

Digital Reverse(Over)power & Underpower & Reactive-Power Relay Manual

TYPE : GD3-P11

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Version 1.20



Kyongbo Electric Co., Ltd.

Safety Precautions

This document is for the safety of the user, and to prevent property damage.

Be sure to read the user manual carefully, and use the product accordingly.

The user manual must be kept in a place where it can be easily seen by the product user.



WARNING

This symbol indicates the possibility of death or serious injury.



CAUTION

This symbol indicates the possibility of injury or damage to properties only.

SYMBOLS



Be sure not to do.



Be sure to follow the instruction.



WARNING



- **Do not perform any wiring work while the power is on or the product is in operation.**

It may cause an electric shock.



- **Must verify the status of the grounding connection before starting the operation.**

Otherwise, it may cause an electric shock, damage, or a fire.



- **Do not operate the product with wet hands.**

It may cause an electric shock.



- **Do not use if the clothing of the cable is damaged.**

It may cause an electric shock.



- **Do not perform any wiring work when the main cable is live.**

It may cause an electric shock, and a damage or a fire by the charged voltage of the converter.



- **Do not disassemble the product even if the power is not on, except for wiring or maintenance.**

It may cause an electric shock by the charged current in the product.



- **Let the electrical technician to perform wiring, test run, and maintenance.**

Otherwise, it may cause an electric shock or a fire by a wrongful operation.



- **Perform terminal work when cutting a cable.**

Otherwise, it may cause an electric shock from the naked part of the cable.



- **Place the terminal cover on the terminal in the back after the wiring work.**

Otherwise, it may cause an electric shock.



CAUTION



- **Apply the rated power to the power source terminal.**

Otherwise, it may cause a damage to the product or a fire.



- **Follow the rated load on the input and output connections.**

Otherwise, it may cause a damage to the product or a fire.



- **Prevent screws, metal parts, water, or oil from entering the product.**

It may cause a damage to the product or a fire.



- **Do not let the product be exposed to a direct sunlight.**

It may cause a damage to the product.



- **Extract and insert Case on a leveled surface.**

Otherwise, it may cause a damage to the product.



- **Do not store the product in a humid or a dusty area.**

It may cause a damage to the product.



- **When disposing of the product, treat it as industrial waste**

CONTENTS

• Safty for Caution	2
1. General Features	7
2. Technical Data	8
2.1 Voltage / Current Input	8
2.2 Rated Control Source Voltage	8
2.3 Rated Frequency	8
2.4 Output Contacts	9
2.5 Input Contact Operating Range	9
2.6 Case	9
2.7 Time Reverse(Over)power	10
2.8 Time Underpower	10
2.9 Time Reactive-Power	10
2.10 Insulation Test	11
2.11 Mechanical Test	11
2.12 Noise Test	12
2.13 Temperature and Humidity Test.....	12
2.14 Other Operating Condition	12
3. Protection Characteristics	13
3.1 Reverse(Over)power Function	13
3.2 Underpower Function	15
3.3 Reactive-Power Function	17
4. Subsidiary Function	19
4.1 Metering Function	19
4.2 Communication Function	20
4.2.1 RS-232C Communication	21
4.2.2 RS-485 Communication	21
4.3 Self Diagnosis Function	22
4.4 Event Record Function	23
4.5 Waveform Record Function	24
4.6 Control Function by Input Contact	25
5. Display Panel Construction	26
5.1 Front-side Display Panel Structure	26
5.2 Key Pad & Communication Connector	27
5.3 LED (Operating Indicators)	27
6. Display & Setting Modes	31
6.1 Key Control & LCD	28
6.1.1 LCD Initial Status, Backlight On/Off	28
6.1.2 LCD Display & Key Control Basis	28
6.1.3 One-button	28
6.1.4 Menu-Tree	29
6.2 Display Modes	29
6.2.1 Status Display	30
6.2.1.1 Status ▶ Contact Input	30
6.2.1.2 Status ▶ Contact Output	31

6.2.1.3 Status ▶ Self-Diagnosis -----	32
6.2.1.4 Status ▶ Protection -----	33
6.2.1.5 Status ▶ RS-485 Monitor -----	34
6.2.2 Measure Display -----	35
6.2.3 Event Record Display -----	36
6.2.4 Waveform Record Display -----	37
6.2.5 System Info. Display -----	38
6.3 Setting Modes -----	40
6.3.1 System Setting -----	42
6.3.1.1 System ▶ Power System -----	42
6.3.1.2 System ▶ T/S -----	47
6.3.1.3 System ▶ RTC -----	53
6.3.1.4 System ▶ Waveform Record -----	54
6.3.1.5 System ▶ COM -----	57
6.3.1.6 System ▶ Password -----	58
6.3.2 Protection Setting -----	58
6.3.2.1 Protection ▶ OPR -----	59
6.3.2.2 Protection ▶ UPR -----	62
6.3.2.3 Protection ▶ Re.PR -----	66
6.3.3 Command -----	70
6.3.3.1 Command ▶ Event Clear -----	70
6.3.3.2 Command ▶ Waveform Clear -----	71
6.3.3.3 Command ▶ Contact OUT Test -----	73
6.3.3.4 Command ▶ Panel Test -----	76
7. PC Software -----	80
7.1 KBIED_MNE -----	80
7.1.1 Application Software Program Install Method -----	80
7.1.2 KBIED_MNE Program Menu -----	81
7.1.3 Create Project (Edit devices) -----	82
7.1.3.1 Station -----	83
7.1.3.2 Device -----	83
7.1.3.3 Project window -----	85
7.1.3.4 Save/Open Project -----	86
7.1.3.5 Save Device -----	86
7.1.3.6 Setting window menu -----	87
7.1.4 Direct Connect -----	88
7.1.5 Write Device saved Settings Files (PC→Device) -----	89
7.1.6 Print/Print preview -----	89
7.1.7 Compare Device Settings with Settings File -----	90
7.1.8 Export Setting File -----	91
7.1.9 Event -----	92
7.1.10 Waveform -----	92
7.1.11 Power Quantity -----	93
7.1.12 Status Screen -----	94
Appended 1. Dimensioned Drawings -----	97
Appended 2. Internal Block Diagram -----	98
Appended 3. SMPS Hardware Internal Structure -----	98
Appended 4. External Connection -----	99
Appended 5. Characteristic Curve -----	102
Appendix A. Product Shipping Setting Values -----	109
Appendix B. Use Method and Precautions when protection of Cogeneration system -----	111
Appendix C. Relay Self Diagnosis Logic Diagram -----	115

1. General Features

This Relay contains Relay elements of R(O)PR×3, UPR×3, and Re.PR×3, and as a digital arithmetic Relay designed and manufactured to be perfectly applied to protection for machine and electric circuit when occur the active reverse(over) power, active under power, reactive over power of small and large power generator, Motor, transmission line-distribution line. Not only it has a variety of operation times and is easy to change the operation current, but it can also record and store fault information thereby greatly enhancing the reliability of the cable line. The main characteristics are as follows.

Features

- Total arithmetic type, reverse(over)power(32P) and underpower(32U), reactive power(32Q) Relay
- This Relay can use 32P with 32U. (If you want to add 32Q in system installed 32P, must install more relay)
- Variety of timing characteristics
 - R(O)PR : Inverse time(Forward, Reverse), Definite time enclosed
 - UPR : Reverse inverse time, Definite time enclose
 - Re.PR : Inverse time, Definite time enclosed
- Duration of maintaining output contact is 0.00 ~ 200.00Sec (0.01Sec Step), and variable setting is possible
- Set value and measured values are Displayed digitally through LCD Display. (4 x 20 LCD Screen)
- Records all Events(max. 1024) and abnormal waveform in case of fault (max. 8)
- Enhance reliability with various self diagnosis and surveillance function at all times.
- Suspension of each elements of Relay by input to external contacts in Relay inspection.
- Free selection of frequency Settings according to the rated frequency of the line. (50 / 60Hz)
- Possible to set each of 8 Relay contact output (T/S Output) to 21 modes, and these can be used for Alarm and SCADA.
 - contact for Trip(3c), contact for Signal(4a, 1c)
- Reliability is increased by the operation through output contacts when the Relay is in abnormal state.
- Convenient PC Applications
 - Setting Tool : Modification of setting values, View event and fault waveforms.
 - Evaluation Tool : Fault Waveform Analysis

- Possible to test output contacts through manual Trip command inside a Relay (Contact Test)
- Thorough security using password input when changing setting values
- Various communications supported
 - Communication Methods : RS-232C, RS-485 (SCADA communications)
 - Supported Protocol : ModBus
- Various current measurement functions (size and level of current in each phase, voltage/current measurement of symmetrical sets, active/reactive power measurement of each phase, PF/active/reactive/complex power measurement of 3-phase)
- Increased EMC / EMI performances
- Applied standards : KEMC-1120

2. Technical Data

2.1 Voltage/Current Input

Rated Voltage (V_N)		AC 63.5V ~ 190V (Free Voltage)
Rated Current (I_N)		AC 5A
Overload	Voltage Input	1.15 Times/3h of rated voltage
	Current Input	Continuous 10A, 2sec 100A
	Control Power	1.3 Time/3h of rated Voltage
Burden	Current Input	1.0VA or less/Phase
	Voltage Input	0.5VA or less/Phase

2.2 Rated Control Source Voltage

AC/DC 110 ~ 220V (Free Voltage)

2.3 Rated Frequency

50Hz or 60Hz (Sine Waveform)

2.4 Output Contacts / Capacity

T / S1 ~ T / S3 Trip contacts 3c Contact	
Rated Voltage	AC 250V, DC 125V
Continuous Flow Electricity Capacity	16A (AC 250V)
0.5 sec. Close Circuit Capacity	30A (DC 125V)
Opening Capacity	DC 125V, 30W, Time constant(25ms), 1A
Closing Capacity	4000VA / 480W
Material	AgCdO
T / S4 ~ T / S8 Signal contacts 4a, 1c Contact	
Rated Voltage	AC 250V, DC 125V
Continuous Flow Electricity Capacity	5A (AC 250V)
0.5 sec. Close Circuit Capacity	5A (DC 125V)
Opening Capacity	DC 125V, 30W, Time constant(25ms), 1A
Closing Capacity	1250VA / 150W
Material	AgCdO

2.5 Input Contact Operating Range

Rated Control Source Voltage	AC/DC 110 ~ 220V
ON/OFF Voltage	$V_{on} \geq 80V$, $V_{off} \leq 60V$
When Contact-out Close, Sending Current	10mA or less

2.6 Case

Structure	Flushed Drawer Type
Color	Munsell No. N1.5 (Black)
Material	Fe (Metal)

2.7 Time Reverse(Over)power

Operation Value	2 ~ 1500W (1W Step)
Operation Value Setting	1Phase, 3Phase
Direction	Forward, Reverse, Disabled
Operating Time Characteristic	INV1, INV2, DT
Operating time ratio	0.10 ~ 10.00 (0.05 Step)
Definite Time Operation Time	0.04 ~ 60.00Sec (0.01Sec Step)
Release Delay Time	0.00 ~ 200.00Sec (0.01Sec Step)
Release Value	Over 95% of Setting Value
Operation Accuracy	Less than $\pm 5\%$ of Setting Value

2.8 Time Underpower

Operation Value	2 ~ 900W (1W Step)
Operation Value Setting	1Phase, 3Phase
Direction	Forward, Reverse, Disabled
Operating Time Characteristic	Reverse Inverse Time, DT
Operating time ratio	0.10 ~ 10.00 (0.05 Step)
Definite Time Operation Time	0.04 ~ 60.00Sec (0.01Sec Step)
Release Delay Time	0.00 ~ 200.00Sec (0.01Sec Step)
Release Value	Over 105% of Setting Value
Operation Accuracy	Less than $\pm 5\%$ of Setting Value

2.9 Time Reactive-Power

Operation Value	2 ~ 900Var (1Var Step)
Direction	Forward, Reverse, Disabled
Operating Time Characteristic	NI, DT
Operating time ratio	0.10 ~ 10.00 (0.05 Step)
Definite Time Operation Time	0.04 ~ 60.00Sec (0.01Sec Step)
Release Delay Time	0.00 ~ 200.00Sec (0.01Sec Step)
Release Value	Over 95% of Setting Value
Operation Accuracy	Less than $\pm 5\%$ of Setting Value

2.10 Insulation Test

Insulation Resistance	Over 10MΩ, 500 Vdc	IEC60255-5
Commercial Frequency Withstand Voltage	2kV, 50/60Hz, 1min	IEC60255-5
Impulse Withstand Voltage	5kV, 1.2×50μs, + · -Polarity, 3Time	IEC60255-5

Caution) AUX POWER and 485 Communication Circuits enclose surge protection circuit inside the relay, so do not test insulation resistance test and withstand voltage test

2.11 Mechanical Test

Vibration	Vibration Response Test	10 ~ 150Hz, 0.5G, Front/Back, Left/Right, Up/Down 1 time
	Vibration Endurance Test	10 ~ 150Hz, 1G, Front/Back, Left/Right, Up/Down 20 times
Shock	Shock Response Test	5G, Front/Back, Left/Right, Up/Down 3 times
	Shock Withstand Test	15G, Front/Back, Left/Right, Up/Down 3 times
	Bump Test	10G, Front/Back, Left/Right, Up/Down 100 times
Earth quake	1 ~ 8.5Hz	Horizontal excitation force 1G, Sweep : 1 time
	8.5 ~ 35Hz	Horizontal excitation force 0.5G, Sweep : 1 time

2.12 Noise Test

1MHz burst disturbance	2.5kV, 1MHz, 75ns, 400Hz, 2Sec		IEC60255-22-1
EFT Burst	Apply Voltage	4kV	IEC60255-22-4
	Repetition Frequency	2.5kHz	
Electrostatic Discharge	Air discharge	8kV	IEC60255-22-2
	Contact discharge	6kV	
Surge Electrical Disturbance	2.0kV, 1.2×50μs, 8×20μs, 30Sec, 3times		IEC60255-22-5
Radio Frequency Radiation Endurance	80MHz ~ 1GHz, 10V/m, 1Sec		IEC60255-22-3
Radio Frequency Conduction Endurance	150kHz ~ 80MHz, 10V/m, 1Sec		IEC60255-22-6

2.13 Temperature, Humidity Test

Temperature Range	Operation Assurance	-10℃ ~ +55℃
	Recovery Assurance	-20℃ ~ +70℃
Relativity Humidity		Day Average 10% ~ 90%

2.14 Other Operating Condition

Altitude	1000m less
Condition where there is no abnormal vibration, shock, slope or influence of the magnetic field	
Place where there is no explosive dust, flammable dust, or flammable / rusty gas, or salt	

3. Protection Characteristics

3.1 Reverse(Over)power Function

GD3-P11 has over power, reverse power protection elements for protect in over power and reverse power fault.

Reverse(over)power element can be select to operation by active power of 3 phase or active power of single phase. therefore it can be applied single phase and 3 phase. In over power pick up setting if you want to operates as over power value of 3 phase, select **3Phase** of Mode category in OPR setting Menu. And if you want to operates as over power value of single phase, select to **1Phase** of Mode category. Please follow the above procedures when you change under power element because of under power element also can be set to single and 3phase.

Please refer to Appended 3. external wiring diagram for matters pertaining to wiring. Reverse(over)power element has direction setting and it is designed to operate only section set the direction. If direction setting is Forward, operate at +88°~0°~-88° area by reference voltage, if direction setting is Reverse, operate at +92°~+180°~-92° area by reference voltage and if direction setting is Disabled, it designed to be operation when size of active power exceed setting value regardless of direction.

Also GD3-P11 has Inverse Time characteristic, Definite Time characteristic. So protection element operation time setting can be convenient.

Inverse Time characteristic is a function of power and time, and when the power gets bigger, the operation time shortens, and the operational characteristics are set as the same as an induction type Relay, so it is convenient that you can set the same when an induction type Relay is used as an alternative.

Also, in the Inverse Time characteristic, it operates the same time of 800% input when more than 800% current is input than the setting value of the Relay.

In inverse time characteristic, equation of the time and power is as follows.

1) Over power inverse time :

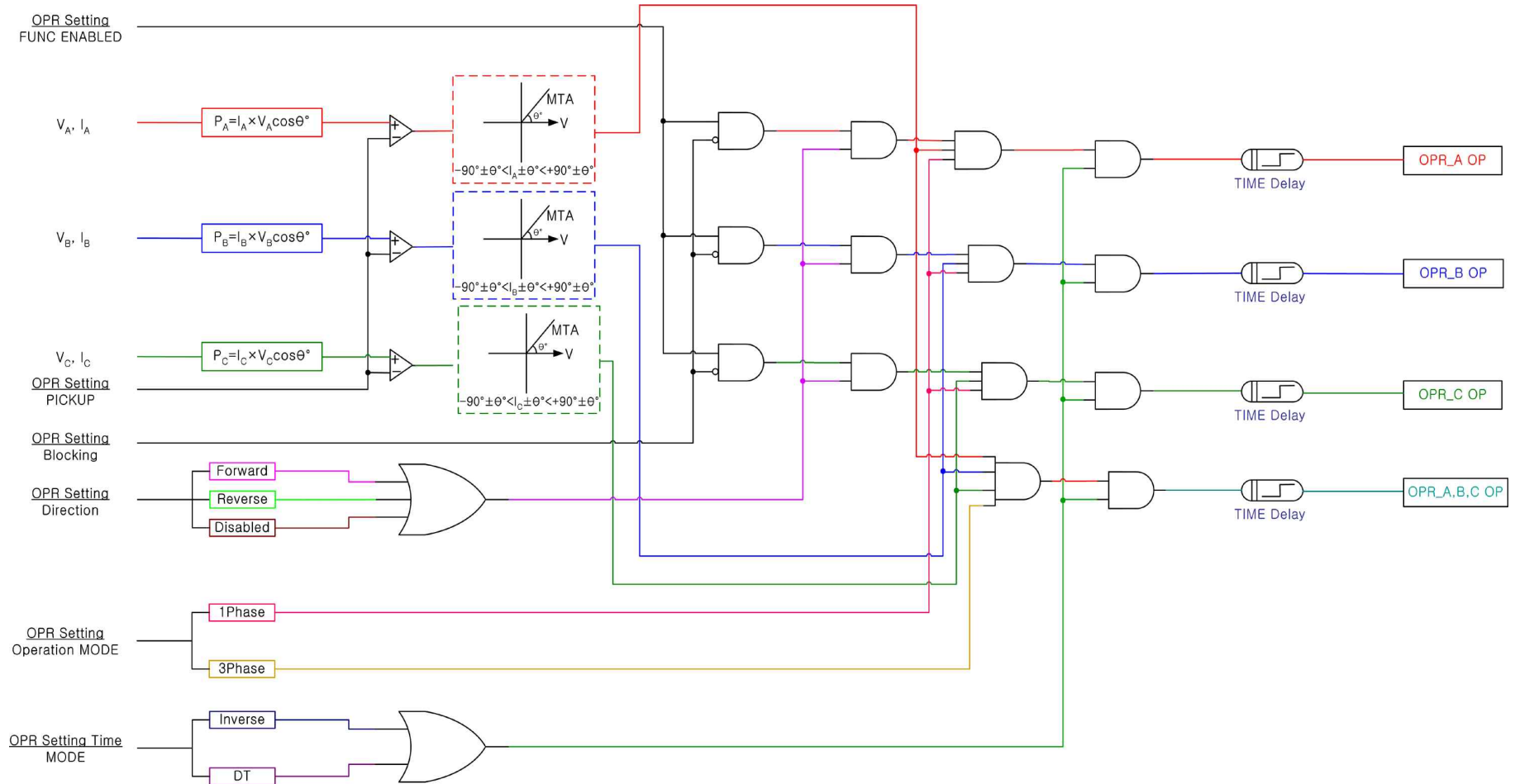
$$T = \left(\frac{16.8}{P^{0.95} - 1} + 0.05 \right) \times \frac{M}{10} (\text{sec})$$

2) Reverse power inverse time :

$$T = \left(\frac{10.3}{P^{0.95} - 1} + 0.1 \right) \times \frac{M}{10} (\text{sec})$$

$$P = \frac{P_i}{P_s} \quad P_i : \text{Input Value}, P_s : \text{Setting Value}, M : \text{Time Multiplier}$$

The Logic Diagram for the operations of reverse(over) power element is as follows.



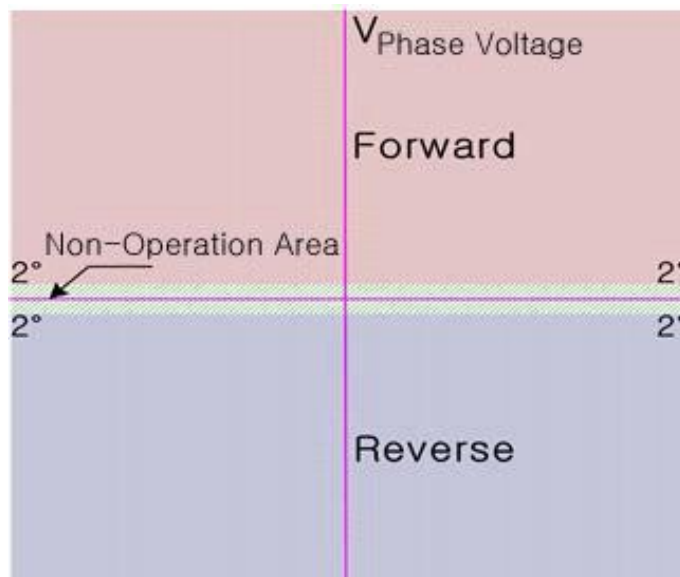
<Figure 1. R(O)PR Logic Diagram>

3.2 3-Phase Underpower Function

GD3-P11 has under power protection element for use in the protection of under power fault.

If direction setting is Forward, operate at $+88^{\circ}\sim 0^{\circ}\sim -88^{\circ}$ area by reference voltage, if direction setting is Reverse, operate at $+88^{\circ}\sim 0^{\circ}\sim -88^{\circ}$ area by reference voltage and if direction setting is Disabled, it designed to be operation when size of active power exceed setting value regardless of direction of current.

The picture for the operations area is as follows.



<Figure 2. UPR operation characteristic when phase voltage input>

And this relay contains Reverse Inverse Time characteristic and Definite Time characteristic, it was designed to eliminate the difficulties at operation time setting.

Reverse inverse time characteristic is set as the same as a reverse inverse time of induction type under power Relay.

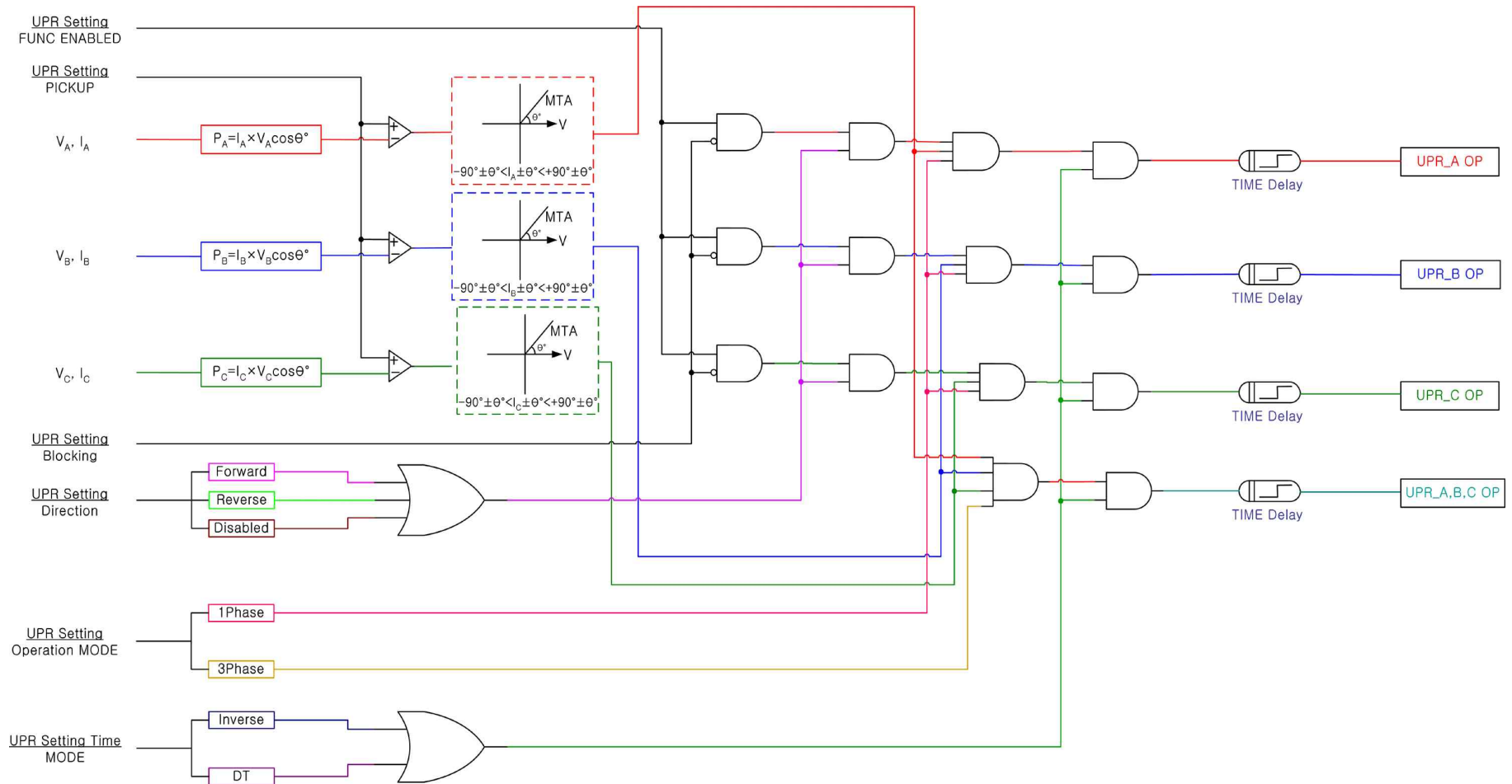
Under power element does not operate when the power is input to the Relay. And relay operated only power is risen more than setting and dropped less than setting, if you press the **“RESET” Key** when operated state, right to return.

In the reverse inverse time characteristic, relation of time and power is as follows.

$$T = \left(\frac{8.5}{1-P} + 1.5 \right) \times \frac{M}{10} (\text{sec})$$

$$P = \frac{P_i}{P_s} \quad P_i : \text{Input Value}, \quad P_s : \text{Setting Value}, \quad M : \text{Time Multiplier}$$

The Logic Diagram for the operations of under power element is as follows.



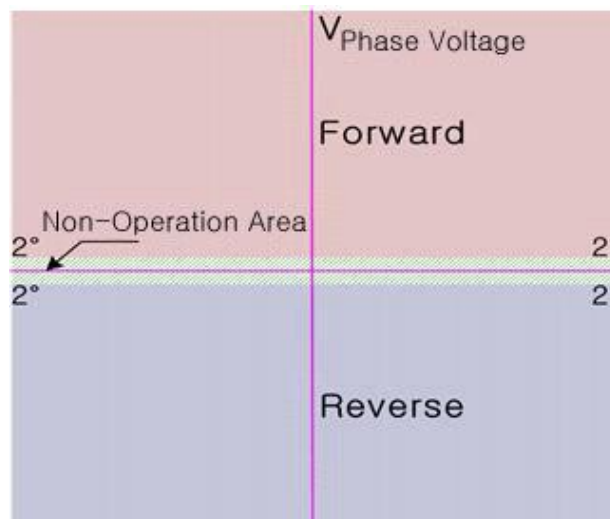
<Figure 3. UPR Logic Diagram>

3.3 React-Power Function

GD3-P11 has reactive power protection element for the protection of reactive power fault.

Operation of reactive power element designed to be operation as single phase value. Therefore when pick up value change, if 3phase reactive power is 300Var, you must set 100Var. Also, if direction setting is Forward, operate at $\pm 88^\circ$ area by reference voltage, if direction setting is Reverse, operate at $\pm 88^\circ$ area by reference voltage and if direction setting is Disabled, it designed to be operation when size of active power exceed setting value regardless of direction

The picture for the operations area is as follows.



<Figure 4. Re.PR operation characteristic when phase voltage input>

And this relay contains Inverse Time characteristic and Definite Time characteristic, you can easy to set the protection element operation time.

Inverse Time characteristic is a function of power and time, and when the power gets bigger, the operation time shortens, and the operational characteristics are set as the same as an induction type Relay, so it is convenient that you can set the same when an induction type Relay is used as an alternative.

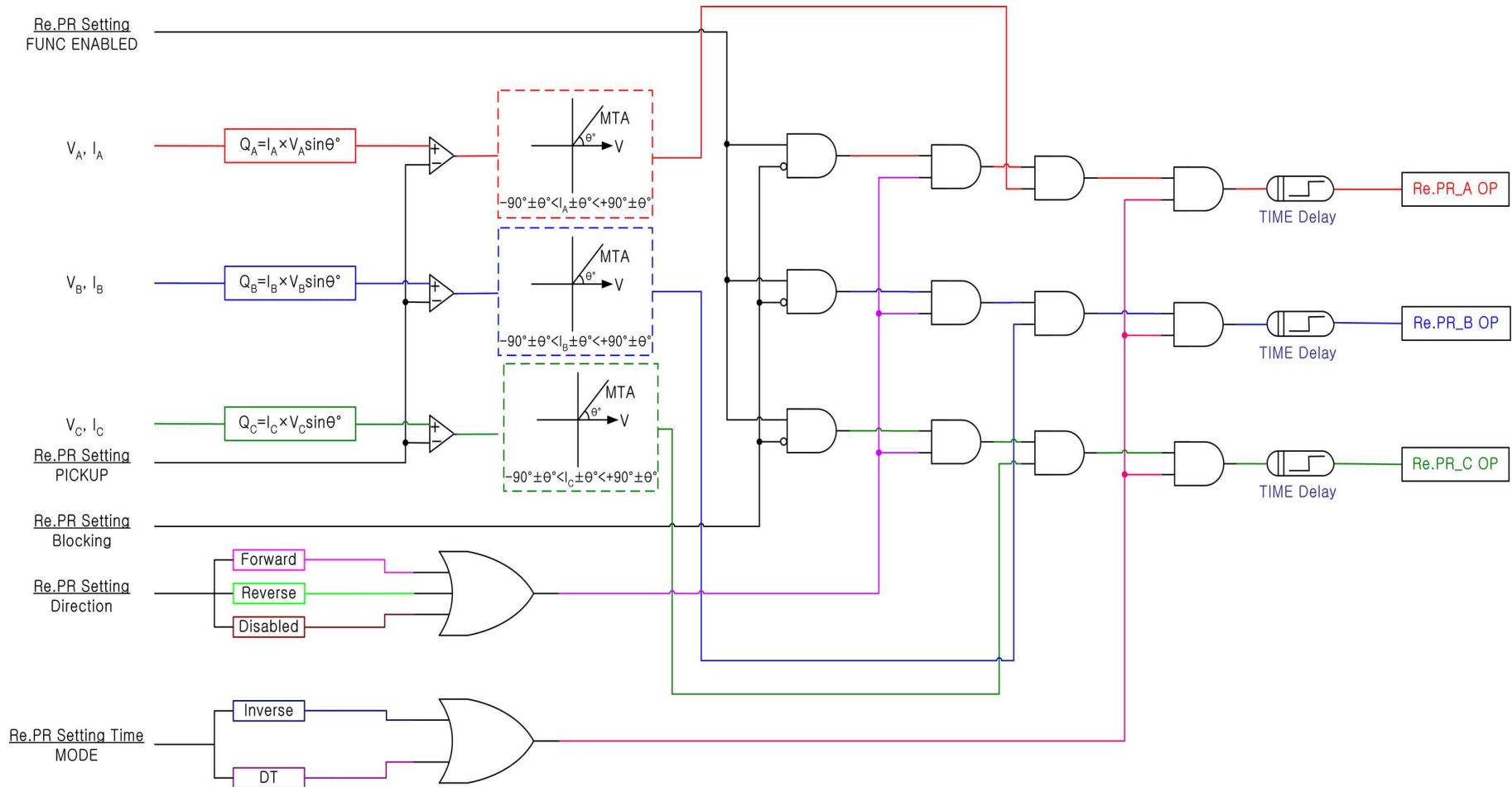
Also, in the Inverse Time characteristic, it operates the same time of 800% input when more than 800% current is input than the setting value of the Relay.

The inverse time characteristic time and power relative equation are as follows.

$$T = \left(\frac{16.8}{P^{0.95} - 1} + 0.05 \right) \times \frac{M}{10} (\text{sec})$$

$$P = \frac{P_i}{P_s} \quad P_i : \text{Input Value, } P_s : \text{Setting Value, } M : \text{Time Multiplier}$$

The Logic Diagram for the operations of reactive power element is as follows.



<Figure 5. Re.PR Logic Diagram>

4. Subsidiary Function

4.1 Metering

This Relay (GD3-P11) has the high precision calibrating functions such as 3 phase current, 3 phase voltage, line-line voltage value and phase, symmetric current(positive sequence/negative sequence/zero sequence), and phases, each phase active/reactive/complex powers, etc.

Content	Feature
Based Voltage	<ul style="list-style-type: none"> ● Effective value of fundamental wave voltage for each phase ● Phase measurement based on A phase voltage ● 1st voltage which converted Relay input voltage by PT ratio ● Measurement boundary : 0 ~ 300V (When the Phase PT Ratio is 1:1)
Based Current	<ul style="list-style-type: none"> ● Effective value of fundamental wave current for each phase ● Phase measurement based on A phase current ● 1st current which converted Relay input current by CT ratio ● Measurement boundary : 0 ~ 50A (When the Phase CT Ratio is 5:5)
Symmetrical Voltage/Current	<ul style="list-style-type: none"> ● Measurement of positive sequence, negative sequence, zero phase sequence current size and phase ● 1st voltage/current which converted Relay input voltage/current by PT/CT ratio ● Measurement boundary : - 0 ~ 300V (When the Phase PT Ratio is 1:1) - 0 ~ 50A (When the Phase CT Ratio is 5:5)
Power Factor (PF)	<ul style="list-style-type: none"> ● Measurement of each phase PF and Total PF ● Measurement boundary : Lead 0.00 ~ 1.00 ~ Lag 0.00
Active/Reactive power for each phase	<ul style="list-style-type: none"> ● Effective value of fundamental wave current/voltage for each phase and phase measurement ● Measurement of active/reactive power for each phase ● Measurement boundary of active power : 0 ~ 15000W ● Measurement boundary of reactive power : 0 ~ 15000Var
3 Phase Active/Reactive/Complex power	<ul style="list-style-type: none"> ● Measurement of 3 phase active/reactive/complex power ● Measurement boundary of active power : 0 ~ 45000W ● Measurement boundary of reactive power : 0 ~ 45000Var ● Measurement boundary of complex power : 0 ~ 45000VA
Measure Accuracy	<ul style="list-style-type: none"> ● 0.1% rdg. ±2 dgt.

<Table 1. Measurement Display>

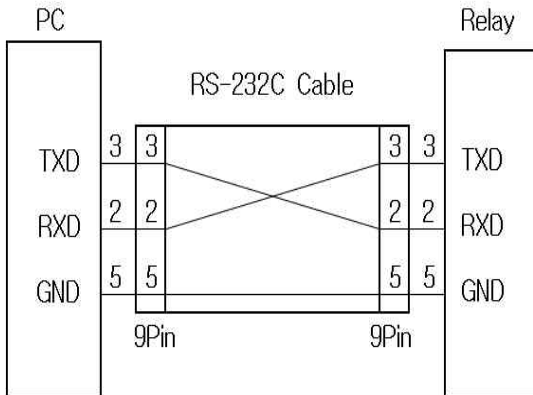
4.2 Communication

This Relay (GD3-P11) offers the general purpose RS-232C / RS-485 communication protocol and possible to transmit Data at maximum of 38400Bps. There are 2 communication ports in the Relay, 1 RS232C port in the front, and 1 RS485 port in the back. The front RS232C communication port is for MMI Application Tool and used to link to PC to change the structure of power system, protection element, output contacts, and to receive and analyze Data such as Event Data recorded in the Relay and fault event wave forms, and the RS485 communication port in the back is used for distant SCADA communications.

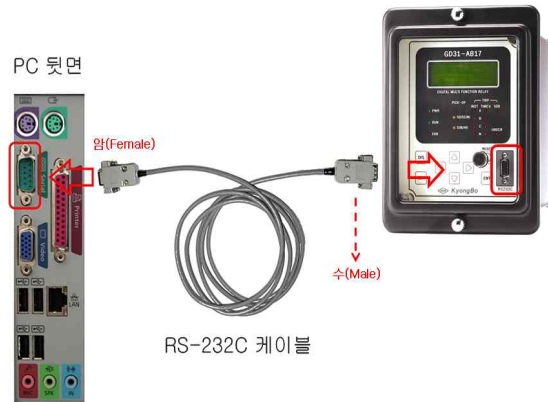
Protocol	Method	<ul style="list-style-type: none"> ● RS-232C/485
	Protocol	<ul style="list-style-type: none"> ● ModBus
RS-485 Communication Standard	Distance	<ul style="list-style-type: none"> ● 1.2km
	Line	<ul style="list-style-type: none"> ● General RS-485 Two-Pair cable
	Speed	<ul style="list-style-type: none"> ● 9600, 19200, 38400 bps
	Method	<ul style="list-style-type: none"> ● Half-Duplex
	Max In-Out Voltage	<ul style="list-style-type: none"> ● -7V ~ +12V
Communication Port	LCD Display	<ul style="list-style-type: none"> ● RS232 1Port (19200 BPS, ModBus Protocol) ● A/S & KBIED_MNE
	Real	<ul style="list-style-type: none"> ● RS485 1Port ● (9600, 19200, 38400 BPS, ModBus Protocol) ● Client SCADA Communication ● Terminal Number : 49(+), 51(-), 53(Com)

<Table 2. Communication Method>

4.2.1 RS-232C Communication



<Figure 6. RS-232C Circuit>



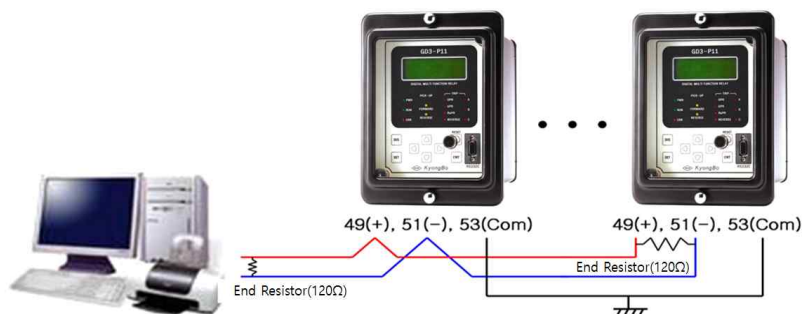
<Figure 7. RS-232C Connect>

- ▶ The RS-232C communication cable offered in this product uses Cross Cable which has pin No. 2 and pin No. 3 crossed as of <Figure 6>, therefore using general Direct Cable which has no cross does not make communication and generates “Communication Error” Message.
- ▶ If there is no RS-232C Port in the PC, you can use USB Port for communication, and you need to use USB to 232 Cable when using the USB port, but this cable is a direct cable, and it cannot communicate when connected to the Relay. However, you can use the Cross Cable that we provide by connecting it to the 232 port of the USB to 232 Cable.

4.2.2 RS-485 Communication

This Relay(GD3-P11) provides insulated RS-485 Half Duplex communications for the connection to the Upper level monitoring control system. This communication method can connect to the Relay with Multi Drop, and the maximum communication distance is 1.2km.

When installing communication cable for RS-485 communications, connect 120Ω resistor parallel to the end of RS-485 cable as of the figure below.



<Figure 8. Wiring Diagram>

4.3 Self Diagnosis Function

Self diagnostic function is to monitor the operation status of the Relay continuously to prevent malfunction of the device.

If an error is detected in the Relay, the red "ERR" LED is lighted on the front of the Relay, marks "ERR" to the error category in the Self Diagnosis categories in the Status Menu, and records the self diagnosis error in the Event Data.

Also, if an error occurs in the Relay, it stops the Relay element operation, and error occurred mark is Displayed on LCD and LED until the error is fixed.

When the user verifies the error status, take appropriate measures, and the error is fixed, it Displays "System OK" on the front LCD of the Relay, pressing "RESET" key turns off "ERR" LED on the front of the Relay, and the error category changes to "OK" in the Self Diagnosis of the Status Menu.

If an error occurs in the Relay, user should verify the Self Diagnosis in the Status Menu and find which category has the error in the self diagnosis categories, and call our A/S department, then the user can receive an appropriate measure.

Please refrain from turning Off and On the power of the Relay while the product is in unstable state.

The guide to verify Self Diagnosis categories is explained in detail in p.35, and the tel. no. of our A/S department is 02-465-1133.

The major diagnosis categories are as follows.

- DC Power Fail
- CPU Fail
- Memory Fail
- Setting Fail
- A/D Converter Fail
- DI/O Circuit Fail
- Auto Calibration

4.4 Event Record Function

It is a function to record the verify the history when the status of the Relay changes, such as when the Relay elements operate, Relay Settings change, or error in the Relay.

The maximum number of records is 1024, and if it is more than 1024, the oldest record is erased, and the new record is written, and the recorded data is stored permanently even if the power is lost.

By comparing the error waveform recorded and the occurrence order of Event Data when analyzing the error, you can conclude on the error factor and whether there was a malfunction between devices collectively.

By comparing the error waveform recorded and the occurrence order of Event Data when analyzing the error, you can conclude on the error factor and whether there was a malfunction between devices collectively.

The stored Event Data can be identified through the Relay front LCD by the Local Key of the Relay, and by connecting RS232C Cable which we provided to RS232C communication port on the Relay front and to PC, you can view the Event Data collectively from PC using MMI Application Tool.

Please operate Keys as follows to identify Event Data using Relay Local Key.

From the Relay Default Screen “DIS” Key → Press (↓)Direction Key twice → Press (→)Direction Key once → and view Event Data by pressing (↓)Direction Key

Recording Number of Time	<ul style="list-style-type: none"> ● Max 1024
Decomposition Capability	<ul style="list-style-type: none"> ● 1ms Unit
Event Recording Content	<ul style="list-style-type: none"> ● Protection Element Pick-Up/Release/Operation ● Self-Diagnosis Error ● Setting Change ● Fault Data Triggered ● Fault Data Recorded ● Fault Recording Data Clear ● Event Recording Data Clear ● Flash Memory Error ● Relay Control Power On (Power On) ● Relay Control Power Off (Power Down)
Display Content	<ul style="list-style-type: none"> ● Event Operation ● Protection Element Pick-Up/Release/Operation ● Electric Value : Current RMS & Phase
Data Saving	<ul style="list-style-type: none"> ● If it lose control Power, upkeep event data. ● Saving for *.txt

<Table 3. Event Record>

4.5 Waveform Record Function

This function is record the waveforms before and after the times of satisfying Fault Trigger conditions set in the Relay, and it is convenient to analyze system malfunction or to identify system flow. The maximum number of record is 6, and if it goes over 6, the oldest record is erased, and the new record is written, and the stored data is permanently stored even in the case of power loss, and the maximum length of malfunction waveform that can be recorded is 150 or 300 cycles per record. The record types of stored fault waveform are 6x150, 6x300 two types, and the first number means the maximum number to be stored, and the later number means the length to be stored for 1 record. The conditions to store fault waveforms are divided to 6 types, and the conditions that enables storage are PickUp, Trip, PickUp+Trip of Relay element, power Off to On and On to Off to Relay input contact(D/I3 : External Trigger), Trip generated on input contact and Relay element. Also, fault waveform Trigger location can be set to 0~99%, and with this setting, user can set the time before fault and after fault at the user's own discretion. For example, setting storing type to 6x300, storing condition to Trip, and fault waveform Trigger location to 40%, Relay stores when Trip is generated, 40%(120Cycle, 2Sec) before the Trip, and 60%(180Cycle, 3Sec) after the Trip.

The waveform data recorded in the Relay can be Downloaded from the Relay using MMI Application Tool(KBIED_MNE) and in Comtrade File format. Stored Comtrade File can be accessed to identify the fault waveform in Graphic format using Evaluation Tool(KBIED_MNE) that we provide, and reproduce the fault situation using voltage, current output devices such as Doble or Omicron, etc.

Recording Number Time	<ul style="list-style-type: none"> ● Max 6 as Setting
Recording Type (Block × Cycles)	<ul style="list-style-type: none"> ● 6×150, 6×300
Sampling	<ul style="list-style-type: none"> ● 32 Sample / Cycles
Waveform Record Trigger Condition	<ul style="list-style-type: none"> ● Protection Element Pickup ● Protection Element Operation ● Protection Element Pickup or Operation ● Digital Input (Terminal Number : 19, 22) From On to Off ● Digital Input (Terminal Number : 19, 22) From On to Off ● Protection Element Operation or Digital Input (Terminal Number : 19, 22) Status Change
Waveform Record Display Content	<ul style="list-style-type: none"> ● Each Phase Current (Angle, Harmonic, THD) ● Contact Out Status ● Digital Input Status ● Protection Element Pickup, Operation Status
Data Saving	<ul style="list-style-type: none"> ● If it lose control Power, upkeep event data. ● Saving for *.cfg, *.dat ● Comtrade File Format Support

<Table 4. Waveform Record>

4.6 Control Function by Input Contact

This Relay(GD3-P11) has 3 input contacts. - D/I1, D/I2, D/I3.

▶ D/I1 is "Remote Reset (Annunciator Reset)" function, and restores operation status indicator(LED) and contacts when voltage(AC/DC 110V) is input to Relay connectors(18, 19). These input contacts can be used to restore operation status remotely through RTU in SCADA system, or to restore operation status with a separate Push Key mounted on the Panel.

▶ D/I2 is "Trip Blocking (External Blocking)" function to stop the operation of protection element when voltage(AC/DC 110V) is input to Relay connectors(19, 20). It blocks only the protection elements which their **External Block** category of Setting Menu are set to "**Yes**" when D/I2 input contacts are activated.

▶ D/I3 is "Fault Recording Trigger (External Trigger)" function to record the waveforms according to TSRC conditions when TSRC(Trigger Source) in the Fault Recording setting categories is set to one of "EXT_L_H", "EXT_H_L", or "TRIP+EXT", and when voltage(AC/DC 110V) is input to Relay connector(19, 22) or Off after input.

This function is convenient to be used to record the waveform of current at the time of the open(open by Trip or by manual open command) of circuit breaker.

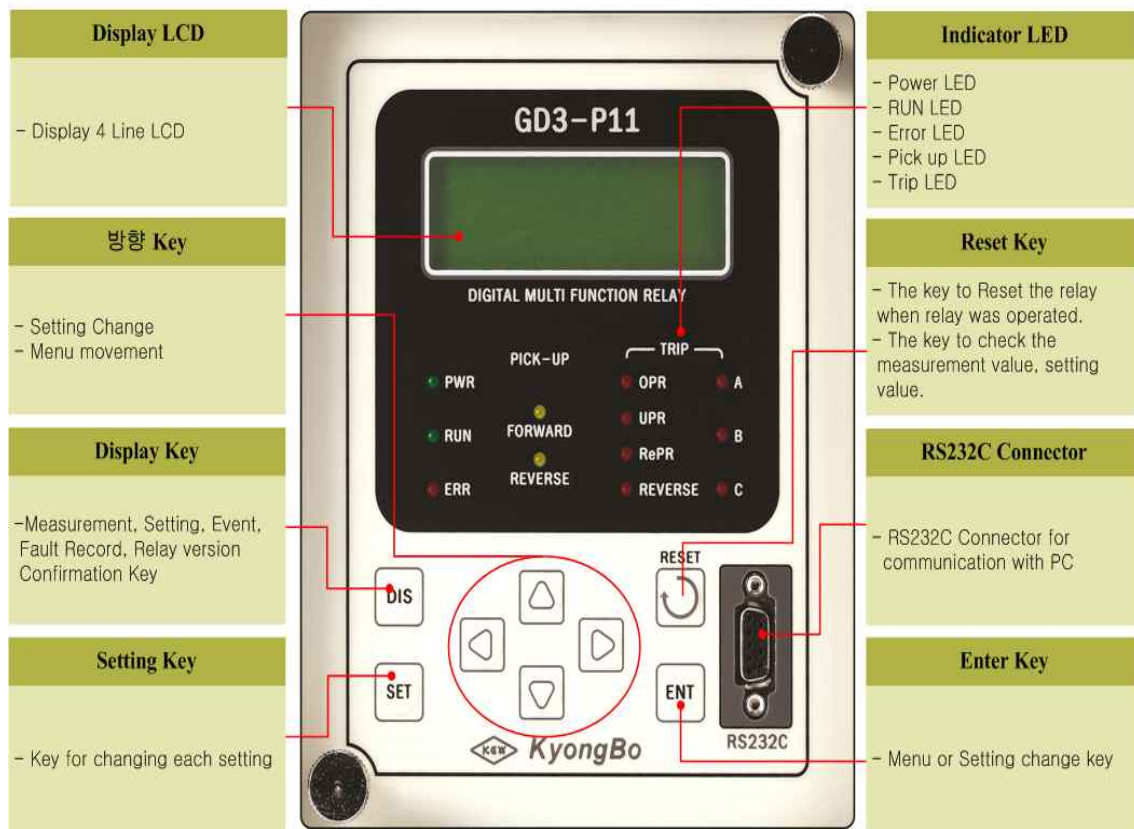
D/I1 (Terminal Number 18, 19)	Remote Reset (Annunciator Reset)
D/I2 (Terminal Number 19, 20)	Trip Blocking (External Blocking)
D/I3 (Terminal Number 19, 22)	Fault Recorder Trigger (External Trigger)

<Table 5. Control Function of Input contacts>

5. Display Panel Construction

5.1 Front-side Display Panel Structure

Front Display and control parts are composed of 20 characters 4 lines LCD, 12 LEDs, 8 KeyPad, and RS232C communication connector. There is a transparent cover on the Relay front part to protect Relay from dust and foreign objects, and protects the Relay front part from the damage that may be caused by the user's mistakes. Also, password is required to change setting value to prohibit anyone other than the designated user from changing the Settings. You can view the operation status through LCD by pressing "RESET" Key during normal operation of the Relay, and the protection function is still performed while viewing the operation status.



<Figure 9. Front display panel>

5.2 Key Pad & Communication Connector

Direction Key	Used when changing the Settings and moving between menus.
“DIS” Key	You can identify the informations such as Metering, Event record, Waveform record, and Software Version, etc.
“SET” Key	Used when changing the values of various Settings.
“RESET” Key	When the Relay is in operation, it is the Key to be used as an Indicator Reset, and it can identify the Settings without opening the cover when there is no trouble event.
“ENT” Key	It is a the Key to change and verify when selecting menu or changing various Settings.
RS232C Connector	It is a connector for the RS232C communication between the Relay and PC, and it you can change Settings and view Event Data, Waveform Record Data, etc. using MMI Application Tool.

5.3 LED (Operating Indicators)

PWR (Green)	It is an indicator always lit as green when the power is normally input.
RUN (Green)	It is a LED indicating the power is input and CPU of Relay is normal state, and when the power is input and LED is not on, the device has a serious fault and needs to be repaired or replaced.
ERR (Red)	When there is a fault in the device, and it is detected by the self diagnosis, "ERR" LED is lit as red, and the Relay element operation stops. You can identify the corresponding category through Self Diagnosis for the details of the fault, and after the fault is removed, pressing "RESET" Key will turn off the lit LED.
P K P (Yellow)	When current is satisfied with change condition in the range of $\pm 87^\circ$ from forward status and relay is pick up, PR LED on. And when current is satisfied with change condition in the range of $\pm 87^\circ$ from reverse status and relay is pick up, RPR LED off, if element returned, the LED automatically off.
T R I P (Red)	It is a operation indicator for OPR, UPR, Re.PR elements, if relay operate to forward, LED of the element and phase is lit as red. If relay operate to reverse, LED of the element, RPR and phase is lit as red. And it stays until "RESET" Key is pressed even if the Relay element is restored.

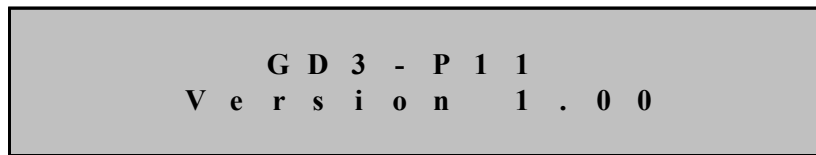
6. Display & Setting Modes

6.1 Key Control & LCD Composition

6.1.1 LCD Initial Display Status, Backlight On/Off

LCD Screen is composed of Relay Default Screen, Relay status Display Screen, and Relay Settings input Screen.

When the power is input to the Relay, the Relay Default Screen like the following is Displayed.



When there is a fault in the device, "System Error" is Displayed instead of "System OK". The Backlight of LCD will turn Off automatically after 3 minutes without button operation.

6.1.2 LCD Display & Key Control Basis

The information Displayed on LCD Screen is made of a Tree structure, and you can find and select the information in the Tree structure using **Left(←)**, **Right(→)**, **Up(↑)**, and **Down(↓)** Keys.

The category that the cursor(↔) is pointing indicates the current selected category, and pressing **Right(→) Direction Key** will Display detail categories. To exit the current category, press **Left(←) Direction Key**.

The Right triangle mark(▶) on the first line of LCD indicates the level in the menu tree.

One (▶) mark indicates the highest category in the menu tree, (▶▶) indicates detail categories from the highest category, that is, the second level, and if this has another detail categories, it is marked as the third level detail category, (▶▶▶).

“DIS” Key moves to Display Mode, and **“SET” Key** moves to Setting Mode.

6.1.3 One-button Display

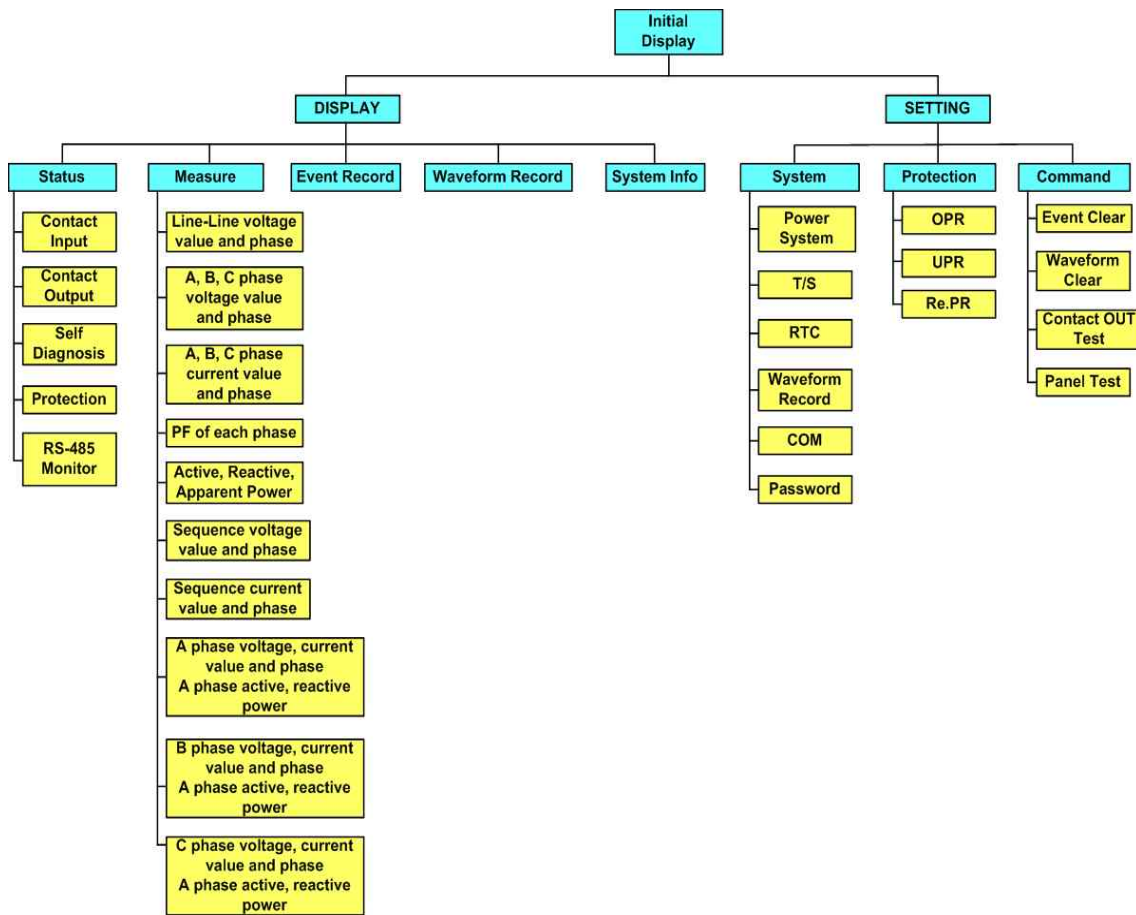
You can view the measured values and setting values sequentially on LCD Screen by pressing **“RESET” Key** repeatedly. This enables viewing without opening the transparent cover on the front part of the Relay.

When Operating Indicator is turned on as the Relay element is operational, it operates as Indicator Reset.

6.1.4 Menu-Tree

<Figure 10. Menu Tree> summarized the menu structure that can be Displayed on the Relay.

Operations and descriptions of each menu are stated in detail in the next chapter.

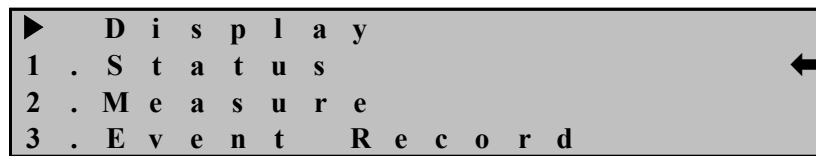


<Figure 10. Menu Tree>

6.2 Display Modes

Pressing “DIS” Key in the Default Screen will move to Display Mode Screen, and you can view the status of Relay input output contacts and self diagnosis, the operation status of protection elements, measurements, Event Data, Waveform Record Data, and Relay Version, etc. of the Relay.

Display Screen is as follows.



To convert to Status Mode, pressing **Right(→) Direction Key** when the cursor(◀) is located moves to the following detail status indicating categories.

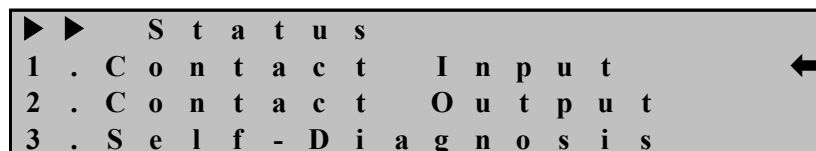
Pressing **Up(↑) Direction** or **Down(↓) Direction Key** moves the location of the cursor(◀) together, and the Displayed categories moves in the circular order. That is, pressing **Up(↑) Direction Key** from the first category will move to the last category, and pressing **Down(↓) Direction Key** from the last category will move to the first category.

6.2.1 Status Display

There are 4 detail categories indicating Contact Input, Contact Output, Self-Diagnosis, and Protection in the Status Screen.

Use **Up(↑) Direction** or **Down(↓) Direction Key** to move between the categories, each category has detail categories, to convert to the detail category Screen, move the cursor(◀) to the desired category and press **Right (→) Direction Key**.

The Status Screen is as follows.



Pressing **Left(←) Direction Key** in the Status Menu will exit this menu and convert to the Upper level menu.

6.2.1.1 Status ▶ Contact Input

There are 3 contact inputs in the Relay, and this menu indicates the ON/OFF status of each contact.

"On" status indicates the contact input is activated, and it means logical 1.

On the other hand, "Off" status indicates the contact input is deactivated, and it means logical 0.

To move to Contact Input Screen, operate keys as follows in the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

- (1) Press **“DIS” Key** : Display Screen

```
▶   D i s p l a y
1 . S t a t u s
2 . M e a s u r e
3 . E v e n t   R e c o r d
```

- (2) Press **Right(→) Direction Key** : Display ▶ Status Screen

```
▶▶   S t a t u s
1 . C o n t a c t   I n p u t
2 . C o n t a c t   O u t p u t
3 . S e l f - D i a g n o s i s
```

- (3) Press **Right(→) Direction Key** : Display ▶ Status ▶ Contact Input Display

```
▶▶▶   C o n t a c t   I n p u t
1 . C o n t   I n 1           : O n
2 . C o n t   I n 2           : O f f
3 . C o n t   I n 3           : O f f
```

Pressing **Left(←) Direction Key** in the Contact Input Screen will exit this menu and convert to the Upper level menu.

6.2.1.2 Status ▶ Contact Output

There are 8 contact outputs, this menu shows the activation status of each contact. "Ene" status indicates the contact output is activated, and it means logical 1. On the other hand, "DeE" status indicates the contact output is deactivated, and it means logical 0.

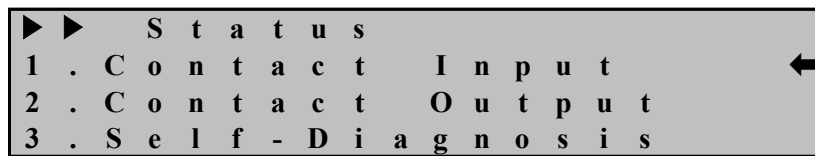
To move to Contact Output Screen, operate keys as follows from the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

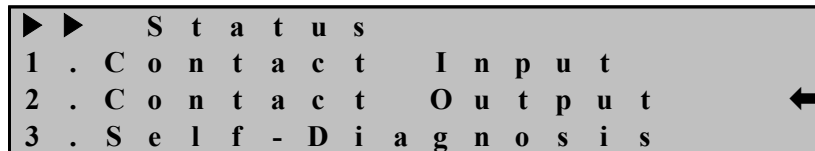
- (1) Press **“DIS” Key** : Display Screen

```
▶   D i s p l a y
1 . S t a t u s
2 . M e a s u r e
3 . E v e n t   R e c o r d
```

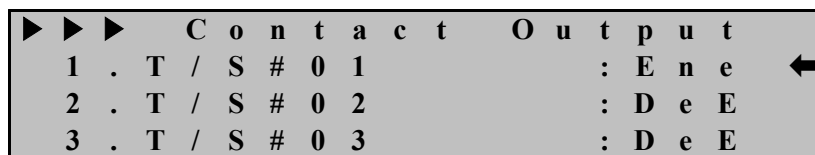
- (2) Press **Right(→) Direction Key** : Display ▶ Status Screen



(3) Press **Down(↓) Direction Key** : Cursor(←) points to 2.Contact Output category



(4) Press **Right(→) Direction Key** : Display ▶ Status ▶ Contact Output Screen



To identify the status of the other output contacts not Displayed on the Screen, press **Up(↑)** or **Down(↓) Direction Key**.

Pressing **Left(←) Direction Key** in the Contact Input Screen will exit this menu and covert to the Upper level menu.

6.2.1.3 Status ▶ Self-Diagnosis

This menu Displays the result of self diagnosis function for each diagnosis category.

Diagnosis categories are control power, CPU, memory, Settings, A/D converter, Digital Input circuit, and Calibration, and when a fault occurs in each category, "ERR" is indicated, "System Error" instead of "System OK" is Displayed in the LCD Default Screen, and "ERR" LED is lit as red.

When the source of fault is removed, "System Error" Displayed on LCD Default Screen is changed to "System OK", but the "ERR" LED and self diagnosis result state stays the same until **“RESET” Key** is pressed, so after verifying the cause of the fault, please press **“RESET” Key** to release the status indicator.

To move to the Self-Diagnosis Screen, operate keys as follows from the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

- (1) Press **“DIS” Key** : Display Screen

```
▶   D i s p l a y
1 . S t a t u s
2 . M e a s u r e
3 . E v e n t   R e c o r d
```

- (2) Press **Right(→) Direction Key** : Display ▶ Status Screen

```
▶▶   S t a t u s
1 . C o n t a c t   I n p u t
2 . C o n t a c t   O u t p u t
3 . S e l f - D i a g n o s i s
```

- (3) Press **Down(↓) Direction Key** twice : Cursor(←) points to 3. Self-Diagnosis

```
▶▶   S t a t u s
1 . C o n t a c t   I n p u t
2 . C o n t a c t   O u t p u t
3 . S e l f - D i a g n o s i s
```

- (4) Press **Right(→) Direction Key** : Display ▶ Status ▶ Self-Diagnosis Screen

```
▶▶▶   S e l f - D i a g n o s i s
1 . D C   P o w e r           : E R R
2 . M e m o r y               : O K
3 . S e t t i n g             : O K
```

To identify the status of the other output contacts not Displayed on the Screen, press **Up(↑)** or **Down(↓) Direction Key**.

Pressing **Left(←) Direction Key** in the Protection Screen will exit this menu and covert to the Upper level menu.

6.2.1.4 Status ▶ Protection

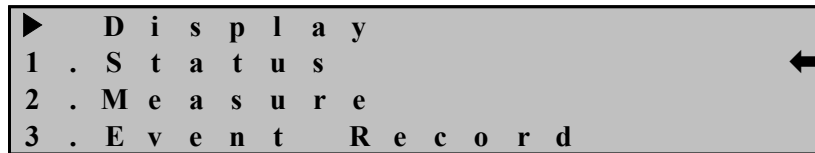
This menu identifies and Displays the current real time status of Pick-Up and Operation for each 4 protection Relay element.

When Pick-Up or Operation occurs in protection Relay element, it Displays the occurred fault state at the corresponding element

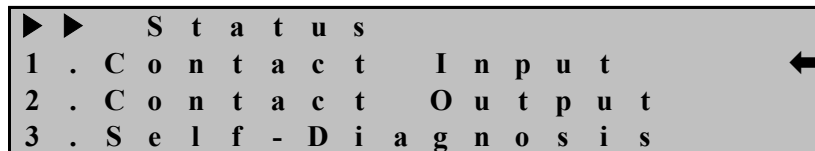
To move to Protection Screen, operate keys as follows from the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

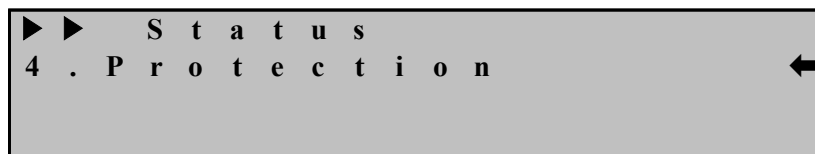
(1) Press **“DIS” Key** : Display Screen



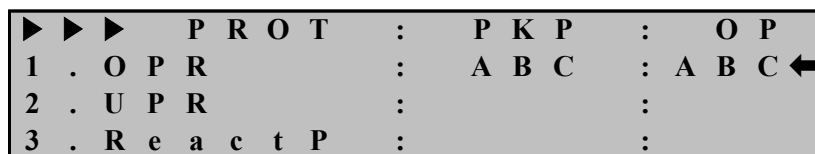
(2) Press **Right(→) Direction Key** : Display ▶ Status Screen



(3) Press **Down(↓) Direction Key** three times : Cursor(←) points to 4. Protection



(4) Press **Right(→) Direction Key** : Display ▶ Status ▶ Protection Screen



Pressing **Left(←) Direction Key** in the Protection Screen will exit this menu and convert to the Upper level menu.

6.2.1.5 Status ▶ RS-485 Monitor

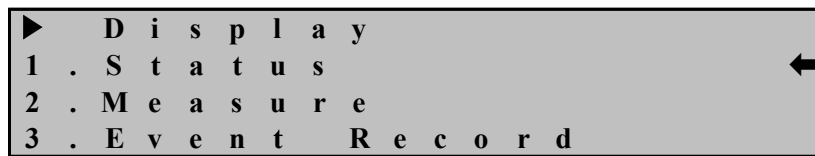
This menu can be check RS-485 communication status separating by TXD and RXD.

When the data were received, RXD category display the "Receive" category, when the data were transmitted, TXD category display the "Send".

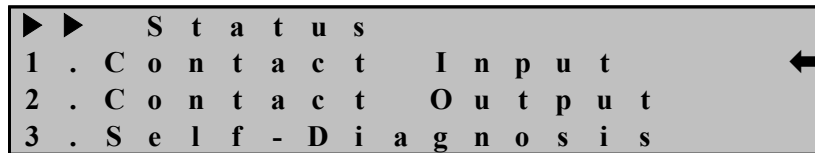
To move to RS-485 Monitor, operate keys as follows from the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

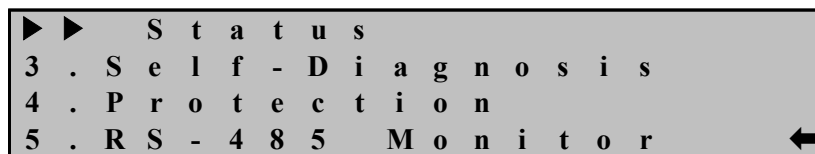
(1) Press **“DIS” Key** : Display Screen



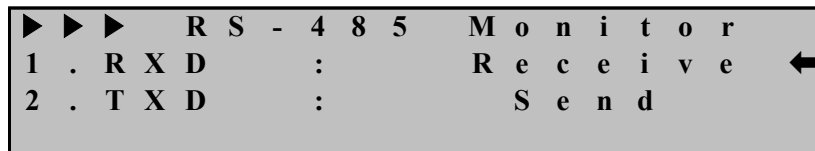
(2) Press **Right(→) Direction Key** : Display ► Status Screen



(3) Press **Down(↓) Direction Key** three times : Cursor(←) points to 5.RS-485 Monitor



(4) Press **Right(→) Direction Key** : Display ► Status ► RS-485 Monitor



Pressing **Left(←) Direction Key** in the RS-485 Monitor Screen will exit this menu and convert to the Upper level menu.

6.2.2 Measure Mode

In the Measure Screen, fundamental wave voltage/current value and phase, symmetrical component current value and phase, PF/active/reactive power for each phase, 3 phase PF/active/reactive/complex power for the measured voltage/current for each phase are Displayed.

Fundamental wave voltage/current for each phase are measured using DFT(Discrete Fourier Transform) algorithm, and symmetrical component currents are calculated using method of symmetrical coordinates for each voltage/current of phase measured. Measure Display is as follows.

V a	:	1	1	0	.	0	0	V , <	0	.	0
V b	:	1	1	0	.	0	0	V , <	2	4	0
V c	:	1	1	0	.	0	0	V , <	1	2	0

Measure Screen has 9 detail categories as follows.

1. Phase voltage : Display voltage value and phase for each phase (Displayed by PT 1st side)
2. Line voltage : Display line voltage value and phase for each line (Displayed by PT 1st side)
3. Phase current : Display current value and phase for each phase (Displayed by CT 1st side)
4. Phase PF : Display PF value for each phase and total PF
5. 3 Phase active/reactive/complex-power : Display 3 phase active/reactive/complex power
6. Symmetrical component voltage : Display zero sequence, positive sequence, and negative sequence (Displayed by PT 1st side)
7. Symmetrical component current : Display zero sequence, positive sequence, and negative sequence (Displayed by CT 1st side)
8. A Phase : Display A Phase voltage/current/active/reactive-power value and phase
9. B Phase : Display B Phase voltage/current/active/reactive-power value and phase
10. C Phase : Display C Phase voltage/current/active/reactive-power value and phase

To identify the status of the other output contacts not Displayed on the Screen, press **Up(↑)** or **Down(↓) Direction Key**.

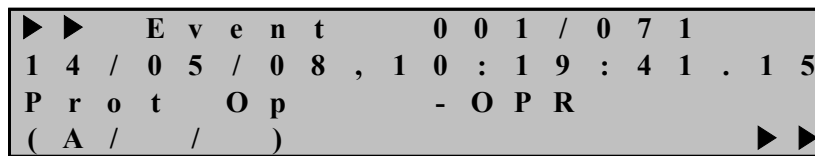
Pressing **Left(←) Direction Key** in the Measure Screen will exit this menu and covert to the Upper level menu.

6.2.3 Event Record Mode

This category can show Event Data that can be stored Up to maximum of 1024 records, and the latest Event Data is first Displayed on the Relay LCD.

As the Event Data number is lower, is the more recent Event, and when the number of Event exceeds 1024, the oldest Event Data is erased, and the new Event Data is recorded, and the stored Data is kept permanently even in the case of the Relay control power loss.

Event Record Screen is as follows.



From the above Screen, "001/071" on the first line means there are total of 71 Events occurred, and it is the first Event among them, and "14/05/08,10:19:41.15" means the Event occurred on AM 10hr:19min:41.15sec. on Oct. 08th, 2014, "Prot Op -TOCR" and "(A/ /)" on the third and fourth line shows that definite time OCR A phase operated, and pressing **Right(→) Direction Key** from this state can identify the size and phase of current for each phase when protection element was operated.

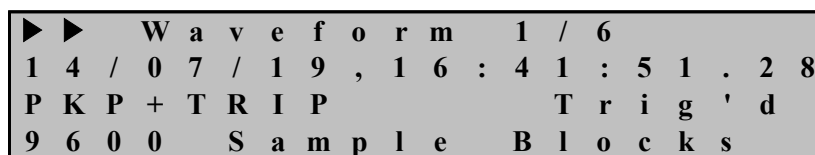
To identify the next Event, press **Down(↓) Direction Key**. Pressing **Left(←) Direction Key** in the Event Record Screen will exit this menu and covert to the Upper level menu.

6.2.4 Waveform Record Mode

Information for the maximum of 6 fault waveform records can be viewed, and it Displays from the most recently occurred fault record.

As lower the number is, is the more recently occurred fault waveform record, and if it exceeds the number set by Waveform Record Type Settings, the oldest Waveform Data is erased, and the new Waveform Data is recorded, and the stored Data is kept permanently even in the case of the Relay control power loss.

Waveform Record Screen is as follows.



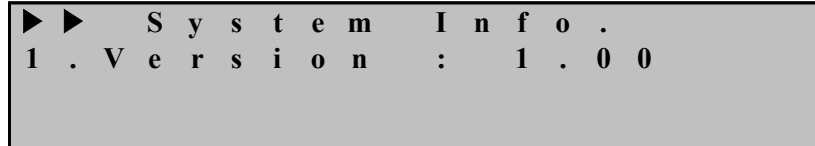
From the above Screen, "1/6" on the first line means there are total of 6 Waveform Data are stored, and it is the first Waveform Data among these Data, "14/07/19,16:41:51.28" on the second line means that it is stored on PM 4hr:41min:51.28Sec.on July 19th, 2014, "PKP+TRIP Trig'd" on the third line means the condition that the Waveform was stored on, and "9600 Sample Blocks" on the fourth line means the number of the Samples of Waveform Data stored. GD3-P11 Relay takes 32 Samples in one cycle, and stores 9600 Samples, so $9600 \div 32 = 300$ Cycle, that is, stores Waveform of 5 Sec.

To identify the next Waveform Data, press **Down(↓) Direction Key**.

Pressing **Left(←) Direction Key** in the Waveform Record Screen will exit this menu and convert to the Upper level menu.

6.2.5 System Info. Mode

This category Displays the Version of the Relay.



Pressing **Left(←) Direction Key** in the System Info. Screen will exit this menu and convert to the Upper level menu.

I n i t i a l D i s p l a y	Display (DIS)	1. Status	1. Contact Input	Cont In1 ~ 3
			2. Contact Output	T/S#01 ~ 08
			3. Self-Diagnosis	1. DC Power 2. Memory 3. Setting 4. AI Circuit 5. DI/O Circuit 6. Auto Cal. 7. CPU Watchdog
			4. Protection	1. OPR 2. UPR 3. ReactPR
			5. RS-485 Monitor	1. RXD 2. TXD
	2. Measure	1. 3-Phase Voltage 2. Line to Line Voltage 3. 3-Phase Current 4. 3-Phase Power Factor 5. Active/Reactive/Apparent Power 6. Sequence Voltage 7. Sequence Current 8. A-Phase Voltage/Current/Power 9. B-Phase Voltage/Current/Power 10. C-Phase Voltage/Current/Power		
		3. Event Record	1 ~ 1024 Event Display	
		4. Waveform Record	1 ~ 6 Waveform Display	
		5. System Info.	Relay Version	

<Table 6. Display Menus>

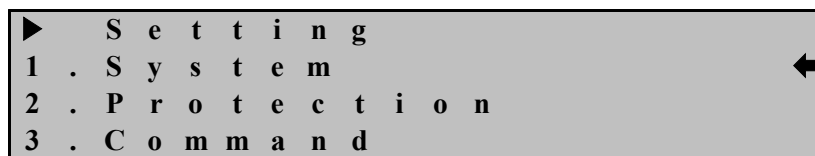
6.3 Setting Modes

Pressing **“SET” Key** from the LCD Default Screen will convert to the Settings Display.

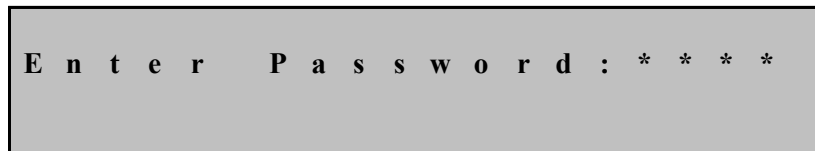
For this Relay to operate properly, it needs to be set appropriately to the system environment in which it is used.

The Settings elements are composed of 3 categories of System, Protection, and Command.

The Default Setting Screen is as follows.

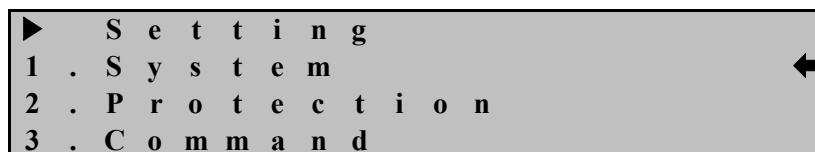


When trying to change the Settings of the Relay, a Password input Screen appears. Change of Settings can only be permitted after correct Password input, therefore maintaining a thorough security.

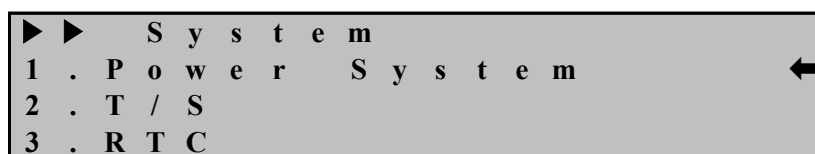


For example, to set Phase PT Primary to 22.90kV, operate in the order below.

(1) Press **“SET” Key** : Display Setting Screen



(2) Press **Right(→) Direction Key** : Display Setting ▶ System Screen



(3) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ Power System


```

▶▶▶ Power System
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 0 . 1 1 k V
3 . P _ P T _ S E C : 1 1 0 . 0 V
    
```

(4) Press **Down(↓) Direction Key** 2 times : Cursor(←) points to 2.P_PT_PRI category

```

▶▶▶ Power System
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 0 . 1 1 k V ←
3 . P _ P T _ S E C : 1 1 0 . 0 V
    
```

(5) Press **Right(→) Direction Key** : Display Password input requirement Screen

```

E n t e r P a s s w o r d : * * * *
    
```

(6) The Default password is set to "0000", so just press **"ENT" Key** : Cursor(←) points to 2.P_PT_PRI category

```

▶▶▶ Power System
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 0 . 1 1 k V ←
3 . P _ P T _ S E C : 1 1 0 . 0 V
    
```

(7) Press **Right(→) Direction Key** : Cursor(←) points to 2.P_PT_PRI category, and "0.11" flashes on the Display.

(8) Press **Up(↑) Direction Key** to set value to "22.90"

(9) Press **"ENT" Key** after changing the Settings

```

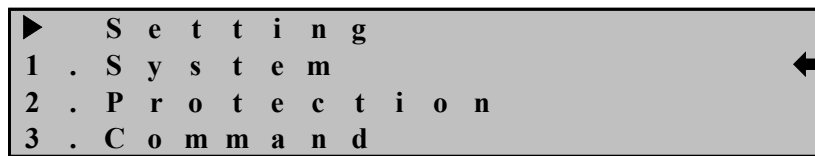
▶▶▶ Power System
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 2 2 . 9 0 k V ←
3 . P _ P T _ S E C : 1 1 0 . 0 V
    
```

(10) Press **Left(←) Direction Key** : Display Setting ▶ System Screen

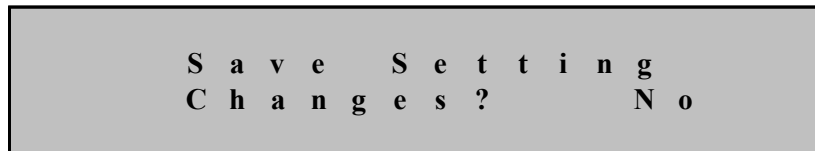
```

▶▶ System
1 . P o w e r S y s t e m ←
2 . T / S
3 . R T C
    
```

(11) Press **Left(←) Direction Key** : Display Setting Screen

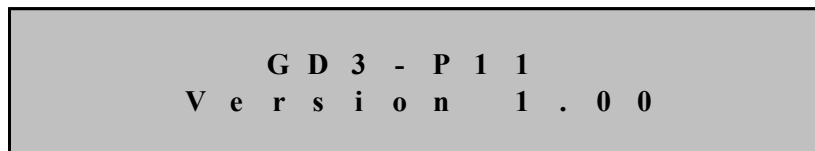


(12) Press **Left(←) Direction Key** : Display the following Screen. "No" flashes.



(13) Press **Up(↑) or Down(↓) Direction Key** to change to "Yes"

(14) Press **"ENT" Key** : Display the Default Screen



If you press **"ENT" Key** at "No" category in (13), changed Settings will be deleted, and the previous Settings Data is maintained.

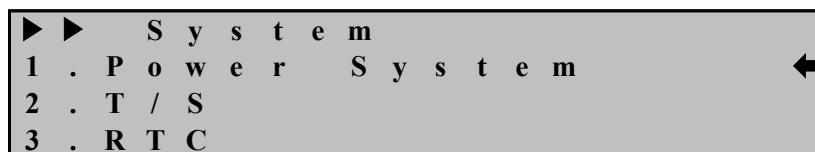
Also, until pressing **"ENT" Key** at "Save Settings Changes?" "Yes", the changed Settings does not affect the protection Relay, but the previous Settings values apply.

Please follow the above procedures to change all of the Settings.

6.3.1 System Setting

In the System category, there are detail categories such as power system Settings, output contacts, RTC, fault waveform recording Settings, Settings for the communication with Upper level system, and password Settings for security, etc.

System Screen is as follows.



Pressing **Left(←) Direction Key** in the System Screen will exit this menu and convert to the Default Settings Display.

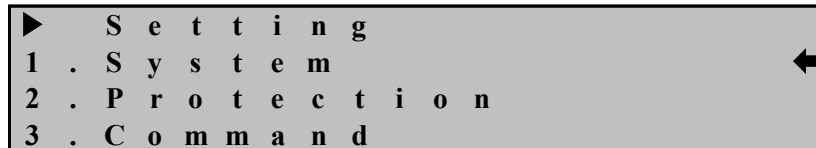
6.3.1.1 System ▶ Power System Setting

Power System is a category that can set Frequency, PT connection, PT second rating/PT ratio of phase side, PT second rating/PT ratio of ground side, CT ratio of phase side, and CT ratio of Ground side.

To move to Power System Screen, you can operate Keys as follows from the Relay Default Display.

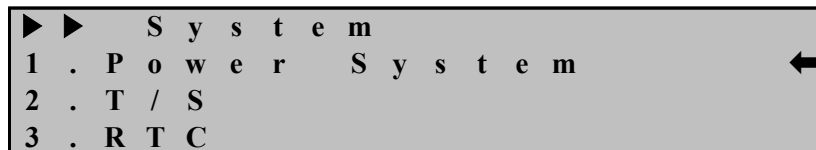
If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

- (1) Press **"SET" Key** : Display Setting



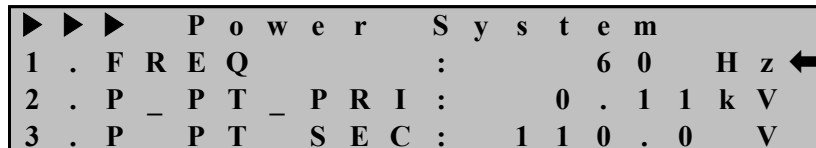
```
▶ S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
```

- (2) Press **Right(→) Direction Key** : Display Setting ▶ System



```
▶ ▶ S y s t e m
1 . P o w e r S y s t e m
2 . T / S
3 . R T C
```

- (3) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ Power System



```
▶ ▶ ▶ P o w e r S y s t e m
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 0 . 1 1 k V
3 . P _ P T _ S E C : 1 1 0 . 0 V
```

Pressing **Left(←) Direction Key** in the "Power System" Screen will exit this menu and convert to the Upper level menu.

System ▶ Power System ▶ 1. FREQ Setting

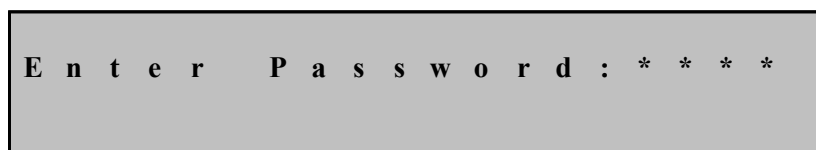
It is a category to set the nominal frequency used in the Relay.

There are two categories, 50Hz and 60Hz, and if your power system is 60Hz, select 60Hz.

If the power system frequency where the Relay is installed is different from the set Relay frequency, current measurement error can occur and cause Relay malfunctions.

For example, if you are changing the frequency to 50Hz, in 1.Power System Screen, operate as follows.

- (1) Press **Right(→) Direction Key** : Display Password requirement category



```
E n t e r P a s s w o r d : * * * *
```

- (2) The Default Relay password is set to “0000”, so just press “ENT” Key :
 Cursor(←) points to 1.FREQ category.

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z ←
2 . P _ P T _ P R I :      0 . 1 1 k V
3 . P _ P T _ S E C :      1 1 0 . 0  V
    
```

- (3) Press **Right(→) Direction Key** : Cursor(←) points to 1.FREQ category and “60” flashes on the Display.
 (4) Press **Up(↑) or Down(↓) Direction Key** to change the Settings value
 (5) Press “ENT” Key after Settings value has been changed. ex) 50Hz

```

▶▶▶ Power System
1 . F R E Q      :      5 0  H z ←
2 . P _ P T _ P R I :      0 . 1 1 k V
3 . P _ P T _ S E C :      1 1 0 . 0  V
    
```

System ▶ Power System ▶ 2. P_PT_PRI Setting

It is a category to set the PT primary rating of phase side, it can be set between 0.01 to 600.00 with the increment of 0.01, and it does not affect the protection element but only give a information of phase PT primary rating stored fault record.

If you use PT of $\frac{23kV}{\sqrt{3}} / \frac{190V}{\sqrt{3}}$ for Phase side, the relay input phase voltage is 110V. If you display the primary voltage value is 13.3kV, you set 13.30kV.
 If phase voltage display to line-line voltage, power measurement is change so be careful.

To change PT primary rating of phase side to 13.3kV, from 1.Power System Screen, operate as follows.

- (1) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.P_PT_PRI category.

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z
2 . P _ P T _ P R I :      0 . 1 1 k V ←
3 . P _ P T _ S E C :      1 1 0 . 0  V
    
```

- (2) Press **Right(→) Direction Key** : Display Password requirement category

```

E n t e r   P a s s w o r d : * * * *
    
```

- (3) Relay Default password is set to “0000”, so just press “ENT” Key :

Cursor(←) points to 2.P_PT_PRI category

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z
2 . P _ P T _ P R I :      0 . 1 1 k V ←
3 . P _ P T _ S E C :      1 1 0 . 0  V
    
```

(4) Press **Right(→) Direction Key** : Cursor(←) points to 2.P_PT_PRI category, and “0.11” flashes on the Display.

(5) Press **Up(↑) Direction Key** to set the value of “13.30”

(6) Press **“ENT” Key** after changing the Settings.

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z
2 . P _ P T _ P R I :      1 3 . 3 0 k V ←
3 . P _ P T _ S E C :      1 1 0 . 0  V
    
```

System ▶ Power System ▶ 3. P_PT_SEC Setting

It is a category to set the PT secondary rating of phase side, it can be set between 50.0 to 240.0 with the increment of 0.1, and it does not affect the protection element but only affects the measurement Display.

To change P_PT_SEC ratio of phase side to 190V, from 1.Power System Screen, operate as follows.

(1) Press **Down(↓) Direction Key** twice : Cursor(←) points to 3.P_PT_SEC category.

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z
2 . P _ P T _ P R I :      1 3 . 3 0 k V
3 . P _ P T _ S E C :      1 1 0 . 0  V ←
    
```

(2) Press **Right(→) Direction Key** : Display Password requirement category

```

E n t e r   P a s s w o r d : * * * *
    
```

(3) Relay Default password is set to “0000”, so just press **“ENT” Key** :
 Cursor(←) points to 3.P_PT_SEC category

```

▶▶▶ Power System
1 . F R E Q      :      6 0  H z
2 . P _ P T _ P R I :      1 3 . 3 0 k V
3 . P _ P T _ S E C :      1 1 0 . 0  V ←
    
```

- (4) Press **Right(→) Direction Key** : Cursor(←) points to 3.P_PT_SEC category, and “110.0” flashes on the Display.
- (5) Press **Up(↑) Direction Key** to set the value of “190.0”
- (6) Press **“ENT” Key** after changing the Settings.

```

▶▶▶ Power System
1 . F R E Q : 6 0 H z
2 . P _ P T _ P R I : 1 3 . 3 0 k V
3 . P _ P T _ S E C : 1 9 0 . 0 V ←
    
```

System ▶ Power System ▶ 4. P_CT_RAT Setting

It is a category to set the primary CT ratio of Phase side, and it can be set between 5 to 30000 with the increment of 5, and it does not affect the protection element but only affects the measurement Display.

The CT secondary rated current of this Relay is designed to be 5A, therefore you must select the secondary to be 5A when selecting CT.

If you use CT of 1000:5 for Phase side, changing to 1000 on P_CT_RAT Settings will Display as 1000A measurement on 5A input, and if you change to 5 on P_CT_RAT Settings, it will Display as 5A measurement on 5A input.

To change CT Ratio of Phase side to 75, from 1.Power System Screen, operate as follows.

- (1) Press **Up(↑) Direction Key** once : Cursor(←) points to 4.P_CT_RAT category

```

▶▶▶ Power System
2 . P _ P T _ P R I : 1 3 . 3 0 k V
3 . P _ P T _ S E C : 1 9 0 . 0 V
4 . P _ C T _ R A T : 5 : 5 ←
    
```

- (2) Press **Right(→) Direction Key** : Display Password requirement category

```

E n t e r P a s s w o r d : * * * *
    
```

- (3) Relay Default password is set to “0000”, so just press **“ENT” Key** : Cursor(←) points to 4.P_CT_RAT category

```

▶▶▶ Power System
2 . P _ P T _ P R I : 1 3 . 3 0 k V
3 . P _ P T _ S E C : 1 9 0 . 0 V
4 . P _ C T _ R A T : 5 : 5 ←
    
```

- (4) Press **Right(→) Direction Key** : Cursor(←) points to 4.P_CT_RAT category, and “5” flashes on the Display.
- (5) Press **Up(↑) Direction Key** to set the value of “75”.
- (6) Press **“ENT” Key** after changing the Settings.

▶▶▶	P	o	w	e	r	S	y	s	t	e	m
2	.	P	_	P	T	_	P	R	I	:	13.30kV
3	.	P	_	P	T	_	S	E	C	:	190.0V
4	.	P	_	C	T	_	R	A	T	:	75 : 5 ←

6.3.1.2 System ▶ T/S Setting

In T/S Output Settings, output conditions for 8 output contacts, restoration method for output contacts, and restoration delay time for output contacts can be set.

System ▶ T/S ▶ 1. CON Setting

It is a category to set on which conditions to operate the output contacts. "SYS_ERR" among the output contacts conditions is a condition to operate when there is a fault in the Relay, and when there is no fault in the Relay, it converts to the opposite contact from the original contact.

That is, **if "SYS_ERR" is set on a contact, it stays as b contact, and when a fault occurs in the Relay, it changes to a contact.**

For example, if you set T/S 8 output contacts(connector number: 16 [a contact], 17 [b contact], 15 [Com contact]) which are c contacts to "SYS_ERR", when the power is not input to the Relay, among the Relay diagnosis categories, it falls into "DC Power Fail", so No. 16 is a contact, and No. 17 is a b contact but when the power is input to the Relay, No. 16 changes to b contact, and No. 17 changes to a contact

The types and meanings of connecting output contacts are as follows.

Connection	Description
OFF	Do not use.
SYS_ERR	System Error on output.
PROT_OR	All protection operate on output.
OPR_OR	Reverse(over) power element operate on output.
OPR_A	Reverse(over) power element A phase operate on output.
OPR_B	Reverse(over) power element B phase operate on output.
OPR_C	Reverse(over) power element C phase operate on output.
UPR_OR	Under power element operate on output.
UPR_A	Under power element A phase operate on output.
UPR_B	Under power element B phase operate on output.
UPR_C	Under power element C phase operate on output.
RePR_OR	Reactive power element operate on output.
RePR_A	Reactive power element A phase operate on output.
RePR_B	Reactive power element B phase operate on output.
RePR_C	Reactive power element C phase operate on output.
PR_A_OR	Output if A phase operate of all relay element
PR_B_OR	Output if B phase operate of all relay element
PR_C_OR	Output if C phase operate of all relay element
OPR+UPR	Output if any one of reverse(over) power element and under power element is in operation.
OPR+RePR	Output if any one of reverse(over) power element and reactive power element is in operation.
UPR+RePR	Output if any one of under power element and reactive power element is in operation.

<Table 7. T/S Connection Menus>

If you set the 1Phase in reverse over-power, under-power operation value setting mode, if the phase operated, output contacts. And if you set the 3Phase in operation value setting mode, if the protection element is operated regardless of the phase, output contacts.

Therefore when you set the output contact, output method according to operation setting mode is different.

System ► T/S ► 2. RST Setting

It is a category to set the restoration methods of output contacts.

There are "Self Mode" and "Manual Mode" in the methods of restoration of output contacts. "Self Mode" is a method that output contacts are automatically restored when the Relay elements are restored, and "Manual Mode" is a method that output contacts are not automatically restored when the Relay elements are restored but is restored when "RESET" Key is pressed, and it maintains the output contacts until

“RESET” Key is pressed.

System ▶ T/S ▶ 3. DLY Setting

It is a category to delay the restoration time of output contacts.
This menu only applies to when it is set to "Self Mode" in the above 2. RST Settings, and it is not set in the case of "Manual Mode".

The automatic restoration time of GD3-P11 is 40ms or less, DLY Settings can be set between 0.00~200.00Sec with the increment of 0.01Sec.

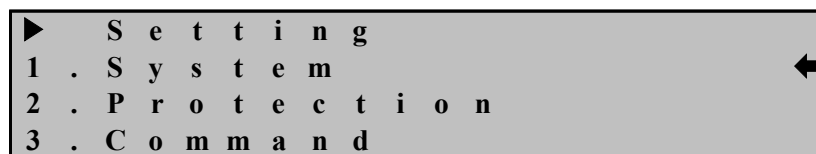
For example, to restore output contacts in 100ms or less, set DLY to 0.06Sec, and the restoration time error is ± 35 ms for less than 100ms, and $\pm 5\%$ or less for 100ms or above.

◆ T/S Output Setting Method

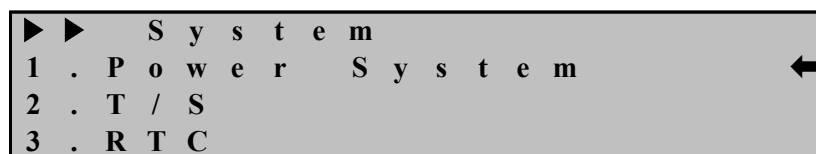
For example, to set T/S1 to OPR_OR, T/S2 to UPR_OR, and T/S3 to RePR_OR operate Keys as follows in the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

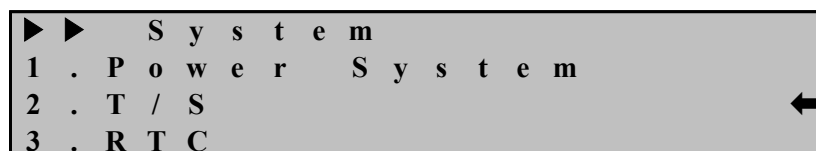
(1) Press “SET” Key : Display Setting Display



(2) Press **Right(→) Direction Key** : Display Setting ▶ System Screen



(3) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.T/S category



(4) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ T/S#01 Screen, and "01" of "T/S#01" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 1
1 . C O N : P R O T _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(5) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ T/S#01 Screen, "01" of "T/S#01" on the first line of the below Screen stops flashing, and "←" is Displayed.

```

▶▶▶ T / S # 0 1
1 . C O N : P R O T _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(6) Press **Right(→) Direction Key** : Display Password requirement category

```

E n t e r P a s s w o r d : * * * *
    
```

(7) Relay Default password is set to "0000", so just press **"ENT" Key** : Cursor(←) points to 1.CON category

```

▶▶▶ T / S # 0 1
1 . C O N : P R O T _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(8) Press **Right(→) Direction Key** : Cursor(←) points to 1.CON category, and "PROT_OR" value flashes on the Display.

(9) Press **Up(↑) Direction Key** to set the value of "OPR_OR"

(10) Press **"ENT" Key** after changing the Settings

```

▶▶▶ T / S # 0 1
1 . C O N : O P R _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(11) Press **Left(←) Direction Key** : Display Setting ▶ System ▶ T/S#01 Screen, and "01" of "T/S#01" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 1
1 . C O N : O P R _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(12) Press **Up(↑) Direction Key** : Display Setting ▶ System ▶ T/S#02 Screen, and

"02" of "T/S#02" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 2
1 . C O N : P R O T _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(13) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ T/S#02 Screen, "02" of "T/S#02" on the first line of the below Screen stops flashing, and "←" is Displayed.

```

▶▶▶ T / S # 0 2
1 . C O N : P R O T _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(14) Press **Right(→) Direction Key** : Cursor(←) points to 1.CON category, and "PROT_OR" value flashes on the Display.

(15) Press **Up(↑) Direction Key** to set the value of "UPR_OR"

(16) Press **"ENT" Key** after changing the Settings

```

▶▶▶ T / S # 0 2
1 . C O N : U P R _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(17) Press **Left(←) Direction Key** : Display Setting ▶ System ▶ T/S#02 Screen, and "02" of "T/S#02" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 2
1 . C O N : U P R _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(18) Press **Up(↑) Direction Key** : Display Setting ▶ System ▶ T/S#03 Screen, and "03" of "T/S#03" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 3
1 . C O N : P R O T _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(19) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ T/S#03 Screen, "03" of "T/S#03" on the first line of the below Screen stops flashing, and "←" is Displayed.

```

▶▶▶ T / S # 0 3
1 . C O N : P R O T _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(20) Press **Right(→) Direction Key** : Cursor(←) points to 1.CON category, and “PROT_OR” value flashes on the Display.

(21) Press **Up(↑) Direction Key** to set the value of “RePR_OR”

(22) Press **“ENT” Key** after changing the Settings

```

▶▶▶ T / S # 0 3
1 . C O N : R e P R _ O R ←
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(23) Press **Left(←) Direction Key** : Display Setting ▶ System ▶ T/S#03 Screen, and "03" of "T/S#03" on the first line of the below Screen flashes.

```

▶▶▶ T / S # 0 3
1 . C O N : R e P R _ O R
2 . R S T : S e l f
3 . D L Y : 0 . 0 0 s
    
```

(24) Press **Left(←) Direction Key** : Cursor(←) points to 2.T/S category

```

▶▶ S y s t e m
1 . P o w e r S y s t e m
2 . T / S ←
3 . R T C
    
```

(25) Press **Left(←) Direction Key** : Display Setting Display

```

▶ S e t t i n g
1 . S y s t e m ←
2 . P r o t e c t i o n
3 . C o m m a n d
    
```

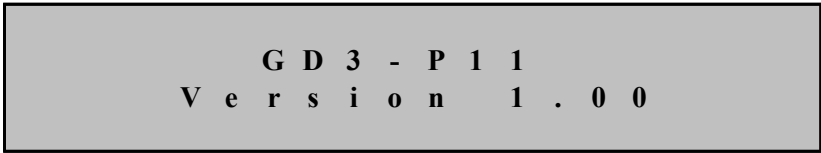
(26) Press **Left(←) Direction Key** : Display below Screen. “No” category flashes

```

S a v e S e t t i n g
C h a n g e s ? N o
    
```

(27) Press **Up(↑) or Down(↓) Direction Key** to change to “Yes”

(28) Press **“ENT” Key** : Display Default Screen



6.3.1.3 System ▶ RTC Setting

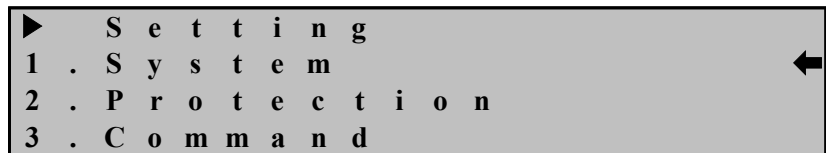
It is a category to set the time that the Relay recognizes.

Even if the power is lost, it still remembers the time, and year/month/date/hour/minute/sec can be input in that order.

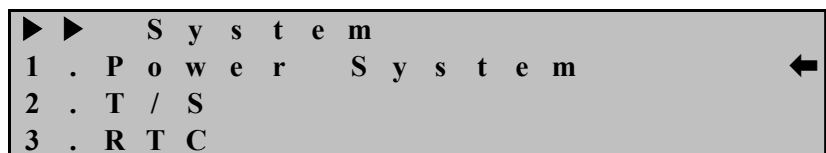
To change the date and time of the Relay, operate Keys as follows from the Relay Default Screen.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

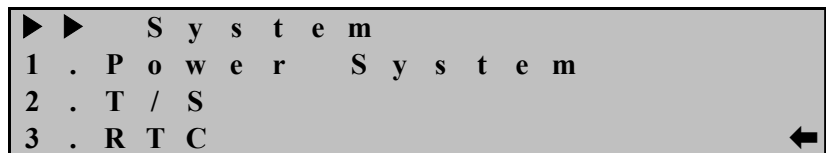
- (1) Press **“SET” Key** : Display Setting Screen



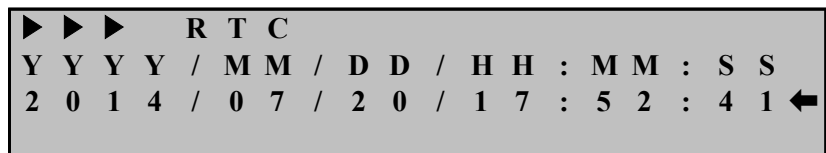
- (2) Press **Right(→) Direction Key** : Display Setting ▶ System Display



- (3) Press **Down(↓) Direction Key** twice : Cursor(←) points to 3.RTC category



- (4) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ RTC Display



- (5) Press **Right(→) Direction Key** : Display Password requirement category

E n t e r P a s s w o r d : * * * *

- (6) Relay Default password is set to "0000", so just press "ENT" Key

▶▶▶ R T C
Y Y Y Y / M M / D D / H H : M M : S S
2 0 1 4 / 0 7 / 2 0 / 1 7 : 5 2 : 4 1 ◀

- (7) Press **Right(→) Direction Key** : "14" value of "2014/07/20/17:52:41" flashes
For example, in the case of setting to "2014/08/10/12:30:20",
(8) Press **Right(→) Direction Key** : "07" value of "2014/07/20/17:52:41" flashes
(9) Press **Up(↑) Direction Key** to set to "08"
(10) Press **Right(→) Direction Key** : "20" value of "2014/08/20/17:52:41" flashes
(11) Press **Down(↓) Direction Key** to set to "10"
(12) Press **Right(→) Direction Key** : "17" value of "2014/08/10/17:52:41" flashes
(13) Press **Down(↓) Direction Key** to set to "12"
(14) Press **Right(→) Direction Key** : "52" value of "2014/08/10/12:52:41" flashes
(15) Press **Down(↓) Direction Key** to set to "30"
(16) Press **Right(→) Direction Key** : "41" value of "2014/08/10/12:30:41" flashes
(17) Press **Down(↓) Direction Key** to set to "20"
(18) Press "ENT" Key after changing the Settings

▶▶▶ R T C
Y Y Y Y / M M / D D / H H : M M : S S
2 0 1 4 / 0 8 / 1 0 / 1 2 : 3 0 : 2 0 ◀

Pressing **Left(←) Direction Key** in the RTC Screen will exit this menu and convert to the Upper level menu.

6.3.1.4 System ▶ Waveform Record Setting

It is a category to set Waveform Record related Settings, and you can set Waveform Record Type, Waveform Record Trigger Position, and Waveform Record Trigger Condition.

GD3-P11 maximum of 6 fault waveform records, and stores Waveform of 2.5Sec or 5Sec.

System ▶ Waveform Record ▶ 1. TYPE Setting

It is a category to set Waveform Record Type.

The record types of Waveform of GD3-P11 are 2 types, 150cycle, 300cycle.

System ▶ Waveform Record ▶ 2. TPOS Setting

It is a category to set the time of the event waveform to record waveform, and you may set between 0%~99% with an increment of 1%.

If you set TPOS to be 60%, it records 60% before and 40% after the Trigger time.

If you want to record the same time before and after the Trigger time, you can set TPOS to 50%.

System ▶ Waveform Record ▶ 3. TSRC Setting

It is a category to set in which conditions the waveform to be recorded, and there are total of 6 categories, TRIP, PKP, TRIP+EXT, PKP+TRIP, EXT_H_L, and EXT_L_H.

TRIP is recording when Trip occurs by the Relay element, PKP is when the Relay element is PickUp, TRIP+EXT is when Trip occurs by the Relay element or D/I3 External Trigger input contact turns ON to OFF, or OFF to ON, PKP+TRIP is when the Relay element is PickUp or Trip occurs, EXT_H_L is when D/I3 External Trigger input contact turns ON to OFF, and EXT_L_H is when D/I3 External Trigger input contact turns OFF to ON.

When you want to store the event waveform, set TSRC to PKP+TRIP, and if you want to record waveform before and after the breaker open status, or waveform of the cable in the normal operation, set TSRC to EXT_L_H and EXT_H_L.

◆ Waveform Record Setting Method

For example, to set the Waveform Type to 6×300, Trigger Position to 80%, and Trigger Source to PKP+TRIP, operate Keys as follows from the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

(1) Press **“SET” Key** : Display Setting Display

```

▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
    
```

(2) Press **Right(→) Direction Key** : Display Setting ▶ System Display

```

▶▶   S y s t e m
1 . P o w e r   S y s t e m
2 . T / S
3 . R T C
    
```

(3) Press **Down(↓) Direction Key** 3 times : Cursor(←) points to 4.Waveform Record category

```

▶▶   S y s t e m
2 . T / S
3 . R T C
4 . W a v e f o r m   R e c o r d
    
```

(4) Press **Right(→) Direction Key** : Display Setting ▶ System ▶ Waveform Record

```

▶▶▶   W a v e f o r m   R e c o r d
1 . T Y P E           : 1 5 0 c y c l e
2 . T P O S           :           5 0 %
3 . T S R C           :           T R I P
    
```

(5) Press **Right(→) Direction Key** : Display Password requirement category

```

E n t e r   P a s s w o r d : * * * *
    
```

(6) Relay Default password is set to “0000”, so just press **“ENT” Key** :
 Cursor(←) points to 1.TYPE category

```

▶▶▶   W a v e f o r m   R e c o r d
1 . T Y P E           : 1 5 0 c y c l e
2 . T P O S           :           5 0 %
3 . T S R C           :           T R I P
    
```

(7) Press **Right(→) Direction Key** : Cursor(←) points to 1.TYPE category, and
 “150cycle” value flashes on the Display

(8) Press **Down(↓) Direction Key** to set to “300cycle” value

(9) Press **“ENT” Key** after changing the Settings

▶▶▶	W a v e f o r m	R e c o r d
1 .	T Y P E	: 3 0 0 c y c l e ←
2 .	T P O S	: 5 0 %
3 .	T S R C	: T R I P

(10) Press **Down(↓) Direction Key** : Cursor(←) points to 2.TPOS category

▶▶▶	W a v e f o r m	R e c o r d
1 .	T Y P E	: 3 0 0 c y c l e
2 .	T P O S	: 5 0 % ←
3 .	T S R C	: T R I P

(11) Press **Right(→) Direction Key** : Cursor(←) points to 2.TPOS category, and “50” value flashes on the Display

(12) Press **Up(↑) Direction Key** to set to “80” value

(13) Press **“ENT” Key** after changing the Settings

▶▶▶	W a v e f o r m	R e c o r d
1 .	T Y P E	: 3 0 0 c y c l e
2 .	T P O S	: 8 0 % ←
3 .	T S R C	: T R I P

(14) Press **Down(↓) Direction Key** : Cursor(←) points to 3.TSRC category

▶▶▶	W a v e f o r m	R e c o r d
1 .	T Y P E	: 3 0 0 c y c l e
2 .	T P O S	: 8 0 %
3 .	T S R C	: T R I P ←

(15) Press **Right(→) Direction Key** : Cursor(←) points to 3.TSRC category, and “TRIP” value flashes on the Display

(16) Press **Down(↓) Direction Key** to set to “PKP+TRIP” value

(17) Press **“ENT” Key** after changing the Settings

▶▶▶	W a v e f o r m	R e c o r d
1 .	T Y P E	: 3 0 0 c y c l e
2 .	T P O S	: 8 0 %
3 .	T S R C	: P K P + T R I P ←

Pressing **Left(←) Direction Key** in the Waveform Record Screen will exit this menu and convert to the Upper level menu.

6.3.1.5 System ▶ COM Setting

It is a category to set RS485 communication Settings, and you can set Address, Communication speed, and Protocol types.

Selecting 5. COM from System Displays the following Display.

```
▶▶▶ C O M
1 . S L V _ A D D R : 1 ←
2 . B P S : 1 9 2 0 0
3 . P R O T O C O L : M o d B u s
```

Pressing **Left(←) Direction Key** in the COM Screen will exit this menu and covert to the Upper level menu.

System ▶ COM ▶ 1. SLV_ADDR Setting

It is a category to set Slave Address, when you use ModBus protocol, it can be set from 1 to 255.

System ▶ COM ▶ 2. BPS Setting

It is a category to set the communication speed, and you can select one among 9600, 19200, and 38400.

System ▶ COM ▶ 3. PROTOCOL Setting

It is a category to set Protocol Type, Protocol is Modbus.

6.3.1.6 System ▶ Password Setting

It is a category to change the Password Settings.

To change the Settings, you must input Password, and this is to maintain the security when changing important Settings elements.

When the product is shipped, Password is set to “0000”, and the Password can be changed to 4 digits using digits 0~9.

Selecting 7. Password category from System will Display the following Display.

```
▶▶▶ P a s s w o r d
1 . N E W P A S S : * * * * ←
```

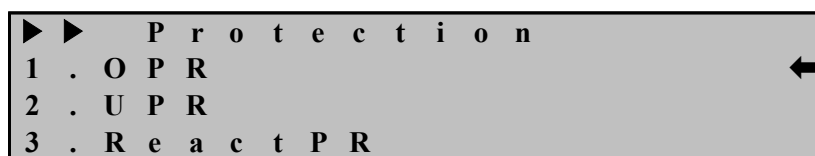
Pressing **Left(←) Direction Key** in the Password Screen will exit this menu and covert to the Upper level menu.

6.3.2 Protection Setting

Protection category is composed of R(O)PR, UPR and ReactPR that are the

categories to perform the protection functions.

Protection Screen is as follows.



Pressing **Left(←) Direction Key** in the Protection Screen will exit this menu and convert to the Upper level menu.

6.3.2.1 Protection ► OPR Setting

It is a category to set the reverse(over) power element, it can be set between 2W to 1500W with the increment of 1W, and time setting can set the Inverse Time characteristic, and Definite Time characteristic.

OPR element is designed operate accordingly through 3 phase or single phase setting from pick-up changing mode. Therefore you should be change pick-up mode setting of 3 phase, single phase accordingly when pick-up change.

The detail categories that can be set in OPR are as follows.

Contents	Range	Unit	Default	Reference
FUNCTION	Disabled, Enabled	-	Enabled	Use or not use
MODE	1Phase, 3Phase	-	3Phase	3Phase, Single Phase Setting
DIR	Forward, Reverse, Disabled	-	Forward	Direction setting
CURVE	INV1, INV2, DT	-	INV1	Inverse, Definite Time Setting
LEVEL	2 ~ 1500W	1W	750W	Pick-up value
T_DIAL	0.10 ~ 10.00	0.05	10.00	Time dial setting
DT_TIME	0.04 ~ 60.00Sec	0.01Sec	-	Definite Time setting
EXT_BLK	No, Yes	-	No	If D/I2 Trip Blocking lived, OPR Blocking

<Table 9. OPR Parameter Menus>

◆ OPR Setting Method

For example, to set PickUp value to Single 150W, Reverse, Definite Time 1.5, operate Keys as follows in the relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

- (1) Press **“SET” Key** : Display Setting Display

```
▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
```

- (2) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.Protection category

```
▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
```

- (3) Press **Right(→) Direction Key** : Display Setting ▶ Protection Display

```
▶▶   P r o t e c t i o n
1 . O P R
2 . U P R
3 . R e a c t P R
```

- (4) Press **Right(→) Direction Key** : Display Setting ▶ Protection ▶ OPR Display

```
▶▶▶   O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   3 P h a s e
3 . D I R             : F o r w a r d
```

- (5) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.Mode category

```
▶▶▶   O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   3 P h a s e
3 . D I R             : F o r w a r d
```

- (6) Press **Right(→) Direction Key** : display Password requirement category

```
E n t e r   P a s s w o r d : * * * *
```

- (7) Relay Default password is set to “0000”, so just press **“ENT” Key** :
Cursor(←) points to 2.Mode category

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   3 P h a s e ←
3 . D I R           :   F o r w a r d
    
```

- (8) Press **Right(→) Direction Key** : Cursor(←) points to 2.Mode category, and "3Phase" value flashes on the Display
- (9) Press **Down(↓) Direction Key** to set to "1Phase" value
- (10) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   1 P h a s e ←
3 . D I R           :   F o r w a r d
    
```

- (11) Press **Down(↓) Direction Key** : Cursor(←) points to 3.DIR category

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   1 P h a s e
3 . D I R           :   F o r w a r d ←
    
```

- (12) Press **Right(→) Direction Key** : Cursor(←) points to 3.DIR category, and "Forward" value flashes on the Display
- (13) Press **Up(↑) Direction Key** to set to "Reverse" value
- (14) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   1 P h a s e
3 . D I R           :   R e v e r s e ←
    
```

- (15) Press **Down(↓) Direction Key** : Cursor(←) points to 4.CURVE category

```

▶▶▶ O P R
2 . M O D E           :   1 P h a s e
3 . D I R           :   R e v e r s e
4 . C U R V E         :   I N V 1 ←
    
```

- (16) Press **Right(→) Direction Key** : Cursor(←) points to 4.CURVE category, and "INV1" value flashes on the Display
- (17) Press **Down(↓) Direction Key** to set to "DT" value
- (18) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
2 . M O D E           : 1 P h a s e
3 . D I R             : R e v e r s e
4 . C U R V E         : D T
    
```

(19) Press **Down(↓) Direction Key** : Cursor(←) points to 5.LEVEL category

```

▶▶▶ O P R
3 . D I R             : R e v e r s e
4 . C U R V E         : D T
5 . L E V E L         : 2 W
    
```

(20) Press **Right(→) Direction Key** : Cursor(←) points to 5.LEVEL category, and "2" value flashes on the Display

(21) Press **Up(↑) Direction Key** to set to "150" value

(22) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
3 . D I R             : R e v e r s e
4 . C U R V E         : D T
5 . L E V E L         : 1 5 0 W
    
```

(23) Press **Down(↓) Direction Key** : Cursor(←) points to 6.DT_TIME category

```

▶▶▶ O P R
4 . C U R V E         : D T
5 . L E V E L         : 1 5 0 W
6 . D T _ T I M E     : 0 . 0 4 s
    
```

(24) Press **Right(→) Direction Key** : Cursor(←) points to 6.DT_TIME category, and "0.04" value flashes on the Display

(25) Press **Up(↑) Direction Key** to set to "2.00" value

(26) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
4 . C U R V E         : D T
5 . L E V E L         : 1 5 0 W
6 . D T _ T I M E     : 2 . 0 0 s
    
```

Pressing **Left(←) Direction Key** in the OPR Screen will exit this menu and convert to the Upper level menu.

6.3.2.2 Protection ▶ UPR Setting

It is a category to set the under power element, it can be set between 2W to 900W with the increment of 1W, and time setting can set the Reverse Inverse Time

characteristic, and Definite Time characteristic.

UPR element is designed operate accordingly through 3 phase or single phase setting from pick-up changing mode. Therefore you should be change pick-up mode setting of 3 phase, single phase accordingly when pick-up change.

The detail categories that can be set in UPR are as follows.

Contents	Range	Unit	Default	Reference
FUNCTION	Disabled, Enabled	-	Enabled	Use or not use
MODE	1Phase, 3Phase	-	3Phase	3Phase, Single Phase Setting
DIR	Forward, Reverse, Disabled	-	Forward	Direction setting
CURVE	Inverse, DT	-	Inverse	Reverse Inverse Time, Definite Time setting
LEVEL	2 ~ 900W	1W	450W	Pick-up value
T_DIAL	0.10 ~ 10.00	0.05	10.00	Time dial setting
DT_TIME	0.04 ~ 60.00Sec	0.01Sec	-	Definite Time setting
EXT_BLK	No, Yes	-	No	If D/I2 Trip Blocking lived, UPR Blocking

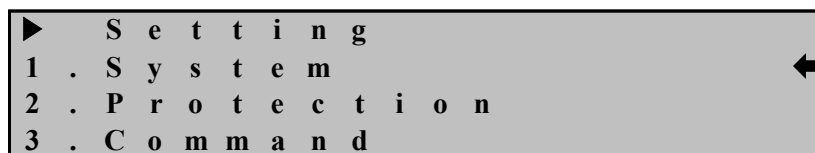
<Table 10. UPR Parameter Menus>

◆ UPR Setting Method

For example, to set PickUp value to 3Phase 150W, Reverse, Definite Time 1.00Sec, operate Keys as follows in the relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

- (1) Press **“SET” Key** : Display Setting Display



- (2) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.Protection category

```

▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
    
```

(3) Press **Right(→) Direction Key** : Display Setting ▶ Protection

```

▶▶   P r o t e c t i o n
1 . O P R
2 . U P R
3 . R e a c t P R
    
```

(4) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.UPR category

```

▶▶   P r o t e c t i o n
1 . O P R
2 . U P R
3 . R e a c t P R
    
```

(5) Press **Right(→) Direction Key** : display Setting ▶ Protection ▶ UPR Display

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           : 1 P h a s e
3 . D I R             : F o r w a r d
    
```

(6) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.UPR category

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           : 1 P h a s e
3 . D I R             : F o r w a r d
    
```

(7) Press **Right(→) Direction Key** : display Password requirement category

```

E n t e r   P a s s w o r d : * * * *
    
```

(8) Relay Default password is set to "0000", so just press **"ENT" Key** :
 Cursor(←) points to 2.Mode category

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           : 1 P h a s e
3 . D I R             : F o r w a r d
    
```

(9) Press **Right(→) Direction Key** : Cursor(←) points to 2.Mode category, and
 "1Phase" value flashes on the Display

(10) Press **Down(↓) Direction Key** to set to “3Phase” value

(11) Press **“ENT” Key** after changing the Settings

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   3 P h a s e ←
3 . D I R             :   F o r w a r d
    
```

(12) Press **Down(↓) Direction Key** once : Cursor(←) points to 3.DIR category

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   1 P h a s e
3 . D I R             :   F o r w a r d ←
    
```

(13) Press **Right(→) Direction Key** : Cursor(←) points to 3.DIR category, and "Forward" value flashes on the Display

(14) Press **Down(↓) Direction Key** to set to “Reverse” value

(15) Press **“ENT” Key** after changing the Settings

```

▶▶▶   U P R
1 . F U N C T I O N : E n a b l e d
2 . M O D E           :   3 P h a s e
3 . D I R             :   R e v e r s e ←
    
```

(16) Press **Down(↓) Direction Key** once : Cursor(←) points to 4.CURVE category

```

▶▶▶   U P R
2 . M O D E           :   3 P h a s e
3 . D I R             :   R e v e r s e
4 . C U R V E         :   I n v e r s e ←
    
```

(17) Press **Right(→) Direction Key** : Cursor(←) points to 4.CURVE category, and "Forward" value flashes on the Display

(18) Press **Down(↓) Direction Key** to set to “DT” value

(19) Press **“ENT” Key** after changing the Settings

```

▶▶▶   U P R
2 . M O D E           :   3 P h a s e
3 . D I R             :   R e v e r s e
4 . C U R V E         :   D T ←
    
```

(20) Press **Down(↓) Direction Key** once : Cursor(←) points to 5.LEVEL category

```

▶▶▶   U P R
3 . D I R             :   R e v e r s e
4 . C U R V E         :   D T
5 . L E V E L         :           2 W ←
    
```

- (21) Press **Right(→) Direction Key** : Cursor(←) points to 5.LEVEL category, and "2" value flashes on the Display
- (22) Press **Down(↓) Direction Key** to set to "120" value
- (23) Press **"ENT" Key** after changing the Settings

```

▶▶▶ U P R
3 . D I R           : R e v e r s e
4 . C U R V E       :   D T
5 . L E V E L       :   1 2 0   W ←
    
```

- (24) Press **Down(↓) Direction Key** once : Cursor(←) points to 6.DT_TIME category

```

▶▶▶ U P R
4 . C U R V E       :   D T
5 . L E V E L       :   1 2 0   W
6 . D T _ T I M E   :   0 . 0 4   s ←
    
```

- (25) Press **Right(→) Direction Key** : Cursor(←) points to 6.DT_TIME category, and "0.04" value flashes on the Display
- (26) Press **Down(↓) Direction Key** to set to "1.00" value
- (27) Press **"ENT" Key** after changing the Settings

```

▶▶▶ U P R
4 . C U R V E       :   D T
5 . L E V E L       :   1 2 0   W
6 . D T _ T I M E   :   1 . 0 0   s ←
    
```

Pressing **Left(←) Direction Key** in the UPR Screen will exit this menu and convert to the Upper level menu.

6.3.2.3 Protection ▶ ReactPR Setting

It is a category to set the complex power element, it can be set between 2Var to 900Var with the increment of 1Var, and time setting can set the Inverse Time characteristic, and Definite Time characteristic.

You should be set single phase pick-up value When pick up change because of ReactPR element is designed to operate single phase.

The detail categories that can be set in ReactPR are as follows.

Contents	Range	Unit	Default	Reference
FUNCTION	Disabled, Enabled	-	Enabled	Use or not use
DIR	Forward, Reverse, Disabled	-	Forward	Direction setting
CURVE	Inverse, DT	-	Inverse	Inverse Time, Definite Time setting
LEVEL	2 ~ 900Var	1Var	450Var	Pickup Value
T_DIAL	0.10 ~ 10.00	0.05	10.00	Time dial setting
DT_TIME	0.04 ~ 60.00Sec	0.01Sec	-	Definite Time Setting
EXT_BLK	No, Yes	-	No	If D/I2 Trip Blocking lived, ReactPR Blocking

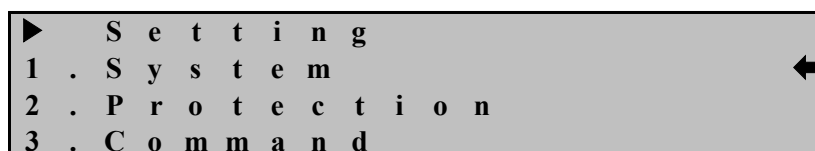
<Table 11. ReactPR Parameter Menus>

◆ ReactPR Setting Method

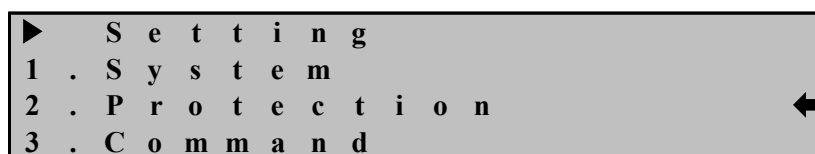
For example, to set pick-up value of ReactPR to 90Var, Reverse, Definite time 1.50Sec, operate Keys as follows in the Relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

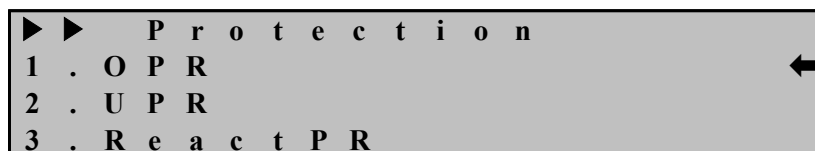
(1) Press **“SET” Key** : Display Setting Display



(2) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.Protection category



(3) Press **Right(→) Direction Key** : display Setting ▶ Protection Display



(4) Press **Up(↑) Direction Key** once : Cursor(←) points to 3.ReactPR category

```
▶▶ Protection
1 . O P R
2 . U P R
3 . R e a c t P R ←
```

(5) Press **Right(→) Direction Key** : display Setting ▶ Protection ▶ ReactPR Display

```
▶▶▶ ReactPR
1 . F U N C T I O N : E n a b l e d ←
2 . D I R : F o r w a r d
3 . C U R V E : I n v e r s e
```

(6) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.DIR category

```
▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . D I R : F o r w a r d ←
3 . C U R V E : I n v e r s e
```

(7) Press **Right(→) Direction Key** : display Password requirement category

```
E n t e r P a s s w o r d : * * * *
```

(8) Relay Default password is set to "0000", so just press **"ENT" Key** :
Cursor(←) points to 2.DIR category

```
▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . D I R : F o r w a r d ←
3 . C U R V E : I n v e r s e
```

(9) Press **Right(→) Direction Key** : Cursor(←) points to 2.DIR category, and
"Forward" value flashes on the Display

(10) Press **Down(↓) Direction Key** to set to "Reverse" value

(11) Press **"ENT" Key** after changing the Settings

```
▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . D I R : R e v e r s e ←
3 . C U R V E : I n v e r s e
```

(12) Press **Down(↓) Direction Key** : Cursor(←) points to 3.MODE category

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . D I R           : R e v e r s e
3 . C U R V E      : I n v e r s e ←
    
```

(13) Press **Right(→) Direction Key** : Cursor(←) points to 3.CURVE category, and "Inverse" value flashes on the Display

(14) Press **Up(↑) Direction Key** to set to "DT" value

(15) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
1 . F U N C T I O N : E n a b l e d
2 . D I R           : R e v e r s e
3 . C U R V E      : D T ←
    
```

(16) Press **Down(↓) Direction Key** : Cursor(←) points to 4.LEVEL category

```

▶▶▶ O P R
2 . D I R           : R e v e r s e
3 . C U R V E      : D T
4 . L E V E L      : 2 v a r ←
    
```

(17) Press **Right(→) Direction Key** : Cursor(←) points to 4.LEVEL category, and "2" value flashes on the Display

(18) Press **Up(↑) Direction Key** to set to "90" value

(19) Press **"ENT" Key** after changing the Settings

```

▶▶▶ O P R
2 . D I R           : R e v e r s e
3 . C U R V E      : D T
4 . L E V E L      : 9 0 v a r ←
    
```

(20) Press **Down(↓) Direction Key** : Cursor(←) points to 5.DT_TIME category

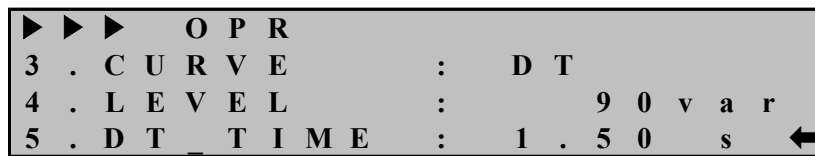
```

▶▶▶ O P R
3 . C U R V E      : D T
4 . L E V E L      : 9 0 v a r
5 . D T _ T I M E : 0 . 0 4 s ←
    
```

(21) Press **Right(→) Direction Key** : Cursor(←) points to 5.DT_TIME category, and "0.04" value flashes on the Display

(22) Press **Up(↑) Direction Key** to set to "1.50" value

(23) Press **"ENT" Key** after changing the Settings



Pressing **Left(←) Direction Key** in the ReactPR Screen will exit this menu and covert to the Upper level menu.

6.3.3 Command

Command category is composed of the categories such as Event Data Delete, Waveform Data Delete, Output Contact Test, Front Side Panel Test, and Reclosing interface Test, etc.

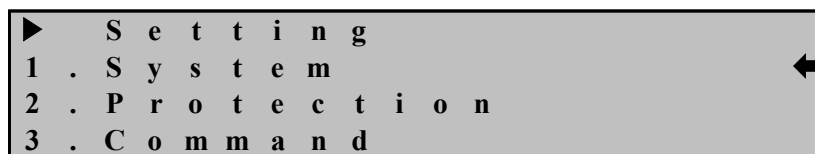
6.3.3.1 Command ▶ Event Clear

It is a category to delete Event Data stored.

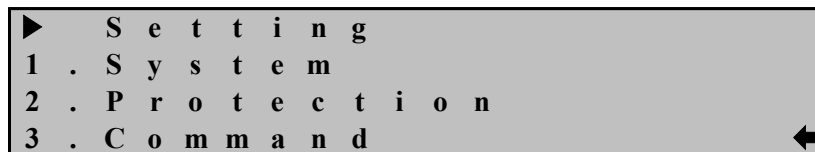
To delete an Event Data, operate Keys as follows from the relay Default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

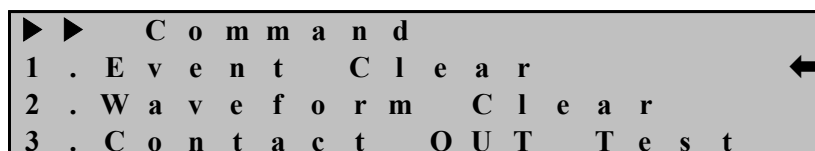
- (1) Press **“SET” Key** : display Setting Display



- (2) Press **Up(↑) Direction Key** once : Cursor(←) points to 3.Command category



- (3) Press **Right(→) Direction Key** : display Setting ▶ Command Display



- (4) Press **Right(→) Direction Key** : display Password requirement category

```
E n t e r   P a s s w o r d : * * * *
```

(5) Relay Default password is set to "0000", so just press "ENT" Key :
Cursor(←) points to 1.Event Clear category

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r   ←
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
```

(6) Press Right(→) Direction Key : "No" value flashes on the Display

```
▶▶▶   E v e n t   C l e a r
      C l e a r   A l l   E v e n t s ?
              N o
```

(7) Press Down(↓) Direction Key to set to "Yes" value

(8) Press "ENT" Key after changing the Settings

```
▶▶▶   E v e n t   C l e a r
      C l e a r   A l l   E v e n t s ?
      A l l   C l e a r e d .
```

(9) Automatically converts to Setting ▶ Command Display

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r   ←
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
```

Pressing Left(←) Direction Key in the Command Screen will exit this menu and convert to the Upper level menu.

6.3.3.2 Command ▶ Waveform Clear

It is a category that can delete Waveform Data stored.

To delete a Waveform Data, operate Keys as follows from the relay Default Display.
If the Default Screen is not Displayed on the Relay LCD, press Left(←) Direction Key about 3 times.

- (1) Press **“SET” Key** : display Setting Screen

```
▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
```

- (2) Press **Up(↑) Direction Key** once : Cursor(←) points to 3.Command category

```
▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
```

- (3) Press **Right(→) Direction Key** : display Setting ▶ Command Display

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
```

- (4) Press **Down(↓) Direction Key** once : Cursor(←) points to 2.Waveform Clear category

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
```

- (5) Press **Right(→) Direction Key** : display Password requirement category

```
E n t e r   P a s s w o r d : * * * *
```

- (6) Relay Default password is set to “0000”, so just press **“ENT” Key** :
Cursor(←) points to 2. Waveform Clear category

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
```

- (7) Press **Right(→) Direction Key** : "No" value flashes on the Display


```
▶▶▶ W a v e f o r m C l e a r
C l e a r A l l W a v e f o r m ?
      N o
```

- (8) Press **Down(↓) Direction Key** to set to “Yes” value
- (9) Press **“ENT” Key** after changing the Settings

```
▶▶▶ W a v e f o r m C l e a r
C l e a r A l l W a v e f o r m ?
      A l l C l e a r e d .
```

- (10) Automatically converts to Setting ▶ Command Display

```
▶▶ C o m m a n d
1 . E v e n t C l e a r
2 . W a v e f o r m C l e a r ←
3 . C o n t a c t O U T T e s t
```

Pressing **Left(←) Direction Key** in the Command Screen will exit this menu and convert to the Upper level menu.

6.3.3.3 Command ▶ Contact OUT Test

When performing Contact OUT Test, to let the user know that it is performing Contact OUT Test currently, the "RUN" LED flashes on the relay front side, and during the Contact OUT Test, the set value in T/S Output is maintained the same. That is, if **T/S#8(b contact)** is set as “**SYS_ERR**”, when the relay is normal, TS#8 is displayed as “Ene” and stays as a contact, but if you want to send System Error signal through Contact OUT Test, when T/S#8 is changed to "DeE", the signal is out as it is changed to b contact.

When the contact is activated(Ene), a contact changes to b contact, and b contact to a contact, and when the contact is deactivated(DeE), they return to the original contact types.

If the contacts are operating normally, whenever it changes to "Ene" or "DeE", "click" sounds.

If there is no sound, measure the resistance value when it changes from "Ene" to "DeE" using resistance probe, and if the resistance value does not change when the contact is changed, the output contact is in fault, so the output contact should be replaced.

To Test output of T/S#01 and T/S#02 contacts, operate Keys as follows in the relay default Display.

If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

(1) Press **“SET” Key** : display Setting Display

```

▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
    
```

(2) Press **Up(↑) Direction Key** once : Cursor(←) points to 3.Command category

```

▶   S e t t i n g
1 . S y s t e m
2 . P r o t e c t i o n
3 . C o m m a n d
    
```

(3) Press **Right(→) Direction Key** : display Setting ▶ Command Display

```

▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
    
```

(4) Press **Down(↓) Direction Key** twice : Cursor(←) points to 3.Contact OUT Test category

```

▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r
3 . C o n t a c t   O U T   T e s t
    
```

(5) Press **Right(→) Direction Key** : display Setting ▶ Command ▶ Contact OUT Test Display

```

▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : D e E
2 . T / S # 0 2           : D e E
3 . T / S # 0 3           : D e E
    
```

(6) Press **Right(→) Direction Key** : display Password requirement category

```
E n t e r   P a s s w o r d : * * * *
```

(7) Relay Default password is set to "0000", so just press "ENT" Key :
 Cursor(←) points to 1.T/S#01 category

```
▶▶   C o m m a n d
1 . E v e n t   C l e a r
2 . W a v e f o r m   C l e a r   ←
3 . C o n t a c t   O U T   T e s t
```

(8) Press Right(→) Direction Key : "DeE" value flashes on the Display

```
▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : D e E   ←
2 . T / S # 0 2           : D e E
3 . T / S # 0 3           : D e E
```

(9) Press Down(↓) Direction Key : "Ene" value flashes on the Display

```
▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : E n e   ←
2 . T / S # 0 2           : D e E
3 . T / S # 0 3           : D e E
```

(10) When T/S#01 contact is output, press Left(←) Direction Key

```
▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : D e E   ←
2 . T / S # 0 2           : D e E
3 . T / S # 0 3           : D e E
```

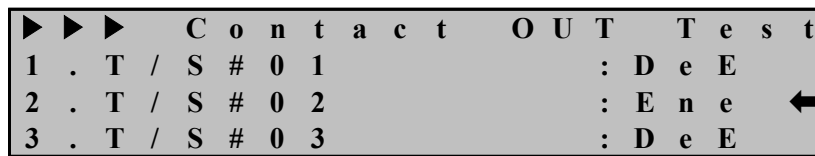
(11) Press Down(↓) Direction Key once : Cursor(←) points to 2.T/S#02 category

```
▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : D e E
2 . T / S # 0 2           : D e E   ←
3 . T / S # 0 3           : D e E
```

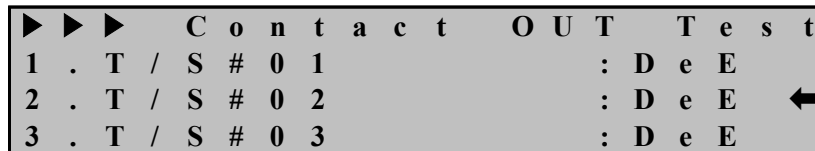
(12) Press Right(→) Direction Key : "DeE" value flashes on the Display

```
▶▶▶   C o n t a c t   O U T   T e s t
1 . T / S # 0 1           : D e E
2 . T / S # 0 2           : D e E   ←
3 . T / S # 0 3           : D e E
```

(13) Press Down(↓) Direction Key : "Ene" value flashes on the Display



(14) When T/S#02 contact is output, press **Left(←) Direction Key**

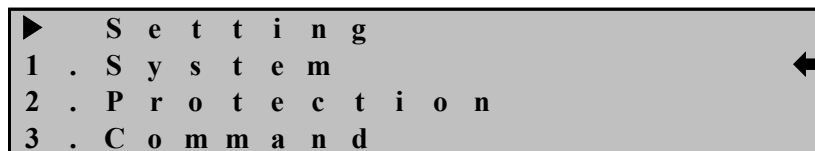


Pressing **Left(←) Direction Key** in the Contact OUT Test Screen will exit this menu and convert to the Upper level menu.

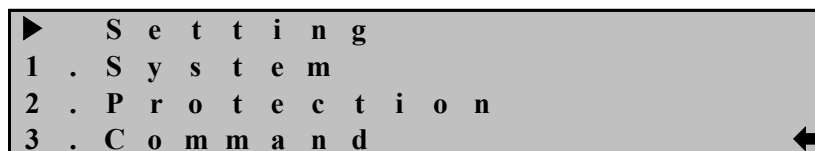
6.3.3.4 Command ▶ Panel Test

It is a category to check the normality of LCD and LED on the relay front side. To perform Panel Test, operate Keys as follows in the relay default screen. If the Default Screen is not Displayed on the Relay LCD, press **Left(←) Direction Key** about 3 times.

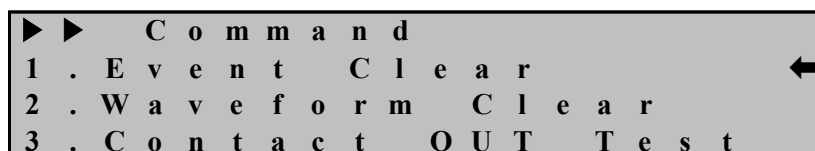
(1) Press **“SET” Key** : display Setting Display



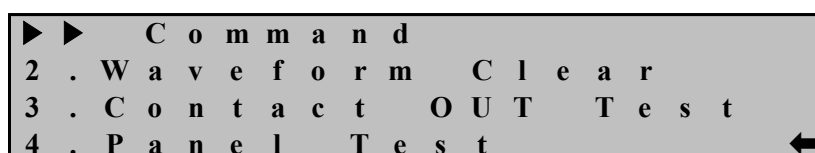
(2) Press **Up(↑) Direction Key** once : Cursor(←) points to 3.Command category



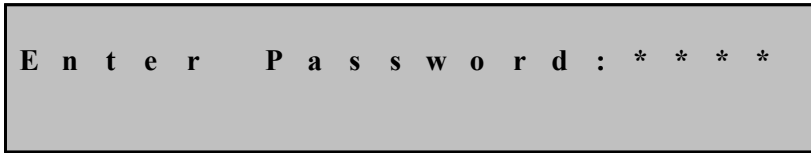
(3) Press **Right(→) Direction Key** : display Setting ▶ Command Display



(4) Press **Up(↑) Direction Key** once : Cursor(←) points to 4.Panel Test category

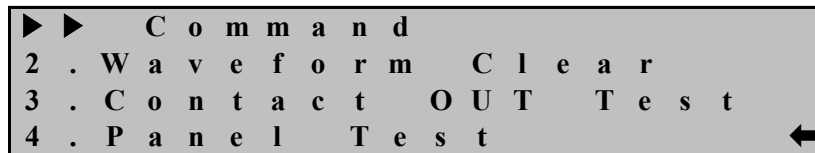


(5) Press **Right(→) Direction Key** : display Password requirement category



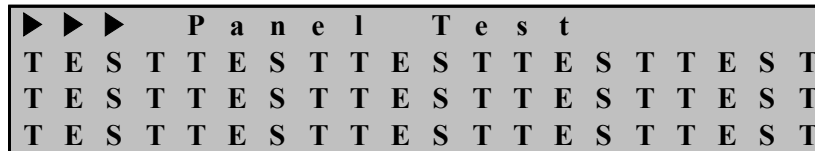
E n t e r P a s s w o r d : * * * *

(6) Relay Default password is set to "0000", so just press **"ENT" Key** :
Cursor(←) points to 4.Panet Test category

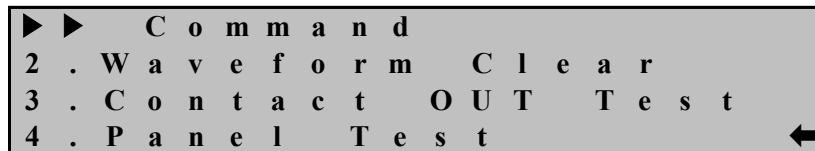


▶ ▶ C o m m a n d
2 . W a v e f o r m C l e a r
3 . C o n t a c t O U T T e s t
4 . P a n e l T e s t ←

(7) Press **Right(→) Direction Key** : "TEST" flashes 3 times on all LED and LCD except Power LED, and automatically converts to Setting ▶ Command Display



▶ ▶ ▶ P a n e l T e s t
T E S T T E S T T E S T T E S T T E S T
T E S T T E S T T E S T T E S T T E S T
T E S T T E S T T E S T T E S T T E S T



▶ ▶ C o m m a n d
2 . W a v e f o r m C l e a r
3 . C o n t a c t O U T T e s t
4 . P a n e l T e s t ←

Pressing **Left(←) Direction Key** in the Command Screen will exit this menu and covert to the Upper level menu.

If LEDs except Power LED does not flash, that LED needs to be repaired.

Initial Display	Setting (SET)	1. System	1. Power System	1. FREQ		50Hz or 60Hz	
				2. P_PT_PRI		0.01 ~ 600.00V (0.1V Step)	
				3. P_PT_SEC		50.0 ~ 240.0 : 1 (0.1 Step)	
				4. P_CT_RAT		5 ~ 30000 : 5 (5 Step)	
			2. T/S	T/S#01 ~ T/S#08	1. CON	OFF, SYS_ERR, PROT_OR, OPR_OR, OPR_A, OPR_B, OPR_C, UPR_OR, UPR_A, UPR_B, UPR_C, RePR_OR, RePR_A, RePR_B, RePR_C, PR_A_OR, PR_B_OR, PR_C_OR, OPR+UPR, OPR+RePR, UPR+RePR	
						2. RST	Self or Manual
							3. DLY
			3. RTC			YYYY/MM/DD/HH:MM:SS 년 / 월 / 일 / 시 : 분 : 초	
			4. Waveform Record	1. TYPE		150cycle, 300cycle	
				2. TPOS		0 ~ 99% (1% Step)	
				3. TSRC		TRIP, EXT_L_H, EXT_H_L, TRIP+EXT PKP, PKP+TRIP	
			5. COM	1. SLV_ADDR		1 ~ 254	
				2. BPS		9600, 19200, 38400	
				3. PROTOCOL		ModBus	
			6.Password			New Password : ****	

I n i t i a l D i s p l a y	Setting (SET)	2. Protection	1. OPR	1. FUNCTION	Enabled or Disabled
				2. MODE	1Phase or 3Phase
				3. DIR	Forward or Reverse or Disabled
				4. CURVE	INV1, INV2, DT
				5. PICKUP	2 ~ 1500W (1W Step)
				6. T_DIAL	0.10 ~ 10.00 (0.05 Step)
				7. DT_TIME	0.04 ~ 60.00Sec (0.01Sec Step)
				8. BLOCK	Yes or No
		2. UPR	1. FUNCTION	Enabled or Disabled	
			2. MODE	1Phase or 3Phase	
			3. DIR	Forward or Reverse or Disabled	
			4. CURVE	Inverse, DT	
			5. PICKUP	2 ~ 900W (1W Step)	
			6. T_DIAL	0.10 ~ 10.00 (0.05 Step)	
			7. DT_TIME	0.04 ~ 60.00Sec (0.01Sec Step)	
			8. OP_MODE	Induct. or Digital	
			9. BLOCK	Yes or No	
		3.ReactPR	1. FUNCTION	Enabled or Disabled	
			2. DIR	Forward or Reverse or Disabled	
			3. CURVE	Inverse, DT	
			4. PICKUP	2 ~ 900Var (1Var Step)	
			5. T_DIAL	0.10 ~ 10.00 (0.05 Step)	
			6. DT_TIME	0.04 ~ 60.00Sec (0.01Sec Step)	
			7. BLOCK	Yes or No	
		3. Command	1. Event Clear	Clear All Event? Yes or No	
			2. Waveform Clear	Clear All Waveform? Yes or No	
			3. Contact OUT Test	Cont OUT#01 ~ 08 Test Ene or DeE	
			4. Panel Test		

<Table 12. Setting Menus>

7. PC Software

PC Software is an Application Software designed to use this relay(GD3-P11) conveniently using PC or Notebook.

PC Software is composed of KBIED_MNE and KbCanes.

KBIED_MNE has the functions such as relay setting and file storage, Verification and Text file type storage of Event Data, Verification and Comtrade file Type Storage of Fault Waveform(Waveform Data), Verification of each Phase Voltage and Line-line Voltage, Sequence voltage, Frequency, Frequency input voltage and Monitoring the relay element operation status and relay self diagnosis status.

KbCanes can verify and analyze the fault wave forms, that are stored in Comtrade File type by the relay using KBIED_MNE, in the Graphic mode.

The fault wave forms stored in the relay are Digital signals converted from Analog signals through A/D Converter after the voltage input to the relay passed through the Analog Filter inside the relay.

The fault waveform is 32 Samples per 1 Cycle, and KbCanes expresses the waveform in Graphic form using the Digital signal.

7.1 KBIED_MNE

As you can set various settings and system configuration related settings in menu of the K-PAM F300 relay itself, you can set collectively from remote PC or notebook using this KBIED_MNE.

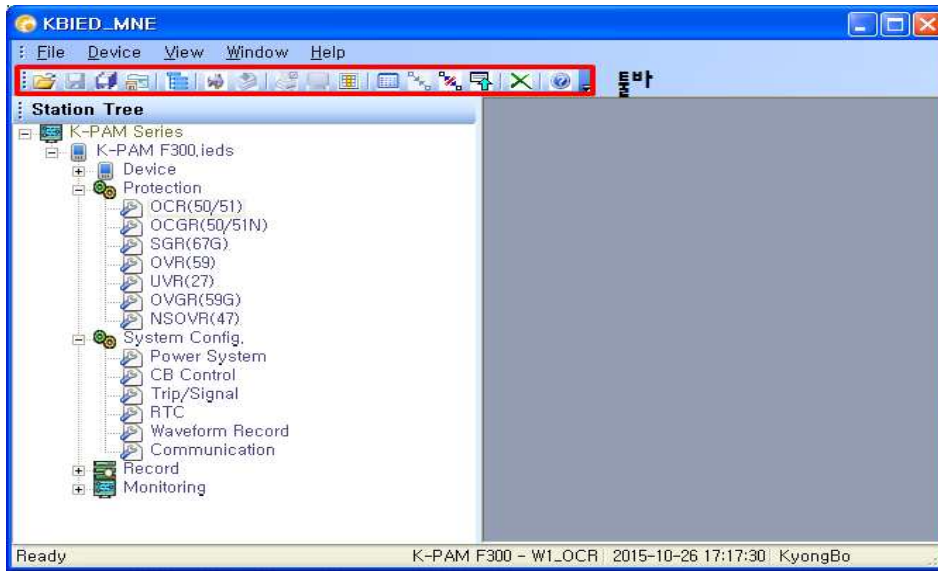
You can use KBIED_MNE in not only RS-232C communications, but also RS-485 communications, and you need to change the protocol to ModBus when using RS-485 communications.

When you change the settings in the relay, you have to repeat the changing work for each category, but if you use KBIED_MNE, you can work collectively, and you can also store the contents of the changes as a file, so you can change more conveniently when you work on the same task.

7.1.1 Application Software Program Install Method

To install the application software program, download KBIED_MNE_SETUP.zip from KyongBo Electric Homepage. If you unzip it, KBIED_MNE setup folder will appear.
















Double click on the **Setup.Exe** file and install the program. After the installation is completed, to execute Setting Tool Program, double click on the **KBIED_MNE.exe** file of the wallpaper. When KBIED_MNE is run, the following screen appears.



<Figure 11. KBIED_MNE Initial Display>

7.1.2 KBIED_MNE Program Menu

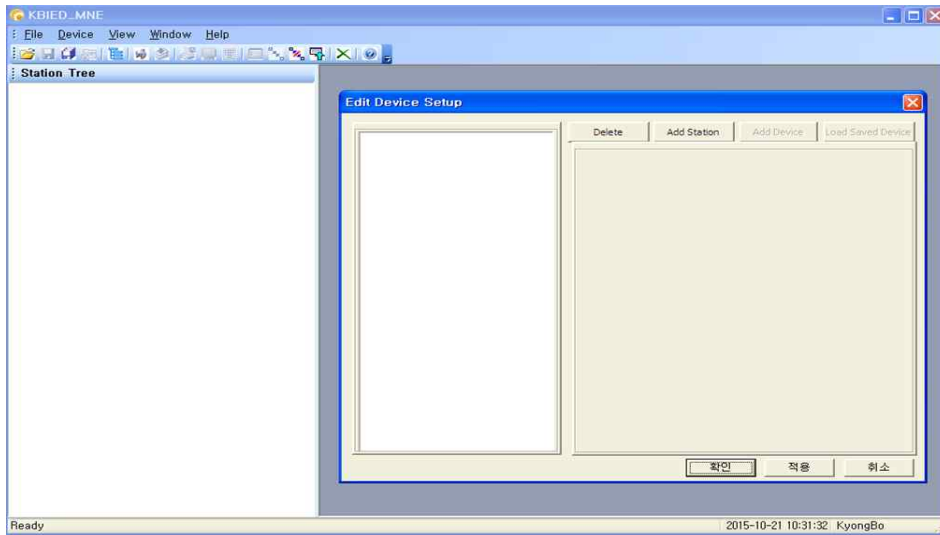
The basic menu of KBIED_MNE is largely divided to Protection element Setting, Setting Menu related System, Monitoring of the Relay measurement and status, and please refer to the following table for details.

● Program Menu	
 Open Project	Load the saved project file.
 Save Device	Save setting for Protection element and system setting
 Save All	Save all changes to protection elements and setting in all open window
 Save Project	Save Project tree of left window
 Edit Devices	Add, delete or change protection relays to the project.
 Direct Connect	it is used for direct connection with protection relay.
 Write Device Saved Settings File (PC→Device)	Transmits Setting changes of System and Protection to the Relay
 Print	Print the saved data.
 Compare Device Settings with Settings File	Compares the data of relay with the data saved in the pc.
 Export Setting File	Save the setting value as a TEXT document.
 Connect Status/Metering	Connect communication to verify status and measurement.
 Disconnect Status/Metering	Disconnect communication
 Relay → PC	Automatically reads the setting value saved in the relay
 Close All Windows	close all pop-up windows.
 Customer support	The menu is informed company website and email address

<Table 13. KBIED_MNE Program Menus>

7.1.3 Create Project (Edit Devices)

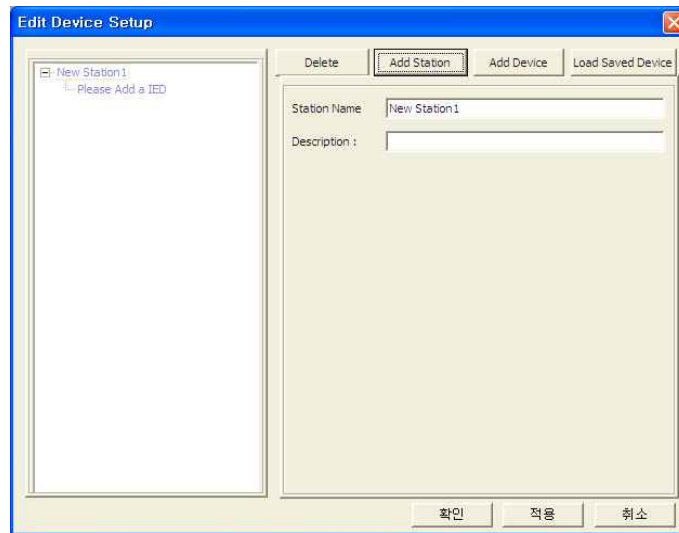
KBIED_MNE can manage the protection relay file as much as you want by using one project file. To create a project file, first select the Edit Devices menu and a window will be created to add, delete or modify the protection relay as shown below.



<Figure 12. Edit Devices Screen>

7.1.3.1 Station

If you press 'Add Station' button in Edit Devices window, information for creating station appears as below picture. And enter station name will create station in the left window.



<Figure 13. Edit Devices - Station Screen>

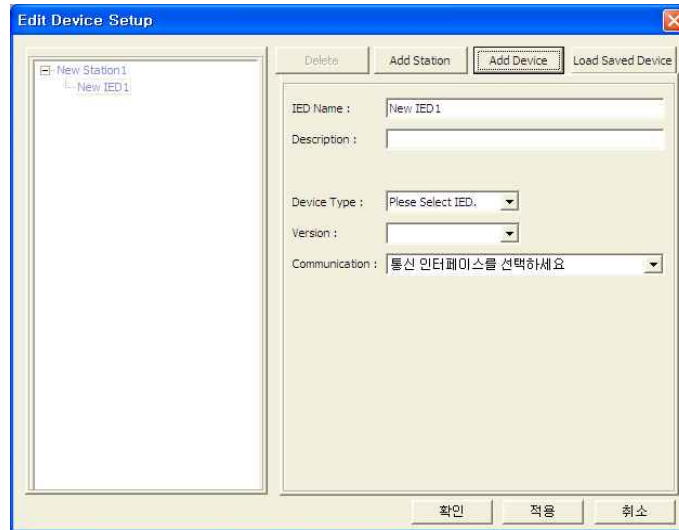
7.1.3.2 Device

If 'Add Device' is pressed as shown in the figure below, information for creating a protection relay will be displayed. Enter information for the protection relay and selecting communication interface. Than Input information for setting the corresponding

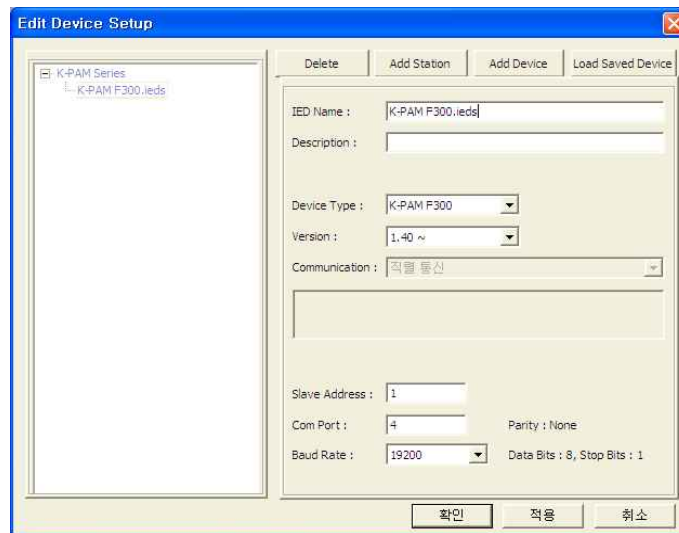
communication interface appears.

1	IED name	Set the name of protection relay.	
2	Description	Describes the devices.	
3	Device Type	Define the type of protection relay.	
4	Version	Determines the version of the selected protection relay.	
5	Communication	Select the communication interface.	
6	Serial Comm.	Slave Address	Slave address of protection relay for modbus communication
		Com Port	Select the Com Port of the PC to communicate with the protection relay.
		Baud Rate	Decide the communication speed.

<Table 14. Device input information>



<figure 14-1. Edit Devices - Device screen>



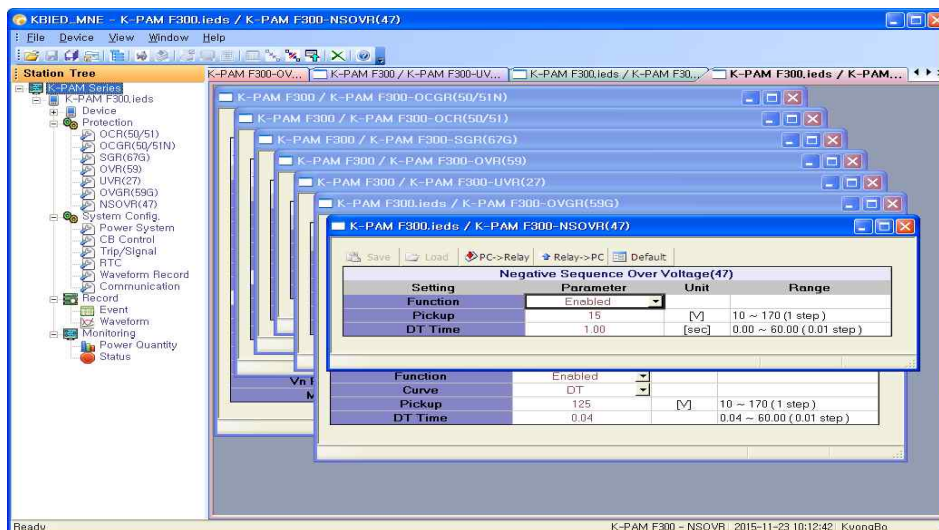
<figure 14-2. Edit Devices - Device screen>

7.1.3.3 Project window

When you complete Edit Devices, the Project Tree is created in the left window as shown below. In the Project Tree, the Device displays information such as Type, Version, Description, Communication Interface, Storage Path, etc. that inform the information of the protection relay.

In addition, the correction tree menu such as Protection, System Config., Record, Monitoring which can change the setting value of protection relay appears.

When you want to view or correct the information, double click the menu tree to display the corresponding window.



<figure 15. Project Tree screen>

7.1.3.4 Save/Open Project

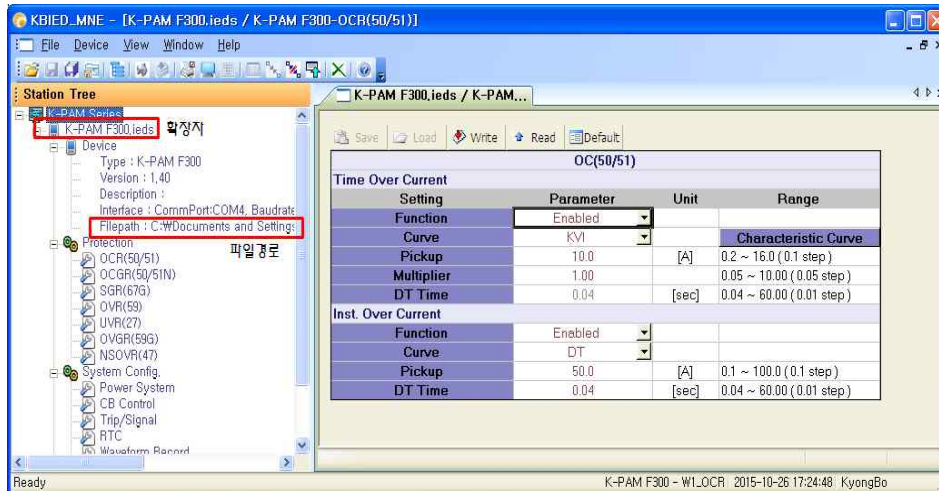
The Project Tree in the left window can be saved / opened and can be accessed from the File - Save / Open Project menu.

The saved project file only saves the project tree of the explorer. To save the setting of the protection relay, you can save it using Device Save menu.

Device save is described in "7.1.3.5 Device Save" below.

The Device in the Project Tree can be checked whether it is actually stored in the device or not in the search window. This can be identified by the presence of ".ieds" in the device name. That is, if you have the extension ".ieds", then the file with that name exists.

The location of the saved device file appears in the Device - Filepath of the Project Tree.

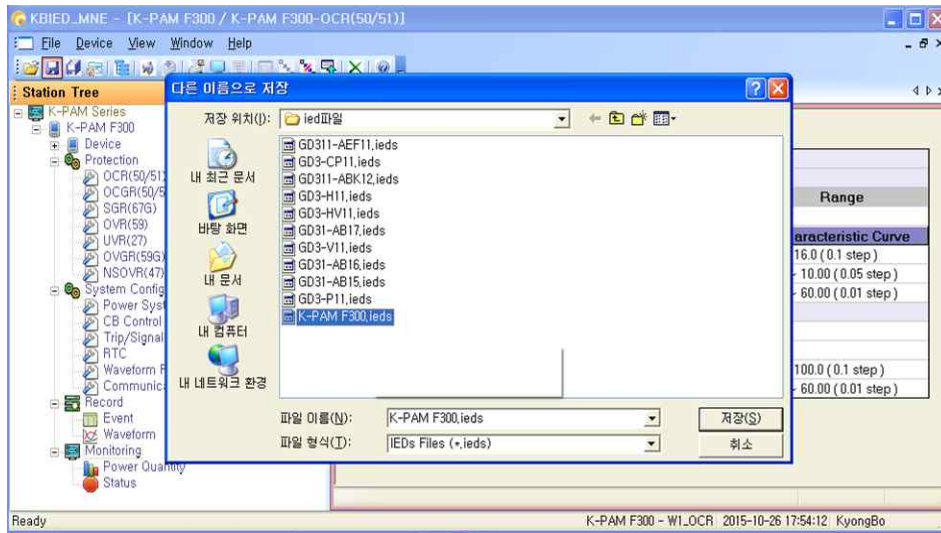


<figure 16. Project save screen>

7.1.3.5 Save Device

To save the Device file, double-click the desired correction item in the Device Tree.

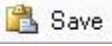
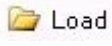
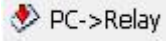
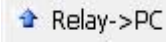
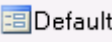
Select Device Save from the File menu and save using the file save window, then the value of the current window is saved. Other setting are saved as the product shipping setting value. Refer to "7.1.3.6 Setting Window Menu"



<figure 17. Device save screen>

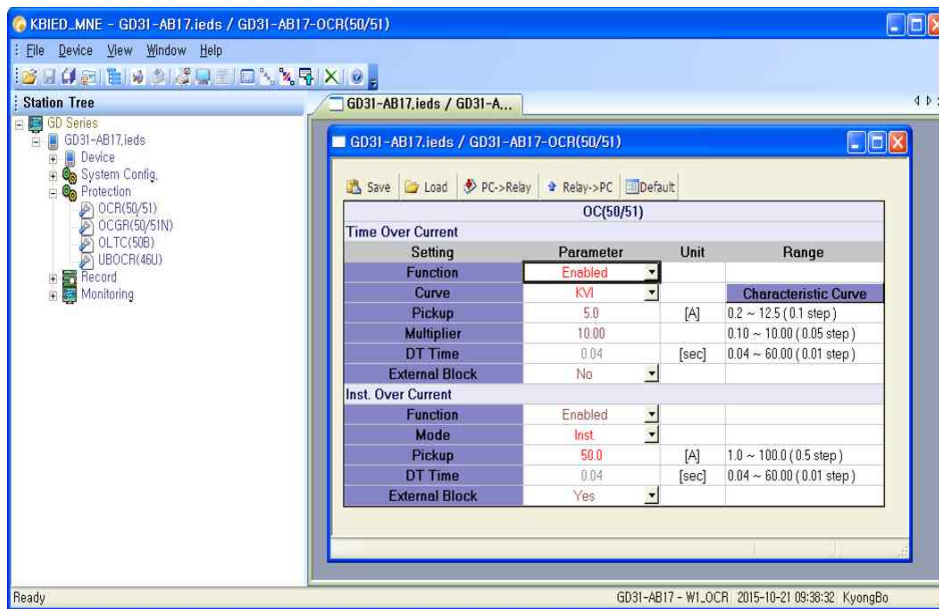
7.1.3.6 Setting window menu

The setting of Device in the search window create windows individually. Save / Load / PC → Relay / Relay → PC / Default is independent for each window.

1		Save the window. After saving, change setting item to brown.
2		The saved data of the window is loaded. After loading, change setting item to brown.
3		Write the setting data to Device. After write, change setting item to blue
4		Read the setting data from Device After read, change setting item to blue
5		Change the setting data to the product shipping setting value. After change, change to black

<table 15. Device setting window menu information>

The items changed by the user will change to red as shown below.



<figure 18. setting window menu screen>

7.1.4 Direct Connect

This function is used to connect the protection relay immediately without creating a Project file. The setting data is the same as the communication setting in Device creation.

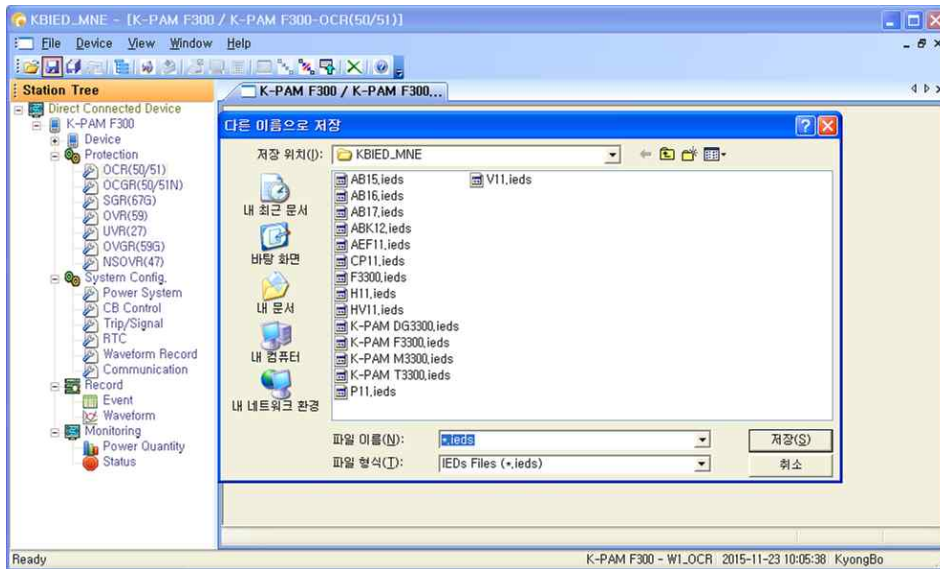
If the communication port can not be used by another device, another Com-Port can be selected. The communication port can be used by selecting one of 15 ports.

In addition, RS-232C communication protocol uses ModBus, KBIED_MNE can be used in RS-485 communication.

If you want to use KBIED_MNE in RS-485 communication, first set the relay's address, Connect the RS-485 converter to the RS-232C connector of the notebook and connect it to the RS-485 terminal (51, 52, 53) of the relay.



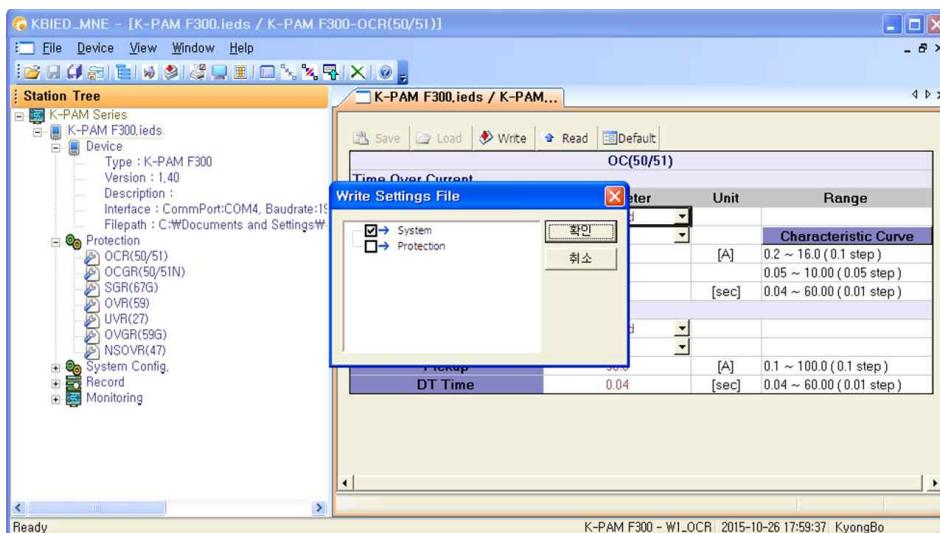
<figure 19-1. Direct Connect>



<figure 19-2. Direct Connect ' Save Device '>

7.1.5 Write Device saved Settings Files(PC→Device)

This function is used to download all corrected data from the PC to the protection relay at one time (PC → Device). In the project tree, right-click the saved device ('. Ieds') you wish to download (PC → Device) and use the popup menu or click the saved device ('. Ieds' Files ", you will see an option window to download (PC → Device) as shown below. Press the OK button to download the saved device file from the PC to the Device (Protection Relay) (PC → Device).



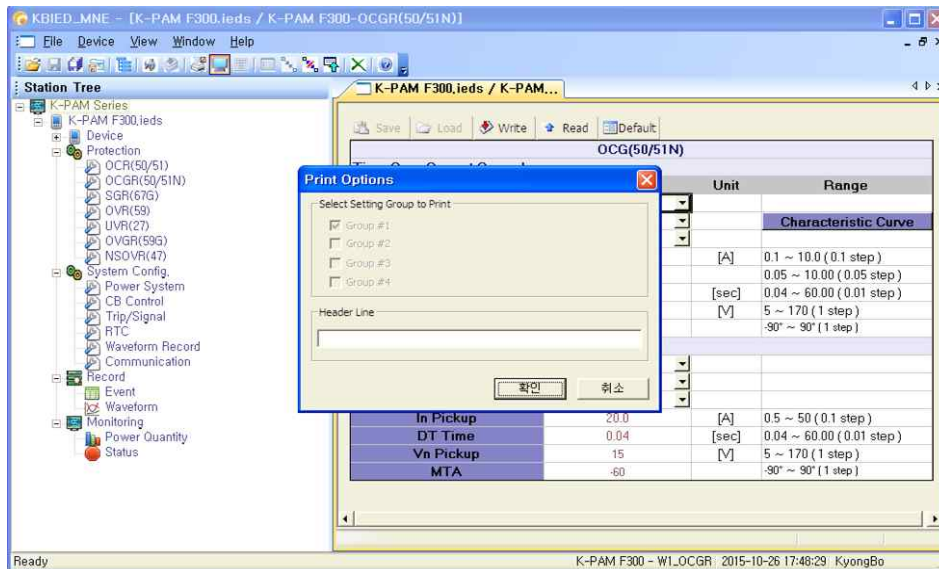
<figure 20. Write device saved setting files (PC→Device)>

7.1.6 Print/Print preview

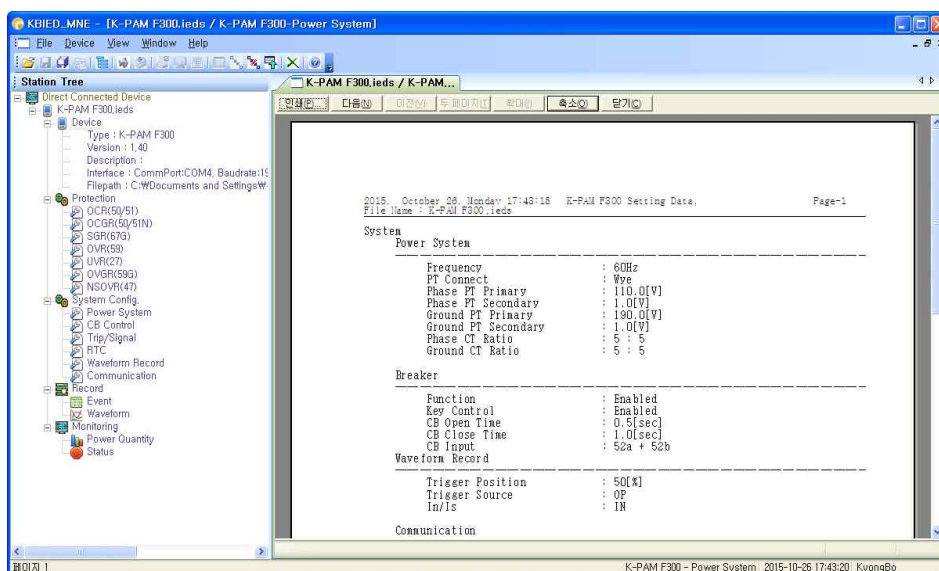
You can preview the settings to be printed by selecting Print Preview as a function to

print the stored device settings.

To preview a print, first select the target device file to be printed in the search window, and then select the Preview menu. The Print Options window will appear as shown below. Select the data to be printed and insert "Header Line". The preview screen will appear.



<figure 21. Print Option screen>

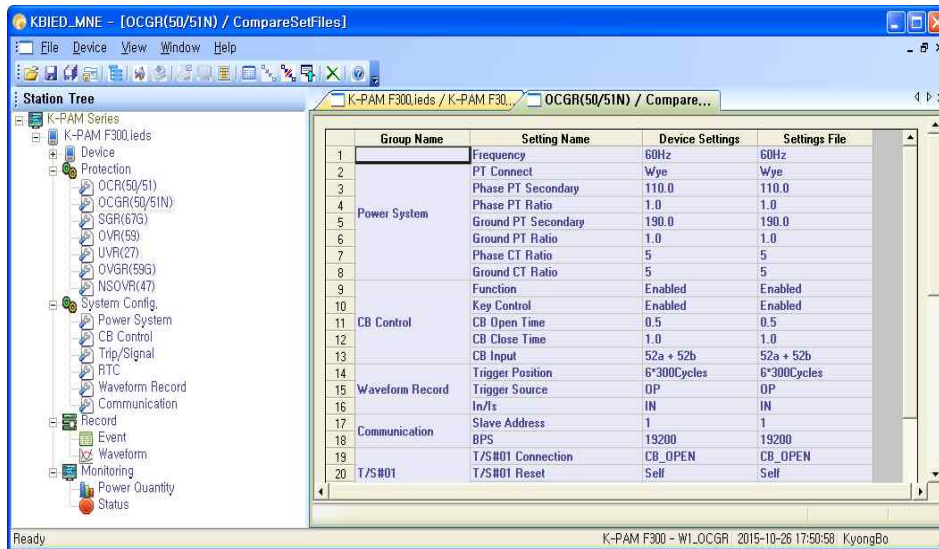


<figure 22. Print Preview screen>

7.1.7 Compare Device Settings with Settings File

This function compares the correction data of the protection relay with the correction data stored in the PC and displays the elements with different values through a separate

window. Select the device file you want to compare using the project search window and compare the data with other settings as shown below.

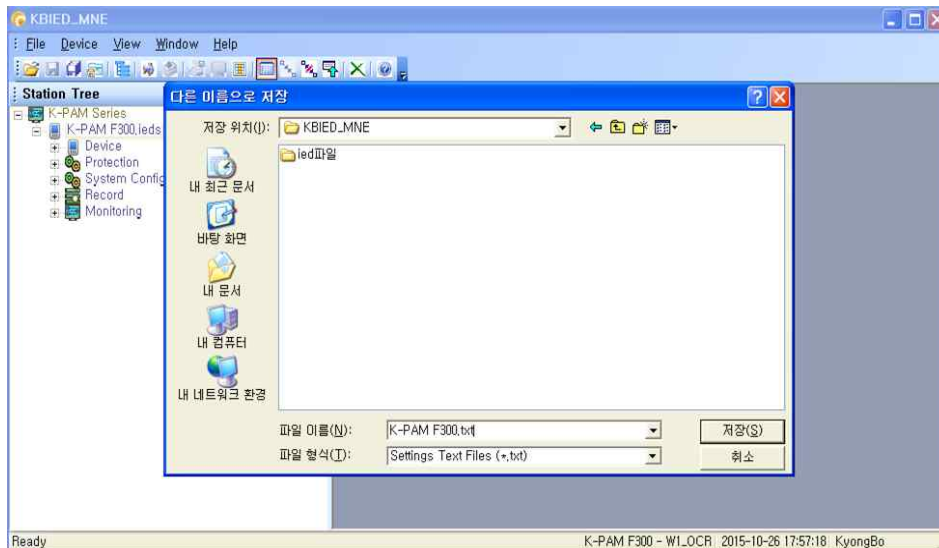


<figure 23. Compare device setting screen>

7.1.8 Export Setting File

It is a function that makes it possible to view corrected data more easily by storing all data of setting value as Text File.


Use the project search window to select the device file to be saved as a text file, and then use the Export Setting File function to create the file.



<figure 24. Text save screen>

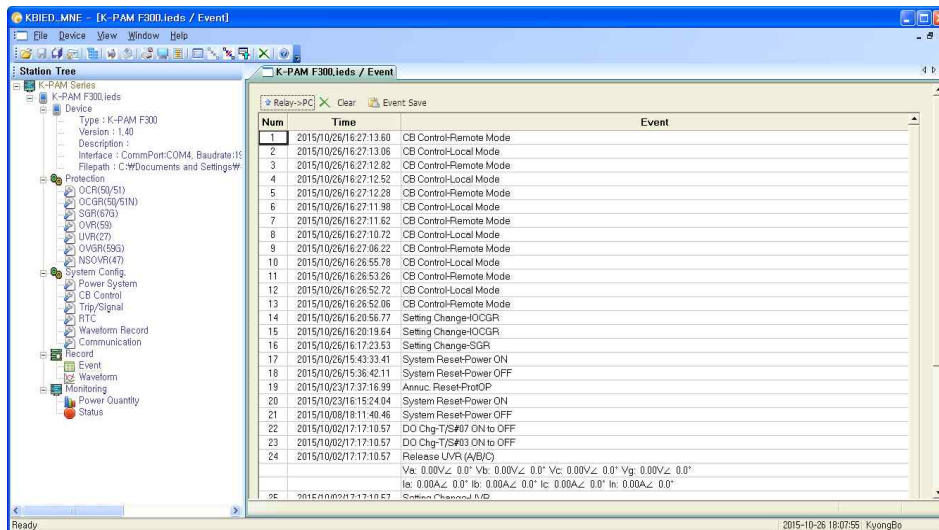
7.1.9 Event

Click Record / Event category in KBIED_MNE Menu, then a screen that can verify Event Data pops up. In the Event Screen, you can verify Event Data stored, store in Text file format, and delete Event Data stored in the Relay.

Clicking Device -> PC () brings Event Data stored in the Relay's non volatile memory(EEPROM) and shows on the screen, and clicking "Event Save" at this state stores the Event Data as *.txt file.

The smaller the number in the Event Data display, is more recent Event Data, and clicking "Clear" deletes the Event Data stored in the Relay.

Event contents are the same as the menu configuration screen of the Relay, so please refer to "6.2.3 Event Record Mode"




<figure 25. Event>

7.1.10 Waveform

Click Record / Waveform in KBIED_MNE Menu, then a screen where you can verify Waveform Data appears.

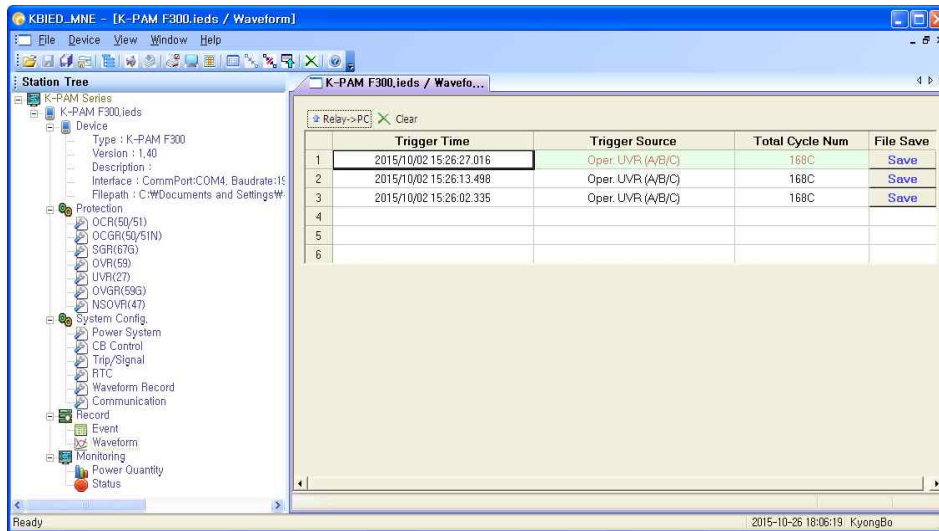
Waveform screen can display the fault record information stored in the Relay, convert and store the fault record data as Comtrade File format, and delete desired fault Waveform stored.

Click Device -> PC (), then Fault waveform(Waveform Data) information stored in the Relay is displayed, and select desired fault waveform with a mouse and click "Save" to convert the fault waveform to Comtrade File format and store from the Relay to PC.

Comtrade file is composed of *.cfg and *.dat files, and these two files are stored as the same file name with different extensions. These two files are used in fault waveform

analysis program(KbCans).

The smaller the number in Waveform Data display, is more recent fault record, and clicking “Clear” deletes the fault waveform record stored in the Relay.

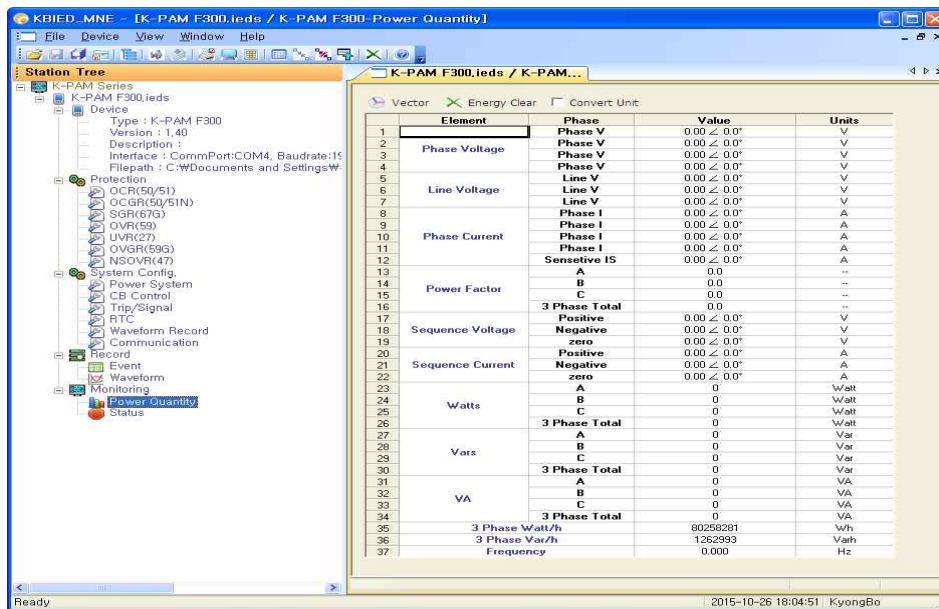


<figure 26. WaveForm>

7.1.11 Power Quantity

Click Monitoring / Measurement category in KBIED_MNE Menu, then a screen that can verify Measurement pops up. Monitoring / Measurement category displays the size and phase of the input phase voltage, the size and phase of the line-line voltage, the size and phase of the zero sequence current/current. the size and phase of symmetrical component(positive-sequence, negative-sequence, and zero-sequence) voltage/current, PF, active/reactive/complex power, active/reactive energy, frequency, CB OPEN number in real time.

Also, to identify the 3 phase voltage/current input to the Relay more easily, clicking "Vector" on Measurement category at the top, it displays as a Graph of the Monitor Display and clicking “Energy Clear” deletes the active/reactive energy stored in the Relay.



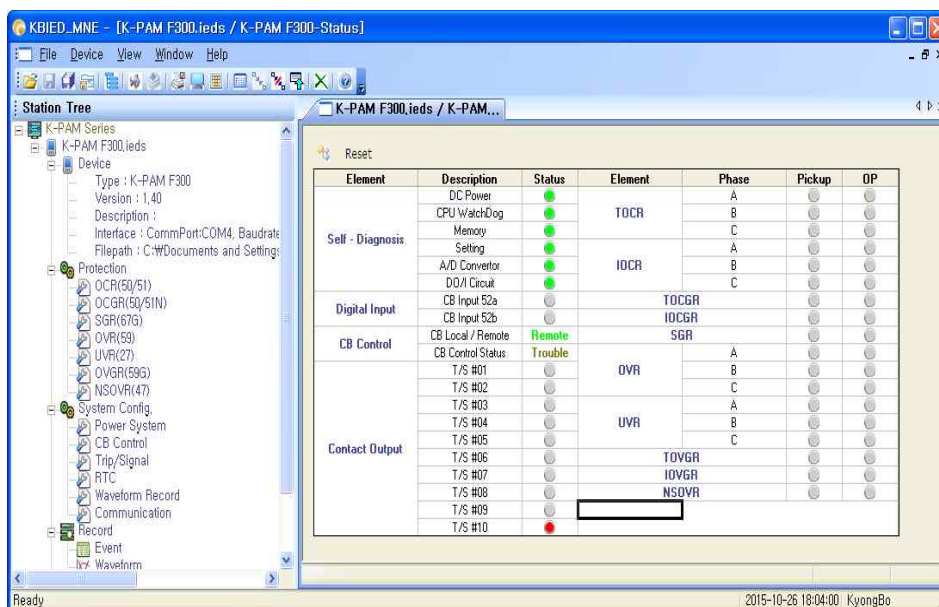
<figure 27. Power Quantity>

7.1.12 Status Screen

Click Monitoring / Status category in KBIED_MNE Menu, then a screen that can verify status of relay pops up.

Monitoring / Status category displays the self diagnosis status of relay, protection element operation status, input/output contacts status etc. in real time.

If System / T/S output / CON category set to SYS_ERR, operation status of contacts display the Red, when self-diagnosis is normal.



<figure 28. Status>

※ KBIED_MNE Communication Method

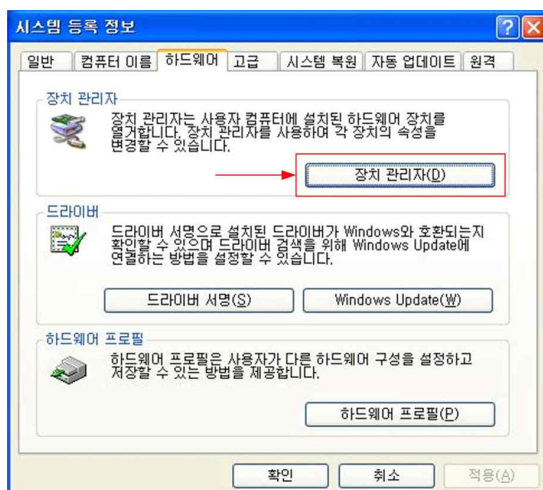
You can follow the procedures below to use KBIED_MNE program to communicate with the relay.

※ In case there is RS-232C Communication Port on PC or Notebook

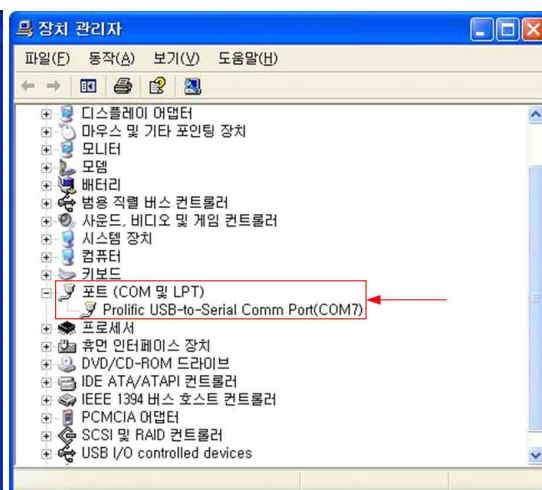
- 1) Connect RS-232C Cable Female connector which our company supplied to RS-232C Communication Port of PC or Notebook
- 2) Connect RS-232C Cable Male connector to RS-232C communication port of the relay
- 3) Input AC/DC 110~220V power to the control power connectors(No. 21 and 23) of the relay
- 4) Select Connect(🔌) in File menu of KBIED_MNE.

※ If there is no RS-232C Communication Port in PC or Notebook

- 1) Purchase USB To RS-232C Cable, and connect USB To RS-232C Cable to USB Port
- 2) Install Cable Driver into the Computer using the installation CD in the package of purchased USB To RS-232C Cable
- 3) Click right mouse button on My Computer icon in the Computer Background Screen, and select Attribute from the pop up menu.
- 4) Select Hardware menu from the System Registration Information, and click Device Manager
- 5) Select Port(COM and LPT) in the Device Manager, and verify the COM Port Number that the computer recognized




<figure 29. System Config>

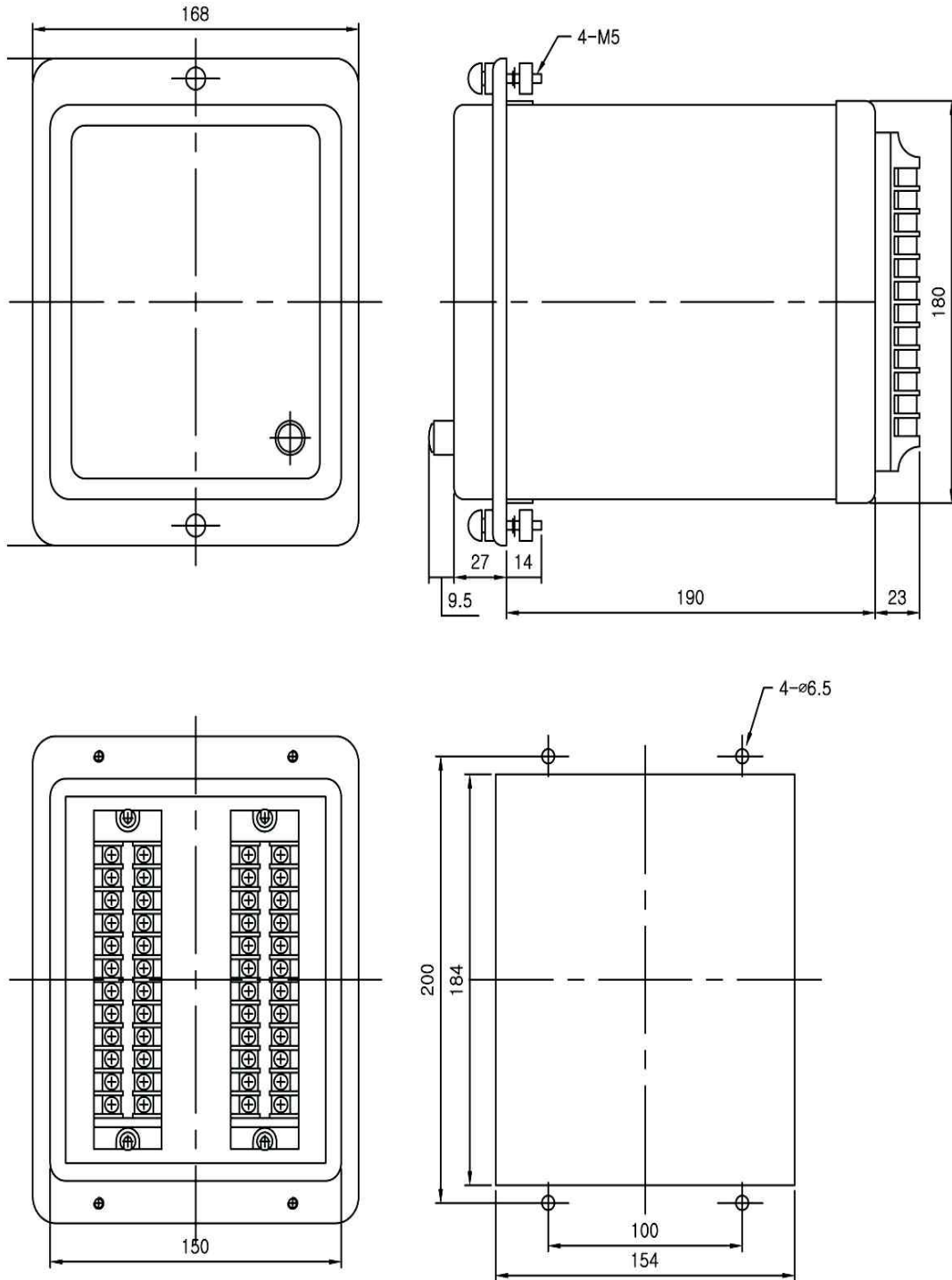


<figure 30. Device Supervision>

- 6) Select Comm.port(⚙️) in KBIED_MNE File menu, select COM Number that the computer recognized in the COM Port Settings, and click “Apply” button

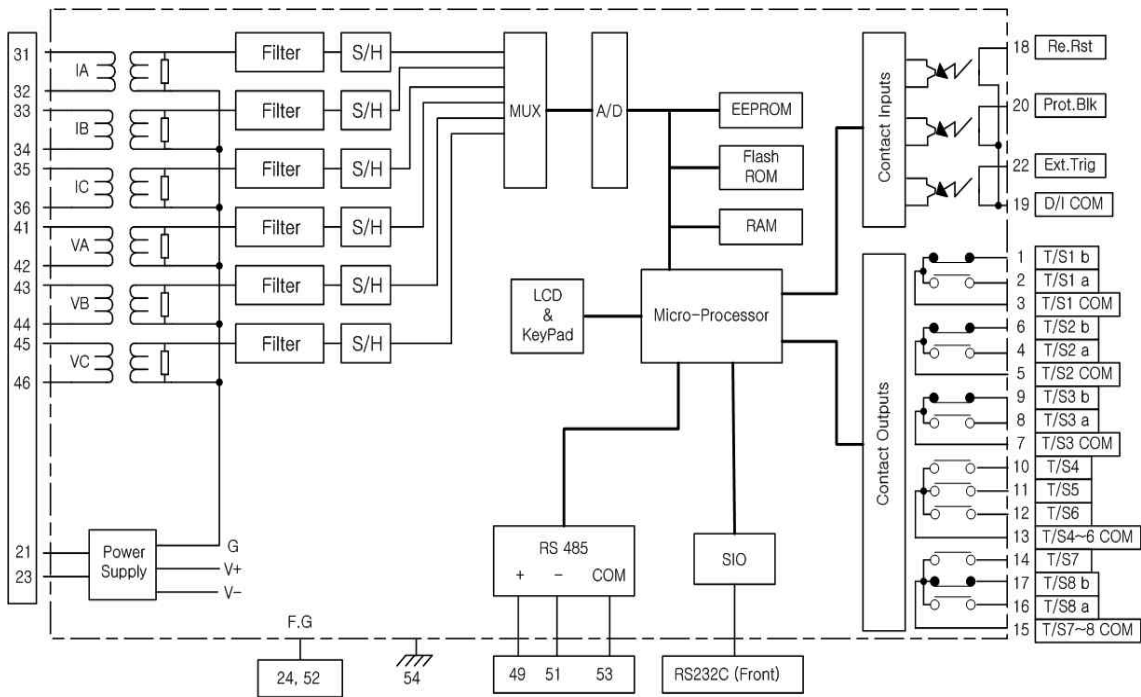
- 7) Connect RS-232C Cable Female connector which our company supplied to RS-232C Communication Port of PC or Notebook
- 8) Connect RS-232C Cable Male connector which our company supplied to RS-232C Communication Port of the relay.
- 9) Input AC/DC 110~220V power to the control power connectors(No. 21 and 23) of the relay
- 10) Select Connect() in KBIED_MNE File menu

Appended 1. Dimensioned Drawings Unit : mm



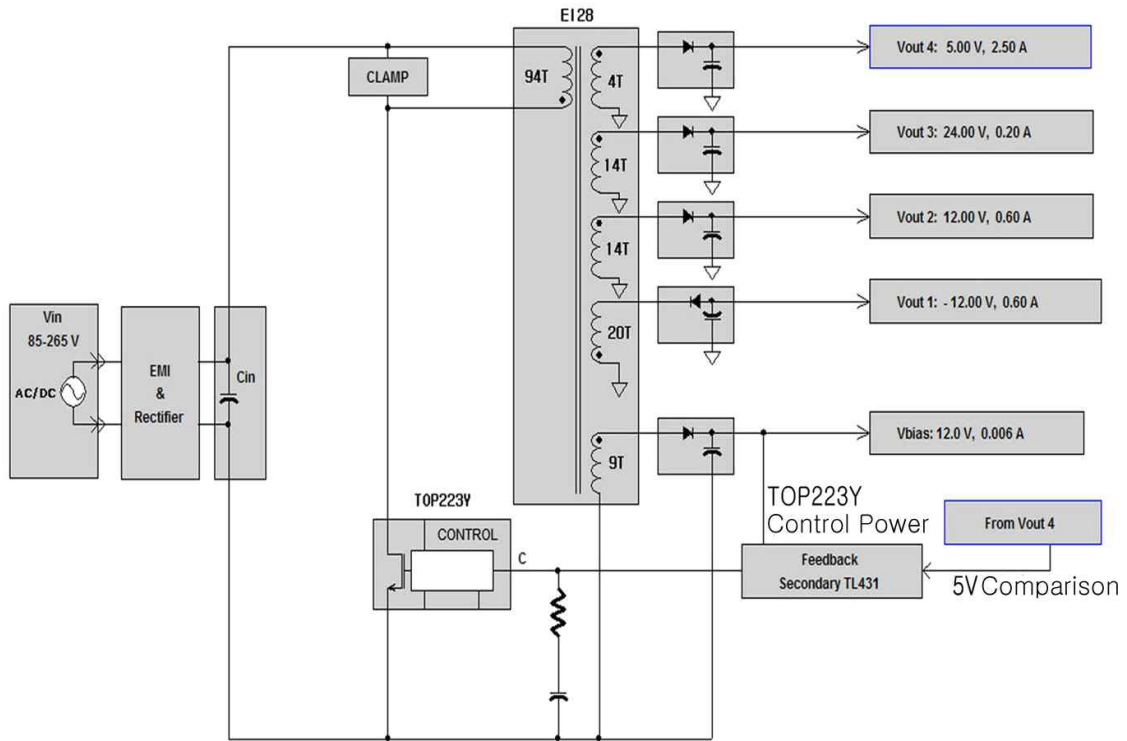
<Appended 1. Dimension>

Appended 2. Relay Hardware Structure



<Appended 2. Internal Block Diagram>

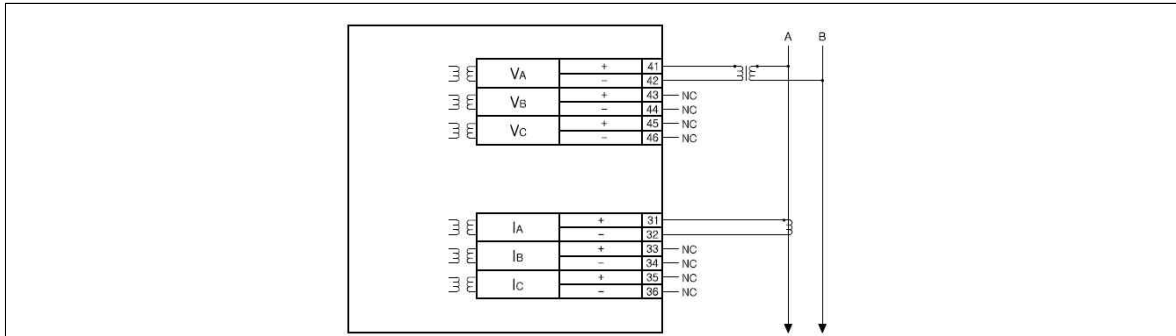
Appended 3. SMPS Hardware Internal Structure



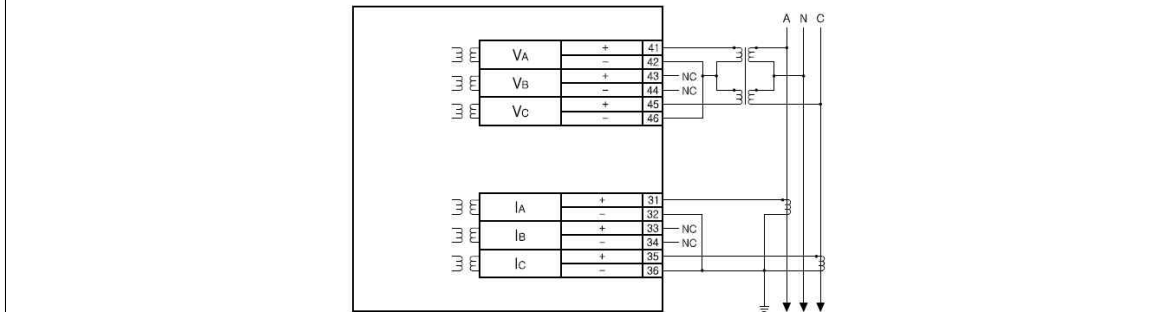
<Appended 3. SMPS Hardware Internal Structure>

Appended 4. External Connection Diagram

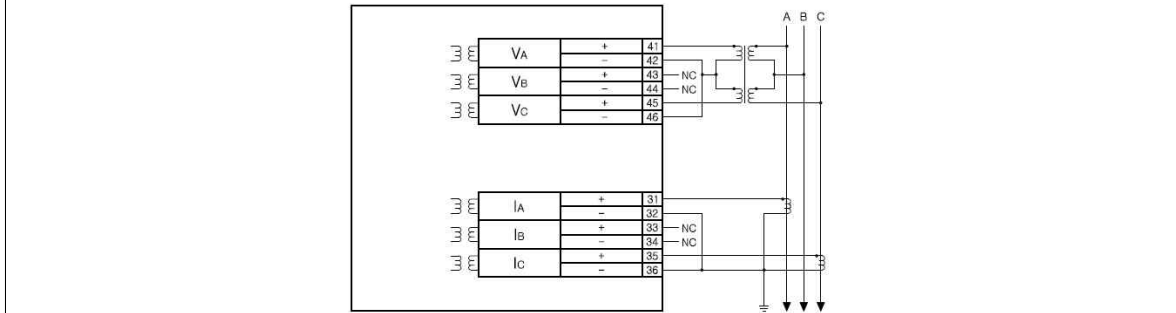
4.1 Single phase two wire, Single phase three wire, Three phase three wire(2PT, 2CT), Three phase three wire(3PT, 3CT)



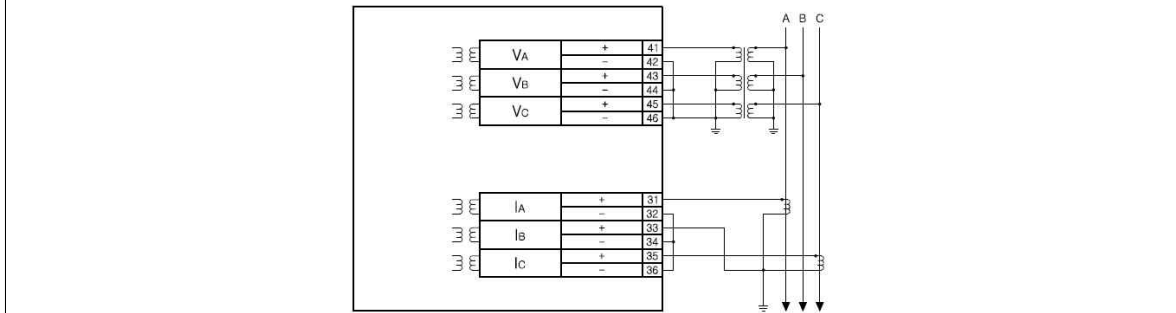
<Appended 4.1 Single phase two wire External Connection Diagram>



<Appended 4.2 Single phase three wire External Connection Diagram>

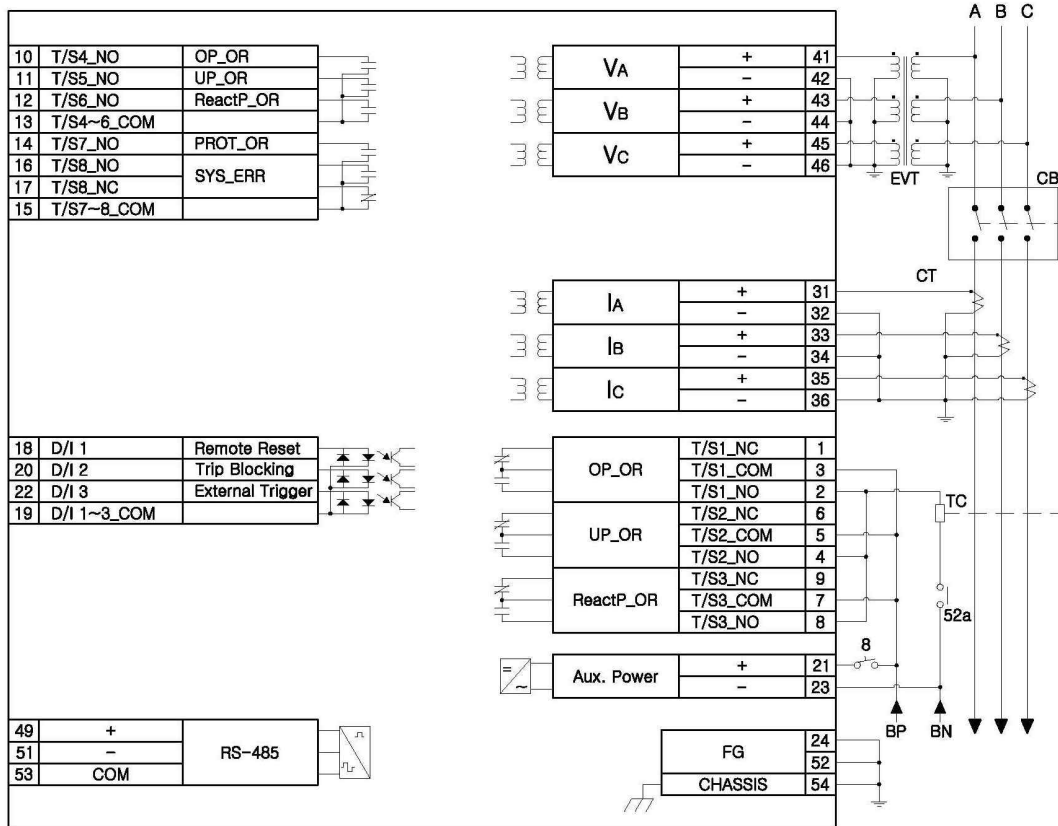


<Appended 4.3 Three phase three wire (2PT, 2CT) External Connection Diagram>



<Appended 4.4 Three phase three wire (3PT, 2CT) External Connection Diagram>

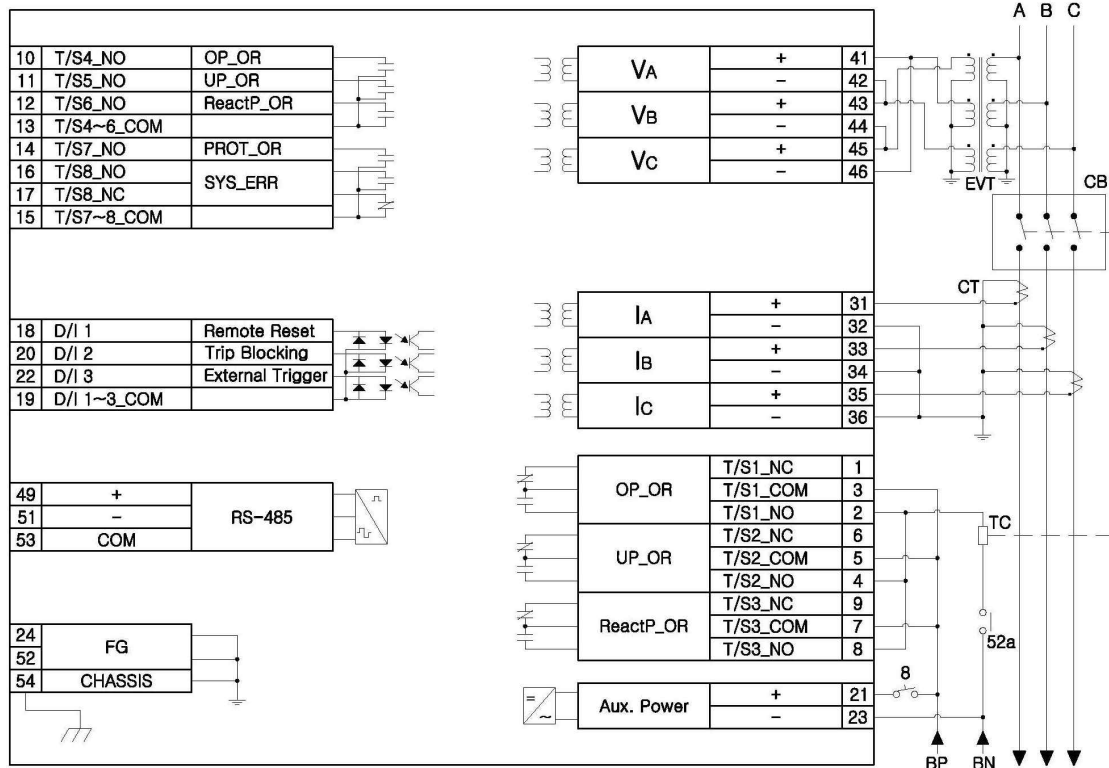
4.2 Three phase four wire system(3 phase reverse power transmission prevention, 32P)



- Setting is initial value, can be changed.
- SYS_ERR contact is changed NO contact to "b" contact, NC contact to "a" contact when there is no abnormality in the protection relay and auxiliary power input status.

<Appended 4.5 Three phase four wire system External Connection Diagram>

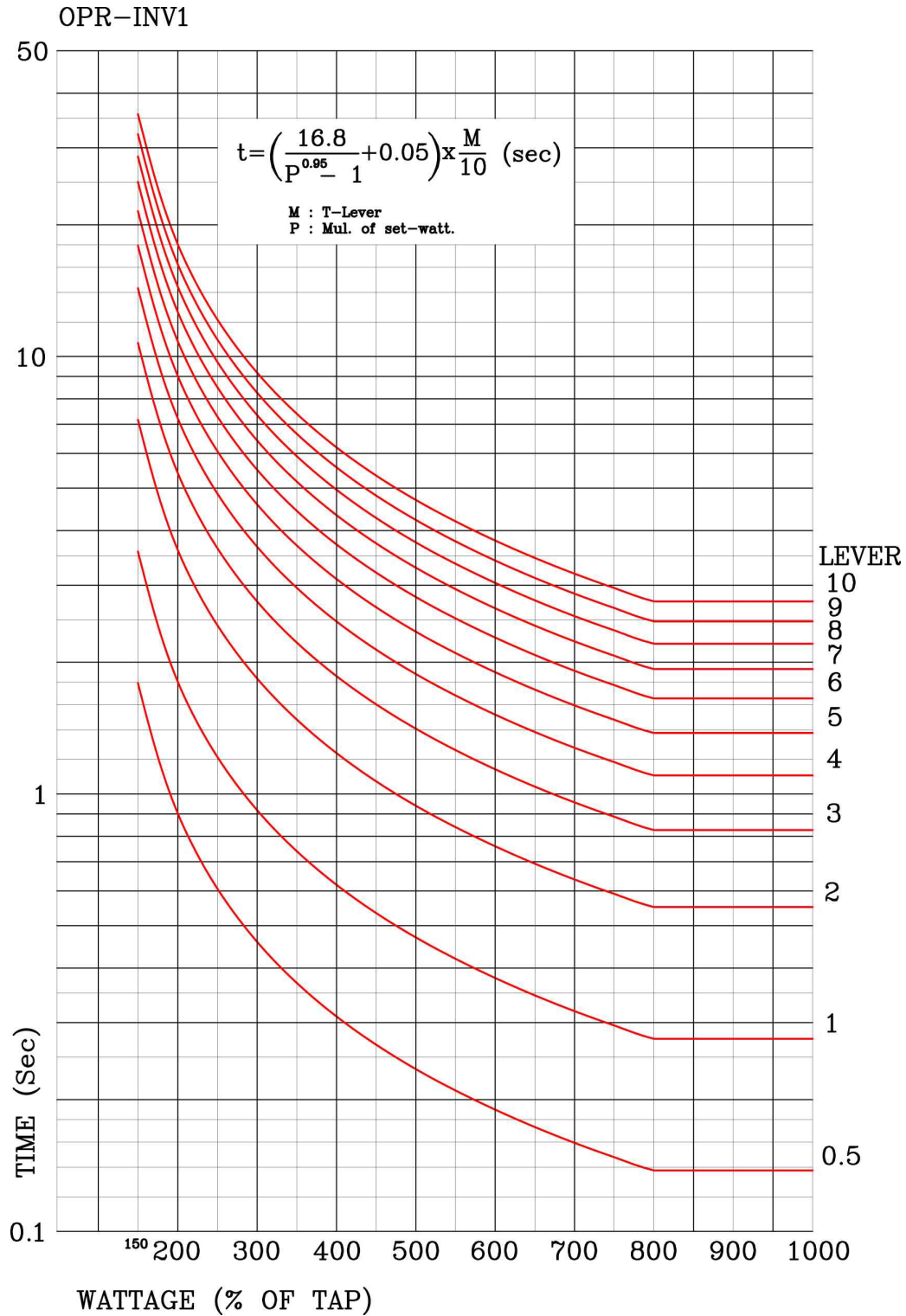
4.3 Three phase four wire system (Line fault protection, 32Q)



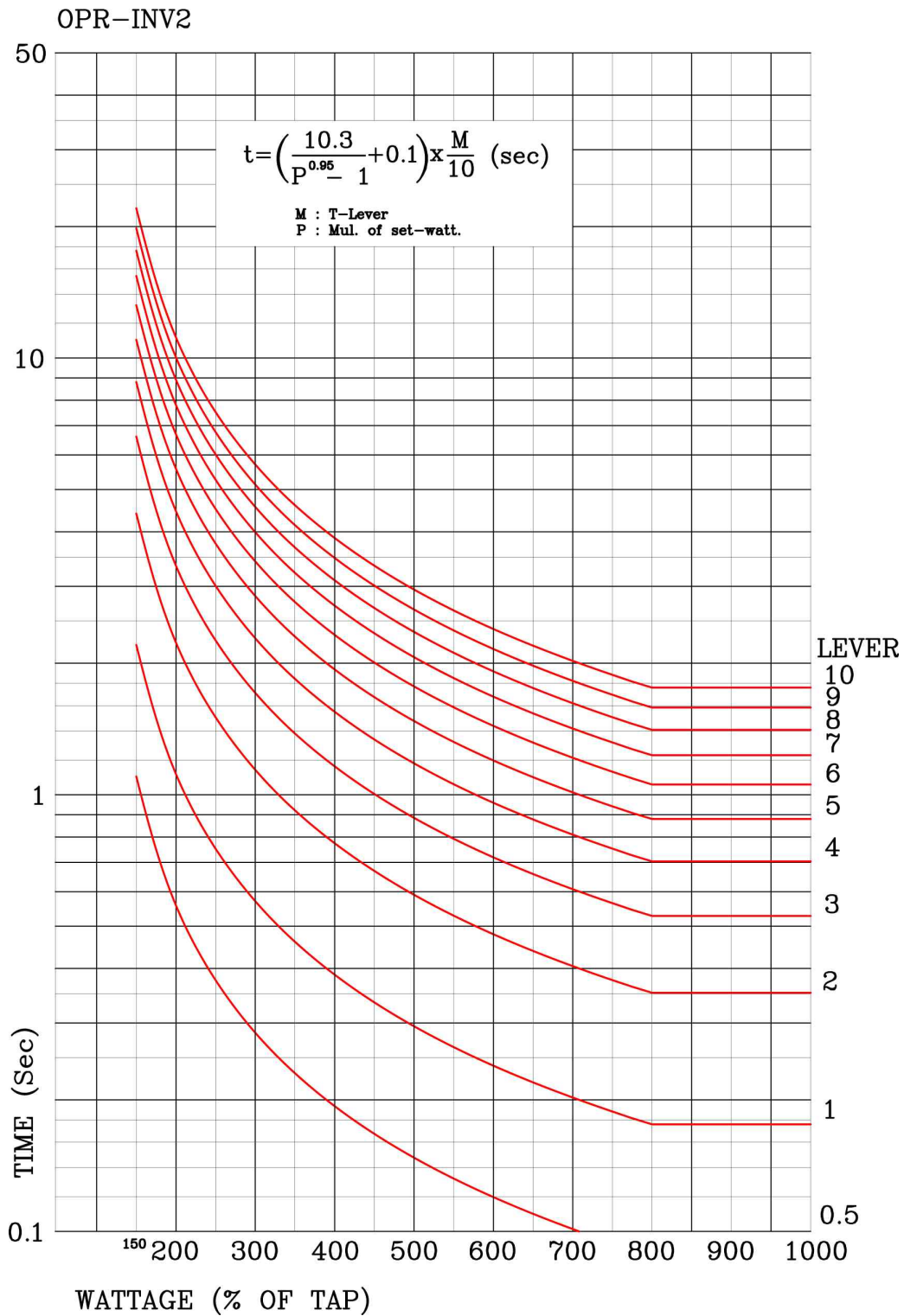
- Setting is initial value, can be changed.
- SYS_ERR contact is changed NO contact to "b" contact, NC contact to "a" contact when there is no abnormality in the protection relay and auxiliary power input status.

<Appended 4.6 Three phase four wire system External Connection Diagram>

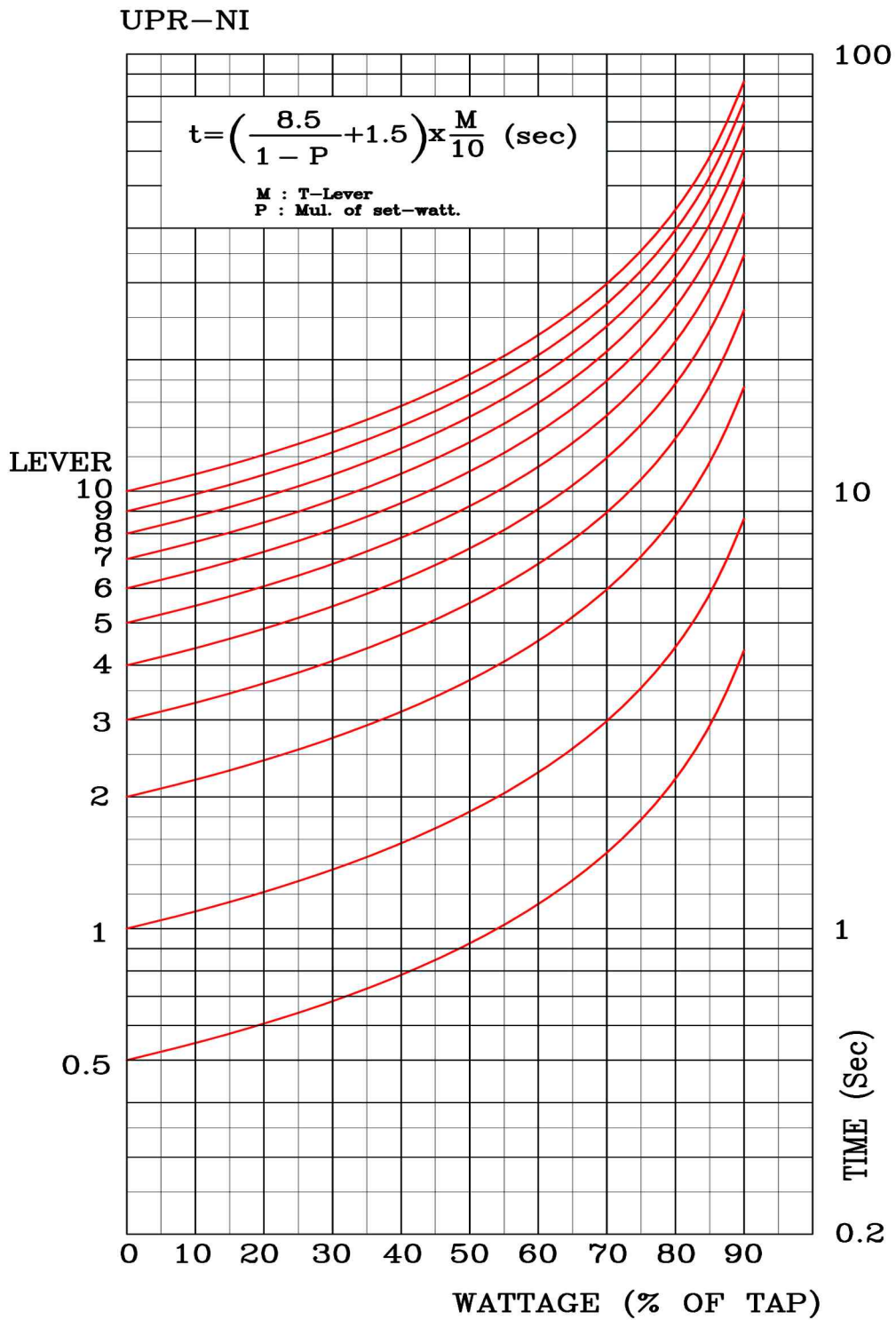
Appended 5. Characteristic Curve



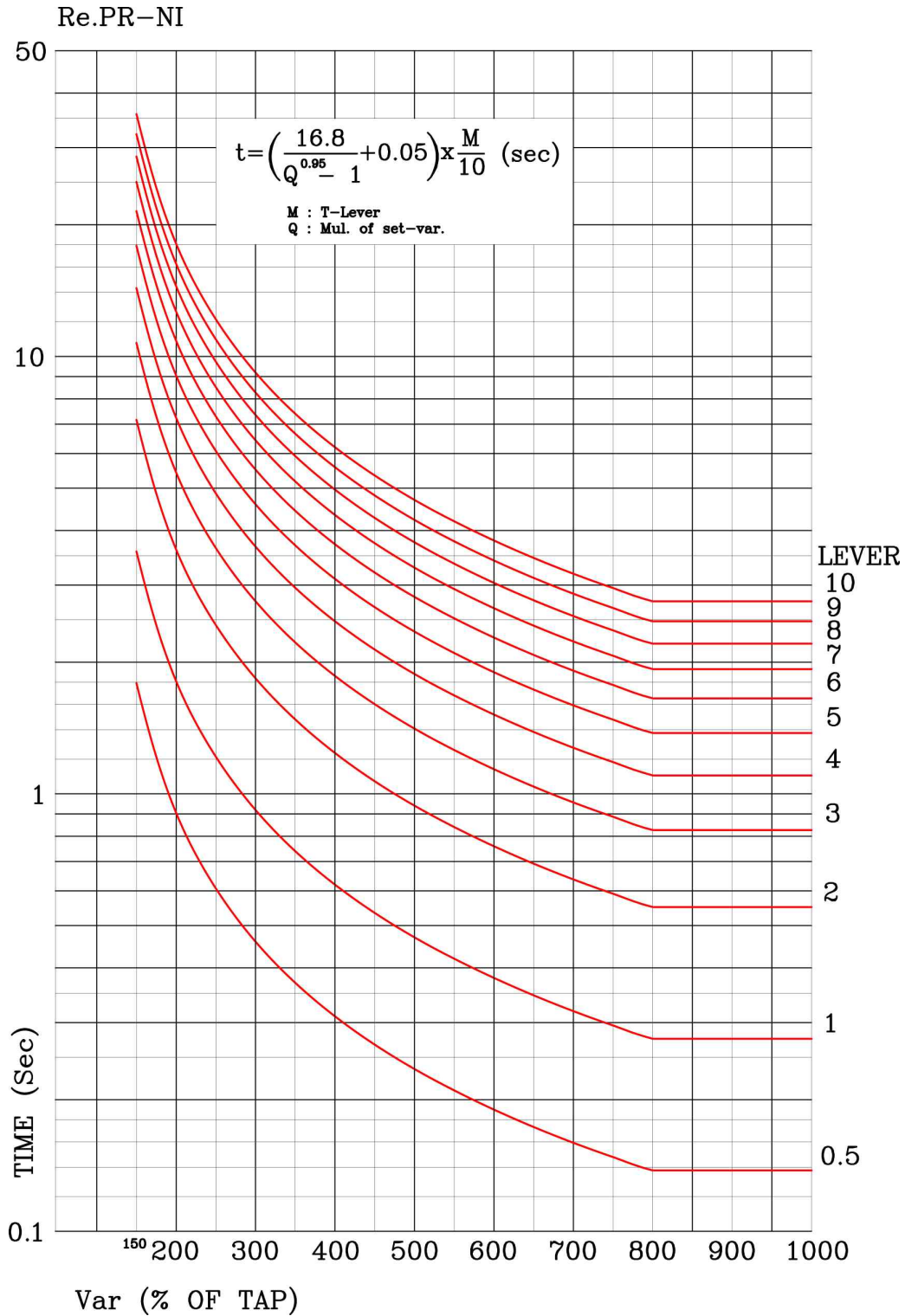
<Appended 5.1 Over Power Element INV1 Inverse Characteristic Curve>



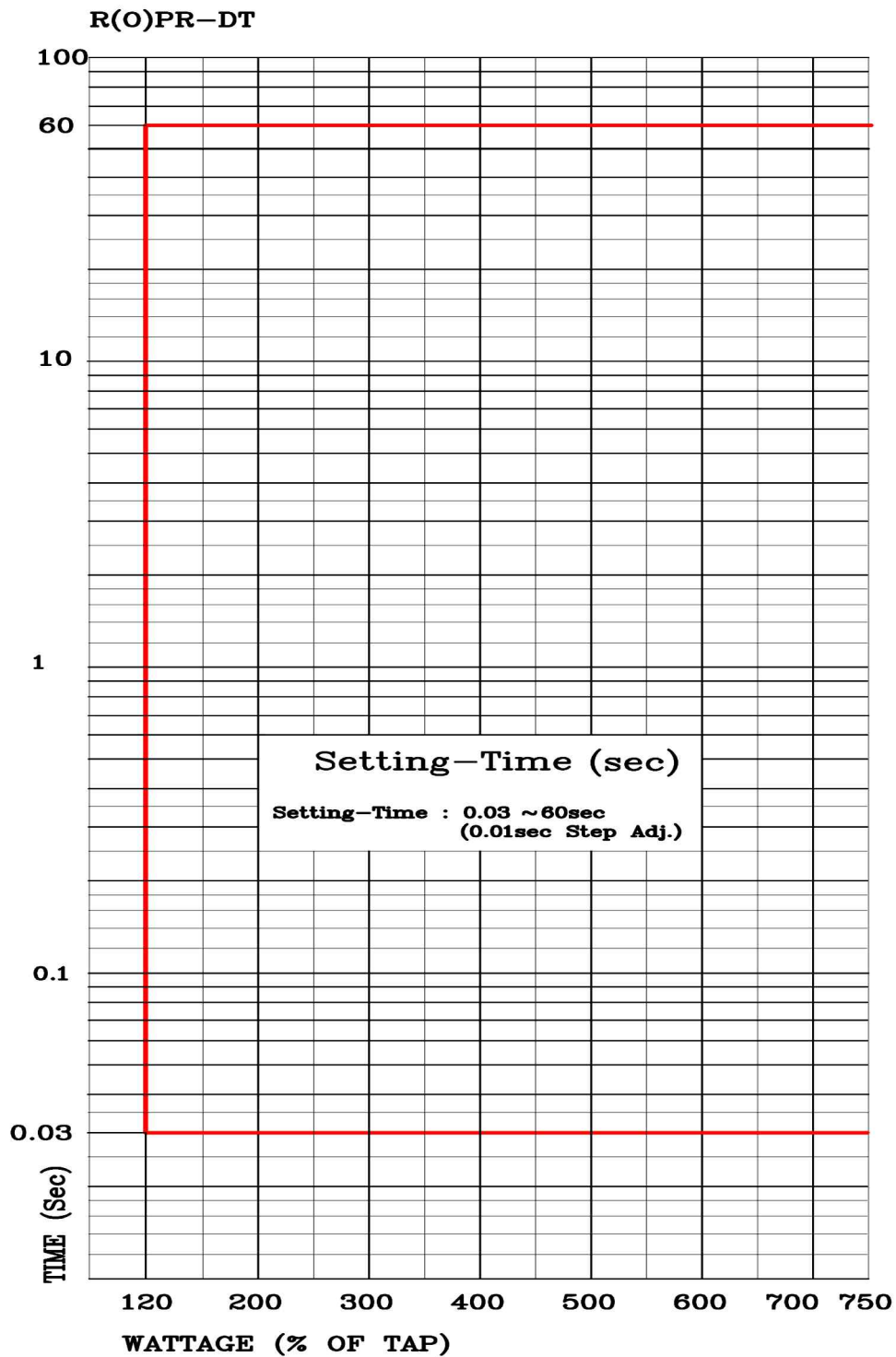
<Appended 5.2 Over Power Element INV2 Inverse Characteristic Curve>



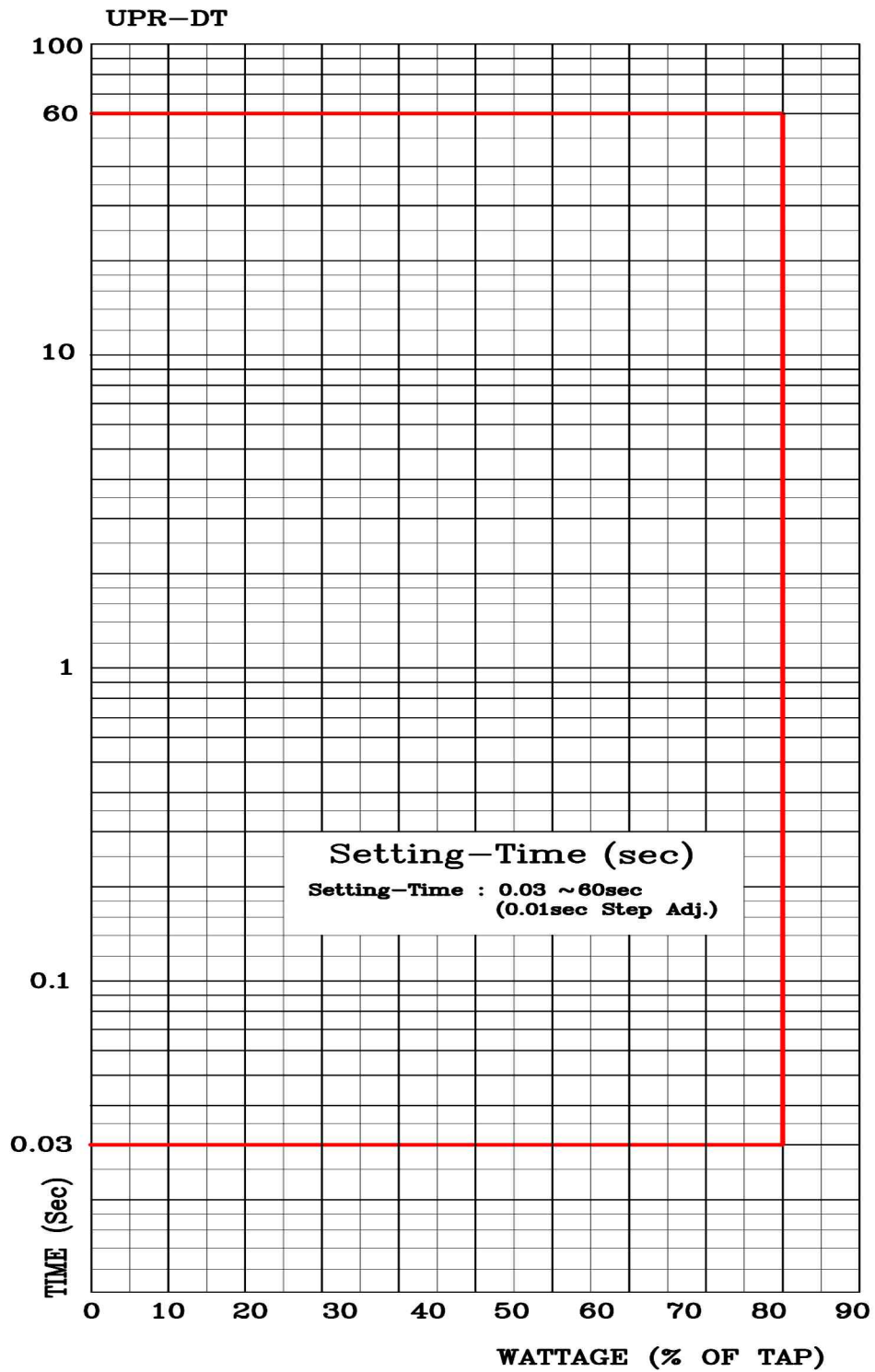
<Appended 5.3 Under Power Element Reverse Inverse Time characteristic Curve>



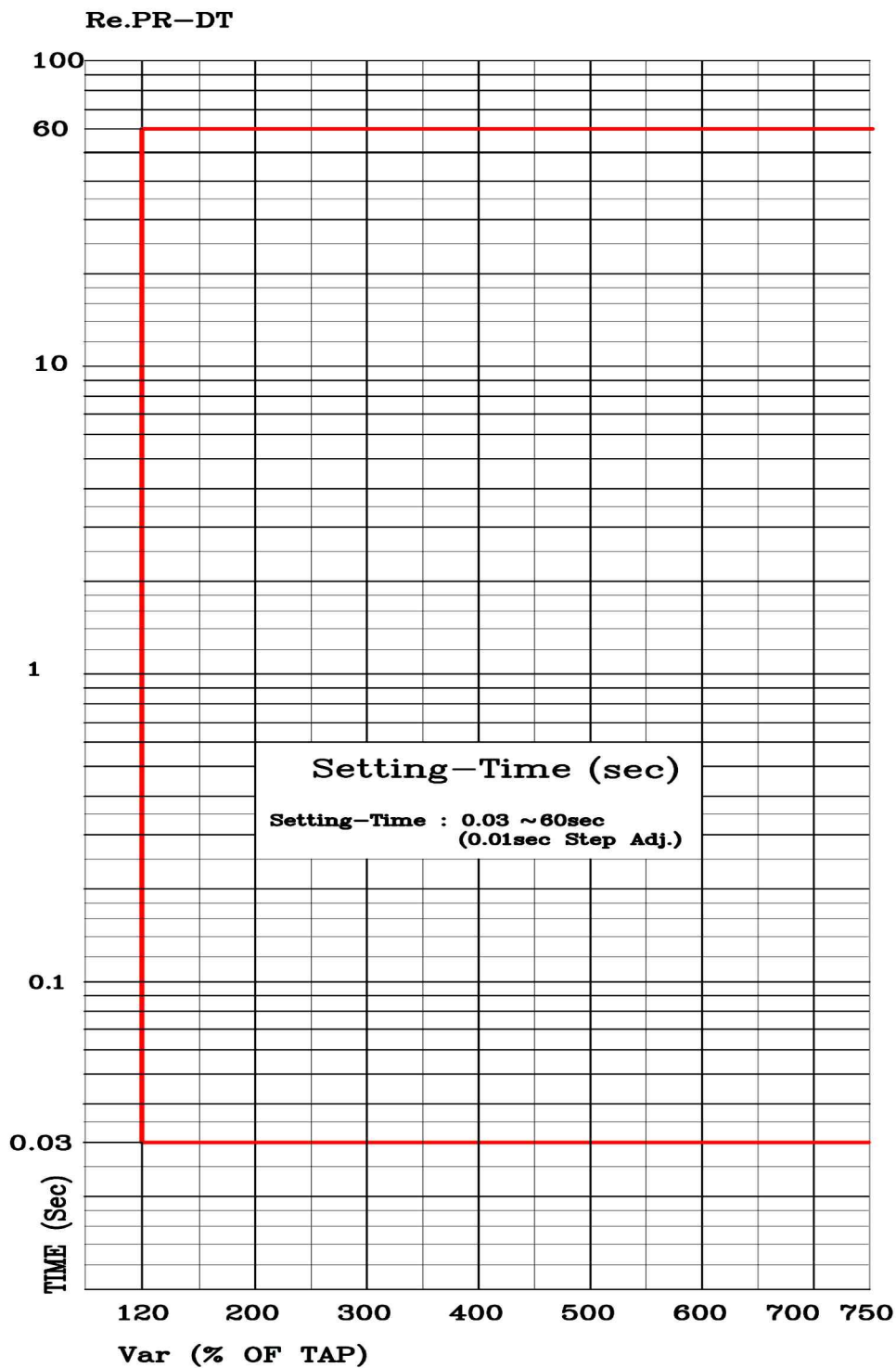
<Appended 5.4 Reactive Power Element Inverse Characteristic Curve>



<Appended 5.5 Reverse(over) Power Element Characteristic Curve>



<Appended 5.6 Under Power Element Definite Time characteristic Curve>



<Appended 5.7 Complex Power Element Definite characteristic Curve>

Appendix A. Product Shipping Setting Value

I n I t I a l D I s p l a y	Setting (SET)	1. System	1. Power System	1. FREQ		60Hz
				2. P_PT_SEC		110.0V
				3. P_PT_RAT		1 : 1
				4. P_CT_RAT		5 : 5
			2. T/S	T/S#01	1. CON	OP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#02	1. CON	UP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#03	1. CON	ReactP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#04	1. CON	OP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#05	1. CON	UP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#06	1. CON	ReactP_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#07	1. CON	PROT_OR
					2. RST	Self
					3. DLY	0.00Sec
				T/S#08	1. CON	SYS_ERR
					2. RST	Self
					3. DLY	0.00Sec
3. RTC				PC Time		
4. Waveform Record	1. TYPE		8×60			
	2. TPOS		50%			
	3. TSRC		TRIP+EXT			

I n I t I a l D I s p l a y	Setting (SET)	2. Protection	5. COM	1. SLV_ADDR	1
				2. BPS	19200
				3. PROTOCOL	ModBus
			7. Password		0000
			1. OPR	1. FUNCTION	Enabled
				2. MODE	3Phase
				3. DIR	Forward
				4. CURVE	INV1
				5. LEVEL	750W
		6. T_DIAL		10.00	
		7. DT_TIME		-	
		8. EXT_BLK		No	
		2. UPR	1. FUNCTION	Enabled	
			2. MODE	3Phase	
			3. DIR	Forward	
			4. CURVE	Inverse	
			5. LEVEL	450W	
			6. T_DIAL	10.00	
			7. DT_TIME	-	
			8. EXT_BLK	No	
		3. ReactPR	1. FUNCTION	Enabled	
			2. DIR	Forward	
			3. CURVE	Inverse	
			4. LEVEL	450Var	
			5. T_DIAL	10.00	
			6. DT_TIME	-	
			7. EXT_BLK	No	

Appendix B. Use Method and Notice when Cogeneration system protection

B.1 Use Method

GD3-P11 contains elements of OPR, UPR, and ReactPR, it can be protection of correct system when protection of cogeneration system.

Main use purpose of power relay from cogeneration system is prevent of **reverse power transmission(32P)** and protection of **ground or short-circuit fault(32Q)** in interconnection line.

If you install power relay for **prevent of reverse power transmission**, input phase voltage and phase current in the relay. On the other hand, If you install relay for protection of ground or short-circuit fault, input line-line voltage and phase current in the relay.

Therefore 32P and 32Q is different in protection purpose, state of voltage and current inputted relay is different, so two GD3-P11 relay is required.

The right picture is block diagram of parallel operation 1circuit 22.9kV KEPCO's bus and cogeneration.

From Figure, the customer side line is used to direction over-current relay(67) and ground over-current relay(67G), this is ground and short circuit fault occur in interconnection line, relay is used if fault current is sufficient to operate the relay.

And if direction over-current relay has nonoperational concern by insufficient fault current, used 32Q.

The reason for the voltage input of 32Q input line-line voltage, not a phase voltage, when ground fault, if fault phase voltage is 0V, it can protect use regular voltage. If all voltage is 0V occurred by 3phase ground and short circuit fault, power is not measuring, power relay do not protect. So under power voltage relay(27) operate as back-up protection, protected 3phase short circuit fault. But voltage occur even 0.1V by line impedance, GD3-P11 is performed correctly to protect.

If relay used in the cogeneration system protection is apply to it's relay, relay model is as follows.

Instrument Number	Model Name
87	K-PAM T3300
67 / 67G	GD31 - AB16
27 / 59	GD3 - V11
50 / 51(N)	GD31 - AB17

B.2 Wiring Method and Precaution

If GD3-P11 is used to reverse power transmission prevention(32P) from cogeneration system protection, relay connect as <appended 4.5> connection diagram. If GD3-P11 is used to protection of ground and short circuit in interconnection line(32Q), relay connect as <appended 4.6>

If GD3-P11 is used as reverse power transmission prevention, changing mode set to 3phase using a OPR element, direction set to Forward and pick up value input as 3phase power.

The reason for the pick up mode set to 3phase is if load of KEPCO's bus is imbalance and pick up setting as single phase, operated over than pick up value. it is often lead to power outage because of very sensitive operation. So pick up mode set to 3 phase power value.

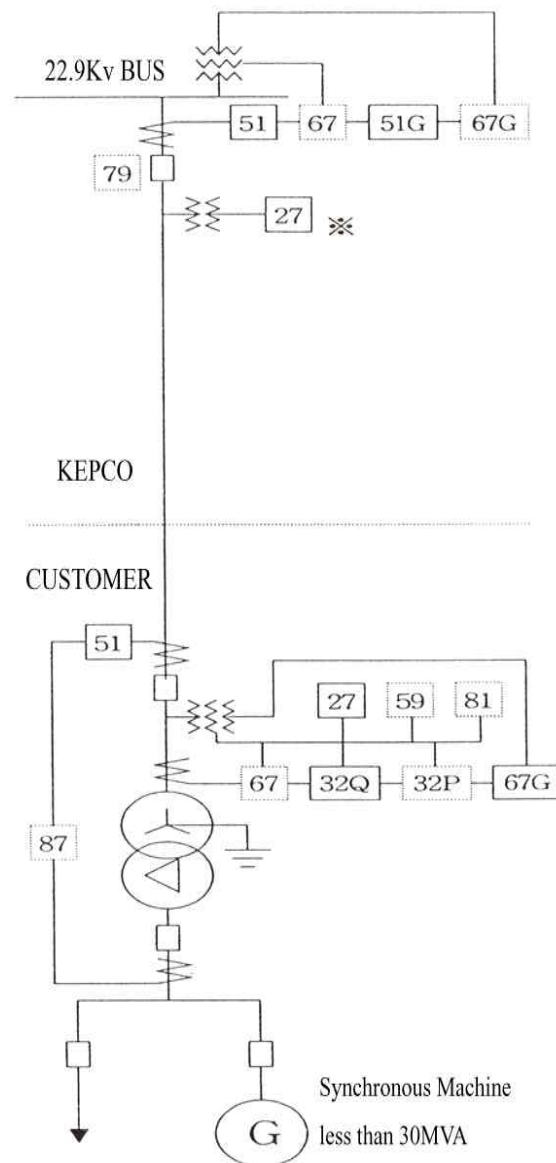
If relay connect as <appended 3.6> for ground, short circuit protection purpose, A phase power calculated by line-line voltage V_{bc} and phase current I_a , B phase power calculated by line-line voltage V_{ca} and phase current I_b , C phase power calculated by line-line voltage V_{ab} and phase current I_c . Therefore you should be a exactly understand of measurement display state of relay.

For example, relay connected as <appended 3.6>, suppose that if PT 2 side phase voltage is 110V, phase current is 1A and PF is lag $30^\circ(0.866)$, measurement display of relay

. Voltage : $V_a 190 \angle 0^\circ V$, $V_b 190 \angle 240^\circ V$, $V_c 190 \angle 120^\circ V$

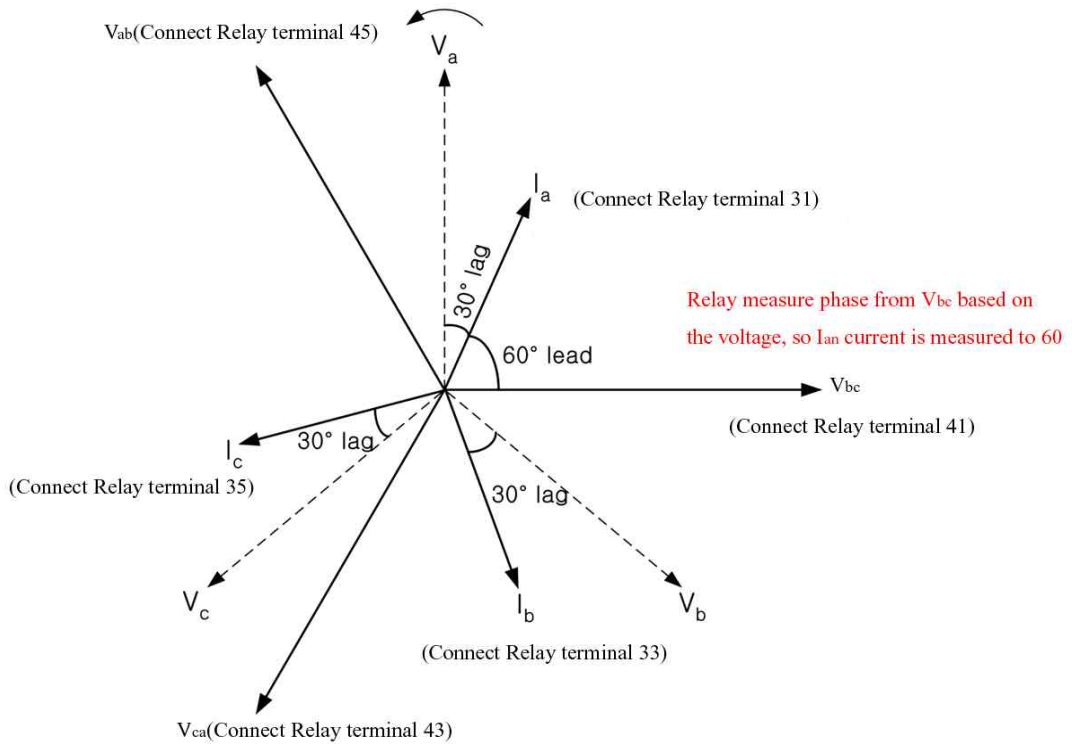
. Current : $I_a 1 \angle 60^\circ A$, $I_b 1 \angle 300^\circ A$, $I_c 1 \angle 180^\circ A$

The reason for appear as above from phase measurement is phase measure to Lead



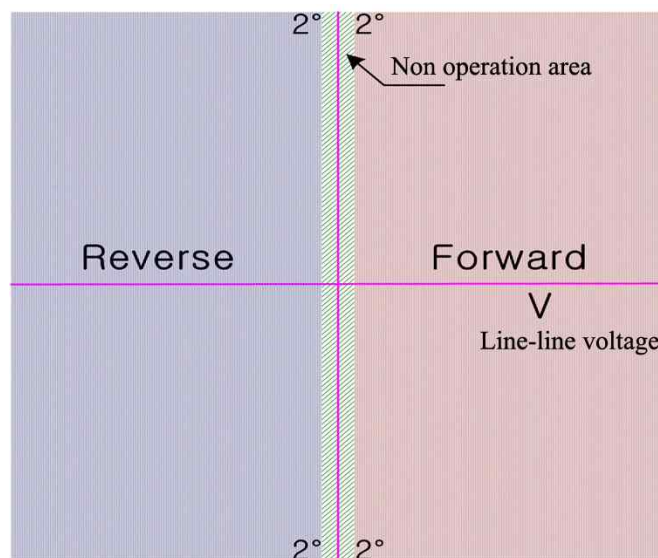
direction by basis of input voltage to the terminals.

Input value of voltage, current and phase to relay represent a vector diagram is as follows.



<Figure B.2.1 Relay measurement display method when line-line voltage input>

And if line-line voltage input to relay, operation area is as follows differently when input phase voltage.



<Figure B.2.3 Relay operation area when line-line voltage input>

If GD3-P11 use for protection of ground and short circuit like this, current lead 90° than voltage because of input voltage is line-line voltage.

If GD3-P11 use for protection of external ground, short circuit fault(32Q), protected by OPR element, operation direction is Forward from over-power element setting, operation mode setting is 1phase.

The reason for the operation mode setting is 1 phase, when 1 line ground fault occurred, need a 3 single phase operation method because of protect to each phase.

Therefore, When reverse power transmission protection and external ground, short circuit fault protection in cogeneration system, if you use two GD3-P11, you can be perfectly protected.

Appendix C. Relay Self Diagnosis Logic Diagram

