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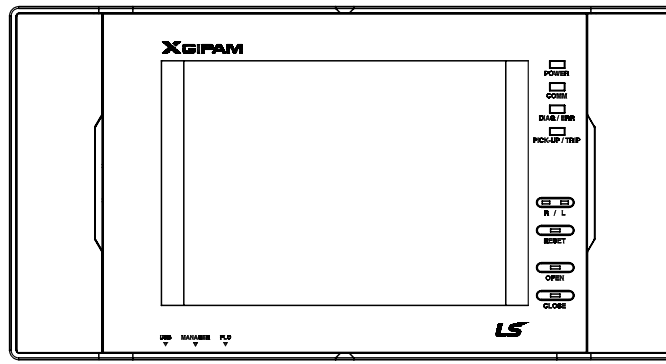
Next Generation Intelligent Device

XGIPAM

User's Manual

GIPAM Series



Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment.
- Keep this manual within easy reach for quick reference.

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Safety Caution

Please read carefully before putting the product into service for the proper operation of XGIPAM.

- Please keep the safety caution to prevent any accident happen by using the product incorrectly.
- Safety caution is classified with caution and danger and Indication of them as follows.

⚠ **Caution**	Not following the instruction may result in serious injury or even death
⚠ **Danger**	Not following the instruction may result in serious injury or property damage

Symbols, used in this manual, is indicated as follows.

⚠	This symbol is for warning the hazardousness under the specific condition.
⚠	This symbol is for warning the electric shocks or any accidents under the specific condition.

This instruction must be kept at a close place to XGIPAM.

⚠ Caution

- Please do not work with, test, or set up the equipment alone.
- Please do not wiring when applied with power or on the operation;
  It may result in electric shock.
- Please do not all the wiring operation with the live bus bar;
  It may result in electric shock or fire and property damage by charging voltage of current transformer.
- Please connect to the ground.
  It may cause electric shock.
  F.G socket must be grounded to the proof case of the switchboard.
- Please do not attempt to disassemble even when the power not applied;
  It may result in electric shock by charging current remained in the product.
- Please do not short the secondary side of the PT.

- Please do not short the secondary side of the CT.
  It may result in fire.
- Please do not wire or operate with wet hands;
  It may result in electric shock.
- Please do not use any damaged cable;
  It may result in electric shock.
- Please use the ring terminal when wiring the cable;
  It may result in electric shock by bare wire

⚠ Danger

■ Safety caution for installation & terminal wiring

- Apply the rated voltage to the power supply terminal of the product.
  It may result in damage of product or fire.
- Please keep away product from screws, metals, water, or oil.
  It may result in fire.
- Please keep the rated load and polarity of input & output contacts;
  It may result in product damage or fire.
- While connecting to a port, check the number of the terminal before short.
  It may result in damage in the product or fire.
- Assemble the cover of the terminal after disconnecting the terminal.
- Product must be installed and managed by a specialist.
  Otherwise, wrongly installed product may cause malfunction or accident.
- Use circuit breaker input/output auxiliary relay only.
  If direct control is caused to a circuit breaker, inner RELAY flame may result.
- Turn the power OFF when changing the communication card.
  All DO is reset when the power is turned OFF.

■ Checklist before supply of power

- Check the polarity and voltage in control power.
- Check if short exists in the input/output terminal.

■ Caution for storage and handling

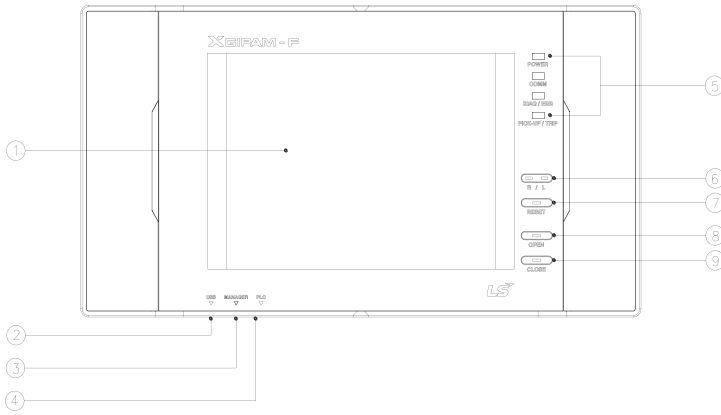
- Please store at a dry and clean place.
- Do not throw or put too much force on the product while handling.
- Do not load over 5 stories.

■ Caution for disposal

- Please dispose product according to the industrial waste regulation.

1. Outer Layout

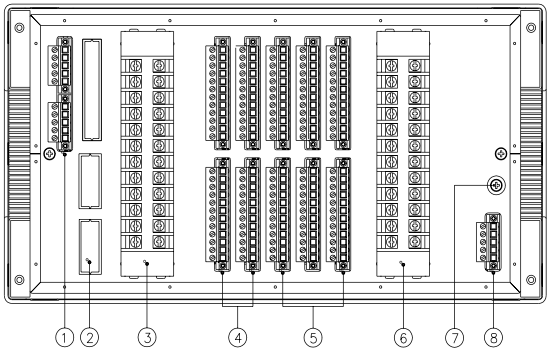
1.1 Front Layout



No.	Name	Primary function
1	TFT LCD Panel	Shows set up menu, measurement, information of product. It is also possible to change the menu and option on the screen by using the touch screen.
2	Memory Port	It is possible to download set up files by using the USB Memory.
3	Manager Port	Used with a PC manager program in order to connect the equipment to the PC.
4	PLC Port	Used with a GMWIN PLC manager program in order to connect the equipment to the PC. * Caution : Use GMWIN over version 4.17.
5	Status LED	Power LED(Green) : Lights when the power is ON Comm LED(Orange) : Lights when the distant communication works properly DIAG/ERR LED(Red) : Lights when malfunction is found in product PICK-UP/TRIP LED(Red) : Lights when relay element is PICK-UPed, Lights when TRIP happens
6	Remote/Local Key	Used when changing Remote/Local state Lights green light when it is Remote, and lights red light when it is Local
7	Reset Key	Used to reset the relay, It lights a red light only when Reset is needed
8	CB OPEN Key	Used to Open the circuit breaker, and lights a green light when circuit breaker is opened
9	CB CLOSE Key	Used to Close the circuit breaker, and lights a red light when circuit breaker is closed

1. Outer Layout

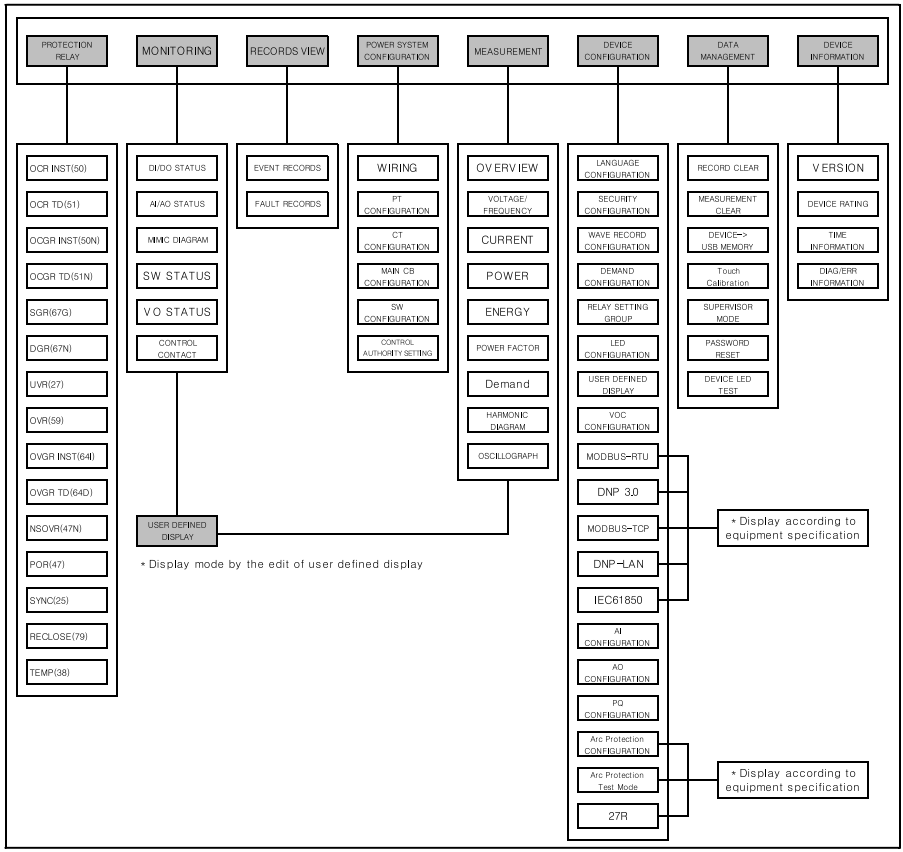
1.2 Backside Layout



No.	Name	Primary Function
1	Main & Comm Board	Handles the main process, and conducts RS485 communication such as Modbus/DNP3.0. (Basic)
2	Extension Board	Ethernet communication and IEC61850 communication modules are installed. (Option)
3	CT/PT Board	Receives systematic current/voltage input. (Basic)
4	AI/AO Board SMS VOICE Board	Modules that have DC 4~20mA input/output are installed. (Option) AI : 6 points, AO : 4 points Modules which have alarm function of SMS/VOICE are installed. (Option)
5	Conn type DI/DO Board APM Board	Connecter type DI/DO modules are installed. Also, basically 1 sheet is installed at the F type, and 2 sheets at the B type. DI : 10 points, PO : 2 points, Normal DO : 8 points Module which has Arc Protection function is installed. (Only F TYPE served this module as option.)
6	TB type DI/DO Slot	Terminal Block type DI/DO module is installed. (Basic) DI : 10 points, PO : 2 points, Normal DO : 8 points
7	FG Terminal	Frame Ground terminal (Outer earthing connecting terminal) F.G terminal must be earthed to the outer part of the switchboard panel. ※ F.G (Frame Ground) : This allows the leaking current and the electrical noise to be discharged through earthing in order to decrease the electrical impact on the equipment. This happens when electrical problems occur because of the earthing on metal such as the outer box of the equipment or the panel board.
8	Power Board	AC/DC 110V rate control power module is installed. (Basic)

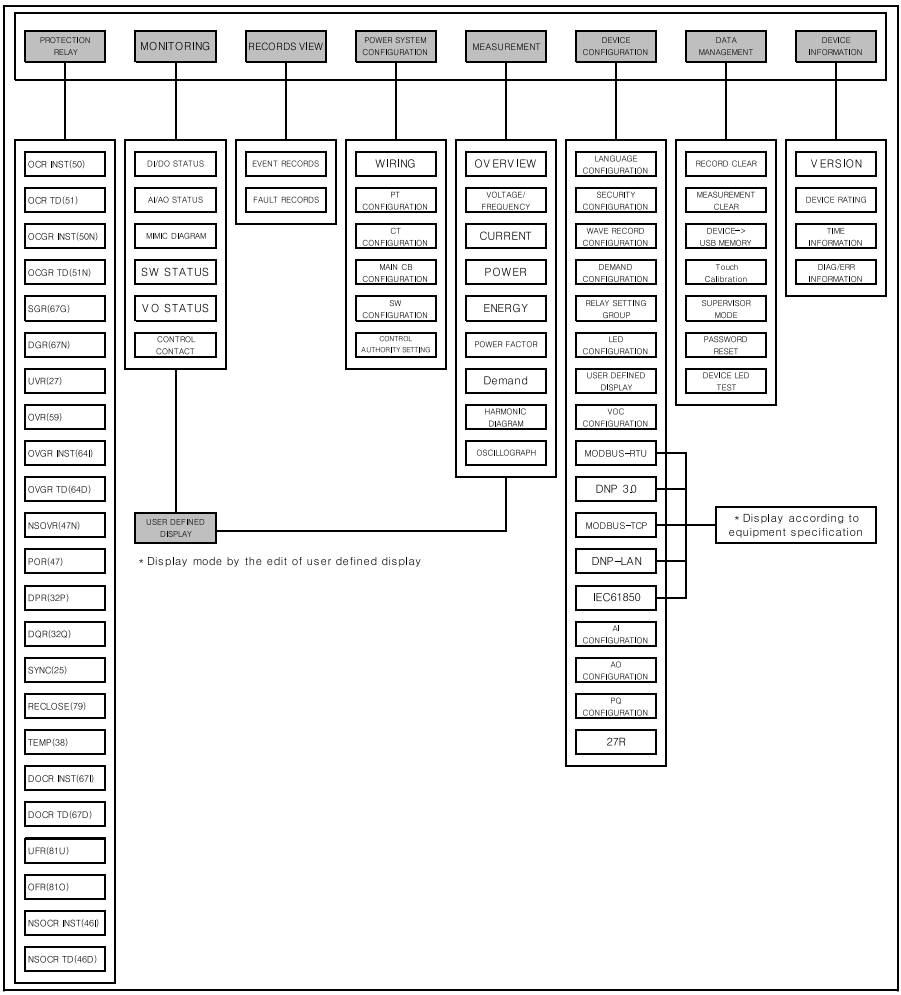
1. Outer Layout

1.3 Menu Layout – F Type



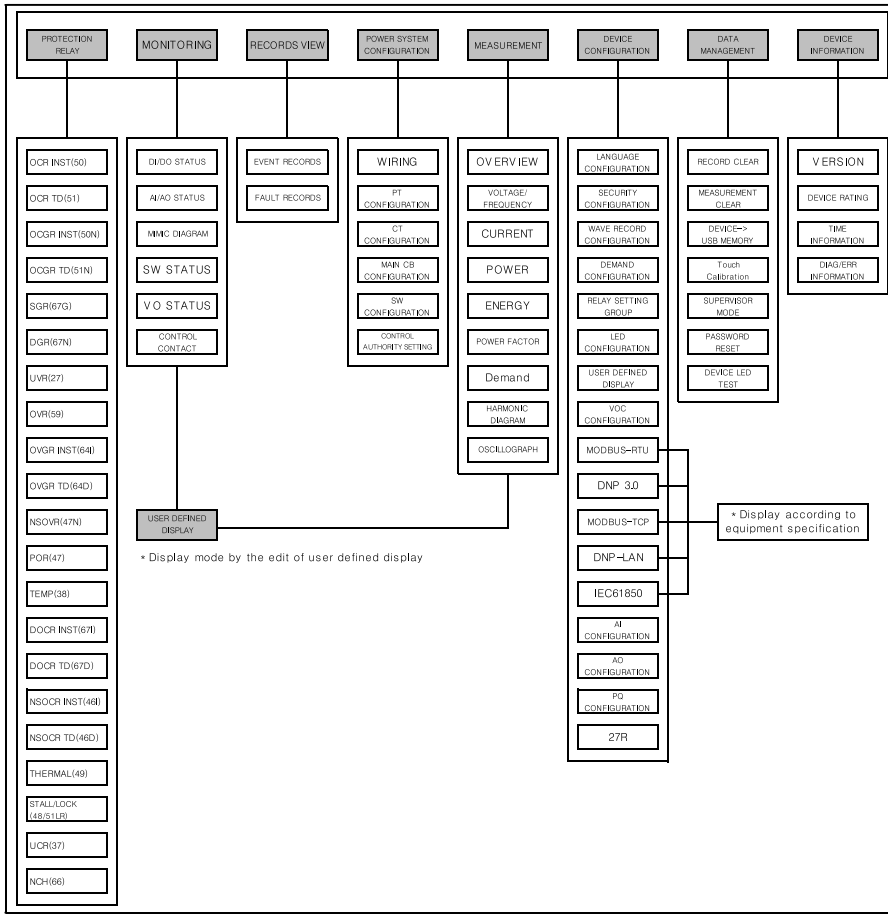
1. Outer Layout

1.4 Menu Layout – B Type



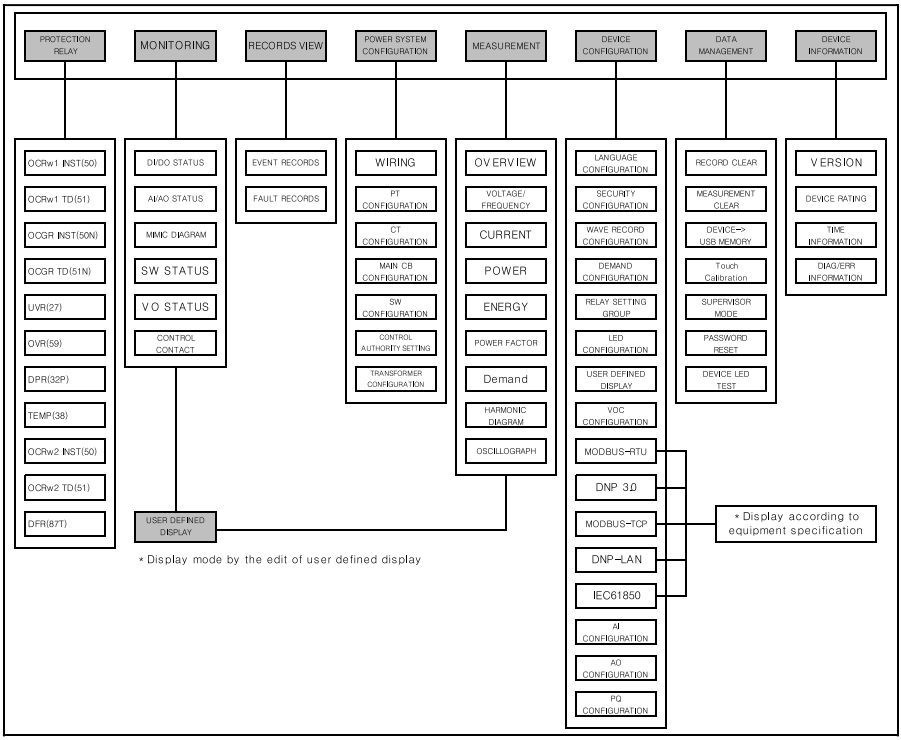
1. Outer Layout

1 5 Menu Layout – M Type



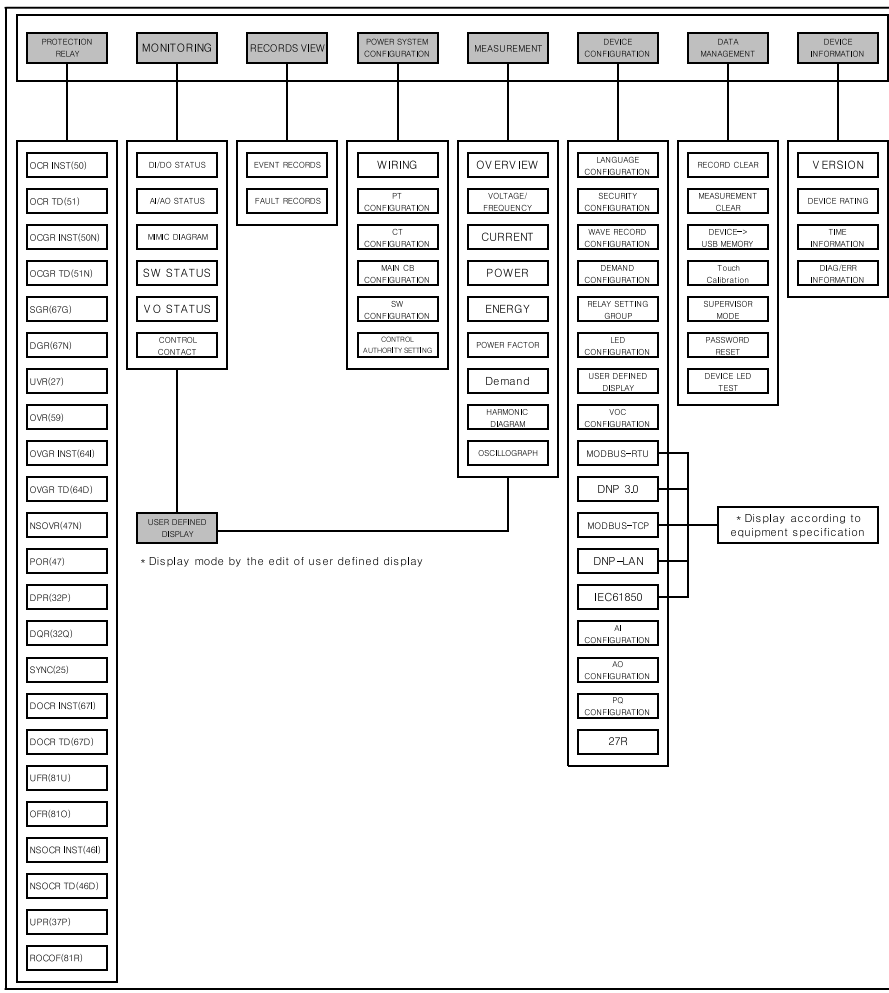
1. Outer Layout

1.6 Menu Layout – T Type



1. Outer Layout

1.7 Menu Layout – DG Type



2. Rated Values for the Product

2.1 Rated Values for the equipment

Contents		Specification
Cut off method		3P3W(2PT-D), 3P4W(3PT-Y)
Input point	Frequency	50Hz or 60Hz
	Voltage	PT : 100V,110V, 120V,190V (Phase/line input choice 1/√3) * Maximum 120V
		GPT : 110~190V
	Current	CT : 5A
		ZCT : 1.5mA
	Control Power	AC : 110V, DC110~125V
	Usage Power	Normally Under 30W, Operation : Under 70W
	Input Burden	PT : 0.5VA (PT phase is the standard form)
		CT : 1.0VA
	Input point	Digital Input : AC/DC 110V
Output point	TRIP use	AC 250V 10A / DC 30V 10A Resistive Load
		AC 2500VA, DC300W
	ALARM use	AC 250V 5A / DC 30V 5A Resistive Load
		AC 1250VA, DC150W
Usable Temperature Range		-10℃ ~ 55℃
Storage Temperature Range		-25℃ ~ 70℃
Usable Humidity Range		Daily average 30% ~ 80%
Altitudinous		Below the altitude 1000m
ETC		Area without vibration and impact
Application Standard		KEMC 1120 IEC 60255-22-1 ~ 7 IEC 60255-11 IEC 60255-25

2. Rated Values for the Product

2.2 Measuring Specifications

Measuring contents	Indications		Note
	Unit	Range	
Voltage	V	0.0 ~ 999.999 k	±0.2% Phase Voltage, Line Voltage
Zero phase voltage	V	0.0 ~ 999.999 k	±2.0% Vo
Bus voltage	V	0.0 ~ 999.999 k	±0.2% VB
Voltage Unbalanced Factor	%	0.0 ~ 200.00	±2.0%
Reverse Phase Voltage	V	0.0 ~ 999.999 k	±1.0% V2
Current	A	0.0 ~ 999.999 k	±0.2% Phase Current
Zero phase current (CT4)	A	0.0 ~ 999.999 k	±2.0% In
Zero phase current (ZCT)	A	0.0 ~ 999.999	±1.0% Io
Reverse phase current	A	0.0 ~ 999.999 k	±1.0% I2
Phase	°	0.0 ~ 360.0	±5°
Active power	W	0.00 ~ 9999.999 M	±0.5% +Forward, -Reverse
Reactive power	VAR	0.00 ~ 9999.999 M	±0.5%
Apparent power	VA	0.00 ~ 9999.999 M	±1.0%
Active electric energy	WH	0.00 ~ 99999.999 M	±0.5% +Forward, -Reverse
Reactive electric energy	VARH	0.00 ~ 99999.999 M	±0.5%
Frequency(Va)	Hz	45 ~ 65	±0.005Hz
Frequency(VB)	Hz	45 ~ 65	±0.005Hz
Power Factor(PF)	-	-1.000 ~ 1.000	±1.0% Foward/Reverse
Fundamental Power Factor(DPF)	-	-1.000 ~ 1.000	±1.0% Foward/Reverse
Voltage Harmonics	%	0.00 ~ 100.00	±5.0% 2nd ~ 63 trillion Harmonics and THD,TDD,K-Factor
Current Harmonics	%	0.00 ~ 100.00	±5.0% 2nd ~ 63 trillion Harmonics and THD,TDD,K-Factor
Active power Demand	W	0.00 ~ 9999.999 M	Total Peak Demand
Reactive power Demand	VAR	0.00 ~ 9999.999 M	Total Peak Demand
Current Demand	A	0.3 ~ 999.999 k	Total Peak Demand and Peak Demand of each phase
Load Factor	%	0.0 ~ 100.000	±0.2% Load factor of each phase

XGIPAM RELAY SETTING

Protection relay	Operation type	Operation value setting / Variation, operation time	Note
OCR Inst (50)	Instant time Definite time	Setting : OFF, 0.10 ~ 32.00 / 0.01In Operation time : 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time)	When set up to "0", (60Hz) It acts lower than 30ms. (50Hz) It acts lower than 40ms.
OCR TD (51)	Definite time Inverse time	Setting : OFF, 0.02 ~ 10.00 / 0.01In Operation time : 0.05 ~ 1.20 / 0.01 (inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(inverse time)	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
OCGR Inst (50N)	Instant time Definite time	Setting : OFF, 0.1 ~ 32.00 / 0.01In Operation time : 0, 0.05 ~ 300.0 / 0.001s Motor Block time : 0.1 ~ 300.0 / 0.1s (Instant time, Definite time)	When set up to "0", (60Hz) It acts lower than 30ms. (50Hz) It acts lower than 40ms. Motor Block I > 0.1A
OCGR TD (51N)	Definite time Inverse time	Setting : OFF, 0.02 ~ 10.00 / 0.01In Operation time : 0.05 ~ 1.20 / 0.01 (Inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time) Motor Block time : 0.1 ~ 300.0 / 0.1s	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI Motor Block I > 0.1A
SGR (67G)	Definite time	Zero phase current setting : 0.6 ~ 6.0 / 0.1mA Zero phase voltage setting : 0, 8.0 ~ 80.0 / 1V Phase-sensitivity standard angle : 0 ~ ±90 / 1° Operation time : 0.05 ~ 10.0 / 0.001s	If the zero phase voltage is set to 0, the zero phase current will act only.
DGR (67N)	Instant time Definite time Inverse time	Zero phase current Setting : 0.02 ~ 10.00 / 0.01In Zero phase voltage Setting : 8.0 ~ 80.0 / 1V Phase-sensitivity standard angle : 0 ~ ±90 / 1° Phase operation range : 60 ~ 87 / 1° Operation time : 0.05 ~ 1.20 / 0.01 (Inverse time) 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time) POWER FLOW DIRECTIOIN : FORWARD / REVERSE	When set up to "0", (60Hz) It acts lower than 50ms. (50Hz) It acts lower than 55ms. Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
UVR (27)	Definite time	Setting : OFF, 0.10 ~ 1.10 / 0.01Vn Operation time : 0.05 ~ 300.0 / 0.001s (Definite time) Auto reset : Use / Not use Dead Voltage Block : Use / Not use	Dead Voltage Block: If the 3 phase voltage is lower than 0.05Vn, the UVR does not operate.

XGIPAM RELAY SETTING

Protection relay	Operation type	Operation value setting / Variation, operation time	Note
OVR (59)	Definite time Inverse time	Setting : OFF, 0.80 ~ 1.60 / 0.01Vn Operation time : 0.01 ~ 1.20 / 0.01 (Inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time)	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
OVGR Inst (64I)	Instant time Definite time	Setting : OFF, 5 ~ 80 / 1V Operation time : 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time)	When set up to "0", (60Hz) It acts lower than 30ms. (50Hz) It acts lower than 40ms.
OVGR TD (64D)	Definite time Inverse time	Setting : OFF, 5 ~ 80 / 1V Operation time : 0.05 ~ 1.20 / 0.01 (Inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time)	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
NSOVR (47N)	Definite time	Setting : OFF, 11 ~ 120 / 1V Operation time : 0.05 ~ 300.0 / 0.001s	Definite time All 3 phase voltages must be over 5V.
POR (47)	Definite time	Setting : OFF, 2.0 ~ 100.0 / 1% Operation time : 0.05 ~ 300.0 / 0.001s Vub(Unbalanced Factor) = Max(|Vphase-Vavg|)/Vavg *100%	Definite time
SYNC (25)	Definite time	V Diff : OFF, 2 ~ 50 / 1V Phase Diff : OFF, 5 ~ 45 / 1° Freq Diff : 0.01 ~ 0.50 / 0.01Hz Dead Voltage : 0.2 ~ 0.4 / 0.01Vn	After the synchronous conditions are satisfied, it operates within 1sec.
Reclosing (79)	-	Reclosed circuit number : 1 ~ 5 / 1 time Prepare Time : 0.02 ~ 60.00 / 0.001s Dead Time : 0.06 ~ 300.0 / 0.001s CB Operation time : 0.05 ~ 0.500 / 0.001s Reclaim Time : 1.00 ~ 300.0 / 0.001s Scheme : Not use, L-L, L-D, D-L, D-D *CB operation time: It is setup as Switch Fault time delay equipment setup-SW setup menu.	Not use, Live Bus – Live Line Live Bus – Dead Line, Dead Bus – Live Line Dead Bus – Dead Line
TEMP (38)	Definite time	Setting : Off, 20 ~ 180 / 1℃ Operation time : 0, 0.05 ~ 300.0 / 0.001s	The range is needed to be setup as AI mode when equipment is setup as a relay.

3. Relay Element

XGIPAM RELAY SETTING

Protection relay	Operation type	Operation value setting / Variation, operation time	Note
UFR (81U)	Definite time	60Hz Setting : OFF, 50 ~ 60 / 0.05Hz 50Hz Setting : OFF, 40 ~ 50 / 0.05Hz Operation time : 0.10 ~ 300.0 / 0.001s UV Block : 0.5 ~ 0.9 / 0.01Vn	Select PT#1 or PT#5
OFR (81O)	Definite time	60Hz Setting : OFF, 60 ~ 70 / 0.05Hz 50Hz Setting : OFF, 50 ~ 60 / 0.05Hz Operation time : 0.10 ~ 300.0 / 0.001s UV Block : 0.5 ~ 0.9 / 0.01Vn	Select PT#1 or PT#5
DPR (32P)	Definite time	Setting : OFF, 0.01 ~ 1.50 / 0.01Pn Operation time : 0.10 ~ 300.0 / 0.001s (Definite time) Direct : Forward / Reverse	-
DQR (32Q) (Bay Type use only)	At definite time	Setup : OFF, 0.02 ~ 1.50 / 0.01Qn Action time : 0.10 ~ 300.0 / 0.001s (Definite time) Direct : Forward / Reverse	-
DOCR Inst (67I)	Instant time Definite time	Setting : OFF, 0.1 ~ 32.0 / 0.01In Phase-sensitivity standard angle : 0 ~ ±90 / 1° Phase operation range: 60 ~ 87 / 1° Direct : Forward / Reverse Operation time : 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time)	When set up to "0", (60Hz) It acts lower than 50ms. (50Hz) It acts lower than 55ms.
DOCR TD (67D)	Definite time Inverse time	Setting : OFF, 0.02 ~ 10.00 / 0.01In Phase-sensitivity standard angle : 0 ~ ±90 / 1° Phase operation range: 60 ~ 87 / 1° Direct : Forward / Reverse Operation time : 0.05 ~ 1.20 / 0.01 (Inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time)	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI
NSOCR Inst (46I)	Instant time Definite time	Setting : OFF, 0.1 ~ 2.00 / 0.01In Operation time : 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time)	When set up to "0", (60Hz) It acts lower than 50ms. (50Hz) It acts lower than 55ms.
NSOCR TD (46D)	Definite time Inverse time	Setting : OFF, 0.05 ~ 2.00 / 0.01In Operation time : 0.05 ~ 1.20 / 0.01 (Inverse time) 0.05 ~ 300.0 / 0.001s (Definite time) Operation delay time : 0 ~ 300.0 / 0.001s(Inverse time)	Temporary Curve IEC SI/VI/EI/LI ANSI SI/VI/EI KEPCO SI/VI

XGIPAM RELAY SETTING

Protection relay	Operation type	Operation value setting / Variation, operation time	Note
STALL (48)	Definite time	Setting : OFF, 0.20 ~ 10.00 / 0.01In Operation time : 0.05 ~ 300.0 / 0.001s (Definite time)	Motor Start Time : 1.000~300.0s/0.001s
LOCK (51LR)	Definite time Inverse time	Setting : OFF, 0.20 ~ 10.00 / 0.01In Operation time : 0.05 ~ 1.20 /0.01 (Inverse time) 0.05 ~ 300.0s / 0.001s (Definite time) Operation delay time : 0 ~ 300.0s / 0.001s(Inverse time)	Temporary Curve IEC VI/EI
NCH (66)	–	Motor start number limit : OFF,1 ~ 5 / Once Motor start permission time : 10 ~ 60 / 1min Motor start limit time : OFF,1 ~ 60 / 1min Remaining calorie limit : OFF,10 ~ 80 / 1% Motor mobility condition : If the Max value of the 3 phase is measured as over 0.05A, it is judged as the motor is in action	*If the remaining calorie limit function is used, the THERMAL(49) setup value is used
THERMAL (49)	–	FLC(Full Load Current) : 0.20 ~ 2.00 / 0.01In OLC(Over Load Constant) : 0.8 ~ 1.2 / 0.01 SF(Service Factor) : 0.8 ~ 1.2 / 0.01 Operation value : OFF, 50 ~ 100 / 1% Heating Factor : 2.0 ~ 60.0 / 0.1min Cooling Factor : 2.0~60.0/0.1min	k factor = SF × OLC
Current Differential Relay (87T)	Instant time Definite time	Id(Low pick up) : OFF, 0.2 ~ 1.0 / 0.01In Slope1 : 15 ~ 100 / 1 % Slope2 : 15 ~ 100 / 1 % Knee point : 1.0 ~ 20.0 / 0.1In Inrush inhibit : OFF, 5 ~ 50 / 1 % Io elimination : on, off Id (High pick up) : OFF, 2.0 ~ 32.0 / 0.01In Operation time : 0, 0.05 ~ 300.0 / 0.001s (Instant time, Definite time)	When set up to “0”, (60Hz) It acts lower than 50ms. (50Hz) It acts lower than 60ms.

XGIPAM RELAY SETTING

Protection relay	Operation type	Operation value setting / Variation, operation time	Note
ROCOF (81R)	Definite time	Setting : OFF, 0.1 ~ 2 .0 / 0.1Hz/s Operation time : 0.20 ~ 60.0 / 0.001s UV Block : 50 ~ 100 / 1V	-
DQR (32Q) (DG Type use only)	Definite time	Setting : OFF, 0.01 ~ 1.50 / 0.01Qn Operation time : 0.10 ~ 300.0 / 0.001s (Definite time) Direct : Forward / Reverse Q Calc. Method : Qa=IaVasin(theta), Qa=Ia(Vb-Vc)	-
UPR (37P)	Definite time	Setting : OFF, 0.02 ~ 0.80/0.01Pn Operation time : 0.10 ~ 300.0/0.001s (Definite time) Direct : Forward / Reverse	-
UCR (37)	Definite time	Setting : OFF, 0.10 ~ 0.90/0.01In Operation time : 0.10 ~ 300.0/0.001s (Definite time) Dead Current Block : ON,OFF	-

4. Additional Functions

XGIPAM Additional Functions

4.1 DI/DO Monitoring

X-GIPAM provides 3 kinds of digital input/output modules.

The digital IO module basically has two(In the case of Bay Types, there are 3.) installed, and at maximum there can be 4 installed.

1) Terminal Block type / Normal connector types are composed DI 10 points, PO 2 points, DO 8 points

a) DI Composition : DI01, DI02, DI03, DI04, DI05, DI COM0 / DI06, DI07, DI08, DI09, DI10, DI COM1

Note) DI01/DI02 is the point that receives the state indication of SW and CB (DI01 : ON Status, DI02 : OFF status)

b) DO Composition

- PO Relay : CB OPEN+(DO02+), CB OPEN-(DO02-) / CB CLOSE+(DO01+), CB CLOSE-(DO01-)
- Alarm Relay : DO03, DO04, DO05, COM0 / DO06, DO07, DO08, COM1

2) PO(Power Output) type is composed DI 6 points, PO 6 points

a) DI Composition: DI01, DI02, DI COM0 / DI03, DI04, DI COM1 / DI05, DI06, DI COM2

b) DO Composition: CB OPEN+(PO02+), CB OPEN-(PO02-) / CB CLOSE+(PO01+), CB CLOSE-(PO01-)

c) Switch control: PO03+- / PO04+- / PO05+-

4.2 AI/AO Monitoring

The analog input/output function indicates the function that can input or output DC4~20mA .

1) Input/output composition of an analog board: 6AI/4AO

There can be a maximum of 2 sheets of analog boards attached to X-GIPAM.

2) Analog input/output specification: DC 4~20mA

3) User setup - Engineering Value Function

The AIAO module of the X-GIPAM has a function that receives a current input of DC4~20mA from the outside.

However since most of the 4~20mA output is the current being output from the sensor, if the current is displayed as a primary value of the sensor it will allow the user to use the equipment with more convenience.

Engineering Value function indicates the current value of DC4~20mA being expressed on the monitor as the primary value set by the user.

- Caution -

Min/Max can be setup at HMI, but the unit can only be setup at the PC Manager.

Other user setup can be setup at DEVICE CONFIGURATION/AI CONFIGURATION and DEVICE CONFIGURATION/AO CONFIGURATION .

4.3 Event Record Function

Input and output of the product in action and all the state changes with the time information recorded in the order in which the data refers to the place. Because the event records the operation state of the relay, accident record analysis or failure analysis can be performed with this function. Additionally the accident information is recorded every 1msec.

4. Additional Functions

XGIPAM Additional Functions

1) Event Record Reading

As soon as the X-GIPAM realizes that an Event happened, the Event and the additional information about the cause of the event is recorded and the content of the record and the type of information are like the follows.

a) Change setting Event

- Values before and after the change

b) Relay operation (Pick Up/Operation/Drop out Event)

- The quantity of the electricity that causes the relay operation
- In the case of Operation, Wave information is basically recorded.

c) The change of state of DI/DO/VO/SW

- Values before and after the state and the user name of DI/DO/VO

※ If the initial power is permitted during the change of state of DI/DO, the state change event does not recorded. However, VO makes the Event recorded.

d) Control (SW, DO, CC, Fault Reset, Auto-Reclosing, Count/Value Clear etc.)

- The control Event does not have additional information.

e) VOC/Demand Event

- The quantity of electricity that causes VOC/Demand operation

f) When TCS Status, TRS Status, SWF STATUS, I2t STATUS EVENT occurs, the SW NAME is not recorded, and only when the SW STATUS EVENT occurs the SW NAME is recorded.

2) Event Storage Capacity

If up to 1000 events of the past can be saved, when there are more than 1000 events the oldest Events are deleted and the newest data are filled in(Roll-over function).

4.4 Fault Record Function

Fault Record function is the record that is the recorded that extracted the information about the accident in the system.

1) Event recorded in the Fault

- Pick Up Event / Operation Event / Drop Out Event

2) Relay element common record event Values

a) Common VALUES of an event

- The name of the relay element and the relevant Stage / Operation state(Pickup, Operate, Dropout etc) / Time information / Main Control [REMOTE / LOCAL]

b) Fault Values

- Fundamental wave Va, Vb, Vc, Vo, VB / fundamental wave Ia, Ib, Ic, In(Io)
- According to some relay elements, set to display the quantity of electricity

4. Additional Functions

XGIPAM Additional Functions

4.5 Power System Configuration Function

1) Wiring Information Setup

This configuration is an important setup about the protection function like the PT/CT setup, and this must be compatible with the installation environment in order to prevent malfunction.

X-GIPAM allows both the WYE wiring and the DELTA wiring in the wiring between PT and the relay.

The wiring information setup means the setup on how the PT of the relay is wired. In other words, if DELTA wiring is used, 2PT-D mode be selected and if WYE wiring is used, 3PT-Y mode be selected.

2) Voltage Transformer (PT) Setup

a) Phase Voltage Transformer

i) PRIMARY : The setup of the phase PT primary ratio

- Input Range : 100 ~ 999999V

ii) SECONDARY : The setup of the phase PT secondary ratio

- Input Range : 100, 110, 120, 190

iii) PRI./SEC. FACTOR : The setup of the input voltage in the phase/line (According to the standard of the installed PT)

- Input Range : 1= The installation of the PT for input in line voltage, 1/√3 = The installation of the PT for input in phase voltage

b) Ground Voltage Transformer(GPT)

i) PRIMARY : The setup of the phase PT primary ratio. There can be no modification in the monitor GPT setup window, the setup value in the setup of the phase PT is used at it is.

ii) TERITIARY : The setup of the Three winding PT. GPT tertiary voltage

- Input Range : 110 ~ 190

c) Zero phase Voltage Input

i) Vo SOURCE : The Source of the zero phase voltage

-SLOT#01 PT4 : The direct input of Slot#1 through PT4

-SLOT#01 VECTOR SUM : Cognizes the Vo value as a vector sum of the PT1/2/3 input of Slot#1.

d) Voltage Transformer Breakdown Monitoring (PTF)

A function that alarms when the X-GIPAM Fuse and PT is disconnected (PT Fail)

- If in the CB close state the current unbalanced factor(I2/I1) is below 20%, the relevant current of the phase is below 0.1~5A, and the relevant voltage is below 10%, continued long than 50msec, it is judged to be a PT Failure.

4. Additional Functions

XGIPAM Additional Functions

3) Current Transformer (CT) Setup

If the CT ratio is changed, the accumulated Energy is cleared.

F,B,M,DG Type	T Type
a) Phase Current Transformer i) PRIMARY: Setup of the primary ratio of the phase CT (Input Range : 5 ~ 9999A) ii) SECONDARY: Setup of the secondary ratio of the phase CT (Input Range : It is fixed at 5A, so there can be no change.)	a) Primary Winding Phase Current Transformer i) PRIMARY: Setup of the primary ratio of the phase CT (Input Range : 5 ~ 9999A) ii) SECONDARY: Setup of the secondary ratio of the phase CT (Input Range : It is fixed at 5A, so there can be no change.)
b) Ground Current Transformer i) PRIMARY: The input range of the primary side of the zero phase current (Input Range : 5 ~ 9999A) ii) SECONDARY: The input range of the secondary side of the zero phase current (Fixed at 5A)	b) Secondary Winding Phase Current Transformer i) PRIMARY: Setup of the primary ratio of the phase CT (Input Range : 5 ~ 9999A) ii) SECONDARY: Setup of the secondary ratio of the phase CT (Input Range : It is fixed at 5A, so there can be no change.)
c) Zero phase Current Transformer i) PRIMARY: The primary ratio of the Non-Earthed zero phase current (Fixed at 200mA) ii) SECONDARY: The secondary ratio of the non-earthed zero phase current (Fixed at 1.5mA)	c) Zero phase Current Transformer i) Connection: Choice between Pri. and Sec. windings ii) PRIMARY: The input range of the primary side of the zero phase current (Input Range : 5 ~ 9999A) iii) SECONDARY: The input range of the secondary side of the zero phase current (Fixed at 5A)
d) The input of the zero phase current i) SLOT#01 CT4 : The zero phase current input using CT4 (Read Only)	d) The input of the zero phase current i) SLOT#01 CT7 : The zero phase current input using CT4 (Read Only)

4) The setup of the main circuit breaker / SW / control system

X-GIPAM can compose up to 4 SW objects. The user can set up the main control circuit breaker of the relay. Using the OPEN/CLOSE key which is on the front side, the main control switch, direct control order can be issued and quick control motion is possible. This switch lets the function that predicts the life expectancy operate, and only one main control circuit breaker can be set up.

※ Caution : SW composing and the main circuit breaker selection function needs to setup identical to the ladder of PLC, and if not(when the PLC is not fixed and setup only in the menu) the function cannot be performed correctly.

a) The setup of the main circuit breaker

i) MAIN CB

Select the SW that will be used as a main circuit breaker. The SW that will be setup must be set up as SW in the menu of the SW CONFIGURATION, and has to select only the one that is setup as SW.

ii) I2t LIMIT USE

This decides whether to use the circuit breaker life span limit function. When set up as the main circuit breaker, the cutoff current that occurs because of the opening of the main circuit breaker is calculated in the inner algorithm and if the result exceeds the limited figure, an Event occurs.

iii) I2t LIMIT

Setup Range : 10,000(MIN) ~ 1,000,000,000(MAX)

XGIPAM Additional Functions

b) SW Setup

i) FUNCTION : It can select the use of PO to be a SWITCH or a signal DO.

ii) TCS USAGE : It selects whether or not to use the TCS function

– USE : Uses the TCS function – NOT USE : Does not use the TCS function

※ When the Function is set as normal signal DO(PO), it is fixed at NOT USE

iii) TRS USAGE : It decides whether to use the TRS function

– USE : Uses the TRS function – NOT USE : Does not use the TRS function

※ When the Function is set as normal signal DO(PO), it is fixed at NOT USE

iv) TRS SCHEDULE : This sets up the operation frequency of the TRS checking function

– Setup Range : 1 ~ 365 day

v) SW FAULT USAGE : This selects whether to use the function that checks the failure of the switch that is set as the main circuit breaker.

– USE : Uses the function. –NOT USE : Does not use the function

vi) SW FAULT TIME DELAY (SW fault check operation time) : After the relay element operation changed the circuit breaker to OPEN, the operation time of the switch operation Fail check function that is used to judge the normal operation needs to be set up with an interval of 50 ~ 500 ms / 1 ms.

vii) SOURCE

This shows the location of the DO(PO) that can be set as a SWITCH. Senses the IO module that is installed in the product, and displays the information. So the information cannot be changed by user.

viii) 3PSW EARTH DI SOURCE

In the case of a 3 pole control SWTICH, the third condition input is set up with this function. This needs to be set as NOT USE when normal circuit breaker is being set up.

c) Control Relay Setup

– R/L CHANGE SOURCE : This decides if the REMOTE/LOCAL will be controlled with a key or a DI.

– [LOCAL] SETTING STATUS : This decides which state(OPEN/CLOSE) will be chosen as the LOCAL state when the REMOTE/LOCAL main agent is set as DI.

※ CONTROL AUTHORITY reflects the current REMOTE/LOCAL state.

5) Transformer Setup(Displays the menu only at the T Type)

The T Type which is the relay for the protection of the transformer, lets the rating and wiring method of the primary and secondary side of the transformer.

a) The rating of the primary side of the transformer (1 ~ 999,999V)

b) The rating of the secondary side of the transformer (1 ~ 999,999V)

c) The setup of the wiring method of primary and secondary side of the transformer: Select and use a total of 24 connection (Ex: DY11)

5. Equipment Setup

XGIPAM Equipment Setup

5.1 Language selection

- ENGLISH: Displays the menu and the message in English
- KOREAN: Displays the menu and the message in Korean

5.2 Security setup

X-GIPAM uses a password for the security. Also the password can be used or not, and the use of the password on each menu/function group can be chosen by the user. The password is composed of four numbers, and is input with the use of the keypad on the HMI which uses the touch screen function. If the password is confirmed, the security is cleared for ten minutes

If there is no input(Touch, Mouse etc) for the next ten minutes, the security is closed again and the password needs to be confirmed again.

(※ Initial Password : "0000")

- Usage: Chooses whether to use the Password.
- Change of Password: Uses the existing Password
- Controls whether to use the password of each menu/function group

5.3 Wave form record setup

X-GIPAM saves the Wave regardless of the setup of the user when the safety relay function shows Pickup and Operation function.

On top of that it saves the Wave when the equipment performs the Capture order in the Oscilloscope function. Also X-GIPAM saves whenever the user chooses to save the wave. The user can choose one wave trigger source, and if the trigger source that is chosen by the user is input the wave is saved. The Wave is saved with 64 Samples per 1 cycle and 128 Cycles are saved with the number of samples

The change of cycle is impossible. But, in the saving before/after the trigger timing, the cycle setup is possible.

- RECORD CYCLE : Wave Cycle to be saved – 128 cycle (Fix)
- SAMPLE RATE : The number of Wave samples to be saved – 64 Sample (Fix)
- PRE TRIGGER CYCLE : The wave cycle before the Wave save Event happens, 0 ~ 128 CYCLE
- TRIGGER SOURCE : Wave save input Source that is selected by the user – DI, VO choice
- TRIGGER SOURCE STATUS : The state of Trip Source – CLOSE (Fixed)

5.4 Demand current/power setup

1) Load Record

- Average time : The demand time limit for the Load Profile record

2) Demand Current

- I3ϕ/Ia/Ib/Ic USAGE : 3phase/A phase/B phase/C phase current Demand usage

  USE : Uses the function, NOT USE : Does not use the function

- I3ϕ/Ia/Ib/Ic VALUE : 3 phase/A phase/B phase/C phase Over Demand setup value

  1 ~ 999999 A

- DEMAND TIME (Current demand time limit): Current Demand time limit

  1 ~ 3600 sec

3) Demand Power

This means the accumulated forward/backward P3 valid quantity of electricity during the demand time, Forward/backward Q3 invalid quantity of electricity

- Demand Time limit : 5~60 min/5 min

5.5 Relay setup group

Setting Group alteration Event can be selected with the combination of the change of the input/output of certain DIs, the user change of the PC/HMI or the setup alteration to the long distance communication. One to four automatic alteration Setting group can be set up and also it can be not used. Without using automatic Setting group, the change of the setting group through manual or long distance operation is always possible.

1) Environment Setup

a) Vitality Group

This shows the presently applied Setting group and through the touch LCD, PC manager, and long distance setup can be changed to 1~4.

b) Re-setup Suppression Time

If the Setting group is changed once, during the time that is setup with the SWITCH BLOCK TIME, the change to another setting group through manual or automatic methods and the change of the setting group automatic alteration relation setup(USE/NOT USE, SOURCE, SOURCE STATUS, Block Time) is blocked.

- Setup Range : 1 ~ 600 sec / 1 sec

2) GROUP1 ~GROUP4

a) Automatic vitality Usage

The automatic change of each Setting group can be set to be used or not.

b) Input Choice

Setting group is set to automatic change event source. It can be chosen from all the DI, VO.

c) Input State

Setting group is set up to the automatic alteration event source state. Since the ACTIVE SOURCE is DI, VO, the ACTIVE SOURCE STATUS is CLOSE.

5. Equipment Setup

XGIPAM Equipment Setup

5.6 LED Setup

There are 8 virtual LEDs on the left side of the HMI monitor, and the Source for the lighting of the LED can be changed by the user.

If the source condition that is set up by the user satisfies the trigger condition, the light lights up in a red or yellow band.

LED 01 ~ LED 08 Setup

- Usage : USE or NOT USE
- Input Choice : Relay element (Stage1, Stage2), DI/DO, VO
- Input State : If it is a relay element, PICK-UP or OPERATION

  [25 Protection Content] Sync, Sync permission v.

  [79 Protection Content] Ready, Process, Fail/Lock-out, Cancel

  If it is DI/DO/VO : Fixed to CLOSE

5.7 User Defined Display Setup

If there is no input by the user for 10 minutes, the monitor is changed to the screen that is selected. If there is more than one selected screen, each screen is maintained for five seconds and the next screens is displayed on the screen. The user can choose 3 screens maximum.

The elements that can be set up have the same DISPLAY 1/2/3 composition.

- Usage : The usage of certain screens, USE or NOT USE
- Screen selection : The screen that can be chose by the user

Measurement: Overview, Voltage/Freq, Current, Power, Energy, Power Factor, Demand, Harmonic, Oscillograph

Monitoring: DI/DO, AI/AO, MIMIC, VO, SW

5.8 VOC Setup

VOC (Value of Change) is the analog event function that generates an event when the measurement of the relay deviates the value set up by the user.

1) Usage : USE or NOT USE

2) Input Choice: Va, Vb, Vc, Vo, VB, Ia, Ib, Ic, IN, Io, Pa, Pb, Pc, Qa, Qb, Qc, AIO #1 ~ AIO #2, AI01 ~ AI06

* The setup is only possible on the modules that have slots installed.

* In the case of power, there is no difference in the setup of forward and reverse, and on the relevant quantity of electricity the VOC operates only with the absolute value of the input power. However, if the VOC operates with the reverse power source "-"signal is recorded on the event.

3) Range: 10 ~ 50% / 1%

4) Operation delay time: 1 ~ 300 sec / 1 sec

5) Range re-selection time: 1~ 300 sec / 1 sec

XGIPAM Equipment Setup

5.9 Communication Setup : Long distance function uses the Protocol like the following.

1) DNP 3.0

a) Usage : USE or Not USE

b) Address setup : 1~65534

c) BaudRate setup : 9600, 19200, 38400 bps

2) MODBUS RTU

a) Usage : USE or Not USE

b) Address setup : 1~247

c) BaudRate setup : 9600, 19200, 38400 bps

d) Float Data SWAP function setup : SWAP ON, SWAP OFF

※ RS485 communications (DNP 3.0 , MODBUS RTU)

1) Operation mode : Differential

2) Communication Range : Maximum 1.2Km

3) Communication Line : General-purpose RS-485, Shield twisted 2-Pair Cable

4) Maximum Input/Output Voltage : ±6V

3) DNP-LAN

a) Usage : USE or Not USE

b) Address setup : 1~65534

c) Client Max Idle Time setup : 10~60 sec

- If the fixed time is passes, the TCP connection is disconnected because of the Timeout, and is put to cleared state

d) 100-FX Duplex setup : Full Duplex, Half Duplex

e) IP Address setup : 0.0.0.0 ~ 255.255.255.255

※ When setting the IP Address of Channel A and B, the third address[Class3] should be configured differently.

Ex) When the IP Address of Channel A is "192.168.1.1", Channel B can be "192.168.10.1"which has different address of Class3.

f) Subnet mask setup : 0.0.0.0 ~ 255.255.255.255

g) MAC Address setup : 00-0B-29-yy-yy-yy (y : 0 ~ F) (※ Mac Address has already been set, so it is not allowed to be set by user.)

4) MODBUS-TCP

a) Usage : USE or Not USE

b) SWAP function setup : SWAP ON, SWAP OFF

c) Client Max Idle Time setup : 10~60 sec

- If the fixed time is passes, the TCP connection is disconnected because of the Timeout, and is put to cleared state

d) 100-FX Duplex setup : Full Duplex, Half Duplex

e) IP Address setup : 0.0.0.0 ~ 255.255.255.255

XGIPAM Equipment Setup

※ When setting the IP Address of Channel A and B, the third address[Class3] should be configured differently.

Ex) When the IP Address of Channel A is "192.168.1.1", Channel B can be "192.168.10.1"which has different address of Class3.

f) Subnet mask setup : 0.0.0.0 ~ 255.255.255.255

g) MAC Address setup : 00-0B-29-yy-yy-yy (y : 0 ~ F) (※ Mac Address has already been set, so it is not allowed to be set by user.)

※ 10BASE-T Ethernet (DNP-LAN, MODBUS-TCP)

1) Maximum baud rate : 10 Mbps

2) Topology : Star

3) Transmission medium : UTP(CAT.3, CAT.5)

4) Access control method : CSMA/CD

5) Transmission code : Manchester

6) Maximum transmission distance : Up to 100m between HUB and Terminal

※ 100BASE-TX Ethernet (DNP-LAN, MODBUS-TCP)

1) Maximum baud rate : 100 Mbps

2) Topology : Star

3) Transmission media : UTP(CAT.5), STP(Level 3)

4) Access control method : CSMA/CD

5) Transmission code : 4B/5B + MLT-3

6) Maximum transmission distance : Up to 100m between HUB and Terminal

※ 100BASE-FX (DNP-LAN, MODBUS-TCP)

1) Maximum baud rate: 100 Mbps

2) Topology : Star

3) Transmission media

- Wavelength: 1300nm
- Multi-Mode fiber
- Fiber Size: 62.5/125, 50/125um
- Optic Connector: SC type

4) Access control method : CSMA/CD, Transmission code : 4B/5B + NRZI

5) Maximum transmission distance : Up to 2km per segment

5. Equipment Setup

XGIPAM Equipment Setup

5) IEC61850

a) SNTP Server IP Address setup : 0.0.0.0 ~ 255.255.255.255

b) IP Address setup : 0.0.0.0 ~ 255.255.255.255

c) Subnet Mask setup : 0.0.0.0 ~ 255.255.255.255

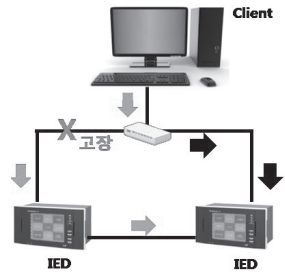
d) Gateway setup : 0.0.0.0 ~ 255.255.255.255

g) MAC Address setup : 00-0B-29-yy-yy-yy (y : 0 ~ F) (※ Mac Address has already been set, so it is not allowed to be set by user.)

※ IEC61850 standard supports Direct control and SBO control modes.

6) RSTP(Rapid Spanning Tree Protocol) Duplexing Function

Currently main systems are applying HA(High Availability) to prevent system failure and network error through duplexing communication and equipment. Therefore, electric power equipment needs duplexing function to maintain system normalization by switchover to reserve switch/communication line when accident occurs on switch/communication line. (Below picture is for example. When communication is normal, data flows through green arrow, and when accident occurs, data flow switches to black arrow).



When communication line, which is connected to X-GIPAM IEC61850/DNP, disconnects by failure, RSTP switches to normal functioning communication line in a rapid time manner. However, all of the equipment which is connected to the communication line has to support RSTP.

- When 30 units of X-GIPAM IEC61850/DNP RSTP are connected to one ring network, standard 1 second switch over time.
- When one switch's switchover time is delayed, entire systems' switchover time can be delayed. If equipment that does not support RSTP is connected (i.e. Switch), when communication line has an error and when Hello Time Frame is not received for three times, entire system's communication direction will readjust.
- Estimated Switchover time is 3~6 seconds.
- Switchover time can change due to equipment without RSTP supporting function.

※ Types of Network Topology

Network Topology means form of arrangement, network formation of elements (link, nod) which enters the computer network.

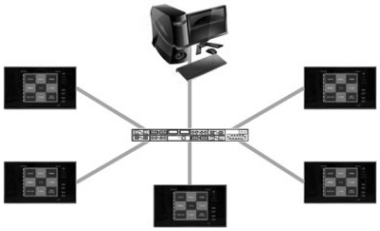
X GIPAM IEC61850/DNP RSTP supports following Network Topology Method.

① Star Method

Each nod can communicate with other nods through the central nod.

5. Equipment Setup

XGIPAM Equipment Setup

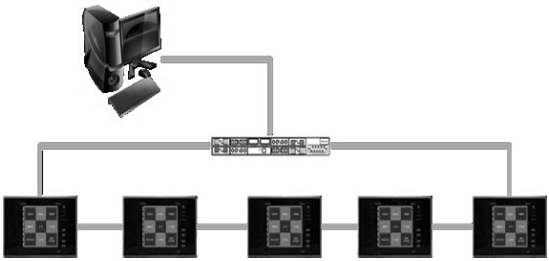


Advantage: Easy to identify an error and easy to manage.

Disadvantage: If an error occurs on the central nod, entire network becomes unavailable.

② Ring Method

Each nod is connected to the adjacent nods, which forms a circular form.

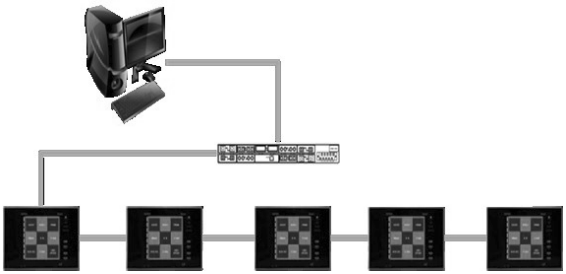


Advantage: Amplification of signal by simplex channel, less distance restriction.

Disadvantage: Since it uses Token, only token using nod can enter the network.

③ Daisy chain Method

Ring Method (One way) by transferring signal to the equipment which does not request the Daisy Chain Signal.



Advantage: Easy to identify an error, easy to manage

Disadvantage: Impossible of duplexing function. When central nod has an error, entire network becomes unavailable.

XGIPAM Equipment Setup

5.10 AI/AO Setup

AIO module has a function which can accept the 4~20mA input current from outside and print out the output.

AIO module has 6 channels of AI and 4 channels of AO.

Also, it has a function which indicates the current value of 4~20mA being expressed on the monitor as the primary setting values by user.

1) AI Setup

This can be configured as AI 01 ~ AI 06. In case of AI 01, it can not be configured because it has already been fixed as minimum 20 and maximum 180.

The name of AI can be changed through PC Manager only and displayed up to 8 characters in both Korean/English.

a) Min(Measuring MIN): AI measuring minimum can be configured from 0 to 1,000,000.000.

b) Max(Measuring MAX): AI measuring maximum can be configured from 0 to 1,000,000.000.

c) Measures can not be configured at HMI, but it can only be configured at the PC Manager.

2) AO Setup

AO can be configured 4 channels as 01 ~ AO 04.

The name of AO can be changed through PC Manager only and displayed up to 8 characters in both Korean/English.

a) Min (Measuring MIN): AO measuring minimum can be configured from 0 to 1,000,000.000.

b) Max (Measuring MAX): AI measuring maximum can be configured from 0 to 1,000,000.000.

c) Selection of Input : The source of AO output can be selected.

F/BAY/M/DG Type	T Type
3P4W(3PT-Y): Va, Vb, Vc, Vo, VB, When setup 3P3W(2PT-D) : Va=Vab, Vb=Vbc, Vc=Vca Ia, Ib, Ic, IN, IN Max, Io, Sa, Sb, Sc, P3Φ, Pa, Pb, Pc, rP3Φ, rPa, rPb, rPc, Q3ΦL, QaL, QbL, QcL, Q3ΦC QaC, QbC, QcC PF3Φ,PFa,PFb,PFc, PK P3Φ	3P4W(3PT-Y): Va, Vb, Vc When setup 3P3W(2PT-D) : Va=Vab, Vb=Vbc, Vc=Vca Ia(_1st), Ib(_1st),Ic(_1st),IN, IN Max Sa, Sb, Sc, P3Φ, Pa, Pb, Pc, rP3Φ, rPa, rPb, rPc, Q3ΦL, QaL, QbL, QcL, Q3ΦC QaC, QbC, QcC PF3Φ,PFa,PFb,PFc, PK P3Φ
AI01 ~ AI06	AI01 ~ AI06

5. Equipment Setup

XGIPAM Equipment Setup

5.11 PQ Setup

The function which is power quality(PQ) measurement function like Sag, Interruption, Swell can be configured its availability.

PQ function record Start/End Event when the voltage keep its level more than one half(1/2) cycle(8.4msec).

When PQ function works, the result will output as Event/PLC Logic.

1) Sag: The operating range can be configured as 0.4PU ~ 0.9PU/0.1PU. It also records its quantity/min or max/duration time of electricity for each phase at the time of detection.

2) Swell: The operating range can be configured as 1.1PU ~ 1.6PU/0.1PU. It also records its quantity/min or max/duration time of electricity for each phase at the time of detection.

3) Interruption: When the system voltage drops under 0.1Vn, it records its quantity/min or max/duration time of electricity for each phase at the time of detection and Event.

5.12 Monitoring element of the bus bar under voltage(27R)

27R is for monitoring the under voltage of bus and it is not relay protection element but additional elements. It operates through VB applied source.

1) Operating range : 0.1Vn ~1.1 Vn / 0.01Vn

2) Operating time range : 0.05~300 / 0.001s (Definite-time)

3) Remarks

a) When 27R works, there's no other message such as screen or LED displayed like relay element, but the events are recorded only.

b) When 27R works, Pick up, Operation, Drop-out events are recorded like the relay element.

However, waveform is not recorded.

5.13 Arc Protective Monitoring function

This function is for detecting arc promptly when the accident occurs inside of the Switchgear.

1) Components of APM: 3pcs of Arc Light Point type Sensors(hereinafter referred to as "Point Sensor") which detects light intensity (Measurement: Lx) from Arc accident, 1pc of Arc Light Loop type Sensor(hereinafter referred to as "Loop Sensor").

2) APM Setup Items

a) Availability of APM : USE, Not USE

b) Arc accidents judgement current setup (Current leading to Arc accidents setup)

i) Setting range of ArcI : 0.1~32.0In / 0.01In (Default setting as 32.0In)

ii) Setting range of ArcIN : 0.1~32.0In / 0.01In (Default setting as 32.0In)

c) Availability of Point Sensor/ Loop Sensor: Set USE or Not USE for 3pcs of Point Sensor and 1pc of Loop Sensor individually

d) Length of Optical fiber cable for Point Sensors : Select 1.5m, 3m / 5m, 7m / 10m, 15m / 20m, 30m about each of Point Sensors(3pcs)

e) Output setting function : DO, PLC (Default: DO output)

XGIPAM Equipment Setup

3) Features of APM

a) Judgement of Arc accidents

i) Pick up Condition : It happens when light intensity from optical signal detected by Arc Light Sensor is over the established set of light intensity.

ii) Operation Condition : With above Pick up condition, when the detected current from CT(Current Transformer) is over the established set of current, the accident will be judged by Arc Flash.

b) The compensation function of Ambient light amount (base light amount): Depending on the location, the structure of the switchgear, and the location where the sensor is installed, the sensor automatically detects the amount of base light due to a difference in the amount of light in the baseline state. And it determines an arc accident with an increased light amount (DELTA Lx) with respect to the detected base light amount.

Arc function can be disabled when the control power is turned OFF / ON in the arc operation state by continuously applying the operation light amount through the base light amount compensation function.

c) Light intensity for judgement of Arc accidents

i) Operated : When the light amount increment over 100,000ΔLx in comparison with base light amount lasts more than 1msec, it is operated.

ii) Not operated : Less than 10,000ΔLx in comparison with the base light amount

d) Operation time for Arc protective function

i) Operating time : Lead time of DO or TRIP function after the Arc accident current/Light happened.

ii) Operating time when using DO : Under 15ms (Direct DO operating time of Slot#7 DO 6)

iii) Operating time when using PLC : Under 20ms (Operating time through circuit breaker control by using PLC)

※ It works basic Alarm(set the ARC protective function as DO). In order to work as Trip, PLC Logic should be modified.

※ Note : Operating time can be delayed if the harmonics exceed 10%.

e) Operating value error for Arc accidents judgment current

– ±5.0% of setting or below a large value of ±0.05A

f) Condition for returning Arc accidents

i) When both fault current and light quantity are removed, it returns.

ii) When the operation light quantity is removed regardless of current, it returns Trip contact within 100ms and records Drop out Events.

iii) When operation light quantity is maintained, it doesn't return even if operation electricity is removed.

g) Record the Arc operation events

i) Arc accidents detective function detects the first occurrence of the operation light, records the pick up events, and then records the Operation by detecting the operation current.

ii) In case of detecting the operation light amount when the operation current reference value is exceeded, only the operation events is recorded without recording pick up events.

XGIPAM Equipment Setup

iii) Arc accidents recording events can be recorded in the following order.

a) Pick up, Operation, DO output, Drop out

b) Pick up, DO output, Operation, Drop out

h) Save waveform

i) Record the waveform at Operation operating time

ii) No information on light intensity (It is not recorded.)

4) Features of APM Test

a) Definition : The APM test function is for checking the health of the Sensors.

b) Features of APM Test

i) Availability : USE, Not USE

ii) When using APM test function, "Diag. LED" will be turned off.

iii) Operating method : For operating as APM Test function, the APM function setting should be "USE" status.

iv) Point Sensor : When the light amount increment over 100,000ΔLx in comparison with base light amount lasts more than 1msec, it shows 'Arc fault operation events' and 'Fault window".

However, circuit breaker Trip and signal DO output are not displayed.

v) Loop Sensor : Health of Loop sensor is monitored regularly.

- Loop sensor is monitored its damage through receiving a loopback signal by sending a test pulse signal periodically.
- Monitoring cycle : 1min
- When the abnormal situation is detected, HMI screen shows the contents of abnormal condition.
  - * Route : Device Information – Self-diagnosis
  - * Content : "ARC LOOP SENSOR has a problem"

5) APM applied sensor types

a) Point Sensor

i) Connector types : ST(Attach to the Product) – DNP(Light Sensing)

ii) Length of the cables : 1.5m, 3m, 5m, 7m, 10m, 15m, 20m, 30m

b) Loop Sensor

i) Connector types : ST(Attach to the Product) – ST(Attach to the Product)

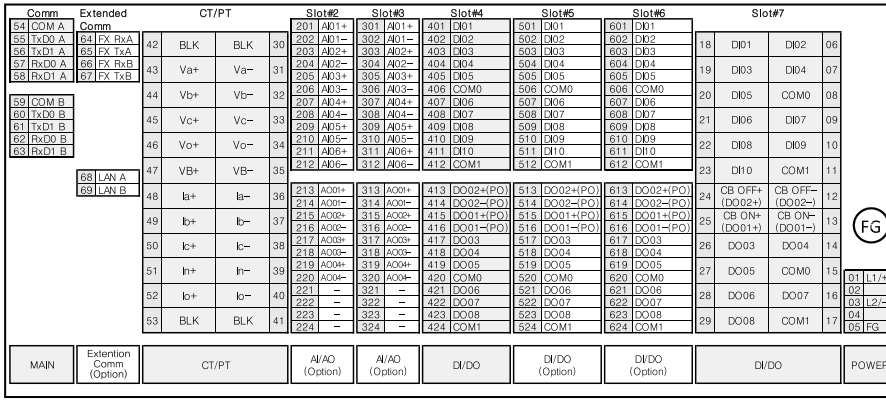
ii) Length of the cables : 20m, 30m, 60m

Note) The sensor is not enclosed with the product , but should be purchased separately.

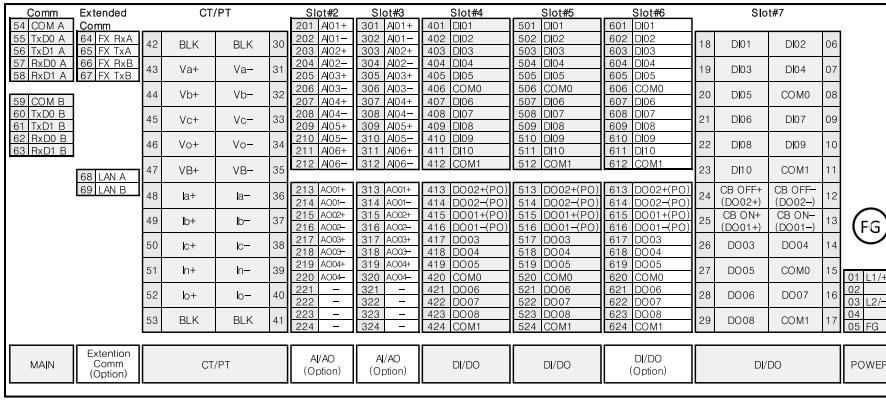
6. User Interface Specifications

6.1 XGIPAM TERMINAL Composition

1. Composition of the XGIPAM F, M terminal board



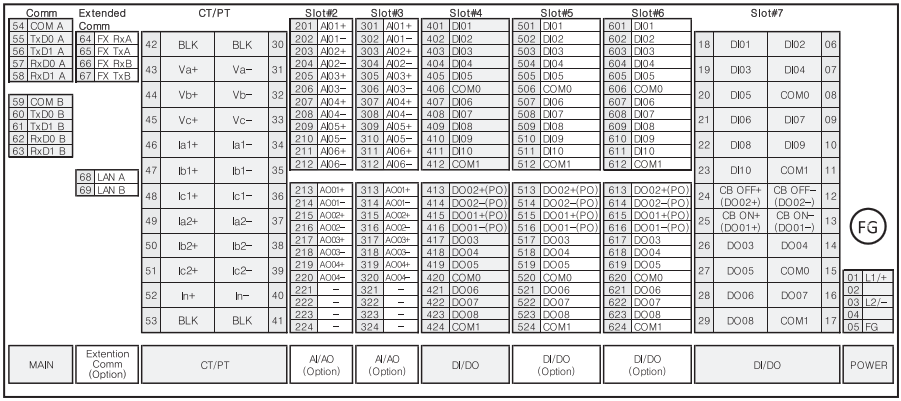
2. Composition of the XGIPAM B, DG terminal board



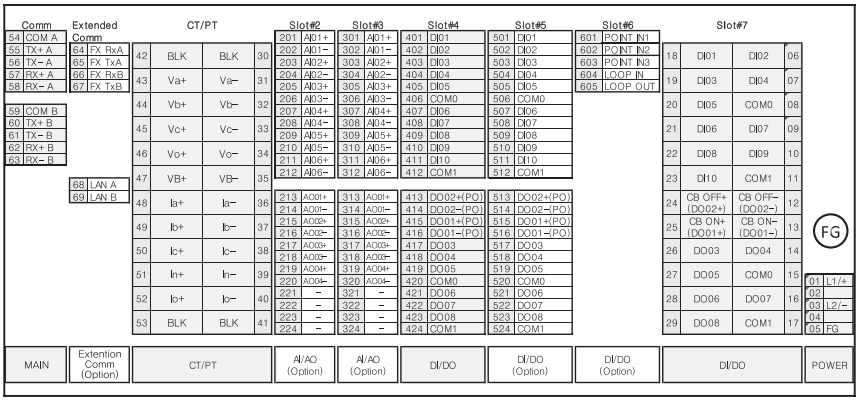
6. User Interface Specifications

6.1 XGIPAM TERMINAL Composition

3. Composition of the XGIPAM T terminal board



4. Composition of the XGIPAM F APM(Arc Protection Module) terminal board



* CB OPN+ can use PO02+, CB OPN-can use PO02-, CB CLS+ can use PO01+, and CB CLS-can use PO01-

* The terminal number abbreviation of AI/AO, DI/DO which are installed at Slot2, 3, 4, 5, 6 is indicated as the slot number in front of the terminal number.

Ex) DI01 of Slot6 -> 601

* RS-485 Communication wiring
  - Communication cable specification: AWG 22, Twisted Shield Pair Cable
  - The Shield of communication line must be connected to each other, and both ends of the line must be grounded.

6. User Interface Specifications

6.1 XGIPAM TERMINAL Composition

5. Default Logic composition of the XGIPAM F/M Terminal Board

F Type Basic DIO (slot_4,7)

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC06	
	DI 04	•	DO 04	SYNC. Check	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	UVR_Pulse	CC03	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	OPTION					
Slot 4	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	OCR	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	OVGR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

F Type DIO tea Expansion (slot_4,5,7)

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC06	
	DI 04	•	DO 04	SYNC. Check	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	UVR_Pulse	CC03	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	•	•	
	DI 04	•	DO 04	•	•	
	DI 05	•	DO 05	•	•	
	DI 06	•	DO 06	•	•	
	DI 07	•	DO 07	•	•	
	DI 08	•	DO 08	•	•	
	DI 09	•				
	DI 10	•				
Slot 4	DI 01	SWLA	DO 01	SWL_Close	•	
	DI 02	SWL_B	DO 02	SWL_Open	•	
	DI 03	•	DO 03	OCR	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	OVGR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

M Type Basic DIO (slot_4,7)

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC06	
	DI 04	•	DO 04	NSOCR	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	Stall / Lock	CC09	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	OPTION					
Slot 4	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	OCR / DOCR	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	UCR	CC04	
	DI 07	•	DO 07	THR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

M Type DIO tea Expansion (slot_4,5,7)

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC06	
	DI 04	•	DO 04	NSOCR	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	Stall / Lock	CC09	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	•	•	
	DI 04	•	DO 04	•	•	
	DI 05	•	DO 05	•	•	
	DI 06	•	DO 06	•	•	
	DI 07	•	DO 07	•	•	
	DI 08	•	DO 08	•	•	
	DI 09	•				
	DI 10	•				
Slot 4	DI 01	SWLA	DO 01	SWL_Close	•	
	DI 02	SWL_B	DO 02	SWL_Open	•	
	DI 03	•	DO 03	OCR / DOCR	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	UCR	CC04	
	DI 07	•	DO 07	THR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

6. Default Logic Composition of the XGIPAM T/B/DG terminal Board

Basic DIO (slot_4,7) : T Type

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	DPR	CC06	
	DI 04	•	DO 04	OCR (Secondary)	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	Extra Fault	CC09	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	OPTION					
Slot 4	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	OCR (Primary)	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	DPR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

DIO tea Expansion (slot_4,5,7) : T Type

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	DPR	CC06	
	DI 04	•	DO 04	OCR (Secondary)	CC07	
	DI 05	•	DO 05	TPR(38)	CC08	
	DI 06	•	DO 06	Extra Fault	CC09	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	•	•	
	DI 04	•	DO 04	•	•	
	DI 05	•	DO 05	•	•	
	DI 06	•	DO 06	•	•	
	DI 07	•	DO 07	•	•	
	DI 08	•	DO 08	•	•	
	DI 09	•				
	DI 10	•				
Slot 4	DI 01	SWLA	DO 01	SWL_Close	•	
	DI 02	SWL_B	DO 02	SWL_Open	•	
	DI 03	•	DO 03	OCR (Primary)	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	DPR	CC05	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

Bay Type

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC05	
	DI 04	•	DO 04	NSOCR	CC05	
	DI 05	•	DO 05	TPR(38)	•	
	DI 06	•	DO 06	UVR_Pulse	CC03	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	DPR	CC06	
	DI 04	•	DO 04	DGR	CC06	
	DI 05	•	DO 05	UFR	CC07	
	DI 06	•	DO 06	OFR	CC07	
	DI 07	•	DO 07	Extra Fault	CC09	
	DI 08	•	DO 08	SYNC. Check	CC08	
	DI 09	•				
	DI 10	•				
Slot 4	DI 01	SWLA	DO 01	SWL_Close	•	
	DI 02	SWL_B	DO 02	SWL_Open	•	
	DI 03	•	DO 03	OCR / DOCR	CC01	
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	OVGR	CC02	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

DG Type

Slot 7	DI 01	SWI_A	DO 01	SWI_Close	•	
	DI 02	SWI_B	DO 02	SWI_Open	•	
	DI 03	•	DO 03	POR / NSOVR	CC05	
	DI 04	•	DO 04	NSOCR	CC05	
	DI 05	•	DO 05	Extra Fault	•	
	DI 06	•	DO 06	UVR_Pulse	CC03	
	DI 07	•	DO 07	86X	•	
	DI 08	•	DO 08	Buzzer	CC10	
	DI 09	•				
	DI 10	•				
Slot 5	DI 01	SWZ_A	DO 01	SWZ_Close	•	
	DI 02	SWZ_B	DO 02	SWZ_Open	•	
	DI 03	•	DO 03	DPR	CC06	
	DI 04	•	DO 04	DGR	CC06	
	DI 05	•	DO 05	UFR	CC07	
	DI 06	•	DO 06	OFR	CC07	
	DI 07	•	DO 07	ROCOF	CC07	
	DI 08	•	DO 08	SYNC. Check	CC08	
	DI 09	•				
	DI 10	•				
Slot 4	DI 01	SWLA	DO 01	SWL_Close	•	
	DI 02	SWL_B	DO 02	SWL_Open	•	
	DI 03	•	DO 03	OCR / DOCR	CC01	
	DI 04	•	DO 04	OCGR / DGR	CC02	
	DI 05	•	DO 05	UVR	CC03	
	DI 06	•	DO 06	OVR	CC04	
	DI 07	•	DO 07	UPR	CC09	
	DI 08	•	DO 08	Power Fail	•	
	DI 09	•				
	DI 10	•				

6. User Interface Specifications

6.1 XGIPAM TERMINAL Composition

7. Default Logic Composition of the XGIPAM F APM terminal Board

	F Type Basic DIO (slot_4,7)					F Type DIO 1ea Expansion (slot_4,5,7)				
Slot 7	DI 01	SW1_A	DO 01	SW1_Close	•	DI 01	SW1_A	DO 01	SW1_Close	•
	DI 02	SW1_B	DO 02	SW1_Open	•	DI 02	SW1_B	DO 02	SW1_Open	•
	DI 03	•	DO 03	POR / NSOVR	CC06	DI 03	•	DO 03	POR / NSOVR	CC06
	DI 04	•	DO 04	SYNC. Check	CC07	DI 04	•	DO 04	SYNC. Check	CC07
	DI 05	•	DO 05	TPR(38)	CC08	DI 05	•	DO 05	TPR(38)	CC08
	DI 06	•	DO 06		•	DI 06	•	DO 06		•
	DI 07	•	DO 07	86X	•	DI 07	•	DO 07	86X	•
	DI 08	•	DO 08	Buzzer	CC10	DI 08	•	DO 08	Buzzer	CC10
	DI 09	•				DI 09	•			
	DI 10	•				DI 10	•			
Slot 5	OPTION					DI 01	SW2_A	DO 01	SW2_Close	•
						DI 02	SW2_B	DO 02	SW2_Open	•
						DI 03	•	DO 03	•	•
						DI 04	•	DO 04	•	•
						DI 05	•	DO 05	•	•
						DI 06	•	DO 06	•	•
						DI 07	•	DO 07	•	•
						DI 08	•	DO 08	•	•
						DI 09	•			
						DI 10	•			
Slot 4	DI 01	SW2_A	DO 01	SW2_Close	•	DI 01	SW3_A	DO 01	SW3_Close	•
	DI 02	SW2_B	DO 02	SW2_Open	•	DI 02	SW3_B	DO 02	SW3_Open	•
	DI 03	•	DO 03	OCR	CC01	DI 03	•	DO 03	OCR	CC01
	DI 04	•	DO 04	OCGR/SGR/DGR	CC02	DI 04	•	DO 04	OCGR/SGR/DGR	CC02
	DI 05	•	DO 05	UVR	CC03	DI 05	•	DO 05	UVR	CC03
	DI 06	•	DO 06	OVR	CC04	DI 06	•	DO 06	OVR	CC04
	DI 07	•	DO 07	OVGR	CC05	DI 07	•	DO 07	OVGR	CC05
	DI 08	•	DO 08	Power Fail	•	DI 08	•	DO 08	Power Fail	•
	DI 09	•				DI 09	•			
	DI 10	•				DI 10	•			

* PQ(Sag, Swell, Interruption), PTF, CBF, I2t, TCS/TRS uses the EXTRA FAULT point to provide output. (slot7 DO 08)

* Bay Type 27 Relay Protection Element : stage 1 is composed of 3 phase ORs, stage 2 is made of 32Q and each phase AND

* DG Type 27 Relay Protection Element : stage 1 is composed of 3 phase ANDs (3phase short backup protection use) ,

stage 2 is made of 32Q and each phase ANDs.

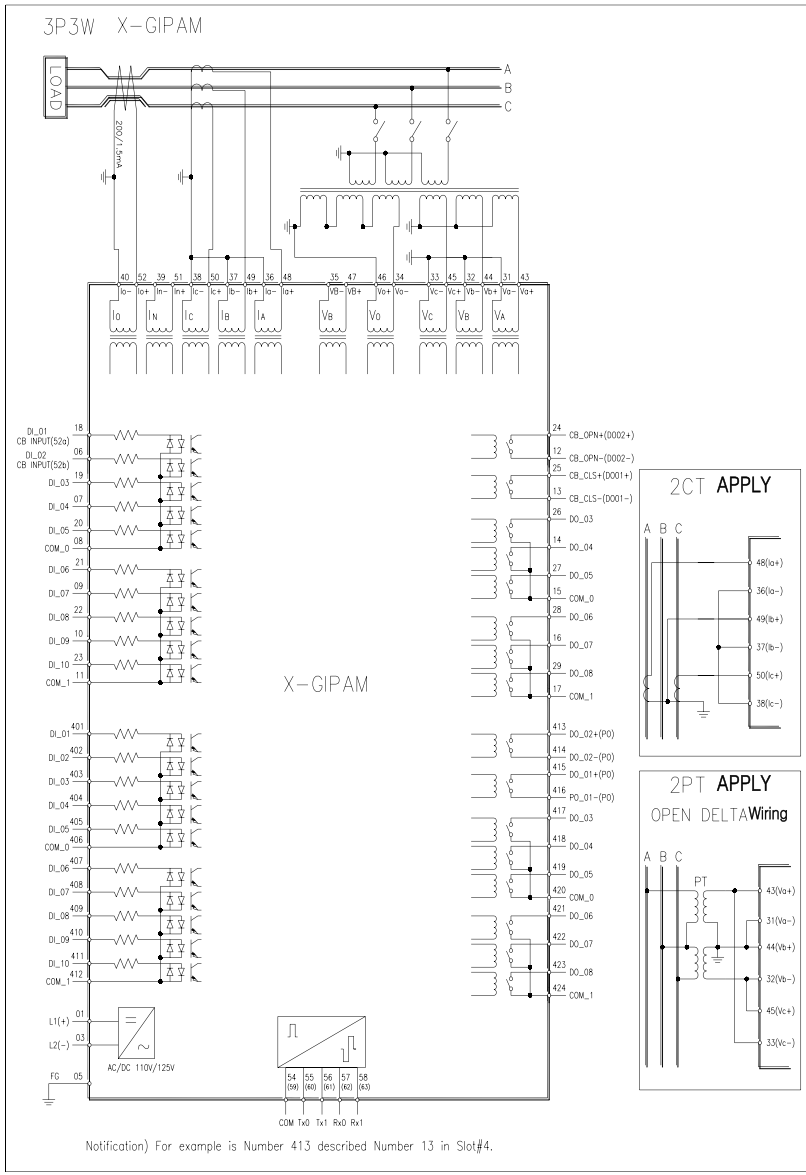
* CC : Switch for the relay output point Test. Can check operation in the equipment without tester

* OVGR(64) element is setup as basic alarm

* SLOT#4 DI10 is composed of B contact for buzzer stop

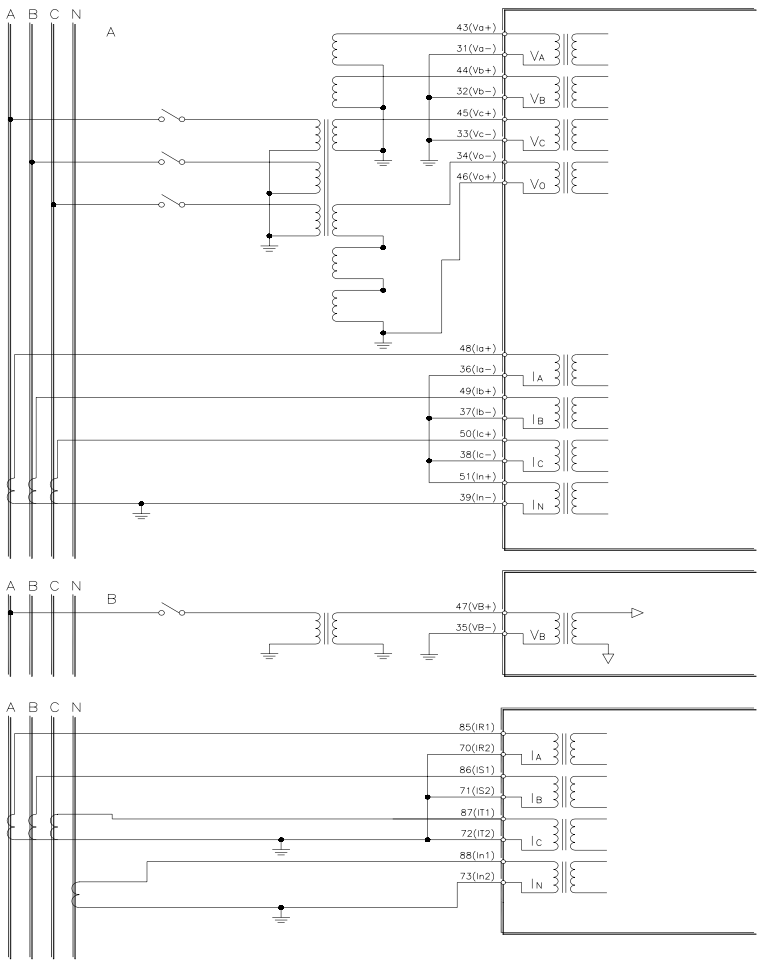
* For DG Type only, DPR(32P) element is set as basic alarm

6.2 XGIPAM F/B/M/DG Connective Diagram

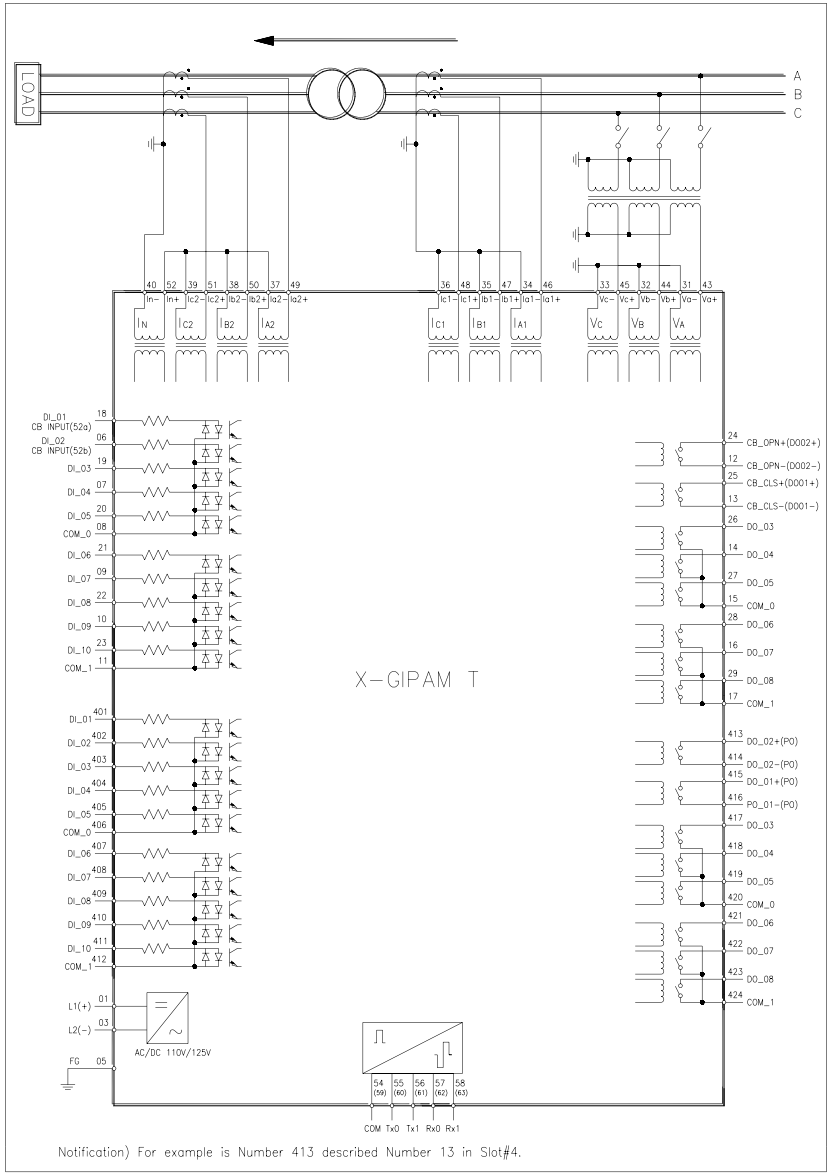


6.2 XGIPAM F/B/M/DG Connective Diagram

3P4W X-GIPAM

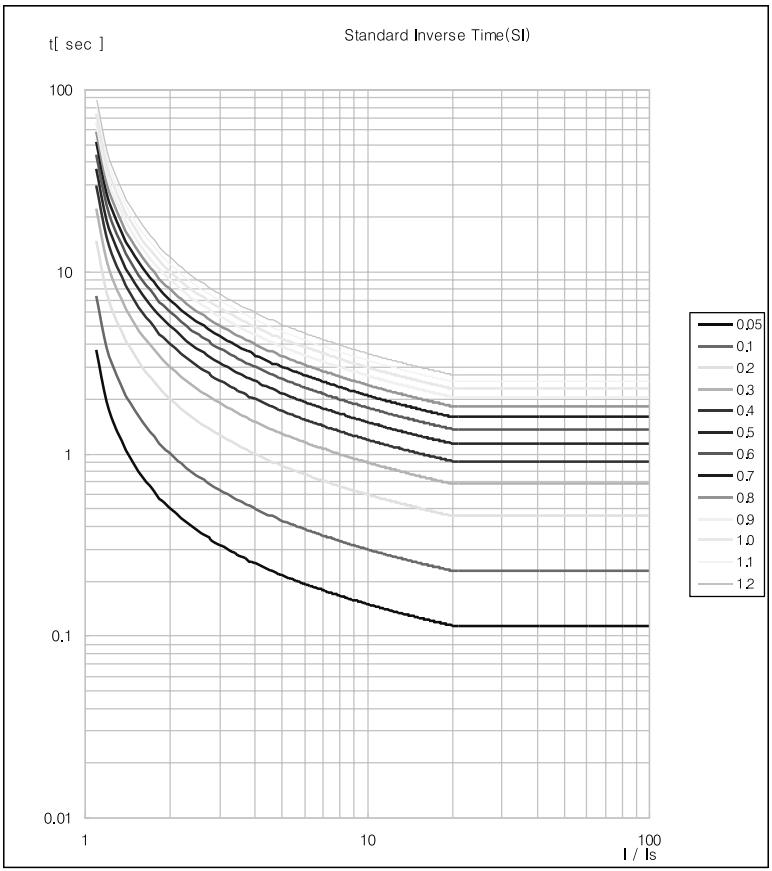


6.2 XGIPAM T Connective Diagram



7. Characteristic Curve

IEC - SI(Standard Inverse) Characteristic Curve

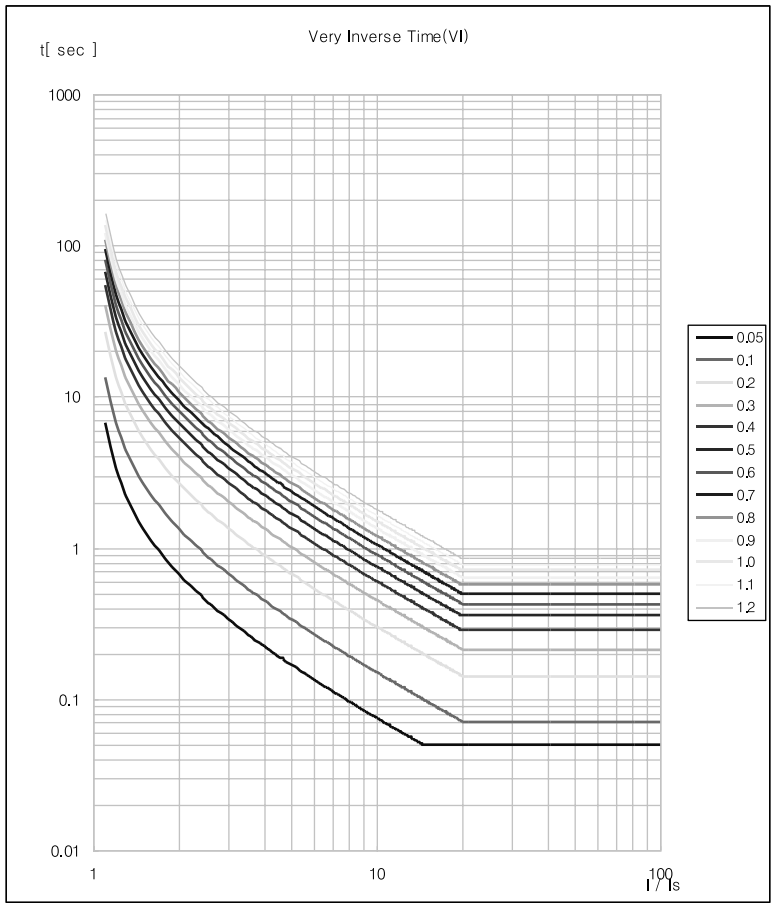


$$\text{TRIP TIME} = \left(\frac{0.14}{\left(\frac{I_F}{I_S}\right)^{0.02} - 1} \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEC - VI(Very Inverse) Characteristic Curve

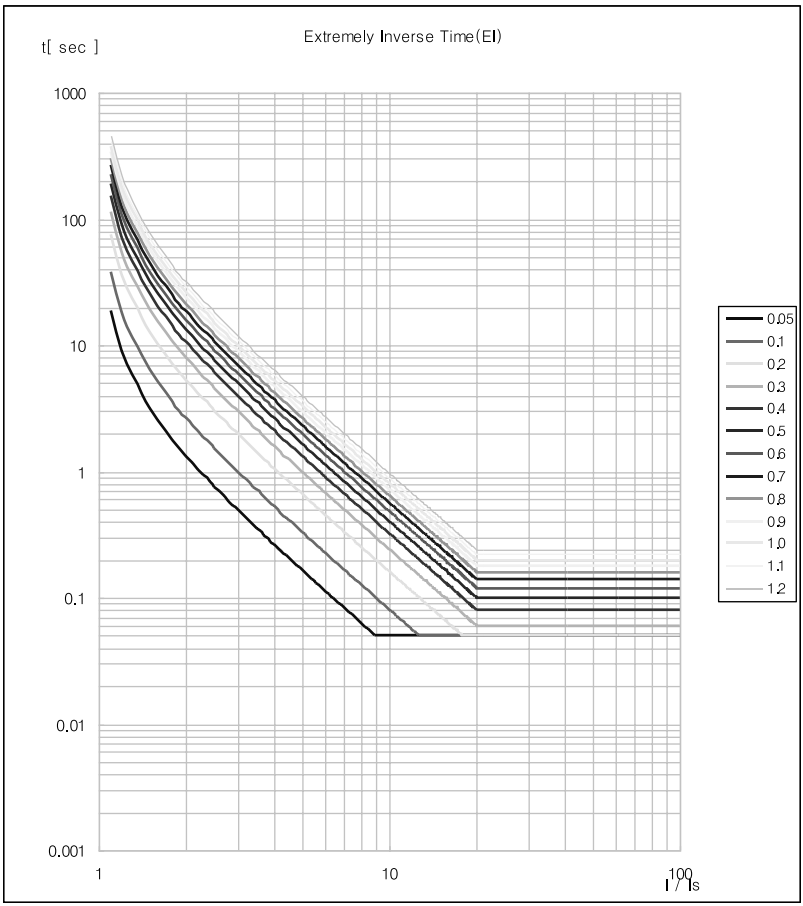


$$\text{TRIP TIME} = \left(\frac{13.5}{\left(\frac{I_F}{I_S}\right)^1 - 1} \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEC - EI(Extremely Inverse) Characteristic Curve

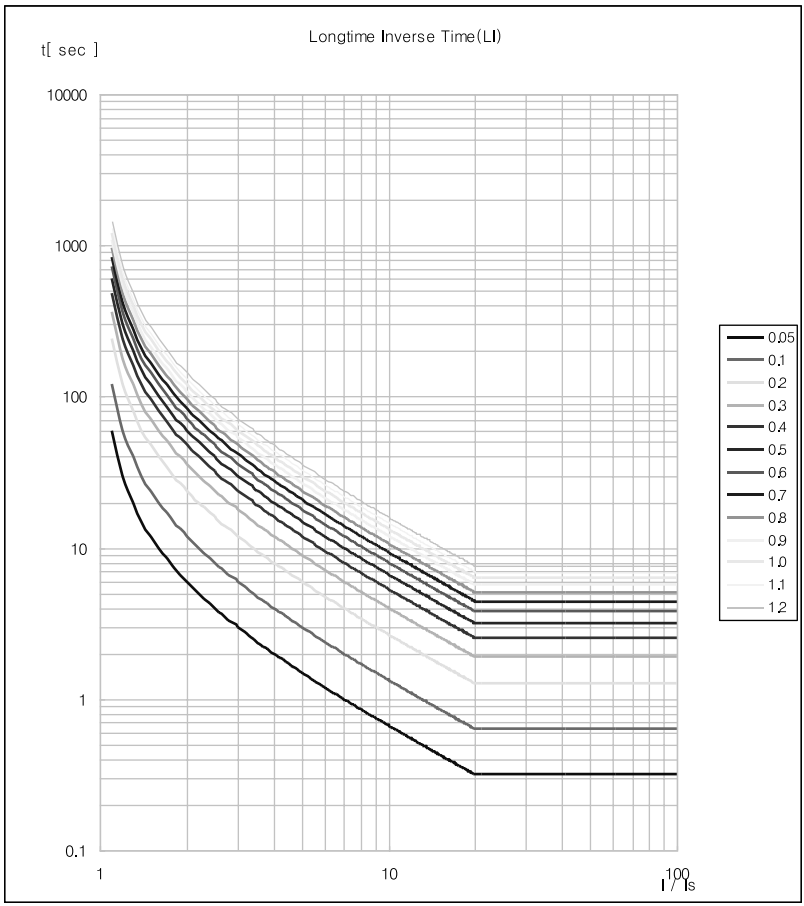


$$\text{TRIP TIME} = \left(\frac{80}{\left(\frac{I_F}{I_S}\right)^2 - 1} \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEC - LI(Longtime Inverse) Characteristic Curve

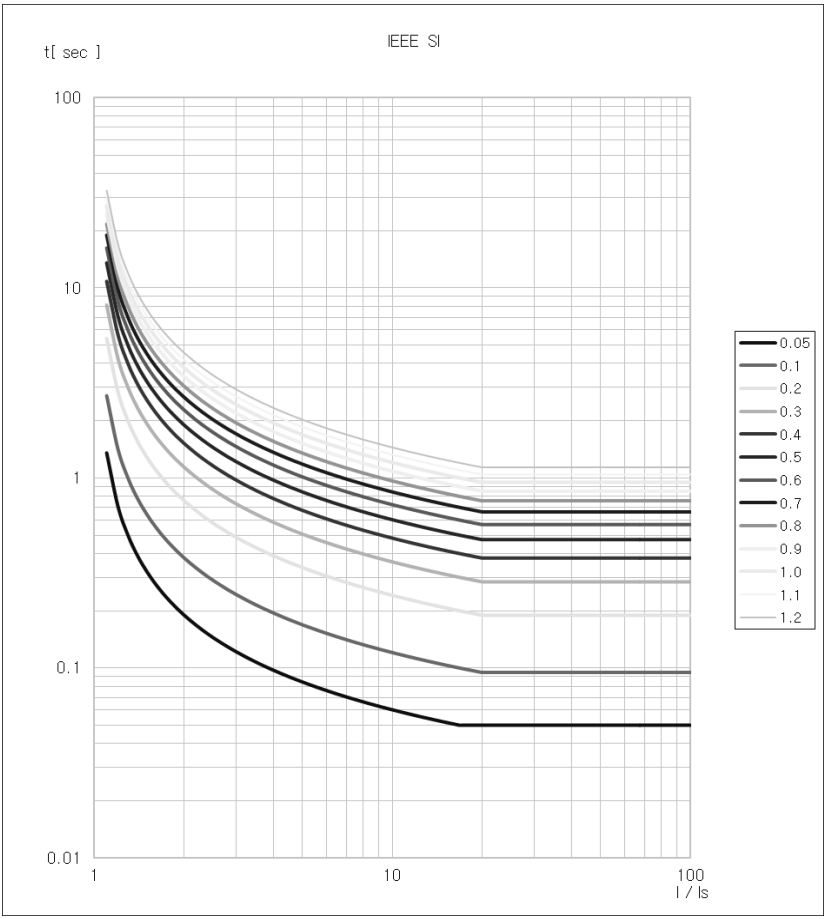


$$\text{TRIP TIME} = \left(\frac{120}{\left(\frac{I_F}{I_S}\right)^{1} - 1} \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEEE(ANSI) - SI(Standard Inverse) Characteristic Curve

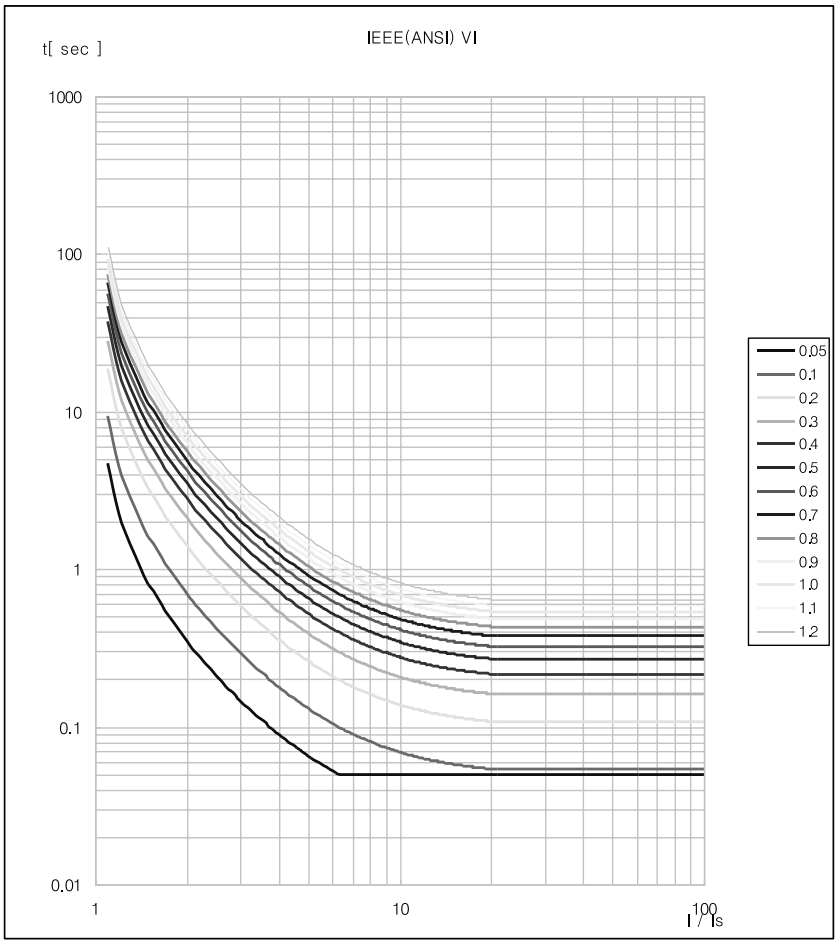


$$\text{TRIP TIME} = \left(\frac{0.0515}{\left(\frac{I_F}{I_S}\right)^{0.02} - 1} + 0.114 \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEEE(ANSI)- VI(Very Inverse) Characteristic Curve

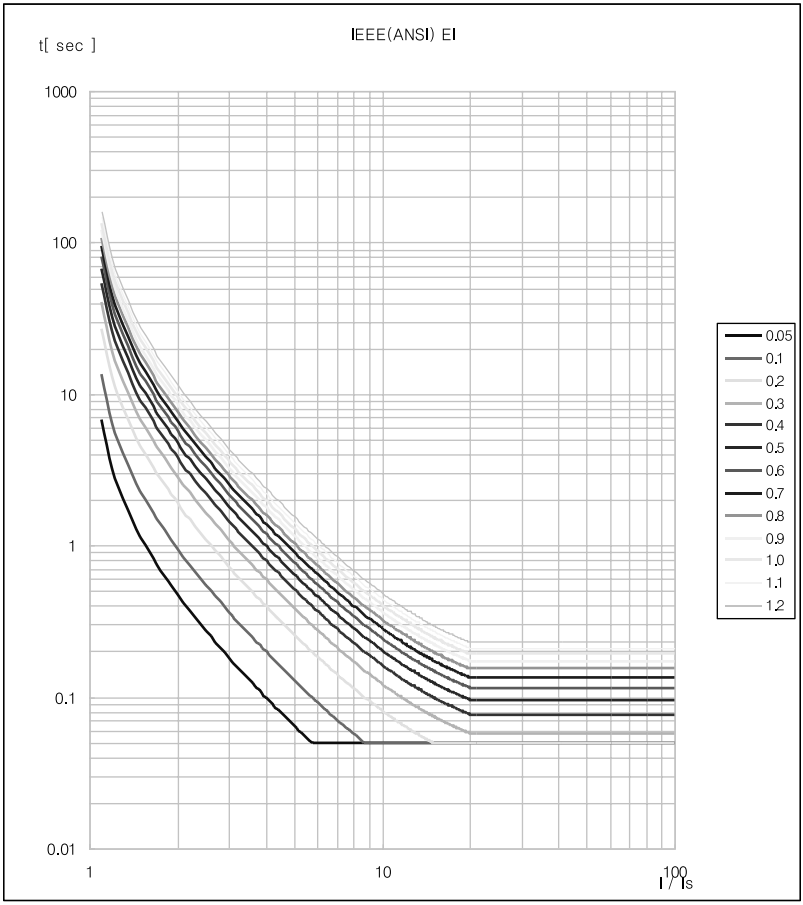


$$\text{TRIP TIME} = \left(\frac{19.61}{\left(\frac{I_F}{I_S}\right)^2 - 1} + 0.491 \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

IEEE(ANSI) - EI(Extremely Inverse) Characteristic Curve

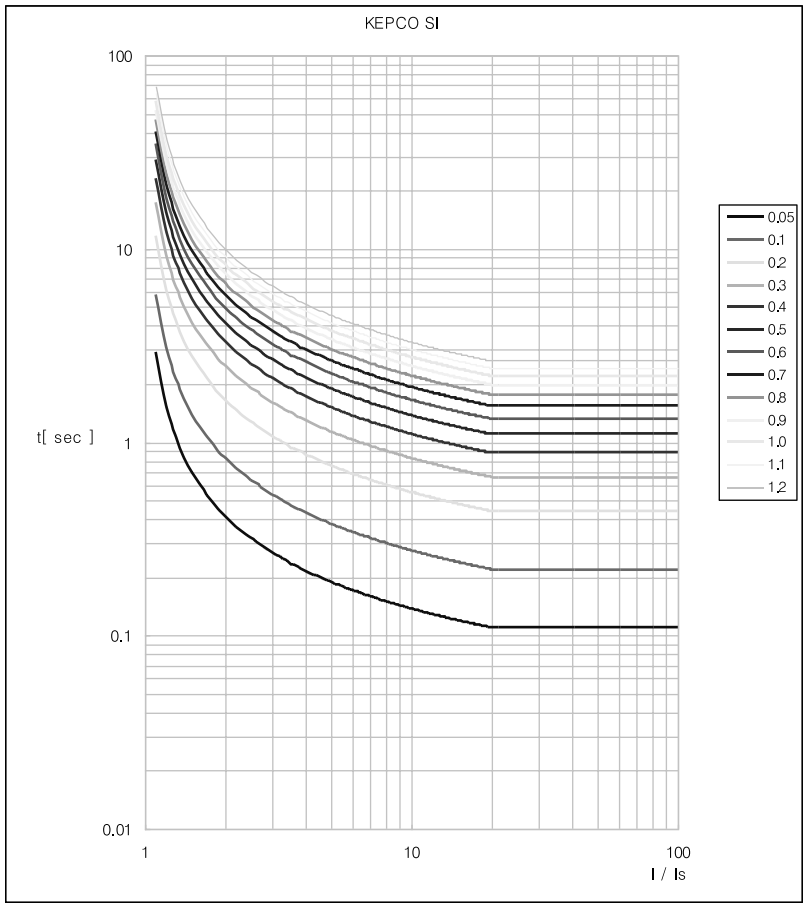


$$\text{TRIP TIME} = \left(\frac{28.2}{\left(\frac{I_F}{I_S}\right)^2 - 1} + 0.1217 \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

KEPCO - SI(Standard Inverse) Characteristic Curve

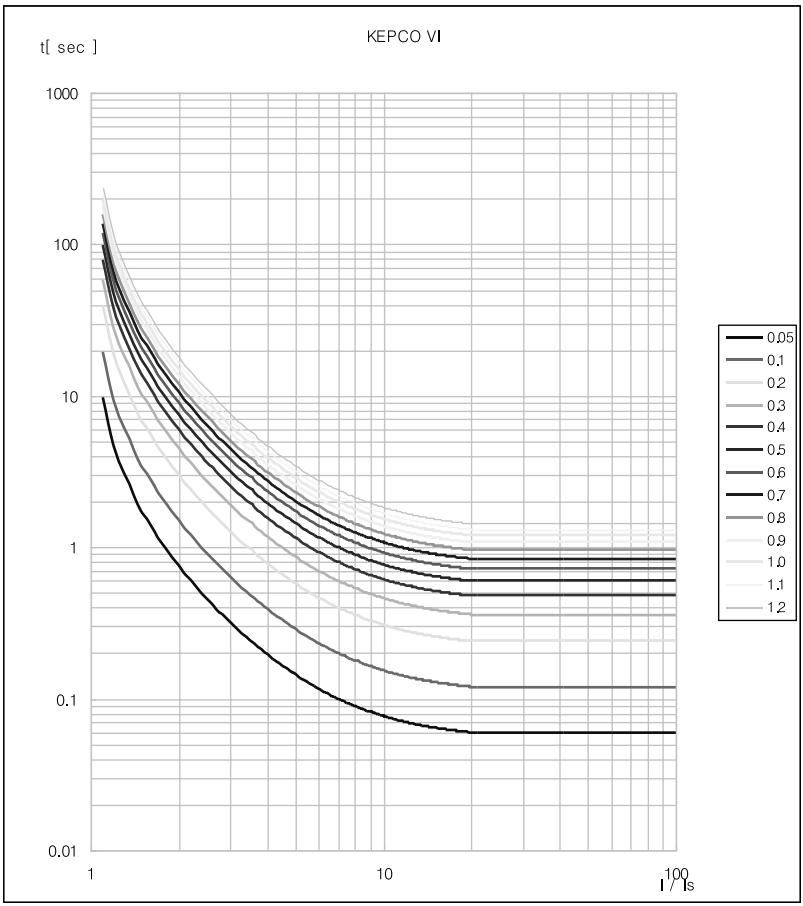


$$\text{TRIP TIME} = \left(\frac{0.11}{\left(\frac{I_F}{I_S}\right)^{0.02} - 1} + 0.42 \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

7. Characteristic Curve

KEPCO - VI(Very Inverse) Characteristic Curve

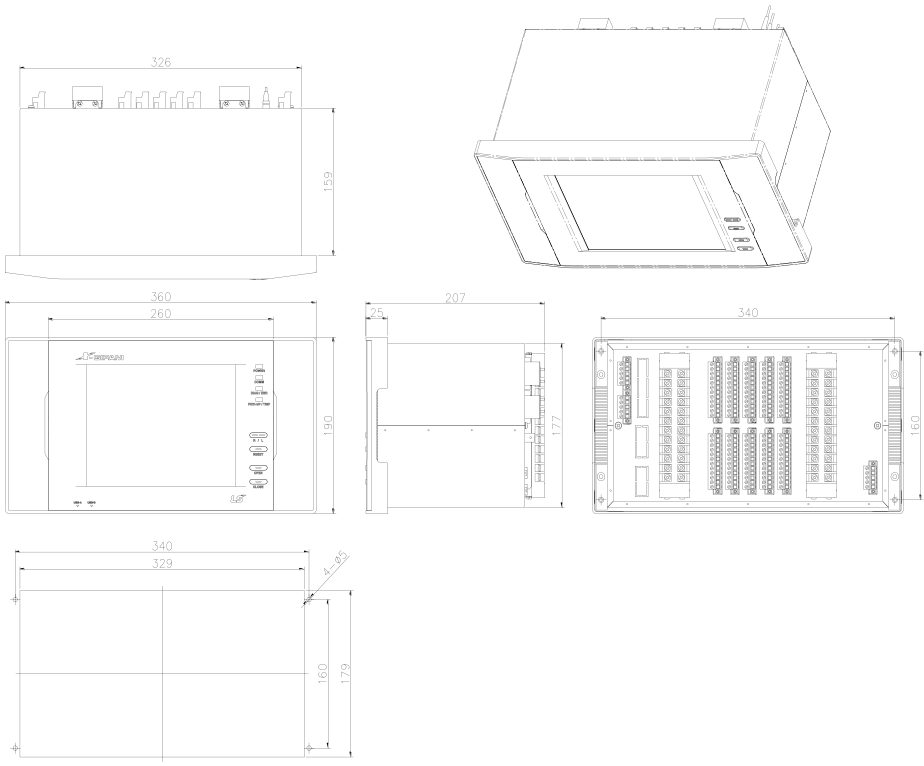


$$\text{TRIP TIME} = \left(\frac{39.85}{\left(\frac{I_F}{I_S}\right)^{1.95} - 1} + 1.084 \right) \times \text{TL} + \text{TD}$$

I_F = Fault Value
I_S = Setting Value
TL = TIME LEVER
TD = TIME Delay(sec)

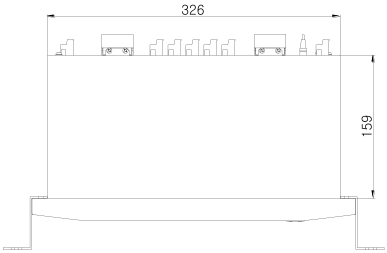
8. External Dimensions

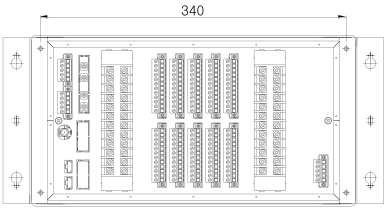
Outer layout and Cut Size (mm)

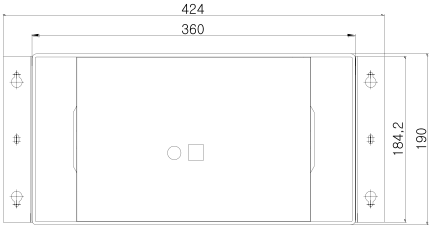


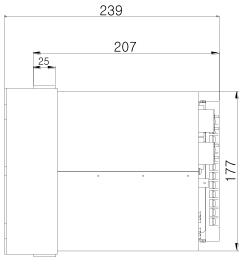
8. External Dimensions

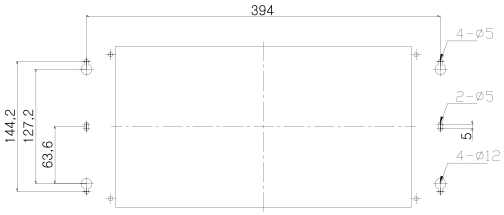
Separation outer layout and Cut Size (mm)





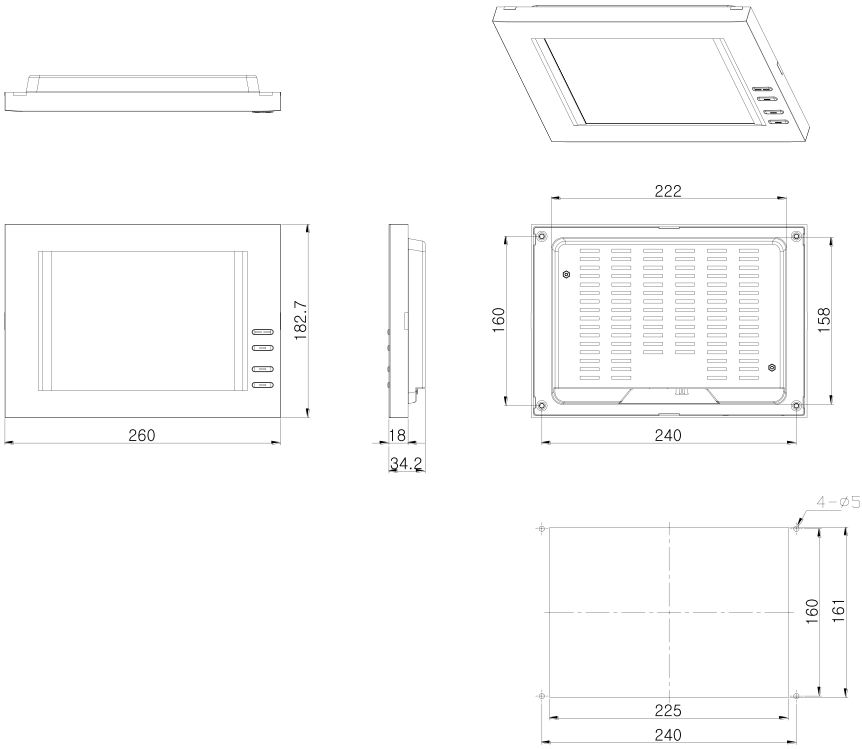






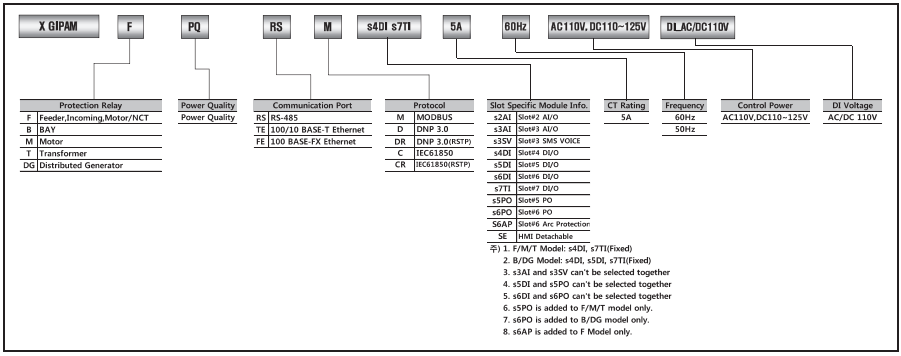
8. External Dimensions

Separation Outer layout and Cut Size (mm)



9. Ordering Information

XGIPAM Equipment Naming System



* Please contact us for specification about 50Hz Model.

* The XGIPAM-F APM(Arc Protection Module) model is available for 60Hz only.

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Specifications in this instruction manual are subject to change without notice due to continuous products development and improvement.

XGIPAM / 2020.09