K5MBC

INTERFACE DESIGN

Design

- **Deign**

  The K5BMC EI Design Consists of

- **Interface Design**

  Wiring diagram of Interlocking equipments such as Signals, Points, Crank handles, LX, Siding, Slot, Block, Axle Counters etc…

  Communication diagram between systems and other consoles.

  Power supply for EI system's and Interlocking equipments.

- **Application logic Design**

  Completely Station Interlocking logic.

Design

- **Inputs for Interface Design**
  - **Approved Signalling Plan.**
  - **Approved Panel Diagram.**
  - **Relay and SM Room building layout.**
  - **Power Supply scheme for EI.**
  - **Details of any additional Interlocking equipment to be interlocked with EI system.**
- **Interface Design**
  - **Interface Design divided into two types.**
    - **Baseline design**
    - **Detailed Interface Design**

Design

- **Baseline Design Consists of the following**
  - **ET-PIO2 Bit calculation - Vital I/O.**
  - **MMIF2 Bit calculation - Non-Vital I/O.**
  - **ET-PIO2 & MMIF2 board calculation.**
  - **System Configuration.**
  - **Relay disposition chart.**
  - **K (EI) rack layout.**
  - **Relay room & SM's room floor plan.**

Design

ET-PIO2 Bit calculation - Vital I/O.

Gather following information from Interlocking plan:

- **Type of signals – Direct / Indirect feed**
- **Points / Cross over and type of control / operation**
- **Motor points / Hand operated points**
- **Slot's, Level crossings, siding control and crank handles**
- **Track circuits**
- **Axle counters & AFTC**
- **Type of block working with adjacent stations**
- **Vital Output Read back contact to be considered for all signal outputs.**
- **System bits.**

SCOPE

MMIF2 Bit calculation – Non-Vital I/O.

Gather following information from Panel Diagram:

- **Number of Knobs, push button controls and key controls**
- **Number of indications, counters, buzzers etc**

The information gathered from “Signal Interlocking Plan” and “Front Plate Drawing” is used to calculate Vital I/O and Non-Vital I/O respectively.

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
4 ASPECT SIGNAL	DR, HHR, HR.	DECR, DR_F HHECR, HHR_F HECR, HR_F RECR.	4GN	4DGKE, 4HHGKE, 4HGKE, 4RGKE.	QN1 - 3 QECX61 – 4
3 ASPECT SIGNAL	DR, HR.	DECR, DR_F HECR, HR_F RECR.	3GN	DGKE, HGKE, RGKE.	QN1 - 2 QECX61 – 3
2 ASPECT SIGNAL	HR.	HECR, HR_F RECR.	2GN	HGKE, RGKE.	QN1 - 1 QECX61 – 2

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
1 way Route Indicator	UGR1.	UECR. UGR1_F	--	UGKE1.	QN1 - 1 QECX61 – 1
2 way Route Indicator	UGR1, UGR2.	UGR1_F, UGR2_F, UECR.	--	UGKE1, UGKE2.	QN1 - 2 QECX61 – 1
Calling-on signal	COHR.	COHECR, COHR_F.	GN	CO_HGKE.	QN1 - 1 QECX61 – 1

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
Semi-auto signal	AHR.	AECR, AHR_F	--	AGKE.	QN1 - 1 QECX61 – 1
Fixed on aspect	--	RECR.	--	RGKE.	QECX61 – 1
Ground shunt signal	HR.	OFFECR, ONECR, HR_F.	GN	OFFKE, ONKE.	QN1 - 1 QECX61 – 2

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
Post shunt signal	HR.	OFFECR, HR_F.	GN	OFFKE.	QN1 - 1 QECX61 – 1
Point	WNR, WRR.	NWKR, RWKR.	WN	NWKE, RWKE.	QN1 – 2, QNA1 – 2
Crank handle	CHYR.	CHCR.	GN	KEYINKE, OUTKE.	QN1 - 1 QNA1-1

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
Level Crossing	LXYR.	LXCR.	LC.N	CLOSKE, OPENKE.	QN1 - 1 QNA1 – 1
Siding	YR.	CR.	N	KEYINKE, KEYOUTKE	QN1 – 1, QNA1 – 1
Slot	YR.	OVYR, YR_F.	YN	YKE, OVYKE.	QN1 - 1 QNA1-1

BASELINE DESIGN

VITAL I/O BIT CALCULATION

OUT DOOR GEAR	VITAL OUTPUT	VITAL INPUT	NON-VITAL INPUT	NON-VITAL OUTPUT	RELAYS
Track circuit	--	TPR	--	TKE, TKRE.	QNA1 – 1

ETPIO2 Bit chart

- Counter output bits to be taken.
- Following system Output bits are to be taken.
  - FCOR – False feed cutoff relay.
  - F.FCOR – FCOR false cutoff relay.
  - KVCOR – Kyosan Vital cutoff relay.
  - POWERUP – System ON relay.
- Following system Input bits are to be taken.
  - S1-PW-OK - System1 DC-DC converter Normal.
  - S2-PW-OK - System2 DC-DC converter Normal.
  - PWL2B-OK – ET LINE2B DC-DC converter Normal.
  - PWPIO2-OK – ET PIO2 DC-DC converter Normal.
  - DC-DC.OPC_HLY – Operator Console DC-DC converter Normal.
  - DC-DC.MMIF_HLY – Control panel DC-DC converter Normal.

ETPIO2 Bit chart

SHEET NO.	(00101–00108)		(00109–00116)		(00117–00124)		(00125–00132)		(00133–00140)	
POSITION	ET1–1 PIO2		ET1–2 PIO2		ET1–3 PIO2		ET1–4 PIO2		ET1–5 PIO2	
TYPE / BIT NO.	INPUT	OUTPUT	INPUT	OUTPUT	INPUT	OUTPUT	INPUT	OUTPUT	INPUT	OUTPUT
BIT 1	ET1-LIN1-OK	1D.DR	32D.DECPR	32D.DZR	50.NWKR	50.WCR	1D.DR_F	SPARE	32D.DZR_F	1CC0_INT_CNT
BIT 2	ET1-LIN2-OK	1D.HHR	32D.HHECPR	32D.HHZR	50.RWKR	SPARE	1D.HHR_F	SPARE	32D.HHZR_F	32C.CO_INT_CNT
BIT 3	FAN-OK	1.DR	32D.HECPR	32D.HZR	100.NWKR	SPARE	1.DR_F	SPARE	32D.HZR_F	COCANCNT
BIT 4	S1-PW-OK	1.HR	32D.RECPR	32.DR	1.CHR	50.WNR	1.HR_F	SPARE	32.DR_F	120RC_CNT
BIT 5	S2-PW-OK	1.UGR	32.DECR	32.HR	5.KPR	50.WRR	1.UGR_F	SPARE	32.HR_F	60RC_CNT
BIT 6	PWL28-OK	1C.HR	32.HECR	32.UGR	SPARE	SPARE	1C.HR_F	SPARE	32.UGR_F	SPARE
BIT 7	PWP102-OK	SPARE	32.RECR	32C.HR	1.TPR	SPARE	SPARE	SPARE	32C.HR_F	SPARE
BIT 8	1D.DECR	25.DR	32.UECR	2.DR	1C.TPR	1.CHR.ZR	25.DR_F	SPARE	2.DR_F	SPARE
BIT 9	1D.HHECR	30.HR	32C.HECR	2.HR	25.TPR	SPARE	30.HR_F	SPARE	2.HR_F	SPARE
BIT 10	1D.HECR	31.DR	2.DECR	3.HR	50.TPR	71.LR	31.DR_F	SPARE	3.HR_F	SPARE
BIT 11	1.DECR	31.HR	2.HECR	&_32D.DR	SPARE	SPARE	31.HR_F	SPARE	&_32D.DR_F	SPARE
BIT 12	1.HECR	SPARE	2.RECR	&_32D.HHR	01.TPR	SPARE	SPARE	SPARE	&_32D.HHR_F	SPARE
BIT 13	1.RECR	SPARE	3.HECR	&_32D.HR	02.TPR	71.LCXR	SPARE	SPARE	&_32D.HR_F	SPARE
BIT 14	1.UECR	SPARE	3.RECR	SPARE	SPARE	65.WCR	1.TARB_F	SPARE	32.TARB_F	SPARE
BIT 15	1C.HECR	SPARE	&_32D.DECR	SPARE	SPARE	SPARE	1.TAR_F	SPARE	32.TAR_F	SPARE
BIT 16	SPARE	SPARE	&_32D.HHECR	SPARE	71.LCPR	SPARE	CPL.MLU.1R_F	SPARE	CPL.REPL1R_F	SPARE
BIT 17	SPARE	SPARE	&_32D.HECR	SPARE	65.NWKR	65.WNR	CPL.MLU.2R_F	SPARE	CPL.REPL2R_F	SPARE
BIT 18	25.DECR	SPARE	&_32D.RECR	SPARE	65.RWKR	65.WRR	FCOR_F	SPARE	SPARE	SPARE
BIT 19	25.RECR	1.TARB	SPARE	32.TARB	103.NWKR	SPARE	F.FCOR_F	SPARE	SPARE	SPARE
BIT 20	30.HECR	1.TAR	SPARE	32.TAR	2.CHR	SPARE	EMR.CHR.CPR	SPARE	65.WCR_F	SPARE
BIT 21	30.RECR	CPL.MLU.1R	MMF.DC.DC_HLY	CPL.REPL1R	SPARE	2.CHR.ZR	50.WCR_F	SPARE	SPARE	SPARE
BIT 22	31.DECR	CPL.MLU.2R	OPC.DC.DC_HLY	CPL.REPL2R	SPARE	SPARE	SPARE	SPARE	65.WNR_F	SPARE
BIT 23	31.HECR	FCOR	SPARE	SPARE	8.TPR	SPARE	50.WNR_F	SPARE	65.WRR_F	SPARE
BIT 24	31.RECR	F.FCOR	CPL.REPLVPR	SPARE	32.TPR	SPARE	50.WRR_F	SPARE	SPARE	SPARE
BIT 25	SPARE	KVCOR	CPL.REPL2PR	SPARE	32C.TPR	SPARE	SPARE	SPARE	SPARE	SPARE
BIT 26	SPARE	POWERUP	CPL.REPL2PR1	SPARE	65.TPR	SPARE	SPARE	SPARE	2.CHR.ZR_F	SPARE
BIT 27	CPL.MLU.VPR	SPARE	CPL.REPL.BPAC.ZR	SPARE	SPARE	SPARE	1.CHR.ZR_F	SPARE	SPARE	SPARE
BIT 28	CPL.MLU.PPR	SPARE	&_32D.ASCR	SPARE	SPARE	SPARE	SPARE	SPARE	71.LCXR_F	SPARE
BIT 29	CPL.MLU.PPR1	SPARE	SPARE	SPARE	SPARE	SPARE	71.LR_F	SPARE	R_F	SPARE
BIT 30	CPL.MLU.BPAC.ZR	SPARE	REPL.DZR	SPARE	SPARE	R	1.ACZR	SPARE	32.ACZR	SPARE
BIT 31	25.ASCR	SPARE	REPL.HHZR	SPARE	LVR	SPARE	CPL.MLU.ZSR	SPARE	CPL.REPL.ZSR	SPARE
BIT 32	SPARE	SPARE	REPL.HZR	SPARE	SMR	SPARE	DN.TJPR	SPARE	UP.TJPR	SPARE

MMIF2 Bit chart

- **System Output bits to be taken in MMIF2 Bit chart.**
  - **SYSINKE, ALL_BLKKE, EI.FSR.NORKE, EI.FSR.BUZ, EI_LFL_OFFKE, EI_LFL_ONKE, EI_HFL_OFFKE, EI_HFL_ONKE, PANEL_S1_ONKE, PANEL_S1_OFFKE, PANEL_S2_ONKE, PANEL_S2_OFFKE, OPC_S1_ONKE, OPC_S1_OFFKE, OPC_S2_ONKE, OPC_S2_OFFKE.**
- **The following system Input bits to be taken in MMIF2 Bit chart.**
  - **ALL_UNBLK, SYS_FACK_N**

MMIF2 Bit chart

SHEET NO.	(01061–01065)				(01066–01070)				(01071–01075)			
POSITION	MMIF2 – 1				MMIF2 – 2				MMIF2 – 3			
TYPE / BIT NO.	INPUT	OUTPUT	TYPE / BIT NO.	OUTPUT	INPUT	OUTPUT	TYPE / BIT NO.	OUTPUT	INPUT	OUTPUT	TYPE / BIT NO.	OUTPUT
BIT 1	1.N	1D.DGNE	BIT 33	32D.DGNE	71.N	1.CHFNE.W	BIT 33	56.RWNE.W	1C.CCLERR.N	SPARE	BIT 33	DC_DC_FAILNE
BIT 2	1.R	1D.HHGNE	BIT 34	32D.HHGNE	71.R	1.CHLNE.R	BIT 34	57.RWNE.R	32.CC0ERR.N	SPARE	BIT 34	UP__TJFAILNE
BIT 3	1C.N	1D.HGNE	BIT 35	32D.HGNE	SPARE	2.CHFNE.W	BIT 35	SPARE	SPARE	SPARE	BIT 35	DN__TJFAILNE
BIT 4	1C.R	1.DGNE	BIT 36	32D.RGNE	SPARE	2.CHLNE.R	BIT 36	SPARE	TJFAILACK.N	SPARE	BIT 36	SPARE
BIT 5	2.N	1.HGNE	BIT 37	32.DGNE	65.N	SPARE	BIT 37	SPARE	SYSFACK.N	SPARE	BIT 37	SPARE
BIT 6	2.R	1.RGNE	BIT 38	32.HGNE	65.R	SPARE	BIT 38	SPARE	SIGFACK.N	SPARE	BIT 38	TJFAILBUZ
BIT 7	3.N	1.UGNE	BIT 39	32.RGNE	65.C	SPARE	BIT 39	SPARE	PFACK.N	SPARE	BIT 39	SIGFBUZ
BIT 8	3.R	SPARE	BIT 40	32.UGNE	SPARE	SPARE	BIT 40	SPARE	BHACK.N	SPARE	BIT 40	PFBUZ
BIT 9	SPARE	SPARE	BIT 41	SPARE	SPARE	SPARE	BIT 41	SPARE	DCDC.FACK.N	CPL_MLU_CLR.G	BIT 41	BHBUZ
BIT 10	SPARE	1C.HGNE	BIT 42	32C.HGNE	66.LC.N	01.TKE.W	BIT 42	SPARE	SPARE	CPL_MLU_OCC.R	BIT 42	DCDCFBUZ
BIT 11	4__32D.N	2.DGNE	BIT 43	58.NWKE.G	66.LC.R	01.TKE.R	BIT 43	SPARE	SPARE	CPL_REPI_CLR.G	BIT 43	SYSFBUZ
BIT 12	4__32D.R	2.HGNE	BIT 44	58.RWKE.Y	PANEL__MODE	02.TKE.W	BIT 44	SPARE	SPARE	CPL_REPI_OCC.R	BIT 44	EI__FSR_FBUZ
BIT 13	SPARE	2.RGNE	BIT 45	SPARE	OPC__MODE	02.TKE.R	BIT 45	SPARE	SPARE	01.LOV__NE.W	BIT 45	SPARE
BIT 14	SPARE	3.HGNE	BIT 46	100.NWKE.G	SPARE	SPARE	BIT 46	SPARE	SPARE	01.ROV__KE.W	BIT 46	SPARE
BIT 15	SPARE	3.RGNE	BIT 47	5.KE.Y	A.PR	SPARE	BIT 47	SPARE	SPARE	02.LOV__KE.W	BIT 47	EI__FSR_FAILNE
BIT 16	SPARE	SPARE	BIT 48	65.NWKE.G	B.PR	1C.TKE.R	BIT 48	SPARE	SPARE	02.ROV__KE.W	BIT 48	PANEL_S1ONNE
BIT 17	25.N	SPARE	BIT 49	65.RWKE.Y	SPARE	1.TKE.W	BIT 49	SPARE	SPARE	SPARE	BIT 49	PANEL_S1OFFNE
BIT 18	25.R	SPARE	BIT 50	SPARE	SPARE	1.TKE.R	BIT 50	SPARE	SPARE	SPARE	BIT 50	PANEL_S2ONNE
BIT 19	SPARE	4__32D.DGNE	BIT 51	SPARE	SPARE	4.TKE.W	BIT 51	SPARE	SPARE	1C.CO_INT_NE	BIT 51	PANEL_S2OFFNE
BIT 20	SPARE	4__32D.HHGNE	BIT 52	103.NWKE.G	H.PR	4.TKE.R	BIT 52	SPARE	SPARE	32.CO_INT_NE	BIT 52	OPC__S1ONNE
BIT 21	34.N	4__32D.HGNE	BIT 53	71.FKE	J.PR	25.TKE.W	BIT 53	SPARE	SPARE	OOCAKE	BIT 53	OPC__S1OFFNE
BIT 22	34.R	4__32D.RGNE	BIT 54	SPARE	K.PR	25.TKE.R	BIT 54	SPARE	SPARE	128__NE	BIT 54	OPC__S2ONNE
BIT 23	35.N	SPARE	BIT 55	58.FKE	L.PR	32C.TKE.R	BIT 55	SPARE	SPARE	63__NE	BIT 55	OPC__S2OFFNE
BIT 24	35.R	SPARE	BIT 56	SPARE	SPARE	32.TKE.W	BIT 56	SPARE	SPARE	SPARE	BIT 56	EI__HFL0NNE
BIT 25	32.N	25.DGNE	BIT 57	SPARE	SPARE	32.TKE.R	BIT 57	65.TCKE.W	SPARE	SYSINKE	BIT 57	EI_HFL0FFNE
BIT 26	32.R	25.RGNE	BIT 58	SPARE	ALL__UNBLK	SPARE	BIT 58	65.TCKE.R	SPARE	PANELKE	BIT 58	EI_LRL0NNE
BIT 27	32C.N	SPARE	BIT 59	SPARE	SPARE	58.TCKE.W	BIT 59	65.NKE.W	SPARE	OPCKE	BIT 59	EI_LRL0FFNE
BIT 28	32C.R	30.HGNE	BIT 60	SPARE	1.CH.PR	58.TCKE.R	BIT 60	65.NKE.R	SPARE	SMRKE	BIT 60	SPARE
BIT 29	SPARE	30.RGNE	BIT 61	65.FKE	2.CH.PR	58.NKE.W	BIT 61	65.NWKE.W	SPARE	ALL__BKE	BIT 61	SPARE
BIT 30	58.N	31.DGNE	BIT 62	SPARE	SPARE	58.NKE.R	BIT 62	65.NWKE.R	SPARE	BHKE.R	BIT 62	SPARE
BIT 31	58.R	31.HGNE	BIT 63	SPARE	SPARE	58.NWKE.W	BIT 63	65.RWKE.W	SPARE	GFKE.R	BIT 63	SPARE
BIT 32	58.C	31.RGNE	BIT 64	71.LCKE.G	SPARE	58.NWKE.R	BIT 64	65.RWKE.R	SPARE	LVKE.R	BIT 64	SPARE

Calculation of boards & Relays

- After finding out final quantity of Vital and Non-vital I/O bits, quantity of various boards is derived as below:
- 32 Vital input and output per ETPIO2 card.
- 32 Non-vital input and 64 output per MMIF2 card.
- One EP5 sub rack will have 2 Line2B card.
- One EM6 sub rack will have 2 LineM2 card.
- Calculate the quantity of various relays on the basis of above table and design of relay rack.

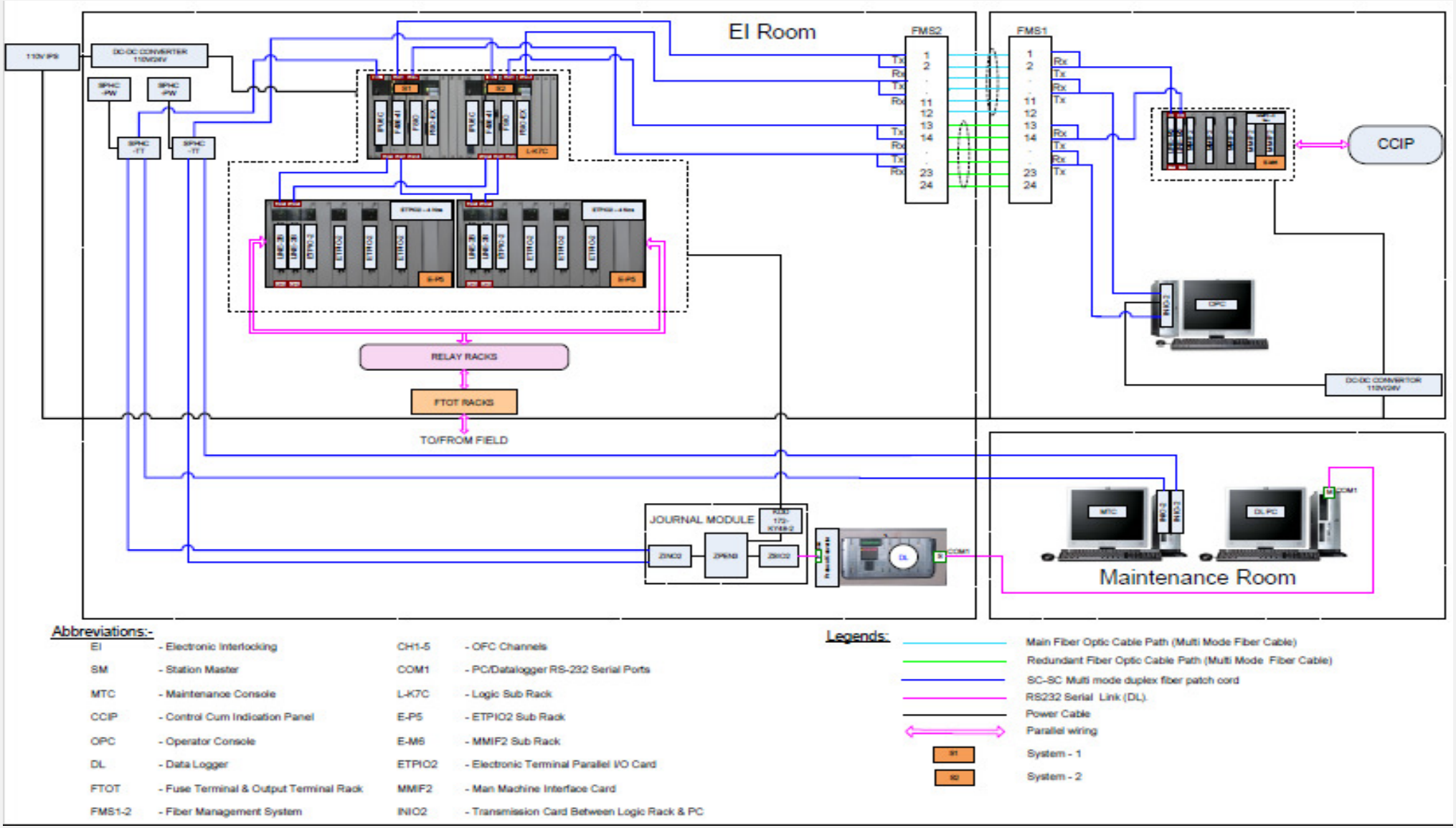
Calculation of Sub racks

- After finding out final quantity of Vital and Non-vital boards, quantity of various sub racks is derived as below:
- Place maximum of 5 nos. of ETPIO2 cards per sub rack. Arrive at final quantity of EP5 sub rack.
- Place maximum of 6 nos. of MMIF2 cards per sub rack. Arrive at final quantity of EM6 sub rack.
- The station which is having more than 120 routes Journal Module sub rack to be considered for data logger communication.
- 2 nos. of SPHC – TT & SPHC – PW card required for divide the one communication channel into two. One for MTC & one for Journal module.
- Stations which is having Less than 120 routes through FIO7[P] board serial port will be used for data logger communication.
- For large stations which cannot be processed by one EI, 2 or more EI logic modules can be connected via signal LAN.

System Configuration

- On the basis of requirement of installation / site, Logic Sub rack is connected with the peripheral equipments such as EP5, EM6 Sub racks, OPC, Journal module, MTC and another Logic units.
- All the peripheral equipments are connected with logic sub rack module through multimode fiber patch cord.
- Journal Module connected to data logger with help of “Non-Twisted pair – Communication” cable.
- MTC connected to journal module with help of Cat-6e Ethernet cable.
- Relay racks are connected to EP5 sub rack with “Single Strand Multi core” Indoor (40 Core) cable.
- Relay racks are connected to CT rack with “Multi strand, Single core”.
- Relay wiring is done with help of “Multi strand, Single core” wire.

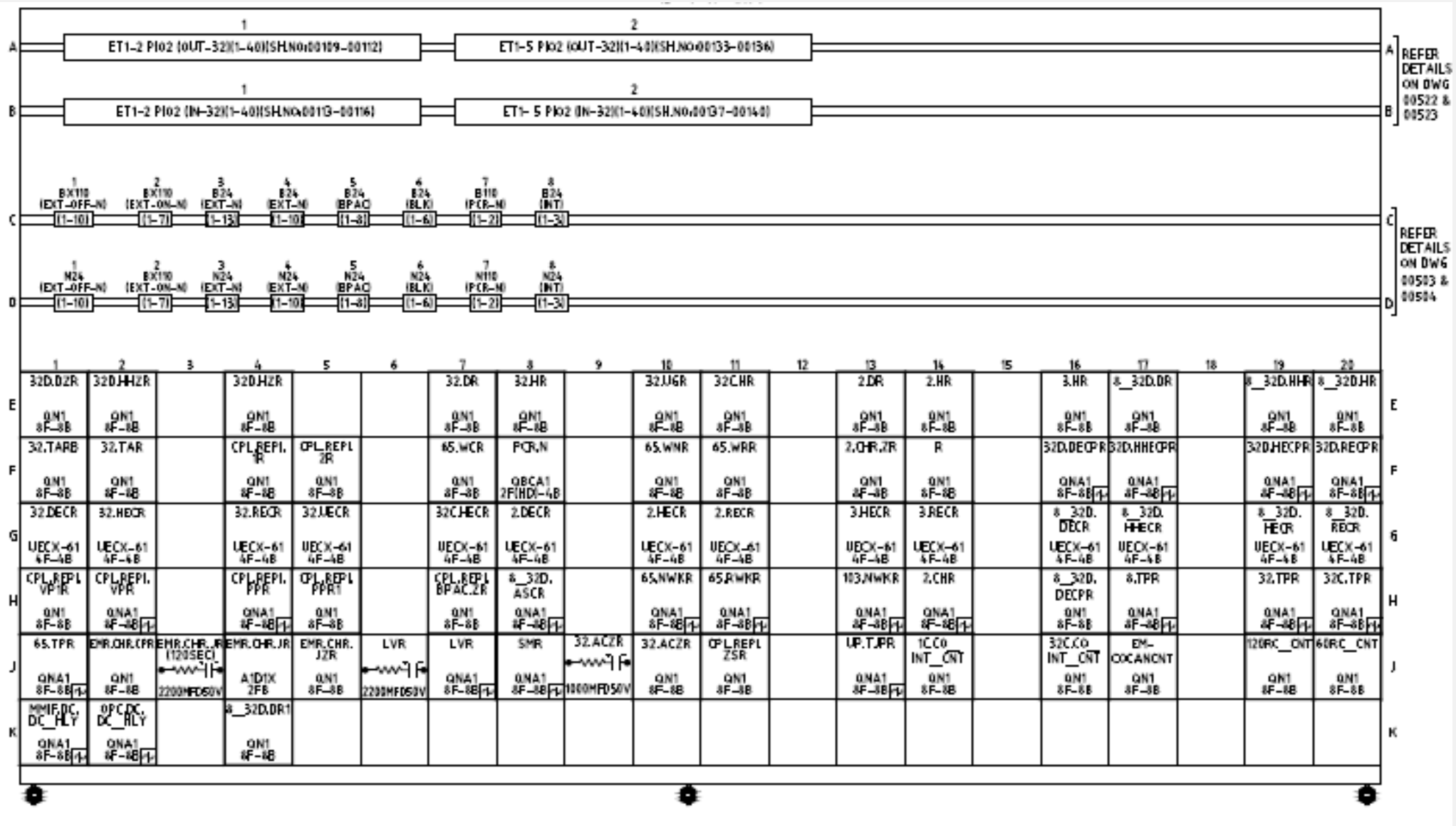
System Configuration



Relay Rack

- Maximum of 120 relays can be accommodated in one relay rack.
- Relay rack is having 10 rows (A-K).
- A – Row used for ETPIO2 vital output terminals.
- B – Row used for ETPIO2 vital input terminals.
- C – Row used for power fuse terminals.
- D – Row used for power negative terminals.
- E,F,G,H,J,K – Rows used for relays.
- Two relays after one Space to be provided.
- Relay rack layout design should avoid unnecessary rack to rack wirings.

Relay Rack



Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

Relay Rack

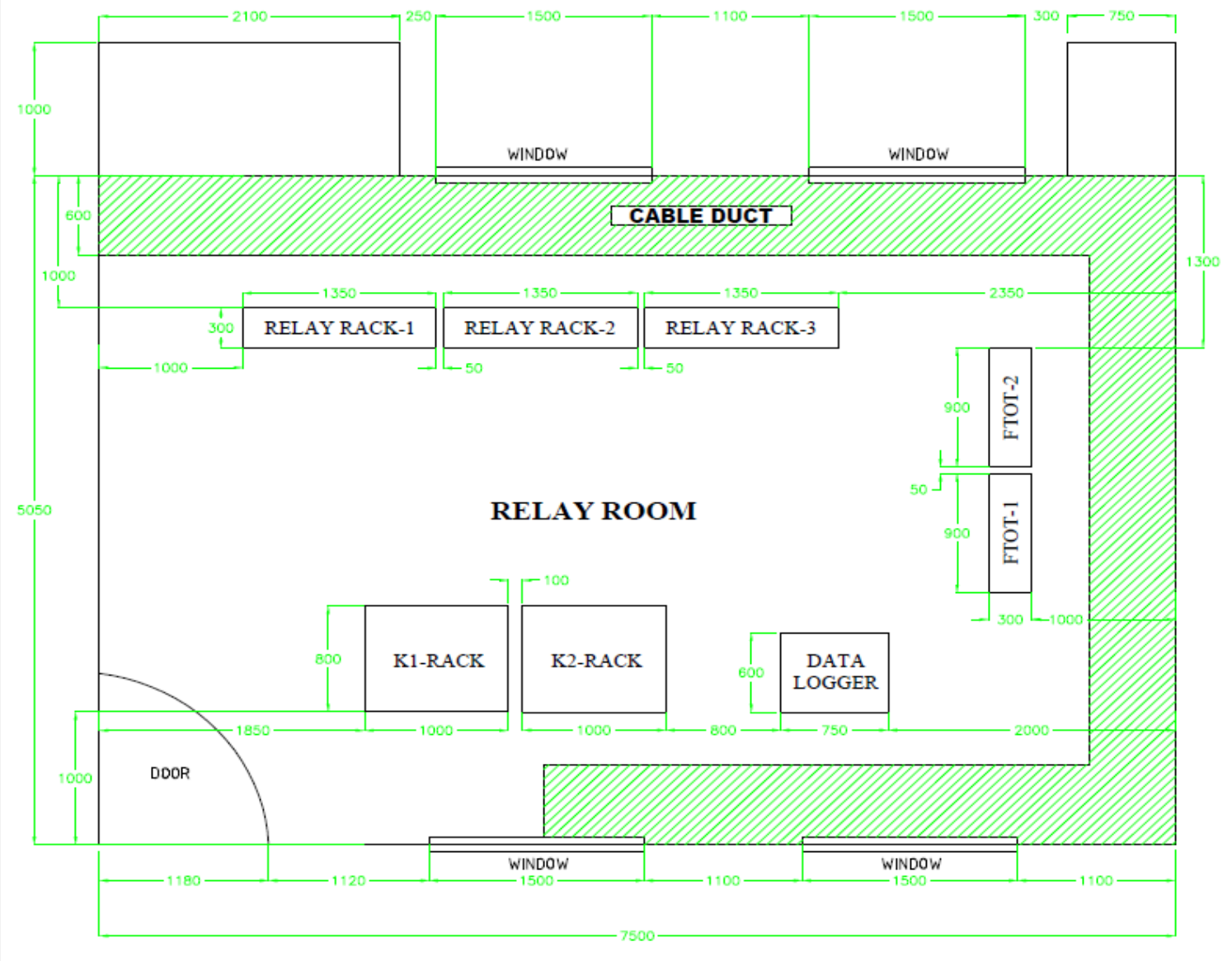
Relay Room & SM Room Layout

- **Once calculation of boards, relays and system configuration is finalized**

  Design of Relay Room Floor Plan is taken up with following criterion:

  - **K-Rack - 1100 * 800 * 2250 mm**
  - **Relay Rack - 1350 * 300 * 2100 mm**
  - **Data logger - 710 * 510 mm**
  - **OPC & MTC Table - 1200 * 750 mm**

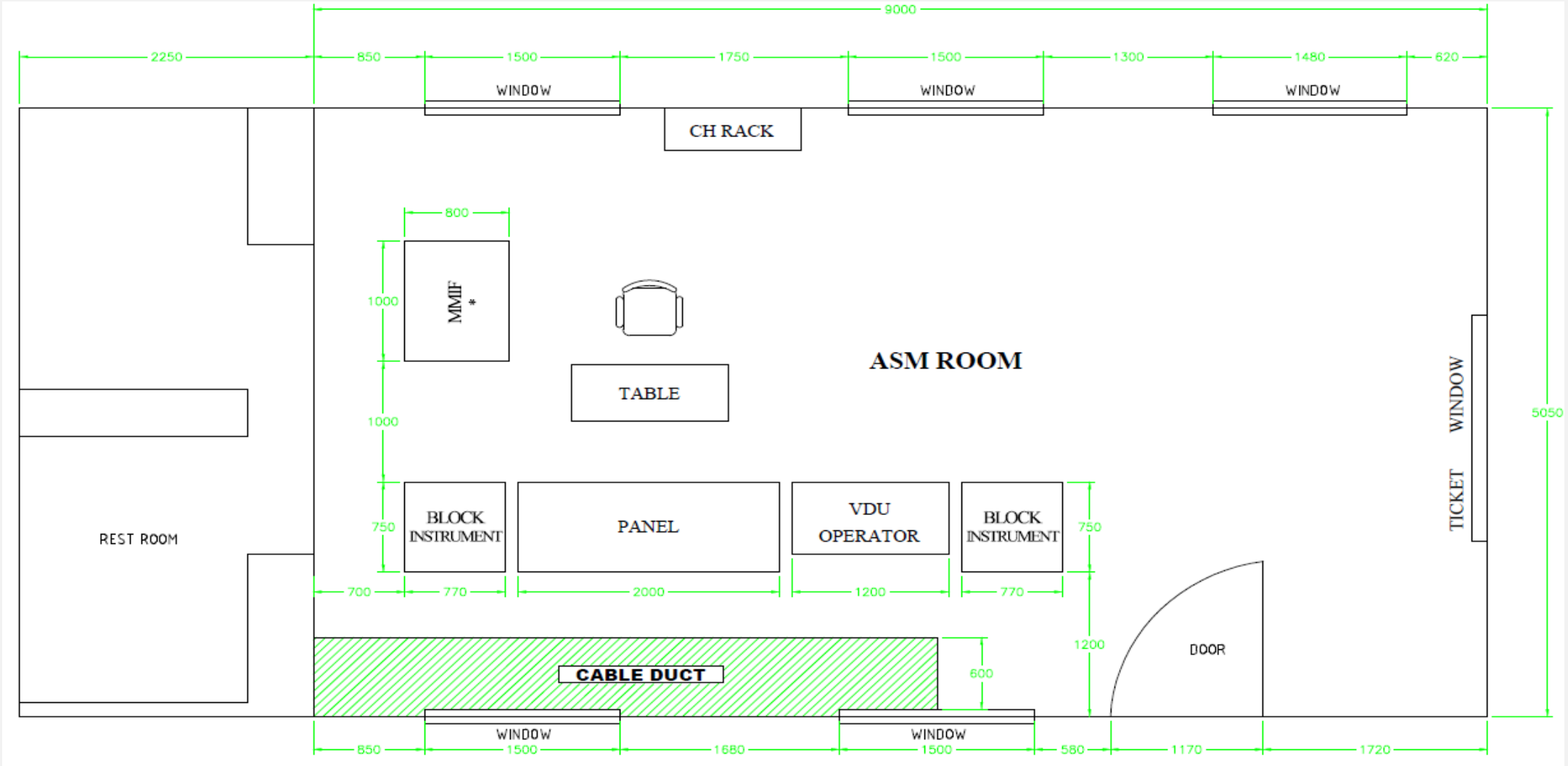
Relay Room & SM Room Layout



Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

Relay Room & SM Room Layout



Detailed Interface Circuit

Detailed Interface circuit design having the following contents.

- Index
- K rack layout
- Input / Output board circuit
- Counter circuit
- FCOR circuit
- FSIO I/O circuit
- Fuse and Terminal chart
- Symbols
- Communication circuit
- Field circuit
- Miscellaneous circuit
- Power Distribution circuit
- DID circuit
- Contact analysis

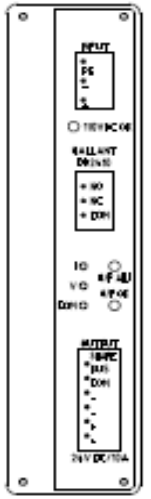
Index and sheet number allotment

SL.NO.	DESCRIPTION	SHEET NO.	REV NO.
01	INDEX	00001	01
02	INDEX	00002	01
03	INDEX	00003	01
04	SPARE	00004	
05	SYMBOLS	00005	00
06	SPARE	00006–00014	
07	EI ROOM FLOOR PLAN	00015	00
08	SM ROOM FLOOR PLAN	00016	00
09	RELAY ROOM EARTHING DIAGRAM	00017	00
10	SM ROOM EARTHING DIAGRAM	00018	00
11	SPARE	00019–00020	
12	R1 RACK LAYOUT	00021	00
13	R2 RACK LAYOUT	00022	01
14	SPARE	00023–00029	
15	K1 RACK LAYOUT	00030	00
16	I/O TERMINALS BLOCK DETAILS	00031	00
17	LAYOUT OF ELECTRONIC TERMINAL BLOCK	00032	00
18	FRONT & REAR VIEW OF LOGIC PARTS & RELAY PARTS	00033	00
19	FRONT VIEW OF JOURNAL MODULE LAYOUT DIAGRAM	00034	00
20	DIP SWITCH SETTING FOR ELECTRONIC POLARITY KEY	00035	00
21	SPARE	00036–00040	
22	SYSTEM CONFIGURATION	00041	00
23	SPARE	00042–00045	
24	ET1 PI02 VITAL BIT CHART	00046	01
25	SPARE	00047–00080	
26	INTERNAL FIBER OPTIC COMMUNICATION	00081–00082	00
27	SERIAL LINK BETWEEN ZS102, DL & DL-HTC	00083	00
28	SPARE	00084–00100	
29	ET1-1 PI02 INPUT CIRCUIT	00101	01
30	ET1-1 PI02 INPUT CIRCUIT	00102	01
31	ET1-1 PI02 INPUT CIRCUIT	00103	01
32	ET1-1 PI02 INPUT CIRCUIT	00104	01
33	ET1-1 PI02 OUTPUT CIRCUIT	00105	00
34	ET1-1 PI02 OUTPUT CIRCUIT	00106	00
35	ET1-1 PI02 OUTPUT CIRCUIT	00107	00
36	ET1-1 PI02 OUTPUT CIRCUIT	00108	00
37	ET1-2 PI02 INPUT CIRCUIT	00109	01
38	ET1-2 PI02 INPUT CIRCUIT	00110	01
39	ET1-2 PI02 INPUT CIRCUIT	00111	01
40	ET1-2 PI02 INPUT CIRCUIT	00112	01
41	ET1-2 PI02 OUTPUT CIRCUIT	00113	00
42	ET1-2 PI02 OUTPUT CIRCUIT	00114	00

Symbols

SYMBOLS	DESCRIPTION
	FUSE TERMINAL WITH INDICATION 24V DC WAGO FUSE PART NO.281-611/281-541 FUSE TERMINAL WITH INDICATION 110V DC WAGO FUSE PART NO.281-611/281-418
	NON-DISCONNECT TERMINAL 2.5 Sq mm WAGO TERMINAL PART NO.280-901
	NON-DISCONNECT TERMINAL 16 Sq mm WAGO TERMINAL PART NO.283-901
	TERMINAL END
	HRC FUSE TERMINAL
	WAGO 2 IN 1 OUT TERMINAL 280-681
	FTOT TERMINAL
	FRONT CONTACT
	BACK CONTACT
	LED
	DIODE
	BUS BAR
	CAPACITOR
	RESISTOR
	AC IMMUNIZED RELAY COIL
	FC TYPE(GI FIBER)
	HITACHI ACTIVE CONNECTOR(HAC-105) : UNMOUNTED.
	ETHERNET PORT

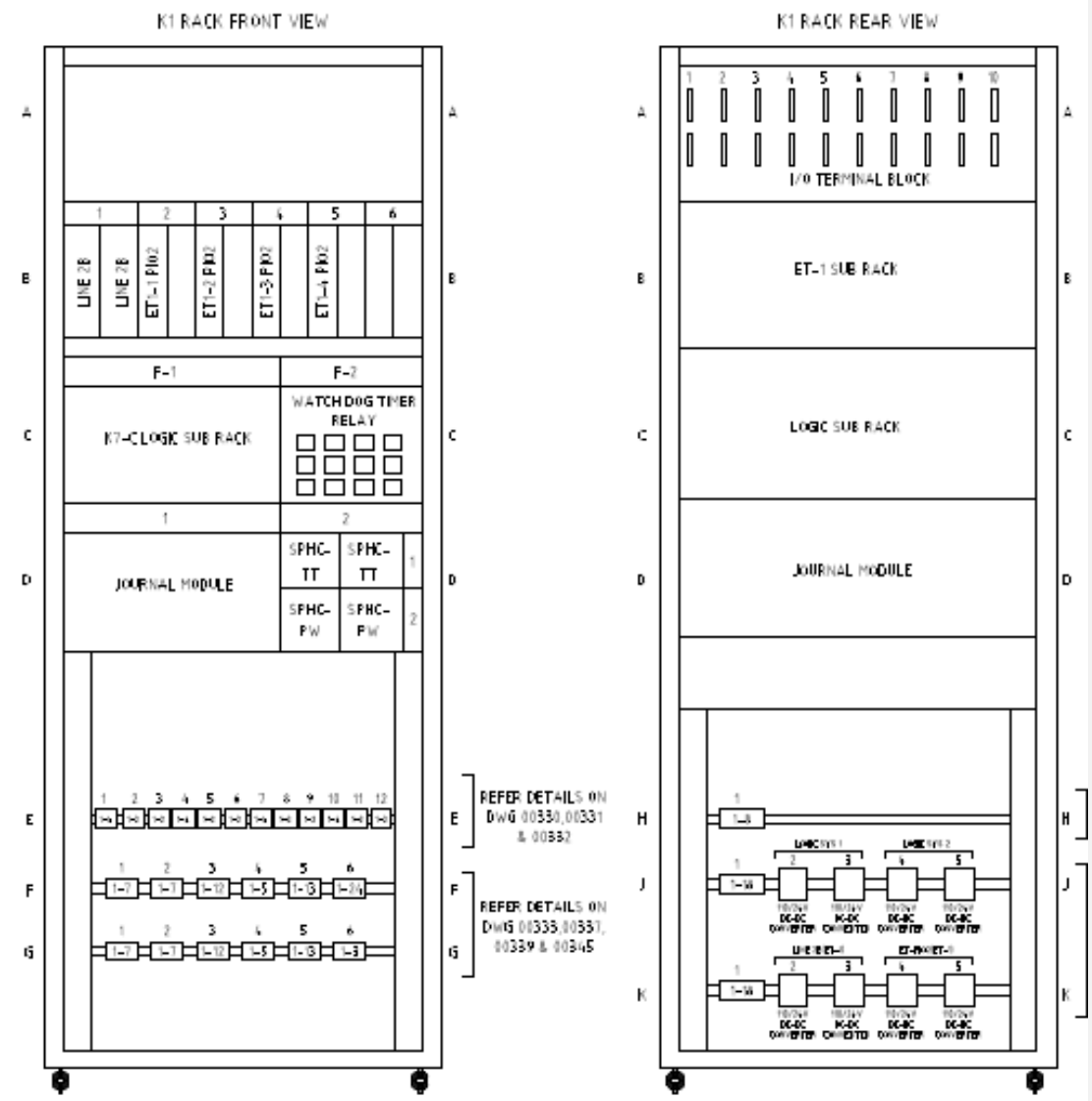
SYMBOLS	DESCRIPTION
	RELAY COIL
	MULTICORE CABLE
	ANTI VIBRATOR BASE
P (N.O)	RKT PUSH BUTTON
	SUMICON CONNECTOR HIROSE J1,J2,J4,J5 PLUG CASE : P-1660A-CA(50) HOUSING : SC-1660 PIN CONTACT : SC-1600-111
XX XX	PLUG CONNECTOR FEMALE CONNECTOR PART NO.231-120/031-000 PLUG CONNECTOR MALE CONNECTOR PART NO.231-620
XX XX XX	NON-DISCONNECT TERMINAL 2.5SQUARE WAGO TERMINAL TYPE PART NO.280-901
	MULTI-CORE OPTICAL PATCH CORD
	VARISTORS 120V 4500A ZNR SURGE ABSORBER MOUNTED BEHIND O-BASE ACROSS RELAY COIL. PART NO.ERZ-V14D121

SYMBOLS	DESCRIPTION
	110/24V DC-DC CONVERTER
	SURGE SUPPRESSOR

K – Rack Layout

- All the sub racks such as Logic sub rack, ET sub rack and Journal module sub racks and its required power wirings & terminations will be installed in the K-rack.
- This rack can be used in three ways according to the sub rack usages
  - One ET sub rack, One logic sub rack & Journal module (Type:1).
  - Only logic sub rack and Journal module (Type:2).
  - Only 2 ET sub racks (Type:3).
  - A row will be used for I/O termination of ET sub rack.
  - B row will be used for ET sub rack.
  - C row will be used for Logic sub rack.
  - D row will be used for journal Module.

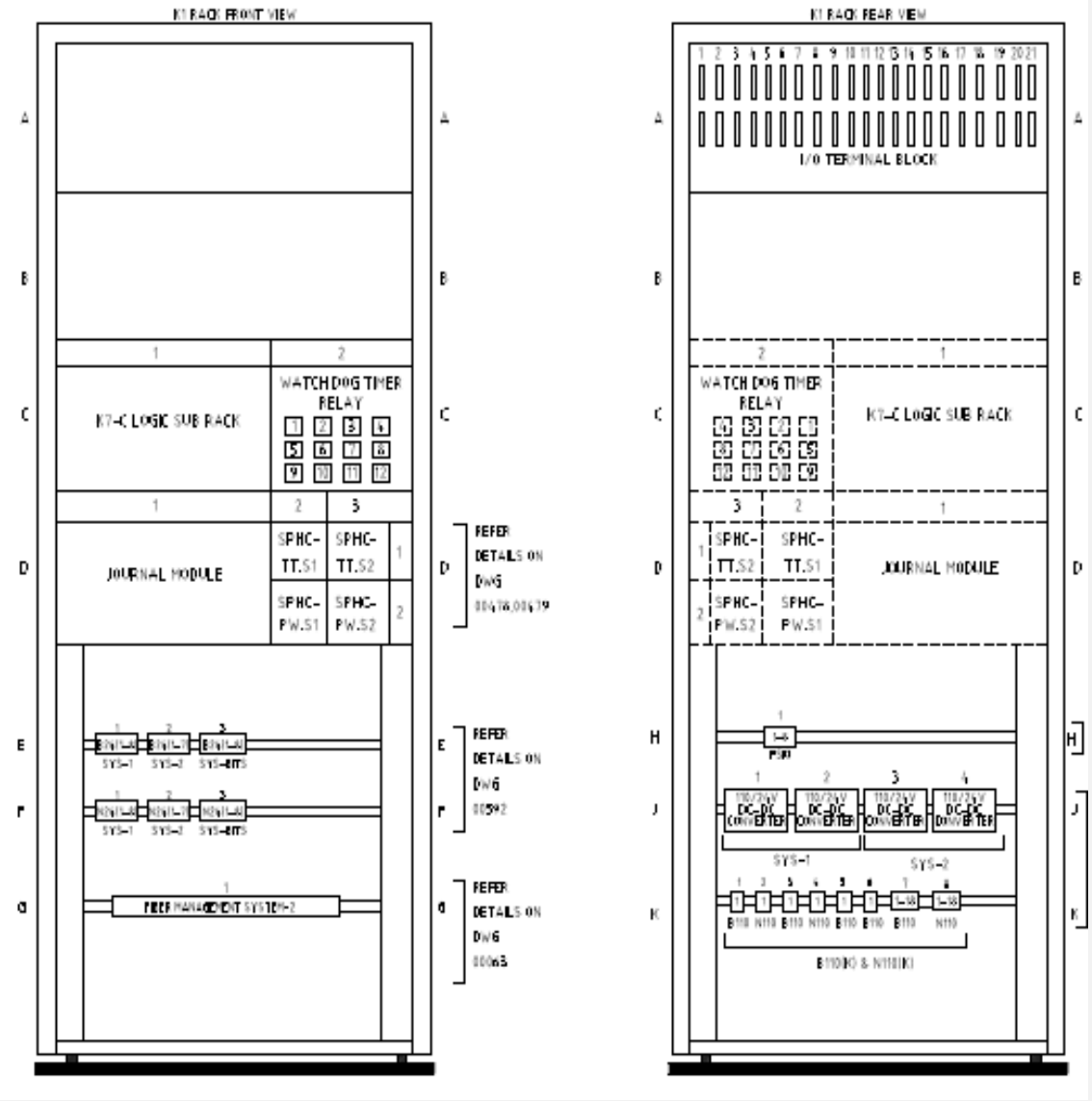
K – Rack Layout – Type 1



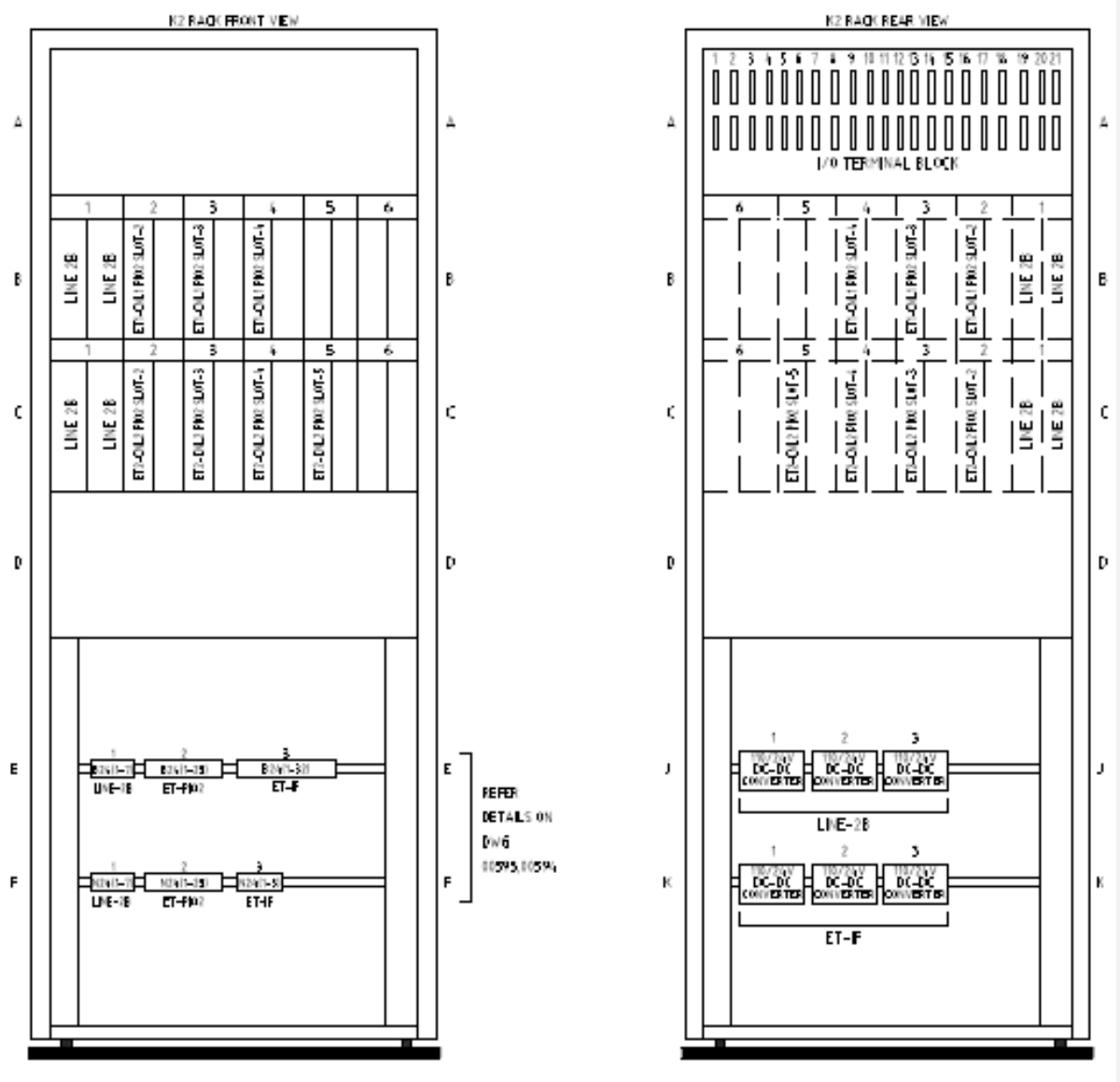
Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

K – Rack Layout – Type 2



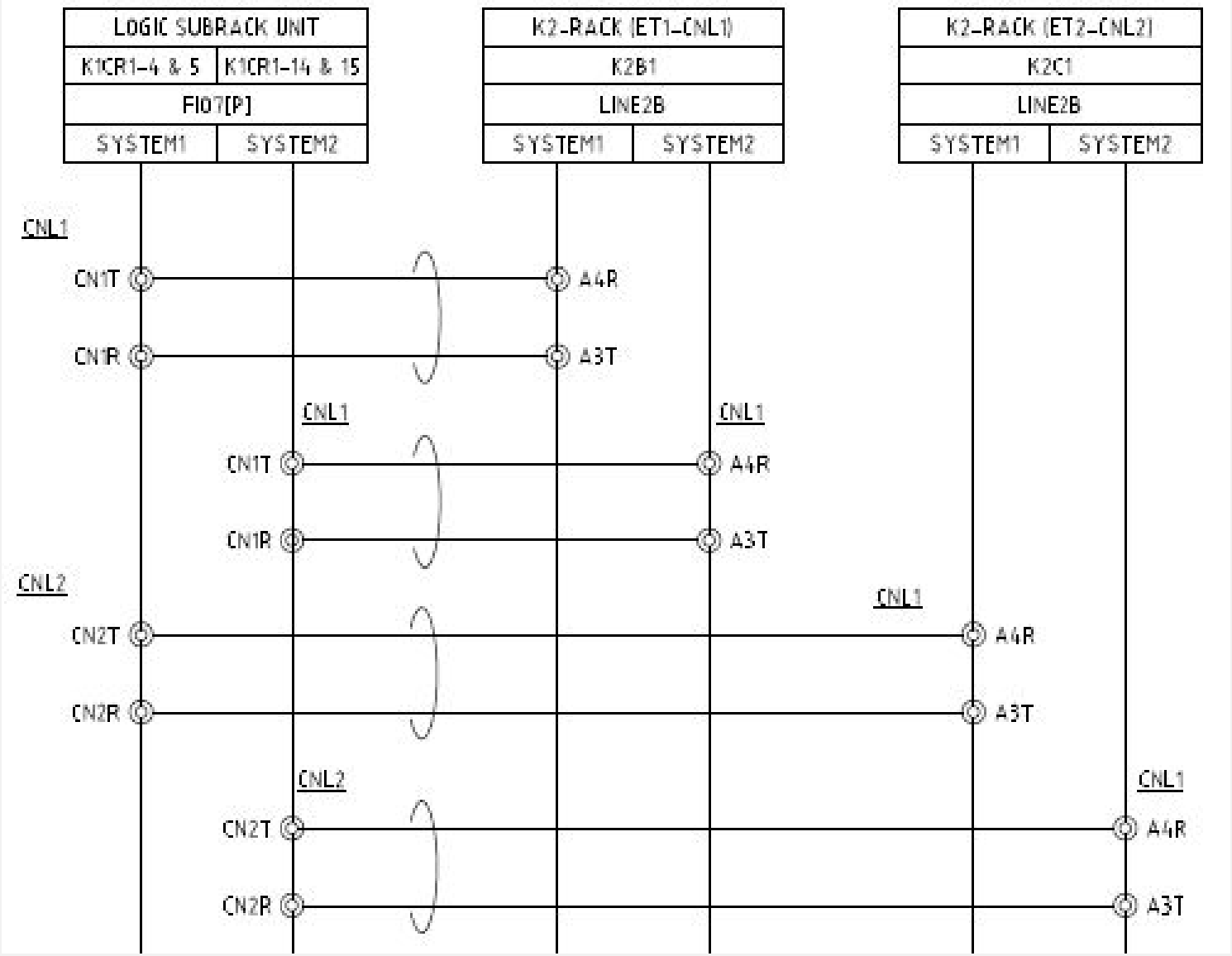
K – Rack Layout – Type 3



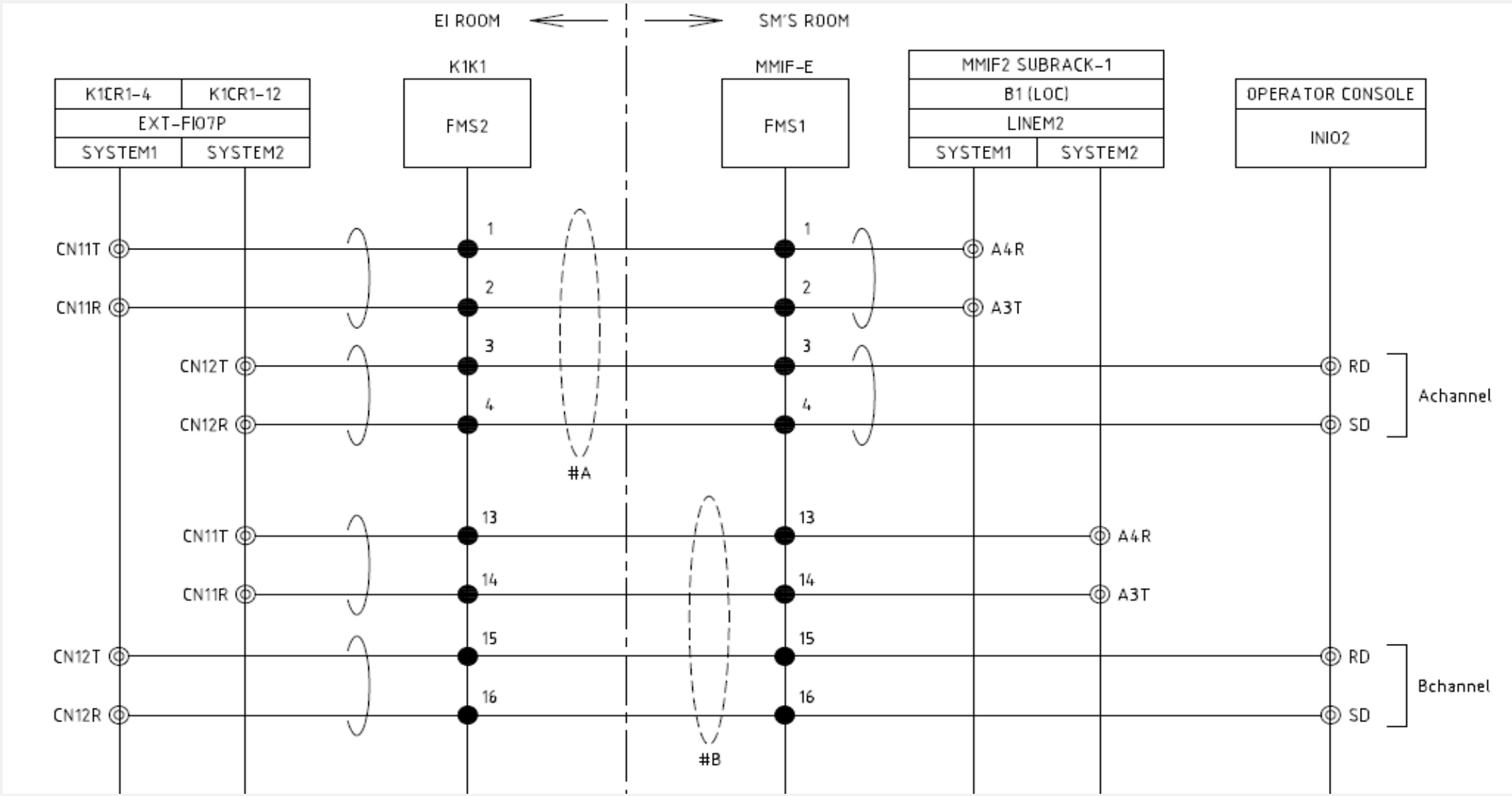
Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

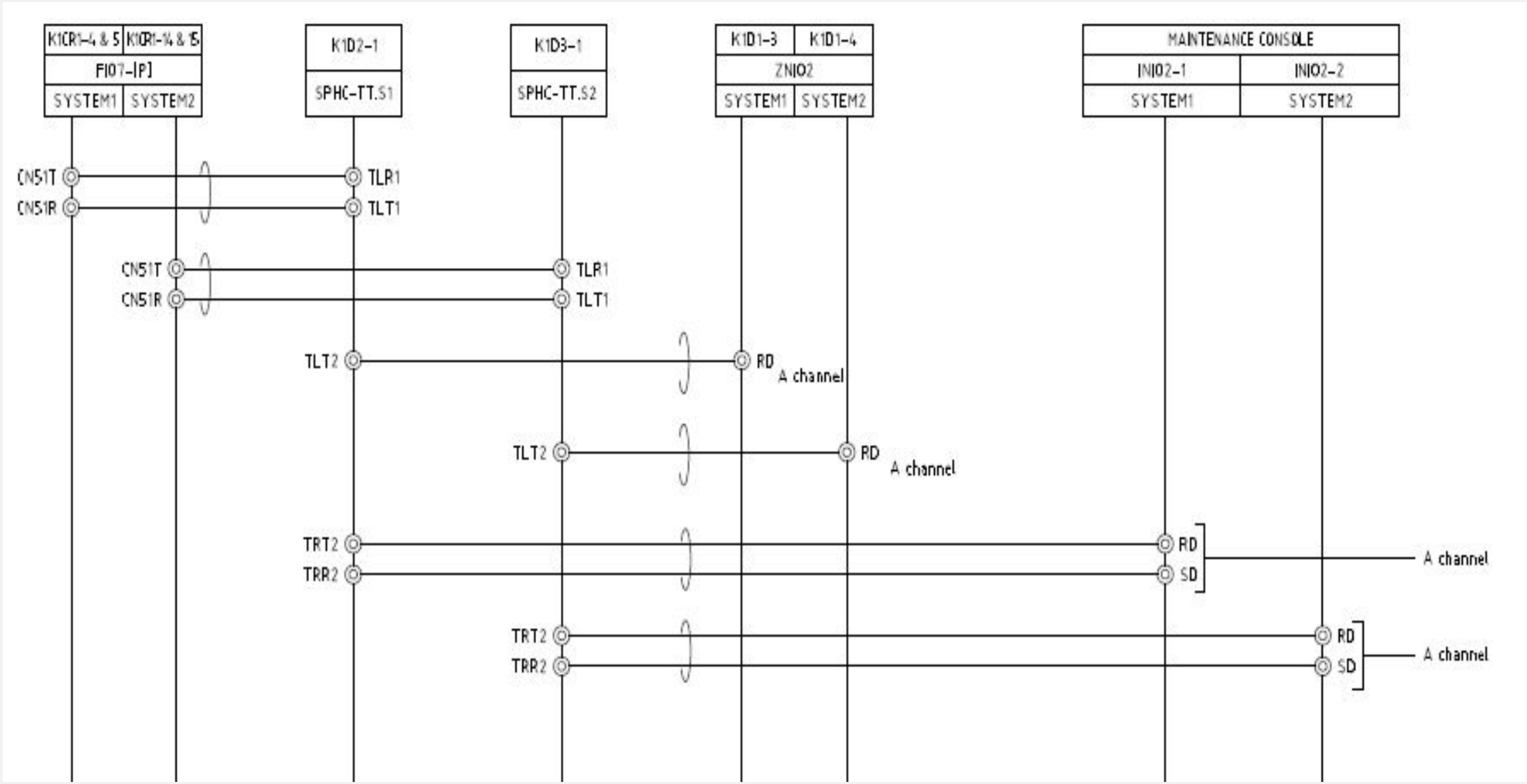
Communication between Logic sub rack & ET sub rack



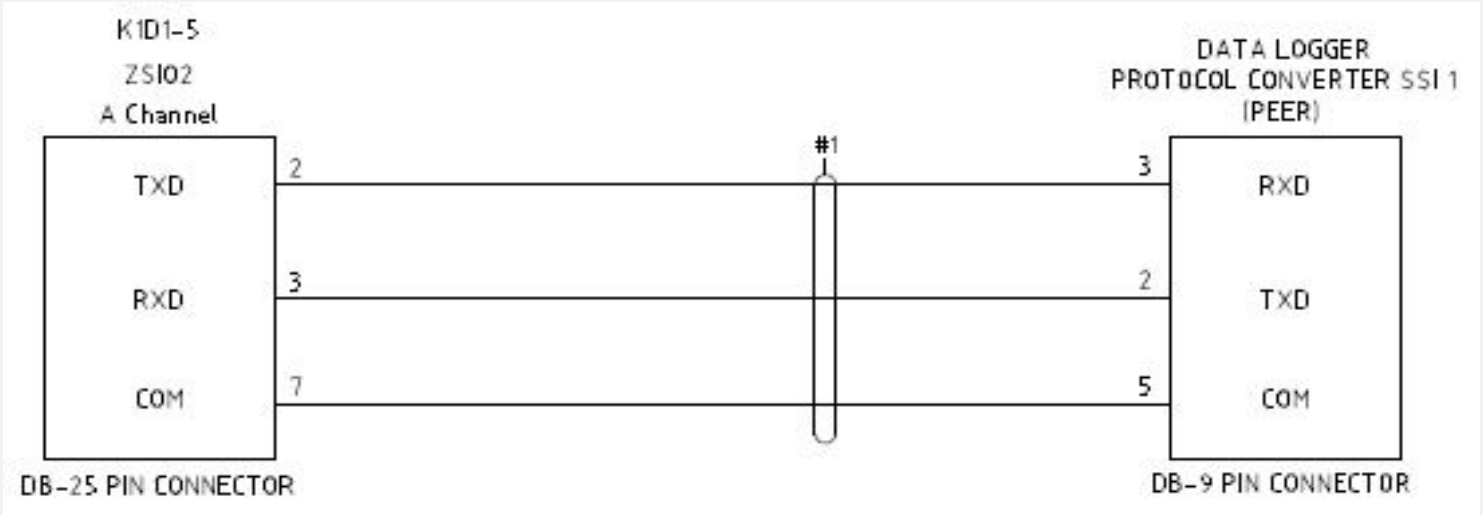
Communication between Logic sub rack and EM6 sub rack and OPC

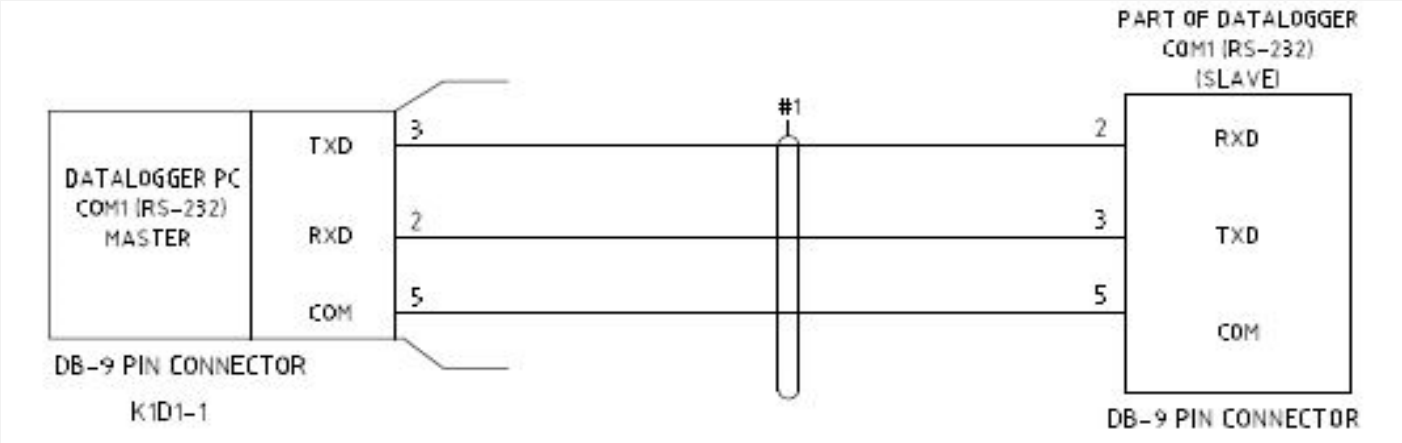


Communication between Logic Sub Rack and Journal module and MTC

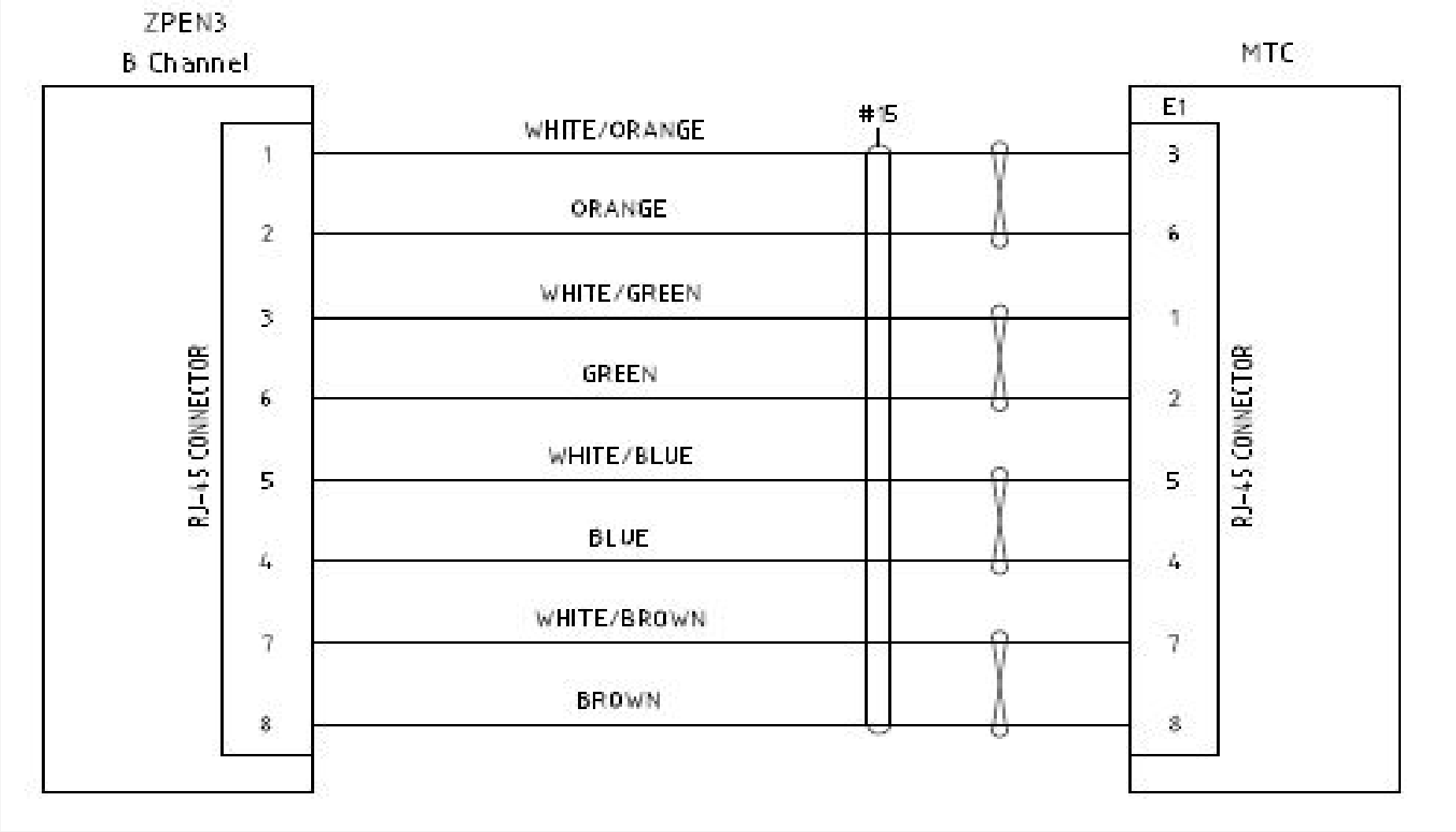


Serial communication for Datalogger





Ethernet Communication between MTC and JM



Input and Output board circuit

Standard wire notes:

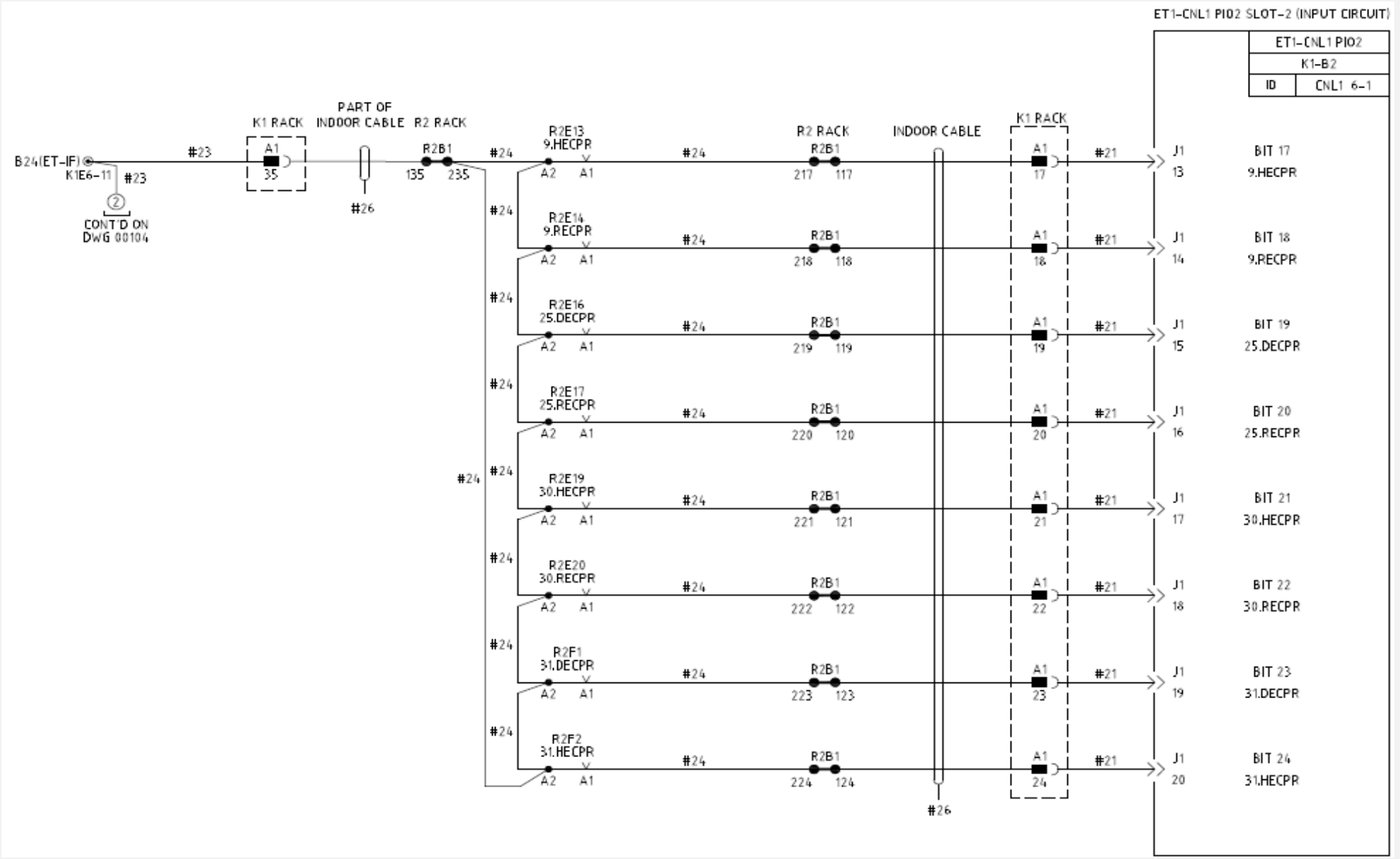
- **The below table shows the standard wire gauge to be used for design and wiring at site.**

SL.NO.	WIRE CODE	DESCRIPTION
01	#20	0.2 sq.mm WIRE (RED COLOUR)
02	#21	0.2 sq.mm WIRE (BLUE COLOUR)
03	#22	0.2 sq.mm WIRE (BLACK COLOUR)
04	#23	0.5 sq.mm WIRE (RED COLOUR)
05	#24	0.5 sq.mm WIRE (BLUE COLOUR)
06	#25	0.5 sq.mm WIRE (BLACK COLOUR)
07	#26	40 CORE CABLE (0.6 sq.mm))
08	#28	1.5 sq.mm (TWISTED PAIR)
09	#31	0.5 sq.mm WIRE (GREEN COLOUR)
10	#34	0.5 sq.mm (TWISTED PAIR)
11	#36	1.5 sq.mm WIRE (RED COLOUR)
12	#37	1.5 sq.mm WIRE (BLACK COLOUR)
13	#38	4 sq.mm WIRE (RED COLOUR)
14	#39	4 sq.mm WIRE (BLACK COLOUR)
15	#42	10 sq.mm WIRE (RED COLOUR)
16	#43	10 sq.mm WIRE (BLACK COLOUR)
17	#47	16 sq.mm WIRE (RED COLOUR)
18	#48	16 sq.mm WIRE (BLACK COLOUR)

INPUT BOARD CIRCUIT

- ET-PIO2 I/O board is having 32 Vital input and output.
- Board Input supply Voltage – 24V DC.
- For 8 Input bits one looping supply will be used. Positive will looped at relay side & negative will be looped in the connector side.
- From the board J1 Connector to I/O termination in K-rack, 0.2 sq.mm blue colour wire will be used.
- From K rack to relay rack, 0.6 sq.mm 40 core indoor cable to be used.
- All the relay contact wiring will be in 0.5 sq.mm blue colour wire.

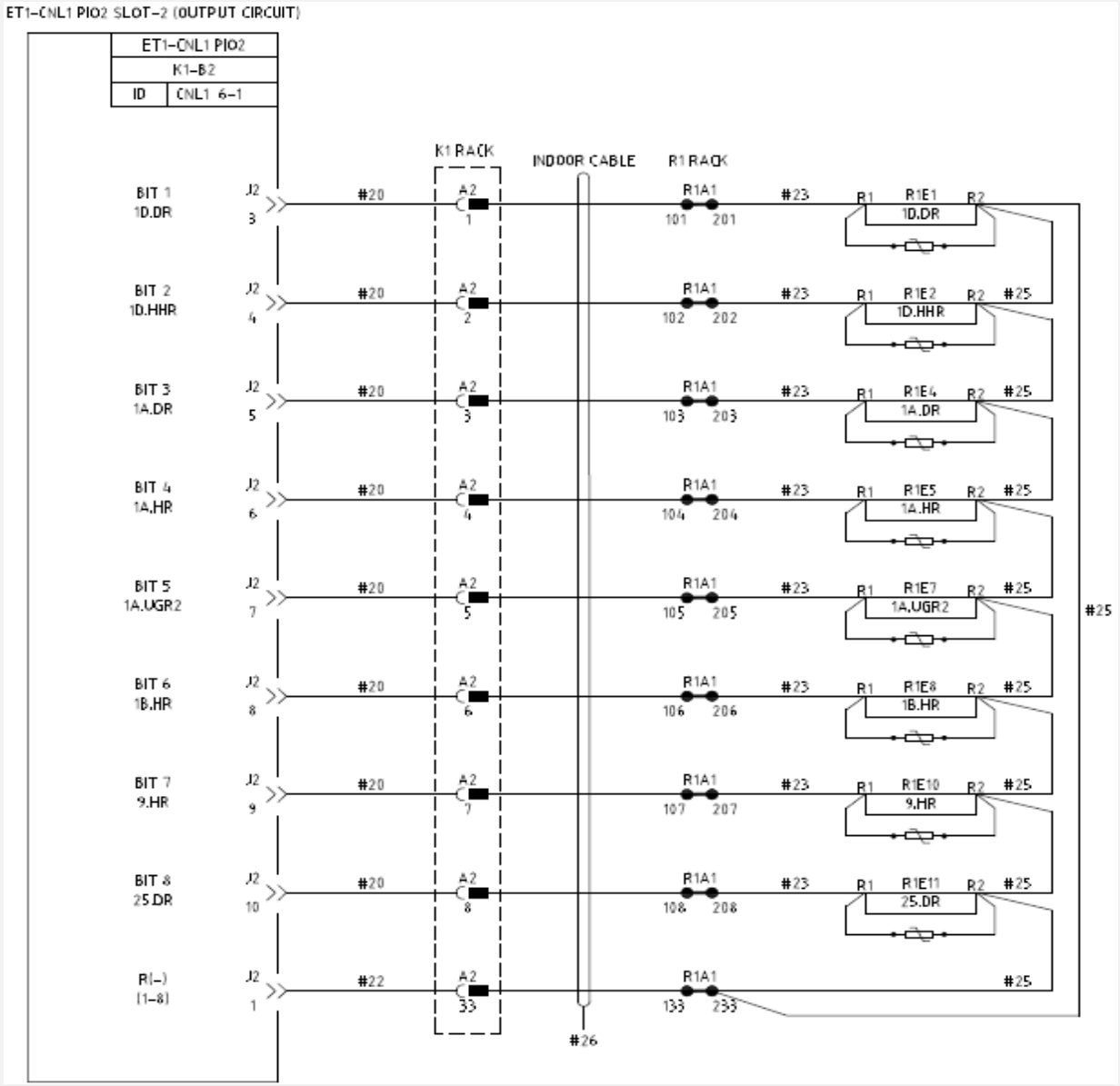
INPUT BOARD CIRCUIT



OUTPUT BOARD CIRCUIT

- Positive supply will be delivered from the ETPIO-2 board.
- Negative supply will be looped in relay side.
- For 8 outputs one negative will be used.
- MOV to be provided across all the Output relays to avoid the back EMF.
- From the board J2 Connector to I/O termination in K-rack, 0.2 sq.mm RED colour wire will be used.
- From K rack to relay rack, 0.6 sq.mm 40 core indoor cable to be used.
- From the relay rack to relay coil 0.5 sq.mm red colour wire will be used.
- For Negative looping 0.5 sq.mm black colour wire will be used.

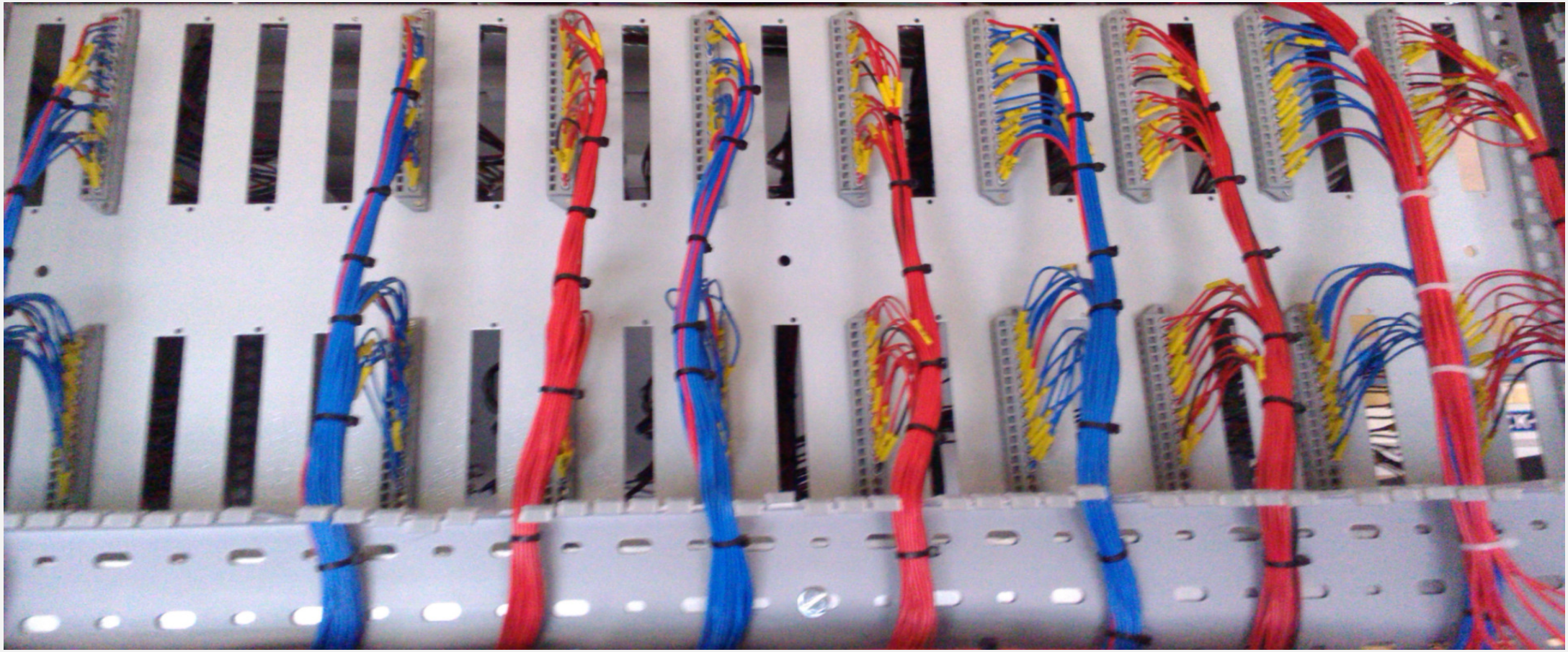
OUTPUT BOARD CIRCUIT



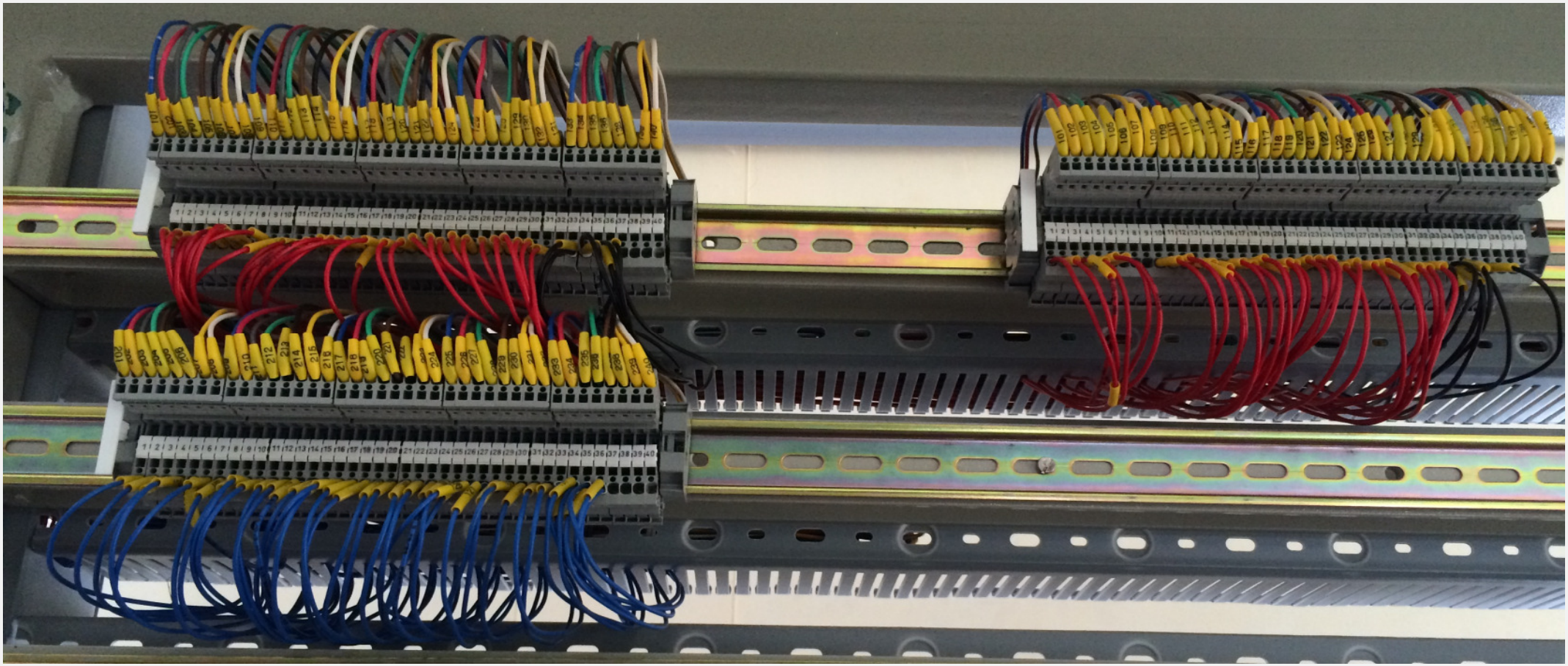
Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

I/O BOARD TERMINAL DETAILS



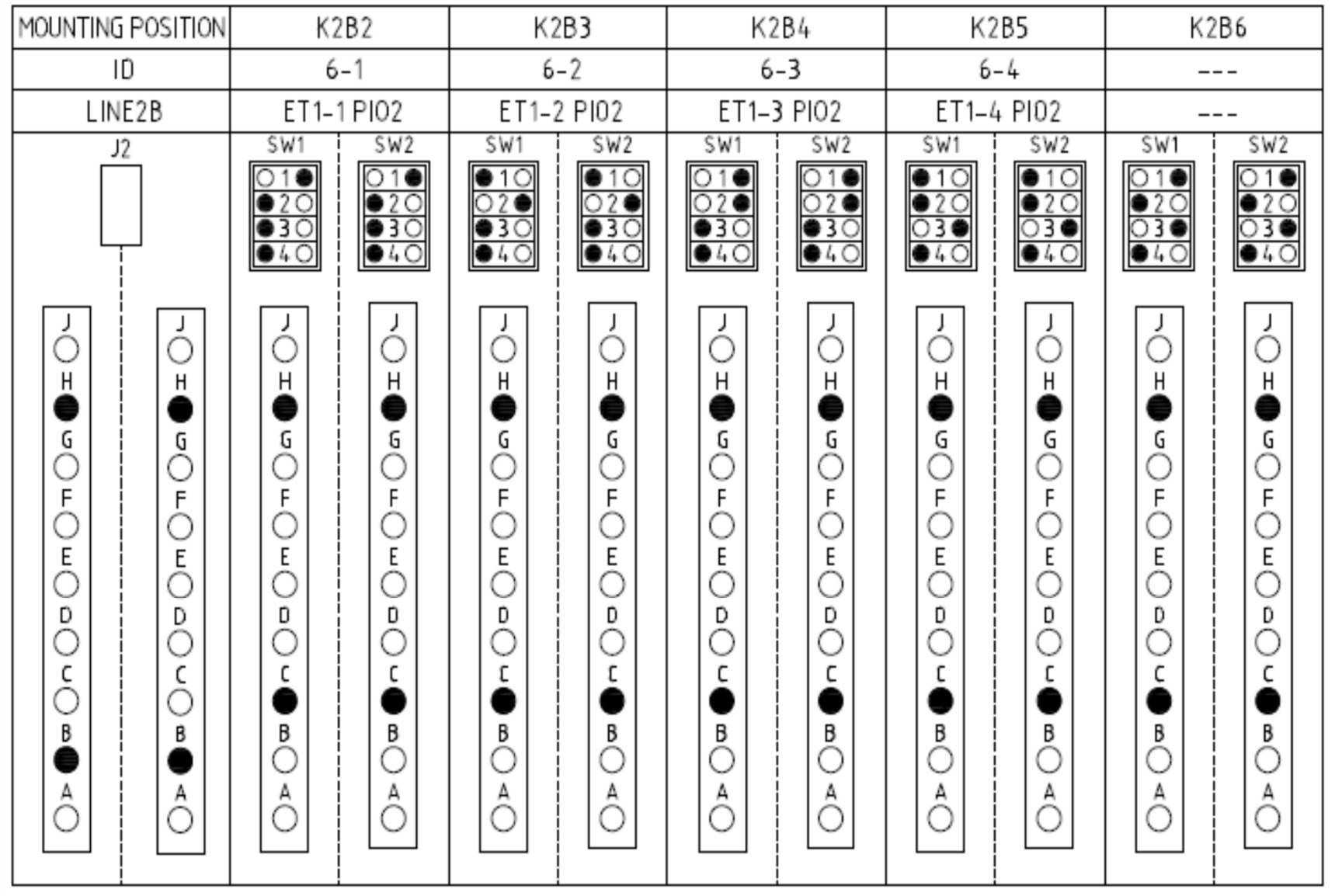
I/O BOARD TERMINAL DETAILS



DIP SWITCH SETTINGS FOR ELECTRONIC POLARITY KEY

- **Used to address particular card of the sub-rack.**
- **For one channel we shall connect up to 15 board's accordingly binary 4 digit code to be applied to each board SW1 & SW2.**
- **The system of operation classified as Single system operation and Double system operation.**
- **In single system of operation LINE2B card only got duplicated other PIO 2 I/O boards are not duplicated.**
- **The jumper setting should be short between 1 to 6 and 2 to 7 in LINE2B J2 for Single system operation.**
- **The jumper setting should be open in LINE2B J2 for Double system operation.**

DIP SWITCH SETTINGS FOR ELECTRONIC POLARITY KEY

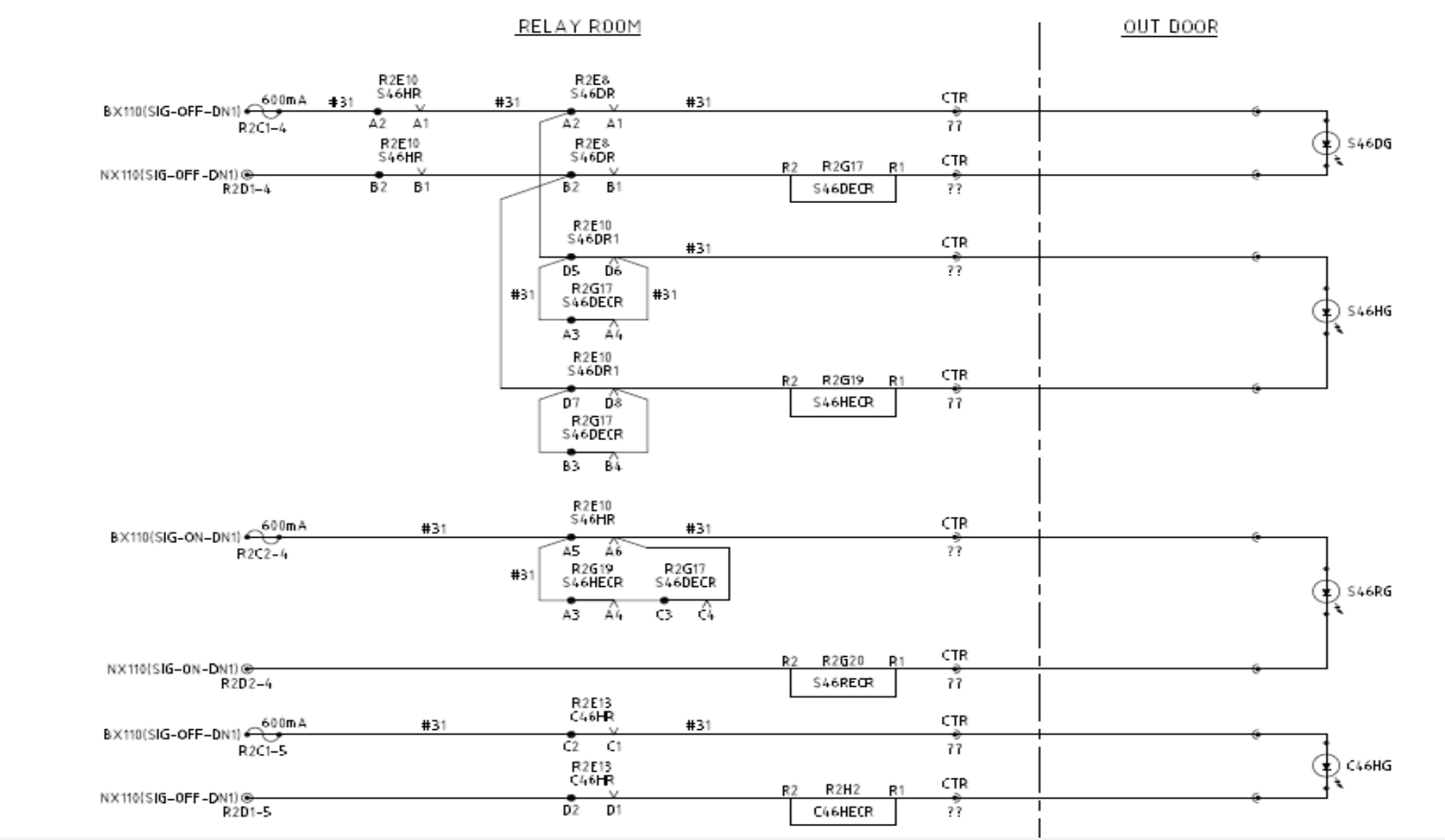


FIELD CIRCUIT

Field circuit consists

- Signal lightning circuits.
- Point control and detection circuits.
- Crank handle control and detection circuits.
- Siding control and detection circuits.
- Track input circuits.
- LC gate control and detection circuits.
- Block instrument and axle counter circuits.
- All the above circuits should be designed as per the zonal railway practice.

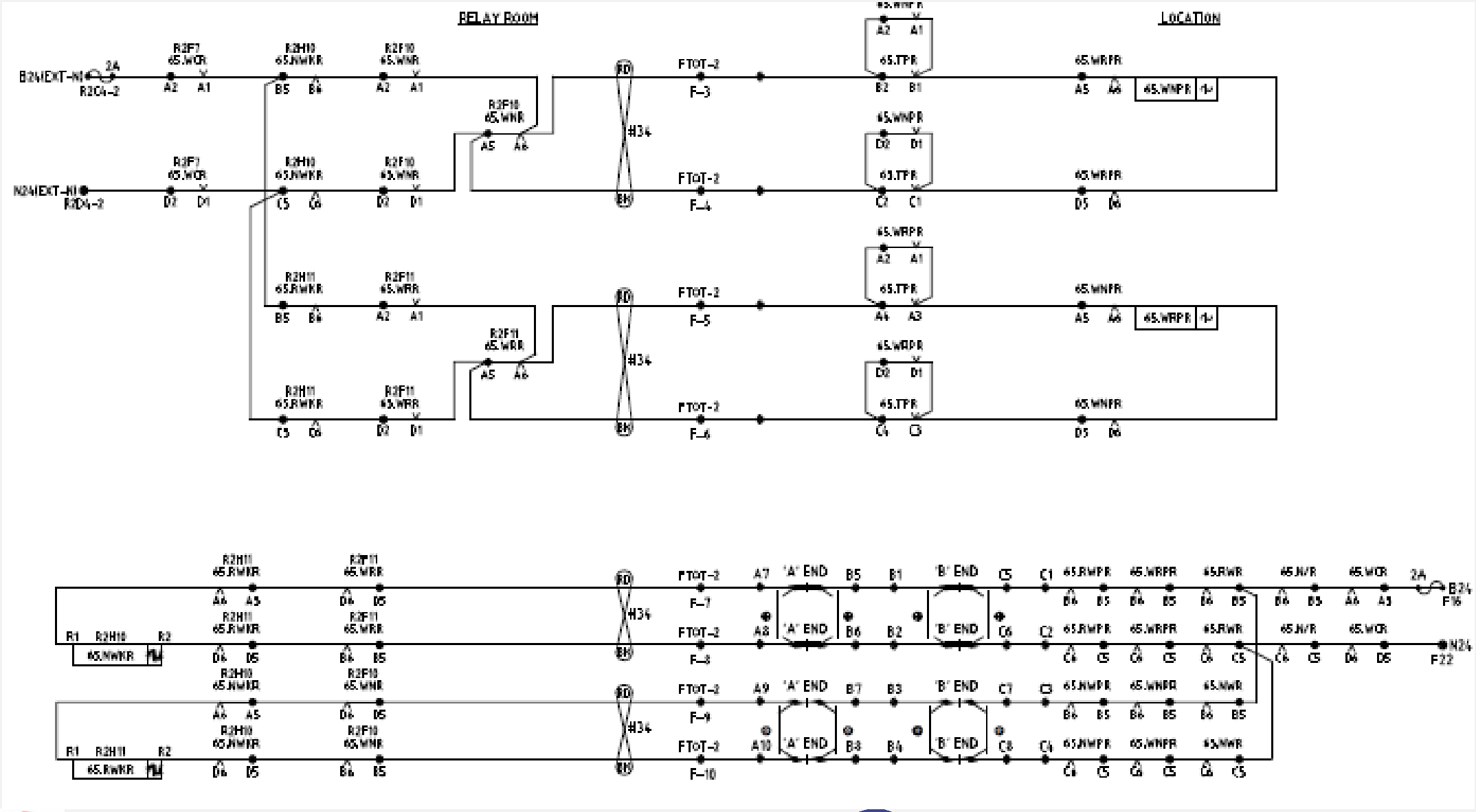
Signal Lightening circuits



Kyosan India Pvt Ltd.

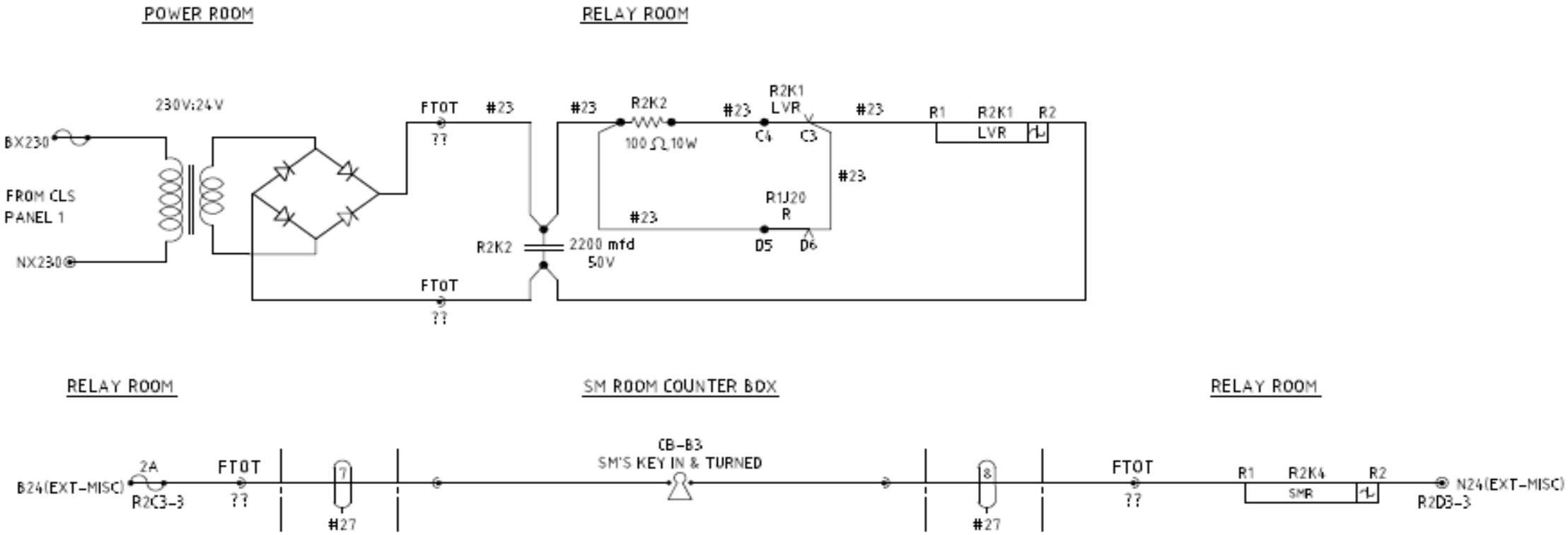
TVM Signalling & Transportation Systems Pvt Ltd.

MISCELLANEOUS CIRCUIT



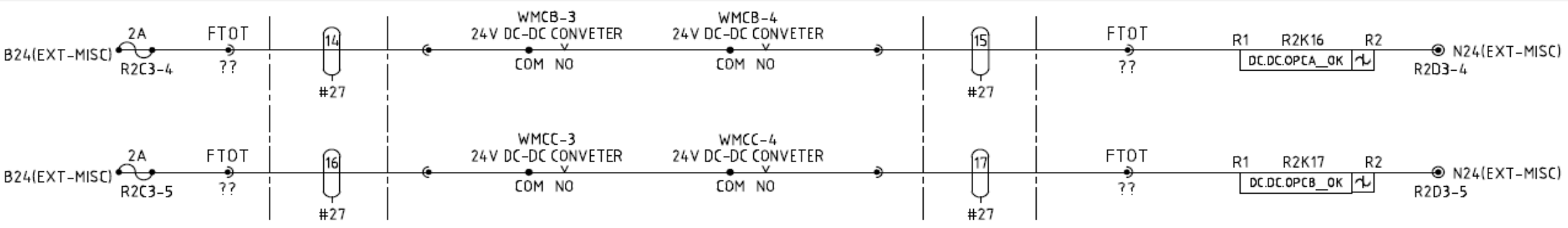
MISCELLANEOUS CIRCUIT

- **LVR, SMR, Relay room door and DC.DC.FAIL circuits are considered as miscellaneous circuits**

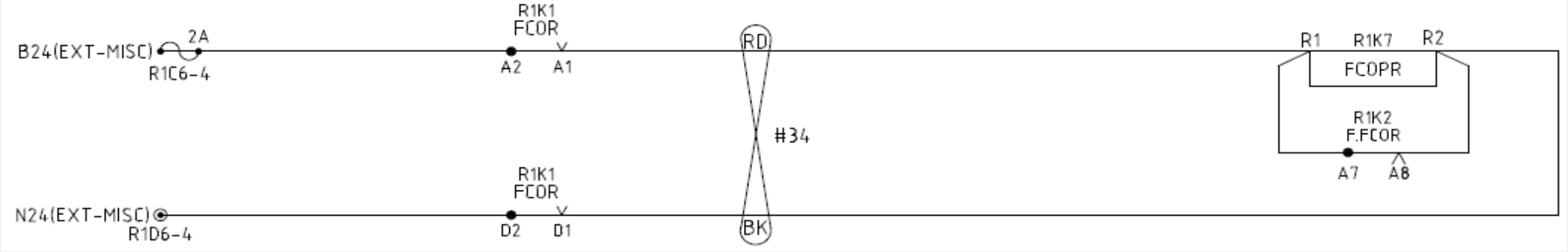


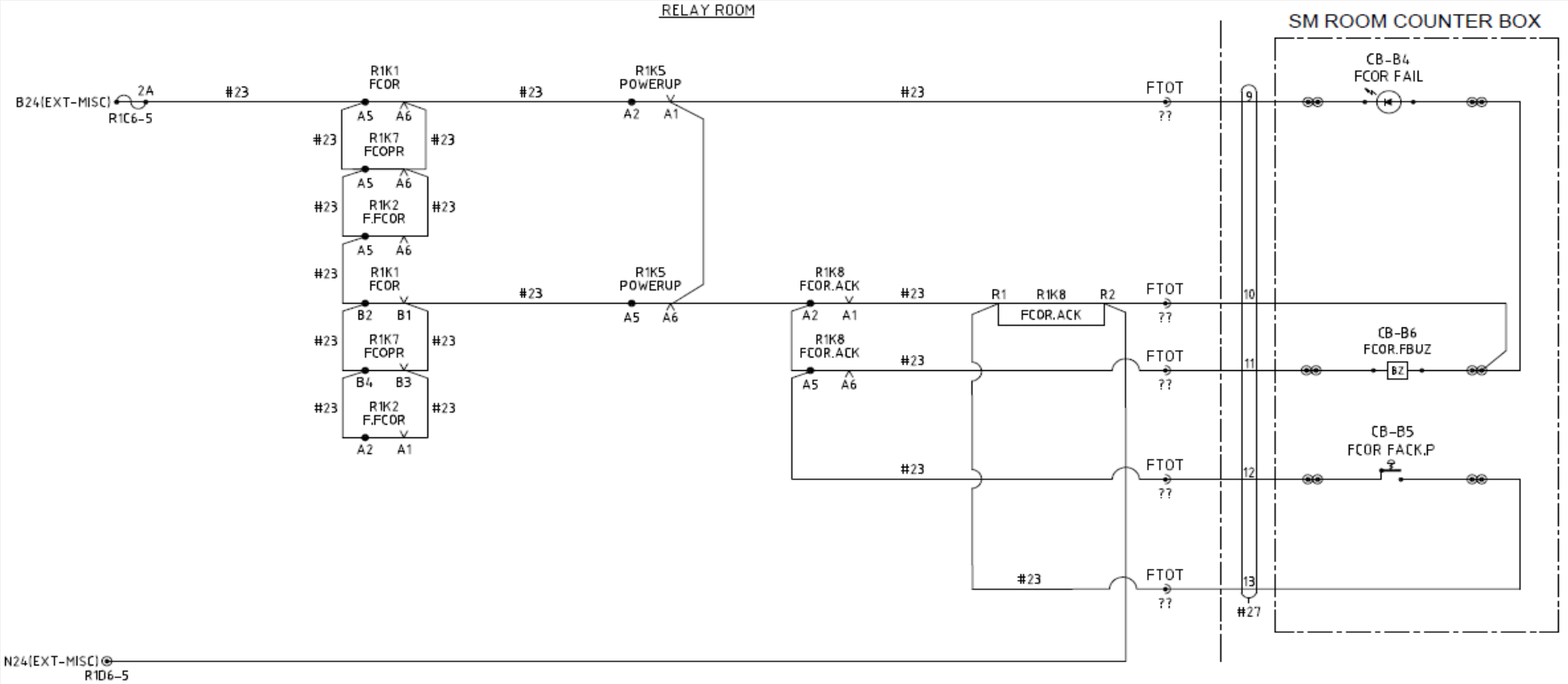
MISCELLANEOUS CIRCUIT

- **DC-DC Converters potential free contact of Sys1 supply, Sys2 supply, LINE2B supply, ET-PIO2 supply, OPC supply and MMIF supply to be taken as separate input for indication purpose.**

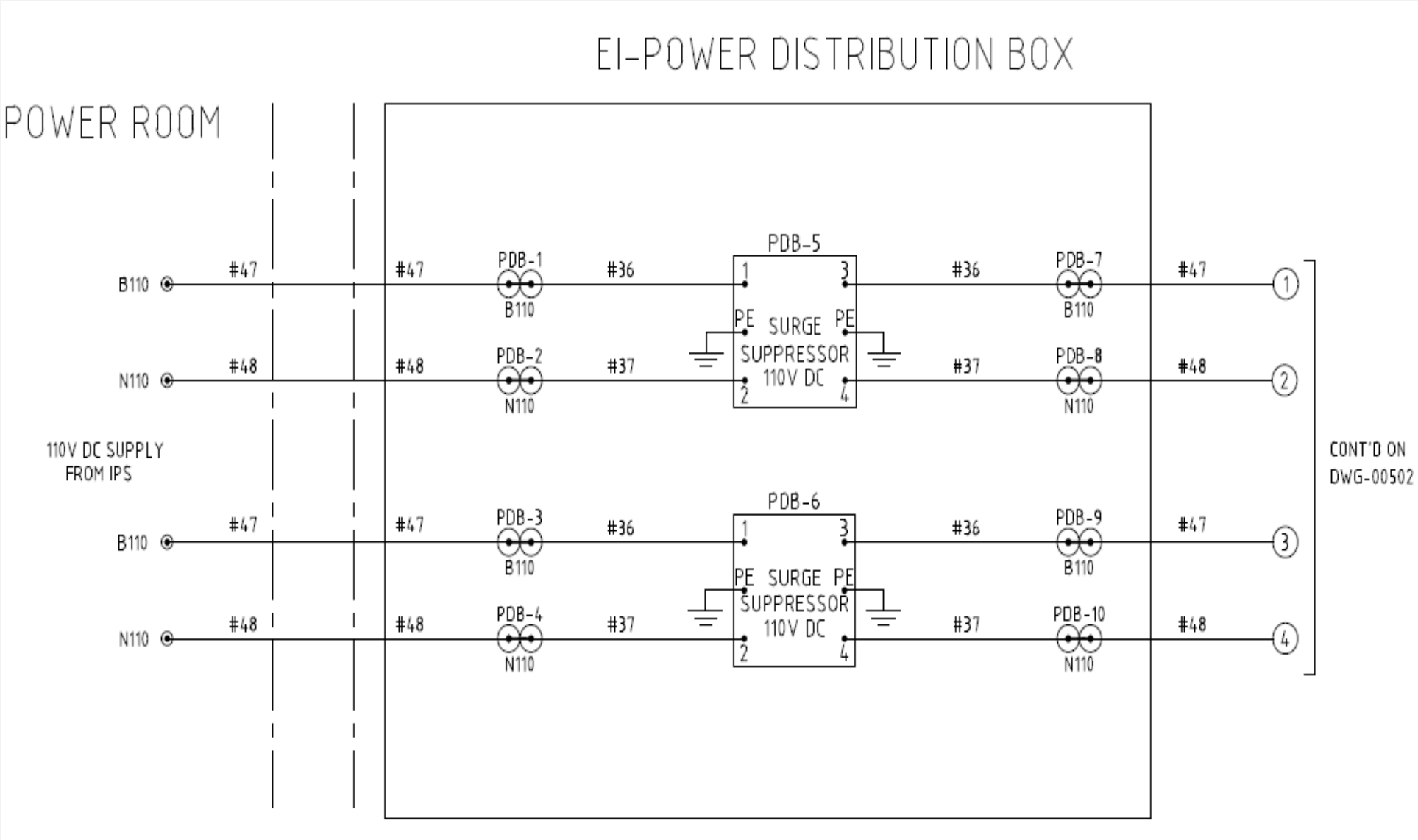


FCOR CIRCUIT

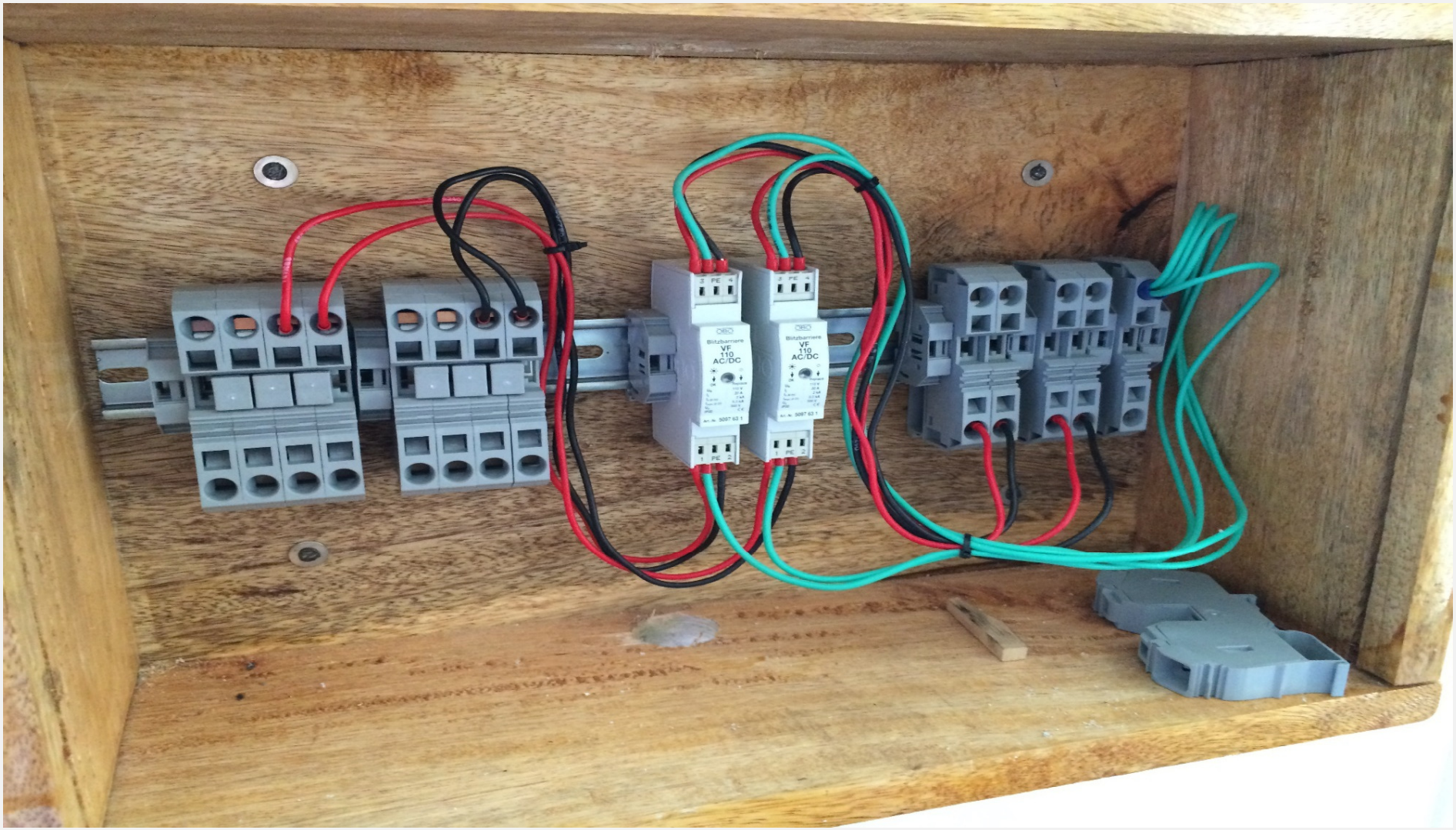




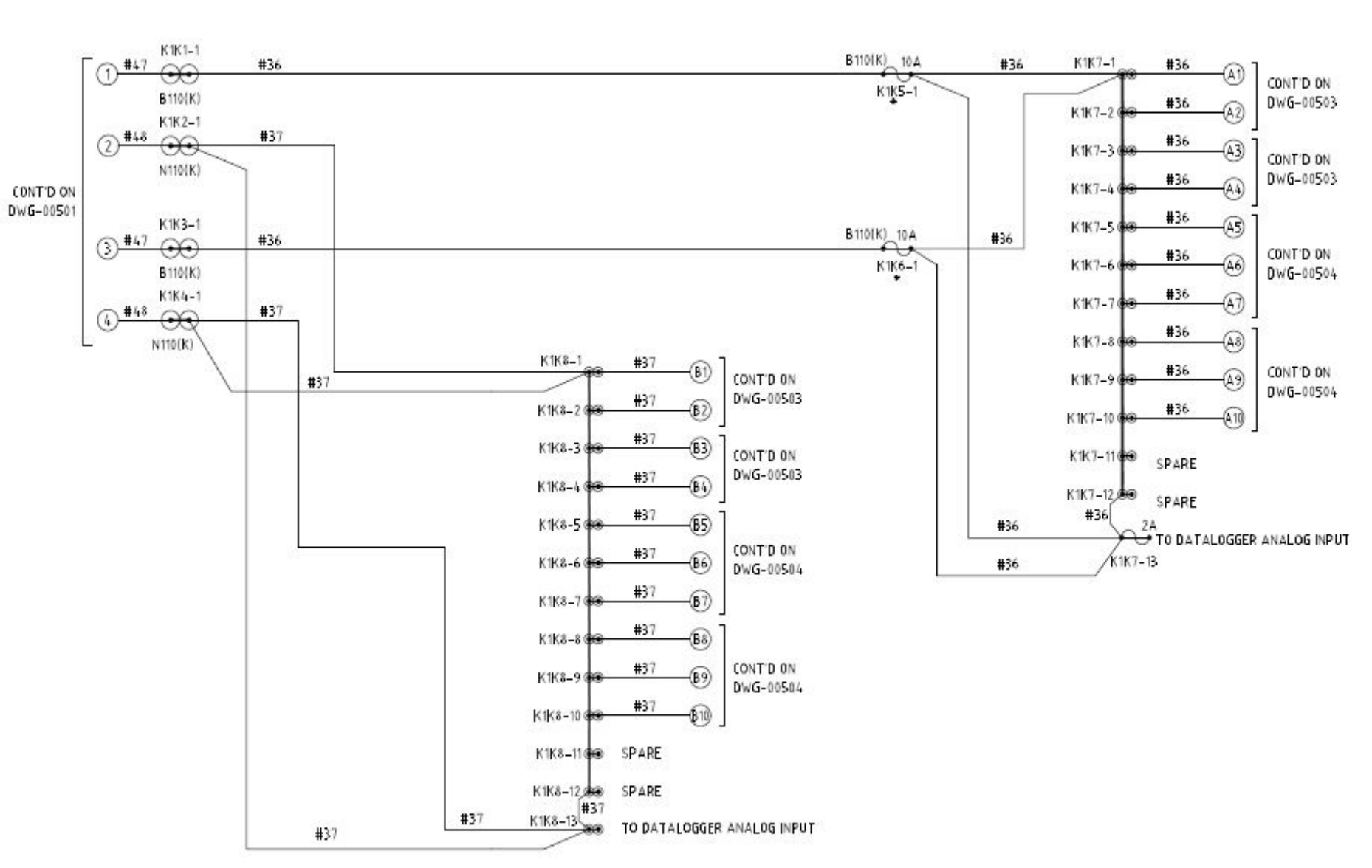
Power Distribution Circuit



Power Distribution Box



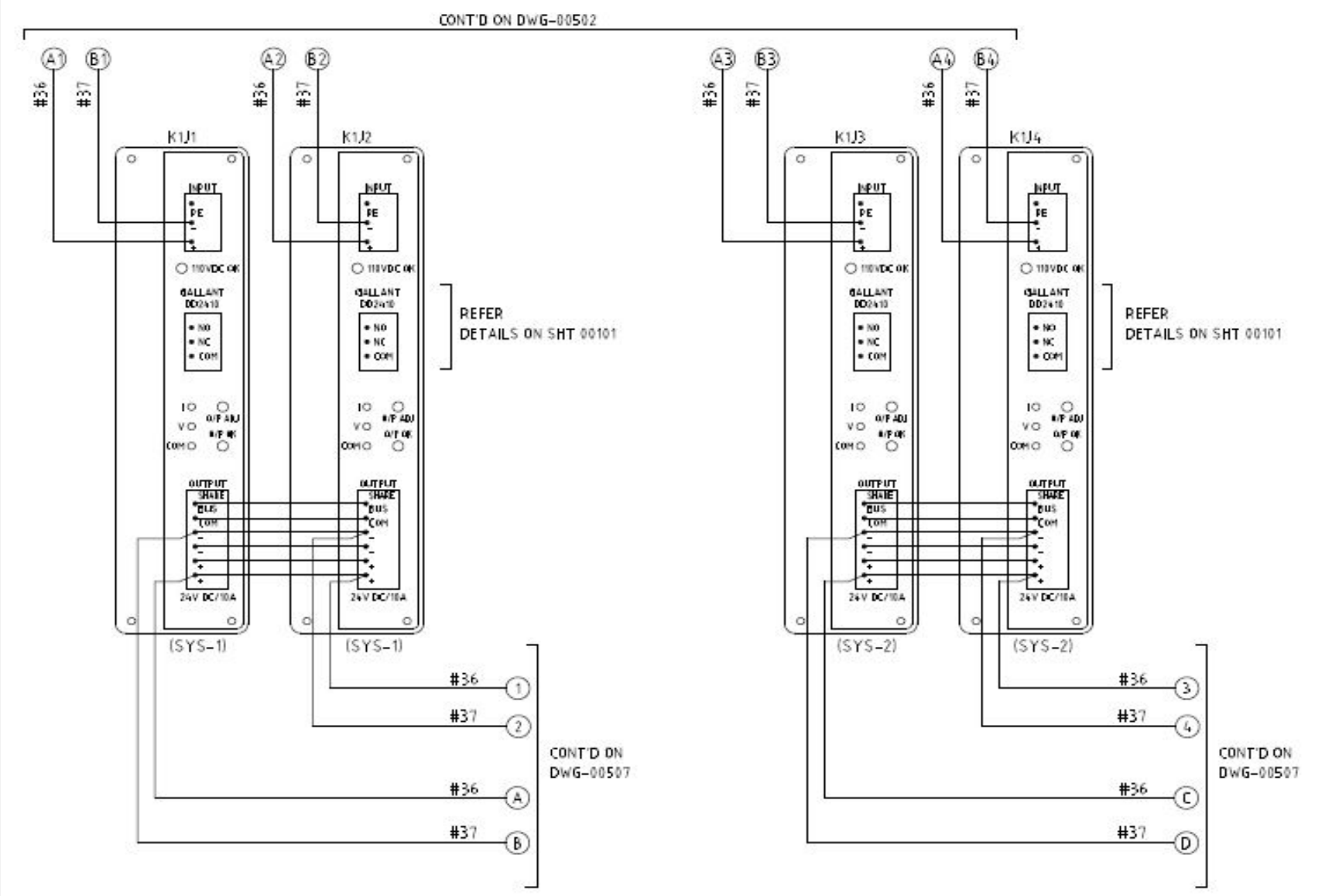
Power Distribution Circuit



DC-DC Converter calculation

EI equipments	Voltage (V)	Current(A)	Number of units	Power(V A)
System 1 (JM and Data logger)	24	4	1	96
System 2	24	2	1	48
LINE2B Supply (ET Sub Rack with 5 boards)	24	4	3	288
ETPIO2 Supply (IF supply Average of I/O relays considered)	24	3	3	216
MTC VDU Supply	24	2	1	48
Total load at output of DC-DC Converter				864
Total load at input of DC-DC Converter(110V DC)				**960**
Monitor 42" Supply	110	3	1	330
Monitor 32" Supply	110	3	1	330
110V AC load for Monitor				**660**

DC-DC Converter calculation

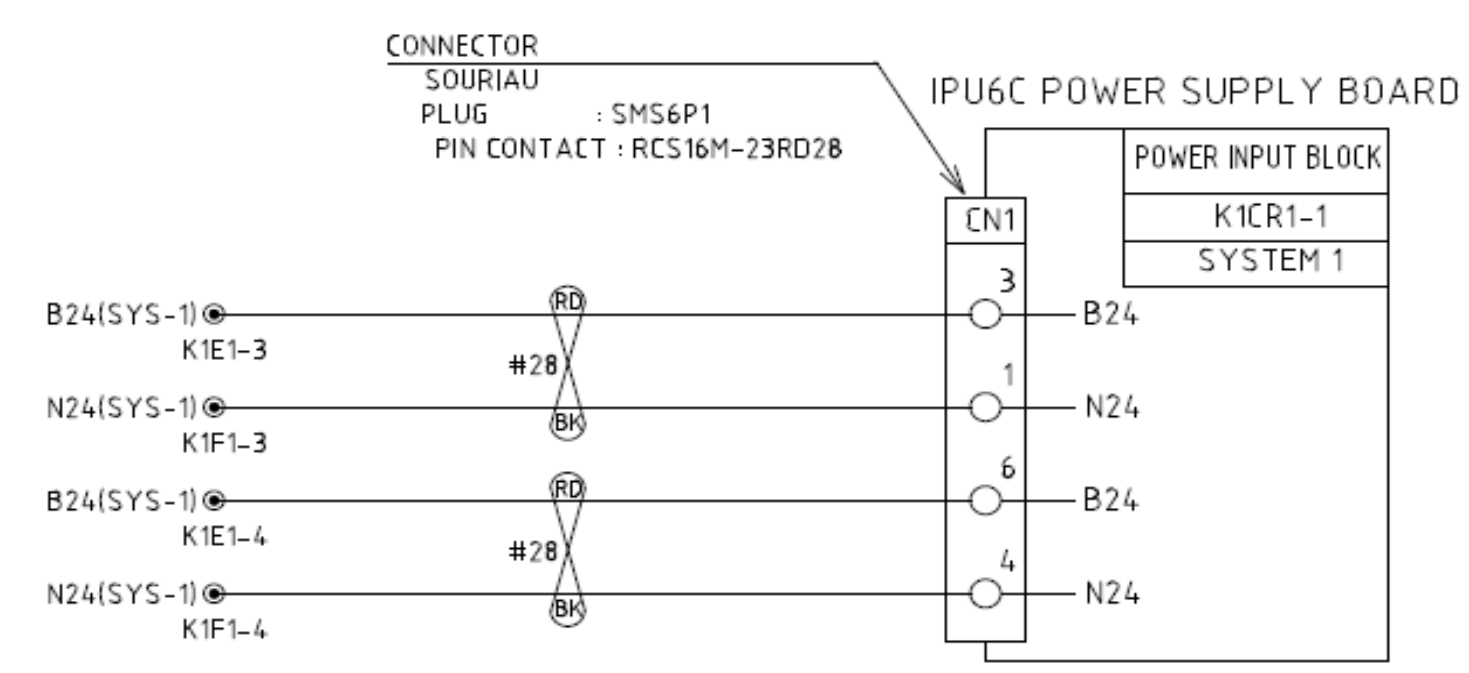


Kyosan India Pvt Ltd.

TVM Signalling & Transportation Systems Pvt Ltd.

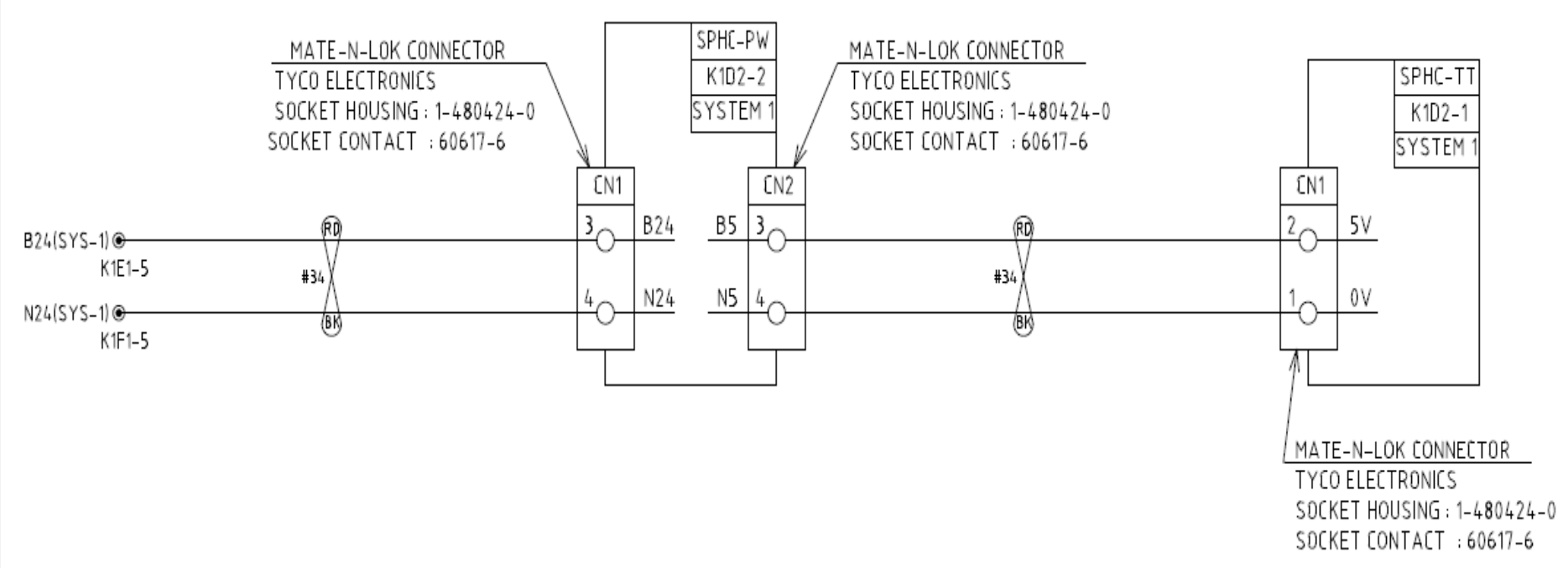
DC-DC Converter

IPU6C supply

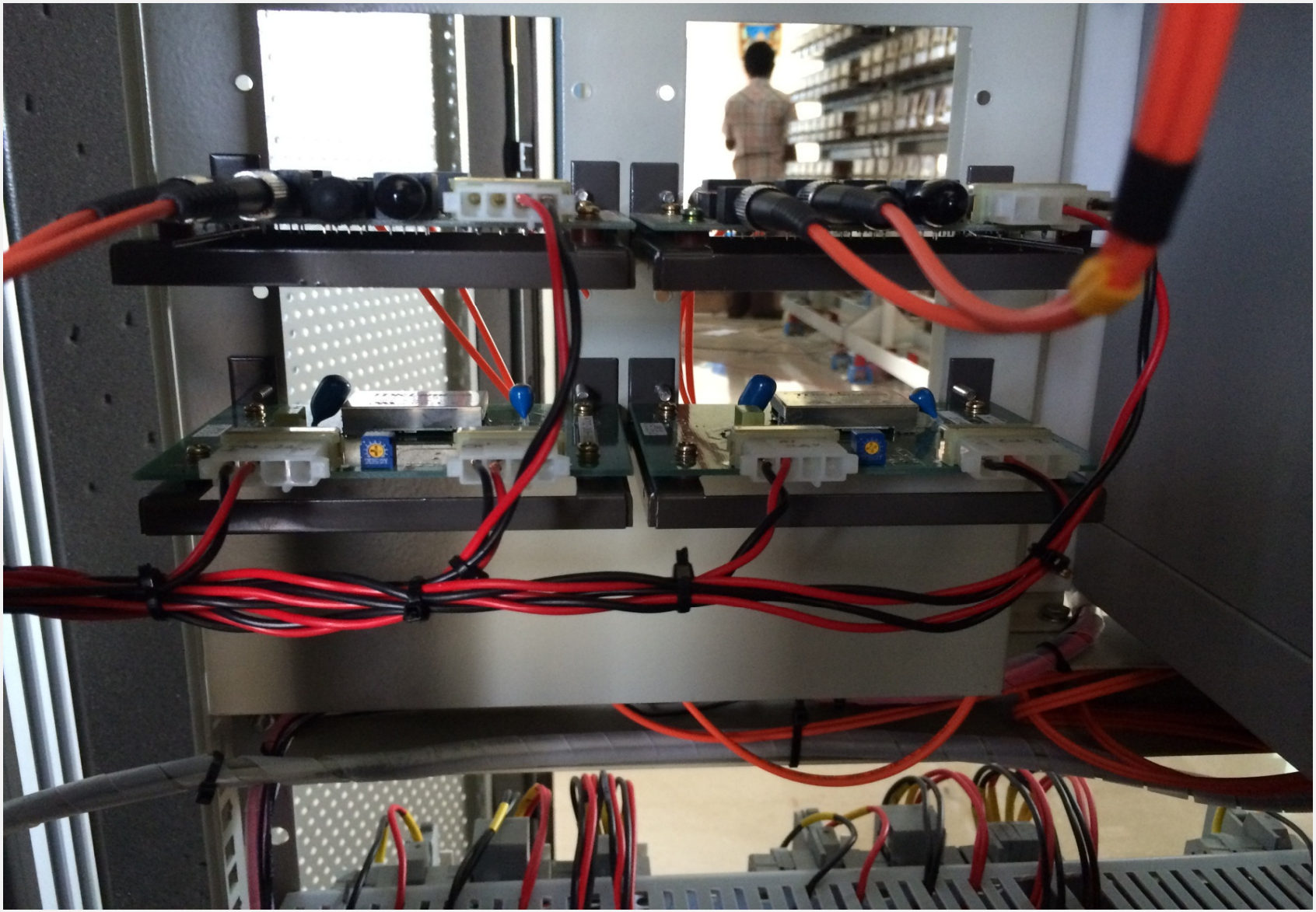


IPU6C supply

SPHC-PW supply

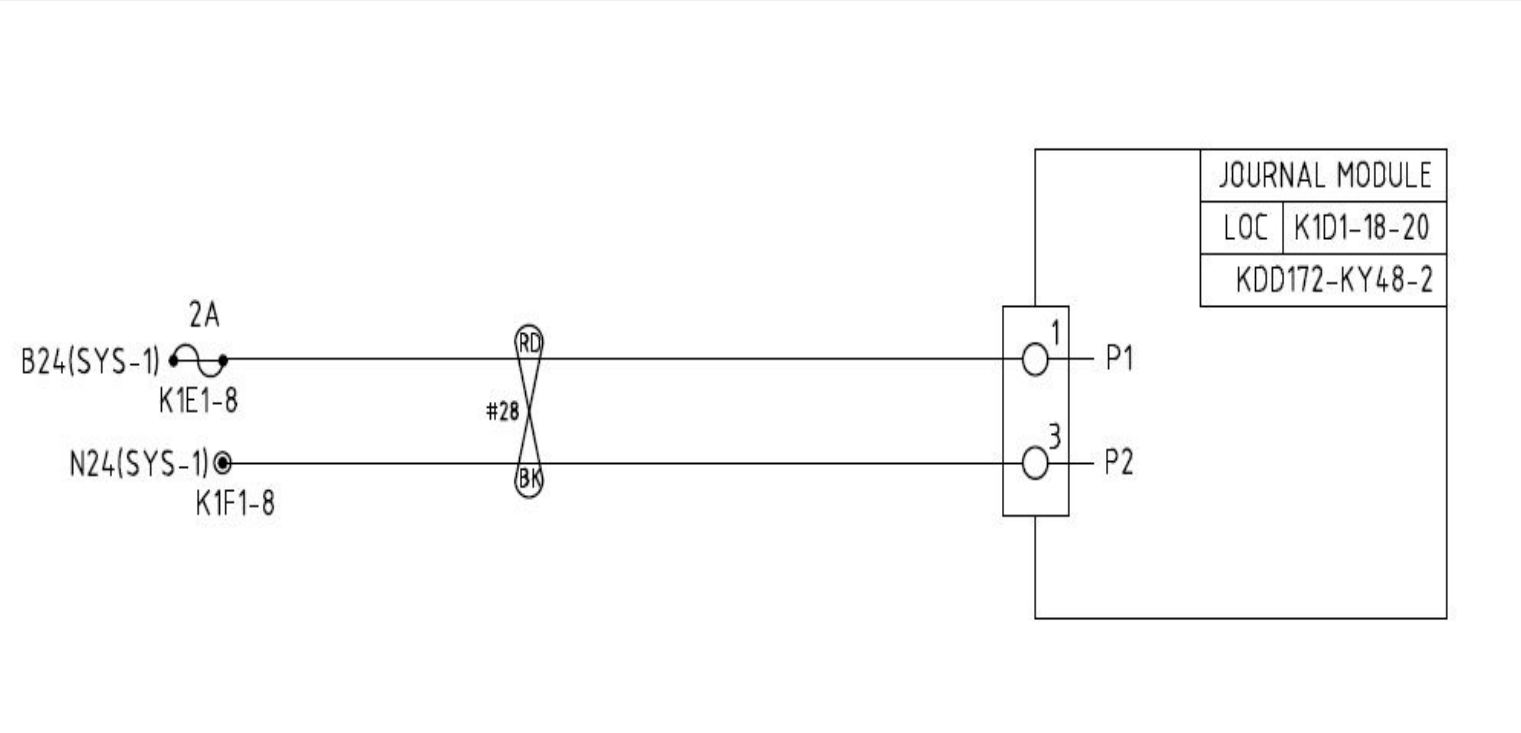


SPHC-PW supply



Journal Module supply

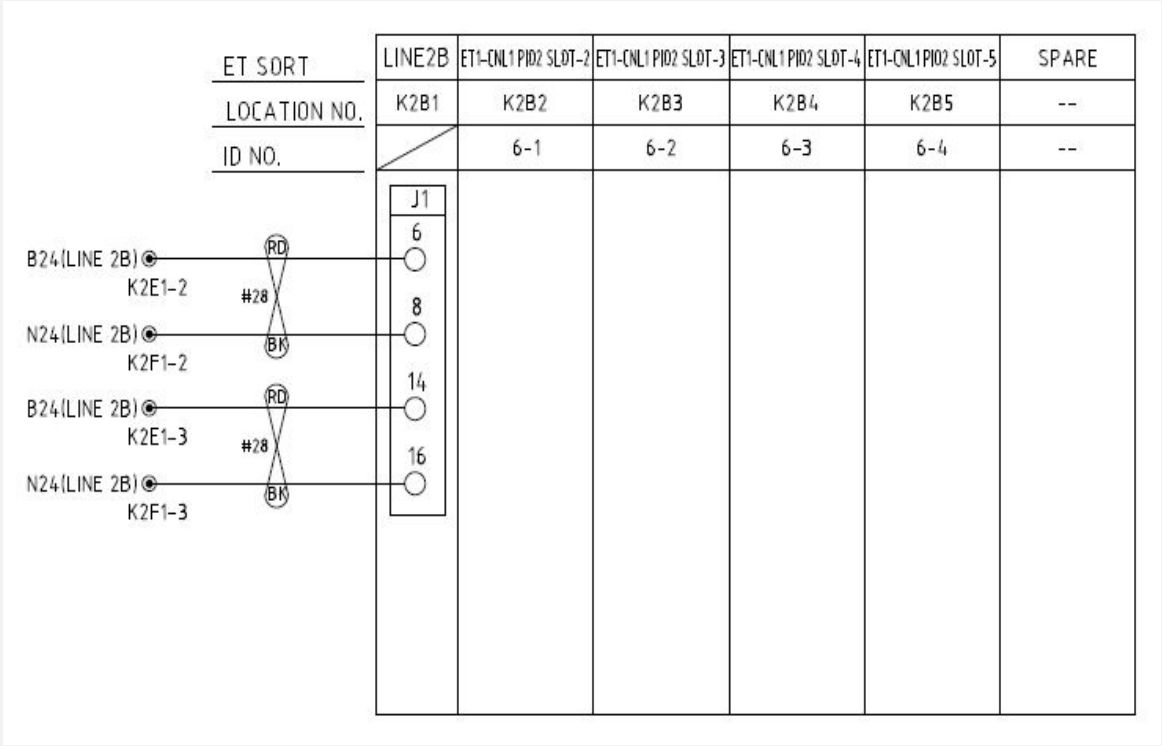
- System 1 DCDC converter supply to be connected to JM power card.
- 24 VDC positive and negative supply to be given to JM power card terminals P1 & P2 respectively.
- 1.5 sq.mm twisted pair red and black wire to be used.



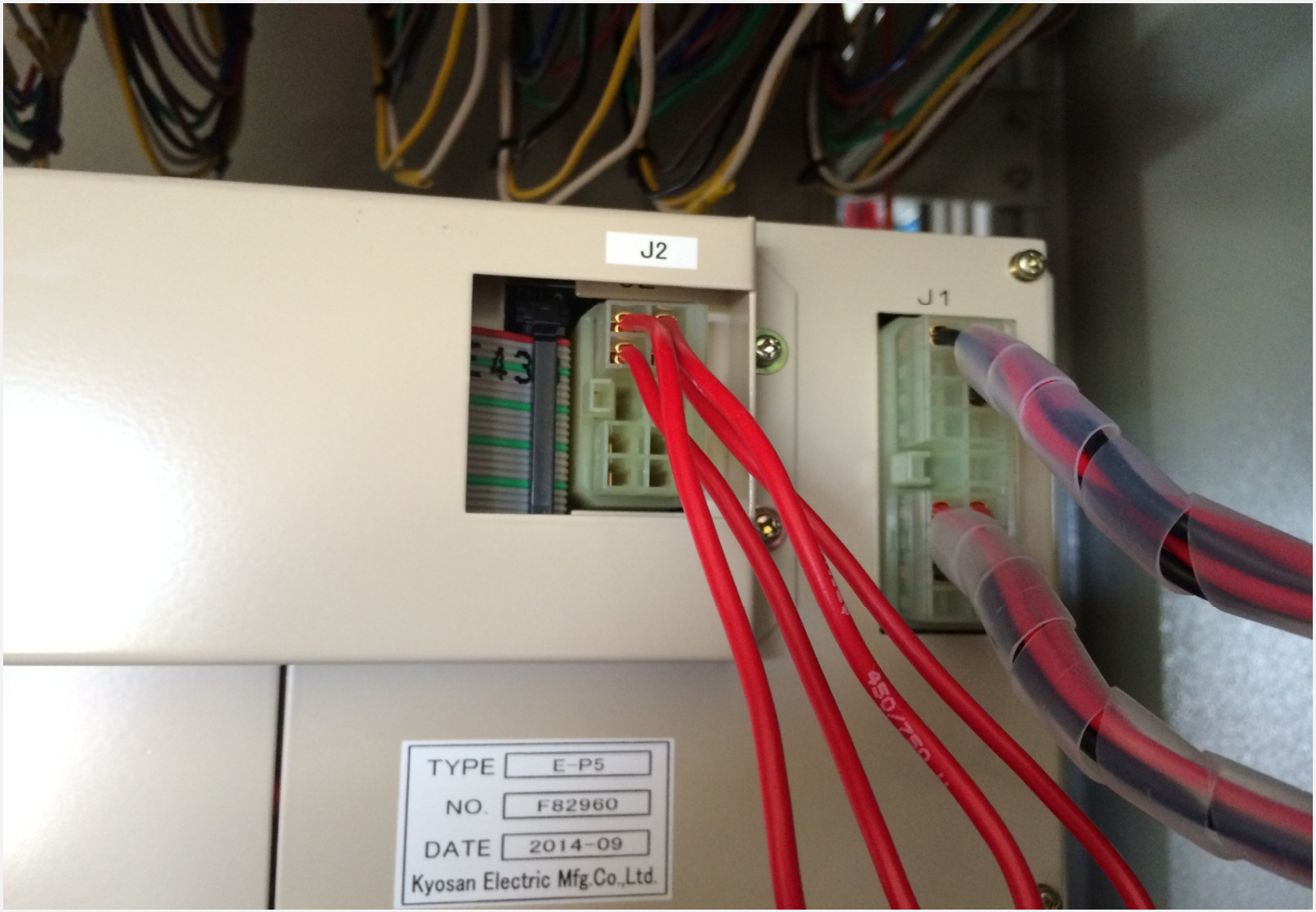
Journal Module supply

LINE2B Supply

- **LINE2B DCDC converter supply to be connected to LINE2B card.**
- **24 VDC positive and negative supplies to be given to LINE2B card J1 connectors 6 & 14 and connector 8 & 16 respectively for all LINE2B cards.**
- **1.5 sq.mm twisted pair red and black wire to be used.**



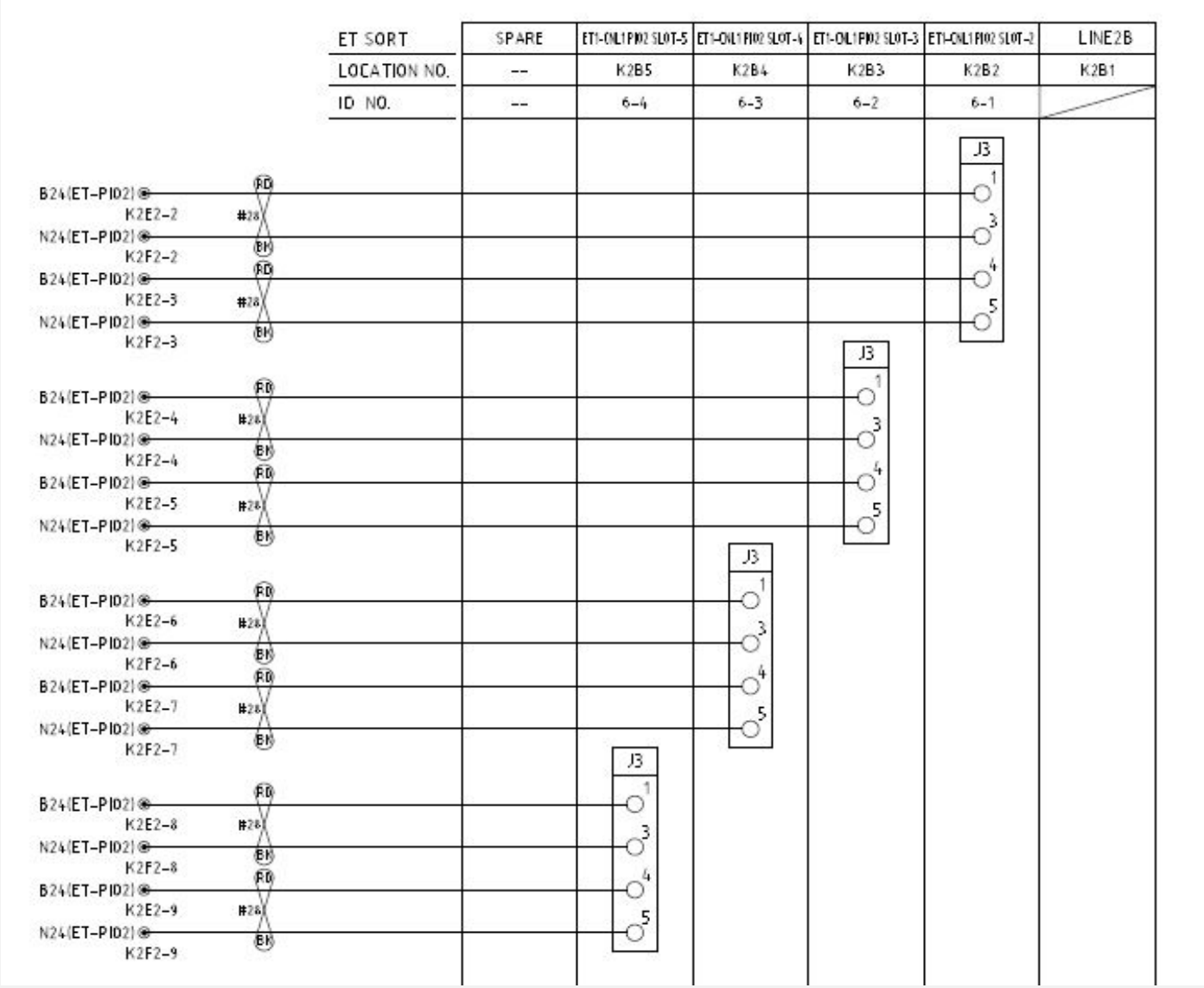
LINE2B Supply



ETPIO2 Supply

- ET-PIO2 DCDC converter supply to be connected to each ET-PIO2 card.
- 24 VDC positive and negative supplies to be given to ET-PIO2 card J3 connectors 1 & 4 and connector 3 & 5 respectively for all ET-PIO2 cards.
- 1.5 sq.mm twisted pair red and black wire to be used.

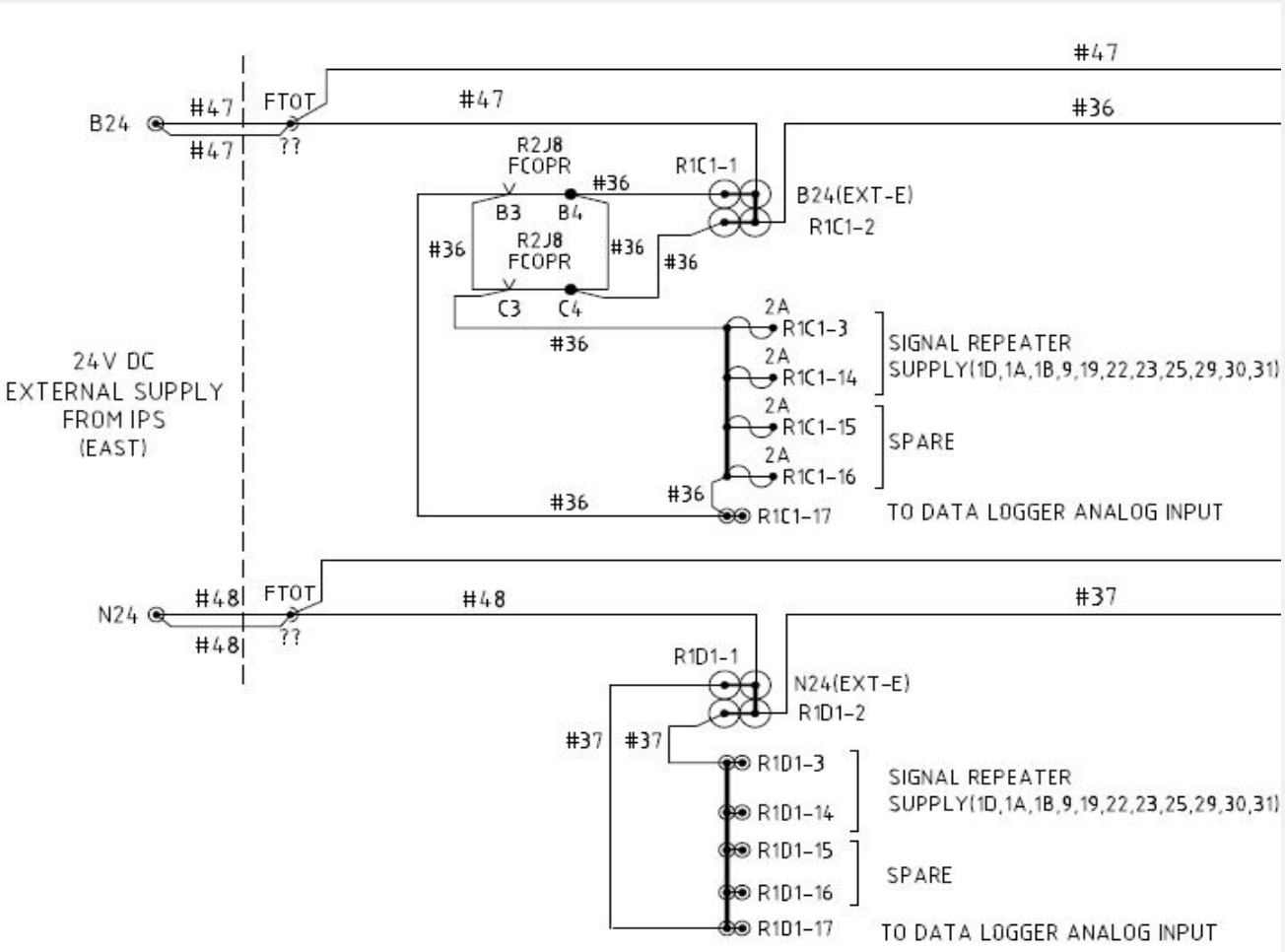
ETPIO2 Supply



ETPIO2 Supply

Signal OFF ECR Supply

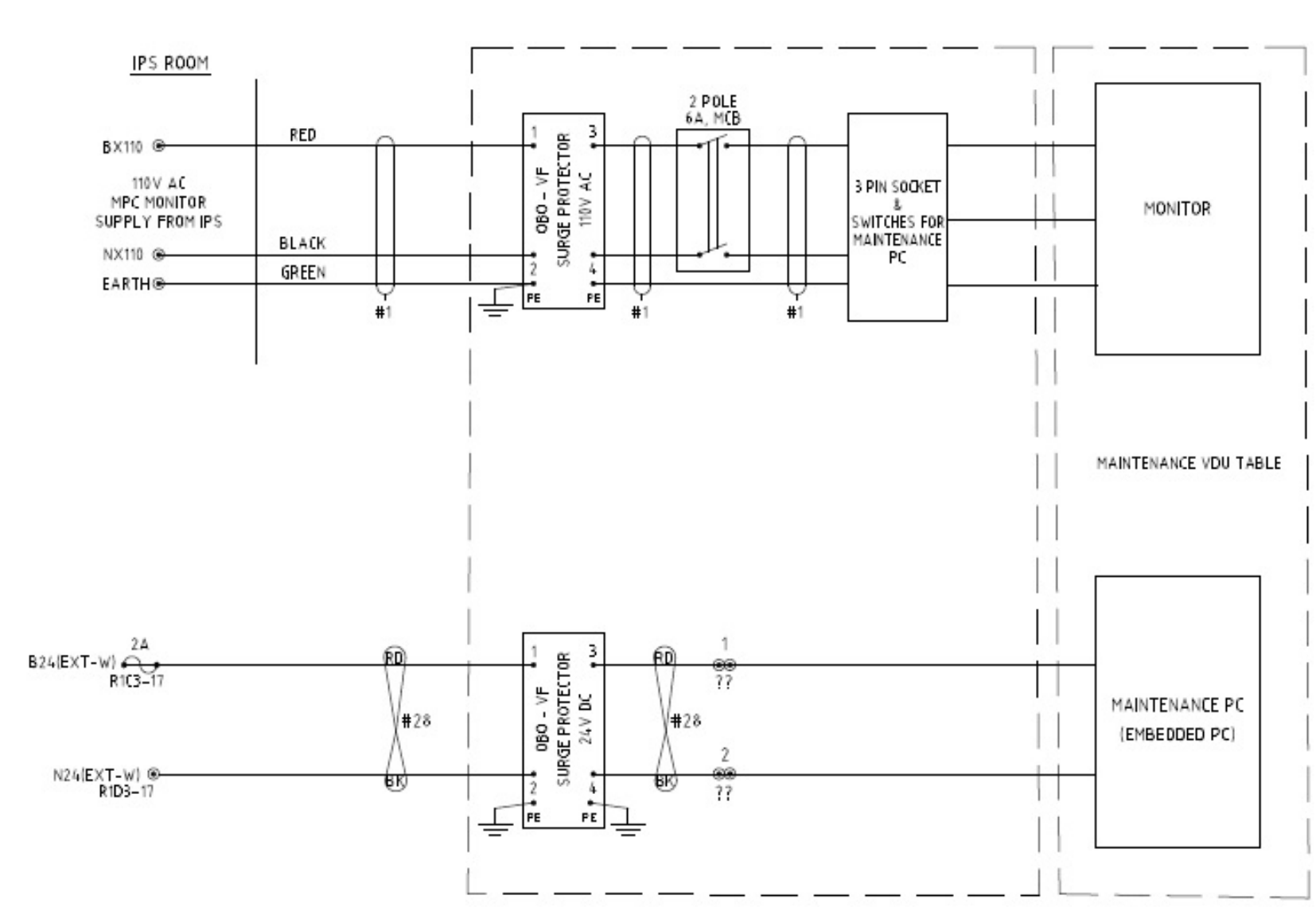
- **All Signals' OFF supply should feed via FCOR contact.**



Maintenance PC power supply

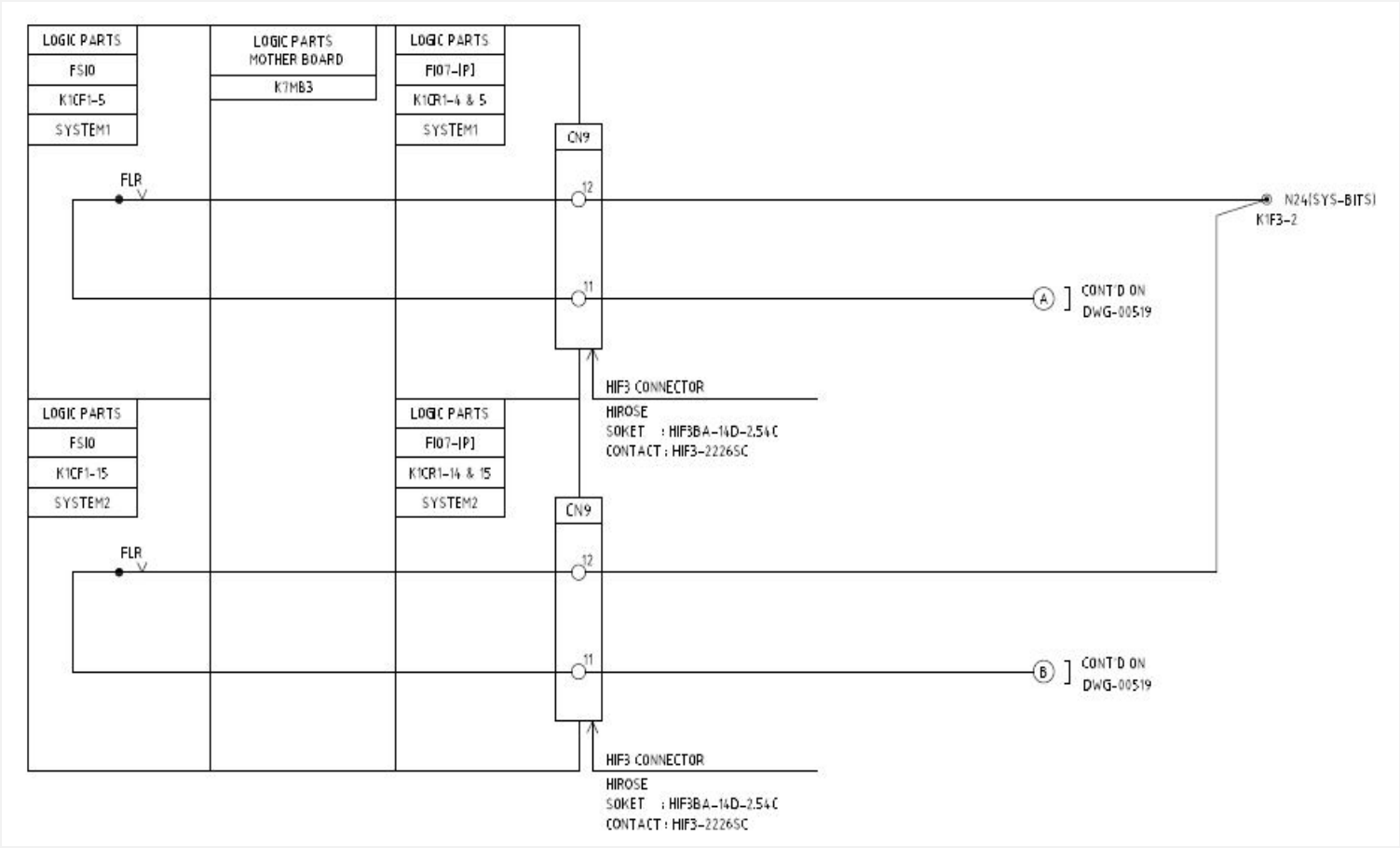
- **Maintenance embedded PC power supply shall be taken from the B24 (EXT) via 24VSurge protector.**
- **110VAC to be taken from IPS for MTC & OPC monitor supply.**

Maintenance PC power supply



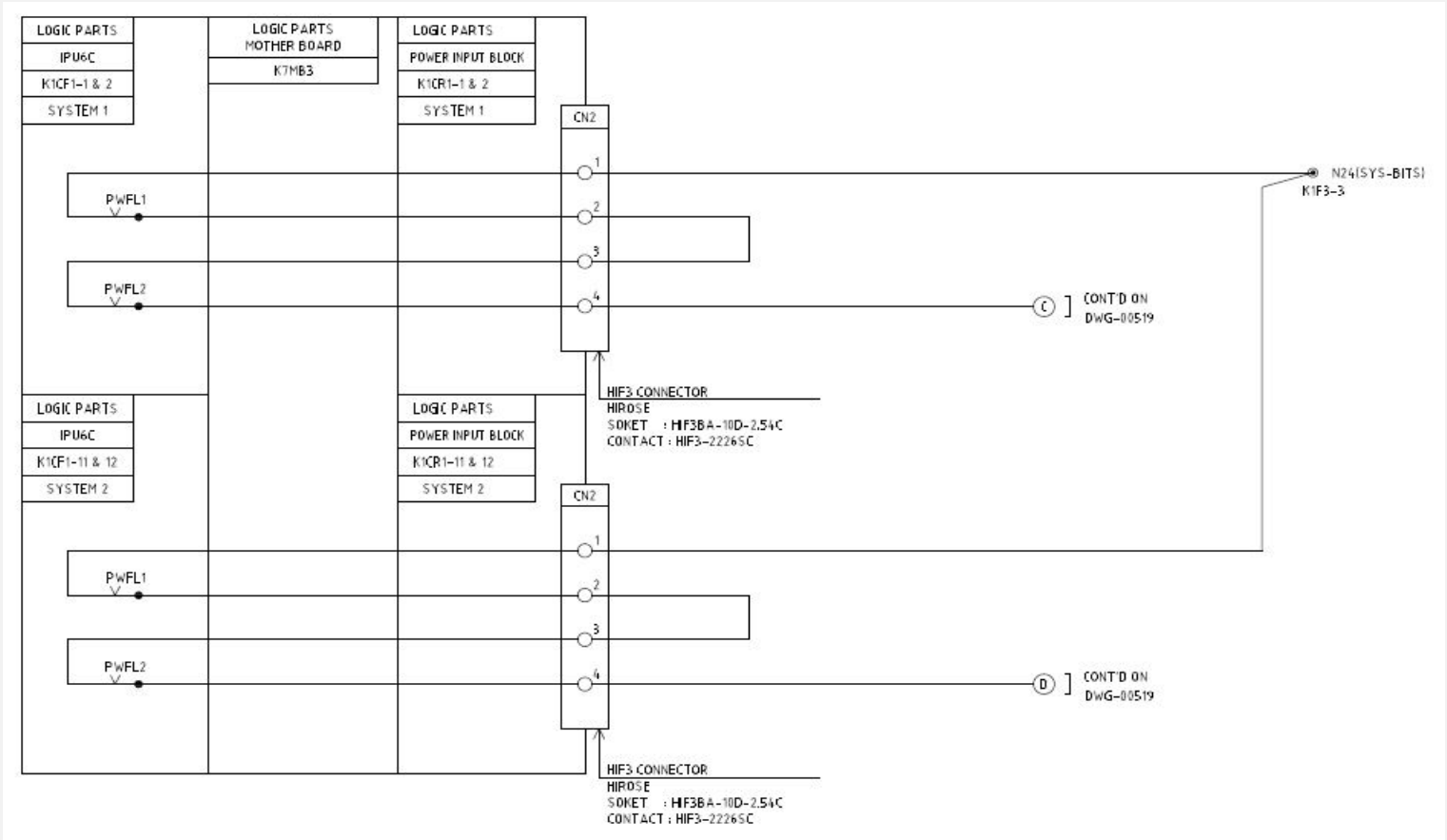
FSIO Input Output circuits

- **System Bits Negative supply to be given to FIO7- [P] of S1 & S2 in CN9 connector pin number 12 for healthy status bits (FSC1FLR, FSC2FLR) of FSIO boards.**



FSIO Input Output circuits

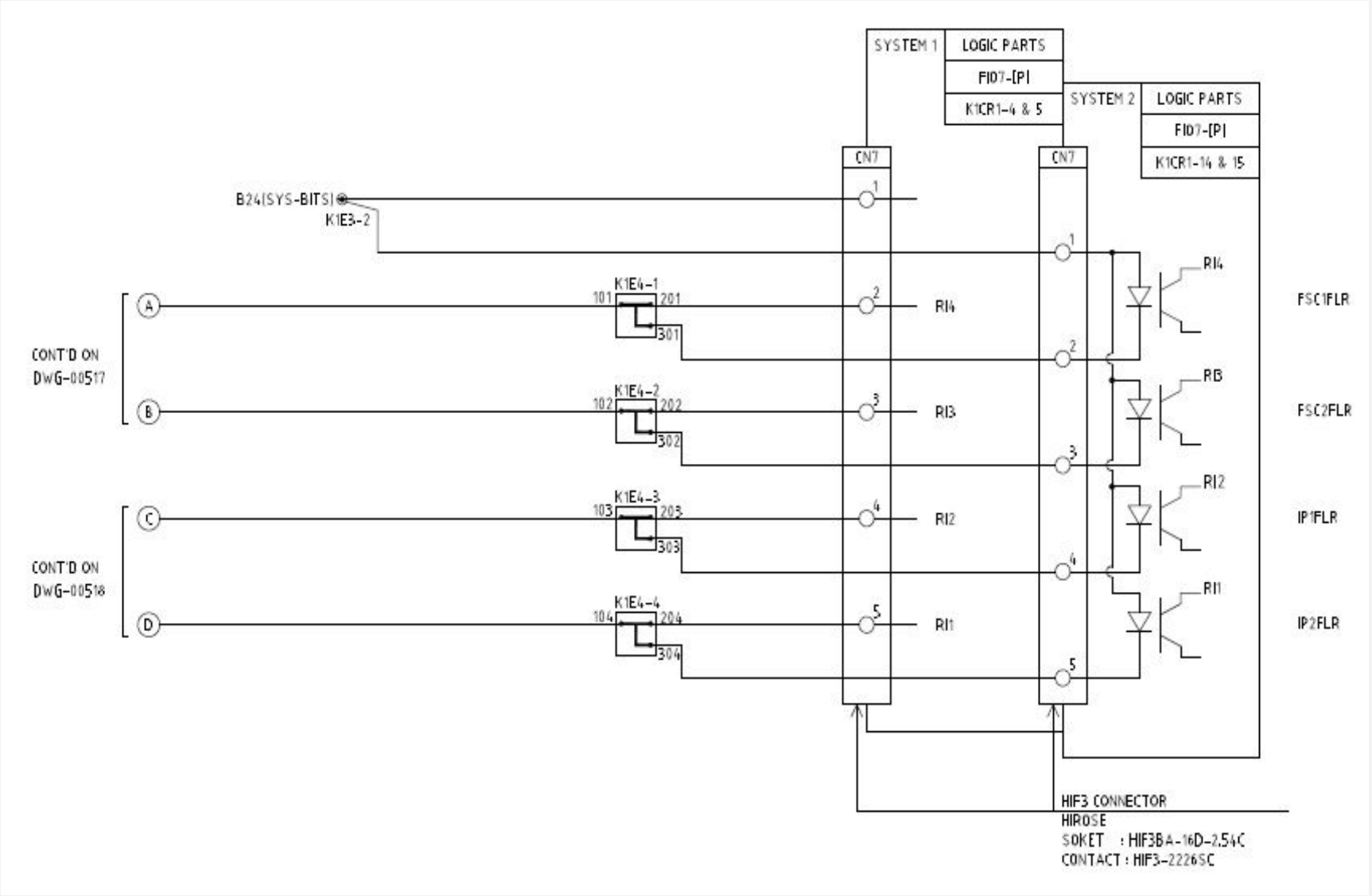
- **System Bits Negative supply to be given to IPU6C of S1 & S2 in CN2 connector pin number 1 for healthy status bits (IP1FLR, IP2FLR) of IPU6C boards.**



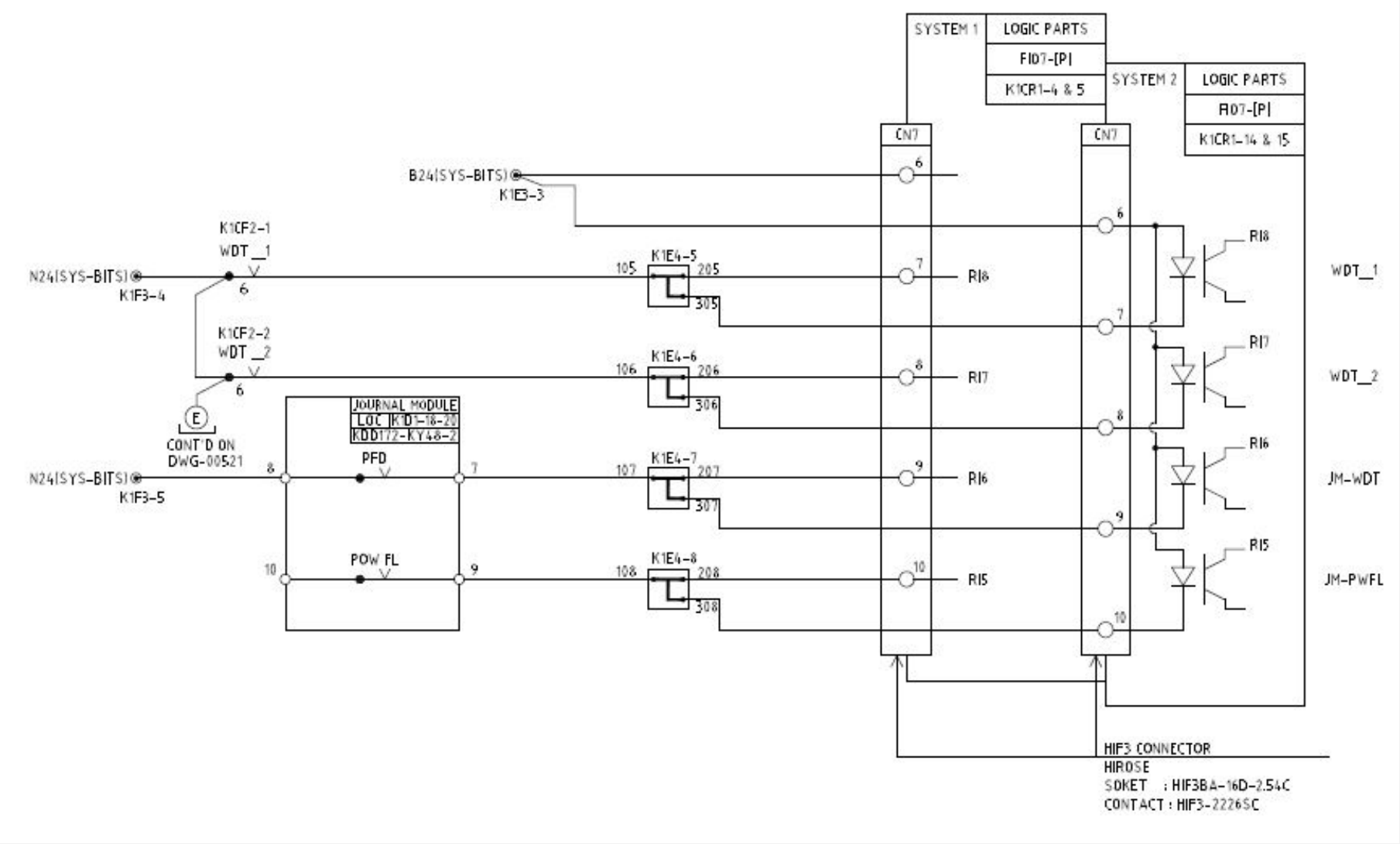
FSIO Input Output circuits

- JM-WDT & JM-PWFL inputs to be taken from 7,8 and 9,10 pins respectively from KDD board in journal module sub rack.
- Front contact of WDTR relays also to be read in FSIO input.
- FSC1FLR, FSC2FLR, IP1FLR, IP2FLR, JM-WDT, JM-PWFL, WDTR1, WDTR2 bits to be given as input in CN7 of FSIO board.
- Twin terminal is used to read the FSIO inputs for system 1 and system 2.
- System bits positive supply to be given in CN7 pin number7 of FSIO board.

FSIO Input Output circuits

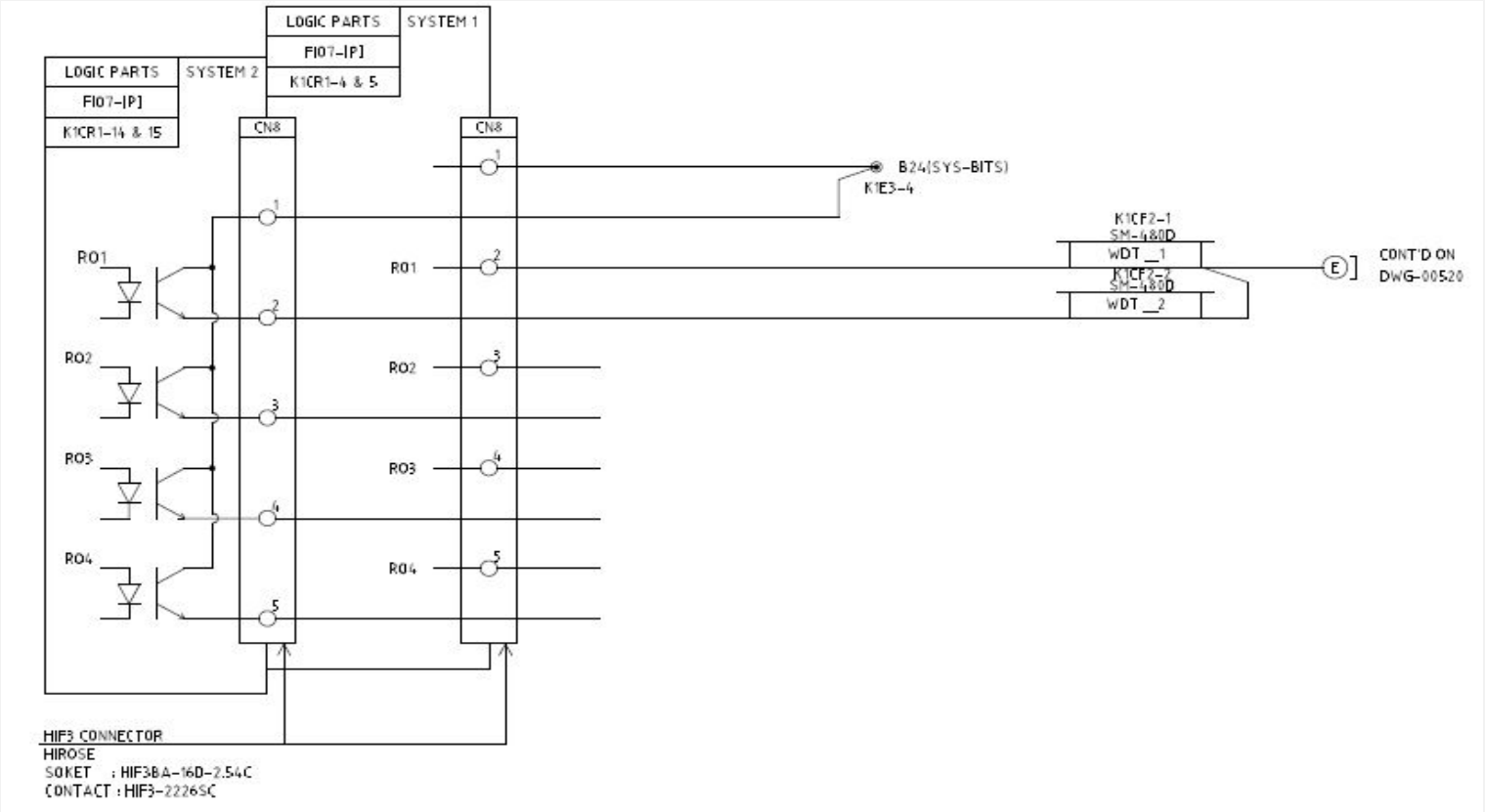


FSIO Input Output circuits



FSIO Input Output circuits

- **WDTR1 and WDTR2 outputs will be delivered from CN8 pin number2 of FSIO board.**
- **System bits positive supply to be given in CN8 pin number 1.**

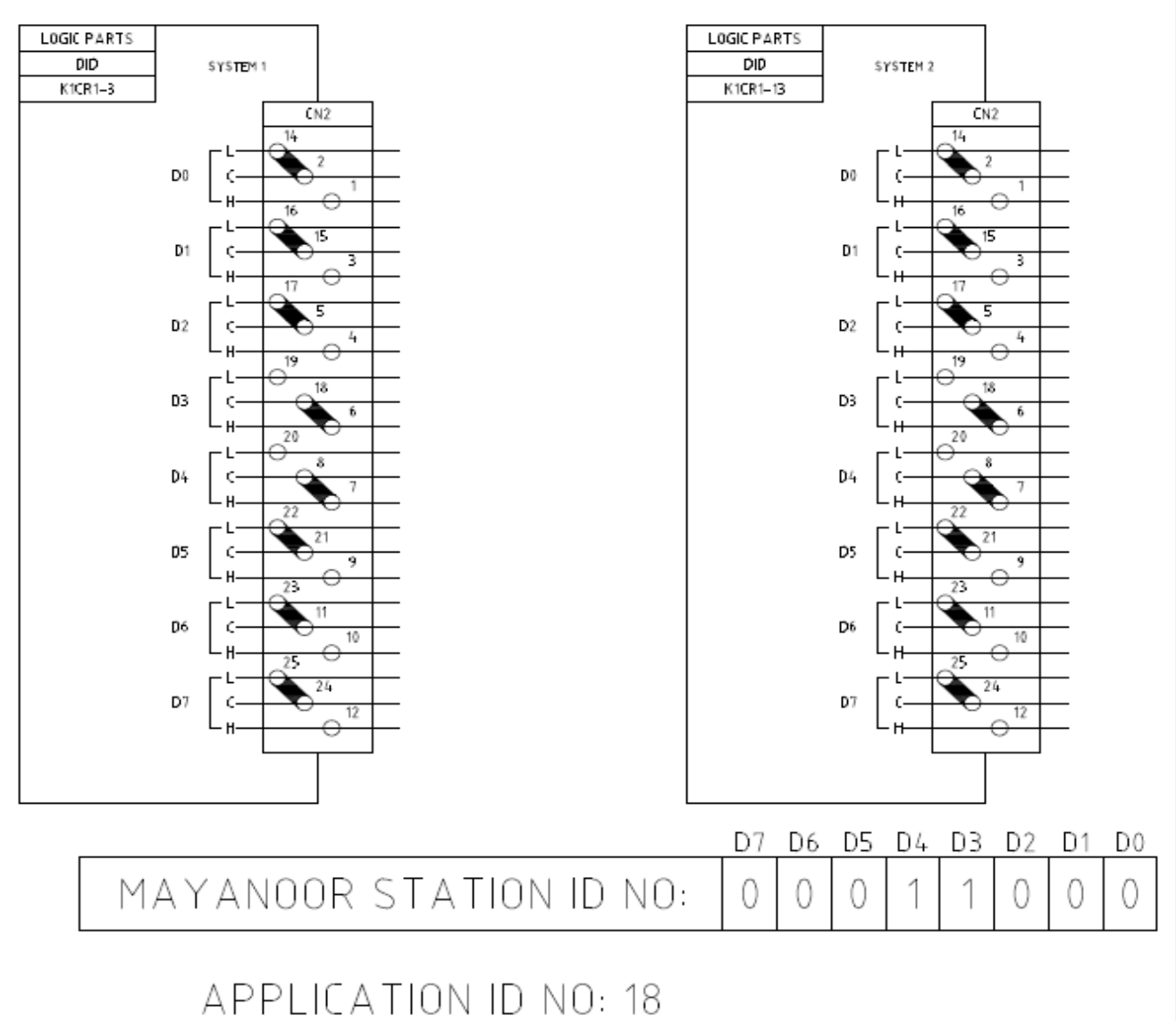


FSIO Input Output circuits

DID circuit

- Station ID is an unique number.
- Each station is having different station ID.
- It has 8 switches for various setting. Each switch has three pins. Low. High & Center.
- If Low and Center pins are wired, System will take a 0.
- If High and Center pins are wired, System will take a 1.
- This station ID should match with the ID given in application logic.

DID circuit


LOGIC PARTS
DID
K1CR1-3
SYSTEM 1
CN2
D0
D1
D2
D3
D4
D5
D6
D7
LOGIC PARTS
DID
K1CR1-13
SYSTEM 2
CN2
D7 D6 D5 D4 D3 D2 D1 D0
MAYANOOR STATION ID NO: 0 0 0 1 1 0 0 0
APPLICATION ID NO: 18

Fuse and Terminal Chart

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
B24(EXT-W)	R1C4	1	T	#78	B24 EXTERNAL WEST SUPPLY	00525
		2	T	#78	B24 EXTERNAL WEST SUPPLY	00525
		3	2	#75	POINT CIRCUIT - 65	00303
		4	2	#75	SPARE	---
B24(EXT-W)	R1C4	5	2	#75	SPARE	---

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
N24(EXT-W)	R1D4	1	T	#78	N24 EXTERNAL WEST SUPPLY	00525
		2	T	#78	N24 EXTERNAL WEST SUPPLY	00525
		3	T	#77	POINT CIRCUIT - 65	00303
		4	T	#77	SPARE	---
N24(EXT-W)	R1D4	5	T	#77	SPARE	---

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
B24(EXT-CH)	R1C5	1	T	#78	B24 EXTERNAL SUPPLY	00526
		2	T	#78	B24 EXTERNAL SUPPLY	00526
		3	2	#75	TO CRANK HANDLE CIRCUIT-CH1	00425
		4	2	#75	TO CRANK HANDLE CIRCUIT-CH2	00426
		5	2	#75	SPARE	---
		6	2	#75	SPARE	---
B24(EXT-CH)	R1C5	7	T	#77	DATA LOGGER ANALOG INPUT	00530

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
N24(EXT-E)	R1D5	1	T	#78	N24 EXTERNAL SUPPLY	00526
		2	T	#78	N24 EXTERNAL SUPPLY	00526
		3	T	#77	TO CRANK HANDLE CIRCUIT-CH1	00425
		4	T	#77	TO CRANK HANDLE CIRCUIT-CH2	00426
		5	T	#77	SPARE	---
		6	T	#77	SPARE	---
N24(EXT-E)	R1D5	7	T	#77	DATA LOGGER ANALOG INPUT	00530

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
B24(EXT-MISC)	R1C6	1	T	#78	B24 EXTERNAL SUPPLY	00526
		2	2	#75	TO COUNTER CIRCUIT	00465
		3	2	#75	TO EMR.CHR.CR CIRCUIT	00454
		4	2	#75	TO FCOPR CIRCUIT	00454
		5	2	#75	TO FCOR.ACK CIRCUIT	00455
		6	2	#75	MAINTENANCE PC SUPPLY	00544
B24(EXT-MISC)	R1C6	7	2	#75	SPARE	---

BUSBAR	ROW	TERMINAL	FUSE/LINK	TYPE	FUNCTION	SHEET NO.
N24(EXT-MISC)	R1D6	1	T	#78	N24 EXTERNAL SUPPLY	00526
		2	T	#77	TO COUNTER CIRCUIT	00465
		3	T	#77	TO EMR.CHR.CR CIRCUIT	00454
		4	T	#77	TO FCOPR CIRCUIT	00454
		5	T	#77	TO FCOR.ACK CIRCUIT	00455
		6	T	#77	MAINTENANCE PC SUPPLY	00544
N24(EXT-MISC)	R1D6	7	T	#77	SPARE	---

Contact Analysis

RELAY				COILS			CONTACTS																																													
TITLE	STYLE		POSITION				A1		A2	A3		A4	A5		A6	A7		A8	B1		B2	B3		B4	B5		B6	B7		B8	C1		C2	C3		C4	C5		C6	C7		C8	D1		D2	D3		D4	D5		D6	D7		D8
	TYPE	CONTACTS CONFIG.		R1		R2	F		A	F		A	A		B	A		B	F		A	F		A	A		B	A		B	F		A	F		A	A		B	A		B	F		A	F		A	A		B	A		B
				W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W	W	SH	W
8.TPR	QNA1	8F-8B	R2J1	1	00402	1	1	00117	2										1	00552	2																																	
25.TPR	QNA1	8F-8B	R2J2	1	00402	1	1	00117	2										1	00552	2																																	
C32.TPR	QNA1	8F-8B	R2J4	1	00403	1	1	00117	2										1	00552	2																																	
32.TPR	QNA1	8F-8B	R2J5	1	00403	1	1	00117	2										1	00552	2																																	
50A.TPR	QNA1	8F-8B	R2J7	1	00403	1	1	00118	2										1	00552	2																																	
50B.TPR	QNA1	8F-8B	R2J8	1	00403	1	1	00118	2										1	00552	2																																	
65A.TPR	QNA1	8F-8B	R2J10	1	00404	1	1	00118	2										1	00552	2																																	
65B.TPR	QNA1	8F-8B	R2J11	1	00404	1	1	00118	2										1	00552	2																																	
47.LCPR	QNA1	8F-8B	R2J14	1	00451	1	1	00118	2										1	00552	2																																	
1.CHR	QNA1	8F-8B	R2J16	2	00425	1	1	00118	2										1	00425	1										1	00552	2																					
2.CHR	QNA1	8F-8B	R2J17	2	00426	1	1	00119	2										1	00426	1										1	00552	2																					

Detailed MMIF Circuit

Detailed MMIF circuit design having the following contents.

- **Index**
- **Symbols**
- **Input / Output board circuit**
- **Power Distribution circuit**

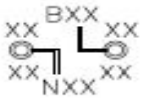
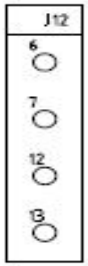
Index and Sheet number allotment

- **Following two tables to be used for sheet number allotment to maintain similar sheet number in all detailed interface circuits.**

MMIF Detailed Interface Circuits	
Drawing Number	Drawing Name
1500	Cover Sheet
1501- 1510	Index
1511- 1520	Symbols
1521- 1540	General Circuits
1541-1544	System Configuration
1545-1555	MMIF2 Bit chart
1601-1800	MMIF2 Input / Output Board Circuits
1801-1850	Power Distribution Circuits
1851-1900	Fuse and Terminal Analysis
1900- 2000	Panel Terminal chart

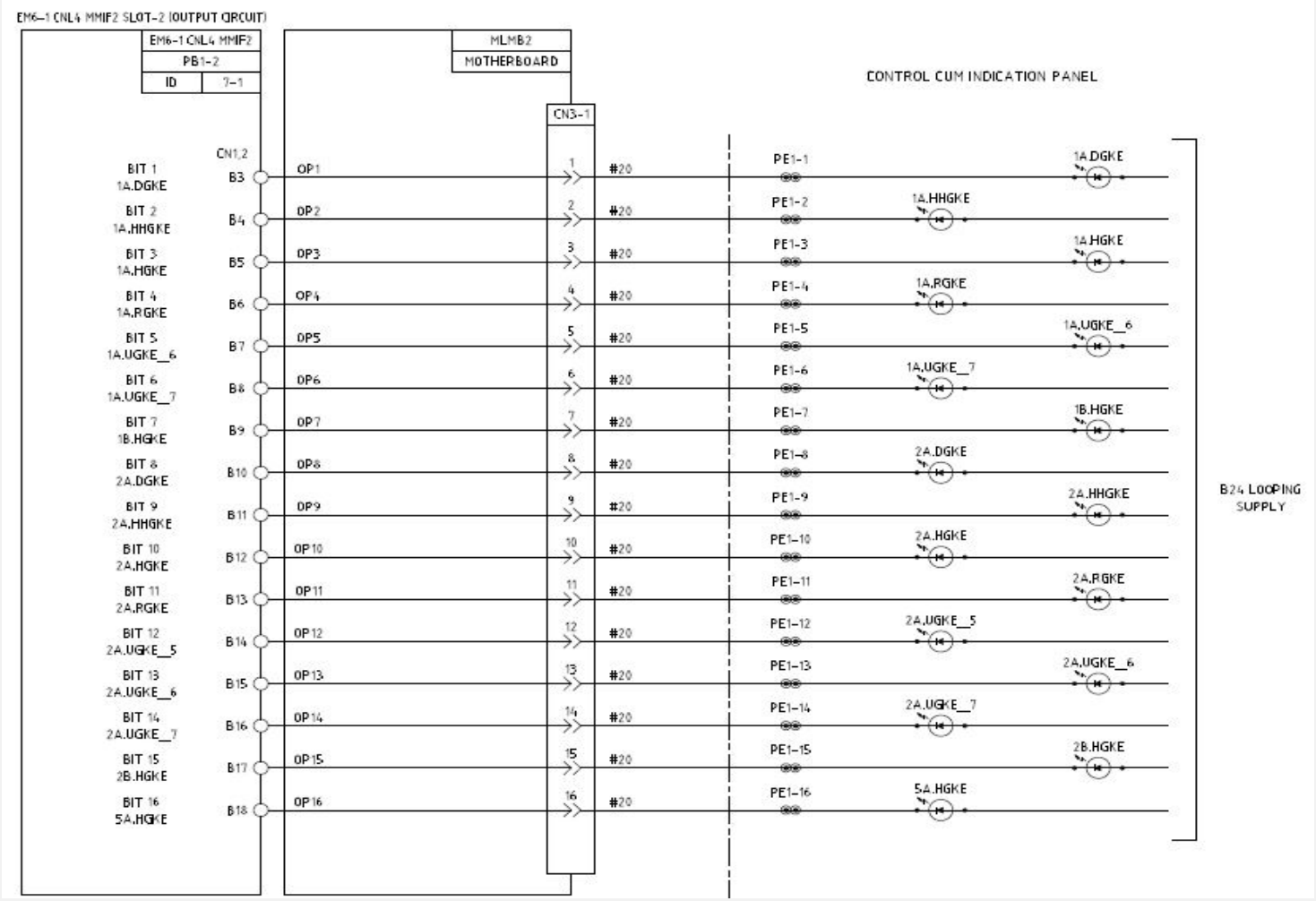
Symbols

SYMBOLS	DESCRIPTION
	FUSE TERMINAL WITH INDICATION 24V DC WAGO FUSE PART NO.281-611/281-541
	NON-DISCONNECT TERMINAL 2.5 Sq mm WAGO TERMINAL PART NO.280-901
	NON-DISCONNECT TERMINAL 16 Sq mm WAGO TERMINAL PART NO.283-901
	TERMINAL END
	HRC FUSE
	PUSH BUTTON
	LED
BZ	BUZZER
	BUS BAR
	KNOB
	KEY
	FC TYPE(GI FIBER)
	HITACHI ACTIVE CONNECTOR (HAC-105);UNMOUNTED.
	MODULAR JACK (CROSS CABLE)

SYMBOLS	DESCRIPTION
	DC-DC CONVERTER
	SURGE SUPPRESSOR
	TWISTED PAIR WIRE
	BOARD INPUT SUPPLY
	CONNECTOR

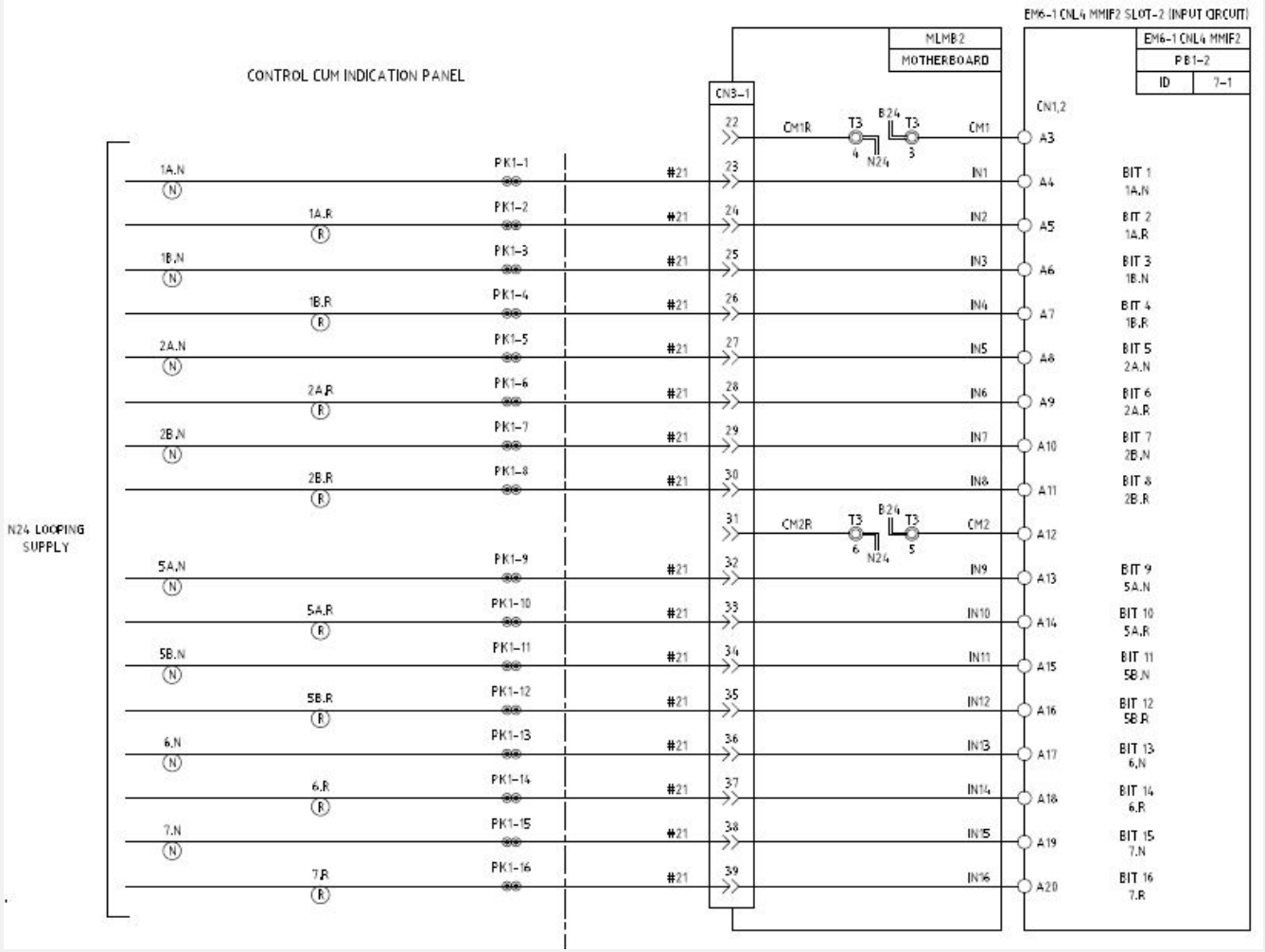
MMIF2 Output Board Circuit

- **Positive 24V DC will be looped in the panel for non-vital outputs and negative 24 V DC will delivered by the system.**



MMIF2 Input Board Circuit

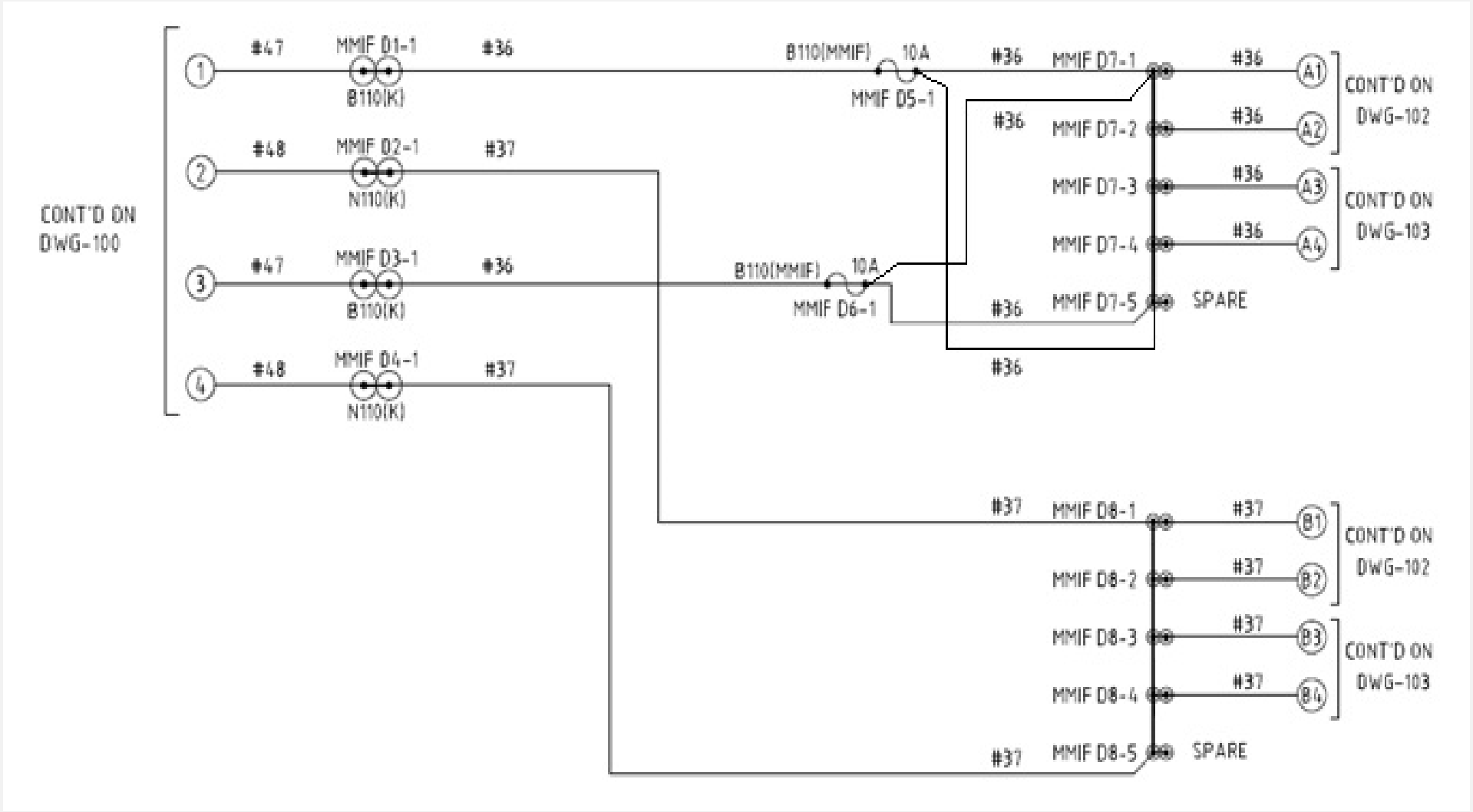
- **Negative 24 V DC will be looped in the panel & Positive 24V DC will be looped inside the board.**



Power Distribution

- As per the RDSO requirement 110V supply with redundant Supply and redundant path shall be taken from IPS.
- Surge Suppressor to be provided for each supply between IPS and Power Distribution Box (PDB) at SM Room to arrest the surges.
- As per the system requirement 24V DC needed. DC-DC converters are used to convert 110V DC to 24V DC.

Power Distribution



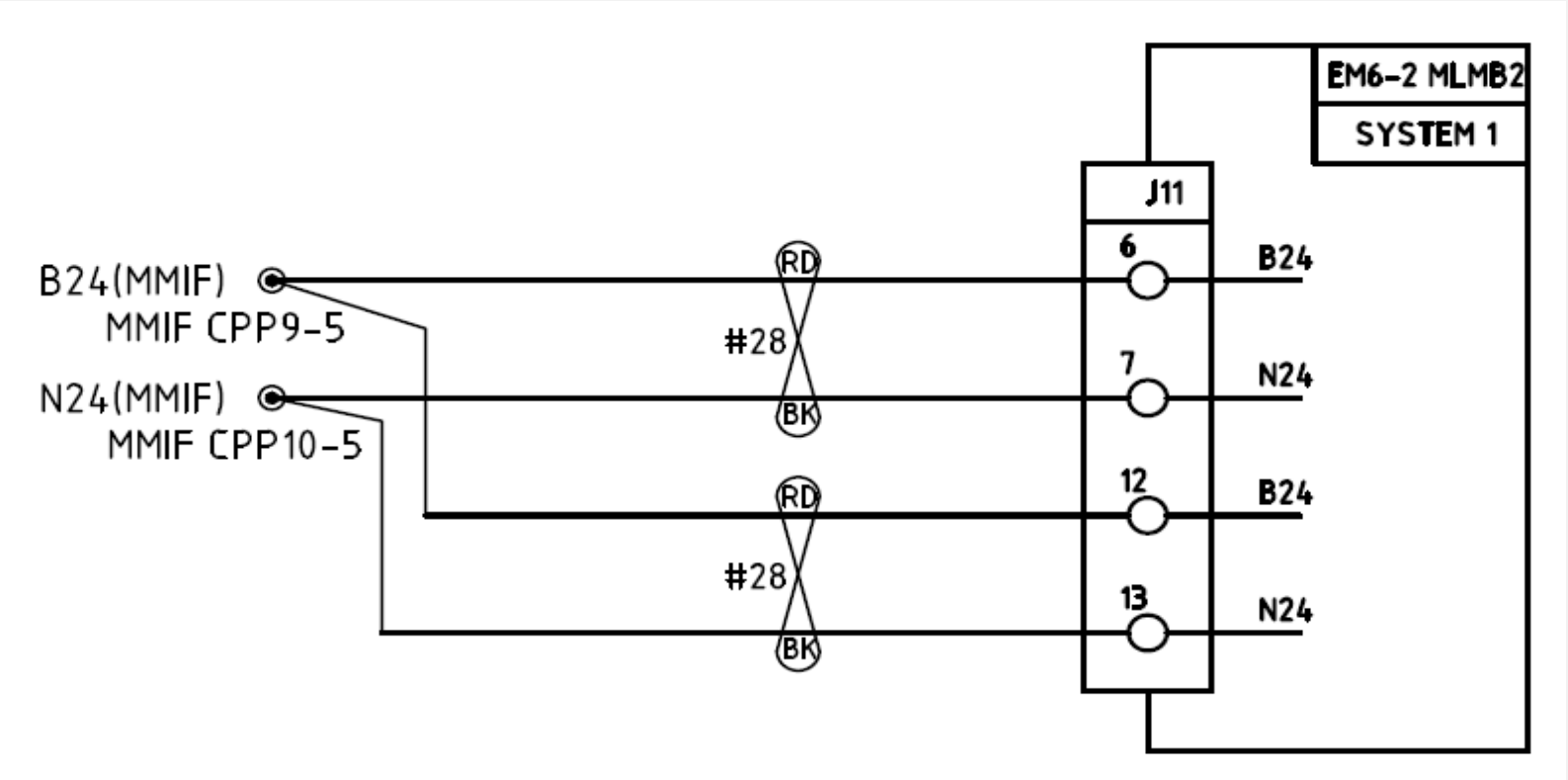
DC-DC Converter Calculation

- **24V Gallent make 10 A DC-DC converter is used for power distribution purpose.**
- **Converters shall be calculated as n+1 configuration.**
- **Load to be sharing to be done between DC-DC converters.**

EI equipments	Voltage (V)	Current(A)	Number of units	Power(VA)
E-M6 Sub Rack Supply	24	2.5	2	120
OPC VDU Supply	24	2	1	48
Total load at output of DC-DC Converter				864
Total load at input of DC-DC Converter(110V DC)				**960**
Monitor 42" Supply	110	3	1	330
Monitor 32" Supply	110	3	1	330
110V AC load for Monitor				**660**

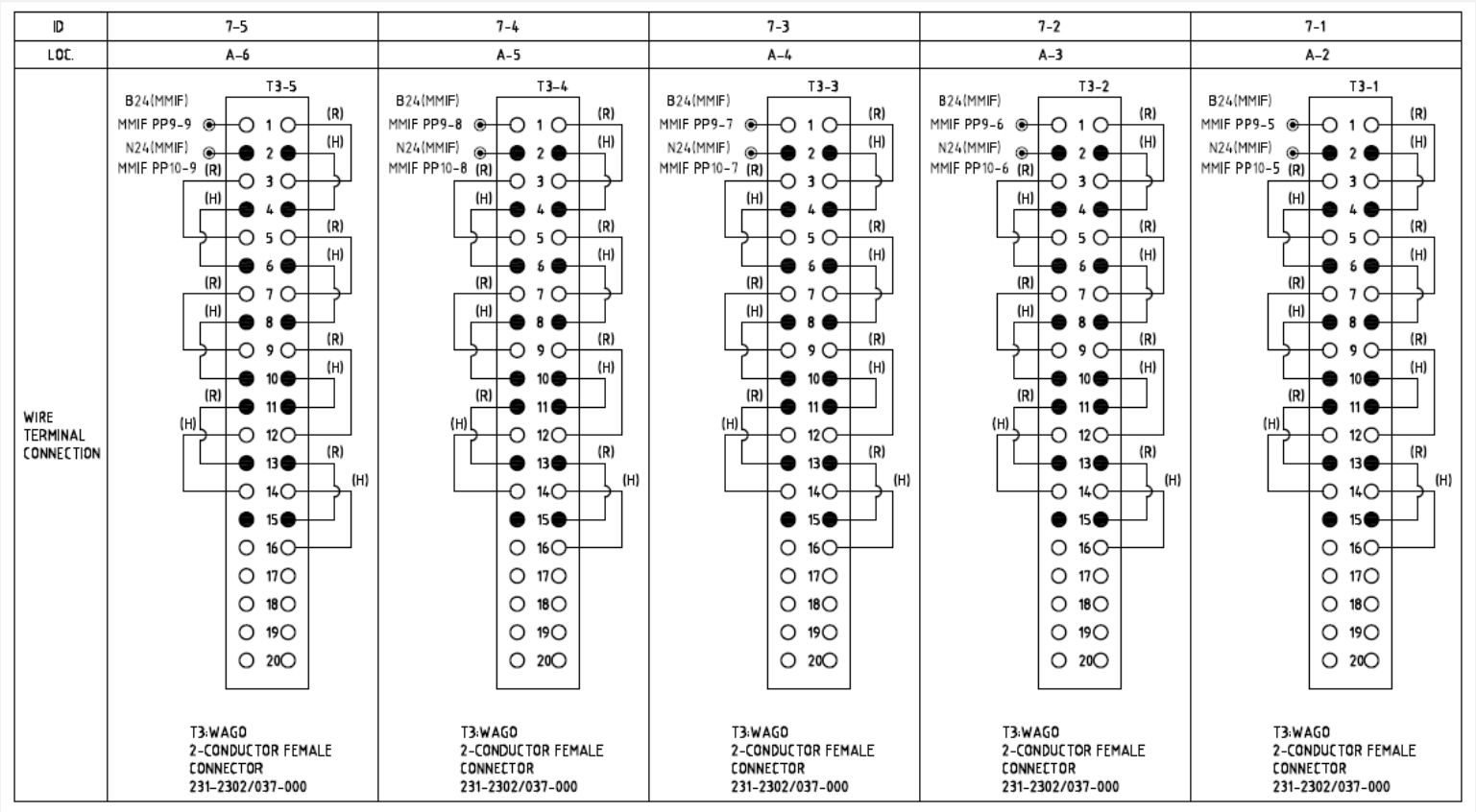
LINEM2 Board Supply

- **24V DC supply to be given in J11 connector pin number 6 & 12. Negative supply to be given in pin number 7 & 13.**

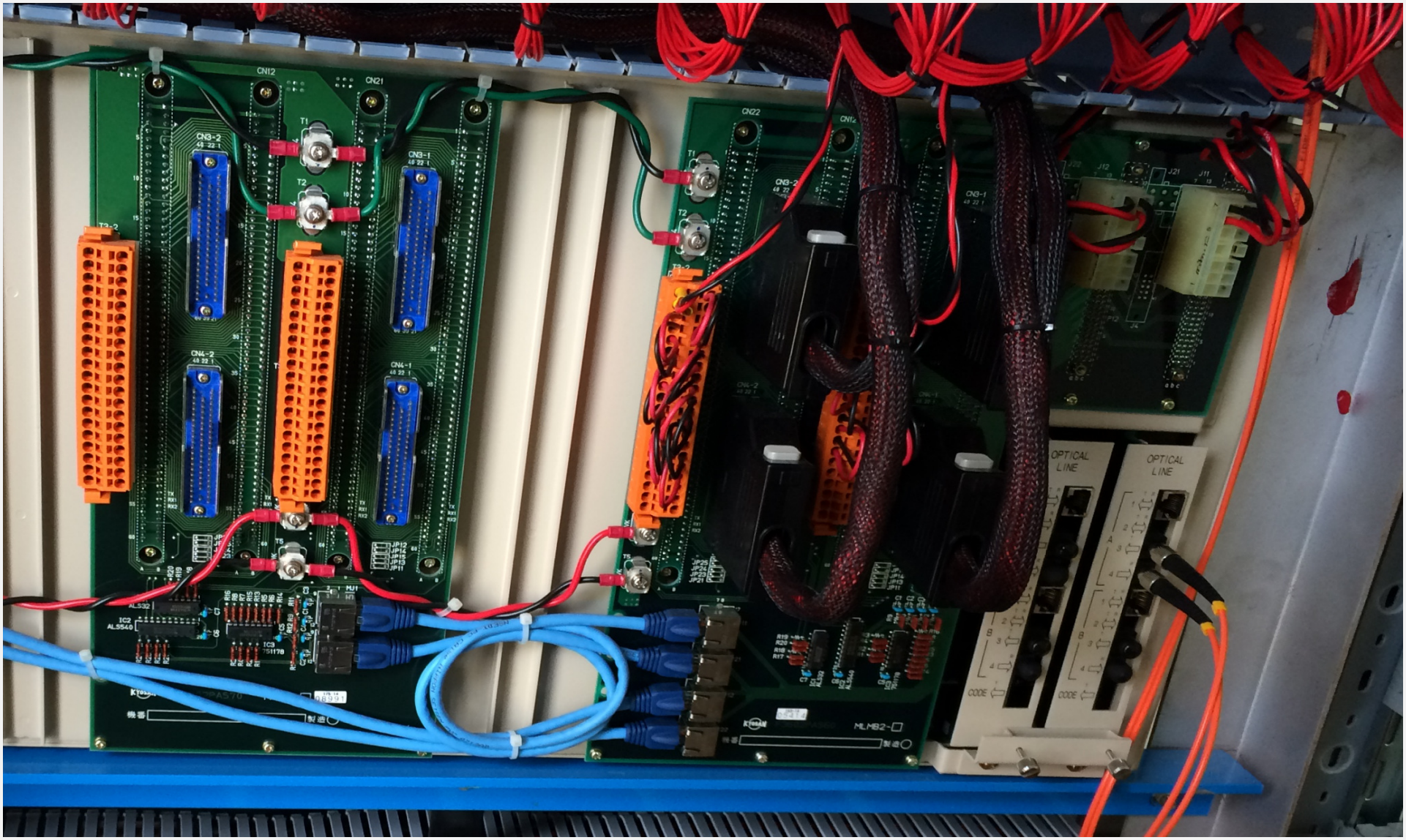


MMIF2 Board Supply

- **Positive supply to be given connector CN1 and negative supply to be given connector CN2.**
- **Individual 24 VDC to be given for Individual MMIF2 boards.**



LINEM2 Board Supply



CRIMPING TOOL DETAILS FOR INTERFACE WIRING

Sl.No	Connection details	Connector	Crimping Tool	Extraction tool	MAKE
1	Line 2B Power (J1)	Mic (17P White),171354-1	91584-1	723735-1	Tyco
2	ET PIO2 Power supply(J3)	Mic (5P White),172026-1			
	Line 2B Power (J2)	Mic (9P White),171892-1	91587-1	723735-1	Tyco
3	IPU6C Power	Souriau (SMS6P1)	M10S-1J(tool)S-3D1(dice)SL-39(Stop bushing)(SOURIAU BURNDY)	RX20-25V2J	Souriau
5	ET Input wiring	Sumicon (HIROSE),SC-1660	TC1600-111	TC-1600-21	Hirose
6	ET Output Wiring				
7	FIO7P Input reading	HIROSE Connector - HIF3BA-14D-2.54C	HIF3-T2226HC	HIF1-PO	Hirose
8	IPU6C Input reading	HIROSE Connector - HIF3BA-10D-2.54C			
9	FIO7 P Input Board	HIROSE Connector - HIF3BA-16D-2.54C			
10	FIO7 P OUTPUT Board	HIROSE Connector - HIF3BA-16D-2.54C			

CRIMPING TOOL DETAILS FOR INTERFACE WIRING

Sl.No	Connection details	Connector	Crimping Tool	Extraction tool	MAKE
11	SPHC-PW	Commercial MATE-N-LOK Connector, 1-480424-0	91512-1	465644-1	km
12	I/O Termination	Souriau,(MB52R-L120)	M10S-1J(tool)S-10(dice)SL-40(Stop bushing)(SOURIAU BURNDY)	RX20-25V2J	Souriau
13	I/O Termination	Souriau,(MB52R-L110)			Souriau
15	MMIF Line 2B power	171883-1 1 3C	91584-1	723735-1	Tyco
16	MMIF Input wiring	Sumicon (HIROSE),SC-1660	TC1600-111	TC-1600-21	Hirose
17	MMIF Output Wiring				