

Page 1 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

ENCLOSURE: DRG.NO. CLW/ES/3/SK-1/0195/J K

TECHNICAL SPECIFICATION FOR
CONTROL CUBICLE-2 (SB-2)
FOR 3-PHASE ELECTRIC LOCOMOTIVES.

Specification No : CLW/ES/3/0195 ALT. J K

ISSUE DATE: 29.04.2010

ISSUED BY :

**DY.CHIEF ELECTRICAL ENGINEER/D-II
CHITTARANJAN LOCOMOTIVE WORKS
P.O.CHITTARANJAN – 713331
DIST.BARDHAMAN (WEST), WEST BENGAL (INDIA)**

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 2 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

ALTERATION RECORD SHEET

ALT.NO.	PAGE NO.	DESCRIPTION	INITIAL
A		(i) Drg. Of Page No.4 has been deleted. (ii) Modified Drg of Page No.22 has been added. (iii) Sheet No.18 to 21 has been added.	Sd/-
B	Page No. 22, 18	Contactor for wheel flange lubrication of Sch.Position 300.3/1 & 300.3/2 has been deleted in sketch no.CLW/ES/3/SK-1/0195.	Sd/-
C	Page No. 21	Modification sheet no.RDSO/2009/EL/MS/0375 (Rev.0) dated.27.03.09 has been included. Clause No.13.1 of Page No.16 has been added.	Sd/-
D	Page No. 20, 22	One no. 6 Amps MCB has been provided for speed sensor monitoring as per letter no.C-D&D/ T/07 dated.01.10.10.	Sd/-
E	Page No. 20	Specn.no. for Bare Panel has been corrected and sources are modified at sheet.20	Sd/-
F	Page No. 18	OEM/ Part-I source is replaced by CLW Approved Sources (the term only)	Sd/-
G	Page No. 5, 7, 8, 10, 12, 18, 19 & 20.	Schematic position and quantity has been modified. Contactor subset and MCB for speed sensor monitoring have been deleted.	Sd/-
H	Page No. 21	Clause No.20 (Page No-21) has been added for modifications required in Push Pull Operation of WAP-5 & WAP-7 locomotives.	Sd/-
I	Page No. 21	(i) MS-413, paralleling of Interlock of Aux Contactor of 3 Ph loco. (ii) Modification in Blocking Diode to improve the reliability of 3 Phase Locos vide RDSO/ 2017/ EL/ MS/ 0467 dated.07.12.2017.	Sd/-
J	Page No. 12, 13, 17	Sub-D Connectors along with related cabling are to be deleted from the scope of supply as per Dy.CEE/D&D-I letter no.C-D&D/T/42 dtd.14.06.21.	Sd/-
K	5, 6, 7, 8, 9, 10, 11, 15, 16 & 17	i) 01 no. of Blocking Diode 12 Amps of Conventional Loco spec. no. CLW/ES/D-2 has been provided for implementation of RDSO MS 488 in WAP-7 & 5 Loco. ii) Modification sheet no. RDSO/2022/EL/MS/0490 (Rev.0) dated.09.09.22 has been included. iii) Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM and type no. has been deleted. iv) Complete Continuity test as per cable cutting chart to be done 100 % during routine test. Remark added for Crimping test marked as *. v) Final Cable cutting chart enclosed as Annexure-II. The references are for guidance only. vi) KAVACH has been incorporated in the cable cutting chart vide RDSO letter no. EL/0.1.3/3 dated 26.09.2023. vii) For implementation of RDSO MS 496 for TMDDS extra materials added.	

Note:- Specifications have been digitized and all alterations have been incorporated.

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

INDEX

Sl.No.	Description	Page No.
1.	INTRODUCTION	4 of 17
2.	CLIMATIC AND ENVIRONMENTAL CONDITIONS OF LOCO	6 of 17
3.	LIST OF ELECTRICAL COMPONENTS	6 to 11 of 17
4.	STANDARDS	11 of 17
5.	WIRING AND CABLING	12 of 17
6.	SHEET METAL STRUCTURE	12 of 17
7.	ENVIRONMENTAL AND OPERATIONAL CONDITIONS	12 of 17
7.1	Environmental conditions	
7.2	Operational conditions	
7.3	Reliability	
8.	TEST CONDITIONS	13 of 17
9.	STANDARDS / UNITS	14 of 17
10.	SCOPE OF SUPPLY	14 of 17
11.	INSPECTION	14 of 17
12.	SUBMISSION OF TENDER QUOTATION	14 of 17
13.	TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER	14 of 17
14	DETAILS OF SUB-COMPONENTS	15 to 16 of 17
15	TESTS	16 of 17
16	IMPORTANT INFORMATION	17 of 17
17	ANNEXURE	17 of 17

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 4 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

1. INTRODUCTION

Control cubicle-2 (i.e.SB-2) is a panel of contactors, switches, circuit breakers etc used to control various functions of the locomotive. SB2 cubicle provides interface to both locomotive devices like Pantograph, Traction converter, Auxiliary converter, and Pneumatic Panel etc. as well as to the control electronics. The external interface is provided on Circular SICEM Connectors for easy maintenance. This specification contains the technical details of the cubicle structure, equipment mounted within, wiring procedure, environmental specification & acceptance test criteria. SB2 is assembled as per the drawing enclosed with this document, Drg.No: 3EHP 130216 R0002.

1. Circuit breaker - Output battery charger (110)
2. Circuit breaker - Control circuit locomotive (112.1)
3. Circuit breaker - Commissioning 1 (127.81)
4. Circuit breaker - Vigilance control (127.15)
5. Circuit breaker - Pneumatic panel (127.7)
6. Circuit breaker- Commissioning 2 (127.82), 127.24
7. Circuit breaker- Auxiliary compressor (48.1)
8. Circuit breaker- Driver's cab (127.3/2)
9. Circuit breaker- Power supply 24V/48V (127.91/2)
10. Circuit breaker- Marker lights (310.7/1)
11. Circuit breaker- Lighting front (310.1/2)
12. Circuit breaker- Lighting machine room (310.4)
13. Circuit breaker- Electronics traction converter (127.1/2)
14. Circuit breaker- Power supply Gate Units (127.11/2)
15. Circuit breaker- Monitoring (127.2/2)
16. Thermostat – Control electronics (211.1/2) and the cable connecting the thermostat to the electronics **(Not in the tenderer's scope of supply)**
17. Circuit breaker- Electronics auxiliary converter (127.22/2)
18. Circuit breaker- Electronics auxiliary converter (127.22/3)
19. Circuit breaker- Central electronics (127.9/3)
20. Circuit breaker- Central electronics (127.9/4)
21. Circuit breaker- MEMOTEL speedometer (127.92)
22. Fire detection equipment (212)
23. Snubber circuit to Auxiliary contactor – Pantograph (130.1A)
24. Snubber circuit to Relay- Temperature control Electronics (211.A)
25. Snubber circuit to item 126.7 (126.7A/2)
26. Contactor- Power supply driver's cab (126.7/2)
27. Safety relay- Control electronics ' ON' (126.6)
28. Relay- Temperature control electronics (211)
29. Auxiliary contactor- Pantograph (130.1)
30. DC/DC converter (118.5/2)
31. DC/DC converter (118.4/2)
32. Rack – Central electronics (CEL2) (412) **(Not in the tenderer's scope of supply)**
33. Contactor- Auxiliary compressor (48.2)
34. Blocking diodes (123/6)
35. Blocking diodes (123/4)
36. Blocking diodes (123/2)
37. Blocking diodes (123/8), (123/9)
38. Blocking diodes – Illumination test (123.1/2)

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

39. Mechanical structure complete with

- Connectors
- Wiring and other accessories
- Terminal Blocks
- Fastener and fixing arrangement for attaching the Thermostat (211.1/2) **although the thermostat along with the cable is not in the tenderer's scope of supply.**
- Fastener and fixing arrangement for attaching the casing containing the Central electronics (CEL2) (412) Rack to the SB2 equipment cubicle, **although the Central electronics (CEL2) (412) is not in the tenderer's scope of supply.**
- Fastener and fixing clamps etc. for mounting the total cubicle (along with Central electronics (CEL2) (412) Rack) inside the locomotive.

40. Aux.Contacts (48.1)

41. Contactor for Head light (338)

2. CLIMATIC AND ENVIRONMENTAL CONDITIONS OF LOCO

Maximum atmospheric temperature	Under Sun : + 70°C In Shade : + 50°C
Humidity	100% saturation during rainy season.
Reference site conditions	The maximum machine room temperature can be up to 70 °C and the equipment provided in the cubicle must function even at this temperature.
Rainfall	Very heavy in certain areas.
Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas.
Coastal area	Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.
Vibration	The equipment , sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC 77 unless otherwise prescribed.

3. LIST OF ELECTRICAL COMPONENTS

The following electrical components which are mounted in the cubicle, shall be supplied by the panel supplier. ~~The OEM of components are also mentioned.~~ **Only the makes specified in CLW approved vendor directory shall be accepted. The detailed CLW specification of each of these items would be passed on to the successful tenderers.**

Circuit Breaker DC

Scheme Position : 48.1, 310.4
Required Number : 2
Identification : HBTB585555R1033

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 6 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

Details :

Manufacturer : CMC *As per CLW approved Vendor Directory on UVAM*
Type : CMC QX1-DH-8538-16A
Nominal Data : 16 A-250 VDC-1 POLE

Aux. Contacts

Scheme Position : 48.1
Required Number : 1
Identification : HBTB5855557R1200

Details :

Manufacturer : CMC *As per CLW approved Vendor Directory on UVAM*
Type : CMC QHK-SS
Nominal Data : AUX.CONTACT-2NO

Contactor

Scheme Position : 48.2, 338.2
Required Number : 2
Identification : HBTB585402R0821

Details :

Manufacturer : SCHALTBAU *As per CLW approved Vendor Directory on UVAM*
Type : SBM-S163C1DT/110V
Nominal Data : 110 VDC-1345 OHM-NO

Circuit Breaker

Scheme Position : 110, 112.1
Required Number : 2
Identification : HBTB585501R4371

Details :

Manufacturer : MITSUBISHI *As per CLW approved Vendor Directory on UVAM*
Type : TRE-NF100-SS
Nominal Data : 75 A-250 VDC-3 POLES

DC/DC Converter

Scheme Position : 118.4
Required Number : 1
Identification : 3EHP590001R0100

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 7 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

Details :

Manufacturer : MELCHER *As per CLW approved Vendor Directory on UVAM*
 Type : MEC-PSB-483-9IR-B02
 Nominal Data : 58...144 VDC-3 A-48 VDC

DC/DC Converter

Scheme Position : 118.5
 Required Number : 1
 Identification : 3EHP590001R0090

Details :

Manufacturer : MELCHER *As per CLW approved Vendor Directory on UVAM*
 Type : MEC-PSB-243-9IR-B02
 Nominal Data : 31...144 VDC-3 A-24 VDC

Diode Block-5

Scheme Position : 123
 Required Number : 5
 Identification : HBTB585480R0001

Details :

Manufacturer : B+Z *As per CLW approved Vendor Directory on UVAM*
 Type : ABB-DIBLO-5
 Nominal Data : 1.5 A-1600 V-5 DIODE

Socket

Scheme Position : 123, 123.1
 Required Number : 5
 Identification : HBT415175P0001

Details :

Manufacturer : ELESTA *As per CLW approved Vendor Directory on UVAM*
 Type : GRI-HYTREL-4056
 Nominal Data : 14 Poles-6 A-240 VAC

Fixation

Scheme Position : 123, 123.1
 Required Number : 5
 Identification : HBT415177P0001

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 8 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

Details :

Manufacturer : ELESTA *As per CLW approved Vendor Directory on UVAM*
Type : ELE-X12-CR-NH177
Nominal Data : 76 MM HIGH-82 MM BR

Contact 1.0 mm²

Scheme Position : 123, 123.1
Required Number : 70
Identification : HBT415176P0001

Details :

Manufacturer : ELESTA *As per CLW approved Vendor Directory on UVAM*
Type : GRIMS-58
Nominal Data : 1.0 MM² 0 GROOVE

Diode Block

Scheme Position : 123.1
Required Number : 1
Identification : HBTB585480R0003

Details :

Manufacturer : B+Z *As per CLW approved Vendor Directory on UVAM*
Type : ABB-DIBLO-8GA
Nominal Data : 0.3 A-1400 V-8 DIODE

Relay

Scheme Position : 126.6, 211
Required Number : 2
Identification : 3EHP585807P1207

Details :

Manufacturer : TELEMECANIQUE *As per CLW approved Vendor Directory on UVAM*
Type : TEL-CA3-DN-22FW
Nominal Data : 10 A-600 VDC-110 VDC

Accessories Relay

Scheme Position : 126.6, 126.7
Required Number : 2
Identification : 3EHP585771R0006

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 9 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
--------------	---	----------

Details :

Manufacturer : TELEMECANIQUE *As per CLW approved Vendor Directory on UVAM*
Type : TEL-LA1-DC-22
Nominal Data : 2NO, 2NC

Relay

Scheme Position : 126.7
Required Number : 1
Identification : HBTB585683R4227

Details :

Manufacturer : TELEMECANIQUE *As per CLW approved Vendor Directory on UVAM*
Type : TEL-LP1-D12008FW
Nominal Data : 12A/ 25A-750V-4 POLES

Snubber Circuit

Scheme Position : 126.7A, 130.1A, 211A
Required Number : 3
Identification : 3EHW470024R0005

Details :

Manufacturer : ABB *As per CLW approved Vendor Directory on UVAM*
Type : ABB-DSA1/1N5654A
Nominal Data : 110/120 VDC

Circuit Breaker DC

Scheme Position : 127.1, 127.15, 127.2, 127.81, 127.24, 127.82, 127.9, 127.91,
127.92, 310.1, 310.7
Required Number : 12
Identification : HBTB585555R1013

Details :

Manufacturer : CMC *As per CLW approved Vendor Directory on UVAM*
Type : CMC-QX1-DH-9538-6A
Nominal Data : 6 A-250 VDC-1 POLE

Circuit Breaker DC

Scheme Position : 127.11
Required Number : 1

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 10 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
----------------------	---	----------------------------

Identification : HBTB585555R1043

Details :

Manufacturer : ~~CMC~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~CMC-QX1-DH-8538-20A~~
Nominal Data : 20 A-250 VDC-1 POLE

Circuit Breaker DC

Scheme Position : 127.3, 127.22, 127.7, 129.1 (WAP-7 only)
Required Number : 4
Identification : HBTB585555R1023

Details :

Manufacturer : ~~CMC~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~CMC-QX1-DH-9538-10A~~
Nominal Data : 10 A-250 VDC-1 POLE

Contactor

Scheme Position : 130.1
Required Number : 1
Identification : HBTB585683R1127

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~TEL-LP1-D09-10FW~~
Nominal Data : 9A/ 25A--750V-3 POLES

Thermostat

Scheme Position : 211.1
Required Number : 1
Identification : 3EHP590484R0003

Details :

Manufacturer : ~~TRAFAG~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~TRF-414.2620~~
Nominal Data : 70 DEGREE CELCIUS

Detection Equipment

Scheme Position : 212
Required Number : 1
Identification : 3EHP590451R0002

Details :

Manufacturer : ~~CERBERUS~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~AD1-L~~
Nominal Data : 24 VDC-0.23 A

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 11 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
---------------	---	----------

Connector Subset

Scheme Position : 212A
 Required Number : 4
 Identification : HBTB316240R0025

Details :

Manufacturer : ~~GIMOTA~~ As per CLW approved Vendor Directory on UVAM
 Type : ~~GIM-D-SUB-25-P-TRAC~~
 Nominal Data : SZ 3-25 POLES

6 U Racks Inc. PCBS

Scheme Position : 412
 Required Number : 1
 Identification : 3EHL409257R0001

Details :

Manufacturer : ~~ADTRANZ INDIA/SWITZERLAND~~ As per CLW approved Vendor
 Directory on UVAM
 Type : ~~HV-B494~~

Blocking diode- VSHOG (For WAP-7 & 5 only) For RDSO MS 488

Manufacturer: As per latest UVAM VD of Conv. Loco.
 Required No. 01 No.
 Type: Train Parting
 Nominal data: Normal Voltage – 400 volt
 Peak inverse voltage – 1000 volt
 Normal Current - 12 amps

RDSO MS 496 (TMDDS) For WAP-7 & WAG-9 only

MCB 2 Pole, 2A DC - 01 No.
 VS Diode – 12 Amps – 01 no.
 Contactor/Relay (LCD-128 type) – 01 no

4. STANDARDS

IEC 60077 : Electrical Traction Equipment
 NF.F.16.101 : Rolling stock, Fire behavior, Materials Choosing
 NF.F.16.102 : Rolling stock, Fire behavior, Effects on electrical equipment
 3EHN600359 : Insulation Co-ordination
 3EHN600385 : Min. insulation distance for basis insulation within air
 IEC 60571 : Electronic equipment for traction rolling stock
 These standards will be available for study and reference at C-D&D/CLW

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

5. WIRING AND CABLING

1. The cables for wiring within the cubicle will be of RADOX CABLES (Electron Beam irradiated crosslinked Thin walled cables from M/s. HUBER & SUHNER, Germany) till some other type of cable is approved by CLW. The cables will be of fire retardant type
2. All connections will be terminated on terminal bars of approved design, provided for the purpose. The terminals and wire cable ends will be marked to facilitate correct connections.
3. Plugs and sockets and connectors will be used to connect pre-assembled units and to facilitate maintenance and ensure a better layout. The details of which will be passed on subsequently to the successful tenderer/s. But these details will be available for study and reference at C-D&D/CLW.
4. Cables for terminal connections will have only crimped joints.
5. The Cable size and cabling has to be according to CLW Documents which will be passed on subsequently to the successful tenderer/s.

6. SHEET METAL STRUCTURE

The cubicle is of detachable type and shall comply with the dimensions and tolerances specified in relevant part drawings documents which will be passed on subsequently to the successful tenderer/s but these details will be available for study and reference at C-D&D/CLW. The complete cubicle shall consist of a no. of panels secured to each other by Hex. Bolts/ screws, nuts, washers etc. made of stainless steel. The cubicle should be of sturdy construction so as not to vibrate loosely or excessively, when mounted in the machine room (The Fastener and the fixing clamps etc. for mounting the total cubicle along with the central electronics (CEL2) (412) Rack inside the locomotive has to be supplied by the tenderer).The dimensions and weight of the complete cubicle shall not be exceeded.

7. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The SB2 Cubicle shall be used under the following conditions:

7.1 Environmental Conditions

Environmental Condition within machine room :

Air Circulation	: Weak forced cooling
Operational temperature	: 0.....+65 °C
Environmental air	: salty, dusty
Air humidity	: Condensation possible

7.2 Operational conditions

Operational Time :

Daily approx	: 6 hours (approx 330 days per year)
Yearly approx	: 5,280 hours
Within 30 years approx.	: 158,400 hours

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 13 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
----------------------	---	-----------------

Environmental conditions:

Rated values for environmental temperature and air humidity according to 7.1 “Condition within machine room”.

7.3 Reliability

Operational Conditions	: according to 7.2
Availability Rate	: 98 %
Lifetime of the Loco	: min. 30 years (Maintenance, spare parts, life time)

8. TEST CONDITIONS

8.1 TYPE TESTING :

- a) Type test certificate of material and equipments used in the cubicle must be provided from an approved test house /supplier has to be procured during inspection and along with supplies.
- b) Certificate for fasteners used and their material to be produced and supplied along with supplies.
- c) Welding to be checked properly as per an approved test plan, which will be given to successful tenderer.
- d) Panel should be electrically tested after wiring as per relevant standards to be passed on to the successful tenderer.
- e) All electrical equipment's procured shall be tested at assembly stages. Acceptance Test certificates shall be produced for OEM components. For use of any make/type of equipments/components other than that specified prior approval of CLW is required. Such approval will be given only after a thorough type test and field validation.

8.2 ROUTINE TESTING

The Cubicle will be tested for the following routine tests :

1. Integrity and completeness.
2. Testing of inter-connections and functionality of different sub assemblies within the panel.
3. Suitable checking fixtures are to be made by successful tenderers for checking the dimensions of the complete assembled panels .Certificate for raw materials and fasteners to be provided.
4. Complete cubicle and electrical items will be tested as per relevant standards.

8.3 Details of Type & Routine test are given clause no. 15.

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 14 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
---------------	---	----------

9. STANDARDS /UNITS

Only international standards like IEC, ISO internal standards of ADTRANZ, Switzerland like BBC/ABB/Adtranz-Standards only are acceptable. Only the SI unit will be accepted.

10. SCOPE OF SUPPLY

One Control Cubicle 2 assembled as per the drawing no. 3EHP 130216 R0002, duly tested as per chapter 8 of this document.

11. INSPECTION

1. The Type/ Routine inspection will be carried out by authorized representative of Dy. CEE/Design.
2. The complete testing to be carried out as per clause 8 of this specification
3. The purchaser may carry out stage inspection during inspection of components, cabling or assly. stage of complete cubicle.

12. SUBMISSION OF TENDER QUOTATION

- 12.1 The tenderer shall give sufficient information to prove that his factory has adequate facilities and capacity to manufacture the complete panel to meet fully the technical requirement of the specification and quality of materials and workmanship.
- 12.2 Quotation shall not be considered complete unless all information is furnished and therefore liable to be rejected.

13. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER

- i) Type Test Reports
- ii) Routine test report along with each set
- iii) ~~Maintenance Manual~~
- iv) Detailed drawing

13.1 All individual components of the panel should be procured as per Annexure – I

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Annexure – 1 (SB-2)

14. Details of Sub-components

Sl. no.	Description	Specn. No.	Sch. Pos.	ABB Identification No.	Qty /Panel	Approved sources
i)	Circuit Breaker DC (Aux.Comp + lighting M/c Room)	CLW/ES/3/0037/B	48.1 310.4	HBTB585555R1033	2 Nos.	Sources are to be followed as per latest CLW approved vendor list published on UVAM.
ii)	Aux.Contacts	CLW/ES/3/0037/B	48.1	HBTB585555R1200	1 No.	
iii)	Contactor (Aux.Comp)	CLW/ES/3/0034/B	48.2	HBTB585402R0821	1 No.	
iv)	Circuit Breaker (Battery Charger, Battery)	CLW/ES/3/0050/B	110, 112.1	HBTB5855501R4371	2 Nos.	
v)	DC-DC Converter	CLW/ES/3/0054/A	118.4 118.5	3EHP590001R0100/ R0090	2 Nos.	
vi)	Diode Block – 5	CLW/ES/3/0055/B	123/2,4, 6,8	HBTB585480R0001	5 Nos.	
vii)	Diode Block	CLW/ES/3/0055/B	123.1	HBTB585480R0003	1 No.	
viii)	Wago Type Terminal Block	CLW/ES/3/0644/A				
ix)	Relay (Control Electronics, Temp.Cont. Electronics Safety)	CLW/ES/3/0066/A	126.6 211	3EHP585807P1207	2 Nos.	
x)	Accessories Relay (Contactor Power Supply Control Electronics Cab)		126.6 126.7	3EHP585771R0006	2 Nos.	
xi)	Relay (Contactor Power Supply Cab)	CLW/ES/3/0064/A	126.7	HBTB585683R4227	1 No.	
xii)	Snubber Circuit (Contactor Power Supply Cab, EP Valve Pantograph, Relay Temp.Control Electronics)	CLW/ES/3/0067/A	126.7A 211A 130.1A	3EHW470024R0005	3 Nos.	
xiii)	DC Circuit Breaker (Traction Converter, Vigilance Control, Monitoring.Aux. Converter, Pneumatic Panel, Commissioning-1,2, Control Electronics, 24/48V Power Supply, Speedometer, Lighting Front, Marker Light)	CLW/ES/3/0037/B	127.1, 127.15, 127.2, 127.81, 127.82, 127.9, 127.91, 127.92,3 10.1, 310.7, 128.1, 127.24	HBTB585555R1013	12 Nos.	

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

xiv)	DC Circuit Breaker (Power Supply Gate Unit)	CLW/ES/3/0037/B	127.11	HBTB585555R1043	1 No.	
xv)	DC Circuit Breaker (Driver's Cab)	CLW/ES/3/0037/B	127.3, 127.22, 127.7, 129.1 (WAP-7 only)	HBTB585555R1023	4 Nos.	
xvi)	Aux. Contactor (Pantograph Contactor)	CLW/ES/3/0040/A	130.1	HBTB585683R1127	1 No.	
xvii)	Fire Detection Equipment	CLW/ES/3/0057	212	3EHP590451R0002	1 No.	
xviii)	Contactor for Head Light (Contactor Ty.6)	CLW/ES/3/0034/B	338	HBTB585402R0821	1 No.	
xix)	Bare SB-2 Panel	CLW/ES/3/098/Alt.10		3EHP130215	1 No.	
xx)	Blocking diode -VSHOG (WAP-7 & 5 only) and VS Diode for TMDDS (WAP-7 & WAG-9 only) for implementation of RDSO MS 488 & 496)	CLW/ES/D-2			2 Nos.	
xxi)	MCB 2 pole 2 A DC (RDSO MS 496)	CLW/ES/3/0037			1 No.	
xxii)	Contactor/Relay (LCD-128 type) (RDSO MS 496)	CLW/ES/3/0012			1 No	

15. Tests

SI No.	Description	Type Test	Routine Test
(i)	Dimensional Checking	Yes	Yes
(ii)	Verification of Electrical & Mechanical equipments and its test reports	Yes	Yes
(iii)	Complete Continuity test as per cable cutting chart	Yes	Yes (100%)
(iv)	Fire –retardant test of all insulating material	Yes	No
(v)	Crimping test: - To check whether proper crimping tool with required pressure is applied so that there is no void in the cross section of the crimped cable	Yes*	No Yes*
(vi)	Vibration Test (Optional)	Yes	No

* Sample cable crimped by each tool of each size are to be sealed in front of the inspector which shall be tested as per EN 50343 for crimping quality. The issued certificate shall be valid for inspection crimping during 3 Months and same process is to be repeated again for next 3 Months.

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

Page 17 of 17	Specification No. CLW/ES/3/0195 CONTROL CUBICLE-2 (SB-2)	ALT. J K
---------------	---	----------

16. Important Information :-

16.1 All the insulating material should have Fire Retardant Property as per CLW individual specn.

16.2 The Cable for wiring of SB-2 Panel will be with Electron beam irradiated cable only. The cable size and cabling have to be according to the CLW document which will be passed on subsequently to the successful tenders.

16.3 The Cable and terminal connections will have only proper crimping joints.

16.4 *All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW at firms own cost.*

16.5 *Final Cable cutting chart has been enclosed as Annexure-II. RDSO's Modification Sheet should be implemented by panel manufacturer time to time as required for.*

17. Annexure :

- (i) All specifications of components, sub components.
- (ii) All documents referred for Cabling are 3EHP431441, 3EHP130216 & 3EHP130216R0200.
- (iii) All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW at firms own cost.
- (iv) Document of cable list of Control Cubicle - 2 (SB- 2) – 3EHP431441 along with MR451 A. Identification no .of Control Cubicle-2 (SB-2) 3EHP130216.
- (v) Identification no. of Cable Looms 3EHP130216R0200.

Note: The above mentioned references are for guidance only.

18. Modification Sheet No. RDSO/ 2009/ EL/ MS/ 0375 (Rev.0) Dated.27.03.09 has been included.

19. Modifications for push Pull operation in WAP-5 & WAP-7 locomotives to be incorporated in SB-2. As per scheme issued vide letter no. C-D&D/ T/ 47 dtd.8.8.19.

20. (i) MS-413, paralleling of interlock of Aux. Contactor of 3 Ph. Loco.

(ii) Modification in Blocking Diode to improve the reliability of 3Phase Loco vide RDSO/ 2017/ EL/ MS/ 0467 dated.07.02.2017.

21. 01 no. of Blocking Diode 12 Amps of Conventional Loco spec. no. CLW/ES/D-2 has been provided for implementation of RDSO MS 488 in WAP-7 & 5 Loco.

22. Modification sheet no. RDSO/2022/EL/MS/0490 (Rev.0) dated.09.09.22 has been included.

23. KAVACH has been incorporated in the cable cutting chart vide RDSO letter no. EL/0.1.3/3 dated 26.09.2023.

24. Modification sheet no. RDSO/2018/EL/MS/0475 (Rev. 1) dated 26.10.23 has been implemented in WAG-9 Locomotive. Previous RDSO modification RDSO/2018/EL/MS/0475 Rev. '0' dated 12.12.2018 remains valid for WAP-5 & 7 only.

25. Modification sheet no. RDSO/2023/EL/MS/0496 (Rev. 0) dated 01.12.23 has been implemented in WAG-9 & WAP-7 Locomotives.

Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

ANNEXURE-II**Cable Connection chart of Control Cubicle SB2 for WAP7/WAG9/WAP5**

*** Sub-D Connectors along with related Cabling are deleted from the scope of supply as per Dy.CEE/D&D letter no. C-D&D /T/42 dated.14.06.2021.**

35 PIN FOR WAG 9 WAP-5 AND 61 PIN FOR WAP 7 / 12 GRADE XK77V: 01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 77V:01-1	XB 77S-3
2	2.5	2050	XK 77V:01-2	XB 77S-2
3	2.5	2050	XK 77V:01-3	XB 77S-2
4	2.5	2050	XK 77V:01-4	XB 77S-2
5	1.5	2063	XK 77V:01-5	XK 77A:01-7
6	1.5	2064	XK 77V:01-6	XF 77S:01-1
7	1.5	2067	XK 77V:01-7	XF 77S:01-3
7a	1.5	2067	XK 77V:01-7	XK 77A:01-8
8	2.5	2069	XK 77V:01-8	XF 77S:01-4
9	2.5	2094	XK 77V:01-9	XB 77S-15
10	2.5	2094	XK 77V:01-10	XB 77S-15
11	2.5	2094	XK 77V:01-11	XB 77S-15
12	2.5	2094	XK 77V:01-12	XB 77S-15
13	2.5	2095	XK 77V:01-13	127.3/2-1
14	2.5	2095	XK 77V:01-14	S:2095.2-Q1
15	2.5	2096	XK 77V:01-15	127.11/2-Q1
16	2.5	2096	XK 77V:01-16	S:2096.2-Q1
17	1.5	2300	XK 77V:01-17	XK 77A:01-10
18	1.5	2310	XK 77V:01-18	XK 77A:01-11
19	1.5	2312	XK 77V:01-19	XF 77S:01-9
20	1.5	2314	XK 77V:01-20	XF 77S:01-10
21	1.5	2319	XK 77V:01-21	XF 77S:01-12
22	2.5	2320	XK 77V:01-22	XK 77R-4
23	1.5	2325	XK 77V:01-23	XK 77R-1
24	1.5	2326	XK 77V:01-24	126.6-76
25	1.5	2327	XK 77V:01-25	XF 77S:01-13
26	1.5	2501	XK 77V:01-26	XF 77S:01-14
27	1.5	2510	XK 77V:01-27	211.1/2-Q2
28	1.5	2510	XK 77V:01-27	211.A-2+
29	1.5	2511	XK 77V:01-28	126.6-43
30	1.5	2515	XK 77V:01-29	211-14
31	1.5	2517	XK 77V:01-30	211-44
32	1.5	2808	XK 77V:01-31	XK 77B-25
33	1.5	2809	XK 77V:01-32	XK 77B-12
34	1.5	2817	XK 77V:01-33	XK 77B-22
35	1.5	2819	XK 77V:01-34	XK 77B-26
36	2.5	2864	XK77V:01-35	XK77R-17
<u>ADDITIONAL FOR WAP7 ONLY</u>				

37	1.5	2331AR	XK 77V:01-36	XF 77S:03-50
38	1.5	2050AR	XK 77V:01-37	XF 77S:03-62
39	1.5	2111AR	XK 77V:01-38	XF 77S:02-48
40	1.5	2500AR	XK 77V:01-39	XF 77S:03-48
41	1.5	2503AR	XK 77V:01-40	XF 77S:03-49
42	1.5	4242AR	XK 77V:01-41	XF 77S:02-47
43	1.5	5672AR	XK 77V:01-42	XF 77S:02-50
44	1.5	5671AR	XK 77V:01-43	XF 77S:02-49
45	1.5	2069A	XK 77V:01-45	130.1-21
46	1.5	2069B	XK 77V:01-46	130.1-22
47	1.5	3048	XK 77V:01-47	XF 77S:01-30

61 PIN / 16 GRADE XK77V: 02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2866	XK 77V:02-1	XK 77R-18
2	2.5	2867	XK 77V:02-2	XK 77R-19
3	1.5	2874	XK 77V:02-3	XK 77B-31
4	1.5	2894	XK 77V:02-4	XK 77B-21
5	1.5	3000	XK 77V:02-5	XF 77S:01-16
6	1.5	3001	XK 77V:02-6	XK 77A:01-12
7	1.5	3042	XK 77V:02-7	XK 77D-10
8	2.5	3054	XK 77V:02-8	XF 77S:01-35
9	1.5	3097	XK 77V:02-9	XK 77X-14
10	1.5	3530	XK 77V:02-10	310.7/2
11	1.5	4200	XK 77V:02-11	127.15-2
12	1.5	4201	XK 77V:02-12	XF 77S:02-7
13	1.5	4218	XK 77V:02-13	XF 77S:02-27
14	1.5	4234	XK 77V:02-14	XF 77S:02-35
15	1.5	4235	XK 77V:02-15	XF 77S:02-36
16	1.5	4236	XK 77V:02-16	XF 77S:02-37
17	1.5	4238	XK 77V:02-17	XF 77S:02-38
18	1.5	4243	XK 77V:02-18	XF 77S:02-39
19	1.5	5091	XK 77V:02-19	XK 77B-33
20	2.5	5092	XK 77V:02-20	XK 77B-23
21	1.5	5209	XK 77V:02-21	XK 77R-12
22	1.5	5210	XK 77V:02-22	XK 77R-13
23	2.5	2098A	XK 77V:02-23	XK 77B-8
24	1.5	2098B	XK 77V:02-24	XF 77S:03-4
25	1.5	2099A	XK 77V:02-25	XF 77S:03-5
26	1.5	2099B	XK 77V:02-26	XF 77S:03-6
27	2.5	2111B	XK 77V:02-27	XF 77S:03-16
28	1.5	2331B	XK 77V:02-28	XK 77A:01-22
29	1.5	2500B	XK 77V:02-29	XF 77S:03-20
30	1.5	2503A	XK 77V:02-30	XF 77S:03-21
31	1.5	2503B	XK 77V:02-31	XK 77A:01-26
32	1.5	2504A	XK 77V:02-32	126.7/2-76
33	1.5	2504B	XK 77V:02-33	126.7A/2-2+
34	1.5	2514A	XK 77V:02-34	XF 77S:03-22

35	1.5	2516A	XK 77V:02-35	XK 77Z-18
36	2.5	2816B	XK 77V:02-36	XK 77R-20
37	2.5	2862B	XK 77V:02-37	XK 77R-21
38	2.5	2863B	XK 77V:02-38	XK 77R-22
39	2.5	3046A	XK 77V:02-39	XK 77D-20
40	2.5	3064A	XK 77V:02-40	XK 77P:01-12
41	2.5	3065A	XK 77V:02-41	XK 77P:01-8
42	2.5	3066A	XK 77V:02-42	XK 77P:01-5
43	2.5	3067A	XK 77V:02-43	XK 77P:01-14
44	1.5	3549A	XK 77V:02-44	XF 77S:01- 46
45	1.5	3549B	XK 77V:02-45	XF 77S:03-28
46	2.5	5108A	XK 77V:02-46	XK 77R-16
47	2.5	5108B	XK 77V:02-47	XK 77R-14
<u>ADDITIONAL FOR WAP7 ONLY</u>				
48	1.5	UH 06	XK 77V:02-48	XF 77S:02-52
49	1.5	UH 07	XK 77V:02-49	XF 77S:02-53
50	1.5	UH 08	XK 77V:02-50	XF 77S:02-54
51	1.5	UH 09	XK 77V:02-51	XF 77S:02-55
52	1.5	UH 10	XK 77V:02-52	XF 77S:02-56
53	1.5	UH 11	XK 77V:02-53	XF 77S:03-51
54	1.5	UH 12	XK 77V:02-54	XF 77S:03-52
55	1.5	2806	XK 77V:02-55	XF 77S:03-53
56	1.5	2860	XK 77V:02-56	XF 77S:03-54
57	1.5	HL 01	XK 77V:02-57	XF 77S:01-53
58	1.5	HL 02	XK 77V:02-58	XF 77S:01-54

35 PIN / 12 GRADE XK77D

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 77D-1	XB 77S-10
2	1.5	2050	XK 77D-2	XB 77S-5
3	1.5	2050	XK 77D-3	XB 77S-5
4	1.5	2050	XK 77D-4	128.1/2-2
5	1.5	2050	XK 77D-5	XB 77S-4
6	1.5	2050	XK 77D-6	XB 77S-4
7	1.5	3027	XK 77D-7	XF 77S:01-20
8	1.5	3036	XK 77D-8	XF 77S:01-23
9	1.5	3038	XK 77D-9	XF 77S:01-24
10	1.5	3044	XK 77D-11	XF 77S:01-28
11	1.5	3052	XK 77D-12	XF 77S:01-33
12	1.5	3053	XK 77D-13	XF 77S:01-34
13	2.5	3101	XK 77D-14	XK 77D-15
14	2.5	3101	XK 77D-14	XF 77S:01-40
15	2.5	3101	XK 77D-15	XK 77D-16
16	2.5	3101	XK 77D-17	XK 77D-18
17	2.5	3101	XK 77D-17	XF 77S:01-40
18	2.5	3101	XK 77D-19	128.1/2-4

19	1.5	3046B	XK 77D-21	XF 77S:01-1/10
<u>ADDITIONAL FOR WAP7 ONLY</u>				
20	1.5	3035A	XK 77D-35	XK 77V:03-22 & XK77D-24

35 PIN / 12 GRADE XK77B

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2876	XK 77B-1	XK 77V:03-12
2	1.5	2880A	XK 77B-3	XK 77H-33
3	1.5	2880B	XK 77B-4	XK 77H-34
4	2.5	2050	XK 77B-5	XB 77S-6
5	2.5	5093	XK 77B-6	XK 77B-11
6	1.5	5093	XK 77B-6	127.22/3-2
7	2.5	2050	XK 77B-7	XB 77S-6
8	2.5	2050	XK 77B-9	XB 77S-6
9	2.5	2098A	XK 77B-10	XF 77S:03-3
10	2.5	5093	XK 77B-11	XK 77B-6
11	1.5	5094	XK 77B-16	XF 77S:02-43
12	2.5	5092	XK 77B-23	XK 77B-29
13	2.5	2050	XK 77B-24	XB 77S-6
14	2.5	5092	XK 77B-29	XK 77B-23
15	1.5	5092	XK 77B-29	127.22/2-2
16	1.5	2050	XK 77B-32	XB 77S-5

35 PIN / 12 GRADE XK77H

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 77H-1	XB 77S-4
2	1.5	2858	XK 77H-2	XF 77S:01-15
3	1.5	2801B	XK 77H-3	127.2/2-2
4	1.5	2850B	XK 77H-4	XF 77S:01-1/1
5	0.5	2851B	XK 77H-5	XF 77S:01-1/2
6	0.5	2852B	XK 77H-6	XF 77S:01-1/3
7	0.5	2853B	XK 77H-7	XF 77S:01-1/4
8	0.5	2855B	XK 77H-8	XF 77S:01-1/5
9	0.5	2856B	XK 77H-9	XF 77S:01-1/6
10	0.5	2857B	XK 77H-10	XF 77S:01-1/7
11	1.5	3037B	XK 77H-11	XF 77S:03-27
12	0.5	2840B	XK 77H-26	XF 77S:01-1/8
13	0.5	2897	XK 77H-28	XF 77S:01-1/9
14	1.5	5094	XK 77H-29	XF 77S:02-42
15	1.5	5094	XK 77H-30	XF 77S:02-42
16	1.5	2877A	XK 77H-31	XK 77V:03-14
17	1.5	2877B	XK 77H-32	XK 77V:03-13
18	1.5	5092	XK 77H-14	127.22/2-2

19	1.5	5093	XK 77H-15	127.22/3-2
----	-----	------	-----------	------------

35 PIN / 12 GRADE XK77R

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2098B	XK 77R-2	XK77S:03-3
2	2.5	2340	XK 77R-3	XK77R-5
3	1.5	2320	XK 77R-4	126.6-13
5	2.5	2340	XK 77R-5	XK77R-3
6	2.5	2340	XK 77R-5	XK77V:03-6
7	2.5	2601B	XK 77R-6	XK77R-7
8	2.5	2601B	XK 77R-6	127.11/2-2
9	2.5	2601B	XK 77R-7	XK77R-6
10	2.5	2050	XK 77R-8	XB77S-3
11	2.5	2050	XK 77R-9	XB77S-3
12	2.5	5101B	XK 77R-10	XK77V:03-9
13	2.5	5101B	XK 77R-10	127.1/2-2
14	2.5	2050	XK 77R-11	XB77S-3
15	2.5	5101A	XK 77R-15	XK77V:03-10

35 PIN / 12 GRADE XK77A:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4203	XK77A:01-1	XF77S:02-8
2	1.5	2309B	XK77A:01-2	XF77S:03-18
3	1.5	2064	XK77A:01-3	XF77S:01-1
4	1.5	3000	XK77A:01-4	XF77S:01-16
5	2.5	2050	XK77A:01-5	XB77S-7
6	2.5	2050	XK77A:01-6	XB77S-7
7	1.5	2067	XK77A:01-8	XF77S:01-3
8	1.5	2069	XK77A:01-9	XF77S:01-4
9	2.5	3054	XK77A:01-13	XF77S:01-35
10	1.5	3530	XK77A:01-14	310.7-2
11	1.5	4218	XK77A:01-15	XF77S:02-27
12	1.5	4234	XK77A:01-16	XF77S:02-35
13	1.5	4235	XK77A:01-17	XF77S:02-36
14	1.5	2097B	XK77A:01-18	XF77S:03-1
15	1.5	2097B	XK77A:01-18	126.7/2-53
16	1.5	2099B	XK77A:01-19	XF77S:03-6
17	2.5	2111B	XK77A:01-20	XF77S:03-17
18	2.5	2111B	XK77A:01-20	126.7/2-2
19	1.5	2313B	XK77A:01-21	XF77S:03-19
20	1.5	2331B	XK77A:01-22	XF77S:03-11
21	1.5	2333B	XK77A:01-23	XF77S:02-45
22	1.5	2334B	XK77A:01-24	XF77S:02-46
23	1.5	2500B	XK77A:01-25	XF77S:03-20
24	1.5	2514B	XK77A:01-27	XF77S:03-23
25	1.5	2516B	XK77A:01-28	XK77Z-19
26	1.5	2520B	XK77A:01-29	XF77S:02-1/1

27	1.5	2521B	XK77A:01-30	XF77S:02-1/2
28	1.5	2522B	XK77A:01-31	XF77S:02-1/3
29	1.5	2523B	XK77A:01-32	XF77S:02-1/4
30	1.5	2524B	XK77A:01-33	XF77S:02-1/5
31	1.5	2525B	XK77A:01-34	XF77S:02-1/6
32	1.5	2526B	XK77A:01-35	XF77S:02-1/7

61 PIN / 16 GRADE XK77A:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2527 B	XK77A:02-1	XF77S:02-1/8
2	1.5	2532 B	XK77A:02-2	XF77S:02-1/9
3	1.5	2540 B	XK77A:02-3	XF77S:02-1/10
4	1.5	2541 B	XK77A:02-4	XF77S:02-1/11
5	1.5	2542 B	XK77A:02-5	XF77S:02-1/12
6	1.5	2803 B	XK77A:02-6	XF77S:03-1/1
7	1.5	2804 B	XK77A:02-7	XF77S:03-1/2
8	1.5	2807 B	XK77A:02-8	XF77S:03-1/3
9	1.5	3005 B	XK77A:02-9	XF77S:03-24
10	1.5	3020 B	XK77A:02-10	XF77S:03-25
11	1.5	3033 B	XK77A:02-11	XF77S:03-1/4
12	1.5	3034 B	XK77A:02-12	XF77S:03-26
13	1.5	3035 B	XK77A:02-13	XF77S:03-1/5
14	1.5	3060 B	XK77A:02-14	XF77S:03-1/6
15	2.5	3064 B	XK77A:02-15	XK77P:01-13
16	2.5	3065 B	XK77A:02-16	XK77P:01-9
17	2.5	3066 B	XK77A:02-17	XK77P:01-6
18	2.5	3067 B	XK77A:02-18	XK77P:01-15
19	1.5	3069 B	XK77A:02-19	XF77S:03-1/7
20	1.5	3071 B	XK77A:02-20	XF77S:03-1/8
21	1.5	3117 B	XK77A:02-26	XF77S:03-1/9
22	1.5	3501 B	XK77A:02-27	XF77S:03-39
23	1.5	3543 B	XK77A:02-28	XF77S:03-36
24	1.5	3544 B	XK77A:02-29	XF77S:01-45
25	2.5	3549 B	XK77A:02-30	XF77S:03-43
26	1.5	3554 B	XK77A:02-31	XF77S:03-29
27	1.5	4211 B	XK77A:02-32	XF77S:03-30
28	1.5	4232 B	XK77A:02-33	XF77S:03-31
29	1.5	4237 B	XK77A:02-34	XF77S:03-32
30	1.5	4242 B	XK77A:02-35	XF77S:03-34
31	1.5	5671 B	XK77A:02-36	XF77S:03-1/10
32	1.5	5672 B	XK77A:02-37	XF77S:03-1/11
33	1.5	5673 B	XK77A:02-38	XF77S:03-1/12
34	1.5	3542 B	XK77A:02-61	XF77S:03-40
35	1.5	3549B	XK77A:02-59	XF77S:03-28 (LED Based Twin Beam Headlight)
<u>ADDITIONAL FOR WAP7 ONLY</u>				

35	1.5	2500 AR	XK77A:02-39	XF77S:03-48
36	1.5	2503 AR	XK77A:02-40	XF77S:03-49
37	1.5	2331 AR	XK77A:02-41	XF77S:03-50
38	1.5	4242 AR	XK77A:02-42	XF77S:02-47
39	1.5	2111 AR	XK77A:02-43	XF77S:02-48
40	1.5	5671 AR	XK77A:02-44	XF77S:02-49
41	1.5	5672 AR	XK77A:02-45	XF77S:02-50
42	1.5	2050 AR	XK77A:02-50	XF77S:03-62

61 PIN / 16 GRADE XK77P:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2111 A	XK77P:01-1	XF77S:03-16
2	2.5	2111 B	XK77P:01-2	XF77S:03-17
3	1.5	3047	XK77P:01-3	XF77S:01-29
4	1.5	3048	XK77P:01-4	XF77S:01-30
5	1.5	2050	XK77P:01-7	XB77S-4
6	1.5	3056	XK77P:01-10	XF77S:01-37
7	1.5	3016	XK77P:01-11	XF77S:01-18
8	1.5	4240	XK77P:01-16	XK77X-28
9	1.5	3055	XK77P:01-17	XF77S:01-36
10	1.5	3039	XK77P:01-18	XF77S:01-25
11	1.5	4224	XK77P:01-19	XF77S:02-29
12	1.5	3059	XK77P:01-20	XF77S:01-38
13	1.5	3050	XK77P:01-21	XF77S:01-31
14	1.5	3043	XK77P:01-22	XF77S:01-27
15	1.5	2307	XK77P:01-23	XF77S:01-7
16	1.5	2308	XK77P:01-24	XF77S:01-8
17	1.5	3041	XK77P:01-26	XF77S:01-26
18	1.5	2105B	XK77P:01-27	XF77S:03-15
19	1.5	2105A	XK77P:01-28	XF77S:03-14
20	1.5	3028	XK77P:01-29	XF77S:01-21
21	1.5	3029	XK77P:01-30	XF77S:01-22
22	1.5	2069	XK77P:01-31	XF77S:01-4
23	1.5	3026	XK77P:01-32	XF77S:01-19
24	1.5	3008	XK77P:01-33	XF77S:01-17
25	1.5	3101	XK77P:01-34	XF77S:01-40
26	1.5	3051	XK77P:01-35	XF77S:01-32
27	1.5	3070	XK77P:01-37	XF77S:01-39

4 PIN XK77C:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	35	2092	XK77C:01-01	110-01
2	35	2052	XK77C:01-02	XH77S-1
3	35	2050	XK77C:01-03	XH77S-2

4 PIN XK77C:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	16	2021	XK77C:02-1	110-02
2	16	2052	XK77C:02-2	XH77S-1

61 PIN / 16 GRADE XK77X

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2050	XK77X-3	XB77S-2
2	1.5	4206	XK77X-4	XF77S:02-20
3	1.5	2050	XK77X-10	XB77S-1
4	1.5	2050	XK77X-11	XB77S-1
5	1.5	2050	XK77X-12	XB77S-1
6	1.5	3055	XK77X-13	XF77S:01-36
7	1.5	4206	XK77X-15	XF77S:02-20
8	1.5	4206	XK77X-16	XF77S:02-20
9	1.5	4206	XK77X-17	XF77S:02-21
10	1.5	4206	XK77X-18	XF77S:02-21
11	1.5	4206	XK77X-19	XF77S:02-22
12	1.5	4207	XK77X-20	XF77S:02-23
13	1.5	4208	XK77X-21	XF77S:02-24
14	1.5	4209	XK77X-22	XF77S:02-25
15	1.5	4210	XK77X-23	XF77S:02-26
16	1.5	4236	XK77X-27	XF77S:02-37
17	1.5	4244	XK77X-29	XF77S:02-40

22 PIN / 12 GRADE XK77Z

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK77Z-1	XB77S-1
2	2.5	3000	XK77Z-3	XF77S:01-16
3	1.5	4218	XK77Z-4	XF77S:02-27
4	2.5	4220	XK77Z-5	XF77S:02-28
5	2.5	4224	XK77Z-6	XF77S:02-29
6	1.5	4225	XK77Z-7	XF77S:02-30
7	1.5	4226	XK77Z-9	XF77S:01-1/11
8	1.5	4233	XK77Z-10	XF77S:02-34
9	1.5	4234	XK77Z-11	XF77S:02-35
10	1.5	4236	XK77Z-14	XF77S:02-37
11	1.5	2097B	XK77Z-17	XF77S:03-1

22P/12 GRADE XK77HL (ONLY FOR WAP7)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
	1.5	UH 01	XK77HL:02-1	XF77S:01-48
2	1.5	UH 02	XK77HL:02-2	XF77S:01-49
3	1.5	UH 03	XK77HL:02-3	XF77S:01-50
4	1.5	UH 04	XK77HL:02-4	XF77S:01-51
5	1.5	UH 05	XK77HL:02-5	XF77S:01-52
6	1.5	UH 06	XK77HL:02-6	XF77S:02-52
7	1.5	UH 07	XK77HL:02-7	XF77S:02-53
8	1.5	UH 08	XK77HL:02-8	XF77S:02-54
9	1.5	UH 09	XK77HL:02-9	XF77S:02-55
10	1.5	UH 10	XK77HL:02-10	XF77S:02-56
11	1.5	UH 11	XK77HL:02-11	XF77S:03-51
12	1.5	UH 12	XK77HL:02-12	XF77S:03-52
13	1.5	UH 13	XK77HL:02-13	XF77S:03-56

22 PIN / 12 GRADE XK77V:03

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2328	XK77V:03-7	126.6-61
2	1.5	2329	XK77V:03-8	126.6-62
3	2.5	5094	XK77V:03-15	XF77S:02-42
4	2.5	3542C	XK77V:03-16	XF77S:03-41
5	2.5	3542D	XK77V:03-17	XF77S:03-42
9	1.5	2890	XK77V:03-11	XK77H-27
13	1.5	3034 B	XK77V:03-18	XF77S:03-26
14	1.5	3035 B	XK77V:03-19	XF77S:03-1/5
15	1.5	3008	XK77V:03-20	XF77S:01-17
16	1.5	5671 B	XK77V:03-21	XF77S:03-1/10
17	1.5	3035	XK77V:03-22	XF77S:01-49
<u>ADDITIONAL FOR WAP7 ONLY</u>				
17	1.5	UH 01	XK77V:03-01	XF77S:01-48 130.1-21 for WAG-9
18	1.5	UH 02	XK77V:03-02	XF77S:01-49 130.1-22 for WAG-9
19	1.5	UH 03	XK77V:03-03	XF77S:01-50 XF77S:01-30 for WAG-9
20	1.5	UH 04	XK77V:03-04	XF77S:01-51
21	1.5	UH 05	XK77V:03-05	XF77S:01-52

LINK CABLE FOR MODIFICATION TO DRIVE MR BLOWER AND SCAVENGE BLOWER BY THREE PHASE SUPPLY

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2897 + 2890	XK22V:03-11	XF77S:01-1/9

LINK CABLES**127.81 CB for Commissioning -1**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2094	127.81-1	XB77S-16
2	1.5	2067	127.81-2	XF77S:01-3

127.15 (6A) CB for Vigilance Control

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4200	127.15-2	XK77V:02-11
2	0	2095	127.15-1	S2095.2-Q2

127.7 (6A) CB for Pneumatic Panel

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3101	127.7-2	XF77S:01-41
2	0	2095	127.7-1	S2095.2-Q2

127.82 (6A) for Commissioning-2

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069	127.82-2	XF77S:01-5
2	1.5	2069	127.82-2	211.1/2-Q1
3	0	2095	127.82-1	S2095.2-Q2

127.91 / 2 (6A) CB for 24V/48V Power Supply

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2005 B	127.91/2-2	118.4/2-VI+
2	2.5	2005 B	127.91/2-2	118.5/2-VI+
3	0	2095	127.91/2-1	S2095.2-Q2

310.7 (6A) CB for Marker Light

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3530	310.7-2	XK77A:01-14
2	1.5	3530	310.7-2	XK77V:02-10
3	2.5	2021	310.7-1	112.1-1

310.1/2 (6A) CB for Lighting Front

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2101C	310.1/2-2	126.7/2-3
2	2.5	2094	310.1/2-1	XB77S-15

127.1/2 (6A) CB for Traction Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	5101B	127.1/2-2	XK77R-10
2	0	2096	127.1/2-1	S2096.2-Q2

127.2/2 (6A) CB for Monitoring

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2801B	127.2/2-2	XK77H-3
2	0	2096	127.2/2-1	S2096.2-Q2

127.22/2 (10A) CB for Aux. Converter -2

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	5092	127.22/2-2	XK77B-29
2	1.5	5092	127.22/2-2	XK77H-14
3	0	2096	127.22/2-1	S2096.2-Q2

127.22/3 (10A) CB for Aux. Converter -3

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	5093	127.22/3-2	XK77B-6
2	1.5	5093	127.22/3-2	XK77H-15
3	0	2096	127.23/2-1	S2096.2-Q2

127.9/3 (6A) CB for Central Electronics

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4203	127.9/3-2	XF77S:02-10
2	1.5	4203	127.9/3-2	XF77S:02-11
3	0	2096	127.9/3-1	S2096.2-Q2

127.9/4 (6A) CB for Central Electronics

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4204	127.9/4-2	XF77S:02-15
2	1.5	4204	127.9/4-2	XF77S:02-15
3	0	2096	127.9/4-1	S2096.2-Q2

127.92 (6A) CB for Memotel

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4206	127.92-2	XF77S:02-22
3	0	2095	127.92-1	S2095-2Q2 RDSO MS 490

127.24 (6A) CB for Aux. Contactor

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	5094	127.24-2	XF77S:02-43
2	0	2096	127.24-1	S2096.2-Q2

128.1/2 (3A) CB for Aux. Dryer

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2050	128.1/2-1	XB77S-5
2	2.5	2095	128.1/2-1+	S2095-2Q1
3	2.5	3101	128.1/2-4+	XK77D-19
4	1.5	2050	128.1/2-2-	XK77D-4

48.1 (16A) CB for Aux. Compressor

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2068	48.1-2	48.2-1+
2	2.5	2094	48.1-1	XH77S-16

127.3/2 (10A) CB for Driver Cab

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2101 B	127.3/2-2	126.7/2-1
2	0	2095	127.3/2-1	S2095.2.Q2
3	2.5	2095	127.3/2-1	310.4-1

310.4 (16A) CB for Machine Room Lighting

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2095	310.4-1	127.3/2-1
2	2.5	3054	310.4-2	XF77S:01-35

127.11/2 (20A) CB for Power Supply Gate Unit

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2601 B	127.11/2-2	XK77R-6
2	2.5	2096	127.11/2-1	S2096.2-Q2
3	2.5	2096	127.11/2-1	XK77V:01-15

129.1/2 (10A) CB for Hotel Load (Only for WAP 7)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	UH11	129.1/2-2	VSHOG (Anode) 12A spec. CLW/ES/D-2 (As per RDSO MS 0488 Rev. '0')
2	1.5	UH11	VSHOG (Cathode) 12A spec. CLW/ES/D-2 (As per RDSO MS 488)	XF77S:03-51
3	1.5	2096	129.1/2-1	127.11/2-1

110 CB for Battery Charger

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	35	2092	110-1	XK77C:01-1
2	16	2021	110-2	XK77C:02-1
3	16	2021	110-2	112.1-1

XH77S Terminal Block

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	35	2052	XH77S-1	XK77C:01-2
2	35	2050	XH77S-2	XK77C:01-3
3	16	2050	XB77S-2	XB77S-7
4	16	2052	XH77S-1	XK77C:02-2

112.1 Circuit Breaker Control Circuit

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	16	2094	112.1-2	XB77S-16
2	16	2021	112.1-1	110-2

3	2.5	2021	112.1-1	310.7-1
---	-----	------	---------	---------

212.A Fire Detection Unit

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	212.A	MASSE-M

130.1 Aux. Contactor VCB/Pantograph

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2064	130.1-1	XF77S:01-2
2	1.5	2302	130.1-2	XF77S:01-6
3	1.5	2111 A	130.1-3	XF77S:03-16
4	1.5	2111 B	130.1-5	XF77S:03-17
5	1.5	2327	130.1-13	XF77S:01-13
6	1.5	2313 B	130.1-14	XF77S:03-19
7	1.5	2103 A	130.1-4	126.6-21
8	1.5	2103 B	130.1-6	126.6-31
9	1.5	2301	130.1-A1	130.1A-1+
10	1.5	2050	130.1-A2	130.1A-4-
11	1.5	2069B	130.1-22	XK77V:01-46 (WAP-7 & WAP-5)
12	1.5	2069A	130.1-21	XK77V:01-45 (WAP-7 & WAP-5)
13	1.5	2069B	130.1-22	XK77V:03-2 (WAG-9)
14	1.5	2069A	130.1-21	XK77V:03-1 (WAG-9)

211 Relay Temp. Control Electronics

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2515	211-14	XK77V:01-29
2	1.5	2099 A	211-21	XF77S:03-5
3	1.5	2514	211-22	XF77S:03-22
4	1.5	2099 B	211-31	XF77S:03-7
5	1.5	2514 B	211-32	XF77S:03-23
6	1.5	2069	211-43	XF77S:01-5
7	1.5	2517	211-44	XK77V:01-30
8	1.5	2510	211-A1	211.A-1+
9	1.5	2050	211-A2	211.A-4-
10	1.5	2512	211-13	126.6-44

126.6 Safety Relay Control Electronics

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2501	126.6-A1	XF77S:01-14

2	1.5	2050	126.6-A2	XB77S-11
3	1.5	2320	126.6-13	XK77R-4
4	1.5	2314	126.6-14	XF77S:01-10
5	1.5	2104 A	126.6-22	XF77S:03-12
6	1.5	2104 B	126.6-32	XF77S:03-13
7	1.5	2511	126.6-43	XK77V:01-28
8	1.5	2328	126.6-61	XK77V:03-7
9	1.5	2329	126.6-62	XK77V:03-8
10	1.5	2312	126.6-75	XF77S:01-9
11	1.5	2326	126.6-76	XK77V:01-24
12	1.5	4201	126.6-87	XF77S:02-7
13	1.5	4243	126.6-88	XF77S:02-39
14	1.5	2050	126.6-A2	126.7A/2-3-
15	1.5	2103 A	126.6-21	130.1-4
16	1.5	2103 B	126.6-31	130.1-6
17	1.5	2512	126.6-44	211-13

126.7/2 Contactor for Power Supply to Cab and its Accessories

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2111 B	126.7/2-2	XK77A:01-20
2	1.5	2097 B	126.7/2-53	XK77A:01-18
3	1.5	2099 B	126.7/2-54	XF77S:03-6
4	1.5	2503 A	126.7/2-75	XF77S:03-21
5	1.5	2504 A	126.7/2-76	XK77V:02-32
6	1.5	2101 B	126.7/2-1	127.3/2-2
7	1.5	2504 B	126.7/2-A1	126.7A/2-1+
8	1.5	2050	126.7/2-A2	126.7A/2-4-
9	1.5	2101 C	126.7/2-3	310.1/2-2
10	1.5	3501 B	126.7/2-4	XF77S:03-39

130.1A SNUBBER

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2301	130.1A-1	130.1-A1
2 *	1.5	2301	130.1A-2	412.JJ-9
3	1.5	2050	130.1A-3	XB77S-11
4	1.5	2050	130.1A-4	130.1-A2

211 A SNUBBER

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2510	211 A -1	211 – A1
2	1.5	2510	211 A -2	XK77V:01-27
3	1.5	2050	211 A -3	XB77S-8
4	1.5	2050	211 A -4	211 – A2

126.7A/2 SNUBBER

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2504 B	126.7A/2 – 2+	XK77V:02 - 33
2	1.5	2504 B	126.7A/2 – 1+	126.7/2 – A1
3	1.5	2050	126.7A/2 – 3	126.6 – A2
4	1.5	2050	126.7A/2 – 4	126.7/2 – A2

48.2 Contactor for Aux. Compressor Type-6

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2068	48.2 – 1	48.1 - 2
2	1.5	3027	48.2 – 2	XF77S:01 - 20
3	1.5	3026	48.2 – A1	XF77S:01 – 19
4	1.5	2050	48.2 – A2	XB77S – 9

338/2 Contactor Head Light Type-6

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	3542 D	338/2 – 1	XF77S:03 – 42
2	2.5	3549 D	338/2 – 2	XF77S:03 – 43
3	1.5	3549 B	338/2 – A1	XF77S:03 – 28
4	1.5	2050	338/2 – A2	XB77S – 8

118.4/2 DC-DC Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	118.4/2 – GI	XB77S – 10
2	2.5	2050	118.4/2 – G0	XB77S – 10
3	2.5	2098 B	118.4/2 – V0	XF77S:03 – 4
4	2.5	2005 B	118.4/2 – VI	127.91/2 - 2

118.5/2 DC-DC Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	118.5/2 – GI	XB77S – 10
2	2.5	2050	118.5/2 – G0	XB77S – 11
3	2.5	2097 B	118.5/2 – V0	XF77S:03 – 1
4	2.5	2005 B	118.5/2 – VI	127.91/2 – 2

211.1/2 Temperature Sensor

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2510	211.1/2 – Q2	XK77V:01 - 27
2	1.5	2069	211.1/2 – Q1	127.82 – 2

SB2 VCU RESET MODIFICATIONS ONLY FOR WAG-9 &WAP-5 (RDSO MS 475)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069A	XK77V:03-1	130.1-21
2	1.5	2069B	XK77V:03-2	130.1-22
3	1.5	3048	XK77V:03-3	XF77S:01-30

SB2 VCU RESET MODIFICATIONS ONLY FOR WAP-5 &7 (RDSO MS 475, REV. '0')
XK77V:01 CONNECTOR CHANGES FROM 35P/40 TO 61P/40 FOR PUSH PULL MOD.
PINS ARE IN USE FROM 36-43. SO, WE CAN USE PINS 44-46 FOR VCU RESET

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069A	XK77V:01-45	130.1-21
2	1.5	2069B	XK77V:01-46	130.1-22
3	1.5	3048	XK77V:01-47	XF77S:01-30

SB2 VCU RESET MODIFICATIONS ONLY FOR WAP- 9 (RDSO MS 475, REV. '1')

Sl. No.	Cable Size Sq. mm	Cable no.	From	To	Remarks
1	1.5	----	XK77V:03-4	130.1-Aux. Contact Block NC	NEW FOR SB2
2	1.5	----	130.1-Aux. Contact Block NC	XK77V:03-5	NEW FOR SB2

123/2 Blocking Diodes

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2104 A	123/2 – 1	XF77S:03 - 12
2	1.5	2105 A	123/2 – 2	XF77S:03 – 14
3	1.5	2104 B	123/2 – 3	XF77S:03 – 13
4	1.5	2105 B	123/2 – 4	XF77S:03 - 15
5	1.5	2111 B	123/2 – 5	XF77S:03 - 17
6	1.5	4211 B	123/2 – 6	XF77S:03 - 30
7	1.5	3543 B	123/2 – 7	XF77S: 03- 36
8	1.5	3549 B	123/2 – 8	XK77S:03 - 28
9	1.5	3544 B	123/2 – 9	XF77S :03- 45
10	1.5	3549 A	123/2 – 10	XF77S :01- 46

123/4 Blocking Diodes

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4233	123/4 – 1	XF77S:02 - 34
2	1.5	4235	123/4 – 2	XF77S:02 – 36
3	1.5	2333 B	123/4 – 3	XF77S:02 – 45
4	1.5	2319	123/4 – 4	XF77S:01 – 12

5	1.5	2334 B	123/4 – 5	XF77S:02 – 46
6	1.5	2327	123/4 – 6	XF77S:01 – 13
7	1.5	4239 B	123/4 – 7	XF77S:03 – 33
8	1.5	4232 B	123/4 – 8	XF77S:03 – 31
9	1.5	4238	123/4 – 9	XF77S:02 – 38
10	1.5	4232 B	123/4 – 10	XF77S:03 - 31

123/6 Blocking Diodes

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3110	123/6 – 1	XF77S:02 - 1
2	1.5	3039	123/6 – 2	XF77S:01 – 25
3	1.5	3111	123/6 – 3	XF77S:02 – 2
4	1.5	3039	123/6 – 4	XF77S:01 – 25
5	1.5	3112	123/6 – 5	XF77S:02 – 3
6	1.5	3041	123/6 – 6	XF77S:01 – 26
7	1.5	3113	123/6 – 7	XF77S:02 – 4
8	1.5	3040	123/6 – 8	XF77S:01 - 26

123/8 Blocking Diodes

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3116	123/8 – 1	XF77S:02 - 5
2	1.5	3037 B	123/8 – 2	XF77S:03 – 27
3	1.5	3118	123/8 – 3	XF77S:02 – 6
4	1.5	3037 B	123/8 – 4	XF77S:03 – 27
5	1.5	2302	123/8 – 5	XF77S:01 – 6
6	1.5	2319	123/8 – 6	XF77S:01 - 12

123.1/2 Blocking Diodes Illumination Test

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2331 B	123.1/2 – 1	XF77S:03 – 45
2	1.5	2514 B	123.1/2 – 2	XF77S:03 – 23
3	1.5	4235	123.1/2 – 3	XF77S:02 – 36
4	1.5	3554 B	123.1/2 – 4	XF77S:03 – 29
5	1.5	3503 B	123.1/2 – 14	XF77S:03 – 46

123/9 Blocking Diodes

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3542 B	123/9 – 7	XF77S:03 - 40
2	1.5	3542 C	123/9 – 8	XF77S:03 – 41
3	1.5	3542 B	123/9 – 9	XF77S:03 - 40
4	1.5	3542 D	123/9 – 10	XF77S:03 - 42

SHORTING LINK FOR PARKING BRAKE IN WAP-7 & WAG-9 ONLY

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3070+3101	XF77S:01-39	XF77S:01-40

412 M

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	412 – M	MASSE – M
2	2.5	0	412 – M	MASSE – M

0 MASSE - M

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	MASSE – M	212 - M
2	2.5	0	MASSE – M	412 - M
3	2.5	0	MASSE – M	412 - M

212A (25 PIN)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2097 B	212.A-1	XF77S:03 – 2
2	0.5	2050	212.A-2	XB77S – 8
3	0.5	4228	212.A-4	XF77S:02 – 32
4	0.5	4203	212.A-5	XF77S:02 – 11
5	0.5	4227	212.A-7	XF77S:02 – 31
6	0.5	4204	212.A-8	XF77S:02 – 16
7	0.5	4229	212.A-10	XF77S:02 – 33
8	0.5	2097 B	212.A-14	XF77S:03 – 2
9	0.5	2050	212.A-15	XB77S – 8
10	0.5	4238	212.A-18	XF77S:02 – 38
11	0.5	4246	212.A-19	XF77S:02 – 41
12	0.5	2097 B	212.A-21	XF77S:03 – 2
13	0.5	4246	212.A-22	XF77S:02 – 41
14	0.5	4203	212.A-23	XF77S:02 – 12

***412.AJ SUB D 17 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	4203	412.AJ-A1	XF77S:02–12
2	2.5	2050	412.AJ-A2	XB77S –12

***412.CJ SUB D 17 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	4204	412.CJ-A1	XF77S:02-16
2	2.5	2050	412.CJ-A2	XB77S -12

***412.JA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2520B	412.JA-1	XF77S:02 -1/1
2	0.5	2521B	412.JA-2	XF77S:02 -1/2
3	0.5	2500B	412.JA-3	XF77S:03 - 20
4	0.5	2541B	412.JA-4	XF77S:02 - 1/11
5	0.5	2050	412.JA-8	XB77S-9
6	0.5	3060B	412.JA-9	XF77S:03 -1/6
7	0.5	2803B	412.JA-10	XF77S:03 -1/1
8	0.5	4242B	412.JA-11	XF77S:03 -34
9	0.5	2804B	412.JA-12	XF77S:03 -1/2
10	0.5	4203	412.JA-15	XF77S:02 -8

***412.JD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3117B	412.JD-1	XF77S:03 -1/9
2	0.5	2526B	412.JD-2	XF77S:02 -1/7
3	0.5	4208	412.JD-3	XF77S:02 -24
4	0.5	2523B	412.JD-4	XF77S:02 - 1/4
5	0.5	2050	412.JD-8	XB77S-9
6	0.5	2524B	412.JD-9	XF77S:02 -1/5
7	0.5	2522B	412.JD-10	XF77S:02 -1/3
8	0.5	4244	412.JD-11	XF77S:02 -40
9	0.5	4207	412.JD-12	XF77S:02 -23
10	0.5	4203	412.JD-15	XF77S:02 -8

***412.JG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2099B	412.JG-3	XF77S:03 - 7
2	0.5	2099B	412.JG-4	XF77S:03 - 8
3	0.5	2099B	412.JG-6	XF77S:03 - 7
4	0.5	2099B	412.JG-7	XF77S:03 - 8
5	0.5	3020B	412.JG-9	XF77S:03 - 25
6	0.5	2099B	412.JG-10	XF77S:03 - 8
7	0.5	5673B	412.JG-15	XF77S:03 - 1/12
8	0.5	5672B	412.JG-17	XF77S:03 - 1/11
9	0.5	3071B	412.JG-18	XF77S:03 - 1/8

10	0.5	2542B	412.JG-19	XF77S:03 – 1/12
11	0.5	2532B	412.JG-20	XF77S:03 – 1/9
12	0.5	2099B	412.JG-22	XF77S:03 – 9
13	0.5	2807B	412.JG-23	XF77S:03 – 1/3

***412.JJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2315	412.JJ-1	XF77S:01 –11
2	0.5	4203	412.JJ-4	XF77S:02 –13
3	0.5	2099B	412.JJ-6	XF77S:03 –9
4	0.5	2301	412.JJ-9	130.1A-2+
5	0.5	3118	412.JJ-12	XF77S:02 –6
6	0.5	3503B	412.JJ-13	XF77S:03 –46

***412.LA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2855B	412.LA-1	XF77S:01 –1/5
2	0.5	2852B	412.LA-2	XF77S:01 –1/3
3	0.5	2856B	412.LA-3	XF77S:01 –1/6
4	0.5	2851B	412.LA-4	XF77S:01 –1/2
5	0.5	2050	412.LA-8	XB77S-12
6	0.5	2853B	412.LA-9	XF77S:01 –1/4
7	0.5	2857B	412.LA-10	XF77S:01 –1/7
8	0.5	2850B	412.LA-11	XF77S:01 –1/1
9	0.5	2858	412.LA-12	XF77S:01 –15
10	0.5	4203	412.LA-15	XF77S:01 –13

***412.LD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2302	412.LD-1	XF77S:01 –6
2	0.5	4228	412.LD-2	XF77S:02 –32
3	0.5	3051	412.LD-3	XF77S:01 –32
4	0.5	4220	412.LD-4	XF77S:02 –28
5	0.5	2050	412.LD-8	XB77S-12
6	0.5	3052	412.LD-9	XF77S:01 –33
7	0.5	4229	412.LD-10	XF77S:02 –33
8	0.5	3070	412.LD-11	XF77S:01 –39
9	0.5	3000	412.LD-12	XF77S:01 –16
10	0.5	4203	412.LD-15	XF77S:02 –9

***412.LJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2064	412.LJ-2	XF77S:01 –2
2	0.5	3110	412.LJ-3	XF77S:02 –1
3	0.5	4203	412.LJ-4	XF77S:02 –9
4	0.5	2105A	412.LJ-9	XF77S:03 –14
5	0.5	4203	412.LJ-10	XF77S:02 –10
6	0.5	3113	412.LJ-12	XF77S:02 –4
<u>FOR WAP 7 & 5 ONLY</u>				
7	0.5	HL02	412.LJ-6	XF77S:01 –54
8	0.5	HL12	412.LJ-13	XF77S:03 –55

***412.NI SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2098B	412.NI-1	XF77S:03 –3
2	0.5	2050	412.NI-3	XK77S –13

***412.OA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2840B	412.OA-1	XF77S:01 –1/8
2	0.5	3005B	412.OA-2	XF77S:03 –24
3	0.5	2540B	412.OA-3	XF77S:02 –1/10
4	0.5	3034B	412.OA-4	XF77S:03 –26
5	0.5	2050	412.OA-8	XB77S-13
6	0.5	2500B	412.OA-9	XF77S:03 –20
7	0.5	2897	412.OA-10	XF77S:01 –1/9
8	0.5	3069B	412.OA-11	XF77S:03 –1/7
9	0.5	3035B	412.OA-12	XF77S:03 –1/5
10	0.5	3035B	412.OA-15	XF77S:02 –14

***412.OD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3033B	412.OD-1	XF77S:03 –1/4
2	0.5	2527B	412.OD-2	XF77S:02 –1/8
3	0.5	2521B	412.OD-3	XF77S:02 –1/2
4	0.5	2323B	412.OD-4	XF77S:02 –1/4
5	0.5	2050	412.OD-8	XB77S-13
6	0.5	2525B	412.OD-9	XF77S:02 –1/6
7	0.5	2520B	412.OD-10	XF77S:02 –1/1
8	0.5	2522B	412.OD-11	XF77S:02 –1/3

9	0.5	5671B	412.OD-12	XF77S:03 –1/10
10	0.5	4204	412.OD-15	XF77S:02 –14

***412.OG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2099B	412.OG-2	XF77S:03 –10
2	0.5	4237B	412.OG-3	XF77S:03 –32
3	0.5	2099B	412.OG-7	XF77S:03 –10
4	0.5	4239B	412.OG-14	XF77S:03 –33
5	0.5	2099B	412.OG-15	XF77S:03 –10
6	0.5	5672B	412.OG-19	XF77S:03 –1/11
7	0.5	5673B	412.OG-20	XF77S:03 –1/12

***412.OJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3101	412.OJ-2	XF77S:01 –41
2	0.5	3046B	412.OJ-3	XF77S:01 –1/10
3	0.5	4204	412.OJ-4	XF77S:02 –17
4	0.5	4204	412.OJ-6	XF77S:02 –17
5	0.5	3016	412.OJ-7	XF77S:01 –18
6	0.5	4224	412.OJ-9	XF77S:02 –29
7	0.5	3101	412.OJ-10	XF77S:01 –42
8	0.5	4226	412.OJ-12	XF77S:01 –1/11
9	0.5	4225	412.OJ-13	XF77S:02 –30
10	0.5	3051	412.OJ-14	XF77S:01 –32

***412.QA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2307	412.QA-1	XF77S:01 -7
2	0.5	3070	412.QA-2	XF77S:01 -39
3	0.5	3056	412.QA-3	XF77S:01 -37
4	0.5	3059	412.QA-4	XF77S:01 -38
5	0.5	2050	412.QA-8	XB77S-13
6	0.5	2308	412.QA-9	XF77S:01 -8
7	0.5	3008	412.QA-10	XF77S:01 -17
8	0.5	3055	412.QA-11	XF77S:01 -36
9	0.5	3051	412.QA-12	XF77S:01 -32
10	0.5	4204	412.QA-15	XF77S:02-18

***412.QD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3050	412.QD-1	XF77S:01 -31

2	0.5	3038	412.QD-2	XF77S:01 -24
3	0.5	3053	412.QD-3	XF77S:01 -34
4	0.5	3036	412.QD-4	XF77S:01 -23
5	0.5	2050	412.QD-8	XB77S-9
6	0.5	2302	412.QD-9	XF77S:01 -6
7	0.5	4227	412.QD-10	XF77S:02 -31
8	0.5	3044	412.QD-11	XF77S:01 -28
9	0.5	3043	412.QD-12	XF77S:01 -27
10	0.5	4204	412.QD-15	XF77S:02-18

***412.QG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	4204	412.QG-2	XF77S:02 -19
2	0.5	3112	412.QG-3	XF77S:02 -3
3	0.5	3101	412.QG-4	XF77S:01 -42
4	0.5	3101	412.QG-6	XF77S:01 -43
5	0.5	3101	412.QG-9	XF77S:01 -23
6	0.5	2064	412.QG-10	XF77S:01 -1
7	0.5	3029	412.QG-12	XF77S:01 -22
8	0.5	3111	412.QG-14	XF77S:02 -2
9	0.5	4204	412.QG-15	XF77S:02 -19
10	0.5	3028	412.QG-17	XF77S:01 -21
11	0.5	3048	412.QG-18	XF77S:01 -30
12	0.5	3047	412.QG-22	XF77S:01 -29
13	0.5	2105B	412.QG-23	XF77S:03 -15
14	0.5	3101	412.QG-24	XF77S:01 -43

***412.QJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2309B	412.QJ-1	XF77S:03 -18
2	0.5	4204	412.QJ-3	XF77S:02 -14
3	0.5	2315	412.QJ-9	XF77S:01 -11
4	0.5	3116	412.QJ-10	XF77S:02 -5

KAVACH SB-2

Cable No.	From		To		Length	Cable Size
	Wago No.	Location	Wago No.	Location		
2500B CAB2 BL KEY	XF77S:03/20	SB-2	XF22S:04/06	Kavach, SB	21 meter	1.5
2526B CAB2 FORWARD	XF77S:02-01/7	SB-2	XF22S:04/07	Kavach, SB	21 meter	1.5
2524B CAB2 REVERSE	XF77S:02-01/5	SB-2	XF22S:04/08	Kavach, SB	21 meter	1.5
3051 TR. CUT OFF	XF77S:01/32	SB-2	XF22S:04/09	Kavach, SB	21 meter	2.5
SP (TRACTION CUT OFF OUT)		SB-2	XF22S:04/10	Kavach, SB	21 meter	1.5

MODIFICATIONS SHEET FOR DEVELOPMENT TRACTION MOTOR DROPPING DETECTION SYSTEM
(RDSO/2023/EL/MS/0476 Rev. '0') (For WAP-7, WAG 9, WAG-9H, WAG-9HC)

Sl. No.	Cable Size Sq. mm	Cable no.	From	To	REMARKS
1	2.5	2096	S.2096	2 Amps MCB TMDDS-1	SB2
2	2.5	008 TM	2 Amps MCB TMDDS-2	New Terminal block M5-1	04 nos. of M5 Screw Type Terminal Block are to be introduced. Connection points are designated as 1&2, 3&4, 5&6, 7&8. SB2
3	2.5	----	New Terminal block M5-2	New Terminal block M5-5	Terminals are shorted. SB2
4	2.5	----	New Terminal block M5-4	New Terminal block M5-7	Terminals are shorted. SB2
5	2.5	067 TM	New Terminal block M5-3	XF77S:01-44	SB2
6	2.5	067 TM	XF77S:01-44	XK77A:02-58	SB2
7	2.5	067 TM	XF77S:01-44	XK77V:02-59	SB2
8	2.5	067 TM	XF77S:01-44	VSTM Diode-Back	SB2
9	2.5	067 TM	VSTM Diode-Front	QEMS-A1 (Type no. LC1D128FD)	SB2
10	2.5	2050	QEMS-A2	XB77S	SB2
FOR PANTO AND VCB CIRCUIT					
11	2.5	2064	XK77A:01-3	XF77S:01-53	SB2
12	2.5	2064	XF77S:01-53	QEMS-R1	SB2
13	2.5	2064/1	QEMS-R2	XF77S:01-1	SB2
FOR BUZZER CIRCUIT					
14	2.5	2097B	XF77S:03-2	QEMS-01	SB2
15	2.5	4238	QEMS-02	XF77S:02-38	SB2
2FOR EP VALVE EMERGENCY BRAKE CIRCUIT					
16	2.5	3000	XK77V:02-5	XF77S:01-54	SB2
17	2.5	3000	XF77S:01-54	QEMS-R3	SB2
18	2.5	3000/1	QEMS-R4	XF77S:01-16	SB2

Only for SB2.