ANNEXURE:-
DRG. NO. CLW/ES/3/SK-1/0192
DRG. NO. CLW/ES/3/SK-2/0192/G
DRG. NO. CLW/ES/3/SK-3/0192/H
DRG.NO. 1209-15-143-002 ALT 13

TECHNICAL SPECIFICATION FOR

AUXILIARY CIRCUIT CUBICLE-2 (HB-2)

FOR 3-PHASE ELECTRIC LOCOMOTIVES.

Specification No : CLW/ES/3/0192 ALT. I

ISSUE DATE: 15.02.1998

ISSUED BY :

DY.CHIEF ELECTRICAL ENGINEER/D-II
CHITTARANJAN LOCOMOTIVE WORKS
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Prepared By	Checked By	Approved By
SSE/Design	SEE/Design	Dy.CEE/D-II

ALTERATION RECORD SHEET

Amendment No.	Date of Amendment	Page No.	Alt.	Reason	Authority
1.	03.01.2004	3, 4, 5, 6,7, 13,14,15&16	A	Implementation of modification Release no: 460, 434,429	Sd/-
2.	29.04.2010	15 to 19	B	Sheet no. 15 to 18 added and Drg. No. CLW/ES/3/SK-1/0192 is added at sheet no.19	Sd/-
3.	21.06.2010	12	C	Modification sheet no. RDSO/2008/EL/MS/0367/Rev. 0 dated 29.08.08 is included. Clause no. 10.1 of page no. 11 has been added.	Sd/-
4.	17.02.2017	17	D	Specn. no. of Bare Panel has been corrected and sources are modified at sheet no. 17.	Sd/-
5.	25.05.2018	15	E	OEM/ Part-I is replaced by CLW Approved Sources (the term only)	Sd/-
6.	12.03.2019	4,5,7, 15,16	F	Schematic position and quantity has been modified & Circuit Breaker Oil Pump Converter has been deleted.	Sd/-
7	24.03.2021	12	G	MS – 413 , paralleling of interlock of Aux. Contactor of 3 phase locomotive.	Sd/-
8	11.02.2022	4, 6, 7, 15 & 16	H	Modification to drive MR Blower & SCMR by three phase, 20 A 1 Pole & 6 A 1 Pole CB have been replaced by 6 A 3 Pole AC. Capacitor start & Run (22 & 47 µF) and Time Relay MR Blower has been deleted vide letter no. C- D&D/T/42/(Pt) dt. 27.01.22	Sd/-
9		5, 6, 7, 8, 9, 10, 12, 17, 18	I	Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM and type no. has been deleted. Sources for SS Hardware added in page no. 13. D.E. Test applied between Insulator & body. Remark added for Crimping test marked as *. Final Cable cutting chart enclosed as Annexure-II. The references are for guidance only.	As Signed
10			J	Energy saving scheme for 3-phase freight electric locomotives as per RDSO MS 482 has been incorporated in the cable connection chart of HB-2	

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

SPECIFICATION FOR AUXILIARY CIRCUITS, CUBICLE-2 (HB2)

TABLE OF CONTENTS

1. INTRODUCTION

Auxiliary Cubicle 2 i.e.HB2 is a panel of contactors, switches, circuit breakers etc. It controls the input to several auxiliary assemblies of the locomotive like machine room blower, compressors, crew fan, cab heater etc.

SCOPE OF SUPPLY

THE TENDERER'S SCOPE OF SUPPLY INCLUDES THE TOTAL PANEL ALONG WITH FOLLOWING ITEMS :

1. Snubber circuit to Contactor main compressor (47.2A, 52.4A, 52.7A)
2. Contactor Main Compressor (47.2/2,52.4,52.7)
3. Earth fault Relay , auxiliary converter (89.2)
4. Circuit breaker , oil cooling unit , transformer/ converter (59.1/2)
5. Circuit breaker , scavenge blower to traction motor blower and oil cooling unit (55.1/2)
6. Circuit breaker , traction motor blower (53.1/2)
7. Earthing resistor earth fault detection auxiliary converter (90.3/1-2)
8. Current sensor , auxiliary circuits (42.3/2)
9. Current sensor , auxiliary circuits (42.3/1)
10. Circuit breaker, scavenge blower to machine room blower (56.1/2)
11. Circuit breaker, machine room blower (54.1/2)
12. Circuit breaker, main compressor (47.1/2)
13. Circuit breaker, transformer oil pump (62.1/2)
14. Connectors
15. Wiring and other accessories
16. Terminal Blocks
17. Contactor Scavenge Blower (52.4)
18. Capacitor Input filter Aux. Converter (49.1)
19. Resistor Input filter Aux. Converter (49.2)
20. Contactor Oil pumps (52.5)
21. Snubber circuit to item 52.5 (52.5A)
22. Aux Contactor to item 52.4 & 52.5 (52.6)
23. Choke Input filter aux. converter (49.3)
24. CB for AC System (64.1)

2. CLIMATIC AND ENVIRONMENTAL CONDITION OF LOCO

Maximum atmospheric temperatures	Under Sun : + 70°C In shade : + 50°C
Humidity	100% saturation during rainy season.
Reference site conditions	1) Ambient Temp. max 55°C, min 0°C 2) The contractor will indicate the expected temperature rise in the machine room under reference site conditions.

	3) Humidity : 60 % 4) Altitude : 100 m above sea level
Rainfall	Very heavy in certain areas. The locomotive will be designed to permit its running at 10 km /hr in flood water level of 102 mm above rail level.
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 60077 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. ***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.

Current Sensor Auxiliary Circuit

Scheme Position : 42.3
Required Number : 2
Identification : HIET428008P0002

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 1:5000-1000 A- 40 ohm

Connector 9 Pole

Scheme Position : 42.3A
Required Number : 2
Identification : HETT401293P0001

Details :
Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 9 Pole GR. 13 -13A, M. BUCHSE

Circuit Breaker AC

Scheme Position : 53.1, 59.1
Required Number : 2
Identification : HBTB585554R3083

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 63A-690 VAC- 3 Poles

Aux. Contacts

Scheme Position : 47.1, 53.1, 54.1, 55.1, 56.1, 59.1, 62.1
Required Number : 7
Identification : HBTB585557R1200

Details :

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

Contactor Main Compressor

Scheme Position : 47.2
Required Number : 1
Identification : HBTB585683R2927

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 80A/125A- 690 V-3 Poles

Snubber Circuit

Scheme Position : 47.2A
Required Number : 1
Identification : 3EHW470024R0005

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*

Nominal Data : 110/120 VDC

Circuit Breaker AC

Scheme Position : 56.1, 54.1, 55.1, 64.1
Required Number : 4
Identification : HBTB585552R3013

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 6 A-690 VAC- 3 Poles

Circuit Breaker AC

Scheme Position : 62.1
Required Number : 1
Identification : HBTB585552R3033

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 16 A-690 VAC- 3 Poles

Earth Fault Relay Aux Converter

Scheme Position : 89.2
Required Number : 1
Identification : HBVW400011R0001

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 150 mA-43 Ohm

Earthing Resistor Earth fault Detection Aux. Converter

Scheme Position : 90.3
Required Number : 2
Identification : NBT300210P0087
Details:

Manufacturer : *As per CLW approved Vendor Directory on UVAM*

Nominal Data : 3.9 kOhm ±10%, 250W

Key Lock

Scheme Position : 1004.4
Required Number : 1
Identification : HSBA331645R0002

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : "C"- GREEN

Keeper of Key Lock

Scheme Position : 1004.4
Required Number : 1
Identification : HSBA331645R0005

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*

Contactor Type – 3 , Scavenge Blower

Scheme Position : 52.4, 52.7
Required Number : 03 nos.
Identification : HBTB585683R2927

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 80 A /125 A- 750 V – 3 POLES

Capacitor input Filter Aux. Converter

Scheme Position : 49.1
Required Number : 3
Identification : HIES309976P0001

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 0.22 µF/ 2000 V

RESISTOR INPUT FILTER AUX. CONV.

Scheme Position : 49.2
Required Number : 4 nos.
Identification : HIET402702P1029

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 220 ohm/ 80 W /LOW IND

Circuit Breaker Type -16

Scheme Position : 47.1
Required Number : 1

Nominal Data : 40 A, 690 V, 3 POLE

Snubber Circuit to item 52.4

Scheme Position : 52.4A
Required Number : 2
Identification : 3EHW470024R0005

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : TRANSZORB + DIODE , 110/120 V DC

CONTACTOR OIL PUMPS WITH AUX. CONTACT LAIDN13

Scheme Position : 52.5
Required Number : 2
Identification : 3EHE428074R0001

Details :
Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 150 A/1000 V – 3 POLES

SNUBBER CIRCUIT TO ITEM 52.5

Scheme Position : 52.5 A
Required Number : 2
Identification : 3EHE428099P0001

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : VARISTOR 110 V AC /DC

AUX. CONTACTOR TO ITEM 52.4 & 52.5

Scheme Position : 52.6
Required Number : 2
Identification : HBTB585402R0821

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 110 V DC- 1345 ohm – 1 NO

CHOKE INPUT FILTER AUX. CONVERTER

Scheme Position : 49.3
Required Number : 1

Details :

Manufacturer : *As per CLW approved Vendor Directory on UVAM*
Nominal Data : 100 µH

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

5. WIRING AND CABLING

1. The cables for wiring in the locomotives and equipments will use high grade electrolytic copper stranded conductors tinned as used in WAG-9 loco.

2. The cables will be of approved quality and grade of insulation and sheath. They will be fire retarding type. In locations where high temperatures are likely to be met, special cables may be employed.

3. 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.

4. 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.

5. No cable having a conductor size of less than 2.5 sq.mm will ordinarily be used.

6. Smaller size cables for internal wiring panels, control cubicles, signal wiring, consistent with the mechanical and electrical requirements, may be adopted.

7. The layout of the cable should be such that contamination by oils is avoided.

8. Loading of power cables will not be more than 75% of its capacity.

9. Cables for terminal connections will have only crimped joints.

10. The Documents related to cabling of the panel would be passed on subsequently to the successful tenderer/s. All wiring and cabling should be as per CLW specification.

6. SHEET METAL STRUCTURE

The cubicle is of detachable type and shall comply with the dimensions and tolerances specified in relevant part drawings. The complete cubicle shall consist of a no. of panels secured to each other by Hex. Bolts/ screw, 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 dimensions and weight of the complete cubicle shall not be exceeded.

7. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The HB2 Cubicle shall be used under the following conditions.

7.1 Environmental conditions

Environmental condition within the 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.	:	16 hours (approx. 330 days per year)
Yearly approx	:	5,280 hours
Within 30 years approx	:	158,400 hours

Environmental conditions:-

Rated values of environmental temperature and air humidity according to 7.1 “conditions within the machine room”.

7.3 Reliability

Operational condition	:	according to 7.2
Availability rate	:	98%
Lifetime of the loco	:	min. 36 years (Maintenance, spare parts, lifetime)

NOTE :-

1) The name and year of manufacture of the firm should be embossed on the item.
2) Hardwares are to be used should be any of the following make :
   a) UNBRAKO (Precision fastener)
   b) Laxmi precision (LPS)
   c) Sundaram fastener (TVS)
   d) All spring washer of Forbes Gokak ltd., Moka Mumbai only.
3) *SS Hardware required in the assembly are to be procured from CLW approved sources list for SS Hardwares.*

8. TEST CONDITIONS

8.1 TYPE TESTING :

a) Material certificate for materials used from an approved test house/supplier has to be produced 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 has to be submitted to Dy. CEE/Design.

d) Panel should be electrically tested after wiring as per relevant standards. The components will be tested as per CLW's stipulations to be passed on to the successful tenderer.

e) All electrical equipments procured shall be tested at assembly stages. Test certificates shall be produced for OEM components. Any change will have to be taken prior approval of DY.CEE/Design and it will involve complete type test.

8.2 ROUTINE TESTING :

The cubicle will be tested for the following routine test :

1. Integrity and completeness.

2. Testing of inter-connections and functionality of the different sub-assemblies within the panel

3. Suitable checking fixtures are to be made for checking the dimensions of the complete assembled panels. Certificates for raw materials and fasteners to be provided.

4. Complete cubicle and electrical items will be tested as per as per relevant IS.

9. STANDARDS/ UNITS

IS/ IEC- Standards will be accepted. Internally used BBC/ABB/adtranz if any should be mentioned together with corresponding IEC Standard. Only SI Units will be accepted.

10. SCOPE OF SUPPLY

One Auxiliary Cubicle 2 fully assembled with the equipments as given in clause 3 and duly tested as per clause 8 of this document.

10.1 All individual components of the Panel should be procured as per Annexure-I.

11. INSPECTION

1. 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 document.

12. SUPPLY OF DOCUMENTS (In addition to those indicated in bid documents of CLW)

i) Technical details composition and characteristics of the material including fasteners to be used for manufacture of cubicles
ii) Source(s) of raw materials and hardwares.
iii) Manufacturing process.
iv) Type test plan including checks for vibration and welding.
v) Routine test plan.
vi) Details for similar items supplied for locomotive, if any.
vii) Source of the components being offered including cables.

13. SUBMISSION OF TENDER QUOTATION :

13.1 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 requirements of the specification and quality of materials and workmanship.

13.2 Quotation shall not be considered complete unless all information is furnished and are therefore liable to be rejected.

14. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER :

i) Type test reports

ii) Routine test reports along with each set

iii) Detailed drawings

15. The tenderer shall confirm that the equipments are as either used in 3 phase AC locomotive manufactured by Indian Railways . Any equivalent components will need CLW's prior approval

16. Modification sheet no. RDSO/2008/EL/MS/0367/Rev '0' dated 29.08.08 is included

17. MS-413 , paralleling of interlock of Aux. Contactor of 3- phase locomotives.

Annexure-I (HB-2)

18. Details of Sub-components to be procured from CLW approved sources

Sl. No	Description	Specn.No.	Sch.Pos.	ABB Identification No.	Qty/Panel
1.	Current Sensor	CLW/ES/3/0084/A or latest	42.3	HIET428008P0002	2 Nos.
2.	Connector	CLW/ES/3/0124/M or latest	42.3A	HETT401293P0001	2 Nos.
3.	Circuit Breaker– Type- 17	CLW/ES/3/0096/G or latest	53.1 59.1	HBTB585554R3083 HBTB585557R1200	2 Nos.
4.	Contactor for Scavenge Blower, AC System	CLW/ES/3/0095/C or latest	52.4/1 52.4/2 52.7	HBTB585683R2927	3 Nos.
5.	Capacitor Input filter Auxiliary Converter	CLW/ES/3/0448 or latest	49.1	HIES309976P0001	3 Nos.
6.	Resistor Input filter Auxiliary Converter	CLW/ES/3/0464/A or latest	49.2	HIET402702P1029	4 Nos.
7.	Contactor for Main Compressor	CLW/ES/3/0095/C or latest	47.2	HBTB585683R2927	1 No.
8.	Snubber Circuit to Contactor for Main Compressor (Type 3)	CLW/ES/3/0067/A or latest	47.2A 52.7A	3EHW470024R0005	2 Nos.
9.	Snubber Circuit to Contactor Scavenge Blower	CLW/ES/3/0067/A or latest	52.4A	3EHW470024R0005	2 Nos.
10.	Contactor Oil Pump with Aux. Contactor LAIDN13	CLW/ES/3/0201/A or latest	52.5	3EHE428074R0001	2 Nos.
11.	Snubber Circuit to Oil Pump with aux. Contactor LAIDN13	CLW/ES/3/0202 or latest	52.5A	3EHE428099P0001	1 No.
12.	Circuit Breaker to	CLW/ES/3/0096/G or latest	55.1, 64.1,	HBTB585552R3013 HBTB585557R1200	2 Nos.

	Scavenge Blower TM, AC System		56.1 & 54.1		
13.	Circuit Breaker to Scavenge Blower MR	CLW/ES/3/0096/G or latest	56.1	HBTB585552R1013 HBTB585557R1200	1 No.
14.	Circuit Breaker to Oil Pump Transformer	CLW/ES/3/0096/G or latest	62.1	HBTB585552R3033 HBTB585557R1200	1 No.
15.	Contactor Type – 6	CLW/ES/3//0034/B or latest	52.6	HBTB585402R0821	2 Nos.
16.	Choke Input Filter Auxiliary converter	CLW/MS/3/0448 or latest	49.3		3 Nos.
17.	Earth fault Relay Aux. Converter	CLW/ES/3/0090/B or latest	89.2	HBVW400011R0001	1 No.
18.	Earthing Resistor Earth fault detection Aux. Converter	CLW/ES/0014/C or latest	90.3	NBT300210P0087	2 Nos.
19.	Key Lock	CLW/ES/3/0049/E or latest	1004.4	HSBA331645R0002	1 No.
20.	Keeper Key Lock	CLW/ES/3/0049/E or latest	1004.4	HSBA331645R0005	1 No.
21.	Bare HB-2 Panel	CLW/MS/3/0047 Alt.12 or latest		3EHP130167	1 No.
22.	Screw Type Terminal Block	CLW/ES/3/0645/B or latest			
23.	Cable (Electron Beam irradiation)	CLW/ES/3/0645 or latest			

19. Tests

Sl 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)	D.E Test applied 2.27 KV for one minute *between Insulator and body*	Yes	No
(v)	Voltage test between terminals of Capacitor & terminal to casing	Yes	No
(vi)	Measurement if resistance	Yes	Yes
(vii)	Measurement of resistance of Earthing Resistors	Yes	Yes
(viii)	Fire –retardant test of all insulating material	Yes	No
(ix)	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 *	Yes *
(x)	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.*

20. IMPORTANT INFORMATIONS

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

20.2 The Cable for wiring of HB-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.

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

21. ANNEXURE:

21.1 All specification of components, sub components.

21.2 All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW.

21.3 *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.*

21.4 Energy saving scheme for 3-phase freight electric locomotives as per RDSO MS 482 has been incorporated in the cable connection chart of HB-2.

22. References

22.1 Cable cutting chart – 3EHP431445

22.2 Identification no. of cable list of Control Cubicle-2 (HB-2) – 3EHP431445 along with Modification release 460 (MO.16). identification no. of Aux. Cubicle-2 (HB-2) 3EHP130177.

22.3 The Cabling will be according to 3EHP601578

22.4 Documents referred for Cabling are 3EHP431445, 3EHP130177 & 3EHF601578.

Note: *The above mentioned references are for guidance only.*

Cable Connection chart of Auxiliary Cubicle HB2 for WAP7/WAG9/WAP5

*** In order to Drive MR Blower and ScMR Blower by three phase supply from BUR2 the connections should be treated as deleted.**

35 PIN /12 GRADE XK67S

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK67S-1	47.2A/2-3
2	1.5	2858	XK67S-2	89.2-B
3	1.5	2801B	XK67S-3	62.1/2-23
4	1.5	2850B	XK67S-4	53.1/2-24
5	1.5	2851B	XK67S-5	55.1/2-24
6	1.5	2852B	XK67S-6	56.1/2-24
7	1.5	2853B	XK67S-7	54.1/2-24
8	1.5	2855B	XK67S-8	59.1/2-24
9	1.5	2856B	XK67S-9	62.1/2-24
10	1.5	2857B	XK67S-10	63.1/2-24
11	1.5	3037B	XK67S-11	47.2A/2-2+
11A*	1.5	2857B	XK67S-10	63.1/2-24 (Deleted)
12	1.5	2840B	XK67S-26	47.1/2-14
13*	1.5	2890	XK67S-27	Link from A1 to 54.2/2-3 (Not Required)
14*	1.5	2897	XK67S-28	54.2/2-4 (Not required)
15	2.5	5094	XK67S-29	52.4/1-13
16	2.5	5094	XK67S-30	52.4/2-13
17	2.5	2877A	XK67S-31	52.6/1-A1
18	2.5	2877B	XK67S-32	52.6/2-A1
19	2.5	2880A	XK67S-33	52.5/2-54
20	2.5	2880B	XK67S-34	52.5/1-54

7 PIN /12 GRADE XK67C:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1218	XK67C:01-1	XB67A-1
2	6	1218	XK67C:01-2	XB67A-1
3	2.5	6501	XK67C:01-3	XK67C:02-3
4	2.5	6510	XK67C:01-4	XK67C:02-4
5	2.5	6503	XK67C:01-6	XK67C:02-6

7 PIN /12 GRADE XK67C:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	6	1218	XK67C:02-1	XB67A-1
2	6*	1200	XK67C:02-5	54.1/2-1 (Deleted)
3	2.5	6501	XK67C:02-3	XK67C:01-3
4	2.5	6510	XK67C:02-4	XK67C:01-4
5	2.5	6503	XK67C:02-6	XK67C:01-6

4 PIN XK67P:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	6	1157B	XK67P:01-1	62.1/2-2
2	6	1158B	XK67P:01-2	62.1/2-4
3	6	1159B	XK67P:01-3	62.1/2-6

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* 4 PIN XK67A:05

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1218	XK67A:05-1	XB67A-2
2	2.5	1201B	XK67A:05-2	54.1/2-2
3	2.5	1202B	XK67A:05-3	54.5/2-Q2 (For WAG 9 &WAP-5 only)
3A	2.5	1202B	XK67A:05-3	XK67A-9 (For WAP 7 only)
3A	2.5	1202B	54.1/2-Q2	Lower panel TB (For WAP 7 only)

4 PIN XK67A:05

(Modified Connection for inverter fed MR Blower)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1201B	XK67A:05-1	54.1/2-2
2	2.5	1202B	XK67A:05-2	54.1/2-4
3	2.5	1204B	XK67A:05-3	54.1/2-6

*** 4 PIN XK67A:06**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1218	XK67A:06-1	XB67A-2
2	2.5	1211B	XK67A:06-2	56.1/2-2

4 PIN XK67A:06

(Modified Connection for inverter fed ScMR Blower)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1121B	XK67A:06-1	56.1/2-2
2	2.5	1122B	XK67A:06-2	56.1/2-4
3	2.5	1123B	XK67A:06-3	56.1/2-6

4 PIN XK67AC:01 (CAB 1)

Sl. No.	Cable Cross Section	Cable no.		Connection To
1	2.5	1140A	XK67AC:01-1	DT SWITCH-2
2	2.5	1141A	XK67AC:01-2	DT SWITCH-6
3	2.5	1142A	XK67AC:01-3	DT SWITCH-10

4 PIN XK67AC:02 (CAB 2)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1140B	XK67AC:02-1	DT SWITCH-4
2	2.5	1141B	XK67AC:02-2	DT SWITCH-8
3	2.5	1142B	XK67AC:02-3	DT SWITCH-12

4 PIN XK67A:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1137B	XK67A:02-1	55.1/2-2
2	2.5	1138B	XK67A:02-2	55.1/2-4
3	2.5	1139B	XK67A:02-3	55.1/2-6

4 PIN XK67D

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	25	1131	XK67D-1	XH67A-4
2	25	1132	XK67D-2	XH67A-5
3	25	1133	XK67D-3	XH67A-6

4 PIN XK67B

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	25	1121B	XK67B-1	XH67A-1
2	25	1122B	XK67B-2	XH67A-2
3	25	1123B	XK67B-3	XH67A-3

4 PIN XK67E:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	50	1121B	XK67E:01-1	XH67A-1
2	50	1122B	XK67E:01-2	XH67A-2
3	50	1123B	XK67E:01-3	XH67A-3

4 PIN XK67E:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	50	1131	XK67E:02-1	XH67A-4
2	50	1132	XK67E:02-2	XH67A-5
3	50	1133	XK67E:02-3	XH67A-6

52.7,CONTACTOR

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2877B	52.7-A1	52.7A-2+
2	2.5	2050	52.7-A2	52.7A-4-
3	2.5	1137A	52.7-1	64.1/2-2
4	2.5	1137B	52.7-2	DT SWITCH-1
5	2.5	1138A	52.7-3	64.1/2-4
6	2.5	1138B	52.7-4	DT SWITFH-5

7	2.5	1139A	52.7-5	64.1/2-6
8	2.5	1139B	52.7-6	DT SWITCH-9

52.7A SNUBBER CIRCUIT

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2878B	52.7A-1+	52.6/2-2
2	2.5	2877B	52.7A-2+	52.7-A1
3	2.5	2050	52.7A-3-	47.2A/2-4
4	2.5	2050	52.7A-4-	52.7-A2

47.2/2 , CONTACTOR

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3037B	47.2/2-A1	47.2A/2-1+
2	1.5	2050	47.2/2-A2	47.2A/2-4
3	10	1131	47.2/2-1	XH67A-4
4	10	1141B	47.2/2-2	47.1/2-1
5	10	1132	47.2/2-3	XH67A-5
6	10	1142B	47.2/2-4	47.1/2-3
7	10	1133	47.2/2-5	XH67A-6
8	10	1143B	47.2/2-6	47.1/2-5

47.2A/2 , SNUBBER CIRCUIT

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3037B	47.2A/2-1+	47.2/2-A1
2	1.5	3037B	47.2A/2-2+	XK67S-11
3*	1.5	2050	47.2A/2-3	54.2/2-A2 (Deleted)
4	2.5	2050	47.2A/2-3	XK67S-1
5	2.5	2050	47.2A/2-4	52.7A-3-
6	1.5	2050	47.2A/2-4	47.2/2-A2

52.6/1, AUX. CONTACTOR, 80A

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2877A	52.6/1-A1	XK67S-31
2	1.5	2050	52.6/1-A2	52.6/2-A2
3	2.5	2050	52.6/1-A2	52.4/1-A2

4	1.5	5094	52.6/1-1+	52.4/1-13
5	2.5	2877A	52.6/1-2+	XB67A-3
6	2.5	2877A	52.6/1-2	52.4/1-A1

52.6/2, AUX. CONTACTOR 80A

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2877B	52.6/2-A1	XK67S-32
2	1.5	2050	52.6/2-A2	52.4/2-A2
3	1.5	2050	52.6/2-A2	52.6/1-A2
4	2.5	5094	52.6/2-1+	52.4/2-13
5	1.5	2877B	52.6/2-2	XB67A-4
6	2.5	2877B	52.6/2-2	52.7A-1+

89.2, EARTH FAULT RELAY

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	1105	89.2-U	90.3/1-Q2 (For WAG 9 & WAP-5 only)
1A	1.5	1105	89.2U	XB67A-7 (For WAP 7 only)
1A	1.5	1105	90.3/1-Q2	Lower panel TB (For WAP 7 only)
2	2.5	0	89.2-V	MASSE-M
3	1.5	2801B	89.2-A	47.1/2-13
4	1.5	2801B	89.2-A	56.1/2-23
5	1.5	2858	89.2-B	XK67S-2

* 54.2/2, CONTACTOR WITH TIME DELAY MODULE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2890B	54.2/2-A1 TO 3	XK67S-27
2	1.5	2890B	54.2/2-3	54.2/2-A1 (Timer)
3	2.5	1201B	54.2/2-R1	XB67A-7
4	2.5	1204B	54.2/2-R2	54.8/2-Q1 (For WAG 9 only)
4A	2.5	1204B	54.2/2-R2	XB67-8 (For WAP 7 & 5 only)
4A	2.5	1204B	54.8/2-Q1	Lower panel TB (For WAP 7 & 5 only)
5	2.5	1201B	54.2/2-R3	XB67A-7
6	2.5	1204B	54.2/2-R4	54.8/2-Q1 (For WAG9 only)
6A	2.5	1204B	54.2/2-R4	XB67A-8 (For WAP

				7 & 5 only)
7	1.5	2897	54.2/2-4	XK67S-28
8	1.5	2050	54.2/2-A2	54.2/2-A2 (Timer)
9	1.5	2890	54.2/2-A1	54.2/2-16 (Timer)

62.1/2, CIRCUIT BRERAKER, 16A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	1134	62.1/2-1	XH67A-7
2	6	1157B	62.1/2-2	XK67P:01-1
3	10	1135	62.1/2-3	XH67A-8
4	6	1158B	62.1/2-4	XK67P:01-2
5	10	1136	62.1/2-5	XH67A-9
6	6	1159B	62.1/2-6	XK67P:01-3
7	1.5	2801B	62.1/2-23	XK67S-3
8*	1.5	2801B	62.1/2-23	63.1/2-23 (Deleted)
9	1.5	2856B	62.1/2-24	XK67S-9

47.1/2, CIRCUIT BREAKER, 40A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	1141B	47.1/2-1	47.2/2-2
2	10	1187B	47.1/2-2	XB67A:04-1
3	10	1142B	47.1/2-3	47.2/2-4
4	10	1188B	47.1/2-4	XB67A:04-2
5	10	1143B	47.1/2-5	47.2/2-6
6	10	1189B	47.1/2-6	XB67A:04-3
7	1.5	2801B	47.1/2-13	89.2-A
8	1.5	2840B	47.1/2-14	XK67S-26

53.1/2, CIRCUIT BREAKER, 63A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	16	1121B	53.1/2-1	XH67A-1
2	16	1127B	53.1/2-2	XB67A:01-1
3	16	1122B	53.1/2-3	XH67A-2
4	16	1128B	53.1/2-4	XB67A:01-2
5	16	1123B	53.1/2-5	XH67A-3
6	16	1129B	53.1/2-6	XB67A:01-3
7	1.5	2801B	53.1/2-23	55.1/2-23
8	1.5	2801B	53.1/2-23	63.1/2-23 (Deleted)
9	1.5	2850B	53.1/2-24	XK67S-4

63.1/2 ,Circuit Breaker Oil Pump Converter

(MCB is deleted from scope of supply of Panel, it is to be provided by Propulsion manufacturer) (CB has been deleted, but cable with end lug is to be provided by the panel supplier)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1167B	63.1/2-2	XB67P:02-1
2	2.5	1168B	63.1/2-4	XB67P:02-2
3	2.5	1169B	63.1/2-6	XB67P:02-3
4	2.5	1134	63.1/2-1	XH67A-7
5	2.5	1135	63.1/2-3	XH67A-8
6	2.5	1136	63.1/2-5	XH67A-9
7	1.5	2801B	63.1/2-23	62.1/2-23
8	1.5	2857B	63.1/2-24	XK67S-10
9	1.5	2801B	63.1/2-23	53.1/2-23

55.1/2, CIRCUIT BREAKER,10A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	1124	55.1/2-1	XB67U:02-1
2	2.5	1137B	55.1/2-2	XK67A:02-1
3	10	1125	55.1/2-3	XB67U:02-2
4	2.5	1138B	55.1/2-4	XK67A:02-2
5	10	1126	55.1/2-5	XB67U:02-3
6	2.5	1139B	55.1/2-6	XK67A:02-3
7	1.5	2801B	55.1/2-23	59.1/2-23
8	1.5	2801B	55.1/2-23	53.1/2-23
9	1.5	2851B	55.1/2-24	XK67S-5

59.1/2, CIRCUIT BREAKER,10A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	16	1121A	59.1/2-1	XB67U:01-1
2	16	1147B	59.1/2-2	XB67A:03-1
3	16	1122A	59.1/2-3	XB67U:01-2
4	16	1148B	59.1/2-4	XB67A:03-2
5	16	1123A	59.1/2-5	XB67U:01-3
6	16	1149B	59.1/2-6	XB67A:03-3
7	1.5	2801B	59.1/2-23	54.1/2-23
8	1.5	2801B	59.1/2-23	55.1/2-23
9	1.5	2855B	59.1/2-24	XK67S-8

* 54.1/2, CIRCUIT BREAKER, 20A, 1 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	6	1200	54.1/2-1	56.1/2-1
2	6	1200	54.1/2-1	XK67C:02-5
3	2.5	1201B	54.1/2-2	XK67A:05-2
4	2.5	1201B	54.1/2-2	54.5/2-Q1 (For WAG 9 only)
4A	2.5	1201B	54.1/2-2	XB67A-9 (For WAP 7 & 5 only)
4A	2.5	1201B	54.5/2-Q1	Lower panel TB (For WAP 7 & 5 only)
5	1.5	2801B	54.1/2-23	56.1/2-23
6	1.5	2801B	54.1/2-23	59.1/2-23
7	1.5	2853B	54.1/2-24	XK67S-7

DUE TO OVERHEATING IN TERMINALS OF MCB, BLOCK XH67A HAS BEEN INCREASED FROM 09 TO 12 TERMINAL WITH EXTENSION OF TB AT XH67A-4,5 & 6 AND FEED HAS BEEN GIVEN TO 54.1/2 & 56.1/2

54.1/2, CIRCUIT BREAKER, 10A, 3 POLE

(Modified Connection for inverter fed MR Blower)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1131	XH67A-4	54.1/2-1 (RDSO MS 482, Energy Saving)
2	2.5	1132	XH67A-5	54.1/2-3(RDSO MS 482, Energy Saving)
3	2.5	1133	XH67A-6	54.1/2-5 (RDSO MS 482, Energy Saving)
4	2.5	1121B	XH67A-1	56.1/2-1
5	2.5	1122B	XH67A-2	56.1/2-3
6	2.5	1123B	XH67A-3	56.1/2-5
7	2.5	1201B	54.1/2-2	XK67A:05-1
8	2.5	1202B	54.1/2-4	XK67A:05-2
9	2.5	1204B	54.1/2-6	XK67A:05-3
10	1.5	2801A	54.1/2-23	59.1/2-23
11	1.5	2801A	54.1/2-23	56.1/2-23
12	1.5	2853B	54.1/2-24	XK67S-7

* 56.1/2, CIRCUIT BREAKER, 10A, 1 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1211B	56.1/2-2	XK67A:06-2
2	1.5	2801B	56.1/2-23	54 .1/2-23
3	1.5	2801B	56.1/2-23	89.2-A
4	1.5	2852B	56.1/2-24	XK67S-6

56.1/2, CIRCUIT BREAKER, 10A, 3 POLE

(Modified Connection for inverter fed ScMR Blower)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1131	XH67A-4	56.1/2-1 (RDSO MS 482, Energy Saving)
2	2.5	1132	XH67A-5	56.1/2-3 (RDSO MS 482, Energy Saving)
3	2.5	1133	XH67A-6	56.1/2-5 (RDSO MS 482, Energy Saving)
4	1.5	2801B	56.1/2-23	54.1/2-23
5	2.5	1121B	56.1/2-2	XK67A:06-1
6	2.5	1122B	56.1/2-4	XK67A:06-2
7	2.5	1123B	56.1/2-6	XK67A:06-3
8	1.5	2852B	56.1/2-24	XK67S-6
9	1.5	2801B	56.1/2-23	89.2-A

64.1, CIRCUIT BREAKER, 10A, 3 POLE

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1131	64.1-1	XH67A-4(RDSO MS 482, Energy Saving)
2	2.5	1137A	64.1-2	52.7-1
3	2.5	1132	64.1-3	XH67A-5 (RDSO MS 482, Energy Saving)
4	2.5	1138A	64.1-4	52.7-3
5	2.5	1133	64.1-5	XH67A-6(RDSO MS 482, Energy Saving)
6	2.5	1139A	64.1-6	52.7-5

LOOSE CONNECTION (DT SWITCH)

Sl. No.	Cable	Cable no.	Connection From	Connection To

	Cross Section			
1	2.5	1137B	DT SWITCH-1	52.7-2
2	2.5	1140A	DT SWITCH-2	XK67AC:01-1
3	2.5	1140B	DT SWITCH-4	XK67AC:02-1
4	2.5	1138B	DT SWITCH-5	52.7-4
5	2.5	1141A	DT SWITCH-6	XK67AC:01-2
6	2.5	1141B	DT SWITCH-8	XK67AC:02-2
7	2.5	1139B	DT SWITCH-9	52.7-6
8	2.5	1142A	DT SWITCH-10	XK67AC:01-3
9	2.5	1142B	DT SWITCH-12	XK67AC:02-3

52.4/1, CONTACTOR

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	2878A	52.4/1-A1	52.4A/1-1+
2	1.5	2050	52.4/1-A2	52.4A/2-4
3	16	1121A	52.4/1-1	XB67U:01-1
4	16	1124	52.4/1-2	XB67U:02-1
5	16	1122A	52.4/1-3	XB67U:01-2
6	16	1125	52.4/1-4	XB67U:02-2
7	16	1123A	52.4/1-5	XB67U:01-3
8	16	1126	52.4/1-6	XB67U:02-3
9	2.5	5094	52.4/1-13	XK67S-29
10	2.5	5094	52.4/1-13	52.6/1-1+
11	1.5	2879A	52.4/1-14	52.5/2-53

52.4A/1, SNUBBER CIRCUIT

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	2877A	52.4A/1-1+	52.4/1-A1
2	2.5	2877A	52.4A/1-2+	XB67A-3
3	2.5	2050	52.4A/1-3	XB67A-5
4	2.5	2050	52.4A/1-4	52.4/1-A2

52.4/2, CONTACTOR

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	2877A	52.4/2-A1	52.4A/2-1+
2	1.5	2050	52.4/2-A2	52.4A/1-4
3	10	1131	52.4/2-1	52.5/2-1
4	10	1124	52.4/2-2	XB67U:02-1
5	10	1132	52.4/2-3	52.5/2-3
6	10	1125	52.4/2-4	XB67U:02-2

7	10	1133	52.4/2-5	52.5/2-5
8	10	1126	52.4/2-6	XB67U:02-3
9	2.5	5094	52.4/2-13	XK67S-30
10	2.5	5094	52.4/2-13	52.6/2-1+
11	1.5	2879B	52.4/2-14	52.5/1-53

52.4A/2,SNUBBER

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2878B	52.4A/2-1+	52.4/2-A1
2	2.5	2878A	52.4A/2-2	52.4/1-A1
3	2.5	2050	52.4A/2-3	XB67A-5
4	2.5	2050	52.4A/2-4	52.4/2-A2

52.5/1, CONTACTOR

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2877B	52.5/1-A1	XB67A-4
1A	1.5	2878B	52.5/1-A1	52.5A/1-1
2	1.5	2050	52.5/1-A2	54.2/2-A2
2A	1.5	2050	52.5/1-A2	52.5/2-A2
3	25	1121B	52.5/1-1	XH67A-1
4	25	1134	52.5/1-2	52.5/2-2
5	25	1134	52.5/1-2	XH67A-7
6	25	1122B	52.5/1-3	XH67A-2
7	25	1135	52.5/1-4	52.5/2-4
8	25	1135	52.5/1-4	XH67A-8
9	25	1123B	52.5/1-5	XH67A-3
10	25	1136	52.5/1-6	52.5/2-6
11	25	1136	52.5/1-6	XH67A-9
12	1.5	2879B	52.5/1-53	52.4/2-14
12A	2.5	2879B	52.5/1-53	52.5/1-83
13	2.5	2880B	52.5/1-54	XK67S-34
13A	2.5	2880B	52.5/1-54	52.5/1-84

52.5/2, CONTACTOR

Sl. No	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2878A	52.5/2-A1	52.4/1-A1
2	1.5	2050	52.5/2-A2	52.5/1-A2
3	25	1131	52.5/2-1	XH67A-4
4	10	1131	52.5/2-1	52.4/2-1
5	25	1134	52.5/2-2	52.5/1-2

6	25	1132	52.5/2-3	XH67A-5
7	10	1132	52.5/2-3	52.4/2-3
8	25	1135	52.5/2-4	52.5/1-4
9	25	1133	52.5/2-5	XH67A-6
10	10	1133	52.5/2-5	52.4/2-5
11	25	1136	52.5/2-6	52.5/1-6
12	1.5	2879A	52.5/2-53	52.4/1-14
12A	2.5	2879A	52.5/2-53	52.5/2-83
13	2.5	2880A	52.5/2-54	XK67S-33
13A	2.5	2880A	52.5/2-54	52.5/2-84

*** 54.5/2,CAPACITOR**

Sl. No	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1201B	54.5/2-Q1	XB67A-7
2	2.5	1202B	54.5/2-Q2	XK67A:05-3 (For WAG 9 only)
3	2.5	1202B	54.5/2-Q2	54.8/2-Q2

*** 54.8/2, CAPACITOR**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	1204B	54.8/2-Q1	54.2/2-R2 (For WAG 9 only)
2	2.5	1204B	54.8/2-Q1	54.2/2-R4 (For WAG 9 only)
3	2.5	1202B	54.8/2-Q2	54.5/2-Q2

90.3/1, RESISTOR

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	1103	90.3/1-Q1	S1103.1-Q1
2	1.5	1105	90.3/1-Q2	89.2-U (For WAG 9 & WAP-5 only)
2A	1.5	1105	90.3/1-Q2	To small panel terminal box (For WAP-7 only)
2B	1.5	1105	89.2-U	XB67A-7 (For WAP-7 only)
3	1.5	1105	90.3/1-Q2	90.3/2-Q1

90.3/2,RESISTOR

Sl. No.	Cable	Cable no.	Connection From	Connection To

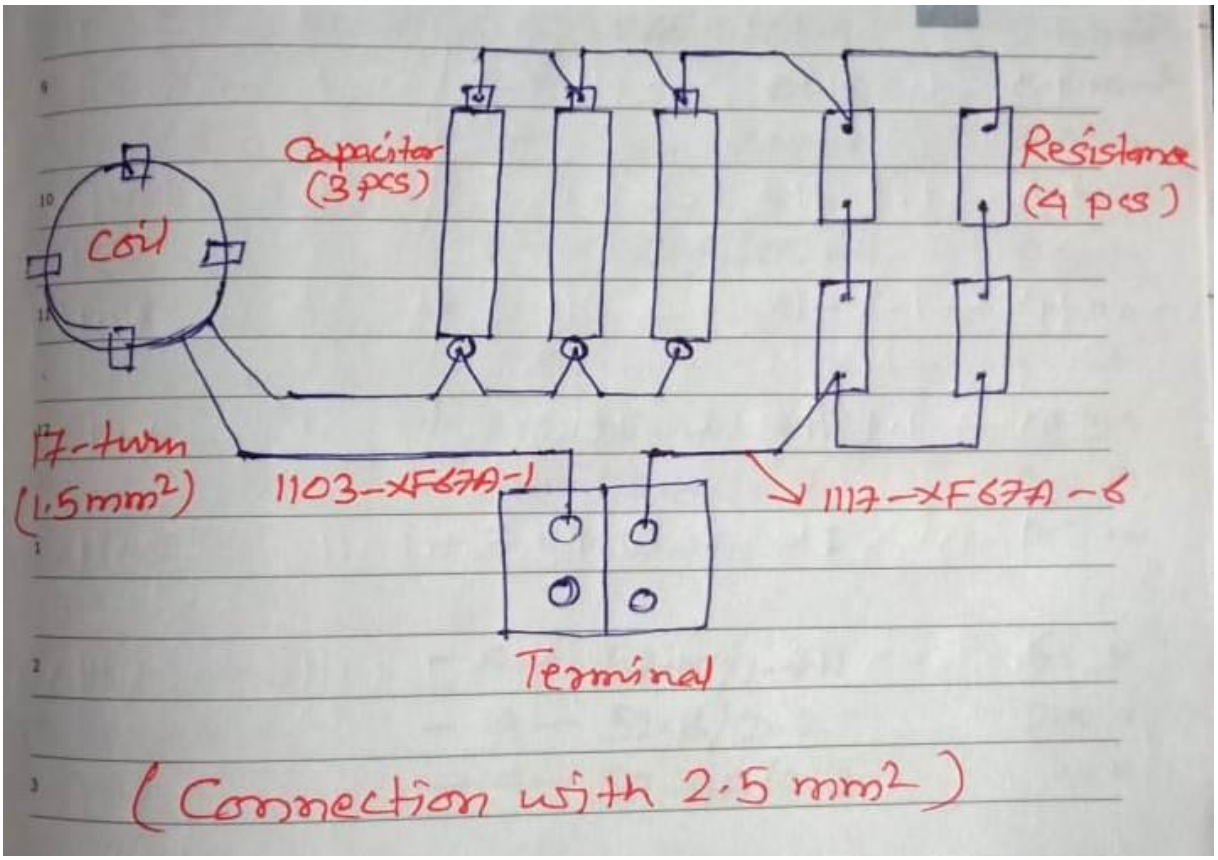
	Cross Section			
1	1.5	1105	90.3/2-Q1	90.3/1-Q2
2	1.5	1117	90.3/2-Q2	S1117.1-Q1

Bus Bar-1

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	0.0	1103	S1103.1-Q1	42.3/1-IN
2	1.5	1103	S1103.1-Q1	90.3/1-Q1
3	0.0	1103	S1103.1-Q2	42.3/1-OUT

Bus Bar-2

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	1117	S1117.1-Q1	90.3/2-Q2
2	0.0	1117	S1117.1-Q2	42.3/2-OUT
3	0.0	1117	S1117.1-Q1	42.3/2-IN



CONNECTION OF R-L-C CIRCUIT BUR INPUT SNUBBER IN HB2

XH67A (TB TO TB)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	1134	XB67U:03-1/ XH67A(1)- 16	XH67A-7/ XH67A(2)- 7
2	10	1135	XB67U:03-2/ XH67A(1)- 17	XH67A-8/ XH67A(2)- 8
3	10	1136	XB67U:03-3/ XH67A(1)- 18	XH67A-9/ XH67A(2)- 9

SNUBBER CIRCUIT TO ITEM 52.5 (SCH. POS : 52.5A/1)

Sl. No.	Cable CrossSection	Cable no.	ConnectionFrom	ConnectionTo
1	0.0	2877B	52.5A/1-1+	52.5/1-A1
2	0.0	2050	52.5A/1-4-	52.5/1-A2

SNUBBER CIRCUIT TO ITEM 52.5 (SCH. POS : 52.5A/2)

Sl. No.	Cable CrossSection	Cable no.	ConnectionFrom	ConnectionTo

1	0.0	2877A	52.5A/2-1+	52.5/2-A1
2	0.0	2050	52.5A/2-4-	52.5/2-A2

SCREW CONNECTIONTB XH67A (1) - 21 TB

SN	Cable Cross section	Cable no.	From		To	
1	16.00mm²	1127B	XH67A (1)	1	53.1/2	2
2	16.00mm²	1128B	XH67A (1)	2	53.1/2	4
3	16.00mm²	1129B	XH67A (1)	3	53.1/2	6
4	16.00mm²	1147B	XH67A (1)	4	59.1/2	2
5	16.00mm²	1148B	XH67A (1)	5	59.1/2	4
6	16.00mm²	1149B	XH67A (1)	6	59.1/2	6
7	10.00mm²	1187B	XH67A (1)	7	47.1/2	2
8	10.00mm²	1188B	XH67A (1)	8	47.1/2	4
9	10.00mm²	1189B	XH67A (1)	9	47.1/2	6
10	10.00mm²	1121A	XH67A (1)	10	52.4/1	1
11	10.00mm²	1122A	XH67A (1)	11	52.4/1	3
12	10.00mm²	1123A	XH67A (1)	12	52.4/1	5
13	16.00mm²	1121A	XH67A (1)	10	59.1/2	1
14	16.00mm²	1122A	XH67A (1)	11	59.1/2	3
15	16.00mm²	1123A	XH67A (1)	12	59.1/2	5

16	10.00mm²	1124	XH67A (1)	13	52.4/1	2
17	10.00mm²	1125	XH67A (1)	14	52.4/1	4
18	10.00mm²	1126	XH67A (1)	15	52.4/1	6
19	10.00mm²	1124	XH67A (1)	13	55.1/2	1
20	10.00mm²	1125	XH67A (1)	14	55.1/2	3
21	10.00mm²	1126	XH67A (1)	15	55.1/2	5
22	10.00mm²	1124	XH67A (1)	13	52.4/2	2
23	10.00mm²	1125	XH67A (1)	14	52.4/2	4
24	10.00mm²	1126	XH67A (1)	15	52.4/2	6
25	10.00mm²	1134	XH67A (1)	16	XH67A (2)	7
26	10.00mm²	1135	XH67A (1)	17	XH67A (2)	8
27	10.00mm²	1136	XH67A (1)	18	XH67A (2)	9
28	2.50mm²	1167B	XH67A (1)	19	63.1/2	2
29	2.50mm²	1168B	XH67A (1)	20	63.1/2	4
30	2.50mm²	1169B	XH67A (1)	21	63.1/2	6

SCREW CONNECTIONTB XH67A (2) - 9 TB

SN	Cable Cross section	Cable no.	From		To	
1	16.00mm²	1121B	XH67A (2)	1	53.1/1	1
2	25.00mm²	1121B	XH67A (2)	1	XK67B	1
3	50.00mm²	1121B	XH67A (2)	1	XK67E:01	1
4	25.00mm²	1121B	XH67A (2)	1	52.5/1	1
5	16.00mm²	1122B	XH67A (2)	2	53.1/3	3
6	25.00mm²	1122B	XH67A (2)	2	XK67B	2
7	50.00mm²	1122B	XH67A (2)	2	XK67E:01	2
8	25.00mm²	1122B	XH67A (2)	2	52.5/1	3
9	16.00mm²	1123B	XH67A (2)	3	53.1/5	5
10	25.00mm²	1123B	XH67A (2)	3	52.5/1	5
11	25.00mm²	1123B	XH67A (2)	3	XK67B	3
12	50.00mm²	1123B	XH67A (2)	3	XK67E:01	3
13	25.00mm²	1131	XH67A (2)	4	52.5/2	1
14	25.00mm²	1131	XH67A (2)	4	XK67D	1

15	50.00mm²	1131	XH67A (2)	4	XK67E:02	1
16	10.00mm²	1131	XH67A (2)	4	47.2/2	1
17	25.00mm²	1132	XH67A (2)	5	52.5/2	3
18	25.00mm²	1132	XH67A (2)	5	XK67D	2
19	50.00mm²	1132	XH67A (2)	5	XK67E:02	2
20	10.00mm²	1132	XH67A (2)	5	47.2/2	3
21	25.00mm²	1133	XH67A (2)	6	52.5/2	5
22	25.00mm²	1133	XH67A (2)	6	XK67D	3
23	50.00mm²	1133	XH67A (2)	6	XK67E:02	3
24	10.00mm²	1133	XH67A (2)	6	47.2/2	5
25	10.00mm²	1134	XH67A (2)	7	62.1/2	1
26	10.00mm²	1134	XH67A (2)	7	XH67A (1)	16
27	25.00mm²	1134	XH67A (2)	7	52.5/1	2
28	2.50mm²	1134	XH67A (2)	7	63.1/2	1
29	10.00mm²	1135	XH67A (2)	8	62.1/2	3
30	10.00mm²	1135	XH67A (2)	8	XH67A (1)	17
31	25.00mm²	1135	XH67A (2)	8	52.5/1	4
32	2.50mm²	1135	XH67A (2)	8	63.1/2	3
33	10.00mm²	1136	XH67A (2)	9	62.1/2	5
34	10.00mm²	1136	XH67A (2)	9	XH67A (1)	18
35	25.00mm²	1136	XH67A (2)	9	52.5/1	6
36	2.50mm²	1136	XH67A (2)	9	63.1/2	5

SCREW CONNECTIONUPPER PANEL TB XB67A (1) - 10 TB FOR WAP-7

SN	Cable Cross section	Cable no.	From		To	
1	2.5 mm²	1218	XB67A (1)	1	XK67C:01	1
2	6.00mm²	1218	XB67A (1)	1	XK67C:01	2
3	6.00mm²	1218	XB67A (1)	1	XK67C:02	1
4	2.50mm²	1218	XB67A (1)	2	XK67A:06	1
5	2.50mm²	1218	XB67A (1)	2	XK67A:05	1
6	2.50mm²	2878A	XB67A (1)	3	52.6/1	2-
7	2.50mm²	2878A	XB67A (1)	3	52.4A/1	2+
8	2.50mm²	2878B	XB67A (1)	4	52.4A/2	2+
9	1.50mm²	2878B	XB67A (1)	4	52.5/1	A1
10	1.50mm²	2050	XB67A (1)	5	54.2/2	A2
11	2.50mm²	2050	XB67A (1)	5	52.4A/1	3-

12	2.50mm²	2050	XB67A (1)	5	52.4A/2	3-
13	2.50mm²	1201B	XB67A (1)	7	54.1/2	2
14	2.50mm²	1201B	XB67A (1)	7	54.2/2	R1
15	2.50mm²	1201B	XB67A (1)	7	XB67A (2)	3
16	2.50mm²	1204B	XB67A (1)	8	54.2/2	R2
17	2.50mm²	1204B	XB67A (1)	8	XB67A (2)	4
18	2.50mm²	1202B	XB67A (1)	9	XK67A:05	3
19	2.50mm²	1202B	XB67A (1)	9	XB67A (2)	2
20	1.50mm²	1105	XB67A (1)	10	89.2	U
21	2.50mm²	1105	XB67A (1)	10	XB67A (2)	1

SCREW CONNECTION LOWER PANEL TB XB67A (2) - 4 TB FOR WAP-7

SN	Cable Cross section	Cable no.	From		To	
1	1.50mm²	1105	XB67A (2)	1	90.3/1	Q2
2	1.50mm²	1105	XB67A (2)	1	XB67A (1)	10
3	2.50mm²	1202B	XB67A (2)	2	54.5/2	Q2
4	2.50mm²	1202B	XB67A (2)	2	XB67A (1)	9
5	2.50mm²	1201B	XB67A (2)	3	54.5/2	Q1
6	2.50mm²	1201B	XB67A (2)	3	XB67A (1)	7
7	2.50mm²	1204B	XB67A (2)	4	54.8/2	Q1
8	2.50mm²	1204B	XB67A (2)	4	XB67A (1)	8

SCREW CONNECTION TB XB67A - 8 TB FOR WAG-9

SN	Cable Cross section	Cable no.	From		To	
1	2.5 mm²	1218	XB67A	1	XK67C:01	1
2	6.00mm²	1218	XB67A	1	XK67C:01	2
3	6.00mm²	1218	XB67A	1	XK67C:02	1
4	2.50mm²	1218	XB67A	2	XK67A:06	1
5	2.50mm²	1218	XB67A	2	XK67A:05	1
6	2.50mm²	2878A	XB67A	3	52.6/1	2-
7	2.50mm²	2878A	XB67A	3	52.4A/1	2+
8	2.50mm²	2878B	XB67A	4	52.4A/2	2+
9	1.50mm²	2878B	XB67A	4	52.5/1	A1

10	1.50mm²	2050	XB67A	5	54.2/2	A2
11	2.50mm²	2050	XB67A	5	52.4A/1	3-
12	2.50mm²	2050	XB67A	5	52.4A/2	3-
13	2.50mm²	1201B	XB67A	7	54.1/2	2
14	2.50mm²	1201B	XB67A	7	54.2/2	R1
15	2.50mm²	1201B	XB67A	7	54.5/2	Q1
16	2.5mm^2	2877B	XB67A	4	52.6/2	2
17	2.5mm^2	2877A	XB67A	3	52.5/2	A1