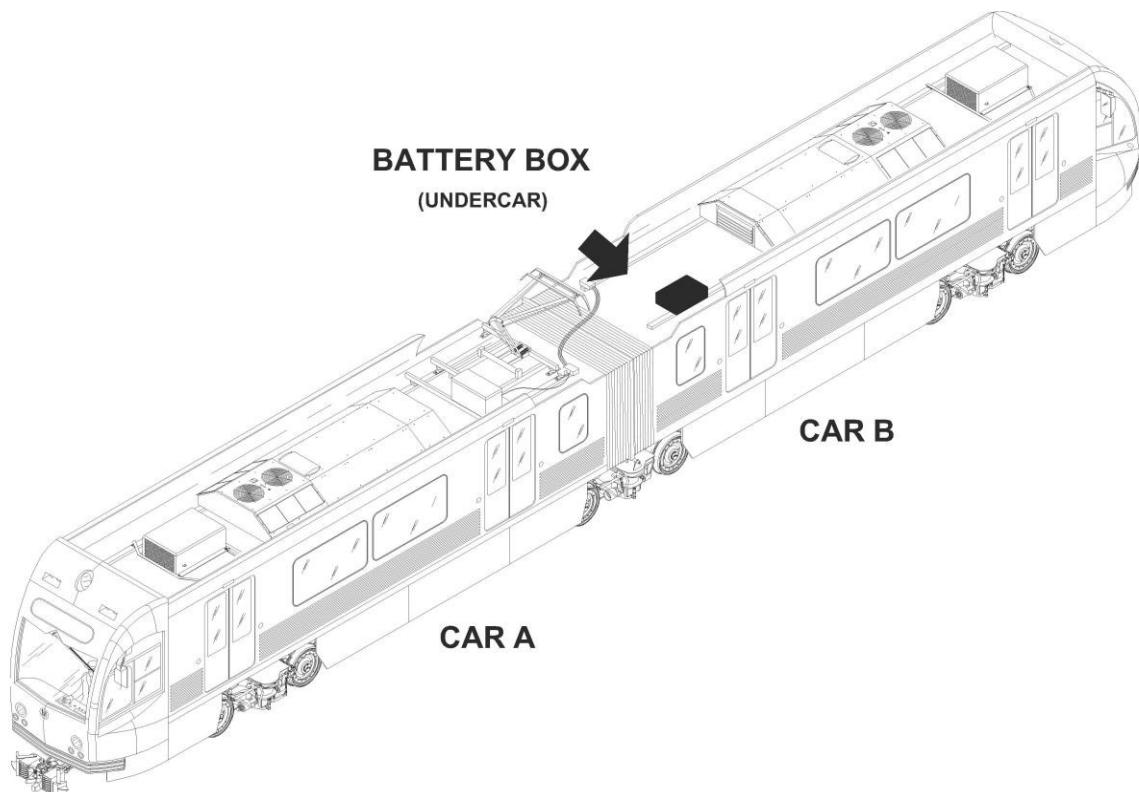
Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**
**LOCATION:**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### SAFETY PRECAUTIONS:

**WARNING: BEFORE PERFORMING MAINTENANCE PROCEDURES AND TOUCHING ANY COMPONENT, USE A RELIABLE HIGH VOLTAGE TEST PROBE TO VERIFY THAT NO VOLTAGE IS PRESENT.**

**WARNING: BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).**

**WARNING: TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.**

### TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

### CONSUMABLES:

CRC Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

### SPARE PARTS:

3F01 Battery Circuit Breaker Type S5N400 3P P/N AA03V6P (211VK01375B-02010100)

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**3/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

#### REMOVAL

To perform the Task proceed as follows:

##### A) CB ASSY REMOVAL (Refer to Figures 1 through 3)

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery Circuit Breakers Box.
2. Gain access to the Battery Circuit Breakers Box by disengaging Box Front Cover Safety Latches and by removing the Front Cover.
3. Switch the Battery Protection Circuit Breaker (3F01) to "OFF" position.
4. Remove the 3F01 Cover by looseing the relevant fixing Screws. Retain Hardware for later use.
5. Loose the CB Assy Fixing Screws (Fig 3).
6. Disconnect Electrical Connections as indicated in the next Step B.
7. Remove the 3F01 Circuit Breaker Assy.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

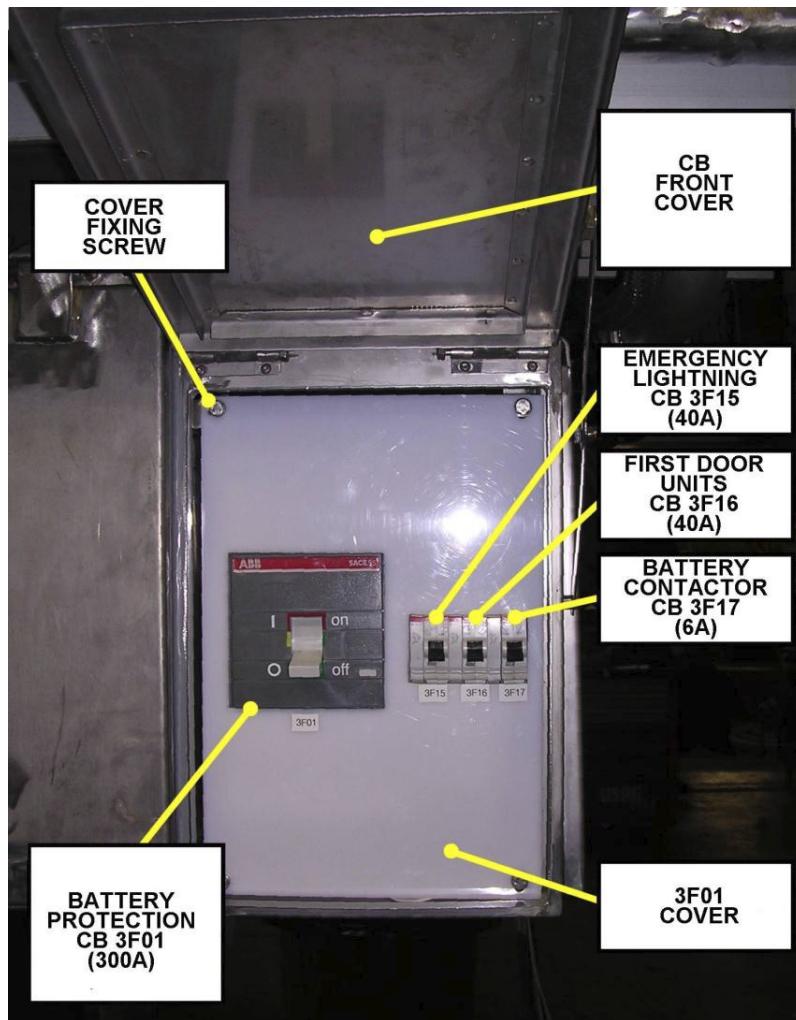
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):



**Figure 1 - BATTERY CIRCUIT BREAKERS BOX - FRONT SIDE**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

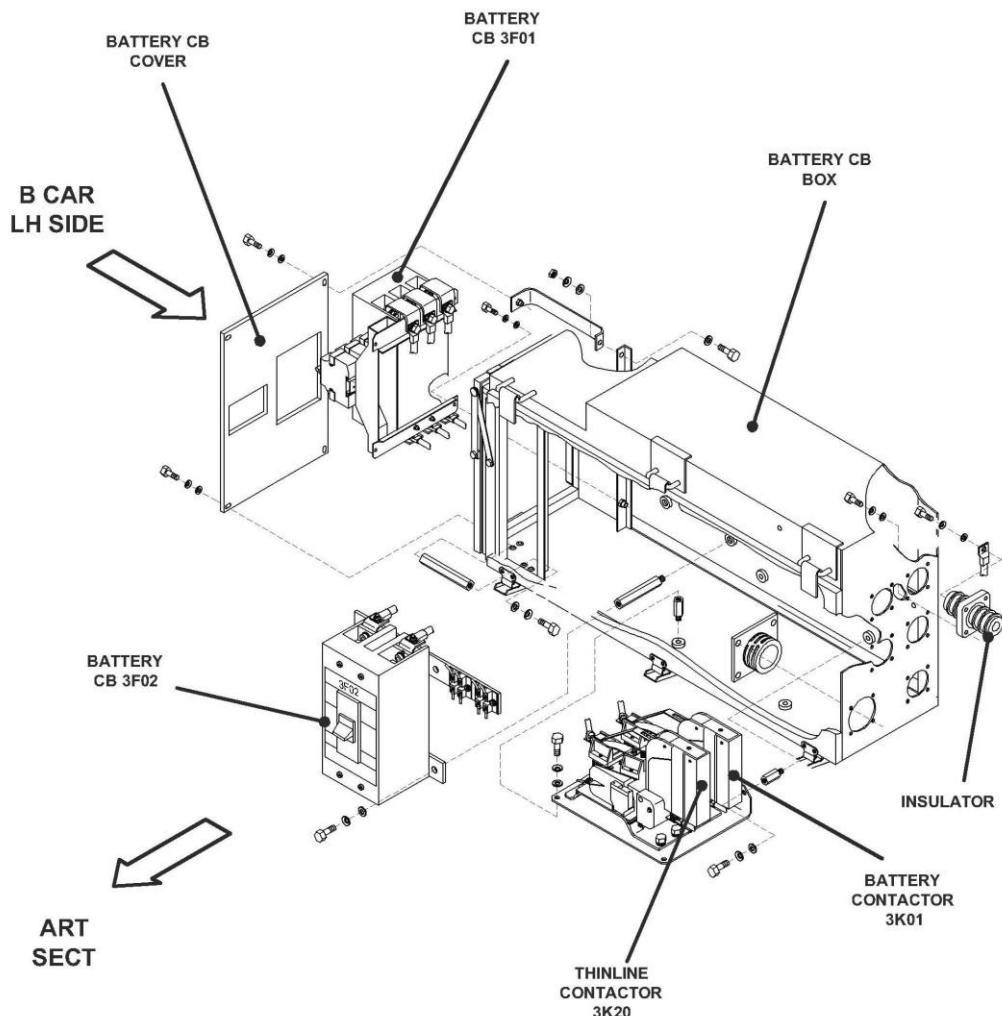
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):



**Figure 2 - BATTERY CIRCUIT BREAKERS BOX - ITEMS INSTALLATION**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

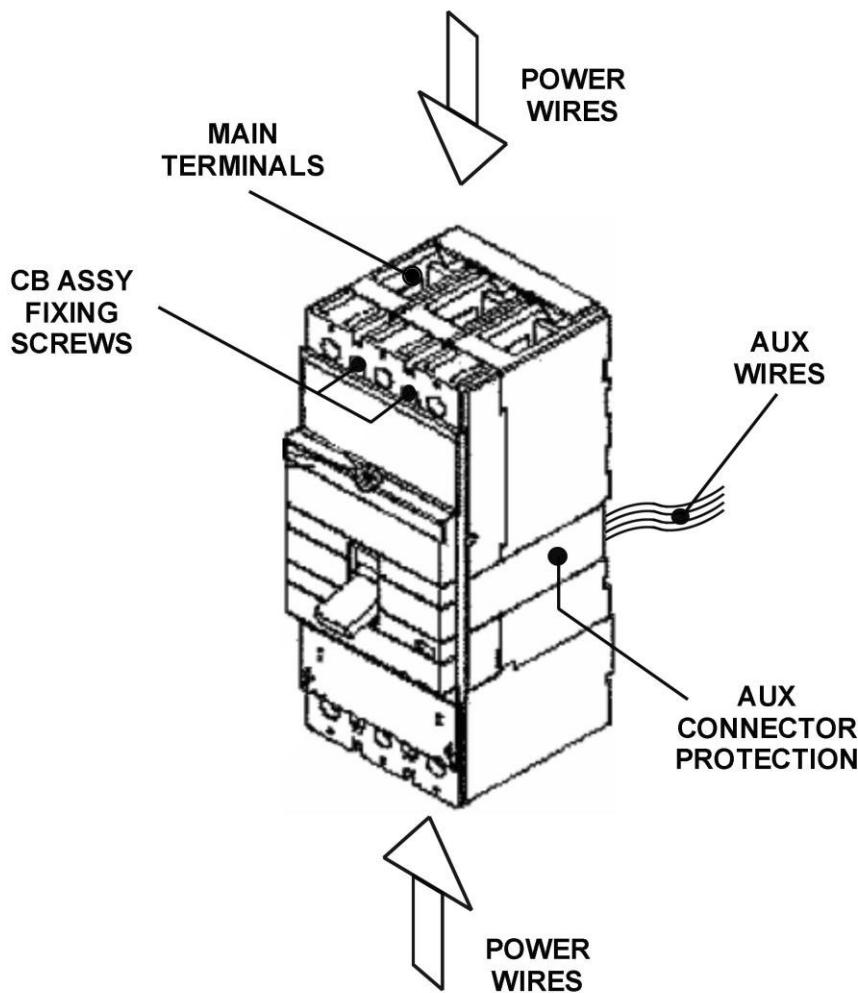
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):



**Figure 3 - 3F01 TRIPOLAR CIRCUIT BREAKER ASSY 400 A**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

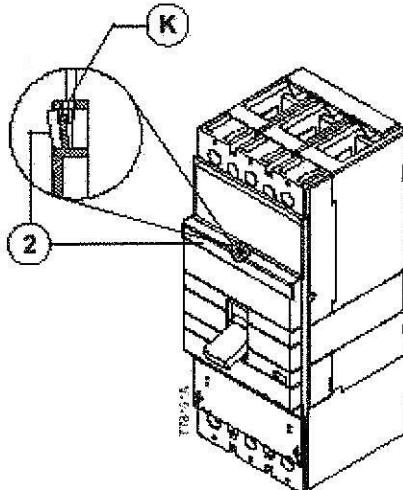
Maintenance Task:

**REPLACEMENT**

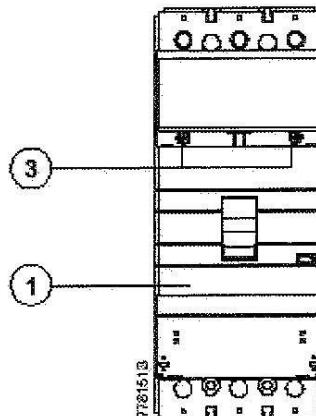
### PROCEDURE (CONT'D):

#### **B) CB WIRES REMOVAL** (Refer to Figures 4 through 9)

- 1 Place in the rabbet "K" a suitable screwdriver and pull to remove the Label (2).


**Figure 4**

- 2 Loose the Screws (3) to remove the Front Cover (1).


**Figure 5**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

- 3** Loose the Screws (4) to remove the Interior Cover (5).

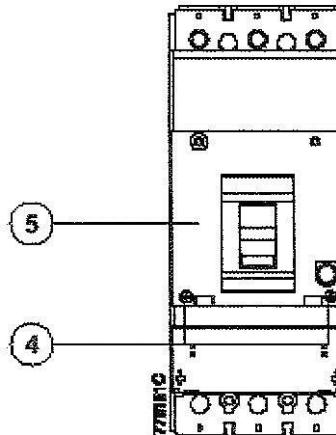


Figure 6

- 4** Remove the Aux Connectors Protector (6).

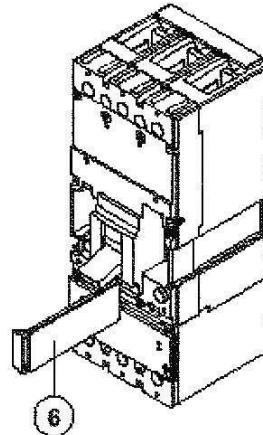


Figure 7

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

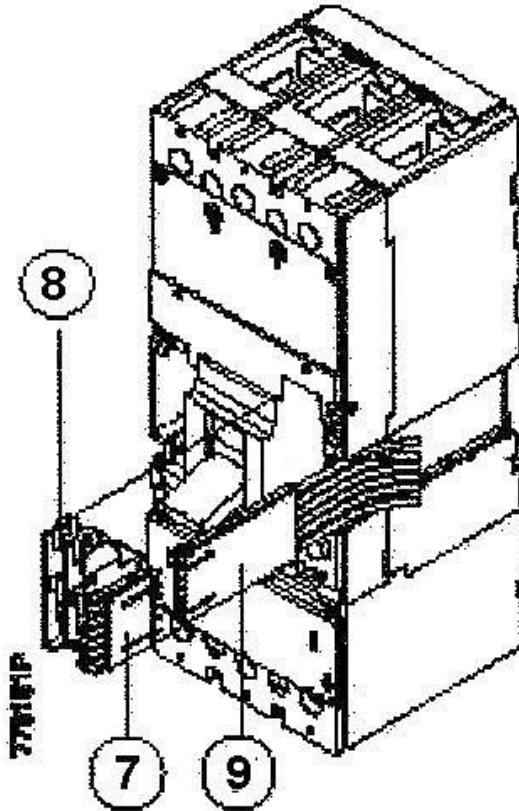
**REPLACEMENT**

### PROCEDURE (CONT'D):

- 5** Remove the Male Aux Connector (7) and ,at the same time ,the Aux Contacts Assy (8).

- 6** Disconnect the Aux Wires by disengaging the Female Aux Connector (9).

- 7** Disconnect the Power Wires by loosening the relevant Terminal Fixing Screws.


**Figure 8**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

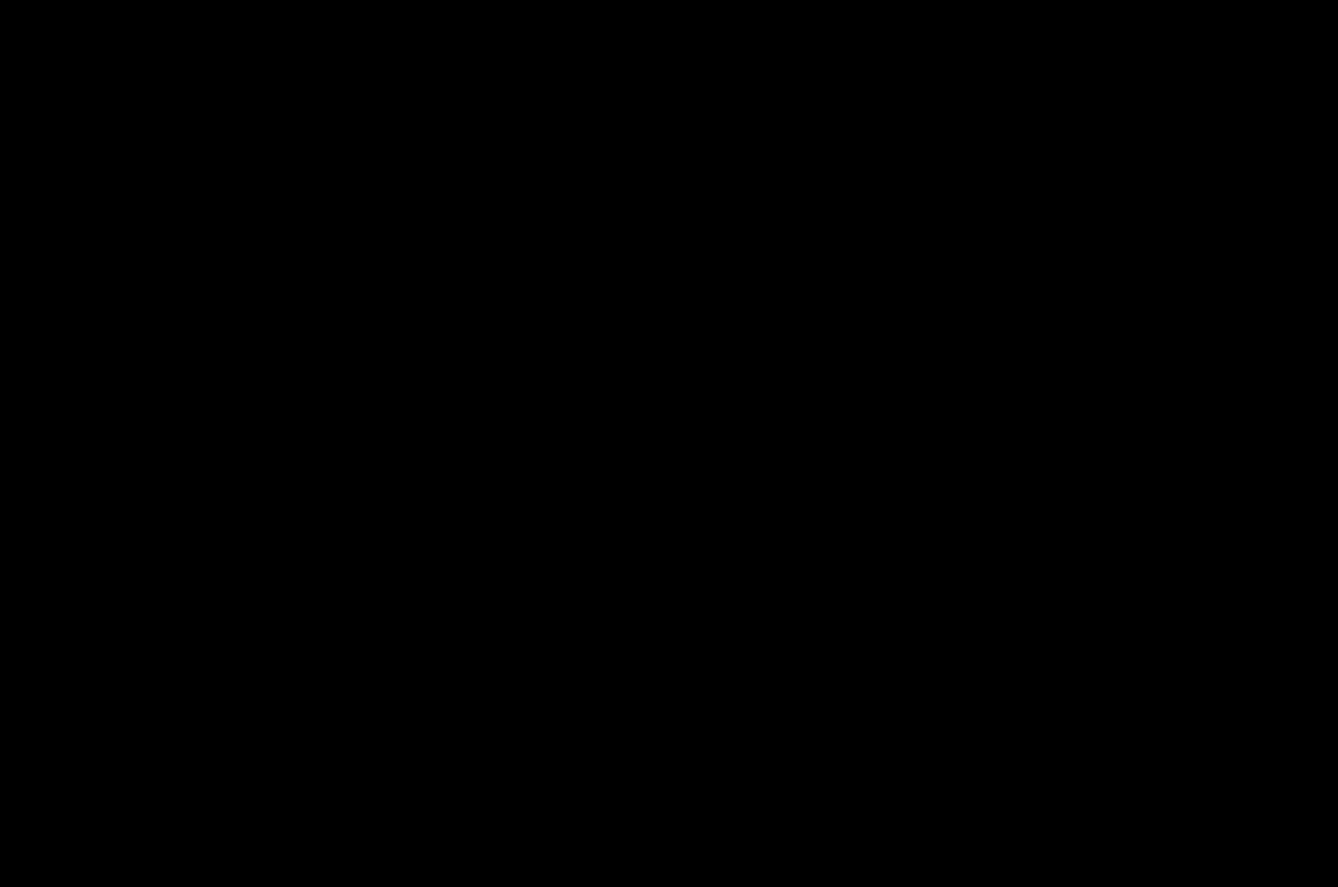
Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE (CONT'D):**  
**Figure 9- 3F01 TRIPOLAR CIRCUIT BREAKER - MAIN AND AUXILIARY WIRING SCHEME**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**11/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

#### INSTALLATION

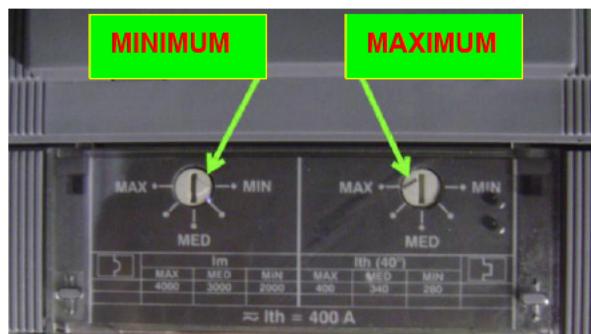
To perform the Task proceed as follows:

##### A) CB ASSY INSTALLATION (Refer to Figures 1 through 3)

1. Clean the Circuit Breaker Seat using recommended Cleaner / Agent and lint-free rags.
2. Check the Power Wires and relevant Terminals for signs of overheating. Replace as per check Results.
3. Check the Male and Female Aux Connectors for Pins damaged / burns or missing. Replace as per check result.
4. Place and support the 3F01 Circuit Breaker Assy nearly to its position.
5. Reconnect Electrical Connections as indicated in the next Step B.
6. Fix the 3F01 Circuit Breaker as follows:
  - a) Install the CB Assy Fixing Screws (Fig 3) .Torque to 14.8 lb ft.
  - b) Check that the Circuit Breaker Moving Parts can be moved freely and are easy to operate
  - c) Check / set the Circuit Breaker for proper settings according to the following Setting Knob Positions (Refer to Figure 10).

Magnet Current:      Setting Knob Position = MINIMUM ( $\sim 2000,00$  A)

Thermal Current:      Setting Knob Position =MAXIMUM ( $\sim 400,00$  A)



**Figure 10 - 3F01 CB -MAGNET & THERMAL CURRENT SETTINGS**

- d) Install the 3F01 Cover and fix it by the relevant Screws. Tighten as needed

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**12/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

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

7. Install the 3F01 Cover and the relevant fixing Screws. Tighten as needed.
8. Switch the Battery Protection Circuit Breaker (3F01) to "ON" position.
9. Carefully reinstall Battery Circuit Breakers Box Front Cover and lock it by engaging all Safety Latches
10. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01)
11. Close Vehicle Skirt and lock it using the Maintenance Key.
12. Restore Electrical Power to Vehicle
13. On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons.
14. Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the following Fault Code **is not listed**

**#4030****APS/LVPS****PowerSupplyCrcBrkOpen**

15. 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 11-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-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**13/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

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

#### ***B) CB WIRES INSTALLATION*** (Refer to Figures 4 through 9)

1. Connect the Power Wires to the relevant Terminals according to their positions and Color Codes previously noted .(Refer to Fig 9 for Wiring Scheme) Tighten as required.
2. Connect the Aux Wires by engaging the Female Aux Connector (9) as follows:
  - a) Insert the Female Aux Connector (9) into the rabbet pushing till to engage it.
  - b) Insert the Aux Contact Assy (8) into the 3F01 Circuit Breaker Assy pushing till to engage it.
  - c) At the same time insert the Male Aux Connector (7) pushing till to connect its.
3. Install the Aux Connectors Protector (6).
4. Install the Interior Cover (5) and fix it by the relevant Fixing Screws (4). Tighten as needed.
5. Install the Front Cover (1) fix it by the relevant Fixing Screws (3). Tighten as needed.
6. Install the Label (2) pushing till to engage it.

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-03-00-00/R-00**

System:

**BATTERY**

Sheet:

**14/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F01) TYPE S5N400 3P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****INTENTIONALLY LEFT BLANK**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

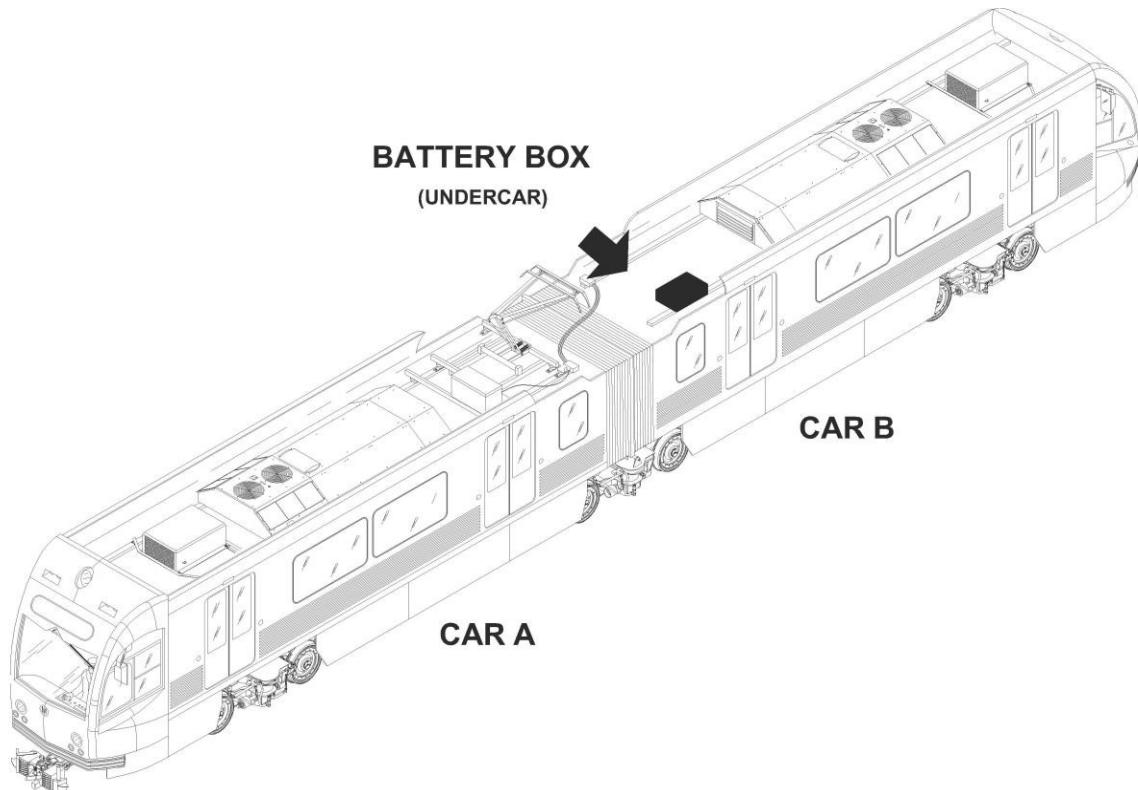
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

LOCATION:



## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### SAFETY PRECAUTIONS:

**WARNING: BEFORE PERFORMING MAINTENANCE PROCEDURES AND TOUCHING ANY COMPONENT, USE A RELIABLE HIGH VOLTAGE TEST PROBE TO VERIFY THAT NO VOLTAGE IS PRESENT.**

**WARNING: BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).**

**WARNING: TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.**

### TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

### CONSUMABLES:

CRC Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

### SPARE PARTS:

3F02 Battery Circuit Breaker Type S5N400 2P P/N AA03V6P (211VK01375B-04010000)

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**3/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

### REMOVAL

To perform the Task proceed as follows:

#### A) CB ASSY REMOVAL (Refer to Figures 1 through 4)

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery Circuit Breakers Box.
2. Gain access to the Battery Circuit Breakers Box by disengaging Box Front & Side Cover Safety Latches and by removing the Covers.
3. Switch the Battery Protection Circuit Breaker (3F01) to "OFF" position.
4. Set the 3F17 Battery Contactor CB to "OFF" position.
5. Loose the CB Assy Fixing Screws (Fig 3).
6. Disconnect Electrical Connections as indicated in the next Step B.
7. Remove the 3F02 Circuit Breaker Assy.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

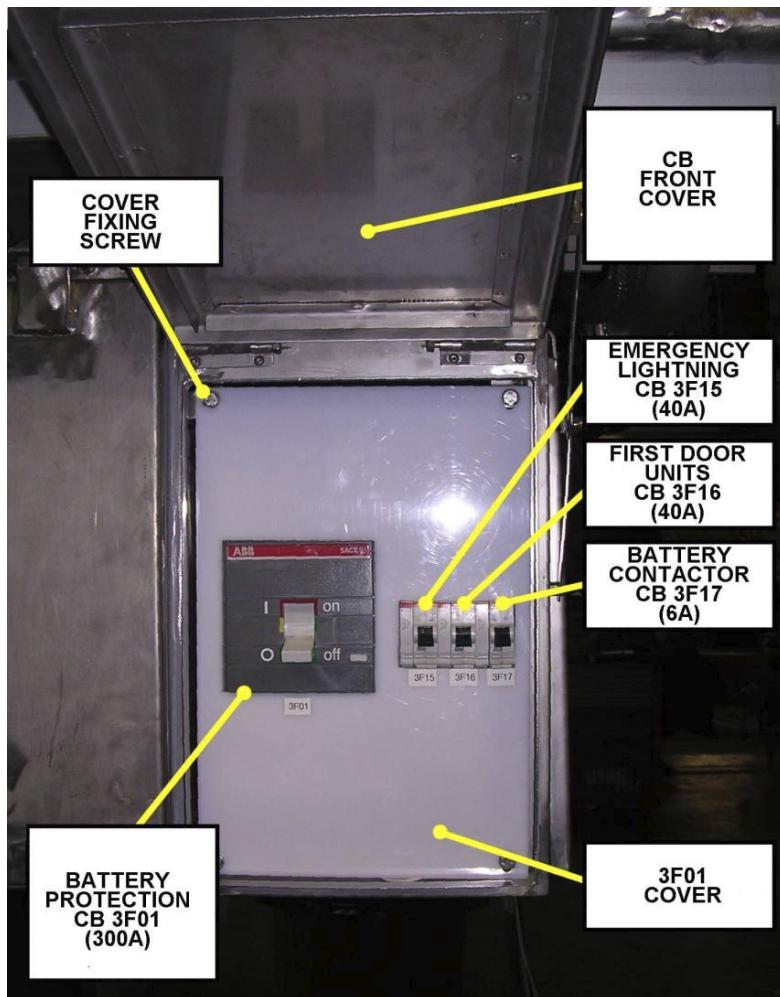
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):



**Figure 1 - BATTERY CIRCUIT BREAKERS BOX - FRONT SIDE**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

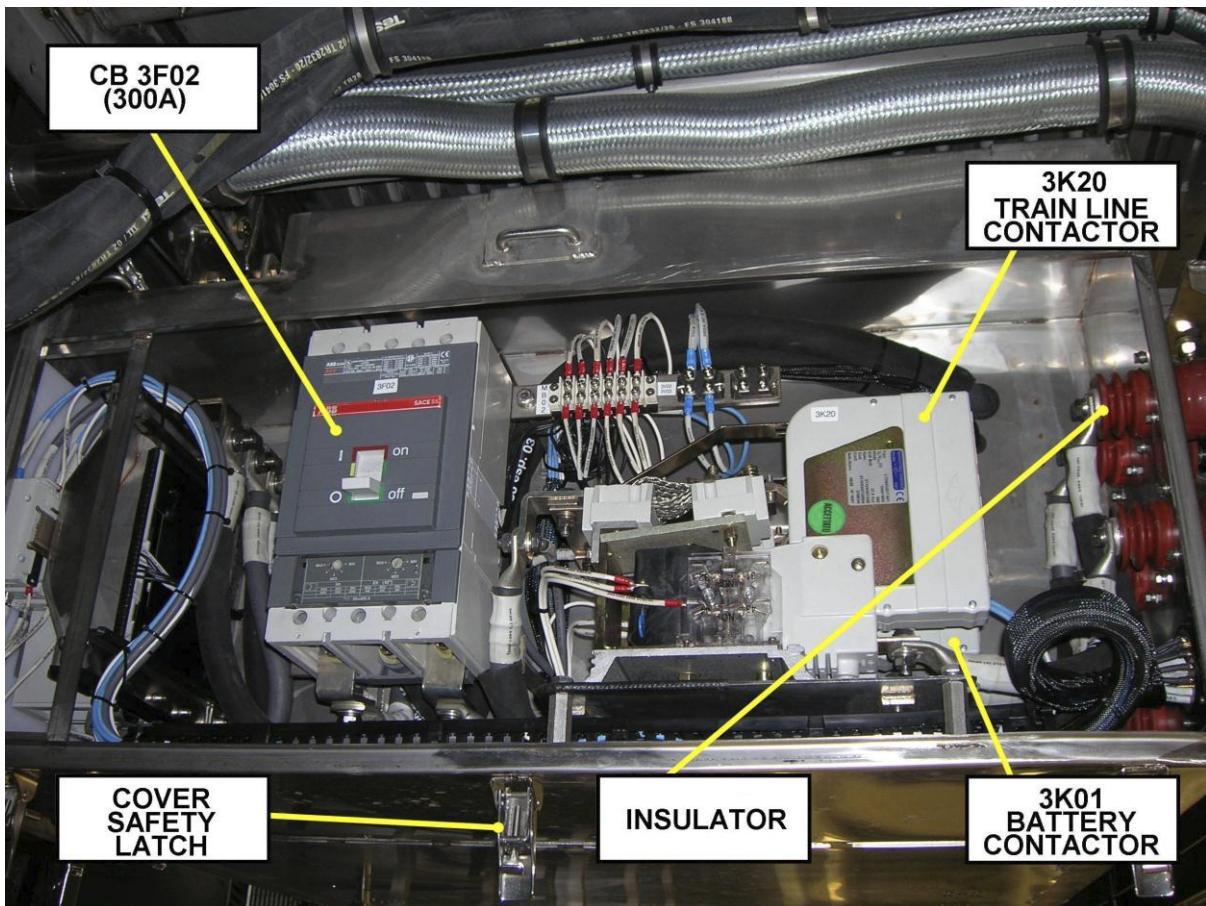


Figure 2 - BATTERY CIRCUIT BREAKERS BOX -SIDE VIEW -CB3F02 LOCATION

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

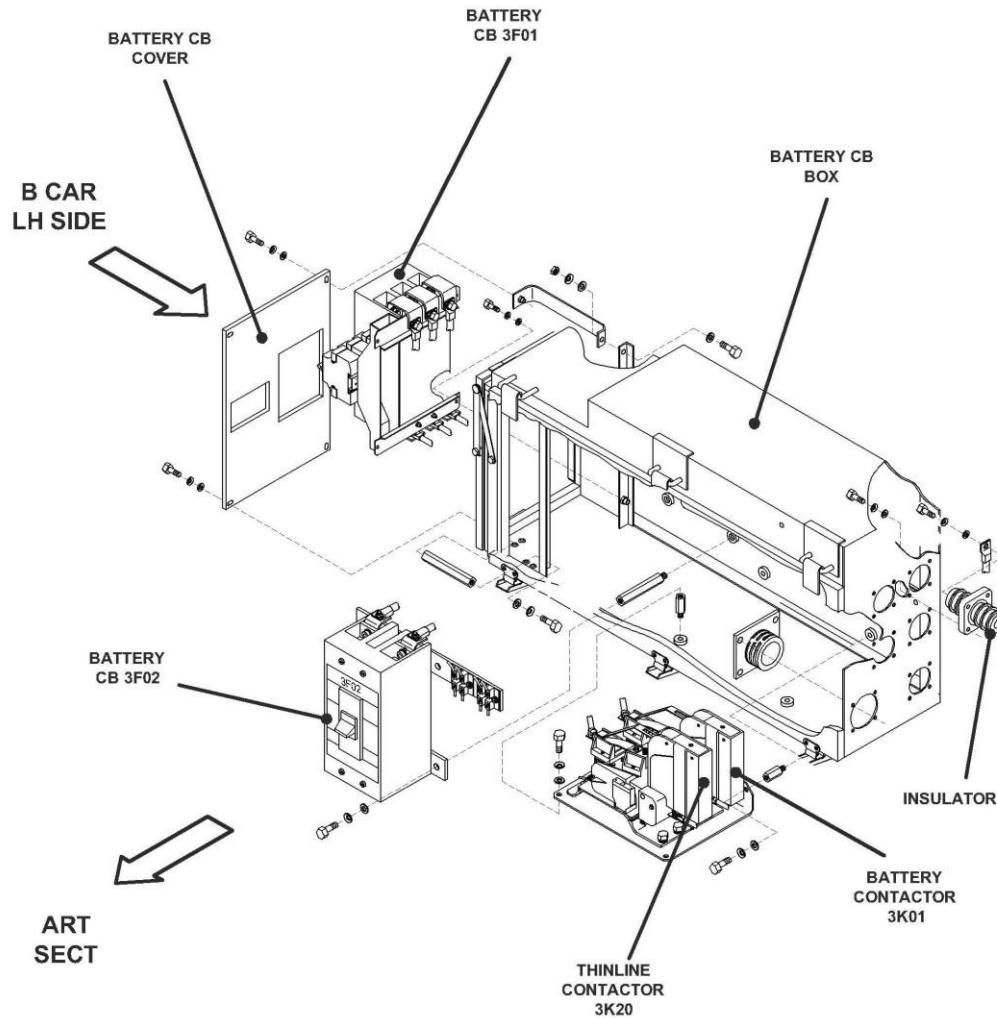


Figure 3 - BATTERY CIRCUIT BREAKERS BOX - ITEMS INSTALLATION

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

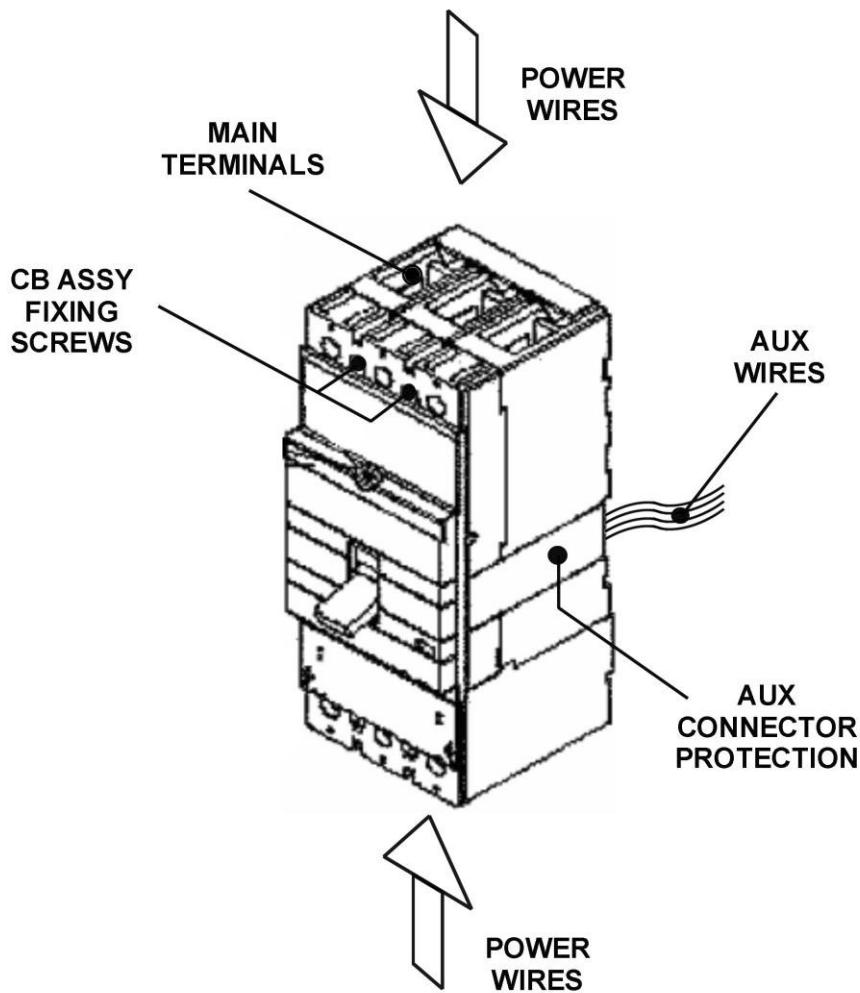


Figure 4 - 3F02 BIPOLAR CIRCUIT BREAKER ASSY 300 A

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

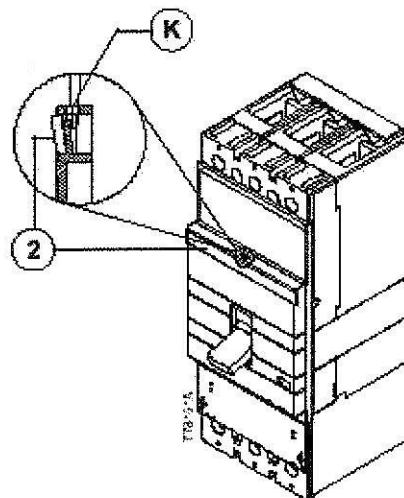
**R-C-11-04-00-00/R-00**

System: <b>BATTERY</b>	Sheet: <b>8/14</b>
Subsystem/Assy: <b>BATTERY CONTROL</b>	Unit:
Component: <b>BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P</b>	Man Hours: <b>1</b>
Maintenance Task: <b>REPLACEMENT</b>	

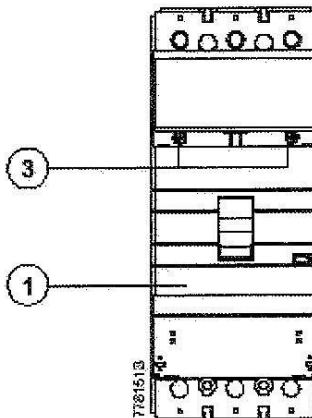
### PROCEDURE (CONT'D):

#### ***B) CB WIRES REMOVAL*** (Refer to Figures 4 through 9)

- 1 Place in the rabbet "K" a suitable screwdriver and pull to remove the Label (2).

**Figure 5**

- 2 Loose the Screws (3) to remove the Front Cover (1).

**Figure 6**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

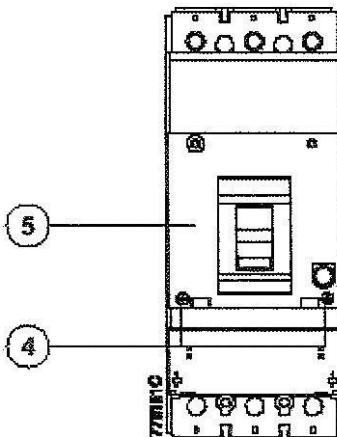
**1**

Maintenance Task:

**REPLACEMENT**

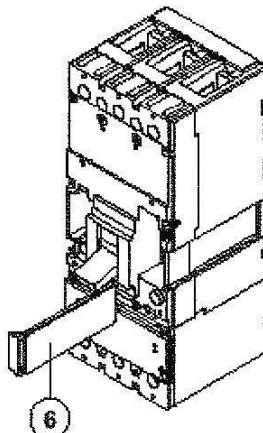
### PROCEDURE (CONT'D):

- 3** Loose the Screws (4) to remove the Interior Cover (5).



**Figure 7**

- 4** Remove the Aux Connectors Protector (6).



**Figure 8**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

- 5** Remove the Male Aux Connector (7) and ,at the same time ,the Aux Contacts Assy (8).

- 6** Disconnect the Aux Wires by disengaging the Female Aux Connector (9).

- 7** Disconnect the Power Wires (2118 and 2104) by loosening the relevant Terminal Fixing Screws.

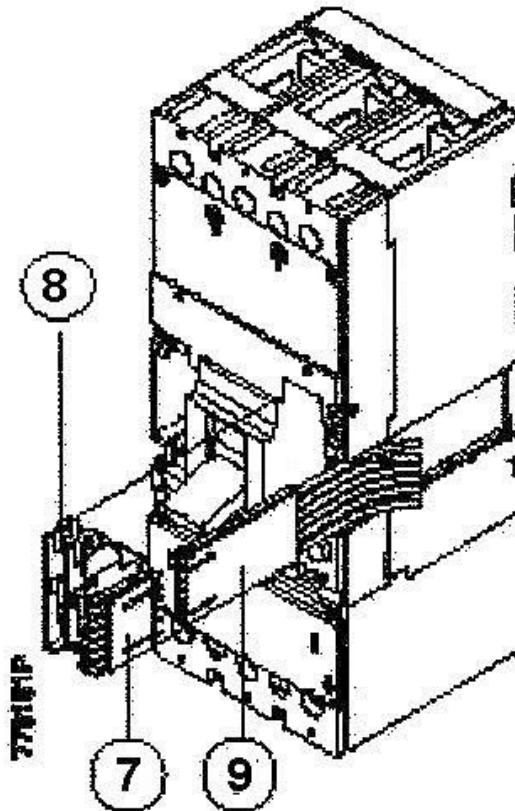


Figure 9

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**11/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

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

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**12/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

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

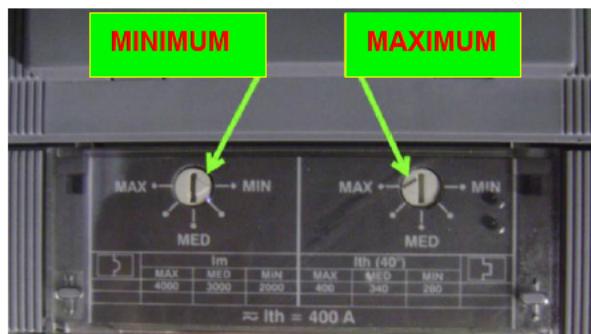
To perform the Task proceed as follows:

**A) CB ASSY INSTALLATION (Refer to Figures 1 through 4)**

1. Clean the Circuit Breaker Seat using recommended Cleaner / Agent and lint-free rags.
2. Check the Power Wires and relevant Terminals for signs of overheating. Replace as per check Results.
3. Check the Male and Female Aux Connectors for Pins damaged / burns or missing. Replace as per check result.
4. Place and support the 3F02 Circuit Breaker Assy nearly to its position.
5. Reconnect Electrical Connections as indicated in the next Step **B**.
6. Fix the 3F02 Circuit Breaker as follows:
  - a) Install the CB Assy Fixing Screws (Fig 3) .Torque to 14.8 lb ft.
  - b) Check that the Circuit Breaker Moving Parts can be moved freely and are easy to operate.
  - c) Check / set the Circuit Breaker for proper settings according to the following Setting Knob Positions (Refer to Figure 11).

**Magnet Current:**      **Setting Knob Position = MINIMUM ( $\sim 2000,00$  A)**

**Thermal Current:**      **Setting Knob Position =MAXIMUM ( $\sim 400,00$  A)**



**Figure 11 - 3F02 CB -MAGNET & THERMAL CURRENT SETTINGS**

- d) Install the 3F01 Cover and fix it by the relevant Screws. Tighten as needed.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**13/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

7. Switch the Battery Protection Circuit Breaker (3F01) to "ON" position.
8. Set the 3F17 Battery Contactor CB to "ON" position.
9. Carefully reinstall Battery Circuit Breakers Box Front & Side Covers and lock them by engaging all the Safety Latches.
10. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01).
11. Close Vehicle Skirt and lock it using the Maintenance Key.
12. Restore Electrical Power to Vehicle.
13. On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons.
14. Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the following Faults Code **is not listed**

**#4030**
**APS/LVPS**
**PowerSupplyCrcBrkOpen**

15. 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 11-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-11-04-00-00/R-00**

System:

**BATTERY**

Sheet:

**14/14**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CIRCUIT BREAKER (3F02) TYPE S5N400 2P**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

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

***B) CB WIRES INSTALLATION*** (Refer to Figures 5 through 10).

1. Connect the Power Wires (2118 and 2104) to the relevant Terminals according to their positions and Color Codes previously noted .(Refer to Fig 10 for Wiring Scheme) Tighten as required.
2. Connect the Aux Wires by engaging the Female Aux Connector (9) as follows:
  - d) Insert the Female Aux Connector (9) into the rabbet pushing till to engage it.
  - e) Insert the Aux Contact Assy. (8) into the 3F02 Circuit Breaker Assy. pushing till to engage it.
  - f) At the same time insert the Male Aux Connector (7) pushing till to connect its.
3. Install the Aux Connectors Protection (6).
4. Install the Interior Cover (5) and fix it by the relevant Fixing Screws (4). Tighten as needed.
5. Install the Front Cover (1) fix it by the relevant Fixing Screws (3). Tighten as needed.
6. Install the Label (2) pushing till to engage it.

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

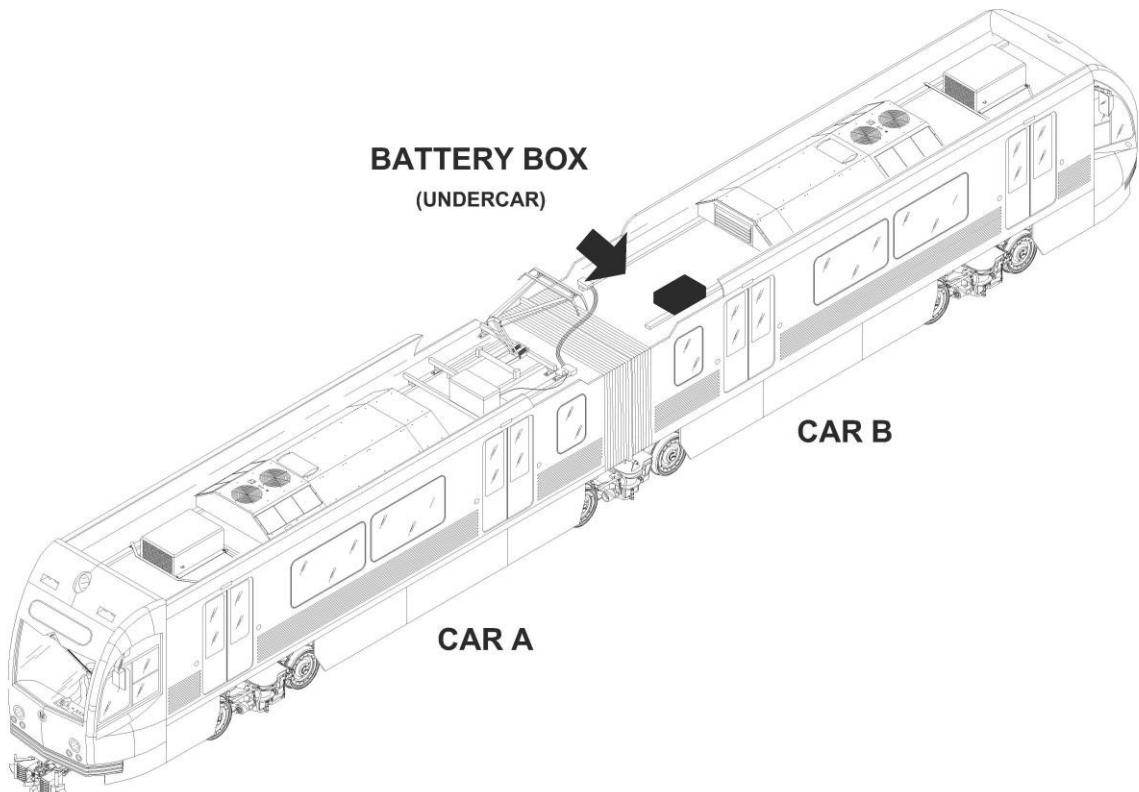
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

LOCATION:



## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### **SAFETY PRECAUTIONS:**

**WARNING: BEFORE PERFORMING MAINTENANCE PROCEDURES AND TOUCHING ANY COMPONENT, USE A RELIABLE HIGH VOLTAGE TEST PROBE TO VERIFY THAT NO VOLTAGE IS PRESENT.**

**WARNING: BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).**

**WARNING: TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.**

### **TOOLS:**

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

### **CONSUMABLES:**

CRC Industrial - Precision Cleaner M3 PN 147535

Dry Compressed Air for Electronic Equipment (commercial).

### **SPARE PARTS:**

3F17 CB Type S 281 Unipolar 6A "C" P/N AA03V2J (211EK22984B)

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**3/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

#### REMOVAL

To perform the Task proceed as follows: (Refer to Figures 1 through 3)

1. Set the 3F03 APS/LVPS Power Supply CB (LV Locker "B" Section) to OFF.
2. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery Circuit Breakers Box.
3. Gain access to the Battery Circuit Breakers Box by disengaging Box Front Cover Safety Latches and by removing the Front Cover.
4. Switch the Battery Protection Circuit Breaker (3F01) to "OFF" position.
5. Remove the 3F01 Cover by loosening the relevant fixing Screws. Retain Hardware for later use.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

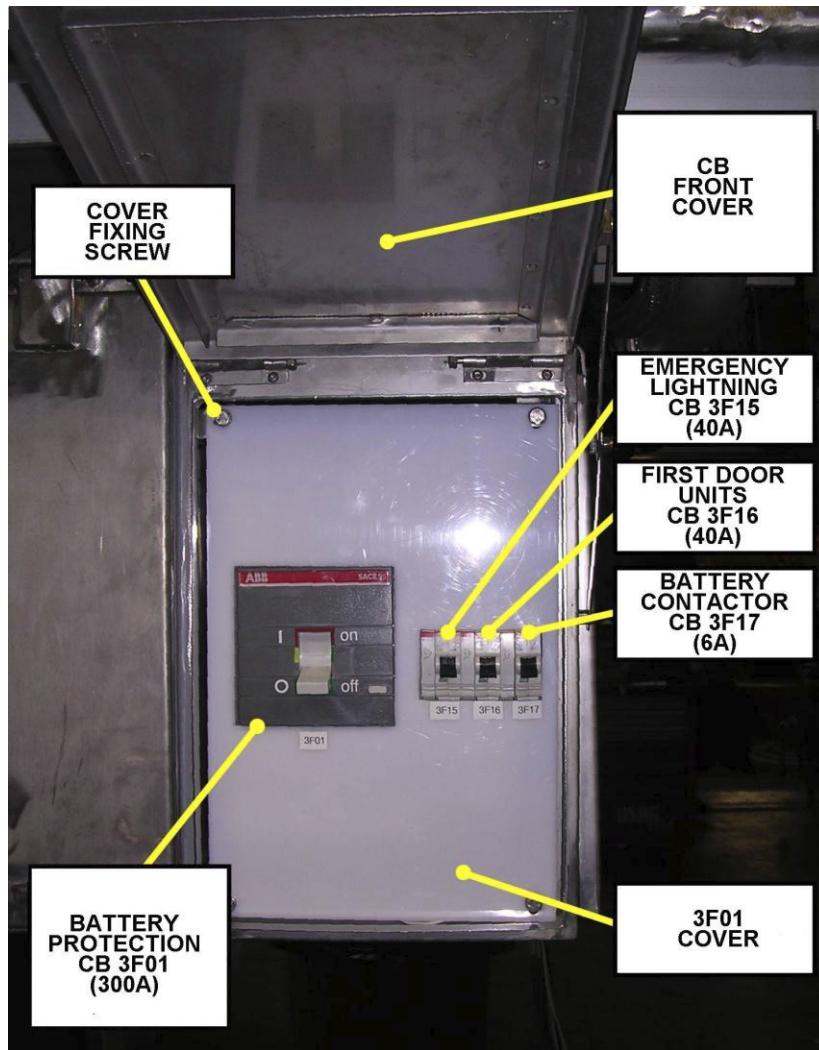
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):



**Figure 1 - BATTERY CIRCUIT BREAKER BOX - FRONT SIDE**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

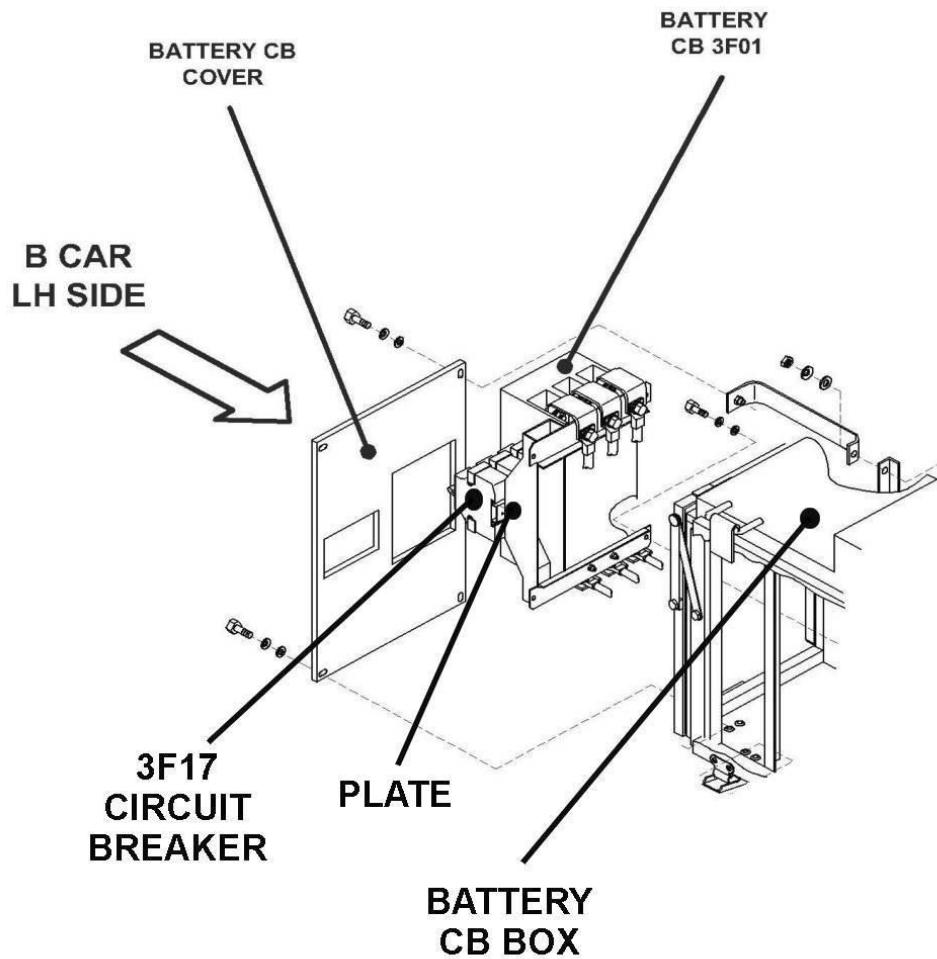


Figure 2 - 3F17 CIRCUIT BREAKER - LOCATION

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

6. Remove and discard the Circuit Breaker according to the instructions provided in the following Figure 3.

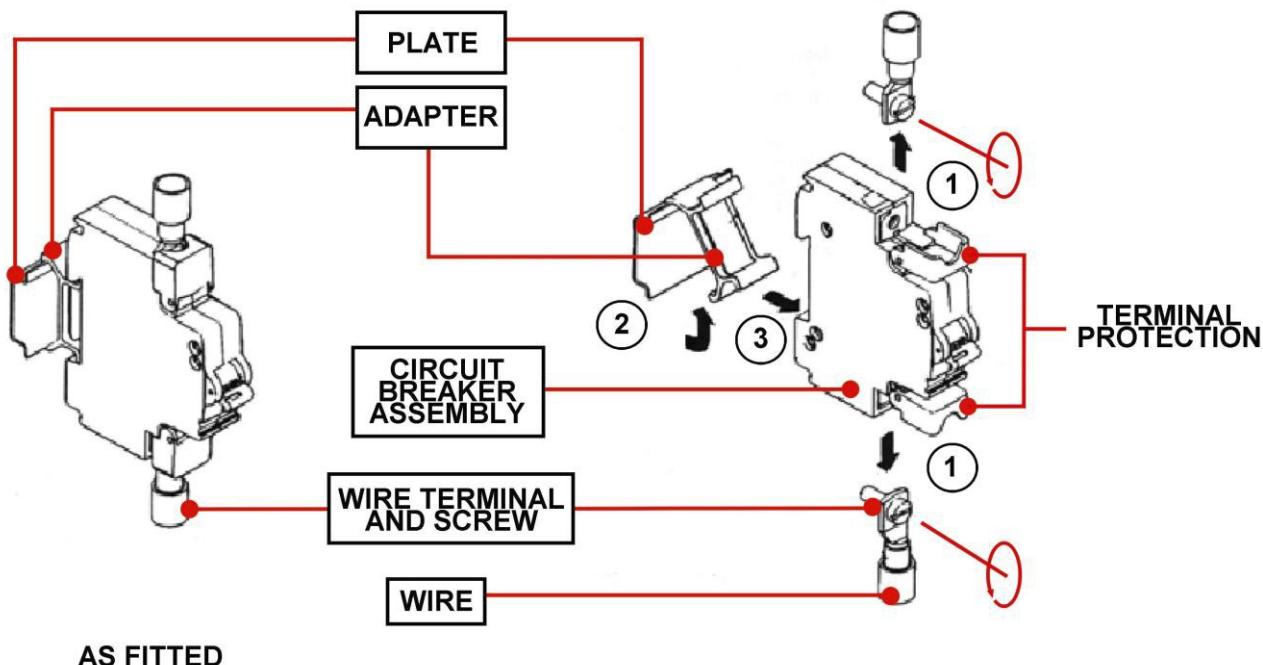


Figure 3 - UNIPOLAR CIRCUIT BREAKER TYPE S281 - REMOVAL

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

#### INSTALLATION

To perform the Task proceed as follows:

1. Clean the Circuit Breaker Seat using recommended Cleaner / Agent and lint-free rags.
2. Check CB Plate for installation / missing / loose Hardware. Torque, as per check result, to **15.2 ft-lb**.
3. Check Wires and Wire Terminals for signs of overheating.
4. Install the Circuit Breaker according to the instructions provided in the following figure 4.

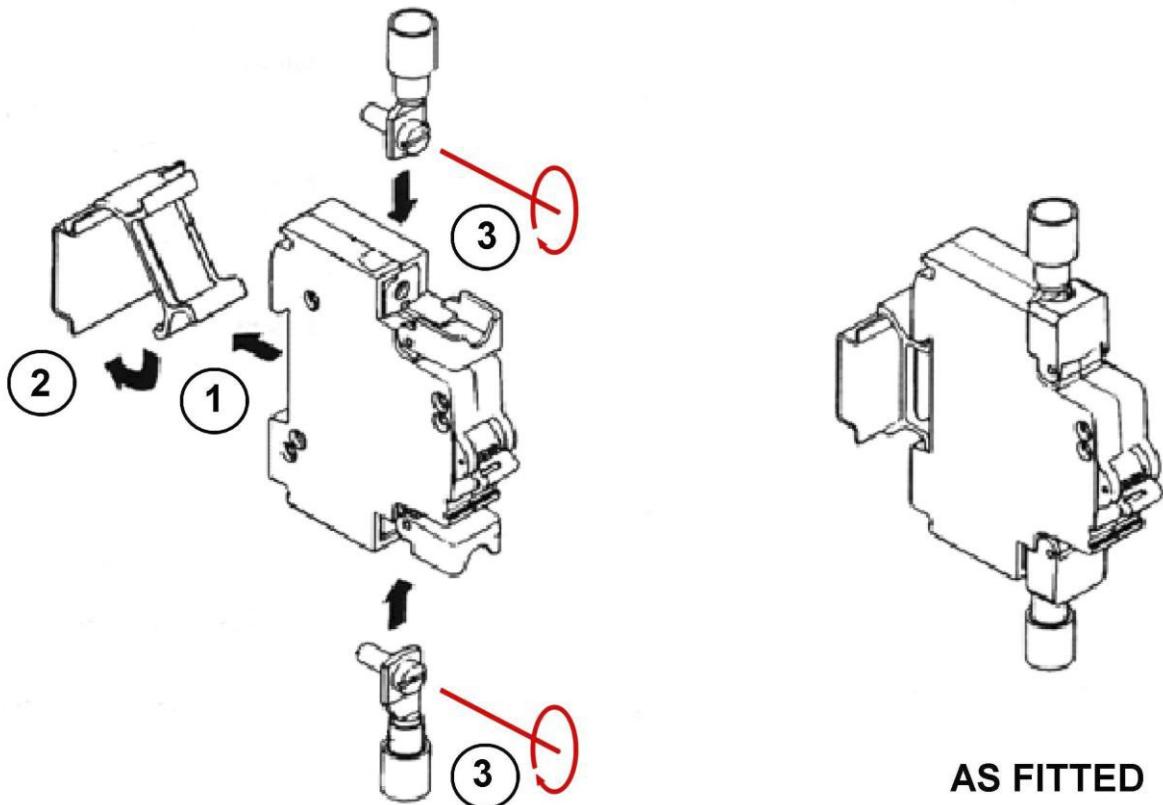


Figure 4 - UNIPOLAR CIRCUIT BREAKER TYPE S281 - INSTALLATION

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

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

- 5** Torque Wires Terminals Screws according to the following Torque Values :

	<b>MAIN CONTACTS</b>	<b>AUX CONTACTS</b>
<b>SCREW</b>	<b>M5</b>	<b>M3</b>
<b>TORQUE</b>	<b>5 ft-*lb</b>	<b>4 ft-*lb</b>

- 6** Install the 3F01 CB Cover and the relevant Fixing Screws. Tighten as needed.
- 7** Check that the moving parts of the "new" Circuit Breaker can be moved freely and are easy to operate.
- 8** Switch the 3F17 Circuit Breaker to "ON" position.
- 9** Carefully reinstall Battery Circuit Breakers Box Front Cover and lock it by engaging all Safety Latches
- 10** Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01).
- 11** Close Vehicle Skirt and lock it using the Maintenance Key.
- 12** Set the 3F03 APS/LVPS Power Supply CB (LV Locker "B" Section) to ON.
- 13** Restore Electrical Power to Vehicle.
- 14** On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons.
- 15** Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the following Fault Code is not listed

**#A115      IDU\_A      Low Voltage Circuit Breaker Open Fault 3**

- 16.** 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 11-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-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

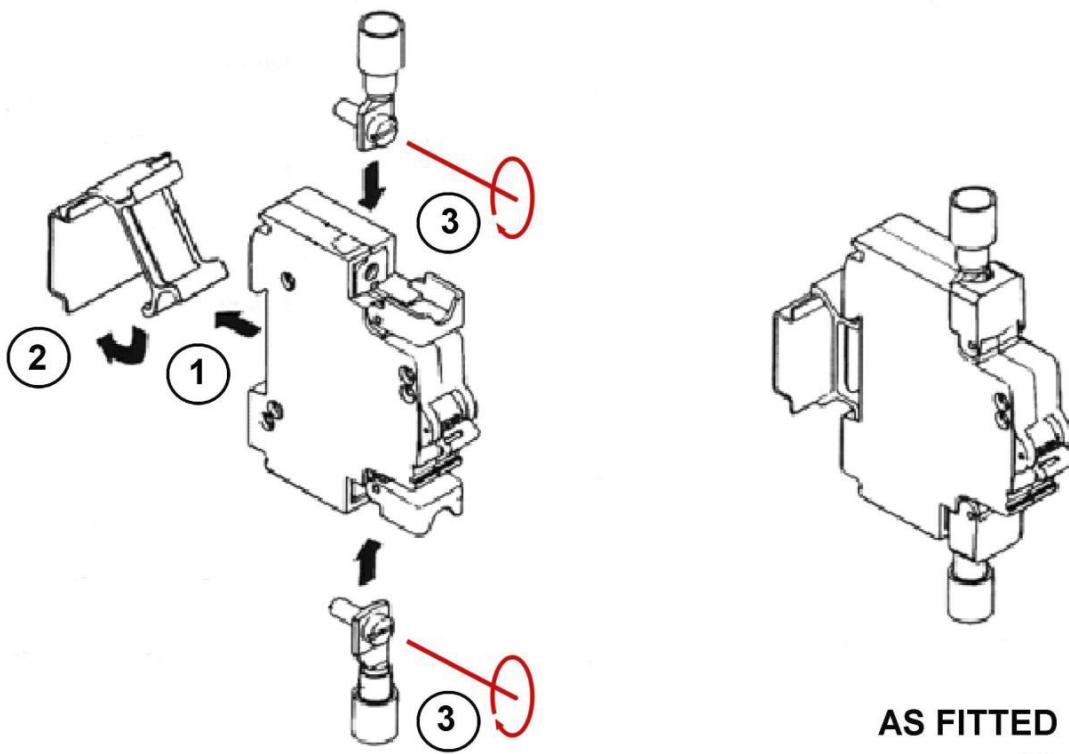
Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

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

**Figure 4 - UNIPOLAR CIRCUIT BREAKER TYPE S281 - INSTALLATION**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-05-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

**BATTERY CONTACTOR CB (3F17)**

Component:

**CB TYPE S 281 UNIPOLAR**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****INTENTIONALLY LEFT  
BLANK**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

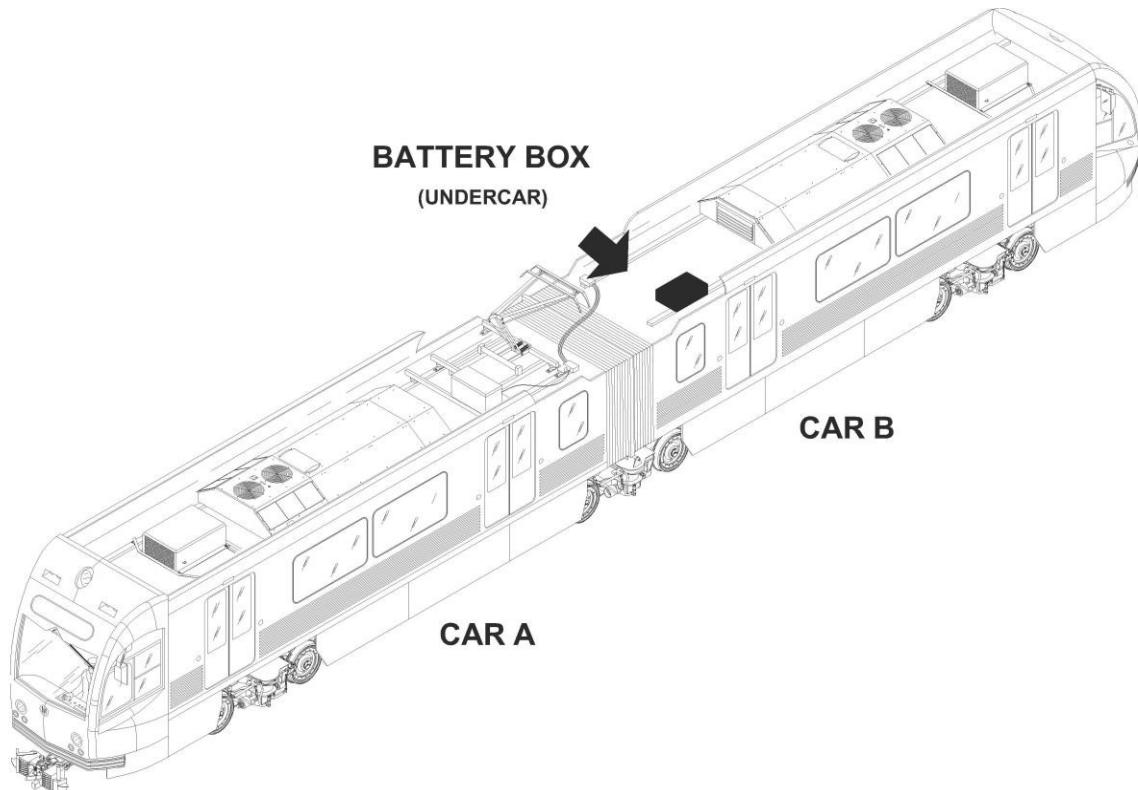
Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**
**LOCATION:**


## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****SAFETY PRECAUTIONS:**

**WARNING: EXPLOSION AND FIRE RISK; METAL PARTS OF THE BATTERY CELLS ARE ALWAYS LIVE.**

AVOID SHORT-CIRCUITS BY NEVER PLACING FOREIGN OBJECTS OR TOOLS ON THE BATTERY. ENSURE ADEQUATE VENTILATION OF THE BATTERY ROOM, SO THAT EXPLOSIVE GASES PRODUCED DURING CHARGING ARE DRAWN OFF.

**WARNING: HAVE EYE RINSING BOTTLE ON HAND. IF ELECTROLYTE SPLASHES INTO THE EYES OR ONTO THE SKIN, RINSE WITH PLENTY OF CLEAR WATER AND SEEK IMMEDIATE MEDICAL ADVICE. CLOTHING CONTAMINATED WITH ELECTROLYTE IS TO BE WASHED THOROUGHLY.**

**WARNING: ELECTROLYTE IS HIGHLY CORROSIVE. IN NORMAL OPERATION THERE IS NO POSSIBILITY OF CONTACT WITH THE ELECTROLYTE. ELECTROLYTE IS RELEASED ONLY IF THE CELL HOUSING IS DESTROYED.**

**WARNING: CELL ELECTROLYTE (LIQUID OR DRY) IS CAUSTIC, CORROSIVE, POTASSIUM HYDROXIDE. DO NOT ALLOW CONTACT WITH SKIN.**

**WARNING: DO NOT USE OR EXPOSE CELLS TO SULFURIC ACID. NEVER USE TOOLS OR EQUIPMENT PREVIOUSLY USED WITH SULFURIC ACID. INTRODUCTION OF SULFURIC ACID TO THE CELLS, EVEN IN MINUTE QUANTITIES, WILL DESTROY THE CELLS**

**WARNING: BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).**

**CAUTION: EACH CELL WEIGHS 27.3 LB AND CONTAINS ELECTROLYTE SUPPORT THE CELL WITH SUITABLE LIFTING DEVICE. FAILURE TO COMPLY CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.**

**TOOLS:**

LACMTA Maintenance Shop Standard Tools Kit

Vacuum Cleaner M10 wrench

Cell Lifting Device

**CONSUMABLES:**

CRC Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

**SPARE PARTS:**

Battery 30 V P/N AA03GDN

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**3/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**
**PROCEDURE:**

### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

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

To perform the task proceed as follows (Refer to Figures 1 through 4):

**NOTE:** It is advised to retain removed Hardware for later use.

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery.
2. Remove Electrical Power by switching off the Battery Protection Circuit Breaker (3F01) located in the Battery Circuit Breakers Box (B Section Rh Side).
3. Gain access to the Battery Rack. by disengaging Box Front Cover Safety Latches and removing Cover
4. Unlock the Locking Device of Battery Rack.
5. Pull out the Battery Rack.
6. Remove the Terminal Protector of the Power Negative (Wire #2120))
7. Disconnect the Power Positive Terminal ((Wire #2120)) by loosening the relevant Terminal Fixing Hardware.
8. Remove the Terminal Protector of the Power Positive (Wire #2119)
9. Disconnect the Power Negative Terminal ((Wire #2119)) by loosening the relevant Terminal Fixing Hardware.
10. Remove all the Plastic Protectors.
11. Disconnect the 3B02 Thermal Sensor Circuit by loosening and removing the relevant fixing Hardware. (For details refer to Sheet R C 11 02 00 00 / R 00.)
12. Remove all the Inter-Cells Plate Connections by loosening and removing the relevant Hardware.
13. Remove each Cell from the Battery Rack using suitable Lifting Device.

**WARNING:** **DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.**

**CAUTION:** EACH CELL WEIGHS 27.3 LB AND CONTAINS ELECTROLYTE .  
SUPPORT THE CELL WITH SUITABLE LIFTING DEVICE.  
FAILURE TO COMPLY CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

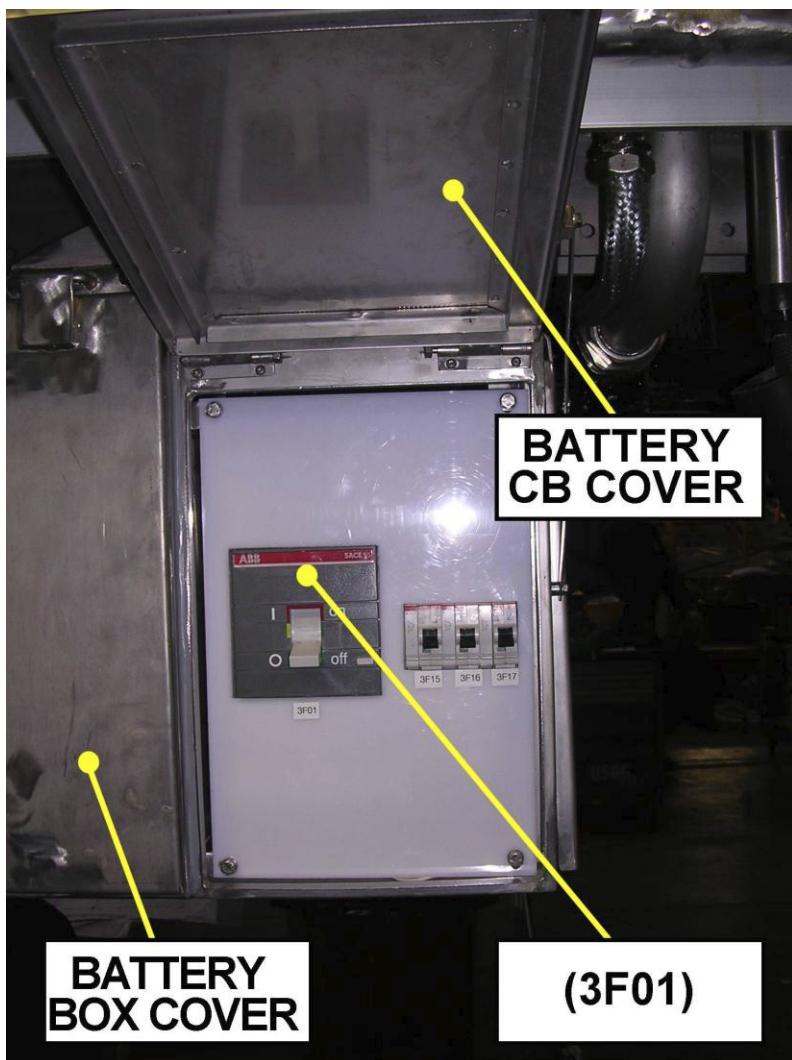
**REPLACEMENT**
**PROCEDURE (CONT'D):**


Figure 1 - BATTERY PROTECTION CIRCUIT BREAKER (3F01)

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

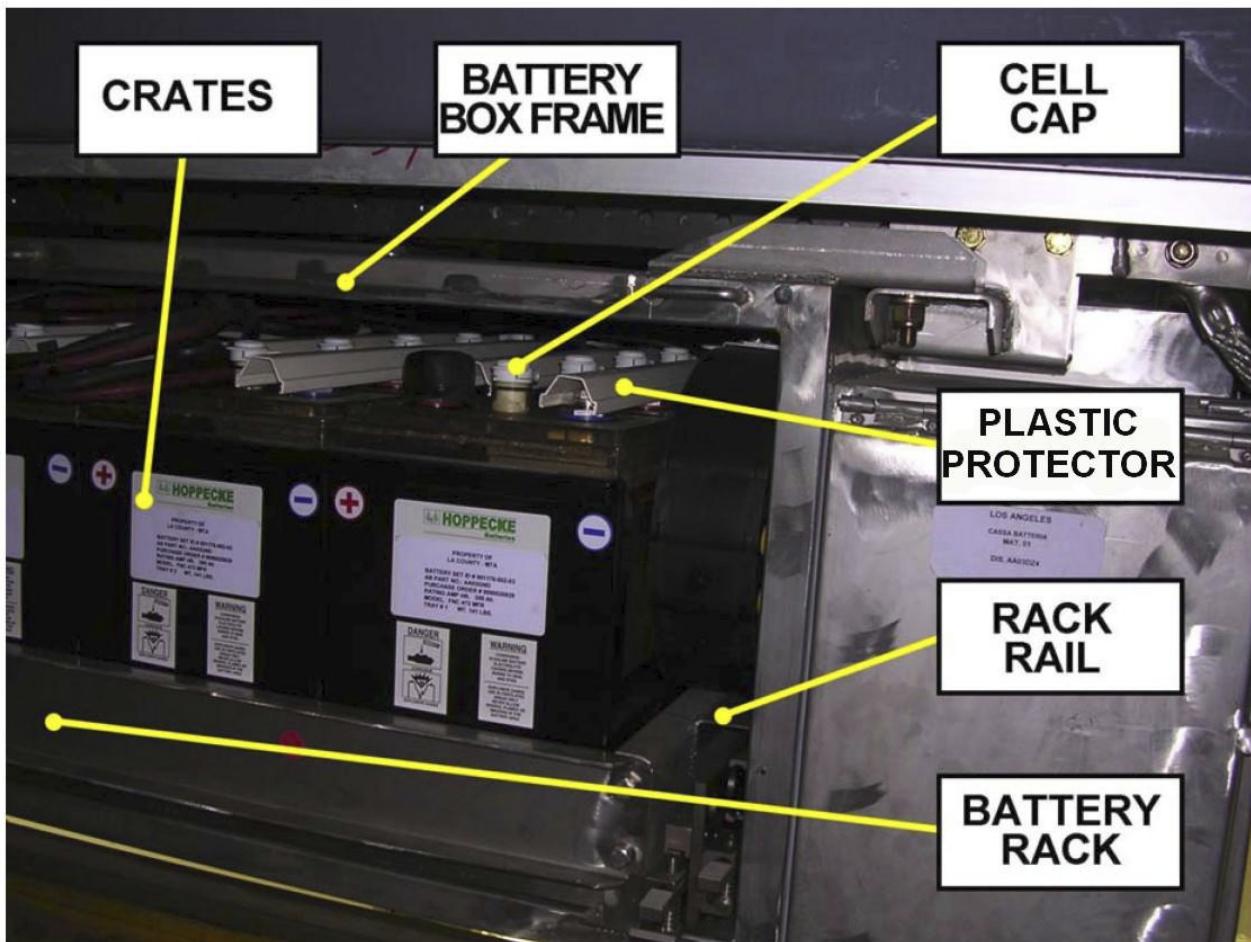
**REPLACEMENT****PROCEDURE (CONT'D):**

Figure 2 - BATTERY RACK & COMPONENTS

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

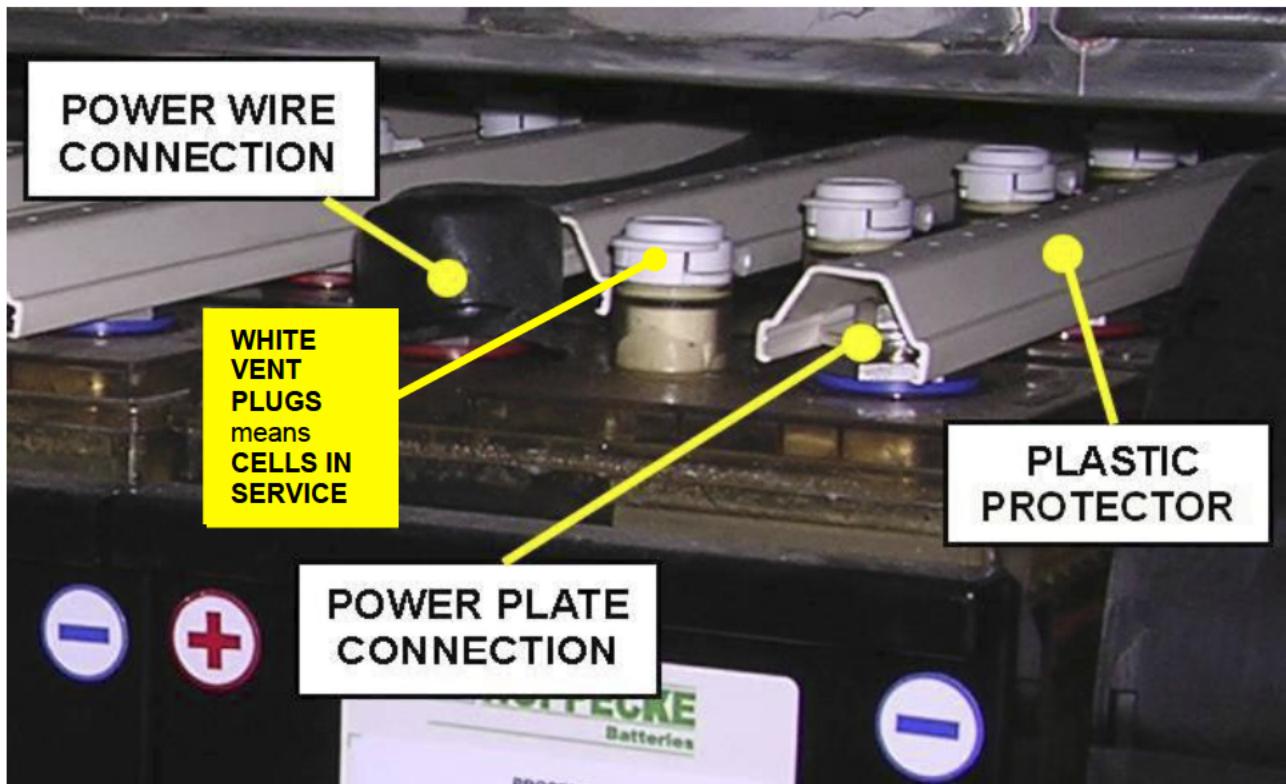
Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE (CONT'D):**
**Figure 3 - BATTERY CONNECTIONS**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

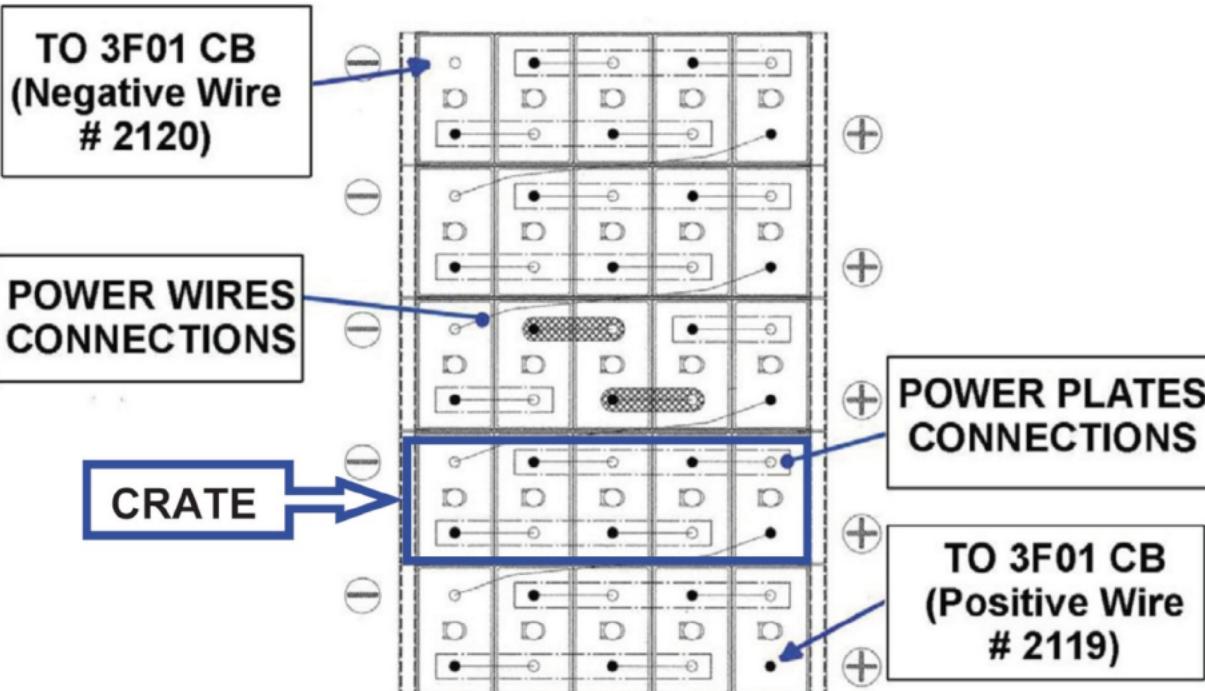
Unit:

Component:

Man Hours:

**1**

Maintenance Task:

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

**Figure 4 - BATTERY CONNECTIONS - WIRING SCHEME**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

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

### INSTALLATION

To perform the Task proceed as follows (Refer to Figures 1 through 5):

#### 1. PRE-INSTALLATION OPERATIONS ON BATTERY / CELLS

##### a. Flip too Vent Plug

The Cells are provided with Yellow Transport Plugs. These Transport Plugs are to be removed only immediately before putting the Battery into Service and are to be replaced by White Vent Plugs.

##### b. Charging Instructions

If the Battery is to be put into Service in under 6 weeks following delivery, it can be installed without any special charging routines.

If the Battery is to be installed after 6 weeks following delivery, it must be Pre-Service Charged.

##### c. Pre-Service Charging in the Workshop

Pre-Service Charging is to be not with a constant current without voltage regulation.

During Pre-Service Charging, the individual Cell Voltage climbs fast 1.8 V after recharging 1.5 V per Cell.

Pre-Service Charging is to be finished after 4 hours following this period of rapid Cell-Voltage climb.

##### d. Electrolyte Level Inspection, " Measuring The Electrolyte Level"

Before installation and roughly 10 hours after completion of Pre-Service Charging, the electrolyte level of the Cells should be adjusted to the max. level with distilled water.

Distilled water as specified in IEC Standard 993 execution 1989.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE (CONT'D):****2 INSTALLATION ON VEHICLE**

1. Clean the Battery Cells Crates using recommended Cleaner / Agent and lint-free rags.
2. Vacuum clean the Battery Rack Interior.
3. Check the correct operation of the Battery Rack by pulling and pushing it.
4. Check the Positive (#2119) and Negative (#2120) Wires Terminals for signs of overheating.
5. Position each cell in the respective crates. using suitable Lifting Device.

**WARNING: DO NOT TILT THE BATTERY! USE ONLY APPROVED LIFTING AND CONVEYING EQUIPMENT. LIFTING HOOKS MUST NOT CAUSE DAMAGE TO CELLS, CONNECTORS OR CONNECTION CABLES.**

**CAUTION: EACH CELL WEIGHS 27.3 LB AND CONTAINS ELECTROLYTE SUPPORT THE CELL WITH SUITABLE LIFTING DEVICE. FAILURE TO COMPLY SO CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH**

6. Install the Inter Cells Plates Connections and the relevant Hardware . Tighten as needed
7. Check for right polarity (refer to Figure 4) and assure for proper tightening
8. Install the 3B02 Thermal Sensor Circuit and the relevant fixing. Hardware .Tighten as required . (For details refer to Sheet R C 11 02 00 00 / R 00.)
9. Install all the Plastic Protector.
10. Connect the Power Negative Terminal (Wire #2120) and the relevant Terminal fixing Hardware.
11. Install the Power Negative Terminal Protector.
12. Connect the Power Positive Terminal (Wire #2119) and the relevant Terminal fixing Hardware
13. Install the Power Positive Terminal Protector.
14. Verify the correct value (approximately 31.25 Volt) of the Battery Voltage by using Digital Multi Meter between Power Negative Terminal (Wire #2120) and Power Positive Terminal (Wire #2119).
15. Stow the Battery and lock the Battery Rack with the Locking Device.
16. Carefully reinstall Battery Box Front Cover and lock it by engaging all Safety Latches.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**11/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

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

### 2 INSTALLATION ON VEHICLE (cont'd)

17. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01)
18. Close Vehicle Skirt and lock it using the Maintenance Key.
19. Restore Electrical Power to Vehicle.
20. On IDU "A" access to the APS/LVPS System Status Screen by selecting, in sequence, the relevant icons.
21. Verify, on the APS/LVPS System Status Screen, for Battery Charge Status.

### SYSTEM STATUS SCREEN

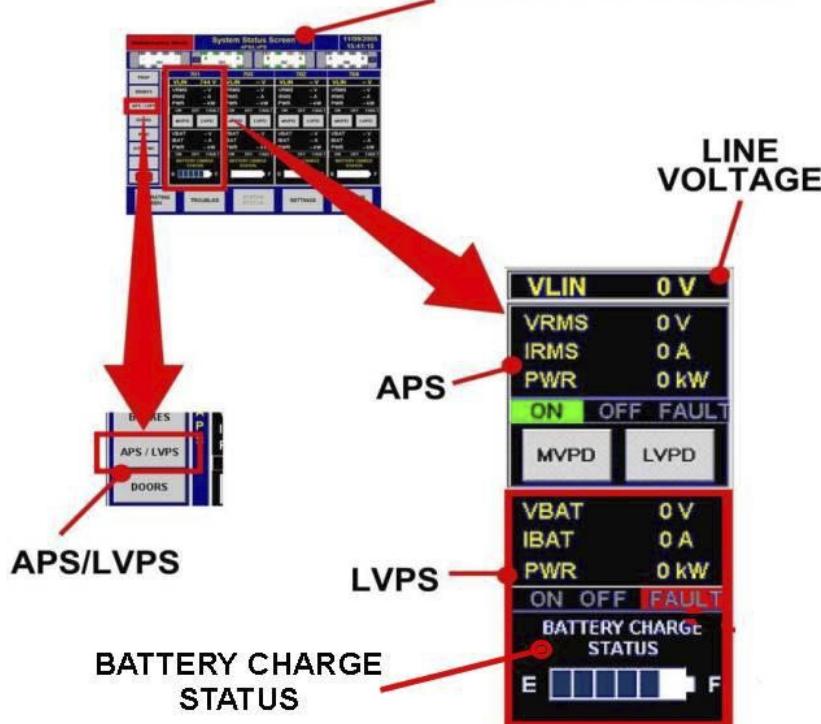


Figure 5 - IDU - SYSTEM STATUS SCREEN - APS LVPS - BATTERY CHARGE STATUS

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-06-00-00/R-00**

System:

**BATTERY**

Sheet:

**12/12**

Subsystem/Assy:

**BATTERY (280 Ah)**

Unit:

Component:

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

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

#### **2 INSTALLATION ON VEHICLE (cont'd)**

- 22.** On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons.
- 23.** Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the following Fault Code is **not listed**

#4033      APS/LVPS      **BatteryProtectionOpen**

- 24.** 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 11-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-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**1/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

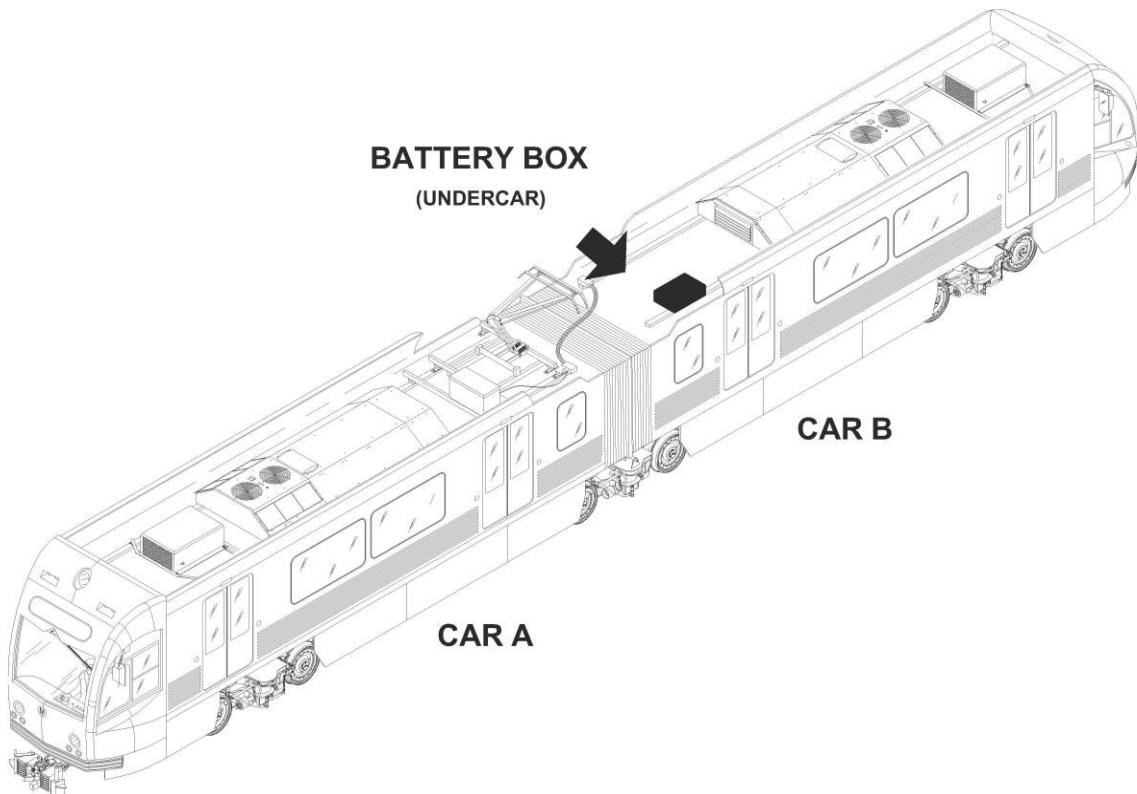
Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

LOCATION:



## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**2/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### SAFETY PRECAUTIONS:

**WARNING: BEFORE PERFORMING MAINTENANCE PROCEDURES AND TOUCHING ANY COMPONENT, USE A RELIABLE HIGH VOLTAGE TEST PROBE TO VERIFY THAT NO VOLTAGE IS PRESENT.**

**WARNING: BEFORE PERFORMING BATTERY MAINTENANCE, REMOVE ELECTRICAL POWER (37.5 VDC) BY SWITCHING OFF THE BATTERY PROTECTION CIRCUIT BREAKER (3F01) LOCATED IN THE BATTERY BOX (B SECTION RH SIDE).**

**WARNING: TO AVOID THE RISK OF EXPLOSION AND FIRE, ENSURE THAT THERE IS NO SMOKING. NO OPEN FLAME, NO EMBERS OR SPARKS NEAR THE BATTERY.**

### TOOLS:

LACMTA Maintenance Shop Standard Tools Kit.

Vacuum Cleaner

### CONSUMABLES:

CRC Industrial - Precision Cleaner M3 PN 147535.

Dry Compressed Air for Electronic Equipment (commercial).

### SPARE PARTS:

Contactor P/N AA03V2G (211VK00732B)

Lock Washer P/N AA00RH8

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**3/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE:

#### PRELIMINARY OPERATIONS

Set the Vehicle in safety conditions in accordance with LACMTA Maintenance Shop Regulations:

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.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**4/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

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

To perform the Task proceed as follows: (Refer to Figure 1 through 4)

**NOTE:** It is advised to retain removed Hardware for later use.

1. Open the Battery Box Side Skirt, using the Maintenance Key, to gain access to the Battery Circuit Breakers Box.
2. Gain access to the Battery Circuit Breakers Box by disengaging Box Front & Side Cover Safety Latches and by removing the Covers.
3. Switch the Battery Protection Circuit Breaker (3F01) to "OFF" position
4. Set the 3F17 Battery Contactor CB to "OFF" position.
5. Gain access to the 3K01 Battery Contactor to be removed by removing first the 3K20 Contactor Positive Train Line according to Sheet R-C-10-00-00-R-02
6. Disconnect the 3K01 Battery Contactor Power Wires (number 2401 and 2118) by loosening and removing the relevant Terminal Fixing Screws  
Take note of Wiring Color Codes and relevant positions on CB Terminals(Refer to Fig 4 for Wiring Scheme).
7. Disconnect the 3K01 Battery Contactor Auxiliary Wires by loosening and removing the relevant Terminal Fixing Screws.  
Take note of Wiring Color Codes and relevant positions on CB Terminals .(Refer to Fig 4 for Wiring Scheme).
8. Remove the 3K01 Battery Contactor Assy by loosening and removing the relevant Fixing Screws
9. Discard the relevant Lock Washers.

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**5/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

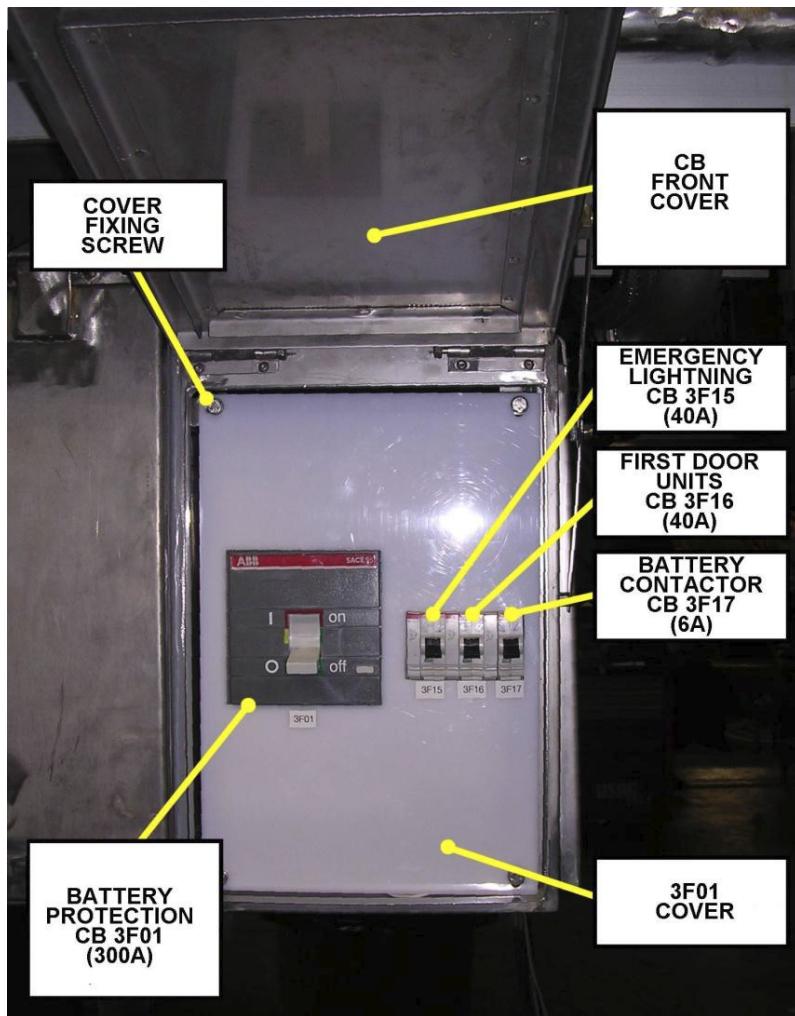


Figure 1 - BATTERY CIRCUIT BREAKERS BOX - FRONT SIDE

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**6/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

### PROCEDURE (CONT'D):

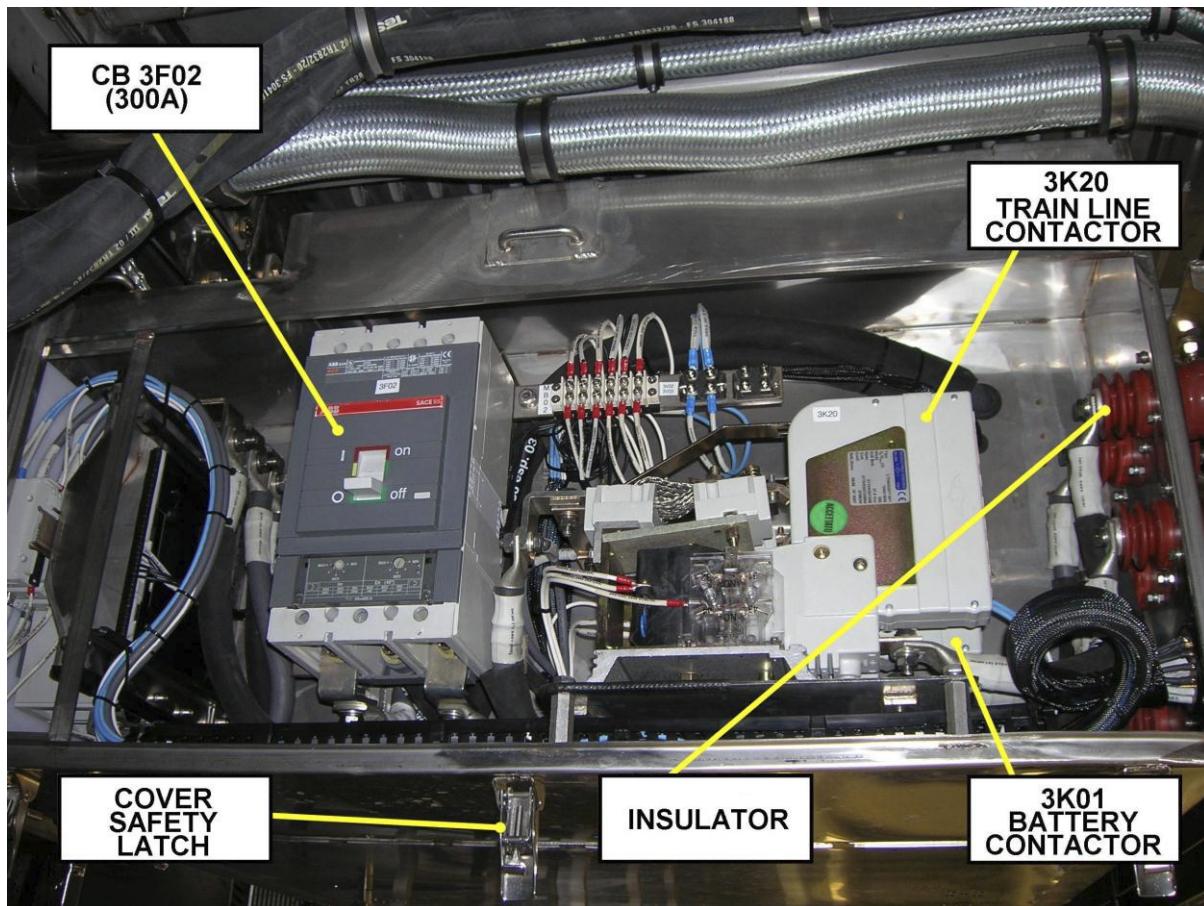


Figure 2 - BATTERY CIRCUIT BREAKERS BOX - SIDE

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**7/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

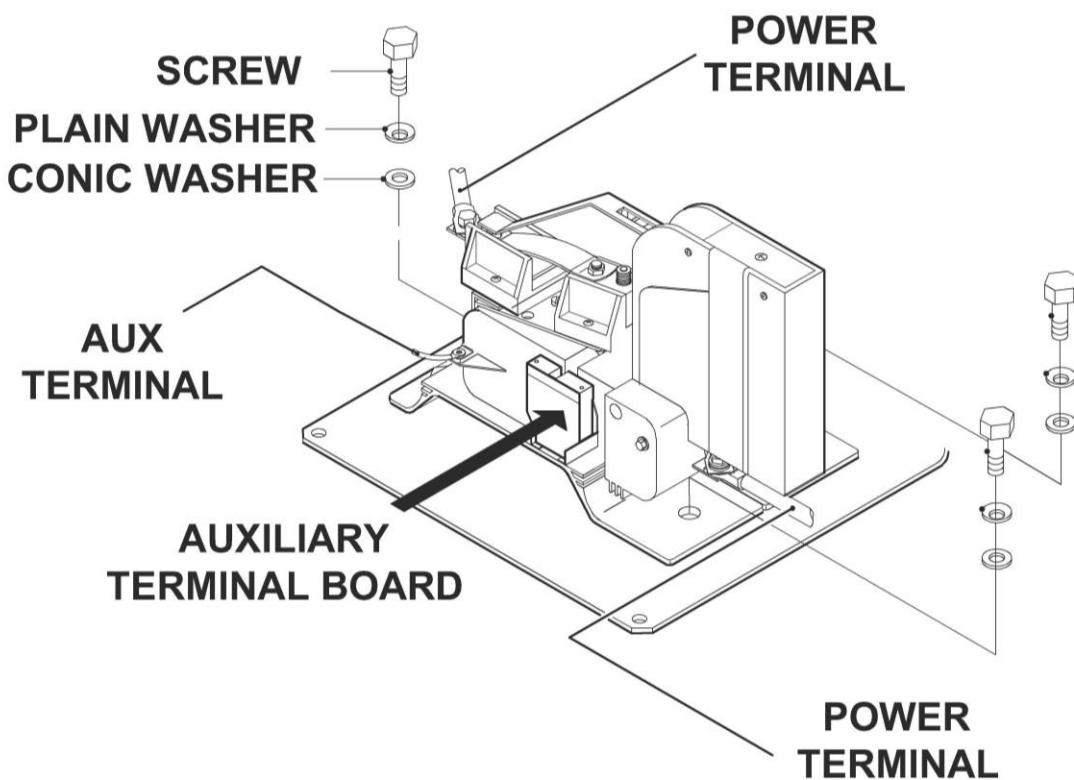
Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

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

**Figure 3 - 3K01 BATTERY CONTACTOR - COMPONENTS**

**P2550 CORRECTIVE MAINTENANCE SHEET**

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**8/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****PROCEDURE (CONT'D):****Figure 4- 3K01 BATTERY CONTACTOR - MAIN AND AUXILIARY WIRING SCHEME**

## P2550 CORRECTIVE MAINTENANCE SHEET

Card Code:

**R-C-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**9/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT**

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

#### **INSTALLATION**

To perform the Task proceed as follows: (Refer to Figures 1 through 3)

1. Clean the 3KI01 Contactor Seat using recommended Cleaner / Agent and lint-free rags.
2. Check Power and Auxiliary Wires and Terminals for signs of overheating.  
Replace as per check results
3. Install the 3K01 Battery Contactor and the relevant Fixing Screws, Plain Washers and the "new" Lock Washers. Torque to **16 lb ft**:
4. Connect the Power and Auxiliary Wires of the 3K01 Battery Contactor to the relevant Terminals according to their positions and Color Codes previously noted .(Refer to Fig 4 for Wiring Scheme)  
Tighten as required.
5. Install and reconnect the 3K20 Contactor Positive Train Line according to Sheet R-C-10-00-00-00-R-02
6. Switch the Battery Protection Circuit Breaker (3F01) to "ON" position
7. Set the 3F17 Battery Contactor CB to "ON" position
8. Carefully reinstall Battery Circuit Breakers Box Front & Side Covers and lock them engaging the relevant Safety Latches
9. Reinstate Electrical Power by switching on the Battery Protection Circuit Breaker (3F01)
10. Close Vehicle Skirt and lock it using the Maintenance Key.
11. Restore Electrical Power to Vehicle
12. On IDU "A" access to the Maintenance Menu first and then to "Faults" Screen by selecting, in sequence, the relevant Icons
13. Check, through the List of the Current Active "Faults" shown in the "Faults" Screen, that the following Fault Code **is not listed**

**#4031**
**APS/LVPS**
**APS Fault Relay**

14. 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 11-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-11-07-00-00/R-00**

System:

**BATTERY**

Sheet:

**10/10**

Subsystem/Assy:

**BATTERY CONTROL**

Unit:

Component:

**BATTERY CONTACTOR (3K01)**

Man Hours:

**1**

Maintenance Task:

**REPLACEMENT****INTENTIONALLY  
LEFT BLANK**

### 11-III-05 CONSUMABLE MATERIALS LIST (R-CML)

The Consumable Materials needed to accomplish the “ Battery ” Running Maintenance are listed, sequenced in alphabetical order , by SUBSYSTEM /ASSY -UNIT / COMPONENT, in the following Table 11-III-05.1.

**Table 11-III-05.1 Running Maintenance Consumable Materials List (R-CML)**

<b>SYSTEM 11</b>		<b>BATTERY</b>		
<b>SUBSYSTEM /ASSY - UNIT / COMPONENT</b>	<b>AGENT</b>	<b>PN</b>	<b>MTA PN</b>	
30V-300A/h BATTERY	Distilled Water	(Purity should be equivalent to IEC standard 993 execution 1989)		
	Vaseline Gel			
	Lint-Free Rag			
	CRC Industrial - Precision Cleaner	M3 PN 147535		
	Dry Compressed Air for Electronic Equipment	(commercial)		
BATTERY BOX ELECTRICAL COMPONENTS	CRC Industrial - Precision Cleaner	M3 PN 147535		
	Dry Compressed Air for Electronic Equipment	(commercial)		

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

The Tools and Test Equipment needed to accomplish the “ Battery ” Running Maintenance are listed, sequenced in alphabetical order, by SUBSYSTEM /ASSY -UNIT / COMPONENT, in the following Table 11-III-06.1.

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

**Table 11-III-06.1 Running -Test Equipment & Special Tools List (R-TESTL)**

<b>SYSTEM 11</b>		<b>BATTERY</b>		
<b>SUBSYSTEM /ASSY - UNIT / COMPONENT</b>	<b>LACMTA STANDARD TOOLS KIT</b>	<b>LACMTA WORKSHOP DEVICES</b>	<b>SPECIAL TOOL / TEST EQUIPMENT</b>	<b>PN</b>
BATTERY	X	Vacuum Cleaner	Battery Maintenance Toolkit	7140200020
			External Charging and Discharging Unit	
			Water Replenishment Cart	HO27-02-1012

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