

USER MANUAL

Forte I-302 (v2.4)
[User 37Pin]
positive



Contents

Chapter 1. Introduction

1.1 Manual Outline	1-1
1.2 Warranty	1-1

Chapter 2. General Description

2.1 Features	2-1
2.2 Electrical Construction	2-1

Chapter 3. Specifications

3.1 Specifications	3-1
3.2 Dimension	3-2

Chapter 4. Installation

4.1 Requirement	
4.1.1 For the safe operation	4-1
4.1.2 Airflow requirements	4-2
4.2 Connecting	
4.2.1 Rear side connections	4-3
4.2.2 The connection diagram of the Power supply	4-4

Chapter 5. Operation

5.1 Front Panel	5-1
5.2 Rear Panel	5-3
5.3 Operating Diagram	
5.3.1 Main menu	5-5
5.3.2 Menu map	5-6
5.4 Operating Parameter	
5.4.1 Process control	5-7
5.4.2 Arc Processing	5-8
5.4.3 Monitoring Data	5-11
5.5 Interface	
5.5.1 User1 (D-sub 37pin)	5-13

Chapter 6. Maintenance

6.1 General Troubleshooting	6-1
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Chapter 1. Introduction

1.1 Manual Outline

This manual is designed for those people who will be installing and operating the the EN's power unit. It provides the information required to safely install and operating the power unit.

If used properly, the information contained in this manual will not only promote reliable power output performance, but will also encourage a safe operating for all customers.



<Appearance>

1.2 Warranty

This product is manufactured under strict quality control and inspection by the engineers at EN Technologies Inc.

EN Technologies Inc.'s warrants to the original purchaser for a period of 12 months from the date of Shipment.

During the warranty period, products damaged under the proper usages will be repaired at request of the customers.

Damage caused by improper use or unauthorized modification of the device dose not constitute grounds for a warranty claim.

Chapter 2. General Description

2.1 Features

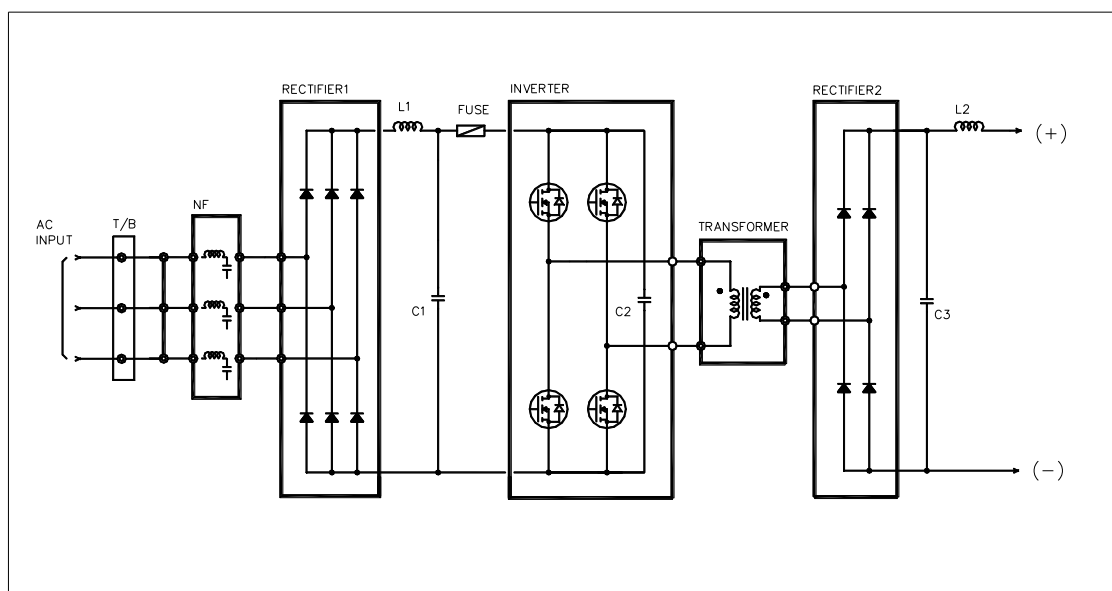
Superior Arc Management

Arc energy minimization method decreases damages on substrate during the process; resulting excellent thin film coating. Furthermore, posses control parameters (arc level, time, etc.) for arc control, providing diverse process recipe for users.

High Performance and Reliability

Applied very stable control topology, realizing high-speed and precise output control during excessive status caused by load. Constant voltage, current, and power control is possible by output regulation selection. Applied system protection device through self diagnosis function.

2.2 Electrical Construction



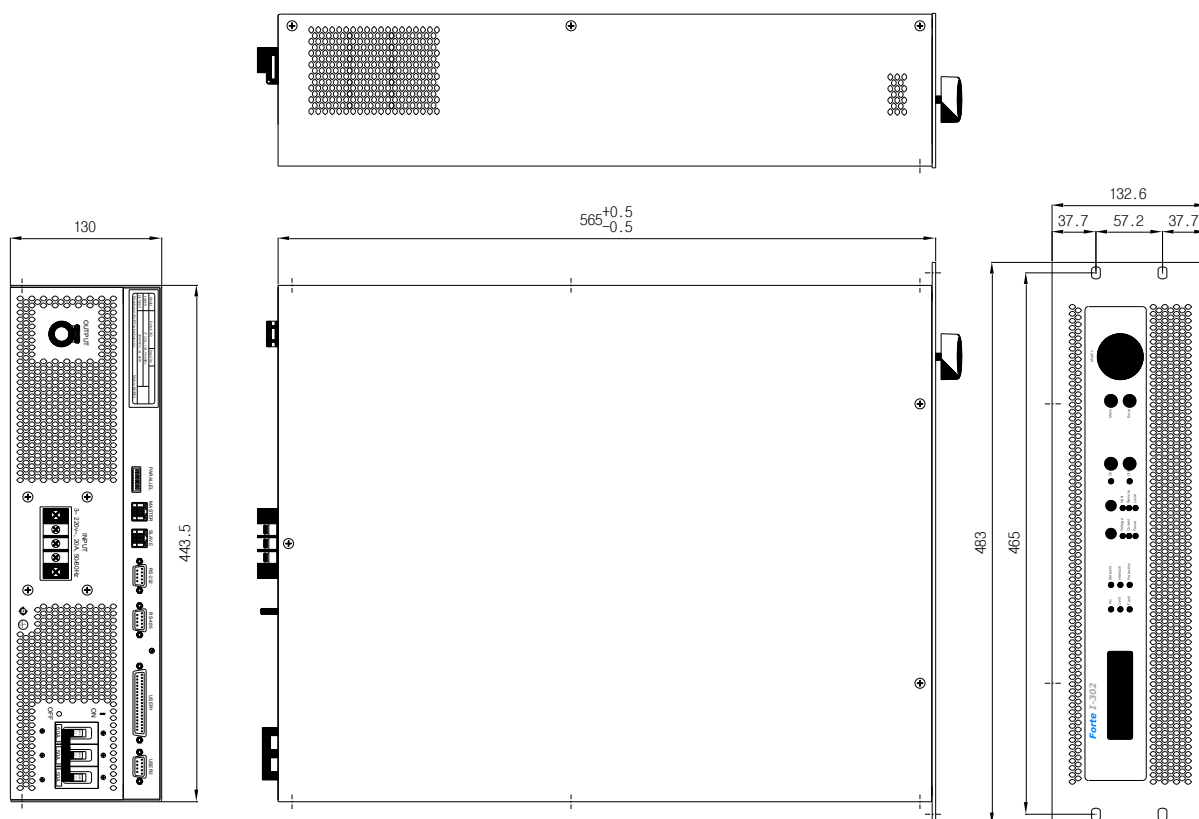
〈Schematic diagram〉

Chapter 3. Specifications

3.1 Specifications

Item	Contents
Input voltage	198VAC to 242VAC, 3Phase, 50/60Hz
Input	Less than 7kVA
Output power	6kW
Output voltage	0.2 ~ 3.0kV, No load(360V~)
Output current	2000mA
Regulation	Voltage/ Current/ Power
Voltage ripple	Less than 0.8% (rms, at rated output)
Arc energy	Less than 1mJ per 1kW
Display	VFD(2Line, 20character), Status LED
Arc control	Delay time, Pause time, Sensitivity
Interface	Host, Remote(User interface), Local
Temperature	+ 5℃ ~ 40℃ (Operating)
Dimension[mm]	133[H] × 483[W] × 565[D]
Weight	18.5kg

3.2 Dimension



<Dimensional drawing>

Chapter 4. Installation

4.1 Requirements

4.1.1 For the safe operation

► Installation Location

Avoid excessive moisture.

Avoid extremely high temperature places.

Avoid places with frequent vibration.

Avoid dusty places.

Avoid air circulation is interrupted.

► Cautions

Use ground stud for your safety.

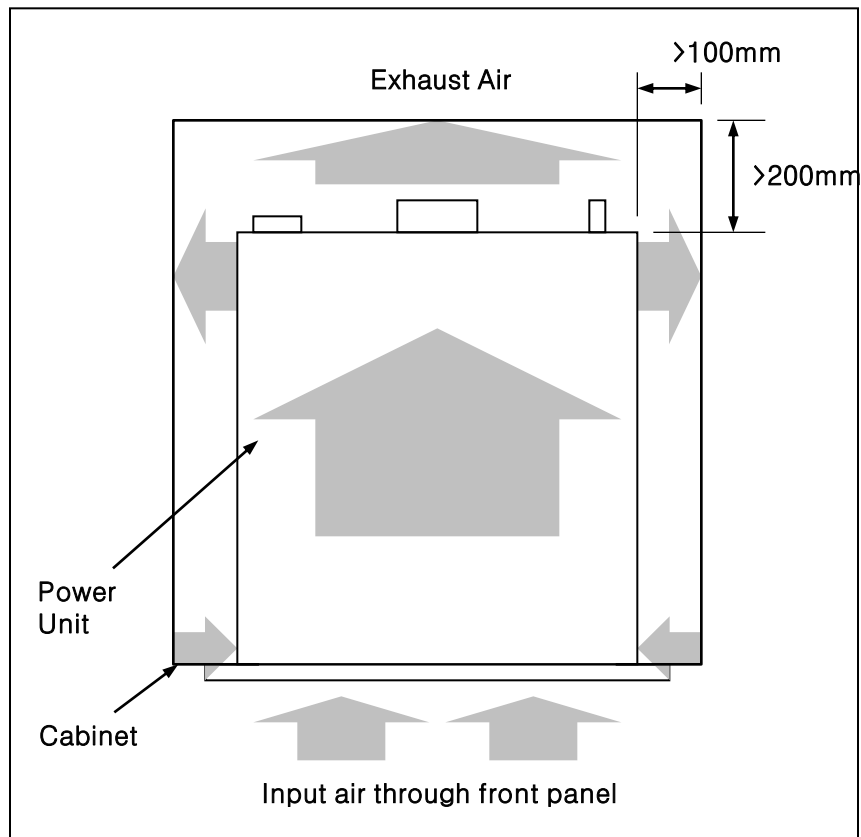
Use proper voltage.

(Prior to connecting input power, check whether it fits power supply's specifications)

Be cautious about disconnection of input & output cables.

4.1.2 Airflow requirements

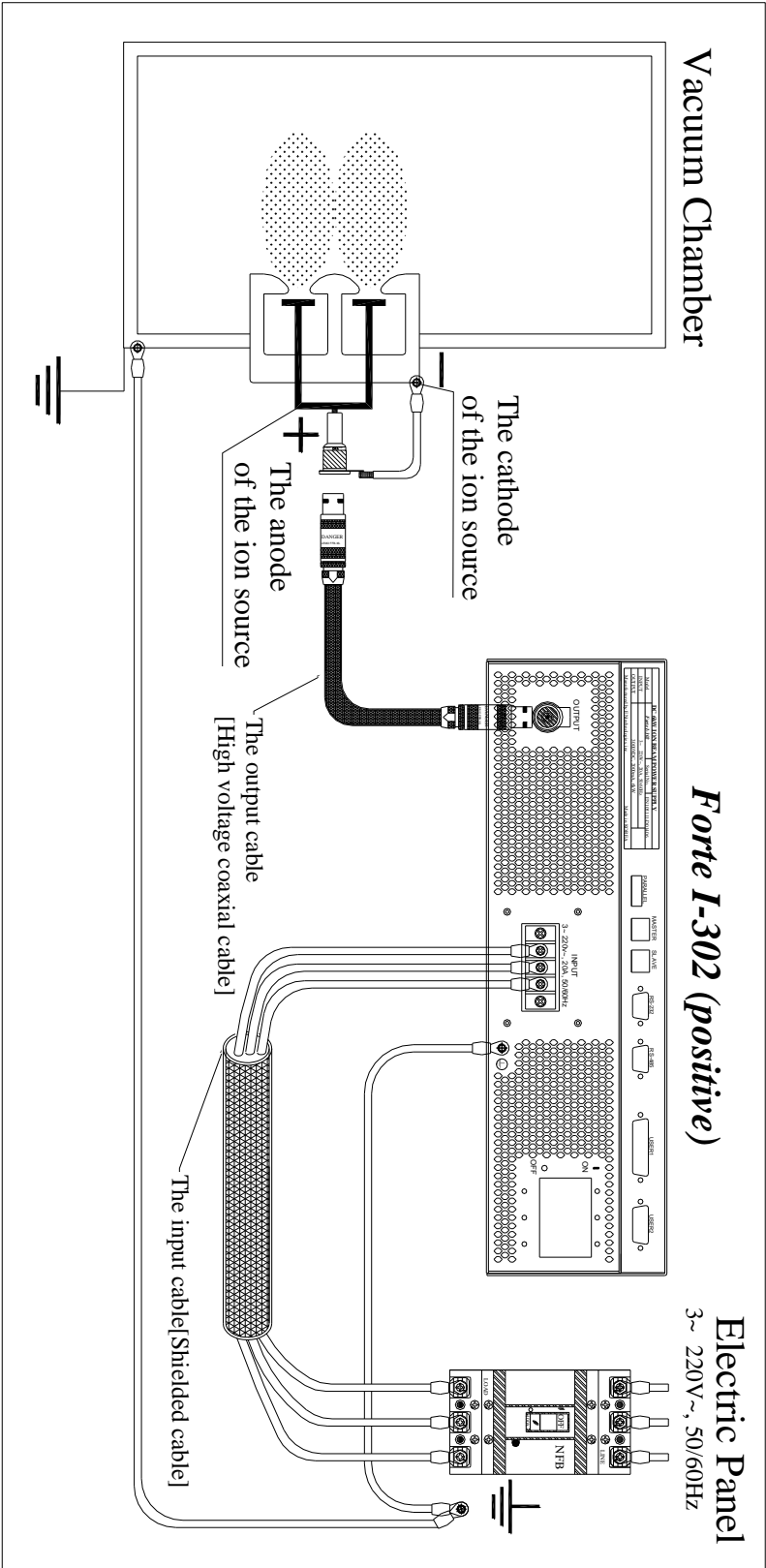
Coolant each air inlet located on the unit's front panel and front-side panel provide for air intake. Exhausted warm air leaves the unit through coolant air outlets located on the unit's rear panel and rear-side panel. Consideration must be given to the power unit's installation so as not to impede the supply or flow of air to the unit.



<Side clearance for the power unit in a cabinet>

4.2 Connecting

4.2.1 The connection schematic

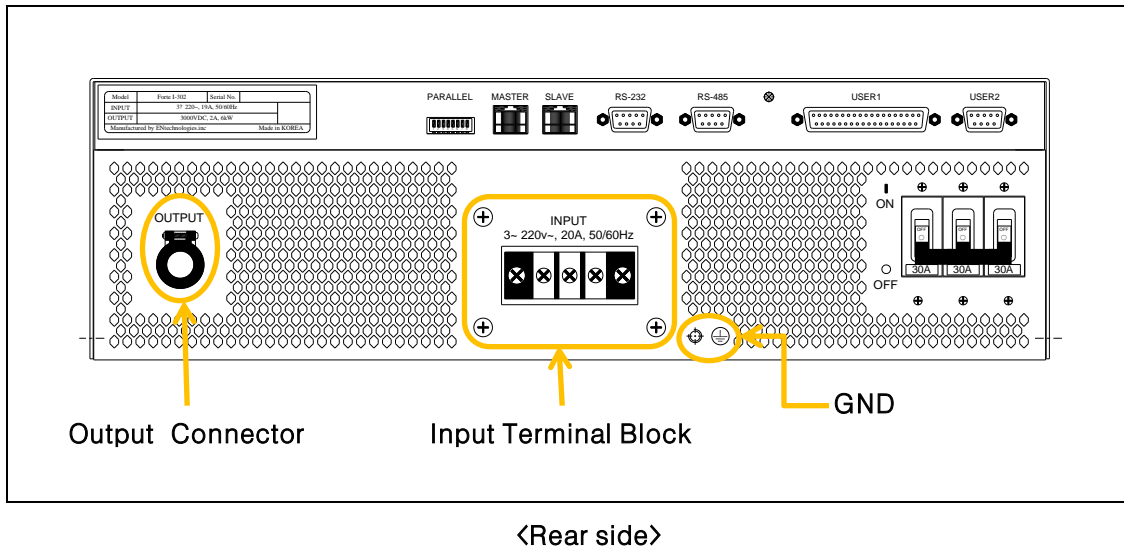


Warning

Before connecting the input cable, be sure to putting down the main switch on the main electric panel , and connect as following sequence 'Ground cable→Output Cable→Input Cable'. The input voltage should be checked before putting the main switch on, and if it is measured more than 242vac. Do not put the switch(NFB)On the main electric panel.

4.2 Connecting

4.2.2 Rear side connections



Grounding

Before making any other connection, connect a ground stud to earth ground.
For your safety, use after grounding the power supply.

Connecting input power

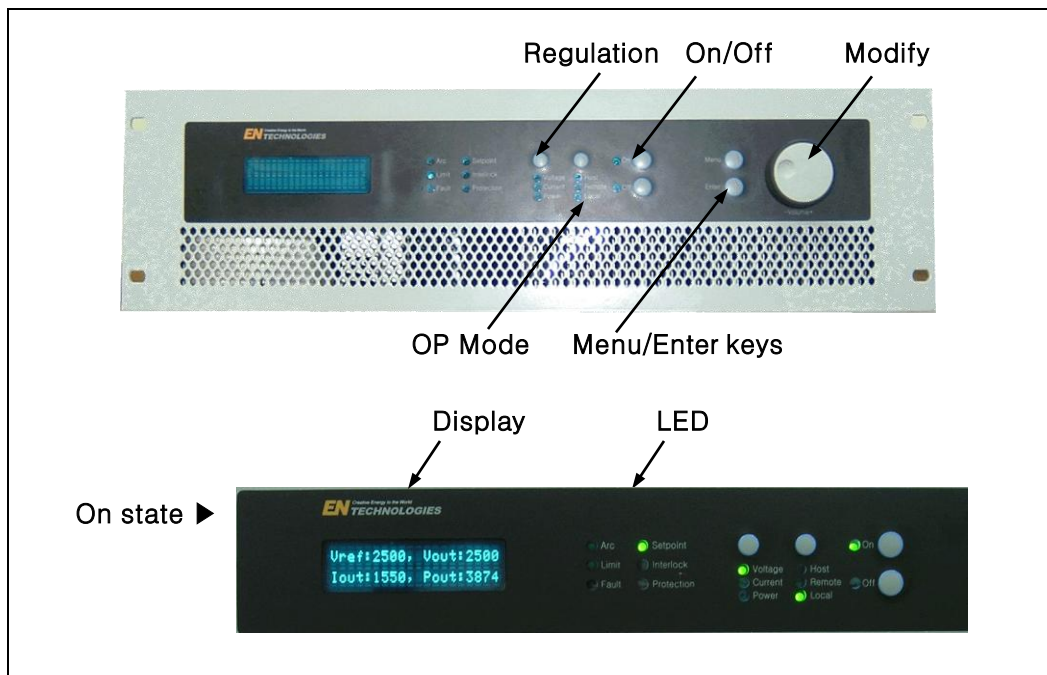
Input terminal is made of 3Pin Terminal block.
The power unit's input voltage is 220VAC, three phase, 50/60Hz.
Note that no neutral connection is required.

Connecting output power

The standard output connector is ERA.3S female, fixed socket type(LEMO).
The connector of the output cable is push-pull self-latching type(FFB 3S, male, LEMO)

Chapter 5. Operation

5.1 Front Panel



〈Front panel〉

Display	Used for indicating output status mode and the setting of set values and parameters. Moreover, displays message if fault error occurs.
LED	Used for efficient monitoring of the output status
Arc	illuminates when an arc occurs
Limit	illuminates when output voltage, current or interior temperature value exceeds than maximum set value
Fault	illuminates when an error occurs on the power supply
Setpoint	illuminates when output reach to set value
Interlock	illuminates upon interruption of the interlock circuit
Protection	illuminates when the over-current or hard arc occurs

Regulation	Used for setting the output regulation mode (Voltage/ Current/ Power)	
OP Mode	Used for selecting the controlling interface	
	Host	Gives control to the host computer through the RS-232C serial comm.
	Local	Takes back control from the serial port or user port and give it to the control panel at the front
	Remote	Gives control to the controller through the user port

※ Refer to 5.5 Interface

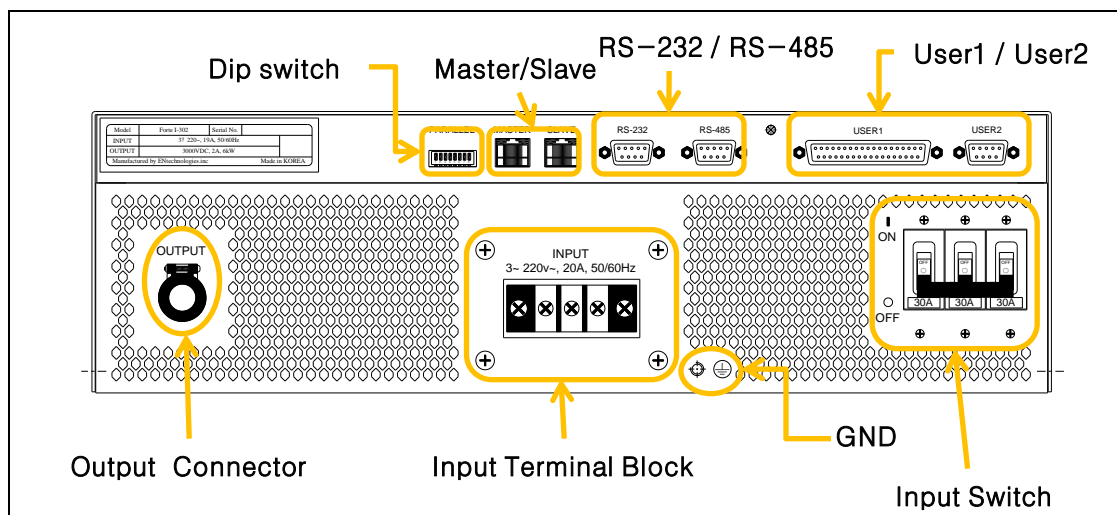
Menu/Enter keys

Used for navigating in menu lists and for setting values

On/Off Used for turning output power on and off

Volume Used for navigating in menu lists and for the setting of set values and parameters

5.2 Rear Panel



<Rear panel>

Dip switch Provides the operator a way to select the master or slave unit and set the slave address of this unit (Not available)

Master/Slave Used for operating parallel running (Not available)

RS-232 Used for operating the serial communications with a host computer
 ※ Refer to RS-232C Protocol manual

RS-485 Used for operating the serial communications with a host computer (Optional)

User1 This interface lets you use the digital interface
 Connector type is D-sub 37p female
 Please refer to 5.5 Interface.

User2 Used for operating the interface (Not available)

Output	<p>The output connector is ERA.3S female, fixed socket type(LEMO).</p> <p>The connector for the output cable is push–pull self–latching type(FFB 3S, male, LEMO)</p> <p>The center conductor is the output of a positive voltage.</p>
Input	<p>This power unit’s input voltage is 220VAC, three phase, 50/60Hz. The ac input connection is provided by means of a three terminal block.</p>
Ground	<p>Used for grounding the body of the power unit</p> <p>Always use after grounding the power supply for your safety.</p>
Input switch	<p>Used as the switch for supplying input power to power unit. Circuit protection function is internalized inside the switch.</p>

5.3 Menu Structure

5.3.1 Main menu

Process Control	This part sets general process control and relevant parameters. Sets time to output setpoint value and limit value of voltage, current, power.
Arc Processing	Parameters are designed for various arc control. Arc level, delay time, and shutdown time can be controlled.
Monitoring Data	Can monitor output status. Output voltage, current, power, number of arc occurrence per second, and operating time.

5.3.2 Menu map

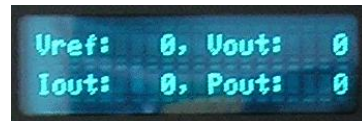
<u>Main Menu</u>	<u>Sub Menu</u>	<u>Default</u>
Process Control	Max Power (1 ~ 6000W)	6000W
	Max Current (1 ~ 2000mA)	2000mA
	Max Voltage (500 ~ 3001V)	3001V
	Ramp Time (10 ~ 2000ms)	200ms
Arc Processing	Delay Time (0 ~ 10us)	0us
	Pause Time (40 ~ 90us)	50us
	Arc Voltage (30 ~ 400V)	50V
	Arc Current(3000 ~ 6000mA)	5000mA
	Soft Arc Lev. (10 ~ 90%)	50%
	Shutdown dly (0.1 ~ 1.0ms)	0.1ms
	Shutdown tim (0.1 ~ 20.0ms)	0.3ms
Monitoring Data	Cref (Set value, V/ I/ P)	Enable
	Vout (Output voltage, V)	Enable
	Iout (Output current, mA)	Enable
	Pout (Output power, W)	Enable
	ArcN (Arc count)	Disable
	RunT (Running time, h:m)	Disable
	kWh (Accumulated power)	Disable

5.4 Operating Parameter

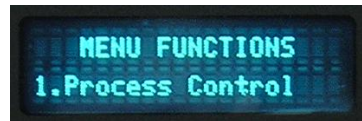
5.4.1 Process control

Max Power	Sets output capacity's Limit value.
Max Current	Sets output current's Limit value.
Max Voltage	Sets output voltage's Limit value.
Ramp time	Sets time to output Setpoint value.

- Using the process control
(To modify Max current of 2000mA to 1200mA)



1. Press Menu key.
You will see the screen on the right.
2. Press Enter key.
You will see the screen on the right.
3. Use Volume knob to move to [Max current] item.
4. Press Enter key, then cursor will blink. Use Volume knob to set the desired value. Press Enter key again.



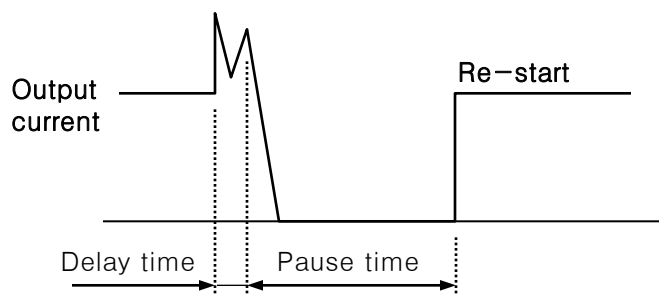
- ※ Follow the same steps to control and set other control parameters.

5.4.2 Arc Processing

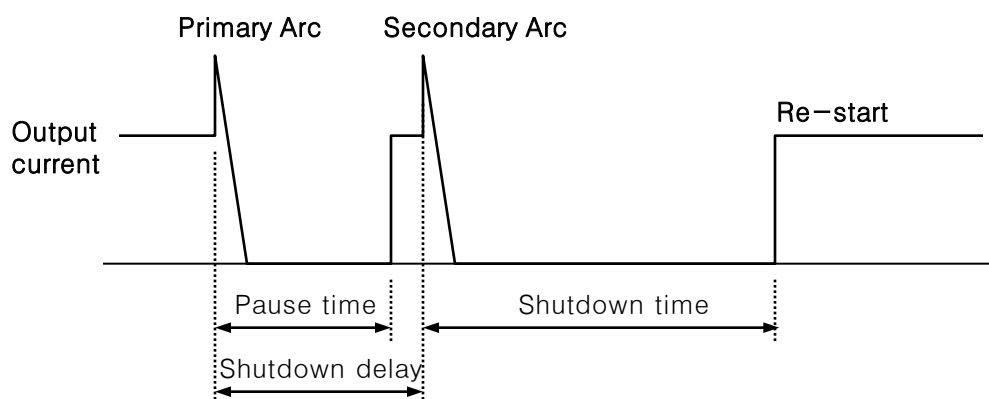
Delay time	Sets output break delay time when arc occurs. (0 ~ 10us)
Pause time	Sets break time until re-start after arc occurrence and output break (40 ~ 90us)
Arc Voltage	Sets Arc break voltage value when arc occurs Arc. (30 ~ 400V)
Arc Current	Sets arc break current value. (3000 ~ 6000mA)
Soft Arc Lev	Detects Soft Arc, control parameter for interruption of arc that is relatively more sensitive than arc current and arc voltage. (10 ~ 90%)
Shutdown dly	Detects continuity of arc occurrence, This is function for interrupting output when arc occurs more than twice during setting time. (0.1 ~ 1.0ms)
Shutdown tim	Sets break time to re-start after output is interrupted by arc detection (0.1 ~ 20.0ms)

► Explanation of parameters for arc control

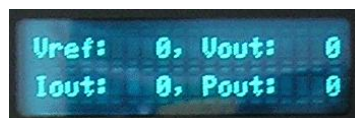
1) Single arc



2) Continuous Arc

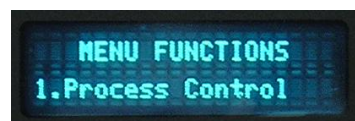


- Using the Arc processing
(To set Pause time of
40us to 100us)



Vref: 0, Vout: 0
Iout: 0, Pout: 0

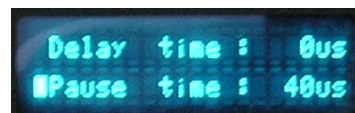
1. Press Menu key then
you will see the screen
on the right.
2. Use Volume knob to
move to [2.Arc processing]
menu.
3. Press Enter key, use
Volume knob to move to
[Pause time] item.
4. If you press Enter key,
cursor will blink. Then
use Volume knob to set
to desired value.
Press Enter key again.



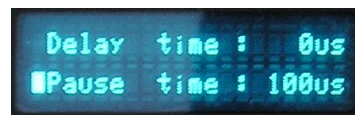
MENU FUNCTIONS
1.Process Control



MENU FUNCTIONS
2.Arc Processing



Delay time : 0us
■Pause time : 40us



Delay time : 0us
■Pause time : 100us

- ※ Follow the same steps to control and set other
Control parameters.

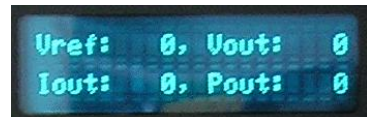
5.4.3 Monitoring Data

- This function allows users to select variables displayed at front panel for monitoring power supply's output status. Four is the maximum number of parameters that can be displayed.

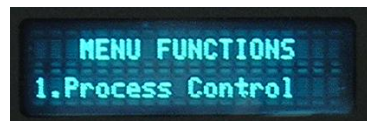
Cref	Indicates Control Mode setpoint value.
Vout	Indicates Output Voltage
Iout	Indicates Output Current
Pout	Indicates Output Power
ArcN	Indicates Number of Arc occurrence per second
kWh	Indicates Accumulated Power

- Using the monitoring data (Modify indicating factors from Vref, Vout, Iout, Pout to Vref, Vout, Iout, ArcN.)

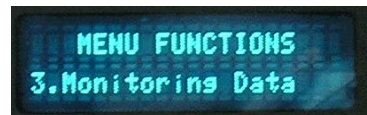
1. Press Menu key.
You will see the screen on the right.



2. Move to [3.Monitoring Data] using Volume knob



3. Press Enter key, use Volume knob to move to [Pout] item.



4. Change [Pout:o] to [Pout:x] using Enter key




SELECT ITEM (O/X) 3
Iout:0→Pout:X→ArcN:X

5. Press Enter key, move to [ArcN] using Volume knob.



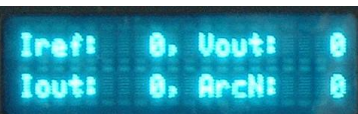
SELECT ITEM (O/X) 3
Pout:X→ArcN:X→RunT:X

6. Change [ArcN:x] to [ArcN:o] using Enter Key



SELECT ITEM (O/X) 4
Pout:X→ArcN:0→RunT:X

7. Then you will see the screen on the top-right.



Iref: 0. Uout: 0
Iout: 0. ArcN: 0

※ Other factors can also show their monitoring variables by following the same steps

5.5 Interface

5.5.1 User1(D-sub 37pin)

No.	Name	Description	Type
19	GND(D/I)	Signal Ground	Return
12	Inhibit	Inhibit(Normal open)	D/I
11	Interlock	Interlock(Normal closed)	D/I
36	GND(D/I)	Return for interlock	Return
25	Output Current	0 ~ 10V(2000mA)	A/O
23	Output Voltage	0 ~ 10V(3000V)	A/O
18	+15Vdc Out	+15Vdc,Max.100mA, Nonisolate	
24	Output Power	0 ~ 10V(6000W)	A/O
27	Reference Input	0 ~ 10V(0~100% Rated output)	A/I
17	OP Mode1	Local/ Remote/ Host (Open collector, On=Active)	D/O
22	OP Mode2		D/O
37	D/O Return	Digital Out Return line	Return
7	Remote On/Off	Remote (ON:Closed)	D/I
3	OFF State	+15V(Active high)	D/O
2	ON State	+15V(Active high)	D/O
1	Reg. Mode1	Voltage/ Current/ Power (Open collector, On=Active)	D/O
20	Reg. Mode2		D/O
14	Usable Remote	Normal Open, 15V NonAvailable Remote Mode (In Closed)	D/I
21	ARC Out	Arc Signal	D/O
33	Fault	Normal Open(+15V)	D/O

※ OP Mode(Digital Output)

State	Local	Remote	Host
OP Mode1	H(0V)	L	H
OP Mode2	L(15V)	H	H

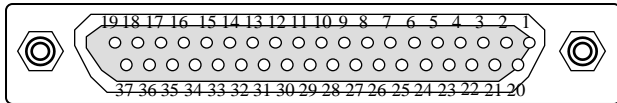
* H=On, L=Off

※ Reg. Mode(Digital Output)

State	Voltage	Current	Power
Reg. Mode1	L(15V)	H	H
Reg. Mode2	H(0V)	L	H

* H=On, L=Off

※ Example 1 Power supply

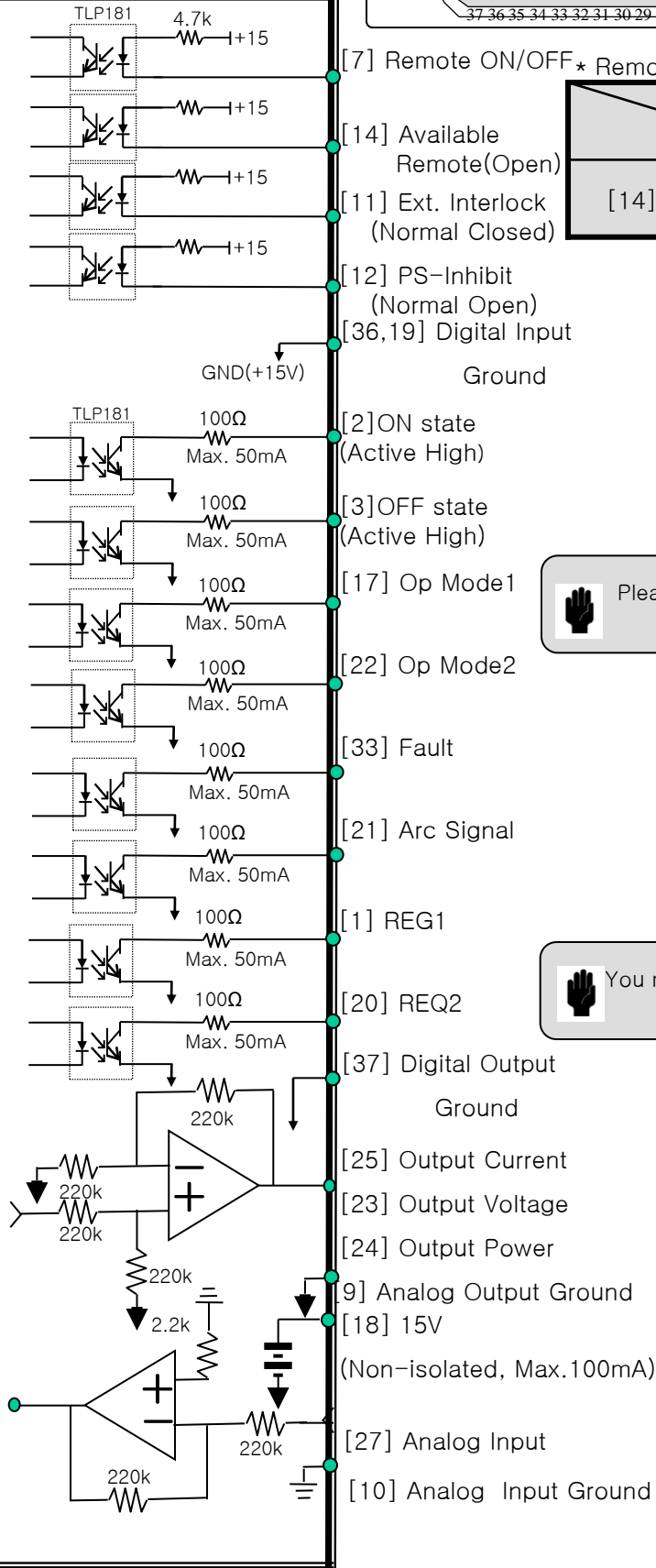


Digital Input

Digital Output

Analog I/O

D-Sub 37 Pin



Please Select the pull-up resistor more than 1.4kOhm.(Digital Output)



You must not use the unisolated analog signal (Measuring gauge, MFC, etc.)

※ Example 1 Power supply

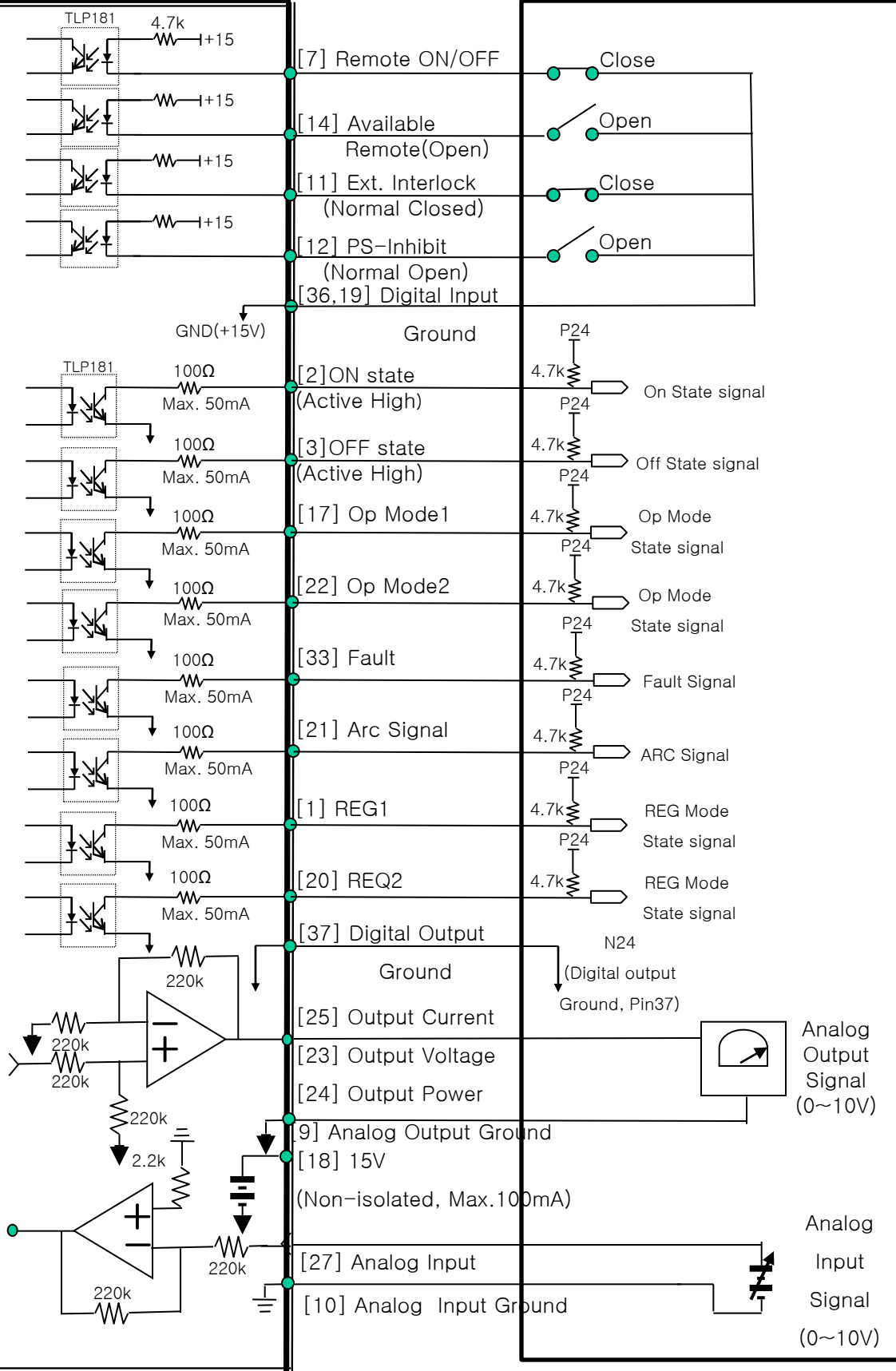
Controller(PLC)

Digital Input

Digital Output

Analog I/O

D-Sub 37 Pin



Chapter 6. Maintenance

6.1 General Troubleshooting

Symptoms	Probable Cause	Recommendations
Display(VFD) does not light	AC input power not connected.	Check rear panel input connector's connection and input power
	AC input circuit protector not turned on.	Turn the input circuit protector on
No output	Output power connector Interlock is open.	Check the interlock port
	The load is not connected	Make sure that the load is connected

