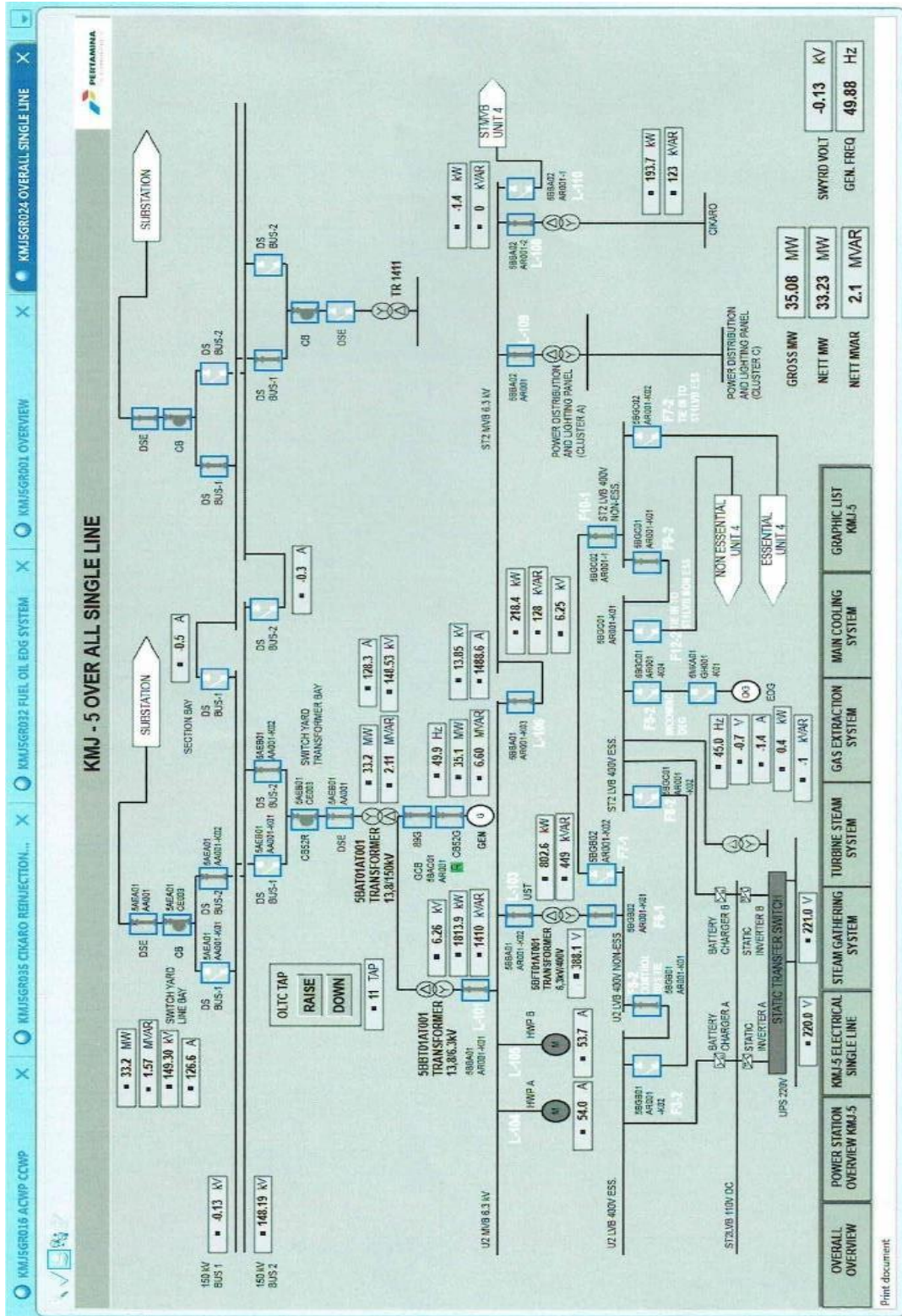
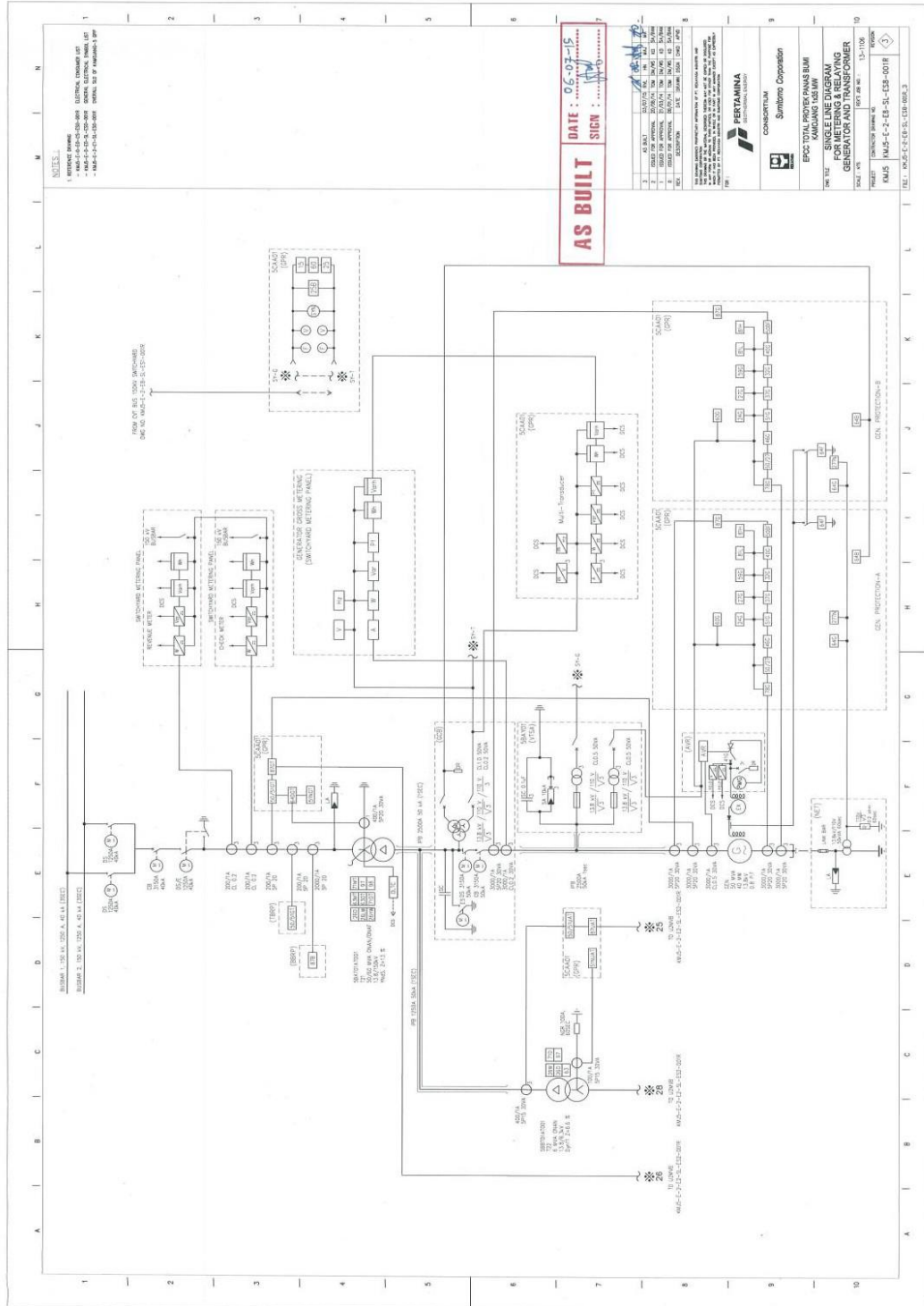


# LAMPIRAN

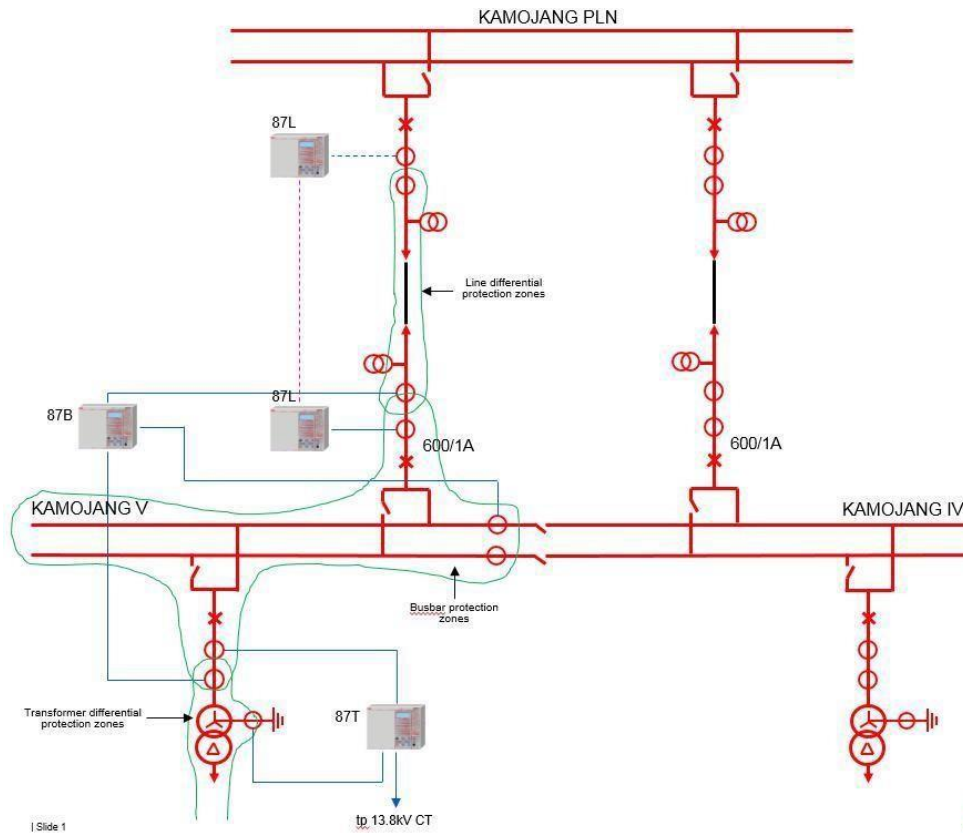
Lampiran 1. Over All Single Line Diagram PLTP KMJ Unit 5



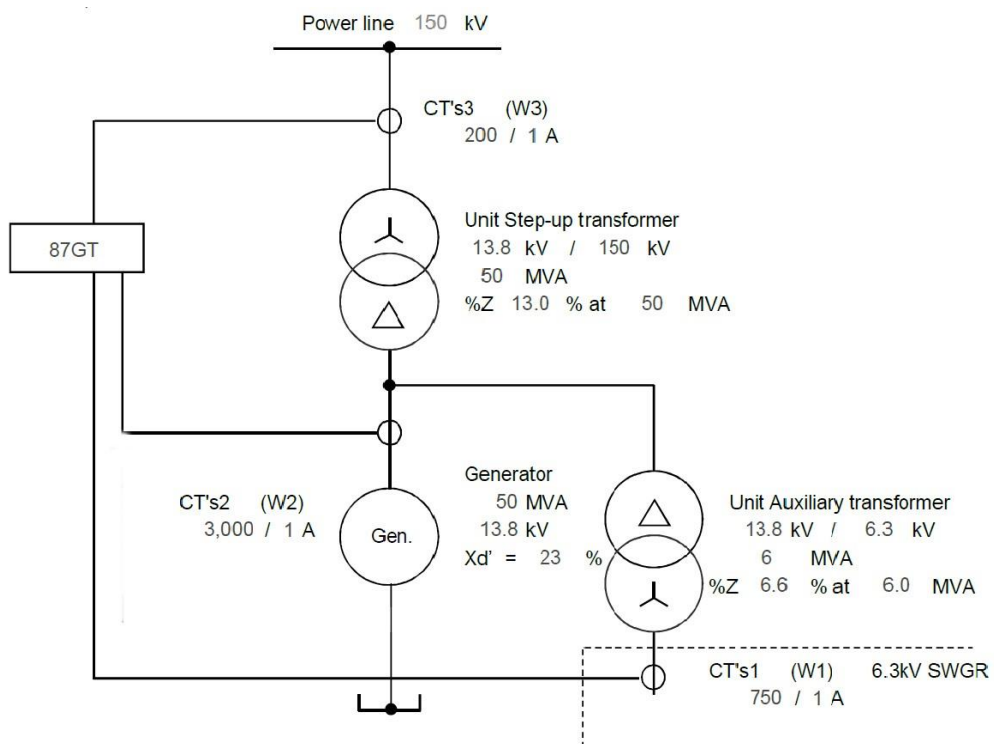
## Lampiran 2. Single Line Diagram PLTP KMJ Unit 5 For Metering & Relaying Generator and Transformer



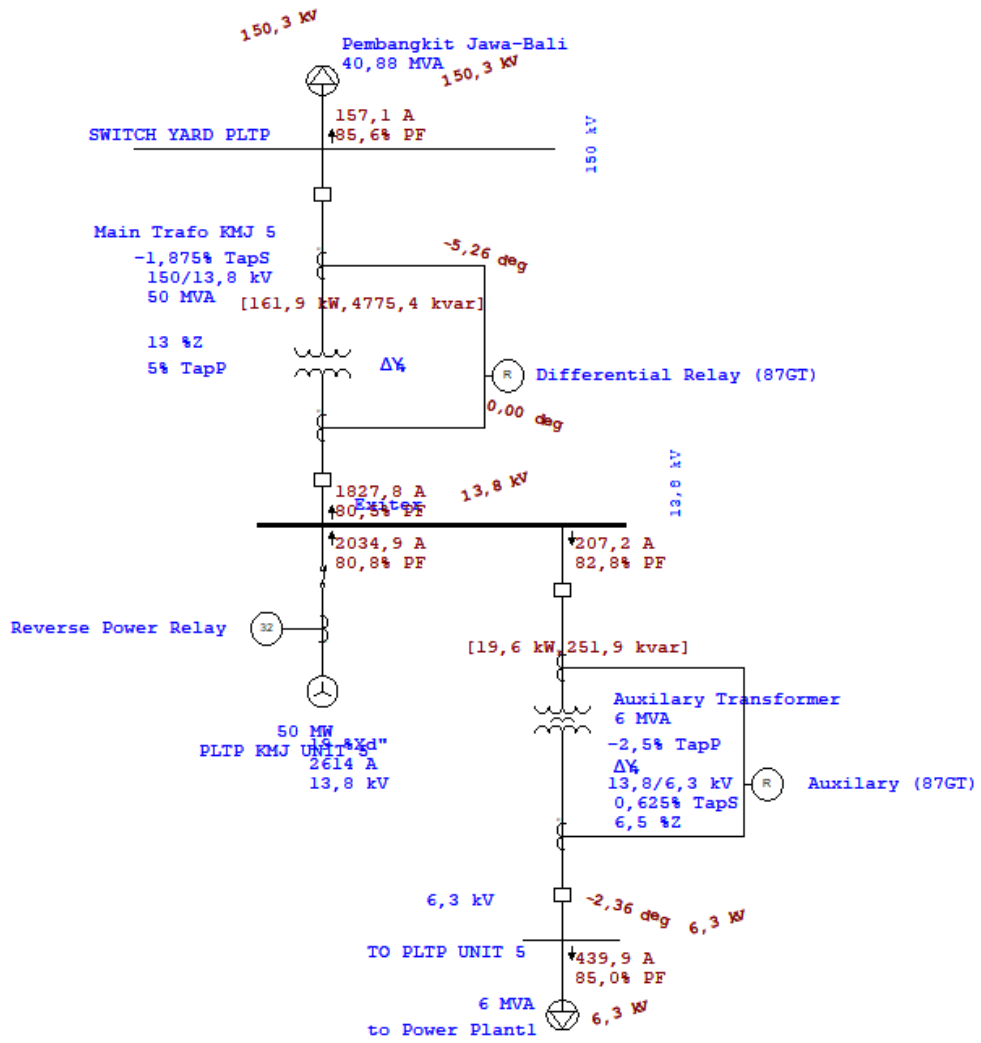
Lampiran 3. Single Line Diagram (Skematik Rele Diferensial)



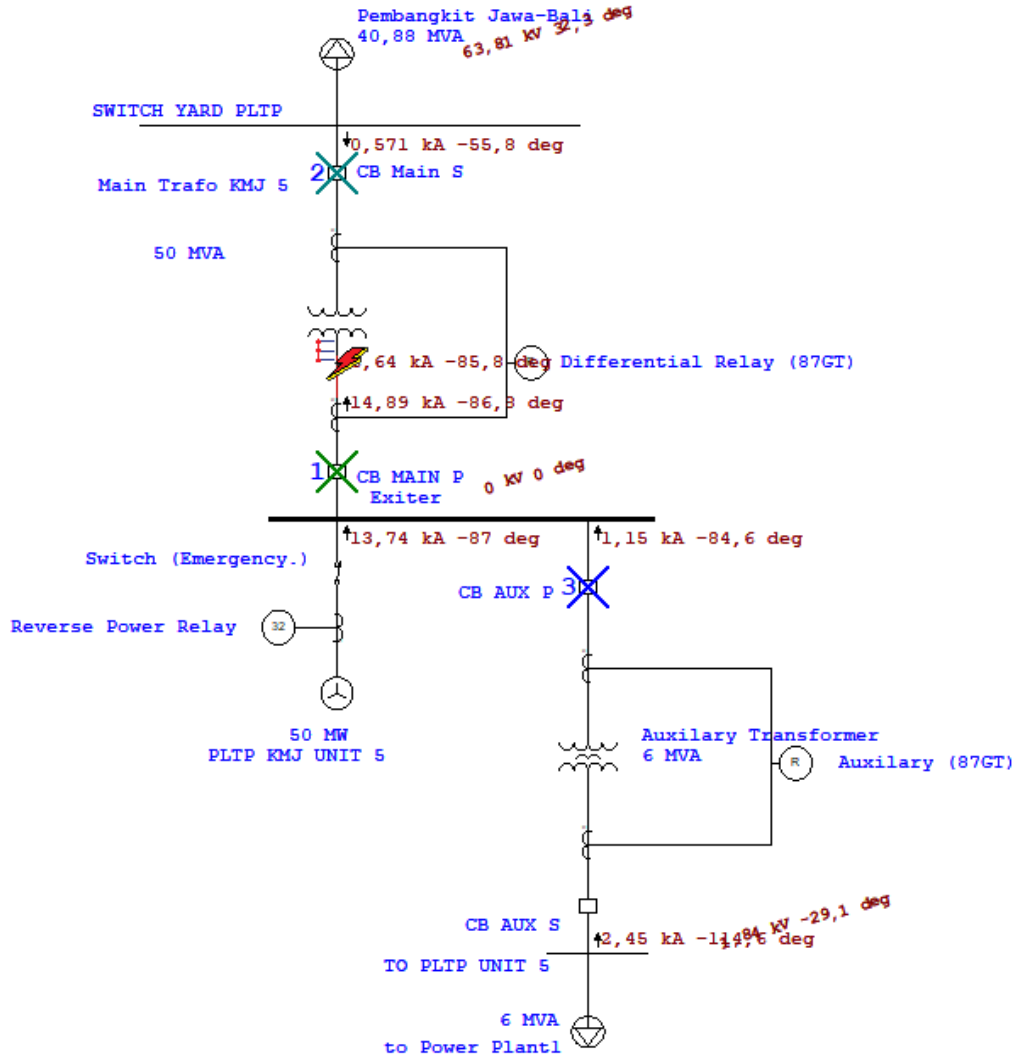
Lampiran 4. Zona Proteksi Rele Diferensial (87 GT)



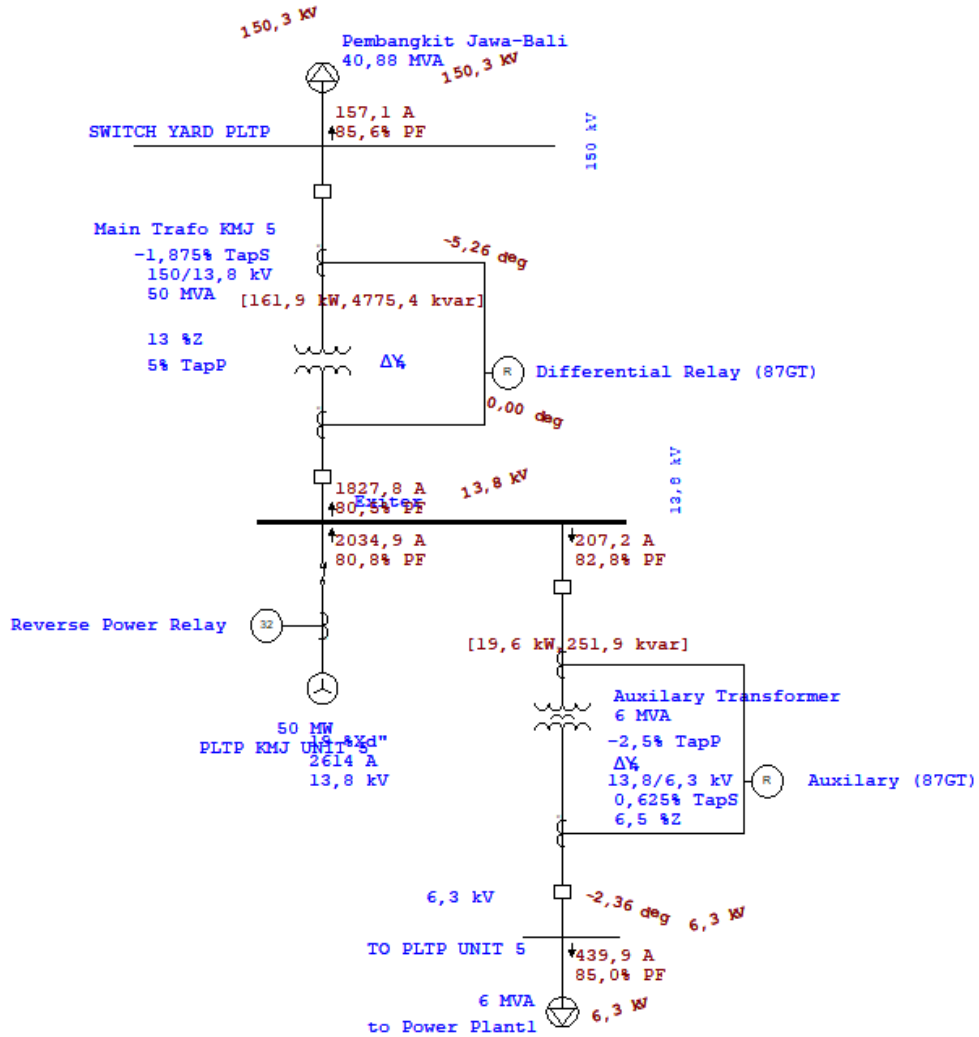
Lampiran 5. Hasil Simulasi (Keadaan Normal)



Lampiran 6. Hasil Simulasi (Keadaan Gangguan pada *Main Transformer*)



Lampiran 7. Hasil Simulasi (Keadaan Gangguan pada *Auxiliary Transformer*)



Lampiran 8. Generator Utama 1x35 MW PLTP KMJ Unit 5



Lampiran 9. Transformator Daya PLTP KMJ Unit 5



Lampiran 10. Data OLTC Transformator Daya KMJ Unit 5

POSITION OF OLTC Unit 5	HIGH VOLTAGE			LOW VOLTAGE		RATED POWER (MVA)	
	TAPPING VOLTAGE (kV)	TAPPING CURRENT (A)		RATED VOLTAGE (kV)	RATED CURRENT (A)		
		ONAN	ONAF		ONAN		ONAF
17	161.250	179.0	214.8	13.800	2091.8	2510.2	50 / 60
16	159.375	181.1	217.4				
15	157.500	183.3	219.9				
14	155.625	185.5	222.6				
13	153.750	187.8	225.3				
12	151.875	190.1	228.1				
11	150.000	192.5	230.9				
10	148.125	194.9	233.9				
9	146.250	197.4	236.9				
8	144.375	199.9	239.9				
7	142.500	202.6	243.1				
6	140.625	205.3	246.3				
5	138.750	208.1	249.7				
4	136.875	210.9	253.1				
3	135.000	213.8	256.6				
2	133.125	216.8	260.2				
1	131.250	219.9	263.9				

Lampiran 11. Panel Kontrol Transformator Daya KMJ Unit 5

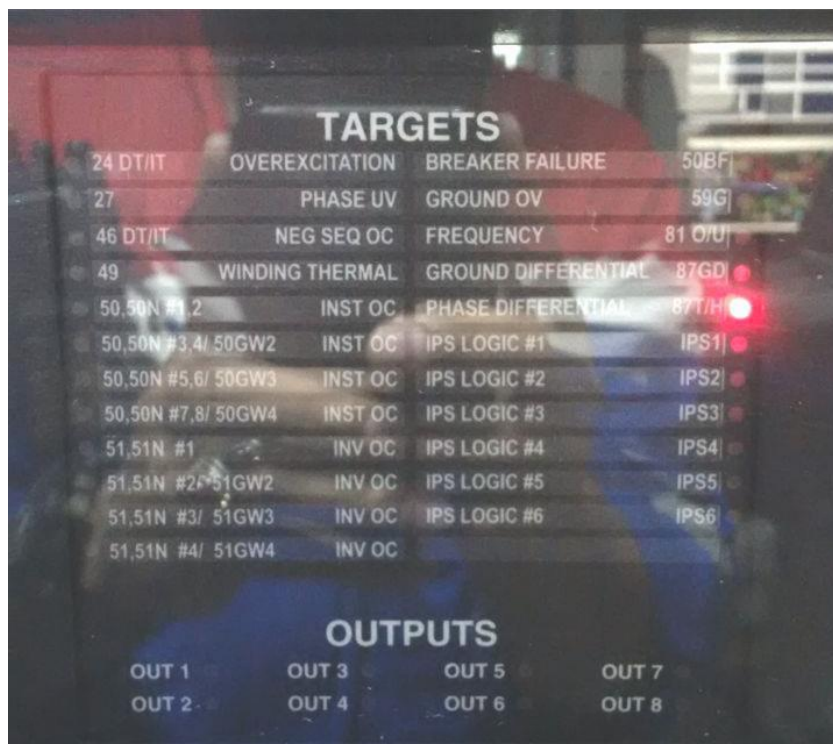




Lampiran 12. Tabel Spesifikasi Transformator Daya KMJ Unit 5

<b>Specifications of Main Transformer KMJ Unit - 5</b>	
<i>Manufactured By</i>	: Fuji Electric Co., Ltd.
<i>Made In</i>	: Indonesia
<i>Code Name</i>	: 5BAT01AT001   T21
<i>Year of Mnuufacture</i>	: 2015
<i>Rated Power</i>	: 50/60 MVA
<i>Rated Voltage (kV)</i>	
<i>High</i>	: 150 kV
<i>Low</i>	: 13,8 kV
<i>Connection</i>	: YNd5
<i>Frequency (f)</i>	: 50 Hz
<i>Impedance (Z)</i>	: 13%
<i>Type</i>	: ONAN ONAF In Over Load

Lampiran 13. Rele Diferensial (87 GT) dalam Keadaan Aktif



## Lampiran 14. Spesifikasi Rele Diferensial (87 GT)

### 6.2 GT.RY Beckwith M-3411A

#### 6.2.1 Gen. Tr. differential (87GT)

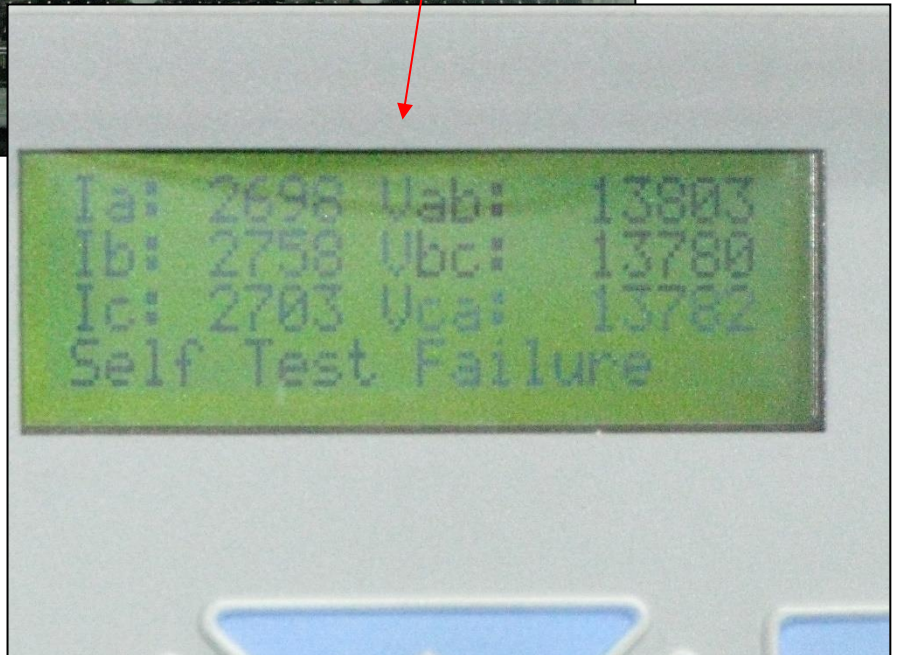
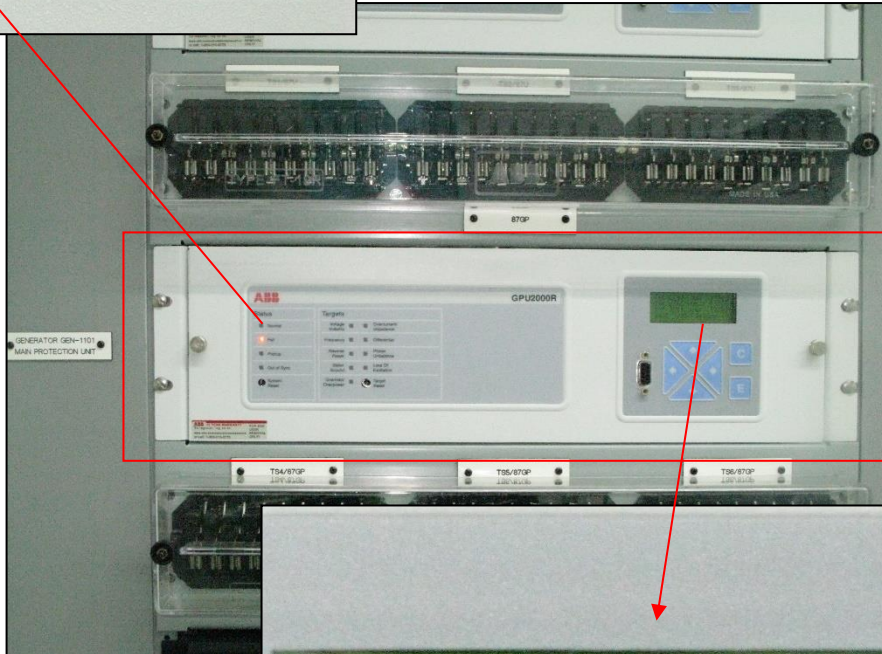
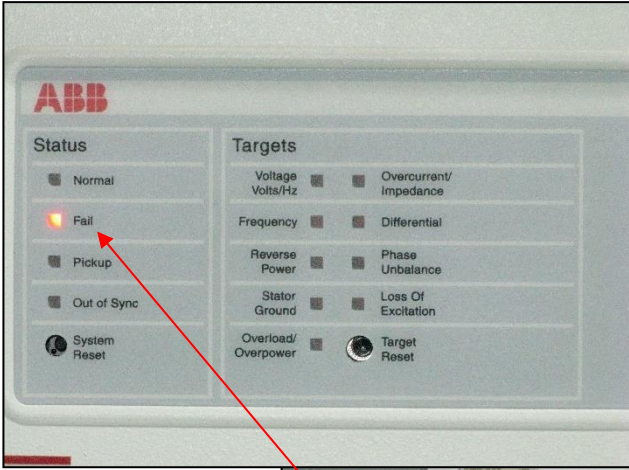
##### a) Relay specifications

	Range	Step size
Pickup	: 0.10-1.00pu	(0.01pu)
Percent slope #1	: 5-100%	(1%)
Percent slope #2	: 5-200%	(1%)
Slope break point	: 1.0-4.0pu	(0.1pu)
2 <sup>nd</sup> , 4 <sup>th</sup> Harmonic restraining	: 5-50%	(1%)
5 <sup>th</sup> harmonic restraint	: 5-50%	(1%)
pickup at 5 <sup>th</sup> harmonic	: 0.10-2.00pu	(0.01pu)
CT 1 tap(W1)	: 0.20-20.00A	(0.01)
CT 2 tap(W2)	: 0.20-20.00A	(0.01)
CT 3 tap(W3)	: 0.20-20.00A	(0.01)
CT 4 tap(W4)	: 0.20-20.00A	(0.01)

## Lampiran 15. Panel Kontrol Rele Diferensial (87 GT)



# Lampiran 16. Pemeriksaan Rele Differensial pada Generator



Lampiran 17. Konfigurasi Rele Diferensial

The screenshot shows a dialog box titled "Catalog Number Selection for Non-Communication Viewing". It features a text input field for "Catalog Number" containing "589W041251114". Below this, a list of configuration options is shown, each with a dropdown menu. The options and their selected values are: Configuration (Type W), Current Range (2.0-8.0A (Phase), 2.0-8.0A (Grd)), Control Voltage (70-280 Vdc), Man-Machine Interface (Man Machine Interface), Rear Comm Port (Auxiliary Port & RS-232 (isolated)), Frequency (50 Hertz), Software Options 1 (Oscillographics), Software Options 2 (User Programmable Curves), Software Options 3 (Load Profile), and Communications Protocol (Modbus). An "OK" button is located at the bottom center.

Field	Value
Catalog Number	589W041251114
Configuration	Type W
Current Range	2.0-8.0A (Phase), 2.0-8.0A (Grd)
Control Voltage	70-280 Vdc
Man-Machine Interface	Man Machine Interface
Rear Comm Port	Auxiliary Port & RS-232 (isolated)
Frequency	50 Hertz
Software Options 1	Oscillographics
Software Options 2	User Programmable Curves
Software Options 3	Load Profile
Communications Protocol	Modbus

Lampiran 18. Data Masukan Rele (*Unit Information*)

The screenshot shows a dialog box titled "Unit Information". It has a menu bar with "Set/Exit", "Get Data", and "Send Data". The dialog contains several text input fields with the following data: Division Code (5), Product Identification (GPU2000R), Catalog Number (589W041251114), Serial Number (283336), CPU Software Version No (3.41), DSP Software Version No (1.5), Front Panel Version No (2.0), and Rear Comm Version No (1.8).

Field	Value
Division Code	5
Product Identification	GPU2000R
Catalog Number	589W041251114
Serial Number	283336
CPU Software Version No	3.41
DSP Software Version No	1.5
Front Panel Version No	2.0
Rear Comm Version No	1.8

Lampiran 19. Data Masukan Rele (*Date Time*)

The screenshot shows a window titled "Date-Time" with a menu bar containing "Set/Exit", "Get Data", and "Send Data". The window is divided into three sections: "Unit", "System", and "System".

- Unit Name:** GPU2000R
- Unit**
  - Date:** January 00, 1996
  - Time:** 00:00:00
- System**
  - Date:** July 10, 2009
  - Time:** 16:47:29

Lampiran 20. Data Masukan Rele (*Communication Setting*)

The screenshot shows a window titled "Communication Setting" with a menu bar containing "Set/Exit", "Get Data", and "Send Data". The window is divided into several sections:

- Unit Name:** GPU2000R
- GPU Address:** 001
- Front Port RS232**
  - Baud Rate:** 9600
  - Frame:** N-8-1
- Rear Port RS232**
  - Baud Rate:** 9600
  - Frame:** N-8-1
- Rear Port RS485**
  - Baud Rate:** 9600
  - Frame:** N-8-1
- Rear Port Incom**
  - Baud Rate:** (empty)
- Rear Port IRIG:** Disable
- NETWORK MODES**
  - Mode Par1: Disable
  - Mode Par2: Disable
  - Mode Par3: Disable
  - Mode Par4: Disable
  - Mode Par5: Disable
  - Mode Par6: Disable
  - Mode Par7: Disable
  - Mode Par8: Disable
- NETWORK PARAMETER**
  - Param1: 0
  - Param2: 0
  - Param3: 0
  - Param4: 0
  - Param5: 0
  - Param6: 0
  - Param7: 0
  - Param8: 0
  - Param9: 0
  - Param10: 0

Lampiran 21. Data Masukan Rele (*Primary Output Settings*)

The screenshot shows a software window titled "Primary Output Settings" with a menu bar containing "Set/Exit", "Get Data", and "Send Data". The window contains a list of relay settings:

Relay ID	Parameter	Value
32R	Select	Select
	Disable	Disable
32D	Select	Select
	Disable	Disable
32U	Select	Select
	Disable	Disable
81	Freq Select	Freq Select
	Disable	Disable
81U-1	Pickup Freq	46.00
	Time Delay	0.10 sec
81D-1	Pickup Freq	Disable
	Time Delay	0.10 sec
81U-2	Pickup Freq	46.00
	Time Delay	0.10 sec
81D-2	Pickup Freq	Disable
	Time Delay	0.10 sec
81V	Block	Block
	Value	40



Lampiran 24. Data Masukan Rele (*Master Trip Output*)

Master Trip Output							
Set/Exit Get Data Send Data							
Unit Name:		GPU2000R					
21-1a	<input checked="" type="checkbox"/>	32R	<input checked="" type="checkbox"/>	51G	<input checked="" type="checkbox"/>	81U2	<input checked="" type="checkbox"/>
21-1	<input checked="" type="checkbox"/>	32FO	<input checked="" type="checkbox"/>	51V	<input checked="" type="checkbox"/>	81O1	<input checked="" type="checkbox"/>
21-2	<input checked="" type="checkbox"/>	32FU	<input checked="" type="checkbox"/>			81O2	<input checked="" type="checkbox"/>
24	<input checked="" type="checkbox"/>	40T	<input checked="" type="checkbox"/>	59	<input checked="" type="checkbox"/>	87M	<input checked="" type="checkbox"/>
		46Q	<input checked="" type="checkbox"/>	59G	<input checked="" type="checkbox"/>		
27-1P	<input checked="" type="checkbox"/>	50P	<input checked="" type="checkbox"/>	67P	<input checked="" type="checkbox"/>	50IE	<input checked="" type="checkbox"/>
27-3P	<input checked="" type="checkbox"/>	50G	<input checked="" type="checkbox"/>	67N	<input checked="" type="checkbox"/>		
27G	<input checked="" type="checkbox"/>	51P	<input checked="" type="checkbox"/>	81U1	<input checked="" type="checkbox"/>		

Lampiran 25. Data Masukan Rele (*Alarm Thresholds*)

Alarm Thresholds			
Set/Exit Get Data Send Data			
Unit Name		GPU2000R	
KSI Summation Alarm Threshold (kA)	Disable	Positive kW/MW Alarm 1 (kW or MW)	Disable
Overcurrent Trip Counter Alarm (trips)	Disable	Positive kW/MW Alarm 2 (kW or MW)	Disable
Phase Demand Alarm	Disable		
Neutral Demand Alarm	Disable		
Demand 3 Phase Kilo Vars Alarm (kVAR)	Disable		
Low Power Factor Alarm Threshold [Capacitor ON]	Disable		
High Power Factor Alarm Threshold [Capacitor OFF]	Disable		
Load Current Alarm (A)	Disable	Machine Run Time #1 (hours)	10000
Positive kVar Alarm (kVar)	Disable	Machine Run Time #2 (hours)	10000
Negative kVar Alarm (kVar)	Disable		



Lampiran 26. Data Masukan Rele (I/O Configuration)

**User Logical I/O Configuration**

Set/Exit Get Data Send Data

Unit Name: GPU2000R

**Connected**

UL1:	UL1	<input checked="" type="checkbox"/>	ULO1:	ULO1
UL2:	UL2	<input checked="" type="checkbox"/>	ULO2:	ULO2
UL3:	UL3	<input checked="" type="checkbox"/>	ULO3:	ULO3
UL4:	UL4	<input checked="" type="checkbox"/>	ULO4:	ULO4
UL5:	UL5	<input checked="" type="checkbox"/>	ULO5:	ULO5
UL6:	UL6	<input checked="" type="checkbox"/>	ULO6:	ULO6
UL7:	UL7	<input checked="" type="checkbox"/>	ULO7:	ULO7
UL8:	UL8	<input checked="" type="checkbox"/>	ULO8:	ULO8
UL9:	UL9	<input checked="" type="checkbox"/>	ULO9:	ULO9

= Disconnected     = Connected

Lampiran 27. Data Masukan Rele (Force Logical Inputs)

**Forced Logical Inputs**

Set/Exit Get Data Send Data

Logical	User Name	Logical	User Name
21-1A	21-1A	59	59
21-1	21-1	24	24
21-2	21-2	59G	59G
25	25	67P	67P
27-1P	27-1P	67N	67N
27-3P	27-3P	81U-1	81U1
32FO	32FO	810-1	8101
32FU	32FU	81U-2	81U2
32R	32R	810-2	8102
-----		87G	87G
46Q	46Q	87M	87M
50P	50P	27G	27G
50G	50G	24 RES	24 RES
51P	51P	46QRES	46QRES
51G	51G	40T	40T
51V	51V	40A	40A