

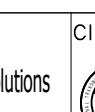


**Grid Solutions**  
A GE and Alstom joint venture

# 220kV/132kV GIS SUBSTATION GHAZI ROAD , LAHORE

## 220kV TRANSFORMER RELAY SET-1 PANEL (=D03+R3) SCHEMATIC DRAWINGS

REFERENCE DRAWINGS								
SR. NO.	DRAWING TITLE			DOCUMENT NO.				
1.	220kV / 132kV Metering & Protection SLD			P60194-E-SLMP-001				
2.	220kV GIS LCC Schematic Drawings			P60194-E-GISS-001				
REV	DATE	DRW. BY	CHK. BY	APR. BY	REVISION DESCRIPTION			
0	22.11.2018	ASJ	MFT	NAH	AS BUILT			
Scale			Sheet size		A3			
NOT-TO-SCALE								
Client		NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)						
Contractor			Manufacturer					
			 <b>EPESOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan					
Project								
220kV / 132kV GIS SUBSTATION GHAZI ROAD , LAHORE								
Title								
220kV TRANSFORMER RELAY SET-1 PANEL (=D03+R3) SCHEMATIC DRAWINGS								
Order no			Document no					
P-60194			P60194-E-DTR-SC-003					
Sheet type		Total sheets		Sheet no				
A		48		01				

	1	2	3	4	5	6	7	8								
	PAGE NO.	SHEET NAME	SHEET DESCRIPTION			ISSUE / REVISION										
						A	B	C	D	E	F	01	02	03	04	05
A	01	A	Cover Sheet			X	X	X	X	X	X					
	02	AA	List Of Contents			X	X	X	X	X	X					
	03	AB	Symbols and Legends			X	X	X	X	X	X					
	04	AC	Component List			X	X	X	X	X	X					
	04A	AC	Component List			X	X	X	X	X	X					
	05	AD	Panel View			X	X	X	X	X	X					
	06	AE	Bay Concept & Protection Logics			X	X	X	X	X	X					
B	07	D	AC Supply Distribution Circuit			X	X	X	X	X	X					
	08	E	DC Supply Distribution Circuit			X	X	X	X	X	X					
	09	F	AC/DC Supply Failure Circuits			X	X	X	X	X	X					
	10,11	G1,G2	Relay Control & Supply Circuits			X	X	X	X	X	X					
	12	H1	Differential Relay Protection CT Circuit			X	X	X	X	X	X					
	13	H2	REF Protection CT Input Circuit			X	X	X	X	X	X					
	14	H3	Thermal Overload Relay CT Input Circuit			X	X	X	X	X	X					
C	15	H4	Over Excitation Relay VT Inputs			X	X	X	X	X	X					
	16	H5	HV OCP/EFP Relay CT Inputs			X	X	X	X	X	X					
	17	H6	LV OCP/EFP Relay CT Inputs			X	X	X	X	X	X					
	18,19,20	K1, K2, K3	Protection Trips Circuit			X	X	X	X	X	X					
	21,22,23	K11, K12, K13	Trip Circuit for Coil-1			X	X	X	X	X	X					
	24,25,26	K21, K22, K23	Trip Circuit for Coil-2			X	X	X	X	X	X					
	27,28	K31, K32	Trip Circuit for 132kV Breaker Coil-1			X	X	X	X	X	X					
D	29,30	K41, K42	Trip Circuit for 132kV Breaker Coil-2			X	X	X	X	X	X					
	31,32	NA1, NA2	System Alarm Circuits			X	X	X	X	X	X					
	33,34	O1, O2	Reset Circuit For Tripping Relays			X	X	X	X	X	X					
	35,36,37,38	PA1, PA2, PA3, PA4, PA5	Protection Inter-Circuits			X	X	X	X	X	X					
	39	RA1	CP Annunciation Circuit			X	X	X	X	X	X					
	40	RA2	Event Recorder Circuit			X	X	X	X	X	X					
	41	RA3	SCADA Circuit			X	X	X	X	X	X					
E	42	RA4	Fault Recorder Circuit			X	X	X	X	X	X					
	43,44,45,46,47	Z1, Z2, Z3, Z4, Z5	Component Diagram			X	X	X	X	X	X					
	0	AS BUILT	22.11.2018	ASJ	Manufacturer  <b>EPESOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  <b>Grid Solutions</b> A GE and Alstom joint venture	Client  <b>NATIONAL TRANSMISSION &amp; DISPATCH COMPANY LIMITED (NTDC-WAPDA)</b>	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE			Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) LIST OF CONTENTS			Drawing no. P60194-E-DTR-SC-003		
	REV.	DESCRIPTION	DATE	DRAWER												

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	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
A		CIRCUIT BREAKER		MINIATURE CIRCUIT BREAKER		AUXILIARY CONTACTOR NO+NC	21	DISTANCE
B		SWITCH/ISOLATOR		KEY OPERATED SELECTOR SWITCH		AMMETER	24	OVEREXCITATION
C		EARTHING		LIMITED SWITCH		VOLTMETER	25	SYNCHROCHECK
D		SF6 TO AIR BUSHING		HUMIDITY & TEMPERATURE CONTROLLER		POWER FACTOR METER	49	THERMAL OVERLOAD
E		LINE TRAP		PANEL HEATER		DIGITAL PANEL METER	50/51	PHASE INST./OVERCURRENT
F		SURGE ARRESTOR		THREE PIN SOCKET		ACTIVE POWER METER	50N/51N	EARTH INST./OVERCURRENT
G		CURRENT TRANSFORMER		INDICATION LIGHT		REACTIVE POWER METER	50BF	CIRCUIT BREAKER FAILURE
H		COUPLING CAPACITOR VOLTAGE TRANSFORMER		PUSH BUTTON		ENERGY METER	64	RESTRICTED EARTH FAULT
I		POWER TRANSFORMER		AUXILIARY CONTACTOR COIL			67N	DIRECTIONAL EARTH FAULT
J		AUTO TRANSFORMER		POWER SUPPLY AC/DC			68	POWER SWING BLOCKING
K				TERMINAL			24	OVER EXCITATION
L				OPTO CONTACTS			79	AUTO-RECLOSING
M				RELAY CONTACTS			49	THERMAL OVERLOAD
N				HOOTER			87T	TRAFO DIFFERENTIAL
O				AC BELL			87C	DIFFERENTIAL CONNECTION
P							87BB	DIFFERENTIAL BUSBAR

0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) SYMBOLA AND LEGENDS	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type AB
									Sheet no. 03

	1	2	3	4	5	6	7	8	
	QTY.	DEVICE DESCRIPTION	DEVICE SPECIFICATIONS DEVICE TYPE ; TECHNICAL DATA / SPECIFICATIONS			DEVICE DESIGNITION	MANUFACTURER		
A	01	TRANSFORMER DIFFERENTIAL PROTECTION RELAY		AGILE P643, Cortec: P64391BA6M0060M Supply: 110-250VDC / 100-240VAC, 12 CT + 1 VT (Vn=100-120V),(In=1/5A) Inputs 16 Opto Inputs, 16 Relay Outputs			-F87T1		
	01	OVER EXCITATION PROTECTION RELAY		AGILE P642, Cortec: P64291BA6M0060P Supply: 110-250VDC / 100-240VAC, 1 VT + 8 CT (Vn=100-120V),(In=1/5A) Inputs 8 Opto Inputs, 8 Relay Outputs			-F24		
	04	OVERCURRENT EARTHFAULT RELAY		AGILE P14N, Cortec: P14N-B16A7C0570A Supply: 24-250VDC / 110-240VAC, 4 CT (In=1/5A) Inputs 8 Opto Inputs, 8 Relay Outputs			-F49, -F51HV, -F51LV, F87REF		
B	06	TEST BLOCK		MMLG01, Cortec: MMLG01-R1AA9002D			-XT87T1, -XT87REF, -XT49, -XT24, -XT51HV, -XT51LV,		
	20	TRIPPING RELAY (HAND/ELECTRICAL RESET)		MVAJ105, Cortec: MVAJ105-RA1002A Supply: 220-250VDC, 8 NO + 2 NC Contacts			-F86-1 TO -F86-20		
	02	CONTROL MCB - PANEL LIGHT & HEATER		G62C02+(CAH2),2-Pole, Ratings: 2A, 230VAC, 6kA @ 230VAC, 2 C/O Contacts			-F101-102		
C	01	CONTROL ELCB - PANEL SOCKET		DM100C216/030+(CAH2),2-Pole, Ratings: 16A, 30mA, 230VAC, 2 C/O Contacts			-F103		
	04	CONTROL MCB - DC DISTRIBUTION		EP102UCC04+(CAH2),2-Pole, Ratings: 4A, 220VDC, 10kA, 2 C/O Contacts			-F201 ~ - F204		
	01	PUSHBUTTON - DIRECT TRANSFER TRIP RESET		YS-AP1-2-40-B-D-W, Black button, Spring return, 2-Pole, Ratings: 12A, 220VDC			-S86		
D	01	AUXILIARY CONTACTOR		MCRC022ATWN-B+MARN211AT, Coil Voltage: 220VDC, 3NO+3NC Contacts			-KCS		
	22	AUXILIARY CONTACTOR		PRC4M40DCML, Coil Voltage: 220VDC, 4 C/O Contacts			-KDCM,-KAC,-KDC1,-KDC2,-K49A,-K24A,K87T,-K87REFT,-K49T -K24T,-K51HVT,-K51LVT,-KOTHVT,-KOTLVT,-KWTHVT,KWTLVT -K87F,-K87REFF,-K49F,-K24F,-K51HVF,-K51LVF		
	02	AUXILIARY CONTACTOR		PRC4M40ANL, Coil Voltage: 230VAC, 4 C/O Contacts			-KACM, -KDC		
E	01	INDICATION LAMP - DC SUPPLY FAILURE		YS-PL-2-AL-22-R-W, Type: Integrated LED , Color : RED , Supply : 230VAC @ 50Hz			-H200		
	01	PANEL LIGHT WITH DOOR SWITCH		YST8-30-5W+YSP3315GWB, 230VAC @ 50Hz, 20W, with Door Limit Sw. 1 CO contact			-H100, -S100		
	01	THREE PIN SOCKET		1N+PE, 16A, 230VAC @ 50Hz			-X100		
F	01	PANEL HEATER		230VAC @ 50Hz, 50W			-R100		
	01	HUMIDITY & TEMPERATURE CONTROLLER		THERMOSTAT AND HUMIDSTAT			-B100		
	01	RESISTOR		ZB9016774, (1500 Ohm)			-RS1		
F	01	METROSIL		600A/S1/S1088			-M1		
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT		Type: SCB-6			-X4		
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT		Type: SCB-6			-X5		
	03	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT		Type: SCB-6			-X6		
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT		Type: SCB-6			-X7		
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		Manufacturer		Contractor		Client		Title	
								Drawing no.	
		EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan		Grid Solutions A GE and Alstom joint venture		NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)		P60194-E-DTR-SC-003	
		REV.		DESCRIPTION		DATE		Project	
								220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	
								Title	
								220KV TRAFO RELAY SET-1 PANEL (=D03+R3) COMPONENT LIST	
								Drawing no.	
								P-60194	
								Project no.	
								Sheet type	
								AC	
								Sheet no.	
								04	

	1	2	3	4	5	6	7	8			
	QTY.	DEVICE DESCRIPTION	DEVICE SPECIFICATIONS DEVICE TYPE ; TECHNICAL DATA / SPECIFICATIONS			DEVICE DESIGNITION	MANUFACTURER				
A	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT	Type: SCB-6			-X8		CABUR			
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT	Type: SCB-6			-X9		CABUR			
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT	Type: SCB-6			-X10		CABUR			
	08	TERMINAL BLOCKS FOR CT WITH SHORTING ARRANGEMNT	Type: SCB-6			-X11		CABUR			
B	02	TERMINAL BLOCKS FOR VT	Type: SCB-6			-X01		CABUR			
	05	TERMINAL BLOCKS FOR AC SUPPLY	Type: CBD-4			-XAC		CABUR			
	04	TERMINAL BLOCKS FOR DC SUPPLY-1	Type: CBD-4			-XDC1		CABUR			
	04	TERMINAL BLOCKS FOR DC SUPPLY-2	Type: CBD-4			-XDC2		CABUR			
C	02	TERMINAL BLOCKS FOR AC FAULTY CIRCUIT	Type: CBD-4			-X12		CABUR			
	06	TERMINAL BLOCKS FOR TRANSFORMER MECH. TRIP	Type: CBD-4			-X02		CABUR			
	13	TERMINAL BLOCKS FOR 220KV CB TRIP CIRCUIT-1	Type: CBD-4			-XTCL		CABUR			
	09	TERMINAL BLOCKS FOR 220KV CB TRIP CIRCUIT-2	Type: CBD-4			-XTCL2		CABUR			
D	05	TERMINAL BLOCKS FOR 132KV CB TRIP CIRCUIT-1	Type: CBD-4			-XTCL3		CABUR			
	05	TERMINAL BLOCKS FOR 132KV CB TRIP CIRCUIT-2	Type: CBD-4			-XTCL4		CABUR			
	11	TERMINAL BLOCKS FOR CLOSE BLOCK, BFI SIGNALS	Type: CBD-4			-X03		CABUR			
	19	TERMINAL BLOCKS FOR ANNUNCIATION SIGNALS	Type: CBD-4			-XAN		CABUR			
E	19	TERMINAL BLOCKS FOR ER SIGNALS	Type: CBD-4			-XEV		CABUR			
	18	TERMINAL BLOCKS FOR SCADA SIGNALS	Type: CBD-4			-XSC		CABUR			
	12	TERMINAL BLOCKS FOR FR SIGNALS	Type: CBD-4			-XFR		CABUR			
F											
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									Project no. P-60194	Sheet type AC1	Sheet no. 04a
REV.		DESCRIPTION	DATE	DRAWER							



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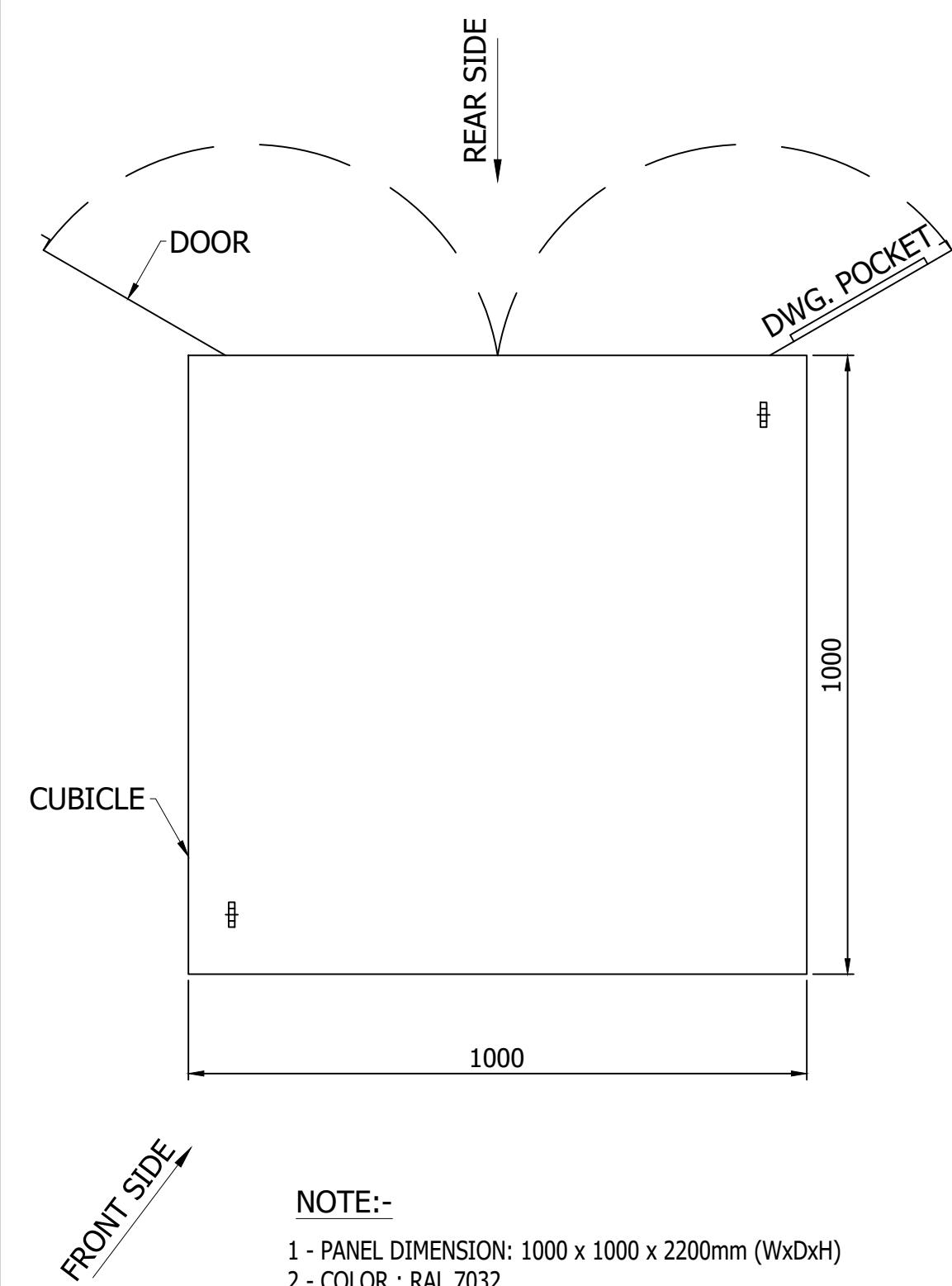
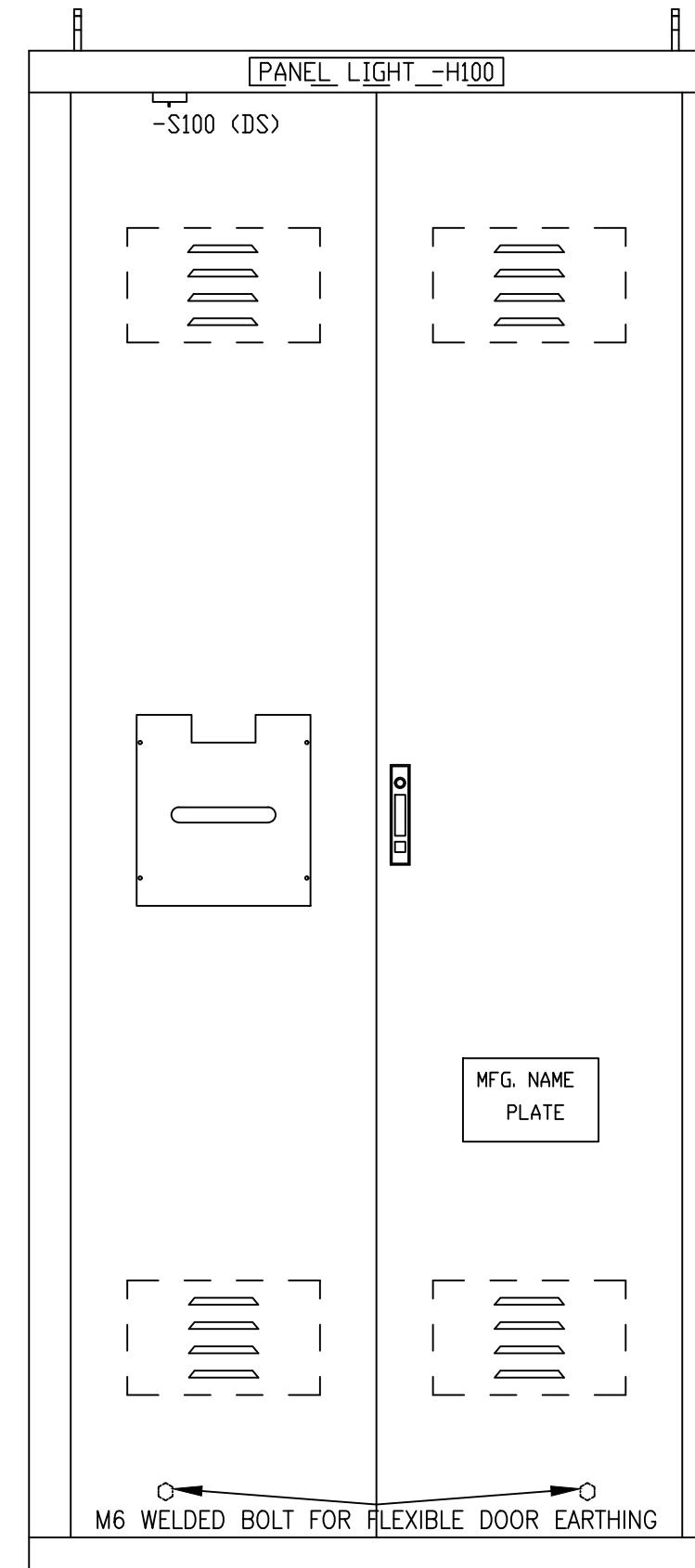
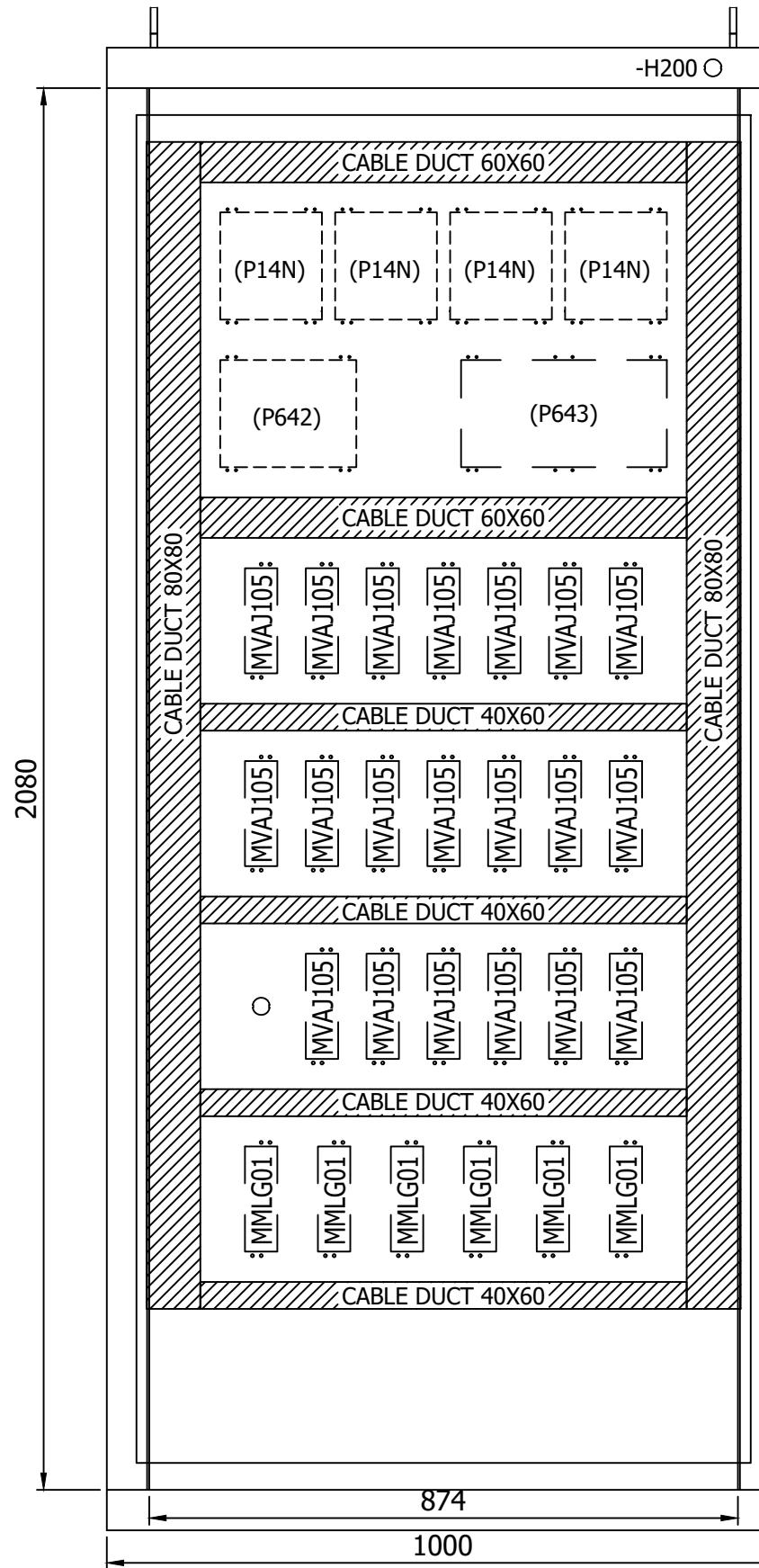
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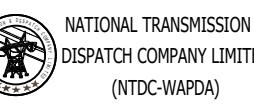
8

FRONT VIEWBACK VIEW WITH DOORTOP VIEW

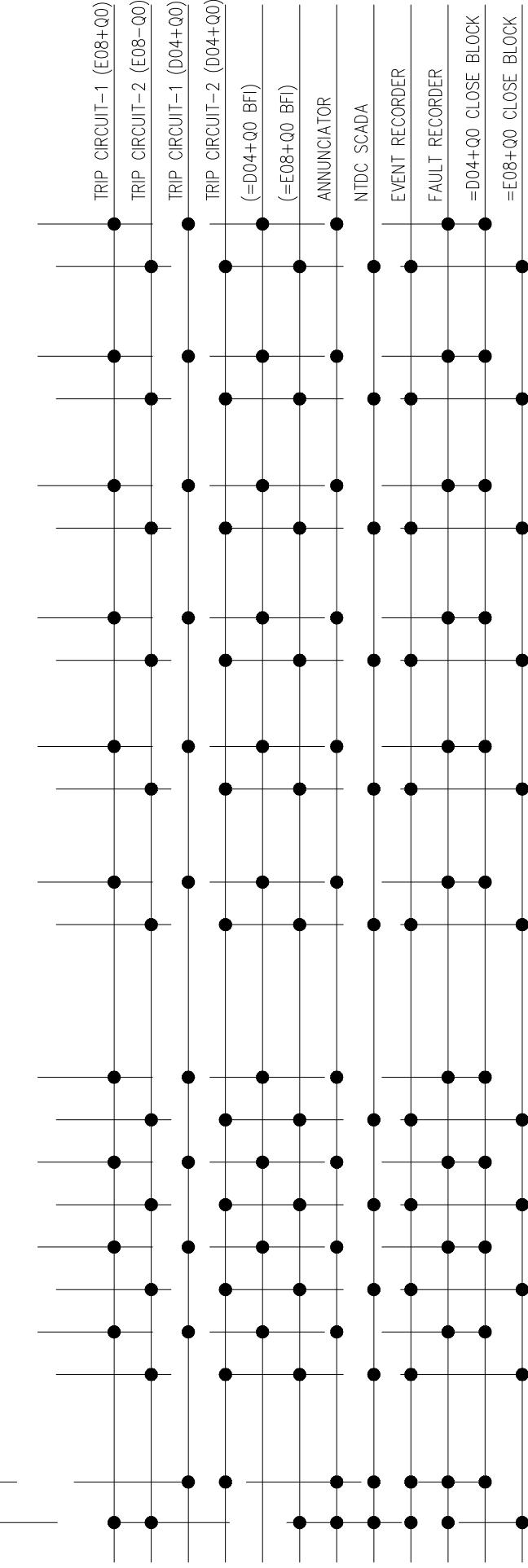
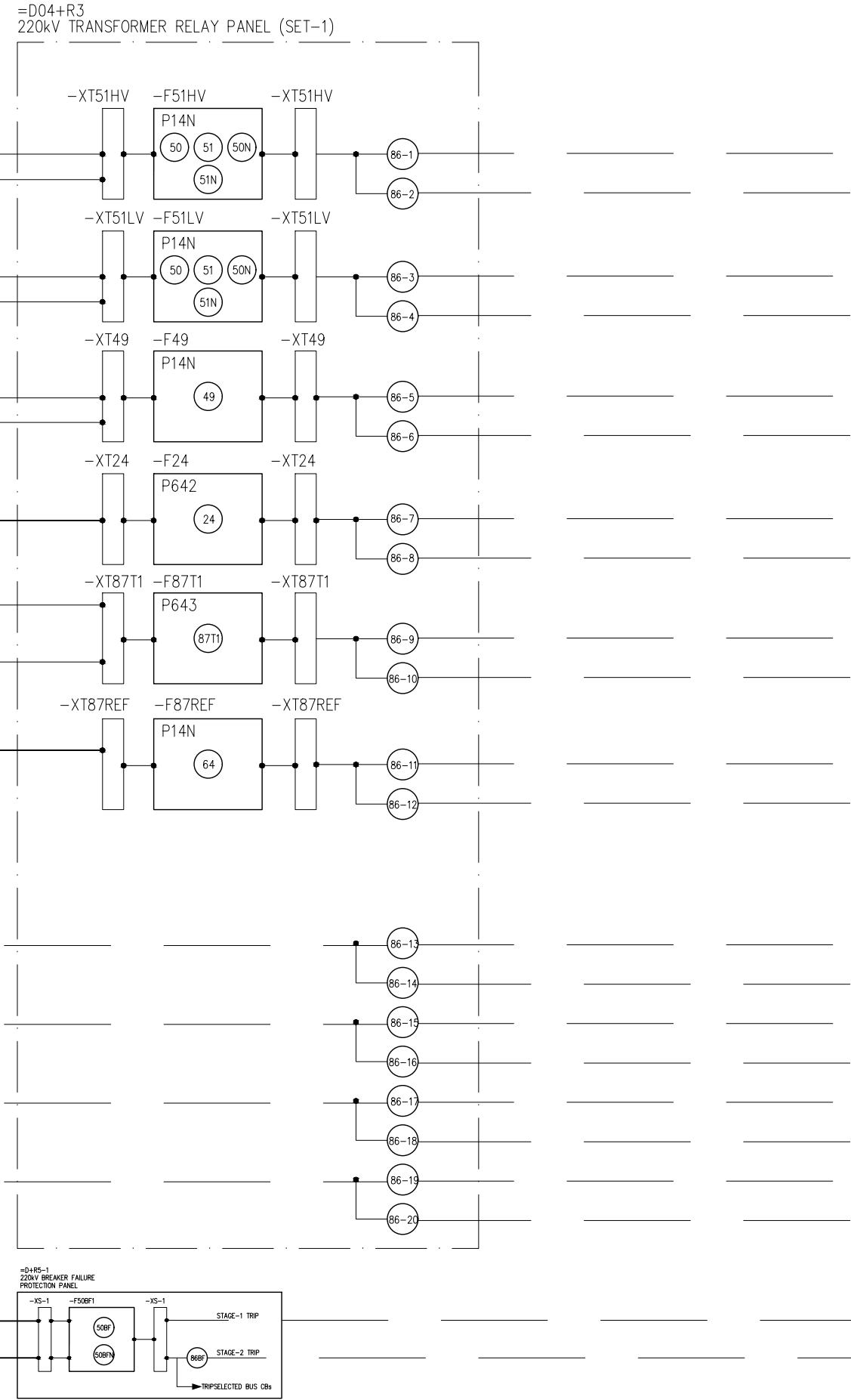
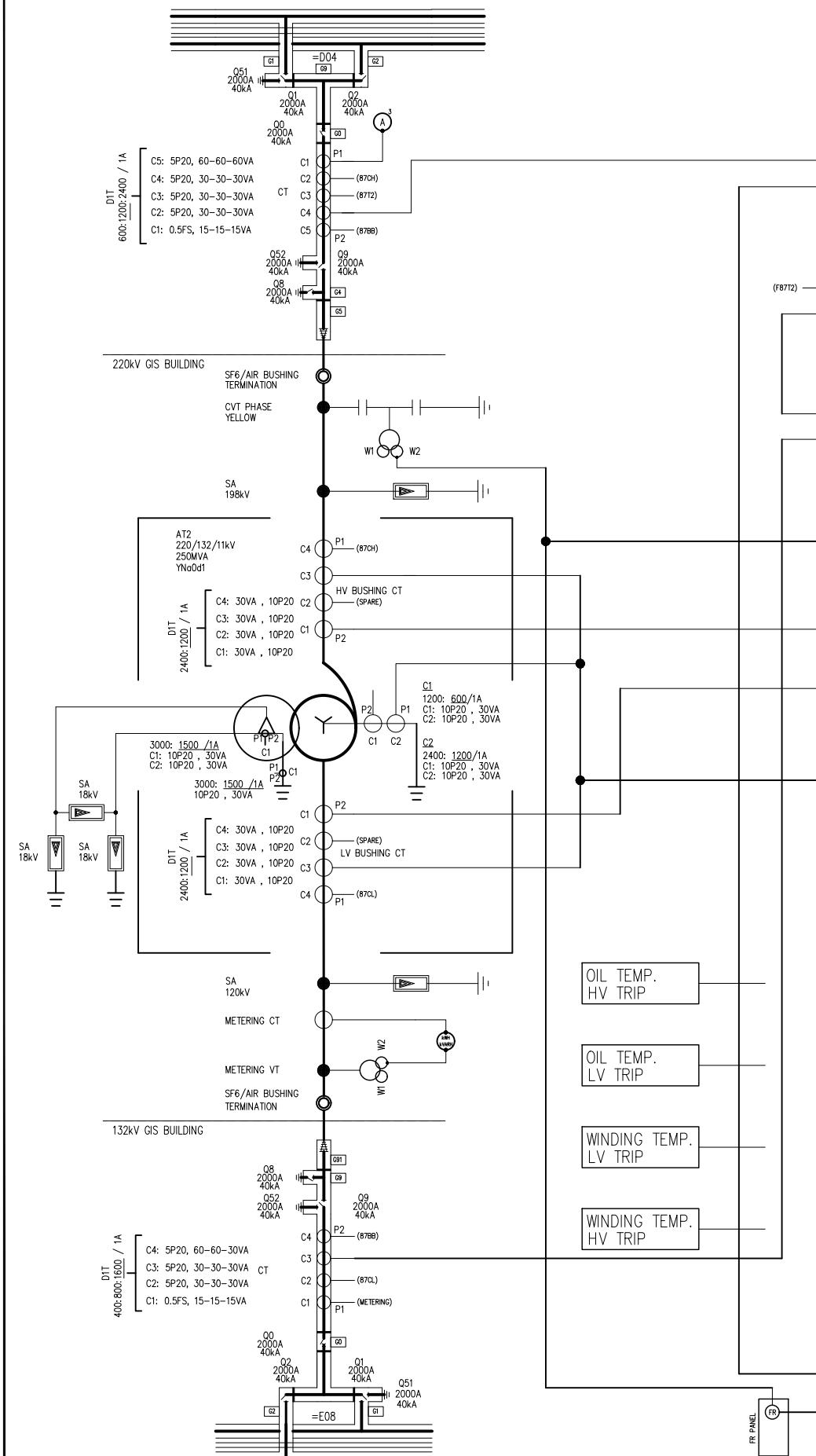
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**NOTE:-**

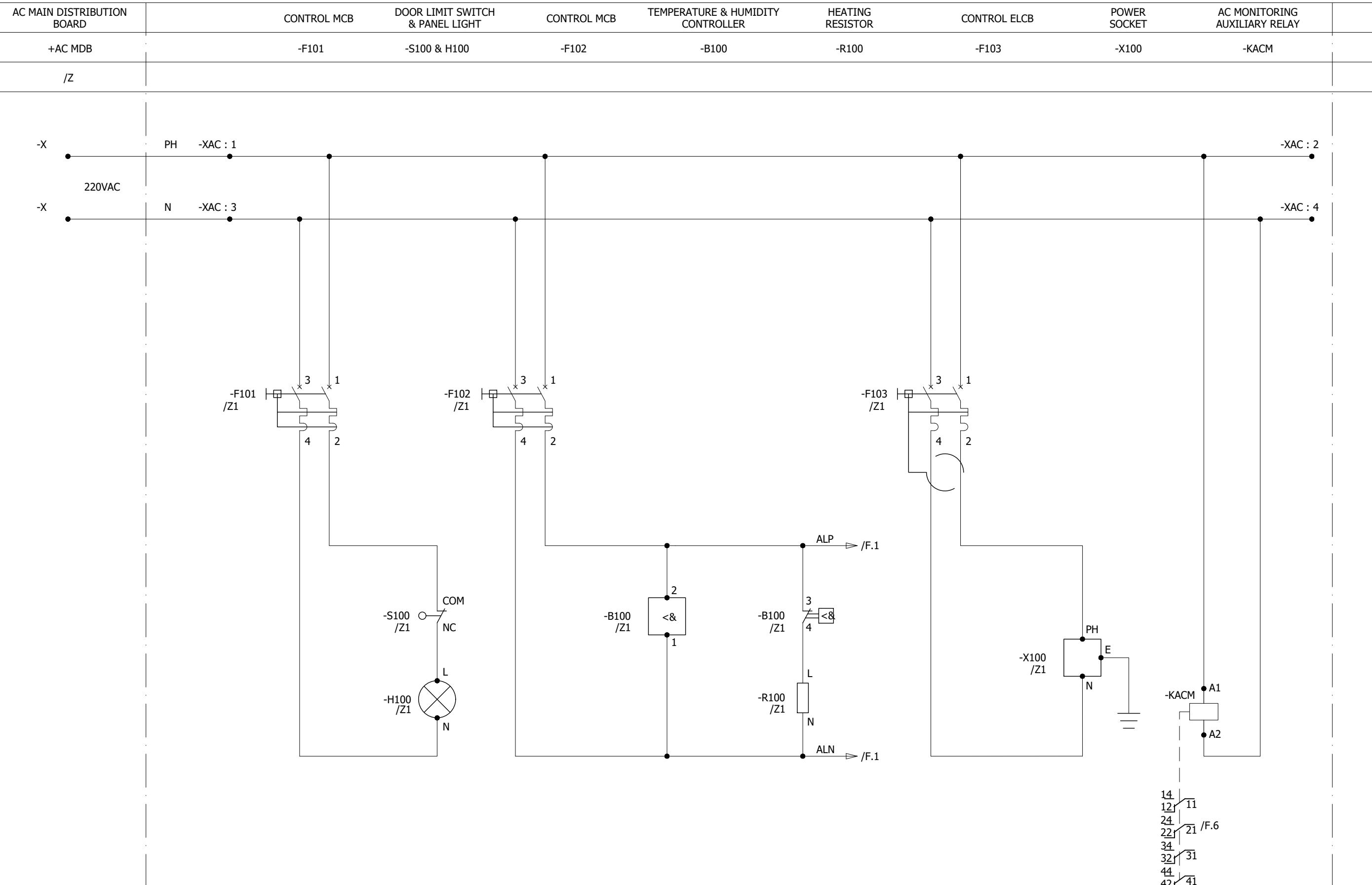
- PANEL DIMENSION: 1000 x 1000 x 2200mm (WxDxH)
- COLOR : RAL 7032
- SHEET THICKNESS : 2-2.5 mm
- PROTECTION CLASS : IP-51 (INDOOR TYPE)
- ALL DOOR FITTED WITH 16mm EARTH STRAP & INSULATED WITH GREEN-YELLOW COLOUR.

0	AS BUILT	22.11.2018	ASJ	Manufacturer  7-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PANEL VIEW	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type AD	Sheet no. 05
1		2	3							

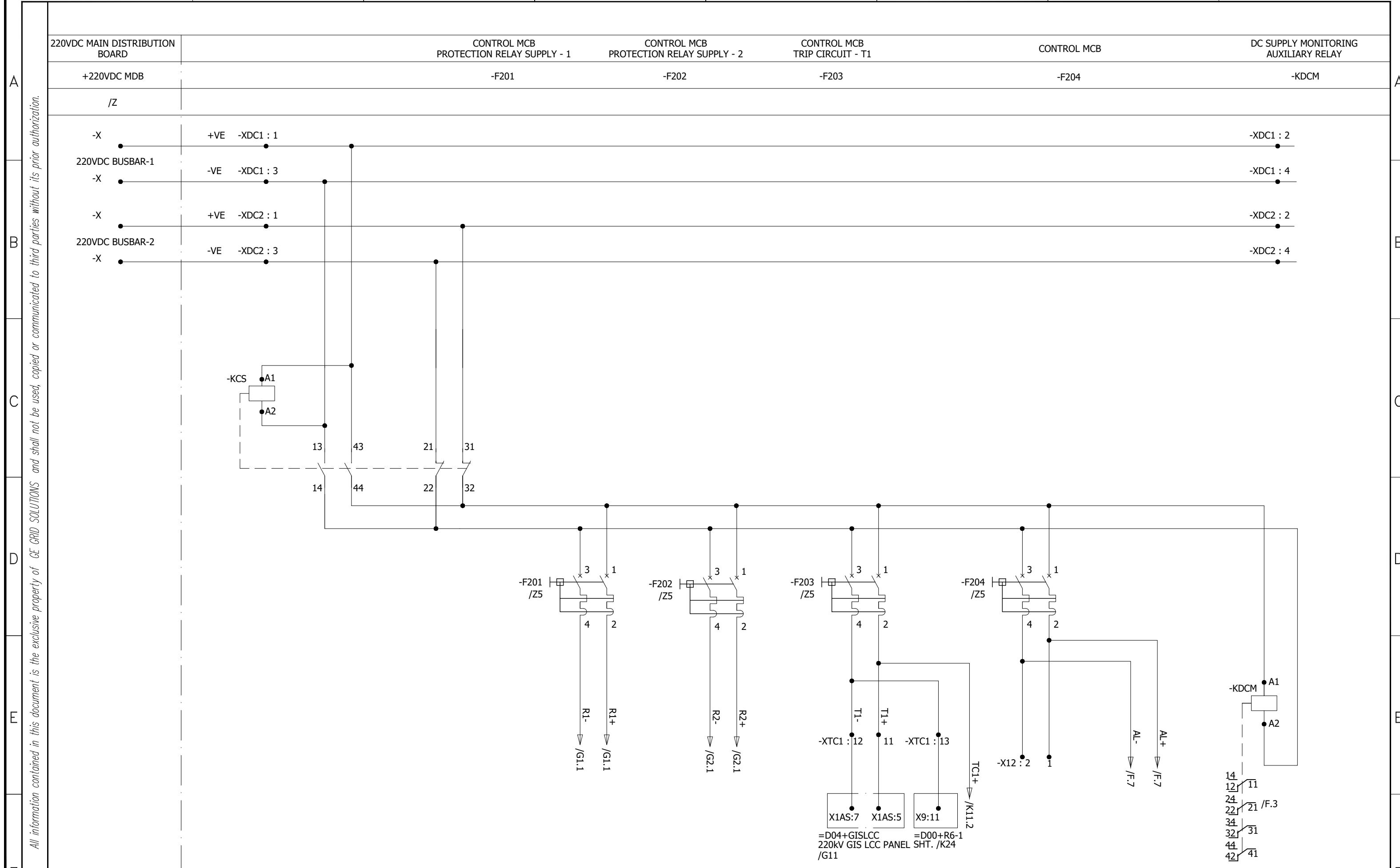
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REV.	DESCRIPTION		DATE	DRAWER						Project no. P-60194	Sheet type D	Sheet no. 07
1	2	3	4	5	6	7	8					



220V DC CIRCUIT FAULTY

220V DC CIRCUIT FAULTY INDICATION

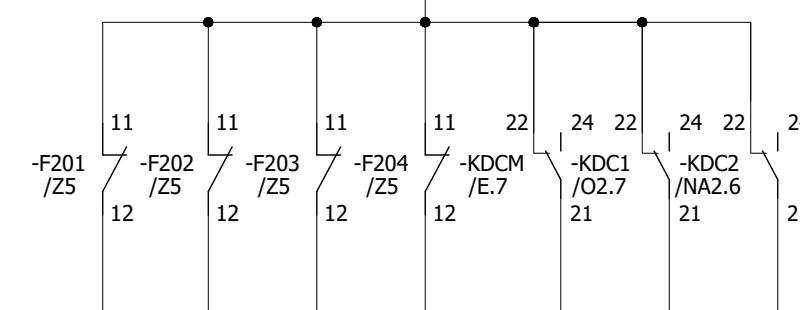
220V AC CIRCUIT FAULTY

-KDC

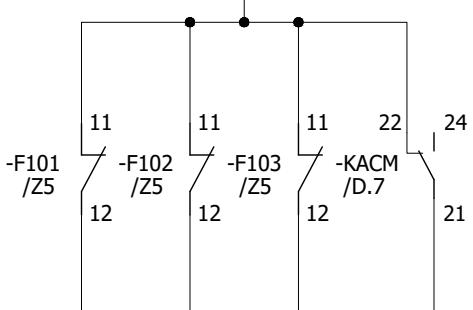
-H200

-KAC

/D.5 ➤ ALP

42  
44  
41

/E2.7 ➤ AL+ ➤ /K1.1

14  
12  
24  
22  
34  
32  
44  
42  
11  
21  
RA1.7  
RA2.7  
RA3.7  
F.5  
41

/D.5 ➤ ALN

-KDC

A1  
A2-H200  
/Z5  
L  
N14  
12  
24  
22  
34  
32  
44  
42  
11  
21  
RA1.7  
RA2.7  
RA3.7  
F.5  
41

/E2.7 ➤ AL- ➤ /K1.1

14  
12  
24  
22  
34  
32  
44  
42  
11  
21  
RA1.7  
RA2.7  
RA3.7  
F.5  
41

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0	AS BUILT	22.11.2018	ASJ	Manufacturer <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) AC/DC SUPPLY FAILURE CIRCUIT	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194

TRAFO DIFF. RELAY

REF RELAY

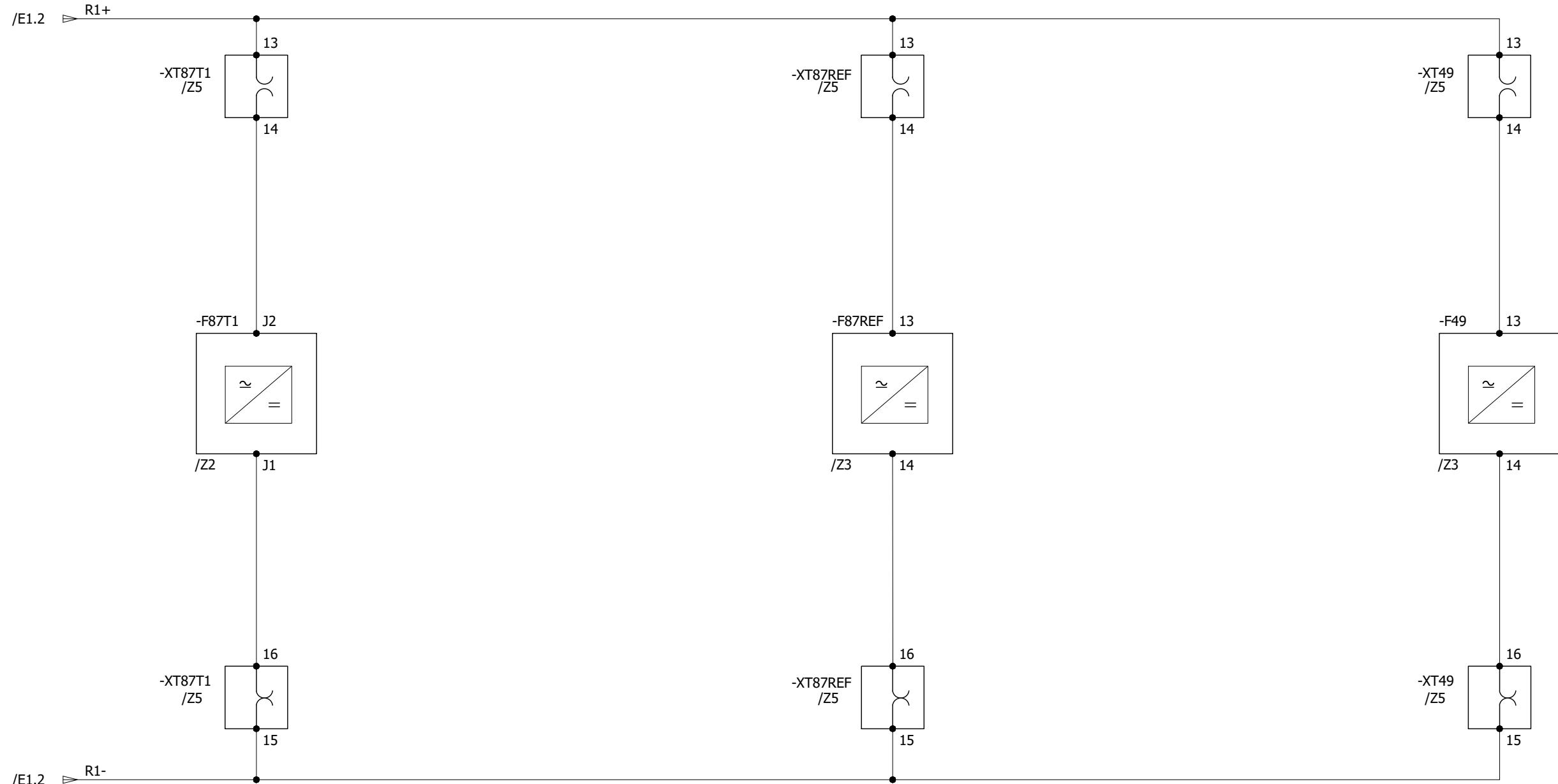
THERMAL O/L RELAY

RELAY SUPPLY

RELAY SUPPLY

RELAY SUPPLY

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REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194	Sheet type G1	Sheet no. 10

## OVER EXCITATION RELAY

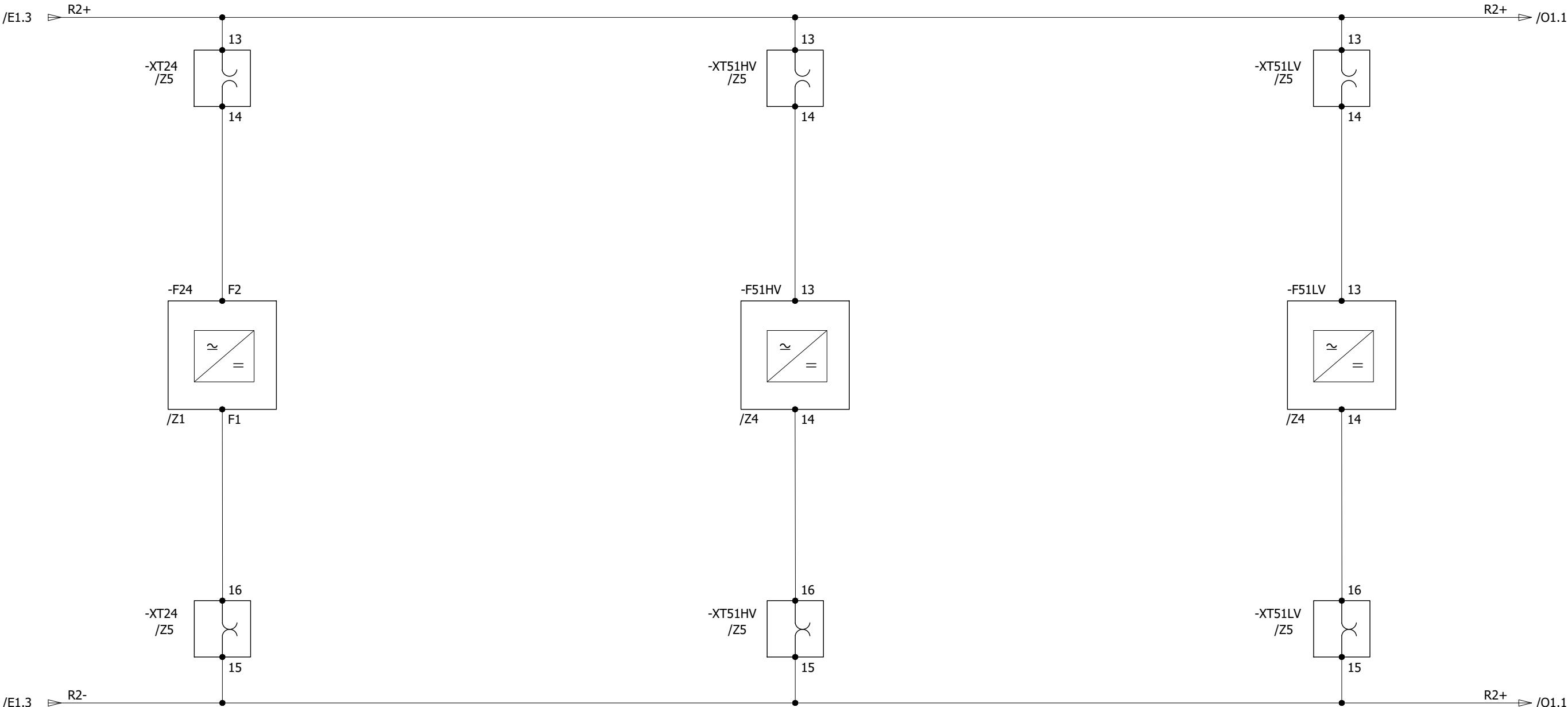
## HV OC/EF RELAY

## LV OC/EF RELAY

## RELAY SUPPLY

## RELAY SUPPLY

## RELAY SUPPLY



All information contained in this document is the exclusive property of GE GRID SOLUTIONS and shall not be used, copied or communicated to third parties without its prior authorization.

A

A

B

B

C

C

D

D

E

E

F

F

0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) RELAY CONTROL & SUPPLY	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type G2	Sheet no. 11

TEST BLOCK

TRAFO DIFFERENCE PROTECTION  
RELAY

-XT87T1

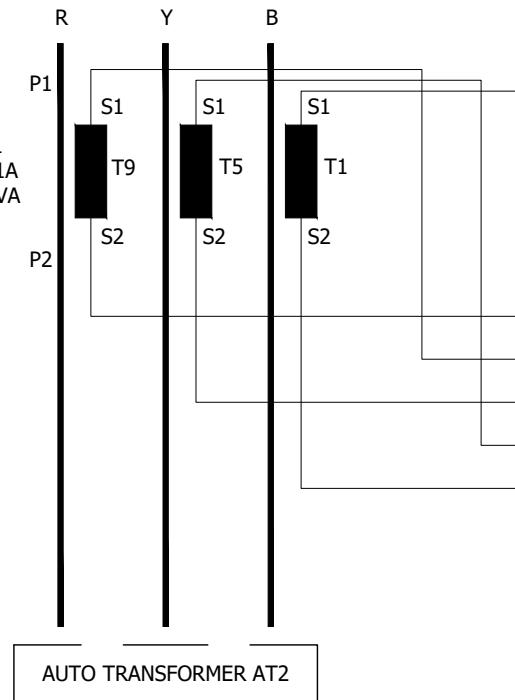
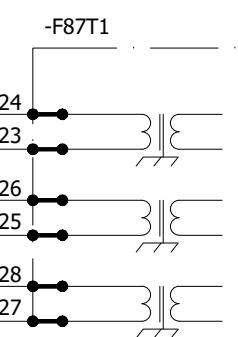
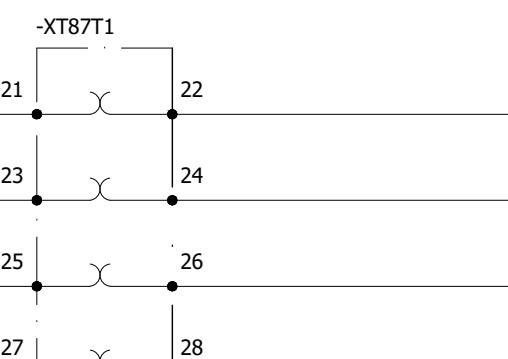
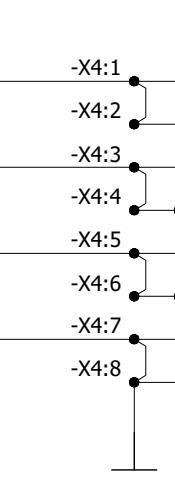
-F87T1

/Z5

/Z2

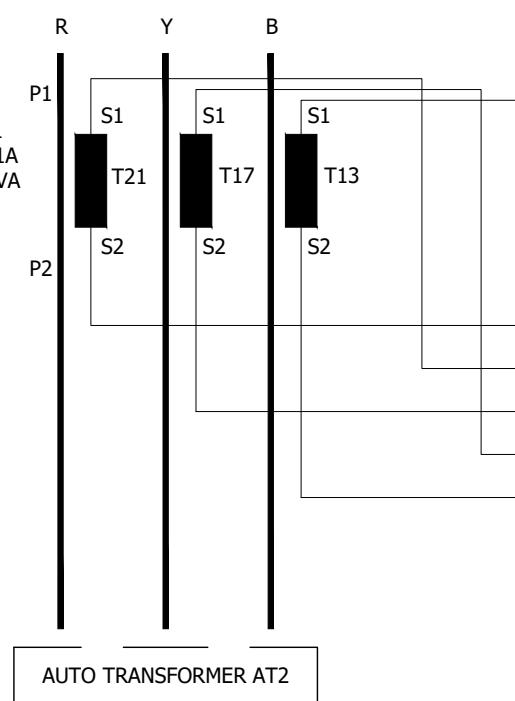
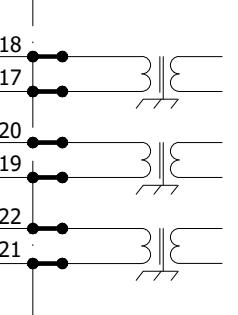
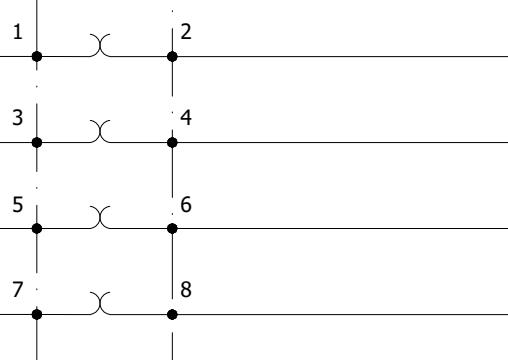
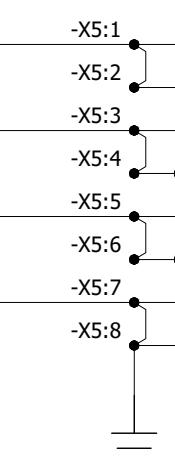
## CONTROL ROOM

HV SIDE BUSHING CT

AT2 CORE-1  
2400:1200 / 1A  
Cl. 10P20, 30VA=D04+AT2  
220KV/132KV AT2 TCC PANEL  
/S25-S26

AGILE P643 TRANSFORMER DIFFERENTIAL PROTECTION RELAY

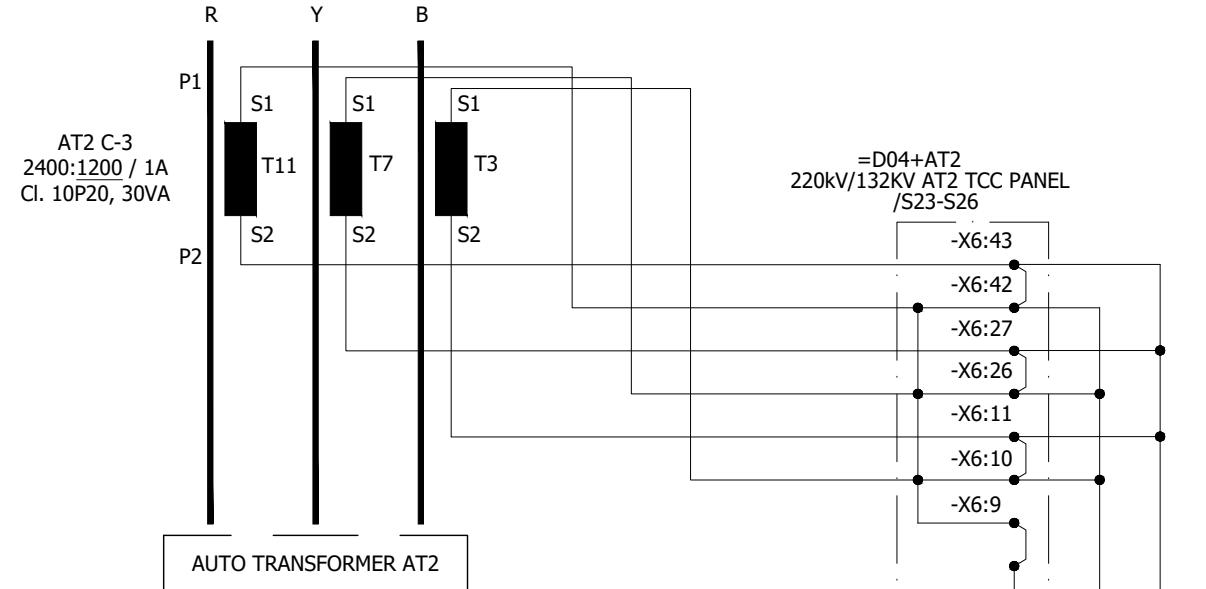
LV SIDE BUSHING CT

AT2 CORE-1  
2400:1200 / 1A  
Cl. 10P20, 30VA=D04+AT2  
220KV/132KV AT2 TCC PANEL  
/S23-S24

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0	AS BUILT	22.11.2018	ASJ	Manufacturer	Contractor	Client	Project	Title	Drawing no.		
				EPESEL 7-B Garden Block, New Garden Town, Lahore, Pakistan	Grid Solutions A GE and Alstom joint venture	NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	220KV TRAFO RELAY SET-1 PANEL (=D03+R3) TRAFO DIFFERENTIAL PROTECTION CT CIRCUIT	Project no. P-60194	Sheet type H1	Sheet no. 12
REV.	DESCRIPTION	DATE	DRAWER								

HV SIDE BUSHING CT



=D04+AT2  
220kV/132kV AT2 TCC PANEL  
/S23-S26

CONTROL ROOM

/Z5

TEST BLOCK  
MTEROSIL  
LIMITING RESISTOR

RESTRICTED EARTH FAULT  
RELAY

-XT87  
-M1  
-RS1

-F87REF

/Z3

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B

C

D

E

F

AGILE P14N REF PROTECTION RELAY

A

B

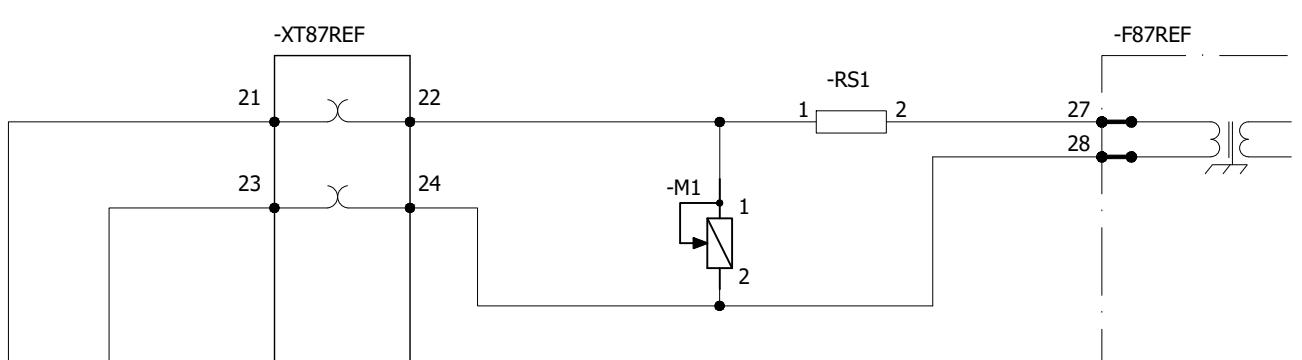
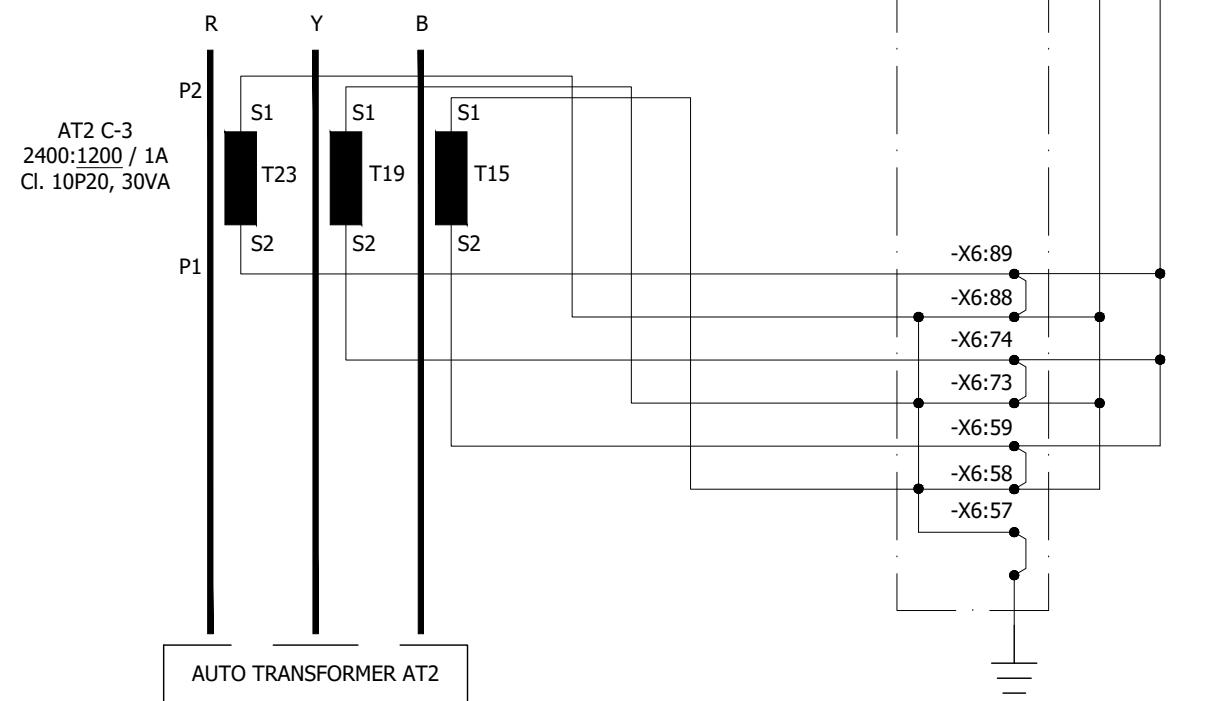
C

D

E

F

LV SIDE BUSHING CT



0	AS BUILT	22.11.2018	ASJ	Manufacturer	Contractor	Client	Project	Title	Drawing no.
				 <b>EPESOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	 Grid Solutions A GE and Alstom joint venture	 NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	220kV TRAFO RELAY SET-1 PANEL (=D03+R3) REF PROTECTION CT CIRCUIT	P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194 Sheet type H2 Sheet no. 13

132kV GIS LCC  
PANEL

=E08

/MA1

TEST BLOCK

THERMAL OVERLOAD  
RELAY

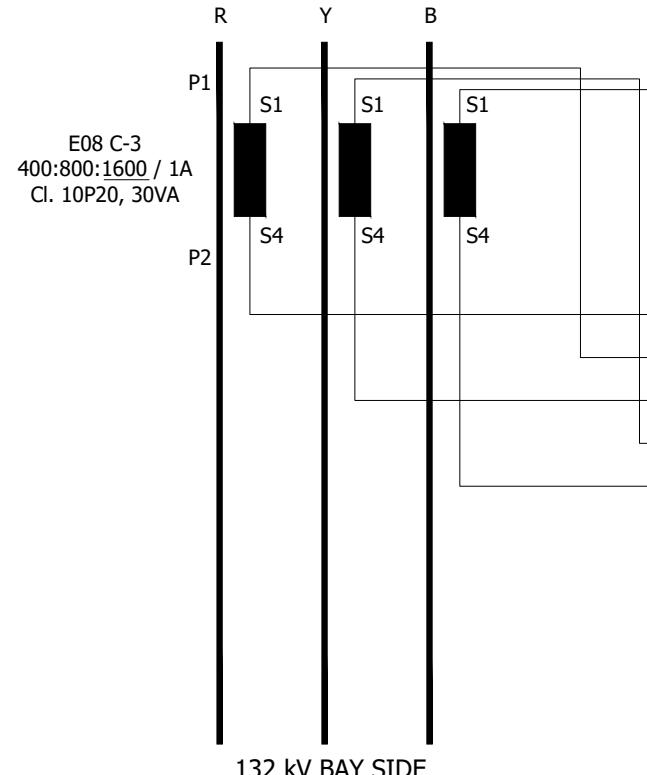
-XT49

-F49

/Z5

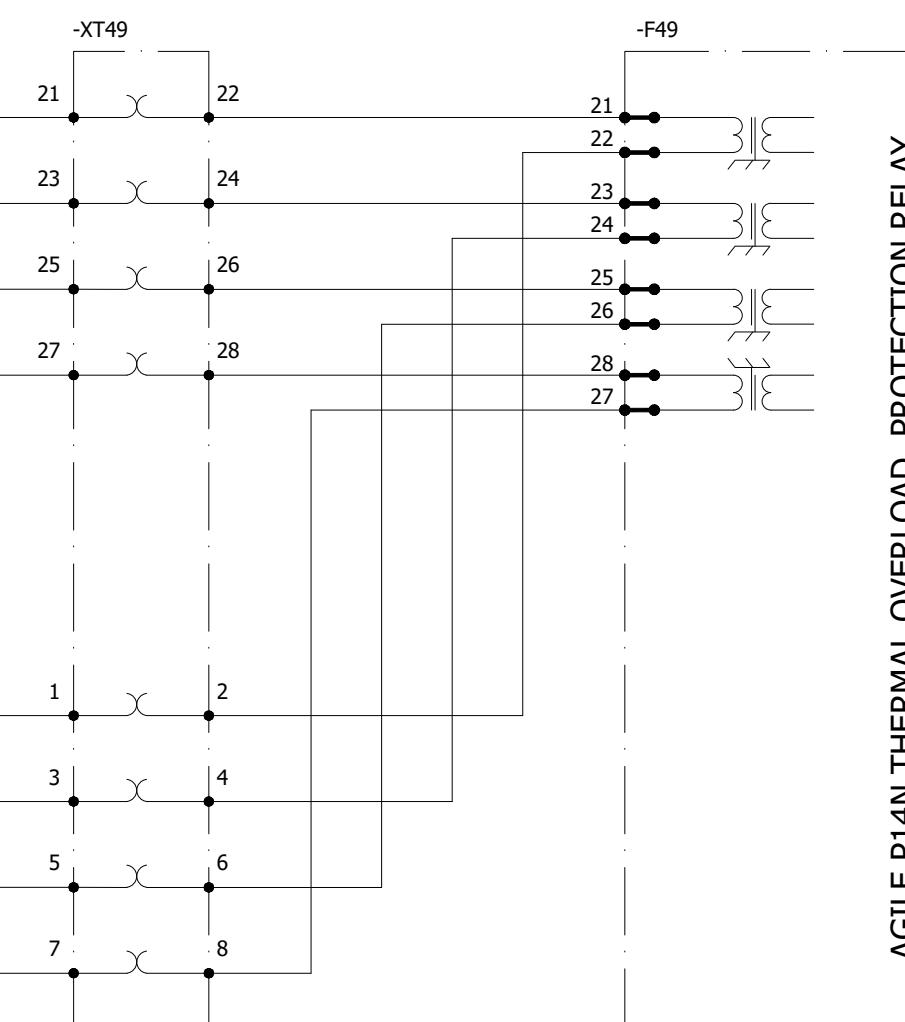
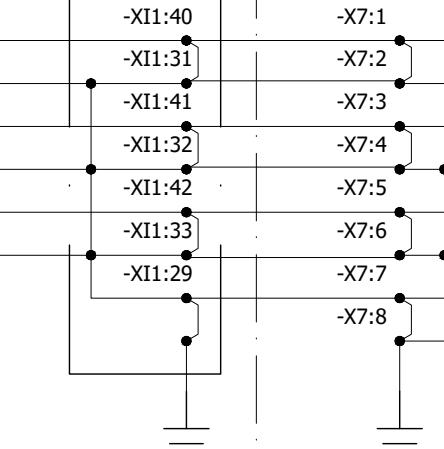
/Z3

LV TRAFO SIDE



132KV GIS HALL CONTROL ROOM

=E08+GIS LCC  
132KV GIS LCC PANEL  
/S11



AGILE P14N THERMAL OVERLOAD PROTECTION RELAY

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0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) THERMAL OVERLOAD RELAY CT INPUTS	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type H3	Sheet no. 14

220KV CVT TRAFO SIDE  
PANEL

=D04 + CVT KIOSK

/MA1

## TEST BLOCK

OVER EXCITATION  
RELAY

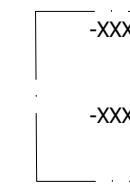
-XT24

-F24

/Z5

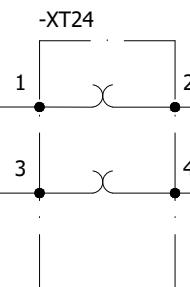
/Z1

CONTROL ROOM

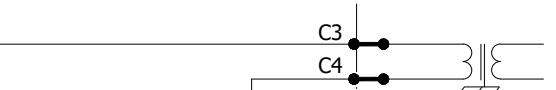
=CVT KIOSK  
RY PHASE  
/S81

-X01:1

-X01:2



-XT24

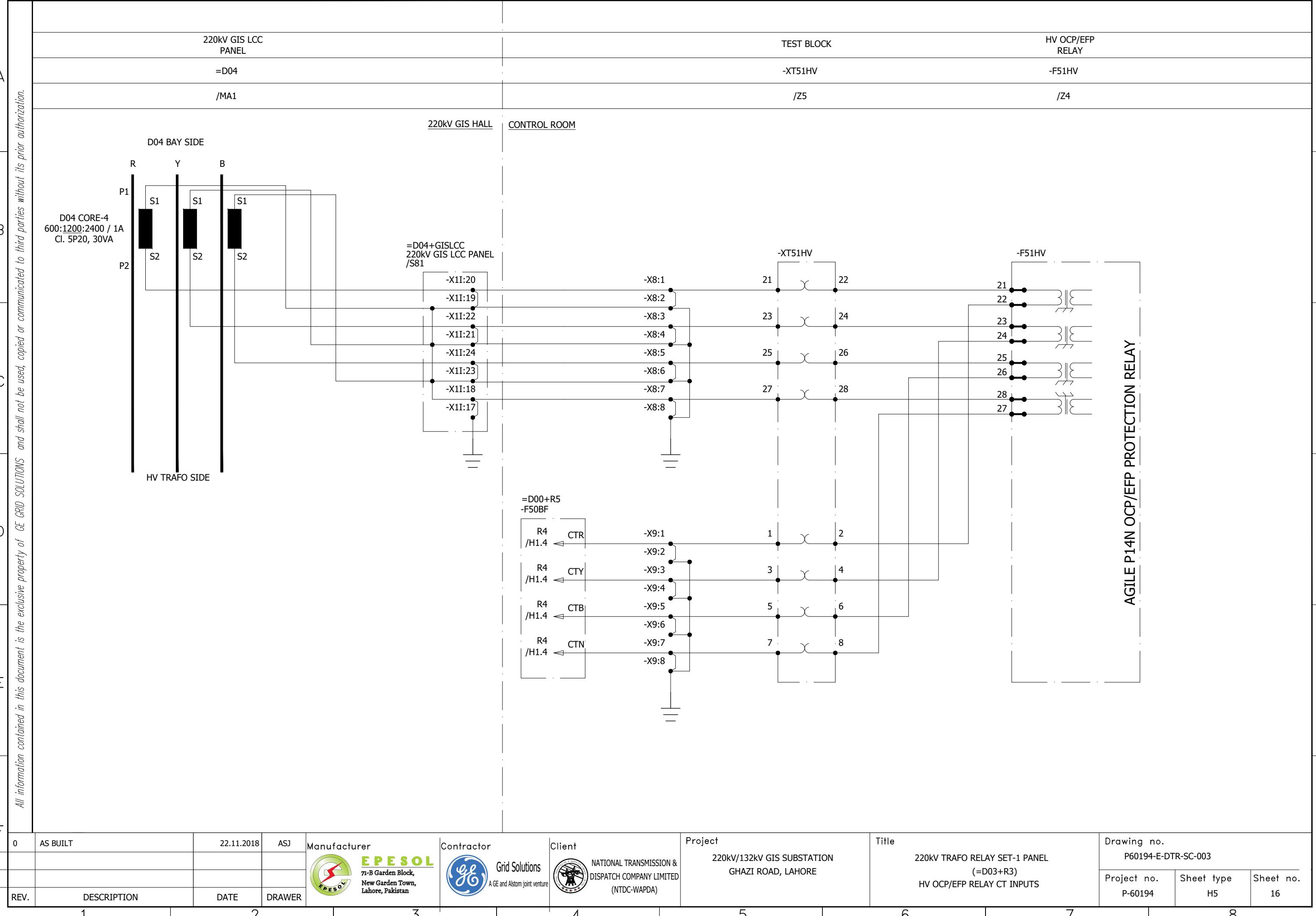


-F24

AGILE P642 OVER EXCITATION PROTECTION RELAY

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0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) OVER EXCITATION RELAY VT INPUTS	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type H4	Sheet no. 15



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## ST BLOCK

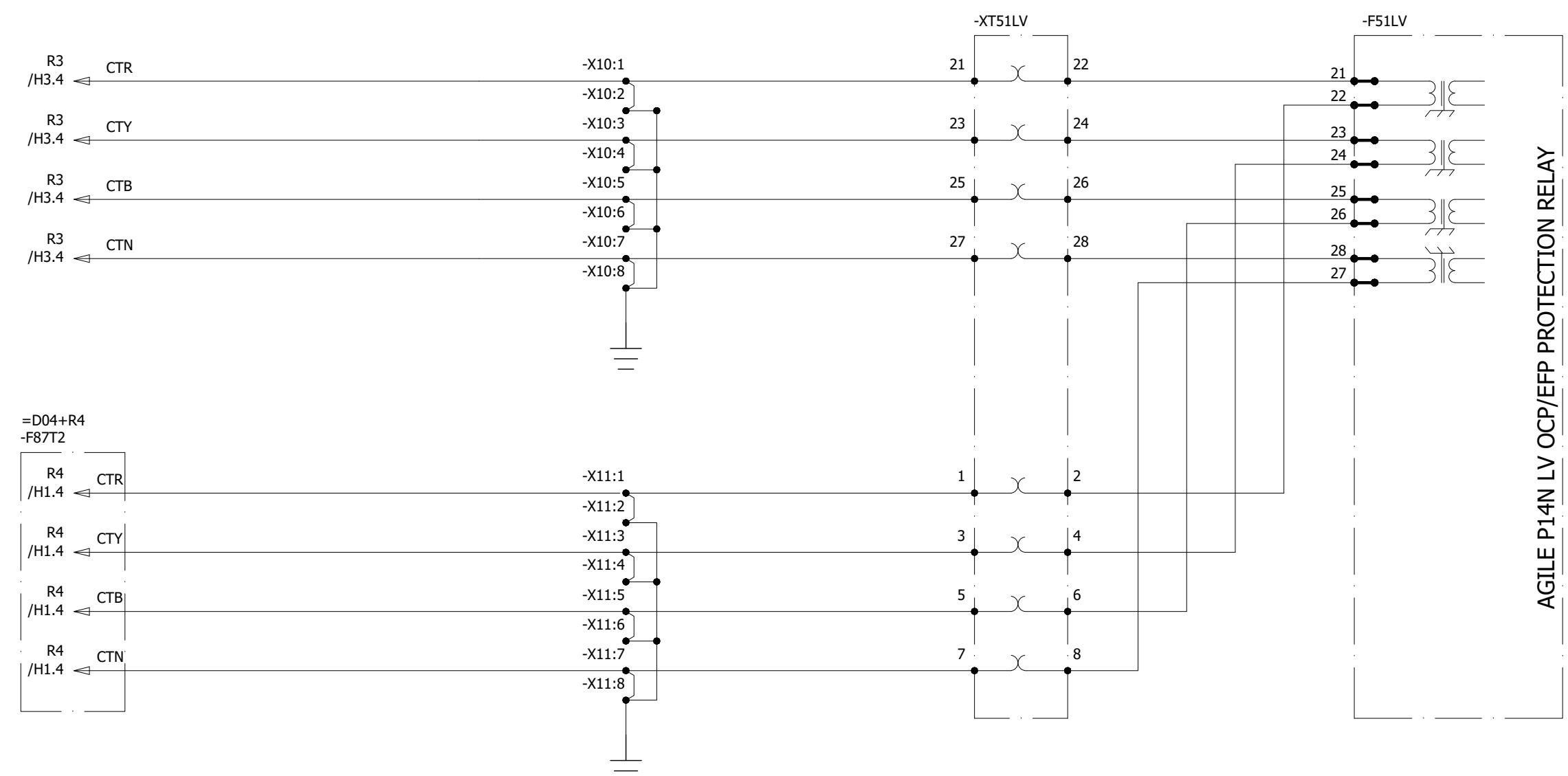
LV OCP/EFP  
RELAY

-XT51LV

-F51LV

/Z5

/Z4



AGILE P14N LV OCP/EFP PROTECTION RELAY

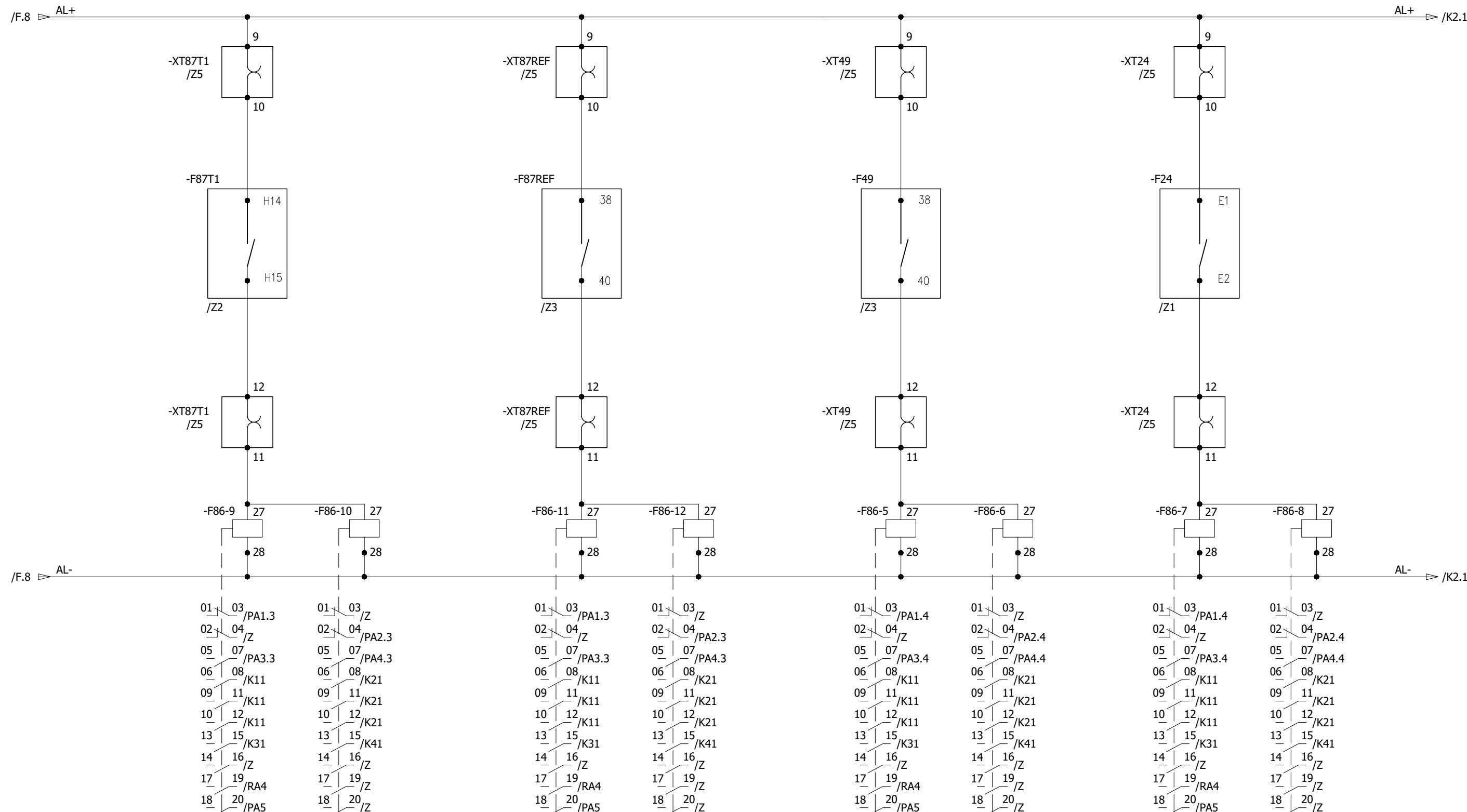
## DIFFERENTIAL PROTECTION TRIP

## REF PROTECTION TRIP

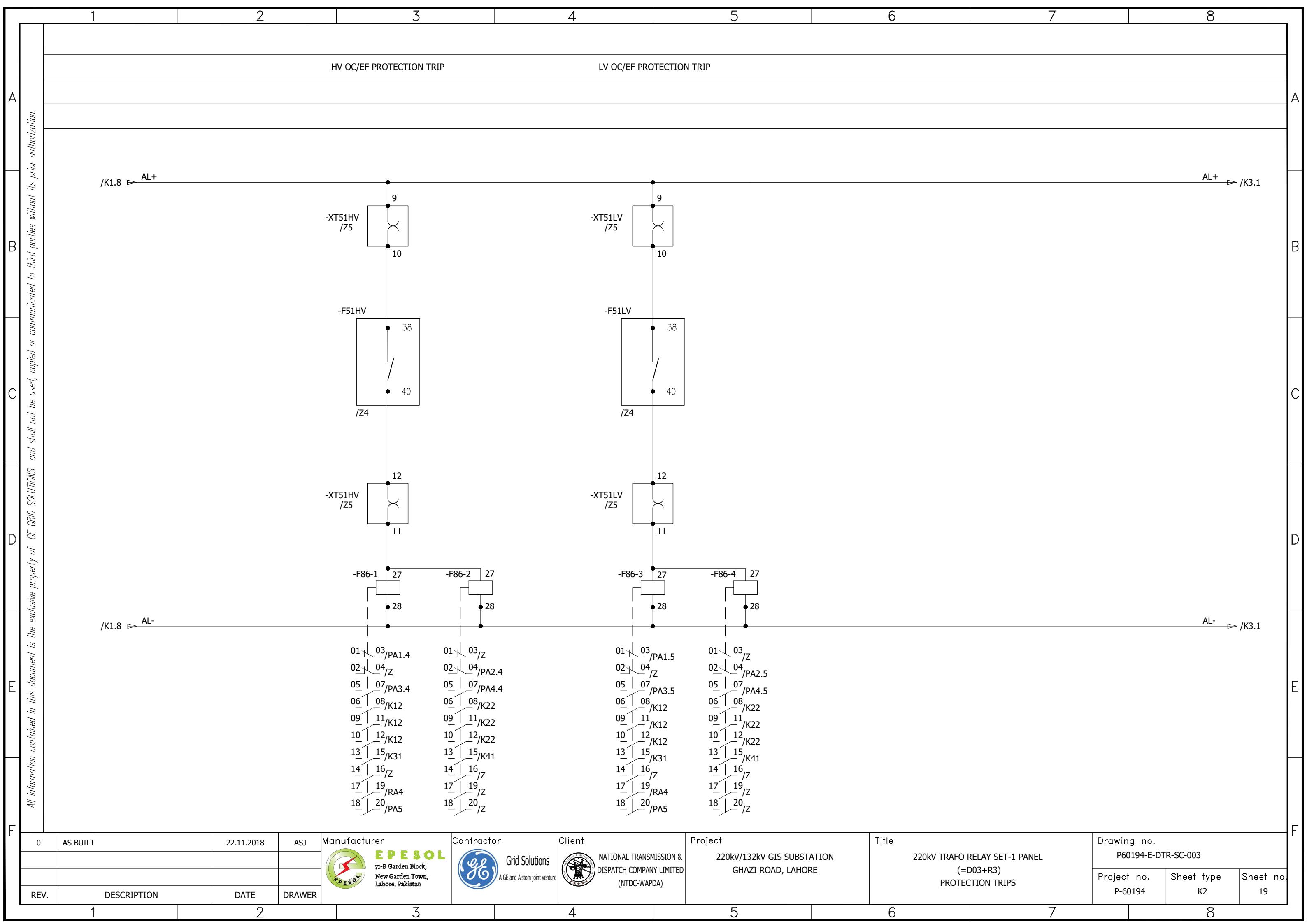
## THERMAL OVERLOAD PROTECTION TRIP

## OVER EXCITATION PROTECTION TRIP

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0	AS BUILT		22.11.2018	ASJ	Manufacturer  <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  <b>Grid Solutions</b> A GE and Alstom joint venture	Client  <b>NATIONAL TRANSMISSION &amp; DISPATCH COMPANY LIMITED (NTDC-WAPDA)</b>	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION TRIPS	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION		DATE	DRAWER					Project no. P-60194	Sheet type K1	Sheet no. 18
1	2	3	4	5	6	7	8				



OIL TEMP. HV TRIP

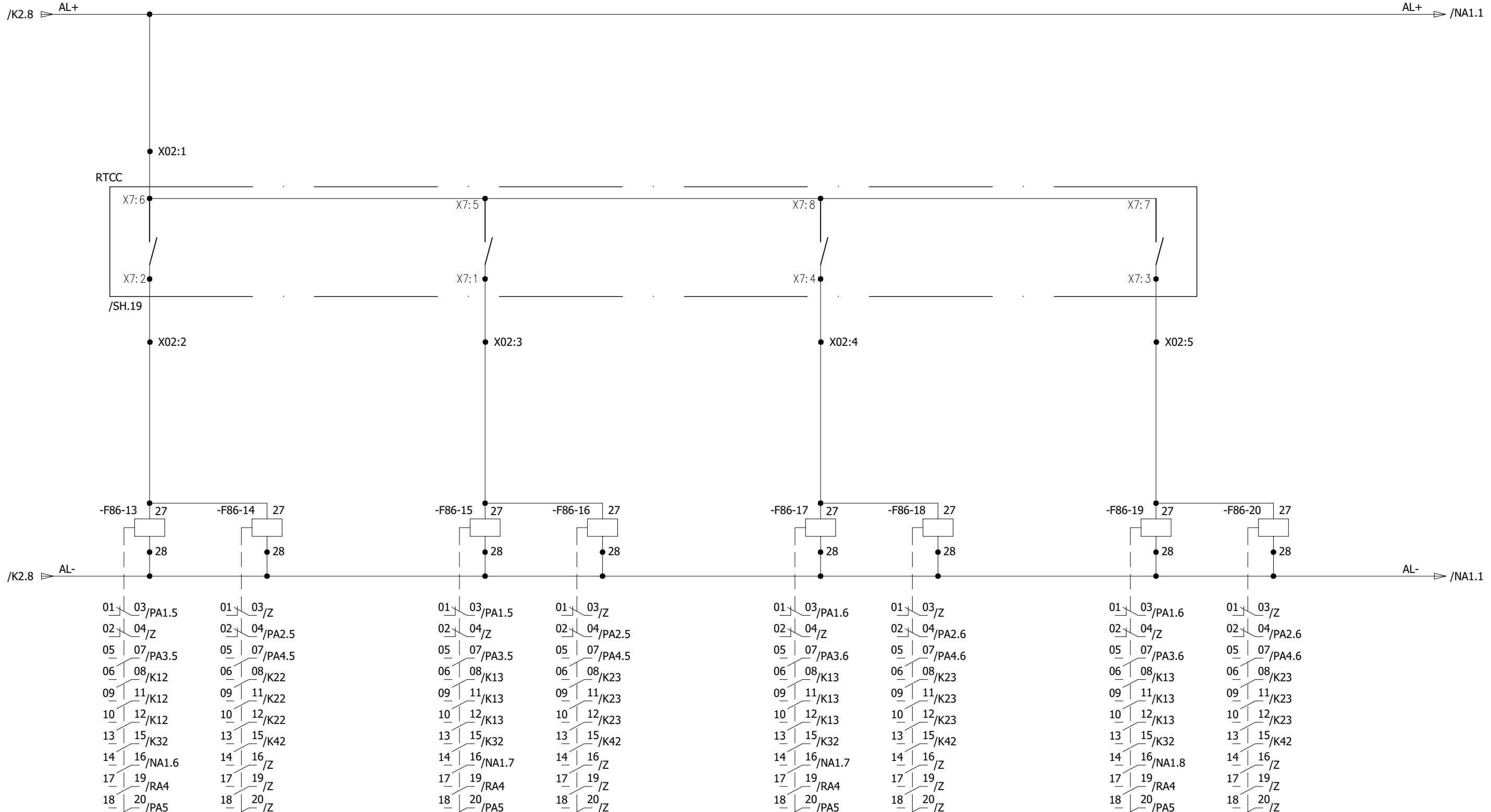
OIL TEMP. LV TRIP

WINDING TEMP. HV TRIP

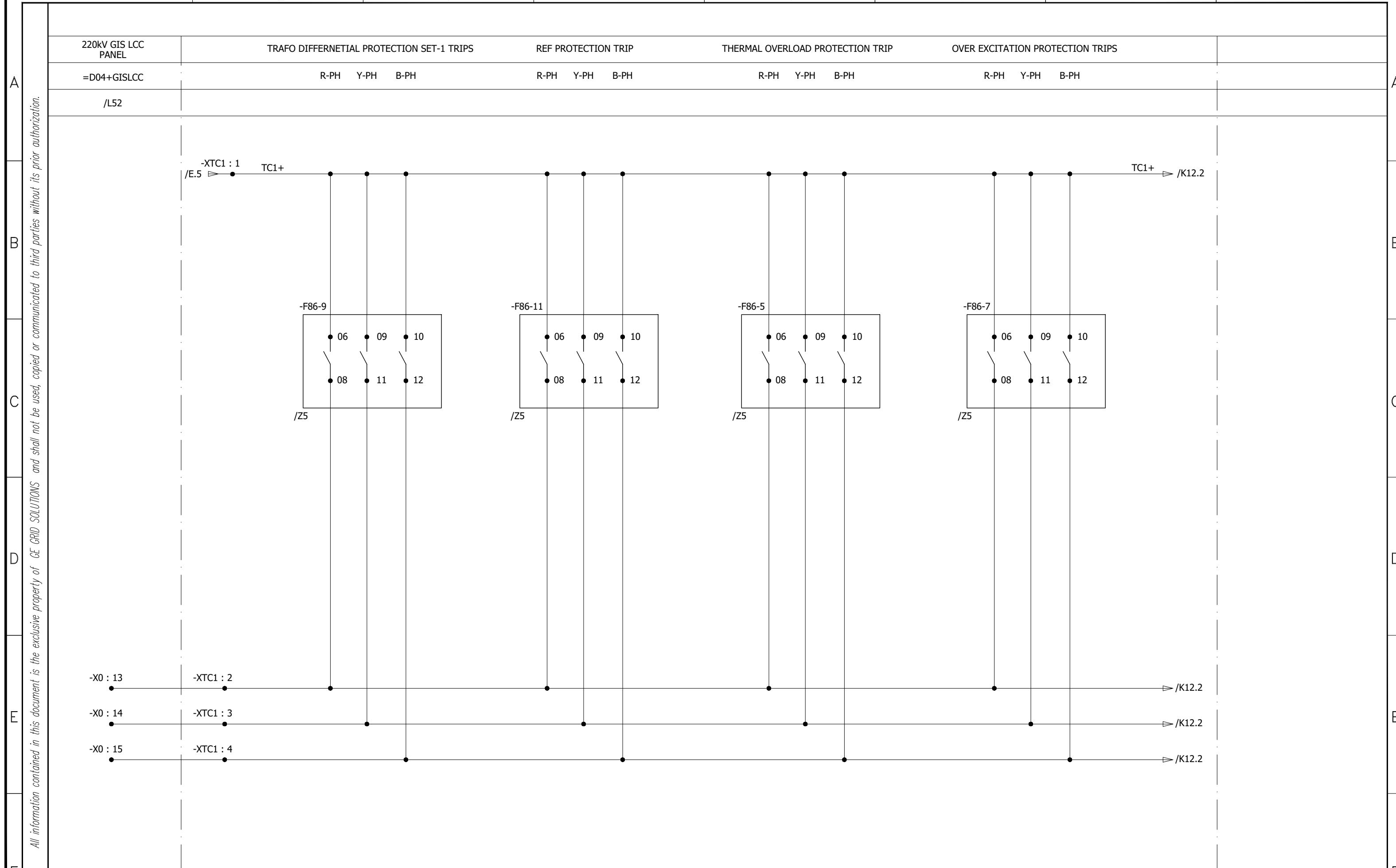
WINDING TEMP. LV TRIP

DC MONITORING

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0	AS BUILT	22.11.2018	ASJ	Manufacturer <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor <b>Grid Solutions</b> A GE and Alstom joint venture	Client <b>NATIONAL TRANSMISSION &amp; DISPATCH COMPANY LIMITED (NTDC-WAPDA)</b>	Project 220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220KV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION TRIPS	Drawing no. P60194-E-DTR-SC-003
									Project no. P-60194
REV.	DESCRIPTION	DATE	DRAWER						Sheet type K3
									Sheet no. 20



0	AS BUILT		22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE		Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR COIL - 1		Drawing no. P60194-E-DTR-SC-003		
REV.	DESCRIPTION		DATE	DRAWER								Project no. P-60194	Sheet type K11	Sheet no. 21

## HV OC/EF PROTECTION TRIPS

R-PH Y-PH B-PH

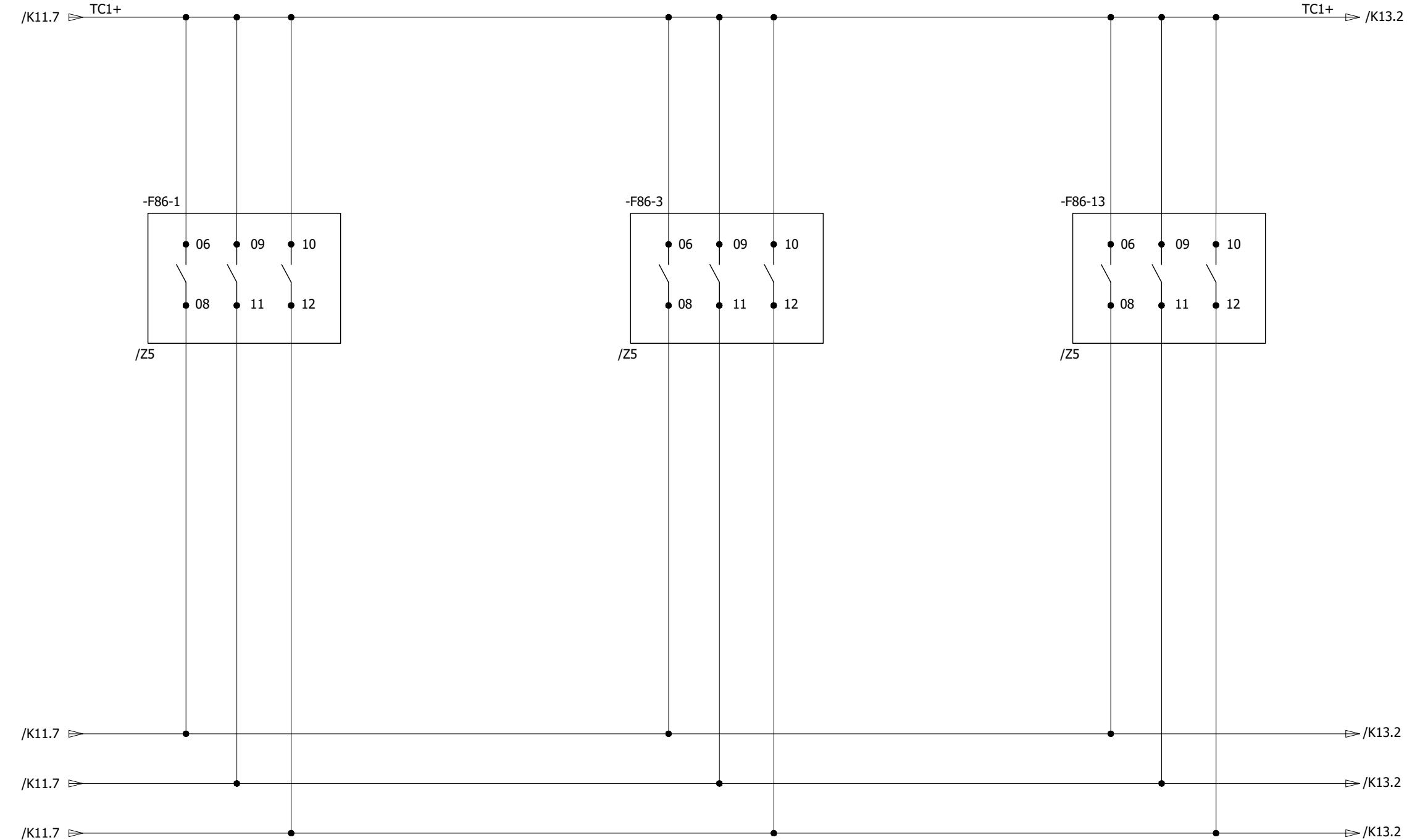
## LV OC/EF PROTECTION TRIPS

R-PH Y-PH B-PH

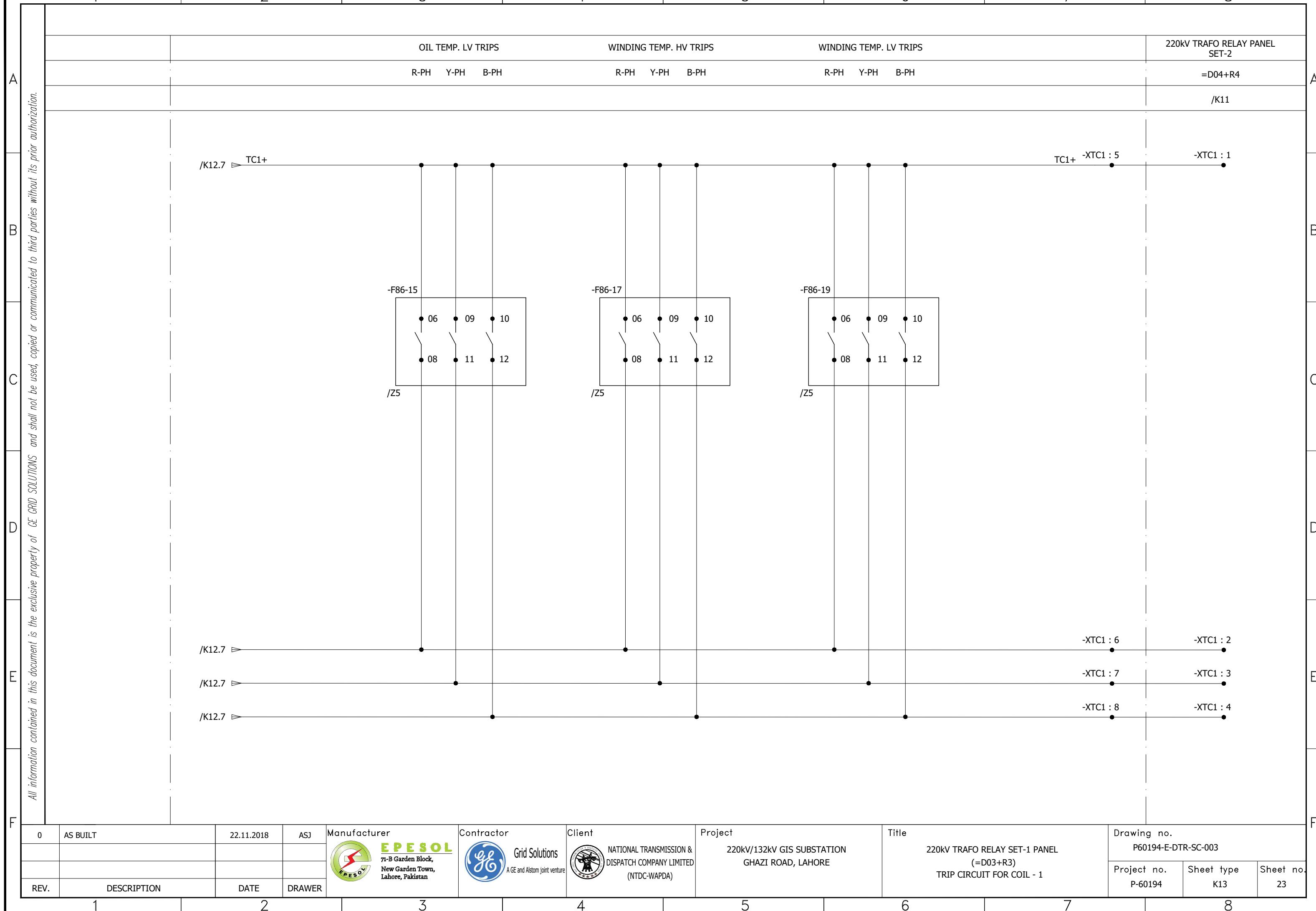
## OIL TEMP. HV TRIPS

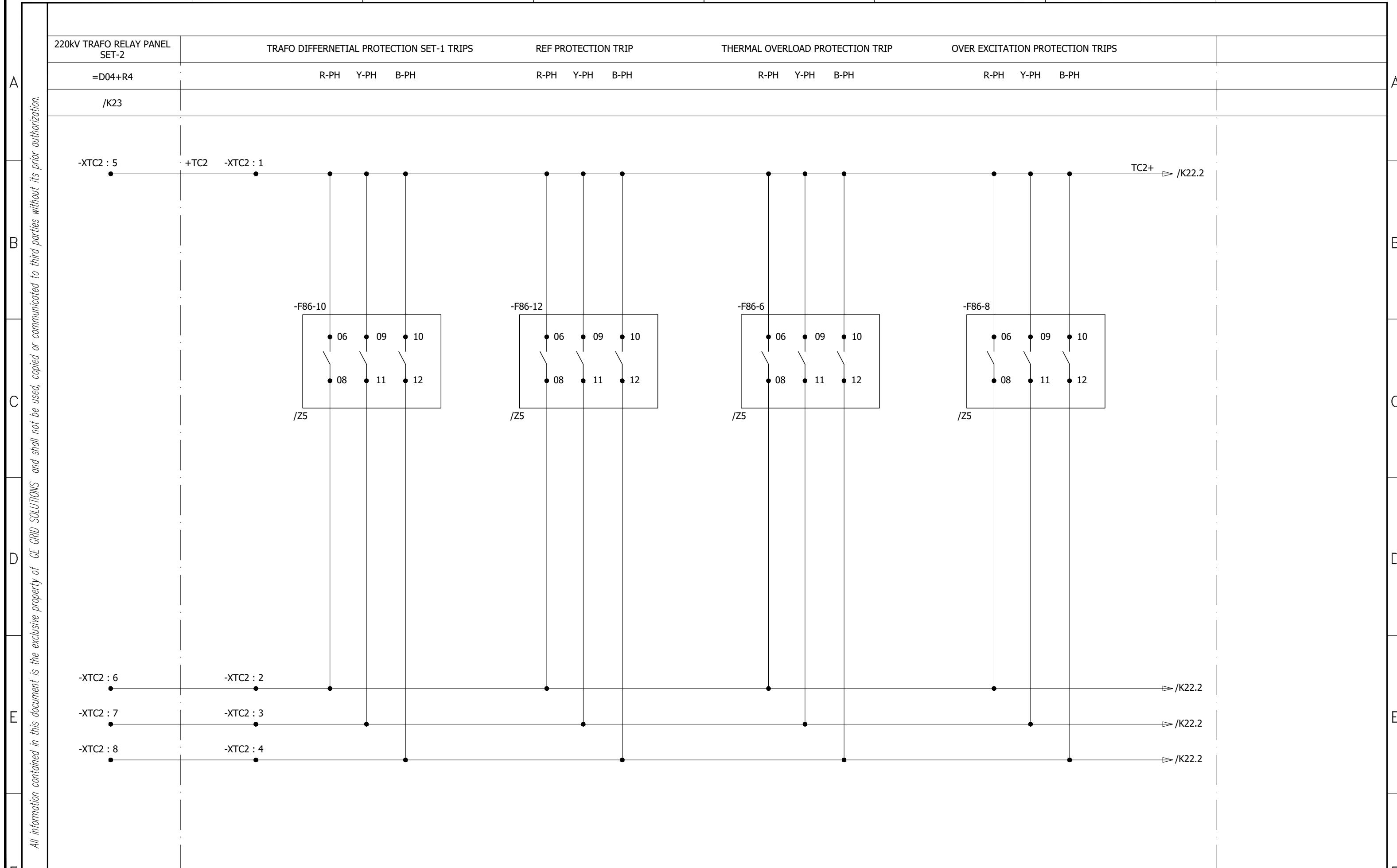
R-PH Y-PH B-PH

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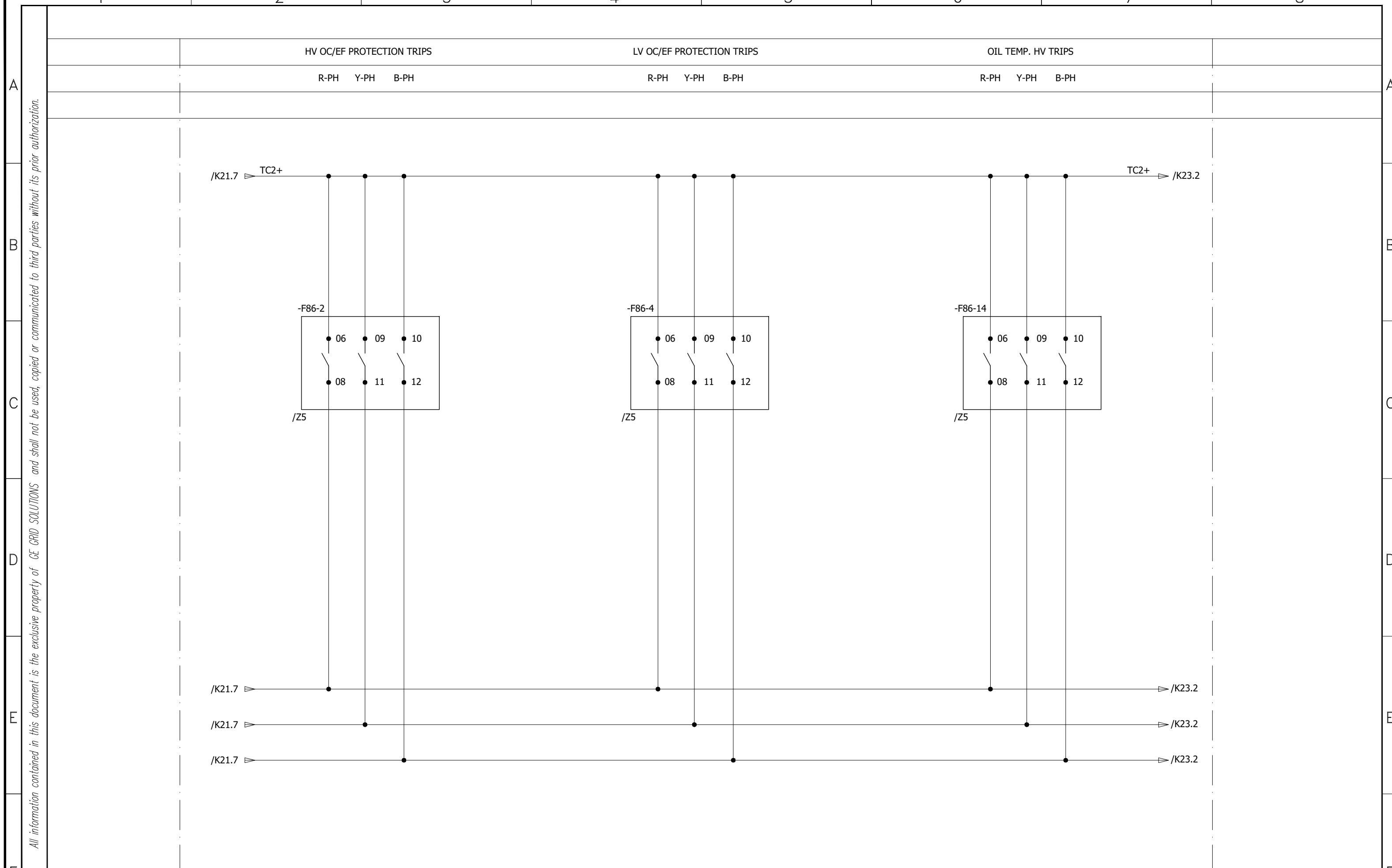


	1	2	3	4	5	6	7	8		
A	HV OC/EF PROTECTION TRIPS			LV OC/EF PROTECTION TRIPS			OIL TEMP. HV TRIPS			
B	R-PH Y-PH B-PH			R-PH Y-PH B-PH			R-PH Y-PH B-PH			
C										
D										
E										
F										
0	AS BUILT	22.11.2018	ASJ	Manufacturer  <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220KV TRAFO RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR COIL - 1	Drawing no. P60194-E-DTR-SC-003	
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type K12	Sheet no. 22





0	AS BUILT		22.11.2018	ASJ	Manufacturer	Contractor	Client	Project	Title	Drawing no.			
REV.	DESCRIPTION		DATE	DRAWER	 EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	 Grid Solutions A GE and Alstom joint venture	 NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	220KV TRAFO RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR COIL - 2	P-60194-E-DTR-SC-003	Project no.	Sheet type	Sheet no.
1	1		2	3	4	5	6	7	8	P-60194	K21	24	



0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR COIL - 2	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194
									Sheet type K22
									Sheet no. 25

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OIL TEMP. LV TRIP

WINDING TEMP. HV TRIPS

## WINDING TEMP. LV TRIPS

220kV CBF PANEL  
SET-1

R-PH Y-PH B-P

R-PH Y-PH B-PH

R-PH Y-PH B-PH

=D00+R5

/K11

/K11

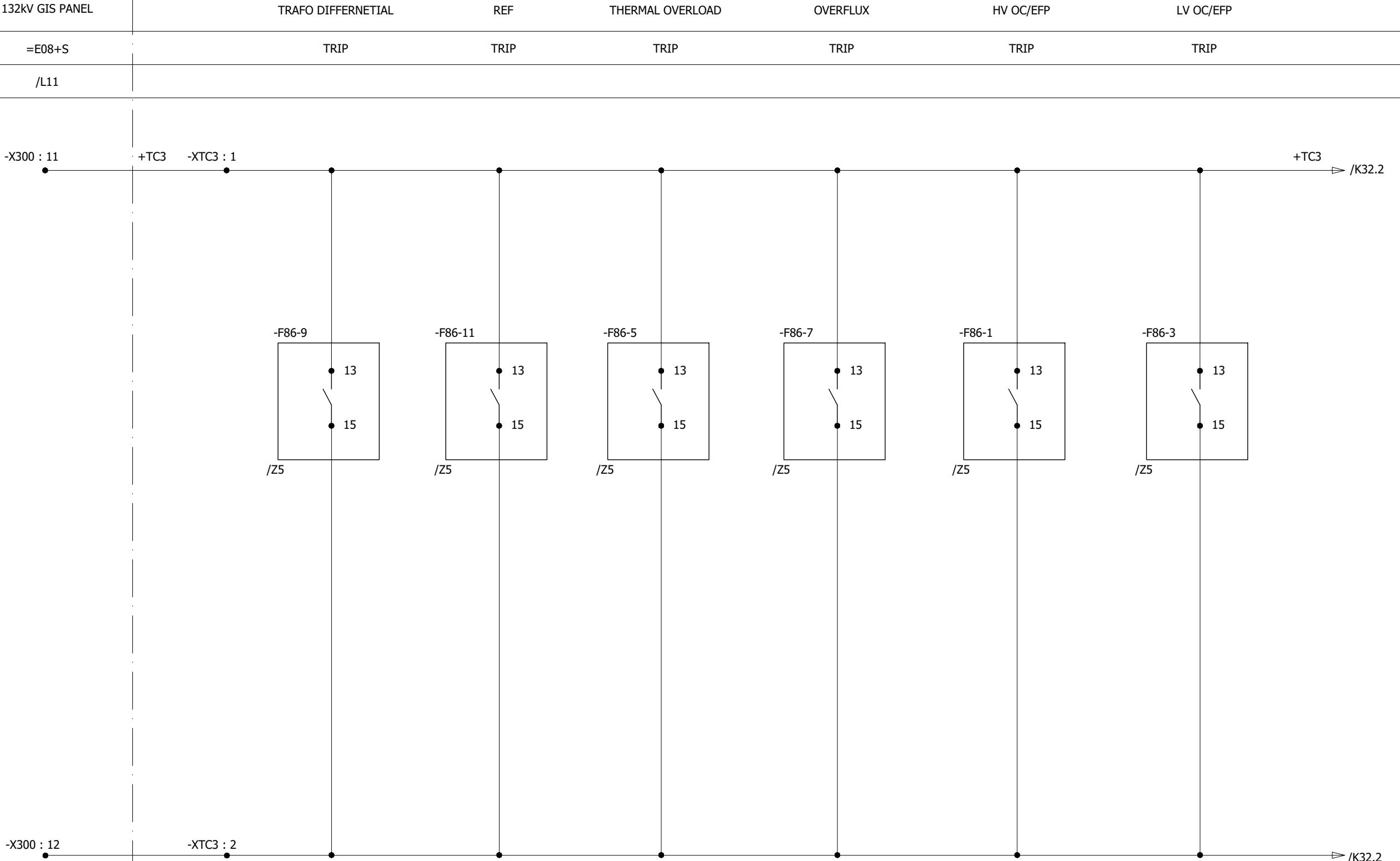
The diagram illustrates a particle detector configuration across three vertical planes:

- Plane F86-16:** Located at the top left. It features a central horizontal line with three black dots. A rectangular box labeled **-F86-16** encloses the bottom section of the plane. Inside this box, six black dots are arranged in two rows of three. The bottom row is labeled **/Z7**.
- Plane F86-18:** Located in the middle left. It has a similar structure with a central horizontal line and three black dots. A rectangular box labeled **-F86-18** encloses the bottom section. Inside, six black dots are arranged in two rows of three. The bottom row is labeled **/Z7**.
- Plane F86-20:** Located at the top right. It has a similar structure with a central horizontal line and three black dots. A rectangular box labeled **-F86-20** encloses the bottom section. Inside, six black dots are arranged in two rows of three. The bottom row is labeled **/Z7**.

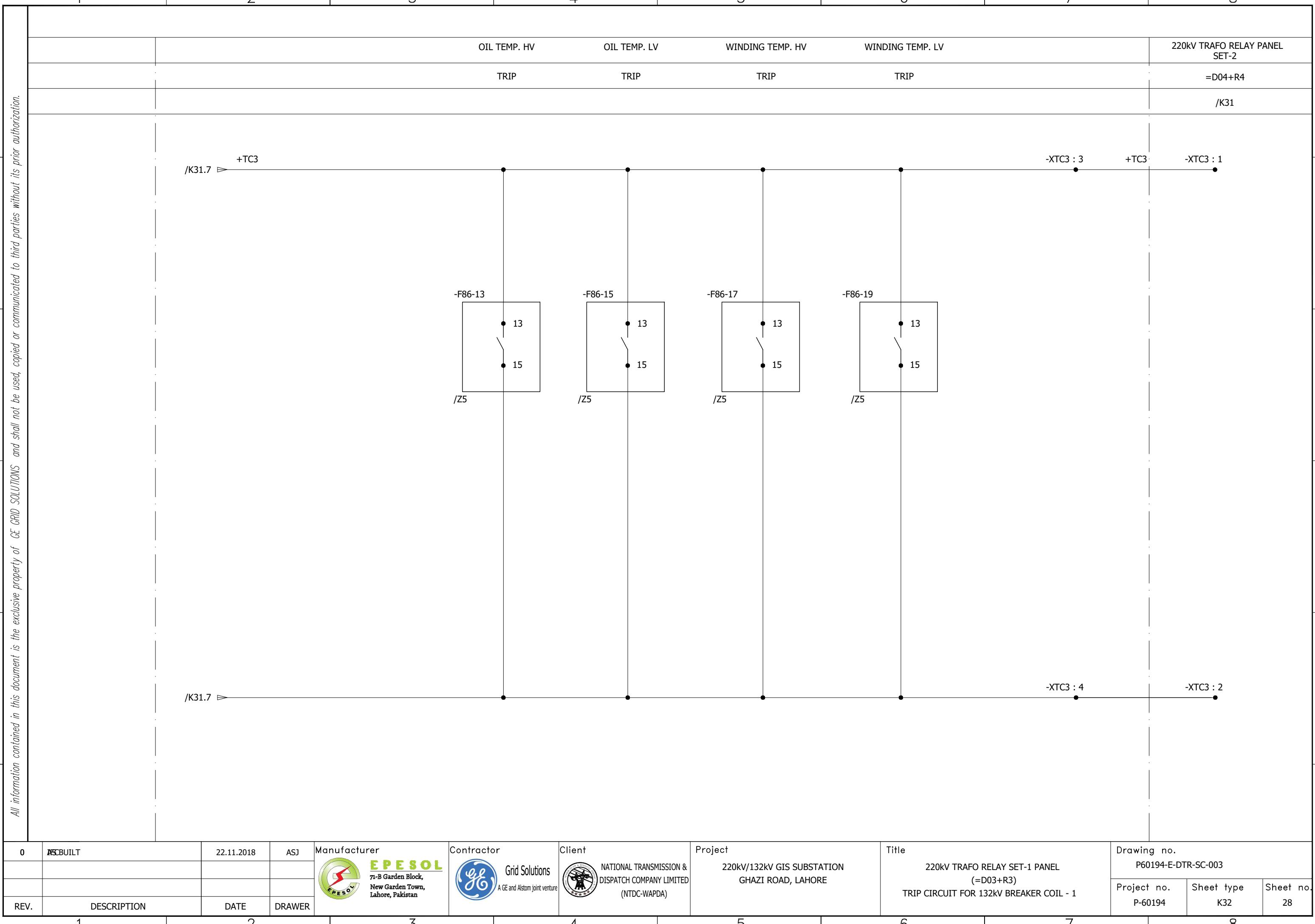
Horizontal lines extend from the right side of each plane to the right edge of the diagram, labeled as follows:

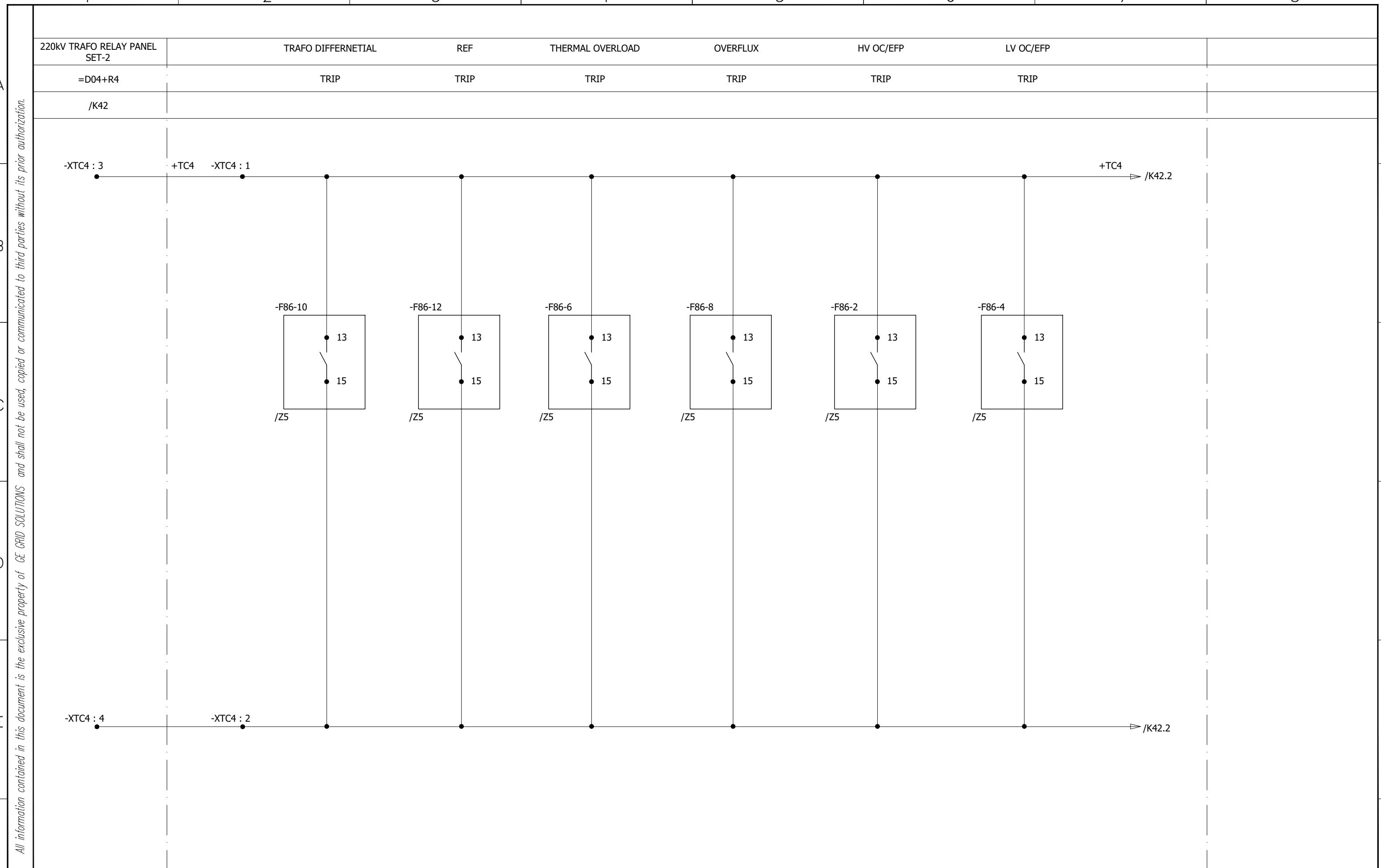
- TC2+:** At the top right.
- XTC2 : 5**: Between the first and second planes.
- TC2+:** Between the second and third planes.
- XTC1 : 1**: At the far right edge.
- XTC2 : 6**: Below the second plane.
- XTC1 : 2**: Below the third plane.
- XTC2 : 7**: Between the second and third planes.
- XTC1 : 3**: Between the second and third planes.
- XTC2 : 8**: Below the third plane.
- XTC1 : 4**: At the far right edge.

Vertical lines also connect the bottom of each plane to the bottom edge of the diagram, labeled **/K22.7**.



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0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220KV LINE RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR 132KV BREAKER COIL - 2	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type K41
								Sheet no. 29	

OIL TEMP. HV

OIL TEMP. LV

WINDING TEMP. HV

WINDING TEMP. LV

220KV CBF PANEL  
SET-1

TRIP

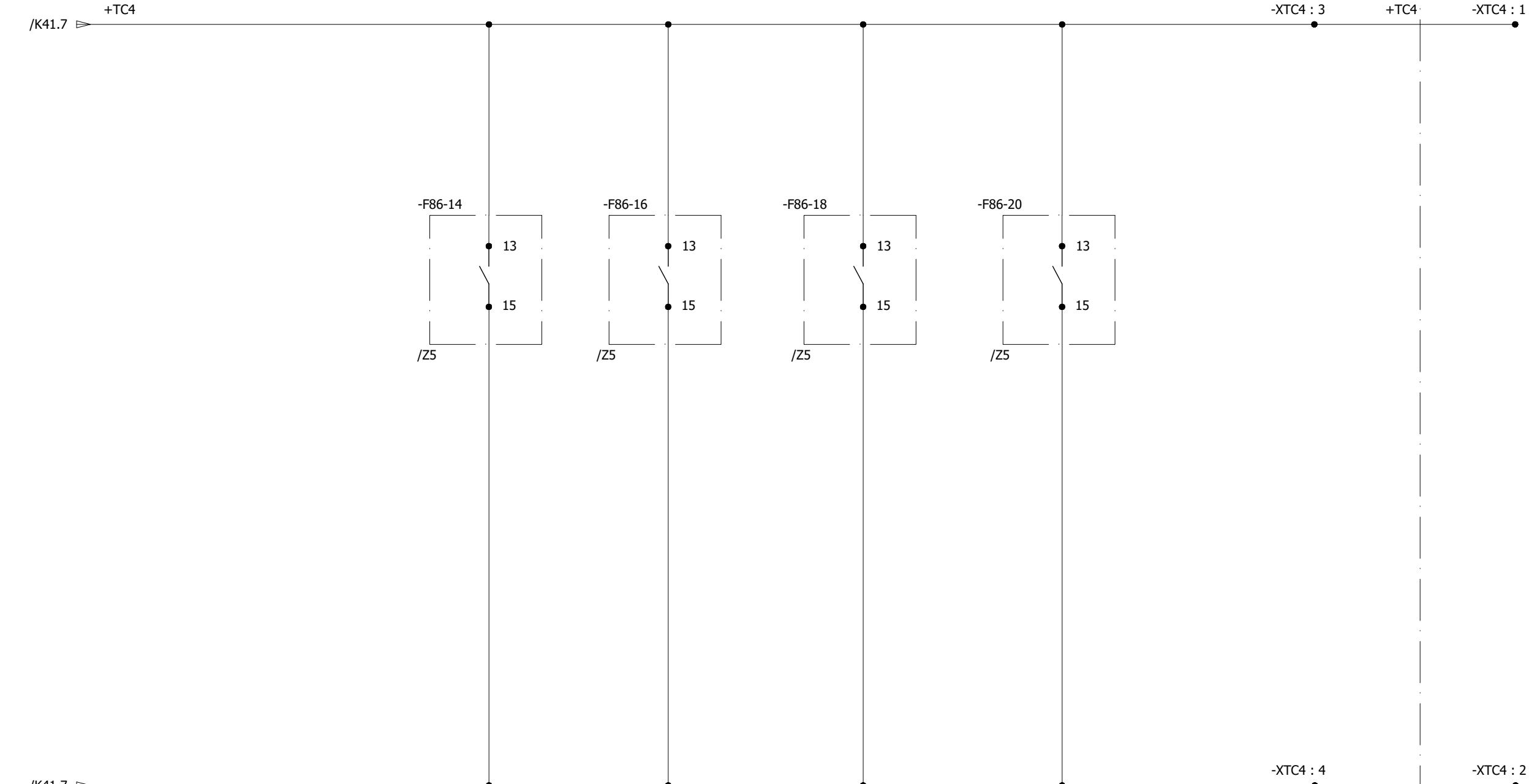
TRIP

TRIP

TRIP

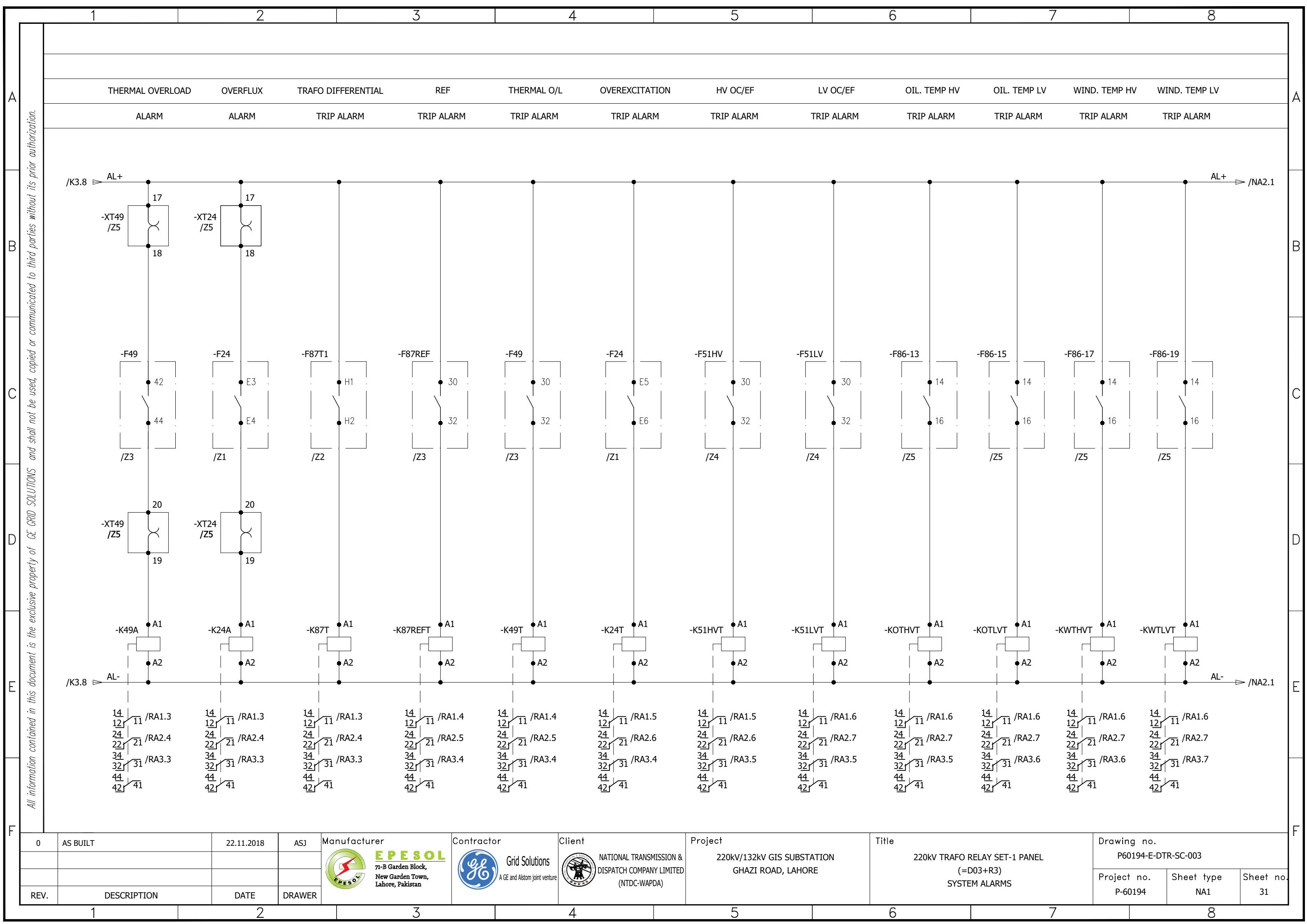
=D00+R5

/Z

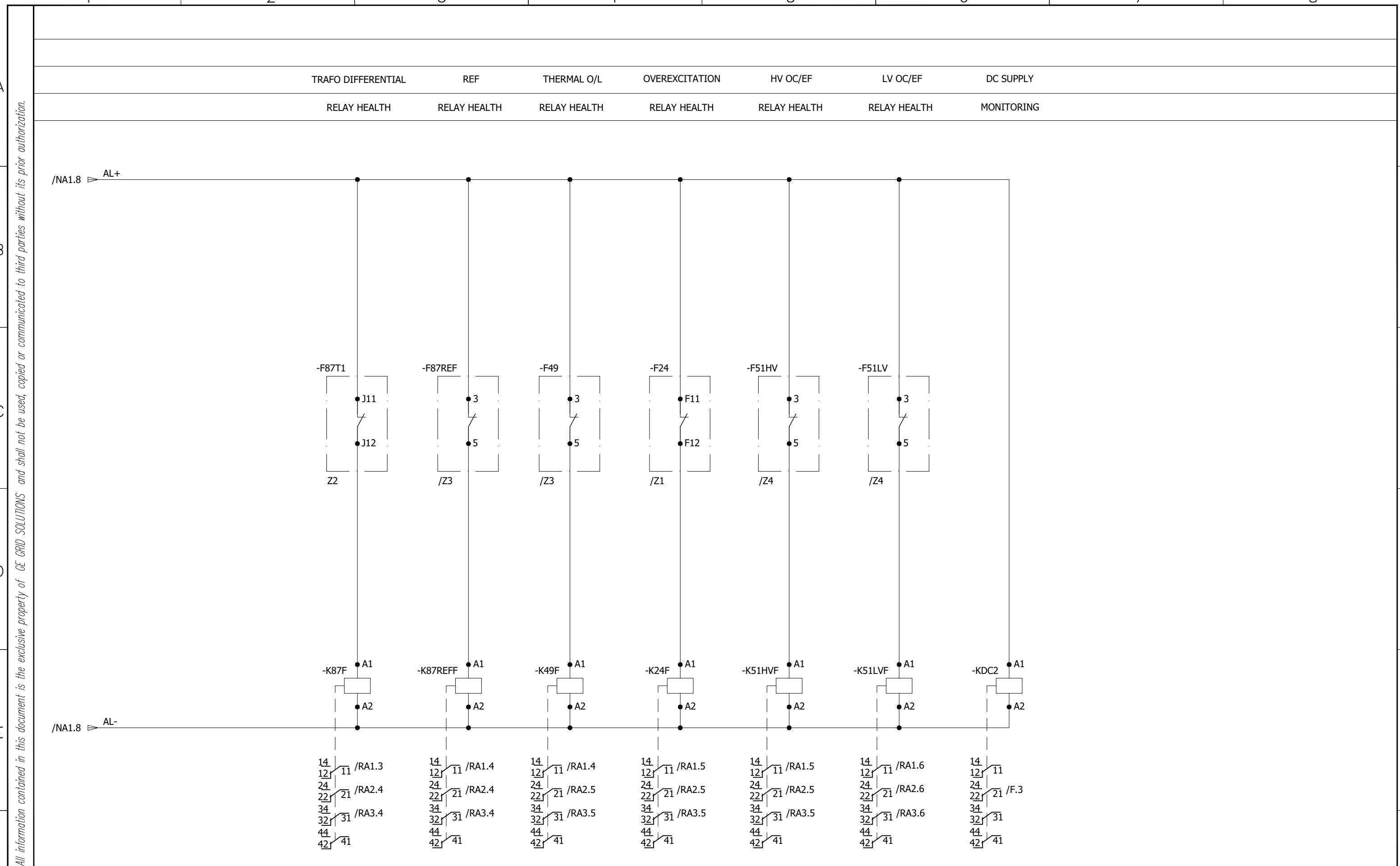


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0	AS BUILT	22.11.2018	ASJ	Manufacturer  <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220KV TRAFO RELAY SET-1 PANEL (=D03+R3) TRIP CIRCUIT FOR 132KV BREAKER COIL - 2	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194
									Sheet type K42
									Sheet no. 30



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0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) SYSTEM ALARMS	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194
									Sheet type NA2
									Sheet no. 32

RESET PUSHBUTTON  
TRIP RELAYS

-S86

/G2.8 R2+ /O2.1

-S86  
/Z1 1  
2

/G2.8 /O2.1

-F86-1 /Z5 -F86-2 /Z5 -F86-3 /Z5 -F86-4 /Z5 -F86-5 /Z5 -F86-6 /Z5 -F86-7 /Z5 -F86-8 /Z5 -F86-9 /Z5 -F86-10 /Z5 -F86-11 /Z5

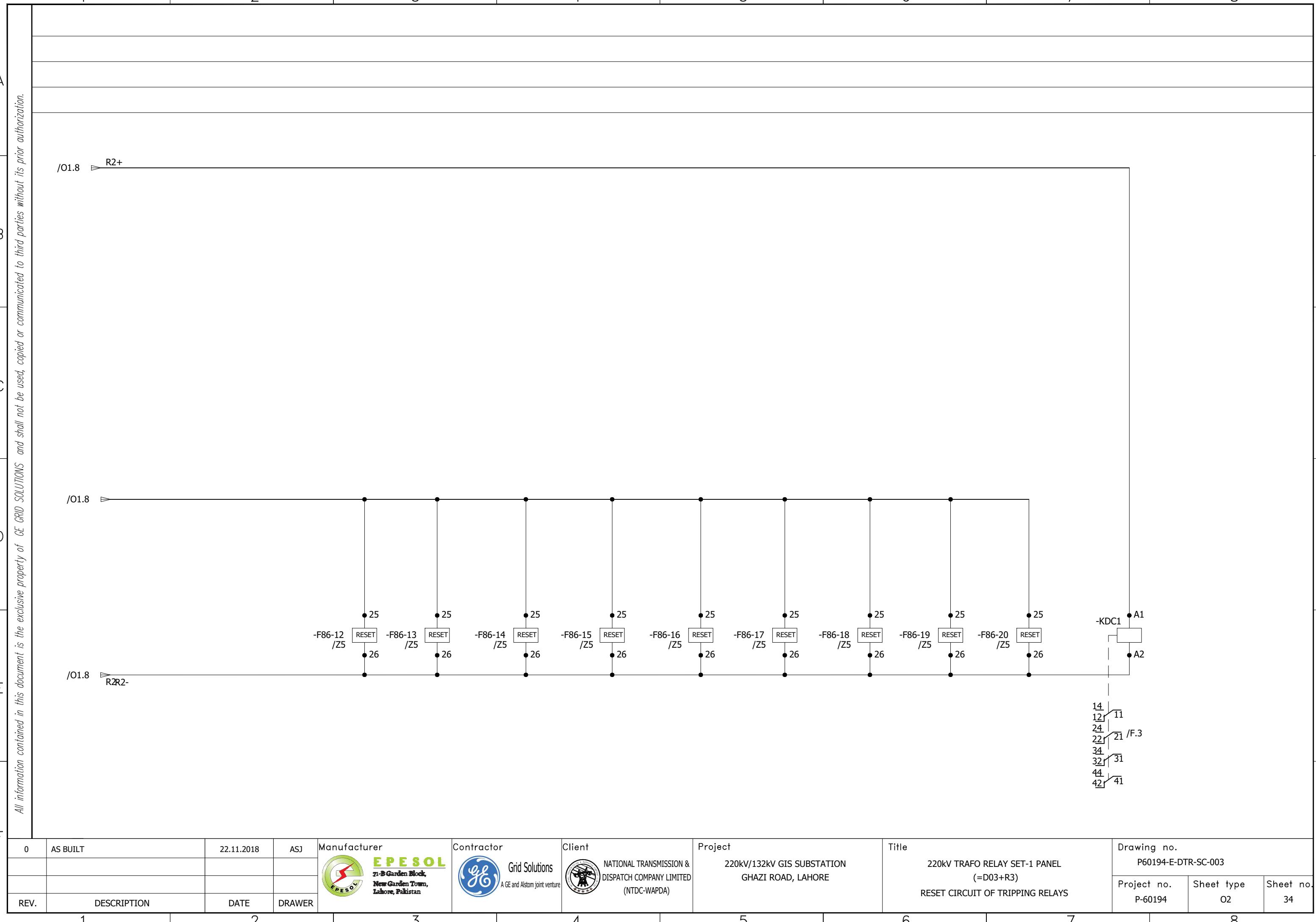
25 25 25 25 25 25 25 25 25 25 25 25  
RESET RESET

26 26 26 26 26 26 26 26 26 26 26 26

/G2.8 R2- /O2.1 R2-

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0	AS BUILT	22.11.2018	ASJ	Manufacturer  <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) RESET CIRCUIT OF TRIPPING RELAYS	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194
									Sheet type O1
									Sheet no. 33



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A

B

C

D

E

F

A

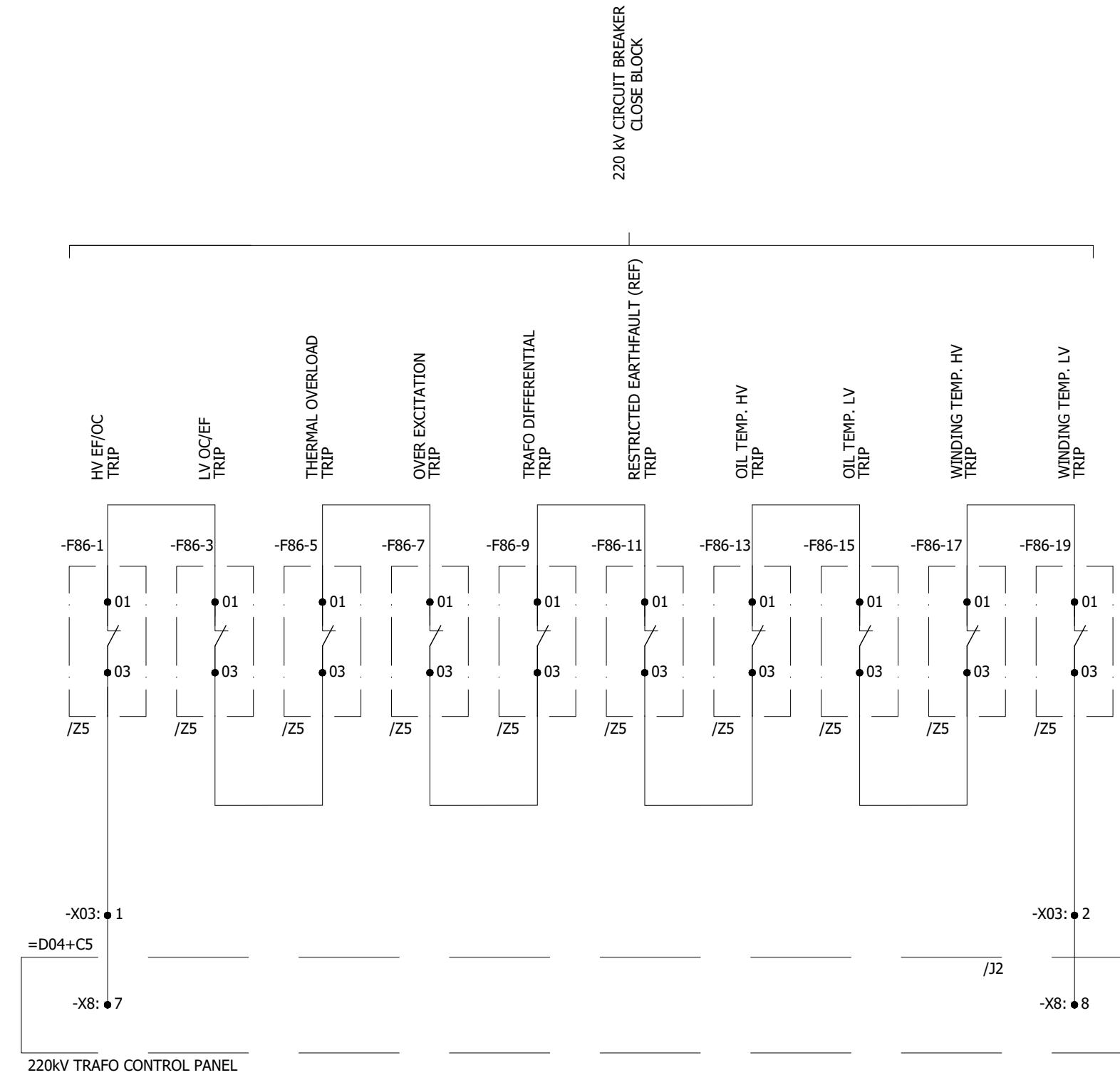
B

C

D

E

F



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A

B

C

D

E

F

A

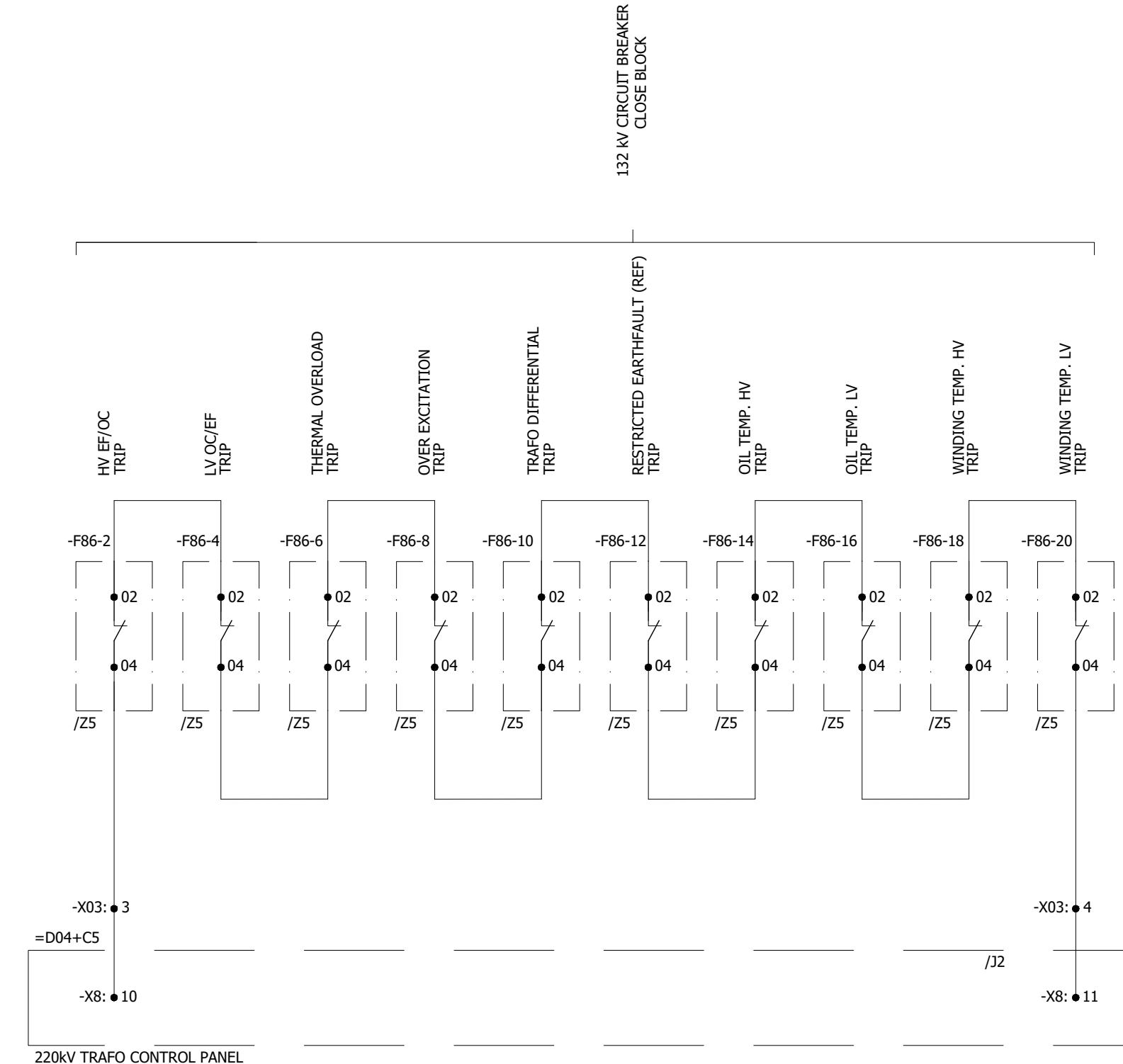
B

C

D

E

F



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A

B

C

D

E

F

A

B

C

D

E

F

0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION INTER-CIRCUITS	Drawing no. P60194-E-DTR-SC-003		
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194	Sheet type PA2	Sheet no. 36

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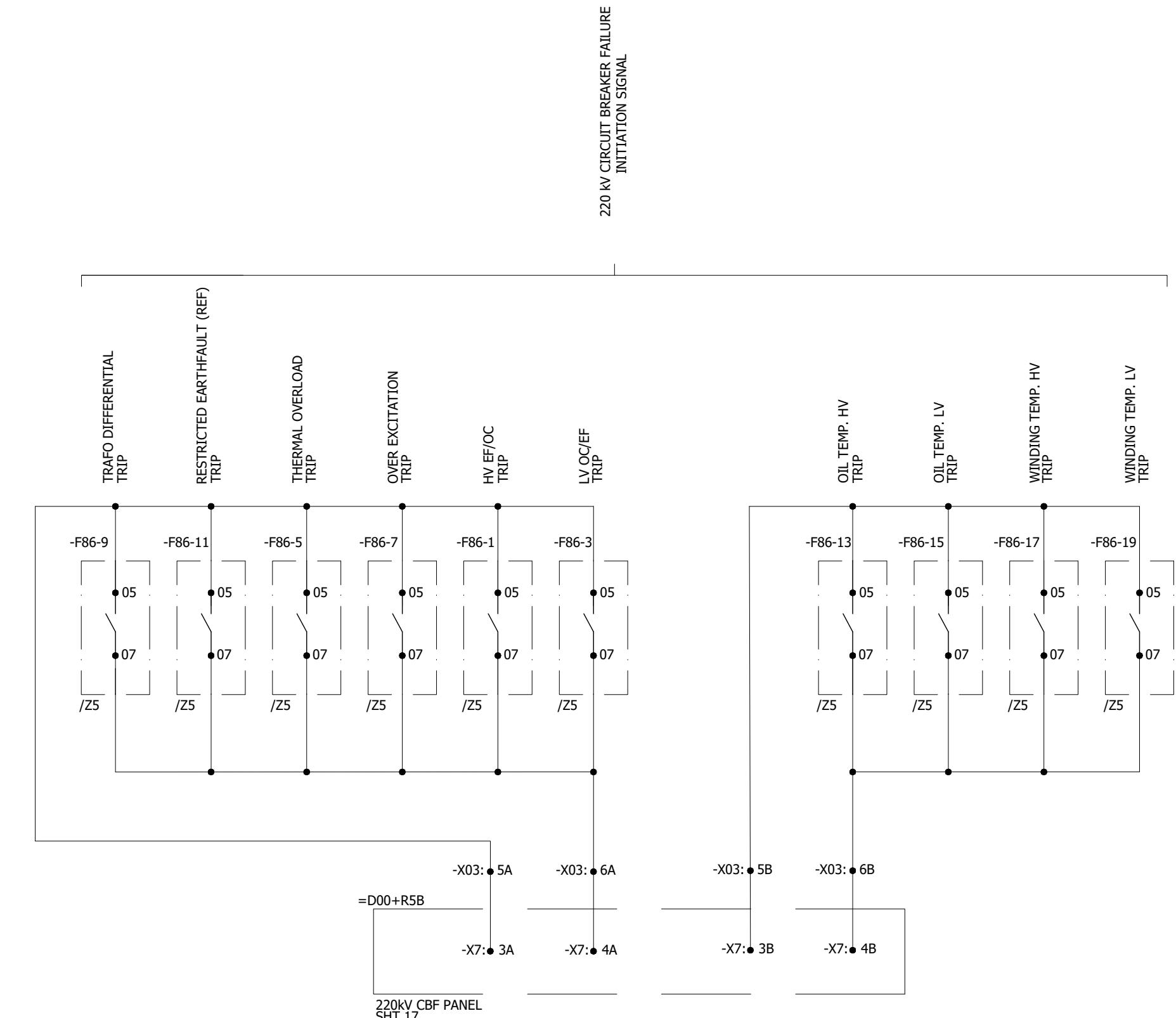
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0	AS BUILT		22.11.2018	ASJ	Manufacturer	Contractor	Client	Project	Title	Drawing no.		
REV.	DESCRIPTION		DATE	DRAWER	EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Grid Solutions A GE and Alstom joint venture	NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION INTER-CIRCUITS	Project no.	Sheet type	Sheet no.
1	2	3	4	5	6	7	8			P-60194	PA3	37

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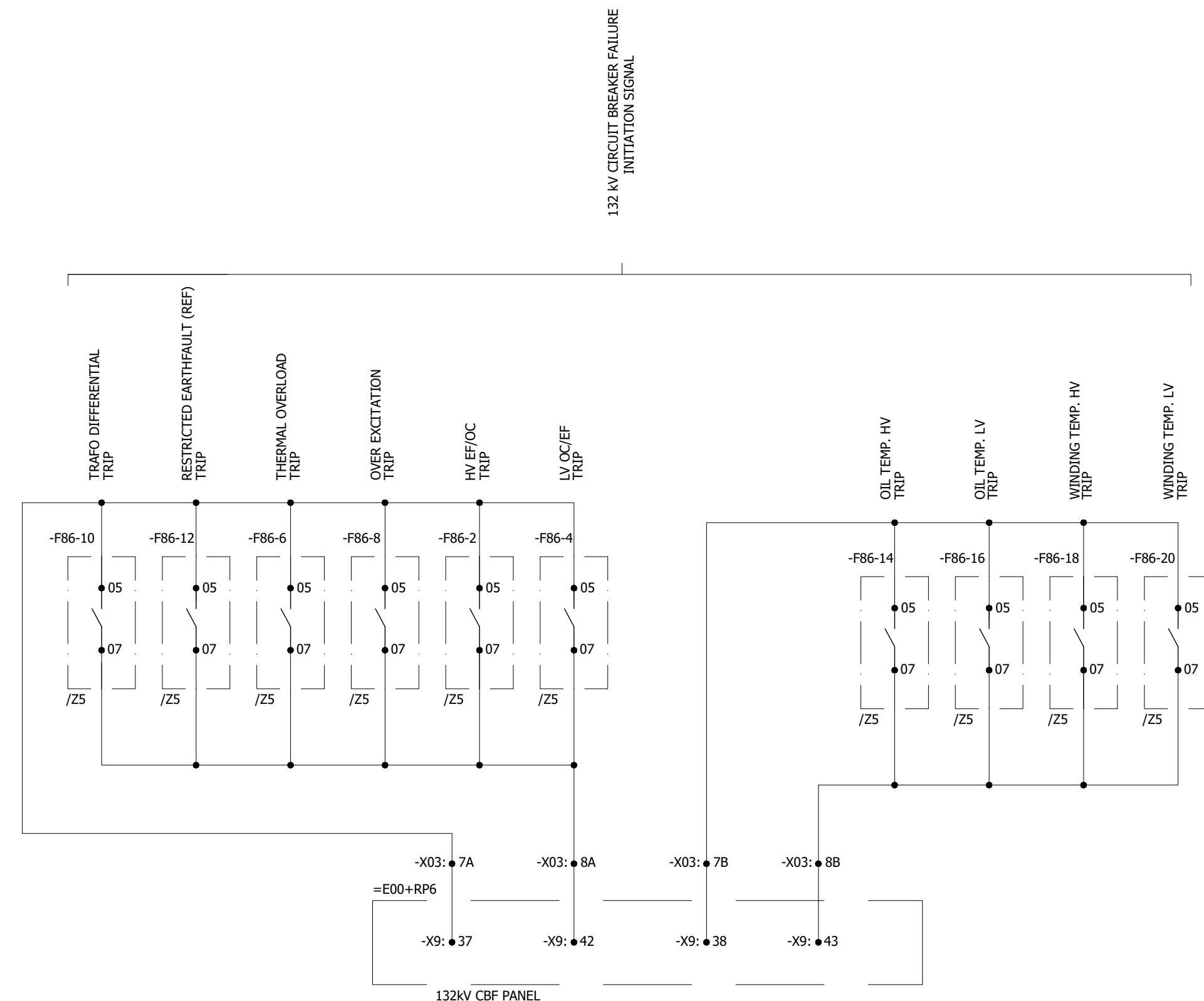
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0	AS BUILT		22.11.2018	ASJ	Manufacturer	Contractor	Client	Project	Title	Drawing no.		
REV.	DESCRIPTION		DATE	DRAWER	EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Grid Solutions A GE and Alstom joint venture	NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	220kV/132kV GIS SUBSTATION GAZI ROAD, LAHORE	220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION INTER-CIRCUITS	P-60194	PA4	38
										Project no.	Sheet type	Sheet no.
1			2		3	4	5	6	7			

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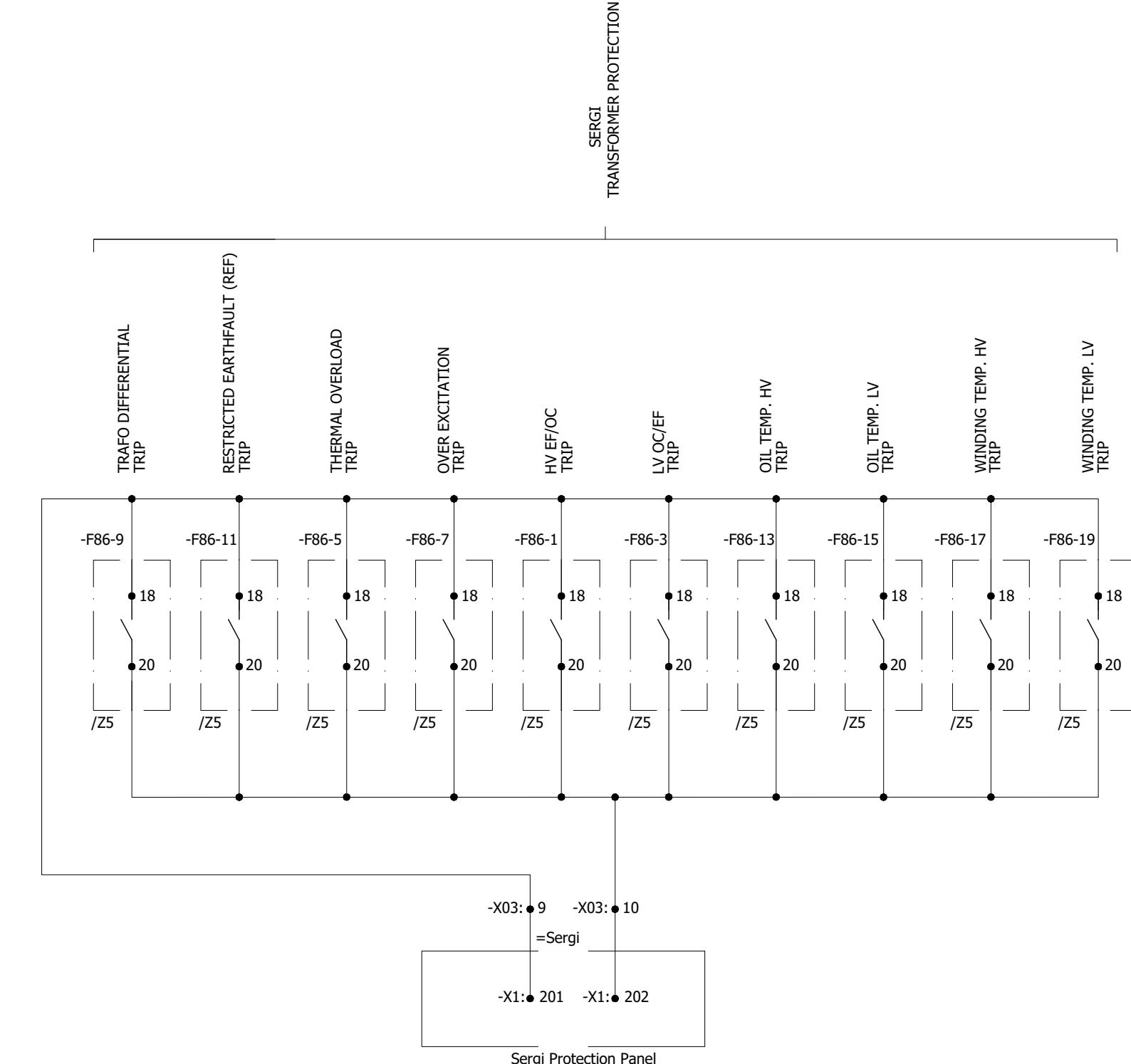
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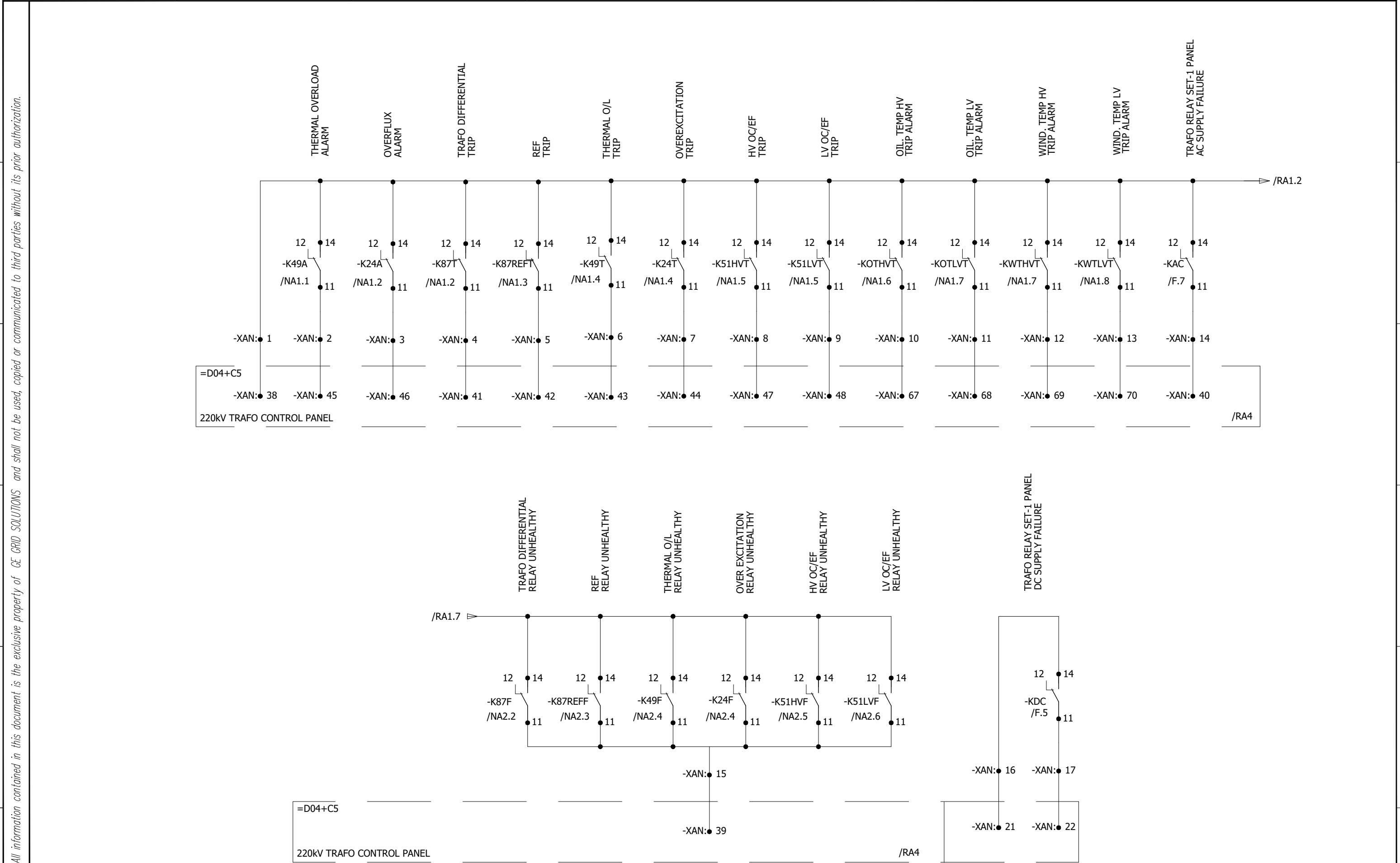
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0	AS BUILT	22.11.2018	ASJ	Manufacturer <b>EPE SOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor <b>Grid Solutions</b> A GE and Alstom joint venture	Client <b>NATIONAL TRANSMISSION &amp; DISPATCH COMPANY LIMITED (NTDC-WAPDA)</b>	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) PROTECTION INTER-CIRCUITS	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194
									Sheet type PA5
									Sheet no. 39

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0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPE SOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) ANNUNCIATION CIRCUIT	Drawing no. P60194-E-DTR-SC-003
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194 Sheet type RA1 Sheet no. 40
1	2	3	4	5	6	7	8		

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THERMAL OVERLOAD ALARM

OVERFLUX ALARM

TRAFO DIFFERENTIAL TRIP

REF TRIP

THERMAL O/L TRIP

OVEREXCITATION TRIP

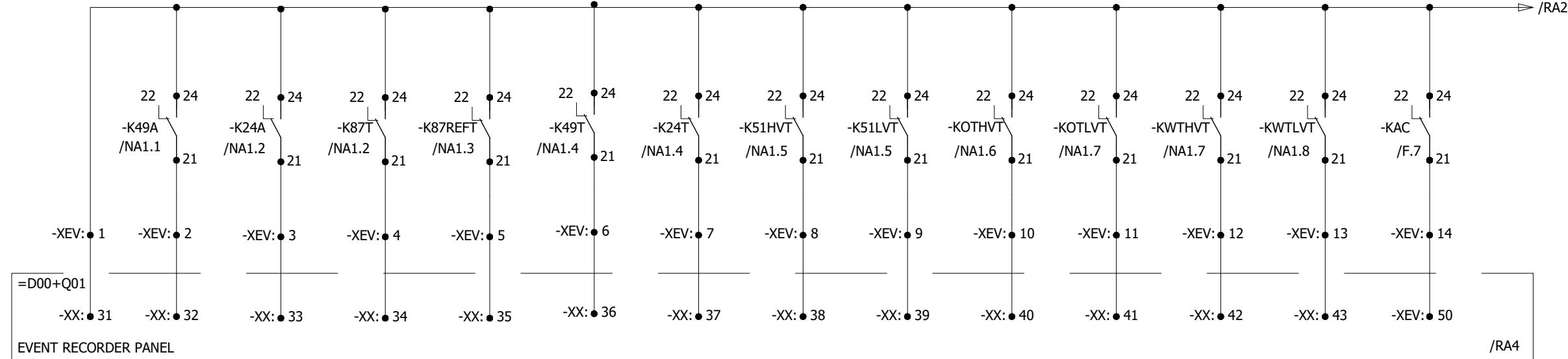
HV OC/EF TRIP

LV OC/EF TRIP

OIL TEMP HV TRIP ALARM

WIND, TEMP LV TRIP ALARM

TRAFO RELAY SET-1 PANEL AC SUPPLY FAILURE



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TRAFO DIFFERENTIAL RELAY UNHEALTHY

REF RELAY UNHEALTHY

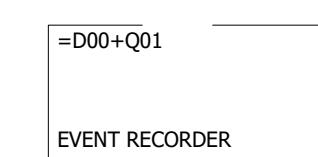
THERMAL O/L RELAY UNHEALTHY

OVER EXCITATION RELAY UNHEALTHY

HV OC/EF RELAY UNHEALTHY

LV OC/EF RELAY UNHEALTHY

TRAFO RELAY SET-1 PANEL DC SUPPLY FAILURE



REV.

DESCRIPTION

DATE

DRAWER



Grid Solutions  
A GE and Alstom joint venture



NATIONAL TRANSMISSION &  
DISPATCH COMPANY LIMITED  
(NTDC-WAPDA)

Project  
220kV/132kV GIS SUBSTATION  
GHAZI ROAD, LAHORE

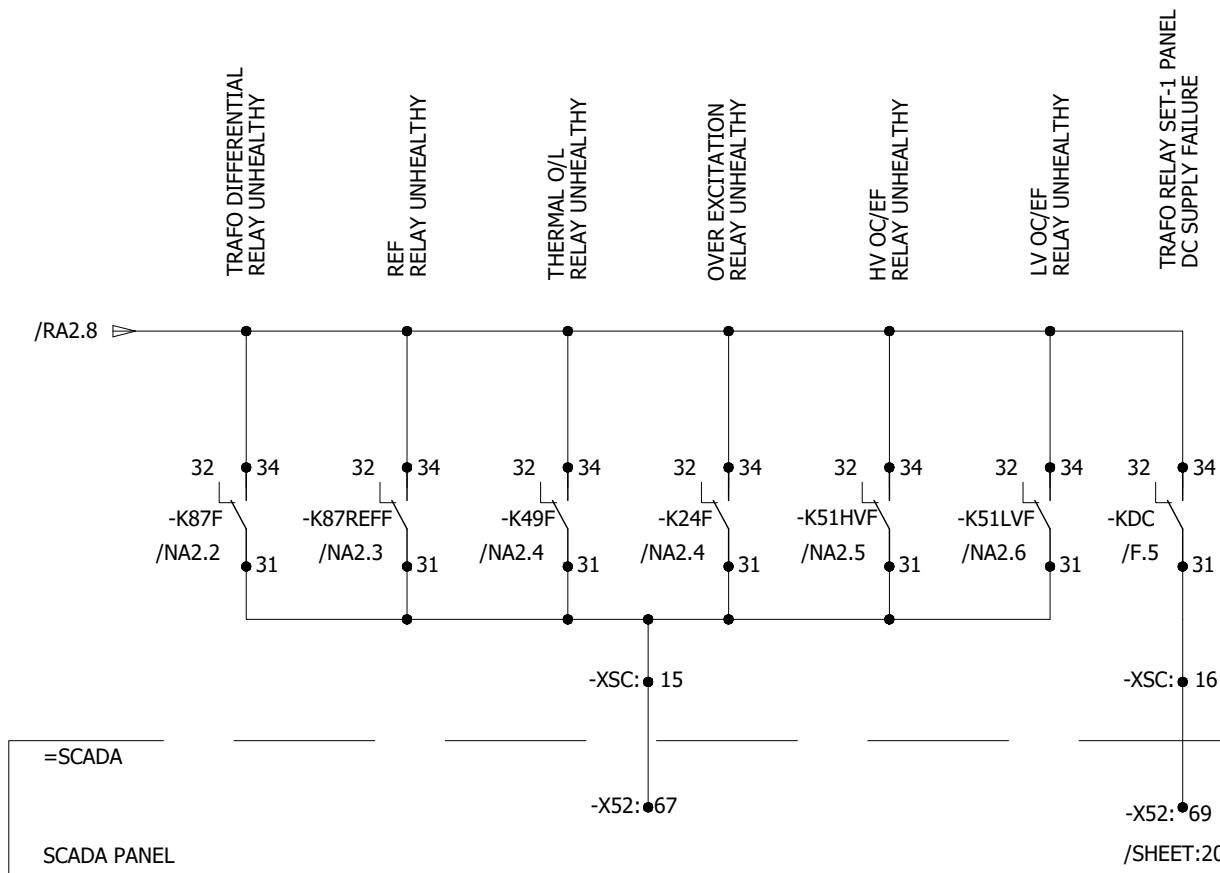
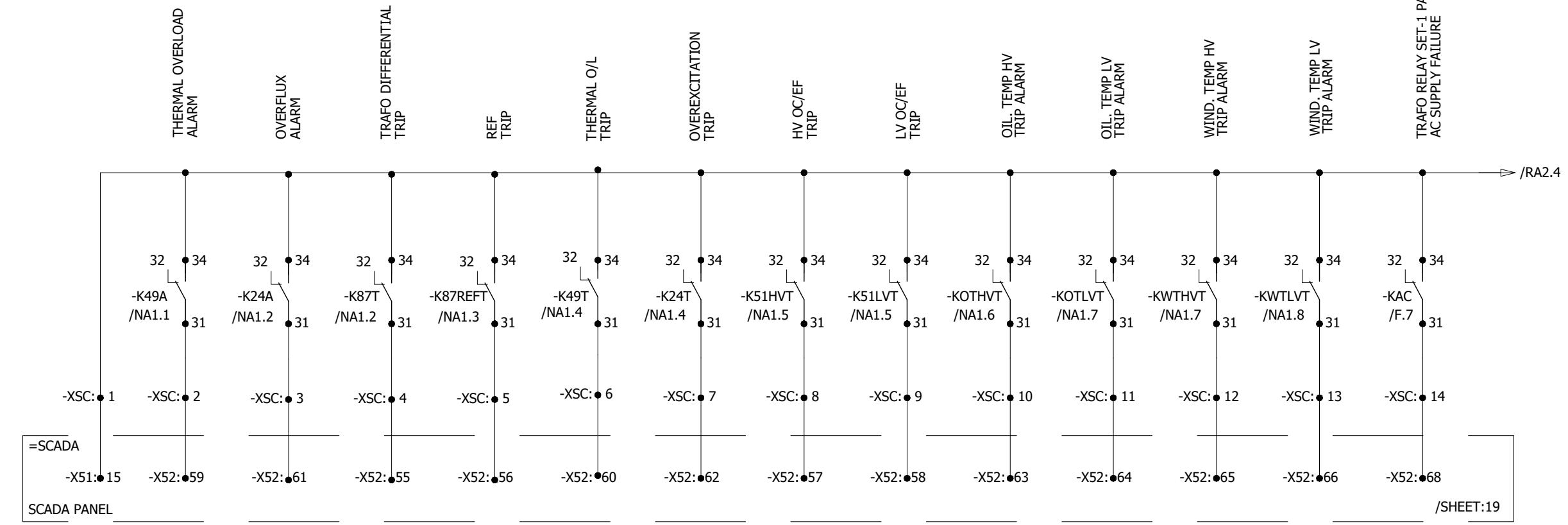
Title  
220kV TRAFO RELAY SET-1 PANEL  
(=D03+R3)  
EVENT RECORDER CIRCUITS

Drawing no.  
P60194-E-DTR-SC-003

Project no. P-60194 Sheet type RA2 Sheet no. 41

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0	AS BUILT		22.11.2018	ASJ	Manufacturer  EPESOL 71-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) SCADA CIRCUIT	Drawing no. P60194-E-DTR-SC-003		
REV.	DESCRIPTION		DATE	DRAWER						Project no. P-60194	Sheet type RA3	Sheet no. 42
1	2	3	4	5	6	7	8					



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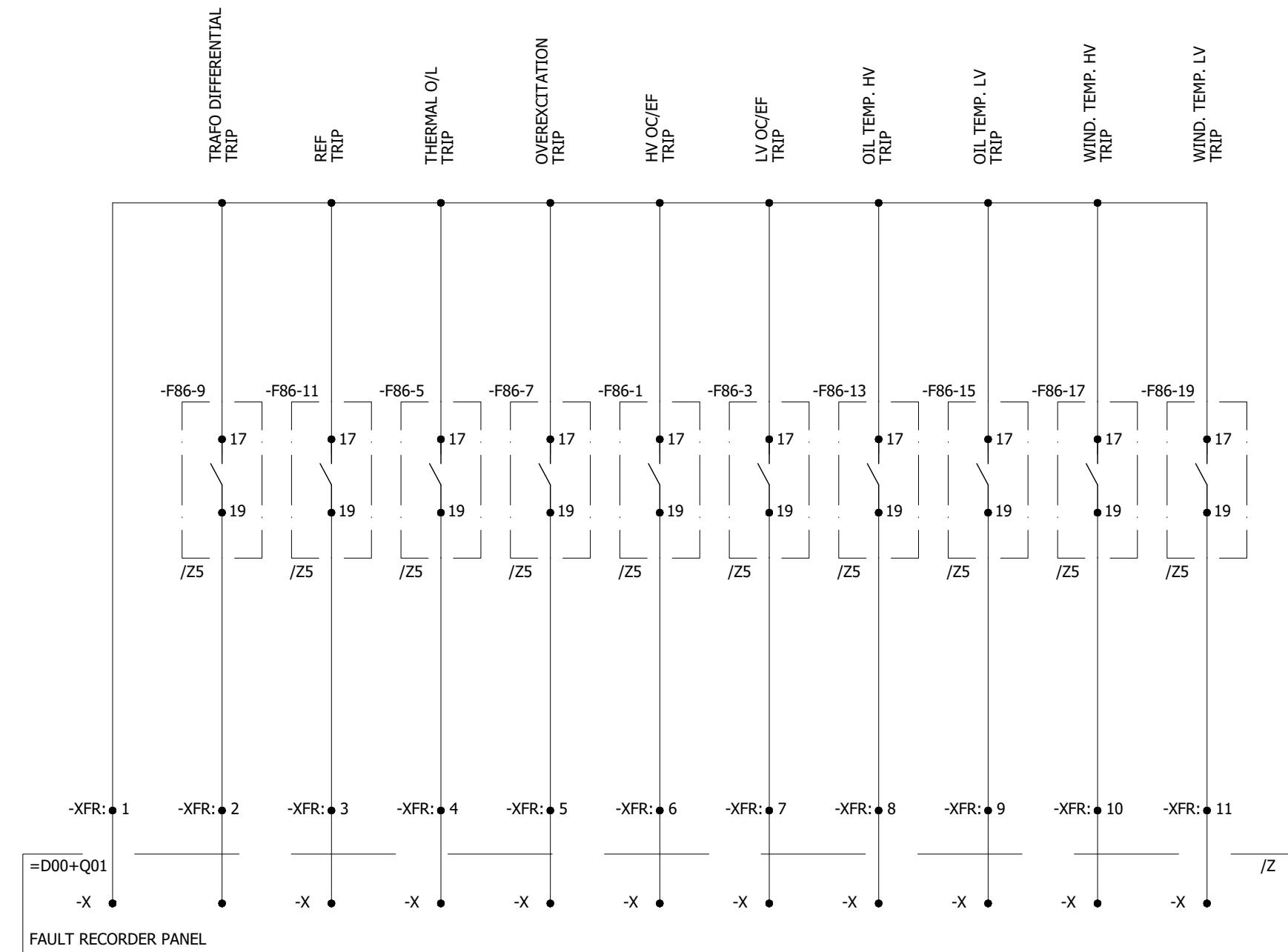
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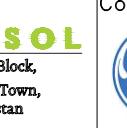
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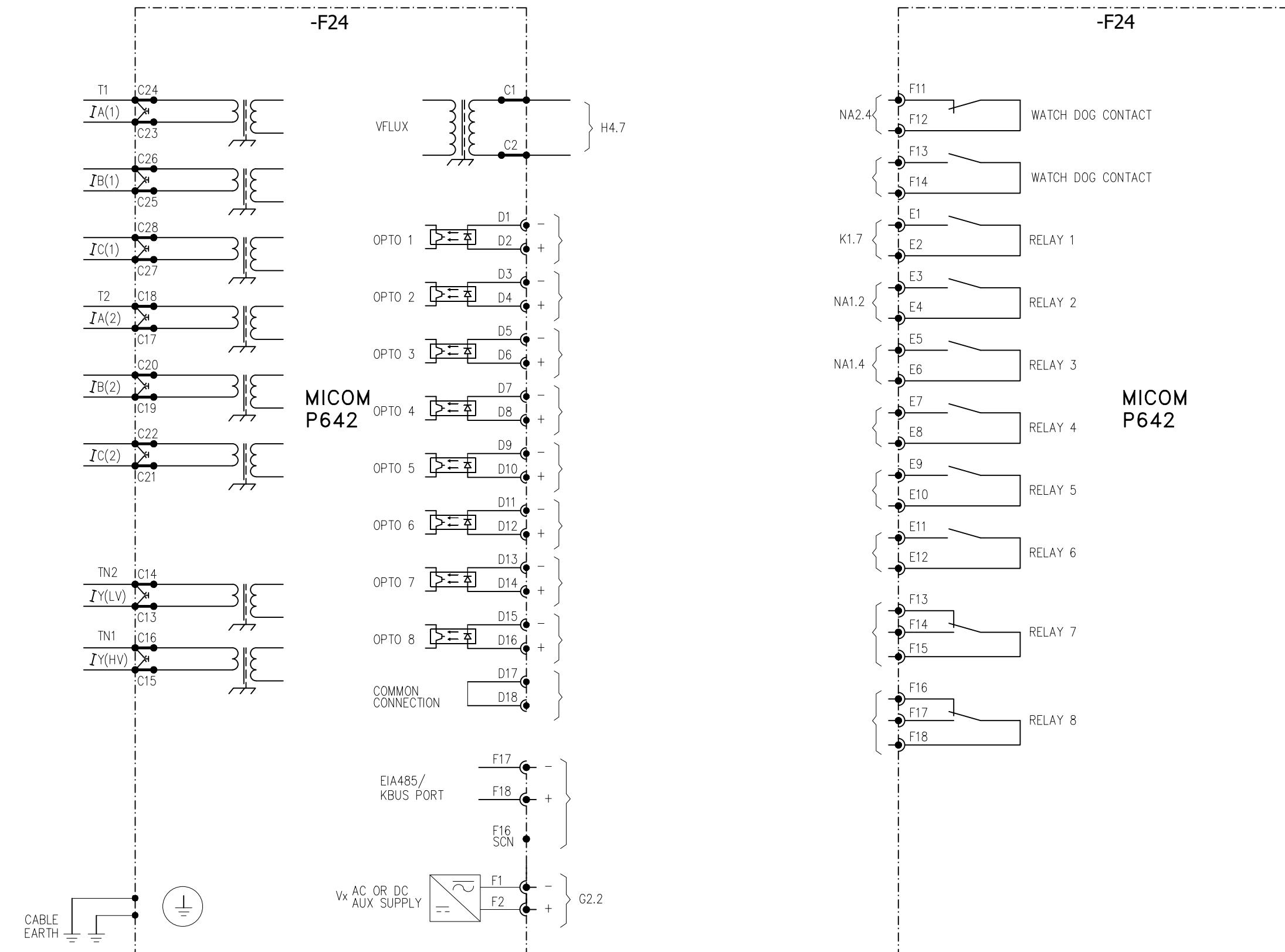
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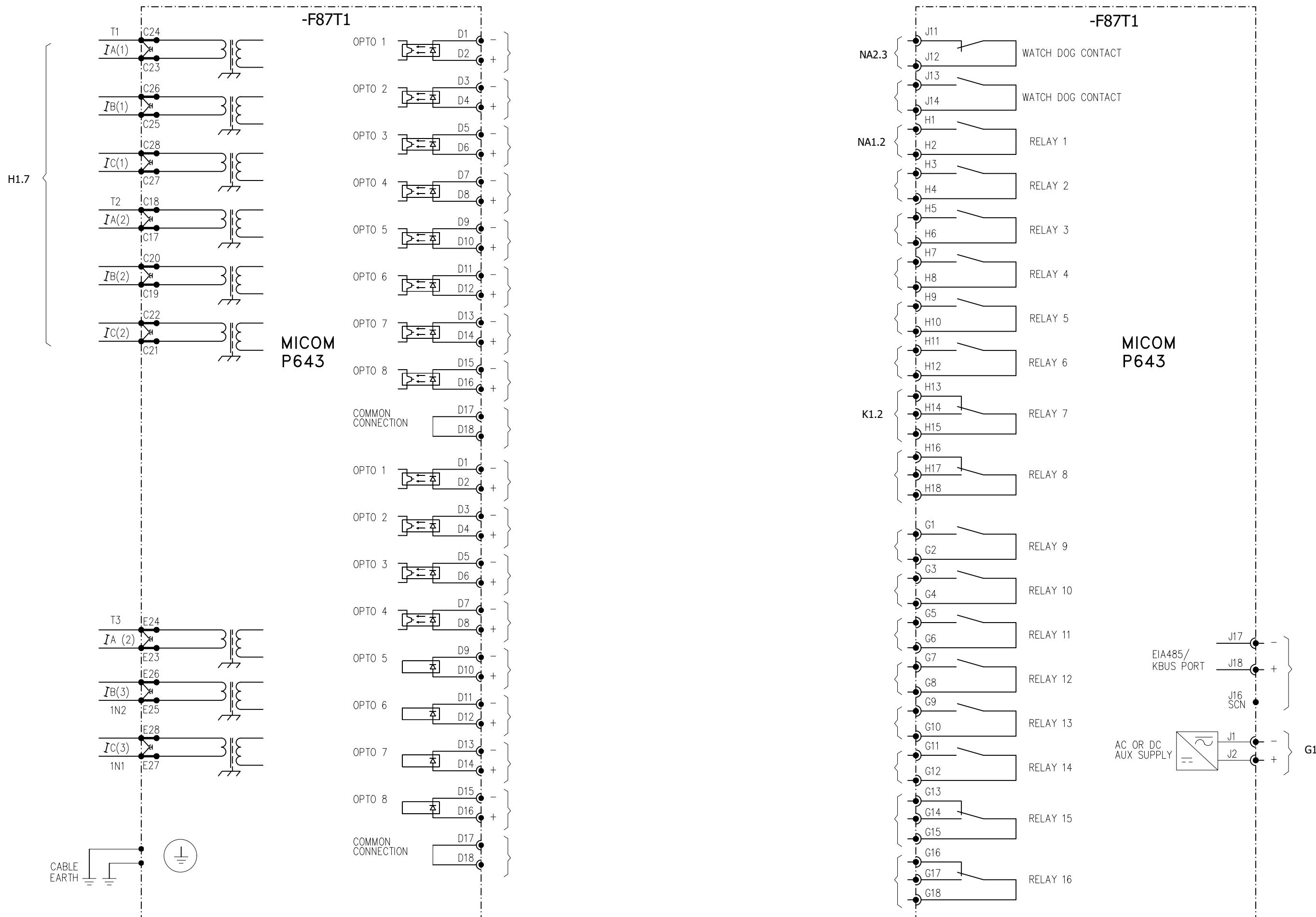
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REV.	DESCRIPTION	DATE	DRAWER					Project no. P-60194	Sheet type RA4	Sheet no. 43

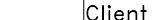
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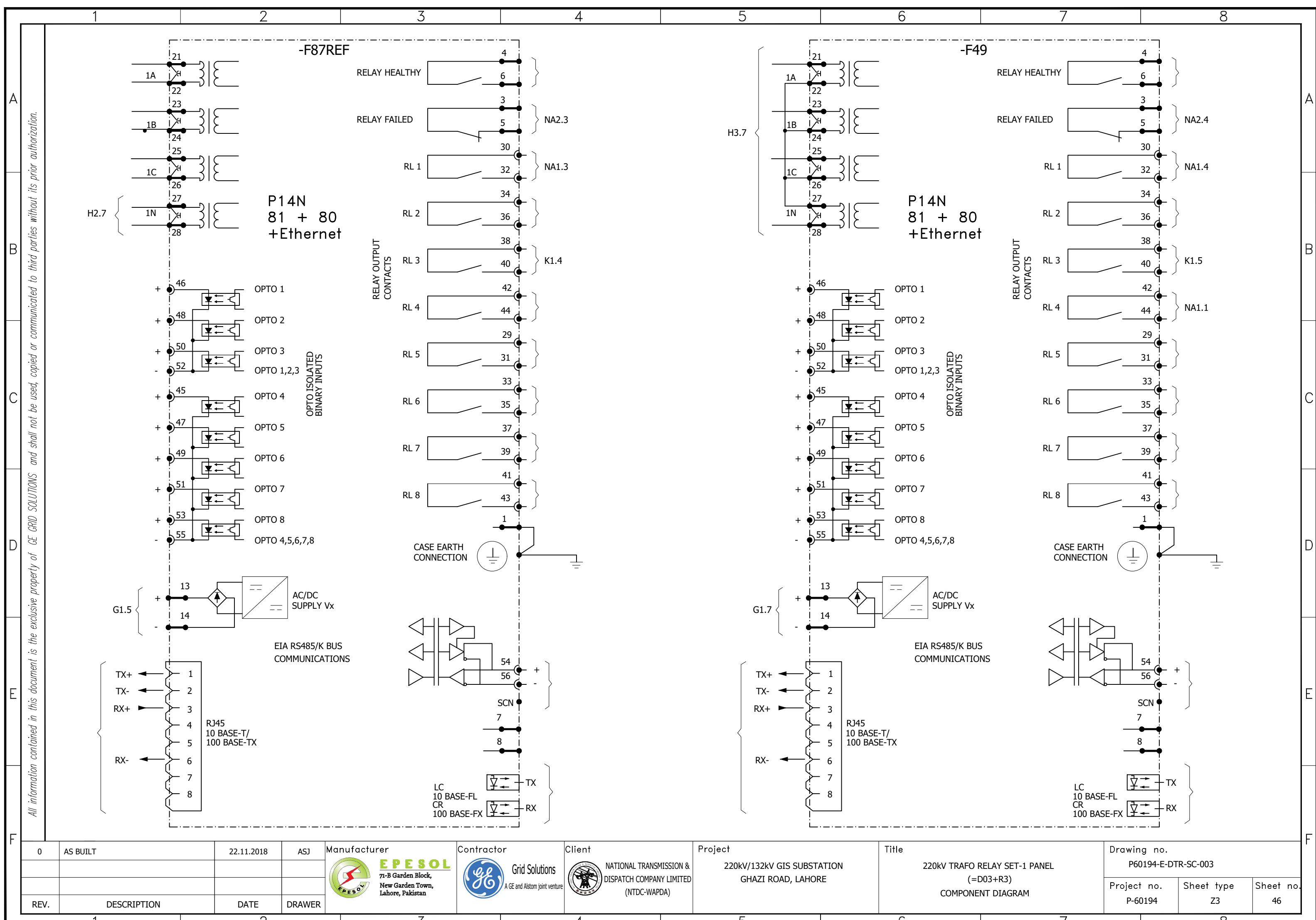


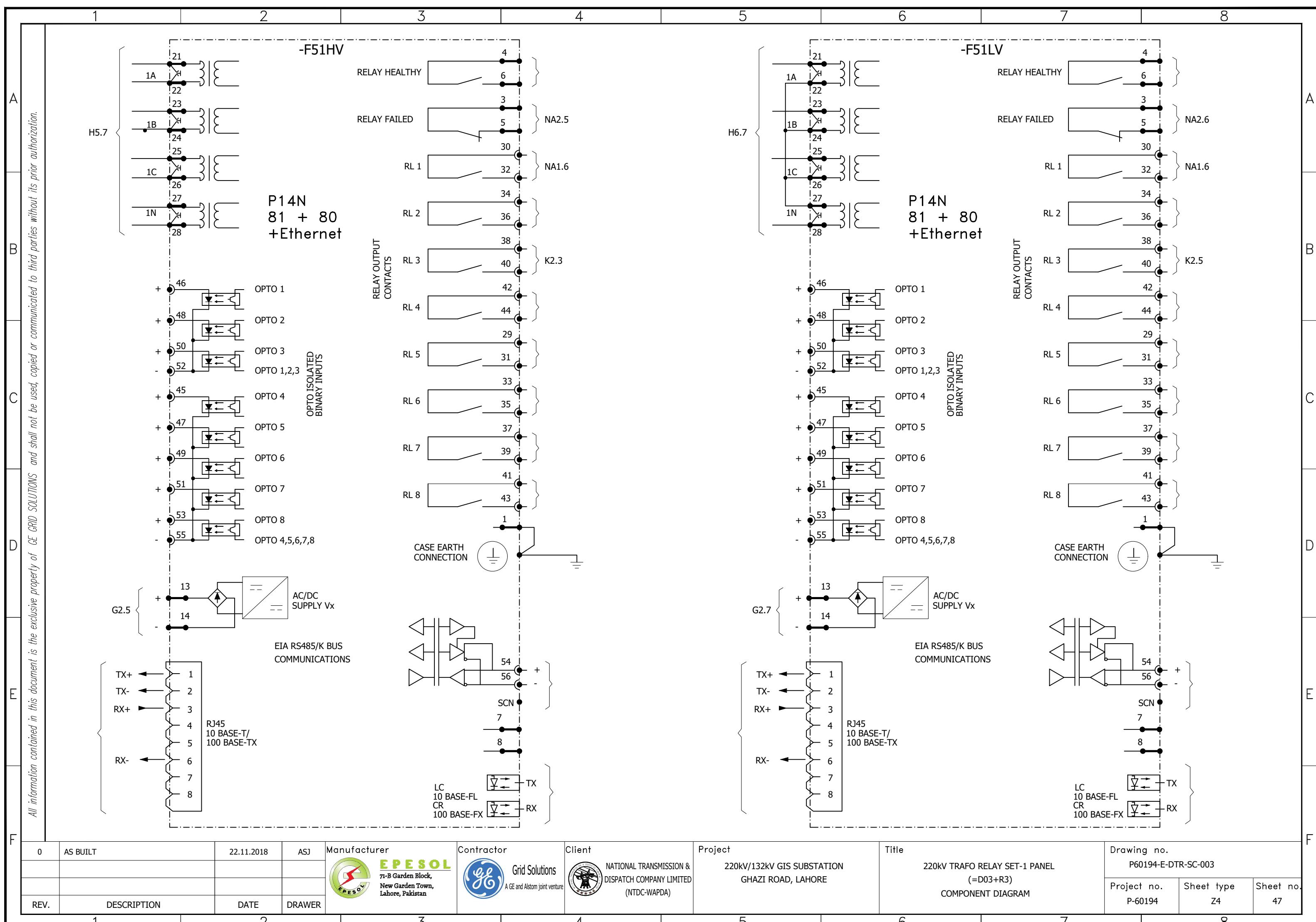
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REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194	Sheet type Z1	Sheet no. 44

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0	AS BUILT	22.11.2018	ASJ	<b>Manufacturer</b>  <b>EPESOL</b> 71-B Garden Block, New Garden Town, Lahore, Pakistan	<b>Contractor</b>  Grid Solutions A GE and Alstom joint venture	<b>Client</b>  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	<b>Project</b> 220kV/132kV GIS SUBSTATION GHAZI ROAD, LAHORE	<b>Title</b> 220kV TRAFO RELAY SET-1 PANEL (=D03+R3) COMPONENT DIAGRAM	<b>Drawing no.</b>		
								P60194-E-DTR-SC-003			
REV.	DESCRIPTION	DATE	DRAWER					<b>Project no.</b>	Sheet type	Sheet no.	
								P-60194	Z2	45	





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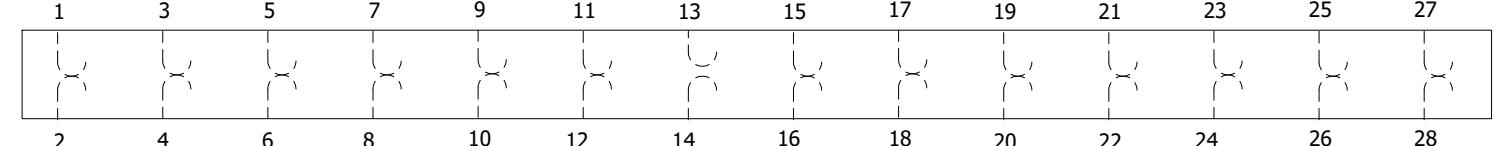
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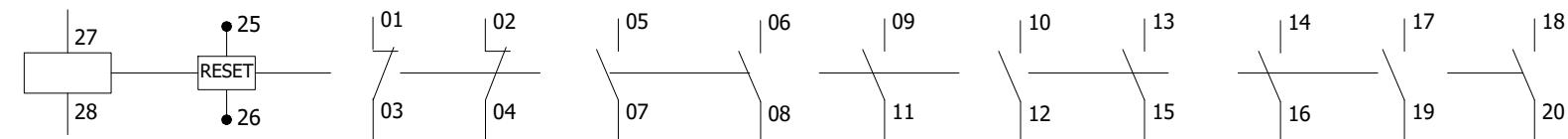
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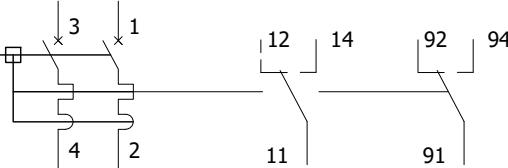


-XT87T	H1.5	K1.2	G1.2		H1.5
-XT87REF		K1.4	G1.5		H2.5
-XT49	H3.5	K1.6	G1.7	NA1.1	H3.5
-XT24	H4.5	K1.7	G2.2	NA1.2	
-XT51HV	H5.5	K2.3	G2.5		H5.5
-XT51LV	H6.5	K2.5	G2.7		H6.5

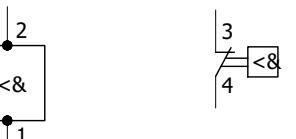


-F86-9	K1.2	O1.2	PA1.3		PA3.3	K11	K11	K11		RA4.3	PA5.3
-F86-10	K1.3	O1.2		PA2.3	PA4.3	K21	K21	K21	K41		
-F86-11	K1.4	O1.3	PA1.3		PA3.3	K11	K11	K11	K31	RA4.3	PA5.3
-F86-12	K1.4	O1.3		PA2.3	PA4.3	K21	K21	K21	K41		
-F86-5	K1.5	O1.4	PA1.4		PA3.4	K11	K11	K11	K31	RA4.4	PA5.4
-F86-6	K1.6	O1.4		PA2.4	PA4.4	K21	K21	K21	K41		
-F86-7	K1.7	O1.5	PA1.4		PA3.4	K11	K11	K11	K31	RA4.4	PA5.4
-F86-8	K1.7	O1.5		PA2.4	PA4.4	K21	K21	K21	K41		
-F86-1	K2.3	O1.6	PA1.4		PA3.4	K12	K12	K12	K31	RA4.4	PA5.4
-F86-2	K2.3	O1.6		PA2.4	PA4.4	K22	K22	K22	K41		
-F86-3	K2.4	O1.7	PA1.5		PA3.5	K12	K12	K12	K31	RA4.5	PA5.5
-F86-4	K2.5	O2.2		PA2.5	PA4.5	K22	K22	K22	K41		
-F86-13	K3.2	O2.2	PA1.5		PA3.5	K12	K12	K12	K32	NA1.6	RA4.5
-F86-14	K3.3	O2.3		PA2.5	PA4.5	K22	K22	K22	K42		
-F86-15	K3.4	O2.3	PA1.5		PA3.5	K13	K13	K13	K32	NA1.7	RA4.5
-F86-16	K3.4	O2.4		PA2.5	PA4.5	K23	K23	K23	K42		
-F86-17	K3.5	O2.4	PA1.6		PA3.6	K13	K13	K13	K32	NA1.7	RA4.6
-F86-18	K3.6	O2.5		PA2.6	PA4.6	K23	K23	K23	K42		
-F86-19	K3.7	O2.5	PA1.6		PA3.6	K13	K13	K13	K32	NA1.8	RA4.6
-F86-20	K3.8	O2.6		PA2.6	PA4.6	K23	K23	K23	K42		

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-F101	D.2	F.6	
-F102	D.4	F.6	
-F103	D.6	F.6	
-F201	E.2	F.2	
-F202	E.3	F.2	
-F203	E.4	F.2	
-F204	E.5	F.3	



-B100	D.4	D.5
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-S86	G.2	
-X100	D.7	



-S100	D.3	
-H100	D.3	
-H200	F.4	

0	AS BUILT	22.11.2018	ASJ	Manufacturer  EPEPSOL 7-B Garden Block, New Garden Town, Lahore, Pakistan	Contractor  Grid Solutions A GE and Alstom joint venture	Client  NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)	Project 220KV/132KV GIS SUBSTATION GHAZI ROAD, LAHORE	Title 220KV TRAFO RELAY SET-1 PANEL (=D03+R3) COMPONENT DIAGRAM	Drawing no. P60194-E-DTR-SC-003		
REV.	DESCRIPTION	DATE	DRAWER						Project no. P-60194	Sheet type Z5	Sheet no. 48
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