TL & AC SYSTEMS IN LHB COACHES

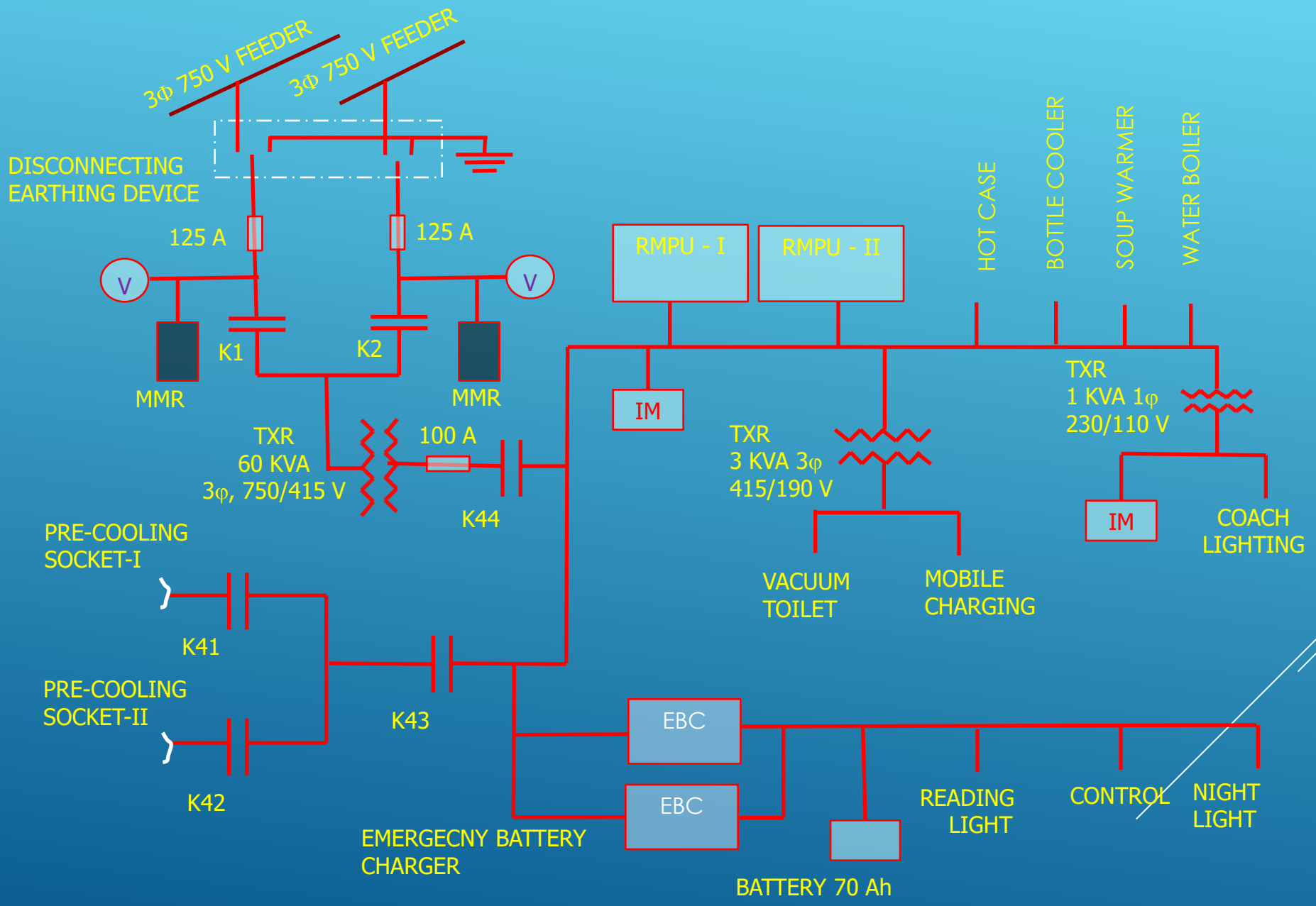
K. S. Jha

CI/Electrical/IRIMEE

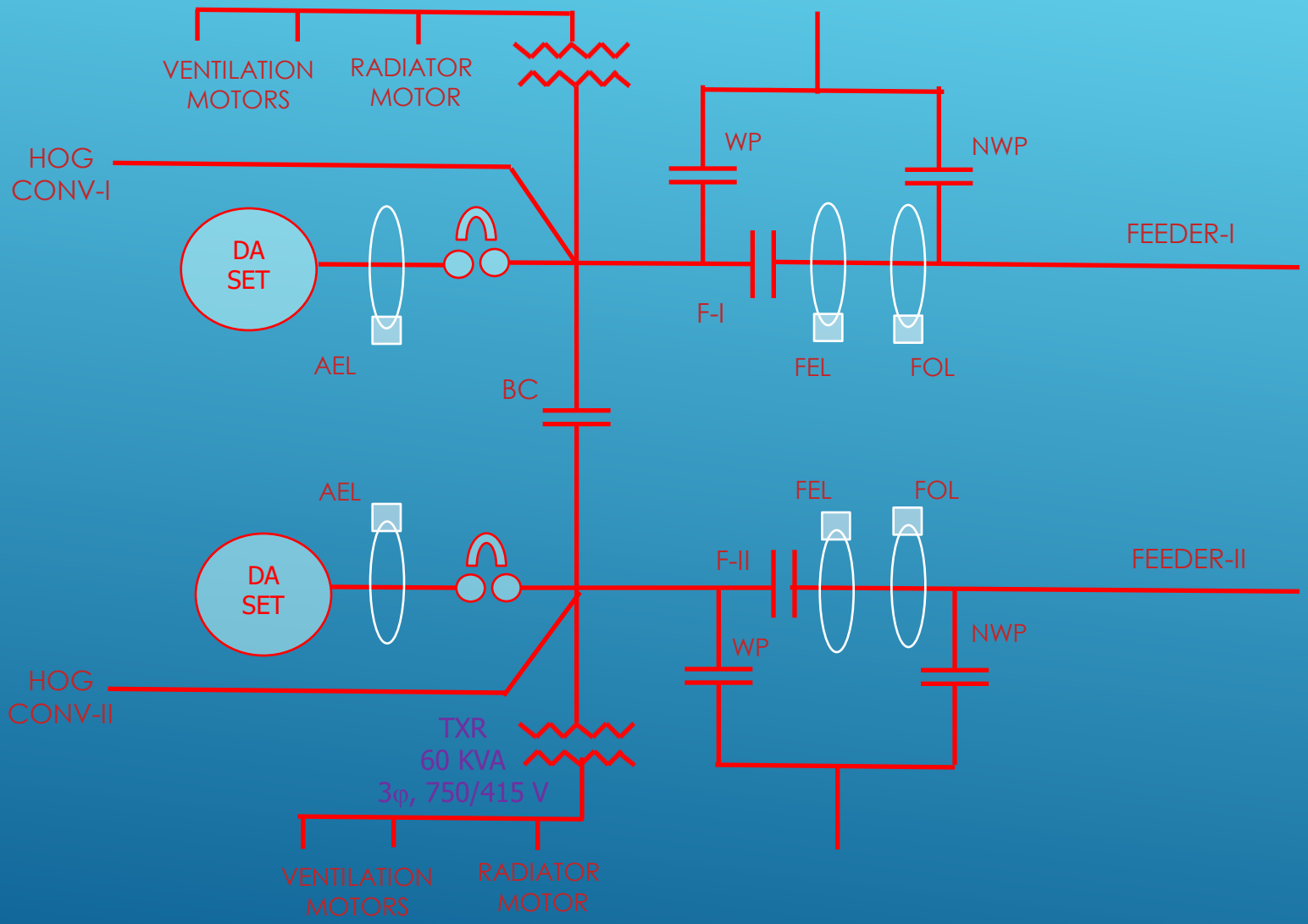
LHB COACHES –ELECTRICAL DESIGN

- SWITCHBOARD CABINET
- AIR CONDITIONING SYSTEM
- BATTERY AND CHARGING
- PANTRY EQUIPMENT
- TRANSFORMER
- ZS COUPLING
- ELECTRICAL LOAD
- ELECTRICAL WIRING
- EARTHING AND ELECTRICAL PROTECTION
- DIESEL ALTERNATOR SETS

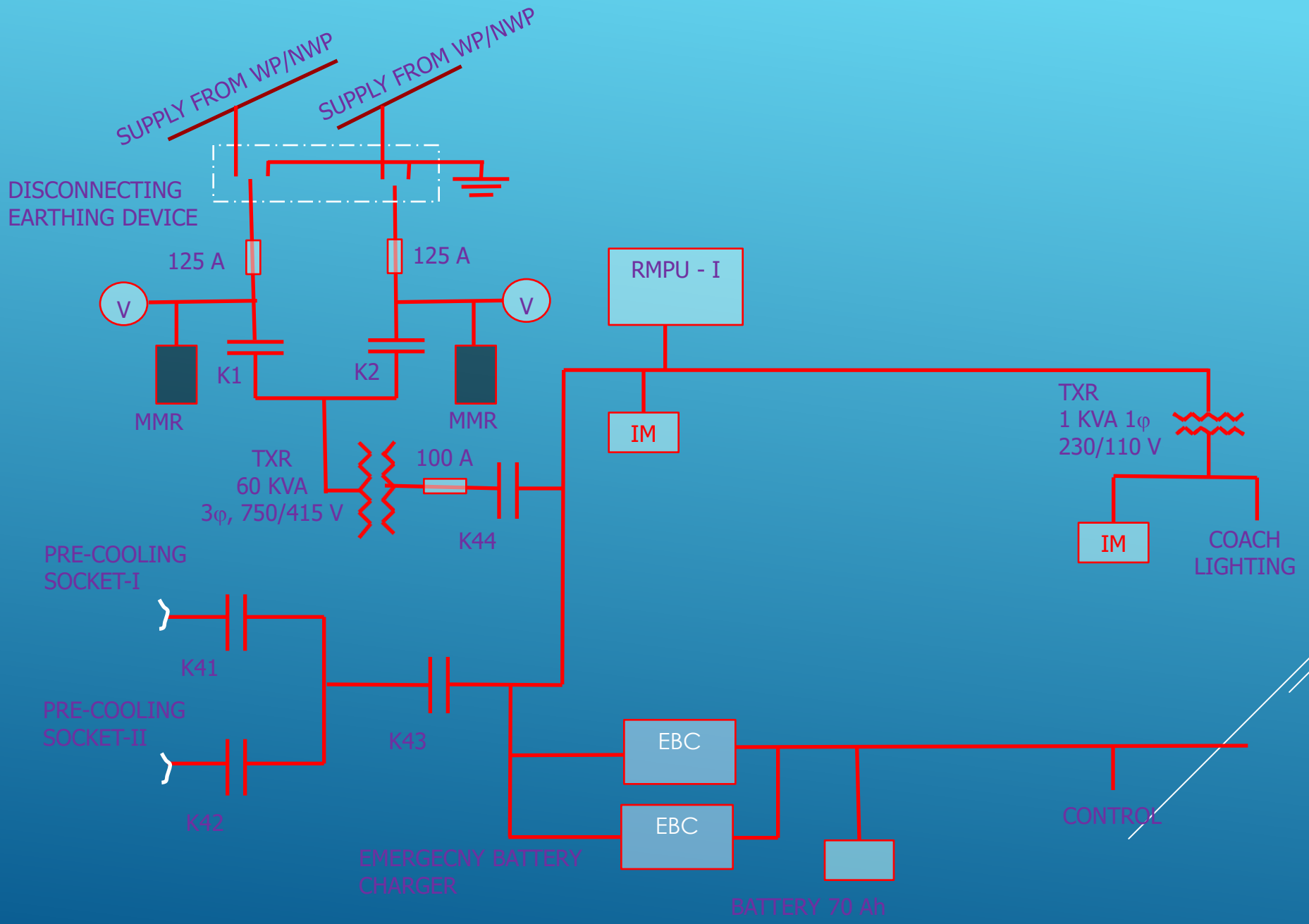
SYSTEM OF POWER SUPPLY IN LHB COACHES



SYSTEM OF POWER SUPPLY IN LHB POWER CAR



SYSTEM OF POWER SUPPLY IN LHB POWER CARS



SWITCHBOARD CABINET

TYPES OF SWITCHBOARD CABINET

	COACHES	EDTS073*	EDTS134	EDTS104	EDTS103
1	**AC2-TIER AC3-TIER AC CHAIR CAR**	•			
2	**AC HOT BUFFET COACH**		•		
3	**POWER CAR DISTRIBUTION PANEL**			•	
4	**DG SET CONTROL PANEL**				•

* - SPECIFICATION NO RDSO/PE/SPEC/AC-0184 ISSUED BY RDSO

FEATURES

- INTEGRATED CUM MODULAR MULTI-LAYER SS STRUCTURE WITH CNC FABRICATION
- PROVISION OF WIDE BAND CONTACTORS TO ABSORB SEVERE V/I RIPPLES & TRANSIENTS SURGES AND VOLTAGE FLUCTUATIONS
- ALL LINES INSULATION MONITORING OF 415V AND 110 VOLT CIRCUIT FOR PREVENTIVE MAINTENANCE AND SAFETY
- PROVISION OF EARTHING AND DISCONNECTING DEVICE FOR COACH ISOLATION IN EMERGENCY DURING RUN
- PROVISION OF MMR FOR PHASE SEQUENCE, SINGLE PHASING, OVERLOAD, OVERVOLTAGE PROTECTION
- PROVISION OF MCB'S, MPCB'S FOR TL AC AND MOTOR PROTECTIONS FOR SHORT CKTPROVISION OF ELECTRON BEAM IRRADIATED CABLES
- CABLE PROTECTION SYSTEM WITH IP-68 PROTECTION AND UL-94 V0 FIRE RETARDANCY
- INTERLOCKED FEED TO EXTERNAL SUPPLY SOCKET

AC MCB'S

DC MCB'S

MEASURING INSTRUMENTS

PUMP CONTROLLER

DISPLAY UNIT OF MICROPROCESSOR CONTROLLER

SPACE FOR THE MAIN CONTACTORS

FUSES

EMERGENCY BATTERY CHARGER

DISCONNECTING AND EARTHING DEVICE

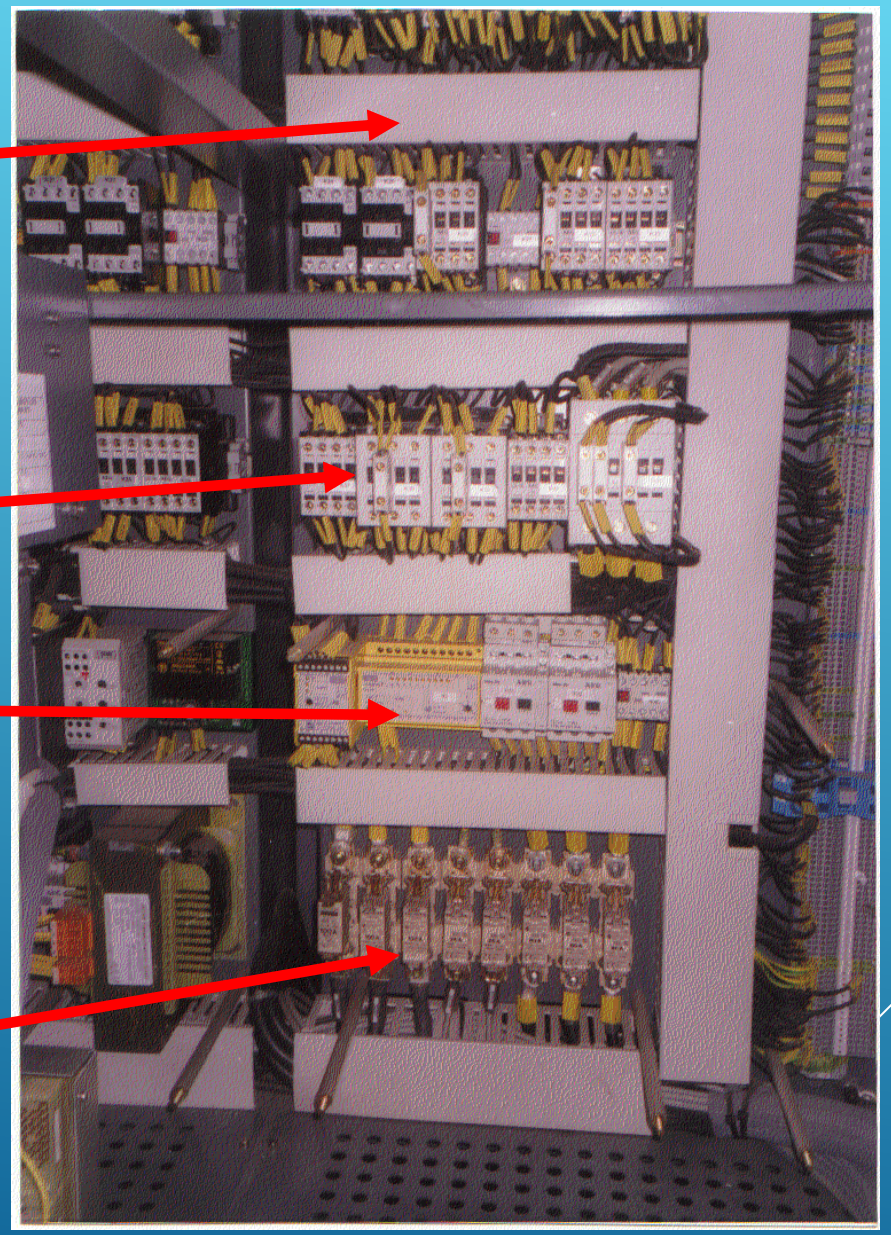
SWITCHBOARD VIEW WITH TOP RIGHT DOOR OPEN

CABLE ALLEYS

WIDE BAND CONTACTORS

INSULATION MONITORING DEVICE

HIGH LIFE 1000V INSU. FUSES



INSIDE VIEW OF THE CONTROL PANEL

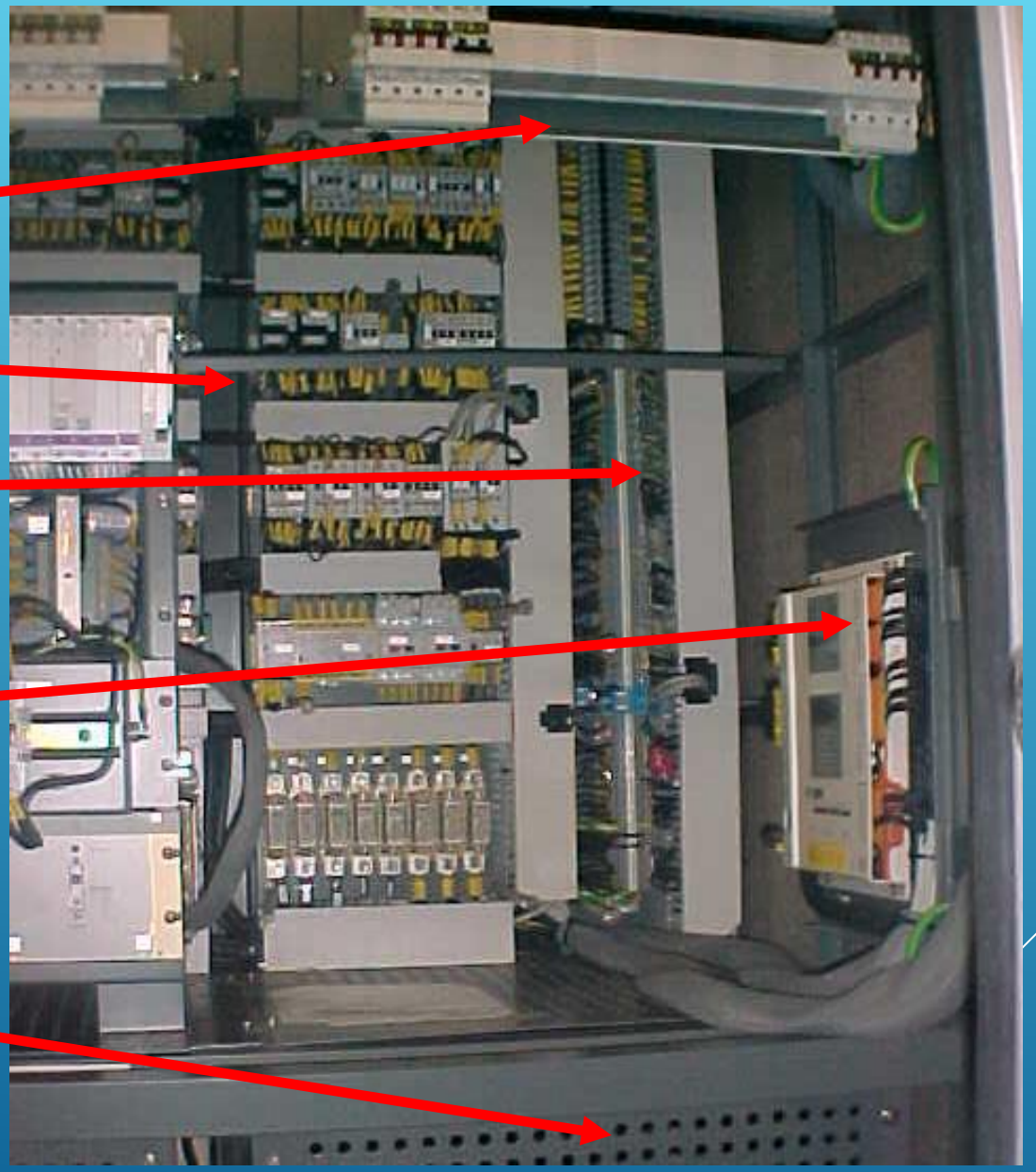
MCB'S FOR THE LIGHTING AND THE PUMP / SANITARY EQUIPMENT

ANTI SKID DEVICE

CAGE CLAMP CONNECTORS (FOR 109g VIB.)

MICROPROCESSOR FOR AC

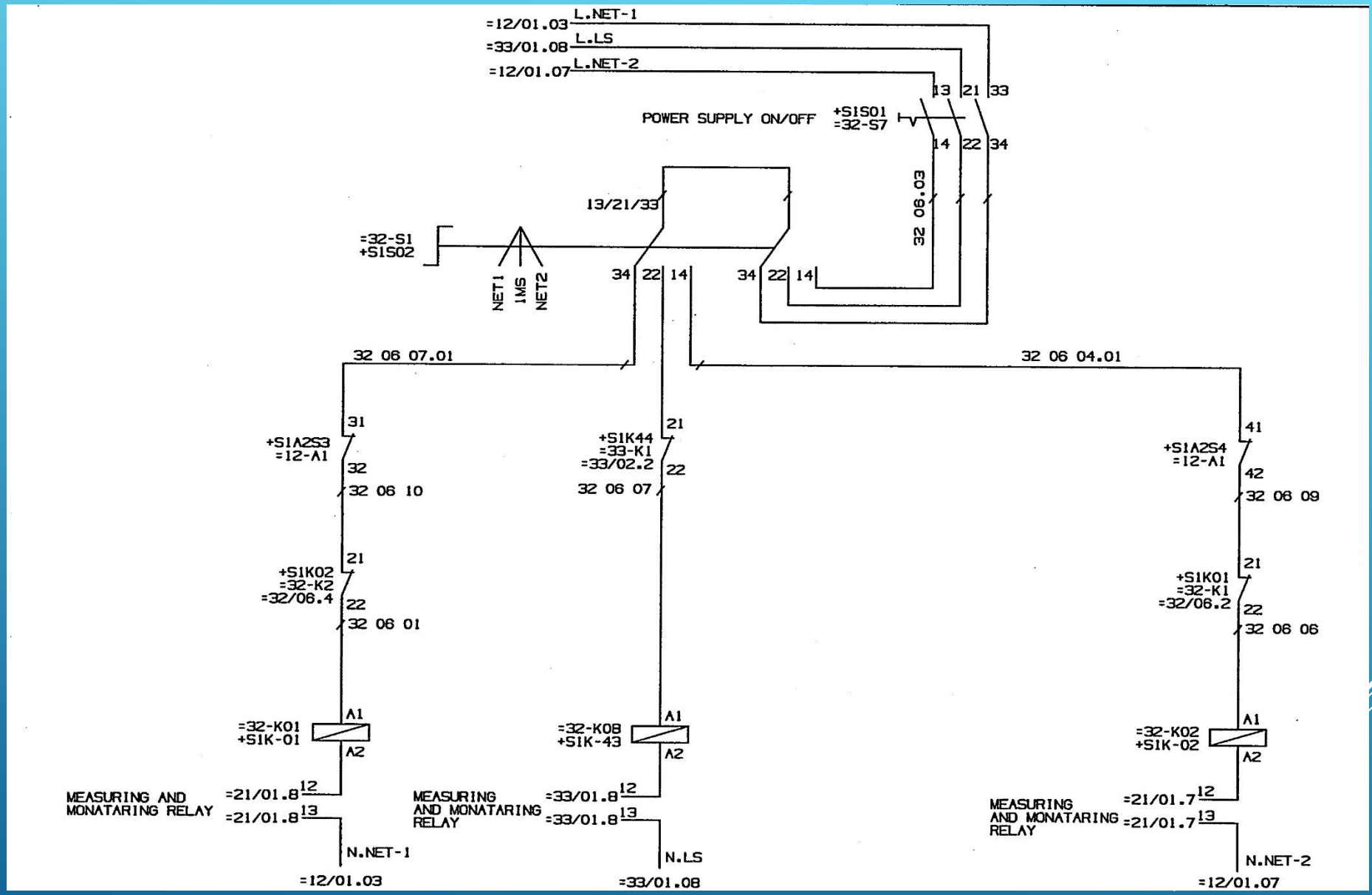
DS&E DEVICE



DISCONECTING AND EARTHING DEVICE

- SWITCH IS IN OFF POSITION MAKES COACH CIRCUIT EARTHED FOR SAFE WORKING (FEEDER SUPPLY IS ISOLATED)

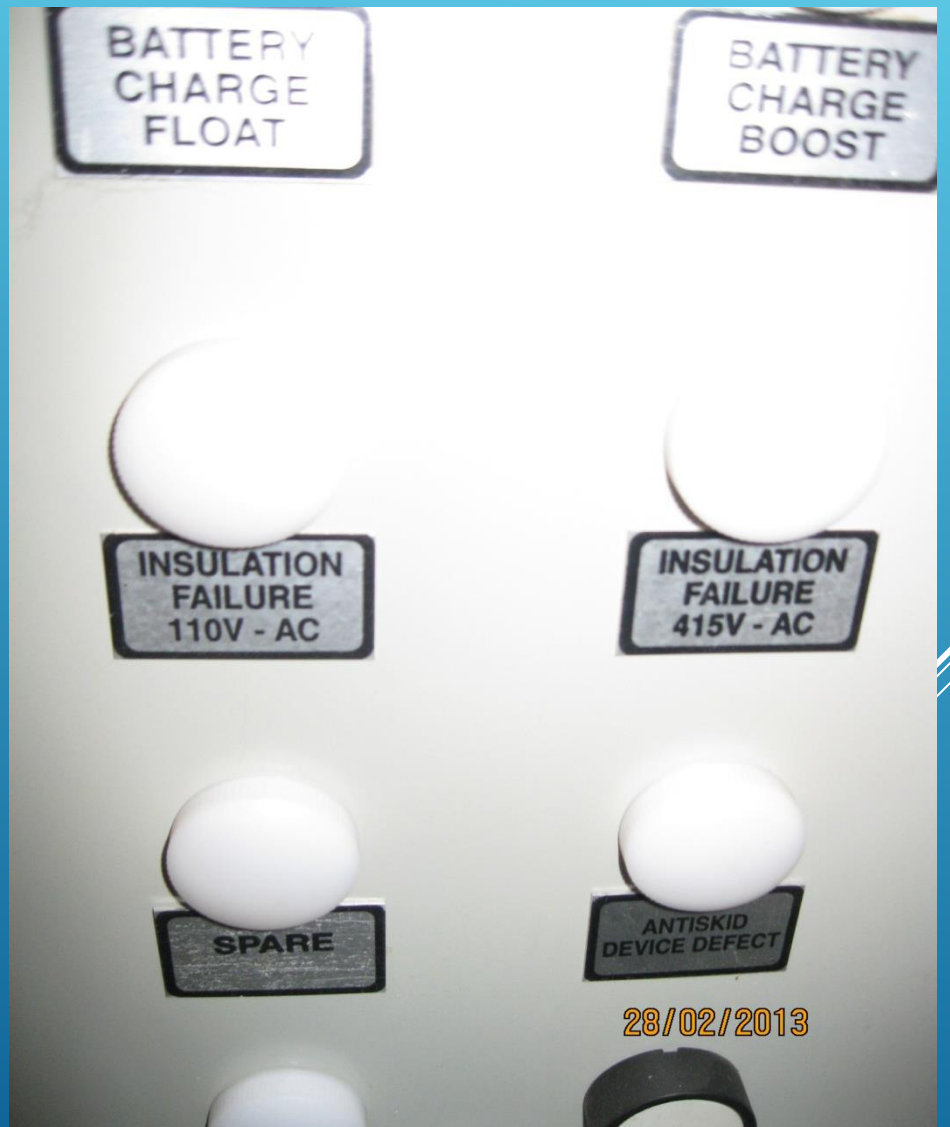
- DURING THIS MODE ONLY EMERGENCY LIGHTS CIRCUIT ONLY WORK

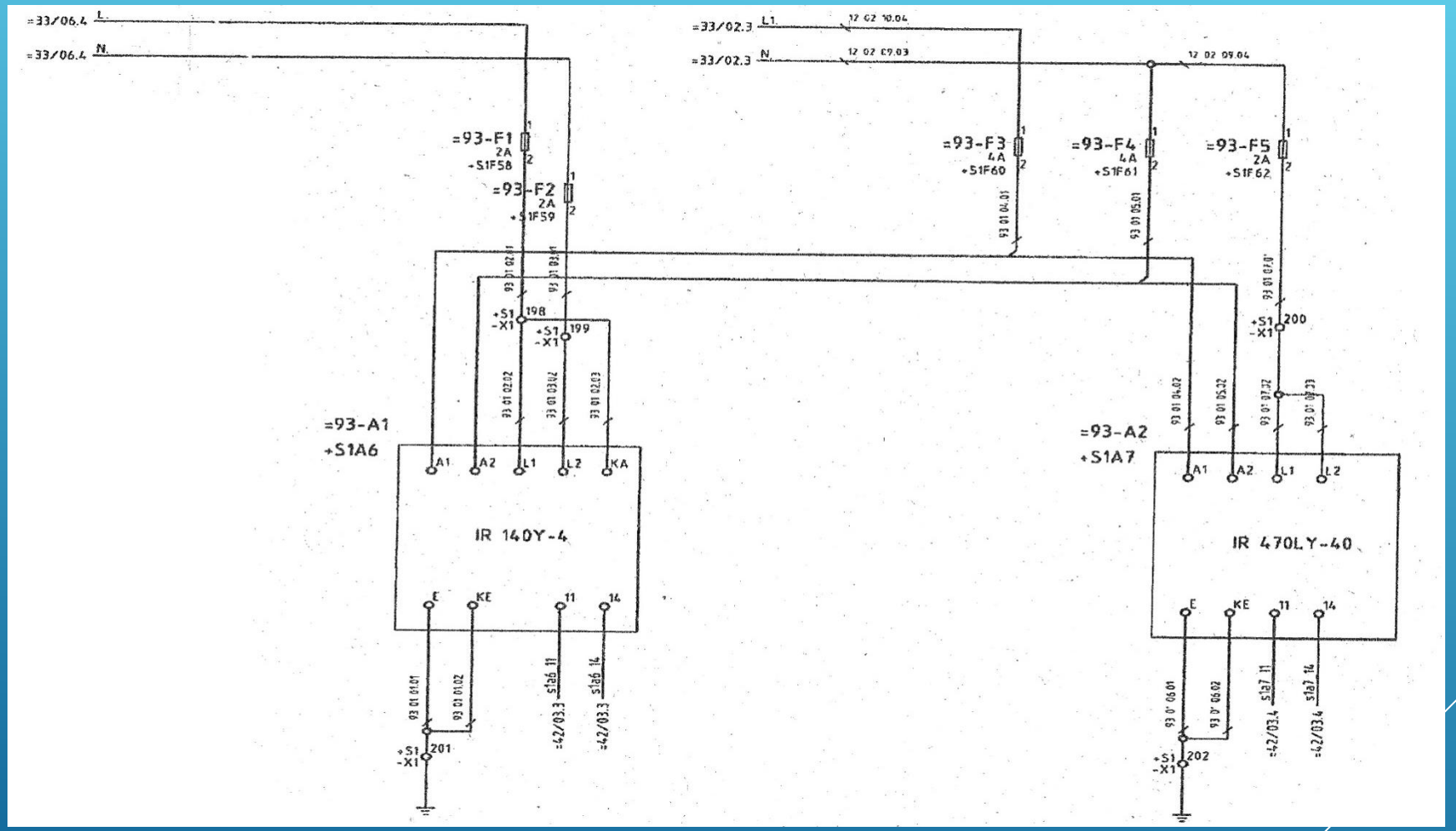

=12/01.03 L.NET-1
=33/01.08 L.LS
=12/01.07 L.NET-2
13 21 33
POWER SUPPLY ON/OFF +S1S01 =32-S7
14 22 34
32 06.03
13/21/33
=32-S1 +S1S02
NET1 1MS NET2
34 22 14
34 22 14
32 06 07.01
32 06 04.01
31
+S1A2S3 =12-A1
32
32 06 10
21
+S1K02 =32-K2 =32/06.4
22
32 06 01
A1
=32-K01 +S1K-01
A2
MEASURING AND MONATARING RELAY
=21/01.8 12
=21/01.8 13
N.NET-1
=12/01.03
21
+S1K44 =33-K1 =33/02.2
22
32 06 07
A1
=32-K08 +S1K-43
A2
MEASURING AND MONATARING RELAY
=33/01.8 12
=33/01.8 13
N.LS
=33/01.08
41
+S1A2S4 =12-A1
42
32 06 09
21
+S1K01 =32-K1 =32/06.2
22
32 06 06
A1
=32-K02 +S1K-02
A2
MEASURING AND MONATARING RELAY
=21/01.7 12
=21/01.7 13
N.NET-2
=12/01.07

INSULATION MONITORING AC SIDE

- INSULATION MEASURING DEVICE MONITOR THE INSULATION OF UNEARTHED AC AND THREE PHASE MAINS
- IN THIS SYSTEM FOR MEASURING DC VOLTAGE IS CREATED IN THE DEVICE. THROUGH THE TERMINAL CLAMPS THE POSITIVE POLE IS APPLIED TO THE MAINS WHICH IS TO BE MONITORED, AND NEGATIVE POLE IS APPLIED TO EARTH THROUGH AN ELECTRICAL MEASURING CIRCUIT
- THE TERMINAL ARE PERMANENTLY MONITORED: AS OHMIC INSULATION RESISTANCE FALLS BELOW 30K OHMS (FAILURE BETWEEN MAINS AND EARTH) LED FLASHES. *AT THE SAME TIME A LUMINOUS DISPLAY ON THE SWITCH CABINET DOOR IS ACTIVATED.*
- TO MEASURE INSULATION AT DC SIDE THE PUSH BUTTON NEAR VOLT METER HAS TO BE PRESSED. IF THE NEEDLE COME TO ZERO MEANS INSULATION VALUE IS OK.

ONLINE INSULATION MONITORING



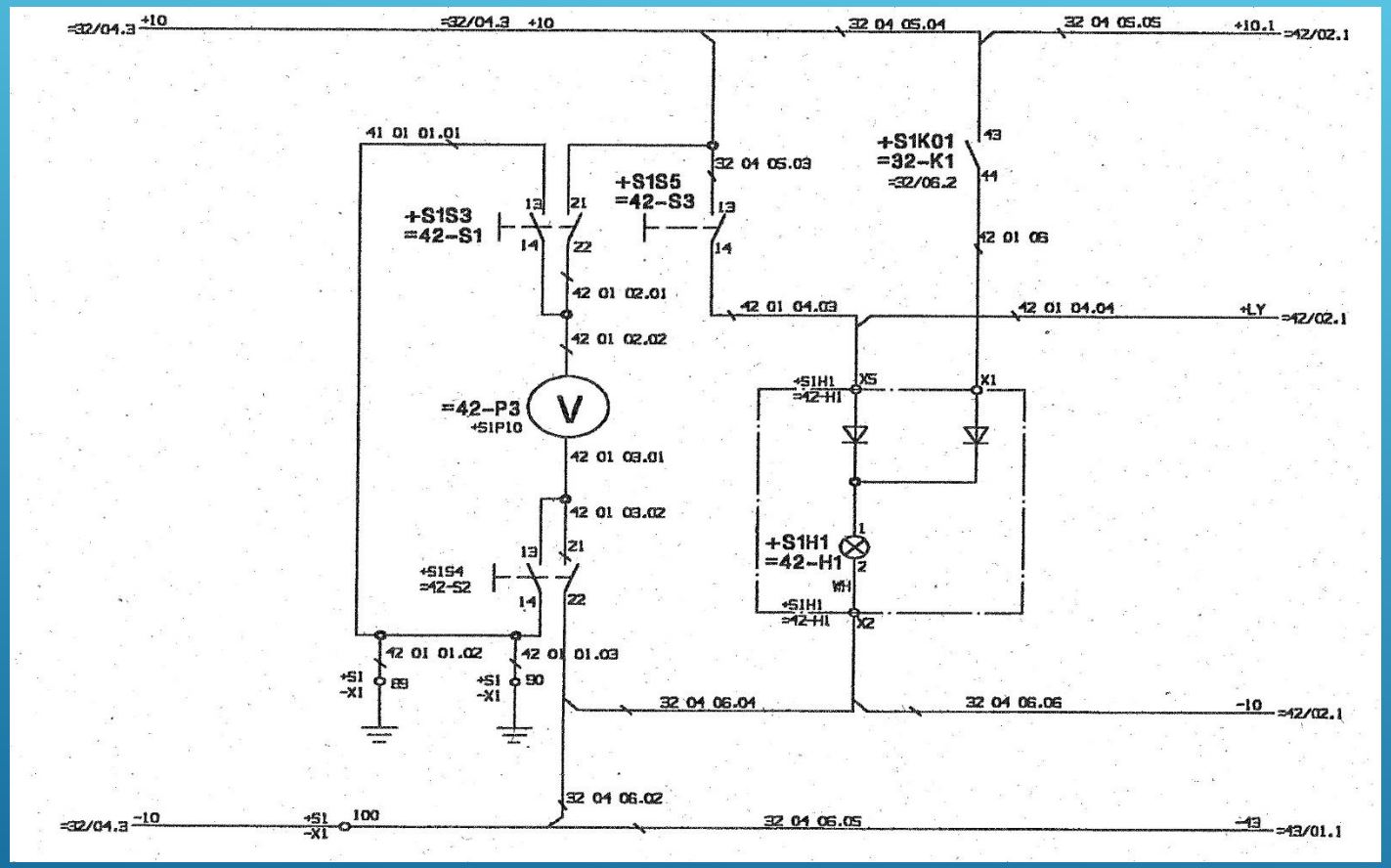

=33/06.4 L
=33/06.4 N
=33/02.3 L1
=33/02.3 N
12 02 10.04
12 02 09.03
12 02 09.04
=93-F1
2A
+S1F58
=93-F2
2A
+S1F59
=93-F3
4A
+S1F60
=93-F4
4A
+S1F61
=93-F5
2A
+S1F62
93 01 04.01
93 01 05.01
93 01 07.01
93 01 02.01
93 01 03.01
+S1 -X1 198
+S1 -X1 199
+S1 -X1 200
93 01 02.02
93 01 03.02
93 01 02.03
93 01 04.02
93 01 05.02
93 01 07.02
93 01 08.03
=93-A1
+S1A6
A1 A2 L1 L2 KA
IR 140Y-4
E KE 11 14
=93-A2
+S1A7
A1 A2 L1 L2
IR 470LY-40
E KE 11 14
93 01 01.01
93 01 01.02
=42/03.3 s1a6 11
=42/03.3 s1a6 14
93 01 06.01
93 01 06.02
=42/03.4 s1a7 11
=42/03.4 s1a7 14
+S1 -X1 201
+S1 -X1 202

DC SIDE INSULATION TEST

DC Negative side Insulation

DC Positive side Insulation

110 V DC DIAGNOSIS :



DC / DC CONVERTER

TWO DC/ DC CONVERTER USED INSIDE THE COACH

THIS CONVERTS 110V DC TO 24 V DC

- S1A8 USED FOR RMPU MICRO PROCESSOR CONTROL & HP LP CUT OUT)
- S1U2 USED FOR

  SANITARY CIRCUIT

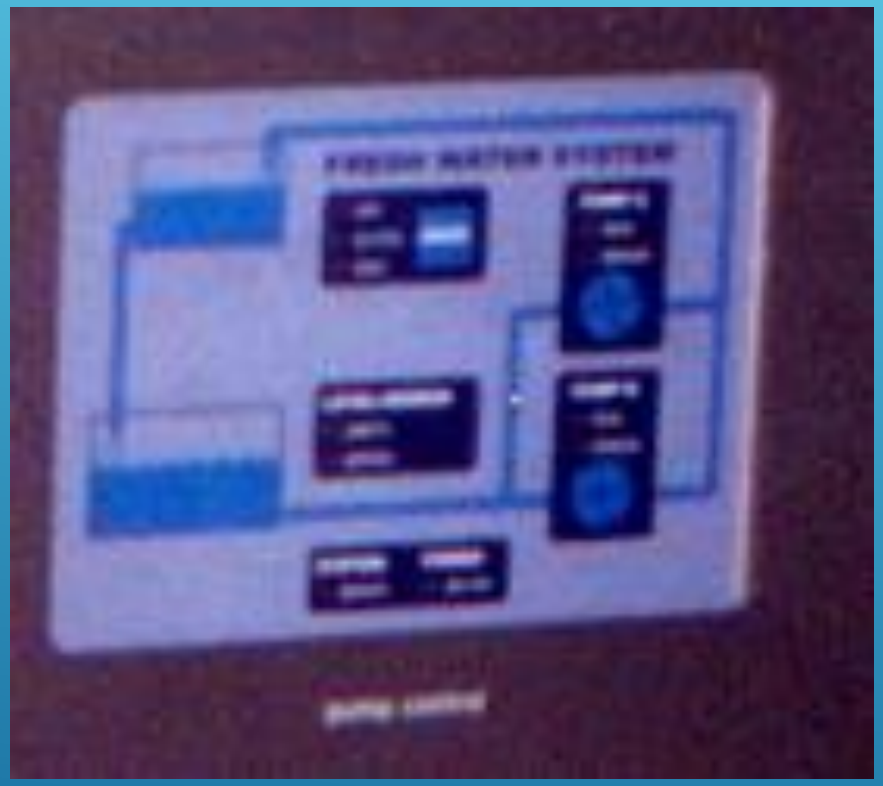
  L.S SYSTEM (local supply)

  TL REMOTE CONTROL (train light)

MINIMUM VOLTAGE RELAY

- USED TO PROTECT BATTERY DEEP DISCHARGE

PUMP CONTROLLER



LAMINATED PUMP STATUS DISPLAY (FRONT VIEW)

(REAR VIEW)

MICROPROCESSOR BASED PUMP CONTROLLER (RDSO /PE/SPEC/AC/0022/REV-O AMBT.1)

- AUTOMATICALLY CHANGE OVER FROM ONE PUMP TO OTHER PUMP.(PERIOD OF 4HOURS)
- FAILURE OF ONE PUMP (TOP)THE CONTROLLER WILL SWITCH OVER TO THE OTHER PUMP
- PUMP OPERATION WILL INDICATED IN INDICATION PANEL

MEASURING & MONITORING RELAY

- CHECK WHETHER ALL 3 PHASES ARE PRESENT
- CORRECT PHASE SEQUENCE
- 3-PHASE OVER AND UNDER VOLTAGE,
- OVER AND UNDER FREQUENCY,
- UNBALANCE VOLTAGE

ADVANTAGES

- SEPARATELY ADJUSTABLE SET POINTS
- SEPARATELY ADJUSTABLE DELAY FUNCTIONS (0.1 TO 30 S)
- LED INDICATION FOR RELAYS, ALARM AND POWER SUPPLY ON

MODIFICATIONS IN THE SWITCHBOARD CABINET

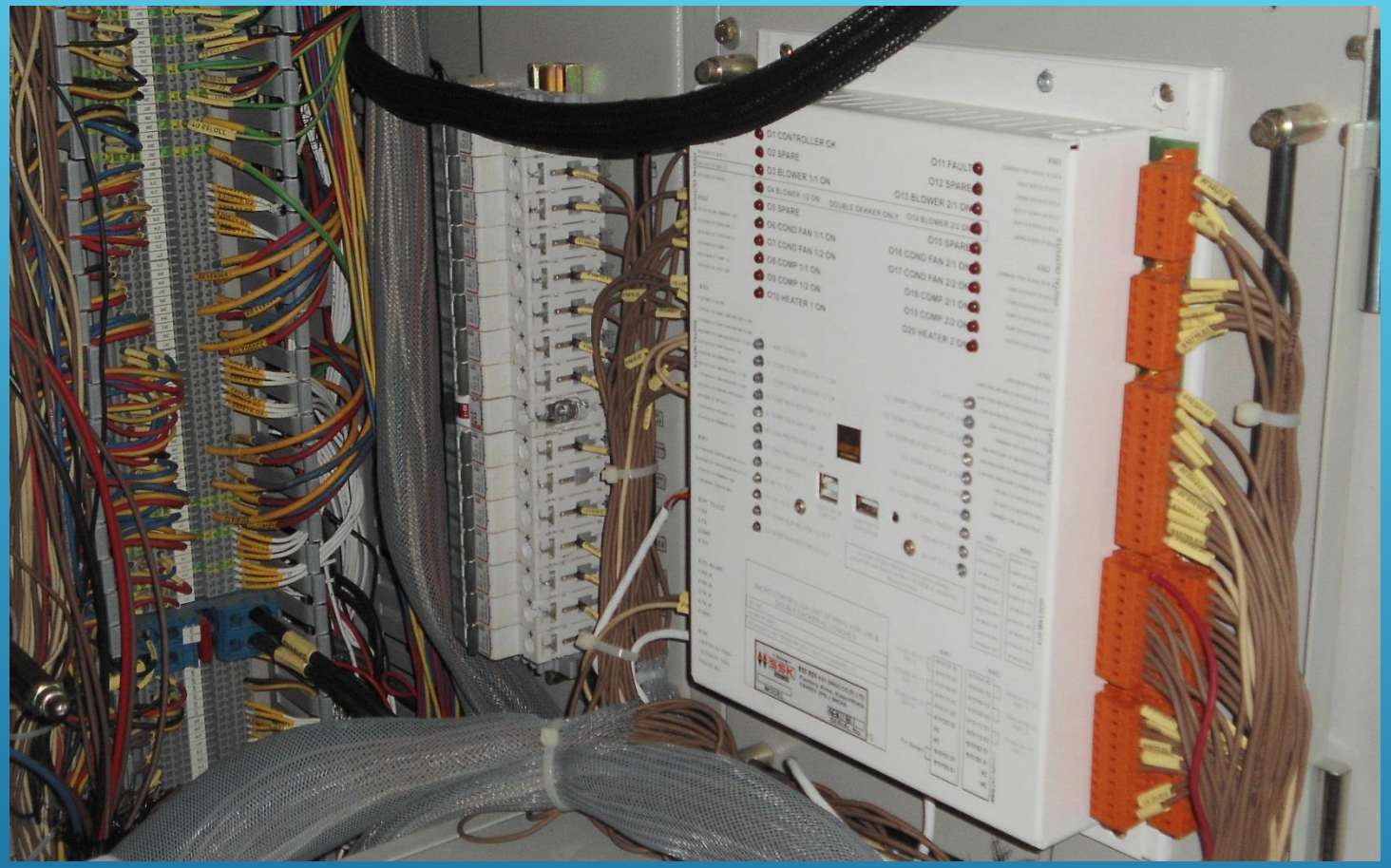
- MANUAL BYE-PASS FOR THE MICRPROCESSOR
- EMERGENCY BATTERY CHARGER IN PLACE OF REGULATED BATTERY CHARGER
- MCB'S AT OUTPUT OF THE RMPU MICROPROCESSOR
- LOOP IN LOOP OUT IN PLACE OF MCB COMB
- PROVISION OF MCB'S FOR CAPACITOR BANK
- ADDITIONAL MCB'S FOR 5 KVA TRANSFORMER FOR MOBILE CHARGING
- PROVISION OF HOG COMPLIANCE EQUIPMENT.

MANUAL BYE PASS FOR MICRPROCESSOR

- PROVISION OF ROTARY SWITCH BY-PASS FOR THE RMPU MICRO-PROCESSOR
  - PROVISION AS PER RDSO INSTRUCTION FOR BY-PASSING THE MICROPROCESSOR IN CASE OF FAILURE
  - SMI SHEET NO RDSO/PE/MS/AC/0057 (REV-0)

EMERGENCY BATTERY CHARGER IN PLACE OF REGULATED BATTERY CHARGER

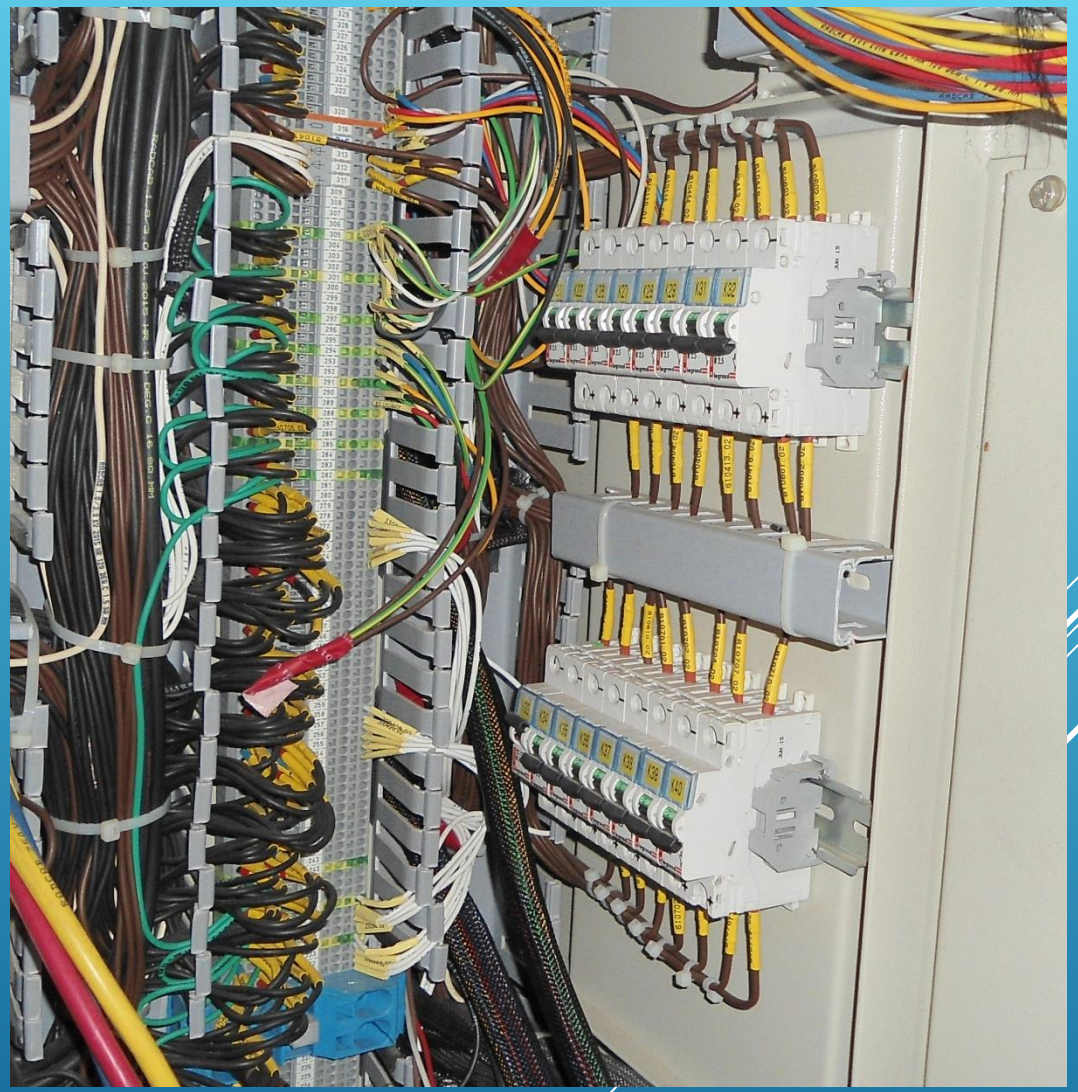
MCB'S AT OUTPUT OF THE RMPU MICROPROCESSOR



REF:- RDSO SMI SHEET

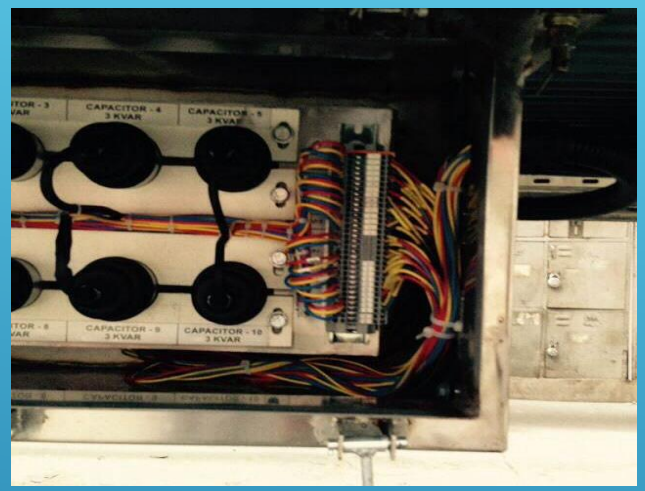
MCB's FOR CAPACITOR BANK

- **PROVISION OF MCB IN SWITCHBOARD CABINET AND CAPACITOR BANK IN THE UNDERFRAME AS PER RDSO INSTRUCTION SMI SHEET NO RDSO/PE/MS/AC/0054 (REV-0)**

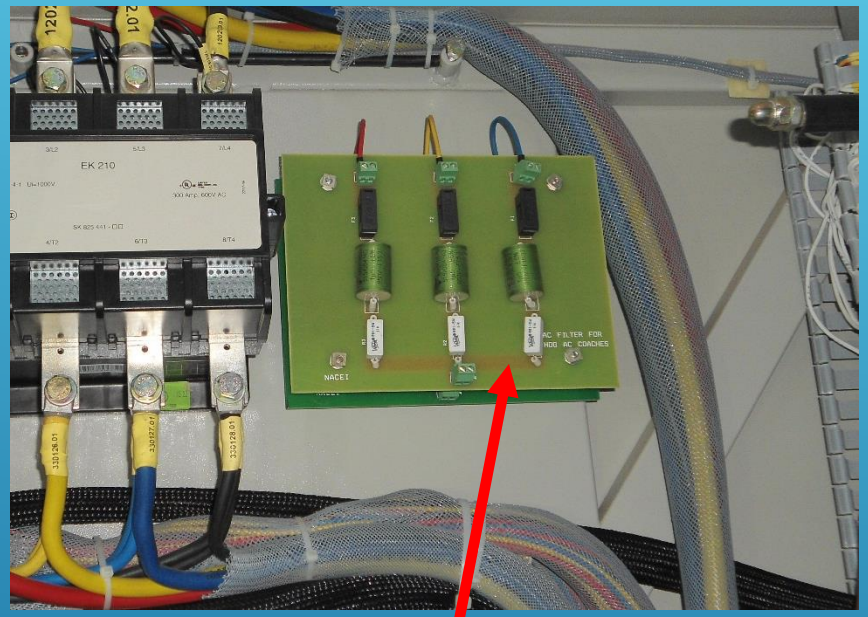


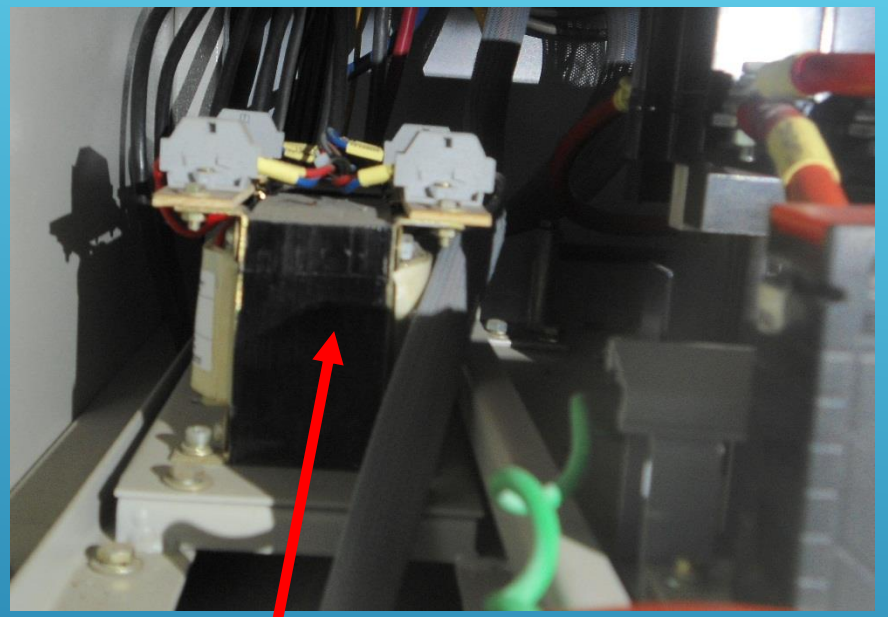
CAPACITOR BANK IN EOG AC COACHES

- **ELECTRICAL LOAD IN AC EOG COACHES IS PREDOMINANTLY REACTIVE IN NATURE**
- **STUDY AND TRIALS HAVE REVEALED THAT POWER FACTOR IN AC COACHES VARIES FROM 0.5 TO 0.7 LAGGING UNDER DIFFERENT LOAD CONDITIONS**
- **FIXED POWER COMPENSATION BY PROVIDING CAPACITOR BANKS AT LOAD END**
- **ACCORDINGLY, UNDER SLUNG CAPACITOR BANKS OF 18 KVAR FOR LHB AC COACHES AND 10 KVAR FOR LHB POWER CAR WERE DESIGNED TO PROVIDE REACTIVE LOAD COMPENSATION**



HOG COMPLIANT SWITCHBOARD CABINET





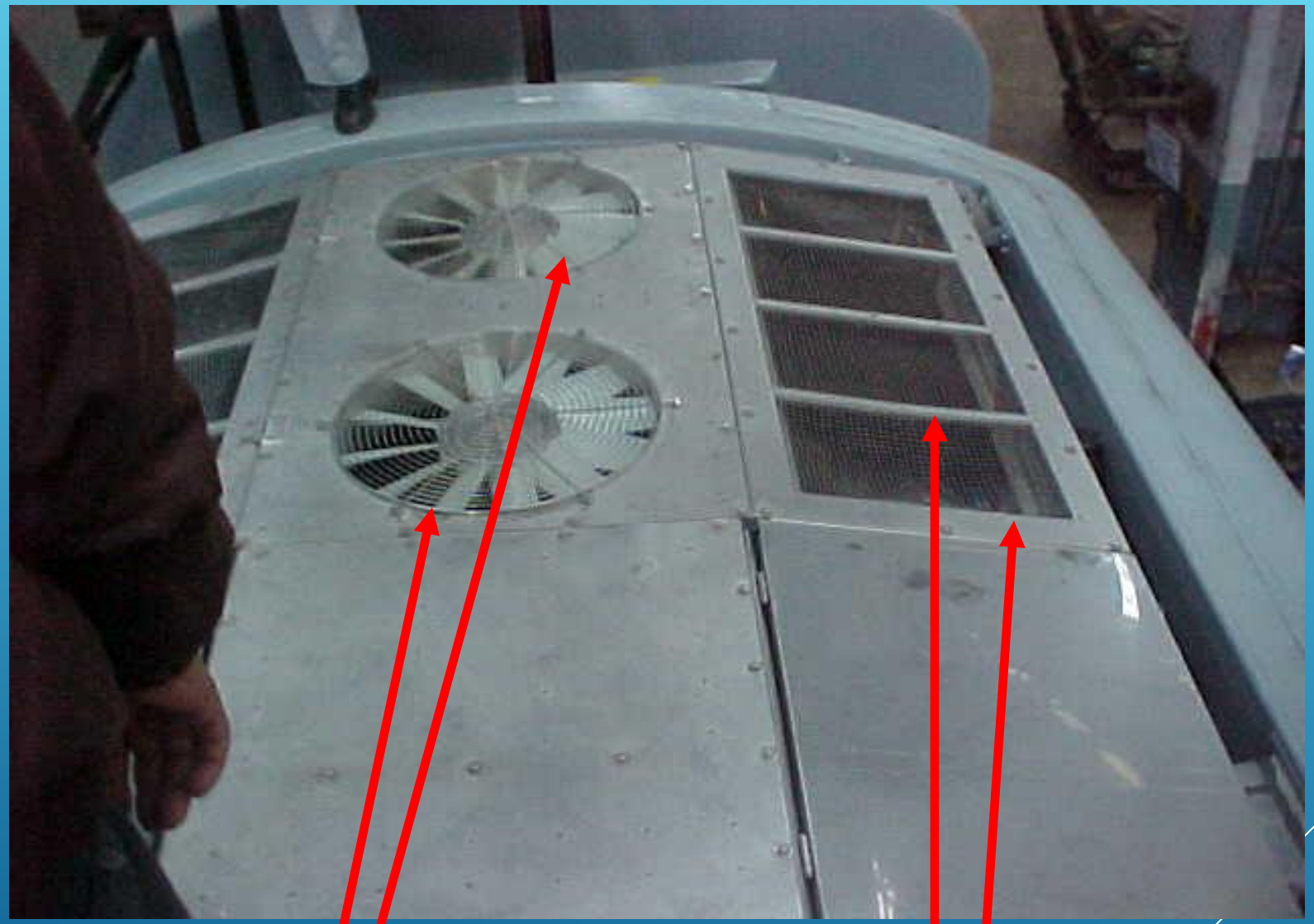
RC FILTER

TRANSFORMER

REF:- RDSO SMI SHEET NO RDSO/

ROOF MOUNTED AC PACKAGE UNIT

ROOF MOUNTED AC PACKAGE UNIT



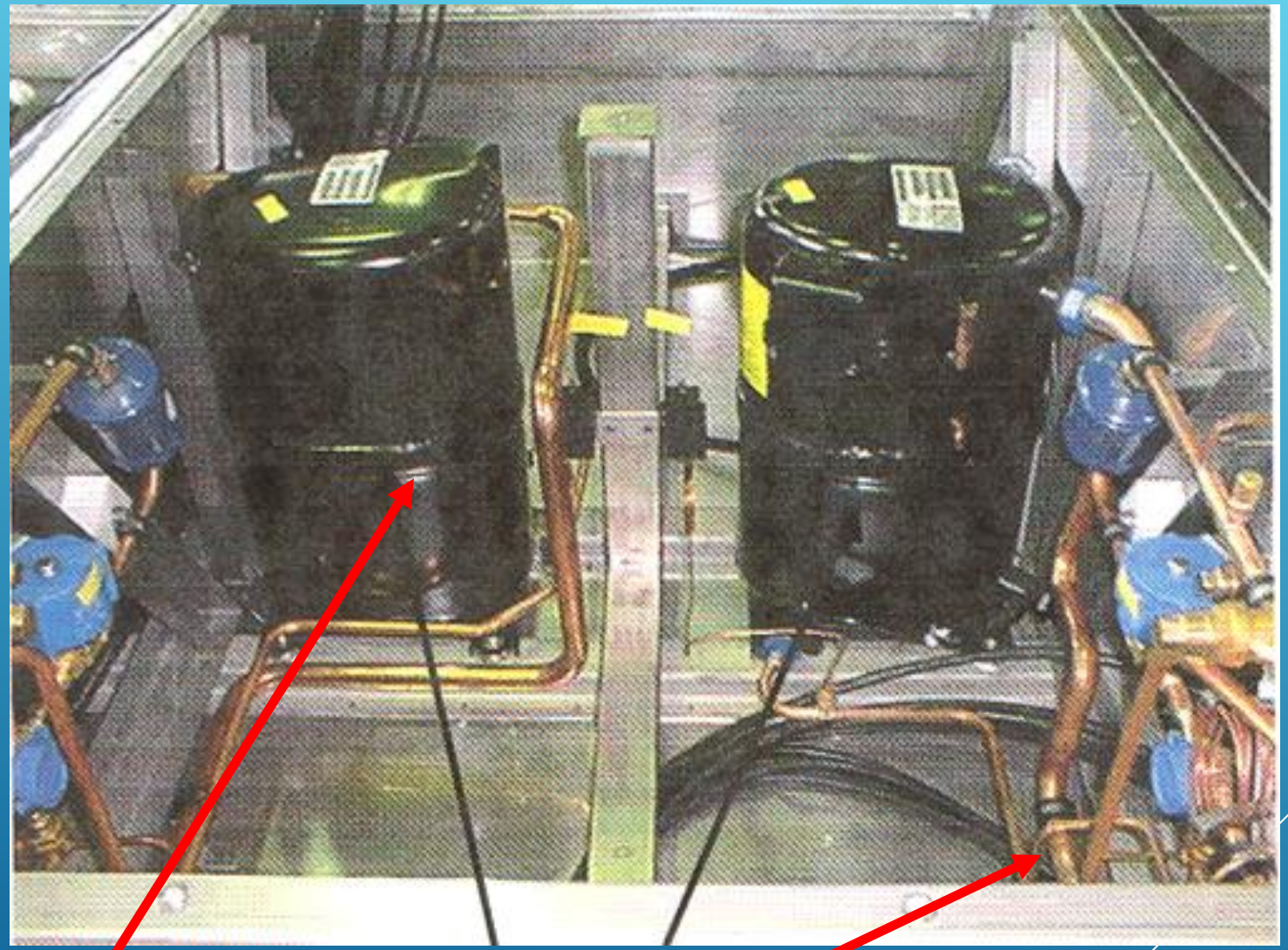
ROOF MOUNTED AC PACKAGE UNIT

- MODULAR CORROSIONLESS SS RIVETTED STRUCTURE, BOTTOM CLOSED
- MICRO-PROCESSOR CONTROL (WITH RS232 PORT) WITH FAULT DIAGNOSTICS AND DATA ACQUISITION SYSTEM
- MULTI-PIN POWER & CONTROL CONNECTIONS BY HARTING CONNNECTORS

ROOF MOUNTED AC PACKAGE UNIT

- HUMIDITY CONTROL THROUGH HYGROSTAT
- BOTTOM CLOSED AND SEALED UNIT WITH RETURN AND FRESH AIR FILTER CLEANING FROM TOP OF THE COACH
- AUTOMATIC TEMPERTURE SETTING BASED ON AMBIENT AND SWITCH OVER TO PRE-COOLING/HEATING MODE

COMPRESSORS PLACEMENT



COMPRESSORS

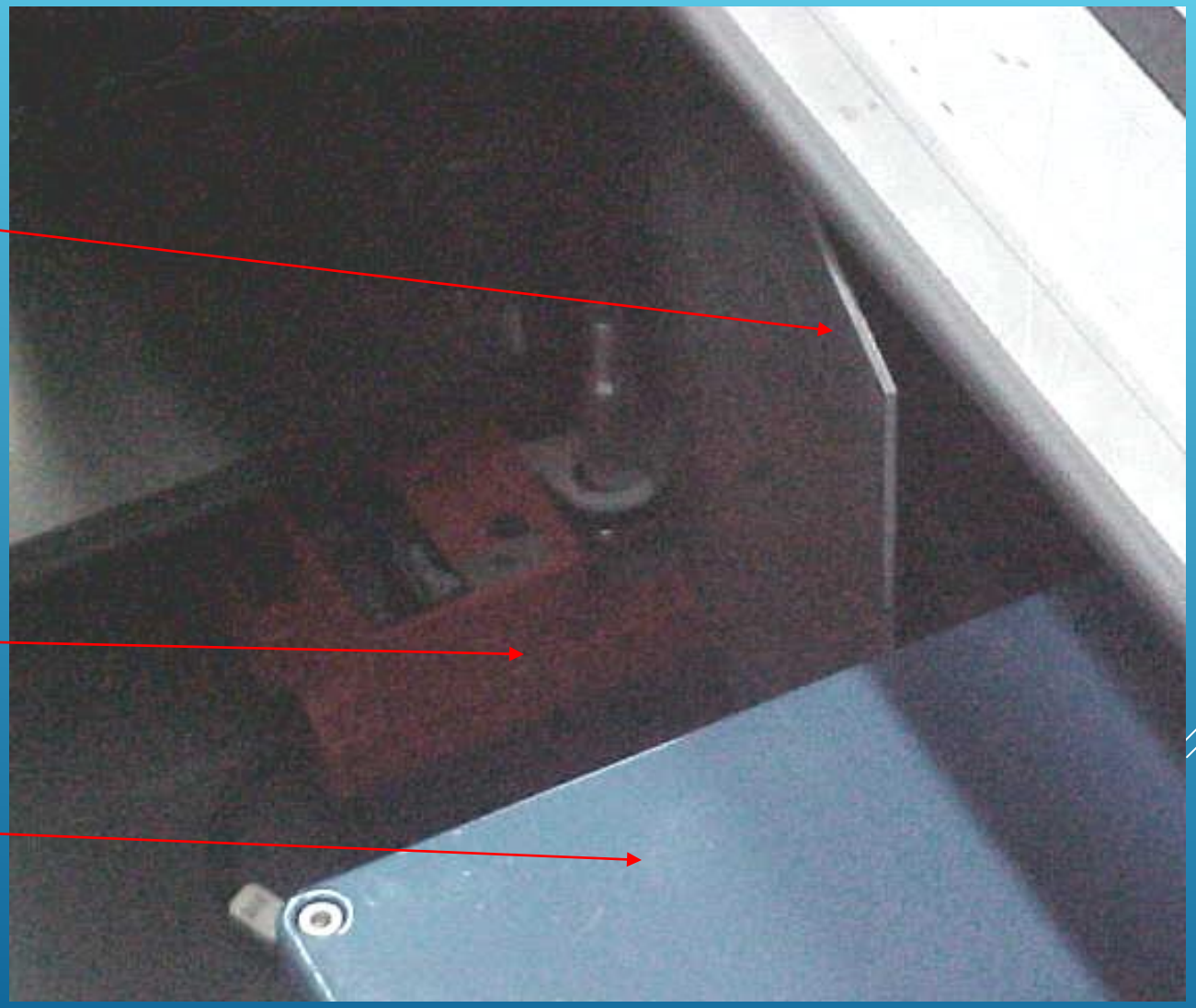
COPPER
REFRIGERANT PIPING

SERVOMOTOR CONTROLLED FRESH AIR DAMPERS

FRESH AIR DAMPER

SERVO MOTOR

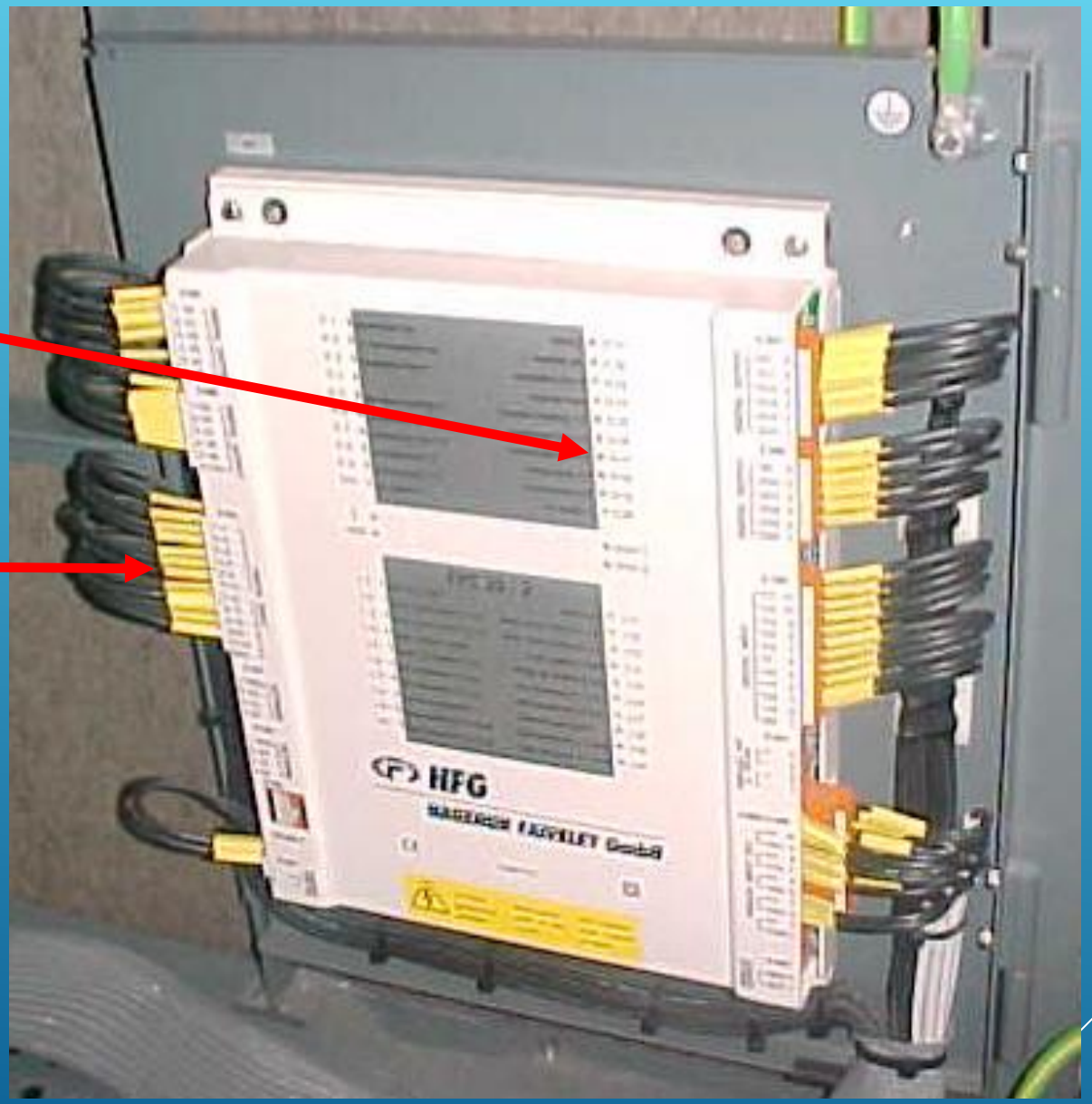
JUNCTION BOX



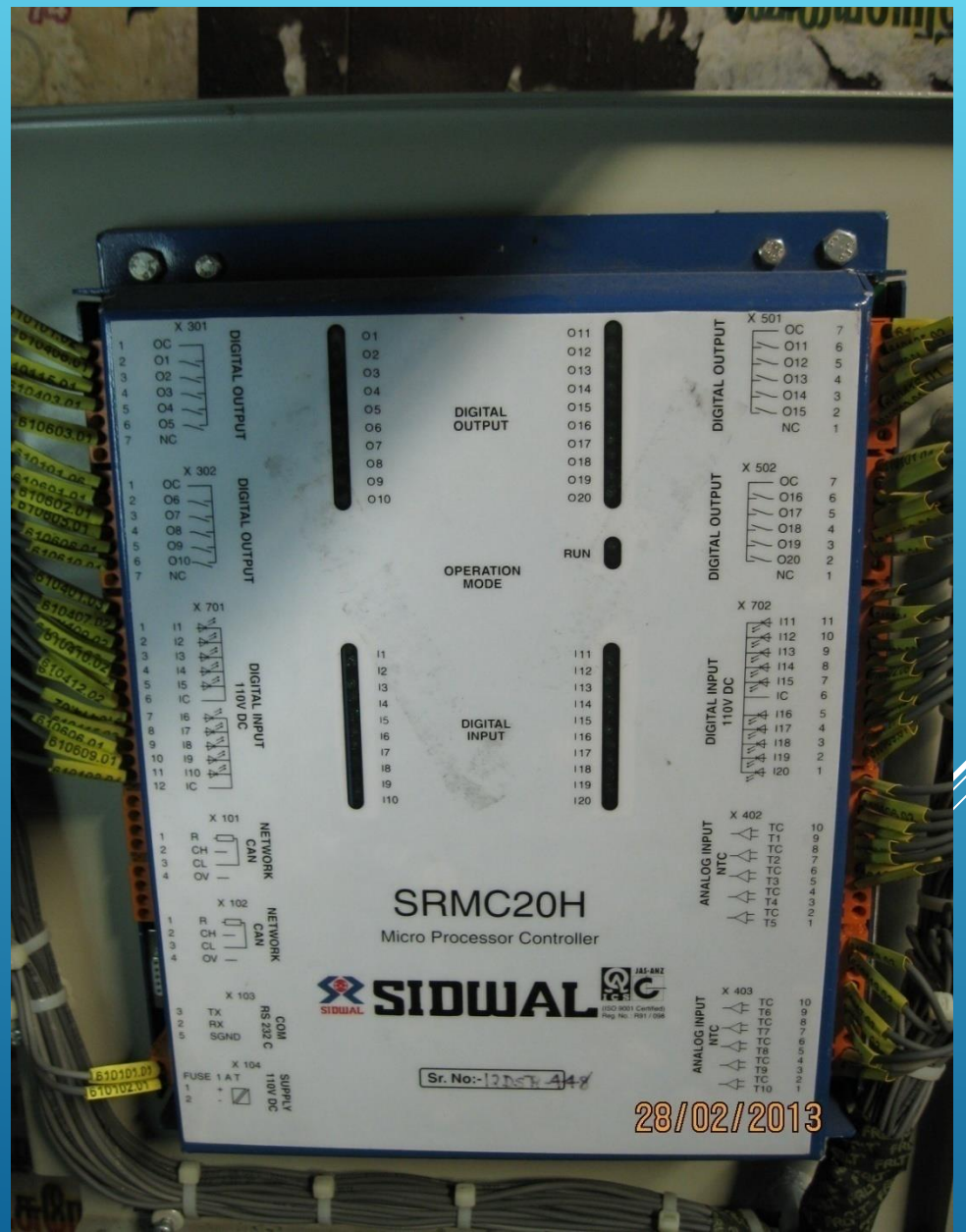
AC PACKAGE MICROPROCESSOR CONTROLLER

MICRO CONTROLLER

CAGE CLAMP CONNECTORS



AC PACKAGE MICROPROCESSOR CONTROLLER



DISPLAY UNIT OF MICRO PROCESSOR SYSTEM

- ONE DISPLAY UNIT FOR EACH CONTROL UNIT IS MOUNTED ON THE LEFT DOOR OF THE CONTROL PANEL.
- THE CONTROL DISPLAY UNIT FUNCTIONS AS AN INTERFACE BETWEEN OPERATOR AND SYSTEM. DISPLAY UNIT HAVE NECESSARY KEYS FOR THE PURPOSE.
- THE FOLLOWING FUNCTIONS ARE POSSIBLE THROUGH KEY BOARD.
  - SETTING OF TIME , DATE, TRAIN NO. AND RMPU NO.
  - CLEARING OF THE FAULT ON DISPLAY.
  - VIEWING OF THE STORED FAULTS.
  - DISPLAY OF DIGITAL INPUTS AND OUTPUTS.
  - DISPLAY OF STATUS OF THE SYSTEM.
  - SETTING VARIOUS PARAMETERS FOR CONTROLLER BY MAINTENANCE STAFF.

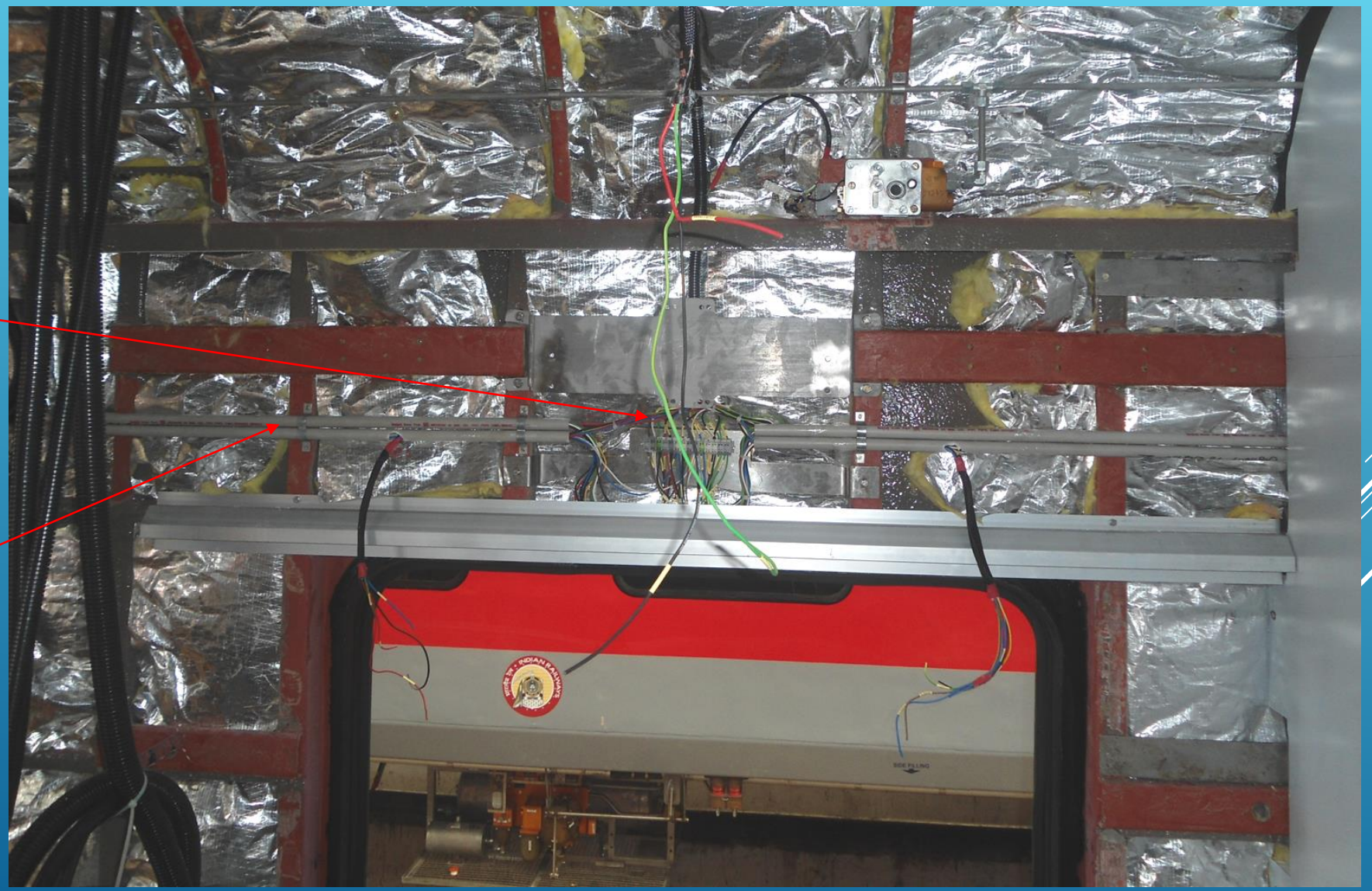
COACH WIRING

SIDE WALL AC-3TIER

SIDE WALL AC-3TIER

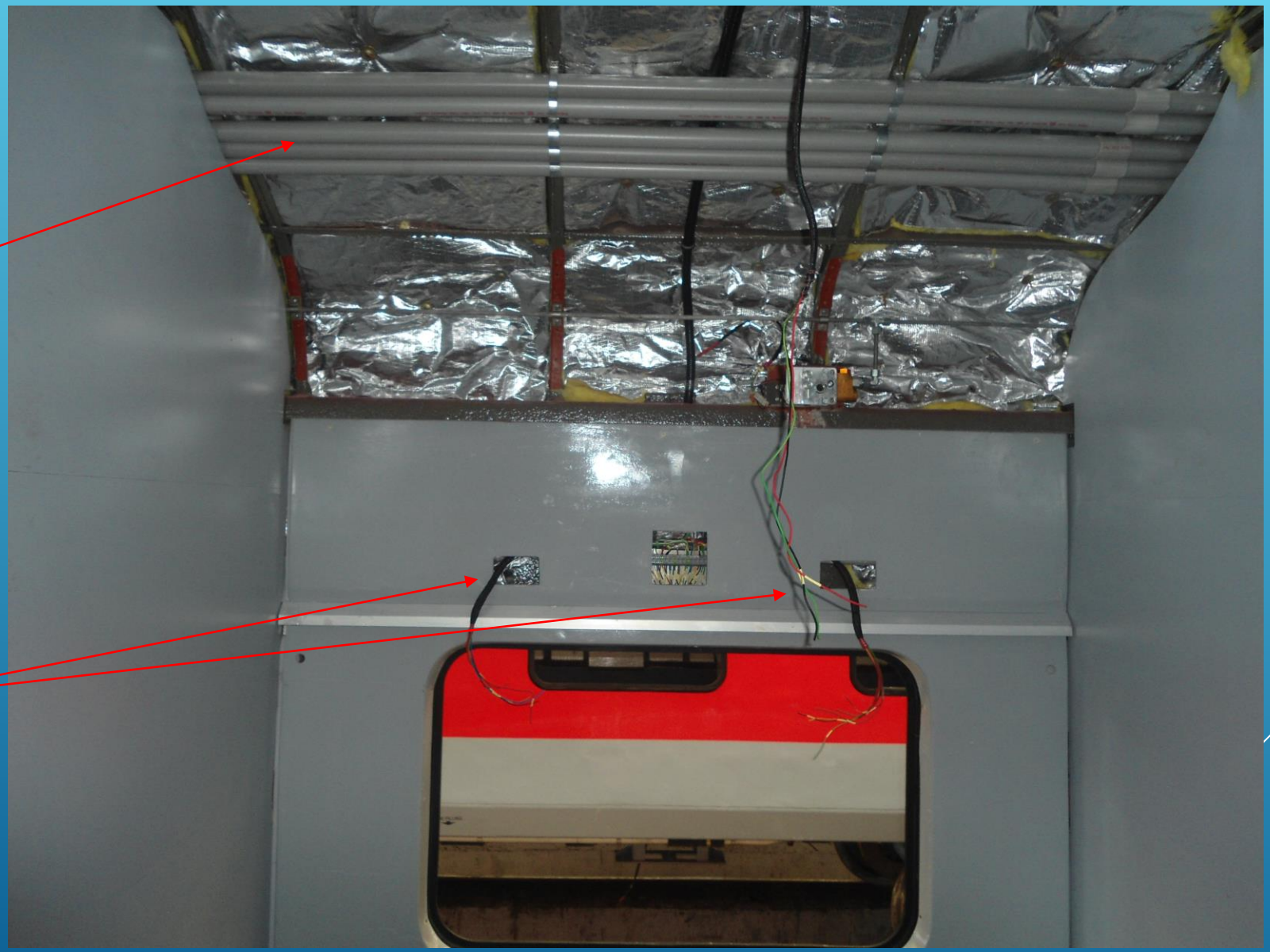
WAGO CONNECTORS FOR COMPARTMENT

CONDUITS FROM SBC END



THROUGH CONDUITS FOR AC WIRING

SPACE FOR SWITCHES



60 KVA TRANSFORMER

- TYPE - EPOXY COATED ENCAPSULATED , WATER PROOF WINDING
- NEW DESIGN WITH DRY TYPE WINDING W/O FUSES (RDSO MODI SHEET)
- RATING- 3ø, 50HZ ,60KVA,750/415V
- INSULATION - CLASS H
- NATURAL AIR COOLED
- WEIGHT – 450 KG (Max.)
- DEGREE OF PROTECTION -

  IP-65 TERMINAL BOX & WINDING

LHB AC – HOT BUFFET COACH: SPEC. NO. EDTS-118

S.no	Item	Load	QPC	Total Load
1	**Hot case** 3x500W	1500 W	1	1500 W
2	**Bottle Cooler** 90L	400W	1	400W
3	**Deep Freezer**	500W	1	500W
4	**Water Boiler** (30L)	3000W	3	9000W
5	**Refrigerator** (310L) Standard size available in market	475W	1	475W
6	**Oven Toaster Grill** (16L)	1200W	2	2400W
7	**Electric cooking range**	2000W 1.1KW	5 3	10000W 3300W
Pantry load				**27.575K W**

AC-2T,3T PANTRY

AC HOT BUFFET COACH

AC BUFFET COACH PANTRY

CHIMNEY

EXISTING CHIMNEY HAS BEEN REVISED WITH EXHAUST TYPE CHIMNEY WITH HOT AIR GOES OUT OF THE COACH

IV COUPLER FIXTURE (ZS COUPLING)

- THESE ARE USED FOR CONNECTING ELECTRICAL FEEDER CABLES BETWEEN COACHES.
- ONE ZS COUPLING FIXTURE SET CONSISTS OF THE FOLLOWING MAIN ASSEMBLIES
    1. COUPLING RECEPTACLE WITH LIDS.
    2. COUPLING PLUG WITH CONNECTING CABLES.
    3. DUMMY RECEPTACLE FOR RECEIVING THE FREE PLUG.

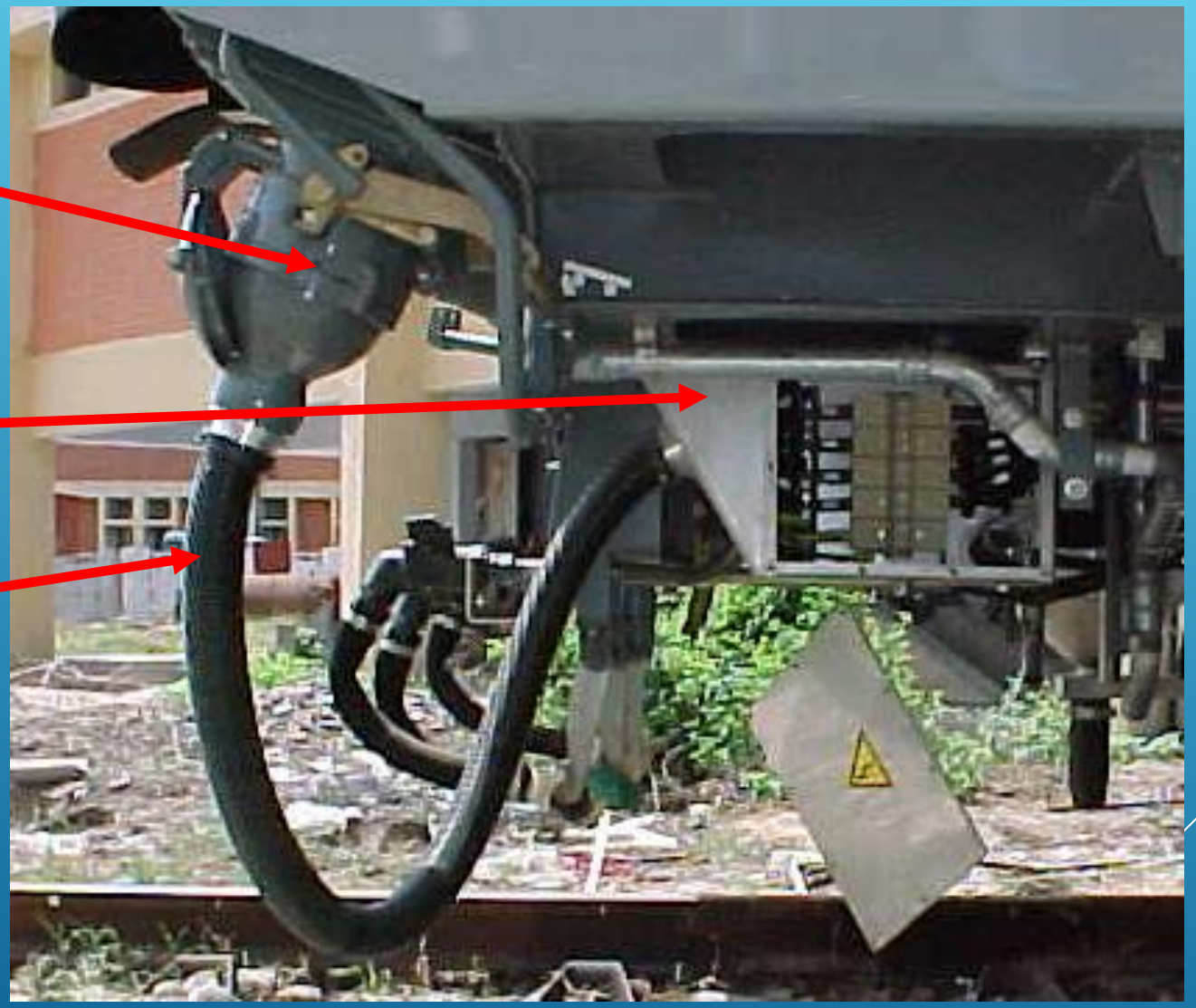
- AS TWO, THREE PHASE SYSTEM ARE INSTALLED IN COACHES TWO COUPLING FIXTURES ARE USED PER VEHICLE.
- THE CONTACT SYSTEMS CONSISTS OF SEVERAL SPRING PRESSURE CONTACT MATNTED IN THE RECEPTACLE AND THE FIXED CONTACT MOUNTED IN THE PLUG.
- THE ELECTRICAL CABLES ARE CONNECTED BY TERMINAL STRIP IN THE TERMINAL BOXES FOR PLUG AND RECEPTACLE.
- FOR MACHANICAL LOCKING OF RECEPTACLE AND PLUG WHEN MATED THE RECEPTACLE IS PROVIDES WITH TOGGLE CATCH INCLUDING AN ADDITIONAL MANNUALLY OPERATED MECHANICLA FIXTURE.
- THE COUPLINGS ARE PROVIDED WITH 4 MAIN CONTACTS FOR 400 A AND ADDITIONAL 4 CONTROL CURRENT CONTACT 25A FOR THE SAFETY LOOP.

400 AMPS INTERVEHICLE COUPLER IVC WITH JUNCTION BOX

IVC PLUG

JUNCTION BOX

FLEXIBLE CONDUIT

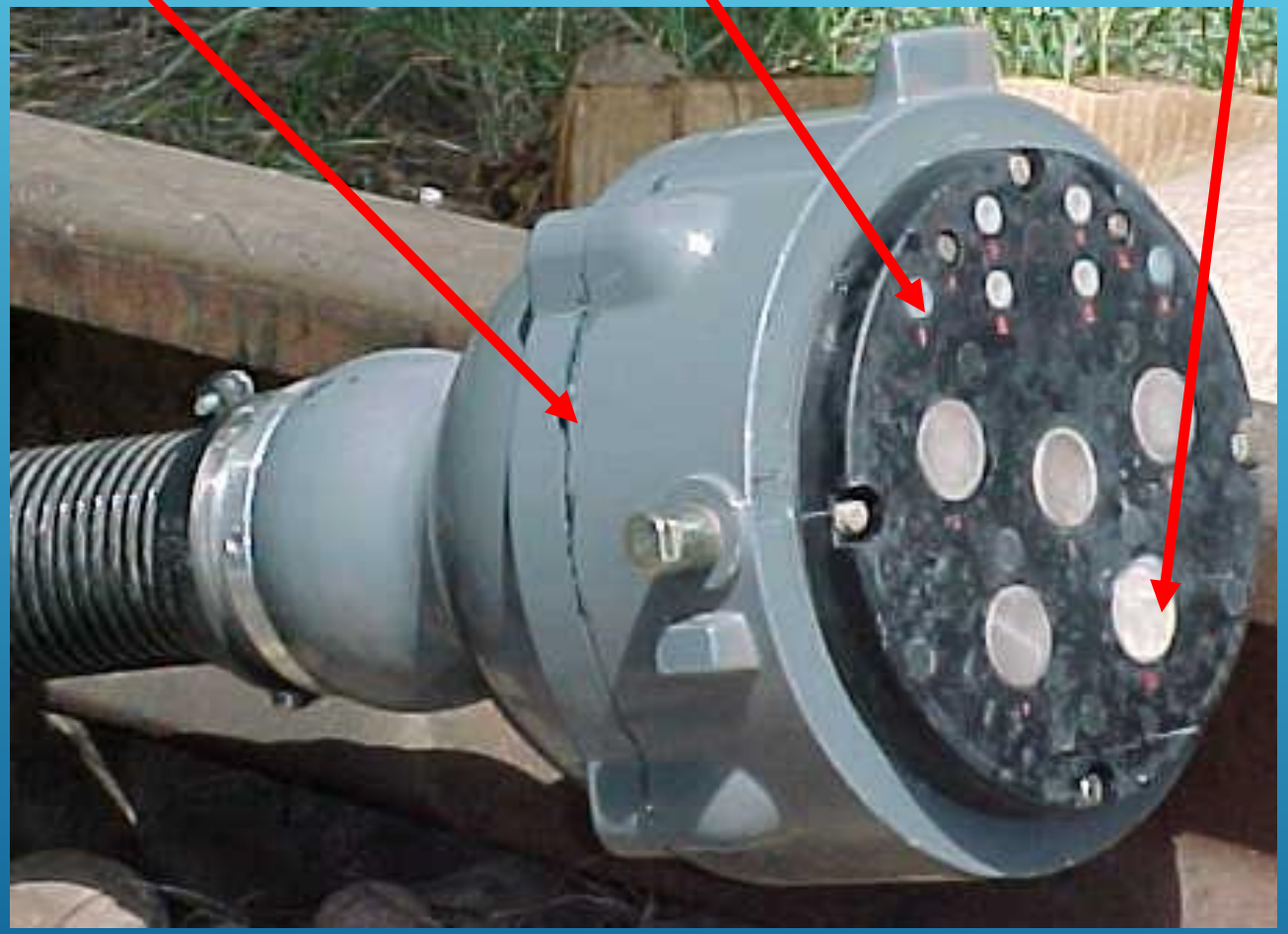


IVC PLUG

IVC HOUSING
(AL. DIE CAST)

CONTROL PINS
(25 AMPS)

MAIN CONTACTS
(400 AMPS)

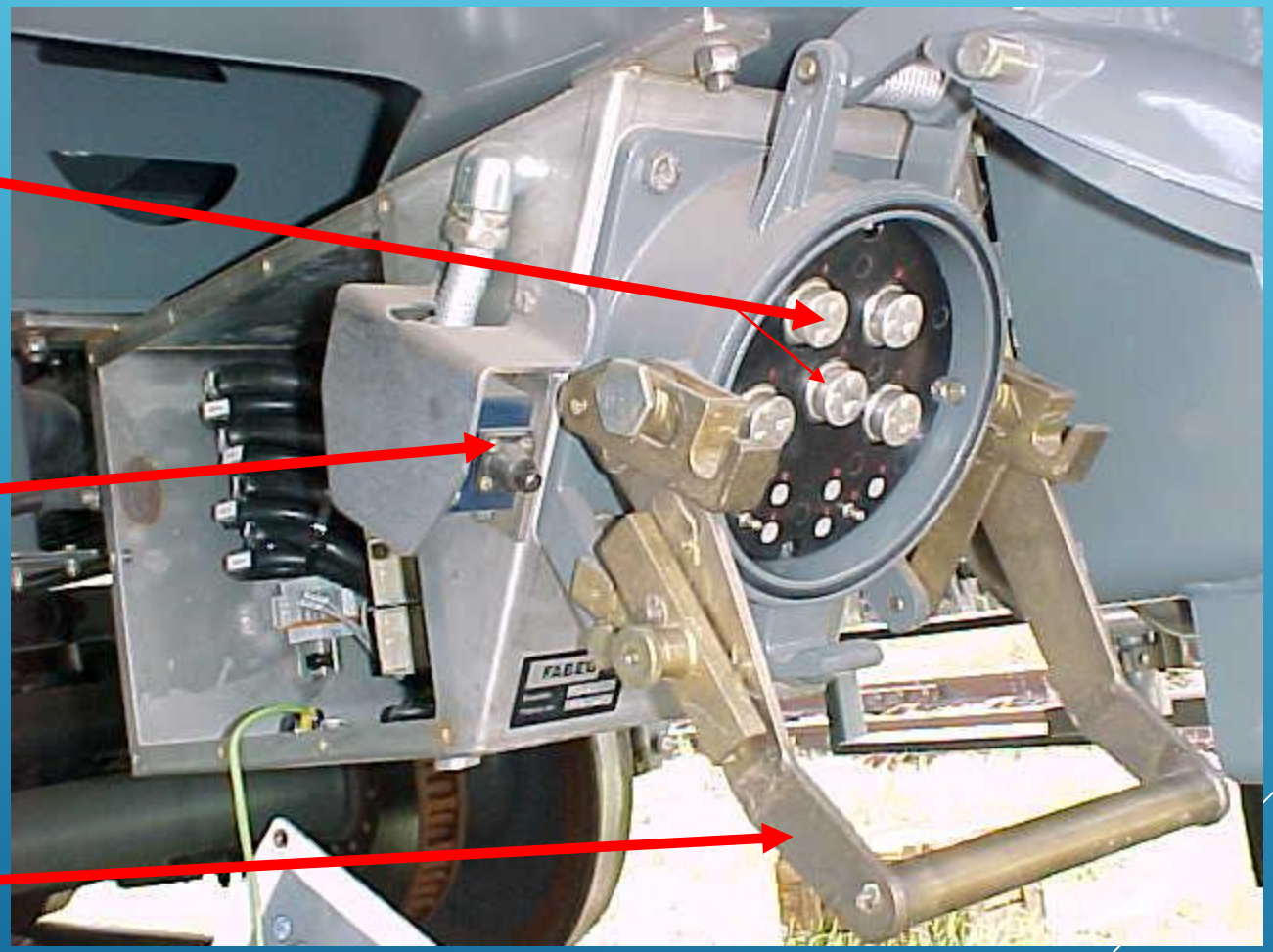


IVC SOCKET WITH RATCHET ARRANGEMENT

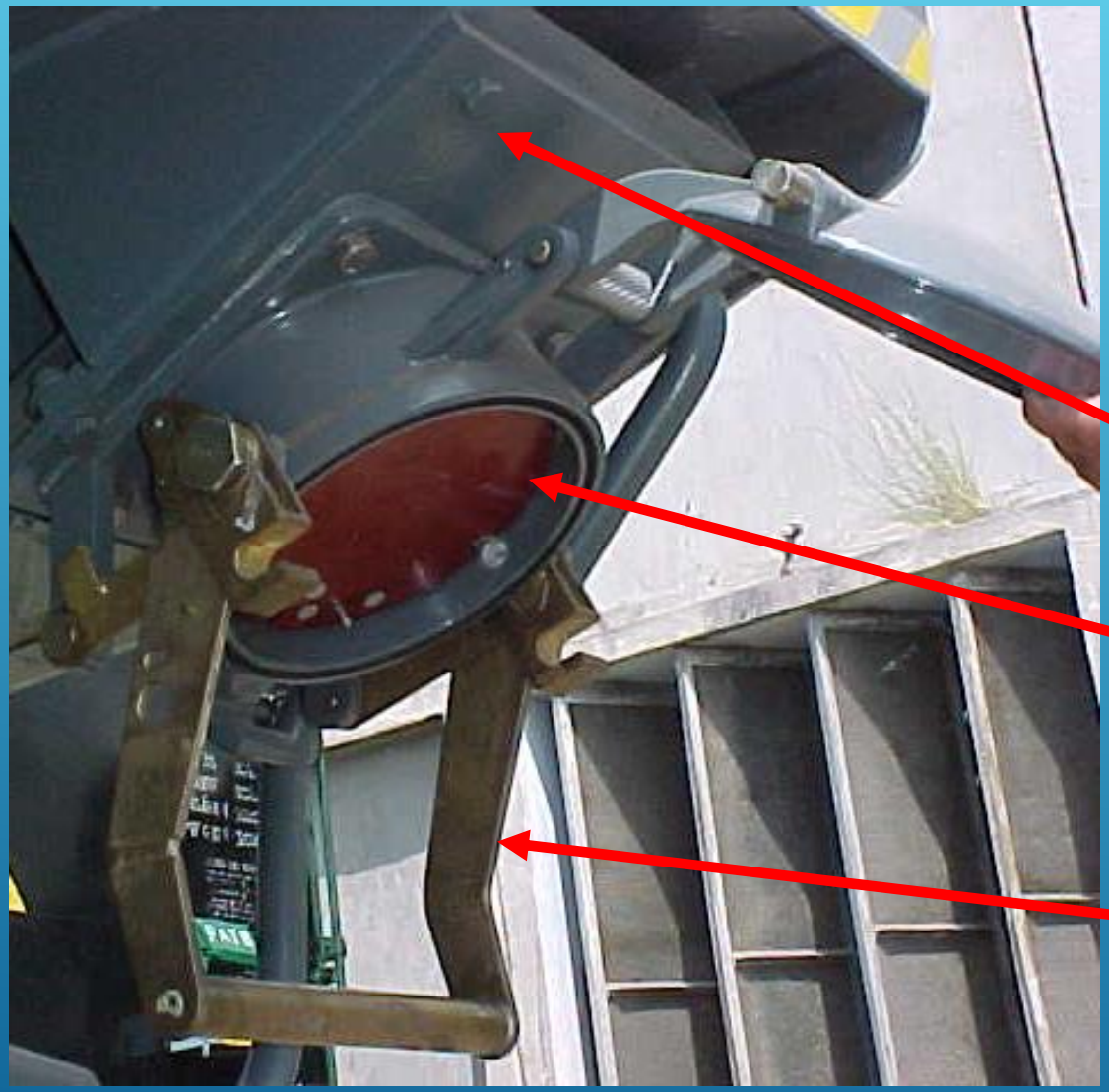
MAIN PINS (PRESSURE CONTACT TYPE) Ag-Cd TIPPED

LIMIT SWITCH (FOR CONTROL PINS / SAFETY LOOP)

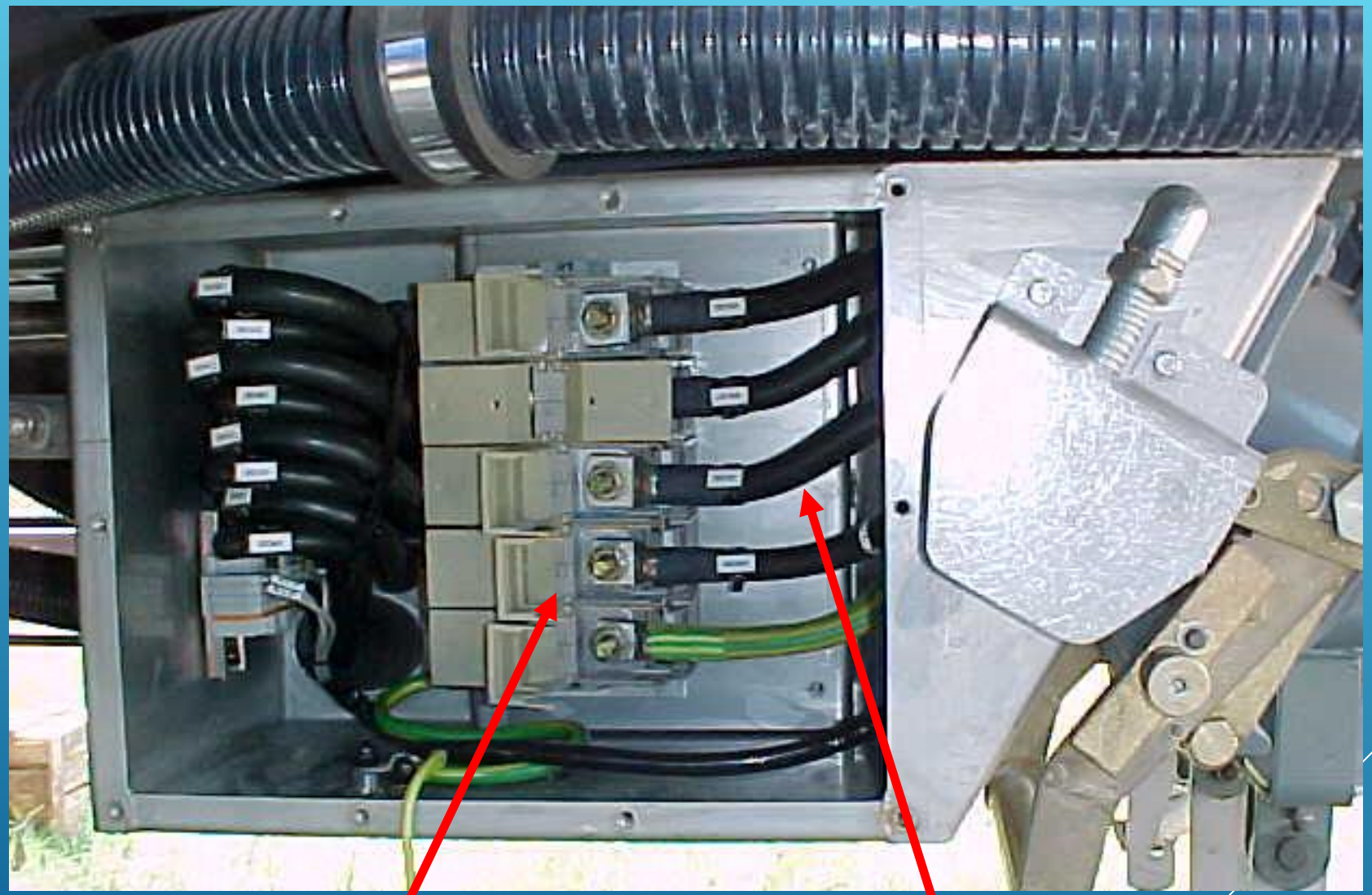
RATCHET ASSY FOR HOLDING THE PLUG



DUMMY SOCKET



FEEDER JUNCTION BOX



WOHNER TERMINALS
FOR 109g VIBRATION LEVEL

MAIN CABLES

500 AMPS INTERVEHICLE COUPLER
IVC WITH JUNCTION BOX

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IVC WITH JUNCTION BOX

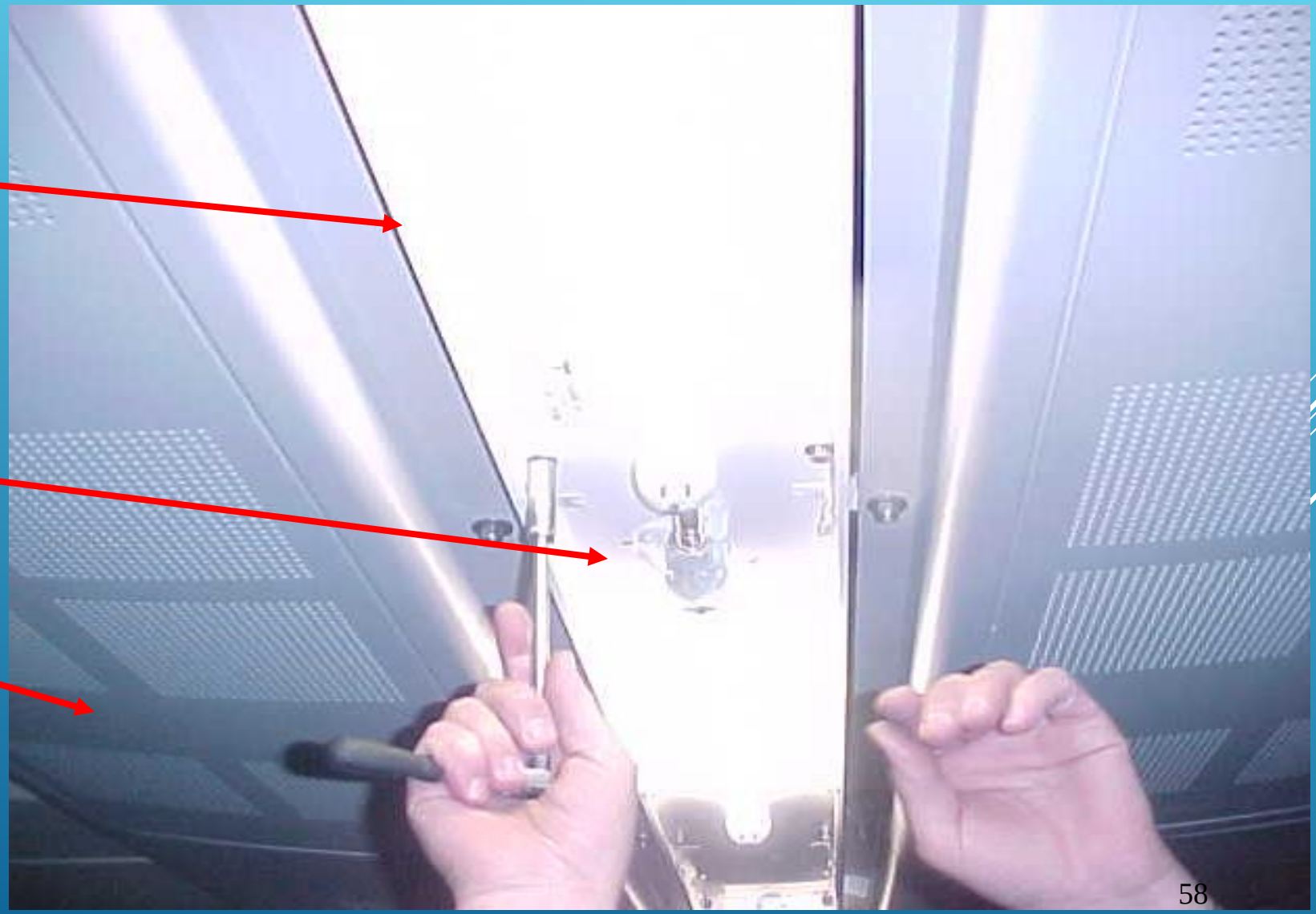

LIGHT FITTINGS

COMPARTMENT LIGHT INSIDE VIEW

CENTRE RIBBON FITTINGS

INCANDESCENT LAMP

AC DUCT PANNELING

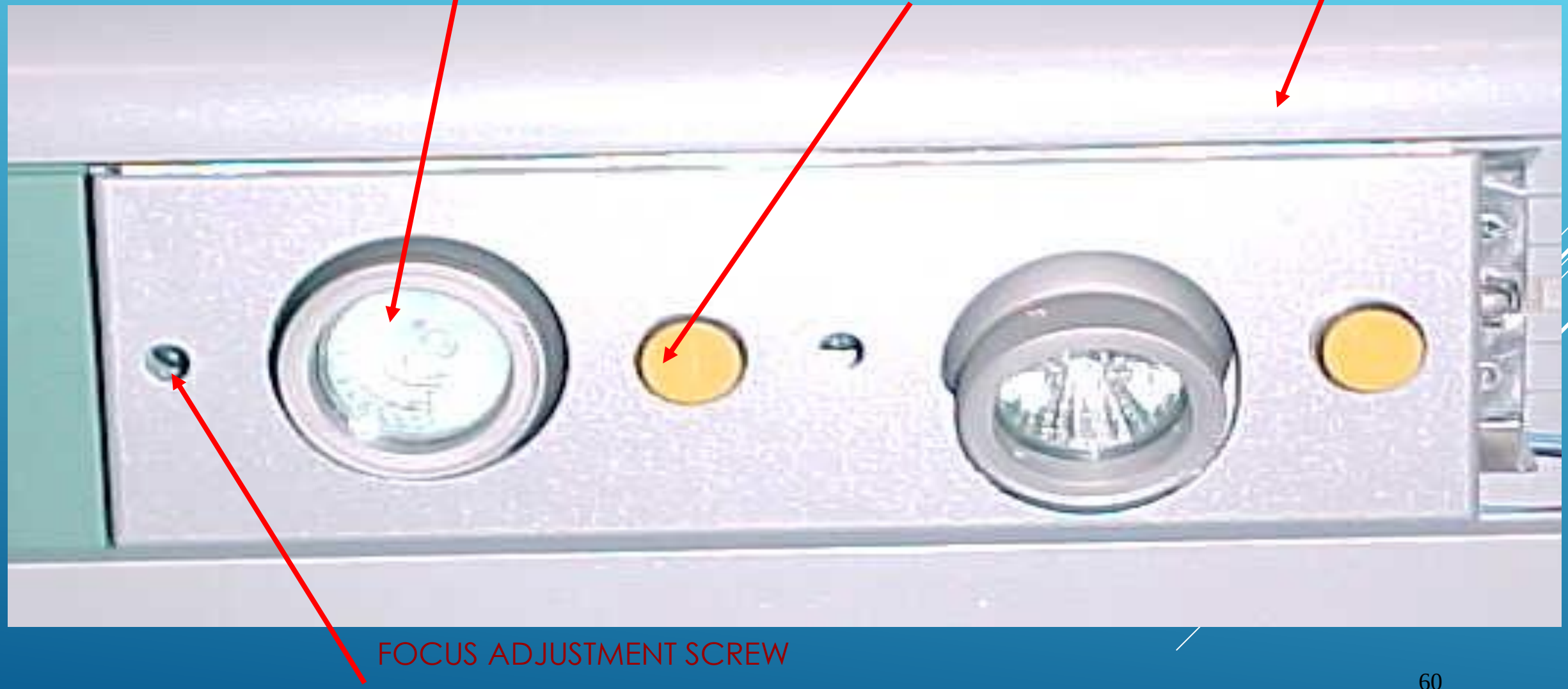


DIFFUSER PROFILE WITH SELF CLAMPING ARRGT.

POLYCARBONATEDIFFUSER

ANTIDUST AND VIBRATION FOAM INSERTS

READING LIGHTS



THANKS