

ORIGINAL



Ref. No. NBM.PCPK.14193.PK1071.12.07.2023

12 July 2023

The Project Consultant for the MRTA Pink Line Project (PCPK)
PCPK Site Office 102/2 Ramintra Road,
Khannayao, Bangkok 10230

Attention: Khun Korawat Thawabutara
Deputy Project Manager 1 (PCPK)

Dear Sir,

**MRTA Pink Line Monorail Project
Design Submission
Power Supply - Trainee Manual Emergency Trip
Switch Maintenance Training**

Please find attached the submittal of the Power Supply - Trainee Manual Emergency Trip Switch Maintenance Training for your information.

Submission No. : PK PSY 60050 A
Submittal Title : Trainee Manual Emergency Trip Switch Maintenance Training
Document No. : G0PK.PSY.42403.NLE.0006.A

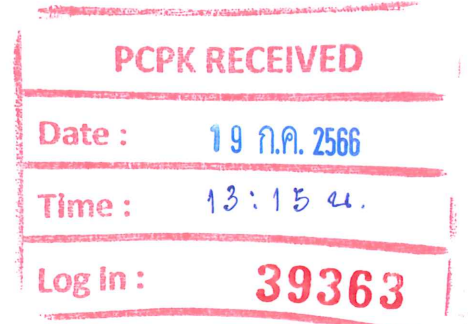
Yours faithfully,

Dr. Chaisak Srisethanil
Project Director
Pink Line Monorail Project

Enclosure:

Submission No. PK PSY 60050 A - Trainee Manual Emergency Trip Switch Maintenance Training

cc: Khun Raveewan Phongsupatsamit - Mass Rapid Transit Authority of Thailand
Khun Sutthipong Apairatana - Mass Rapid Transit Authority of Thailand
Khun Wanat Sucharitdhammadhorn - Mass Rapid Transit Authority of Thailand
(Cover letter)



NORTHERN BANGKOK MONORAIL PINK LINE PROJECT KHAE RAI – MIN BURI SECTION

MAINTENANCE PROCEDURE TRAINING

TRAINEE MANUAL EMERGENCY TRIP SWITCH MAINTENANCE TRAINING

<PK-PSY-MTN-01-M08>

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	PK PSY 60050 A	
	Internal Document Number	Internal Revision
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	12-12-2022	en

Document Title		TRAINEE MANUAL EMERGENCY TRIP SWITCH MAINTENANCE TRAINING		
Document ID Number		G0PK.PSY.42403.NLE.0006.A		
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Approvals				
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Verified	Haibo Ning	System Integration Manager		12-12-2022
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Revision Log

Revision	Date of Release	Description of Changes
A	12-12-2022	Released to Employer

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1 Introduction

The Trainee Manual is prepared for Emergency Trip Switch Maintenance Training< PK-PSY-MTN-01-M08>, which contains all training course materials for the training of the Key Instructors or the selected staff of Northern Bangkok Monorail Pink Line for ETS Key Instructors to have an understanding of the ETS system and acquire the required knowledge and skill in ETS maintenance and complies with the requirements as stipulated in the contract Employer's Requirements Part 2 General Specification, Appendix 6 – Operations, Maintenance, and Training Ref [2]

This course is designed for the following trainees:

- 1) Maintenance staff
- 2) The selected staff of Northern Bangkok Monorail Pink Line

This trainee manual is written for trainees' reference when attending the training course or after successful completion of the course. It is not intended for readers who have not attended the relevant training course. The manual must be updated whenever necessary by qualified course designer or Training Manager if there are substantial modifications made to the system or the maintenance rules and procedures after the training. It should be updated together with the Trainer Manual.

2 Abbreviations and Definitions

Definitions and abbreviations used in this document are as listed in the Project Glossary Ref[1].

Contrary to what is defined in the Project Glossary, when reference is made to the term "Project" in this document it refers to the Contractors scope of Works and when reference is made to the term "Contractor" it means the Consortium of Bombardier Transportation Signal (Thailand) Limited and Bombardier Transportation GmbH.

3 Trainee Manual

3.1 Course Details

Course Title:	Emergency Trip Switch Maintenance
Course Code:	PK-PSY-MTN-01-M08
Duration:	1 days: half day for theory and half day for practical 09:00 to 16:00 hours (with a 1-hour lunch break and 15-minutes break in afternoon session)
Training Topics:	• System Overview (design, interface, features and performance) of Emergency Trip Switch (ETS) • Safety precautions and requirements whilst maintaining the ETS • ETS maintenance procedure
Language:	Thai

Table 3-1: Course Details

3.2 References

3.2.1 Project Documents

Document Number	Document Title
G0PK.PMM.11160.AEE.0001	Project Glossary Ref [1]
PK M&E Works ER Part 2-GES A06	Northern Bangkok Monorail Co. Ltd. Specification for Pink Line Monorail Project M&E Works Employer's Requirements Part 2 General Specification Appendix 6 -Operations, Maintenance and Training Ref [2]
G0PK.SYS.11101.ACE.0002.B	Sub-system Contractor O&M Manuals Specification Ref [3]
G0PK.PSY.42403.NLE.0001	Individual Training Plan for ETS Maintenance Ref [4]
G0PK.PSY.42403.NJE.0001	O&M Manual Power Supply System – Volume 3: Preventative & Corrective Maintenance Manual Emergency Trip Switch Ref [5]

Table 3-2: List of References ~ Project Documents

4 Training Timetable

Time	Topic
09:00 am – 09:15 am	Introduction and Registration
09:15 am – 09:30 am	Safety Precautions and Requirements whilst Maintaining the Emergency Trip Switch
09:30 am – 10:00 am	Overview & Construction of Emergency Trip Switch
10:00 am – 10:15 am	Break
10:15 am – 11:15 pm	Emergency Trip Switch maintenance procedure
11:15 am – 11:30 pm	Questions and answers
11:30 am – 12:00 pm	Written Assessment
12:00 am – 01:00 pm	Lunch
01:00 pm – 01:15 pm	Registration & Safety Briefing
01:15 pm – 02:15 pm	Demonstrate & Practice Emergency Trip Switch maintenance procedure
02:15 pm – 02:30 pm	Break
02:30 pm – 03:45 pm	Practical Assessment
03:45 pm – 04:00 pm	Questions and answers, Course evaluation

Table 4-1: Training Timetable

5 Training Content

	Training PowerPoint Course Title: Emergency Trip Switch (ETS) Maintenance Course Code: PK-PSY-MTN-01-M08 NORTHERN BANGKOK MONORAIL PINK LINE PROJECT KHAE RAI – MIN BURI SECTION Prepared on 30-Oct-2022 Template no. 100439396 Rev A

Document No.	GOPK.PSY.42403.NLE.0005
Revision:	A
Date Issued:	30-Oct-2022

Prepared by	Reviewed by	Approved by
Nontakorn Kumsang, Lead Engineer, TMD	Kriengkrai Rueangcharoen, Construction Manager, TMD	Sanpaphob Lakhong, Project Manager, TMD
		
Revision	Issue Date	Details of Revision
A	30-Oct-2022	Released to Employer

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Training Objectives

- Acquire general knowledge about the system design, interface, functions, features and performance of the ETS
- Understand the safety requirements during the maintenance of the ETS
- Acquire the knowledge and skill to maintain the ETS safely and effectively
- Use the training materials and relevant O&M manuals to conduct rollout training to other O&M staff, as required

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Training Timetable

Time	Topic
09:00 am – 09:15 am	Introduction and Registration
09:15 am – 09:30 am	Safety Precautions and Requirements while maintaining the Emergency Trip Switch
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10:15 am – 11:15 pm	Emergency Trip Switch maintenance procedure
11:15 am – 11:30 pm	Questions and Answers
11:30 am – 12:00 pm	Written Assessment
12:00 am – 01:00 pm	Lunch
01:00 pm – 01:15 pm	Registration & Safety Briefing
01:15 pm – 02:15 pm	Demonstrate & Practice Emergency Trip Switch maintenance procedure
02:15 pm – 02:30 pm	Break
02:30 pm – 03:45 pm	Practical Assessment
03:45 pm – 04:00 pm	Questions and Answers, Course evaluation

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Introduction

Name : Nontakorn Kumsang (Luis)

Job title : Engineer

Experience :

2018 : Air compressor install at BTS South Green line Thailand depot

- Administrator of the project in terms of dividing the air compressor installation work and following up the work as planned.

2019 : PSY-SCADA MRT Blue line extension, AFC BTS Gold line

- Test and commissioning between SCADA and PSY equipment (GIS, Switchgear)
- Installation AG, TIM, TVM, POS for AFC system
- Test and commissioning FAT, SAT, SIT for AFC system

2020 : Stringer system – PSY BTS North Green line

- Planning project timeline.
- Progress project update.
- Test report documents.

2021 : King Chulalongkorn Memorial hospital

- Thermostat installation and Test report documents.
- Management of the project in term of co-ordinate with internal department, dividing the thermostat, LoRawan receptor installation work and follow up the work as planned.

2022 : King Chulalongkorn Memorial hospital

- Prepare project layout for Exhaust and refresh fan, also electric generator installation.
- Planning project timeline.
- Co-ordinate with technician.
- Progress project update.
- Test report documents.



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Topic 1 : Safety Precaution and Requirements

Safety Notes and Indicators

	WARNING Information and instructions that, if not followed, could result in injury or death of personnel such as staffs and passengers. Warning is typed in upper case, bold and in larger fonts than the text, emphasized by red box enclosure and positioned in centre with legend "WARNING". State the nature of hazard and the possible consequences if the recommended procedures are not followed. Recommended recovery action in the event of accident shall be included. A warning sign with STOP represents a prohibition (prohibited action or state)
	CAUTION Information and instructions that, if not followed, could result in damage or loss of equipment. Caution is typed in upper case, bold and in larger fonts than the text, emphasized by yellow box enclosure and positioned in centre with legend "CAUTION". State the nature of the hazard and the possible consequences if the recommended procedures are not followed. Cross-reference to any remedial measures contained within Operations or Maintenance Instructions
	NOTE Reference or supplementary explanation and related information for reminding the user the safe way of handling the equipment or working in the area. Note is typed in normal upper and lower cases as shown

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Topic 1 : Safety Precaution and Requirements

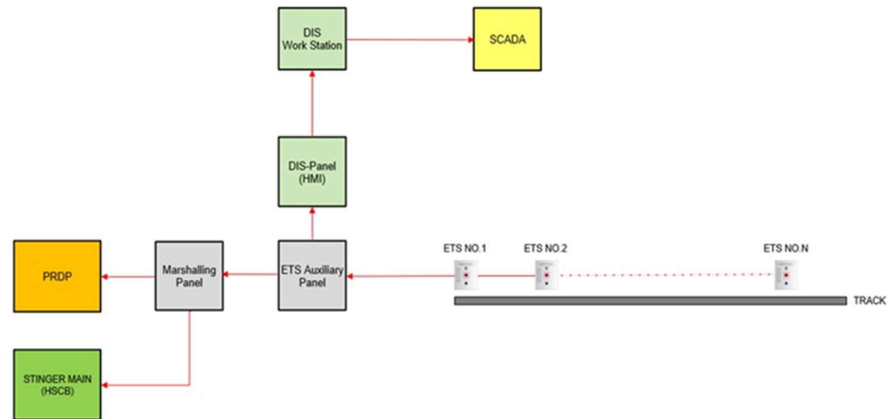
Safety at Work

- Always inspect the working area for uninsulated wires, broken cords, and exposed electrical circuits beforehand.
- Do not make use of faulty electrical equipment at all times.
- Workers must wear personal protective equipment.
- Isolate electrical equipment before working on them, and apply the Lockout/Tagout procedure as required.
- Have a prompt system for the provision of first aid, reporting, and documenting electrical shock incidents in the workplace.
- Have a risk assessment while maintaining the emergency trip switch system.
- To ensure safety conditions while maintaining the emergency trip switch system interface with each equipment of the main workshop.

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Topic 2 : Overview & Construction of Emergency Trip Switch



[G0PK.PSY.42403.NLE.0005]

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Topic 3 : ETS Equipment

- Component overview

Equipment	Qty
Marshalling Panel	1
Auxiliary Panel	6
ETS panel	53
Signboard	53

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Topic 3 : ETS Equipment

- Marshalling Panel

The marshalling panel is located at the beginning of track **M5**, the function of the marshalling panel is to receive signals from auxiliary panels to send tripping signal out to the power rail disconnect panel (PRDP) and stinger main distribution panel (SMDP). It is also receiving LV control power supply and distribute all over ETS system.



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Topic 3 : ETS Equipment

- Marshalling Panel

Pilot lamp

Volt meter



Outside



Inside

MCB

Power supply unit

Relay 24VDC

Terminal connector

Terminal connector for main power supply

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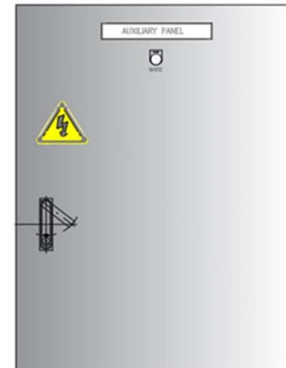
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Topic 3 : ETS Equipment

- Auxiliary Panel

The auxiliary panels are located at the beginning of each track, the auxiliary panel have function for receive signal from each ETS panels which located along the track of main workshop to send signal to the marshalling panel and DIS panel.



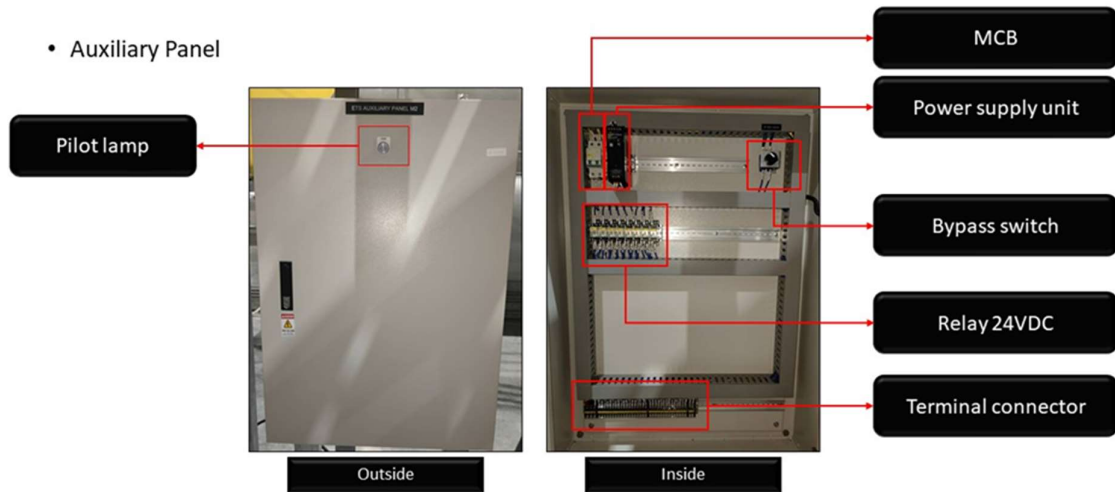
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Topic 3 : ETS Equipment

- Auxiliary Panel



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Topic 3 : ETS Equipment

- Emergency Trip Switch Panel

The ETS is located around the power rail energization track and between track included overhead walkway of the main workshop. The location of ETS will considering to the operate the ETS can be accessible to use and cover hazard area of the power rail energize (PRDP) and power source to the train (SMDP).



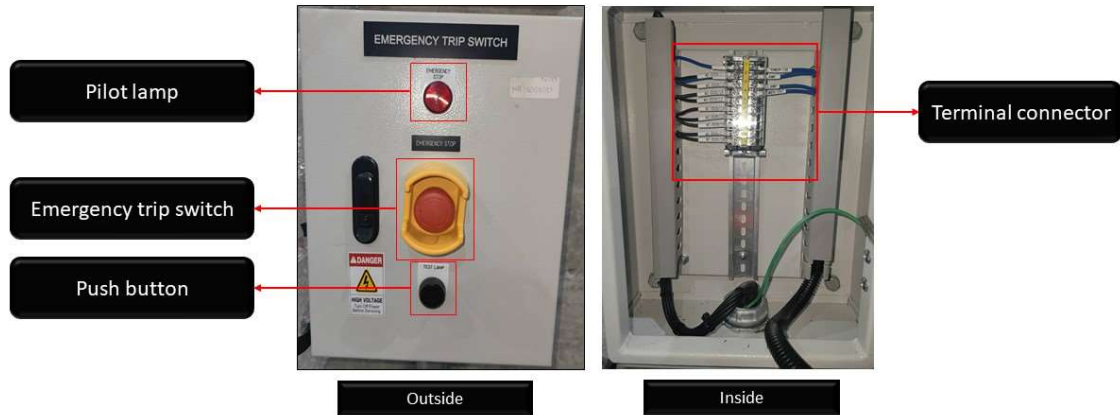
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Topic 3 : ETS Equipment

- Emergency Trip Switch Panel



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Topic 3 : ETS Equipment

- Signboard

The signboard is designed located near the ETS panel for show the symbol of the emergency button point.



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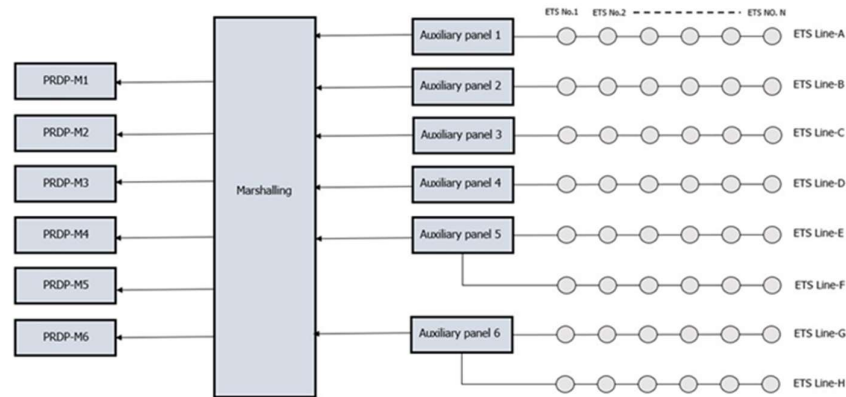
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Topic 4 : ETS interface

- Interface with PRDP : Send signal for command open of the PRDP contact

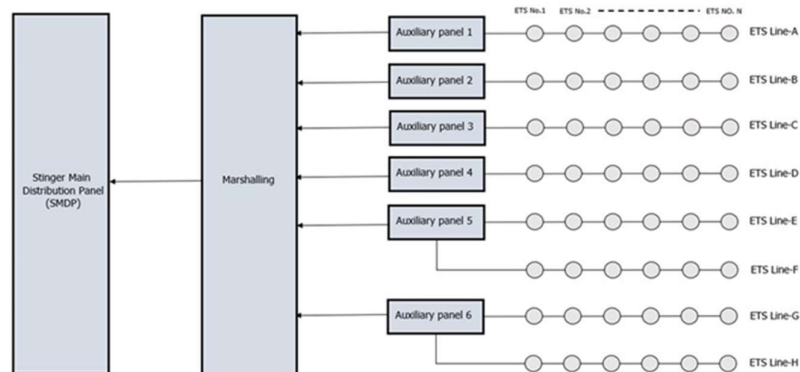


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Topic 4 : ETS interface

- Interface with Stinger main distribution panel (SMDP) : Send signal for open circuit of the stinger main contact (HSCB).

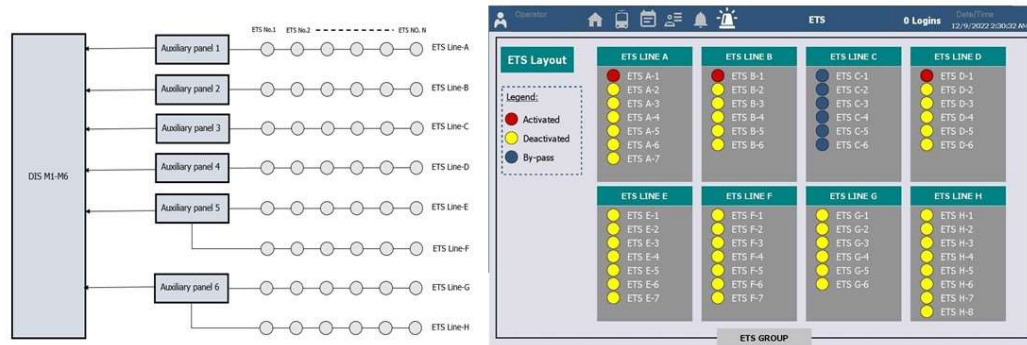


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Topic 4 : ETS interface

- Interface with Depot Interlocking System (DIS) : Monitoring status activate/de-activate ETS panel



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Topic 5 : Preventative Maintenance

Item	Equipment Description	PM Description	Location	Maintenance Interval
1	Emergency Stop Switch	Tightening cable, Termination check, Inspection	Emergency Trip Switch panel	Yearly
2	Power Supply Unit	Tightening cable, Termination check	Marshalling panel, Auxiliary panel	Yearly
3	MCB	Tightening cable, Termination check	Marshalling panel, Auxiliary panel	Yearly
4	Relay 24VDC	Tightening cable, Termination check, Inspection	Marshalling panel, Auxiliary panel	Yearly
5	Push button	Cleaning /Tightening cable termination check	Emergency Trip Switch panel	6 months
6	Pilot lamp	Cleaning /Tightening cable termination check	Marshalling panel, Auxiliary panel	6 months
7	Signboard	Cleaning	Emergency Trip Switch panel	6 months
8	Molly Guard	Cleaning	Emergency Trip Switch panel	6 months
9	Selector Switch	Cleaning /Tightening cable termination check	Auxiliary panel	6 months

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Topic 5 : Preventative Maintenance

- Tool & Equipment



Screwdriver



Multi-Meter



Brush



Rags



Vacuum Cleaner



PU glove

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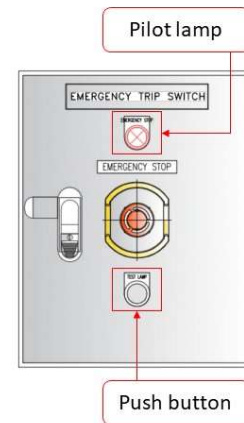
Topic 5.1 : 6-Months Preventative Maintenance

- Push button

- Remove all dirt and dust on the Push button surface using rags (dry, lint-free cloth) and brushes (soft brush) for wiping off the dirt.
- Check operation of the Push button and Pilot lamp on Emergency trip switch panel, by pushing button and Pilot lamp will light up with the red status.

- Pilot lamp

- Remove all dirt and dust on the Pilot lamp surface using rags (dry, lint-free cloth) and brushes (soft brush) for wiping off the dirt.
- Check operation of the Pilot lamp and Push button on Emergency trip switch panel, by pushing button and Pilot lamp will light up with the red status.



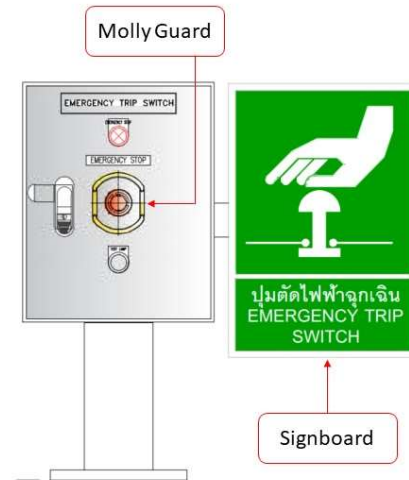
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Topic 5.1 : 6-Months Preventative Maintenance

- Signboard
 - i. Remove all dirt and dust on the Signboard surface using rags (dry, lint-free cloth) and brushes (soft brush) for wiping off the dirt.
- Molly Guard
 - i. Remove all dirt and dust on the Molly Guard surface using rags (dry, lint-free cloth) and brushes (soft brush) for wiping off the dirt.



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Topic 5.2 : Yearly Preventative Maintenance

- Emergency Stop Switch
 - i. Operation check on Bypass mode, Emergency Trip Switch can be operated to cut off power all the line as designed.
 - ii. Continuity test at NC contact, should be NO when Emergency Trip Switch is pushed.
 - iii. Check all connecting points are firmly. If found, turn off the power, then plug it in firmly.



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Topic 5.2 : Yearly Preventative Maintenance

- Power Supply Unit
 - i. Check all connecting points are firmly. If found, turn off the power, then plug it in firmly.
 - ii. Check nominal input/output voltage are normally by the measurement.



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Topic 5.2 : Yearly Preventative Maintenance

- MCB

- Check all connecting points are firmly. If found, turn off the power, then plug it in firmly.
- Check nominal input/output voltage are normally by the measurement.
- Check operation of breaker function is normally. Can be turn ON/OFF.



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Topic 5.2 : Yearly Preventative Maintenance

- Relay 24VDC
 - i. Check all connecting points are firmly. If found, turn off the power, then plug it in firmly.
 - ii. Operation check on Bypass mode, Relay can be operated with LED lights up on relay surface as function designed.
 - iii. Power source check. Use multi-meter to check input voltage.



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Topic 6 : Corrective Maintenance

Item	Equipment Description	CM Description	Location	Maintenance Interval
1	Emergency Stop Switch	Emergency Stop Switch Replacement	Emergency Trip Switch panel	When the device is damaged or unable to work as a function.
2	Power Supply Unit	Power Supply Unit Replacement	Marshalling panel, Auxiliary panel	
3	MCB	MCB Replacement	Marshalling panel, Auxiliary panel	
4	Relay 24VDC	Relay 24VDC Replacement	Marshalling panel, Auxiliary panel	
5	Push button	Push button Replacement	Emergency Trip Switch panel	
6	Pilot lamp	Pilot lamp Replacement	Marshalling panel, Auxiliary panel	
7	Selector Switch	Selector Switch Replacement	Auxiliary panel	

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Topic 6 : Corrective Maintenance

- Emergency Stop Switch Replacement

Safety Precaution

- Turn to bypass mode at auxiliary panel before replacement.
- Working details and areas should be talked before starting replacement.
- The Emergency Stop Switch cable must be terminated to socket carefully and precisely.

Replacement Procedure

- Turn off the power to the push button before starting removal then use the screwdriver pull up the locking lever.
- Turn the lever to the left and remove the locking ring from the operator.
- Remove the contact block from the operator.
- Install the new one as reverse step, insert the operator into the contact block mounting adapter then turn the locking lever to the right.
- Reconnect the cable with tightening carefully and precisely as before removing equipment.

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Topic 6 : Corrective Maintenance

• Emergency Stop Switch Replacement

Test after Replacement

- i. Retest with Continuity test at NC contact, shouldn't be continued, at NO contact should be continued when Emergency Trip Switch is pushed.
- ii. The button could be pushed and released follow instruction manual.



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Topic 6 : Corrective Maintenance

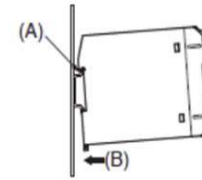
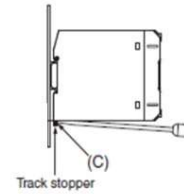
• Power Supply Unit Replacement

Safety Precaution

- Always turn off power to Power Supply Unit before replacement.
- Working details and areas should be talked before starting replacement.
- The Power Supply Unit cable must be terminated to socket carefully and precisely.

Replacement Procedure

- Turn off the power source of the Power Supply Unit.
- Use screwdriver to unplug the cable.
- To dismount the power unit, pull down portion (C) with a flat-blade screwdriver and pull out the power unit.
- Replace the new one on DIN rail.
- To mount the power unit on a DIN Rail, hook portion (A) of the power unit onto the rail and press the power unit in direction (B).
- Connect the cable by screwdriver with tighten fix



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Topic 6 : Corrective Maintenance

- Power Supply Unit Replacement

Test after Replacement

- Check nominal input/output voltage are normally as before by the measurement.



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Topic 6 : Corrective Maintenance

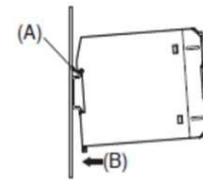
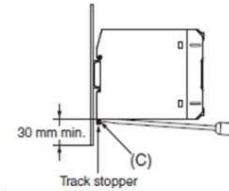
• MCB Replacement

Safety Precaution

- Always turn off power to Power Supply Unit before replacement.
- Working details and areas should be talked before starting replacement.
- The MCB cable must be terminated to socket carefully and precisely.

Replacement Procedure

- Turn off the Main Circuit breaker.
- Check the power terminal by voltage to make sure they have no electrical.
- Disconnect the wire of the MCB by use screwdriver.
- Dismount the MCB, pull down portion (C) with a flat-blade screwdriver and pull out the power unit.
- Replace the new one on DIN rail.
- Insert the new MCB and push it into position.
- To mount the MCB on a DIN rail, hook portion (A) of the MCB onto the rail and press the power unit in direction (B).
- Connect the cable with the new MCB with tightening fix and mark.



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Topic 6 : Corrective Maintenance

- MCB Replacement

Test after Replacement

- Check operation of breaker function is normally. Can be turn ON/OFF.
- Check nominal input/output voltage are normally as before by the measurement.

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Topic 6 : Corrective Maintenance

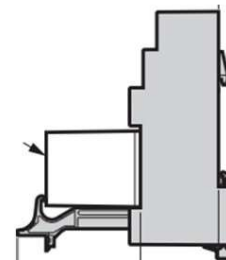
• Relay 24VDC Replacement

Safety Precaution

- i. Always turn off power to the relay before replacement.
- ii. Working details and areas should be talked before starting replacement.
- iii. The relay cable must be terminated to socket carefully and precisely.

Replacement Procedure

- i. To replace the relay, turn OFF the power supply to the load and relay coil sides.
- ii. Push a Hold-down Clip to remove relay from a socket.
- iii. Remove the old relay out of a socket.
- iv. Add the new one by pushing to a socket, make sure that the relay is installed so that the contacts are not subjected to vibration or shock in their movement direction.



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Topic 6 : Corrective Maintenance

- Relay 24VDC Replacement

Test after Replacement

- Power source check. Use multi-meter to check input voltage.
- Relay can be operated with LED lights up on relay surface as function designed.



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Topic 6 : Corrective Maintenance

- Push button Replacement

Safety Precaution

- Always turn off power to the push button before replacement.
- Working details and areas should be talked before starting replacement.
- The push button cable must be terminated to socket carefully and precisely.

Replacement Procedure

- Turn off the power to the push button before starting removal then use the screwdriver pull up the locking lever.
- Turn the lever to the left and remove the locking ring from the operator.
- Remove the contact block from the operator.
- Install the new one as reverse step, insert the operator into the contact block mounting adapter then turn the locking lever to the right.
- Reconnect the cable with tightening carefully and precisely as before removing equipment.

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Topic 6 : Corrective Maintenance

• Push button Replacement

Test after Replacement

- i. Retest with Continuity test at NC contact, should be continued when the button is pushed.
- ii. The pilot lamp will light up with red color when the button is pushed.



[G0PK.PSY.42403.NLE.0005]

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Topic 6 : Corrective Maintenance

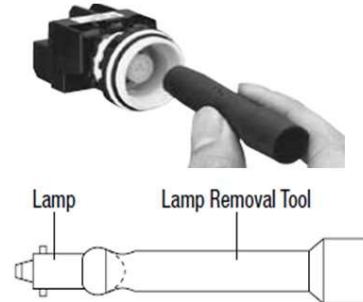
• Pilot lamp Replacement

Safety Precaution

- i. Always turn off power to the pilot lamp before replacement.
- ii. Working details and areas should be talked before starting replacement.
- iii. The pilot lamp cable must be terminated to socket carefully and precisely.

Replacement Procedure

- i. Lamps can be replaced using the lamp holder tool (OR-55) from the front of the panel, or by removing the contact block from the operator unit.
- ii. To remove, gently insert the lamp holder tool onto the lamp head. Then push slightly, and turn the lamp holder tool to the left.
- iii. Insert the lamp head into the lamp holder tool, and hold the lamp as shown in the side figure.
- iv. Place the pins on the lamp base to the grooves in the lamp socket. Insert the lamp and turn it to the right.



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Topic 6 : Corrective Maintenance

- Pilot lamp Replacement

Test after Replacement

- The pilot lamp will light up with red color when the button is pushed.



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Topic 6 : Corrective Maintenance

• Selector Switch Replacement

Safety Precaution

- i. Always turn off power the selector switch before replacement.
- ii. Working details and areas should be talked before starting replacement.
- iii. The Selector Switch cable must be terminated to socket carefully and precisely.

Replacement Procedure

- i. Turn off the power to the selector switch before starting removal then use the screwdriver pull up the locking lever.
- ii. Turn the lever to the left and remove the locking ring from the operator.
- iii. Remove the contact block from the operator.
- iv. Install the new one as reverse step, insert the operator into the contact block mounting adapter then turn the locking lever to the right.
- v. Reconnect the cable with tightening carefully and precisely as before removing equipment.

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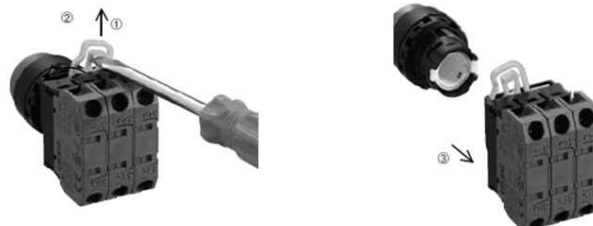
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Topic 6 : Corrective Maintenance

• Selector Switch Replacement

Test after Replacement

- i. Check operation of Selector Switch function is normally. Can be selected function.
- ii. Test with Continuity test at NC contact, should be continued when select to NC contact, and also when select to NO contact shouldn't be continued.



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Questions and Answers

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ALSTOM

End of Training

6 Handouts

There are no handouts applicable for this training.

End of Document