ERL MAINTENANCE SUPPORT SDN BHD

Co. Reg. No. 199901023674 (498574-T)

E-MAS

Effective Railway Operations; Reliable System Maintenance

ELECTRIFICATION (ELT) DEPARTMENT

TRACTION POWER SUPPLY SWITCHING VIA SCADA PRODECURE

Ref. No. U00.OME.M40000.BT.1001.B

Release

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Amendments or additions to this procedure must be indicated with a vertical black line in the adjacent left margin.

Change Record and Configuration Control

B	02.03.2020	Incorporated the 25kV switching procedure for OCL switches at TPSS	Nur Arina
A	02.07.2019	New	Nur Arina
Revision	**Date**	**Modification**	**Name**

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Issues To Consider	**Checked** *(Please mark X)*				**Remarks**
1) Are there any negative impact?	YES		NO	X	
2) Will the integrity of QEMS be affected?	YES		NO	X	
3) Resources available?	YES	X	NO		
4) Allocation or relocation of responsibilities and authorities required?	YES		NO	X	

ABBREVIATIONS & DEFINITIONS

Abbreviation	Definition
AC	Alternating Current
BTS	Bandar Tasik Selatan Station
CB	Circuit Breaker
CER	Communication Equipment Room
CRS	Crossover
CT	Current Transformer
DC	Direct Current
DEPOT	Salak Tinggi Depot
EC	Engineering Controller
ELT	Electrification
ERLA	ERL Traction Power Supply Substation
ERLSB	Express Rail Link Sdn Bhd
GIS	Gas Insulated Switchgear
KLIA	Kuala Lumpur International Airport Station
KLIA2	Kuala Lumpur International Airport 2 Station
KLS	Kuala Lumpur Sentral Station
LILO	Loop In-Loop Out
OCC	Operation Control Centre
OCL	Overhead Contact Line
OCS	Operation Control Supervisor
OLTC	On-Load Tap Changer
PCS	Putrajaya Cyberjaya Station
RC	Return Conductor
RST	Rolling Stock
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SF_6	Sulphur Hexafluoride
SIG	Signalling

Abbreviation	Definition
STS	Salak Tinggi Station
TLE	Telecommunications
TNB	Tenaga Nasional Berhad
TPSS	Traction Power Supply Substation
VT	Voltage Transformer

ELECTRICAL TERMINOLOGIES

NO	TNB	ERLA	COMMON	REMARKS
1	Substation	Substation	Substation	
2	Switching	Switching	Switching	
3	Circuit Breaker	Circuit Breaker	Circuit Breaker	
4	Transformer	Transformer	Transformer	Refers to Power Transformer
5	Isolator	Isolator	Isolator	
6	Earth Link	Earth link	Earth Link	Earth link is common for both line & transformer
7	Earth Switch	Earth Switch	Earth Switch	
8	Lightning Arrester	Lightning Arrestor	Lightning Arrester	
9	Capacitor Voltage Transformer (CVT)	Capacitor Voltage Transformer (CVT)	Capacitor Voltage Transformer (CVT)	
10	Capacitor Bank	Capacitor Bank	Capacitor Bank	
11	Potential Transformer (PT)	Potential Transformer (PT)	Potential Transformer (PT)	
12	Voltage Transformer (VT)	Voltage Transformer (VT)	Voltage Transformer (VT)	
13	Current Transformer (CT)	Current Transformer (CT)	Current Transformer (CT)	
14	Bushing	Bushing	Bushing	
15	Arching Horn	Arching Horn	Arching Horn	
16	Busbar	Busbar	Busbar	
17	Right Busbar	Right Busbar	Right Busbar	
18	Left Busbar	Left Busbar	Left Busbar	
19	Bus Coupler	Bus Coupler	Bus Coupler	
20	Bus Section	Bus Section	Bus Section	
21	Earthing Transformer	Earthing Transformer	Earthing Transformer	
22	Insulator	Insulator	Insulator	
23	Conductor	Conductor	Conductor	
24	Jumper	Jumper	Jumper	

NO	TNB	ERLA	COMMON	REMARKS
25	Down Dropper	Down Dropper	Down Dropper	
26	Gantry	Gantry	Gantry	
27	Cross-arm	Cross-arm	Cross-arm	
28	Stay wire	Stay wire	Stay wire	
29	Earth Wire	Earth Wire	Earth Wire	
30	Tower	Tower	Tower	
31	Span	Span	Span	
32	Relay	Relay	Relay	
33	Panel	Panel	Panel	
34	Flag	Indication	Flag	
35	Setting	Setting	Setting	
36	Overcurrent Relay	Overcurrent Relay	Overcurrent Relay	
37	Directional Over Current	Directional Over Current	Directional Over Current	
38	Low Impedance Differential Relay	Low Impedance Differential Relay	Low Impedance Differential Relay	
39	High Impedance Differential Relay	High Impedance Differential Relay	High Impedance Differential Relay	
40	Distance Protection	Distance Protection	Distance Protection	
41	Earth Fault	Earth Fault	Earth Fault	
42	Restricted Earth Fault	Restricted Earth Fault	Restricted Earth Fault	
43	Standby Earth Fault	Standby Earth Fault	Standby Earth Fault	
44	Buchholz	Buchholz	Buchholz	
45	Winding Temperature	Winding Temperature	Winding Temperature	
46	Oil Temperature	Oil Temperature	Oil Temperature	
47	Busbar Protection	Busbar Protection	Busbar Protection	
48	OPEN	OPEN / OFF	OPEN	To apply common term
49	CLOSE	CLOSE / ON	CLOSE	To apply common term

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1 PURPOSE

The purpose of this procedure is:

a) To define the steps taken to perform switching of Traction Power Supply Substation (TPSS) switchgear and Overhead Contact Line (OCL) switches via SCADA

2 SCOPE, DISTRIBUTION & ACCESS

This procedure is applicable to all Electrification (ELT) Maintenance personnel, OCC personnel and other relevant departments.

The content of this procedure may also be used by, but not limited to:

a) Operation (OPS) department;
b) Signalling Telecommunication (SIG-TLE) department; and
c) Rolling Stock (RST) department

3 OBJECTIVE

The objective of this procedure is to ensure that the OCC personnel understand the TPSS system, components, function and features; and able to operate via SCADA the TPSS switchgear and OCL switches in a safe manner.

4 PROCEDURE

4.1 Important Rules

Several rules need to be followed before switching procedure is carried:

a) All sections must be assumed to be ENERGIZED unless it is indicated as DE-ENERGIZED;
b) No switching of 132kV equipment without authorization from Registered Competent Engineer;
c) Once switched OPEN for maintenance works, no circuit breaker / OCL switch can be CLOSE, WITHOUT cancellation of Permit To Work (PTW) or Track Possession Request (TPR) or permission from person in charge at site;
d) All switching must be followed with a ‘COMMAND LOCK SET’ and ‘NOTE’ for reminder in SCADA;
e) When protection system at TPSS detects a fault, it will cause affected switchgear to OPEN. Depending on the type of fault, this causes either a ‘TRIP’ or ‘PERMANENT TRIP’
f) If ‘TRIP’ occurs, system will automatically attempt an ‘AUTO RECLOSE’ within 600ms:
    i. OCC shall inform OCL shift personnel for immediate inspection and Senior Chargeman and ELT HOD for further actions
    ii. For further action to be taken, refer to “Procedure For OCC”; Ref No. G00.OMO.M15111.NA.1003.* Clause 8.17

g) If 'PERMANENT TRIP' occurs, OCC personnel has to perform 'MANUAL RECLOSE' via SCADA. As safety purposes for personnel and installation, manual reclose can only be done ONCE:
   i. OCC shall inform OCL shift personnel for immediate inspection and Senior Chargeman and ELT HOD for further actions
   ii. Isolate the fault section. Take actions as described in "Procedure For OCC" Ref No. G00.OMO.M15111.NA.1003.* Clause 8.17

4.2 Important Notes

a) It must be highlighted that circuit breaker Q0 1T0 at HA02 and Q0 2T0 at HA05 SHOULD NOT be CLOSE at the same time.
b) This is to prevent T1 & T2 from being connected in parallel as per TNB requirement in Section 5.1.1 of Interconnection and Operation Manual (IOM).

4.3 132kV Switchgear

a) The 132kV switchgear function is to receive power supply from TNB in a Loop In-Loop Out (LILO) concept. The traction power supply is obtained from 2 independent TNB sources which currently are SERDANG NEW (SRDN) and CYBERJAYA NORTH (CBJN).

b) Table 4-1 illustrates the operational boundary/schedule of responsibilities for the 132kV switchgear.

Device	Ownership	Control	Operation	Maintenance	*Inform
Earth Switch 132kV 101A, 501A	ERLSB	TNB	TNB ERLSB	ERLSB	TNB inform ERLSB
Earth Switch 132kV 101B, 101C, 111A, 111B, 121A, 121B, 121C, 121D, 211A, 211B, 501B, 501C	ERLSB	TNB	ERLSB	ERLSB	ERLSB inform TNB
CBs 132kV 105, 110, 120, 210, 505	ERLSB	TNB	ERLSB	ERLSB	ERLSB inform TNB
Isolators 103, 104, 124, 128, 114, 214, 503, 504	ERLSB	TNB ERLSB	ERLSB	ERLSB	ERLSB inform TNB

Device	Ownership	Control	Operation	Maintenance	*Inform
Earth Switch 25kV 1T1, 2T1	ERLSB	ERLSB	ERLSB	ERLSB	ERLSB inform TNB
CBs 25kV 1T0, 2T0	ERLSB	ERLSB	ERLSB	ERLSB	ERLSB inform TNB

Table 4-1 : Operational Boundary / Schedule of Responsibilities

**Remark : TNB to inform ERLSB prior operating any Devices listed in Table 4-1; or vice versa*

c) All work related to 132kV switchgear will be coordinated by Registered Competent Engineer. OCC personnel performing the switching will act on the instruction of the Chargeman (B0 / B4), or Engineer and monitored by Registered Competent Engineer.
d) Switch OPEN circuit breaker first followed by Isolator. Once both are OPEN, only then CLOSE earth switch.
e) Switch OPEN earth switch. Only then switch CLOSE isolator followed by circuit breaker.
f) Exceptions are made for earth switch 101A and 501A as follows:
    i. Must be isolated and proven dead before switching (if applicable)
    ii. TNB personnel to unlock the padlock on-site and initiate operation of earth switch (OPEN or CLOSE)
    iii. After earth switch operation, TNB personnel to lock the padlock on-site
    iv. Padlock key is in possession and control of TNB
g) Switching CLOSE the earth switch connects the line to earth. This is for safety purpose.

4.4 25kV Switchgear

a) The 25kV switchgear functions to deliver the power for train traction within the ERL railway network.

b) In normal operation conditions, the following CB are in operational or CLOSE position:

Device	Status	Remarks
HA01 Q0	CLOSE	Supply traction power for Track 3 towards KLS
HA03 Q0	CLOSE	Supply traction power for Track 2 towards KLS
HA04 Q0	CLOSE	Supply traction power for Track 3 towards KLIA2
HA06 Q0	CLOSE	Supply traction power for Track 2 towards KLIA2

Table 4-2 : 25kV Circuit Breaker in Normal Condition

4.5 OCL Switch Switching in Normal Operations

a) The OCL switch function to provide selective switching of individual parts of the ERL OCL network for operational and maintenance flexibility.

b) In normal operation conditions, switches at TPSS are as below:

Device	Status	Remarks
Switch TPSS #U01	CLOSE	Supply traction power for Track 3 towards KLS
Switch TPSS #U02	CLOSE	Supply traction power for Track 2 towards KLS
Switch TPSS #U03	CLOSE	Supply traction power for Track 3 towards KLIA2
Switch TPSS #U04	CLOSE	Supply traction power for Track 2 towards KLIA2
Switch TPSS #301	OPEN	Connection of Track 2 from KLS to KLIA2
Switch TPSS #302	OPEN	Connection of Track 3 from KLS to KLIA2
Switch TPSS #15	OPEN	Interconnection of Track 2 & Track 3 towards KLS
Switch TPSS #25	OPEN	Interconnection of Track 2 & Track 3 towards KLIA2

Table 4-3 : TPSS Switches in Normal Condition

c) Switch KLS #E1 and switch KLS #E2 (which are normally CLOSE) control the supply of traction power to KL Sentral Station. These 2 switches have earth contacts, which mean if they are switched OPEN, the connected lines to KL Sentral station are earthed. This will cause a trip at TPSS. Hence, switch KLS #E1 and switch KLS #E2 are kept CLOSE in normal condition.

d) Switch KLS #4 and switch KLS #9 CANNOT be both CLOSE at the same time. Only either one of switch KLS #4 or switch KLS #9 can be CLOSE. Refer Table 4-4.

No.	Switch KLS #4	Switch KLS #9	Switch KLS #E1	Switch KLS #E2	TPSS Trip (YES / NO)
1	CLOSE	CLOSE	CLOSE	OPEN	***YES***
2	CLOSE	CLOSE	OPEN	CLOSE	***YES***
3	***CLOSE***	***OPEN***	***CLOSE***	***CLOSE***	NO
4	***OPEN***	***CLOSE***	***CLOSE***	***CLOSE***	NO
5	OPEN	OPEN	CLOSE	CLOSE	*NO
6	CLOSE	CLOSE	CLOSE	CLOSE	NO

Table 4-4 : Tripping Table for KLS Switches

**Remark : Reversing Track at KLS will not be energized*

e) To prevent TPSS from tripping, safety precautions are imposed for switch KLS #E1 and switch KLS #E2. Both switches must have “COMMAND LOCK SET’, “MESSAGE LOCK SET” and “NOTE” to avoid the switches from unintentionally being OPEN by any personnel.

f) In following subsections, the action "CONFIRM that switch *XX* is CLOSE" means to check and take necessary action and ensure switch is CLOSE.

g) In following subsections, the action "CONFIRM that switch *XX* is OPEN" means to check and take necessary action and ensure switch is OPEN.

4.5.1 Track 2 TPSS – KLS

Refer to Table 4-5 for de-energize sequences for Track 2 TPSS – KLS:

Sequence	Action	Result
1	OPEN switch KLS #4	Switch KLS #4 GREEN colour
2	OPEN switch KLS #9	Switch KLS #9 GREEN colour
3	CONFIRM that switch KLS #5 is OPEN	Switch KLS #5 GREEN colour
4	CONFIRM that switch BTS #5 is OPEN	Switch BTS #5 GREEN colour
5	CONFIRM that switch CRS #205 is OPEN	Switch CRS #205 GREEN colour
6	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
7	CONFIRM that switch TPSS #301 is OPEN	Switch TPSS #301 GREEN colour
8	OPEN switch TPSS #U02	Switch TPSS #U02 GREEN colour
9	Set "COMMAND LOCK SET" switch TPSS #U02	Diagonal black line on switch TPSS #U02
10	Insert "NOTE" switch TPSS #U02	Exclamation mark at switch TPSS #U02
11	OPEN HA03 Q0	HA03 Q0 GREEN colour
12	Set "COMMAND LOCK SET" HA03 Q0	Diagonal black line on HA03 Q0
13	Insert "NOTE" HA03 Q0	Exclamation mark at HA03 Q0

Table 4-5 : De-energize Sequences Track 2 TPSS – KLS

Refer to Table 4-6 for energize sequences for Track 2 TPSS – KLS:

Sequence	Action	Result
1	Remove "NOTE" switch TPSS #U02	No exclamation mark at switch TPSS #U02
2	Remove "COMMAND LOCK SET" switch TPSS #U02	No diagonal black line on switch TPSS #U02
3	CONFIRM that switch TPSS #301 is OPEN	Switch TPSS #301 GREEN colour
4	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
5	CONFIRM that switch TPSS #25 is	Switch TPSS #25 GREEN colour

Sequence	Action	Result
	OPEN	
6	CONFIRM that switch CRS #205 is OPEN	Switch CRS #205 GREEN colour
7	CONFIRM that switch BTS #5 is OPEN	Switch BTS #5 GREEN colour
8	CONFIRM that switch KLS #5 is OPEN	Switch KLS #5 GREEN colour
EITHER		
9	CONFIRM that switch KLS #9 is OPEN	Switch KLS #9 GREEN colour
10	CLOSE switch KLS #4	Switch KLS #4 RED colour
11	CLOSE switch TPSS #U02	Switch TPSS #U02 RED colour
12	Remove “NOTE” HA03 Q0	No exclamation mark at HA03 Q0
13	Remove “COMMAND LOCK SET” HA03 Q0	No diagonal black line on HA03 Q0
14	CLOSE HA03 Q0	HA03 Q0 RED colour
OR		
9	CONFIRM that switch KLS #4 is OPEN	Switch KLS #4 GREEN colour
10	CLOSE switch KLS #9	Switch KLS #9 RED colour
11	CLOSE switch TPSS #U02	Switch TPSS #U02 RED colour
12	Remove “NOTE” HA03 Q0	No exclamation mark at HA03 Q0
13	Remove “COMMAND LOCK SET” HA03 Q0	No diagonal black line on from HA03 Q0
14	CLOSE HA03 Q0	HA03 Q0 RED colour

Table 4-6 : Energize Sequences Track 2 TPSS – KLS

4.5.2 Track 3 TPSS – KLS

Refer to Table 4-7 for de-energize sequences for Track 3 TPSS – KLS:

Sequence	Action	Result
1	OPEN switch KLS #4	Switch KLS #4 GREEN colour
2	OPEN switch KLS #9	Switch KLS #9 GREEN colour
3	CONFIRM that switch KLS #5 is OPEN	Switch KLS #5 GREEN colour
4	CONFIRM that switch BTS #5 is OPEN	Switch BTS #5 GREEN colour
5	CONFIRM that switch CRS #205 is OPEN	Switch CRS #205 GREEN colour
6	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
7	CONFIRM that switch TPSS #302 is OPEN	Switch TPSS #302 GREEN colour
8	OPEN switch TPSS #U01	Switch TPSS #U01 GREEN colour
9	Set “COMMAND LOCK SET” switch TPSS #U01	Diagonal black line on switch TPSS #U01

Sequence	Action	Result
10	Insert “NOTE” switch TPSS #U01	Exclamation mark at switch TPSS #U01
11	OPEN HA01 Q0	HA01 Q0 GREEN colour
12	Insert “COMMAND LOCK SET” HA01 Q0	Diagonal black line on HA01 Q0
13	Insert “NOTE” HA01 Q0	Exclamation mark at HA01 Q0

Table 4-7 : De-energize Sequences Track 3 TPSS – KLS

Refer to Table 4-8 for energize sequences for Track 3 TPSS – KLS:

Sequence	Action	Result
1	Remove “NOTE” switch TPSS #U01	No exclamation mark at switch TPSS #U01
2	Remove “COMMAND LOCK SET” switch TPSS #U01	No diagonal black line on switch TPSS #U01
3	CONFIRM that switch TPSS #302 is OPEN	Switch TPSS #302 GREEN colour
4	CONFIRM that switch TPSS #25 is OPEN	Switch TPSS #25 GREEN colour
5	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
6	CONFIRM that switch CRS #205 is OPEN	Switch CRS #205 GREEN colour
7	CONFIRM that switch BTS #5 is OPEN	Switch BTS #5 GREEN colour
8	CONFIRM that switch KLS #5 is OPEN	Switch KLS #5 GREEN colour
EITHER		
9	CONFIRM that switch KLS #9 is OPEN	Switch KLS #9 GREEN colour
10	CLOSE switch KLS #4	Switch KLS #4 RED colour
11	CLOSE switch TPSS #U01	Switch TPSS #U01 RED colour
12	Remove “NOTE” HA01 Q0	No exclamation mark at HA01 Q0
13	Remove “COMMAND LOCK SET” HA01 Q0	No diagonal black line on HA01 Q0
14	CLOSE HA01 Q0	HA01 Q0 RED colour
OR		
9	CONFIRM that switch KLS #4 is OPEN	Switch KLS #4 GREEN colour
10	CLOSE switch KLS #9	Switch KLS #9 RED colour
11	CLOSE switch TPSS #U01	Switch TPSS #U01 RED colour
12	Remove “NOTE” HA01 Q0	No exclamation mark at HA01 Q0
13	Remove “COMMAND LOCK SET” HA01 Q0	No diagonal black line on HA01 Q0
14	CLOSE HA01 Q0	HA01 Q0 RED colour

Table 4-8 : Energize Sequences Track 3 TPSS – KLS

4.5.3 Track 2 TPSS – KLIA2

Refer to Table 4-9 for de-energize sequences for Track 2 TPSS – KLIA2:

Sequence	Action	Result
1	CONFIRM DEPOT powered from Track 3	Switch DEPOT #102 RED colour
2	CONFIRM TEST TRACK powered from Track 3	Switch DEPOT #104 RED colour
3	CONFIRM KLIA manual switch #505 is OPEN	KLIA manual switch #505 GREEN colour
4	CONFIRM that switch KLIA #11 is OPEN	Switch KLIA #11 GREEN colour
5	CONFIRM that switch KLIA #12 is OPEN	Switch KLIA #12 GREEN colour
6	CONFIRM that switch STS #5 is OPEN	Switch STS #5 GREEN colour
7	CONFIRM that switch PCS #5 is OPEN	Switch PCS #5 GREEN colour
8	CONFIRM that switch TPSS #25 is OPEN	Switch TPSS #25 GREEN colour
9	CONFIRM that switch TPSS #301 is OPEN	Switch TPSS #301 GREEN colour
10	OPEN switch TPSS #U04	Switch TPSS #U04 GREEN colour
11	Set “COMMAND LOCK SET” switch TPSS #U04	Diagonal black line on switch TPSS #U04
12	Insert “NOTE” switch TPSS #U04	Exclamation mark at switch TPSS #U04
13	OPEN HA06 Q0	HA06 Q0 GREEN colour
14	Insert “COMMAND LOCK SET” HA06 Q0	Diagonal black line on HA06 Q0
15	Insert “NOTE” HA06 Q0	Exclamation mark at HA06 Q0

Table 4-9 : De-energize Sequences Track 2 TPSS - KLIA2

Refer to Table 4-10 for energize sequences for Track 2 TPSS – KLIA2:

Sequence	Action	Result
1	CONFIRM DEPOT powered from Track 3	Switch DEPOT #102 RED colour
2	CONFIRM TEST TRACK powered from Track 3	Switch DEPOT #104 RED colour
3	Remove “NOTE” switch TPSS #U04	No exclamation mark at switch TPSS #U04
4	Remove “COMMAND LOCK SET”	No diagonal black line on switch TPSS #U04

Sequence	Action	Result
	switch TPSS #U04	
5	CONFIRM that switch TPSS #301 is OPEN	Switch TPSS #301 GREEN colour
6	CONFIRM that switch TPSS #25 is OPEN	Switch TPSS #25 GREEN colour
7	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
8	CONFIRM that switch PCS #5 is OPEN	Switch PCS #5 GREEN colour
9	CONFIRM that switch STS #5 is OPEN	Switch STS #5 GREEN colour
10	CONFIRM KLIA manual switch #505 is OPEN	KLIA manual switch #505 GREEN colour
EITHER		
11	CONFIRM that switch KLIA #11 is OPEN	Switch KLIA #11 GREEN colour
12	CLOSE switch KLIA #12	Switch KLIA #12 RED colour
13	CLOSE switch TPSS #U04	Switch TPSS #U04 RED colour
14	Remove “NOTE” HA06 Q0	No exclamation mark at HA06 Q0
15	Remove “COMMAND LOCK SET” HA06 Q0	No diagonal black line on HA06 Q0
16	CLOSE HA06 Q0	HA06 Q0 RED colour
OR		
11	CONFIRM that switch KLIA #12 is OPEN	Switch KLIA #12 GREEN colour
12	CLOSE switch KLIA #11	Switch KLIA #11 RED colour
13	CLOSE switch TPSS #U04	Switch TPSS #U04 RED colour
14	Remove “NOTE” HA06 Q0	No exclamation mark at HA06 Q0
15	Remove “COMMAND LOCK SET” HA06 Q0	No diagonal black line on HA06 Q0
15	CLOSE HA06 Q0	HA06 Q0 RED colour

Table 4-10 : Energize Sequences Track 2 TPSS – KLIA2

4.5.4 Track 3 TPSS – KLIA2

Refer to Table 4-11 for de-energize sequences for Track 3 TPSS – KLIA2:

Sequence	Action	Result
1	CONFIRM DEPOT powered from Track 2	Switch DEPOT #101 RED colour
2	CONFIRM TEST TRACK powered from Track 2	Switch DEPOT #103 RED colour
3	CONFIRM KLIA manual switch #505 is OPEN	KLIA manual switch #505 GREEN colour

Sequence	Action	Result
4	CONFIRM that switch KLIA #11 is OPEN	Switch KLIA #11 GREEN colour
5	CONFIRM that switch KLIA #12 is OPEN	Switch KLIA #12 GREEN colour
6	CONFIRM that switch STS #5 is OPEN	Switch STS #5 GREEN colour
7	CONFIRM that switch PCS #5 is OPEN	Switch PCS #5 GREEN colour
8	CONFIRM that switch TPSS #25 is OPEN	Switch TPSS #25 GREEN colour
9	CONFIRM that switch TPSS #302 is OPEN	Switch TPSS #302 GREEN colour
10	OPEN switch TPSS #U03	Switch TPSS #U03 GREEN colour
11	Set “COMMAND LOCK SET” switch TPSS #U03	Diagonal black line on switch TPSS #U03
12	Insert “NOTE” switch TPSS #U03	Exclamation mark at switch TPSS #U03
13	OPEN HA04 Q0	HA04 Q0 GREEN colour
14	Insert “COMMAND LOCK SET” HA04 Q0	Diagonal black line on HA04 Q0
15	Insert “NOTE” HA04 Q0	Exclamation mark at HA04 Q0

Table 4-11 : De-energize Sequences Track 3 TPSS – KLIA2

Refer to Table 4-12 for energize sequences for Track 3 TPSS – KLIA2:

Sequence	Action	Result
1	CONFIRM DEPOT powered from Track 2	Switch DEPOT #101 RED colour
2	CONFIRM TEST TRACK powered from Track 2	Switch DEPOT #103 RED colour
3	Remove “NOTE” switch TPSS #U03	No exclamation mark at switch TPSS #U03
4	Remove “COMMAND LOCK SET” switch TPSS #U03	No diagonal black line on switch TPSS #U03
5	CONFIRM that switch TPSS #302 is OPEN	Switch TPSS #302 GREEN colour
6	CONFIRM that switch TPSS #15 is OPEN	Switch TPSS #15 GREEN colour
7	CONFIRM that switch TPSS #25 is OPEN	Switch TPSS #25 GREEN colour
8	CONFIRM that switch PCS #5 is OPEN	Switch PCS #5 GREEN colour
9	CONFIRM that switch STS #5 is OPEN	Switch STS #5 GREEN colour
10	CONFIRM KLIA manual switch #505 is	KLIA manual switch #505 GREEN

Sequence	Action	Result
	OPEN	colour
	EITHER	
11	CONFIRM that switch KLIA #11 is OPEN	Switch KLIA #11 GREEN colour
12	CLOSE switch KLIA #12	Switch KLIA #12 RED colour
13	CLOSE switch TPSS #U03	Switch TPSS #U03 RED colour
14	Remove “NOTE” HA04 Q0	No exclamation mark at HA04 Q0
15	Remove “COMMAND LOCK SET” HA04 Q0	No diagonal black line on HA04 Q0
16	CLOSE HA04 Q0	HA04 Q0 RED colour
	OR	
11	CONFIRM that switch KLIA #12 is OPEN	Switch KLIA #12 GREEN colour
12	CLOSE switch KLIA #11	Switch KLIA #11 RED colour
13	CLOSE switch TPSS #U03	Switch TPSS #U03 RED colour
14	Remove “NOTE” HA04 Q0	No exclamation mark at HA04 Q0
15	Remove “COMMAND LOCK SET” HA04 Q0	No diagonal black line on HA04 Q0
16	CLOSE HA04 Q0	HA04 Q0 RED colour

Table 4-12 : Energize Sequences for Track 3 TPSS – KLIA2

4.5.5 Depot and Test Track

Depot and Test Track can receive 25kV power supply from either Track 2 or Track 3. Depot area can be energized / de-energized partially or entirely.

4.5.5.1 Depot

Refer to Table 4-13 for de-energize sequences for Depot area:

Sequence	Action	Result
1	CONFIRM that all train pantographs are DOWN	All train CONFIRMED pantograph DOWN
2	OPEN switch DEPOT #101	Switch DEPOT #101 GREEN colour
3	OPEN switch DEPOT #102	Switch DEPOT #102 GREEN colour
4	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch DEPOT #101 and switch DEPOT #102
5	Insert “NOTE” as needed	Exclamation mark at switch DEPOT #101 and switch DEPOT #102

Sequence	Action	Result
6	Sleeve tracks as needed	No unintentional train movement into de-energized section

Table 4-13 : De-energize Sequences for Depot Area

Refer to Table 4-14 for energize sequences for Depot area from Track 2:

Sequence	Action	Result
1	CONFIRM that all train pantographs are DOWN	All train CONFIRMED pantograph DOWN
2	CONFIRM that switch DEPOT #310 is CLOSE	Switch DEPOT #310 RED colour
3	CONFIRM that switch DEPOT #316 is CLOSE	Switch DEPOT #316 RED colour
4	CONFIRM that switch DEPOT #326 is CLOSE	Switch DEPOT #326 RED colour
5	CONFIRM Track 2 is powered	Track 2 shows blue line
6	CONFIRM that switch DEPOT #102 is OPEN	Switch DEPOT #102 GREEN colour
7	CLOSE switch DEPOT #101	Switch DEPOT #101 RED colour
8	Instruct train to raise pantograph as needed	Respective train CONFIRMED train pantograph is UP

Table 4-14 : Energize Sequences for Depot Area from Track 2

Refer to Table 4-15 for energize sequences for Depot area from Track 3:

Sequence	Action	Result
1	CONFIRM that all train pantographs are DOWN	All train CONFIRMED pantograph DOWN
2	CONFIRM that switch DEPOT #310 is CLOSE	Switch DEPOT #310 RED colour
3	CONFIRM that switch DEPOT #316 is CLOSE	Switch DEPOT #316 RED colour
4	CONFIRM that switch DEPOT #326 is CLOSE	Switch DEPOT #326 RED colour
5	CONFIRM that Track 3 is powered	Track 3 shows blue line
6	CONFIRM that switch DEPOT #101 is OPEN	Switch DEPOT #101 GREEN colour
7	CLOSE switch DEPOT #102	Switch DEPOT #102 RED colour
8	Instruct train to raise pantograph as needed	Respective train CONFIRMED train pantograph is UP

Table 4-15 : Energize Sequences for Depot Area from Track 3

4.5.5.2 Test Track

Refer to Table 4-16 for de-energize sequences for Test Track:

Sequence	Action	Result
1	CONFIRM that Test Track is powered	Test Track shows blue line
2	CONFIRM that Test Track is clear from train / service vehicle	Instruct train / service vehicle if there are any in section
3	CONFIRM that respective trains pantograph are DOWN	Respective trains CONFIRMED pantograph DOWN
4	CONFIRM that switch DEPOT #104 is OPEN	Switch DEPOT #104 GREEN colour
5	CONFIRM that switch DEPOT #103 is CLOSE	Switch DEPOT #103 RED colour
6	CONFIRM that switch STS #507 is CLOSE	Switch STS #507 RED colour
7	OPEN switch DEPOT #103	Switch DEPOT #103 GREEN colour
8	OPEN switch STS #507	Switch STS #507 GREEN colour
9	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch DEPOT #103 and switch STS #507
10	Insert “NOTE” as needed	Exclamation mark at switch DEPOT #103 and switch STS #507
11	Sleeve tracks as needed	No unintentional train movement into de-energized section

Table 4-16 : De-energize Sequences for Test Track

Refer to Table 4-17 for energize sequences for Test Track from Track 2:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph are DOWN	Respective trains CONFIRMED pantograph DOWN
2	OPEN switch DEPOT #104	Switch DEPOT #104 GREEN colour
3	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch DEPOT #104
4	Insert “NOTE” as needed	Exclamation mark at switch DEPOT #104
5	CLOSE switch DEPOT #103	Switch DEPOT #103 RED colour
6	CLOSE switch STS #507	Switch STS #507 RED colour
7	Instruct train to raise pantographs as needed	Respective train CONFIRMED train pantograph UP

Table 4-17 : Energize Sequences for Test Track from Track 2

Refer to Table 4-18 for energize sequences for Test Track from Track 3:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph are DOWN	Respective trains CONFIRMED pantograph DOWN
2	OPEN switch DEPOT #103	Switch DEPOT #103 GREEN colour
3	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch DEPOT #103
4	Insert “NOTE” as needed	Exclamation mark at switch DEPOT #103
5	CLOSE switch DEPOT #104	Switch DEPOT #104 RED colour
6	CLOSE switch STS #507	Switch STS #507 RED colour
7	Instruct train to raise pantographs as needed	Respective train CONFIRMED train pantograph UP

Table 4-18 : Energize Sequences for Test Track from Track 3

4.5.5.3 Track 9 Main Workshop

Refer to Table 4-19 for de-energize sequences for Track 9 in Main Workshop:

Sequence	Action	Result
1	CONFIRM that all trains pantograph in Track 9 & Track 10 are DOWN	All trains CONFIRMED pantograph DOWN
2	OPEN switch DEPOT #326	Switch DEPOT #326 GREEN colour
3	Inform RST personnel switch DEPOT #326 is OPEN	RST personnel acknowledge switch DEPOT #326 is OPEN
4	RST personnel to OPEN manual switch DEPOT #326/1	RST personnel visually verifies manual switch DEPOT #326/1 is OPEN
5	RST personnel checks presence of voltage using voltage detector	Voltage detector confirms NO voltage
6	RST personnel installs earthing device	
7	RST personnel informs OCC location of installed earthing device	OCC records location of installed earthing device
8	Sleeve tracks as needed	No unintentional train movement into de-energized section
9	If needed, RST will request to CLOSE switch DEPOT #326	Switch DEPOT #326 RED colour
10	If not needed, set “COMMAND LOCK SET” for switch DEPOT #326 (OPEN position). Insert “NOTE” as needed	Switch DEPOT #326 remains GREEN colour with diagonal black line

Table 4-19 : De-energize Sequences Track 9 Main Workshop

Refer to Table 4-20 for energize sequences for Track 9 in Main Workshop:

Sequence	Action	Result
1	RST personnel checks and ensures no person(s) are working on elevated platform on Track 9	
2	RST personnel removes earthing device on Track 9 and informs OCC	OCC acknowledges earthing device is removed
3	CONFIRM that all trains pantograph in Track 9 & Track 10 are DOWN	All trains CONFIRMED pantograph DOWN
4	Remove “COMMAND LOCK SET” switch DEPOT #326 if any	No diagonal black line on switch DEPOT #326
5	Remove “NOTE” and sleeve for switch DEPOT #326 if any	No exclamation mark on switch DEPOT #326
6	OPEN switch DEPOT #326	Switch DEPOT #326 GREEN colour
7	Inform RST personnel switch DEPOT #326 is OPEN	
8	RST personnel to CLOSE manual switch DEPOT #326/1	RST personnel visually verifies manual switch DEPOT #326/1 is CLOSE
9	RST personnel informs OCC that manual switch DEPOT #326/1 is CLOSE	OCC acknowledges manual switch DEPOT #326/1 is CLOSE
10	Remove sleeve tracks if any	
11	CLOSE switch DEPOT #326	Switch DEPOT #326 RED colour
12	Instruct trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-20 : Energize Sequences for Track 9 Main Workshop

4.5.5.4 Track 10 Main Workshop

Refer to Table 4-21 for de-energize sequences for Track 10 in Main Workshop:

Sequence	Action	Result
1	CONFIRM that all trains pantograph in Track 9 & Track 10 are DOWN	All trains CONFIRMED pantograph DOWN
2	OPEN switch DEPOT #326	Switch DEPOT #326 GREEN colour
3	Inform RST personnel switch DEPOT #326 is OPEN	RST personnel acknowledge switch DEPOT #326 is OPEN
4	RST personnel to OPEN manual switch DEPOT #326/2	RST personnel visually verifies manual switch DEPOT #326/2 is OPEN

Sequence	Action	Result
5	RST personnel checks presence of voltage using voltage detector	Voltage detector confirms NO voltage
6	RST personnel installs earthing device	
7	RST personnel informs OCC location of installed earthing device	OCC records location of installed earthing device
8	Sleeve tracks as needed	No unintentional train movement into de-energized section
9	If needed, RST will request to CLOSE switch DEPOT #326	Switch DEPOT #326 RED colour
10	If not needed, set “COMMAND LOCK SET” for switch DEPOT #326 (OPEN position). Insert “NOTE” as needed	Switch DEPOT #326 remains GREEN colour with diagonal black line

Table 4-21 : De-energize Sequences Track 10 Main Workshop

Refer to Table 4-22 for energize sequences for Track 10 in Main Workshop:

Sequence	Action	Result
1	RST personnel checks and ensures no person(s) are working on elevated platform on Track 10	
2	RST personnel removes earthing device on Track 10 and informs OCC	OCC acknowledges earthing device is removed
3	CONFIRM that all trains pantograph in Track 9 & Track 10 are DOWN	All trains CONFIRMED pantograph DOWN
4	Remove “COMMAND LOCK SET” switch DEPOT #326 if any	No diagonal black line on switch DEPOT #326
5	Remove “NOTE” and sleeve for switch DEPOT #326 if any	No exclamation mark on switch DEPOT #326
6	OPEN switch DEPOT #326	Switch DEPOT #326 GREEN colour
7	Inform RST personnel switch DEPOT #326 is OPEN	
8	RST personnel to CLOSE manual switch DEPOT #326/2	RST personnel visually verifies manual switch DEPOT #326/2 is CLOSE
9	RST personnel informs OCC that manual switch DEPOT #326/2 is CLOSE	OCC acknowledges manual switch DEPOT #326/2 is CLOSE
10	Remove sleeve tracks if any	
11	CLOSE switch DEPOT #326	Switch DEPOT #326 RED colour
12	Instruct trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-22 : Energize Sequences for Track 10 Main Workshop

4.5.5.5 Train Washing Plant

Refer to Table 4-23 for de-energize sequences for Train Washing Plant:

Sequence	Action	Result
1	CONFIRM that respective train pantograph is DOWN	Respective train CONFIRMED pantograph is DOWN
2	OPEN switch DEPOT #316	Switch DEPOT #316 GREEN colour
3	Insert “COMMAND LOCK SET” set if needed	Diagonal black line on switch DEPOT #316

Table 4-23 : De-energize Sequences for Train Washing Plant

Refer to Table 4-24 for energize sequences for Train Wash Plant:

Sequence	Action	Result
1	CONFIRM that respective train pantograph is DOWN	Respective train CONFIRMED pantograph is DOWN
2	Remove “COMMAND LOCK SET” if any	No diagonal black line on switch DEPOT #316
3	CLOSE switch DEPOT #316	Switch DEPOT #316 RED colour
4	Instruct train to raise pantograph as needed	Respective train CONFIRMED train pantograph is UP

Table 4-24 : Energize Sequences for Train Washing Plant

4.5.6 KL Sentral Station (KLS)

Refer to Table 4-25 for de-energize sequences for KLS section:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLS are DOWN	Respective trains CONFIRMED pantograph in KLS are DOWN
2	OPEN switch KLS #5	Switch KLS #5 GREEN colour
3	OPEN switch KLS #1	Switch KLS #1 GREEN colour
4	OPEN switch KLS #2	Switch KLS #2 GREEN colour
5	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch KLS #5, switch KLS #1, and switch KLS #2
6	Insert “NOTE” as needed	Exclamation mark at switch KLS #5, switch KLS #1, and switch KLS #2
7	Sleeve track as needed	No unintentional train movement into de-energized section

Table 4-25 : De-energize Sequences for KLS

Refer to Table 4-26 for energize sequences for KLS section:

Sequence	Action	Result
1	Remove “NOTE” and “COMMAND LOCK SET” for switch KLS #5, switch KLS #1, and switch KLS #2	No exclamation mark and diagonal black line on switch KLS #5, switch KLS #1, and switch KLS #2
2	CONFIRM that Track 2 and Track 3 at BTS is powered	SCADA shows blue line at line section 300 and 200
EITHER		
3	CONFIRM that switch KLS #9 is OPEN	Switch KLS #9 GREEN colour
4	CLOSE switch KLS #4	Switch KLS #4 RED colour
OR		
3	CONFIRM that switch KLS #4 is OPEN	Switch KLS #4 GREEN colour
4	CLOSE switch KLS #9	Switch KLS #9 RED colour
AND		
5	OPEN switch KLS #5	Switch KLS #5 GREEN colour
6	CLOSE switch KLS #1	Switch KLS #1 RED colour
7	CLOSE switch KLS #2	Switch KLS #2 RED colour
8	Remove track sleeves as needed	
9	Instruct trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-26 : Energize Sequences for KLS

4.5.7 KL International Airport Station (KLIA)

Refer to Table 4-27 for de-energize sequences for KLIA section:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLIA are DOWN	Respective trains CONFIRMED pantograph in KLIA are DOWN
2	OPEN switch STS #3	Switch STS #3 GREEN colour
3	OPEN switch STS #4	Switch STS #4 GREEN colour
4	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch STS #3 and switch STS #4
5	Insert “NOTE” as needed	Exclamation mark at switch STS #3 and switch STS #4
6	Sleeve track as needed	No unintentional train movement into de-energized section

Table 4-27 : De-energize Sequences for KLIA

Refer to Table 4-28 for energize sequences for KLIA section:

Sequence	Action	Result
1	Remove “NOTE” and “COMMAND LOCK SET” for switch STS #3 and switch STS #4	No exclamation mark and diagonal black line on switch STS #3 and switch STS #4
2	CONFIRM that Track 2 and Track 3 at STS is powered	SCADA shows blue line at line section 344 and 244
3	CONFIRM that KLIA manual switch #505 is OPEN. CONFIRM with OSS KLIA if needed	KLIA manual switch #505 is CONFIRMED OPEN
4	CLOSE switch STS #3	Switch STS #3 RED colour
5	CLOSE switch STS #4	Switch STS #4 RED colour
6	Remove track sleeves as needed	
7	Instruct trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-28 : Energize Sequences for KLIA

4.5.8 KL International Airport 2 Station (KLIA2)

Refer to Table 4-29 for de-energize sequences for KLIA2 section:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLIA are DOWN	Respective trains CONFIRMED pantograph in KLIA are DOWN
2	CONFIRM that respective trains pantograph in KLIA2 are DOWN	Respective trains CONFIRMED pantograph in KLIA2 are DOWN
3	OPEN switch KLIA #1	Switch KLIA #1 GREEN colour
4	OPEN switch KLIA #2	Switch KLIA #2 GREEN colour
5	Set “COMMAND LOCK SET” as needed	Diagonal black line on switch KLIA #1 and switch KLIA #2
6	Insert “NOTE” as needed	Exclamation mark at switch KLIA #1 and switch KLIA #2
7	CONFIRM that KLIA manual switch #505 is OPEN. CONFIRM with OSS KLIA if needed	KLIA manual switch #505 is CONFIRMED OPEN
8	Sleeve tracks as needed	No unintentional train movement into de-energized section
9	Instruct OCL site personnel to OPEN manual switch KLIA2 #1	
10	CONFIRM with OCL site personnel manual switch KLIA2 #1 is OPEN	OCL site personnel CONFIRMED manual switch KLIA2 #1 is OPEN

Sequence	Action	Result
11	Instruct OCL site personnel to lock manual switch KLIA2 #1	
12	Instruct OCL site personnel to OPEN manual switch KLIA2 #2	
13	CONFIRM with OCL site personnel manual switch KLIA2 #2 is OPEN	OCL site personnel CONFIRMED manual switch KLIA2 #2 is OPEN
14	Instruct OCL site personnel to lock manual switch KLIA2 #2	
15	CLOSE switch KLIA #1 if needed	Switch KLIA #1 RED colour
16	CLOSE switch KLIA #2 if needed	Switch KLIA #2 RED colour

Table 4-29 : De-energize Sequences for KLIA2

Refer to Table 4-30 for energize sequences for KLIA2 section:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLIA are DOWN	Respective trains CONFIRMED pantograph in KLIA are DOWN
2	CONFIRM respective trains pantograph in KLIA2 are DOWN	Respective trains CONFIRMED pantograph in KLIA2 are DOWN
3	OPEN switch KLIA #1	Switch KLIA #1 GREEN colour
4	OPEN switch KLIA #2	Switch KLIA #2 GREEN colour
5	Remove “NOTE” and “COMMAND LOCK SET” as needed	No exclamation mark and diagonal black line on switch KLIA #1 and switch KLIA #2
6	CONFIRM that KLIA manual switch #505 is OPEN. CONFIRM with OSS KLIA if needed	
7	Remove sleeve tracks as needed	
8	Instruct OCL site personnel to CLOSE manual switch KLIA2 #1	
9	CONFIRM with OCL site personnel manual switch KLIA2 #1 is CLOSE	OCL site personnel CONFIRMED manual switch KLIA2 #1 is CLOSE
10	Instruct OCL site personnel to lock manual switch KLIA2 #1	
11	Instruct OCL site personnel to CLOSE manual switch KLIA2 #2	
12	CONFIRM with OCL site personnel manual switch KLIA2 #2 is CLOSE	OCL site personnel CONFIRMED manual switch KLIA2 #2 is CLOSE
13	Instruct OCL site personnel to lock manual switch KLIA2 #2	

Sequence	Action	Result
14	CLOSE switch KLIA #1	Switch KLIA #1 RED colour
15	CLOSE switch KLIA #2	Switch KLIA #2 RED colour
16	Instruct respective trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-30 : Energize Sequences for KLIA2

4.5.9 Manual Switch KLIA #505

Refer to Table 4-31 for de-energize sequences for manual switch KLIA #505:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLIA are DOWN	Respective trains CONFIRMED pantograph in KLIA are DOWN
2	CONFIRM that respective trains pantograph in KLIA2 are DOWN	Respective trains CONFIRMED pantograph in KLIA2 are DOWN
3	OPEN switch KLIA #1	Switch KLIA #1 GREEN colour
4	OPEN switch KLIA #2	Switch KLIA #2 GREEN colour
5	Instruct OCL site personnel to OPEN manual switch KLIA #505	
6	CONFIRM with OCL site personnel KLIA manual switch #505 is OPEN	OCL site personnel CONFIRMED manual switch KLIA #505 is OPEN
7	CLOSE switch KLIA #1	Switch KLIA #1 RED colour
8	CLOSE switch KLIA #2	Switch KLIA #2 RED colour
9	Instruct respective trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-31 : De-energize Sequences for Manual Switch KLIA #505

Refer to Table 4-32 for energize sequences for Manual Switch KLIA #505:

Sequence	Action	Result
1	CONFIRM that respective trains pantograph in KLIA are DOWN	Respective trains CONFIRMED pantograph in KLIA are DOWN
2	CONFIRM that respective trains pantograph in KLIA2 are DOWN	Respective trains CONFIRMED pantograph in KLIA2 are DOWN
3	OPEN switch KLIA #1	Switch KLIA #1 GREEN colour
4	OPEN switch KLIA #2	Switch KLIA #2 GREEN colour
5	Instruct OCL site personnel to CLOSE manual switch KLIA #505	
6	CONFIRM with OCL site personnel manual switch KLIA #505 is CLOSE	OCL site personnel CONFIRMED KLIA manual switch #505 is CLOSE

Sequence	Action	Result
7	CLOSE switch KLIA #1	Switch KLIA #1 RED colour
8	CLOSE switch KLIA #2	Switch KLIA #2 RED colour
9	Instruct respective trains to raise pantograph as needed	Respective train CONFIRMED train pantograph UP

Table 4-32 : Energize Sequences for Manual Switch KLIA #505

4.5.10 Motorized Switch TPSS #U01

Refer to Table 4-33 for de-energize sequences for Motorized Switch TPSS #U01:

Sequence	Action	Result
1	OPEN HA01 Q0	HA01 Q0 GREEN colour
2	OPEN switch TPSS #U01	Switch TPSS #U01 GREEN colour
3	Set “COMMAND LOCK SET” switch TPSS #U01	Diagonal black line on switch TPSS #U01
4	Insert “NOTE” switch TPSS #U01	Exclamation mark at switch TPSS #U01
5	OPEN HA01 Q1	HA01 Q1 GREEN colour
6	Set “COMMAND LOCK SET” HA01 Q1	Diagonal black line on HA01 Q1
7	Insert “NOTE” HA01 Q1	Exclamation mark at HA01 Q1
8	CLOSE HA01 Q1E	HA01 Q1E RED colour
9	CLOSE HA01 Q0	HA01 Q0 RED colour
10	Set “COMMAND LOCK SET” HA01 Q0	Diagonal black line on HA01 Q0
11	Insert “NOTE” HA01 Q0	Exclamation mark at HA01 Q0

Table 4-33 : De-energize Sequences for Motorized Switch TPSS #U01

Refer to Table 4-34 for energize sequences for Motorized Switch TPSS #U01:

Sequence	Action	Result
1	Remove “NOTE” HA01 Q0	No exclamation mark at HA01 Q0
2	Remove “COMMAND LOCK SET” HA01 Q0	No diagonal black line on HA01 Q0
3	OPEN HA01 Q0 manually at TPSS	HA01 Q0 GREEN colour
4	OPEN HA01 Q1E	HA01 Q1E GREEN colour
5	Remove “NOTE” HA01 Q1	No exclamation mark at HA01 Q1
6	Remove “COMMAND LOCK SET” HA01 Q1	No diagonal black line on HA01 Q1
7	CLOSE HA01 Q1	HA01 Q1 RED colour

Sequence	Action	Result
8	Remove “NOTE” for switch TPSS #U01	No exclamation mark at switch TPSS #U01
9	Remove “COMMAND LOCK SET” switch TPSS #U01	No diagonal black line on switch TPSS #U01
10	CLOSE switch TPSS #U01	Switch TPSS #U01 RED colour
11	CLOSE HA01 Q0	HA01 Q0 RED colour

Table 4-34 : Energize Sequences for Motorized Switch TPSS #U01

4.5.11 Motorized Switch TPSS #U02

Refer to Table 4-35 for de-energize sequences for Motorized Switch TPSS #U02:

Sequence	Action	Result
1	OPEN HA03 Q0	HA03 Q0 GREEN colour
2	OPEN switch TPSS #U02	Switch TPSS #U02 GREEN colour
3	Set “COMMAND LOCK SET” switch TPSS #U02	Diagonal black line on switch TPSS #U02
4	Insert “NOTE” switch TPSS #U02	Exclamation mark at switch TPSS #U02
5	OPEN HA03 Q1	HA03 Q1 GREEN colour
6	Set “COMMAND LOCK SET” HA03 Q1	Diagonal black line on HA03 Q1
7	Insert “NOTE” HA03 Q1	Exclamation mark at HA03 Q1
8	CLOSE HA03 Q1E	HA03 Q1E RED colour
9	CLOSE HA03 Q0	HA03 Q0 RED colour
10	Set “COMMAND LOCK SET” HA03 Q0	Diagonal black line on HA03 Q0
11	Insert “NOTE” HA03 Q0	Exclamation mark at HA03 Q0

Table 4-35 : De-energize Sequences for Motorized Switch TPSS #U02

Refer to Table 4-36 for energize sequences for Motorized Switch TPSS #U02:

Sequence	Action	Result
1	Remove “NOTE” HA03 Q0	No exclamation mark at HA03 Q0
2	Remove “COMMAND LOCK SET” HA03 Q0	No diagonal black line on HA03 Q0
3	OPEN HA03 Q0 manually at TPSS	HA03 Q0 GREEN colour
4	OPEN HA03 Q1E	HA03 Q1E GREEN colour
5	Remove “NOTE” HA03 Q1	No exclamation mark at HA03 Q1
6	Remove “COMMAND LOCK SET” HA03 Q1	No diagonal black line on HA03 Q1
7	CLOSE HA03 Q1	HA03 Q1 RED colour

Sequence	Action	Result
8	Remove “NOTE” switch TPSS #U02	No exclamation mark at switch TPSS #U02
9	Remove “COMMAND LOCK SET” switch TPSS #U02	No diagonal black line on switch TPSS #U02
10	CLOSE switch TPSS #U02	Switch TPSS #U02 RED colour
11	CLOSE HA03 Q0	HA03 Q0 RED colour

Table 4-36 : Energize Sequences for Motorized Switch TPSS #U02

4.5.12 Motorized Switch TPSS #U03

Refer to Table 4-37 for de-energize sequences for Motorized Switch TPSS #U03:

Sequence	Action	Result
1	OPEN HA04 Q0	HA04 Q0 GREEN colour
2	OPEN switch TPSS #U03	Switch TPSS #U03 GREEN colour
3	Set “COMMAND LOCK SET” switch TPSS #U03	Diagonal black line on switch TPSS #U03
4	Insert “NOTE” switch TPSS #U03	Exclamation mark at switch TPSS #U03
5	OPEN HA04 Q1	HA04 Q1 GREEN colour
6	Set “COMMAND LOCK SET” HA04 Q1	Diagonal black line on HA04 Q1
7	Insert “NOTE” HA04 Q1	Exclamation mark at HA04 Q1
8	CLOSE HA04 Q1E	HA04 Q1E RED colour
9	CLOSE HA04 Q0	HA04 Q0 RED colour
10	Set “COMMAND LOCK SET” HA04 Q0	Diagonal black line on HA04 Q0
11	Insert “NOTE” HA04 Q0	Exclamation mark at HA04 Q0

Table 4-37 : De-energize Sequences for Motorized Switch TPSS #U03

Refer to Table 4-38 for energize sequences for Motorized Switch TPSS #U03:

Sequence	Action	Result
1	Remove “NOTE” HA04 Q0	No exclamation mark at HA04 Q0
2	Remove “COMMAND LOCK SET” HA04 Q0	No diagonal black line on HA04 Q0
3	OPEN HA04 Q0 manually at TPSS	HA04 Q0 GREEN colour
4	OPEN HA04 Q1E	HA04 Q1E GREEN colour
5	Remove “NOTE” HA04 Q1	No exclamation mark at HA01 Q1
6	Remove “COMMAND LOCK SET” HA04 Q1	No diagonal black line on HA04 Q1
7	CLOSE HA04 Q1	HA04 Q1 RED colour

Sequence	Action	Result
8	Remove “NOTE” switch TPSS #U03	No exclamation mark at switch TPSS #U03
9	Remove “COMMAND LOCK SET” switch TPSS #U03	No diagonal black line on switch TPSS #U03
10	CLOSE switch TPSS #U03	Switch TPSS #U03 RED colour
11	CLOSE HA04 Q0	HA04 Q0 RED colour

Table 4-38 : Energize Sequences for Motorized Switch TPSS #U03

4.5.13 Motorized Switch TPSS #U04

Refer to Table 4-39 for de-energize sequences for Motorized Switch TPSS #U04:

Sequence	Action	Result
1	OPEN HA06 Q0	HA06 Q0 GREEN colour
2	OPEN switch TPSS #U04	Switch TPSS #U04 GREEN colour
3	Set “COMMAND LOCK SET” switch TPSS #U04	Diagonal black line on switch TPSS #U04
4	Insert “NOTE” switch TPSS #U04	Exclamation mark at switch TPSS #U04
5	OPEN HA06 Q1	HA06 Q1 GREEN colour
6	Set “COMMAND LOCK SET” HA06 Q1	Diagonal black line on HA06 Q1
7	Insert “NOTE” HA06 Q1	Exclamation mark at HA06 Q1
8	CLOSE HA06 Q1E	HA06 Q1E RED colour
9	CLOSE HA06 Q0	Circuit Breaker Q0 RED colour
10	Set “COMMAND LOCK SET” HA06 Q0	Diagonal black line on HA06 Q0
11	Insert “NOTE” HA06 Q0	Exclamation mark at HA06 Q0

Table 4-39 : De-energize Sequences for Motorized Switch TPSS #U04

Refer to Table 4-40 for energize sequences for Motorized Switch TPSS #U04:

Sequence	Action	Result
1	Remove “NOTE” HA06 Q0	No exclamation mark at HA06 Q0
2	Remove “COMMAND LOCK SET” HA06 Q0	No diagonal black line on HA06 Q0
3	OPEN HA06 Q0 manually at TPSS	HA06 Q0 GREEN colour
4	OPEN HA06 Q1E	HA06 Q1E GREEN colour
5	Remove “NOTE” HA06 Q1	No exclamation mark at HA06 Q1
6	Remove “COMMAND LOCK SET” HA06 Q1	No diagonal black line on HA06 Q1
7	CLOSE HA06 Q1	HA06 Q1 RED colour

Sequence	Action	Result
8	Remove “NOTE” switch TPSS #U04	No exclamation mark at switch TPSS #U04
9	Remove “COMMAND LOCK SET” switch TPSS #U04	No diagonal black line on switch TPSS #U04
10	CLOSE switch TPSS #U04	Switch TPSS #U04 RED colour
11	CLOSE HA06 Q0	HA06 Q0 RED colour

Table 4-40 : Energize Sequences for Motorized Switch TPSS #U04

4.6 Switching Sequences in Emergency / Degraded Operation

In the case of emergency or degraded operations, the switching of 25kV shall be done after consultation and concurrence of OCS, EC and Chargeman (B0 / B4). For 132kV, all switching activities need to be done under instruction of Registered Competent Engineer.

4.7 Switching Switchgear Sequences for Maintenance

For maintenance of switchgear which involves works such as protection relay calibration, transformer for maintenance and others, the switching of 25kV shall be done after consultation and concurrence of OCS, EC and Chargeman (B0 / B4). For 132kV, all switching activities need to be done under instruction of Registered Competent Engineer.

5 SUMMARY

This procedure is a general guideline for switching process via SCADA. By understanding the physical, theoretical, function and operation of TPSS and wayside OCL switches, it is expected that EC and related personnel shall have more confidence in performing their duties in a safe and practical manner.

6 APPENDICES

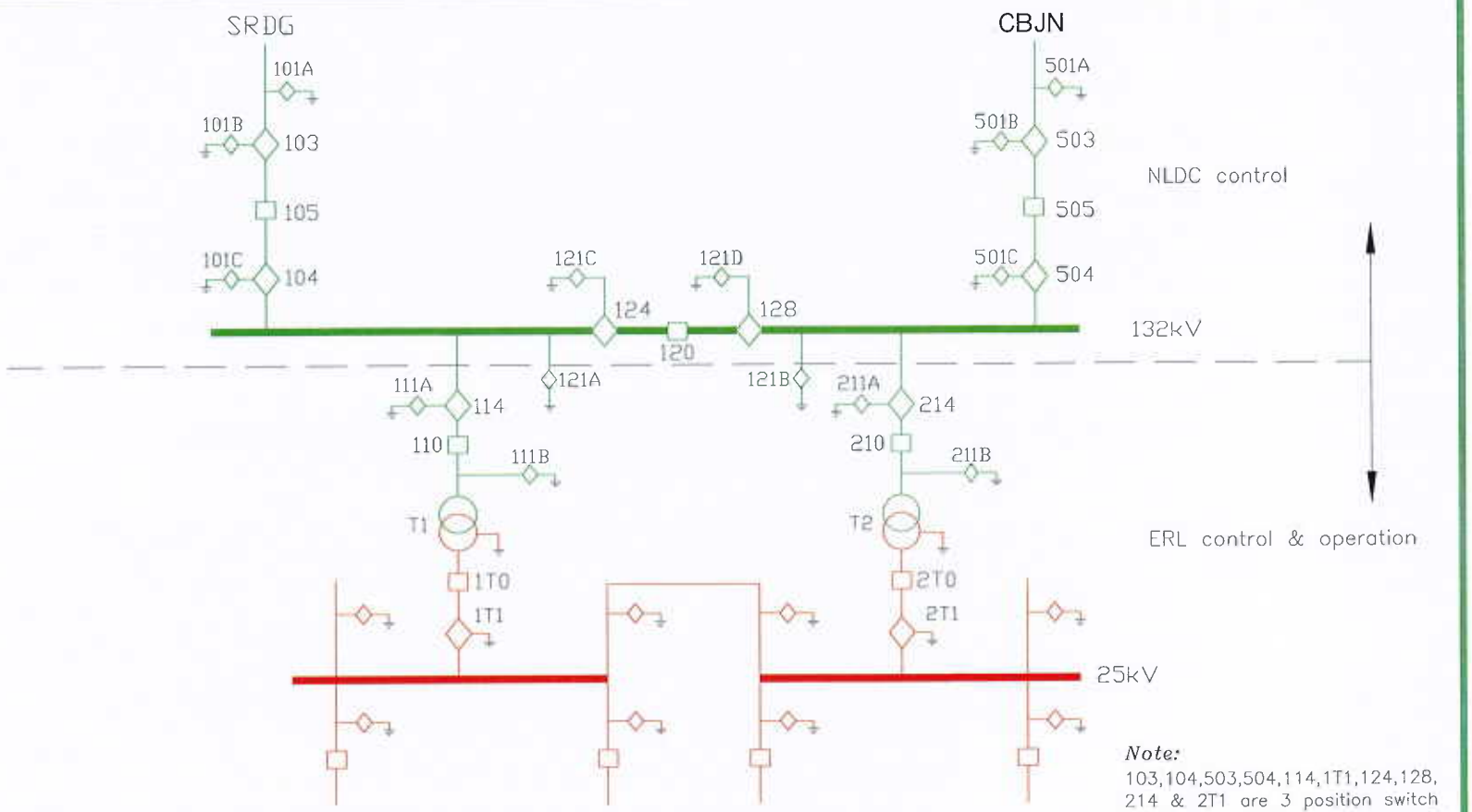
This procedure shall be read with reference of related appendices:

a) ERLA Single Line Diagram (Document Reference No. 1-CCB-ERLA-1374)
b) ERL Traction Power Supply Substation Overview (Document Reference No. U10.OME.M40000.YQ.1002.C)
c) ERL Overhead Contact Line Overview (Document Reference No. U20.OME.M30000.YQ.1001.C)

Appendix 1
ERL Single Line Diagram

Jabatan Perancangan Sistem

Substation:	EXPRESS RAIL LINK (A)
Mneumonic:	ERLA
Voltage:	132kV
Drawing No.:	1-CCB-ERLA-1374
Date Drawn:	12nd. JUNE., 2001
Date Updated:	01st. NOV., 2001
Revision:	3/01
Area:	PETALING JAYA
PLC:	–
Telephone:	–
Drawn by:	KAMARUL
Checked by:	AZIZAN
Approved by:	THOO P.C



Note:
103,104,503,504,114,1T1,124,128, 214 & 2T1 are 3 position switch i.e in open, close & earth position

Transformer Rating

132/25kV 2x30 MVA Total Cap.: 60 Vector Group: –

Commissioning Date

T1 –

T2 –

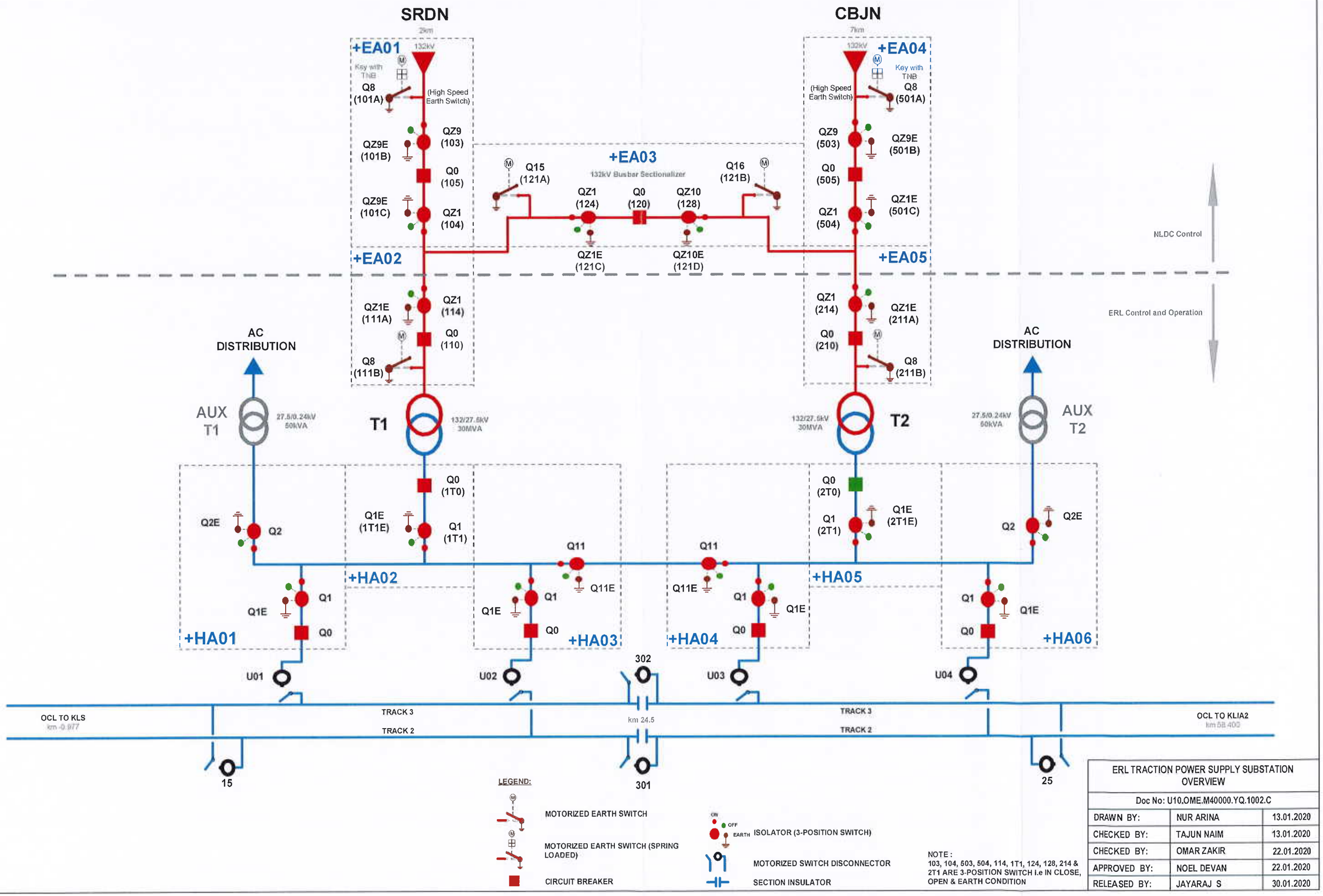
REMARKS:

1/01–Substation commissioned on 17/07/01
2/01–Changed as per site
3/01–Changed as per site

1-CCB-ERLA-1374

Appendix 2
ERL Traction Power Supply Overview

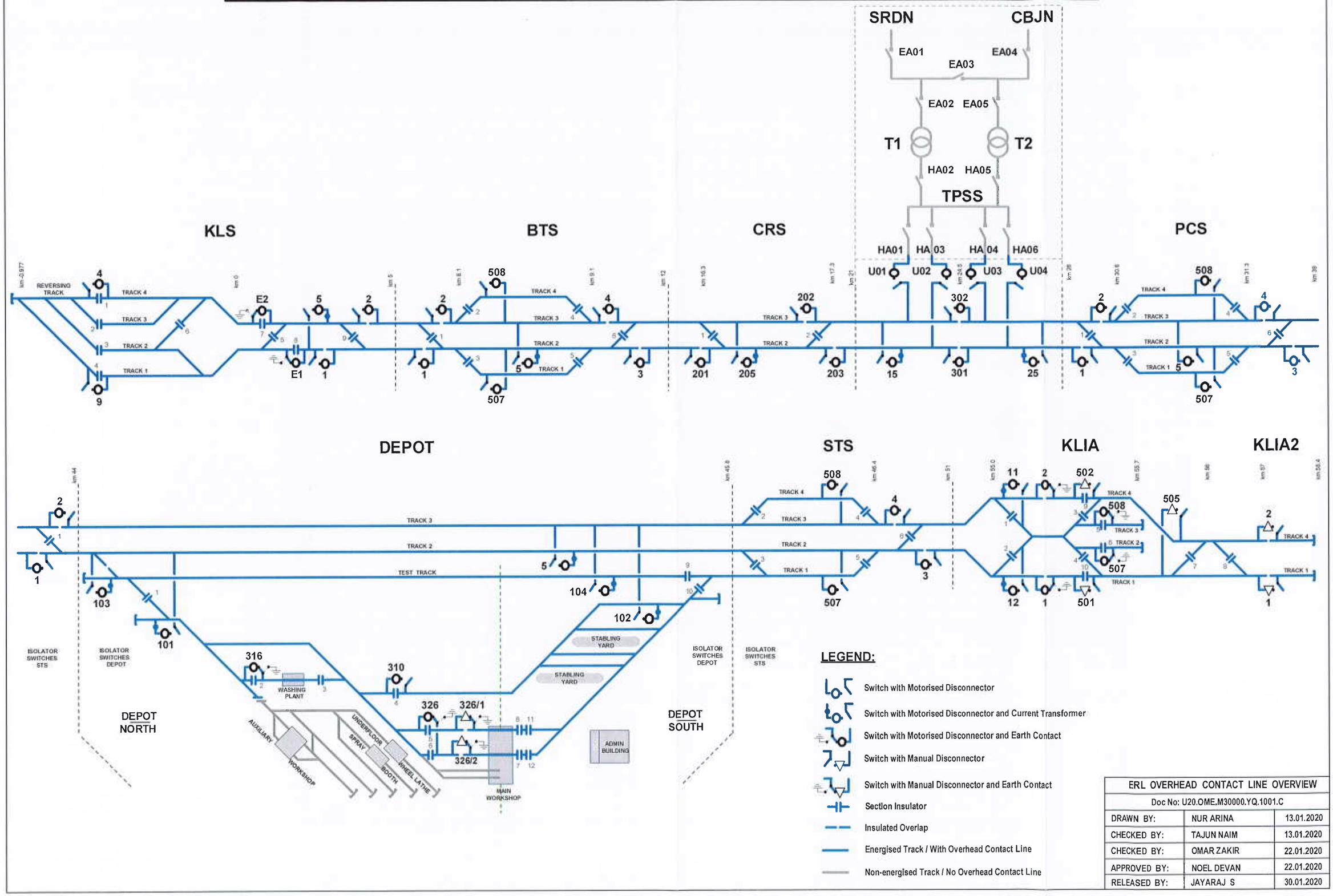
EXPRESS RAIL LINK - TRACTION POWER SUPPLY SUBSTATION OVERVIEW



ERL TRACTION POWER SUPPLY SUBSTATION OVERVIEW		
Doc No: U10.OME.M40000.YQ.1002.C		
DRAWN BY:	NUR ARINA	13.01.2020
CHECKED BY:	TAJUN NAIM	13.01.2020
CHECKED BY:	OMAR ZAKIR	22.01.2020
APPROVED BY:	NOEL DEVAN	22.01.2020
RELEASED BY:	JAYARAJ S	30.01.2020

Appendix 3
ERL Overhead Contact Line Overview

EXPRESS RAIL LINK - OVERHEAD CONTACT LINE OVERVIEW



LEGEND:

- Switch with Motorised Disconnector
- Switch with Motorised Disconnector and Current Transformer
- Switch with Motorised Disconnector and Earth Contact
- Switch with Manual Disconnector
- Switch with Manual Disconnector and Earth Contact
- Section Insulator
- Insulated Overlap
- Energised Track / With Overhead Contact Line
- Non-energised Track / No Overhead Contact Line

ERL OVERHEAD CONTACT LINE OVERVIEW		
Doc No: U20.OME.M30000.YQ.1001.C		
DRAWN BY:	NUR ARINA	13.01.2020
CHECKED BY:	TAJUN NAIM	13.01.2020
CHECKED BY:	OMAR ZAKIR	22.01.2020
APPROVED BY:	NOEL DEVAN	22.01.2020
RELEASED BY:	JAYARAJ S	30.01.2020