Multi-function Motor Protection Relay with Insulation Resistance Measurement

< VIP-RL,RTL/RM,RTM >

< Enhanced Type,Year 2011 >

< “Logic/ON/OFF” Mode:2017>

<”OPSET”,Etherenet:2018>

Samwha DSP Ltd.

Content

1.System Construction
2 Main Feature
3.Specialized Point
4. Function List
5. Technical Specification
6. Self-diagonostics Display Indication
7. Input-Output Terminal
8. Presetting Description
9. Order of MODE
10. Display Window Image
11. Control Key Operation
1. Trip Indication
13. Current range table matched with external CT
14. Time-Current Characteristics
15. Rotated Indication
16. Time based Trip Relay Output
17. Application Sequence Diagram
18. Example for Applied Communication
19.PC Operation Program/"Samdsp^{R}"
20.Ethernet Network Operation
21. Dimension
22. Order Form
23. Guide for user

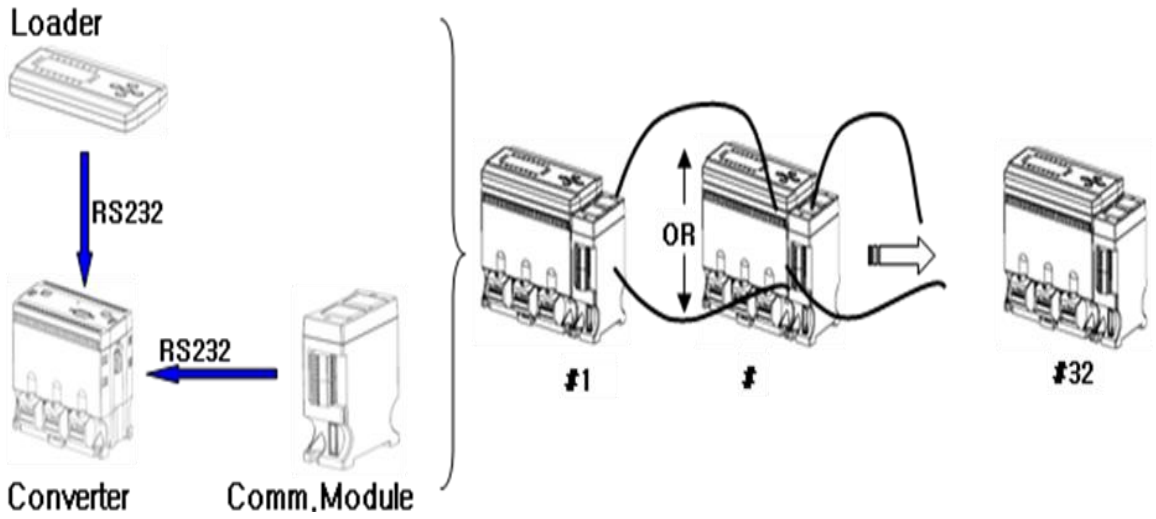
Multifunction Motor Protection Relay with Insulation Resistance Measurement

During Working:Protection Relay ,During Stopping:Resistance Measurement

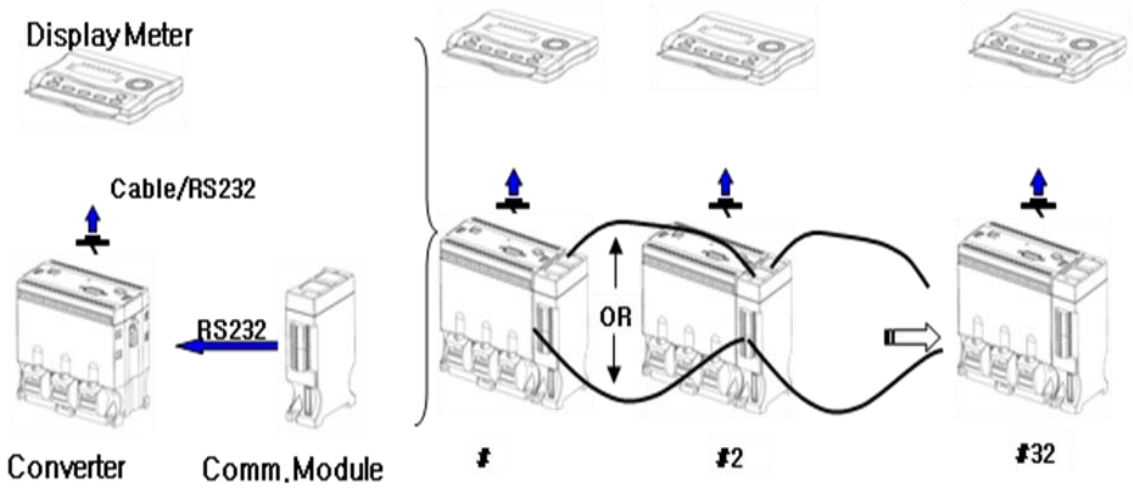
1.System Construction

① RS485/422 Serial Network

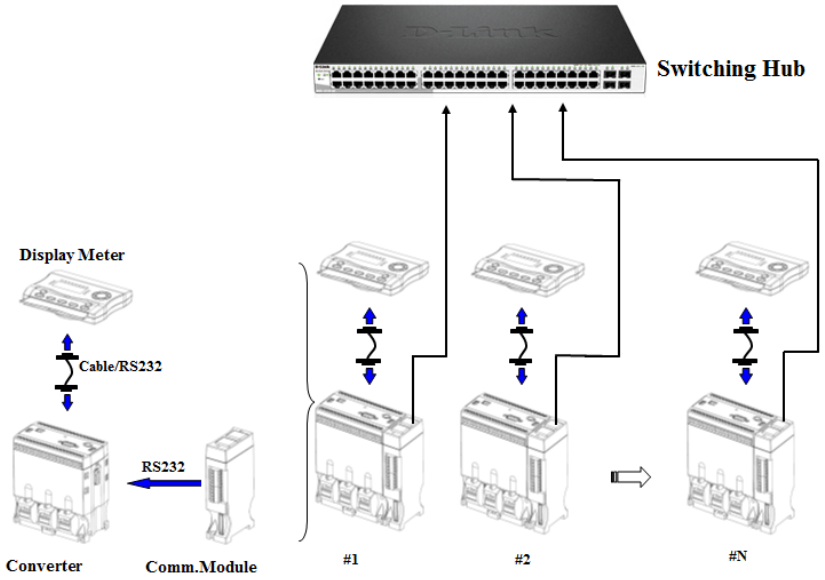
▸ **DSP-VIP-RL/RTL:Panel Mounting Type**



▸ **DSP-VIP-RM/RTM:Panel Flush Mounting Type**

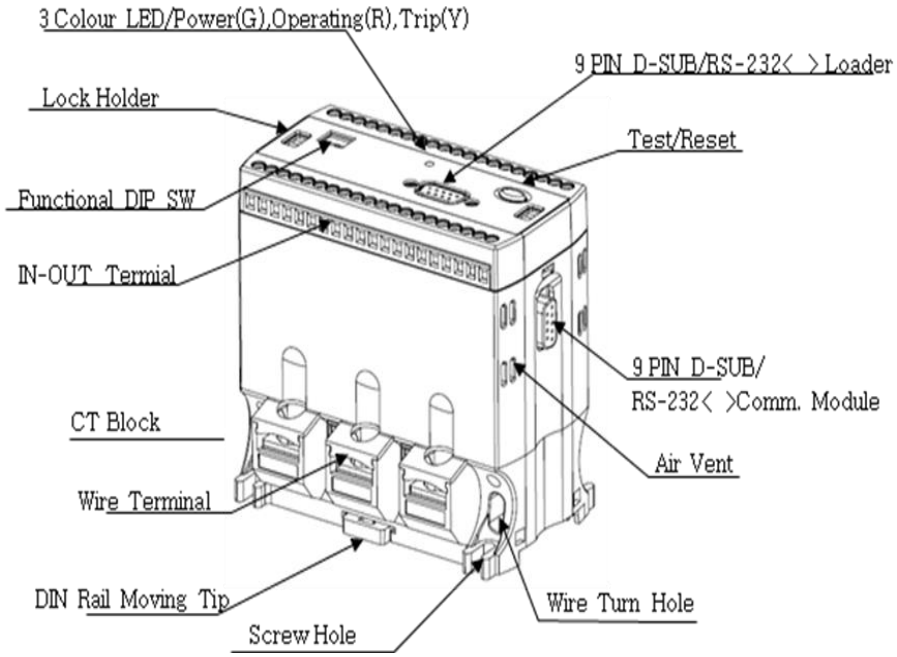


② Ethernet Network

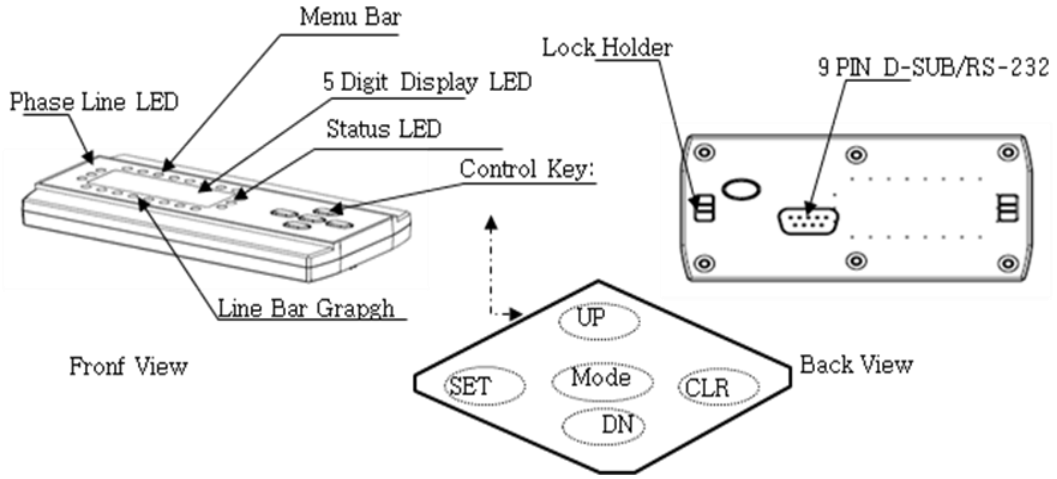


③ Detailed Structure

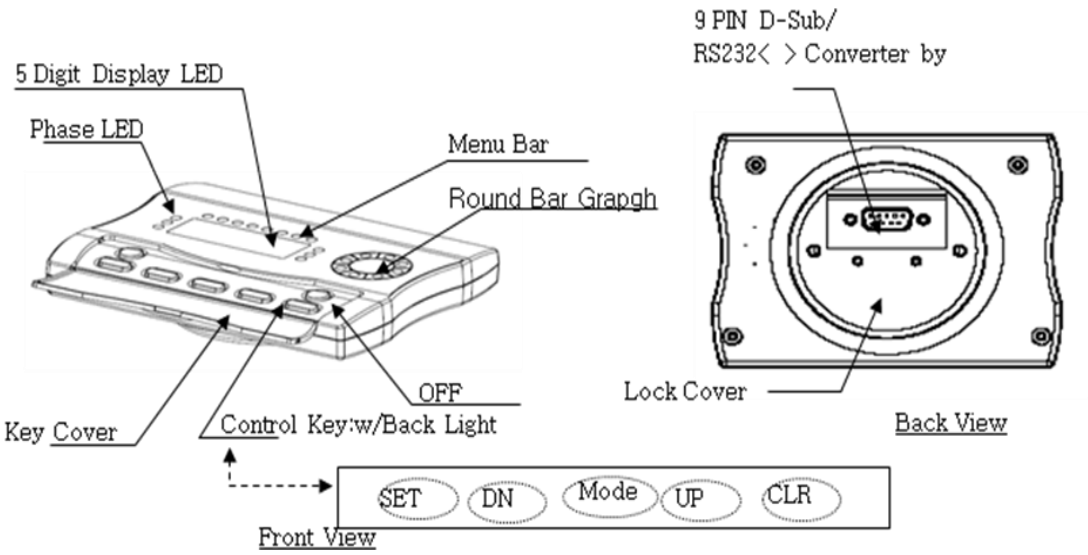
○ Converter



○ **Loader**

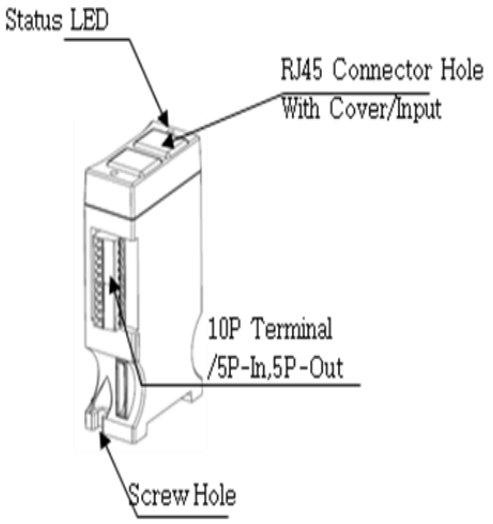


○ **Display Meter**

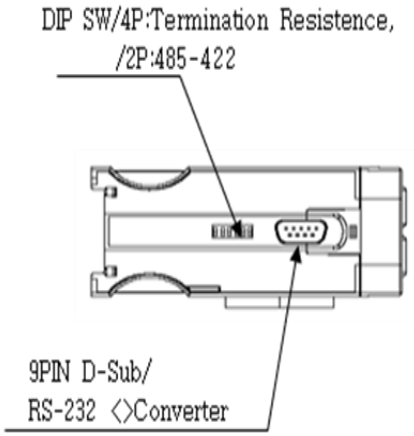


○ Communication Module

▸ CM-44,MWR-S

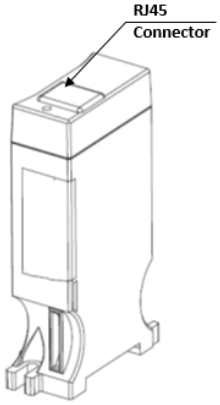


Outside View



Inside View

▸ CM-44E



2. Main Feature

❑ Easy Handling

▶ To give a guarantee to exclusive operator:Password Input
▶ To realize convenient and various data input
- Loader: DSP-VIP-RL/RTL(RTL:with 4~20mA)
- Display Meter: DSP-VIP-RM/RTM(RTM:with 4~20mA)
- Note Book PC: DSP-VIP-RL/RTL,RM/RTM

▶ Main/Sub/Cab Menu:Three devided menu group according to usage and the frequency of data input
- Main menu:Data input frequency is rather higher
- Sub menu:Ratherly common application for all kind rating of motor
- Cab menu(calibration menu):adjustable for indicating value within narrow range(+/- 12.7%) /This menu is appeared when "SET" key is pressed for 5 sec or more and disappeared right after pressing again.

▶ Alarm before Trip:adjustable for 65~100% to OC

▶ ON-OFF switch/Foward & Reverse,respectively/DSP-VIP-RM,RTM:to save a wiring ,space and a labor cost inside panel

▶ Convenient installation: possible to match with both 65 Phi round hole and rectagular hole/DSP-VIP-RM,RTM, Display Meter.

▶ To indicate a number of main contactor ON-OFF : to contribute to check a replacing term and an effective maintenance schedule.

▶ To keep a stable operation under the frequency variation of Inverter:1Hz ~ 400Hz
▶ To call a preset default value in the factory : possible by pressing test button before power-on ,then keeping a pressing state for 3 sec after power-on.

❑ Insualtion Measurement Function : Motor Stopping

▶ How to check motor stop state:followed condition must be satisfied at same time
*To keep close state of P1-P2 through Aux output of Contactor("b" cotact state : this is critical safety condition for this product to have a normal measurement function
*To keep close state of M1-M2 from output open state(b) of MCCB: highly recommended safety condition
*Any current greater than 0.2A is not sensed by converter
*Logic input #1 keeps low state(zero Voltage)

▶ Initial indication state after the control power is ON
Prior to do the first measurement by the preset time in "1st" mode(minimum time :6 sec), the initial indication state is appeared as followed :

1) In case ZCT is not connected
LOP→t1-no(temperature sensor PT100 is not connected :"t1-no" is shown for 1sec, then go ahead next procedure →Ec-ct(ZCT is not connected: "Ec-ct" is shown for 1sec, then go ahead next procedure → Firmware Version → the latest measured insulation resistance value → Stanby(this means first measurement is done)→position to command ON-OFF(one of LOP/MCC/rcs/PC)→ Stanby →alternatively shown[the latest measured resistance value-present measured temperature (in case "tEMP" is preset by "rota" mode)-control command position] → actually entering into measurement action

2) In case ZCT is connected(included embedded zct type)
LOP-->t1-no(if temperature sensor PT100 is not connected, "t1-no" is shown for 1sec,then go ahead next procedure) → Firmware Version → the the latest measured insulation resistance value → Stanby(first measurement is done)→position to command ON- OFF (one of LOP/MCC/rcs/PC)→Stanby→alternatively shown[the latest measured resistance value-present measured temperature (in case "tEMP" is preset by "rota"mode)-control command position] → actually entering into measurement action

▶ Critical "Preset Mode" to have measurement function : 1st measurement time, interval time. a number of the measurement, alarm level and manual/auto for the measurement.

Preset		Description
Mode	Mode group	
IrAL	Sub	*to preset alarm level
rECOd		*to preset the measuring interval time after 1st measurement is done *This mode is available in case Auto is preset in "Class" mode *If the motor is running state after the preset time is elapsed , the 1st measurement is done in 6sec from the followed mtor stop.
rE-nb		*to preset the number of allowable measurement in case Auto is preset in "Class" mode. *the reset by power-off or "pressing SET key" must be done if the operator wants to renew this number of allowable measurement , otherwise the measurement is not done until the reset is done after the measuring action by preset times has done
rota		*to decide if the latest measured insulation resistance value is displayed in the orderly rotated indication or not.
Auo		*to decide if alarm output comes through AUX output in case the measured value is under the preset value or not.
CLASS	CAB	*to decide a method how to execute the actual measurement :OFF/MAN/AUTO *OFF : not use the measurement function *MAN : the measurement is done whenever "Mode" key is pressed for 1sec under pressed state for "DN" key at first *AUTO : the measurement is done according to a conditions for first measuring time and next measuring interval time which is preset in each mode
1ST		*to preset the first measurement time from the instant that the control power is loaded. *this mode is available only for AUTO in "Class" mode
LOG2		*to decide "reset condition" by High→Low of logic input #2 after trip *LOP: only for LOP operation *ALL: for all/MCC,RCS,PC
LOGIC		*ON: Logic input(C2~1- -6) is able state *OFF : Logic input(C2~1- -6) is disable state : Output of C-F(1a) is closed in order to make serial contact with MC for motor starting , but C-F(1a) is opened as soon as measurement is executed in order to prevent motor starting :"Auto" is shown as a control power is loaded

▶ **Useful management for "Class" mode & "1st" mode**

***In case it is entered into "Auto" mode, "Stanby" is appeared and start to measure a resistance for 15sec→ shown measured value → continuously, next measurement is done by the number of allowable measurement and the measurement interval time →shown a measured value of every meaurement (on the way of the measurement, the command position for ON-OFF is shown between first "Stanby" and next second "Stanby"// "Stanby" means "just to start to measure") → the measured value and the control command position is shown alternatively after next second measurement**

***In case the motor has been kept the stopping state as the control power is ON : the latest measured value and the control command position for ON-OFF(one of LOP/mCC/PC/rcs) is shown alternatively before showing "Stnby" to do the first measurement action → first measuring action for 15 sec after showing "Stnby" →the measurement is done and shown a measured value according to measurement interval time and the number of allowable measurement(the command position for ON-OFF ,measured value and the present temperature are shown between previous "Stanby" and next "Stanby"**

***The reset by power-off or "pressing SET key" must be done if the operator wants to renew this the number of allowable measurement , otherwise the measurement is not done until the reset is done after the measuring action by preset times has done**

▶ **How to make a command for the measurement in motor stop state whenever the operator wants.**

***It is possible by pressing "Mode" key for 3 sec under pressing state for "DN" key or by pressing "SET" key 2 times after preseting "MAN" in "Class" mode**

▶ **In case the control power is ON newly**

***if temperature sensor PT100 or ZCT is not connected , "t1-no", "Ec-ct" is appeared for 1sec, then next action is going on forwardly**

▶ **How to indicate measured insulation resitance**

***The latest measured value among 8 events is indicated during motor stop ,also the rest of 7 events can be checked by pressing "UP,"DN" key as matched with the number of turned-on LED in round bar graph position ,finally "None" is appeared if there is no more measurement result under the content of 8 events.**

***"Ir-Ps" is appeared in case the value greater than 500MOhm is measured, it means a line state is normal / neverthless, need to check the disconnection of line to input "L-E " and the openning between M1-M2**

***"Ir-0.0" is flickering in case the measured value is zero or under 50 KOhm**

▶ **Execution if the latest measured value is lower than preset value**

***Motor Stop State**

- **the measured value is flickeing**
- **In order to make clear, enter into "IrAL" mode as pressing "SET" key,then preset "OFF" or lower level than the latest value**

***Motor Working State**

- **the measured value is flickeing continuously, but the converter work its job regulary**
- **detailed working information comes out normally through communication Port**

▶ **The openning state between P1-P2(to be connected with Aux output "b" from main contactor)**

- **"OPEn" is flickering / operator needs to make a proper connection**
- **not possible to measure insulation resistance**
- **This is strongly a critical condition to operate this product safely**

▶ **Openning state between M1 and M2(to be connected by MCCB)**
- **"Ir-Ps" is appeared , but Motor start is possible/ to clear this indication, the operator needs to connect "b" output from MCCB with M1-M2 each or make short state intentionally between M1 and M2**
- **this condition is highly recommended for the measurement safety**

▶ **Alarm for a measured resistance value lower than preset value**
***This alarm output is possible to do through aux output(07-08) in case "Ir" is preset in "Au-o" mode**

❑ **Multi-complexed Protection Function**

▶ **Multi-complexed protection relay based on current and temperature**
▶ **To indicate RMS value for current :RMS chip adopted in every input/to contribute to check an exact condition of the motor**
▶ **To provide actual meter function : current, temperature, insulation tester**
- **Current Meter:high preceision**
- **Insulation resistance meter:0.1 MOhm~500 MOhm/500VDC**
- **Temperature Meter(Pt100):0^{O}C ~ 150^{O}C**
- **Auto Range: to indicate decimal point in conjunction with "K" LED in Loader and Display Meter**

▶ **To cover a wide current range**
- **70 Type: 0.2A ~70A or 0.2A~6A with an external CT("5t" must be selected in "cto"mode)**
- **With external CT :1A~3600A**

▶ **To Indicate a necessasary information in every 3 sec**
- **Rotated indication for basic factor : 3 phase current,GR current/ "OFF" must be preset in "rota" mode**
- **Additional indication above basic factor : Basic Factor +Temp,AWT (Accumulated Working Time)/"ON" must be preset in "rota" mode**
- **Possible to fix one of circulated factor or to release:one touch for CLR Key**
- **To show load factor(actual/preset)/65% ~ 100%:Line Type/DSP-VIP-RL/RTL, Round Type/DSP-VIP-RM/RTM**

▶ **Wide range with high sensitivity for ground fault protection:30mA~ 10A**
- **Need to use shield wire for connection between ZCT and Z1,Z2 terminal of DSP-VIP**
- **Alarm for disconnection with ZCT:in case ZCT is not connected with Z1,Z2 of the converter, "Ec-ct" is shown for 1sec,then go ahead next procedure**

▶ **To realize ground fault protection in any neccessary time: 0.05sec/instant,0.1~30sec /Def T-I, inv T-I**
▶ **To be acceptable for various rating of ZCT**
- **200/1.5mA or 200/100mV,selectable in DIP SW**
- **Optional type:ZCT emebed internally**

▶ **To protect an arised temperature of the case, winding of motor:sensed by PT100**
▶ **Various and multiple output of Main and Aux trip output**
- ***C1-FWD-REV(1a*2) : close/co-worked with logic input,open/trip with main trip**
- ***Main trip(1a) : 97-98**
- ***AUX(1a)/07-08:acts same as main trip or one of Ec/Uc/Shoc/AL/tEMP/Ir/ Ec-tE-AL selected in "Au-o" mode**

▶ **To memorize the latest trip cause of 8 trip event : to contribute for analyzing a trouble cause and motor working condition in conjunction with a number of lighted LED in bar graph to show an order of trip event.**

▶ **Main contactor Auto Close:in case a line power is "on" again within a preset time(SDDT) after a line power is "OFF" during a normal operation,main contactor is closed automatically after another preset time(DOMT)**

- **Shut Down Delay Time:1~5sec/Adjustable**
- **Delay On Make Time:0(instant)~25sec/Adjustable by 5 sec unit**
- **Expression in mode:eg/2-3:in case power is on within 2sec after power-off, motor starts after 15sec(3 is matched with 15sec) from the instant of power-on**

▶ **Self-diagonostics : in case an operator press "test" button of the converter once or “CLR” button for 3 sec, the main trip output is energized(trip) after counting down the preset o-time of definite T-I characteristics or a time matched with 550% of the preset "OC" value inselected clss of Inverse T-I Curve , hence % of bar graph LED shows how much time is counted down**

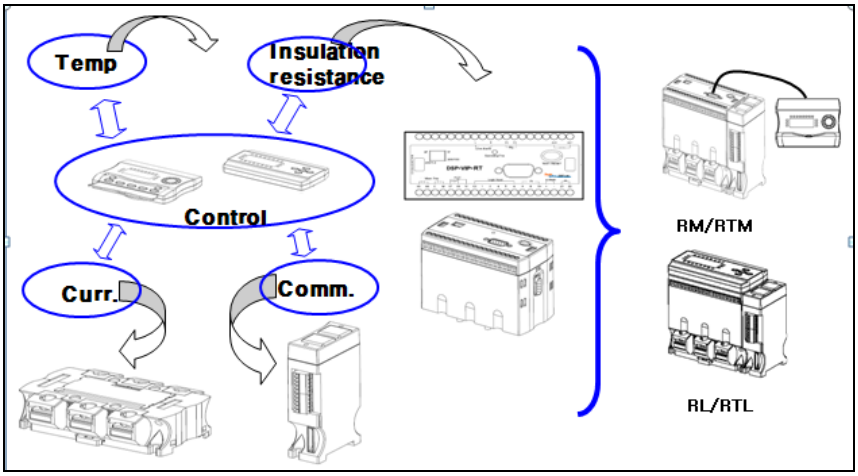
❑ **Remote Control through RS-485/422,232 digital communication**

▶ **4~20mA output:20mA for maximum current of 3 phase:RTL/RTM type**
▶ **To realize effective control for digital comminication:possible with combining a communication module simply**
▶ **Specialized communication module :to response for digital communicate**
- **CM-44 : 485/422,Modbus/RTU , RS232 coorperated with converter**
- **CM-44E :Ethernet,Modbus TCP coorperated with converter**
- **MWR-S : 485, Modbus/RTU, data recorder/record interval:50msec/max , RS232 coorperated with converter**

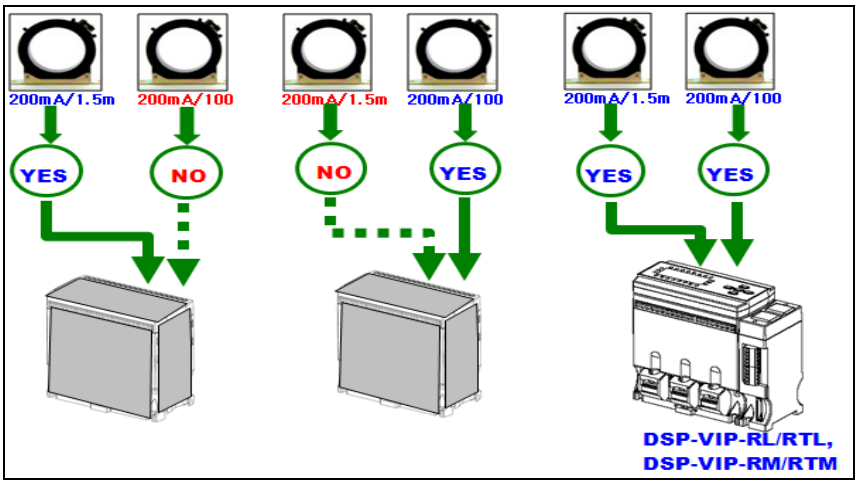
▶ **To select one of RS 485 and 422 : simply selectable in DIP SW inside communication Module : CM44**
▶ **To put easily terminattion resistence in extreme end unit: simply selectable in DIP SW inside communication Module**
▶ **To monitor and to input a data by using "samdsp" or by using EFDS in the field**
- **“samdsp” : PC < > Converter of DSP ,for monitoring and controlling**
- **Possible to communicate with converter by PC through the communication module or a converter directly without communication module**

3.Specialized Point

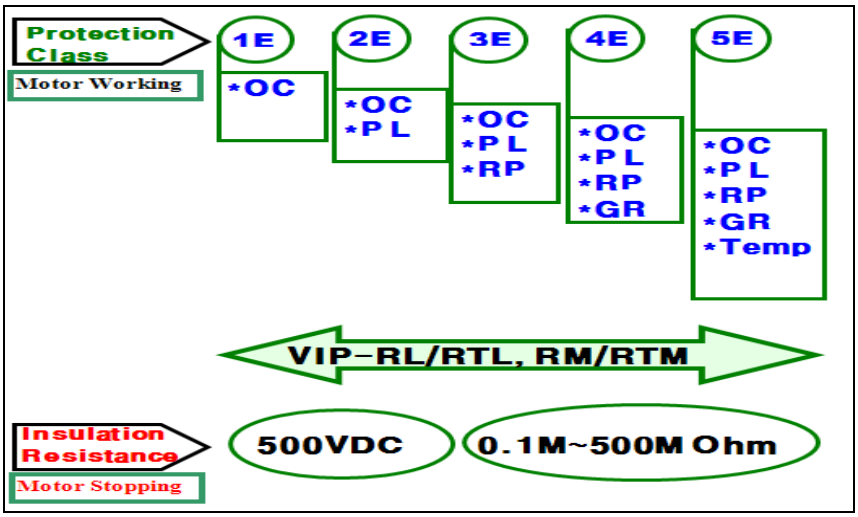
❑ **Current based protection(operating state) & Insulation resistance measurement (stopping state)**



❑ **To be acceptable both rating of ZCT**



❑ **High Level Protetion Class**

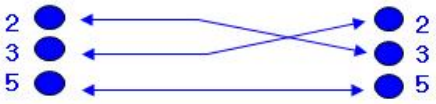


❑ Convenient Communication Module

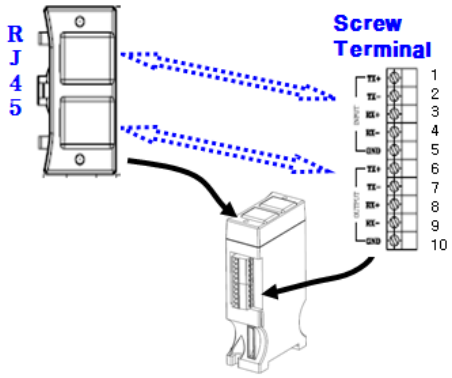
▸ Direct Communication between Converter and PC :RS232

Monitoring and Data input through Note PC

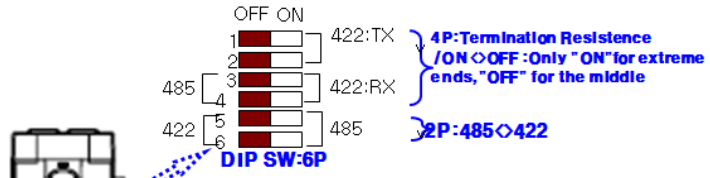
Note:If DSP is connected through a 9 pin port in PC,
the wiring must be changed as follows:



▸ Communication between Module/CM-44,MWR-S and PC:RS485/422



Communication Module/Serial connection through RJ45 or Terminal



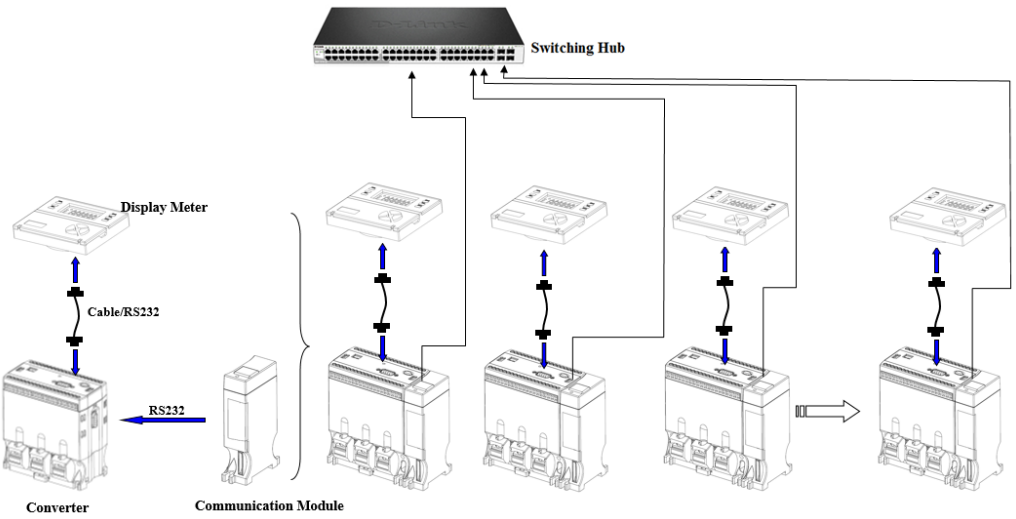
Terminal NO.	Function		Termina l NO.	Function	
	422	485		422	485
1	TX+	TRX+	6	TX+	TRX+
2	TX-	TRX-	7	TX-	TRX-
3	RX+		8	RX+	
4	RX-		9	RX-	
5	Signal GND		10		

Movable Terminal:10P

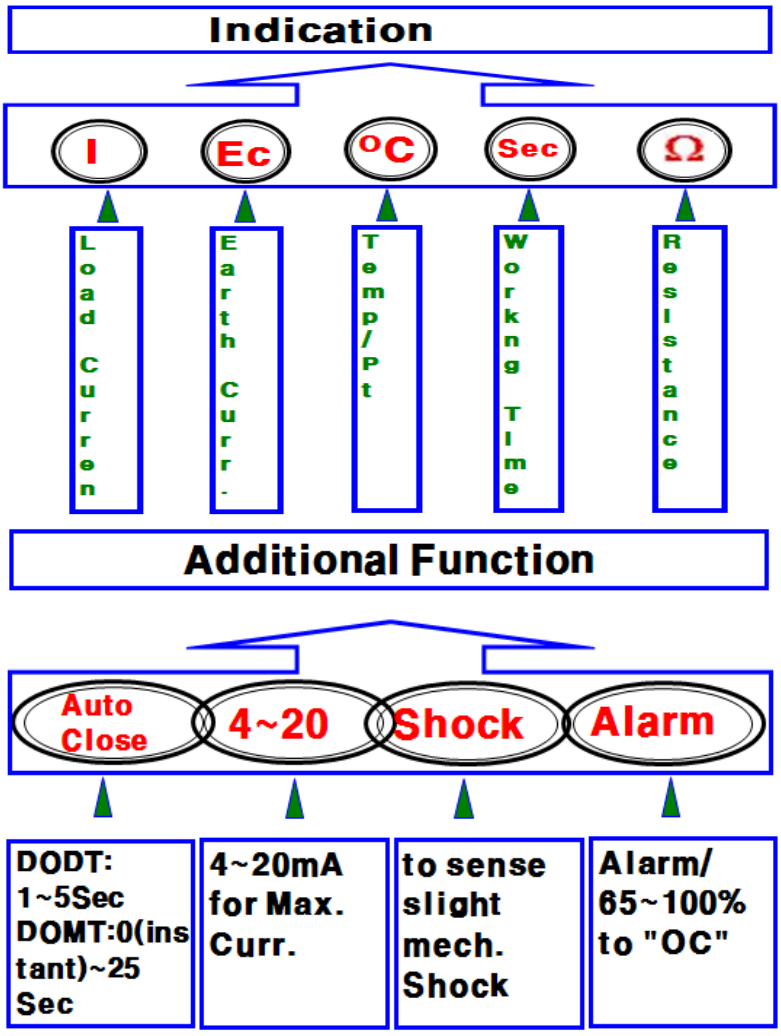
DIP SW Selection:484◇422 ,Termination Resistence

※DIP SW for MWR-S is described in the manual for MWR-S

- **Communication between Module/CM-44E and PC: Ethernet**



❑ Various and Multiple Indication



4. Function List

Function		DSP-VIP-RL/RTL		DSP-VIP-RM/RTM	
		Converter + Loader	Comm. Module	Converter+ D. Meter	Comm. Module
Protection	Over Current	O		O	
	Under Current	O		O	
	Phase Loss	O		O	
	Reverse Phase	O		O	
	Unbalance	O		O	
	Locked Rotor	O		O	
	Shock/Stall	O		O	
	Ground Fault	O		O	
	Over temperature	O		O	
Indication	Load Current	O		O	
	Earth Current	O		O	
	Insulation resistance	O		O	
	Accumulated working time	O		O	
	Load factor /Bar graph	O		O	
Auxiliary	Alarm	O		O	
	ON-OFF	X		O	
	Main contactor Auto Close	O		O	
Communication	4~20mA	O		O	
	RS 485/422 -Modbus,RTU	X	O	X	O
	Ethernet.Modbus/TCP		O		O
	RS232	O		O	
	Interface with Note PC directly	O		O	

Protection

Item	Description	Remarks
Over Current	Trip is done if the load current greater than preset value is kept over preset o-time	
Under Current	Trip is done if the load current greater than preset value is kept over preset o-time	
Unbalance	*Trip is done if the preset current unbalance rate is continued over 8 sec. *rate=[(max curr.-min curr.)/max curr.]*100[%]	
Locked Rotor	Trip is done if 300% current greater than preset oc is kept for d-time plus 0.1 sec.	

Shock/Stall (instant over current)	***Trip is done if a current greater than preset value during working is happened for presetting time. *Presetting range:180%~700% *0.05sec, 0.1~3sec**	***upper limit for type 70 is based on [(240/OC setting value) *100(%)]**
Ground Fault	**Trip is done if a current greater than preset zero phase current is continued for Eot(earth operating time)**	**According to selection of DIP SW *ZCT rating is used for 200mA/1.5mA or 200mA/100mV**
Over temperature	**Trip is done if the temperature sensed by PT100 greater than preset temperature is continued over 8 sec**	**If measured temperature from a motor is greater than presetting value in initial state ,measured value is flickering**
Phase Loss by load current	***This protection is identified by load current within preset Time : 1~5sec/definite,adjustable *"OFF" is possible in this mode**	***If phase loss is happened, this is not allowed to have auto reset,but manual reset.**
Reverse phase by load current	***This protection is identified by load current within 0.5 sec. *"OFF" is possible in this mode**	

Indication

Item	Description	Remarks
Load Current	**L1,L2,L3**	
Insulation Resistance	***to measure insulation resistance between line connected to motor and earth during stopping state of the motor**	
Temperature/ case,winding	**$1^{O}C$ ~ $150^{O}C$/scale $1^{O}C$**	**sensed by PT100**
Accumulated working time (AWT)	***if 0.2A is loaded, working time is accumulated in every 6 min *range:0~6553.5 hr,next to zero *to clear existing accumulated time:press "DN" or ""UP"**	
preset time to make alarm for working time	***making alarm if preset working time is passed over. *range:0~6553.5 hr,next to zero *to clear stored time:refer AWT**	
Trip number /main contactor	***indicating tripped number of main contactor *range:1~65535, next to zero *to clear existing accumulated number:press "DN" under pressing "UP" at first ,then finally make both pressing state,consequently release "DN" at first ,after then release "UP" in "Cn" mode**	
Load factor by bar graph	***calculating % as followed. [actual load curr./preset curr.]*100[%] or [actual load kw/preset load kw]*100[%] *Line type/DSP-VIP-RL/RTL ,round type/DSP-VIP-RM/RTM *indicating for 65~100%**	
Alarm	***preset "AL" in "Au-o" mode *1a is closed(energized) if actual level exceeds preset level %/Available even when a condition is continued for 3 sec**	

Auxiliary Function

Item	Description	Remarks
DC 4~20mA	*To change max current among 3 phase into 20mA *The receiver for 4-20 signal does not have loop voltage	*Available for VIP-RTL,RTM type
Password	*The presetting in a mode is possible as inputing password to have gurantee for an exclusive operator	
Self-diagonistics	*Main trip relay will be tripped(energized) after count down a preset o-time(dt or time of 550% in inverse) in "Test" mode to check if a self-function is normal or not.	
Forward-Reverse start	*FWD-REV button switch is installed on the display meter	*Available for VIP-RM,RTM type
Main contactor Auto Close	*In case a line power is "on" again within a presetting time after a line power is "OFF" during a normal operation,main contactor is closed automatically after another presetting time(DOMT) *Shut Down Delay Time:1~5sec/Adjustable *Delay On Make Time:0(instant) ~25sec/Adjustable by 5sec unit *Expression in mode:eg/2-3:in case power is "on" within 2sec after power-off,motor starts after 15sec((3 is matched with 15sec) from the instant of power-on	

5. Technical Specification

Division		Description
Current setting range	70 Type	0.2A ~ 70A or 0.2A~6A with external CT
	External CT	Refer Table
Ground protection	Zero Sequence Current	30mA~10A
Time setting	Starting delay time(dt)	OFF,0.1 ~300 sec/def, "OFF" selection means inverse curve
	Over current trip delay time(ot)	0.1~60 sec/def, 5~30class/Inv:refer curve
	under current trip delay time(ut)	0.1~30 sec/def
	Shock/stall trip delay time(st)	0.05sec, 0.1 ~ 3 sec/def
	Ground fault starting delay time(Edt)	OFF,0.1 ~ 25 sec/def
	Ground fault trip delay time(Eot)	*0.05sec(instant),0.1~ 30 sec/def, 1~10class/Inv
	Main contactor Auto Close	*Shut down delay Time:1 sec~5 sec *Delay On Make Time:0(instant)~25 sec
	Phase loss trip delay time(PLc)	1~5sec/definite,adjustable
	Current unbalance trip delay time(ubt)	1~10sec/definite,adjustable
Allowable tollerance	Current	C<=2A:0.1A,C>2A:+,- 5%
	Time	t<=2sec:+,-,0.1sec, t>2sec:+,-,5%

	Insulation resistance	**R<=1M:±0.05M, 1M<R<=50M:±5%(avg), 50M<R<=200M: ±10%(avg), 200M<R<500M:available range**	
Control power		***85VAC~260VAC,50/60Hz(90VDC~370VDC)**	
		***24VAC/DC(optional)**	
Trip Output Relay	**Main(C1-F-R)**	**1a * 2(2-SPST),3A/Resistive**	
	Main trip(97-98)	**1a(1-SPST)**	
	Aux(07-08)	**1a(1-SPST),3A/Resistive**	
	GR(07-08)	**1a,3A/Resistive(Aux output must be set "GR" in "Au-o" mode)**	
Application environment	**Temperature**	**Operation**	**-25 ^{O}C ~ +70 ^{O}C**
		Storage	**-40 ^{O}C ~ +80 ^{O}C**
	Relative humidity	**30 ~ 85%,non-condensing**	
Current assword against changeable frequency in Inverter		**Avg ± 5% in 20Hz ~ 400Hz**	
Logic Input		***220VAC:150～260VAC,50/60Hz(220～370VDC)/Standard *110VAC:75～150VAC,50/60Hz(110～220VDC)/Optional**	
Max Conductor Size		**25sq**	
Screw Torque		**Max 0.6 N.m**	
Insulation Resistence/IEC-60255-5		**10Mohm or more/500VDC,circuit-case**	
High Voltage Withstand Test/ IEC-60255-5		***circuit-case:AC 2000V,60Hz, 1 min *contact-contact:AC 1500V,60Hz,1 min**	
Lightning Impulse Voltage Withstand Test)/ IEC-60255-5		***Circuit-Ground,Circuit-Circuit:1.2/50uS,5KV *Control Circuits:1.2/50uS, 3KV**	
1 MHz Burst Immunity Test: IEC 60255 -22-1		**2.5KV,Positive/Negative under 2sec**	
Electrostatic Discharge):IEC-60255-22-2		**Air:Level 3, 8KV,Contact:Level 3,6KV**	
Radiated Electromagnetic Field Disturbance:IEC-60255-22-3		**Level 3, 10V/m**	
Electric Fast Transient Burst:IEC-60255-22-4		**Power,Realy output:Level 4,4KV**	
Surge Immunity test:IEC/EN 60255-22-5		**Relay output:1.2X50uS,2KV (0^{O},90^{O},180^{O},270O)**	
Conducted Disturbence Test: IEC-60255-22-6		**10V,Level 3**	
Digital Communication/ Serial network /with CM-44, MWR-S	**Physical feature**	***RS 485/ RS 422 : CM-44 *RS485 : MWR-S**	
	Address	**1 ~ 250**	
	Speed	***MWR-S:9.6/19.2/38.4/57.6/76.8/115.2kbps *CM44: 9.6/19.2/38.4**	
	wiring connection	***Input/Output:RJ 45 and/or Screw Terminal *RJ45 and Screw Terminal(5P) is commoned physically *RJ45 is recommended for the test by "Samdsp"**	
	Termination resistence	***DIP S/W selection/200 Ohm**	
	Cable	**Sheathed cable,2 Pair/4 pair**	
Digital	**Physical feature**	**Etherent TCP,RJ45**	

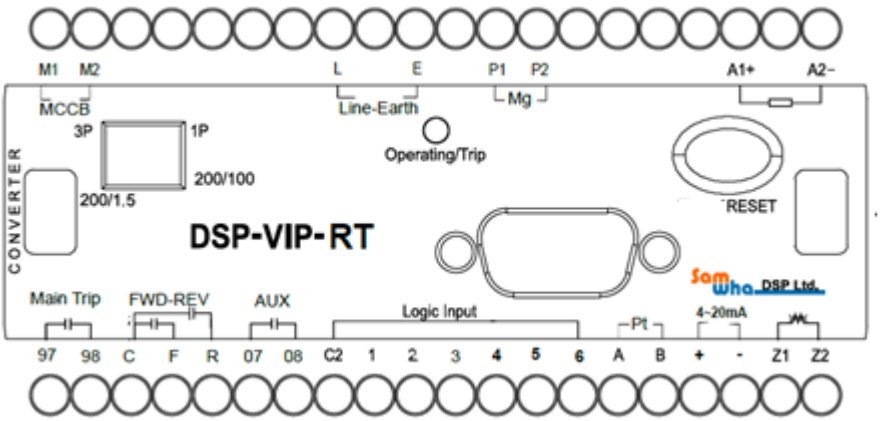
Communication/ Ethernet Network/ CM-44E	**Address**	**http://www.sollae.co.kr/kr/down load/utility.php : ezManager v3.2E**
Current Loop Communication/4 ~ 20mA		**Maximum value in 3 phase current/VIP-RTL,RTM type**
Consuming power		**10W max**

6. Self-diagnostics Display Indication

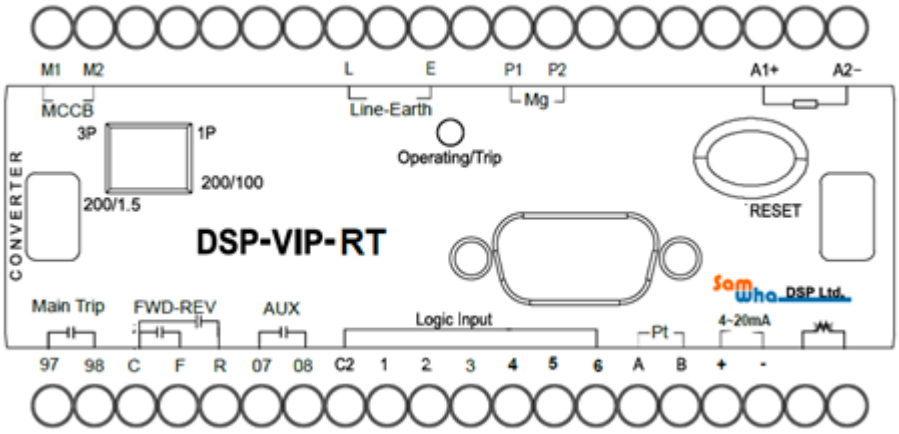
Discription	Display Indication
485 communication error	**LED for the communication module is not turned on or is not flickering**
Fault for internal current board	**cu-no**
Fault for internal main board	**ec-no**
ZCT disconnection	**ec-ct is shown, , next procedure is ahead**
PT100 disconnection	**t1-no is shown, next procedure is ahead**
Latest measured temp >preset value	**"teMP" & value is shown alternatively, but preset and protection job is going on reguraly**
P1-P2 disconnection	**"oPEn".not possible to operate unless making connection from main contactor ,also this is strongly critical condition to operate this product safely**
Open of M1-M2	***"Ir-pS".not possible to start unless making connection from MCCB or making short state for M1-M2 *Unless M1-M2 is opened, it means resistance value is good**
Test SW in converter	**Main trip(97-98) is tripped after counting down preset o-time in definite T-I or 550% time in inverse T-I/the number of lighted LED is matched with counted time**

7. Input-Output Terminal

- **Standard type/possible with external CT**



▸ **Optional type:ZCT assword internally/not possible with external CT**



Division			Description	
Feature		Terminal		
Input (available for "ON" in "logic" mode)	3P/1P	3P-1P	3 phase/Single phase	
	External ZCT	Z1,Z2	200/1.5mA-200/100mV	
	Control Power	A1+,A2-		
	LOGIC	C2	COMMON	
		1	ON	LOP
		2	OFF/Reset(high→low :refer "log2" mode in "Cab"mode group	LOP
		3	Reverse starting	LOP
		4	Remote Control Sensor/ must be matched with logic #1 to start and stop a motor	PC
		5	Meter Run	PC
		6	External fault input[EFI]	
	Temperature	A,B	*PT100	
	Insulation Resistance measurement	L-E	Line-Earth	
		P1-P2	From Contactor	
		M1-M2	From MCCB	
State	RED	Operating	3 Tone Colour LED	
	Green	Control Power		
	Yellow	Trip		
Output	MAIN TRIP	97-98	1a	
		C-F-R	*"Logic" mode : "ON" ▸ 1a X 2(C-F:Foward, C-R:Reverse) ▸ Close:co-worked by logic input ▸ Open: Trip with main trip *"Logic" mode : "OFF" ▸ C-F is closed to be connected with a serial contact with MC for motor starting ▸ but, C-F is opened when a measurement is started	
	AUX	07-08	1a	
	4~20mA	+, -	RTL,RTM type	

Relay Output

Trip	Relay	Output	Remark
Main	*Trip Output : 1a/97-98 *Close by Logic input, then opened by trip →1a:C-FWD →1a:C-REV	*OverCurrent	
		*Under Current	
		*Locked Rotor	
		*Phase Loss	
		*Reverse Phase	
		*Ground Fault	
		*Over Temperature	
		*Current Unbalance	
		*Shock	
Aux	1a,Normal de-energized(07-08)	*Selected in Au-o mode : one of OFF, Ec/Uc/Shoc/AL/tEP/Ir/ Ec-tE-AL/Ec-ta/Ec-tb *OFF:same as Main trip *Ec-ta,Ec-tb:Main trip action caused by Ec independent from main trip/initial aux output state in normal running as followed: .Ec-ta:normal energized state(open→close) .Ec-tb:normal de-energized state(open→open) *AL:Alarm level to OC,65~100%/Contact is closed after 3 sec from reaching preset alarm level *Ir:Insulation resistance *Ec:Earth current *Uc:Under current *Shoc:Instant overcurrent during operation *tEP;Temperature by PT100 *Flickering in stopping state if measured insulation resistance value is lower than preset value in “IrAL” mode	

8. Presetting Description

❑ Main Mode

Mode	Function/range	Description	Factory Setting value
P0000	Password	*need to input a number of 4 digit,”0000” to enter into setting mode *need to move a cursor from first digit(1000 unit) to last unit (1 unit) to pass over next mode as pushing CLR key(Enter function) 4 times. *possible to change password in “PedIt” mode in “CAB” mode group *If the operator forget a assword,manufacturer can support it or use factory initialized setting value *To call factory seting value,make pressed state for Test button of converter at first under power-off condition, then power-on under pressed state of test button for 3 sec or more	“0000”
oc/ setting value]	to preset a range to protect over current	*Current range ▸0.2 ~ 70A ▸possible to match with external CT(0.2A~ 6A:naturally changed) as presetting 5A in next “Cto” mode	10
Cto/1t/ 5A	*to sense a current through DSP in itself or combined with external CT	*1t ▸current is sensed through its own CT ▸next “ct” mode is not appeared automatically and goes to next mode after “CT”.. *5A:available for external CT/a secondary current rating of external CT is 5A	1t

ct /setting value	**to preset a ratio of external CT**	***if 1t is selected in "cto" mode , this mode is displayed like "- -", it means that any preset is not available anymore/ so need to enter to next mode.** ***to preset the value of CT ratio[primary value/5]** ***setting value :1~600** ***1 for its own CT or 5:5 external CT**	**"- -"**
dt/off/setting value	**to preset starting delay time**	***Trip delay time to prevent unwanted trip caused by starting current** ***0.1~300 sec**	**5 sec**
Otc/deF/ Inv	**to select time-current chracteristics for over current**	***to decide t-i characteristics to protect over current : deF/Inv** ***deF(definite):trip based on preset value for "OC" and "ot"** ***inverse** **▸dt=0 : trip based on cold curve** **▸dt>0 :trip based on hot curve after dt is elapsed(actually dt+ calculated time in inverse curve)** **▸Available range:100~(240/"oc" value)*100[%]**	**deF**
Ot/oFF/setting value	**to preset trip delay time**	**to make a time for a trip when a current exceeds preset value** ***definite:0.1sec ~ 60sec** ***inverse:0.2 ~ 30 Class**	**5**
Lc/oFF / on	**to protect locked rotor**	***OFF:disable for this mode** ***ON** **-Otc=Def/Inv:dt+0.1sec if starting current exceeds 300% to oc during dt, Lc is shown in trip**	**oFF**
Shoc/ oFF /Setting Value	**Shock protection during working**	***to preset a value in each current range** ***Preset range is 180% ~700% to OC setting value** ***In case of 70 type ,maximum % is decided by a formular [(240/OC setting value)*100(%)],but if it is over 700%, possible maximum setting % is 700%.**	**oFF**
st /setting value	**to preset a time for shock protection**	***0.05sec,0.1~3 sec/definite** ***If "Shoc" mode is oFF, this mode is displayed like a image of "st —",it means that user is not able to input a value anymore**	**"—"**
PLc /oFF / setting value	**to protect phase loss by load current**	***OFF:to make this mode disable** ***1~5sec/adjustable,definite** ***Auto reset is not possible,only for manual reset.**	**3**
rPc /oFF / on	**to protect reverse phase by load current**	***OFF:not to protect reverse phase** ***ON:to make a trip to protect reverse phase based on load current within 0.5 sec** ***Auto reset is not possible,only for manual reset.**	**oFF**
Ec/oFF/ setting value	**to preset zero phase current to protect ground fault**	***based on zero phase current through ZCT** ***range:20mA~10A**	**oFF**
Edt/oFF/ setting value	**to preset trip delay time to protect ground fault**	***OFF:to make this mode disable** ***trip delay time:1 ~ 25 sec/def** ***Sensitive range:30mA~10A** ***If "Ec" mode is off,this mode is displayed like an image of "- -",it means that user is not able to input a value anymore**	**2**
Etc/deF/ Inv	**to select time-current chracteristics to protect ground fault**	***deF or inv** ***If "Ec" mode is off,this mode is displayed like an image of "- -",it means that user is not able to input a value anymore**	**deF**

Eot /setting value	**to preset trip delay time to protect ground fault**	***deF:0.05 sec/instant,0.1 ~ 30 sec/1sec step *Inv:1 ~ 10 Class/refer curve *If "Ec" mode is off,this mode is displayed like an image of "- - ",it means that user is not able to input a value anymore**	**05sec**
Test	**This is done by pressing test sw once on the converter or by pressing "CLR" key *to check if this relay is ready to work normally or not. *main trip output will be tripped after counting down preset o-time(definite T-I;o-time,inverse T-I:550% time of its class) *need to make a reset to enter into operational condition *"End" is shown as pressing "test button" or "CLR" key for 3sec in order to make reset after trip, then release pressed state**		

❑Sub Mode

Mode	Function/ range	Description	Factory setting value
P****	**Password**	***same as a case of "main Mode"**	**0000**
Out /a/ b	**to decide initial state of main trip relay**	***to make initial state(a or b) of main trip output(97-98) when control power is powered *a:normal energized type(open→close) *b: normal deenergized type(open→open) *Not possible to change the preset value of this mode in any case during operation even if "OPSET" mode of "CAB" mode group is "ON"**	**b**
Fr-ty/ a/b	**to decide a pattern for forward – reverse transfer**	***a:C1-FwD is closed,then C1-REV is closed as keeping that C1-FWD is opend after Frdt is elapsed *b: C1-FWD is closed,then C1-REV is closed as keeping that C1-FWD is closed after Frdt is elapsed *this mode is disable(OFF) if "Logic" mode is preset "OFF" *Not possible to change the preset value of this mode in any case during operation even if "OPSET" mode of "CAB" mode group is "ON"**	**a**
Frdt/ oFF/ Setting value	**to preset a transfer time for F-R**	***transfer time range for reactor starting,forward-reverse operation :1sec~5 min *transfer interval time for Fwd-end～Rev-start : 0.2sec *dt is normally available for each contactor while the transfer operation is done *OFF:transfer for F-R is not done,also possible to have reverse operation in case Logic input #3 is used *this mode is disable(OFF) if "Logic" mode is preset "OFF" *Not possible to change the preset value of this mode in any case during operation even if "OPSET" mode of CAB" mode group is "ON"**	**oFF**
uc/oFF/setting value	**to preset a range to protect under current/load**	***OFF:disable *under current setting range:0.1A~ under preset OC value**	**oFF**
ut/oFF/ setting value	**to preset trip delay time to protect under load/current**	***OFF:disable *to preset trip delay time to protect under current *def:0.1~30sec *in case "uc" mode is OFF ,this mode is displayed an image like "uc—", which means this mode is disabe**	**"- -"**

ub / oFF /setting value	**to preset current unbalance rate(%) among 3 phase**	***OFF:disable** ***formular:[(max-min)/max]*100 [%]** ***range:30% ~ 90%** ***minimum available current:0.3A**	**50%**
Ubt/ Setting value	**to preset current unbalance trip delay time**	***1~10sec/adjustable**	**10**
Au-o/ OFF /Ec/Uc/ Shoc/AL /tEMP/Ir /Ec-tE-AL/Ec-ta /Ec-tb	**to preset a kind of AUX trip output**	***oFF:to make same output as main trip** ***Ec:only for ground fault protection** ***Uc:only for under current protection** ***shoc:only for shock protection** ***AL:only for alarm to oc before trip** ***tEMP:only for over temperature** ***Ir:only for indication for insulation resistance** ***Ec-tE-AL: only for one of Ec or AL or temperature** ***Ec-ta:the state of 07-08 before trip is "b"(close) , then takes trip action caused by GR like same manner of the main trip** ***Ec-tb:the state of 07-08 before trip is not changed as "a"(open) , then takes trip action caused by GR like same manner of the main trip** ***independent output from main trip except presetting "OFF', Ec-ta & Ec-tb** ***This selected protection factor is excluded in main trip naturally** ***This trip is automatically reset if a trip condition is clear**	**oFF**
AL/oFF/ setting value	**to preset alarm level rate(%) to OC**	***oFF:if other factor except AL in "Au-o" mode is preset,this mode is displayed an image like "- -"** ***% range:65% ~100% of preset value to OC**	**"__"**
ALt/ setting value	**to preset a limit of accumulated working time necessary to give alarm.**	***if 0.2A is loaded, working time is accumulated in every 6 min** ***setting range:0.1 hr ~6553.5 hr in 0.1 hr of a step** ***"Sec" LED of front menu LED will be flickered to give alarm after passing a presetted value of hour** ***To clear:press "UP" or "DN", but "- - will be flickerd until 6 min has passed after starting a motor**	**6500**
dc/ setting value	**to dedide max current to change into 20mA**	***to transfer maximum current of 3 phase current into 20mA** ***4mA means zero ampere output** ***Primary current is transferred in case external CT is used.** ***The receiver for 4-20 signal does not loop voltage**	**5**
tEMP/ oFF/ Setting Value	**to preset temperature value to protect temperature rising**	***based on PT100 sensor** ***range: 1^{O}C ~150^{O}C/ 1^{O}C in a step** ***If measureed temperature from a motor is greater than presetting value in initial state, measured value and "tEmP" is shown alternatively,but protection job is going on regulary**	**OFF**
Cn/ fixed value	**to count tripped number of main contactor**	***Fixed Value:to show accumulated number of actual trip** *** max value is 65535** ***need to press both "UP" and "DN" key** ***ON-OFF must be done by logic input and actual current greater than 0.2A must be loaded.**	**OFF**
rota /oFF/ on/ temp	**to decide additional factor besides basic factor to indicate value**	**▶Motor Running State** ***OFF:to indicate basic factor/3 phase current,GR current in every 3 sec** ***ON:to indicate additional factor such as Ir(latest measured line insulation resistance value), temp , AWT**	**OFF**

	in the order	(Accumulated Working Time) including basic factor together ▶Motor Stopping State *ON,OFF : to indicate control command position(LOP, rcs, mcc) , latest Ir *temp: to indicate control command position(LOP, rcs,mcc) ,latest Ir,latest temperature ▶ Possible to fix one of rotated factor or to release:one touch button(CLR Key:enter function)	
rESEt/Hr/Aut-#	to decide how to reset tripped state	*Hr:password input *Er :"Reset" button of converter :"CLR" Key :Control power : OFF :Logic #2 input :OFF(High⟶Low) *Aut-# :to preset auto reset and allowable number for auto reset, posible number is 1 to 9. *if Auto reset is preset,manual reset by self Reset S/W of converter is not available *if trip is acted by phase loss,auto reset is not able,only for manual reset	Er
Aut-t/ setting value	to preset automatic reset time	*to preset time from trip to reset in auto reset mode *time range:1sec~3600sec(60min) .1~59 sec:actual digit, .1min~30min:actual digit + -m(bar n/time unit) in display. *if Hr is preset in "rESEt" mode,this mode is like a "Aut--"	“- -“
t-Aut/ setting value	to preset total possible time available for executing defined time of auto reset	*possible total allowable time to have the preset number of auto reset *time range:30min~60min *only possible for over current trip *the preset time is counted from the instant of first trip and return to the preset condition for auto reset after the allowable time is elapsed *Password lock in Auto Reset :able in case the preset number of auto trip is done within preset total reset time :otherwise, the counted number of trip time is initialized to previous preset value *If Hr is preset in "rESEt" mode, this mode becomes disable	"--"
trIP /8~1/trip cause / trip value	to show latest number of 8 trip cause	*To show latest number of 8 trip cause in the order *8th trip cause and caused value are appeared firstly, next 7th and finally 1st trip cause as every pressing "up" button *to support an operator how many order of 8 tripped event is appeared in conjunction with a number of lighted LED in bar graph. *need to press "Mode" key to return to main mode *trip information in order:faulty phase and faulty value is appeared alternatively *more detailed information can be retrieved by note PC directly or remote center	nonE
Addr /Setting value	to put self-address to communicate with pc	*to preset an address for 485/422 communication *range of number:#1 ~ #250	1

bPS / setting value	**to decide communication speed**	***to select communication speed * 9.6/19.2/38.4/57.6/76.8/115.2kbps**	**9.6**
Tover/ OFF/ Setting value(sddt-dodt)	**Main contactor Auto Close**	***In case a line power is "on" again within a presetting time(SDDT) after a line power is "OFF" during a normal operation, main contactor(M) is closed automatically after another presetting time(DOMT) *Shut Down Delay Time:1~5sec/Adjustable *Delay On Make Time:0(instant)~25sec/Adjustable by 5sec unit *Expression in mode:eg/2-3:in case power is on within 2sec after power-off,motor starts after 15sec((3 is matched with 15sec) from the instant of power-on *this mode is disable(OFF) if "Logic" mode is preset "OFF"**	**OFF**
IrAL/OFF/Setting value	**to preset alarm level for insulation resistance**	***OFF:disable *preset range:0.1Mohm~500Mohm *If measureed insulation resistance is lower than preset value in initial state, measured value is flickering,but protection job is going on regulary *Aux output(07-08) is energized(tripped) in case "Ir" is selected in "au-o" mode**	**2**
rEcOd/ Setting value (min)	**to preset measurement interval time for insulation resistance**	***adjustable interval time:0.1 min~3000 min *First measument is done after preset time from motor stop *If such interval time is placed on the mid of motor operation,a measurement is neglected**	**60**
rE-nb /oFF/ Setting Value	**to preset possible number to continue a measument by interval time**	***OFF:a measurement is done in every interval time during motor stopping state *Setting value: measurement is done only preset times. *Adjustable range:1~10 times *First measument is done after preset measuring inteval time from motor stop *the reset by power-off or "pressing SET key" must be done if the operator wants to renew the number of allowable measurement , otherwise the measurement is not done until the reset is done after the measuring action by preset times has done**	**oFF**

❑ Cab Mode

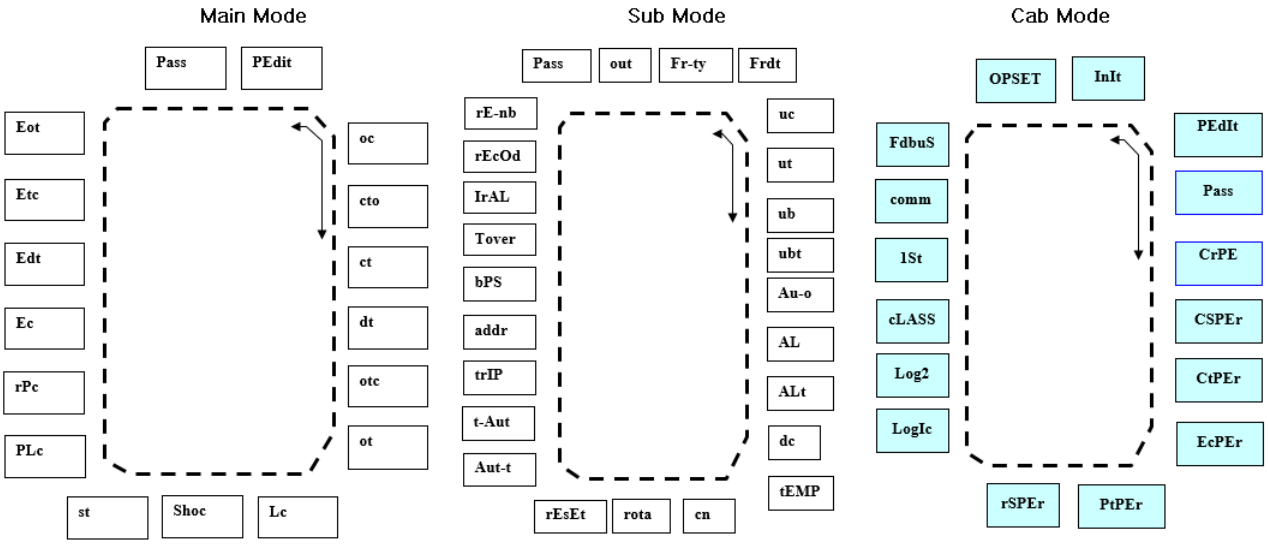
This mode is appeared as pressing "SET" key for 5 sec or more and is disappeared as pressing "M/OFF" key

Mode	Function/ range	Description	Factory setting value
PEdIt/ setting Value (P**)**	**to change password**	***possible to enter new digit by using "UP" or "DN" key after positioning a curser on the required digit *possible to enter into main mode or sub mode as pressing "mode" key**	**P0000**
CrPEr	**to have a caribration for phase "R" current**	***possible to adjust within +,- 12.7% from indicated value by using "UP" or "DN" key**	**0**

CsPEr	**to have a caribration for phase "S" current**		**0**
CtPEr	**to have a caribration for phase "T" current**		**0**
EcPEr	**to have a caribration for ground fault current**		**0**
PtPEr	**to have a caribration for a temperatute from Pt1**		**0**
rSPEr	**to have a caribration for insulation resistance measurement value**		**0**
Logic/ ON/OFF	**To decide if logic input state can be activated or not**	***ON : Logic input is able state** **▸C-F/1a : forward, C-R /1a : reverse** ***OFF : Logic input is disable state** **▸"AUTO" is shown as a control power is loaded** **▸ C-F is closed to be serial connection with MC for motor starting** **▸ but, C-F is opened in case a measurement is executing in order to prevent for motor starting**	**OFF**
Log2/ LOP/ ALL	**to determine method and scope to reset through Logic input #2**	***LOP:reset is possible as the state of logic input #2 is transferred from high to low in case trip is happened in the condition of LOP** ***ALL:reset is possible as the state of logic input #2 is transferred from high to low in case trip is happened in the whole condition,so Logic 2 should be high firstly** ***In any case, reset is possible by pressing "CLR" key** ***this mode is disable(OFF) if "Logic" mode is preset "OFF"**	**LOP**
CLASS/ oFF/Man /AUTO	**to determine a method to measure a resistance**	***oFF:not available for resistance measurement function** ***MAN(displayed:bar-nan):a measurement is done whenever "Mode"key is pressed for 1 sec under pressing state for "DN" key at first→Not possible during an operation** ***Auto:resistance is measured automatically according to first measuring time and next measuring interval time which is preset in each mode/pressing "SET" twice is able to measure a resistance once manually** ***the starting point to measure a resistance is the time control power is on** ***the measured resistance is lower than preset value in MAN and AUTO , the mortor is not possible to start**	**Man**

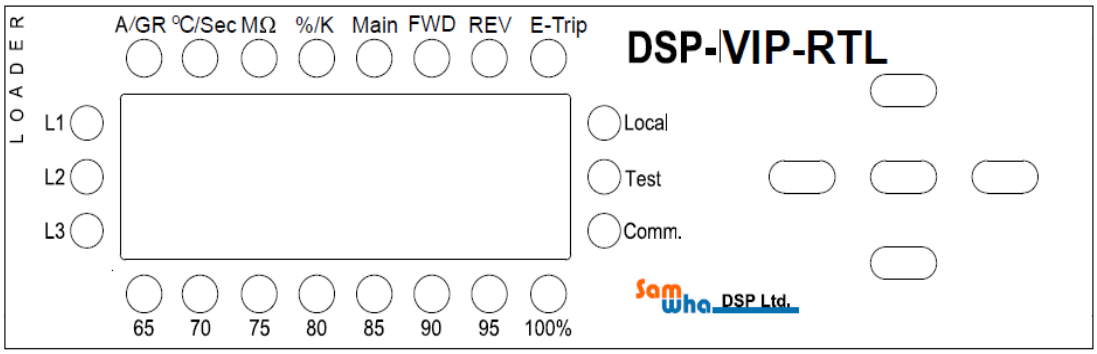
1st/oFF/ Setting Value(min)	**to preset a first measuring time**	***OFF:not available for this function after the control power is on *available only in case "Class" mode is preset by "Auto" *adjustable value:0.1 min(6 sec)~ 3000min *the measurement starts in the point of motor stop and next measurement is done by the preset time of "Recod" mode *if the preset time is positioned in the mid of running state, the actual measuring action is not executed *if the motor is restarted according to the "Tover" mode, this function is not executed *this is reset by power OFF or the pressing "SET" button**	**0.1**
Comm/ auto /slave	**To decide a qualification of VIP in communication**	***auto:VIP always dispatches a data *Slave:VIP dispatches a data only in case the master requires**	**slave**
FdbuS/ RTU/ TCP	**To decide network protocol**	***RTU : Modbus/RTU,422/485 *TCP : Modbus TCP, Ethernet**	**RTU**
oPSEt/ ON/OFF	**to decide if it is possible to preset during the operation**	***ON : it is possible for operator to change a preset value during motor normal operation except "out"mode * OFF : it is not possible for operator to change a preset value during motor normal operation**	**OFF**
InIt	**To make factory default condition**	***It becomes the factory default value afer "EEPIn" is shown as pressing "UP" and "DN" key together for 2sec or more**	

9.Operational Order of MODE

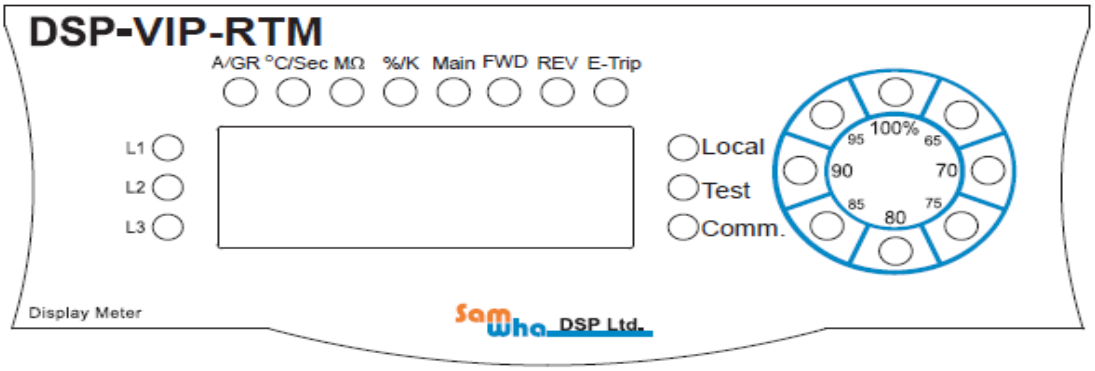


10. Display Window Image

• Panel Mounting Type : Loader



• Panel Flush Mounting Type : Dispaly meter

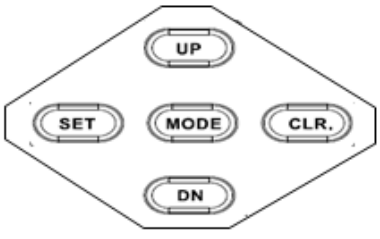


‣ LED Indication

*E-trip: trip by External fault input theough Logic #6
*Local:turned on on LOP/rCS, turned off in PCoperation
*Comm:communication between Converter and Meter

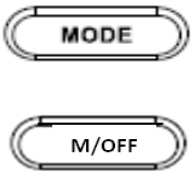
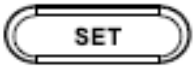
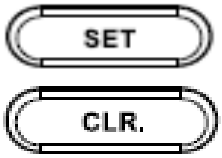
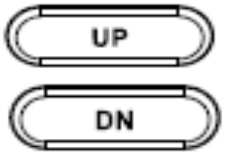
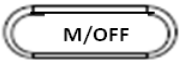
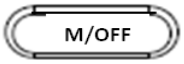
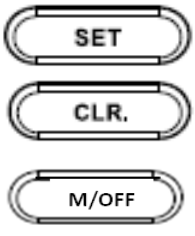
*A/GR : Load current/Earth Current
* %/K : alarm % /1000 Unit
* °C/Sec : temperature/Time
*Main : Main mode/Turn on, Sub mosde/Turn off
*FWD : Forward operation
*REV : Reverse operation
*E-Trip : Trip by external signal
*L1,L2,L3 : Each phase
*Test : Self-diagnostic
*65-100% : Load factor

11. Control Key Operation



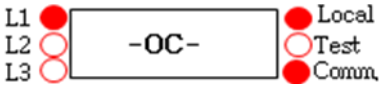
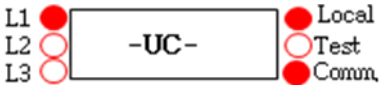
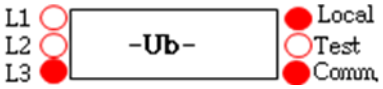
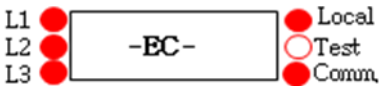
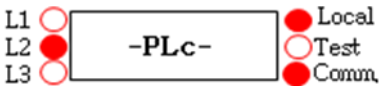
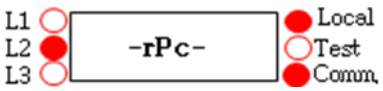
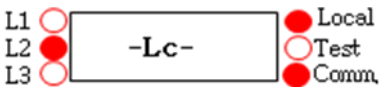
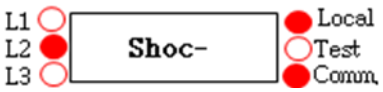
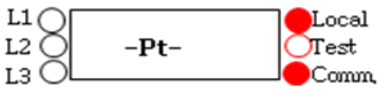
DSP-VIP-RL/RTL

DSP-VIP-RM/RTM

Function	Key	Description
1.Mode Group Selection		***Initial state to indicate one of controlled position(ON-OFF control:LOP/bar-nCC/rcs/PC) is appeared.** ***Main Mode or Sub Mode in conjunction with "Main" LED/"main mode":LED is turned on.** ***Press "SET" Key to enter into setting mode,then "P0000" (factory default password) is shown** ***In case of using this default number, move cursor from first digit to right end digit by pressing "CLR" key and finally operator meets possible state for setting as pressing "CLR" key one more after a cursor is positioning right end digit** ***If there is no input for 15 sec or pressing "Mode" key, VIP is entered into operating condition.**
2.Setting Key Function		***After entering into posible state for setting , each key acts its job as follows : SET → backward direction,CLR → foward direction,UP.DN → able to select number or character in preset mode.** ***if operator wants to stop setting,it is possible to return as "Mode" key ,in result selected data untill previous mode is strored**
3.MODE selection		*** a Mode selection to preset data is done by pressing "SET" or "CLR" under the job of directional key.**
4.Adjust		***To select number or character in the each mode** ***Return to next mode as pressing "CLR" key**
5.Mode (Store)		***As pressing "Mode" Key once again ,preset procedure is completed and is ready to operate in its duty.** ***it needs 3 sec to store a preset data,so if operator makes "power-off" without waiting a storing precess for this time,ratherly VIP could returns to initial factory state**
Forward start		
Reverse start		***this is only useful for Fwd-Rev starting motor.**
Motor stop		***Possible to stop a motor in any direction**
Possible to check and/or to change preset value of each mode during operation		***possible to check preset value during an operation** **▸press "SET" key once during operation** **▸preset vale and mode are appeared alternatively** **▸"SET" and "CLR" key works same direction job above to check next mode or previous mode** *** possible to change preset value during an operation** **▸"oPSEt" mode will be "ON" before activating this condition** **▸"UP" and "DN" key for changing a preset value/**

		”SET” for next mode and “CLR” key for previous mode *press “Mode” key in order to return to normal operation state or wait 15 sec after completing its job *there is no interval between ”Main” and “sub” for direction of “SET” or “CLR” key

12. Trip Indication

Trip	Display	Trip cause
Over Current		**Trip caused by over current in phase L1 was happened**
Under Current		**Trip caused by under current in phase L1 was happened**
Current unbalance		**Trip caused by unbalanced current in phase L3**
Ground Fault		**Trip caused by ground fault current**
Phase loss		**Trip caused by phase loss in phase L2**
Reverse phase		**Trip caused by reverse phase in phase L2**
Locked Rotor		**Trip caused by locked rotor current in phase L2 during motor start**
Shock/Stall		**Trip caused by shocking current in phase L2 during working**
Over Temp		**Trip caused by over temperature in conjunction with "Pt" LED im menu**

13. Current range table matched with external CT

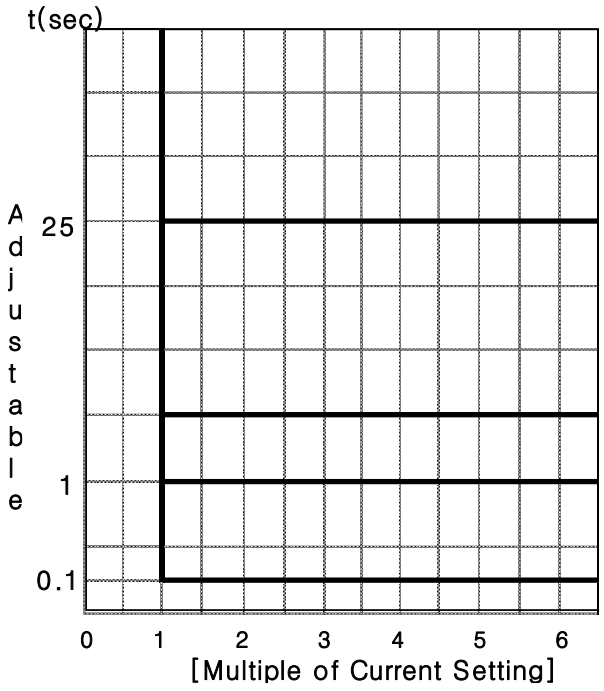
Range	Number of CT turn in itself	Preset in "ct" mode (ct ratio)	Preset in "cto" mode	Remarks
0.2A~70A	**1**	***Without external CT**	1t	70 Type,Wide Range
	1	***With external CT:0.2~6A**	5t	
0.4A~10A	**1**	**2(10:5)**	**5A**	***With external CT, Secondary rating of CT is 5A *CT ratio to preset is 1~600**
0.6A~15A	**1**	**3(15:5)**		

0.8A~20A	**1**	**4 (20:5)**		
1.2A~30A	**1**	**6 (30:5)**		
1.6A~40A	**1**	**8 (40:5)**		
2A~50A	**1**	**10(50:5)**		
2.4A~60A	**1**	**12 (60:5)**		
3A~75A	**1**	**15 (75:5)**		
4A~100A	**1**	**20(100:5)**		
4.8A~120A	**1**	**24(120:5)**		
3.6A~150A	**1**	**30(150:5)**		
8A~200A	**1**	**40(200:5)**		
10A~250A	**1**	**50(250:5)**		
12A~300A	**1**	**600(300:5)**		
16A~400A	**1**	**80(400:5)**		
20A~500A	**1**	**100(500:5)**		
24A~600A	**1**	**120(600:5)**		
30A~750A	**1**	**150 (750:5)**		
32A~800A	**1**	**160(800:5)**		
40A~1000A	**1**	**200(1000:5)**		
48A~1200A	**1**	**240(1200:5)**		
60A~1500A	**1**	**300(1500:5)**		
80A~2000A	**1**	**400(2000:5)**		
100A~2500A	**1**	**500(2500:5)**		
120A~3000A	**1**	**600(3000:5)**		

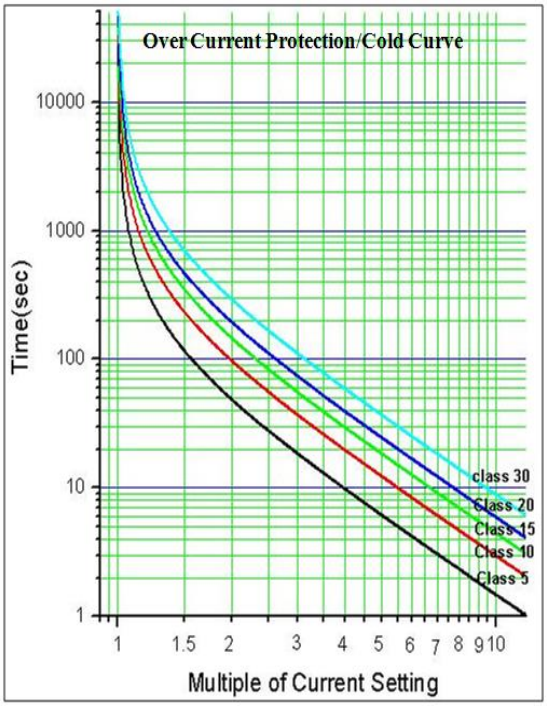
14. Time-Current Characteristics

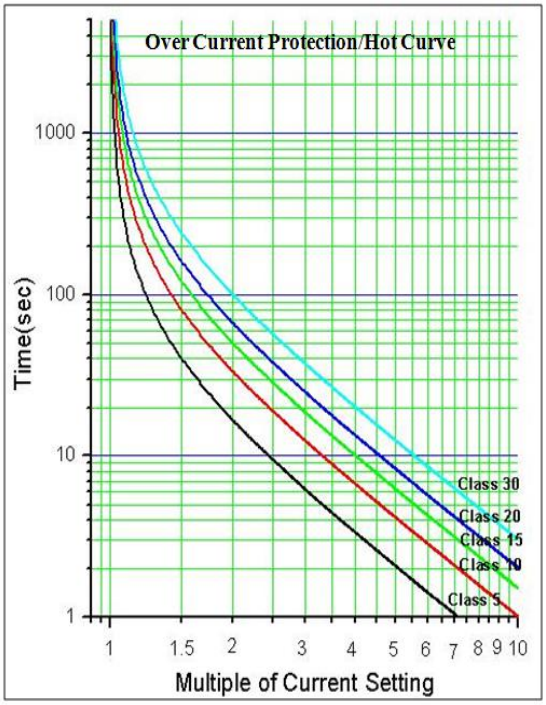
❑ Over Current Protection

▶ Definite

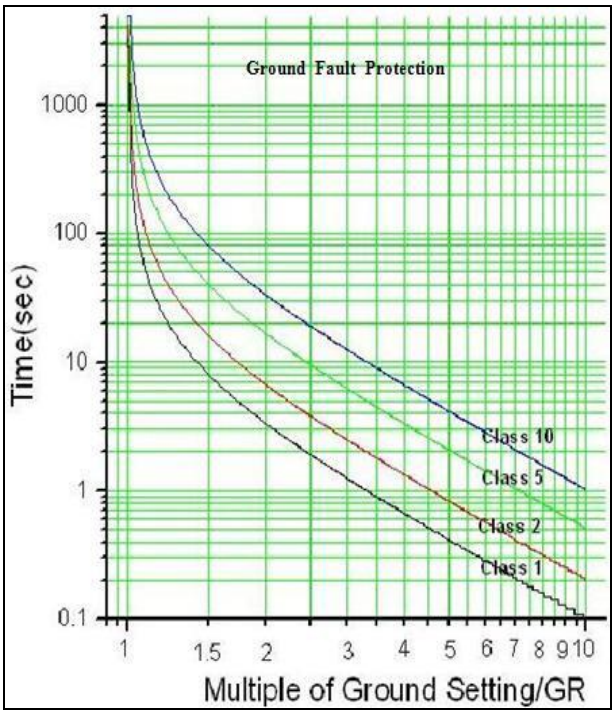


▶ Inverse



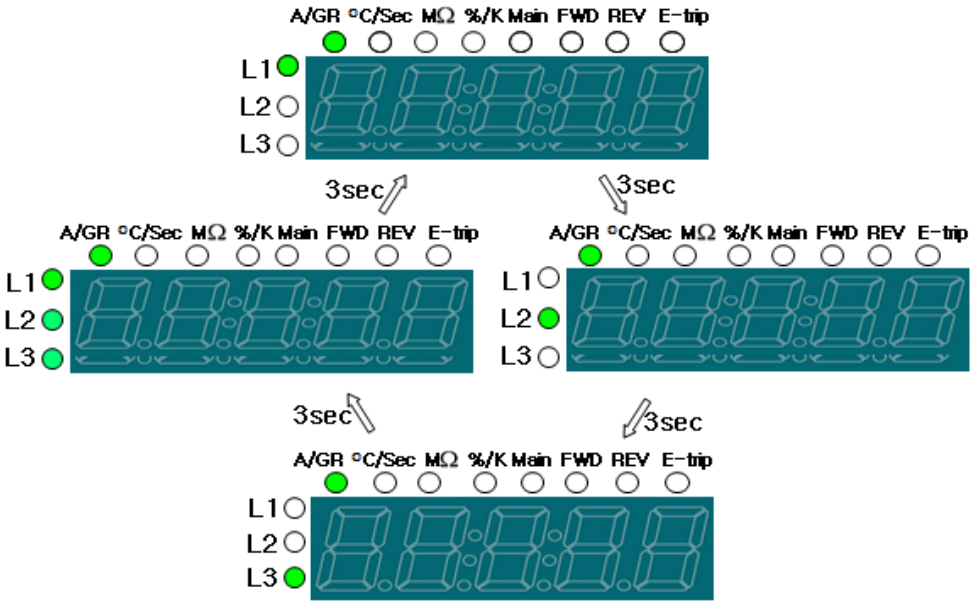


❑ **Ground Fault Protection**

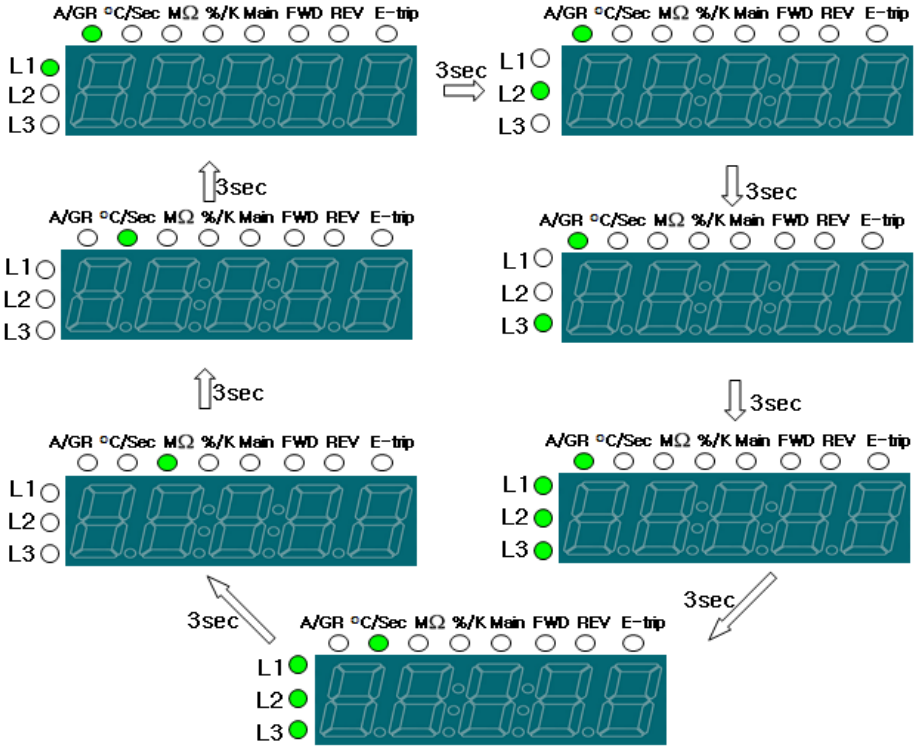


15. Rotated Indication

❑ **Basic factor:3 phase current,GR**

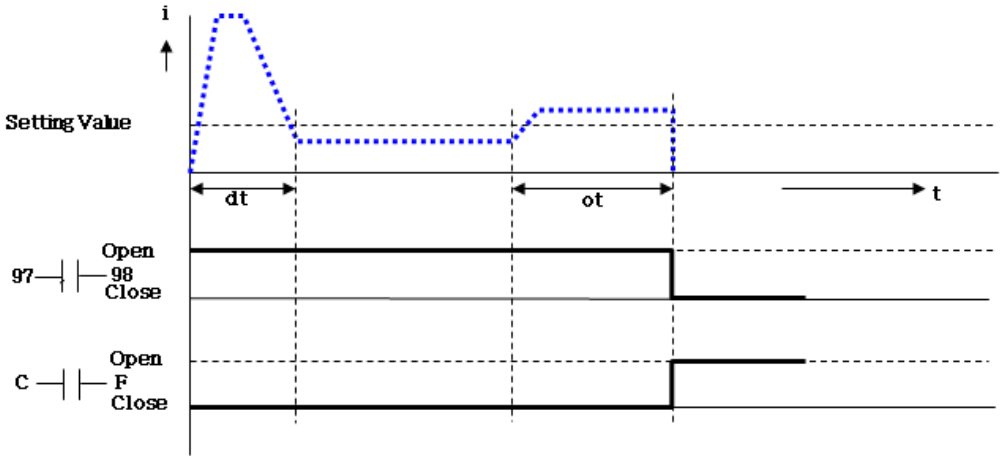


❑ **Basic factor + Pt,Ir,AWT**

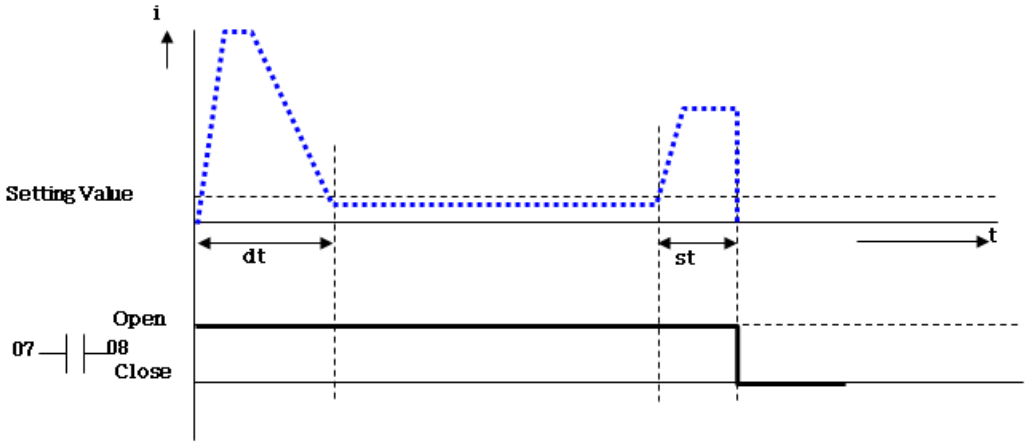


16. Time based Trip Relay Output

❑ **Over Current Protection/Forward running,"out" mode : b**

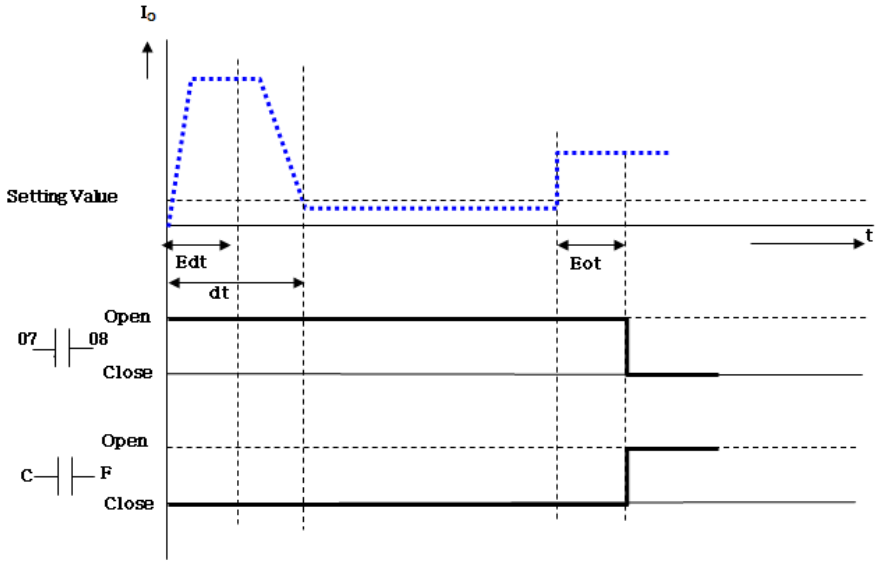


❑ Shock/Stall Protection:AUX is selected for exclusive output for shock in "Au-o" mode



❑ Ground fault Protection

In case of trip in 07-08, "Au-o" mode : Ec-tb



17. Application Sequence Diagram

▸This table and example diagram is based on ”Logic” mode is preset “ON”(able state)

LOP Duty

Logic I put	High	Low	State	Output relay operation by Logic input [C1-F ,C1-R]
1	Low→High		Motor Start	C1-F → Close
2	O	-		
1	-	O	Motor Stop	C1-F → Open
2	High→Low			

rcS(Remote Control Sensor) Duty

Logic Input	High	Low	State	Output relay operation by Logic input [C1-F ,C1-R]
1	O		Motor Start	C1-F → Close
4	O			
1		O	Motor St p	C1-F → Open
4	O			

PC Duty

Logic Input	High	L w	State	Output relay operation by Logic input [C1-F ,C1-R]
4	O	-	Motor start/stop in PC	C1-F → Close(start) C1-F → Open(stop)
5	O	-		

Display Meter Duty(MCC)

Logic Input	High	Low	Sta e	Output relay operation by Logic input [C1-F ,C1-R]
5	O	-	Start/Stop in Display Meter	C1-F → Close(start C1-F → Open(stop)

LOP-FWD/REV (PM,CM / RM,RTM)

Logic Input	High	Low	Sta e	Output relay operation by Logic input [C1-F ,C1-R]
1	Low→High		Forward Start	C1- F → close
2	O	-		
2	-	O	Forward Stop	C1- F → open
3	Low→High		Reverse Start	C1- R → close
2	O	-		
2	-	O	Reverse Stop	C1- R → open

rcS-FWD/REV

Logic Input	High	L w	State	Output relay operation by Logic input [C1-F ,C1-R]
1	Low→High		Forward Start	C1 – F → close
4	O	-		
1	-	O	Forward Stop	C1 – F → open
3	Low→Hig		Reverse Start	C1 – R → close
4	O	-		
3	-	O	Reverse St p	C1 – R → open

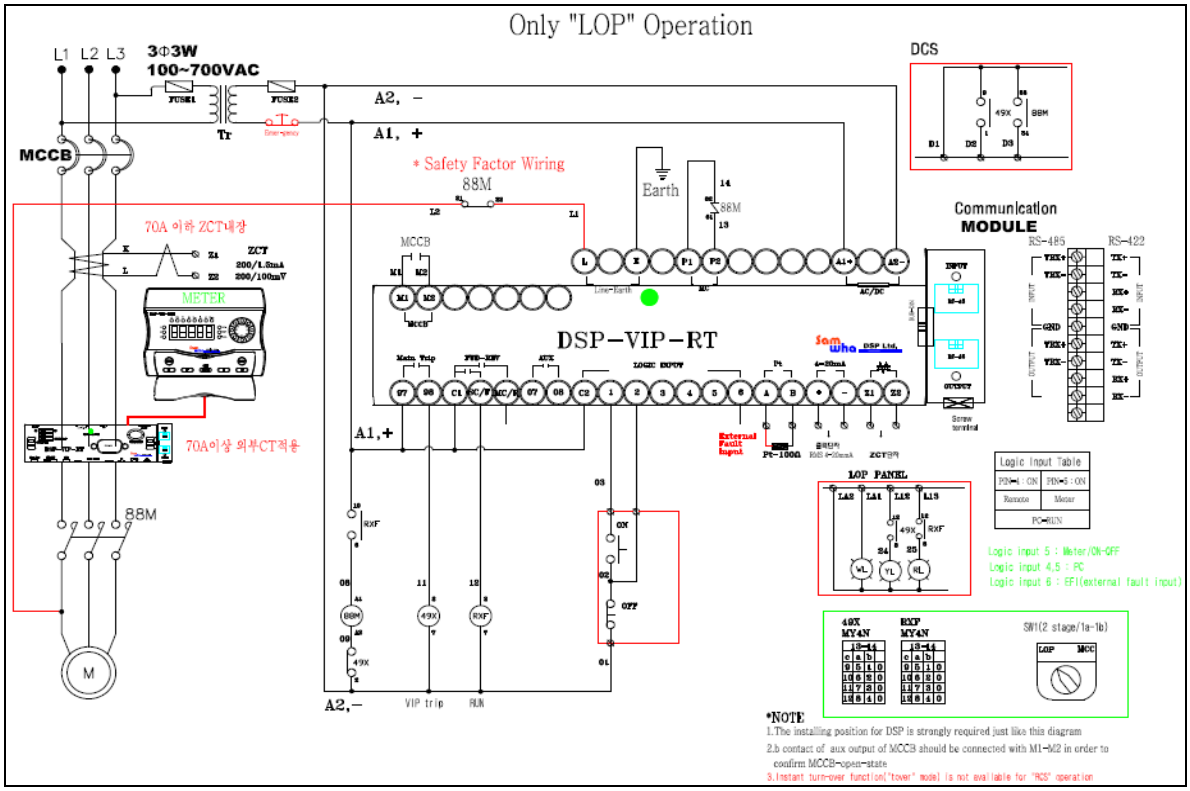
EFI(External Fault Input) Duty				
Logic Input	High	Low	State	Output relay operation by Logic input [C1-F ,C1-R]
6	O	-	*Motor stop *Displayed : OUT-F(auLt)	97-98(Close,selected "b" on "out" mode),C1-F → Open 97-98(Open,selected "a" on "out" mode),C1-F → Open

※In case selected operation mode is changed by Selector SW, the motor will be continued to work according to new selected mode afte the motor is stopped shortly
※ It would be easy to understand as referring the application sequence diagram
※ In order to use Logic input #3 for FWD-REV operation, "Frdt" mode in sub menu group must be preset "OFF"
※ In case motor is stopped by the command of ON-OFF(Rmote sensor or external fault input ,not by the trip output signal) , LOP,MCC,rcS(remote control sensor) ,out-F(External fault Input) or PC is appeared in the front window to indicate originated command source
※ It is required that logic input from long distance sensor must be connected through the output of external aux relay because input line could keep unwanted voltage by induced current
※ The followed mode is disable naturally if ″Logic″ mode is preset ″OFF″(disable)

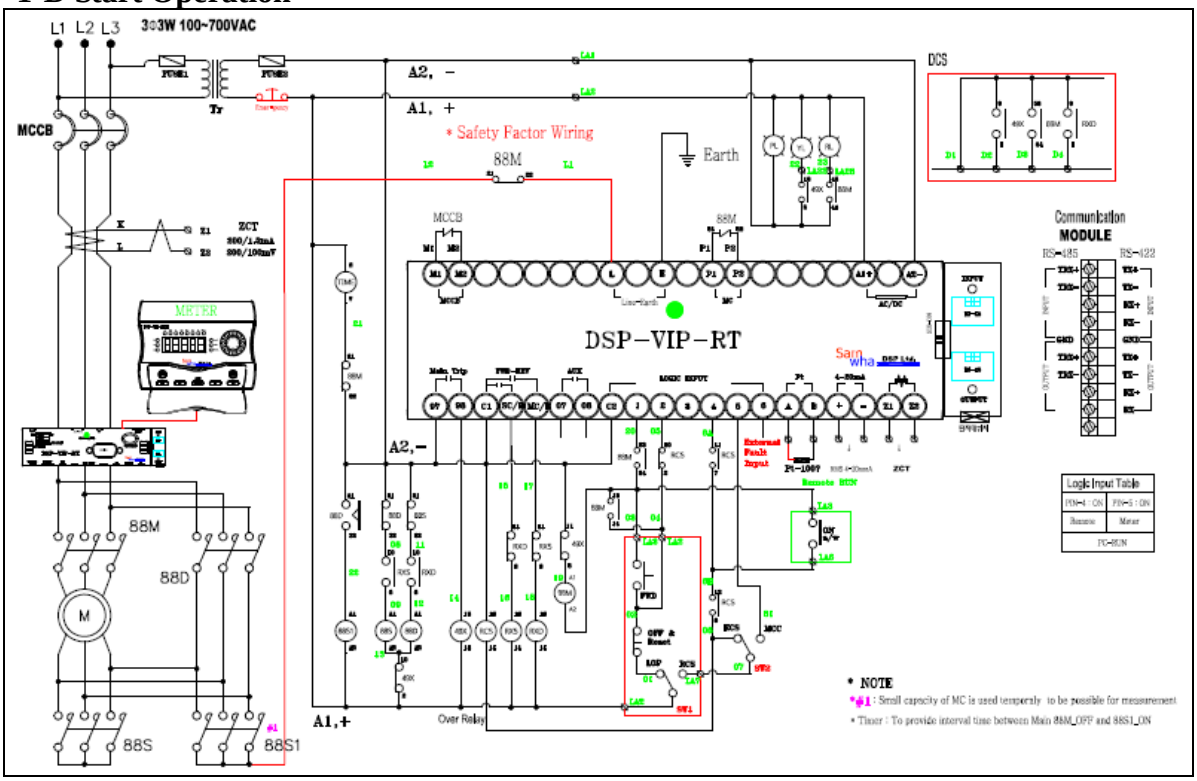
Mode group	Mode	Description
Sub	Fr-ty/a/b	Forward - Reverse pattern
	Frdt/OFF/Setting	Forward-Reverse transfer time
	Tover/OFF/Setting	Shut down turn over
Cab	Log2/LOP/ALL	Reset pattern by Logic input #2

▶"Logic" mode "ON"

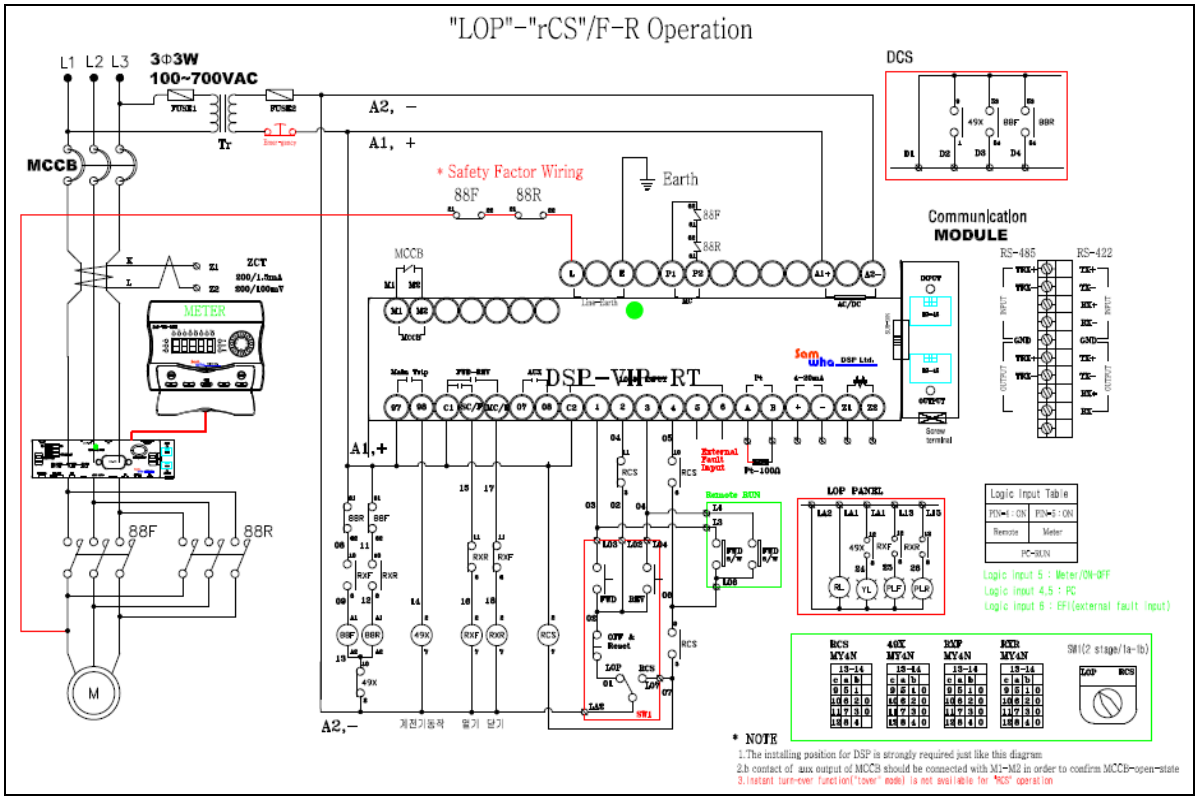
○ DOL(Direct on Line)



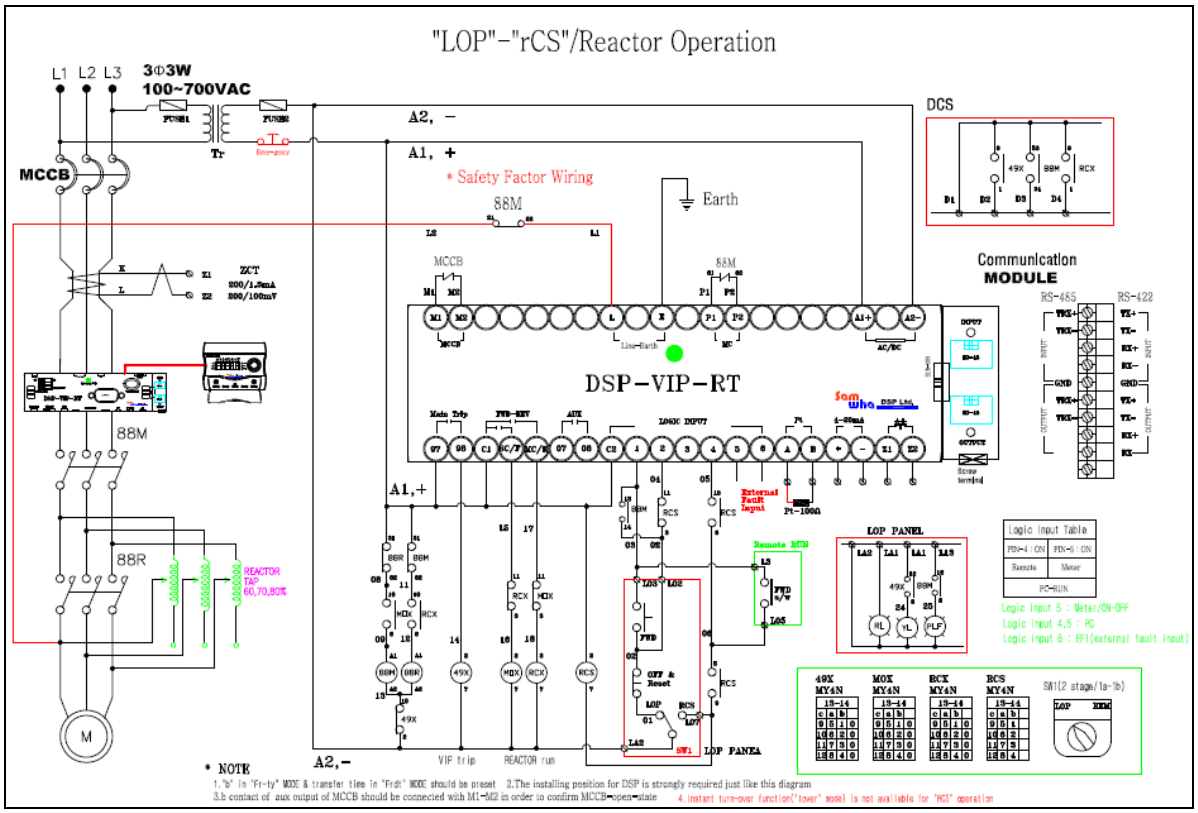
○ Y-D Start Operation



○ Forward-Reverse Operation

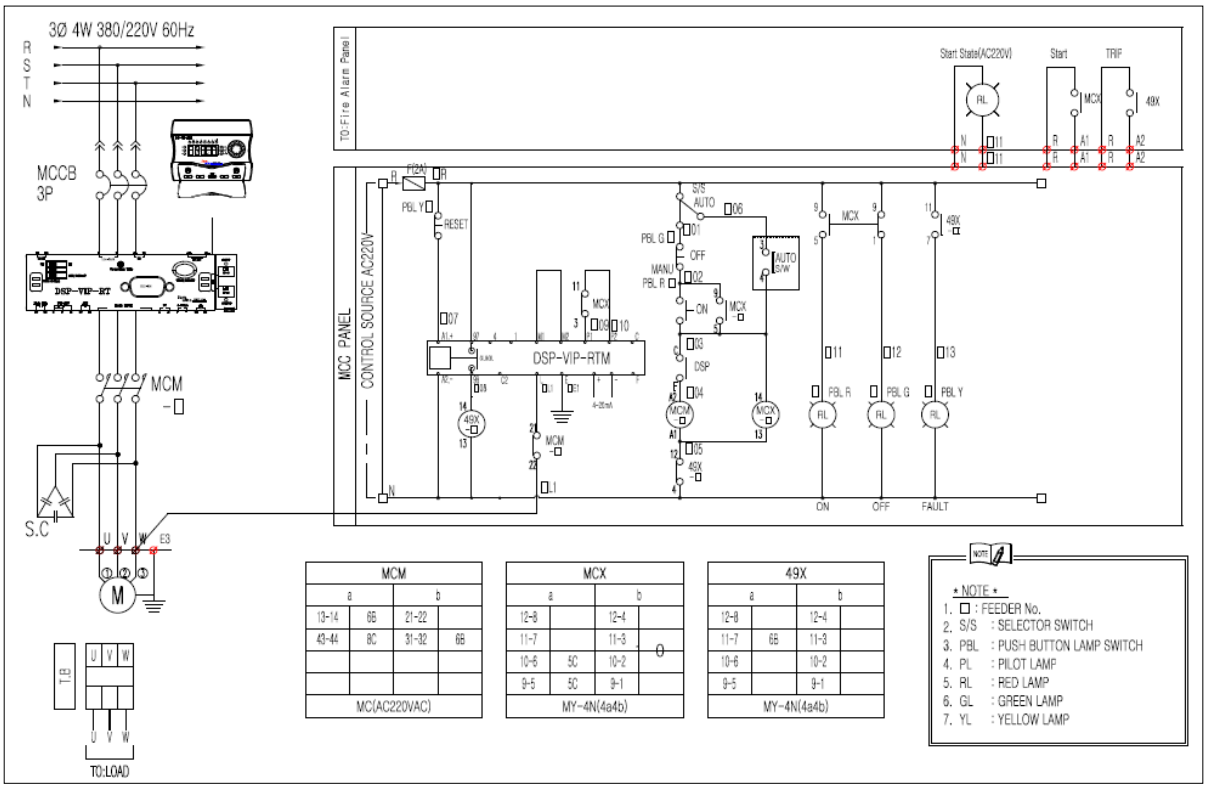


○ Reactor Start Operation



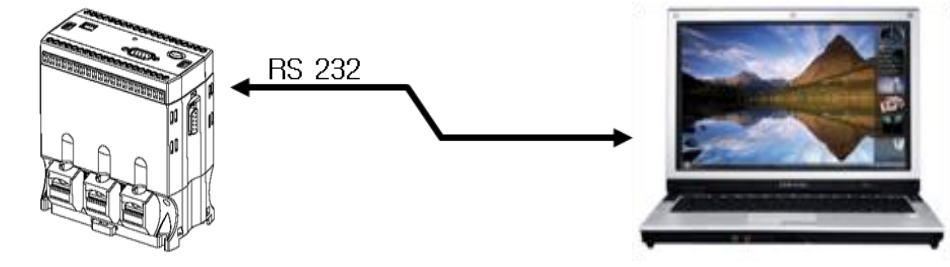
▶"Logic" mode "OFF

"C-F" should be applied for a serial connection with MC in order to prevent for motor start while a insulation resistance is measuring



18. Example for Applied Communication

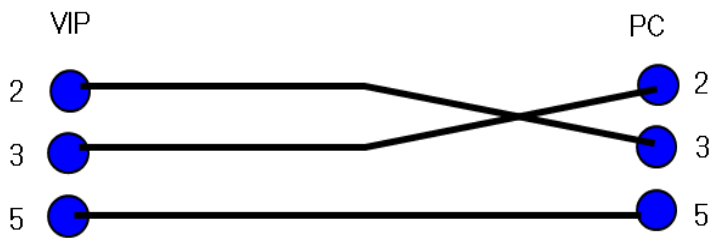
18-1.PC <Directly > DSP by RS-232/Data Input & Monitoring



DSP-VIP/Converter

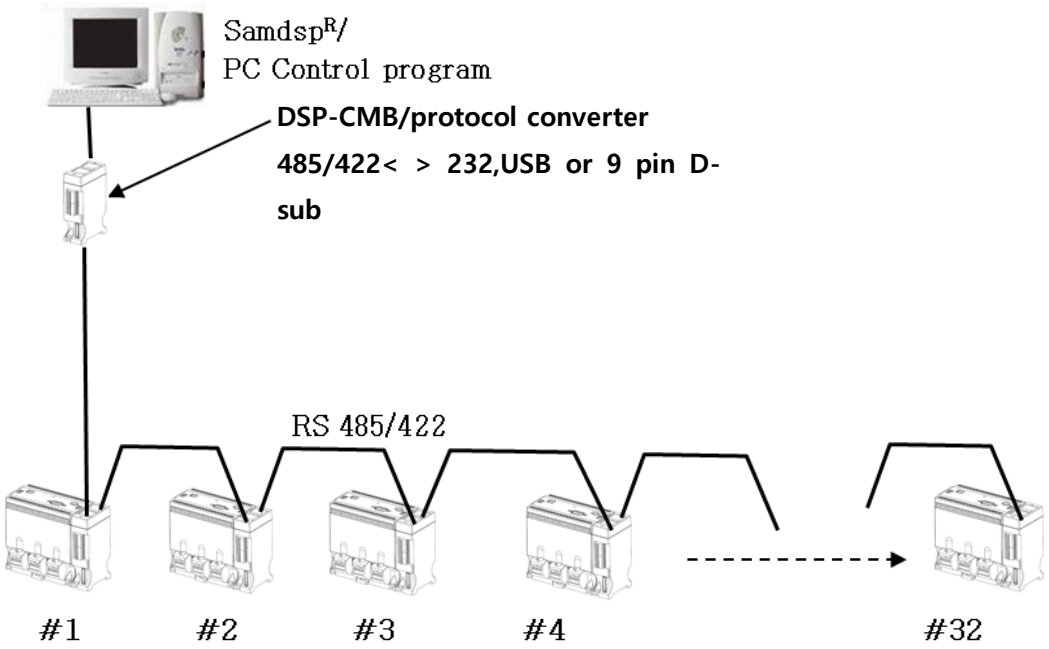
Samdsp^{R}/
PC Control program

***In case VIP is connected with PC through 9 pin connector in PC,a connection is changed as follows: ,but if USB port of PC is used,it is not changed**



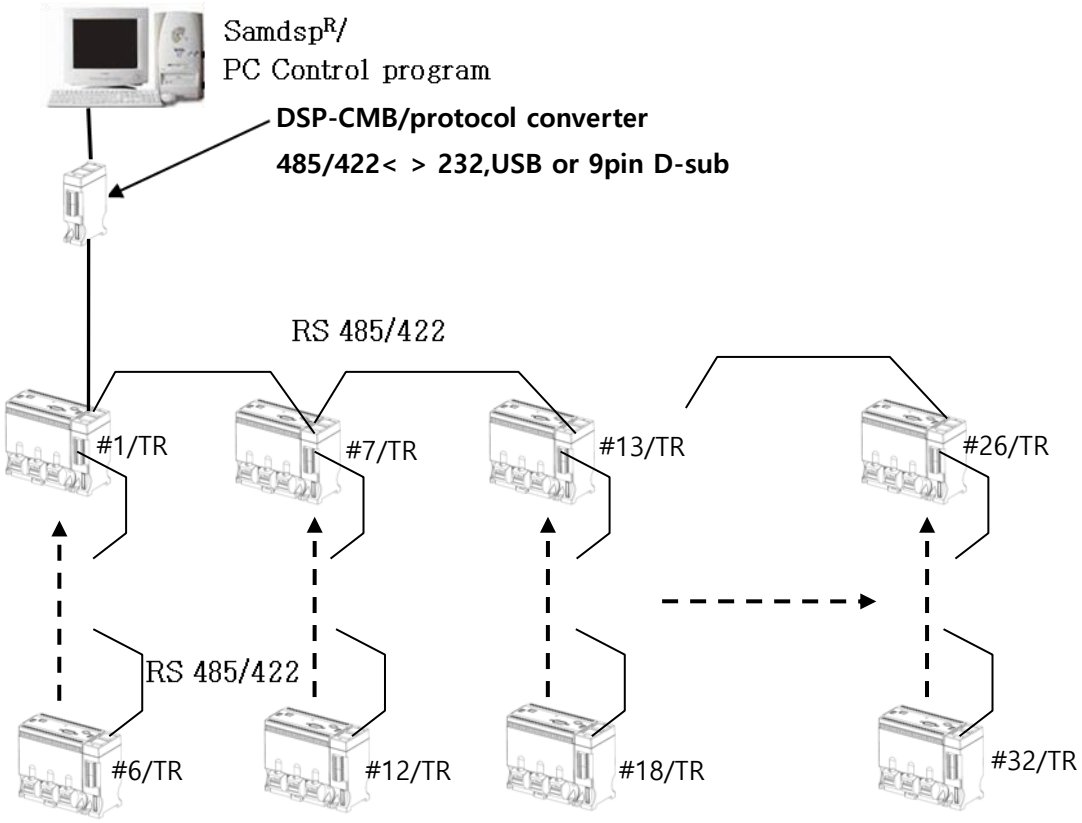
18-2.Center(PC),PLC < > DSP by RS-485/422

a.Serial Line Connection



※TR : termination resistance

b.Serial Line-Parallel Connection

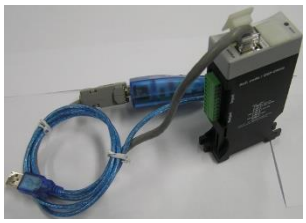


1. ▮ : termination resistance/120Ω ~200Ω

2.Termination resistance for extreme end slave :possible to engage by the DIP SW inside

※ Note

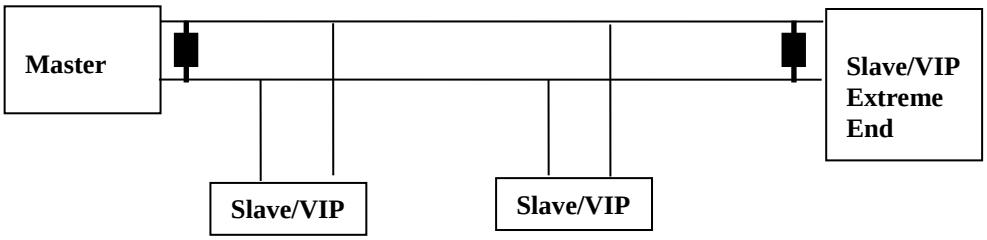
○The end connection device to connect with communication module is available for both RJ45 and/or screw terminal.
But it is mainly recommended to use RJ45 for the test of communication state one by one or a serial group ,on the other hand Screw terminal for actual field connection wiring to secure from the vibration, noise, humidity,etc.
The example picture for RJ45 is as follows:



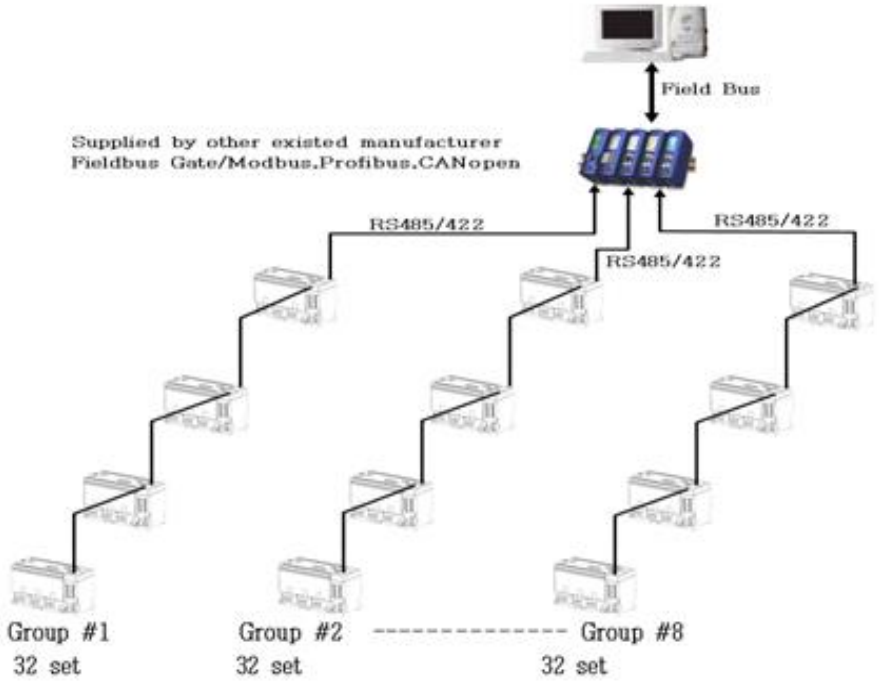
Also the actual connection through screw terminal between Master and Slave(DSP-VIP) in field bus system is as follows:

○In the connection on the concept with Master and Slave, a matching converter (protocol converter) to match 485 of VIP with Master ,which is manufacured by other manufacturer, is required to have isolated power from a PC(Master)

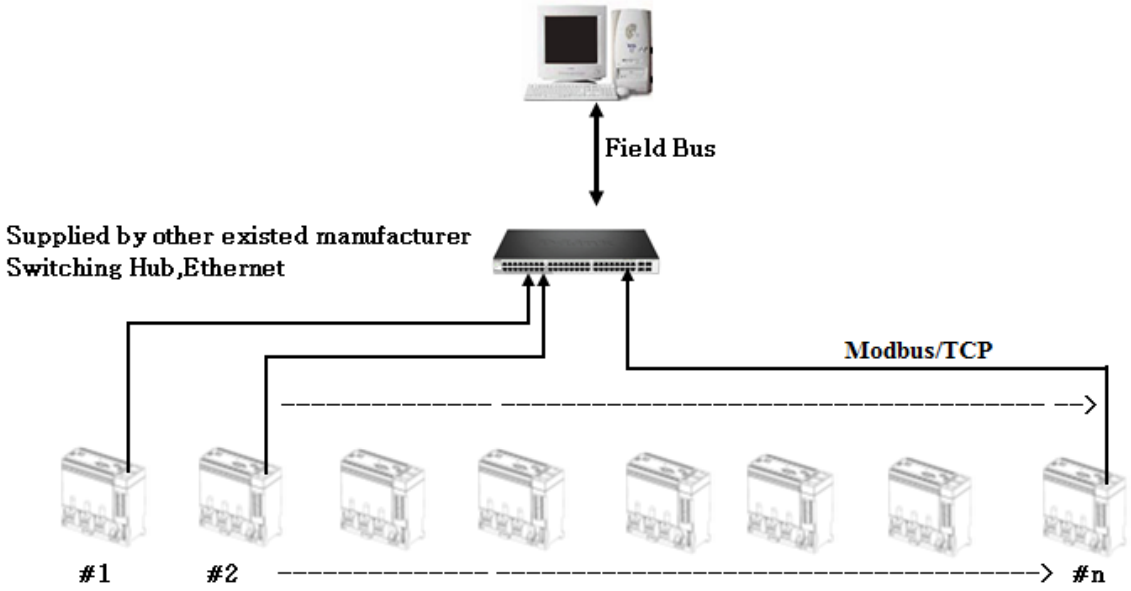
○The position of termination resistance in serial communication between Master and Slave(VIP) is basically referred as follows,but it could be changed according to a field condition:



18-3.Center(PC),PLC < > DSP by RS-485/422 through Gateway



18-4.Center(PC),PLC < > DSP by Ethernet



18-5.How to handle

1)It is not possible that an operator presets an address in VIP while a motor is working ,so if user wants to do so,motor must be stopped.

2)The operator needs to check carefully additional selection by DIP SW for 485/422 or termination resistance before combining.not to make a seperation again to preset DIP SW or termination resistance

3)As possible as you can, do not seperate this module once after combining in order not to give a damage caused by an unwanted force while the separation job is doing

4) The operator needs to give a very attention to combine this module with VIP converter through 9 pin D-sub which is located in inside of this module, because a connection pin could be damaged by unwanted enforcement during a combining job.

To prevent a pin damage during a combination, follow a next procedure

1) check a pin condition if there is any defect ,corooked state or not.

2) put a hook into the hole in the bottom of VIP converter

3)align correctly both D-sub connector each other

4)press a top side of module slightly toward a converter untill a cricking sound is sensed

5) As like a same manner, a seperation for this module from the converter must be done carefully.

If a seperation is needed inevitably, give a force slightly to expand a clearance between a converter and a module on the center part of top side as using something like a thin driver.

6)Operator needs to use RS 422/485< >RS232(USB) protocol converter to make a communication between a converter of VIP and Note PC through a this module to operate VIP by using “Samdsp” operation program.

“Samdsp” is provided by a manufacturer in free of charge,also ”Samdsp” is loaded in our web site(www://samwhadsp.com)

7)The model name of protocol converter mentioned in above is DSP-CMB(Multi-1U/USB Combo @ Cross Cable) and is not included in standard product of DSP-VIP

So if this is necessary , a purchaser of DSP-VIP needs to order this protocol converter seperately because this item is very common in the commercial market.

It is mainly recommended that DSP-CMB is useful to test VIP by using “Samdsp”

8)In actual serial communication, the proper protocol converter is desireably required to have with two of 485 port at least

Also one end of cross cable is terminated with RJ45,hence if operator wants to connect this one end with 10P screw terminal of a communication module, please do to cut a RJ45,then connect a wire into screw terminal as follows:

19.PC Operation Program/"Samdsp^{R}"

▶ General

(1) This program is written by C# language and a basic bps is ranged in 9.6K to 38.4K,but MWR-S is 9.6K~115.2Kbps)

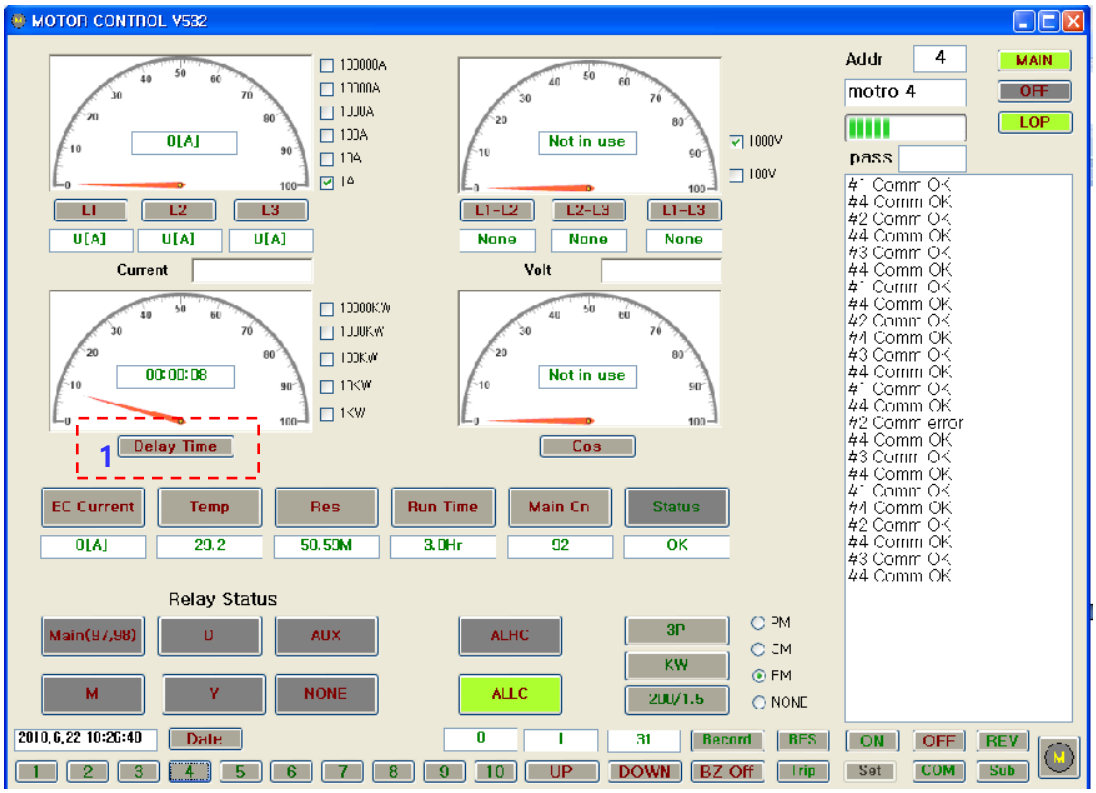
(2) The user needs additional USB/232<>485/422 protocol converter like DSP-CMB to make PC to communicate with VIP

(3) The user's PC basically based on Window XP and Window 7 should be embeded by following file
*.net framework 4.0(dotnetfx40_full_setup.exe) for MS Window :able to down load from MS or "www://samwhadsp.com"
* This is opened software with a free of charge

(4) This program is to operate a serial communication by CM-44 and MWR-S

○ "MAIN","SET" and "TRIP" window is as bellow

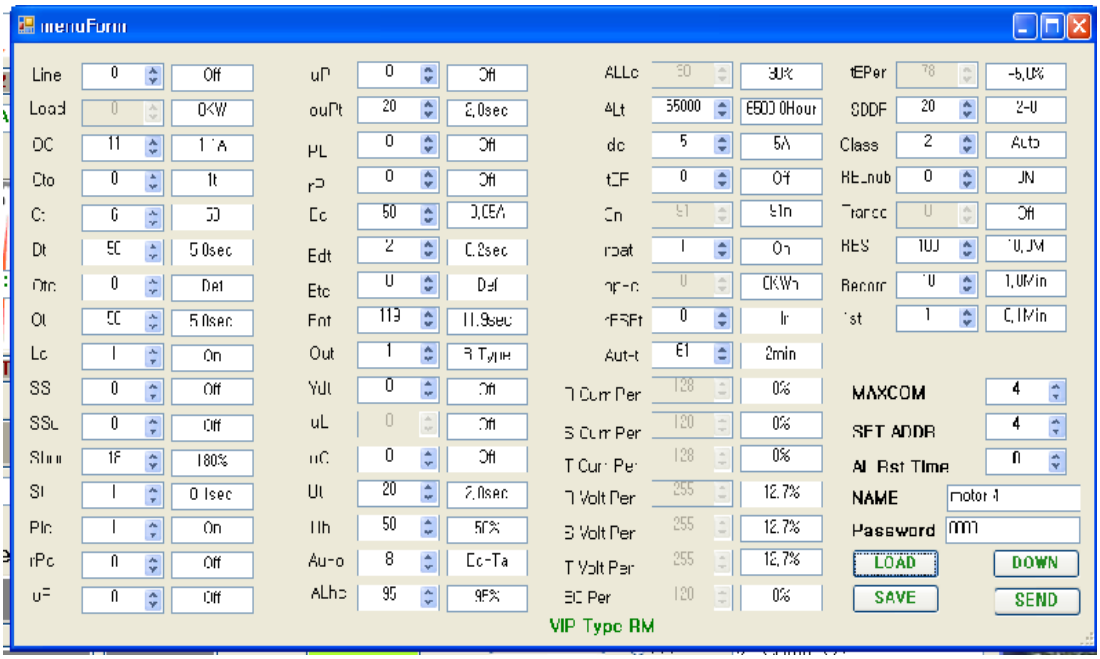
▶ "MAIN" Window



All information except "Delay time" is a same manner like VIP-PM/PL

- 1 : Delay time : the value of this indication is not a starting delay time which is normally adopted in all of motor protection relay. The value in here means the remaining time to have next comming resistance measurement

▶ “SET” Window



▶ “TRIP” Window

▶ How to install "samdsp" program

(1) Down load latest "samdsp-v(version nmber)" file provided by SamWha DSP.Co.(web page or CD) in C:// of your PC and run into the execution for this file**

(2) Check if c:\"samdsp" folder is created naturally or not

(3) If you find "Samdsp" folder ,enter into c:\"samdsp",then user will meet "samdsp" file with circled "M" symbol , hereafter this "samdsp" is execution file to open main window.

4)Eexcute "samdsp" with image of motor symbol "M" in circle,then main window is shown.

5) In this stage,if communication port to be run in "samdsp" is not matched with it in your PC, errorred message in right column is shown, then user can preset right port number and bps in pop-up window that is shown by pressing "COM" button
After preset port number and bps, make a press "SAVE" button in pop-up window.

▶ **How to monitor a data in your PC**

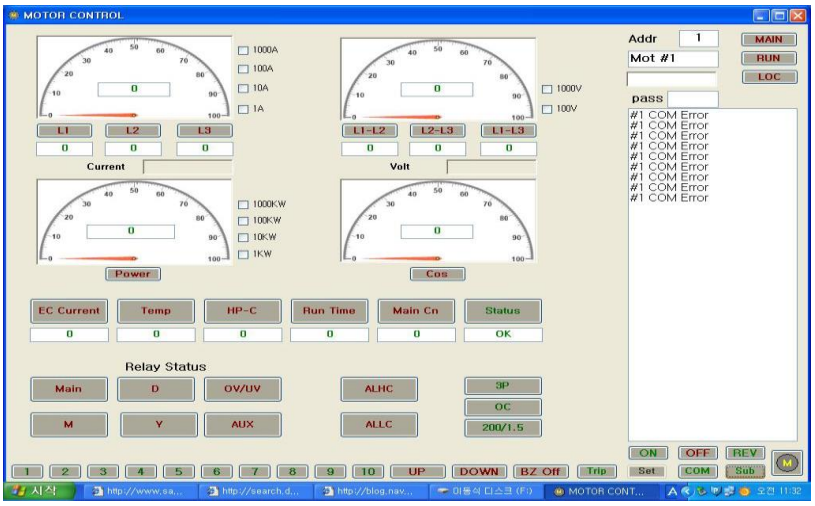
1) Unless you make other picture to be expressed by "main.bmp" file, you meet a window with Samwha DSP company image below . It means everything is OK.

2)if you want to change this main window with image of samwha dsp company into your own layout,then you need to save a file named by "main.bmp" for new layout in "samdsp" folder

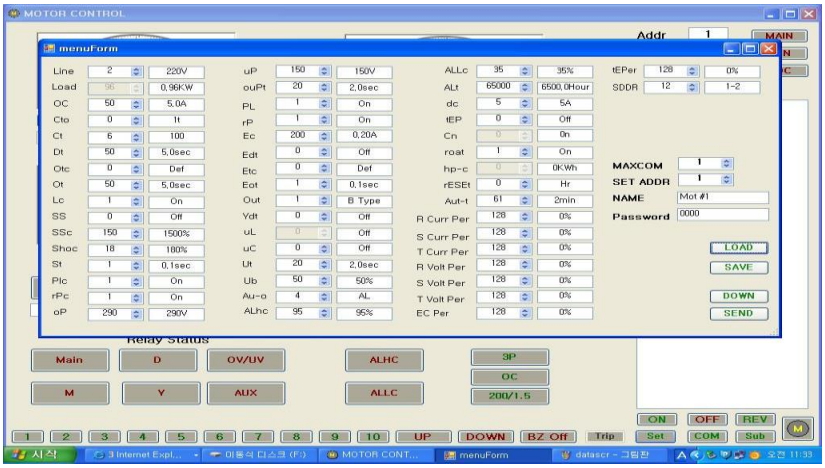
3) If you create a motor symbol matched with address of VIP in the position what you want to put,click a number matched in a bottom ,then you can put a motor symbol in proper position by operating a mouse. Like this manner,same process should be done for remained motor.

4)After this action,an operator is able to control a data by clicking a button in screen on the right bottom side.

5)In case you click "Main" button,a following screen has come



6) In case you click "Set" button under the condition with password input,a following screen is come



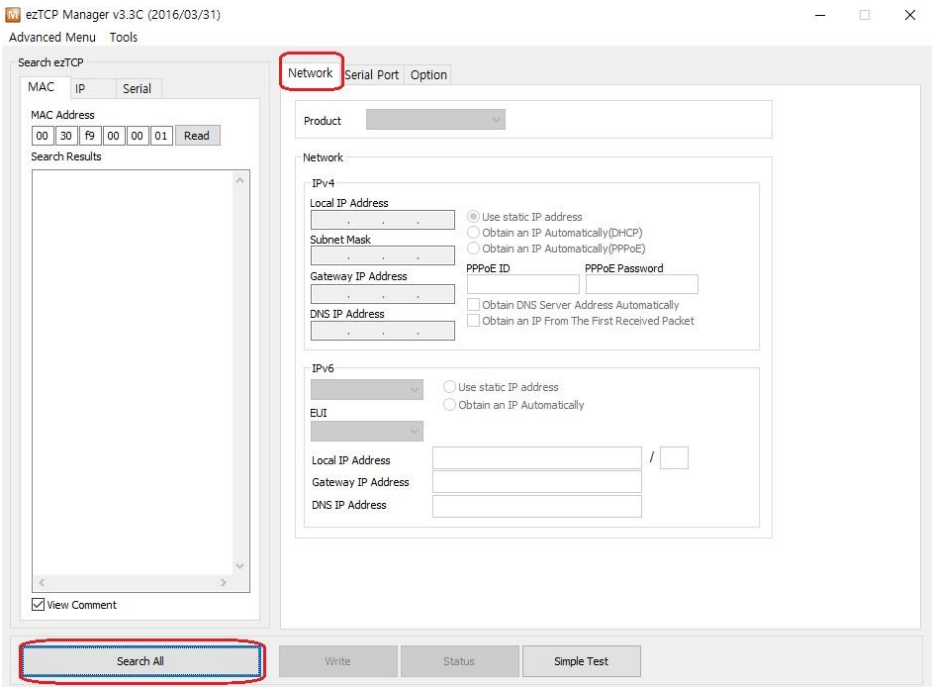
7) In case you click "Trip" button,a following screen is come

8)Then,you could operate this protection relay as controllng and/or monitoring in every screen

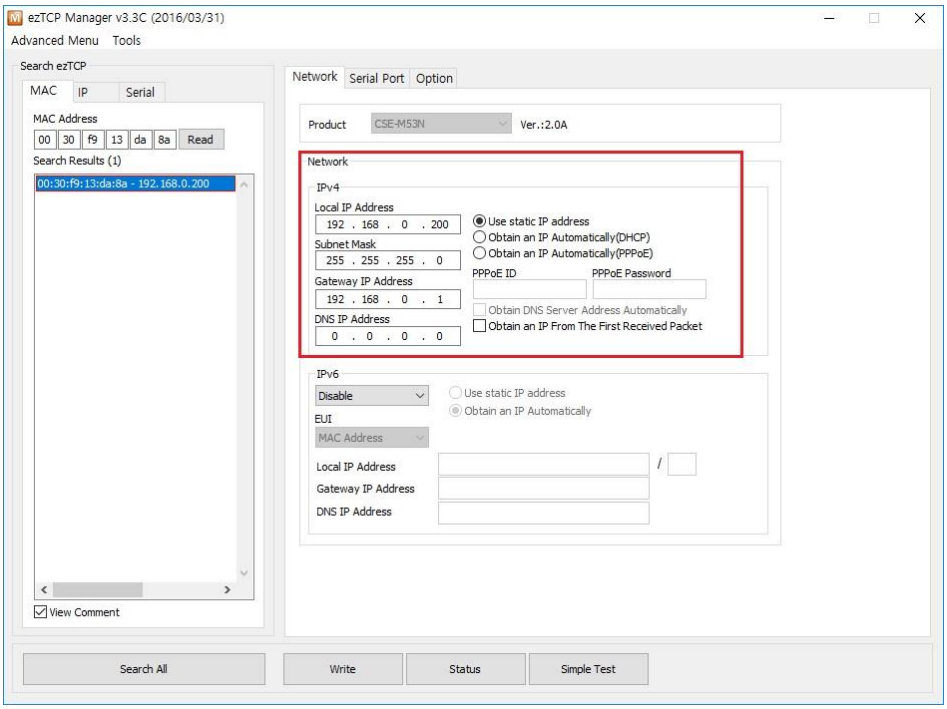
20.Ethernet Network Operation

- **Ethernet network is based on Modbus TCP and the applied module for this job is CM-44E**
- **CM-44E is embeded system chip , CSE-M53E,which is made by "Sollae Systems(www.sollae.co.kr)**
- **The user will follow to preset a necessary value in order to fix IP address according to manual of "ezManager"**

1.The followed window is shown firstly after completing "down load" for "ezManager"

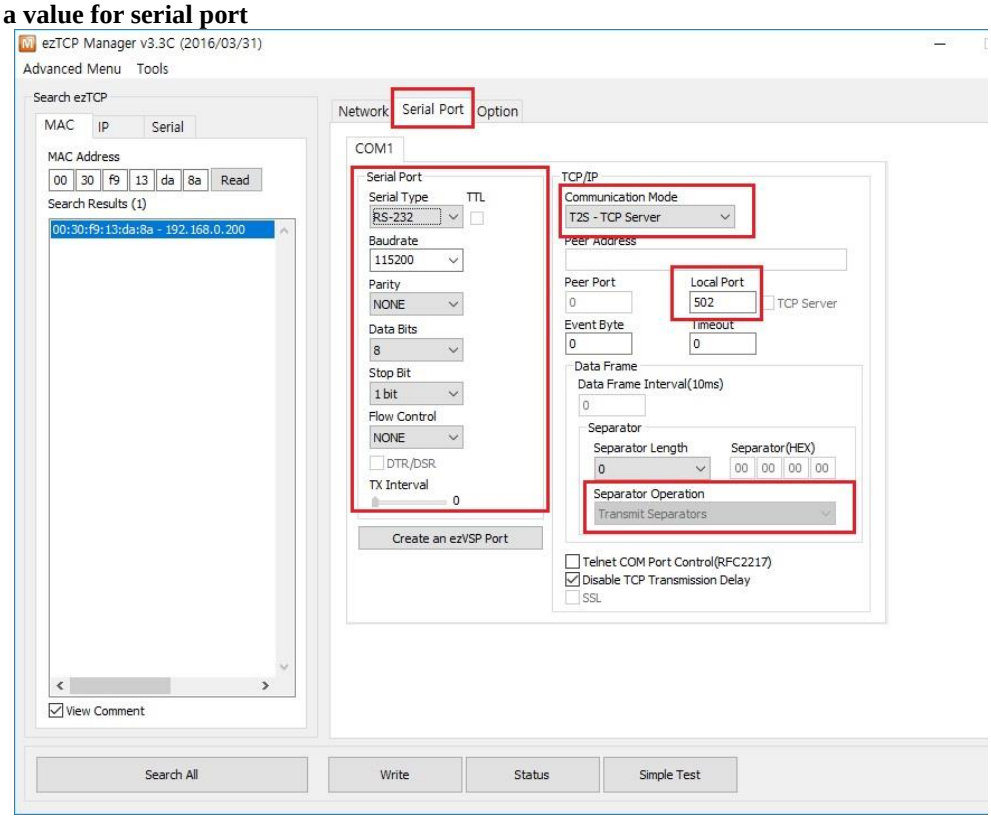


2.Select “Network” and click “Search All” ,then product CSE-53N / embedded chip will be rised with an information about IP as followed window

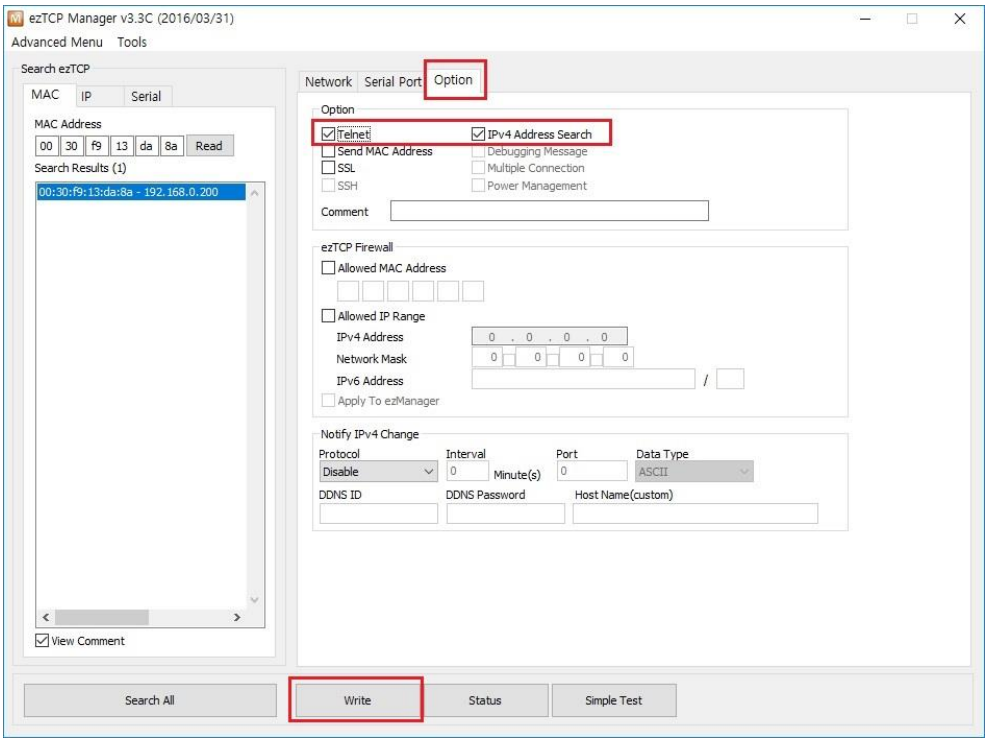


- **The user need to input an necessary information into above needs and make “write”**

3.input a value for serial port



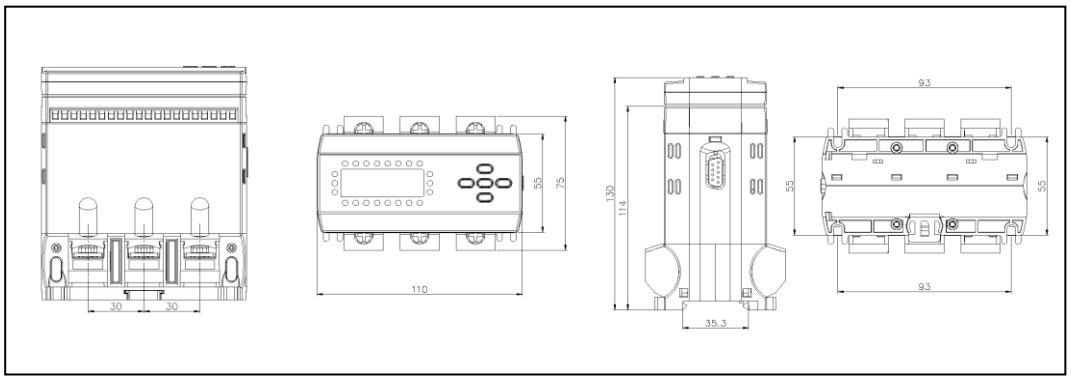
4.make a store after input necessary information inside “option” menu, also “telnet” and “IPv address search” must be selected. Finally make a store as clicking “write”



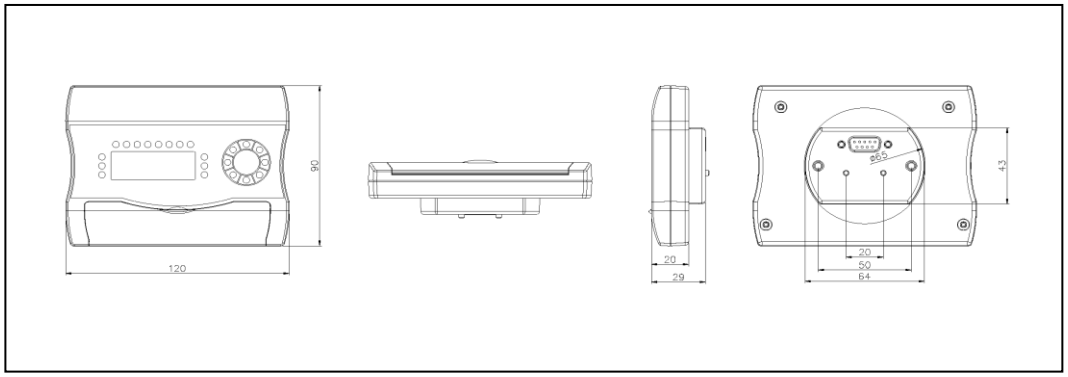
- **For the more detail. the user can make down load for “ezManager”/user’s manual in “Sollae system Website”**

21. Dimension

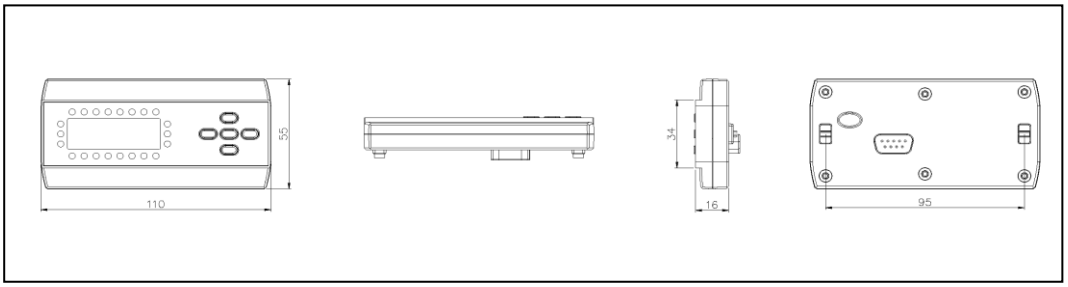
❑ Converter/Loader



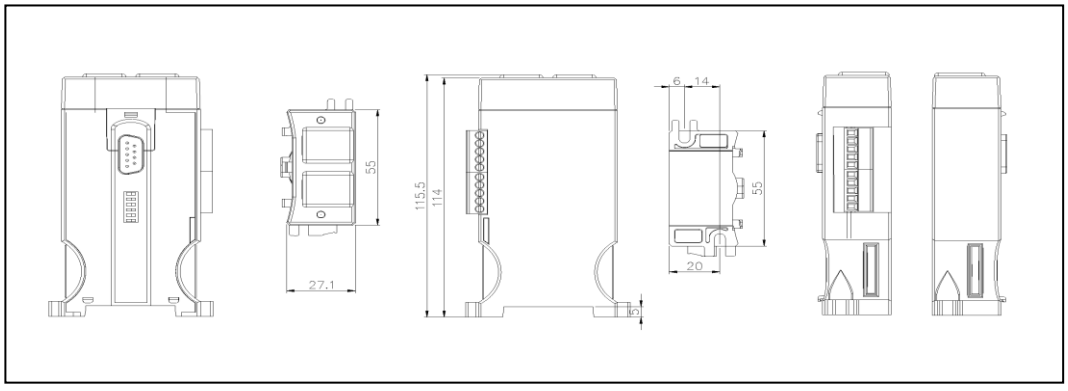
❑ Display Meter



❑ Loader



❑ Communication Module



22 Order Form

*** DSP-VIP-1-2-3-4-5-XX**

DIV		Description	Remark
1	RL	Loader	Data Input Device/Panel Mounting Type
	RTL		Data Input evice/4~20mA/Panel Mounting Type
2	RM	Display Meter	Data Input Device/Panel Flush Mounting Type
	RTM		Data Input evice/4~20mA/Panel Flush Mounting Type
3	70	0.2A ~ 70A	Possible with external CT[0.2A～ 6A]
	B	24VAC/DC(Option)	Control Power
	Z	85VAC~260VAC(120VDC~370VDC)	
4	7	50/60Hz	Frequency/Control Power
5	ZCT	ZCT Embedded	Not possible to use with external CT
XX	Option	Exclusive Customer Order	*Available for Package type 1)None:Standard Software 2)P:Optional Software 3)PC:Optional Software 4)Communication Module: 485/422 5) Communication Module: Ethernet 6)Others except above: Customer Order Made
	A	Logic Input Voltage	220VAC(150~260 VAC)/220~370VDC
	B		110VAC(75~150VAC)/110~220VVDC

❑ Basic Type Reference Code except optional condition

Reference Code		Data Input Device	Current Rating	Description
VIP	-RL70B		70A	24VAC/DC
	-RL70Z7			85VAC～260VAC,50/60Hz,(120VDC～370VDC)
	-RTL70B			24VAC/DC,4～20mA
	-RTL70Z7			85VAC～260VAC,50/60Hz)120VDC～370VDC),4～20mA
	-RL70BZCT			24VAC/DC,ZCT Embedded
	-RL70Z7ZCT			85VAC~260VAC,50/60Hz)120VDC~370VDC),ZCT Embedded
	-RTL70BZCT			24VAC/DC,4～20mA,ZCT Embedded

	-RTL70Z7ZCT			85VAC～260VAC,50/60Hz,(120VDC～70VDC),4～20 mA,ZCT Embedded
	-RM70B			24VAC/DC
	-RM70Z7			85VAC~260VAC,50/60Hz,(120VDC~370VDC),
	-RTM70B			24VAC/DC,4～20mA
	-RTM70Z7			85VAC～260VAC,50/60Hz,(120VDC～370VDC),4～20mA
	-RM70BZCT			24VAC/DC,ZCT Embedded
	-RM70Z7ZCT			85VAC～260VAC,50/60Hz)120VDC～370VDC),ZCT Embedded
	-RTM70BZCT			24VAC/DC,4～20mA,ZCT Embeded
	RTM70Z7ZCT			85VAC～260VAC,50/60Hz(120VDC～370VDC),4～20mA,ZCT Embedded

※Note

Logic input voltage is 220VAC(150~260 VAC)/220~370VDC unless "B" is suffixed in completed reference code.

❑ **Accessory**

Item	Reference	Description	Remarks
Cable	DSP-CABLE-12	1.2m	
	DSP-CABLE-18	1.8m	
	DSP -CABLE-30	3m	
	DSP -CABLE-XX	Over 3m	
ZCT	DSP -ZCT-I-XX	100mA/1.5mA	XX:inside diameter of ZCT
	DSP -ZCT-V-XX	100mA/100mV	XX::inside diameter of ZCT
Loader	DSP -ID-RL	Input Device/ Loader matched with converter,VIP-RL	
	DSP-ID-RTL	Input Device/ Loader matched with converter,VIP-RTL	
Display Meter	DSP -ID-RM	Input Device/Display Meter,matched with converter,VIP-RM	
	DSP-ID-RTM	Input Device/Display Meter,matched with converter,VIP-RTM	
CT Terminal	DSP -TB-3T	Terminal through CT Hole	
Communication Module	DSP -CM-44	*Module:RS 485/422< > RS 485/422	RS485/422 Serial communication
	DSP-CM-44E	*Module,Ethernet < > Switching Hub	Ethernet

Communication & recorder Module	DSP-MWR-S	*Module:RS 485< > RS 485 *Recorder for 20 days in every second	RS485 Serial communication
Matching (Protocol) Converter	DSP -CMB	*Module:RS 485/422 < > RS 232:USB	*Existed product by other manufacturer * only for test, input,retrieval for VIP-CM44 combined with VIP by using "Samdsp"
External CT	DSP-C1	3CT/Rectangular, 100/5	
	DSP-CC	3CT/Rectangular, 150/5	
	DSP-C2	3CT/Rectangular, 200/5	
	DSP-C3	3CT/Rectangular, 300/5	
	DSP-C4	3CT/Rectangular, 400/5	

※Note

1. Logic input voltage is 220VAC(150~260 VAC)/220~370VDC unless "B" is suffixed in completed reference code in case control voltage is 220VAC
2. Logic input voltage is 24VDC unless "C" or "D" is suffixed in completed reference code in case control voltage is 24VDC
   - "C" : 220VAC(150～260VAC),50/60Hz,(220～370VDC)
   - "D" : 110VAC(75～150VAC),50/60Hz(110～220VDC)

23 Guide for user

- **This product should be maintained by qualified engineer according to manufacturer's guide, so a damage or something wrong of this product which comes from vioiolating this guide may cost to user**
- **Using environment is as follows:**

  1)Temperature:-25 OC ~+70 OC

  2)Storage :-40 OC ~ +80 OC

  3)Humidity:30 ~ 80%/RH,Non-condensing

  4)Voltage
- **The control voltage is AC 85V~260V ,220V, 50/60Hz(DC 120V~370V) or AC/DC 24V and allowable deviationfor this voltage is +.-10% .**

  1)a supplied voltage greater than rating value many be given a damage to incoming part of DSP,so customer must keep allowable deviation of input voltage. Also this control voltage must be supplied through a transformer insulated between primary and secondary,also proper fuse(not use Line-Neutral Voltage in 3P4W)

  2)in case of the interface between Note PC and DSP directly by RS232 to monitor and to preset data ,power source for Note PC also must be provided through an insulated transformer and a proper fuse above mentioned,otherwise RS 232 communication could be interfered

  3)fastening screw:a connection between a terminal of DSP and a wire must be done clearly and surely, but user should be care of distortion caused by extra fastening torque

  4)It is not possible that an operator presets a data directly through PC while DSP and a motor are working ,so if user wants to do so,please stop to operate a motor.
- **An operator should not combine a converter with a loader and a display meter while the motor is working,s o if necessary to do so, a motor should be stopped.**
- **An operator should not control DIP SW while a motor is working. If necessary to do so, a motor should be stopped and be done in waiting mode state**
- **Operator need to use RS 422/485<>RS232(USB) converter(eg:DSP-CMB),so USB must have isolated power to connect communication module of DSP-VIP to PC in serial connection . This converter is one of common accessory provided by other manufacturer.**