

# SOHO POWER SUPPLY UNIT

Energy Saving & Conversion

## SAFETY

1. Please read the manual before using the SOHO PS
2. Please let the person who is an expert in Electric do the electric construction and wiring work.

Seoho Electric Co., Ltd.  
[www.seoho.com](http://www.seoho.com)

Tel) 82-031-463-6710~13 (Sales)  
82-031-463-6720~23 (Technical Support)  
Fax) 031-468-3311

Dealer

POWER SUPPLY UNIT  
Energy Saving & Conversion

# SOHO PS User's Manual

The contents of this manual can be changed  
without any notices to customers.  
2010-09-REV.0



## ⚠ SAFETY

- ◆ Please read "SAFETY" and "Receiving Products" carefully Before operating the SOHO PS
- ◆ Keep this manual in a notable place for future reference

 **SEOHO**  
ELECTRIC

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2010. 09

## 1. SAFETY



**ONLY A COMPETENT ELECTRICIAN SHOULD CARRY OUT THE ELECTRICAL INSTALLATION.**

## 1.1 WARNINGS

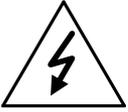
	<b>1</b>	Internal Components and circuit boards (excepting the isolated I/O terminals) apply an electric current when <b>SOHO Power Supply</b> is connected to the main voltage. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.
	<b>2</b>	When <b>SOHO Power Supply</b> is connected to the main power, the current is flowing in DC-Link(P, N) and output port(R, S, T) even if the <b>SOHO Power Supply</b> is not operating.
	<b>3</b>	<b>SOHO Power Supply</b> has a large capacitive leakage current.
	<b>4</b>	The control I/O terminals are isolated from the I/O voltage but the relay outputs and other I/Os may have dangerous voltage connected even if the power is disconnected from <b>SOHO Power Supply</b>
	<b>5</b>	If a <b>SOHO Power Supply</b> is used as a part of the machine, the machine manufacturer is obliged to take care that the Power Supply has a main switch and power fuse in the machine.
	<b>6</b>	Spare part can be delivered only by Seoho Electric Co., Ltd.

### 1.2 SAFETY INSTRUCTIONS

	<b>1</b>	Do NOT make any connections when <b>SOHO Power Supply</b> is connected to main voltage.
	<b>2</b>	Do NOT make any measurements when <b>SOHO Power Supply</b> is connected to main voltage.
	<b>3</b>	After disconnecting main power, wait until the cooling fan stops and the indicator on display goes out. Wait a further 5 minutes before doing any work on <b>SOHO Power Supply</b> connections. Do NOT open even the cover within this time.
	<b>4</b>	Do NOT make any voltage withstand tests on any parts of <b>SOHO Power Supply</b>
	<b>5</b>	Make sure that the cover of <b>SOHO Power Supply</b> is closed before connecting main voltage.

#### Ground

#### Warning Sign

<p>The ground terminal of <b>SOHO Power Supply</b>  has to contact with ground wire.</p> <p><b>Ground of SOHO Power Supply</b> prevent high voltage accidents that are caused by switching</p>	<p>Please be more cautious for the following warning signs for user's safety</p> <p> = Dangerous Voltage</p> <p> = General Warning</p>
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### 1.3 Storing and Warranty

Check the ambient conditions in the storage room before the first commissioning. (Temperature: -40°C ~ +50°C, relative humidity < 95%, no condensation allowed).

Seoho electric will not be responsible for the damage caused by ambient conditions.

**The period of manufacturer's warranty is 12 months from the date of delivery.**

## 2. Specifications

Items	Specifications	Remark
Rated Input Voltage Range	3Ø 265Vac ~ 480Vac	for regulated output with 230Vac
Max Input Voltage	3Ø 540Vac	within 2sec
Input Frequency Range	30Hz ~ 70Hz	
Output Voltage	up to 95% for Input Voltage	before L-C filter
Output Frequency	0 ~ 200Hz	Adjustable(Default 60Hz)
Switching Frequency	0 ~ 8KHz	Adjustable(Default 2.5KHz)
Start-up Voltage	200Vdc	
Cut-off Voltage	170Vdc	
THD	less than 2%	Under linear load condition
Voltage Drop	less than 15%	Under rated load condition (include L-C Filter)
Rated Output Power	37KW/18.5KW	440Vac/220Vac
Rated Output Current	72Arms	Under ambient temperature 40°C
Peak Output Current	135Arms	Heat-sink Temperature : less than 65°C
Over Load Capability	150% of rated current	1min/10min
Over Current Trip	250Arms(max)	Adjustable
Feedback Control Method	Load Unbalance Observer	Automatic Mode Exchange
Open loop Control Method	Open-loop Compensator	
Protection Function	Over Current, Over Load, Over Voltage, Under Voltage, Feedback Line Fail, Low Voltage, Pre-charging Fault, Short Current. Etc.	
User Interface	Keypad (with LCD)	Management Software(Free)
User Connection	8 Digital Input	DI1 : Reserved with Run/Stop
	1 Analog Output	Multi Function
	3 Digital Output	Multi Function
	2 Relay Output	Relay Output 1 : Fault Output Relay Output 2 : Feedback Line Fail
	Voltage Feedback	R,S,T (from isolation transformer output)
Communication	CAN, RS-485, Profi-Bus	Optional (RS-232 default : Keypad)
Ambient Temperature	-10°C ~ +40°C	
Relative Humidity	90%, no condensation allowed	

2.1 Schematic

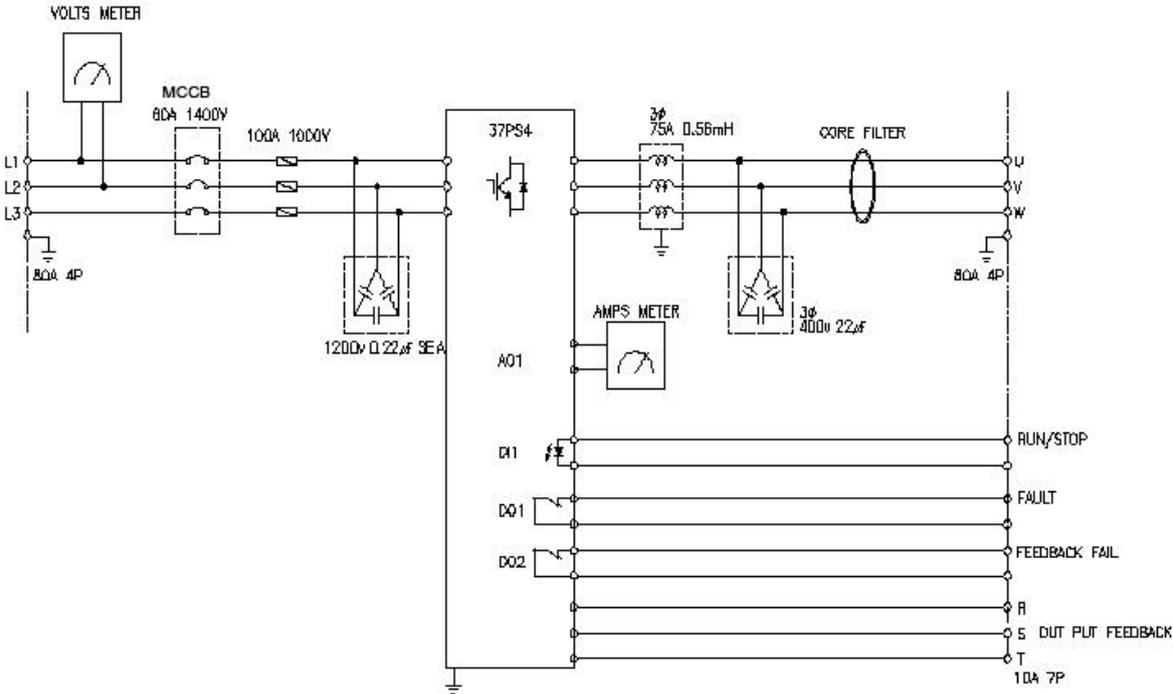


Figure 2.1 Layout

2.2 Power Supply Dimensions

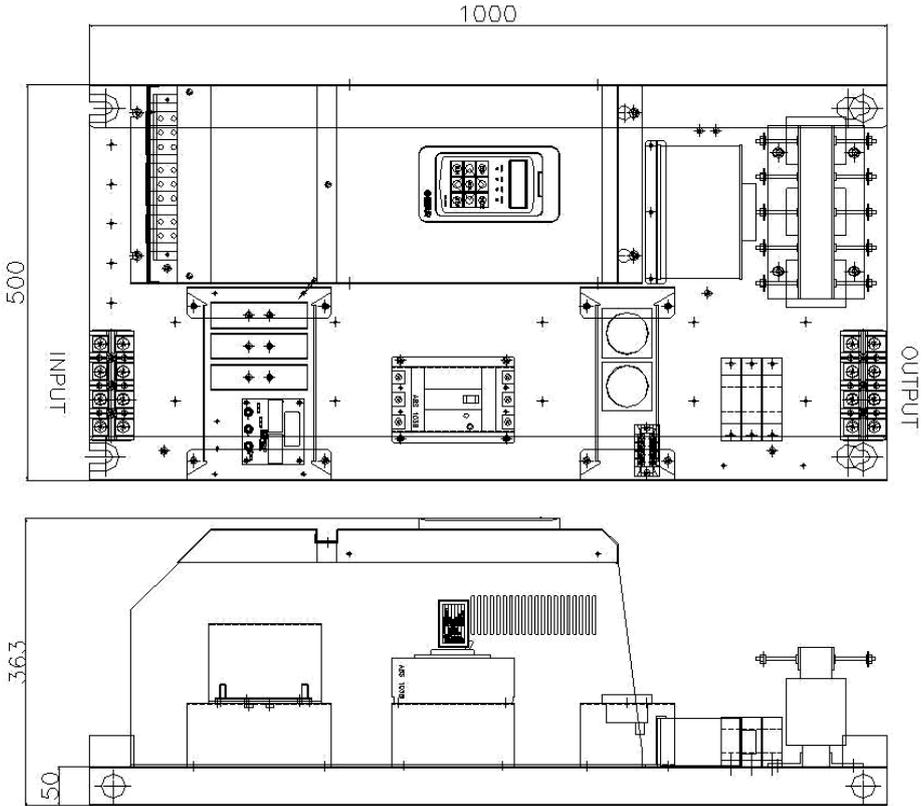


Figure 2.2 Dimension 1

### 2.3 Driver's Dimensions

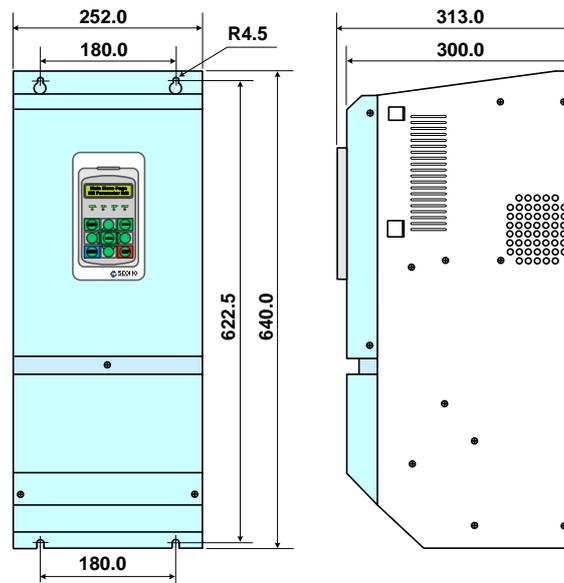


Figure 2.3 Dimension 2

### 2.4 System Configuration

Figure 2-4 shows a block diagram of the SOHO VD Power Supply.

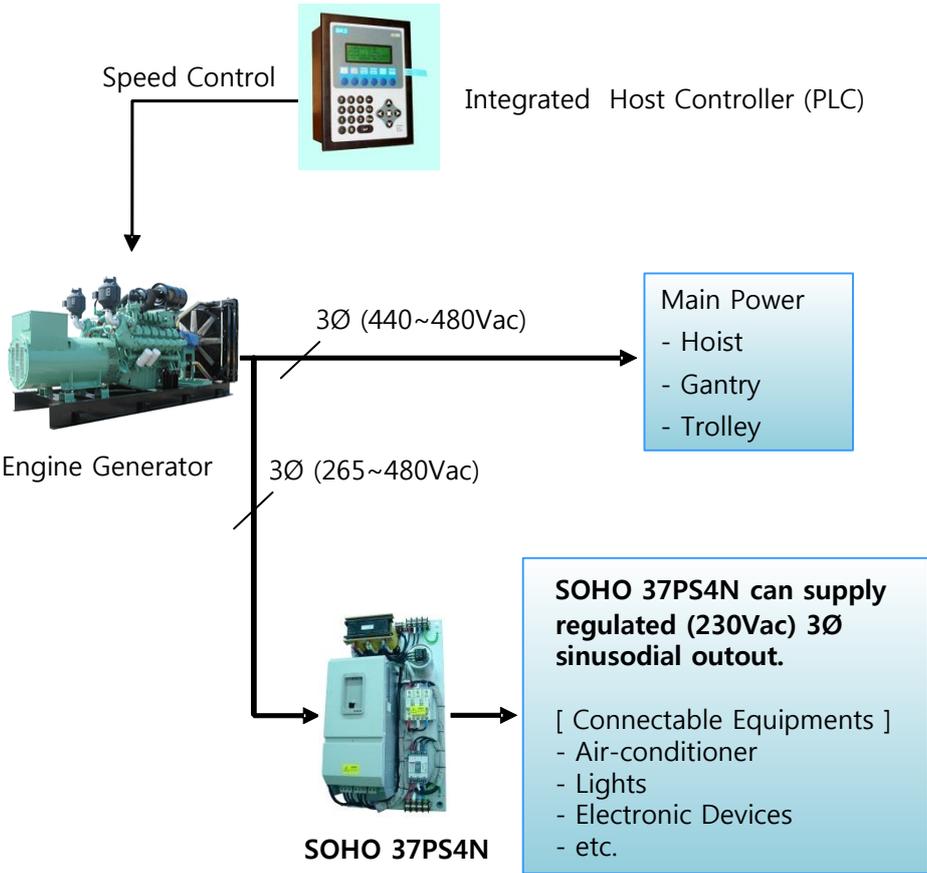


Figure 2.4 System Configuration

### 3. Installation

#### 3.1 Installation Condition

Please install the **SOHO VD Power Supply** on the places satisfying the following conditions.

	<b>1</b>	Avoid rain, hot temperature and high humidity place.
	<b>2</b>	Avoid the direct sunlight.
	<b>3</b>	The place should be protected from dirt, metal dust, and welding flame.
	<b>4</b>	Install so as to be bearable to the vibration.
	<b>5</b>	Defective main power may cause the Power Supply damages. - Using the same power source with welding machine.
	<b>6</b>	Keep away from flammables. - Install on the nonflammable materials as steel.
	<b>7</b>	Fasten the terminal screws to the relevant torque value and make sure that there are not loose terminals.

3.2 System Wiring

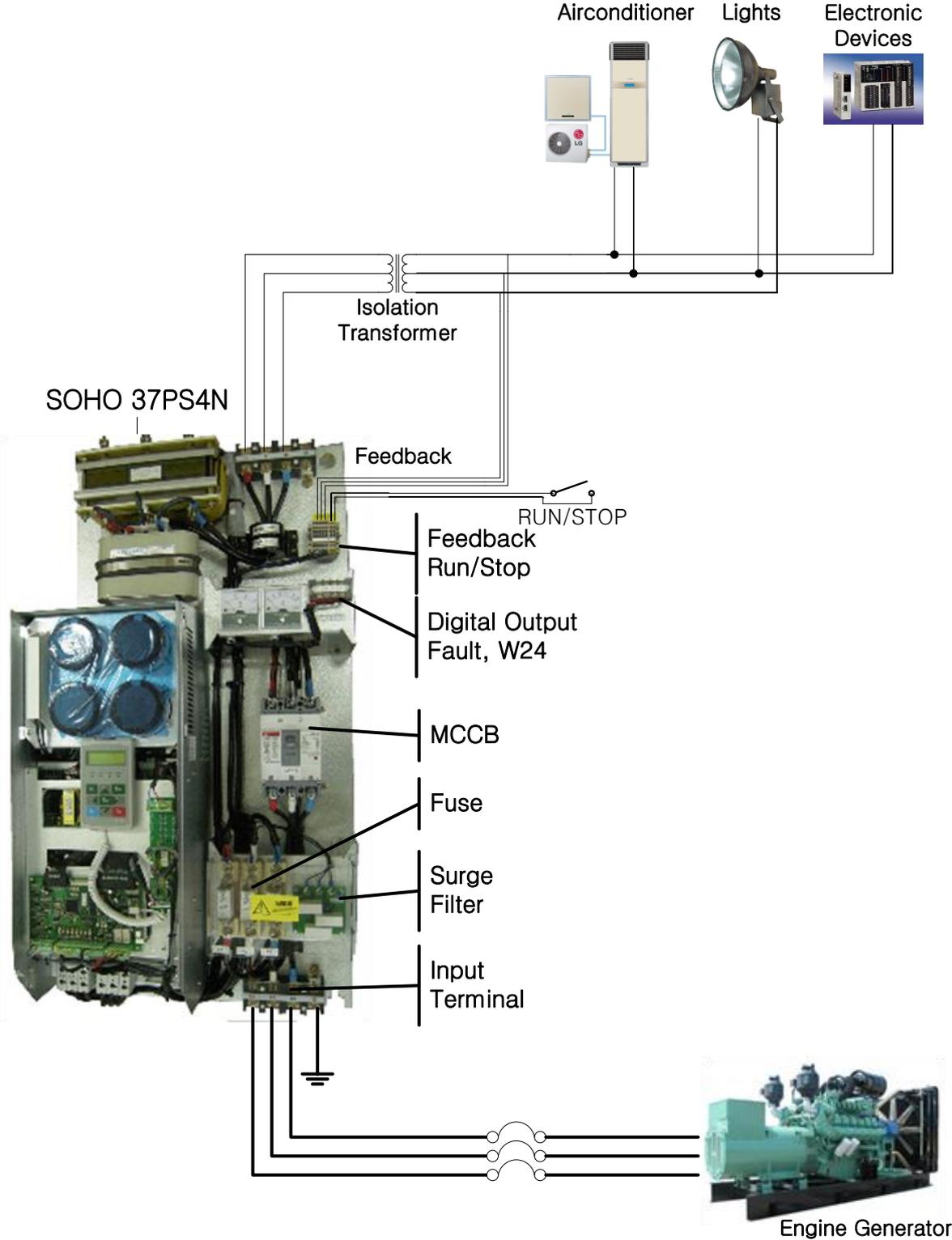


Figure 3.1 System Wiring

3.3 Wiring Diagram

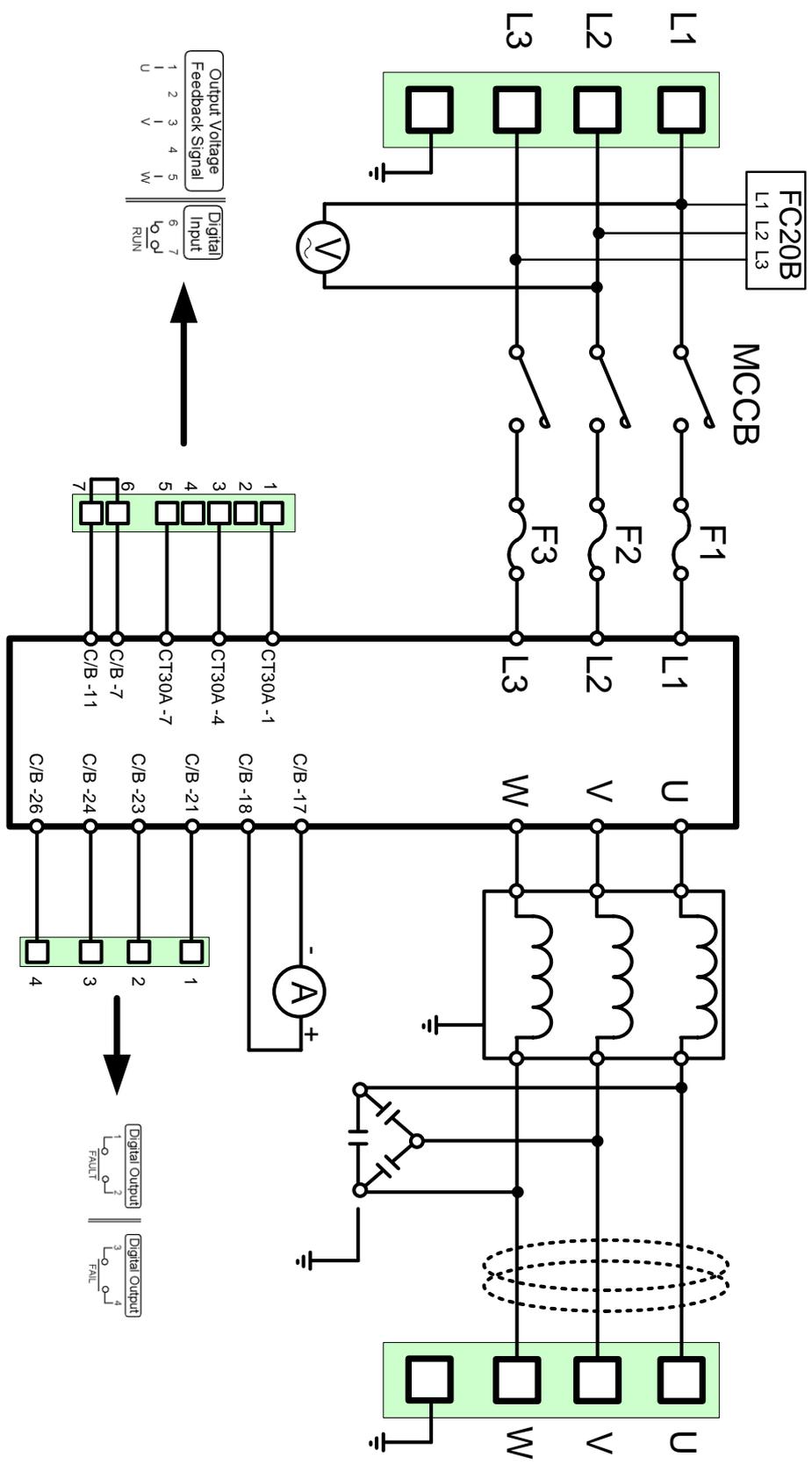


Figure 3.2 Wiring Diagram

3.4 Power Wiring of the Power Converter

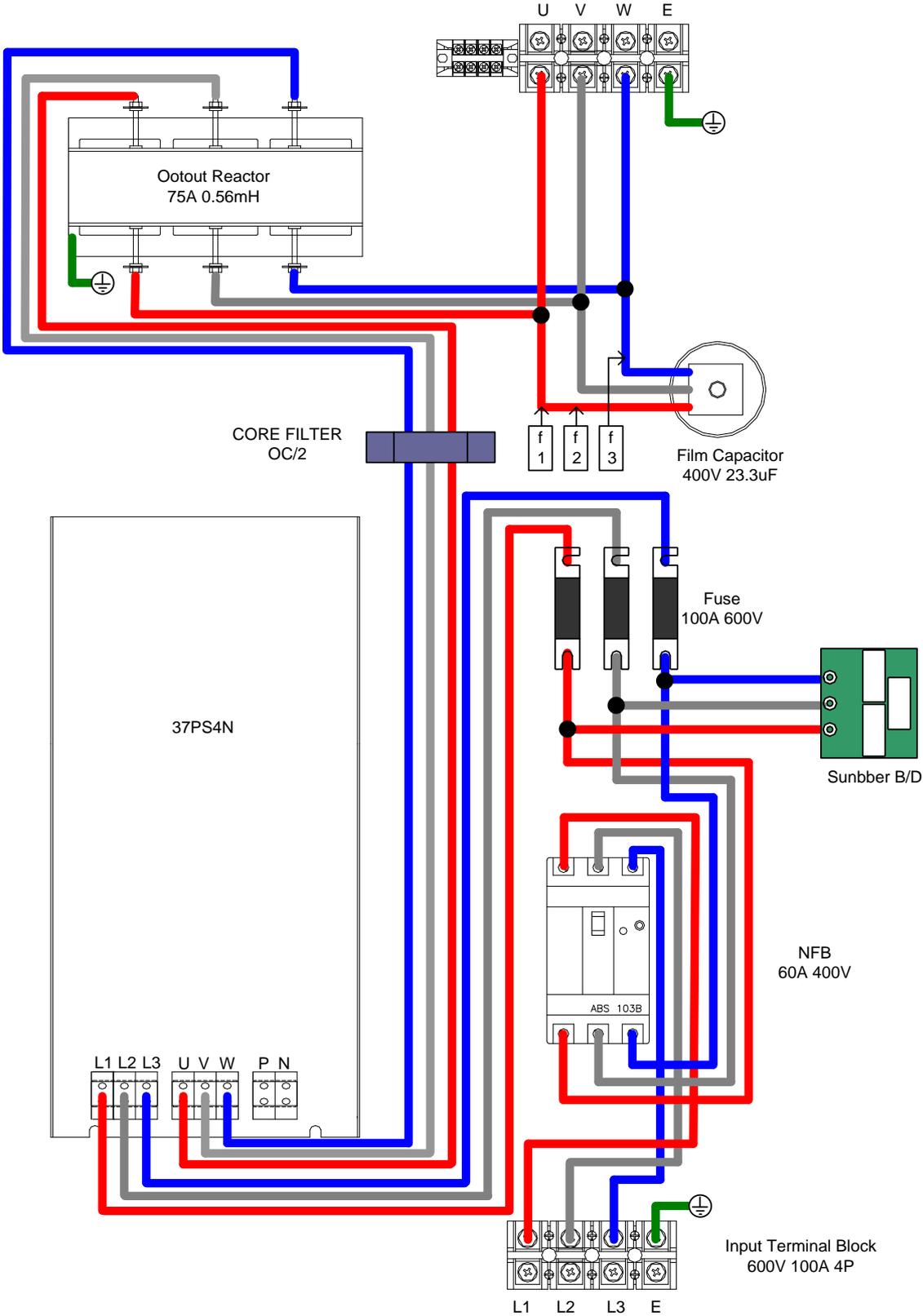


Figure 3.3 Power Wiring of the Power Converter

## 4. KEYPAD

### 4.1 KEYPAD description

The keypad of SOHO VD Power Supply is composed with 9 keys (ESC, ENTER, RUN, STOP, MENU, Left, Right, UP and Down scroll key). Users can set up parameters and monitor the operation status and run/ stop the power supply with keypad, etc.

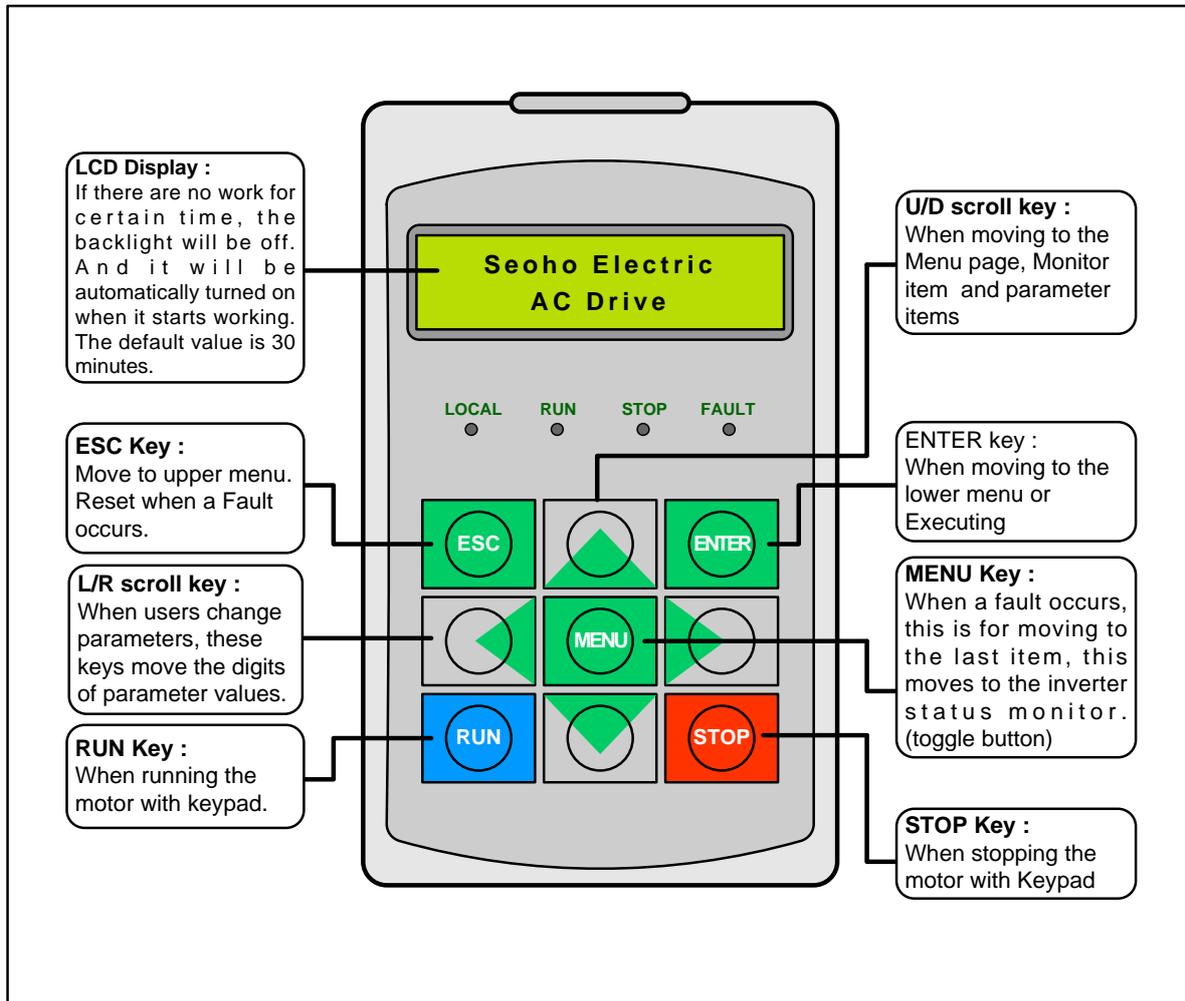


Figure 4.1 KEYPAD

### 4.2 KEYPAD operation

The data of KEYPAD is composed with Main Menu and low-level sub-Menu as Figure 4.1 Push the button, , to move from Main Menu to low-level sub-menu. And Push the button, , to escape from low-level sub-Menu to Main Menu. Use the buttons,  , to Increase or decrease the data value. Use the button,  , to move cursors when setting-up parameters. When monitoring/checking the status of Power Supply and listing the Error/Fault, use the button, . When operating by KEYPAD, users can start/stop the power supply with the buttons,  and .

4.3 KEYPAD usage

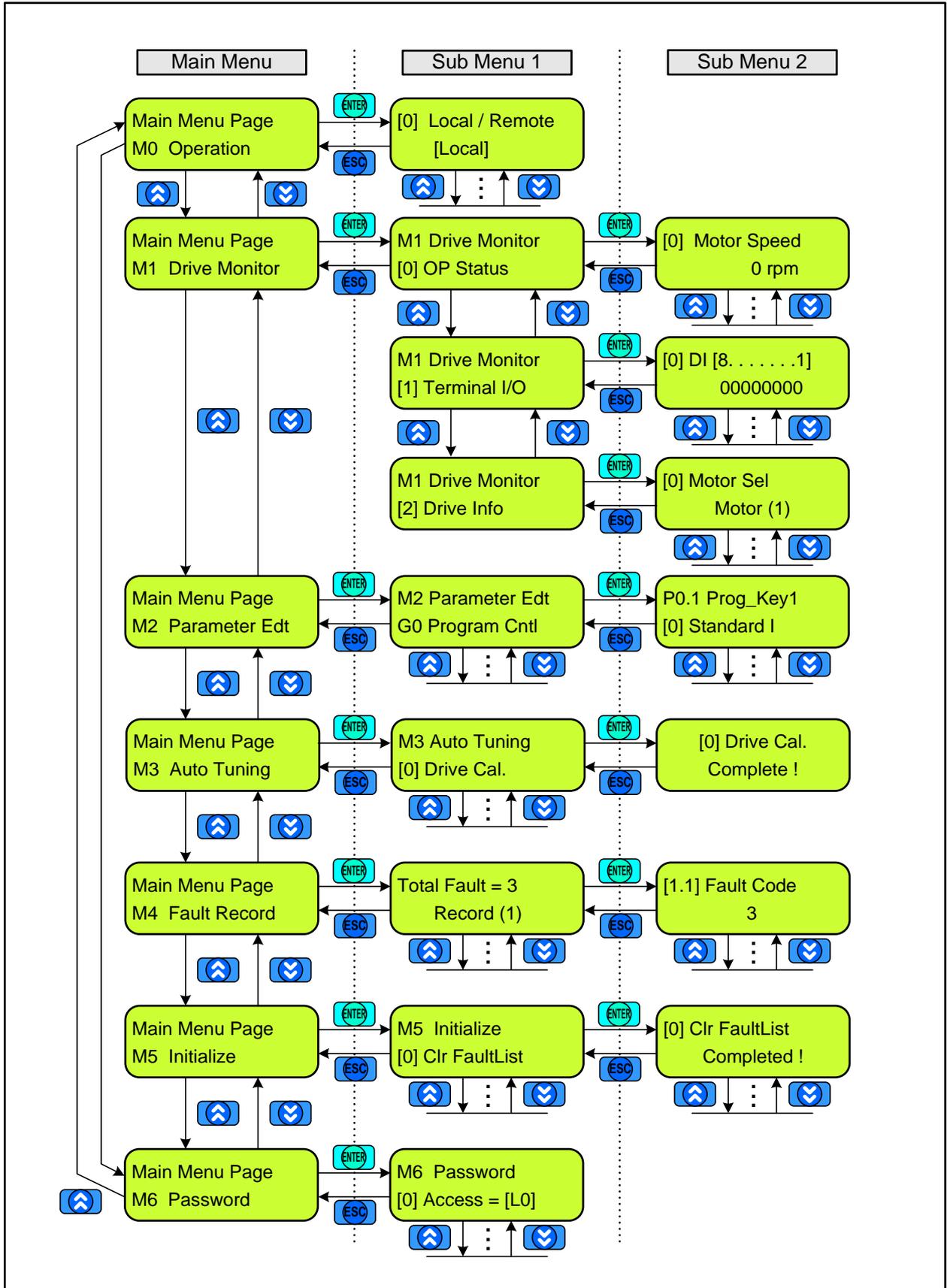


Figure 4.2 Key Flow

4.4 Main Menu Page[1] Drive Monitor

In M1 Drive Monitor Page, it allows to monitor the operation status of Power Supply, I/O reference status and setting information.

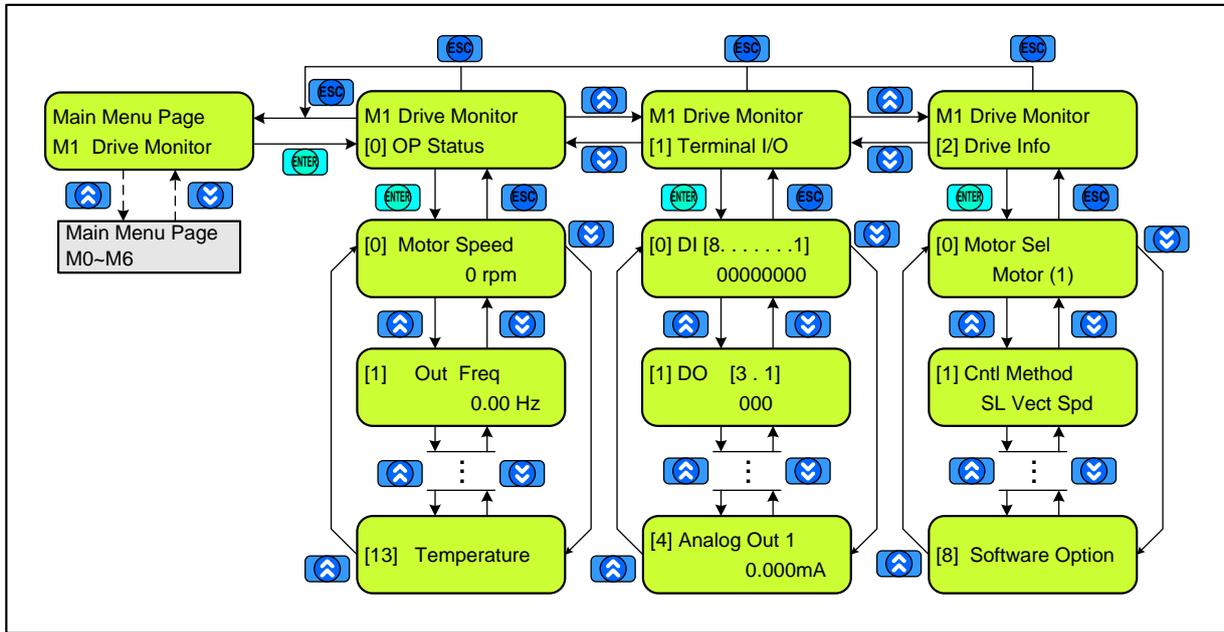


Figure 4.3 Main Menu Flow

M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[0] Operation Status	[0] Motor Speed	rpm	Do not use(for Motor control)
	[1] Output Frequency	Hz	Indication of output frequency
	[2] DC Link Voltage	Vdc	Indication of DC Link Voltage
	[3] Motor Current	Arms	Indication of Output Current
	[4] Output Voltage	Vrms	Indication of Output Voltage
	[5] Actual Torque	Nm	Indication of motor Torque
	[6] Torque Current	A	Do not use(for Motor control)
	[7] Flux Current	A	Do not use(for Motor control)
	[8] Input Power	kW	Indication of Input Power
	[9] Output Power	kW	Indication of Output Power
	[10] PID Reference		
	[11] PID Feedback		
	[12] PID Error		
	[13] Temperature	°C	Indication of the Power Supply temperature of heat sink

< Next >

< Continued >

M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[1] Terminal I/O	[0] Digital Input		Indication of status for digital input. Refer to Figure 4.4
	[1] Digital Output		Indication of status for digital output. Refer to Figure 4.5
	[2] Analog Input 1	V or mA	Indication of Analog Voltage(0[-10]~10V) or Analog Current (0[4]~20mA) for AI 1 port
	[3] Analog Input 2	V or mA	Indication of AI 2 Analog Voltage(0[-10]~10V) or Analog Current (0[4]~20mA) for AI 2 port
	[4] Analog Output	mA	Indication of Analog output current (0[4]~20mA)
[2] Drive Information	[0] Motor Sel		Do not use(for Motor control)
	[1] Control Method		Do not use(for Motor control)
	[2] RUN/STOP Source		Indication of the source where start/stop signal for the motor comes from. (KEYPAD, I/O Terminal, communication, etc.)
	[3] Reference Method		Do not use(for Motor control)
	[4] Drive Power	kW	Indication of the Power Supply rated power
	[5] Drive Voltage	V	Indication of the Power Supply Voltage Range
	[6] Option Card		Indication of option card number (0: not installed / over 1 : number of the installed option card)
	[7] Software Version		Indication of the Power Supply program version
	[8] Software Option		Indication of the option program that is installed to the Power Supply. (0: standard VD Program / over 1 : the installed option program)

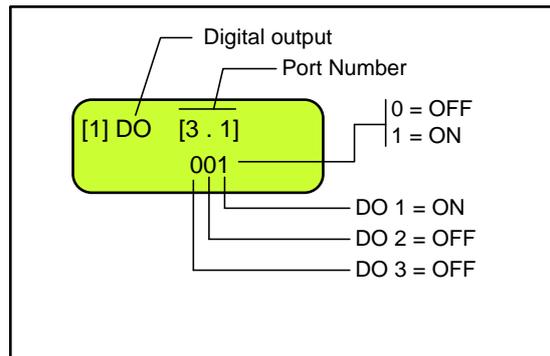
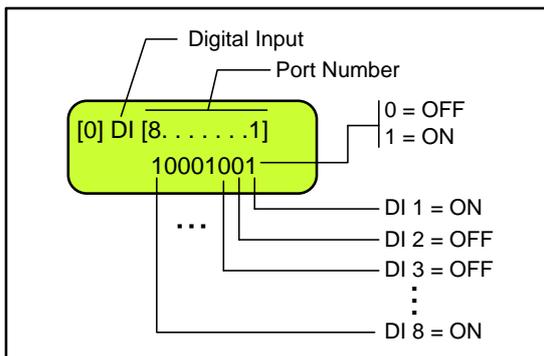


Figure 4.4 Status of Digital input

Figure 4.5 Status of Digital Output

### 4.5 Main Menu Page[4] Fault Record

In M4 Fault record page, users can monitor the number of Faults, Fault code and operation status when it occurs. Total 9 Faults are saved from Record(1) to the last occurred Fault

If Faults are occurred more than 9, the earliest Fault record is erased. Refer to Figure 4.6 for KEYPAD usage and the setting instruction.

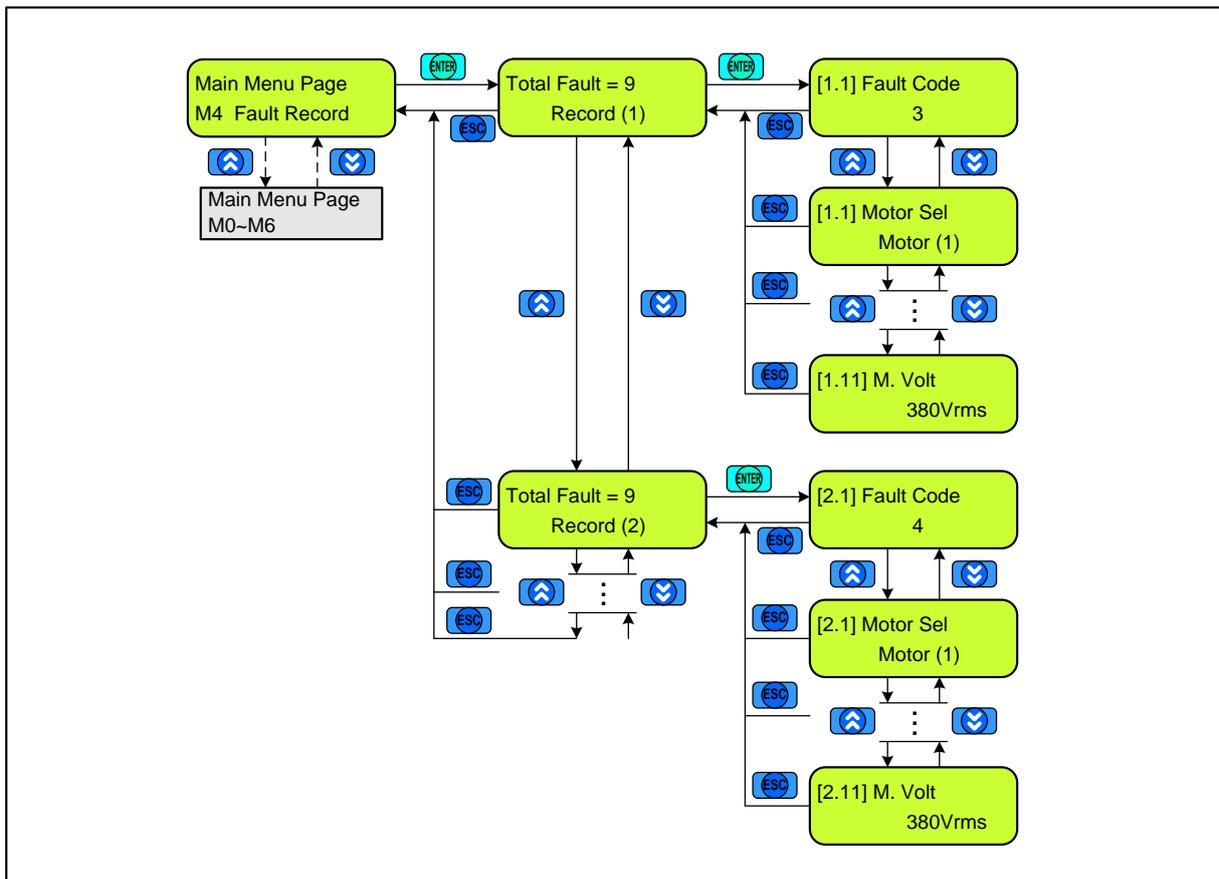


Figure 4.6 "M4 Fault Record" Menu Page

M4 Fault Record	No	Unit	Description
Total = x (x : Total occurred Faults number)	[y.1] Fault Code		Fault details (Refer to the Fault Code table)
	[y.2] Motor Selection		Ignore ( for motor control)
	[y.3] Control Method		Ignore ( for motor control)
	[y.4] Speed command	rpm	Ignore ( for motor control)
Record (y) y : occurred order y=1~9 1 = the newest occurred Fault	[y.5] Motor Speed	rpm	Ignore ( for motor control)
	[y.6] Frequency	Hz	Indication of output frequency
	[y.7] Torque command	Nm	Ignore ( for motor control)
	[y.8] Actual Torque	Nm	Ignore ( for motor control)
	[y.9] DC Link Voltage	Vdc	Indication of DC link voltage.

	[y.10] Motor Current	Arms	Indication of Output Current.
	[y.11] Motor Voltage	Vrms	Indication of Output Voltage.

### 4.6 Main Menu Page[5] Initialize

In M5 Initialize page, users can remove of the recorded Fault list, reset the system of Power Supply and return to the default parameter values. Refer to Figure 4.7 for KEYPAD usage and the setting instruction.

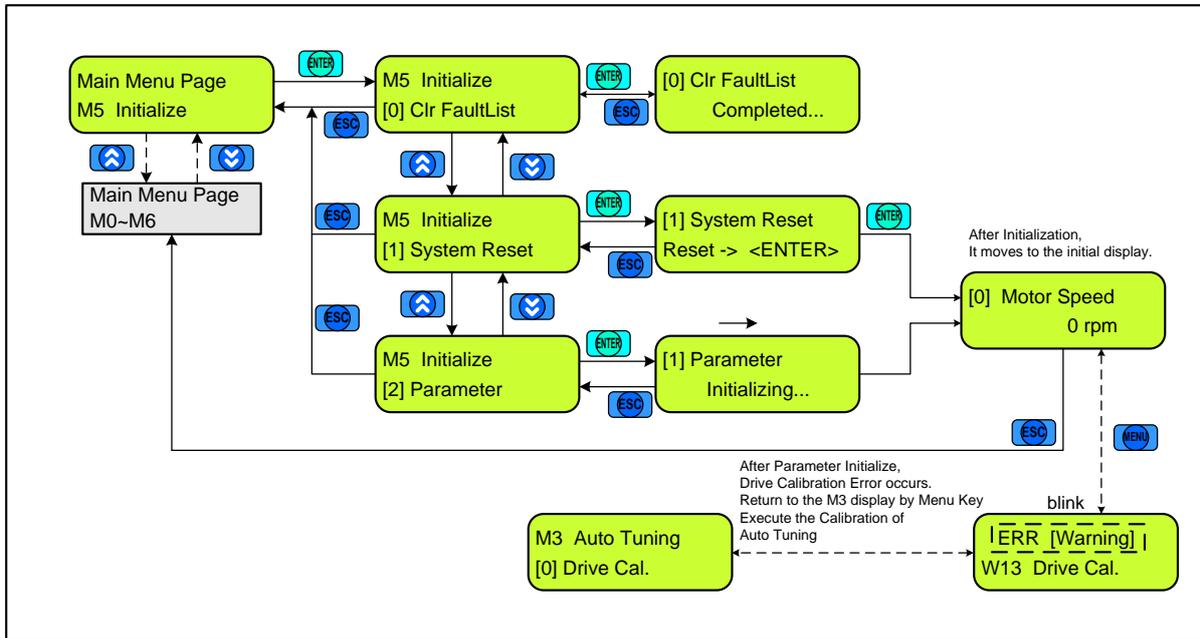


Figure 4.7 " M5 Initialize" Menu Page

No	M5 Initialize	Description
[0]	Clear Fault List	remove the recorded fault details
[1]	System Reset	reset the system of the Power Supply (Same effect to give the main power back again after turn off the Power Supply.)
[2]	Parameter	return all the parameters to the default value

4.7 Main Menu Page[6] Password

In M6 password Page, users can check what access level of parameters can be edited. If a user wants to change the Power Supply parameters for more professional level, the user must be certified for higher level access. Certifying the higher level access can be done at "Admission" with the relevant password for each level. Then, the parameters of the higher level can be accessed. It is recommended to use Access level from 0 to 1 for normal users (L[0] ~ L[1]). If users want higher level, please contact the head office. If users are certified higher than L[1], it will be returned to L[0] automatically after 1 hour passes. Refer to Figure 4.8 for KEYPAD usage and the setting instruction.

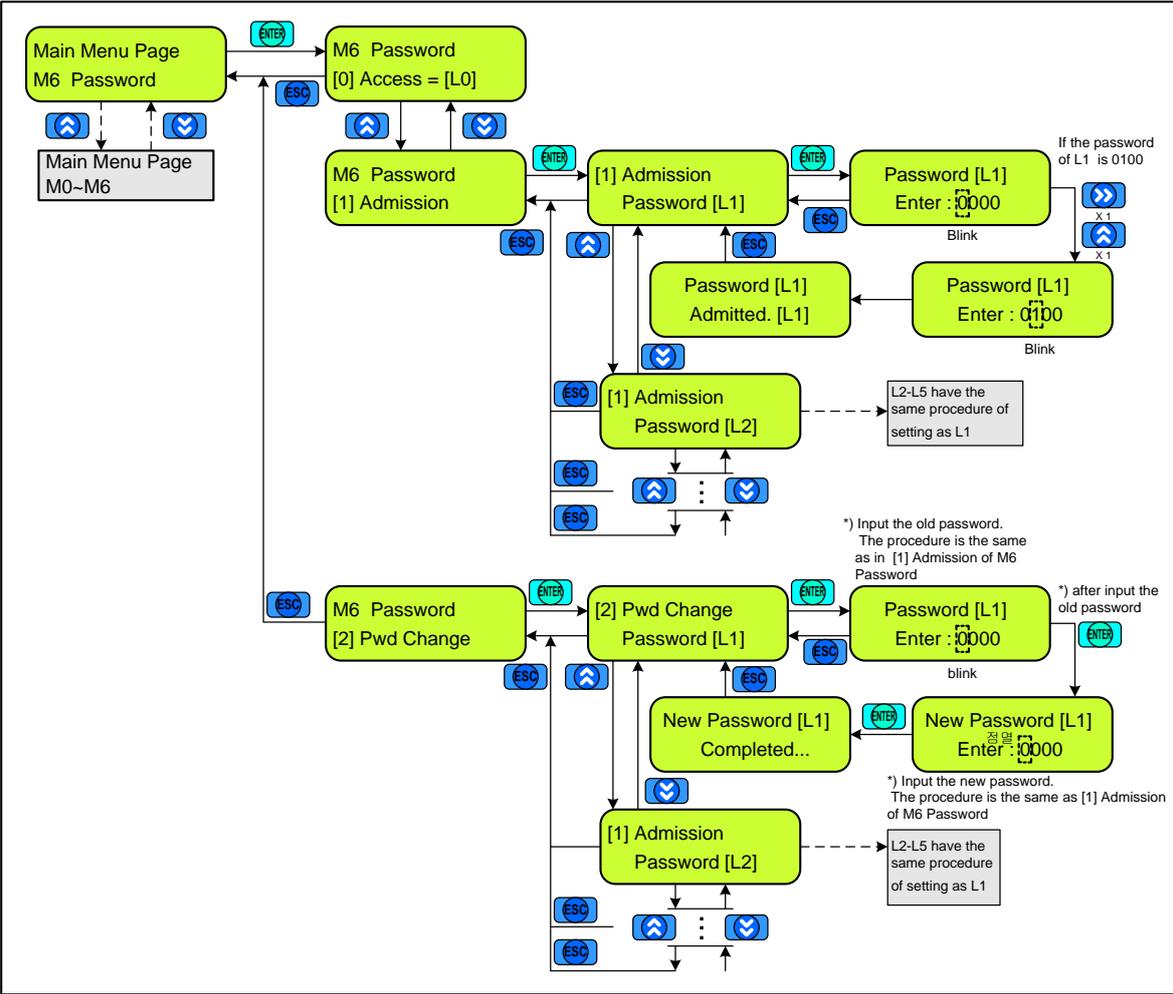


Figure 4.8 "M6 Password" Menu Page

No	M6 Password	Description
[0]	Access Level	Indication of certified Access level
[1]	Admission	L[1] : Password 0 0 0 0
		L[2] ~ L[5] : Contact the Seoho Electric.

[2]	Password Change	Change the password for the certified level (users can directly change the password)
-----	-----------------	-----------------------------------------------------------------------------------------

#### 4.8 Usage of MENU key (Error, Warning occurrence and Power Supply status)

MENU key is used to return to the normal screen when error or warning occurs. And it is also used to indicate the current status of the Power Supply. Refer to Figure 4.9

In cases of error or warning, the source of the trouble is indicated.

Push the "MENU" button,  and return to the normal screen then correct the relevant parameters or remove the occurrence source by checking the status of Power Supply.

If the occurrence source is not removed, the error or warning sign appears every 10 seconds while operating KEYPAD. In this case, hit the "MENU" button,  and then it will return to the last setting screen. Refer to Figure 4.9 for KEYPAD operation.

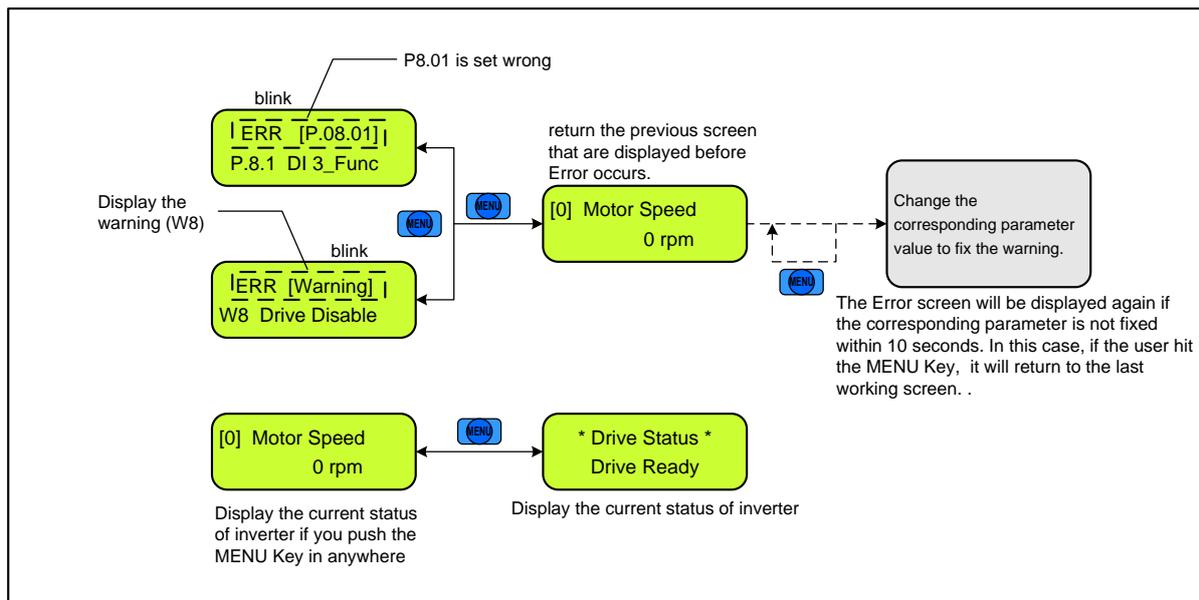
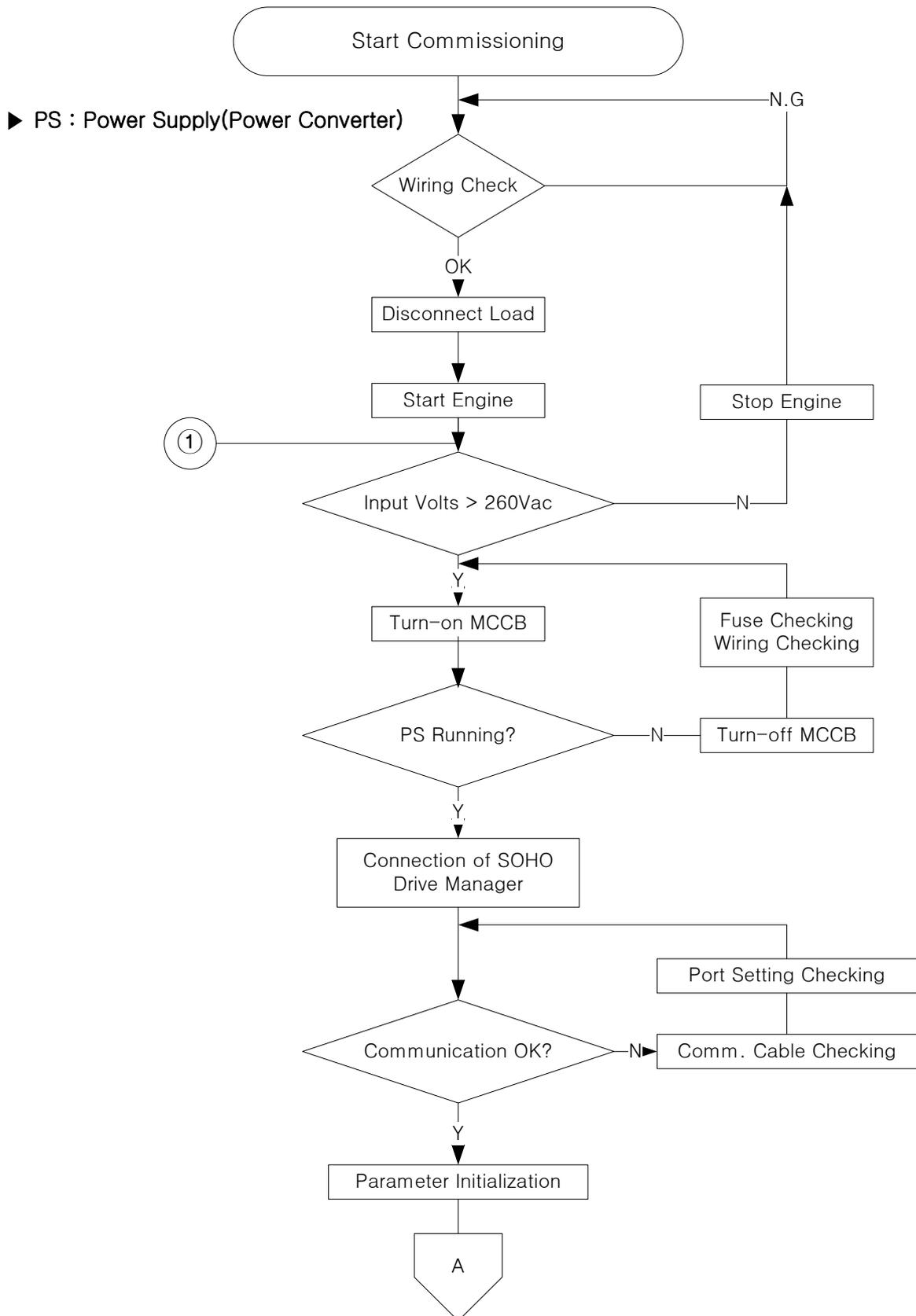


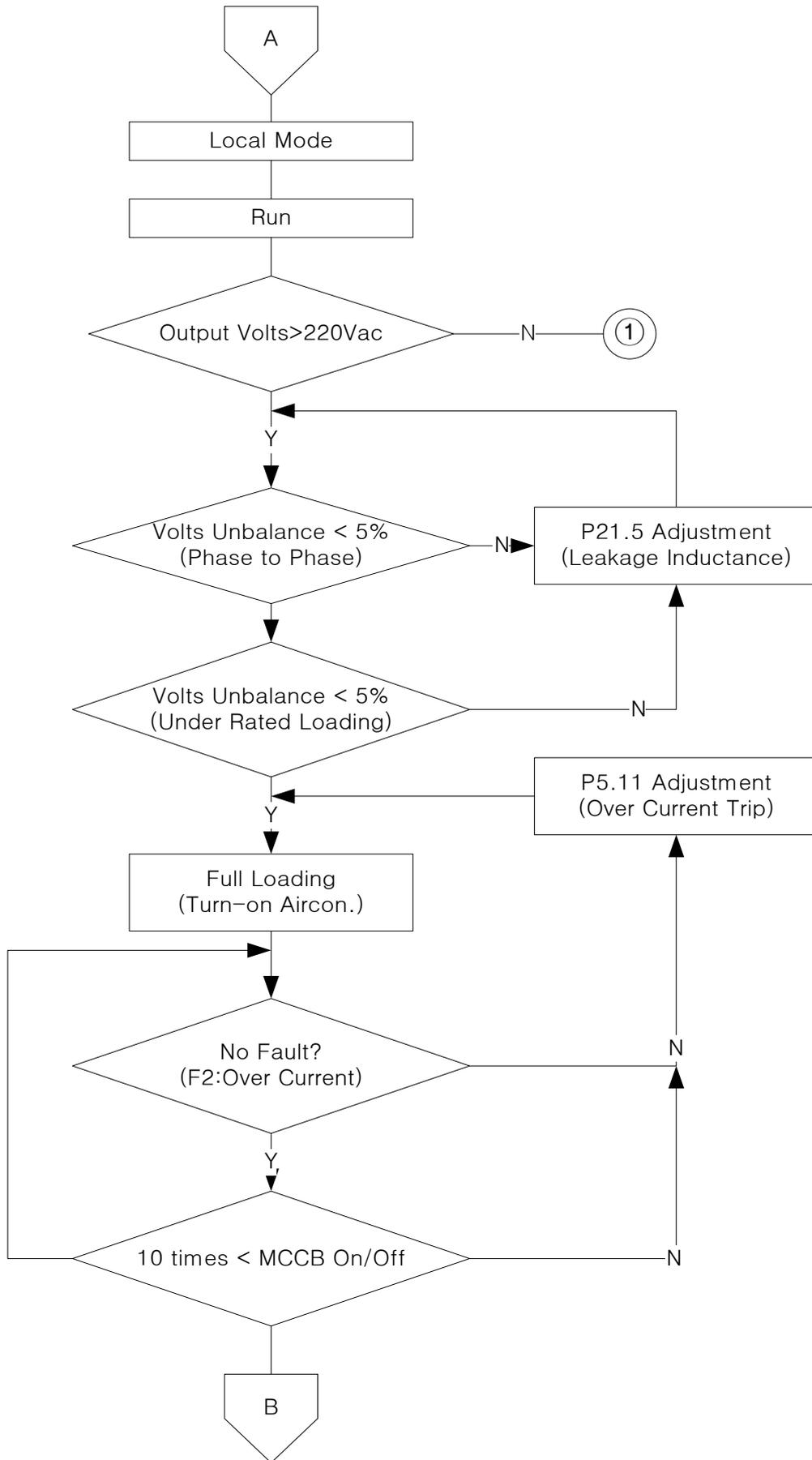
Figure 4.9 Checking Error, Warning and Power Supply status by using Menu key

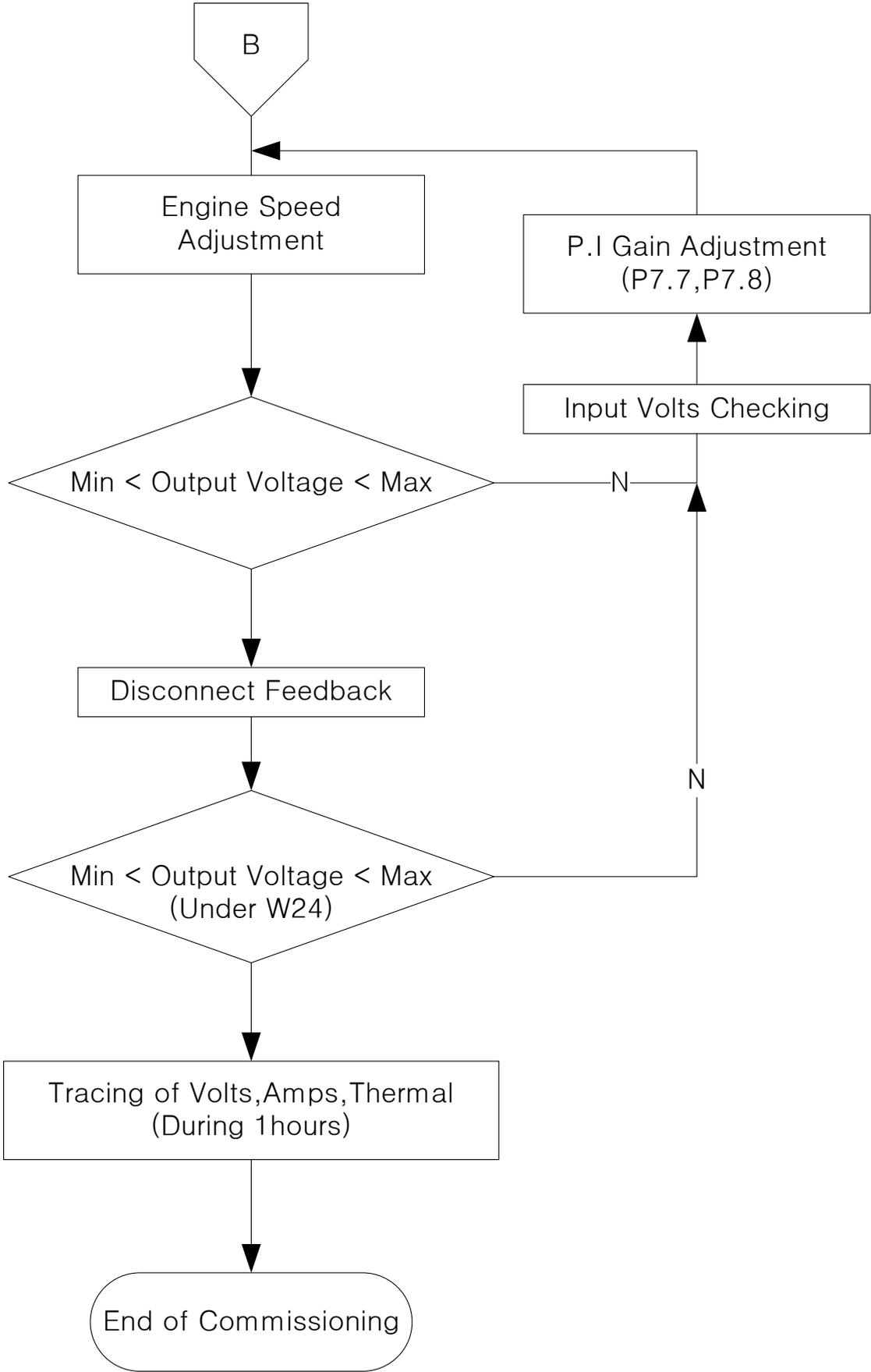
### 5. Commissioning

The commissioning follows as below flowchart.









## 6. Monitoring & Management Software

### 6.1 Installing New Software from a Disc or USB Memory

Simply insert the CD or USB Memory in your computer's optical disc drive or USB socket. In most cases the software installer will open automatically. If not, double-click the disc icon on your desktop and in the resulting window, look for a file with the "setup.exe" in the "DriveManager" folder. Double-click the file to open the setup and follow the onscreen instructions to install the software. Monitoring software will quickly install into computer.

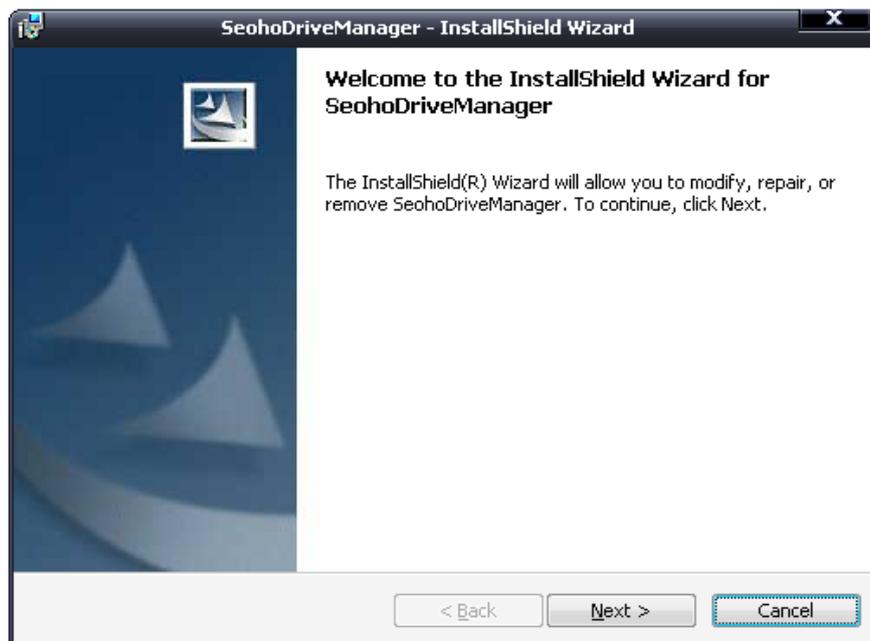


Figure 6.1 Software installation

### 6.2 Execution

Click the "Seoho Drive Manager" icon on your desktop screen.



Figure 6.2 Execution icon on desktop screen



Figure 6.3 Intro

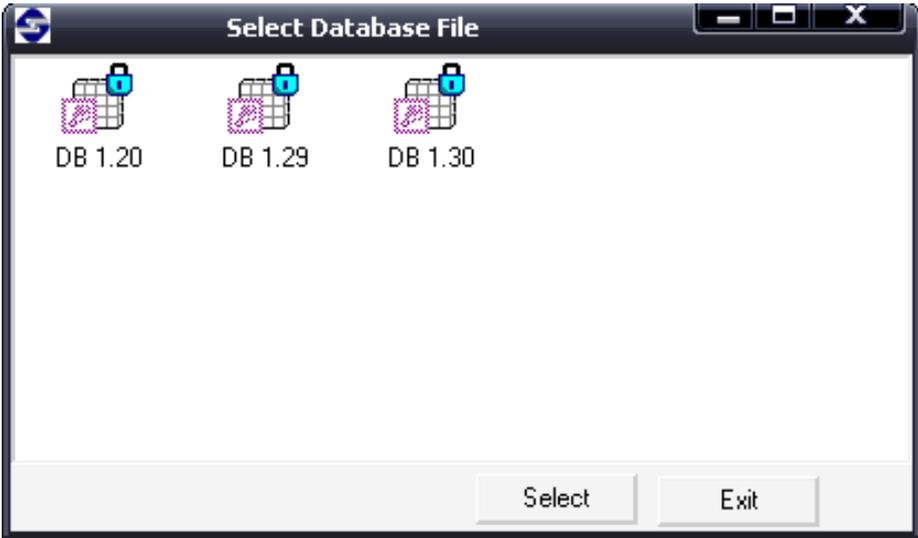


Figure 6.4 A selection of the database

You can meet selection of the database file after intro screen. Seoho will provide with only one of database file in case of Power Supply user. And database file can update in order to upgrade of performance.

### 6.3 Usage of the Seoho Drive Manager

After the database selection, you can meet the window as figure 6.5

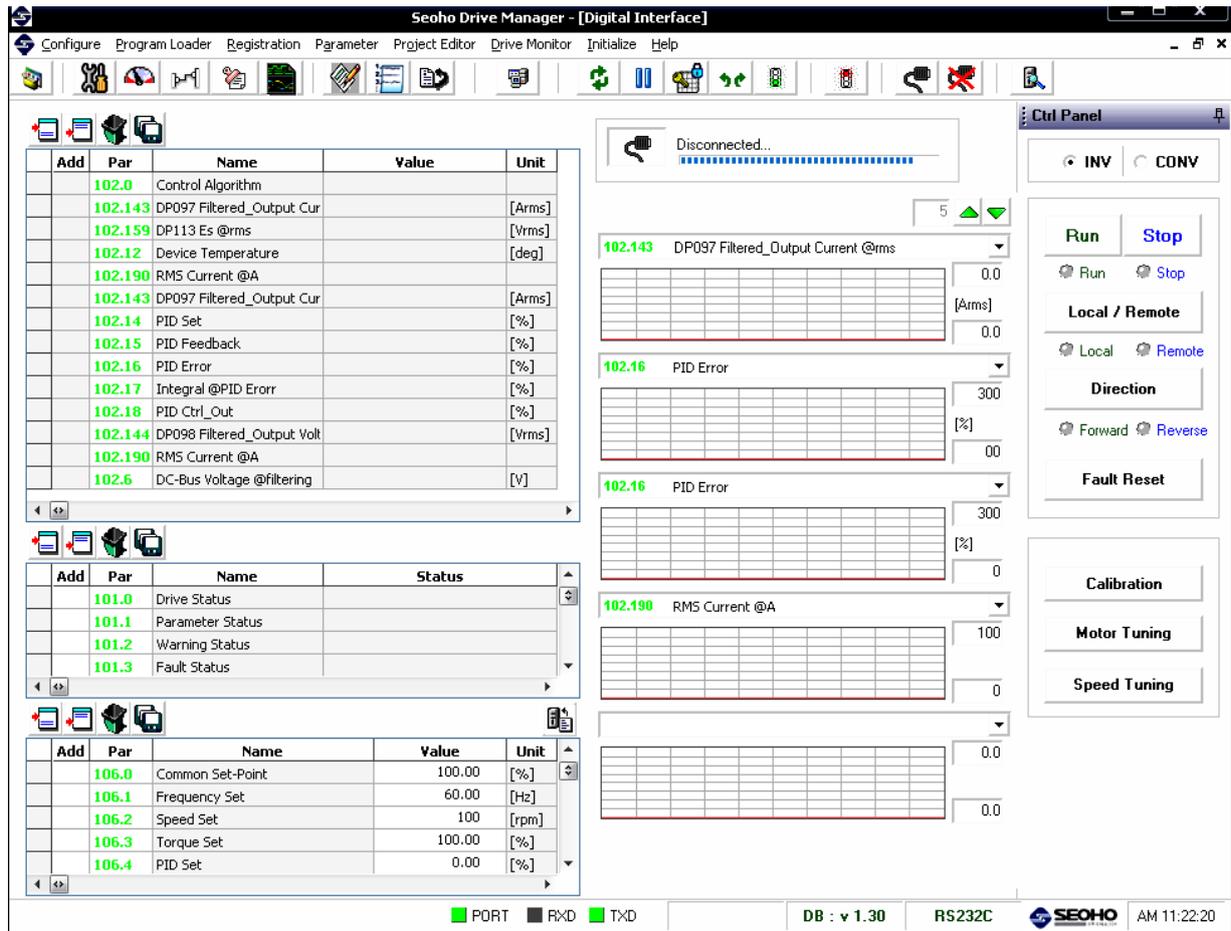


Figure 6.5 Main Window of the Seoho Drive Manager

Add	Par	Name	Value	Unit
	102.0	Control Algorithm		
	102.143	DP097 Filtered_Output Cur		[Arms]
	102.159	DP113 Es @rms		[Vrms]
	102.12	Device Temperature		[deg]
	102.190	RMS Current @A		
	102.143	DP097 Filtered_Output Cur		[Arms]
	102.14	PID Set		[%]
	102.15	PID Feedback		[%]
	102.16	PID Error		[%]
	102.17	Integral @PID Error		[%]
	102.18	PID Ctrl_Out		[%]
	102.144	DP098 Filtered_Output Volt		[Vrms]
	102.190	RMS Current @A		
	102.6	DC-Bus Voltage @filtering		[V]

Add	Par	Name	Status
	101.0	Drive Status	
	101.1	Parameter Status	
	101.2	Warning Status	
	101.3	Fault Status	

Add	Par	Name	Value	Unit
	106.0	Common Set-Point	100.00	[%]
	106.1	Frequency Set	60.00	[Hz]
	106.2	Speed Set	100	[rpm]
	106.3	Torque Set	100.00	[%]
	106.4	PID Set	0.00	[%]

Figure 6.6 Real time display area of the Parameters & Variables

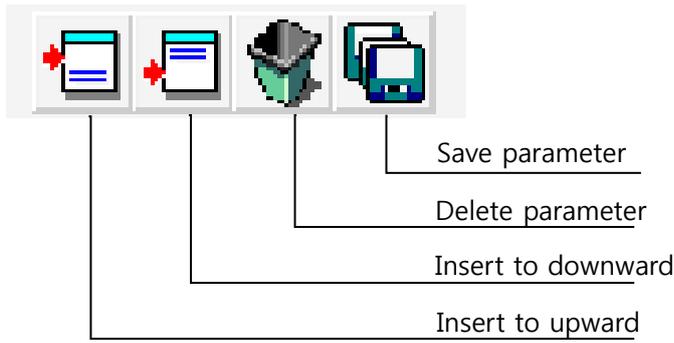


Figure 6.7 Parameter edition icons

Displayed internal parameters can edit by using with the icons in figure 6.6

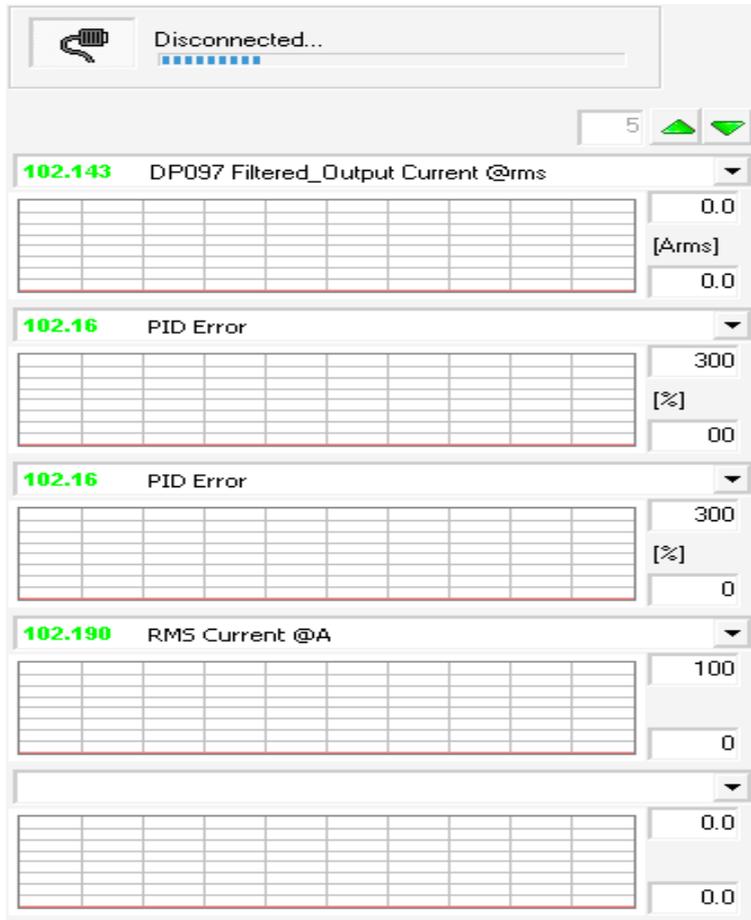


Figure 6.8 Communication connection button and waveform viewing area

Communication connection button will toggle as every click. Also it will change if "Connected" to "Disconnected" or such as opposite case.

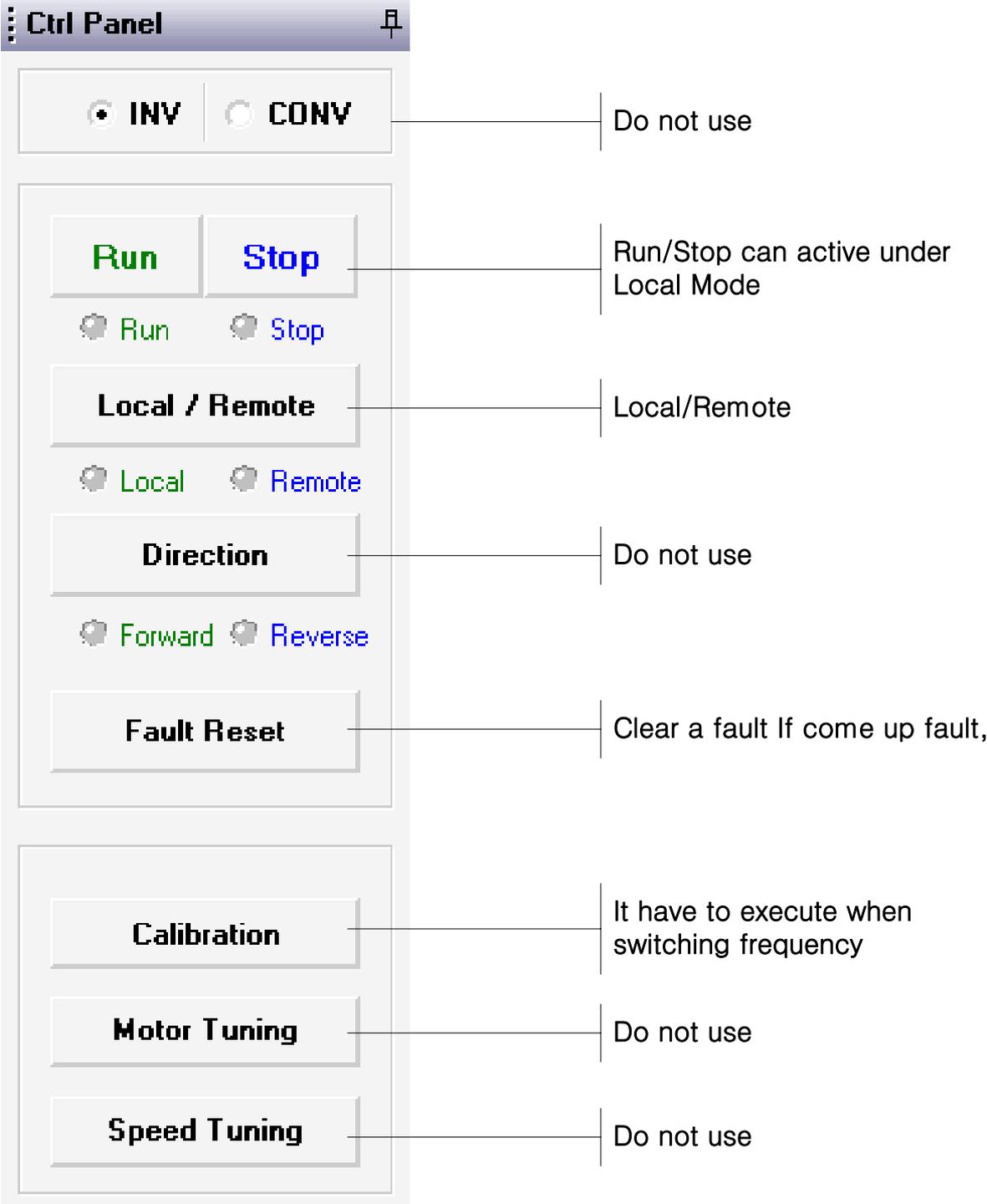


Figure 6.9 Control Panel

6.3.1 Setup of the communication

You can see as follows when click "Configure + Communication Configure" menu.

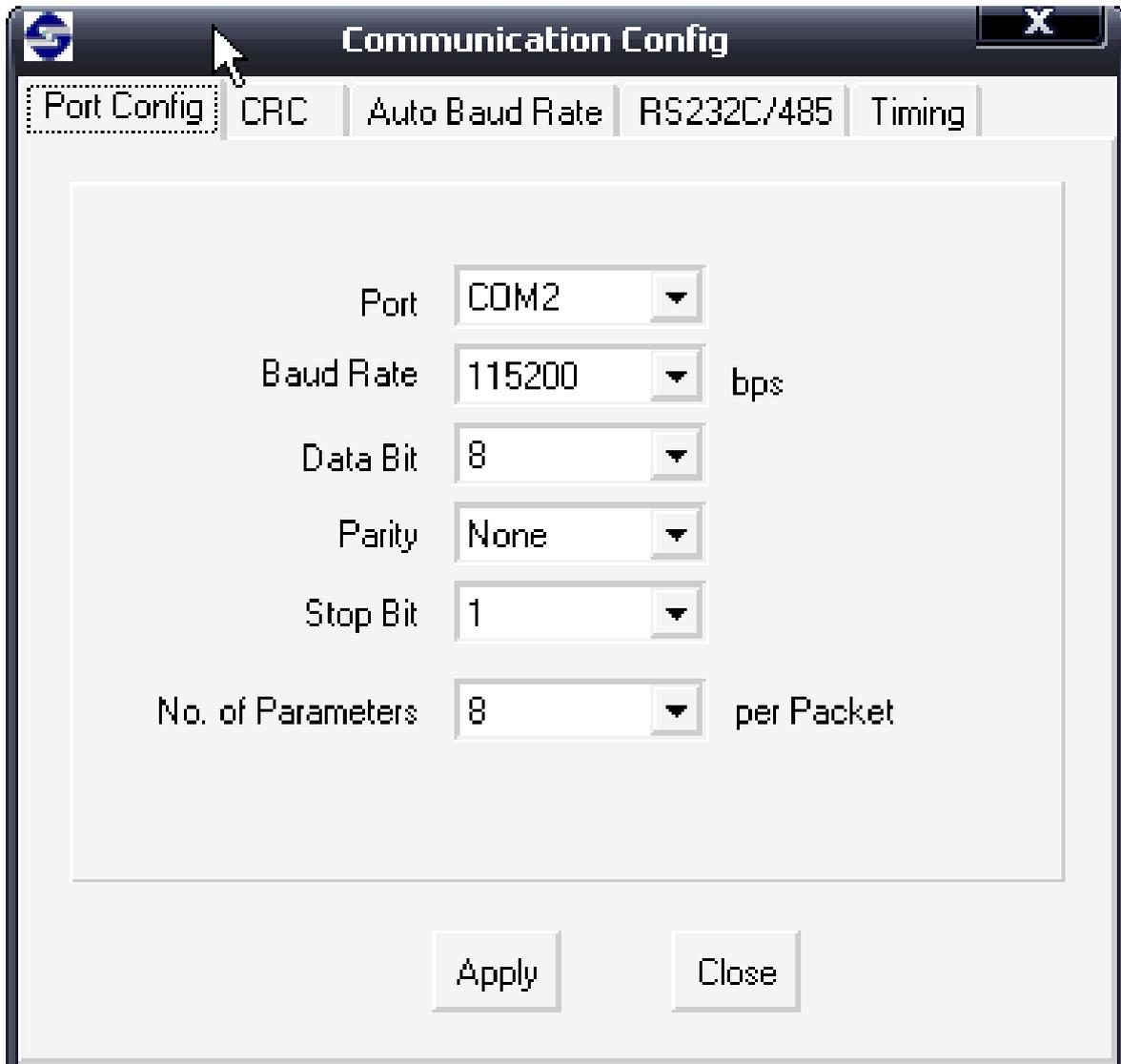


Figure 6.10 Communication setup window

It need to change "COM port "if have another port on your notebook computer. But other one is no need to change. You can use default value except for special case. If without serial port on the notebook, you can configure by use USB to Serial converter. After change, once click "Apply" for it.

6.3.2 Display Functions

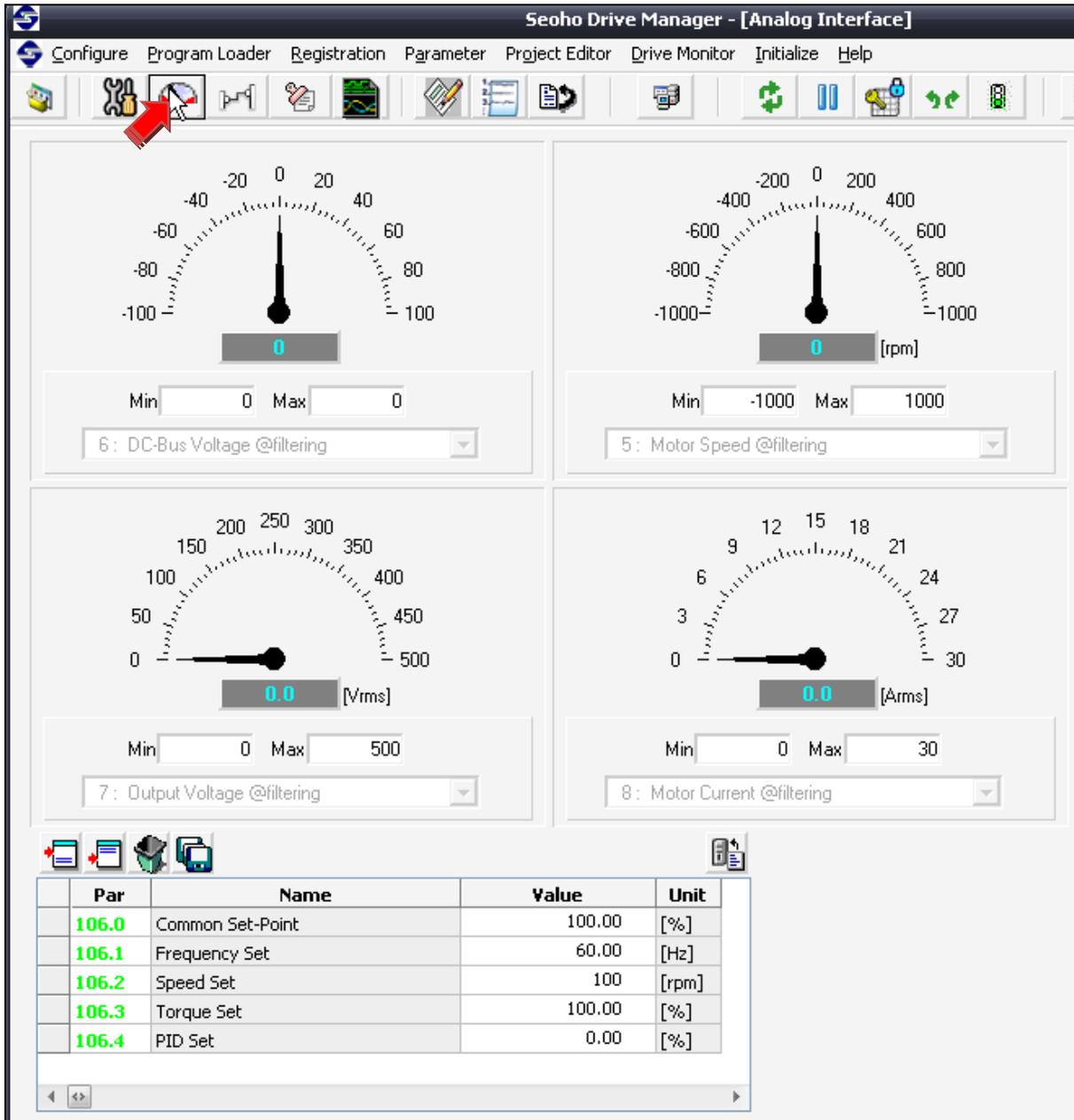


Figure 6.11 Analog meter style display

In case of using the analog meter style display, you will be able to select in the parameter table.

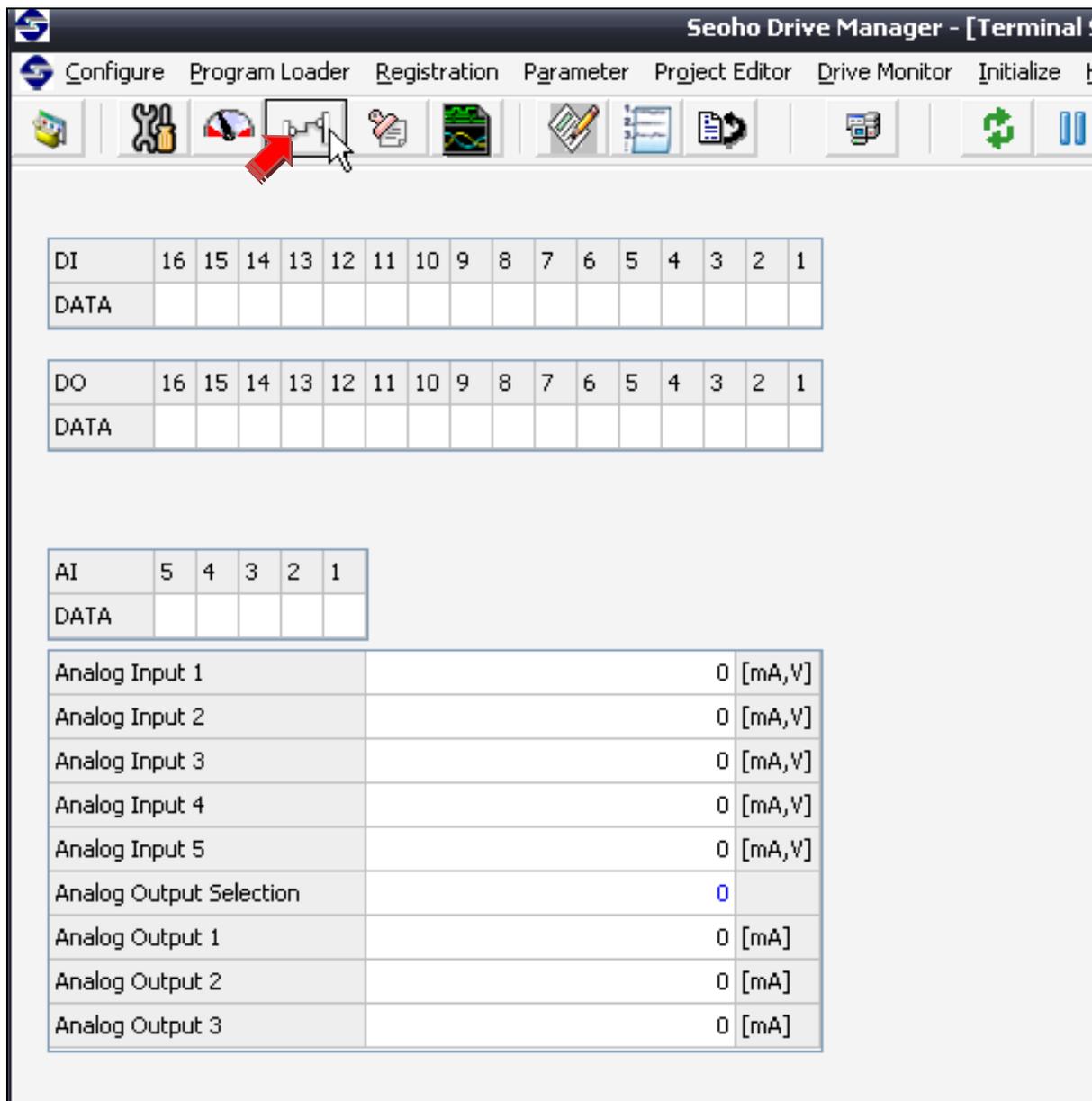
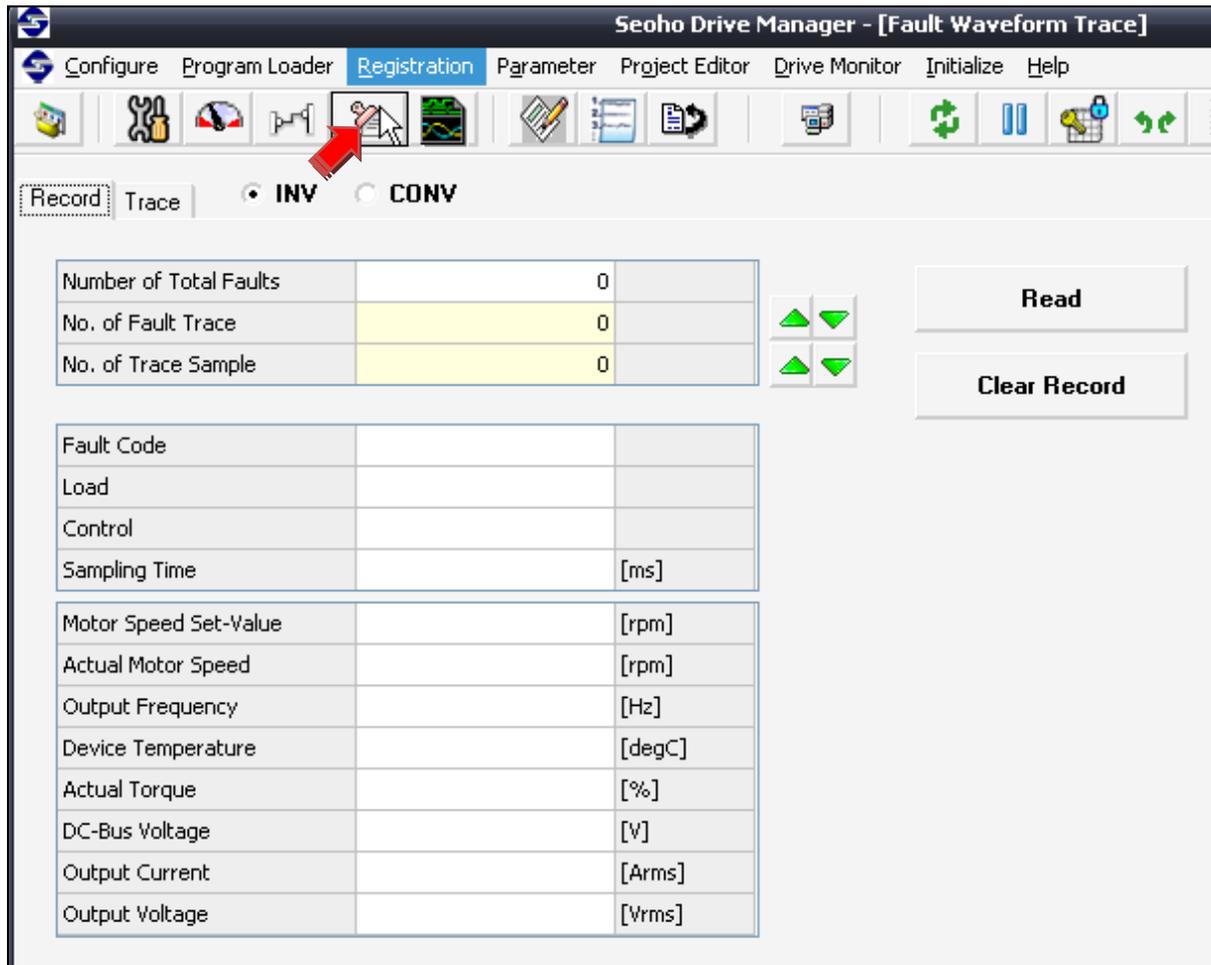


Figure 6.12 Terminal monitoring

Using of the upper window is will be very useful to monitor of the INPUT and OUTPUT terminals.



**Figure 6.13** Fault Record Monitoring

If you want to see fault history, are able to use this function. The fault recording function can save 9 times fault maximum. The fault recorder is configured with FIFO. Therefore the last 10th information cannot find in this recorder. The fault recorder can re-construct with the output frequency, output current, DC-Link voltages etc before 1second from the fault time.

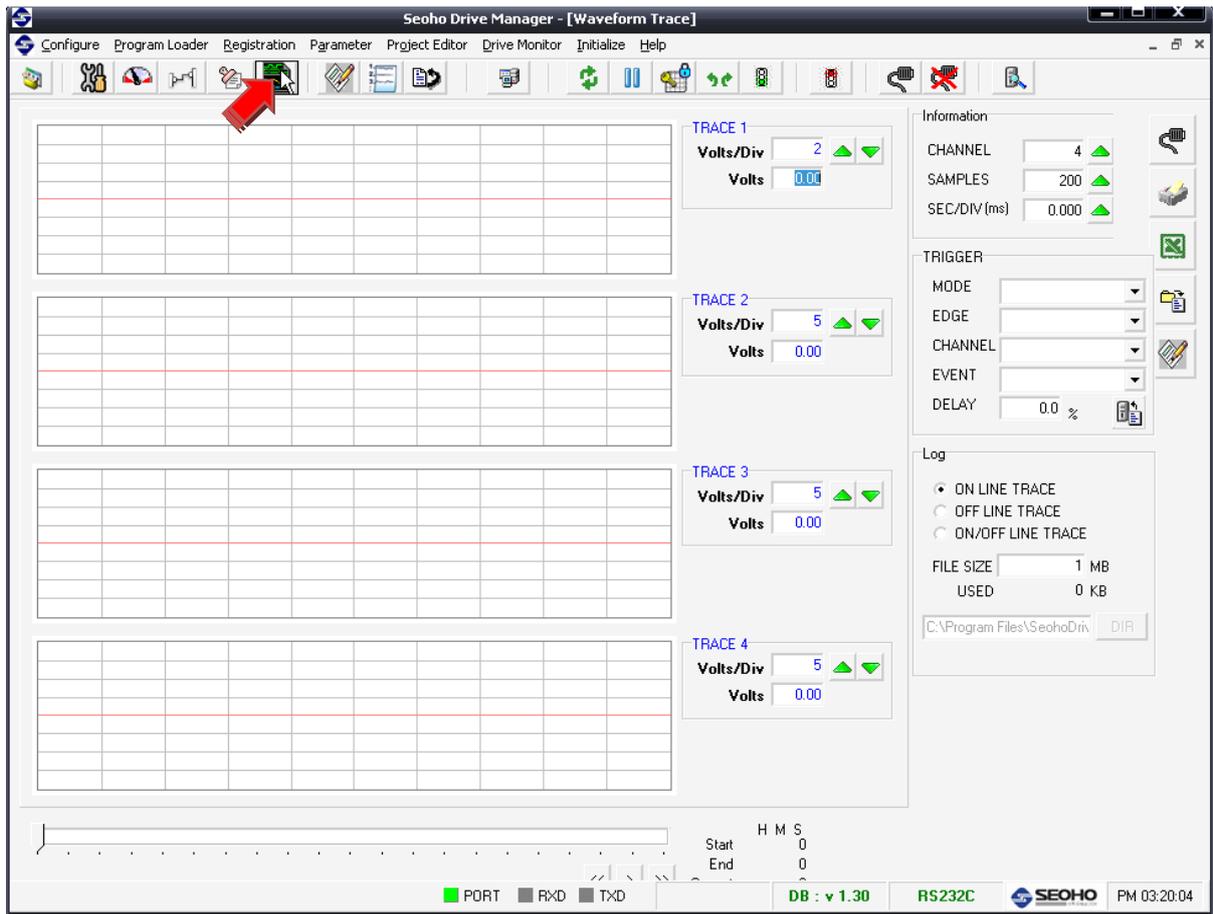


Figure 6.14 Waveform trace window

This function can use as if it is oscilloscope. Maximum 4channel is available also have trigger function and can store to the hard disk drives with every waveforms.

[Usage]

- 1) Choosing of the parameter.
- 2) Selection of the number of channel.
- 3) Decision of the scaling and sampling time.
- 4) Selection of the trigger mode.

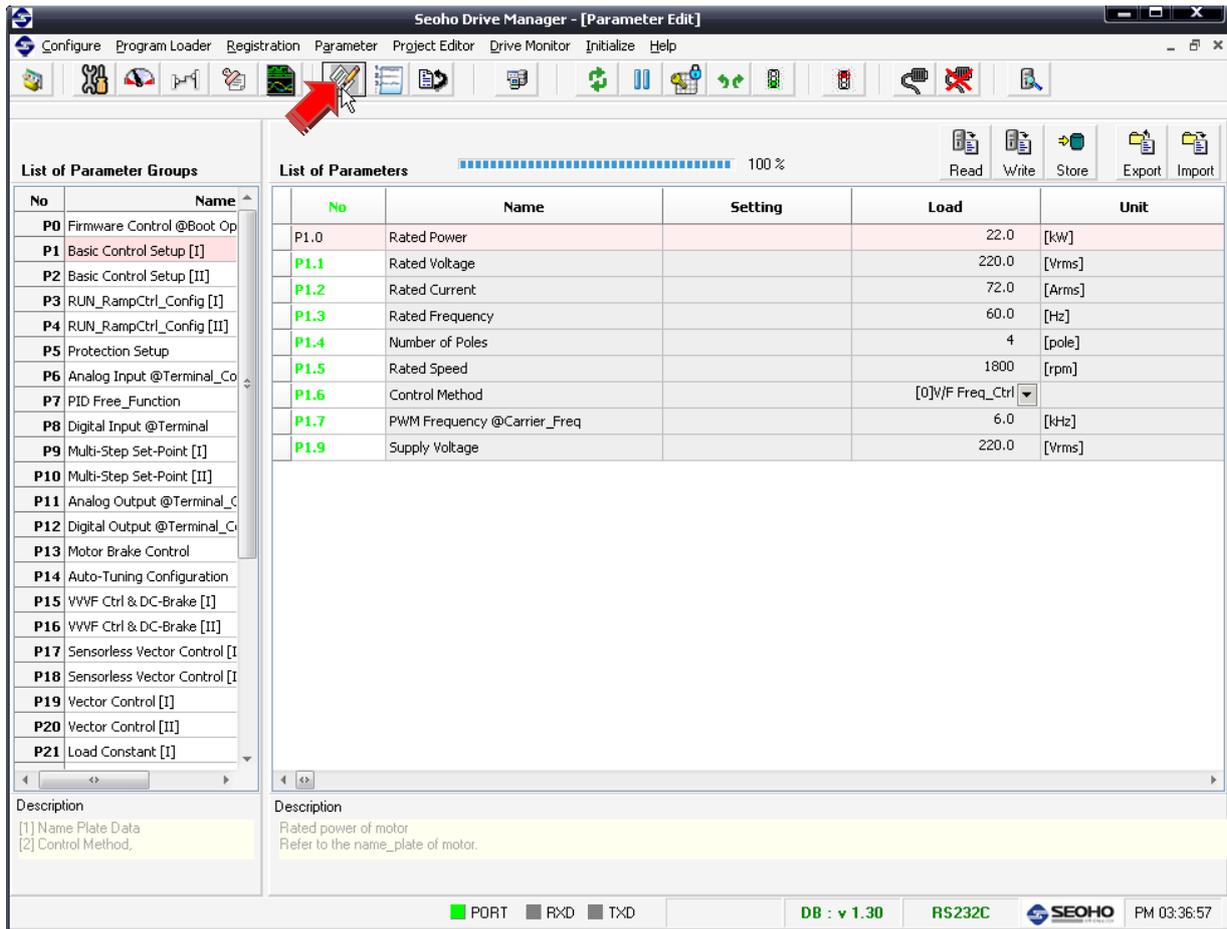


Figure 6.15 Parameter Editing Window

Figure 6.13 shows the window of the parameter editing. In this window, you can adjust every parameter of connected with operation and protection and control. Detail is described in next chapter.

The other functions and details will become education through our engineers.

## 7. Parameters

Colored parameters are with related to the Power Supply. You need to close look about this.

### G1 Basic Control Setup [I]

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P1.0	Rated Power	18.5	0	[kW]	0 ~ 1000
P1.1	Rated Voltage	230	0	[Vrms]	0 ~ 1500
P1.2	Rated Current	72	0	[Arms]	0 ~ 2000
P1.3	Rated Frequency	60	0	[Hz]	0 ~ 3000
P1.4	Number of Poles	4	0	[pole]	0 ~ 24
P1.5	Rated Speed	1800	1800	[rpm]	0 ~ 60000
P1.6	Control Method	0	0		[0] V/F Freq_Ctrl
P1.7	PWM Frequency @Carrier_Freq	6.2	2.5	[kHz]	0.8 ~ 10
P1.9	Supply Voltage	220	0	[Vrms]	0 ~ 1500

### G3 RUN\_RampCtrl\_Config [I]

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P3.0	RUN/STOP Method	0	0		[0] Terminal
P3.1	RampFunc_Input_Src	0	0		[0] Terminal @Digital, Analog
P3.2	STOP Cmd Detection Time	0	0	[s]	0 ~ 10
P3.3	STOP Mode	1	0		[1] Free-RUN STOP
P3.4	STOP Hold-Time	0	0	[s]	0 ~ 300
P3.5	Output OFF Hold-Time	0	1	[s]	0 ~ 30
P3.6	Mixed-Mode STOP Reference	20	20	[%]	0 ~ 500
P3.7	Accel/Decel Ramp Function	0	1		[0] Disabled
P3.8	Accel_Time Range	0	0		[0] 0 ~ 300s
P3.9	Accel_Switching_Ref [1-2]	100	100	[%]	0 ~ 300
P3.10	Accel_Switching_Ref [2-3]	150	150	[%]	0 ~ 300
P3.11	Accel_Switching_Ref [3-4]	200	200	[%]	0 ~ 300
P3.12	Accel_Switching_Ref [4-5]	225	225	[%]	0 ~ 300
P3.16	Acceleration Time I.1 @Region 1	0.2	5	[s]	0.01 ~ 300
P3.17	Acceleration Time I.2 @Region 2	5	5	[s]	0.01 ~ 300
P3.18	Acceleration Time I.3 @Region 3	5	5	[s]	0.01 ~ 300
P3.19	Acceleration Time I.4 @Region 4	5	5	[s]	0.01 ~ 300
P3.20	Acceleration Time I.5 @Region 5	5	5	[s]	0.01 ~ 300
P3.24	Acceleration Time II	10	10	[s]	0 ~ 300
P3.25	Decel_Time Range	0	0		[0] 0 ~ 300s
P3.26	Decel_Switching_Ref [1-2]	100	100	[%]	0 ~ 300
P3.27	Decel_Switching_Ref [2-3]	150	150	[%]	0 ~ 300

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P3.28	Decel_Switching_Ref [3-4]	200	200	[%]	0 ~ 300
P3.29	Decel_Switching_Ref [4-5]	225	225	[%]	0 ~ 300
P3.33	Deceleration Time I.1 @Region 1	5	5	[s]	0 ~ 300
P3.34	Deceleration Time I.2 @Region 2	5	5	[s]	0 ~ 300
P3.35	Deceleration Time I.3 @Region 3	5	5	[s]	0.01 ~ 300
P3.36	Deceleration Time I.4 @Region 4	5	5	[s]	0.01 ~ 300
P3.37	Deceleration Time I.5 @Region 5	5	5	[s]	0.01 ~ 300
P3.41	Deceleration Time II	10	10		0 ~ 300
P3.42	Counter Deceleration Ramp Function	0	0		[0] Disabled
P3.43	Counter Deceleration Time	5	5	[s]	0 ~ 300
P3.49	Emergency_STOP Mode	1	0		[1] Free-RUN STOP
P3.50	Emergency_STOP Decel_Time	1	1		0.001 ~ 30
P3.51	Continuous Operation Mode	1	1		[1] Enabled
P3.52	Reverse_DIR Operation	0	1		[0] Disabled

### G5 Protection Setup

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P5.0	Current Limit	250	145	[%]	0 ~ 200
P5.1	Current Limit [II]	150	145	[%]	0 ~ 200
P5.7	Max. Continuous Current @Thermal_Protection	90	95	[%]	0 ~ 250
P5.8	Over-Load Current @Thermal_Protection	170	135	[%]	0 ~ 250
P5.9	Over-Load Time @Thermal_Protection	70	60	[s]	0 ~ 300
P5.10	Over Load Fault @Action	2	0		[2] Free_RUN
P5.11	Over-Current Trip	300	220	[%]	0 ~ 300
P5.12	Zero-Sequence Current Trip	15	15	[%]	0 ~ 50
P5.13	Over-Voltage Limiting Function	0	0		[0] Disabled
P5.14	Over-Voltage Limit	670	670	[V]	0 ~ 2200
P5.15	Over-Voltage Trip	780	780	[V]	0 ~ 2200
P5.16	Under-Voltage [UV] Compensation	0	1		[0] Disabled
P5.17	UV Compensation_Voltage	450	450	[V]	0 ~ 2200
P5.18	Under-Voltage Trip	230	360	[V]	0 ~ 2200
P5.19	Open Phase Protection	1	1		[1] Enabled
P5.20	Supply Frequency	60	60	[Hz]	0 ~ 300
P5.21	Built-in Dynamic Brake	1	1		[1] Enabled @RUN
P5.22	DB Switching Frequency	1	1	[kHz]	1 ~ 5

P5.23	DB Start Voltage	690	690	[V]	0 ~ 2200
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Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P5.24	DB Full Voltage	750	710	[V]	0 ~ 2200
P5.25	Over-Temperature Trip @Action	2	0		[2] CTRL_OFF
P5.30	Auto-Restart Count	0	0		0 ~ 15
P5.31	Retry Delay Time	1.5	1.5	[s]	0 ~ 100
P5.32	OC Auto-Reset	0	0		[0] Disabled
P5.33	OV Auto-Reset	0	0		[0] Disabled
P5.34	UV Auto-Reset	0	0		[0] Disabled
P5.37	Out_of_Control Auto-Reset	0	0		[0] Disabled
P5.38	Out_of_Control Time	5	5	[s]	0 ~ 100
P5.39	Out_of_Control Current	95	90	[%]	50 ~ 100
P5.40	Over Temperature Trip	75	75	[deg]	20 ~ 85
P5.41	Over-Current Trip [III]	200	200	[%]	50 ~ 350
P5.42	Line Under_Voltage Trip	75	75	[%]	50 ~ 100
P5.43	Ln_UV Auto_Reset	0	0		[0] Disabled
P5.44	Ln_Unbalance Auto_Reset	0	0		[0] Disabled

### G6 Analog Input @Terminal\_Config

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P6.0	Analog Reference Source	1	1		[1] AI 1
P6.1	AI.1 Function	1	1		[1] AI
P6.2	AI.1 Type	1	0		[1] -10 ~ 10V
P6.4	AI.1 Filter Time Constant	5	25	[ms]	1 ~ 2000
P6.5	AI.1 Offset	0	0	[mA,V]	-10 ~ 10
P6.6	AI.1 Min. Voltage	0	0	[V]	0 ~ 9
P6.7	AI.1 Min. Current	0	0	[mA]	0 ~ 18
P6.8	AI.1 Minimum	0	0	[%]	0 ~ 500
P6.9	AI.1 Max. Voltage	10	10	[V]	1 ~ 10
P6.10	AI.1 Max. Current	20	20	[mA]	2 ~ 20
P6.11	AI.1 Maximum	100	100	[%]	0 ~ 500
P6.12	AI.1 Inversion	0	0		[0] Disabled
P6.13	AI.1 Discreteness	0	0		[0] Disabled
P6.14	AI.1 Dead-Zone	0	0		[0] Disabled
P6.15	AI.2 Function	1	1		[1] AI
P6.16	AI.2 Type	1	3		[1] -10 ~ 10V
P6.18	AI.2 Filter Time Constant	5	25	[ms]	1 ~ 2000
P6.19	AI.2 Offset	0	0	[mA,V]	-10 ~ 10
P6.20	AI.2 Min. Voltage	0	0	[V]	0 ~ 9
P6.21	AI.2 Min. Current	0	0	[mA]	0 ~ 18

P6.22	AI.2 Minimum	0	0	[%]	0 ~ 500
P6.23	AI. 2 Max. Voltage	10	10	[V]	1 ~ 10

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P6.24	AI. 2 Max. Current	20	20	[mA]	2 ~ 20
P6.25	AI.2 Maximum	100	100	[%]	0 ~ 500
P6.26	AI.2 Inversion	0	0		[0] Disabled
P6.27	AI.2 Discreteness	0	0		[0] Disabled
P6.28	AI.2 Dead-Zone	0	0		[0] Disabled
P6.29	AI.3 Function	0	0		[0] Disabled
P6.30	AI.3 Type	0	0		[0] 0 ~ 10V
P6.32	AI.3 Filter Time Constant	25	25	[ms]	1 ~ 2000
P6.33	AI.3 Offset	0	0	[mA,V]	-10 ~ 10
P6.34	AI.3 Min. Voltage	0	0	[V]	0 ~ 9
P6.35	AI.3 Min. Current	0	0	[mA]	0 ~ 18
P6.36	AI.3 Minimum	0	0	[%]	0 ~ 500
P6.37	AI.3 Max. Voltage	10	10	[V]	1 ~ 10
P6.38	AI.3 Max. Current	20	20	[mA]	2 ~ 20
P6.39	AI.3 Maximum	100	100	[%]	0 ~ 500
P6.40	AI.3 Inversion	0	0		[0] Disabled
P6.41	AI.3 Discreteness	0	0		[0] Disabled
P6.42	AI.3 Dead-Zone	0	0		[0] Disabled
P6.43	AI.4 Function	0	0		[0] Disabled
P6.44	AI.4 Type	0	0		[0] 0 ~ 10V
P6.46	AI.4 Filter Time Constant	25	25	[ms]	1 ~ 2000
P6.47	AI.4 Offset	0	0	[mA,V]	-10 ~ 10
P6.48	AI.4 Min. Voltage	0	0	[V]	0 ~ 9
P6.49	AI.4 Min. Current	0	0	[mA]	0 ~ 18
P6.50	AI.4 Minimum	0	0	[%]	0 ~ 500
P6.51	AI.4 Max. Voltage	10	10	[V]	1 ~ 10
P6.52	AI.4 Max. Current	20	20	[mA]	2 ~ 20
P6.53	AI.4 Maximum	100	100	[%]	0 ~ 500
P6.54	AI.4 Inversion	0	0		[0] Disabled
P6.55	AI.4 Discreteness	0	0		[0] Disabled
P6.56	AI.4 Dead-Zone	0	0		[0] Disabled
P6.57	AI.5 Function	0	0		[0] Disabled
P6.58	AI.5 Type	0	0		[0] 0 ~ 10V
P6.60	AI.5 Filter Time Constant	25	25	[ms]	1 ~ 2000
P6.61	AI.5 Offset	0	0	[mA,V]	-10 ~ 10
P6.62	AI.5 Min. Voltage	0	0	[V]	0 ~ 9
P6.63	AI.5 Min. Current	0	0	[mA]	0 ~ 18
P6.64	AI.5 Minimum	0	0	[%]	0 ~ 500

P6.65	AI.5 Max. Voltage	10	10	[V]	1 ~ 10
P6.66	AI.5 Max. Current	20	20	[mA]	2 ~ 20
P6.67	AI.5 Maximum	100	100	[m/m]	0 ~ 500

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P6.68	AI.5 Inversion	0	0		[0] Disabled
P6.69	AI.5 Discreteness	0	0		[0] Disabled
P6.70	AI.5 Dead-Zone	0	0		[0] Disabled

### G7 PID Free\_Function

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P7.0	Ctrl_Mode	3	0		[3] Free_Function PID
P7.1	Reference_Src	1	2		[1] Fixed Value by Parameter Setting
P7.2	Fixed Set-Point	100	0	[%]	0 ~ 400
P7.3	Feedback_Src	2	1		[2] Free Function
P7.4	Reference Sign_Change	0	0		[0] Disabled
P7.5	Feedback Sign_Change	0	0		[0] Disabled
P7.6	Control Period @Scan_Time	2	10	[ms]	1 ~ 1000
P7.7	Proportional Gain	120	5	[%]	0 ~ 3000
P7.8	Integration Time @10%error to 100% Output	0.01	30	[s]	0 ~ 300
P7.9	Differentiator Time Constant	0	0	[ms]	0 ~ 30000
P7.10	Feedforward Gain	0	0	[%]	0 ~ 200
P7.11	Zero-Shift Factor	100	100	[%]	5 ~ 100
P7.12	Proportional-Gain 2	5	5	[%]	0 ~ 1000
P7.13	Integration Time 2 @10%error to 100% Output	30	30	[s]	0 ~ 300
P7.14	Differentiator Time Constant 2	0	0	[ms]	0 ~ 30000
P7.15	Feedforward Gain 2	0	0	[%]	0 ~ 200
P7.16	Zero-Shift Factor 2	100	100	[%]	5 ~ 100
P7.17	Output Inversion	0	0		[0] Disabled
P7.18	Integrator Lower_Limit	-25	0	[%]	-300 ~ 300
P7.19	Integrator Upper_Limit	15	100	[%]	-300 ~ 300
P7.20	Output Lower_Limit	-30	0	[%]	-300 ~ 300
P7.21	Output Upper_Limit	35	100	[%]	-300 ~ 300
P7.22	Output_Scale Func_Src	0	0		[0] Null Data @0
P7.23	Integrator_Ini_Value	0	0		[0] Null Data @0
P7.24	Auto RUN/STOP	0	0		[0] Disabled
P7.25	Auto STOP Delay Time	5	0	[s]	0 ~ 3000
P7.26	Auto START Error Condition	10	10	[%]	0 ~ 50

P7.27	Set_Pt Func_Src	0	0		[0] Null Data @0
P7.28	Feedback Func_Src	110	0		[110] Es [V] @x10

### G8 Digital Input @Terminal

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P8.0	RUN/STOP Control @ 7.8	1	0		[1] RUN / DIR
P8.1	DI 3 Function @9	0	0		[0] None
P8.2	DI 4 Function @10	0	10		[0] None
P8.3	DI 5 Function @12	0	6		[0] None
P8.4	DI 6 Function @13	0	2		[0] None
P8.5	DI 7 Function @14	0	3		[0] None
P8.6	DI 8 Function @15	0	4		[0] None
P8.7	DI 9 Function	0	0		[0] None
P8.8	DI 10 Function	0	0		[0] None
P8.9	DI 11 Function	0	0		[0] None
P8.10	DI 12 Function	0	0		[0] None
P8.15	Blank Time after Motor Change	0.5	0.5	[s]	0.1 ~ 2
P8.16	Ref_Tuning Accl/Dec Time	50	50	[s]	1 ~ 300
P8.17	Flying START	0	0		[0] Disabled
P8.18	"RUN" Delay Time	1	0	[s]	0 ~ 5
P8.19	Tmr_RUN Time	0	0	[s]	0 ~ 30

### G15 VVVF Ctrl & DC-Brake [I]

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P15.0	Torque Compensation Mode	0	0		[0] Manual Compensation
P15.1	Min. Output Frequency	60	0	[Hz]	0 ~ 3000
P15.2	Max. Output Frequency	60	60	[Hz]	0 ~ 3000
P15.3	Torque Compensation Field Current	50	50	[%]	0 ~ 100
P15.4	Torque Compensation Time Constant	500	500	[ms]	20 ~ 3000
P15.5	Speed_Detection Time Constant	100	100	[ms]	20 ~ 3000
P15.6	Volt/Freq Pattern	3	0		[3] Free Function
P15.7	Zero_Frequency Voltage	0	1.5	[%]	0 ~ 150
P15.8	Mid. Frequency	6	6	[Hz]	1 ~ 3000
P15.9	Mid. Frequency Voltage	11	11	[%]	0 ~ 100
P15.10	Nominal Voltage Frequency	100	99	[%]	0 ~ 300
P15.11	Nominal Output Voltage	110	100	[%]	0 ~ 150
P15.12	Output Voltage Limiter	0	0		[0] Disabled
P15.14	Sq_Crv_Voltage Compensation	25	25	[%]	0 ~ 100
P15.15	DC-Brake Time @START	0	0	[s]	0 ~ 30
P15.16	DC-Brake Blanking Time @START	0	0	[s]	0 ~ 30

P15.17	DC-Brake Current @START	75	75	[%]	0 ~ 150
P15.18	DC-Brake Time @STOP	0	0	[s]	0 ~ 30
P15.19	DC-Brake Blanking Time @STOP	0	0	[s]	0 ~ 30
P15.20	DC-Brake Hold_Current @STOP	75	75	[%]	0 ~ 150

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P15.21	DC-Brake Starting_Current @STOP	90	90	[%]	0 ~ 150
P15.22	Proportional Gain @Current Ctrl	100	100	[%]	0 ~ 1000
P15.23	Integral Gain @Current Ctrl	100	100	[%]	0 ~ 1000
P15.24	Stabilization Time Constant	0.8	0.8	[ms]	0.8 ~ 10
P15.25	Stabilization Gain	10	10	[%]	0 ~ 50
P15.26	Stabilization Limit	0.7	0.7	[%]	0 ~ 2
P15.27	High_Speed Unity_Current_Range @Frequency	300	300	[%]	100 ~ 500
P15.28	Accel_OC_Protection_Ctrl_Gain	100	100	[%]	0 ~ 3000

### G21 Load Constant [I]

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P21.0	Primary (Stator) Resistance 1 (IC)	0	0	[mΩ]	0 ~ 5000
P21.1	Primary (Stator) Resistance (IC)	0	0	[mΩ]	0 ~ 5000
P21.2	Secondary (Rotor) Resistance (IC)	0	0	[mΩ]	0 ~ 5000
P21.3	Primary (Stator) Inductance (IC)	0	0	[mH]	0 ~ 10000
P21.4	Secondary (Rotor) Inductance (IC)	0	0	[mH]	0 ~ 10000
P21.5	Leakage Inductance (IC)	0.61	0	[mH]	0 ~ 1000
P21.6	Inertia Time Constant (IC)	0.6	0.5	[s]	0.01 ~ 5
P21.7	Iron Loss	0	0	[%]	0 ~ 500
P21.8	Viscous Damping	0	0	[%]	-150 ~ 150

### G23 Sensor/Hardware Calibration

Par. NO	Parameter Name LCD Display	Setting	Default	Unit	Range
P23.0	Effective Blank Time	0	4.075	[us]	0 ~ 10
P23.3	Current Sensing Scale Adjustment	1	1	[p.u.]	1 ~ 1
P23.6	Current Offset @A	-0.902	0	[A]	-30 ~ 30
P23.7	Current Offset @B	1.332	0	[A]	-30 ~ 30
P23.8	Current Offset @C	0.348	0	[A]	-30 ~ 30
P23.9	Current Offset @A2	0	0	[A]	-30 ~ 30
P23.10	Current Offset @B2	0	0	[A]	-30 ~ 30
P23.11	Current Offset @C2	0	0	[A]	-30 ~ 30



## 8. Protection

### 8.1 Warning

State	Indication	Type	Specification
Warning <b>ERR</b> <b>[Warning]</b> *) These are only applied to VDC PWM	W1 Under Volt	Under Voltage	When DC_Link Voltage is lower than the "Under-Voltage limit" (P.5.17)
	W2 Over Volt[S]	Over Voltage1	When DC_Link Voltage exceeds the Over-Voltage limit (P.5.14) (Software manages).
	W3 Over Volt[H]	Over Voltage2	When there is a detection of Over Voltage by hardware.
	W4 Sensor Error	Sensor Error	When there is a problem of current sensor & circuit.
	W5 Over Load	Over Load	This occurs if the output current satisfies the over-load condition of P5.8 and P5.9. If P5.10=[2] ignore, it doesn't occur.
	W6 Zero Seq. Curr	Zero sequence current	There is a detection of current leakage that exceeds P15.12 (ZC Trip).
	W7 Over_Temp	Over Temperature	When the temperature of heat sink of inverter exceeds 90°C.
	W8 Device_Short	Device Short	When there is a problem with a switching device of inverter.
	W9 Drv. Disable	VD Drive Disable	When there is no "Enable" input signal from the digital input terminal when Digital Input function is set to "Drive Enable".
	W10 AR1 Disable	AR1 Disable	Analog Reference is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W11 AR2 Disable	AR2 Disable	Analog Reference 2 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W12 Pre-charging	AF1 Disable	Analog Feedback 1 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W13 ReverseVD_13	AF2 Disable	Analog Feedback 2 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W14 Drive Cal.	Drive Calibration Disorder	It occurs after parameter initialization of changing switching Frequency. Execute by [0] Drive Calibration of Auto Tuning.
	W15 ReverseVD_15	AR3 Disable	Analog Reference 3 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W16 Drv_Cooling	Drive Cooling	Once the inverter gets over-heated, the controller waits until the temperature goes down below 75°C. Then, it continues operating.
	W17 Tuning_Stop	Auto Tuning Failure	This means that "Auto-tuning is not completed well. Any operation cannot be used with this warning. Turn-off the main power and then, turn it on again to use the operation that does not need auto-tuning (etc. V/F). The drive Calibration must be executed. Reset the system

State	Indication	Type	Specification
			to operate again.
	W18 M_Brk_not_Op	Motor Brake not open	When motor brake is used, this warning tells that the condition for opening the motor brake is not qualified. In this case, the speed is not accelerated.
	W19 Ext_Fault	External Fault	This tells that inverter gets the external fault signal when it is stopped.
	W20 Acc/Dec_Byp	V/F Accel/Decel Bypass Error	Acceleration and deceleration time can be prohibited when V/F control is used. Over-Current Fault can be caused. If [17] Accel/Decel Bypass, the terminal function, is used and V/F control is used, this warning can be generated. In V/F control, If frequency is changed without Accel or Decel slop, the over-current can occur.
	W21 Low_OV_Limit	Over Voltage Limit	When there is a setting error in OV limit value.
	W22 Sync_Com_Err	Synchronous Com. Err	When there is an error in synchronous communication.
	W23 Slave Error	Slave Error	When there is an error from slaves.
	*)W24 Line_Seq_Err	Line Sequence Err	Line sequence error of VDC PWM converter
	*)W25 Line_UV	Line Under Voltage	When there is Under Voltage.
	*)W26 Line_Disconnection	Line Unbalance	When there is Unbalance input.
	*)W27 Line Over-Voltage	Line Connection Test No Fulfillment	When there is test No fulfillment.
	W28 Line Unbalance		
	W29 Line_Connection Check		
	W30 Profibus Error		
	W31 UV Limiting		
	W32 OV Limiting		
	W33 OC Limiting		
	W34 OT Limiting		
	W35 Warning Logic 1		
	W36 Warning Logic 2		
	W37 Warning Logic 3		

8.2 Errors

State	Indication	Type	Specification
Parameter Err <b>ERR[Pxx.xx]</b>	Parameter Corruption	Parameter Damage	A flash memory of parameter is damaged.
	kW/ V/ A Mismatch	Output power, Voltage Setting Err	Setting error of rated output, rated voltage, and rated current of the motor.
Parameter Combination Err <b>ERR[Parameter]</b>	Hz/rpm Mismatch	Frequency Setting Err	Setting error of Frequency, Speed, and number of poles of the motor
	Jumper Setting	VD Capacity Setting Err	Setting error of checking inverter power
	ERR[Pxx.xx]	Parameter Setting Err	A number of the parameter is indicated when there is a parameter setting error (Example: ERR[P2.1])

8.3 Fault

State	Indication	Type	Specification
Control Fault <b>ERR[Control]</b>	F1 Over Load	Over Load	When output current of inverter meets Over Load condition of P.5.7, P.5.8.
	F2 Over Curr.	Over Current [S]	When output current of inverter exceeds the set value of P.5.9. (Software manages.)
	F3 Over Curr. (H)	Over Current [H]	A state of Over Current by hardware
	F4 Zero Seq Curr.	Zero-sequence current [S]	When Zero-phase-sequence current exceeds the set value of P5.12.
	F5 Zero Seq Curr. (H)	Zero-sequence current [H]	A detection of Zero-phase-sequence current by hardware.
	F6 Under Current	Under Current	When output current of inverter meets the condition of P.5.5, P.5.6 and so the current is unusually low.
	F7 Over_Volt	Over Voltage [S]	When DC_Link voltage of the inside of inverter exceeds the set value of P.5.15. (Software manages.)
	F8 Over_Volt (H)	Over Voltage [H]	When there is a detection of Over Voltage by hardware.
	F9 Under_Volt	Under Voltage	When DC_Link voltage of the inside of inverter is lower than the set value of P.5.18. In case of using S/L Vector Control, it also happens When the connections between motor and inverter are cut.
	F10 Over Speed	Over-speeding Motor	When the motor's rotating speed exceeds the speed that is set to P17.2 (P.18.2, P.19.4, P.20).
	F11 Out of Ctrl	Out of Control	When a control condition is not good due to internal and external factors; When a brake is not

State	Indication	Type	Specification
			released; When a load is extremely big; When an input signal does not go into the encoder.
Drive Fault <b>ERR</b> [Operation]	F21 Over_Temp	Overheated Inverter	If the output frequency exceeds by 45Hz and the heat sink exceeds temperature by set in P 5.40, the fault occurs. If the output frequency is less than 45Hz, overheat detection value of inverter is changed by the output current and output frequency. It's necessary to keep watching the output frequency, current and temperature when a fault occurs.
	F22 Device_Short	IGBT/MOTOR Device_Short	When there is a problem with a switching device of inverter.
	F23 Charging Err	Initial Charge Fault	When you fail in charging the DC_link after you turn on the power.
	F24 Brake Damage	Dynamic Brake Chopper (DBR) Damage	When DC_link voltage does not go up due to a problem of built-in Brake Chopper after you turn on the power. And it also happens When over current occurs or a device is damaged while Brake Chopper is at work.
	F25 Ext_Fault	Signal Input of External Fault	When a Fault signal is inputted from external device.
	F26 Zero_Current	Fault Connection Error of gate drive voltage	When time passes the set time of P5.3 with no current in the condition that P5.2=Enabled.
	F27 Open Phase	Open phase Fault	When one of phases is broken or cut.
	F28 Motor Lock	Capacitor Bank Damage	When there is a fault in capacitor bank.
	F29 Keypad_Error	Keypad Error	When keypad is not connected well.
	F30 Sync_Com_Err	Synchronous Com. Error	When synchronous communication has an error.
	*)F31 Line_UV	Line Under Voltage	When input is low.
	*)F32 Line_Open	Line Unbalance	When input is not stable.
	*)F33 Line Sequence Change	Line Over Voltage	When input is over the rated voltage.
	F34 Line Over Voltage		
	F35 Line Unbalance		

State	Indication	Type	Specification
	F36 Profibus Error		
	F37 Fault_Logic 1		
	F38 Fault_Logic 2		
	F39 Master_Emergency		