Grid Solutions
A GE and Alstom joint venture

220kV/132kV GIS SUBSTATION GHAZI ROAD , LAHORE

220kV CB FAILURE PROTECTION PANEL (=D00+R5A) 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
3.		
4.		

REVISION HISTORY

REV	DATE	DRW. BY	CHK. BY	APR. BY	REVISION DESCRIPTION
0	10.10.2018	ASJ	MSC	NAH	AS BUILT

Scale: NOT-TO-SCALE

Sheet size: A3

Client: NATIONAL TRANSMISSION & DISPATCH COMPANY LIMITED (NTDC-WAPDA)

Contractor: Grid Solutions, A GE and Alstom joint venture

Manufacturer: EPESOL, 71-B Garden Block, New Garden Town, Lahore, Pakistan

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

Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) SCHEMATIC DRAWINGS

Order no: P-60194

Document no: P60194-E-DFR-SC-001

Sheet type: A

Total sheets: 48

Sheet no: 1

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PAGE NO.	SHEET NAME	SHEET DESCRIPTION	ISSUE / REVISION										
			A	B	C	D	E	F	01	02	03	04	05
01	A	Cover Sheet	X										
02	AA	List Of Contents	X										
03	AA1	List Of Contents	X										
04	AB	Symbols and Legends	X										
05	AC	Component List	X										
06	AC1	Component List	X										
07,7a	AD,AD1	Panel View	X										
08	AE1	Bay Concept & Protection Logics	X										
09	AE2	Bay Breakers Trip Logic	X										
10	D	AC Supply Distribution Circuit	X										
11	E	DC Supply Distribution Circuit	X										
12	F	AC/DC Supply Failure Circuits	X										
13	G	Relay Control & Supply Circuits	X										
14	H1	Breaker Failure Relay CT Circuit	X										
15	H2	Breaker Failure Relay CT Circuit	X										
16	I1	CBF Relay Input Circuit-50BF1 (D01)	X										
17	I2	CBF Relay Input Circuit-50BF2 (D02)	X										
18	I3	CBF Relay Input Circuit-50BF3 (D05)	X										
19	I4	CBF Relay Input Circuit-50BF4 (D08)	X										
20	J	Common Reset Tripping Relays	X										
21	K1	Stage 1 Trip Circuit	X										
22	K2	Stage 2 Trip Circuit	X										
23	K3	Stage 1 Contact Multiplication	X										
24	K4	Stage 2 Contact Multiplication	X										
25	K5	Stage 2 Contact Multiplication	X										
26	K11	Trip Circuit for Coil-1 (D01)	X										
27	K12	Trip Circuit for Coil-2 (D01)	X										
28	K21	Trip Circuit for Coil-1 (D02)	X										
29	K22	Trip Circuit for Coil-2 (D02)	X										
30	K31	Trip Circuit for Coil-1 (D05)	X										
31	K32	Trip Circuit for Coil-2 (D05)	X										
32	K41	Trip Circuit for Coil-1 (D08)	X										

REV.	DESCRIPTION	DATE	DRAWER
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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) LIST OF CONTENTS

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AA1	02

PAGE NO.	SHEET NAME	SHEET DESCRIPTION	ISSUE / REVISION										
			A	B	C	D	E	F	01	02	03	04	05
33	K42	Trip Circuit for Coil-2 (D08)	X										
34	NA1	System Alarms	X										
35	NA2	System Alarms	X										
36	PA1	DTT SEND	X										
37	PA2	DTT SEND	X										
38	PA3	Closing Lockouts Signal	X										
39	RA1	Tripping Annunciations	X										
40	RA2	SCADA Interface Cabinet	X										
41	RA3	Event Recorder	X										
42	RA4	Fault Recorder	X										
43	Z1	Component Diagram	X										
44	Z2	Component Diagram	X										
45	Z3	Component Diagram	X										
46	Z4	Component Diagram	X										
47	Z5	Component Diagram	X										
48	Z6	Component Diagram											

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Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AA1	03

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CIRCUIT BREAKER		MINIATURE CIRCUIT BREAKER		AUXILIARY CONTACTOR NO+NC	21	DISTANCE
	SWITCH/ISOLATOR		KEY OPERATED SELECTOR SWITCH	A	AMMETER	24	OVEREXCITATION
	EARTHING		LIMITED SWITCH	V	VOLTMETER	25	SYNCHROCHECK
	SF6 TO AIR BUSHING	A1 <& A2 1 2 <&	HUMIDITY & TEMPERATURE CONTROLLER	PF	POWER FACTOR METER	49	THERMAL OVERLOAD
	LINE TRAP		PANEL HEATER	DPM	DIGITAL PANEL METER	50/51	PHASE INST./OVERCURRENT
	SURGE ARRESTOR	PH E N	THREE PIN SOCKET	MW	ACTIVE POWER METER	50N/51N	EARTH INST./OVERCURRENT
	CURRENT TRANSFORMER		INDICATION LIGHT	MVAR	REACTIVE POWER METER	-50BF	CIRCUIT BREAKER FAILURE
W1 W2	COUPLING CAPACITOR VOLTAGE TRANSFORMER		PUSH BUTTON	KWH	ENERGY METER	64	RESTRICTED EARTH FAULT
	POWER TRANSFORMER		AUXILIARY CONTACTOR COIL			67N	DIRECTIONAL EARTH FAULT
	AUTO TRANSFORMER	~ =	POWER SUPPLY AC/DC			68	POWER SWING BLOCKING
			TERMINAL			78	OUT OF STEP
			OPTO CONTACTS			79	AUTO-RECLOSING
			RELAY CONTACTS			85	COMMUNICATION FAILURE
			HOOTER			87T	TRAFO DIFFERENTIAL
			AC BELL			87C	DIFFERENTIAL CONNECTION
						87BB	DIFFERENTIAL BUSBAR

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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) SYMBOLA AND LEGENDS

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AB	04

QTY.	DEVICE DESCRIPTION	DEVICE SPECIFICATIONS DEVICE TYPE ; TECHNICAL DATA / SPECIFICATIONS	DEVICE DESIGNITION	MANUFACTURER
04	BREAKER FAILURE PROTECTION RELAY	AGILE P841, Cortec: P841-91BA7M0660M	-50BF1,-50BF2,-50BF3,-50BF4	GE
		Supply: 110-250VDC / 100-240VAC, 4 VT + 3 CT (100-120V:1/5A) Inputs		
		16 Opto Inputs, 14 Relay Outputs		
08	TEST BLOCK	MMLG01, Cortec: MMLG01-R1AA9002D	-XTBF1-1,-XTBF1-2,-XTBF2-1,-XTBF2-2,	GE
			-XTBF3-1,-XTBF3-2,-XTBF4-1,-XTBF4-2	
04	TRIPPING RELAY (SELF-RESETTING)	MVAJ101, Cortec: MVAJ101-RA1002A	-94BF1,-94BF2,-94BF3,-94BF4	GE
		Supply: 220-250VDC, 8 NO + 2 NC Contacts		
08	TRIPPING RELAY (HAND/ELECTRICAL RESET)	MVAJ105, Cortec: MVAJ105-RA1002A	-86BF1-1,-86BF1-2,-86BF2-1,-86BF2-2,	GE
		Supply: 220-250VDC, 8 NO + 2 NC Contacts	-86BF3-1,-86BF3-2,-86BF4-1,-86BF4-2	
02	CONTROL MCB - PANEL LIGHT & HEATER	G62C02+(CAH2), 2-Pole, Ratings: 2A, 230VAC, 6kA @ 230VAC, 2 C/O Contact	-F101-102	GE
01	CONTROL ELCB - PANEL SOCKET	DM100C216/030+(CAH2), 2-Pole, Ratings: 16A, 30mA, 230VAC, 2 C/O Contact	-F103	GE
05	CONTROL MCB - DC DISTRIBUTION	EP102UCC04+(CAH2), 2-Pole, Ratings: 4A, 220VDC, 10kA @ 220VDC, 2 C/O Contact	-F201,-F202,-F203,-F204,-F205	GE
01	PUSHBUTTON - DIRECT TRANSFER TRIP RESET	YS-AP1-2-40-B-D-W, Black button, Spring return, 2-Pole, Ratings: 12A, 220VDC	-S86	YONGSUNG
01	AUXILIARY CONTACTOR	MCRC022ATWN+MARN211AT, Coil Voltage: 220VDC, 3NO+3NC Contacts	-AKCS	GE
26	AUXILIARY CONTACTOR	PRC4M40DCML, Coil Voltage: 220VDC, 4 C/O Contacts	-KDCM,-KAC,-KBF1-1,-KBF2-1,-KBF3-1,-KBF4-1,-K1ST1,-K2ST1	GE
			-K3ST1,-K4ST1,-K1ST2,-K2ST2,-K3ST2,-K4ST2,-K1DTT	
			-K3DTT,-K4DTT,-K50BF1,-KDC1,-K50BF2,-KDC2,-K2DTT	
			-K50BF3,-KDC3,-K50BF4,-KDC4	
03	AUXILIARY CONTACTOR	PRC4M40ANL, Coil Voltage: 230VAC, 4 C/O Contacts	-KDC,-KACM,-KDCA	GE
01	INDICATION LAMP - DC SUPPLY FAILURE	YS-PL-2-AL-22-R-W, Type: Integrated LED , Color : RED , Supply : 230VAC @ 50Hz	-H200	YONGSUNG
01	PANEL LIGHT WITH DOOR SWITCH	YST8-30-5W+YSP3315GWB, 230VAC @ 50Hz, 20W, with Door Limit Sw.	-H100,-S100	YONGSUNG
01	THREE PIN SOCKET	1N+PE, 16A, 230VAC @ 50Hz	-X100	LEAR
01	PANEL HEATER	230VAC @ 50Hz, 50W	-R100	E-LABS
01	HUMIDITY & TEMPERATURE CONTROLLER	Thermostat and Humidstat	-B100	E-LABS
32	TERMINAL BLOCKS FOR CT (SCREW TYPE) WITH SHORTENING	SCB-6	-X4	CABUR
	ARRANGEMENT FOR CT SHORTENING			
05	TERMINAL BLOCKS FOR AC SUPPLY DISTRIBUTION	CBD-4	-XAC	CABUR
14	TERMINAL BLOCKS FOR DC SUPPLY DISTRIBUTION	CBD-4	-XDC	CABUR
15	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X6	CABUR

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Contractor: Grid Solutions, A GE and Alstom joint venture

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

Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT LIST

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AC	05

QTY.	DEVICE DESCRIPTION	DEVICE SPECIFICATIONS DEVICE TYPE ; TECHNICAL DATA / SPECIFICATIONS	DEVICE DESIGNITION	MANUFACTURER
15	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X7	CABUR
15	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X8	CABUR
15	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X9	CABUR
53	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X25	CABUR
10	TERMINAL BLOCKS FOR CONTROL FUNCTION	CBD-4	-X24	CABUR
18	TERMINAL BLOCKS FOR STAGE-2 TRIPPING	CBD-4	-X23	CABUR
35	TERMINAL BLOCKS FOR TRIP CIRCUIT-1	CBD-4	-XTC1	CABUR
35	TERMINAL BLOCKS FOR TRIP CIRCUIT-2	CBD-4	-XTC2	CABUR
32	TERMINAL BLOCKS FOR ANNUNCIATION	CBD-4	-XAN	CABUR
28	TERMINAL BLOCKS FOR SCADA	CBD-4	-XSC	CABUR
23	TERMINAL BLOCKS FOR EVENT RECORDER	CBD-4	-XEV	CABUR
28	TERMINAL BLOCKS FOR FAULT RECORDER	CBD-4	-XFL	CABUR

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Project no.	Sheet type	Sheet no.
P-60194	AC1	06

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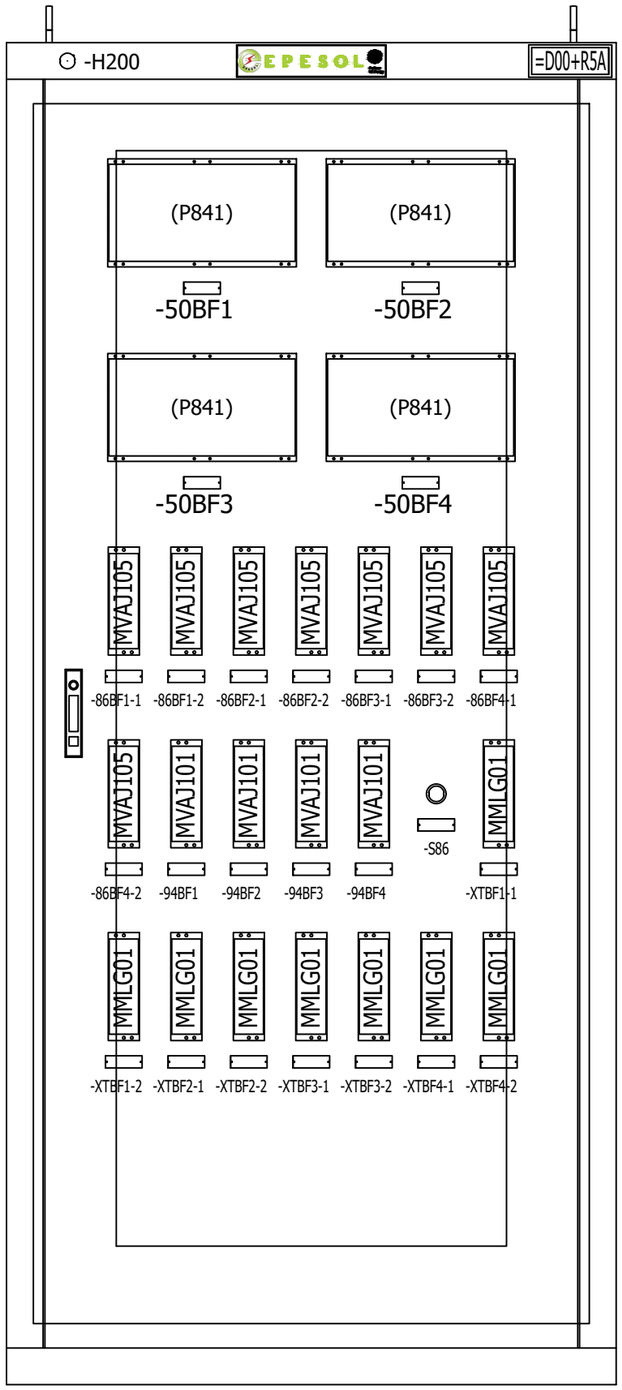
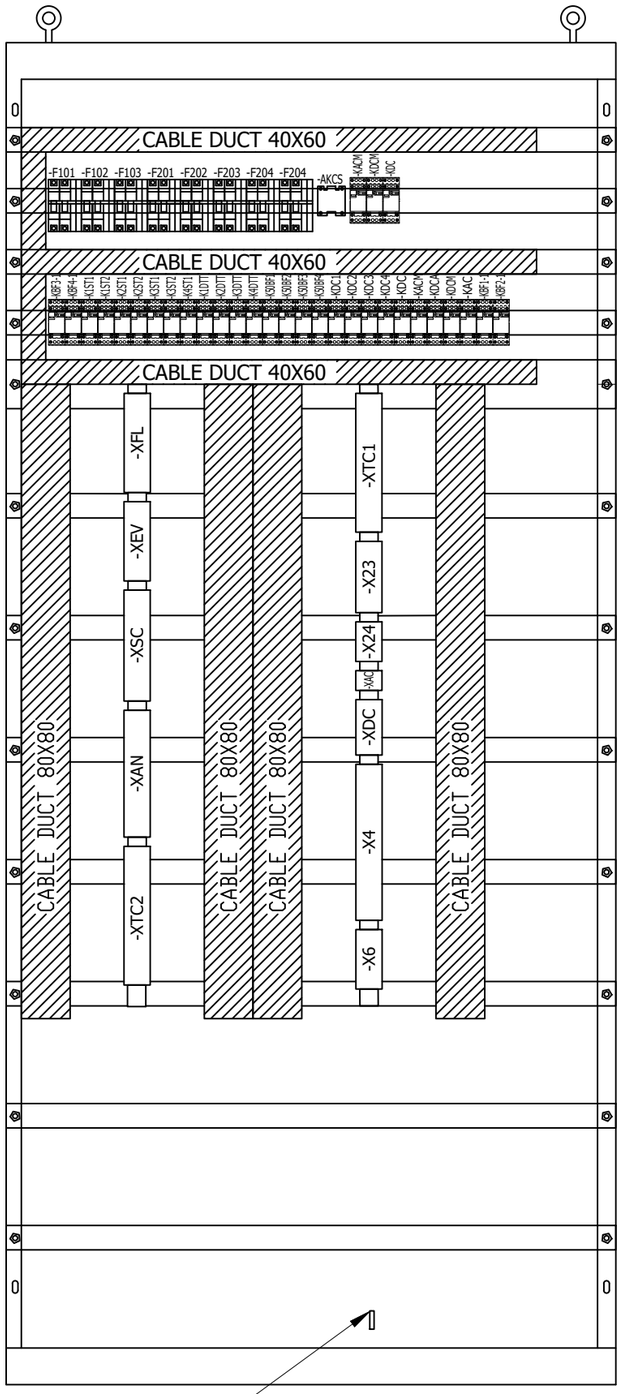
FRONT SIDE VIEW

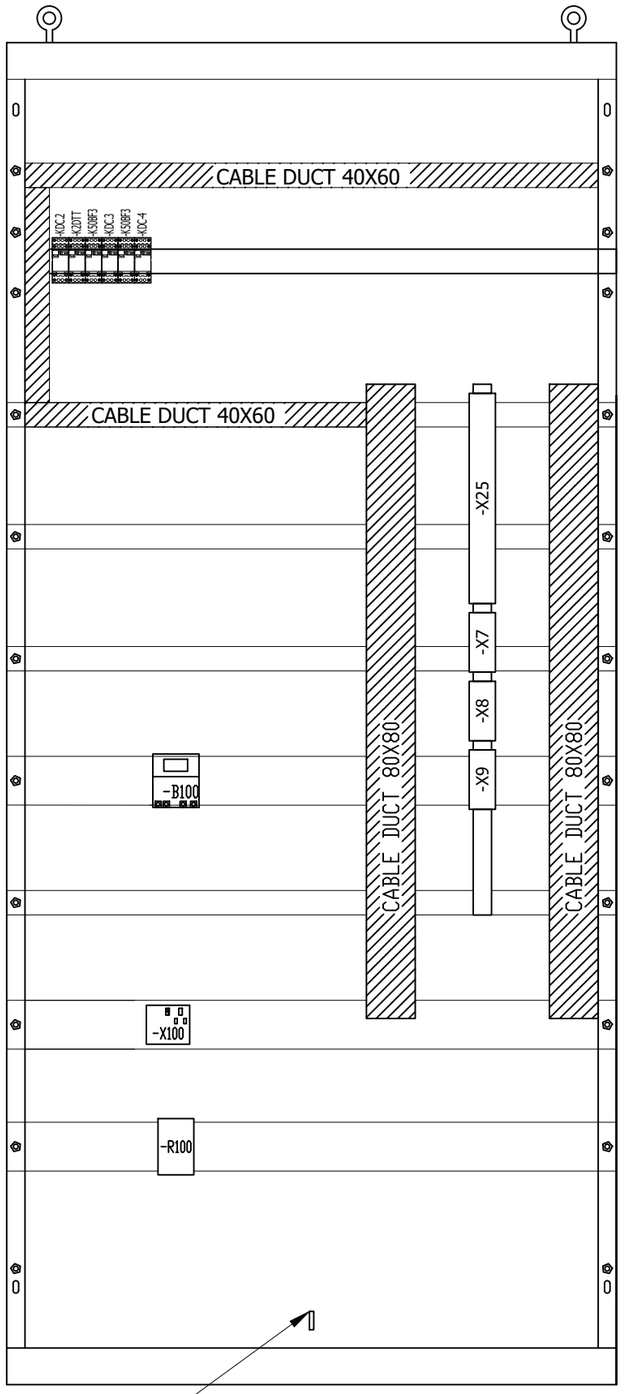


LEFT SIDE VIEW



SLOT FOR EARTHING
BUSBAR
7X30mm

RIGHT SIDE VIEW



SLOT FOR EARTHING
BUSBAR
7X30mm

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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) PANEL VIEW

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AD	07

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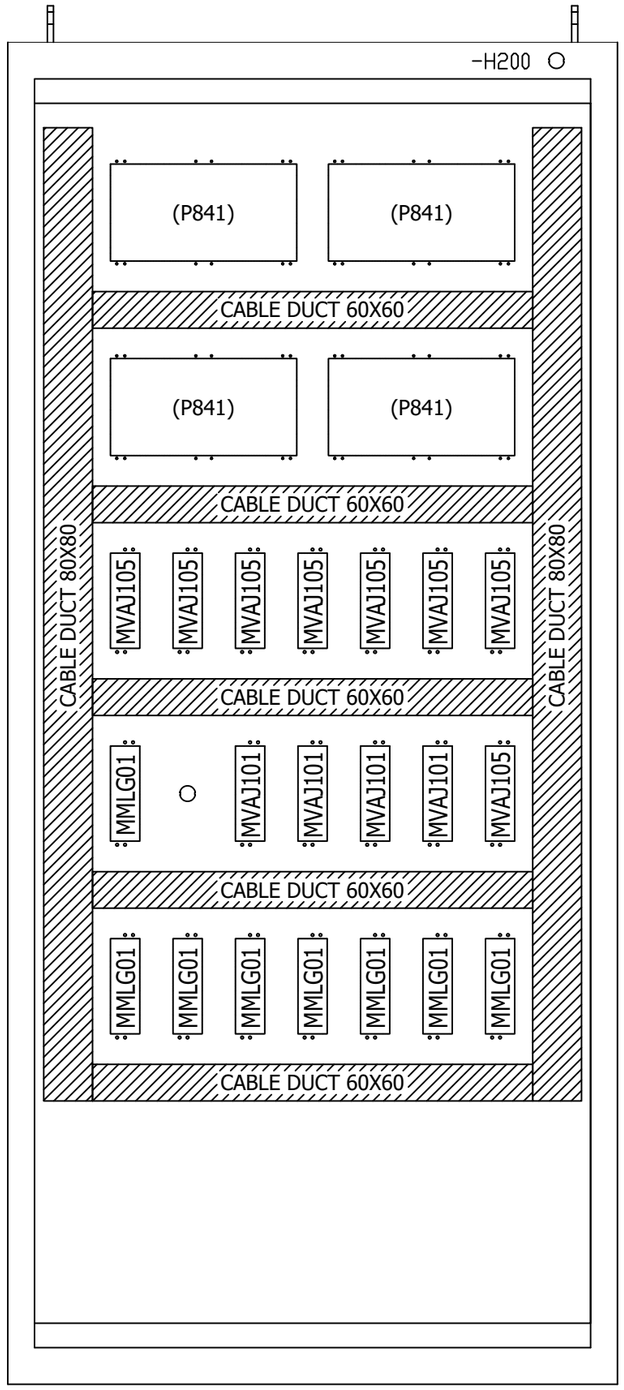
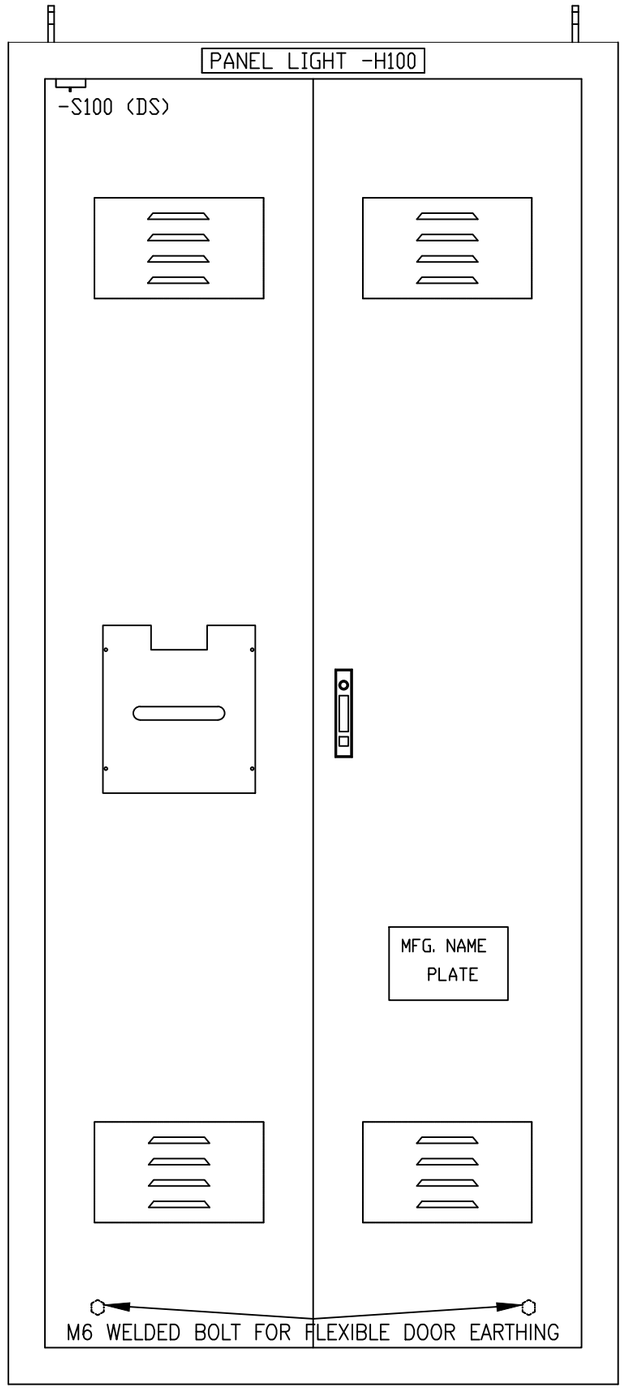
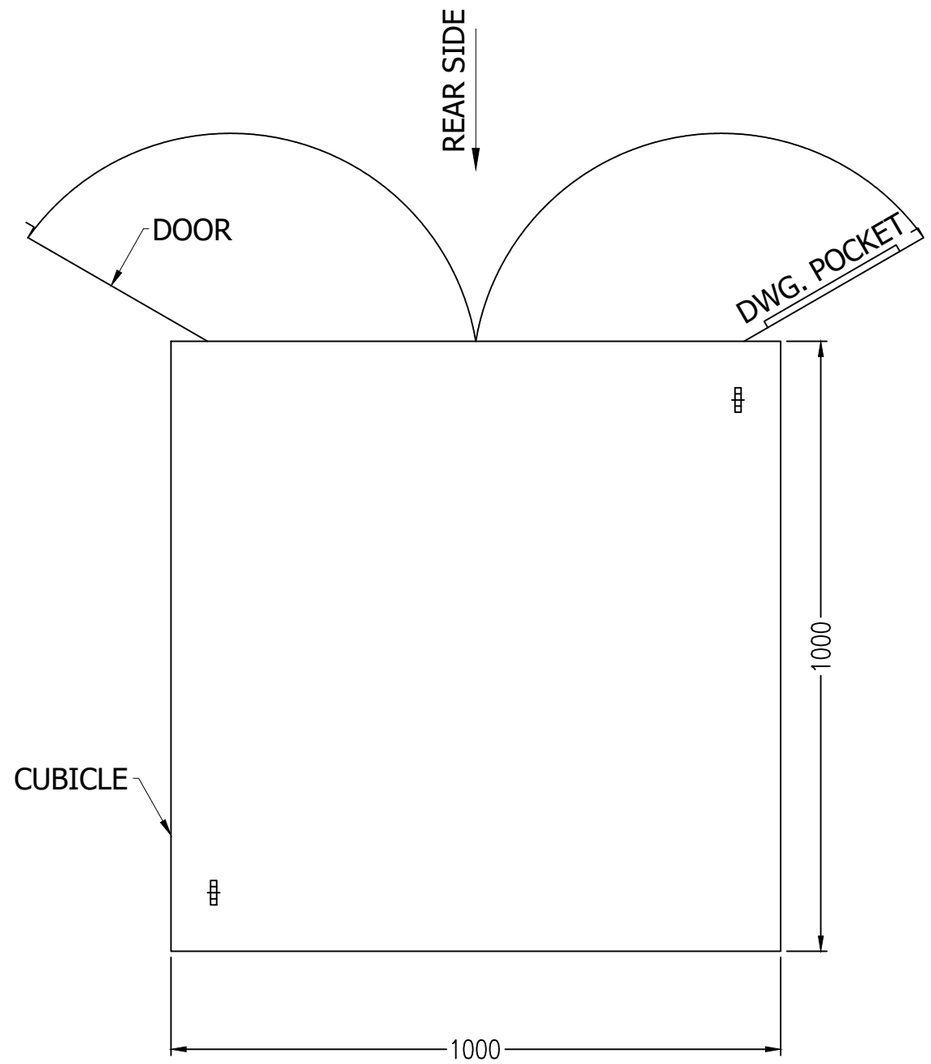
BACK VIEW WITHOUT DOOR



BACK VIEW WITH DOOR



TOP VIEW



NOTE:-

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

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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) PANEL VIEW

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AD1	07a

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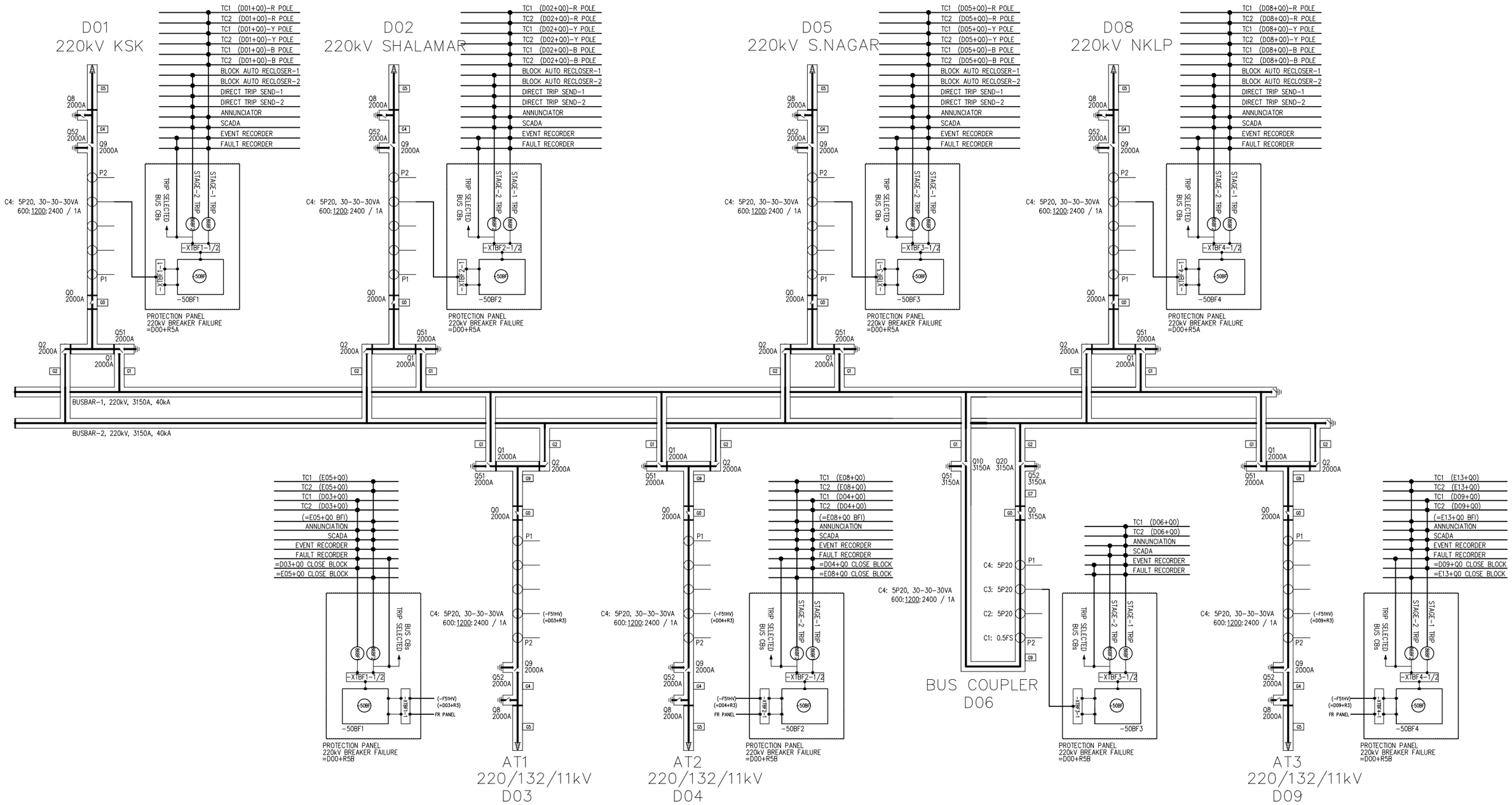

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Title: 220kV CB FAILURE PROTECTION PANEL CONCEPT & PROTECTION LOGICS (=D00+R5A)

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AE1	08

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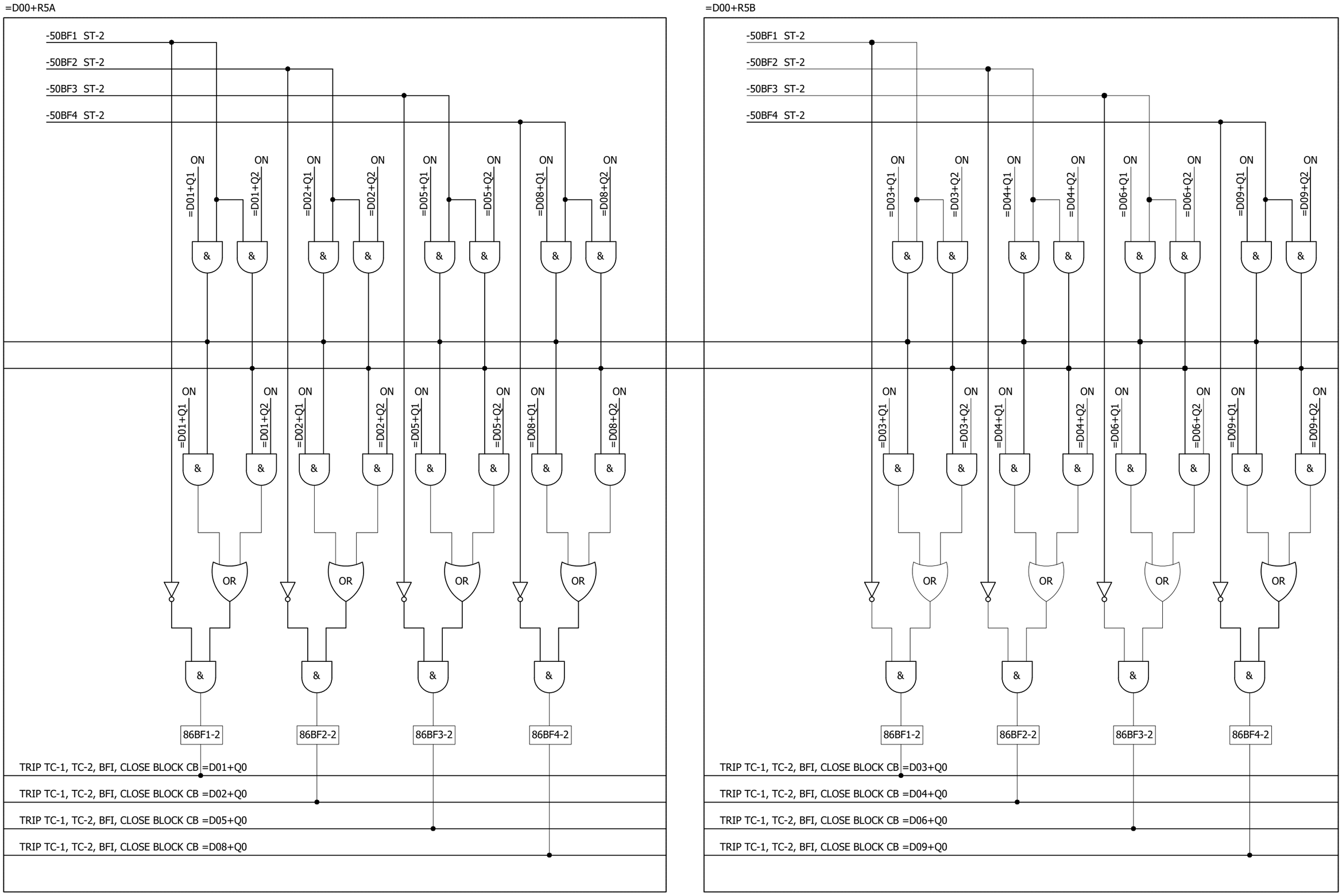

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Title: 220kV CB FAILURE PROTECTION PANEL BAY BREAKERS TRIP LOGIC (=D00+R5A)

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	AE2	09

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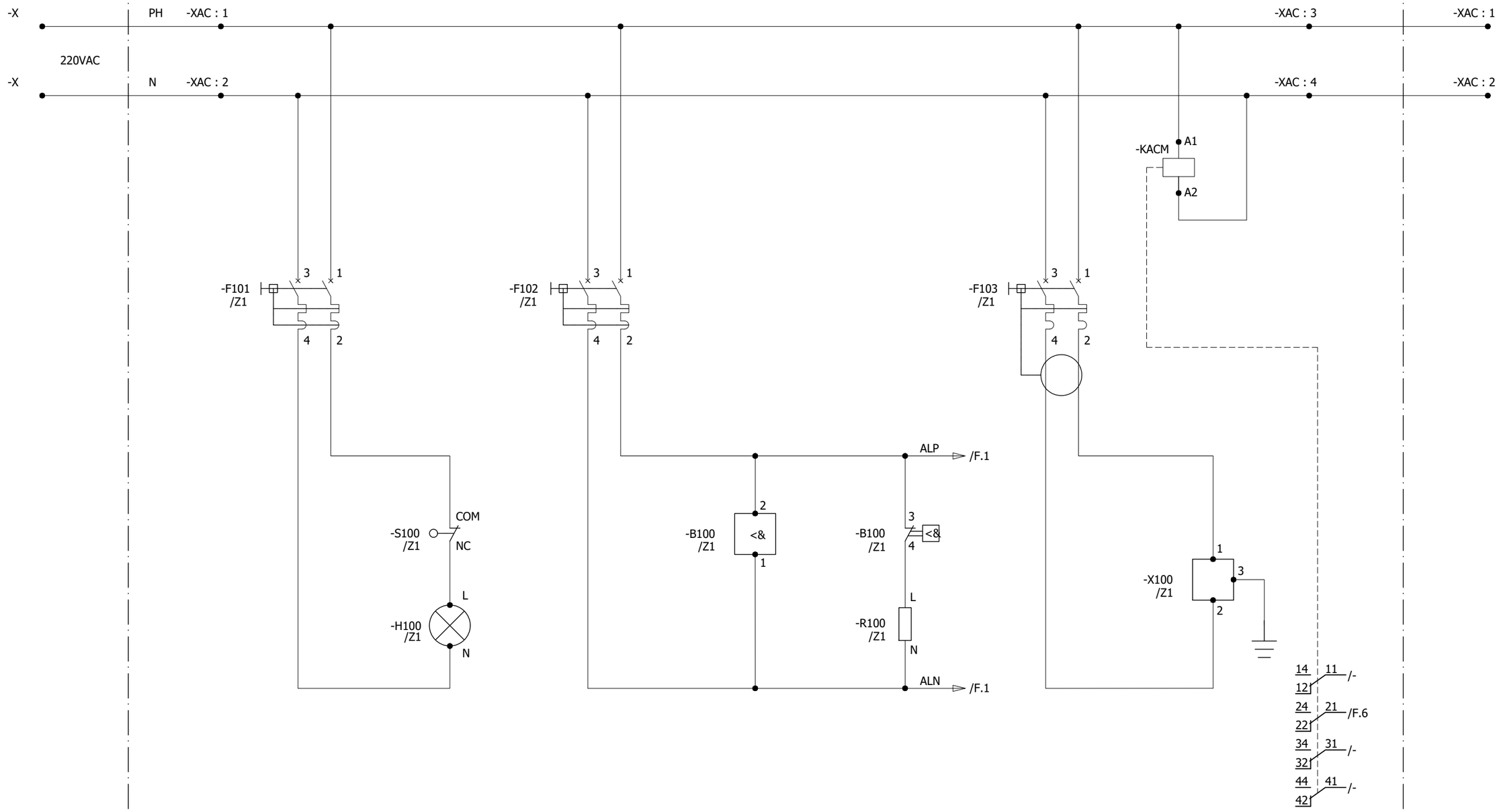
ACDB	CONTROL MCB -F101	DOOR LIMIT SWITCH & PANEL LIGHT -S100 & H100	CONTROL MCB -F102	TEMPERATURE & HUMIDITY CONTROLLER -B100	HEATING RESISTOR -R100	CONTROL ELCB -F103	POWER SOCKET -X100	=D00+R5B
								/D.1



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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) AC SUPPLY DISTRIBUTION

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	D	10

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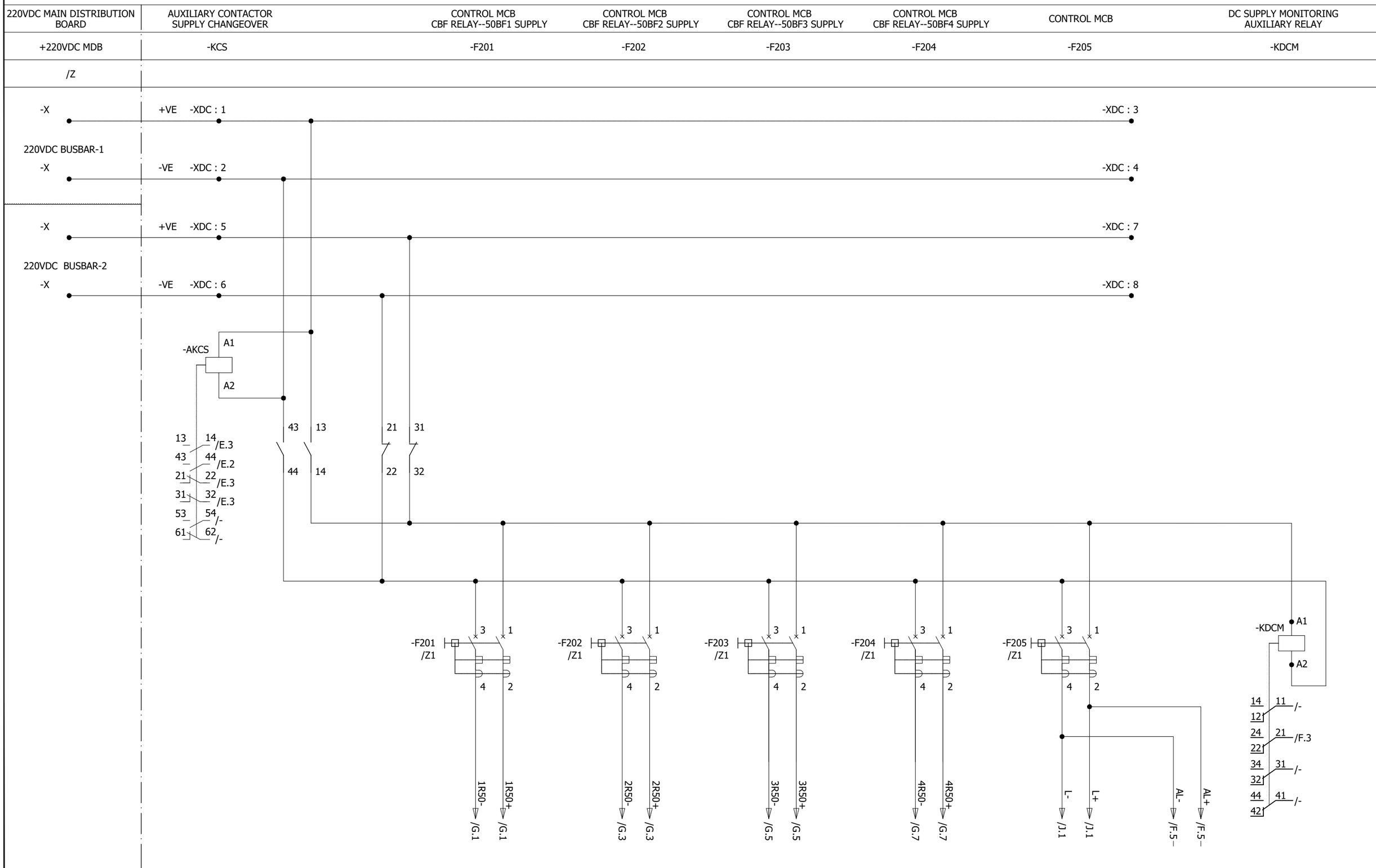

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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) DC SUPPLY DISTRIBUTION

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	E	11

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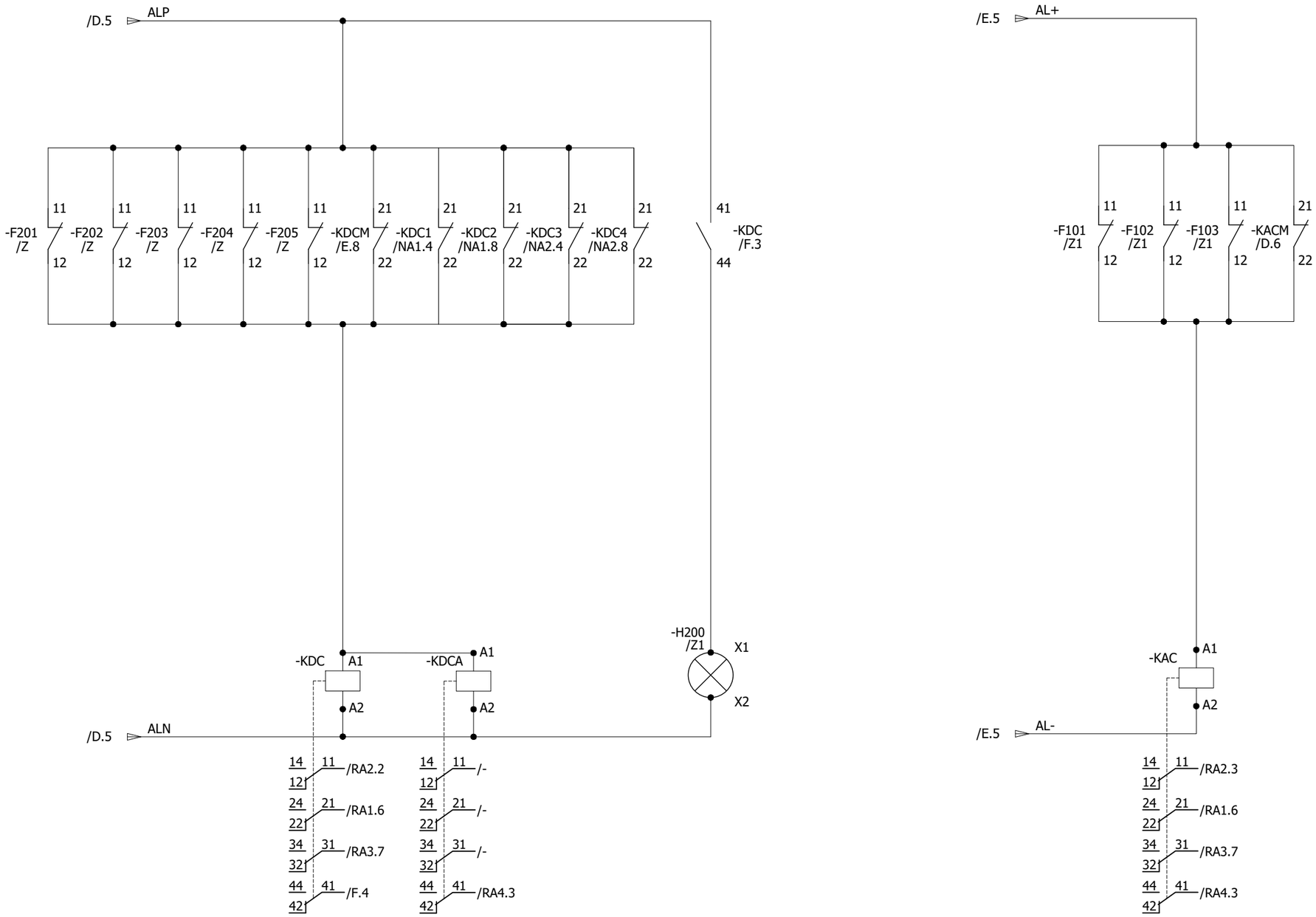
220V DC CIRCUIT FAULTY	220V DC CIRCUIT FAULTY INDICATION	220V AC CIRCUIT FAULTY
-KDC	-H200	-KAC



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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) AC/DC SUPPLY FAILURE CIRCUIT

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	F	12

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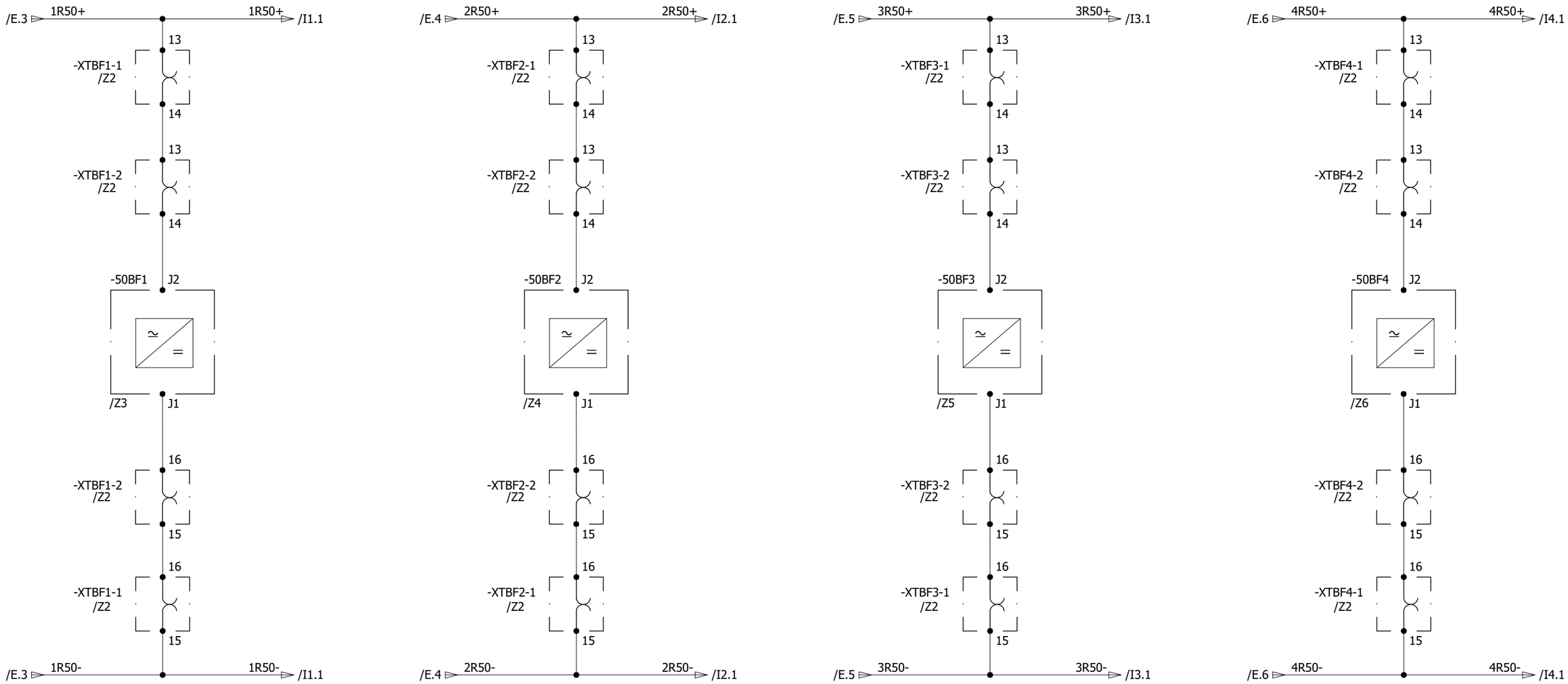
BREAKER FAILURE PROTECTION	BREAKER FAILURE PROTECTION	BREAKER FAILURE PROTECTION	BREAKER FAILURE PROTECTION
RELAY SUPPLY	RELAY SUPPLY	RELAY SUPPLY	RELAY SUPPLY
(=D01+Q0)	(=D02+Q0)	(=D05+Q0)	(=D08+Q0)



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

Manufacturer: EPESOL, 21-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 CB FAILURE PROTECTION PANEL (=D00+R5A) RELAY CONTROL & SUPPLY

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	G	13

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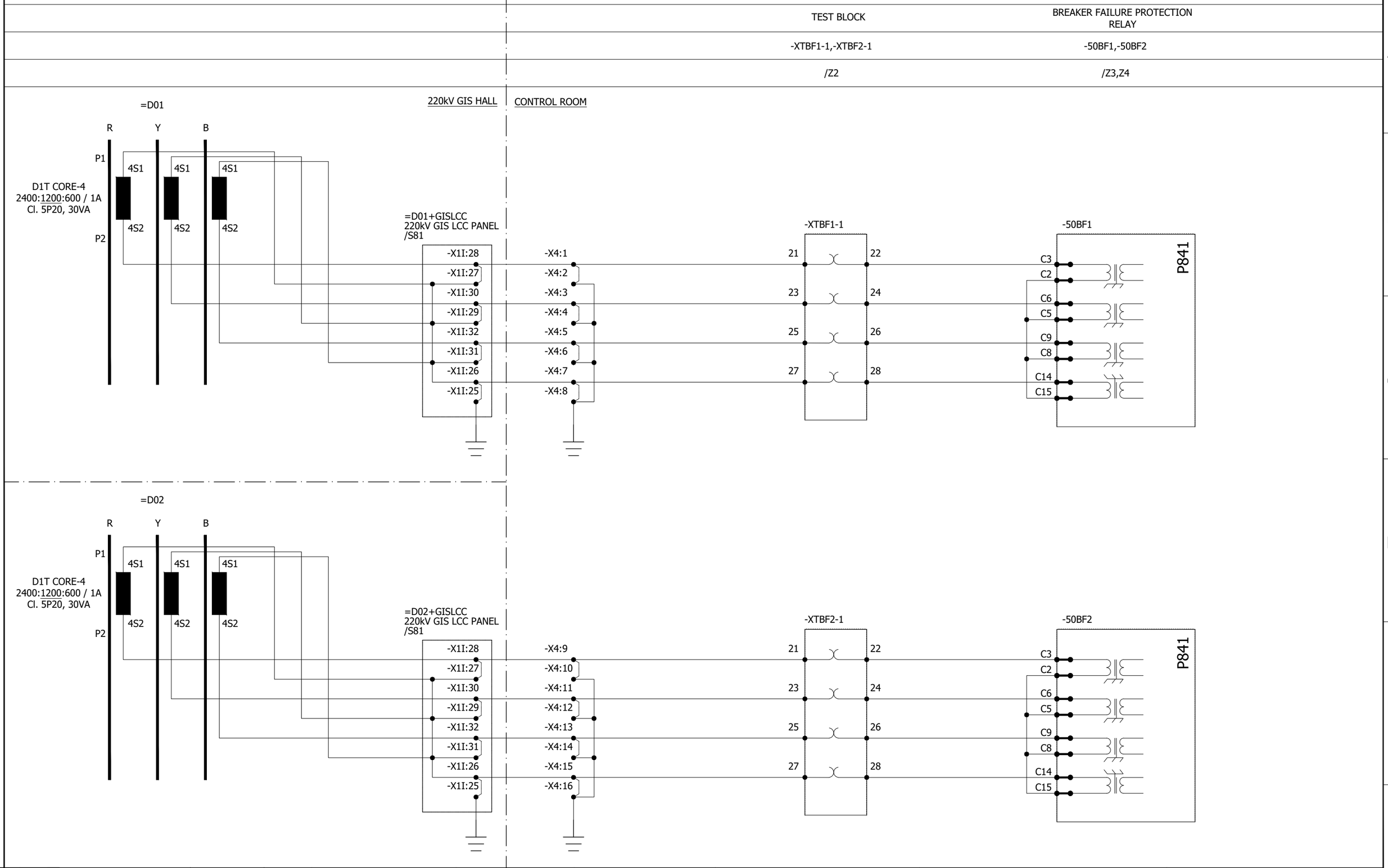

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) BREAKER FAILURE RELAY CT CIRCUIT

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	H1	14

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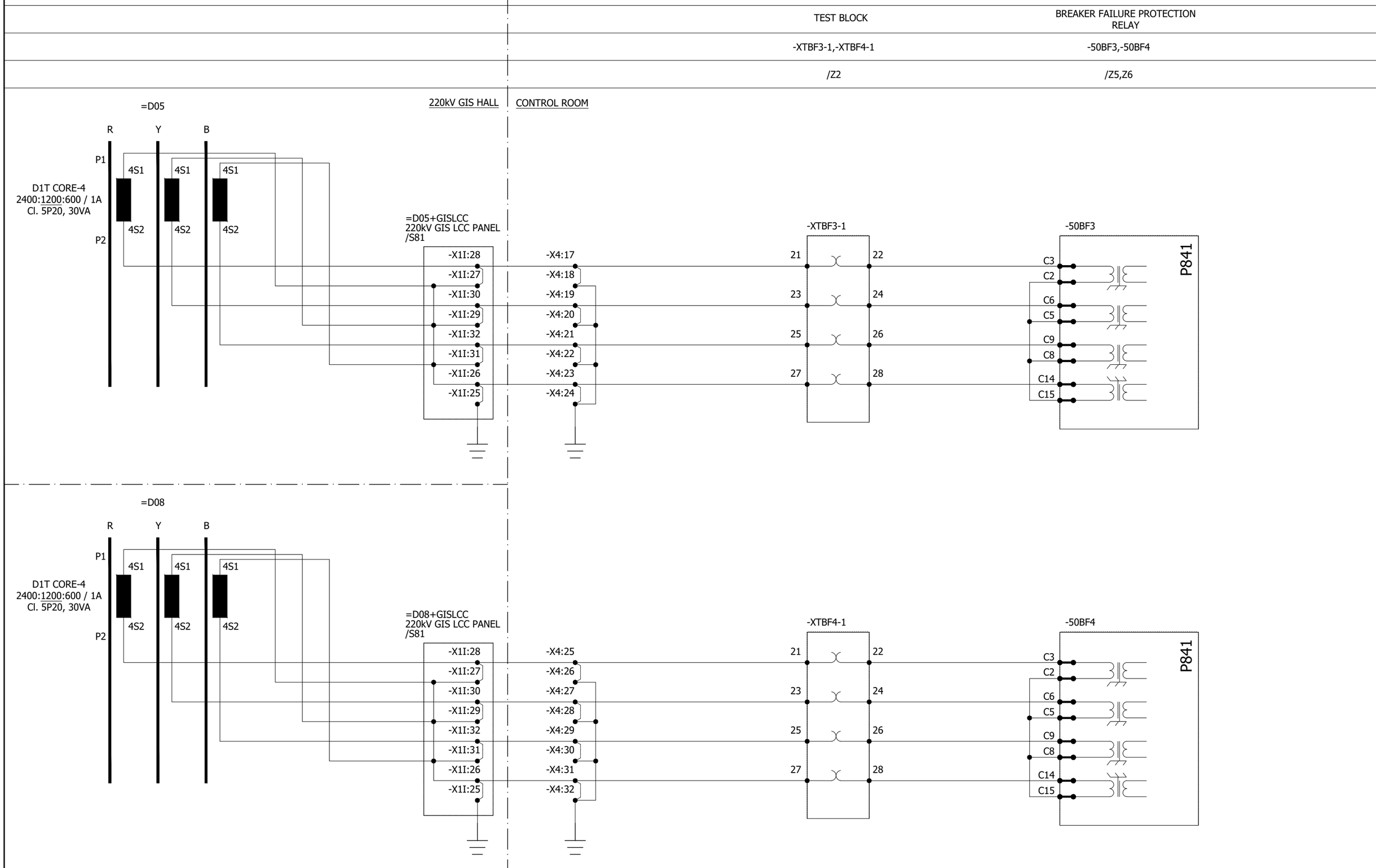

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) BREAKER FAILURE RELAY CT CIRCUIT

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	H2	15

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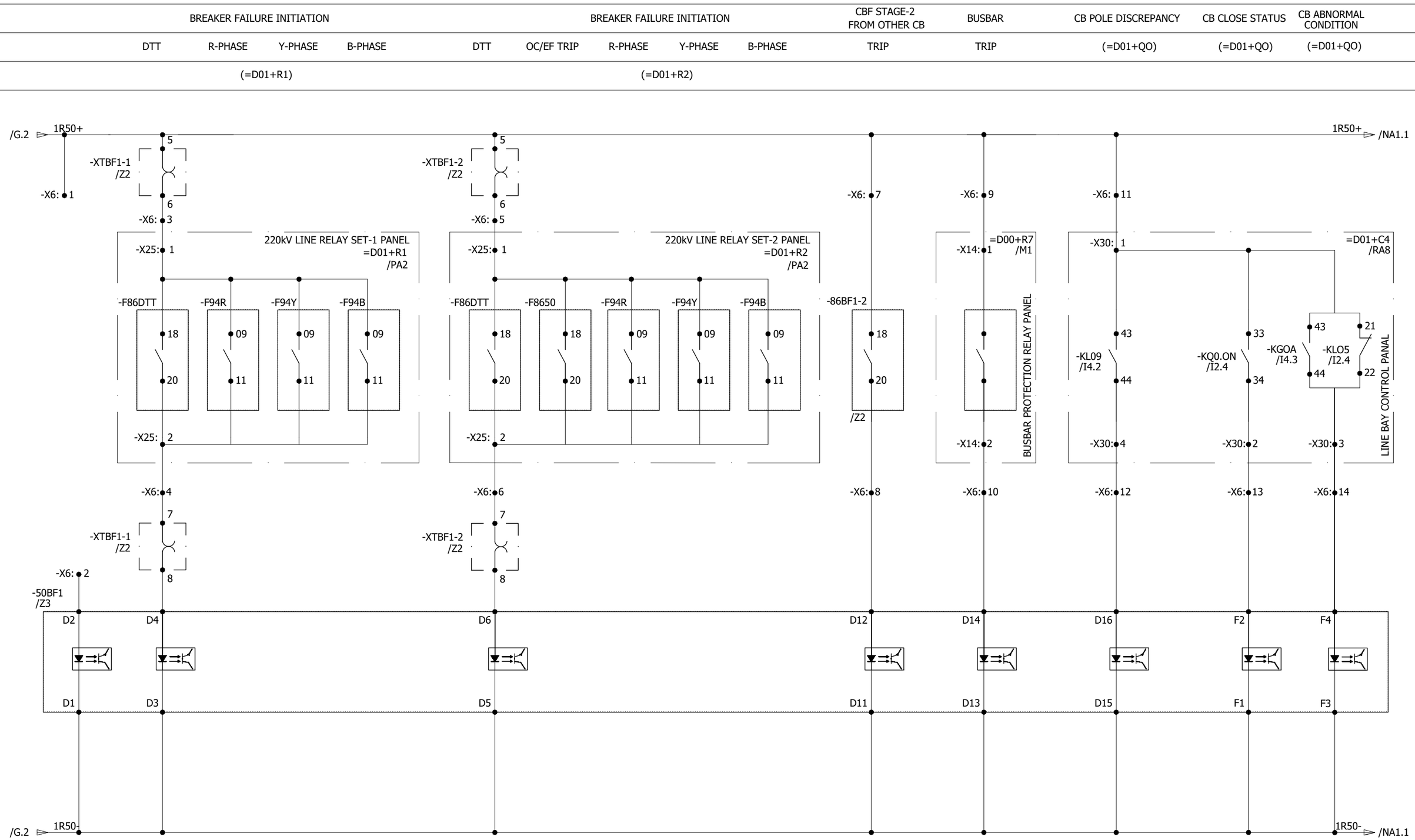

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) CBF RELAY INPUT CIRCUIT-50BF1

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	I1	16

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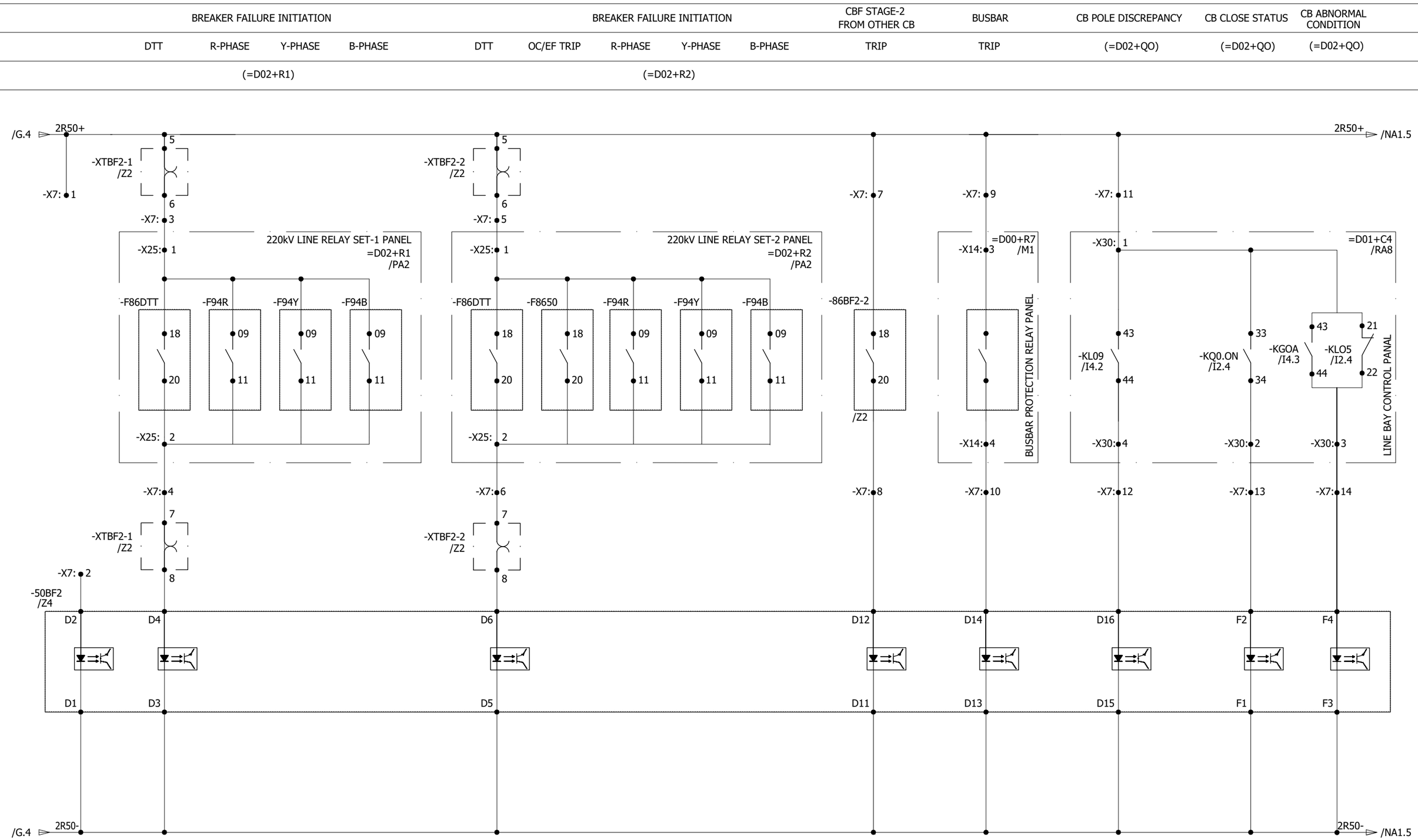

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) CBF RELAY INPUT CIRCUIT-50BF2

Drawing no.		
P60194-E-DFR-SC-001		
Project no.	Sheet type	Sheet no.
P-60194	I2	17

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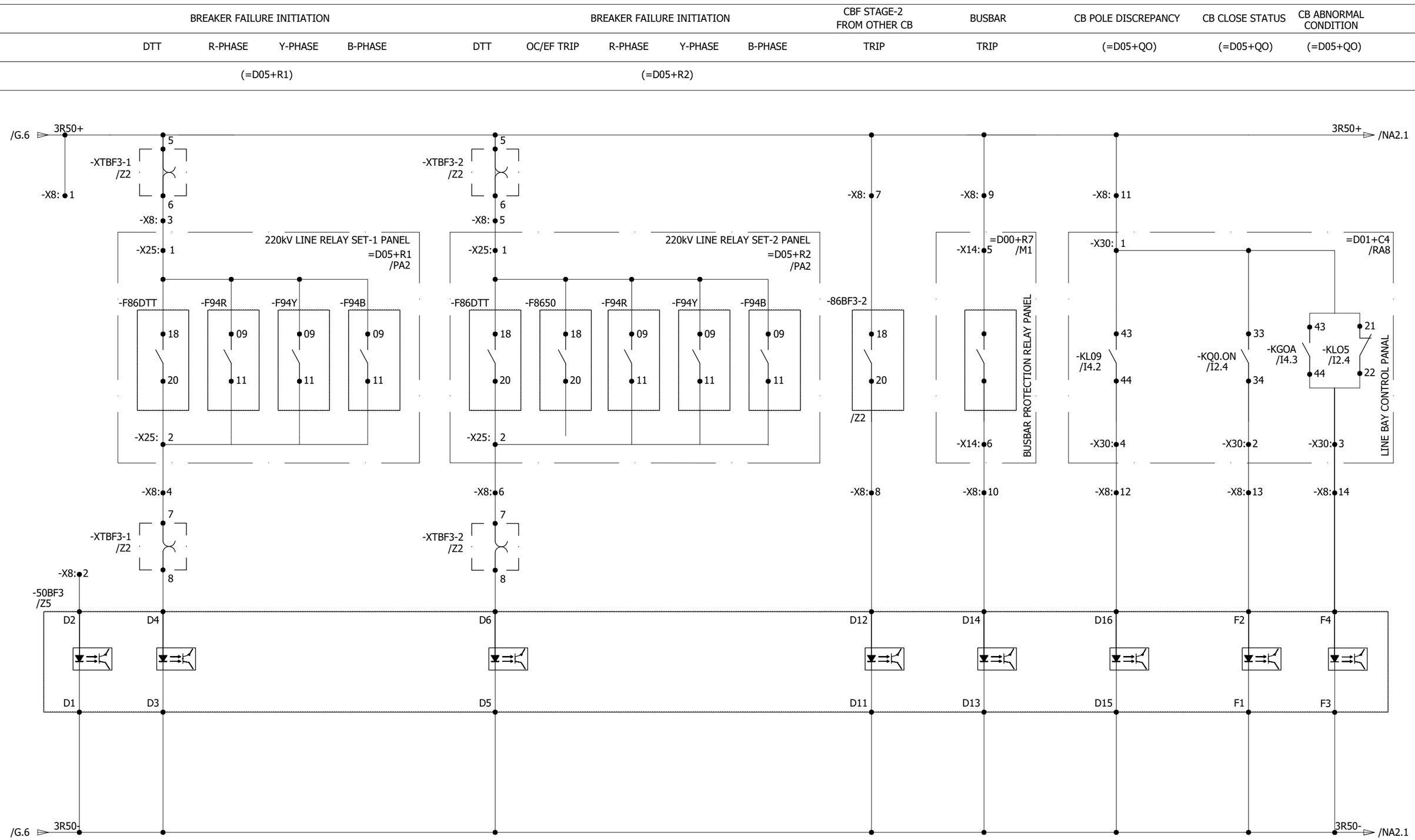

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) CBF RELAY INPUT CIRCUIT-50BF3

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	I3	18

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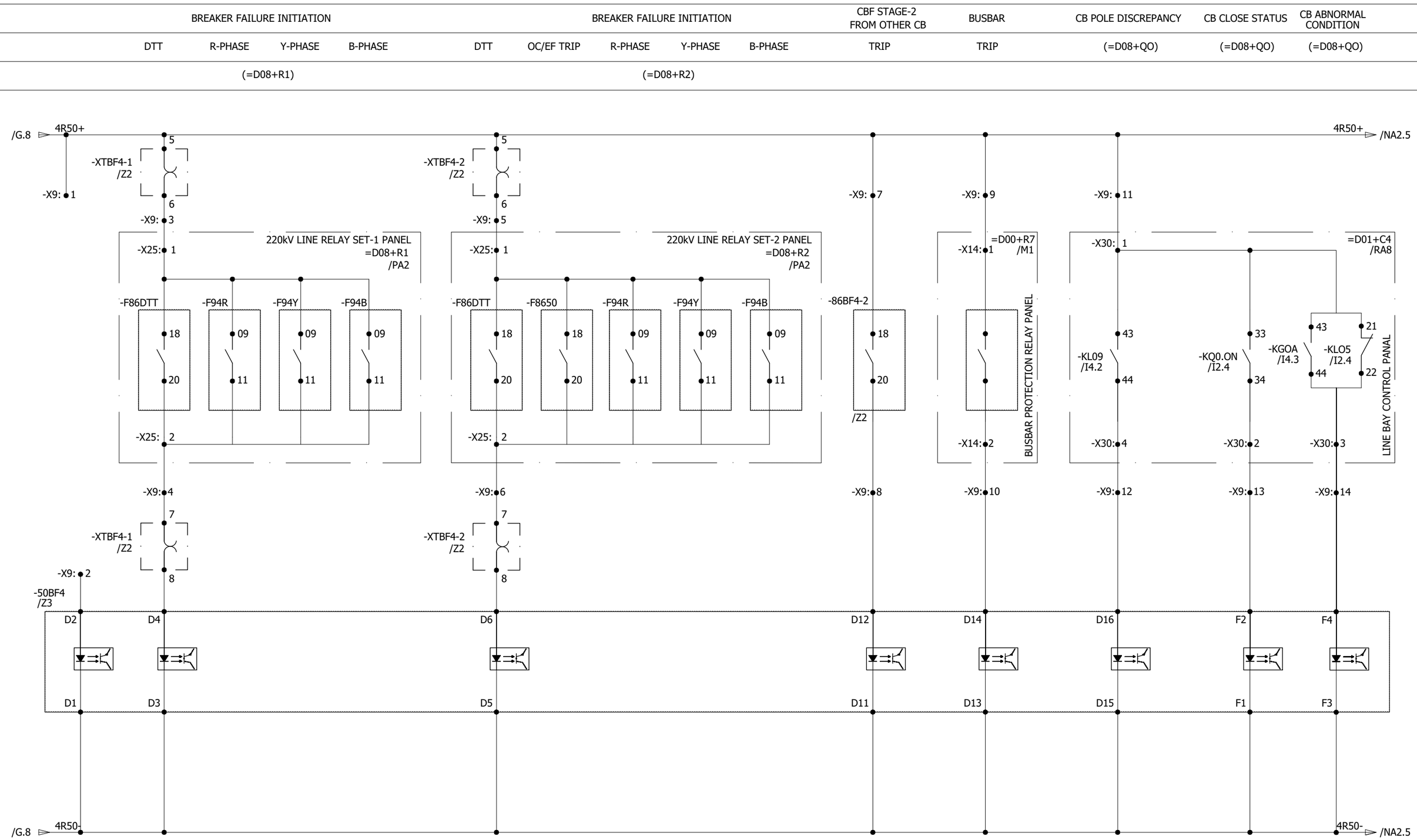


REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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

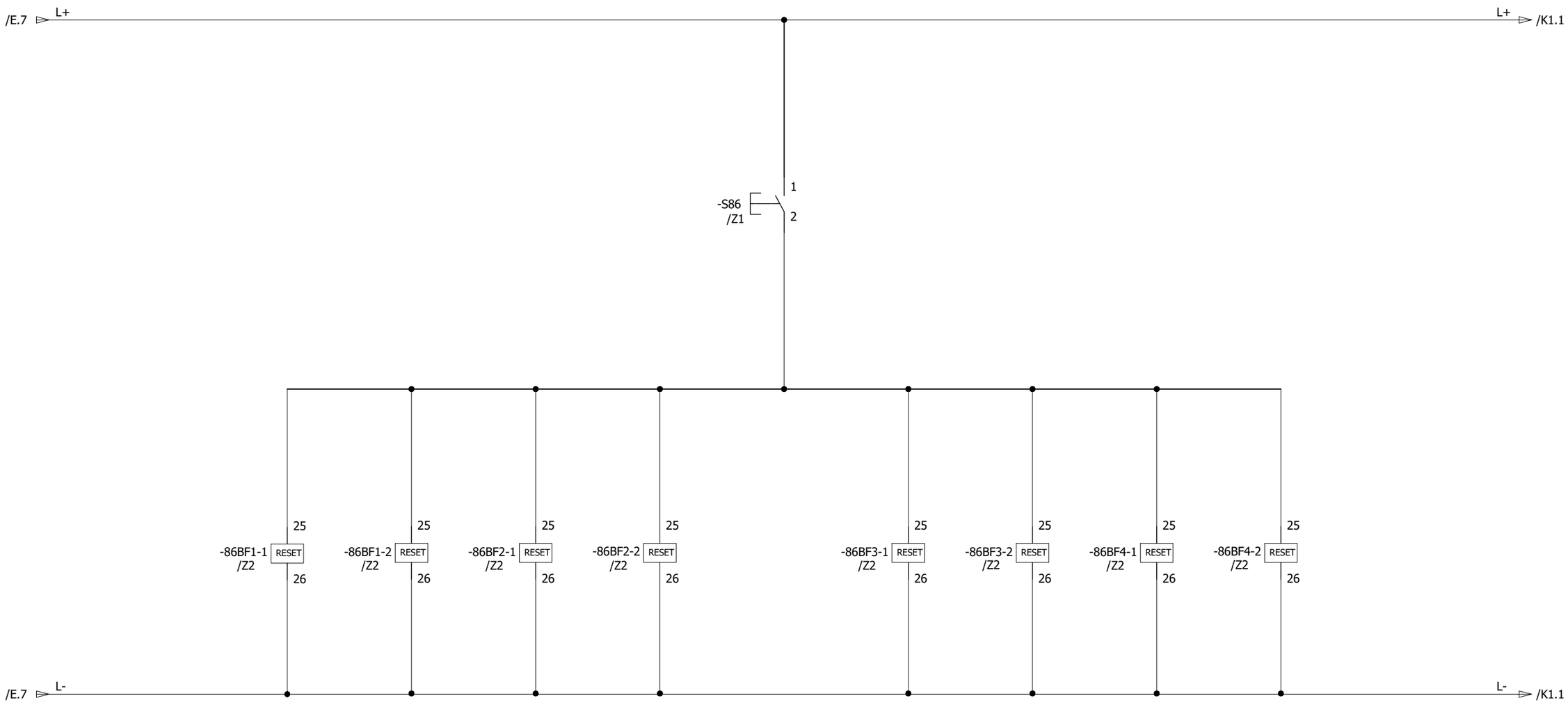
Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) CBF RELAY INPUT CIRCUIT-50BF4

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	I4	19

RESET PUSHBUTTON
TRIP RELAY

-S86



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REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) COMMON RESET TRIPPING RELAYS

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	J	20

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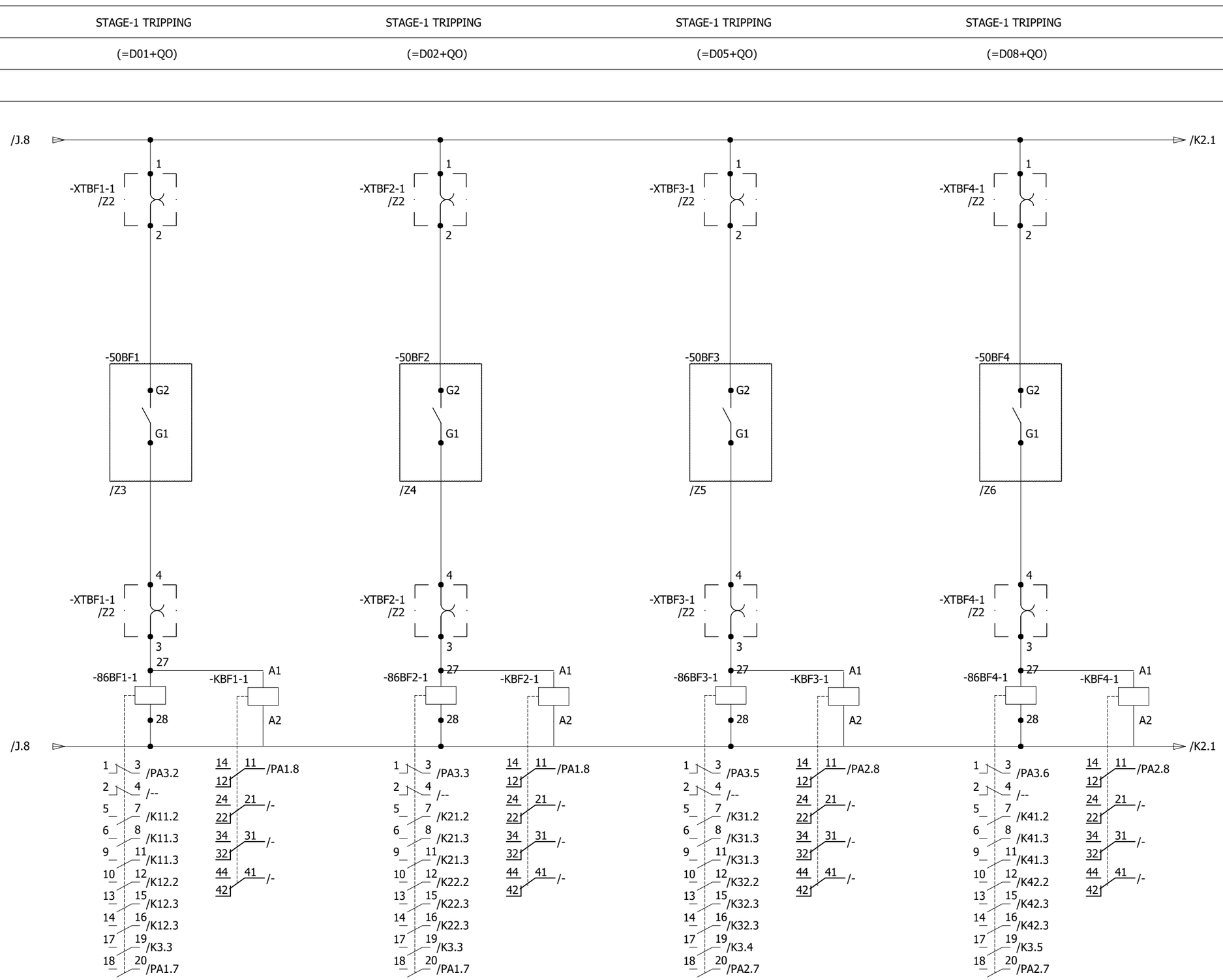

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) STAGE-1 TRIPPING

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K1	21

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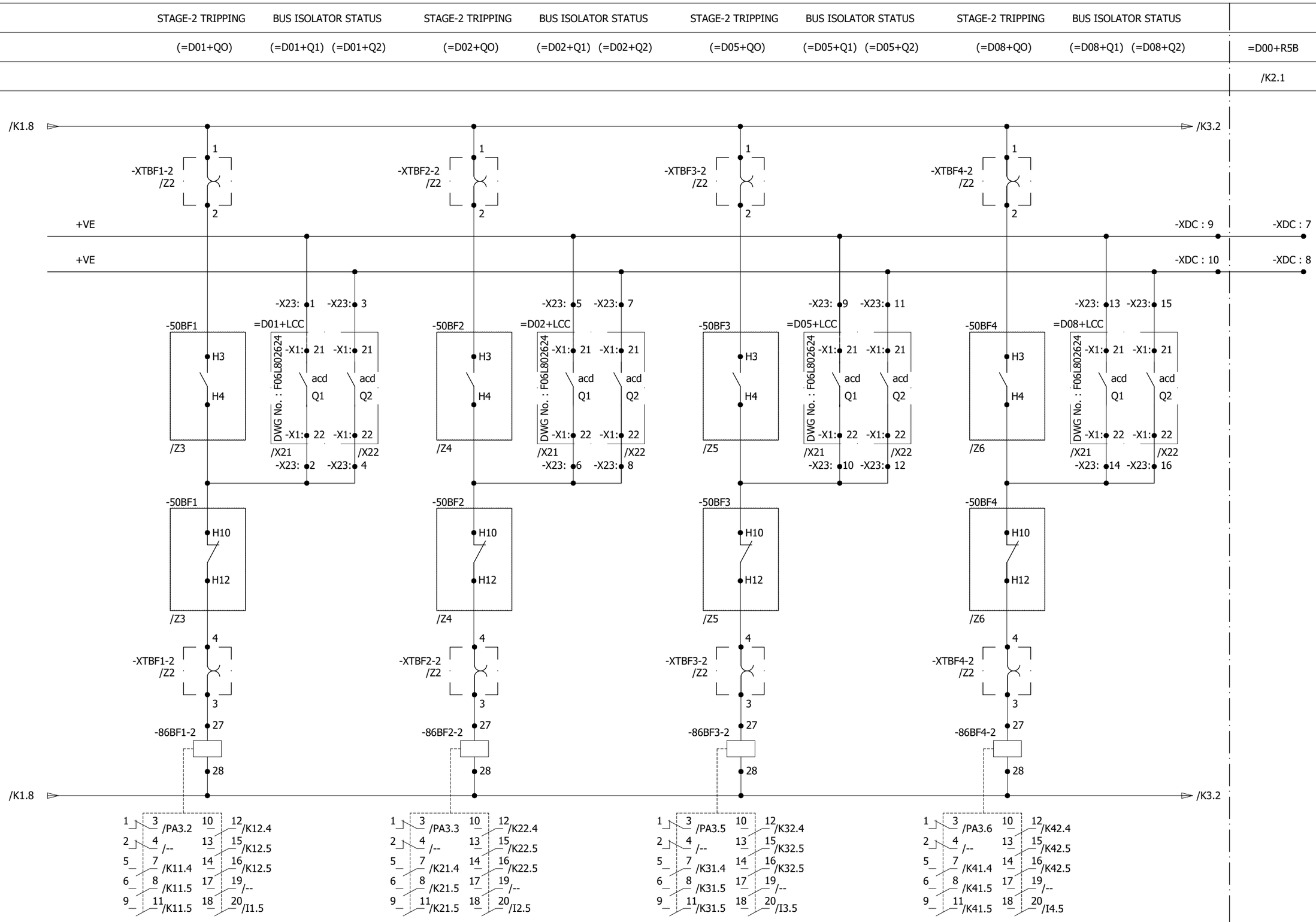

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) STAGE-2 TRIPPING

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K2	22

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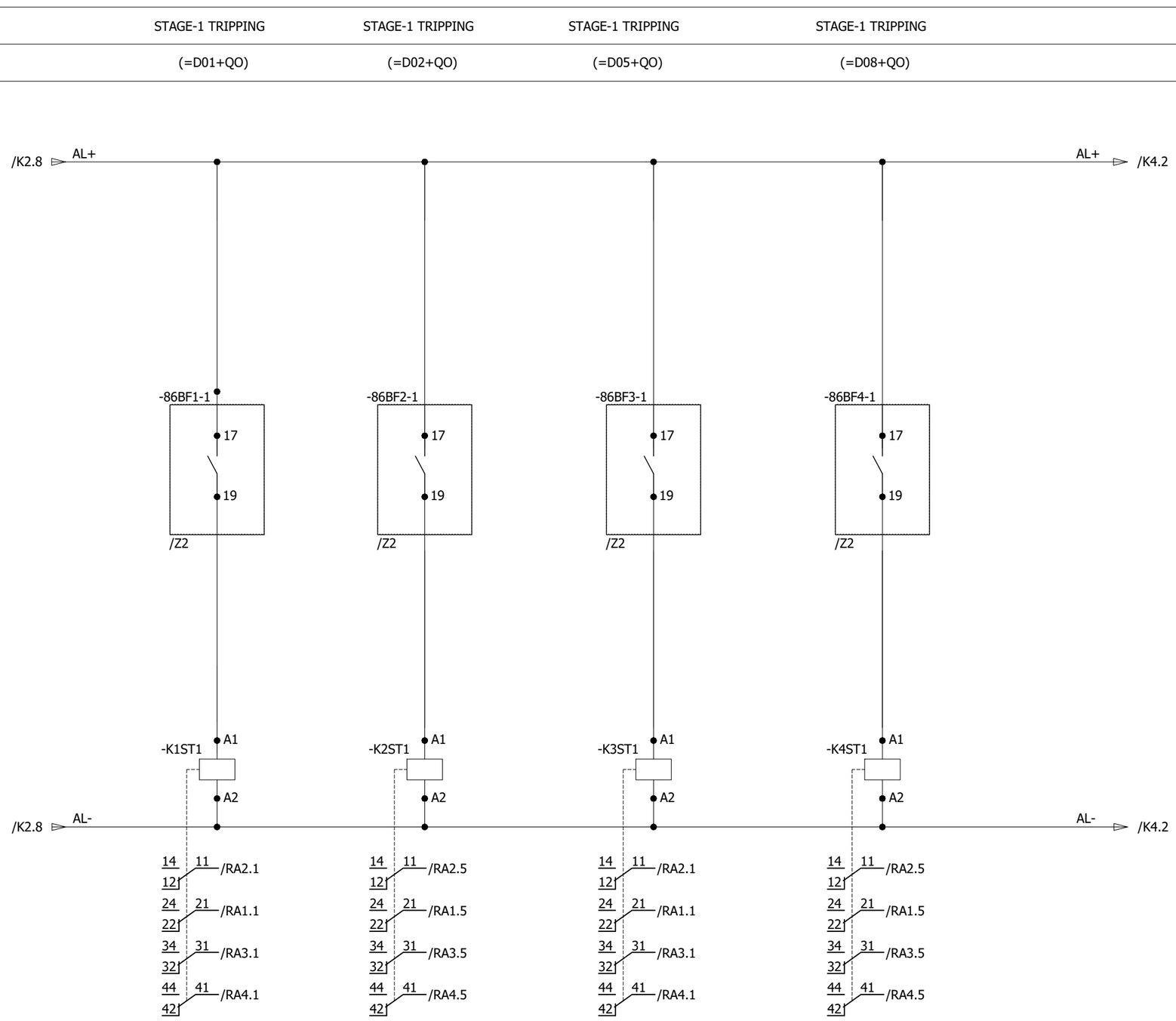

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) STAGE-1 CONTACT MULTIPLICATION

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K3	23

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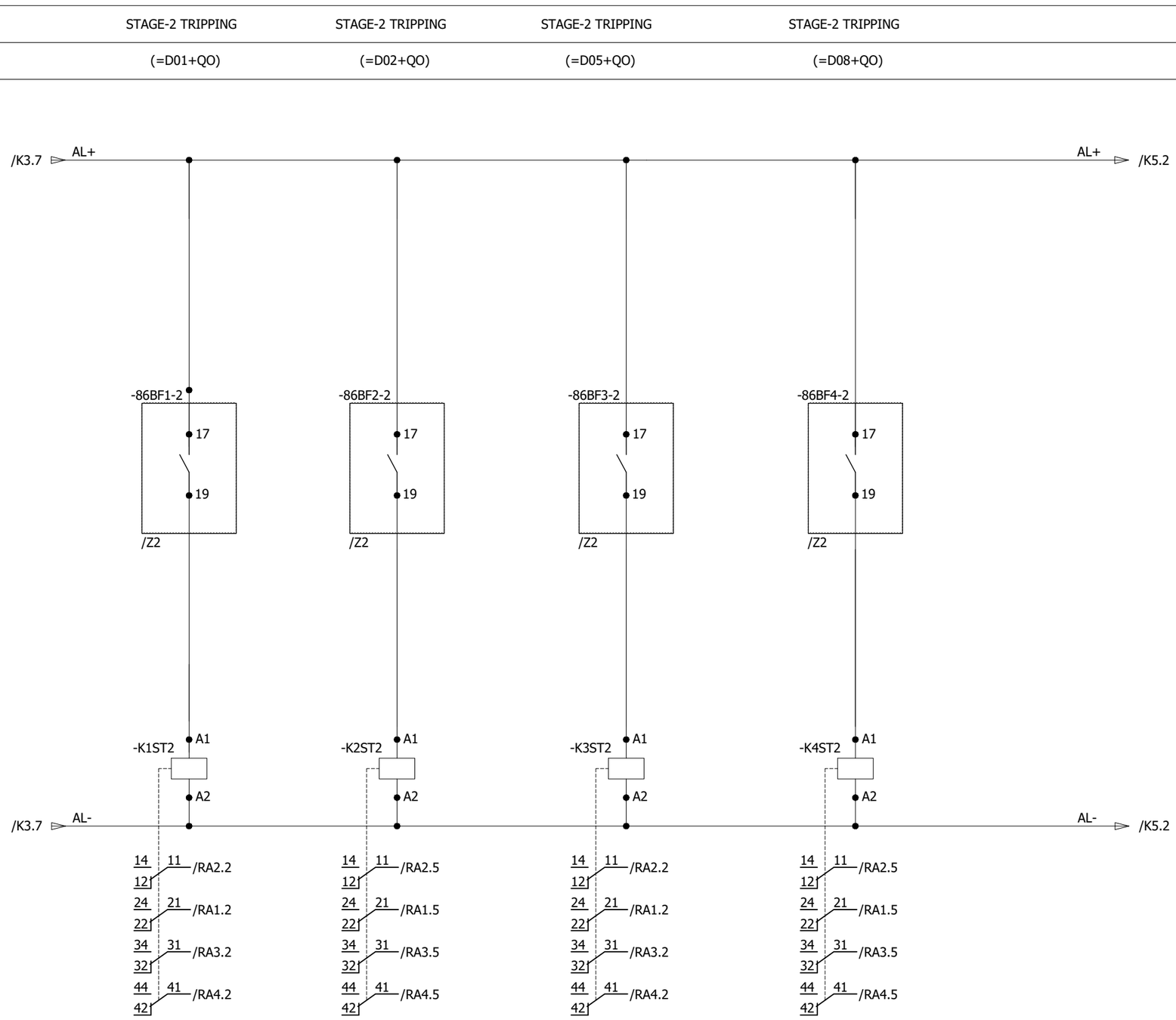

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) STAGE-2 CONTACT MULTIPLICATION

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K4	24

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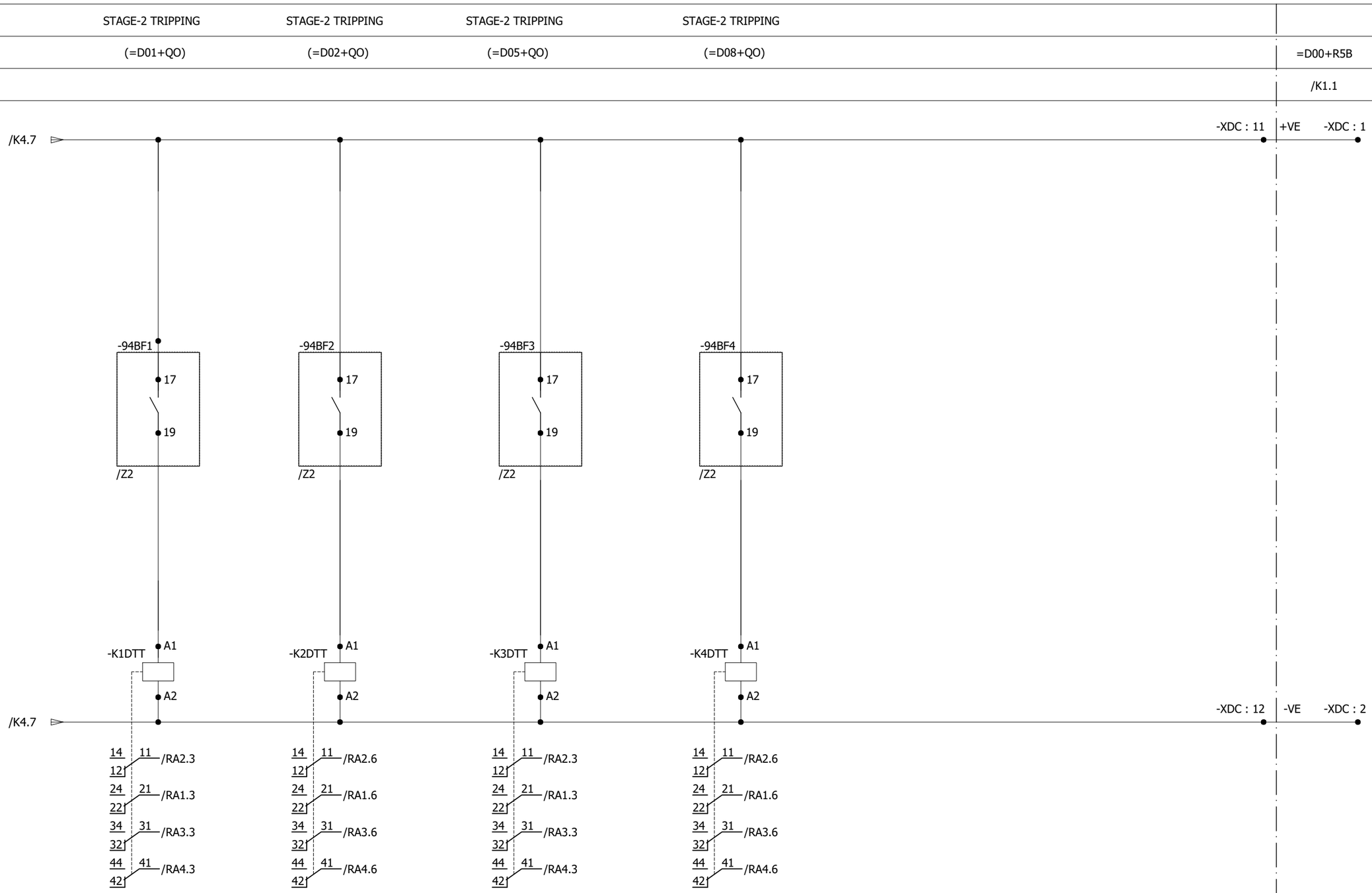

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) STAGE-2 CONTACT MULTIPLICATION

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K5	25

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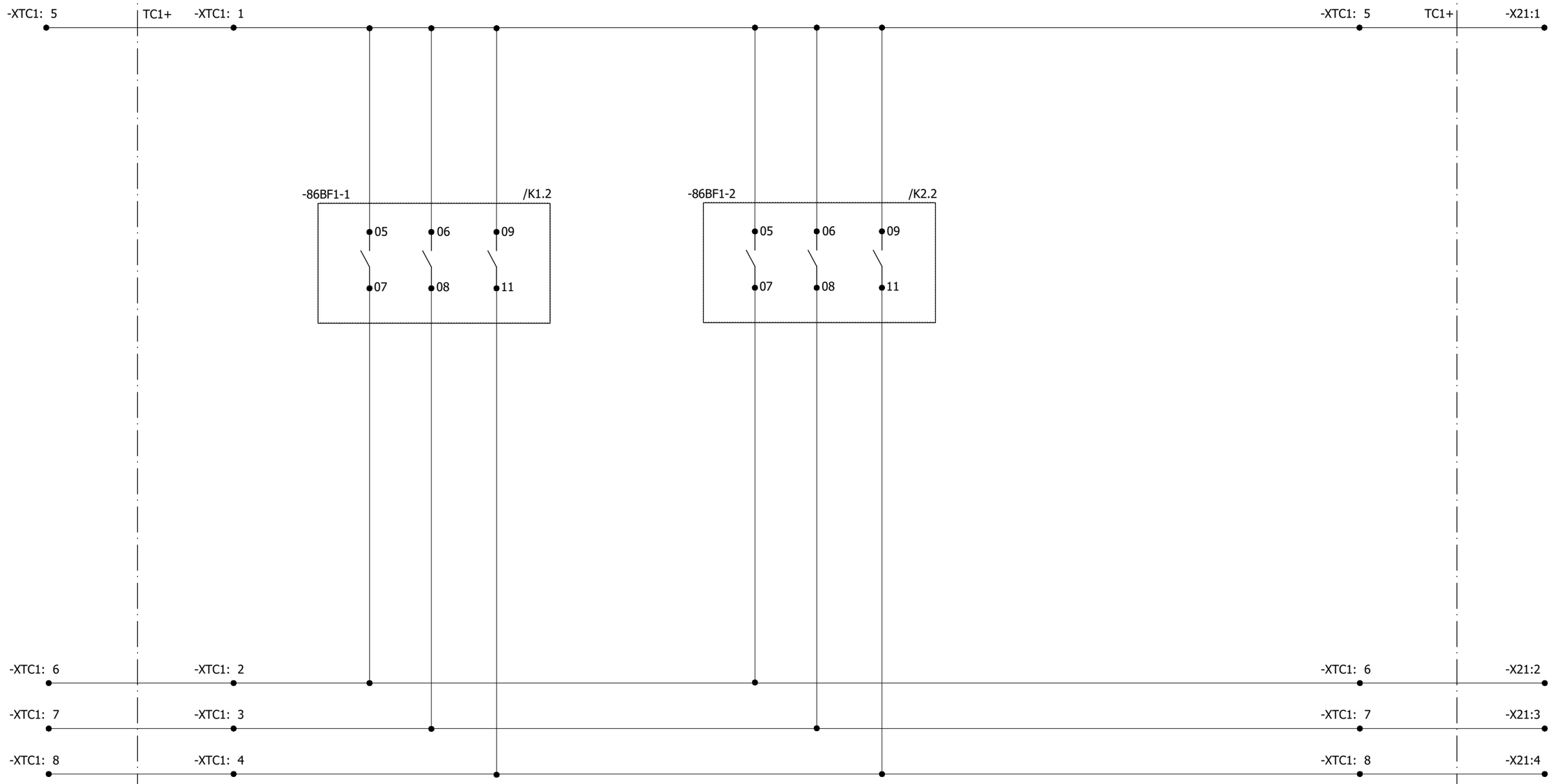
220kV LINE RELAY PANEL SET-2	STAGE-1 CB COIL-1	D01 TRIP ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D01+R2	(=D01+QO)	BF STAGE-2 OPERATED	=D00+R7
/K11			/N1



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 1

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K11	26

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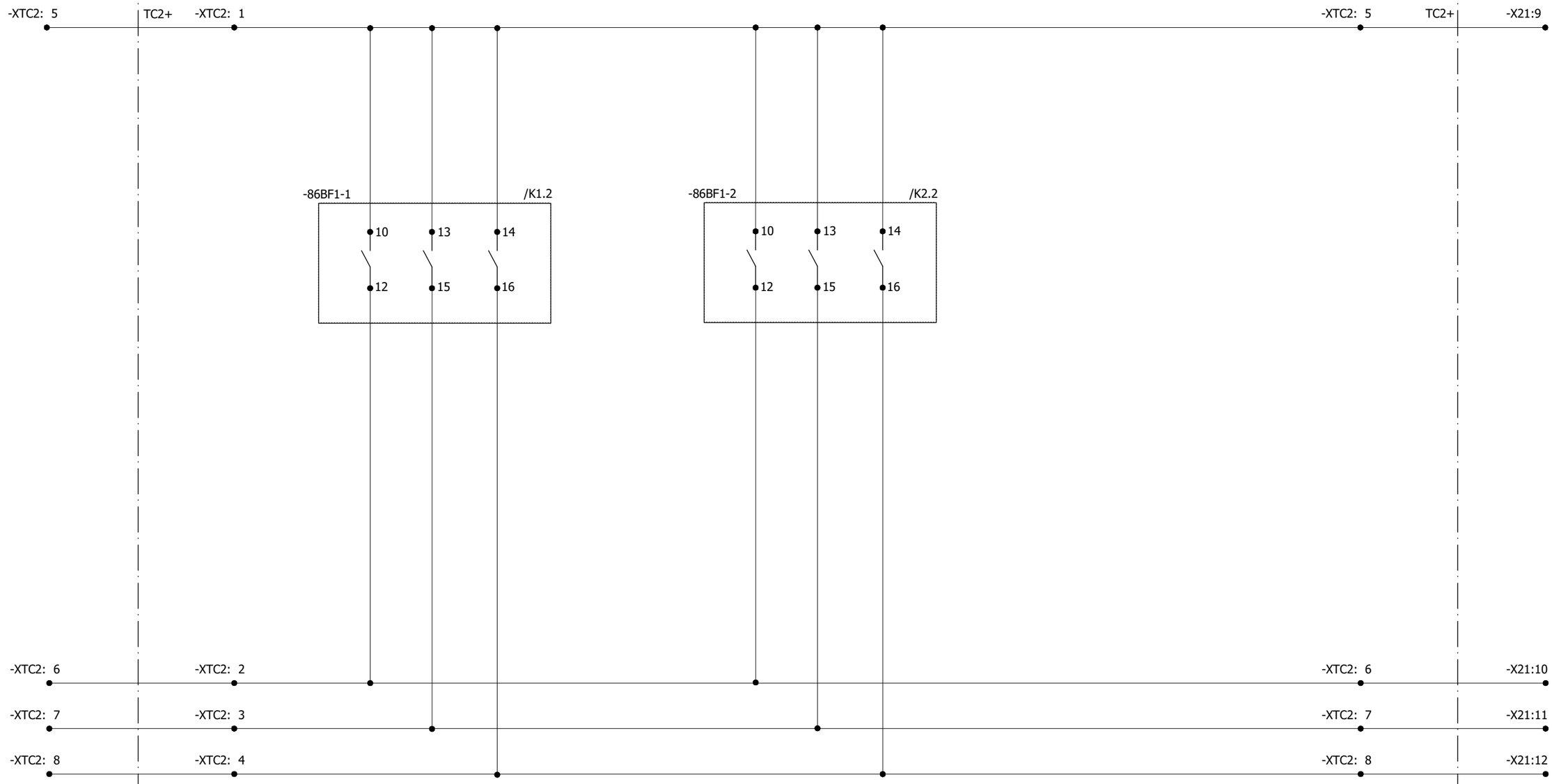
220kV LINE RELAY PANEL SET-1	STAGE-1 CB COIL-2	D01 TRIP ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D01+R1	(=D01+QO)	BF STAGE-2 OPERATED	=D00+R7
/K12			/N3



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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

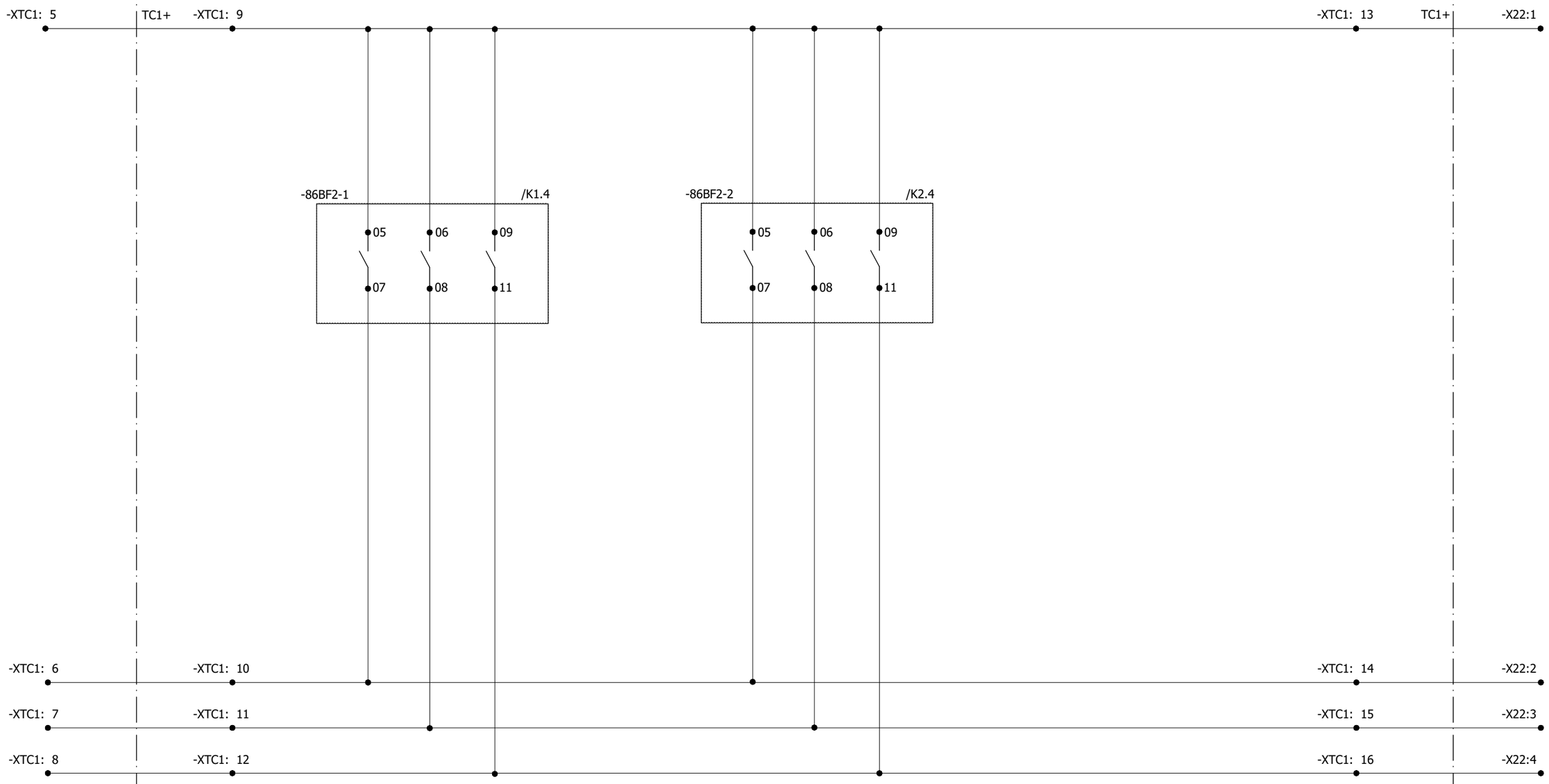
Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 2

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K12	27

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.

220kV LINE RELAY PANEL SET-2	STAGE-1 CB COIL-1	D02 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D02+R2	(=D02+QO)	BF STAGE-2 OPERATED	=D00+R7
/K11			/N1



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

Manufacturer: EPESOL, 21-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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 1

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K21	28

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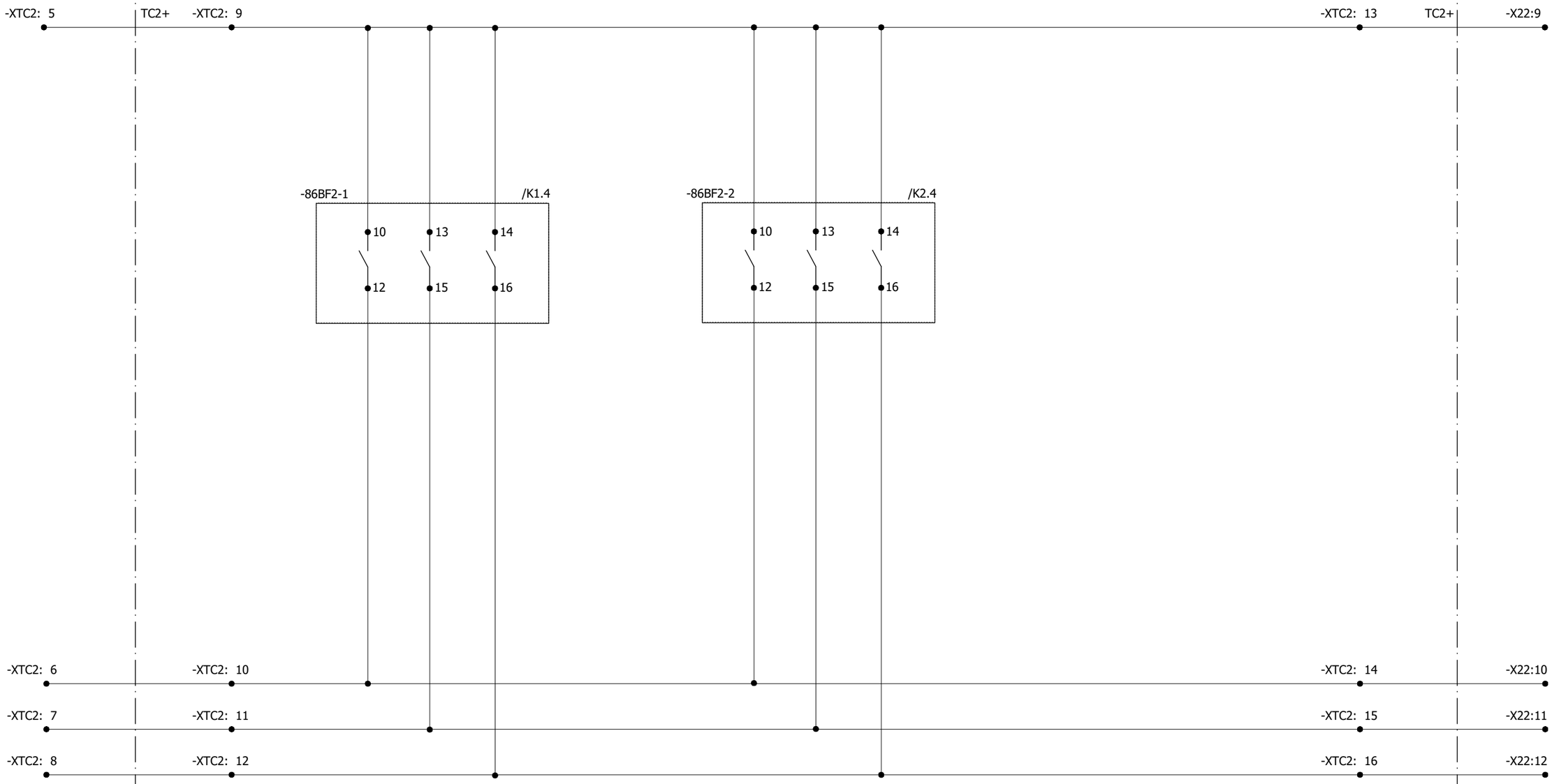
220kV LINE RELAY PANEL SET-1	STAGE-1 CB COIL-2	D02 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D02+R1	(=D02+QO)	BF STAGE-2 OPERATED	=D00+R7
/K12			/N3



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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

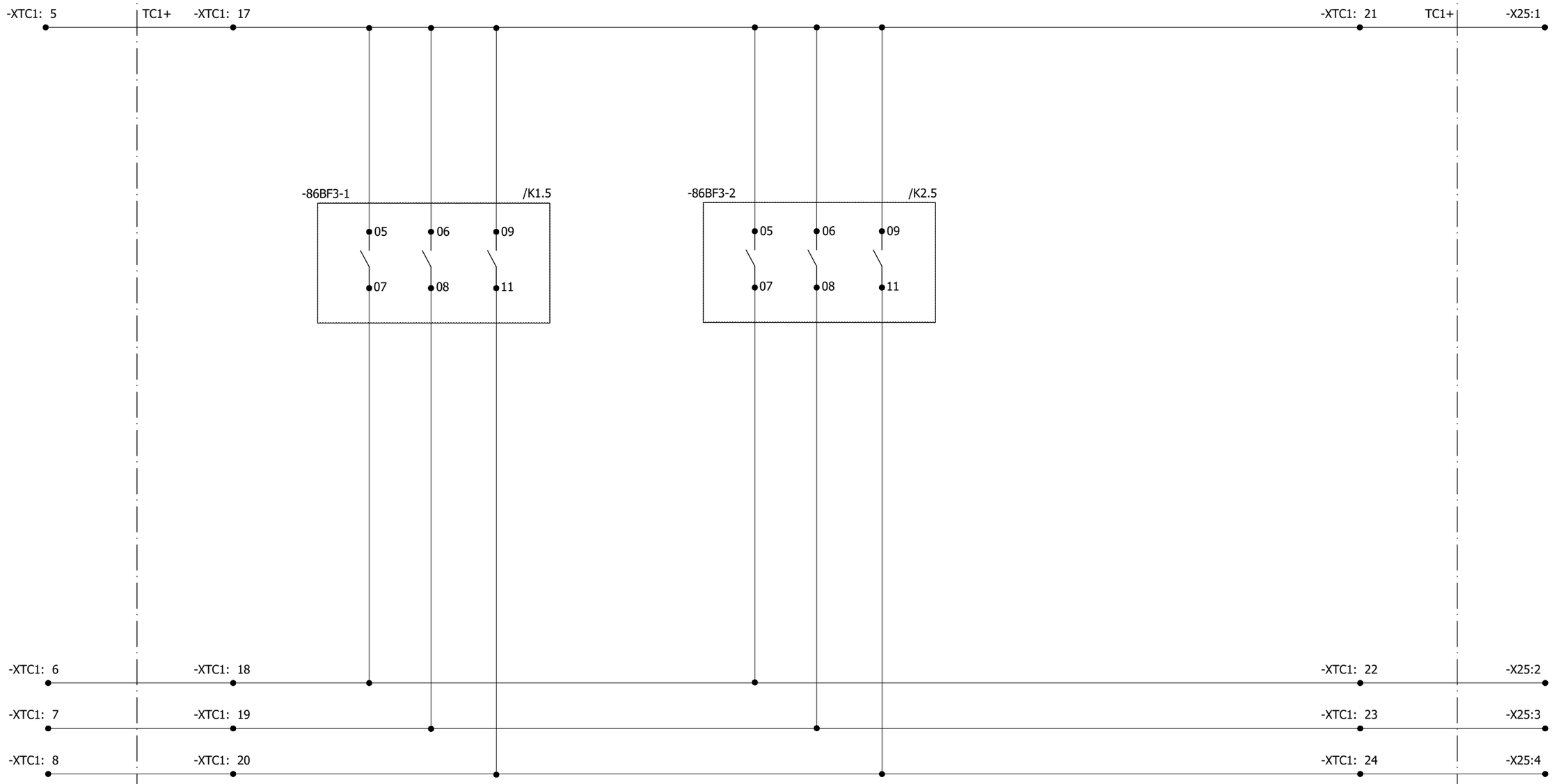
Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 2

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K22	29

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.

220kV LINE RELAY PANEL SET-2	STAGE-1 CB COIL-1	D05 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D05+R2	(=D05+QO)	BF STAGE-2 OPERATED	=D00+R7
/K11			/N2



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 1

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K31	30

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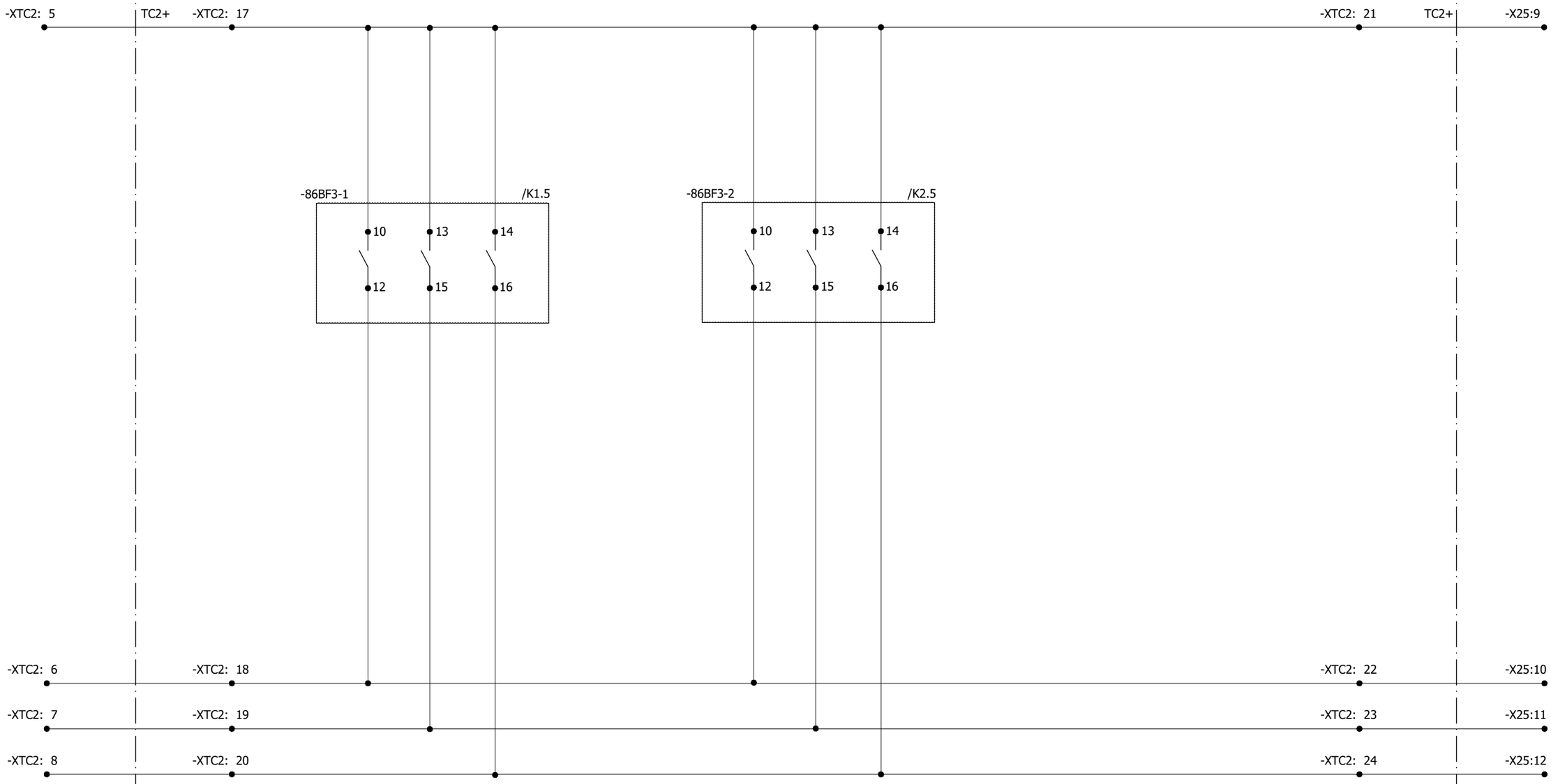
220kV LINE RELAY PANEL SET-1	STAGE-1 CB COIL-2	D05 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D05+R1	(=D05+QO)	BF STAGE-2 OPERATED	=D00+R7
/K12			/N4



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 2

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K32	31

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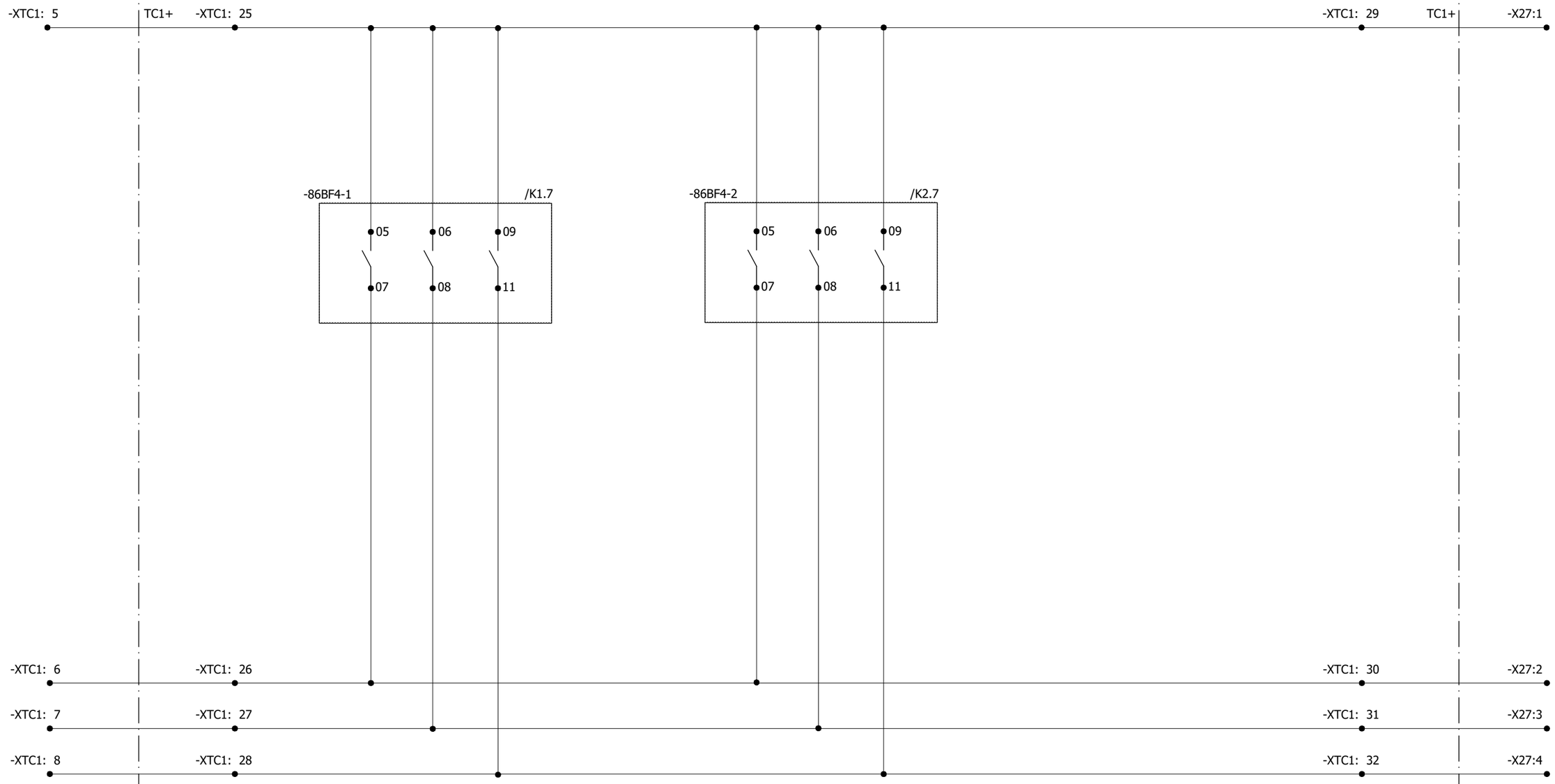
220kV LINE RELAY PANEL SET-2	STAGE-1 CB COIL-1	D08 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D08+R2	(=D08+QO)	BF STAGE-2 OPERATED	=D00+R7
/K11			/N2



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 1

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K41	32

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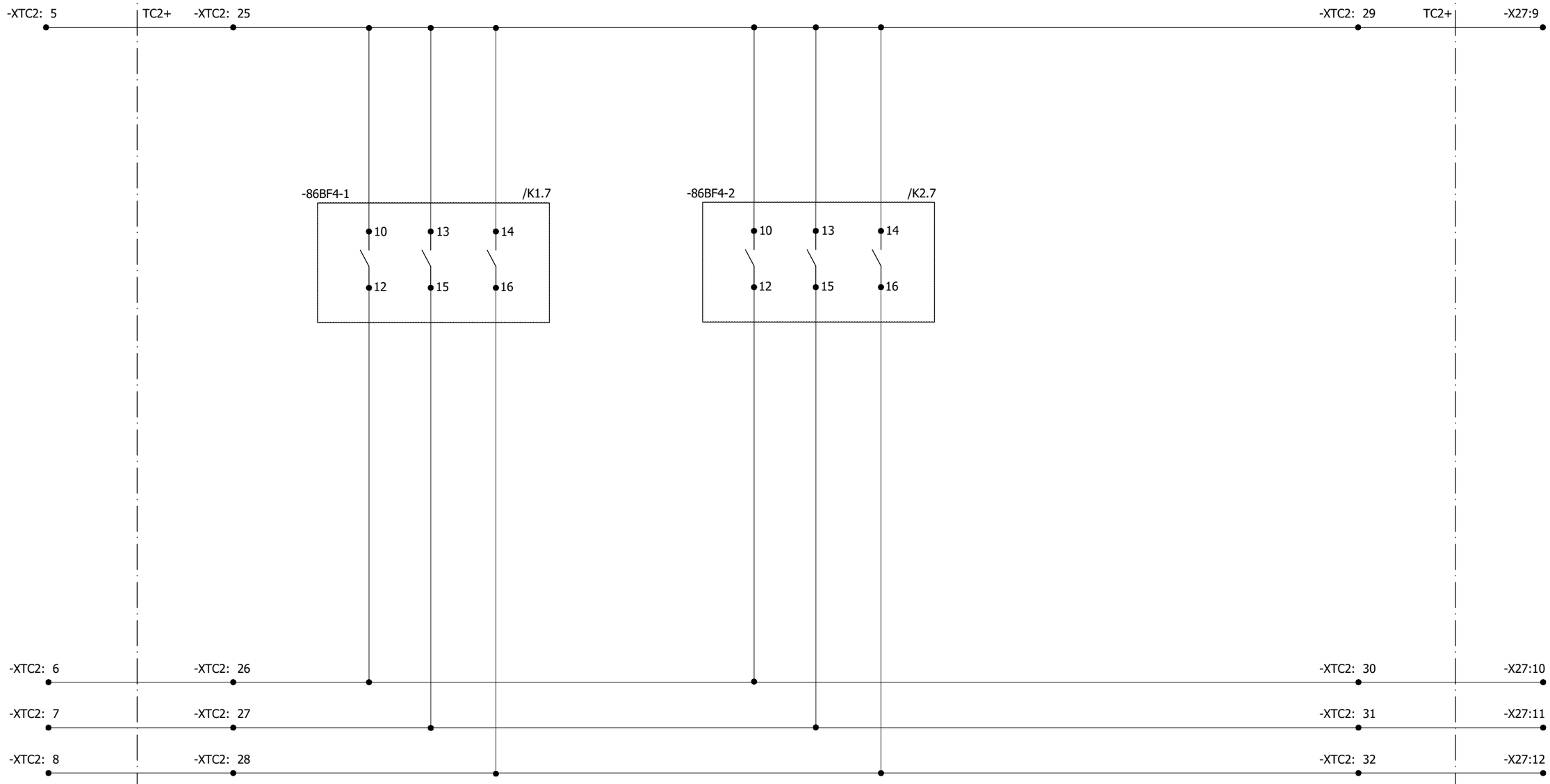
220kV LINE RELAY PANEL SET-1	STAGE-1 CB COIL-2	D08 TRIPPING ON ADJACENT CB	220kV BUSBAR PROTECTION RELAY PANEL
=D08+R1	(=D08+QO)	BF STAGE-2 OPERATED	=D00+R7
/K12			/N4



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIP CIRCUIT FOR COIL - 2

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	K42	33

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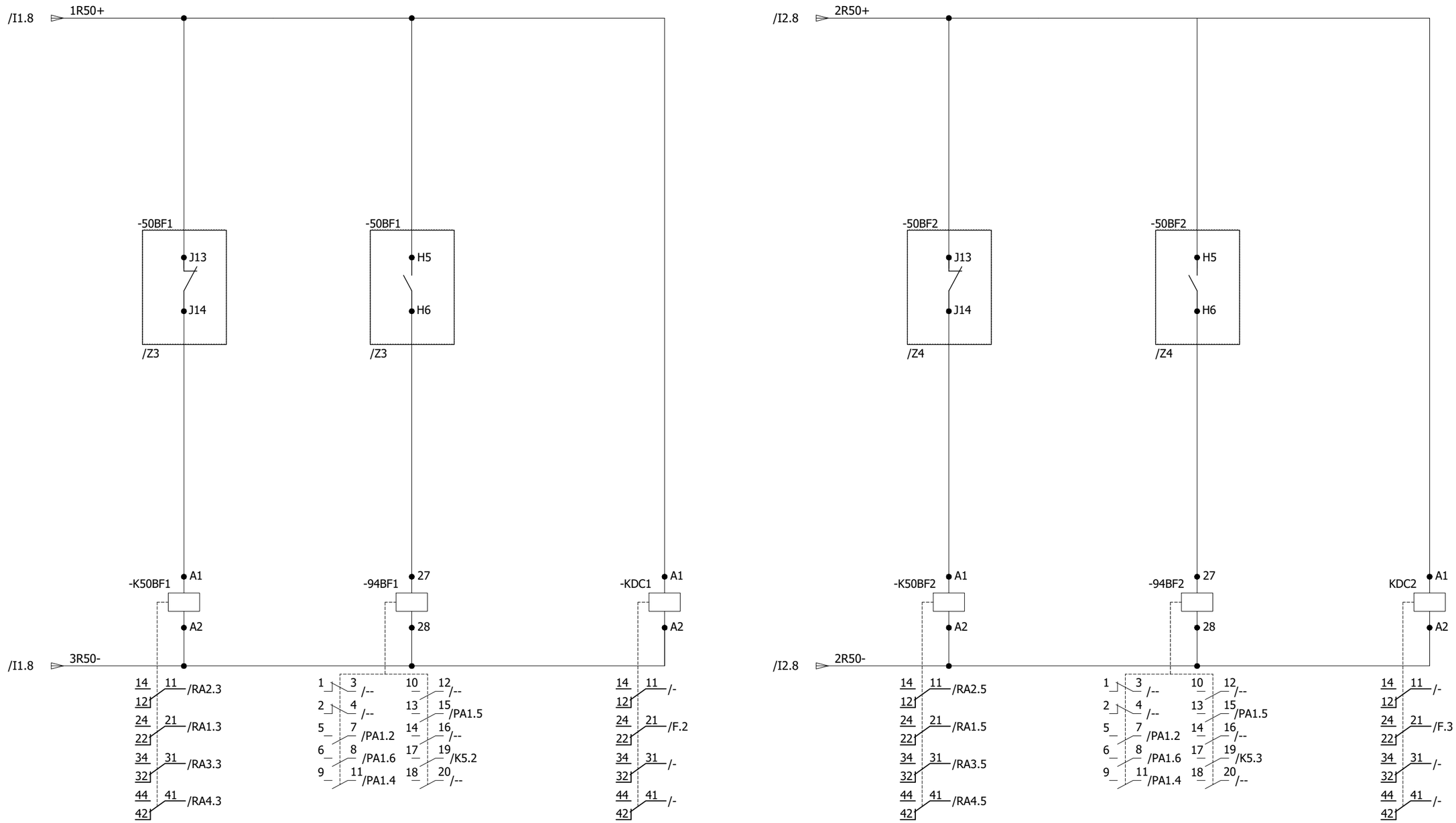
CBF RELAY FAULTY	STAGE-2 TRIPPING	DC SUPERVISION	CBF RELAY FAULTY	STAGE-2 TRIPPING	DC SUPERVISION
(D01+Q0)	-94BF-1		(D02+Q0)	-94BF-2	



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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

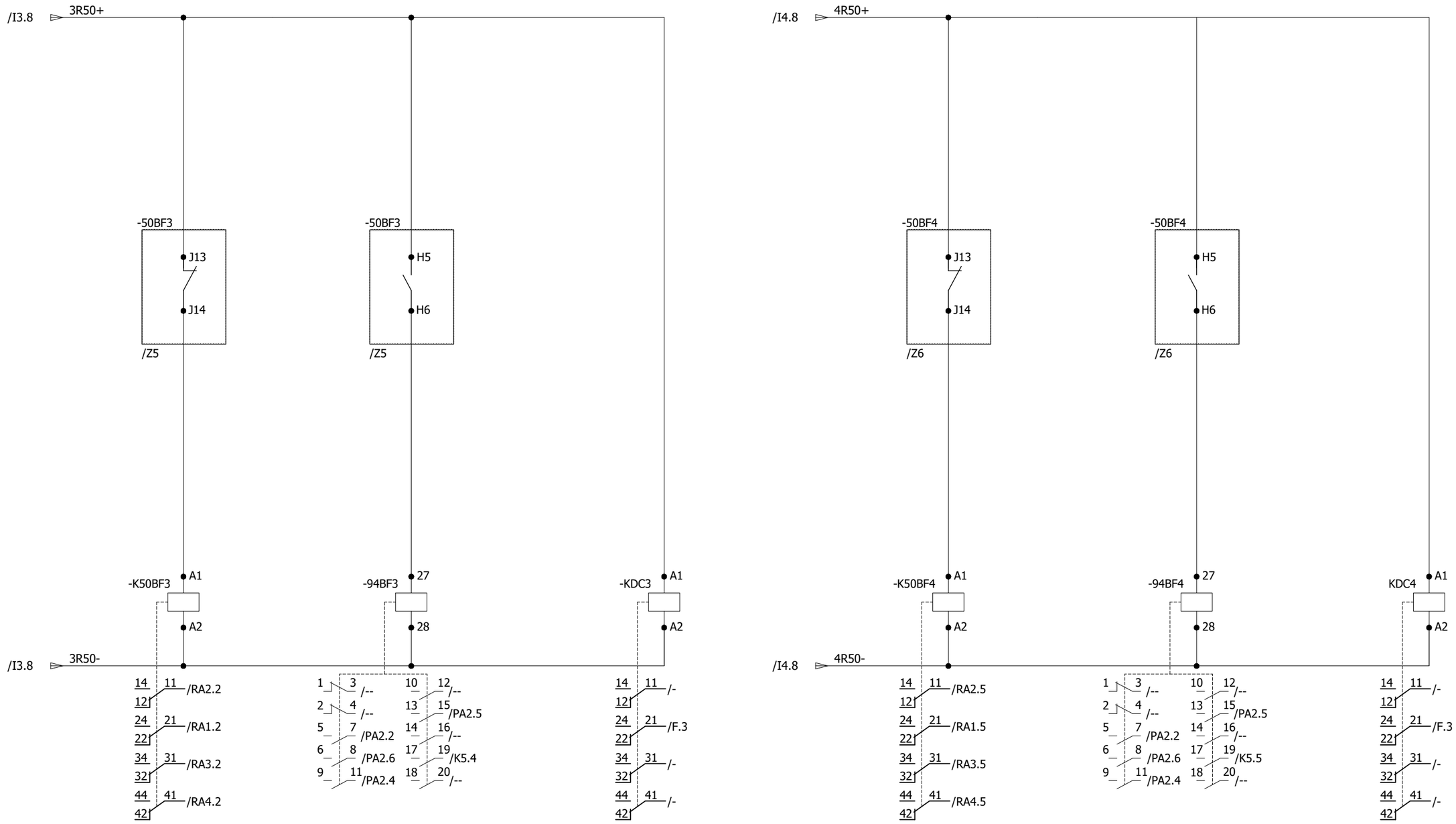
Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) SYSTEM ALARMS

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	NA1	34

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.

CBF RELAY FAULTY	STAGE-2 TRIPPING	DC SUPERVISION	CBF RELAY FAULTY	STAGE-2 TRIPPING	DC SUPERVISION
(D05+Q0)	-94BF-3		(D08+Q0)	-94BF-4	



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) SYSTEM ALARMS

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	NA2	35

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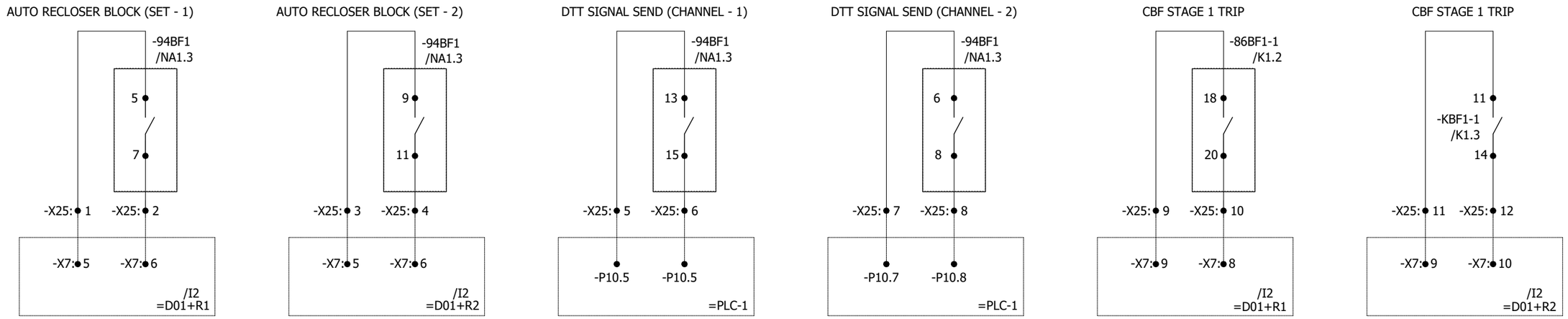
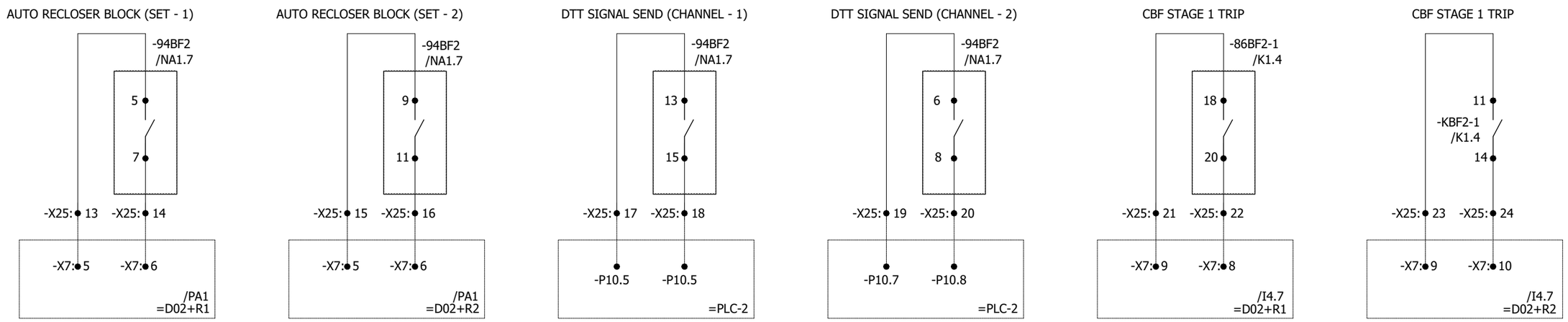
=D01



=D02



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) DTT SEND

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	PA1	36

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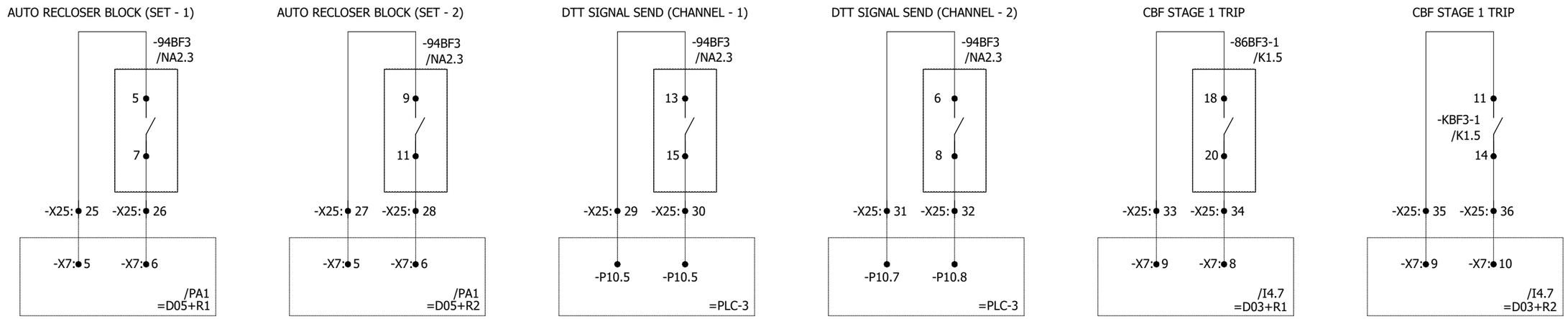
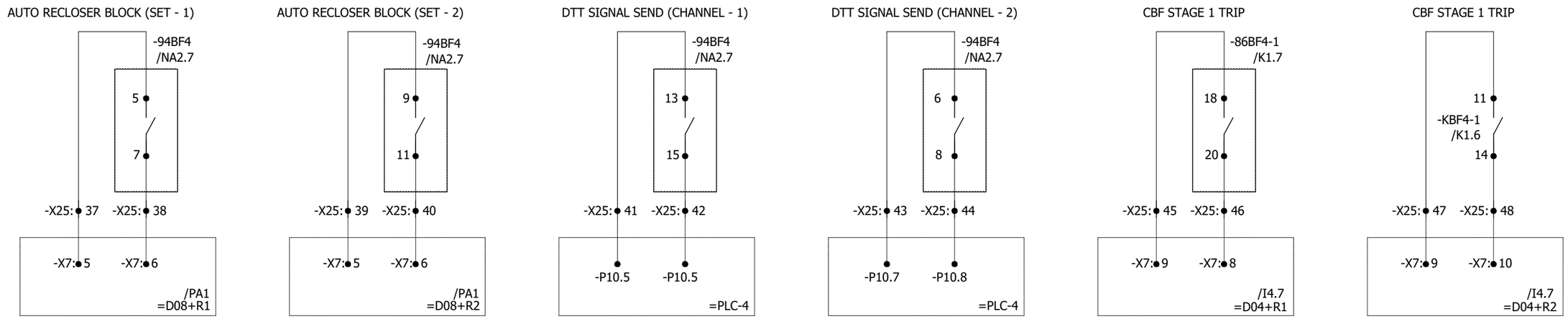
=D05



=D08



REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) DTT SEND

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	PA2	37

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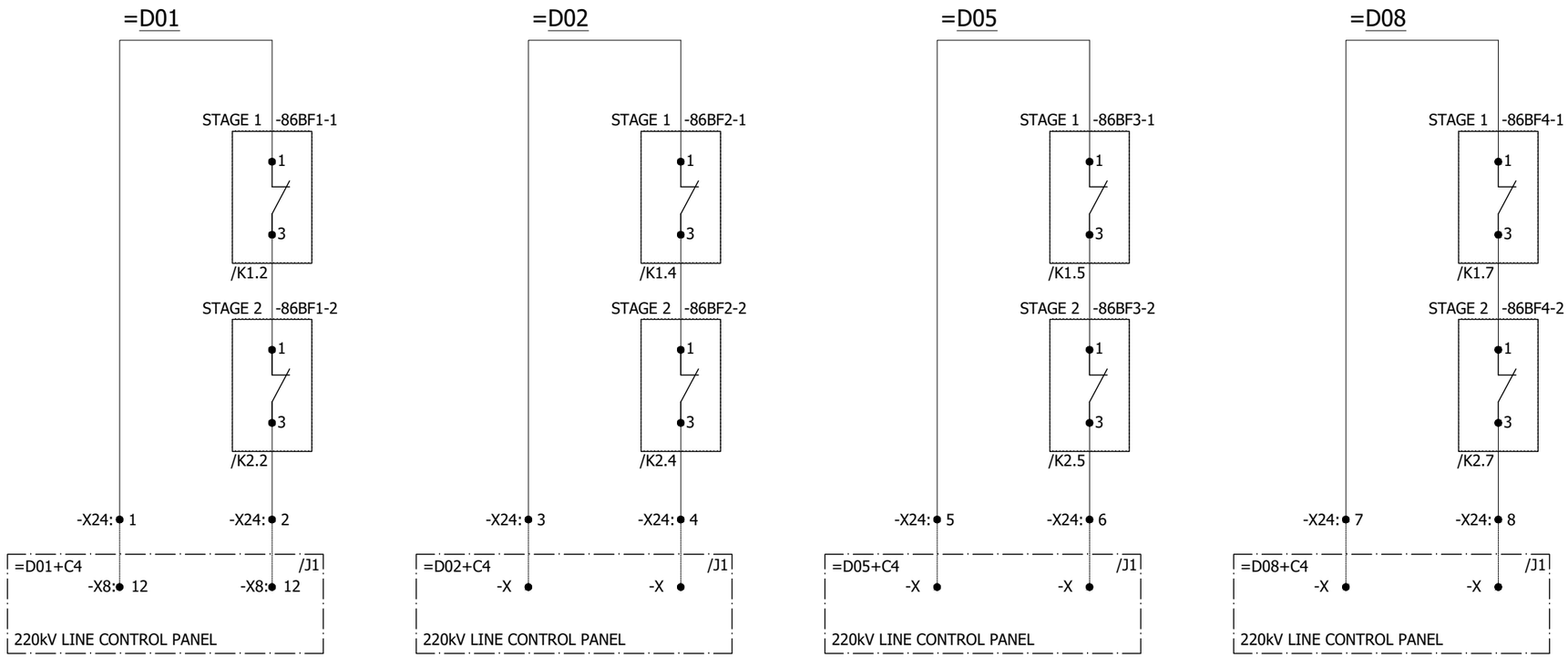

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) CLOSING LOCKOUTS SIGNAL

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	PA3	38

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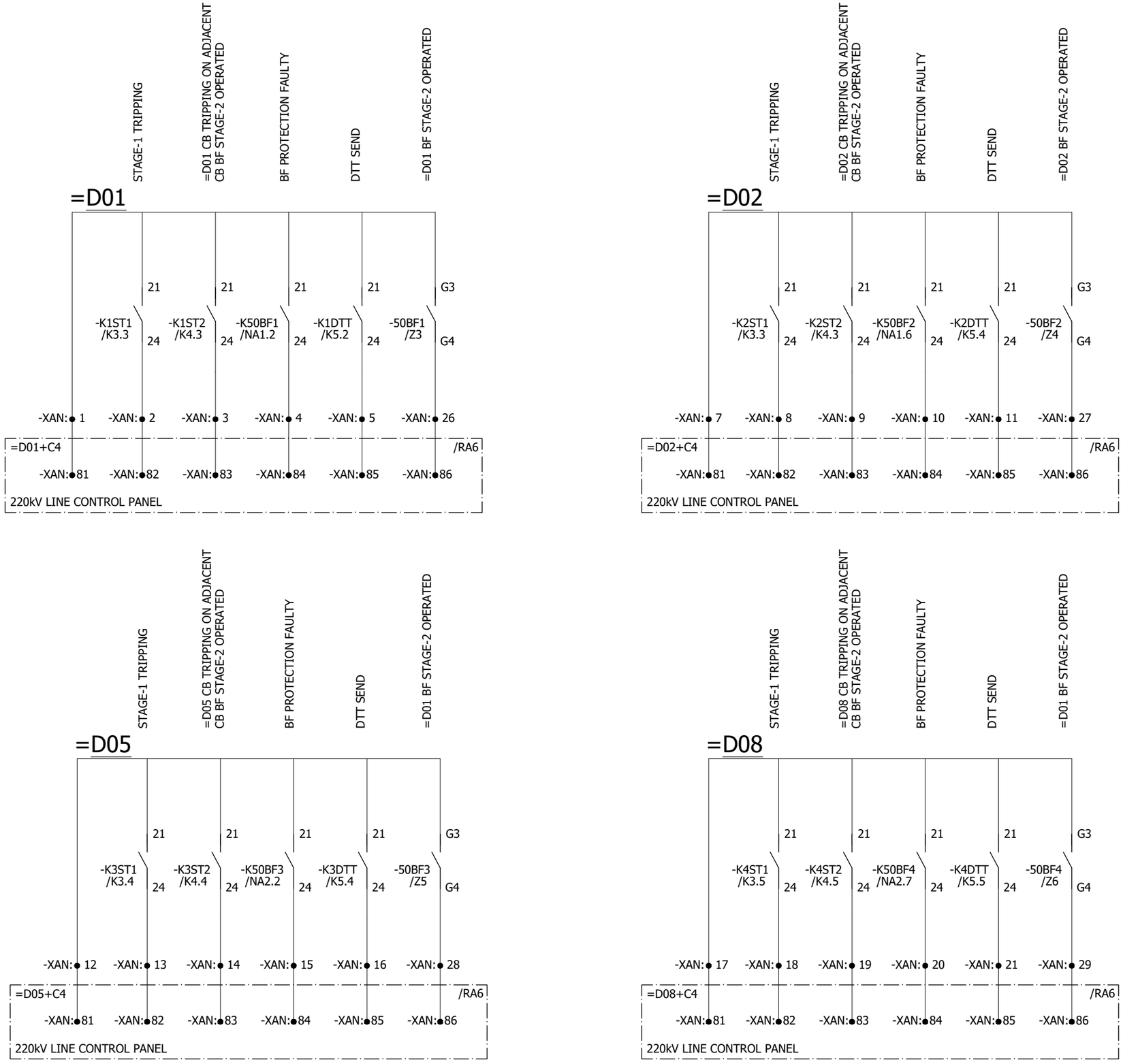

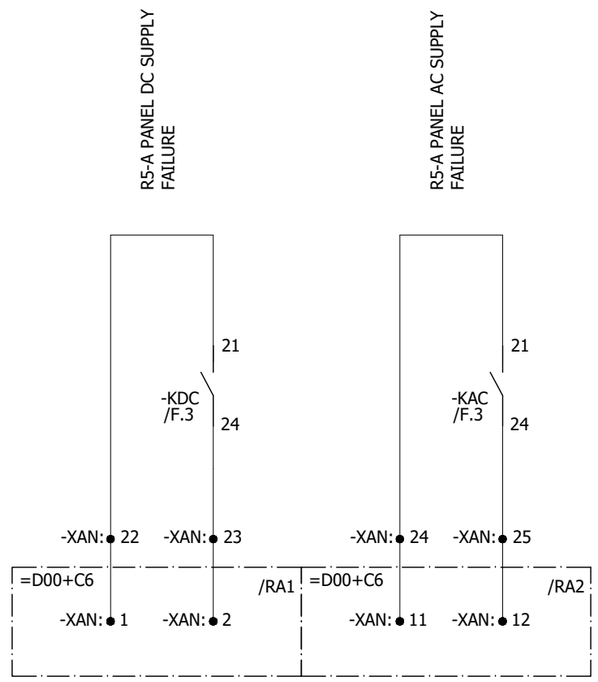

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) TRIPPING ANNUNCIATIONS

Drawing no.: P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	RA1	39

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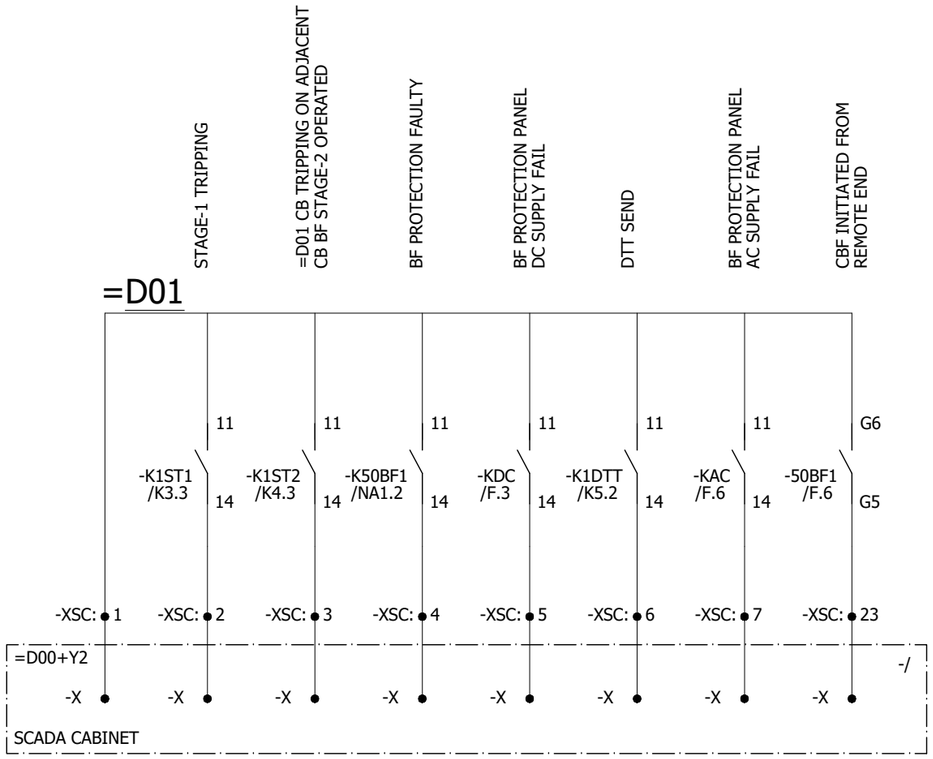

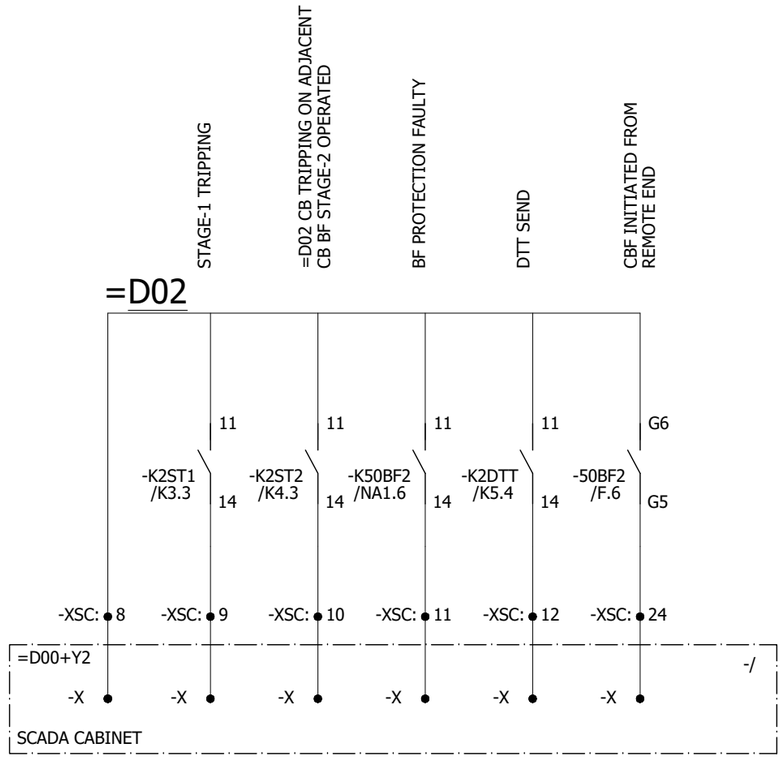

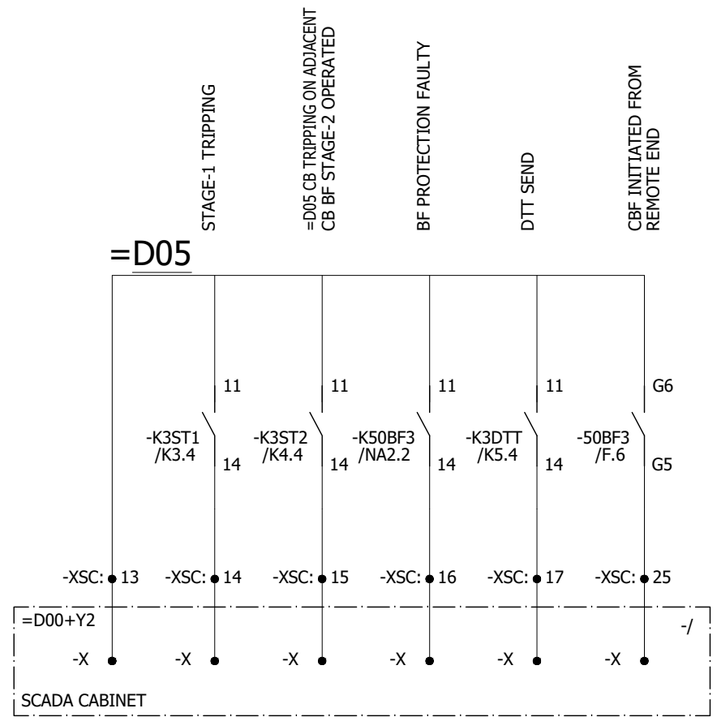

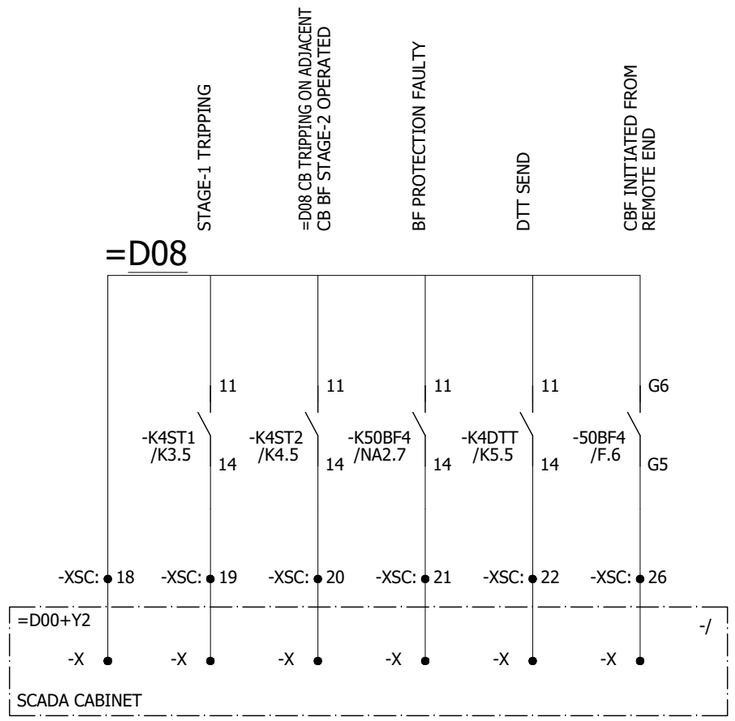

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) SCADA INTERFACE CABINET

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	RA2	40

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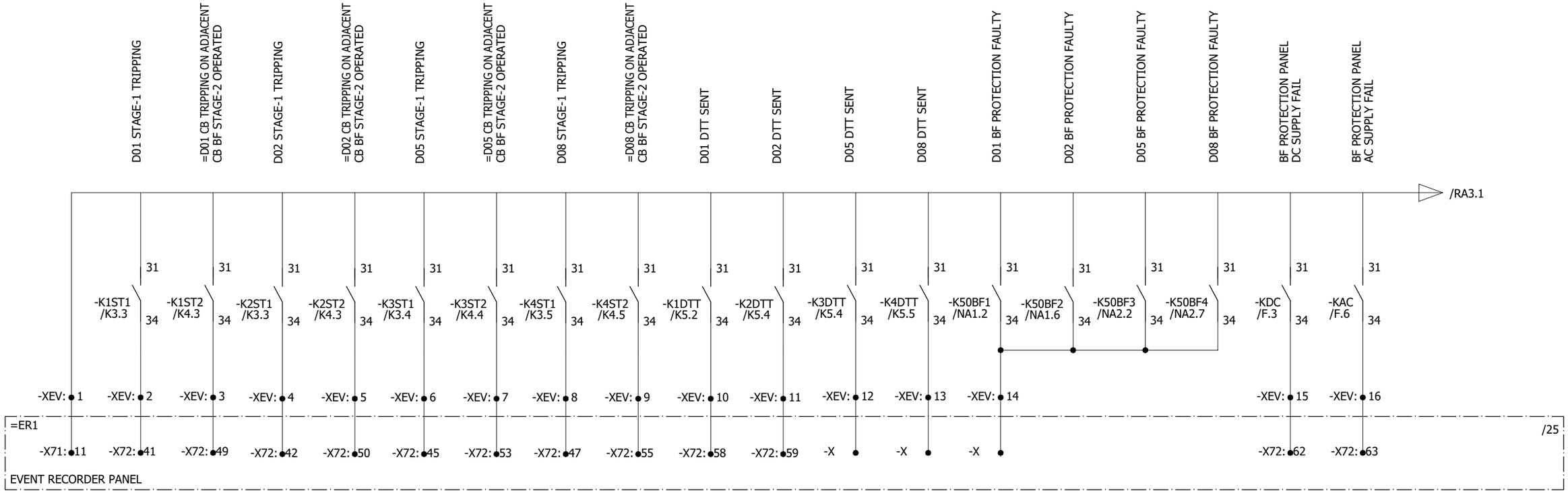

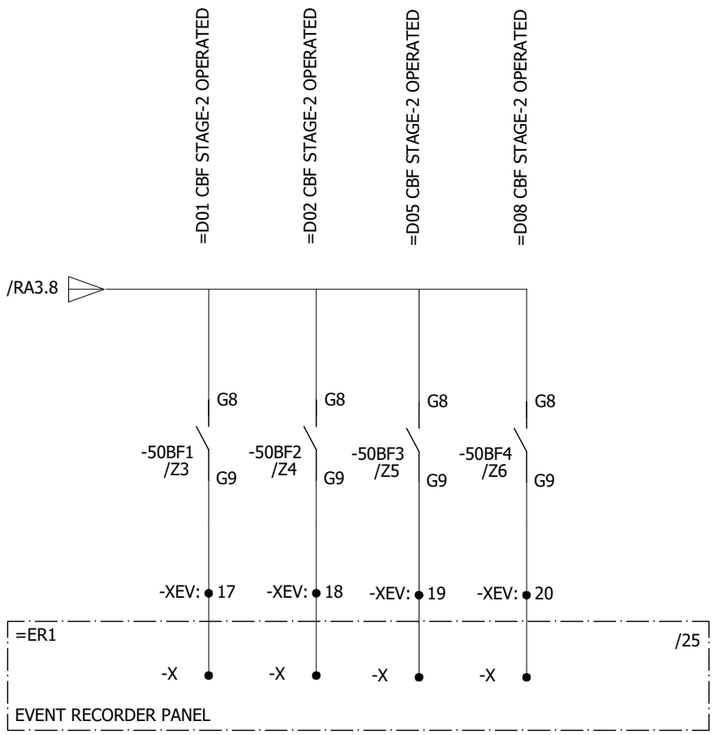

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) EVENT RECORDER

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	RA3	41

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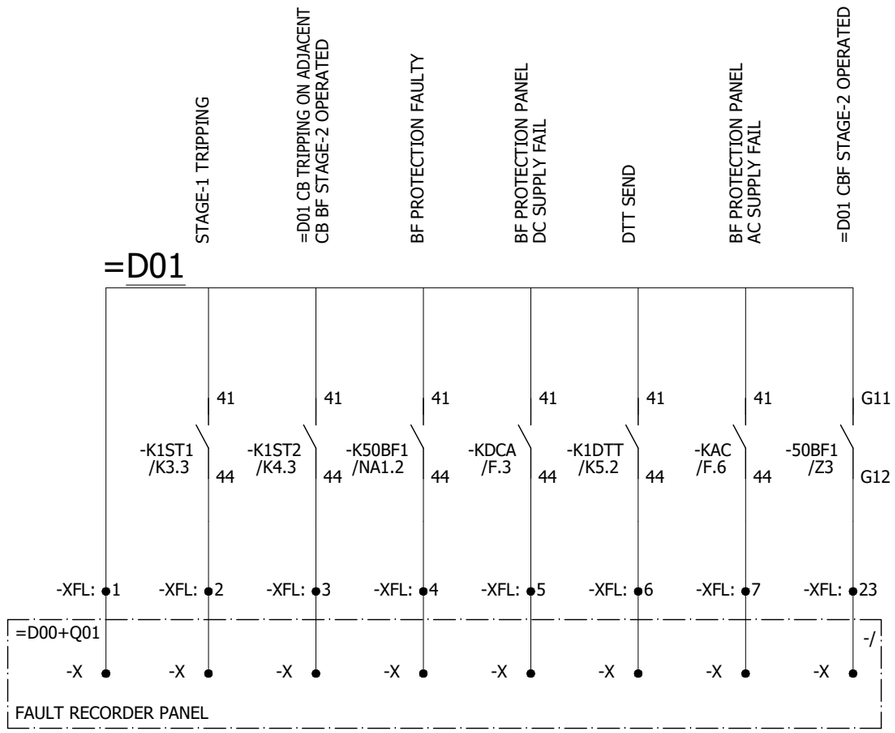

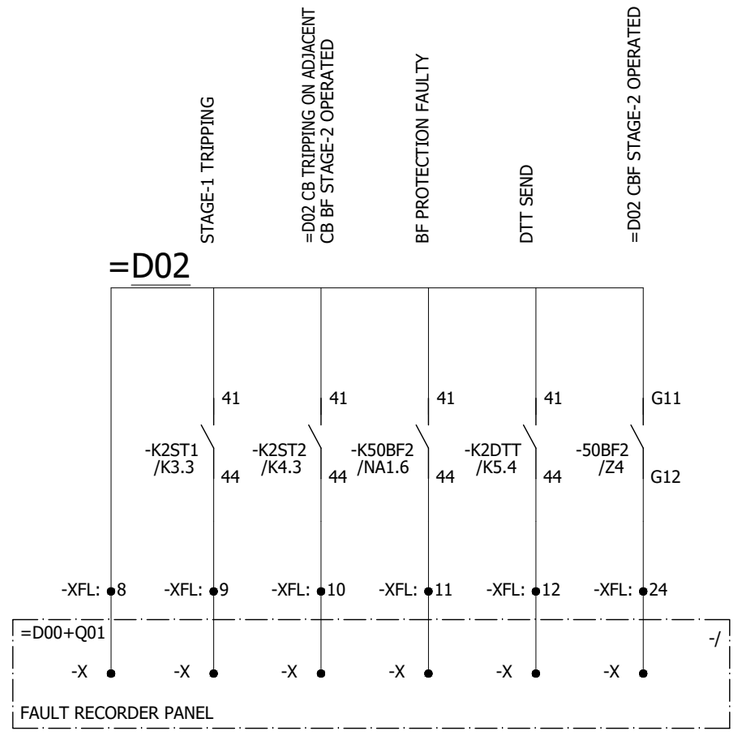

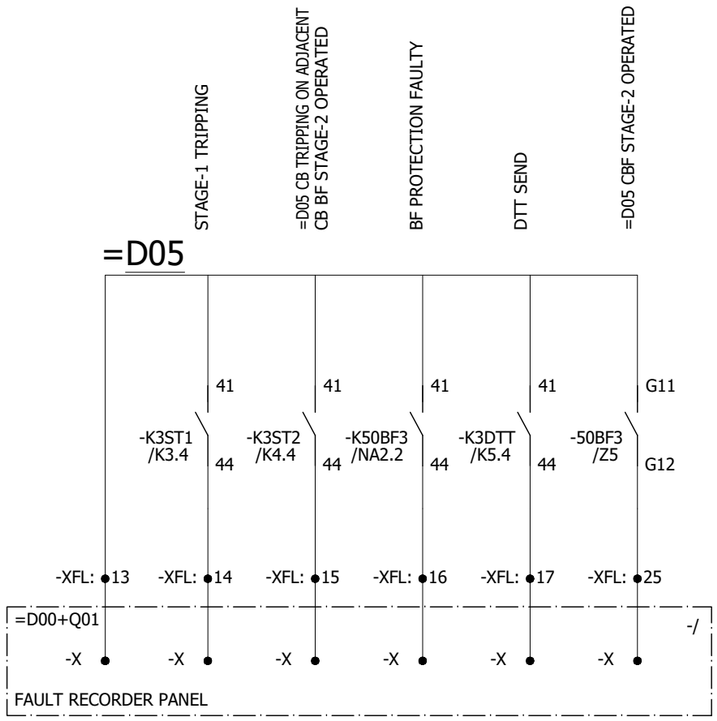

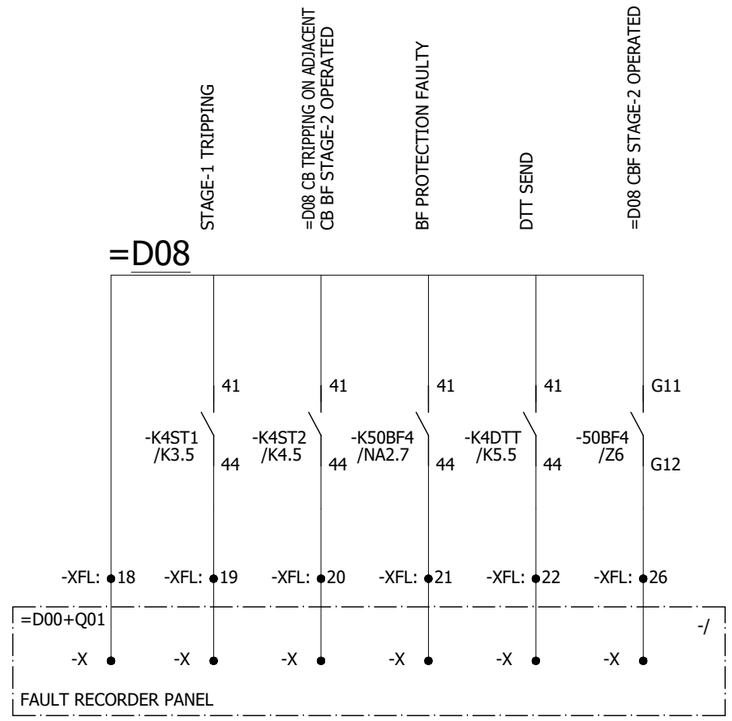

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) FAULT RECORDER

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	RA4	42

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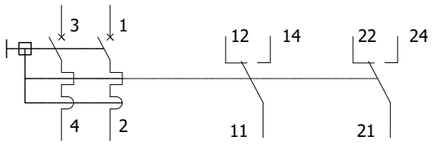


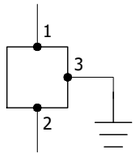
-F101	D.2	F.6	
-F102	D.4	F.6	
-F103	D.6	F.6	
-F201	E.3	F.1	
-F202	E.4	F.1	
-F203	E.5	F.1	
-F204	E.6	F.2	
-F205	E.7	F.3	

-S100	D.3

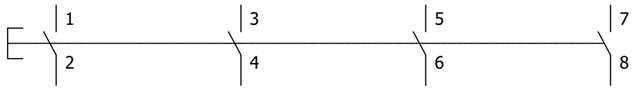
-B100	D.4	D.5

-H200	F.4

-R100	D.5



-X100	D.7



-S86	J.5			

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT DIAGRAM

Drawing no.: P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z1	43

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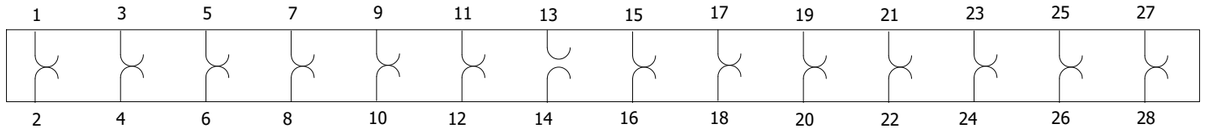
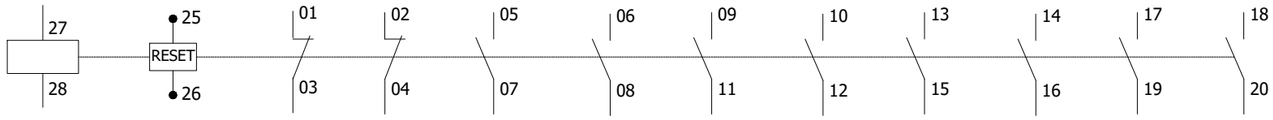


-XTBF1-1	K1.2	K1.2	I1.2	I1.3			G.2	G.2			H1.5	H1.5	H1.5	H1.5
-XTBF1-2	K2.2	K2.2	I1.2	I1.3			G.2	G.2						
-XTBF2-1	K1.4	K1.4	I2.2	I2.3			G.4	G.4			H1.5	H1.5	H1.5	H1.5
-XTBF2-2	K2.4	K2.4	I2.2	I2.3			G.4	G.4						
-XTBF3-1	K1.5	K1.5	I3.2	I3.3			G.5	G.5			H2.5	H2.5	H2.5	H2.5
-XTBF3-2	K2.5	K2.5	I3.2	I3.3			G.5	G.5						
-XTBF4-1	K1.7	K1.7	I4.2	I4.3			G.7	G.7			H2.5	H2.5	H2.5	H2.5
-XTBF4-2	K2.7	K2.7	I4.2	I4.3			G.7	G.7						



94BF1	NA1.3				PA1.2	PA1.6	PA1.4		PA1.5		K5.2	
94BF2	NA1.7				PA1.2	PA1.6	PA1.4		PA1.5		K5.3	
94BF3	NA2.3				PA2.2	PA2.6	PA2.4		PA2.5		K5.4	
94BF4	NA2.7				PA2.2	PA2.6	PA2.4		PA2.5		K5.5	
86BF1-1	K1.2	J.2	PA3.4		K11.2	K11.3	K11.3	K12.2	K12.3	K12.2	K3.3	PA1.7
86BF1-2	K2.2	J.3			K11.4	K11.5	K11.5	K12.4	K12.5	K12.5		
86BF2-1	K1.4	J.3	PA3.4		K21.2	K21.3	K21.3	K22.2	K22.3	K22.2	K3.3	PA1.7
86BF2-2	K2.4	J.4			K21.4	K21.5	K21.5	K22.4	K22.5	K22.5		
86BF3-1	K1.5	J.5	PA3.4		K31.2	K31.3	K31.3	K32.2	K32.3	K32.2	K3.4	PA2.7
86BF3-2	K2.5	J.6			K31.4	K31.5	K31.5	K32.4	K32.5	K32.5		
86BF4-1	K1.7	J.6	PA3.4		K41.2	K41.3	K41.3	K42.2	K42.3	K42.2	K3.5	PA2.7
86BF4-2	K2.7	J.7			K41.4	K41.5	K41.5	K42.4	K42.5	K42.5		

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	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 CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT DIAGRAM

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z2	44

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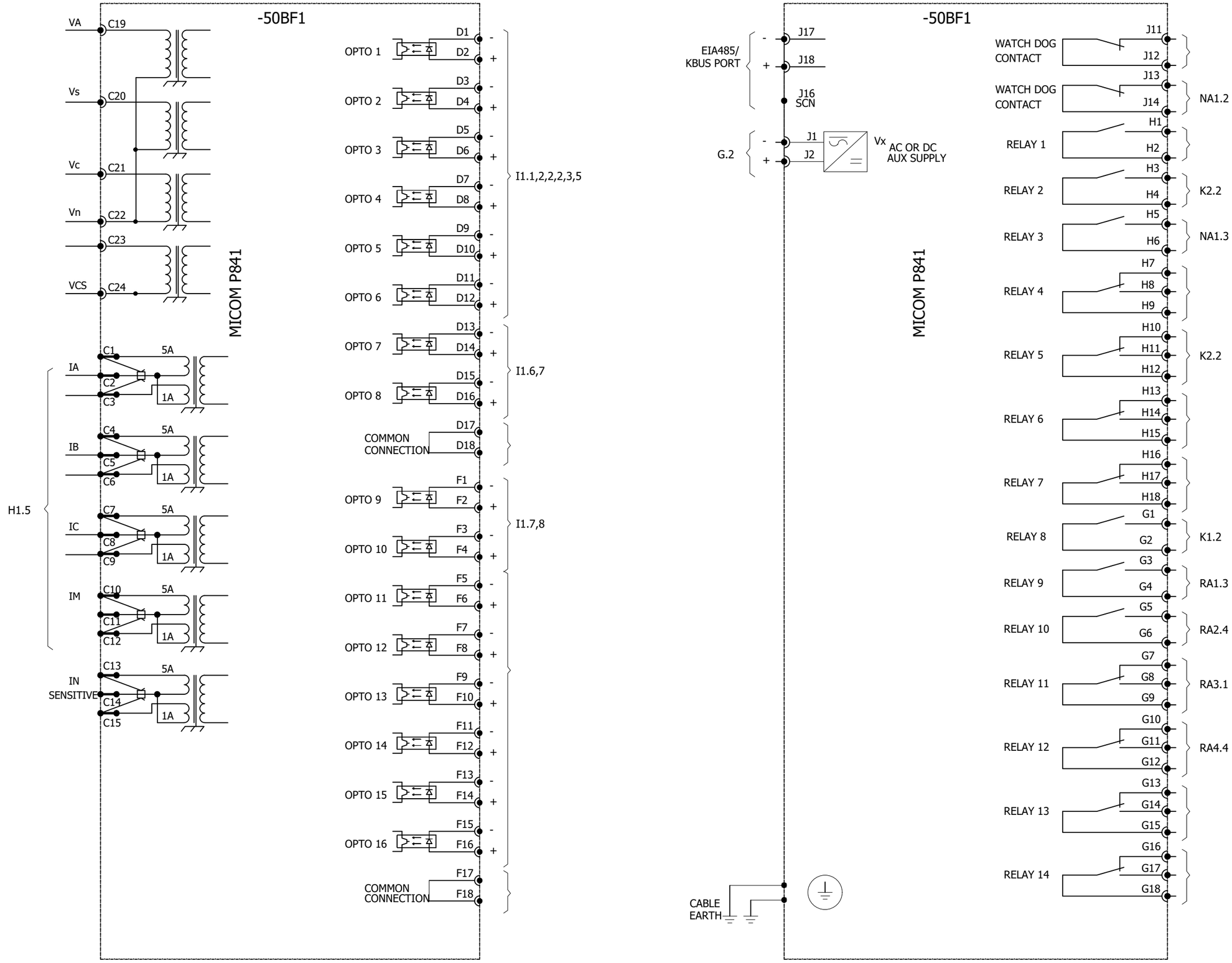

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT DIAGRAM

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z3	45

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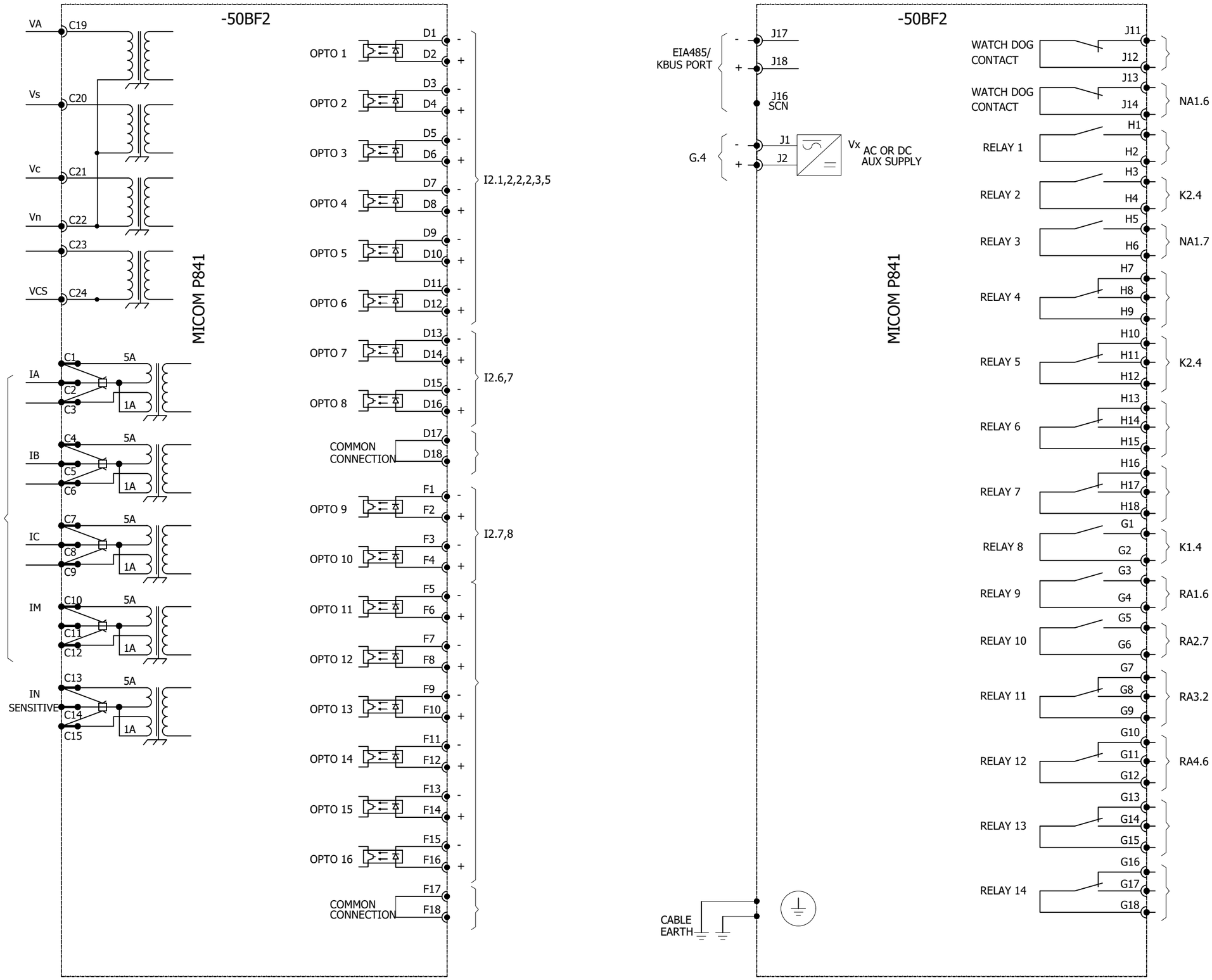

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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 CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT DIAGRAM

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z4	46

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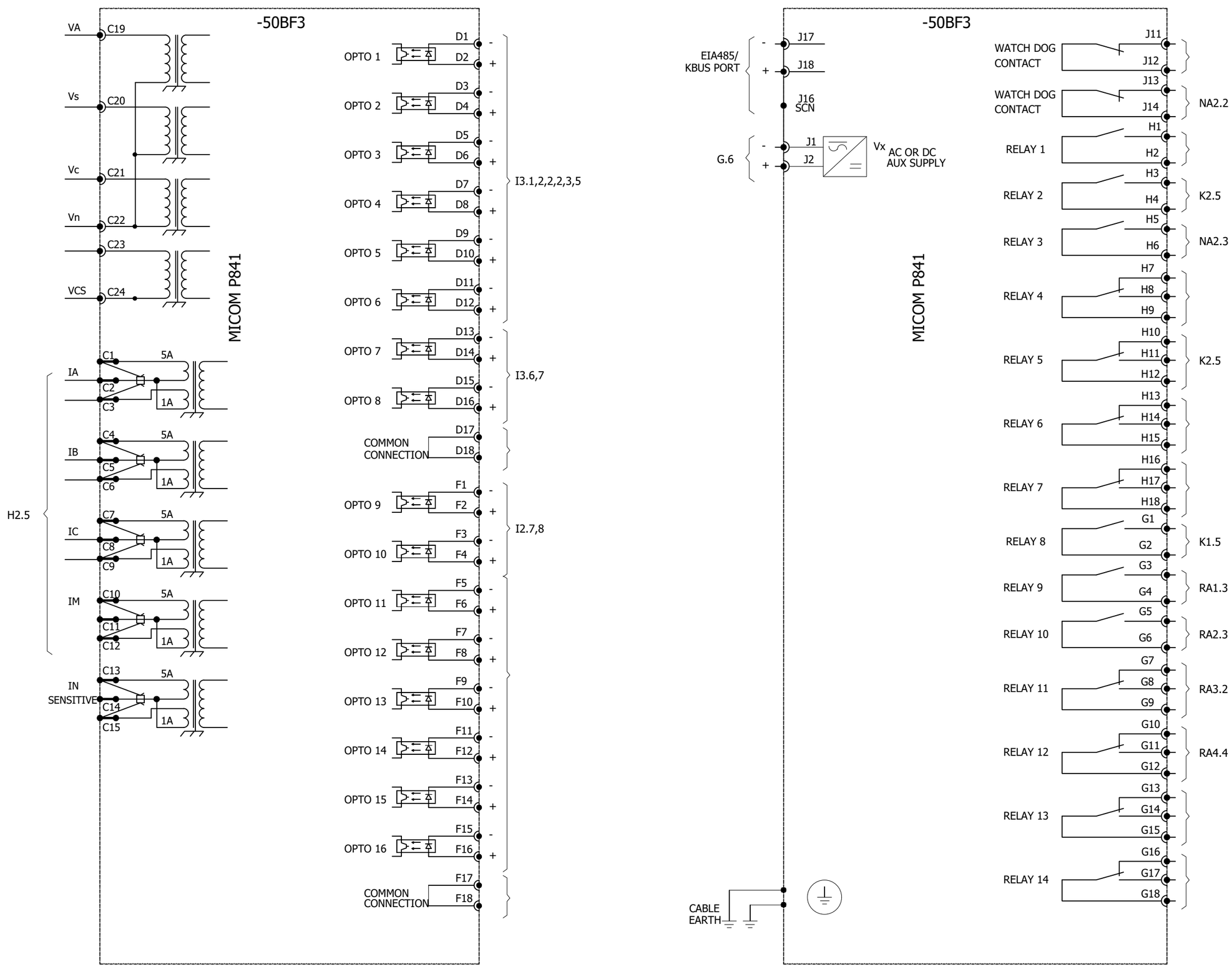

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z5	47

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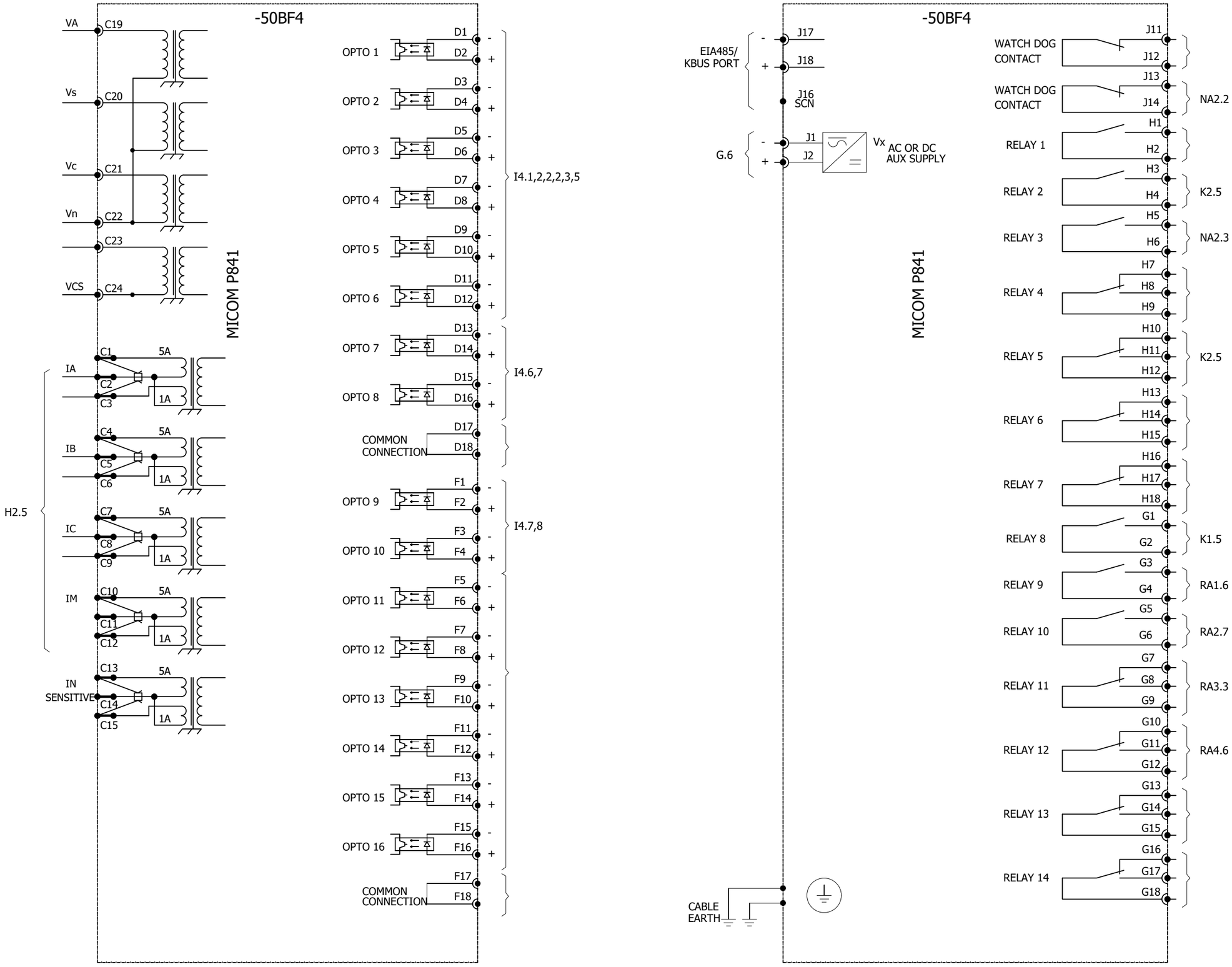

REV.	DESCRIPTION	DATE	DRAWER
0	AS BUILT	10.10.2018	ASJ

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Title: 220kV CB FAILURE PROTECTION PANEL (=D00+R5A) COMPONENT DIAGRAM

Drawing no. P60194-E-DFR-SC-001

Project no.	Sheet type	Sheet no.
P-60194	Z6	48